MITSUBISHI MOTORS

2003 Eclipse & Eclipse Spyder
Service Manual

VOLUME 1 (00-13A)

VOLUME 2 (13B-22B)

VOLUME 3 (23-52B)

VOLUME 4 (54-90)

2003 MITSUBISHI ECLIPSE/ ECLIPSE SPYDER SERVICE MANUAL

Volume 1

FOREWORD

This service manual is subdivided into various group categories. Each section contains diagnostic, disassembly, repair, and installation procedures, along with complete specifications and tightening references. Use of this manual will aid in properly performing any service necessary to maintain or restore the high levels of performance and reliability designed into this Mitsubishi vehicle.

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For the information on all service manual groups not listed above, please refer to Volume 2, 3 and 4.

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- Operate the engine only in a well-ventilated area.
- Keep clear of moving parts when the engine is running.
- To prevent serious burns, avoid contact with hot metal parts such as the radiator, exhaust manifold, tail pipe, catalytic converter and muffler.
- Do not smoke while working on or near a vehicle.

CALIFORNIA PROPOSITION 65 WARNING

⚠ WARNING

- ***This product contains or emits chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.***

WARNINGS REGARDING SERVICING OF SUPPLEMENTAL RESTRAINT SYSTEM (SRS) EQUIPPED VEHICLES

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- ***Improper service or maintenance of any component of the SRS, or any SRS-related component, can lead to personal injury or death to service personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).***
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2003 MITSUBISHI ECLIPSE/ ECLIPSE SPYDER SERVICE MANUAL Volume 2

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2003 MITSUBISHI ECLIPSE/ ECLIPSE SPYDER SERVICE MANUAL

Volume 3

FOREWORD

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2003 MITSUBISHI ECLIPSE/ ECLIPSE SPYDER SERVICE MANUAL

Volume 4

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GENERAL
<BODY AND CHASSIS>

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HOW TO USE THIS MANUAL

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MAINTENANCE, REPAIR AND SERVICING EXPLANATIONS

This manual provides explanations, etc. concerning procedures for the inspection, maintenance, repair and servicing of the subject model. Unless otherwise specified, each service procedure covers all models. Procedures covering specific models are identified by the model codes, or similar designation (engine type, transaxle type, etc.). A description of these designations is covered in this manual under "VEHICLE IDENTIFICATION."

ON-VEHICLE SERVICE

"ON-VEHICLE SERVICE" section has procedures for performing inspections and adjustments of particularly important components. These procedures are done with regard to maintenance and servicing, but other inspections (looseness, play, cracking, damage, etc.) must also be performed.

SERVICE PROCEDURES

The service steps are arranged in numerical order. Attention to be paid in performing vehicle service are described in detail in SERVICE POINTS.

DEFINITION OF TERMS

STANDARD VALUE

Indicates the value used as the standard for judging whether or not a part or setting up on inspection is correct.

LIMIT

Shows the maximum or minimum value for judging whether or not a part or setting up on inspection is acceptable.

REFERENCE VALUE

Indicates the adjustment value prior to starting the work (presented in order to facilitate assembly and adjustment procedures, and so they can be completed in a shorter time).

DANGER, WARNING, AND CAUTION

DANGER, WARNING, and CAUTION call special attention to a necessary action or to an action that must be avoided. The differences among DANGER, WARNING, and CAUTION are as follows:

- If a DANGER is not followed, the result is severe bodily harm or even death.
- If a WARNING is not followed, the result could be bodily injury.
- If a CAUTION is not followed, the result could be damage to the vehicle, vehicle components or service equipment.

TIGHTENING TORQUE INDICATION

The tightening torque indicates a median and its tolerance by a unit of N·m (in-lb) or N·m (ft-lb). For fasteners with no assigned torque value, refer to P.00-33.

SPECIAL TOOL NOTE

Only MMC special tool part numbers are called out in the repair sections of this manual. Please refer to the special tool cross reference chart located at the beginning of each group for a cross reference from the MMC special tool number to the special tool number that is available in your market.

ABBREVIATIONS

The following abbreviations are used in this manual for classification of model types.

M/T:Indicates manual transaxle, or models equipped with manual transaxle.
A/T: Indicates automatic transaxle, or models equipped with automatic transaxle.
MFI: Indicates multiport fuel injection, or engines equipped with multiport fuel injection.
A/C: Indicates air conditioning.
2.4L Engine: Indicates the 2.4 liter <4G64> engine, or a model equipped with such an engine.
3.0L Engine: Indicates the 3.0 liter <6G72> engine, or a model equipped with such an engine.
PCM: Powertrain control module
ECM: Engine control module
SWS: Simplified Wiring System

EXPLANATION OF MANUAL CONTENTS

Indicates procedures to be performed before the work in that section is started, and procedures to be performed after the work in that section is finished.

Component diagram

A diagram of the component parts is provided near the front of each section in order to give the reader a better understanding of the installed condition of component parts.

Maintenance and servicing procedures

The numbers provided within the diagram indicate the sequence for maintenance and servicing procedures.

- Removal steps :
  The part designation number corresponds to the number in the illustration to indicate removal steps.
- Disassembly steps :
  The part designation number corresponds to the number in the illustration to indicate disassembly steps.
- Installation steps :
  Specified in case installation is impossible in reverse order of removal steps. Omitted if installation is possible in reverse order of removal steps.
- Assembly steps :
  Specified in case assembly is impossible in reverse order of disassembly steps. Omitted if assembly is possible in reverse order of disassembly steps.

Classifications of major maintenance / service points

When there are major points relative to maintenance and servicing procedures (such as essential maintenance and service points, maintenance and service standard values, information regarding the use of special tools, etc.). These are arranged together as major maintenance and service points and explained in detail.

<<A>> : Indicates that there are essential points for removal or disassembly.
>>A<< : Indicates that there are essential points for installation or assembly.

Symbols for lubrication, sealants and adhesives

Symbols are used to show the locations for lubrication and for application of sealants and adhesives.
These symbols are included in the diagram of component parts or on the page following the component parts page. The symbols do not always have accompanying text to support that symbol.

- : Grease
  (Multi-purpose grease unless there is a brand or type specified)
- : Sealant or adhesive
- : Brake fluid or automatic transmission fluid
- : Engine oil, gear oil or air conditioning compressor oil
- : Adhesive tape or butyl rubber tape

AC102240AB

TSB Revision

Indicates the group title.

Indicates the section title.

Indicates the group number.

Indicates the page number.

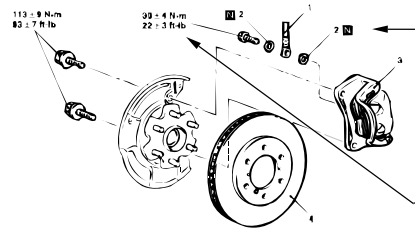
BASIC BRAKE SYSTEM
FRONT DISC BRAKE ASSEMBLY

35A-81

FRONT DISC BRAKE ASSEMBLY

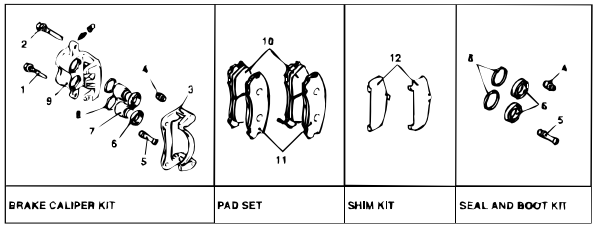
REMOVAL AND INSTALLATION

Pre-removal Operation	Post-installation Operation
• Brake Fluid Draining	• Brake Fluid Supplying and Air Bleeding (Refer to .)



Mark N denotes non-reusable part.

Denotes tightening torque. If there is no indication of tightening torque, refer to tightening torque



BRAKE CALIPER KIT	PAD SET	SHIM KIT	SEAL AND BOOT KIT

Repair kit or parts sets are shown. (Only very frequently used parts are shown.)

REMOVAL STEPS
1. BRAKE HOSE CONNECTION
2. GASKET

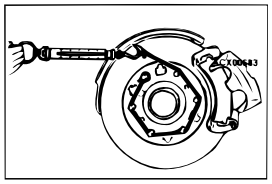
REMOVAL STEPS (Cont.)
>>A<< 3. DISC BRAKE ASSEMBLY
4. BRAKE DISC

Required Special Tool:
- MB990520: Disc Brake Piston Expander

Operating procedures, cautions, etc. Removal, installation, disassembly and assembly are described.

INSTALLATION SERVICE POINT

>>A<< DISC BRAKE ASSEMBLY INSTALLATION



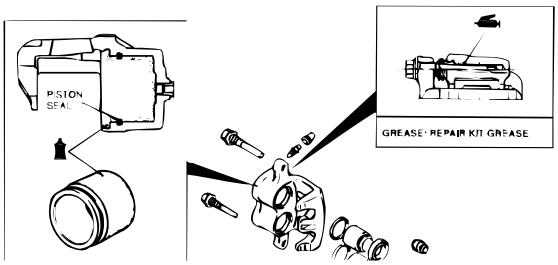
1. To check the brake drag force after mounting the pad, measure the hub torque in the advancing direction using a spring balance with the pad is removed.

⚠ CAUTION
Do not allow any oil, grease or other contamination to contact the friction surfaces of the pads and brake discs.

2. After re-installing the caliper support to the knuckle, install the pad clips and the pads to the caliper support.

The title of the page (following the page on which the diagram of component parts is presented) indicating the locations of lubrication and sealing procedures.

LUBRICATION AND SEALING POINTS



Indicates (by symbols) where lubrication is necessary.

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TROUBLESHOOTING GUIDELINES

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VERIFY THE COMPLAINT

- Make sure the customer's complaint and the service writer's work order description are understood before starting work.
- Make sure the correct operation of the system is understood. Read the service manual description to verify any aspect of normal system operation.
- Operate the system to see the symptoms. Look for other symptoms that were not reported by the customer, or on the work order, that may be related to the problem.

DETERMINE POSSIBLE CAUSES

Compare the confirmed symptoms to the diagnostic symptom indexes to get to the right diagnosis procedure.
If the confirmed symptoms can not be found on any symptom index, determine other possible causes.

- Analyze the system diagrams and list all possible causes for the problem symptoms.
- Rank all these possible causes in order of probability, based on how much of the system they cover, how likely they are to be the cause, and how easy they will be to check. Be sure to take experience into account. Consider the causes of similar problems seen in the past. The list of causes should be ranked in order from general to specific, from most-likely to least-likely, and from easy-to-check to hard-to-check.

FIND THE PROBLEM

After the symptoms have been confirmed, and probable causes have been identified, the next step is to make step-by-step checks of the suspected system components, junctions, and links in logical order.
Use the diagnostic procedures in the service manual whenever possible. Follow these procedures carefully to avoid missing an important step in the diagnosis sequence. It might be the skipped step that leads to the solution of the problem.
If the service manual doesn't have step-by-step procedures to help diagnose the problem, come up with a series of checks based on the ranked list of probable causes. Troubleshooting checks should be made in the order that the list of causes was ranked:

- general to specific
- most-likely to least-likely
- easy-to-check to hard-to-check

REPAIR THE PROBLEM

When the step-by-step troubleshooting checks find a fault, perform the proper repairs. Be sure to fix the root cause of the problem, not just the symptom. Just fixing the symptom, without fixing the root cause, will cause the symptom to eventually return.

VERIFY THE REPAIR

After repairs are made, recheck the operation of the system to confirm that the problem is eliminated. Be sure to check the system thoroughly. Sometimes new problems are revealed after repairs have been made.

HOW TO USE TROUBLESHOOTING/INSPECTION SERVICE POINTS

M1001000200258

Troubleshooting of electronic control systems for which the scan tool can be used follows the basic outline described below. Even in systems for which the scan tool cannot be used, part of these systems still follow this outline.

TROUBLESHOOTING CONTENTS

1. STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

Troubleshooting strategy is shown in each group.

2. SYSTEM OPERATION AND SYMPTOM VERIFICATION TESTS

If verification of the symptom(s) is difficult, procedures for checking operation and verifying symptoms are shown.

3. DIAGNOSTIC FUNCTION

The following trouble code diagnosis are shown.

- How to read diagnostic trouble codes
- How to erase diagnostic trouble codes
- Input inspection service points

4. DIAGNOSTIC TROUBLE CODE CHART
If the scan tool displays a diagnostic trouble code, retrieve an applicable inspection procedure according to this chart.

5. SYMPTOM CHART
If there are symptoms, even though the results of inspection using the scan tool show that all diagnostic trouble codes are normal, inspection procedures for each symptom will be found by using this chart.

6. DIAGNOSTIC TROUBLE CODE PROCEDURES
Indicates the inspection procedures corresponding to each diagnostic trouble code.

7. SYMPTOM PROCEDURES
Indicates the inspection procedures corresponding to each symptoms classified in the Symptom Chart.

8. SERVICE DATA REFERENCE TABLE
Inspection items and normal judgement values have been provided in this chart as reference information.

9. CHECK AT ECU TERMINALS
Terminal numbers for the ECU connectors, inspection items, and standard values have been provided in this chart as reference information.

Terminal Voltage Checks
1. Connect a needle-nosed wire probe to a voltmeter probe.

⚠ CAUTION
Short-circuiting the positive (+) probe between a connector terminal and ground could damage the vehicle wiring, the sensor, the ECU, or all three. Use care to prevent this!

2. Insert the needle-nosed wire probe into each of the ECU connector terminals from the wire side, and measure the voltage while referring to the check chart.
   NOTE: Measure voltage with the ECU connectors connected.
   You may find it convenient to pull out the ECU to make it easier to reach the connector terminals.
   Checks don't have to be carried out in the order given in the chart.
3. If voltage readings differ from normal condition values, check related sensors, actuators, and wiring, then replace or repair.
4. After repair or replacement, recheck with the voltmeter to confirm that the repair has corrected the problem.

Terminal Resistance and Continuity Checks
1. Turn the ignition switch to "LOCK" (OFF) position.
2. Disconnect the ECU connector.

⚠ CAUTION
If resistance and continuity checks are performed on the wrong terminals, damage to the vehicle wiring, sensors, ECU, and/or ohmmeter may occur. Use care to prevent this!

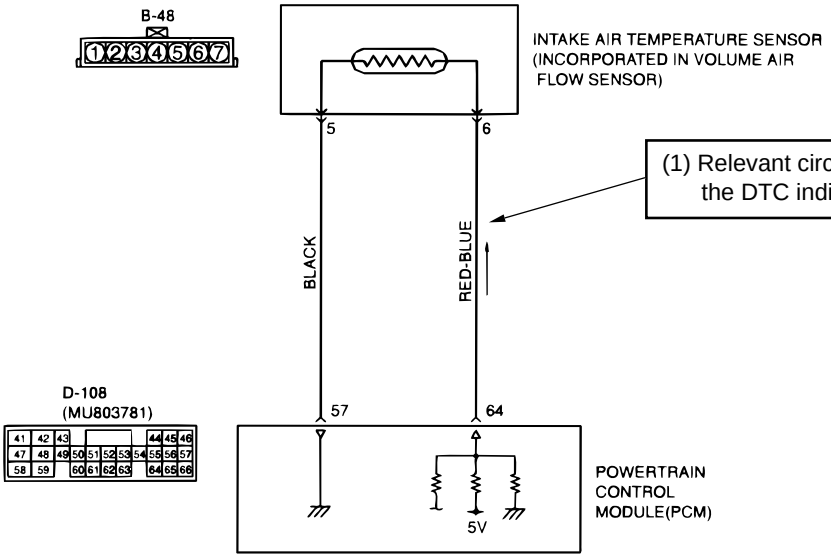
3. Measure the resistance and check for continuity between the terminals of the ECU harness-side connector while referring to the check chart.
   NOTE: Checks don't have to be carried out in the order given in the chart.
4. If the ohmmeter shows any deviation from the Normal Condition value, check the corresponding sensor, actuator and related electrical wiring, then repair or replace.
5. After repair or replacement, recheck with the ohmmeter to confirm that the repair has corrected the problem.

10. INSPECTION PROCEDURES USING AN OSCILLOSCOPE
When there are inspection procedures using an oscilloscope, these are listed here.

HOW TO USE THE INSPECTION PROCEDURES

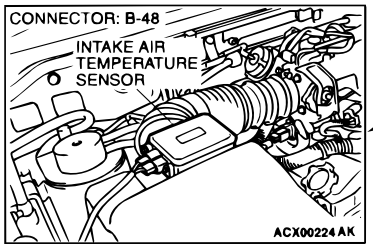
The causes of many of the problems occurring in electric circuitry are generally the connectors, components, the ECU, and the harnesses between connectors, in that order. These inspection procedures follow this order. They first try to discover a problem with a connector or a defective component.

DTC P0110: Intake Air Temperature Circuit Malfunction



(1) Relevant circuit(s) of the component which the DTC indicates are described.

(2) Shows the location of the connector(s) from the circuit(s) above.



(3) Explains about the operation principle of the component or its relevant parts in that circuit.

CIRCUIT OPERATION

- Approximately 5 volts are applied to the intake air temperature sensor output terminal (terminal 6) from the PCM (terminal 64) via the resistor in the PCM. The ground terminal (terminal 5) is grounded with or PCM (terminal 57).
- The intake air temperature sensor is a negative temperature coefficient type of resistor. When the intake air temperature rises, the resistance decreases.
- The intake air temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases.

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(4) Explains about technical details.

(5) Describes the conditions for that DTC being set (stored).

(6) Describes possible cause(s)for that DTC.

(7) Start of the diagnosis procedure for that DTC.

(8) Identifies the special tool(s) necessary for diagnosing that DTC.

(9) Provides the inspection procedure for that DTC step by step.

TECHNICAL DESCRIPTION
- The intake air temperature sensor converts the intake air temperature to a voltage.
- The PCM checks whether this voltage is within a specified range.

DTC SET CONDITIONS

Check Conditions
- Two seconds or more have passed since the engine was started.

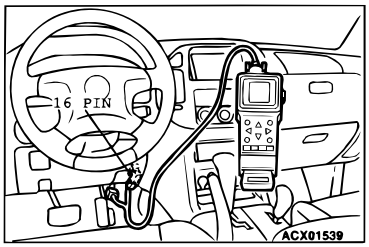
Judgement Criteria
- Intake air temperature sensor output voltage has continued to be 4.6 volts or higher [corresponding to an air intake temperature of -45°C (-49°F) or lower] for 2 seconds.

- ntake air temperature sensor output voltage has continued to be 0.2 volt or lower [corresponding to an air intake temperature of 125°C (257°F) or higher] for 2 seconds.

TROUBLESHOOTING HINTS(The most likely causes for this code to be set are:)
- Intake air temperature sensor failed.
- Open or shorted intake air temperature sensor circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tool:
MB991502: Scan Tool(MUT-II)



STEP 1. Using scan tool MB991502, check data list item 13: Intake Air Temperature Sensor.

CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 13, Intake Air Temperature Sensor.
- The intake air temperature and temperature shown with the scan tool should approximately match.

(4) Turn the ignition switch to "LOCK"(OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points.

NO : Go to Step 2.

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HARNESS INSPECTION

Check for an open or short circuit in the harness between the terminals which were faulty according to the connector measurements. Carry out this inspection while referring to GROUP 00E, Harness Connector Inspection P.00E-2. Here, "Check harness between power supply and terminal xx" also includes checking for blown fuse. For inspection service points when there is a blown fuse, refer to "Inspection Service Points for a Blown Fuse."

MEASURES TO TAKE AFTER REPLACING THE ECU

If the trouble symptoms have not disappeared even after replacing the ECU, repeat the inspection procedure from the beginning.

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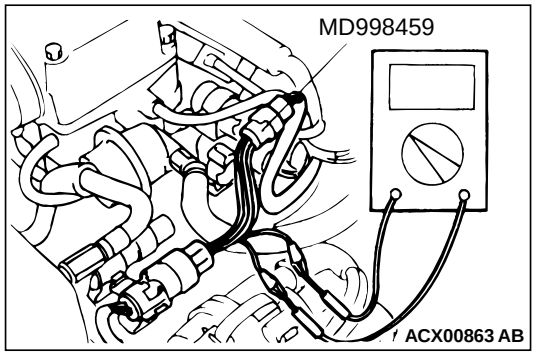
CONNECTOR MEASUREMENT SERVICE POINTS

Turn the ignition switch to the "LOCK" (OFF) position when connecting and disconnecting the connectors. Turn the ignition switch to "ON" when measuring if there are no instructions to the contrary.

IF INSPECTING WITH THE CONNECTOR CONNECTED

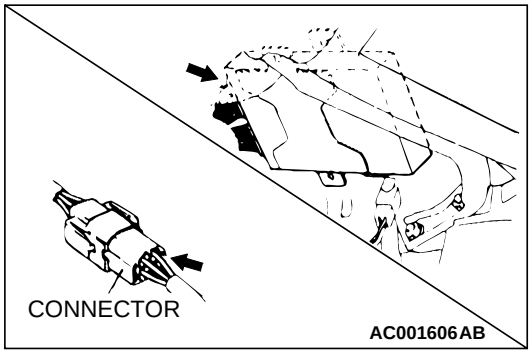
Required Special Tool:
MD998459: Test Harness

Waterproof Connectors



Be sure to use special tool, MB998459. Never insert a test probe from the harness side, as this will reduce the waterproof performance and result in corrosion.

Ordinary (non-waterproof) Connectors



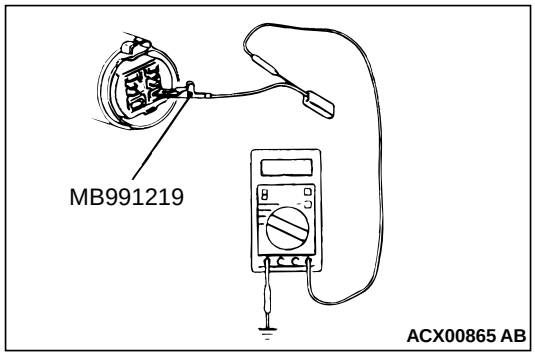
Check by inserting the multi-meter test probe from the harness side. Note that if the connector (control unit, etc.) is too small to permit insertion of the test probe, it should not be forced; use the backprobing tool for this purpose.

IF INSPECTING WITH THE CONNECTOR DISCONNECTED

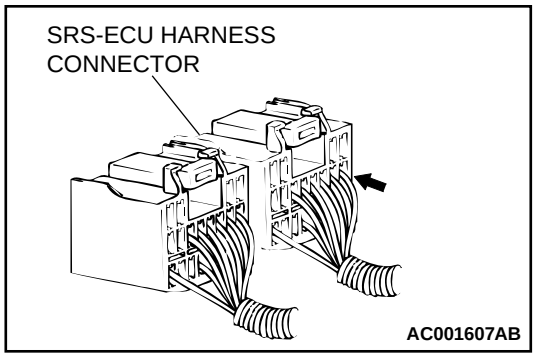
<When Inspecting a Female Pin>

- From front side of the connector

  Required Special Tool:
  MB991219:
  Inspection Harness (Included in MB991223, Harness Set)
  The inspection harness for connector pin contact pressure should be used. The test probe should never be forcibly inserted, as it may cause a defective contact.



- From back side of the connector (SRS-ECU harness side connector)



Since the SRS-ECU harness connector is plated to improve conductivity, observe the warning below when checking this connector.

⚠ *WARNING*

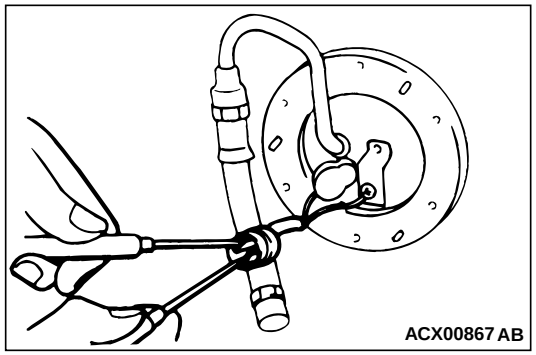
Insert the backprobing tool into the connector from the harness side, and connect the tester to the backprobing tool. If any tool other than the backprobing tool is used, it may cause damage to the harness and other components. Furthermore, measurement should not be carried out by touching the backprobing tool directly against the terminals from the front of the connector. The terminals are plated to increase their conductivity, so that if they are touched directly by the backprobing tool, the plating may break, which will decrease reliability.

<When Inspecting a Male Pin>

⚠ CAUTION

At this time, be careful not to short the connector pins with the test probes. To do so may damage the circuits inside the ECU.

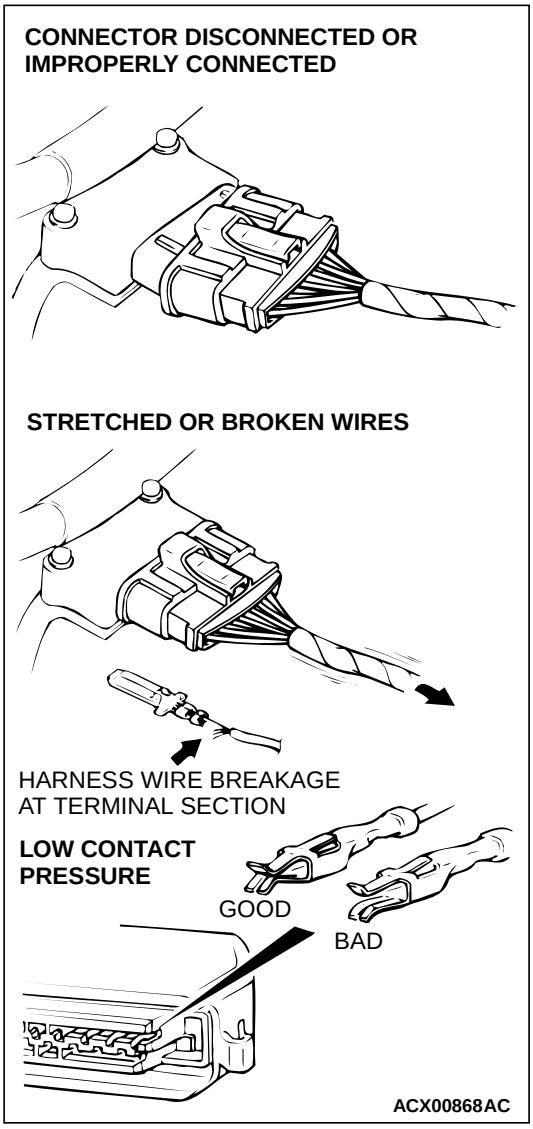
Touch the pin directly with the test probe.



CONNECTOR INSPECTION SERVICE POINTS

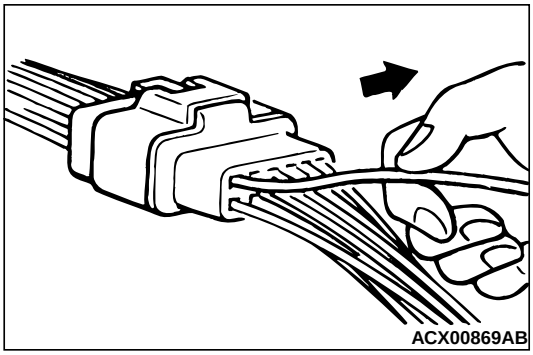
VISUAL INSPECTION

- Connector is disconnected or improperly connected
- Connector pins are pulled out
- Stretched an broken wires at terminal section
- Low contact pressure between male and female terminals
- Low connection pressure due to rusted terminals or foreign matter lodged in terminals



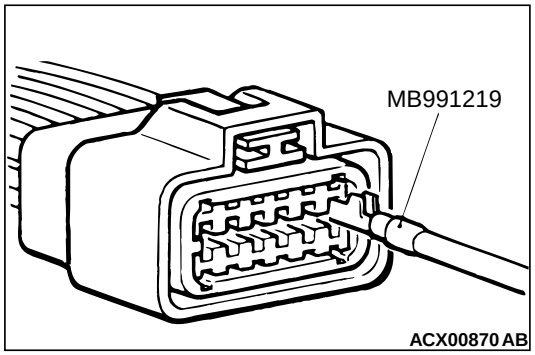
CONNECTOR PIN INSPECTION

If the connector pin stopper is damaged, the terminal connections (male and female pins) will not be perfect even when the connector body is connected, because the pins may pull out of the back side of the connector. Therefore, gently pull the wires one by one to make sure that no pins pull out of the connector.



CONNECTOR ENGAGEMENT INSPECTION

Required Special Tool:
MB991219: Inspection Harness (contained in MB991223 Test Harness)
Use special tool, MB991219 to inspect the engagement of the male pins and female pins. [Pin drawing force: 1 N (0.2 pound) or more]



HOW TO COPE WITH INTERMITTENT MALFUNCTIONS

Most intermittent malfunctions occur under certain conditions. If those conditions can be identified, the cause will be easier to find.

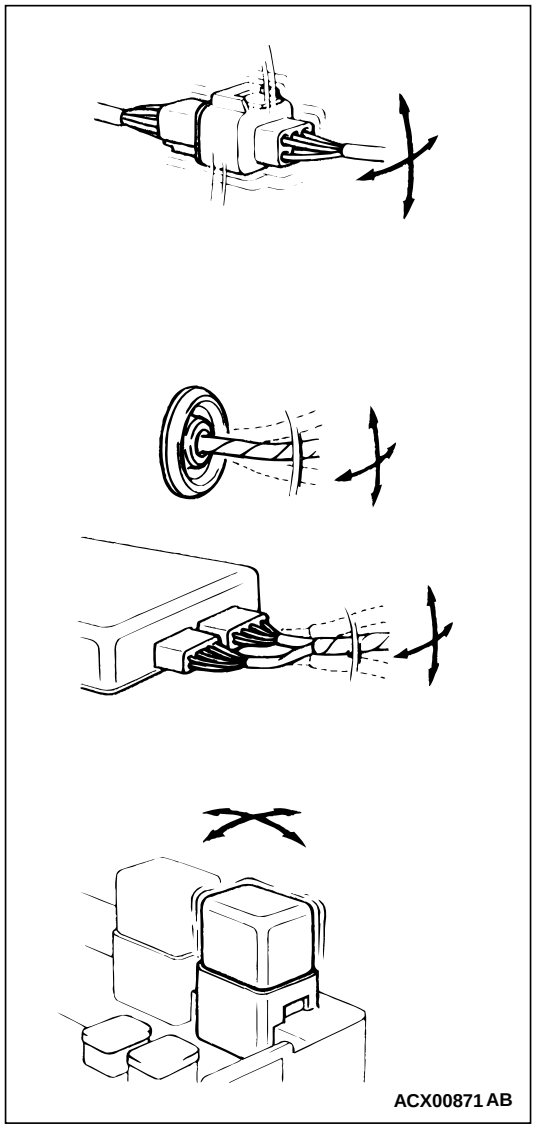
TO COPE WITH INTERMITTENT MALFUNCTION;

1. Ask the customer about the malfunction
Ask what it feels like, what it sounds like, etc. Then ask about driving conditions, weather, frequency of occurrence, and so on.

2. Determine the conditions from the customer's responses
Typically, almost all intermittent malfunctions occur from conditions like vibration, temperature and/or moisture change, poor connections. From the customer's responses, it should be reasoned which condition is most likely.

3. Use simulation test
In the cases of vibration or poor connections, use the simulation tests below to attempt to duplicate the customer's complaint. Determine the most likely circuit(s) and perform the simulation tests on the connectors and parts of that circuit(s). Be sure to use the inspection procedures provided for diagnostic trouble codes and trouble symptoms.
For temperature and/or moisture condition related intermittent malfunctions, try to change the conditions of the suspected circuit components, then use the simulation tests below.

4. Verify the intermittent malfunction is eliminated
Repair the malfunctioning part and try to duplicate the condition(s) again to verify the intermittent malfunction has been eliminated.



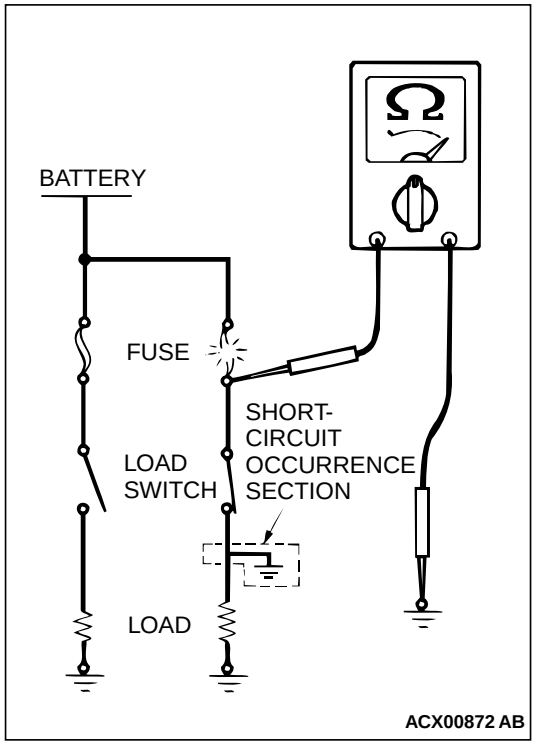
SIMULATION TESTS

NOTE: In case of difficulty in finding the cause of the intermittent malfunction, the data recorder function in the scan tool is effective.

For these simulation tests, shake, then gently bend, pull, and twist the wiring of each of these examples to duplicate the intermittent malfunction.

- Shake the connector up-and-down, and right-and-left.
- Shake the wiring harness up-and-down, and right-and-left. Especially, check the splice points of wiring harnesses carefully. Refer to GROUP 80B, SPLICE LOCATION P.00E-2.
- Vibrate the part or sensor.

INSPECTION SERVICE POINTS FOR A BLOWN FUSE



Remove the blown fuse and measure the resistance between the load side of the blown fuse and the ground. Close the switches of all circuits which are connected to this fuse. If the resistance is almost 0 Ω at this time, there is a short somewhere between these switches and the load. If the resistance is not 0 Ω, there is no short at the present time, but a momentary short has probably caused the fuse to blow.
The main causes of a short circuit are the following.

- Harness being clamped by the vehicle body
- Damage to the outer casing of the harness due to wear or heat
- Water getting into the connector or circuitry
- Human error (mistakenly shorting a circuit, etc.)

VEHICLE IDENTIFICATION

VEHICLE IDENTIFICATION

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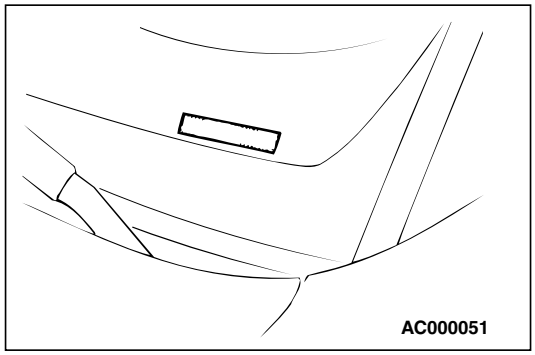
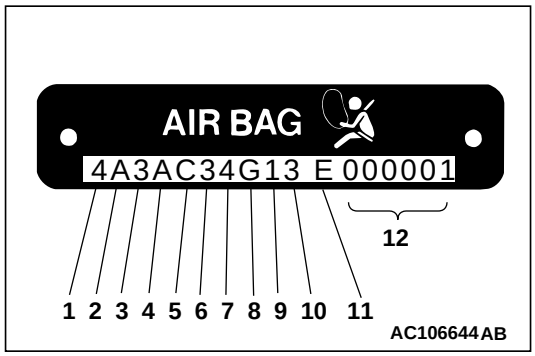


VEHICLES IDENTIFICATION NUMBER LOCATION

The vehicle identification number (VIN) is located on a plate attached to the left top side of the instrument panel.

VEHICLE IDENTIFICATION CODE CHART PLATE



All vehicle identification numbers contain 17 digits. The vehicle number is a code which tells country, make, vehicle type, etc.

NO.	ITEMS	CONTENTS
1	Country	4: USA
2	Make	A: Mitsubishi
3	Vehicle type	3: Passenger car
4	Others	A: Driver and passenger air bags
5	Line	C: ECLIPSE
		E: ECLIPSE SPYDER
6	Price class	3: Medium
		4: High
		5: Premium
		7: ULTIMATE
		8: Sports
7	Body	4: 3-door hatch back
		5: 2-door convertible
8	Engine	G: 2.4L S-4 (4G64)
		H: 3.0L S-4 (6G72)
9	Check digits*	0, 1, 2, 3, ----------9, X
10	Model year	3: 2003 year
11	Plant	E: Mitsubishi Motor Manufacturing of America, Inc.
12	Serial number	000001 to 999999

*NOTE: *: Check digit means a single number, or letter X, used to verify the accuracy of transcription of vehicle identification number.*

VEHICLE IDENTIFICATION NUMBER LIST

ECLIPSE

VEHICLES FOR FEDERAL EMISSION REGULATION

VIN (EXCEPT SEQUENCE NUMBER)	BRAND	ENGINE DISPLACEMENT	MODEL CODE
4A3AC34G_3E	MITSUBISHI ECLIPSE	2.4L	D52AMNJEL4M
			D52AMRJEL4M
4A3AC44G_3E			D52AMNHEL4M
			D52AMRHEL4M
4A3AC84H_3E		3.0L	D53AMNXEL4M
			D53AMRXEL4M
4A3AC54H_3E			D53AMNGEL4M
			D53AMRGEL4M
4A3AC74H_3E			D53AMNPVL4M
			D53AMRPVL4M

VEHICLES FOR CALIFORNIA EMISSION REGULATION

VIN (EXCEPT SEQUENCE NUMBER)	BRAND	ENGINE DISPLACEMENT	MODEL CODE
4A3AC34G_3E	MITSUBISHI ECLIPSE	2.4L	D52AMNJEL9M
			D52AMRJEL9M
4A3AC44G_3E			D52AMNHEL9M
			D52AMRHEL9M

ECLIPSE SPYDER

VEHICLES FOR FEDERAL EMISSION REGULATION

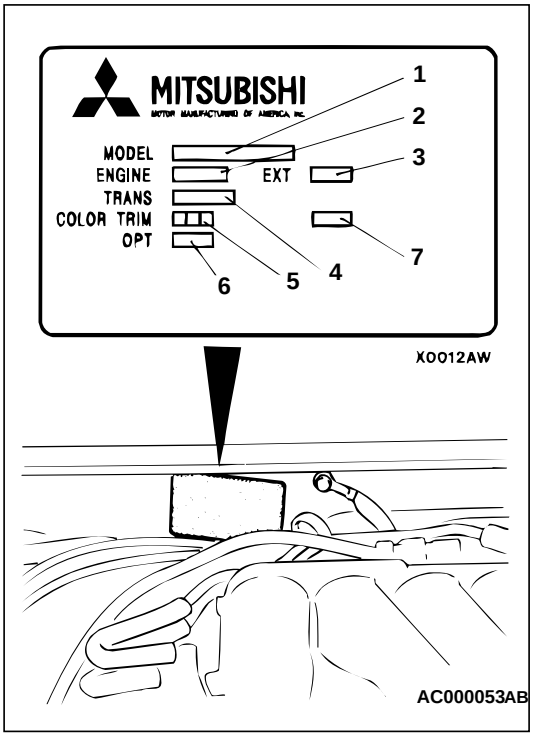
VIN (EXCEPT SEQUENCE NUMBER)	BRAND	ENGINE DISPLACEMENT	MODEL CODE
4A3AE45G_3E	MITSUBISHI ECLIPSE SPYDER	2.4L	D52ABNHEL4M
			D52ABRHEL4M
4A3AE85H_3E		3.0L	D53ABNXEL4M
			D53ABRXEL4M
4A3AE75G_3E			D53ABNGVL4M
			D53ABRGVL4M

VEHICLES FOR CALIFORNIA EMISSION REGULATION

VIN (EXCEPT SEQUENCE NUMBER)	BRAND	ENGINE DISPLACEMENT	MODEL CODE
4A3AE45G_3E	MITSUBISHI ECLIPSE SPYDER	2.4L	D52ABNHEL9M
			D52ABRHEL9M

VEHICLE IDENTIFICATION CODE PLATE

M1001005400213

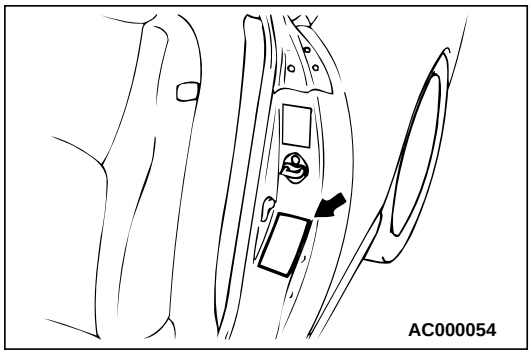


The vehicle information code plate is riveted onto the cowl top outer panel in the engine compartment.
The plate shows model code, engine model, transmission model and body color code.

NO.	ITEMS	CONTENTS	
1	MODEL	D53AMRGEL4M	D53A: Vehicle model
			MRGEL4M; Model series
2	ENGINE	6G72	Engine model
3	EXT	W69A	Exterior code
4	TRANS	F4A51	F4A51:Transaxle model
5	COLOR	W69	W69: Body color code
6	TRIM	71H	71H: Interior code
7	OPT	Z31	Z31: Equipment code

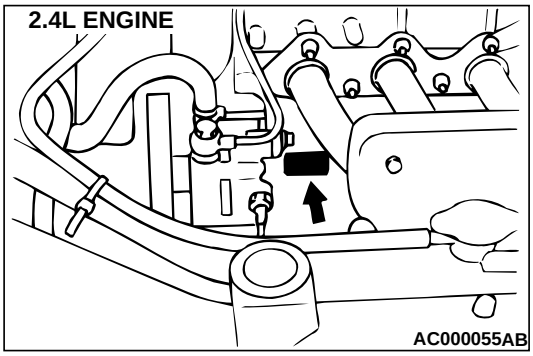
For monotone color vehicles, the body color code shall be indicated.

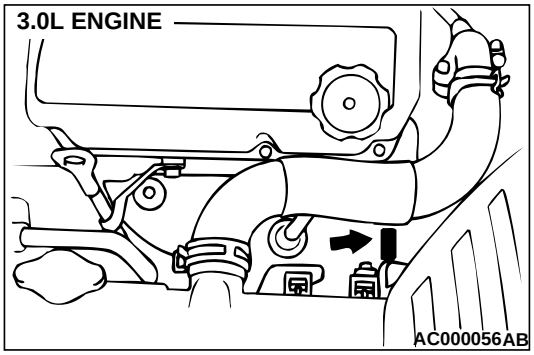
VEHICLE SAFETY CERTIFICATION LABEL



The vehicle safety certification label is attached to the face of the left door sill.
This label indicates the month and year of manufacture, Gross Vehicle Weight Rating (GVWR), front and rear Gross Axle Weight Rating (GAWR), and Vehicle Identification Number (VIN).

ENGINE MODEL STAMPING



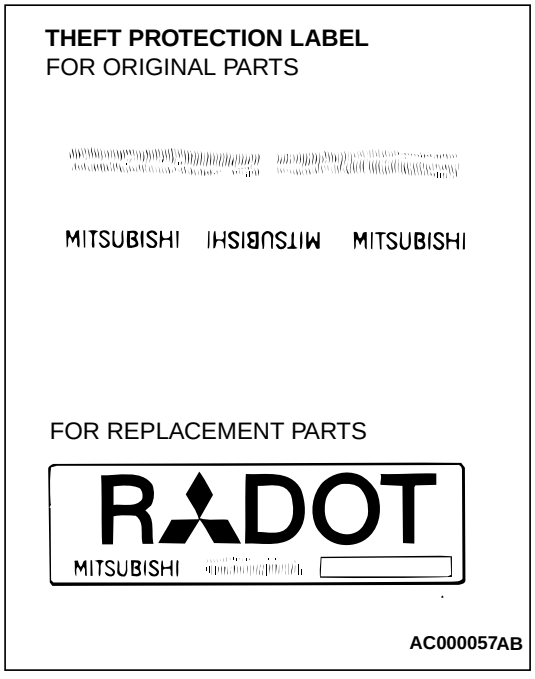


The engine model is stamped on the cylinder block.
These engine model numbers are as shown as follows.

ENGINE MODEL	ENGINE DISPLACEMENT
4G64	2.4L
6G72	3.0L

The engine serial number is stamped near the engine model number.

THEFT PROTECTION



In order to protect against theft, a Vehicle Identification Number (VIN) is attached as a plate or label to the following major parts of the engine and transmission, as well as main outer panels: Engine cylinder block, Transmission housing. Fender, Doors, Liftgate, Quarter panel, Hood, Bumpers
In addition, a theft-protection label is attached to replacement parts for the body outer panel main components, and the same data is stamped into replacement parts for the engine and the transmission.

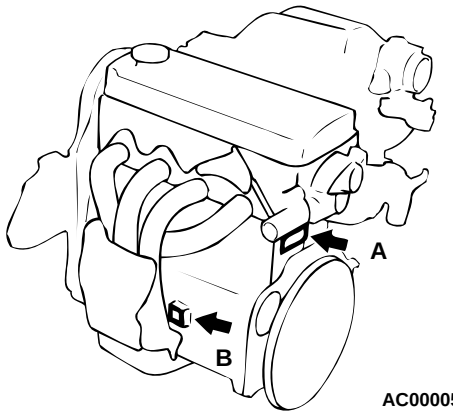
⚠ CAUTION
Cautions regarding panel repairs:

1. **When repainting original parts, do so after first masking the theft-protection label. After painting, be sure to peel off the masking tape.**
2. **The theft-protection label for replacement parts is covered by masking tape, so such parts can be painted as is. The masking tape should be removed after painting is finished.**
3. **The theft-protection label should not be removed from original parts or replacement parts.**

LOCATIONS

LABEL AREA (A: FOR ORIGINAL EQUIPMENT PARTS, B: FOR REPLACEMENT PARTS)

ENGINE <4G64>



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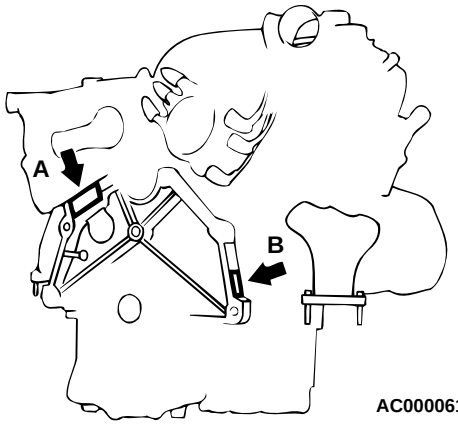
ENGINE <6G72>



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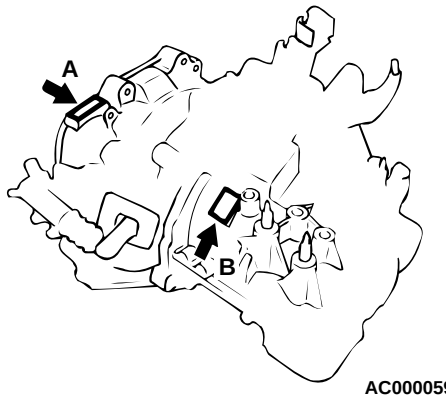
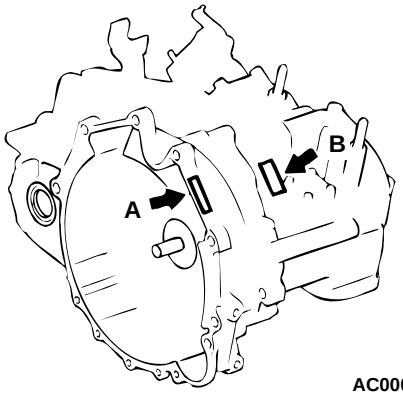
MANUAL TRANSAXLE <F5M42>



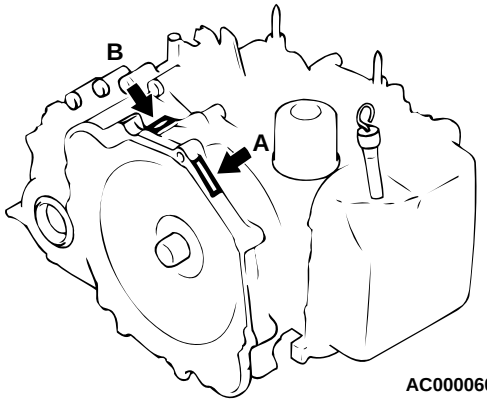
AC000059AB

MANUAL TRANSAXLE <F5M51>



AC000062AB

AUTOMATIC TRANSAXLE



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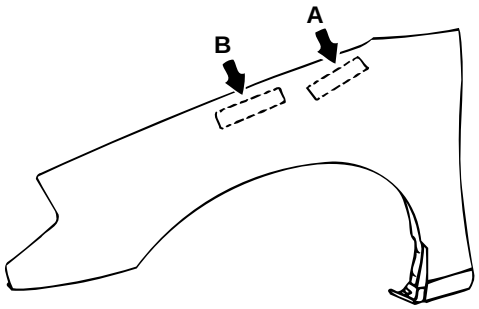
FENDER



THE ILLUSTRATION INDICATES LEFT OUER SIDE. RIGHT SIDE IS SYMMETRICALLY OPPOSITE.

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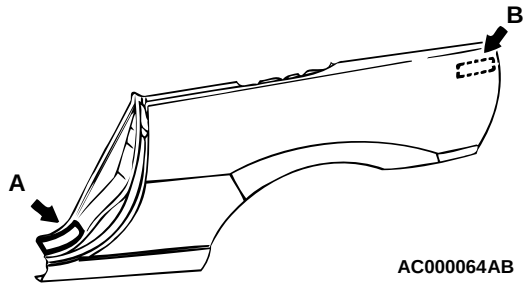
TSB Revision

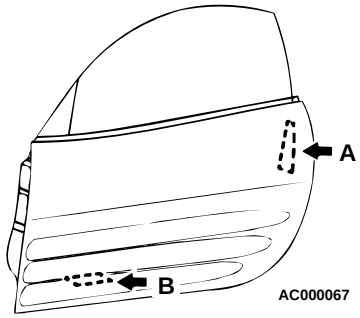
LABEL AREA (A: FOR ORIGINAL EQUIPMENT PARTS, B: FOR REPLACEMENT PARTS)

QUARTER PANEL OUTER



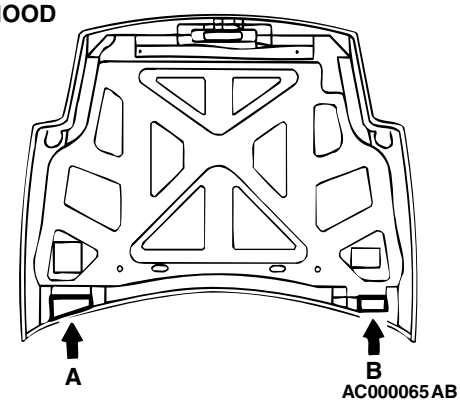
THE ILLUSTRATION INDICATES LEFT OUER SIDE. RIGHT SIDE IS SYMMETRICALLY OPPOSITE.

DOOR

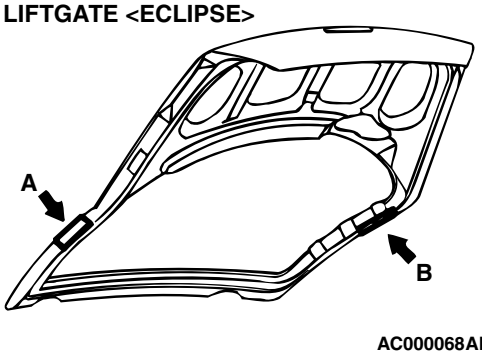


THE ILLUSTRATION INDICATOR LEFT OUER SIDE. RIGHT SIDE IS SYMMETRICALLY OPPOSITE.

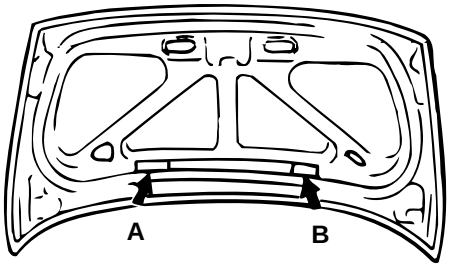
HOOD



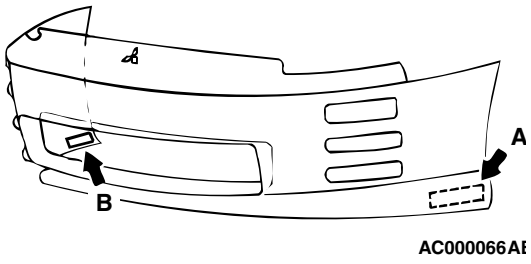
LIFTGATE <ECLIPSE>

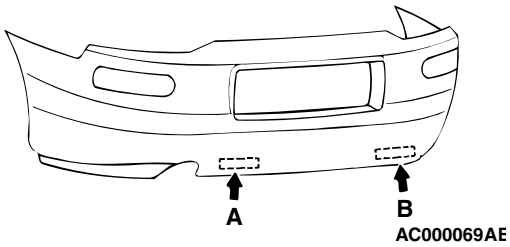


TRUNK LID <ECLIPSE SPYDER>



FRONT BUMPER



TARGET AREA (A: FOR ORIGINAL EQUIPMENT PARTS, B: FOR REPLACEMENT PARTS)	
REAR BUMPER  AC000069AE	

PRECAUTIONS BEFORE SERVICE

M1001000500215

SUPPLEMENTAL RESTRAINT SYSTEM (SRS)

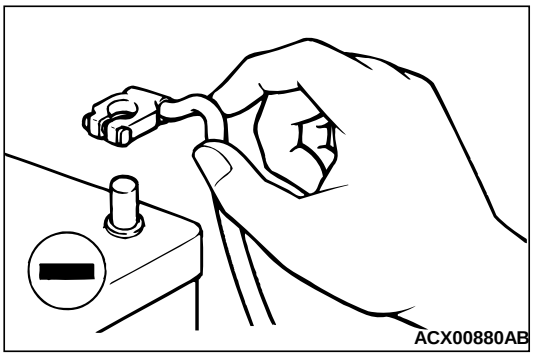
1. Items to review when servicing SRS
   (1) Be sure to read GROUP 52B, Supplemental Restraint System (SRS). For safe operation, please follow the directions and heed all warnings.
   (2) Wait at least 60 seconds after disconnecting the battery cable before doing any further work. The SRS system is designed to retain enough voltage to deploy the air bag even after the battery has been disconnected. Serious injury may result from unintended air bag deployment if work is done on the SRS system immediately after the battery cable is disconnected.
   (3) Warning labels must be heeded when servicing or handling SRS components. Warning labels can be found in the following locations.
   - Hood
   - Sun visor
   - Glove box
   - SRS-ECU
   - Steering wheel
   - Air bag module (Driver's side or front passenger's side)
   - Side air bag module
   - Clock spring
   - Steering gear box

   (4) Always use the designated special tools and test equipment.
   (5) Store components removed from the SRS in a clean and dry place. The air bag module should be stored on a flat surface and placed so that the pad surface is facing upward.
   (6) Never attempt to disassemble or repair the SRS components (SRS-ECU, air bag module and clock spring). If there is a defect, replace the defective part.
   (7) Whenever you finish servicing the SRS, check the SRS warning light operation to make sure that the system functions properly.
   (8) Be sure to deploy the air bag before disposing of the air bag module or disposing of a vehicle equipped with an air bag. (Refer to GROUP 52B P.52B-157, Air bag Module Disposal Procedures.)
2. Observe the following when carrying out operations on places where SRS components are installed, including operations not directly related to the SRS air bag.
   (1) When removing or installing parts, do not allow any impact or shock to occur to the SRS components.
   (2) SRS components should not be subjected to temperatures of over 93°C (200°F). Remove the SRS components before drying or baking the vehicle after painting. After re-installing them, check the SRS warning light operation to make sure that the system functions properly.

SERVICING ELECTRICAL SYSTEM

⚠ *WARNING*

Battery posts, terminals and related accessories contain lead and lead compounds. WASH HANDS AFTER HANDLING.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1. Note the following before proceeding with working on the electrical system.

   Never perform unauthorized modifications to any electrical device or wiring. Such modifications might lead to a vehicle malfunction, over-capacity or short-circuit that could result in a fire in the vehicle.

⚠ **CAUTION**

- **Before connecting or disconnecting the negative battery cable, be sure to turn the ignition switch to the "LOCK" (OFF) position and turn off the lights. (If this is not done, there is the possibility of semiconductor parts being damaged.)**
- **After completion of the work (and the negative battery terminals is connected), warm up the engine and allow it to idle for approximately 10 minutes under the conditions described below in order to stabilize engine control conditions, and then check to be sure that the idle is satisfactory.**

2. When servicing the electrical system, disconnect the negative cable terminal from the battery.

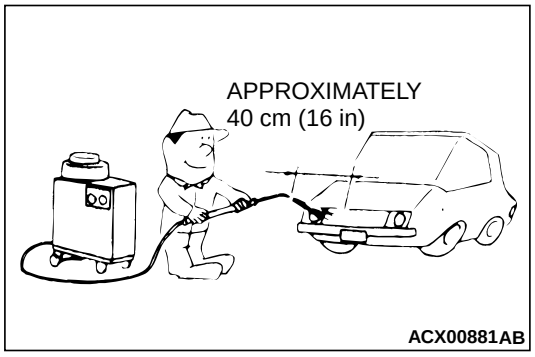
   Engine coolant temperature: 85 – 95°C (185 – 203°F)

   Lights and all accessories: OFF

   Transmission: "N" or "P" position

   Steering wheel: straight-forward position

VEHICLE WASHING



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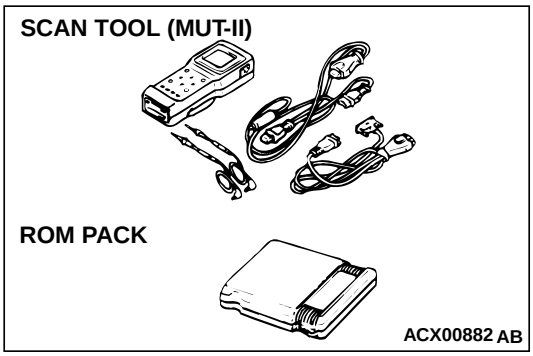
If high-pressure car-washing equipment or steam car-washing equipment is used to wash the vehicle, be sure to maintain the spray nozzle at a distance of at least approximately 40cm (16 inches) from any plastic parts and all opening parts (doors, luggage compartment, etc.).

APPLYING ANTI-CORROSION AGENT OR OTHER UNDERCOAT AGENTS

Be careful not to apply oil or grease to the heated oxygen sensor. If applied the sensor may malfunction. Protect the heated oxygen sensor with a cover before applying anti-corrosion agent, etc.

SCAN TOOL (MUT-II)



⚠ CAUTION

Turn the ignition switch to "LOCK" (OFF) position before disconnecting or connecting the scan tool.

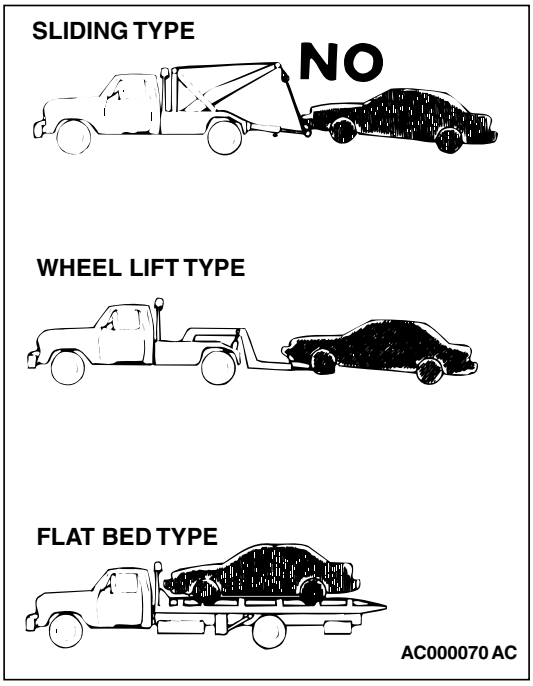
To operate the scan tool, refer to "MUT-II Operating Instructions."

TOWING AND HOISTING

M1001000800205

WRECKER TOWING RECOMMENDATION

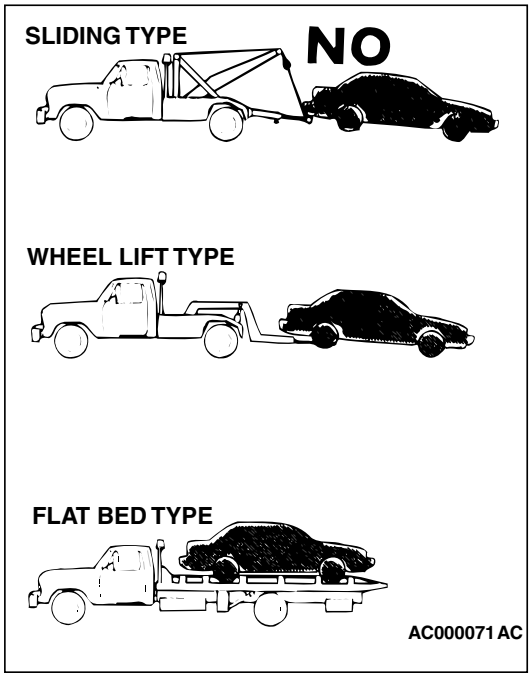
FRONT TOWING PICKUP



⚠ CAUTION

This vehicle cannot be towed by a wrecker using sling-type equipment otherwise the bumper may become deformed. If this vehicle is towed, use wheel lift or flat bed equipment.

The vehicle may be towed on its rear wheels for extended distances provided the parking brake is released. It is recommended that vehicles be towed using the front pickup whenever possible.



REAR TOWING PICKUP

⚠ CAUTION

- **This vehicle cannot be towed by a wrecker using sling-type equipment otherwise the lower arm may become deformed. If this vehicle is towed, use a wheel lift or flat bed equipment.**
- **Do not use the steering column lock to secure the front wheels for towing.**
- **Make sure the transaxle is in Neutral if vehicle will have drive wheels on the ground.**
- **If these requirements cannot be met, the front wheels must be placed on a tow dolly.**

Automatic transmission vehicle may be towed on the front wheels at speeds not to exceed 50 km/h (30 mph) for distances not to exceed 30 km (18 miles).

TOWING WHEN KEYS ARE NOT AVAILABLE

When a locked vehicle must be towed and keys are not available, the vehicle may be lifted and towed from the front, provided the parking brake is released. If not released, the rear wheels should be placed on a tow dolly.

SAFETY PRECAUTIONS

The following precautions should be taken when towing the vehicle:

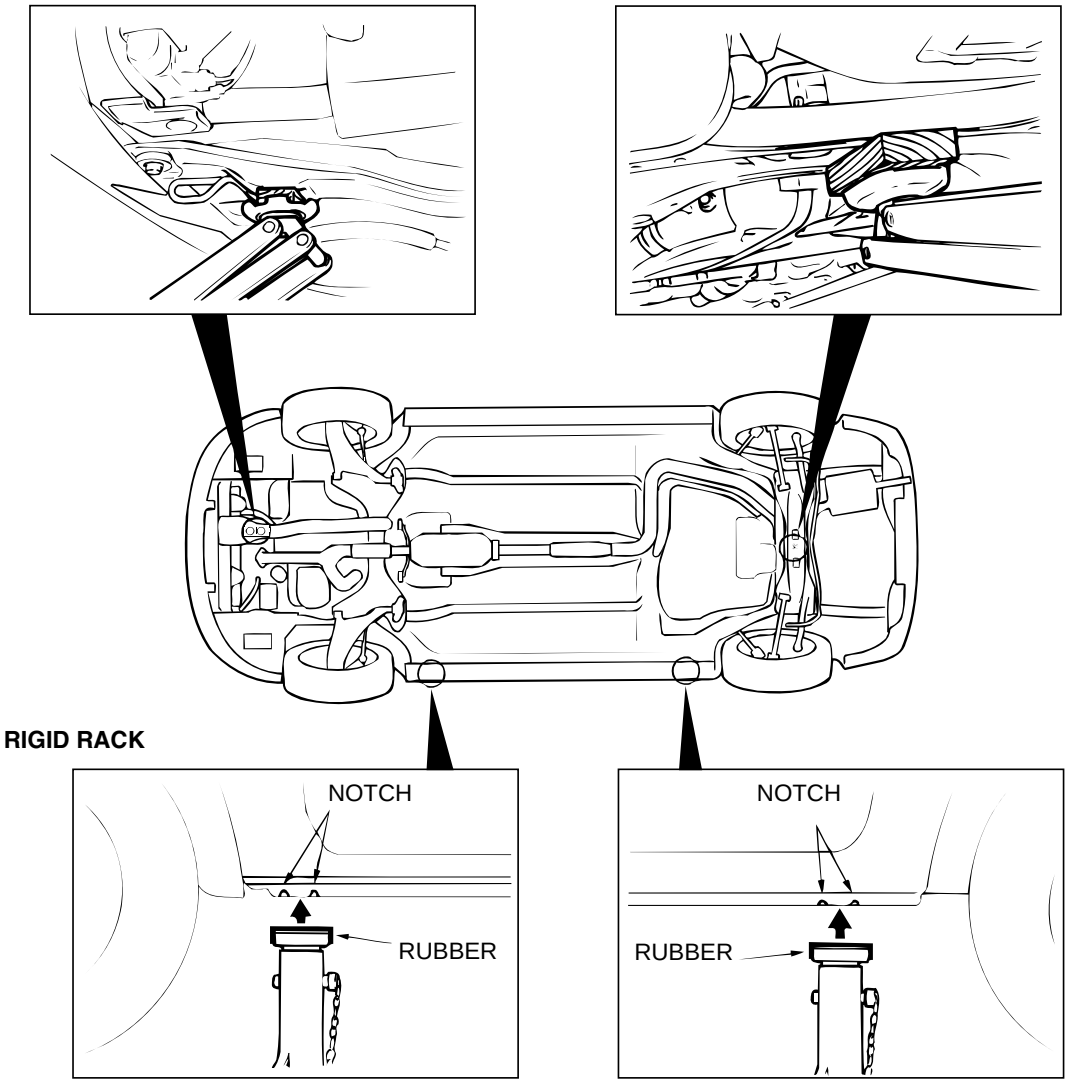
1. DO NOT LIFT OR TOW THE VEHICLE BY ATTACHING TO OR WRAPPING AROUND THE BUMPER.
2. Any loose, protruding, or damaged parts such as hoods, doors, fenders, trim, etc. should be secured or removed prior to moving the vehicle.
3. Operator should refrain from going under a vehicle when it is lifted by the towing equipment, unless the vehicle is adequately supported by safety stands.
4. Never allow passengers to ride in a towed vehicle.
5. State and local rules and regulations must be followed when towing a vehicle.

LIFTING AND JACKING SUPPORT LOCATION

FLOOR JACK

⚠ CAUTION

- **Never support any point other than the specified one, or that point will be deformed.**
- **For lifting, put rubber or similar material between the side sill and rigid rack, or the side sill area will be damaged.**



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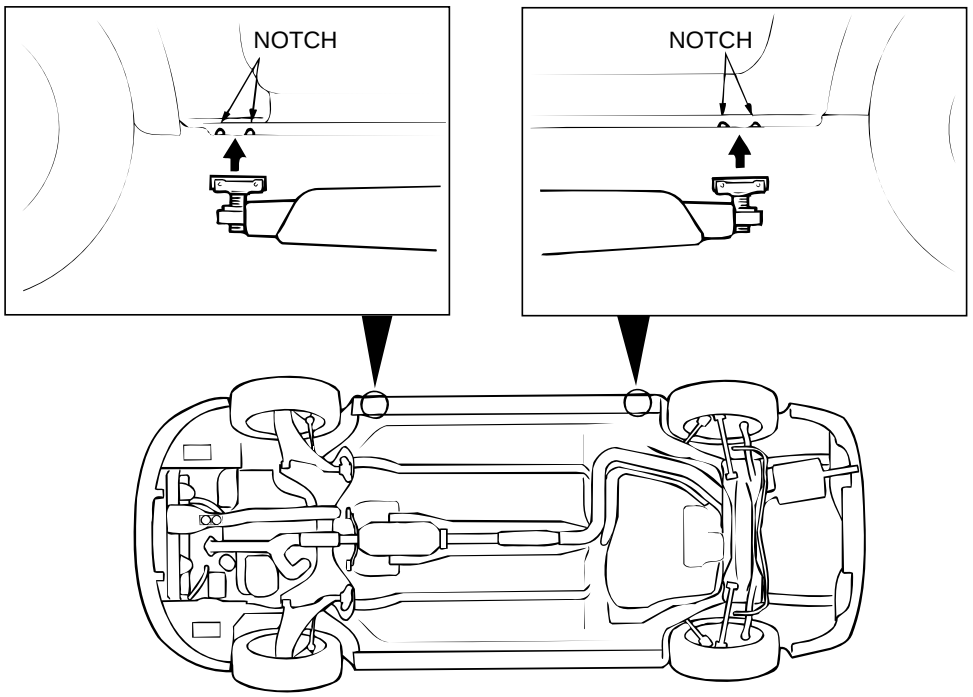
POST TYPE

Special care should be taken when raising the vehicle on a frame contact type hoist. The hoist must be equipped with the proper adapters in order to support the vehicle at the proper locations.

⚠ CAUTION

When service procedures require removing rear suspension, fuel tank and spare tire, place additional weight on rear end of vehicle or anchor vehicle to hoist to prevent tipping when the location of the center of gravity changes.



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GENERAL DATA AND SPECIFICATIONS

M1001000900213

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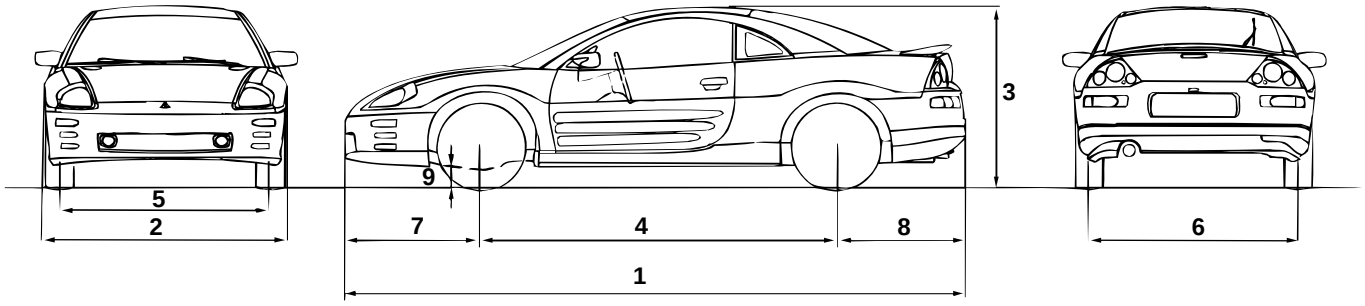

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GENERAL SPECIFICATIONS (Model with 2.4L Engine)

ITEMS			RS MNJEL4M/9M	RS MRJEL4M/9M	GS MNHEL4M/9M	GS MRHEL4M/9M
Vehicle dimension mm (in)	Overall length	1	4,490 (176.8)	4,490 (176.8)	4,490 (176.8)	4,490 (176.8)
	Overall width	2	1,750 (68.9)	1,750 (68.9)	1,750 (68.9)	1,750 (68.9)
	Overall height (unladen)	3	1,310 (51.6)	1,310 (51.6)	1,310 (51.6)	1,310 (51.6)
	Wheelbase	4	2,560 (100.8)	2,560 (100.8)	2,560 (100.8)	2,560 (100.8)
	Tread-front	5	1,510 (59.4)	1,510 (59.4)	1,510 (59.4)	1,510 (59.4)
	Tread-rear	6	1,510 (59.4)	1,510 (59.4)	1,510 (59.4)	1,510 (59.4)
	Overhang-front	7	1010 (39.8)	1010 (39.8)	1010 (39.8)	1010 (39.8)
	Overhang-rear	8	920 (36.2)	920 (36.2)	920 (36.2)	920 (36.2)
	Minimum running ground clearance	9	148 (5.8)	148 (5.8)	148 (5.8)	148 (5.8)
Vehicle weight kg (lb)	Curb weight		1,320 (2,910)	1,350 (2,976)	1,345 (2,965)	1,375 (3,031)
	Gross vehicle weight rating		1,750 (3,859)	1,750 (3,859)	1,750 (3,859)	1,750 (3,859)
	Gross axle weight rating-front		980 (2,161)	980 (2,161)	980 (2,161)	980 (2,161)
	Gross axle weight rating-rear		770 (1,698)	770 (1,698)	770 (1,698)	770 (1,698)
Seating capacity			4			
Engine	Model No.		4G64			
	Displacement		2.4L			
Transaxle	Model No.		F5M42	F4A42	F5M42	F4A42
	Type		5-speed manual	4-speed automatic	5-speed manual	4-speed automatic
Fuel system	Fuel supply system		Electronic controlled multiport fuel injection			

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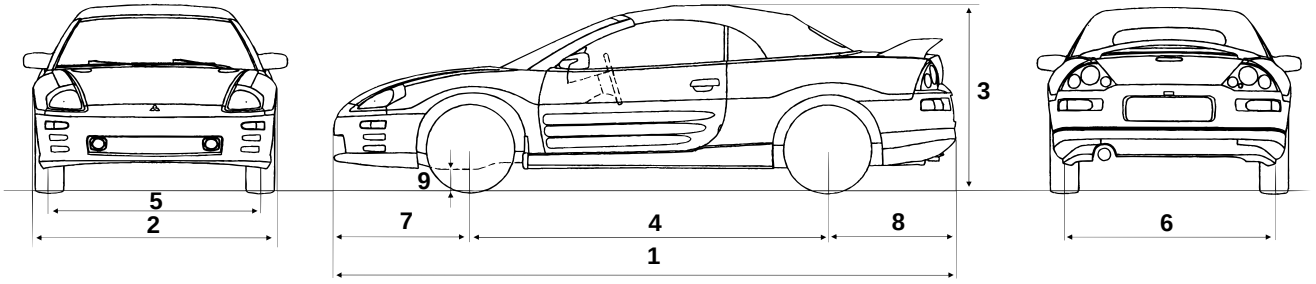
GENERAL SPECIFICATIONS (Model with 3.0L Engine without Variable Induction System)

ITEMS			GT MNXEL4M	GT MRXEL4M	GT MNGEL4M	GT MRGEL4M
Vehicle dimension mm (in)	Overall length	1	4,490 (176.8)	4,490 (176.8)	4,490 (176.8)	4,490 (176.8)
	Overall width	2	1,750 (68.9)	1,750 (68.9)	1,750 (68.9)	1,750 (68.9)
	Overall height (unladen)	3	1,310 (51.6)	1,310 (51.6)	1,310 (51.6)	1,310 (51.6)
	Wheelbase	4	2,560 (100.8)	2,560 (100.8)	2,560 (100.8)	2,560 (100.8)
	Tread-front	5	1,510 (59.4)	1,510 (59.4)	1,510 (59.4)	1,510 (59.4)
	Tread-rear	6	1,510 (59.4)	1,510 (59.4)	1,510 (59.4)	1,510 (59.4)
	Overhang-front	7	1010 (39.8)	1010 (39.8)	1010 (39.8)	1010 (39.8)
	Overhang-rear	8	920 (36.2)	920 (36.2)	920 (36.2)	920 (36.2)
	Minimum running ground clearance	9	150 (5.9)	150 (5.9)	150 (5.9)	150 (5.9)
Vehicle weight kg (lb)	Curb weight		1,425 (3,142)	1,455 (3,208)	1,465 (3,230)	1,495 (3,296)
	Gross vehicle weight rating		1,820 (4,013)	1,820 (4,013)	1,820 (4,013)	1,820 (4,013)
	Gross axle weight rating-front		1,050 (2,315)	1,050 (2,315)	1,050 (2,315)	1,050 (2,315)
	Gross axle weight rating-rear		770 (1,698)	770 (1,698)	770 (1,698)	770 (1,698)
Seating capacity			4			
Engine	Model No.		6G72			
	Displacement		3.0L			
Transaxle	Model No.		F5M51	F4A52	F5M51	F4A51
	Type		5-speed manual	4-speed automatic	5-speed manual	4-speed automatic
Fuel system	Fuel supply system		Electronic controlled multiport fuel injection			

GENERAL SPECIFICATIONS (Model with 3.0L Engine with Variable Induction System)

ITEMS			GTS MNPVL4M	GTS MRPVL4M
Vehicle dimension mm (in)	Overall length	1	4,490 (176.8)	4,490 (176.8)
	Overall width	2	1,750 (68.9)	1,750 (68.9)
	Overall height (unladen)	3	1,310 (51.6)	1,310 (51.6)
	Wheelbase	4	2,560 (100.8)	2,560 (100.8)
	Tread-front	5	1,510 (59.4)	1,510 (59.4)
	Tread-rear	6	1,510 (59.4)	1,510 (59.4)
	Overhang-front	7	1010 (39.8)	1010 (39.8)
	Overhang-rear	8	920 (36.2)	920 (36.2)
	Minimum running ground clearance	9	150 (5.9)	150 (5.9)
Vehicle weight kg (lb)	Curb weight		1,470 (3,241)	1,500 (3,307)
	Gross vehicle weight rating		1,820 (4,013)	1,820 (4,013)
	Gross axle weight rating-front		1,050 (2,315)	1,050 (2,315)
	Gross axle weight rating-rear		770 (1,698)	770 (1,698)
Seating capacity			4	
Engine	Model No.		6G72	
	Displacement		3.0L	
Transaxle	Model No.		F5M51	F4A52
	Type		5-speed manual	4-speed automatic
Fuel system	Fuel supply system		Electronic controlled multiport fuel injection	

<ECLIPSE SPYDER>



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GENERAL SPECIFICATIONS (Model without 3.0L Engine with Variable Induction System)

ITEMS			GS BNHEL4M	GS BRHEL4M	GT BNXEL4M	GT BRXEL4M
Vehicle dimension mm (in)	Overall length	1	4,490 (176.8)	4,490 (176.8)	4,490 (176.8)	4,490 (176.8)
	Overall width	2	1,750 (68.9)	1,750 (68.9)	1,750 (68.9)	1,750 (68.9)
	Overall height (unladen)	3	1,340 (52.8)	1,340 (52.8)	1,340 (52.8)	1,340 (52.8)
	Wheelbase	4	2,560 (100.8)	2,560 (100.8)	2,560 (100.8)	2,560 (100.8)
	Tread-front	5	1,510 (59.4)	1,510 (59.4)	1,510 (59.4)	1,510 (59.4)
	Tread-rear	6	1,510 (59.4)	1,510 (59.4)	1,510 (59.4)	1,510 (59.4)
	Overhang-front	7	1010 (39.8)	1010 (39.8)	1010 (39.8)	1010 (39.8)
	Overhang-rear	8	920 (36.2)	920 (36.2)	920 (36.2)	920 (36.2)
	Minimum running ground clearance	9	163 (6.4)	163 (6.4)	165 (6.5)	165 (6.5)
Vehicle weight kg (lb)	Curb weight		1,405 (3,097)	1,435 (3,164)	1,490 (3,285)	1,520 (3,351)
	Gross vehicle weight rating		1, 770 (3,903)	1, 770 (3,903)	1,865 (4,112)	1,865 (4,112)
	Gross axle weight rating-front		985 (2,172)	985 (2,172)	1,070 (2,359)	1,070 (2,359)
	Gross axle weight rating-rear		785 (1,731)	785 (1,731)	795 (1,753)	795 (1,753)
Seating capacity			4			
Engine	Model No.		4G64		6G72	
	Displacement		2.4L		3.0L	
Transaxle	Model No.		F5M42	F4A42	F5M51	F4A51
	Type		5-speed manual	4-speed automatic	5-speed manual	4-speed automatic
Fuel system	Fuel supply system		Electronic controlled multiport fuel injection			

GENERAL SPECIFICATIONS (Model with 3.0L Engine with Variable Induction System)

ITEMS			GT MNXEL4M	GT RXEL4M
Vehicle dimension mm (in)	Overall length	1	4,490 (176.8)	4,490 (176.8)
	Overall width	2	1,750 (68.9)	1,750 (68.9)
	Overall height (unladen)	3	1,340 (52.8)	1,340 (52.8)
	Wheelbase	4	2,560 (100.8)	2,560 (100.8)
	Tread-front	5	1,510 (59.4)	1,510 (59.4)
	Tread-rear	6	1,510 (59.4)	1,510 (59.4)
	Overhang-front	7	1010 (39.8)	1010 (39.8)
	Overhang-rear	8	920 (36.2)	920 (36.2)
	Minimum running ground clearance	9	165 (6.5)	165 (6.5)
Vehicle weight kg (lb)	Curb weight		1,510 (3,329)	1,540 (3,395)
	Gross vehicle weight rating		1,865 (4,112)	1,865 (4,112)
	Gross axle weight rating-front		1,070 (2,359)	1,070 (2,359)
	Gross axle weight rating-rear		795 (1,753)	795 (1,753)
Seating capacity			4	
Engine	Model No.		6G72	
	Displacement		3.0L	
Transaxle	Model No.		F5M51	F4A52
	Type		5-speed manual	4-speed automatic
Fuel system	Fuel supply system		Electronic controlled multiport fuel injection	

TIGHTENING TORQUE

M1001001100221

Each torque value in the table is a standard value for tightening under the following conditions.

1. Bolts, nuts and washers are all made of steel and plated with zinc.
2. The threads and bearing surface of bolts and nuts are all in dry condition.

The values in the table are not applicable:

1. If toothed washers are inserted.
2. If plastic parts are fastened.
3. If bolts are tightened to plastic or die-cast inserted nuts.
4. If self-tapping screws or self-locking nuts are used

Standard bolt and nut tightening torque

THREAD SIZE		STANDARD TIGHTENING TORQUE		
NOMINAL BOLT DIAMETER (mm)	PITCH (mm)	HEAD MARK "4"	HEAD MARK "7"	HEAD MARK "8"
M5	0.8	2.5±0.5 N·m (23±4 in-lb)	5.0±1.0 N·m (44±9 in-lb)	6.0±1.0 N·m (53±9 in-lb)
M6	1.0	5.0±1.0 N·m (44±9 in-lb)	9.0±2.0 N·m (79±18 in-lb)	10±2 N·m (89±17 in-lb)
M8	1.25	12±2 N·m (107±17 in-lb)	22±4 N·m (16±3 ft-lb)	25±4 N·m (18±3 ft-lb)
M10	1.25	24±4 N·m (18±3 ft-lb)	44±10 N·m (33±7 ft-lb)	53±7 N·m (39±5 ft-lb)
M12	1.25	41±8 N·m (30±6 ft-lb)	83±12 N·m (61±9 ft-lb)	98±12 N·m (72±9 ft-lb)
M14	1.5	73±12 N·m (54±9 ft-lb)	140±20 N·m (104±14 ft-lb)	155±25 N·m (115±18 ft-lb)
M16	1.5	110±20 N·m (81±15 ft-lb)	210±30 N·m (155±22 ft-lb)	235±35 N·m (174±25 ft-lb)
M18	1.5	165±25 N·m (122±18 ft-lb)	300±40 N·m (222±29 ft-lb)	340±50 N·m (251±37 ft-lb)
M20	1.5	225±35 N·m (166±26 ft-lb)	410±60 N·m (303±44 ft-lb)	480±70 N·m (354±52 ft-lb)
M22	1.5	300±40 N·m (222±29 ft-lb)	555±85 N·m (410±62 ft-lb)	645±95 N·m (476±70 ft-lb)
M24	1.5	395±55 N·m (292±40 ft-lb)	735±105 N·m (543±77 ft-lb)	855±125 N·m (631±92 ft-lb)

Flange bolt and nut tightening torque

THREAD SIZE		STANDARD TIGHTENING TORQUE		
NOMINAL BOLT DIAMETER (mm)	PITCH (mm)	HEAD MARK "4"	HEAD MARK "7"	HEAD MARK "8"
M6	1.0	5.0±1.0 N·m (44±9 in-lb)	10±2 N·m (89±17 in-lb)	12±2 N·m (107±17 in-lb)
M8	1.25	13±2 N·m (111±22 in-lb)	24±4 N·m (18±3 ft-lb)	27±5 N·m (20±4 ft-lb)
M10	1.25	26±4 N·m (19±3 ft-lb)	49±9 N·m (36±7 ft-lb)	58±7 N·m (43±5 ft-lb)
M10	1.5	24±4 N·m (18±3 ft-lb)	45±8 N·m (33±6 ft-lb)	55±10 N·m (41±7 ft-lb)
M12	1.25	46±8 N·m (34±6 ft-lb)	95±15 N·m (70±11 ft-lb)	105±15 N·m (78±11 ft-lb)
M12	1.75	43±8 N·m (32±6 ft-lb)	83±12 N·m (61±9 ft-lb)	98±12 N·m (72±9 ft-lb)

LUBRICATION AND MAINTENANCE

M1001001200217

Maintenance and lubrication service recommendations have been compiled to provide maximum protection for the vehicle owner's investment against all reasonable types of driving conditions. Since these conditions vary with the individual vehicle owner's driving habits, the area in which the vehicle is operated and the type of driving to which the vehicle is subjected, it is necessary to prescribe lubrication and maintenance service on a time frequency as well as mileage interval basis.
Oils, lubricants and greases are classified and graded according to standards recommended by the Society of Automotive Engineers (SAE), the American Petroleum Institute (API) and the National Lubricating Grease Institute (NLGI).

MAINTENANCE SCHEDULES

Information for service maintenance is provided in the "SCHEDULED MAINTENANCE TABLE." Three schedules are provided; one for "Required Maintenance." one for "General Maintenance " and one for "Severe Usage Service."
The item numbers in "SCHEDULED MAINTENANCE TABLE" correspond to the section numbers in "MAINTENANCE SERVICE."

SEVERE SERVICE

Vehicles operating under severe service conditions will require more frequent service.
Component service information is included for vehicles operating under one or more of the following conditions:

1. Trailer towing or police, taxi or commercial type operation.
2. Operation of Vehicle
   (1) Short-trip operation at freezing temperature (engine not thoroughly warmed up)
   (2) More than 50% operation in heavy city traffic during hot weather above 32°C (90°F)
   (3) Extensive idling
   (4) Driving in sandy areas
   (5) Driving in salty areas
   (6) Driving in dusty conditions
   (7) Driving off-road

ENGINE OIL

⚠ CAUTION

Test results submitted to EPA have shown that laboratory animals develop skin cancer after prolonged contact with used engine oil. Accordingly, the potential exists for humans to develop a number of skin disorders, including cancer, from such exposure to used engine oil. Therefore, when changing engine oil, be careful not to touch it as much as possible. Protective clothing and gloves, that cannot be penetrated by oil, should be worn. The skin should be thoroughly washed with soap and water, or use waterless hand cleaner, to remove any used engine oil. Do not use gasoline, thinners, or solvents.

Either of the following engine oils should be used:

1. Engine oil displaying ILSAC certification mark.
2. Engine oil conforming to the API classification SJ EC or SJ/CD EC.

For further details, refer to "LUBRICANTS SELECTION."

LUBRICANTS AND GREASES

Semi-solid lubricants bear the NLGI designation and are further classified as grades 0, 1, 2, 3, etc.
Whenever "Chassis Lubricant" is specified, Multipurpose Grease, NLGI grade Number 2, should be used.

FUEL USAGE STATEMENT

⚠ CAUTION

Using leaded gasoline in your car will damage the catalytic converters and heated oxygen sensors, and affect the warranty coverage validity.

This vehicle must use unleaded gasoline only.
This vehicle has a fuel filler tube which is especially designed to accept only the smaller-diameter unleaded gasoline dispensing nozzle.
2.4L model is designed to operate on unleaded gasoline having a minimum octane rating of 87 [(MON + RON)/2], or 91 RON.
3.0L model is designed to operate on premium grade unleaded gasoline having a minimum octane rating of 91 [(MON + RON)/2], or 95 RON. If premium grade unleaded gasoline is not available, unleaded gasoline having an octane rating of 87 [(MON + RON)/2], or 91 RON may be used. However, the performance level may be reduced.
MON: Motor Octane Number
RON: Research Octane Number

GASOLINE CONTAINING ALCOHOL

Some gasoline sold at service stations contain alcohol although they may not be so identified.
Using fuels containing alcohol is not recommended unless the nature of the blend can be determined as being satisfactory.
Gasohol: A mixture of 10% ethanol (grain alcohol) and 90% unleaded gasoline may be used in your vehicle. If driveability problems are experienced as a result of using gasohol, it is recommended that the vehicle be operated on gasoline.
Methanol: **Do not use gasoline containing methanol (wood alcohol).** Using this type of alcohol can result in vehicle performance deterioration and damage critical parts in the fuel system components. Fuel system damage and performance problems resulting from the use of gasoline containing methanol may not be covered by the new vehicle warranty.

GASOLINE CONTAINING METHYL TERTIARY BUTYL ETHER (MTBE)

Unleaded gasoline containing 15% or less MTBE may be used in your vehicle. (Fuel containing MTBE over 15% in volume may cause reduced engine performance and produce vapor lock or hard starting.

MATERIALS ADDED TO FUEL

Indiscriminate use of fuel system cleaning agents should be avoided. Many of these materials intended for gum and varnish removal may contain highly active solvents or similar ingredients that can be harmful to gasket and diaphragm materials used in fuel system component parts.

RECOMMENDED LUBRICANTS AND LUBRICANT CAPACITIES TABLE

M1001001300214

RECOMMENDED LUBRICANTS

PARTS	SPECIFICATIONS	REMARKS
Engine oil	Engine oil displaying ILSAC certification mark ("Starburst" symbol) conforming to API classification SJ EC or SJ/CD EC	For further details, refer to "LUBRICANTS SELECTION" section.
Manual transaxle	API classification GL-4	SAE grade number:SAE75W-90 or 75W/85W
Automatic transaxle	DIAMOND ATF SP III	-
Power steering	DIAMOND ATF	-
Brakes	Conforming to DOT 3 or DOT 4	
Engine coolant	MITSUBISHI genuine coolant or an equivalent	-
Door hinges, back door hinges	Engine oil	-

LUBRICANT CAPACITY TABLE

DESCRIPTION			SPECIFICATIONS
Engine oil dm^3 (qt)	Oil pan (excluding oil filter)		4.0 (4.2)
	Oil filter		0.3 (0.32)
Engine coolant dm^3 (qt)		2.4L engine	7.0 (7.4)
Engine coolant dm^3 (qt)		3.0L engine	8.0 (8.5)
Manual transaxle dm^3 (qt)		2.4L engine	2.2 (2.3)
Manual transaxle dm^3 (qt)		3.0L engine	2.8 (3.0)
Automatic transaxle dm^3 (qt)		2.4L engine	7.7 (8.1)
Automatic transaxle dm^3 (qt)		3.0L engine	8.4 (8.5)
Power steering dm^3 (qt)			1.2 (1.3)
Fuel tank dm^3 (gal)			62 (16.4)

LUBRICANT SELECTION

ENGINE OIL

⚠ CAUTION

Never use nondetergent or straight mineral oil.

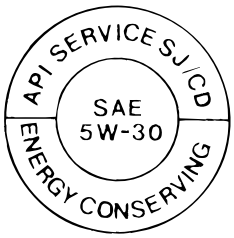
Oil Identification Symbol

Use only engine oils displaying the ILSAC certification mark ("Starburst" symbol) on the container.

ILSAC CERTIFICATION MARK ("STARBURST" SYMBOL)

ACX00394AI

API SERVICE SYMBOL



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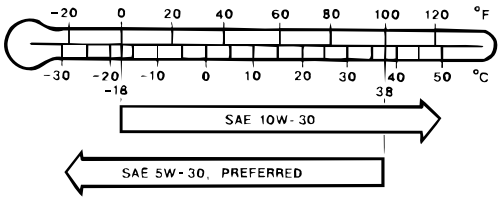
If these oils are not available, an API classification SJ EC or SJ/CD EC can be used.

Oil Viscosity

The SAE grade number indicates the viscosity of the oil. A proper SAE grade number should be selected according to ambient temperature.



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SELECTION OF COOLANT

COOLANT

Relationship between Coolant Concentration and Specific Gravity

⚠ CAUTION

- **If the concentration of the coolant is below 30%, the anti-corrosion property will be adversely affected. In addition, if the concentration is above 60%, both the anti-freeze and engine cooling properties will decrease, affecting the engine adversely. For these reasons, be sure to maintain the concentration level within the specified range.**
- **Do not use a mixture of different brands of anti-freeze.**

COOLANT TEMPERATURE °C (°F) AND SPECIFIC GRAVITY					FREEZING TEMPERATURE	SAFE OPERATING TEMPERATURE	COOLANT CONCENTRATION (SPECIFIC VOLUME)
10 (50)	20 (68)	30 (86)	40 (104)	50 (122)	°C (°F)	°C (°F)	%
1.054	1.050	1.046	1.042	1.036	−16 (3.2)	−11 (12.2)	30
1.063	1.058	1.054	1.049	1.044	−20 (−4)	−15 (5)	35
1.071	1.067	1.062	1.057	1.052	−25 (−13)	−20 (−4)	40
1.079	1.074	1.069	1.064	1.058	−30 (−22)	−25 (−13)	45
1.087	1.082	1.076	1.070	1.064	−36 (−32.8)	−31 (−23.8)	50
1.095	1.090	1.084	1.077	1.070	−42 (−44)	−37 (−35)	55
1.103	1.098	1.092	1.084	1.076	−50 (−58)	−45 (−49)	60

Example

The safe operating temperature is −15°C (5° F) when the specific gravity is 1.058 at the coolant temperature of 20°C (68°F)

SCHEDULED MAINTENANCE TABLE

M1001001400222

SCHEDULED MAINTENANCE SERVICE FOR EMISSION CONTROL AND PROPER VEHICLE PERFORMANCE

Inspection and service should be performed any time a malfunction is observed or suspected.

NO.	EMISSION CONTROL SYSTEM MAINTENANCE	SERVICE INTERVALS	KILOMETERS IN THOUSANDS	24	48	72	96	120	144	168
			MILEAGE IN THOUSANDS	15	30	45	60	75	90	105
1	Fuel system (tank, pipe line and connection, and fuel tank filler tube cap)	Check for leaks every 5 years or					X			
2	Fuel hoses	Check condition every 2 years or			X		X		X	
3	Air cleaner element	Replace at			X		X		X	
4	Evaporative emission control system (except evaporative emission canister)	Check for leaks and clogging every 5 years or					X			
5	Spark plugs	Replace	standard type		X		X		X	
			Platinum-tipped type				X			
6	Ignition cables	Replace every 5 years or					X			
7	Distributor cap and rotor	Check every 5 years					X			

GENERAL MAINTENANCE SERVICE FOR PROPER VEHICLE PERFORMANCE

NO.	GENERAL MAINTENANCE	SERVICE INTERVALS	KILOMETERS IN THOUSANDS	24	48	72	96	120	144	168
			MILEAGE IN THOUSANDS	15	30	45	60	75	90	105
8	Timing belt	Replace at					X[*1]		At 160,000 km[*2] (100,000 miles)	
9	Drive belt (for the generator, water pump and power steering pump)	Check condition at			X		X		X	
10	Engine oil	Change oil every 12 months or		Every 12,000 km (7,500 miles)						
11	Engine oil filter	Replace every 12 months or [*3]		X	X	X	X	X	X	X
12	Manual transaxle oil	Check oil level every at			X		X		X	

TSB Revision

NO.	GENERAL MAINTENANCE	SERVICE INTERVALS	KILOMETERS IN THOUSANDS	24	48	72	96	120	144	168
			MILEAGE IN THOUSANDS	15	30	45	60	75	90	105
13	Automatic transaxle fluid*4	Check fluid level every 12 months or		X	X	X	X	X	X	X
14	Engine coolant	Change	at first 4 years or				X			
			after that every 2 years or				Every 48,000km/h (30,000 miles)		X	
15	Disc brake pads	Inspect for wear every 12 months or		X	X	X	X	X	X	X
16	Rear drum brake linings and rear wheel cylinders	Inspect for wear and leaks every 2 years or			X		X		X	
17	Brake hoses	Check for deterioration or leaks every 12 months or		X	X	X	X	X	X	X
18	Ball joint and steering linkage seals	Inspect for grease leaks and damage every 2 years or			X		X		X	
19	Drive shaft boots	Inspect for grease leaks and damage every 12 months or		X	X	X	X	X	X	X
20	SRS air bag	Inspect the SRS system at		10 years						
21	Exhaust system (connection portion of muffler, muffler pipes and converter heat shields)	Check and service as required every 2 years or			X		X		X	
22	Tires	Rotate every 12 months or		Every 12,000 km (7,500 miles)						

NOTE:

**1: For California, Massachusetts, Vermont and maine, this maintenance is recommended but not required*

**2: Not required if belt was previously changed*

**3: If the mileage is less than 12,000 km (7,500 miles) each year, the oil filter should be replaced at every oil change*

**4: Change fluid under severe usage conditions only.*

SCHEDULED MAINTENANCE UNDER SEVERE USAGE CONDITIONS

Maintenance should be carried out according to the following table:

NO.	MAINTENANCE ITEM	SERVICE INTERVALS	KILOMETERS IN THOUSANDS	24	48	72	96	120	144	168	SEVERE USAGE CONDITIONS
			MILEAGE IN THOUSANDS	15	30	45	60	75	90	105	
3	Air cleaner element	Replace at		X	X	X	X	X	X	X	A and E
5	Spark plugs	Replace at		X	X	X	X	X	X	X	B and D
10	Engine oil	Change every 3 months or		Every 4,800 km (3,000 miles)							A, B, C, D and G
11	Engine oil filter	Replace every 6 months or		Every 9,600 km (6,000 miles)							A, B, C, D and G
12	Manual transaxle oil	Change oil at			X		X		X		B, G and H
13	Automatic transaxle fluid	Change A/T fluid at			X		X		X		B, G and H
15	Disc brake pads	Inspect for wear every 6 months or		Every 9,600 km (6,000 miles)							A and F
16	Rear drum brake linings and rear wheel cylinders	Inspect for wear every 12 months or		Every 2,400 km (15,000 miles)							A and F
22	Tires	Rotate every 6 months or		Every 9,600 km (6,000 miles)							B, C, E, G and H

Sever usage conditions:

A: Driving in dusty conditions

B: Trailer towing, or police, taxi, or commercial type operation

C: Extensive idling, driving in stop and go traffic

D: Short-trip operation at freezing temperatures (engine not thoroughly warmed up)

E: Driving in sandy areas

F: Driving in salty areas

G: More than 50% operation in heavy city traffic or at sustained high speeds during hot weather above 32°C (90°F)

H: Driving off-road

MAINTENANCE SERVICE

1. FUEL SYSTEM (TANK, PIPE LINE AND CONNECTION, AND FUEL TANK FILLER TUBE CAP) (CHECK FOR LEAKS)

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Check for damage or leakage in the fuel lines and connections.

2. FUEL HOSES (CHECK CONDITION)

M1001001700212

1. Inspect the surface of fuel hoses for heat and mechanical damage.Hard and brittle rubber, cracking, tears, cuts, abrasions and excessive swelling indicate deterioration of the rubber.
2. If the fabric casing of the rubber hose is exposed by cracks and abrasions in the fuel system, the hoses should be replaced.

3. AIR CLEANER ELEMENT (REPLACE)

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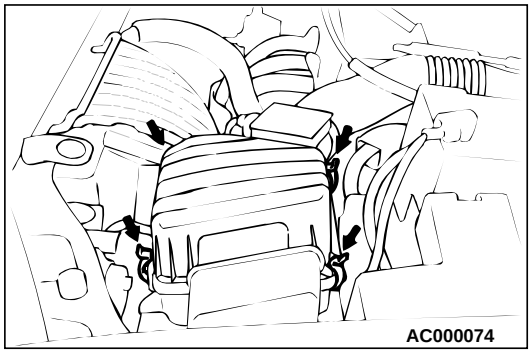
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The air cleaner element will become dirty during use, reducing its effectiveness. Replace it with a new one.

REPLACEMENT OF AIR CLEANER ELEMENT

1. Unclamp the air cleaner cover.
2. Remove the air cleaner element and install a new one.
3. When clamping the air cleaner cover in place, be sure that the cover is completed closed.

4. EVAPORATIVE EMISSION CONTROL SYSTEM (EXCEPT EVAPORATIVE EMISSION CANISTER) (CHECK FOR LEAKS AND CLOGGING)

M1001001900216

If the fuel-vapor vent line is clogged or damaged, fuel vapor will escape into the atmosphere causing excessive emissions. Disconnect the line at both ends, and blow it clean with compressed air. Remove the fuel tank filler tube cap from the filler tube and check to see if there is evidence that the seal makes improper contact to the filler tube.

5. SPARK PLUGS (REPLACE)

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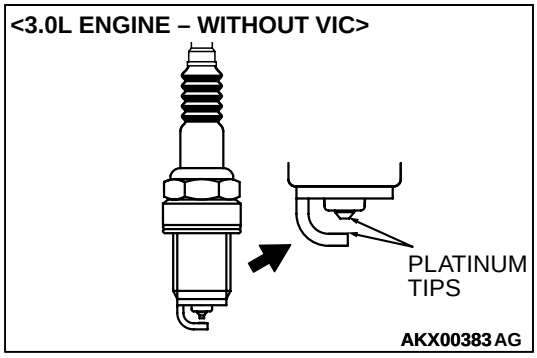
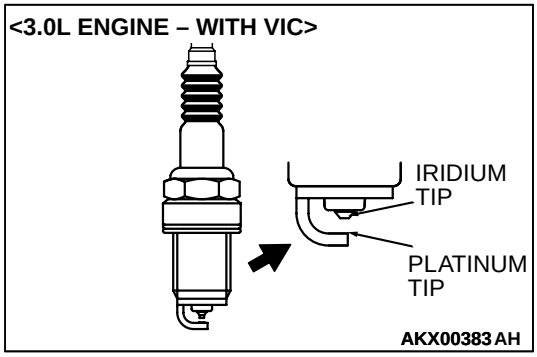


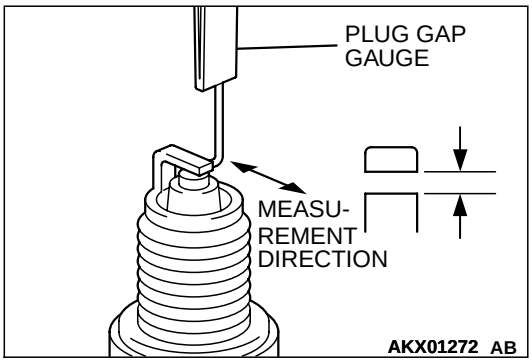


⚠ CAUTION

Platinum plugs are used on the 3.0L engine model without VIC. Iridium plugs are used on the 3.0L engine model with VIC. Use care not to damage the platinum tips and iridium tips of the platinum plugs and iridium plugs. Do not attempt to adjust the gap on these plugs.

1. Spark plugs must spark properly to assure proper engine performance and reduce exhaust emission level.
   Therefore, they should be replaced periodically with new ones.
   Spark plug type

MAKER	2.4L ENGINE	3.0L ENGINE without VIC	3.0L ENGINE with VIC
NGK	BKR5E-11	PFR5G-11	IFR6B
DENSO	K16PR-U11	PK16PR11	SK20PR-B8
CHAMPION	RC10YC4	RC10PYP4	–



2. The new plugs should be checked for the proper gap.
   Spark plug gap:
   <2.4L Engine, 3.0L Engine – without VIC>
   1.0 – 1.1 mm (0.039 – 0.043 inch)
   <3.0L Engine – with VIC>
   0.7 – 0.8 mm (0.039 – 0.043 inch)
3. Install the spark plugs and tighten to 25 ± 4 N·m (18 ± 3 ft-lb).

6. IGNITION CABLES (REPLACE)

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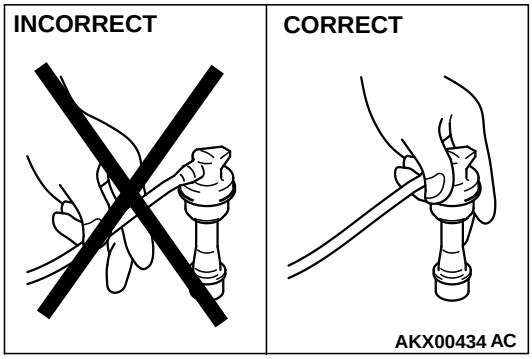
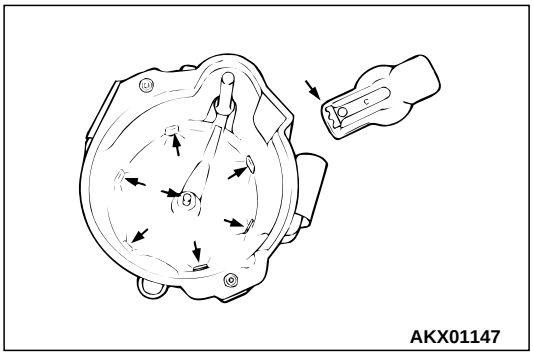


⚠ CAUTION

When disconnecting an ignition cable, be sure to hold the cable boot. If the cable is disconnected by pulling on the cable alone, an open circuit might result.

The ignition cables should be replaced periodically with new ones. After replacing, make sure that the ignition cables are routed properly and fully seated.


AKX01147

7. DISTRIBUTOR CAP AND ROTOR (CHECK) <3.0L ENGINE>

M1001002200050

Check the distributor cap and rotor to maintain driveability and reduce exhaust emissions.

DISTRIBUTOR CAP AND ROTOR INSPECTION

Inspect in accordance with the following procedure. Repair or replace as necessary.

- Check the cap for cracks.
- Check the cap and rotor electrodes for damage.
- Wipe clean the cap and rotor.
- Clean the corrosion off the terminals inside the distributor cap.

8. TIMING BELT (REPLACE)

M1001002300154

Replace the belt with a new one according to the maintenance schedule on P.00-39 to assure proper engine performance. For removal and installation procedures, refer to GROUP 11A, Timing Belt P.11A-32 and Timing Belt B P.11A-36 <2.4L engine> or GROUP 11C, Timing Belt P.11C-37 <3.0L engine>.

9. DRIVE BELT (FOR THE GENERATOR, WATER PUMP, POWER STEERING PUMP (CHECK CONDITION)

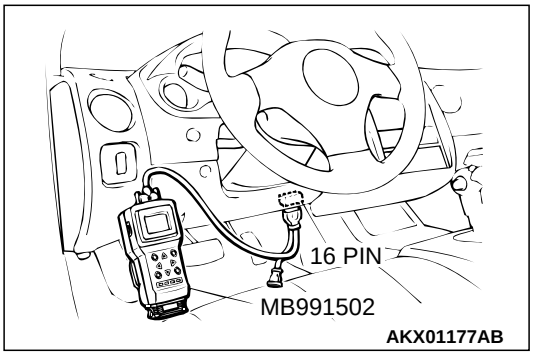
M1001002500222

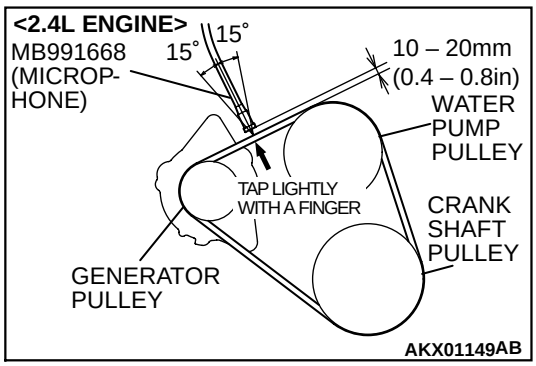
GENERATOR DRIVE BELT TENSION CHECK

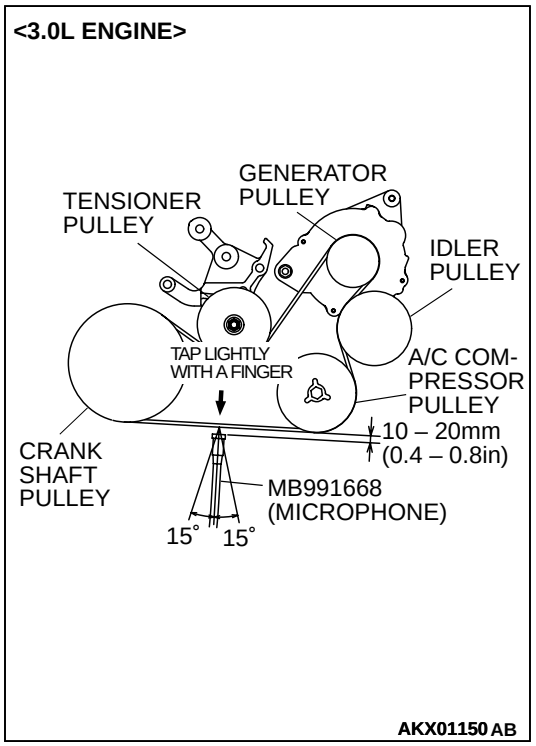
<When using scan tool MB991502>

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991668: Belt Tension Meter Set







⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

1. Connect special tool MB991668 to the scan tool MB991502.
2. Connect scan tool MB991502 to the data link connector.
3. Turn the ignition switch to the "ON" and select scan tool MB991502 "Belt Tension Measurement" from the menu screen.
4. Hold special tool MB991668 (microphone) to the middle of the drive belt between the pulleys (at the place indicated by the arrow), about 10 – 20 mm (0.4 – 0.8 inch) away from the rear surface of the belt and so that it is perpendicular to the belt (within an angle of ± 15 degree angle).

⚠ CAUTION

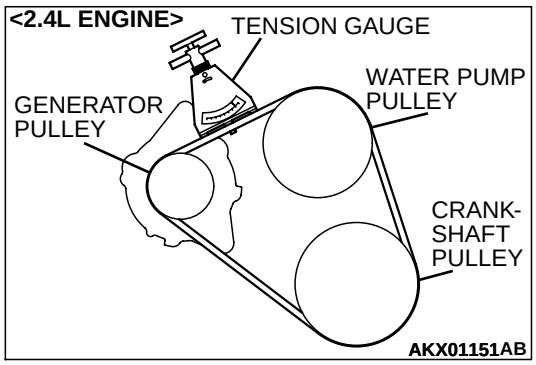
- **The temperature of the surface of the belt should be as close as possible to underhood temperature.**
- **Do not let any contaminants such as water or oil get onto the microphone.**
- **If strong gusts of wind blow against the microphone or if there are any loud sources of noise nearby, the values measured by the microphone may not correspond to actual values.**
- **If the microphone is touching the belt while the measurement is being made, the values measured by the microphone may not correspond to actual values.**
- **Do not take the measurement while the vehicle's engine is running.**

5. Gently tap the middle of the belt between the pulleys (the place indicated by the arrow) with your finger as shown in the illustration, and check that the vibration frequency of the belt is within the standard value.

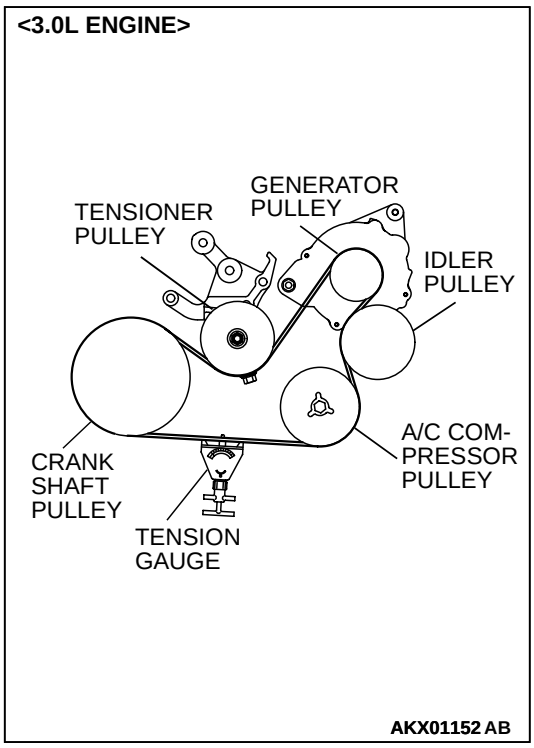
Standard value:

ITEM	2.4L ENGINE	3.0L ENGINE
Vibration frequency Hz	189 – 232	134 – 159

<2.4L ENGINE>



<3.0L ENGINE>

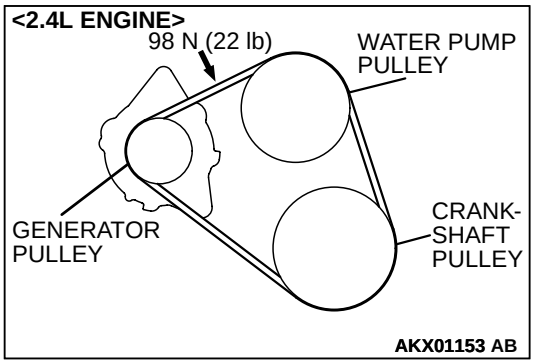


<When using the tension gauge>

Use a belt tension gauge to check that the belt tension is within the standard value.

Standard value:

ITEM	2.4L ENGINE	3.0L ENGINE
Tension N (lb)	392 – 588 (88 – 132)	490 – 686 (110 – 154)

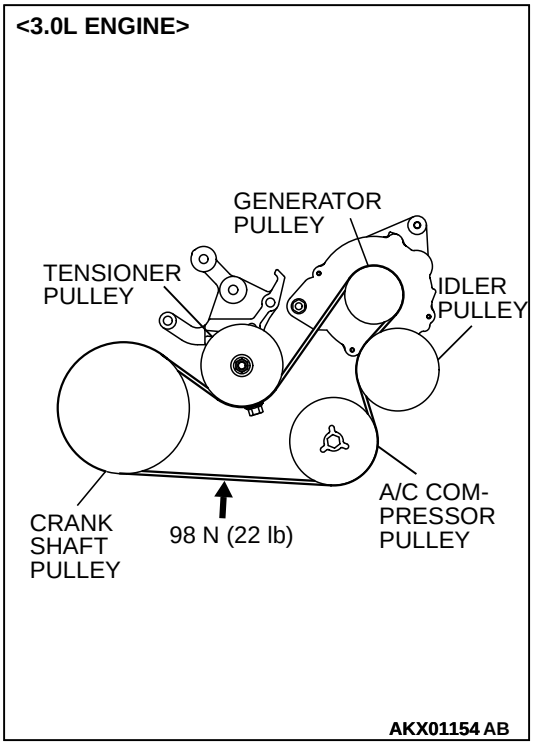


<Belt deflection check>

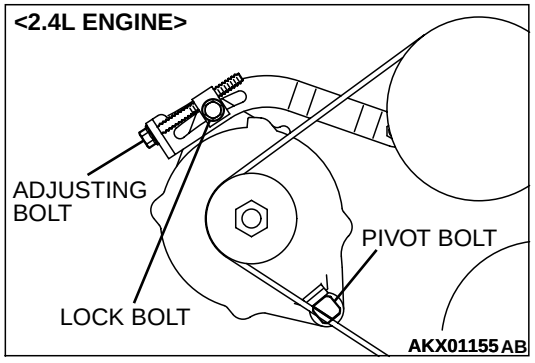
Apply 98 N (22 pound) of force to the middle of the drive belt between the pulleys (at the place indicated by the arrow) and check that the amount of deflection in within the standard value.

Standard value:

ITEM	2.4L ENGINE	3.0L ENGINE
Deflection (Reference value) mm (in)	6.7 – 9.0 (0.26 – 0.35)	8.5 – 10.9 (0.33 – 0.43)



GENERATOR DRIVE BELT TENSION ADJUSTMENT



<2.4L ENGINE>

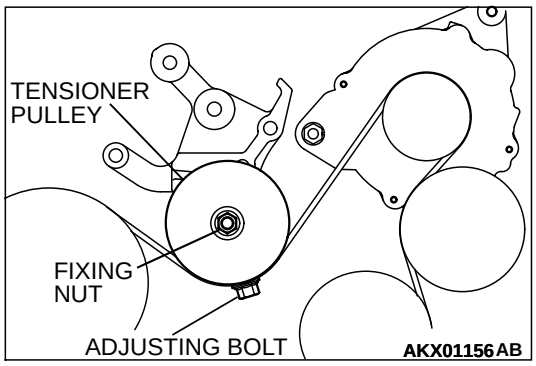
1. Loosen the nut of the generator pivot bolt.
2. Loosen the lock bolt.
3. Turn the adjusting bolt to adjust the belt vibration frequency, belt tension or deflection to the standard value.

Standard value:

ITEMS	DURING ADJUSTMENT	DURING REPLACEMENT
Vibration frequency Hz	201 – 222	267 – 299
Tension N (lb)	441 – 539 (99 – 121)	785 – 981 (176 – 220)
Deflection (Reference value) mm (in)	7.2 – 8.4 (0.28 – 0.33)	4.4 – 5.3 (0.17 – 0.21)

4. Tighten the lock bolt.
   Tightening torque: 23 ± 2 N·m (16 ± 2 ft-lb)
5. Tighten the nut of the generator pivot bolt.
   Tightening torque: 44 ± 10 N·m (33 ± 7 ft-lb)
6. Tighten the adjusting bolt.
   Tightening torque: 4.9 ± 1.0 N·m (44 ± 8 in-lb)

<3.0L ENGINE>



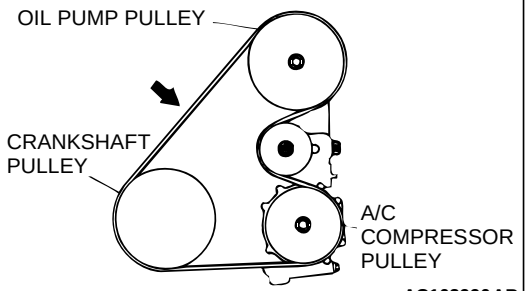
1. Loosen the tensioner pulley fixing nut.
2. With the tensioner pulley fixing nut temporarily tightened to 15 ± 5 N·m (11 ± 4 ft-lb), set the belt tension or defection amount to the standard value using the adjusting bolt.
   Standard value:

ITEMS	DURING ADJUSTMENT	DURING REPLACEMENT
Vibration frequency Hz	141 – 153	170 – 190
Tension N (lb)	539 – 637 (121 – 143)	785 – 981 (176 – 221)
Deflection (Reference value) mm (in)	9.0 – 10.1 (0.35 – 0.40)	6.2 – 7.6 (0.24 – 0.30)

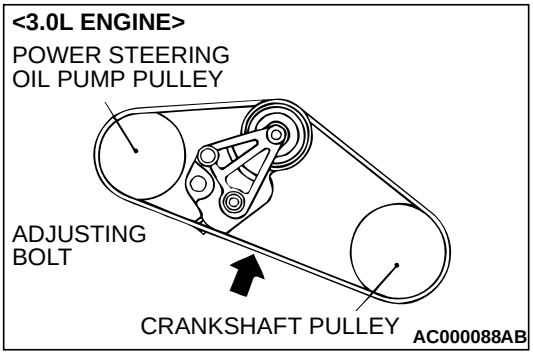
3. Tighten the tension pulley fixing nut.
   Tightening torque: 49 ± 10 N·m (36 ± 7 ft-lb)

POWER STEERING OIL PUMP DRIVE BELT TENSION CHECK AND ADJUSTMENT

<2.4L ENGINE>



<3.0L ENGINE>



Check the drive belt tension by the following procedure.

<When using scan tool MB991502>

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991668: Belt Tension Meter Set

Gently tap the middle of the belt between the pulleys (the location indicated by the arrow) with your finger as shown in the illustration, and check that the vibration frequency of the belt is within the standard value.

NOTE: Refer to for details on the method of measuring the vibration frequency using the scan tool.

<When using a tension gauge>

Use a belt tension gauge to check that the belt tension is within the standard value.

<Belt deflection check>

Apply 98 N (22 pound) of force to the middle of the drive belt between the pulleys (at the place indicated by the arrow) and check that the amount of deflection is within the standard value.

Standard value:

<2.4L ENGINE>

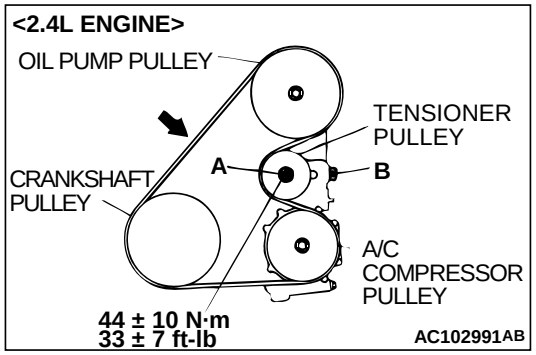
ITEMS	WHEN CHECKED	DURING ADJUSTMENT	DURING REPLACEMENT
Vibration frequency Hz	108 – 132	114 – 126	137 – 157
Tension N (lb)	392 – 588 (88 – 132)	441 – 539 (99 – 121)	637 – 834 (143 – 187)
Deflection (Reference value) mm (in)	11.7 – 15.3 (0.46 – 0.60)	12.5 – 14.3 (0.49 – 0.56)	8.8 – 11.0 (0.35 – 0.43)

<3.0L ENGINE>

ITEMS	WHEN CHECKED	DURING ADJUSTMENT	DURING REPLACEMENT
Vibration frequency Hz	125 – 154	133 – 148	160 – 183
Tension N (lb)	373 – 569 (84 – 128)	422 – 520 (95 – 117)	608 – 804 (137 – 181)
Deflection (Reference value) mm (in)	11.0 – 14.2 (0.43 – 0.56)	11.7 – 13.4 (0.46 – 0.53)	8.4 – 9.3 (0.33 – 0.37)

If the tension or deflection is outside the standard value, adjust by the following procedure.

<2.4L ENGINE>



1. Loosen the tension pulley fixing nut A behind the tension pulley.
2. Adjust the belt deflection amount using the adjusting bolt B.
3. Tighten the fixing nut A.

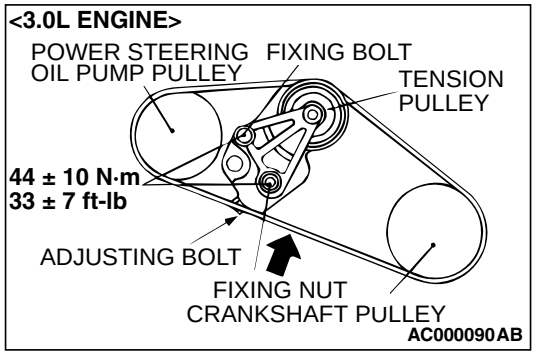
Tightening torque: 44 ± 10 N·m (33 ±7 ft-lb)

⚠ CAUTION

Check after turning the crankshaft one or more rotation clockwise.

4. Check the belt deflection amount and tension, and readjust if necessary.

<3.0L ENGINE>



1. Loosen the tension pulley fixing nut and bolt.
2. Adjust the belt tension using the adjusting bolt.
3. Tighten the fixing nut and bolt.

Tightening torque: 44 ± 10 N·m (33 ± 7 ft-lb)

⚠ CAUTION

Check after turning the crankshaft one or more rotation clockwise.

4. Check the belt deflection amount and tension, and readjust if necessary.

10. ENGINE OIL (CHANGE)

M1001002600207

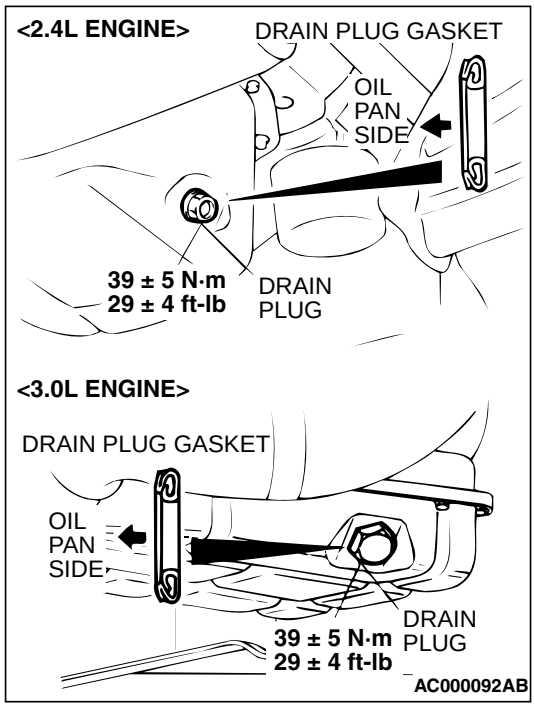
Use the specified oil. (Refer to P.00-36.)

1. After warming up the engine, remove the oil filler cap.

⚠ WARNING

Use care as oil could be hot.

2. Remove the drain plug to allow the engine oil to drain.



3. Replace the drain plug gasket with a new one, and then tighten the drain plug to the specified torque.

   Tightening torque: 39 ± 5 N·m (29 ± 4 ft-lb)

   NOTE: Install the drain plug gasket so it faces in the direction shown in the illustration.

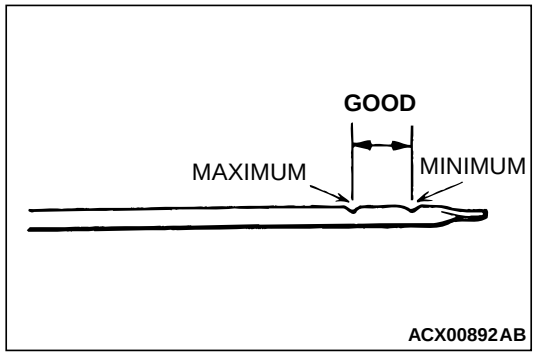
4. Pour new engine oil in through the oil filler.

   Engine oil capacity:

   - **4.3 dm^3 (4.5 quarts)**

     [add 0.3 dm^3 (0.32 quarts) if replacing the oil filter.]

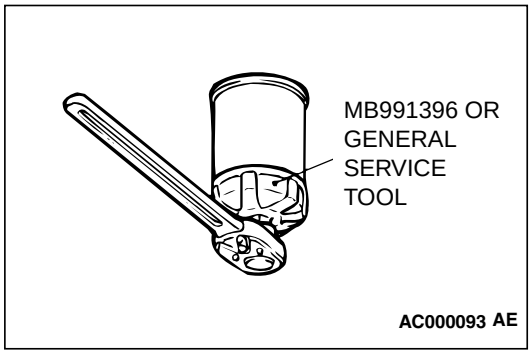
5. Start the engine and run it at idle for a few minutes.



6. Stop the engine and check to ensure that the engine oil level is within the level range indicated on the dip stick.

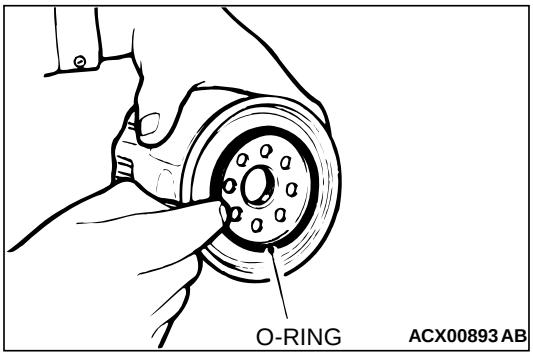
11. ENGINE OIL FILTER (REPLACE)

M1001002700196



The quality of replacement filters varies considerably. Only high quality filters should be used to assure most efficient service. Genuine oil filters require that the filter is capable of withstanding a pressure of 1,765 kPa (256 psi) are high quality filters and are recommended as follows:

Mitsubishi Oil Filter Part Number:
<2.4L Engine>
MD136466, MD322508, MD325714, MD332687
MD360935, MD365876 or equivalent
<3.0L Engine>
MD352626 or equivalent



ENGINE OIL FILTER SELECTION

This vehicle is equipped with a full-flow, throw-away oil filter. The same type of filter is recommended as a replacement filter for this vehicle. It is possible, particularly in cold weather, that this vehicle may develop high oil pressure for a short duration. Make sure that any replacement filter used on this vehicle is a high-quality filter. The filter must withstand a pressure of 1,765 kPa (256 psi) [manufacturer's specifications] to avoid filter and ultimately engine damage. The following is a high-quality filter and is strongly recommended for use on this vehicle: Mitsubishi Engine Oil Filter Part number MD136466, MD322508, MD325714, MD332687, MD352626, MD360935 and MD365876.

Any replacement oil filter should be installed in accordance with the oil filter manufacturer's installation instructions.

1. Drain the engine oil by removing the oil drain plug.
2. Use an oil filter wrench to remove the engine oil filter.
3. Clean the contacting surface of the filter bracket.
4. Lubricate the O-ring of the new oil filter with a small amount of new engine oil.
5. Screw on the oil filter by hand until it touches the surface of the flange and then tighten it with an oil filter wrench, etc.

ENGINE	NUMBER	SPECIAL TOOL	TIGHTENING TORQUE
2.4L	MD360935	MB991396 or equivalent	Approximately one turn [14 ± 2 N·m (124 ± 18 in-lb)]
	MD325714 MD332687 MD365876	MB991396 or equivalent	Approximately 3/4 turn [16 ± 4 N·m (12 ± 3 ft-lb)]
	MD136466 MD322508	General service tool	Approximately 3/4 turn [17 ± 3 N·m (34 ± 2 ft-lb)]
3.0L	MD352626	General service tool	Approximately one turn [14 ± 2 N·m (124 ± 18 in-lb)]

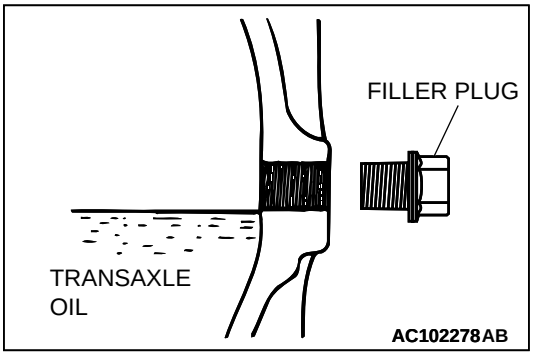
6. Add new engine oil through the oil filler.

12. MANUALTRANSAXLE OIL

M1001002800126

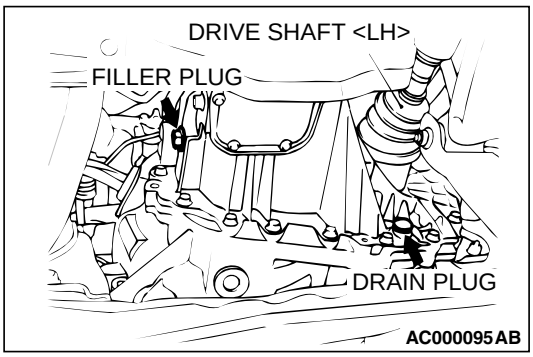
Inspect each component for evidence of leakage. Check the oil level by removing the filler plug.

CEHCK OIL LEVEL



1. Remove the filler plug.
2. Check that the oil is not noticeably dirty, and that it has a suitable viscosity.
3. Tighten the filler plug to the specified torque.

Tightening torque: 32 ± 2 N·m (24 ± 1 ft-lb)



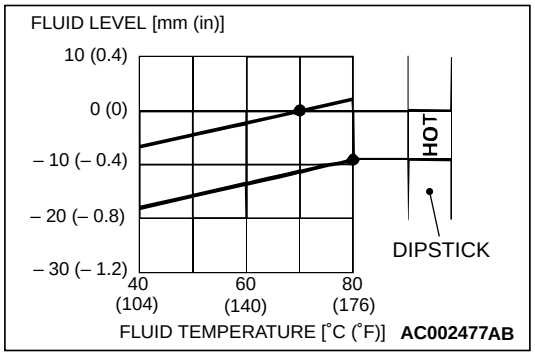
CHANGE OIL

1. Remove the filler plug.
2. Remove the drain plug and drain the oil.
3. Tighten the drain plug to the specified torque.
   Tightening torque: 32 ± 2 N·m (24 ± 1 ft-lb)
4. Fill with Hypoid gear oil SAE 75W-90 or 75W-85W conforming to API classification GL-4 until the level comes to the lower portion of filler plug hole.
   Quantity:
   <2.4L Engine> 2.2 dm^3 (2.3 quarts)
   <3.0L Engine> 2.8 dm^3 (3.0 quarts)
5. Tighten the filler plug to the specified torque.
   Tightening torque: 32 ± 2 Nm (24 ± 1 ft-lb)

13. AUTOMATIC TRANSAXLE FLUID

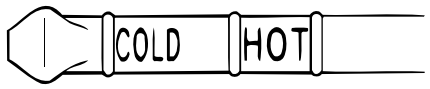
M1001002900190

CHECKING A/T FLUID LEVEL



1. Drive the vehicle until the A/T fluid temperature rises to the normal temperature [70 – 80°C (158 – 176°F)].
   NOTE: The A/T fluid temperature is measured with MUT-II.
   NOTE: If it takes some amount of time until the A/T fluid reaches its normal operating temperature [70 – 80°C (158 – 176°F)], check the A/T fluid level by referring to the left diagram.
2. Park the vehicle on a level surface.
3. Move the selector lever through all positions to fill the torque converter and the hydraulic circuits with A/T fluid, and then move the selector lever to the "N" position.
4. After wiping off any dirt around the dipstick, remove the dipstick and check the condition of the A/T fluid.
   NOTE: If the fluid smells as if it is burnt, it means that the A/T fluid has been contaminated by fine particles from the bushings and friction materials, A transaxle overhaul and cooler line flushing may be necessary.

<2.4L ENGINE>



<3.0L ENGINE>

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5. Check that the A/T fluid level is at the "HOT" mark on the dipstick. If the A/T fluid level is lower than this, pour in more DIAMOND ATF SP-II M or SP-III or equivalent until the level reaches the "HOT" mark.

   NOTE: If the A/T fluid level is too low, the oil pump will draw in air along with the A/T fluid, which will cause bubbles to form. If the A/T fluid level is too high, rotating components inside the transaxle will churn the fluid and air into a foamy liquid. Both conditions (level too low or too high) will cause the hydraulic pressure to drop, which will result in late shifting and slipping of the clutches and brakes.
   In either case, air bubbles can interfere with normal valve, clutch, and brake operation. Also, foaming can cause A/T fluid to escape from the transaxle vent where it may be mistaken for a leak.
6. Securely insert the dipstick.

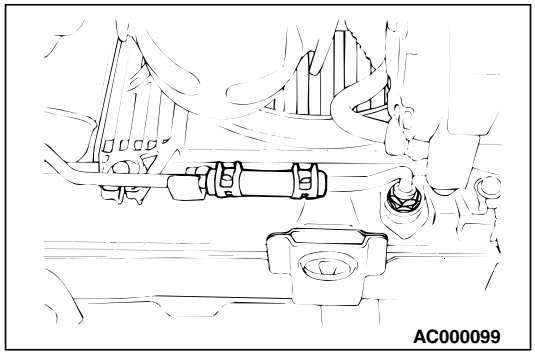
   NOTE: The A/T fluid should always be replaced when:

   - *When troubleshooting the transaxle*
   - *When overhauling the transaxle*
   - *When the oil is noticeably dirty or burnt (vehicle was driven under severe conditions)*

CHANGE A/T FLUID

If you have an A/T fluid changer, use this changer to replace the A/T fluid. If you do not have an A/T fluid changer, replace the A/T fluid by the following procedure.

1. Disconnect the hose shown in the illustration which connects the transaxle and the oil cooler (inside the radiator). Place a container under the hose to collect the discharge.



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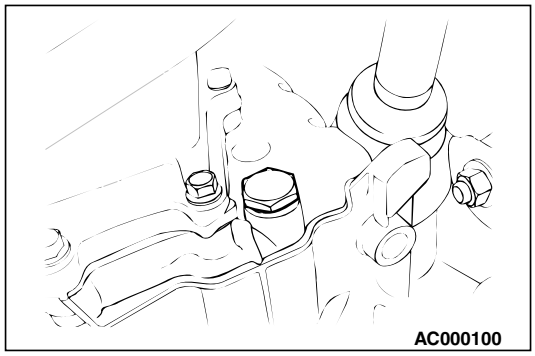
⚠ CAUTION

The engine should be stopped within one minute after it is started. If the A/T fluid has all drained out before then, the engine should be stopped at that point. Discharge volume: Approximately 3.5 dm^3 (3.7 quarts)

2. Start the engine and let the A/T fluid drain out.

   Running conditions: "N" range with engine idling
3. Remove the drain plug from the bottom of the transaxle case to drain the A/T fluid.

   Discharge volume: Approximately 2.0 dm^3 (2.1 quarts)



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4. Install the drain plug with a new gasket, and tighten it to the specified torque.

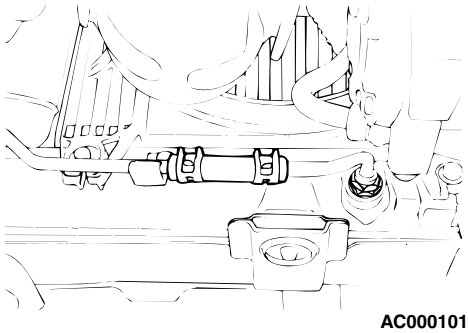
   Tightening torque: 32 ± 2 N·m (24 ± 1 ft-lb)
5. Pour new A/T fluid (Diamond ATF SP III or equivalent) in through the oil filler tube.

   Adding volume: Approximately 5.5 dm^3 (5.8 quarts)

⚠ CAUTION
Stop pouring if the full volume of A/T fluid cannot be poured in.

6. Repeat the procedure in Step 2. (to pump out the rest of the contaminated A/T fluid)
7. Pour the new A/T fluid in through the oil filler tube.

   NOTE: Check for contamination or burnt smell. If A/T fluid is still contaminated or burnt, repeat Steps 6 and 7 before proceeding to Step 8.
8. Reconnect the hose which was disconnected in step 1 above, and firmly replace the dipstick.
9. Start the engine and run it at idle for 1 – 2 minutes.
10. Move the selector lever through all positions, and then move it to the "N" position.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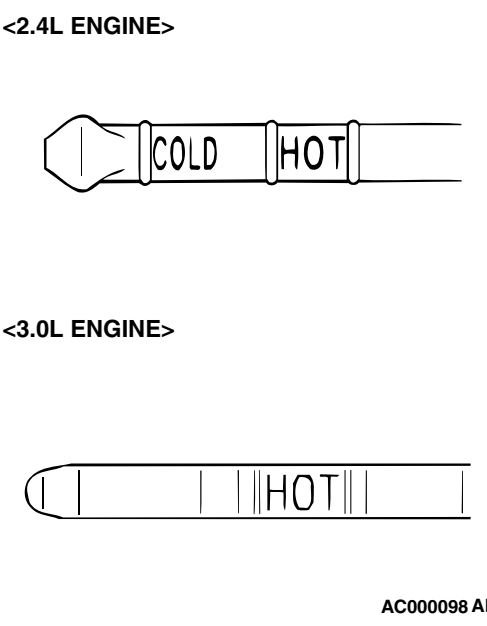
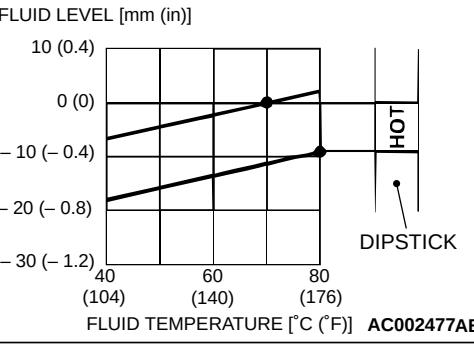


11. Check that the A/T fluid level is at the "COLD" mark on the dipstick. If the level is lower than this, pour in more A/T fluid.
12. Drive the vehicle until the A/T fluid temperature rises to the normal temperature [70 – 80°C (158 – 176°F)], and then check the A/T fluid level again. If it takes some amount of time until the A/T fluid reaches its normal operating temperature [70 – 80°C (158 – 176°F)], check the A/T fluid level by referring to the diagram at left. The A/T fluid level must be at the "HOT" mark.

    NOTE: The A/T fluid temperature is measured with scan tool (MUT-II). The "COLD" level is for reference only; the "HOT" level should be regarded as the standard level.



NOTE: If it takes some amount of time until the A/T fluid reaches its normal operating temperature [70 – 80°C (158 – 176°F)], check the A/T fluid level by referring to the left diagram.

13. Firmly insert the dipstick into the oil filler tube.

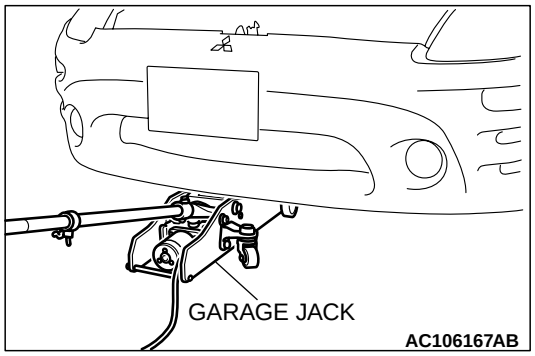
14. ENGINE COOLANT (CHANGE)

M1001003100197

Check the cooling system parts such as the radiator, heater and oil cooler hoses, thermostat and the connections for leakage and damage.

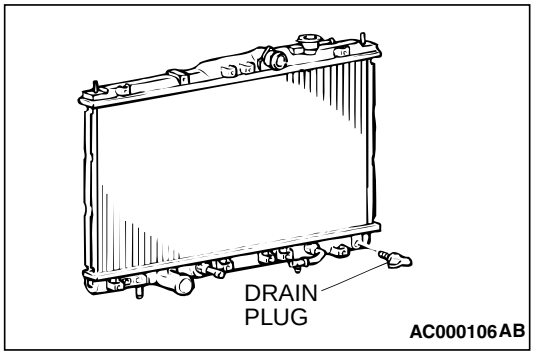
CHANGING COOLANT

1. Turn the ignition switch to the "ON" position, and then rotate the heater control to the "MAX HOT" position.
2. Turn the ignition switch to the "OFF" position.
3. Raise the vehicle at the front with a garage jack.



⚠ CAUTION

When removing the radiator cap, use care to avoid contact with hot coolant or steam. Place a shop towel over the cap and turn the cap counterclockwise a little to let the pressure escape through the vinyl tube. After relieving the steam pressure, remove the cap by slowly turning it counterclockwise.



4. Remove the radiator cap, radiator drain plug and if equipped engine coolant drain plug to drain the coolant.
5. Remove the reserve tank and drain the coolant.
6. After completely draining the coolant, reinstall the drain plugs and flush the engine and radiator using a radiator cleaning fluid.
7. After the flushing is completed, completely drain the cleaning fluid and install the radiator and engine drain plugs.

⚠ CAUTION

Do not use alcohol or methanol anti-freeze or any engine coolants mixed with alcohol or methanol anti-freeze. The use of an improper anti-freeze can cause corrosion of the aluminum components.

8. By referring to the section on coolant, select an appropriate concentration for safe operating temperature within the range of 30 to 60 %. Use special tool MB991871 to refill the coolant. A convenient mixture is a 50 % water and 50 % antifreeze solution [freezing point: –31°C (–32.8 °F)].

   Recommended antifreeze:

   MITSUBISHI GENUINE Part NO.MD970389 or equivalent

   Quantity:

   <2.4L Engine> 7.0 dm^3 (7.4 quarts)

   <3.0L Engine> 8.0 dm^3 (8.5 quarts)

TSB Revision

9. Reinstall the radiator cap.
10. Start the engine and let it warm up until the thermostat opens.
11. After repeatedly revving the engine up to 3,000 r/min several times, then stop the engine.
12. Remove the radiator cap after the engine has become cold, and pour in coolant up to the brim. Reinstall the cap.

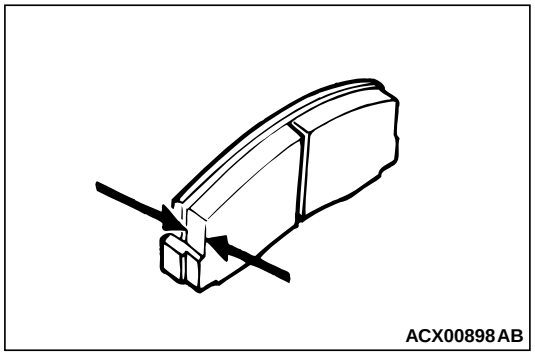
⚠ CAUTION

Do not overfill the reserve tank.

13. Add coolant to the reserve tank between the "FULL" and "LOW" mark if necessary.

15. DISC BRAKE PADS (INSPECT FOR WEAR)

M1001003200194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Check for fluid contamination and wear. Replace the complete set of pads if any one pad is defective.

Thickness of lining
Minimum limit: 2.0 mm (0.08 inch)

⚠ CAUTION

The pads for the right and left wheels should be replaced at the same time. Never split or intermix brake pad sets. All four pads must be replaced as a complete set.

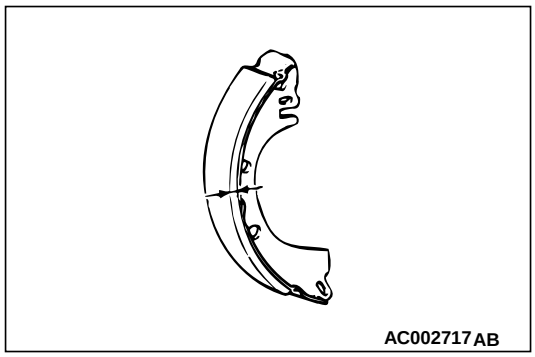
16. REAR DRUM BRAKE LININGS AND REAR WHEEL CYLINDERS (INSPECT FOR WEAR AND LEAKS)

M1001003300179

1. Remove the brake drum and check the thickness of brake shoe lining for wear. Check the automatic brake adjusting system by hand to see if it operates smoothly. Also see if the gears are in proper mesh with each other. To assure smooth operation, apply a very thin coat of multipurpose grease to the friction surface of the adjuster and link shaft.

⚠ CAUTION

The shoes for the right and left wheels should be replaced at the same time. Never split or intermix brake shoe sets. All four shoes must be replaced as a complete set.


AC002717AB

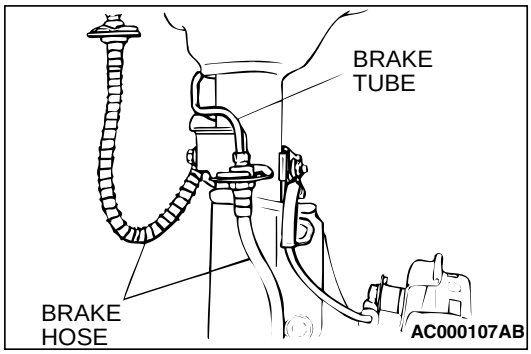
2. Inspect the wheel cylinder boot for evidence of a brake fluid leak. Visually check the boot for cuts, tears or heat cracks. (A slight amount of fluid on the boot may not be a leak, but may be preservative fluid used at assembly.) Check the Brake Shoes for Wear.

Thickness of lining

Minimum limit: 1.0 mm (0.04 inch)

17. BRAKE HOSES (CHECK FOR DETERIORATION OR LEAKS)

M1001003400198

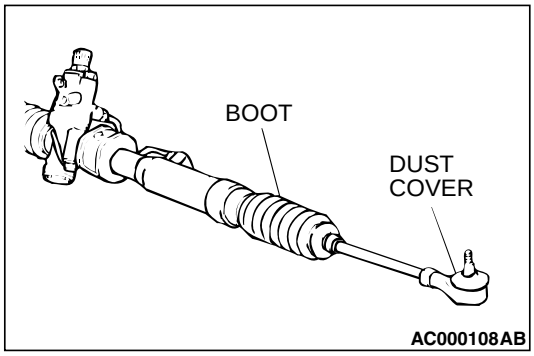


Inspection of brake hoses and tubing should be included in all brake service operations.
The hoses should be checked for:

1. Correct length, severe surface cracking, pulling, scuffing or worn spots. (If the fabric casing of the hoses is exposed by cracks or abrasion in the rubber hose cover, the hoses should be replaced. Eventual deterioration of the hose and possible bursting failure may occur.)
2. Incorrect installation, casing twisting or interference with wheel, tire or chassis.

18. BALL JOINT AND STEERING LINKAGE SEALS (INSPECT FOR GREASE LEAKS AND DAMAGE)

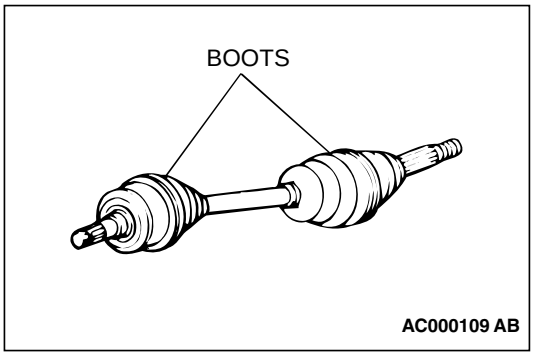
M1001003500195



1. These components, which are permanently lubricated at the factory, do not require periodic lubrication. Damaged seals and boots should be replaced to prevent leakage or contamination of the grease.
2. Inspect the dust cover and boots for proper sealing, leakage and damage, and replace them if defective.

19. DRIVE SHAFT BOOTS (INSPECT FOR GREASE LEAKS AND DAMAGE)

M1001003600192

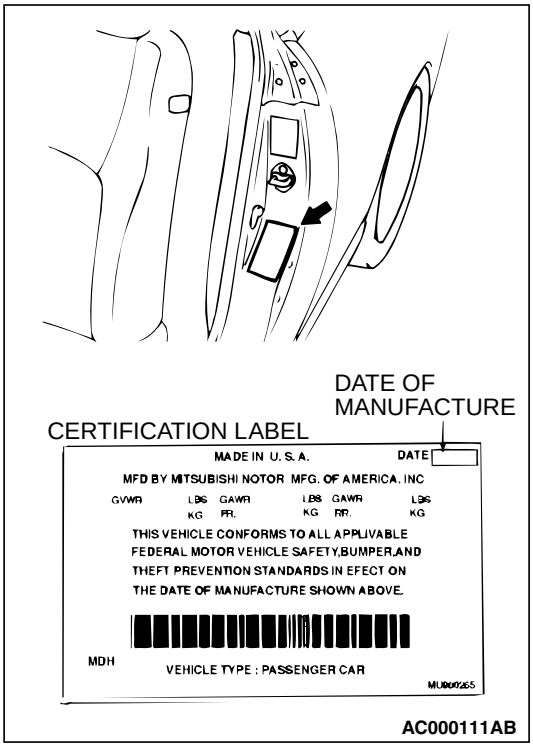


1. These components, which are permanently lubricated at the factory, do not require periodic lubrication. Damaged seals and boots should be replaced to prevent leakage or contamination of the grease.
2. Inspect the dust cover and boots for proper sealing, leakage and damage, and replace them if defective.

20. SRS AIR BAG (INSPECT FOR SRS SYSTEM)

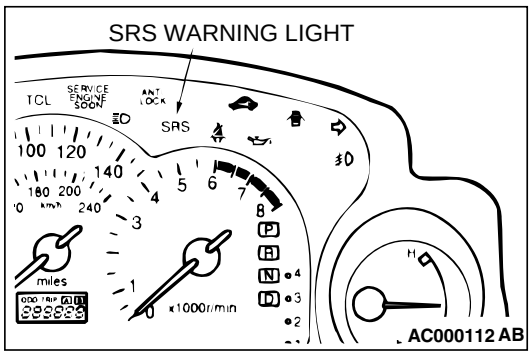
M1001003700199

The SRS must be inspected by an authorized dealer 10 years after the car manufacture date shown on the certification label located on the left center sill.

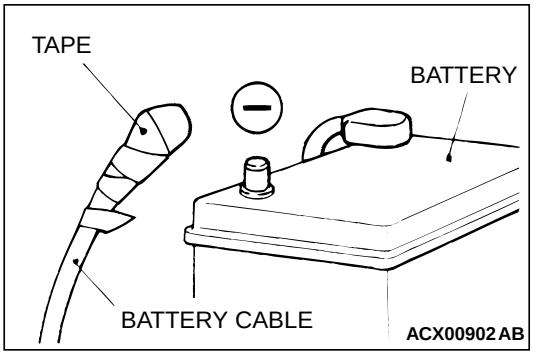


SRS WARNING LIGHT CHECK

Turn the ignition key to the "ON" position. Does the "SRS" warning light illuminate for about seven seconds, and then remain off for at least five seconds after turning OFF? If yes, the SRS system is functioning properly. If no, refer to GROUP 52B, Diagnosis P.52B-23.



SRS COMPONENT VISUAL CHECK



⚠ ***DANGER***

Wait at least 60 seconds after disconnecting the battery cable before doing any further work. The SRS system is designed to retain enough voltage to deploy the air bag for a short time even after the battery has been disconnected, Serious injury may result from unintended air bag deployment if work is done on the SRS system immediately after the battery cable is disconnected.

⚠ ***WARNING***

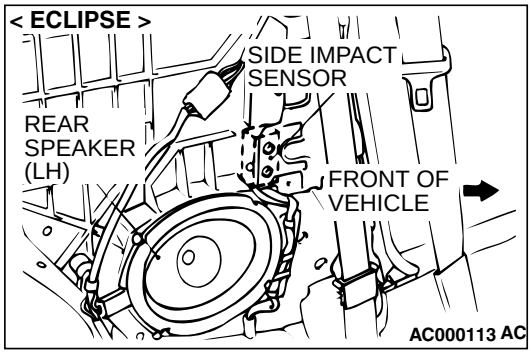
Battery posts, terminals and related accessories contain lead and lead compounds. WASH HANDS AFTER HANDLING.

1. Turn the ignition switch to the "LOCK" (OFF) position, disconnect the negative battery cable and tape the terminal.
2. Remove the floor console assembly. (Refer to GROUP 52A, Floor Console P.52A-8.)
3. Disconnect a connector from the SRS-ECU.

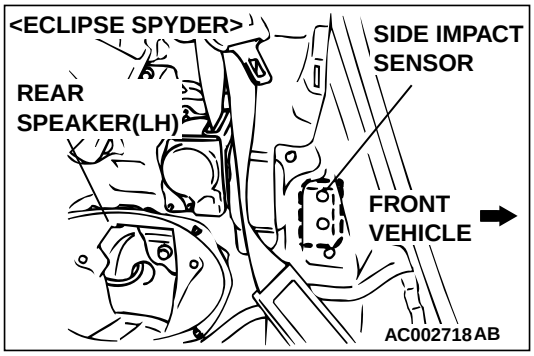
SIDE IMPACT SENSORS

⚠ ***WARNING***

- ***If the side impact sensor is not installed securely and correctly, the side-airbag may not operate normally.***
- ***If a dent, crack, deformation or rust is detected, replace with a new sensor.***



1. Check the side impact sensor and bracket for dents, cracks or deformation.
2. Check the connector for damage, and terminal for deformation.
3. Check that there is no bending or corrosion in the side outer panel (ECLIPSE) or quarter panel (ECLIPSE SPYDER).

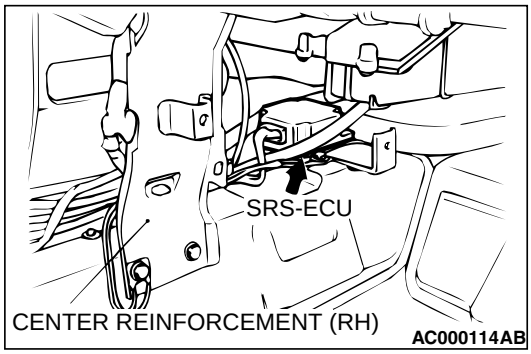


REPLACE THE SIDE IMPACT SENSOR IF IT FALS THE VISUAL CHECK

Refer to GROUP 52B,Side Impact Sensor P.52B-153.

NOTE: The illustration at left shows the left side impact sensor (LH). The position of the side impact sensor (RH) is symmetrical to this.

SRS AIR BAG CONTROL UNIT (SRS-ECU)



⚠ ***WARNING***

The SRS may not activate if the SRS-ECU (with built-in safing G-sensor and analog G-sensor) is not installed properly, which could result in serious injury or death to the vehicle's driver and passenger.

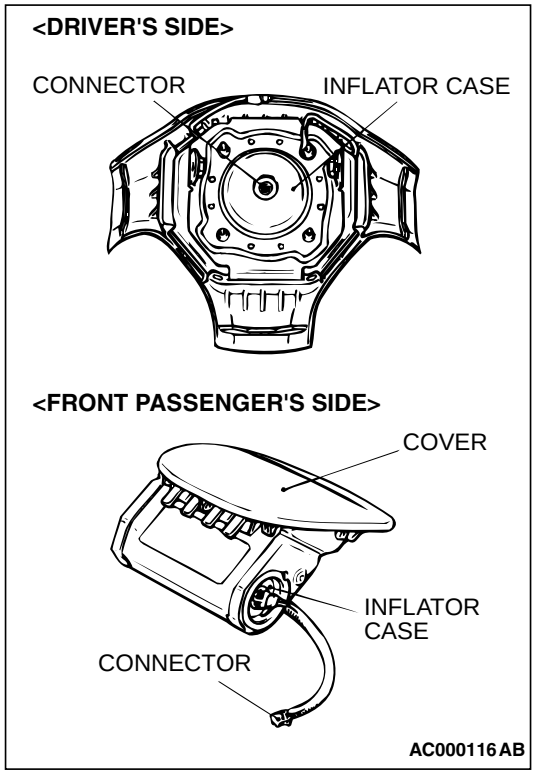
1. Check the SRS-ECU case and brackets for dents, cracks, deformation or rust.
2. Check the connector for damage, and check the terminals for deformation or rust.
   Replace the SRS-ECU if it fails the visual checks above. (Refer to GROUP 52B, SRS Air bag Control Unit P.52B-142.)

AIR BAG MODULE, STEERING WHEEL AND CLOCK SPRING

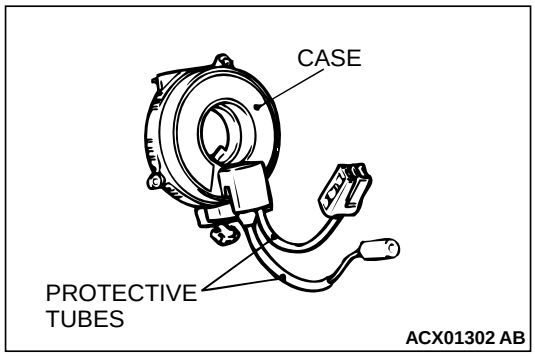
⚠ ***WARNING***

The removed air bag module should be stored in a clean, dry place with the pad cover face up.

1. Remove the air bag module, steering wheel and clock spring.
   (Refer to GROUP 52B, Air bag Module and Clock Spring P.52B-144.)
2. Check the pad cover for dents, cracks or deformation.



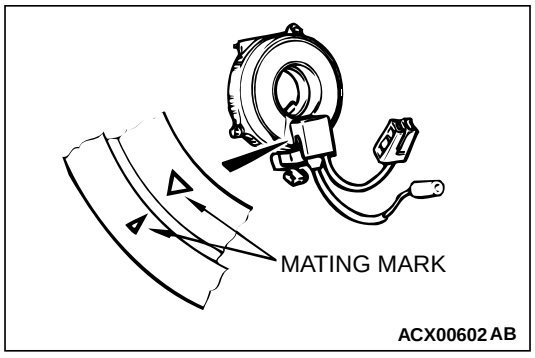
3. Check the connector for damage and deformed terminals, and check the harness for binds.
4. Check the air bag inflator case for dents, cracks or deformation.
5. Check the harness (built into the steering wheel) and connectors for damage, and check the terminals for deformation.



6. Check the clock spring connectors and protective tube for damage, and terminals for deformities.
7. Visually check the case for damage.

⚠ ***WARNING***

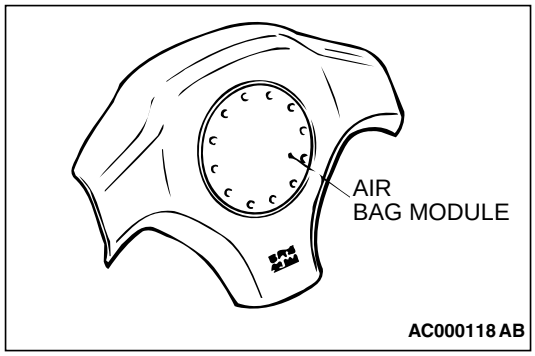
If the clock spring's mating mark is not properly aligned, the steering wheel may not completely rotate during a turn, or the flat cable within the clock spring may be severed, obstructing normal operation of the SRS and possibly leading to serious injury to the vehicle's driver and front passenger.



8. Align the mating marks of the clock spring, and after turning the front wheels to the straight-ahead position, install the clock spring to the column.

Mating marks alignment

After turning the clock spring fully clockwise, turn it approximately 3 4/5 turns counterclockwise until the mating marks are aligned.



9. Install the steering column covers, steering wheel and air bag module.
10. Check the steering wheel for noise, binds or difficult operation.

⚠ ***DANGER***

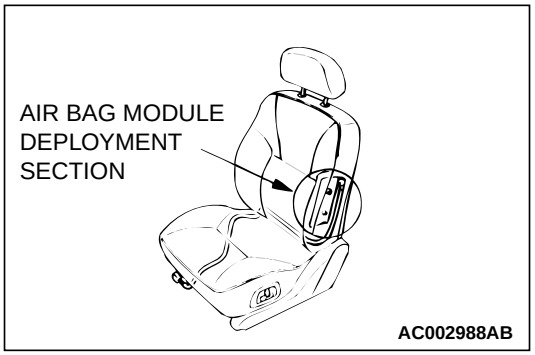
The SRS may not activate if any of the above components are not installed properly, which could result in serious injury or death to the vehicle's driver and front passenger.

11. Check the steering wheel for excessive free play.
    REPLACE ANY PART IF IT FAILS VISUAL INSPECTION. (Refer to GROUP 52B, Air bag Module and Clock Spring P.52B-144.)

FRONT SEATBACK ASSEMBLY WITH SIDE-AIRBAG MODULE

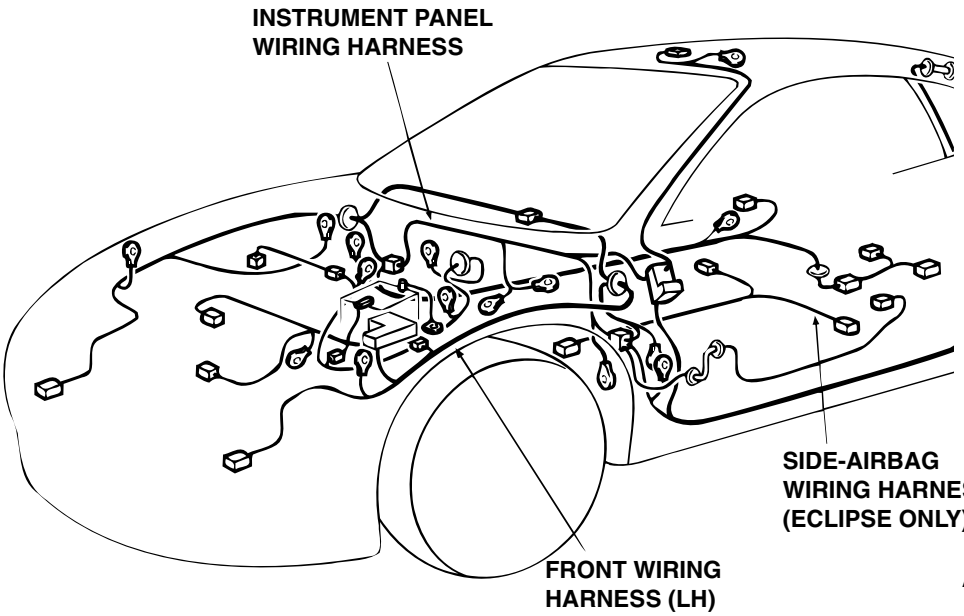
⚠ ***WARNING***

- ***If any improper part is found during the following inspection, replace the front seatback assembly with a new one.***
- ***Dispose of the old one according to the specified procedure. (Refer to GROUP 52B, Air bag Module Disposal Procedures P.52B-157 .)***
- ***Never attempt to measure the circuit resistance of the air bag module (squib) even if you are using the specified tester. If the circuit resistance is measured with a tester, accidental air bag deployment will result in serious personal injury.***



1. Check the air bag module deployment section for dents or deformation.
2. Check the connector for damage, the terminals for deformation, and harness for binds.

WIRING HARNESS



1. Check the connector for poor connection.

⚠ *DANGER*

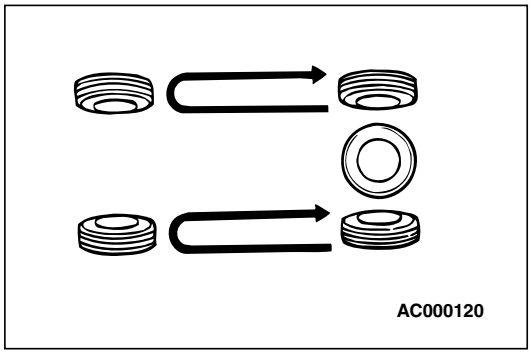
The SRS system may not operate if SRS harnesses or connectors are damaged or improperly connected, which could result in serious injury or death to the vehicle's driver and front passenger.

2. Check the harness for binds, the connectors for damage, and the terminals for deformation. REPLACE ANY CONNECTOR OR HARNESS THAT FAILS THE VISUAL INSPECTION. (Refer to GROUP 52B, SRS Service Precaution P.52B-144.)

21. EXHAUST SYSTEM (CONNECTIONS, PIPES AND CONVERTER HEAT SHIELDS) (CHECK AND SERVICE AS REQUIRED)

M1001005800170

1. Check for holes and exhaust gas leaks due to damage, corrosion, etc.
2. Check the joints and connections for looseness and exhaust gas leaks.
3. Check the rubber hangers and brackets for damage.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22. TIRES (ROTATE)

M1001008900187

Rotate tires regularly to equalize tire wear and help extend tire life. Recommended tire rotation is every 12,000 km (7,500 miles) under normal driving conditions and every 9,600km (6,000 miles) in severe driving conditions.
Timing for the rotation may vary according to vehicle condition, road surface conditions, and individual driver's habits.
When rotating tires, check for uneven wear, damage, and wheel alignment. Abnormal wear is usually caused by incorrect tire pressure, improper wheel alignment, out-of balance wheels, or severe braking.
The first rotation is the most important to achieve more uniform wear for all tires on the vehicle.

MAIN SEALANT AND ADHESIVE TABLE

M1001003800215

APPLICATION		3M™ NO.	LOCTITE®/ PERMATEX®NO.
ENGINE AND DRIVETRAIN	Between rocker cover and camshaft bearing cap. Between rocker cover, semicircular packing and cylinder head. Between oil pressure switch and engine.	3M™ AAD Part No. 8660 Ultrapro High Temp.Silicone Gasket or 3M™ AAD Part No. 8679 Black/8678 Black Press-In-Place Silicone gasket strips	Permatex® Ultra Black 598, No.82180
	Between engine coolant temperature switch, engine coolant temperature sensor, thermo valve, thermo switch, joint, engine coolant temperature gauge unit (large-size) and engine	3M™ AAD Part No. 8731 Medium Strength Blue Threadlocker	Loctite®242 Blue Service Tool Removable 24200
	Between oil pan and engine block	3M™ AAD Part No. 8672, 3M™ AAD Part No. 8704 or 3M™ AAD Part No. 8679/ 3M™ AAD Part No. 8678 or	Permatex® Ultra Gray 599, No.82194
WEATHER-STRIPPING FOR GLASS	Between tempered glass, body flanges, and weatherstrip	3M™ AAD Part No. 8509 Auto Bedding and Glazing Compound or 3M™ AAD Part No. 8633 Windo-weld Resealant	–
WEATHER-STRIPPING FOR GLASS	Between laminated glass and weatherstrip	3M™ AAD Part No. 8633	–

APPLICATION		3M™ NO.	LOCTITE®/ PERMATEX®NO.
INTERIORS	Adhesive of vinyl chloride cloth	3M™ AAD Part No. 8088 General Trim Adhesive or 3M™ AAD Part No. 8064 Vinyl Trim Adhesive	Permatex® Vinyl Repair Kit No.81786
	Adhesion of door weatherstrip	3M™ AAD Part No. 8001 (yellow) or 3M™ AAD Part No. 8008 (black) Super Weatherstrip Adhesive or 3M™ AAD Part No. 8011 Black Weatherstrip Adhesive	Permatex® Super Black Weatherstrip Adhesive No.82, 81850
	Sealing of various grommets and packing	3M™ AAD Part No. 8509 or 3M™ AAD Part No. 8678	–
	Adhesion of headliners and various interior decorative materials	3M™ AAD Part No. 8088 General Trim Adhesive or 3M™ AAD Part No. 8090 Super Trim Adhesive	Permatex® Spray Adhesive No.82019
BODY SEALANTS	Sealing of sheet metal joints, drip rail, floor, side panels, trunk, front panel, tail gate hinge	3M™ AAD Part No. 8531 Heavy Drip-Check Sealer (gray) or 3M™ AAD Part No. 8302 Ultrapro Autobody Sealant (clear) or 3M™ AAD Part No. 8361 Urethane A/B Sealant (gray or white)	–
	Miscellaneous body sealants (originally mounted w/ adhesive tape) • Waterproof door film • Fender panel • Splash shield • Mud guard • Rear combination lamp	3M™ AAD Part No. 8633 Windo-weld Resealant	–
	Fuel Tank and Pad	3M™ AAD Part No. 8088 General Trim Adhesive or 3M™ AAD Part No. 8090 Super Trim Adhesive	Permatex® Spray Adhesive No.82019

APPLICATION		3M™ NO.	LOCTITE®/ PERMATEX®NO.
CHASSIS SEALANT	Sealant of various flange faces and threaded parts. Packing of fuel gauge unit	3M™ AAD Part No. 8730 High Strength Red Thread lock or 3M™ AAD Part No. 8731 Medium Strength Blue Threadlocker	Loctite®272 High Strength and High Temperature 27200
	Sealing of various threaded parts, dust covers. Differential carrier packing, dust covers and ball joint and linkage. Packing and shims of steering box, sealing of rack support cover and top cover of steering box housing, seal of junction face of knuckle arm flange	3M™ AAD Part No. 8672 Ultrapro High Temp.Silicone Gasket or 3M™ AAD Part No. 8679 (black) or 3M™ AAD Part No. 8678 (black) Press-In-Place Silicone gasket strips 3M™ AAD Part No. 8661 or 3M™ AAD Part No. 8663 Super Silicone sealant	Permatex® The Right Stuff No.25223
	Seal of brake shoe hold down pin and wheel cylinder of drum brakes	3M™ AAD Part No. 8633 Windo-weld Resealant	–
QUICK FIX ADHESIVE	–	3M™ AAD Part No. 8155 Quick Fix Adhesive	Loctite®Quicktite Super Glue 21309
ANAEROBIC STRONG SEALING AGENT	Fixing of various threads, bolts, screws. Fixing of differential drive gear bolt, Connecting of tilt steering bolt. Fan, pulley, gear Sealing of small gaps and flange faces	3M™ AAD Part No. 8730 High Strength Threadlocker or 3M™ AAD Part No. 8731 Medium Strength Threadlocker	Loctite®271, High-Strength Threadlocker 27100 or 27200
UNDERCOATING AGENT	-	3M™ AAD Part No. 8883 Rubberized Undercoating Aerosol or 3M™ AAD Part No. 8864 Body Schutz Undercoating (qt)	Permatex® Heavy-Duty Undercoating 81833

NOTES

GROUP 00E

GENERAL <ELECTRICAL>

CONTENTS

HARNESS CONNECTOR INSPECTION 00E-2

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HOW TO DIAGNOSE 00E-5
TROUBLESHOOTING STEPS 00E-5
INFORMATION FOR DIAGNOSIS 00E-6
INSPECTION 00E-7
INSPECTION INSTRUMENTS 00E-7
CHECKING SWITCHES 00E-9
CHECKING RELAYS 00E-10
CHECKING FUSES. 00E-11
CABLES AND WIRES CHECK 00E-12
BATTERY HANDLING 00E-12
GENERAL ELECTRICAL SYSTEM CHECK 00E-13

HARNESS CONNECTOR INSPECTION

M1001003900104

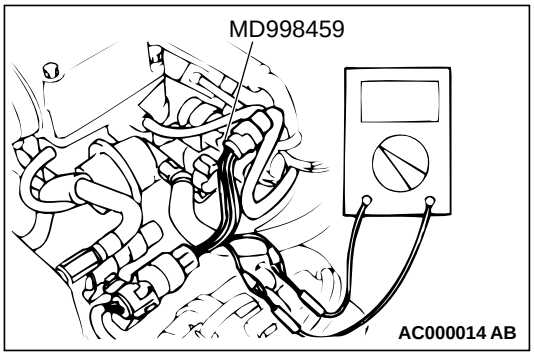
CONNECTOR CONTINUITY AND VOLTAGE TEST

Required Special Tools:
- MB991219: Test Harness Set
- MD998459: Test Harness

Follow the steps below to avoid causing poor connector contact and/or reduced waterproof performance of connectors when checking continuity and/or voltage at connectors of waterproof connectors.

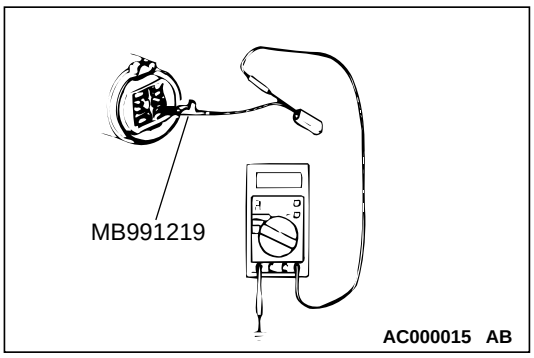
⚠ CAUTION
Never backprobing a waterproof connector. Backprobing a connector may cause the terminals to corrode, deteriorating circuit performance.

1. If the circuit is to be checked in the closed state of use a special tool like MD998459.



⚠ CAUTION
Forcing the probe into the terminal may open the terminal, causing intermittent or poor contact and creating an open circuit.

2. If the connector is disconnected for checking and the facing part is the female pin side, use an appropriate male terminal for checking the contact pressure of connector pins (like MB991219).

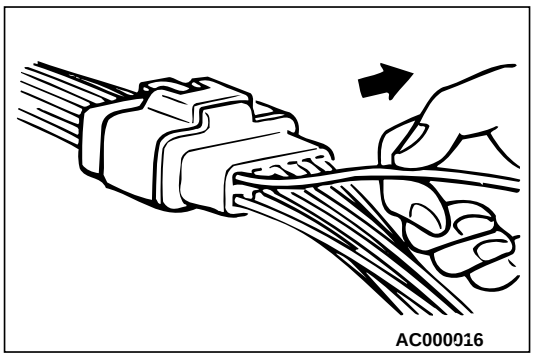


⚠ CAUTION
Do not simultaneously contact more than one terminal with the probe. Contacting two or more terminals at the same time may damage a circuit, possibly to the point of starting an electrical fire.

3. If the facing part is the male pin side, either carefully touch the probe to the pin so it does not accidently contact other pins, or use an appropriate female terminal.

IMPROPER TERMINAL ENGAGEMENT CHECK

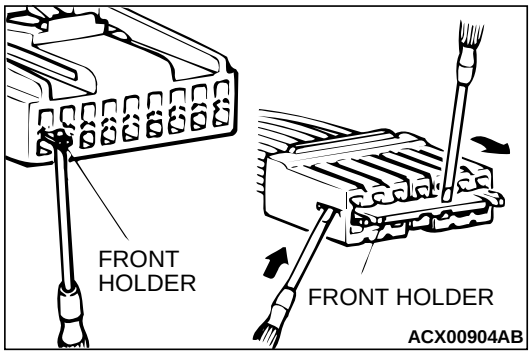
Terminals inside a connector may not engage properly even if the connectors engage. Make sure that each terminal does not come out of the connector when gently pulling each harness wire. If it does, repair or replace the terminal and/or connector.



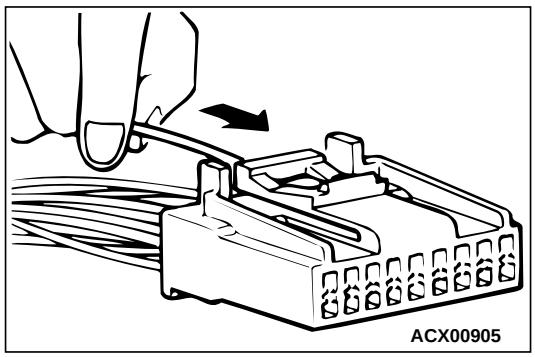
CONNECTOR TERMINAL ENGAGEMENT AND DISENGAGEMENT

Loosely engaged terminals can be repaired by removing the female terminal from the connector housing and raising its lance to establish better engagement. Removal of the connector terminal used for MFI and INVECS-II A/T control circuit can be done in the following manner.

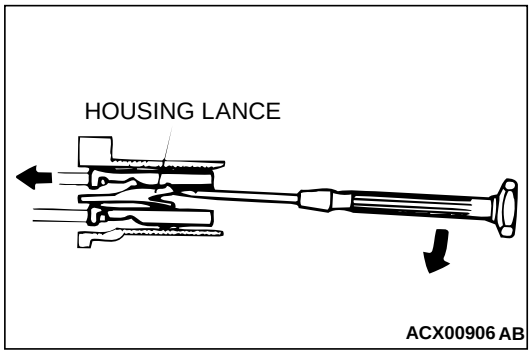
COMPUTER CONNECTOR



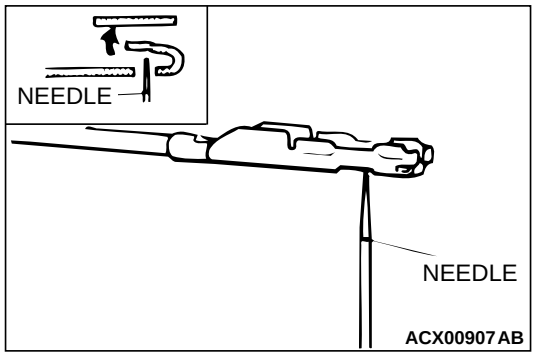
1. Insert a screwdriver [1.4 mm (0.06 inch) width] as shown in the figure, disengage front holder, and remove it.



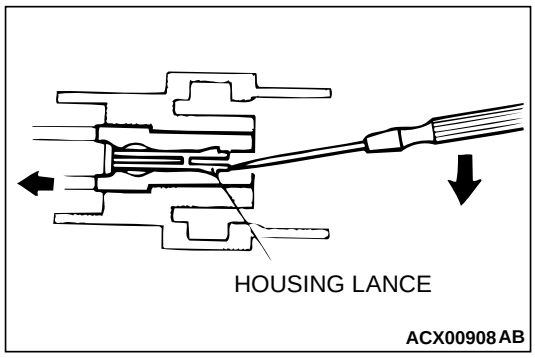
2. Push the harness wire of the terminal to be repaired deep into the connector from the harness side and hold it there.



3. Insert the tip of the screwdriver [1.4 mm (0.06 inch) width] into the connector as shown in the figure, raise the housing lance slightly with the tip, and pull out the terminal.

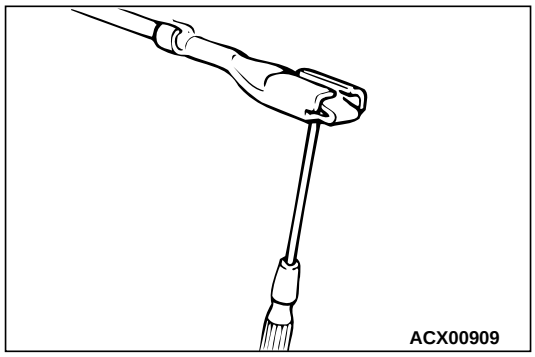


4. Insert a needle through the hole provided on the terminal and raise the contact point. Lightly squeeze the outer edge so the flats are parallel with the bottom.



ROUND WATERPROOF CONNECTOR

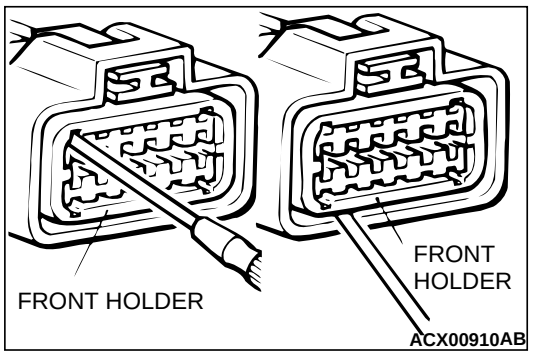
1. Remove the waterproof cap by using a screwdriver.
2. Insert the tip of the screwdriver [1.4 mm (0.06 inch) or 2.0 mm (0.08 inch) width] into the connector as shown in the figure, raise the housing lance slightly with the tip, and pull out the terminal.

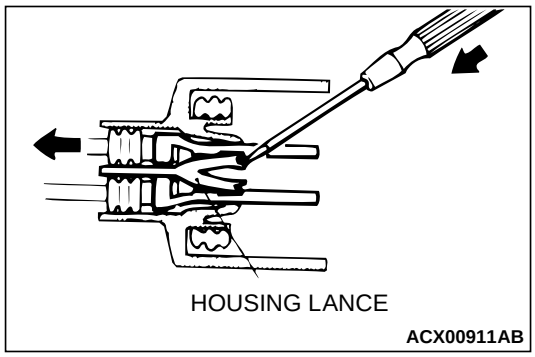


3. Insert a screwdriver through the hole provided on the terminal and raise the contact point. Lightly squeeze the outer edge so the flats are parallel with the bottom.

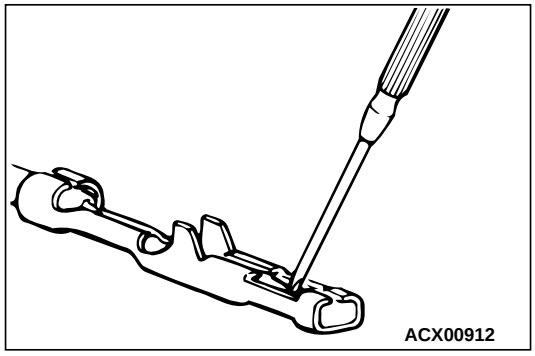
RECTANGULAR WATERPROOF CONNECTOR

1. Disengage the front holder with a screwdriver and remove it.



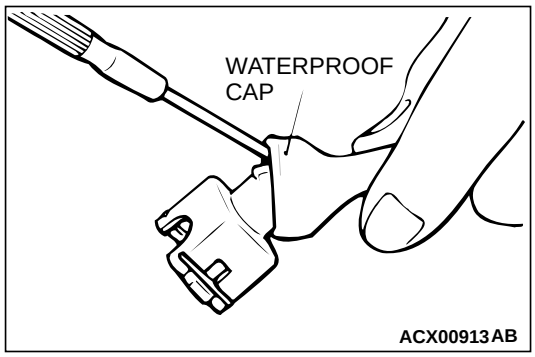


2. Insert the tip of a screwdriver [0.8 mm (0.03 inch) width] into the connector as shown in the figure, push it lightly to raise the housing lance, and pull out the terminal.

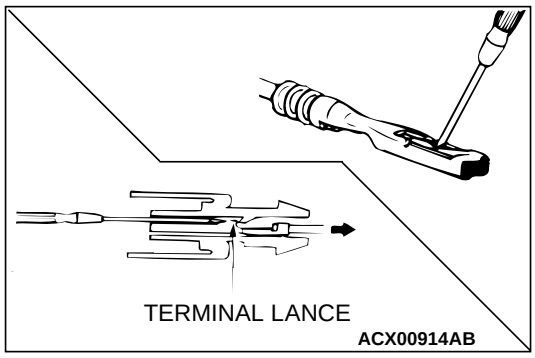


3. Press the contact point of the female terminal down by holding a screwdriver [1.4 mm (0.06 inch) width] as shown in the figure. Lightly squeeze the outer edge so the flats are parallel with the bottom.

INJECTOR CONNECTOR



1. Remove the waterproof cap.



2. Insert the tip of a screwdriver [1.4 mm (0.06 inch) width] into the connector as shown in the figure, press in the terminal lance, and pull out the terminal.

⚠ CAUTION

Make sure the lance is pressed in before the terminal is inserted into the connector.

3. Press the contact point of the male terminal down by holding a screwdriver [1.4 mm (0.06 inch) width] as shown in the figure.

HOW TO DIAGNOSE

HOW TO DIAGNOSE

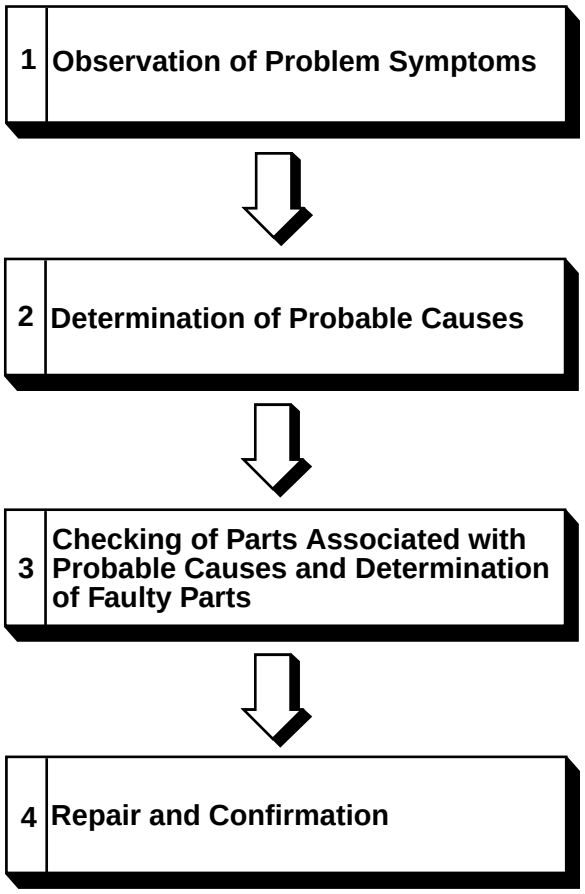
M1001004300086

The most important point in troubleshooting is to determine "Probable Cause." Once the probable causes are determined, parts to be checked can be limited to those associated with such probable causes. The determination of the probable causes must be based on a theory and be supported by facts and must not be based on intuition only.

TROUBLESHOOTING STEPS

M1001004400049

If an attempt is made to solve a problem without going through correct steps for troubleshooting, the symptoms could become more complicated, resulting in failure to determine the causes correctly and making incorrect repairs. The four steps below should be followed in troubleshooting.



Observe the symptom carefully. Check if there are also other problems.

In determining the probable causes, it is necessary to study the wiring diagram to understand the circuit as a system. Knowledge of switches, relays and other parts is necessary for accurate analysis. The causes of similar problems in the past must be taken into account.

Troubleshooting is carried out by making step-by-step checks until the cause is found.

After the problems are corrected, be sure to check that the system operates correctly. Also check that new problems have not been caused by the repair.

ACX00915AC

INFORMATION FOR DIAGNOSIS

M1001004500046

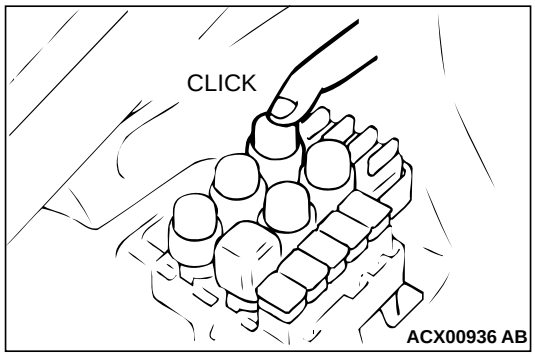
This manual contains the harness diagrams as well as the individual circuit drawings, operational explanations, and troubleshooting hints for each component. The information is presented in the following manner:

1. Connector diagrams show the connector positions, etc., on the actual vehicle as well as the harness path.
2. Circuit diagrams show the configuration of the circuit with all switches in their normal positions.
3. Operational explanations include circuit drawings of voltage flow when the switch is operated and how the component reacts.
4. Troubleshooting hints include numerous examples of problems which might occur, traced backward in a common-sense manner to the origin of the trouble. Problems whose origins may not be found in this manner are pursued through the various system circuits.

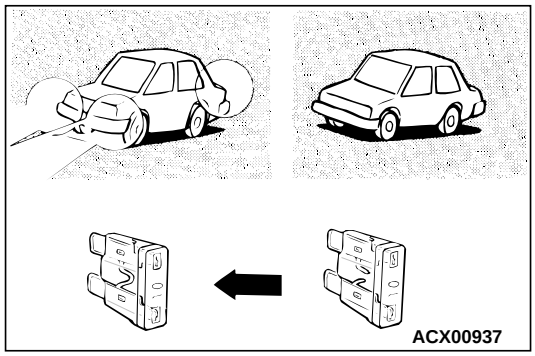
NOTE: Components of MFI, ETACS, etc. with ECU do not include 3 and 4 above. For this information, refer to a relevant group which includes details of these components.

INSPECTION

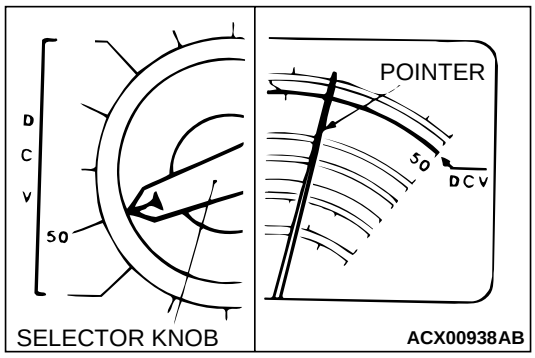
M1001004600043



1. Sight and sound checks
   Check relay operation, blower motor rotation, light illumination, etc. Listen for a "click" when some relay covers are pushed down.



2. Simple checks
   For example, if a headlight does not come on and a faulty fuse or poor grounding is suspected. Replace the fuse with a new one. Or use a jumper wire to ground the light to the body. Determine which part(s) is/are responsible for the problem.

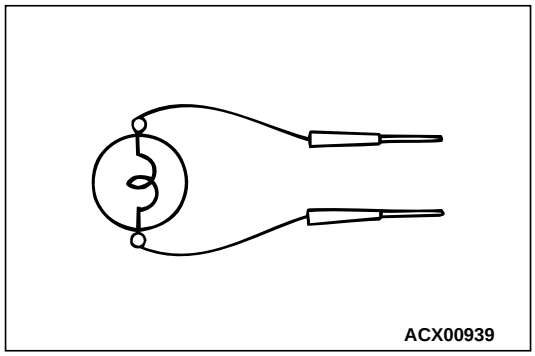


3. Checking with instruments
   Use an appropriate instrument in an adequate range and read the indication correctly.

INSPECTION INSTRUMENTS

M1001004700040

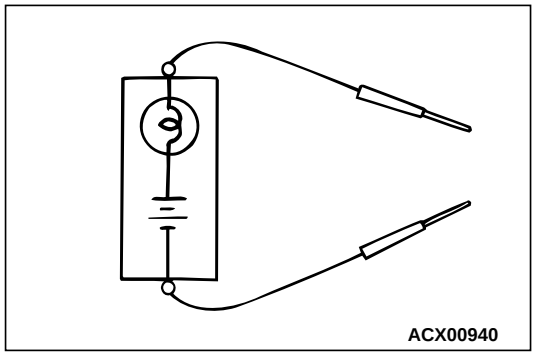
For inspection, use the following instruments:



1. Test lights
   A test light consists of a 12V bulb and lead wires. It is used to check voltages or short circuits.

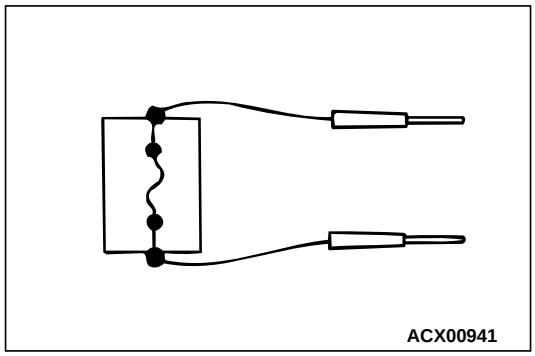
⚠ CAUTION

Never use a test light for checking ECU-related circuits or ECUs.



2. Self-powered test light

   A self-powered test light consists of a bulb, battery and lead wires connected in series. It is used to check continuity or grounding.

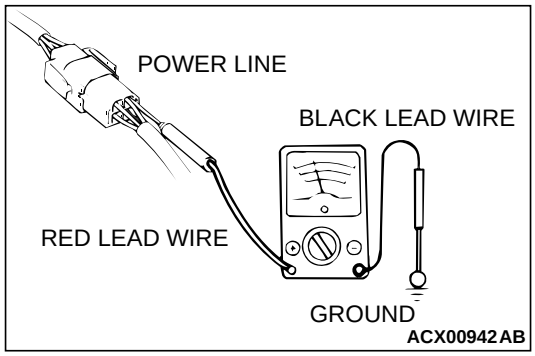


3. Jumper wire

   A jumper wire is used to close an open circuit.

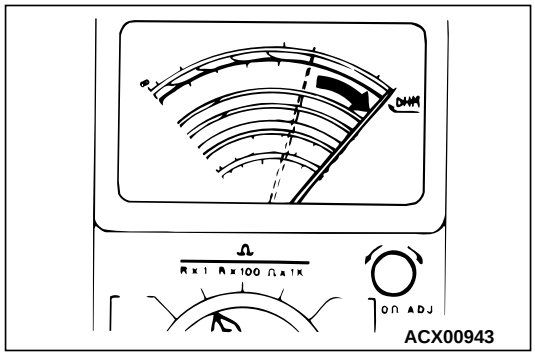
⚠ CAUTION

Never use a jumper wire to connect a power supply directly to a load.



4. Voltmeter

   A voltmeter is used to measure the circuit voltage. Normally, the positive (red lead) probe is applied to the point of voltage measurement and the negative (black lead) probe to the body ground. Use a digital voltmeter to check for voltage drop before or after a component.



5. Ohmmeter

   An ohmmeter is used to check continuity or measure resistance of a switch or coil. If the measuring range has been changed, the zero point must be adjusted before measurement.

CHECKING SWITCHES

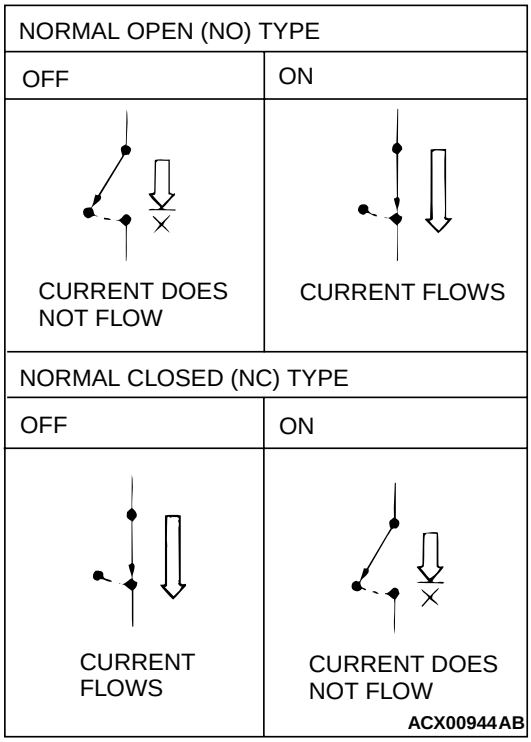
M1001004800047

In a circuit diagram, a switch is shown in the idle state.

1. Normally open or normally closed switch

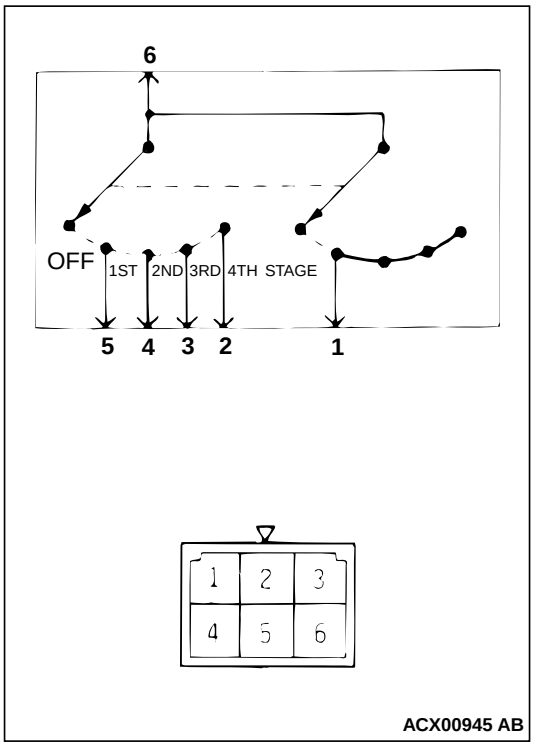
   Switches are classified into those which open the circuit and those which close the circuit when off.

   Switches are shown in their normal state unless specified otherwise.



2. Switch connection

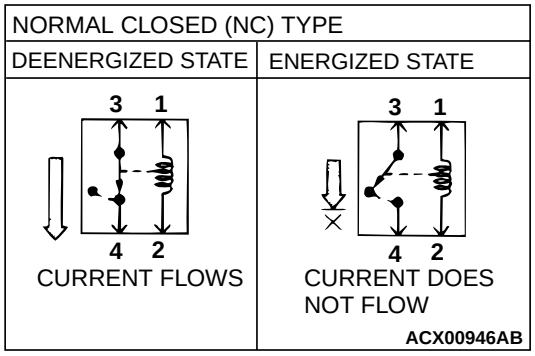
   This figure illustrates a complex switch. The continuity between terminals at each position is as indicated in the table below.



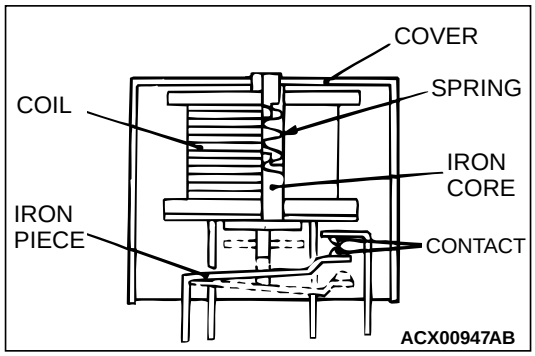
SWITCH POSITION	TESTER CONNECTION	SPECIFIED CONNECTION
OFF	–	–
1st stage	1–5–6	Continuity
2nd stage	1–4–6	Continuity
3rd stage	1–3–6	Continuity
4th stage	1–2–6	Continuity

CHECKING RELAYS

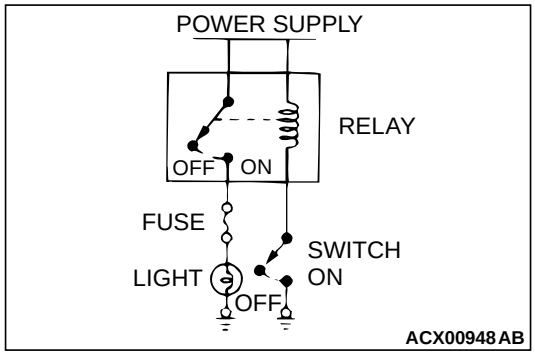
M1001004900044



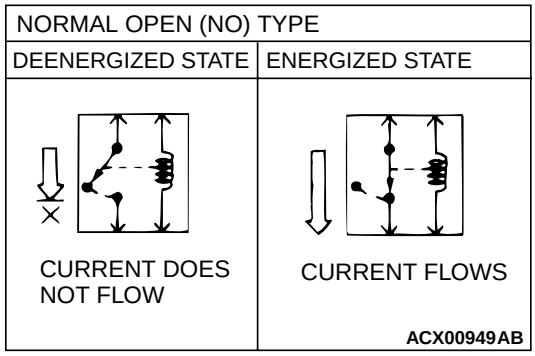
NOTE: The deenergized state means that no current is flowing through the coil. The energized state means that current is flowing through the coil.
When a normally closed relay as illustrated here is checked, there should be continuity between terminals 1 and 2 and between terminals 3 and 4 when the relay is deenergized. There should be no continuity between terminals 3 and 4 when battery voltage and ground are applied to terminals 1 and 2.

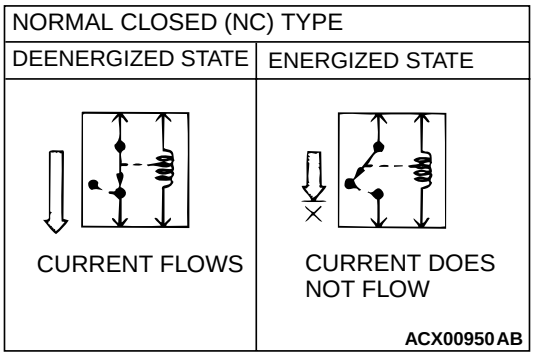


1. When current flows through the coil of a relay, its core is magnetized to attract the iron piece, closing (ON) the contact at the tip of the iron piece. When the coil current is turned off, the iron piece returns to its original position by a spring, opening the contact (OFF).



2. By using a relay, a heavy current can be turned on and off by a switch using much less current. For example, in the circuit shown here, when the switch is turned on (closed), current flows to the coil of the relay. Then, its contact is turned on (closed) and the light comes on. The current flowing through the switch is much less than that for the light.



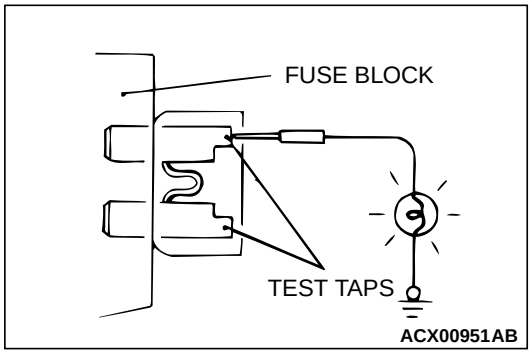


3. Relays may be classified as the normally open-type or the normally closed-type, depending on their contact construction.

CHECKING FUSES

M1001005000044

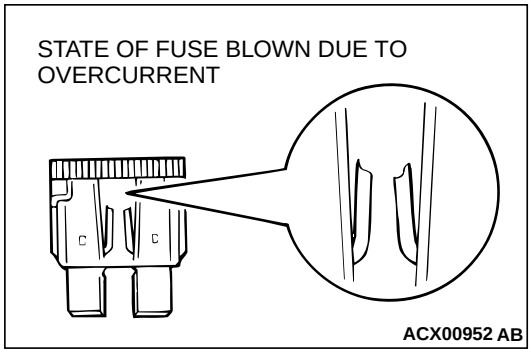
A blade type fuse has test taps provided to allow checking of the fuse itself without removing it from the fuse block. The fuse is okay if the test light comes on when its one lead is connected to the test taps (one at a time) and the other lead is grounded. Remember to turn the ignition switch to ON to ensure all circuits are live.

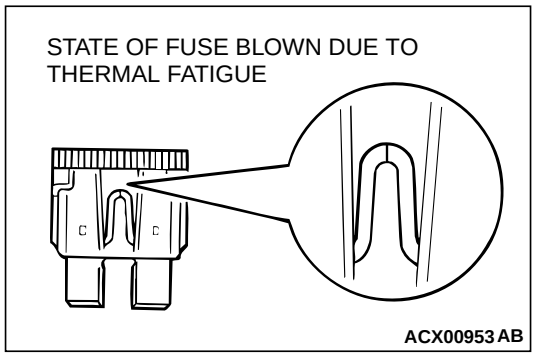


CAUTIONS IN EVENT OF BLOWN FUSE

When a fuse is blown, there are two probable causes. One is that it is blown due to flow of current exceeding its rating. The other is that it is blown due to repeated on/off current flowing through it. Which of the two causes is responsible can be easily determined by visual check as described below.

1. Fuse blown due to current exceeding rating
   The illustration shows the state of a fuse blown due to this cause. In this case, do not replace the fuse with a new one hastily since a current heavy enough to blow the fuse has flowed through it. First, check the circuit for shorts and check for abnormal electric parts. After correcting shorts or replacing parts, use only a fuse of the same capacity as a replacement. Never use a fuse of larger capacity than the original fuse. If a larger capacity fuse is used, electric parts or wiring could be damaged, or could start a fire.

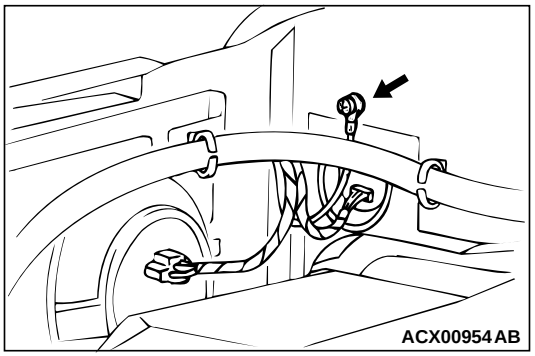


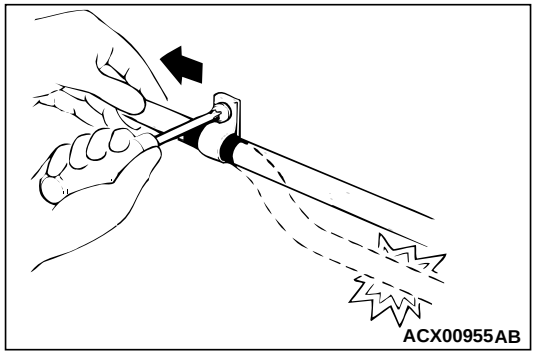


2. Fuse blown due to repeated turning current on and off
   The illustration shows the state of a fuse blown due to repeated current on/off. Normally, this type of problem occurs after a fairly long period of use and is less frequent than above. In this case, simply replace with a new fuse of the same capacity.

CABLES AND WIRES CHECK

M1001005100041

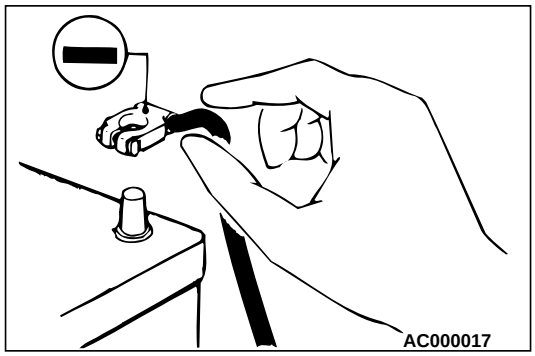




1. Check connections for looseness, rust, and stains.
2. Check terminals and wires for corrosion by battery electrolyte, etc.
3. Check terminals and wires for open circuit or impending open circuit.
4. Check wire insulation and coating for damage, cracks, and wear.
5. Check conductive parts of terminals for contact with other metallic parts (vehicle body and other parts).
6. Check grounding parts to verify that there is complete continuity between attaching bolt(s) and vehicle body.
7. Check for incorrect wiring.
8. Check that harnesses are secured to prevent contact with sharp edges and corners or hot parts (exhaust manifold, pipe, etc.).
9. Check that harnesses are secured firmly to provide enough clearance from the fan pulley, fan belt, and other rotating or moving parts.
10. Check that the harness between fixed parts (such as the vehicle body) and vibrating parts (such as the engine) are long enough to allow for vibration and movement.

BATTERY HANDLING

M1001005200048



⚠ WARNING

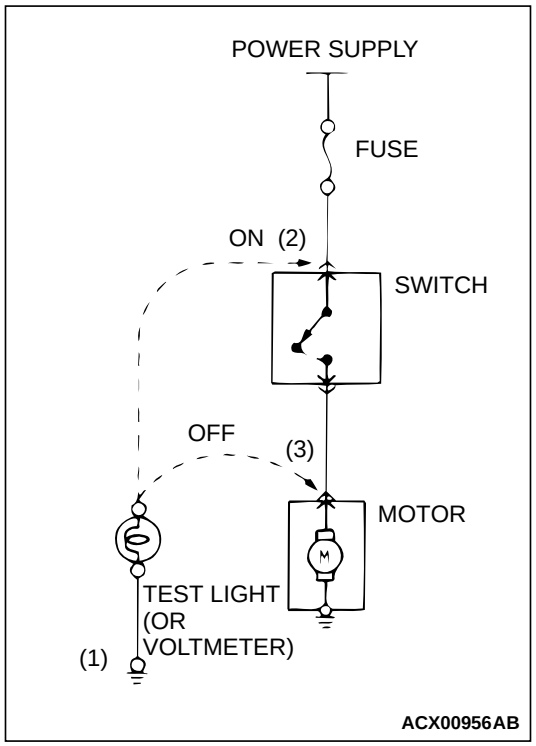
Battery posts, terminals and related accessories contain lead and lead compounds. WASH HANDS AFTER HANDLING.

When checking or servicing does not require power from the vehicle battery, be sure to disconnect the cable from the battery (–) terminal. This will prevent problems that could be caused by a short circuit. Disconnect the (–) battery terminal first and reconnect it last.

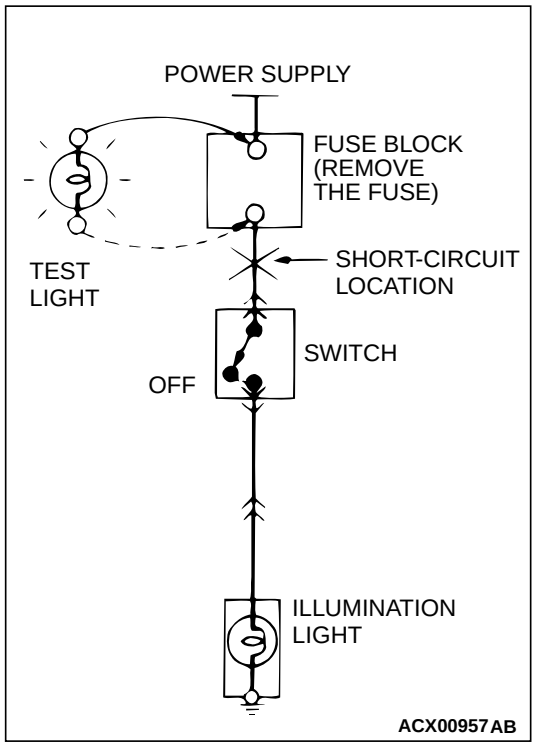
GENERAL ELECTRICAL SYSTEM CHECK

M1001005300045

A circuit consists of the power supply, switch, relay, load, ground, etc. There are various methods to check a circuit including an overall check, voltage check, short-circuit check, and continuity check. Each of the methods briefly described below apply only to circuits similar to the illustration.



1. VOLTAGE CHECK
   (1) Ground one lead wire of the test light. If a voltmeter is used instead of the test light, ground the grounding side lead wire.
   (2) Connect the other lead wire of the test light to the power side terminal of the switch connector. The test light should come on or the voltmeter should indicate a voltage.
   (3) Then, connect the test light or voltmeter to the motor connector. The test light should not come on, or the voltmeter should indicate no voltage. When the switch is turned ON in this state, the test light should come on, or the voltmeter should indicate a voltage, with the motor starting to run.
   (4) The circuit illustrated here is normal. If there is any problem, such as the motor failing to run, check voltages beginning at the connector nearest to the motor until the faulty part is identified.
2. SHORT-CIRCUIT CHECK
   Because the fuse has blown, it is probable that there is a short circuit. Follow the procedures below to narrow down the short-circuit location.



STEP 1. Remove the blown fuse and connect the test light across the fuse terminals (Circuit switch: OFF).
Q: Does the test light illuminate?

YES : Short-circuit exists between the fuse block and the switch. Repair the harness between the fuse block and the switch.
NO : Go to Step 2.

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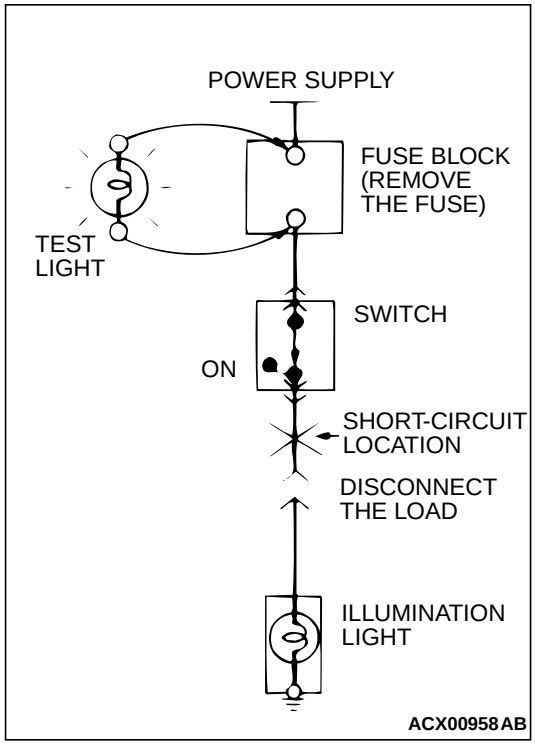
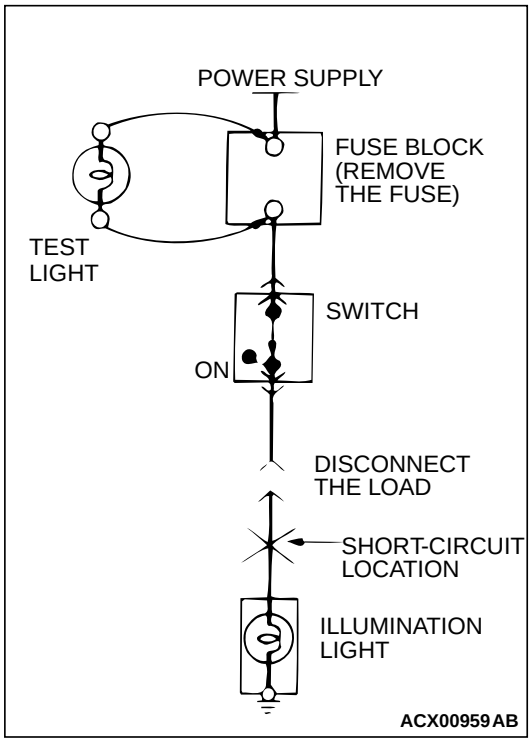


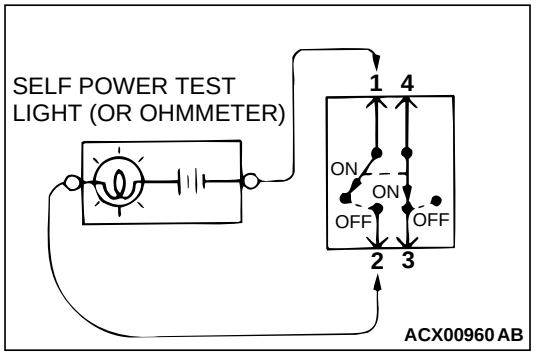


STEP 2. Turn the switch ON and disconnect the illumination light connector.

Q: Does the test light illuminate?

YES : Short-circuit exists between the switch and the connector. Repair the harness between the switch and the connector.

NO : Short-circuit exists between the connector and the illumination light. Repair the harness between the switch and the connector.



3. CONTINUITY CHECK
   (1) When the switch is in the "OFF" position and the contact points of terminals 1 and 2 are connected, the self-powered test light should illuminate or the ohmmeter should read 0 ohm.
   (2) When the switch is the "ON" position and the contact points of terminals 3 and 4 are connected, the self-powered test light should come on or the ohmmeter should read 0 ohm.

NOTES

GROUP 11A

ENGINE MECHANICAL <2.4L>

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GENERAL DESCRIPTION

M1111000100099

The 4G64 (2.4L) engine is an in-line four cylinder engine. The cylinder numbers are assigned as 1 – 2 – 3 – 4 from the front of the engine (timing belt side). This engine is fired in the order of the 1, 3, 4 and 2 cylinders.

ITEMS			SPECIFICATIONS
Type			In-line SOHC
Number of cylinders			4
Bore mm (in)			86.5 (3.41)
Stroke mm (in)			100.0 (3.94)
Piston displacement cm^3 (cu in)			2,351 (143.4)
Compression ratio			9.0
Firing order			1 – 3 – 4 – 2
Counterbalance shaft			Equipped
Valve timing	Intake valve	Opens (BTDC)	16°
		Closes (ABDC)	60° <M/T> 53° <A/T>
	Exhaust valve	Opens (BBDC)	60° <M/T> 50° <A/T>
		Closes (ATDC)	16°
Lubrication			Pressure feed-full flow filtration
Oil pump type			Involute gear type

ENGINE DIAGNOSIS

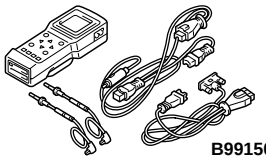
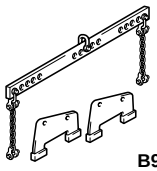
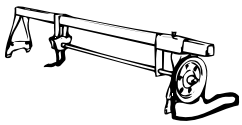
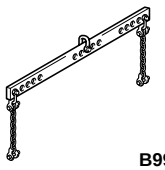
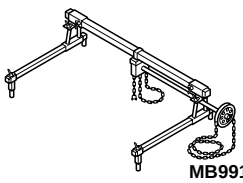
M1111000700109

SYMPTOMS	PROBABLE CAUSE	REMEDY
Compression is too low	Blown cylinder head gasket	Replace the gasket
	Worn or damaged piston rings	Replace the rings
	Worn piston or cylinder	Repair or replace the piston and/or the cylinder block
	Worn or damaged valve seat	Repair or replace the valve and/or the seat ring
Drop in oil pressure	Engine oil level is too low	Check the engine oil level
	Malfunction of oil pressure switch	Replace the oil pressure switch
	Clogged oil filter	Install a new filter
	Worn oil pump gears or cover	Replace the gears and/or the cover
	Thin or diluted engine oil	Change the engine oil to correct viscosity
	Stuck (opened) oil relief valve	Repair the relief valve
	Excessive bearing clearance	Replace the bearings
Oil pressure too high	stuck (closed) oil relief valve	Repair the relief valve

SYMPTOMS	PROBABLE CAUSE	REMEDY
Noisy valves	Malfunction of lash adjuster (including entry of air into high pressure chamber)	Check the lash adjuster
	Thin or diluted engine oil (low oil pressure)	Change the engine oil
	Worn or damaged valve stem or valve guide	Replace the valve and/or the guide
Connecting rod noise/ main bearing noise	Insufficient oil supply	Check the engine oil level
	Low oil pressure	Refer to oil pressure drop symptoms above
	Thin or diluted engine oil	Change the engine oil
	Excessive bearing clearance	Replace the bearings

SPECIAL TOOLS

M1111000600317

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 B991502	MB991502 Scan tool (MUT-II)	MB991496-OD	• Ignition timing check • Idle speed check
 B991453	MB991453 Engine hanger attachment set	MZ203827-01	When an engine lifer is used: Supporting the engine assembly during removal and installation of the transaxle
 MZ203827	GENERAL SERVICE TOOL MZ203827 Engine lifter	MZ203827-01	
 B991454	MB991454 Engine hanger balancer	MZ203827-01	When the engine hanger is used: Supporting the engine assembly during removal and installation of the transaxle *NOTE: Special tool MB991454 is a part of engine hanger attachment set MB991453.*
 MB991895	MB991895 Engine hanger	–	

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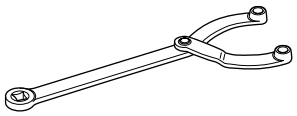
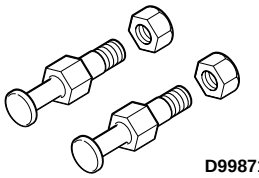
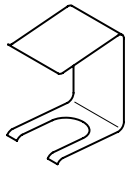
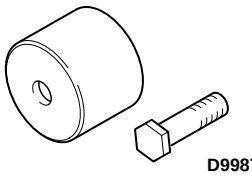
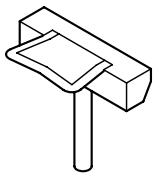
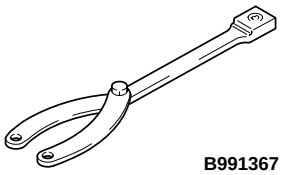
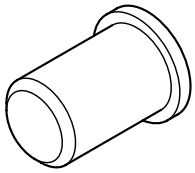
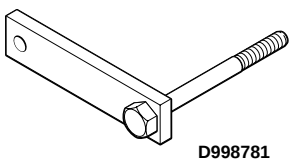
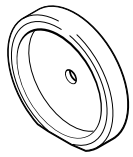
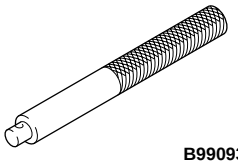
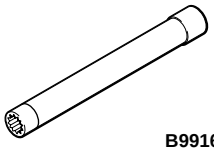
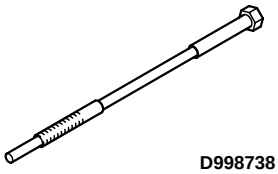
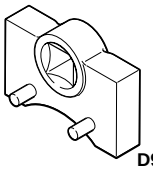
TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 B990767	MB990767 End yoke holder	MB990767-01	Holding the camshaft sprocket when loosening and tightening bolt
 D998719	MD998719 Crankshaft pulley holder pin	MT308239	
 D998443	MD998443 Lash adjuster holder (8)	MD998443-01	Supporting of the auto-lash adjuster to prevent it from falling when rocker shaft assembly is removed or installed
 D998713	MD998713 Camshaft oil seal installer	MD998713-01	Camshaft oil seal installation
 D998727	MD998727 Oil pan remover	MD998727-01	Oil pan removal
 B991367	MB991367 Special spanner	MB991367-01	Holding the crankshaft sprocket
	MD998375 Crankshaft oil seal installer	MD998375-01	Crankshaft front oil seal installation
 D998781	MD998781 Flywheel stopper	General service tool	Flywheel <M/T> or drive plate <A/T> supporting

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 D998776	MD998776 Crankshaft rear oil seal installer	MD998776-01	Crankshaft rear oil seal installation
 B990938	MB990938 Handle	MB990938-01	
 B991654	MB991654 Cylinder head bolt wrench (12)	General service tool	Removal and installation of cylinder head bolt
 D998738	MD998738 Adjusting screw	General service tool	• Holding the auto-tensioner • Timing belt tension adjustment
 D998767	MD998767 Tensioner pulley socket wrench	MD998752-01	Timing belt tension adjustment

ON VEHICLE SERVICE

DRIVE BELT TENSION CHECK AND ADJUSTMENT

M1111003100106

Refer to GROUP 00, Maintenance Service – Drive Belts (Check Condition) P.00-44.

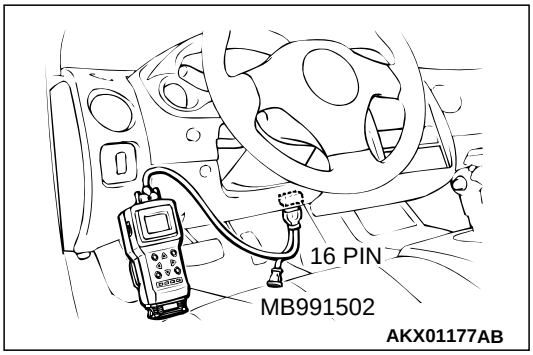
IGNITION TIMING CHECK

M1111001700061

Required Special Tool:
MB991502: Scan Tool (MUT-II)

1. Before inspection, set vehicles in the following condition:
   - Engine coolant temperature: 80 – 95°C (176 – 203°F)
   - Lights and all accessories: OFF
   - Transaxle: Neutral (P range on vehicles with A/T)

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.



2. Connect scan tool MB991502 to the data link connector.
3. Set up a timing light.
4. Start the engine and run it at idle.
5. Check that the idle speed is approximately 700 r/min.
6. Select scan tool MB991502 actuator test "item number 17."
7. Check that basic ignition timing is within the standard value.

   Standard value: 5° BTDC ± 3°

8. If the basic ignition timing is not within the standard value, check the following items:
   - Diagnosis output
   - Timing belt cover and crankshaft position sensor installation conditions
   - Crankshaft sensing blade condition

⚠ CAUTION
If the actuator test is not canceled, the forced drive will continue for 27 minutes. Driving in this state could lead to engine failure.

9. Press the clear key on scan tool MB991502 (select forced drive stop mode), and cancel the actuator test.
10. Check that the actual ignition timing is at the standard value.

    Standard value: Approximately 10° BTDC

    NOTE: Ignition timing fluctuates about ± 7° Before Top Dead Center, even under normal operating condition.

    NOTE: It is automatically further advanced by about 5° to 10° Before Top Dead Center at higher altitudes.

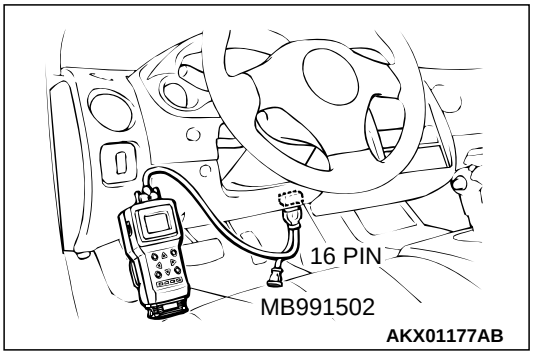
IDLE MIXTURE CHECK

M1111002100062

Required Special Tool:
MB991502: Scan Tool (MUT-II)

1. Before inspection, set vehicles in the following condition:
   - Engine coolant temperature: 80 – 95°C (176 – 203°F)
   - Lights and all accessories: OFF
   - Transaxle: Neutral (P range on vehicles with A/T)

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.



2. Connect scan tool MB991502 to the data link connector.
3. Check that the basic ignition timing is within the standard value.

   Standard value: 5° BTDC ± 3°

4. Start the engine and increase the engine speed to 2,500 r/min for 2 minutes.
5. Set the CO, HC tester.
6. Check the CO contents and the HC contents at idle.

   Standard value:
   CO contents: 0.5 % or less
   HC contents: 100 ppm or less

7. If the CO and HC contents do not remain inside the standard value, check the following items:

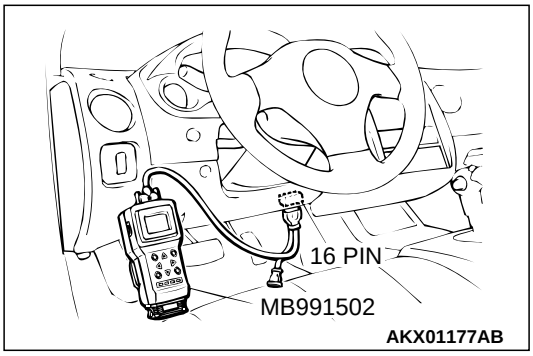
   NOTE: Replace the catalytic converter when the CO and HC contents do not remain inside the standard value, even though the result of the inspection is normal for all items.
   - Diagnosis output
   - Closed-loop control (When the closed-loop control is carried out normally, the output signal of the heated oxygen sensor changes between 0 – 400 mV and 600 – 1,000 mV at idle.)
   - Fuel pressures
   - Injector
   - Ignition coil, spark plug cable, spark plug
   - EGR system and EGR valve leak
   - Evaporative emission control system
   - Compression pressure

CURB IDLE SPEED CHECK

M1111003500245

Required Special Tool:
- MB991502: Scan Tool (MUT-II)

1. Before inspection and adjustment set vehicles in the following condition.
   - Engine coolant temperature: 80 – 95°C (176 – 203°F)
   - Lights and all accessories: OFF
   - Transaxle: Neutral (P range on vehicles with A/T)



⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

2. Connect scan tool MB991502 to the data link connector.
3. Check the basic ignition timing.

   Standard value: 5° BTDC ± 3°
4. Start the engine.
5. Run the engine at idle for 2 minutes.
6. Check the idle speed. Select item number 22 and take a reading of the idle speed.

   Curb idle speed: 700 ± 100 r/min

   NOTE: The idle speed is controlled automatically by the idle air control system.
7. If the idle speed is outside the standard value, refer to GROUP 13A, Diagnosis – Symptom Chart P.13A-25.

COMPRESSION PRESSURE CHECK

M1111002600238

1. Before inspection, check that the engine oil, starter and battery are normal. Also, set the vehicle in the following condition:
   - Engine coolant temperature: 80 – 95°C (176 – 203°F)
   - Lights, and all accessories: OFF
   - Transaxle: Neutral (P range on vehicles with A/T)
2. Disconnect the spark plug cables.
3. Remove all of the spark plugs.
4. Disconnect the crankshaft position sensor connector.

   NOTE: Doing this will prevent the engine control module from carrying out ignition and fuel injection.

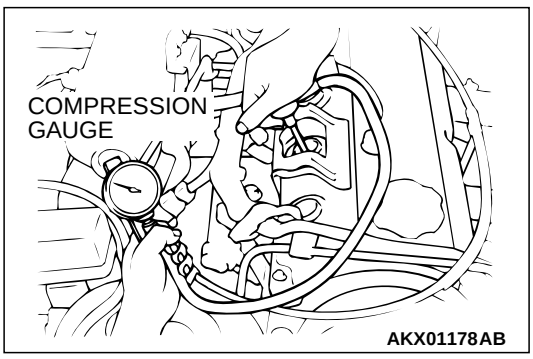
⚠ *WARNING*
Keep your distance from the spark plug hole when cranking. Oil, fuel, etc., may spray out from the spark plug hole and may cause serious injury.

5. Cover the spark plug hole with a shop towel etc., during cranking. After the engine has been cranked, check for foreign material adhering to the shop towel.
6. Set compression gauge to one of the spark plug holes.
7. Crank the engine with the throttle valve fully open and measure the compression pressure.

   Standard value (at engine speed of 250 – 400 r/min): 1,275 kPa (185 psi)

   Minimum limit (at engine speed of 250 – 400 r/min): 959 kPa (139 psi)
8. Measure the compression pressure for all the cylinders, and check that the pressure differences of the cylinders are below the limit.

   Limit: 98 kPa (14 psi)

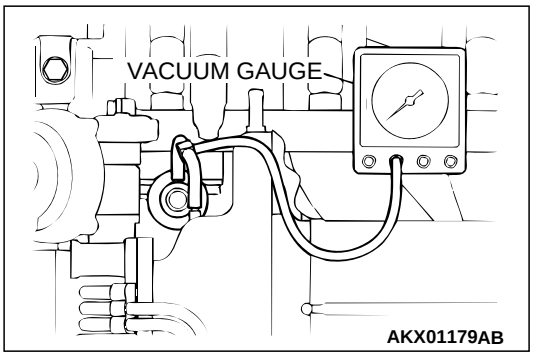


9. If there is a cylinder with compression or a compression difference that is outside the limit, pour a small amount of engine oil through the spark plug hole, and repeat the operations in steps 6 to 8.
   (1) If the compression increases after oil is added, the cause of the malfunction is a worn or damaged piston ring and/or cylinder inner surface.
   (2) If the compression does not rise after oil is added, the cause is a burnt or defective valve seat, or pressure is leaking from the gasket.
10. Connect the crankshaft position sensor connector.
11. Install the spark plugs and spark plug cables.
12. Use the scan tool to erase the diagnostic trouble codes.

    NOTE: This will erase the diagnostic trouble code resulting from the crankshaft position sensor connector being disconnected.

MANIFOLD VACUUM CHECK

M1111002700235



1. Start the engine and allow it to warm up until the temperature of the engine coolant reaches 80 – 95°C (176 – 203°F).
2. Connect a tachometer.
3. Attach a tee-fitting union to the vacuum hose between the fuel pressure regulator and the intake manifold plenum, and connect a vacuum gauge.
4. Start the engine and check that idle speed is within specification. Then check the vacuum gauge reading.

   Idle speed: 700 ± 100 r/min

   Minimum limit: 60 kPa (18 in Hg)

LASH ADJUSTER CHECK

M1111002900121

If an abnormal noise (chattering noise) suspected to be caused by malfunction of the lash adjuster is produced immediately after starting the engine and does not disappear, perform the following check.

NOTE: An abnormal noise due to malfunction of the lash adjuster is produced immediately after starting the engine and changes with the engine speed, irrespective of the engine load. If, the abnormal noise is not produced immediately after starting the engine or does not change with the engine speed, or it changes with the engine load, the lash adjuster is not the cause for the abnormal noise.

NOTE: When the lash adjuster is malfunctioning, the abnormal noise is rarely eliminated by continuing the warming-up of the engine at idle speed.
However, the abnormal noise may disappear only when seizure is caused by oil sludge in the engine whose oil is not maintained properly.

1. Start the engine.
2. Check if the abnormal noise produced immediately after starting the engine, changes with the change in the engine speed.
   If the abnormal noise is not produced immediately after starting the engine or it does not change with the engine speed, the lash adjuster is not the cause for the noise. Therefore, investigate other causes. The abnormal noise is probably caused by some other parts than the engine proper if it does not change with the engine speed. (In this case, the lash adjuster is in good condition.)
3. With the engine idling, change the engine load (shift from N to D range, for example) to make sure that there is no change in the level of abnormal noise.
   If there is a change in the level of abnormal noise, suspect a tapping noise due to worn crankshaft bearing or connecting rod bearing. (In this case, the lash adjuster is in good condition.)
4. After completion of warm-up, run the engine at idle to check for abnormal noise.
   If the noise is reduced or disappears, clean the lash adjuster (Refer to GROUP 11B-Engine overhaul – Rocker Arms and Camshaft – Inspection P.11B-27.) As it is suspected that the noise is due to seizure of the lash adjuster. If there is no change in the level of the abnormal noise, proceed to step 5.
5. Run the engine to bleed the lash adjuster system. (Refer to.)
6. If the abnormal noise does not disappear after air bleeding operation, clean the lash adjuster (Refer to GROUP 11B-Engine overhaul – Rocker Arms and Camshaft – Inspection P.11B-27.)

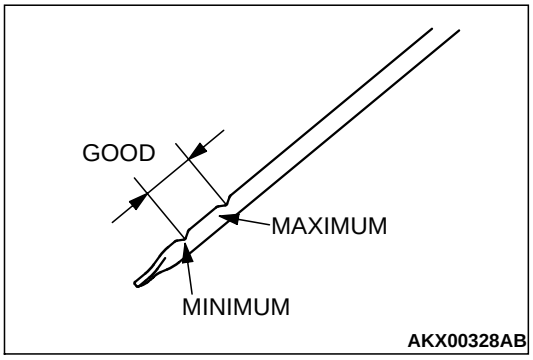
TSB Revision

Bleeding lash adjuster system

NOTE: Parking the vehicle on a grade for a long time may decrease oil in the lash adjuster, causing air to enter the high pressure chamber when starting the engine.

NOTE: After parking for many hours, oil may run out from the oil passage and take time before oil is supplied to the lash adjuster, causing air to enter the high pressure chamber.

NOTE: In the above cases, abnormal noise can be eliminated by bleeding the lash adjuster system.

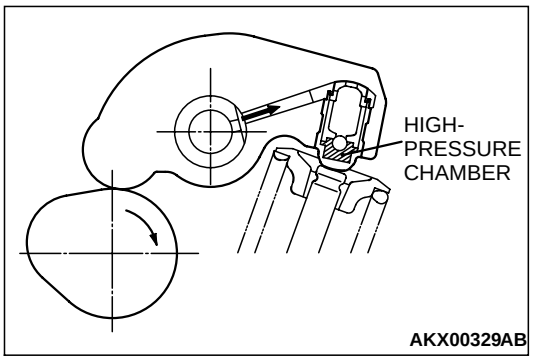


1. Check engine oil and add or change oil if required.

   NOTE: If the engine oil level is low, air is sucked from the oil screen, causing air to enter the oil passage.

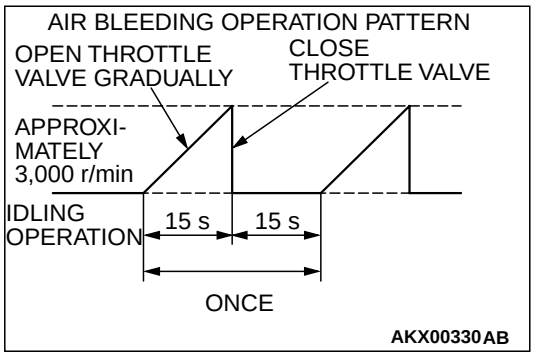
   NOTE: If the engine oil level is higher than specification, oil may be stirred by the crankshaft, causing oil to be mixed with a large quantity of air.

   NOTE: If oil is deteriorated, air is not easily separated from oil, increasing the quantity of air contained in oil.



   NOTE: If air mixed with oil enters the high pressure chamber inside the lash adjuster from the above causes, air in the high pressure chamber is compressed excessively while the valve is opened, resulting in an abnormal noise when the valve closes.
   This is the same phenomenon as that observed when the valve clearance has become excessive. The lash adjuster can resume normal function when air entered the lash adjuster is removed.

2. Idle the engine for one to three minutes to warm it up.



3. Repeat the operation pattern, shown in left figure, at no load to check for abnormal noise. (Usually the abnormal noise is eliminated after repetition of the operation 10 to 30 times. If, however, no change is observed in the level of abnormal noise after repeating the operation more than 30 times, suspect that the abnormal noise is due to some other factors.)
4. After elimination of abnormal noise, repeat the operation shown in left figure five more times.
5. Run the engine at idle for one to three minutes to make sure that the abnormal noise has been eliminated.

ENGINE ASSEMBLY

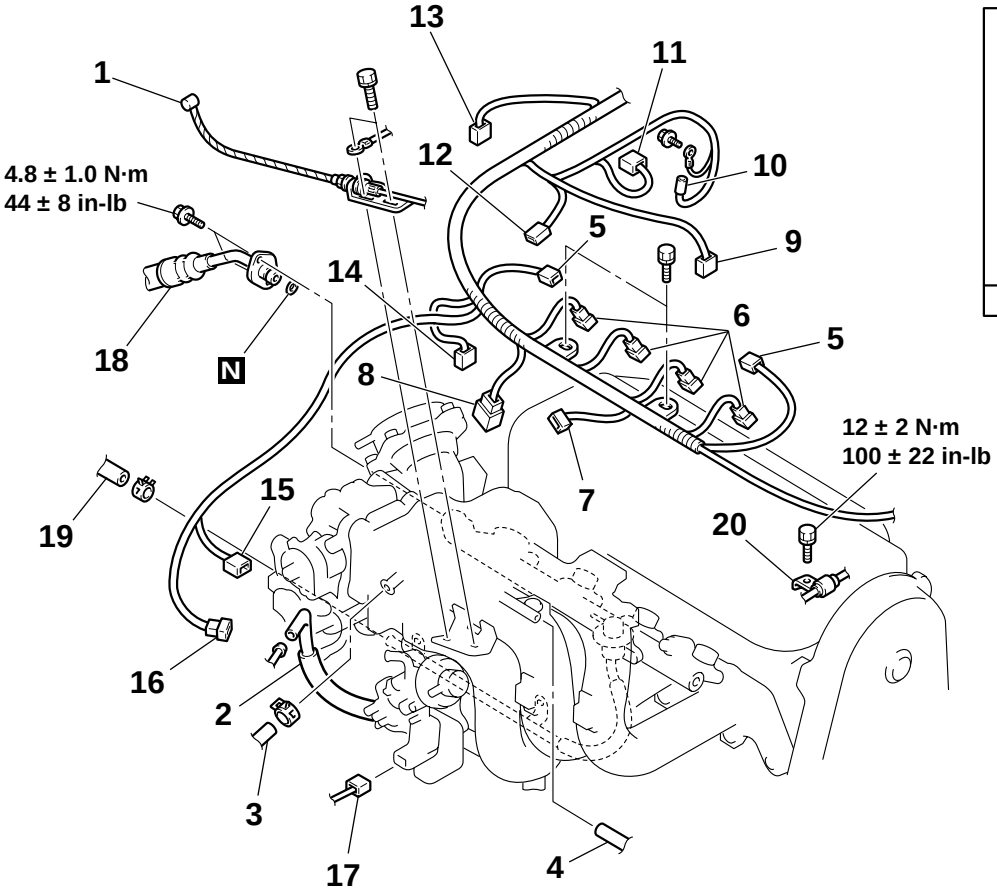
REMOVAL AND INSTALLATION

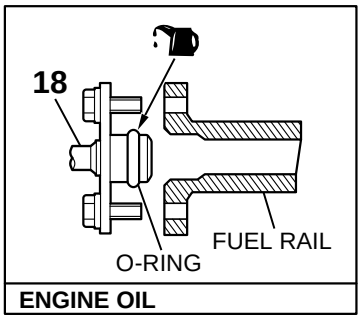
M1112001000407

⚠ CAUTION

***: Indicates parts which should be temporarily tightened, and then fully tightened after placing the vehicle horizontally and loading the full weight of the engine on the vehicle body.**

Pre-removal Operation	Post-installation Operation
• Hood Removal (Refer to GROUP 42, Hood P.42-7.) • Fuel Line Pressure Reduction [Refer to GROUP 13A, On-vehicle Service – Fuel Pump Relay Disconnection (How to Reduce Pressurized Fuel Lines) P.13A-580.] • Engine Oil Draining (Refer to GROUP 12, On-vehicle Service – Engine Oil Replacement P.12-3.) • Engine Coolant Draining [Refer to GROUP 00, Maintenance Service – Engine Coolant (Change) P.00-56.] • Strut Tower Bar Removal (Refer to GROUP42, Strut Tower Bar P.42-11.) • Air Cleaner Removal (Refer to GROUP 15, Air Cleaner P.15-6.) • Reserve Tank and Radiator Removal (Refer to GROUP 14, Radiator P.14-21.) • Front Exhaust Pipe Removal (Refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-21.)	• Front Exhaust Pipe Installation (Refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-21.) • Reserve Tank and Radiator Installation (Refer to GROUP 14, Radiator P.14-21.) • Air Cleaner Installation (Refer to GROUP 15, Air Cleaner P.15-6.) • Strut Tower Bar Installation (Refer to GROUP 42, Strut Tower Bar P.42-11.) • Drive Belt Tension Adjustment [Refer to GROUP 00, Maintenance Service – Drive Belts (Check Condition) P.00-44.] • Engine Oil Refilling (Refer to GROUP 12, On-vehicle Service – Engine Oil Replacement P.12-3.) • Engine Coolant Refilling [Refer to GROUP 00, Maintenance Service – Engine Coolant (Change) P.00-56.] • Accelerator Cable Adjustment (Refer to GROUP 17, On-vehicle Service – Accelerator Cable Check and Adjustment P.17-5.) • Hood Installation (Refer to GROUP42, Hood P.42-7.)





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REMOVAL STEPS

1. ACCELERATOR CABLE CONNECTION
2. PURGE HOSE CONNECTION

REMOVAL STEPS (Continued)

3. BRAKE BOOSTER VACUUM HOSE CONNECTION
4. VACUUM HOSE CONNECTION

TSB Revision

REMOVAL STEPS (Continued)

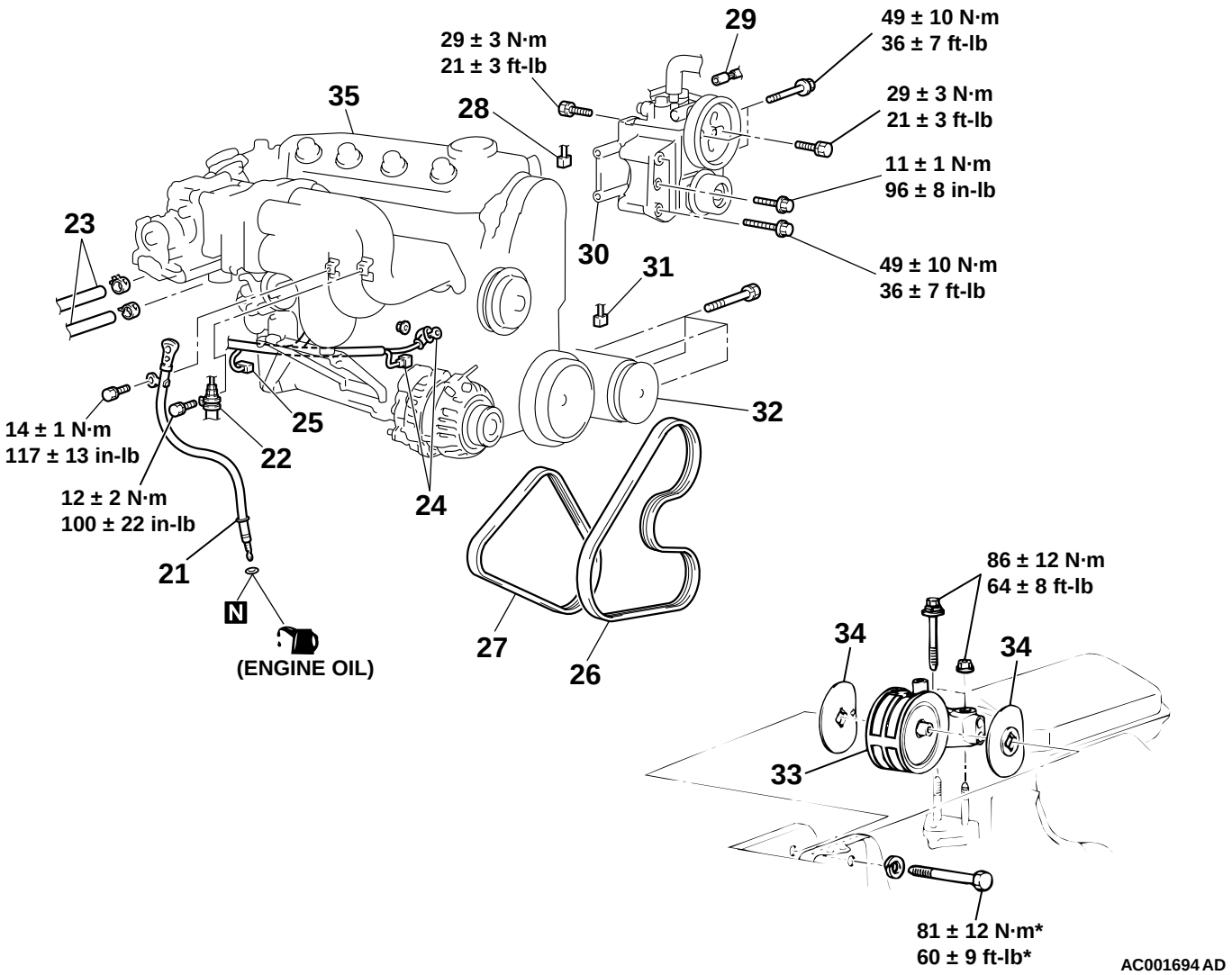
5. IGNITION COIL CONNECTOR
6. INJECTOR CONNECTOR
7. MANIFOLD DIFFERENTIAL PRESSURE SENSOR CONNECTOR
8. THROTTLE POSITION SENSOR CONNECTOR
9. HEATED OXYGEN SENSOR CONNECTOR
10. CAPACITOR CONNECTOR
11. ENGINE COOLANT TEMPERATURE SENSOR CONNECTOR
12. CAMSHAFT POSITION SENSOR CONNECTOR
13. KNOCK SENSOR CONNECTOR

REMOVAL STEPS (Continued)

14. ENGINE COOLANT TEMPERATURE GAUGE UNIT CONNECTOR
15. IDLE AIR CONTROL MOTOR CONNECTOR
16. EVAPORATIVE EMISSION PURGE SOLENOID VALVE CONNECTOR
17. EGR SOLENOID VALVE CONNECTOR

>>D<< 18. HIGH-PRESSURE FUEL HOSE CONNECTION

19. FUEL RETURN HOSE CONNECTION
20. PRESSURE HOSE CONNECTION



21. OIL DIPSTICK AND DIPSTICK GUIDE
22. PRESSURE HOSE CONNECTION
23. HEATER HOSE CONNECTION
24. GENERATOR CONNECTOR

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25. OIL PRESSURE SWITCH CONNECTOR
26. DRIVE BELT (POWER STEERING OIL PUMP AND A/C COMPRESSOR)
27. DRIVE BELT (GENERATOR)
28. CRANKSHAFT POSITION SENSOR CONNECTOR
29. POWER STEERING PRESSURE SWITCH CONNECTOR

<<A>>

<<B>>

<<C>>

<<D>> **>>C<<**

>>B<<

<<E>> **>>A<<**

30. POWER STEERING OIL PUMP AND BRACKET ASSEMBLY
31. A/C COMPRESSOR ASSEMBLY CONNECTOR
32. A/C COMPRESSOR
    - TRANSAXLE ASSEMBLY
33. ENGINE MOUNT BRACKET
34. ENGINE MOUNT STOPPER
35. ENGINE ASSEMBLY

Required Special Tools:

- MB991453: Engine Hanger Assembly
- MZ203827: Engine Lifter
- MB991454: Engine hanger balancer (MB991453, part of the engine hanger attachment set)
- MB991895: Engine Hanger

REMOVAL SERVICE POINTS

<<A>> POWER STEERING OIL PUMP AND BRACKET ASSEMBLY REMOVAL

Remove the power steering oil pump and bracket assembly from the engine with the hose attached.

NOTE: Place the removed power steering oil pump in a place where it will not be a hindrance when removing and installing the engine assembly, and secure it with a cord or wire.

<<B>> A/C COMPRESSOR REMOVAL

Remove the compressor from the compressor bracket with the hose still attached.

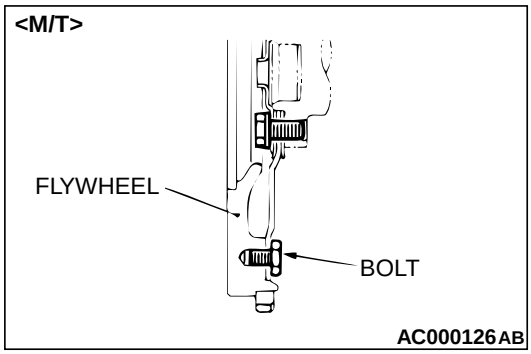
NOTE: Place the removed A/C compressor where it will not be a hindrance when removing and installing the engine assembly, and secure it with a cord or wire.

<<C>> TRANSAXLE ASSEMBLY REMOVAL

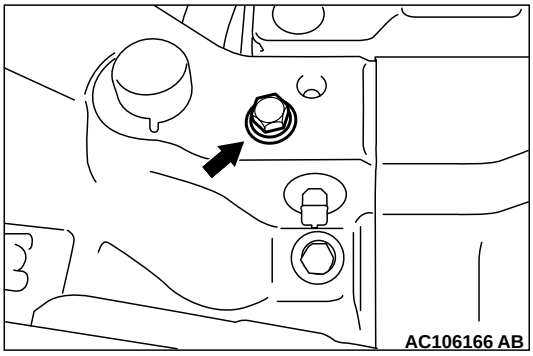
⚠ CAUTION

Do not remove the flywheel mounting bolt shown by the arrow. If this bolt Is removed, the flywheel will become out of balance and damaged.

<M/T>



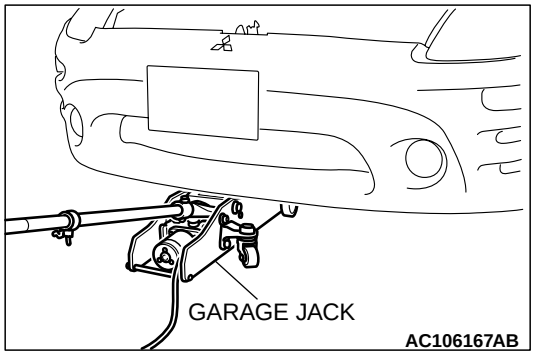
1. <Engine lifter MZ20783827 is used>
   Remove the transaxle assembly.
   <M/T>: Refer to GROUP 22A, Transaxle Assembly P.22A-16.
   <A/T>: Refer to GROUP 23A, Transaxle Assembly P.23A-366.

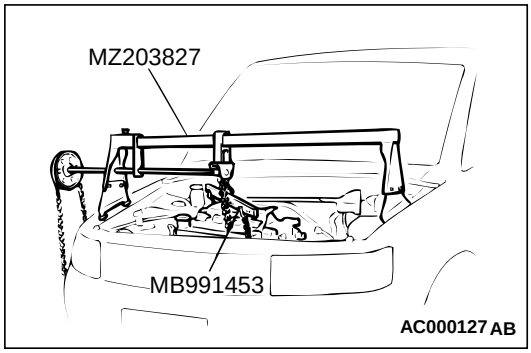


2. <Engine hanger MB991895 is used>
   (1) Loosely fit the two radiator support upper insulator mounting bolts to the vehicle body.
   (2) Remove the transaxle assembly.
   <M/T>: Refer to GROUP 22A, Transaxle Assembly P.22A-16.
   <A/T>: Refer to GROUP 23A, Transaxle Assembly P.23A-366.

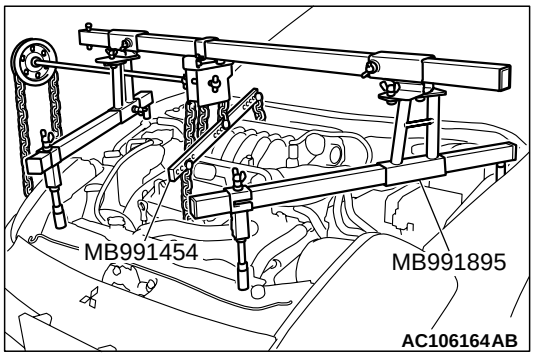
<<D>> ENGINE MOUNT BRACKET REMOVAL

1. Support the engine with a garage jack.

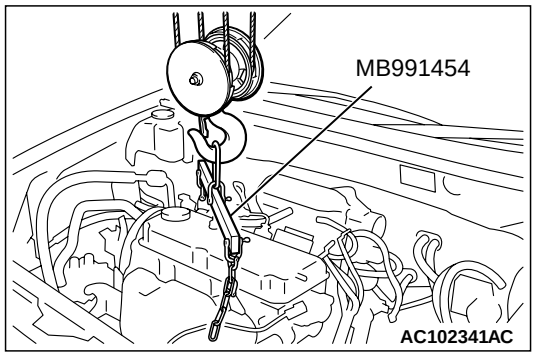




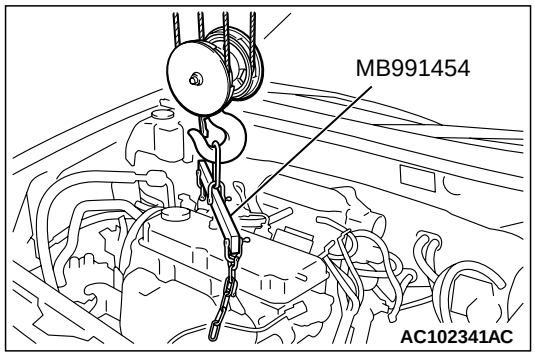
2. <Engine lifter MZ2073827 is used>
   Remove special tools MB991453 and MZ203827 which was attached when the transaxle assembly was removed.



3. <Engine hanger MB991895 is used>
   Remove special tools MB991895 which was attached when the transaxle assembly was removed.



4. Hold the engine assembly with a chain block or similar tool.
5. Place a garage jack against the engine oil pan with a piece of wood in between, jack up the engine so that the weight of the engine is no longer being applied to the engine mount bracket, and then remove the engine mount bracket.



<<E>> ENGINE ASSEMBLY REMOVAL

After checking that all cables, hoses and harness connectors, etc., are disconnected from the engine, lift the chain block slowly to remove the engine assembly upward from the engine compartment.

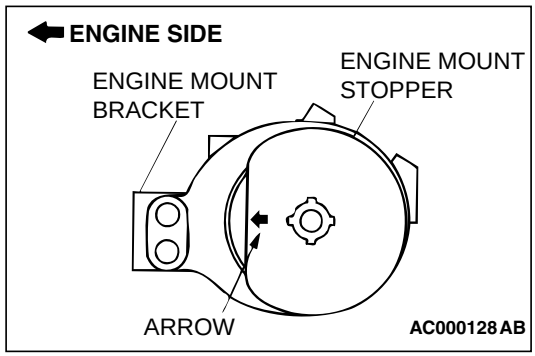
INSTALLATION SERVICE POINTS

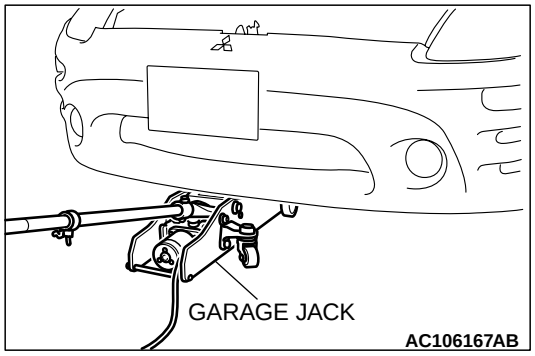
>>A<< ENGINE ASSEMBLY INSTALLATION

Install the engine assembly, checking that the cables, hoses, and harness connectors are not clamped.

>>B<< ENGINE MOUNT STOPPER INSTALLATION

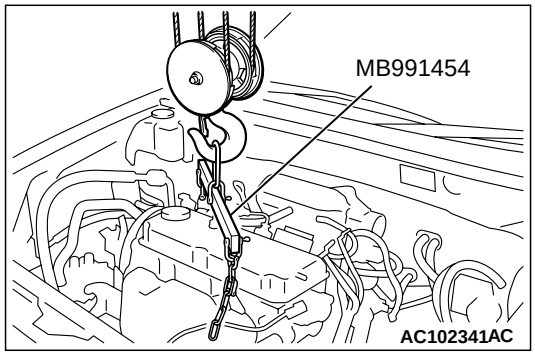
Clamp the engine mount stopper so that the arrow points in the direction as shown in the diagram.



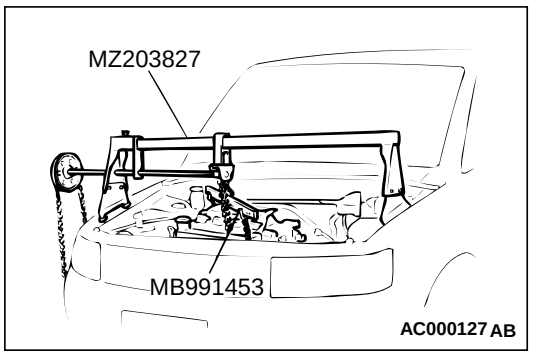


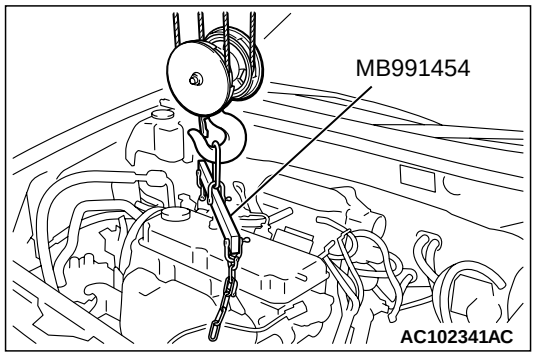
>>C<< ENGINE MOUNT BRACKET INSTALLATION

1. Place a garage jack against the engine oil pan with a piece of wood in between, and install the engine mount bracket while adjusting the position of the engine.
2. Support the engine with the garage jack.

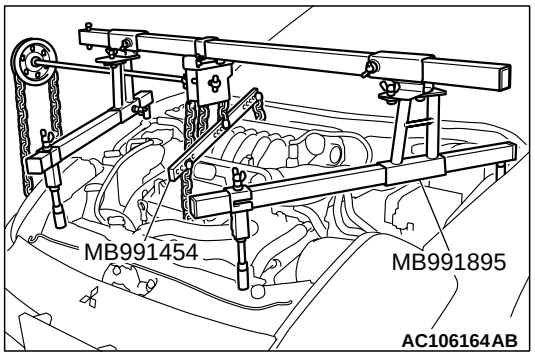


3. <Engine lifter MZ2073827 is used>
   Remove the chain block and support the engine assembly with special tools MB991453 and MZ203827.





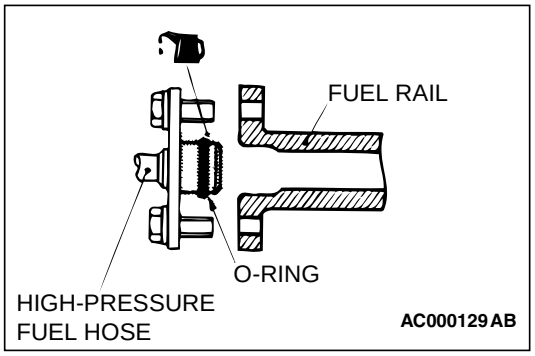
4. <Engine hanger MB991895 is used>
   Remove the chain block and support the engine assembly with special tools MB991895.



>>D<< HIGH-PRESSURE FUEL HOSE INSTALLATION

⚠ CAUTION

Do not allow any engine oil to enter the fuel rail.



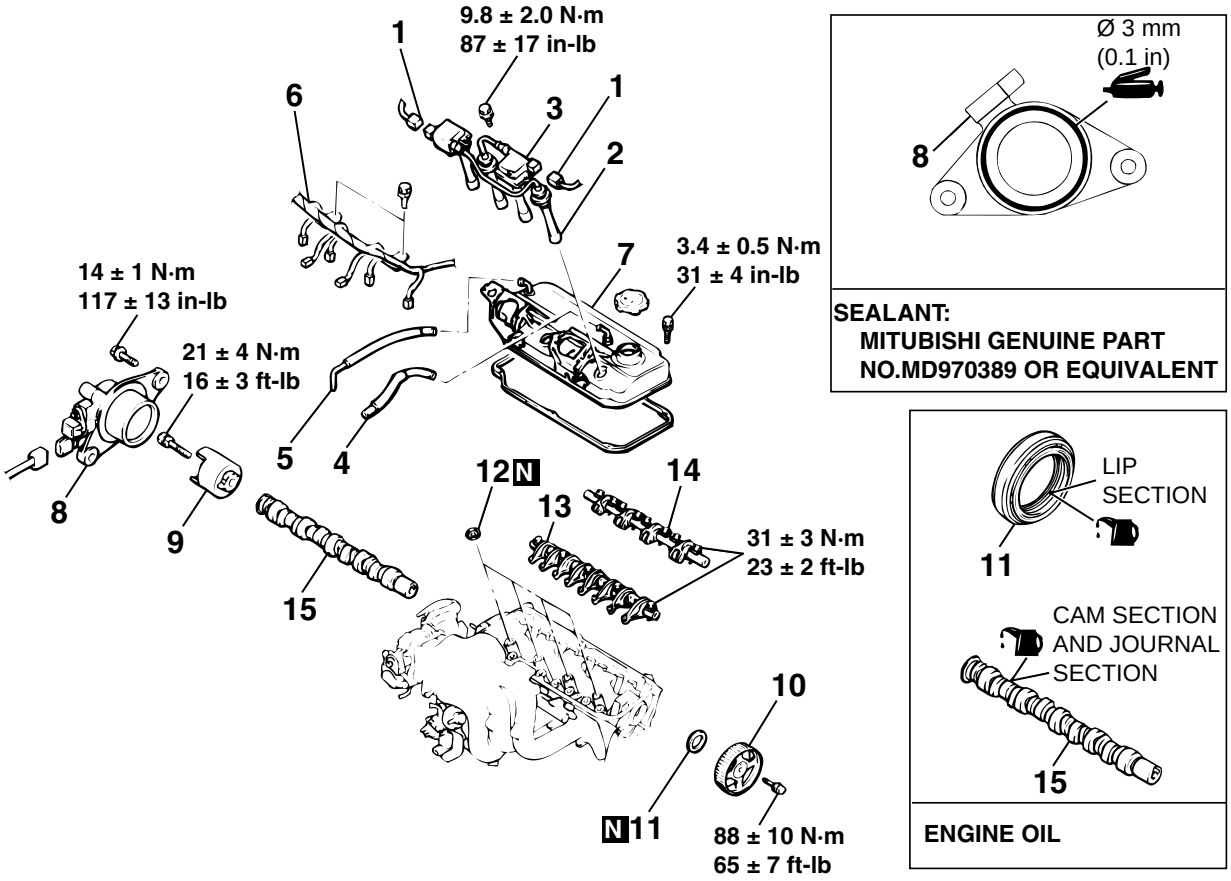
1. Apply a small amount of new engine oil to the O-ring.
2. While turning the high-pressure fuel hose to the right and left, install it to the fuel rail, while being careful not to damage the O-ring. After installing, check that the hose turns smoothly.
3. If the hose does not turn smoothly, the O-ring is probably being clamped. Disconnect the high-pressure fuel hose and check the O-ring for damage. Replace if necessary.
4. Re-insert the fuel rail and confirm the hose turns smoothly.

CAMSHAFT AND CAMSHAFT OIL SEAL

REMOVAL AND INSTALLATION

M1112001900314

Pre-removal and Post-installation Operation
- Air Cleaner Removal and Installation (Refer to GROUP 15, Air Cleaner P.15-6.)
- Timing Belt Removal and Installation (Refer to P.11A-32.)



CAMSHAFT REMOVAL STEPS
1. IGNITION COIL CONNECTOR
2. SPARK PLUG CABLE
3. IGNITION COIL
4. PCV HOSE
5. BREATHER HOSE
6. CONTROL HARNESS CONNECTION
7. ROCKER COVER
8. CAMSHAFT POSITION SENSOR SUPPORT
9. CAMSHAFT POSITION SENSING CYLINDER

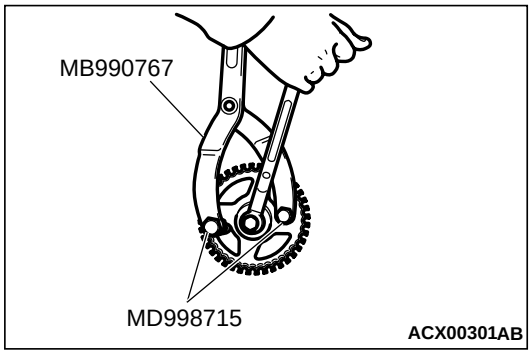
CAMSHAFT REMOVAL STEPS
- <<A>> >>C<< 10. CAMSHAFT SPROCKET
- 12. SPARK PLUG GUIDE OIL SEAL
- <<B>> >>A<< 13. ROCKER ARM AND SHAFT ASSEMBLY (INTAKE SIDE)
- <<B>> >>A<< 14. ROCKER ARM AND SHAFT ASSEMBLY (EXHAUST SIDE)
- 15. CAMSHAFT

CAMSHAFT OIL SEAL REMOVAL STEPS
- <<A>> >>C<< 10. CAMSHAFT SPROCKET
- >>B<< 11. CAMSHAFT OIL SEAL

Required Special Tools:
- MB990767: End Yoke Holder
- MB998713: Crankshaft Oil Seal Installer
- MD998443: Auto-lash Adjuster Holder
- MD998719: Crankshaft Pulley Holder Pin

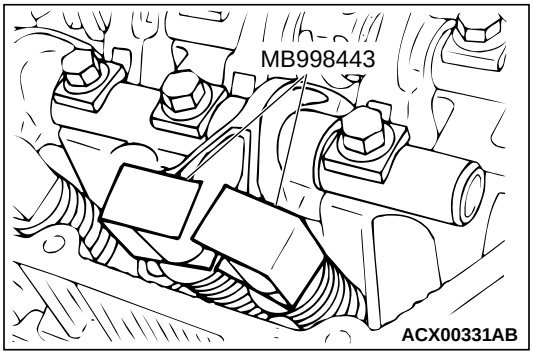
TSB Revision

REMOVAL SERVICE POINTS



<<A>> CAMSHAFT SPROCKET REMOVAL

1. Use special tools MB990767 and MD998719 to loosen the camshaft sprocket securing bolt.
2. Remove the camshaft sprocket.



<<B>> ROCKER ARM AND SHAFT ASSEMBLY REMOVAL

1. Install special tool MD998443 as shown in the illustration so that the lash adjusters will not fall out.

⚠ CAUTION

Never disassemble the rocker arm and shaft assembly.

2. Loosen the rocker arm and shaft assembly mounting bolt, and then remove the rocker arm and shaft assembly with the bolt still attached.

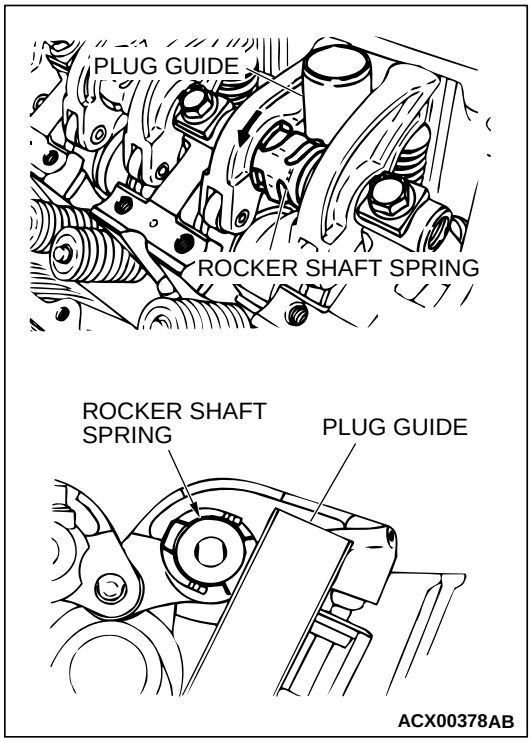
INSTALLATION SERVICE POINTS

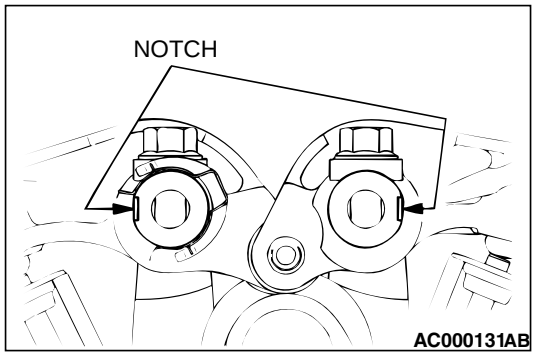
>>A<< ROCKER ARM AND SHAFT ASSEMBLY INSTALLATION

1. Temporarily tighten the rocker shaft with the bolt so that all rocker arms do not push the valves.
2. Fit the rocker shaft spring from the above and position it so that it is right angles to the plug guide.

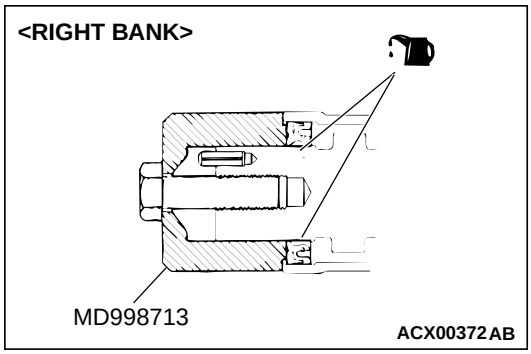
   NOTE: Install the rocker shaft spring before installing the rocker arm and rocker arm shaft on the exhaust side.
3. Tighten the rocker arm and shaft assembly mounting bolt to the specified torque.

   Tightening torque: 31 ± 3 N·m (23 ± 2 ft-lb)
4. Remove special tool MD998443.



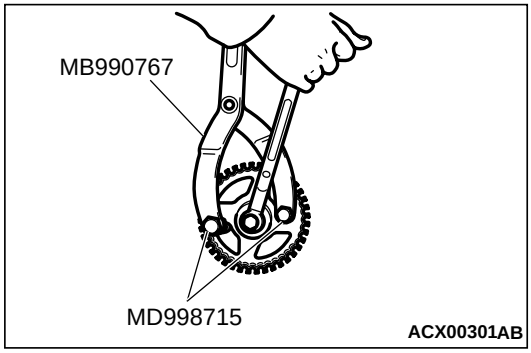


5. Make sure that the notch in the end of the rocker arm shaft is facing the direction shown.



>>B<< CAMSHAFT OIL SEAL INSTALLATION

1. Apply engine oil to the camshaft oil seal lip.
2. Use special tool MD998713 to press-fit the camshaft oil seal.



>>C<< CAMSHAFT SPROCKET INSTALLATION

1. Install the camshaft sprocket.
2. Use special tools MB990767 and MD998719 to tighten the camshaft sprocket securing bolt to the specified torque.

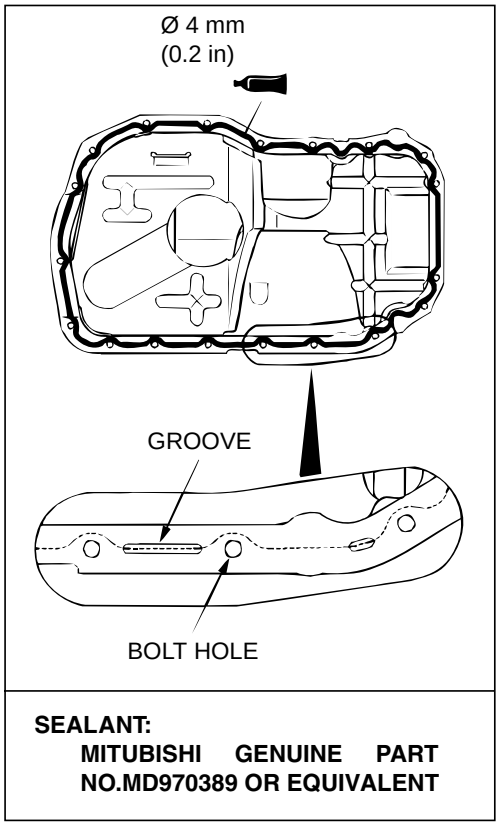
   Tightening torque: 88 ± 10 N·m (65 ± 7 ft-lb)

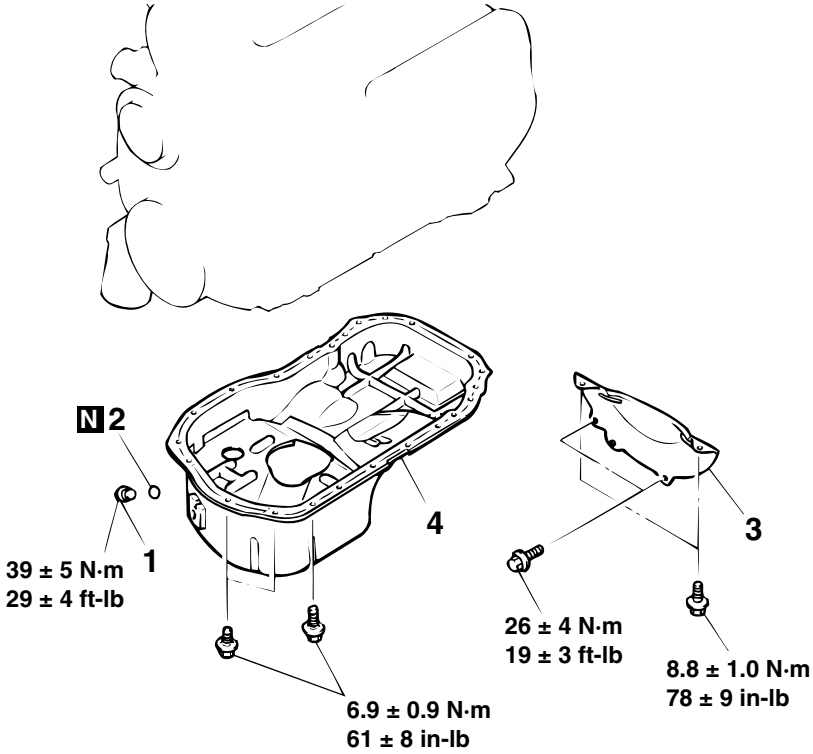
OIL PAN

REMOVAL AND INSTALLATION

M1112002800280

Pre-removal and Post-installation Operation
- Engine Oil Draining and Refilling (Refer to GROUP 12, On-vehicle Service – Engine Oil Replacement P.12-3.)
- Oil Dipstick Removal and Installation
- Front Exhaust Pipe Removal and Installation (Refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-21.)





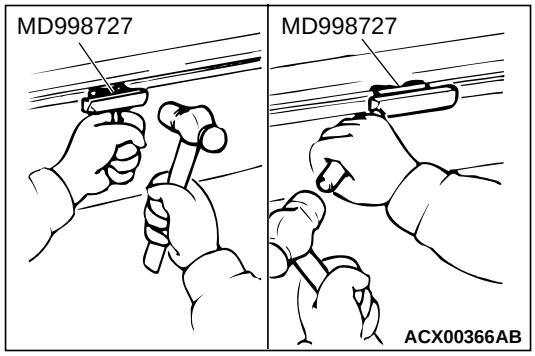
REMOVAL STEPS
1. DRAIN PLUG
>>B<< 2. DRAIN PLUG GASKET

REMOVAL STEPS (Continued)
3. BELL HOUSING COVER
<<A>> >>A<< 4. OIL PAN

Required Special Tool:
- MD998727: Oil Pan Remover

REMOVAL SERVICE POINT

<<A>> OIL PAN REMOVAL



⚠ CAUTION

Perform this slowly to avoid deformation of the oil pan flange.

After removing the oil pan mounting bolts, remove the oil pan with special tool MD998727 and a brass bar.

INSTALLATION SERVICE POINTS

>>A<< OIL PAN INSTALLATION

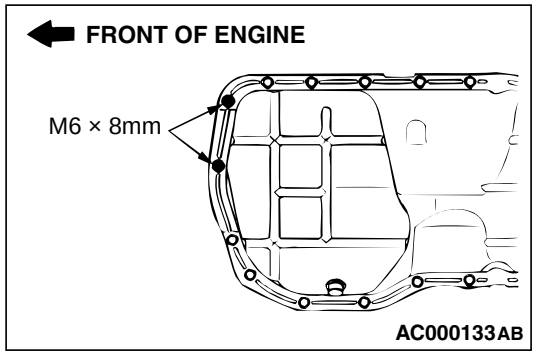
⚠ CAUTION

After installing the oil pan, wait at least one hour before starting the engine.

1. Remove sealant from the oil pan and cylinder block mating surfaces.
2. Degrease the sealant-coated surface and the engine mating surface.
3. Apply MITSUBISHI GENUINE PART number MD970389 or equivalent around the gasket surface of the oil pan.

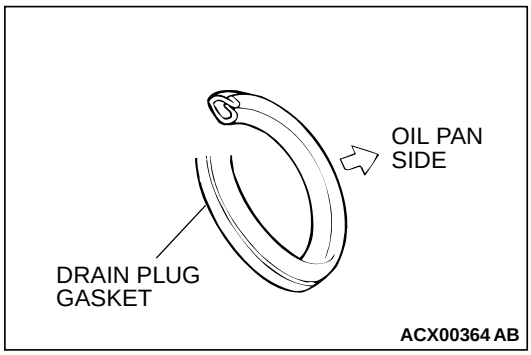
   NOTE: The sealant should be applied in a continuous bead approximately 4 mm (0.2 inch) in diameter.
4. Assemble the oil pan to the cylinder block within 15 minutes after applying the sealant.

   Be careful when installing the oil pan. The bolts indicated in the illustration have different lengths from the other bolts.



>>B<< DRAIN PLUG GASKET INSTALLATION

Install the drain plug gasket in the direction shown in the illustration.



INSPECTION

M1112002900124

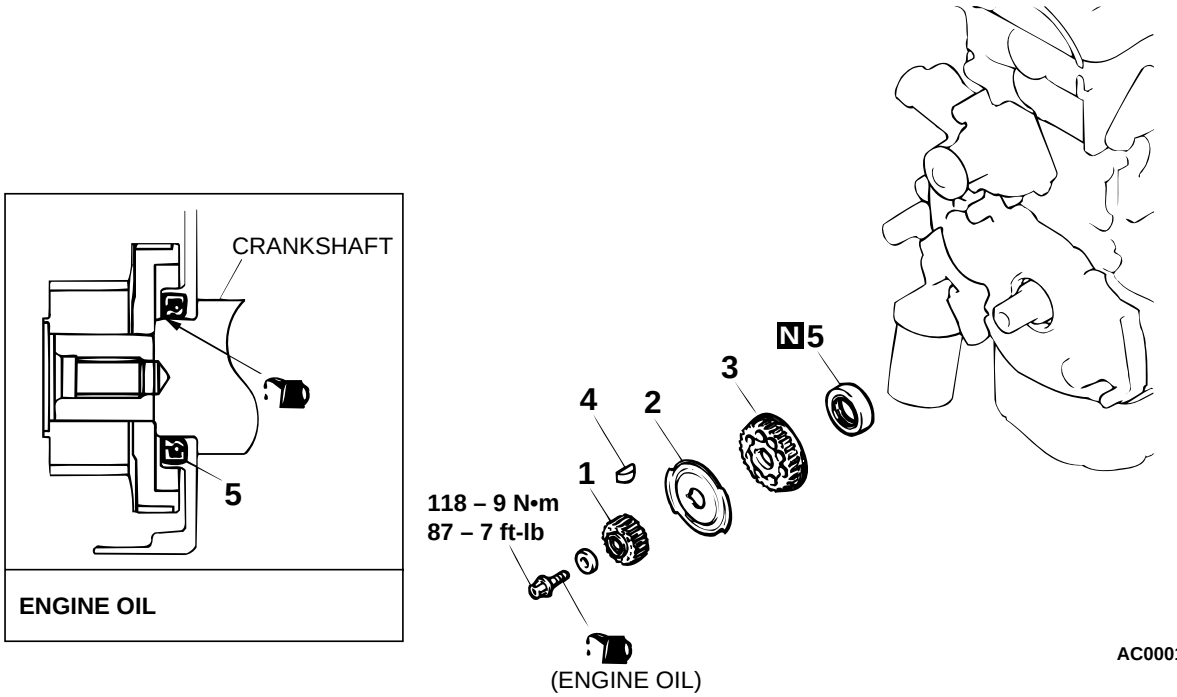
- Check the oil pan for cracks.
- Check the oil pan sealant-coated surface for damage and deformation.

CRANKSHAFT FRONT OIL SEAL

REMOVAL AND INSTALLATION

M1112003400274

Pre-removal and Post-installation Operation
- Timing Belt Removal and Installation (Refer to P.11A-32.)
- Crankshaft Position Sensor Removal and Installation (Refer to GROUP 16, Ignition System – Crankshaft Position Sensor <2.4L Engine>P.16-55 .)



REMOVAL STEPS

<<A>> >>B<< 1. CRANKSHAFT SPROCKET
>>B<< 2. CRANKSHAFT SENSING BLADE
- TIMING BELT B (REFER TO P.11A-36.)

REMOVAL STEPS (Continued)

>>B<< 3. CRANKSHAFT SPROCKET B
4. KEY
>>A<< 5. CRANKSHAFT FRONT OIL SEAL

Required Special Tools:
- MB991367: Special Spanner
- MB998375: Crankshaft Front Oil Seal Installer

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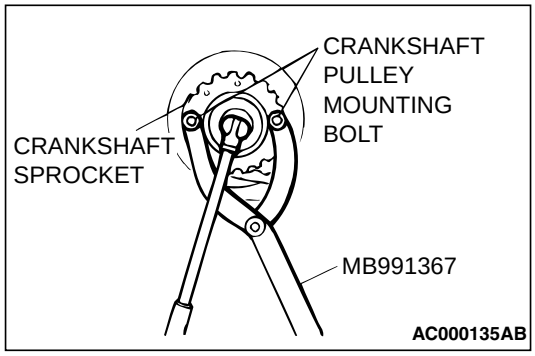
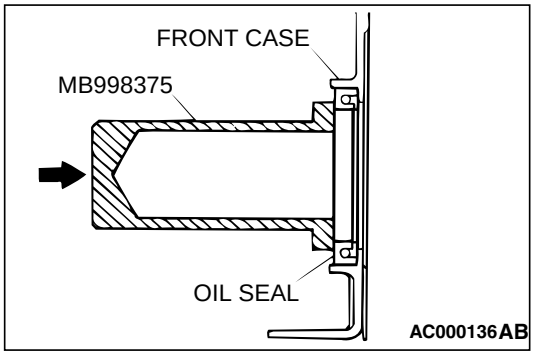
REMOVAL SERVICE POINT



<<A>> CRANKSHAFT SPROCKET REMOVAL

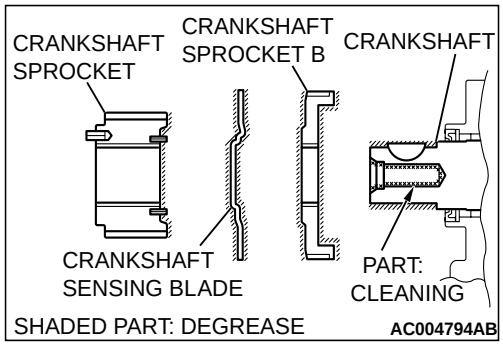
1. Use the crankshaft pulley mounting bolt to secure special tool MB991367.
2. Loosen the crankshaft sprocket mounting bolt, and remove the sprocket.

INSTALLATION SERVICE POINTS



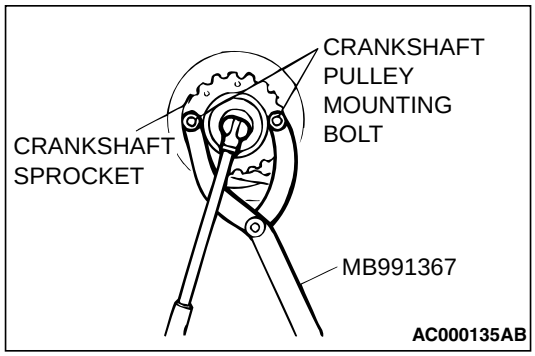
>>A<< CRANKSHAFT FRONT OIL SEAL INSTALLATION

1. Apply engine oil to the entire inside diameter of the oil seal lip.
2. Use special tool MD998375 to press-fit the oil seal until it is flush with the front case.



>>B<< CRANKSHAFT SPROCKET B/CRANKSHAFT SENSING BLADE/CRANKSHAFT SPROCKET INSTALLATION

1. To prevent the crankshaft bolt from loosening, degrease or clean the seating surfaces of the crankshaft, crankshaft sprocket B, crankshaft sensing blade and crankshaft at the shown positions.
2. Install the crankshaft sensing blade so that they face as shown in the illustration.
3. Apply the minimum amount of engine oil to the seat surface and thread of the crankshaft bolt.



4. Use the crankshaft pulley mounting bolt to secure special tool MB991367.
5. Tighten the crankshaft sprocket bolt to the specified torque.

   Tightening torque: 118 ± 9 N·m (87 ± 7 ft-lb)

CRANKSHAFT REAR OIL SEAL

REMOVAL AND INSTALLATION

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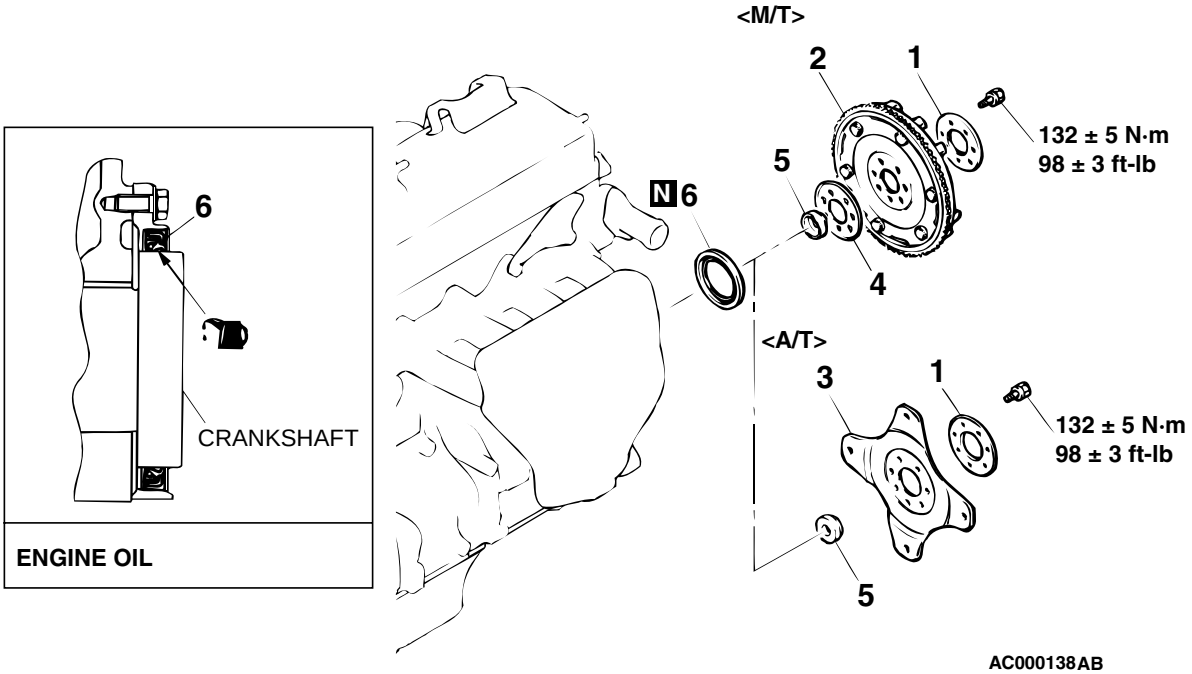


REMOVAL STEPS

- OIL PAN (REFER TO P.11A-22.)
- TRANSAXLE ASSEMBLY
- CLUTCH COVER AND CLUTCH DISC <M/T> (REFER TO GROUP 21B, CLUTCH P.21B-2.)

<<A>>

<<B>> >>B<< 1. ADAPTER PLATE

REMOVAL STEPS (Continued)

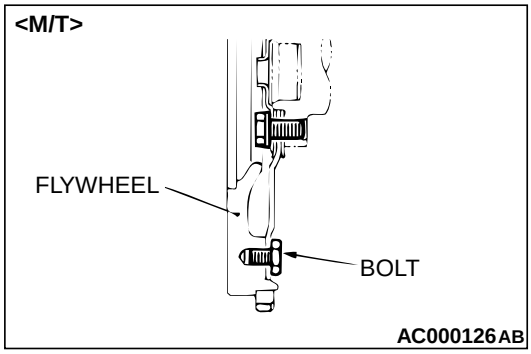
<<B>> >>B<< 2. FLYWHEEL <M/T>
<<B>> >>B<< 3. DRIVE PLATE <A/T>
<<B>> >>B<< 4. ADAPTER PLATE <M/T>
5. CRANKSHAFT BUSHING
>>A<< 6. CRANKSHAFT REAR OIL SEAL

Required Special Tools:

- MB990938: Handle
- MD998776: Crankshaft Rear Oil Seal Installer
- MD998781: Flywheel Stopper

REMOVAL SERVICE POINTS

<<A>> TRANSAXLE ASSEMBLY REMOVAL



⚠ CAUTION

Do not remove the flywheel mounting bolt shown by the arrow. If this bolt is removed, the flywheel will become out of balance and damaged.

<M/T>: Refer to GROUP 22A, Transaxle Assembly P.22A-16.
<A/T>: Refer to GROUP 23A, Transaxle Assembly P.23A-366.

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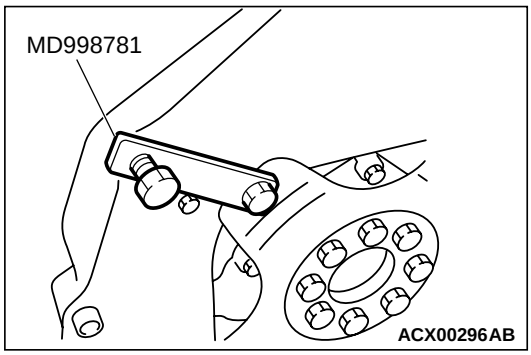
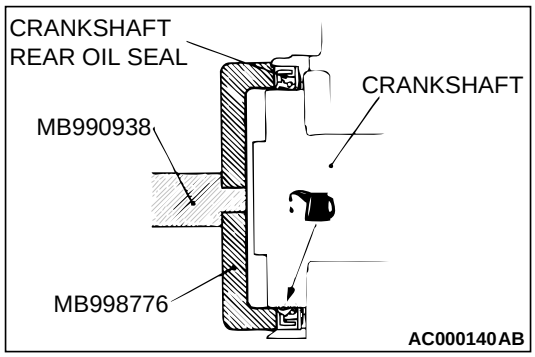


<<B>> ADAPTER PLATE/FLYWHEEL <M/T>/DRIVE PLATE <A/T>/ADAPTER PLATE <M/T> REMOVAL

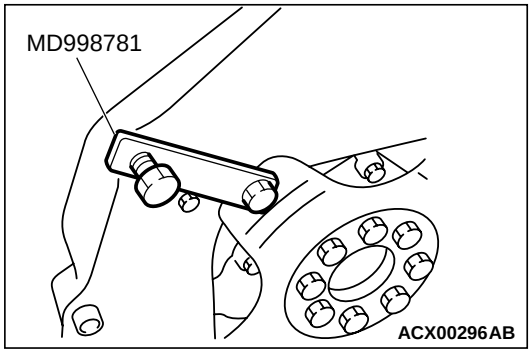
Use special tool MD998781 to secure the flywheel or drive plate, and remove the bolt.

INSTALLATION SERVICE POINTS



>>A<< CRANKSHAFT REAR OIL SEAL INSTALLATION

1. Apply a small amount of engine oil to the entire inside diameter of the oil seal lip.
2. Use special tools MB990938 and MD998776 to tap in the oil seal as shown in the illustration.



>>B<< ADAPTER PLATE <M/T>/DRIVE PLATE <A/T>/ FLYWHEEL <M/T>/ADAPTER PLATE INSTALLATION

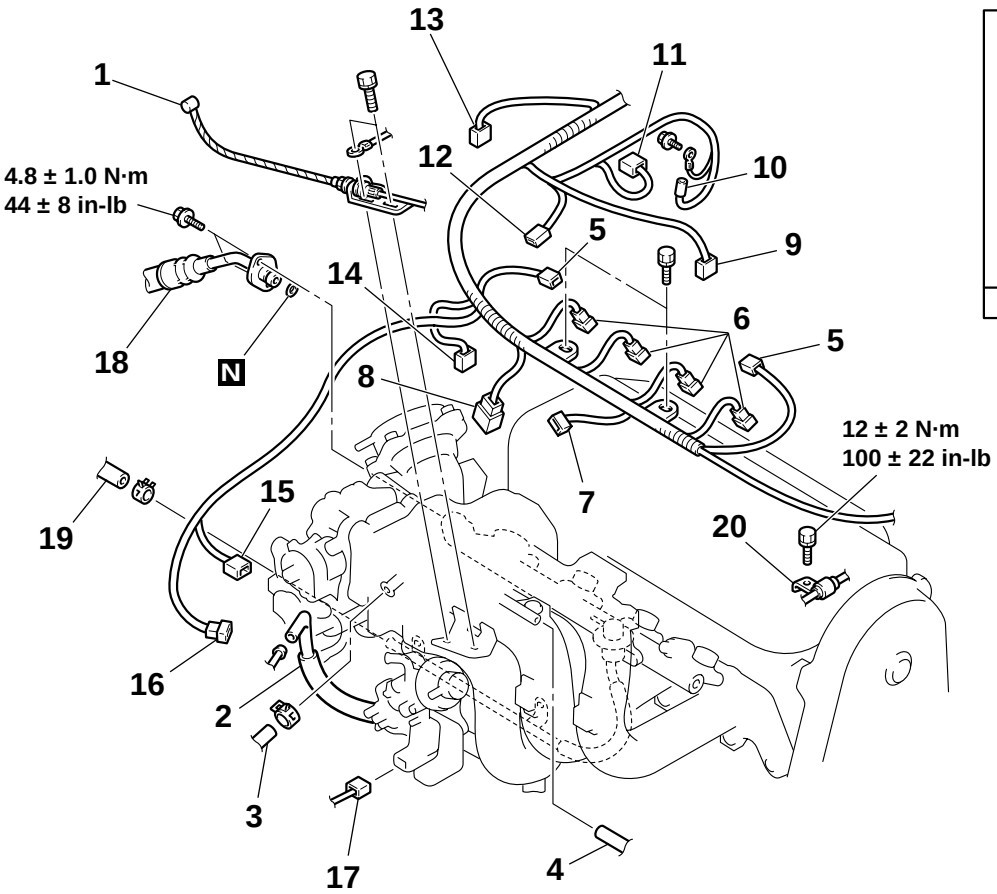
Use special tool MD998781 to hold the flywheel or drive plate in the same manner as removal, and install the bolt.

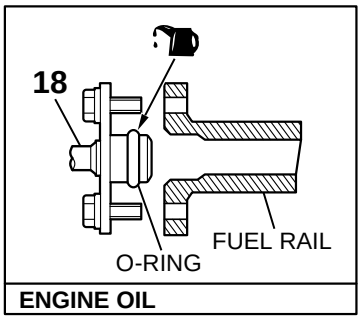
CYLINDER HEAD GASKET

REMOVAL AND INSTALLATION

M1112004000354

Pre-removal Operation	Post-installation Operation
• Fuel Line Pressure Reduction [Refer to GROUP 13A, On-vehicle Service – Fuel Pump Relay Disconnection (How to Reduce Pressurized Fuel Lines) P.13A-580.] • Engine Oil Draining (Refer to GROUP 12, On-vehicle Service – Engine Oil Replacement P.12-3.) • Engine Coolant Draining [Refer to GROUP 00, Maintenance Service – Engine Coolant (Change) P.00-56.] • Strut Tower Bar Removal (Refer to GROUP42, Strut Tower Bar P.42-11.) • Air Cleaner Removal (Refer to GROUP 15, Air Cleaner P.15-6.) • Thermostat Case Assembly Removal (Refer to GROUP 14, Water Hose and Water Pipe P.14-28.) • Front Exhaust Pipe Removal (Refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-21.)	• Front Exhaust Pipe Installation (Refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-21.) • Thermostat Case Assembly Installation (Refer to GROUP 14, Water Hose and Water Pipe P.14-28.) • Air Cleaner Installation (Refer to GROUP 15, Air Cleaner P.15-6.) • Strut Tower Bar Installation (Refer to GROUP42, Strut Tower Bar P.42-11.) • Engine Oil Refilling (Refer to GROUP 12, On-vehicle Service – Engine Oil Replacement P.12-3.) • Engine Coolant Refilling [Refer to GROUP 00, Maintenance Service – Engine Coolant (Change) P.00-56.] • Accelerator Cable Adjustment (Refer to GROUP 17, On-vehicle Service – Accelerator Cable Check and Adjustment P.17-5.)





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REMOVAL STEPS

1. ACCELERATOR CABLE CONNECTION
2. PURGE HOSE CONNECTION
3. BRAKE BOOSTER VACUUM HOSE CONNECTION
4. VACUUM HOSE CONNECTION
5. IGNITION COIL CONNECTOR
6. INJECTOR CONNECTOR

REMOVAL STEPS (Continued)

7. MANIFOLD DIFFERENTIAL PRESSURE SENSOR CONNECTOR
8. THROTTLE POSITION SENSOR CONNECTOR
9. HEATED OXYGEN SENSOR (FRONT) CONNECTOR
10. CAPACITOR CONNECTOR

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REMOVAL STEPS (Continued)

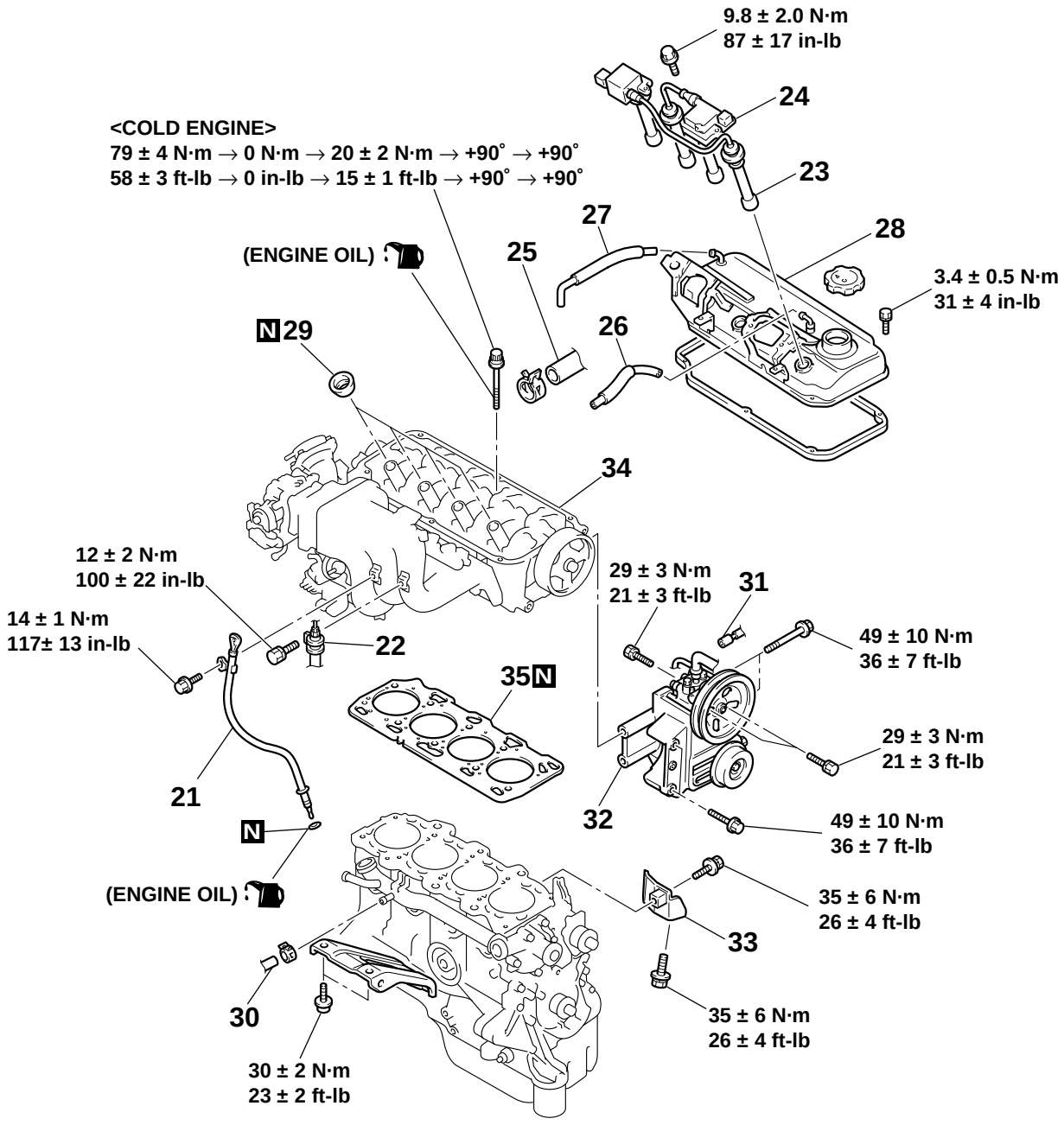
11. ENGINE COOLANT TEMPERATURE SENSOR CONNECTOR
12. CAMSHAFT POSITION SENSOR CONNECTOR
13. KNOCK SENSOR CONNECTOR
14. ENGINE COOLANT TEMPERATURE GAUGE UNIT CONNECTOR
15. IDLE AIR CONTROL MOTOR CONNECTOR

REMOVAL STEPS (Continued)

16. EVAPORATIVE EMISSION PURGE SOLENOID VALVE CONNECTOR
17. EGR SOLENOID VALVE CONNECTOR

>>C<< 18. HIGH-PRESSURE FUEL HOSE CONNECTION

19. FUEL RETURN HOSE CONNECTION
20. PRESSURE HOSE CONNECTION



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REMOVAL STEPS
21. OIL DIPSTICK AND DIPSTICK GUIDE
22. PRESSURE HOSE CONNECTION
23. SPARK PLUG CABLE
24. IGNITION COIL
25. RADIATOR UPPER HOSE CONNECTION
26. PCV HOSE CONNECTION
27. BREATHER HOSE CONNECTION
28. ROCKER COVER

REMOVAL STEPS (Continued)
29. SPARK PLUG GUIDE OIL SEAL
30. WATER HOSE CONNECTION
- TIMING BELT (REFER TO P.11A-32.)

31. POWER STEERING PRESSURE SWITCH
32. POWER STEERING OIL PUMP AND BRACKET ASSEMBLY
33. EXHAUST MANIFOLD BRACKET
34. CYLINDER HEAD ASSEMBLY
35. CYLINDER HEAD GASKET

<<A>>
<<B>> >>B<<
>>A<<

Required Special Tool:
- MB991654: Cylinder Head Bolt Wrench (12)

REMOVAL SERVICE POINTS

<<A>> POWER STEERING OIL PUMP AND BRACKET ASSEMBLY REMOVAL
Remove the power steering oil pump and bracket assembly from the engine with the hose attached.

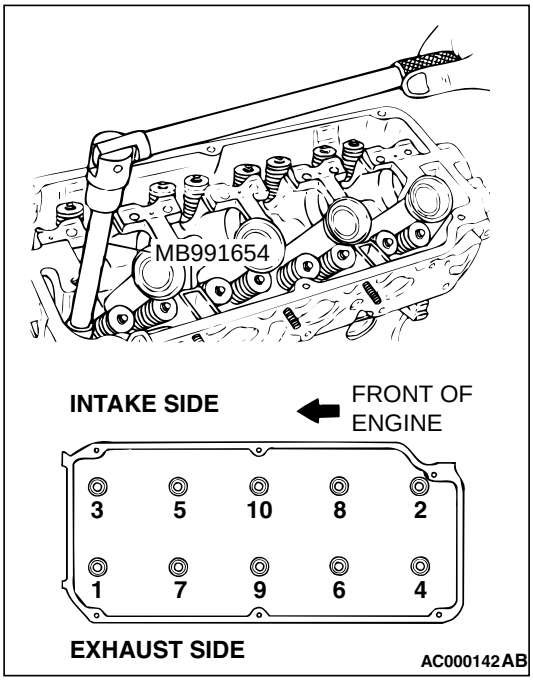
NOTE: Place the removed power steering oil pump in a place where it will not be a hindrance when removing and installing the cylinder head assembly, and secure it with a cord or wire.

<<B>> CYLINDER HEAD ASSEMBLY REMOVAL

⚠ CAUTION

Be careful not to damage or deform the plug guides when removing the cylinder head bolts. Plug guides cannot be replaced separately.

Using special tool MB991654, loosen the bolts in two or three steps in the order of the numbers shown in the illustration, then remove the cylinder head assembly.



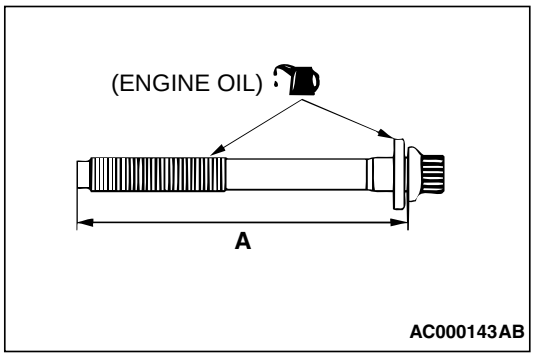
INSTALLATION SERVICE POINTS

>>A<< CYLINDER HEAD GASKET INSTALLATION

1. Wipe off all oil and grease from the gasket mounting surface.
2. Match the shapes of the cylinder head holes with their respective cylinder head gasket holes.

>>B<< CYLINDER HEAD ASSEMBLY INSTALLATION

1. When installing the cylinder head bolts, the length below the head of the bolts should be within the limit.
   If it is outside the limit, replace the bolts.
   Limit (A): 99.4 mm (3.91 inches)
2. Apply a small amount of engine oil to the thread section and the washer of the cylinder head bolt.

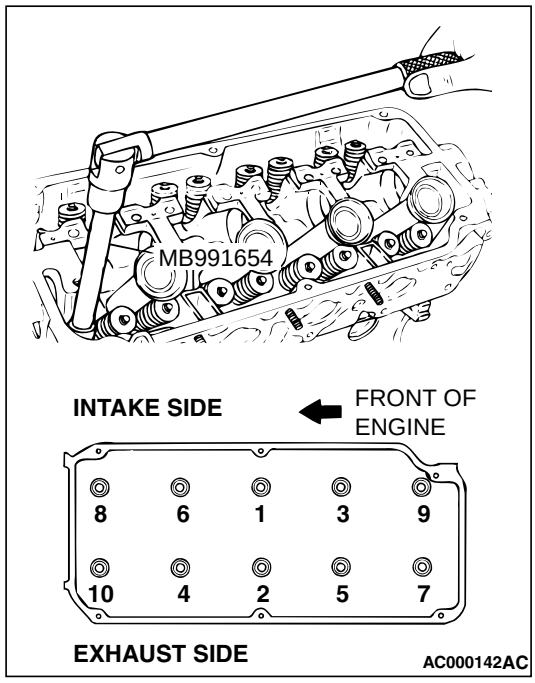


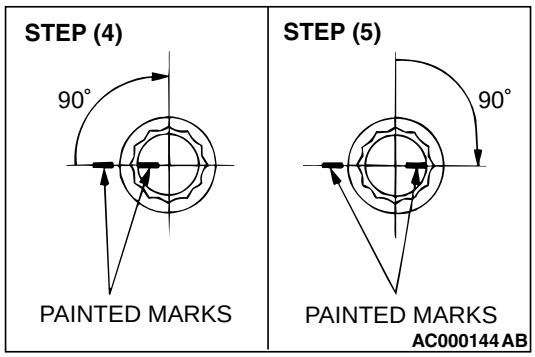
⚠ CAUTION

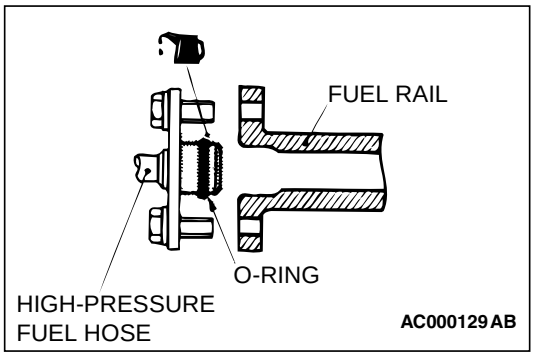
- **Always tighten cylinder head bolts at a 90 degree angle. If it is less than 90 degree angle, the bolt will loosen.**
- **If it is more than 90 degree angle, remove the head bolt and repeat the procedure from step 1.**

3. Using special tool MB991654, tighten the bolts by the following procedure.

STEP	OPERATION	REMARKS
(1)	Tighten to 79 ± 4 N·m (58 ± 3 ft-lb)	Tighten in the order shown in the illustration.
(2)	Fully loosen.	Tighten in the reverse order of that shown in the illustration.
(3)	Tighten to 20 ± 2 N·m (15 ± 1 ft-lb)	Tighten in the order shown in the illustration.
(4)	Tighten 90° of a turn.	Tighten in the order shown in the illustration. Mark the head of the cylinder head bolt and cylinder head with a paint mark.
(5)	Tighten 90° of a turn.	Tighten in the order shown in the illustration. Check that the painted mark of the head bolt is aligned with that of the cylinder head.







>>C<< HIGH-PRESSURE FUEL HOSE INSTALLATION

⚠ CAUTION

Do not allow engine oil to enter the fuel rail.

1. Apply a small amount of new engine oil to the O-ring.
2. While turning the high-pressure fuel hose to the right and left, install the fuel rail, while being careful not to damage the O-ring. After installing, check that the hose turns smoothly.
3. If the hose does not turn smoothly, the O-ring is probably being clamped. Disconnect the high-pressure fuel hose and check the O-ring for damage.
4. Re-insert the fuel rail and confirm the hose turns smoothly.

TIMING BELT

REMOVAL AND INSTALLATION

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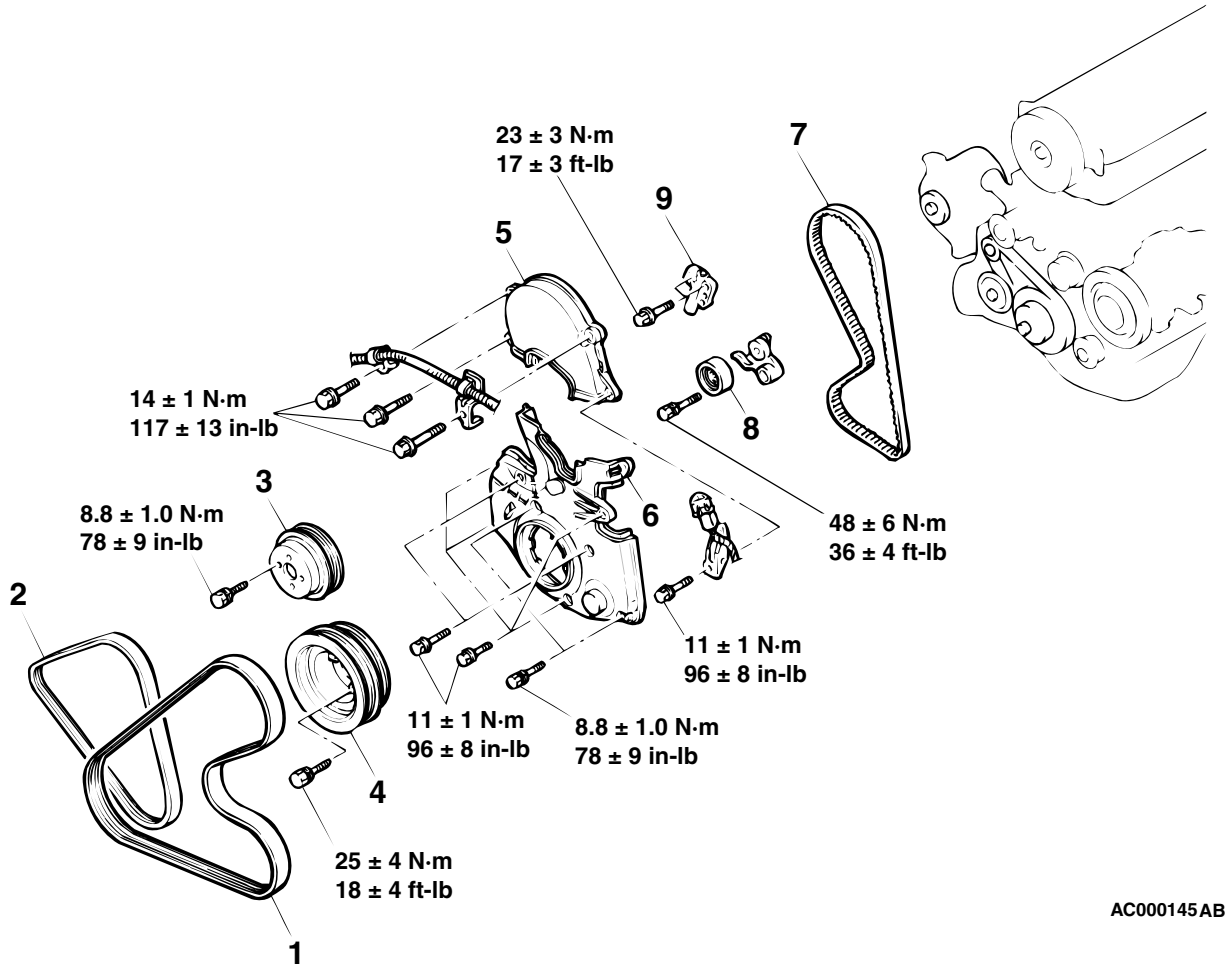
Pre-removal Operation	Post-installation Operation
• Engine Mount Bracket Removal (Refer to GROUP 32, Engine Mounting P.32-4.)	• Engine Mount Bracket Installation (Refer to GROUP 32, Engine Mounting P.32-4.) • Drive Belt Tension Adjustment [Refer to GROUP 00, Maintenance Service – Drive Belts (Check Condition) P.00-44.]



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REMOVAL STEPS
1. DRIVE BELT (POWER STEERING OIL PUMP AND A/C COMPRESSOR)
2. DRIVE BELT (GENERATOR)
3. WATER PUMP PULLEY
4. CRANKSHAFT PULLEY
5. TIMING BELT UPPER COVER ASSEMBLY

<<A>>

>>B<<

>>A<<

REMOVAL STEPS (Continued)
6. TIMING BELT LOWER COVER ASSEMBLY

>>C<<
- TIMING BELT TENSION ADJUSTMENT

7. TIMING BELT
8. TENSIONER PULLEY
9. AUTO-TENSIONER

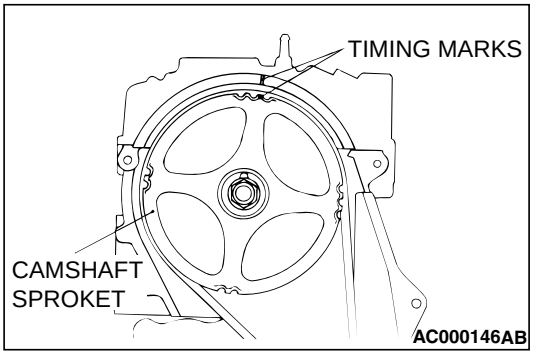
Required Special Tools:
- MD998738: Adjusting Screw
- MD998767: Tensioner Wrench

REMOVAL SERVICE POINT

<<A>> TIMING BELT REMOVAL

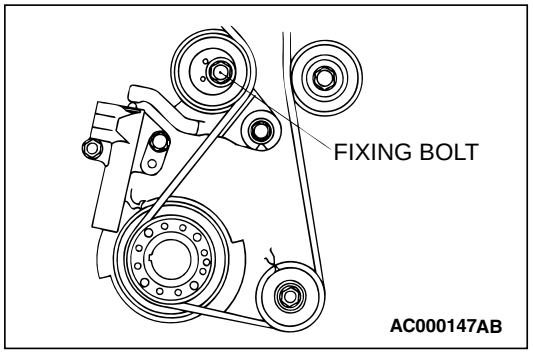
⚠ CAUTION
The crankshaft should always be turned in the forward direction only.

1. Turn the crankshaft in the forward direction (to the right) to align the camshaft sprocket timing marks.

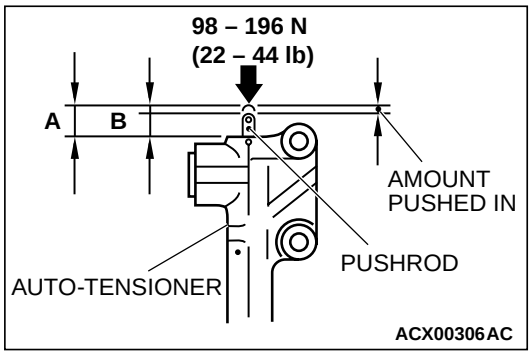


⚠ CAUTION
If the timing belt is to be re-used, use chalk to mark (on its flat side) an arrow indicating the clockwise direction.

2. Loosen the tension pulley fixing bolt.
3. Move the tension pulley to the water pump side, and then remove the timing belt.



INSTALLATION SERVICE POINTS



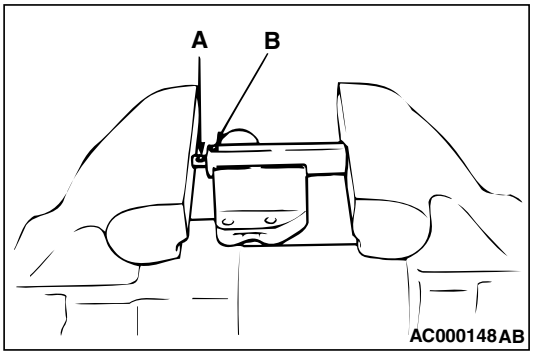
>>A<< AUTO-TENSIONER INSTALLATION

1. Apply 98 – 196 N (22 – 44 pound) force to the pushrod of the auto-tensioner by pressing it against a metal object (such as the engine block) and measure the movement of the pushrod.

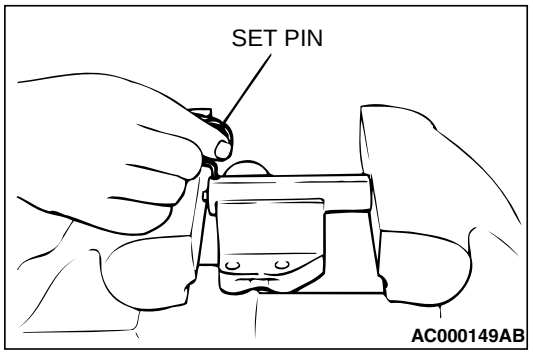
   Standard value: Within 1 mm (0.04 inch)
   A: Length when it is free (not pressed)
   B: Length when it is pressed
   A – B: Movement

2. If it is outside the standard value, replace the auto-tensioner.

⚠ CAUTION
Never compress the pushrod too fast, or it may be damaged.



3. Use a press or vise to gently compress the auto-tensioner pushrod until pin hole A of the pushrod and pin hole B of the tensioner cylinder are aligned.

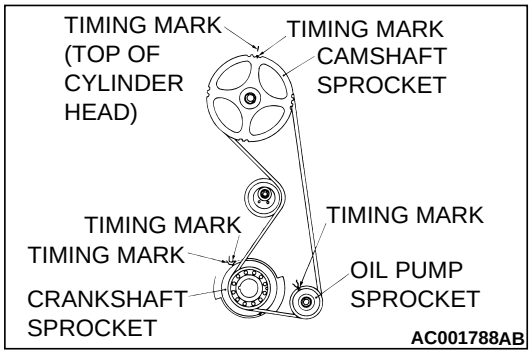


4. When the holes are aligned, insert the set pin.

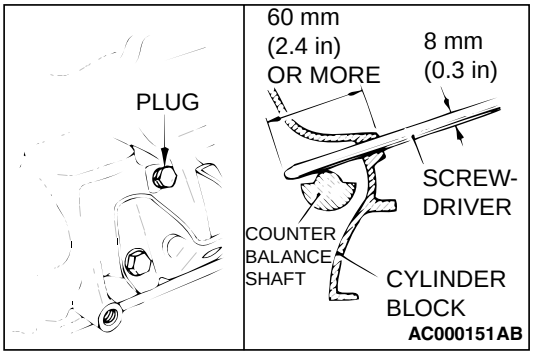
   NOTE: When replacing the auto-tensioner with a new part, the pin will be in the auto-tensioner.

5. Install the auto-tensioner to the engine.

>>B<< TIMING BELT INSTALLATION



1. Align the timing marks on the camshaft sprocket, crankshaft sprocket and oil pump sprocket.

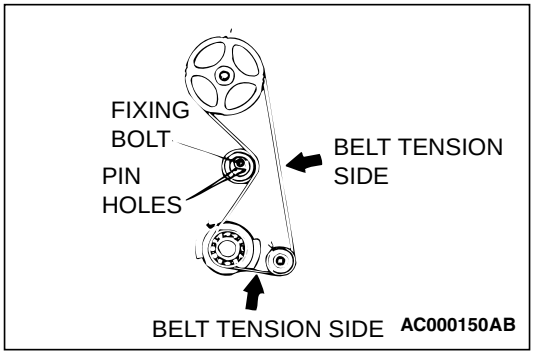


2. After aligning the timing mark on the oil pump sprocket, remove the cylinder block plug and insert a Phillips) head 8 mm (0.3 inch) screwdriver. Check to be sure that the screwdriver goes in 60 mm (2.4 inches) or more. If the screwdriver will only go in 20 – 25 mm (0.8 – 1.0 inch) before striking the counterbalance shaft, turn the sprocket once, realign the timing marks and check that the screwdriver goes in 60 mm (2.4 inches) or more.
   The screwdriver should not be taken out until the timing belt is installed.

⚠ CAUTION

If the timing belt is re-used, install so that the arrow marked on it at time of removal is pointing in the clockwise direction.

3. Install the belt to the crankshaft sprocket, oil pump sprocket and camshaft sprocket in that order, so that there is no slackness in the belt tension.
4. Set the tension pulley so that the pin holes are at the bottom, press the tension pulley lightly against the timing belt, and then provisionally tighten the fixing bolt.
5. Adjust the timing belt tension.

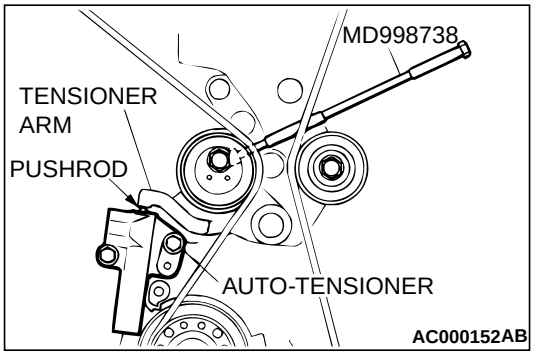


>>C<< TIMING BELT TENSION ADJUSTMENT

⚠ CAUTION

Do not use a spanner or the similar tool to turn special tool MD998738. Otherwise, the auto-tensioner set pin may be broken. Turn special tool MD998738 by hand only.

1. Remove the rubber plug from the rear of the timing belt cover assembly. Then screw in special tool MD998738 by hand until the tensioner arm is touching the auto-tensioner pushrod.
2. After turning the crankshaft 1/4 of a revolution in the counterclockwise direction, turn it in the clockwise direction until the timing marks are aligned.

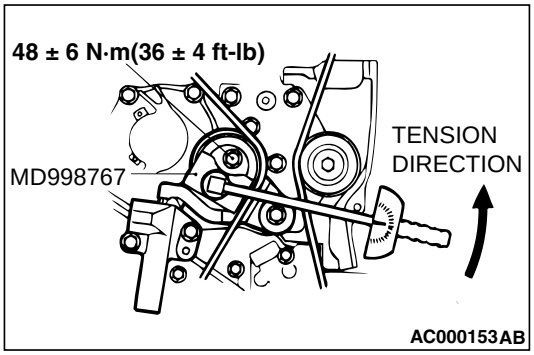


⚠ CAUTION

When tightening the fixing bolt, make sure that the tension pulley does not turn with the bolt.

3. Loosen the tension pulley fixing bolt, and then use special tool MD998767 and a torque wrench to tighten the fixing bolt to the specified torque while applying tension to the timing belt.

   Timing belt tension torque: 3.5 N·m (31 in-lb)
   Tightening torque:48 ± 6 N·m (36 ± 4 ft-lb)



4. Remove the set pin that has been inserted into the auto-tensioner, and then remove special tool MD998767.

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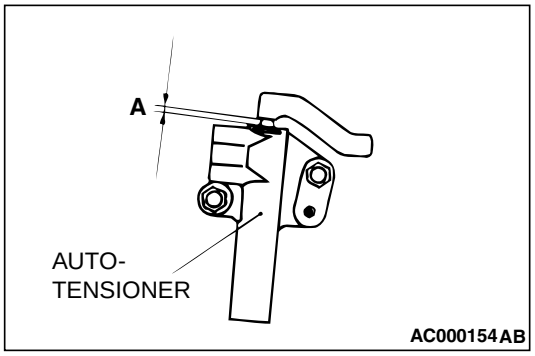


5. Turn the crankshaft two revolutions clockwise so that the timing marks are aligned. After leaving it for 15 minutes, measure the amount of protrusion of the auto-tensioner.

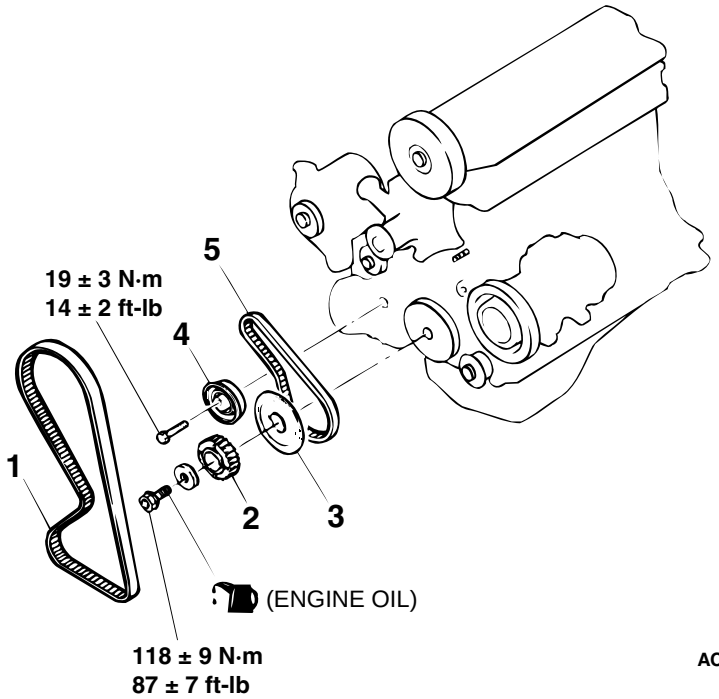
   Standard value (A): 3.8 – 4.5 mm (0.15 – 0.18 inch)

6. If the amount of protrusion is outside the standard value, repeat steps (1) through (5).
7. Check again to be sure that the timing marks of each sprocket are aligned.

TIMING BELT B

REMOVAL AND INSTALLATION

M1112004600107



REMOVAL STEPS

1. TIMING BELT (REFER TO P.11A-32.)

>>C<< • TIMING BELT B TENSION ADJUSTMENT

REMOVAL STEPS (Continued)

<<A>> >>B<< 2. CRANKSHAFT SPROCKET

>>B<< 3. CRANKSHAFT SENSING BLADE

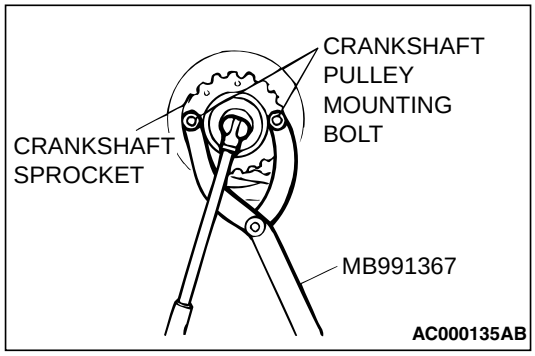
4. TIMING BELT B TENSIONER

<<B>> >>A<< 5. TIMING BELT B

Required Special Tool:

- MB991367: Special Spanner

REMOVAL SERVICE POINTS



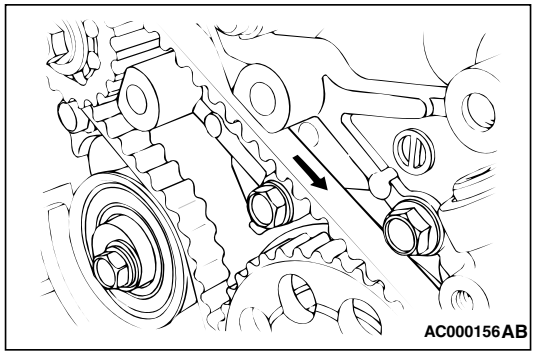
<<A>> CRANKSHAFT SPROCKET REMOVAL

1. Use the crankshaft pulley mounting bolt to hold special tool MB991367.
2. Loosen the crankshaft sprocket mounting bolt, and remove the sprocket.

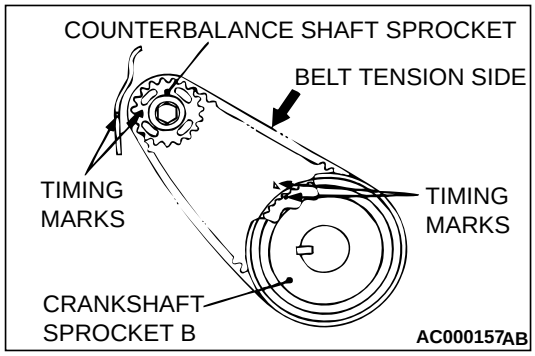
<<B>> TIMING BELT B REMOVAL

⚠ CAUTION

If the belt is to be re-used, mark an arrow on the belt with chalk indicating the clockwise direction of rotation.

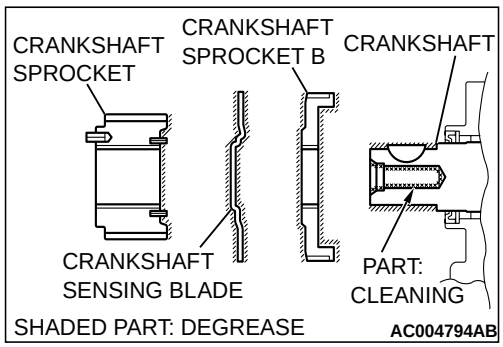


INSTALLATION SERVICE POINTS



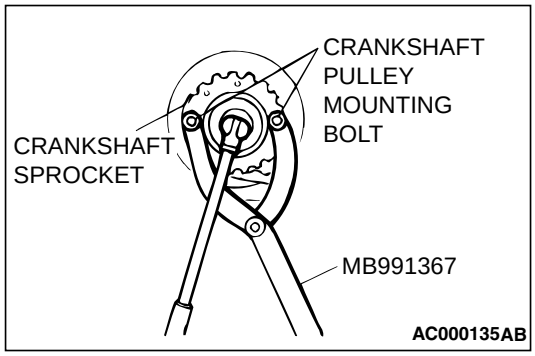
>>A<< TIMING BELT B INSTALLATION

1. Ensure that crankshaft sprocket B timing marks and the counterbalance shaft sprocket timing marks are aligned.
2. Fit timing belt B over crankshaft sprocket B and the counterbalance shaft sprocket. Ensure that there is no slack in the belt.



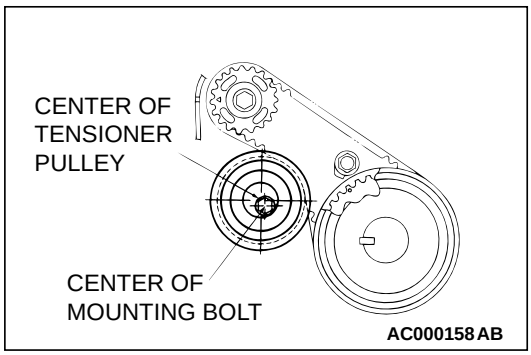
>>B<< CRANKSHAFT SENSING BLADE/CRANKSHAFT SPROCKET INSTALLATION

1. To prevent the crankshaft bolt from loosening, degrease or clean the seating surfaces of the crankshaft, crankshaft sprocket B, crankshaft sensing blade and crankshaft at the shown positions.
2. Install the crankshaft sensing blade so that they face as shown in the illustration.
3. Apply the minimum amount of engine oil to the seat surface and thread of the crankshaft bolt.



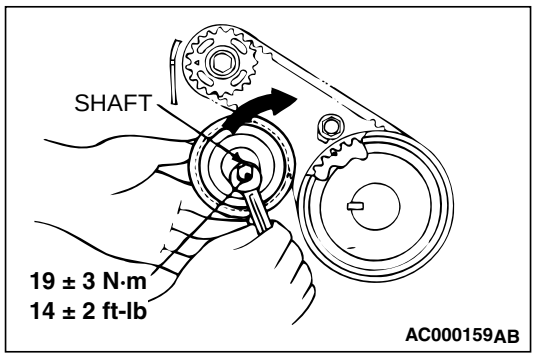
4. Use the crankshaft pulley mounting bolt to secure special tool MB991367.
5. Tighten the crankshaft sprocket bolt to the specified torque.

Tightening torque: 118 ± 9 N·m (87 ± 7 ft-lb)



>>C<< TIMING BELT B TENSION ADJUSTMENT

1. Temporarily fix the timing belt B tensioner so the center of the tensioner pulley is to the left and above the center of the mounting bolt. Temporarily attach the tensioner pulley so the flange is toward the front of the engine.

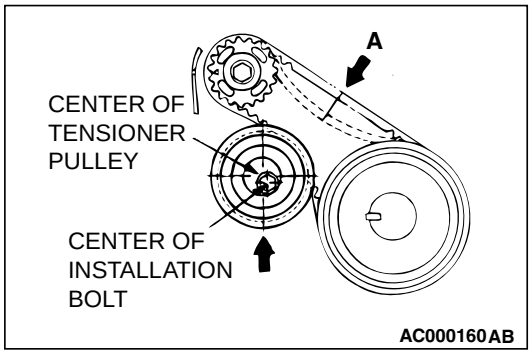


⚠ CAUTION

When tightening the bolt, ensure that the tensioner pulley shaft does not rotate with the bolt. Allowing it to rotate with the bolt can cause excessive tension of the bolt.

2. Holding the timing belt B tensioner up with your finger in the direction of the arrow, apply pressure on the timing belt so the tension side of the belt is taut. Now tighten the bolt to fix the tensioner.

Tightening torque: 19 ± 3 N·m (14 ± 2 ft-lb)



3. To ensure that the tension is correct, depress the belt (point A) with a finger. Adjust the belt tension if it is incorrect.
   Standard value: 5 – 7 mm (0.2 – 0.3 inch)

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1111003800183

ITEMS		SPECIFICATIONS
Auto-tensioner attaching bolt		23 ± 3 N·m (17 ± 3 ft-lb)
Bell housing cover attaching bolt (bolt, flange)		26 ± 4 N·m (19 ± 3 ft-lb)
Bell housing cover attaching bolt (bolt, washer assembled)		8.8 ± 1.0 N·m (78 ± 9 in-lb)
Camshaft position sensor sensing cylinder attaching bolt		21 ± 4 N·m (16 ± 3 ft-lb)
Camshaft position sensor support attaching bolt		14 ± 1 N·m (117 ± 13 in-lb)
Camshaft sprocket attaching bolt		88 ± 10 N·m (65 ± 7 ft-lb)
Crankshaft pulley attaching bolt		25 ± 4 N·m (18 ± 4 ft-lb)
Crankshaft sprocket attaching bolt		118 ± 9 N·m (87 ± 7 ft-lb)
Cylinder head attaching bolt		79 ± 4 N·m → 0 N·m → 20 ± 2 N·m → +90° → +90° (58 ± 3 ft-lb → 0 in-lb → 15 ± 1 ft-lb → +90° → +90°)
Drive plate attaching bolt <A/T>		132 ± 5 N·m (98 ± 3 ft-lb)
Engine mount bracket attaching bolt	M12 × 74	86 ± 12 N·m (64 ± 8 ft-lb)
	M12 × 108	81 ± 12 N·m (60 ± 9 ft-lb)
Engine mount bracket attaching nut		86 ± 12 N·m (64 ± 8 ft-lb)
Exhaust manifold bracket attaching bolt		35 ± 6 N·m (26 ± 4 ft-lb)
Flywheel attaching bolt <M/T>		132 ± 5 N·m (98 ± 3 ft-lb)
High-pressure fuel hose attaching bolt		4.8 ± 1.0 N·m (44 ± 8 in-lb)
Ignition coil attaching bolt		9.8 ± 2.0 N·m (87 ± 17 in-lb)
Intake manifold stay attaching bolt		30 ± 2 N·m (23 ± 2 ft-lb)
Oil dipstick guide attaching bolt		14 ± 1 N·m (117 ± 13 in-lb)
Oil pan attaching bolt		6.9 ± 0.9 N·m (61 ± 8 in-lb)
Oil pan drain plug		39 ± 5 N·m (29 ± 4 ft-lb)
Power steering oil pump attaching bolt		29 ± 3 N·m (21 ± 3 ft-lb)
Power steering oil pump bracket attaching bolt		49 ± 10 N·m (36 ± 7 ft-lb)
Pressure hose attaching bolt		12 ± 2 N·m (100 ± 22 in-lb)
Pressure tube attaching bolt		12 ± 2 N·m (100 ± 22 in-lb)
Rocker arm and shaft assembly attaching bolt		31 ± 3 N·m (23 ± 2 ft-lb)
Rocker cover attaching bolt		3.4 ± 0.5 N·m (31 ± 4 in-lb)
Tensioner pulley attaching bolt		48 ± 6 N·m (36 ± 4 ft-lb)
Timing belt B tensioner attaching bolt		19 ± 3 N·m (14 ± 2 ft-lb)
Timing belt lower cover attaching bolt (bolt, flange)		11 ± 1 N·m (96 ± 8 in-lb)
Timing belt lower cover attaching bolt (bolt, washer assembled)		8.8 ± 1.0 N·m (78 ± 9 in-lb)
Timing belt upper cover attaching bolt	M6	11 ± 1 N·m (96 ± 8 in-lb)
	M8	14 ± 1 N·m (117 ± 13 in-lb)
Water pump pulley attaching bolt		8.8 ± 1.0 N·m (78 ± 9 in-lb)

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SERVICE SPECIFICATIONS

M1111000300338

ITEMS	STANDARD VALUE	LIMIT
Actual ignition timing at idle	Approximately 10° BTDC	–
Auto-tensioner pushrod movement mm (in)	Within 1 (0.04)	–
Auto-tensioner rod protrusion mm (in)	3.8 – 4.5 (0.15 – 0.18)	–
Basic ignition timing at idle	5°BTDC ± 3°	–
CO content %	0.5 or less	–
Compression pressure (250 – 400 r/min) kPa (psi)	1,275 (185)	Minimum 959 (139)
Compression pressure difference of all cylinder kPa (psi)	–	98 (14)
Curb idle speed r/min	700 ± 100	–
Cylinder head bolt shank length mm (in)	–	99.4 (3.91)
HC contents ppm	100 or less	–
Intake manifold vacuum at curb idle kPa (in Hg)	–	Minimum 60 (18)
Timing belt B tension mm (in)	5 – 7 (0.2 – 0.3)	–

SEALANT AND ADHESIVE

M1111000500235

ITEM	SPECIFIED SEALANT
Camshaft position sensor support and oil pan	MITSUBISHI GENUINE Sealant Part No. MD970389 or equivalent

NOTES

GROUP 11B

ENGINE OVERHAUL <2.4L>

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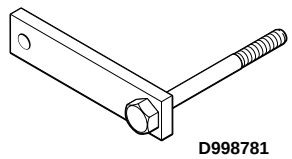
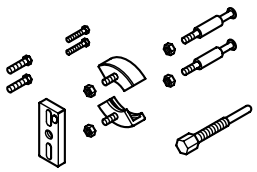
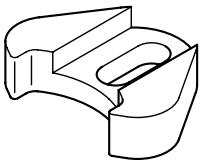
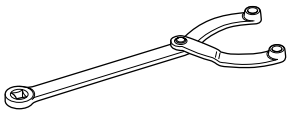
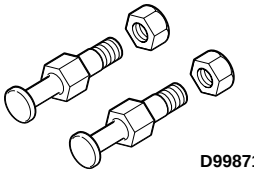
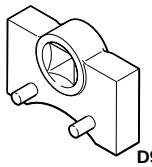
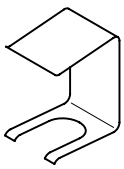
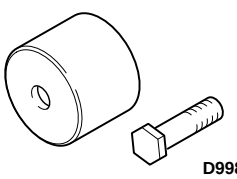
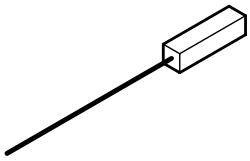
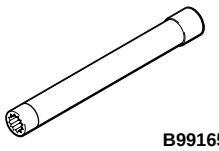
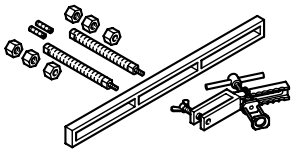
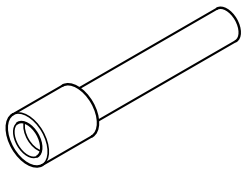
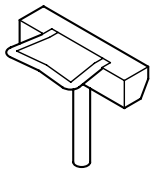
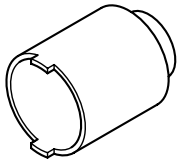
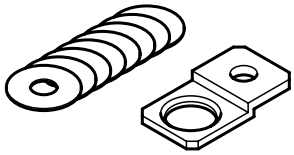
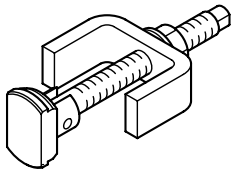
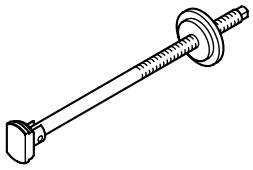
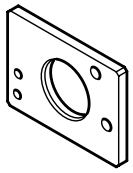
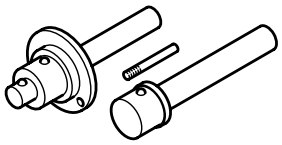
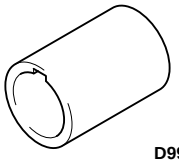
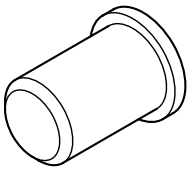
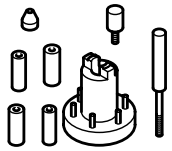
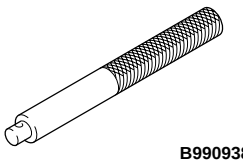
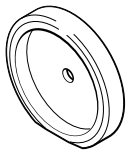
SPECIAL TOOLS

M1113000600056

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 D998781	MD998781 Flywheel stopper	General service tool	Supporting flywheel and drive plate
	MD998778 Crankshaft sprocket puller	General service tool	Removal of crankshaft sprocket
	MD998785 Sprocket stopper	MD998785	Supporting counterbalance shaft sprocket
 B990767	MB990767 End yoke holder	MB990767-01	Holding camshaft sprocket when loosening or torquing bolt
 D998719	MD998719 Pins	MIT308239	
 D998767	MD998767 Tension pulley wrench	MD998752-01	Adjustment of timing belt tension
 D998443	MD998443 Lash adjuster holder (8)	MD998443-01	Supporting of the lash adjuster to prevent it from falling when rocker shaft assembly is removed or installed
 D998713	MD998713 CAMSHAFT OIL SEAL INSTALLER	MD998713-01	Installation of camshaft oil seal

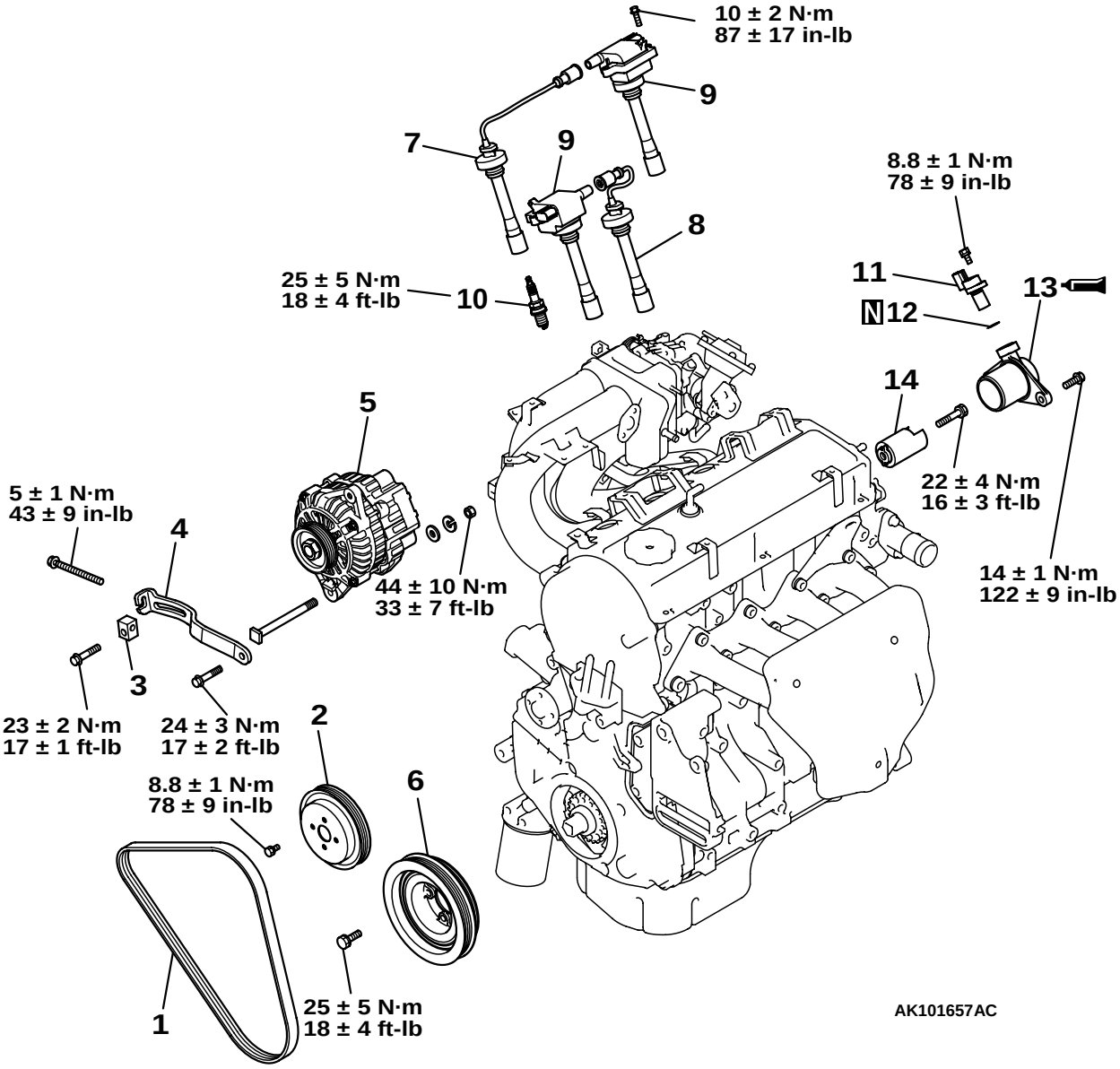
TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
	MD998442 Air bleed wire	General service tool	Air bleed of lash adjuster
 B991654	MB991654 Cylinder head bolt wrench (12)	General service tool	Removal and installation of cylinder head bolt
	MD998772 Valve spring compressor	General service tool	Compression of valve spring
	MD998774 Valve steam seal installer	MD998774-01	Installation of valve steam seal
 D998727	MD998727 Oil pan remover	MD998727-01	Removal of oil pan
	MD998162 Plug wrench Use with MD998783	MD998162-01	Removal and installation of front case cap plug
	MD998783 Plug wrench retainer	General service tool	
	MD998371 Silent shaft bearing puller	MD998371-01	Removal of counterbalance shaft front bearing

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
	MD998372 Silent shaft bearing puller	MD998372-01	Removal of counterbalance shaft rear bearing
	MB991603 Bearing installer stopper	–	Removal and installation of rear bearing
	MD998705 Silent shaft bearing installer	MD998373-01 Use with MB990938-01	Installation of counterbalance shaft bearing
 D998285	MD998285 Crankshaft front oil seal guide	MD998285-01	Installation of crankshaft front oil seal
	MD998375 Crankshaft front oil seal installer	MD998375-01	
	MD998780 Piston pin setting tool	MIT216941	Removal and installation of piston pin
 B990938	MB990938 Handle	MB990938-01	Installation of crankshaft rear oil seal
 D998776	MD998776 Crankshaft rear oil seal installer	MD998376-01	

GENERATOR AND IGNITION SYSTEM

REMOVAL AND INSTALLATION

M1113001000176



REMOVAL STEPS

1. DRIVE BELT
2. WATER PUMP PULLEY
3. ADJUSTING NUT
4. GENERATOR BRACE
5. GENERATOR
6. CRANKSHAFT PULLEY
7. SPARK PLUG CABLE NO.1
8. SPARK PLUG CABLE NO.3

REMOVAL STEPS (Continued)

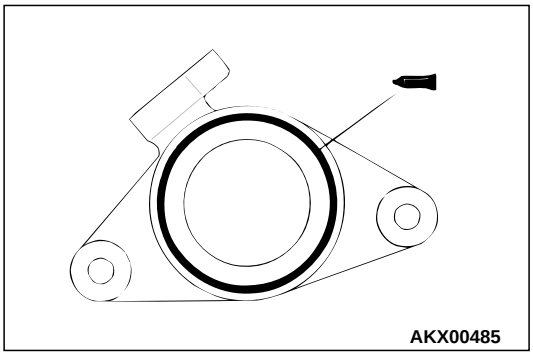
9. IGNITION COIL ASSEMBLY
10. SPARK PLUG
11. CAMSHAFT POSITION SENSOR
12. O-RING

>>A<< 13. CAMSHAFT POSITION SENSOR SUPPORT

14. CAMSHAFT POSITION SENSING CYLINDER

TSB Revision

INSTALLATION SERVICE POINT


AKX00485

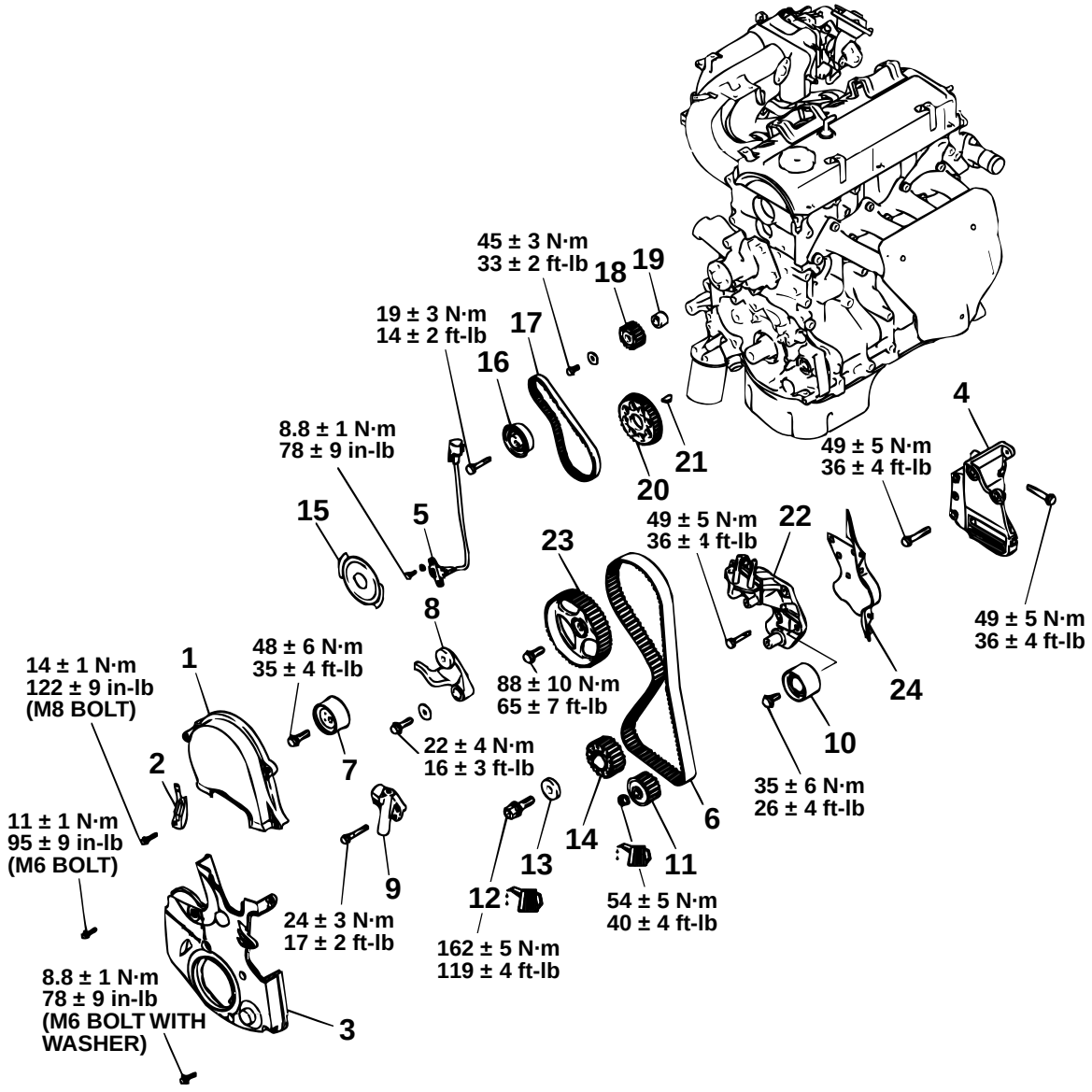
>>A<< CAMSHAFT POSITION SENSOR SUPPORT INSTALLATION

Apply a 3 mm (0.12 inch) bead of sealant (MITSUBISHI Genuine Part number MD970389) in the groove shown.

TIMING BELT

REMOVAL AND INSTALLATION

M1113001900243



AK101649AC

REMOVAL STEPS

1. TIMING BELT FRONT UPPER COVER
2. CONNECTOR BRACKET
3. TIMING BELT FRONT LOWER COVER
4. POWER STEERING PUMP BRACKET
5. CRANKSHAFT POSITION SENSOR

<<A>> >>J<< 6. TIMING BELT

7. TENSIONER PULLEY
8. TENSIONER ARM

>>I<< 9. AUTO-TENSIONER

10. IDLER PULLEY

<<B>> >>H<< 11. OIL PUMP SPROCKET

REMOVAL STEPS (Continued)

<<C>> >>G<< 12. CRANKSHAFT BOLT

>>G<< 13. CRANKSHAFT PULLEY WASHER

<<D>> >>G<< 14. CRANKSHAFT SPROCKET

>>G<< 15. CRANKSHAFT SENSING BLADE

16. TENSIONER "B"

<<E>> >>F<< 17. TIMING BELT "B"

<<F>> >>E<< 18. COUNTERBALANCE SHAFT SPROCKET

>>D<< 19. SPACER

<<G>> >>C<< 20. CRANKSHAFT SPROCKET "B"

21. KEY

>>B<< 22. ENGINE SUPPORT BRACKET

<<H>> >>A<< 23. CAMSHAFT SPROCKET

24. TIMING BELT REAR COVER

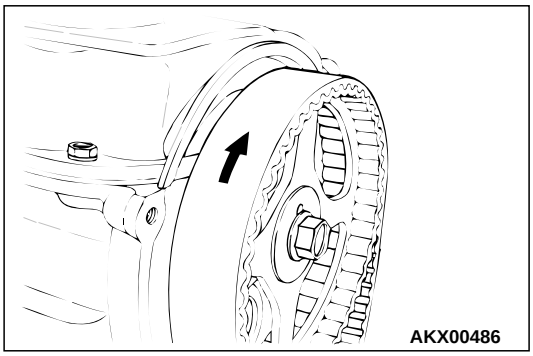
TSB Revision

Required Special Tools:

- MB990767: End Yoke Holder
- MD998719: Pins
- MD998767: Tensioner Pulley Wrench
- MD998778: Crankshaft Sprocket Puller
- MD998781: Flywheel Stopper
- MD998785: Sprocket Stopper

REMOVAL SERVICE POINTS

<<A>> TIMING BELT REMOVAL

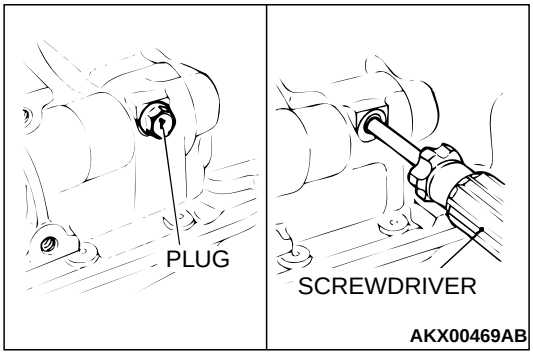

AKX00486

⚠ CAUTION

Water or oil on the belt shortens its life drastically, so the removed timing belt, sprocket, and tensioner must be washed or immersed in solvent. Replace parts if contaminated.If there is oil or water on any part, check the front case oil seals, camshaft oil seal, and water pump for leaks.

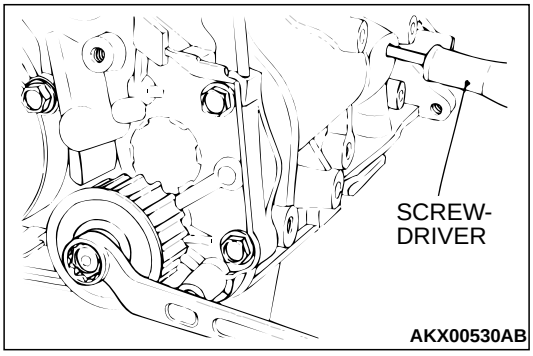
1. Mark the belt running direction for reinstallation.
2. Loosen the tensioner pulley bolt, and then remove the timing belt.

<<B>> OIL PUMP SPROCKET REMOVAL

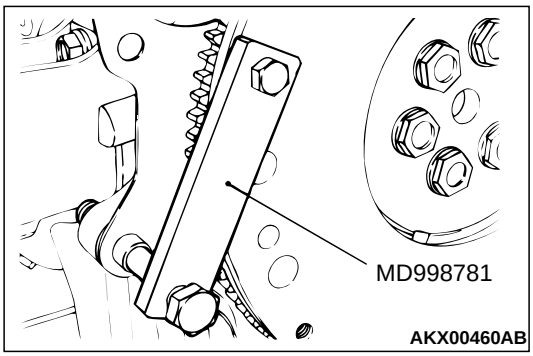


AKX00469AB

1. Remove the plug on the left side of the cylinder block.
2. Insert a Phillips screwdriver [shank diameter 8 mm (0.3 inch)] through the plug hole to block the left counterbalance shaft.
3. Loosen the nut, and then remove the oil pump sprocket.

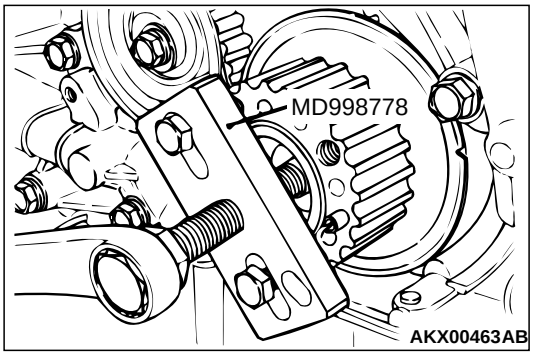


AKX00530AB



<<C>> CRANKSHAFT BOLT LOOSENING

1. Install special tool MD998781 to hold the flywheel or drive plate.
2. Loosen and remove the crankshaft bolt and washer.



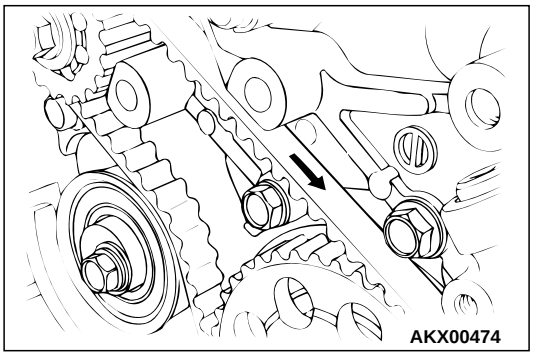
<<D>> CRANKSHAFT SPROCKET REMOVAL

1. Set special tool MD998778 as shown in the illustration.
2. Screw in the center bolt of the special tool to remove the crankshaft sprocket.

<<E>> TIMING BELT "B" REMOVAL

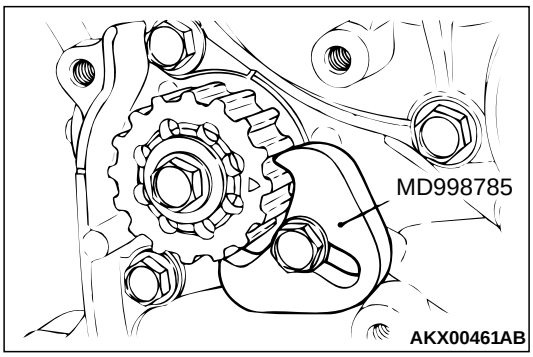
⚠ CAUTION

Water or oil on the belt shortens its life drastically, so the removed timing belt, sprocket, and tensioner must be free from oil and water. These parts should not be washed or immersed in solvent. Replace parts if contaminated.If there is oil or water on each part, check the front case oil seals, camshaft oil seal and water pump for leaks.

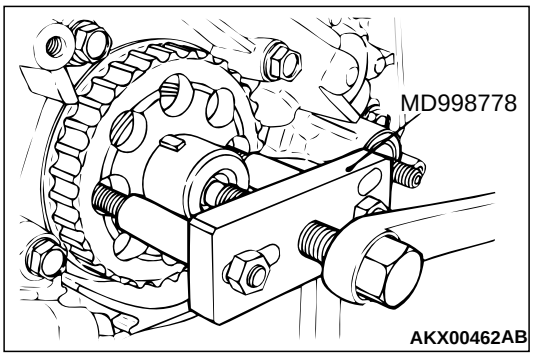


1. Mark the belt running direction for reinstallation.
2. Loosen the tensioner "B" bolt, and then remove the timing belt "B."

<<F>> COUNTERBALANCE SHAFT SPROCKET REMOVAL

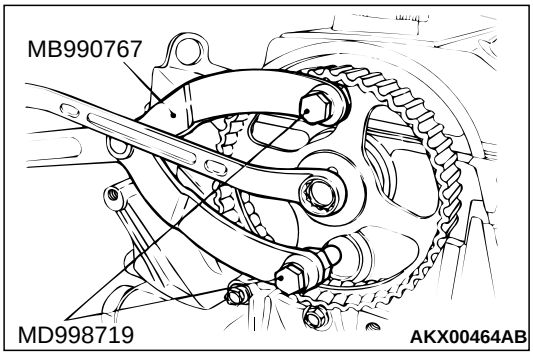


1. Set special tool MD998785 as shown to prevent the counterbalance shaft sprocket from turning together.
2. Loosen the bolt and remove the sprocket.



<<G>> CRANKSHAFT SPROCKET "B" REMOVAL

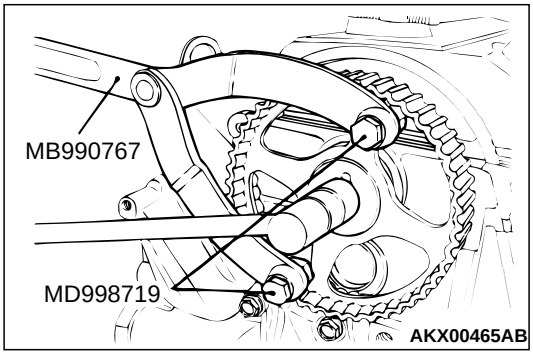
1. Set special tool MD998778 as shown in the illustration.
2. Screw in the center bolt of the special tool to remove crankshaft sprocket "B."



<<H>> CAMSHAFT SPROCKET REMOVAL

1. While holding the camshaft sprocket with special tools MB990767 and MD998719, loosen the camshaft sprocket bolt.
2. Remove the camshaft sprocket.

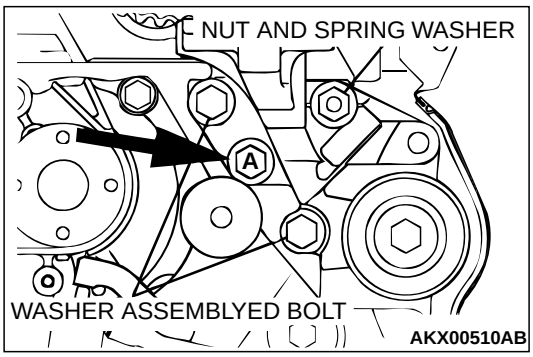
INSTALLATION SERVICE POINTS



>>A<< CAMSHAFT SPROCKET INSTALLATION

1. Fit the camshaft sprocket to the front of the camshaft.
2. While holding the camshaft sprocket with special tools MB990767 and MD998719, tighten the camshaft sprocket bolt.

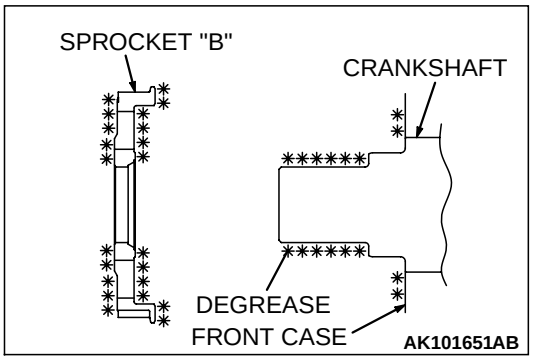
Tightening torque: 88 ± 10 N·m (65 ± 7 ft-lb)



>>B<< ENGINE SUPPORT BRACKET INSTALLATION

Coat the threads of the seal bolt A in the illustration with 3M™ AAD Part number 8672 or equivalent before tightening.

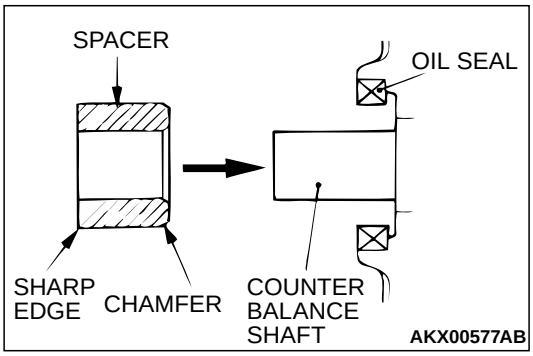
Tightening torque: 49 ± 5 N·m (36 ± 4 ft-lb)



>>C<< CRANKSHAFT SPROCKET "B" INSTALLATION

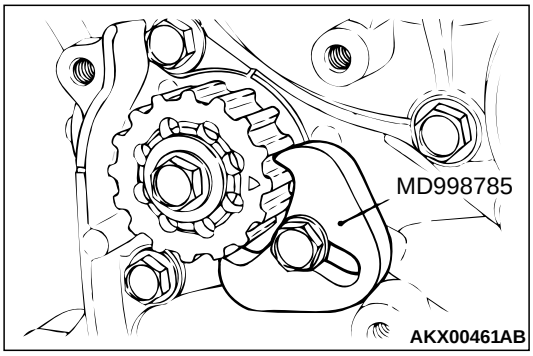
Clean and then degrease the front case of the front case, crankshaft sprocket "B" and crankshaft surface on which sprocket "B" is attached.

NOTE: Degreasing is necessary to prevent decrease in the friction between contacting surfaces.



>>D<< SPACER INSTALLATION

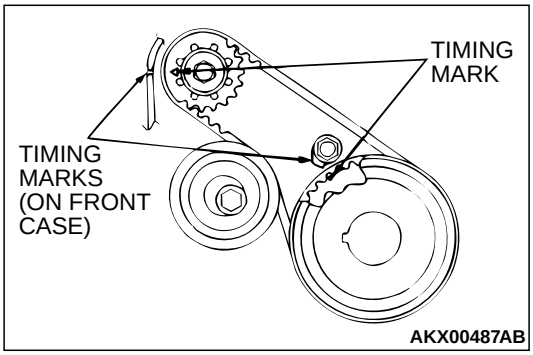
1. Apply a thin coat of clean engine oil to the lip area of the oil seal.
2. Install the spacer with the chamfered end facing toward the oil seal.



>>E<< COUNTERBALANCE SHAFT SPROCKET INSTALLATION

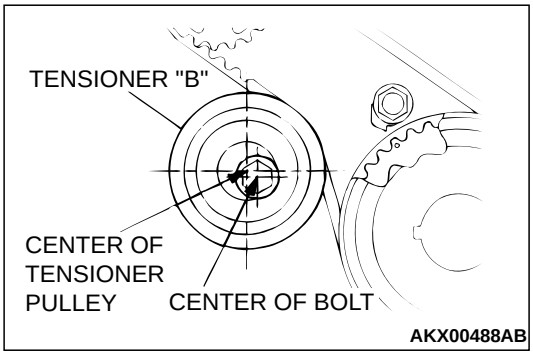
1. Install the counterbalance shaft sprocket and screw the bolt.
2. Install special tool MD998785 as shown in the illustration to lock the counterbalance shaft.
3. Tighten the bolt, and then remove the special tool.

Tightening torque: 45 ± 3 N·m (33 ± 2 ft-lb)

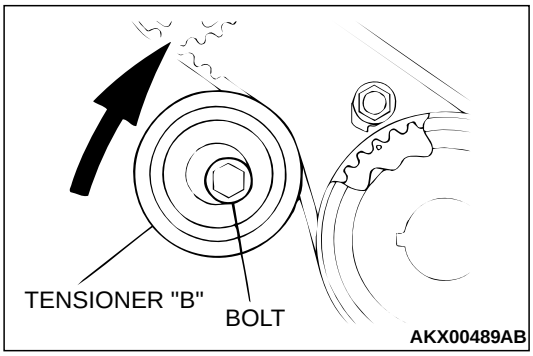


>>F<< TIMING BELT "B" INSTALLATION

1. Align timing marks on the crankshaft sprocket "B" and counterbalance shaft sprocket with the marks on the front case.
2. Install the timing belt "B" on the crankshaft sprocket "B" and counterbalance shaft sprocket. There should be no slack on the tension side.

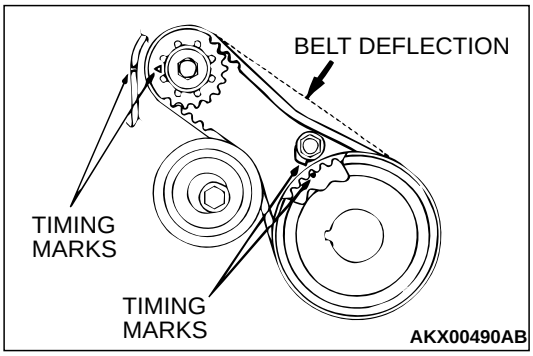


3. Make sure that the relationship between the tensioner pulley center and the bolt center is as shown in the illustration.



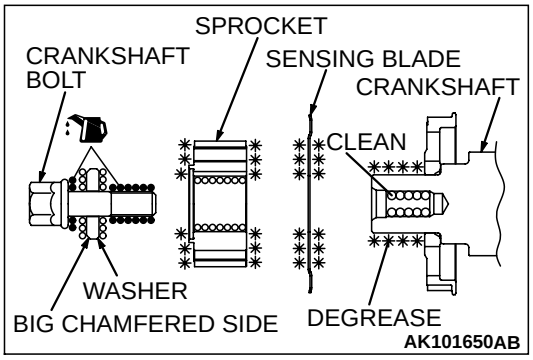
4. Move tensioner "B" in the direction of the arrow while lifting with your finger to give sufficient tension to the tension side of timing belt. In this condition, tighten the bolt to secure tensioner "B." When the bolt is tightened, use care to prevent the tensioner pulley shaft from turning with the bolt. If the shaft is turned with the bolt, the belt will be over tensioned.

   Tightening torque: 19 ± 3 N·m (14 ± 2 ft-lb)



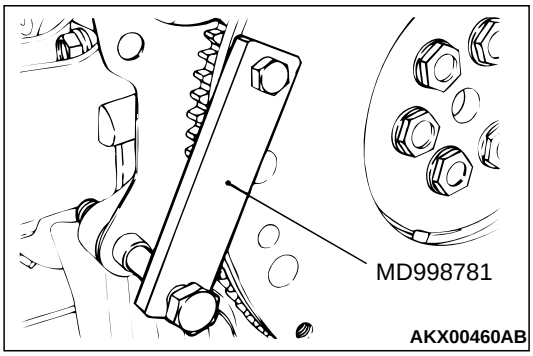
5. Check that timing marks on the sprockets are aligned with the timing marks on the front case.
6. With your index finger, press the midway of span on the tension side of timing belt "B." The bolt must deflect 5 to 7 mm (0.20 to 0.28 inch).

>>G<< CRANKSHAFT SENSING BLADE/CRANKSHAFT SPROCKET/CRANKSHAFT PULLEY WASHER/ CRANKSHAFT BOLT INSTLLATION

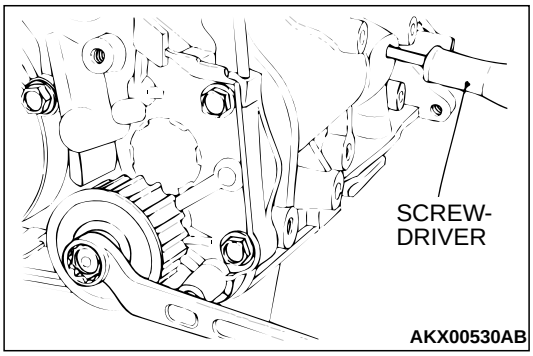


1. Clean and then degrease the contacting surfaces of the crankshaft sprocket, sensing blade and crankshaft.

   NOTE: Degreasing is necessary to prevent decrease in the friction between contacting surfaces.
2. Clean the bolt hole in the crankshaft, the crankshaft contacting surface of the crankshaft sprocket, and the washer.
3. Install the sensing blade and the crankshaft sprocket to the crankshaft.
4. Apply an appropriately small amount of oil to the threads and seating surface of the crankshaft bolt.
5. Install the washer to the crankshaft bolt with its largely chamfered side toward the bolt head.

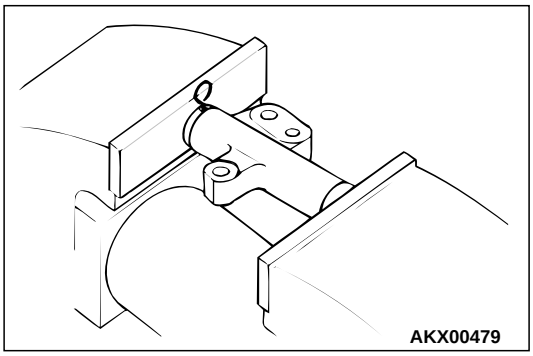


6. Lock the flywheel or drive plate using the special tool.
7. Tighten the crankshaft bolt to the specified torque.
   Tightening torque: 162 ± 5 N·m (119 ± 4 ft-lb)



>>H<< OIL PUMP SPROCKET INSTALLATION

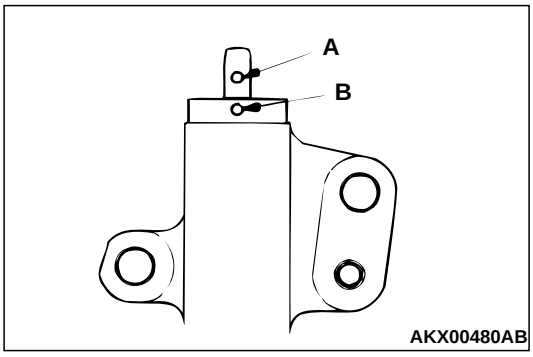
1. Insert a Phillips head screwdriver [shank diameter 8 mm (0.3 inch)] through the plug hole on the left side of the cylinder block to block the left counterbalance shaft.
2. Install the oil pump sprocket.
3. Apply a thin coat of engine oil to the seating surface of the nut.
4. Tighten the nut to the specified torque.
   Tightening torque: 54 ± 5 N·m (40 ± 4 ft-lb)



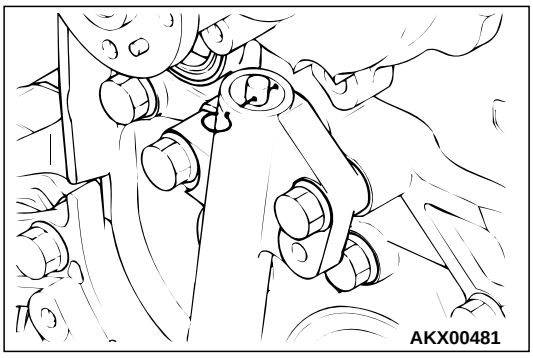
>>I<< AUTO-TENSIONER INSTALLATION

If the auto-tensioner rod is fully extended, reset it as follows:

1. Clamp the auto-tensioner in a vise with soft jaws.



2. Push in the rod little by little with the vise until the set hole A in the rod is aligned with the hole B in the cylinder.
3. Insert a wire [1.4 mm (0.055 inch) in diameter] into the set holes. This auto-tensioner setting wire will be used during timing belt alignment.
4. Unclamp the auto-tensioner from the vise.


AKX00481

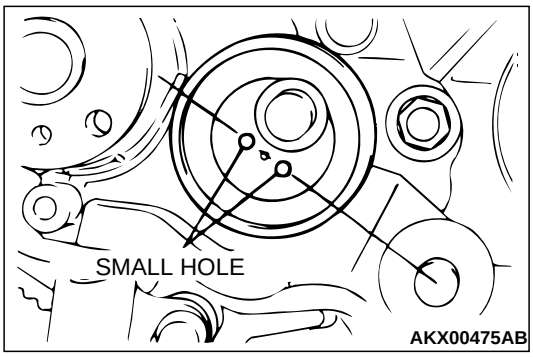
⚠ CAUTION

Leave the wire installed in the auto-tensioner.

5. Install the auto-tensioner onto the front case and tighten to the specified torque.

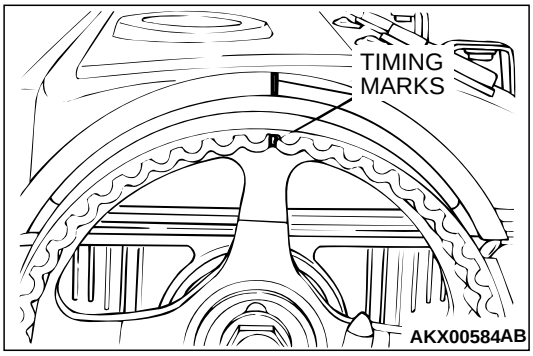
   Tightening torque: 24 ± 3 N·m (17 ± 2 ft-lb)

>>J<< TIMING BELT INSTALLATION



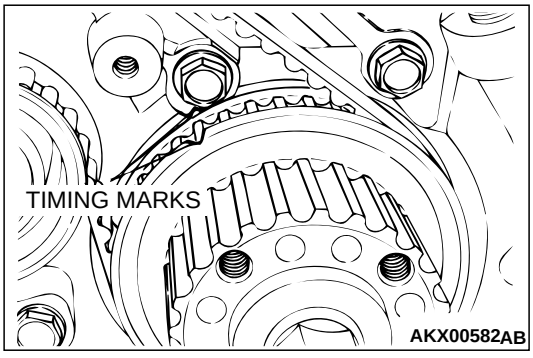
AKX00475AB

1. Set the tensioner pulley so that the holes for attaching a wrench may be positioned as shown in the illustration.



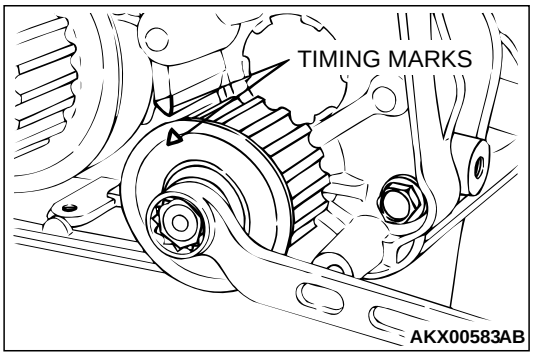
AKX00584AB

2. Align the timing mark on the camshaft sprocket with the timing mark on the rocker cover.

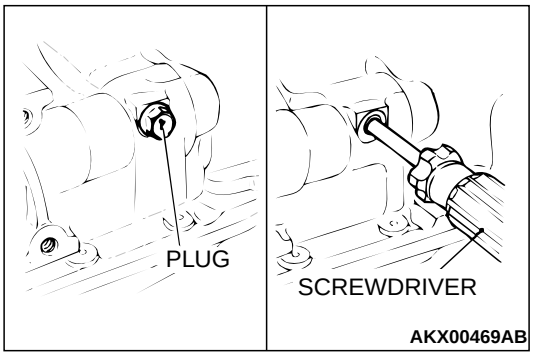


AKX00582AB

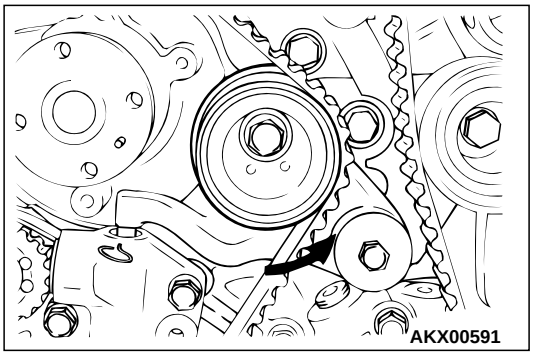
3. Align the timing mark on the crankshaft sprocket with the timing mark on the front case.



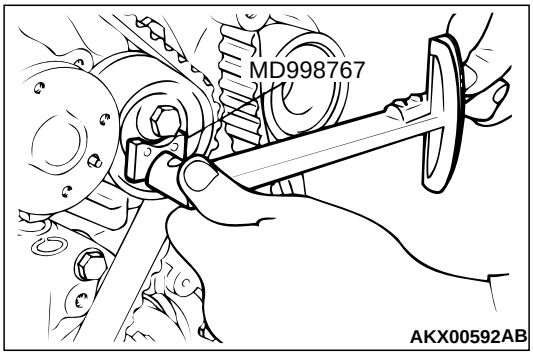
4. Align the timing mark on oil pump sprocket with its mating mark.



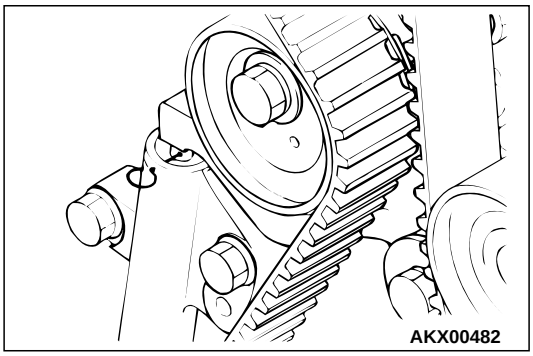
5. Remove the plug on the cylinder block and insert a Phillips head screwdriver [shank diameter 8 mm (0.3 inch)] through the hole.
   If it can be inserted as deep as 60 mm (2.4 inches) or more, the timing marks are correctly aligned.
   if the inserted depth is only 20 to 25 mm (0.8 to 0.9 inch), turn the oil pump sprocket one turn and realign the timing marks. then check to ensure that the screwdriver can be inserted 60 mm (2.4 inches) or more. keep the screwdriver inserted until the timing belt is completely installed.
6. Install the timing belt on the crankshaft sprocket, oil pump sprocket, idler pulley, camshaft sprocket, and tensioner pulley in that order.



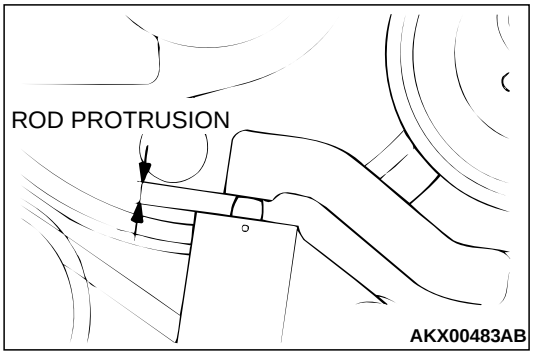
7. Lift up the tensioner pulley in the direction of arrow and tighten the center bolt.
8. Check that all timing marks are aligned.
9. Remove the screwdriver inserted in step 5 and install the plug.
10. Turn the crankshaft a quarter turn counterclockwise. Then, turn it clockwise until the timing marks are aligned again.



11. Install special tool, MD998767 Socket Wrench and Torque Wrench, onto the tensioner pulley, and loosen the tensioner pulley center bolt.
    NOTE: Use a torque wrench that can measure 0 to 5.0 N·m (0 – 50 in-lb).
12. Torque to 3.5 N·m (30 in-lb) with the torque wrench.
13. Holding the tensioner pulley with special tool MD998767 and torque wrench, tighten the center bolt to specification.
    Tightening torque: 48 ± 6 N·m (35 ± 4 ft-lb)


AKX00482

14. Give two clockwise turns to the crankshaft. Wait for 15 minutes, then proceed with the following inspection steps.
15. Check to see whether the metal wire inserted when the auto-tensioner was installed can be removed without any resistance.
    If the metal wire can be removed without any resistance, it means that the belt has a proper tension. Therefore, remove the metal wire. In this condition, check that the rod protrusion of the auto-tensioner is within the standard value.
    Standard value: 3.8 – 4.5 mm (0.15 – 0.17 inch)
16. If the metal wire offers resistance when removed, repeat the previous steps (10) through (15) until the standard value is obtained as measured by the rod projection of the auto-tensioner rod.



AKX00483AB

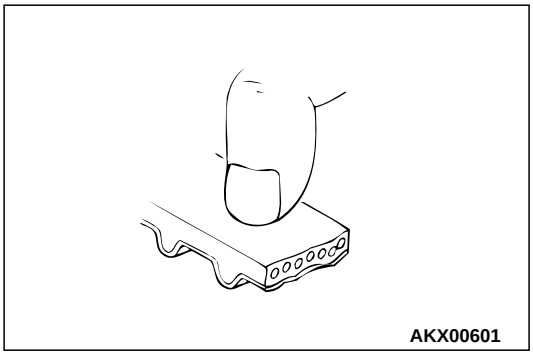
INSPECTION

M1113002000050

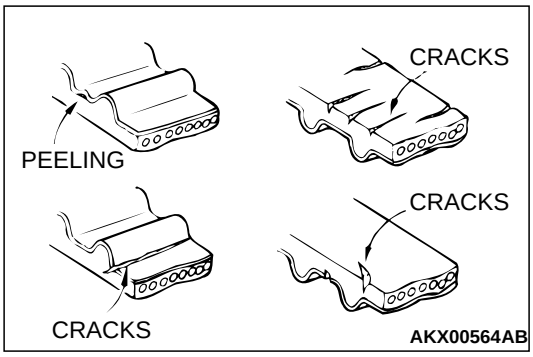
TIMING BELT

Replace the belt if any of the following conditions exist:

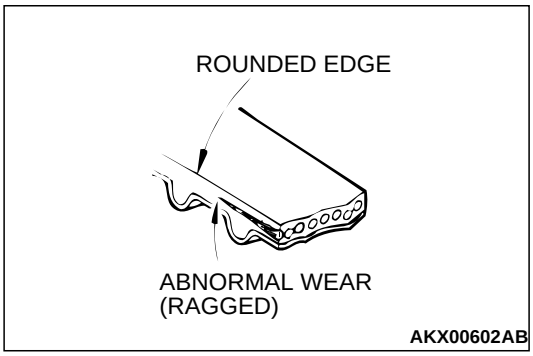
1. Hardening of rubber backing.
   Back side is glossy without resilience and leaves no indent when pressed with fingernail.


AKX00601

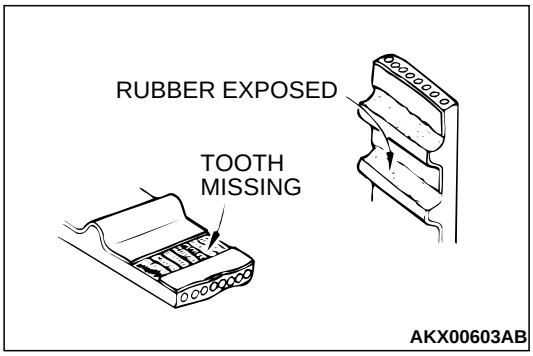
2. Cracks on rubber back.
3. Cracks or peeling of canvas.
4. Cracks on rib root.
5. Cracks on belt sides.



AKX00564AB

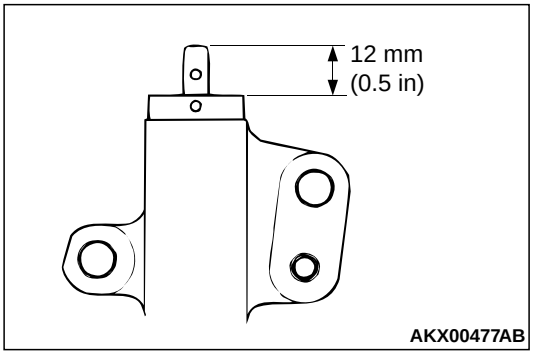


6. Abnormal wear of belt sides. Normal wear is indicated if the sides are sharp as if cut by a knife. Abnormal wear is indicated if the sides are ragged.



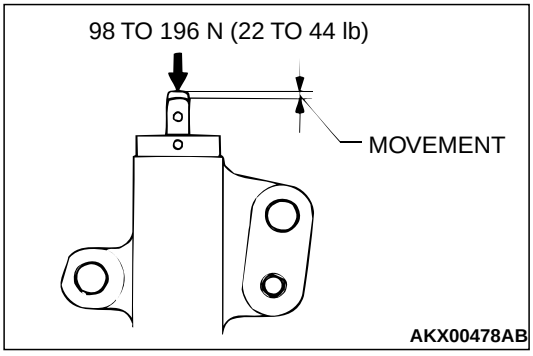
7. Abnormal wear on teeth.
8. Missing tooth.

AUTO-TENSIONER



1. Check for oil leaks. If oil leaks are evident, replace the auto-tensioner.
2. Check the rod end for wear or damage and replace the auto-tensioner if necessary.
3. Measure the rod protrusion. If it is out of specification, replace the auto tensioner.

   Standard value: 12 mm (0.5 inch)



4. Press the rod with a force of 98 to 196 N (22 to 44 pound) and measure the movement of the rod.

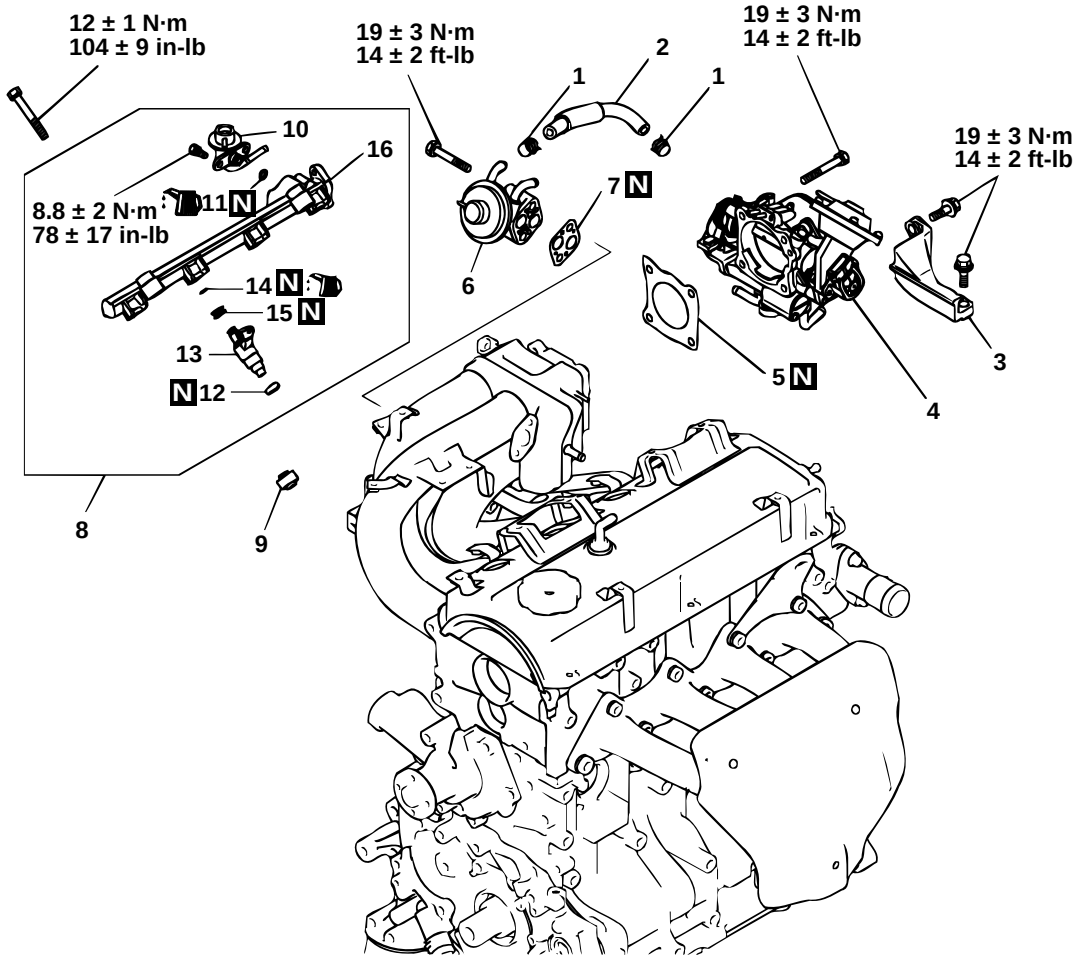
   If the measured value is out of the standard value, replace the auto-tensioner.

   Standard value: 1.0 mm (0.03 inch) or less

FUEL AND EMISSION PARTS

REMOVAL AND INSTALLATION

M1113002200032



AKX00513AB

REMOVAL STEPS

1. HOSE CLIP
2. WATER HOSE
3. THROTTLE BODY STAY
4. THROTTLE BODY

>>C<< 5. THROTTLE BODY GASKET

6. EGR VALVE
7. GASKET
8. INJECTOR AND FUEL RAIL

REMOVAL STEPS (Continued)

9. INSULATOR

>>B<< 10. FUEL PRESSURE REGULATOR

11. O-RING
12. INSULATOR

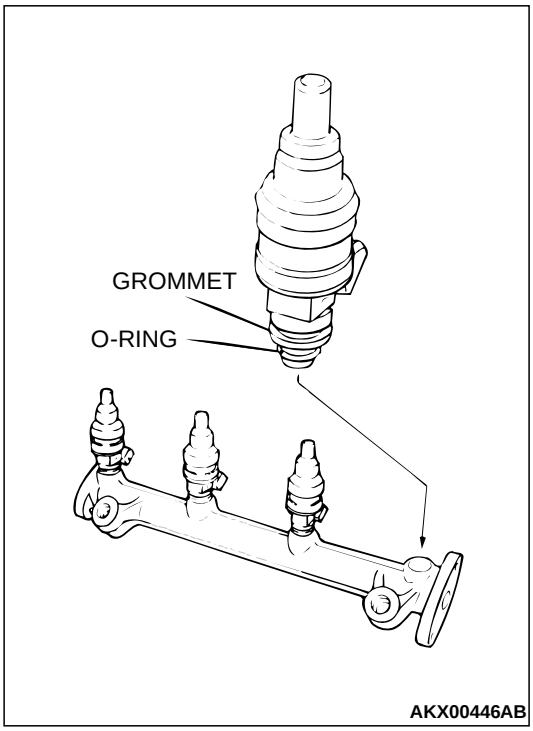
>>A<< 13. INJECTOR

14. O-RING
15. GROMMET
16. FUEL RAIL

TSB Revision

INSTALLATION SERVICE POINTS

>>A<< INJECTORS INSTALLATION



⚠ CAUTION

Use care not to let engine oil enter the fuel rail.

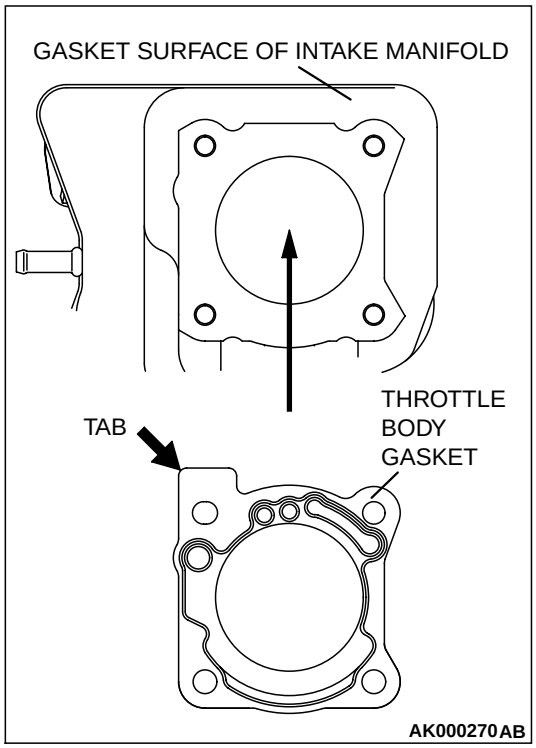
1. Apply clean engine oil to the O-ring.
2. Insert the injector into the fuel rail.
3. Make sure the injector rotates smoothly.
   If not, remove the injector to check the O-ring for damage, and replace the O-ring if necessary. Then, reinstall the injector and check that it rotates smoothly.

>>B<< FUEL PRESSURE REGULATOR INSTALLATION

⚠ CAUTION

Do not let engine oil enter the fuel rail.

1. Apply clean engine oil to the O-ring.
2. Insert the fuel pressure regulator into the fuel rail.
3. Make sure the pressure regulator rotates smoothly.
   If not, remove the fuel pressure regulator to check the O-ring for damage, and replace the O-ring if necessary. Then, reinstall the fuel pressure regulator and check that it rotates smoothly.
4. Tighten the two bolts to the specified torque.
   Tightening torque: 8.8 ± 2 N·m (78 ± 17 in-lb)



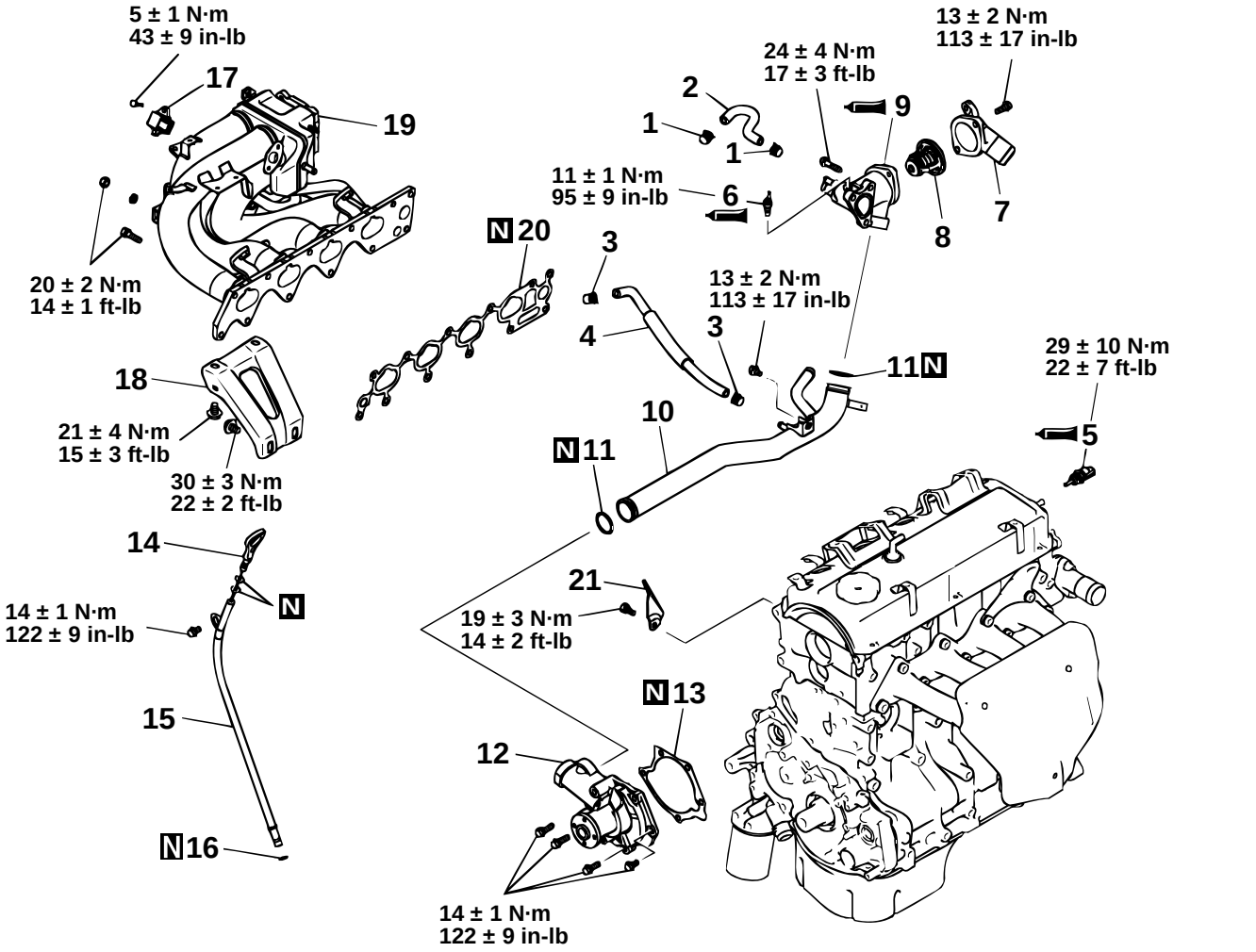
>>C<< THROTTLE BODY GASKET INSTALLATION

Install a new gasket so that the tab is positioned as shown in the illustration.

INTAKE MANIFOLD

REMOVAL AND INSTALLATION

M1113002700059



AKX00511AB

REMOVAL STEPS

1. HOSE CLIP
2. WATER HOSE
3. HOSE CLIP
4. WATER HOSE

>>F<< 5. ENGINE COOLANT TEMPERATURE SENSOR

>>E<< 6. ENGINE COOLAN TEMPERATURE GAUGE UNIT

7. WATER INLET FITTING

>>D<< 8. THERMOSTAT

>>C<< 9. THERMOSTAT HOUSING

>>B<< 10. WATER INLET PIPE

REMOVAL STEPS (Continued)

>>B<< 11. O-RING

12. WATER PUMP

13. WATER PUMP GASKET

14. OIL DIPSTICK

15. OIL DIPSTICK GUIDE

16. O-RING

17. MANIFOLD DIFFERENTIAL PRESSURE SENSOR

>>A<< 18. INTAKE MANIFOLD STAY

19. INTAKE MANIFOLD

20. INTAKE MANIFOLD GASKET

21. ENGINE HANGER

TSB Revision

INSTALLATION SERVICE POINTS

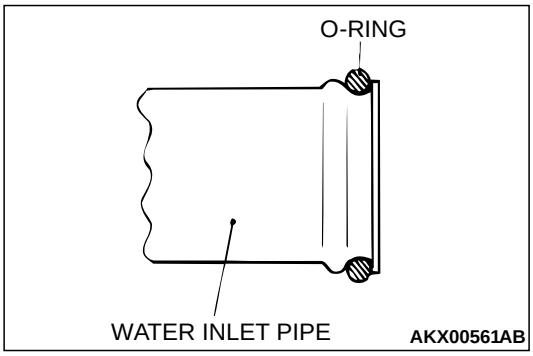
>>A<< INTAKE MANIFOLD STAY INSTALLATION

1. Install the intake manifold stay and tighten the bolts just finger tight.
2. Check to ensure that the stay is in close contact with the bosses of the intake manifold and cylinder block.
3. Tighten first the intake manifold side bolts to the specified torque, then the cylinder block side bolts to the specified torque.

Tightening torque:
21 ± 4 N·m (15 ± 3 ft-lb) for intake manifold side bolts
30 ± 3 N·m (22 ± 2 ft-lb) for cylinder block side bolts

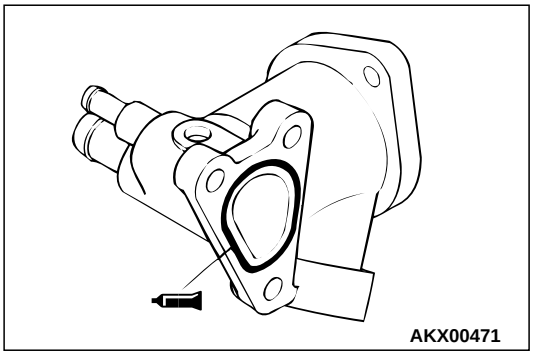
>>B<< WATER INLET PIPE/O-RING INSTALLATION

⚠ CAUTION
Keep the O-ring free of oil or grease.



1. Attach a new O-ring to each end of the water inlet pipe.
2. Wet the O-ring with water.
3. Insert the front end of the pipe into the water pump.

>>C<< THERMOSTAT HOUSING INSTALLATION

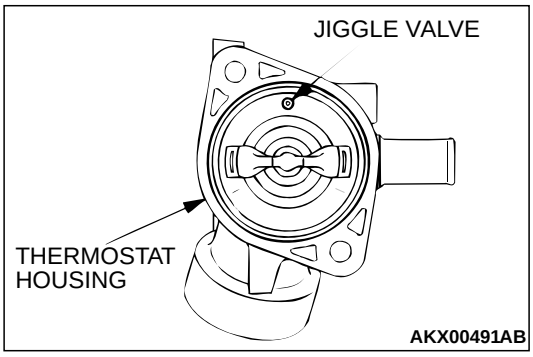


1. Apply a 3 mm (0.1 inch) diameter bead of sealant MITSUBISHI Genuine Part number MD970389 or equivalent to the groove as shown in the illustration.
2. Install the housing quickly (within 15 minutes) while the sealant is wet and tighten the bolts to the specified torque.

Tightening torque: 24 ± 4 N·m (17 ± 3 ft-lb)

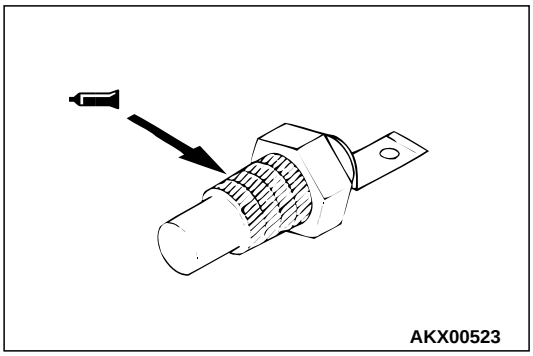
NOTE: After installation, keep the sealed area away from the coolant for approximately one hour.

>>D<< THERMOSTAT INSTALLATION



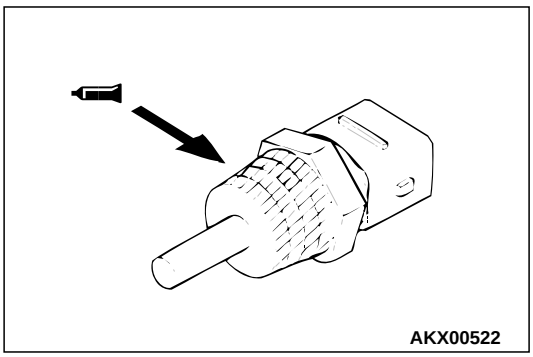
1. Check that the rubber ring is free from damage and seated correctly in the thermostat flange.
2. Install the thermostat as shown in the illustration. The jiggle valve must be at the uppermost position.

TSB Revision



>>E<< SEALANT APPLICATION TO ENGINE COOLANT TEMPERATURE GAUGE UNIT

Apply 3M™ AAD Part number 8672 or equivalent to the engine coolant temperature gauge unit.



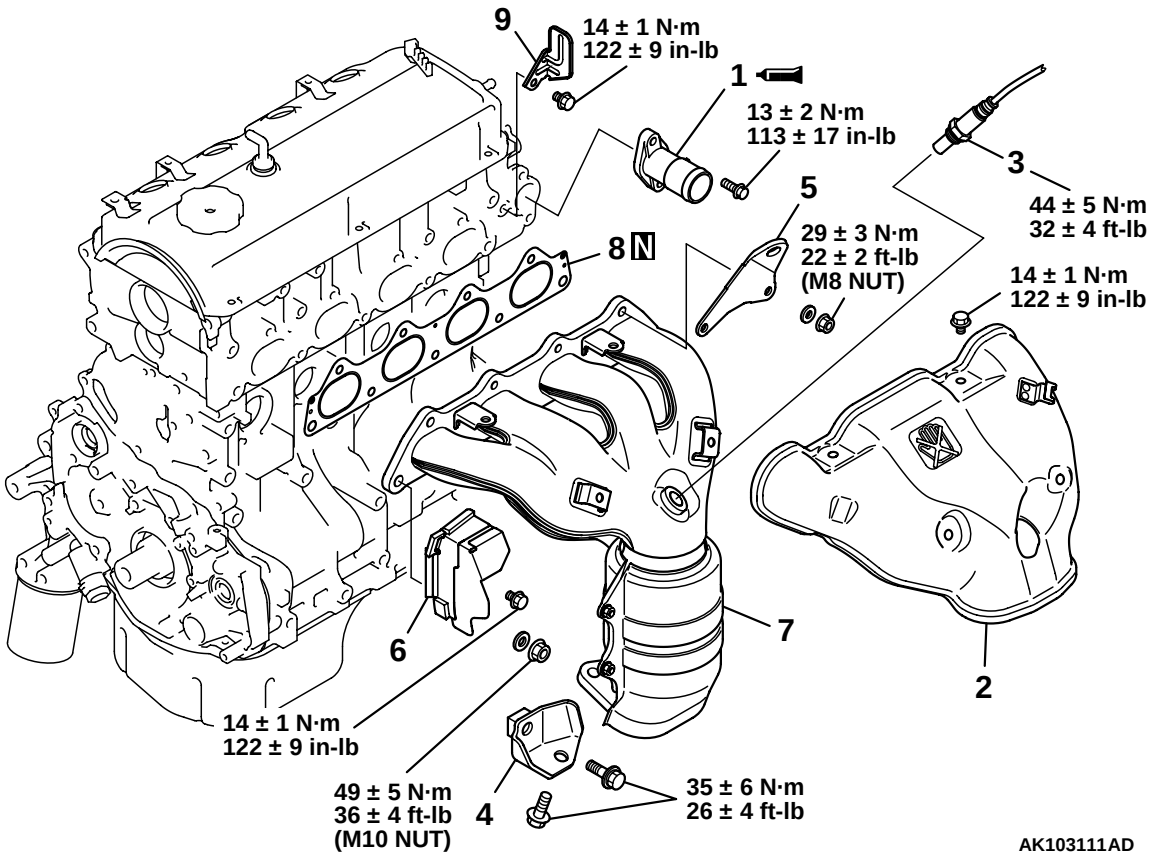
>>F<< SEALANT APPLICATION TO ENGINE COOLANT TEMPERATURE SENSOR

Apply 3M™ AAD Part number 8731 or equivalent to the engine coolant temperature sensor.

EXHAUST MANIFOLD

REMOVAL AND INSTALLATION

M1113004900208

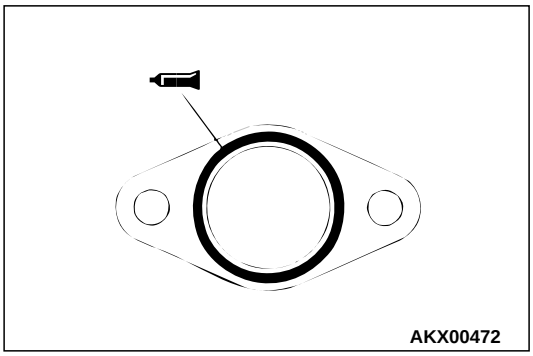


REMOVAL STEPS

>>A<< 1. WATER OUTLET FITTING
2. EXHAUST MANIFOLD COVER
3. OXYGEN SENSOR
4. EXHAUST MANIFOLD BRACKET
5. ENGINE HANGER

REMOVAL STEPS (Continued)

6. HEAT PROTECTOR
7. EXHAUST MANIFOLD
8. EXHAUST MANIFOLD GASKET
9. HEAT PROTECTOR



INSTALLATION SERVICE POINT

>>A<< WATER OUTLET FITTING INSTALLATION

1. Apply a 3 mm (0.1 inch) diameter bead of sealant. (MITSUBISHI Genuine Part number MD970389) to the groove as shown in the illustration.
2. Install the housing quickly (within 15 minutes) while the sealant is wet and tighten the bolts to the specified torque.

Tightening torque: 13 ± 2 N·m (113 ± 17 in-lb)

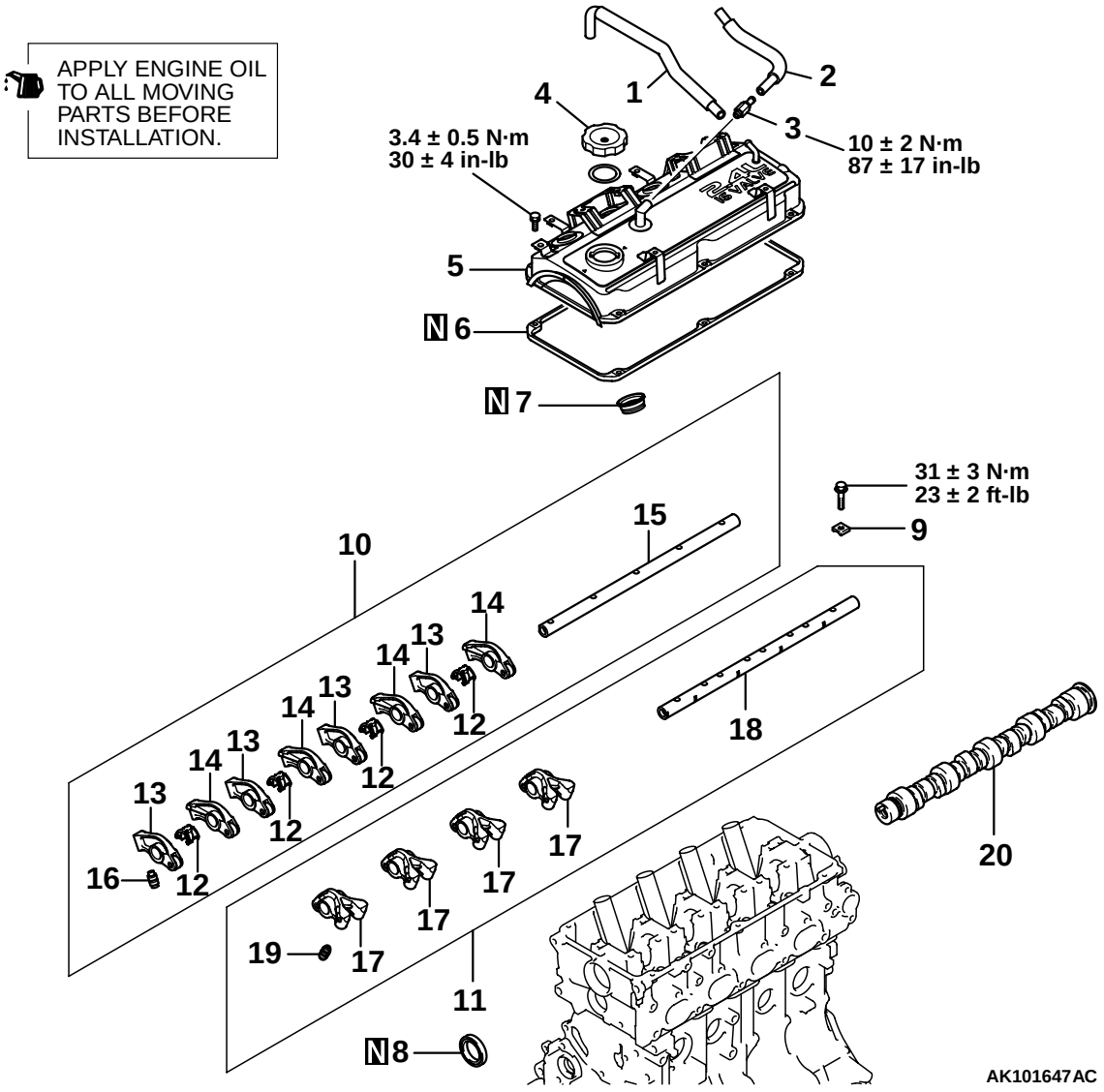
NOTE: After installation, keep the sealed area away from the coolant for approximately one hour.

TSB Revision

ROCKER ARMS AND CAMSHAFT

REMOVAL AND INSTALLATION

M1113005400198



REMOVAL STEPS

1. BREATHER HOSE
2. PCV HOSE
3. PCV VALVE
4. OIL FILLER CAP
5. ROCKER COVER
6. ROCKER COVER GASKET
7. OIL SEAL

>>C<< 8. OIL SEAL

9. ROCKER SHAFT CAP

<<A>> >>B<< 10. ROCKER ARMS AND ROCKER ARM SHAFT

<<A>> >>B<< 11. ROCKER ARMS AND ROCKER ARM SHAFT

REMOVAL STEPS (Continued)

>>B<< 12. ROCKER SHAFT SPRING

13. ROCKER ARM "B"
14. ROCKER ARM "A"
15. ROCKER ARM SHAFT (INTAKE SIDE)

>>A<< 16. LASH ADJUSTER

17. ROCKER ARM "C"
18. ROCKER ARM SHAFT (EXHAUST SIDE)

>>A<< 19. LASH ADJUSTER

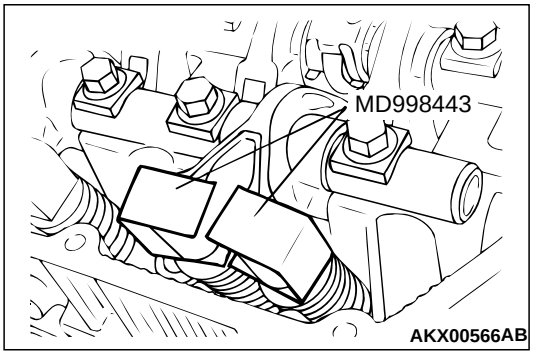
20. CAMSHAFT

TSB Revision

Required Special Tools:

- MD998442: Air Bleed Wire
- MD998443: Lash Adjuster Holder (8)
- MD998713: Camshaft Oil Seal Installer

REMOVAL SERVICE POINT



<<A>> ROCKER ARMS AND ROCKER ARM SHAFT REMOVAL

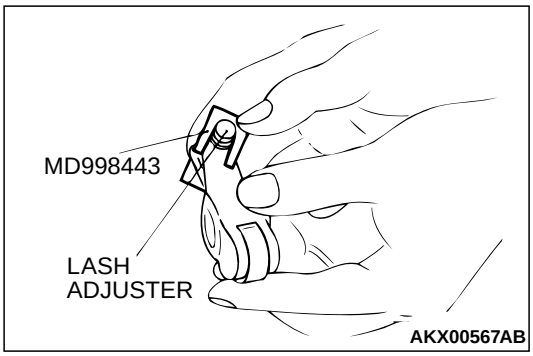
⚠ CAUTION

If the lash adjuster is re-used, clean the lash adjuster. (Refer to P.11B-27)

Set special tool MD998443 to prevent the lash adjuster coming free and falling to the floor.

INSTALLATION SERVICE POINTS

>>A<< LASH ADJUSTER INSTALLATION

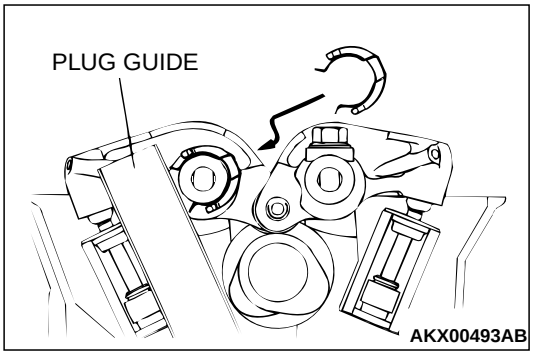


⚠ CAUTION

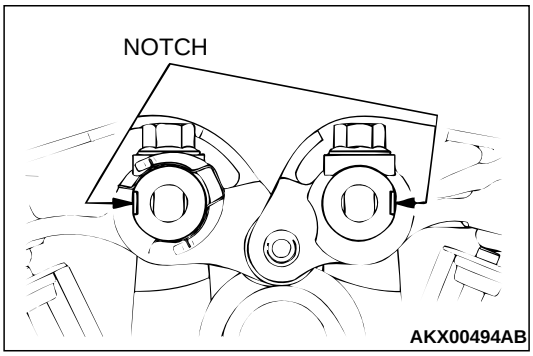
If the lash adjuster is re-used, clean the lash adjuster. (Refer to P.11B-27)

Fit the lash adjuster onto the rocker arm without allowing diesel fuel to spill out. Fit special tool MD998443 to prevent the lash adjuster coming free and falling to the floor.

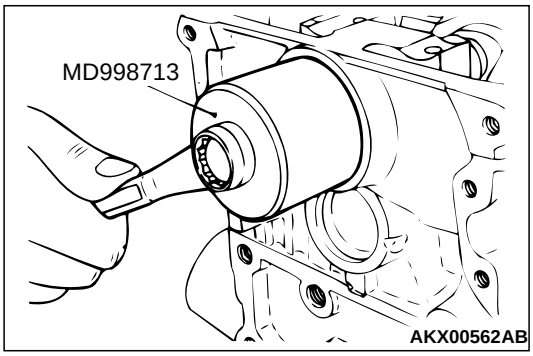
>>B<< ROCKER SHAFT SPRING/ROCKER ARMS AND ROCKER ARM SHAFT INSTALLATION



1. Install the exhaust side rocker arm "C"/shaft assembly to the cylinder head.
2. Install the inlet side rocker arm "A" and "B"/shaft assembly to the cylinder head.
3. Install the rocker shaft spring to the intake side rocker arm shaft as illustrated.



4. Make sure that the notch in the end of the rocker arm shaft is facing the direction as shown.



>>C<< CAMSHAFT OIL SEAL INSTALLATION

1. Apply engine oil to the lip area of the oil seal and the front end outside diameter of camshaft.
2. Using special tool MD998713, install the camshaft oil seal.

INSPECTION

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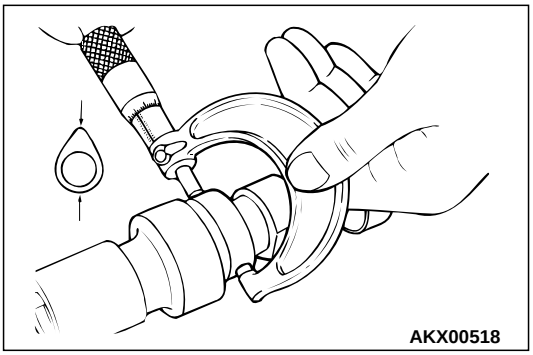
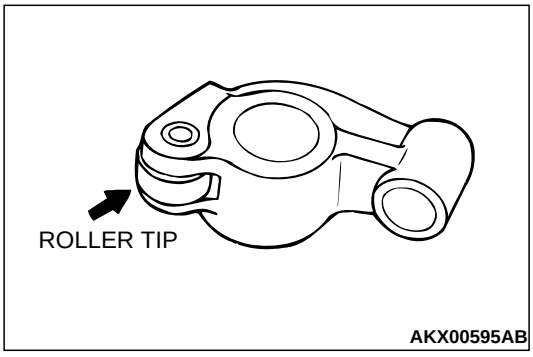


CAMSHAFT

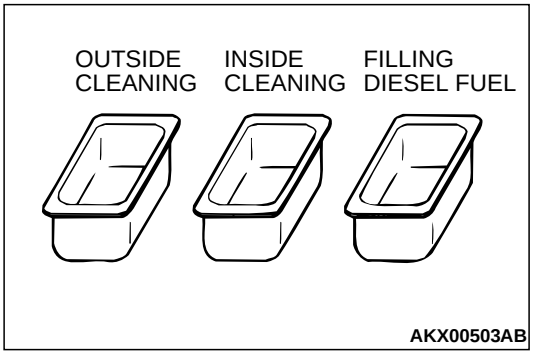
Measure the cam height. If it is below the limit, replace the camshaft.

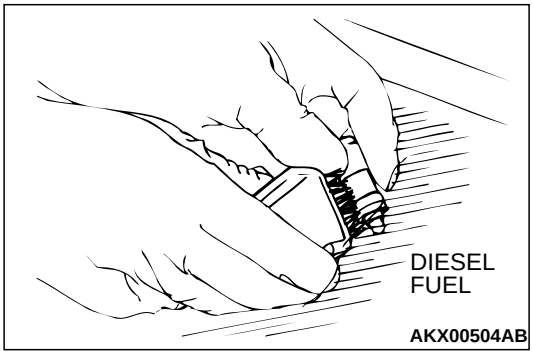
		STANDARD VALUE	MINIMUM LIMIT
Intake		37.39 mm (1.472 in)	36.89 mm (1.452 in)
Exhaust	M/T	37.14 mm (1.462 in)	36.64 mm (1.443 in)
	A/T	36.83 mm (1.450 in)	36.33 mm (1.430 in)

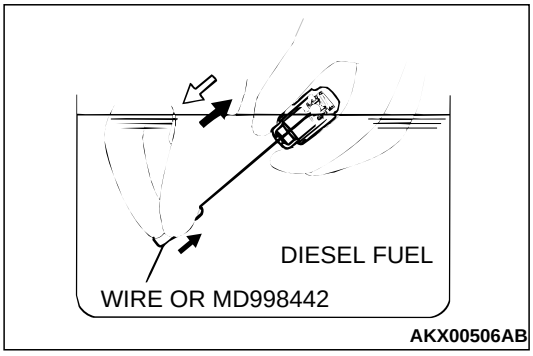


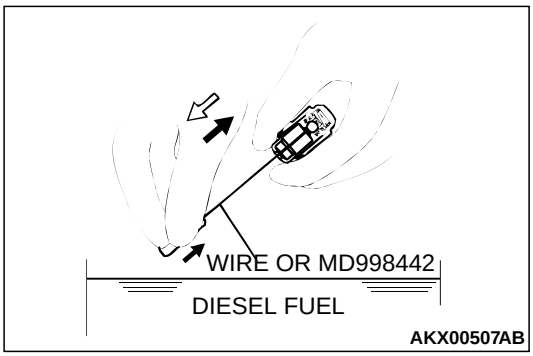
ROCKER ARM

1. Check the roller surface. If any dents, damage or seizure are evident, replace the rocker arm.
2. Check rotation of the roller. If it does not rotate smoothly or if looseness is evident, replace the rocker arm.
3. Check the inside diameter. If damage or seizure is evident, replace the rocker arm.









LASH ADJUSTERS

⚠ CAUTION

- **The lash adjusters are precision-engineered mechanisms. Do not allow them to become contaminated by dirt or other foreign substances.**
- **Do not attempt to disassemble the lash adjusters.**
- **Use only fresh diesel fuel to clean the lash adjusters.**

1. Prepare three containers and approximately 5 dm^3 (30.5 quart) of diesel fuel. Into each container, pour enough diesel fuel to completely cover a lash adjuster when it is standing upright. Then, perform the following steps with each lash adjuster.
2. Place the lash adjuster in container A and clean its outside surface.

   NOTE: Use a nylon brush if deposits are hard to remove.

⚠ CAUTION

The steel ball spring is extremely weak, so the lash adjuster's functionality may be lost if the air bleed wire is pushed in hard.sT

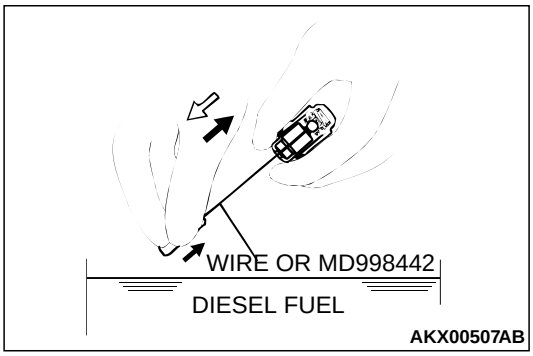
3. While gently pushing down the internal steel ball using wire [0.5 mm (0.020 inch) in diameter] or special tool MD998442, move the plunger through five to ten strokes until it slides smoothly. In addition to eliminating stiffness in the plunger, this operation will remove dirty oil.

   NOTE: If the plunger remains stiff or the mechanism appears otherwise abnormal, replace the lash adjuster.
4. Remove the lash adjuster from the container. Then, push down the steel ball gently and push the plunger to eliminate

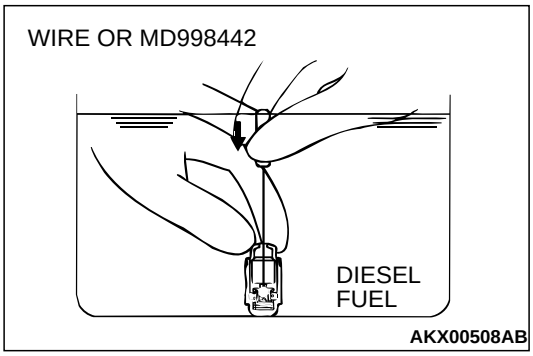
⚠ CAUTION

The steel ball spring is extremely weak, so the lash adjuster's functionality may be lost if the air bleed wire is pushed in hard.

5. Place the lash adjuster in container B. Then, gently push down the internal steel ball using wire [0.5 mm (0.020 inch) in diameter] or special tool MD998442 and move the plunger through five to ten strokes until it slides smoothly. This operation will clean the lash adjuster's pressure chamber.



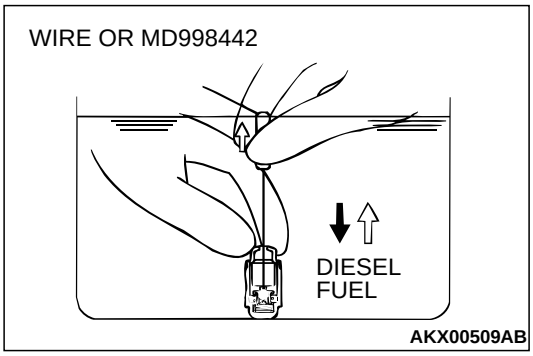
6. Remove the lash adjuster from the container. Then, push down the steel ball gently and push the plunger to eliminate diesel fuel from the pressure chamber.



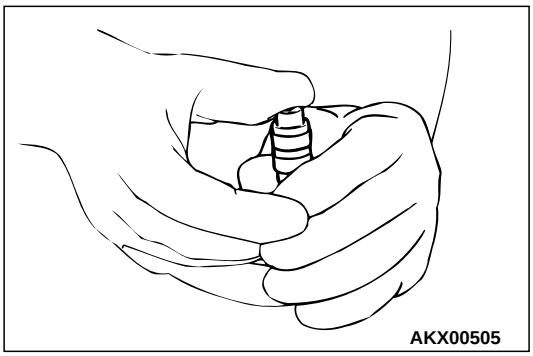
⚠ CAUTION

Do not use container C for cleaning. If cleaning is performed in container C, foreign matter could enter the pressure chamber when the chamber is filled with diesel fuel.

7. Place the lash adjuster in container C. Then, gently push down the internal steel ball using wire [0.5 mm (0.020 inch) in diameter] or special tool MD998442.



8. Stand the lash adjuster with its plunger at the top, then push the plunger downward firmly until it moves through its greatest possible stroke. Return the plunger slowly, then release the steel ball and allow the pressure chamber to fill with diesel fuel.



9. Remove the lash adjuster from the container, then stand the lash adjuster with its plunger at the top. Push the plunger firmly and check that it does not move. Also, check that the lash adjuster's height matches that of a new lash adjuster.

   NOTE: If the lash adjuster contracts or moves, perform the operations (7) through (9) again to fill it with diesel fuel completely. Replace the lash adjuster if it still contracts or moves after performing these steps.

10. Stand the lash adjuster upright to prevent diesel fuel from spilling out. Do not allow the lash adjuster to become contaminated by dirt or other foreign matter. Fit the lash adjuster onto the engine as soon as possible.

CYLINDER HEAD AND VALVES

REMOVAL AND INSTALLATION

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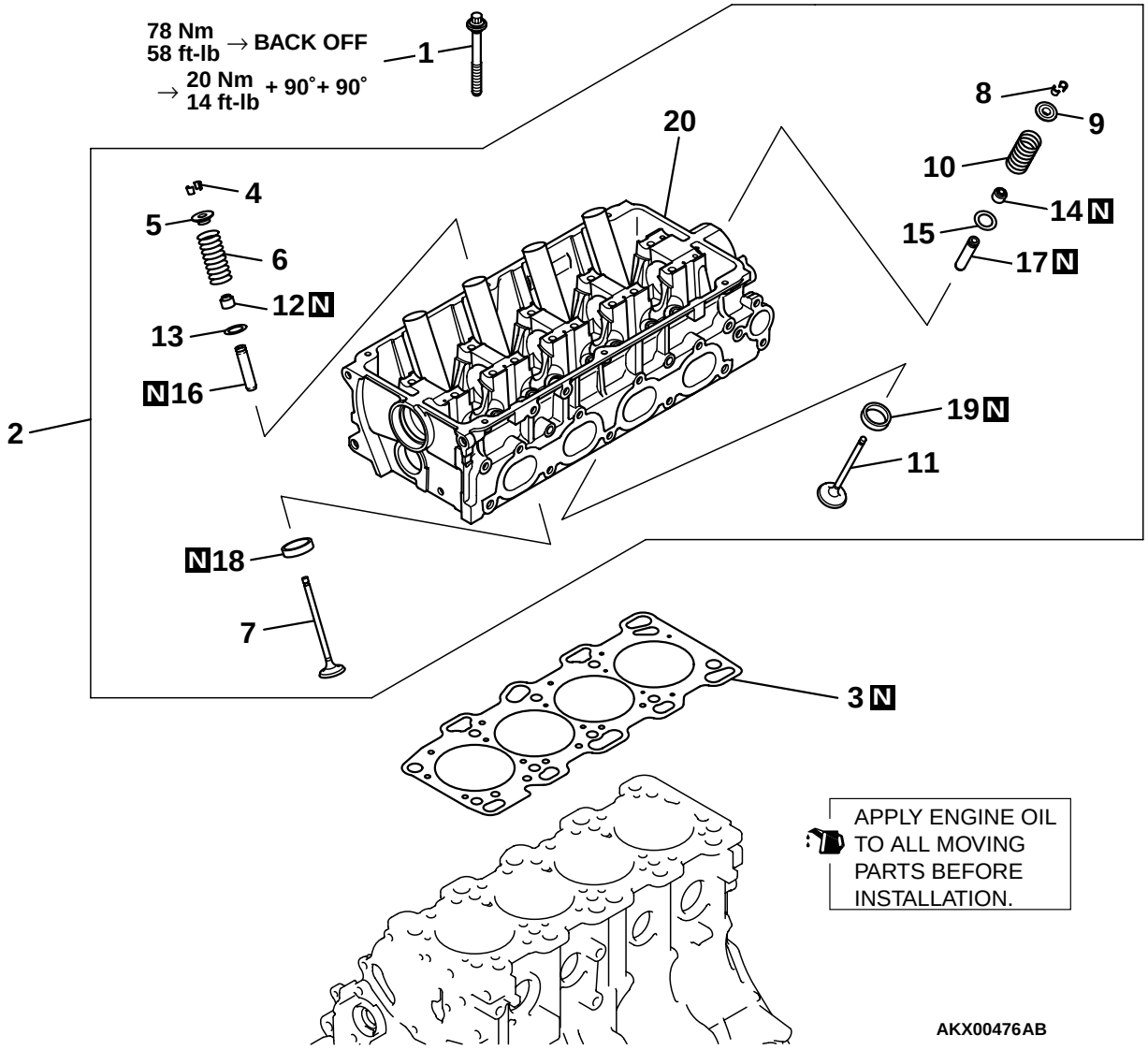

REMOVAL STEPS

<<A>> >>D<< 1. CYLINDER HEAD BOLT
2. CYLINDER HEAD ASSEMBLY
>>D<< 3. CYLINDER HEAD GASKET
<<B>> >>C<< 4. RETAINER LOCK
5. VALVE SPRING RETAINER
>>B<< 6. VALVE SPRING
7. INTAKE VALVE
<<B>> >>C<< 8. RETAINER LOCK
9. VALVE SPRING RETAINER
>>B<< 10. VALVE SPRING

REMOVAL STEPS (Continued)

11. EXHAUST VALVE
>>A<< 12. VALVE STEM SEAL
13. VALVE SPRING SEAT
>>A<< 14. VALVE STEM SEAL
15. VALVE SPRING SEAT
16. INTAKE VALVE GUIDE
17. EXHAUST VALVE GUIDE
18. INTAKE VALVE SEAT
19. EXHAUST VALVE SEAT
20. CYLINDER HEAD

Required Special Tools:

- MB991654: Cylinder Head Bolt Wrench (12)
- MD998772: Valve Spring Compressor
- MD998774: Valve Stem Seal Installer

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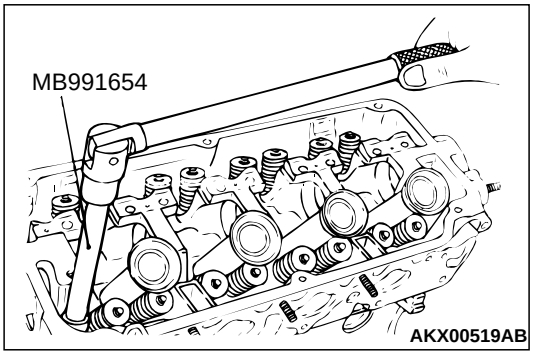
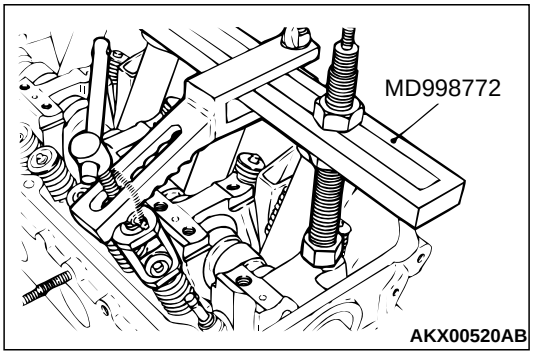
REMOVAL SERVICE POINTS



<<A>> CYLINDER HEAD BOLTS REMOVAL

Using special tool MB991654, loosen the cylinder head bolts. Loosen each bolt evenly, little by little, by two or three steps.

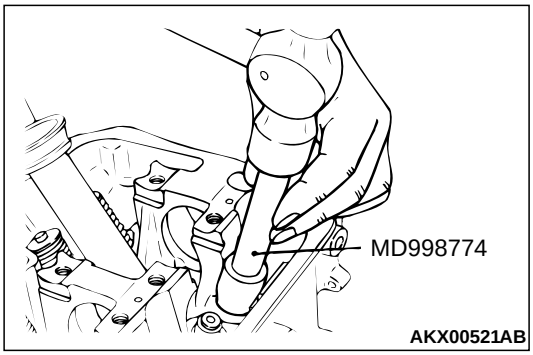


<<B>> RETAINER LOCK REMOVAL

1. Set special tool MD998772 as illustrated to compress the valve spring. Remove the retainer lock.
2. Relieve the spring tension and remove the valve, retainer, spring, etc. Store removed valves, springs, and other parts, tagged to indicated their cylinder number and location for assembly.

INSTALLATION SERVICE POINTS

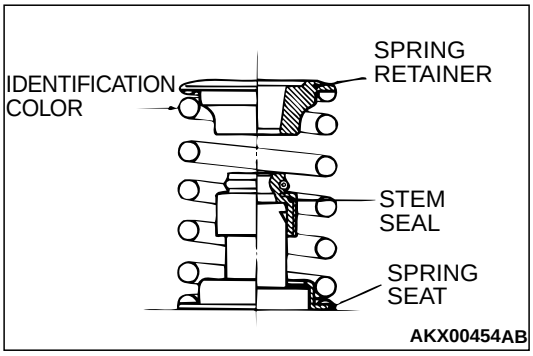
>>A<< VALVE STEM SEAL INSTALLATION



⚠ CAUTION

The special tool must be used to install the valve stem seal. Improper installation could result in oil leaking past the valve guide.

1. Install the valve spring seat.
2. Using special tool MD998774, install a new valve stem seal.



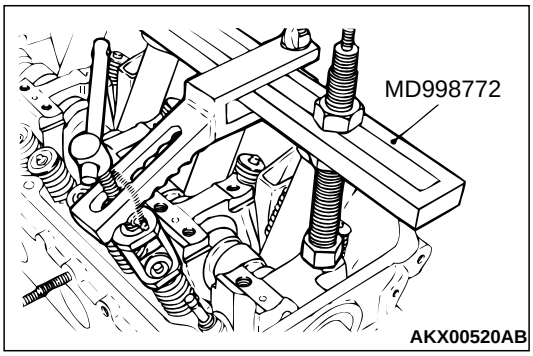
>>B<< VALVE SPRING INSTALLATION

Install the valve spring with its identification color painted end (larger pitch side) upward (toward the valve spring retainer).

>>C<< RETAINER LOCK INSTALLATION

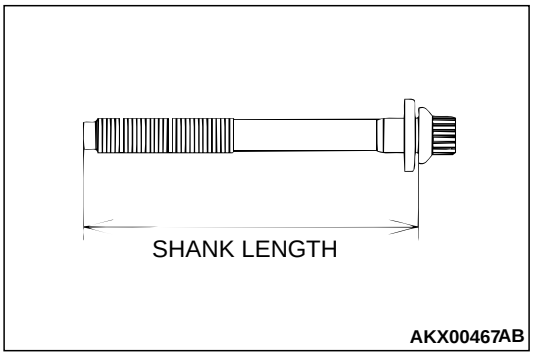
⚠ CAUTION

Do not compress the valve spring excessively. It can damage the stem seal.



1. Set special tool MD998772 as illustrated to compress the valve spring. Install the retainer locks.
2. Relieve the spring tension. Check that the retainer locks are seated correctly.

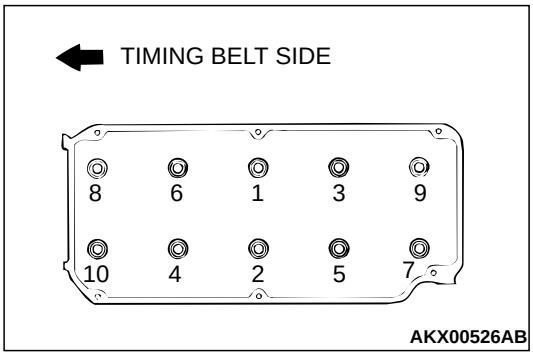
>>D<< CYLINDER HEAD BOLT INSTALLATION



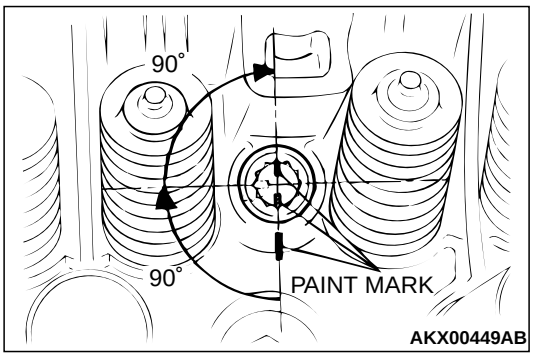
1. When the removed cylinder head bolts are to be reused, check that the shank length of each bolt meets the limit. If it exceeds the limit, replace the bolts.

   Limit: 99.4 mm (3.91 inches)

2. Apply engine oil to the thread of the bolts and to the washers.



3. Using special tool MB991654 tighten the bolts to the specified torque 78 N·m (58 ft-lb), using the tightening sequence shown.
4. Loosen all bolts fully in the reverse order of tightening.
5. Retighten the loosened bolts to 20 N·m (14 ft-lb) in the tightening sequence shown.



6. Make a paint mark across each bolt head and cylinder head.
7. Tighten the cylinder head bolts 90 degree angle in the specified order.

⚠ CAUTION

- **If the bolt is turned less than 90 degree angle, proper fastening performance may not be achieved. Be careful to turn each bolt exactly 90 degree angle.**
- **If the bolt is overtightened, loosen the bolt completely and then retighten it by repeating the tightening procedure from step 1.**

8. Tighten the bolts another 90 degree angle in the same order as in step 7, and check that the paint marks on the cylinder head bolt are aligned with the paint marks on the cylinder head.

INSPECTION

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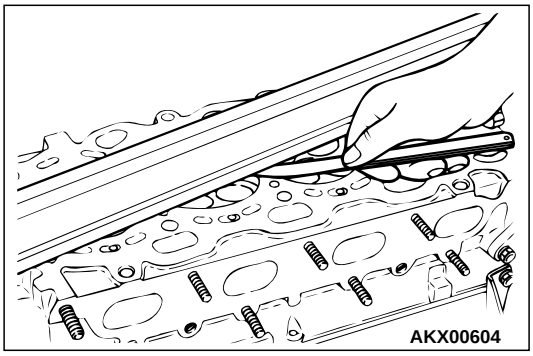
CYLINDER HEAD



1. Check the cylinder head gasket surface for flatness by using a straight edge and feeler gauge.

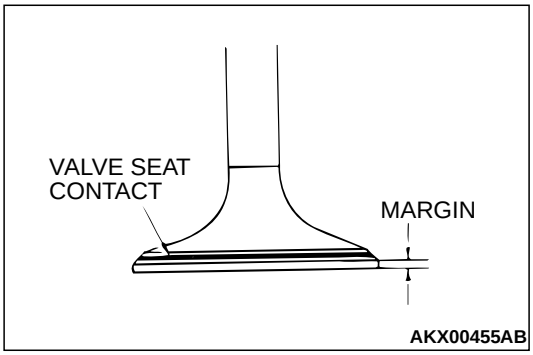
   Standard value: 0.05 mm (0.002 inch)

   Limit: 0.2 mm (0.007 inch)

2. If it exceeds the limit, correct to meet specification.

   Grinding limit: *0.2 mm (0.007 inch)
   *** Includes combined with cylinder block grinding.**
   Cylinder head height (Specification when new):
   120 mm (4.7 inches)

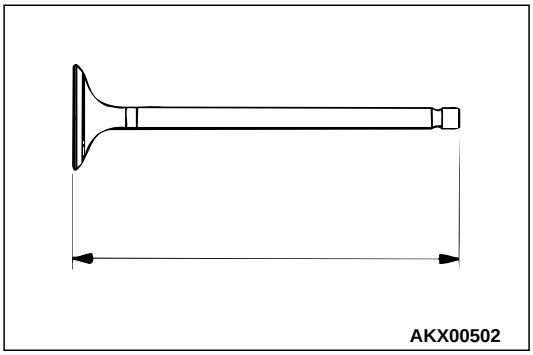
VALVE



1. Check the valve seat contact. Valve seat contact should be uniform at the center of the valve face. If incorrect, reface using a valve refacer.
2. If the margin is below the limit, replace the valve.

   Standard value:
   <Intake> 1.0 mm (0.03 inch)
   <Exhaust> 1.2 mm (0.04 inch)

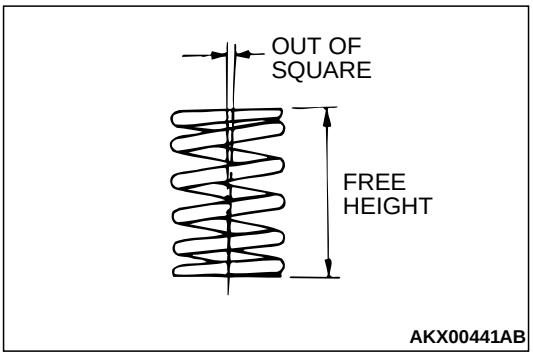
   Minimum limit:
   <Intake> 0.5 mm (0.02 inch)
   <Exhaust> 0.7 mm (0.03 inch)



3. Measure the valve's total length. If the measurement is less than the limit, replace the valve.

   Standard value:
   <Intake> 112.30 mm (4.421 inches)
   <Exhaust> 114.11 mm (4.493 inches)

   Minimum limit:
   <Intake> 111.80 mm (4.402 inches)
   <Exhaust> 113.61 mm (4.473 inches)



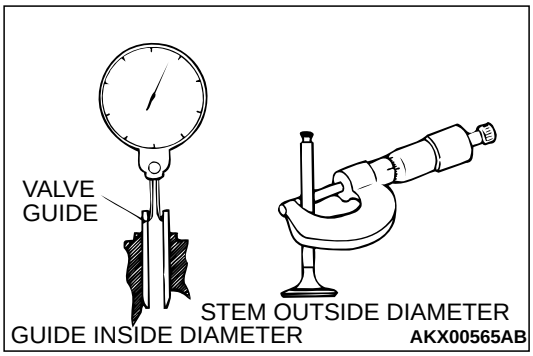
VALVE SPRING

1. Measure the free height of the spring. If it is less than the limit, replace.

   Standard value: 51.0 mm (2.00 inches)
   Minimum limit: 50.0 mm (1.97 inches)

2. Measure the squareness of the spring. If it exceeds the limit, replace.

   Standard value: 2 degree angle or less
   Limit: 4 degree angle

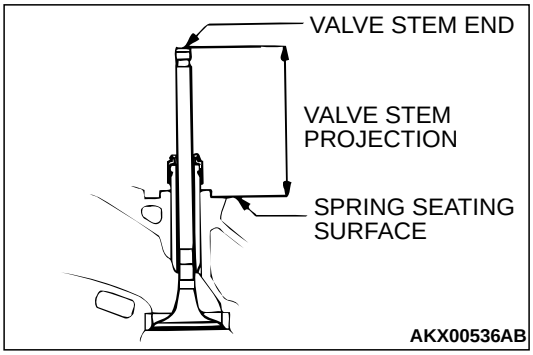


VALVE GUIDE

Measure the clearance between the valve guide and valve stem. If it exceeds the limit, replace the valve guide or valve, or both.

Standard value:
<Intake> 0.02 – 0.05 mm (0.0008 – 0.0019 inch)
<Exhaust> 0.03 – 0.07 mm (0.0012 – 0.0027 inch)

Limit:
<Intake> 0.10 mm (0.003 inch)
<Exhaust> 0.15 mm (0.005 inch)

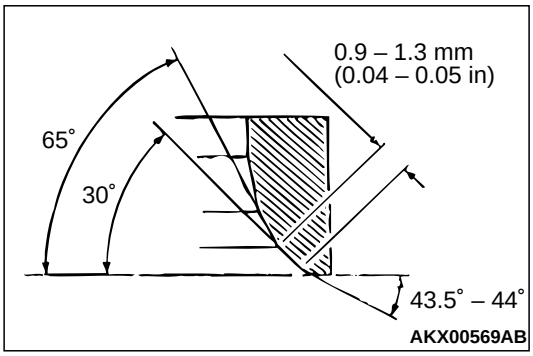


VALVE SEAT

Assemble the valve, then measure the valve stem projection between the end of the valve stem and the spring seating surface. If the measurement exceeds the specified limit, replace the valve seat.

Standard value: 49.30 mm (1.941 inches)
Limit: 49.80 mm (1.960 inches)

VALVE SEAT RECONDITIONING PROCEDURE



1. Before correcting the valve seat, check for clearance between the valve guide and valve and, if necessary, replace the valve guide.
2. Using the seat grinder, correct to obtain the specified seat width and angle.
3. After correcting the valve seat, lap the valve and valve seat using lapping compound. Then, check the valve stem projection.

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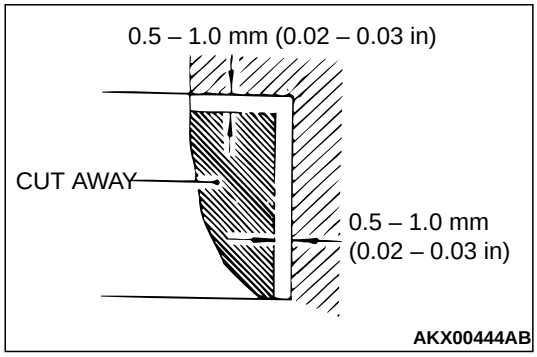
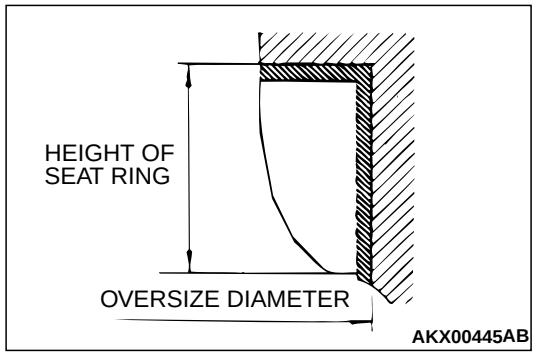
VALVE SEAT REPLACEMENT PROCEDURE



1. Cut the valve seat from the inside to thin the wall thickness. Then, remove the valve seat.



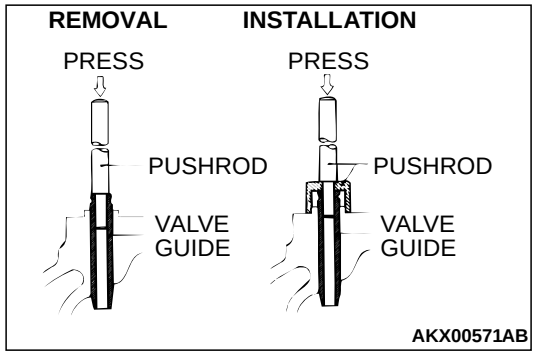
2. Rebore the valve seat hole in the cylinder head to a selected oversize valve seat diameter.

   Intake seat ring hole diameters
   0.3 oversize
   34.30 – 34.33 mm (1.3504 – 1.3515 inches)
   0.6 oversize
   34.60 – 34.63 mm (1.3622 – 1.3633 inches)

   Exhaust seat ring hole diameters
   0.3 oversize
   31.80 – 31.83 mm (1.2520 – 1.2531 inches)
   0.6 oversize
   32.10 – 32.13 mm (1.2638 – 1.2649 inches)

3. Before fitting the valve seat, either heat the cylinder head up to approximately 250°C (482°F) or cool the valve seat in liquid nitrogen, to prevent the cylinder head bore from galling.
4. Using a valve seat cutter, correct the valve seat to the specified width and angle.
   See "VALVE SEAT RECONDITIONING PROCEDURE" on the previous page.

VALVE GUIDE REPLACEMENT PROCEDURE

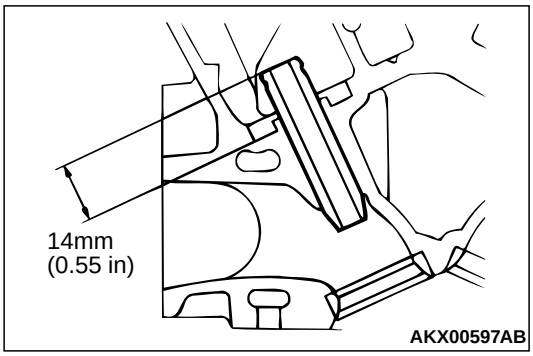


1. Using a press, remove the valve guide toward the cylinder block.

⚠ CAUTION
Do not install a valve guide of the same size again.

2. Rebore the valve guide hole of the cylinder head so that it fits the press-fitted oversize valve guide.

   Valve guide hole diameters
   0.05 oversize 11.05 – 11.07 mm (0.4350 – 0.4358 inch)
   0.25 oversize 11.25 – 11.27 mm (0.4430 – 0.4436 inch)
   0.50 oversize 11.50 – 11.52 mm (0.4528 – 0.4535 inch)



3. Press-fit the valve guide until it protrudes 14.0 mm (0.55 inch) from the cylinder head top surface as shown in the illustration.

NOTE: When press-fitting the valve guide, work from the cylinder head top surface.

NOTE: Pay attention to the difference in length of the valve guides. [Intake side: 45.5 mm (1.79 inches); exhaust side: 50.5 mm (1.99 inches)]

NOTE: After installing the valve guides, insert new valves in them to check for smooth operation.

FRONT CASE AND OIL PUMP

REMOVAL AND INSTALLATION

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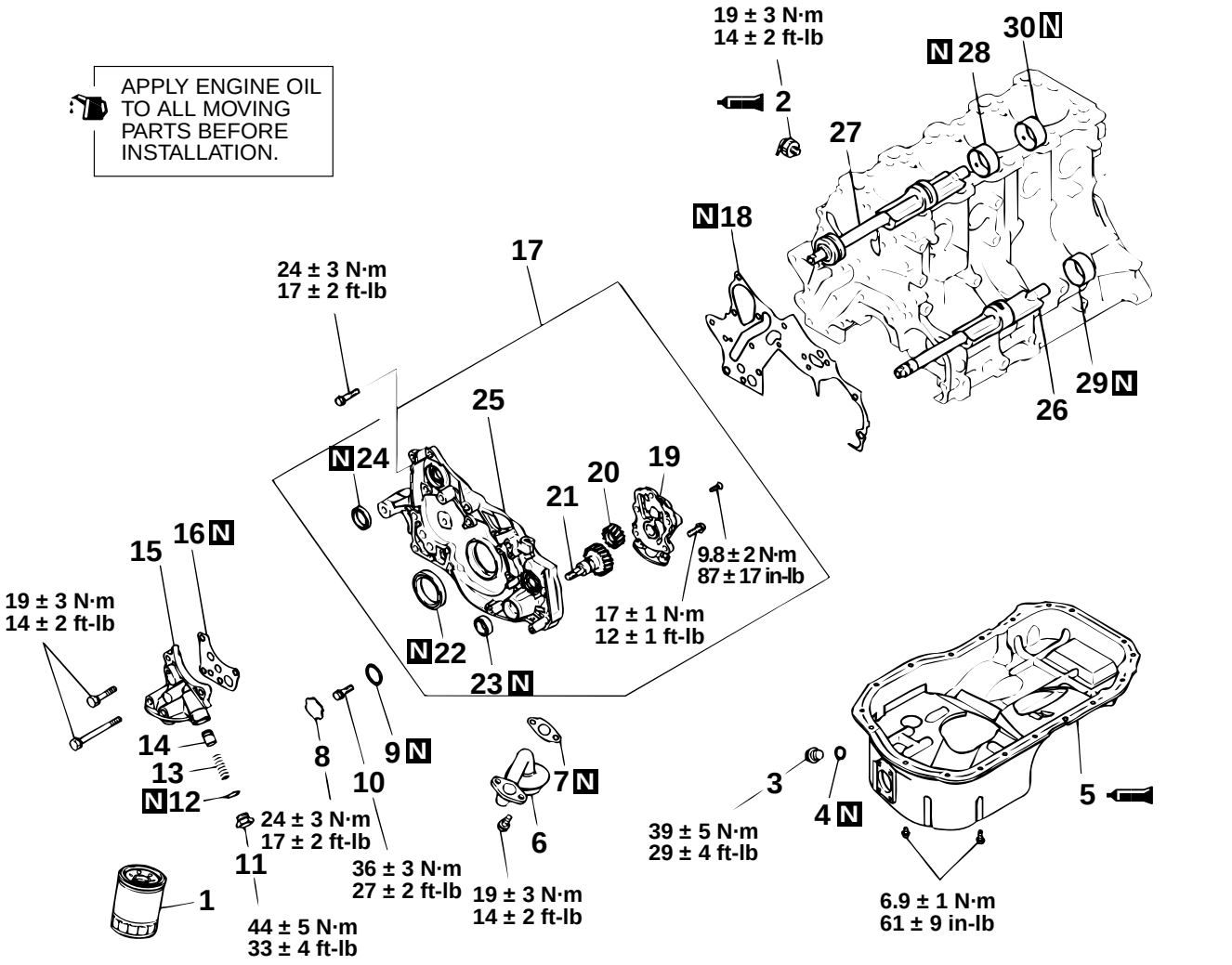

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REMOVAL STEPS

- **>>M<<** 1. OIL FILTER
- **>>N<<** 2. OIL PRESSURE SWITCH
- 3. DRAIN PLUG
- **>>L<<** 4. DRAIN PLUG GASKET

REMOVAL STEPS (Continued)

- **<<A>> >>K<<** 5. OIL PAN
- 6. OIL SCREEN
- 7. OIL SCREEN GASKET
- **<<B>> >>J<<** 8. PLUG

TSB Revision

REMOVAL STEPS (Continued)

9. O-RING
<<C>> >>I<< 10. FLANGE BOLT
11. RELIEF PLUG
12. GASKET
13. RELIEF SPRING
14. RELIEF PLUNGER
>>H<< 15. OIL FILTER BRACKET
16. OIL FILTER BRACKET GASKET
>>H<< 17. OIL PUMP CASE ASSEMBLY
18. FRONT CASE GASKET
19. OIL PUMP COVER
>>G<< 20. OIL PUMP DRIVEN GEAR
>>G<< 21. OIL PUMP DRIVE GEAR
>>F<< 22. CRANKSHAFT FRONT OIL SEAL

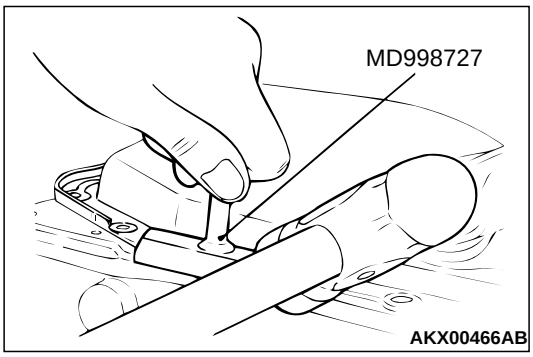
REMOVAL STEPS (Continued)

>>E<< 23. OIL PUMP OIL SEAL
>>D<< 24. COUNTERBALANCE SHAFT OIL SEAL
25. FRONT CASE
26. COUNTERBALANCE SHAFT, LEFT
27. COUNTERBALANCE SHAFT, RIGHT
<<D>> >>C<< 28. COUNTERBALANCE SHAFT, FRONT BEARING
<<E>> >>B<< 29. COUNTERBALANCE SHAFT, REAR BEARING, LEFT
<<E>> >>A<< 30. COUNTERBALANCE SHAFT, REAR BEARING, RIGHT

Required Special Tools:

- MB991603: Bearing Installer Stopper
- MD998162: Plug Wrench
- MD998285: Crankshaft Front Oil Seal Guide
- MD998371: Silent Shaft Bearing Puller
- MD998372: Silent Shaft Bearing Puller
- MD998375: Crankshaft Front Oil Seal Installer
- MD998705: Silent Shaft Bearing Installer
- MD998727: Oil Pan Remover
- MD998783: Plug Wrench Retainer

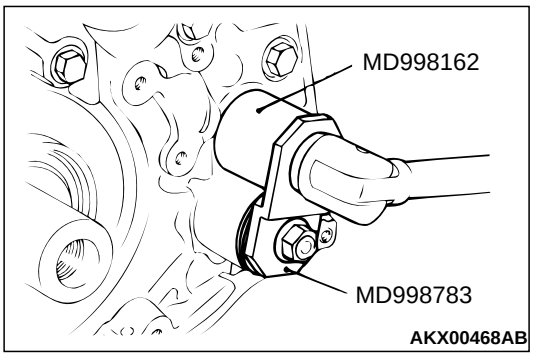
REMOVAL SERVICE POINTS



<<A>> OIL PAN REMOVAL

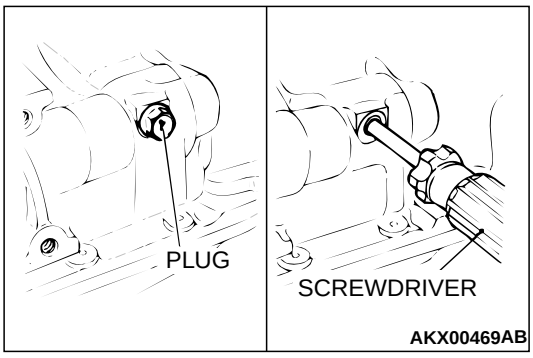
1. Remove all oil pan bolts.
2. Drive in special tool MD998727 between the cylinder block and oil pan.

   NOTE: Never use a screwdriver or chisel to remove the oil pan. It will deform the oil pan flange and result in oil leakage.
3. Gently hit the special tool on its corner (shoulder), then slide it along the oil pan to remove it.



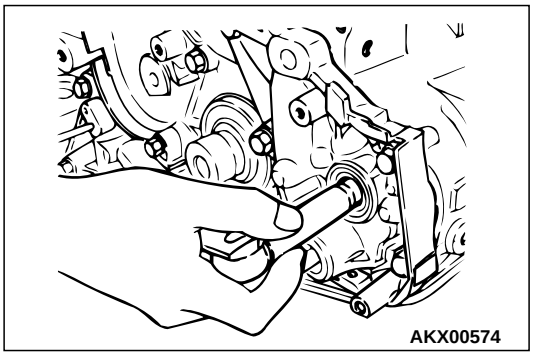
<<B>> PLUG REMOVAL

1. Fit special tool MD998162 on the plug, and then hold it in position with special tool MD998783.
2. Loosen the plug.
3. Remove special tools MD998783 and MD998162 and then the plug.



<<C>> FLANGE BOLT REMOVAL

1. Remove the plug on the side of the cylinder block.
2. Insert a Phillips screwdriver [shank diameter 8 mm (0.3 inch)] into the plug hole to lock the counterbalance shaft.

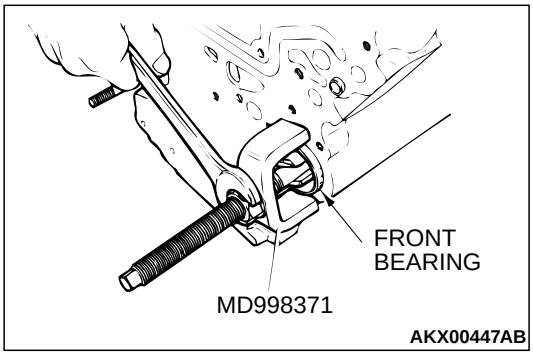


3. Loosen the flange bolt.

<<D>> COUNTERBALANCE SHAFT FRONT BEARING REMOVAL

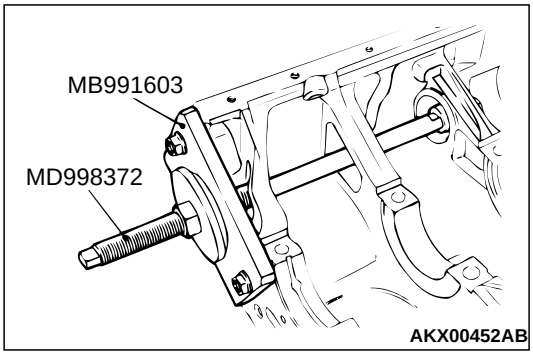
Using special tool MD998371, remove the counterbalance shaft front bearing from the cylinder block.

NOTE: Be sure to remove the front bearing first.
If it has not been removed, special tool MD998372 cannot be used for rear balance shaft bearing removal.



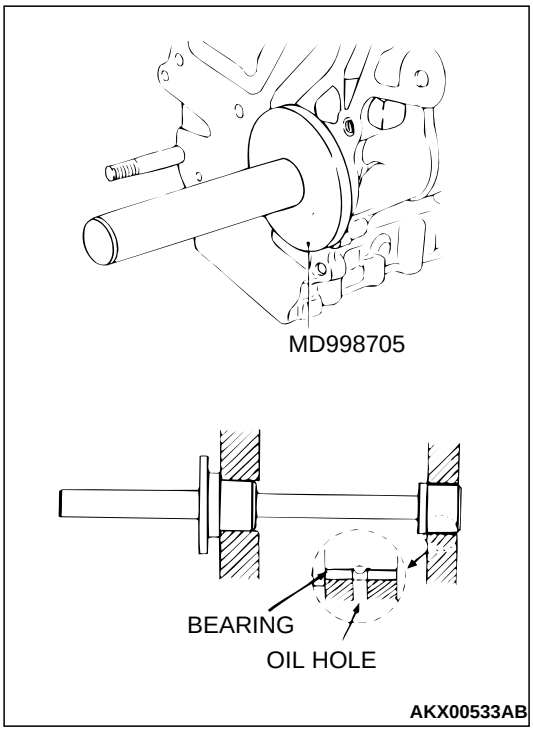
<<E>> COUNTERBALANCE SHAFT REAR BEARING REMOVAL

1. Install special tools MB991603 and MD998372 in front of the cylinder block when removing the left counterbalance shaft rear bearing.
2. Using special tool MD998372, remove the right counterbalance shaft rear bearing from the cylinder block.



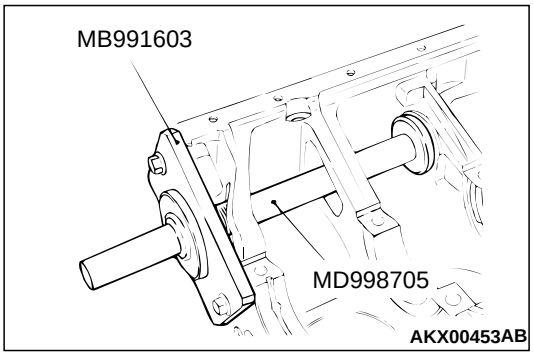
INSTALLATION SERVICE POINTS

>>A<< RIGHT COUNTERBALANCE SHAFT REAR BEARING INSTALLATION



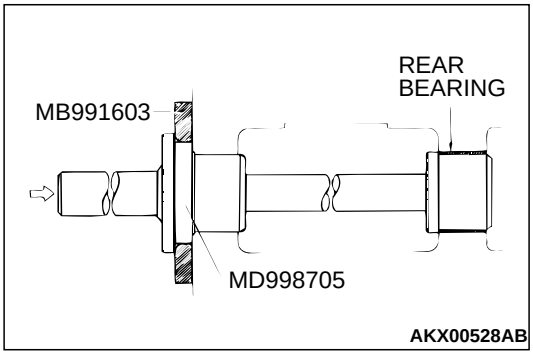
1. Apply engine oil to the bearing outer surface and bearing hole in the cylinder block.
2. Using special tool MD998705, install the rear bearing. Make sure that the oil hole of the bearing is aligned with that of the cylinder block.

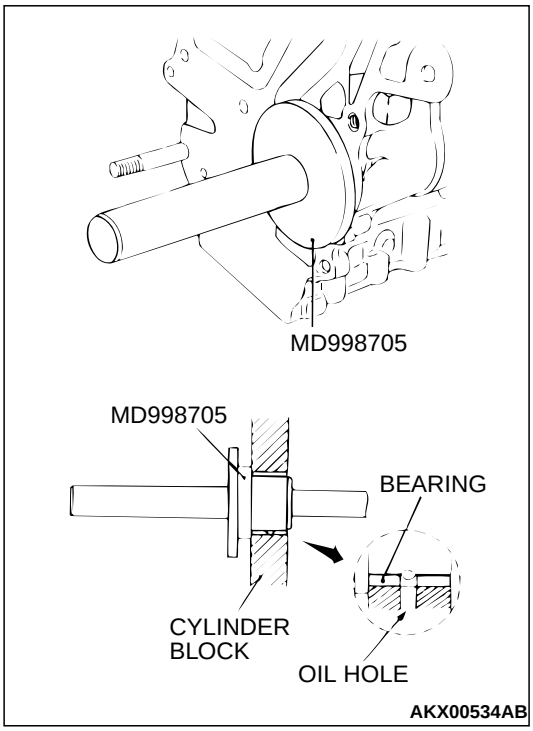
>>B<< LEFT COUNTERBALANCE SHAFT REAR BEARING INSTALLATION



1. Install special tool MB991603 to the cylinder block.
2. Apply engine oil to the rear bearing outer surface and bearing hole in the cylinder block.
3. Using special tool MD998705, install the rear bearing.

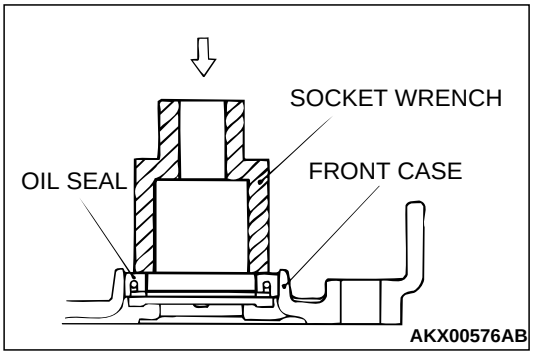
   NOTE: The left rear bearing has no oil holes.





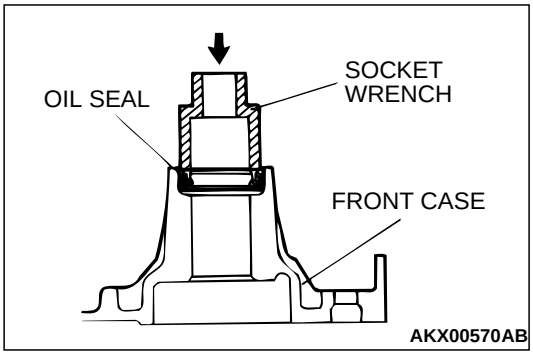
>>C<< COUNTERBALANCE SHAFT FRONT BEARING INSTALLATION

1. Apply engine oil to the front bearing outer surface and bearing hole in the cylinder.
2. Using special tool MD998705, install the front bearing. Make sure that the oil hole of the bearing is aligned with that of the cylinder block.



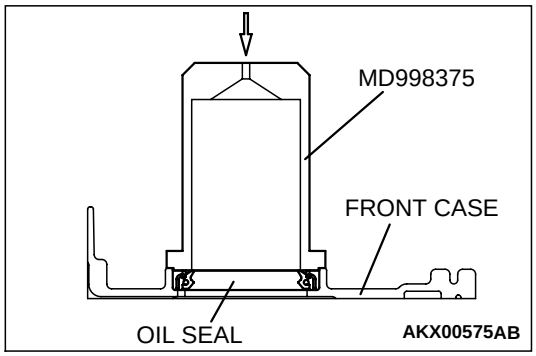
>>D<< COUNTERBALANCE SHAFT OIL SEAL INSTALLATION

Using a suitable socket wrench, install the counterbalance shaft oil seal into the front case.



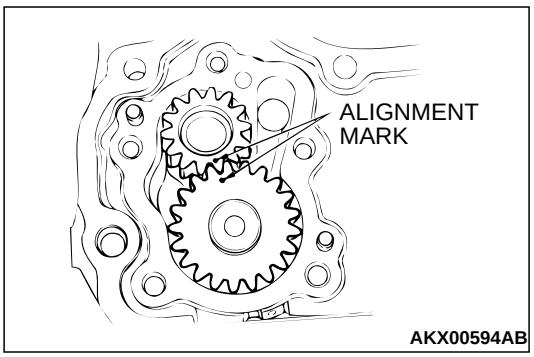
>>E<< OIL PUMP OIL SEAL INSTALLATION

Using a suitable socket wrench, install the oil pump oil seal into the front case.



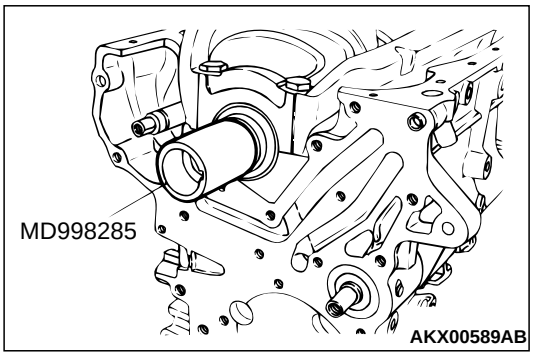
>>F<< CRANKSHAFT FRONT OIL SEAL INSTALLATION

Using special tool MD998375, install the crankshaft front oil seal into the front case.



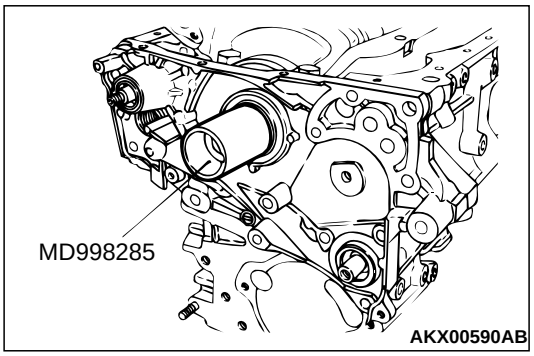
>>G<< OIL PUMP DRIVEN GEAR/OIL PUMP DRIVE GEAR INSTALLATION

Install the oil pump gears into the front case and line up the alignment marks.

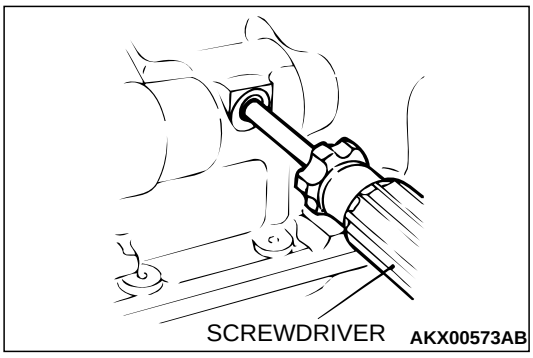


>>H<< OIL PUMP CASE ASSEMBLY/OIL FILTER BRACKET INSTALLATION

1. Set special tool MD998285 on the front end of crankshaft and apply a thin coat of engine oil to the outer surface of special tool MD998285.
2. Apply engine oil to the lip of the crankshaft front oil seal.

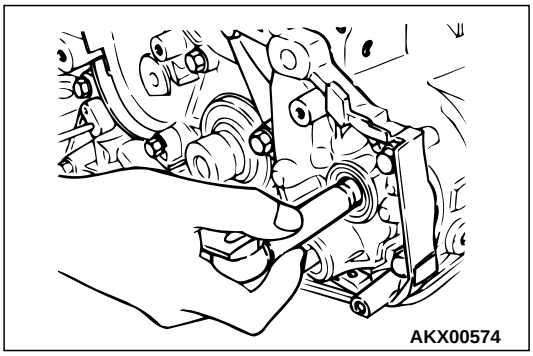


3. Install the oil pump case assembly together with the new front case gasket.
4. Install the oil filter bracket together with the new gasket.
5. Tighten the all flange bolts to 24 ± 3 N·m (17 ± 2 ft-lb).



>>I<< FLANGE BOLT INSTALLATION

1. Insert a Phillips head screwdriver [shank diameter 8 mm (0.3 inch)] into the hole in the left side of the cylinder block to lock the counterbalance shaft.

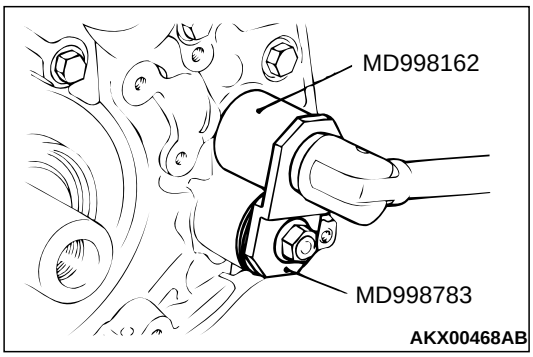


2. Secure the oil pump driven gear onto the left counterbalance shaft by tightening the flange bolt to the specified torque.

   Tightening torque: 36 ± 3 N·m (27 ± 2 ft-lb)

3. Pull out the screwdriver and screw in the plug.

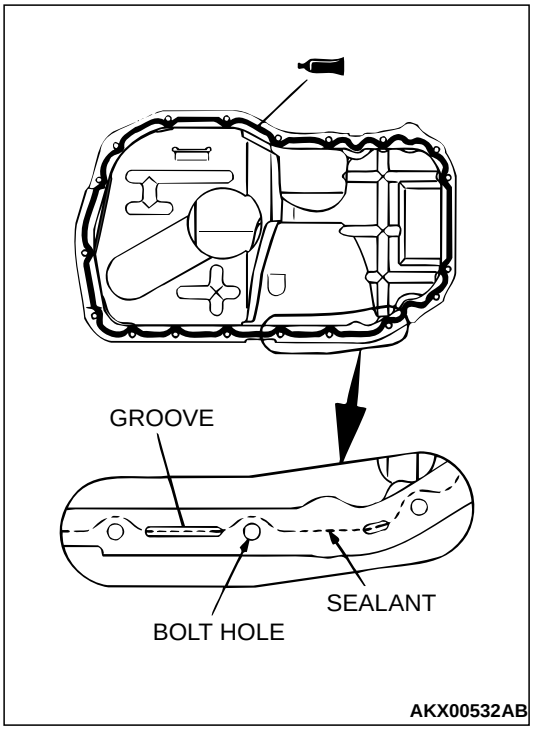
>>J<< PLUG INSTALLATION



1. Install a new O-ring to the groove of the front case.
2. Install the plug to the front case.
3. Fit special tool MD998162 on the plug, and then hold it in position with special tool MD998783.
4. Tighten the plug to the specified torque.

   Tightening torque: 24 ± 3 N·m (17 ± 2 ft-lb)

5. Remove special tools MD998783 and MD998162.

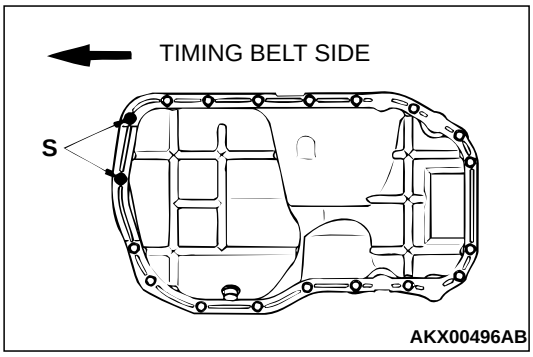


>>K<< OIL PAN INSTALLATION

1. Clean both gasket surfaces of oil pan and cylinder block.
2. Apply a 4 mm (0.15 inch) diameter bead of sealant (MITSUBISHI Genuine Part number MD970389 or equivalent) to the flange of the oil pan.

   Apply sealant as indicated by the broken line in the illustration; the grooves must be traced and the bolt holes must be surrounded with a bead of sealant.
3. Install the oil pump case assembly to the front side of the cylinder block.

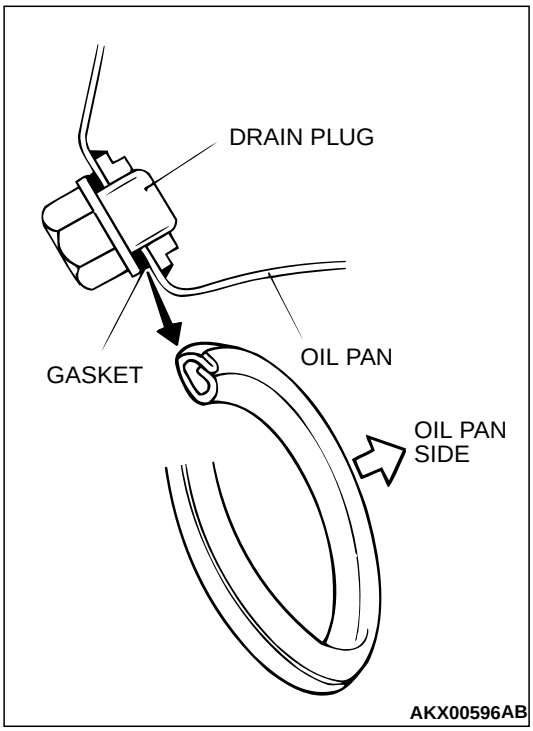
   NOTE: Be sure to install the oil pan quickly while the sealant is wet (within 15 minutes).



4. Fit an 8 mm (0.30 inch) long bolt in each of the two holes identified by the letter "S" in the illustration and a 10 mm (0.39 inch) long bolt in each of the remaining 17 holes. Tighten all bolts to the specified torque.

   Tightening torque: 6.9 ± 1 N·m (61 ± 9 in-lb)

   NOTE: After installation, keep the sealed area away from the oil for approximately one hour.

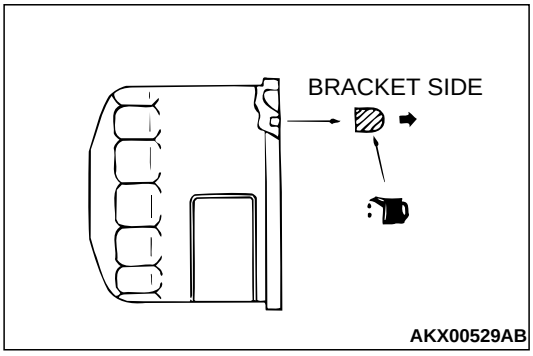


>>L<< DRAIN PLUG GASKET INSTALLATION

⚠ CAUTION

If the gasket is installed in the wrong direction, oil leaks will occur.

Install the drain plug gasket in the direction shown.



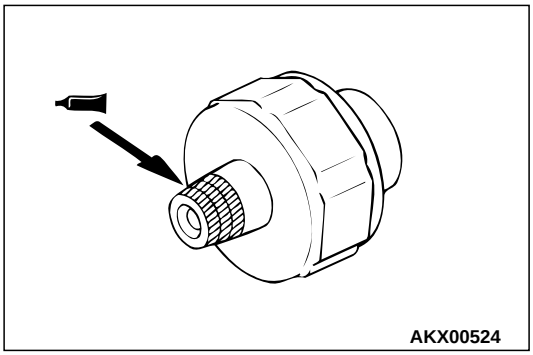
>>M<< OIL FILTER INSTALLATION

1. Clean the installation surface of the filter bracket.
2. Apply engine oil to the o-ring of the oil filter.
3. Install the oil filter to the bracket and tighten it to the specified torque.

   Tightening torque:
   Part number MD360935 filter:
   14 ± 2 N·m (122 ± 17 in-lb)
   Other Mitsubishi Genuine filter:
   17 ± 3 N·m (12 ± 2 ft-lb)

4. If no torque wrench can be used for tightening, use the following procedure:
   (1) Screw in the oil filter until its o-ring contacts the oil filter bracket.
   (2) Tighten the oil filter by giving the specified amount of turn.

   Part number MD360935 filter: one turn
   Other Mitsubishi Genuine filter: 3/4 turn


AKX00524

>>N<< SEALANT APPLICATION TO OIL PRESSURE SWITCH

⚠ CAUTION

Be careful not to block the oil passage with sealant.

1. Apply 3M™ AAD Part number 8672 or equivalent to the threads of the oil pressure switch.
2. Tighten the switch to the specified torque.

   Tightening torque: 19 ± 3 N·m (14 ± 2 ft-lb)

INSPECTION

M1113007300034

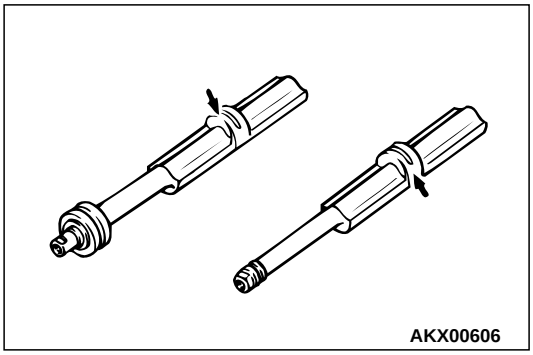
FRONT CASE

1. Check the oil passage for clogging and clean if necessary.
2. Check the left counterbalance shaft front bearing for wear, damage and seizure. If the bearing is damaged, replace the front case.
3. Check the front case for cracks and other damage.
   Replace cracked or damaged front case.

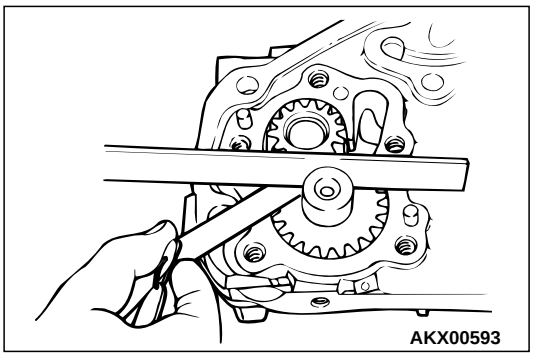
OIL SEAL

1. Check the oil seal lip for wear and damage. Replace the oil seal if necessary.
2. Check the oil seal lip for deterioration. Replace the oil seal if necessary.

COUNTERBALANCE SHAFT


AKX00606

1. Check the oil holes for clogging and clean if necessary.
2. Check the journal for seizure, damage and contact with bearing. If there is anything wrong with the journal, replace the counterbalance shaft, bearing or front case assembly if required.



OIL PUMP

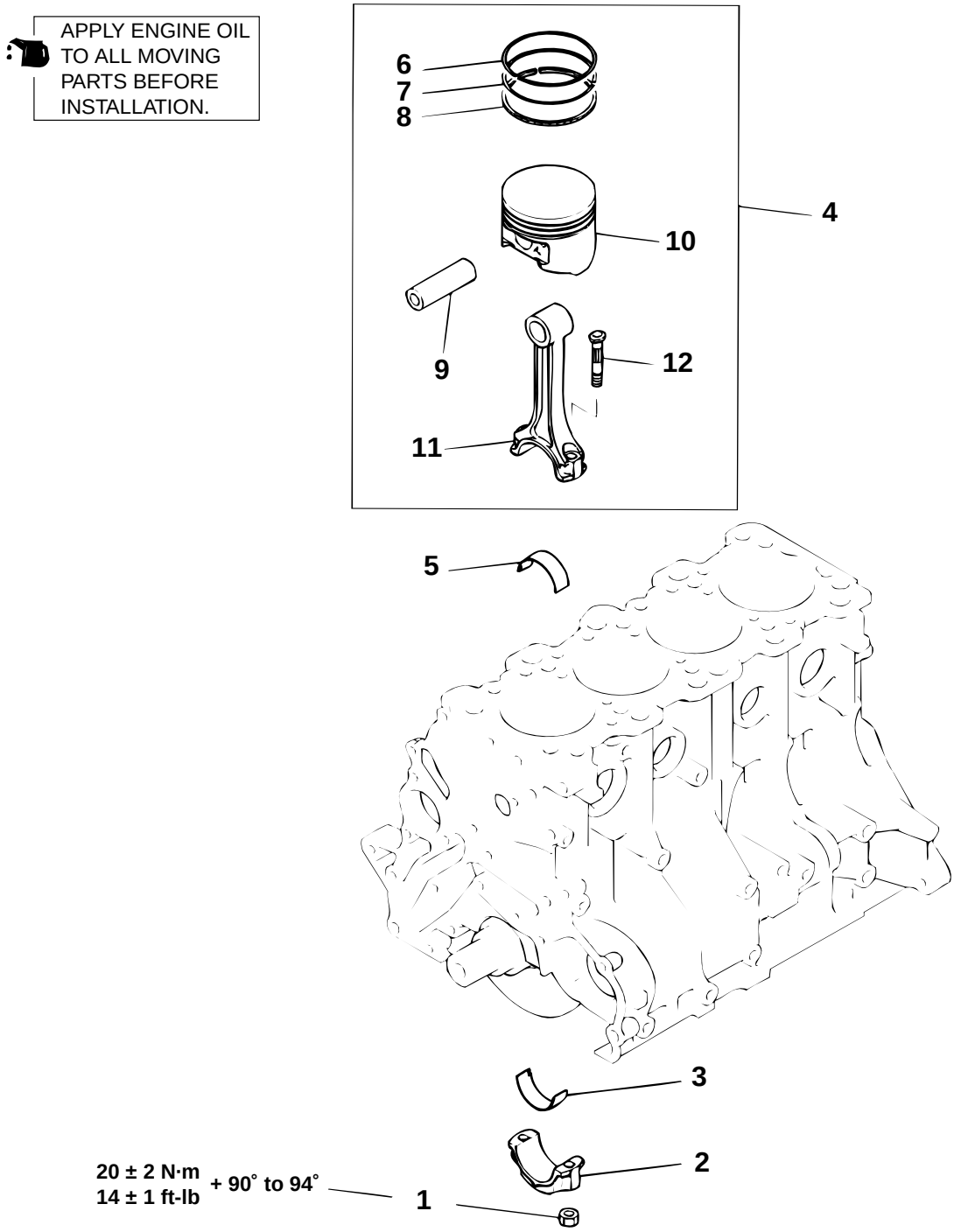
1. Assemble the oil pump gears to the front case and rotate it to ensure smooth rotation with no looseness.
2. Ensure that there is no ridge wear on the contact surface between the front case and the gear surface of the oil pump cover.
3. Check the side clearance.

   Standard value:
   Drive gear 0.08 – 0.14 mm (0.004 – 0.006 inch)
   Driven gear 0.06 – 0.12 mm (0.003 – 0.004 inch)

PISTON AND CONNECTING ROD

REMOVAL AND INSTALLATION

M1113008400238



AKX00501AB

REMOVAL STEPS

- >>G<< 1. NUT
- <<A>> >>F<< 2. CONNECTING ROD CAP
- >>D<< 3. CONNECTING ROD BEARING
- >>E<< 4. PISTON AND CONNECTING ROD ASSEMBLY
- >>D<< 5. CONNECTING ROD BEARING
- >>C<< 6. PISTON RING No. 1

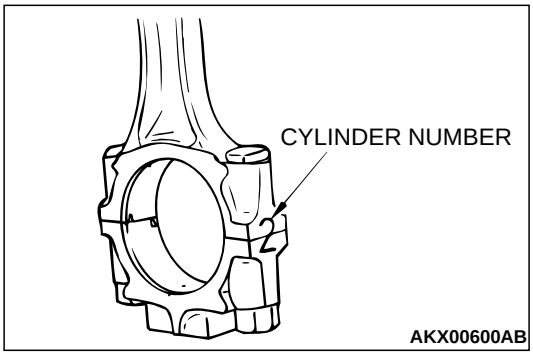
REMOVAL STEPS (Continued)

- >>C<< 7. PISTON RING No. 2
- >>B<< 8. OIL RING
- <<B>> >>A<< 9. PISTON PIN
- 10. PISTON
- 11. CONNECTING ROD
- 12. BOLT

TSB Revision

Required Special Tool:

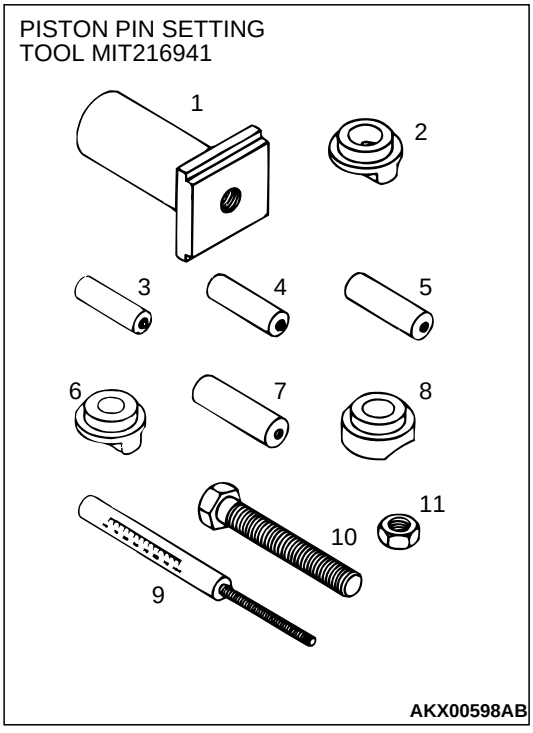
- MIT216941: Piston Pin Setting Tool



REMOVAL SERVICE POINTS

<<A>> CONNECTING ROD CAP REMOVAL

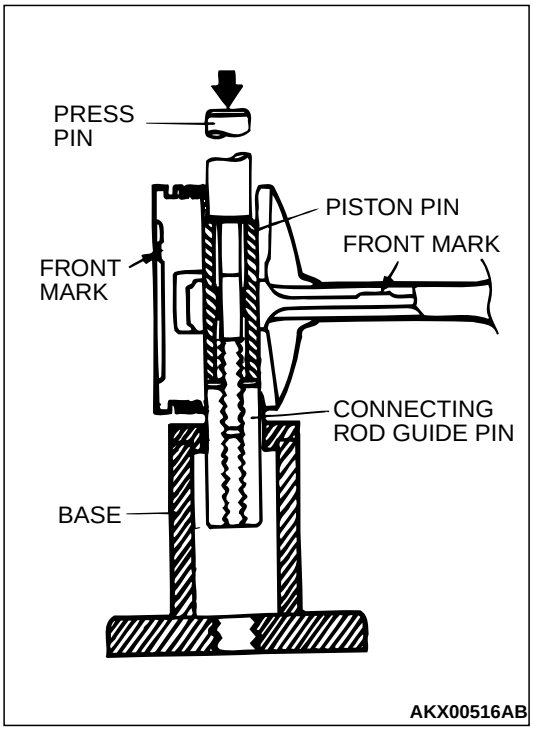
1. Mark the cylinder number on the side of the connecting rod big end for correct reassembly.
2. Keep the removed connecting rods, caps, and bearings in that order according to the cylinder number.



<<B>> PISTON PIN REMOVAL

ITEM NO.	PART NO.	DESCRIPTION
1.	MIT310134	Base
2.	MIT310136	Piston support
3.	MIT310137	Connecting rod guide pin
4.	MIT310138	Connecting rod guide pin
5.	MIT310139	Connecting rod guide pin
6.	MIT310140	Piston support
7.	MIT310141	Connecting rod guide pin
8.	MIT310142	Piston support
9.	MIT48143	Press pin
10.	216943	Stop screw
11.	10396	Nut

1. Remove the stop screw from the base.
2. Select the correct piston support for your application (See above). Fit the piston support onto the base. Place the base on press support blocks.



3. Insert the press pin through the piston pin hole. Select the correct connecting rod guide pin (See above). Thread the guide pin onto the threaded portion of the press pin.
4. Position the piston assembly on the piston support in the press. With the press pin up as shown, insert the guide pin through the hole in the piston and through the hole in the piston support.

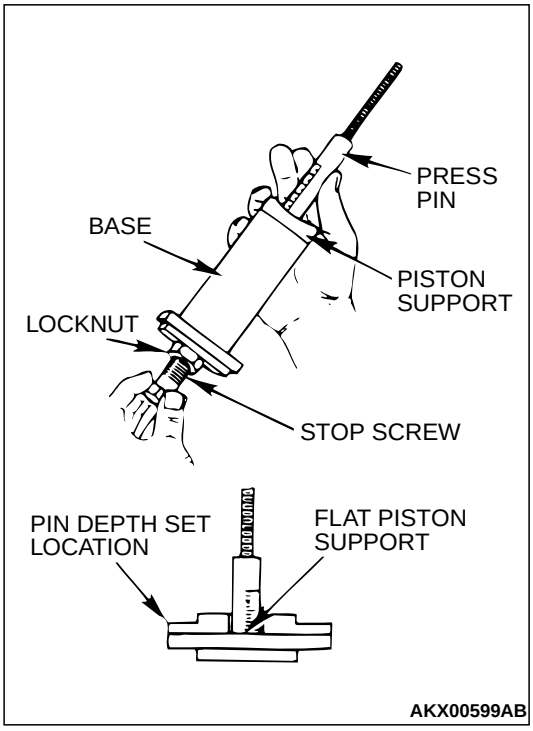
⚠ CAUTION

To avoid piston damage, the piston support must seat squarely against the piston. Verify that the piston pin will slide through the hole in the piston support.

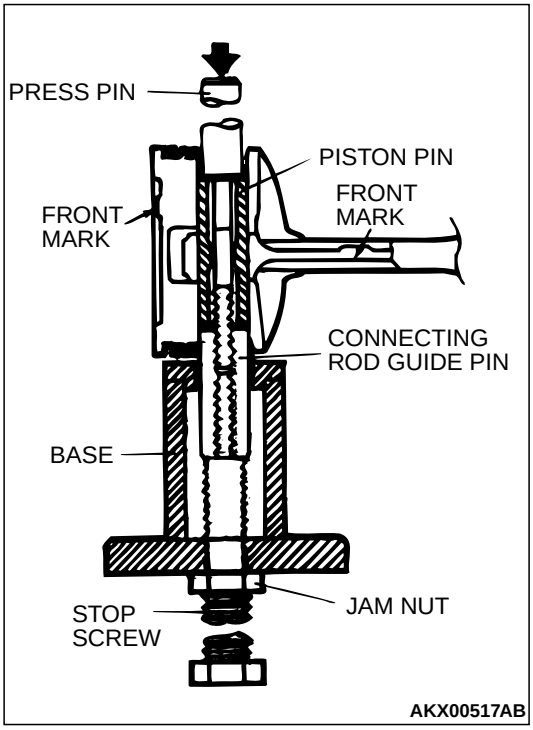
5. Press the piston pin out of the assembly.
6. Remove the piston pin from the press pin.

INSTALLATION SERVICE POINTS

>>A<< PISTON PIN INSTALLATION



1. Thread the stop screw and lock nut assembly into the base. Fit the correct piston support on top of the base. Insert the press pin, threaded end up, into the hole in the piston support until the press pin touches the stop screw.
2. Using the markings on the press pin, adjust the stop screw to the depth shown on the instruction for special tool MIT216941.

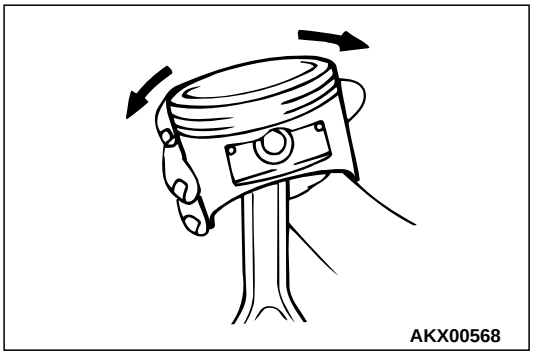


3. Place the base on press support blocks.
4. Slide the piston pin over the threaded end of the press pin, and thread the correct guide pin up against it.
5. Coat the piston pin with engine oil. With the connecting rod held in position, slide the guide pin through the piston and connecting rod.
6. Press the piston pin through the connecting rod until the guide pin contacts the stop screw.

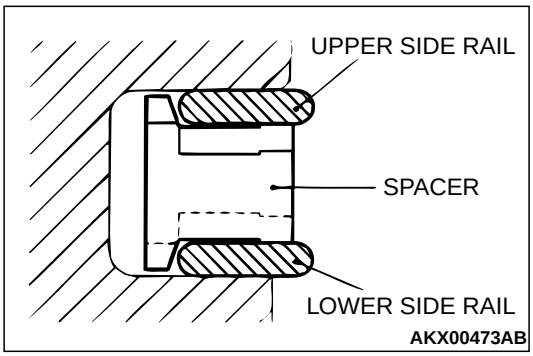
⚠ CAUTION

Due to production tolerance variations, it is necessary to visually inspect the piston pin depth after installation to verify that the piston pin is centered. Adjust if necessary.

7. Remove the piston assembly from the base. Remove the guide pin and press pin from the assembly.



8. Check that the piston moves smoothly.



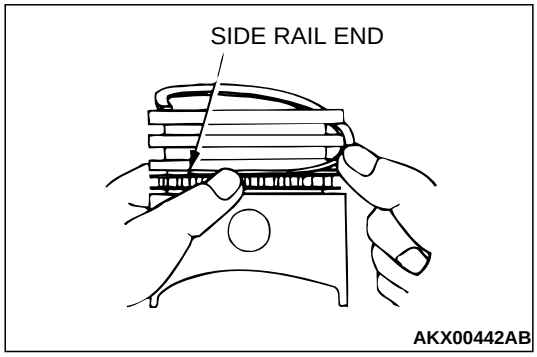
>>B<< OIL RING INSTALLATION

1. Fit the oil ring spacer into the piston ring groove.

   NOTE: The side rails and spacer may be installed in either direction.

   NOTE: New spacers and side rails are colored for identification of their sizes.

SIZE	IDENTIFICATION COLOR
Standard	None
0.50 mm (0.020 in) oversize diameter	Red
1.00 mm (0.040 in) oversize diameter	Yellow

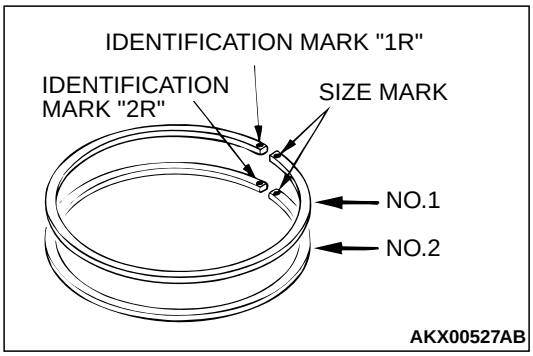


⚠ CAUTION

Do not use a piston ring expander when installing side rail.

2. Install the upper side rail.
   To install the side rail, first fit one end of the rail into the piston groove, then press the remaining portion into position by finger. See illustration.
3. Install the lower side rail in the same procedure as described in step 2.
4. Make sure that the side rails move smoothly in both directions.

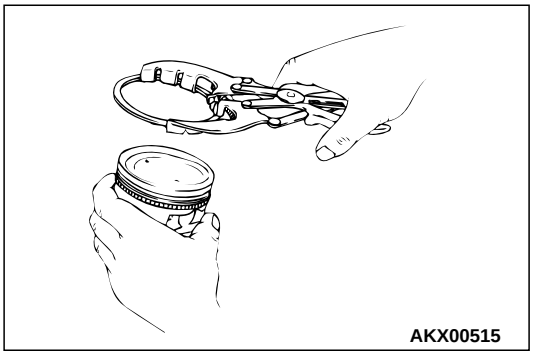
>>C<< PISTON RING NUMBER 2/PISTON RING NUMBER 1 INSTALLATION



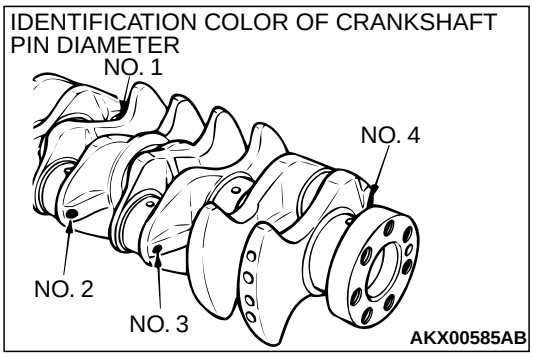
1. To prevent wrong installation, check the identification mark of each piston ring. The identification mark is stamped near the ring gap:
   Identification mark:
   Number 1 ring: 1R
   Number 2 ring: 2R

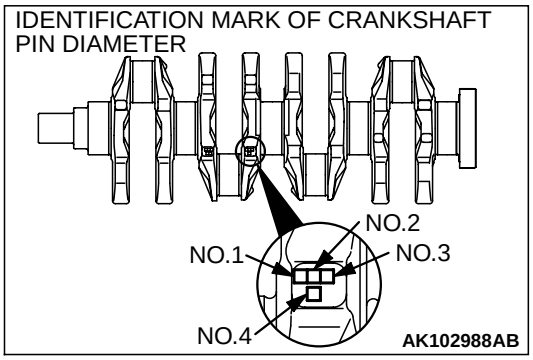
NOTE: Size marks on piston rings are as follows.

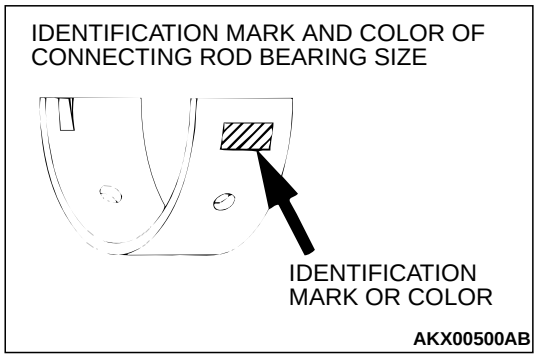
SIZE		SIZE MARK
Standard	No.1 ring	(None) Yellow paint to the ring periphery
	No.2 ring	(None) Red paint to the ring periphery
0.50 mm (0.020 in) oversize diameter		50
1.00 mm (0.040 in) oversize diameter		100



2. Using the piston ring expander, fit number 2 into the number 2 groove of piston.
   NOTE: Install piston rings with identification mark facing up, to the piston crown side.
3. Install the number 1 piston ring in the same manner as step 2.





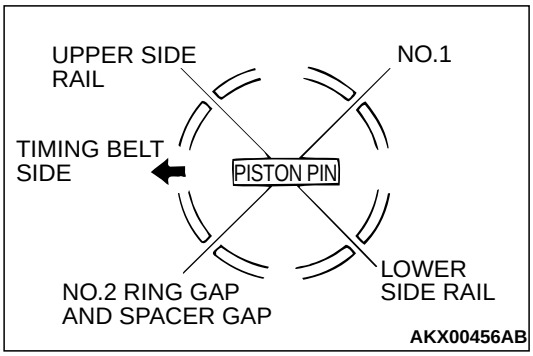


>>D<< CONNECTING ROD BEARING INSTALLATION

1. Measure the crankshaft pin diameter and confirm its classification from the following table. In the case of a crankshaft supplied as a service part, identification colors/ marks of its pins are painted /stamped at the positions shown in the illustration.

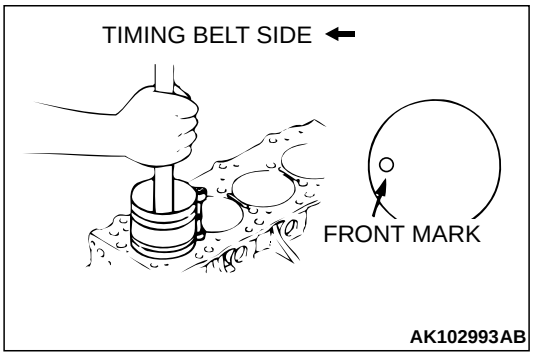
CRANKSHAFT PIN OUTSIDE DIAMETER		CONNECTING ROD BEARING
IDENTIFICATION MARK OR COLOR	SIZE mm (in)	IDENTIFICATION MARK OR COLOR
I or Yellow	44.995 – 45.005 (1.7715 – 1.7719)	1 or Yellow
II or None	44.985 – 44.995 (1.7711 – 1.7715)	2 or None
III or White	44.980 – 44.985 (1.7709 – 1.7711)	3 or Blue

2. If the crankshaft pin outside diameter identification mark is "I" or identification color is "Yellow", for example, select a bearing whose identification mark is "1" or identification color is "Yellow".
   If there is no identification mark or no identification coler paint on the crankshaft, measure the pin outside diameter and select a bearing appropriate for the measured value.
3. Install the selected bearing in the big end and in the cap of the connecting rod.



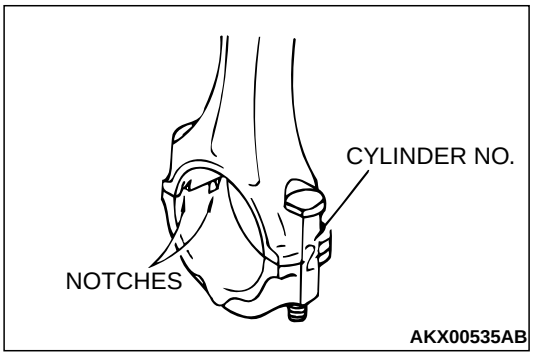
>>E<< PISTON AND CONNECTING ROD INSTALLATION

1. Apply engine oil on the circumference of the piston, piston rings, and oil ring.
2. Arrange the piston ring and oil ring gaps (side rail and spacer) as shown in the illustration.
3. Rotate the crankshaft so that crank pin is on the center of the cylinder bore.

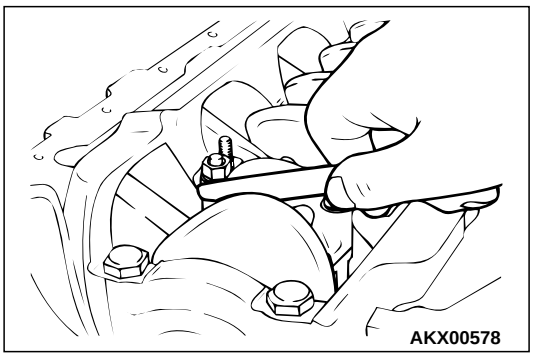


4. Use suitable thread protectors on the connecting rod bolts before inserting the piston and connecting rod assembly into the cylinder block.
   Care must be taken not to nick the crank pin.
5. Insert the piston and connecting rod assembly into the cylinder with front mark on the piston crown pointing to the timing belt side.
6. Using a suitable piston ring compressor tool, install the piston and connecting rod assembly into the cylinder block.

>>F<< CONNECTING ROD CAP INSTALLATION



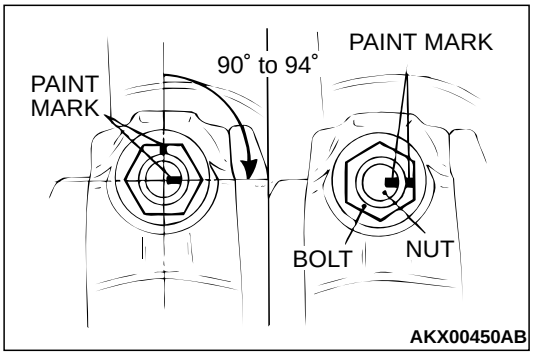
1. Verifying the mark made during disassembly, install the bearing cap to the connecting rod. If the connecting rod is new with no index mark, make sure that the bearing locking notches are on the same side as shown.



2. Make sure that the connecting rod big end side clearance meets the specification.
   Standard value: 0.10 – 0.25 mm (0.004 – 0.009 inch)
   Limit: 0.4 mm (0.015 inch)

>>G<< CONNECTING ROD CAP NUT TIGHTENING

1. The connecting rod bolts should be examined before reuse. If the bolt threads are damaged, the bolt should be replaced.
   Hand-thread the nut to the full length of the bolt threads. If the nut does not run down smoothly, the bolt should be replaced.
2. Before installation of each nut, apply engine oil to the threaded portion and bearing surface of the nut.
3. Loosely tighten each nut to the bolt.
4. Then tighten the nuts alternately to a torque of 20 ± 2 N·m (14 ± 1 ft-lb) to install the cap properly.



5. Make a paint mark on the head of each nut.
6. Make a paint mark on the bolt end at the position 90 degree angle to 94 degree angle from the paint mark made on the nut in the direction of tightening the nut.

⚠ CAUTION

- **If the nut is turned less than 90 degree angle, proper fastening performance may not be achieved. Be careful to tighten the nut exactly 90 degree angle.**
- **If the nut is overtightened (exceeding 94 degree angle), loosen the nut completely and then retighten it by repeating the tightening procedure from step 3.**

7. Turn the nut further 90 degree angle to 94 degree angle and make sure that the paint marks on the nut and bolt are aligned.

INSPECTION

M1113008500138

PISTON

Replace the piston if scratches or seizure is evident on its surfaces (especially the thrust surface). Replace the piston if it is cracked.

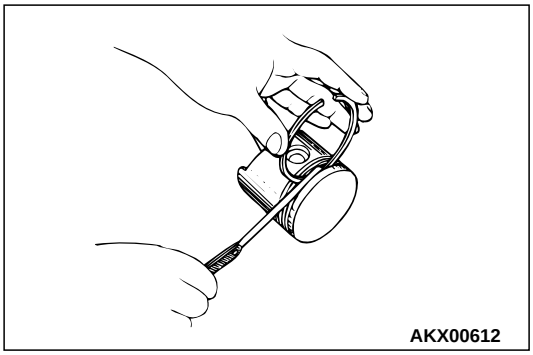
PISTON PIN

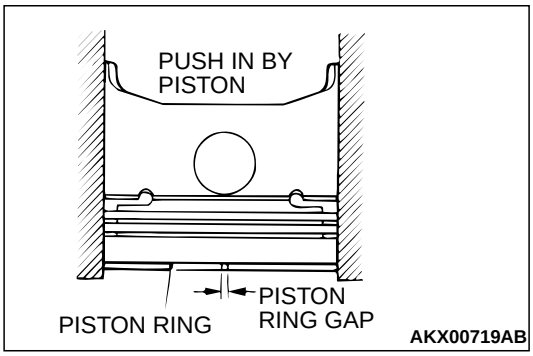
1. Insert the piston pin into the piston pin hole with your thumb. You should feel a slight resistance. Replace the piston pin if it can be easily inserted or there is an excessive play.
2. The piston and piston pin must be replaced as an assembly.

PISTON RING

1. Check the piston ring for damage, excessive wear, and breakage. Replace if defects are evident. If the piston has been replaced, the piston rings must also be replaced.
2. Check for clearance between the piston ring and ring groove. If it exceeds the limit, replace the ring or piston, or both.

   Standard value: 0.02 – 0.06 mm (0.0008 – 0.0023 inch
   Limit: 0.1 mm (0.003 inch)



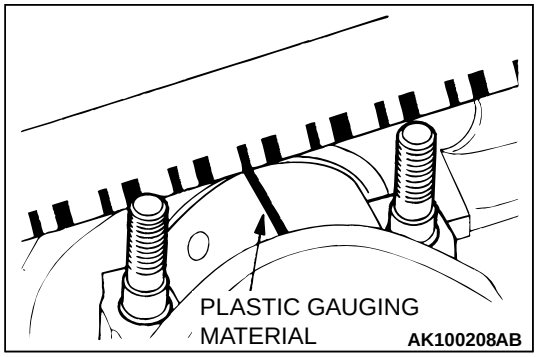


3. Insert the piston ring into the cylinder bore. Force the ring down with a piston, the piston crown being in contact with the ring, to correctly position it at right angles to the cylinder wall. Then, measure the end gap with a feeler gauge.
   If the ring gap is excessive, replace the piston ring.

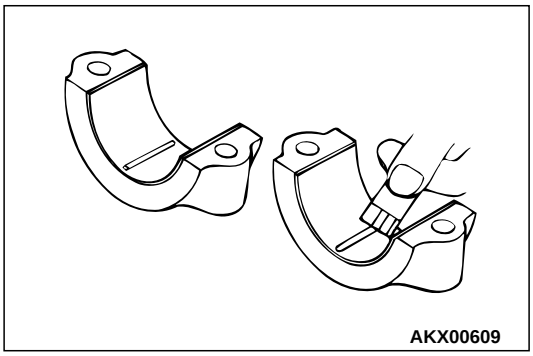
   Standard value:
   Number 1: 0.30 – 0.45 mm (0.012 – 0.017 inch)
   Number 2: 0.45 – 0.60 mm (0.018 – 0.023 inch)
   Oil: 0.20 – 0.60 mm (0.008 – 0.023 inch)

   Limit:
   Number 1, Number 2: 0.8 mm (0.03 inch)
   Oil: 1.0 mm (0.03 inch)

CRANKSHAFT PIN OIL CLEARANCE <PLASTIC GAUGING MATERIAL METHOD>



1. Remove oil from the crankshaft pin and the connecting rod bearing.
2. Cut plastic gauging material to the same length as the width of the bearing and place it on the pin in parallel with its axis.



3. Install the connecting rod cap carefully and tighten the nuts to the specified torque.
4. Carefully remove the connecting rod cap.
5. Measure the width of the plastic gauging material at its widest part by using a scale printed on the plastic gauging material package.

   Standard value: 0.02 – 0.05 mm (0.0008 – 0.0019 inch)
   Limit: 0.1 mm (0.003 inch)

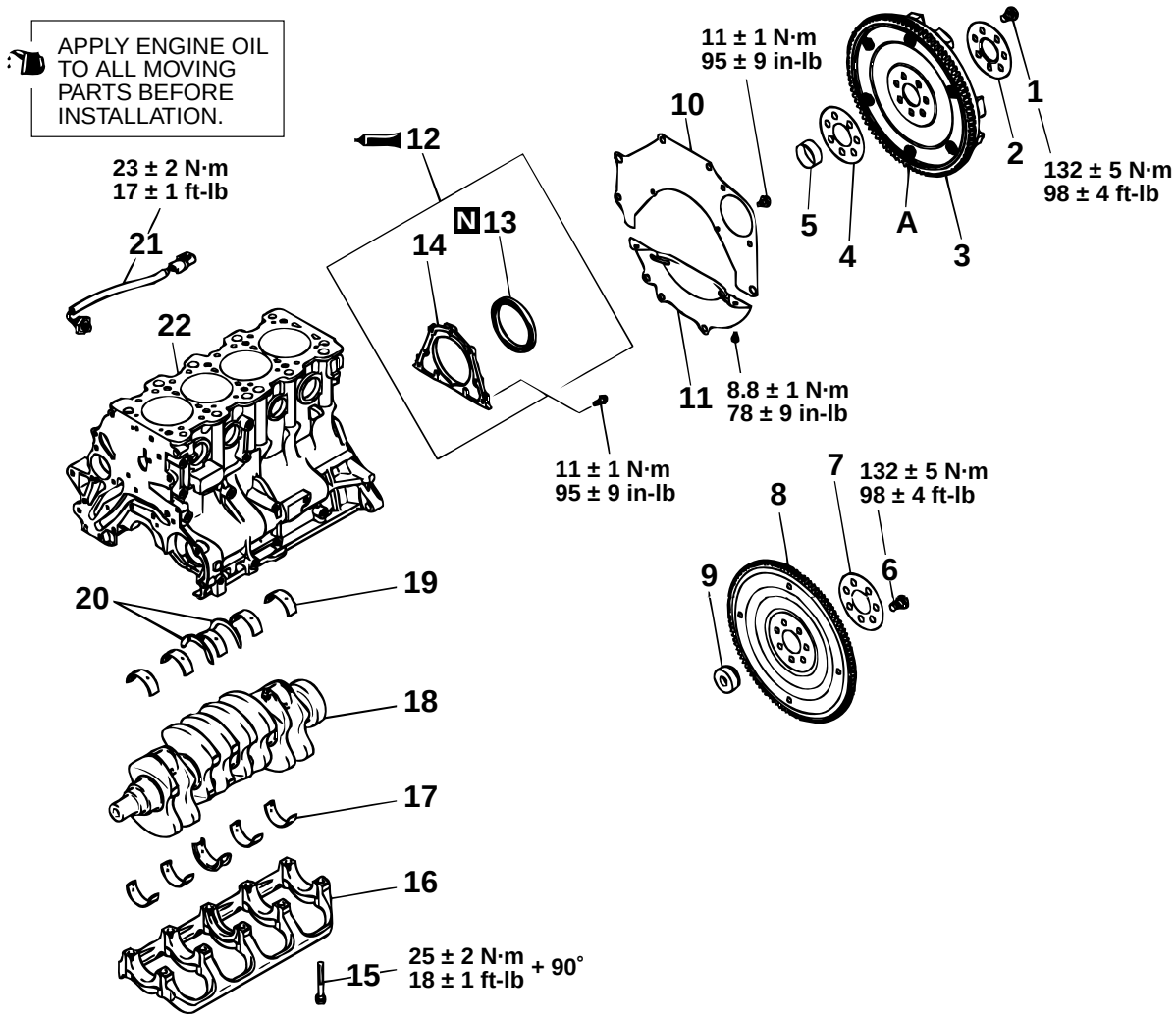
CRANKSHAFT AND CYLINDER BLOCK

REMOVAL AND INSTALLATION

M1113008700284

⚠ CAUTION

On the flexible flywheel equipped engines, do not remove any of the bolts "A" of the flywheel shown in the illustration. The balance of the flexible flywheel is adjusted in an assembled condition. Removing the bolt, therefore, can cause the flexible flywheel to be out of balance giving and resulting in damage.



AKX00512AB

REMOVAL STEPS

1. FLYWHEEL BOLT <M/T>
2. ADAPTER PLATE <M/T>
3. FLYWHEEL <M/T>
4. ADAPTER PLATE <M/T>
5. CRANKSHAFT BUSHING <M/T>
6. DRIVE PLATE BOLT <A/T>
7. ADAPTER PLATE <A/T>
8. DRIVE PLATE <A/T>
9. CRANKSHAFT BUSHING <A/T>
10. REAR PLATE
11. BELL HOUSING COVER

REMOVAL STEPS (Continued)

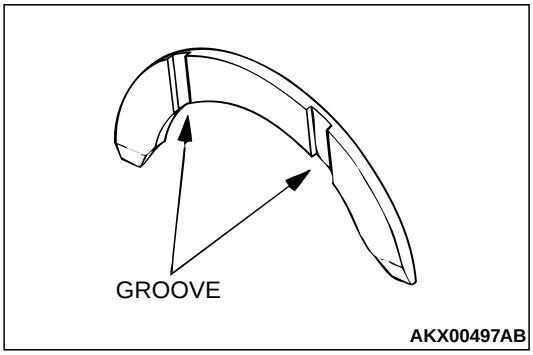
- **>>E<<** 12. OIL SEAL CASE ASSEMBLY
- **>>D<<** 13. OIL SEAL
- 14. OIL SEAL CASE
- **>>C<<** 15. BEARING CAP BOLT
- **>>C<<** 16. BEARING CAP
- **>>B<<** 17. CRANKSHAFT BEARING (LOWER)
- 18. CRANKSHAFT
- **>>B<<** 19. CRANKSHAFT BEARING (UPPER)
- **>>A<<** 20. CRANKSHAFT THRUST BEARING
- 21. KNOCK SENSOR
- 22. CYLINDER BLOCK

TSB Revision

Required Special Tools:

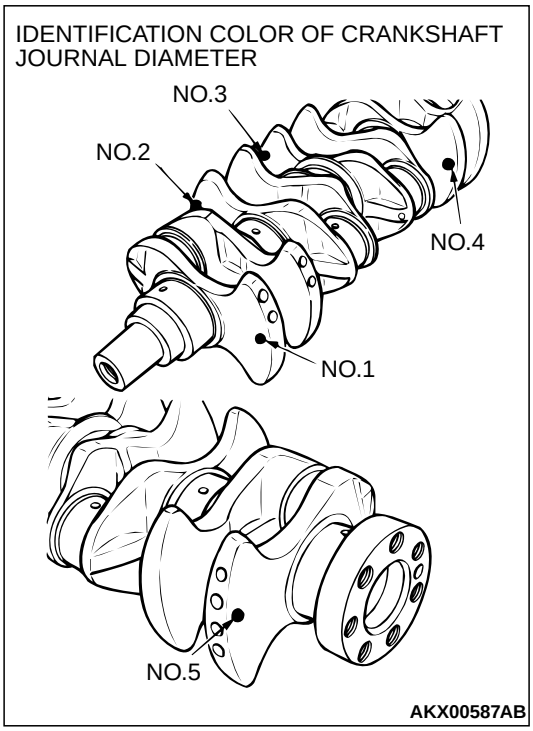
- MB990938: Handle
- MD998776: Crankshaft Rear Oil Seal Installer

INSTALLATION SERVICE POINTS



>>A<< CRANKSHAFT THRUST BEARING INSTALLATION

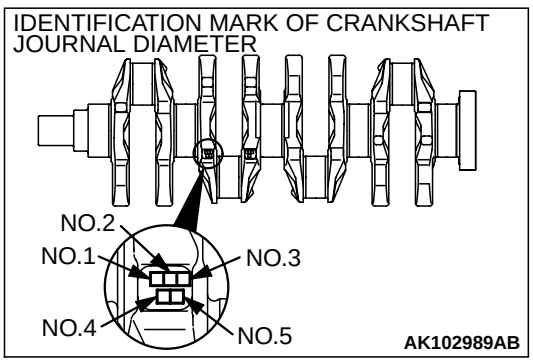
1. Install the two thrust bearings in the number 3 bearing bore in the cylinder block. For easier installation, apply engine oil to the bearings; this will help hold them in position.
2. The thrust bearings must be installed with their groove side toward the crankshaft web.

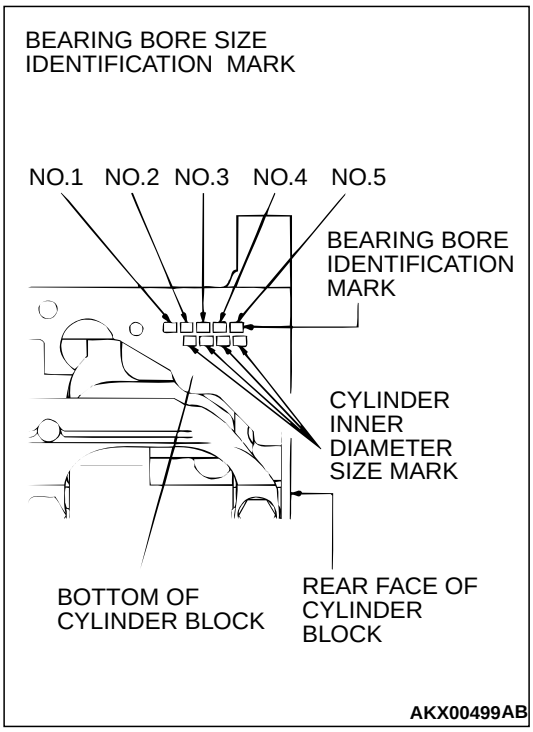


>>B<< CRANKSHAFT BEARING INSTALLATION

When bearing replacement is required, select and install the correct bearing by the following procedure.

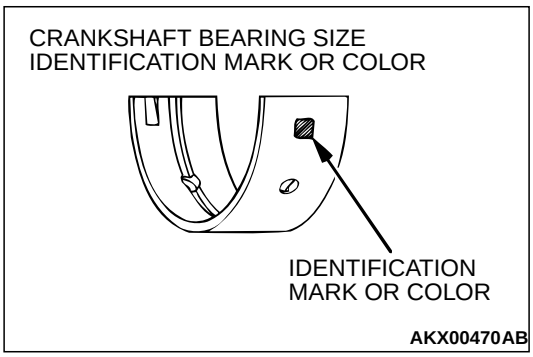
1. Measure the crankshaft journal diameter and confirm its classification from the following table. In the case of a crankshaft supplied as a service part, identification colors/ marks of its journals are painted/stamped at the positions shown in the illustration.





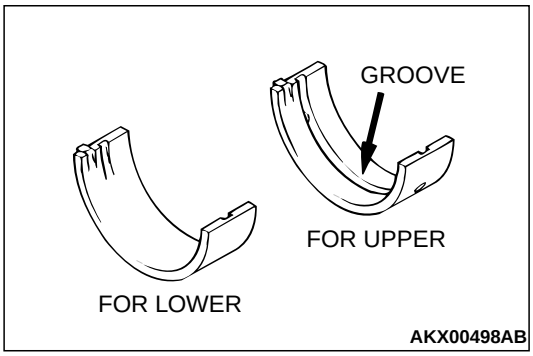
2. The cylinder block bearing bore diameter identification marks are stamped at the position shown in the illustration from left to right, beginning at No.1.

CRANKSHAFT JOURNAL OUTSIDE DIAMETER		CYLINDER BLOCK BEARING BORE	CRANKSHAFT BEARING	CRANKSHAFT BEARING FOR NO.3
IDENTIFICATION MARK OR COLOR	SIZE mm (in)	IDENTIFICATION MARK	IDENTIFICATION MARK OR COLOR	IDENTIFICATION MARK OR COLOR
0 or Yellow	56.994 – 57.000 (2.2439 – 2.2441)	0	1 or Green	0 or Black
		1	2 or Yellow	1 or Green
		2	3 or None	2 or Yellow
1 or None	56.988 – 56.994 (2.2436 – 2.2439)	0	2 or Yellow	1 or Green
		1	3 or None	2 or Yellow
		2	4 or Blue	3 or None
2 or White	56.982 – 56.988 (2.2438 – 2.2436)	0	3 or None	2 or Yellow
		1	4 or Blue	3 or None
		2	5 or Red	4 or Blue



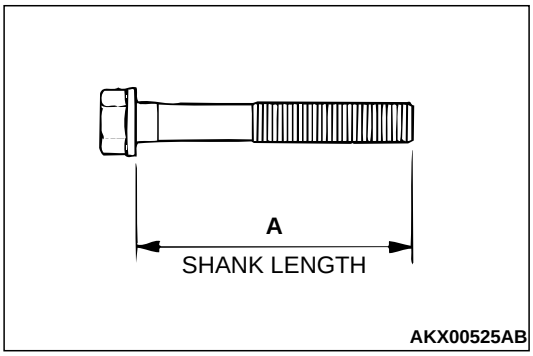
For example, if the crankshaft journal outside diameter identification mark is "0" or identification color is "Yellow" and cylinder block bearing bore identification mark is "1," select a bearing whose identification mark is "2" or identification color is "Yellow" for number 1, 2, 4 and 5, and a bearing whose identification mark is "1" or identification color is "Green" for number 3.
If there is no identification color paint or no identification mark on the crankshaft, measure the journal outside diameter and select a bearing appropriate for the measured value.

TSB Revision



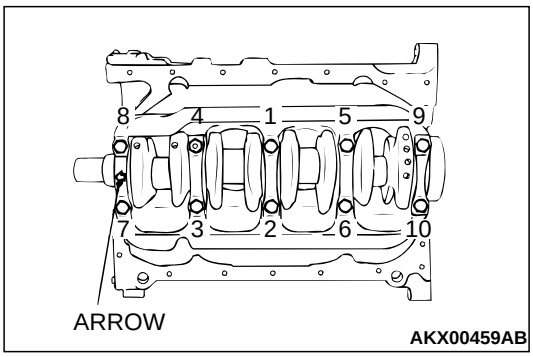
3. Install the bearings having an oil groove to the cylinder block.
4. Install the bearings having no oil groove to the bearing cap.

>>C<< BEARING CAP/BEARING CAP BOLT INSTALLATION

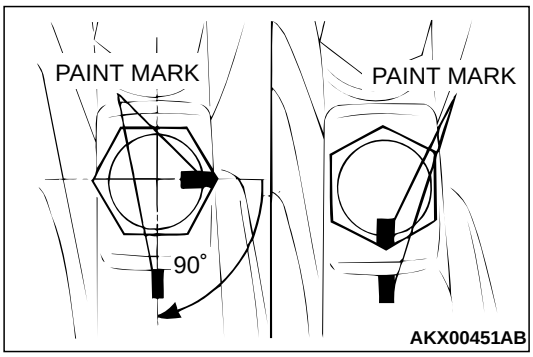


1. Install the bearing caps so that the arrow points to the timing belt side.
2. Before installing the bearing cap bolts, check that the shank length of each bolt meets the limit. If it exceeds the limit, replace the bolt.

   Limit (A): 71.1 mm (2.79 inches)
3. Apply engine oil to the threaded portion and bearing surface of the bolt.



4. Tighten the bolts to 25 ± 2 N·m (18 ± 1 ft-lb) in the tightening sequence shown.

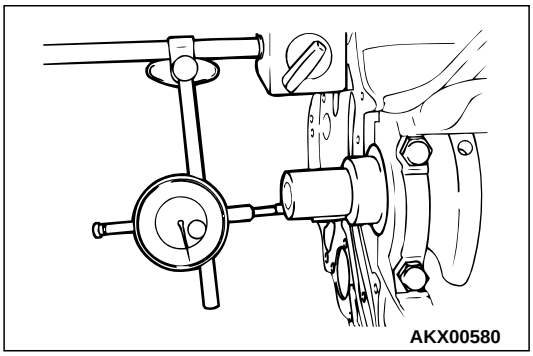


5. Make a paint mark on the head of each bolt.
6. Make a paint mark on the bearing cap at the position 90 degree angle from the paint mark made on the bolt in the direction of tightening the bolt.

⚠ CAUTION

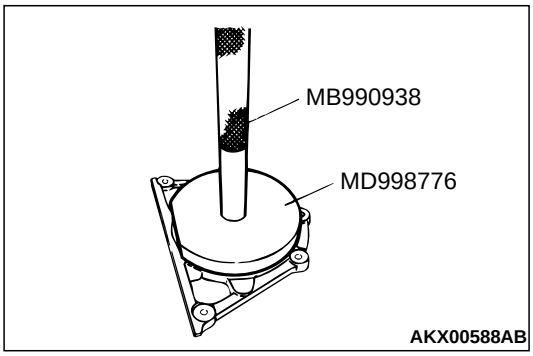
- **If the bolt is overtightened, loosen the bolt completely and then retighten it by repeating the tightening procedure from step 4.**
- **If the bolt is turned less than 90 degree angle, proper fastening performance may not be achieved. Be sure to turn the bolt exactly 90 degree angle.**

7. Turn each bolt 90 degree angle in the tightening sequence specified in step 4, and make sure that the paint marks on the bolt and cap are aligned.


AKX00580

8. Make sure that the crankshaft turns smoothly and the end play is correct. If the end play exceeds the limit, replace the number 3 crankshaft bearings.

   Standard value: 0.05 – 0.25 mm (0.002 – 0.009 inch)
   Limit: 0.40 mm (0.0015 inch)



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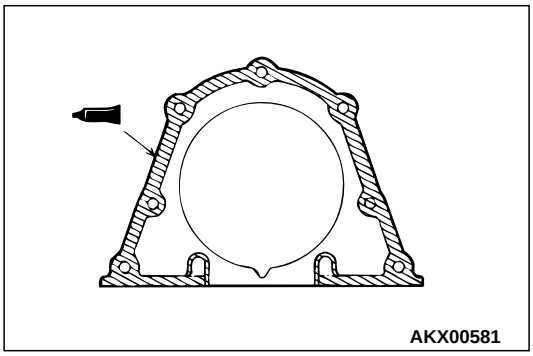
>>D<< OIL SEAL INSTALLATION

Using special tools MD998776 and MB990938, press-fit the oil seal in the case.


AKX00581

>>E<< SEALANT APPLICATION TO OIL SEAL CASE

1. Apply sealant MITSUBISHI Genuine Part number MD970389 or equivalent to the gasket surface of oil seal case.

   NOTE: Be sure to install the case quickly while the sealant is wet (within 15 minutes).

2. Apply engine oil to the oil seal lip, and then install the oil seal case onto the cylinder block.

   NOTE: After installation, keep the sealed area away from the oil for approximately one hour.

INSPECTION

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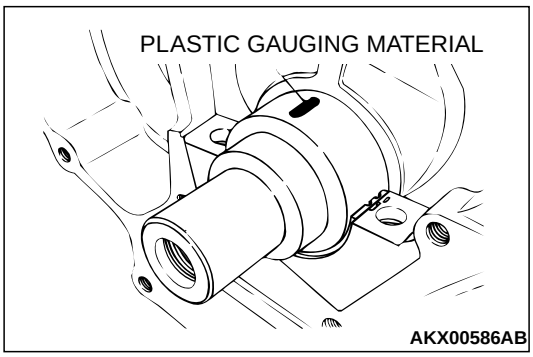
CRANKSHAFT JOURNAL OIL CLEARANCE <PLASTIC GAUGING MATERIAL METHOD>



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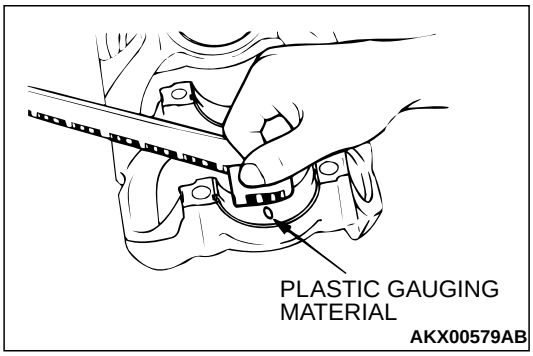
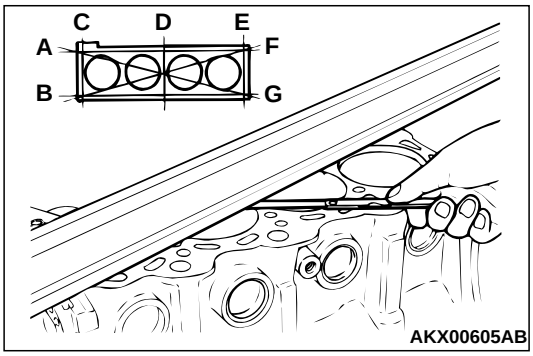
1. Remove oil from the crankshaft journal and crankshaft bearing.
2. Install the crankshaft.
3. Cut the plastic gauging material to the same length as the width of bearing and place it on journal in parallel with its axis.



4. Install the crankshaft bearing cap carefully and tighten the bolts to the specified torque.
5. Carefully remove the crankshaft bearing cap.
6. Measure the width of the plastic gauging material at its widest part by using a scale printed on the plastic gauging material package.

   Standard value: 0.02 – 0.04 mm (0.0008 – 0.0015 inch)
   Limit: 0.1 mm (0.003 inch)



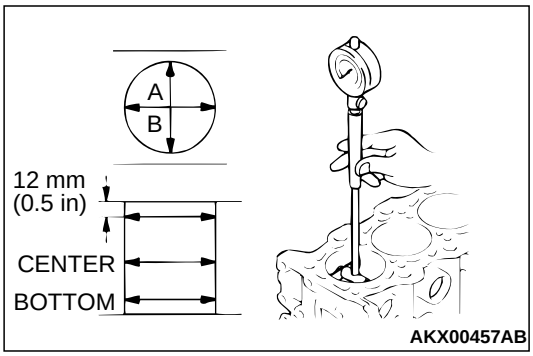
CYLINDER BLOCK

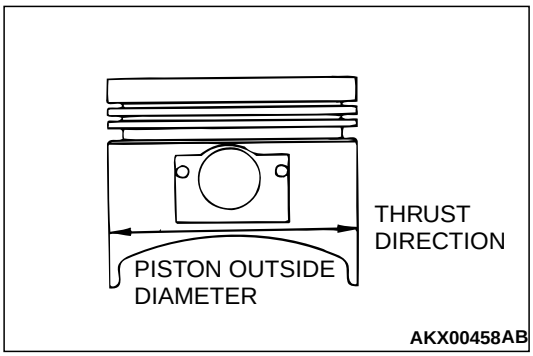
1. Visually check for scratches, rust, and corrosion.
   Use also a flaw detecting agent for the check. If defects are evident, correct or replace.
2. Using a straightedge and feeler gauge, check the block top surface for war page. Make sure that the surface is free from gasket chips and other foreign matter.

   Standard value: 0.05 mm (0.0020 inch)
   Limit: 0.1 mm (0.003 inch)
3. If the distortion is excessive, correct within the allowable limit or replace.

   Grinding limit: 0.2 mm (0.007 inch)
   ***Includes/combined with cylinder head grinding**
   Cylinder block height (when new):
   290 mm (11.4 inches)
4. Check cylinder walls for scratches and seizure. If defects are evident, replace or bore to oversize and replace pistons and piston rings.
5. Using a cylinder gauge, measure the cylinder bore and cylindrically. If worn badly, correct the cylinder to an oversize and replace the piston and piston rings. Measure at the points shown in the illustration.

   Standard value:
   Cylinder inner diameter 86.50 mm (3.41 inches)
   Cylindrically 0.01 mm (0.0003 inch) or less





BORING CYLINDER

1. Oversize pistons to be used should be determined on the basis of the largest bore cylinder.

Piston size identification

SIZE	IDENTIFICATION MARK
0.50 mm (0.020 in) oversize diameter	50
1.00 mm (0.040 in) oversize diameter	100

NOTE: Size mark is stamped on the piston top.

2. Measure the outside diameter (OD) of the piston to be used. Measure it in thrust direction as shown.
3. Based on the measured piston OD, calculate the boring finish dimension.

   Boring finish dimension = Piston OD + (clearance between piston OD and cylinder) − 0.02 mm (0.0008 inch) (honing margin)

⚠ CAUTION

To prevent distortion that may result from temperature rise during honing, bore cylinders, working from number 2 to number 4 to number 1 to number 3.

4. Bore all cylinders to the calculated boring finish dimension.
5. Hone to the final finish dimension (piston OD + clearance between piston OD and cylinder).
6. Check the clearance between the piston and cylinder.

   Clearance between piston and cylinder: 0.02 − 0.04 mm (0.0008 − 0.0015 inch)

   NOTE: When boring cylinders, finish all of four cylinders to the same oversize. Do not bore only one cylinder to an oversize.

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1113023400279

ITEMS	SPECIFICATIONS
Generator and drive belt	
Adjusting bolt	5 ± 1 N·m (43 ± 9 in-lb)
Adjusting nut lock bolt	23 ± 2 N·m (17 ± 1 ft-lb)
Camshaft position sensing cylinder bolt	22 ± 4 N·m (16 ± 3 ft-lb)
Camshaft position sensor bolt	8.8 ± 1 N·m (78 ± 9 in-lb)
Camshaft position sensor support bolt	14 ± 1 N·m (122 ± 9 in-lb)
Crankshaft pulley bolt	25 ± 5 N·m (18 ± 4 ft-lb)
Generator brace bolt	24 ± 3 N·m (17 ± 2 ft-lb)
Generator pivot bolt nut	44 ± 10 N·m (33 ± 7 ft-lb)
Ignition coil bolt	10 ± 2 N·m (87 ± 17 in-lb)
Spark plugs	25 ± 5 N·m (18 ± 4 ft-lb)
Water pump pulley bolt	8.8 ± 1 N·m (78 ± 9 in-lb)
Timing belt	
Auto-tensioner bolt	24 ± 3 N·m (17 ± 2 ft-lb)
Camshaft sprocket bolt	88 ± 10 N·m (65 ± 7 ft-lb)
Counterbalance shaft sprocket bolt	45 ± 3 N·m (33 ± 2 ft-lb)
Crankshaft bolt	162 ± 5 N·m (119 ± 4 ft-lb)
Crankshaft position sensor bolt	8.8 ± 1 N·m (78 ± 9 in-lb)
Engine support bracket bolt and nut	49 ± 5 N·m (36 ± 4 ft-lb)
Idler pulley bolt	44 ± 5 N·m (33 ± 4 ft-lb)
Oil pump sprocket nut	35 ± 6 N·m (26 ± 4 ft-lb)
Power steering pump bolt	49 ± 5 N·m (36 ± 4 ft-lb)
Tensioner arm bolt	22 ± 4 N·m (16 ± 3 ft-lb)
Tensioner B bolt	19 ± 3 N·m (14 ± 2 ft-lb)
Tensioner pulley bolt	48 ± 6 N·m (35 ± 4 ft-lb)
Timing belt cover flange bolt M6	11 ± 1 N·m (95 ± 9 in-lb)
Timing belt cover flange bolt M8	14 ± 1 N·m (122 ± 9 in-lb)
Timing belt cover washer assembled bolt	8.8 ± 1 N·m (78 ± 9 in-lb)
Fuel and emission control parts	
EGR valve bolt	19 ± 3 N·m (14 ± 2 ft-lb)
Fuel pressure regulator bolt	8.8 ± 2 N·m (78 ± 17 in-lb)
Injectors and fuel rail bolt	12 ± 1 N·m (104 ± 9 in-lb)
Throttle body bolt	19 ± 3 N·m (14 ± 2 ft-lb)
Throttle body stay bolt	19 ± 3 N·m (14 ± 2 ft-lb)
Water pump and intake manifold	
Engine coolant temperature gauge unit	11 ± 1 N·m (95 ± 9 in-lb)
Engine coolant temperature sensor	29 ± 10 N·m (22 ± 7 ft-lb)
Engine hanger bolt	19 ± 3 N·m (14 ± 2 ft-lb)

TSB Revision

ITEMS	SPECIFICATIONS
Intake manifold plenum bolt and nut	20 ± 2 N·m (14 ± 1 ft-lb)
Intake manifold plenum stay M8	21 ± 4 N·m (15 ± 3 ft-lb)
Intake manifold plenum stay M10	30 ± 3 N·m (22 ± 2 ft-lb)
Manifold differential pressure sensor bolt	4.9 ± 1 N·m (43 ± 9 in-lb)
Oil dipstick guide bolt	14 ± 1 N·m (122 ± 9 in-lb)
Thermostat housing bolt	24 ± 4 N·m (17 ± 3 ft-lb)
Water inlet fitting bolt	13 ± 2 N·m (113 ± 17 in-lb)
Water inlet pipe bolt	13 ± 2 N·m (113 ± 17 in-lb)
Water pump bolt	14 ± 1 N·m (122 ± 9 in-lb)
Exhaust manifold	
Exhaust manifold bracket bolt	35 ± 6 N·m (26 ± 4 ft-lb)
Exhaust manifold cover bolt	14 ± 1 N·m (122 ± 9 in-lb)
Exhaust manifold nut M8	29 ± 3 N·m (22 ± 2 ft-lb)
Exhaust manifold nut M10	49 ± 5 N·m (36 ± 4 ft-lb)
Heat protector bolt	14 ± 1 N·m (122 ± 9 in-lb)
Oxygen sensor	44 ± 5 N·m (32 ± 4 ft-lb)
Water outlet fitting bolt	13 ± 2 N·m (113 ± 17 in-lb)
Rocker arms and camshaft	
PCV valve	10 ± 2 N·m (87 ± 17 in-lb)
Rocker cover bolt	3.5 ± 0.5 N·m (30 ± 4 in-lb)
Rocker arm shaft bolt	31 ± 3 N·m (23 ± 2 ft-lb)
Cylinder head and valve	
Cylinder head bolt [Tighten to 78 N·m (58 ft-lb) and then completely before tightening to final torque specification]	25 N·m (14 ft-lb) + 90° + 90°
Front case, counterbalance shaft and oil pan	
Drain plug	39 ± 5 N·m (29 ± 4 ft-lb)
Flange bolt	36 ± 3 N·m (27 ± 2 ft-lb)
Front case bolt	24 ± 3 N·m (17 ± 2 ft-lb)
Oil filter part number MD360935	14 ± 2 N·m (122 ± 17 in-lb)
Oil filter other than MITSUBISHI genuine filter	17 ± 2 N·m (13 ± 1 ft-lb)
Oil filter bracket bolt	19 ± 3 N·m (14 ± 2 ft-lb)
Oil pan bolt	6.9 ± 1 N·m (61 ± 9 in-lb)
Oil pressure switch	11 ± 1 N·m (95 ± 9 in-lb)
Oil pump cover bolt	17 ± 1 N·m (12 ± 1 ft-lb)
Oil pump cover screw	9.8 ± 2 N·m (87 ± 17 in-lb)
Oil screen bolt	19 ± 3 N·m (14 ± 3 ft-lb)
Plug	24 ± 3 N·m (17 ± 3 ft-lb)
Relief plug	44 ± 5 N·m (33 ± 4 ft-lb)
Piston and connecting rod	
Connecting rod cap nut	20 ± 2 N·m (14 ± 1 ft-lb) + 90°to 94°

ITEMS	SPECIFICATIONS
Crankshaft and cylinder block	
Bearing cap bolt	25 ± 2 N·m (18 ± 1 ft-lb) + 90°
Bell housing cover bolt	8.8 ± 1 N·m (78 ± 9 in-lb)
Drive plate bolt	132 ± 5 N·m (98 ± 4 ft-lb)
Flywheel bolt	132 ± 5 N·m (98 ± 4 ft-lb)
Knock sensor	23 ± 2 N·m (17 ± 1 ft-lb)
Oil seal case bolt	11 ± 1 N·m (95 ± 9 in-lb)
Rear plate bolt	11 ± 1 N·m (95 ± 9 in-lb)

GENERAL SPECIFICATIONS

M1113000200058

DESCRIPTIONS			SPECIFICATIONS
Type			In-line OHV, SOHC
Number of cylinders			4
Combustion chamber			Pent roof type
Total displacement cm^3 (cu. in)			2,350 (143.4)
Cylinder bore (in)			86.5 (3.41)
Piston stroke mm (in)			100.0 (3.94)
Compression ratio			9.5
Valve timing	Intake valve	Opens (BTDC)	16°
		Closes (ABDC)	60° <M/T>, 53° <A/T>
	Exhaust valve	Opens (BBDC)	60° <M/T>, 50° <A/T>
		Closes (ATDC)	16°
Lubrication system			Pressure feed, full-flow filtration
Oil pump type			Involute gear type

SERVICE SPECIFICATIONS

M1113000300055

ITEM			STANDARD VALUE	LIMIT
Timing belt				
Auto-tensioner rod projection length mm (in)			12 (0.5)	–
Auto-tensioner rod pushed-in amount [When pushed with a force of 98 – 196 N (22 – 44 lb)] mm (in)			1.0 (0.03) or less	–
Rocker arms and camshaft				
Camshaft cam height mm (in)	Intake		37.39 (1.472)	Minimum 36.89 (1.452)
	Exhaust	M/T	37.14 (1.462)	Minimum 36.64 (1.443)
		A/T	36.83 (1.450)	Minimum 36.33 (1.430)
Camshaft journal outside diameter mm (in)			45 (1.8)	–
Cylinder head and valves				
Cylinder head flatness of gasket surface mm (in)			Less than 0.05 (0.002)	0.2 (0.007)

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ITEM		STANDARD VALUE	LIMIT
Cylinder head grinding limit of gasket surface mm (in) (Total resurfacing depth of cylinder head and cylinder block)		–	0.2 (0.007)
Cylinder head overall height mm (in)		120 (4.7)	–
Cylinder head bolt shank length mm (in)		–	99.4 (3.91)
Valve thickness of valve head (margin)	Intake	1.0 (0.03)	Minimum 0.5 (0.02)
	Exhaust	1.2 (0.04)	Minimum 0.7 (0.03)
Valve overall height mm (in)	Intake	112.30 (4.421)	Minimum 111.80 (4.402)
	Exhaust	114.11 (4.493)	Minimum 113.61 (4.473)
Valve stem outside diameter mm (in)	Intake	6.0 (0.24)	–
	Exhaust	5.9 (0.23)	–
Valve thickness to valve guide clearance mm (in)	Intake	0.02 – 0.05 (0.0008 – 0.0019)	0.10 (0.003)
	Exhaust	0.03 – 0.07 (0.0012 – 0.0027)	0.15 (0.005)
Valve face angle mm (in)		45° – 45.5°	–
Valve spring free length mm (in)		51.0 (2.00)	Minimum 50.0 (1.97)
Valve spring load/installed height N (lb)/mm (in)		267 (60)/44.2 (1.74)	–
Valve spring out-of-squareness		2° or less	4°
Valve seat valve contact width mm (in)		0.9 – 1.3 (0.04 – 0.05)	–
Valve guide inside diameter mm (in)		6.0 (0.24)	–
Valve guide projection from cylinder head upper surface mm (in)		14.0 (0.55)	–
Valve stem projection mm (in)		49.30 (1.941)	49.80 (1.960)
Oversize rework dimensions of valve guide hole mm (in)	0.05 oversize diameter	11.05 – 11.07 (0.4429 – 0.4437)	–
	0.25 oversize diameter	11.25 – 11.27 (0.4429 – 0.4437)	–
	0.50 oversize diameter	11.50 – 11.52 (0.4528 – 0.4535)	–
Intake oversize rework dimensions of valve seat hole mm (in)	0.3 oversize diameter	34.30 – 34.33 (1.3504 – 1.3515)	–
	0.6 oversize diameter	34.60 – 34.63 (1.3623 – 1.3633)	–
Exhaust oversize rework dimensions of valve seat hole mm (in)	0.3 oversize diameter	31.80 – 31.83 (1.2520 – 1.2531)	–
	0.6 oversize diameter	32.10 – 32.13 (1.2638 – 1.2650)	–

ITEM		STANDARD VALUE	LIMIT
Front case, counterbalance shaft and oil pan			
Oil pump side clearance mm (in)	Drive gear	0.08 – 0.14 (0.004 – 0.005)	–
	Driven gear	0.06 – 0.12 (0.003 – 0.004)	–
Oil pressure at curb idle speed kPa (psi) [Oil temperature is 75 to 90°C (167 to 194°F)]		78 (11.4) or more	–
Piston and connecting rod			
Piston outside diameter mm (in)		86.5 (3.40)	–
Piston ring side clearance mm (in)	No.1	0.02 – 0.06 (0.0008 – 0.0023)	0.1 (0.003)
	No.2	0.02 – 0.06 (0.0012 – 0.0023)	0.1 (0.003)
Piston ring end gap mm (in)	No.1	0.25 – 0.35 (0.010 – 0.013)	0.8 (0.03)
	No.2	0.40 – 0.55 (0.016 – 0.021)	0.8 (0.03)
	Oil ring side rail	0.10 – 0.40 (0.004 – 0.015)	1.0 (0.03)
Piston pin outside diameter mm (in)		22.0 (0.87)	–
Piston pin press-in load N (lb) (Room temperature)		7,350 – 17,200 (1,653 – 3,866)	–
Crankshaft pin oil clearance mm (in)		0.02 – 0.05 (0.0008 – 0.0019)	0.1 (0.003)
Connecting rod big end side clearance mm (in)		0.10 – 0.25 (0.004 – 0.009)	0.4 (0.015)
Crankshaft and cylinder block			
Crankshaft end play mm (in)		0.05 – 0.25 (0.002 – 0.009)	0.40 (0.015)
Crankshaft journal outside diameter mm (in)		57.0 (2.24)	–
Crankshaft pin outside diameter mm (in)		45.0 (1.77)	–
Crankshaft journal oil clearance mm (in)		0.02 – 0.04 (0.0008 – 0.0015)	0.1 (0.003)
Bearing cap bolt shank length mm (in)		–	71.1 (2.79)
Piston to cylinder clearance mm (in)		0.02 – 0.04 (0.0008 – 0.0015)	–
Cylinder block flatness of gasket surface mm (in)		0.05 (0.02)	0.1 (0.03)
Cylinder block grinding limit of gasket surface mm (in) [Total resurfacing depth of both cylinder head and cylinder block]		–	0.2 (0.007)
Cylinder block overall height mm (in)		290 (11.4)	–
Cylinder block inside diameter mm (in)		86.5 (3.41)	–
Cylindricity mm (in)		0.01 (0.0003)	–

SEALANTS

M1113000500059

ITEM	SPECIFIED SEALANT	QUANTITY
Engine support bracket seal bolt	3M™ AAD Part No. 8672 or equivalent	As required
Thermostat housing	MITSUBISHI genuine part No. MD970389 or equivalent	As required
Water outlet fitting	MITSUBISHI genuine part No. MD970389 or equivalent	As required
Engine coolant temperature sensor	3M™ AAD part No. 8731 or equivalent	As required
Engine coolant temperature gauge unit	3M™ AAD Part No. 8672 or equivalent	As required
Oil pressure switch	3M™ AAD Part No. 8672 or equivalent	As required
Oil pan	MITSUBISHI genuine part No. MD970389 or equivalent	As required
Oil seal case	MITSUBISHI genuine part No. MD970389 or equivalent	As required

GROUP 11C

ENGINE MECHANICAL <3.0L>

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GENERAL DESCRIPTION

M1111000100248

The 6G72 (3.0L) engine is a six-cylinder engine. The cylinder numbers are assigned as 1 – 3 – 5 for the right bank and 2 – 4 – 6 for the left bank from the front of the engine (timing belt side). This engine is fired in the order of the 1, 2, 3, 4, 5 and 6 cylinders.

ITEMS			SPECIFICATIONS
Type			V-type, overhead camshaft
Number of cylinders			6
Bore mm (in)			91.1 (3.59)
Stroke mm (in)			76.0 (2.99)
Piston displacement cm^3 (cu. in)			2,972 (181.4)
Compression ratio <without VIC>			9.0
Compression ratio <with VIC>			10.0
Firing order			1 – 2 – 3 – 4 – 5 – 6
Valve timing <without VIC>	Intake valve	Opens (BTDC)	15°
		Closes (ABDC)	53°
	Exhaust valve	Opens (BBDC)	53°
		Closes (ATDC)	15°
Valve timing <with VIC>	Intake valve	Opens (BTDC)	7°
		Closes (ABDC)	61°
	Exhaust valve	Opens (BBDC)	57°
		Closes (ATDC)	15°

ENGINE DIAGNOSIS

M1111000700080

SYMPTOMS	PROBABLE CAUSE	REMEDY
Compression is too low	Blown cylinder head gasket	Replace the gasket.
	Worn or damaged piston rings	Replace the rings.
	Worn piston or cylinder	Repair or replace the piston and/or the cylinder block.
	Worn or damaged valve seat	Repair or replace the valve and/or the seat ring
Drop in oil pressure	Engine oil level is too low	Check the engine oil level.
	Malfunction of oil pressure switch	Replace the oil pressure switch.
	Clogged oil filter	Install a new filter.
	Worn oil pump gears or cover	Replace the gears and/or the cover.
	Thin or diluted engine oil	Change the engine oil to the correct viscosity.
	Stuck (opened) oil relief valve	Repair the relief valve.
	Excessive bearing clearance	Replace the bearings.
Oil pressure too high	Stuck (closed) oil relief valve	Repair the relief valve.

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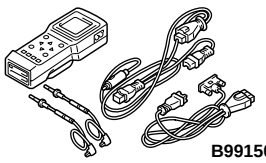
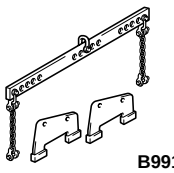
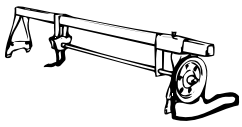
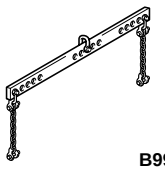
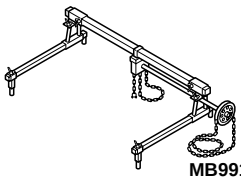
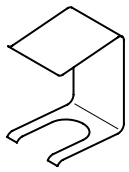
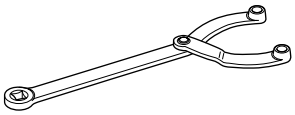
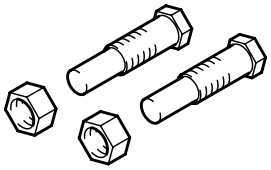
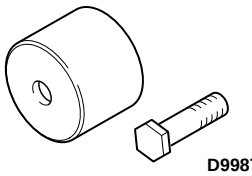
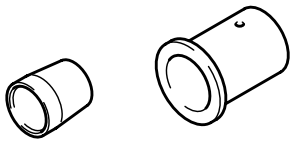
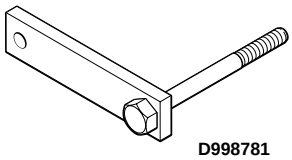
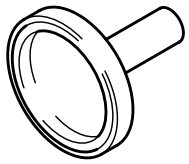
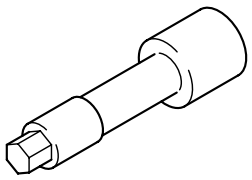
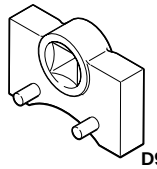
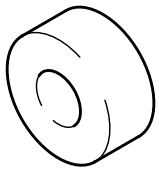
SYMPTOMS	PROBABLE CAUSE	REMEDY
Noisy valves	Malfunction of lash adjuster (including entry of air into high pressure chamber)	Check the lash adjuster.
	Thin or diluted engine oil (low oil pressure)	Change the engine oil.
	Worn or damaged valve stem or valve guide	Replace the valve and/or the guide.
Connecting rod noise/ main bearing noise	Insufficient oil supply	Check the engine oil level.
	Thin or diluted engine oil	Change the engine oil.
	Excessive bearing clearance	Replace the bearings.

SPECIAL TOOLS

M1111000600328

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 B991502	MB991502 Scan tool (MUT-II)	MB991496-OD	• Ignition timing check • Idle speed check
 B991453	MB991453 Engine hanger attachment set	MZ203827-01	When an engine lifer is used: Supporting the engine assembly during remove and installation of the transaxle
 MZ203827	GENERAL SERVICE TOOL MZ203827 Engine lifter	MZ203827-01	
 B991454	MB991454 Engine hanger balancer	MZ203827-01	When the engine hanger is used: Supporting the engine assembly during remove and installation of the transaxle *NOTE: Special tool MB991454 is a part of engine hanger attachment set MB991453.*
 MB991895	MB991895 Engine hanger	–	

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 D998443	MD998443 Lash adjuster holder (8)	MD998443-01	Supporting of the lash adjuster to prevent it from falling when rocker shaft assembly is removed or installed
 B990767	MB990767 End yoke holder	MB990767-01	Holding the camshaft sprocket and crankshaft pulley when loosening and tightening bolt
	MD998715 Crankshaft pulley holder pin	MIT308239	
 D998713	MD998713 Camshaft oil seal installer	MD998713-01	Camshaft oil seal installation
B991559	MB991559 Camshaft oil seal installer adapter	–	Camshaft oil seal installation (left bank side) (Use with MD998713)
	MD998717 Crankshaft front oil seal installer	MD998717-01	Crankshaft front oil seal installation
 D998781	MD998781 Flywheel stopper	General service tool	Flywheel <M/T> or drive plate <A/T> supporting
	MD998718 Crankshaft rear oil seal installer	MD998718-01	Crankshaft rear oil seal installation

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
	MD998051 Cylinder head bolt wrench	MD998051-01 or General service tool	Cylinder head bolt loosening and tightening
 D998767	MD998767 Tensioner pulley socket wrench	MD998752-01	Timing belt tension adjustment
	MD998769 Crankshaft sprocket spacer	General service tool	Used if the crankshaft needs to be rotated to attach the timing belt, etc.

ON VEHICLE SERVICE

DRIVE BELT TENSION CHECK AND ADJUSTMENT

M1111003100139

Refer to GROUP 00, Maintenance Service – Drive Belts (Check Condition) P.00-44.

IGNITION TIMING CHECK

M1111001700113

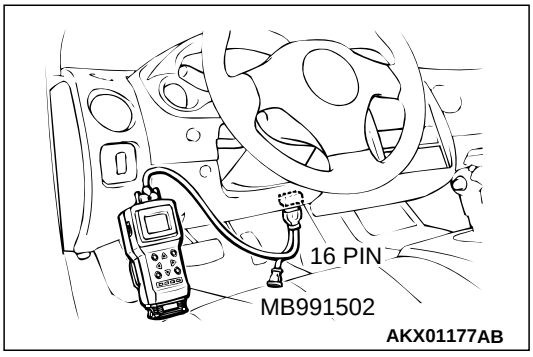
Required Special Tool:

- MB991502: Scan Tool (MUT-II)

1. Before inspection, set vehicles in the following condition:
   - Engine coolant temperature: 80 – 95°C (176 – 203°F)
   - Lights and all accessories: OFF
   - Transaxle: Neutral (P range on vehicles with A/T)

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.



2. Connect scan tool MB991502 to the data link connector.
3. Set up a timing light.
4. Start the engine and run it at idle.
5. Check that the idle speed is approximately 700 r/min.
6. Select scan tool MB991502 actuator test "item number 17".
7. Check that basic ignition timing is within the standard value.

   Standard value: 5° BTDC ± 3°

8. If the basic ignition timing is not within the standard value, check the following items:
   - Diagnosis output

- Timing belt cover and crankshaft position sensor installation conditions
- Crankshaft sensing blade condition

⚠ CAUTION

If the actuator test is not canceled, the forced drive will continue for 27 minutes. Driving in this state could lead to engine failure.

9. Press the clear key on scan tool MB991502 (select forced drive stop mode), and cancel the actuator test.
10. Check that the actual ignition timing is at the standard value.

    Standard value: Approximately 15° BTDC

    NOTE: Ignition timing fluctuates about ± 7° Before Top Dead Center, even under normal operating condition.

    NOTE: It is automatically further advanced by about 5° to 15° Before Top Dead Center at higher altitudes.

IDLE MIXTURE CHECK

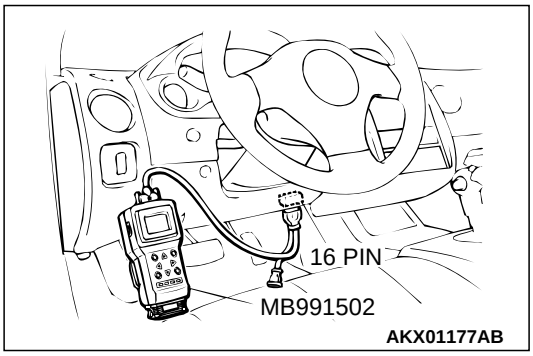
M1111002100073

Required Special Tool:
MB991502: Scan Tool (MUT-II)

1. Before inspection, set vehicles in the following condition:
   - Engine coolant temperature: 80 – 95°C (176 – 203°F)
   - Lights and all accessories: OFF
   - Transaxle: Neutral (P range on vehicles with A/T)

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.



2. Connect scan tool MB991502 to the data link connector.
3. Check that the basic ignition timing is within the standard value.

   Standard value: 5° BTDC ± 3°

4. Start the engine and increase the engine speed to 2,500 r/min for 2 minutes.
5. Set the CO, HC tester.
6. Check the CO contents and the HC contents at idle.

   Standard value:
   CO contents: 0.5 % or less
   HC contents: 100 ppm or less

7. If the CO and HC contents do not remain inside the standard value, check the following items:

   NOTE: Replace the catalytic converter when the CO and HC contents do not remain inside the standard value, even though the result of the inspection is normal for all items.

   - Diagnosis output
   - Closed-loop control (When the closed-loop control is carried out normally, the output signal of the heated oxygen sensor changes between 0 – 400 mV and 600 – 1,000 mV at idle.)
   - Fuel pressures
   - Injector

- Ignition coil, spark plug cable, spark plug
- EGR system and EGR valve leak
- Evaporative emission control system
- Compression pressure

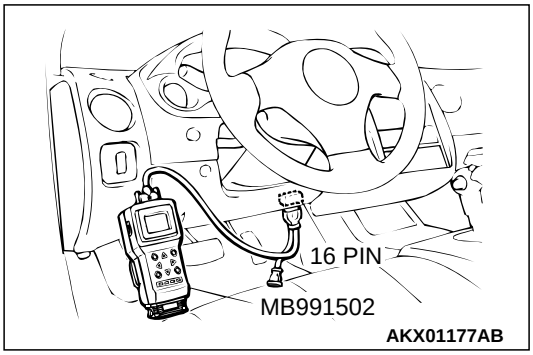
CURB IDLE SPEED CHECK

M1111003500256

Required Special Tool:
MB991502: Scan Tool (MUT-II)

1. Before inspection and adjustment set vehicles in the following condition.
   - Engine coolant temperature: 80 – 95°C (176 – 203°F)
   - Lights and all accessories: OFF
   - Transaxle: Neutral (P range on vehicles with A/T)

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.



2. Connect scan tool MB991502 to the data link connector.
3. Check the basic ignition timing.

   Standard value: 5° BTDC ± 3°

4. Start the engine.
5. Run the engine at idle for 2 minutes.
6. Check the idle speed. Select item number 22 and take a reading of the idle speed.

   Curb idle speed: 700 ± 100 r/min

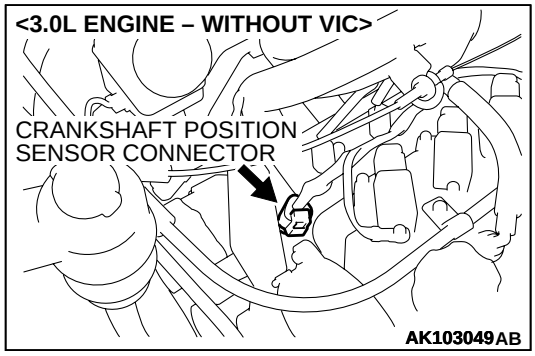
   NOTE: The idle speed is controlled automatically by the idle air control system.

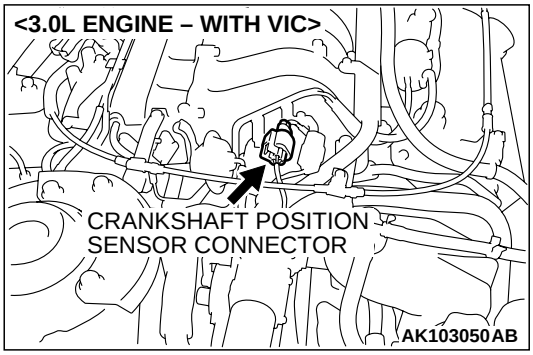
7. If the idle speed is outside the standard value, refer to GROUP 13B, Diagnosis – Symptom Chart P.13B-26.

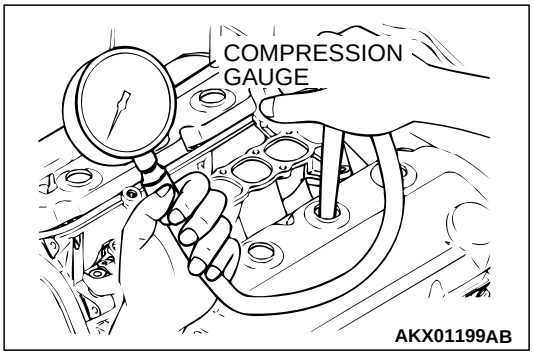
COMPRESSION PRESSURE CHECK

M1111002600227

1. Before inspection, check that the engine oil, starter and battery are normal. Also, set the vehicle in the following condition:
   - Engine coolant temperature: 80 – 95°C (176 – 203°F)
   - Lights, and all accessories: OFF
   - Transaxle: Neutral (P range on vehicles with A/T)
2. Disconnect the spark plug cables.
3. Remove all of the spark plugs.







4. Disconnect the crankshaft position sensor connector.

   NOTE: Doing this will prevent the engine control module from carrying out ignition and fuel injection.

⚠ WARNING

Keep your distance from the spark plug hole when cranking. Oil, fuel, etc., may spray out from the spark plug hole and may cause serious injury.

5. Cover the spark plug hole with a shop towel etc., during cranking. After the engine has been cranked, check for foreign material adhering to the shop towel.
6. Set compression gauge to one of the spark plug holes.
7. Crank the engine with the throttle valve fully open and measure the compression pressure.

   <without VIC>

   Standard value (at engine speed of 250 – 400 r/min): 824 kPa (119 psi)

   Minimum limit (at engine speed of 250 – 400 r/min): 575 kPa (83 psi)

   <with VIC>

   Standard value (at engine speed of 250 r/min): 1,470 kPa (212 psi)

   Minimum limit (at engine speed of 250 r/min): 1,029 kPa (149 psi)

8. Measure the compression pressure for all the cylinders, and check that the pressure differences of the cylinders are below the limit.

   Limit: 98 kPa (14 psi)

9. If there is a cylinder with compression or a compression difference that is outside the limit, pour a small amount of engine oil through the spark plug hole, and repeat the operations in steps 6 to 8.
   (1) If the compression increases after oil is added, the cause of the malfunction is a worn or damaged piston ring and/or cylinder inner surface.
   (2) If the compression does not rise after oil is added, the cause is a burnt or defective valve seat, or pressure is leaking from the gasket.
10. Connect the crankshaft position sensor connector.
11. Install the spark plugs and spark plug cables.
12. Use the scan tool to erase the diagnostic trouble codes.

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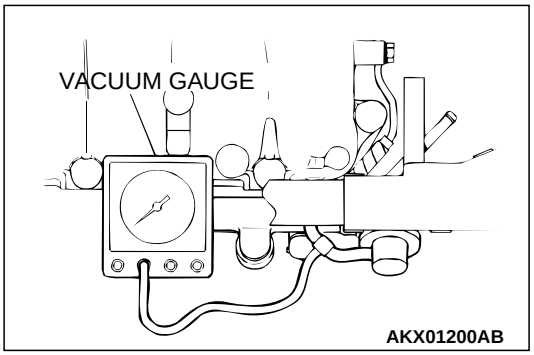
NOTE: This will erase the diagnostic trouble code resulting from the distributor connector being disconnected.

MANIFOLD VACUUM CHECK

M1111002700116



1. Before inspection, set the vehicle in the following condition
   - Engine coolant temperature: 80 – 95°C (176 – 203°F)
   - Lights, and all accessories: OFF
   - Transaxle: Neutral (P range on vehicles with A/T)
2. Connect a tachometer.
3. Attach a tee-fitting union to the vacuum hose between the fuel pressure regulator and the intake manifold plenum, and connect a vacuum gauge.
4. Start the engine and check that idle speed is within specification. Then check the vacuum gauge reading.

   Idle speed: 700 ± 100 r/min

   Minimum limit: 60 kPa (18 in Hg)

LASH ADJUSTER CHECK

M1111002900132

If an abnormal noise (chattering noise) suspected to be caused by malfunction of the lash adjuster is produced immediately after starting the engine and does not disappear, perform the following check.

NOTE: An abnormal noise due to malfunction of the lash adjuster is produced immediately after starting the engine and changes with the engine speed, irrespective of the engine load. If, the abnormal noise is not produced immediately after starting the engine or does not change with the engine speed, or it changes with the engine load, the lash adjuster is not the cause for the abnormal noise.

NOTE: When the lash adjuster is malfunctioning, the abnormal noise is rarely eliminated by continuing the warming-up of the engine at idle speed.
However, the abnormal noise may disappear only when seizure is caused by oil sludge in the engine whose oil is not maintained properly.

1. Start the engine.
2. Check if the abnormal noise produced immediately after starting the engine, changes with the change in the engine speed.

   If the abnormal noise is not produced immediately after starting the engine or it does not change with the engine speed, the lash adjuster is not the cause for the noise. Therefore, investigate other causes. The abnormal noise is probably caused by some other parts than the engine proper if it does not change with the engine speed. (In this case, the lash adjuster is in good condition.)
3. With the engine idling, change the engine load (shift from N to D range, for example) to make sure that there is no change in the level of abnormal noise.

If there is a change in the level of abnormal noise, suspect a tapping noise due to worn crankshaft bearing or connecting rod bearing. (In this case, the lash adjuster is in good condition.)

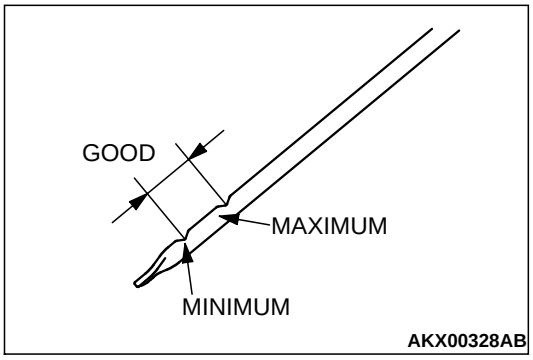
4. After completion of warm-up, run the engine at idle to check for abnormal noise.
   If the noise is reduced or disappears, clean the lash adjuster (Refer to GROUP 11D-Engine overhaul – Rocker Arms and Camshaft – Inspection P.11D-27.) As it is suspected that the noise is due to seizure of the lash adjuster. If there is no change in the level of the abnormal noise, proceed to step 5.
5. Run the engine to bleed the lash adjuster system. (Refer to.)
6. If the abnormal noise does not disappear after air bleeding operation, clean the lash adjuster (Refer to GROUP 11D-Engine overhaul – Rocker Arms and Camshaft – Inspection P.11D-27.)

Bleeding lash adjuster system

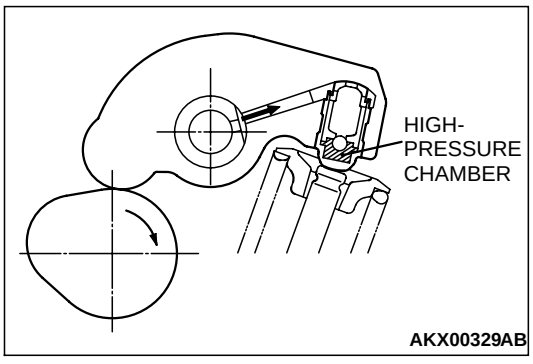
NOTE: Parking the vehicle on a grade for a long time may decrease oil in the lash adjuster, causing air to enter the high pressure chamber when starting the engine.

NOTE: After parking for many hours, oil may run out from the oil passage and take time before oil is supplied to the lash adjuster, causing air to enter the high pressure chamber.

NOTE: In the above cases, abnormal noise can be eliminated by bleeding the lash adjuster system.

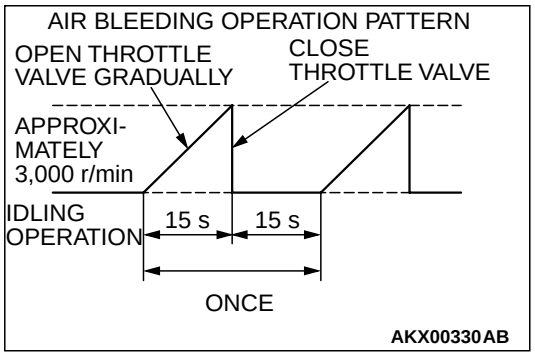


1. Check engine oil and add or change oil if required.
   NOTE: If the engine oil level is low, air is sucked from the oil screen, causing air to enter the oil passage.
   NOTE: If the engine oil level is higher than specification, oil may be stirred by the crankshaft, causing oil to be mixed with a large quantity of air.
   NOTE: If oil is deteriorated, air is not easily separated from oil, increasing the quantity of air contained in oil.



NOTE: If air mixed with oil enters the high pressure chamber inside the lash adjuster from the above causes, air in the high pressure chamber is compressed excessively while the valve is opened, resulting in an abnormal noise when the valve closes.
This is the same phenomenon as that observed when the valve clearance has become excessive. The lash adjuster can resume normal function when air entered the lash adjuster is removed.

2. Idle the engine for one to three minutes to warm it up.



3. Repeat the operation pattern, shown in left figure, at no load to check for abnormal noise. (Usually the abnormal noise is eliminated after repetition of the operation 10 to 30 times. If, however, no change is observed in the level of abnormal noise after repeating the operation more than 30 times, suspect that the abnormal noise is due to some other factors.)
4. After elimination of abnormal noise, repeat the operation shown in left figure five more times.
5. Run the engine at idle for one to three minutes to make sure that the abnormal noise has been eliminated.

ENGINE ASSEMBLY

REMOVAL AND INSTALLATION

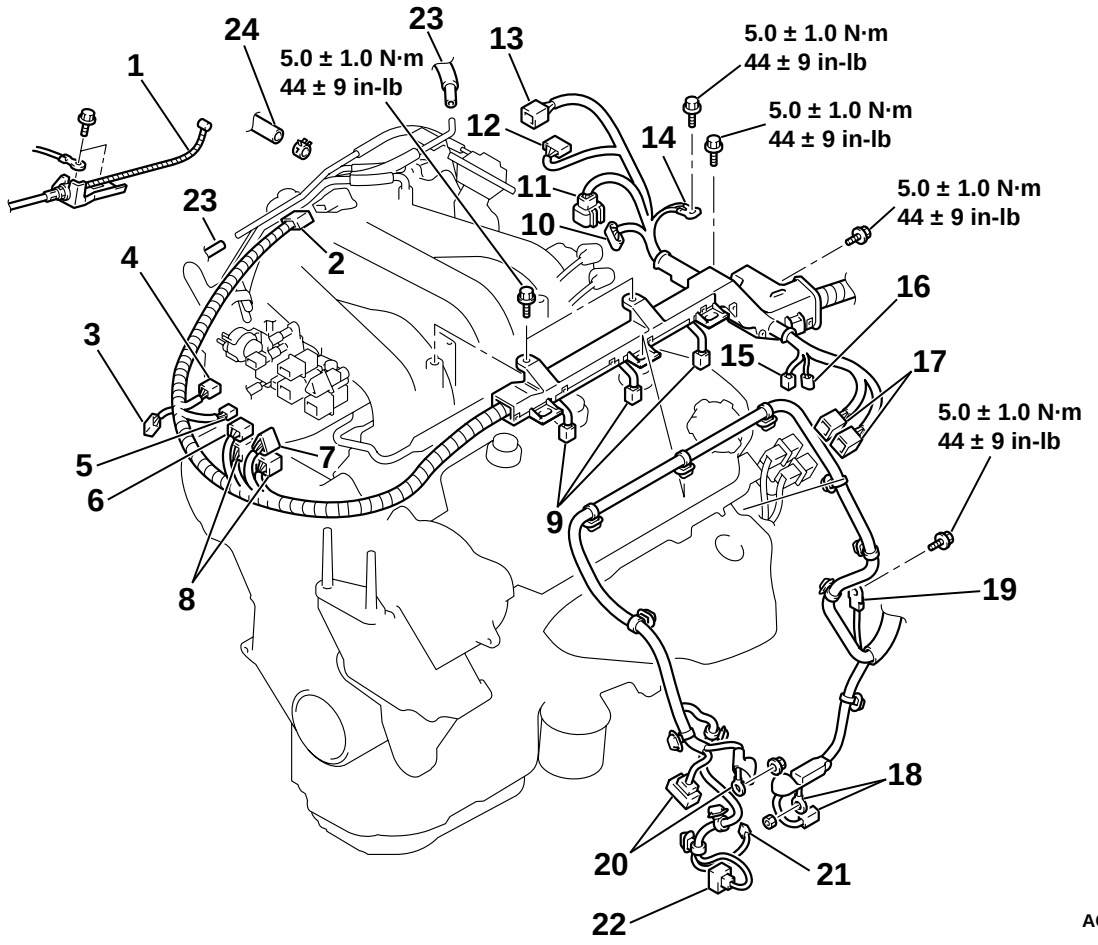
M1112001000418

<VEHICLE WITH OUT VARIABLE INDUCTION CONTOL (VIC) SYSTEM>

⚠ CAUTION

***: Indicates parts which should be temporarily tightened, and then fully tightened after placing the vehicle horizontally and loading the full weight of the engine on the vehicle body.**

Pre-removal Operation	Post-installation Operation
• Hood Removal (Refer to GROUP 42, Hood P.42-7.) • Fuel Line Pressure Reduction [Refer to GROUP 13B, On-vehicle Service – Fuel Pump Relay Disconnection (How to Reduce Pressurized Fuel Lines) P.13B-682.] • Engine Coolant Draining [Refer to GROUP 00, Maintenance Service – Engine Coolant (Change) P.00-56.] • Strut Tower Bar Removal (Refer to GROUP 42, Strut Tower Bar P.42-11.) • Air Cleaner Removal (Refer to GROUP 15, Air Cleaner P.15-6.) • Reserve Tank and Radiator Removal (Refer to GROUP 14, Radiator P.14-21.) • Front Exhaust Pipe Removal (Refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-22.)	• Front Exhaust Pipe Installation (Refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-22.) • Reserve Tank and Radiator Installation (Refer to GROUP 14, Radiator P.14-21.) • Air Cleaner Installation (Refer to GROUP 15, Air Cleaner P.15-6.) • Strut Tower Bar Installation (Refer to GROUP 42, Strut Tower Bar P.42-11.) • Drive Belt Tension Adjustment [Refer to GROUP 00 Maintenance Service – Drive Belts (Check Condition) P.00-44.] • Engine Coolant Refilling [Refer to GROUP 00, Maintenance Service – Engine Coolant (Change) P.00-56.] • Accelerator Cable Adjustment (Refer to GROUP 17, On-vehicle Service – Accelerator Cable Check and Adjustment P.17-5.) • Hood Installation (Refer to GROUP 42, Hood P.42-7.)



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REMOVAL STEPS

1. ACCELERATOR CABLE CONNECTION
2. MANIFOLD DIFFERENTIAL PRESSURE SENSOR CONNECTOR
3. CONTROL WIRING HARNESS AND POWER STEERING WIRING HARNESS COMBINATION CONNECTOR
4. EGR SOLENOID VALVE CONNECTOR
5. EVAPORATIVE EMISSION PURGE SOLENOID VALVE CONNECTOR
6. KNOCK SENSOR CONNECTOR
7. CRANKSHAFT POSITION SENSOR CONNECTOR
8. RIGHT BANK HEATED OXYGEN SENSOR CONNECTOR
9. INJECTOR CONNECTOR
10. DISTRIBUTOR CONNECTOR
11. CONTROL WIRING HARNESS AND INJECTOR WIRING HARNESS COMBINATION CONNECTOR

REMOVAL STEPS (Continued)

12. THROTTLE POSITION SENSOR CONNECTOR
13. IDLE AIR CONTROL MOTOR CONNECTOR
14. GROUND WIRE CONNECTION
15. ENGINE COOLANT TEMPERATURE GAUGE UNIT CONNECTOR
16. ENGINE COOLANT TEMPERATURE SENSOR CONNECTOR
17. LEFT BANK HEATED OXYGEN SENSOR CONNECTOR
18. STARTER CONNECTOR
19. GROUND WIRE CONNECTION
20. GENERATOR CONNECTOR
21. OIL PRESSURE SWITCH CONNECTOR
22. A/C COMPRESSOR CONNECTOR
23. VACUUM HOSE CONNECTION
24. BRAKE BOOSTER VACUUM HOSE CONNECTION

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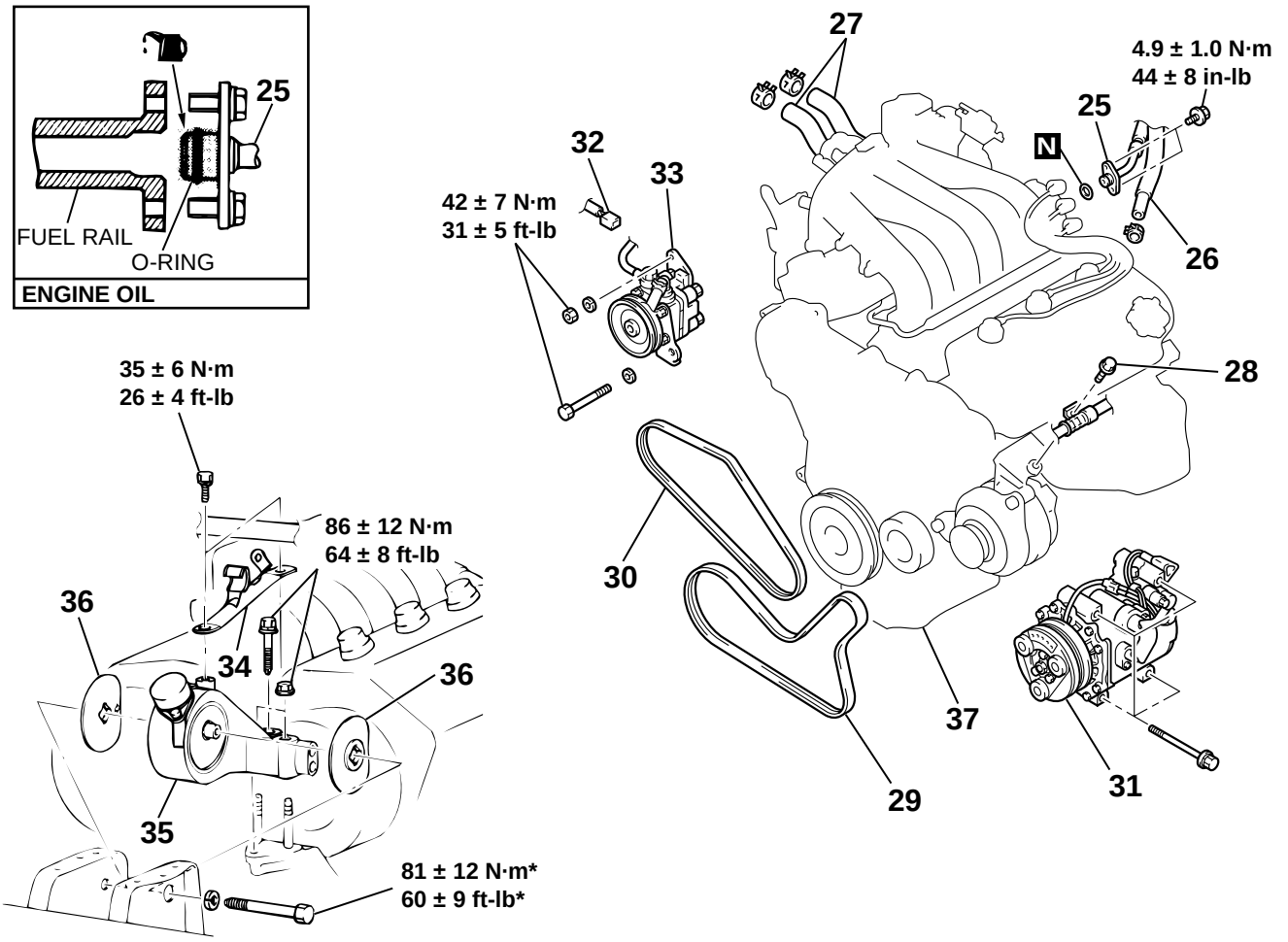


>>D<< 25. HIGH-PRESSURE FUEL HOSE CONNECTION
26. FUEL RETURN HOSE CONNECTION
27. HEATER HOSE CONNECTION
28. SUCTION HOSE CONNECTION
29. DRIVE BELT (GENERATOR AND A/C COMPRESSOR)
30. DRIVE BELT (POWER STEERING OIL PUMP)

<<A>> 31. A/C COMPRESSOR
32. POWER STEERING PRESSURE SWITCH CONNECTOR
<<B>> 33. POWER STEERING OIL PUMP
34. ENGINE MOUNT STAY
<<C>> • TRANSAXLE ASSEMBLY
<<D>> **>>C<<** 35. ENGINE MOUNT BRACKET
>>B<< 36. ENGINE MOUNT STOPPER
<<E>> **>>A<<** 37. ENGINE ASSEMBLY

Required Special Tools:

- MB991453: Engine Hanger Assembly
- MZ203827: Engine Lifter
- MB991454: Engine hanger balancer (MB991453, part of the engine hanger attachment set)
- MB991895: Engine Hanger

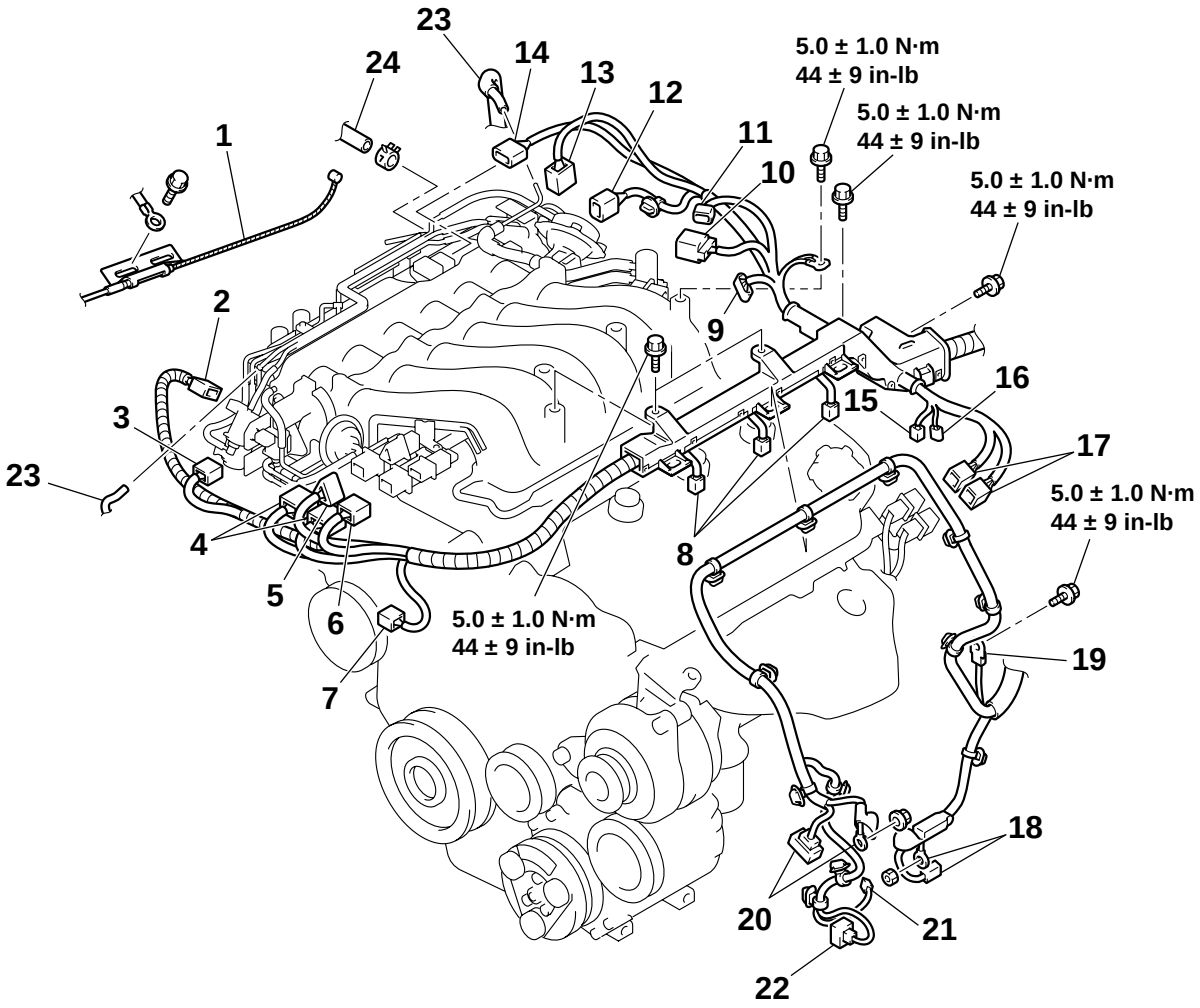
TSB Revision

<VEHICLE WITH VARIABLE INDUCTION CONTOL (VIC) SYSTEM>

⚠ CAUTION

***: Indicates parts which should be temporarily tightened, and then fully tightened after placing the vehicle horizontally and loading the full weight of the engine on the vehicle body.**

Pre-removal Operation	Post-installation Operation
• Hood Removal (Refer to GROUP 42, Hood P.42-7.) • Fuel Line Pressure Reduction [Refer to GROUP 13B, On-vehicle Service – Fuel Pump Relay Disconnection (How to Reduce Pressurized Fuel Lines) P.13B-682.] • Engine Coolant Draining [Refer to GROUP 00, Maintenance Service – Engine Coolant (Change) P.00-56.] • Strut Tower Bar Removal (Refer to GROUP 42, Strut Tower Bar P.42-11.) • Air Cleaner Removal (Refer to GROUP 15, Air Cleaner P.15-6.) • Reserve Tank and Radiator Removal (Refer to GROUP 14, Radiator P.14-21.) • Front Exhaust Pipe Removal (Refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-22.)	• Front Exhaust Pipe Installation (Refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-22.) • Reserve Tank and Radiator Installation (Refer to GROUP 14, Radiator P.14-21.) • Air Cleaner Installation (Refer to GROUP 15, Air Cleaner P.15-6.) • Strut Tower Bar Installation (Refer to GROUP 42, Strut Tower Bar P.42-11.) • Drive Belt Tension Adjustment [Refer to GROUP 00 Maintenance Service – Drive Belts (Check Condition) P.00-44.] • Engine Coolant Refilling [Refer to GROUP 00, Maintenance Service – Engine Coolant (Change) P.00-56.] • Accelerator Cable Adjustment (Refer to GROUP 17, On-vehicle Service – Accelerator Cable Check and Adjustment P.17-5.) • Hood Installation (Refer to GROUP 42, Hood P.42-7.)



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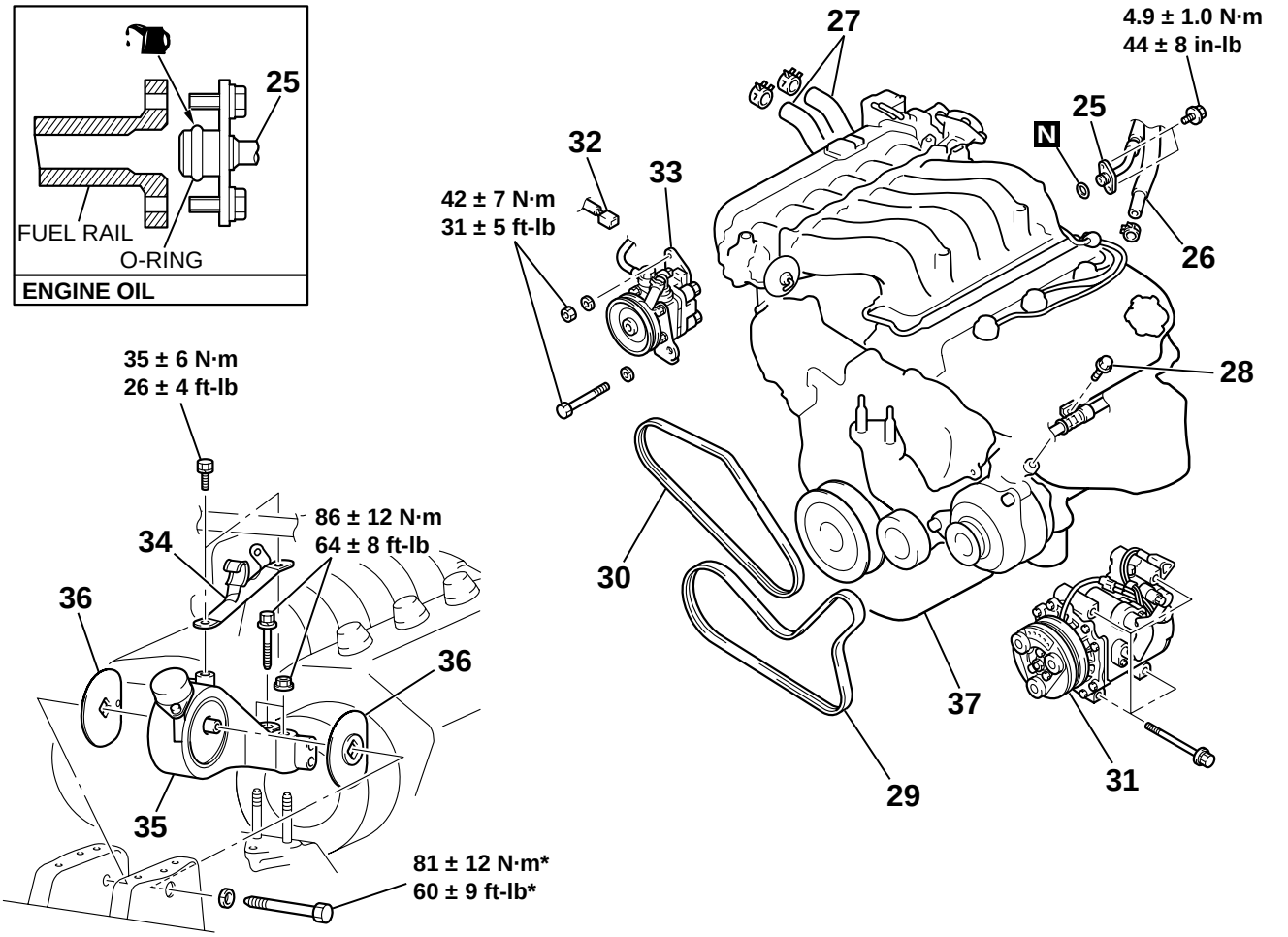
TSB Revision

REMOVAL STEPS

1. ACCELERATOR CABLE CONNECTION
2. EGR SOLENOID VALVE CONNECTOR
3. VARIABLE INDUCTION SOLENOID VALVE CONNECTOR
4. RIGHT BANK HEATED OXYGEN SENSOR CONNECTOR
5. CRANKSHAFT POSITION SENSOR CONNECTOR
6. KNOCK SENSOR CONNECTOR
7. CONTROL WIRING HARNESS AND POWER STEERING WIRING HARNESS COMBINATION CONNECTOR
8. INJECTOR CONNECTOR
9. DISTRIBUTOR CONNECTOR
10. CONTROL WIRING HARNESS AND INJECTOR WIRING HARNESS COMBINATION CONNECTOR
11. PURGE SOLENOID VALUVE CONNECTOR
12. IDLE AIR CONTROL MOTOR CONNECTOR
13. THROTTLE POSITION SENSOR CONNECTOR

REMOVAL STEPS (Continued)

14. MANIFOLD DIFFERENTIAL PRESSURE SENSOR CONNECTOR
15. ENGINE COOLANT TEMPERATURE GAUGE UNIT CONNECTOR
16. ENGINE COOLANT TEMPERATURE SENSOR CONNECTOR
17. LEFT BANK HEATED OXYGEN SENSOR CONNECTOR
18. STARTER CONNECTOR
19. GROUND WIRE CONNECTION
20. GENERATOR CONNECTION
21. OIL PRESSURE SWITCH CONNECTOR
22. A/C COMPRESSOR CONNECTOR
23. VACUUM HOSE CONNECTION
24. BRAKE BOOSTER VACUUM HOSE CONNECTION



>>D<< 25. HIGH-PRESSURE FUEL HOSE CONNECTION
26. FUEL RETURN HOSE CONNECTION
27. HEATER HOSE CONNECTION
28. SUCTION HOSE CONNECTION
29. DRIVE BELT (GENERATOR AND A/C COMPRESSOR)
30. DRIVE BELT (POWER STEERING OIL PUMP)

<<A>> 31. A/C COMPRESSOR
32. POWER STEERING PRESSURE SWITCH CONNECTOR
<<B>> 33. POWER STEERING OIL PUMP
34. ENGINE MOUNT STAY
<<C>> • TRANSAXLE ASSEMBLY
<<D>> **>>C<<** 35. ENGINE MOUNT BRACKET
>>B<< 36. ENGINE MOUNT STOPPER
<<E>> **>>A<<** 37. ENGINE ASSEMBLY

Required Special Tools:

- MB991453: Engine Hanger Assembly
- MZ203827: Engine Lifter
- MB991454: Engine hanger balancer (MB991453, part of the engine hanger attachment set)
- MB991895: Engine Hanger

TSB Revision

REMOVAL SERVICE POINTS

<<A>> A/C COMPRESSOR REMOVAL

Remove the A/C compressor from the compressor bracket with the hose attached.

NOTE: Place the removed A/C compressor where it will not be a hindrance when removing and installing the engine assembly, and secure it with a cord or wire.

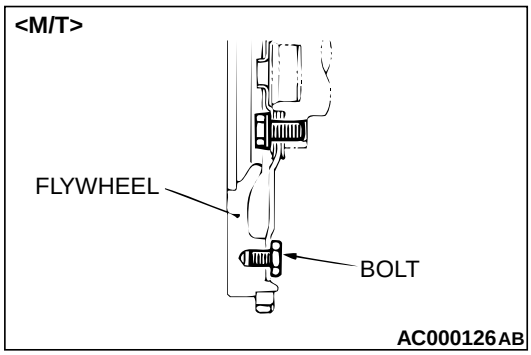
<<B>> POWER STEERING OIL PUMP REMOVAL

Remove the power steering oil pump from the engine with the hose attached.

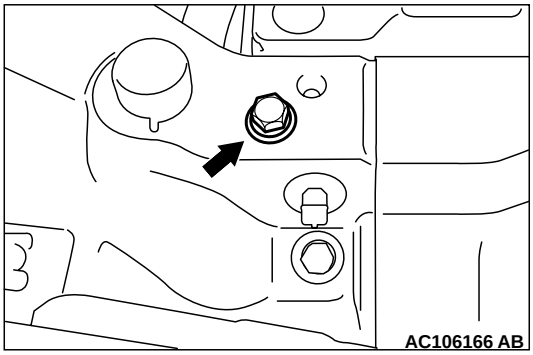
NOTE: Place the removed power steering oil pump in a place where it will not be a hindrance when removing and installing the engine assembly, and secure it with a cord or wire.

⚠ CAUTION

Do not remove the flywheel mounting bolt shown by the arrow. If this bolt is removed, the flywheel will become out of balance and damaged.



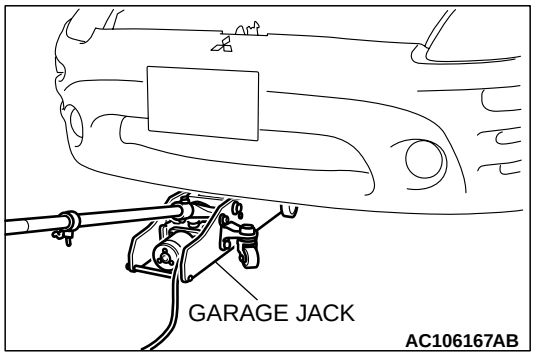
1. <Engine lifter MZ2073827 is used>
   Remove the transaxle assembly.
   <M/T>: Refer to GROUP 22A, Transaxle Assembly P.22A-16.
   <A/T>: Refer to GROUP 23A, Transaxle Assembly P.23A-366.

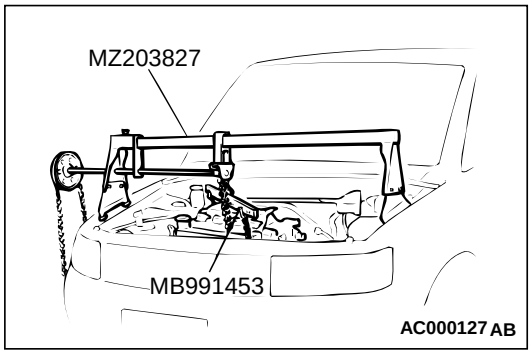


2. <Engine hanger MB991895 is used>
   (1) Loosely fit the two radiator support upper insulator mounting bolts to the vehicle body.
   (2) Remove the transaxle assembly.
   <M/T>: Refer to GROUP 22A, Transaxle Assembly P.22A-16.
   <A/T>: Refer to GROUP 23A, Transaxle Assembly P.23A-366.

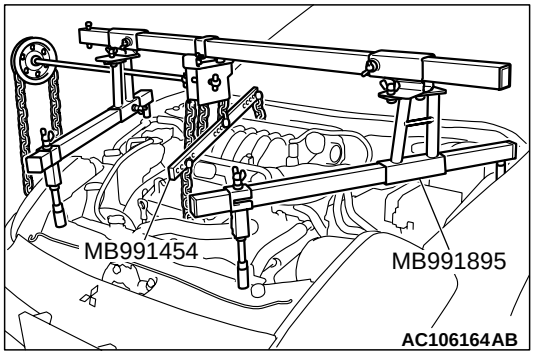
<<D>> ENGINE MOUNT BRACKET REMOVAL

1. Support the engine with a garage jack.

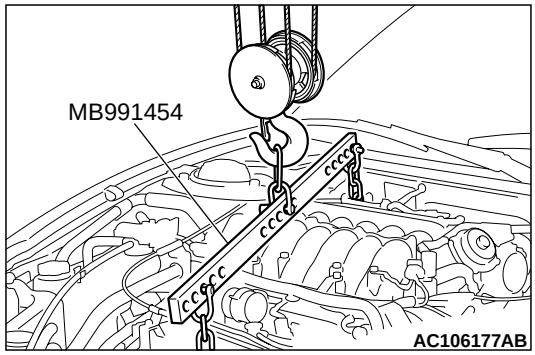




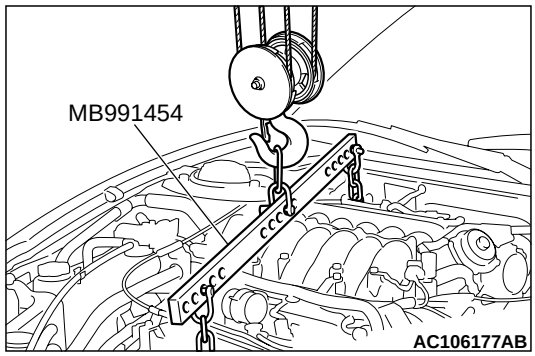
2. <Engine lifter MZ2073827 is used>
   Remove special tools MB991453 and MZ203827 which were attached when the transaxle assembly was removed.



3. <Engine hanger MB991895 is used>
   Remove special tools MB991895 which were attached when the transaxle assembly was removed.



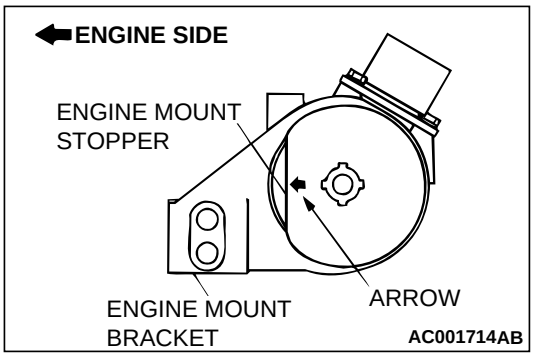
4. Hold the engine assembly with a chain block or similar tool.
5. Place a garage jack against the engine oil pan with a piece of wood in between, jack up the engine so that the weight of the engine is no longer being applied to the engine mount bracket, and then remove the engine mount bracket.



<<E>> ENGINE ASSEMBLY REMOVAL
After checking that all cables, hoses and harness connectors, etc., are disconnected from the engine, lift the chain block slowly to remove the engine assembly upward from the engine compartment.

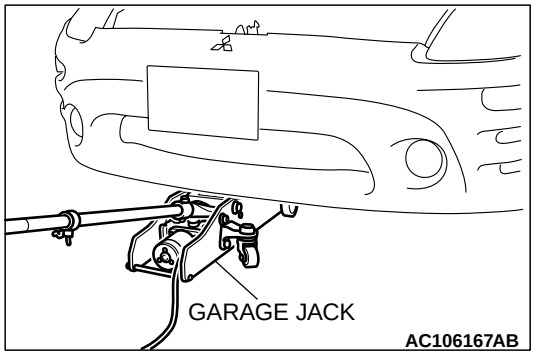
INSTALLATION SERVICE POINTS

>>A<< ENGINE ASSEMBLY INSTALLATION
Install the engine assembly, checking that the cables, hoses, and harness connectors are not clamped.



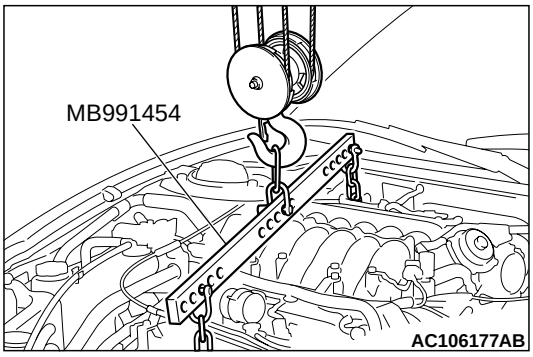
>>B<< ENGINE MOUNT STOPPER INSTALLATION

Clamp the engine mount stopper so that the arrow points in the direction as shown in the diagram.

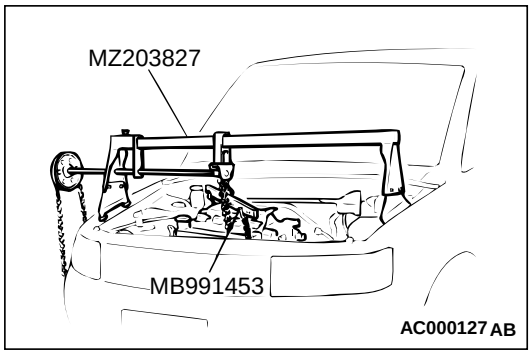


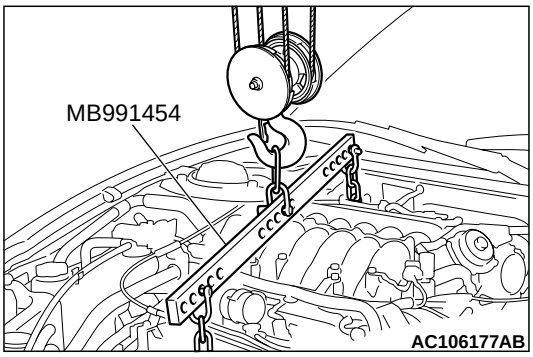
>>C<< ENGINE MOUNT BRACKET INSTALLATION

1. Place a garage jack against the engine oil pan with a piece of wood in between, and install the engine mount bracket while adjusting the position of the engine.
2. Support the engine with the garage jack.

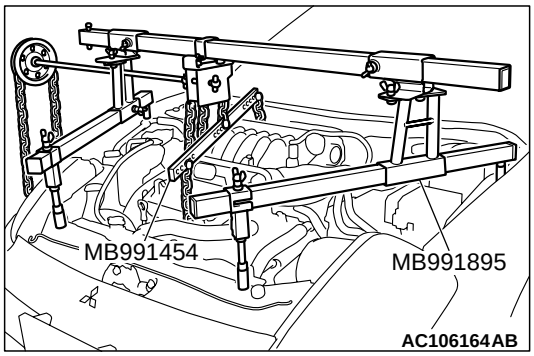


3. <Engine lifter MZ2073827 is used>
   Remove the chain block and support the engine assembly with special tools MB991453 and MZ203827.





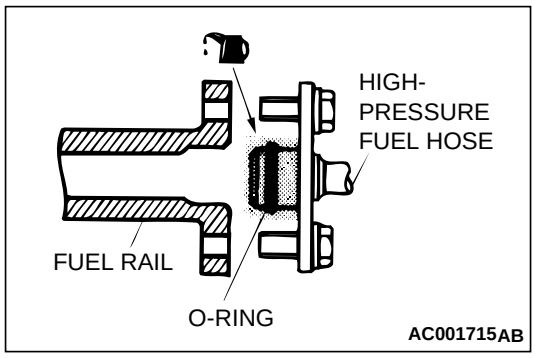
4. <Engine hanger MB991895 is used>
   Remove the chain block and support the engine assembly with special tools MB991895.



>>D<< HIGH-PRESSURE FUEL HOSE INSTALLATION

⚠ CAUTION
Do not allow engine oil to enter the fuel rail.

1. Apply a small amount of new engine oil to the O-ring.
2. Turning the high-pressure fuel hose to the right and left, install it to the fuel rail, while being careful not to damage the O-ring. After installing, check that the hose turns smoothly.
3. If the hose does not turn smoothly, the O-ring may be clamped. Disconnect the high-pressure fuel hose and check the O-ring for damage.
4. Re-insert the fuel rail and check that the hose turns smoothly.



CAMSHAFT AND CAMSHAFT OIL SEAL

REMOVAL AND INSTALLATION

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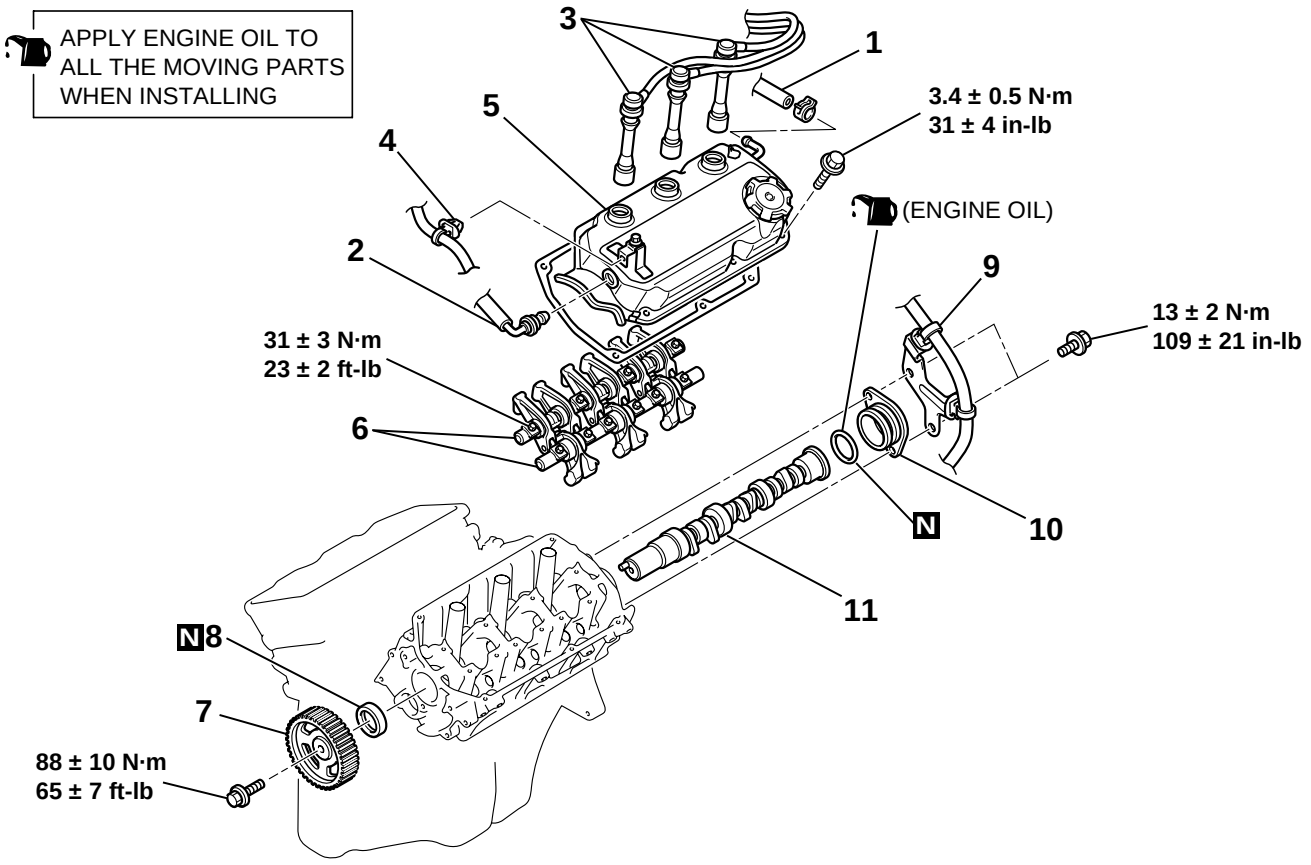
<LEFT BANK>

Pre-removal and Post-installation Operation
- Timing Belt Removal and Installation (Refer to P.11C-37.)



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CAMSHAFT REMOVAL STEPS
- THERMOSTAT HOUSING ASSEMBLY (REFER TO GROUP 14, WATER HOSE AND PIPE P.14-28.)

1. BLOW-BY HOSE CONNECTION
2. PCV HOSE CONNECTION
3. SPARK PLUG CABLE
4. BATTERY CABLE CONNECTION
5. ROCKER COVER

<<A>> >>D<< 6. ROCKER ARM AND SHAFT ASSEMBLY

CAMSHAFT REMOVAL STEPS

<<B>> >>B<< 7. CAMSHAFT SPROCKET
9. BATTERY CABLE AND HARNESS BRACKET
10. THRUST CASE
11. CAMSHAFT

CAMSHAFT OIL SEAL REMOVAL STEPS

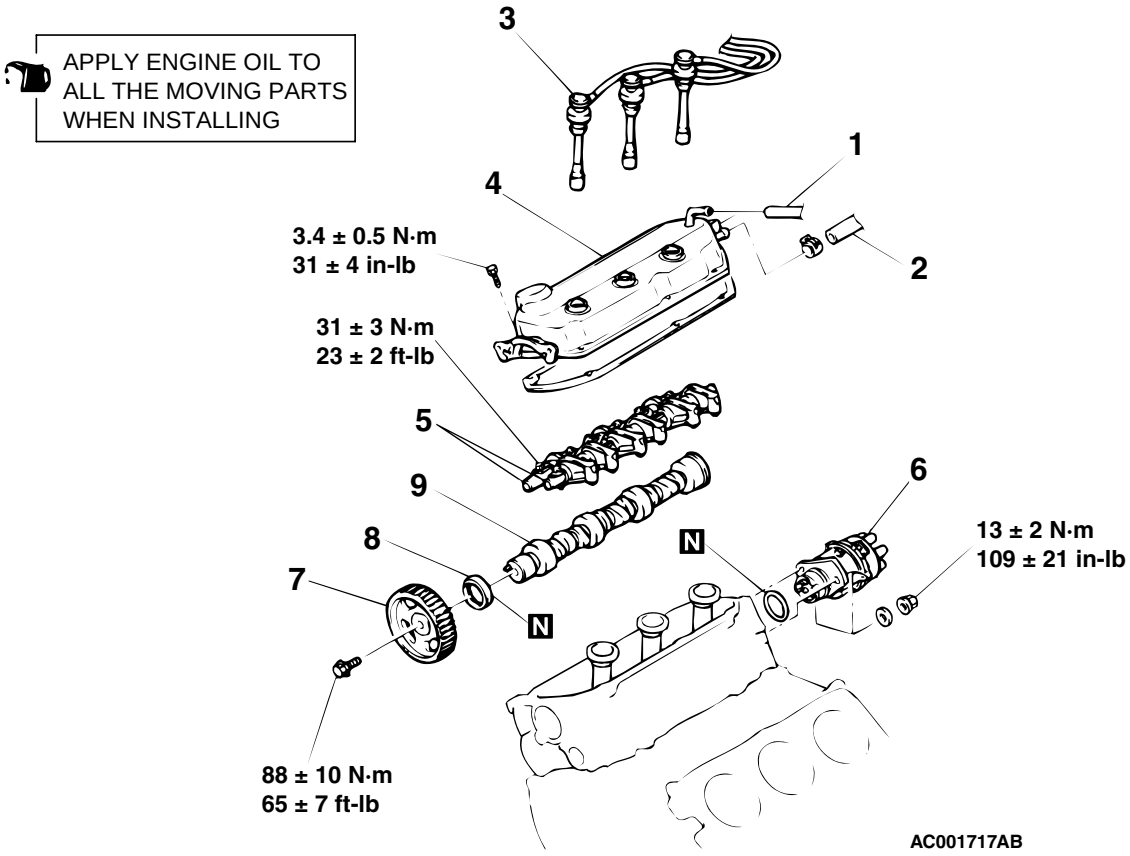
<<B>> >>B<< 7. CAMSHAFT SPROCKET
>>A<< 8. CAMSHAFT OIL SEAL

Required Special Tools:
- MB990767: End Yoke Holder
- MB991559: Camshaft Oil Seal Adapter
- MD998443: Auto-lash Adjuster Holder
- MD998713: Camshaft Oil Seal Installer
- MD998715: Crankshaft Pulley Holder Pin

TSB Revision

<RIGHT BANK>

Pre-removal and Post-installation Operation
- Timing Belt Removal and Installation (Refer to P.11C-37.)



CAMSHAFT REMOVAL STEPS
- INTAKE MANIFOLD PLENUM (REFER TO GROUP 15, INTAKE MANIFOLD PLENUM P.15-7.)

1. BREATHER HOSE CONNECTION
2. BLOW-BY HOSE CONNECTION
3. SPARK PLUG CABLE
4. ROCKER COVER

CAMSHAFT REMOVAL STEPS

<<A>> >>D<< 5. ROCKER ARM AND SHAFT ASSEMBLY
>>C<< 6. DISTRIBUTOR
<<B>> >>B<< 7. CAMSHAFT SPROCKET
9. CAMSHAFT

CAMSHAFT OIL SEAL REMOVAL STEPS

<<B>> >>B<< 7. CAMSHAFT SPROCKET
>>A<< 8. CAMSHAFT OIL SEAL

Required Special Tools:
- MB990767: End Yoke Holder
- MD998443: Auto-lash Adjuster Holder
- MD998713: Camshaft Oil Seal Installer
- MD998715: Crankshaft Pulley Holder Pin

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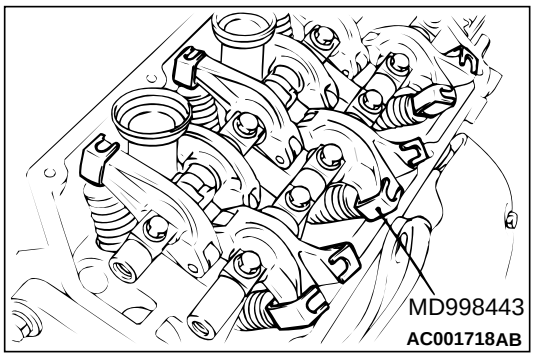
REMOVAL SERVICE POINTS



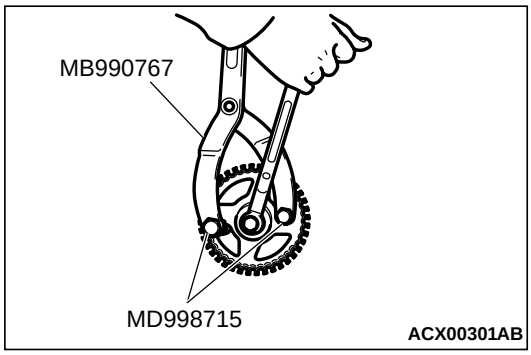
<<A>> ROCKER ARM AND SHAFT ASSEMBLY REMOVAL

1. Install special tool MD998443 as shown in the illustration so that the lash adjusters will not fall out.

⚠ CAUTION

Never disassemble the rocker arm and shaft assembly.

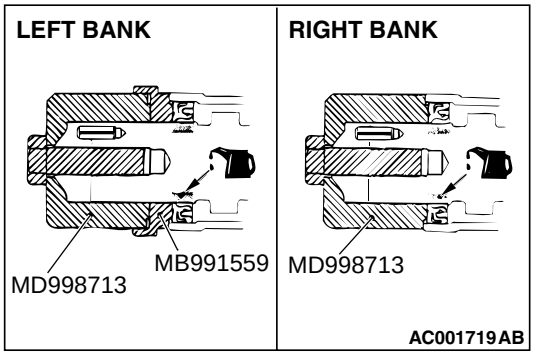
2. Loosen the rocker arm and shaft assembly mounting bolts, then remove the rocker arm and shaft assembly with the bolts still attached.



<<B>> CAMSHAFT SPROCKET REMOVAL

1. Use special tools MB990767 and MD998715 to loosen the camshaft sprocket mounting bolt.
2. Remove the camshaft sprocket.

INSTALLATION SERVICE POINTS

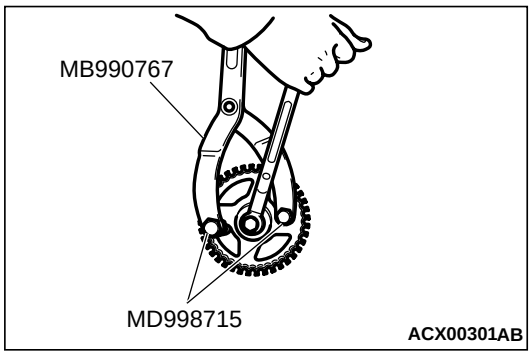


>>A<< CAMSHAFT OIL SEAL INSTALLATION

1. Apply engine oil to the camshaft oil seal lip.
2. Use special tools MB991559 and MD998713 to press-fit the camshaft oil seal.

>>B<< CAMSHAFT SPROCKET INSTALLATION

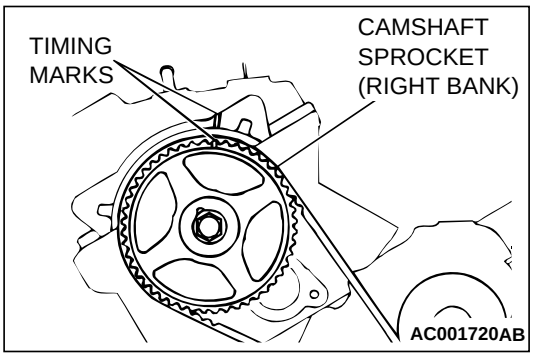
1. Install the camshaft sprocket.



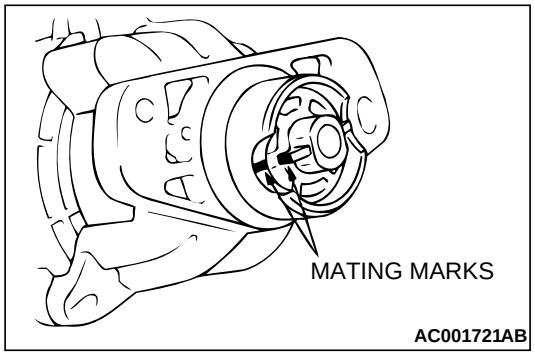
2. Use special tools MB990767 and MD998715 to tighten the camshaft sprocket mounting bolt to the specified torque.

   Tightening torque: 88 ± 10 N·m (65 ± 7 ft-lb)

>>C<< DISTRIBUTOR INSTALLATION

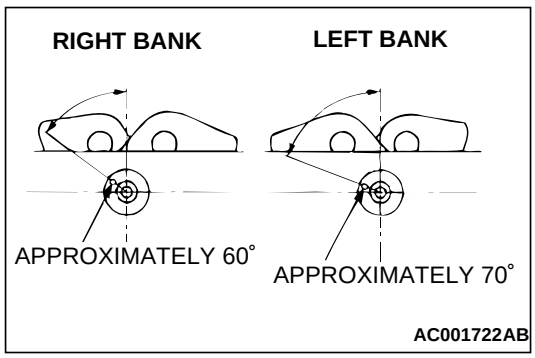


1. Align the timing mark of the camshaft sprocket (right bank) with that of the cylinder head.



2. Align the mating marks on the distributor housing and coupling, then install the distributor to the engine.

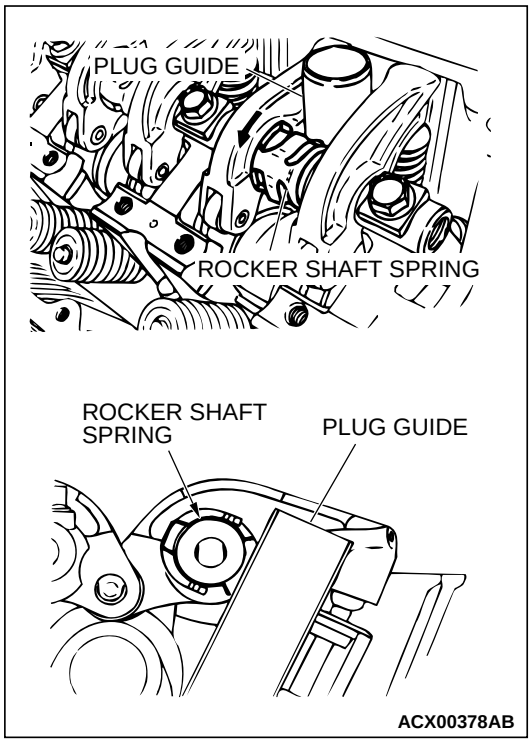
>>D<< ROCKER ARM AND SHAFT ASSEMBLY INSTALLATION



1. Rotate the camshaft until the dowel pin on its front end is located as shown in the illustration.

   NOTE: Placing the camshaft in the illustrated position minimizes the amount of cam lift, making it easier to install the rocker arm and shaft assembly.

2. Temporarily tighten the rocker shaft with the bolts so that all rocker arms on the inlet valve side do not push the valves.



3. Position the rocker shaft spring so that it takes a right angle against the plug guide.

   NOTE: Set the rocker shaft spring before installing the rocker arm and shaft assembly on the exhaust side.

4. Tighten the rocker arm and shaft assembly mounting bolts to the specified torque.

   Tightening torque: 31 ± 3 N·m (23 ± 2 ft-lb)

5. Remove special tool MD998443.

OIL PAN

REMOVAL AND INSTALLATION

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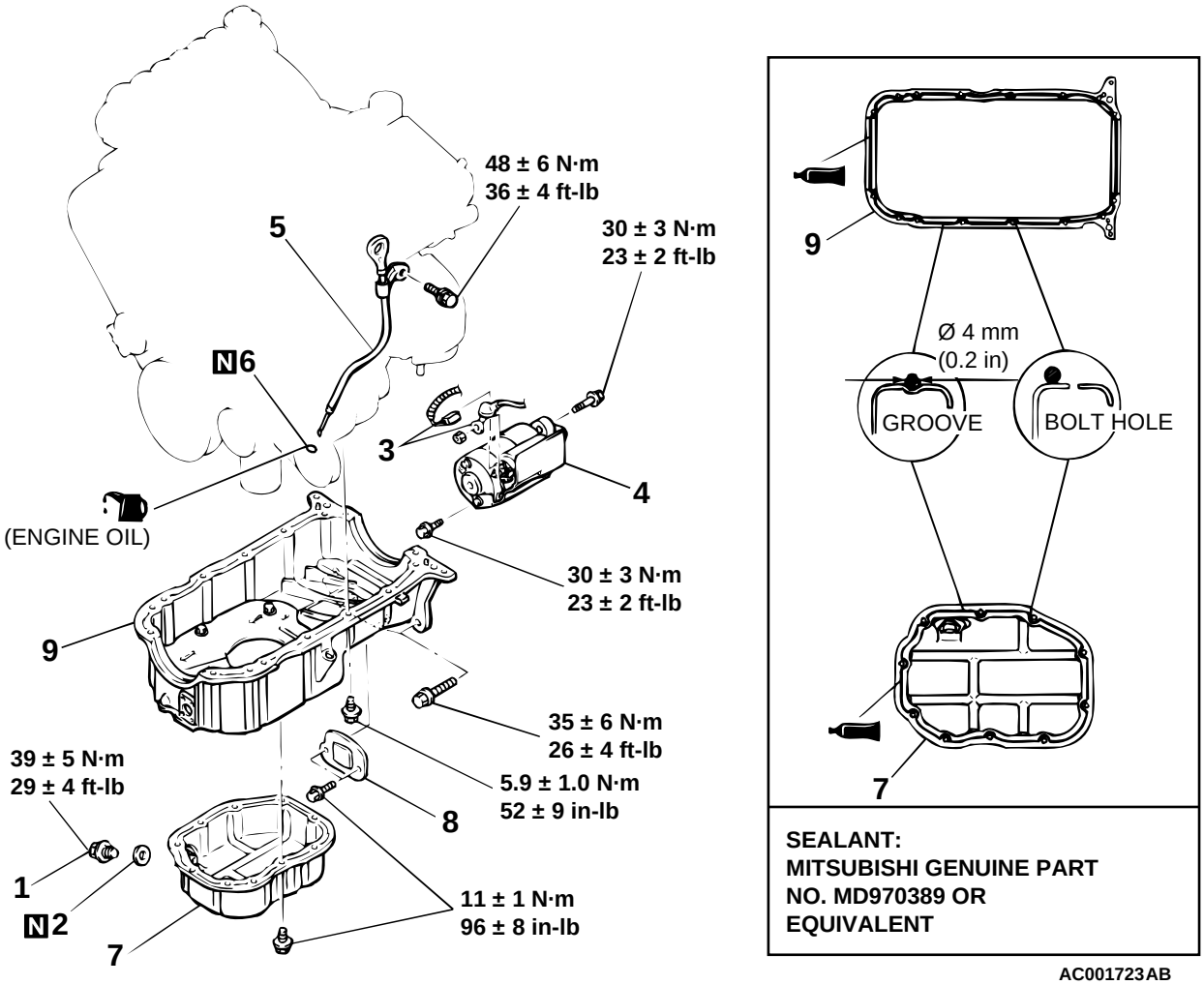
Pre-removal and Post-installation operation
- Engine Oil Draining and Refilling (Refer to GROUP 12, On-vehicle Service – Engine Oil Replacement P.12-3.)
- Front Exhaust Pipe Removal and Installation (Refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-19.)



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LOWER OIL PAN REMOVAL STEPS
1. DRAIN PLUG
>>C<< 2. DRAIN PLUG GASKET
<<A>> >>B<< 7. LOWER OIL PAN

UPPER OIL PAN REMOVAL STEPS
1. DRAIN PLUG
>>C<< 2. DRAIN PLUG GASKET
3. STARTER CONNECTOR

UPPER OIL PAN REMOVAL STEPS (Continued)
4. STARTER
5. OIL DIPSTICK AND DIPSTICK GUIDE
6. O-RING
<<A>> >>B<< 7. LOWER OIL PAN
8. OIL PAN BOLT HOLE COVER
<<B>> >>A<< 9. UPPER OIL PAN

TSB Revision

REMOVAL SERVICE POINTS

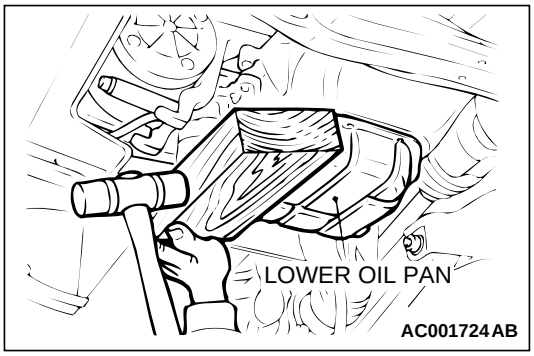
<<A>> LOWER OIL PAN REMOVAL

1. Remove the oil pan, lower mounting bolts.

⚠ CAUTION

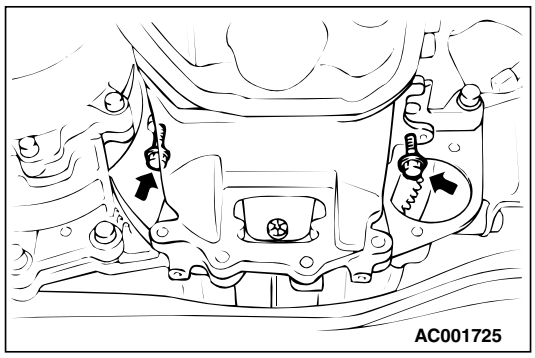
Do not use the oil pan remover (MD998727). It will damage the upper oil pan.

2. Place a wooden block against the lower oil pan as shown in the illustration and remove by tapping with a hammer.



<<B>> UPPER OIL PAN REMOVAL

1. Remove the upper oil pan mounting bolts.
2. Screw the bolts (M10) securing the upper oil pan to the transaxle assembly in the illustrated bolt holes, then remove the upper oil pan.



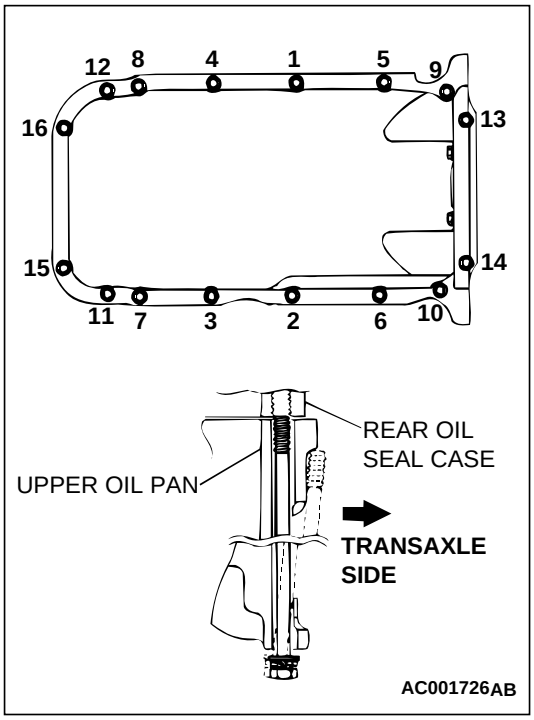
INSTALLATION SERVICE POINTS

>>A<< UPPER OIL PAN INSTALLATION

⚠ CAUTION

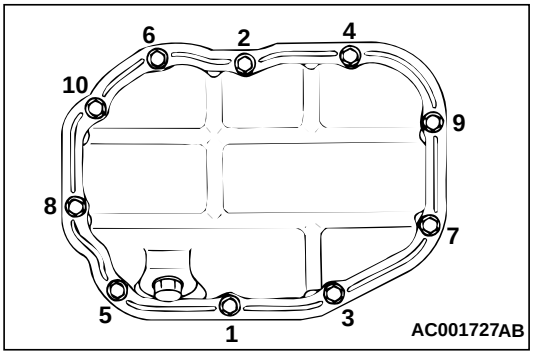
The bolt holes for bolts 13 and 14 in the illustration are cut away on the transaxle side. Be careful not to insert these bolts at an angle.

Tighten the oil pan, upper mounting bolts in the order shown.



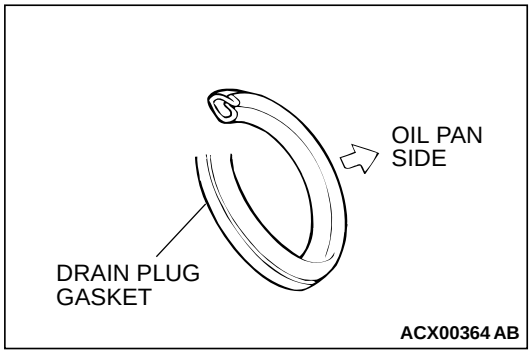
>>B<< LOWER OIL PAN INSTALLATION

Tighten the lower oil pan mounting bolts in the order shown.



>>C<< DRAIN PLUG GASKET INSTALLATION

Replace the gasket with a new gasket. Install the new gasket in the direction shown in the illustration.



OIL PAN INSPECTION

M1112002900135

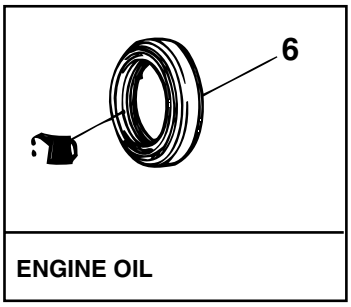
- Check the oil pan for cracks.
- Check the oil pan sealant-coated surface for damage and deformation.

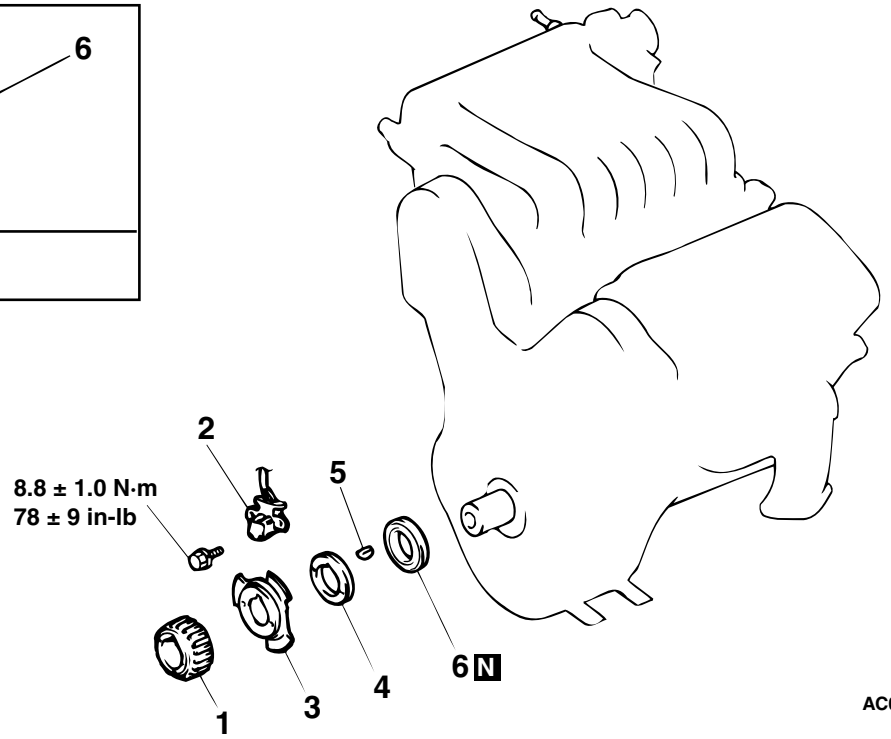
CRANKSHAFT FRONT OIL SEAL

REMOVAL AND INSTALLATION

M1112003400285

Pre-removal and Post-installation Operation
- Timing Belt Removal and Installation (Refer to P.11C-37.)





REMOVAL STEPS

>>B<< 1. CRANKSHAFT SPROCKET
2. CRANKSHAFT POSITION SENSOR
>>B<< 3. CRANKSHAFT SENSING BLADE

REMOVAL STEPS (Continued)

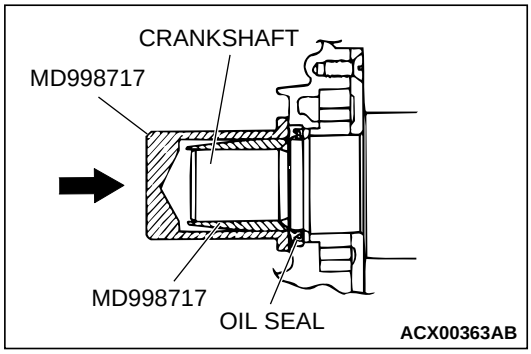
>>B<< 4. CRANKSHAFT SPACER
5. KEY
>>A<< 6. CRANKSHAFT FRONT OIL SEAL

Required Special Tool:
- MD998717: Crankshaft Front Oil Seal Installer

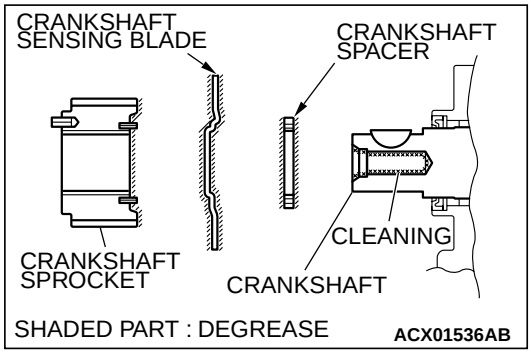
INSTALLATION SERVICE POINTS

>>A<< CRANKSHAFT FRONT OIL SEAL INSTALLATION

1. Apply a small amount of engine oil to the oil seal lip and then insert.



2. Using special tool MD998717, tap the oil seal into the front case.



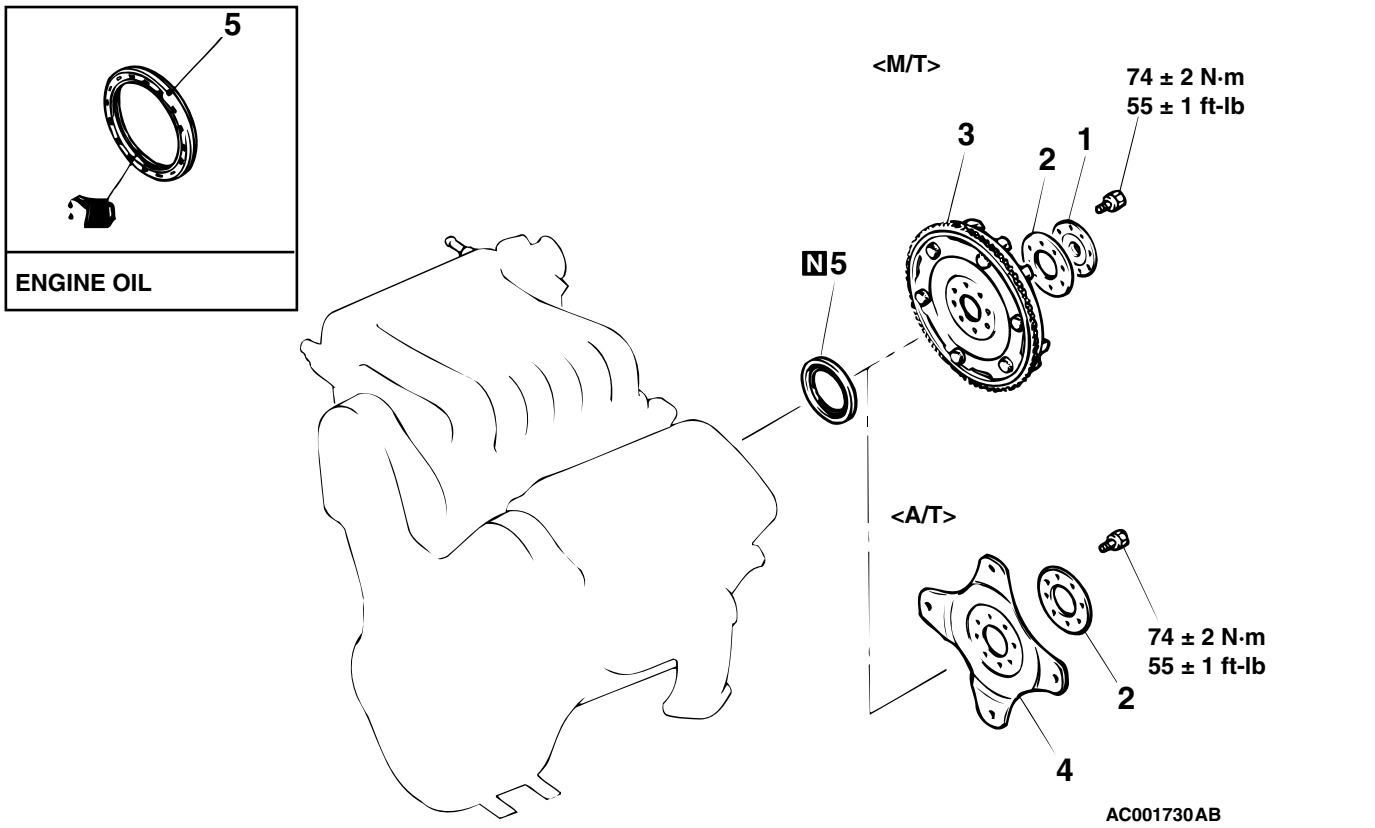
>>B<< CRANKSHAFT SPACER/CRANKSHAFT SENSING BLADE/CRANKSHAFT SPROCKET INSTALLATION

To prevent the crankshaft pulley mounting bolt from loosening, degrees or clean the crankshaft, the crankshaft spacer, the crankshaft sensing blade and the crankshaft at the shown positions.

CRANKSHAFT REAR OIL SEAL

REMOVAL AND INSTALLATION

M1112003700286



REMOVAL STEPS

<<A>> • TRANSAXLE ASSEMBLY
• CLUTCH COVER AND CLUTCH DISC <M/T> (REFER TO GROUP 21B, CLUTCH P.21B-2.)

REMOVAL STEPS (Continued)

<<B>> >>B<< 1. PLATE <M/T>
<<B>> >>B<< 2. ADAPTER PLATE
<<B>> >>B<< 3. FLYWHEEL <M/T>
<<B>> >>B<< 4. DRIVE PLATE <A/T>
>>A<< 5. CRANKSHAFT REAR OIL SEAL

Required Special Tools:

- MD998718: Crankshaft Rear Oil Seal Installer
- MD998781: Flywheel Stopper

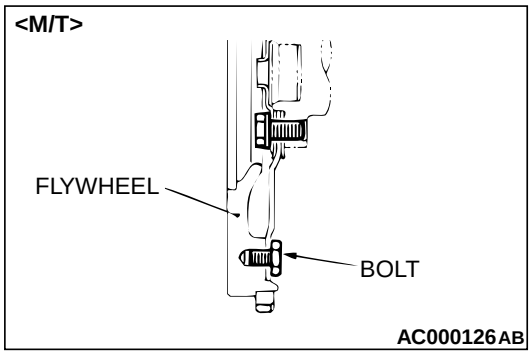
REMOVAL SERVICE POINTS

<<A>> TRANSAXLE ASSEMBLY REMOVAL

⚠ CAUTION

Do not remove the flywheel mounting bolt shown by the arrow. If this bolt is removed, the flywheel will become out of balance and damaged.

<M/T>: Refer to GROUP 22A, Transaxle Assembly P.22A-16.
<A/T>: Refer to GROUP 23A, Transaxle Assembly P.23A-366.



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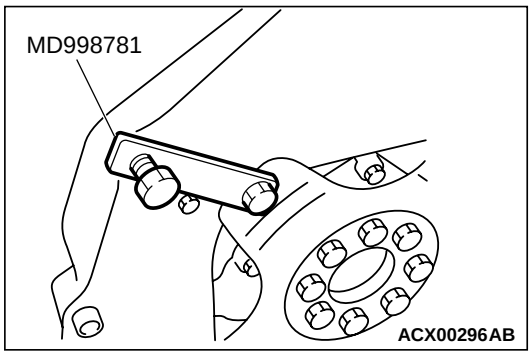


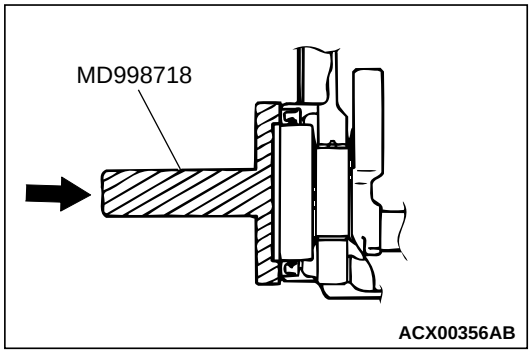
<<B>> PLATE <M/T>/ADAPTER PLATE/FLYWHEEL <M/T>/ DRIVE PLATE <A/T> REMOVAL

Use special tool MB998781 to secure the flywheel or drive plate, and remove the bolts.

INSTALLATION SERVICE POINTS

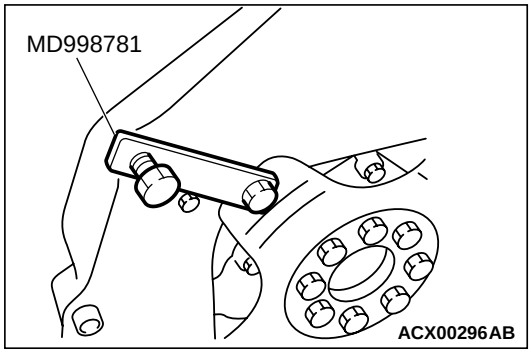
>>A<< CRANKSHAFT REAR OIL SEAL INSTALLATION

1. Apply a small amount of engine oil to the entire circumference of the oil seal lip.
2. Use special tool MD998718 to tap in the oil seal as shown in the illustration.



>>B<< DRIVE PLATE <A/T>/FLYWHEEL <M/T>/ADAPTER PLATE/PLATE <M/T> INSTALLATION

Use special tool MD998781 to hold the flywheel or drive plate in the same manner as removal. Then install the bolts.

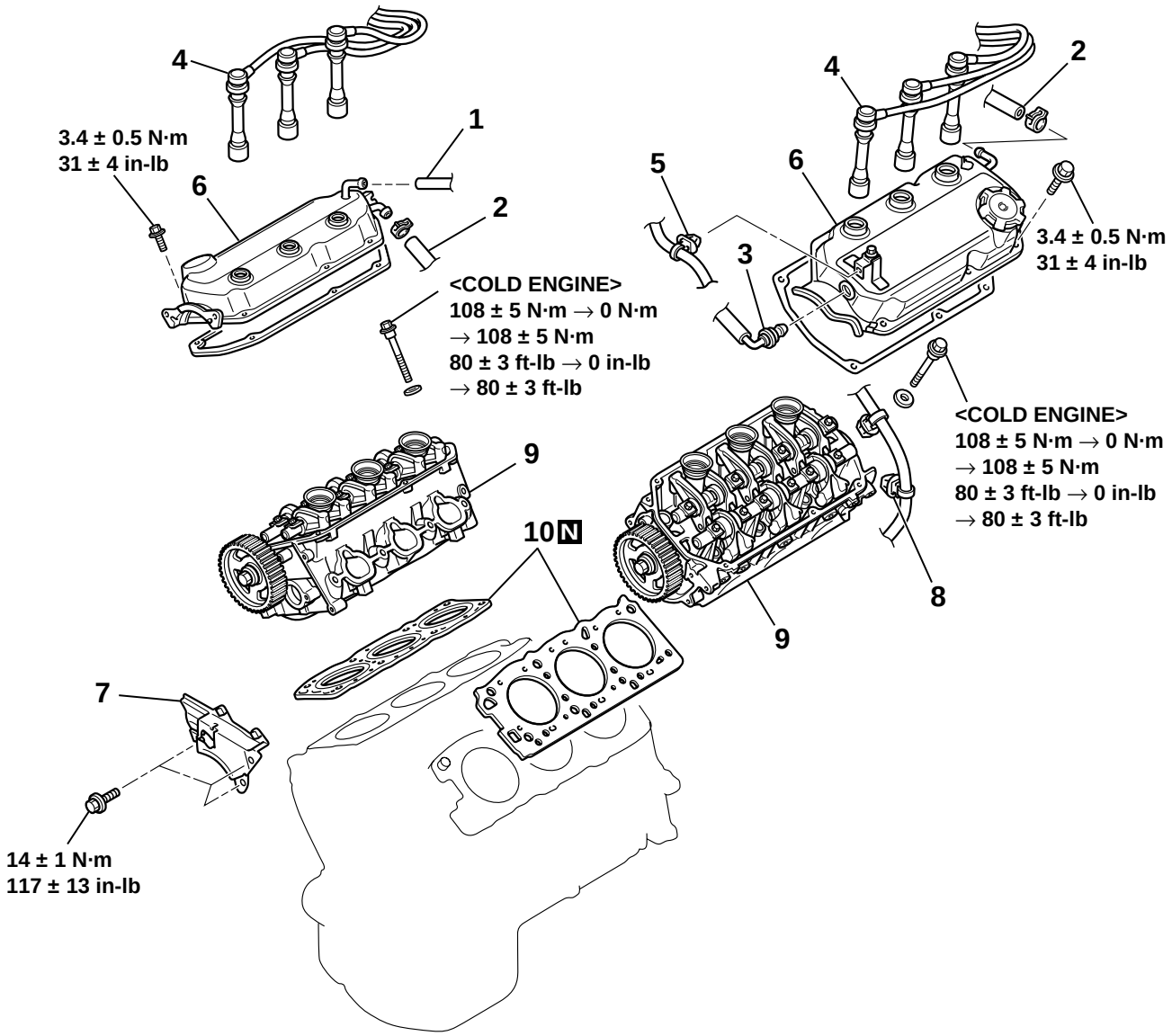


CYLINDER HEAD GASKET

REMOVAL AND INSTALLATION

M1112004000365

Pre-removal and Post-installation Operation
- Engine Coolant Draining and Refilling [Refer to GROUP 00, Maintenance Service – Engine Coolant (Change) P.00-56.]
- Timing Belt Removal and Installation (Refer to P.11C-37.)
- Generator Removal and Installation (Refer to GROUP 16, Generator P.16-14.)
- Intake Manifold Removal and Installation (Refer to GROUP 15, Intake Manifold P.15-15.)
- Exhaust Manifold Removal and Installation (Refer to GROUP 15, Exhaust Manifold P.15-19.)
- Water Inlet Pipe Removal and Installation (Refer to GROUP 14, Water Hose and Water Pipe P.14-28.)



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REMOVAL STEPS
1. BREATHER HOSE
2. BLOW-BY HOSE
3. PCV HOSE

REMOVAL STEPS (Continued)
4. SPARK PLUG CABLE
5. BATTERY CABLE CONNECTION

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REMOVAL STEPS (Continued)

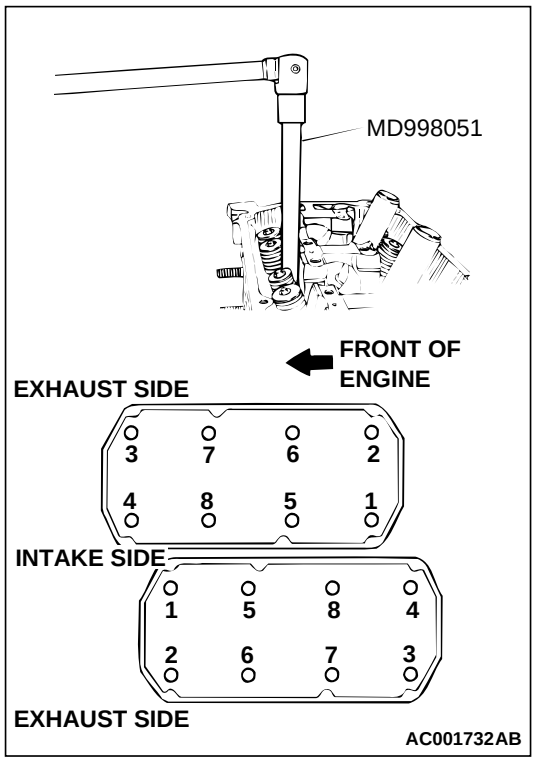
6. ROCKER COVER
7. TIMING BELT REAR COVER
8. BATTERY CABLE AND HARNESS BRACKET

<<A>> >>B<< 9. CYLINDER HEAD ASSEMBLY

>>A<< 10. CYLINDER HEAD GASKET

Required Special Tool:

- MD998051: Cylinder Head Bolt Wrench



REMOVAL SERVICE POINT

<<A>> CYLINDER HEAD ASSEMBLY REMOVAL

Using special tool MD998051, loosen the cylinder head bolts in two or three steps in the order of the numbers shown in the illustration, then remove the cylinder head assembly.

INSTALLATION SERVICE POINTS

>>A<< CYLINDER HEAD GASKET INSTALLATION

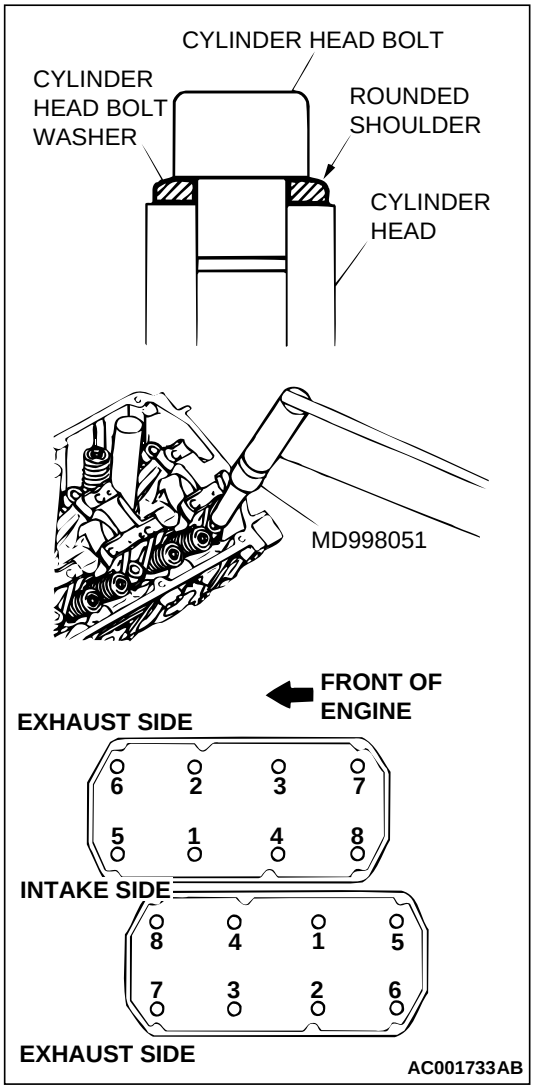
1. Wipe off all oil and grease from the gasket mounting surface.
2. Match the shapes of the cylinder head holes with their respective cylinder head gasket holes.

>>B<< CYLINDER HEAD ASSEMBLY INSTALLATION

⚠ CAUTION

Be careful that no foreign material gets into the cylinder, coolant passages or oil passages. Engine damage may result.

1. Use a scraper to clean the gasket surface of the cylinder head assembly.



⚠ CAUTION

Attach the cylinder head bolt washer in the direction shown in the illustration.

2. Using special tool MD998051 and a torque wrench, tighten the bolts to the specified torque in the order shown in the illustration. (in two or three steps)

   Tightening torque: 108 ± 5 N·m (80 ± 3 ft-lb)

3. Loosen the mounting bolts in the reverse sequence to that shown.
4. Tighten the mounting bolts progressively in the shown sequence to the specified torque again.

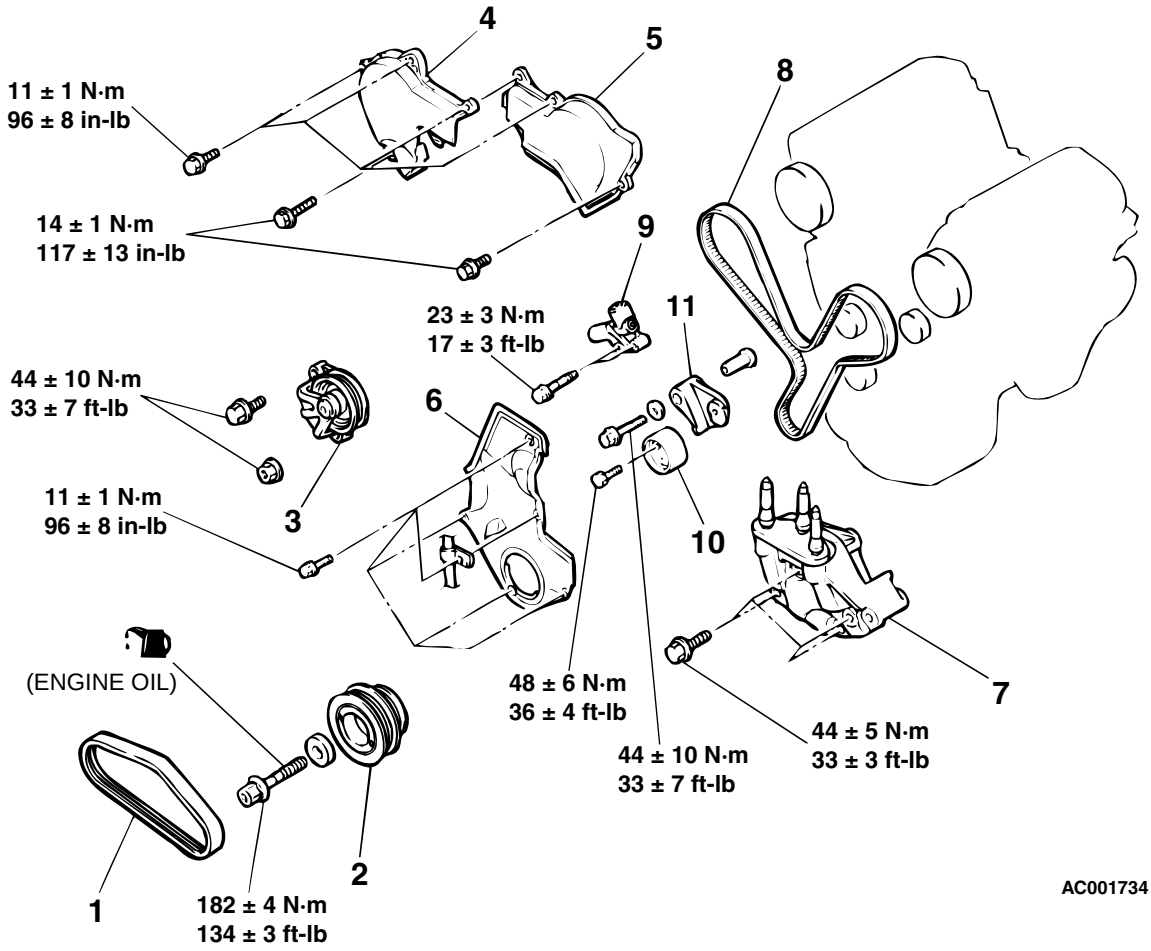
   Tightening torque: 108 ± 5 N·m (80 ± 3 ft-lb)

TIMING BELT

REMOVAL AND INSTALLATION

M1112004300366

Pre-removal Operation	Post-installation Operation
• Generator Removal (Refer to GROUP 16, Generator P.16-14.) • Engine Mount Bracket Removal (Refer to GROUP 32, Engine Mounting P.32-4.)	• Engine Mount Bracket Installation (Refer to GROUP 32, Engine Mounting P.32-4.) • Generator Installation (Refer to GROUP 16, Generator P.16-14.) • Drive Belt Tension Adjustment [Refer to GROUP 00, Maintenance Service – Drive Belts (Check Condition) P.00-44.]



REMOVAL STEPS

1. DRIVE BELT (POWER STEERING OIL PUMP)
<<A>> >>D<< 2. CRANKSHAFT PULLEY
3. TENSIONER PULLEY ASSEMBLY (POWER STEERING OIL PUMP)
4. TIMING BELT FRONT UPPER COVER, RIGHT
5. TIMING BELT FRONT UPPER COVER, LEFT

REMOVAL STEPS (Continued)

6. TIMING BELT FRONT LOWER COVER
>>C<< 7. ENGINE SUPPORT BRACKET, RIGHT
<<B>> >>B<< 8. TIMING BELT
>>A<< 9. AUTO-TENSIONER
10. TENSIONER PULLEY
11. TENSIONER ARM

Required Special Tools:

- MB990767: End Yoke Holder

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- MD998715: Crankshaft Pulley Holder Pin
- MD998767: Tensioner Wrench
- MD998769: Crankshaft Pulley Spacer

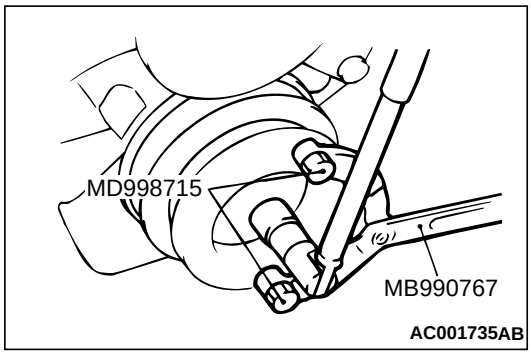
REMOVAL SERVICE POINTS

<<A>> CRANKSHAFT PULLEY REMOVAL

⚠ CAUTION

Use only the specified special tools, or a damaged pulley damper could result.

Use special tools MB990767 and MD998715 to remove the crankshaft pulley from the crankshaft.

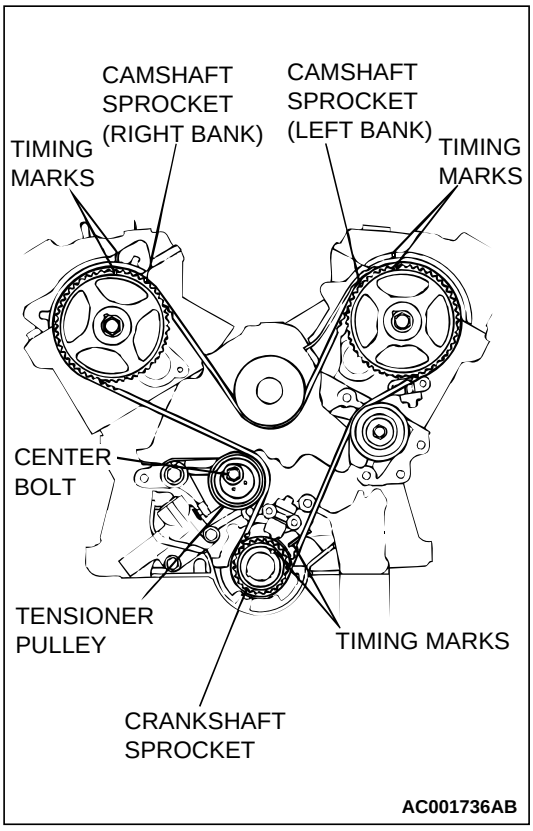


<<B>> TIMING BELT REMOVAL

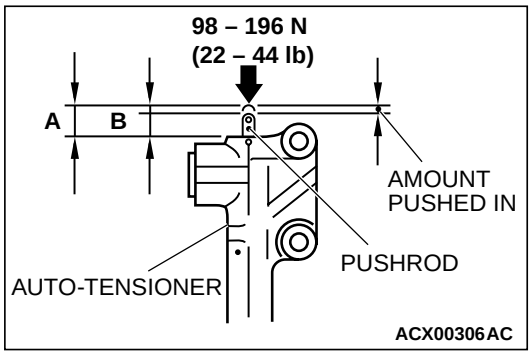
⚠ CAUTION

Never turn the crankshaft counterclockwise.

1. Turn the crankshaft clockwise to align each timing mark and to set the number 1 cylinder to compression top dead center.
2. If the timing belt is to be reused, chalk an arrow on the flat side of the belt, indicating the clockwise direction.
3. Loosen the center bolt of the tensioner pulley, then remove the timing belt.



INSTALLATION SERVICE POINTS

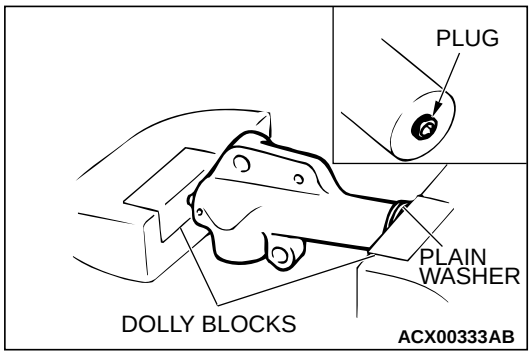


>>A<< AUTO-TENSIONER INSTALLATION

1. While holding the auto-tensioner with your hand, press the end of the pushrod against a metal surface (such as the cylinder block) with a force of 98 – 196 N (22 – 44 pound) and measure how far the pushrod is pushed in.

   Standard value: Within 1 mm (0.04 inch)
   A: Length when no force is applied
   B: Length when force is applied
   A – B: Amount pushed in

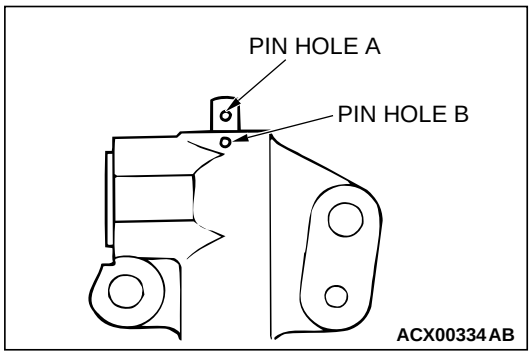
2. If it is not within the standard value range, replace the auto-tensioner.



⚠ CAUTION

- **Place the auto-tensioner perpendicular to the jaws of the vice.**
- **If there is a plug at the base of the auto-tensioner, insert a plain washer onto the end of the auto-tensioner to protect the plug.**

3. Place two blocks in a vice as shown in the illustration, and then place the auto-tensioner in the vice.



⚠ CAUTION

Never compress the pushrod too fast, or it may be damaged.

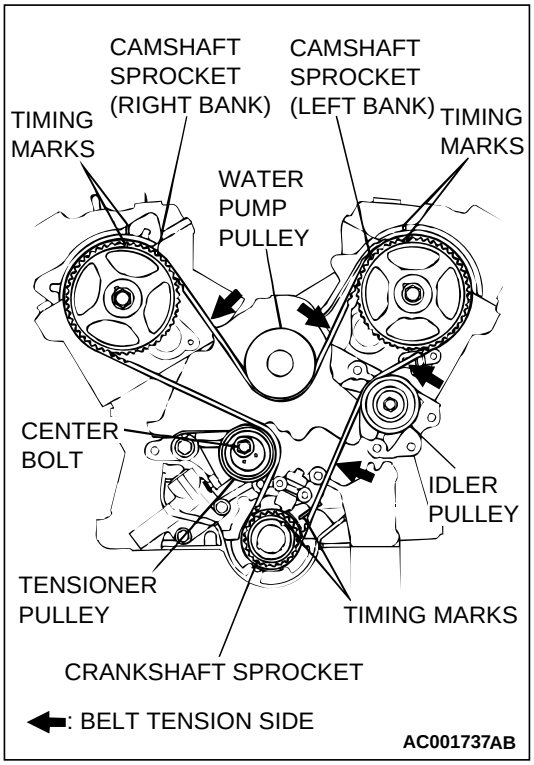
4. Slowly compress the pushrod of the auto-tensioner until pin hole A in the pushrod is aligned with pin hole B in the cylinder.
5. Insert the setting pin into the pin holes once they are aligned.

   NOTE: If replacing the auto-tensioner, the pin will already be inserted into the pin holes of the new part.

⚠ CAUTION

Do not remove the setting pin from the auto-tensioner.

6. Install the auto-tensioner to the engine.



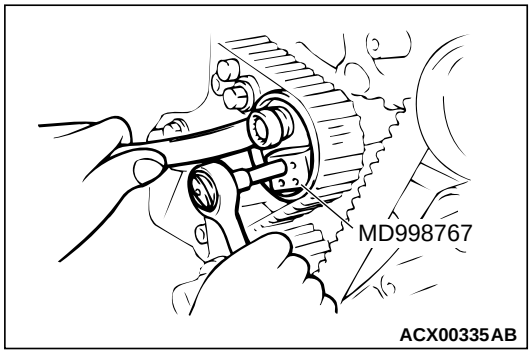
>>B<< TIMING BELT INSTALLATION

1. Align the timing marks on the camshaft sprockets with those on the rocker cover and the timing mark on the crankshaft sprocket with that on the engine block as shown in the illustration.

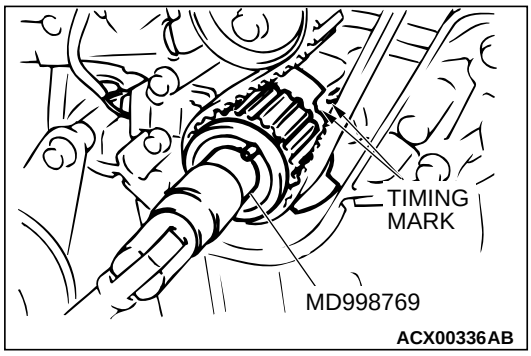
⚠ CAUTION

The camshaft sprocket (right bank) can turn easily due to the spring force applied, so be careful not to get your fingers caught.

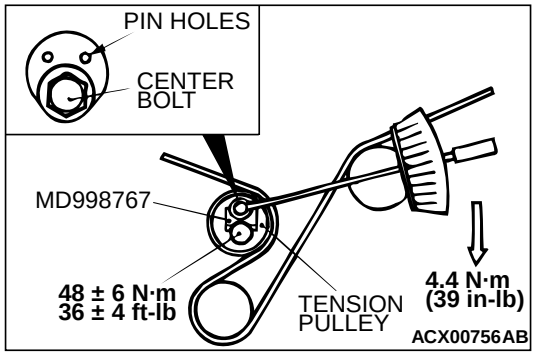
2. Install the timing belt by the following procedure so that there is no deflection in the timing belt between each sprocket and pulley.
   (1) Crankshaft sprocket
   (2) Idler pulley
   (3) Camshaft sprocket (Left bank)
   (4) Water pump pulley
   (5) Camshaft sprocket (Right bank)
   (6) Tensioner pulley
3. Turn the camshaft sprocket (Right bank) counterclockwise until the tension side of the timing belt is firmly stretched. Check all the timing marks again.



4. Use special tool MD998767 to push the tensioner pulley into the timing belt, then temporarily tighten the center bolt.



5. Use special tool MD998769 to turn the crankshaft 1/4 turn counterclockwise, then turn it again clockwise until the timing marks are aligned.



⚠ CAUTION

When tightening the center bolt, be careful that the tensioner pulley does not turn with the bolt.

6. Loosen the center bolt of the tensioner pulley. Use special tool MD998767 and a torque wrench to apply the tension torque to the timing belt as shown in the illustration. Then tighten the center bolt to the specified torque.

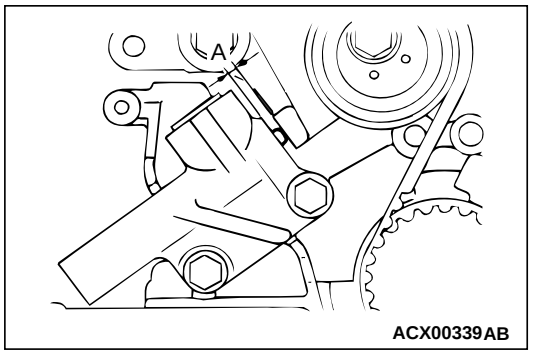
   Standard value: 4.4 N·m (39 in-lb) <Timing belt tension torque>

   Tightening torque: 48 ± 6 N·m (36 ± 4 ft-lb)

7. Remove the setting pin that has been inserted into the auto-tensioner.
8. Turn the crankshaft clockwise twice to align the timing marks.
9. Wait for at least five minutes, then check that the auto-tensioner pushrod extends within the standard value range.

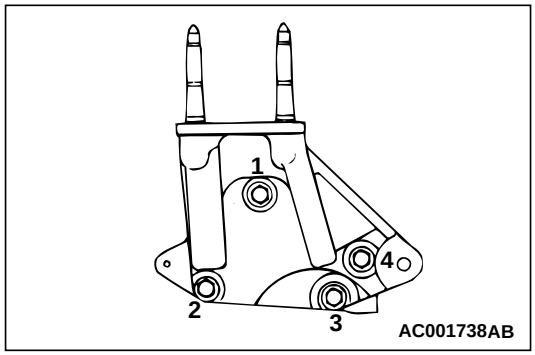
   Standard value (A): 3.8 – 5.0 mm (0.15 – 0.20 inch)

10. If not, repeat the operation in steps (5) to (9) above.
11. Check again that the timing marks of the sprockets are aligned.



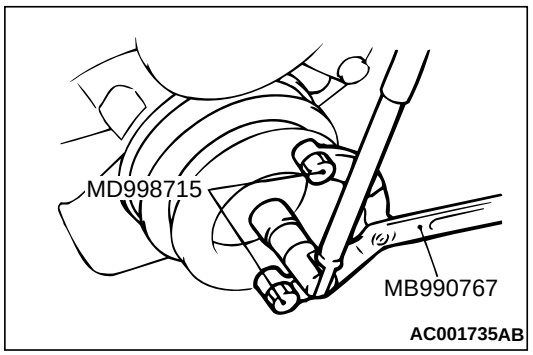
>>C<< ENGINE SUPPORT BRACKET INSTALLATION

Tighten the right engine support bracket mounting bolts in the order shown in the illustration.



>>D<< CRANKSHAFT PULLEY INSTALLATION

Use special tools MB990767 and MD998715 to install the crankshaft pulley.



INSPECTION

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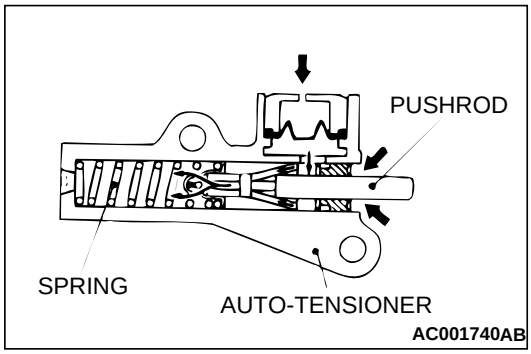
AUTO-TENSIONER



- Check the auto-tensioner for possible leaks.
- Check the pushrod for cracks.

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1111003800194

ITEMS		SPECIFICATIONS
Auto-tensioner attaching bolt		23 ± 3 N·m (17 ± 3 ft-lb)
Camshaft sprocket attaching bolt		88 ± 10 N·m (65 ± 7 ft-lb)
Camshaft thrust case attaching bolt		13 ± 2 N·m (109 ± 21 in-lb)
Control wiring harness protector attaching bolt		5.0 ± 1.0 N·m (44 ± 9 in-lb)
Crankshaft bolt		182 ± 4 N·m (134 ± 3 ft-lb)
Crankshaft position sensor attaching bolt		8.8 ± 1.0 N·m (78 ± 9 in-lb)
Cylinder head bolt <cold engine>		108 ± 5 N·m → 0 N·m → 108 ± 5 N·m (80 ± 3 ft-lb → 0 in-lb → 80 ± 3 ft-lb)
Distributor attaching nut		13 ± 2 N·m (109 ± 21 in-lb)
Drive plate bolt <A/T>		74 ± 2 N·m (55 ± 1 ft-lb)
Engine mount bracket attaching bolt	M10	86 ± 12 N·m (64 ± 8 ft-lb)
	M12	81 ± 12 N·m (60 ± 9 ft-lb)
Engine mount bracket attaching nut		86 ± 12 N·m (64 ± 8 ft-lb)
Engine mount stay attaching bolt		35 ± 6 N·m (26 ± 4 ft-lb)
Engine support bracket right attaching nut		44 ± 5 N·m (33 ± 3 ft-lb)
Flywheel plate bolt <M/T>		74 ± 2 N·m (55 ± 1 ft-lb)
Ground wire attaching bolt		5.0 ± 1.0 N·m (44 ± 9 in-lb)
High-pressure fuel hose attaching bolt		4.9 ± 1.0 N·m (44 ± 8 in-lb)
Lower oil pan attaching bolt		11 ± 1 N·m (96 ± 8 in-lb)
Oil dipstick guide attaching bolt		48 ± 6 N·m (36 ± 4 ft-lb)
Oil pan bolt hole cover attaching bolt		11 ± 1 N·m (96 ± 8 in-lb)
Oil pan drain plug		39 ± 5 N·m (29 ± 4 ft-lb)
Power steering oil pump attaching bolt		42 ± 7 N·m (31 ± 5 ft-lb)
Rocker arm and shaft assembly attaching bolt		31 ± 3 N·m (23 ± 2 ft-lb)
Rocker cover attaching bolt		3.4 ± 0.5 N·m (31 ± 4 in-lb)

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ITEMS		SPECIFICATIONS
Starter attaching bolt		30 ± 3 N·m (23 ± 2 ft-lb)
Tensioner pulley assembly attaching bolt and nut		44 ± 10 N·m (33 ± 7 ft-lb)
Timing belt front lower cover attaching bolt		11 ± 1 N·m (96 ± 8 in-lb)
Timing belt front upper cover attaching bolt	M6	11 ± 1 N·m (96 ± 8 in-lb)
	M8	14 ± 1 N·m (117 ± 13 in-lb)
Timing belt rear cover attaching bolt		14 ± 1 N·m (117 ± 13 in-lb)
Timing belt tensioner arm attaching bolt		44 ± 10 N·m (33 ± 7 ft-lb)
Timing belt tensioner pulley attaching bolt		48 ± 6 N·m (36 ± 4 ft-lb)
Upper oil pan attaching bolt	M6	5.9 ± 1.0 N·m (52 ± 9 in-lb)
	M10	35 ± 6 N·m (26 ± 4 ft-lb)

SERVICE SPECIFICATIONS

M1111000300349

ITEMS	STANDARD VALUE	LIMIT
Basic ignition timing at idle	5°BTDC ± 3°	–
Actual ignition timing at idle	Approximately 15° BTDC	–
CO content %	0.5 or less	–
HC contents ppm	100 or less	–
Curb idle speed r/min	700 ± 100	–
Compression pressure (250 – 400 r/min) kPa (psi) <without VIC>	824 (119)	Minimum 575 (83)
Compression pressure (250 r/min) kPa (psi) <with VIC>	1,470 (212)	Minimum 1,029 (149)
Compression pressure difference of all cylinder kPa (psi)	–	98 (14)
Intake manifold vacuum at curb idle kPa (in Hg)	–	Minimum 60 (18)
Auto-tensioner pushrod movement mm (in)	Within 1.0 (0.04)	–
Auto-tensioner rod protrusion mm (in)	3.8 – 5.0 (0.15 – 0.20)	–

SEALANT

M1111000500246

ITEM	SPECIFIED SEALANT
Oil pan	MITSUBISHI GENUINE Sealant Part No. MD970389 or equivalent

NOTES

GROUP 11D

ENGINE OVERHAUL <3.0L>

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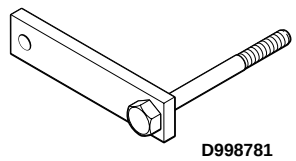
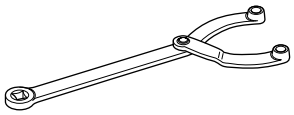
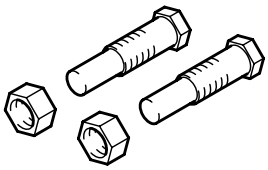
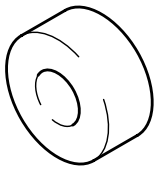
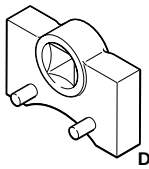
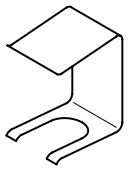
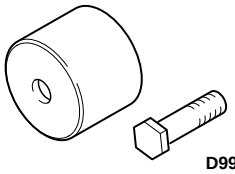
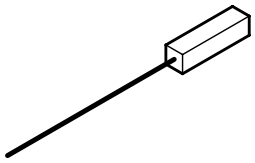
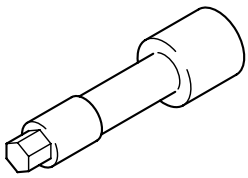
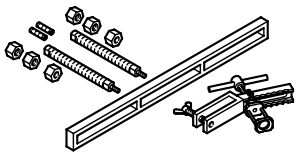
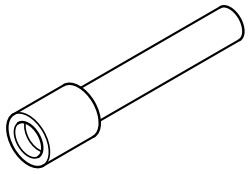
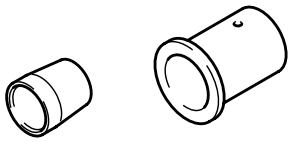
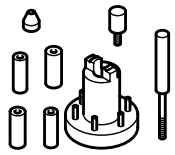
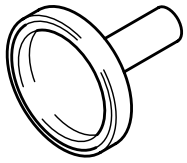
SPECIAL TOOLS

M1113000600045

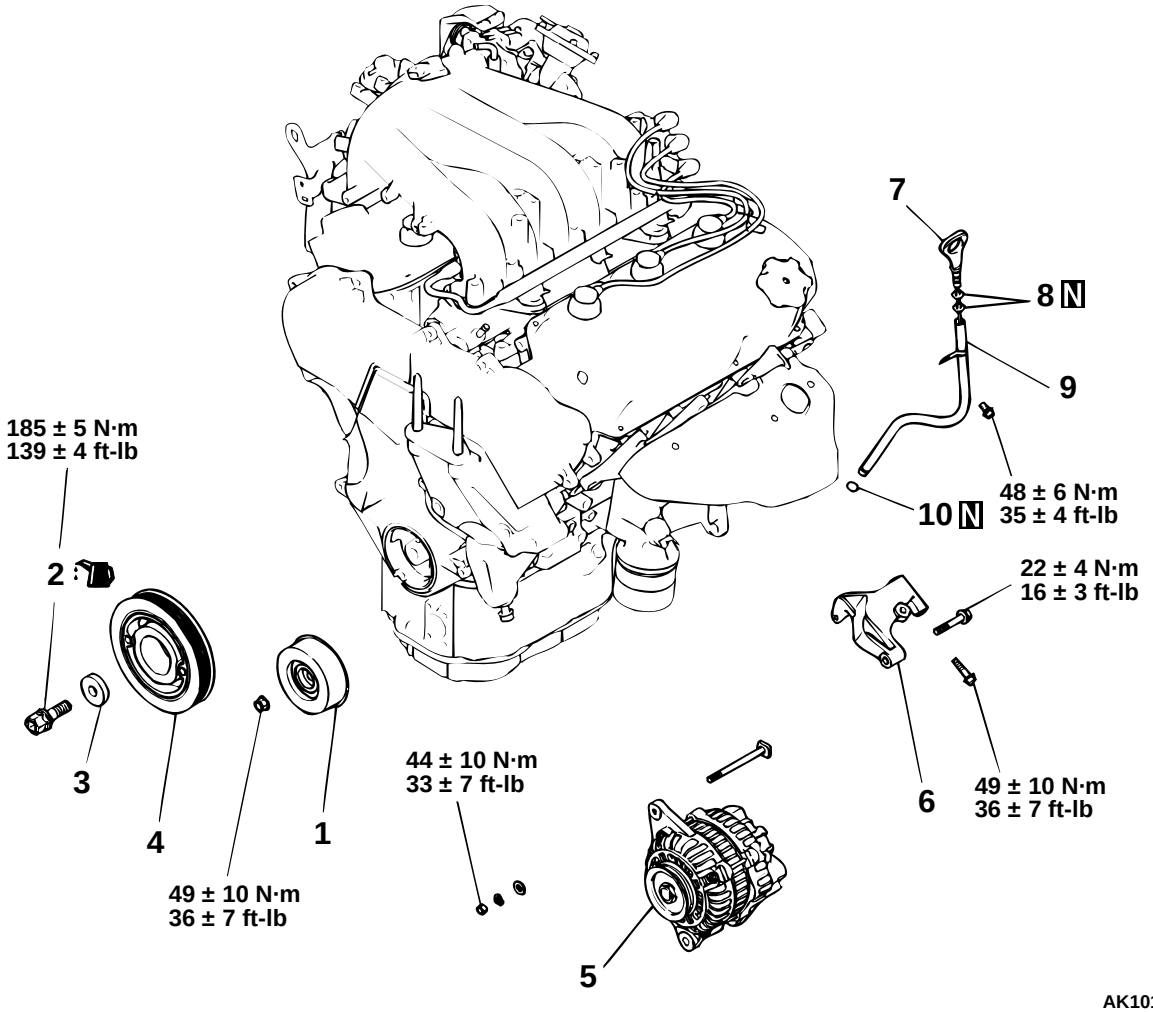
TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 D998781	MD998781 Flywheel stopper	General service tool	Loosening and tightening crankshaft bolts
 B990767	MB990767 End yoke holder	MB990767-01	Holding camshaft sprocket when loosening or torquing bolt
	MD998715 Pins	MIT308239	
	MD998769 Crankshaft spacer	General service tool	Rotation of crankshaft when installing piston and timing belt
 D998767	MD998767 Tension pulley wrench	MD998752-01	Adjustment of timing belt tension
 D998443	MD998443 Lash adjuster holder (8)	MD998443-01	Supporting lash adjuster to prevent it from falling when rocker shaft assembly is removed or installed
 D998713	MD998713 Camshaft oil seal installer	MD998713-01	Installation of camshaft oil seal
B991559	MB991559 Camshaft oil seal installer adaptor<left bank side>	General service tool	

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
	MD998442 Air bleed wire	General service tool	Air bleeding of lash adjuster
	MD998051 Cylinder head bolt wrench	MD998051-01 or General service tool	Loosening and tightening cylinder head bolts
	MD998772 Valve spring compressor	General service tool	Compression of valve spring
	MD998774 Valve stem seal installer	MD998774-01	Installation of valve stem seal
	MD998717 Crankshaft front oil seal installer	MD998717-01	Installation of crankshaft front oil seal
	MD998780 Piston pin setting tool	MIT216941	Removal and installation of piston pin
	MD998718 Crankshaft rear oil seal installer	MD998718-01 Use with MB990938-01	Installation of crankshaft rear oil seal

GENERATOR AND DRIVE BELT

REMOVAL AND INSTALLATION

M1113001300133



AK101688AC

REMOVAL STEPS

1. DRIVE BELT TENSIONER
<<A>> >>A<< 2. CRANKSHAFT BOLT
3. CRANKSHAFT PULLEY WASHER
4. DAMPER PULLEY
5. GENERATOR

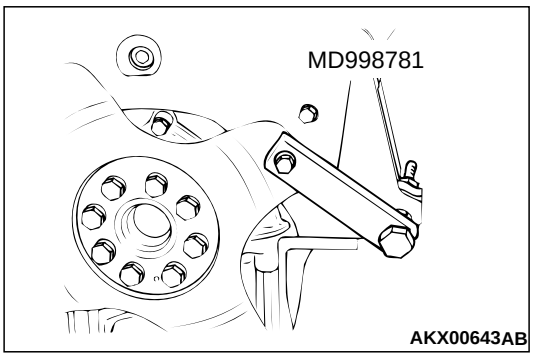
REMOVAL STEPS (Continued)

6. GENERATOR BRACKET
7. OIL DIPSTICK
8. O-RING
9. OIL DIPSTICK GUIDE
10. O-RING

Required Special Tool:

- MD998781: Flywheel Stopper

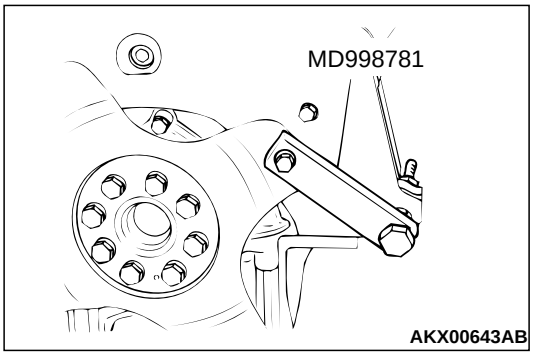
REMOVAL SERVICE POINT



<<A>> CRANKSHAFT BOLT LOOSENING

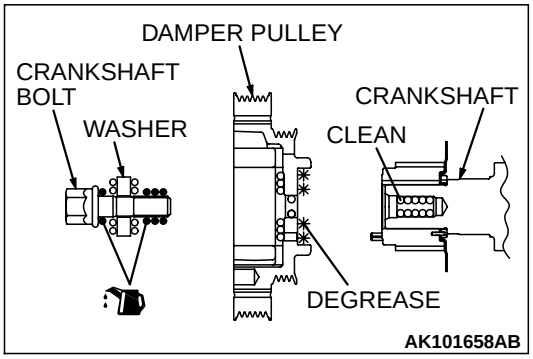
1. Install special tool MD998781 to hold the flywheel or drive plate.
2. Loosen and remove the crankshaft bolt and washer.

INSTALLATION SERVICE POINT



>>A<< CRANKSHAFT BOLT TIGHTENING

1. Install special tool MD998781 to hold the flywheel or drive plate.



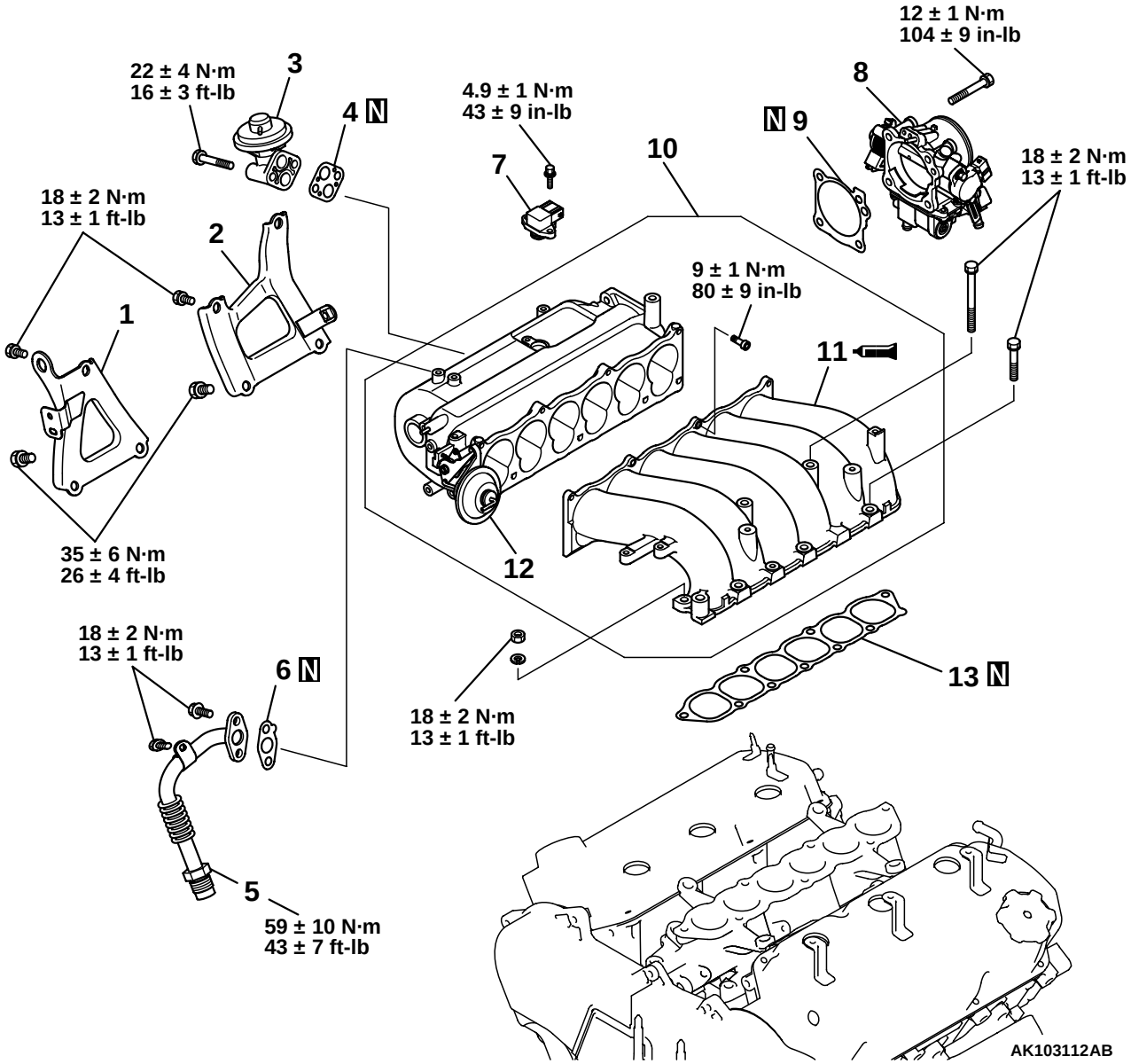
2. Clean the bolt hole in crankshaft bolt and damper pulley's seating surface.
3. Degrease the cleaned seating surface of the damper pulley.
4. Install the damper pulley.
5. Apply oil to the threads of crankshaft bolt and the outer surface of washer.
6. Tighten the crankshaft bolt to the specified torque.
   Tightening torque: 185 ± 5 N·m (139 ± 4 ft-lb)

INTAKE MANIFOLD PLENUM AND THROTTLE BODY ASSEMBLY

REMOVAL AND INSTALLATION

M1113003300106

<WITH INDUCTION CONTROL VALVE>



REMOVAL STEPS

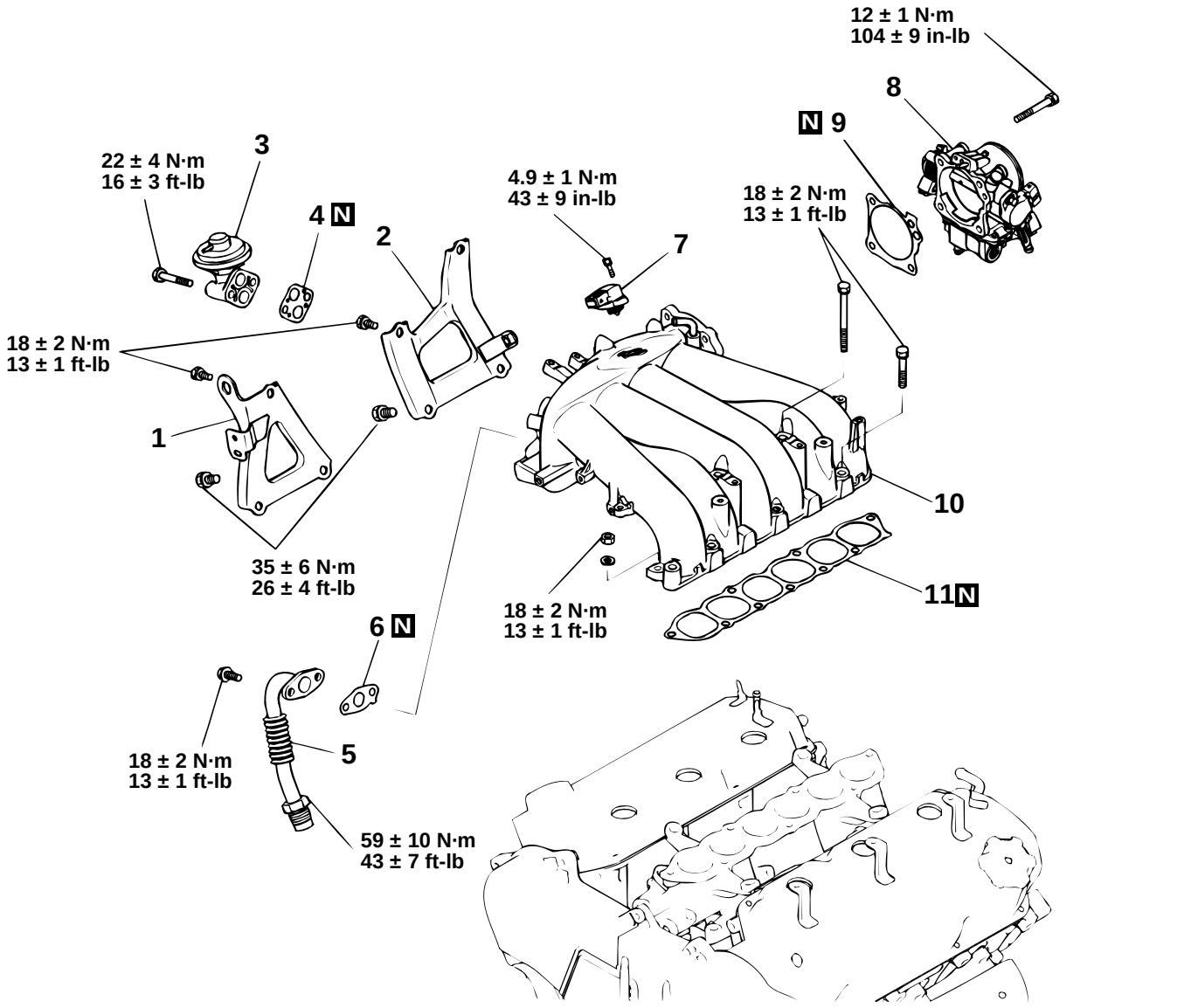
1. INTAKE MANIFOLD PLENUM STAY, FRONT
2. INTAKE MANIFOLD PLENUM STAY, REAR
3. EGR VALVE
4. EGR VALVE GASKET
5. EGR PIPE
6. EGR PIPE GASKET
7. MANIFOLD DIFFERENTIAL PRESSURE SENSOR

REMOVAL STEPS (Continued)

8. THROTTLE BODY
- >>B<< 9. THROTTLE BODY GASKET
10. INDUCTION CONTROL VALVE ASSEMBLY
- >>A<< 11. INTAKE MANIFOLD UPPER
12. INDUCTION CONTROL VALVE
13. INTAKE MANIFOLD PLENUM GASKET

TSB Revision

<WITHOUT INDUCTION CONTROL VALVE>



AKX00662AB

REMOVAL STEPS

1. INTAKE MANIFOLD PLENUM STAY, FRONT
2. INTAKE MANIFOLD PLENUM STAY, REAR
3. EGR VALVE
4. EGR VALVE GASKET
5. EGR PIPE
6. EGR PIPE GASKET

REMOVAL STEPS (Continued)

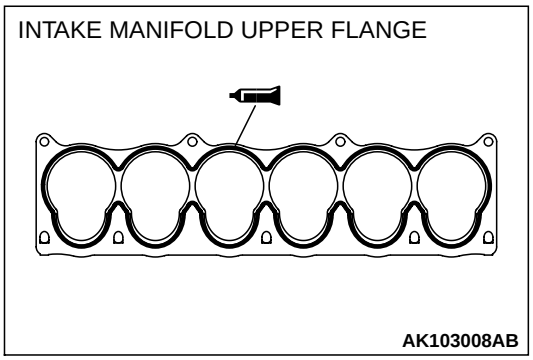
7. MANIFOLD DIFFERENTIAL PRESSURE SENSOR
8. THROTTLE BODY

>>B<< 9. THROTTLE BODY GASKET

10. INTAKE MANIFOLD PLENUM
11. INTAKE MANIFOLD PLENUM GASKET

TSB Revision

INSTALLATION SERVICE POINT



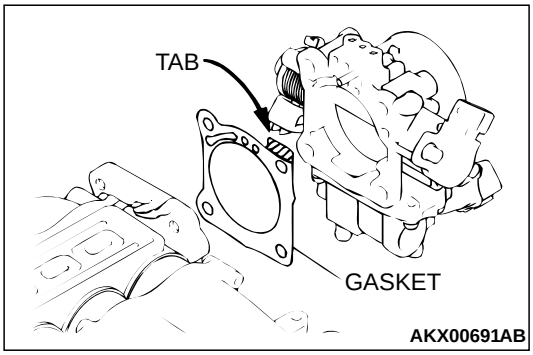
>>A<< INTAKE MANIFOLD UPPER INSTALLATION

1. Clean the contacting surfaces of induction control system and intake manifold upper.
2. Apply Mitsubishi Genuine Parts number MD970389, 3M™ AAD Part number 8660 or equivalent to the intake manifold upper.
3. Install the intake manifold upper to the intake manifold upper.

   NOTE: Be sure to install the intake manifold upper quickly while the sealant is wet (within 15 minutes).
4. Tighten the intake manifold upper mounting bolts to the specified torque.

   Tightening torque:
   9 ± 1 N·m (80 ± 9 in-lb)

   NOTE: After installation, keep the sealed area away from oil and coolant for approximately one hour.



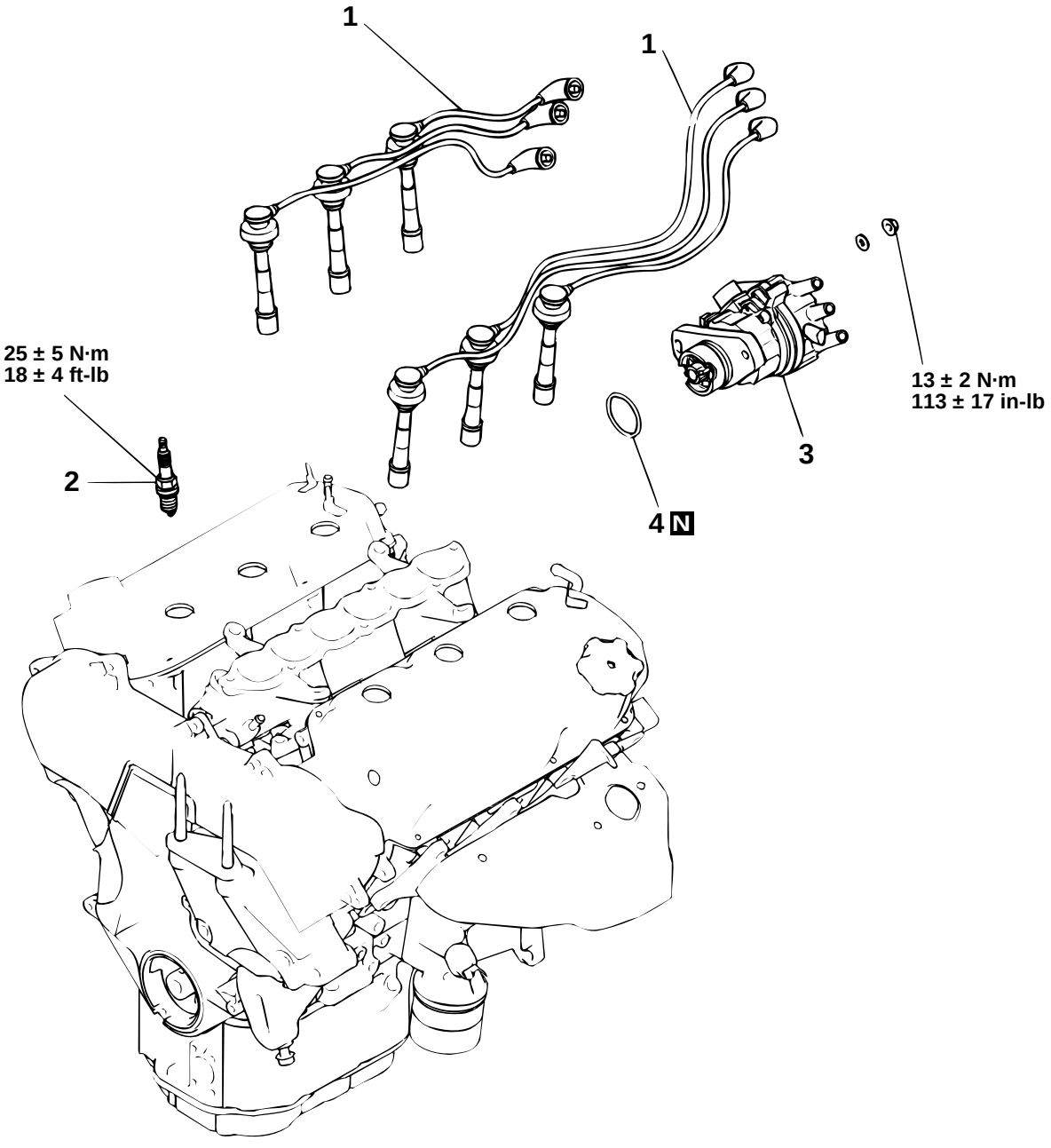
>>B<< THROTTLE BODY GASKET INSTALLATION

Install the gasket so that the tab is positioned as shown in the illustration.

IGNITION SYSTEM

REMOVAL AND INSTALLATION

M1113001600037



AKX00663AB

REMOVAL STEPS
1. SPARK PLUG CABLES
2. SPARK PLUGS

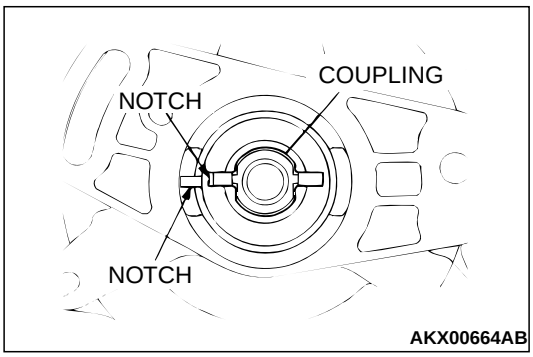
REMOVAL STEPS (Continued)
>>A<< 3. DISTRIBUTOR
4. O-RING

TSB Revision

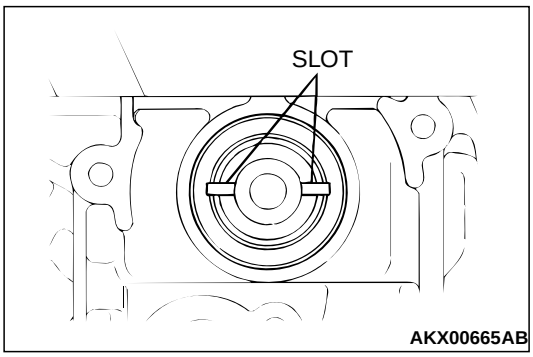
INSTALLATION SERVICE POINT

>>A<< DISTRIBUTOR INSTALLATION

1. Turn the crankshaft to bring the piston in No.1 cylinder to the top dead center on the compression stroke.
2. Rotate the distributor shaft coupling until its notch (mating mark) is lined up with the notch (mating mark) in the housing.



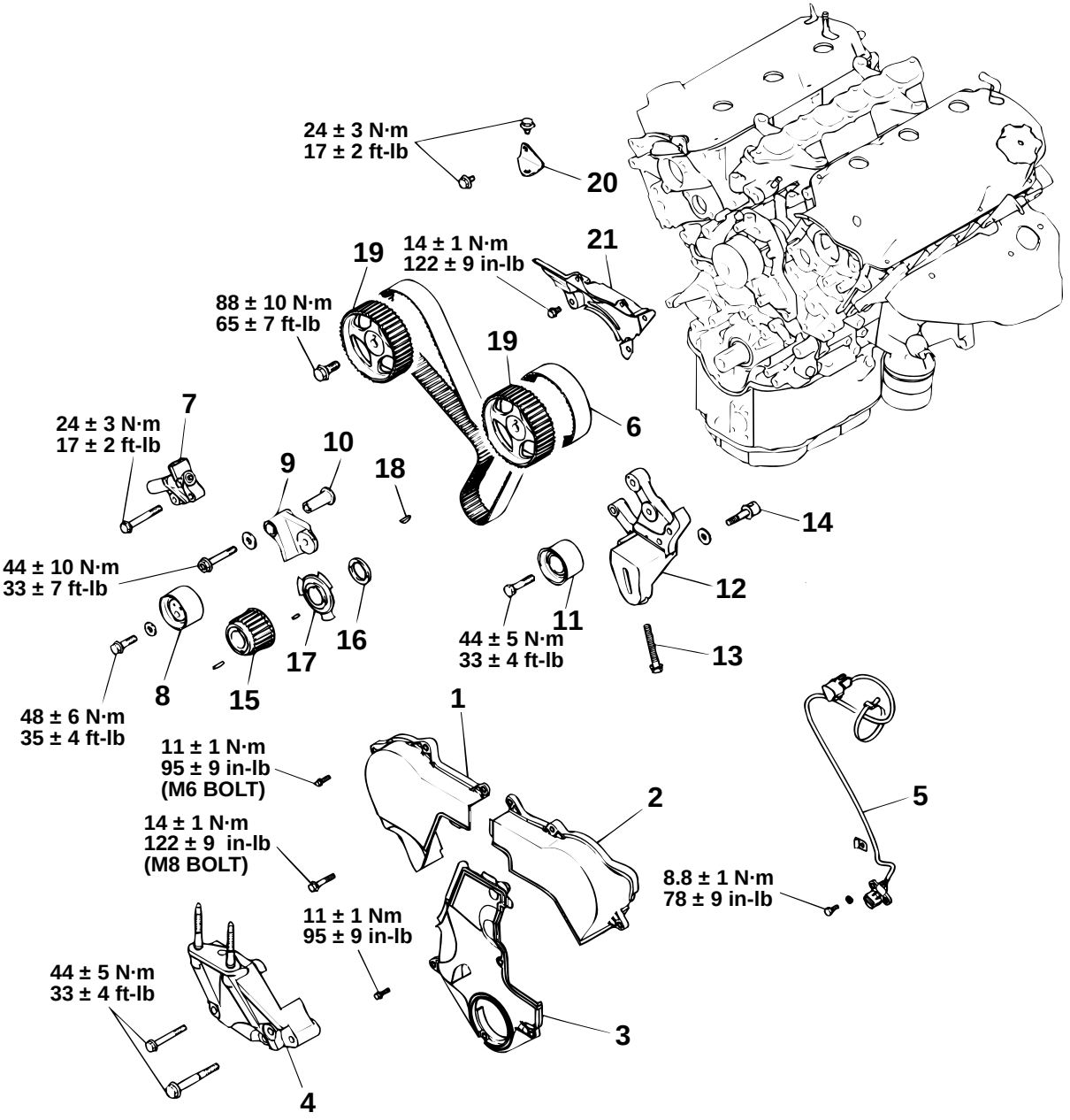
3. Fit the distributor coupling in the slot at the rear end of the camshaft to install the distributor.



TIMING BELT

REMOVAL AND INSTALLATION

M1113001900254



AK101690AC

REMOVAL STEPS

1. TIMING BELT FRONT UPPER COVER, RIGHT
2. TIMING BELT FRONT UPPER COVER, LEFT
3. TIMING BELT FRONT LOWER COVER

>>E<< 4. ENGINE SUPPORT BRACKET, RIGHT

5. CRANKSHAFT POSITION SENSOR

<<A>> >>D<< 6. TIMING BELT

REMOVAL STEPS (Continued)

>>C<< 7. AUTO-TENSIONER
8. TENSIONER PULLEY
9. TENSIONER ARM
10. SHAFT
11. IDLER PULLEY
12. TENSIONER BRACKET
13. ADJUSTING BOLT
14. ADJUSTING STUD

>>B<< 15. CRANKSHAFT SPROCKET

>>B<< 16. CRANKSHAFT SPACER

>>B<< 17. CRANKSHAFT SENSING BLADE

TSB Revision

REMOVAL STEPS (Continued)

18. KEY
<<B>> >>A<< 19. CAMSHAFT SPROCKET
20. BRACKET
21. TIMING BELT REAR COVER

Required Special Tools:

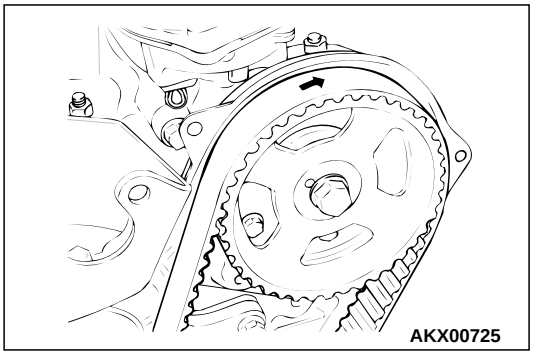
- MB990767: End Yoke Holder
- MD998715: Pins
- MD998767: Tensioner Pulley Wrench
- MD998769: Crankshaft Spacer

REMOVAL SERVICE POINTS

<<A>> TIMING BELT REMOVAL

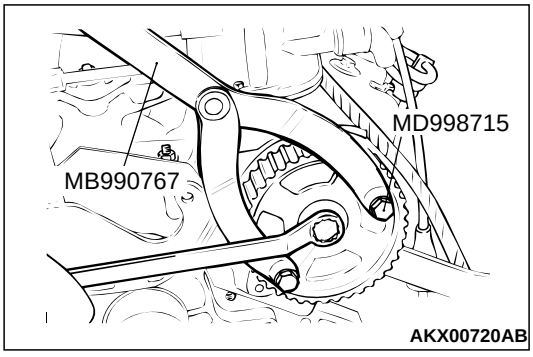
⚠ CAUTION

Water or oil on the belt shortens its life drastically, so the removed timing belt, sprocket, and tensioner must be kept free from oil and water. These parts should not be washed or immersed in solvent. Replace parts if contaminated.If there is oil or water on any part, check the front case oil seal, camshaft oil seal, and water pump for leaks.



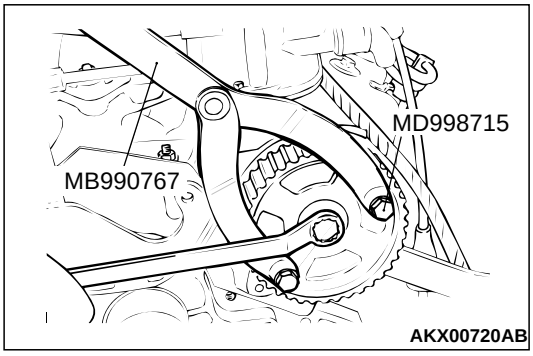
1. 1.Mark the belt running direction for reinstallation.
2. Loosen the tensioner pulley bolt, and then remove the timing belt.

<<B>> CAMSHAFT SPROCKET REMOVAL



1. While holding the camshaft sprocket with special tools MB990767 and MD998715, loosen the camshaft sprocket bolt.
2. Remove the camshaft sprocket.

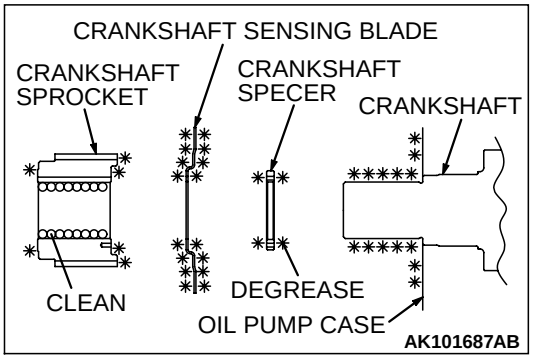
INSTALLATION SERVICE POINT



>>A<< CAMSHAFT SPROCKET INSTALLATION

1. Fit the camshaft sprocket to the front end of the camshaft.
2. While holding the camshaft sprocket with special tools MB990767 and MD998715, tighten the camshaft sprocket bolt.

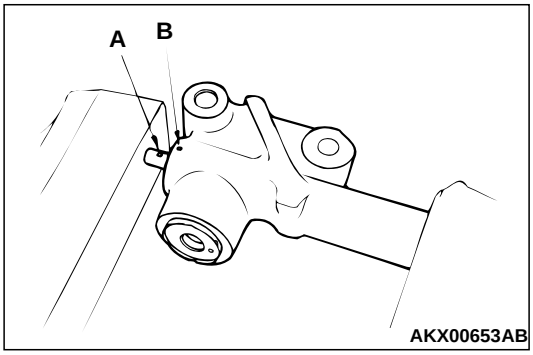
Tightening torque: 88 ± 10 N·m (65 ± 7 ft-lb)



>>B<< CRANKSHAFT SENSING BLADE/CRANKSHAFT SPACER/CRANKSHAFT SPROCKET INSTALLATION

1. Clean the hole in the crankshaft sprocket.
2. Clean and degrease the mating surfaces of the crankshaft sprocket; sensing blade; and spacer

NOTE: Degreasing is necessary to prevent decrease in friction between the mating surface due to presence of oil.



>>C<< AUTO-TENSIONER INSTALLATION

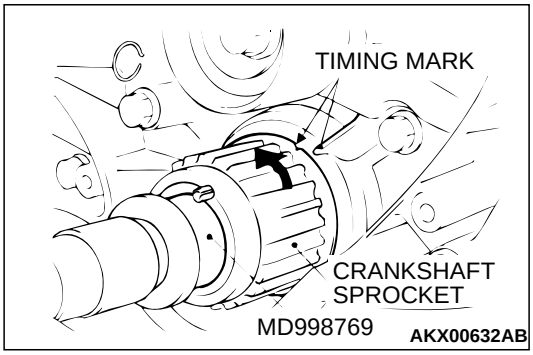
If the auto-tensioner rod is fully extended, reset it as follows:

1. Clamp the auto-tensioner in the vise with soft jaws.
2. Push in the rod little by little with the vise until the set hole A in the rod is aligned with the hole B in the cylinder.
3. Insert a wire [1.4 mm (0.055 inch) in diameter] into the set holes. This auto-tensioner setting wire will be used during timing belt alignment.
4. Unclamp the auto-tensioner from the vise.

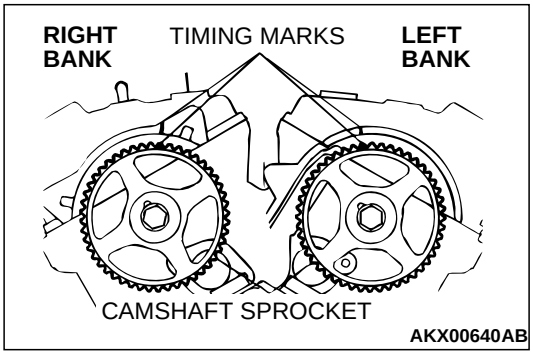
>>D<< TIMING BELT INSTALLATION

⚠ CAUTION

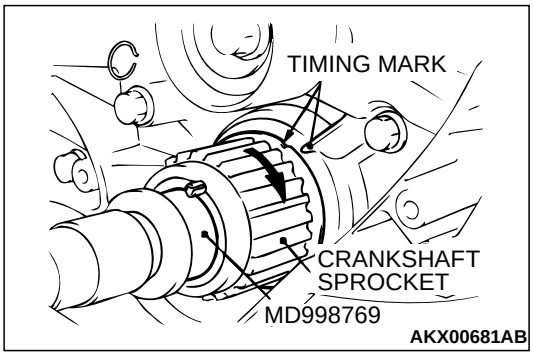
Do not turn the camshaft when the piston in No.1 cylinder is at the top dead center on the compression stroke. Doing so can cause the lifted valve to hit against the piston, resulting in damaging parts.



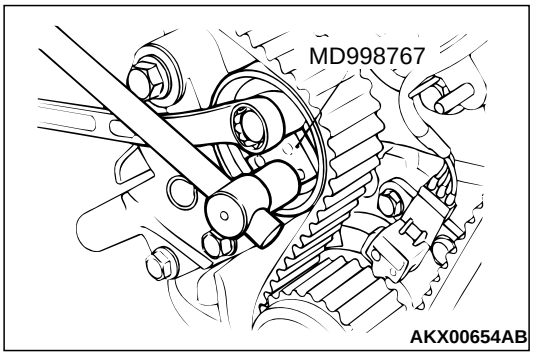
1. Install special tool MD998769 and the crankshaft pulley washer, and then tighten the crankshaft bolt.
2. Align the timing mark on the crankshaft sprocket with the timing mark on the oil pump case, and then rotate the sprocket three teeth counterclockwise.



3. Align the timing mark on the left bank camshaft sprocket with the timing mark on the rocker cover.
4. Align the timing mark on the right bank camshaft sprocket with the timing mark on the rocker cover.

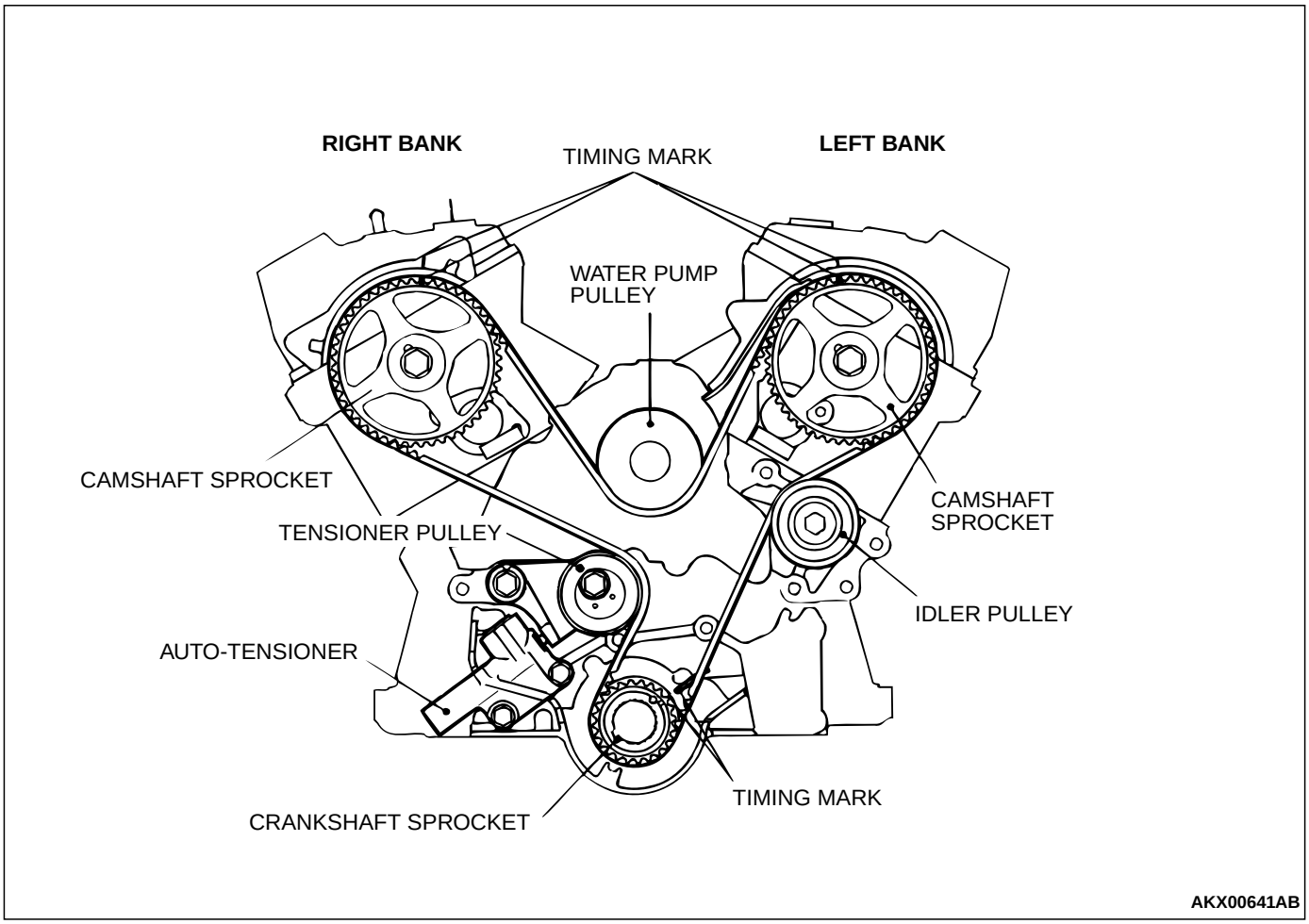


5. Align the timing mark on the crankshaft sprocket with the timing mark on the oil pump case.
6. Install the timing belt on each sprocket and pulley in the following sequence. Do not leave the belt slack between each sprocket and pulley.
   (1) Crankshaft sprocket
   (2) Idler pulley
   (3) Left bank camshaft sprocket
   (4) Water pump pulley
   (5) Right bank camshaft sprocket
   (6) Tensioner pulley

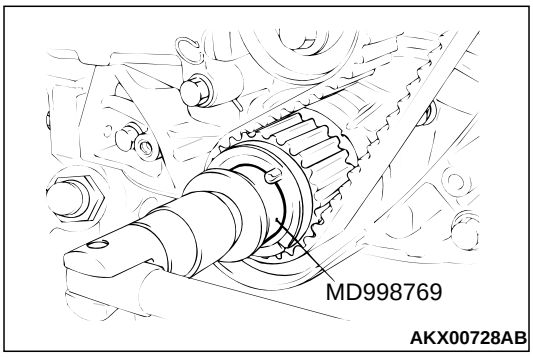


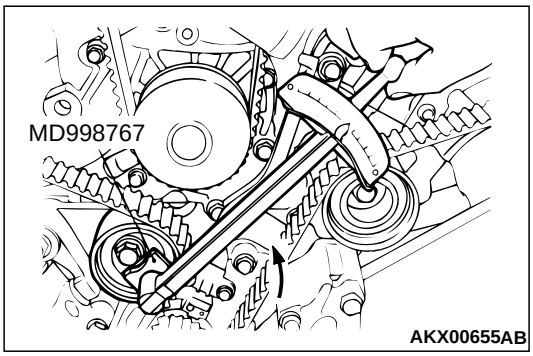
7. Install special tool MD998767 to the tensioner pulley. While pushing the pulley lightly against the belt using the special tool, tighten the flange bolt.

   Tightening torque: 48 ± 6 N·m (35 ± 4 ft-lb)



8. Check to see that the timing marks of all the sprockets are in a alignment.
9. Rotate the crankshaft a quarter turn counterclockwise. Then rotate it back clockwise to verify that all the timing marks are aligned.





10. Loosen the flange bolt securing the tensioner pulley, and then mount special tool MD998767 and a torque wrench on the tensioner pulley.
11. Torque it to 4.4 N·m (39 in-lb) with the torque wrench.
12. While holding the tensioner pulley in position, tighten the flange bolt to the specified torque.

    Tightening torque: 48 ± 6 N·m (35 ± 4 ft-lb)
13. Rotate the crankshaft two turns clockwise and leave it alone for approximately five minutes.

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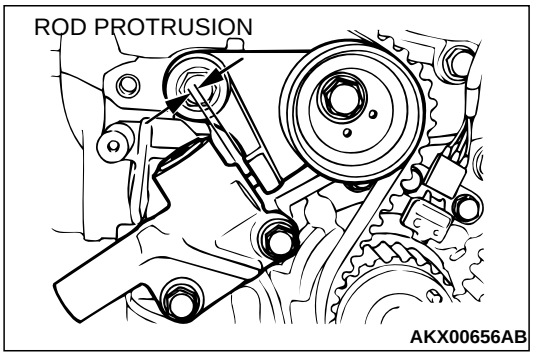
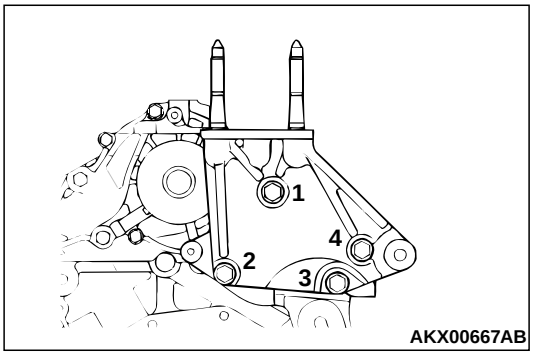


14. Check to see whether the metal wire inserted when the auto-tensioner was installed can be removed without any resistance.
    If the metal wire can be removed without any resistance, it means that the belt has a proper tension. Therefore, remove the metal wire. In this condition, check that the rod protrusion of the auto-tensioner is within the standard value.
    Standard value: 3.8 – 5.0 mm (0.15 – 0.20 inch)
15. If the metal wire offers resistance when removed, repeat the previous steps (10) through (13) until proper belt tension is obtained.

>>E<< ENGINE SUPPORT BRACKET, RIGHT INSTALLATION



The mounting bolts of the right engine support bracket must be tightened in the order shown in the illustration.

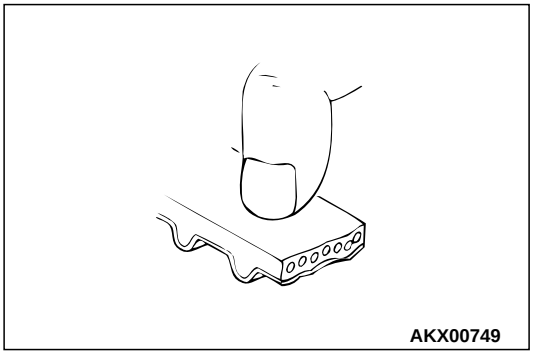
Tightening torque: 44 ± 5 N·m (33 ± 4 ft-lb)

Bolt length
85 mm (33.5 inch) – Bolt 3
95 mm (37.4 inch) – Other bolts

INSPECTION

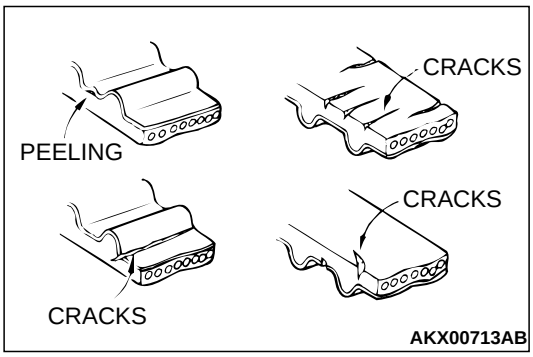
M1113002000049

TIMING BELT

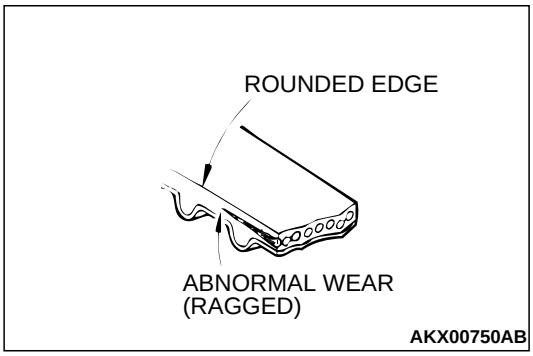


Replace the belt if any of the following conditions exist.

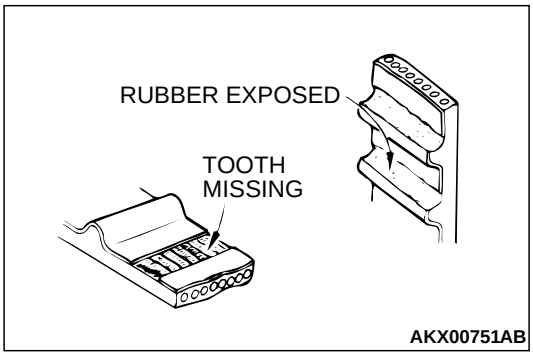
1. Hardening of rubber backing.
   Back side is glossy without resilience and leaves no indent when pressed with fingernail.



2. Cracks on rubber back
3. Cracks or peeling of canvas
4. Cracks on tooth bottom
5. Cracks on belt



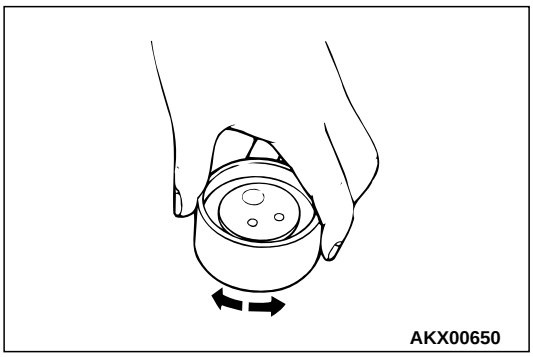
6. Abnormal wear of belt sides. Normal wear is indicated if the sides are sharp as if cut by a knife. Abnormal wear is indicated if the sides are ragged.



7. Abnormal wear on teeth.
8. Missing tooth.

TENSIONER PULLEY AND IDLER PULLEY

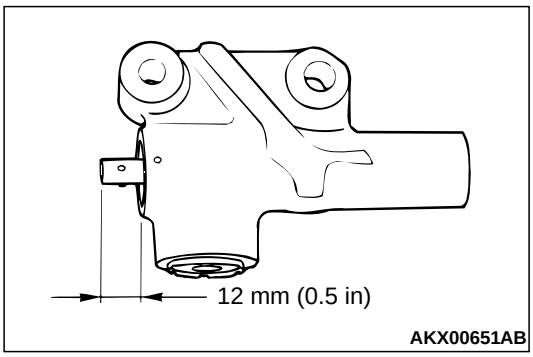
Turn the pulley. If it does not rotate smoothly, or develops noise or excessive play, replace the pulley.

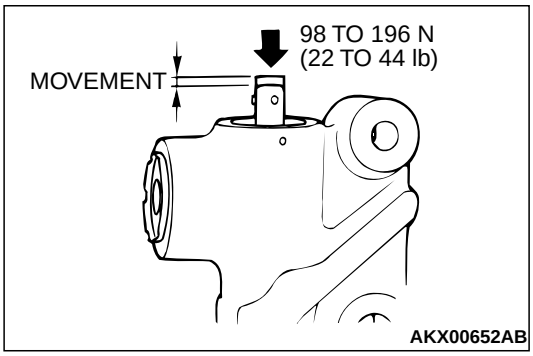


AUTO-TENSIONER

1. Check for oil leaks. If oil leaks are evident, replace the auto-tensioner.
2. Check the rod end for wear or damage and replace the auto-tensioner if necessary.
3. Measure the rod protrusion. If it is out of specification, replace the auto-tensioner.

   Standard value: 12 mm (0.5 inch)



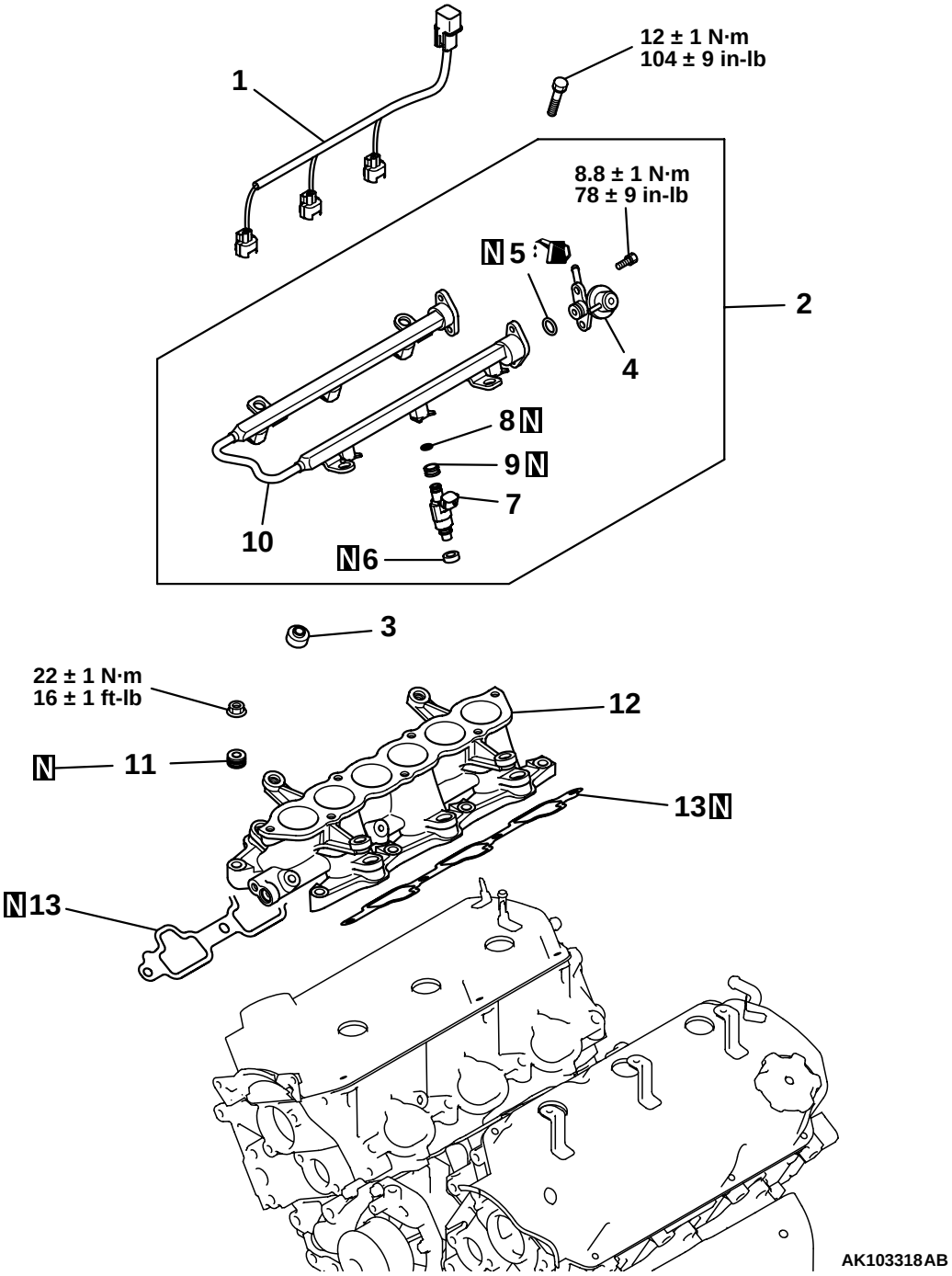


4. Press the rod with a force of 98 to 196 N (22 to 44 pounds) and measure the movement of the rod.
   If the measured value is out of the standard value, replace the auto-tensioner.
   Standard value: 1.0 mm (0.03 inch) or less

INTAKE MANIFOLD AND FUEL PARTS

REMOVAL AND INSTALLATION

M1113004300110



REMOVAL STEPS

1. INJECTOR HARNESS
2. INJECTOR AND FUEL RAIL
3. INSULATOR

>>C<< 4. FUEL PRESSURE REGULATOR

5. O-RING
6. INSULATOR

>>B<< 7. INJECTOR

REMOVAL STEPS (Continued)

8. O-RING
9. GROMMET
10. FUEL RAIL
11. CONED DISC SPRING

>>A<< 12. INTAKE MANIFOLD

13. INTAKE MANIFOLD GASKET

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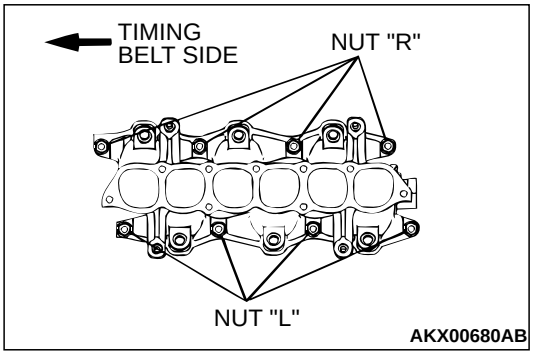
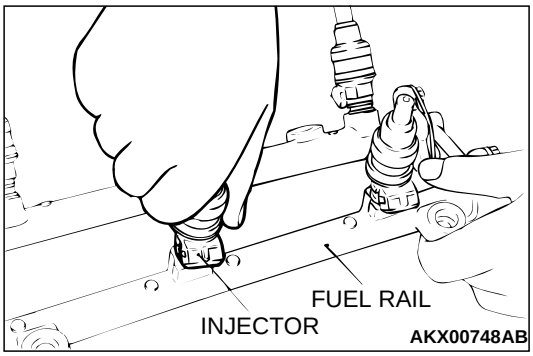
INSTALLATION SERVICE POINTS



>>A<< INTAKE MANIFOLD INSTALLATION

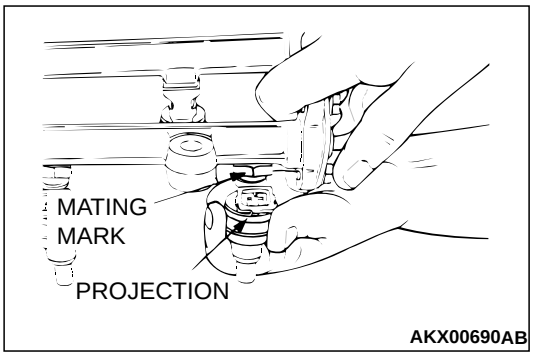
1. Tighten the nuts "R" to 6.4 ± 1.5 N·m (57 ± 13 in-lb).
2. Tighten the nuts "L" to the specified torque.
   Tightening torque: 22 ± 1 N·m (16 ± 1 ft-lb)
3. Tighten the nuts "R" to the specified torque.
   Tightening torque: 22 ± 1 N·m (16 ± 1 ft-lb)
4. Tighten the nuts "L" to the specified torque.
   Tightening torque: 22 ± 1 N·m (16 ± 1 ft-lb)
5. Tighten the nuts "R" to the specified torque.
   Tightening torque: 22 ± 1 N·m (16 ± 1 ft-lb)



>>B<< INJECTOR INSTALLATION

⚠ CAUTION
Use care not to let engine oil enter the fuel rail.

1. Apply clean engine oil to the O-ring.
2. Insert the injector into the fuel rail.
3. Make sure the injector rotates smoothly. If not, remove the injector to check the O-ring for damage, and replace the O-ring if necessary. Then reinsert the injector and check that it rotates smoothly.



4. Align the projection on the injector connector with the mating mark on the fuel rail.

>>C<< FUEL PRESSURE REGULATOR INSTALLATION

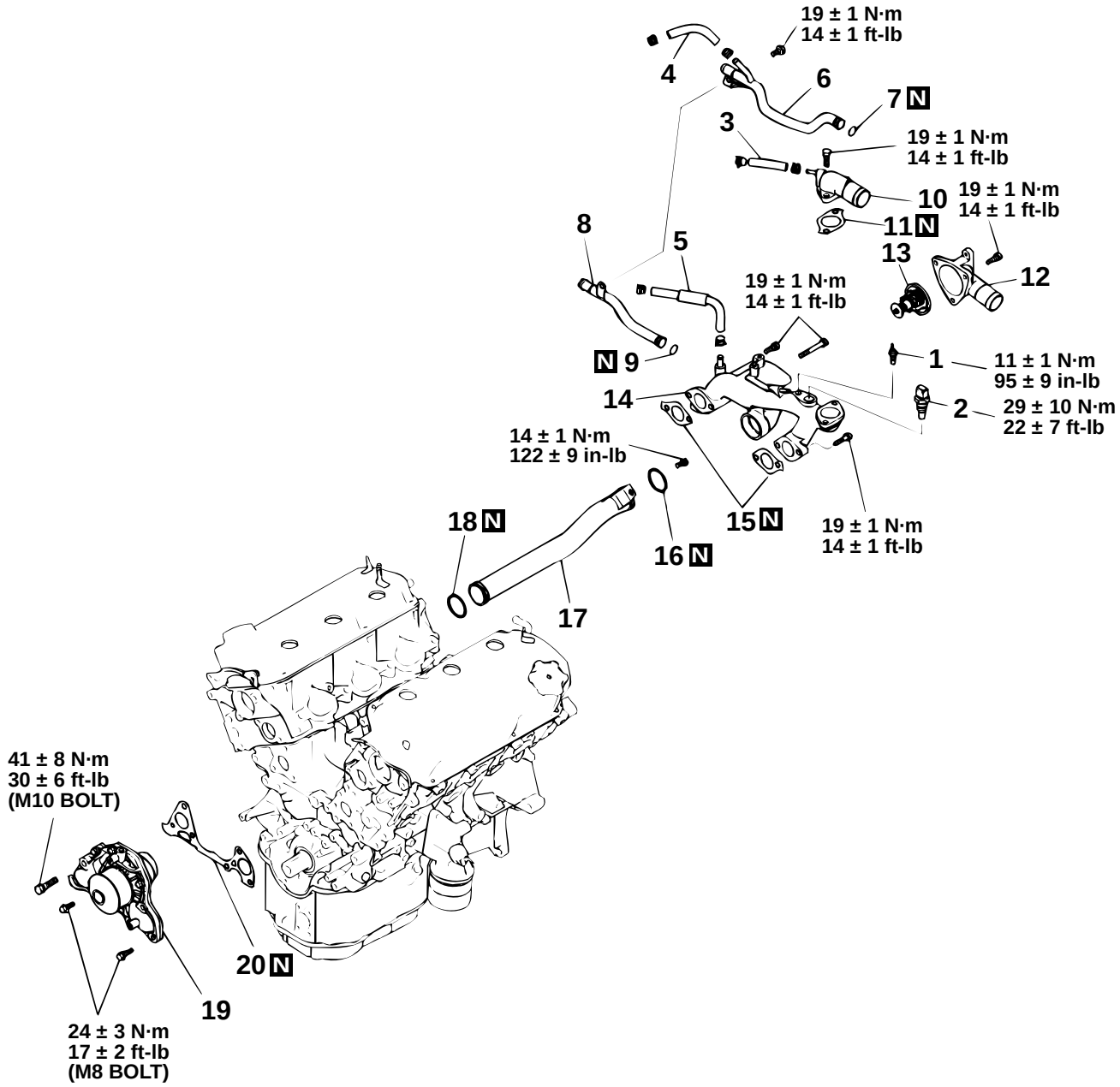
⚠ CAUTION
Do not let engine oil enter the fuel rail.

1. Apply clean engine oil to the O-ring.
2. Insert the fuel pressure regulator into the fuel rail.
3. Make sure the regulator rotates smoothly. If not, remove the fuel pressure regulator to check the O-ring for damage, and replace the O-ring if necessary. Then reinsert the fuel pressure regulator and check that it rotates smoothly.
4. Tighten the two bolts to the specified torque.
   Tightening torque: 8.8 ± 1 N·m (78 ± 9 in-lb)

WATER PUMP & WATER HOSE

REMOVAL AND INSTALLATION

M1113017900026



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REMOVAL STEPS

- **>>D<<** 1. ENGINE COOLANT TEMPERATURE GAUGE UNIT
- **>>C<<** 2. ENGINE COOLANT TEMPERATURE SENSOR
- 3. WATER HOSE
- 4. WATER HOSE
- 5. WATER HOSE
- 6. HEATER INLET PIPE
- 7. O-RING
- 8. HEATER OUTLET PIPE

REMOVAL STEPS (Continued)

- 9. O-RING
- 10. WATER OUTLET FITTINGGROMMET
- 11. GASKET
- 12. WATER INLET FITTING
- **>>B<<** 13. THERMOSTAT
- 14. THERMOSTAT HOUSING
- 15. GASKET
- **>>A<<** 16. O-RING
- **>>A<<** 17. WATER INLET PIPE
- **>>A<<** 18. O-RING

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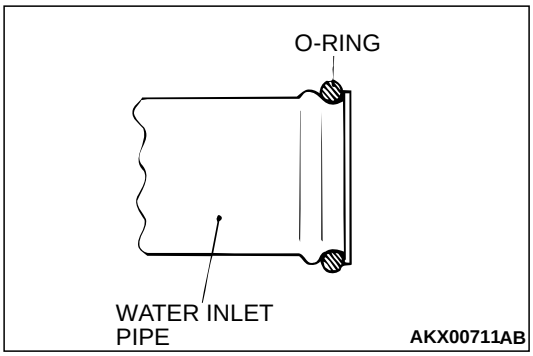
REMOVAL STEPS (Continued)
19. WATER PUMP

REMOVAL STEPS (Continued)
20. WATER PUMP GASKET

INSTALLATION SERVICE POINTS

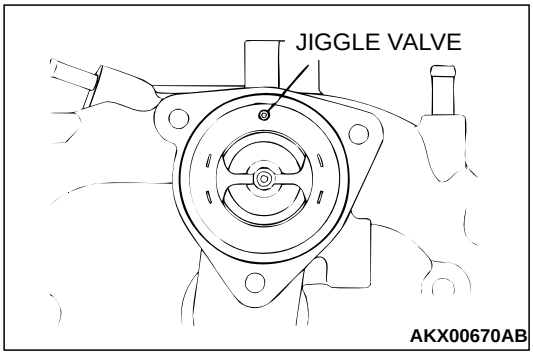
>>A<< O-RING AND WATER INLET PIPE INSTALLATION



⚠ CAUTION
Keep the O-ring free of oil or grease.

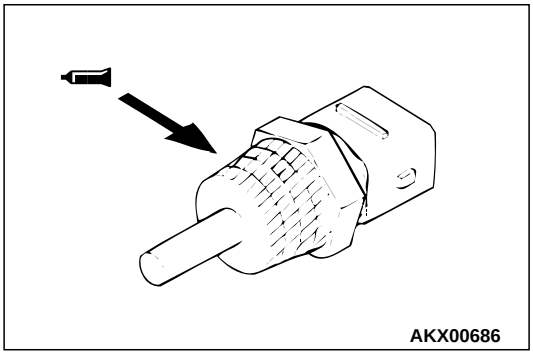
1. Attach a new O-ring to each end of the water inlet pipe.
2. Wet the O-ring with water.
3. Insert the front end of the pipe into the water pump.

>>B<< THERMOSTAT INSTALLATION

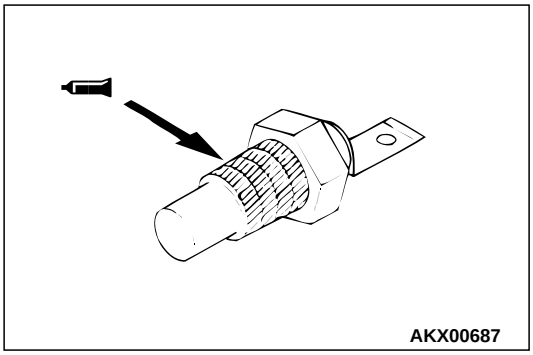


1. Check that the rubber ring is free from damage and seated correctly in the thermostat flange.
2. Install the thermostat as shown in the illustration. The jiggle valve must be at the uppermost position.

>>C<< SEALANT APPLICATION TO ENGINE COOLANT TEMPERATURE SENSOR



Apply 3M™ AAD Part number 8731 or equivalent to the engine coolant temperature sensor.



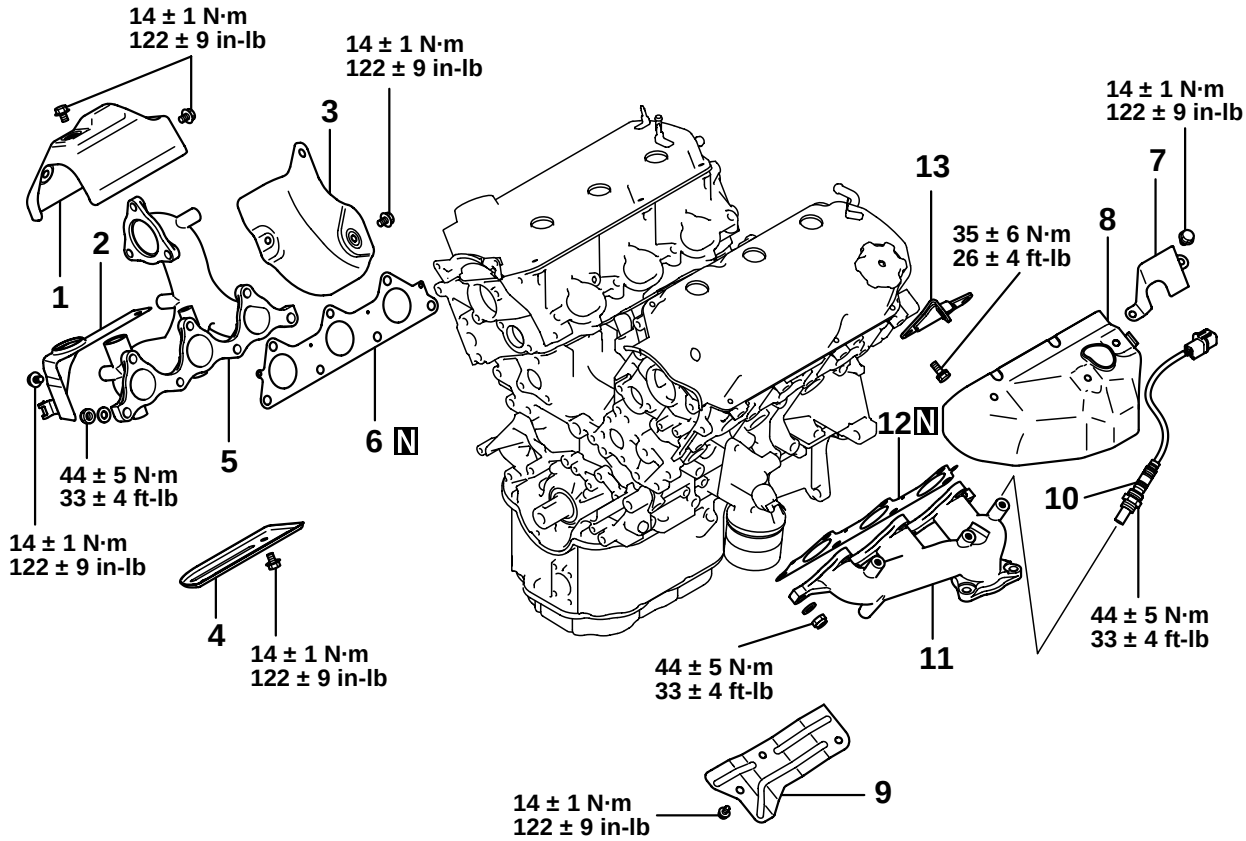
>>D<< SEALANT APPLICATION TO ENGINE COOLANT TEMPERATURE GAUGE UNIT

Apply 3M™ AAD Part number 8672 or equivalent to the engine coolant temperature gauge unit.

EXHAUST MANIFOLD

REMOVAL AND INSTALLATION

M1113004900048



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REMOVAL STEPS

1. HEAT PROTECTOR, UPPER RIGHT
2. HEAT PROTECTOR, FRONT RIGHT

REMOVAL STEPS (Continued)

3. HEAT PROTECTOR, RIGHT
4. HEAT PROTECTOR, LOWER RIGHT

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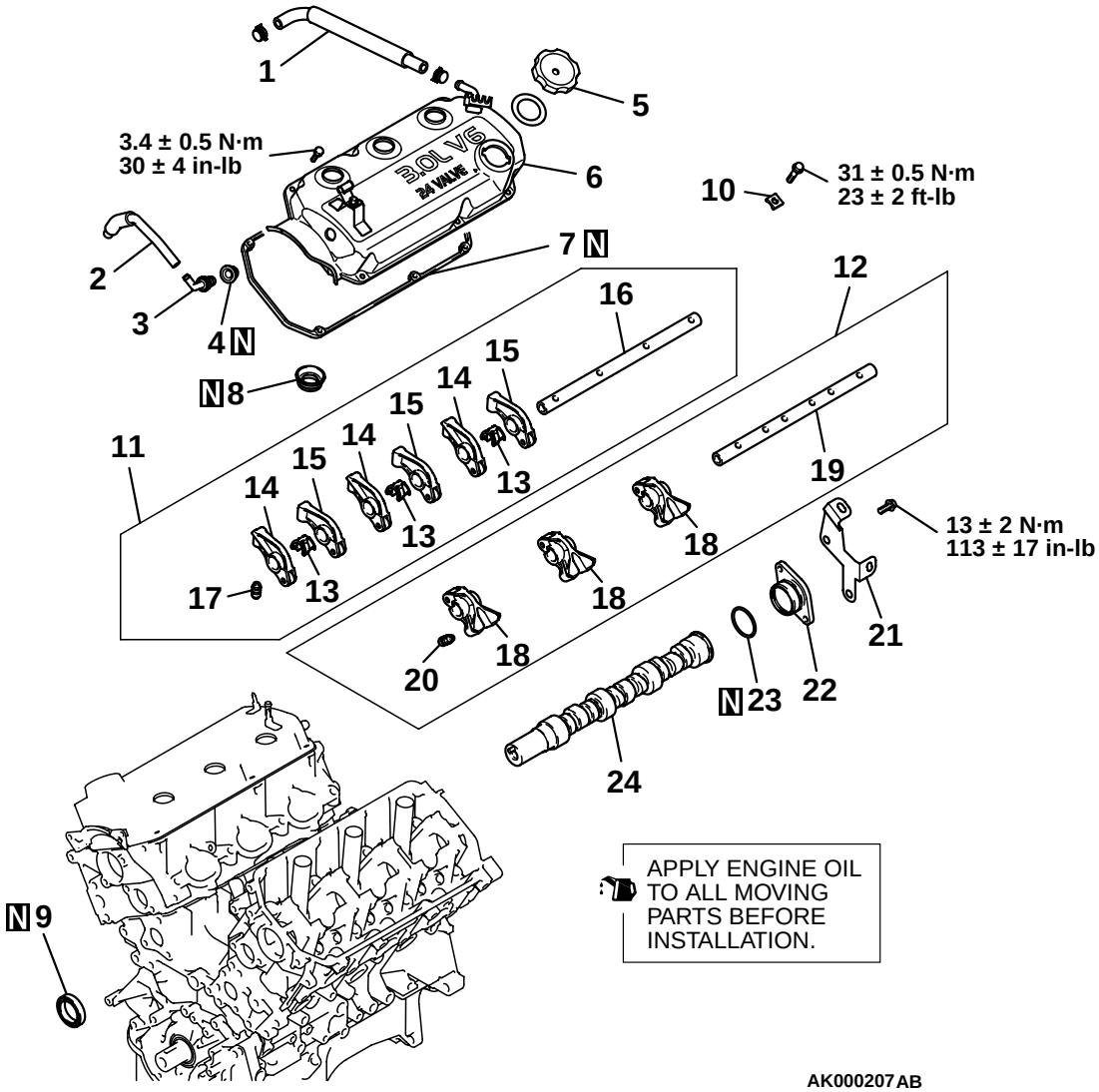
REMOVAL STEPS (Continued)
5. EXHAUST MANIFOLD, RIGHT
6. EXHAUST MANIFOLD GASKET
7. HEAT PROTECTOR, UPPER LEFT
8. HEAT PROTECTOR, LEFT
9. HEAT PROTECTOR, LOWER LEFT

REMOVAL STEPS (Continued)
10. OXYGEN SENSOR
11. EXHAUST MANIFOLD, LEFT
12. EXHAUST MANIFOLD GASKET
13. ENGINE HANGER

ROCKER ARMS AND CAMSHAFT

REMOVAL AND INSTALLATION

M1113005400046



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REMOVAL STEPS
1. BREATHER HOSE
2. PCV HOSE
3. PCV VALVE
4. PCV VALVE GASKET
5. OIL FILLER CAP
6. ROCKER COVER
7. ROCKER COVER GASKET
8. OIL SEAL

REMOVAL STEPS (Continued)
>>D<< 9. CAMSHAFT OIL SEAL
10. ROCKER SHAFT CAP
<<A>> >>C<< 11. ROCKER ARMS AND SHAFT
<<A>> >>C<< 12. ROCKER ARMS AND SHAFT
>>C<< 13. ROCKER SHAFT SPRING
14. ROCKER ARM A
15. ROCKER ARM B
16. ROCKER ARM SHAFT
>>B<< 17. LASH ADJUSTER

TSB Revision

REMOVAL STEPS (Continued)

18. ROCKER ARM C
19. ROCKER ARM SHAFT
>>B<< 20. LASH ADJUSTER
21. HARNESS BRACKET

REMOVAL STEPS (Continued)

22. THRUST CASE <LEFT BANK ONLY>
23. O-RING <LEFT BANK ONLY>
>>A<< 24. CAMSHAFT

Required Special Tools:

- MB991559: Camshaft Oil Seal Installer Adaptor
- MD998442: Air Bleed Wire
- MD998443: Lash Adjuster Holder
- MD998713: Camshaft Oil Seal Installer

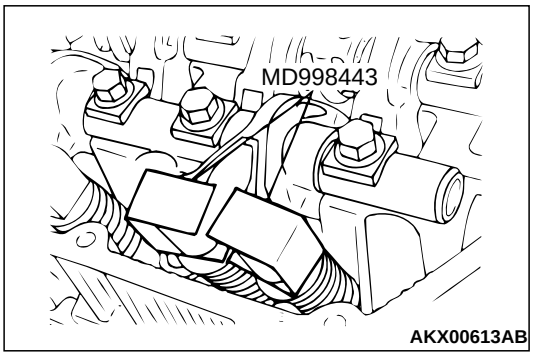
REMOVAL SERVICE POINT

<<A>> ROCKER ARMS AND SHAFT REMOVAL

⚠ CAUTION

If the lash adjuster is re-used, clean the lash adjuster. (Refer to P.11D-27.)

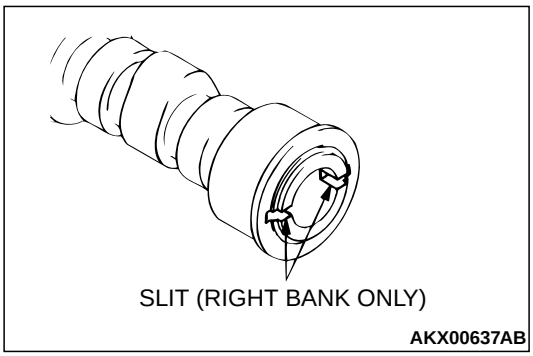
Set special tool MD998443 to prevent the lash adjuster coming free and falling to the floor.



INSTALLATION SERVICE POINTS

>>A<< CAMSHAFT INSTALLATION

1. Apply engine oil to the camshaft journals and cams.
2. The camshaft for the right bank has a slit for driving the distributor at the rear end. The camshaft for the left bank has no slit. Be careful to install the correct camshaft in the correct position.

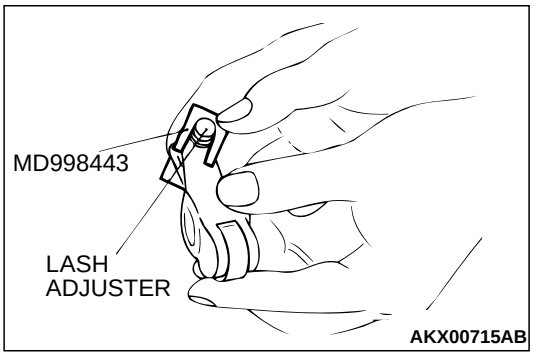


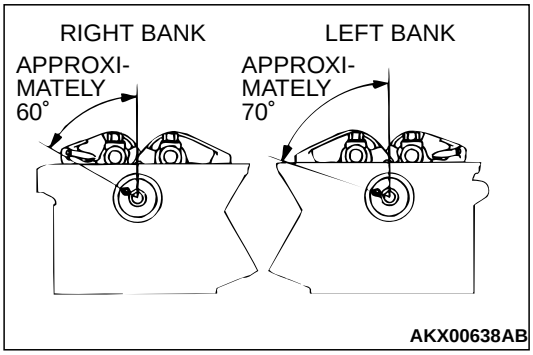
>>B<< LASH ADJUSTER INSTALLATION

⚠ CAUTION

If the lash adjuster is re-used, clean the lash adjuster. (Refer to P.11D-27.)

1. Fit the lash adjuster onto the rocker arm without allowing diesel fuel to spill out. Fit special tool MD998443 to prevent the lash adjuster coming free and falling to the floor.

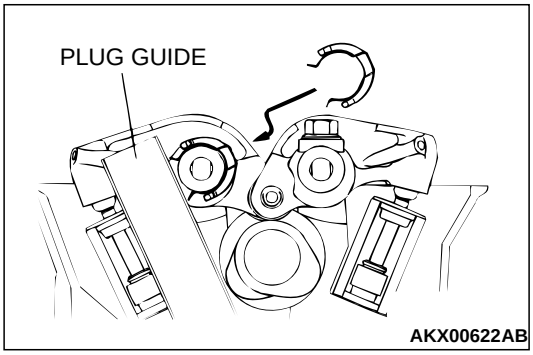




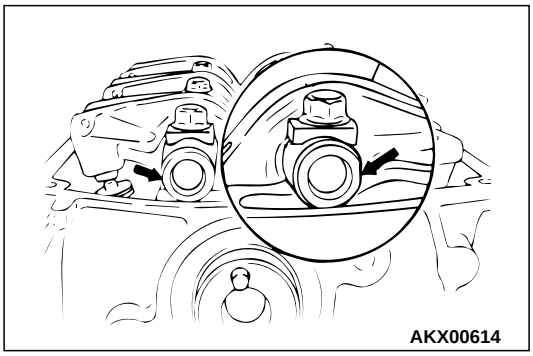
>>C<< ROCKER ARM, ROCKER ARM SHAFT AND ROCKER SHAFT SPRING INSTALLATION

1. Rotate the camshaft until the dowel pin on its front end is located as shown in the illustration.

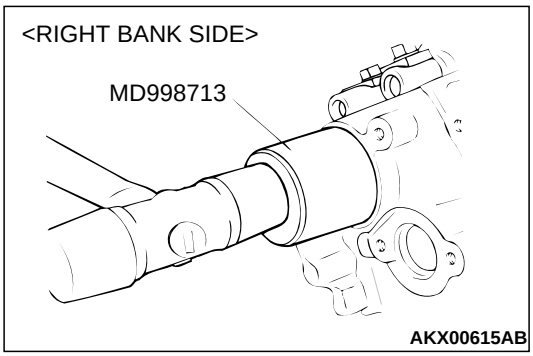
   NOTE: Placing the camshaft in the illustrated position minimizes the amount of cam lift, making it easier to install the rocker arm and shaft assemblies.
2. Install the exhaust side rocker arm "C" and shaft assembly to the cylinder head.
3. Install the inlet side rocker arms "A" and "B" and shaft assembly to the cylinder head.

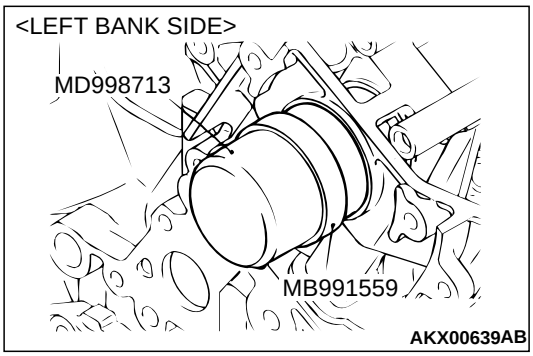


4. Insert the rocker shaft spring to the intake side rocker arm shaft as illustrated.



5. Make sure that the notch in the end of the rocker arm shaft is facing the direction as shown.





>>D<< CAMSHAFT OIL SEAL INSTALLATION

1. Apply engine oil to the lip area of the oil seal and the front end outside diameter of the camshaft.
2. Using special tools MD998713 and MB991559 (for the left bank only), install the camshaft oil seals.

INSPECTION

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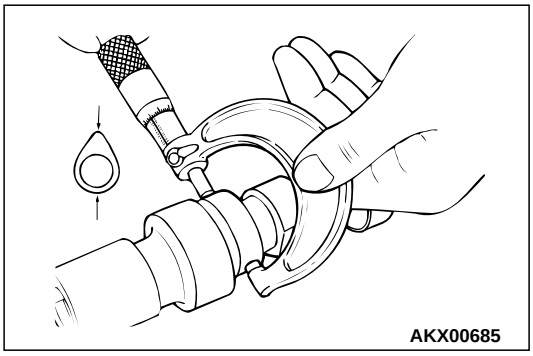
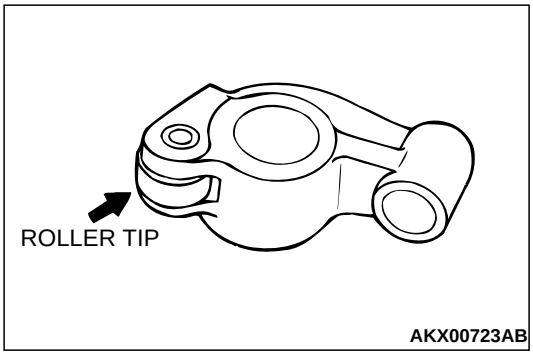


CAMSHAFT

Measure the cam height. If it is below the limit, replace the camshaft.

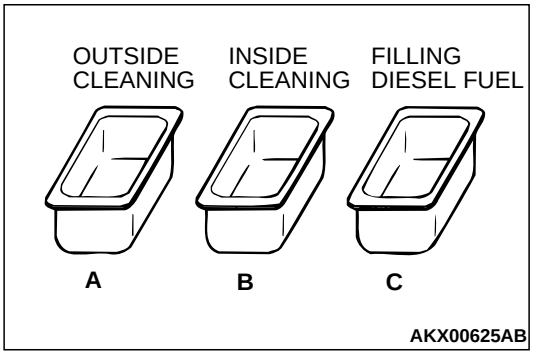
Standard value:
<Intake> 37.71 mm (1.485 inches)
<Exhaust> 37.14 mm (1.462 inches)

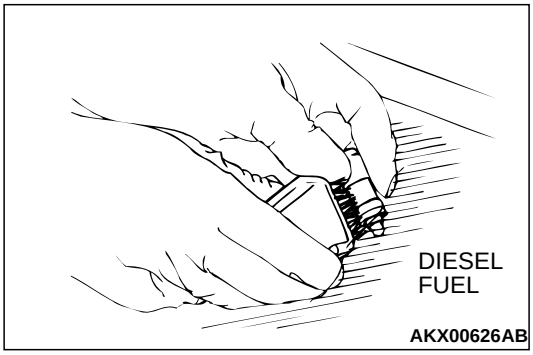
Minimum limit:
<Intake> 37.21 mm (1.465 inches)
<Exhaust> 36.64 mm (1.443 inches)

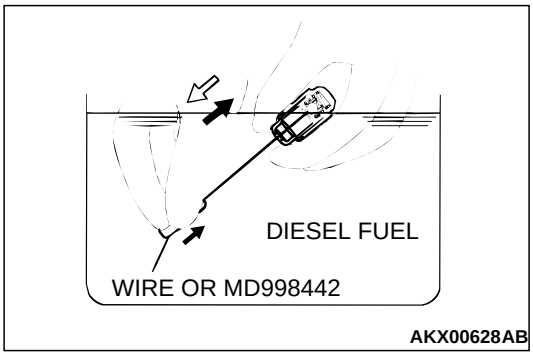


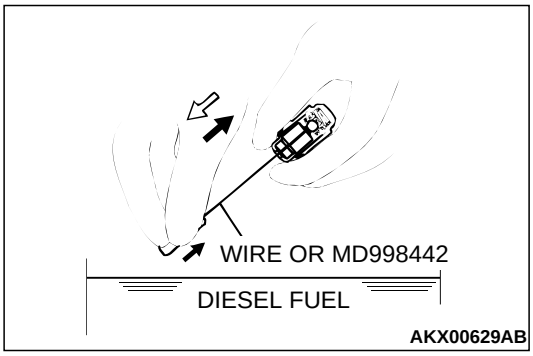
ROCKER ARM

1. Check the roller surface. If any dents, damage or seizure is evident, replace the rocker arm.
2. Check rotation of the roller. If it does not rotate smoothly or if looseness is evident, replace the rocker arm.
3. Check the inside diameter. If damage or seizure is evident, replace the rocker arm.









LASH ADJUSTERS

⚠ CAUTION

- **The lash adjusters are precision-engineered mechanisms. Do not allow them to become contaminated by dirt or other foreign substances.**
- **Do not attempt to disassemble the lash adjusters.**
- **Use only fresh diesel fuel to clean the lash adjusters.**

1. Prepare three containers and approximately 5 dm^3 (30.5 quart) of diesel fuel. Into each container, pour enough diesel fuel to completely cover a lash adjuster when it is standing upright. Then, perform the following steps with each lash adjuster.
2. Place the lash adjuster in container A and clean its outside surface.

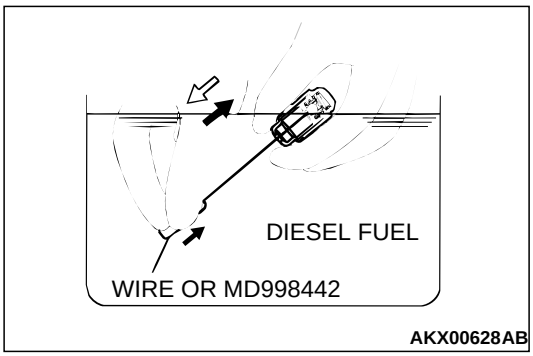
   NOTE: Use a nylon brush if deposits are hard to remove.

⚠ CAUTION

The steel ball spring is extremely weak, so the lash adjuster's functionality may be lost if the air bleed wire is pushed in hard.

3. While gently pushing down the internal steel ball using wire [0.5 mm (0.020 inch) in diameter] or special tool MD998442, move the plunger through five to ten strokes until it slides smoothly. In addition to eliminating stiffness in the plunger, this operation will remove dirty oil.

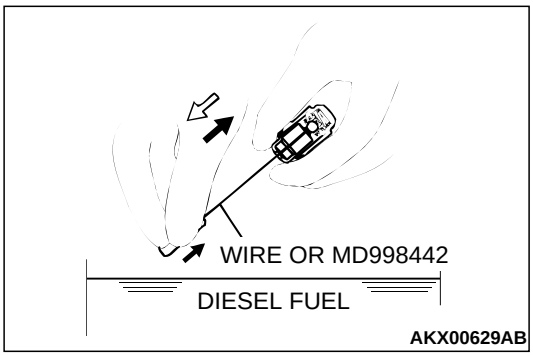
   NOTE: If the plunger remains stiff or the mechanism appears otherwise abnormal, replace the lash adjuster.
4. Remove the lash adjuster from the container. Then, push down the steel ball gently and push the plunger to eliminate diesel fuel from the pressure chamber.



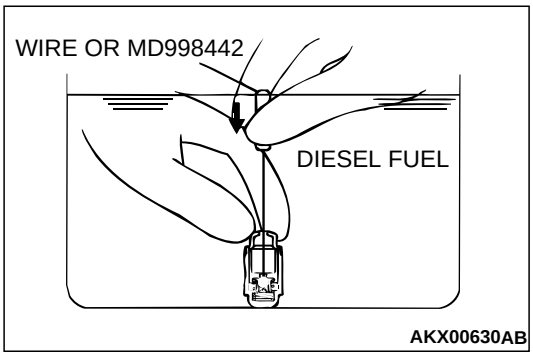
⚠ CAUTION

The steel ball spring is extremely weak, so the lash adjuster's functionality may be lost if the air bleed wire is pushed in hard.

5. Place the lash adjuster in container B. Then, gently push down the internal steel ball using wire [0.5 mm (0.020 inch) in diameter] or special tool MD998442 and move the plunger through five to ten strokes until it slides smoothly. This operation will clean the lash adjuster's pressure chamber.



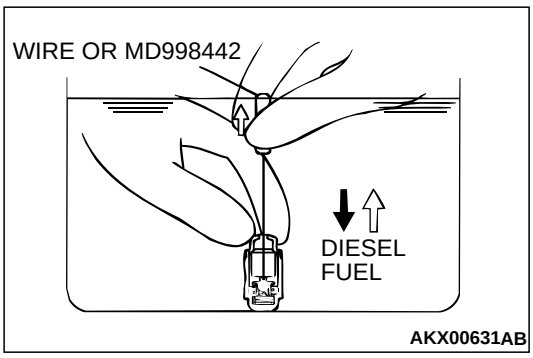
6. Remove the lash adjuster from the container. Then, push down the steel ball gently and push the plunger to eliminate diesel fuel from the pressure chamber.



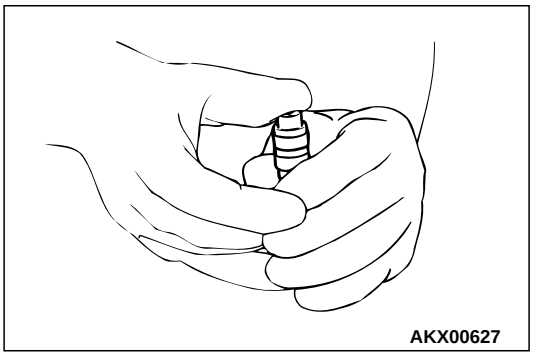
⚠ CAUTION

Do not use container C for cleaning. If cleaning is performed in container C, foreign matter could enter the pressure chamber when the chamber is filled with diesel fuel.

7. Place the lash adjuster in container C. Then, gently push down the internal steel ball using wire [0.5 mm (0.020 inch) in diameter] or special tool MD998442.



8. Stand the lash adjuster with its plunger at the top, then push the plunger downward firmly until it moves through its greatest possible stroke. Return the plunger slowly, then release the steel ball and allow the pressure chamber to fill with diesel fuel.



9. Remove the lash adjuster from the container, then stand the lash adjuster with its plunger at the top. Push the plunger firmly and check that it does not move. Also, check that the lash adjuster's height matches that of a new lash adjuster.
   NOTE: If the lash adjuster contracts or moves, perform the operations (7) through (9) again to fill it with diesel fuel completely. Replace the lash adjuster if it still contracts or moves after performing these steps.
10. Stand the lash adjuster upright to prevent diesel fuel from spilling out. Do not allow the lash adjuster to become contaminated by dirt or other foreign matter. Fit the lash adjuster onto the engine as soon as possible.

CYLINDER HEAD AND VALVES

REMOVAL AND INSTALLATION

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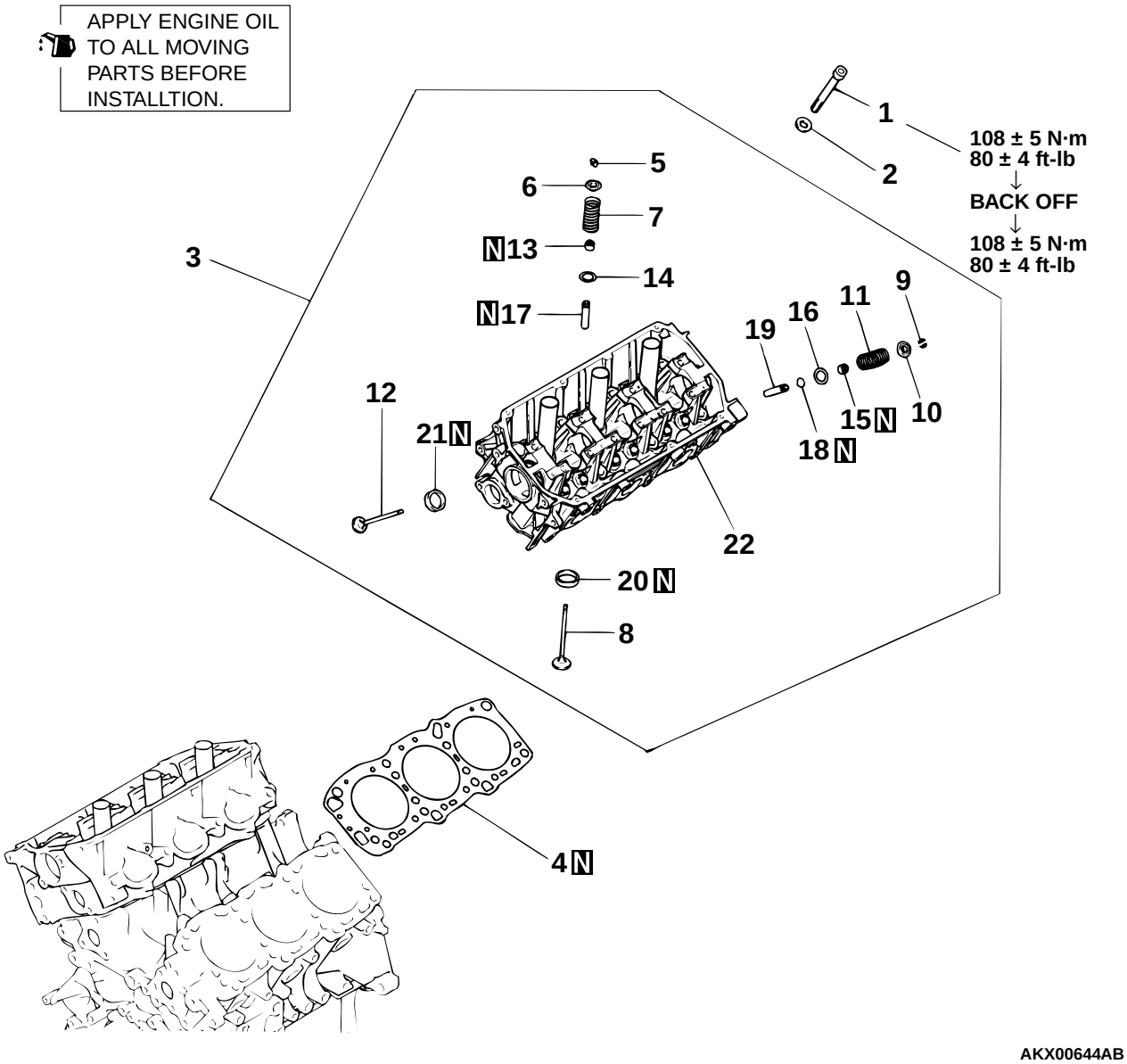

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TSB Revision

REMOVAL STEPS

<<A>> >>D<< 1. CYLINDER HEAD BOLT
>>D<< 2. WASHER
3. CYLINDER HEAD ASSEMBLY
4. CYLINDER HEAD GASKET
<<B>> >>C<< 5. RETAINER LOCK
6. VALVE SPRING RETAINER
>>B<< 7. VALVE SPRING
8. INLET VALVE
<<B>> >>C<< 9. RETAINER LOCK
10. VALVE SPRING RETAINER
>>B<< 11. VALVE SPRING

REMOVAL STEPS (Continued)

12. EXHAUST VALVE
>>A<< 13. VALVE STEM SEAL
14. VALVE SPRING SEAT
>>A<< 15. VALVE STEM SEAL
16. VALVE SPRING SEAT
17. INLET VALVE GUIDE
18. SNAP RING
19. EXHAUST VALVE GUIDE
20. INLET VALVE SEAT
21. EXHAUST VALVE SEAT
22. CYLINDER HEAD

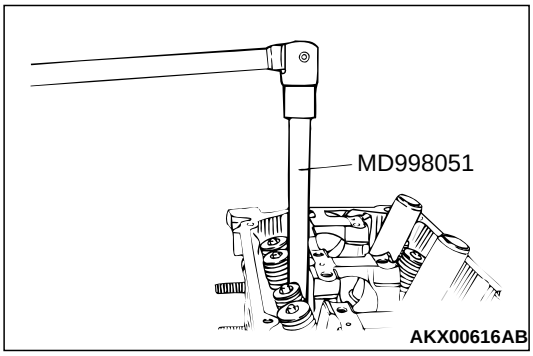
Required Special Tools:

- MD998051: Cylinder Head Bolt Wrench
- MD998772: Valve Spring Compressor
- MD998774: Valve Stem Seal Installer

REMOVAL SERVICE POINTS

<<A>> CYLINDER HEAD BOLT REMOVAL

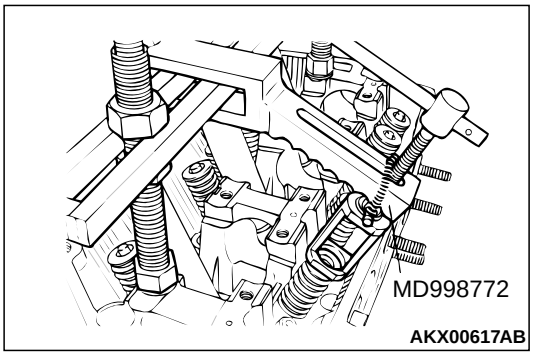
Using special tool MD998051, loosen the cylinder head bolts. Loosen each bolt evenly, little by little, by two or three steps.



<<B>> RETAINER LOCK REMOVAL

1. Set special tool MD998772 as illustrated to compress the valve spring. Remove the retainer locks.
2. Relieve the spring tension and remove the valve, retainer, spring, etc.

   Store removed valves, springs and other parts, tagged to indicate their cylinder number and location for assembly.



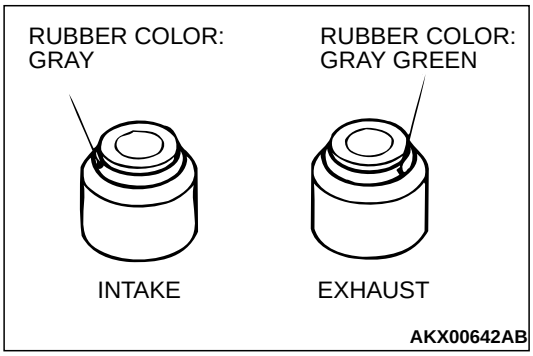
INSTALLATION SERVICE POINTS

>>A<< VALVE STEM SEAL INSTALLATION

1. Install the valve spring seat.

⚠ CAUTION

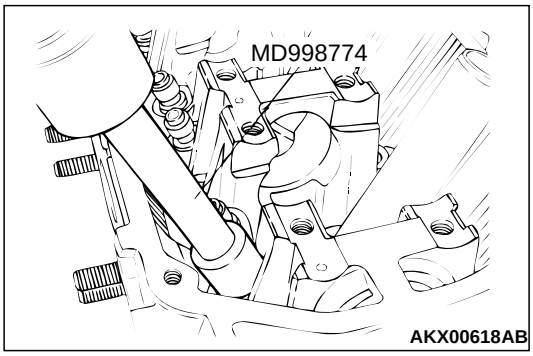
The valve stem seal for the exhaust side is different than the intake side. They are identified by their respective rubber colors. When installing, do not confuse them.



⚠ CAUTION

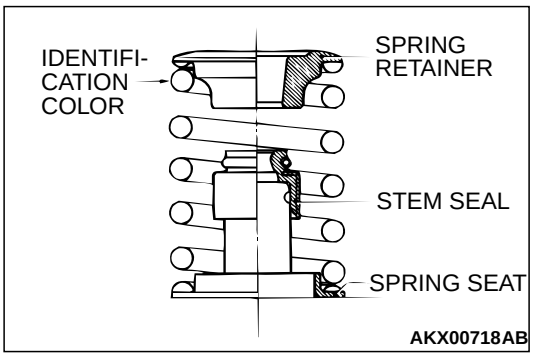
The special tool must be used to install the valve stem seal. Improper installation could result in oil leaking past the valve guide.

2. Using special tool MD998774, install a new stem seal to the valve guide.



>>B<< VALVE SPRING INSTALLATION

Install the valve spring with its ID color painted end (larger pitch side) upward (toward the valve spring retainer).

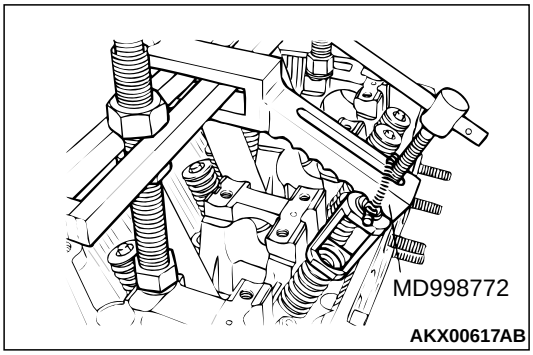


>>C<< RETAINER LOCK INSTALLATION

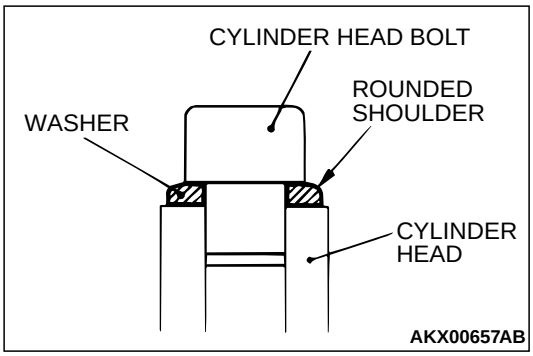
⚠ CAUTION

Do not compress the valve spring excessively. It can damage the stem seal.

1. Set special tool MD998772 as illustrated to compress the valve spring. Install the retainer locks.
2. Relieve the spring tension and check that the retainer locks are seated correctly.

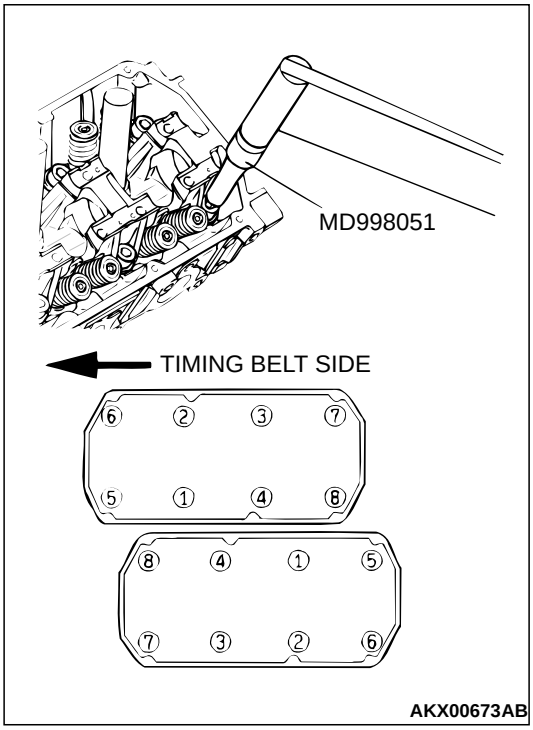


TSB Revision



>>D<< CYLINDER HEAD BOLT INSTALLATION

1. Insert the cylinder head bolt with a washer attached into the bolt hole in the cylinder head. The washer must be set with the "rounded shoulder" side upward.



2. Tighten the cylinder head bolts to the specified torque in the sequence shown.

   Tightening torque: 108 ± 5 N·m (80 ± 4 ft-lb)

3. Loosen all bolts fully.
4. Retighten the cylinder head bolts to the specified torque in the sequence shown.

   Tightening torque: 108 ± 5 N·m (80 ± 4 ft-lb)

INSPECTION

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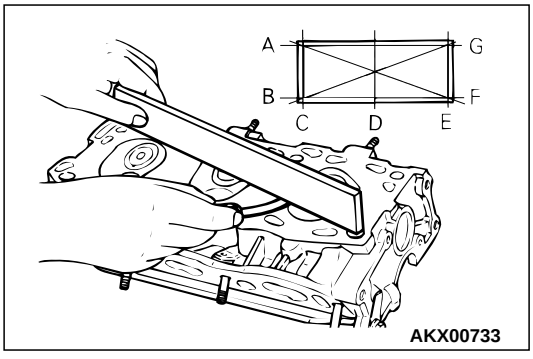
CYLINDER HEAD



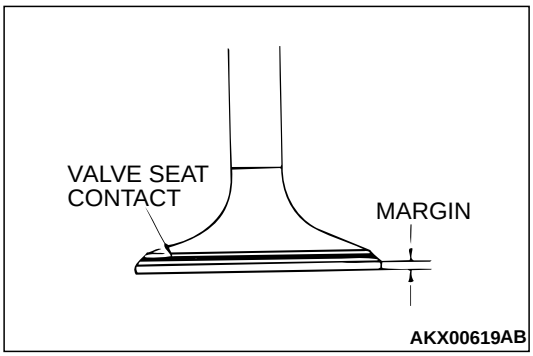
1. Check the cylinder head gasket surface for flatness by using a straightedge and feeler gauge in the directions of A through G shown in the illustration.

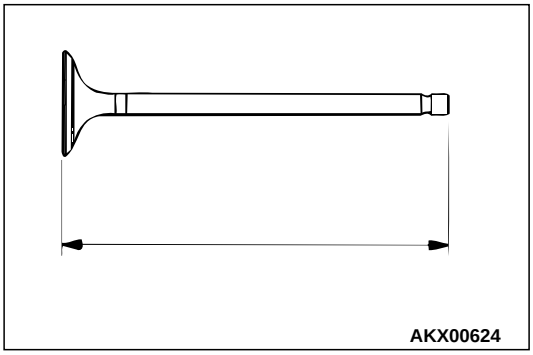
   Standard value: 0.03 mm (0.0012 inch)
   Limit: 0.2 mm (0.007 inch)

2. If it exceeds the limit, correct to meet the specification.

   Grinding limit: *0.2 mm (0.007 inch)
   ***Includes combined with cylinder block grinding.**

   Cylinder head height (specification when new):
   120 mm (4.7 inches)





VALVE

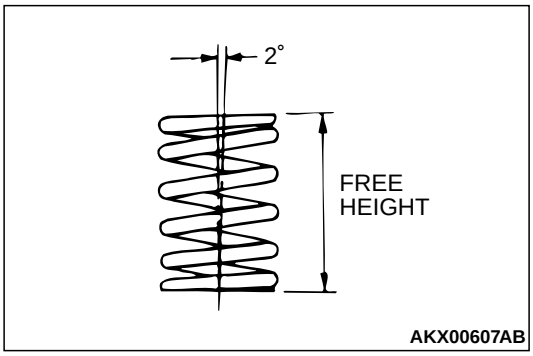
1. Check the valve seat contact. The valve seat contact should be uniform at the center of the valve face. If incorrect, reface using a valve refacer.
2. If the margin is below the limit, replace the valve.

   Standard value:
   <Intake> 1.0 mm (0.04 inch)
   <Exhaust> 1.2 mm (0.05 inch)

   Minimum limit:
   <Intake> 0.5 mm (0.02 inch)
   <Exhaust> 0.7 mm (0.03 inch)
3. Measure the valve's total length. If the measurement is less than the limit, replace the valve.

   Standard value:
   <Intake> 112.30 mm (4.421 inches)
   <Exhaust> 114.11 mm (4.493 inches)

   Minimum limit:
   <Intake> 111.80 mm (4.402 inches)
   <Exhaust> 113.61 mm (4.473 inches)

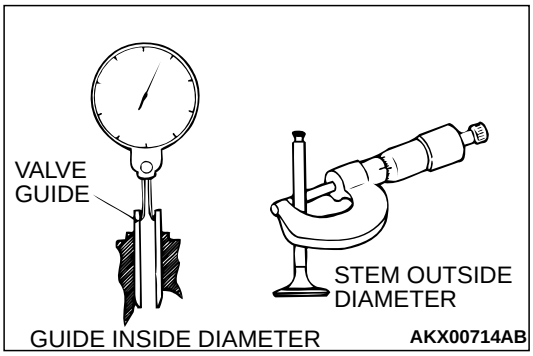


VALVE SPRINGS

1. Measure the free height of the springs. If it is less than the limit, replace.

   Standard value: 51.0 mm (2.01 inches)
   Minimum limit: 50.0 mm (1.97 inches)
2. Measure the squareness of the springs. If it exceeds the limit, replace.

   Standard value: 2 degree angle or less
   Limit: 4 degree angle

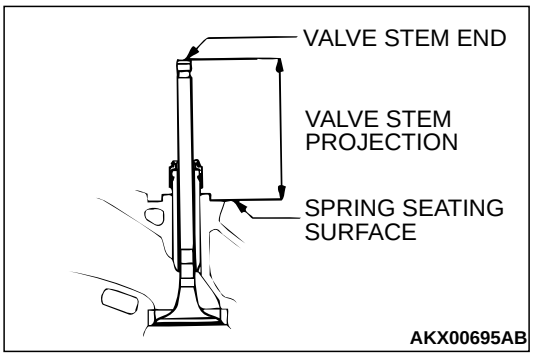


VALVE GUIDES

Measure the clearance between the valve guide and valve stem. If it exceeds the limit, replace the valve guide or valve, or both.

Standard value:
<Intake> 0.02 – 0.05 mm (0.0008 – 0.0019 inch)
<Exhaust> 0.04 – 0.07 mm (0.0016 – 0.0027 inch)

Limit:
<Intake> 0.10 mm (0.003 inch)
<Exhaust> 0.15 mm (0.005 inch)

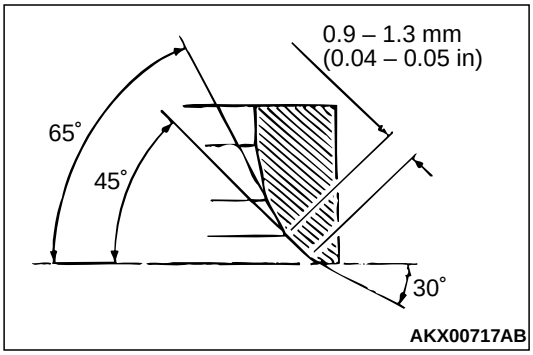


VALVE SEAT

Assemble the valve, then measure the valve stem projection between the end of the valve stem and the spring seating surface. If the measurement exceeds the specified limit, replace the valve seat.

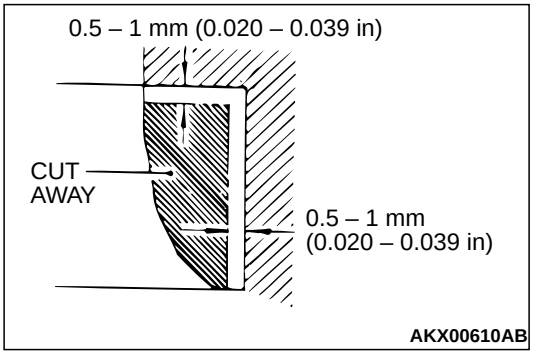
Standard value: 49.30 mm (1.941 inches)
Limit: 49.80 mm (1.960 inches)

VALVE SEAT RECONDITIONING PROCEDURE

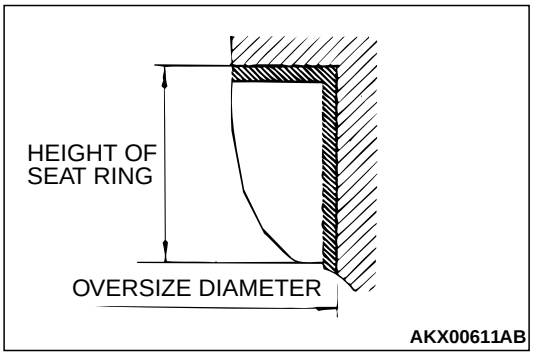


1. Before correcting the valve seat, check for the clearance between the valve guide and valve and, if necessary, replace the valve guide.
2. Using the special tool or a seat grinder, correct to obtain the specified seat width and angle.
3. After correcting the valve seat, lap the valve and valve seat using lapping compound. Then, check the valve stem projection.

VALVE SEAT REPLACEMENT PROCEDURE



1. Cut the valve seat from the inside to thin the wall thickness. Then, remove the valve seat.



2. Rebore the valve seat hole in the cylinder head to a selected oversize valve seat diameter.

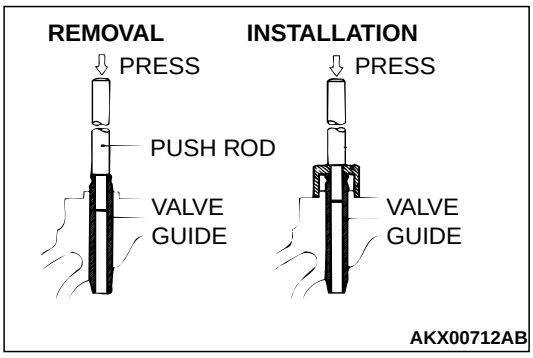
Intake seat ring hole diameter:
0.3 oversize
34.30 – 34.33 mm (1.3504 – 1.3516 inches)
0.6 oversize
34.60 – 34.63 mm (1.3622 – 1.3634 inches)

Exhaust valve seat ring hole diameter:
0.3 oversize
31.80 – 31.83 mm (1.2520 – 1.2531 inches)
0.6 oversize
32.10 – 32.13 mm (1.2638 – 1.2650 inches)

3. Before fitting the valve seat, either heat the cylinder head up to approximately 250°C (482°F) or cool the valve seat in liquid nitrogen, to prevent the cylinder head bore from galling.

4. Using a valve seat cutter, correct the valve seat to the specified width and angle.
   See "VALVE SEAT RECONDITIONING PROCEDURE" on the previous page.

VALVE GUIDE REPLACEMENT PROCEDURE



1. Remove the snap ring from the exhaust valve guide.
2. Using a press, remove the valve guide toward the cylinder block.

⚠ CAUTION

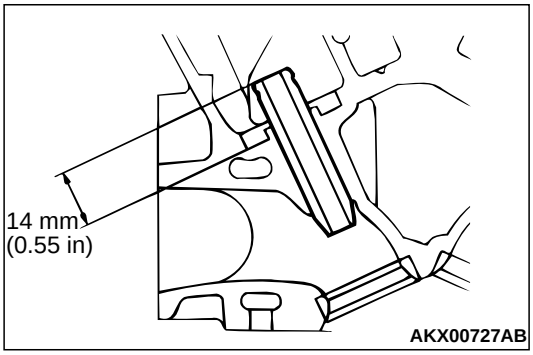
Do not install a valve guide of the same size again.

3. Rebore the valve guide hole of the cylinder head so that it fits the press-fitted oversize valve guide.

   Valve guide hole diameter:
   0.05 oversize 11.05 – 11.07 mm (0.4350 – 0.4358 inch)
   0.25 oversize 11.25 – 11.27 mm (0.4429 – 0.4457 inch)
   0.50 oversize 11.50 – 11.52 mm (0.4528 – 0.4535 inch)

4. Install the new snap ring into groove of the exhaust valve guide.

   NOTE: The inlet valve guide has no snap ring groove.



5. Press-fit the valve guide until it protrudes 14.0 mm (0.55 inch) from the cylinder head top surface as shown in the illustration.

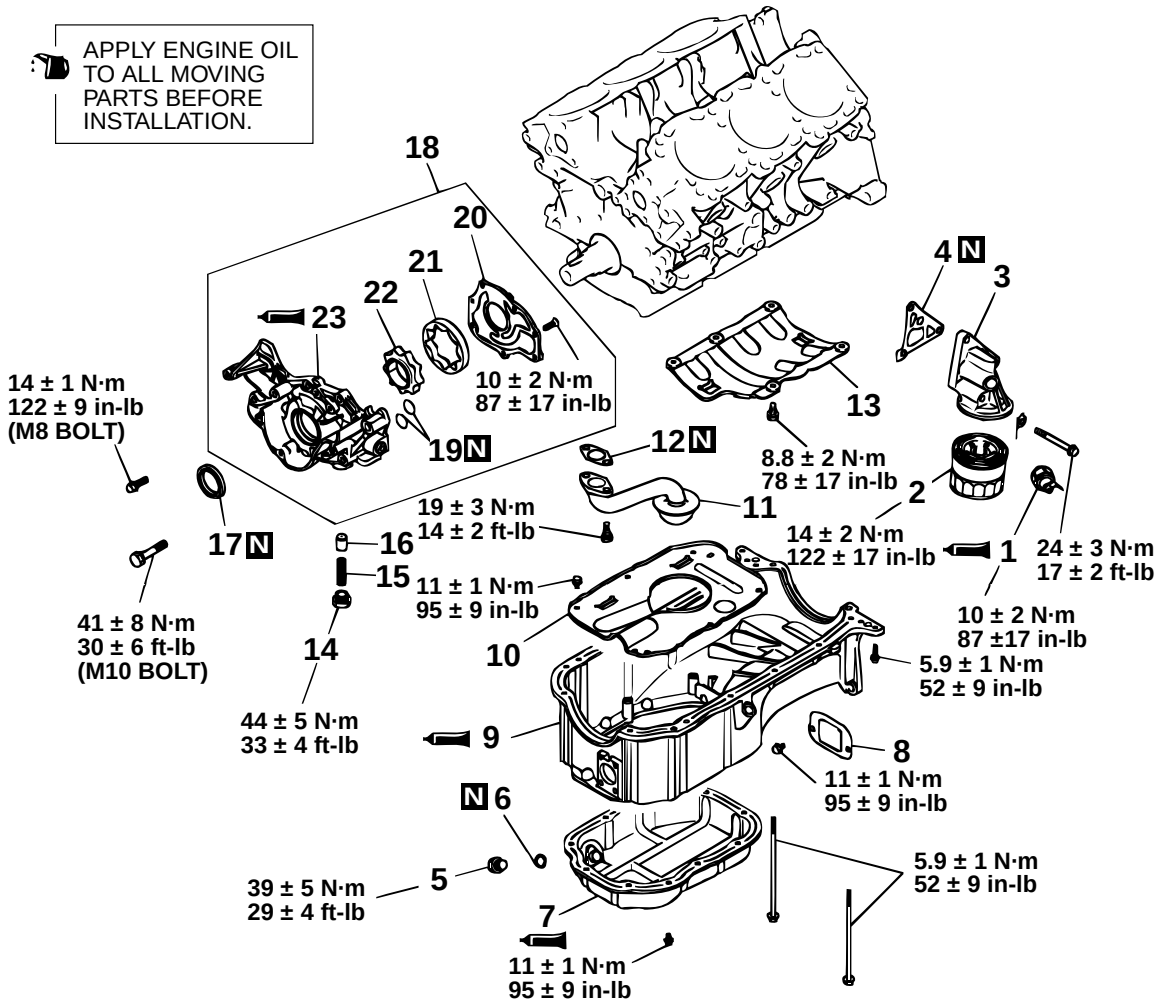
   NOTE: When press-fitting the valve guide, work from the cylinder head top surface.

   NOTE: After installing the valve guides, insert new valves in them to check for smooth operation.

OIL PAN AND OIL PUMP

REMOVAL AND INSTALLATION

M1113008100033



AKX00682AB

REMOVAL STEPS

- >>H<< 1. OIL PRESSURE SWITCH
- >>G<< 2. OIL FILTER
- 3. OIL FILTER BRACKET
- 4. OIL FILTER BRACKET GASKET
- 5. DRAIN PLUG
- >>F<< 6. DRAIN PLUG GASKET
- <<A>> >>E<< 7. OIL PAN, LOWER
- 8. COVER
- <<B>> >>D<< 9. OIL PAN, UPPER
- 10. BAFFLE PLATE
- 11. OIL SCREEN
- 12. OIL SCREEN GASKET

REMOVAL STEPS (Continued)

- 13. BAFFLE PLATE
- 14. PLUG
- 15. RELIEF SPRING
- 16. RELIEF PLUNGER
- >>C<< 17. CRANKSHAFT FRONT OIL SEAL
- >>B<< 18. OIL PUMP CASE ASSEMBLY
- 19. O-RING
- 20. OIL PUMP COVER
- <<C>> >>A<< 21. OIL PUMP OUTER ROTOR
- <<C>> >>A<< 22. OIL PUMP INNER ROTOR
- 23. OIL PUMP CASE

Required Special Tool:

- MD998717: Crankshaft Front Oil Seal Installer

TSB Revision

REMOVAL SERVICE POINT

<<A>> OIL PAN, LOWER REMOVAL

1. Remove the lower oil pan mounting bolts.

⚠ CAUTION

Do not use a scraper or special tool to remove the oil pan.

2. Remove the lower oil pan by tapping on the side wall with a plastic hammer (mallet) through a wooden plank held against it.

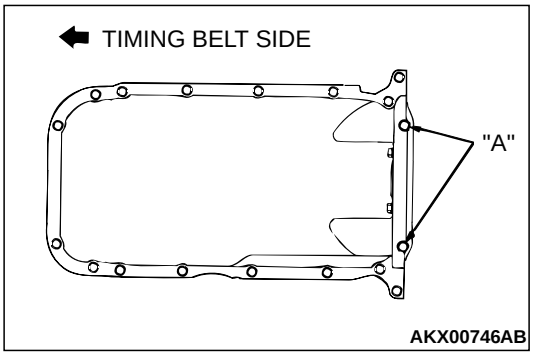
<<B>> OIL PAN, UPPER REMOVAL

1. Remove the long bolts "A" shown in the illustration first.
2. Remove all other bolts.

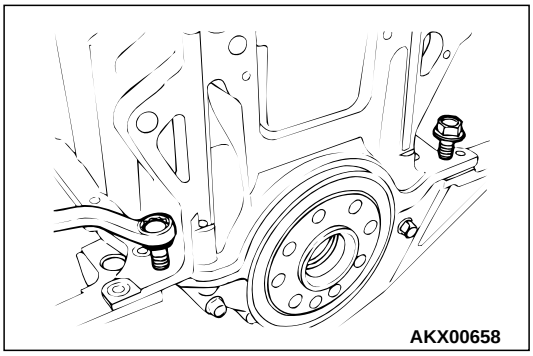
⚠ CAUTION

Do not use a scraper or special tool to remove the oil pan.

3. Remove the oil pan.

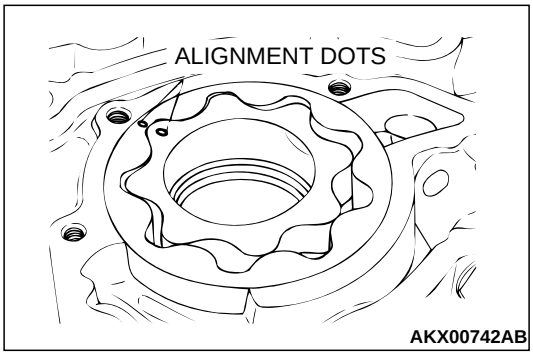


4. Screw M10 bolts into the two bolt holes in the oil pan to break the joint and remove the oil pan.

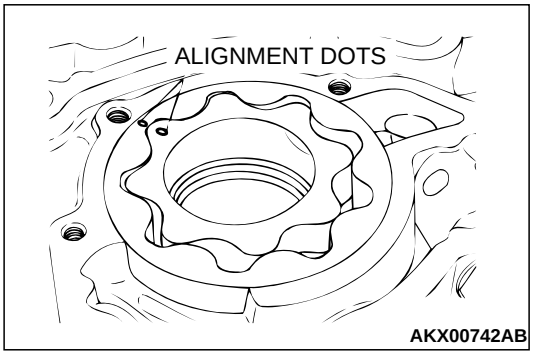


<<C>> OUTER ROTOR/INNER ROTOR REMOVAL

Make alignment dots on the outer and inner rotors for assembly.

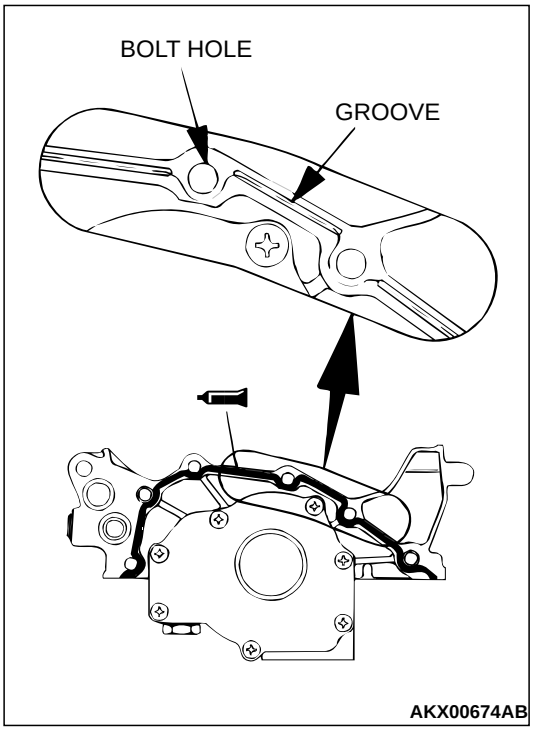


INSTALLATION SERVICE POINTS



>>A<< INNER ROTOR/OUTER ROTOR INSTALLATION

Apply engine oil to the rotors. Then, install the rotors ensuring that the alignment dots made at disassembly are properly aligned.



>>B<< OIL PUMP CASE ASSEMBLY INSTALLATION

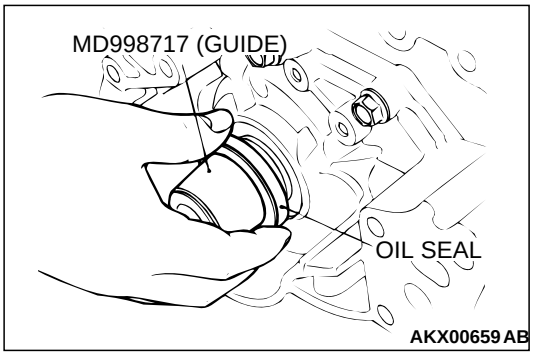
1. Clean the gasket mating surfaces of oil pump case and cylinder block.
2. Apply a 3 mm (0.1 inch) diameter bead of sealant (Mitsubishi Genuine Parts number MD970389 or equivalent) to the oil pump case.

   Apply sealant as indicated by the broken line in the illustration; the grooves must be traced and the bolt holes must be surrounded with a bead of sealant.
3. Install the oil pump case assembly to the front of the cylinder block.

   NOTE: Be sure to install the oil pump case quickly while the sealant is wet (within 15 minutes).
4. Tighten the oil pump case mounting bolts to the specified torque.

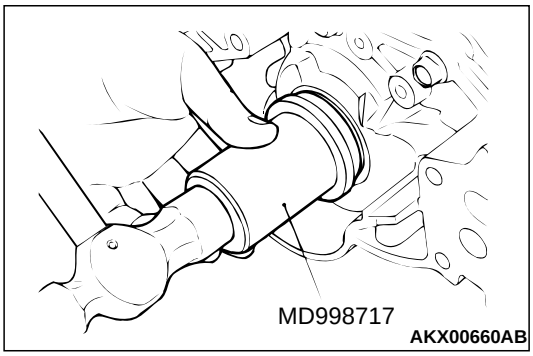
   Tightening torque:
   14 ± 1 N·m (122 ± 9 in-lb) <M8 BOLT>
   41 ± 8 N·m (30 ± 6 ft-lb) <M10 BOLT>

   NOTE: After installation, keep the sealed area away from oil and coolant for approximately one hour.



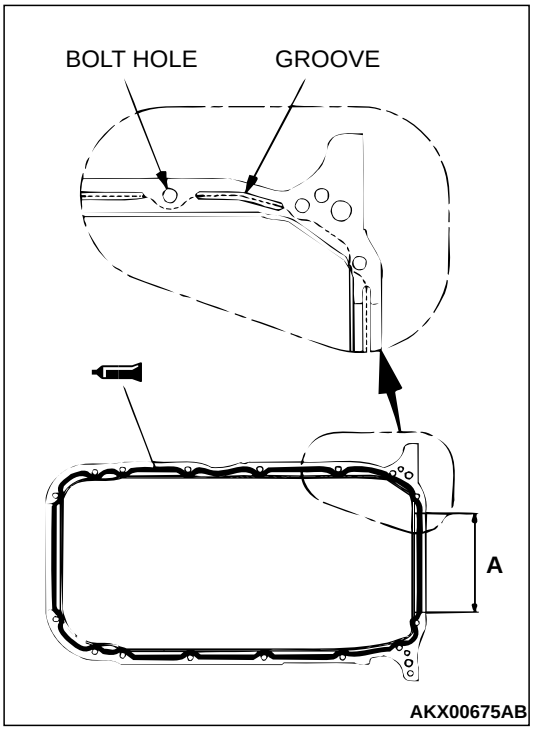
>>C<< CRANKSHAFT FRONT OIL SEAL INSTALLATION

1. Install the guide of special tool MD998717 to the front end of the crankshaft.
2. Apply engine oil to the lip area of a new oil seal and push it in until it contacts the oil pump case.



3. Using special tool MD998717, press-fit the oil seal into the oil pump case.

>>D<< OIL PAN, UPPER INSTALLATION



1. Clean both gasket surfaces of the upper oil pan and cylinder block.
2. Apply a 4 mm (0.2 inch) diameter bead of sealant (Mitsubishi Genuine Parts number MD970389 or equivalent) to the upper oil pan.

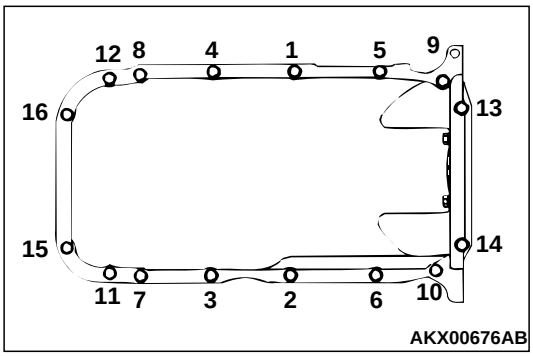
   Apply sealant as indicated by the broken line in the illustration; the grooves must be traced and the bolt holes must be surrounded with a bead of sealant.

⚠ CAUTION

When installing the upper oil pan, be sure not to expel the sealant from the oil pan flange at portion A in the illustration.

3. Install the oil pan to the bottom of the cylinder block.

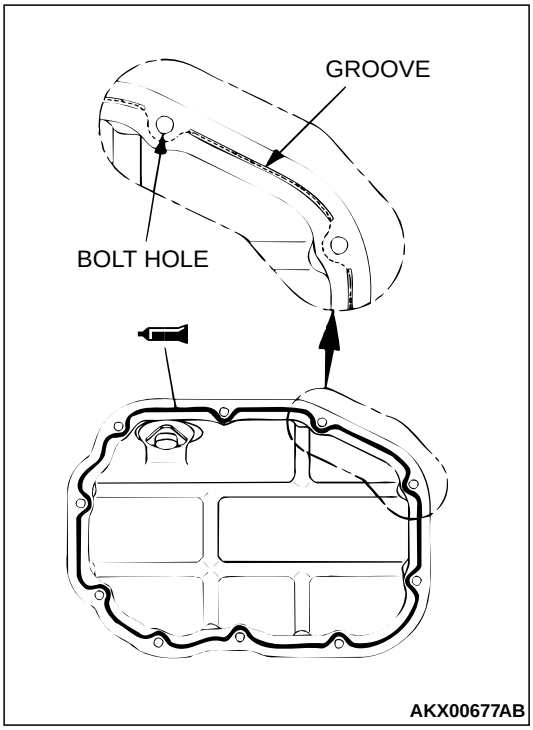
   NOTE: Be sure to install the oil pan quickly while the sealant is wet (within 15 minutes).



4. Tighten the upper oil pan bolts in the sequence shown.

   Tightening torque: 5.9 ± 1 N·m (52 ± 9 in-lb)

   NOTE: After installation, keep the sealed area away from the oil and coolant for approximately one hour.

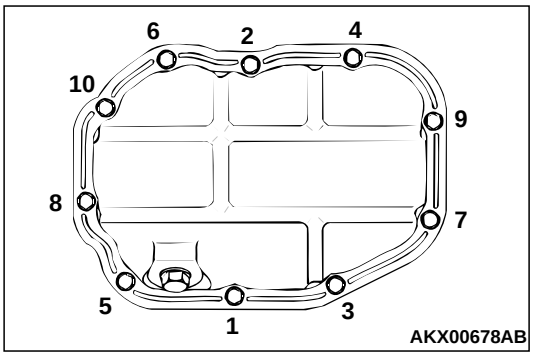


>>E<< OIL PAN, LOWER INSTALLATION

1. Clean both gasket surfaces of the upper and lower oil pans.
2. Apply a 4 mm (0.2 inch) diameter bead of sealant (Mitsubishi Genuine Parts number MD970389 or equivalent) to the lower oil pan.

   Apply sealant as indicted by the broken line in the illustration; the grooves must be traced and the bolt holes must be surrounded with a bead of sealant.
3. Install the lower oil pan to the upper oil pan.

   NOTE: Be sure to install the oil pan quickly while the sealant is wet (within 15 minutes).



4. Tighten the lower oil pan bolts in the sequence shown.

   Tightening torque: 11 ± 1 N·m (95 ± 9 in-lb)

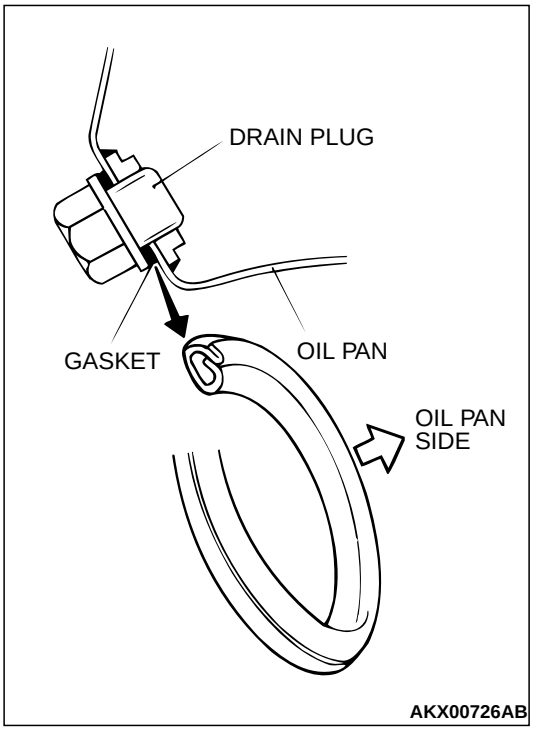
   NOTE: After installation, keep the sealed area away from oil for approximately one hour.

>>F<< DRAIN PLUG GASKET INSTALLATION

⚠ CAUTION

If the gasket is installed in the wrong direction, oil leaks will be occurred.

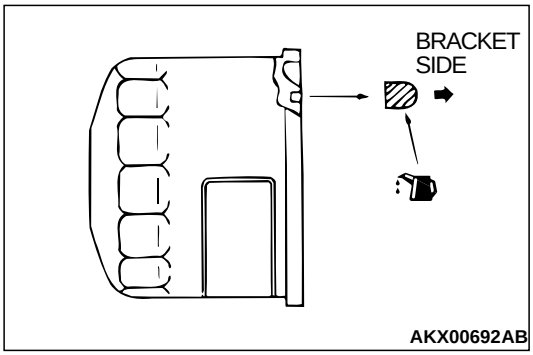
Install the drain plug gasket in the direction shown.



>>G<< OIL FILTER INSTALLATION

1. Clean the installation surface of the filter bracket.
2. Apply engine oil to the O-ring of the oil filter.
3. Install the oil filter to the bracket and tighten it to the specified torque.

   Tightening torque: 14 ± 2 N·m (122 ± 17 in-lb)
4. If no torque wrench can be used for tightening, follow the following procedure.
   (1) Screw in the oil filter until its O-ring contacts the oil filter bracket.
   (2) Tighten the oil filter 3/4 turn.



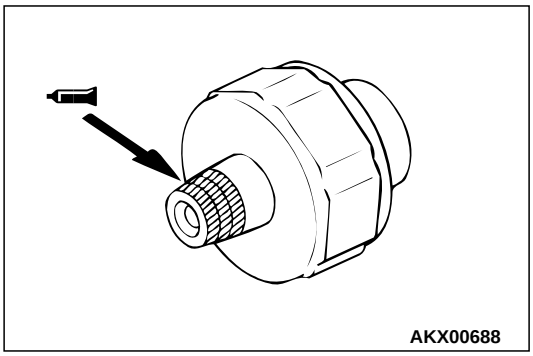
>>H<< OIL PRESSURE SWITCH INSTALLATION

⚠ CAUTION

Be careful not to block the oil passage with sealant.

1. Apply 3M™ AAD Part number 8672 or equivalent to the thread of oil pressure switch.
2. Tighten the switch to the specified torque.

   Tightening torque: 10 ± 2 N·m (87 ± 17 in-lb)



TSB Revision

INSPECTION

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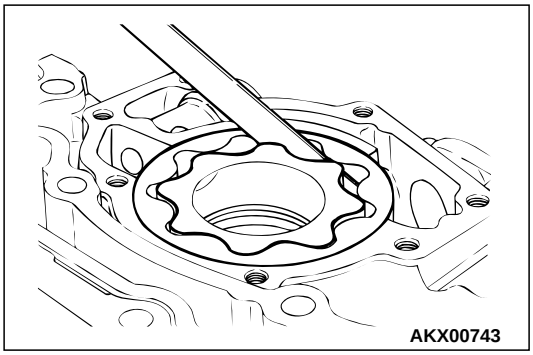
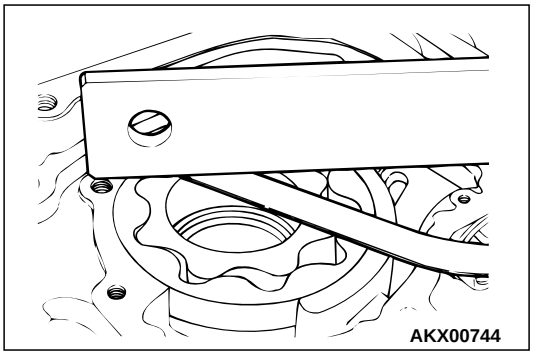
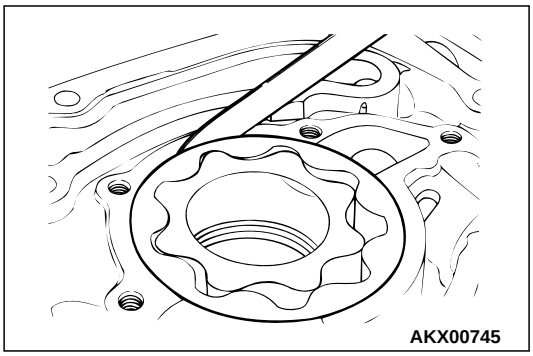
OIL PUMP


AKX00743

1. Check the tip clearance.
   Standard value: 0.06 – 0.18 mm (0.003 – 0.007 inch)


AKX00744

2. Check the side clearance.
   Standard value: 0.04 – 0.10 mm (0.002 – 0.003 inch)


AKX00745

3. Check the body clearance.
   Standard value: 0.10 – 0.18 mm (0.004 – 0.007 inch)
   Limit: 0.35 mm (0.013 inch)

PISTON AND CONNECTING ROD

REMOVAL AND INSTALLATION

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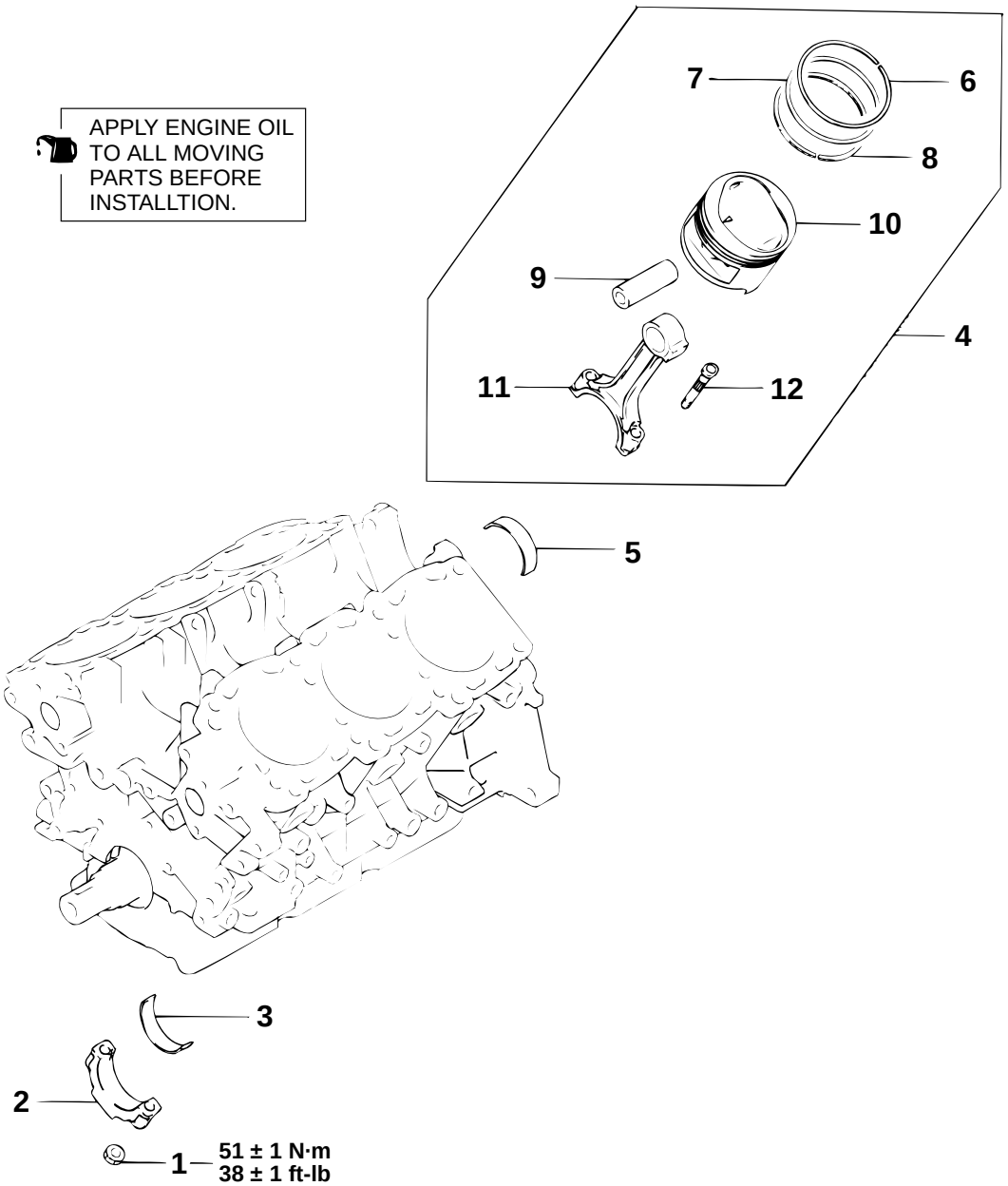


AKX00729AB

REMOVAL STEPS

1. NUT

<<A>> >>E<< 2. CONNECTING ROD CAP

3. CONNECTING ROD BEARING, LOWER

>>D<< 4. PISTON AND CONNECTING ROD ASSEMBLY

5. CONNECTING ROD BEARING, UPPER

REMOVAL STEPS (Continued)

>>C<< 6. PISTON RING NO.1

>>C<< 7. PISTON RING NO.2

>>B<< 8. OIL RING

<<B>> >>A<< 9. PISTON PIN

10. PISTON

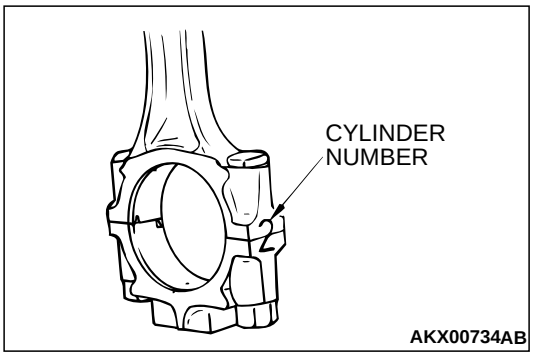
11. CONNECTING ROD

12. BOLT

TSB Revision

Required Special Tool:

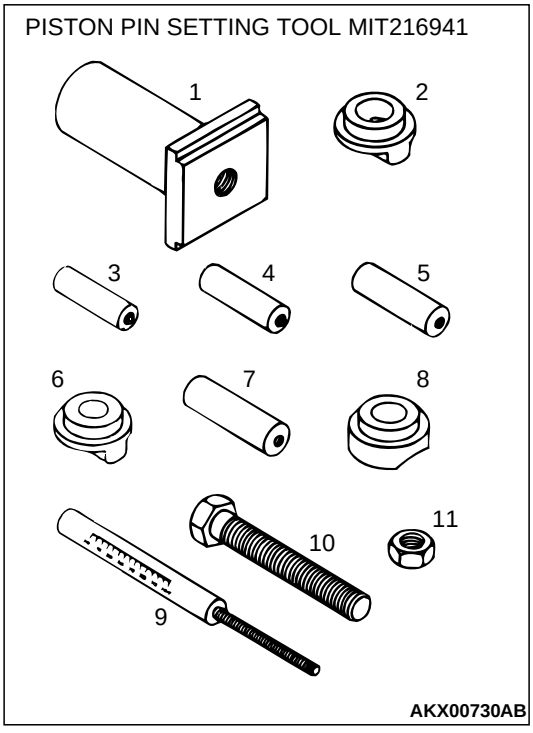
- MIT216941: Piston Pin Setting Tool



REMOVAL SERVICE POINTS

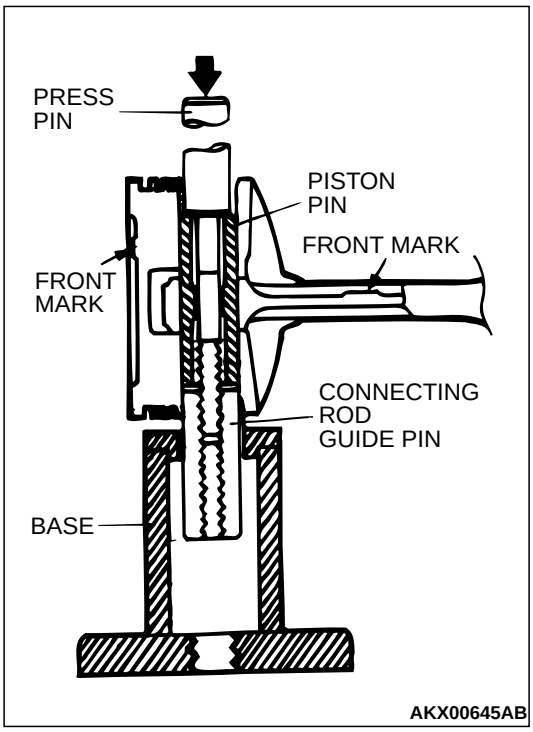
<<A>> CONNECTING ROD CAP REMOVAL

1. Mark the cylinder number on the side of the connecting rod big end for correct reassembly.
2. Keep the removed connecting rods, caps, and bearings in order according to the cylinder number.



<<B>> PISTON PIN REMOVAL

ITEM NO.	PART NO.	DESCRIPTION
1	MIT310134	Base
2	MIT310136	Piston support
3	MIT310137	Connecting rod guide pin
4	MIT310138	Connecting rod guide pin
5	MIT310139	Connecting rod guide pin
6	MIT310140	Piston support
7	MIT310141	Connecting rod guide pin
8	MIT310142	Piston support
9	MIT48143	Press pin
10	216943	Stop screw
11	10396	Nut



1. Remove the stop screw from the base.
2. Select the correct piston support for your application. (See above) Fit the piston support onto the base. Place the base on the press support blocks.
3. Insert the press pin through the piston pin hole. Select the correct connecting rod guide pin. (See above.) Thread the guide pin onto the threaded portion of the press pin.
4. Position the piston assembly on the piston support in the press. With the press pin up as shown, insert the guide pin through the hole in the piston and through the hole in the piston support.

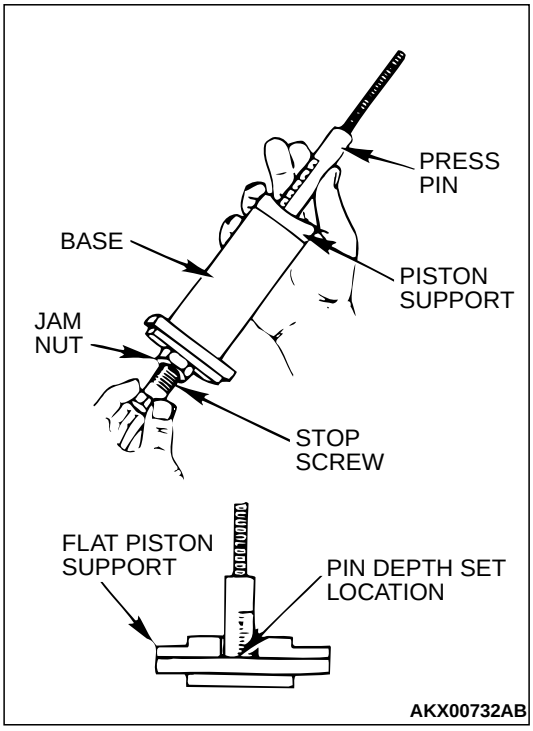
⚠ CAUTION

To avoid piston damage, the piston support must seat squarely against the piston. Verify that the piston pin will slide through the hole in the piston support.

5. Press the piston pin out of the assembly.
6. Remove the piston pin from the piston pin.

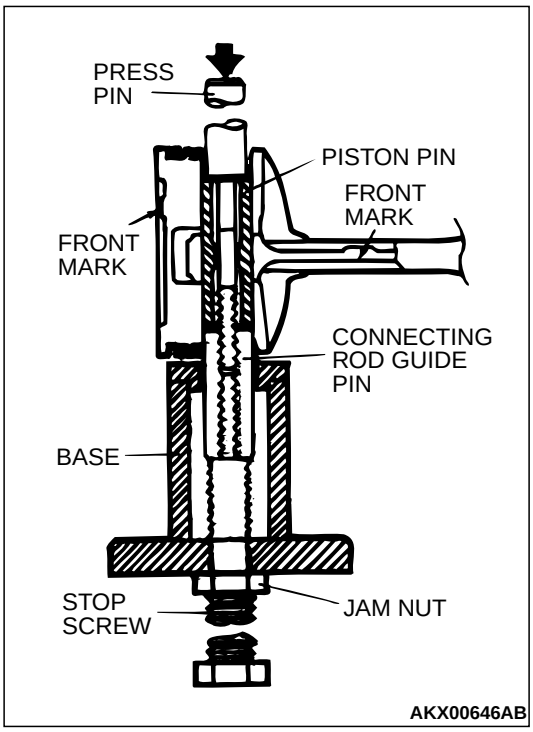
INSTALLATION SERVICE POINTS

>>A<< PISTON PIN INSTALLATION



1. Thread the stop screw and jam nut assembly into the base. Fit the correct piston support on top of the base. Insert the press pin, threaded end up, into the hole in the piston support until the press pin touches the stop screw.
2. Using the graduations on the press pin, adjust the stop screw to the depth.

   Depth: 60 mm (2.36 inches)

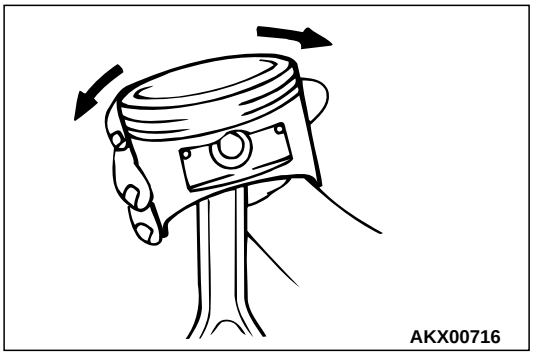


3. Place the base on the press support blocks.
4. Slide the piston pin over the threaded end of the press pin, and thread the correct guide pin up against it.
5. Coat the piston pin with engine oil, and with the connecting rod held in position, slide the guide pin through the piston and connecting rod.
6. Press the piston pin through the connecting rod until the guide pin contacts the stop screw.

⚠ CAUTION

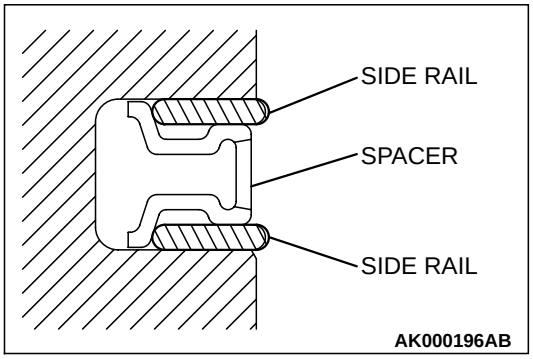
Due to production tolerance variations, it is necessary to visually inspect the piston pin depth after installation to verify that the piston pin is centered. Adjust if necessary.

7. Remove the piston assembly from the base. Remove the guide pin and press pin from the assembly.



8. Check that the piston moves smoothly.

>>B<<OIL RING INSTALLATION

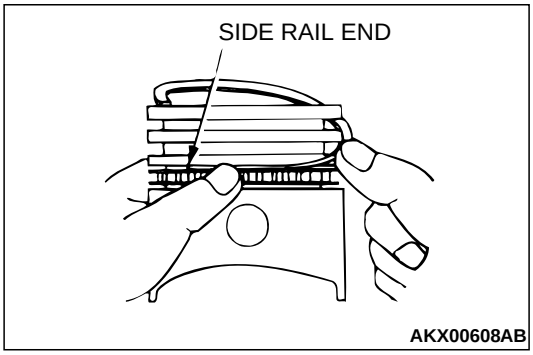


1. Fit the oil ring spacer into the piston ring groove.

   NOTE: The side rails and spacer may be installed in either direction.

   NOTE: New spacers and side rails are colored for identification of their sizes.

SIZE	IDENTIFICATION COLOR
Standard	None
0.50 mm (0.020 in) oversize diameter	Blue
1.00 mm (0.040 in) oversize diameter	Yellow



⚠ CAUTION

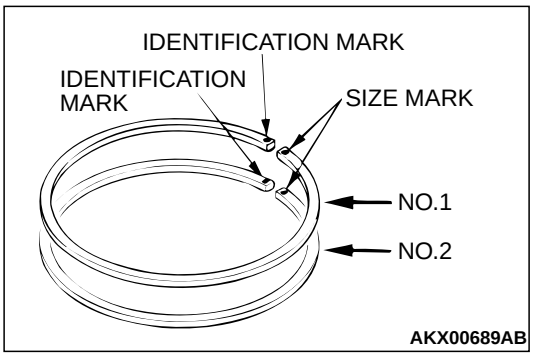
Do not use any piston ring expander when installing the side rail.

2. Install the upper side rail
   To install the side rail, first fit one end of the rail into the piston groove, then press the remaining portion into the position by finger. See illustration.
3. Install the lower side rail in the same procedure as described in step 2.
4. Make sure that the side rails move smoothly in either direction.

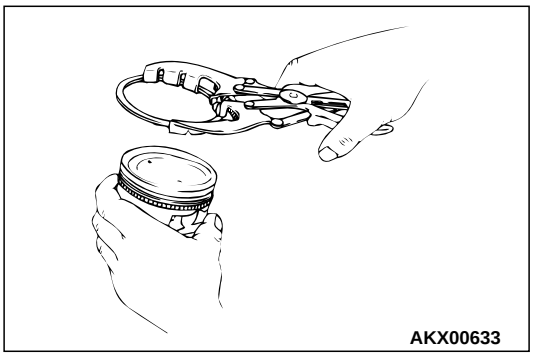
>>C<< PISTON RING NO.2/PISTON RING NO.1 INSTALLATION

1. To prevent wrong installation, check the identification mark of each piston ring. The identification mark is stamped near the ring gap:
   Identification mark
   Number 1 ring: T
   Number 2 ring: 2T
   NOTE: Size marks on piston rings are as follows.

SIZE	IDENTIFICATION MARK
Standard	None
0.50 mm (0.020 in) oversize diameter	50
1.00 mm (0.040 in) oversize diameter	100

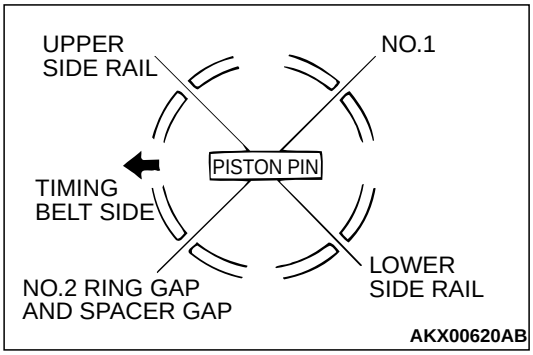


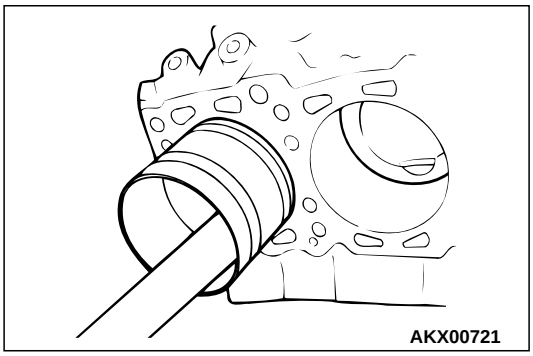
2. Using a piston ring expander, fit the number 2 piston ring into the number 2 groove of piston.
   NOTE: Install the piston rings with their identification mark facing up, to the piston crown side.
3. Install the number 1 piston ring in the same manner as step 2.



>>D<< PISTON AND CONNECTING ROD INSTALLATION

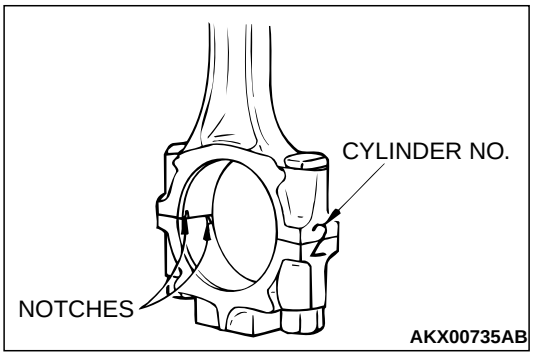
1. Apply engine oil on the circumference of the piston, piston rings, and oil ring.
2. Arrange the piston ring and oil ring gaps (side rail and spacer) as shown in the illustration.
3. Rotate the crankshaft so that the crank pin is on the center of the cylinder bore.




AKX00721

4. Use suitable thread protectors on the connecting rod bolts before inserting the piston and connecting rod assembly into the cylinder block.
   Care must be taken not to nick the crank pin.
5. Insert the piston and connecting rod assembly into the cylinder with the front mark on the piston crown pointing to the timing belt side.
6. Using a suitable piston ring compressor tool, install the piston and connecting rod assembly into the cylinder block.

>>E<< CONNECTING ROD CAP INSTALLATION



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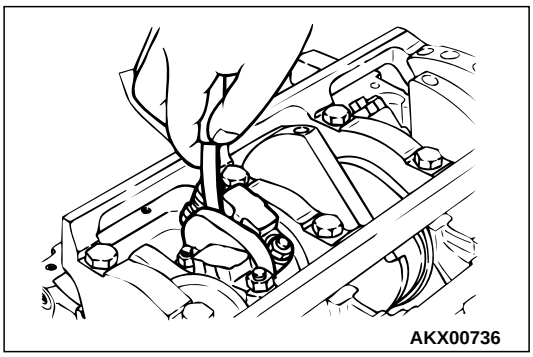
1. Mate the correct bearing cap with the correct connecting rod by checking with the alignment marks marked during disassembly. If a new connecting rod is used which has no alignment mark, position the notches for locking the bearing on the same side.


AKX00736

2. Check if the thrust clearance in the connecting rod big end is correct.
   Standard value: 0.10 – 0.25 mm (0.004 – 0.009 inch)
   Limit: 0.4 mm (0.02 inch)

INSPECTION

M1113008500194

PISTON

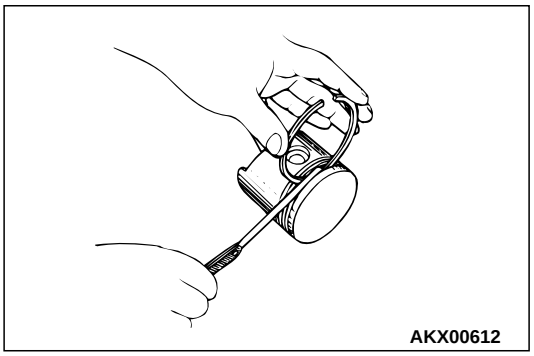
Replace the piston if scratches or seizure is evident on its surfaces (especially the thrust surface). Replace the piston if it is cracked.

PISTON PIN

1. Insert the piston pin into the piston pin hole with your thumb. You should feel a slight resistance. Replace the piston pin if it can be easily inserted or there is an excessive play.
2. The piston and piston pin must be replaced as an assembly.

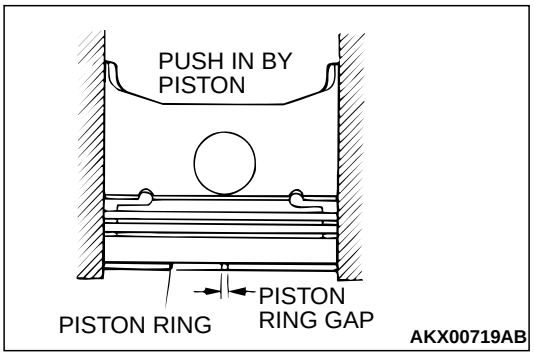
PISTON RING

1. Check the piston ring for damage, excessive wear, and breakage. Replace if defects are evident. If the piston has been replaced, the piston rings must also be replaced.


AKX00612

2. Check for clearance between the piston ring and ring groove. If it exceeds the limit, replace the ring or piston, or both.

Standard value:
Number 1: 0.03 – 0.07 mm (0.0012 – 0.0027 inch)
Number 2: 0.02 – 0.06 mm (0.0008 – 0.0023 inch)
Limit: 0.1 mm (0.003 inch)



AKX00719AB

3. Insert the piston ring into the cylinder bore. Force the ring down with a piston, the piston crown being in contact with the ring, to correctly position it at right angles to the cylinder wall. Then, measure the end gap with a feeler gauge.
If the ring gap is excessive, replace the piston ring.

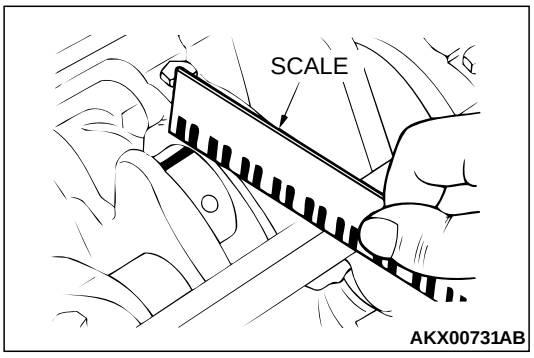
Standard value:
<With variable inducation system>
Number 1: 0.25 – 0.35 mm (0.010 – 0.014 inch)
Number 2: 0.35 – 0.50 mm (0.014 – 0.020 inch)
Oil: 0.10 – 0.35 mm (0.004 – 0.014 inch)
<Without variable inducation system>
Number 1: 0.30 – 0.45 mm (0.012 – 0.018 inch)
Number 2: 0.45 – 0.60 mm (0.018 – 0.024 inch)
Oil: 0.20 – 0.60 mm (0.008 – 0.024 inch)

Limit:
Number 1, Number 2: 0.8 mm (0.03 inch)
Oil: 1.0 mm (0.03 inch)

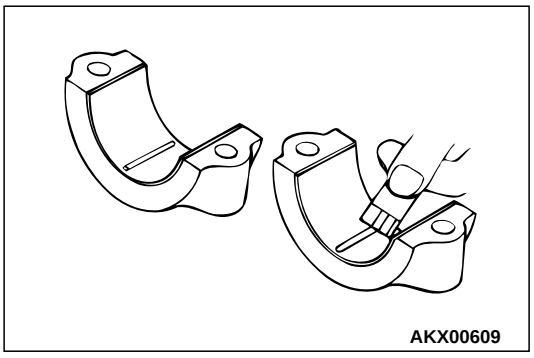
CRANKSHAFT PIN OIL CLEARANCE
<PLASTIC GAUGING MATERIAL METHOD>

1. Remove oil from the crankshaft pin and the connecting rod bearing.
2. Cut plastic gauging material to the same length as the width of the bearing and place it on the pin in parallel with its axis.
3. Install the connecting rod cap carefully and tighten the nuts to the specified torque.
4. Carefully remove the connecting rod cap.
5. Measure the width of the plastic gauging material at its widest part by using a scale printed on the plastic gauging material package.

Standard value: 0.02 – 0.05 mm (0.0008 – 0.0019 inch)
Limit: 0.1 mm (0.003 inch)



AKX00731AB


AKX00609

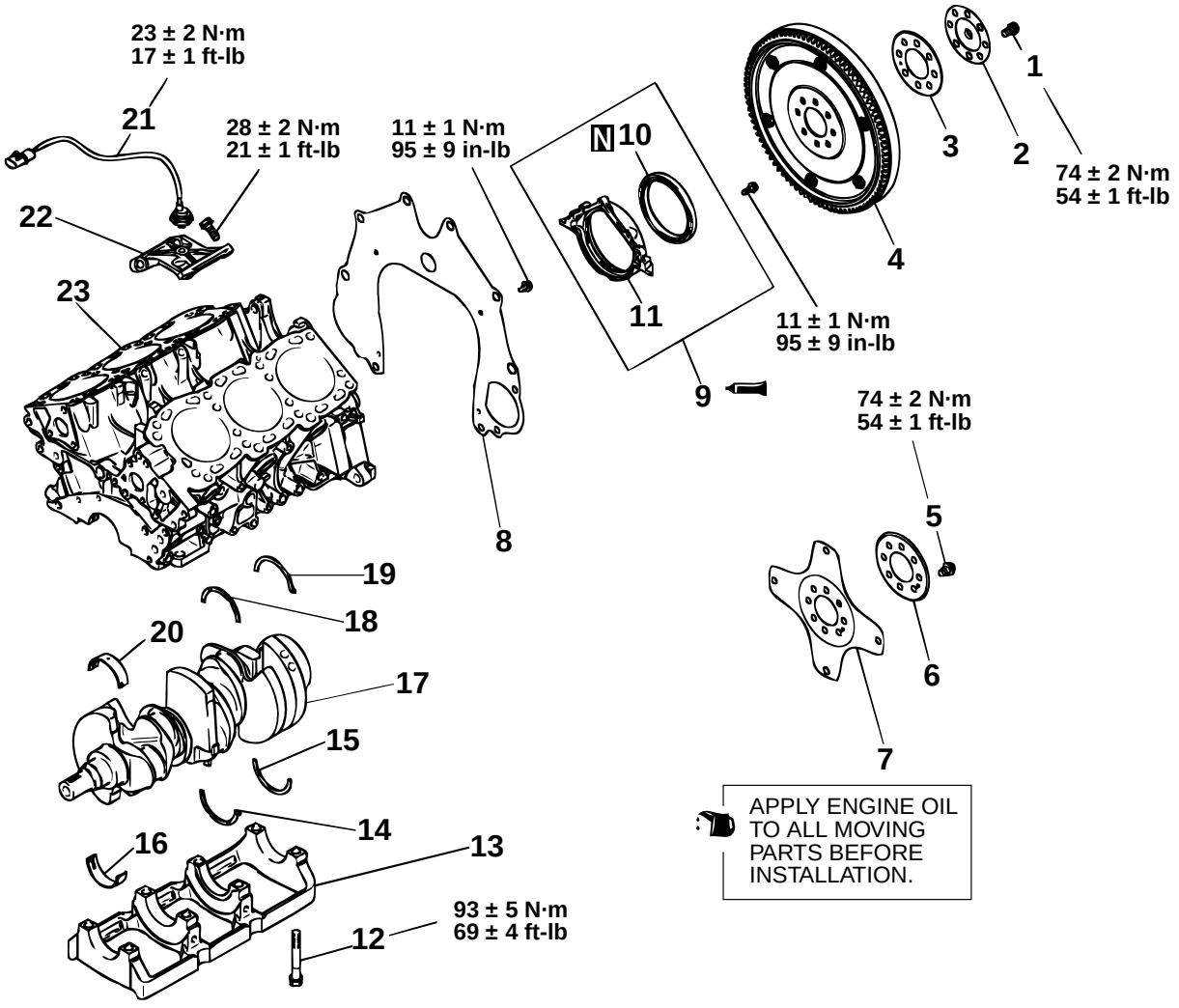
CRANKSHAFT AND CYLINDER BLOCK

REMOVAL AND INSTALLATION

M1113008700046

⚠ CAUTION

On the flexible flywheel equipped engines, do not remove any of the bolts "A" of the flywheel shown in the illustration. The balance of the flexible flywheel is adjusted in an assembled condition. Removing the bolt, therefore, can cause the flexible flywheel to be out of balance and result in damage.



AKX00683AB

REMOVAL STEPS

1. FLYWHEEL BOLT <M/T>
2. ADAPTER PLATE <M/T>
3. PLATE <M/T>
4. FLYWHEEL <M/T>
5. DRIVE PLATE BOLT <A/T>
6. ADAPTOR PLATE <A/T>
7. DRIVE PLATE <A/T>
8. REAR PLATE

>>F<< 9. OIL SEAL CASE ASSEMBLY

>>E<< 10. CRANKSHAFT REAR OIL SEAL

11. OIL SEAL CASE

>>D<< 12. BEARING CAP BOLT

REMOVAL STEPS (Continued)

>>D<< 13. BEARING CAP

>>C<< 14. THRUST BEARING A

>>C<< 15. THRUST BEARING B

>>B<< 16. CRANKSHAFT BEARING, LOWER

17. CRANKSHAFT

>>C<< 18. THRUST BEARING B

>>C<< 19. THRUST BEARING A

>>B<< 20. CRANKSHAFT BEARING, UPPER

21. KNOCK SENSOR

>>A<< 22. KNOCK SENSOR BRACKET

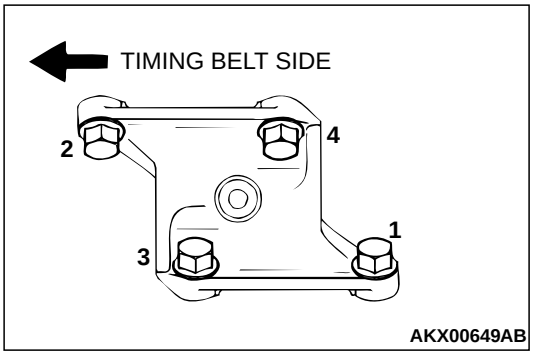
23. CYLINDER BLOCK

TSB Revision

Required Special Tool:

- MD998718: Crankshaft Rear Oil Seal Installer

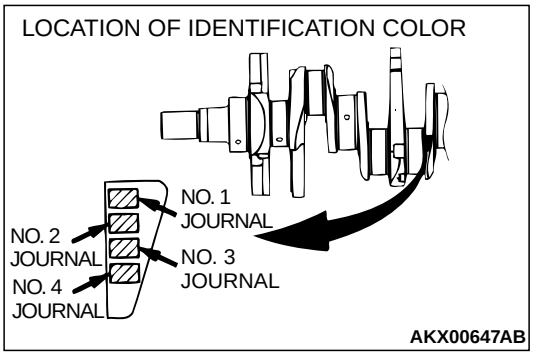
INSTALLATION SERVICE POINTS



>>A<< KNOCK SENSOR BRACKET INSTALLATION

Check that the bracket is in proper contact with the cylinder block boss and tighten to the specified torque in the order shown.

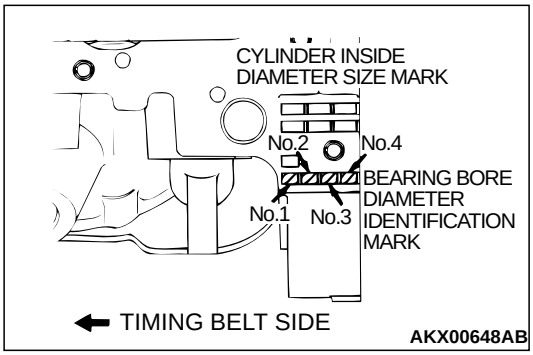
Tightening torque: 28 ± 2 N·m (21 ± 1 ft-lb)



>>B<< CRANKSHAFT BEARING INSTALLATION

When bearing replacement is required, select and install the correct bearing by the following procedure.

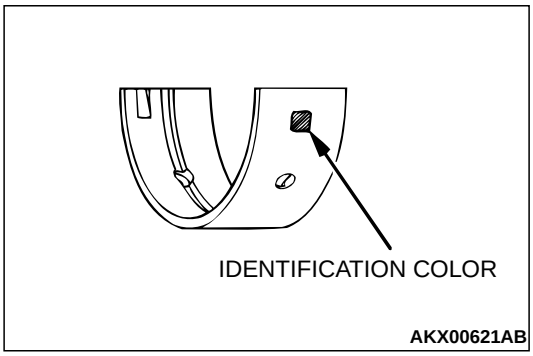
1. Measure the crankshaft journal diameter and confirm its classification from the following table. In the case of a crankshaft supplied as a service part, identification colors/ marks of its journals are painted/stamped at the positions shown in the illustration.



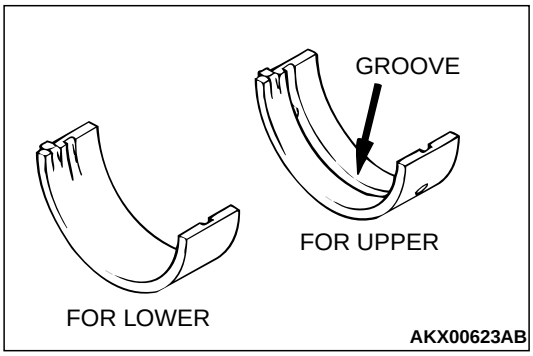
2. The cylinder block bearing bore diameter identification marks are stamped at the position shown in the illustration from left to right, bearing at No.1.

CRANKSHAFT JOURNAL OUTSIDE DIAMETER		CYLINDER BLOCK BEARING BORE	CRANKSHAFT BEARING
IDENTIFICATION COLOR	SIZE mm (in)	IDENTIFICATION MARK	IDENTIFICATION COLOR
Yellow	59.990 – 59.996 (2.3618 – 2.3620)	I	Pink
		II	Red
		III	Green
None	59.984 – 59.990 (2.3616 – 2.3618)	I	Red
		II	Green
		III	Black

CRANKSHAFT JOURNAL OUTSIDE DIAMETER		CYLINDER BLOCK BEARING BORE	CRANKSHAFT BEARING
IDENTIFICATION COLOR	SIZE mm (in)	IDENTIFICATION MARK	IDENTIFICATION COLOR
White	59.978 – 59.984 (2.3613 – 2.3616)	I	Green
		II	Black
		III	Brown

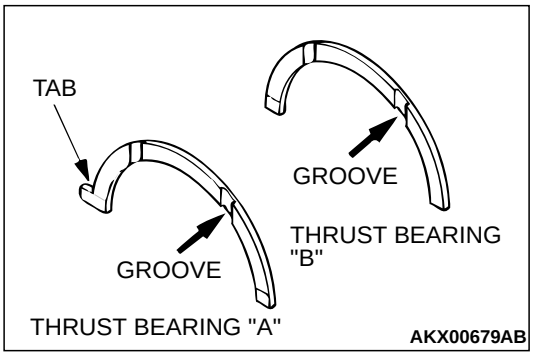


3. For example, if the crankshaft journal outside diameter identification color is "Yellow " and the cylinder block bearing bore identification mark is "III," select a bearing whose identification color is "Green."
   If there is no identification color paint on the crankshaft, measure the journal outside diameter and select a bearing appropriate for the measured value.



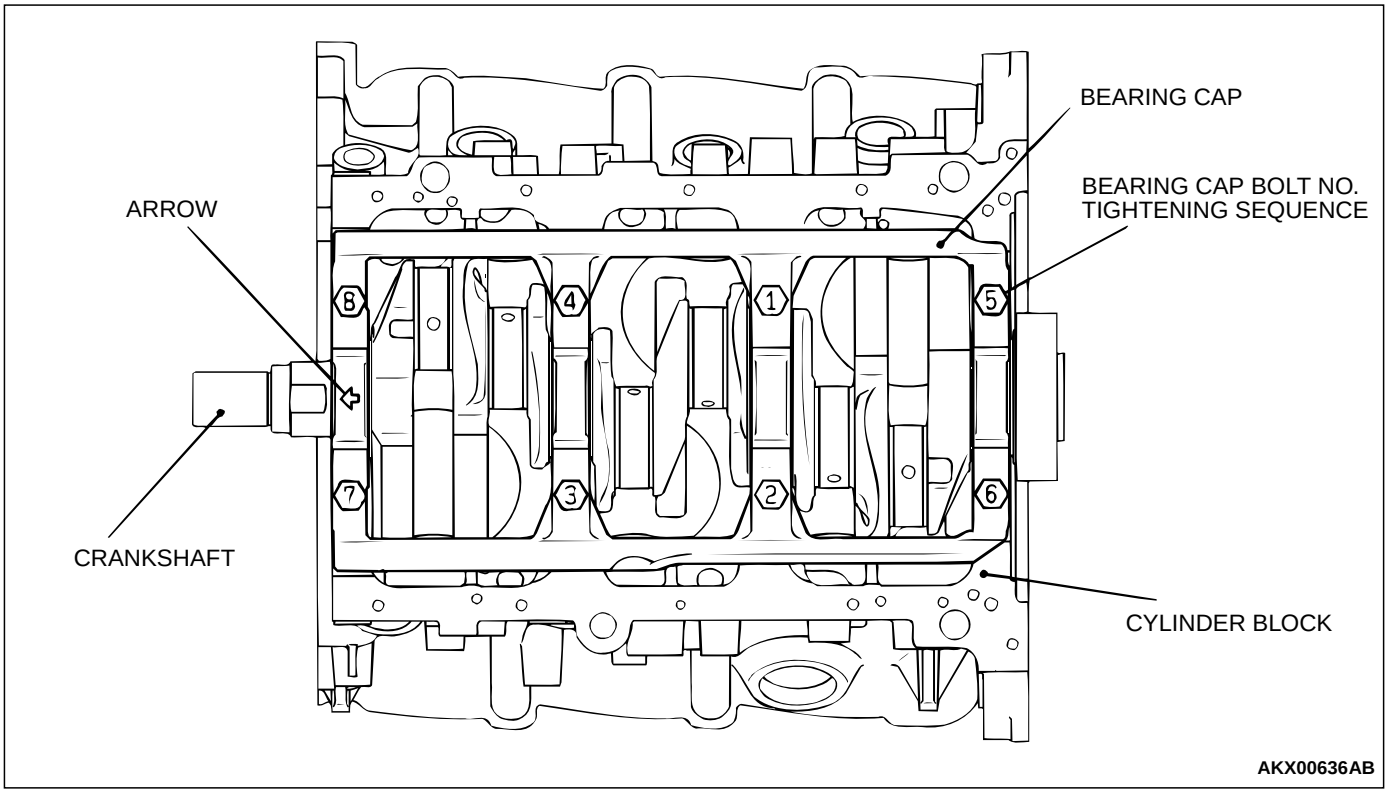
4. Install the bearings having a groove to the cylinder block.
5. Install the bearings having no groove to the bearing cap.

>>C<< CRANKSHAFT THRUST BEARING INSTALLATION



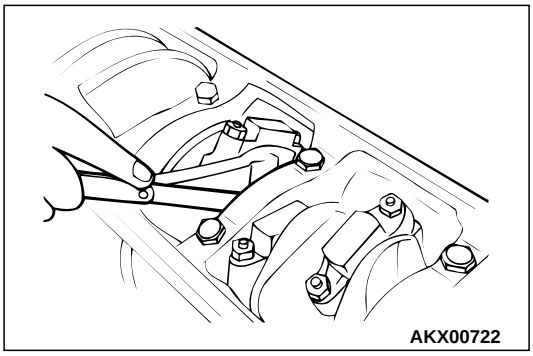
1. Install the thrust bearings in the number 3 bearing bore in the cylinder block and in the bearing cap. For easier installation, apply engine oil to the bearings; this will help hold them in position.
2. The thrust bearings must be installed with their groove toward the crankshaft web. The two thrust bearings are different from each other. One has a tab while the other has no tab. Be careful not to confuse them.

>>D<< BEARING CAP/BEARING CAP BOLT INSTALLATION



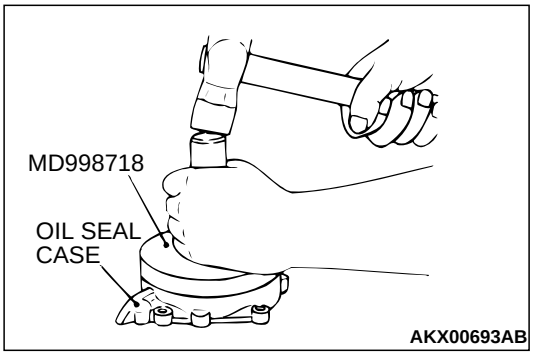
1. Install the bearing cap on the cylinder block, so that the arrow points to the timing belt side.
2. Tighten the bearing cap bolts to 93 ± 5 N·m (69 ± 4 ft-lb) in the specified tightening sequence.
3. Check that the crankshaft rotates smoothly.
4. Check the end play. If it exceeds the limit value, replace the thrust bearing.

   Standard value: 0.05 – 0.25 mm (0.002 – 0.009 inch)
   Limit: 0.3 mm (0.01 inch)

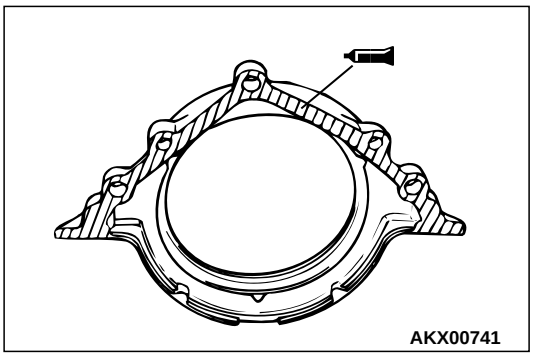


>>E<< CRANKSHAFT REAR OIL SEAL INSTALLATION

Using special tool MD998718, press-fit a new crankshaft rear oil seal into the oil seal case.



TSB Revision


AKX00741

>>F<< OIL SEAL CASE ASSEMBLY INSTALLATION

1. Apply sealant Mitsubishi Genuine Part number MD970389 or equivalent to the gasket surface of oil seal case.

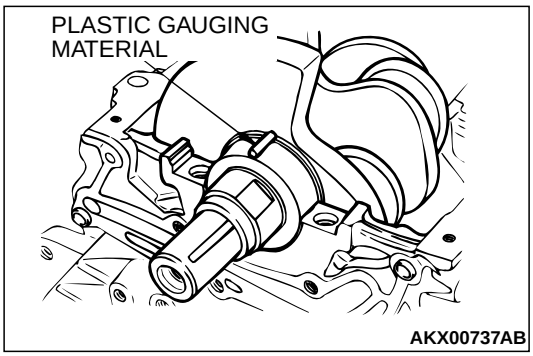
   NOTE: Be sure to install the case quickly while the sealant is wet (within 15 minutes).
2. Apply engine oil to the lip of the oil seal, and then install the oil seal case onto the cylinder block.

   NOTE: After installation, keep the sealed area away from the oil for approximately one hour.

INSPECTION

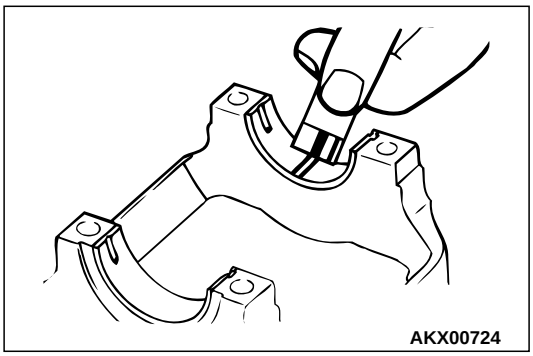
M1113008800043

CRANKSHAFT JOURNAL OIL CLEARANCE <PLASTIC GAUGING MATERIAL METHOD>



AKX00737AB

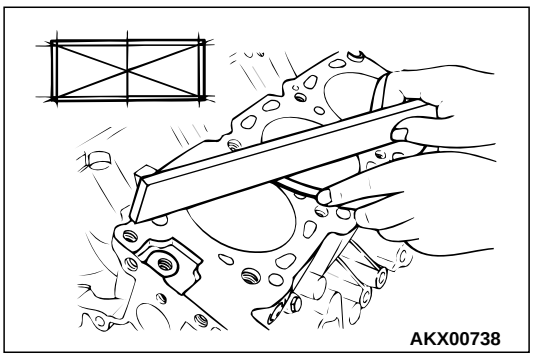
1. Remove oil from the crankshaft journal and crankshaft bearing.
2. Install the crankshaft.
3. Cut plastic gauging material to the same length as the width of the bearing and place it on the journal in parallel with its axis.


AKX00724

4. Install the crankshaft bearing cap carefully and tighten the bolts to the specified torque.
5. Carefully remove the crankshaft bearing cap.
6. Measure the width of the plastic gauging material at its widest part by using a scale printed on the plastic gauging material package.

   Standard value: 0.02 – 0.04 mm (0.0008 – 0.0015 inch)
   Limit: 0.1 mm (0.003 inch)

CYLINDER BLOCK

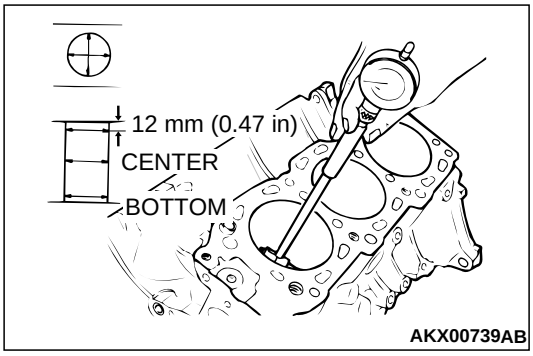

AKX00738

1. Visually check for scratches, rust, and corrosion. Use also a flaw detecting agent for the check. If defects are evident, correct, or replace.
2. Using a straightedge and feeler gauge, check the block top surface for warpage. Make sure that the surface is free from gasket chips and other foreign matter.

   Standard value: 0.05 mm (0.002 inch)
   Limit: 0.1 mm (0.003 inch)
3. If the distortion is excessive, correct within the allowable limit or replace.

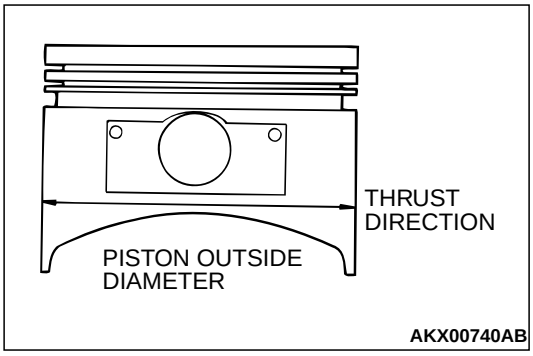
   Grinding limit: 0.2 mm (0.008 inch)
   ***Includes/combined with cylinder head grinding.**

Cylinder block height (when new):
210.5 mm (8.29 inches)



4. Check the cylinder walls for scratches and seizure. If defects are evident, replace or bore to oversize and replace pistons and piston rings.
5. Using a cylinder gauge, measure the cylinder bore and cylindricity. If worn badly, correct by boring the cylinders to an oversize and replace pistons and piston rings. Measure at the points shown in the illustration.

Standard value:
Cylinder Inside Diameter: 91.1 mm (3.59 inches)
Cylindricity: 0.01 mm (0.0003 inch)



BORING CYLINDER

1. Oversize pistons to be used should be determined on the basis of the largest bore cylinder.

Piston size identification

SIZE	IDENTIFICATION MARK
0.50 mm (0.020 in) Oversize diameter	0.50
1.00 mm (0.040 in) Oversize diameter	1.00

NOTE: Size mark is stamped on the piston top.

2. Measure the outside diameter of the piston to be used. Measure it in the thrust direction as shown.
3. Based on the measured piston Outside Diameter (OD), calculate the boring finish dimension.

Boring finish dimension = Piston OD + (clearance between piston OD and cylinder) – 0.02 mm (0.0008 inch) (honing margin)

⚠ CAUTION
To prevent distortion that may result from temperature rise during honing, bore cylinders in the order of number 2, number 4, number 6, number 1, number 3 and number 5.

4. Bore all cylinders to the calculated boring finish dimension.
5. Hone to the final finish dimension (piston OD + clearance between piston OD and cylinder).
6. Check the clearance between the piston and cylinder.

Clearance between piston and cylinder:
0.02 – 0.04 mm (0.0008 – 0015 inch)

NOTE: When boring cylinders, finish all of six cylinders to the same oversize. Do not bore only one cylinder to an oversize.

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1113023400280

ITEMS	SPECIFICATIONS
Generator and drive belt	
Crankshaft bolt	185 ± 5 N·m (139 ± 4 ft-lb)
Dipstick guide bolt	48 ± 6 N·m (35 ± 4 ft-lb)
Drive belt tensioner pulley nut	49 ± 10 N·m (36 ± 7 ft-lb)
Generator bolt nut	44 ± 10 N·m (33 ± 7 ft-lb)
Generator bracket bolt M8	22 ± 4 N·m (16 ± 3 ft-lb)
Generator bracket bolt M10	49 ± 10 N·m (36 ± 7 ft-lb)
Intake manifold plenum and throttle body	
Exhaust gas recirculation pipe bolt	18 ± 2 N·m (13 ± 1 ft-lb)
Exhaust gas recirculation pipe flare nut	59 ± 10 N·m (43 ± 7 ft-lb)
Exhaust gas recirculation valve bolt	22 ± 4 N·m (16 ± 3 ft-lb)
Induction control system assembly bolt and nut	18 ± 2 N·m (13 ± 1 ft-lb)
Intake manifold upper bolt	9 ± 1 N·m (80 ± 9 in-lb)
Intake manifold plenum stay bolt M8	18 ± 2 N·m (13 ± 1 ft-lb)
Intake manifold plenum stay bolt M10	35 ± 6 N·m (26 ± 4 ft-lb)
Manifold differential pressure sensor bolt	4.9 ± 1 N·m (43 ± 9 in-lb)
Throttle body bolt	12 ± 1 N·m (104 ± 9 in-lb)
Ignition system	
Distributor nut	13 ± 2 N·m (113 ± 17 in-lb)
Spark plugs	25 ± 5 N·m (18 ± 4 ft-lb)
Timing belt	
Auto tensioner bolt	24 ± 3 N·m (17 ± 2 ft-lb)
Bracket bolt	24 ± 3 N·m (17 ± 3 ft-lb)
Camshaft sprocket bolt	88 ± 10 N·m (65 ± 7 ft-lb)
Crankshaft position sensor bolt	8.8 ± 1 N·m (78 ± 9 in-lb)
Engine support bracket bolt	44 ± 5 N·m (33 ± 4 ft-lb)
Idler pulley bolt	44 ± 5 N·m (33 ± 4 ft-lb)
Tensioner pulley bolt	48 ± 6 N·m (35 ± 4 ft-lb)
Tensioner arm bolt	44 ± 10 N·m (33 ± 7 ft-lb)
Timing belt cover bolt M6	11 ± 1 N·m (95 ± 9 in-lb)
Timing belt cover bolt M8	14 ± 1 N·m (122 ± 9 in-lb)
Timing belt rear cover bolt	14 ± 1 N·m (122 ± 9 in-lb)
Intake manifold and fuel parts	
Injector and fuel rail bolt	12 ± 1 N·m (104 ± 9 in-lb)
Fuel pressure regulator bolt	8.8 ± 1 N·m (78 ± 9 in-lb)
Intake manifold nut	22 ± 1 N·m (16 ± 1 ft-lb)
Water pump and water pipes	
Engine coolant temperature gauge unit	11 ± 1 N·m (95 ± 9 in-lb)

TSB Revision

ITEMS	SPECIFICATIONS
Engine coolant temperature sensor	29 ± 10 N·m (22 ± 7 ft-lb)
Heater pipe bolt	19 ± 1 N·m (14 ± 1 ft-lb)
Thermostat housing bolt	19 ± 1 N·m (14 ± 1 ft-lb)
Water inlet fitting bolt	19 ± 1 N·m (14 ± 1 ft-lb)
Water inlet pipe bolt	14 ± 1 N·m (122 ± 9 in-lb)
Water outlet fitting bolt	19 ± 1 N·m (14 ± 1 ft-lb)
Water pump bolt M8	24 ± 3 N· (17 ± 2 ft-lb)
Water pump bolt M10	41 ± 8 N·m (30 ± 6 ft-lb)
Exhaust manifold	
Engine hanger bolt	35 ± 6 N·m (26 ± 4 ft-lb)
Exhaust manifold nut	44 ± 5 N·m (33 ± 4 ft-lb)
Heat protector bolt	14 ± 1 N·m (122 ± 9 in-lb)
Oxygen sensor	44 ± 5 N·m (33 ± 4 ft-lb)
Rocker arms and camshaft	
Rocker cover bolt	3.4 ± 0.5 N·m (30 ± 4 in-lb)
Rocker shaft bolt	31 ± 3 N·m (23 ± 2 ft-lb)
Thrust case bolt	13 ± 2 N·m (113 ± 17 in-lb)
Cylinder head and valve	
Cylinder head bolt	108 ± 5 N·m (80 ± 4 ft-lb) to back of to 108 ± 5 N·m (80 ± 4 ft-lb)
Oil pan and oil pump	
Baffle plate bolt (Cylinder block side)	8.8 ± 2 N·m (78 ± 17 in-lb)
Baffle plate bolt (Oil pan side)	11 ± 1 N·m (95 ± 9 in-lb)
Cover bolt	11 ± 1 N·m (95 ± 9 in-lb)
Drain plug	39 ± 5 N·m (29 ± 4 ft-lb)
Oil filter bracket bolt	24 ± 3 N·m (17 ± 2 ft-lb)
Oil pan, lower bolt	11 ± 1 N·m (95 ± 9 in-lb)
Oil pan, upper bolt	5.9 ± 1 N·m (52 ± 9 in-lb)
Oil pressure switch	10 ± 2 N·m (87 ± 17 in-lb)
Oil pump case bolt M8	14 ± 1 N·m (122 ± 9 in-lb)
Oil pump case bolt M10	41 ± 8 N·m (30 ± 6 ft-lb)
Oil pump cover bolt	10 ± 2 N·m (87 ± 17 in-lb)
Oil screen bolt	19 ± 3 N·m (14 ± 2 ft-lb)
Relief plug	44 ± 5 N·m (33 ± 4 ft-lb)
Piston and connecting rod	
Connecting rod cap nut	51 ± 1 N·m (38 ± 1 ft-lb)
Crankshaft and cylinder block	
Bearing cap bolt	93 ± 5 N·m (69 ± 4 ft-lb)
Flywheel or drive plate bolt	74 ± 2 N·m (54 ± 1 ft-lb)
Knock sensor	23 ± 2 N·m (17 ± 1 ft-lb)

ITEMS	SPECIFICATIONS
Knock sensor bracket bolt	28 ± 2 N·m (22 ± 1 ft-lb)
Oil seal case bolt	11 ± 1 N·m (95 ± 9 in-lb)
Rear plate bolt	11 ± 1 N·m (95 ± 9 in-lb)

GENERAL SPECIFICATIONS

M1113000200263

DESCRIPTIONS			SPECIFICATIONS
Type			60° OHV, SOHC
Number of cylinders			6
Combustion chamber			Compact type
Total displacement dm^3 (cu. in)			2.972 (181.4)
Cylinder bore (in)			91.1 (3.59)
Piston stroke mm (in)			76.0 (2.99)
Compression ratio			8.9
Valve timing	Intake valve	Opens (BTDC)	7°*1 or 15°*2
		Closes (ABDC)	61°*1or 53°*2
	Exhaust valve	Opens (BBDC)	61°*1or 53°*2
		Closes (ATDC)	15°
Lubrication system			Pressure feed, full-flow filtration
Oil pump type			Trochoid type

NOTE:

**1: With variable induction system*

**2: Without variable induction system*

SERVICE SPECIFICATIONS

M1113000300237

ITEM		STANDARD VALUE	LIMIT
Timing belt			
Auto-tensioner rod length mm (in)		3.8 – 5.0 (0.15 – 0.20)	–
Auto-tensioner rod production length mm (in)		12 (0.5)	–
Auto-tensioner rod pushed-in amount [when pushed with a force of 98 – 196 N (22 – 44 lb)] mm (in)		1.0 (0.03) or less	–
Rocker arms and camshaft			
Camshaft cam height mm (in)	Intake	37.71 (1.485)	Minimum 37.21 (1.465)
	Exhaust	37.14 (1.462)	Minimum 36.64 (1.443)
Camshaft journal outside diameter mm (in)		45 (1.8)	–
Cylinder head and valves			
Cylinder head flatness of gasket surface mm (in)		Less than 0.03 (0.001)	0.2 (0.007)
Cylinder head grinding limit of gasket surface mm (in) Total resurfacing depth of cylinder head and cylinder block		–	0.2 (0.007)

ITEM		STANDARD VALUE	LIMIT
Cylinder head overall height mm (in)		120 (4.7)	–
Valve thickness of valve head (margin) mm (in)	Intake	1.0 (0.04)	Minimum 0.5 (0.02)
	Exhaust	1.2 (0.05)	Minimum 0.7 (0.03)
Valve overall height mm (in)	Intake	112.30 (4.421)	Minimum 111.80 (4.402)
	Exhaust	114.11 (4.493)	Minimum 113.61 (4.473)
Valve stem outside diameter mm (in)	Intake	6.0 (0.24)	–
	Exhaust	6.0 (0.24)	–
Valve thickness to valve guide clearance mm (in)	Intake	0.02 – 0.05 (0.0008 – 0.0019)	0.10 (0.003)
	Exhaust	0.04 – 0.07 (0.0016 – 0.0027)	0.15 (0.005)
Valve face angle mm (in)		45° – 4.5°	–
Valve spring free length mm (in)		51.0 (2.01)	Minimum 50.0 (1.97)
Valve spring load/installed height N (lb)/mm (in)		267/44.2 (60.0/1.74)	–
Valve spring out-of-squareness		2° or less	4°
Valve seat valve contact width mm (in)		0.9 – 1.3 (0.04 – 0.05)	–
Valve guide inside diameter mm (in)		6.0 (0.32)	–
Valve guide projection from cylinder head upper surface mm (in)		14 (0.6)	–
Valve stem projection mm (in)		49.30 (1.941)	49.80 (1.960)
Oversize rework dimensions of valve guide hole mm (in)	0.05 oversize diameter	11.05 – 11.07 (0.4351 – 0.4358)	–
	0.25 oversize diameter	11.25 – 11.27 (0.4429 – 0.4437)	–
	0.50 oversize diameter	11.50 – 11.52 (0.4528 – 0.4535)	–
Intake oversize rework dimensions of valve seat hole mm (in)	0.3 oversize diameter	34.30 – 34.33 (1.3504 – 1.3515)	–
	0.6 oversize diameter	34.60 – 34.63 (1.3623 – 1.3633)	–
Exhaust oversize rework dimensions of valve seat hole mm (in)	0.3 oversize diameter	31.80 – 31.81 (1.2520 – 1.2531)	–
	0.6 oversize diameter	32.10 – 32.13 (1.2638 – 1.2650)	–
Oil pan and oil pump			
Oil pump tip clearance mm (in)		0.06 – 0.18 (0.003 – 0.007)	–
Oil pump side clearance mm (in)		0.04 – 0.10 (0.002 – 0.003)	–
Oil pump body clearance mm (in)		0.10 – 0.18 (0.004 – 0.007)	0.35 (0.013)
Oil pressure at curb idle speed kPa (psi) [oil temperature is 75 to 90°C (167 to 194°F)]		80 (11.6) or more	–
Piston and connecting rod			
Piston outside diameter mm (in)		91.1 (3.58)	–

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ITEM			STANDARD VALUE	LIMIT
Piston ring to ring groove clearance mm (in)		No.1	0.03 – 0.07 (0.0012 – 0.0027)	0.1 (0.003)
		No.2	0.02 – 0.06 (0.0008 – 0.0023)	0.1 (0.003)
Piston ring end gap mm (in)	With variable induction system	No.1	0.25 – 0.35 (0.009 – 0.013)	0.8 (0.03)
		No.2	0.35 – 0.50 (0.013 – 0.019)	0.8 (0.03)
		Oil ring side rail	0.10 – 0.35 (0.003 – 0.013)	1.0 (0.03)
	Without variable induction system	No.1	0.30 – 0.45 (0.012 – 0.017)	0.8 (0.03)
		No.2	0.45 – 0.60 (0.018 – 0.023)	0.8 (0.03)
		Oil ring side rail	0.20 – 0.60 (0.008 – 0.023)	1.0 (0.03)
Piston pin outside diameter mm (in)			22.0 (0.87)	–
Piston pin press-in load N (lb) (room temperature)			7,350 – 17,200 (1,653 – 3,866)	–
Crankshaft pin oil clearance mm (in)			0.02 – 0.05 (0.0008 – 0.0019)	0.1 (0.003)
Connecting rod big end side clearance mm (in)			0.10 – 0.25 (0.003 – 0.009)	0.4 (0.02)
Crankshaft and cylinder block				
Crankshaft end play mm (in)			0.05 – 0.25 (0.002 – 0.009)	0.3 (0.01)
Crankshaft journal outside diameter mm (in)			60 (2.4)	–
Crankshaft pin outside diameter mm (in)			50 (2.0)	–
Crankshaft journal oil clearance mm (in)			0.02 – 0.04 (0.0008 – 0.0015)	0.1 (0.003)
Piston to cylinder clearance mm (in)			0.02 – 0.04 (0.0008 – 0.0015)	–
Cylinder block flatness of gasket surface mm (in)			0.05 (0.02)	0.1 (0.003)
Cylinder block grinding limit of gasket surface mm (in) total resurfacing depth of both cylinder head and cylinder block			–	0.2 (0.008)
Cylinder block overall height mm (in)			210.5 (8.29)	–
Cylinder bore inside diameter mm (in)			91.1 (3.59)	–
Cylindricity mm (in)			0.01 (0.0003)	–

SEALANTS AND ADHESIVES

M1113000500220

ITEM	SPECIFIED SEALANT	QUANTITY
Intake manifold upper	MITSUBISHI Genuine part No.MD970389, 3M™ AAD Part No. 8660 or equivalent	As required
Engine coolant temperature sensor	3M™ AAD Part No. 8731 or equivalent	As required
Engine coolant temperature gauge unit	3M™ AAD Part No. 8672 or equivalent	As required
Oil pressure switch	3M™ AAD Part No. 8672 or equivalent	As required

ITEM	SPECIFIED SEALANT	QUANTITY
Oil pump case	MITSUBISHI Genuine part No. MD970389 or equivalent	As required
Oil pan	MITSUBISHI Genuine part No. MD970389 or equivalent	As required
Oil seal case	MITSUBISHI Genuine part No. MD970389 or equivalent	As required

GROUP 12

ENGINE LUBRICATION

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GENERAL DESCRIPTION

M1121000100205

The lubrication method is a fully force-fed, full-flow filtration type.

ITEMS	2.4L ENGINE	3.0L ENGINE
Oil pump type	Involute gear type	Trochoid type
Drive method	Timing belt	Crankshaft

ENGINE OILS

⚠ *WARNING*

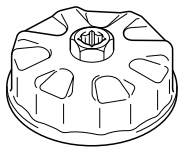
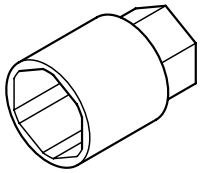
Prolonged and repeated contact with mineral oil will result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer. Adequate means of skin protection and washing facilities must be provided.

Recommended Precautions:
The most effective precaution is to adapt working practices which prevent, as far as practical, the risk of skin contact with mineral oils i.e. use enclosed systems for handling used engine oil and decrease components, where practical, before handling them.

Other Precautions:
- Avoid prolonged and repeated contact with oil, particularly used engine oil.
- Wear protective clothing, including impervious gloves where practical.
- Avoid contaminating clothes, particularly under wear, with oil.
- Do not put oily rags in pockets.
- Do not wear heavily soiled clothing and oil-soaked foot-wear. Overalls must be cleaned regularly and kept separate from personal clothing.
- Where there is a risk of eye contact, eye protection should be worn i.e. chemical goggles or face shields. In addition, an eye wash facility should be provided.
- Obtain First Aid treatment immediately for open cuts and wounds.
- Wash regularly with soap and water to ensure all oil is removed, especially before meals (skin cleansers and nail brushes will help). After cleaning, apply lotion, etc., containing lanolin to replace natural skin oils is advised.
- Do not use gasoline, kerosene, diesel fuel, gas oil, thinners or solvents for cleaning skin.
- Apply barrier creams before each work period to help clean the skin after work.
- If skin disorders develop, obtain medical advice immediately.

SPECIAL TOOLS

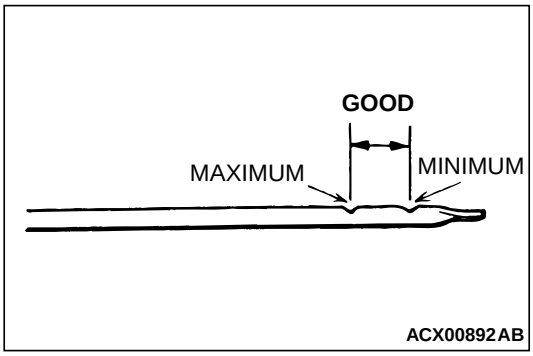
M1121000600244

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 B991396	MB991396 Oil filter wrench	–	Removal and installation of engine oil filter (when using the oil filter of MD360935, MD325714, MD332687 and MD365876) <2.4L Engine>
	MD998054 Oil pressure switch wrench	–	Removal and installation of oil pressure switch

ON-VEHICLE SERVICE

ENGINE OIL CHECK

M1121000900193



1. Pull out the oil dipstick slowly and check that the oil level is within the marks on the oil dipstick.
2. Check that the oil is not excessively dirty, that there is no coolant or gasoline mixed in, and that it is sufficiently thick and slippery.

ENGINE OIL REPLACEMENT

M1121001000201

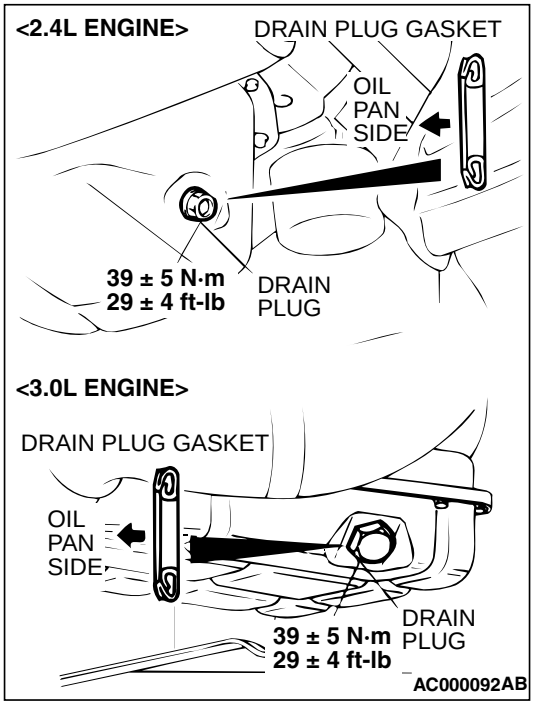
1. Start the engine and allow it to warm up until the temperature of the coolant reaches 80°C (176°F) to 90°C (194°F).
2. Remove the engine oil filler cap.

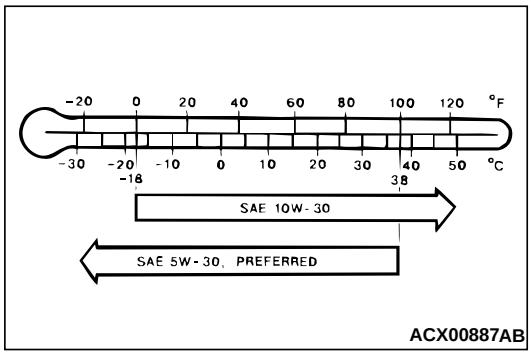
⚠ WARNING

Use care as oil could be hot.

3. Remove the drain plug to drain oil.
4. Install a new drain plug gasket so that it faces in the direction shown in the illustration, and then tighten the drain plug to the specified torque.

   Tightening torque: 39 ± 5 N·m (29 ± 4 ft-lb)





ACX00887AB

5. Refill the specified quantity of oil.
   Specified Engine Oil: Engine oil displaying ILSAC certification mark ("Starburst" symbol) conforming the API classification SJ EC or SJ/CD EC
   Total quantity (Includes volume inside oil filter): 4.3 dm^3 (4.5 quarts)
6. Install the engine oil filler cap.
7. Check oil level.

ENGINE OIL FILTER REPLACEMENT

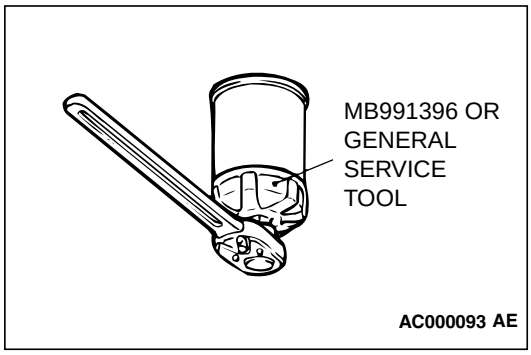
M1121001100220

Required Special Tool:
- MB991396 (When using the oil filter of MD360935, MD325717, MD332687 and MD365876): Oil Filter Wrench

1. Start the engine and allow it to warm up until the temperature of the coolant reaches 80°C (176°F) to 90°C (194°F).
2. Remove the engine oil filler cap.

⚠ ***WARNING***
Use care as oil could be hot.

3. Remove the drain plug to drain oil.
4. Use the respective tool in the following table to remove the engine oil filter.
5. Clean the filter bracket side mounting surface and ensure the old O-ring has been removed.



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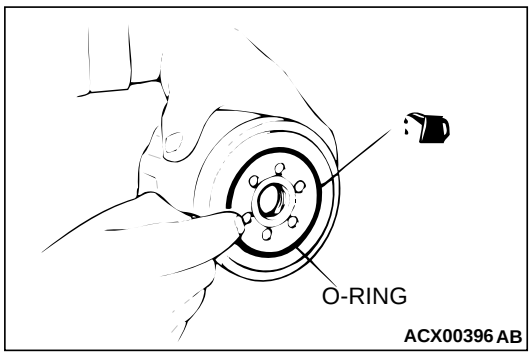


ACX00396 AB

6. Apply a small amount of engine oil to the O-ring of the new oil filter.
7. Once the O-ring of the oil filter is touching the flange, use the respective tool in the following table to tighten to the specified torque.
8. Install the drain plug and refill engine oil. (Refer to Engine Oil Replacement P.12-3.)
9. Race the engine a few times, and check to be sure that no engine oil leaks from the installation section of the oil filter.

NUMBER	ENGINE	SPECIAL TOOL	TIGHTENING TORQUE
MD360935	2.4L	MB991396 or equivalent	Approximately one turn [14 ± 2 N·m (124 ± 18 in-lb)]
MD325714, MD332687, MD365876		MB991396 or equivalent	Approximately 3/4 turn [16 ± 4 N·m (12 ± 3 ft-lb)]
MD136466, MD322508		General service tool	Approximately 3/4 turn [17 ± 3 N·m (13 ± 2 ft-lb)]
MD352626	3.0L	General service tool	Approximately 3/4 turn [14 ± 2 N·m (124 ± 18 in-lb)]

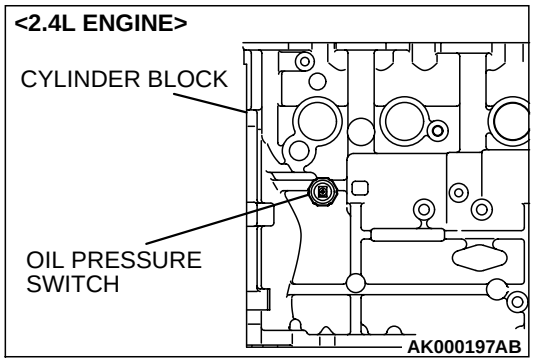
OIL PRESSURE CHECK

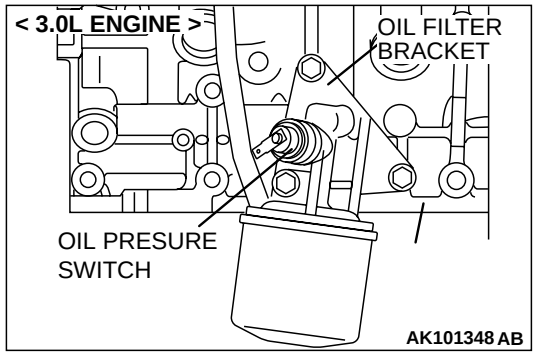
M1121002300197

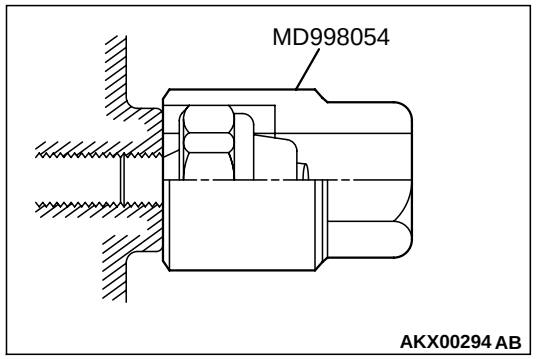
Required Special Tool:

- MD998054: Oil Pressure Switch Wrench

1. Check engine oil quantity.
2. Remove the oil pressure switch terminal.







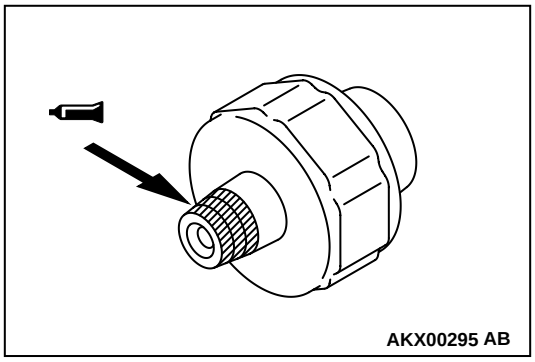
⚠ CAUTION

Since sealant is applied to the thread of the oil pressure switch, take care not to damage the oil pressure switch when removing it.

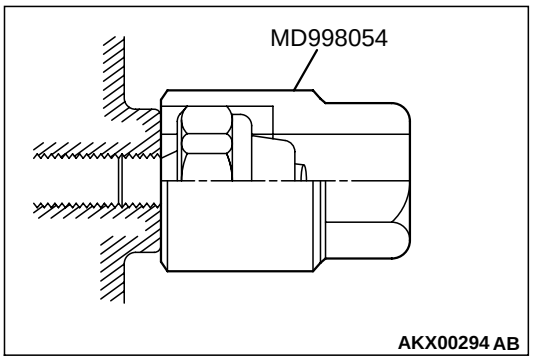
3. Use special tool MD998054 to remove the oil pressure switch.
4. Install the oil pressure gauge.

   NOTE: Use a 1/8 pipe thread adapter.
5. Run the engine to warm it.
6. After the engine has been warmed up, check that oil pressure is within the standard value.

   Standard value:
   At idle: 29 kPa (4.2 psi) or more
   At 3,500 r/min: 294 – 686 kPa (43 – 100 psi)
7. Remove the oil pressure gauge.


AKX00295 AB

8. Apply the specified sealant 3M™ AAD Part number 8672 or equivalent to thread of the oil pressure switch.



AKX00294 AB

⚠ CAUTION
Do not start the engine within one hour after the engine oil pressure switch has been installed.

9. Use special tool MD998054 to tighten the oil pressure switch to the specified torque.
   Tightening torque:
   <2.4L Engine> 19 ± 3 N·m (14 ± 2 ft-lb)
   <3.0L Engine> 10 ± 2 N·m (87 ± 17 in-lb)
10. Install the oil pressure switch terminal.

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1121002200178

ITEMS		SPECIFICATIONS
Engine oil filter	MD360935, MD352626	14 ± 2 N·m (124 ± 18 in-lb)
	MD325714, MD332687, MD365876	16 ± 4 N·m (12 ± 3 ft-lb)
	MD136466, MD322508	17 ± 3 N·m (13 ± 2 ft-lb)
Engine oil pan grain plug		39 ± 5 N·m (29 ± 4 ft-lb)
Oil pressure switch	2.4L Engine	19 ± 3 N·m (14 ± 2 ft-lb)
	3.0L Engine	10 ± 2 N·m (87 ± 17 in-lb)

SERVICE SPECIFICATIONS

M1121000300050

ITEM		STANDARD VALUE
Oil pressure kPa (psi)	at idle	29 (4.2) or more
	at 3,500 r/min	294 – 686 (43 – 100)

SEALANT

M1121000500054

ITEM	SPECIFIED SEALANT
Oil pressure switch	3M™ AAD Part No. 8672 or equivalent

LUBRICANTS

M1121000400239

ITEMS	ENGINE OIL	QUANTITY dm^3 (qt)
Oil filter	Engine oil displaying ILSAC certification mark ("Starburst" symbol) conforming the API classification SJ EC or SJ/CD EC	0.3 (0.32)
Total quantity		4.3 (4.5)

ENGINE OIL

⚠ CAUTION

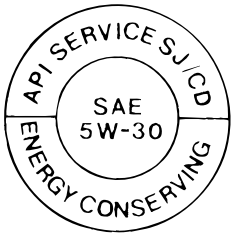
Never use nondetergent or straight mineral oil. Oil Identification Symbol

Use only engine oils displaying the ILSAC certification mark ("Starburst" symbol) on the container.

ILSAC CERTIFICATION MARK ("STARBURST" SYMBOL)

ACX00394AI

API SERVICE SYMBOL



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If these oils are not available, an API classification SJ EC or SJ/CD EC can be used.

NOTES

GROUP 13A

MULTIPORT FUEL INJECTION (MFI) <2.4L>

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GENERAL DESCRIPTION

M1131000100251

The Multiport Fuel Injection System consists of sensors, actuators and the engine control module (ECM) <M/T> or powertrain control module (PCM) <A/T>. The sensors detect the engine condition. The module controls the system based on signals from these sensors. The actuators work under the control of the ECM <M/T> or PCM <A/T>. The ECM <M/T> or PCM <A/T> carries out activities such as fuel injection control, idle air control, and ignition timing control. In addition, the ECM <M/T> or PCM <A/T> is equipped with several diagnostic test modes which simplify troubleshooting when a problem develops.

FUEL INJECTION CONTROL

The ECM <M/T> or PCM <A/T> controls injector drive times and injection timing to supply the optimum air/fuel mixture to the engine according to the continually-changing engine operation conditions. A single injector is mounted at the intake port of each cylinder. The fuel pump supplies pressurized fuel from the fuel tank to the fuel injectors. The fuel pressure regulator controls the fuel pressure. Thus, the regulated fuel is distributed to each injector. Fuel is normally injected for each cylinder every two rotations of the crankshaft. The firing order is 1-3-4-2. Each cylinder has a dedicated fuel injector. This is called "multiport." The ECM <M/T> or PCM <A/T> provides a richer air/fuel mixture by carrying out "open-loop" control when the engine is cold or running under high load conditions. Thus, engine performance is maintained. In addition, when the engine is under normal operating temperature after warming-up, the ECM <M/T> or PCM <A/T> controls the air/fuel mixture according to the heated oxygen sensor signal. This control is a "closed-loop" control. The closed-loop control achieves the theoretical air/fuel mixture ratio where the catalytic converter can obtain the maximum cleaning performance.

IDLE AIR CONTROL

The engine control module controls the amount of air that bypasses the throttle valve according to changes in idling conditions and engine load during idling. Thus, idle speed is kept at an optimum speed. The ECM <M/T> or PCM <A/T> drives the idle air control (IAC) motor according to engine coolant temperature, A/C, and other electrical load. Thus, idle speed is kept at an optimum speed. In addition, when the A/C switch is turned off and on while the engine is idling, the IAC motor adjusts the throttle valve bypass air amount. Thus, idle speed is maintained at constant speed regardless of various engine load conditions.

IGNITION TIMING CONTROL

The ignition power transistor located in the ignition primary circuit turns on and off to control primary current flow to the ignition coil. This maintains ignition timing at an optimum level regardless of various engine operating conditions. The ECM <M/T> or PCM <A/T> determines the ignition timing according to engine speed, intake air volume, engine coolant temperature, and atmospheric pressure.

DIAGNOSTIC TEST MODE

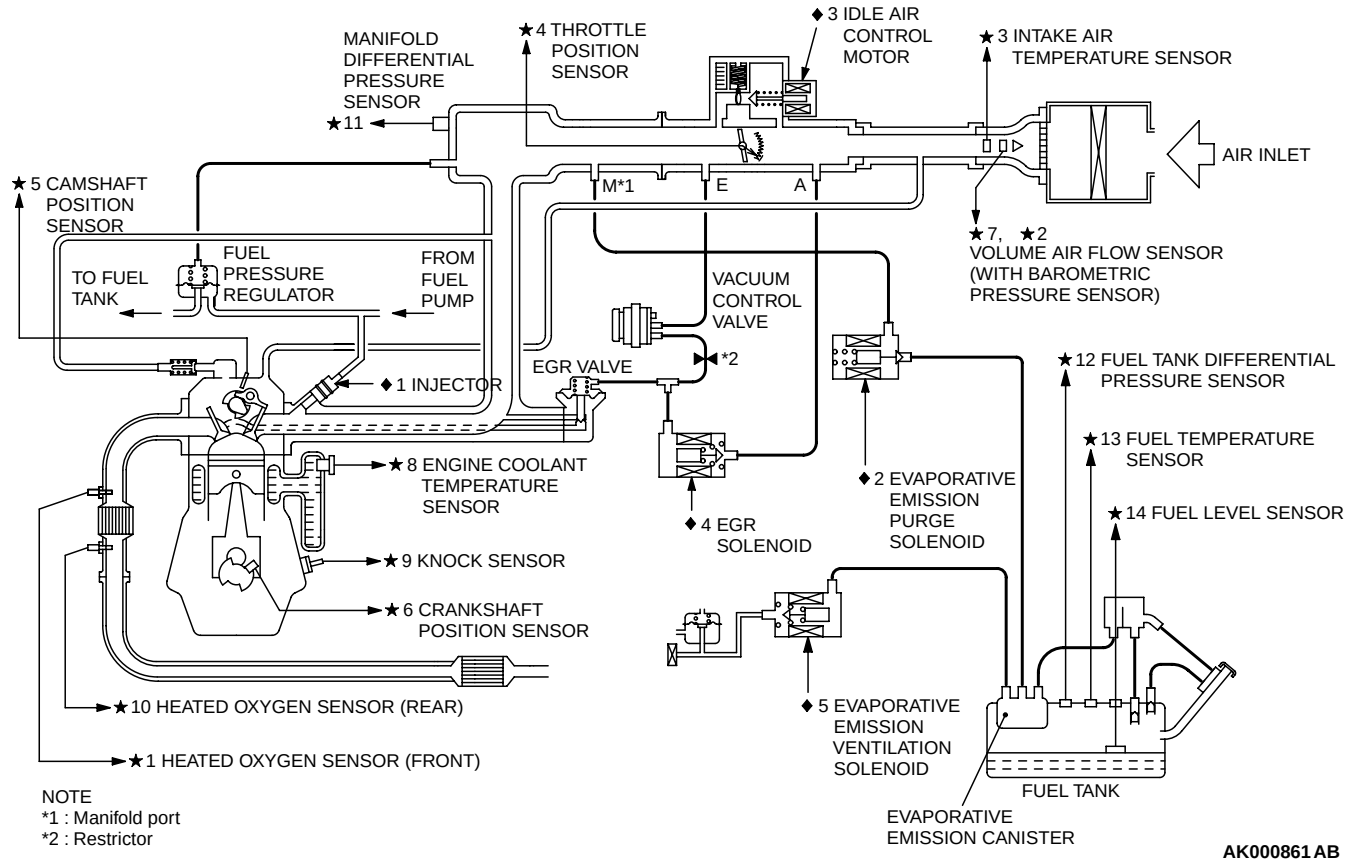
- When a fault is detected in any of the sensors or actuators related to emission control, the SERVICE ENGINE SOON/MALFUNCTION INDICATOR LAMP illuminates to warn the driver.
- When a fault is detected in one of the sensors or actuators, a diagnostic trouble code corresponding to the fault is stored in the ECM <M/T> or PCM <A/T>.
- The RAM data inside the ECM <M/T> or PCM <A/T> that is related to the sensors and actuators can be read with the scan tool. In addition, the actuators can be controlled by the scan tool MUT-II (MB991502) under certain circumstances.

OTHER CONTROL FUNCTIONS

- **Fuel Pump Control**
  Turns on the fuel pump relay so that current is supplied to the fuel pump while the engine is cranking or running.
- **A/C Compressor Clutch Relay Control**
  Turns on and off the air conditioning compressor clutch.
- **Evaporative Emission Purge Control**
  (Refer to GROUP 17, Emission Control System – Evaporative Emission Control System – General Information P.17-97.)
- **EGR Control**
  (Refer to GROUP 17, Emission Control System – Exhaust Gas Recirculation (EGR) System – General Information P.17-103.)

MULTIPORT FUEL INJECTION (MFI) SYSTEM DIAGRAM

SENSE	DECIDE	ACT
★1 HEATED OXYGEN SENSOR (FRONT) ★2 VOLUME AIR FLOW SENSOR ★3 INTAKE AIR TEMPERATURE SENSOR ★4 THROTTLE POSITION SENSOR ★5 CAMSHAFT POSITION SENSOR ★6 CRANKSHAFT POSITION SENSOR ★7 BAROMETRIC PRESSURE SENSOR ★8 ENGINE COOLANT TEMPERATURE SENSOR ★9 KNOCK SENSOR ★10 HEATED OXYGEN SENSOR (REAR) ★11 MANIFOLD DIFFERENTIAL PRESSURE SENSOR ★12 FUEL TANK DIFFERENTIAL PRESSURE SENSOR ★13 FUEL TEMPERATURE SENSOR ★14 FUEL LEVEL SENSOR ● POWER SUPPLY ● A/C PRESSURE SENSOR ● VEHICLE SPEED SENSOR <M/T> ● OUTPUT SHAFT SPEED SENSOR <A/T> ● A/C SWITCH ● PARK/NEUTRAL POSITION SWITCH <A/T> ● POWER STEERING PRESSURE SWITCH ● IGNITION SWITCH - ST	ECM <M/T> PCM <A/T>	◆1 INJECTOR ◆2 EVAPORATIVE EMISSION PURGE SOLENOID ◆3 IDLE AIR CONTROL MOTOR ◆4 EGR SOLENOID ◆5 EVAPORATIVE EMISSION VENTILATION SOLENOID ● FUEL PUMP RELAY 1, 2 ● MULTIPORT FUEL INJECTION (MFI) RELAY ● A/C COMPRESSER CLUTCH RELAY ● SERVICE ENGINE SOON/ MALFUNCTION INDICATOR LAMP ● DIAGNOSTIC OUTPUT ● IGNITION COIL, IGNITION POWER TRANSISTER



NOTE: For the vacuum hose routing, refer to GROUP 17, Vacuum Hoses P.17-89.

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MULTIPORT FUEL INJECTION (MFI) DIAGNOSIS

TROUBLESHOOTING STRATEGY

M1131150000137

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure to have exhausted most of the possible ways to find an MFI fault.

1. Gather as much information as possible about the complaint from the customer.
2. Verify that the condition described by the customer exists.
3. Check the vehicle for any MFI Diagnostic Trouble Code (DTC).
4. If you cannot verify the condition and there are no DTCs, the malfunction is intermittent. For information on how to cope with intermittent malfunctions, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to cope with Intermittent Malfunction P.00-6.
5. If you can verify the condition but there are no DTCs, or the system cannot communicate with the scan tool, refer to the trouble symptom classification table.
6. If there is a DTC, record the number of the code, then erase the code from the memory using the scan tool.

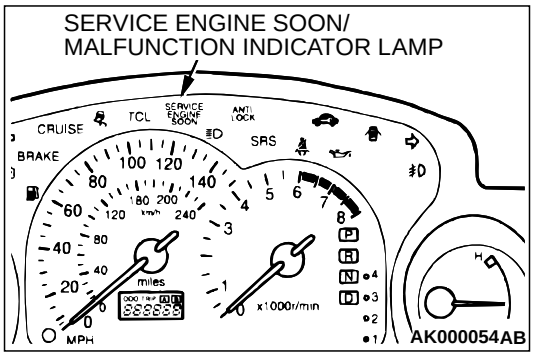
NOTE: If a DTC is erased, its "freeze frame" data will be also erased and the readiness test status will be reset. If necessary, store the "freeze frame" data before erasing the DTC.

7. Reconfirm the malfunction symptom and carry out a test drive with the drive cycle pattern.
8. If DTC is set again, carry out an inspection with the inspection procedure for diagnostic trouble codes of that code.
9. If DTC is not set again, the malfunction is intermittent. For information on how to cope with intermittent malfunctions, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to cope with Intermittent Malfunction P.00-6.
10. After repairs are completed, conduct a road test duplicating the complaint set conditions to confirm the malfunction has been eliminated.

NOTE: If the engine control module (ECM) <M/T> or powertrain control module (PCM) <A/T> is replaced, Immobilizer Encrypted Code Registration should be carried out. Refer to GROUP 54A, Ignition Switch – On-vehicle Service – Immobilizer Encrypted Code Registration P.54A-28.

TROUBLE CODE DIAGNOSIS

M1131150500176



SERVICE ENGINE SOON/MALFUNCTION INDICATOR LAMP

Among the on-board diagnostic items, a Service Engine Soon/Malfunction Indicator Lamp illuminates to notify the driver of an emission control malfunction.

However, when an irregular signal returns to normal and the engine control module (ECM) <M/T> or powertrain control module (PCM) <A/T> judges that it has returned to normal, the Service Engine Soon/Malfunction Indicator Lamp is switched off.

Moreover, when the ignition switch is turned off, the lamp is switched off. Even if the ignition switch is turned on again, the lamp does not illuminate until the malfunction is detected.

Immediately after the ignition switch is turned on, the Service Engine Soon/Malfunction Indicator Lamp is lit for 20 seconds to indicate that the Service Engine Soon/Malfunction Indicator Lamp operates normally.

Items Indicated by the Service Engine Soon/Malfunction Indicator Lamp

DTC NO.	ITEMS
–	Engine control module (ECM) <M/T> or Powertrain control module (PCM) <A/T> malfunction
P0101	Volume air flow circuit range/performance problem
P0102	Volume air flow circuit low input
P0106*	Barometric pressure circuit range/performance problem
P0107	Barometric pressure circuit low input
P0108	Barometric pressure circuit high input
P0111	Intake air temperature circuit range/performance problem
P0112	Intake air temperature circuit low input
P0113	Intake air temperature circuit high input
P0116	Engine coolant temperature circuit range/performance problem
P0117	Engine coolant temperature circuit low input
P0118	Engine coolant temperature circuit high input
P0121	Throttle position sensor circuit range/performance problem
P0122	Throttle position sensor circuit low input
P0123	Throttle position sensor circuit high input
P0125	Insufficient coolant temperature for closed loop fuel control
P0128	Coolant thermostat (Coolant temperature below thermostat regulating temperature)
P0130	Heated oxygen sensor circuit (sensor 1)
P0131	Heated oxygen sensor circuit low voltage (sensor 1)
P0132	Heated oxygen sensor circuit high voltage (sensor 1)
P0133	Heated oxygen sensor circuit slow response (sensor 1)
P0134*	Heated oxygen sensor circuit no activity detected (sensor 1)
P0135	Heated oxygen sensor heater circuit (sensor 1)
P0136	Heated oxygen sensor circuit (sensor 2)
P0137	Heated oxygen sensor circuit low voltage (sensor 2)
P0138	Heated oxygen sensor circuit high voltage (sensor 2)
P0139	Heated oxygen sensor circuit slow response (sensor 2)
P0141	Heated oxygen sensor heater circuit (sensor 2)
P0171	System too lean
P0172	System too rich
P0181	Fuel temperature sensor circuit range/performance
P0182	Fuel temperature sensor circuit low input
P0183	Fuel temperature sensor circuit high input
P0201	Injector circuit-cylinder 1
P0202	Injector circuit-cylinder 2
P0203	Injector circuit-cylinder 3
P0204	Injector circuit-cylinder 4
P0300	Random/multiple cylinder misfire detected

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DTC NO.	ITEMS
P0301	Cylinder 1 misfire detected
P0302	Cylinder 2 misfire detected
P0303	Cylinder 3 misfire detected
P0304	Cylinder 4 misfire detected
P0335	Crankshaft position sensor circuit
P0340	Camshaft position sensor circuit
P0401	Exhaust gas recirculation flow insufficient detected
P0403	Exhaust gas recirculation control circuit
P0421	Warm up catalyst efficiency below threshold
P0441	Evaporative emission control system incorrect purge flow
P0442	Evaporative emission control system leak detected (Small leak)
P0443	Evaporative emission control system purge control valve circuit
P0446	Evaporative emission control system vent control circuit
P0451	Evaporative emission control system pressure sensor range/performance
P0452	Evaporative emission control system pressure sensor low input
P0453	Evaporative emission control system pressure sensor high input
P0455	Evaporative emission control system leak detected (Gross leak)
P0456	Evaporative emission control system leak detected (Very small leak)
P0461	Fuel level sensor circuit range/performance
P0500	Vehicle speed sensor <M/T>
P0506	Idle control system RPM lower than expected
P0507	Idle control system RPM higher than expected
P0513	Immobilizer malfunction
P0551	Power steering pressure sensor circuit range/performance
P0705	Transmission range sensor circuit malfunction (RPNDL input)
P0712	Transmission fluid temperature sensor circuit low input
P0713	Transmission fluid temperature sensor circuit high input
P0715	Input/Turbine speed sensor circuit
P0720	Output speed sensor circuit
P0731	Gear 1 incorrect ratio
P0732	Gear 2 incorrect ratio
P0733	Gear 3 incorrect ratio
P0734	Gear 4 incorrect ratio
P0736	Gear R incorrect ratio
P0741	Torque converter clutch circuit performance or stuck off
P0742	Torque converter clutch circuit stuck on
P0743	Torque converter clutch circuit electrical
P0753	Shift solenoid "A" electrical
P0758	Shift solenoid "B" electrical
P0763	Shift solenoid "C" electrical

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DTC NO.	ITEMS
P0768	Shift solenoid "D" electrical
P1400	Manifold differential pressure sensor circuit malfunction
P1603*	Battery backup circuit malfunction
P1751	A/T control relay malfunction

NOTE: If the Service Engine Soon/Malfunction Indicator Lamp illuminates because of a malfunction of the engine control module (ECM) <M/T> or powertrain control module (PCM) <A/T>, transmission between scan tool MUT-II (MB991502) and the ECM <M/T> or PCM <A/T> is impossible. In this case, the diagnostic trouble code (DTC) cannot be read.

NOTE: After the ECM <M/T> or PCM <A/T> has detected a malfunction, the Service Engine Soon/Malfunction Indicator Lamp illuminates when the engine is next turned on and the same malfunction is re-detected. However, for items marked with a "" in the DTC NO column, the Service Engine Soon/Malfunction Indicator Lamp illuminates on the first detection of the malfunction.*

NOTE: After the Service Engine Soon/Malfunction Indicator Lamp illuminates, it will be switched off under the following conditions.

- *When the ECM <M/T> or PCM <A/T> monitored the power train malfunction three times* it met set condition requirements, it detected no malfunction. *: In this case, "one time" indicates from engine start to stop.*
- *For misfiring or a fuel trim malfunction, when driving conditions (engine speed, engine coolant temperature, etc.) are similar to those when the malfunction was first recorded.*

NOTE: Sensor 1 indicates the sensor mounted at a position closest to the engine, and sensor 2 indicates the sensor mounted at the position second closest to the engine.

HOW TO READ AND ERASE DIAGNOSTIC TROUBLE CODE

Required Special Tool:
- MB991502: Scan Tool (MUT-II)

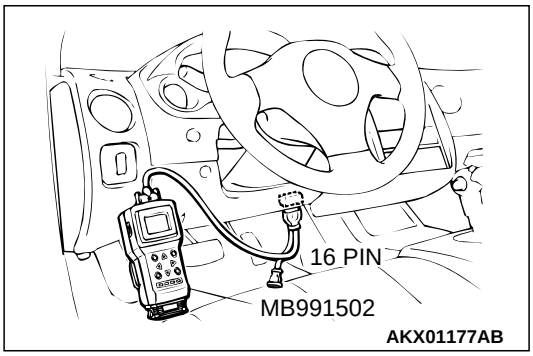
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

NOTE: If Battery positive voltage is low, diagnostic trouble codes may not be output. Be sure to check the battery and charging system before continuing.

NOTE: If battery cable is disconnected or if the engine control module (ECM) connector <M/T> or powertrain control module (PCM) connector <A/T> is disconnected, the diagnostic trouble codes will be erased. Do not disconnect the battery cable or ECM <M/T> or PCM <A/T> connector until the diagnostic trouble codes have been recorded.

NOTE: If a DTC is erased, its "freeze frame" data will be also erased and the readiness test status will be reset. If necessary, store the "freeze frame" data before erasing the DTC.



1. Connect scan tool MB991502 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Read the diagnostic trouble codes for MFI.
4. Refer to the DIAGNOSTIC TROUBLE CODE CHART P.13A-22.
5. Turn the ignition switch to the "LOCK" (OFF) position and then back to "ON" again.
6. Erase the diagnostic trouble code(s) using MUT-II screen prompts.
7. Confirm that the diagnostic trouble code output is normal.
8. Turn the ignition switch to the "LOCK" (OFF) position.
9. Disconnect scan tool MB991502 from the data link connector.

PROVISIONAL DTCs [MUT-II OBD-II Test Mode – Results (Mode 5)]

The MUT-II will display the Provisional DTCs reported by engine control module (ECM) <M/T> or powertrain control module (PCM) <A/T> if the ECM <M/T> or PCM <A/T> detects some malfunction for "Misfire", "Fuel System" and "Comprehensive" monitoring during a SINGLE Driving Cycle. The intended use of this data is to assist the technician after a vehicle repair, and after clearing diagnostic information, by reporting test result after a SINGLE Driving Cycle. Note that the test results reported by this mode do not necessarily indicate a faulty component/system. If test results indicate a failure after ADDITIONAL (consecutive) driving, then the MIL will be illuminated and a DTC will set.

MODE 6 REFERENCE TABLE

The engine control module (ECM) <M/T> or powertrain control module (PCM) <A/T> monitors the condition of emission control system.

By selecting MODE 6 using scan tool, Test Result and Limit Value (minimum) *1 or (maximum) *2 about the main items of emission control system which ECM <M/T> or PCM <A/T> monitors can be confirmed. The value at the last monitoring is output by ECM <M/T> or PCM <A/T> as a test result.

TEST ID	MONITORING ITEM	SIMPLE TECHNICAL DESCRIPTION	INDICATION OF SCAN TOOL	CONVERSION COEFFICIENT IN USING GENERAL SCAN TOOL
01	Catalyst monitor	ECM <M/T> or PCM <A/T> monitors the deterioration of catalyst by the output frequency ratio between heated oxygen sensor (front) and heated oxygen sensor (rear).	Catalyst Frequency Ratio Test Result and Limit Value (max.)	× 0.0039
03	EGR monitor	ECM <M/T> or PCM <A/T> monitors the operation of EGR system by the pressure difference of intake manifold between before and after introduction of EGR using the manifold differential pressure sensor.	EGR Monitor Pressure Value Test Result and Limit Value (min.) kPa	× 0.43 kPa
06	Evaporation leak monitor (Small leak)	ECM <M/T> or PCM <A/T> monitors the leak of fuel evaporation gas by the reduction of vacuum in tank after appointed time using the fuel tank differential pressure sensor after making the fuel tank and the fuel line vacuum.	EVAP Leak Mon. 1 mm Pressure Value Test Result and Limit Value (max.) kPa	× 0.032 kPa
07	Evaporation leak monitor (Gross leak)	ECM <M/T> or PCM <A/T> monitors the leak of fuel evaporation gas by the reduction of vacuum in tank after appointed time using the fuel tank differential pressure sensor after making the fuel tank and the fuel line vacuum.	EVAP Leak Mon. Gross Pressure Value Test Result and Limit Value (min.) kPa	× 0.032 kPa

TEST ID	MONITORING ITEM	SIMPLE TECHNICAL DESCRIPTION	INDICATION OF SCAN TOOL	CONVERSION COEFFICIENT IN USING GENERAL SCAN TOOL
08	Evaporation leak monitor (Very small leak)	ECM <M/T> or PCM <A/T> monitors the leak of fuel evaporation gas by the reduction of vacuum in tank after appointed time using the fuel tank differential pressure sensor after making the fuel tank and the fuel line vacuum.	EVAP Leak Mon. 0.5 mm Pressure Value Test Result and Limit Value (max.) kPa	× 0.032 kPa
09	Heated oxygen sensor (front) monitor (Rich/ Lean switching)	ECM <M/T> or PCM <A/T> monitors the deteriorated condition of the heated oxygen sensor (front) by checking the lean/rich switching frequency of the heated oxygen sensor (front).	HO2S B1 SENSOR1 Rich/Lean switching Count Test Result and Limit Value (min.)	× 1count
0B	Heated oxygen sensor (rear) monitor (Voltage)	ECM <M/T> or PCM <A/T> checks the output voltage of the heated oxygen sensor (rear) in order to monitor whether the heated oxygen sensor (rear) output is stuck.	HO2S B1 SENSOR2 Change in Volt Test Result and Limit Value (min.)	× 19.5 mV

NOTE:

**1: The test fails if test value is less than this value.*

**2: The test fails if test value is greater than this value.*

DIAGNOSTIC BY DIAGNOSTIC TEST MODE II (INCREASED SENSITIVITY)

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

NOTE: When mode II is selected with MUT-II, the Service Engine Soon/Malfunction Indicator Lamp will light when the engine control module (ECM) <M/T> or powertrain control module (PCM) <A/T> first detects the trouble (Note that this is only for emission-related trouble). At the same time, the relevant diagnostic trouble codes will be registered. In respect to the comprehensive component electrical faults (opens/shorts), the time for the diagnostic trouble code to be registered after the fault occurrence is four seconds → one second. Therefore, the confirmation of the trouble symptom and the confirmation after completing repairs can be reduced. To return to the normal mode I after mode II has been selected once, the ignition switch must be turned "OFF" once or mode I must be reselected with MUT-II. The diagnostic trouble code, readiness test status and freeze frame data, etc., will be erased when mode I is returned to, so record these before returning to mode I.

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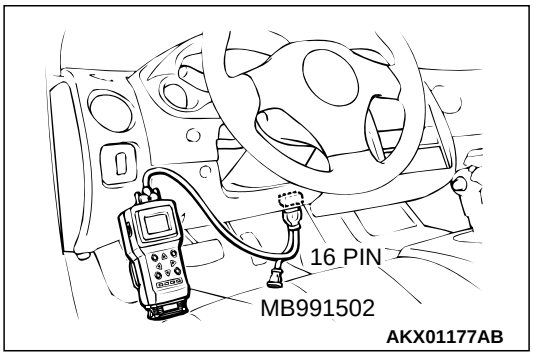
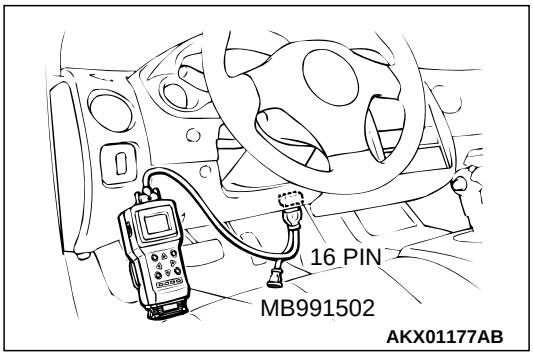


1. Connect scan tool MB991502 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Change the diagnostic test mode of the ECM <M/T> or PCM <A/T> to DIAGNOSTIC TEST MODE II (INCREASED SENSITIVITY).
4. Road test the vehicle.
5. Read the diagnostic trouble code and repair the malfunctioning part.
6. Turn the ignition switch to the "LOCK" (OFF) position.
7. Disconnect scan tool MB991502 from the data link connector.

INSPECTION USING SCAN TOOL MB991502, DATA LIST AND ACTUATOR TESTING

Required Special Tool:
- MB991502: Scan Tool (MUT-II)

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.



1. Connect scan tool MB991502 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Carry out inspection by means of the data list and the actuator test function. If there is an abnormality, check and repair the chassis harnesses and components. Refer to Data List Reference Table P.13A-544.
   Refer to Actuator Test Reference Table P.13A-553.
4. Re-check using scan tool MB991502 and check to be sure that the abnormal input and output have returned to normal because of the repairs.
5. Erase the diagnostic trouble code(s).
6. Turn the ignition switch to the "LOCK" (OFF) position.
7. Disconnect scan tool MB991502 from the data link connector.
8. Start the engine again and do a test drive to confirm that the problem is eliminated.

ON-BOARD DIAGNOSTICS

The engine control module (ECM) <M/T> or powertrain control module (PCM) <A/T> monitors the input/output signals (some signals all the time and others under specified conditions) of the ECM <M/T> or PCM <A/T>. When a malfunction continues for a specified time or longer after the irregular signal is initially monitored, the ECM <M/T> or PCM <A/T> judges that a malfunction has occurred. After the ECM <M/T> or PCM <A/T> first detects a malfunction, a diagnostic trouble code is recorded when the engine is restarted and the same malfunction is re-detected. However, for items marked with a "*," a diagnostic trouble code is recorded on the first detection of the malfunction. There are 83 diagnostic items. The diagnostic results can be read out with a scan tool. Since memorization of the diagnostic trouble codes is backed up directly by the battery, the diagnostic results are memorized even if the ignition key is turned off. The diagnostic trouble codes will, however, be erased when the battery terminal or the ECM <M/T> or PCM <A/T> connector is disconnected. In addition, the diagnostic trouble code can also be erased by turning the ignition switch to "ON" position and sending the diagnostic trouble code erase signal from scan tool MUT-II (MB991502) to the ECM <M/T> or PCM <A/T>.

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NOTE: If the sensor connector is disconnected with the ignition switch turned on, the diagnostic trouble code is memorized. In this case, send the diagnostic trouble code erase signal to the ECM <M/T> or PCM <A/T> in order to erase the diagnostic memory. The 83 diagnostic items are all indicated sequentially from the smallest code number. The ECM <M/T> or PCM <A/T> records the engine operating condition when the diagnostic trouble code is set. This data is called "Freeze-frame" date. This data can be read by using the scan tool, and can then be used in simulation tests for troubleshooting. Data items are as follows:

NOTE: If the ECM <M/T> or PCM <A/T> detects multiple malfunctions, the ECM <M/T> or PCM <A/T> stores the data for only the first item that was detected.

However, if the ECM <M/T> or PCM <A/T> detects a misfire or a fuel system malfunction, the ECM <M/T> or PCM <A/T> stores the data by giving priority to the misfire or fuel system malfunction, regardless of the order in which the malfunction was detected.

NOTE: As for diagnostic trouble code P1603, "freeze frame" data is not memorized.

MUT-II SCAN TOOL DISPLAY	ITEM NO.	DATA ITEM	UNIT or STATE
ECT SENSOR	21	Engine coolant temperature sensor	°C or °F
ENGINE LOAD	87	Calculation load value	%
ENGINE SPEED	22	Crankshaft position sensor	r/min
IAT SENSOR	13	Intake air temperature sensor	°C or °F
IG. TIMING ADV	44	Ignition coils and ignition power transistor	deg
LONG TRIM B1	81	Long-term fuel compensation	%
SHORT TRIM B1	82	Short-term fuel compensation	%
SYS. STATUS	88	Fuel control condition	• Open loop • Closed loop • Open loop-drive condition • Open loop-DTC set • Closed loop-O_2 (rear) failed
TP SENSOR	8A	Throttle position sensor	%
VAF SENSOR	12	Volume air flow sensor (mass air flow rate)	gm/s
VSS	24	Vehicle speed sensor	km/h or mph

OBD- II DRIVE CYCLE

All kinds of diagnostic trouble codes (DTCs) can be monitored by carrying out a short drive according to the following six drive cycle pattern. In other words, doing such a drive regenerates any kind of trouble which involves illuminating the Service Engine Soon/Malfunction Indicator Lamp and verifies the repair procedure has eliminated the trouble (the Service Engine Soon/Malfunction Indicator Lamp is no longer illuminated).

⚠ CAUTION

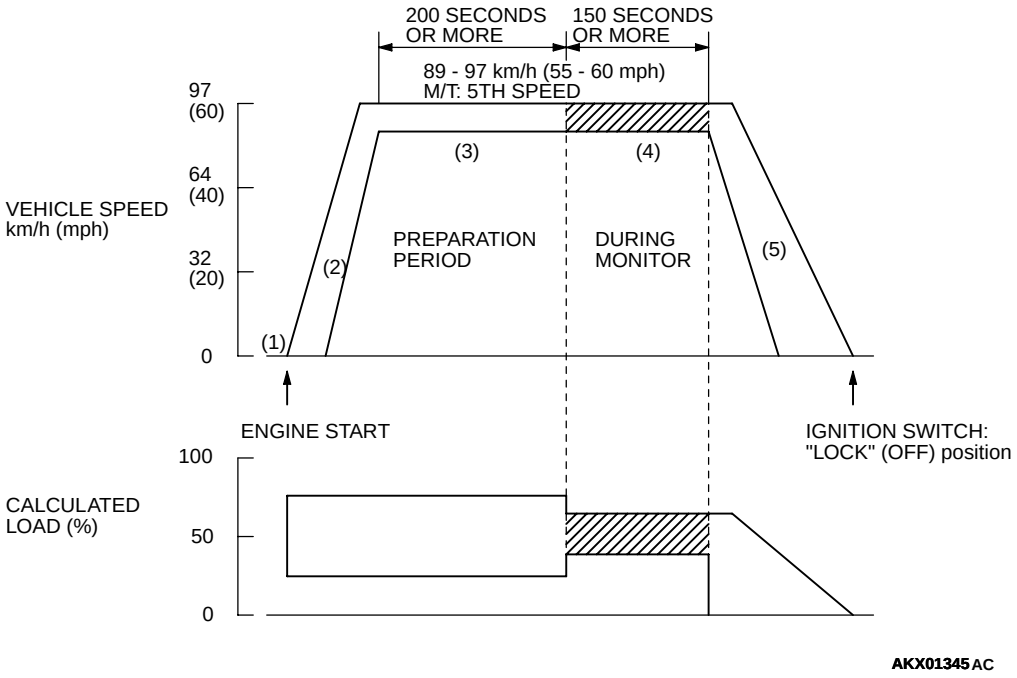
Two technicians should always be in the vehicle when carrying out a test drive.

NOTE: Check that the diagnosis trouble code (DTC) is not output before traveling in the drive cycle pattern. Erase the DTC if it has been output.

DRIVE CYCLE PATTERN LIST

PROCEDURE	MONITOR ITEM		DIAGNOSTIC TROUBLE CODE (DTC)
1	Evaporative emission control system leak monitor		P0441, P0442, P0451, P0452, P0453, P0455, P0456
2	Fuel trim monitor		P0171,P0172
3	Catalytic converter monitor		P0421
4	Heated oxygen sensor monitor		P0133, P0139
5	Exhaust gas recirculation (EGR) system monitor		P0401
6	Other monitor	Main components	P0134, P0300, P0301, P0302, P0303, P0304, P0506, P0507, P1400
		Sensors and switches	P0101, P0102, P0106, P0107, P0108, P0111, P0112, P0113, P0116, P0117, P0118, P0121, P0122, P0123, P0125, P0181, P0182, P0183, P0335, P0340, P0461
		Wire breakage and short circuit	P0130, P0131, P0132, P0135, P0136, P0137, P0138, P0141, P0201, P0202, P0203, P0204, P0403, P0443, P0446

PROCEDURE 1

EVAPORATIVE EMISSION CONTROL SYSTEM LEAK MONITOR	
DTC	P0441, P0442, P0451, P0452, P0453, P0455, P0456
Drive cycle pattern	This monitor [from start to ignition switch to the "LOCK" (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 8 minutes. You must complete this drive twice. *NOTE: . Vehicle speed and throttle opening angle should be within the shaded range.*  AKX01345 AC
Inspection conditions	• Engine coolant temperature: 45°C (113°F) or less (The engine is stopped before the test drive is started) • Atmospheric temperature: 5 – 45°C (41 – 113°F) • Condition of A/T: Selector lever D range
Test procedure	1. Engine: start 2. Accelerate until the vehicle speed is 89 – 97 km/h (55 – 60 mph). 3. Travel for 200 seconds or more while keeping the vehicle speed at 89 – 97 km/h (55 – 60 mph). (M/T: 5th speed) 4. While keeping the accelerator pedal opening degree constant, keep the vehicle speed at 89 – 97 km/h (55 – 60 mph) and travel for 150 seconds or more. (During monitor) 5. Return the vehicle to the shop, then turn the ignition switch to "LOCK" (OFF) position. 6. Confirm that the diagnostic trouble code (DTC) is not output. 7. If DTC P0441 is output, refer to DTC P0441 – Evaporative Emission Control System Incorrect Purge Flow P.13A-269. If DTC P0442 is output, refer to DTC P0442 – Evaporative Emission Control System Leak Detected (Small Leak) P.13A-271. If DTC P0451 is output, refer to DTC P0451 – Evaporative Emission Control System Pressure Sensor Range/performance P.13A-299. If DTC P0452 is output, refer to DTC P0452 – Evaporative Emission Control System Pressure Sensor Low Input P.13A-316. If DTC P0453 is output, refer to DTC P0453 – Evaporative Emission Control System Pressure Sensor High Input P.13A-332. If DTC P0455 is output, refer to DTC P0455 – Evaporative Emission Control System Leak Detected (Gross Leak) P.13A-348. If DTC P0456 is output, refer to DTC P0456 – Evaporative Emission Control System Leak Detected (Very Small Leak) P.13A-364.

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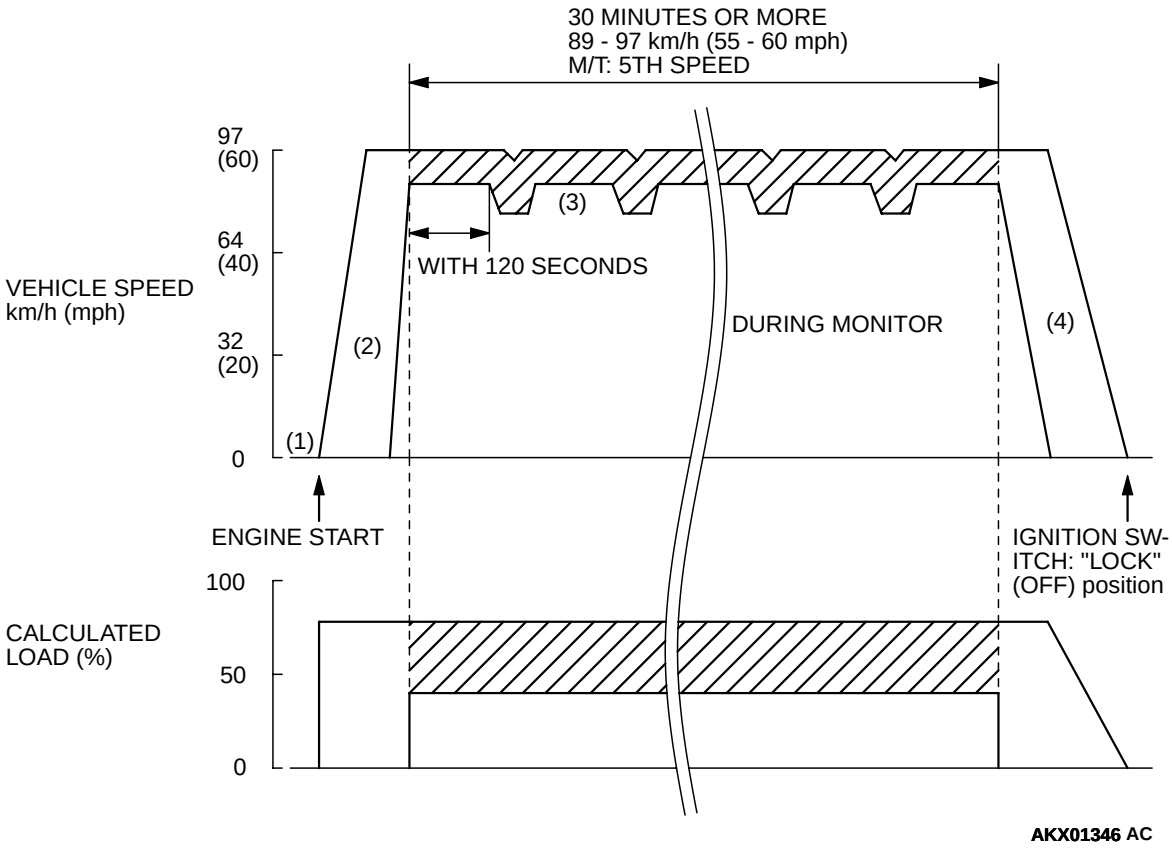
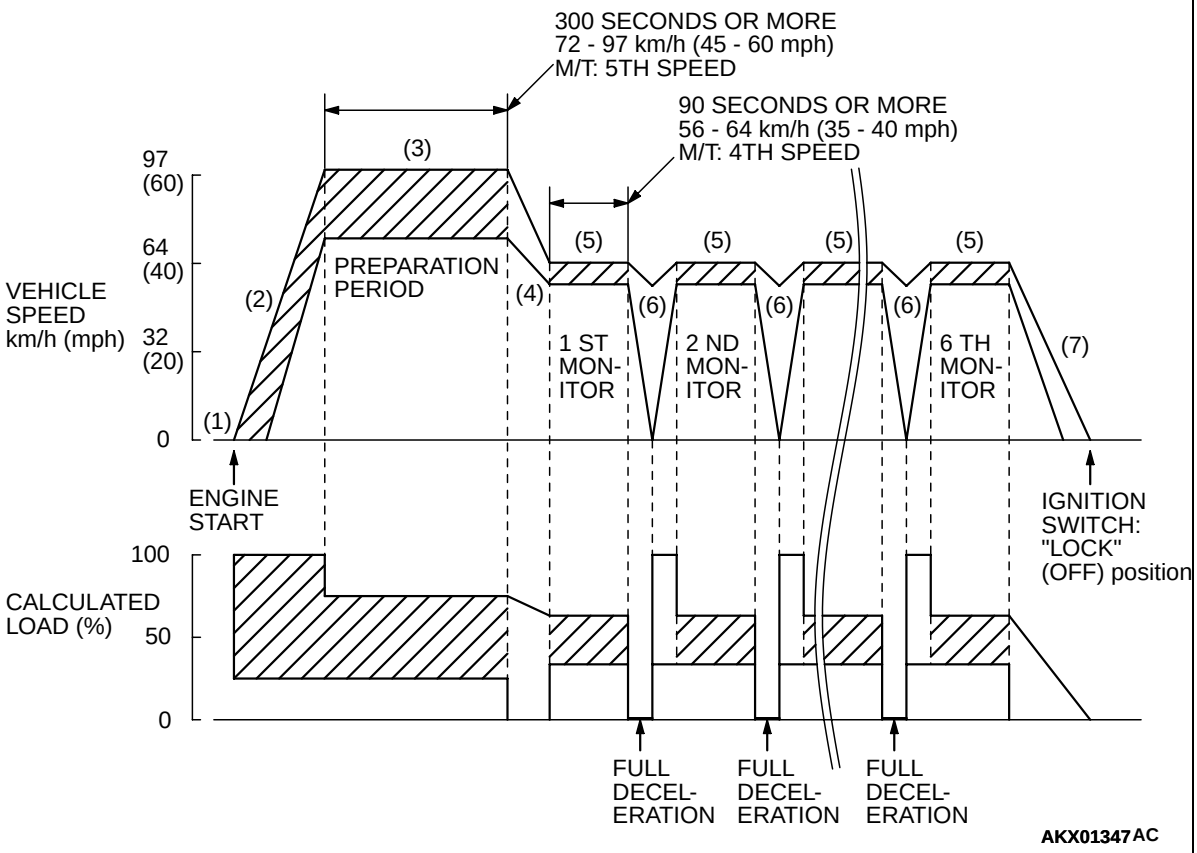
PROCEDURE 2

FUEL TRIM MONITOR	
DTC	P0171, P0172
Drive cycle pattern	This monitor [from start to ignition switch to the "LOCK" (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 35 minutes. You must complete this drive twice. *NOTE: Vehicle speed and throttle opening angle should be within the shaded range.* 
Inspection conditions	• Engine coolant temperature: 80 – 97°C (176 – 207°F) • Atmospheric temperature: –10 – 60°C (14 – 140°F) • Condition of A/T: Selector lever D range
Test procedure	1. Engine: start 2. Accelerate until the vehicle speed is 89 – 97 km/h (55 – 60 mph). 3. Travel for 30 minutes or more while keeping the vehicle speed at 89 – 97 km/h (55 – 60 mph). (M/T: 5th speed) Carry out one gradual deceleration/acceleration returning to 89 – 97 km/h (55 – 60 mph) within 120 seconds. (During monitor) 4. Return the vehicle to the shop, then turn the ignition switch to "LOCK" (OFF) position. 5. Confirm that the diagnostic trouble code (DTC) is not output. If DTC P0171 is output, refer to DTC P0171 – System too lean P.13A-188. If DTC P0172 is output, refer to DTC P0172 – System too rich P.13A-194.

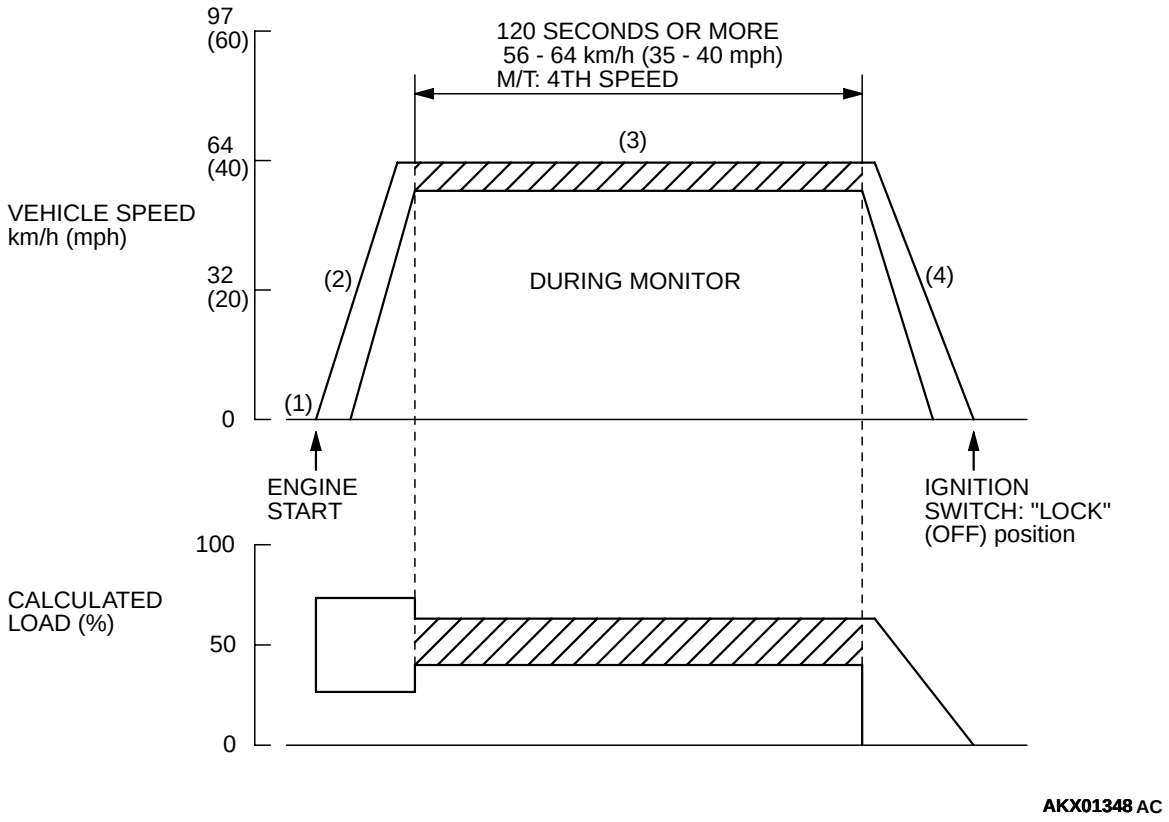
TSB Revision

PROCEDURE 3

CATALYTIC CONVERTER MONITOR	
DTC	P0421
Drive cycle pattern	This monitor [from start to ignition switch to the "LOCK" (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 20 minutes. You must complete this drive twice. *NOTE: Vehicle speed and throttle opening angle should be within the shaded range.* 
Inspection conditions	• Atmospheric temperature: –10°C (14°F) or more • A/C switch: OFF • Condition of A/T: Selector lever D range
Test procedure	1. Engine: start 2. Accelerate until the vehicle speed is 72 km/h (45 mph). 3. Travel for 300 seconds or more while keeping the vehicle speed at 72 – 97 km/h (45 – 60 mph). (M/T: 5th speed) 4. Decelerate until the vehicle speed is within 56 – 64 km/h (35 – 40 mph). 5. While keeping the accelerator pedal opening degree constant (M/T: 4th speed), keep the vehicle speed at 56 – 64 km/h (35 – 40 mph) and travel for 90 seconds or more. (During monitor) 6. Fully close the throttle and decelerate, and keep the deceleration state for 10 seconds. Then, quickly accelerate until the vehicle speed reaches 56 – 64 km/h (35 – 40 mph). Then, repeat steps 5 and 6, and complete six monitor sessions. 7. Return the vehicle to the shop, then turn the ignition switch to "LOCK" (OFF) position. 8. Confirm that the diagnostic trouble code (DTC) is not output. 9. If DTC P0421 is output, refer to DTC P0421 – Warm Up Catalyst Efficiency Below Threshold P.13A-266.

TSB Revision

PROCEDURE 4

HEATED OXYGEN SENSOR MONITOR	
DTC	P0133, P0139
Drive cycle pattern	This monitor [from start to ignition switch to the "LOCK" (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 5 minutes. You must complete this drive twice. *NOTE: Vehicle speed and throttle opening angle should be within the shaded range.*  AKX01348 AC
Inspection conditions	• Engine coolant temperature: 80°C (176°F) or more • Atmospheric temperature: –10°C (14°F) or more • Condition of A/T: Selector lever D range
Test procedure	1. Engine: start 2. Accelerate until the vehicle speed is 56 – 64 km/h (35 – 40 mph). 3. While keeping the accelerator pedal opening degree constant (M/T: 4th speed), keep the vehicle speed at 56 – 64 km/h (35 – 40 mph) and travel for 120 seconds or more. (During monitor) 4. Return the vehicle to the shop, then turn the ignition switch to "LOCK" (OFF) position. 5. Confirm that the diagnostic trouble code (DTC) is not output. 6. If DTC P0133 is output, refer to DTC P0133 – Heated oxygen Sensor Circuit Slow Response (Sensor 1) P.13A-143. If DTC P0139 is output, refer to DTC P0139 – Heated oxygen Sensor Circuit Slow Response (Sensor 2) P.13A-178.

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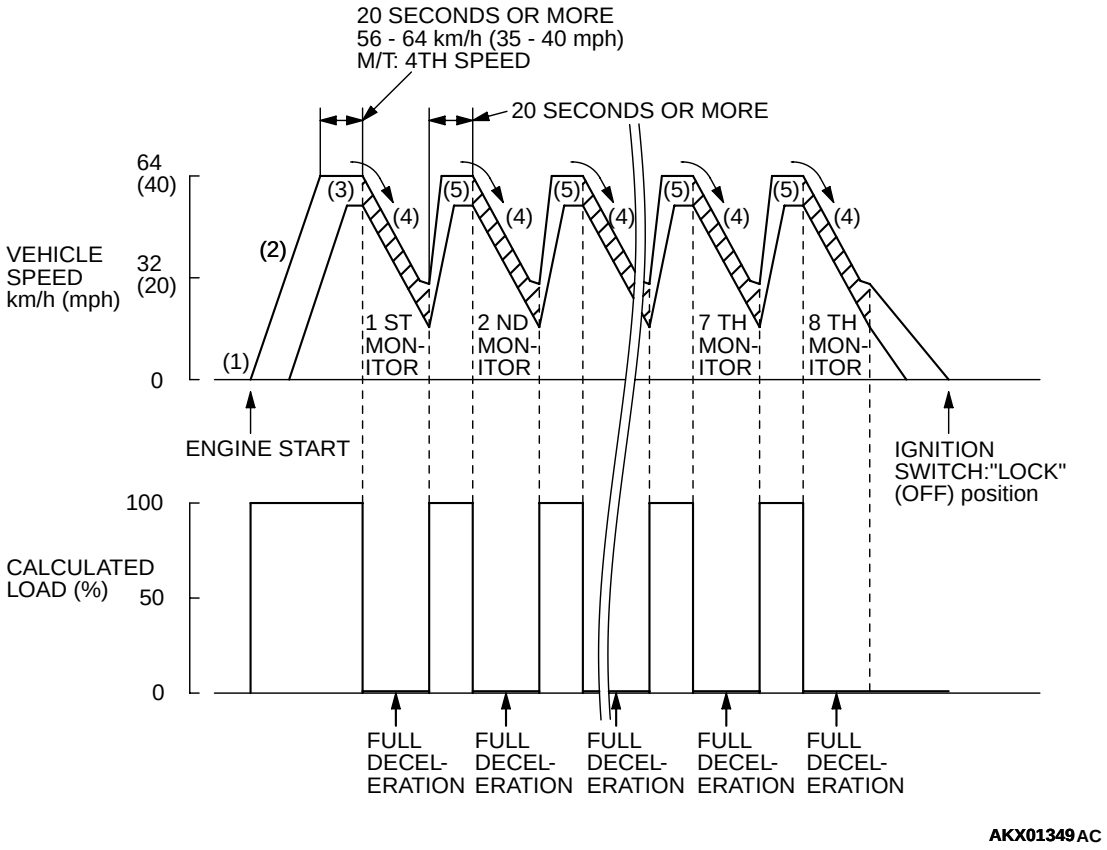
PROCEDURE 5

EXHAUST GAS RECIRCULATION (EGR) SYSTEM MONITOR	
DTC	P0401
Drive cycle pattern	This monitor [from start to ignition switch to the "LOCK" (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 10 minutes. You must complete this drive twice. *NOTE: Vehicle speed and throttle opening angle should be within the shaded range.* 
Inspection conditions	• Engine coolant temperature: 80°C (176°F) or more • Atmospheric temperature: 5°C (41°F) or more • A/C switch: OFF • Condition of A/T: Selector lever D range
Test procedure	1. Engine: start 2. Accelerate until the vehicle speed is 56 – 64 km/h (35 – 40 mph). 3. Travel for 20 seconds or more while keeping the vehicle speed at 56 – 64 km/h (35 – 40 mph). (M/T: 4th speed) 4. Fully close the throttle from an engine speed of 2,000 – 3,000 r/min, and while keeping the clutch engaged, decelerate to approximately 900 r/min without applying the brakes. Do not steer the handle or turn the light ON/OFF during this time. (During monitor) 5. Accelerate until the vehicle speed reaches 56 – 64 km/h (35 – 40 mph), and travel for 20 seconds or more (M/T: 4th speed). Then, repeat steps 4 and 5 and complete 8 monitor sessions. 6. Return the vehicle to the shop, then turn the ignition switch to "LOCK" (OFF) position. 7. Confirm that the diagnostic trouble code (DTC) is not output. 8. If DTC P0401 is output, refer to DTC P0401 – Exhaust Gas Recirculation Flow Insufficient detected P.13A-257.

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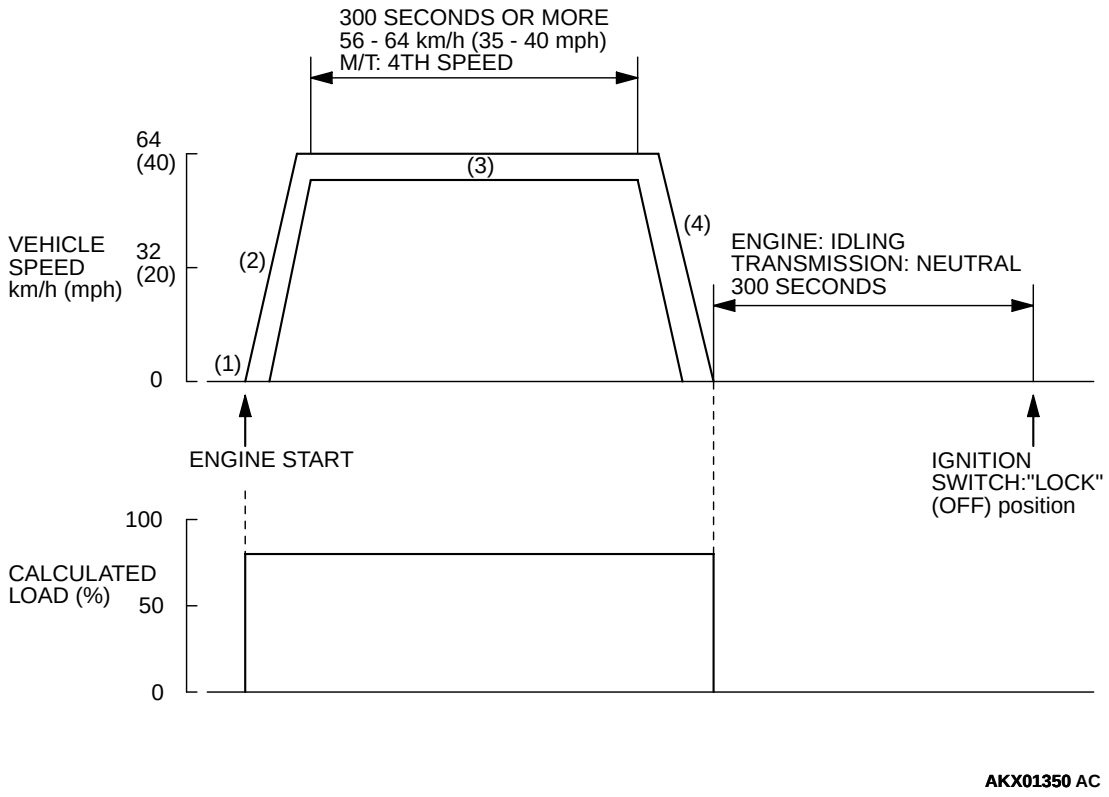
PROCEDURE 6

OTHER MONITOR (Main components, sensors and switches, wire breakage and short circuit)	
DTC	• Main components: P0134, P0300, P0301, P0302, P0303, P0304, P0506, P0507, P1400 • Sensors and switches: P0101, P0102, P0106, P0107, P0108, P0111, P0112, P0113, P0116, P0117, P0118, P0121, P0122, P0123, P0125, P0181, P0182, P0183, P0335, P0340, P0461 • Wire breakage and short circuit: P0130, P0131, P0132, P0135, P0136, P0137, P0138, P0141, P0201, P0202, P0203, P0204, P0403, P0443, P0446
Drive cycle pattern	This monitor [from start to ignition switch to the "LOCK" (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 10 minutes. You must complete this drive twice. *NOTE: . Drive according to the graph below.* 
Inspection conditions	• Engine coolant temperature: 80°C (176°F) or more • Atmospheric temperature: 5°C (41°F) or more • Condition of A/T: Selector lever D range
Test procedure	1. Engine: start 2. Accelerate until the vehicle speed is 56 – 64 km/h (35 – 40 mph), and travel for 300 seconds or more. (M/T: 4th speed) 3. Return the vehicle to the shop. 4. After stopping the vehicle, continue idling for 300 seconds, and then turn the ignition switch to the "LOCK" (OFF) position. Moreover, the vehicle should be set to the following conditions for idling. • A/C switch: OFF • Lights and all accessories: OFF • Transmission: Neutral • Steering wheel: Straightforward position 5. Confirm that the diagnostic trouble code (DTC) is not output. 6. If a DTC is displayed, refer to Diagnostic Trouble Code Chart P.13A-22.

TSB Revision

READINESS TEST STATUS

PURPOSE

The Readiness function also referred as I/M Readiness or I/M Flags indicate if a full diagnostic check has been "Completed" (is "Ready") for each non-continuous monitor. Enhanced I/M State Emission Programs will use the Readiness status (Codes) to see if the vehicle is ready for OBD-II testing. "Incomplete" (Not Ready) codes will be one of the triggers for I/M failure.

OVERVIEW

The engine control module (ECM) <M/T> or powertrain control module (PCM) <A/T> monitors the following main diagnosis items and records whether the evaluation was completed or is incomplete. The Readiness codes were established for the I/M programs, thereby confirming that the vehicle was not tampered with by erasing the diagnostic trouble code(s) (DTC's) before I/M testing. The Readiness and DTC codes can be reset by disconnecting the battery or by erasing the codes with a scan tool. For this reason all Readiness codes must read "Complete" before I/M testing.

When the monitors run and complete, the MUT-II will record the Readiness Code as "Complete" (General Scan Tools record as "Ready"). If the monitor did not run completely, the system then reads as "Incomplete" (General Scan Tools record as "Not Ready"). When the vehicle is operating normally and the OBD-II Drive Cycle is carried out, Readiness Code will set as "Complete" on the first drive cycle. If during the first drive cycle a fault is detected then, a second drive is required before the Readiness Code will "Complete". If the fault is still there, then a DTC will set.

- Catalyst: P0421
- Evaporative system: P0442, P0455, P0456
- Heated oxygen sensor: P0133
- Heated oxygen sensor heater: P0135, P0141
- EGR system: P0401

After the Readiness is "Complete", the technician is assured that any DTC's associated with that monitor will be displayed if the system has a problem. That is why some State's I/M programs require the Readiness Code as "Complete" before they check for DTC's.

NOTE: After a repair is mode for a DTC the technician should drive the OBD-II drive cycle checking that the MUT-II records all Readiness as "Complete".

FAIL-SAFE FUNCTION REFERENCE TABLE

M1131153000040

When the main sensor malfunctions are detected by the diagnostic test mode, the vehicle is controlled by means of the following defaults.

MALFUNCTION ITEM	CONTROL CONTENTS DURING MALFUNCTION
Volume air flow sensor	• Uses the throttle position sensor signal and engine speed signal (crankshaft position sensor signal) for basic injector drive time and basic ignition timing from the pre-set mapping. • Fixes the IAC motor in the appointed position so idle air control is not performed.
Intake air temperature sensor	Controls as if the intake air temperature is 25°C (77°F).
Throttle position sensor	No increase in fuel injection amount during acceleration due to the unreliable throttle position sensor signal.
Engine coolant temperature sensor	Controls as if the engine coolant temperature is 80°C (176°F). (This control will be continued until the ignition switch is turned to the "LOCK" (OFF) position even though the sensor signal returns to normal.)
Camshaft position sensor	Injects fuel into the cylinders in the order 1-3-4-2 with irregular timing. (After the ignition switch is turned to the "ON," the No. 1 cylinder top dead center is not detected at all.)
Barometric pressure sensor	Controls as if the barometric pressure is 101 kPa (30 in Hg).
Knock sensor	Switches the ignition timing from ignition timing for high octane to ignition timing for standard octane fuel.

MALFUNCTION ITEM	CONTROL CONTENTS DURING MALFUNCTION
Heated oxygen sensor <front>	Air/fuel ratio closed loop control is not performed.
Heated oxygen sensor <rear>	Performs the closed loop control of the air/fuel ratio by using only the signal of the heated oxygen sensor (front) installed on the front side of the catalytic converter.
Generator FR terminal	No generator output suppression control is performed for the electrical load (to be operated as an ordinary generator).
Misfire detection	The ECM <M/T> or PCM <A/T> stops supplying fuel to the cylinder with the highest misfiring rate if a misfiring that could damage the catalytic converter is detected.

DIAGNOSTIC TROUBLE CODE CHART

M1131151000174

DTC CODE	DIAGNOSTIC ITEMS	REFERENCE PAGE
P0101	Volume air flow circuit range/performance problem	P.13A-28
P0102	Volume air flow circuit low input	P.13A-34
P0106*	Barometric pressure circuit range/performance problem	P.13A-42
P0107	Barometric pressure circuit low input	P.13A-47
P0108	Barometric pressure circuit high input	P.13A-58
P0111	Intake air temperature circuit range/performance problem	P.13A-65
P0112	Intake air temperature circuit low input	P.13A-70
P0113	Intake air temperature circuit high input	P.13A-74
P0116	Engine coolant temperature circuit range/performance problem	P.13A-80
P0117	Engine coolant temperature circuit low input	P.13A-88
P0118	Engine coolant temperature circuit high input	P.13A-92
P0121	Throttle position sensor circuit range/performance problem	P.13A-98
P0122	Throttle position sensor circuit low input	P.13A-106
P0123	Throttle position sensor circuit high input	P.13A-112
P0125	Insufficient coolant temperature for closed loop fuel control	P.13A-117
P0128	Coolant thermostat (coolant temperature below thermostat regulating temperature)	P.13A-125
P0130	Heated oxygen sensor circuit (sensor 1)	P.13A-126
P0131	Heated oxygen sensor circuit low voltage (sensor 1)	P.13A-136
P0132	Heated oxygen sensor circuit high voltage (sensor 1)	P.13A-140
P0133	Heated oxygen sensor circuit slow response (sensor 1)	P.13A-143
P0134*	Heated oxygen sensor circuit no activity detected (sensor 1)	P.13A-146
P0135	Heated oxygen sensor heater circuit (sensor 1)	P.13A-152
P0136	Heated oxygen sensor circuit (sensor 2)	P.13A-160
P0137	Heated oxygen sensor circuit low voltage (sensor 2)	P.13A-170
P0138	Heated oxygen sensor circuit high voltage (sensor 2)	P.13A-175

DTC CODE	DIAGNOSTIC ITEMS	REFERENCE PAGE
P0139	Heated oxygen sensor circuit slow response (sensor 2)	P.13A-178
P0141	Heated oxygen sensor heater circuit (sensor 2)	P.13A-181
P0171	System too lean	P.13A-188
P0172	System too rich	P.13A-194
P0181	Fuel temperature sensor circuit range/performance	P.13A-198
P0182	Fuel temperature sensor circuit low input	P.13A-205
P0183	Fuel temperature sensor circuit high input	P.13A-210
P0201	Injector circuit-Cylinder 1	P.13A-216
P0202	Injector circuit-Cylinder 2	P.13A-216
P0203	Injector circuit-Cylinder 3	P.13A-216
P0204	Injector circuit-Cylinder 4	P.13A-216
P0300	Random/multiple cylinder misfire detected	P.13A-222
P0301	Cylinder 1 misfire detected	P.13A-227
P0302	Cylinder 2 misfire detected	P.13A-227
P0303	Cylinder 3 misfire detected	P.13A-227
P0304	Cylinder 4 misfire detected	P.13A-227
P0325	Knock sensor circuit	P.13A-231
P0335	Crankshaft position sensor circuit	P.13A-236
P0340	Camshaft position sensor circuit	P.13A-247
P0401	Exhaust gas recirculation flow insufficient detected	P.13A-257
P0403	Exhaust gas recirculation control circuit	P.13A-259
P0421	Warm up catalyst efficiency below threshold	P.13A-266
P0441	Evaporative emission control system incorrect purge flow	P.13A-269
P0442	Evaporative emission control system leak detected (Small leak)	P.13A-271
P0443	Evaporative emission control system purge control valve circuit	P.13A-283
P0446	Evaporative emission control system vent control circuit	P.13A-291
P0451	Evaporative emission control system pressure sensor range/performance	P.13A-299
P0452	Evaporative emission control system pressure sensor low input	P.13A-316
P0453	Evaporative emission control system pressure sensor high input	P.13A-332
P0455	Evaporative emission control system leak detected (Gross leak)	P.13A-348
P0456	Evaporative emission control system leak detected (Very small leak)	P.13A-364
P0461	Fuel level sensor circuit range/performance	P.13A-377
P0500	Vehicle speed sensor <M/T>	P.13A-381
P0506	Idle control system RPM lower than expected	P.13A-390
P0507	Idle control system RPM higher than expected	P.13A-399
P0513	Immobilizer malfunction	P.13A-407

DTC CODE	DIAGNOSTIC ITEMS		REFERENCE PAGE
P0551	Power steering pressure sensor circuit range/performance		P.13A-408
P0622	Generator FR terminal circuit malfunction		P.13A-415
P0705	Transmission range sensor circuit malfunction (PRNDL input)	• A/T DTC No. 27 (Park/Neutral position switch system: Open circuit) • A/T DTC No. 28 (Park/Neutral position switch system: Short circuit)	P.23A-40
P0712	Transmission fluid temperature sensor circuit low input	• A/T DTC No. 16 (Oil temperature sensor system: Short circuit)	P.23A-40
P0713	Transmission fluid temperature sensor circuit high input	• A/T DTC No. 15 (Oil temperature sensor system: Open circuit)	P.23A-40
P0715	Input/turbine speed sensor circuit	• A/T DTC No. 22 (Input shaft speed sensor system: Short circuit/Open circuit)	P.23A-40
P0720	Output speed sensor circuit	• A/T DTC No. 23 (Output shaft speed sensor system: Short circuit/Open circuit)	P.23A-40
P0731	Gear 1 incorrect ratio	• A/T DTC No. 41 (1st gear incorrect ratio)	P.23A-40
P0732	Gear 2 incorrect ratio	• A/T DTC No. 42 (2nd gear incorrect ratio)	P.23A-40
P0733	Gear 3 incorrect ratio	• A/T DTC No. 43 (3rd gear incorrect ratio)	P.23A-40
P0734	Gear 4 incorrect ratio	• A/T DTC No. 44 (4th gear incorrect ratio)	P.23A-40
P0736	Gear R incorrect ratio	• A/T DTC No. 46 (Reverse gear incorrect ratio)	P.23A-40
P0741	Torque converter clutch circuit performance or stuck off	• A/T DTC No. 52 (Torque converter clutch solenoid system: Defective system)	P.23A-40
P0742	Torque converter clutch circuit stuck on	• A/T DTC No. 53 (Torque converter clutch solenoid system: Lock-up stuck on)	P.23A-40
P0743	Torque converter clutch circuit electrical	• A/T DTC No. 36 (Torque converter clutch solenoid system: Short circuit/Open circuit)	P.23A-40
P0753	Shift solenoid "A" electrical	• A/T DTC No. 31 (Low and reverse solenoid valve system: Short circuit/Open circuit)	P.23A-40
P0758	Shift solenoid "B" electrical	• A/T DTC No. 32 (Underdrive solenoid valve system: Short circuit/Open circuit)	P.23A-40
P0763	Shift solenoid "C" electrical	• A/T DTC No. 33 (Second solenoid valve system: Short circuit/Open circuit)	P.23A-40
P0768	Shift solenoid "D" electrical	• A/T DTC No. 34 (Overdrive solenoid valve system: Short circuit/Open circuit)	P.23A-40
P1400	Manifold differential pressure sensor circuit malfunction		P.13A-421
P1603*	Battery backup circuit malfunction		P.13A-429
P1751	A/T control relay malfunction	• A/T DTC No. 54 (A/T control relay system: Short circuit to ground /open circuit)	P.23A-40

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NOTE:

Do not replace the engine control module (ECM) <M/T> or powertrain control module (PCM) <A/T> until a through terminal check reveals there are no short/open circuits.

Check that the ECM <M/T> or PCM <A/T> ground circuit is normal before checking for the cause of the problem.

After the ECM <M/T> or PCM <A/T> detects a malfunction, a diagnostic trouble code is recorded the next time the engine is started and the same malfunction is re-detected. However, for items marked with a "", the diagnostic trouble code is recorded on the first detection of the malfunction.*

Sensor 1 indicates the sensor mounted at a position closest to the engine, and sensor 2 indicates the sensor mounted at the position second closest to the engine.

SYMPTOM CHART

M1131151500168

NOTE: Check that the engine control module (ECM) <M/T> or powertrain control module (PCM) <A/T> ground circuit is normal before checking for the cause of the problem.

SYMPTOMS		INSPECTION PROCEDURE	REFERENCE PAGE
Communication with scan tool is impossible	Communication with all systems is not possible	1	P.13A-434
	Communication with ECM <M/T> or PCM <A/T> only is not possible	2	P.13A-436
Service engine soon/ malfunction indicator lamp and related parts	The service engine soon/malfunction indicator lamp does not illuminate right after the ignition switch is turned to the "ON" position	3	P.13A-439
	The service engine soon/malfunction indicator lamp remains illuminated and never goes out	4	P.13A-444
Starting	Cranks, won't start	5	P.13A-446
	Starts up and dies	6	P.13A-450
	Hard starting	7	P.13A-454
Idling stability (improper idling)	Unstable idle (rough idle, hunting)	8	P.13A-458
	Idle speed is high (improper idle speed)	9	P.13A-462
	Idle speed is low (improper idle speed)	10	P.13A-464
Idling stability (engine stalls)	When the engine is cold, it stalls at idle (die out)	11	P.13A-465
	When the engine is hot, it stalls at idle (die out)	12	P.13A-468
	The engine stalls when accelerating (pass out)	13	P.13A-473
	The engine stalls when decelerating	14	P.13A-474
Driving	Hesitation, sag or stumble	15	P.13A-475
	Acceleration shock	16	P.13A-478
	Deceleration shock	17	P.13A-479
	Poor acceleration	18	P.13A-480
	Surge	19	P.13A-483
	Knocking	20	P.13A-486
Dieseling (Run-on)		21	P.13A-487
Too high CO and HC concentration when idling		22	P.13A-487

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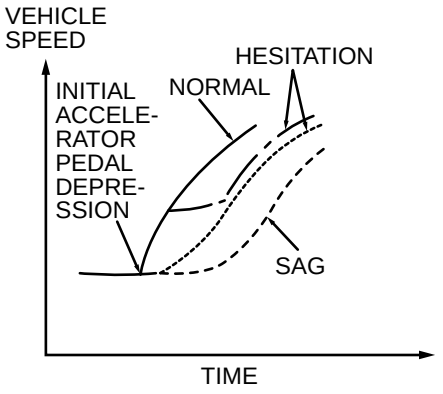
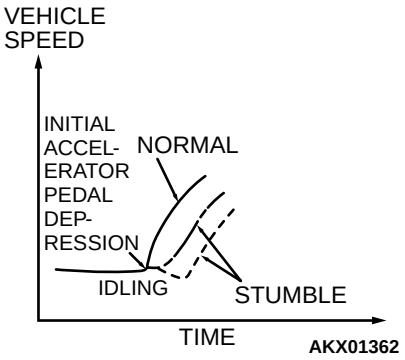
SYMPTOMS		INSPECTION PROCEDURE	REFERENCE PAGE
IM240 test failure	Transient, mass emission tailpipe test failure	23	P.13A-489
	Purge flow test of the evaporative emission canister failure	24	P.13A-493
	Pressure test of the evaporative system failure	25	P.13A-494
Generator output voltage is low (approximately 12.3 volts)		26	P.13A-495
Improper idle speed when the A/C is on (A/C switch 2 signal)		27	P.13A-499
Fans (radiator fan, A/C condenser fan) are inoperative		28	P.13A-501
Power supply system and ignition switch-IG system		29	P.13A-505
Fuel pump system		30	P.13A-515
Ignition switch-ST system <M/T>		31	P.13A-526
Ignition switch-ST system and park/neutral position switch system <A/T>		32	P.13A-531
Ignition circuit system		33	P.13A-535
A/C system		34	P.13A-542

PROBLEM SYMPTOMS TABLE (FOR YOUR INFORMATION)

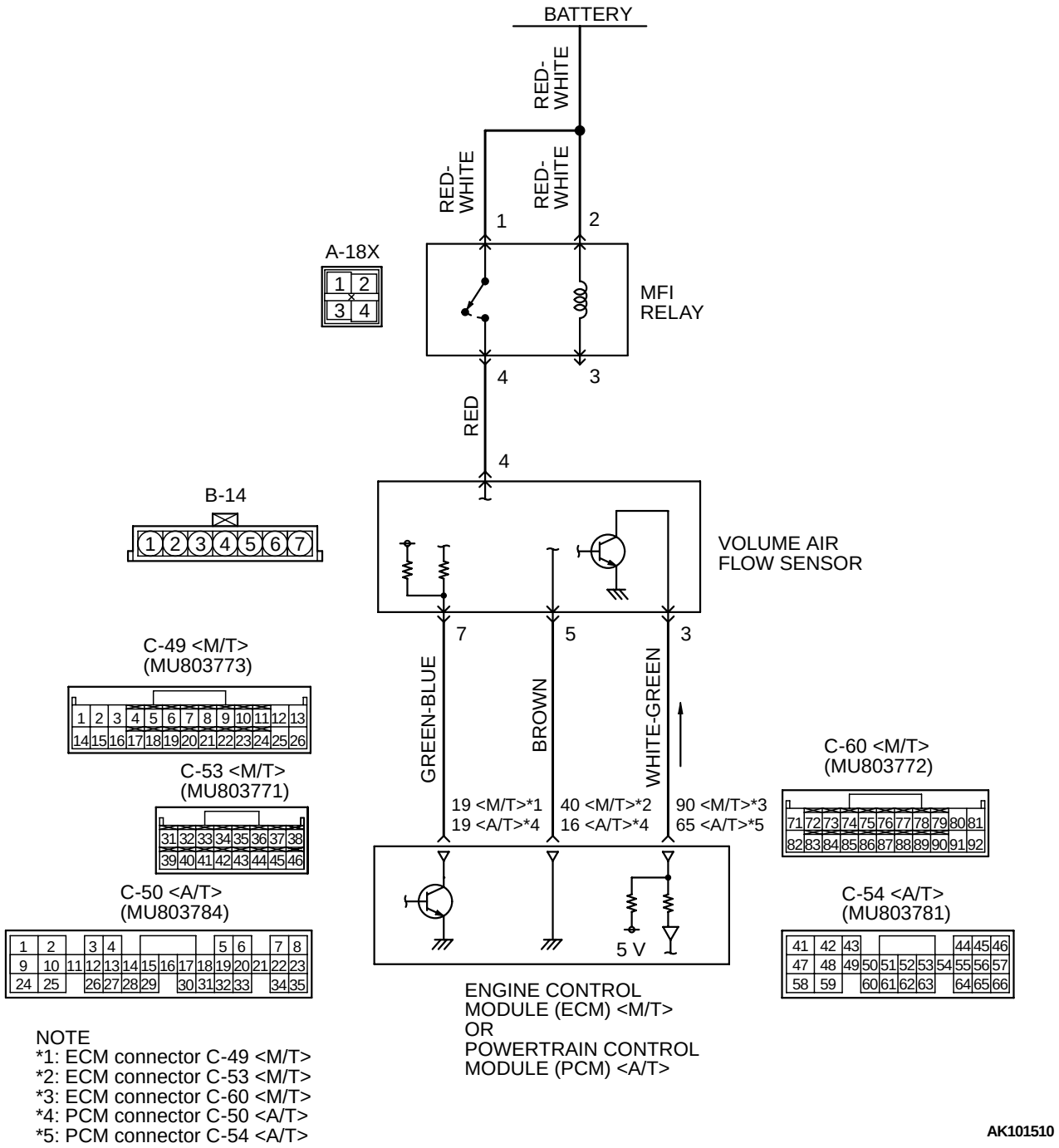
ITEMS		SYMPTOM
Starting	Won't start	The starter is used to crank the engine, but there is no combustion within the cylinders, and the engine won't start.
	Starts up and dies	The engine starts, but then the engine soon stalls.
	Hard starting	Engine starts after cranking a while.
Idling stability	Hunting	Engine speed doesn't remain constant; changes at idle.
	Rough idle	Usually, a judgement can be based upon the movement of the tachometer pointer, and the vibration transmitted to the steering wheel, shift lever, body, etc.
	Incorrect idle speed	The engine doesn't idle at the usual correct speed.
	Engine stall (die out)	The engine stalls when the foot is taken from the accelerator pedal, regardless of whether the vehicle is moving or not.
	Engine stall (pass out)	The engine stalls when the accelerator pedal is depressed or while it is being used.

ITEMS		SYMPTOM
Driving	Hesitation Sag	"Hesitation" is the delay in response of the vehicle speed (engine speed). This occurs when the accelerator is depressed in order to accelerate from the speed at which the vehicle is now traveling, or a temporary drop in vehicle speed (engine speed) during such acceleration. Serious hesitation is called "sag".  AKX01361AB
	Poor acceleration	Poor acceleration is inability to obtain an acceleration corresponding to the degree of throttle opening, even though acceleration is smooth or the inability to reach maximum speed.
	Stumble	Engine speed increase is delayed when the accelerator pedal is initially depressed for acceleration.  AKX01362
	Shock	The feeling of a comparatively large impact or vibration when the engine is accelerated or decelerated.
	Surge	This is slight acceleration and deceleration feel usually felt during steady, light throttle cruise. Most notable under light loads.
	Knocking	A sharp sound during driving like a hammer striking the cylinder walls.
Stopping	Dieseling (run on)	The condition in which the engine continues to run after the ignition switch is turned to the "LOCK" (OFF) position. Also called "dieseling".

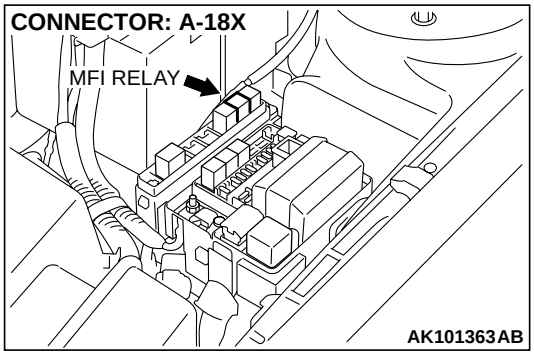
DIAGNOSTIC TROUBLE CODE PROCEDURES

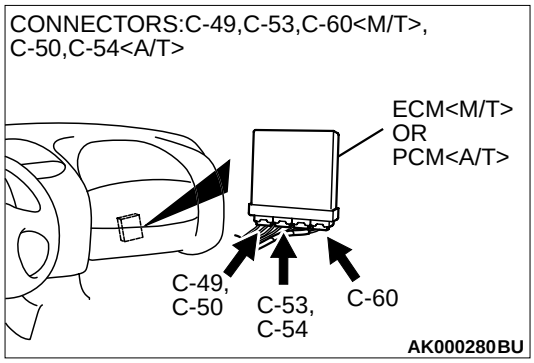
DTC P0101: Volume Air Flow Circuit Range/Performance Ploblem

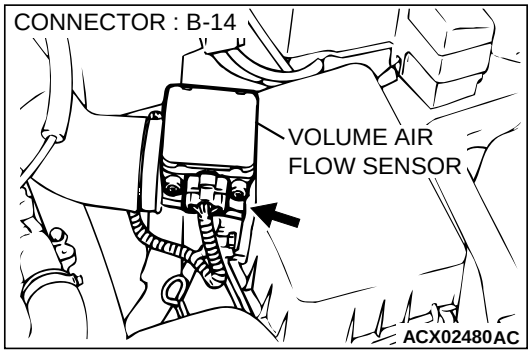
Volume Air Flow Sensor Circuit



TSB Revision







CIRCUIT OPERATION

- The volume air flow sensor power is supplied from the MFI relay (terminal 4), and the ground is provided on the ECM (terminal 40) <M/T> or PCM (terminal 16) <A/T>.
- 5-volt power is applied to the volume air flow sensor output terminal (terminal 3) from the ECM (terminal 90) <M/T> or PCM (terminal 65) <A/T>. The volume air flow sensor generates a pulse signal when the output terminal and ground are opened/closed (opened/short).

TECHNICAL DESCRIPTION

- While the engine is running, the volume air flow sensor outputs a pulse signal which corresponds to the volume of air flow.
- The ECM <M/T> or PCM <A/T> checks whether the frequency of this signal output by the volume air flow sensor while the engine is running is at or above the set value.
- When the throttle position sensor output voltage is low, the ECM <M/T> or PCM <A/T> causes the power transistor to be "ON" to send an air flow sensor reset signal to the air flow sensor. In response to the reset signal, the air flow sensor resets the filter circuit and improves the ability of the air flow sensor to measure the amount of air in a small air intake region.

DTC SET CONDITIONS

Check Conditions

- Throttle position sensor output voltage is 1.5 volts or higher.
- Engine speed is higher than 2,000 r/min.

Judgement Criteria

- Volume air flow sensor output frequency has continued to be 60 Hz or lower for 2 seconds.

Check Conditions

- Throttle position sensor output voltage is 2 volts or lower.
- Engine speed is lower than 2,000 r/min.

Judgement Criteria

- Volume air flow sensor output frequency has continued to be 800 Hz or higher for 2 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

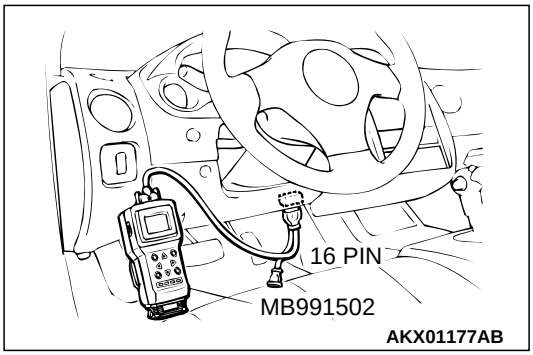
- Volume air flow sensor failed.
- Open or shorted volume air flow sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>
- Air leak between volume air flow sensor and throttle body.

DIAGNOSIS

Required Special Tools

- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check data list item 12: Volume Air Flow Sensor.



⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

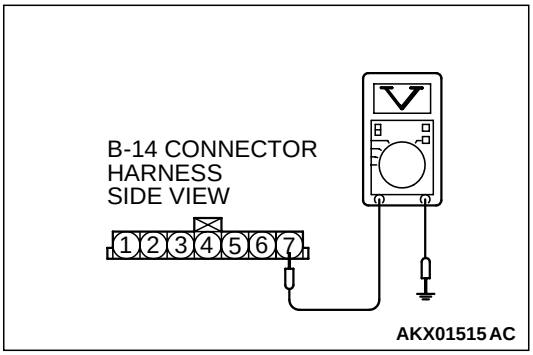
(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 12, Volume Air Flow Sensor.
(4) Warm up the engine to normal operating temperature: 80°C to 96°C (176°F to 205°F).
- The standard value during idling should be 10 Hz or more.
- When the engine is revved, the frequency should increase according to the increase in engine speed.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Go to Step 2.

STEP 2. Check the reset signal voltage at volume air flow sensor connector B-14 by backprobing.

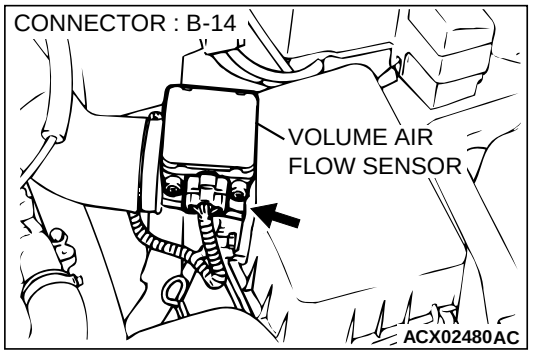


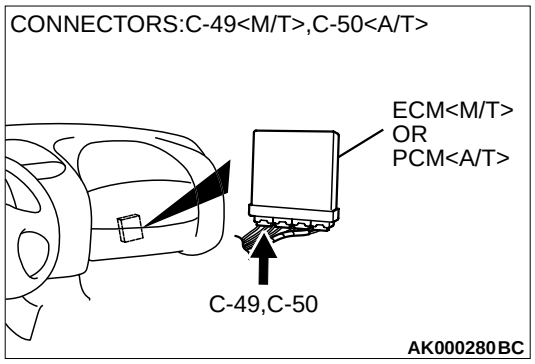
(1) Do not disconnect the connector B-14.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 7 and ground by backprobing.
- Voltage should be between 6.0 and 9.0 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 5.
NO : Go to Step 3.



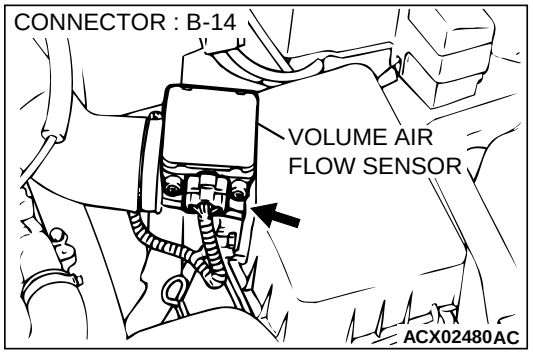


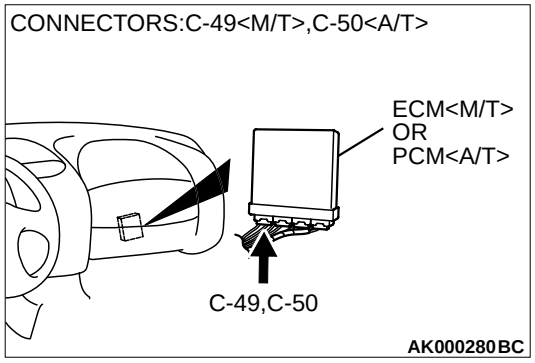
STEP 3. Check connector B-14 at volume air flow sensor and connector C-49 at ECM <M/T> or connector C-50 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.



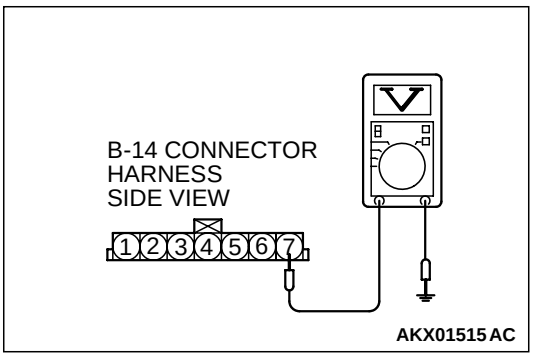


STEP 4. Check for short circuit to ground between volume air flow sensor connector B-14 (terminal 7) and ECM connector C-49 (terminal 19) <M/T> or PCM connector C-50 (terminal 19) <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the volume air flow sensor. Then go to Step 9.

NO : Repair it. Then go to Step 9.



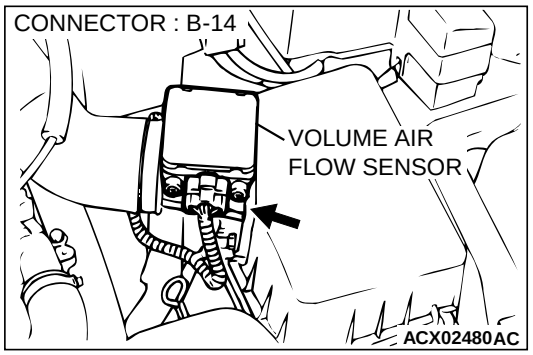
STEP 5. Check the reset signal voltage at volume air flow sensor connector B-14 by backprobing.

(1) Do not disconnect the connector B-14.
(2) Start the engine and run at idle.
(3) Measure the voltage between terminal 7 and ground by backprobing.
- When the engine idling, voltage should be 1.0 volt or less.
- When the engine speed is 3,000 r/min, voltage should be between 6.0 and 9.0 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

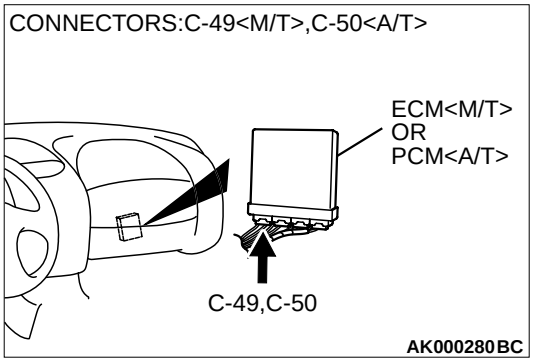
YES : Go to Step 8.
NO : Go to Step 6.



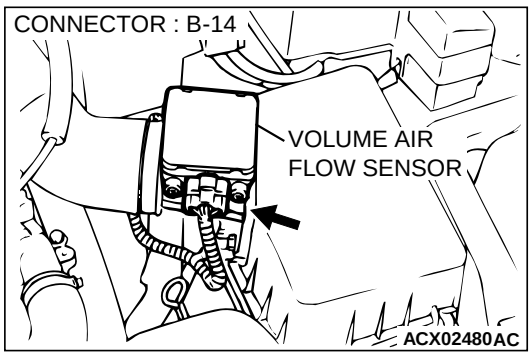
STEP 6. Check connector B-14 at volume air flow sensor and connector C-49 at ECM <M/T> or connector C-50 at PCM <A/T> for damage.

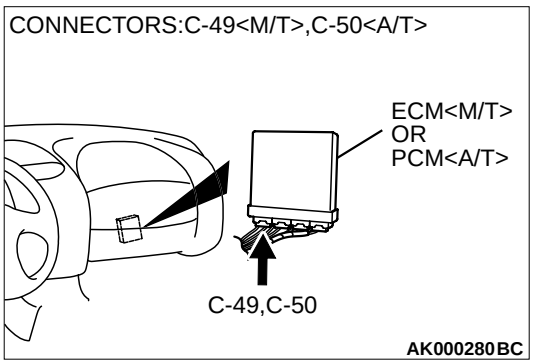
Q: Is the connector in good condition?

YES : Go to Step 7.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.



STEP 7. Check for open circuit and harness damage between volume air flow sensor connector B-105 (terminal 7) and ECM connector C-49 (terminal 19) <M/T> or PCM connector C-50 (terminal 19) <A/T>.

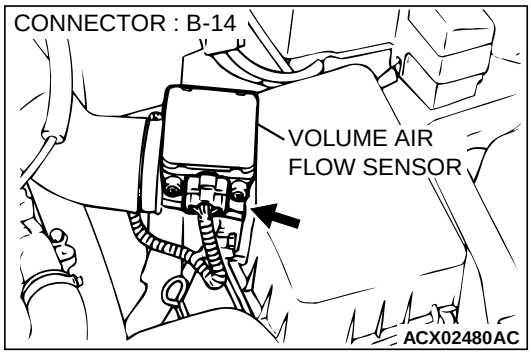




Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 9.
NO : Repair it. Then go to Step 9.

STEP 8. Replace the volume air flow sensor.



(1) Replace the volume air flow sensor.
(2) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.
(3) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0101 is output?

YES : Replace the ECM or PCM. Then go to Step 9.
NO : The inspection is complete.

STEP 9. Test the OBD-II drive cycle.

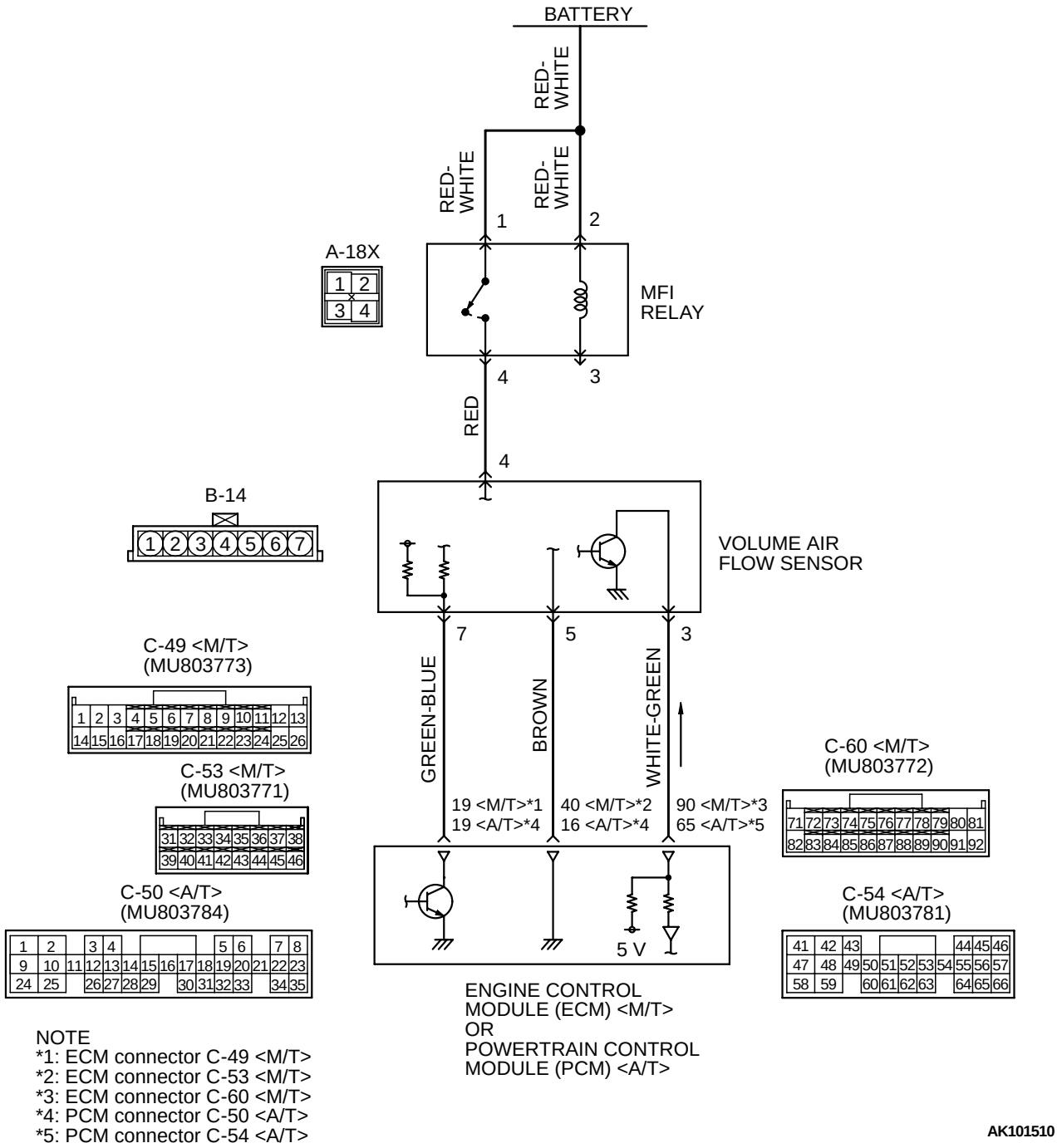
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0101 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

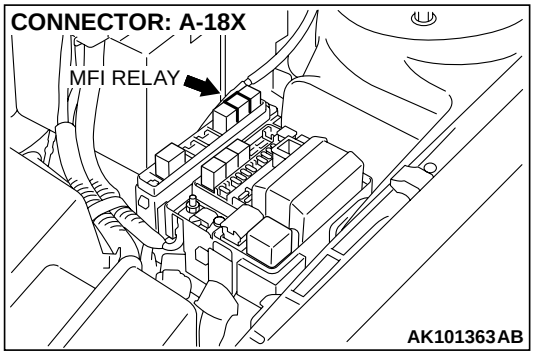
DTC P0102: Volume Air Flow Circuit Low Input

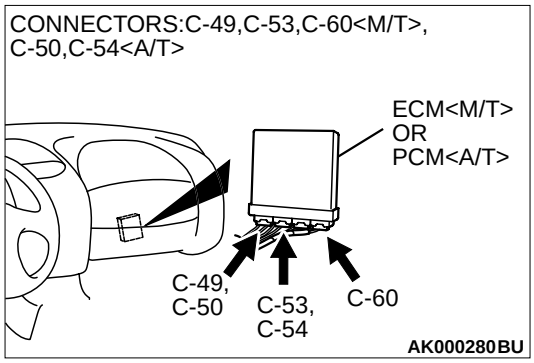
Volume Air Flow Sensor Circuit

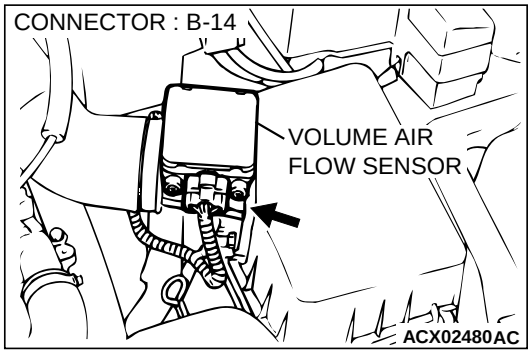


NOTE
*1: ECM connector C-49 <M/T>
*2: ECM connector C-53 <M/T>
*3: ECM connector C-60 <M/T>
*4: PCM connector C-50 <A/T>
*5: PCM connector C-54 <A/T>

TSB Revision







CIRCUIT OPERATION

- The volume air flow sensor power is supplied from the MFI relay (terminal 4), and the ground is provided on the ECM (terminal 40) <M/T> or PCM (terminal 16) <A/T>.
- 5-volt power is applied to the volume air flow sensor output terminal (terminal 3) from the ECM (terminal 90) <M/T> or PCM (terminal 65) <A/T>. The volume air flow sensor generates a pulse signal when the output terminal and ground are opened/closed (opened/short).

TECHNICAL DESCRIPTION

- While the engine is running, the volume air flow sensor outputs a pulse signal which corresponds to the volume of air flow.
- The ECM <M/T> or PCM <A/T> checks whether the frequency of this signal output by the volume air flow sensor while the engine is running is at or above the set value.

DTC SET CONDITIONS

Check Conditions

- Engine speed is higher than 500 r/min.

Judgement Criteria

- Volume air flow sensor output frequency has continued to be 3.3 Hz or lower for 2 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

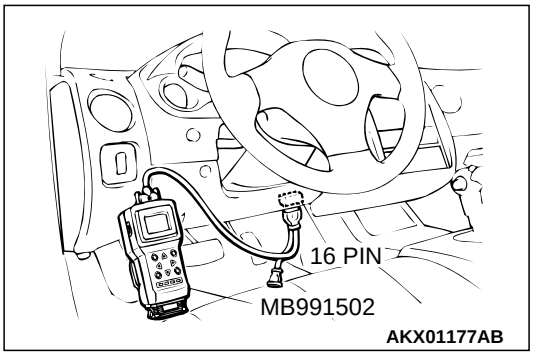
- Volume air flow sensor failed.
- Open or shorted volume air flow sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>
- Air leak between volume air flow sensor and throttle body.

DIAGNOSIS

Required Special Tools

- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check data list item 12: Volume Air Flow Sensor.



⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

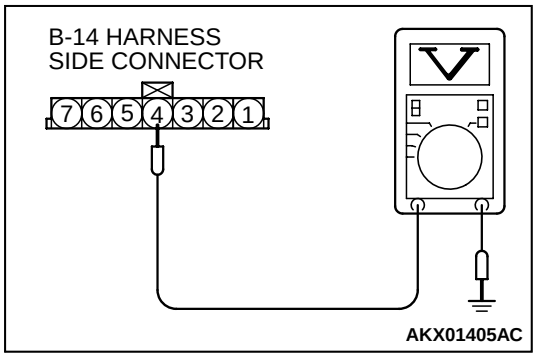
(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 12, Volume Air Flow Sensor.
(4) Warm up the engine to normal operating temperature: 80°C to 96°C (176°F to 205°F).
- The standard value during idling should be 10 Hz or more.
- When the engine is revved, the frequency should increase according to the increase in engine speed.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Go to Step 2.

STEP 2. Check the power supply voltage at volume air flow sensor connector B-14 by backprobing.

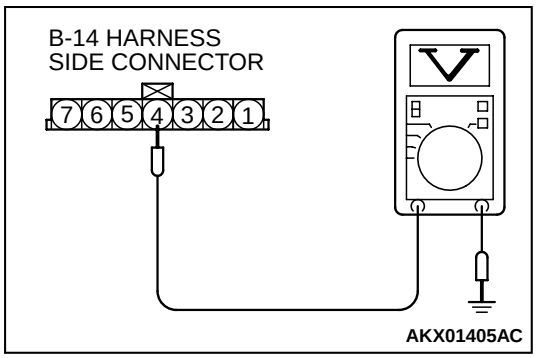


(1) Do not disconnect the connector B-14.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 4 and ground by backprobing.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 5.
NO : Go to Step 3.



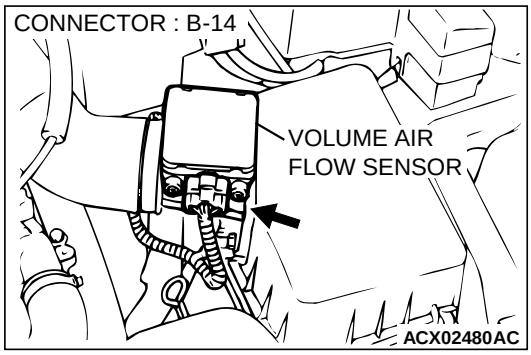
STEP 3. Check the power supply voltage at volume air flow sensor harness side connector B-14.

(1) Disconnect the connector B-14 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 4 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

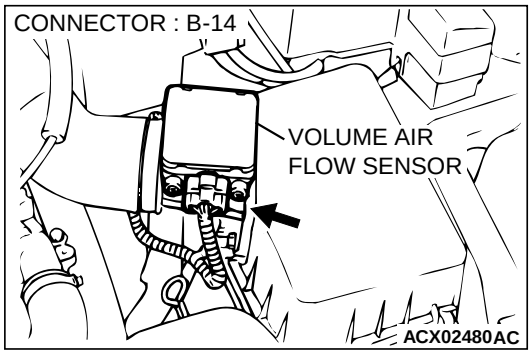
YES : Go to Step 4.
NO : Repair harness wire between MFI relay connector A-18X terminal 4 and volume air flow sensor connector B-105 terminal 4 because of open circuit or short circuit to ground. Then go to Step 13.



STEP 4. Check connector B-14 at the volume air flow sensor for damage.

Q: Is the connector in good condition?

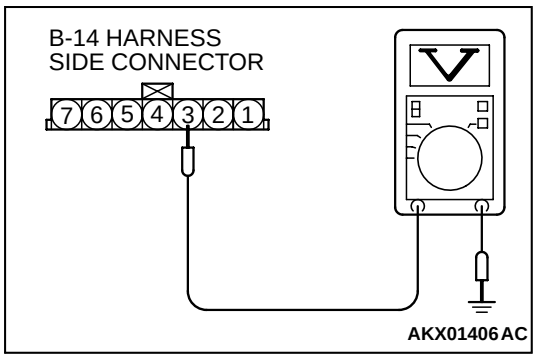
YES : Repair harness wire between MFI relay connector A-18X terminal 4 and volume air flow sensor connector B-14 terminal 4 because of harness damage. Then go to Step 13.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 13.



STEP 5. Check connector B-14 at volume air flow sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 6.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 13.



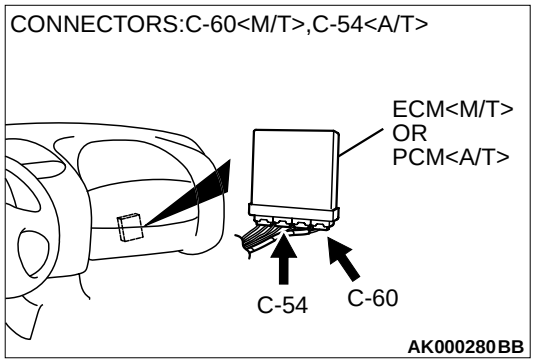
STEP 6. Check the sensor supply voltage at volume air flow sensor harness side connector B-14.

(1) Disconnect the connector B-14 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 3 and ground.
- Voltage should be between 4.8 and 5.2 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 9.
NO : Go to Step 7.

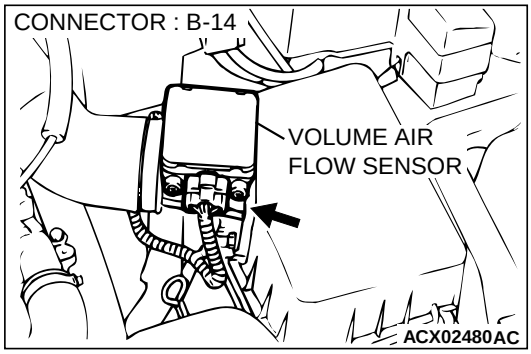


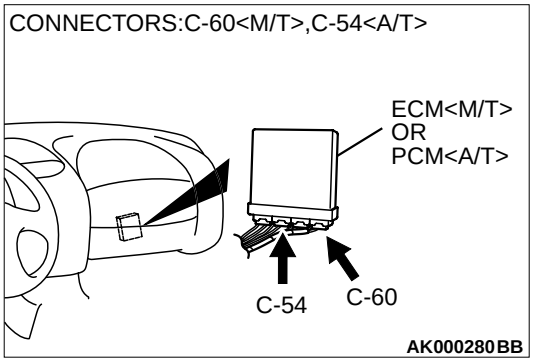
STEP 7. Check connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 8.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 13.

STEP 8. Check for short circuit to ground between volume air flow sensor connector B-14 (terminal 3) and ECM connector C-60 (terminal 90) <M/T> or PCM connector C-54 (terminal 65) <A/T>.



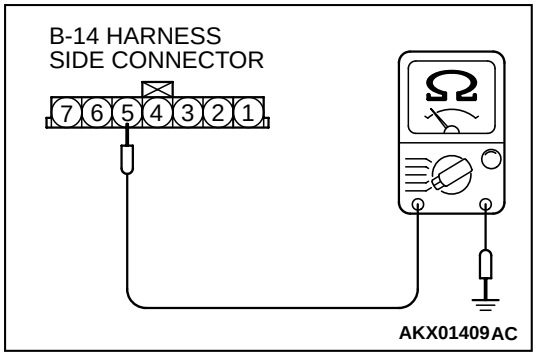


Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 13.
NO : Repair it. Then go to Step 13.

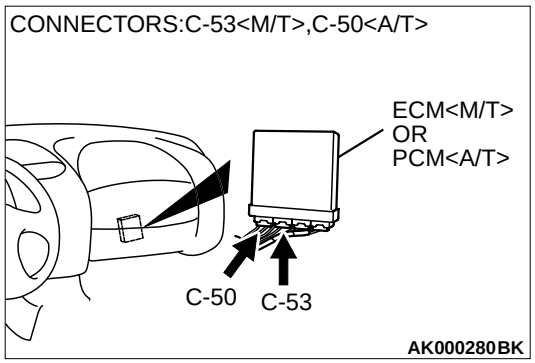
STEP 9. Check the continuity at volume air flow sensor harness side connector B-14.

(1) Disconnect the connector B-14 and measure at the harness side.
(2) Check for the continuity between terminal 5 and ground.
- Should be less than 2 ohm.



Q: Is the continuity normal?

YES : Go to Step 12.
NO : Go to Step 10.

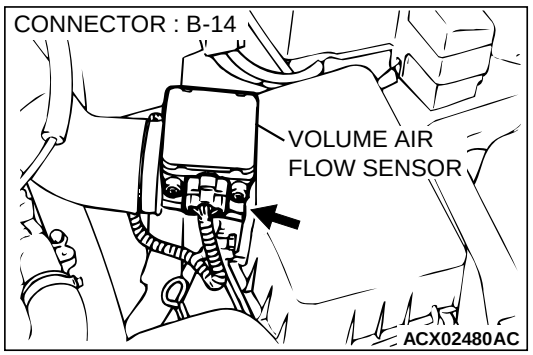


STEP 10. Check connector C-53 at ECM <M/T> or connector C-50 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 11.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 13.

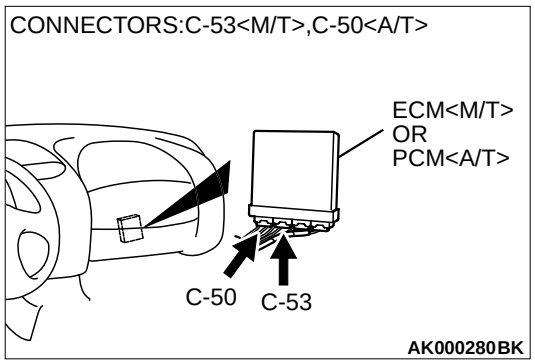


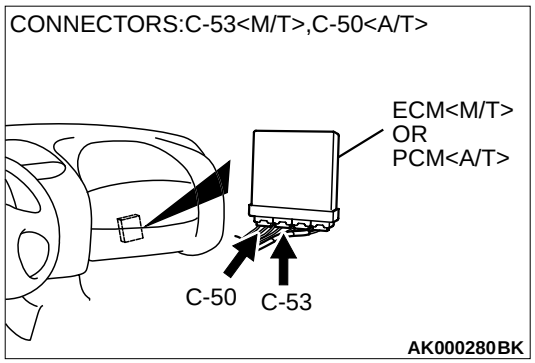
STEP 11. Check for open circuit and harness damage between volume air flow sensor connector B-14 (terminal 5) and ECM connector C-53 (terminal 40) <M/T> or PCM connector C-50 (terminal 16) <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 13.

NO : Repair it. Then go to Step 13.





STEP 12. Check connector C-53 at ECM <M/T> or connector C-50 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Replace the volume air flow sensor. Then go to Step 13.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 13.

STEP 13. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.

(2) Check the diagnostic trouble code (DTC).

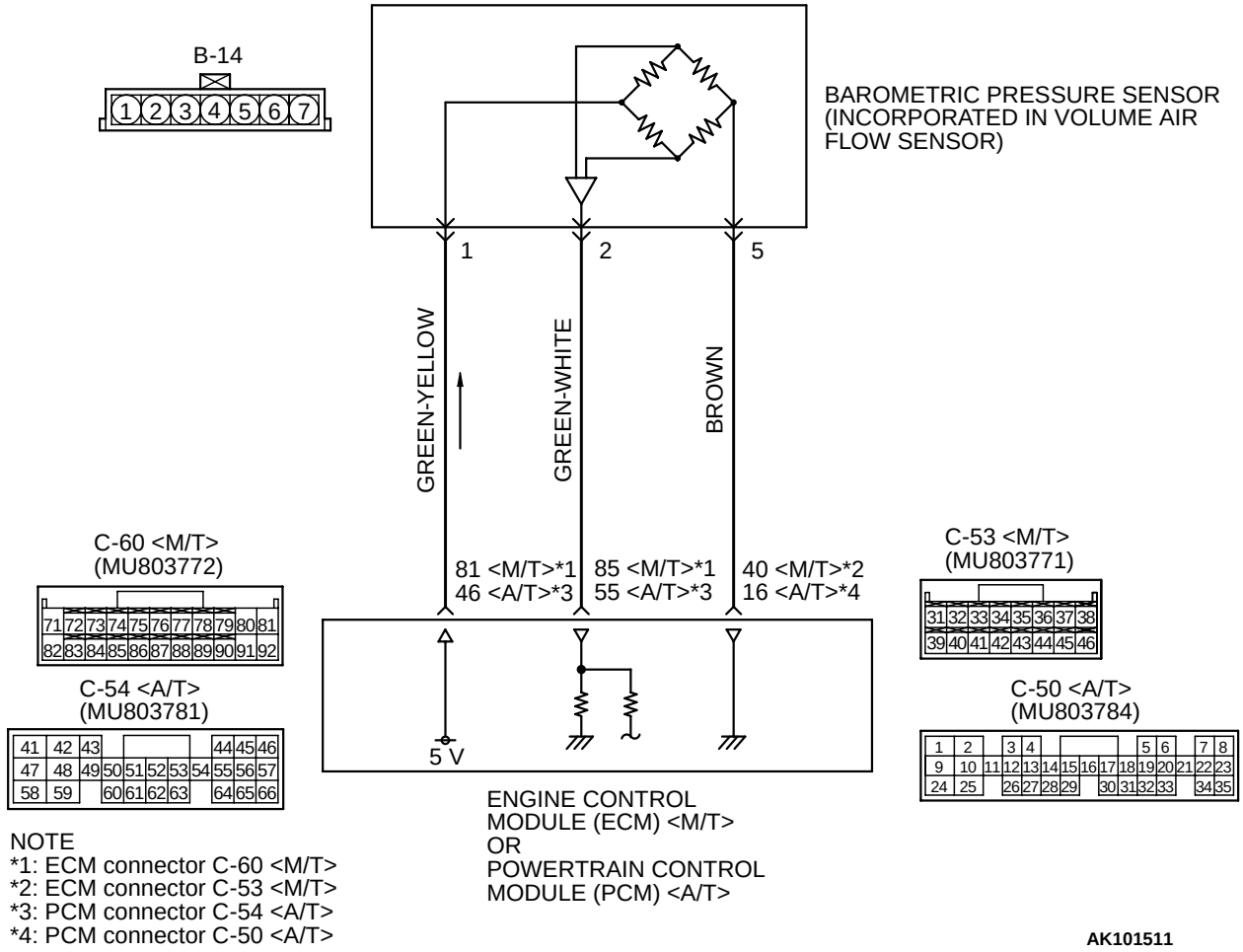
Q: Is the DTC P0102 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0106: Barometric Pressure Circuit Range/Performance Problem

Barometric Pressure Sensor Circuit



NOTE
*1: ECM connector C-60 <M/T>
*2: ECM connector C-53 <M/T>
*3: PCM connector C-54 <A/T>
*4: PCM connector C-50 <A/T>

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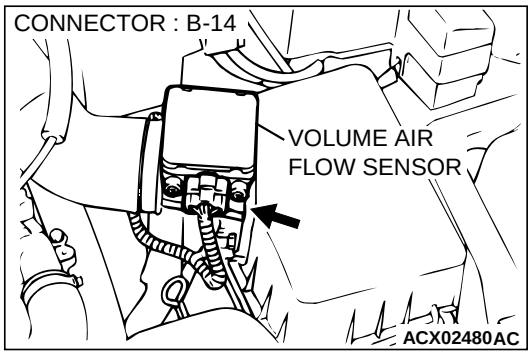
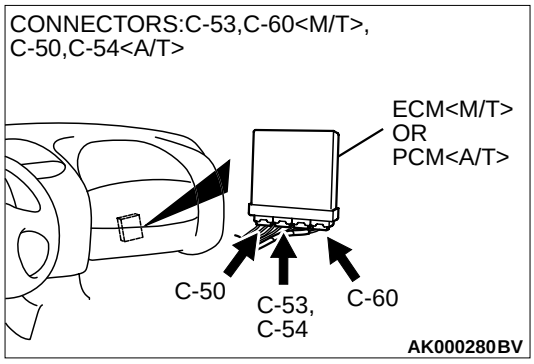




CIRCUIT OPERATION

- A 5-volt voltage is supplied to the barometric pressure sensor power terminal (terminal 1) from the ECM (terminal 81) <M/T> or PCM (terminal 46) <A/T>. The ground terminal (terminal 5) is grounded with ECM (terminal 40) <M/T> or PCM (terminal 16) <A/T>.
- A voltage that is proportional to the atmospheric pressure is sent to the ECM (terminal 85) <M/T> or PCM (terminal 55) <A/T> from the barometric pressure sensor output terminal (terminal 2).

TSB Revision

TECHNICAL DESCRIPTION

- The barometric pressure sensor outputs a voltage which corresponds to the barometric pressure.
- The ECM <M/T> or PCM <A/T> checks whether this voltage is within a specified range.

DTC SET CONDITIONS

Check Conditions

- Barometric pressure is lower than 76 kPa (11 psi).

Judgement Criteria

- During 15 times of driving, the changes in the sensor output voltage should be 0.015 volt [equivalent to 0.4 kPa (0.06 psi)] or less.
- Make sure that the engine coolant temperature is 72°C (162°F) or higher during each of the 15 times of driving. Also, during each of the 15 times of driving, make sure that after the engine has been started, the engine coolant temperature has increased for 23°C (41°F) or higher.

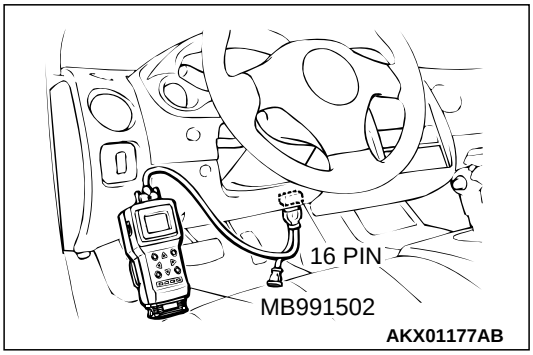
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Barometric pressure sensor failed.
- Open or shorted barometric pressure sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

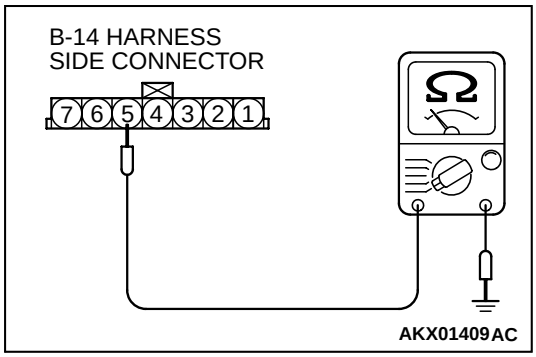
Q: Is the DTC P0107 is output?

YES : Refer to, DTC P0107 – Barometric Pressure Circuit Low Input P.13A-47.
NO : Go to Step 2.

STEP 2. Check connector B-14 at the barometric pressure sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.

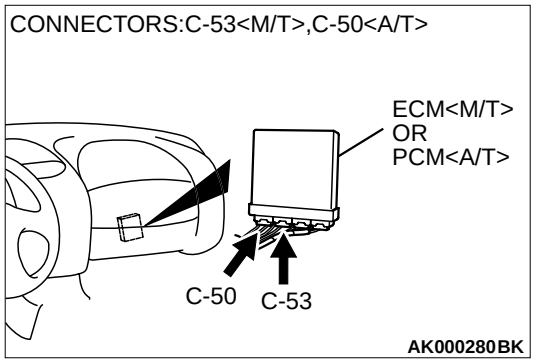


STEP 3. Check the continuity at barometric pressure sensor harness side connector B-14.

(1) Disconnect the connector B-14 and measure at the harness side.
(2) Check for the continuity between terminal 5 and ground.
- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 6.
NO : Go to Step 4.



STEP 4. Check connector C-53 at ECM <M/T> or connector C-50 at PCM <A/T> for damage.

Q: Is the connector in good condition?

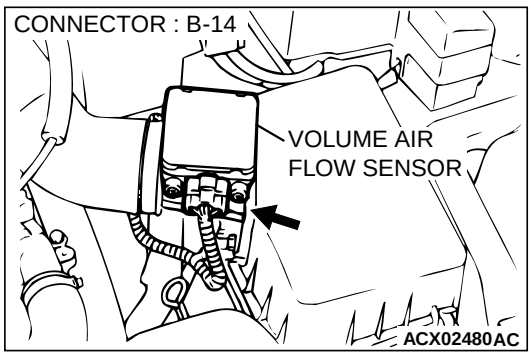
YES : Go to Step 5.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.

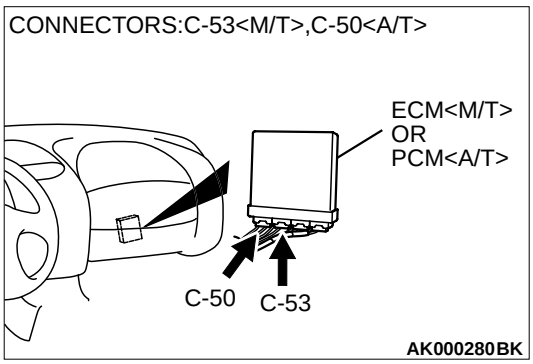
STEP 5. Check for open circuit and harness damage between barometric pressure sensor connector B-14 (terminal 5) and ECM connector C-53 (terminal 40) <M/T> or PCM connector C-50 (terminal 16) <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 9.

NO : Repair it. Then go to Step 9.



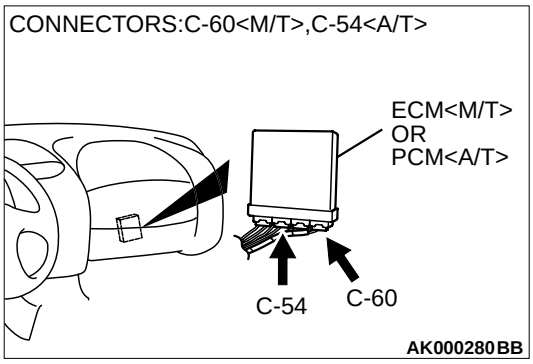


STEP 6. Check connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 7.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.

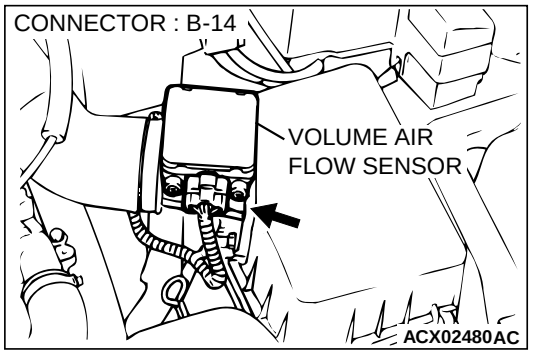


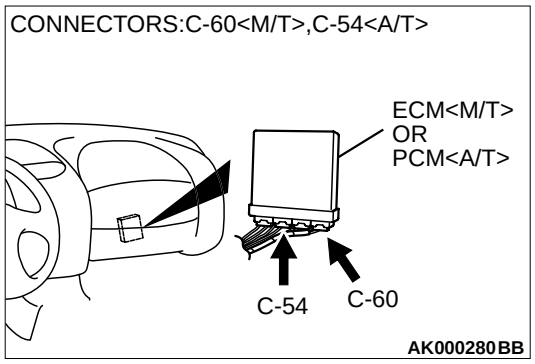
STEP 7. Check for open circuit and harness damage between barometric pressure sensor connector B-14 and ECM connector C-60 <M/T> or PCM connector C-54 <A/T>.

Q: Is the harness wire in good condition?

YES : Go to Step 8.

NO : Repair it. Then go to Step 9.





STEP 8. Replace the barometric pressure sensor.

(1) Replace the barometric pressure sensor.

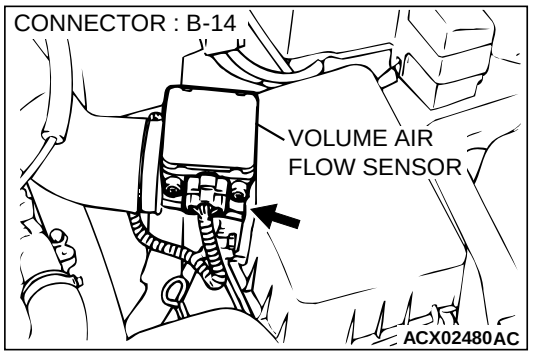
(2) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.

(3) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0106 is output?

YES : Replace the ECM or PCM. Then go to Step 9.

NO : The inspection is complete.



STEP 9. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.

(2) Check the diagnostic trouble code (DTC).

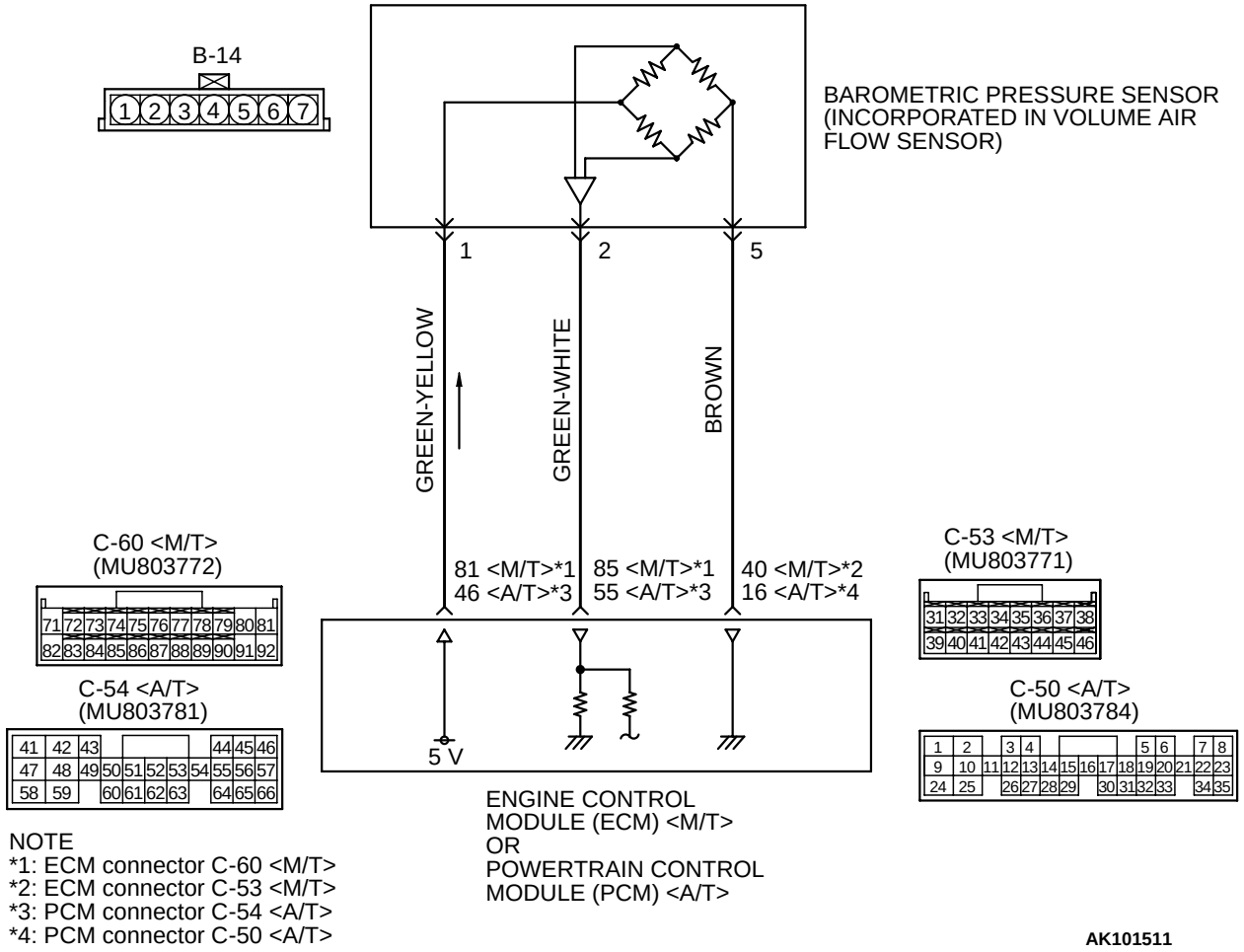
Q: Is the DTC P0106 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0107: Barometric Pressure Circuit Low Input

Barometric Pressure Sensor Circuit



NOTE
*1: ECM connector C-60 <M/T>
*2: ECM connector C-53 <M/T>
*3: PCM connector C-54 <A/T>
*4: PCM connector C-50 <A/T>

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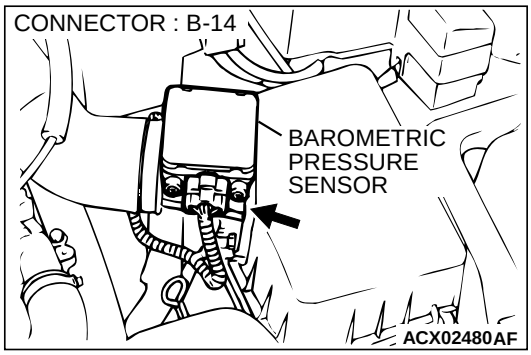
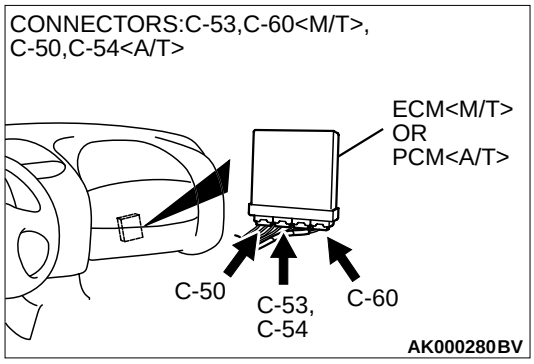




CIRCUIT OPERATION

- A 5-volt voltage is supplied to the barometric pressure sensor power terminal (terminal 1) from the ECM (terminal 81) <M/T> or PCM (terminal 46) <A/T>. The ground terminal (terminal 5) is grounded with ECM (terminal 40) <M/T> or PCM (terminal 16) <A/T>.
- A voltage that is proportional to the atmospheric pressure is sent to the ECM (terminal 85) <M/T> or PCM (terminal 55) <A/T> from the barometric pressure sensor output terminal (terminal 2).

TSB Revision

TECHNICAL DESCRIPTION

- The barometric pressure sensor outputs a voltage which corresponds to the barometric pressure.
- The ECM <M/T> or PCM <A/T> checks whether this voltage is within a specified range.

DTC SET CONDITIONS

Check Conditions

- 2 seconds or more have passed since the starting sequence was completed.
- Battery positive voltage is higher than 8 volts.

Judgement Criteria

- Barometric pressure sensor output has continued to be 49 kPa (7.1 psi) or lower approximately 15,000 ft above sea level for 10 seconds.

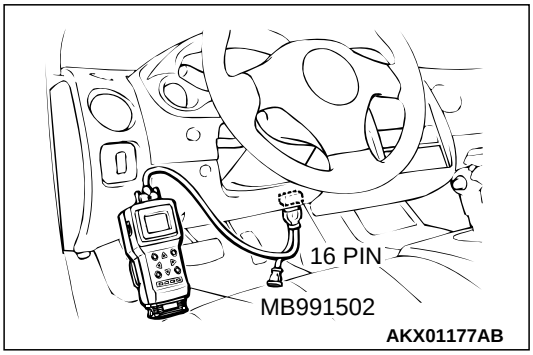
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Barometric pressure sensor failed.
- Open or shorted barometric pressure sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools

- MB991502: Scan Tool (MUT-II)



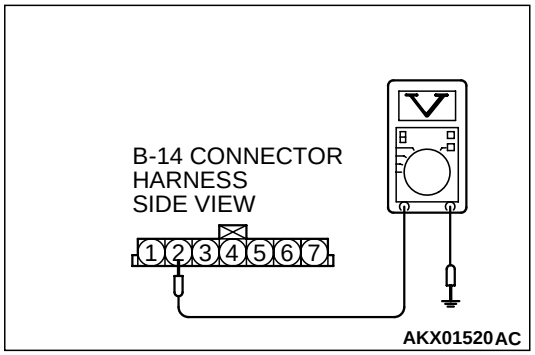
STEP 1. Using scan tool MB991502, check data list item 25: Barometric Pressure Sensor.

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 25, Barometric Pressure Sensor.
  - When altitude is 0 m (0 foot), 101 kPa.
  - When altitude is 600 m (1,969 feet), 95 kPa.
  - When altitude is 1,200 m (3,937 feet), 88 kPa.
  - When altitude is 1,800 m (5,906 feet), 81 kPa.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Go to Step 2.



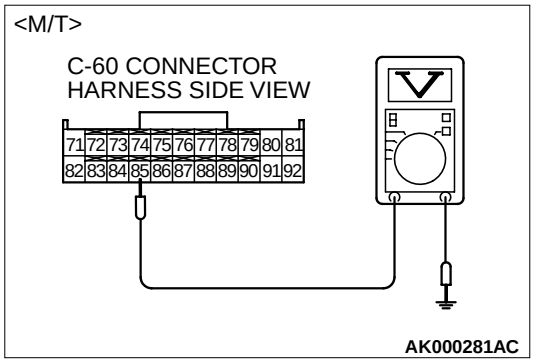
STEP 2. Check the sensor output voltage at barometric pressure sensor connector B-14 by backprobing.

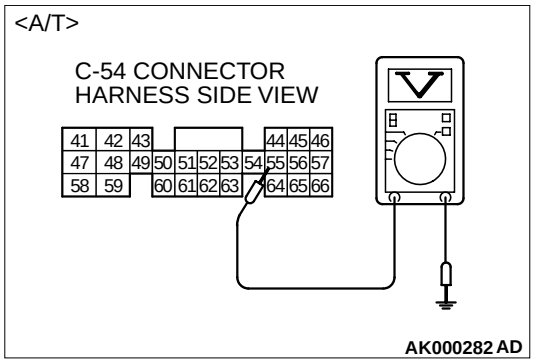
(1) Do not disconnect the connector B-14.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 2 and ground by backprobing.
- When altitude is 0 m (0 foot), voltage should be 3.7 and 4.3 volts.
- When altitude is 600 m (1,969 feet), voltage should be 3.4 and 4.0 volts.
- When altitude is 1,200 m (3,937 feet), voltage should be 3.2 and 3.8 volts.
- When altitude is 1,800 m (5,906 feet), voltage should be 2.9 and 3.5 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 3.
NO : Go to Step 7.





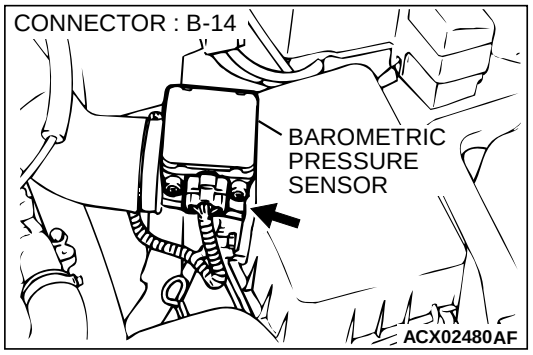
STEP 3. Check the sensor output voltage at ECM connector C-60 <M/T> or PCM connector C-54 <A/T> by backprobing.

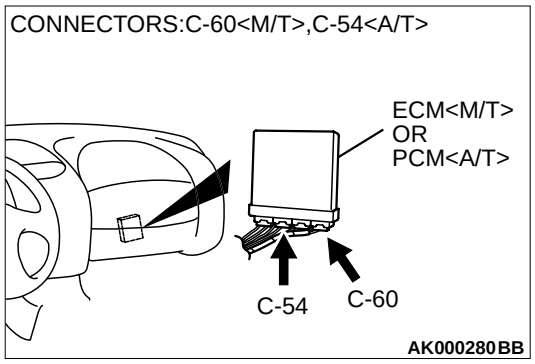
(1) Do not disconnect the connector C-60 <M/T> or C-54 <A/T>.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 85 <M/T> or terminal 55 <A/T> and ground by backprobing.
- When altitude is 0 m (0 foot), voltage should be 3.7 and 4.3 volts.
- When altitude is 600 m (1,969 feet), voltage should be 3.4 and 4.0 volts.
- When altitude is 1,200 m (3,937 feet), voltage should be 3.2 and 3.8 volts.
- When altitude is 1,800 m (5,906 feet), voltage should be 2.9 and 3.5 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 4.
NO : Go to Step 6.



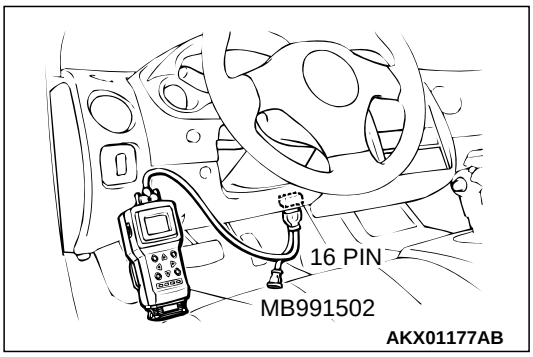


STEP 4. Check connector B-14 at the barometric pressure sensor and connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 18.



STEP 5. Using scan tool MB991502, check data list item 25: Barometric Pressure Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.

(2) Turn the ignition switch to the "ON" position.

(3) Set scan tool MB991502 to the data reading mode for item 25, Barometric Pressure Sensor.

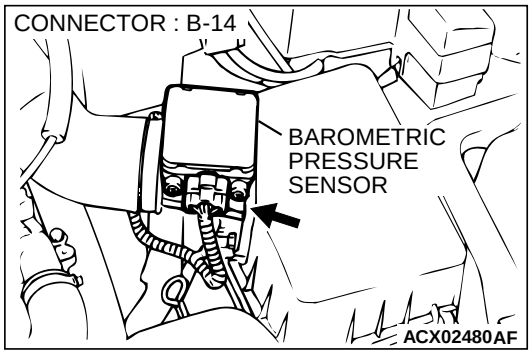
- When altitude is 0 m (0 foot), 101 kPa.
- When altitude is 600 m (1,969 feet), 95 kPa.
- When altitude is 1,200 m (3,937 feet), 88 kPa.
- When altitude is 1,800 m (5,906 feet), 81 kPa.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

NO : Replace the ECM or PCM. Then go to Step 18.

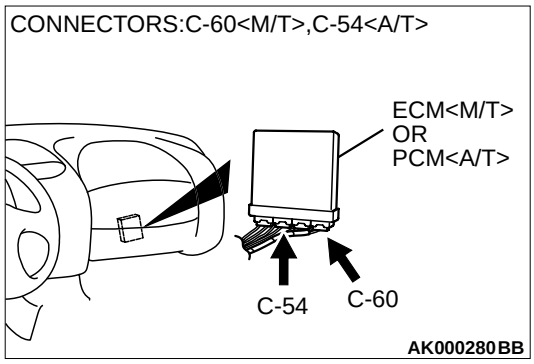


STEP 6. Check connector B-14 at the barometric pressure sensor and connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between barometric pressure sensor connector B-14 terminal 2 and ECM connector C-60 terminal 85 <M/T> or PCM connector C-54 terminal 55 <A/T> because of open circuit or harness damage. Then go to Step 18.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 18.



STEP 7. Check the sensor supply voltage at barometric pressure sensor connector B-14 by backprobing.

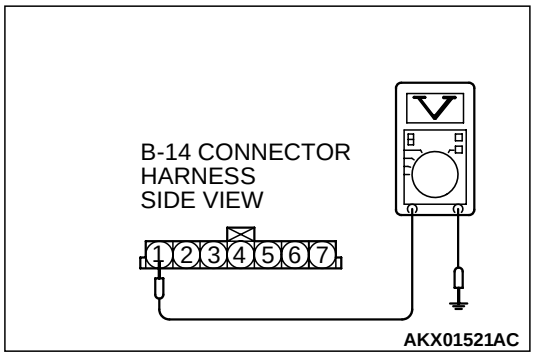
(1) Do not disconnect the connector B-14.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 1 and ground by backprobing.
- Voltage should be between 4.8 and 5.2 volts.

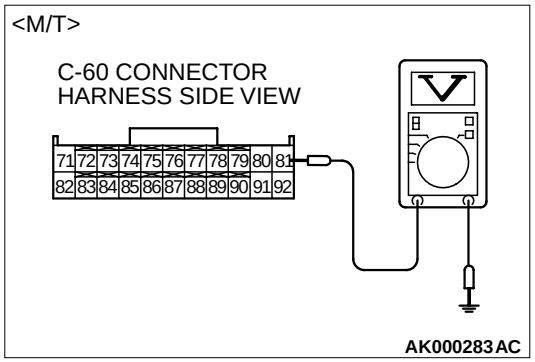
(4) Turn the ignition switch to the "LOCK" (OFF) position.

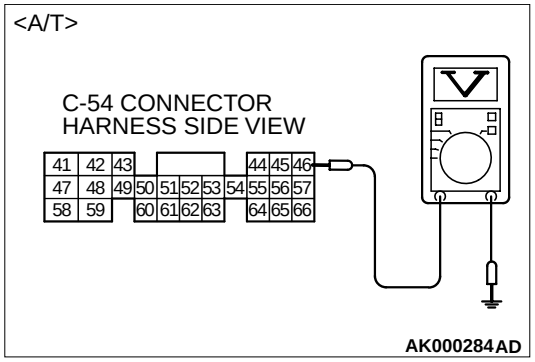
Q: Is the voltage normal?

YES : Go to Step 12.

NO : Go to Step 8.







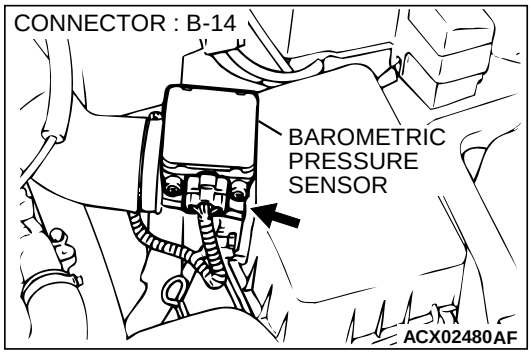
STEP 8. Check the sensor supply voltage at ECM connector C-60 <M/T> or PCM connector C-54 <A/T> by backprobing.

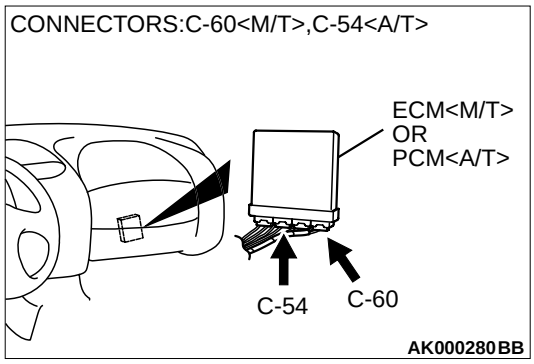
(1) Do not disconnect the connector C-60 <M/T> or C-54 <A/T>.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 81 <M/T> or 46 <A/T> and ground by backprobing.
- Voltage should be between 4.8 and 5.2 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 9.
NO : Go to Step 10.



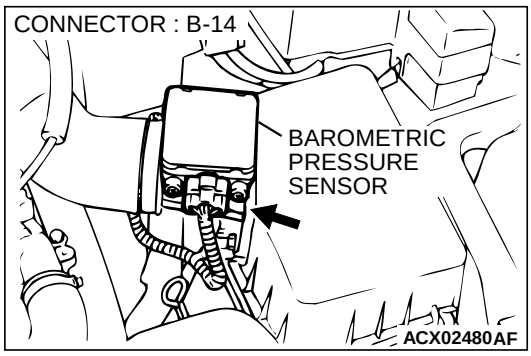


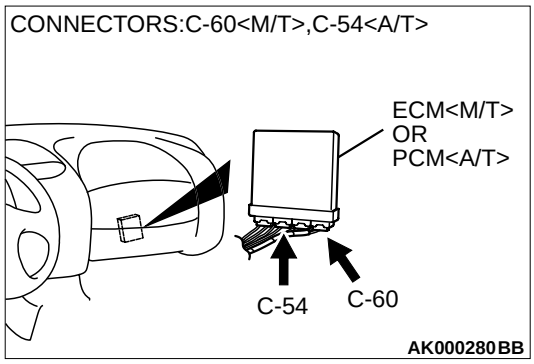
STEP 9. Check connector B-14 at the barometric pressure sensor and connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between barometric pressure sensor connector B-105 terminal 1 and ECM connector C-60 terminal 81 <M/T> or PCM connector C-54 terminal 46 <A/T> because of open circuit or harness damage. Then go to Step 18.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 18.



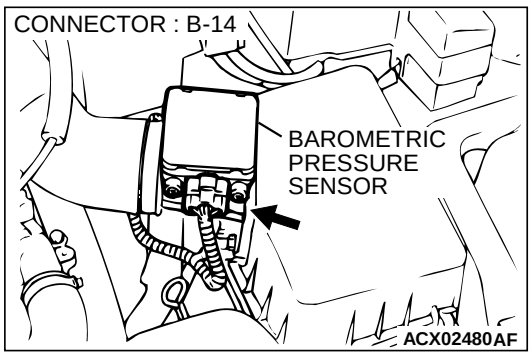


STEP 10. Check connector B-14 at the barometric pressure sensor and connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 11.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 18.

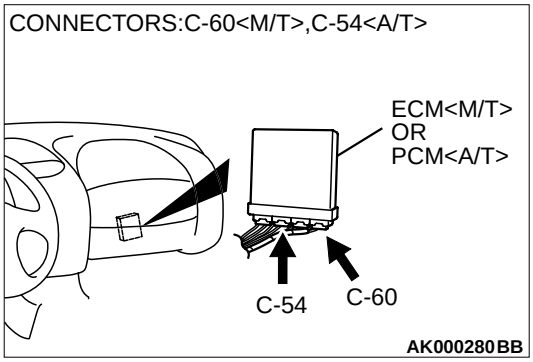


STEP 11. Check for short circuit to ground between barometric pressure sensor connector B-14 (terminal 1) and ECM connector C-60 (terminal 81) <M/T> or PCM connector C-54 (terminal 46) <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 18.

NO : Repair it. Then go to Step 18.



STEP 12. Check the ground voltage at barometric pressure sensor connector B-14 by backprobing.

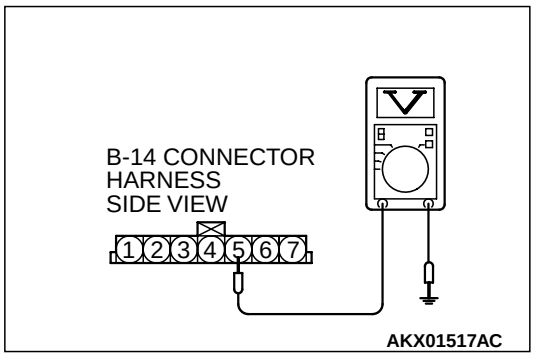
(1) Do not disconnect the connector B-14.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 5 and ground by backprobing.
- Voltage should be 0.5 volt or less.

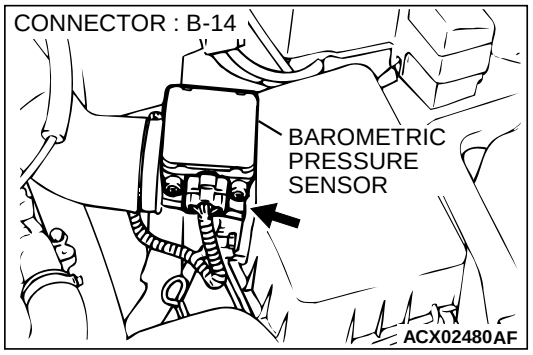
(4) Turn the ignition switch to the "LOCK" (OFF) position.

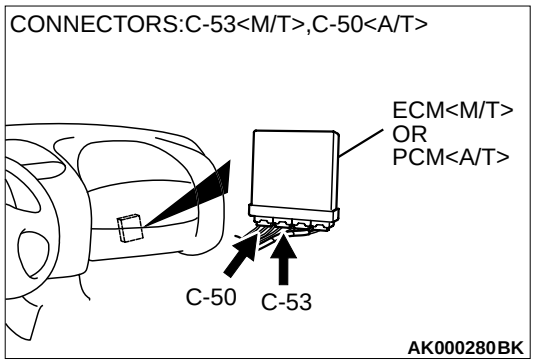
Q: Is the voltage normal?

YES : Go to Step 15.

NO : Go to Step 13.





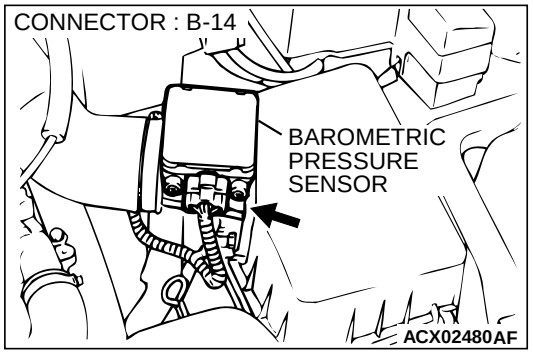


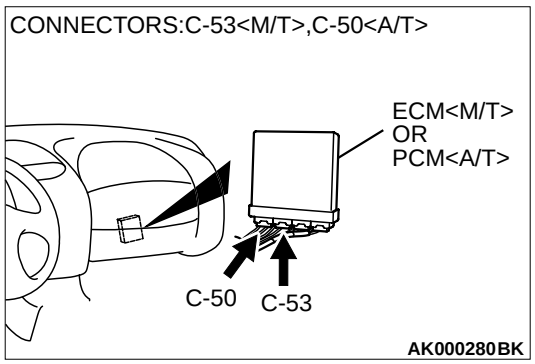
STEP 13. Check connector B-14 at the barometric pressure sensor and connector C-53 at ECM <M/T> or connector C-50 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 18.



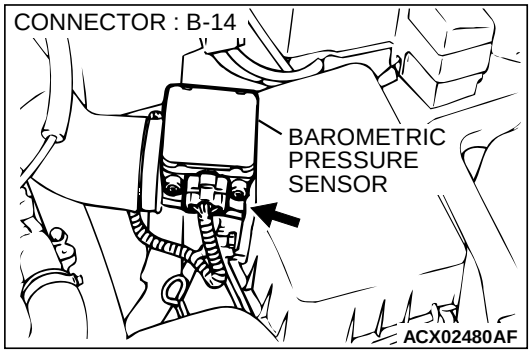


STEP 14. Check for harness damage between barometric pressure sensor connector B-14 (terminal 5) and ECM connector C-53 (terminal 40) <M/T> or PCM connector C-50 (terminal 16) <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 18.

NO : Repair it. Then go to Step 18.

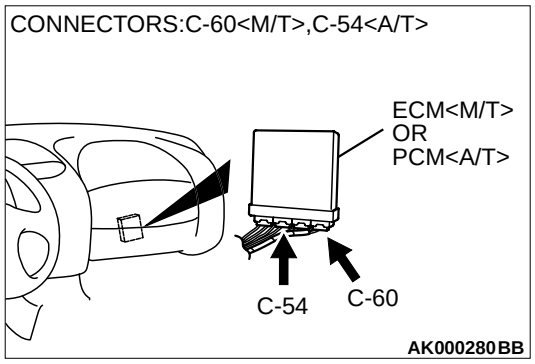


STEP 15. Check connector B-14 at barometric pressure sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 16.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 18.

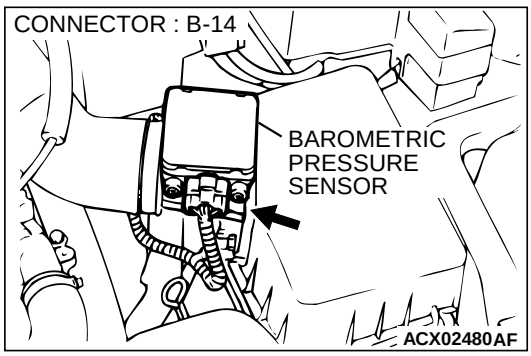


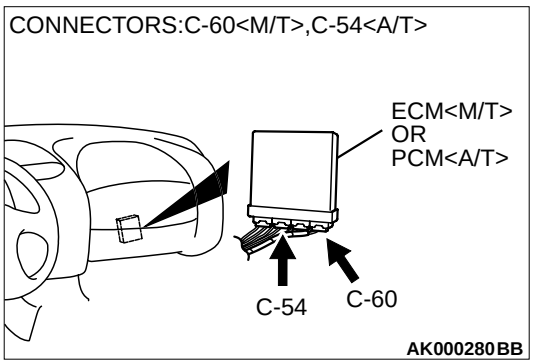
STEP 16. Check connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 17.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 18.





STEP 17. Check for short circuit to ground and harness damage between barometric pressure sensor connector B-14 (terminal 2) and ECM connector C-60 (terminal 85) <M/T> or PCM connector C-54 (terminal 55) <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the volume air flow sensor. Then go to Step 18.

NO : Repair it. Then go to Step 18.

STEP 18. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.

(2) Check the diagnostic trouble code (DTC).

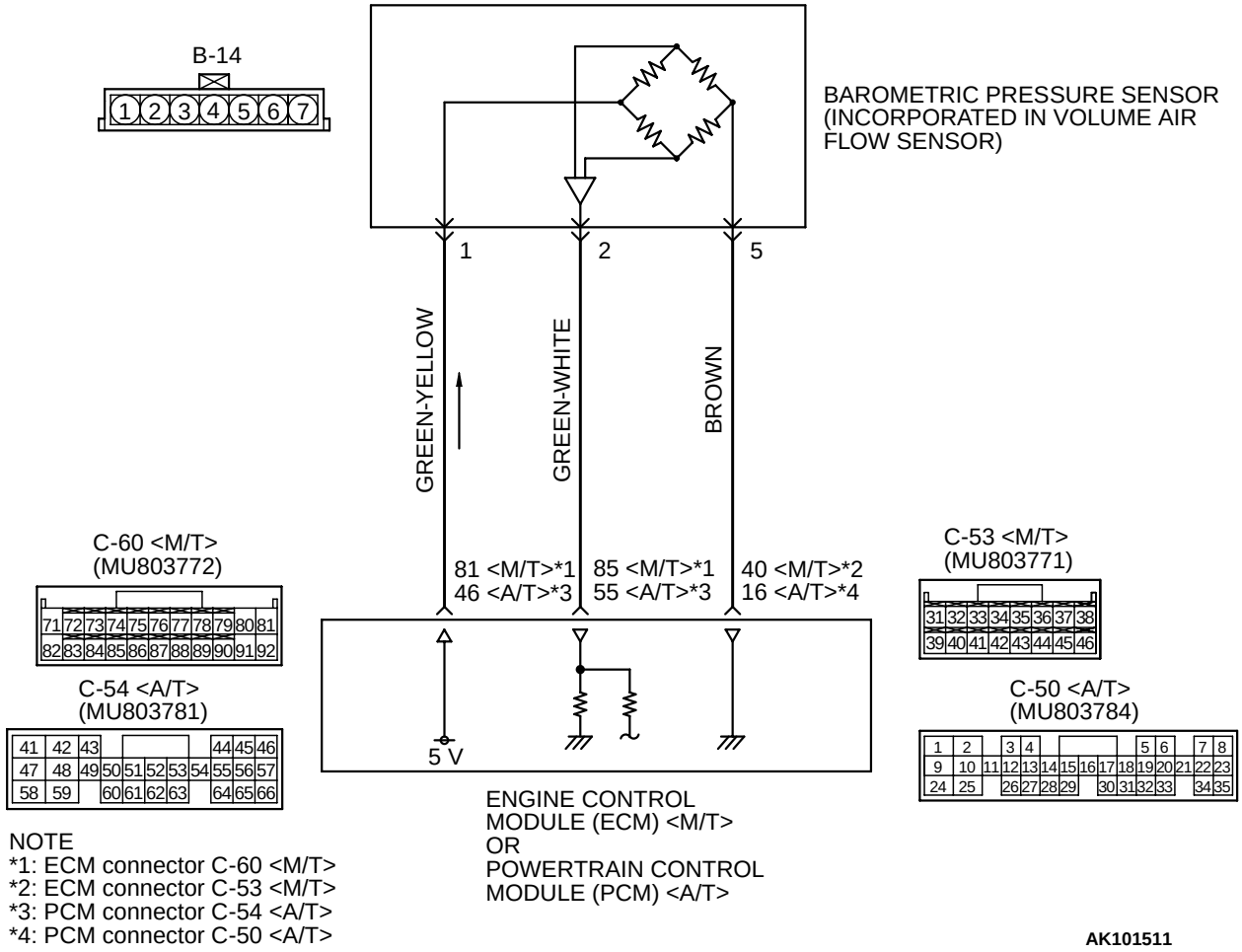
Q: Is the DTC P0107 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0108: Barometric Pressure Circuit High Input

Barometric Pressure Sensor Circuit



NOTE
*1: ECM connector C-60 <M/T>
*2: ECM connector C-53 <M/T>
*3: PCM connector C-54 <A/T>
*4: PCM connector C-50 <A/T>

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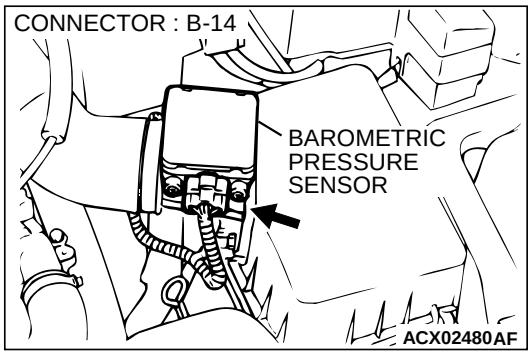
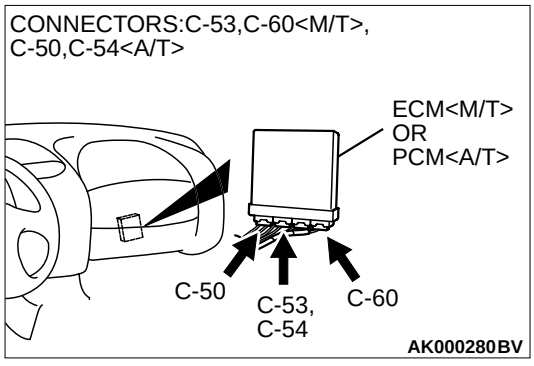




CIRCUIT OPERATION

- A 5-volt voltage is supplied to the barometric pressure sensor power terminal (terminal 1) from the ECM (terminal 81) <M/T> or PCM (terminal 46) <A/T>. The ground terminal (terminal 5) is grounded with ECM (terminal 40) <M/T> or PCM (terminal 16) <A/T>.
- A voltage that is proportional to the atmospheric pressure is sent to the ECM (terminal 85) <M/T> or PCM (terminal 55) <A/T> from the barometric pressure sensor output terminal (terminal 2).

TSB Revision

TECHNICAL DESCRIPTION

- The barometric pressure sensor outputs a voltage which corresponds to the barometric pressure.
- The ECM <M/T> or PCM <A/T> checks whether this voltage is within a specified range.

DTC SET CONDITIONS

Check Conditions

- 2 seconds or more have passed since the starting sequence was completed.
- Battery positive voltage is higher than 8 volts.

Judgement Criteria

- Barometric pressure sensor output has continued to be 113 kPa (16 psi) or higher approximately 4,000 ft below sea level for 10 seconds.

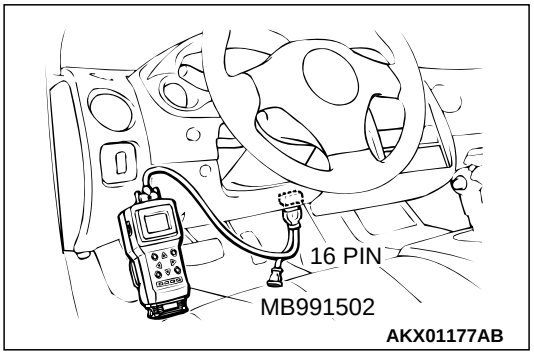
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Barometric pressure sensor failed.
- Open or shorted barometric pressure sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 25: Barometric Pressure Sensor.

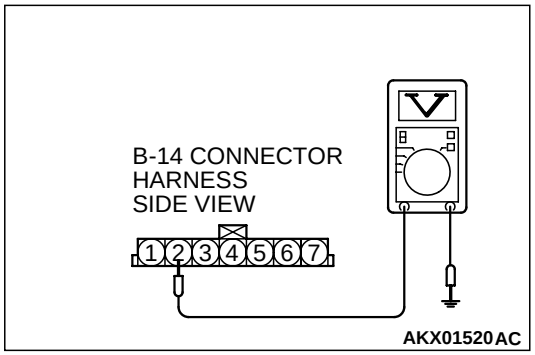
⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 25, Barometric Pressure Sensor.
- When altitude is 0 m (0 foot), 101 kPa.
- When altitude is 600 m (1,969 feet), 95 kPa.
- When altitude is 1,200 m (3,937 feet), 88 kPa.
- When altitude is 1,800 m (5,906 feet), 81 kPa.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Go to Step 2.



STEP 2. Check the sensor output voltage at barometric pressure sensor connector B-14 by backprobing.

(1) Do not disconnect the connector B-14.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 2 and ground by backprobing.
- When altitude is 0 m (0 foot), voltage should be 3.7 and 4.3 volts.
- When altitude is 600 m (1,969 feet), voltage should be 3.4 and 4.0 volts.
- When altitude is 1,200 m (3,937 feet), voltage should be 3.2 and 3.8 volts.
- When altitude is 1,800 m (5,906 feet), voltage should be 2.9 and 3.5 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

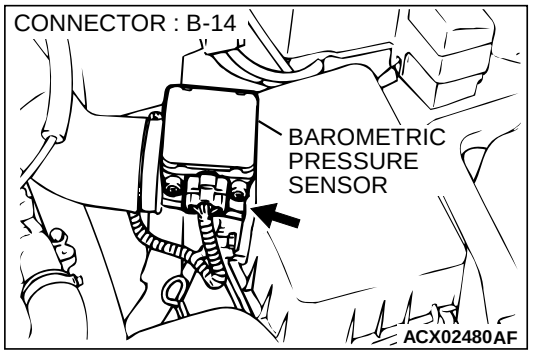
Q: Is the voltage normal?

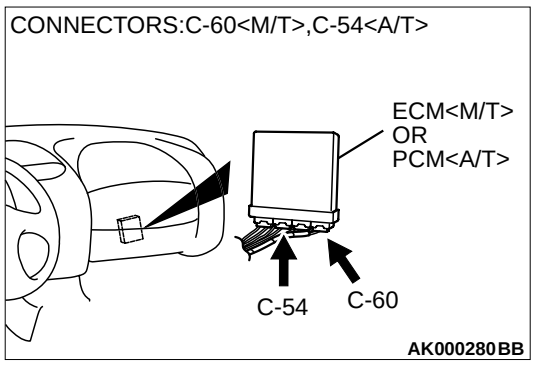
YES : Go to Step 3.
NO : Go to Step 5.

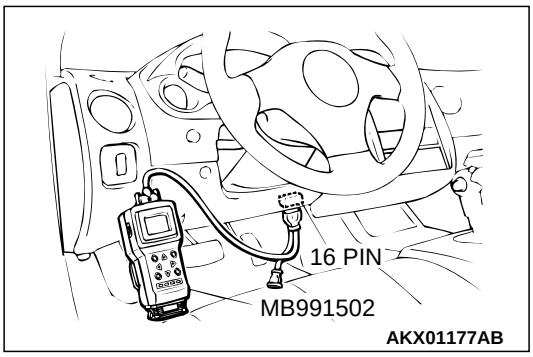
STEP 3. Check connector B-14 at the barometric pressure sensor and connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.







STEP 4. Using scan tool MB991502, check data list item 25: Barometric Pressure Sensor.

⚠ CAUTION

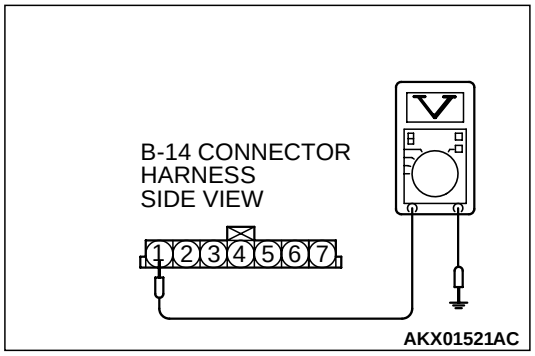
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 25, Barometric Pressure Sensor.
- When altitude is 0 m (0 foot), 101 kPa.
- When altitude is 600 m (1,969 feet), 95 kPa.
- When altitude is 1,200 m (3,937 feet), 88 kPa.
- When altitude is 1,800 m (5,906 feet), 81 kPa.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Replace the ECM or PCM. Then go to Step 12.



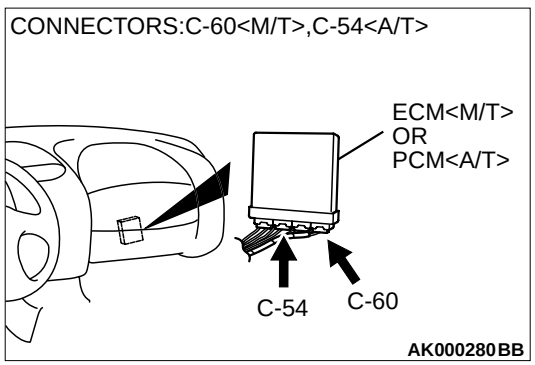
STEP 5. Check the sensor supply voltage at barometric pressure sensor connector B-14 by backprobing.

(1) Do not disconnect the connector B-14.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 1 and ground by backprobing.
- Voltage should be between 4.8 and 5.2 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

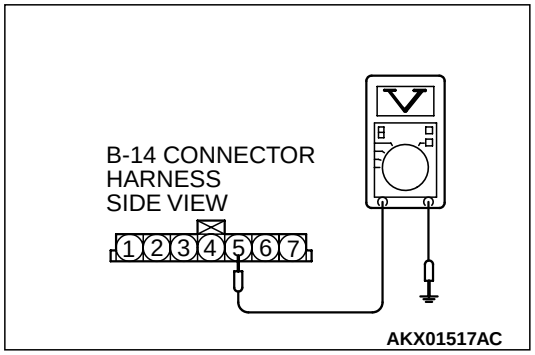
YES : Go to Step 7.
NO : Go to Step 6.



STEP 6. Check connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Replace the ECM or PCM. Then go to Step 12.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



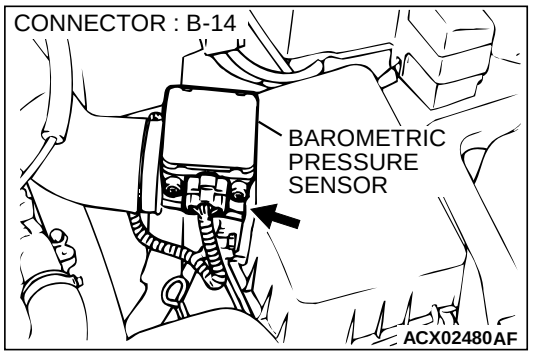
STEP 7. Check the ground voltage at barometric pressure sensor connector B-14 by backprobing.

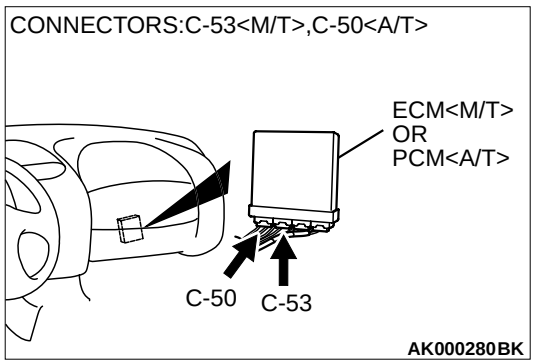
(1) Do not disconnect the connector B-14.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 5 and ground by backprobing.
- Voltage should be 0.5 volt or less.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 10.
NO : Go to Step 8.





STEP 8. Check connector B-14 at the barometric pressure sensor and connector C-53 at ECM <M/T> or connector C-50 at PCM <A/T> for damage.

Q: Is the connector in good condition?

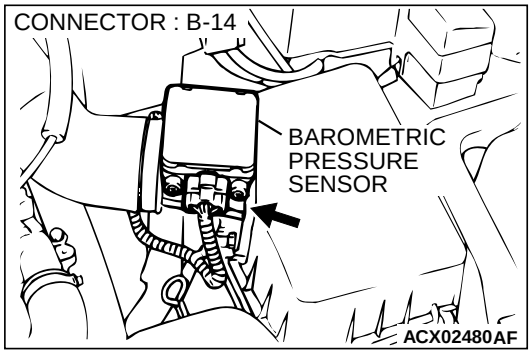
YES : Go to Step 9.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

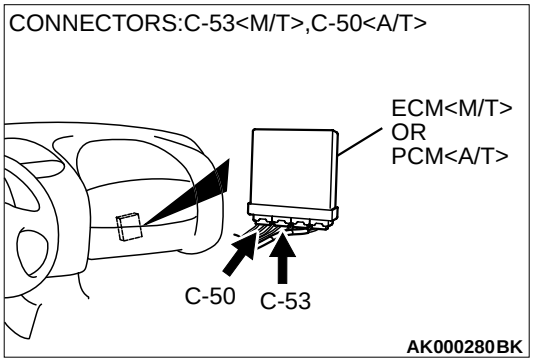
STEP 9. Check for open circuit between barometric pressure sensor connector B-14 (terminal 5) and ECM connector C-53 (terminal 40) <M/T> or PCM connector C-50 (terminal 16) <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 12.

NO : Repair it. Then go to Step 12.



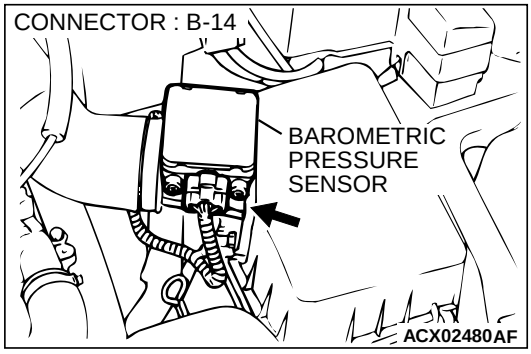


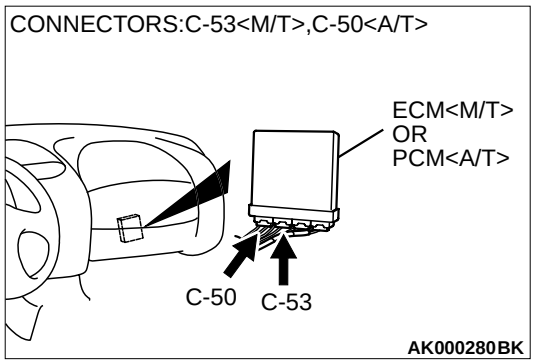
STEP 10. Check connector B-14 at barometric pressure sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 11.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.





STEP 11. Check connector C-53 at ECM <M/T> or connector C-50 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Replace the volume air flow sensor. Then go to Step 12.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 12. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.

(2) Check the diagnostic trouble code (DTC).

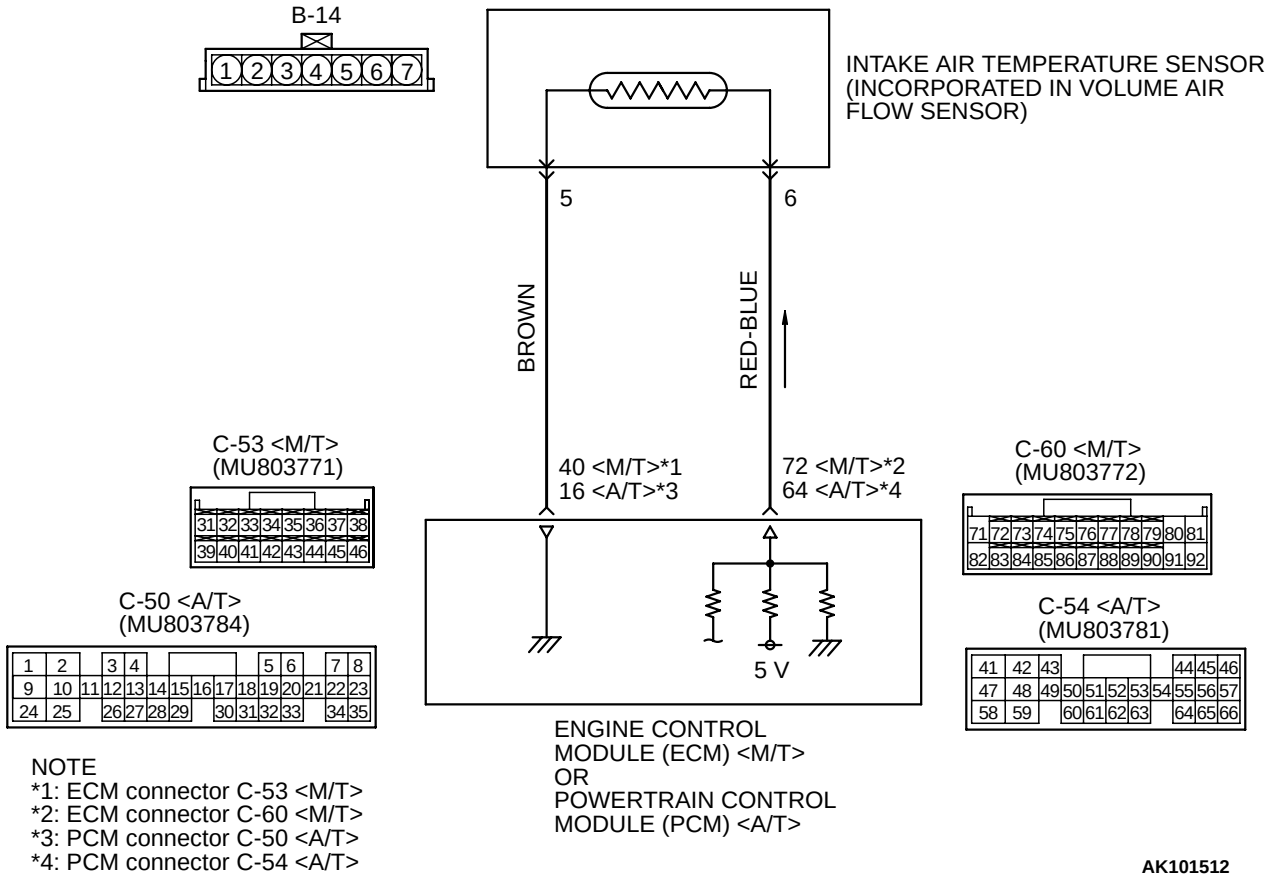
Q: Is the DTC P0108 is output?

YES : Retry the troubleshooting.

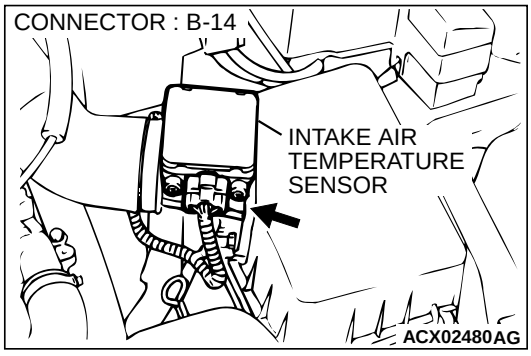
NO : The inspection is complete.

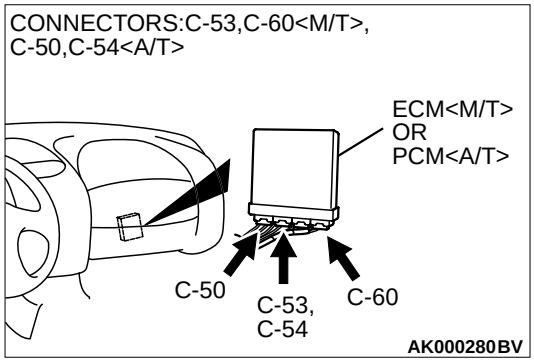
DTC P0111: Intake Air Temperature Circuit Range/Performance Problem

Intake Air Temperature Sensor Circuit



NOTE
*1: ECM connector C-53 <M/T>
*2: ECM connector C-60 <M/T>
*3: PCM connector C-50 <A/T>
*4: PCM connector C-54 <A/T>





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CIRCUIT OPERATION

- Approximately 5 volts are applied to the intake air temperature sensor output terminal (terminal 6) from the ECM (terminal 72) <M/T> or PCM (terminal 64) <A/T> via the resistor in the ECM <M/T> or PCM <A/T>. The ground terminal (terminal 5) is grounded with ECM (terminal 40) <M/T> or PCM (terminal 16) <A/T>.
- The intake air temperature sensor is a negative temperature coefficient type of resistor. When the intake air temperature rises, the resistance decreases.
- The intake air temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases.

TECHNICAL DESCRIPTION

- The intake air temperature sensor converts the intake air temperature to a voltage.
- The ECM <M/T> or PCM <A/T> checks whether this voltage is within a specified range.

DTC SET CONDITIONS

Check Conditions

- Engine coolant temperature is higher than 76°C (169°F).
- Repeat 5 or more times: drive[*1], stop[*2].

  Drive[*1]: vehicle speed higher than 50 km/h (31 mph) lasting a total of more than 60 seconds.

  Stop[*2]: vehicle speed lower than 1.5 km/h (0.9 mph) lasting more than 30 seconds.

Judgement Criteria

- Changes in the intake air temperature is lower than 1°C (1.8°F).

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Intake air temperature sensor failed.
- Open or shorted intake air temperature sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools

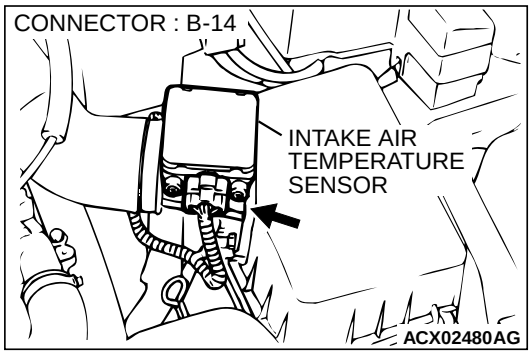
- MB991502: Scan Tool (MUT-II)

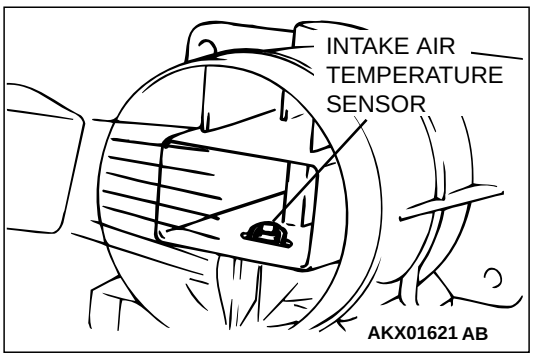
STEP 1. Using scan tool MB991502, check data list item 13: Intake Air Temperature Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Remove the air intake hose from the volume air flow sensor.
(3) Turn the ignition switch to the "ON" position.
(4) Set scan tool MB991502 to the data reading mode for item 13, Intake Air Temperature Sensor.





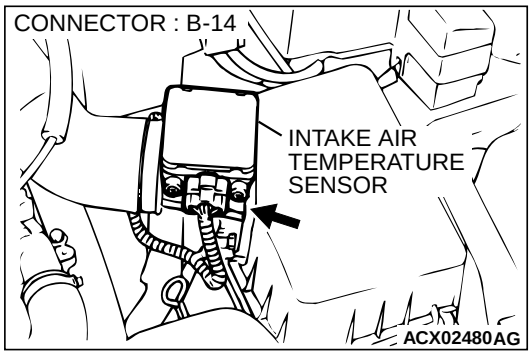
(5) Heating the sensor using a hair drier.
  - The indicated temperature increases.

  NOTE: Do not allow it to increase over 80°C (176°F).
(6) Turn the ignition switch to the "LOCK" (OFF) position.
(7) Attach the air intake hose.

Q: Is the sensor operating properly?

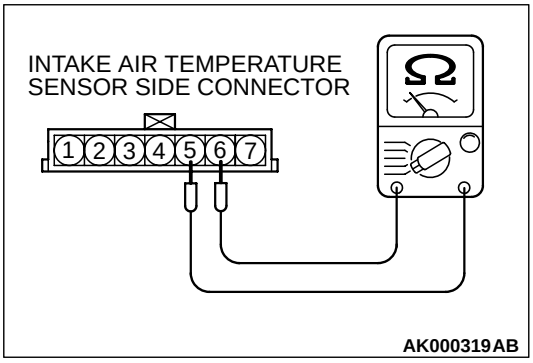
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

NO : Go to Step 2.

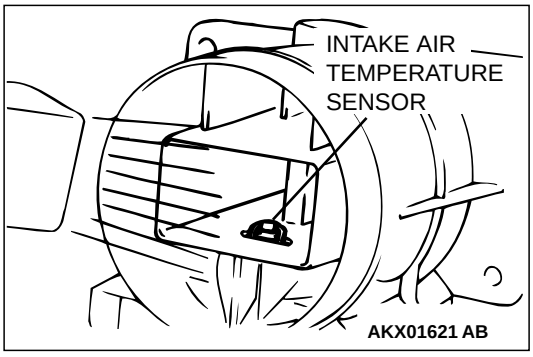


STEP 2. Check the intake air temperature sensor.

(1) Disconnect the intake air temperature sensor connector B-14.



(2) Measure the resistance between intake air temperature sensor side connector terminal 5 and 6.



(3) Measure resistance while heating the sensor using a hair drier.

Standard value:
13 – 17 kΩ [at –20°C (–4°F)]
5.3 – 6.7 kΩ [at 0°C (32°F)]
2.3 – 3.0 kΩ [at 20°C (68°F)]
1.0 – 1.5 kΩ [at 40°C (104°F)]
0.56 – 0.76 kΩ [at 60°C (140°F)]
0.30 – 0.42 kΩ [at 80°C (176°F)]

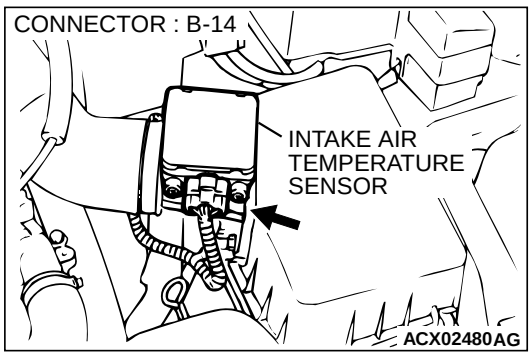
Q: Is the resistance at the standard value?

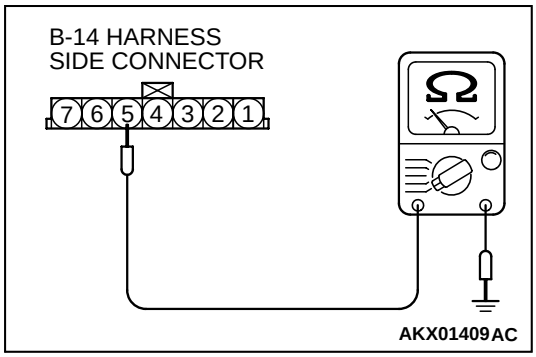
YES : Go to Step 3.
NO : Replace the volume air flow sensor. Then go to Step 9.

STEP 3. Check connector B-14 at the intake air temperature sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.





STEP 4. Check the continuity at intake air temperature sensor harness side connector B-14.

(1) Disconnect the connector B-14 and measure at the harness side.

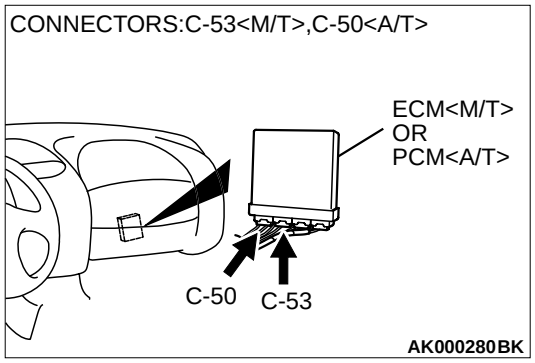
(2) Check for the continuity between terminal 5 and ground.

- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 7.

NO : Go to Step 5.

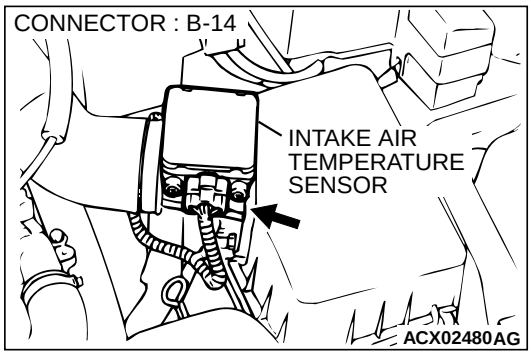


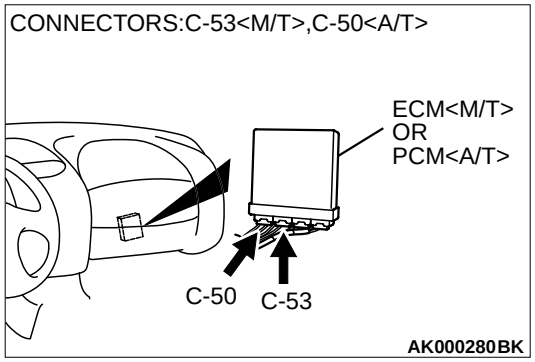
STEP 5. Check connector C-53 at ECM <M/T> or connector C-50 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.





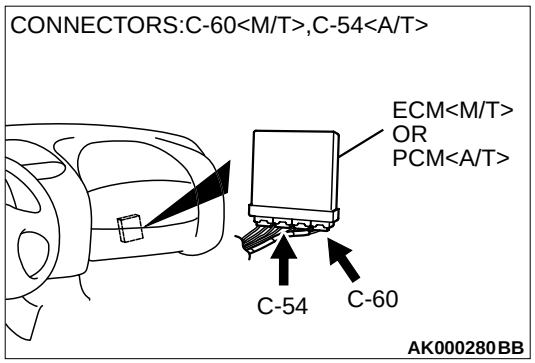
STEP 6. Check for open circuit and harness damage between intake air temperature sensor connector B-14 and ECM connector C-53 <M/T> or PCM connector C-50 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 9.

NO : Repair it. Then go to Step 9.

TSB Revision

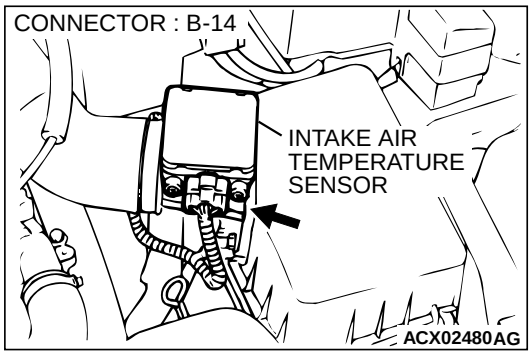


STEP 7. Check connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.

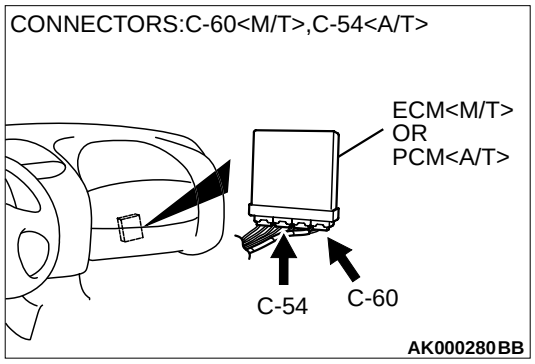


STEP 8. Check for open circuit and harness damage between intake air temperature sensor connector B-14 and ECM connector C-60 <M/T> or PCM connector C-54 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 9.

NO : Repair it. Then go to Step 9.



STEP 9. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.

(2) Check the diagnostic trouble code (DTC).

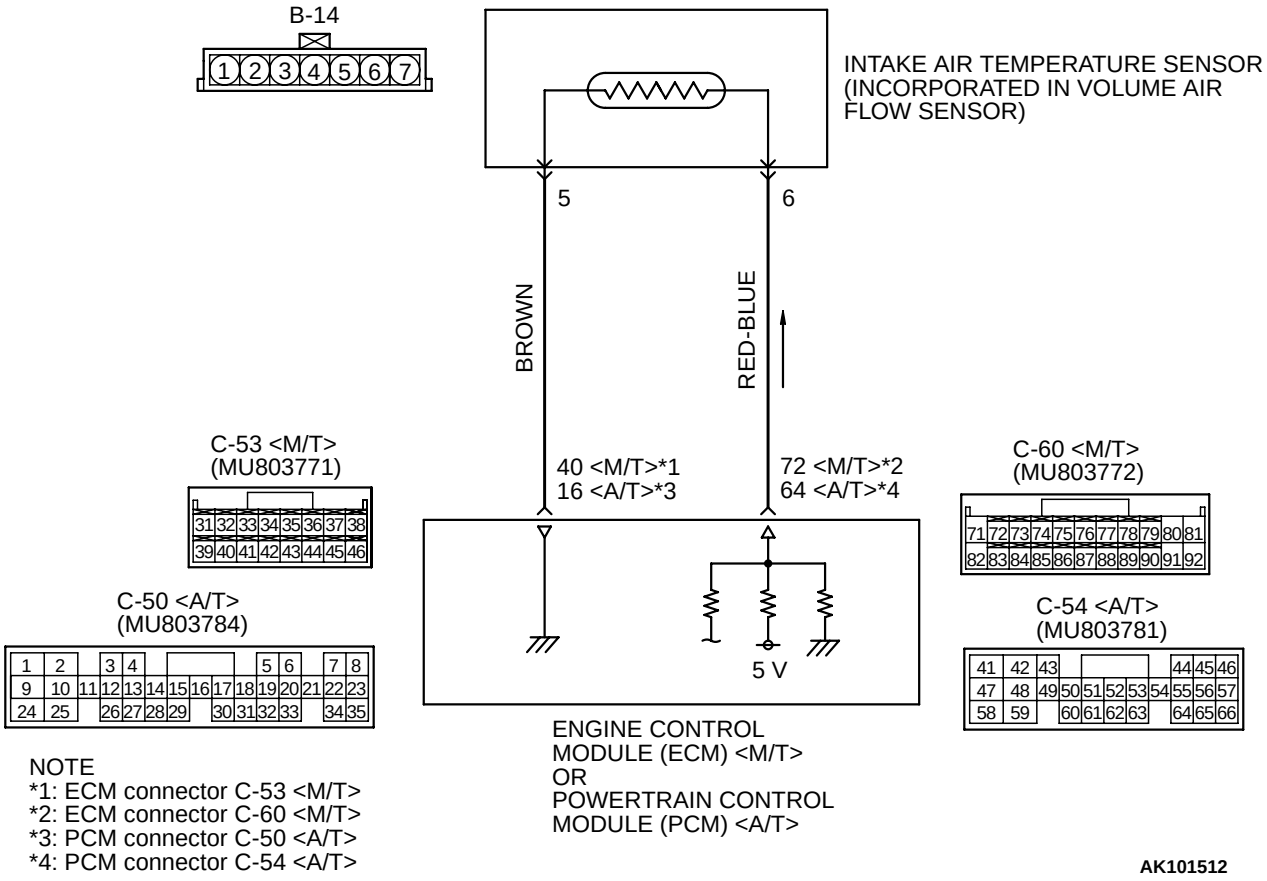
Q: Is the DTC P0111 is output?

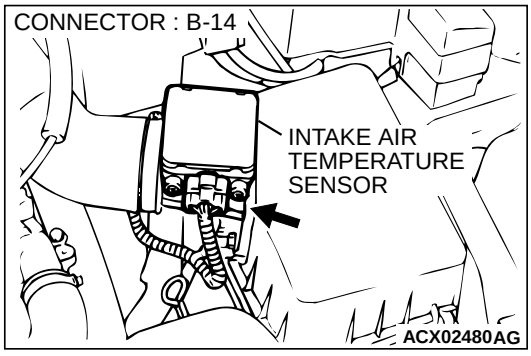
YES : Retry the troubleshooting.

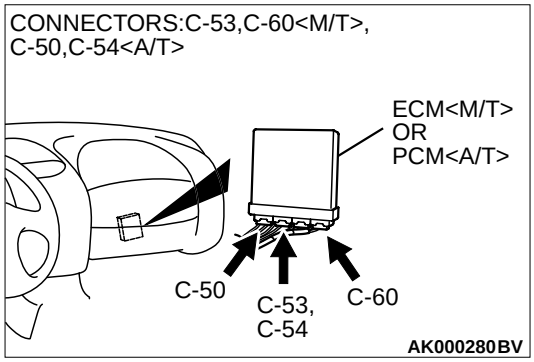
NO : The inspection is complete.

DTC P0112: Intake air temperature Circuit Low Input

Intake Air Temperature Sensor Circuit







TSB Revision

CIRCUIT OPERATION

- Approximately 5 volts are applied to the intake air temperature sensor output terminal (terminal 6) from the ECM (terminal 72) <M/T> or PCM (terminal 64) <A/T> via the resistor in the ECM <M/T> or PCM <A/T>. The ground terminal (terminal 5) is grounded with ECM (terminal 40) <M/T> or PCM (terminal 16) <A/T>.
- The intake air temperature sensor is a negative temperature coefficient type of resistor. When the intake air temperature rises, the resistance decreases.
- The intake air temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases.

TECHNICAL DESCRIPTION

- The intake air temperature sensor converts the intake air temperature to a voltage.
- The ECM <M/T> or PCM <A/T> checks whether this voltage is within a specified range.

DTC SET CONDITIONS

Check Conditions

- 2 seconds or more have passed since the staring sequence was completed.

Judgement Criteria

- Intake air temperature sensor output voltage has continued to be 0.2 volt or lower [corresponding to an air intake temperature of 115°C (239°F) or higher] for 2 seconds.

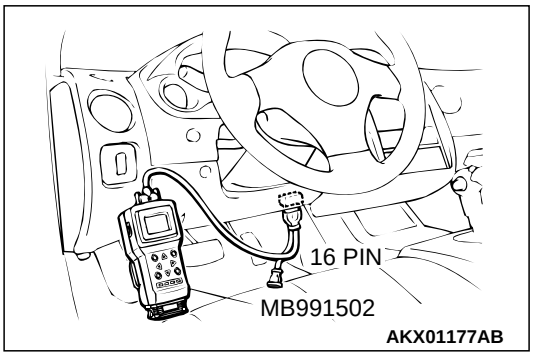
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Intake air temperature sensor failed.
- Open or shorted intake air temperature sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 13: Intake Air Temperature Sensor.

⚠ CAUTION

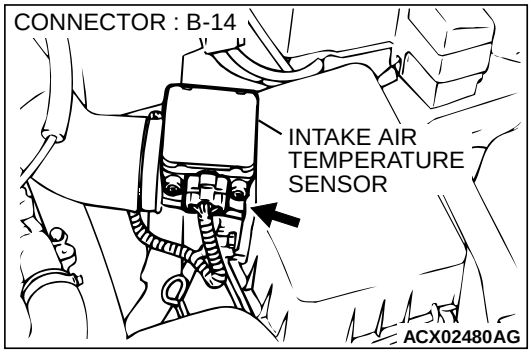
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 13, Intake Air Temperature Sensor.
  - The intake air temperature and temperature shown with the scan tool should approximately match.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

NO : Go to Step 2.

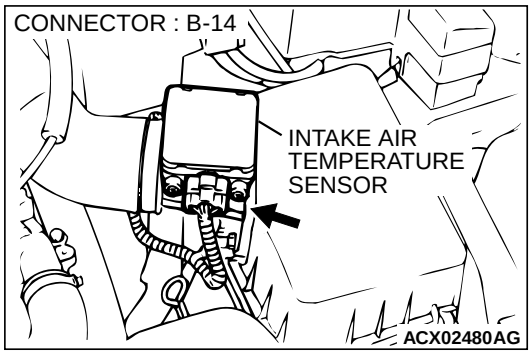


STEP 2. Check connector B-14 at the intake air temperature sensor for damage.

Q: Is the connector in good condition?

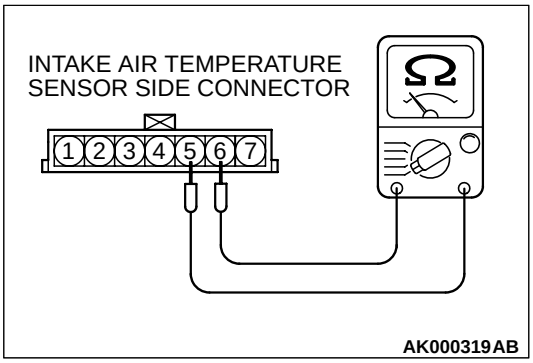
YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.



STEP 3. Check the intake air temperature sensor.

(1) Disconnect the intake air temperature sensor connector B-14.



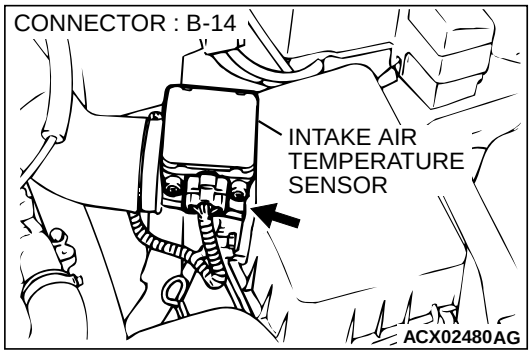
(2) Measure the resistance between intake air temperature sensor side connector terminal 5 and 6.
- There should be continuity. (0.30 – 1.0 kΩ)

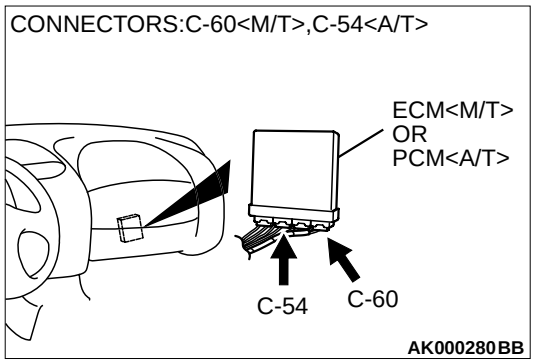
Q: Is the resistance normal?

YES : Go to Step 4.

NO : Replace the volume air flow sensor. Then go to Step 6.

STEP 4. Check for short circuit to ground between intake air temperature sensor connector B-14 and ECM connector C-60 <M/T> or PCM connector C-54 <A/T>.

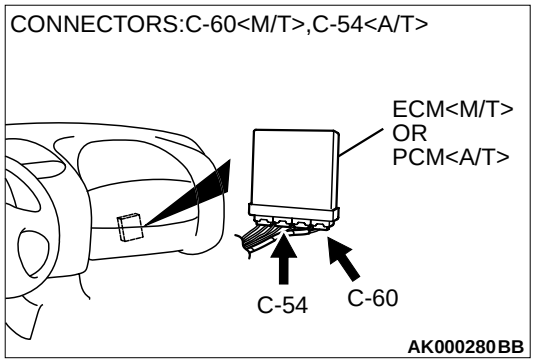




Q: Is the harness wire in good condition?

YES : Go to Step 5.
NO : Repair it. Then go to Step 6.

STEP 5. Check connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.



Q: Is the connector in good condition?

YES : Replace the ECM or PCM. Then go to Step 6.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.

STEP 6. Test the OBD-II drive cycle.

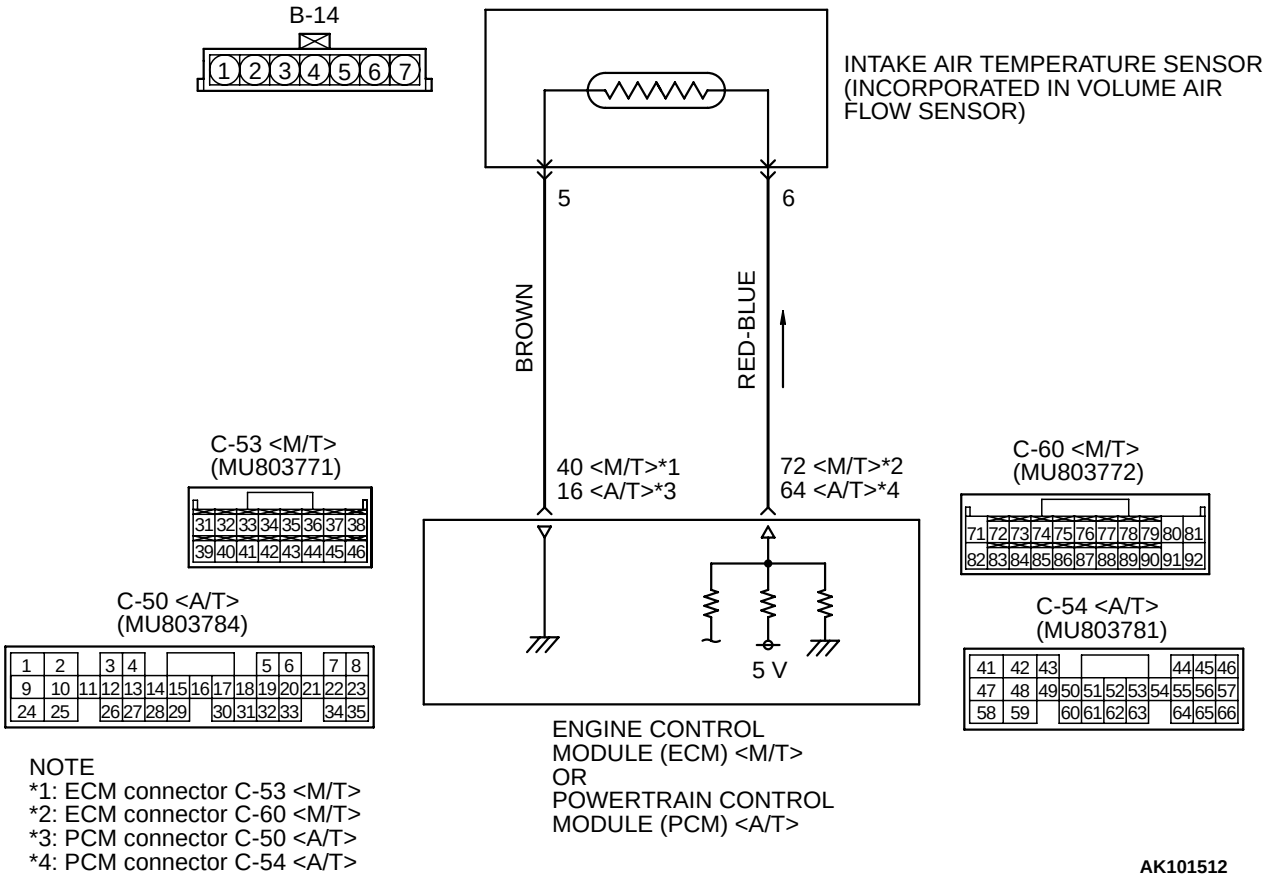
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.
(2) Check the diagnostic trouble code (DTC).

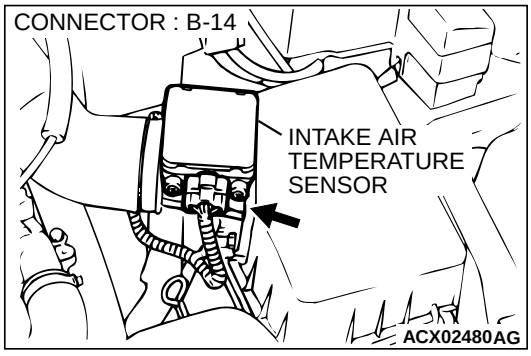
Q: Is the DTC P0112 is output?

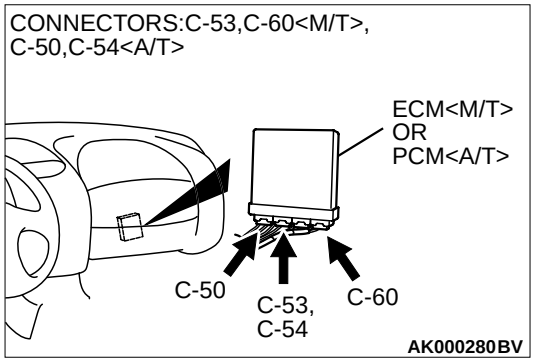
YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0113: Intake air temperature Circuit High Input

Intake Air Temperature Sensor Circuit







TSB Revision

CIRCUIT OPERATION

- Approximately 5 volts are applied to the intake air temperature sensor output terminal (terminal 6) from the ECM (terminal 72) <M/T> or PCM (terminal 64) <A/T> via the resistor in the ECM <M/T> or PCM <A/T>. The ground terminal (terminal 5) is grounded with ECM (terminal 40) <M/T> or PCM (terminal 16) <A/T>.
- The intake air temperature sensor is a negative temperature coefficient type of resistor. When the intake air temperature rises, the resistance decreases.
- The intake air temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases.

TECHNICAL DESCRIPTION

- The intake air temperature sensor converts the intake air temperature to a voltage.
- The ECM <M/T> or PCM <A/T> checks whether this voltage is within a specified range.

DTC SET CONDITIONS

Check Conditions

- 2 seconds or more have passed since the staring sequence was completed.

Judgement Criteria

- Intake air temperature sensor output voltage has continued to be 4.5 volts or higher [corresponding to an air intake temperature of –40°C (–104°F) or lower] for 2 seconds.

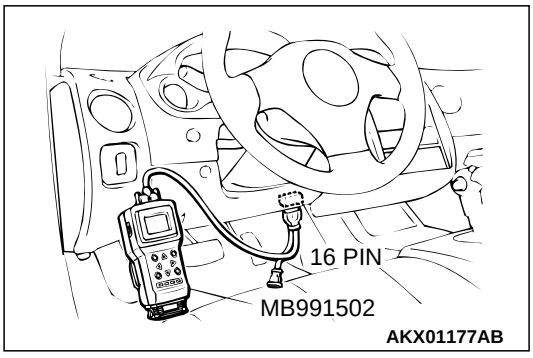
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Intake air temperature sensor failed.
- Open or shorted intake air temperature sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools

- MB991502: Scan Tool (MUT-II)



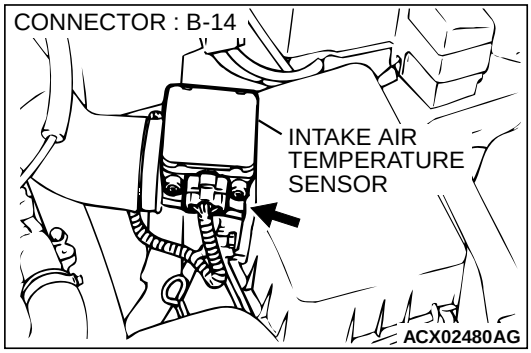
STEP 1. Using scan tool MB991502, check data list item 13: Intake Air Temperature Sensor.

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 13, Intake Air Temperature Sensor.
  - The intake air temperature and temperature shown with the scan tool should approximately match.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Go to Step 2.

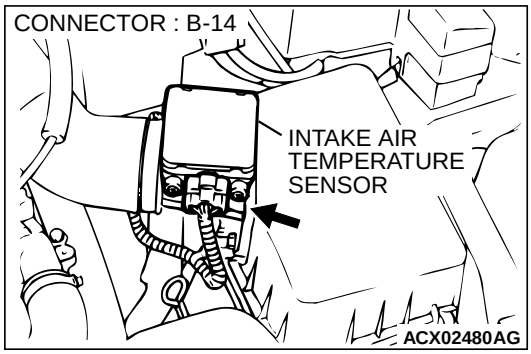


STEP 2. Check connector B-14 at the intake air temperature sensor for damage.

Q: Is the connector in good condition?

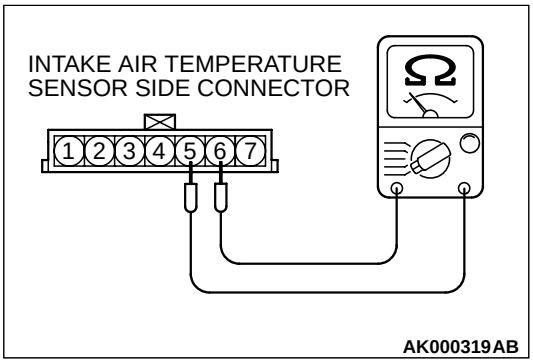
YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.



STEP 3. Check the intake air temperature sensor.

(1) Disconnect the intake air temperature sensor connector B-14.



(2) Measure the resistance between intake air temperature sensor side connector terminal 5 and 6.
- There should be continuity. (0.30 – 1.0 kΩ)

Q: Is the resistance normal?

YES : Go to Step 4.

NO : Replace the volume air flow sensor. Then go to Step 11.

STEP 4. Check the sensor supply voltage at intake air temperature sensor harness side connector B-14.

(1) Disconnect the connector B-14 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.

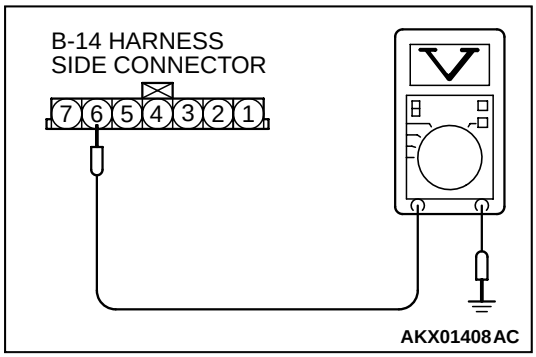
(3) Measure the voltage between terminal 6 and ground.
- Voltage should be between 4.5 and 4.9 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 8.

NO : Go to Step 5.



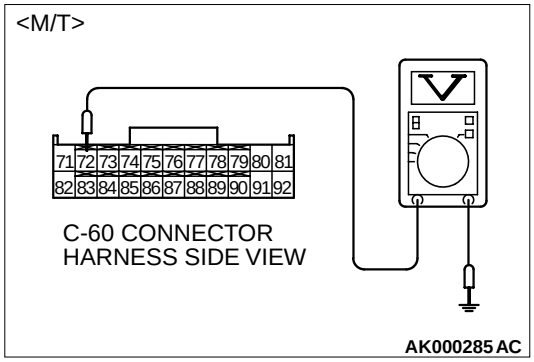
STEP 5. Check the sensor supply voltage at ECM connector C-60 <M/T> or PCM connector C-54 <A/T> by backprobing.

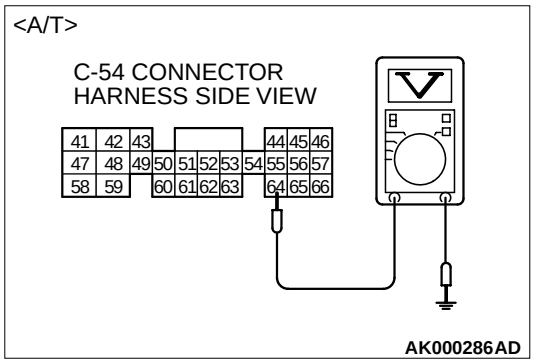
(1) Do not disconnect the ECM connector C-60 <M/T> or PCM connector C-54 <A/T>.
(2) Disconnect the intake air temperature sensor connector B-14.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the voltage between terminal 72 <M/T> or 64 <A/T> and ground by backprobing.
- Voltage should be between 4.5 and 4.9 volts.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 6.
NO : Go to Step 7.

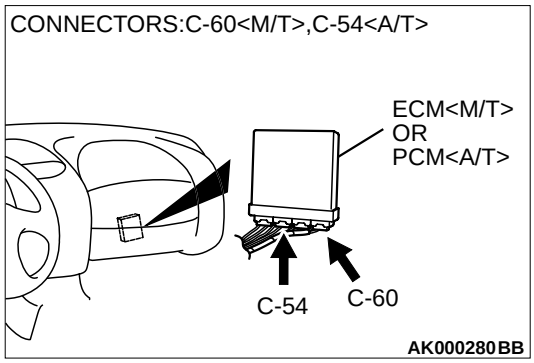


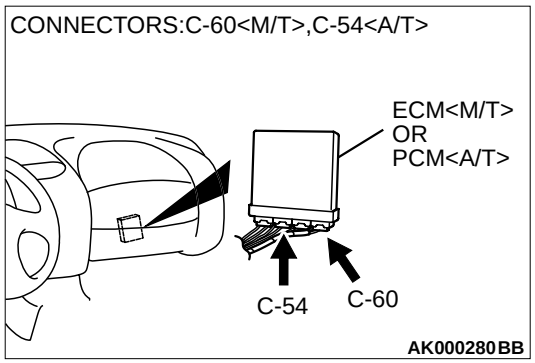


STEP 6. Check connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between intake air temperature sensor connector B-14 and ECM connector C-60 <M/T> or PCM connector C-54 <A/T> because of open circuit. Then go to Step 11.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.



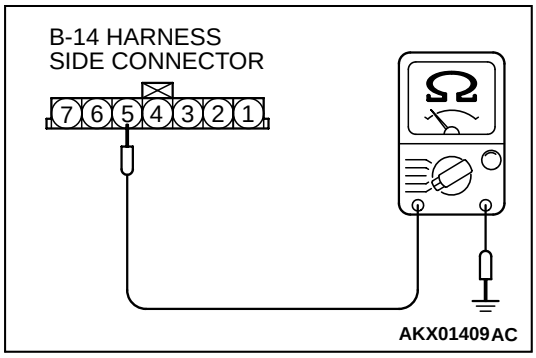


STEP 7. Check connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Replace the ECM or PCM. Then go to Step 11.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.



STEP 8. Check the continuity at intake air temperature sensor harness side connector B-14.

(1) Disconnect the connector B-14 and measure at the harness side.

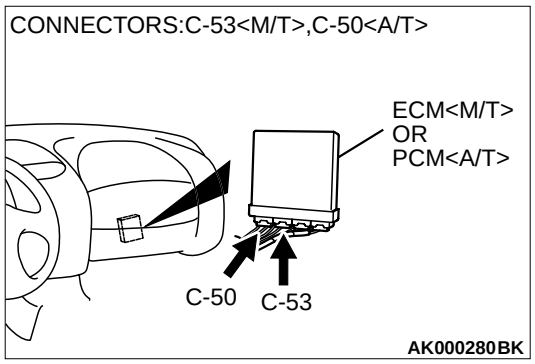
(2) Check for the continuity between terminal 5 and ground.

- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Replace the ECM or PCM. Then go to Step 11.

NO : Go to Step 9.

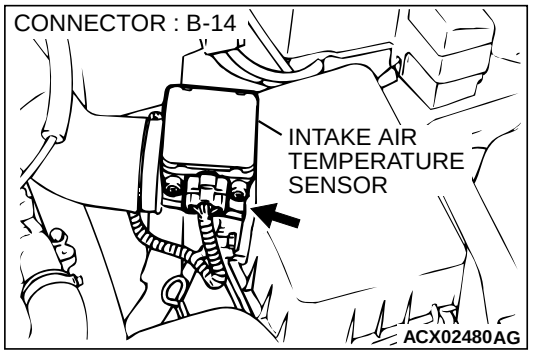


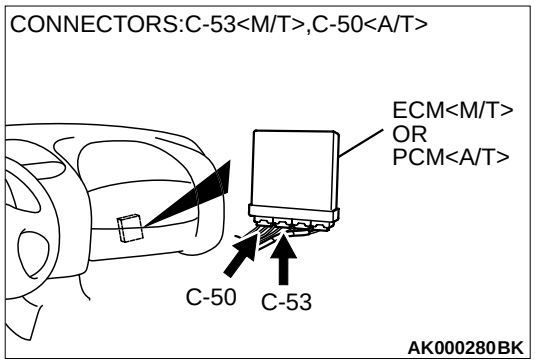
STEP 9. Check connector C-53 at ECM <M/T> or connector C-50 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.





STEP 10. Check for open circuit between intake air temperature sensor connector B-14 and ECM connector C-53 <M/T> or PCM connector C-50 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 11.

NO : Repair it. Then go to Step 11.

STEP 11. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.

(2) Check the diagnostic trouble code (DTC).

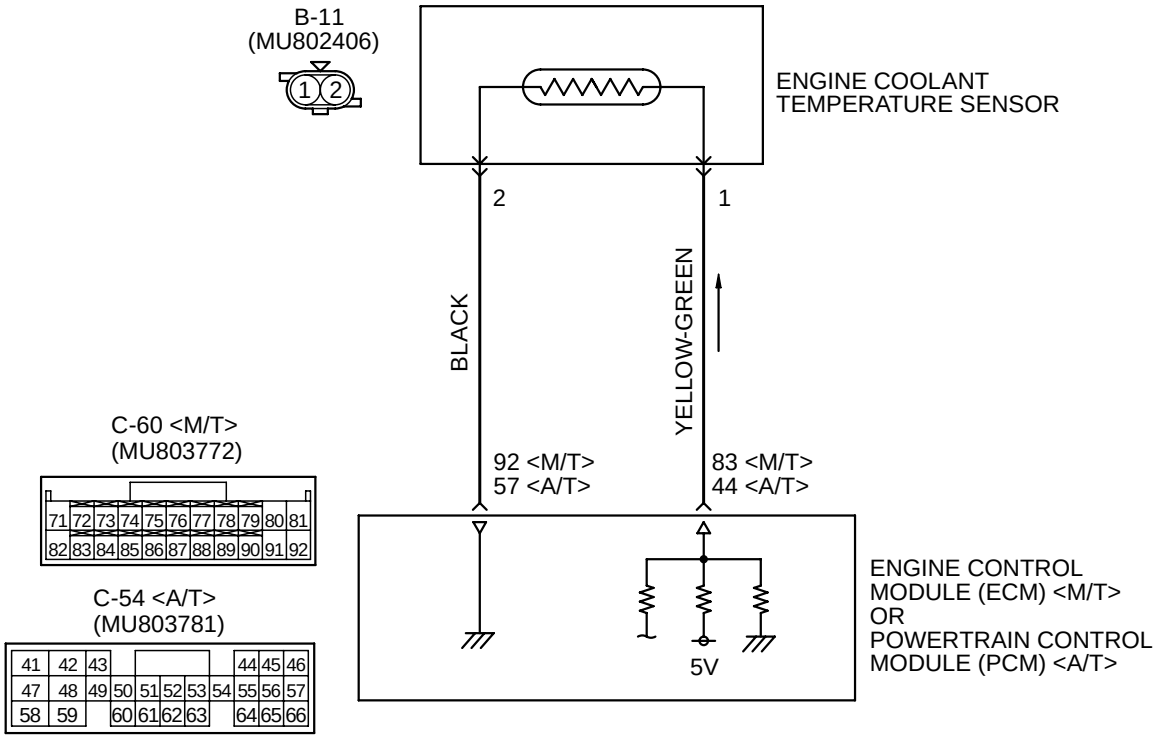
Q: Is the DTC P0113 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0116: Engine Coolant Temperature Circuit Range/Performance Problem

Engine Coolant Temperature Sensor Circuit



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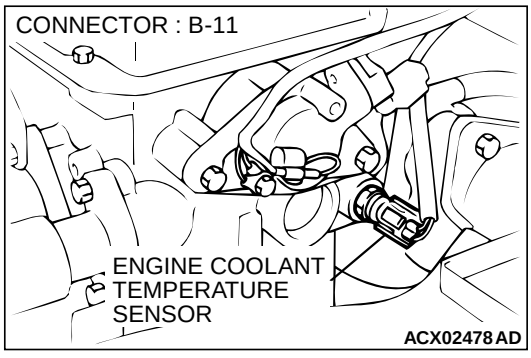
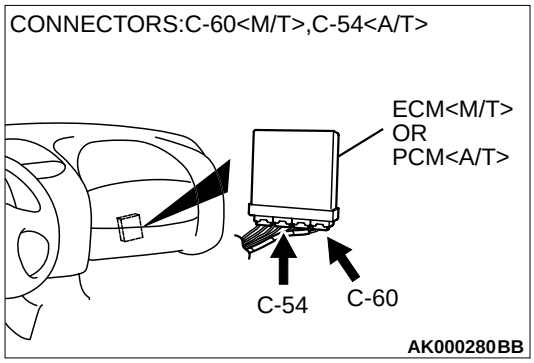




CIRCUIT OPERATION

- 5-volt voltage is applied to the engine coolant temperature sensor output terminal (terminal 1) from the ECM (terminal 83) <M/T> or PCM (terminal 44) <A/T> via the resistor in the ECM <M/T> or PCM <A/T>. The ground terminal (terminal 2) is grounded with ECM (terminal 92) <M/T> or (terminal 57) <A/T>.
- The engine coolant temperature sensor is a negative temperature coefficient type of resistor. It has the characteristic that when the engine coolant temperature rises the resistor decreases.
- The engine coolant temperature sensor output voltage increases when the resistor increases and decreases when the resistor decreases.

TSB Revision

TECHNICAL DESCRIPTION

- The engine coolant temperature sensor converts the engine coolant temperature to a voltage and output it.
- The ECM <M/T> or PCM <A/T> checks whether this voltage is within a specified range.

DTC SET CONDITIONS

Check Conditions

- Engine coolant temperature was 7°C (45°F) or more immediately before the engine was stopped at the last drive.
- Engine coolant temperature was 7°C (45°F) or more when the engine started.

Judgement Criteria

- Engine coolant temperature fluctuates within 1°C (1.8°F) after 5 minutes have passed since the engine was started.
- However, time is not counted if any of the following conditions are met.
  1. Intake air temperature is 60°C (140°F) or more.
  2. Volume air flow sensor output frequency is 70 Hz or less.
  3. During fuel shut-off operation.
- The ECM <M/T> or PCM <A/T> monitors for this condition once during the drive cycle.

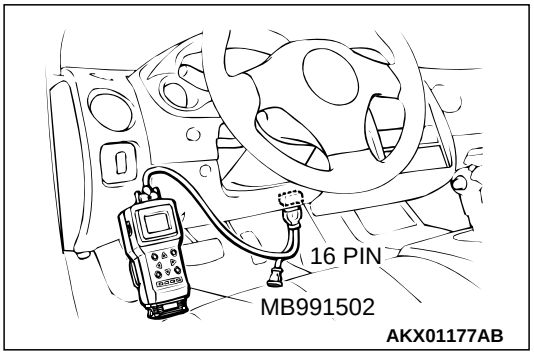
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Engine coolant temperature sensor failed.
- Open or shorted engine coolant temperature sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 21: Engine Coolant Temperature Sensor.

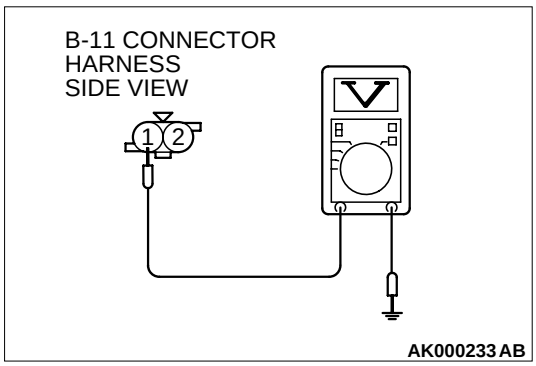
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 21, Engine Coolant Temperature Sensor.
  - The engine coolant temperature and temperature shown with the scan tool should approximately match.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Go to Step 2.



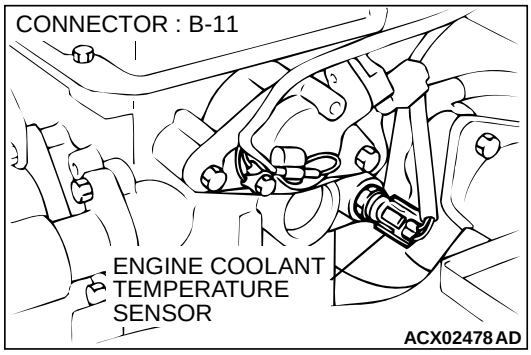
STEP 2. Check the sensor output voltage at engine coolant temperature sensor connector B-11 by backprobing.

(1) Do not disconnect the connector B-11.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 1 and ground by backprobing.
- When engine coolant temperature is –20°C (–4°F), voltage should be 3.9 and 4.5 volts.
- When engine coolant temperature is 0°C (32°F), voltage should be 3.2 and 3.8 volts.
- When engine coolant temperature is 20°C (68°F), voltage should be 2.3 and 2.9 volts.
- When engine coolant temperature is 40°C (104°F), voltage should be 1.3 and 1.9 volts.
- When engine coolant temperature is 60°C (140°F), voltage should be 0.7 and 1.3 volts.
- When engine coolant temperature is 80°C (176°F), voltage should be 0.3 and 0.9 volt.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

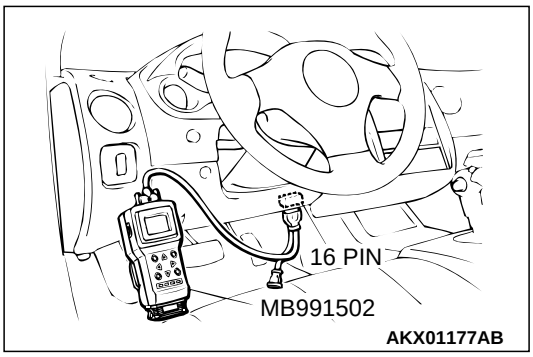
YES : Go to Step 3.
NO : Go to Step 5.



STEP 3. Check connector B-11 at the engine coolant temperature sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP 4. Using scan tool MB991502, check data list item 21: Engine Coolant Temperature Sensor.

⚠ CAUTION

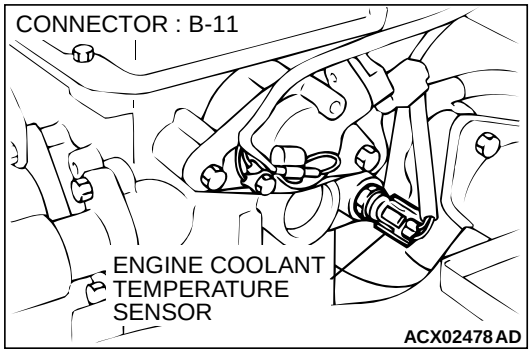
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 21, Engine Coolant Temperature Sensor.
- The engine coolant temperature and temperature shown with the scan tool should approximately match.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

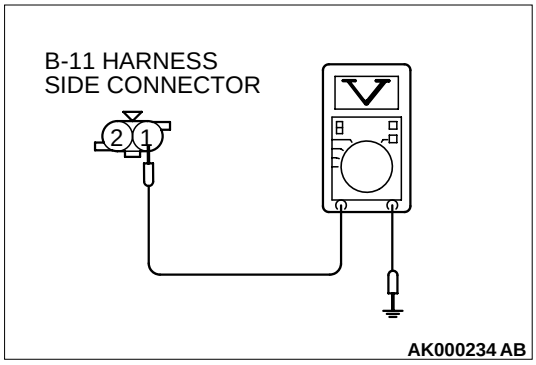
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Replace the ECM or PCM. Then go to Step 14.



STEP 5. Check connector B-11 at engine coolant temperature sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 6.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



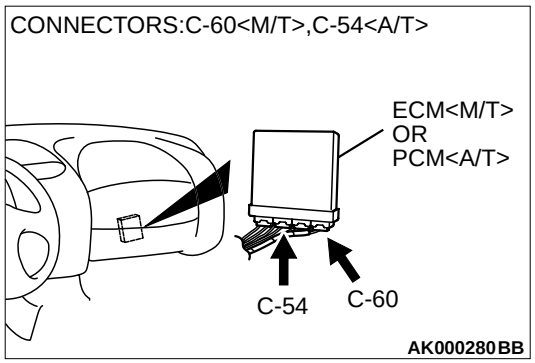
STEP 6. Check the sensor supply voltage at engine coolant temperature sensor harness side connector B-11.

(1) Disconnect the connector B-11 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 1 and ground.
- Voltage should be between 4.5 and 4.9 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 8.
NO : Go to Step 7.

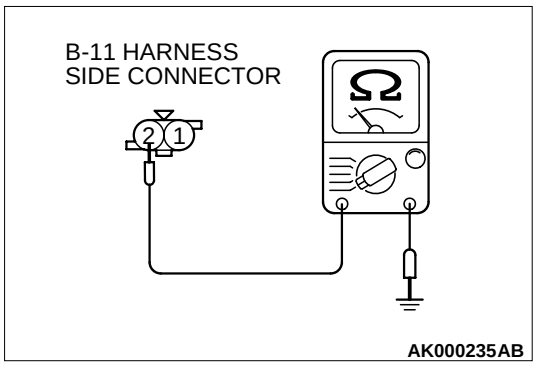


STEP 7. Check connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Replace the ECM or PCM. Then go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP 8. Check the continuity at engine coolant temperature sensor harness side connector B-11.

(1) Disconnect the connector B-11 and measure at the harness side.

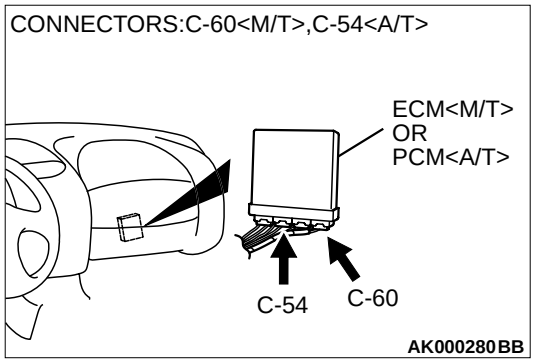
(2) Check for the continuity between terminal 2 and ground.

- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 11.

NO : Go to Step 9.

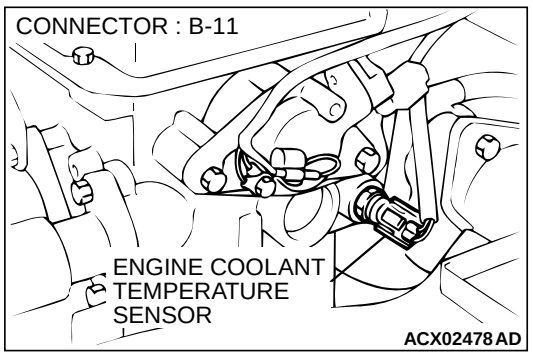


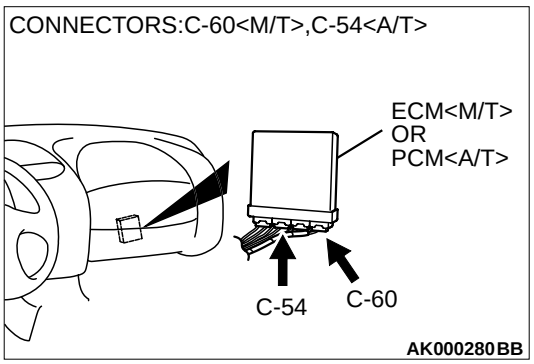
STEP 9. Check connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



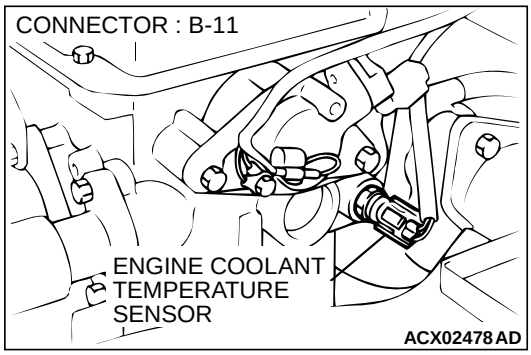


STEP 10. Check for harness damage between engine coolant temperature sensor connector B-11 (terminal 2) and ECM connector C-60 (terminal 92) <M/T> or PCM connector C-54 (terminal 57) <A/T>.

Q: Is the harness wire in good condition?

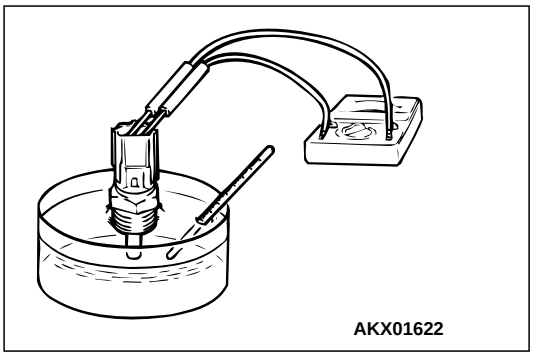
YES : Replace the ECM or PCM. Then go to Step 14.

NO : Repair it. Then go to Step 14.



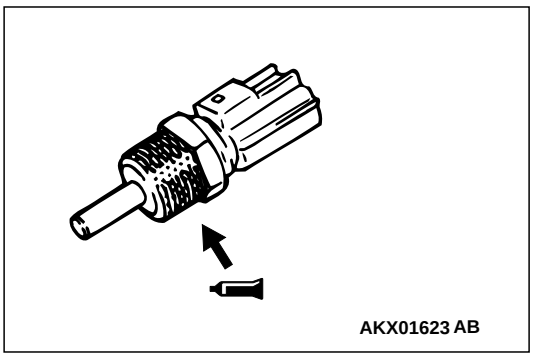
STEP 11. Check the engine coolant temperature sensor.

(1) Disconnect the engine coolant temperature sensor connector B-11.
(2) Remove the engine coolant temperature sensor.



(3) With the temperature sensing portion of engine coolant temperature sensor immersed in hot water, check resistance.

Standard value:
14 – 17 kΩ [at –20°C (–4°F)]
5.1 – 6.5 kΩ [at 0°C (32°F)]
2.1 – 2.7 kΩ [at 20°C (68°F)]
0.9 – 1.3 kΩ [at 40°C (104°F)]
0.48 – 0.68 kΩ [at 60°C (140°F)]
0.26 – 0.36 kΩ [at 80°C (176°F)]



(4) Apply 3M™ AAD part number 8731 or equivalent on the screw section of the engine coolant temperature sensor.
(5) Install the engine coolant temperature sensor, and tighten to the specified torque.

Tightening torque: 29 ± 10 N·m (22 ± 7 ft-lb)

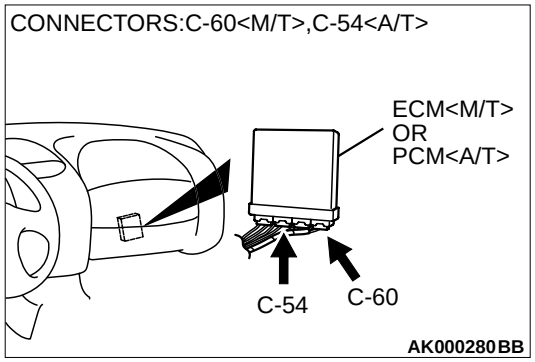
Q: Is the resistance at the standard value?

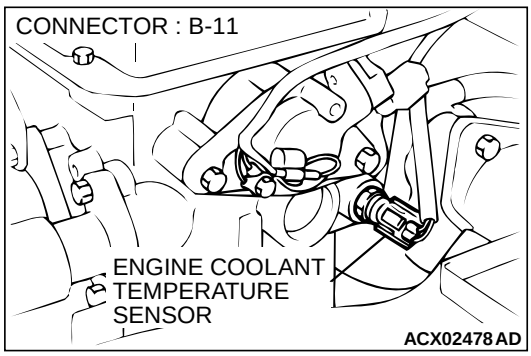
YES : Go to Step 12.
NO : Replace the engine coolant temperature sensor. Then go to Step 14.

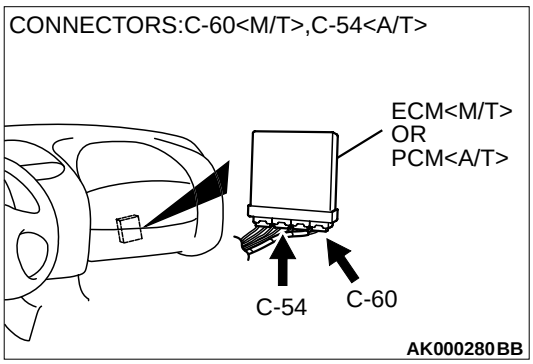
STEP 12. Check connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 13.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.







STEP 13. Check for harness damage between engine coolant temperature sensor connector B-11 (terminal 1) and ECM connector C-60 (terminal 83) <M/T> or PCM connector C-54 (terminal 44) <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 14.

NO : Repair it. Then go to Step 14.

STEP 14. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.

(2) Check the diagnostic trouble code (DTC).

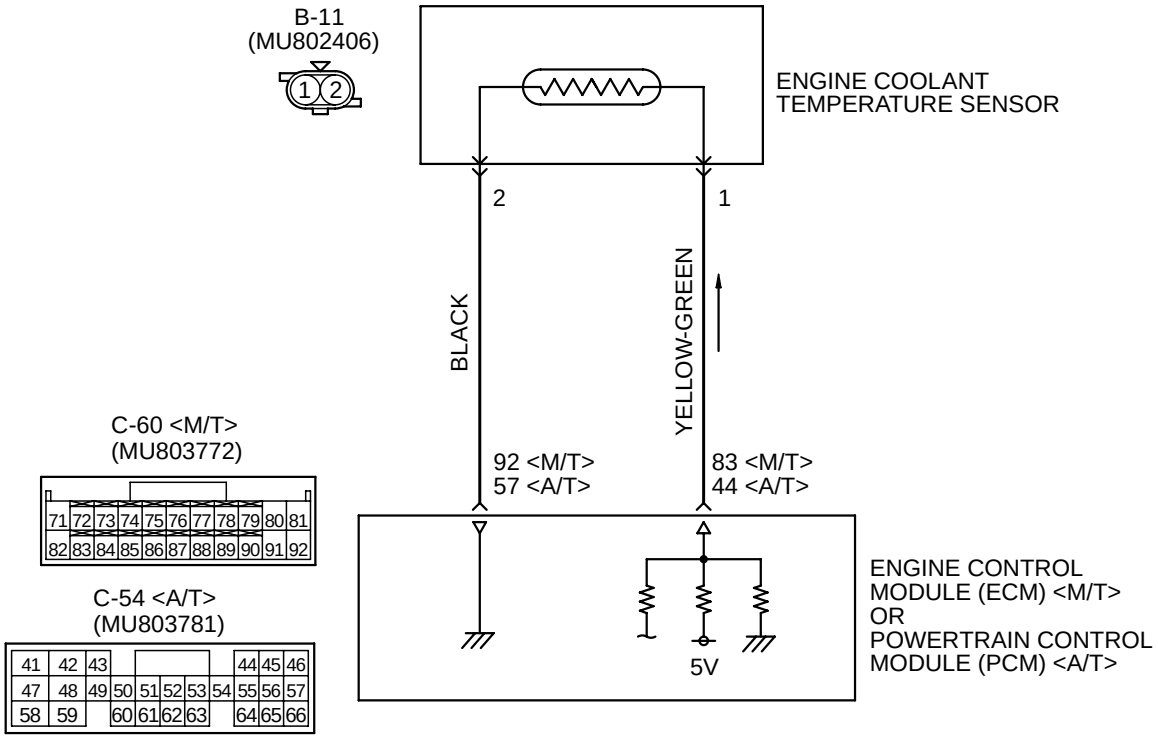
Q: Is the DTC P0116 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0117: Engine Coolant Temperature Circuit Low Input

Engine Coolant Temperature Sensor Circuit



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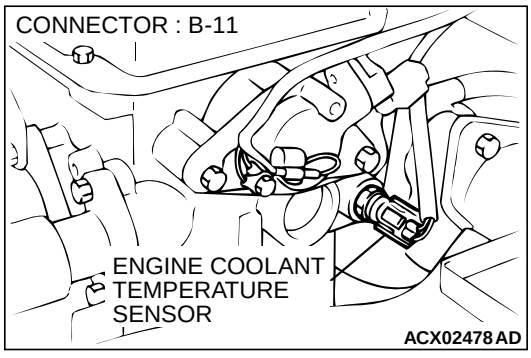
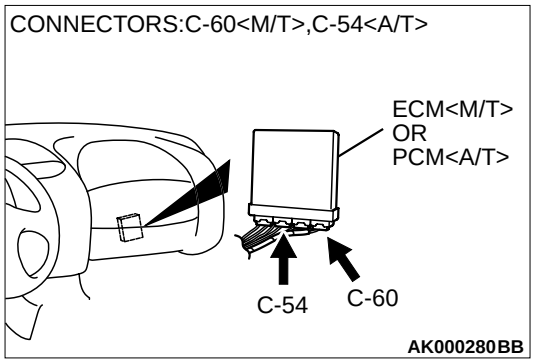




CIRCUIT OPERATION

- 5-volt voltage is applied to the engine coolant temperature sensor output terminal (terminal 1) from the ECM (terminal 83) <M/T> or PCM (terminal 44) <A/T> via the resistor in the ECM <M/T> or PCM <A/T>. The ground terminal (terminal 2) is grounded with ECM (terminal 92) <M/T> or (terminal 57) <A/T>.
- The engine coolant temperature sensor is a negative temperature coefficient type of resistor. It has the characteristic that when the engine coolant temperature rises the resistor decreases.
- The engine coolant temperature sensor output voltage increases when the resistor increases and decreases when the resistor decreases.

TSB Revision

TECHNICAL DESCRIPTION

- The engine coolant temperature sensor converts the engine coolant temperature to a voltage and output it.
- The ECM <M/T> or PCM <A/T> checks whether this voltage is within a specified range.

DTC SET CONDITIONS

Check Conditions

- 2 seconds or more have passed since the staring sequence was completed.

Judgement Criteria

- Engine coolant temperature sensor output voltage has continued to be 0.1 volt or lower [corresponding to a coolant temperature of 140°C (284°F) or higher] for 2 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

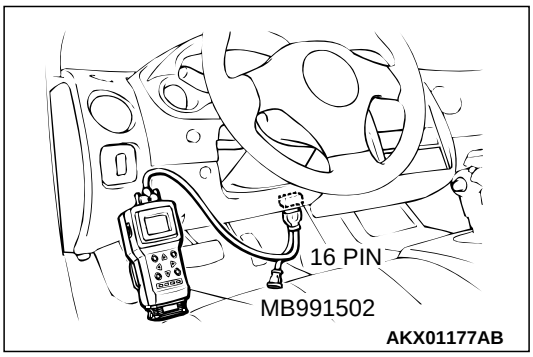
- Engine coolant temperature sensor failed.
- Open or shorted engine coolant temperature sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools

- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check data list item 21: Engine Coolant Temperature Sensor.



⚠ CAUTION

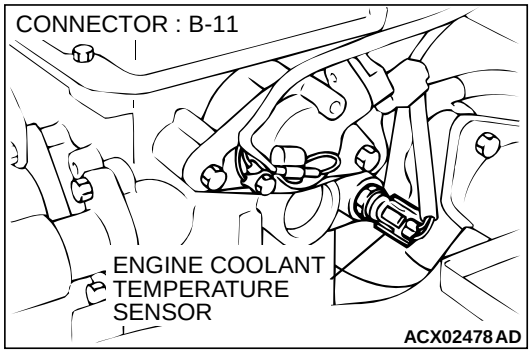
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 21, Engine Coolant Temperature Sensor.
  - The engine coolant temperature and temperature shown with the scan tool should approximately match.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

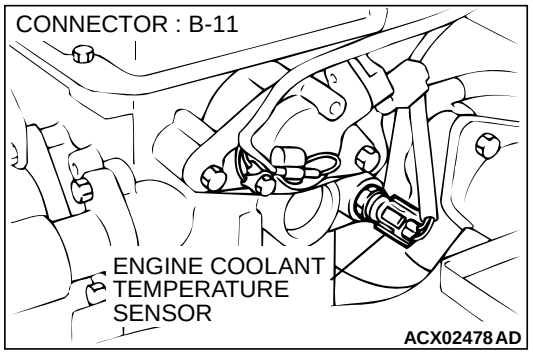
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Go to Step 2.

STEP 2. Check connector B-11 at the engine coolant temperature sensor for damage.



Q: Is the connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.

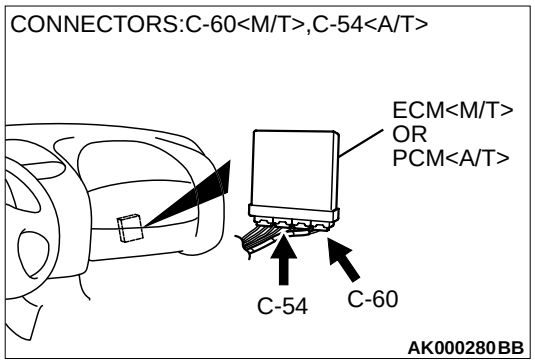


STEP 3. Check for short circuit to ground between engine coolant temperature sensor connector B-11 and ECM connector C-60 <M/T> or PCM connector C-54 <A/T>.

Q: Is the harness wire in good condition?

YES : Go to Step 4.

NO : Repair it. Then go to Step 6.

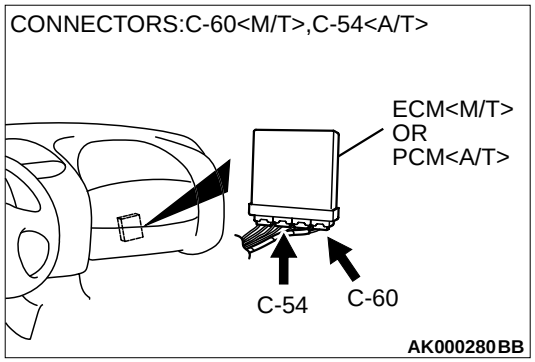


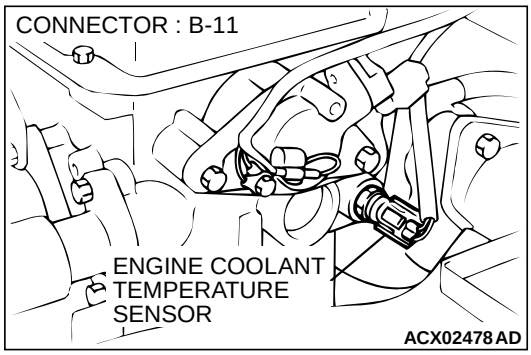
STEP 4. Check connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.

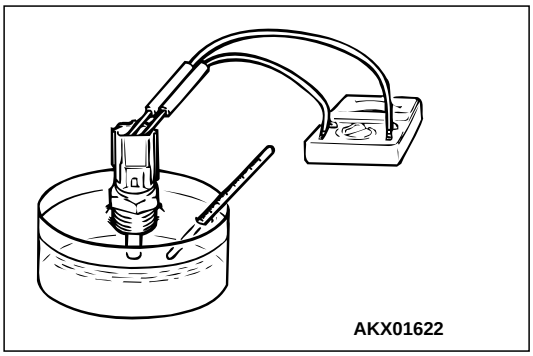
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.





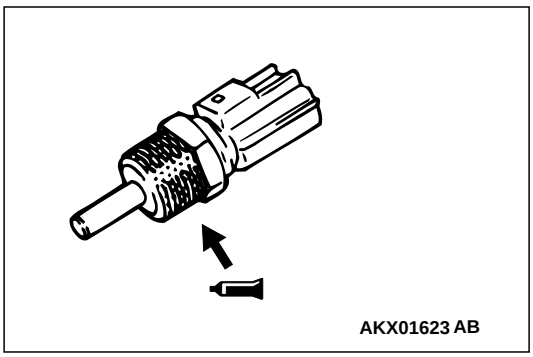
STEP 5. Check the engine coolant temperature sensor.

(1) Disconnect the engine coolant temperature sensor connector B-11.
(2) Remove the engine coolant temperature sensor.



(3) With the temperature sensing portion of engine coolant temperature sensor immersed in hot water, check resistance.

Standard value:
14 – 17 kΩ [at –20°C (–4°F)]
5.1 – 6.5 kΩ [at 0°C (32°F)]
2.1 – 2.7 kΩ [at 20°C (68°F)]
0.9 – 1.3 kΩ [at 40°C (104°F)]
0.48 – 0.68 kΩ [at 60°C (140°F)]
0.26 – 0.36 kΩ [at 80°C (176°F)]



(4) Apply 3M™ AAD part number 8731 or equivalent on the screw section of the engine coolant temperature sensor.
(5) Install the engine coolant temperature sensor, and tighten to the specified torque.

Tightening torque: 29 ± 10 N·m (22 ± 7 ft-lb)

Q: Is the resistance at the standard value?

YES : Replace the ECU or PCM. Then go to Step 6.
NO : Replace the engine coolant temperature sensor. Then go to Step 6.

STEP 6. Test the OBD-II drive cycle.

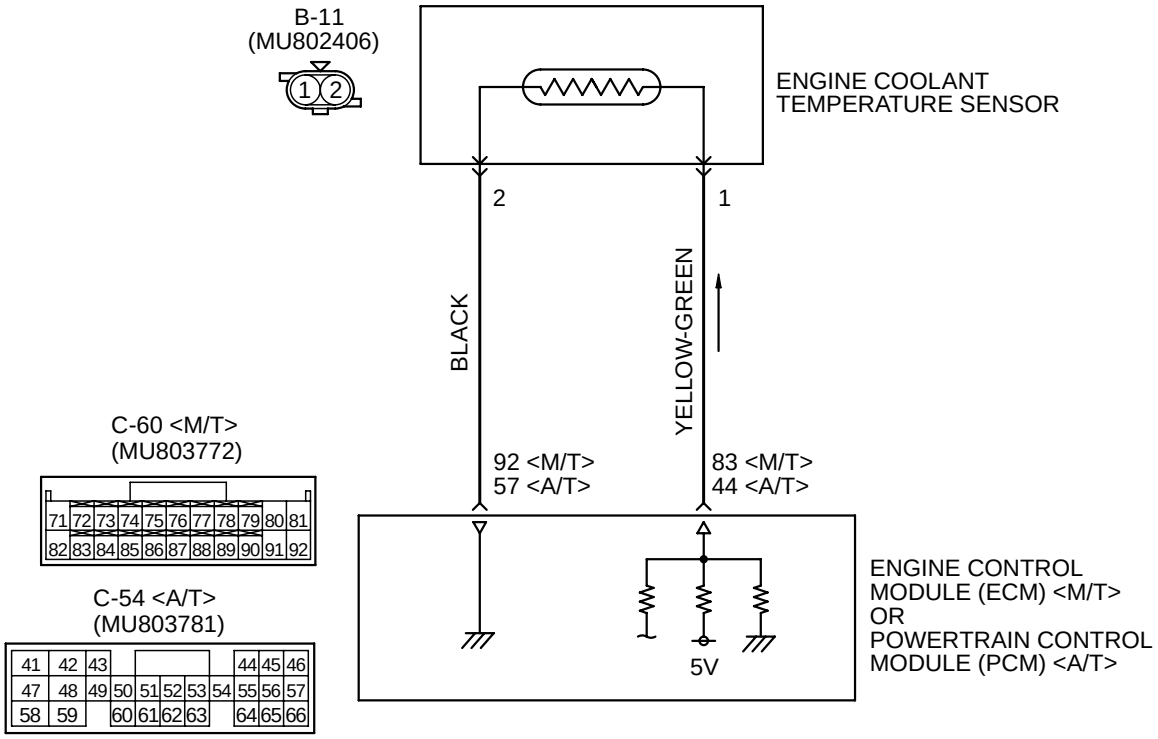
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0117 is output?

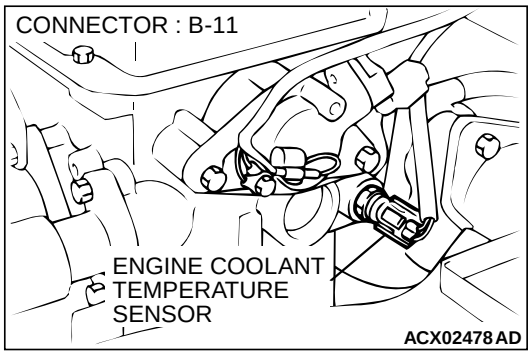
YES : Retry the troubleshooting.
NO : The inspection is complete.

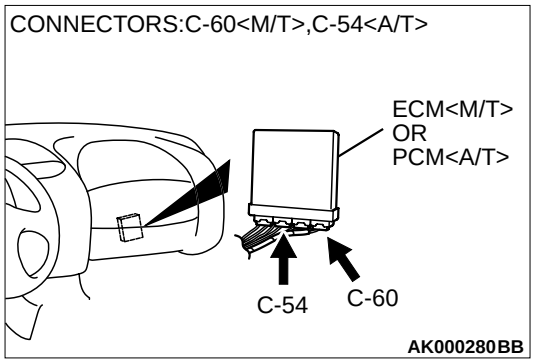
DTC P0118: Engine Coolant Temperature Circuit High Input

Engine Coolant Temperature Sensor Circuit



AK000655





CIRCUIT OPERATION

- 5-volt voltage is applied to the engine coolant temperature sensor output terminal (terminal 1) from the ECM (terminal 83) <M/T> or PCM (terminal 44) <A/T> via the resistor in the ECM <M/T> or PCM <A/T>. The ground terminal (terminal 2) is grounded with ECM (terminal 92) <M/T> or (terminal 57) <A/T>.
- The engine coolant temperature sensor is a negative temperature coefficient type of resistor. It has the characteristic that when the engine coolant temperature rises the resistor decreases.
- The engine coolant temperature sensor output voltage increases when the resistor increases and decreases when the resistor decreases.

TSB Revision

TECHNICAL DESCRIPTION

- The engine coolant temperature sensor converts the engine coolant temperature to a voltage and output it.
- The ECM <M/T> or PCM <A/T> checks whether this voltage is within a specified range.

DTC SET CONDITIONS

Check Conditions

- 2 seconds or more have passed since the staring sequence was completed.

Judgement Criteria

- Engine coolant temperature sensor output voltage has continued to be 4.6 volts or higher [corresponding to a coolant temperature of –45°C (–113°F) or lower] for 2 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

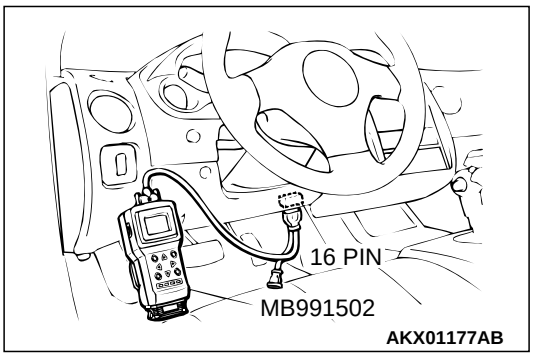
- Engine coolant temperature sensor failed.
- Open or shorted engine coolant temperature sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools

- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check data list item 21: Engine Coolant Temperature Sensor.



⚠ CAUTION

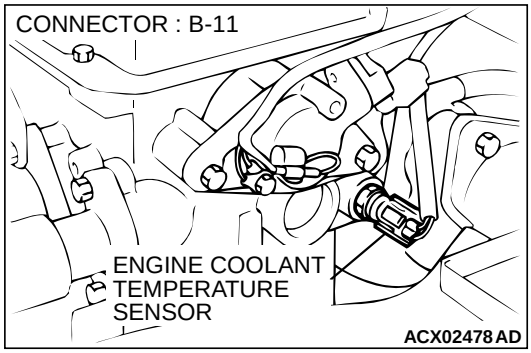
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 21, Engine Coolant Temperature Sensor.
  - The engine coolant temperature and temperature shown with the scan tool should approximately match.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

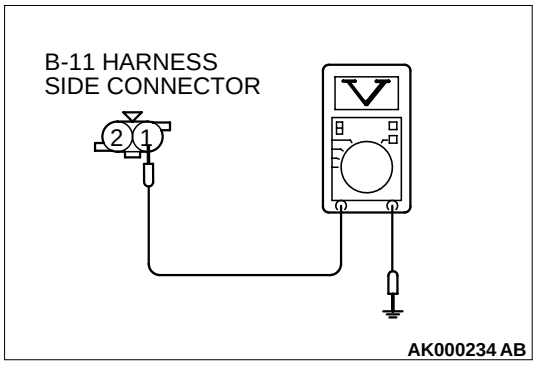
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Go to Step 2.

STEP 2. Check connector B-11 at the engine coolant temperature sensor for damage.



Q: Is the connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.



STEP 3. Check the sensor supply voltage at engine coolant temperature sensor harness side connector B-11.

(1) Disconnect the connector B-11 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 1 and ground.
- Voltage should be between 4.5 and 4.9 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 7.
NO : Go to Step 4.

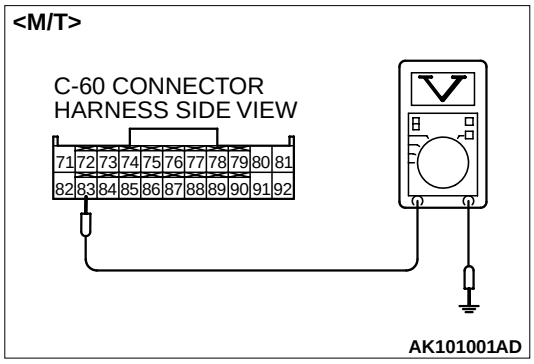
STEP 4. Check the sensor supply voltage at ECM connector C-60 <M/T> or PCM connector C-54 <A/T> by backprobing.

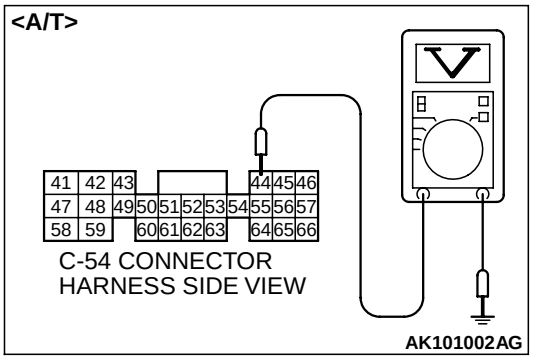
(1) Do not disconnect the ECM connector C-60 <M/T> or PCM connector C-54 <A/T>.
(2) Disconnect the engine coolant temperature sensor connector B-11.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the voltage between terminal 83 <M/T> or 44 <A/T> and ground by backprobing.
- Voltage should be between 4.5 and 4.9 volts.

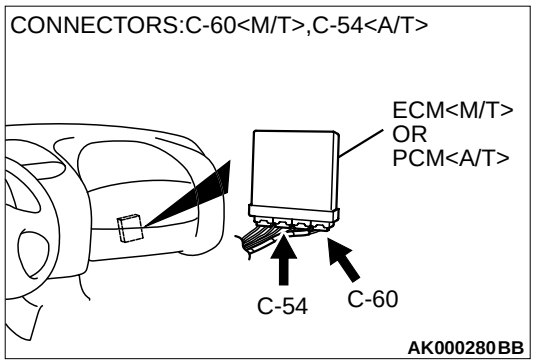
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 5.
NO : Go to Step 6.





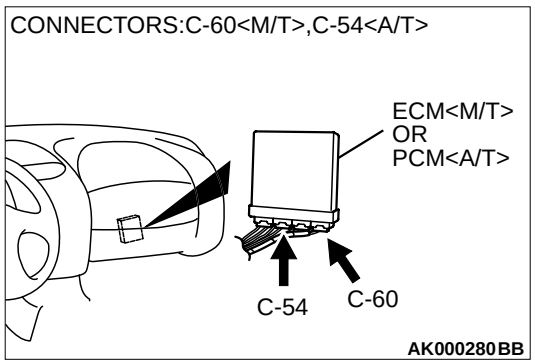


STEP 5. Check connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between engine coolant temperature sensor connector B-11 and ECM connector C-54 <M/T> or PCM connector C-60 <A/T> because of open circuit. Then go to Step 11.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

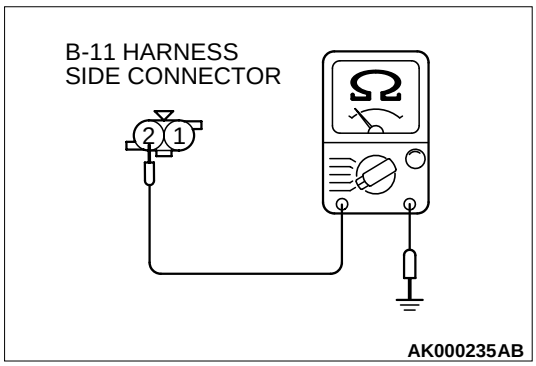


STEP 6. Check connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Replace the ECM or PCM. Then go to Step 11.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.



STEP 7. Check the continuity at engine coolant temperature sensor harness side connector B-11.

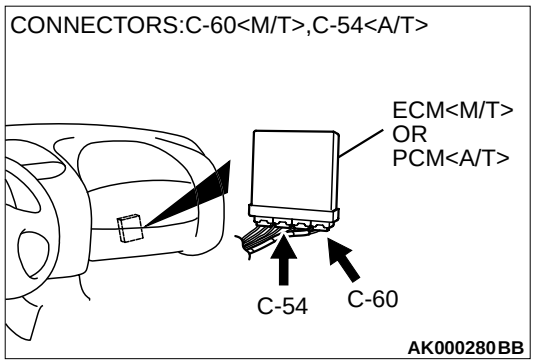
(1) Disconnect the connector B-11 and measure at the harness side.

(2) Check for the continuity between terminal 2 and ground.
- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 10.

NO : Go to Step 8.

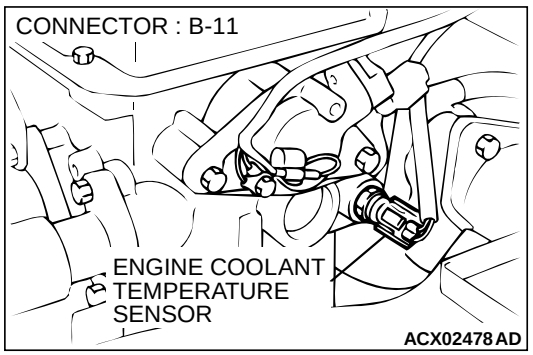


STEP 8. Check connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

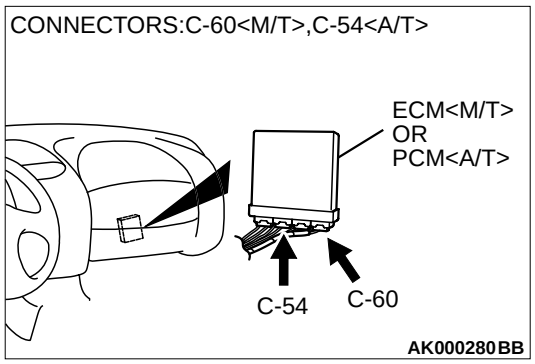


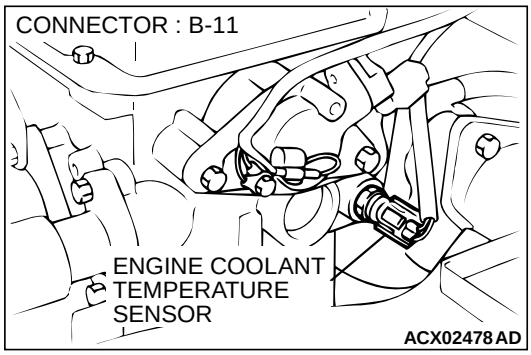
STEP 9. Check for open circuit between engine coolant sensor connector B-11 (terminal 2) and ECM connector C-60 (terminal 92) <M/T> or PCM connector C-54 (terminal 57) <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 11.

NO : Repair it. Then go to Step 11.

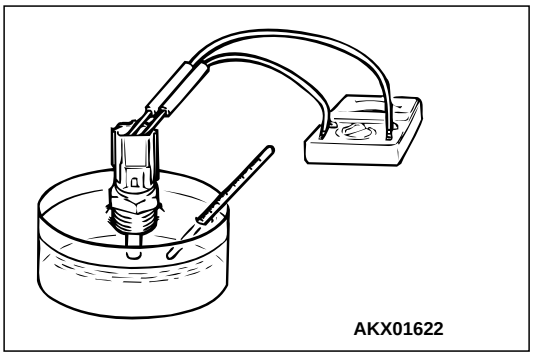




STEP 10. Check the engine coolant temperature sensor.

(1) Disconnect the engine coolant temperature sensor connector B-11

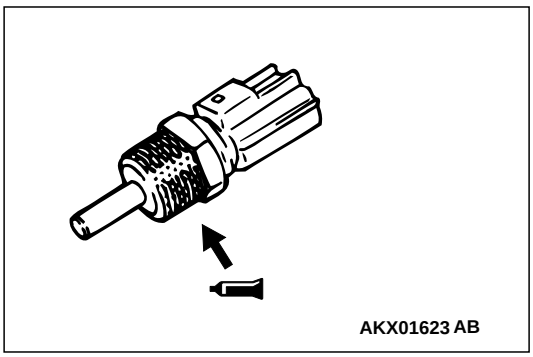
(2) Remove the engine coolant temperature sensor.



(3) With the temperature sensing portion of engine coolant temperature sensor immersed in hot water, check resistance.

Standard value:

14 – 17 kΩ [at –20°C (–4°F)]
5.1 – 6.5 kΩ [at 0°C (32°F)]
2.1 – 2.7 kΩ [at 20°C (68°F)]
0.9 – 1.3 kΩ [at 40°C (104°F)]
0.48 – 0.68 kΩ [at 60°C (140°F)]
0.26 – 0.36 kΩ [at 80°C (176°F)]



(4) Apply 3M™ AAD part number 8731 or equivalent on the screw section of the engine coolant temperature sensor.

(5) Install the engine coolant temperature sensor, and tighten to the specified torque.

Tightening torque: 29 ± 10 N·m (22 ± 7 ft-lb)

Q: Is the resistance at the standard value?

YES : Replace the ECU or PCM. Then go to Step 11.

NO : Replace the engine coolant temperature sensor. Then go to Step 11.

STEP 11. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.

(2) Check the diagnostic trouble code (DTC).

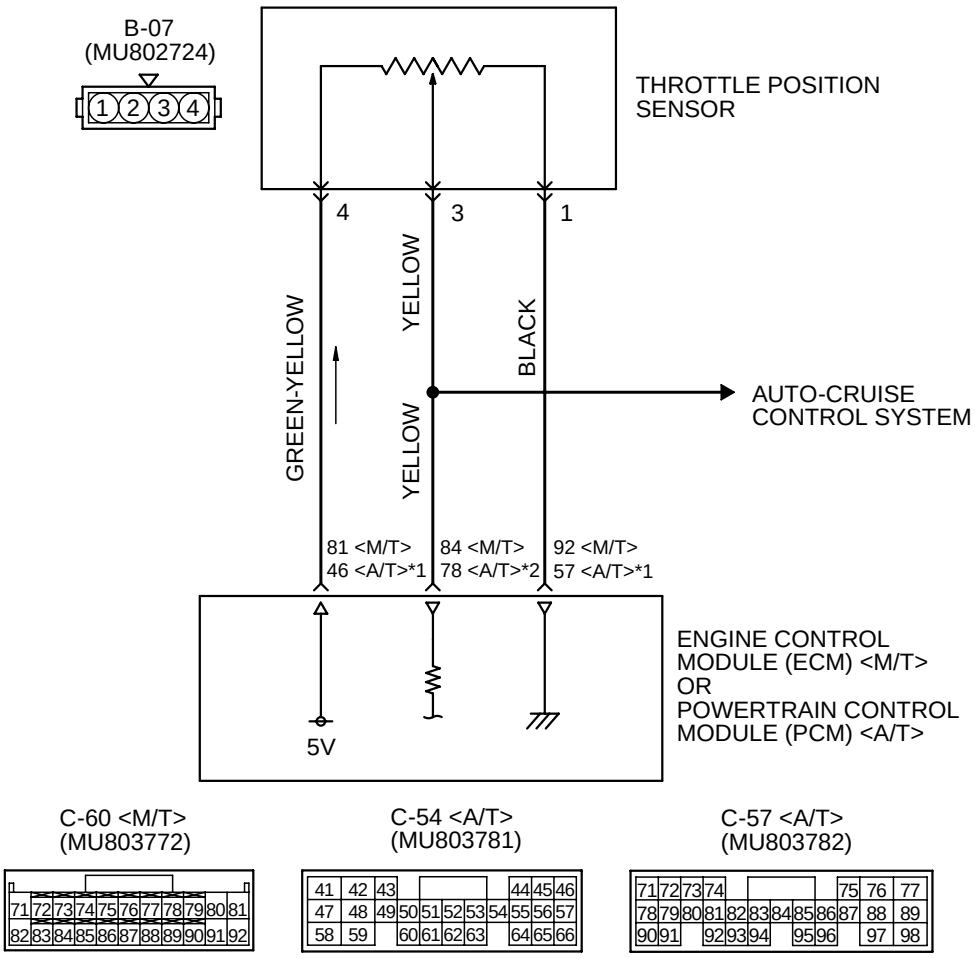
Q: Is the DTC P0118 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

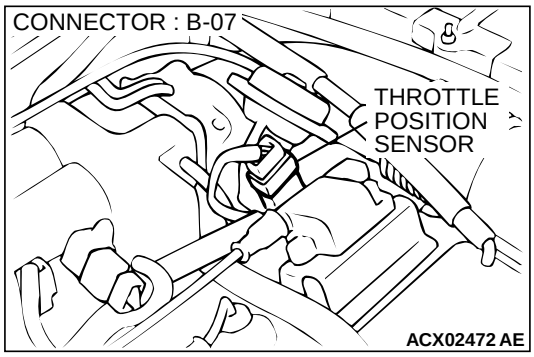
DTC P0121: Throttle Position Sensor Circuit Range/Performance Problem

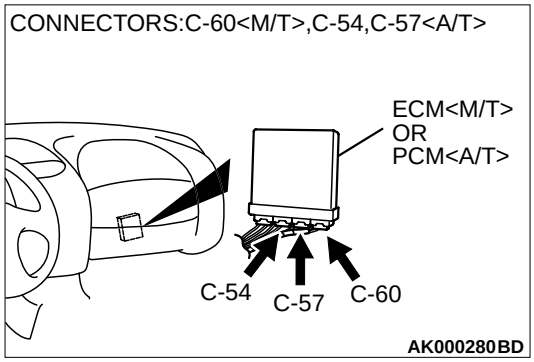
Throttle Position Sensor (TPS) Circuit



NOTE
*1:PCM connector C-54 <A/T>
*2:PCM connector C-57 <A/T>

AK000656





CIRCUIT OPERATION

- A 5-volt power supply is applied on the throttle position sensor power terminal (terminal 3) from the ECM (terminal 81) <M/T> or PCM (terminal 46) <A/T>.

The ground terminal (terminal 2) is grounded with ECM (terminal 92) <M/T> or PCM (terminal 57) <A/T>.

TSB Revision

- When the throttle valve shaft is turned from the idle position to the fully opened position, the resistor between the throttle position sensor output terminal (terminal 3) and ground terminal will increase according to the rotation.

TECHNICAL DESCRIPTION

- The throttle position sensor outputs voltage which corresponds to the throttle valve opening angle.
- The ECM <M/T> or PCM <A/T> checks whether the voltage is within a specified range.

DTC SET CONDITIONS

Check Conditions

- 2 seconds or more have passed since the staring sequence was completed.
- Engine speed is higher than 2,000 r/min.
- Volumetric efficiency is higher than 60 percent.

Judgement Criteria

- Throttle position sensor output voltage has continued to be 0.8 volt or lower for 2 seconds.

Check Conditions

- 2 seconds or more have passed since the staring sequence was completed.
- Engine speed is lower than 3,000 r/min.
- Volumetric efficiency is lower than 30 percent.

Judgement Criteria

- Throttle position sensor output voltage has continued to be 4.6 volts or higher for 2 seconds.

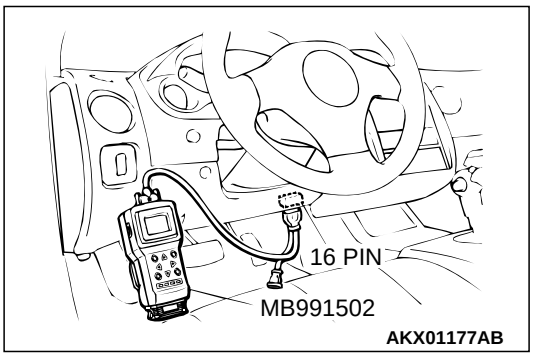
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Throttle position sensor failed or maladjusted.
- Open or shorted throttle position sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 14: Throttle Position Sensor.

⚠ CAUTION

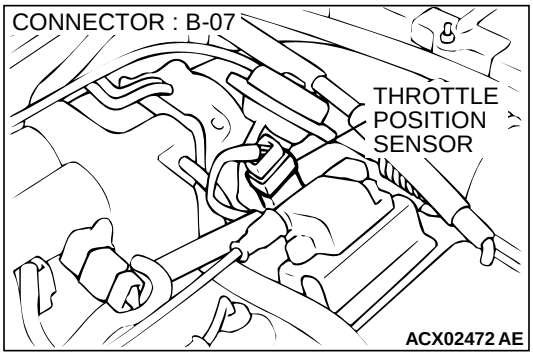
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 14, Throttle Position Sensor.
  - With the throttle valve in the idle position, voltage should be between 0.535 and 0.735 volt.
  - With the throttle valve in the full-open position, voltage should be between 4.5 and 5.5 volts.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

NO : Go to Step 2.

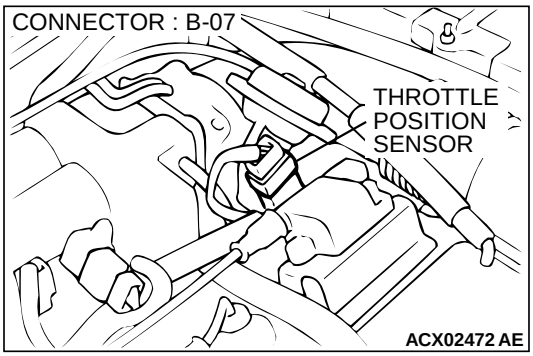


STEP 2. Check connector B-07 at throttle position sensor for damage.

Q: Is the connector in good condition?

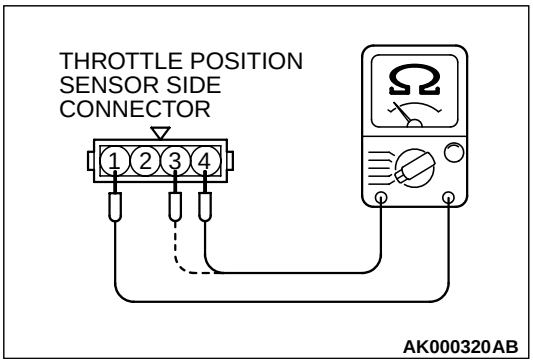
YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP3. Check the throttle position sensor.

(1) Disconnect the connector B-07.



(2) Measure the resistance between throttle position sensor side connector terminal 1 and 4.

Standard value: 3.5 – 6.5 kΩ

(3) Measure resistance between the throttle position sensor side connector terminal 1 and 3.

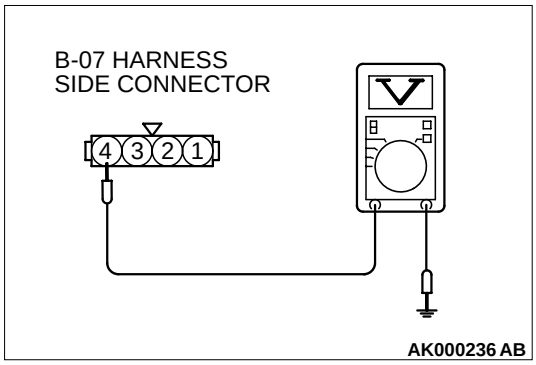
(4) Move the throttle valve from the idle position to the full-open position.

- Resistance should change smoothly in proportion to the opening angle of the throttle valve.

Q: Is the resistance normal?

YES : Go to Step 4.

NO : Replace the throttle position sensor. Refer to P.13A-593, Throttle Body. Then go to Step 14.



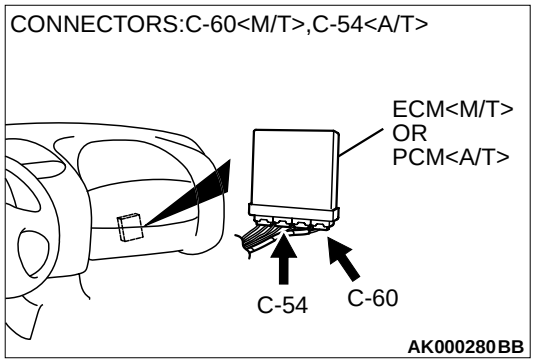
STEP 4. Check the sensor supply voltage at throttle position sensor harness side connector B-07.

(1) Disconnect the connector B-07 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 4 and ground.
- Voltage should be between 4.8 and 5.2 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 7.
NO : Go to Step 5.



STEP 5. Check connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

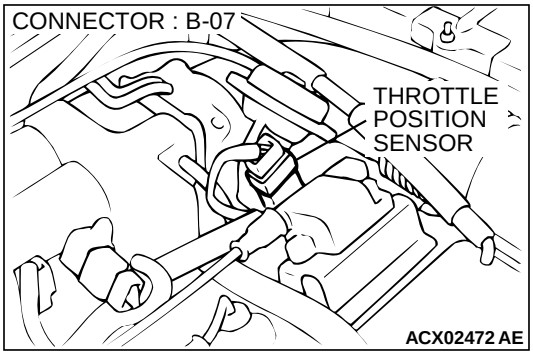
YES : Go to Step 6.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

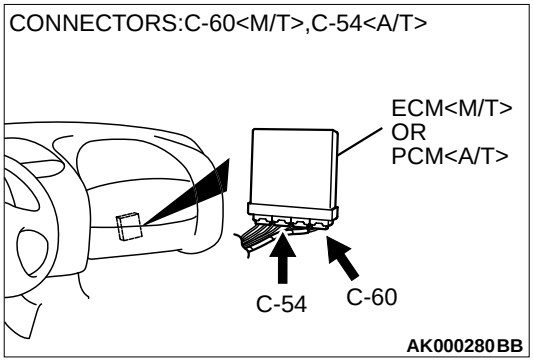
STEP 6. Check for harness damage between throttle position sensor connector B-07 (terminal 3) and ECM connector C-60 (terminal 81) <M/T> or PCM connector C-54 (terminal 46) <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 14.

NO : Repair it. Then go to Step 14.





STEP 7. Check the continuity at throttle position sensor harness side connector B-07.

(1) Disconnect the connector B-07 and measure at the harness side.

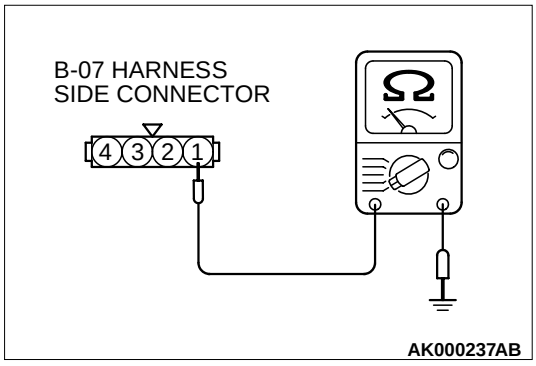
(2) Measure the continuity between terminal 1 and ground.

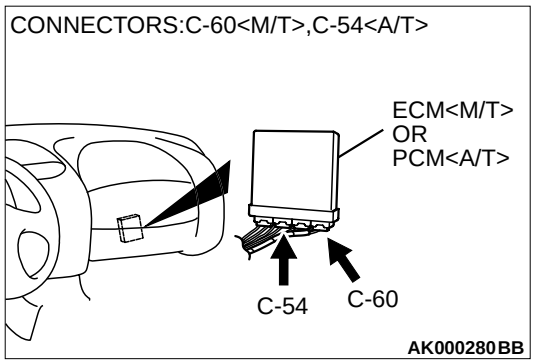
- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 10.

NO : Go to Step 8.



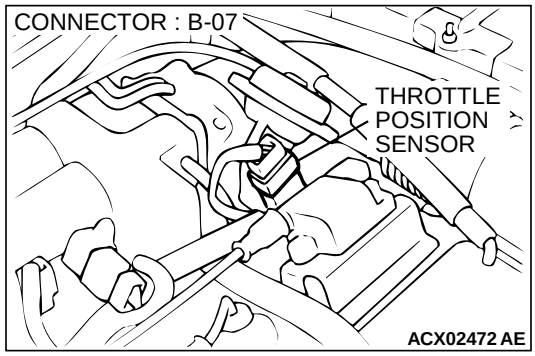


STEP 8. Check connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

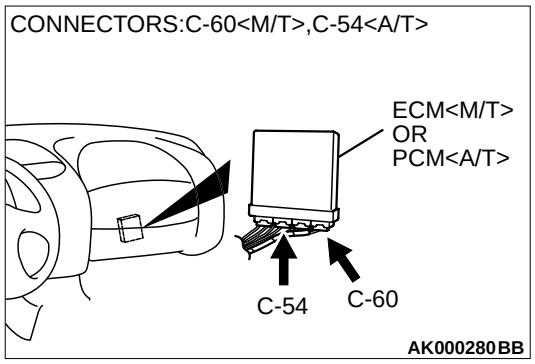


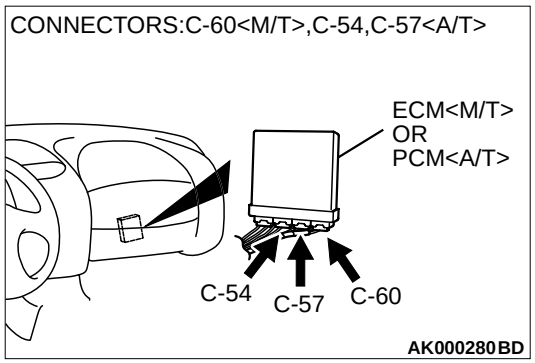
STEP 9. Check for open circuit and harness damage between throttle position sensor connector B-07 (terminal 2) and ECM connector C-60 (terminal 92) <M/T> or PCM connector C-54 (terminal 57) <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 14.

NO : Repair it. Then go to Step 14.



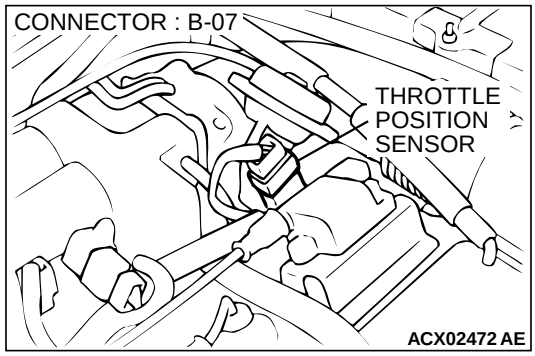


STEP 10. Check connector C-60 at ECM <M/T> or connector C-54, C-57 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 11.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

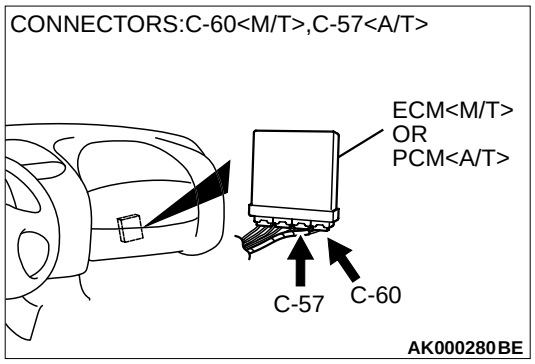


STEP 11. Check for harness damage between throttle position sensor connector B-07 (terminal 1) and ECM connector C-60 (terminal 84) <M/T> or PCM connector C-57 (terminal 78) <A/T>.

Q: Is the harness wire in good condition?

YES : Go to Step 12.

NO : Repair it. Then go to Step 14.



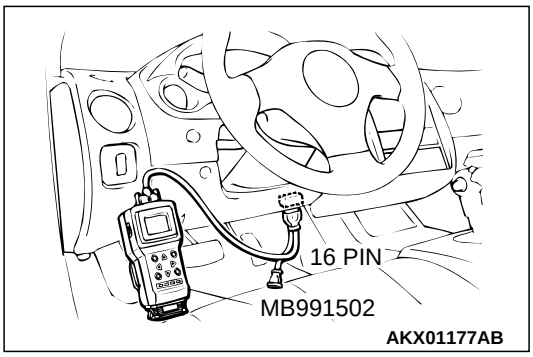
STEP 12. Check the maladjusted throttle position sensor.

Refer to, Throttle Position Sensor Adjustment P.13A-576.

Q: Is the output voltage normal?

YES : Go to Step 13.

NO : Adjust it. Then go to Step 14.



STEP 13. Using scan tool MB991502, check data list item 14: Throttle Position Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 14, Throttle Position Sensor.
- With the throttle valve in the idle position, voltage should be between 0.535 and 0.735 volt.
- With the throttle valve in the full-open position, voltage should be between 4.5 and 5.5 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Replace the ECM or PCM. Then go to Step 14.

STEP 14. Test the OBD-II drive cycle.

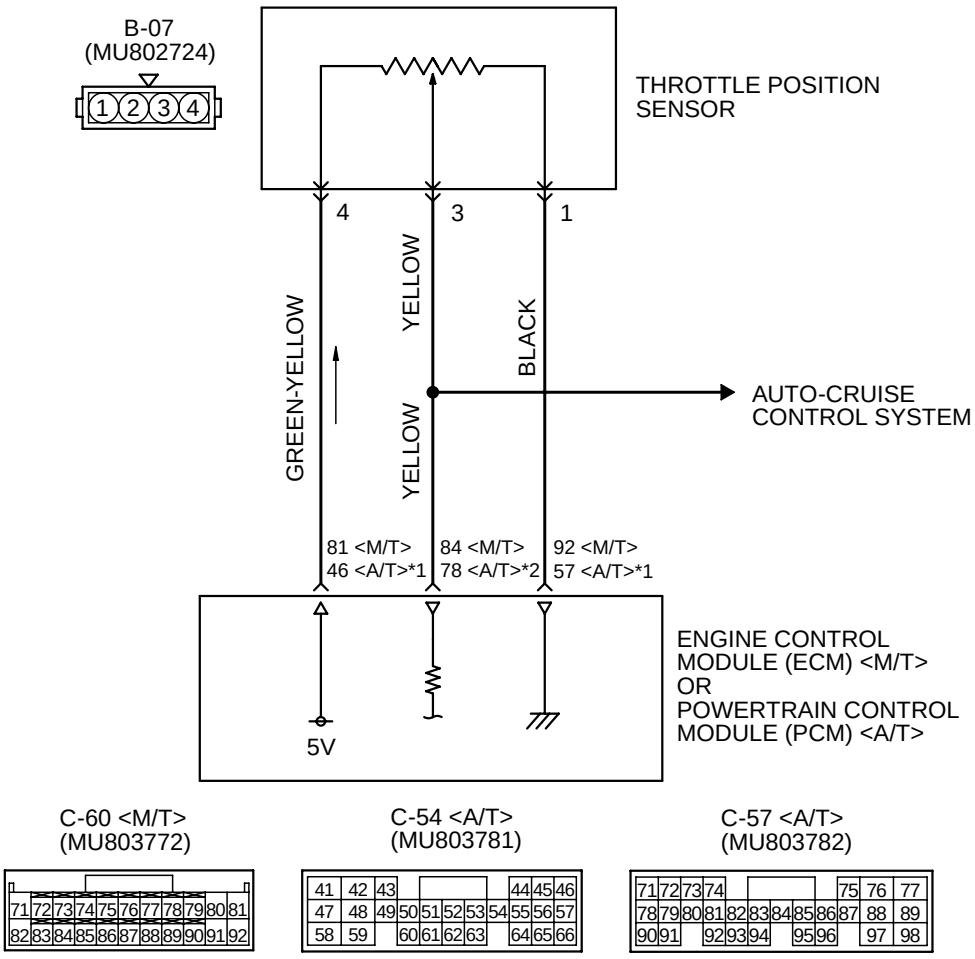
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0121 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

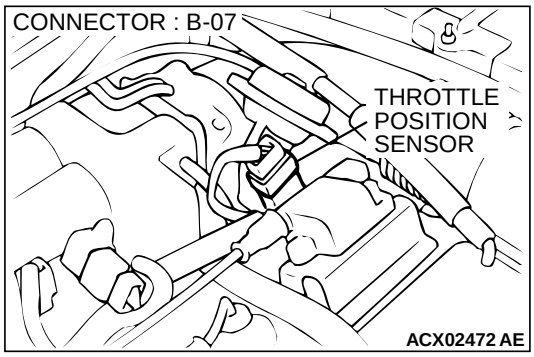
DTC P0122: Throttle Position Sensor Circuit Low Input

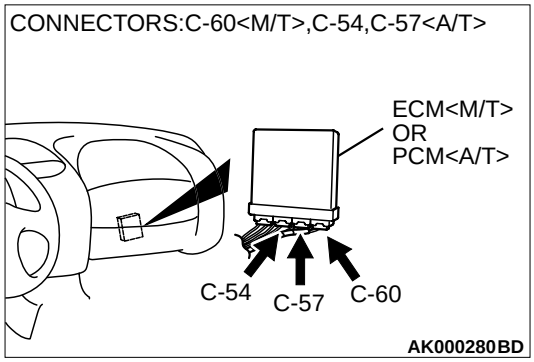
Throttle Position Sensor (TPS) Circuit



NOTE
*1:PCM connector C-54 <A/T>
*2:PCM connector C-57 <A/T>

AK000656





CIRCUIT OPERATION

- A 5-volt power supply is applied on the throttle position sensor power terminal (terminal 4) from the ECM (terminal 81) <M/T> or PCM (terminal 46) <A/T>.

The ground terminal (terminal 1) is grounded with ECM (terminal 92) <M/T> or PCM (terminal 57) <A/T>.

TSB Revision

- When the throttle valve shaft is turned from the idle position to the fully opened position, the resistor between the throttle position sensor output terminal (terminal 3) and ground terminal will increase according to the rotation.

TECHNICAL DESCRIPTION

- The throttle position sensor outputs voltage which corresponds to the throttle valve opening angle.
- The ECM <M/T> or PCM <A/T> checks whether the voltage is within a specified range. In addition, it checks that the voltage output does not become too high while the engine is at idle.

DTC SET CONDITIONS

Check Conditions

- 2 seconds or more have passed since the starting sequence was completed.

Judgement Criteria

- Throttle position sensor output voltage has continued to be 0.2 volt or lower for 2 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Throttle position sensor failed or maladjusted.
- Open or shorted throttle position sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools

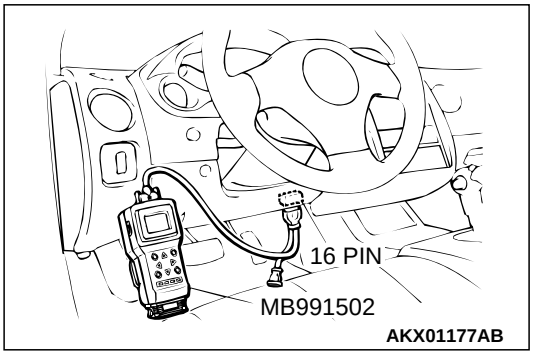
- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check data list item 14: Throttle Position Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

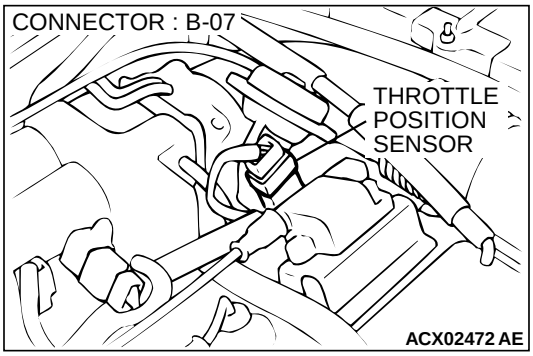
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 14, Throttle Position Sensor.
  - With the throttle valve in the idle position, voltage should be between 0.535 and 0.735 volt.
  - With the throttle valve in the full-open position, voltage should be between 4.5 and 5.5 volts.
(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

NO : Go to Step 2.

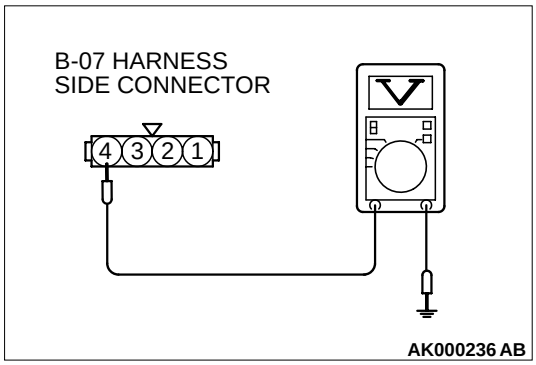


STEP 2. Check connector B-07 at throttle position sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.



STEP 3. Check the sensor supply voltage at throttle position sensor harness side connector B-07.

(1) Disconnect the connector B-07 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between terminal 4 and ground.

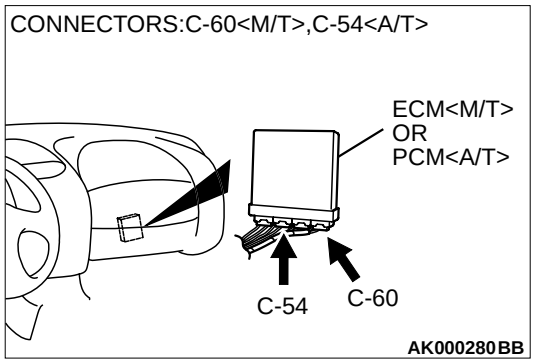
- Voltage should be between 4.8 and 5.2 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 6.

NO : Go to Step 4.



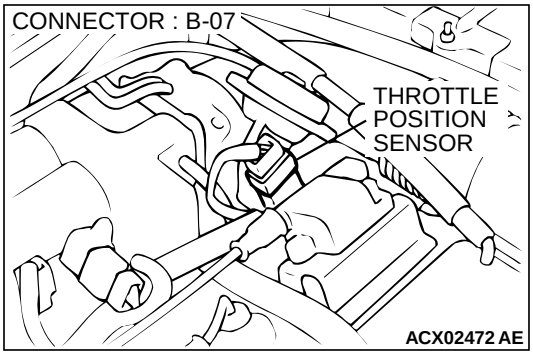
STEP 4. Check connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

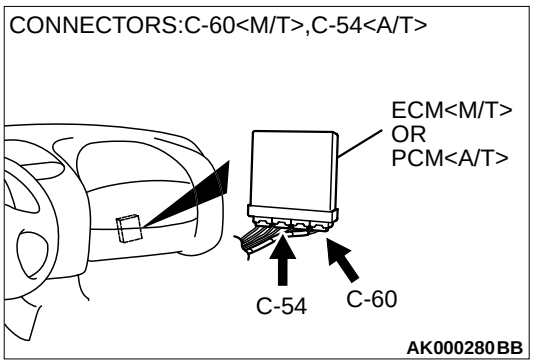
Q: Is the connector in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

STEP 5. Check for open circuit and short circuit to ground between throttle position sensor connector B-07 (terminal 3) and ECM connector C-60 (terminal 81) <M/T> or PCM connector C-54 (terminal 46) <A/T>.





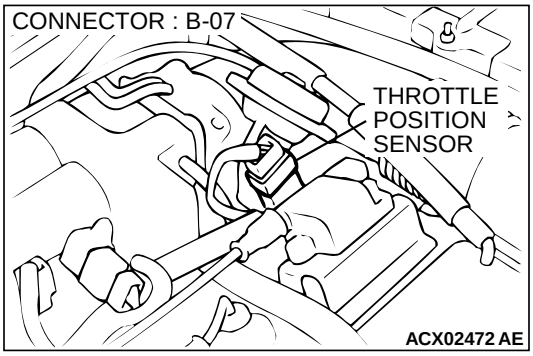
Q: Is the harness wire in good condition?

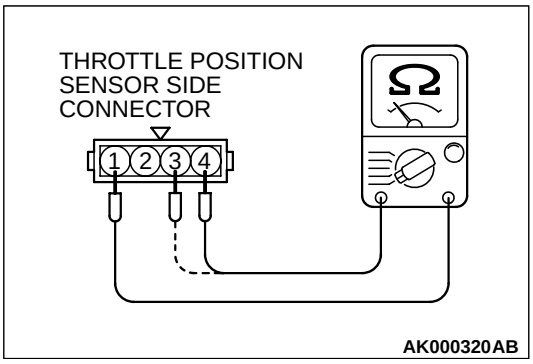
YES : Replace the ECM or PCM. Then go to Step 11.

NO : Repair it. Then go to Step 11.

STEP 6. Check the throttle position sensor.

(1) Disconnect the connector B-07.





(2) Measure the resistance between throttle position sensor side connector terminal 1 and 4.

Standard value: 3.5 – 6.5 kΩ

(3) Measure resistance between the throttle position sensor side connector terminal 1 and 3.

(4) Move the throttle valve from the idle position to the full-open position.

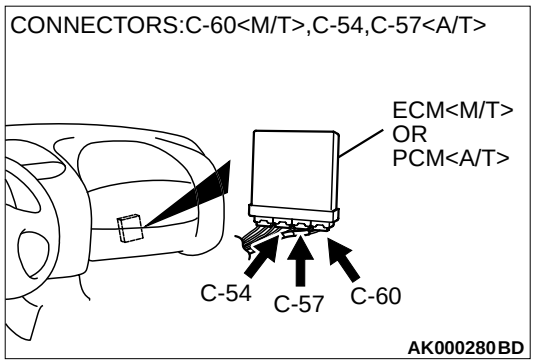
- Resistance should change smoothly in proportion to the opening angle of the throttle valve.

Q: Is the resistance normal?

YES : Go to Step 7.

NO : Replace the throttle position sensor. Refer to P.13A-593, Throttle Body. Then go to Step 11.

TSB Revision

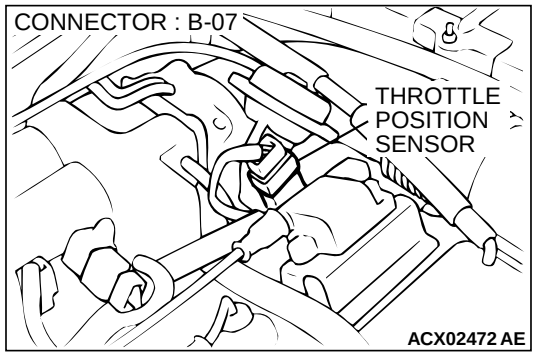


STEP 7. Check connector C-60 at ECM <M/T> or connector C-54, C-57 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

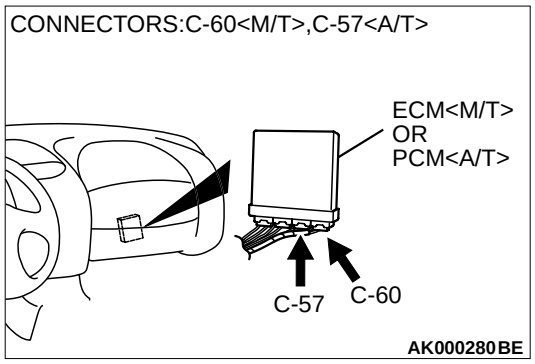


STEP 8. Check for open circuit and short circuit to ground between throttle position sensor connector B-07 (terminal 1) and ECM connector C-60 (terminal 84) <M/T> or PCM connector C-57 (terminal 78) <A/T>.

Q: Is the harness wire in good condition?

YES : Go to Step 9.

NO : Repair it. Then go to Step 11.



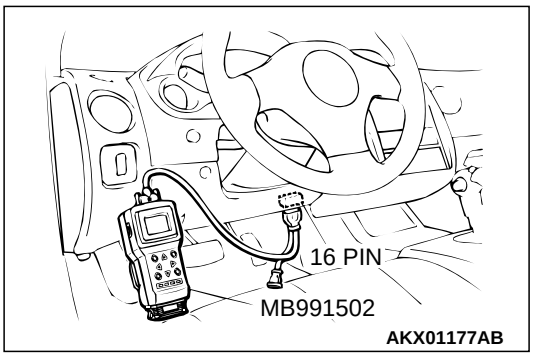
STEP 9. Check for short circuit to ground between throttle position sensor connector and auto-cruise control-ECU.

Refer to GROUP 17, Auto Cruise Control System – Diagnostic Trouble Code Chart P.17-11.

Q: Is the harness wire in good condition?

YES : Go to Step 10.

NO : Repair it. Then go to Step 11.



STEP 10. Using scan tool MB991502, check data list item 14: Throttle Position Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 14, Throttle Position Sensor.
- With the throttle valve in the idle position, voltage should be between 0.535 and 0.735 volt.
- With the throttle valve in the full-open position, voltage should be between 4.5 and 5.5 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Replace the ECM or PCM. Then go to Step 11.

STEP 11. Test the OBD-II drive cycle.

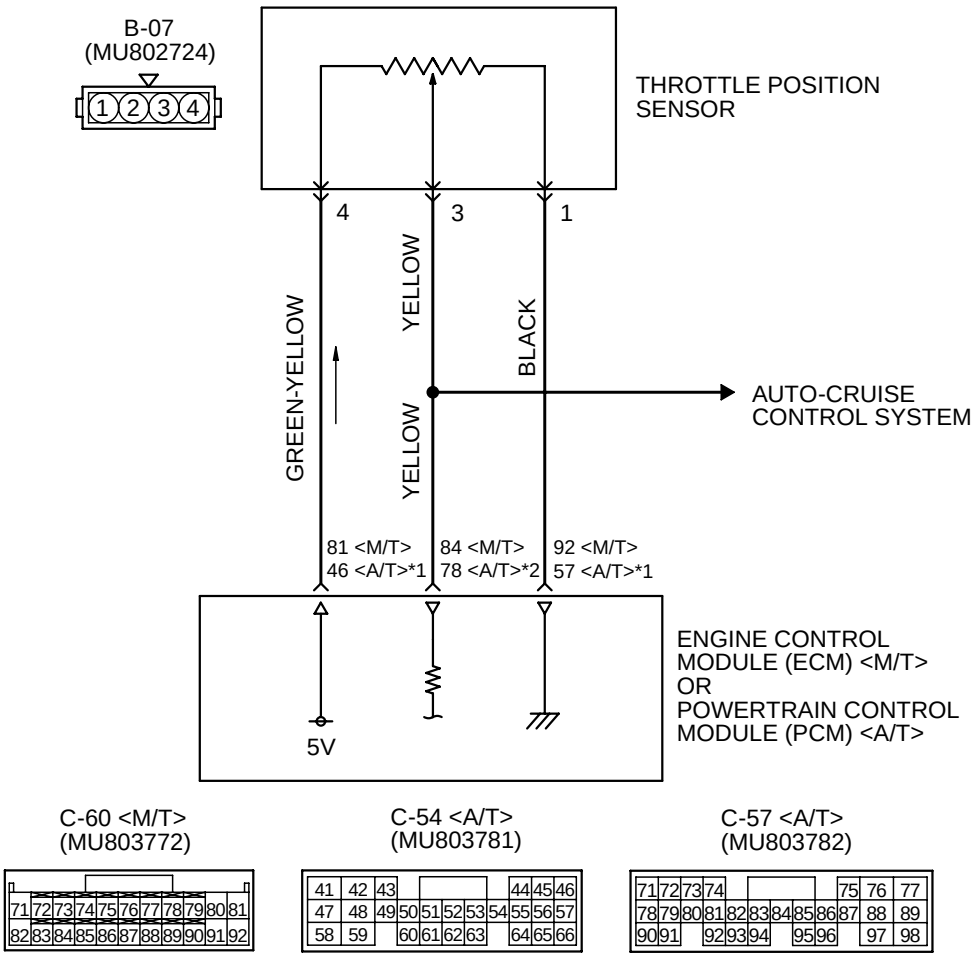
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0122 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

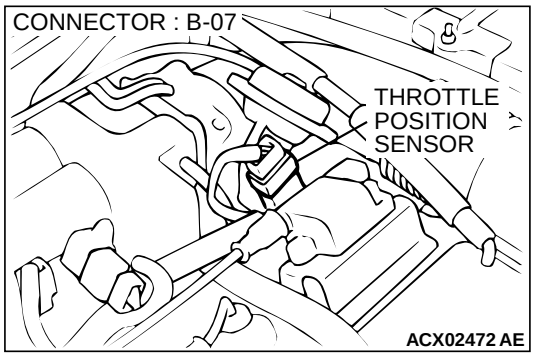
DTC P0123: Throttle Position Sensor Circuit High Input

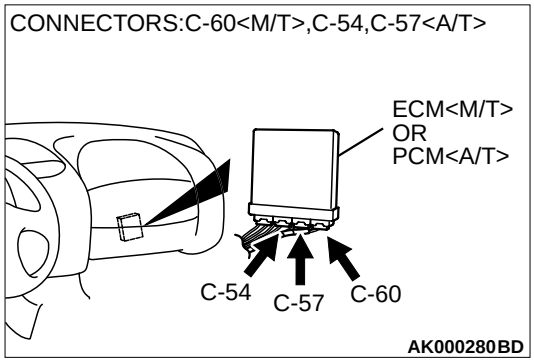
Throttle Position Sensor (TPS) Circuit



NOTE
*1:PCM connector C-54 <A/T>
*2:PCM connector C-57 <A/T>

AK000656





CIRCUIT OPERATION

- A 5-volt power supply is applied on the throttle position sensor power terminal (terminal 4) from the ECM (terminal 81) <M/T> or PCM (terminal 46) <A/T>.

The ground terminal (terminal 1) is grounded with ECM (terminal 92) <M/T> or PCM (terminal 57) <A/T>.

TSB Revision

- When the throttle valve shaft is turned from the idle position to the fully opened position, the resistor between the throttle position sensor output terminal (terminal 3) and ground terminal will increase according to the rotation.

TECHNICAL DESCRIPTION

- The throttle position sensor outputs voltage which corresponds to the throttle valve opening angle.
- The ECM <M/T> or PCM <A/T> checks whether the voltage is within a specified range. In addition, it checks that the voltage output does not become too high while the engine is at idle.

DTC SET CONDITIONS

Check Conditions

- 2 seconds or more have passed since the starting sequence was completed.
- Engine speed is lower than 1,000 r/min.
- Volumetric efficiency is lower than 60 percent.

Judgement Criteria

- TPS output voltage has continued to be 2 volts or higher for 2 seconds.

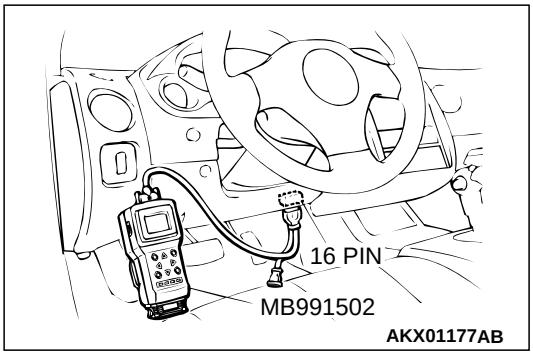
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Throttle position sensor failed or maladjusted.
- Open or shorted throttle position sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 14: Throttle Position Sensor.

⚠ CAUTION

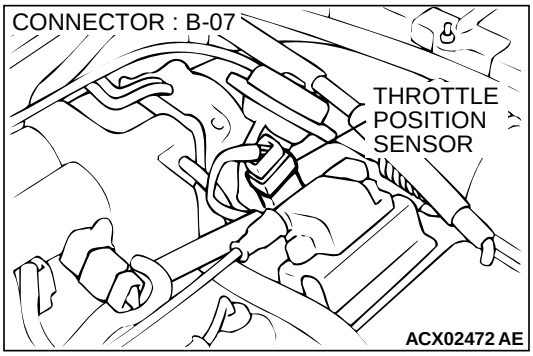
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 14, Throttle Position Sensor.
  - With the throttle valve in the idle position, voltage should be between 0.535 and 0.735 volt.
  - With the throttle valve in the full-open position, voltage should be between 4.5 and 5.5 volts.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

NO : Go to Step 2.

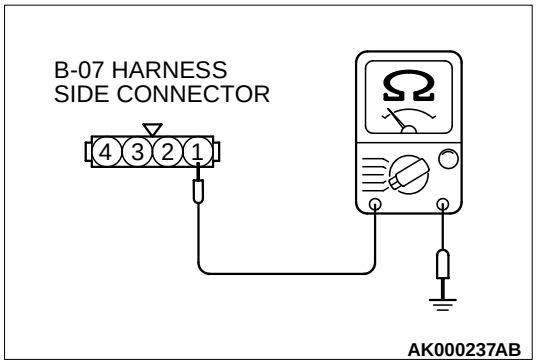


STEP 2. Check connector B-07 at throttle position sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.



STEP 3. Check the continuity at throttle position sensor harness side connector B-07.

(1) Disconnect the connector B-07 and measure at the harness side.

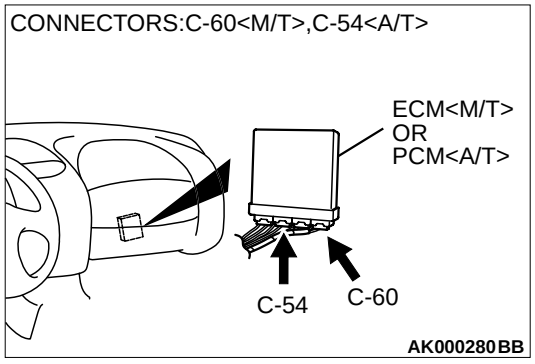
(2) Measure the continuity between terminal 1 and ground.

- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 6.

NO : Go to Step 4.



STEP 4. Check connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.

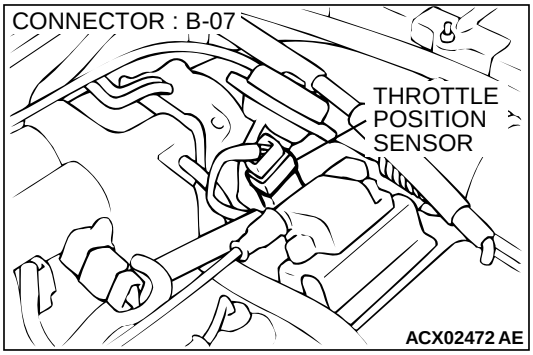
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.

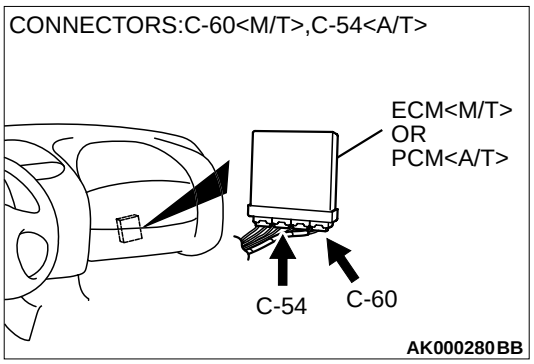
STEP 5. Check for open circuit and harness damage between throttle position sensor connector B-07 (terminal 2) and ECM connector C-60 (terminal 92) <M/T> or PCM connector C-54 (terminal 57) <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 8.

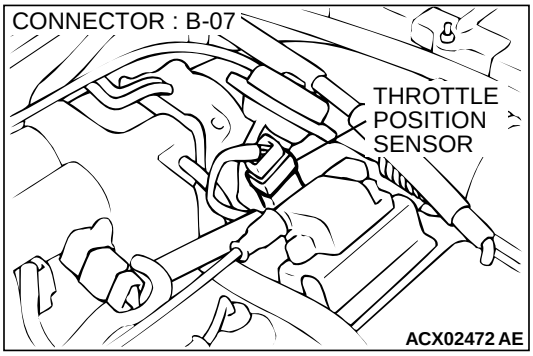
NO : Repair it. Then go to Step 8.

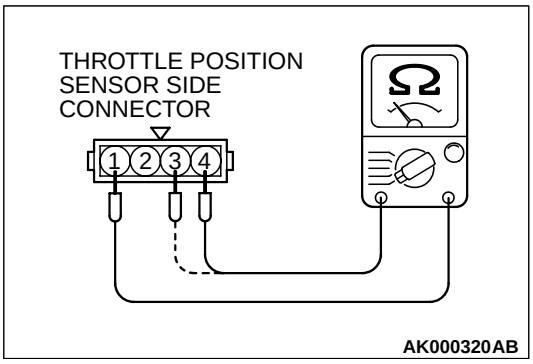




STEP 6. Check the throttle position sensor.

(1) Disconnect the connector B-07.





(2) Measure the resistance between throttle position sensor side connector terminal 1 and 4.

Standard value: 3.5 – 6.5 kΩ

(3) Measure resistance between the throttle position sensor side connector terminal 1 and 3.

(4) Move the throttle valve from the idle position to the full-open position.

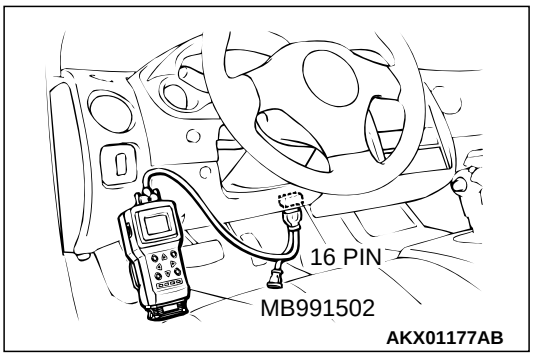
- Resistance should change smoothly in proportion to the opening angle of the throttle valve.

Q: Is the resistance normal?

YES : Go to Step 7.

NO : Replace the throttle position sensor. Refer to P.13A-593, Throttle Body. Then go to Step 8.

TSB Revision



STEP 7. Using scan tool MB991502, check data list item 14: Throttle Position Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 14, Throttle Position Sensor.
- With the throttle valve in the idle position, voltage should be between 0.535 and 0.735 volt.
- With the throttle valve in the full-open position, voltage should be between 4.5 and 5.5 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Replace the ECM or PCM. Then go to Step 8.

STEP 8. Test the OBD-II drive cycle.

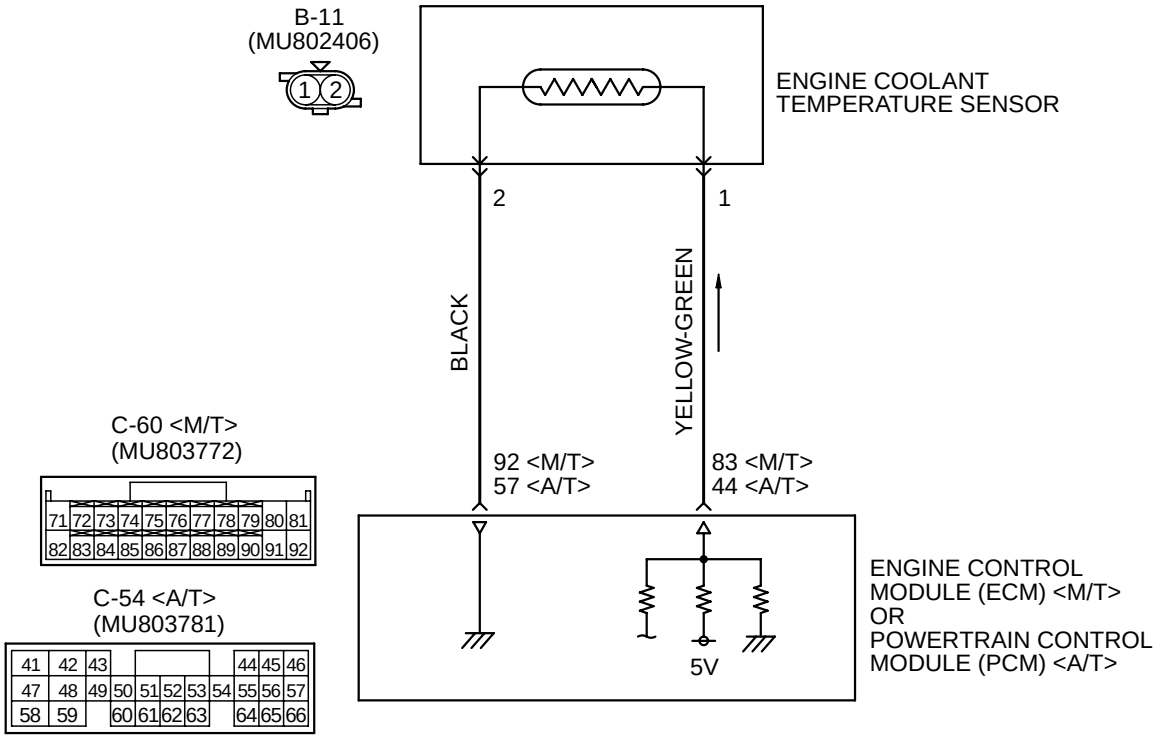
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0123 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0125: Insufficient Coolant Temperature for Closed Loop Fuel Control

Engine Coolant Temperature Sensor Circuit



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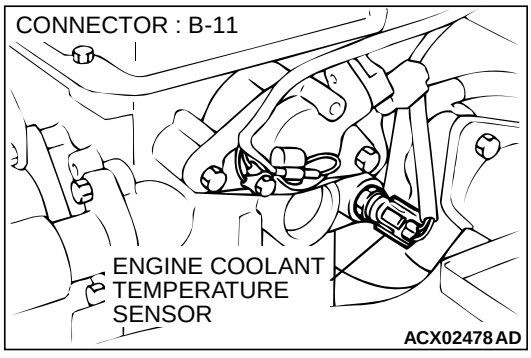
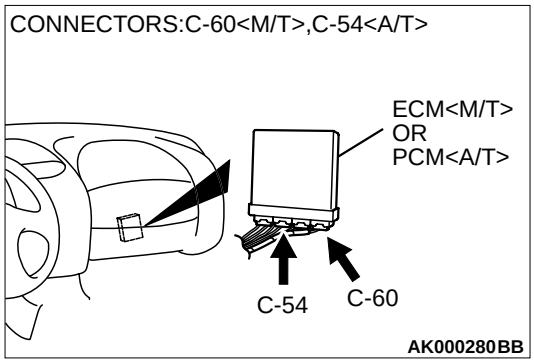




CIRCUIT OPERATION

- A 5-volt voltage is applied to the engine coolant temperature sensor output terminal (terminal 1) from the ECM (terminal 83) <M/T> or PCM (terminal 44) <A/T> via the resistor in the ECM <M/T> or PCM <A/T>. The ground terminal (terminal 2) is grounded with ECM (terminal 92) <M/T> or (terminal 57) <A/T>.
- The engine coolant temperature sensor is a negative temperature coefficient type of resistor. It has the characteristic that when the engine coolant temperature rises the resistor decreases.
- The engine coolant temperature sensor output voltage increases when the resistor increases and decreases when the resistor decreases.

TSB Revision

TECHNICAL DESCRIPTION

- The engine coolant temperature sensor converts the engine coolant temperature to a voltage and output it.
- The ECM <M/T> or PCM <A/T> checks whether this voltage is within a specified range.

DTC SET CONDITIONS

Check Conditions, Judgement Criteria

- Engine coolant temperature decreases from higher than 40°C (104°F) to lower than 40°C (104°F).
- Then the engine coolant temperature has continued to be 40°C (104°F) or lower for 5 minutes.

Check Conditions, Judgement Criteria

- About 60 – 300 seconds have passed for the engine coolant temperature to rise to about 7°C (45°F) after starting sequence was completed.
- However, time is not counted when fuel is shut off.

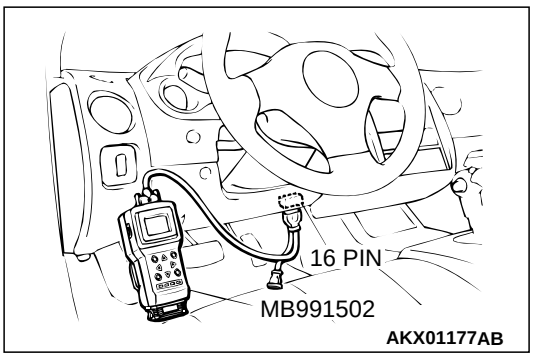
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Engine coolant temperature sensor failed.
- Open or shorted engine coolant temperature sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 21: Engine Coolant Temperature Sensor.

⚠ CAUTION

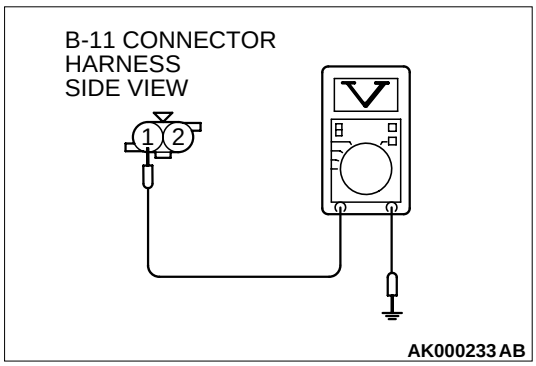
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 21, Engine Coolant Temperature Sensor.
  - The engine coolant temperature and temperature shown with the scan tool should approximately match.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

NO : Go to Step 2.



STEP 2. Check the sensor output voltage at engine coolant temperature sensor connector B-11 by backprobing.

(1) Do not disconnect the connector B-11.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 1 and ground by backprobing.
- When engine coolant temperature is –20°C (–4°F), voltage should be 3.9 and 4.5 volts.
- When engine coolant temperature is 0°C (32°F), voltage should be 3.2 and 3.8 volts.
- When engine coolant temperature is 20°C (68°F), voltage should be 2.3 and 2.9 volts.
- When engine coolant temperature is 40°C (104°F), voltage should be 1.3 and 1.9 volts.
- When engine coolant temperature is 60°C (140°F), voltage should be 0.7 and 1.3 volts.
- When engine coolant temperature is 80°C (176°F), voltage should be 0.3 and 0.9 volt.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

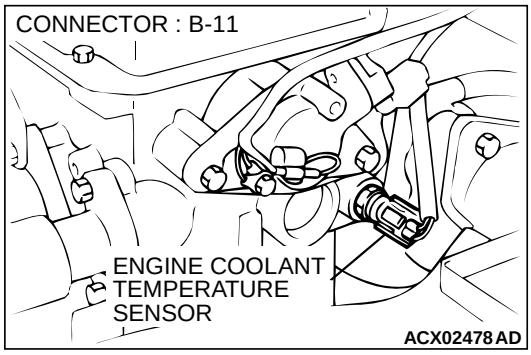
Q: Is the voltage normal?

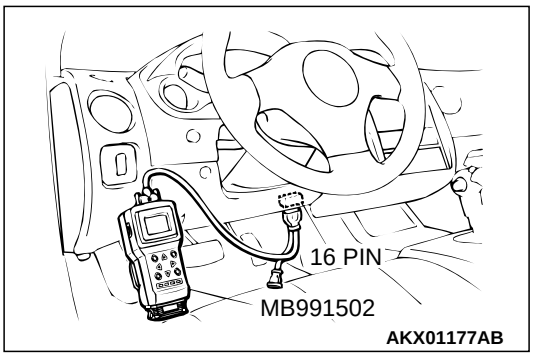
YES : Go to Step 3.
NO : Go to Step 5.

STEP 3. Check connector B-11 at the engine coolant temperature sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.





STEP 4. Using scan tool MB991502, check data list item 21: Engine Coolant Temperature Sensor.

⚠ CAUTION

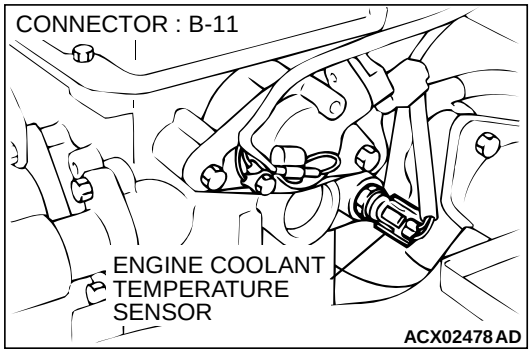
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 21, Engine Coolant Temperature Sensor.
- The engine coolant temperature and temperature shown with the scan tool should approximately match.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

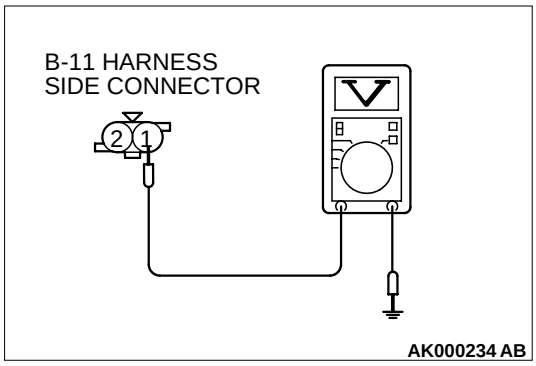
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Replace the ECM or PCM. Then go to Step 14.



STEP 5. Check connector B-11 at engine coolant temperature sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 6.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



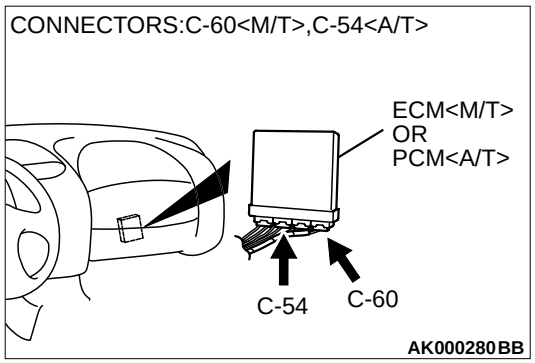
STEP 6. Check the sensor supply voltage at engine coolant temperature sensor harness side connector B-11.

(1) Disconnect the connector B-11 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 1 and ground.
- Voltage should be between 4.5 and 4.9 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 8.
NO : Go to Step 7.

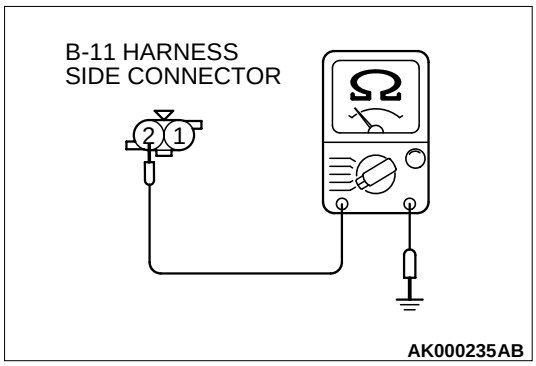


STEP 7. Check connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Replace the ECM or PCM. Then go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP 8. Check the continuity at engine coolant temperature sensor harness side connector B-11.

(1) Disconnect the connector B-11 and measure at the harness side.

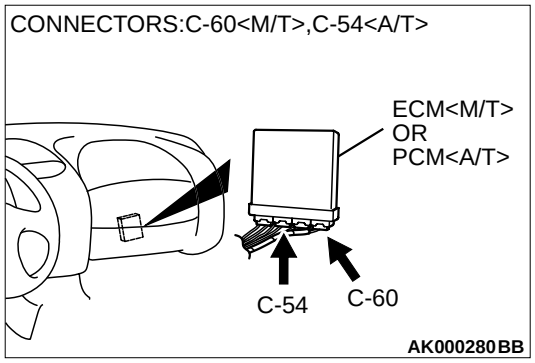
(2) Check for the continuity between terminal 2 and ground.

- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 11.

NO : Go to Step 9.

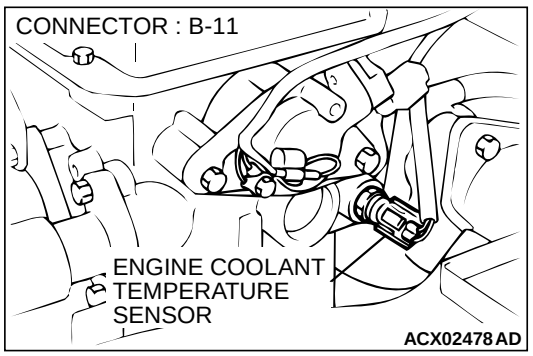


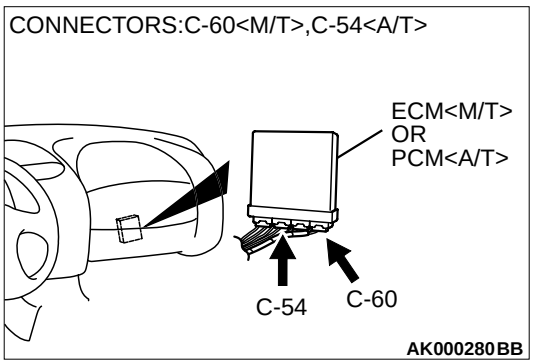
STEP 9. Check connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



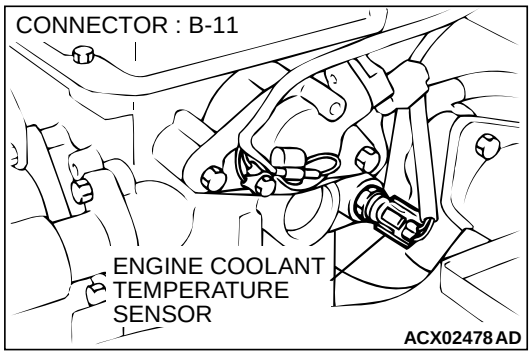


STEP 10. Check for harness damage between engine coolant temperature sensor connector B-11 (terminal 2) and ECM connector C-60 (terminal 92) <M/T> or PCM connector C-54 (terminal 57) <A/T>.

Q: Is the harness wire in good condition?

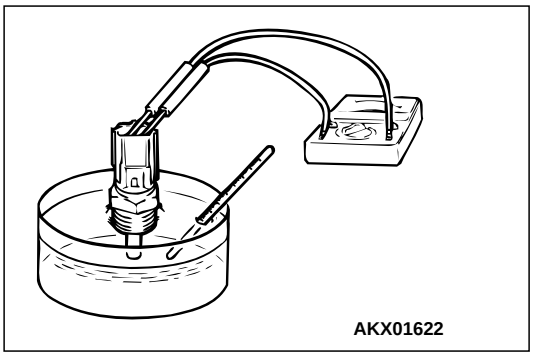
YES : Replace the ECM or PCM. Then go to Step 14.

NO : Repair it. Then go to Step 14.



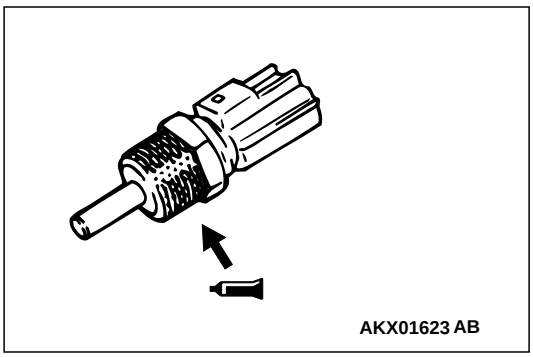
STEP 11. Check the engine coolant temperature sensor.

(1) Disconnect the engine coolant temperature sensor connector B-11.
(2) Remove the engine coolant temperature sensor.



(3) With the temperature sensing portion of engine coolant temperature sensor immersed in hot water, check resistance.

Standard value:
14 – 17 kΩ [at –20°C (–4°F)]
5.1 – 6.5 kΩ [at 0°C (32°F)]
2.1 – 2.7 kΩ [at 20°C (68°F)]
0.9 – 1.3 kΩ [at 40°C (104°F)]
0.48 – 0.68 kΩ [at 60°C (140°F)]
0.26 – 0.36 kΩ [at 80°C (176°F)]



(4) Apply 3M™ AAD part number 8731 or equivalent on the screw section of the engine coolant temperature sensor.
(5) Install the engine coolant temperature sensor, and tighten to the specified torque.

Tightening torque: 29 ± 10 N·m (22 ± 7 ft-lb)

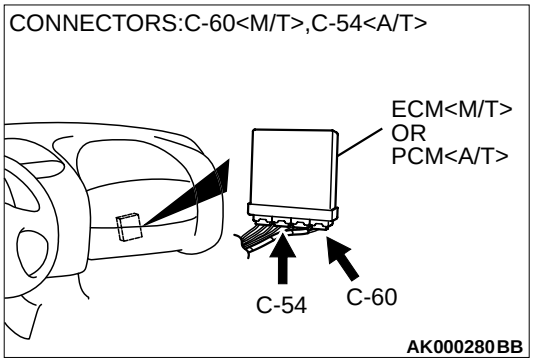
Q: Is the resistance at the standard value?

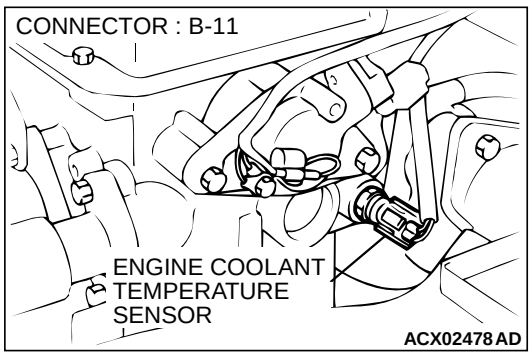
YES : Go to Step 12.
NO : Replace the engine coolant temperature sensor. Then go to Step 14.

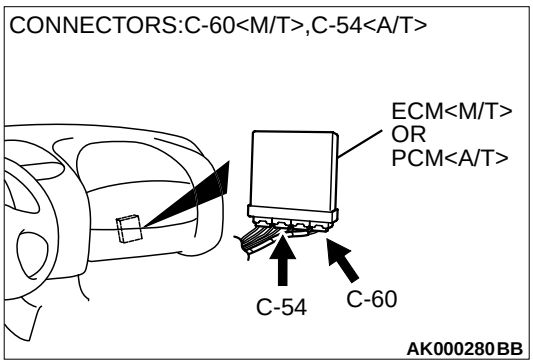
STEP 12. Check connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 13.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.







STEP 13. Check for harness damage between engine coolant temperature sensor connector B-11 (terminal 1) and ECM connector C-60 (terminal 83) <M/T> or PCM connector C-54 (terminal 44) <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 14.

NO : Repair it. Then go to Step 14.

STEP 14. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.

(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0125 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0128: Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)

TECHNICAL DESCRIPTION

- The ECM <M/T> or PCM <A/T> checks the time for the engine coolant temperature to reach the judgment temperature.

DTC SET CONDITIONS

Check Conditions

- Engine coolant temperature is between –10°C (14°F) and 77°C (171°F) when the engine is started.
- The engine coolant temperature – intake air temperature is 5°C (9°F) or less when the engine is started.
- The intake air temperature when the engine is started – intake air temperature is 5°C (9°F) or less.
- The volume air flow sensors output frequency is in the low frequency (50 – 100 Hz or less) state for 300 seconds or less.

Judgment Criteria

- The time for the engine coolant temperature to rise to 77°C (171°F) takes longer than approximately 11 to 22 minutes.
- The PCM monitors for this condition once during the drive cycle.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- The thermostat is faulty
- ECM <M/T> failed.
- PCM <A/T> failed.

DIAGNOSIS

STEP 1. Check the cooling system.

Refer to GROUP 14, Engine Cooling Diagnosis P.14-3.

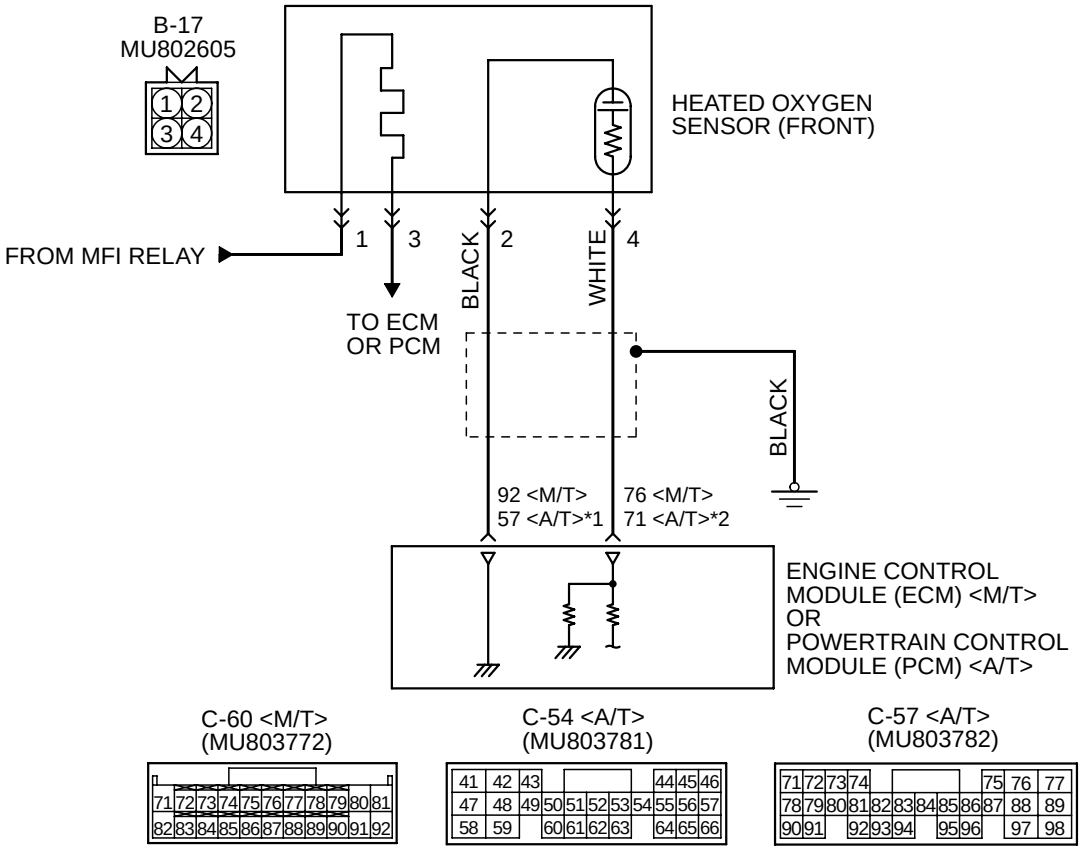
Q: Is the cooling system normal?

YES : Replace the ECM <M/T> or PCM<A/T>. Then check that the DTC P0128 does not reset.

NO : Repair it. Then check that the DTC P0128 does not reset.

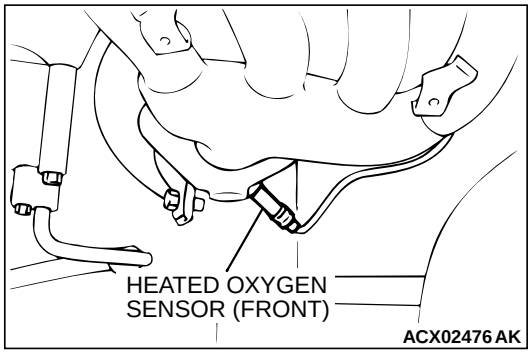
DTC P0130: Heated Oxygen Sensor Circuit (sensor 1)

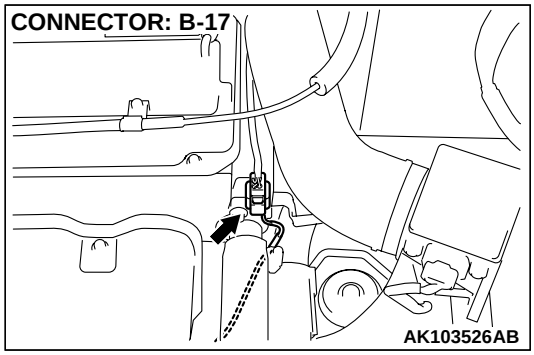
Heated Oxygen Sensor (front) Circuit



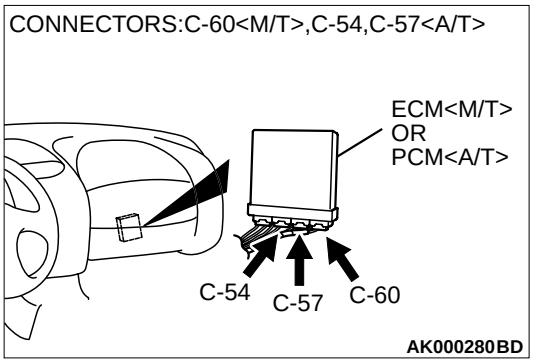
NOTE
*1:PCM connector C-54 <A/T>
*2:PCM connector C-57 <A/T>

AK000657





TSB Revision



CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal 76) <M/T> or PCM (terminal 71) <A/T> from the output terminal (terminal 4) of the heated oxygen sensor (front).
- Terminal 2 of the heated oxygen sensor (front) is grounded with ECM (terminal 92) <M/T> or PCM (terminal 57) <A/T>.

TECHNICAL DESCRIPTION

- The heated oxygen sensor (front) detects the concentration of oxygen in the exhaust gas; it converts those data to voltage, and inputs the resulting signals to the ECM <M/T> or PCM <A/T>.
- When the heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response becomes poor.
- The ECM <M/T> or PCM <A/T> forcibly varies the air/fuel mixture to make it leaner and richer, and checks the response speed of the heated oxygen sensor (front). In addition, the ECM <M/T> or PCM <A/T> also checks for an open circuit in the heated oxygen sensor (front) output line.

DTC SET CONDITIONS

Check Conditions

- 3 minutes or more have passed since the starting sequence was completed.
- Heated oxygen sensor (front) signal voltage has continued to be 0.2 volt or lower.
- Engine coolant temperature is higher than 76°C (169°F).
- Engine speed is higher than 1,200 r/min.
- Volumetric efficiency is higher than 25 percent.
- Monitoring time: 7 seconds.

Judgment Criteria

- Input voltage supplied to the ECM <M/T> or PCM <A/T> interface circuit is higher than 4.5 volts when 5 volts is applied to the heated oxygen sensor (front) output line via a resistor.
- The ECM<M/T> or PCM<A/T> monitors for this condition once during the drive cycle.

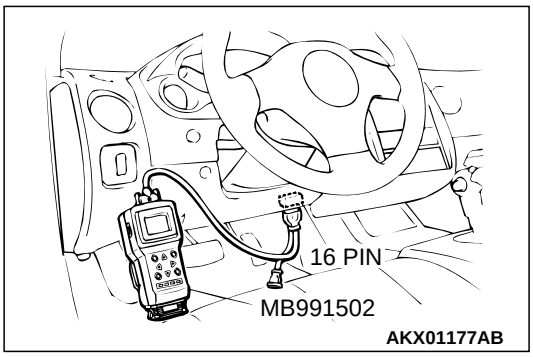
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Heated oxygen sensor (front) deteriorated.
- Open circuit in heated oxygen sensor (front) output line.
- Open circuit in heated oxygen sensor (front) ground line.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MD998464: Test Harness



STEP 1. Using scan tool MB991502, check data list item 11: Heated Oxygen Sensor (front).

⚠ CAUTION

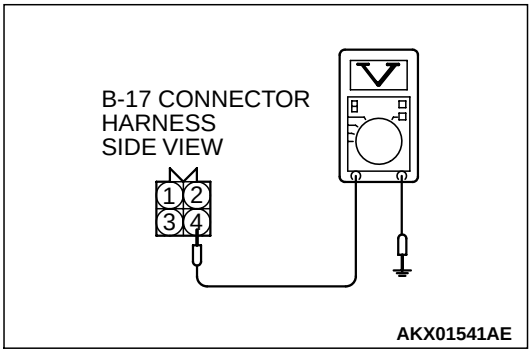
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 11, Heated Oxygen Sensor (front).
- Warming up the engine. When the engine is revved, the output voltage should be 0.6 to 1.0 volt.
- Warming up the engine. When the engine is idling, the output voltage should repeat 0.4 volt and 0.6 to 1.0 volt alternately.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Go to Step 2.



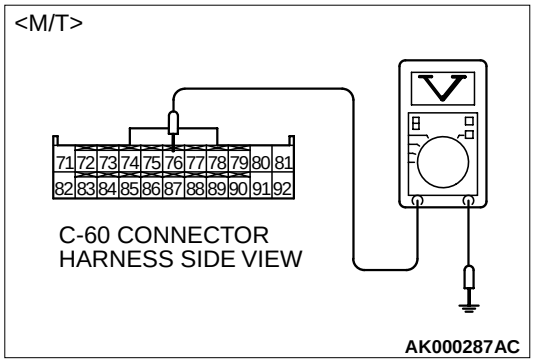
STEP 2. Check the sensor output voltage at heated oxygen sensor (front) connector B-17 by backprobing.

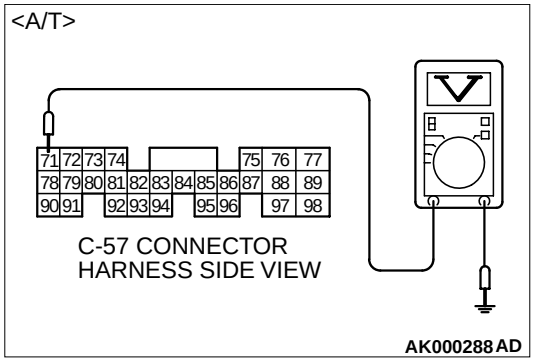
(1) Do not disconnect the connector B-17.
(2) Start the engine and run at idle.
(3) Measure the voltage between terminal 4 and ground by backprobing.
- Warming up the engine. When the engine is 2,500 r/min, the output voltage should repeat 0 to 0.8 volt alternately.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 3.
NO : Go to Step 7.





STEP 3. Check the sensor output voltage at ECM connector C-60 <M/T> or PCM connector C-57 <A/T> by backprobing.

(1) Do not disconnect the connector C-60 <M/T> or C-57 <A/T>.
(2) Start the engine and run at idle.
(3) Measure the voltage between terminal 76 <M/T> or 71 <A/T> and ground by backprobing.
- Warming up the engine. When the engine is 2,500 r/min, the output voltage should repeat 0 to 0.8 volt alternately.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

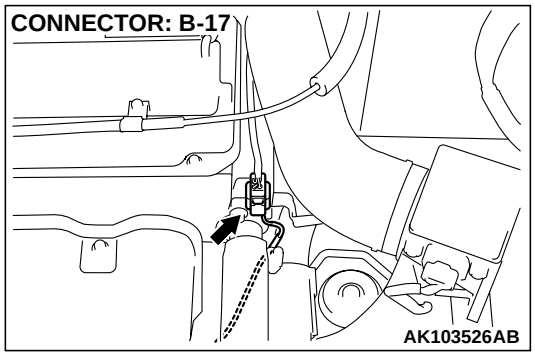
YES : Go to Step 4.
NO : Go to Step 6.

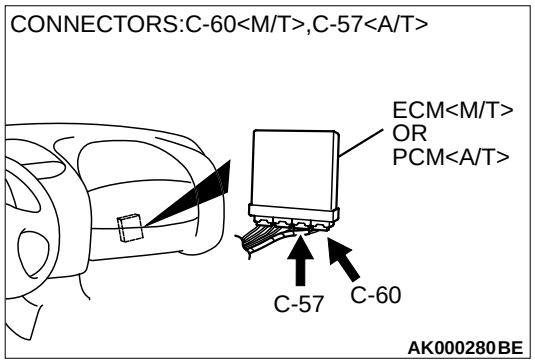
STEP 4. Check connector B-17 at heated oxygen sensor (front) and connector C-60 at ECM <M/T> or connector C-57 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 15.





STEP 5. Using scan tool MB991502, check data list item 11: Heated Oxygen Sensor (front).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.

(2) Start the engine and run at idle.

(3) Set scan tool MB991502 to the data reading mode for item 11, Heated Oxygen Sensor (front).

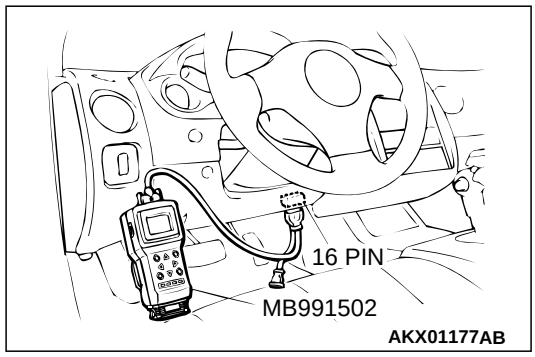
- Warming up the engine. When the engine is revved, the output voltage should be 0.6 to 1.0 volt.
- Warming up the engine. When the engine is idling, the output voltage should repeat 0.4 volt and 0.6 to 1.0 volt alternately.

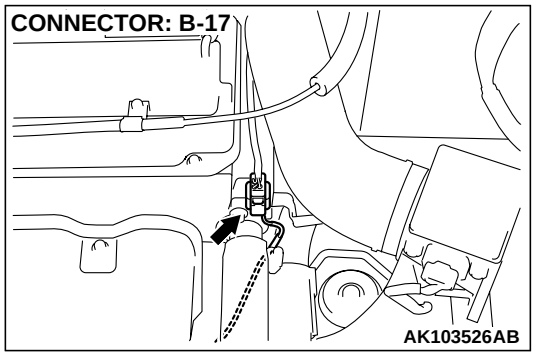
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

NO : Replace the ECM or PCM. Then go to Step 15.



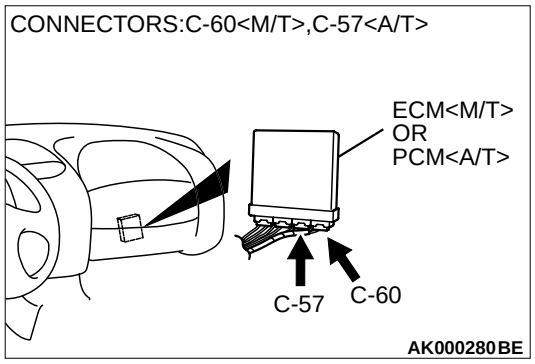


STEP 6. Check connector B-17 at heated oxygen sensor (front) and connector C-60 at ECM <M/T> or connector C-57 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between heated oxygen sensor (front) connector B-17 terminal 4 and ECM connector C-60 terminal 76 <M/T> or PCM connector C-57 terminal 71 <A/T> because of open circuit or harness damage. Then go to Step 15.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 15.

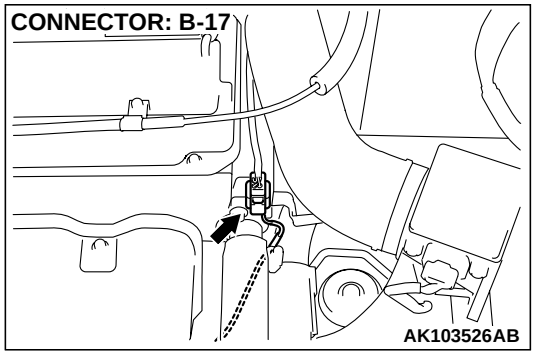


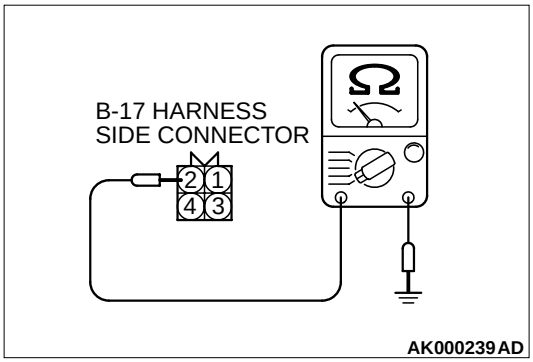
STEP 7. Check connector B-17 at heated oxygen sensor (front) for damage.

Q: Is the connector in good condition?

YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 15.





STEP 8. Check the continuity at heated oxygen sensor (front) harness side connector B-17.

(1) Disconnect the connector B-17 and measure at the harness side.

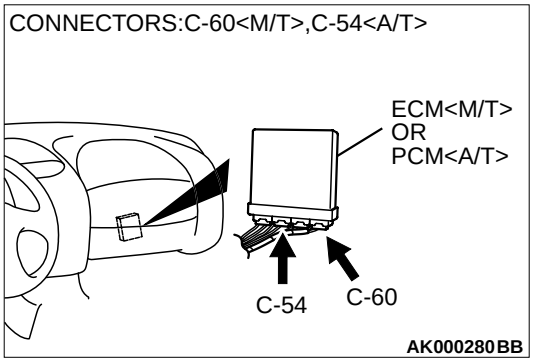
(2) Check for the continuity between terminal 2 and ground.

- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 11.

NO : Go to Step 9.



STEP 9. Check connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

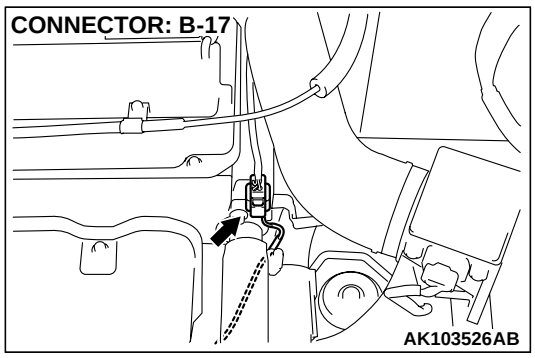
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 15.

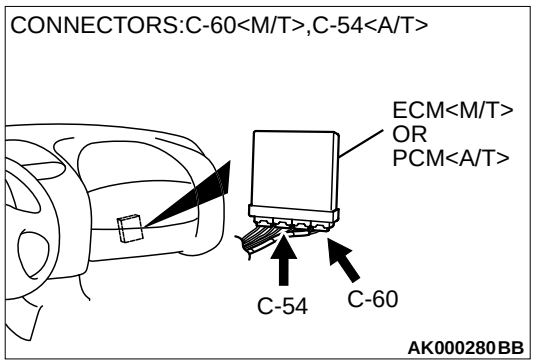
STEP 10. Check for open circuit and harness damage between heated oxygen sensor (front) connector B-17 (terminal 2) and ECM connector C-60 (terminal 92) <M/T> or PCM connector C-54 (terminal 57) <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 15.

NO : Repair it. Then go to Step 15.



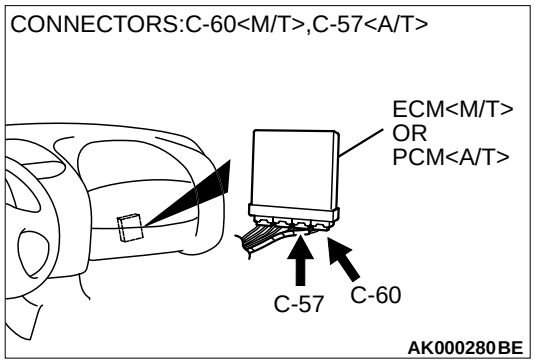


STEP 11. Check connector C-60 at ECM <M/T> or connector C-57 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 12.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 15.

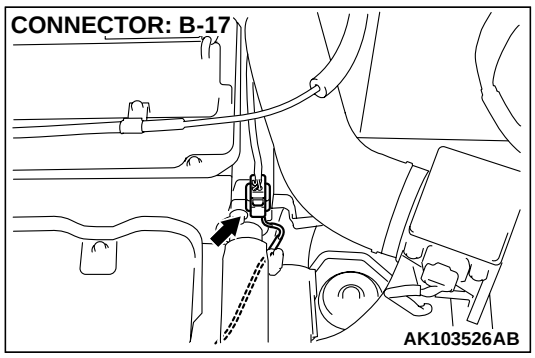


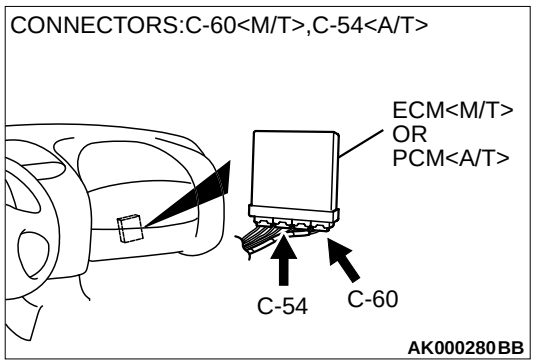
STEP 12. Check for harness damage between heated oxygen sensor (front) connector B-17 (terminal 2) and ECM connector C-60 (terminal 92) <M/T> or PCM connector C-54 (terminal 57) <A/T>.

Q: Is the harness wire in good condition?

YES : Go to Step 13.

NO : Repair it. Then go to Step 15.



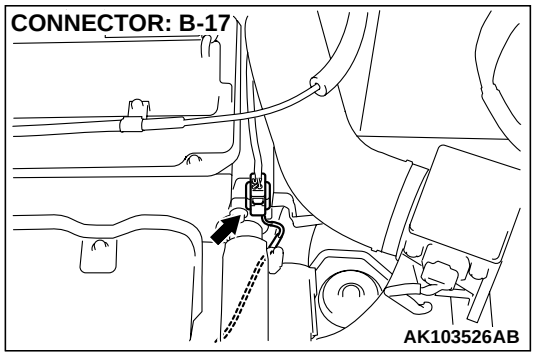


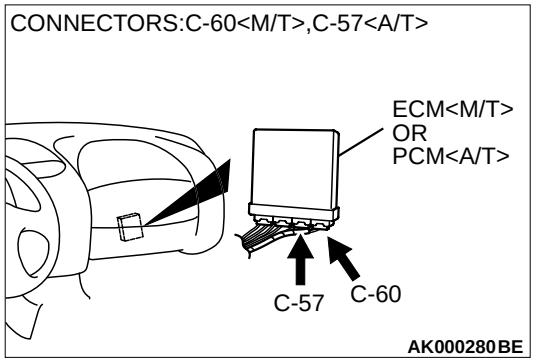
STEP 13. Check for short circuit to ground and harness damage between heated oxygen sensor (front) connector B-17 (terminal 4) and ECM connector C-60 (terminal 76) <M/T> or PCM connector C-57 (terminal 71) <A/T>.

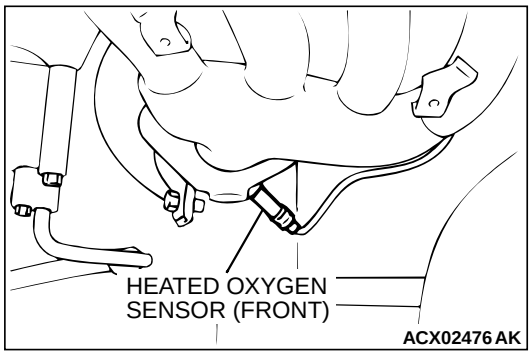
Q: Is the harness wire in good condition?

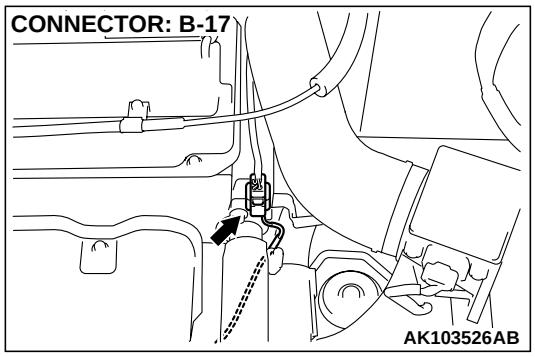
YES : Go to Step 14.

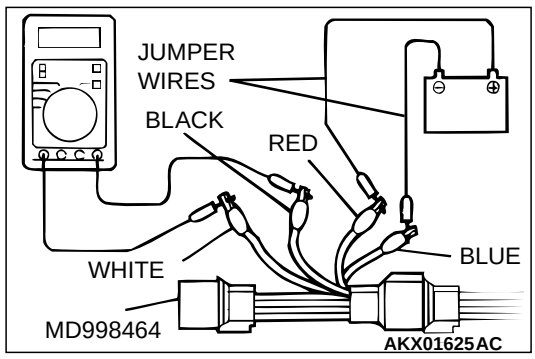
NO : Repair it. Then go to Step 15.











STEP 14. Check the heated oxygen sensor (front).

(1) Disconnect the heated oxygen sensor (front) connector B-17 and connect test harness special tool, MD998464, to the connector on the heated oxygen sensor (front) side.
(2) Warm up the engine until engine coolant 80°C (176°F) or higher.

⚠ CAUTION

Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor (front).

(3) Use the jumper wires to connect terminal 1 (red clip) to the positive battery terminal and terminal 3 (blue clip) to the negative battery terminal.
(4) Connect a digital volt meter between terminal 2 (black clip) and terminal 4 (white clip).
(5) While repeatedly revving the engine, measure the heated oxygen sensor (front) output voltage.

Standard value: 0.6 – 1.0 volt

Q: Is the voltage at the standard value?

YES : Replace the ECM or PCM. Then go to Step 15.
NO : Replace the heated oxygen sensor (front). Then go to Step 15.

STEP 15. Test the OBD-II drive cycle.

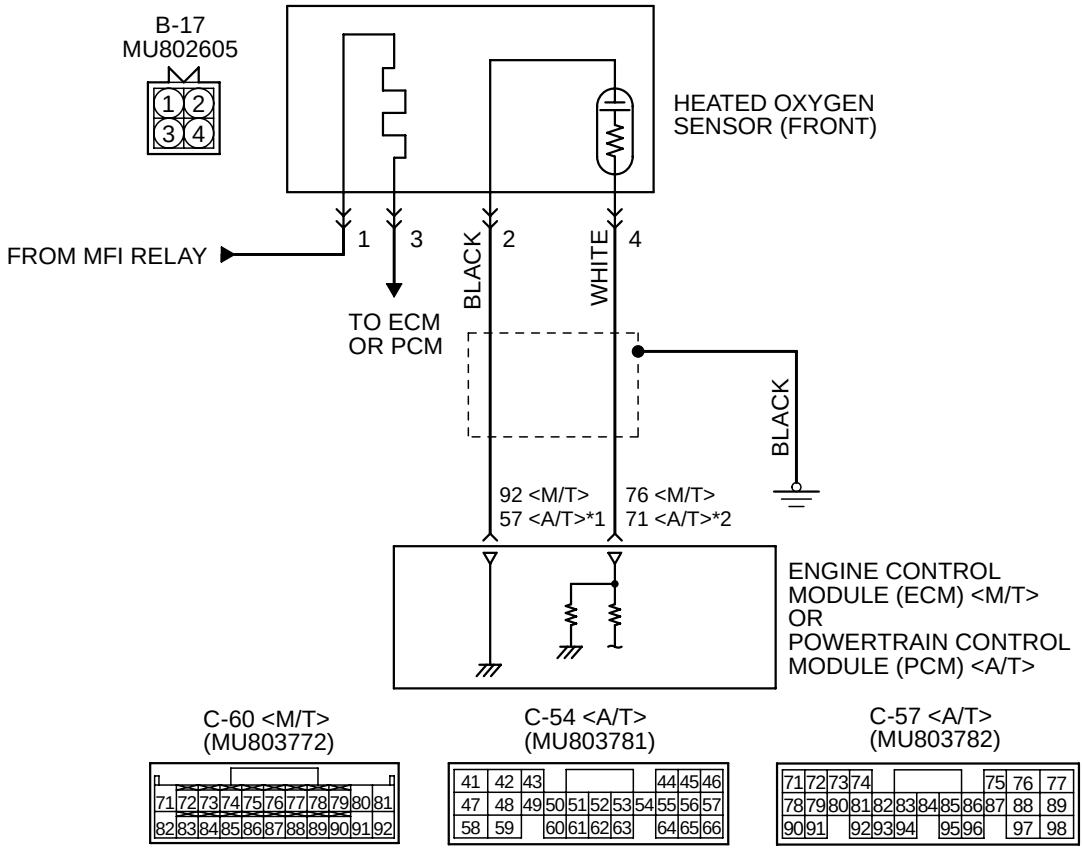
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0130 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

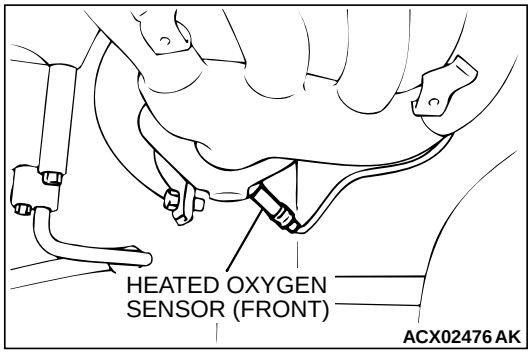
DTC P0131: Heated Oxygen Sensor Circuit Low Voltage (sensor 1)

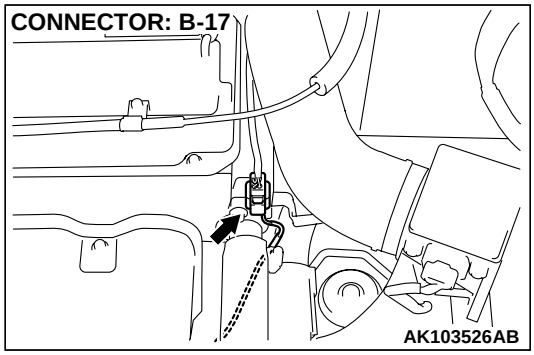
Heated Oxygen Sensor (front) Circuit



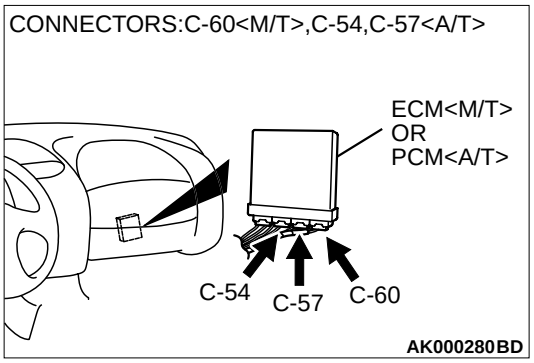
NOTE
*1:PCM connector C-54 <A/T>
*2:PCM connector C-57 <A/T>

AK000657





TSB Revision



CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal 76) <M/T> or PCM (terminal 71) <A/T> from the output terminal (terminal 4) of the heated oxygen sensor (front).
- Terminal 2 of the heated oxygen sensor (front) is grounded with ECM (terminal 92) <M/T> or PCM (terminal 57) <A/T>.

TECHNICAL DESCRIPTION

- The heated oxygen sensor (front) detects the concentration of oxygen in the exhaust gas; it converts those data to voltage, and inputs the resulting signals to the ECM <M/T> or PCM <A/T>.
- When the heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response becomes poor.
- The ECM <M/T> or PCM <A/T> forcibly varies the air/fuel mixture to make it leaner and richer, and checks the response speed of the heated oxygen sensor (front). In addition, the ECM <M/T> or PCM <A/T> also checks for an open circuit in the heated oxygen sensor (front) output line.

DTC SET CONDITIONS

Check Conditions

- 3 minutes or more have passed since the starting sequence was completed.
- Heated oxygen sensor (front) signal voltage has continued to be 0.2 volt or lower.
- Engine coolant temperature is higher than 76°C (169°F).
- Engine speed is higher than 1,200 r/min.
- Volumetric efficiency is higher than 25 percent.
- Volume air flow sensor output frequency is 75 Hz or more.
- At least 20 seconds have passed since fuel shut off control was canceled.
- After the ignition switch is turned ON, the changes in the output voltage of the heated oxygen sensor (front) is lower than 0.078 volt.
- Monitoring time: 10 seconds.

Judgement Criteria

- Making the air/fuel ratio 15 percent for 10 seconds richer does not result in raising the heated oxygen sensor (front) output voltage beyond 0.2 volt.
- The ECM<M/T> or PCM<A/T> monitors for this condition once during the drive cycle.

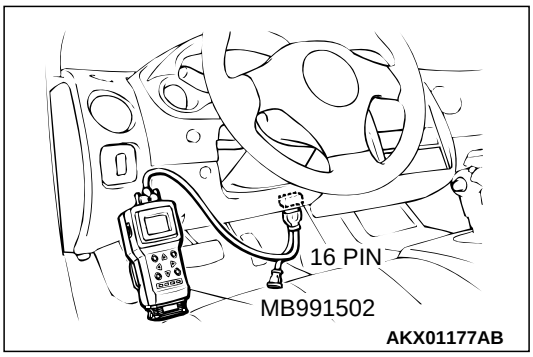
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Heated oxygen sensor (front) deteriorated.
- Short circuit in heated oxygen sensor (front) output line.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MD998464: Test Harness



STEP 1. Using scan tool MB991502, check data list item 11: Heated Oxygen Sensor (front).

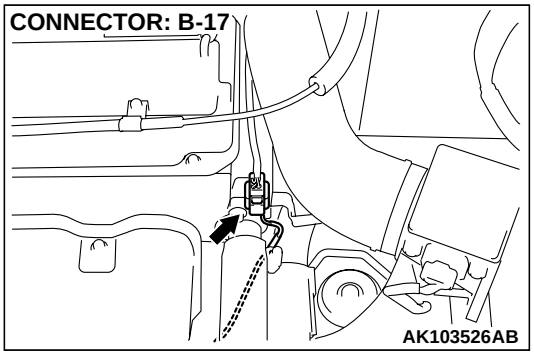
⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 11, Heated Oxygen Sensor (front).
- Warming up the engine. When the engine is revved, the output voltage should be 0.6 to 1.0 volt.
- Warming up the engine. When the engine is idling, the output voltage should repeat 0.4 volt and 0.6 to 1.0 volt alternately.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

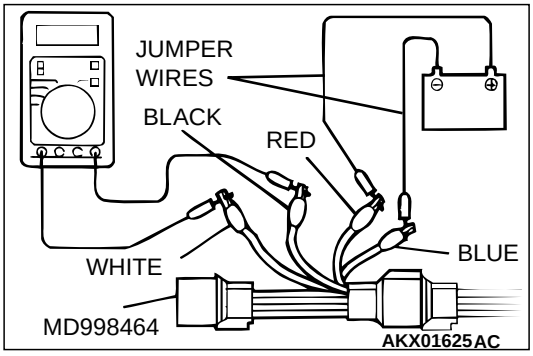
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Go to Step 2.



STEP 2. Check the heated oxygen sensor (front).

(1) Disconnect the heated oxygen sensor (front) connector B-17 and connect test harness special tool, MD998464, to the connector on the heated oxygen sensor (front) side.
(2) Warm up the engine until engine coolant 80°C (176°F) or higher.

⚠ CAUTION
Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor (front).



(3) Use the jumper wires to connect terminal 1 (red clip) to the positive battery terminal and terminal 3 (blue clip) to the negative battery terminal.
(4) Connect a digital volt meter between terminal 2 (black clip) and terminal 4 (white clip).
(5) While repeatedly revving the engine, measure the heated oxygen sensor (front) output voltage.

Standard value: 0.6 – 1.0 volt

Q: Is the voltage at the standard value?

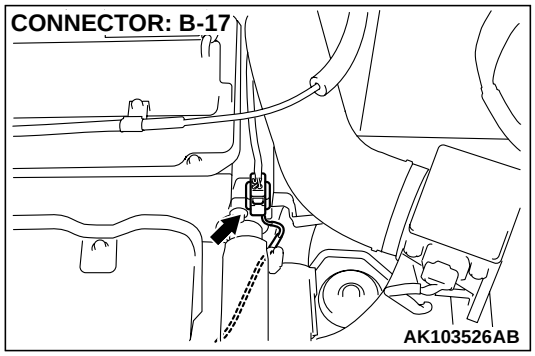
YES : Go to Step 3.
NO : Replace the heated oxygen sensor (front). Then go to Step 5.

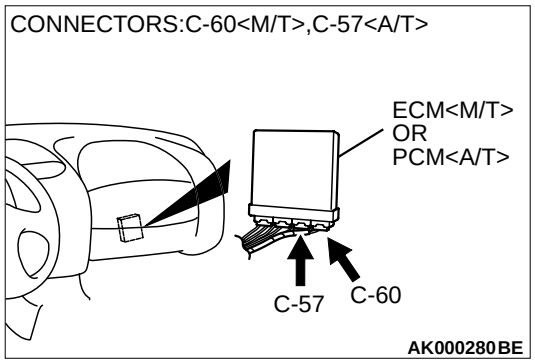
STEP 3. Check connector B-17 at heated oxygen sensor (front) and connector C-60 at ECM <M/T> or connector C-57 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.



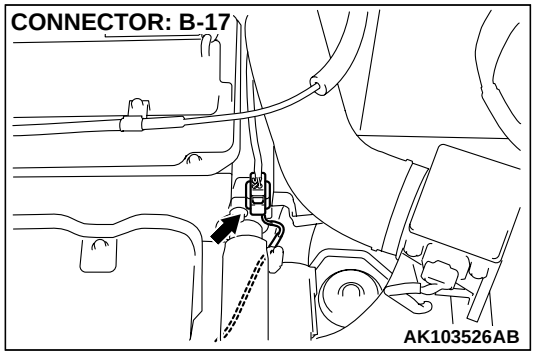


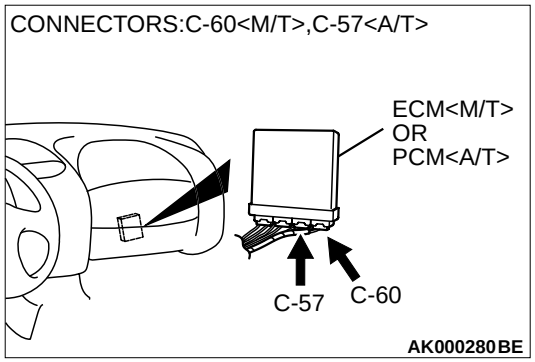
STEP 4. Check for short circuit to ground between heated oxygen sensor (front) connector B-17 (terminal 4) and ECM connector C-60 (terminal 76) <M/T> or PCM connector C-57 (terminal 71) <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 5.

NO : Repair it. Then go to Step 5.





STEP 5. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.

(2) Check the diagnostic trouble code (DTC).

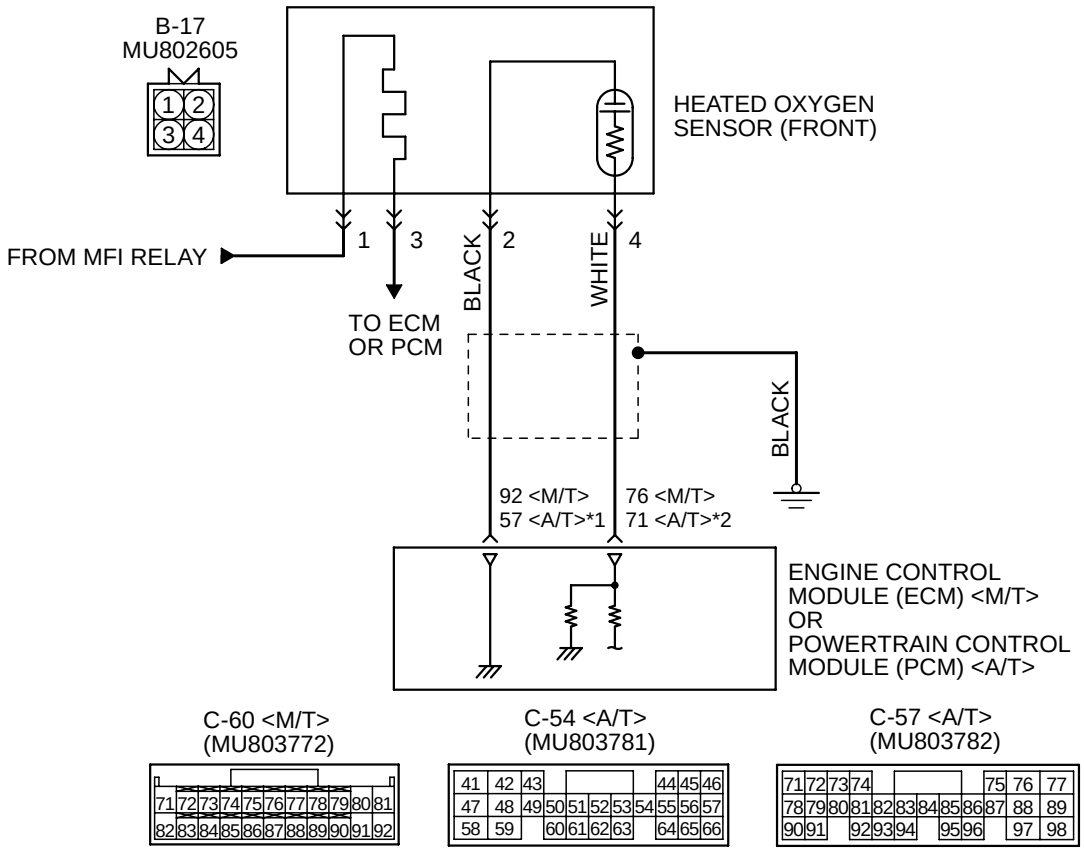
Q: Is the DTC P0131 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

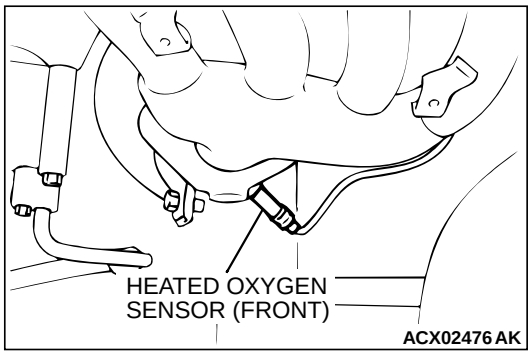
DTC P0132: Heated Oxygen Sensor Circuit High Voltage (sensor 1)

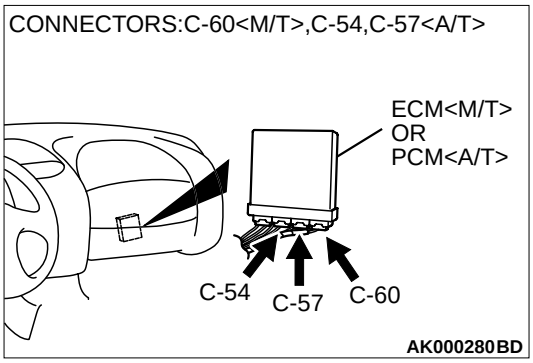
Heated Oxygen Sensor (front) Circuit

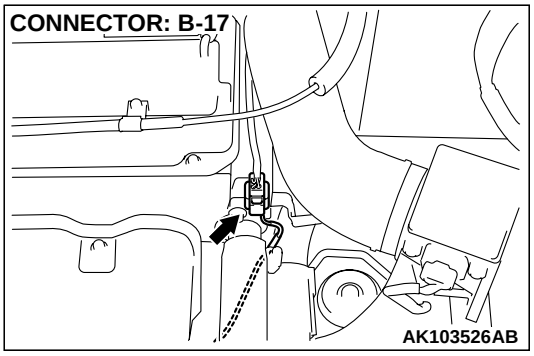


NOTE
*1:PCM connector C-54 <A/T>
*2:PCM connector C-57 <A/T>

AK000657







CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal 76) <M/T> or PCM (terminal 71) <A/T> from the output terminal (terminal 4) of the heated oxygen sensor (front).
- Terminal 2 of the heated oxygen sensor (front) is grounded with ECM (terminal 92) <M/T> or PCM (terminal 57) <A/T>.

TECHNICAL DESCRIPTION

- The heated oxygen sensor (front) detects the concentration of oxygen in the exhaust gas; it converts those data to voltage, and inputs the resulting signals to the ECM <M/T> or PCM <A/T>.
- When the heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response becomes poor.
- The ECM <M/T> or PCM <A/T> forcibly varies the air/fuel mixture to make it leaner and richer, and checks the response speed of the heated oxygen sensor (front). In addition, the ECM <M/T> or PCM <A/T> also checks for an open circuit in the heated oxygen sensor (front) output line.

DTC SET CONDITIONS

Check Conditions

- 2 seconds or more have passed since the starting sequence was completed.

Judgment Criteria

- Heated oxygen sensor (front) output voltage has continued to be 1.2 volts or higher for 2 seconds.

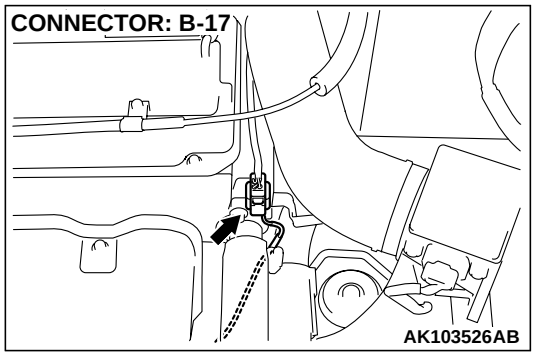
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Heated oxygen sensor (front) deteriorated.
- Short circuit in heated oxygen sensor (front) output line.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

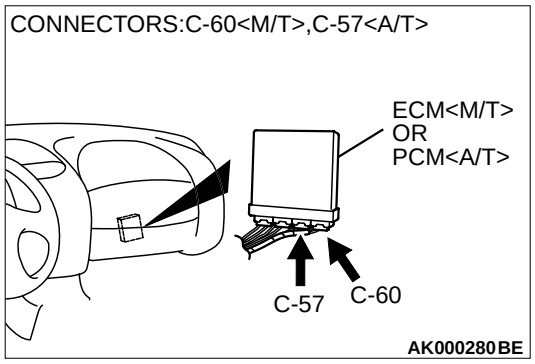


STEP 1. Check connector B-17 at heated oxygen sensor (front) and connector C-60 at ECM <M/T> or connector C-57 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 3.

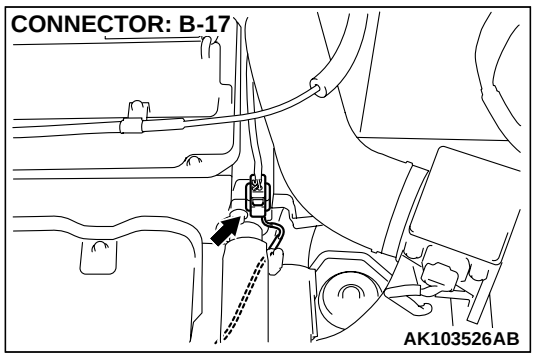


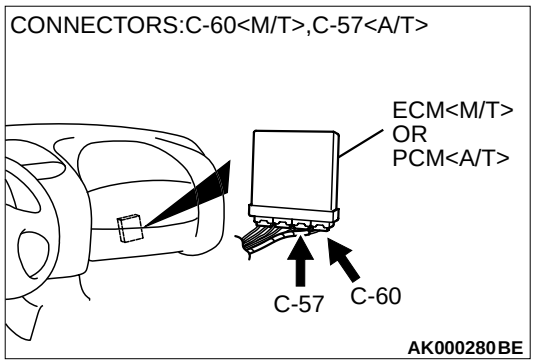
STEP 2. Check for short circuit to power supply between heated oxygen sensor (front) connector B-17 (terminal 4) and ECM connector C-60 (terminal 76) <M/T> or PCM connector C-57 (terminal 71) <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 3.

NO : Repair it. Then go to Step 3.





STEP 3. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.

(2) Check the diagnostic trouble code (DTC).

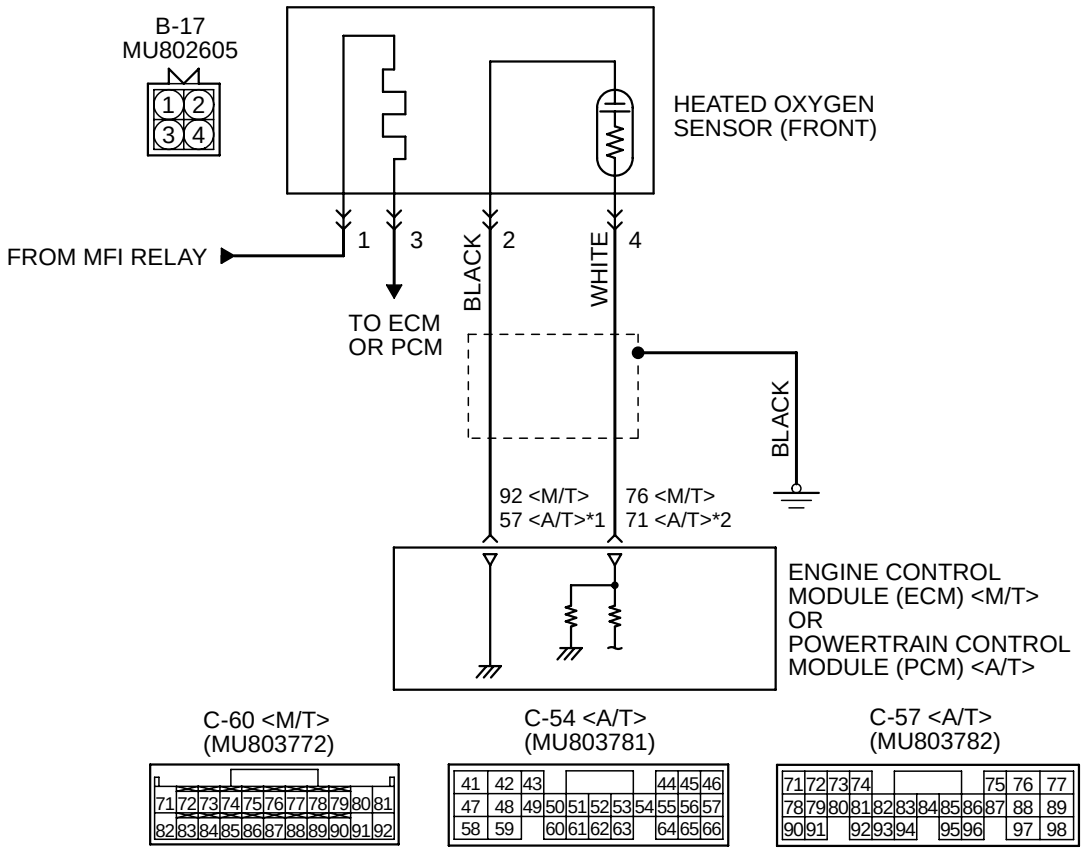
Q: Is the DTC P0132 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

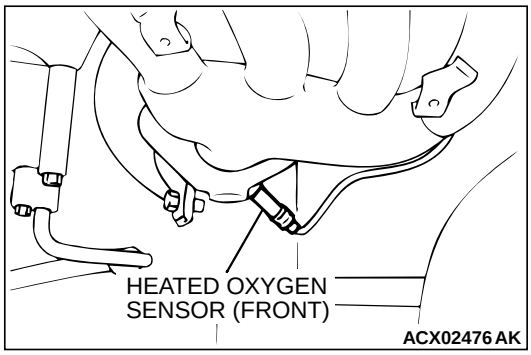
DTC P0133: Heated Oxygen Sensor Circuit Slow Response (sensor 1)

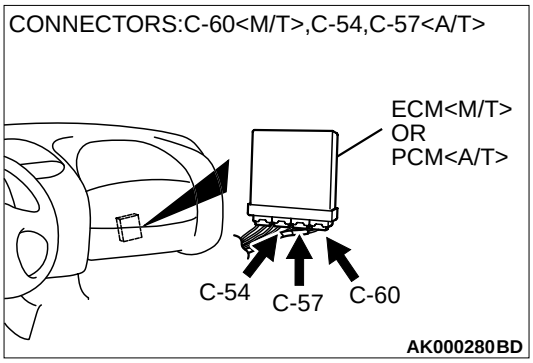
Heated Oxygen Sensor (front) Circuit

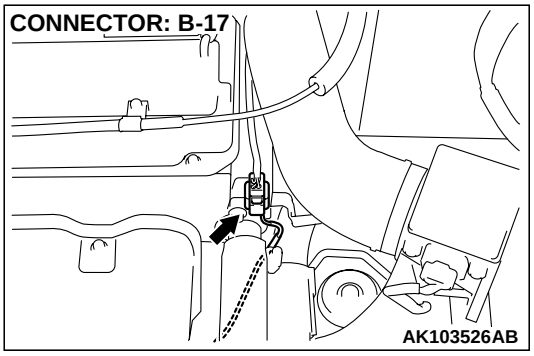


NOTE
*1:PCM connector C-54 <A/T>
*2:PCM connector C-57 <A/T>

AK000657







CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal 76) <M/T> or PCM (terminal 71) <A/T> from the output terminal (terminal 4) of the heated oxygen sensor (front).
- Terminal 2 of the heated oxygen sensor (front) is grounded with ECM (terminal 92) <M/T> or PCM (terminal 57) <A/T>.

TECHNICAL DESCRIPTION

- The heated oxygen sensor (front) detects the concentration of oxygen in the exhaust gas; it converts those data to voltage, and inputs the resulting signals to the ECM <M/T> or PCM <A/T>.
- When the heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response becomes poor.
- The ECM <M/T> or PCM <A/T> forcibly varies the air/fuel mixture to make it leaner and richer, and checks the response speed of the heated oxygen sensor (front). In addition, the ECM <M/T> or PCM <A/T> also checks for an open circuit in the heated oxygen sensor (front) output line.

DTC SET CONDITIONS

Check Conditions

- Engine coolant temperature is higher than 60°C (140°F).
- Engine speed is at between 1,500 and 3,000 r/min <M/T> or 1,200 and 3,000 r/min <A/T>.
- Volumetric efficiency is at between 21 and 60 <M/T> or 30 and 60 <A/T> percent.
- Under the closed loop air/fuel control.
- The throttle valve is open.
- Short-term fuel trim is higher than –25 and lower than +25 percent.
- More than 2 seconds have elapsed after the above mentioned conditions have been met.
- The ECM<M/T> or PCM<A/T> monitors for this condition for 7 cycles of 10 second each during the drive cycle.

Judgment Criteria

- The heated oxygen sensor (front) sends "lean" and "rich" signals alternately 8 times or less for 10 seconds.

NOTE: If the sensor switching frequency is lower than the Judgment Criteria due to the MUT-II OBD-II test Mode – H02S Test Results, it is assumed that the heated oxygen sensor has deteriorated. If it is higher, it is assumed that the harness is damaged or has a short circuit.
If the heated oxygen sensor signal voltage has not changed even once (lean/rich) after the DTC was erased, the sensor switch time will display as 0 seconds.

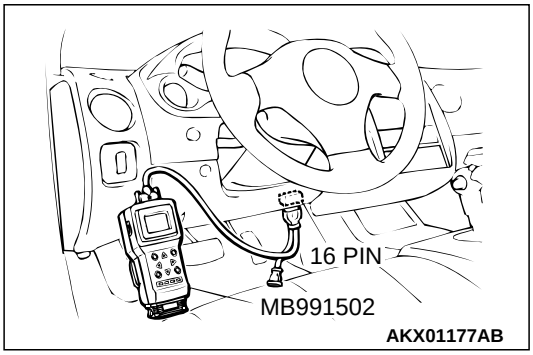
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Heated oxygen sensor (front) deteriorated.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 11: Heated Oxygen Sensor (front).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 11, Heated Oxygen Sensor (front).
(4) Warm up the engine, 2,500 r/min.
  - Output voltage repeats 0.4 volt or less and 0.6 – 1.0 volt 10 times or more within 10 seconds.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Replace the heated oxygen sensor (front). Then go to Step 2.

STEP 2. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 4 – Heated Oxygen Sensor Monitor P.13A-5.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0133 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0134: Heated Oxygen Sensor Circuit No Activity Detected (sensor 1)

Heated Oxygen Sensor Circuit No Activity Detected (sensor 1) Circuit
- Refer to, DTC P0130 Heated Oxygen Sensor (front) Circuit P.13A-126.
- Refer to, DTC P0201, P0202, P0203, P0204 – Injector Circuit P.13A-216.

CIRCUIT OPERATION
- Refer to, DTC P0130 Heated Oxygen Sensor (front) Circuit P.13A-126.
- Refer to, DTC P0201, P0202, P0203, P0204 – Injector Circuit P.13A-216.

TECHNICAL DESCRIPTION
- The ECM <M/T> or PCM <A/T> effects air/fuel ratio feedback control in accordance with the signals from the heater oxygen sensor (front).
- If the heated oxygen sensor (front) has deteriorated, corrections will be made by the heated oxygen sensor (rear).
- DTC P0134 becomes stored in memory if a failure is detected in the above air/fuel ratio feedback control system.

DTC SET CONDITIONS

Check Conditions
- 30 seconds or more have passed since the starting sequence was completed.
- Engine coolant temperature is higher than 76°C (169°F).
- Engine speed is higher than 1,200 r/min.
- Volumetric efficiency is at between 30 and 80 percent.
- Throttle position sensor output voltage is lower than 4.3 volts.
- Except while fuel is being shut off.
- Monitoring time: 30 seconds.

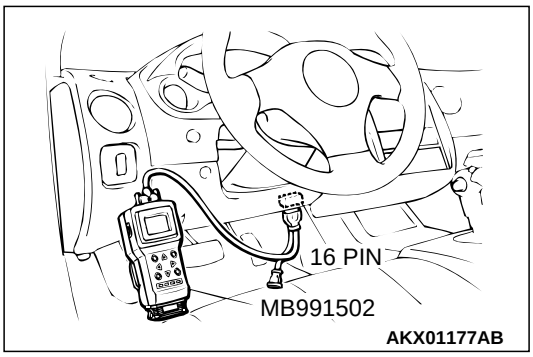
Judgment Criteria
- Heated oxygen sensor (front) output voltage does not get across 0.5 volt within about 30 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Heated oxygen sensor (front) deteriorated.
- Open circuit in heated oxygen sensor (front) output line.
- Open circuit in heated oxygen sensor (front) ground line.
- Heated oxygen sensor (rear) deteriorated.

  NOTE: When the heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor output voltage will deviate from the voltage when the sensor was new (normally 0.5 volt at stoichiometric ratio). This deviation will be corrected by the heated oxygen sensor (rear).
  If the heated oxygen sensor (rear) responds poorly because it has deteriorated, it will improperly correct the heated oxygen sensor (front). Thus, even when closed loop control is being effected, the fluctuation of the heated oxygen sensor (front) output voltage decreases, without intersecting with 0.5 volt. As a result, there is a possibility of DTC P0134 becoming registered.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools:
- MB991502: Scan Tool (MUT-II)
- MD998464: Test Harness



STEP 1. Using scan tool MB991502, check data list item 59: Heated Oxygen Sensor (rear).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 59, Heated Oxygen Sensor (rear).
- Warming up the engine. When the engine is revved, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 2.
NO : Refer to, DTC P0137 – Heated Oxygen Sensor Circuit Low Voltage (sensor 2) P.13A-170, DTC P0138 – Heated Oxygen Sensor Circuit High Voltage (sensor 2) P.13A-175, DTC P0139 – Heated Oxygen Sensor Circuit Slow Response (sensor 2) P.13A-178.

STEP 2. Check the exhaust leaks.

Q: Are there any abnormalities?

YES : Repair it. Then go to Step 12.
NO : Go to Step 3.

STEP 3. Check the intake system vacuum leak.

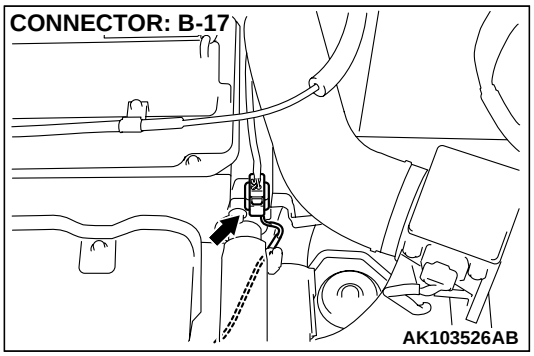
Q: Are there any abnormalities?

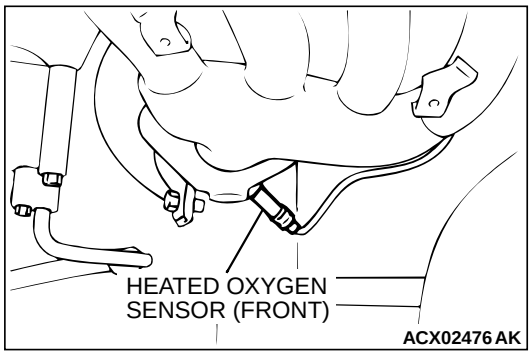
YES : Repair it. Then go to Step 12.
NO : Go to Step 4.

STEP 4. Check connector B-17 at the heated oxygen sensor (front) for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



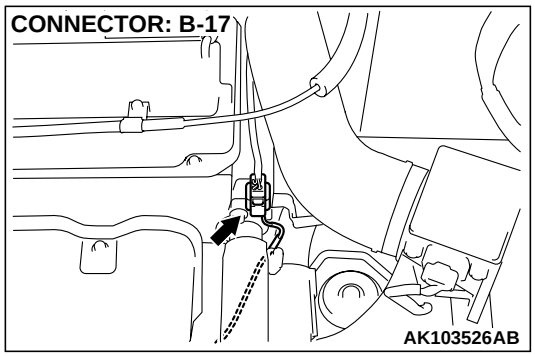


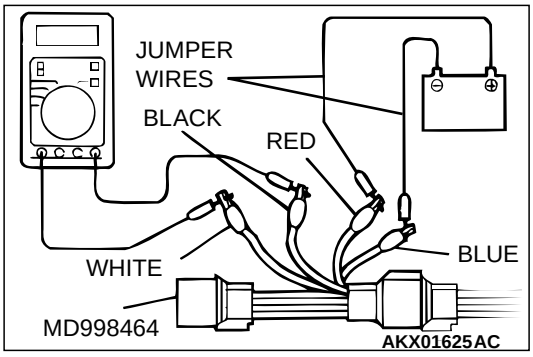
STEP 5. Check the heated oxygen sensor (front).

(1) Disconnect the heated oxygen sensor (front) connector B-17 and connect test harness special tool, MD998464 to the connector on the heated oxygen sensor (front) side.
(2) Warm up the engine until engine coolant 80°C (176°F) or higher.

⚠ CAUTION

Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor (front).





(3) Use the jumper wires to connect terminal 1 (red clip) to the positive battery terminal and terminal 3 (blue clip) to the negative battery terminal.
(4) Connect a digital volt meter between terminal 2 (black clip) and terminal 4 (white clip).
(5) While repeatedly revving the engine, measure the heated oxygen sensor (front) output voltage.

Standard value: 0.6 – 1.0 volt

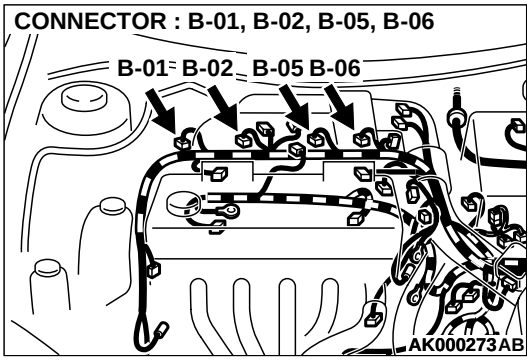
Q: Is the voltage at the standard value?

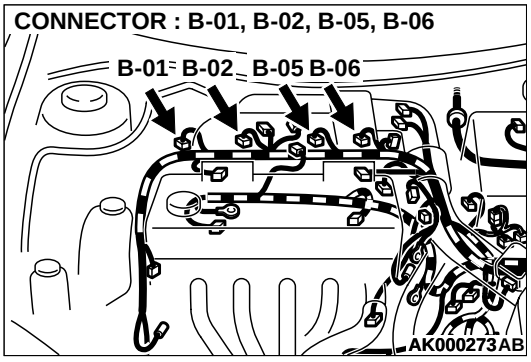
YES : Go to Step 6.
NO : Replace the heated oxygen sensor (front). Then go to Step 12.

STEP 6. Check connector B-01, B-02, B-05, B-06 at injector for damage.

Q: Is the connector in good condition?

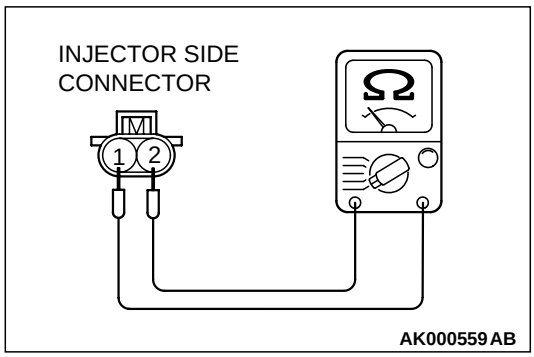
YES : Go to Step 7.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.





STEP 7. Check the injector.

(1) Disconnect each injector connector.



(2) Measure the resistance between injector side connector terminal 1 and 2.

Standard value: 13 – 16 ohm [at 20°C (68°F)]

Q: Is the resistance standard value?

YES : Go to Step 8.

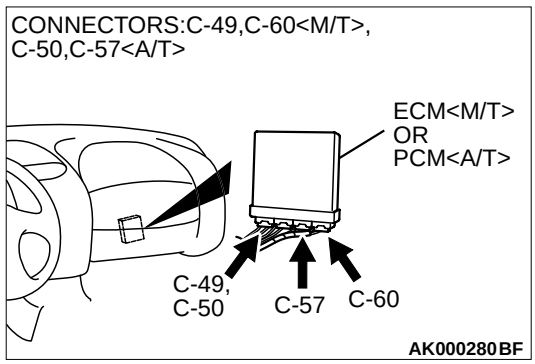
NO : Replace the injector. Then go to Step 12.

STEP 8. Check connector C-60, C-49 at ECM <M/T> or connector C-57, C-50 at PCM <A/T> for damage.

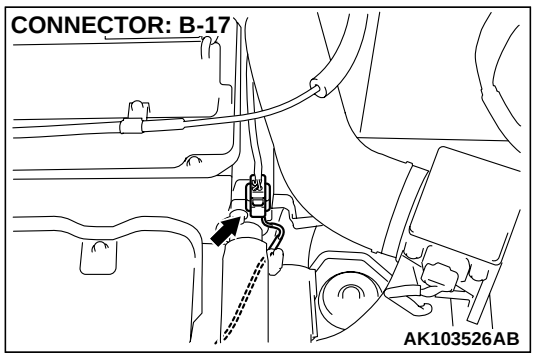
Q: Is the connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



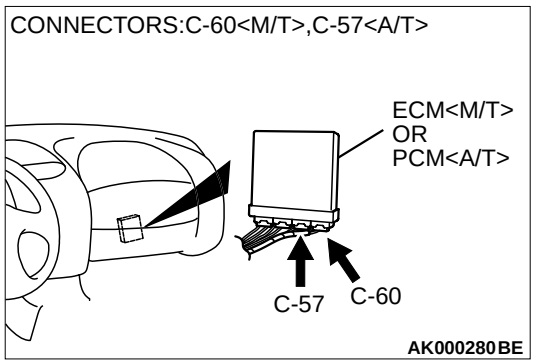
STEP 9. Check for harness damage between heated oxygen sensor (front) connector B-17 (terminal 4) and ECM connector C-60 (terminal 76) <M/T> or PCM connector C-57 (terminal 71) <A/T>.



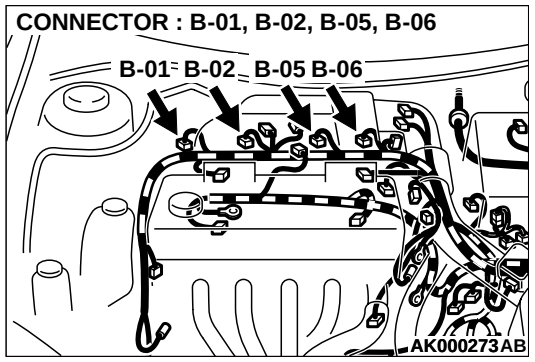
Q: Is the harness wire in good condition?

YES : Go to Step 10.

NO : Repair it. Then go to Step 12.



STEP 10. Check for harness damage between injector connector B-01, B-02, B-05, B-06 and ECM connector C-49 <M/T> or PCM connector C-50 <A/T>.

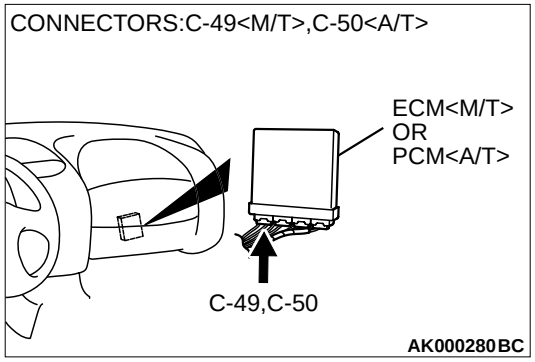


a. Check the harness wire between injector connector B-01 terminal 2 and ECM connector C-49 terminal 1 <M/T> or PCM connector C-50 terminal 1 <A/T> when checking No. 1 cylinder.

b. Check the harness wire between injector connector B-02 terminal 2 and ECM connector C-49 terminal 14 <M/T> or PCM connector C-50 terminal 9 <A/T> when checking No. 2 cylinder.

c. Check the harness wire between injector connector B-05 terminal 2 and ECM connector C-49 terminal 2 <M/T> or PCM connector C-50 terminal 24 <A/T> when checking No. 3 cylinder.

d. Check the harness wire between injector connector B-06 terminal 2 and ECM connector C-49 terminal 15 <M/T> or PCM connector C-50 terminal 2 <A/T> when checking No. 4 cylinder.



Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair it. Then go to Step 12.

STEP 11. Check the fuel pressure.
Refer to, Fuel Pressure Test P.13A-578.

Q: Is the fuel pressure normal?

YES : Replace the ECM or PCM. Then go to Step 12.
NO : Repair it. Then go to Step 12.

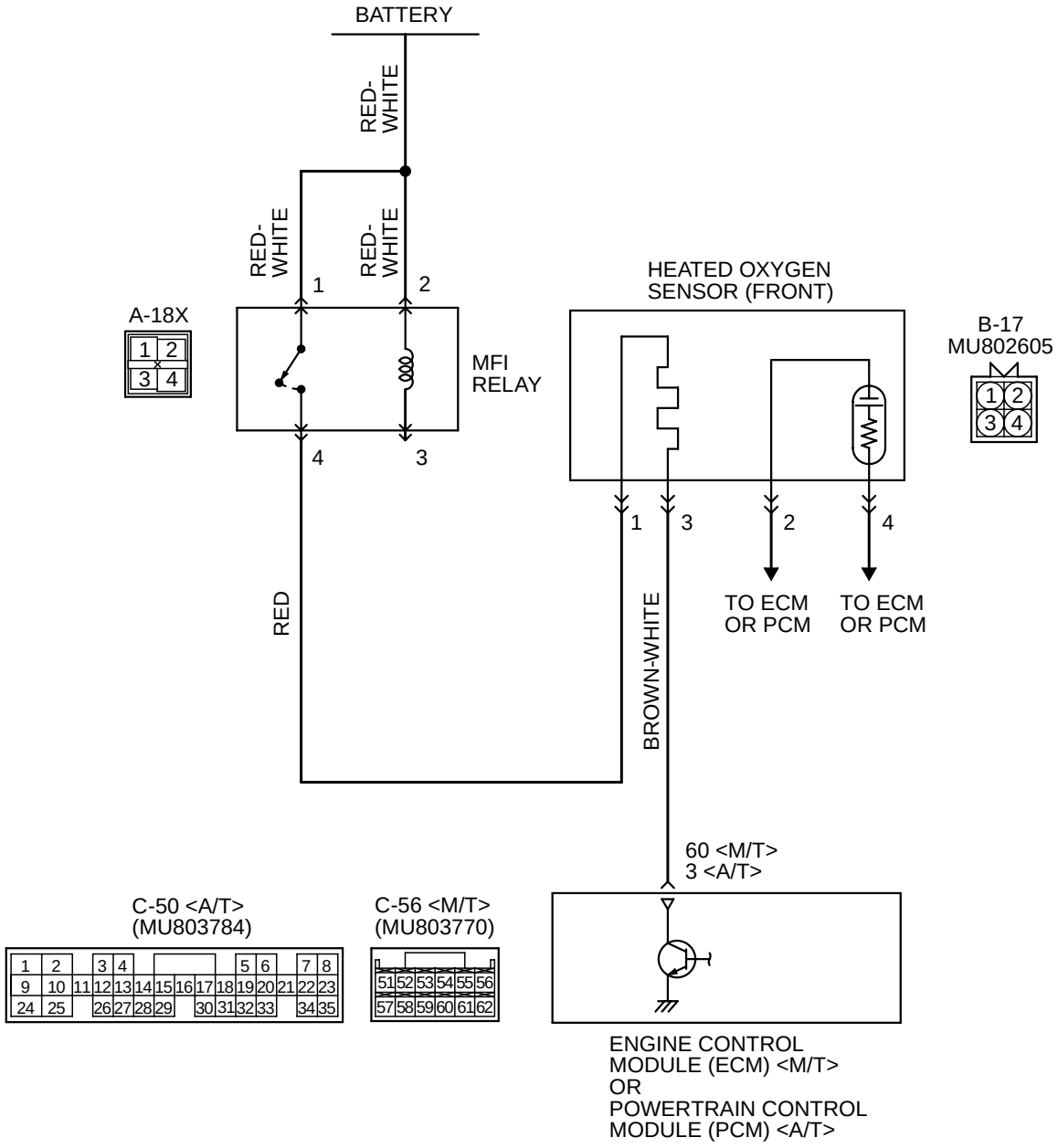
STEP 12. Test the OBD-II drive cycle.
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.
(2) Check the diagnostic trouble code (DTC).

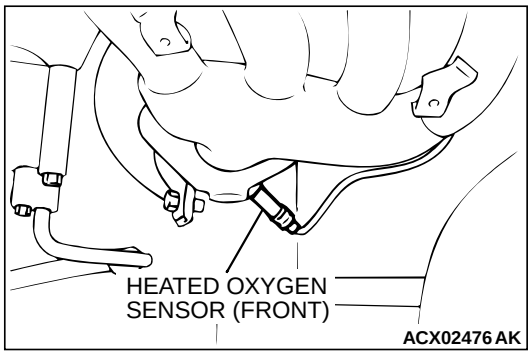
Q: Is the DTC P0134 is output?

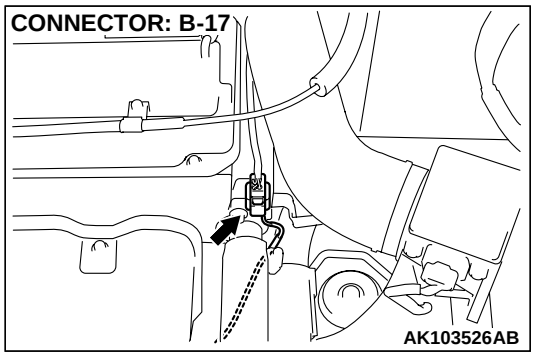
YES : Retry the troubleshooting.
NO : The inspection is complete.

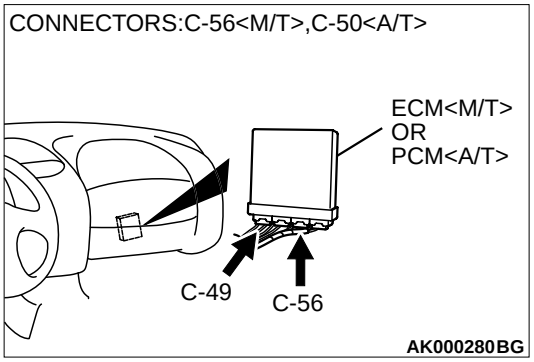
DTC P0135: Heated Oxygen Sensor Heater Circuit (sensor 1)

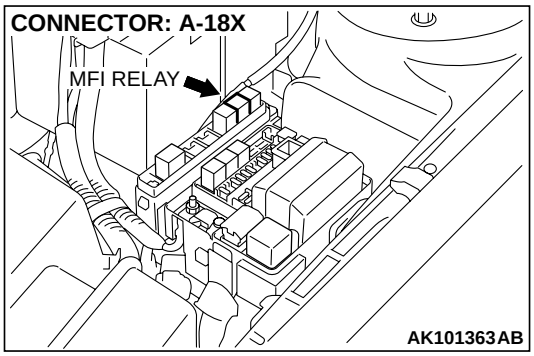
Heated Oxygen Sensor (front) Heater Circuit











CIRCUIT OPERATION

- Power is supplied from the MFI relay (terminal 4) to the heated oxygen sensor (front) heater.
- The ECM (terminal 60) <M/T> or PCM (terminal 3) <A/T> controls continuity to the heated oxygen sensor (front) heater by turning the power transistor in the ECM <M/T> or PCM <A/T> "ON" and "OFF".

TECHNICAL DESCRIPTION

- The ECM <M/T> or PCM <A/T> checks whether the heater current is within a specified range when the heater is energized.

DTC SET CONDITIONS

Check Conditions

- 60 seconds have elapsed from the start of the previous monitoring.
- Engine coolant temperature is higher than 20°C (68°F).
- While the heated oxygen sensor (front) heater is on.
- Battery positive voltage is at between 11 and 16 volts.

Judgment Criteria

- Heater current of the heated oxygen sensor (front) heater has continued to be lower than 0.16 ampere or higher than 7.5 ampere for 4 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

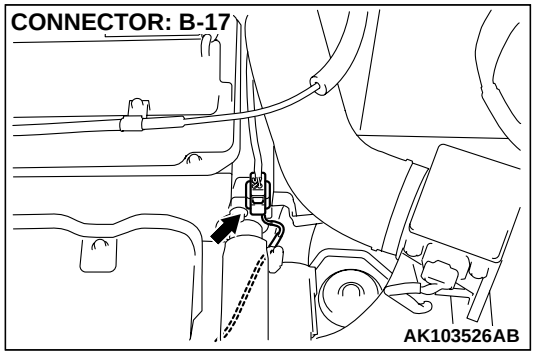
- Open or shorted heated oxygen sensor (front) heater circuit.
- Open circuit in heated oxygen sensor (front) heater.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tool:

- MD998464: Test Harness

TSB Revision

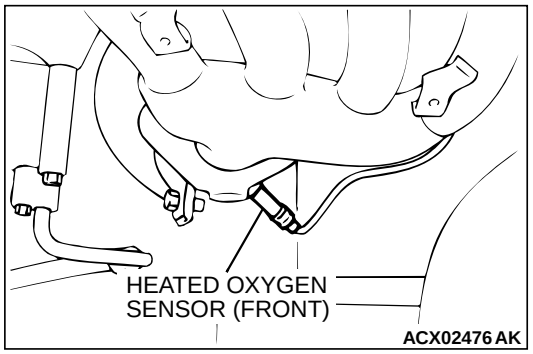


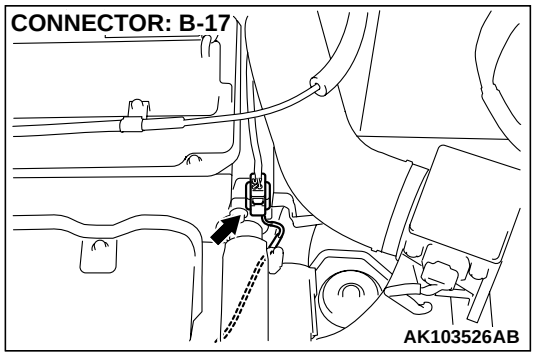
STEP 1. Check connector B-17 at the heated oxygen sensor (front) for damage.

Q: Is the connector in good condition?

YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.





STEP 2. Check the heated oxygen sensor (front).

(1) Disconnect heated oxygen sensor (front) connector B-17 and connect test harness special tool, MD998464, to the connector on the heated oxygen (front) sensor side.

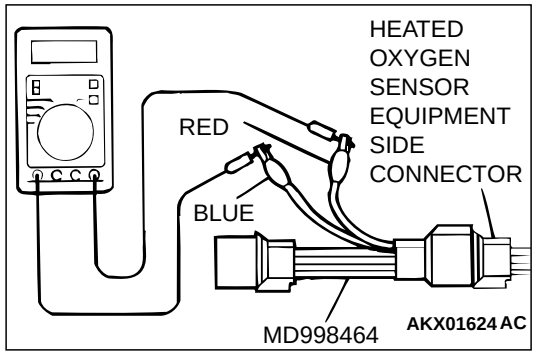
(2) Measure the resistance between heated oxygen sensor connector terminal 1 (red clip) and terminal 3 (blue clip).

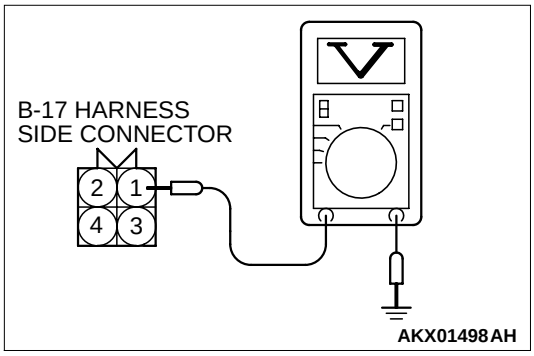
Standard value: 4.5 – 8.0 ohm [at 20°C (68°F)]

Q: Is the resistance normal?

YES : Go to Step 3.

NO : Replace the heated oxygen sensor (front). Then go to Step 12.





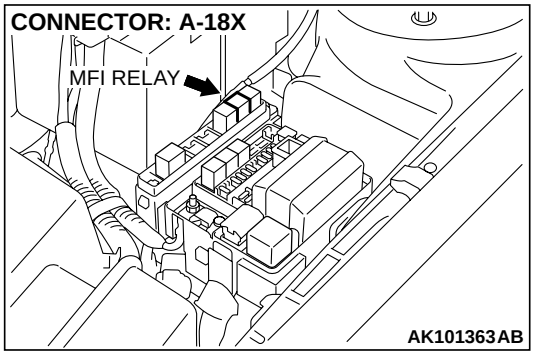
STEP 3. Check the power supply voltage at heated oxygen sensor (front) harness side connector B-17.

(1) Disconnect the connector B-17 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 1 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

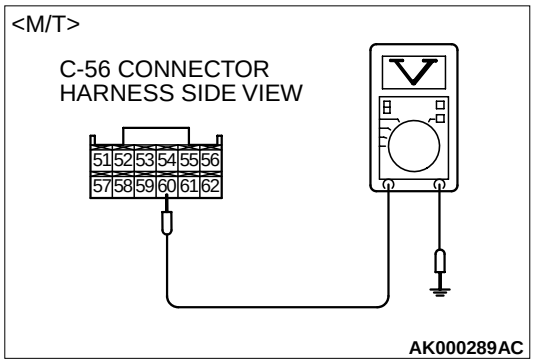
YES : Go to Step 5.
NO : Go to Step 4.

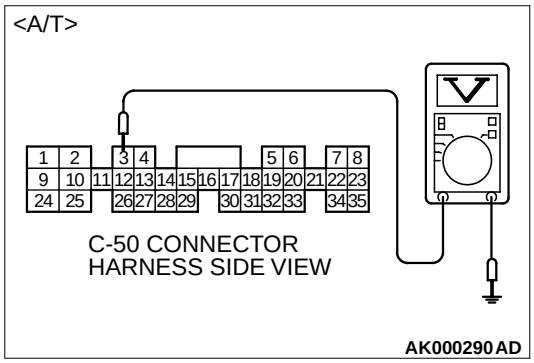


STEP 4. Check connector A-18X at the MFI relay for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between MFI relay connector A-18X terminal 4 and heated oxygen sensor (front) connector B-17 terminal 1 because of open circuit or short circuit to ground. Then go to Step 12.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.





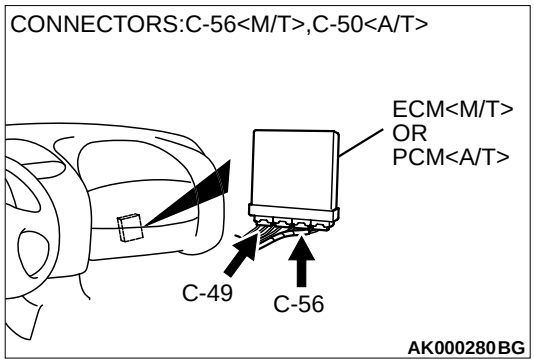
STEP 5. Check the power supply voltage at ECM connector C-56 <M/T> or PCM connector C-50 <A/T> by backprobing.

(1) Do not disconnect the connector C-56 <M/T> or C-50 <A/T>.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 60 <M/T> or 3 <A/T> and ground by backprobing.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 8.
NO : Go to Step 6.



STEP 6. Check connector C-56 at ECM <M/T> or connector C-50 at PCM <A/T> for damage.

Q: Is the connector in good condition?

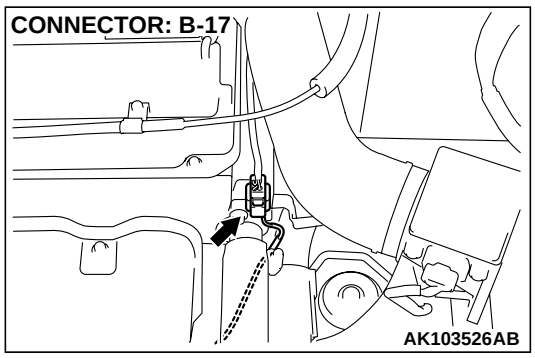
YES : Go to Step 7.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

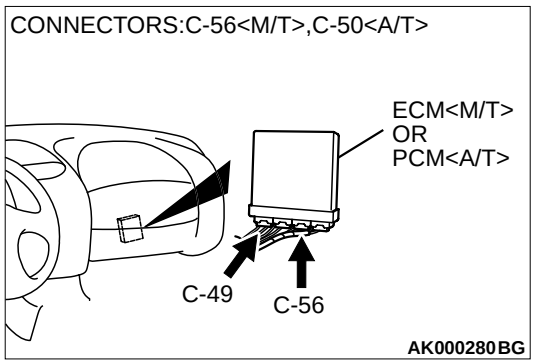
STEP 7. Check for open circuit and short circuit to ground between heated oxygen sensor (front) connector B-17 (terminal 3) and ECM connector C-56 (terminal 60) <M/T> or PCM connector C-50 (terminal 3) <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 12.

NO : Repair it. Then go to Step 12.



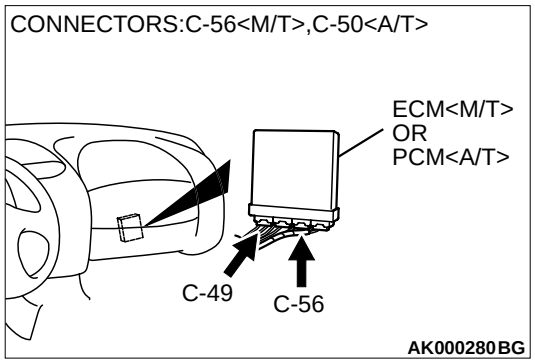


STEP 8. Check connector C-56 at ECM <M/T> or connector C-50 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

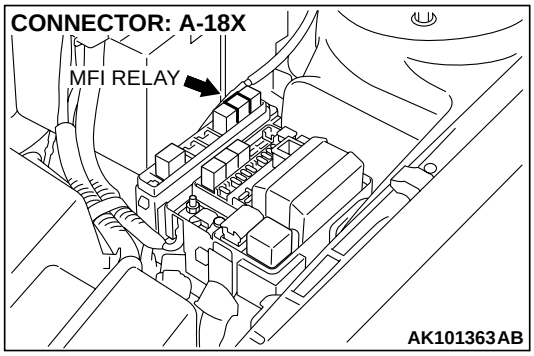


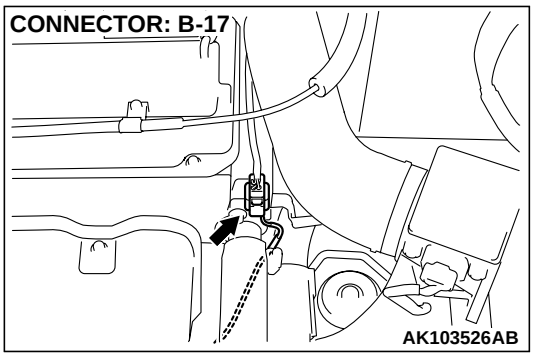
STEP 9. Check for harness damage between MFI relay connector A-18X (terminal 4) and heated oxygen sensor (front) connector B-17 (terminal 1).

Q: Is the harness wire in good condition?

YES : Go to Step 10.

NO : Repair it. Then go to Step 12.



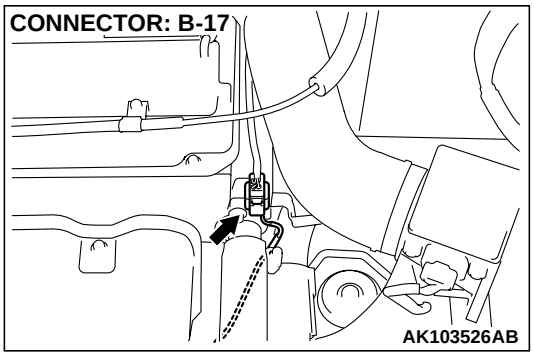


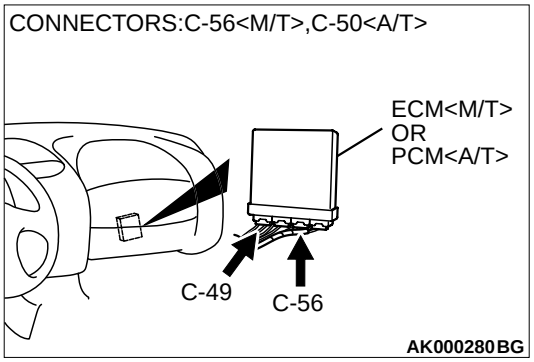
STEP 10. Check for harness damage between heated oxygen sensor (front) connector B-17 (terminal 3) and ECM connector C-56 (terminal 60) <M/T> or PCM connector C-50 (terminal 3) <A/T>.

Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair it. Then go to Step 12.





STEP 11. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0135 is output?

YES : Replace the ECM or PCM. Then go to Step 12.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

STEP 12. Test the OBD-II drive cycle.

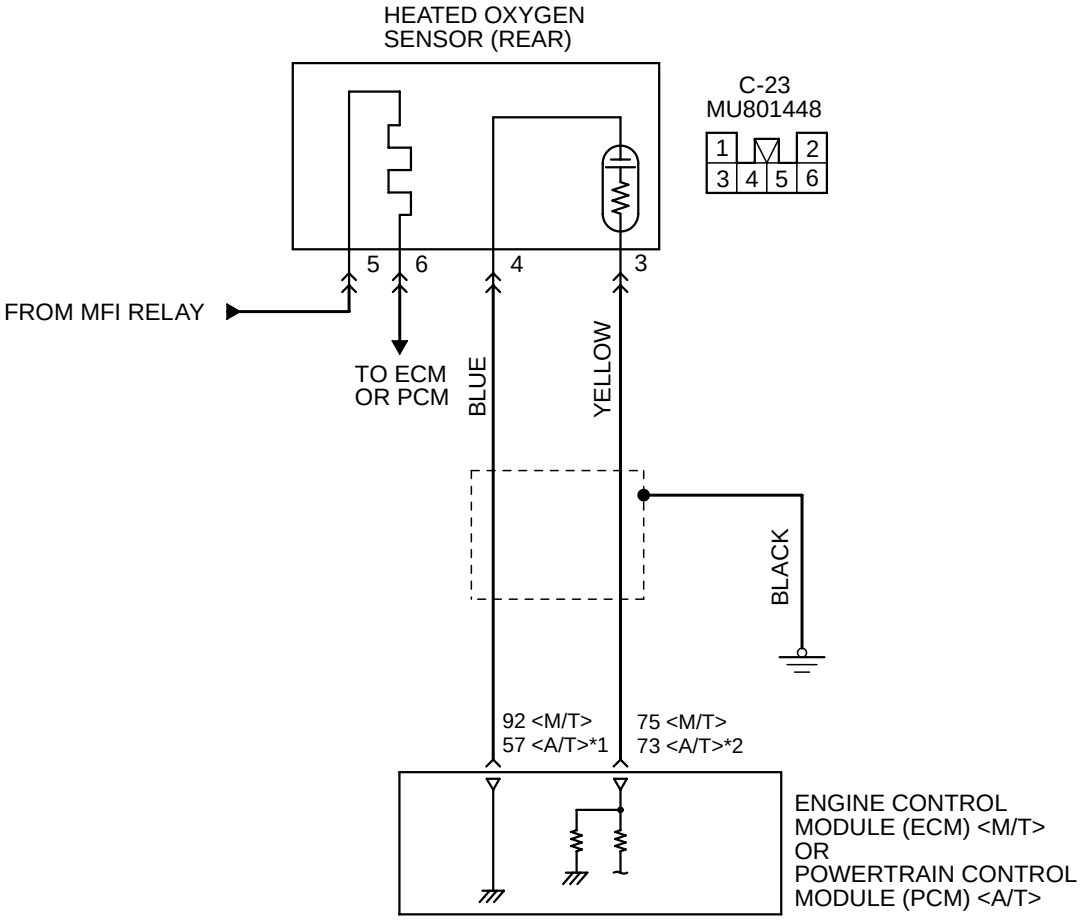
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0135 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0136: Heated Oxygen Sensor Circuit (sensor 2)

Heated Oxygen Sensor (rear) Circuit



C-60 <M/T> (MU803772)

71	72	73	74	75	76	77	78	79	80	81	
82	83	84	85	86	87	88	89	90	91	92	

C-54 <A/T> (MU803781)

41	42	43						44	45	46		
47	48	49	50	51	52	53	54	55	56	57		
58	59		60	61	62	63		64	65	66		

C-57 <A/T> (MU803782)

71	72	73	74					75	76	77		
78	79	80	81	82	83	84	85	86	87	88	89	
90	91		92	93	94		95	96		97	98	

NOTE
*1:PCM connector C-54 <A/T>
*2:PCM connector C-57 <A/T>

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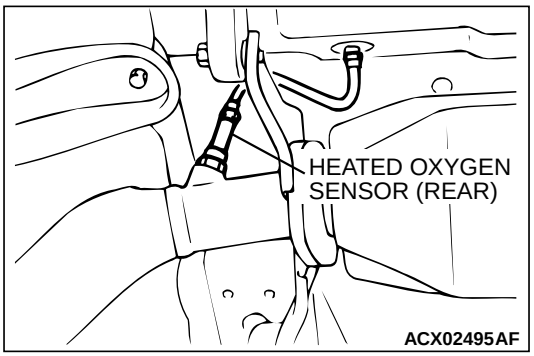

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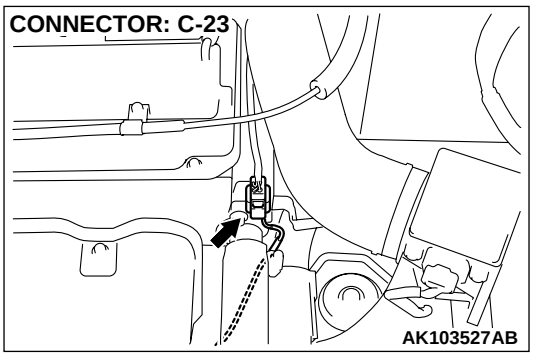

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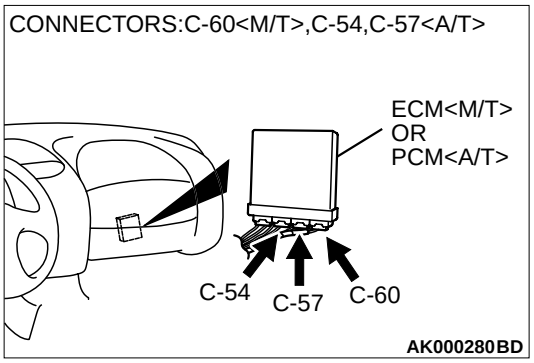
TSB Revision



CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal 75) <M/T> or PCM (terminal 73) <A/T> from the output terminal (terminal 3) of the heated oxygen sensor (rear).
- Terminal 4 of the heated oxygen sensor (rear) is grounded with ECM (terminal 92) <M/T> or PCM (terminal 57) <A/T>.

TECHNICAL DESCRIPTION

- The output signal of the heated oxygen sensor (front) is compensated by the output signal of the heated oxygen sensor (rear).
- The ECM <M/T> or PCM <A/T> checks for an open circuit in the heated oxygen sensor (rear) output line.

DTC SET CONDITIONS

Check Conditions

- 3 minutes or more have passed since the starting sequence was completed.
- Heated oxygen sensor (rear) signal voltage has continued to be 0.15 volt or lower.
- Engine coolant temperature is higher than 76°C (169°F).
- Engine speed is higher than 1,200 r/min.
- Volumetric efficiency is higher than 25 percent.
- Monitoring time: 7 seconds.

Judgment Criteria

- Input voltage supplied to the ECM <M/T> or PCM <A/T> interface circuit is higher than 4.5 volts when 5 volts is applied to the heated oxygen sensor (rear) output line via a resistor.
- The ECM<M/T> or PCM<A/T> monitors for this condition once during the drive cycle.

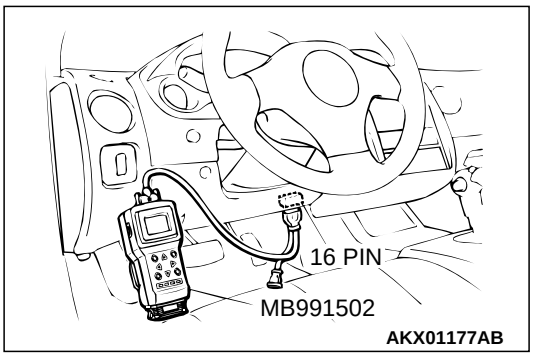
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Heated oxygen sensor (rear) failed.
- Open circuit in heated oxygen sensor (rear) output line.
- Open circuit in heated oxygen sensor (rear) ground line.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991658: Test Harness



STEP 1. Using scan tool MB991502, check data list item 59: Heated Oxygen Sensor (rear).

⚠ CAUTION

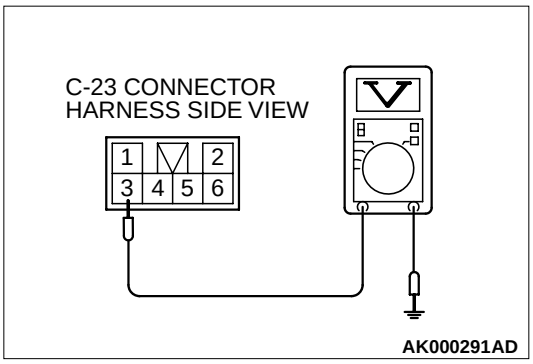
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 59, Heated Oxygen Sensor (rear).
- Warming up the engine. When the engine is revved, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Go to Step 2.



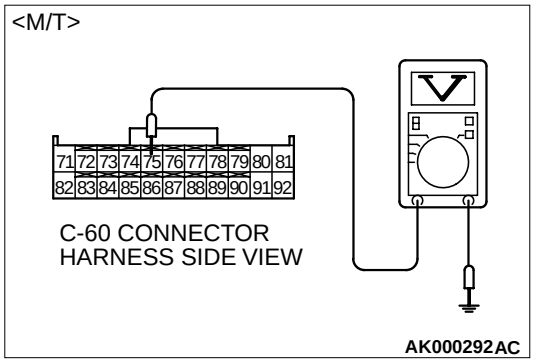
STEP 2. Check the sensor output voltage at heated oxygen sensor (rear) connector C-11 by backprobing.

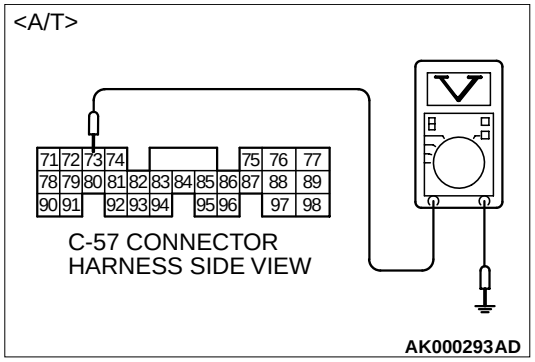
(1) Do not disconnect the connector C-23.
(2) Start the engine and run at idle.
(3) Measure the voltage between terminal 3 and ground by backprobing.
- Warming up the engine. When the engine is revved, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 3.
NO : Go to Step 7.





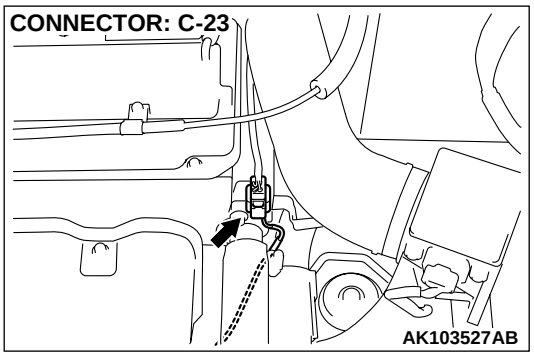
STEP 3. Check the sensor output voltage at ECM connector C-60 <M/T> or PCM connector C-57 <A/T> by backprobing.

(1) Do not disconnect the connector C-60 <M/T> or C-57 <A/T>.
(2) Start the engine and run at idle.
(3) Measure the voltage between terminal 75 <M/T> or 73 <A/T> and ground by backprobing.
- Warming up the engine. When the engine is 2,500 r/min, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 4.
NO : Go to Step 6.

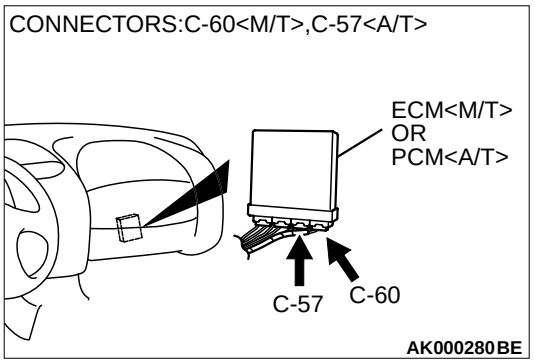


STEP 4. Check connector C-23 at heated oxygen sensor (rear) and connector C-60 at ECM <M/T> or connector C-57 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



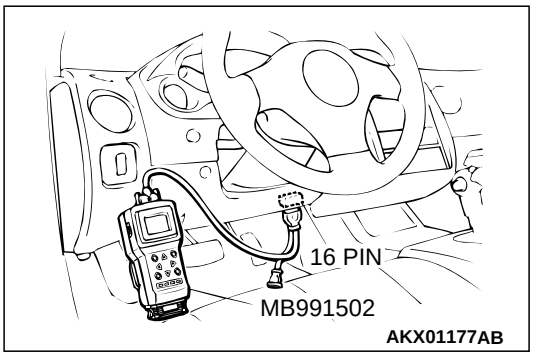
STEP 5. Using scan tool MB991502, check data list item 59: Heated Oxygen Sensor (rear).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 59, Heated Oxygen Sensor (rear).
- Warming up the engine. When the engine is revved, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.

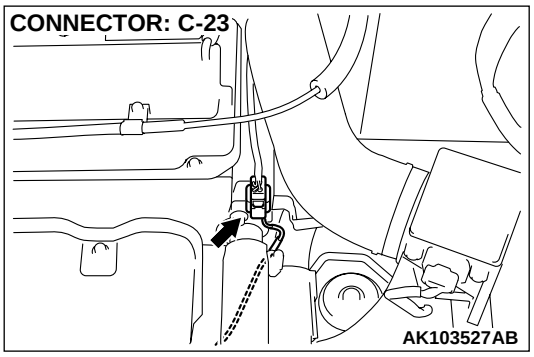
(4) Turn the ignition switch to the "LOCK" (OFF) position.

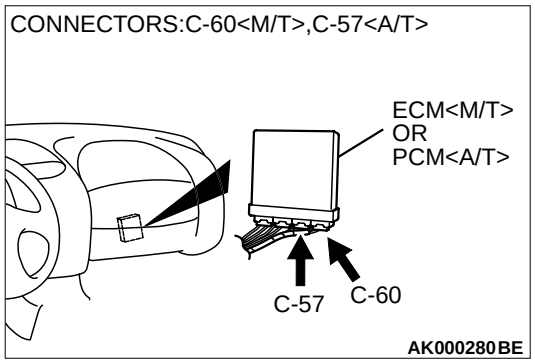


Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

NO : Replace the ECM or PCM. Then go to Step 14.



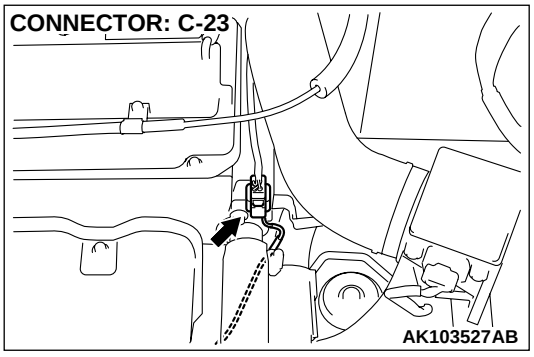


STEP 6. Check connector C-23 at heated oxygen sensor (rear) and connector C-60 at ECM <M/T> or connector C-57 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between heated oxygen sensor (rear) connector C-23 terminal 1 and ECM connector C-60 terminal 75 <M/T> or PCM connector C-57 terminal 73 <A/T> because of open circuit or harness damage. Then go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

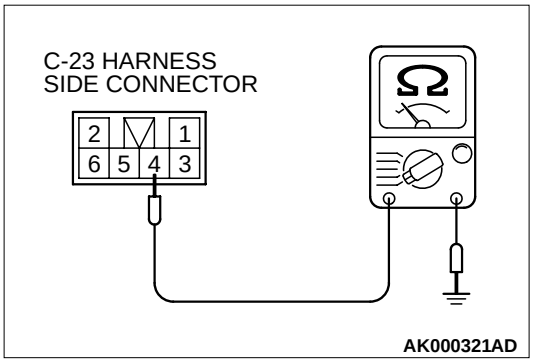


STEP 7. Check connector C-23 at heated oxygen sensor (rear) for damage.

Q: Is the connector in good condition?

YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP 8. Check the continuity at heated oxygen sensor (rear) harness side connector C-23.

(1) Disconnect the connector C-23 and measure at the harness side.

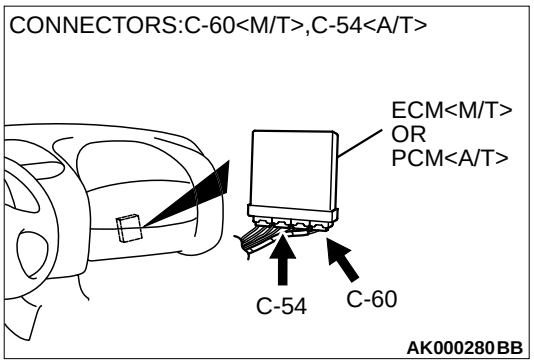
(2) Check for the continuity between terminal 4 and ground.

- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 11.

NO : Go to Step 9.



STEP 9. Check connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

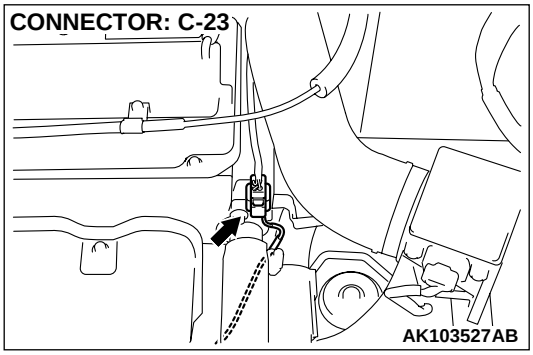
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

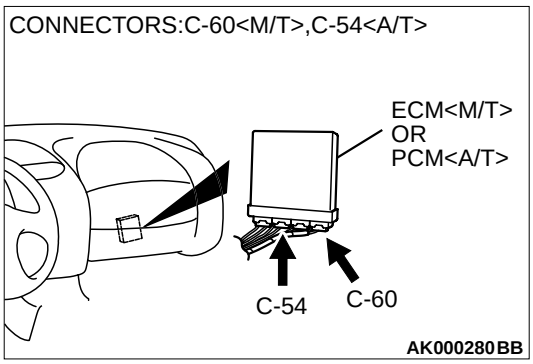
STEP 10. Check for open circuit and harness damage between heated oxygen sensor (rear) connector C-23 (terminal 2) and ECM connector C-60 (terminal 92) <M/T> or PCM connector C-54 (terminal 57) <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 14.

NO : Repair it. Then go to Step 14.



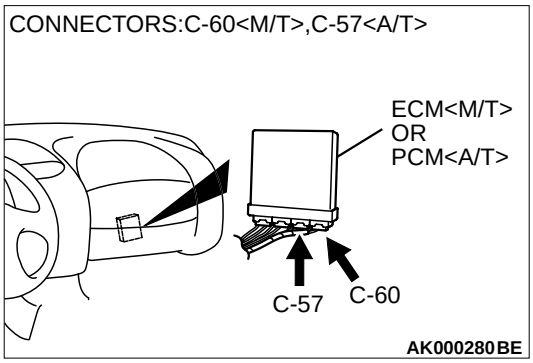


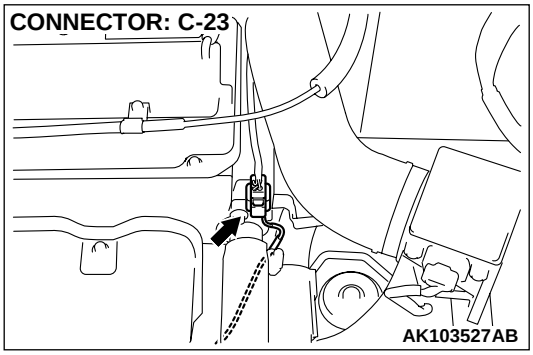
STEP 11. Check connector C-60 at ECM <M/T> or connector C-57 at PCM <A/T> for damage.

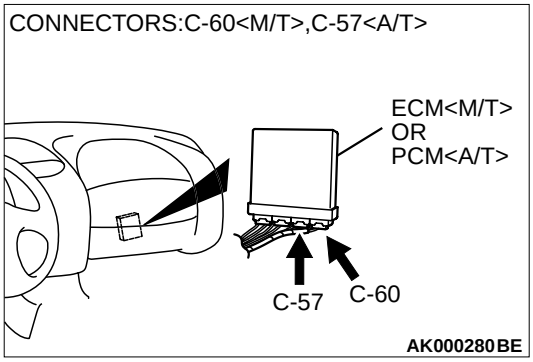
Q: Is the connector in good condition?

YES : Go to Step 12.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.





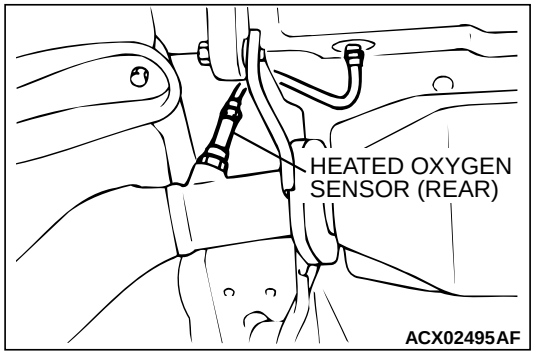


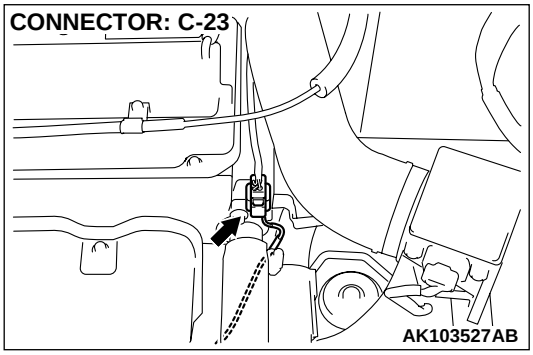
STEP 12. Check for harness damage between heated oxygen sensor (rear) connector C-23 (terminal 4) and ECM connector C-60 (terminal 92) <M/T> or PCM connector C-54 (terminal 57) <A/T>.

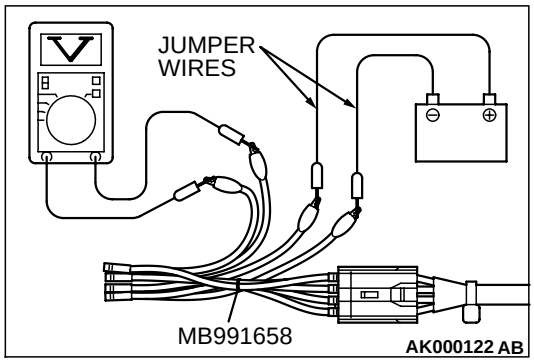
Q: Is the harness wire in good condition?

YES : Go to Step 13.

NO : Repair it. Then go to Step 14.







STEP 13. Check the heated oxygen sensor (rear).

(1) Disconnect the heated oxygen sensor (rear) connector C-23 and connect test harness special tool, MB991658, to the connector on the heated oxygen sensor (front) side.
(2) Warm up the engine until engine coolant 80°C (176°F) or higher.

⚠ CAUTION

Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor (rear).

(3) Use the jumper wires to connect terminal 5 to the positive battery terminal and terminal 6 to the negative battery terminal.
(4) Connect a digital volt meter between terminal 3 and terminal 4.
(5) While repeatedly revving the engine, measure the heated oxygen sensor (rear) output voltage.

Standard value: 0.6 – 1.0 volt

Q: Is the voltage at the standard value?

YES : Replace the ECM or PCM. Then go to Step 14.
NO : Replace the heated oxygen sensor (rear). Then go to Step 14.

STEP 14. Test the OBD-II drive cycle.

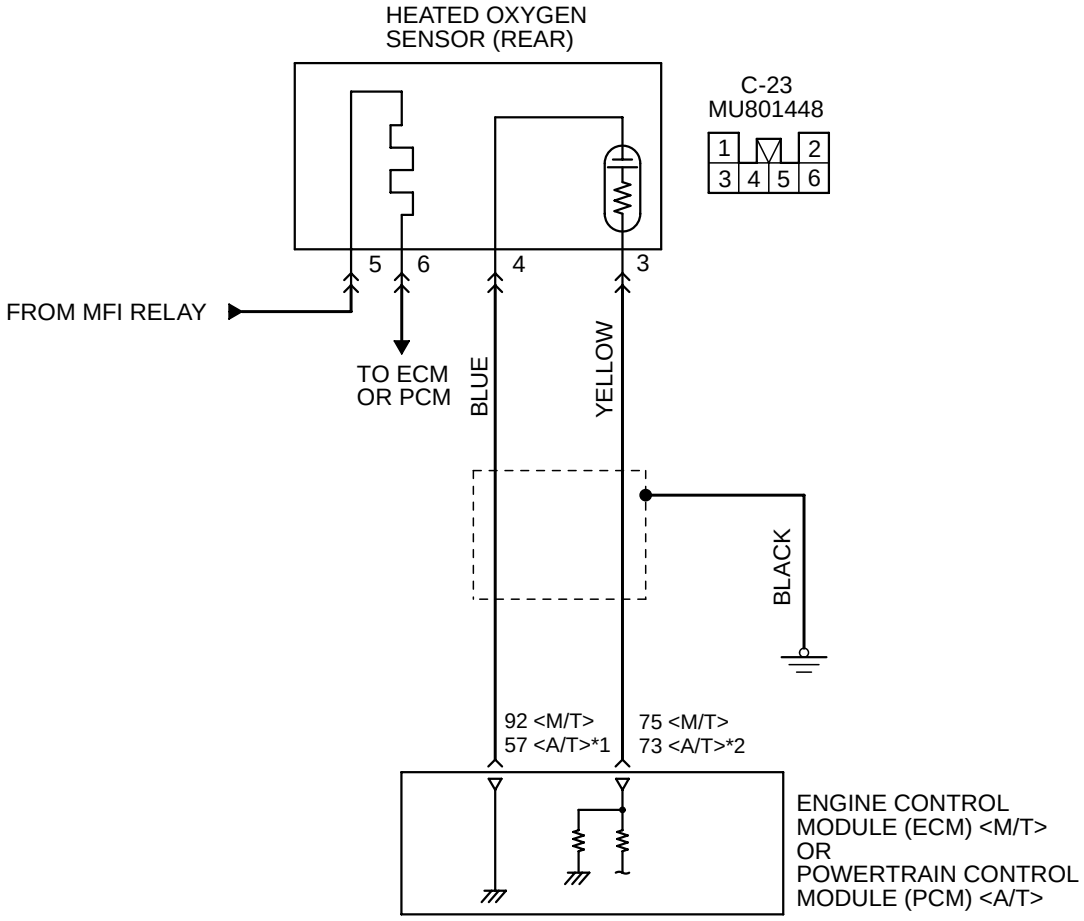
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0136 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0137: Heated Oxygen Sensor Circuit Low Voltage (sensor 2)

Heated Oxygen Sensor (rear) Circuit



C-60 <M/T> (MU803772)

71	72	73	74	75	76	77	78	79	80	81	
82	83	84	85	86	87	88	89	90	91	92	

C-54 <A/T> (MU803781)

41	42	43						44	45	46		
47	48	49	50	51	52	53	54	55	56	57		
58	59		60	61	62	63		64	65	66		

C-57 <A/T> (MU803782)

71	72	73	74					75	76	77		
78	79	80	81	82	83	84	85	86	87	88	89	
90	91		92	93	94		95	96		97	98	

NOTE
*1:PCM connector C-54 <A/T>
*2:PCM connector C-57 <A/T>

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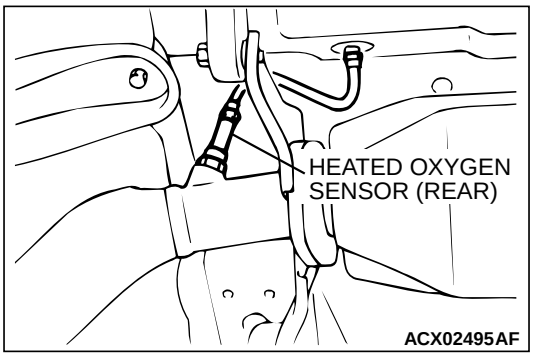

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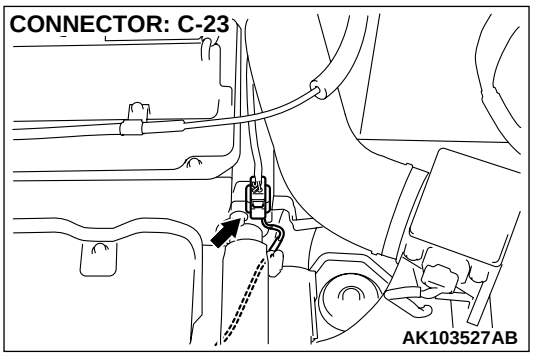

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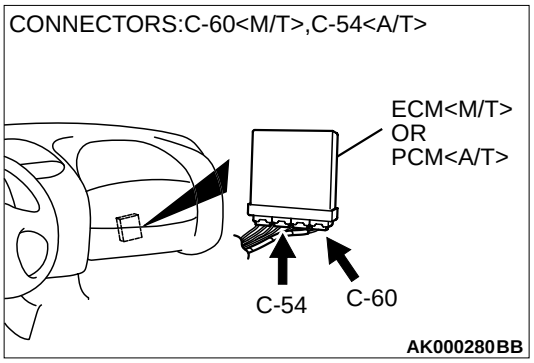
TSB Revision



CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal 75) <M/T> or PCM (terminal 73) <A/T> from the output terminal (terminal 3) of the heated oxygen sensor (rear).
- Terminal 4 of the heated oxygen sensor (rear) is grounded with ECM (terminal 92) <M/T> or PCM (terminal 57) <A/T>.

TECHNICAL DESCRIPTION

- The output signal of the heated oxygen sensor (front) is compensated by the output signal of the heated oxygen sensor (rear).
- The ECM <M/T> or PCM <A/T> checks for an open circuit in the heated oxygen sensor (rear) output line.

DTC SET CONDITIONS

Check Conditions

- 3 minutes or more have passed since the starting sequence was completed.
- Heated oxygen sensor (rear) signal voltage has continued to be 0.15 volt or lower.
- Engine coolant temperature is higher than 76°C (169°F).
- Engine speed is higher than 1,200 r/min.
- Volumetric efficiency is higher than 25 percent.
- Volume air flow sensor output frequency is 88 Hz or more.
- At least 20 seconds have passed since fuel shut off control was canceled.
- The heated oxygen sensor (front) outputs 0.5 volt or more.
- After the ignition switch is turned ON, the changes in the output voltage of the heated oxygen sensor (rear) is lower than 0.078 volt.
- Monitoring time: 10 seconds.

Judgement Criteria

- Making the air/fuel ratio 15 percent for 10 seconds richer does not result in raising the heated oxygen sensor (rear) output voltage beyond 0.15 volt.
- The ECM<M/T> or PCM<A/T> monitors for this condition once during the drive cycle.

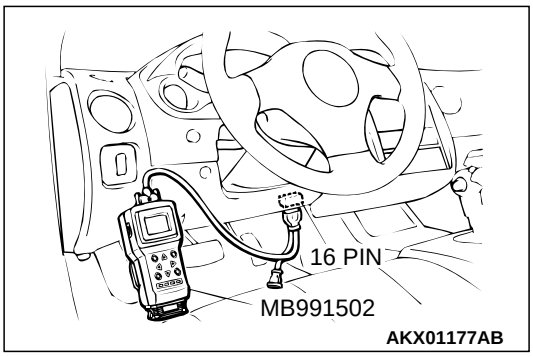
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Heated oxygen sensor (rear) failed.
- Short circuit in heated oxygen sensor (rear) output line.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991658: Test Harness



STEP 1. Using scan tool MB991502, check data list item 59: Heated Oxygen Sensor (rear).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

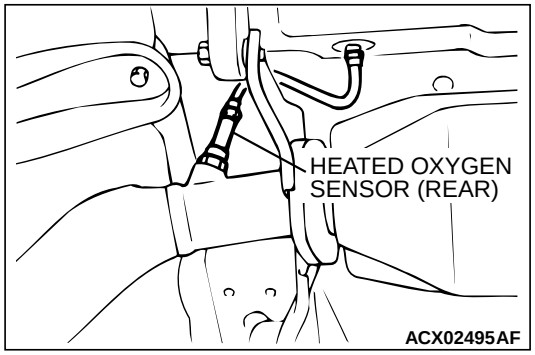
(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 59, Heated Oxygen Sensor (rear).
- Warming up the engine. When the engine is revved, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.

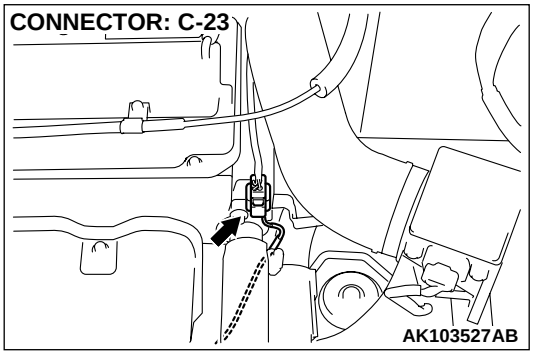
(4) Turn the ignition switch to the "LOCK" (OFF) position.

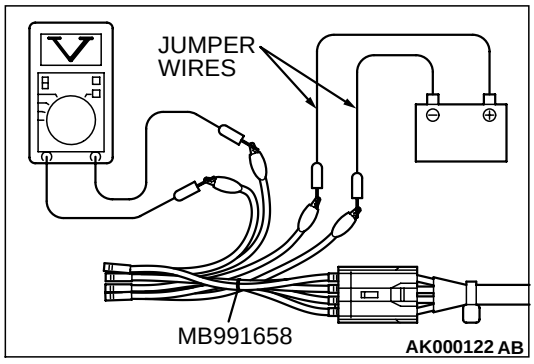
Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

NO : Go to Step 2.







STEP 2. Check the heated oxygen sensor (rear).

(1) Disconnect the heated oxygen sensor (rear) connector C-23 and connect test harness special tool, MB991658, to the connector on the heated oxygen sensor (front) side.
(2) Warm up the engine until engine coolant 80°C (176°F) or higher.

⚠ CAUTION

Be very careful when connecting the jumper wires; incorrect connection can damage the right bank heated oxygen sensor (rear).

(3) Use the jumper wires to connect terminal 5 to the positive battery terminal and terminal 6 to the negative battery terminal.
(4) Connect a digital volt meter between terminal 3 and terminal 4.
(5) While repeatedly revving the engine, measure the heated oxygen sensor (rear) output voltage.

Standard value: 0.6 – 1.0 volt

Q: Is the voltage at the standard value?

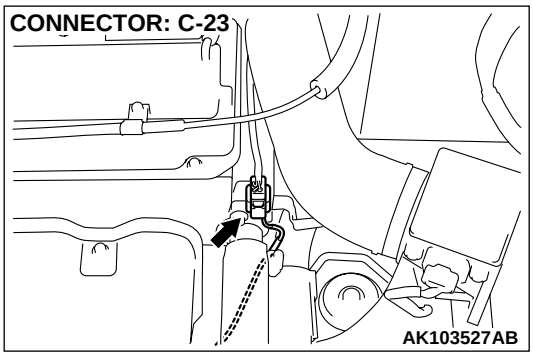
YES : Go to Step 3.
NO : Replace the heated oxygen sensor (rear). Then go to Step 5.

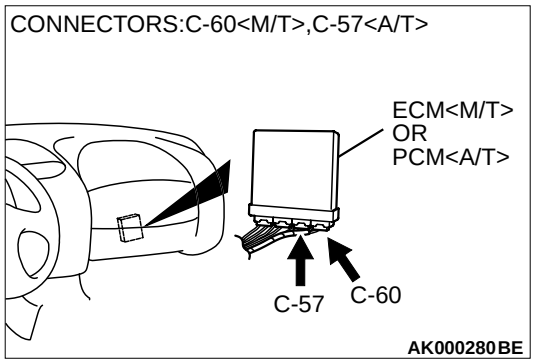
STEP 3. Check connector C-23 at heated oxygen sensor (rear) and connector C-60 at ECM <M/T> or connector C-57 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.



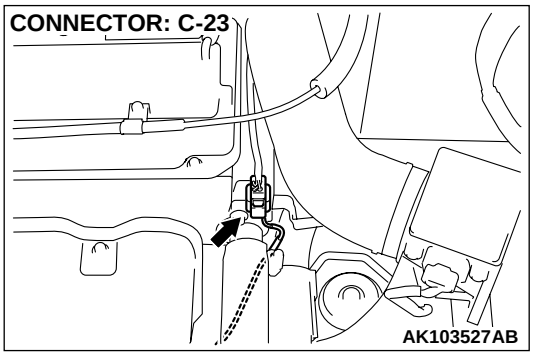


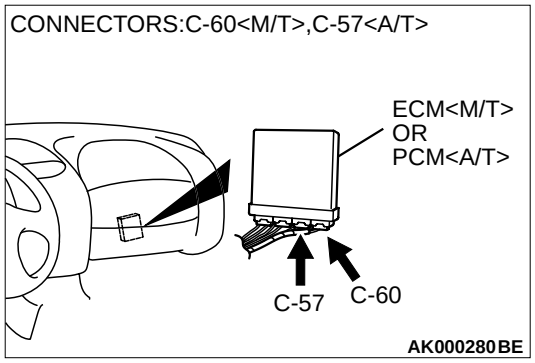
STEP 4. Check for short circuit to ground between heated oxygen sensor (rear) connector C-23 (terminal 1) and ECM connector C-60 (terminal 75) <M/T> or PCM connector C-57 (terminal 73) <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 5.

NO : Repair it. Then go to Step 5.





STEP 5. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.

(2) Check the diagnostic trouble code (DTC).

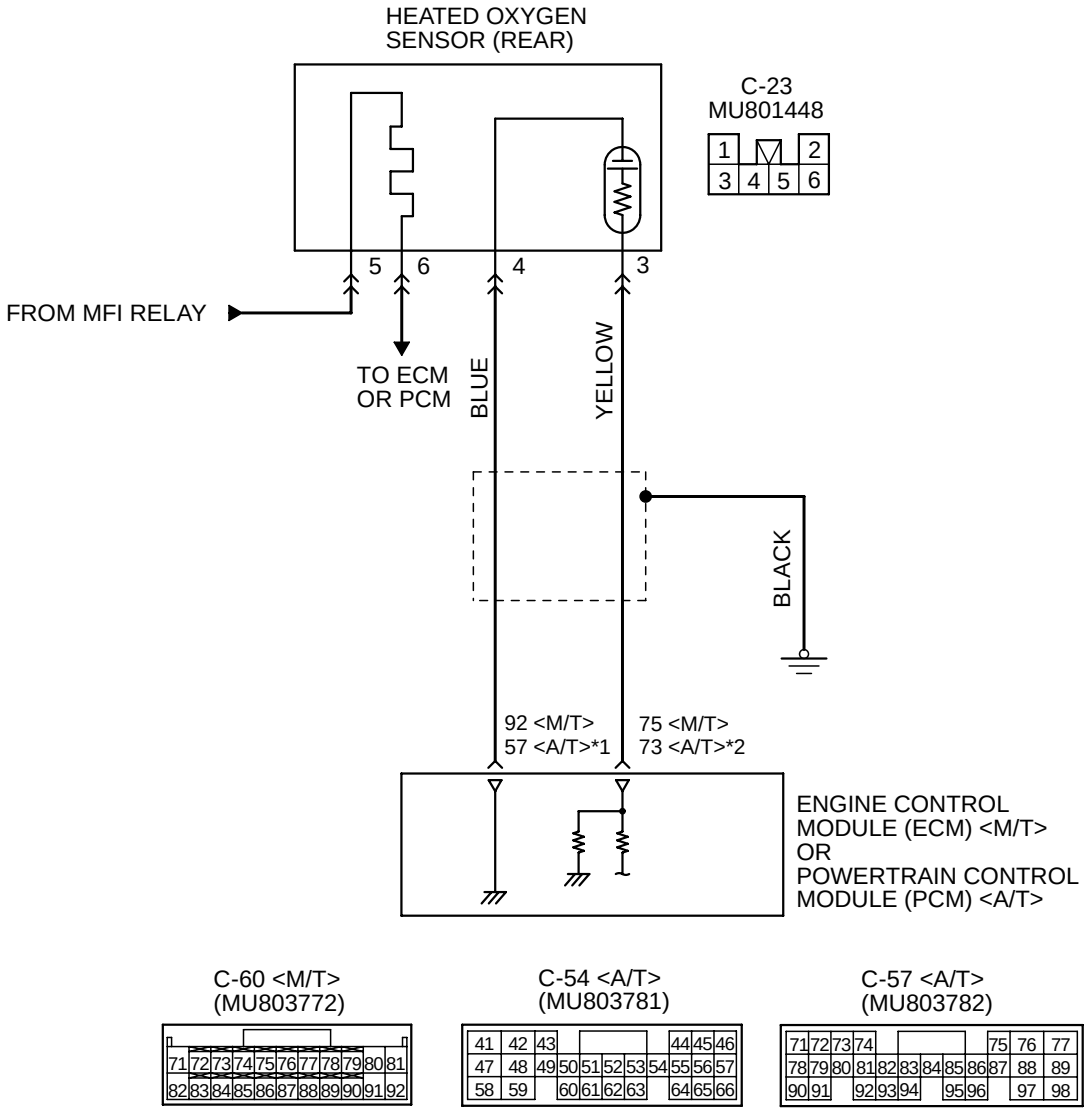
Q: Is the DTC P0137 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0138: Heated Oxygen Sensor Circuit High Voltage (sensor 2)

Heated Oxygen Sensor (rear) Circuit



NOTE
*1:PCM connector C-54 <A/T>
*2:PCM connector C-57 <A/T>

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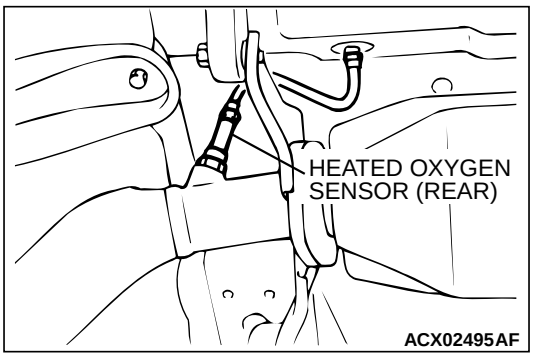
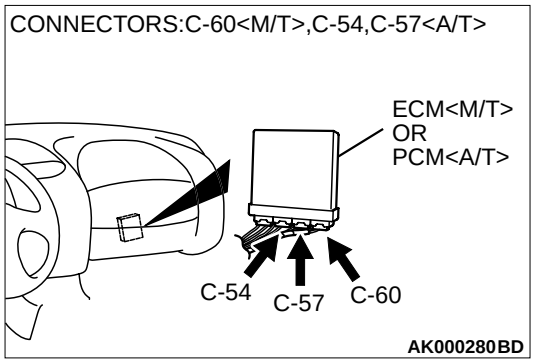
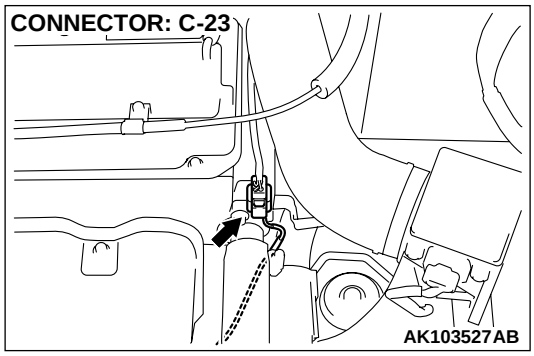






CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal 75) <M/T> or PCM (terminal 73) <A/T> from the output terminal (terminal 3) of the heated oxygen sensor (rear).
- Terminal 4 of the heated oxygen sensor (rear) is grounded with ECM (terminal 92) <M/T> or PCM (terminal 57) <A/T>.

TECHNICAL DESCRIPTION

- The output signal of the heated oxygen sensor (front) is compensated by the output signal of the heated oxygen sensor (rear).
- The ECM <M/T> or PCM <A/T> checks for an open circuit in the heated oxygen sensor (rear) output line.

DTC SET CONDITIONS

Check Conditions

- 2 seconds or more have passed since the starting sequence was completed.

Judgment Criteria

- Heated oxygen sensor (rear) output voltage has continued to be 1.2 volts or higher for 2 seconds.

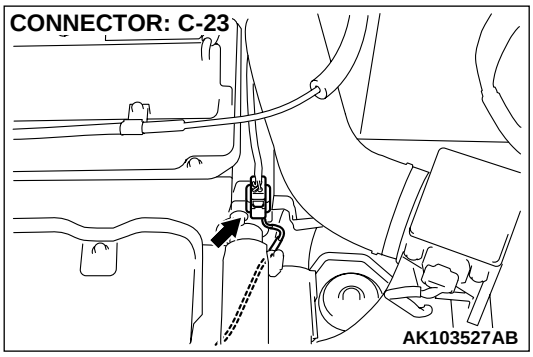
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Heated oxygen sensor (rear) failed.
- Short circuit in heated oxygen sensor (rear) output line.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

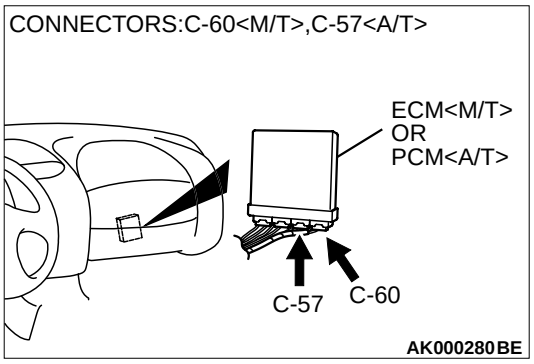


STEP 1. Check connector C-23 at heated oxygen sensor (rear) and connector C-60 at ECM <M/T> or connector C-57 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 3.

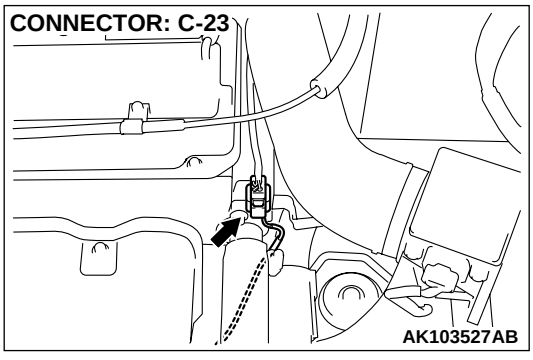


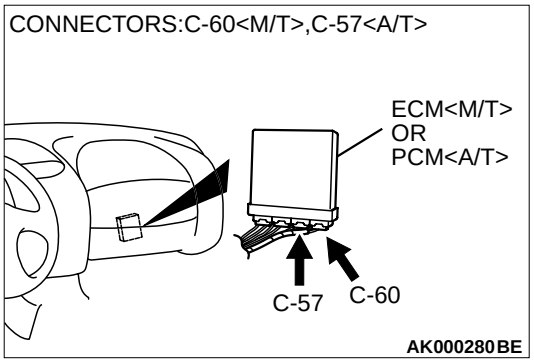
STEP 2. Check for short circuit to power supply between heated oxygen sensor (rear) connector C-23 (terminal 3) and ECM connector C-60 (terminal 75) <M/T> or PCM connector C-57 (terminal 73) <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 3.

NO : Repair it. Then go to Step 3.





STEP 3. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.

(2) Check the diagnostic trouble code (DTC).

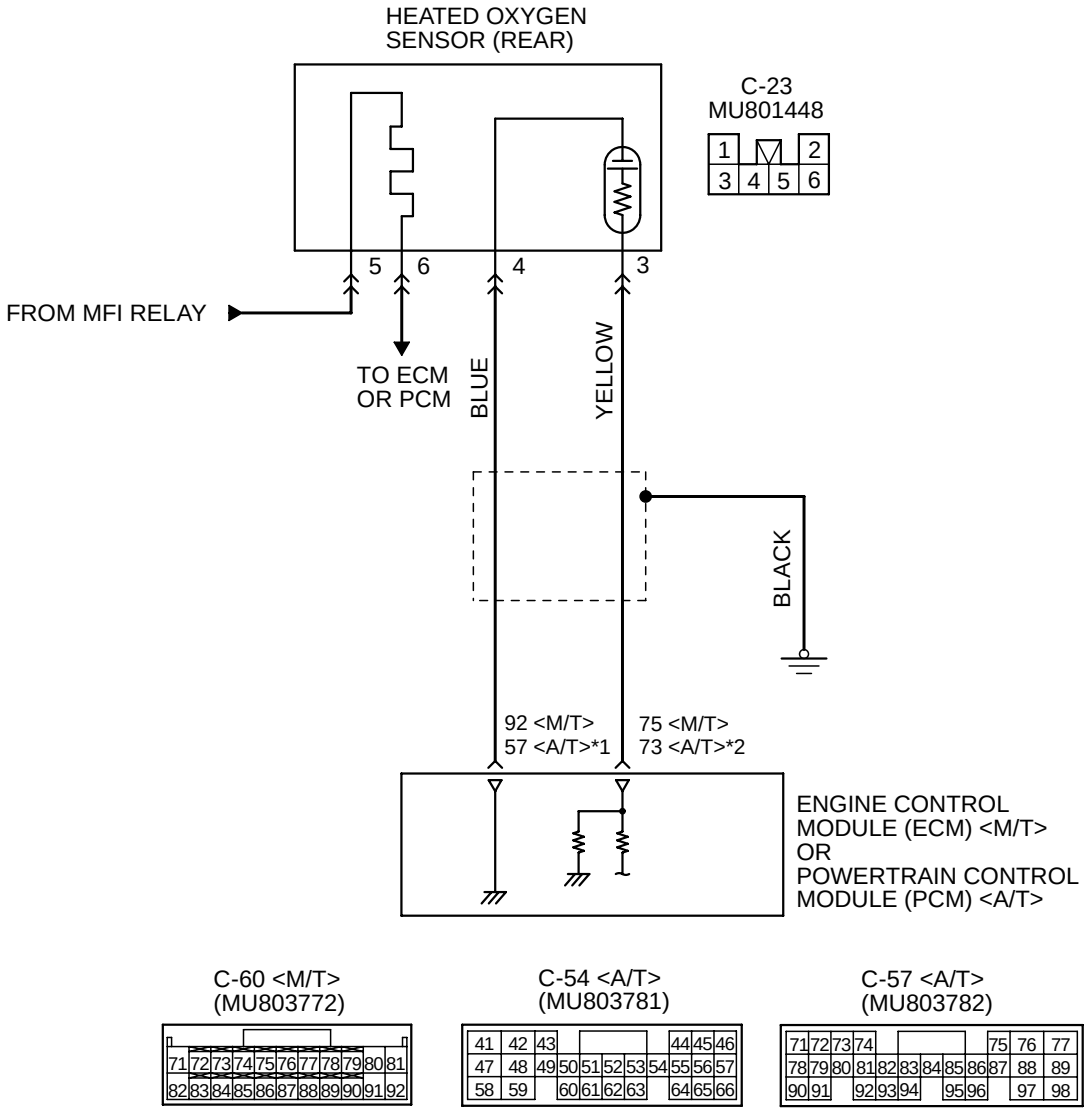
Q: Is the DTC P0138 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0139: Heated Oxygen Sensor Circuit Slow Response (sensor 2)

Heated Oxygen Sensor (rear) Circuit



NOTE
*1:PCM connector C-54 <A/T>
*2:PCM connector C-57 <A/T>

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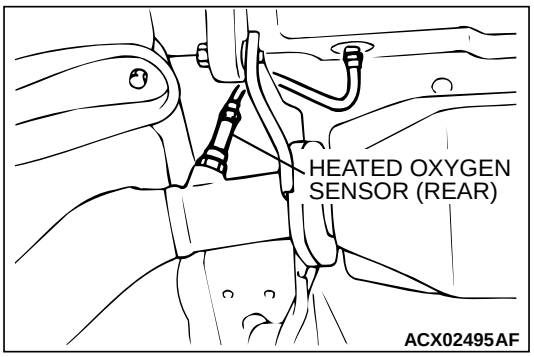
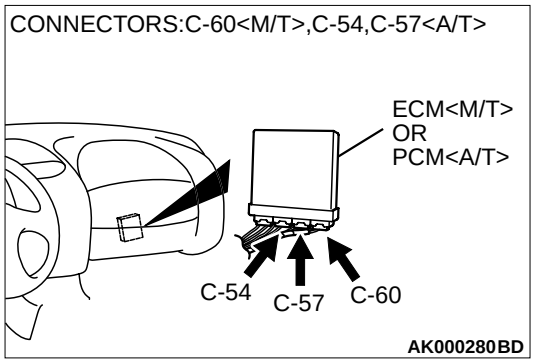
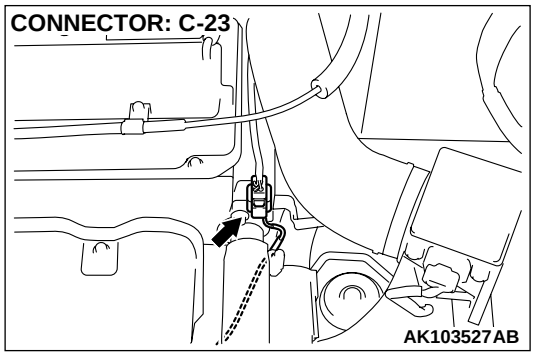
TSB Revision







CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal 75) <M/T> or PCM (terminal 73) <A/T> from the output terminal (terminal 3) of the heated oxygen sensor (rear).
- Terminal 4 of the heated oxygen sensor (rear) is grounded with ECM (terminal 92) <M/T> or PCM (terminal 57) <A/T>.

TECHNICAL DESCRIPTION

- The output signal of the heated oxygen sensor (front) is compensated by the output signal of the heated oxygen sensor (rear).
- The ECM <M/T> or PCM <A/T> checks for an open circuit in the heated oxygen sensor (rear) output line.

DTC SET CONDITIONS

Check Conditions

- Engine coolant temperature is higher than 76°C (169°F).
- The heated oxygen sensor (front) is active.
- The cumulative volume air flow sensor output frequency is higher than 4,000 Hz.
- Repeat 3 or more times: drive[*1], stop[*2].

  Drive[*1]:
  - Engine speed is higher than 1,500 r/min.
  - Volumetric efficiency is higher than 40 percent.
  - Vehicle speed is higher than 30 km/h (18.7 mph).
  - A total of more than 10 seconds have elapsed with the above mentioned conditions, and more than 2 seconds have elapsed with the fuel shut off.

  Stop[*2]:
  - Vehicle speed is lower than 1.5 km/h (0.9 mph).

Judgement Criteria

- Change in the output voltage of the heated oxygen sensor (rear) is lower than 0.312 volt.

  NOTE: Monitoring stops after fuel has been shut off for more than 38 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

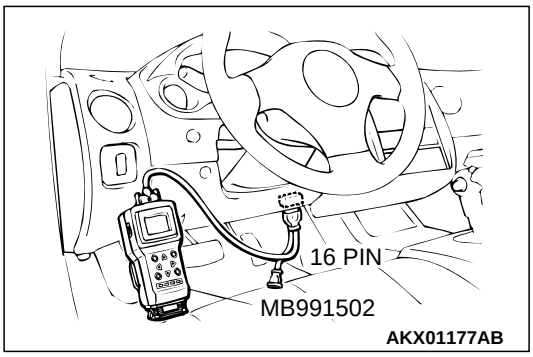
- Heated oxygen sensor (rear) failed.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

TSB Revision



STEP 1. Using scan tool MB991502, check data list item 59: Heated Oxygen Sensor (rear).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 59, Heated Oxygen Sensor (rear).
(4) Warm up the engine.
- Warming up the engine. When the engine is revved, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

NO : Replace the heated oxygen sensor (rear). Then go to Step 2.

STEP 2. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 4 – Heated Oxygen Sensor Monitor P.13A-5.
(2) Check the diagnostic trouble code (DTC).

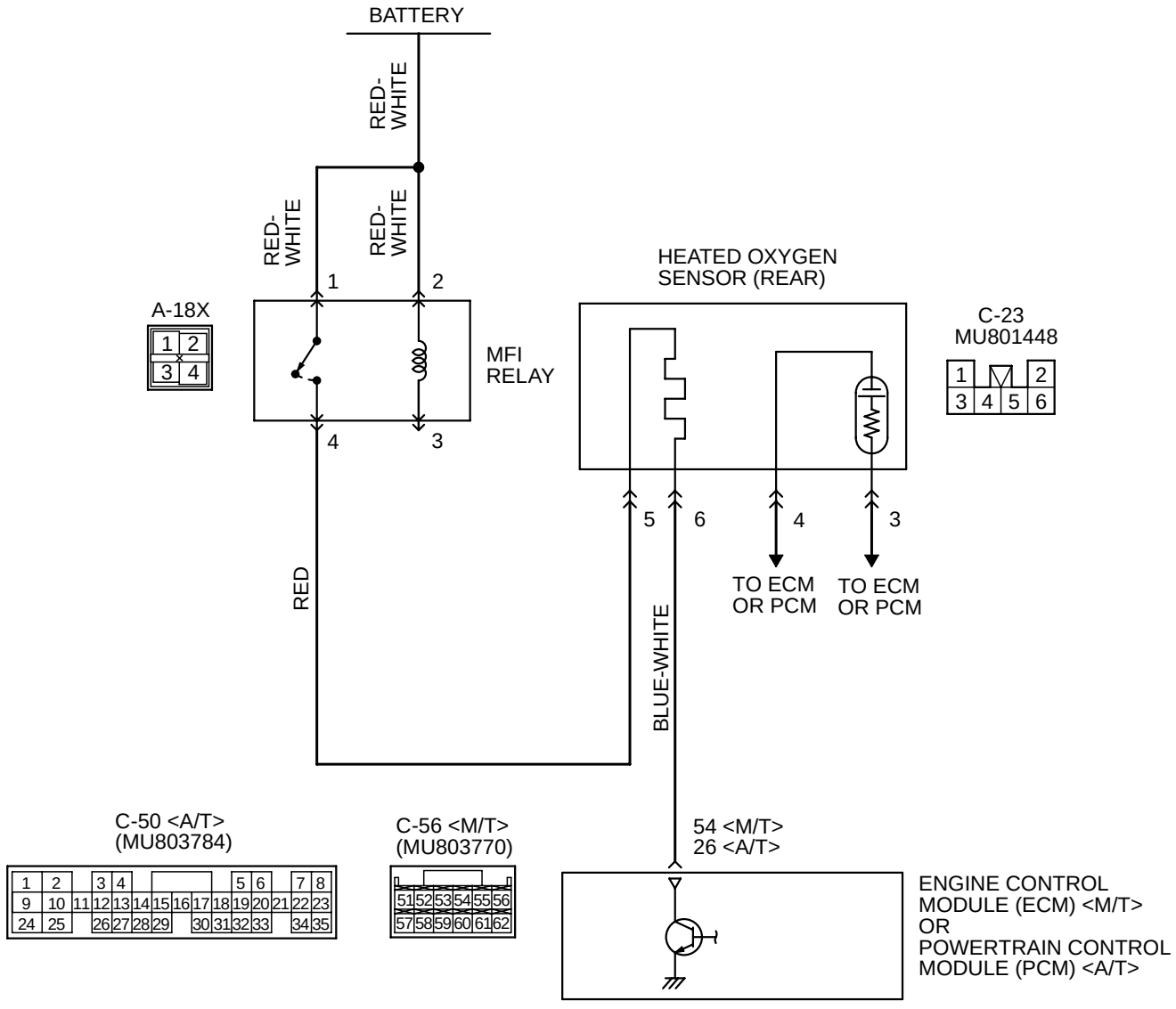
Q: Is the DTC P0139 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0141: Heated Oxygen Sensor Heater Circuit (sensor 2)

Heated Oxygen Sensor (rear) Heater Circuit



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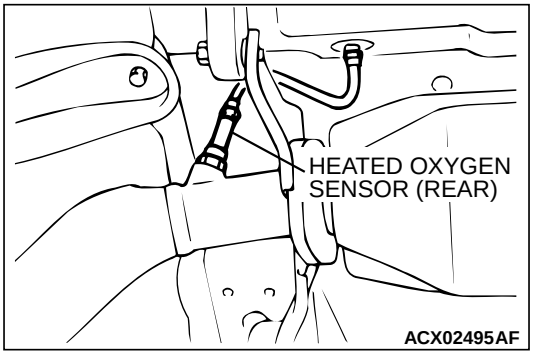

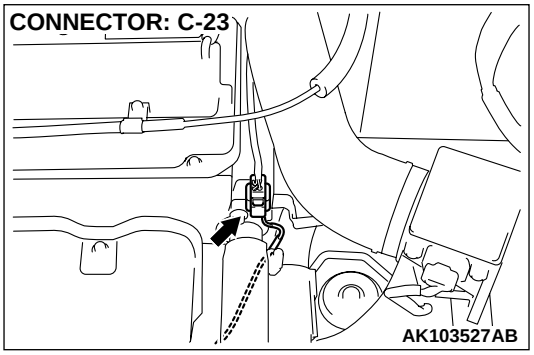

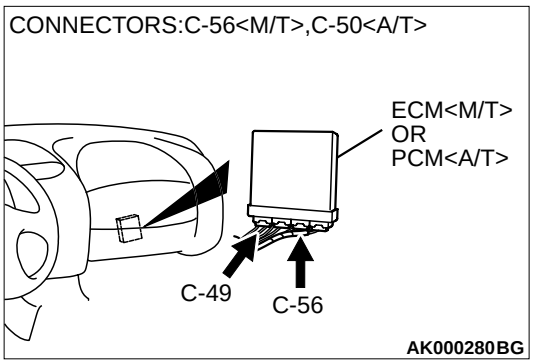

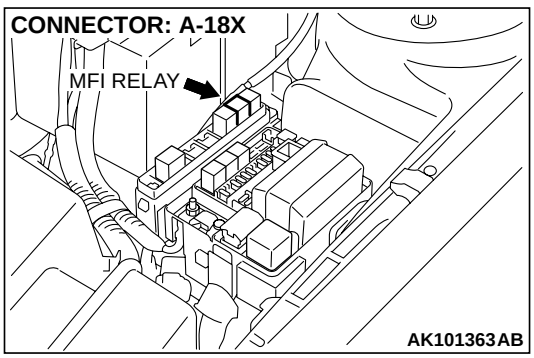

CIRCUIT OPERATION

- Power is supplied from the MFI relay (terminal 4) to the heated oxygen sensor (rear) heater.
- The ECM (terminal 54) <M/T> or PCM (terminal 26) <A/T> controls continuity to the heated oxygen sensor (rear) heater by turning the power transistor in the ECM <M/T> or PCM <A/T> "ON" and "OFF".

BACKGROUND

- The ECM <M/T> or PCM <A/T> checks whether the heater current is within a specified range when the heater is energized.

DTC SET CONDITIONS

Check Conditions

- 60 seconds have elapsed from the start of the previous monitoring.
- Engine coolant temperature is higher than 20°C (68°F).
- While the heated oxygen sensor (rear) heater is on.
- Battery positive voltage is at between 11 and 16 volts.

Judgment Criteria

- Heater current of the heated oxygen sensor (rear) heater has continued to be lower than 0.16 ampere or higher than 5.0 ampere for 4 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Open or shorted heated oxygen sensor (rear) heater circuit.
- Open circuit in heated oxygen sensor (rear) heater.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tool:

- MB991658: Test Harness

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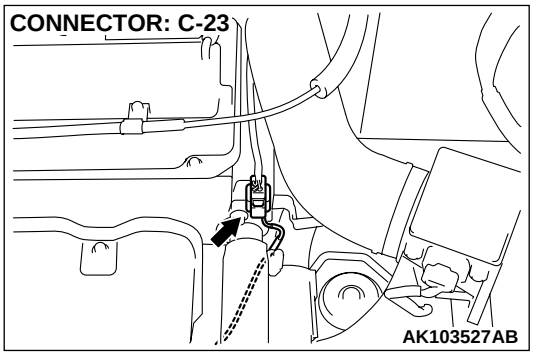
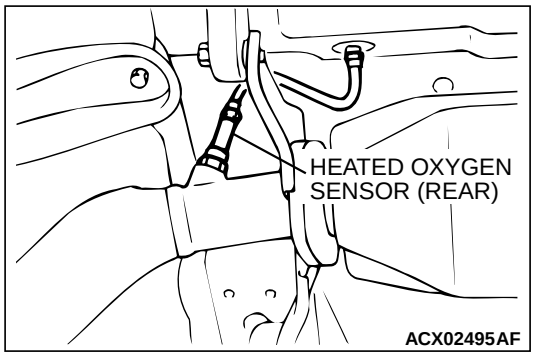


STEP 1. Check connector C-23 at the heated oxygen sensor (rear) for damage.

Q: Is the connector in good condition?

YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



STEP 2. Check the heated oxygen sensor (rear).

(1) Disconnect heated oxygen sensor (rear) connector C-23 and connect test harness special tool, MB991658, to the connector on the heated oxygen (rear) sensor side.

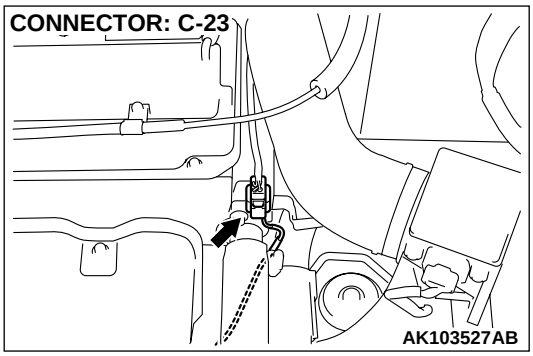
(2) Measure the resistance between heated oxygen sensor connector terminal 5 and terminal 6.

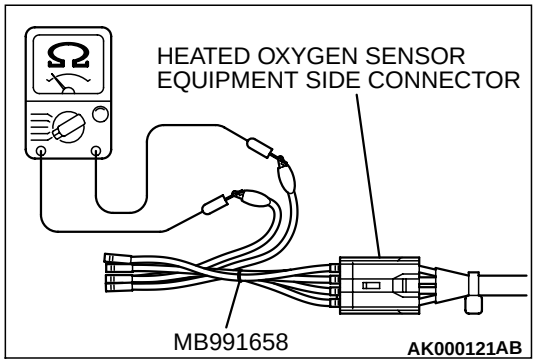
Standard value: 11 – 18 ohm [at 20°C (68°F)]

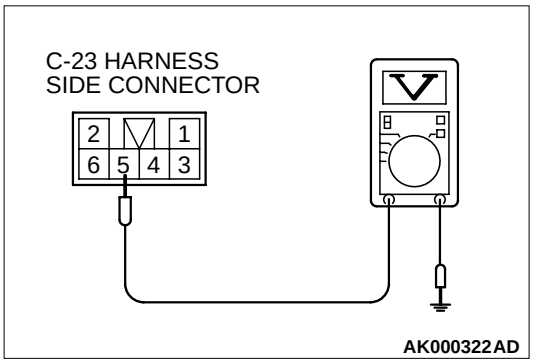
Q: Is the resistance normal?

YES : Go to Step 3.

NO : Replace the heated oxygen sensor (rear). Then go to Step 12.







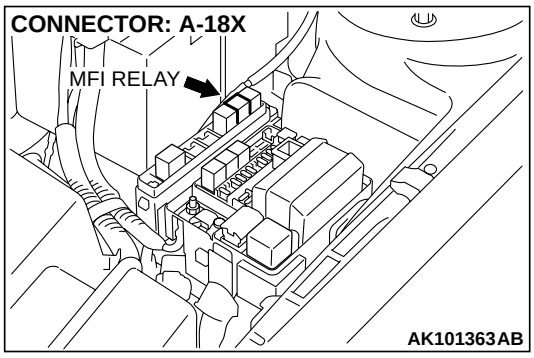
STEP 3. Check the power supply voltage at heated oxygen sensor (rear) harness side connector C-23.

(1) Disconnect the connector C-23 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 3 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 5.
NO : Go to Step 4.



STEP 4. Check harness connector B-18X at the MFI relay for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between MFI relay connector A-18X terminal 4 and heated oxygen sensor (rear) connector C-23 terminal 5 because of open circuit or short circuit to ground. Then go to Step 12.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 5. Check the power supply voltage at ECM connector C-56 <M/T> or PCM connector C-50 <A/T> by backprobing.

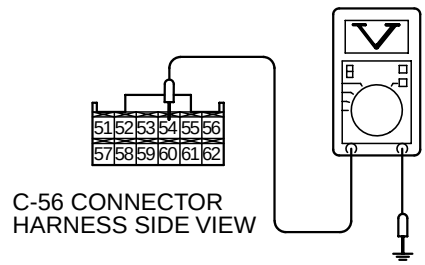
(1) Do not disconnect the connector C-56 <M/T> or C-50 <A/T>.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 54 <M/T> or 26 <A/T> and ground by backprobing.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 8.
NO : Go to Step 6.

<M/T>



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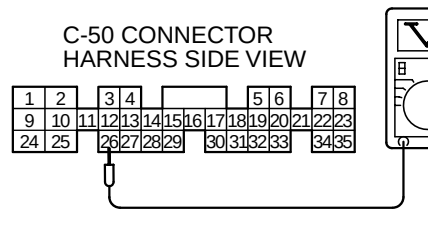
<A/T>



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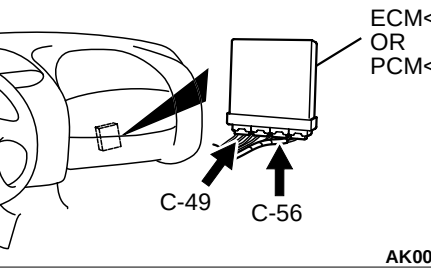
STEP 6. Check connector C-56 at ECM <M/T> or connector C-50 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 7.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

CONNECTORS:C-56<M/T>,C-50<A/T>



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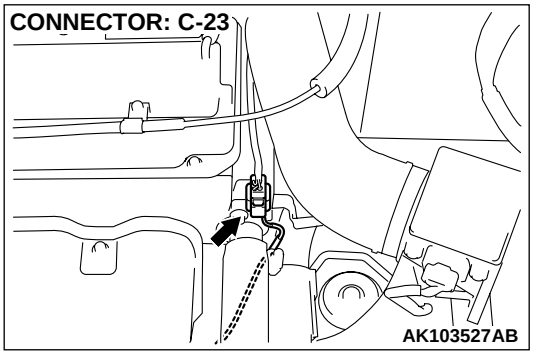
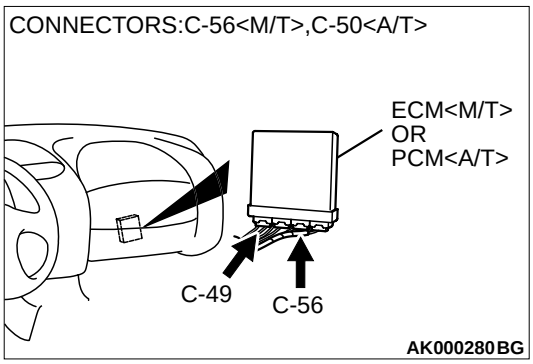
STEP 7. Check for open circuit and short circuit to ground between heated oxygen sensor (rear) connector C-23 (terminal 6) and ECM connector C-56 (terminal 54) <M/T> or PCM connector C-50 (terminal 26) <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 12.

NO : Repair it. Then go to Step 12.



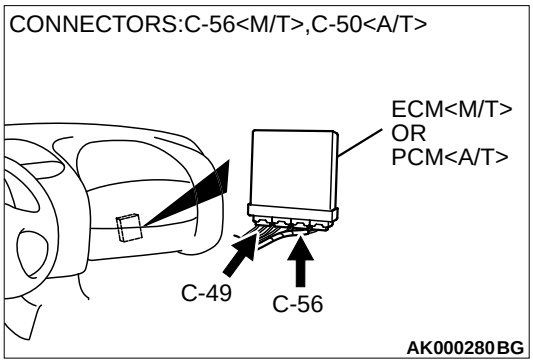


STEP 8. Check connector C-56 at ECM <M/T> or connector C-50 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

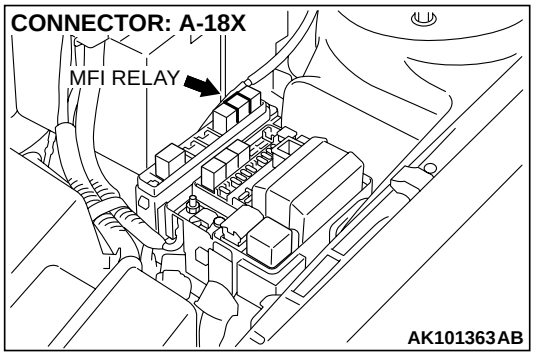


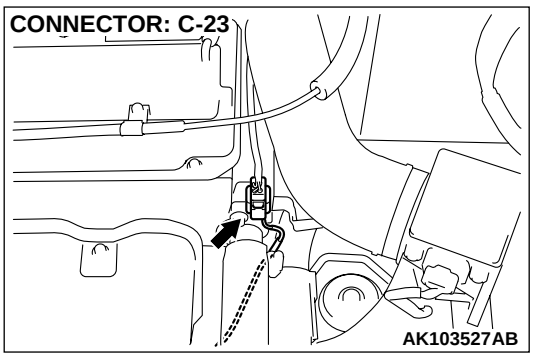
STEP 9. Check for harness damage between MFI relay connector A-18X (terminal 4) and heated oxygen sensor (rear) connector C-23 (terminal 5).

Q: Is the harness wire in good condition?

YES : Go to Step 10.

NO : Repair it. Then go to Step 12.



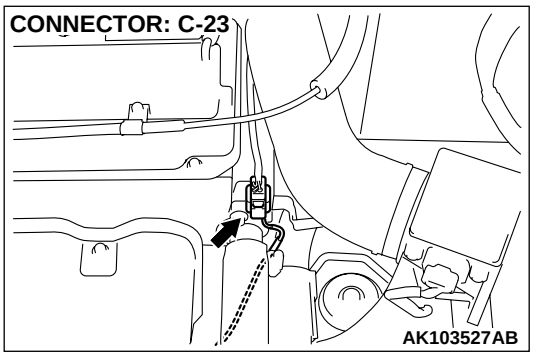


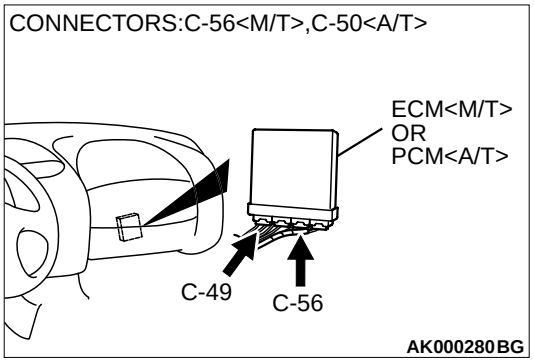
STEP 10. Check for harness damage between heated oxygen sensor (rear) connector C-23 (terminal 6) and ECM connector C-56 (terminal 54) <M/T> or PCM connector C-50 (terminal 26) <A/T>.

Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair it. Then go to Step 12.





STEP 11. Check the trouble symptoms.
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0141 is output?

YES : Replace the ECM or PCM. Then go to Step 12.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

STEP 12. Test the OBD-II drive cycle.
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0141 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0171: System too Lean

System too Lean Circuit
- Refer to, DTC P0201 – P0204 Injector Circuit Malfunction. P.13A-216

CIRCUIT OPERATION
- Refer to, DTC P0201 – P0204 Injector Circuit Malfunction. P.13A-216

TECHNICAL DESCRIPTION
- If a malfunction occurs in the fuel system, the fuel trim value becomes too large.
- The ECM <M/T> or PCM <A/T> checks whether the fuel trim value is within a specified range.

DTC SET CONDITIONS

Check Conditions
- Engine coolant temperature is lower than approximately 100°C (212°F) when the engine is started.
- Intake air temperature is lower than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 77°C (171°F).
- Volume air flow sensor output frequency is 88 Hz or more.

Judgment Criteria
- Long-term fuel trim has continued to be higher than +12.5 percent for 5 seconds.

or
- Short-term fuel trim has continued to be higher than +10.0 percent for 5 seconds.

Check Conditions
- Engine coolant temperature is lower than approximately 100°C (212°F) when the engine is started.
- Intake air temperature is lower than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 77°C (171°F).
- Volume air flow sensor output frequency is 88 Hz or less.

Judgment Criteria
- Long-term fuel trim has continued to be higher than +12.5 percent for 5 seconds.

or
- Short-term fuel trim has continued to be higher than +15 percent for 5 seconds.

Check Conditions
- Engine coolant temperature is higher than approximately 100°C (212°F) when the engine is started.
- Intake air temperature is higher than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 77°C (171°F).

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- Volume air flow sensor output frequency is 88 Hz or more.

Judgment Criteria
- Long-term fuel trim has continued to be higher than +12.5 percent for 5 seconds.

or
- Short-term fuel trim has continued to be higher than +20.0 percent for 5 seconds.

Check Conditions
- Engine coolant temperature is higher than approximately 100°C (212°F) when the engine is started.
- Intake air temperature is higher than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 77°C (171°F).
- Volume air flow sensor output frequency is 88 Hz or less.

Judgment Criteria
- Long-term fuel trim has continued to be higher than +12.5 percent for 5 seconds.

or
- Short-term fuel trim has continued to be higher than +25.0 percent for 5 seconds.

Check Conditions
- Engine coolant temperature is higher than 77°C (171°F).
- Under the closed loop air/fuel ratio control.

Judgment Criteria
- Long-term fuel trim has continued to be +12.5 percent for 5 seconds.

or
- Short-term fuel trim has continued to be +25.0 percent for 5 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Volume air flow sensor failed.
- Injector failed.
- Incorrect fuel pressure.
- Air drawn in from gaps in gasket, seals, etc.
- Heated oxygen sensor failed.
- Engine coolant temperature sensor failed.
- Intake air temperature sensor failed.
- Barometric pressure sensor failed.
- Use of incorrect or contaminated fuel.
- ECU failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools
- MB991502: Scan Tool (MUT-II)

STEP 1. Check the exhaust leaks.

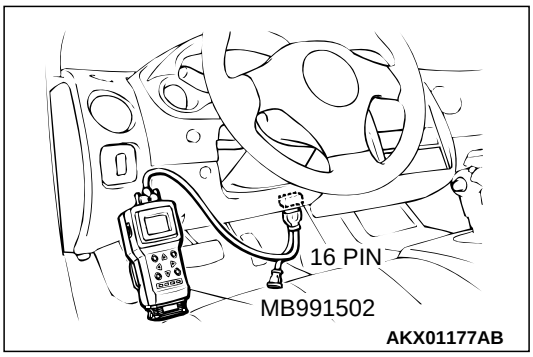
Q: Are there any abnormalities?

YES : Go to Step 2.
NO : Repair it. Then go to Step 14.

STEP 2. Check the intake system vacuum leak.

Q: Are there any abnormalities?

YES : Go to Step 3.
NO : Repair it. Then go to Step 14.



STEP 3. Using scan tool MB991502, check data list item 12: Volume Air Flow Sensor.

⚠ CAUTION

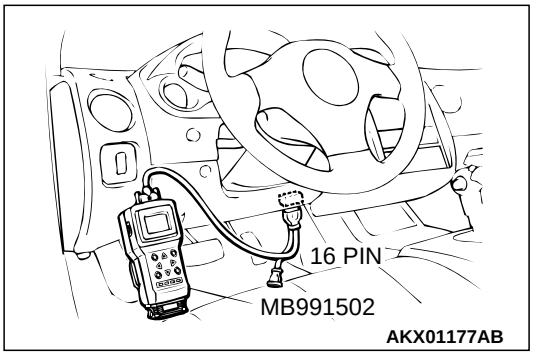
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 12, Volume Air Flow Sensor.
(4) Warm up the engine to normal operating temperature: 80°C to 96°C (176°F to 205°F).
- When idling, between 12 and 38 Hz (between 1.7 and 4.2 g/s).
- When 2,500 r/min, between 55 and 95 Hz (between 7.9 and 12.1 g/s).

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 4.
NO : Refer to, DTC P0101 – Volume Air Flow Circuit Range/Performance Problem P.13A-28, DTC P0102 – Volume Air Flow Circuit Low Input P.13A-34.



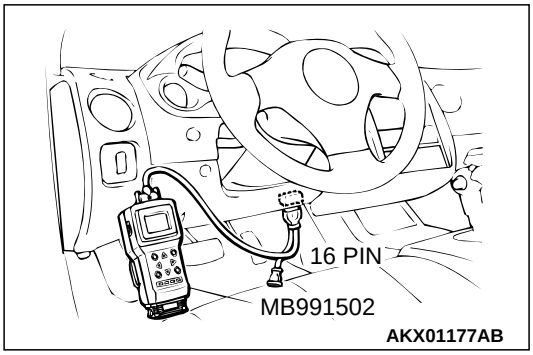
STEP 4. Using scan tool MB991502, check data list item 13: Intake Air Temperature Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991502 to the data reading mode for item 13, Intake Air Temperature Sensor.
- The intake air temperature and temperature shown with the scan tool should approximately match.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 5.
NO : Refer to, DTC P0111 – Intake Air Temperature Circuit Range/Performance Problem P.13A-65, DTC P0112 – Intake Air Temperature Circuit Low Input P.13A-70, DTC P0113 – Intake Air Temperature Circuit High Input P.13A-74.



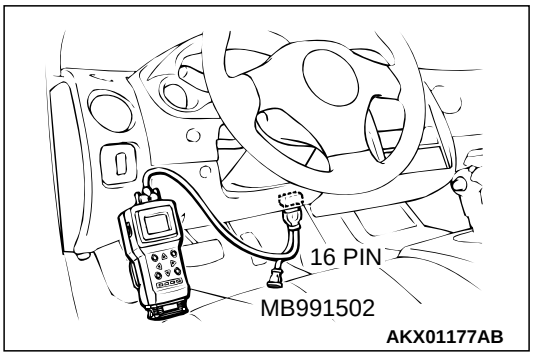
STEP 5. Using scan tool MB991502, check data list item 21: Engine Coolant Temperature Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991502 to the data reading mode for item 21, Engine Coolant Temperature Sensor.
- The engine coolant temperature and temperature shown with the scan tool should approximately match.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 6.
NO : Refer to, DTC P0116 – Engine Coolant Temperature Circuit Range/Performance Problem P.13A-80, DTC P0117 – Engine Coolant Temperature Circuit Low Input P.13A-88, DTC P0118 – Engine Coolant Temperature Circuit High Input P.13A-92.



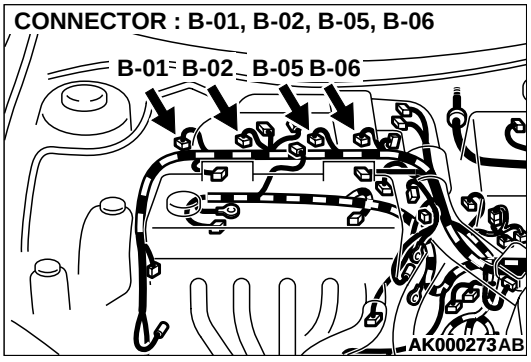
STEP 6. Using scan tool MB991502, check data list item 25: Barometric Pressure Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991502 to the data reading mode for item 25, Barometric Pressure Sensor.
- When altitude is 0 m (0 foot), 101 kPa.
- When altitude is 600 m (1,969 feet), 95 kPa.
- When altitude is 1,200 m (3,937 feet), 88 kPa.
- When altitude is 1,800 m (5,906 feet), 81 kPa.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

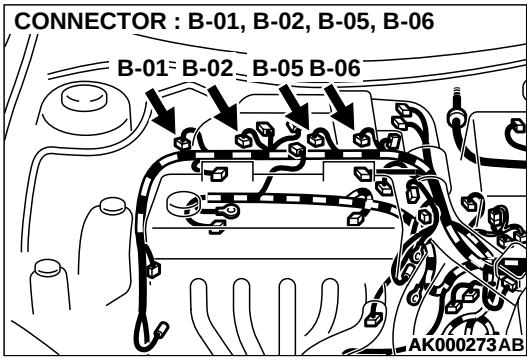
YES : Go to Step 7.
NO : Refer to, DTC P0106 – Barometric Pressure Circuit Range/Performance Problem P.13A-42, DTC P0107 – Barometric Pressure Circuit Low Input P.13A-47, DTC P0108 – Barometric Pressure Circuit High Input P.13A-58.



STEP 7. Check connector B-01, B-02, B-05, B-06 at injector for damage.

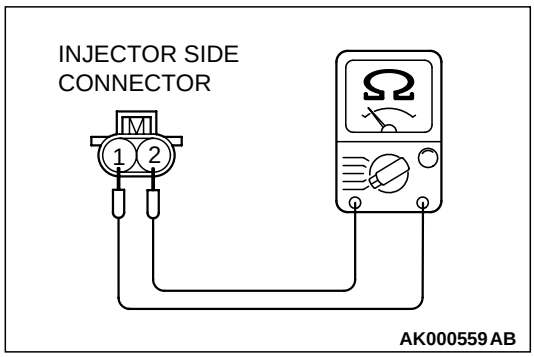
Q: Is the connector in good condition?

YES : Go to Step 8.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP 8. Check the injector.

(1) Disconnect each injector connector.



(2) Measure the resistance between injector side connector terminal 1 and 2.

Standard value: 13 – 16 ohm [at 20°C (68°F)]

Q: Is the resistance standard value?

YES : Go to Step 9.

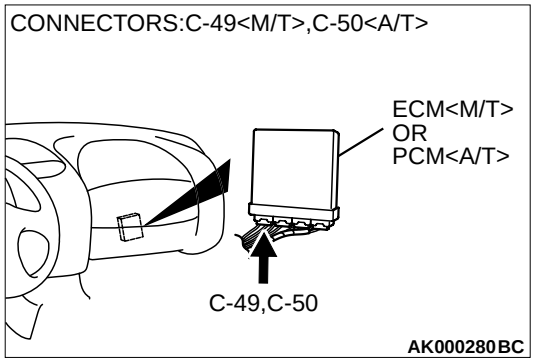
NO : Replace the injector. Then go to Step 14.

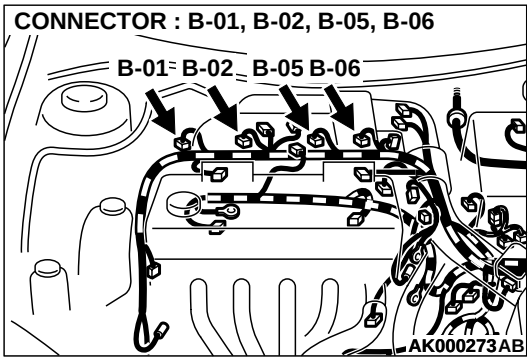
STEP 9. Check connector C-49 at ECM <M/T> or connector C-50 at PCM <A/T> for damage.

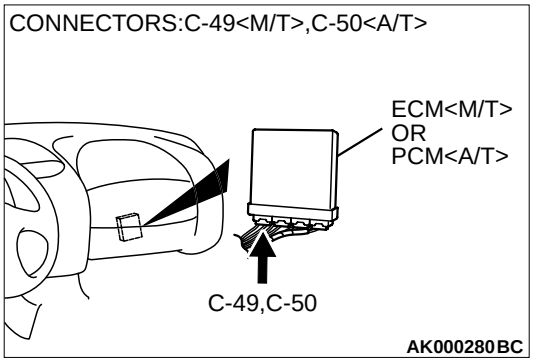
Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.







STEP 10. Check for harness damage between injector connector and ECM connector <M/T> or PCM connector <A/T>.

a. Check the harness wire between injector connector B-01 terminal 2 and ECM connector C-49 terminal 1 <M/T> or PCM connector C-50 terminal 1 <A/T> when checking No. 1 cylinder.
b. Check the harness wire between injector connector B-02 terminal 2 and ECM connector C-49 terminal 14 <M/T> or PCM connector C-50 terminal 9 <A/T> when checking No. 2 cylinder.
c. Check the harness wire between injector connector B-05 terminal 2 and ECM connector C-49 terminal 2 <M/T> or PCM connector C-50 terminal 24 <A/T> when checking No. 3 cylinder.
d. Check the harness wire between injector connector B-06 terminal 2 and ECM connector C-49 terminal 15 <M/T> or PCM connector C-50 terminal 2 <A/T> when checking No. 4 cylinder.

Q: Is the harness wire in good condition?

YES : Go to Step 11.
NO : Repair it. Then go to Step 14.

STEP 11. Check the fuel pressure.

Refer to, Fuel Pressure Test P.13A-578.

Q: Is the fuel pressure normal?

YES : Go to Step 12.
NO : Repair or replace it. Then go to Step 14.

STEP 12. Check for entry of foreign matter (water, kerosene, etc.) into fuel.

Q: Are there any abnormalities?

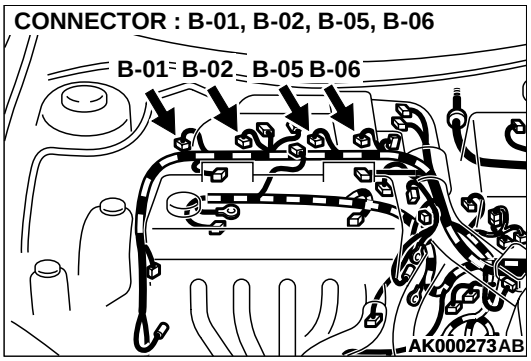
YES : Go to Step 13.
NO : Replace the fuel. Then go to Step 14.

STEP 13. Replace the injector.

(1) Replace the injector.
(2) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 2 – Fuel Trim Monitor P.13A-5.
(3) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0171 is output?

YES : Replace the ECM or PCM. Then go to Step 14.
NO : The inspection is complete.



STEP 14. Test the OBD-II drive cycle.
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 2 – Fuel Trim Monitor P.13A-5.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0171 is output?
YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0172: System too Rich

System too Rich Circuit
- Refer to, DTC P0201 – P0204 Injector Circuit Malfunction P.13A-216.

CIRCUIT OPERATION
- Refer to, DTC P0201 – P0204 Injector Circuit Malfunction P.13A-216.

TECHNICAL DESCRIPTION
- If a malfunction occurs in the fuel system, the fuel trim value becomes too small.
- The ECM <M/T> or PCM <A/T> checks whether the fuel trim value is within a specified range.

DTC SET CONDITIONS

Check Conditions
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 77°C (171°F).
- Volume air flow sensor output frequency is 88 Hz or more.

Judgment Criteria
- Long-term fuel trim has continued to be lower than –12.5 percent for 5 seconds.

or
- Short-term fuel trim has continued to be lower than –10.0 percent for 5 seconds.

Check Conditions
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 77°C (171°F).
- Volume air flow sensor output frequency is 88 Hz or less.

Judgment Criteria
- Long-term fuel trim has continued to be lower than –12.5 percent for 5 seconds.

or
- Short-term fuel trim has continued to be lower than –15.0 percent for 5 seconds.

Check Conditions
- Engine coolant temperature is higher than 77°C (171°F).
- Under the closed loop air/fuel ratio control.

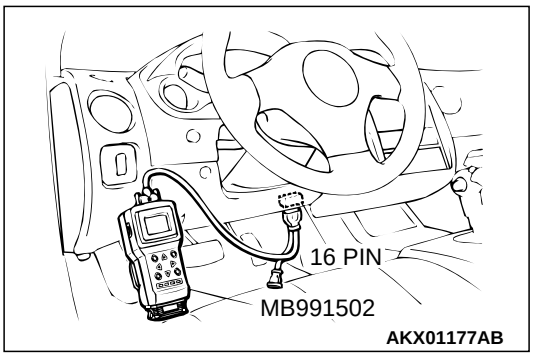
Judgment Criteria
- Long-term fuel trim has continued to be –12.5 percent for 5 seconds.

or
- Short-term fuel trim has continued to be –25.0 percent for 5 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Volume air flow sensor failed.
- Injector failed.
- Incorrect fuel pressure.
- Heated oxygen sensor failed.
- Engine coolant temperature sensor failed.
- Intake air temperature sensor failed.
- Barometric pressure sensor failed.
- Exhaust leak.
- Use of incorrect or contaminated fuel.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 12: Volume Air Flow Sensor.

⚠ CAUTION

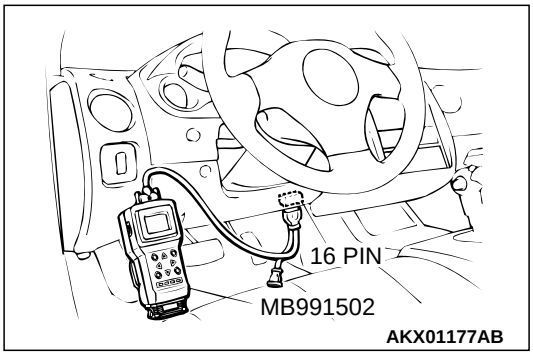
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 12, Volume Air Flow Sensor.
(4) Warm up the engine to normal operating temperature: 80°C to 96°C (176°F to 205°F).
- When idling, between 12 and 38 Hz (between 1.7 and 4.2 g/s).
- When 2,500 r/min, between 55 and 95 Hz (between 7.9 and 12.1 g/s).

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 2.
NO : Refer to, DTC P0101 – Volume Air Flow Circuit Range/Performance Problem P.13A-28, DTC P0102 – Volume Air Flow Circuit Low Input P.13A-34.



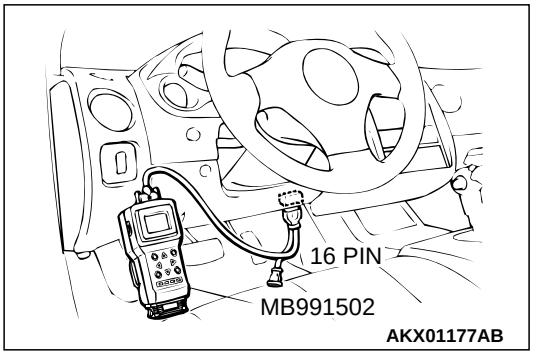
STEP 2. Using scan tool MB991502, check data list item 13: Intake Air Temperature Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991502 to the data reading mode for item 13, Intake Air Temperature Sensor.
- The intake air temperature and temperature shown with the scan tool should approximately match.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 3.
NO : Refer to, DTC P0111 – Intake Air Temperature Circuit Range/Performance Problem P.13A-65, DTC P0112 – Intake Air Temperature Circuit Low Input P.13A-70, DTC P0113 – Intake Air Temperature Circuit High Input P.13A-74.



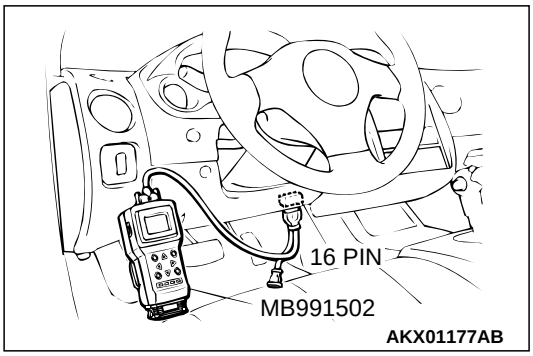
STEP 3. Using scan tool MB991502, check data list item 21: Engine Coolant Temperature Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991502 to the data reading mode for item 21, Engine Coolant Temperature Sensor.
- The engine coolant temperature and temperature shown with the scan tool should approximately match.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 4.
NO : Refer to, DTC P0116 – Engine Coolant Temperature Circuit Range/Performance Problem P.13A-80, DTC P0117 – Engine Coolant Temperature Circuit Low Input P.13A-88, DTC P0118 – Engine Coolant Temperature Circuit High Input P.13A-92.



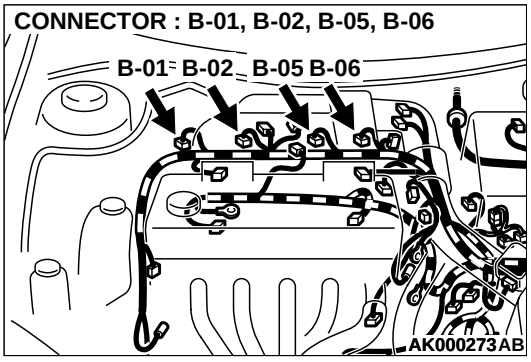
STEP 4. Using scan tool MB991502, check data list item 25: Barometric Pressure Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991502 to the data reading mode for item 25, Barometric Pressure Sensor.
- When altitude is 0 m (0 foot), 101 kPa.
- When altitude is 600 m (1,969 feet), 95 kPa.
- When altitude is 1,200 m (3,937 feet), 88 kPa.
- When altitude is 1,800 m (5,906 feet), 81 kPa.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

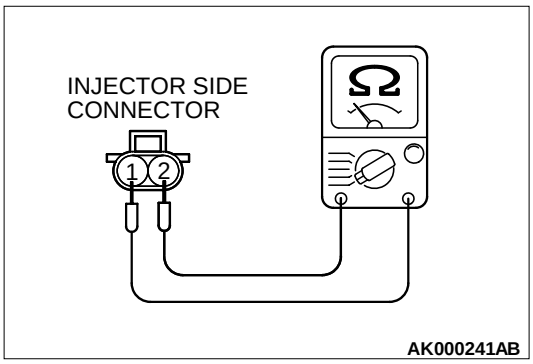
Q: Is the sensor operating properly?

YES : Go to Step 5.
NO : Refer to, DTC P0106 – Barometric Pressure Circuit Range/Performance Problem P.13A-42, DTC P0107 – Barometric Pressure Circuit Low Input P.13A-47, DTC P0108 – Barometric Pressure Circuit High Input P.13A-58.



STEP 5. Check the injector.

(1) Disconnect each injector connector.



(2) Measure the resistance between injector side connector terminal 1 and 2.

Standard value: 13 – 16 ohm [at 20°C (68°F)]

Q: Is the resistance standard value?

YES : Go to Step 6.

NO : Replace the injector. Then go to Step 8.

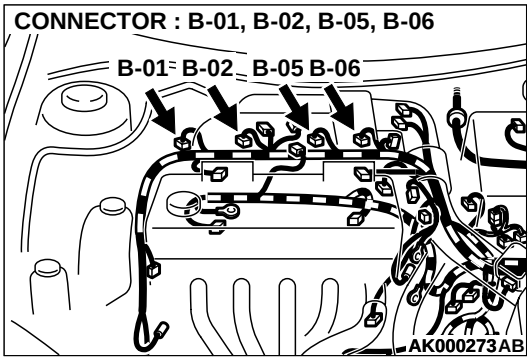
STEP 6. Check the fuel pressure.

Refer to, Fuel Pressure Test P.13A-578.

Q: Is the fuel pressure normal?

YES : Go to Step 7.

NO : Repair or replace it. Then go to Step 8.



STEP 7. Replace the injector.

(1) Replace the injector.

(2) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 2 – Fuel Trim Monitor P.13A-5.

(3) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0172 is output?

YES : Replace the ECM or PCM. Then go to Step 8.

NO : The inspection is complete.

STEP 8. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 2 – Fuel Trim Monitor P.13A-5.

(2) Check the diagnostic trouble code (DTC).

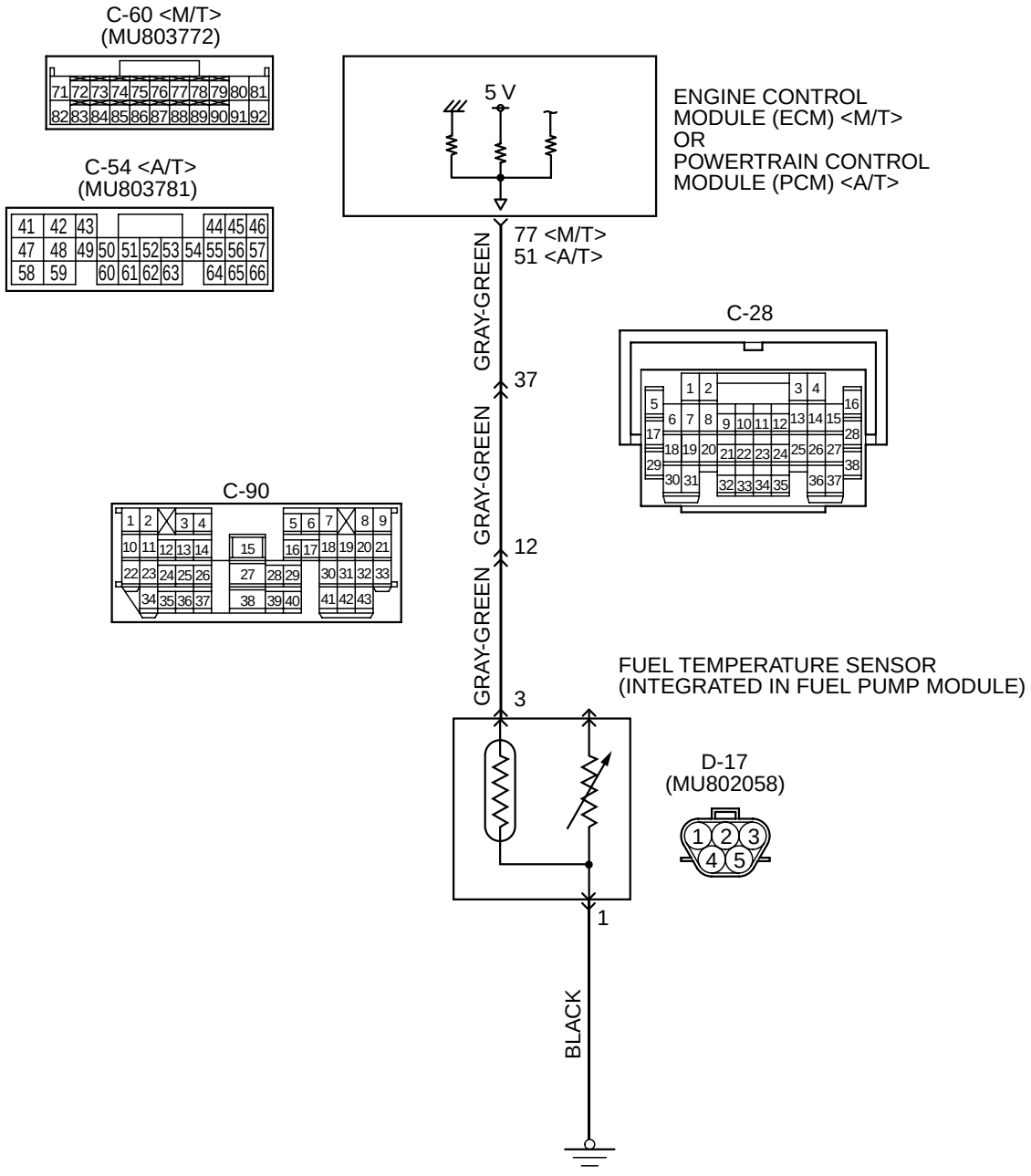
Q: Is the DTC P0172 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0181: Fuel Temperature Sensor Circuit Range/Performance

Fuel Temperature Sensor Circuit



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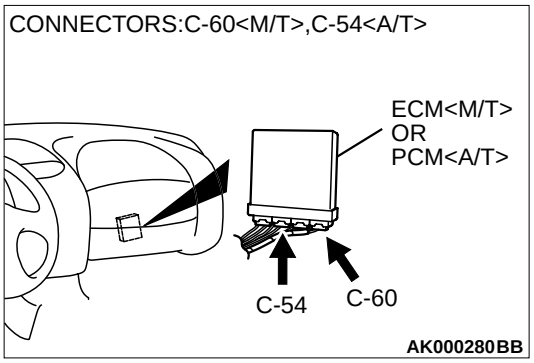
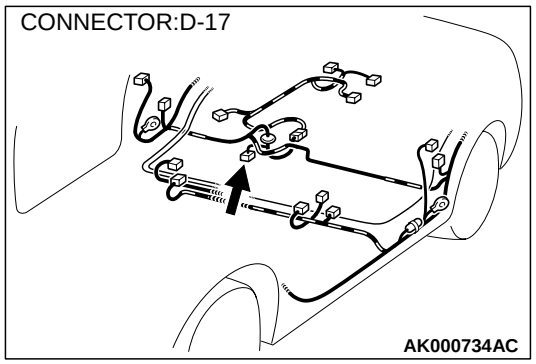
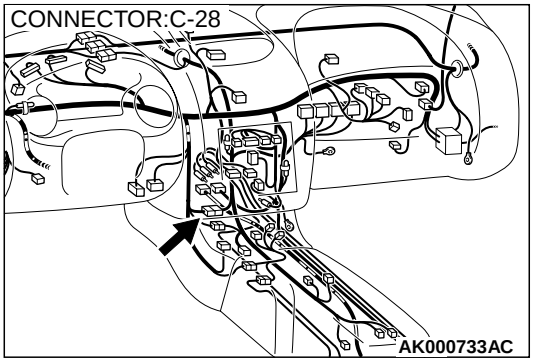
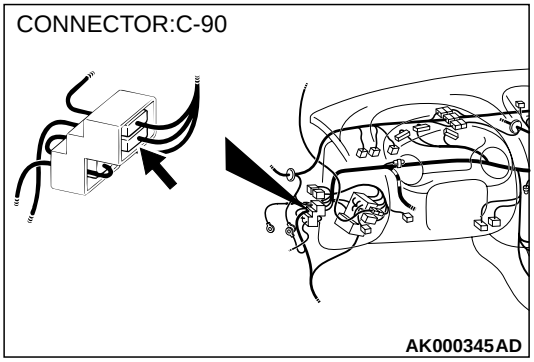








CIRCUIT OPERATION

- 5-volt voltage is applied to the fuel temperature sensor output terminal (terminal 3) from the ECM (terminal 77) <M/T> or PCM (terminal 51) <A/T> via the resistor in the ECM <M/T> or PCM <A/T>.
- The fuel temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases. The ground terminal (terminal 1) is grounded to the vehicle body.

TECHNICAL DESCRIPTION

- The fuel temperature sensor converts the fuel temperature to a voltage.
- The ECM <M/T> or PCM<A/T> detects the fuel temperature in the fuel tank with this output voltage.

DTC SET CONDITIONS

Check Conditions

- The engine coolant temperature – intake air temperature is 5°C (9°F) or less when the engine is started.
- The engine coolant temperature is between –10°C (14°F) and 36°C (97°F) when the engine is started.
- Engine coolant temperature sensor is higher than 60°C (140°F).
- Maximum vehicle speed is higher than 30 km/h (17 mph) after the starting sequence has been completed.

Judgement Criteria

- The fuel temperature – engine coolant temperature is 15° C (27° F) or more when the engine is started.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Fuel temperature sensor failed.
- Open or shorted fuel temperature sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

NOTE: A diagnostic trouble code (DTC) could be output if the engine coolant is changed as indicated below. Because this is not a failure, the DTC must be erased.
Make sure to test drive the vehicle in accordance with the drive cycle pattern in order to verify that a DTC will not be output.

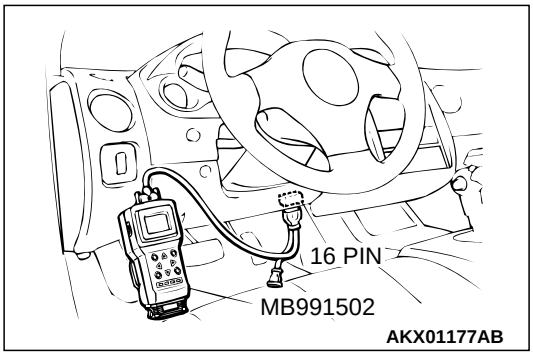
- *The engine and the radiator have been flushed repeatedly when the engine coolant temperature was high (or the fuel temperature was high).*

DIAGNOSIS

Required Special Tools

- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check data list item 4A: Fuel Temperature Sensor.



⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

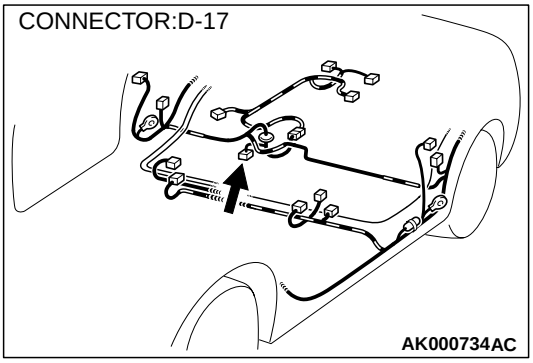
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 4A, Fuel Temperature Sensor.
- Approximately the same as the outside temperature when the engine is cooled.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Go to Step 2.

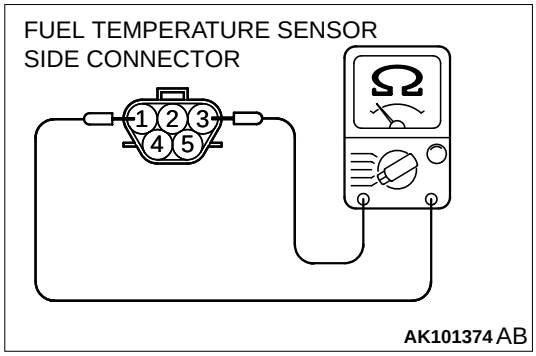
STEP 2. Check connector D-17 at the fuel temperature sensor for damage.



Q: Is the connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 3. Check the fuel temperature sensor.

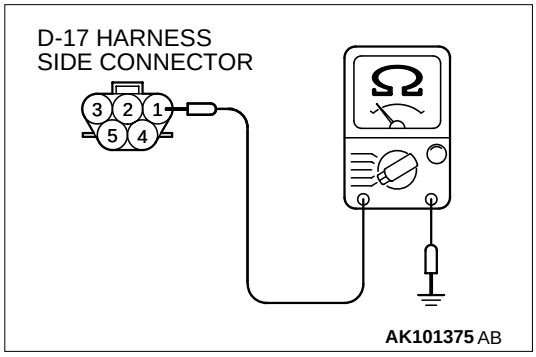


(1) Disconnect the fuel temperature sensor connector D-17
(2) Measure the resistance between terminal 1 and 3 of the fuel temperature sensor.

Standard value:
0.5 – 12.0 kΩ

Q: Is the resistance at the standard value?

YES : Go to Step 4.
NO : Replace the fuel temperature sensor. Then go to Step 12.

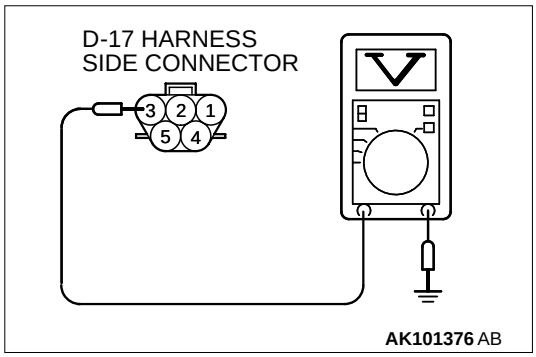


STEP 4. Check the continuity at fuel temperature sensor harness side connector D-17.

(1) Disconnect the connector D-17 and measure at the harness side.
(2) Check for the continuity between terminal 1 and ground.
- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 5.
NO : Repair harness wire between fuel temperature sensor connector D-17 terminal 1 and ground because of open circuit or harness damage. Then go to Step 12.



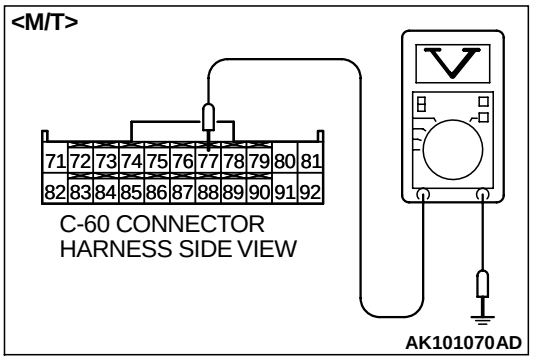
STEP 5. Check the sensor supply voltage at fuel temperature sensor harness side connector D-17.

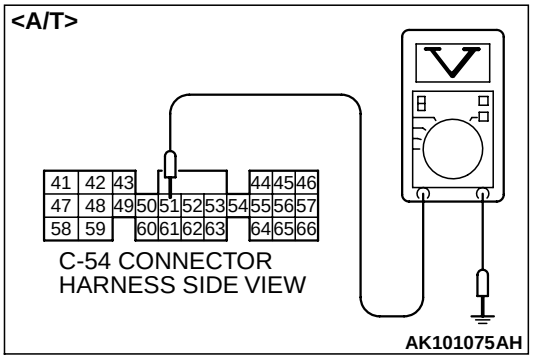
(1) Disconnect the connector D-17 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 3 and ground.
- Voltage should be between 4.5 and 4.9 volts

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 6.
NO : Go to Step 10.





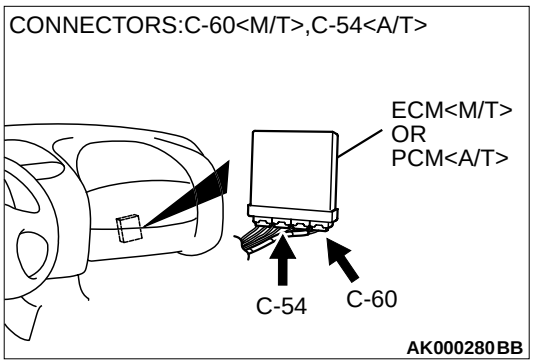
STEP 6. Check the sensor supply voltage at ECM connector C-60 <M/T> or PCM connector C-54 <A/T> by backprobing.

(1) Do not disconnect the ECM connector C-60 <M/T> or PCM connector C-54 <A/T>.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 77 <M/T> or terminal 51 <A/T> and ground by backprobing.
- When fuel temperature is 0°C (32°F), voltage should be 2.7 and 3.1 volts.
- When fuel temperature is 20°C (68°F), voltage should be 2.1 and 2.5 volts.
- When fuel temperature is 40°C (104°F), voltage should be 1.6 and 2.0 volts.
- When fuel temperature is 80°C (176°F), voltage should be 0.8 and 1.2 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

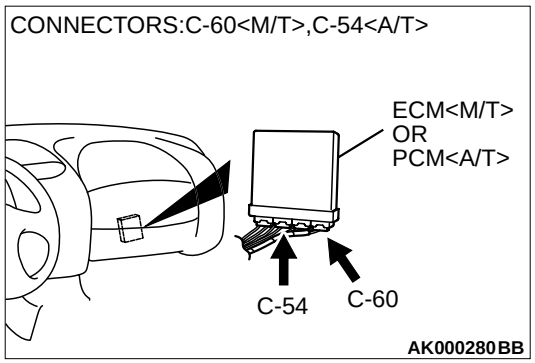
YES : Go to Step 7.
NO : Go to Step 8.



STEP 7. Check connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Check connector C-90 and C-28 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector are in good condition, repair harness wire between fuel gauge unit connector D-17 terminal 3 and ECM connector C-60 terminal 77 <M/T> or PCM connector C-54 terminal 51 <A/T> because of open circuit. Then go to Step 12.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

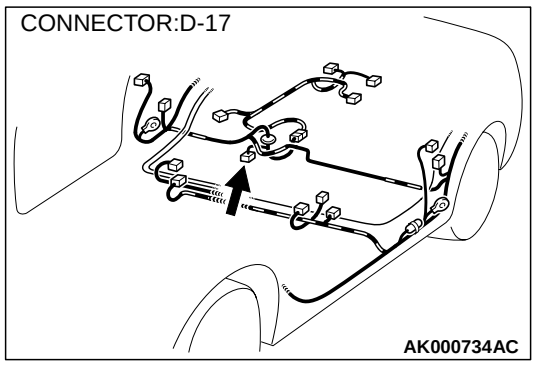


STEP 8. Check connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

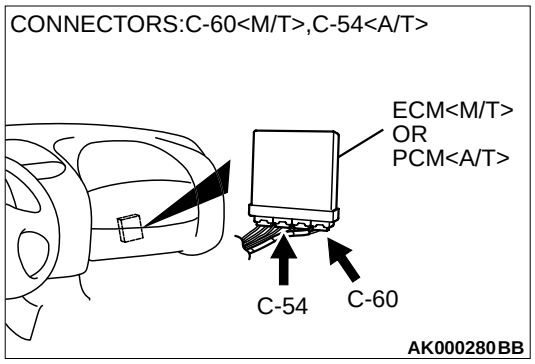


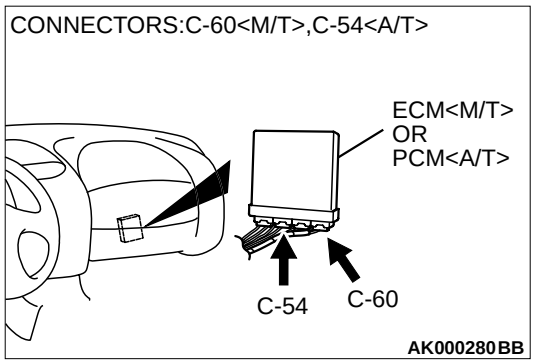
STEP 9. Check for short circuit to ground between fuel gauge unit connector D-17 (terminal 3) and ECM connector C-54 (terminal 77) <M/T> or PCM connector C-60 (terminal 51) <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 12.

NO : Repair it. Then go to Step 12.



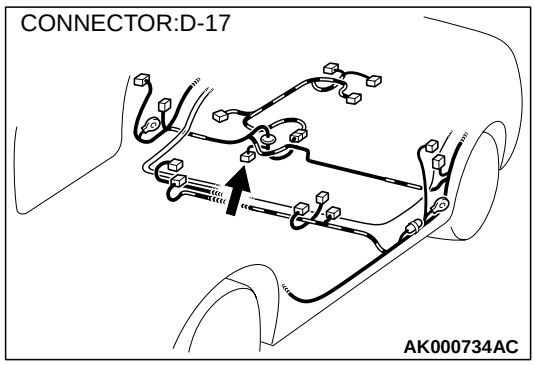


STEP 10. Check connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 11.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



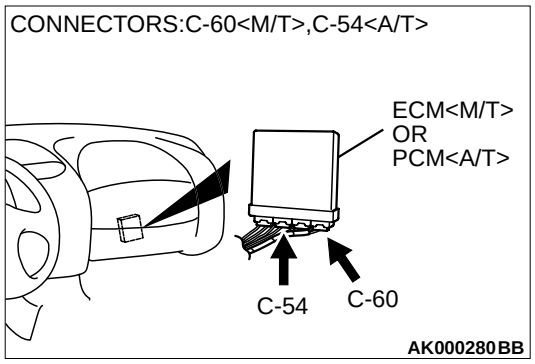
STEP 11. Check for harness damage between fuel temperature sensor connector D-17 (terminal 3) and ECM connector C-60 (terminal 77) <M/T> or PCM connector C-54 (terminal 51) <A/T>.

NOTE: Check harness after checking intermediate connector C-90 and C-28. If intermediate connector are damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 12.

NO : Repair it. Then go to Step 12.



STEP 12. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.

(2) Check the diagnostic trouble code (DTC).

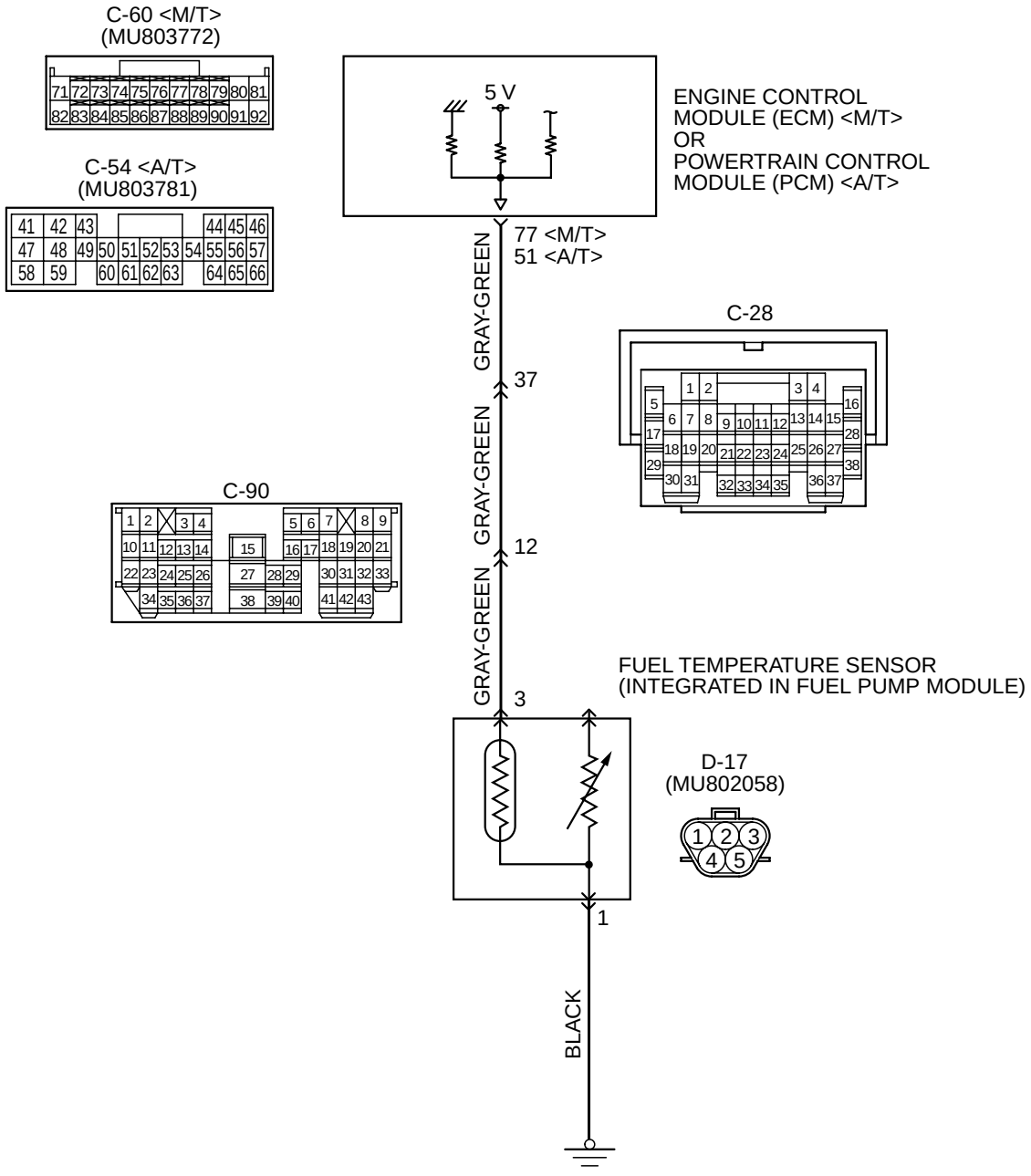
Q: Is the DTC P0181 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0182: Fuel Temperature Sensor Circuit Low Input

Fuel Temperature Sensor Circuit



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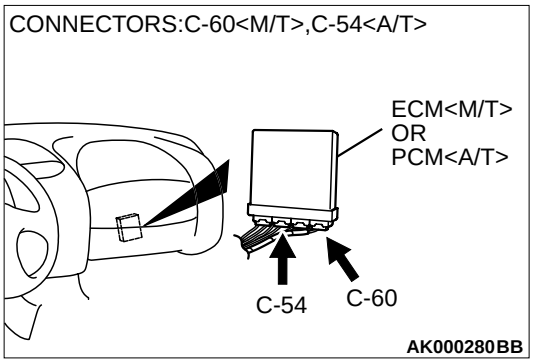
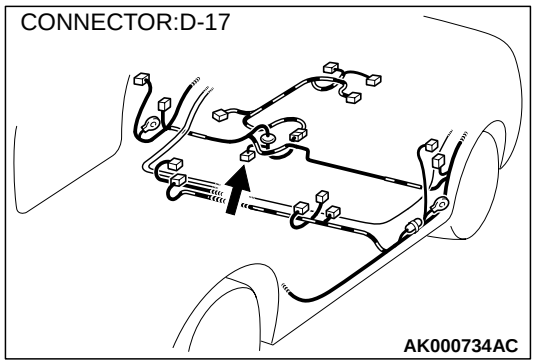
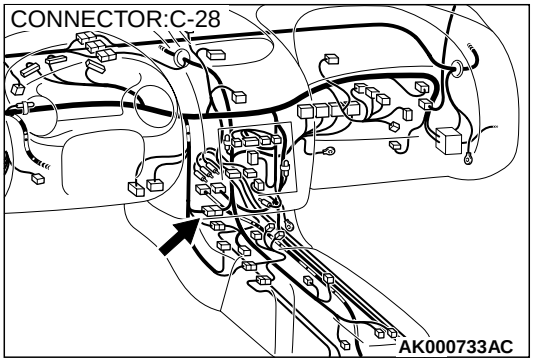
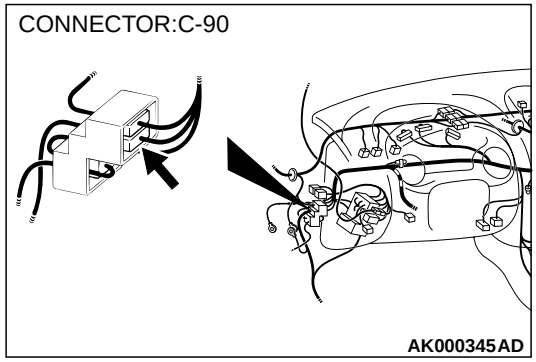








CIRCUIT OPERATION

- 5-volt voltage is applied to the fuel temperature sensor output terminal (terminal 3) from the ECM (terminal 77) <M/T> or PCM (terminal 51) <A/T> via the resistor in the ECM <M/T> or PCM <A/T>.
- The fuel temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases. The ground terminal (terminal 1) is grounded to the vehicle body.

TECHNICAL DESCRIPTION

- The fuel temperature sensor converts the fuel temperature to a voltage.
- The ECM <M/T> or PCM<A/T> detects the fuel temperature in the fuel tank with this output voltage.

DTC SET CONDITIONS

Check Conditions

- 2 seconds or more have passed since the starting sequence was completed.

Judgement Criteria

- Fuel temperature sensor output voltage has continued to be 0.1 volt or lower for 2 seconds.

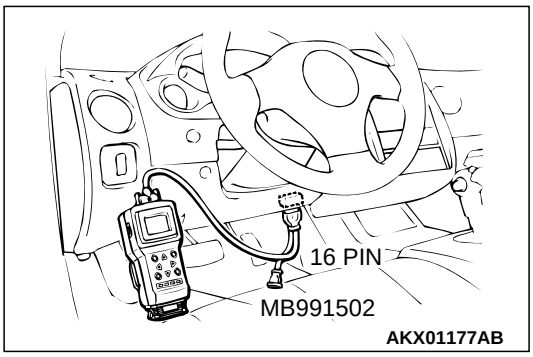
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Fuel temperature sensor failed.
- Open or shorted fuel temperature sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 4A: Fuel Temperature Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

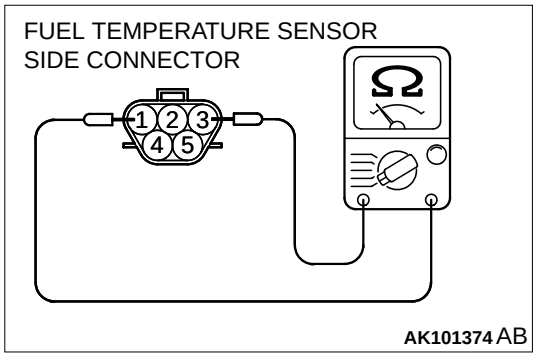
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 4A, Fuel Temperature Sensor.
- Approximately the same as the outside temperature when the engine is cooled.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

NO : Go to Step 2.



STEP 2. Check the fuel temperature sensor.

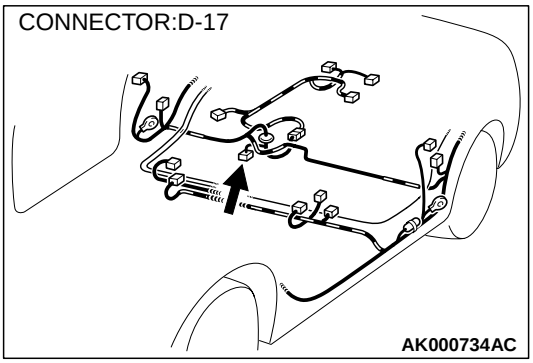
(1) Disconnect the fuel temperature sensor connector D-17
(2) Measure the resistance between terminal 1 and 3 of the fuel temperature sensor.

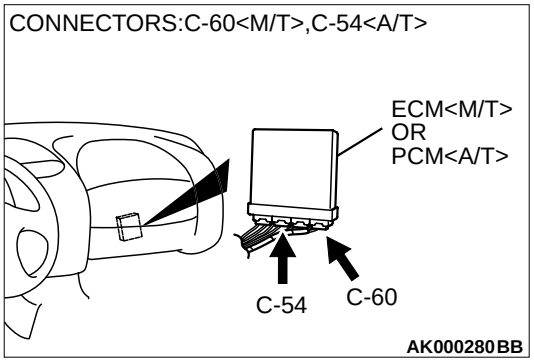
Standard value:
0.5 – 12.0 kΩ

Q: Is the resistance at the standard value?

YES : Go to Step 3.

NO : Replace the fuel temperature sensor. Then go to Step 5.



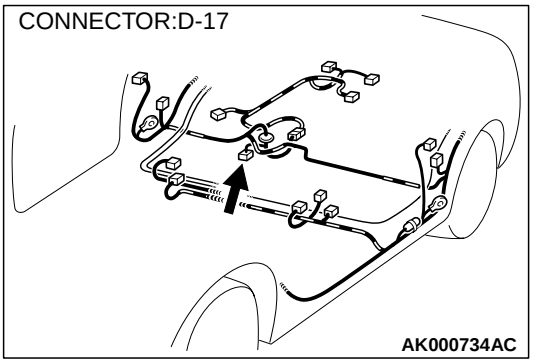


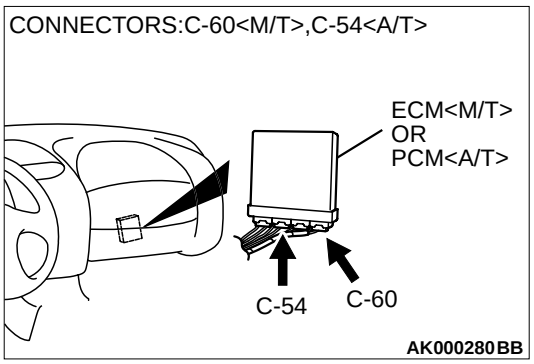
STEP 3. Check connector D-17 at the fuel temperature sensor and connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.





STEP 4. Check for short circuit to ground between fuel temperature sensor connector D-17 and ECM connector C-60 <M/T> or PCM connector C-54 <A/T>.

NOTE: Check harness after checking intermediate connector C-90 and C-28. If intermediate connector are damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 5.

NO : Repair it. Then go to Step 5.

STEP 5. Test the OBD-II drive cycle.

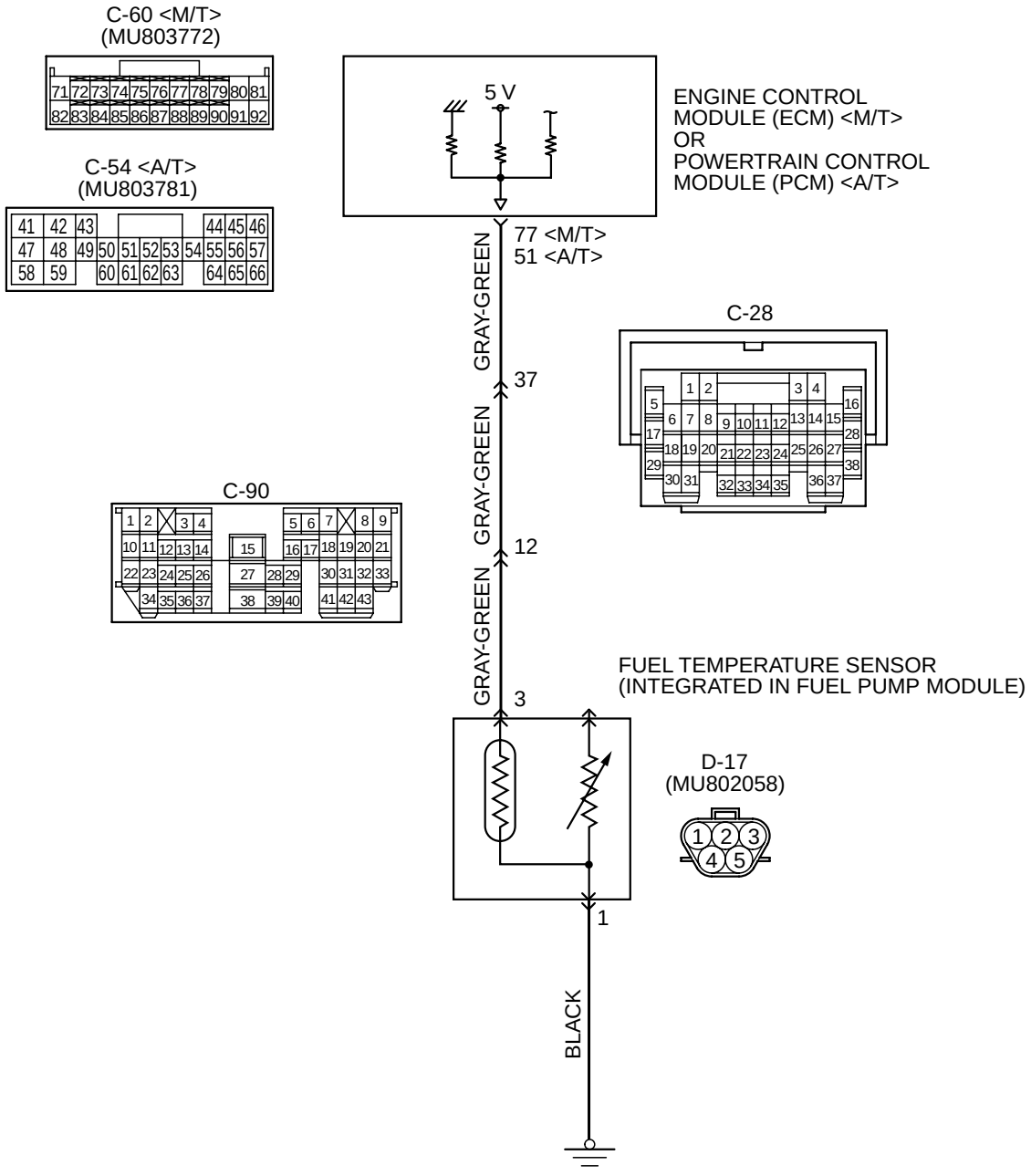
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0182 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0183: Fuel Temperature Sensor Circuit High Input

Fuel Temperature Sensor Circuit



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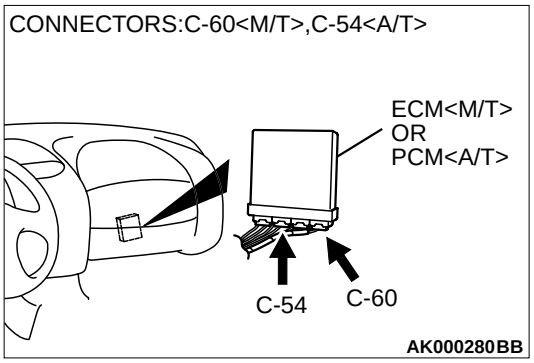
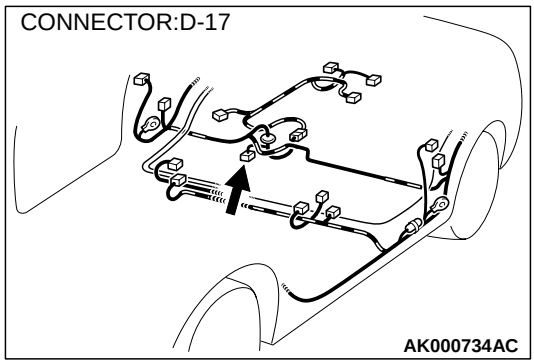
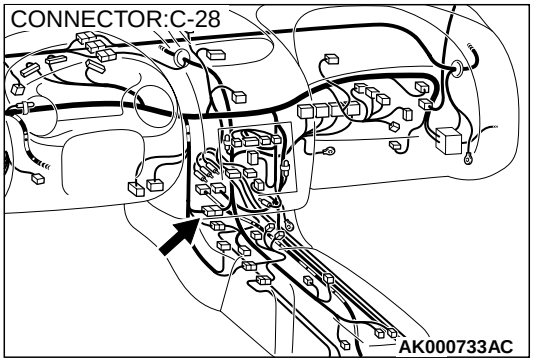
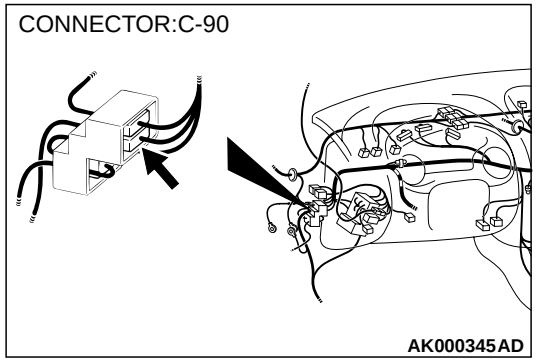








CIRCUIT OPERATION

- 5-volt voltage is applied to the fuel temperature sensor output terminal (terminal 3) from the ECM (terminal 77) <M/T> or PCM (terminal 51) <A/T> via the resistor in the ECM <M/T> or PCM <A/T>.
- The fuel temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases. The ground terminal (terminal 1) is grounded to the vehicle body.

TECHNICAL DESCRIPTION

- The fuel temperature sensor converts the fuel temperature to a voltage.
- The ECM <M/T> or PCM<A/T> detects the fuel temperature in the fuel tank with this output voltage.

DTC SET CONDITIONS

Check Conditions

- 2 seconds or more have passed since the starting sequence was completed.

Judgement Criteria

- Fuel temperature sensor output voltage has continued to be 4.6 volts or higher for 2 seconds.

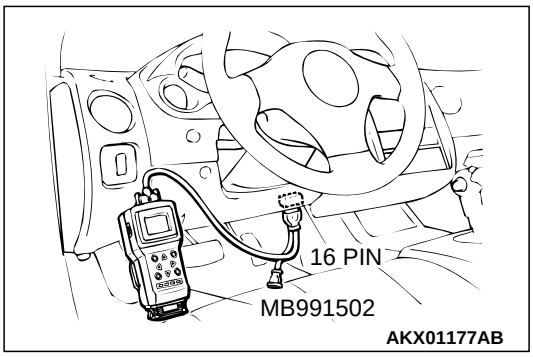
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Fuel temperature sensor failed.
- Open or shorted fuel temperature sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 4A: Fuel Temperature Sensor.

⚠ CAUTION

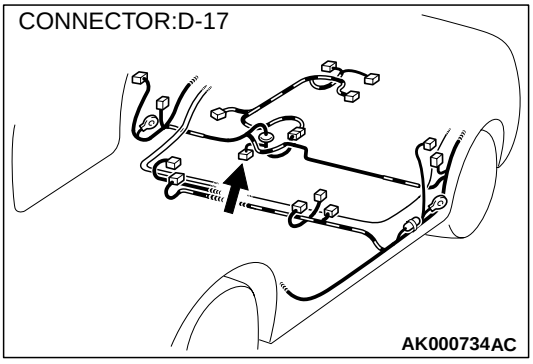
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 4A, Fuel Temperature Sensor.
- Approximately the same as the outside temperature when the engine is cooled.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

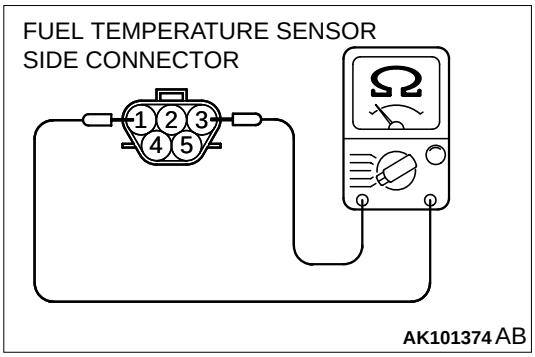
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Go to Step 2.



STEP 2. Check connector D-17 at the fuel temperature sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.



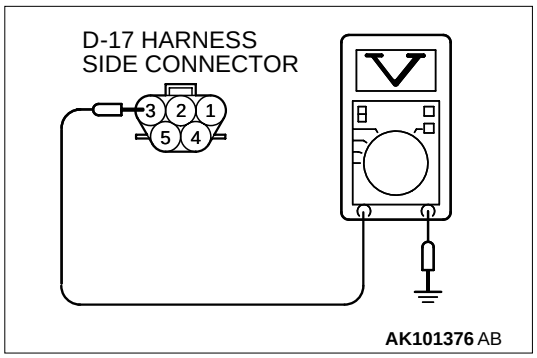
STEP 3. Check the fuel temperature sensor.

(1) Disconnect the fuel temperature sensor connector D-17
(2) Measure the resistance between terminal 1 and 3 of the fuel temperature sensor.

Standard value:
0.5 – 12.0 kΩ

Q: Is the resistance at the standard value?

YES : Go to Step 4.
NO : Replace the fuel temperature sensor. Then go to Step 11.



STEP 4. Check the sensor supply voltage at fuel temperature sensor harness side connector D-17

(1) Disconnect the connector D-17 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 3 and ground.
- Voltage should be between 4.5 and 4.9 volts

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 8.
NO : Go to Step 5.

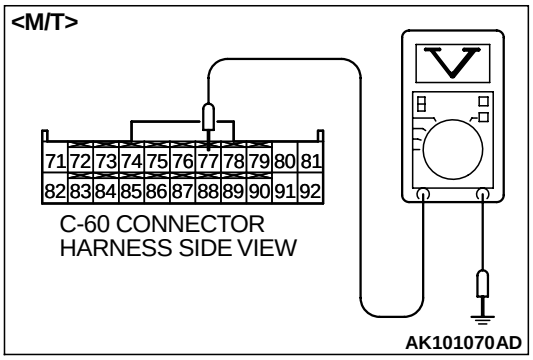
STEP 5. Check the sensor supply voltage at ECM connector C-60 <M/T> or PCM connector C-54 <A/T> by backprobing.

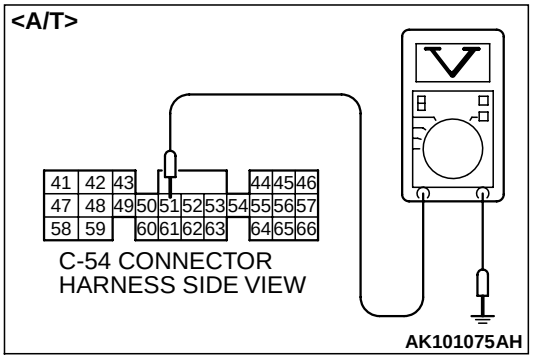
(1) Do not disconnect the ECM connector C-60 <M/T> or PCM connector C-54 <A/T>.
(2) Disconnect the fuel temperature sensor connector D-17.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the voltage between terminal 77 <M/T> or 51 <A/T> and ground by backprobing.
- Voltage should be between 4.5 and 4.9 volts.

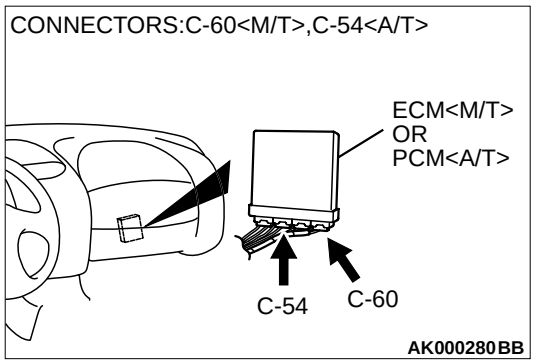
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 6.
NO : Go to Step 7.





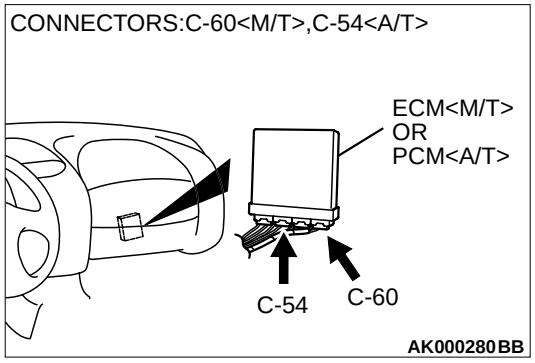


STEP 6. Check connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Check connector C-28 and C-90 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector are in good condition, repair harness wire between fuel temperature sensor connector D-17 terminal 3 and ECM connector C-60 terminal 77 <M/T> or PCM connector C-54 terminal 51 <A/T> because of open circuit. Then go to Step 11.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

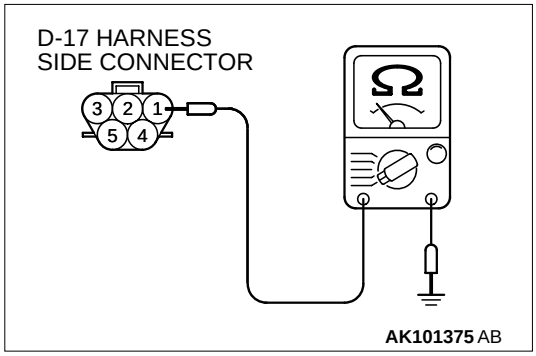


STEP 7. Check connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Replace the ECM or PCM. Then go to Step 11.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.



STEP 8. Check the continuity at fuel temperature sensor harness side connector D-17.

(1) Disconnect the connector D-17 and measure at the harness side.

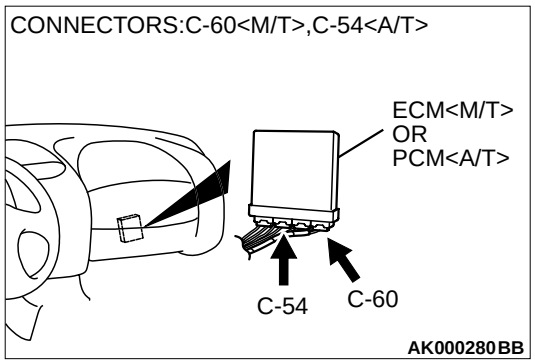
(2) Check for the continuity between terminal 1 and ground.

- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 9.

NO : Repair harness wire between fuel temperature sensor connector D-17 terminal 1 and ground because of open circuit or harness damage. Then go to Step 11.

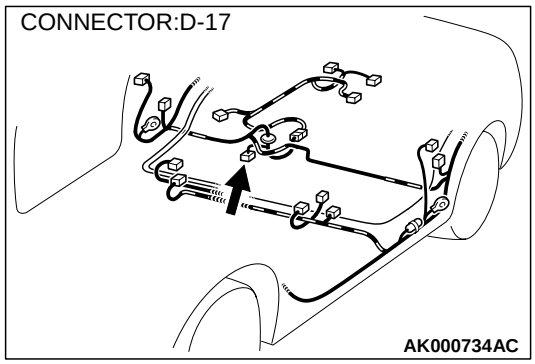


STEP 9. Check connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.



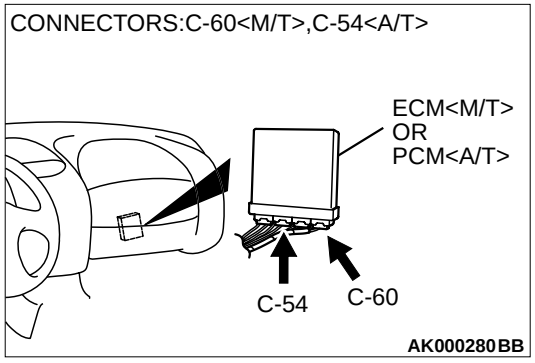
STEP 10. Check for open circuit and harness damage between fuel temperature sensor connector D-17 and ECM connector C-60 <M/T> or PCM connector C-54.

NOTE: Check harness after checking intermediate connector C-90 and C-28. If intermediate connector are damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 11.

NO : Repair it. Then go to Step 11.



STEP 11. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.

(2) Check the diagnostic trouble code (DTC).

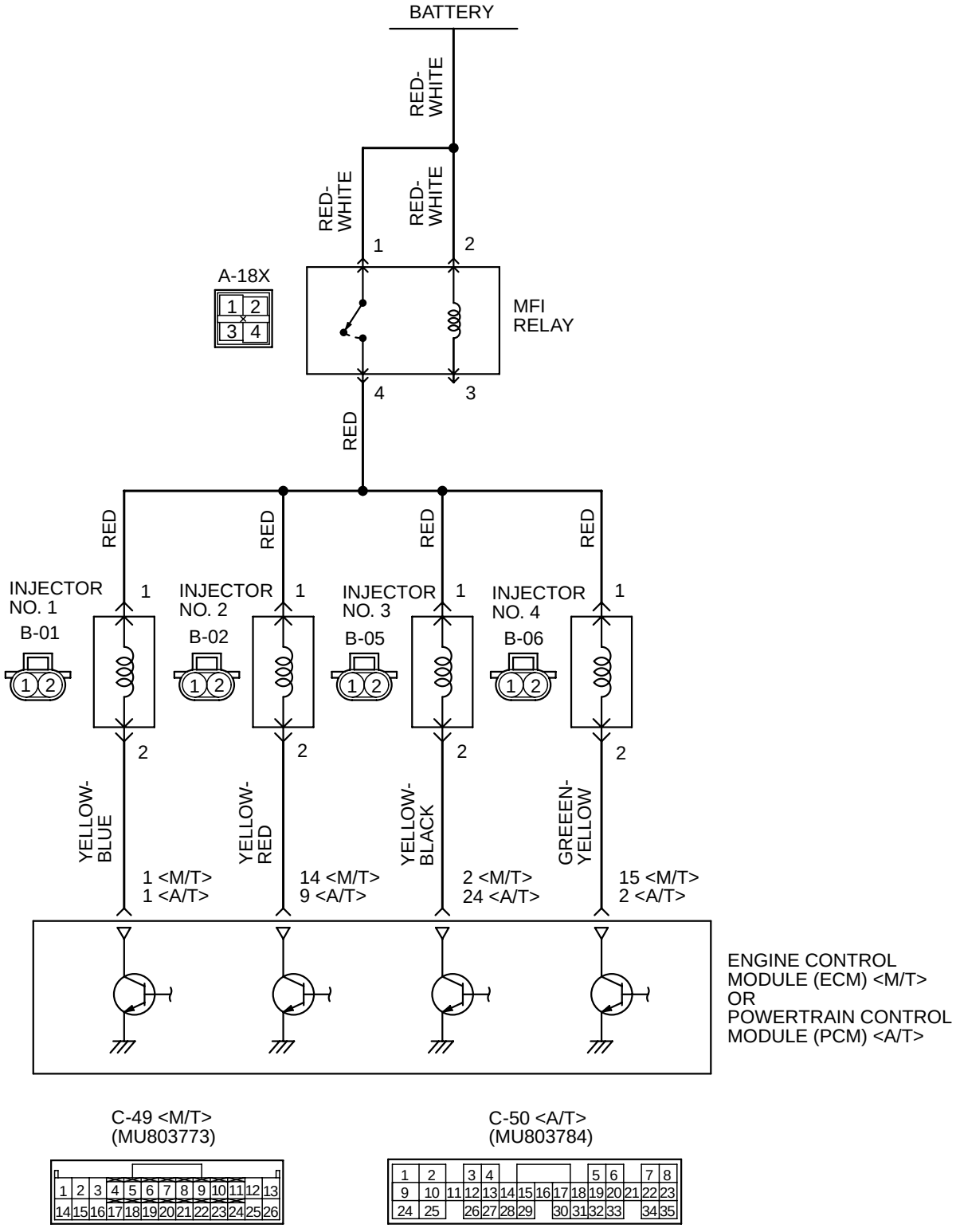
Q: Is the DTC P0183 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0201: Injector Circuit – Cylinder 1, DTC P0202: Injector Circuit – Cylinder 2, DTC P0203: Injector Circuit – Cylinder 3, DTC P0204: Injector Circuit – Cylinder 4

Injector Circuit



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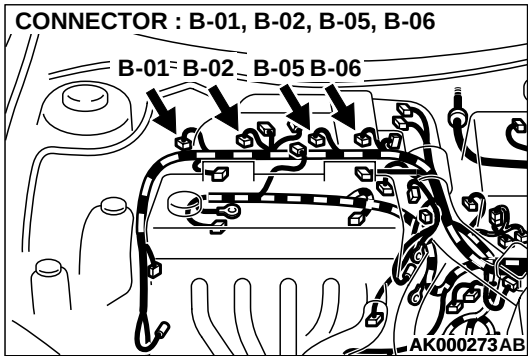
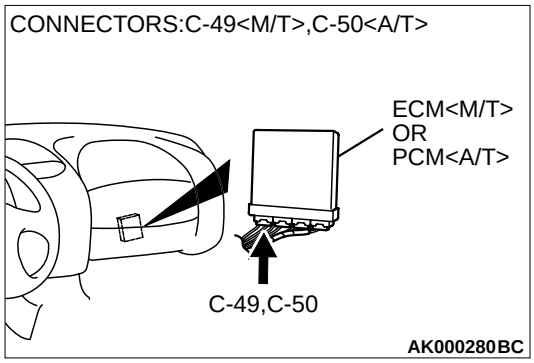
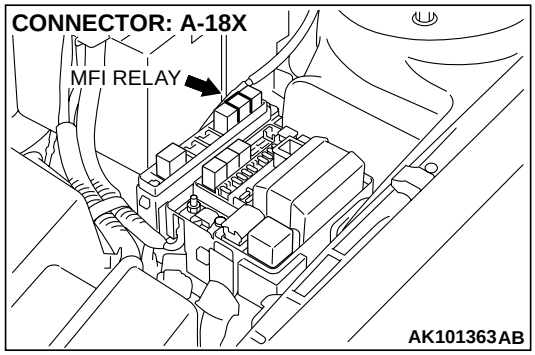






CIRCUIT OPERATION

- The injector power is supplied from the MFI relay (terminal 4).
- The ECM <M/T> or PCM <A/T> controls the injector by turning the power transistor in the ECM <M/T> or PCM <A/T> "ON" and "OFF".

TECHNICAL DESCRIPTION

- The amount of fuel injected by the injector is controlled by the amount of continuity time the coil is grounded by the ECM <M/T> or PCM <A/T>.
- A surge voltage is generated when the injectors are driven and the current flowing to the injector coil is shut off.
- The ECM <M/T> or PCM <A/T> checks this surge voltage.

DTC SET CONDITIONS

Check Conditions

- Engine speed is lower than 1,000 r/min.
- Throttle position sensor output voltage is lower than 1.16 volts.

Judgment Criteria

- Injector coil surge voltage (battery positive voltage +2 volts) has not been detected for 2 seconds.

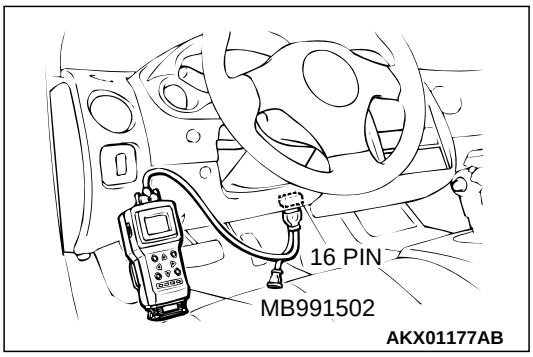
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Injector failed.
- Open or shorted injector circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991348: Test Harness Set



STEP 1. Using scan tool MB991502, check actuator test item 01, 02, 03, 04: Injectors.

⚠ CAUTION

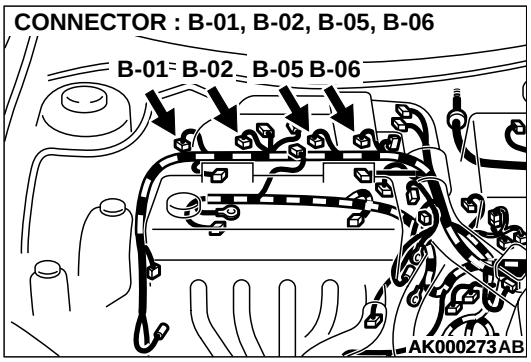
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the actuator testing mode for item 01, 02, 03, 04 Injectors.
(4) Warm up the engine to normal operating temperature: 80°C to 96°C (176°F to 205°F).
- Does the idle state worsen when the injector is cut off. (Does idling become unstable or does the engine stall.)

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Go to Step 2.

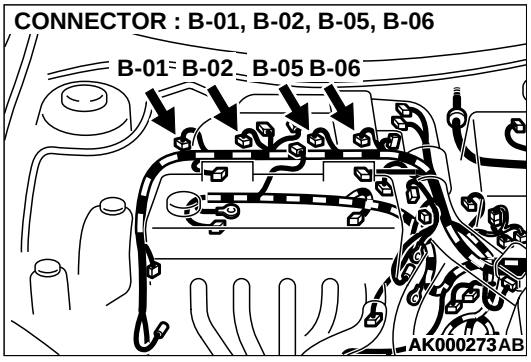


STEP 2. Check the connector at injector for damage.

a. Check the connector B-01 when checking No. 1 cylinder.
b. Check the connector B-02 when checking No. 2 cylinder.
c. Check the connector B-05 when checking No. 3 cylinder.
d. Check the connector B-06 when checking No. 4 cylinder.

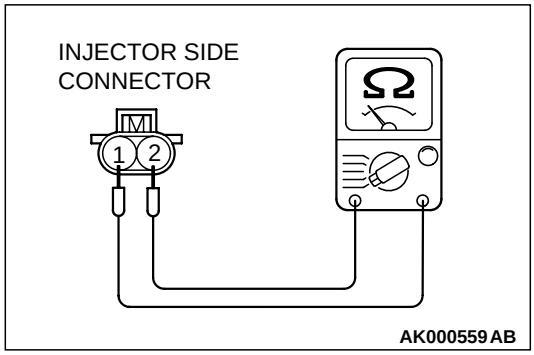
Q: Is the connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.



STEP 3. Check the injector.

(1) Disconnect the injector connector B-01 <No. 1 cylinder> or B-02 <No. 2 cylinder> or B-05 <No. 3 cylinder> or B-06 <No. 4 cylinder>.



(2) Measure the resistance between injector side connector terminal 1 and 2.

Standard value: 13 – 16 ohm [at 20°C (68°F)]

Q: Is the resistance standard value?

YES : Go to Step 4.

NO : Replace the injector. Then go to Step 10.

STEP 4. Check the power supply voltage at injector connector.

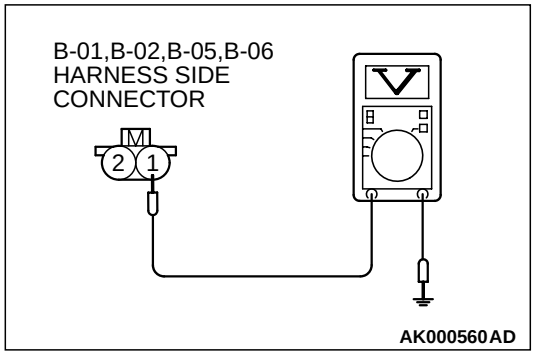
(1) Disconnect connector B-01 <No. 1 cylinder> or B-02 <No. 2 cylinder> or B-05 <No. 3 cylinder> or B-06 <No. 4 cylinder> and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between terminal 1 and ground.

- Voltage should be battery positive voltage.

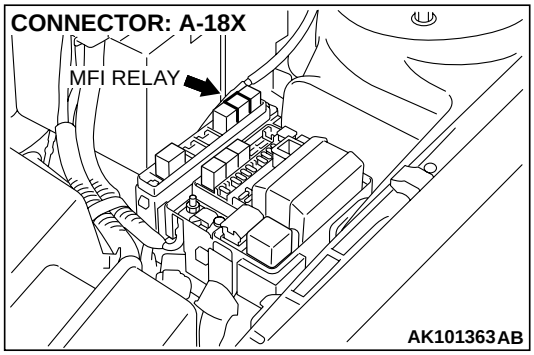
(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the voltage normal?

YES : Go to Step 6.

NO : Go to Step 5.



STEP 5. Check connector A-18X at MFI relay for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between MFI relay connector and injector connector because of open circuit or short circuit to ground.

a. Repair harness wire between MFI relay connector A-18X terminal 4 and injector connector B-01 terminal 1 when checking No. 1 cylinder.

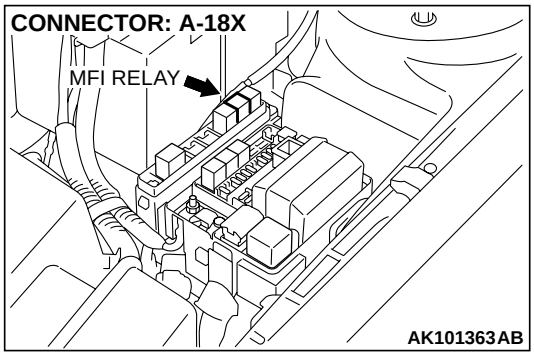
b. Repair harness wire between MFI relay connector A-18X terminal 4 and injector connector B-02 terminal 1 when checking No. 2 cylinder.

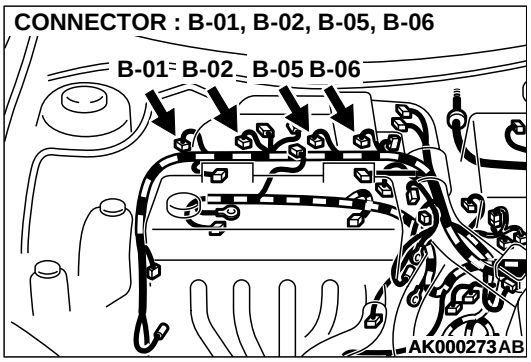
c. Repair harness wire between MFI relay connector A-18X terminal 4 and injector connector B-05 terminal 1 when checking No. 3 cylinder.

d. Repair harness wire between MFI relay connector A-18X terminal 4 and injector connector B-06 terminal 1 when checking No. 4 cylinder.

Then go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.





STEP 6. Check for harness damage between MFI relay connector and injector connector.

a. Check the harness wire between MFI relay connector A-18X terminal 4 and injector connector B-01 terminal 1 when checking No. 1 cylinder.

b. Check the harness wire between MFI relay connector A-18X terminal 4 and injector connector B-02 terminal 1 when checking No. 2 cylinder.

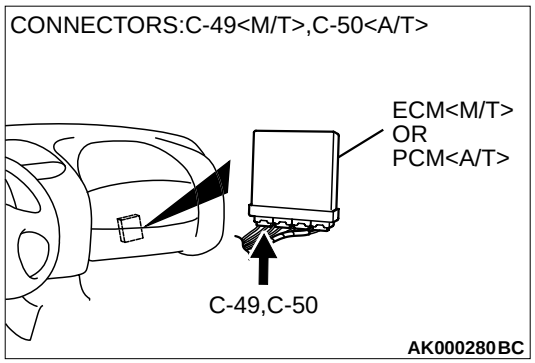
c. Check the harness wire between MFI relay connector A-18X terminal 4 and injector connector B-05 terminal 1 when checking No. 3 cylinder.

d. Check the harness wire between MFI relay connector A-18X terminal 4 and injector connector B-06 terminal 1 when checking No. 4 cylinder.

Q: Is the harness wire in good condition?

YES : Go to Step 7.

NO : Repair it. Then go to Step 10.

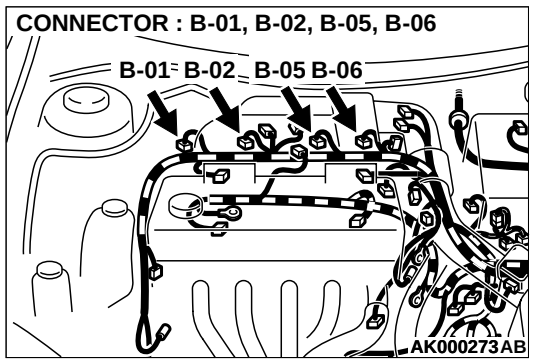


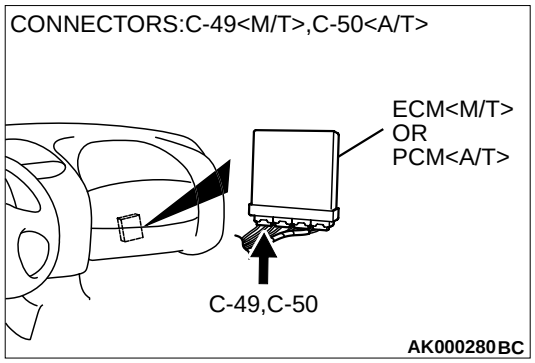
STEP 7. Check connector C-49 at ECM <M/T> or connector C-50 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.





STEP 8. Check for open circuit and short circuit to ground and harness damage between injector connector and ECM connector <M/T> or PCM connector <A/T>.

a. Check the harness wire between injector connector B-01 terminal 2 and ECM connector C-49 terminal 1 <M/T> or PCM connector C-50 terminal 1 <A/T> when checking No. 1 cylinder.

b. Check the harness wire between injector connector B-02 terminal 2 and ECM connector C-49 terminal 14 <M/T> or PCM connector C-50 terminal 9 <A/T> when checking No. 2 cylinder.

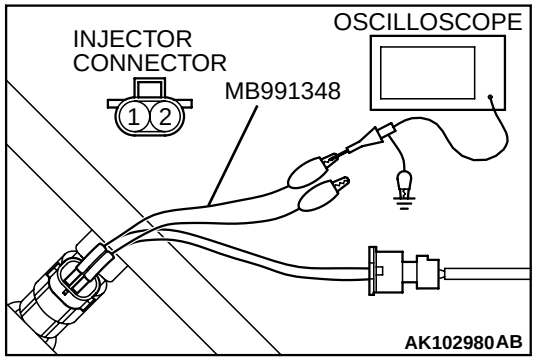
c. Check the harness wire between injector connector B-05 terminal 2 and ECM connector C-49 terminal 2 <M/T> or PCM connector C-50 terminal 24 <A/T> when checking No. 3 cylinder.

d. Check the harness wire between injector connector B-06 terminal 2 and ECM connector C-49 terminal 15 <M/T> or PCM connector C-50 terminal 2 <A/T> when checking No. 4 cylinder.

Q: Is the harness wire in good condition?

YES : Go to Step 9.

NO : Repair it. Then go to Step 10.



STEP 9. Using the oscilloscope, check the injector.

(1) Disconnect the injector connector B-01 <No.1 cylinder> or B-02 <No.2 cylinder> or B-05 <No.3 cylinder> or B-06 <No.4 cylinder> and connect the test harness special tool (MB991348) in between. (All terminals should be connected.)

(2) Connect the oscilloscope probe to the injector side connector terminal 2.

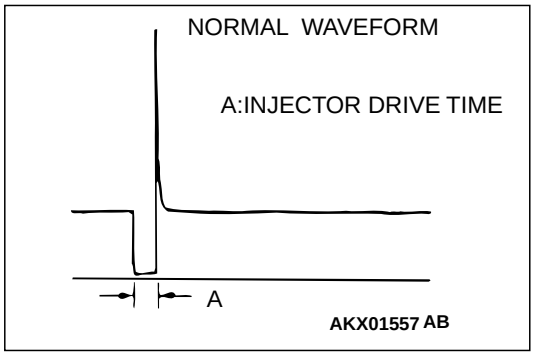
NOTE: When measuring with the ECM or PCM side connector, connect an oscilloscope probe to the each of the following terminals.

- *ECM terminal 1 or PCM terminal 1 when checking No. 1 cylinder.*
- *ECM terminal 14 or PCM terminal 9 when checking No. 2 cylinder.*
- *ECM terminal 2 or PCM terminal 24 when checking No. 3 cylinder.*
- *ECM terminal 15 or PCM terminal 2 when checking No. 4 cylinder.*

(3) Start the engine and run at idle.

(4) Measure the waveform.
- The waveform should show a normal pattern similar to the illustration.

(5) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the waveform normal?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

NO : Replace the ECM or PCM. Then go to Step 10.

STEP 10. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.

(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0201, P0202, P0203, P0204 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0300: Random/Multiple Cylinder Misfire Detected

Random Misfire Circuit

- Refer to, DTC P0201 – P0204 Injector Circuit Malfunction P.13A-216.

CIRCUIT OPERATION

- Refer to, DTC P0201 – P0204 Injector Circuit Malfunction P.13A-216.

TECHNICAL DESCRIPTION

- If a misfire occurs while the engine is running, the engine speed changes for an instant.
- The ECM <M/T> or PCM <A/T> checks for such changes in engine speed.

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DTC SET CONDITIONS

Check Conditions

- Engine speed is between 500 and 6,000 r/min.
- Engine coolant temperature is higher than −10°C (14°F).
- Intake air temperature is higher than −10°C (14°F).
- Barometric pressure is higher than 76 kPa (11 psi).
- Adaptive learning is complete for the vane which generates a crankshaft position signal.
- While the engine is running, excluding gear shifting, deceleration, sudden acceleration/deceleration and A/C compressor switching.
- The throttle deviation is −0.059 volt/10 ms to +0.059 volt/10 ms.

Judgement Criteria (change in the angular acceleration of the crankshaft is used for misfire detection).

- Misfire has occurred more frequently than allowed during the last 200 revolutions [when the catalyst temperature is higher than 950°C (1742°F)].

or

- Misfire has occurred in 20 or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

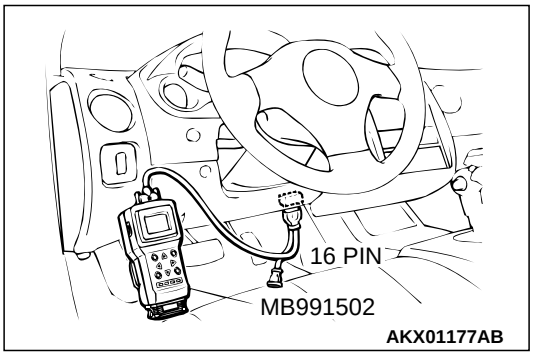
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Ignition system related part(s) failed.
- Poor crankshaft position sensor.
- Incorrect air/fuel ratio.
- Low compression pressure.
- Skipping of timing belt teeth.
- EGR system and EGR valve failed.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 22: Crankshaft Position Sensor.

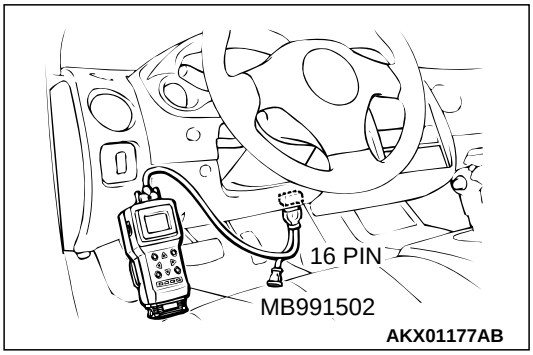
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 22, Crankshaft Position Sensor.
(4) Check the waveform of the crankshaft position sensor while keeping the engine speed constant.
  - The pulse width should be constant.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 2.
NO : Refer to, DTC P0335 – Crankshaft Position Sensor Circuit Malfunction P.13A-236.



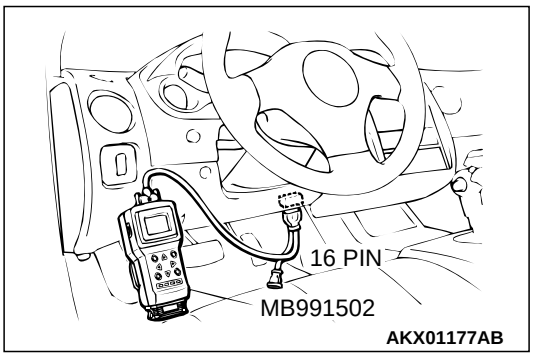
STEP 2. Using scan tool MB991502, check data list item 81: Long-Term Fuel Compensation (trim).

(1) Start the engine and run at idle.
(2) Set scan tool MB991502 to the data reading mode for item 81, Long-Term Fuel Compensation (trim).
- The fuel trim should be between –12.5 and +12.5 when the load is 2,500 r/min (during closed loop) after the engine is warmed.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the specification normal?

YES : Go to Step 3.
NO : Refer to, DTC P0171 – System too Lean P.13A-188, DTC P0172 – System too Rich P.13A-194.



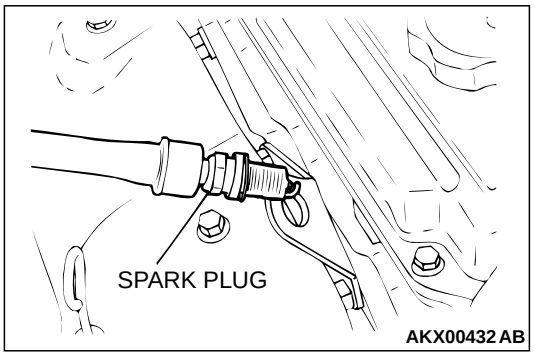
STEP 3. Using scan tool MB991502, check data list item 82: Short-Term Fuel Compensation (trim).

(1) Start the engine and run at idle.
(2) Set scan tool MB991502 to the data reading mode for item 82, Short-Term Fuel Compensation (trim).
- The fuel trim should be between –25 and +25 when the load is 2,500 r/min (during closed loop) after the engine is warmed.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the specification normal?

YES : Go to Step 4.
NO : Refer to, DTC P0171 – System too Lean P.13A-188, DTC P0172 – System too Rich P.13A-194.



STEP 4. Check the ignition coil spark.

(1) Check each ignition coil spark.
(2) Remove the intake manifold.
(3) Remove the spark plug and connect to the spark plug cable.
(4) Ground the spark plug side electrode securely.
- When the engine is cranked, the spark plug should spark.

Q: Did it spark?

YES : Go to Step 7.
NO : Go to Step 5.

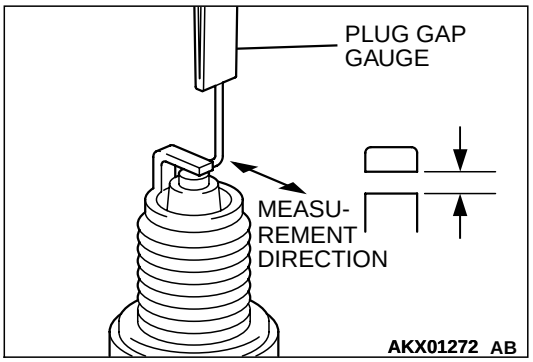
STEP 5. Check the spark plugs.

(1) Check that the plug is not burned, that the insulator plug is not damaged, and that the seizure state is good.
(2) If cleaning is required due to carbon deposits, etc., clean using a plug cleaner or wire brush, etc.
(3) Check the plug gap using a plug gap gauge, and adjust if not within the standard value.

Standard value: 1.0 – 1.1 mm (0.039 – 0.043 inch)

Q: Is the spark plug in good condition?

YES : Go to Step 6.
NO : Replace the faulty spark plug. Then go to Step 13.



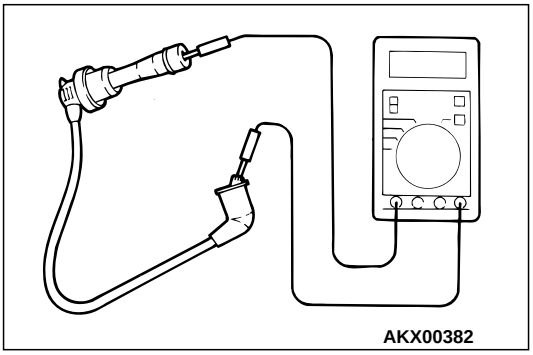
STEP 6. Check the spark plug cable.

(1) Check the cap and coating for cracks.
(2) Measure the resistance.

Limit: maximum 19 kΩ

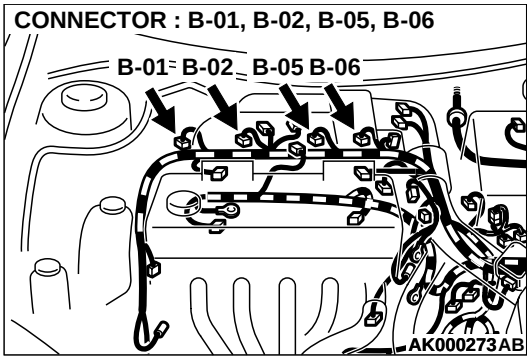
Q: Is the resistance normal?

YES : Refer to, INSPECTION PROCEDURE 33 – Ignition Circuit System P.13A-535.
NO : Replace the faulty spark plug cable. Then go to Step 13.



STEP 7. Check the injector.

(1) Disconnect the injector connector.

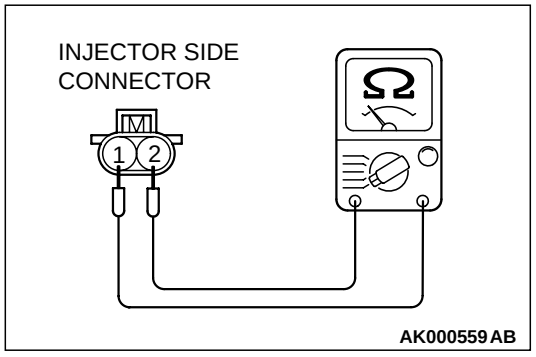


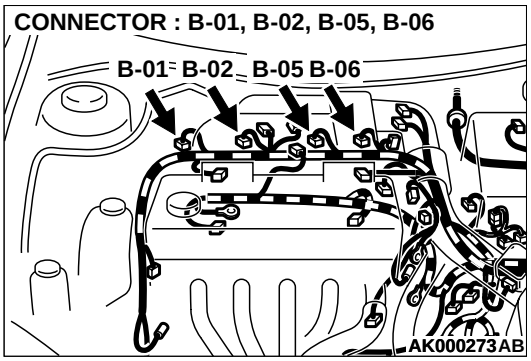
(2) Measure the resistance between each injector side connector terminal 1 and 2.

Standard value: 13 – 16 ohm [at 20°C (68°F)]

Q: Is the resistance standard value?

YES : Go to Step 8.
NO : Replace the faulty injector. Then go to Step 13.



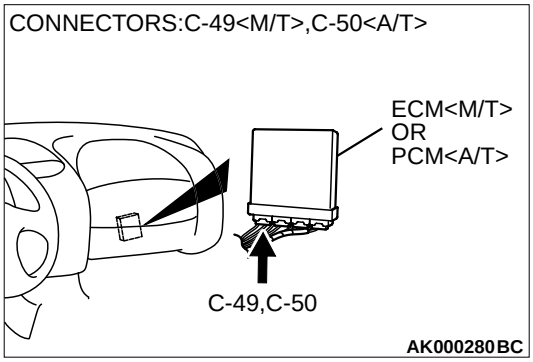


STEP 8. Check connector B-01, B-02, B-05, B-06 at injector for damage.

Q: Is the connector in good condition?

YES : Go to Step 9.

NO : Repair or replace the faulty injector. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 13.

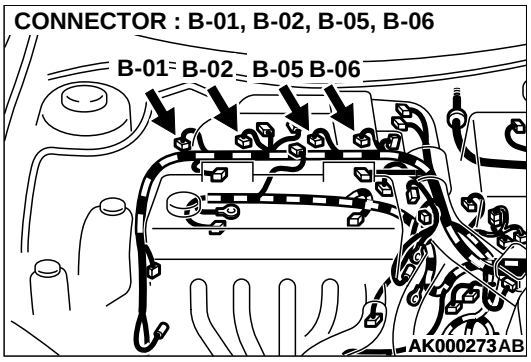


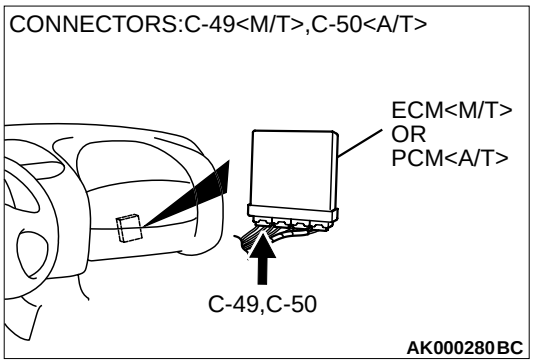
STEP 9. Check connector C-49 at ECM <M/T> or connector C-50 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 13.





STEP 10. Check for harness damage between injector connector and ECM connector <M/T> or PCM connector <A/T>.

a. Check the harness wire between injector connector B-01 terminal 2 and ECM connector C-49 terminal 1 <M/T> or PCM connector C-50 terminal 1 <A/T> when checking No. 1 cylinder.

b. Check the harness wire between injector connector B-02 terminal 2 and ECM connector C-49 terminal 14 <M/T> or PCM connector C-50 terminal 9 <A/T> when checking No. 2 cylinder.

c. Check the harness wire between injector connector B-05 terminal 2 and ECM connector C-49 terminal 2 <M/T> or PCM connector C-50 terminal 24 <A/T> when checking No. 3 cylinder.

d. Check the harness wire between injector connector B-06 terminal 2 and ECM connector C-49 terminal 15 <M/T> or PCM connector C-50 terminal 2 <A/T> when checking No. 4 cylinder.

Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair it. Then go to Step 13.

TSB Revision

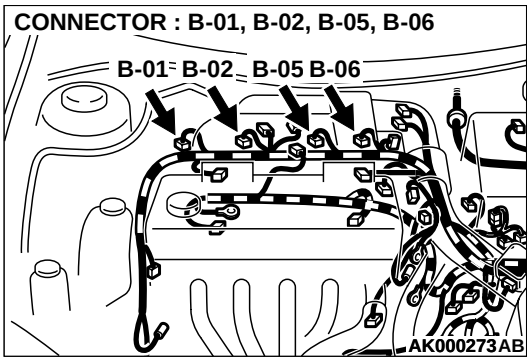
STEP 11. Check the following items.

(1) Check the following items, and repair or replace the defective component.
   a. Check for skipped timing belt teeth.
   b. Check compression.
   c. EGR valve failed.

Q: Are there any abnormalities?

YES : Go to Step 12.
NO : Repair or replace it. Then go to Step 13.

STEP 12. Replace the injector.



(1) Replace the injector.
(2) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.
(3) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0300 is output?

YES : Replace the ECM or PCM. Then go to Step 13.
NO : The inspection is complete.

STEP 13. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0300 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0301: Cylinder 1 Misfire Detected, DTC P0302: Cylinder 2 Misfire Detected, DTC P0303: Cylinder 3 Misfire Detected, DTC P0304: Cylinder 4 Misfire Detected

Misfire Detected Circuit

- Refer to, DTC P0201 – P0204 Injector Circuit Malfunction P.13A-216.

CIRCUIT OPERATION

- Refer to, DTC P0201 – P0204 Injector Circuit Malfunction P.13A-216.

TECHNICAL DESCRIPTION

- If a misfire occurs while the engine is running, the engine speed changes for an instant.
- The ECM <M/T> or PCM <A/T> checks for such changes in engine speed.

DTC SET CONDITIONS

Check Conditions

- Engine speed is between 500 and 6,000 r/min.
- Engine coolant temperature is higher than –10°C (14°F).
- Intake air temperature is higher than –10°C (14°F).
- Barometric pressure is higher than 76 kPa (11 psi) .
- Volumetric efficiency is at between 30 and 55 percent.
- Adaptive learning is complete for the vane which generates a crankshaft position signal.
- While the engine is running, excluding gear shifting, deceleration, sudden acceleration/deceleration and A/C compressor switching.

TSB Revision

- The throttle deviation is –0.059 volt/10ms to +0.059 volt/10ms.

Judgement Criteria (change in the angular acceleration of the crankshaft is used for misfire detection).

- Misfire has occurred more frequently than allowed during the last 200 revolutions [when the catalyst temperature is higher than 950°C (1,742°F)].

or

- Misfire has occurred in 20 or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

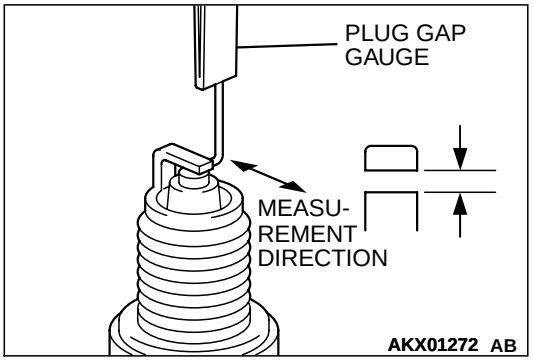
- Ignition system related part(s) failed.
- Low compression pressure.
- Injector failed.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

STEP 1. Check the spark plugs.

(1) Check that the plug is not burned, that the insulator plug is not damaged, and that the seizure state is good.
(2) If cleaning is required due to carbon deposits, etc., clean using a plug cleaner or wire brush, etc.
(3) Check the plug gap using a plug gap gauge, and adjust if not within the standard value.

Standard value: 1.0 – 1.1 mm (0.039 – 0.043 inch)



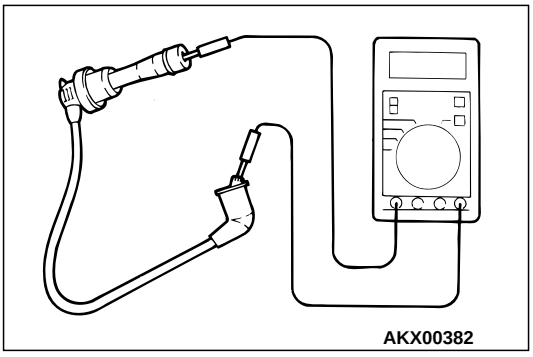
Q: Is the spark plug in good condition?

YES : Go to Step 2.
NO : Replace the spark plug. Then go to Step 9.

STEP 2. Check the spark plug cable.

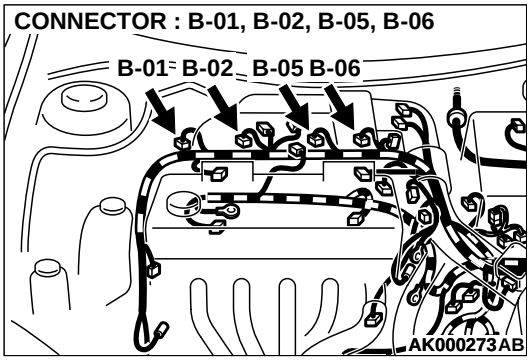
(1) Check the cap and coating for cracks.
(2) Measure the resistance.

Limit: maximum 19 kΩ



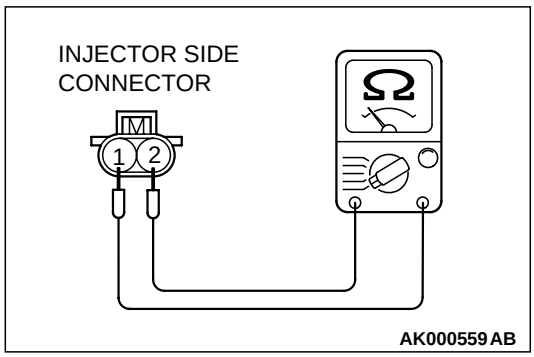
Q: Is the resistance normal?

YES : Go to Step 3.
NO : Replace the spark plug cable. Then go to Step 9.



STEP 3. Check the injector.

(1) Disconnect the injector connector B-01 <No. 1 cylinder>, B-02 <No. 2 cylinder>, B-05 <No. 3 cylinder>, B-06 <No. 4 cylinder>.



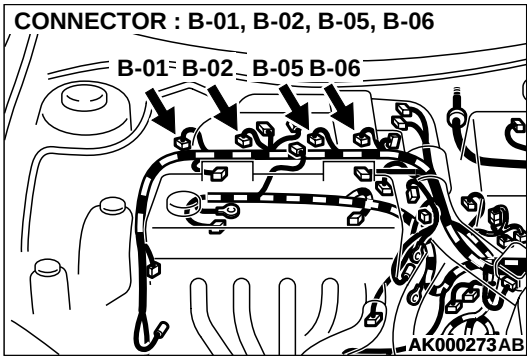
(2) Measure the resistance between injector side connector terminal 1 and 2.

Standard value: 13 – 16 ohm [at 20°C (68°F)]

Q: Is the resistance standard value?

YES : Go to Step 4.

NO : Replace the injector. Then go to Step 9.



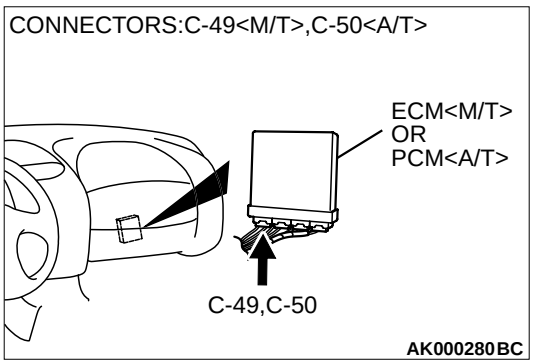
STEP 4. Check connector at injector for damage.

a. Check the connector B-01 when checking No. 1 cylinder.
b. Check the connector B-02 when checking No. 2 cylinder.
c. Check the connector B-05 when checking No. 3 cylinder.
d. Check the connector B-06 when checking No. 4 cylinder.

Q: Is the connector in good condition?

YES : Go to Step 5.

NO : Repair or replace the injector. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.

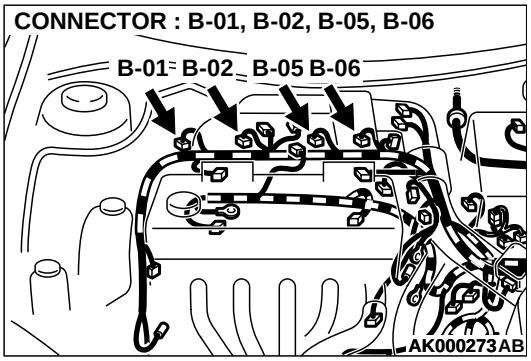


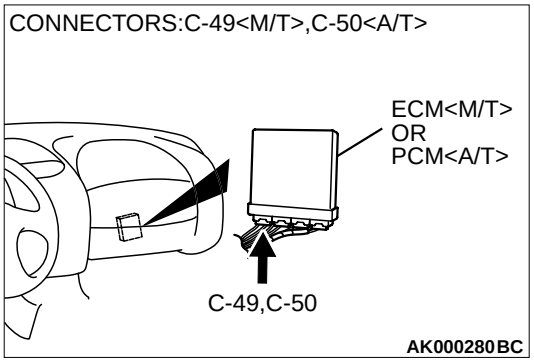
STEP 5. Check connector C-49 at ECM <M/T> or connector C-50 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.





STEP 6. Check for harness damage between injector connector and ECM connector <M/T> or PCM connector <A/T>.

a. Check the harness wire between injector connector B-01 terminal 2 and ECM connector C-49 terminal 1 <M/T> or PCM connector C-50 terminal 1 <A/T> when checking No. 1 cylinder.
b. Check the harness wire between injector connector B-02 terminal 2 and ECM connector C-49 terminal 14 <M/T> or PCM connector C-50 terminal 9 <A/T> when checking No. 2 cylinder.
c. Check the harness wire between injector connector B-05 terminal 2 and ECM connector C-49 terminal 2 <M/T> or PCM connector C-50 terminal 24 <A/T> when checking No. 3 cylinder.
d. Check the harness wire between injector connector B-06 terminal 2 and ECM connector C-49 terminal 15 <M/T> or PCM connector C-50 terminal 2 <A/T> when checking No. 4 cylinder.

Q: Is the harness wire in good condition?

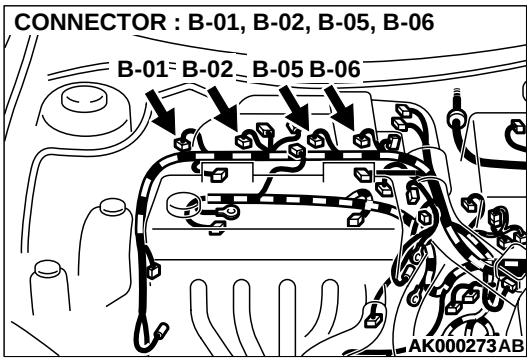
YES : Go to Step 7.
NO : Repair it. Then go to Step 9.

STEP 7. Check the compression.

Refer to GROUP 11A, On-Vehicle Service – Compression Pressure Check P.11A-8.

Q: Are there any abnormalities?

YES : Go to Step 8.
NO : Repair or replace it. Then go to Step 9.



STEP 8. Replace the injector.

(1) Replace the injector.
(2) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.
(3) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0301, P0302, P0303, P0304 is output?

YES : Replace the ECM or PCM. Then go to Step 9.
NO : The inspection is complete.

STEP 9. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.

(2) Check the diagnostic trouble code (DTC).

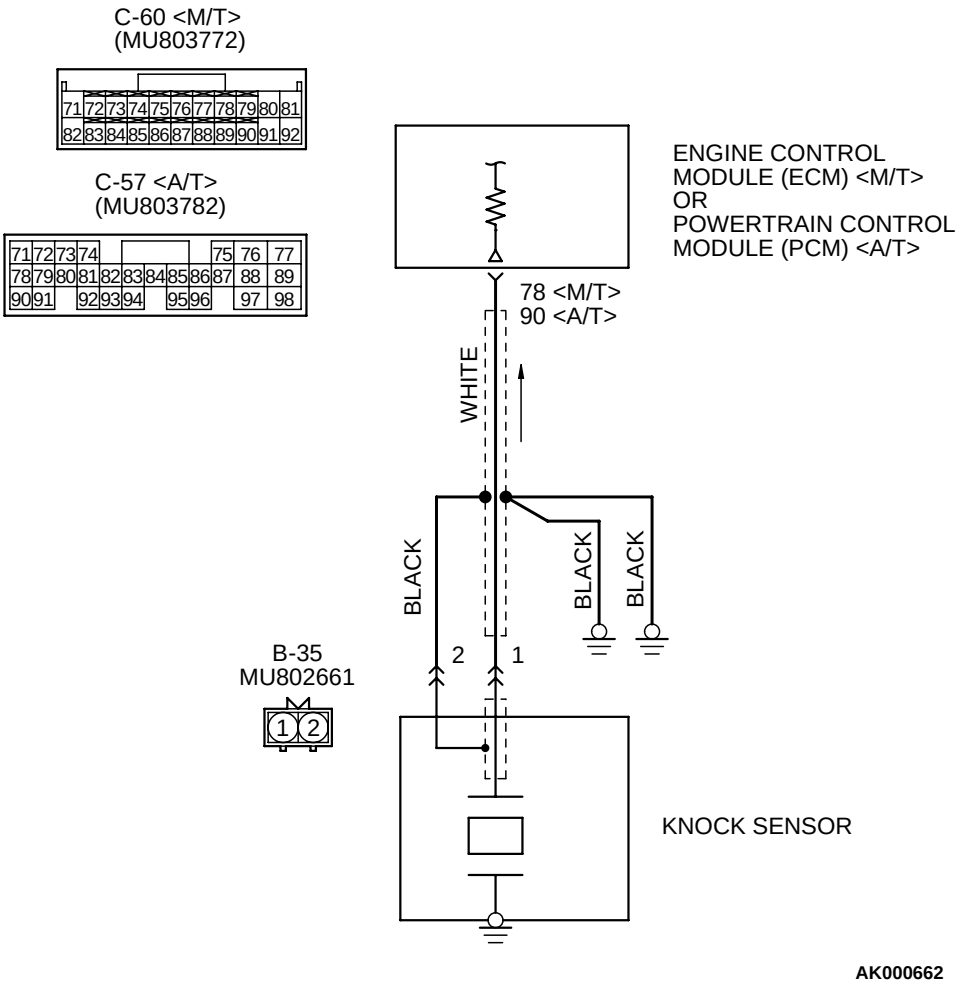
Q: Is the DTC P0301, P0302, P0303, P0304 is output?

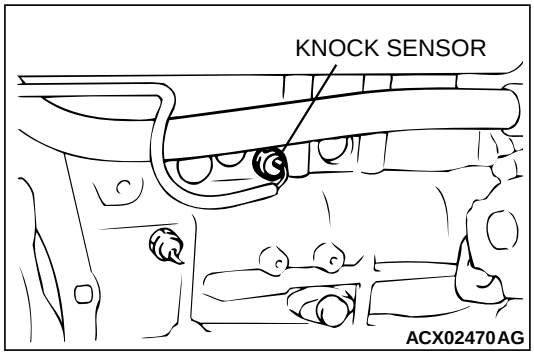
YES : Retry the troubleshooting.

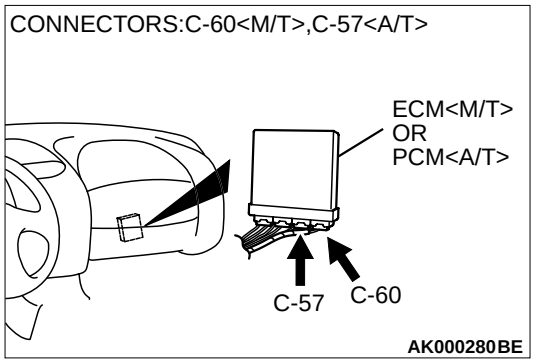
NO : The inspection is complete.

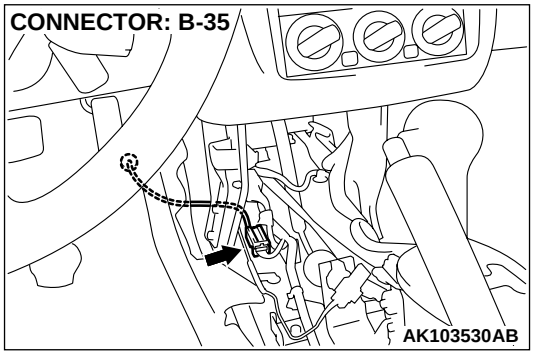
DTC P0325: Knock Sensor Circuit

Knock Sensor Circuit









CIRCUIT OPERATION
- The knock sensor sends a signal voltage to the ECM (terminal 78) <M/T> or PCM (terminal 90) <A/T>.

TECHNICAL DESCRIPTION
- The knock sensor converts the vibration of the cylinder block into a voltage and outputs it. If there is a malfunction of the knock sensor, the voltage output will not change.
- The ECM <M/T> or PCM <A/T> checks whether the voltage output changes.

DTC SET CONDITIONS

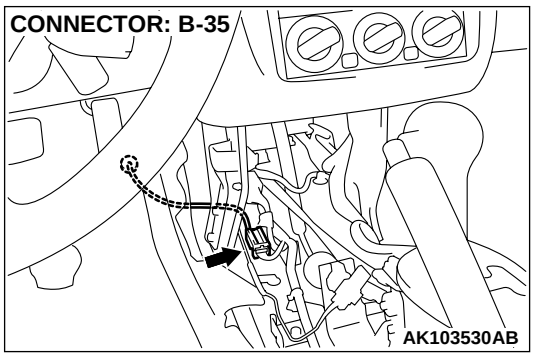
Check Conditions
- 2 seconds or more have passed since the starting sequence was completed.
- Engine speed is higher than 2,500 r/min.

Judgment Criteria
- Knock sensor output voltage (knock sensor peak voltage in each 1/2 turn of the crankshaft) has not changed more than 0.06 volt in the last consecutive 200 periods.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Knock sensor failed.
- Open or shorted knock sensor circuit, or loose connector.
- ECM <M/T> failed.
- PCM <A/T> failed.

DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)

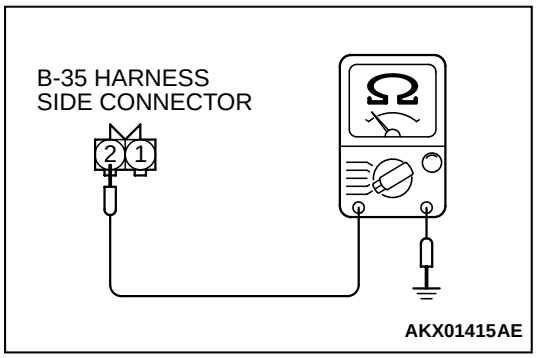


STEP 1. Check connector B-35 at the knock sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.



STEP 2. Check the continuity at knock sensor harness side connector B-35.

(1) Disconnect the connector B-35 and measure at the harness side.

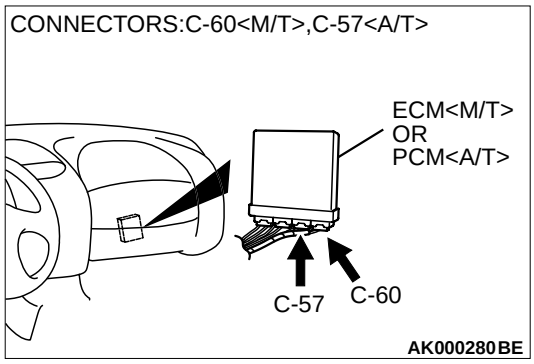
(2) Check for the continuity between terminal 2 and ground.

- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 3.

NO : Repair harness wire between knock sensor connector B-35 terminal 2 and ground because of open circuit or harness damage. Then go to Step 6.



STEP 3. Check connector C-60 at ECM <M/T> or connector C-57 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.

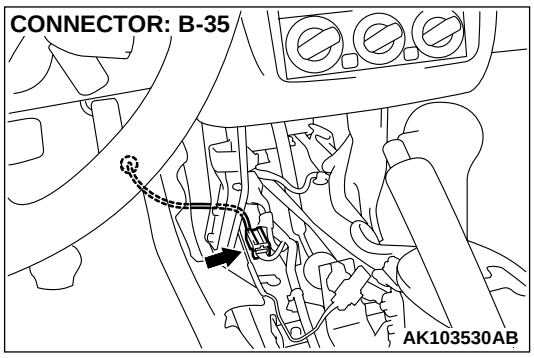
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.

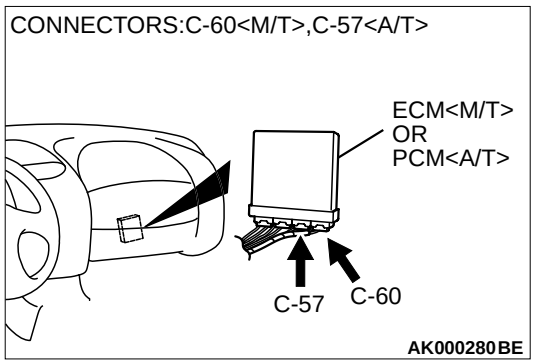
STEP 4. Check for open circuit and short circuit to ground and harness damage between knock sensor connector B-35 (terminal 1) and ECM connector C-60 (terminal 78) <M/T> or PCM connector C-57 (terminal 90) <A/T>.

Q: Is the harness wire in good condition?

YES : Go to Step 5.

NO : Repair it. Then go to Step 6.





STEP 5. Check the knock sensor.

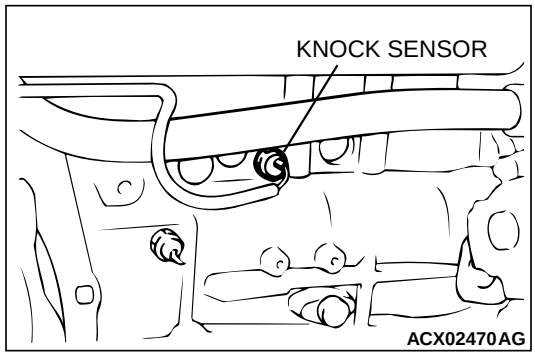
(1) Disconnect the knock sensor connector B-35.
(2) Start the engine and run at idle.
(3) Measure the voltage between knock sensor side connector terminal 1 (output) and 2 (ground).
(4) Gradually increase the engine speed.
- The voltage increases with the increase in the engine speed.

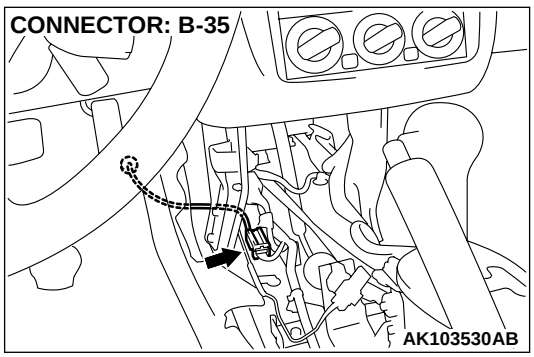
(5) Turn the ignition switch to the "LOCK"(OFF) position.

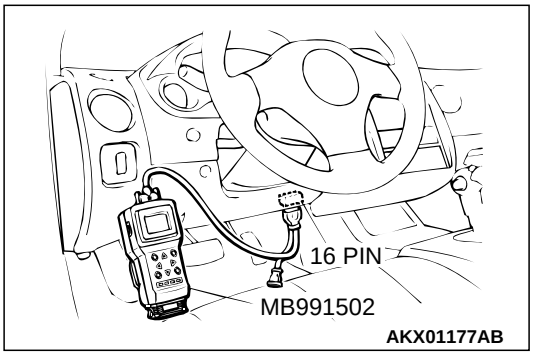
Q: Is the sensor operating properly?

YES : Replace the ECM or PCM. Then go to Step 6.

NO : Replace the knock sensor. Then go to Step 6.







STEP 6. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTC.
(4) Test drive under the following conditions:
- Engine speed: 3000 – 5000r/min
- Engine load : 40 % or more
- Drive a minimum of 3 seconds after the above conditions have been met.

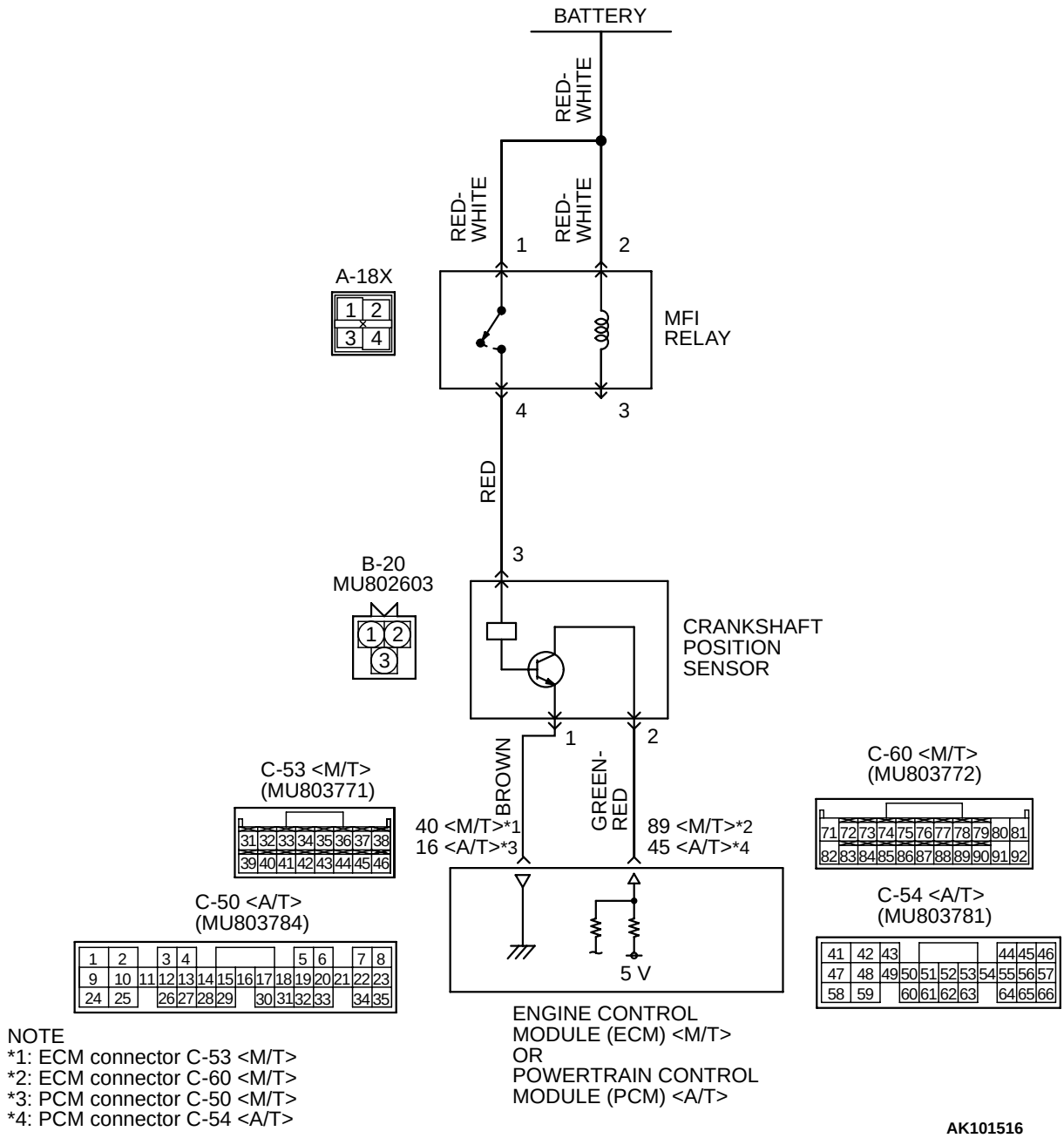
(5) After completing the test drive, read the DTC.Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC P0325 is output?

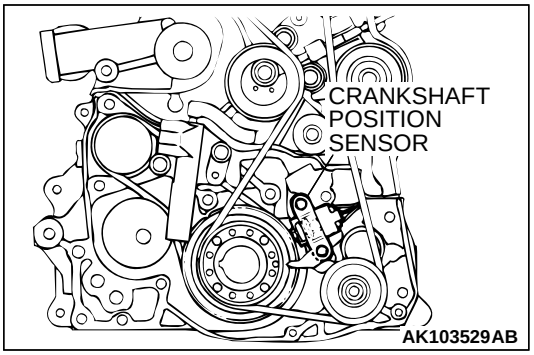
YES : The inspection is complete.
NO : Retry the troubleshooting.

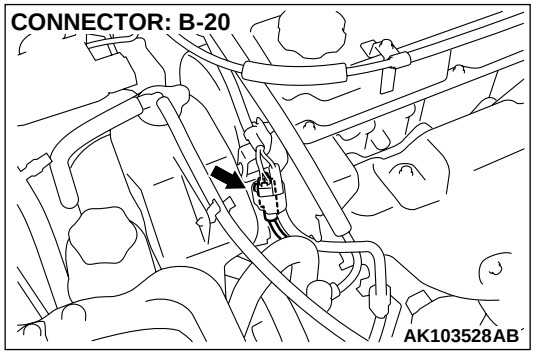
DTC P0335: Crankshaft Position Sensor Circuit

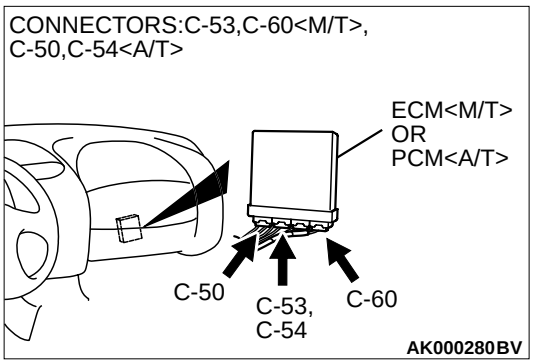
Crankshaft Position Sensor Circuit

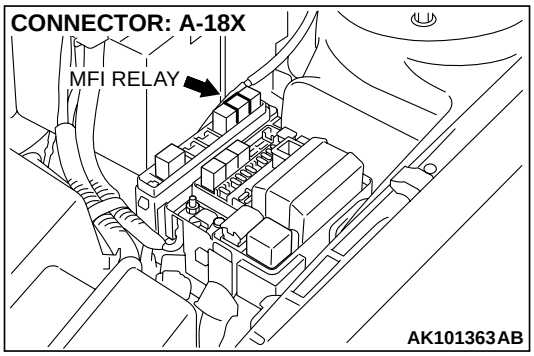


TSB Revision









CIRCUIT OPERATION

- The crankshaft position sensor power is supplied from the MFI relay (terminal 4).
- Terminal 1 of the crankshaft position sensor is grounded with ECM (terminal 40) <M/T> or PCM (terminal 16) <A/T>.
- A 5-volt voltage is applied on the crankshaft position sensor output terminal (terminal 2) from the ECM (terminal 89) <M/T> or PCM (terminal 45) <A/T>. The crankshaft position sensor generates a pulse signal when the output terminal is opened and grounded.

TECHNICAL DESCRIPTION

- The crankshaft position sensor detects the crank angle (position) of each cylinder, and converts that data to pulse signals, which are then input to the ECM <M/T> or PCM <A/T>.
- When the engine is running, the crankshaft position sensor outputs a pulse signal.
- The ECM <M/T> or PCM <A/T> checks whether pulse signal is input while the engine is cranking.

DTC SET CONDITIONS

Check Conditions

- Engine is being cranked.

Judgment Criteria

- Crankshaft position sensor output voltage has not changed (no pulse signal is input) for 2 seconds.

Check Conditions, Judgment Criteria

- Normal signal pattern has not been input for cylinder identification from the crankshaft position sensor signal and camshaft position sensor signal for 2 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

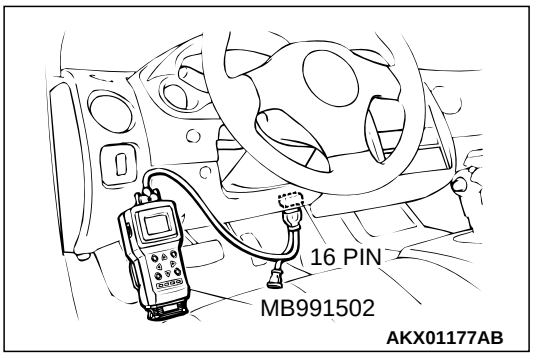
- Crankshaft position sensor failed.
- Open or shorted crankshaft position sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MD998478: Test Harness (3pin, triangle)

TSB Revision



STEP 1. Using scan tool MB991502, check data list item 22: Crankshaft Position Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 22, Crankshaft Position Sensor.
- The tachometer and engine speed indicated on the scan tool should much.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

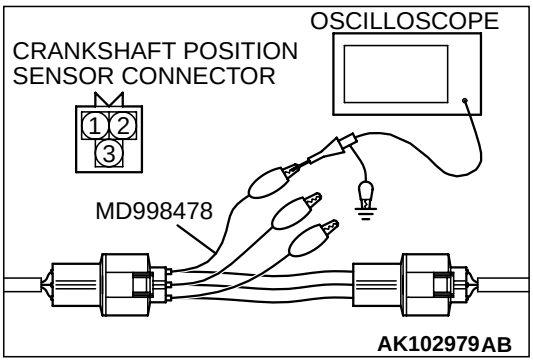
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Go to Step 2.

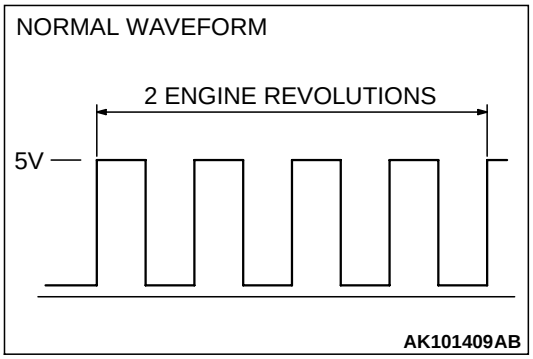
STEP 2. Using the oscilloscope, check the crankshaft position sensor.

(1) Disconnect the crankshaft position sensor connector B-20 and connect the test harness special tool (MD998478) in between.
(2) Connect the oscilloscope probe to terminal 2 of the crankshaft position sensor by backprobing.

NOTE: Connect the oscilloscope probe to terminal 89 <M/T> or terminal 45 <A/T> by backprobing when measuring with the ECM or PCM connector.

(3) Start the engine and run at idle.



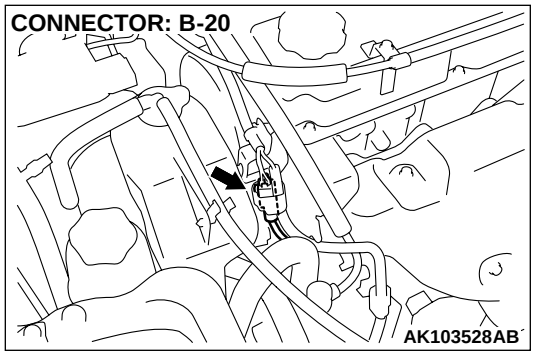


(4) Check the waveform.
- The waveform should show a pattern similar to the illustration.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the waveform normal?

YES : Go to Step 3.
NO : Go to Step 5.

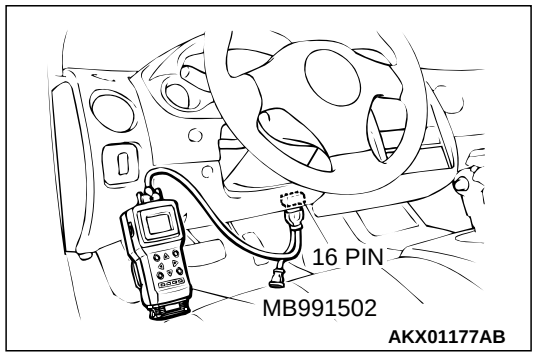


STEP 3. Check connector B-20 at the crankshaft position sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 21.



STEP 4. Using scan tool MB991502, check data list item 22: Crankshaft Position Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

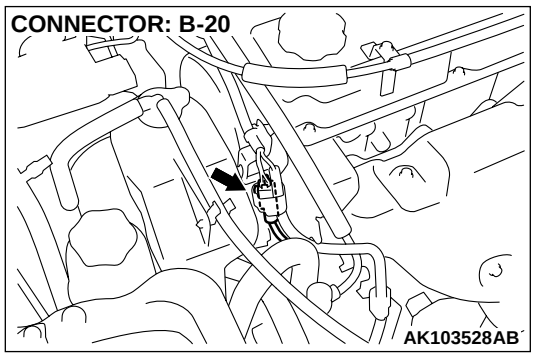
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 22, Crankshaft Position Sensor.
- The tachometer and engine speed indicated on the scan tool should much.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

NO : Replace the ECM or PCM. Then go to Step 21.

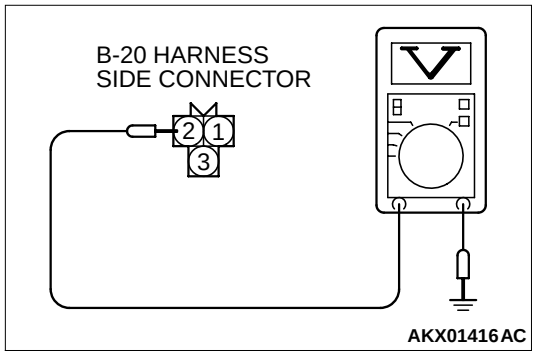


STEP 5. Check connector B-20 at the crankshaft position sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 21.



STEP 6. Check the sensor supply voltage at crankshaft position sensor harness side connector B-20.

(1) Disconnect the connector B-20 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 2 and ground.
- Voltage should be between 4.8 and 5.2 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 11.
NO : Go to Step 7.

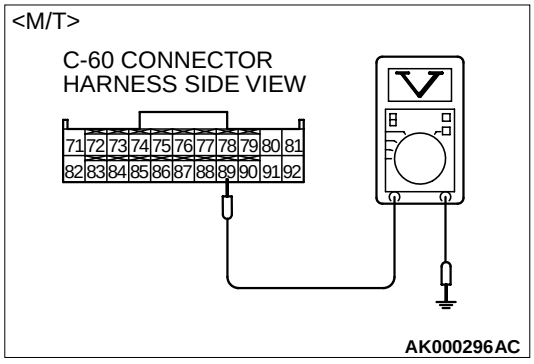
STEP 7. Check the sensor supply voltage at ECM connector C-60 <M/T> or PCM connector C-54 <A/T> by backprobing.

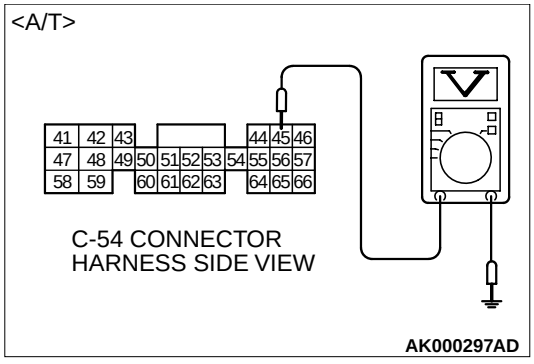
(1) Do not disconnect the ECM connector C-60 <M/T> or PCM connector C-54 <A/T>.
(2) Disconnect the crankshaft position sensor connector B-20.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the voltage between terminal 89 <M/T> or 45 <A/T> and ground by backprobing.
- Voltage should be between 4.8 and 5.2 volts.

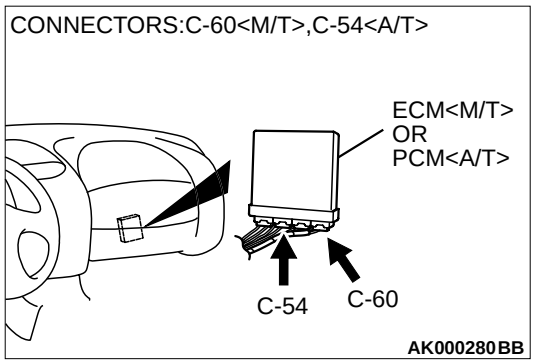
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 8.
NO : Go to Step 9.





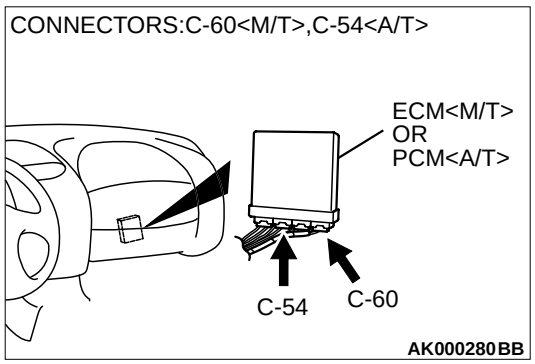


STEP 8. Check connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Repair it because of open circuit between crankshaft position sensor connector B-20 terminal 2 and ECM connector C-60 terminal 89 <M/T> or PCM connector C-54 terminal 45 <A/T>. Then go to Step 21.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 21.



STEP 9. Check connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

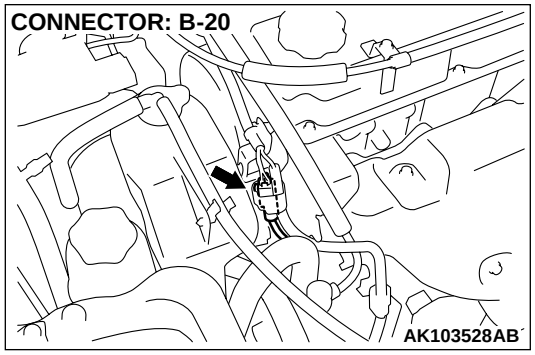
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 21.

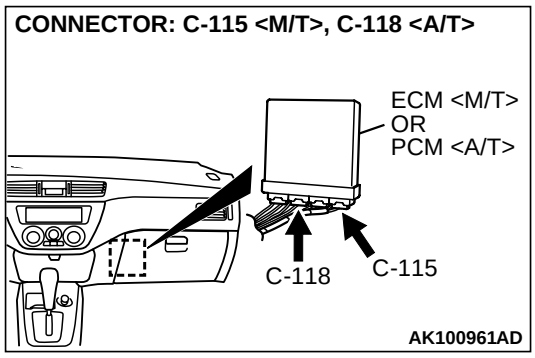
STEP 10. Check for short circuit to ground between crankshaft position sensor connector B-20 (terminal 3) and ECM connector C-60 (terminal 89) <M/T> or PCM connector C-54 (terminal 45) <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 21.

NO : Repair it. Then go to Step 21.





STEP 11. Check the power supply voltage at crankshaft position sensor harness side connector B-20.

(1) Disconnect the connector B-20 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between terminal 3 and ground.

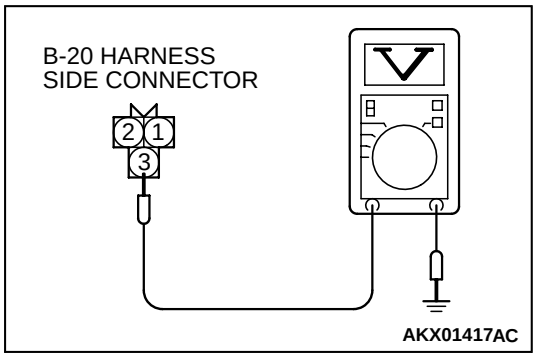
- Voltage should be battery positive voltage.

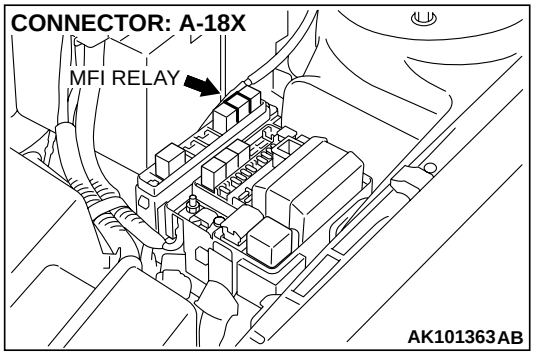
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 13.

NO : Go to Step 12.



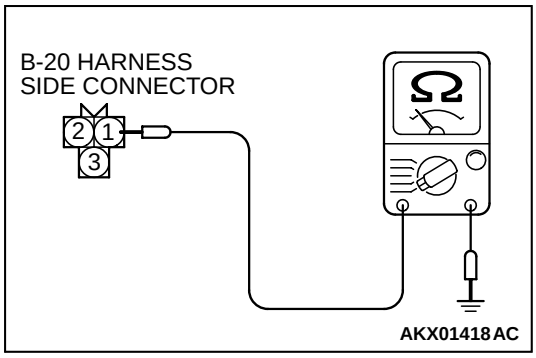


STEP 12. Check connector A-18X at MFI relay for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between MFI relay connector A-18X terminal 4 and crankshaft position sensor connector B-20 terminal 3 because of open circuit or short circuit to ground. Then go to Step 21.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 21.



STEP 13. Check the continuity at crankshaft position sensor harness side connector B-20.

(1) Disconnect the connector B-20 and measure at the harness side.

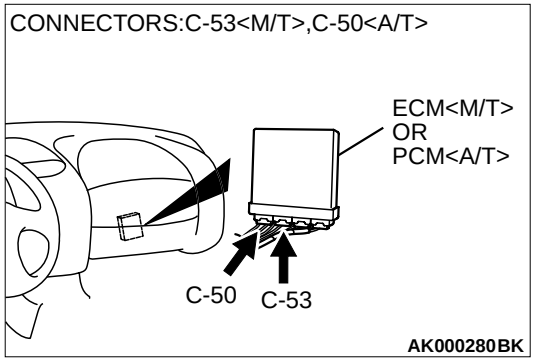
(2) Check for the continuity between terminal 1 and ground.

- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 16.

NO : Go to Step 14.



STEP 14. Check connector C-53 at ECM <M/T> or connector C-50 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 15.

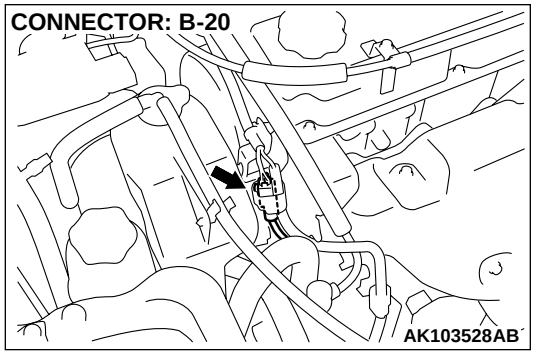
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 21.

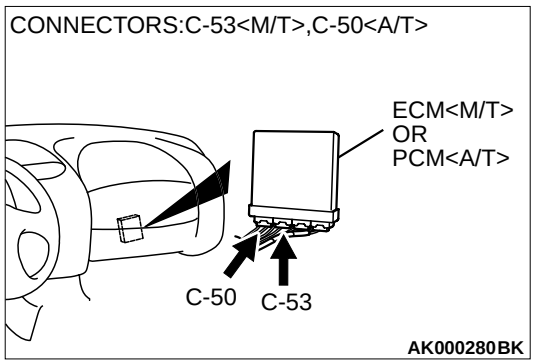
STEP 15. Check for open circuit and harness damage between crankshaft position sensor connector B-20 (terminal 1) and ECM connector C-53 (terminal 40) <M/T> or PCM connector C-50 (terminal 16) <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 21.

NO : Repair it. Then go to Step 21.



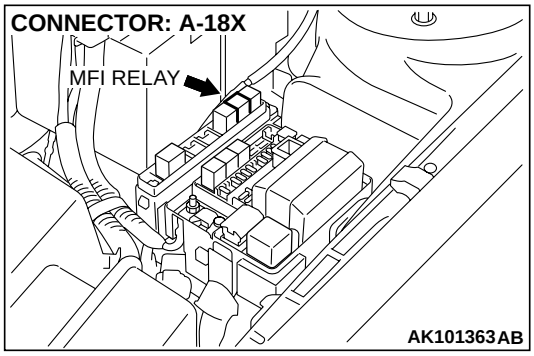


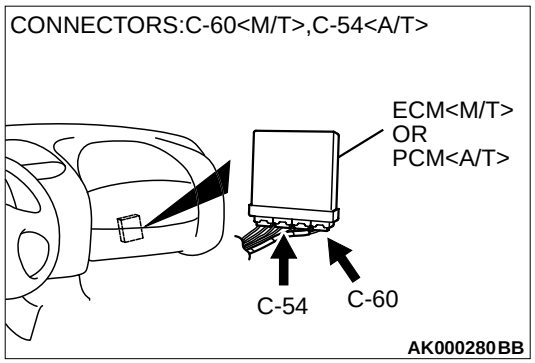
STEP 16. Check connector A-18X at the MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 17.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 21.



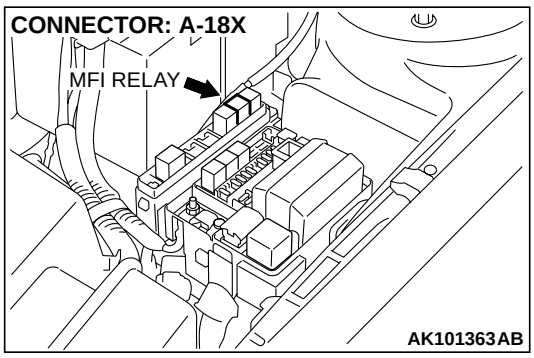


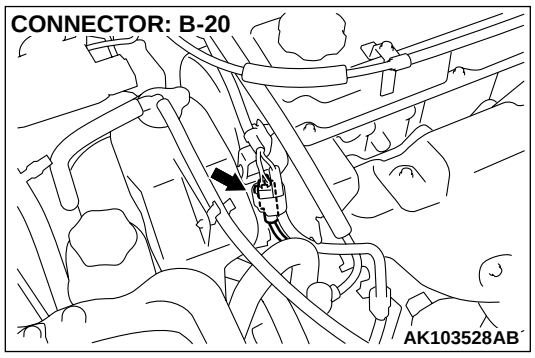
STEP 17. Check connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 18.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 21.





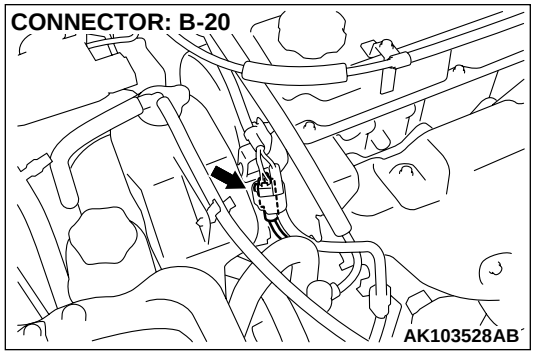
STEP 18. Check for harness damage between MFI relay connector A-18X (terminal 4) and crankshaft position sensor connector B-20 (terminal 3).

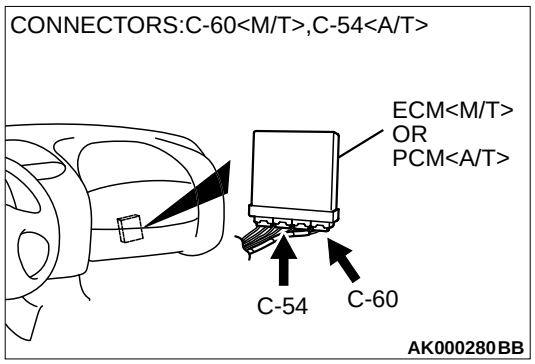
Q: Is the harness wire in good condition?

YES : Go to Step 19.

NO : Repair it. Then go to Step 21.

STEP 19. Check for harness damage between crankshaft position sensor connector B-20 (terminal 2) and ECM connector C-60 (terminal 89) <M/T> or PCM connector C-54 (terminal 45) <A/T>.





Q: Is the harness wire in good condition?

YES : Go to Step 20.
NO : Repair it. Then go to Step 21.

STEP 20. Check the crankshaft sensing blade.

Q: Is the crankshaft sensing blade in a good condition?

YES : Replace the crankshaft position sensor. Then go to Step 21.
NO : Repair it. Then go to Step 21.

STEP 21. Test the OBD-II drive cycle.

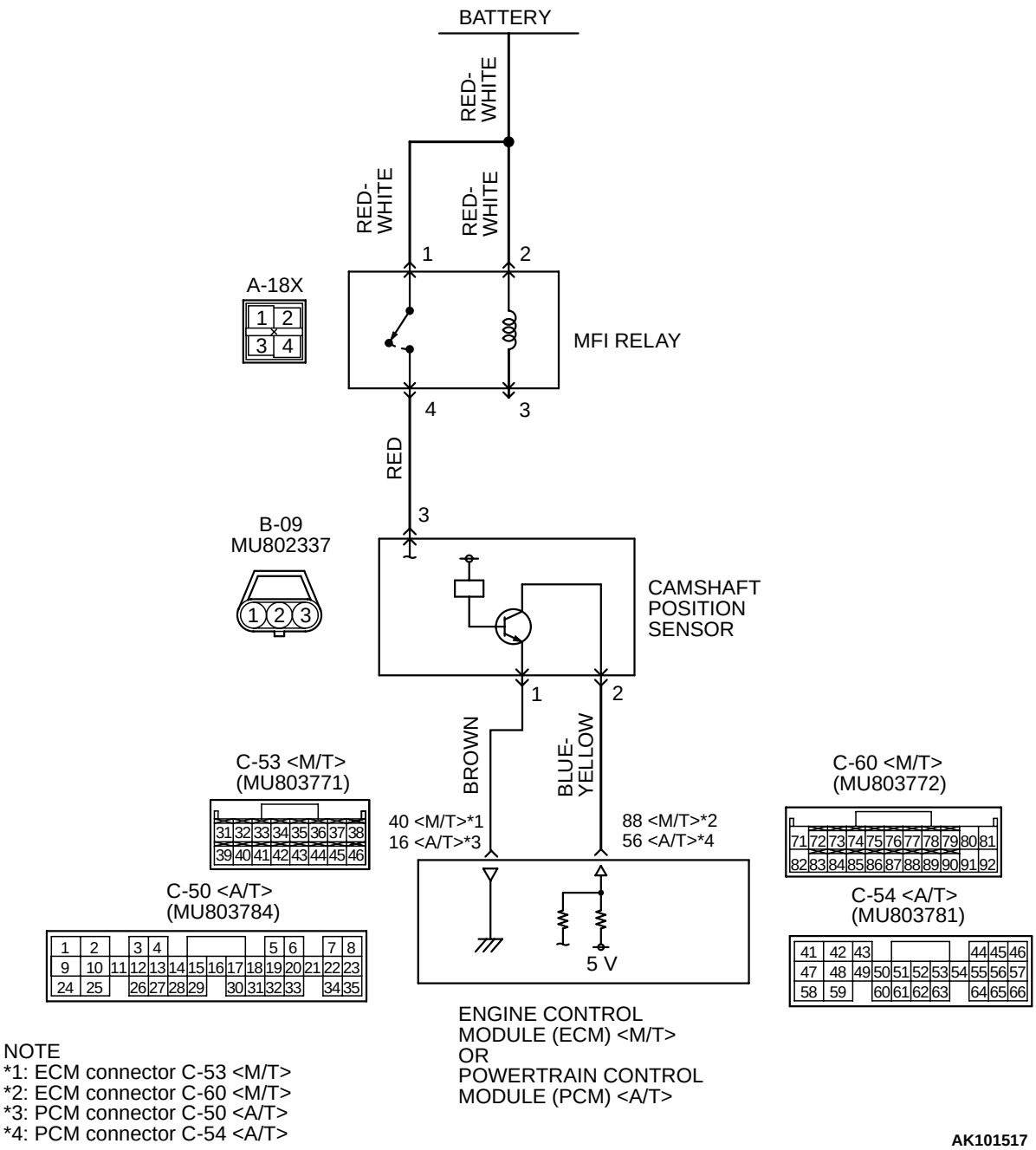
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0335 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0340: Camshaft Position Sensor Circuit

Camshaft Position Sensor Circuit



NOTE
*1: ECM connector C-53 <M/T>
*2: ECM connector C-60 <M/T>
*3: PCM connector C-50 <A/T>
*4: PCM connector C-54 <A/T>

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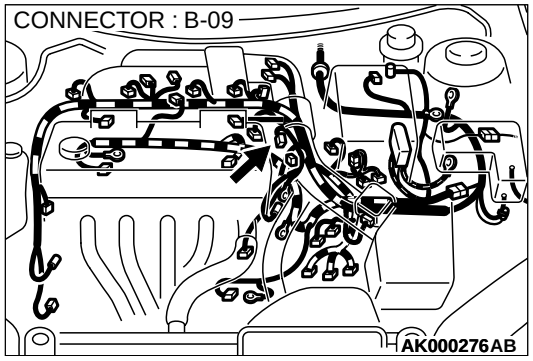
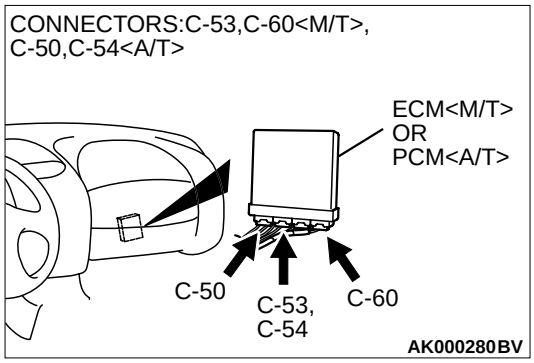
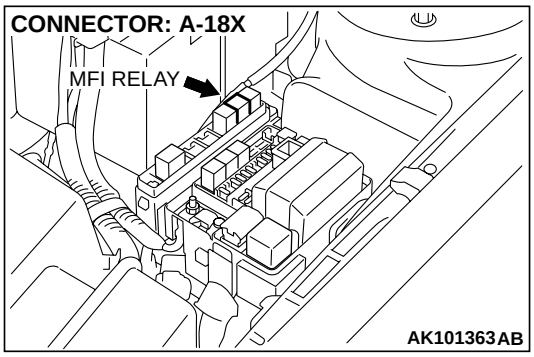






CIRCUIT OPERATION

- The camshaft position sensor power is supplied from the MFI relay (terminal 4).
- Terminal 1 of the camshaft position sensor is grounded with ECM (terminal 40) <M/T> or PCM (terminal 16) <A/T>.
- A 5-volt voltage is applied on the camshaft position sensor output terminal (terminal 2) from the ECM (terminal 88) <M/T> or PCM (terminal 56) <A/T>. The camshaft position sensor generates a pulse signal when the output terminal is opened and grounded.

TECHNICAL DESCRIPTION

- The camshaft position sensor functions to detect the top dead center position of the number 1 cylinder and to convert that data to pulse signals that are input to the ECM <M/T> or PCM <A/T>.
- When the engine is running, the camshaft position sensor outputs a pulse signal.
- The ECM <M/T> or PCM <A/T> checks whether pulse signal is input while the engine is cranking.

DTC SET CONDITIONS

Check Conditions

- Engine speed is higher than 50 r/min.

Judgment Criteria

- Camshaft position sensor output voltage has not changed (no pulse signal is input) for 2 seconds.

Check Conditions

- Engine speed is higher than 50 r/min.

Judgment Criteria

- Normal signal pattern has not been input for cylinder identification from the crankshaft position sensor signal and camshaft position sensor signal for 2 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Camshaft position sensor failed.
- Open or shorted camshaft position sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tool:

- MB991709: Test Harness Set

TSB Revision

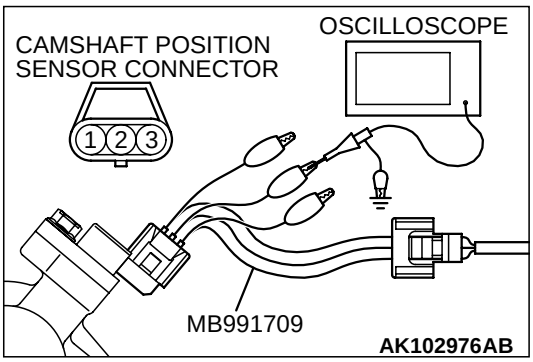
STEP 1. Using the oscilloscope, check the camshaft position sensor.

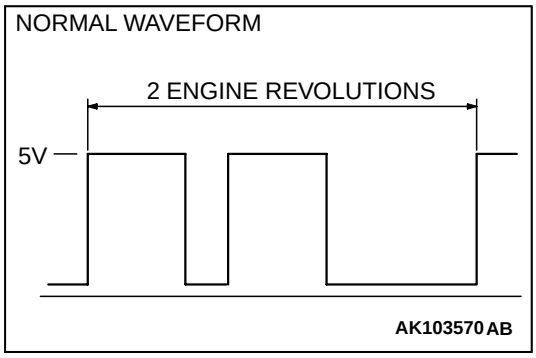
(1) Disconnect the camshaft position sensor connector B-09, and connect test harness special tool (MB991709) in between. (All terminals should be connected.)

(2) Connect the oscilloscope probe to the camshaft position sensor side connector terminal 2.

NOTE: When measuring with the ECM or PCM side connector, connect an oscilloscope probe to terminal 88 <M/T> or terminal 56 <A/T>.

(3) Start the engine and run at idle.





(4) Check the waveform.
- The waveform should show a pattern similar to the illustration.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

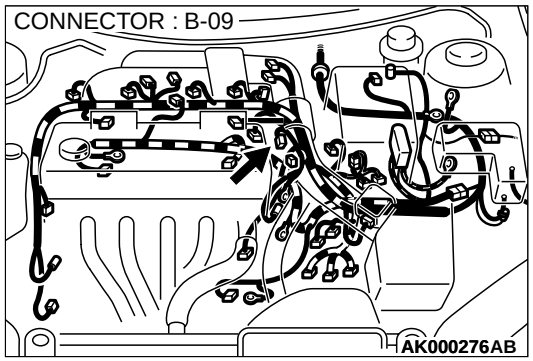
Q: Is the waveform normal?

YES : Go to Step 2.
NO : Go to Step 4.

STEP 2. Check connector B-09 at camshaft position sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.



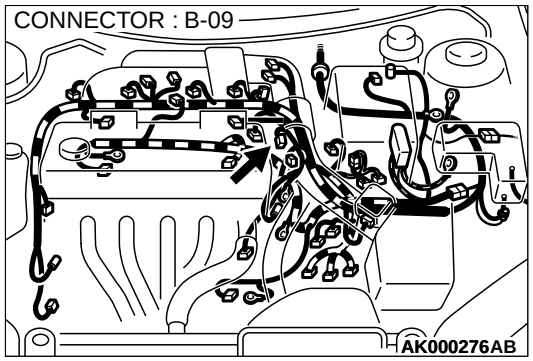
STEP 3. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.

(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0340 is output?

YES : Replace the ECM or PCM. Then go to Step 20.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

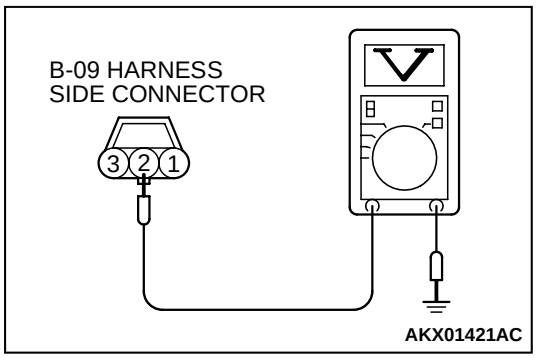


STEP 4. Check connector B-09 at camshaft position sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.



STEP 5. Check the sensor supply voltage at camshaft position sensor connector B-09.

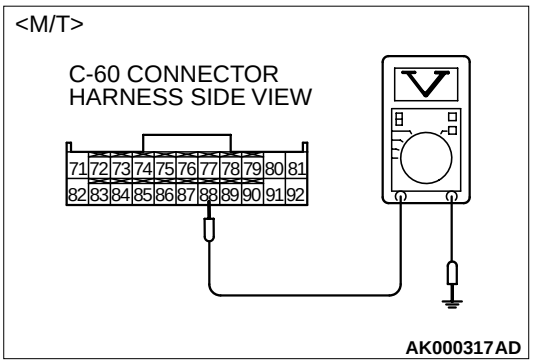
(1) Disconnect the connector B-09 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 2 and ground.
- Voltage should be between 4.8 and 5.2 volts.

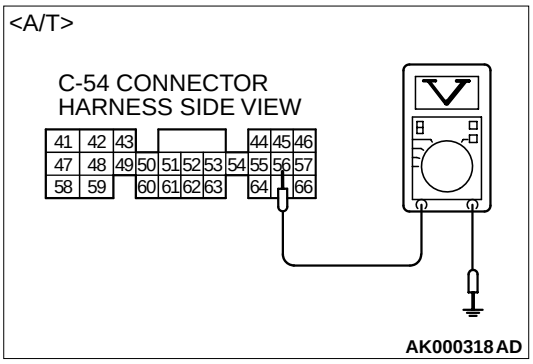
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 10.

NO : Go to Step 6.





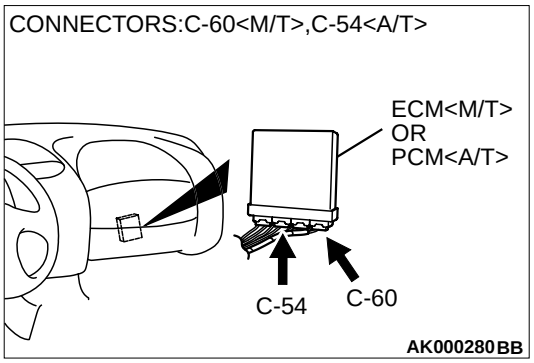
STEP 6. Check the sensor supply voltage at ECM connector C-60 <M/T> or PCM connector C-54 <A/T> by backprobing.

(1) Do not disconnect the ECM connector C-60 <M/T> or PCM connector C-54 <A/T>.
(2) Disconnect the camshaft position sensor connector B-09.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the voltage between terminal 88 <M/T> or 56 <A/T> and ground by backprobing.
- Voltage should be between 4.8 and 5.2 volts.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 7.
NO : Go to Step 8.



STEP 7. Check connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

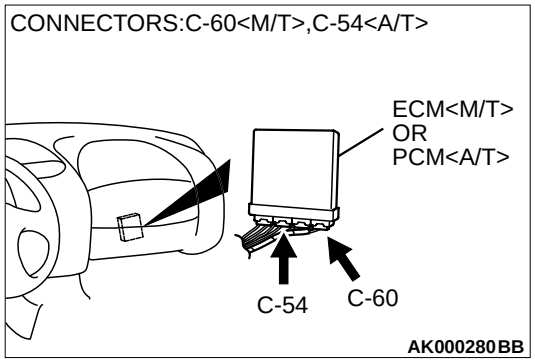
YES : Repair harness wire between camshaft position sensor connector B-09 terminal 2 and ECM connector C-60 terminal 88 <M/T> or PCM connector C-54 terminal 56 <A/T> because of open circuit. Then go to Step 20.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

STEP 8. Check connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

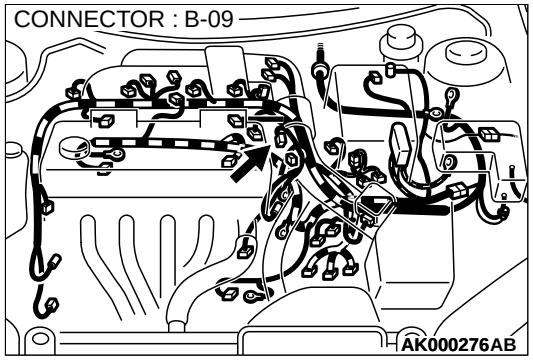


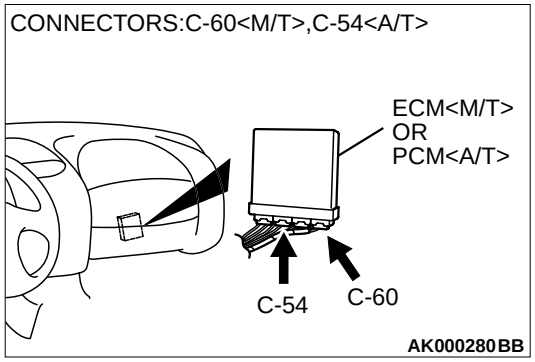
STEP 9. Check for short circuit to ground between camshaft position sensor connector B-09 (terminal 2) and ECM connector C-60 (terminal 88) <M/T> or PCM connector C-54 (terminal 56) <A/T>.

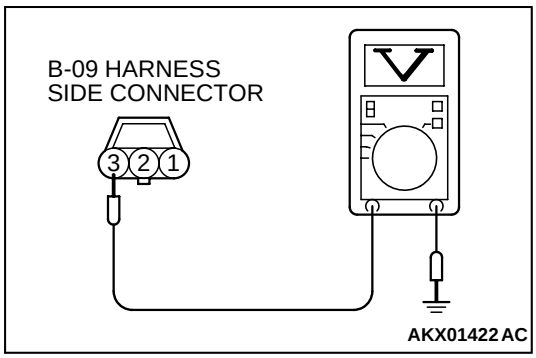
Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 20.

NO : Repair it. Then go to Step 20.







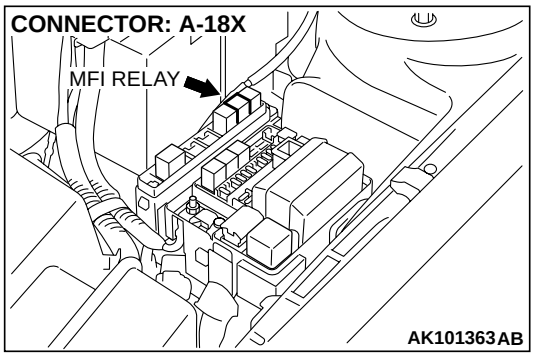
STEP 10. Check the power supply voltage at camshaft position sensor connector B-09.

(1) Disconnect the connector B-09 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 3 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

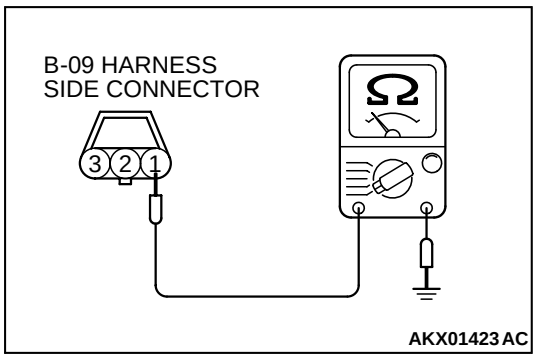
YES : Go to Step 12.
NO : Go to Step 11.



STEP 11. Check connector A-18X at MFI relay for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between MFI relay connector A-18X terminal 4 and camshaft position sensor connector B-09 terminal 3 because of open circuit or short circuit to ground. Then go to Step 20.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

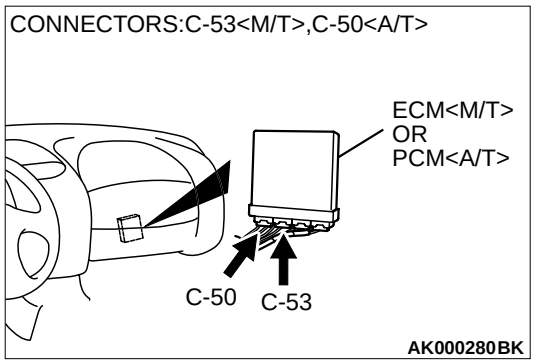


STEP 12. Check the continuity at camshaft position sensor connector B-09.

(1) Disconnect the connector B-09 and measure at the harness side.
(2) Check for the continuity between terminal 1 and ground.
- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 15.
NO : Go to Step 13.

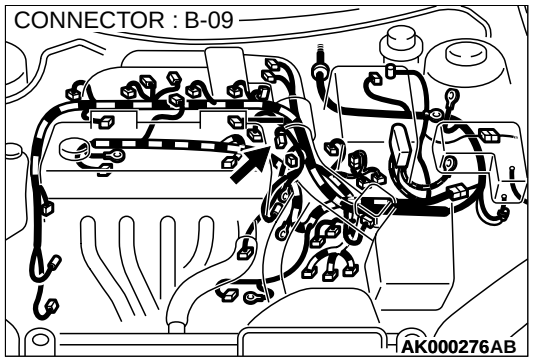


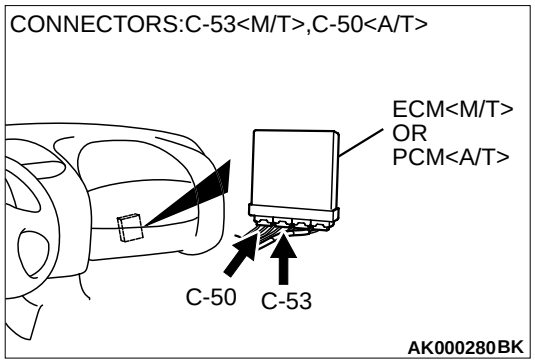
STEP 13. Check connector C-53 at ECM <M/T> or connector C-50 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.



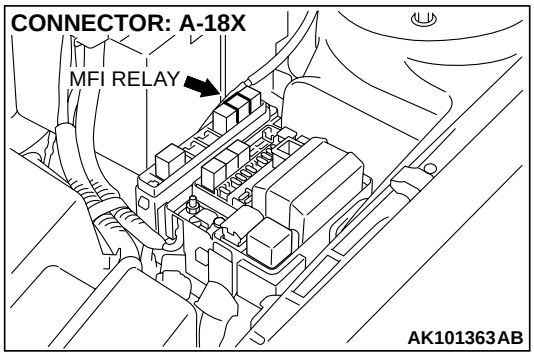


STEP 14. Check for open circuit and harness damage between camshaft position sensor connector B-09 (terminal 1) and ECM connector C-53 (terminal 40) <M/T> or PCM connector C-50 (terminal 16) <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 20.

NO : Repair it. Then go to Step 20.

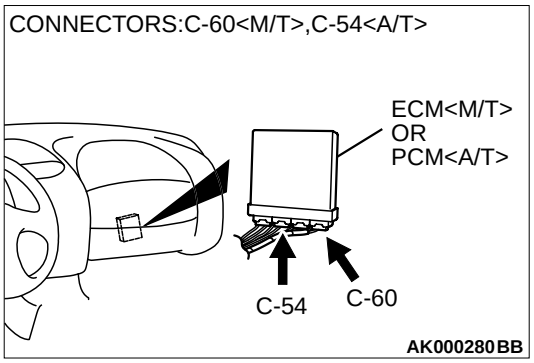


STEP 15. Check connector A-18X at the MFI relay for damage.

Q: Is the connector in good condition?

YES : Go to Step 16.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

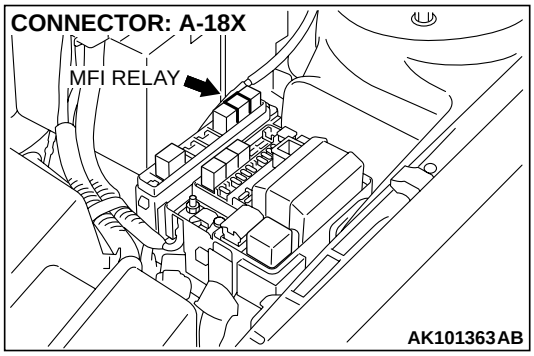


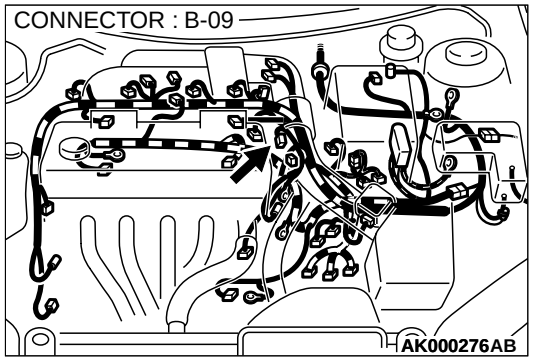
STEP 16. Check connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 17.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.



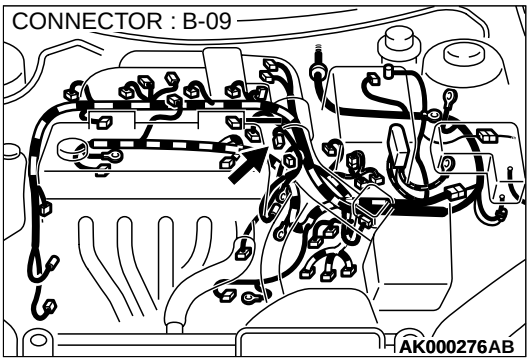


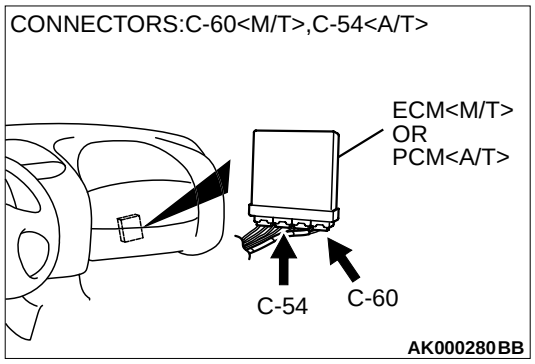
STEP 17. Check for harness damage between MFI relay connector A-18X (terminal 4) and camshaft position sensor connector B-09 (terminal 3).

Q: Is the harness wire in good condition?

YES : Go to Step 18.

NO : Repair it. Then go to Step 20.





STEP 18. Check for harness damage between camshaft position sensor connector B-09 (terminal 2) and ECM connector C-60 (terminal 88) <M/T> or PCM connector C-54 (terminal 56) <A/T>.

Q: Is the harness wire in good condition?

YES : Go to Step 19.

NO : Repair it. Then go to Step 20.

STEP 19. Check the camshaft position sensing cylinder.

Q: Is the camshaft position sensing cylinder in a good condition?

YES : Replace the camshaft position sensor. Then go to Step 20.

NO : Repair it. Then go to Step 20.

STEP 20. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.

(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0340 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0401: Exhaust Gas Recirculation Flow Insufficient Detected

TECHNICAL DESCRIPTION

- When the EGR solenoid switches from "OFF" to "ON" while the engine is running, EGR gas flows.
- The ECM <M/T> or PCM <A/T> checks how the EGR gas flow signal changes.

DTC SET CONDITIONS

Check Conditions

- At least 20 seconds have passed since the last monitor was complete.
- Engine coolant temperature is higher than 76°C (169°F).
- Engine speed is at between 1,000 and 2,000 <M/T> or 940 and 2,000 <A/T> r/min.
- Intake air temperature is higher than 0°C (32°F).
- Barometric pressure is higher than 76 kPa (11 psi).
- Vehicle speed is 1.5 km/h (0.9 mph) <M/T> or 30 km/h (18.7 mph) <A/T> or more.
- At least 90 seconds have passed since manifold differential pressure sensor output voltage fluctuated 1.5 volts or more.
- The throttle valve is closed.
- Volumetric efficiency is lower than 15 <M/T> or 24 <A/T> percent.
- While fuel is being shut off. <M/T>
- The ECM<M/T> or PCM<A/T> monitors for this condition for 3 cycles of 2 second each during the drive cycle.

Judgement Criteria

- When intake manifold pressure fluctuation width is lower than 2.6 kPa (0.38 psi). When the EGR solenoid is turned ON.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- EGR valve does not open.
- EGR control vacuum is too low.
- EGR solenoid failed.
- Open or shorted EGR solenoid circuit, or loose connector.
- Manifold differential pressure sensor failed.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tool:

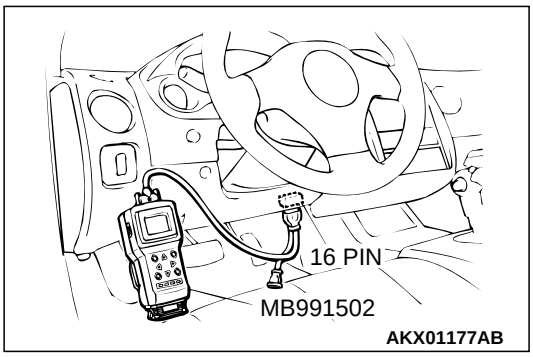
- MB991502: Scan Tool (MUT-II)

STEP 1. Check the EGR system.

Refer to GROUP 17, Emission Control System – Exhaust Gas Recirculation (EGR) System – EGR System Check P.17-106.

Q: Are there any abnormalities?

YES : Go to Step 2.
NO : Repair it. Then go to Step 3.



STEP 2. Using scan tool MB991502, check data list item 95: Manifold Differential Pressure Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 95, Manifold Differential Pressure Sensor.
(4) Warm up the engine to normal operating temperature: 80°C to 96°C (176°F to 205°F).
- Should be between 65 – 78 kPa at engine idling.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Clean the EGR valve and EGR passage. Then go to Step 3.
NO : Refer to, DTC P1400 – Manifold Differential Pressure Sensor Circuit Malfunction P.13A-421.

STEP 3. Test the OBD-II drive cycle.

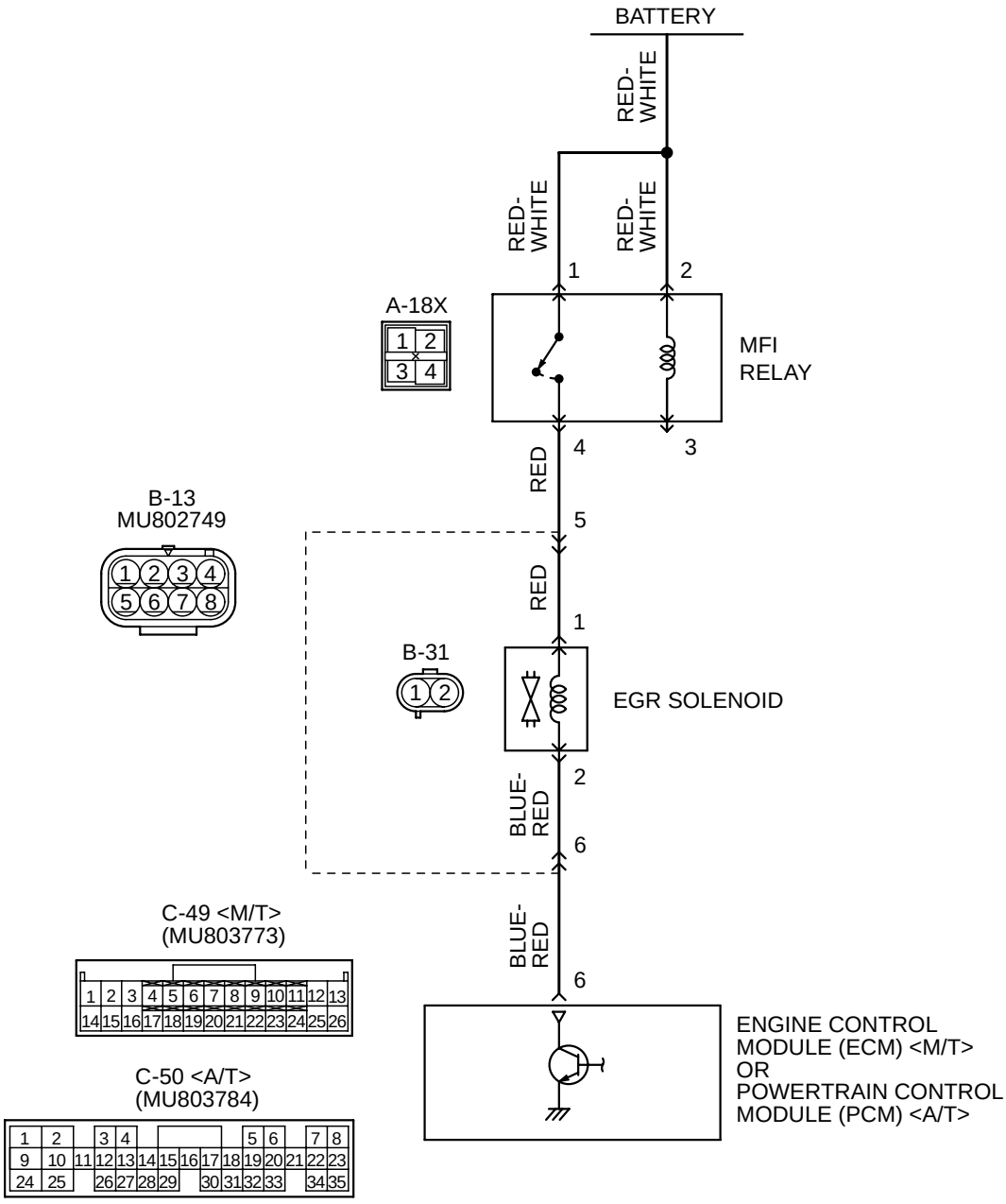
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 5 – Exhaust Gas Recirculation (EGR) System Monitor P.13A-5.
(2) Check the diagnostic trouble code (DTC).

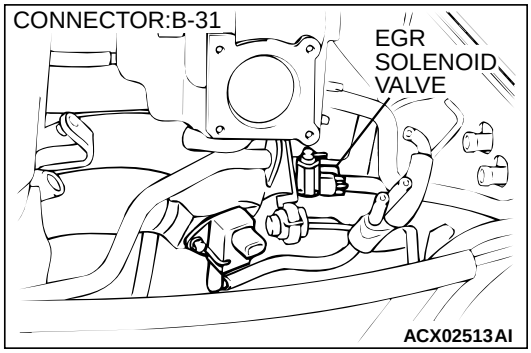
Q: Is the DTC P0401 is output?

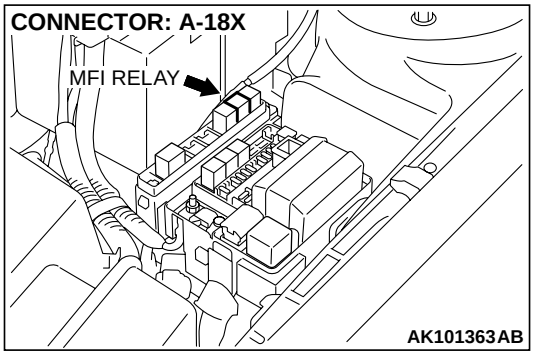
YES : Retry the troubleshooting.
NO : The inspection is complete.

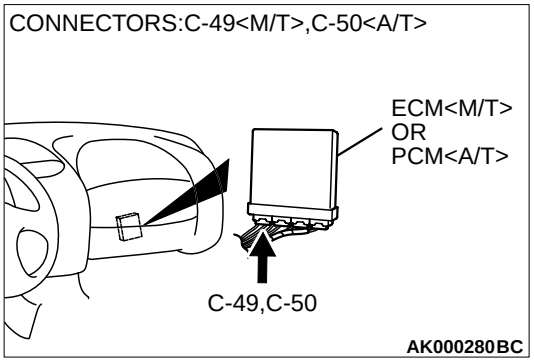
DTC P0403: Exhaust Gas Recirculation Control circuit

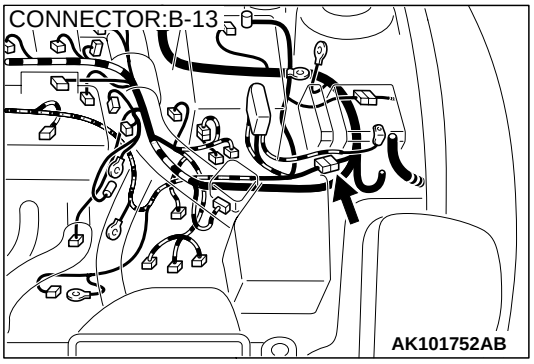
EGR Slenoid Circuit











CIRCUIT OPERATION
- The EGR solenoid power is supplied from the MFI relay (terminal 4).
- The ECM <M/T> or PCM <A/T> controls the EGR solenoid ground by turning the power transistor in the ECM <M/T> or PCM <A/T> "ON" and "OFF".

TECHNICAL DESCRIPTION
- To judge if there is open circuit in the EGR solenoid drive circuit, ECM <M/T> or PCM <A/T> measures the surge voltage of the EGR solenoid coil.
- The ECM <M/T> or PCM <A/T> drives the EGR solenoid. After the solenoid is turned off, the ECM <M/T> or PCM <A/T> will check if the solenoid coil produces a surge voltage of 2 V or more.

DTC SET CONDITIONS

Check Conditions
- Engine is being cranked.
- Battery positive voltage is at between 10 and 16 volts.

Judgment Criteria
- The EGR solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 0.2 second.
- The ECM<M/T> or PCM<A/T> monitors for this condition once during the drive cycle.

Check Conditions
- Battery positive voltage is at between 10 and 16 volts.
- ON duty cycle of the EGR solenoid is between 10 and 90 percent.
- ON duty cycle of the evaporative emission purge solenoid is 0 percent.
- Evaporative emission ventilation solenoid is OFF.
- More than 1 second has elapsed after the above mentioned conditions have been met.

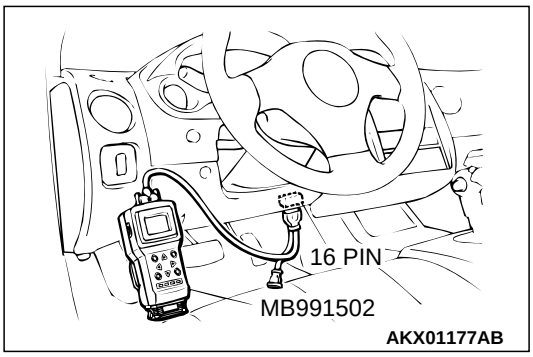
Judgment Criteria
- The EGR solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 1 second. When the EGR solenoid is turned OFF.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- EGR solenoid failed.
- Open or shorted EGR solenoid circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)

TSB Revision



STEP 1. Using scan tool MB991502, check actuator test item 10: EGR solenoid.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

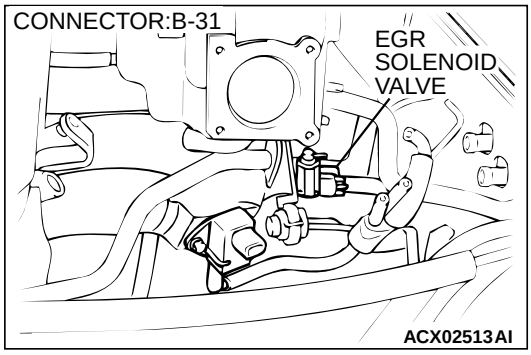
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the actuator test mode for item 10, EGR solenoid.
- An operation sound should be heard and vibration should be felt when the EGR solenoid is operated.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the solenoid operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

NO : Go to Step 2.

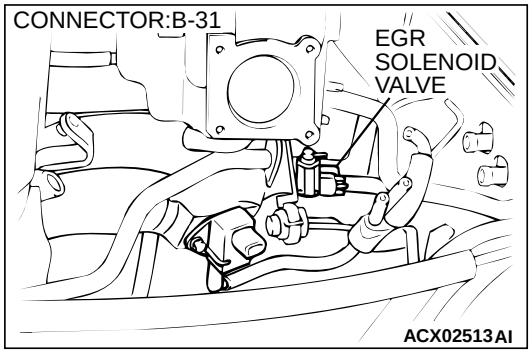


STEP 2. Check connector B-31 at the EGR solenoid for damage.

Q: Is the connector in good condition?

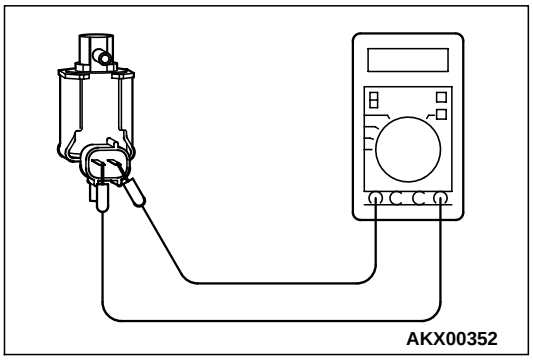
YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



STEP 3. Check the EGR solenoid.

(1) Disconnect the EGR solenoid connector B-31.



(2) Measure the resistance between EGR solenoid side connector terminal 1 and 2.

Standard value: 29 – 35 Ω [at 20°C (68°F)]

Q: Is the resistance at the standard value?

YES : Go to Step 4.

NO : Replace the EGR solenoid. Then go to Step 12.

STEP 4. Check the power supply voltage at EGR solenoid harness side connector B-31.

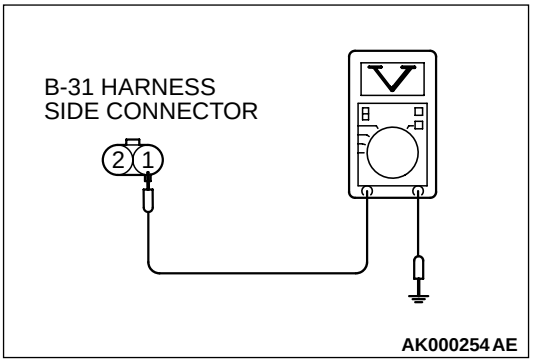
(1) Disconnect the connector B-31 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between terminal 1 and ground.

- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the voltage normal?

YES : Go to Step 6.

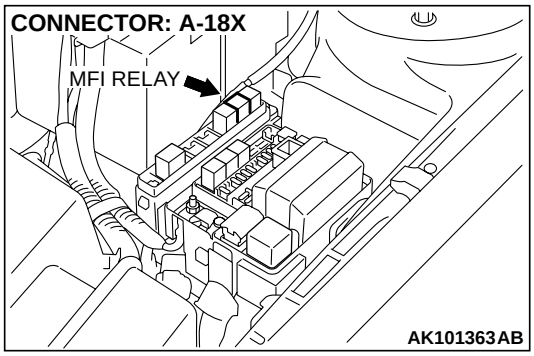
NO : Go to Step 5.

STEP 5. Check connector A-18X at MFI relay for damage.

Q: Is the connector in good condition?

YES : Check connector B-13 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connectors is in good condition, repair harness wire between MFI relay connector A-18X terminal 4 and EGR solenoid connector B-101 terminal 1 because of open circuit or short circuit to ground. Then go to Step 12.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



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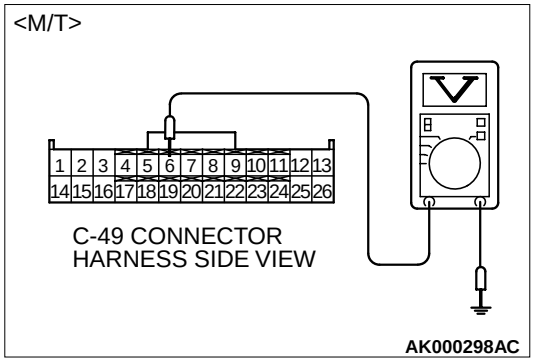
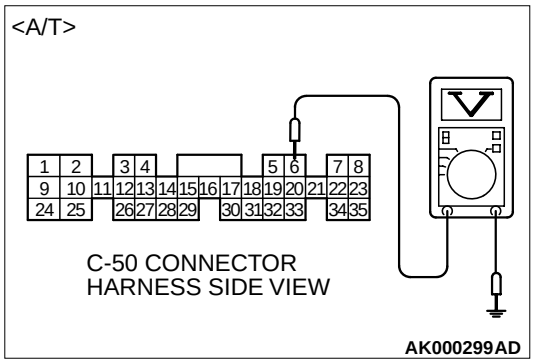




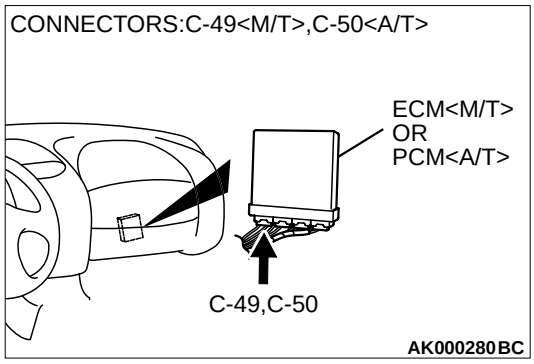
STEP 6. Check the power supply voltage at ECM connector C-49 <M/T> or PCM connector C-50 <A/T> by backprobing.

(1) Do not disconnect the connector C-49 <M/T> or C-50 <A/T>.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 6 and ground by backprobing.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

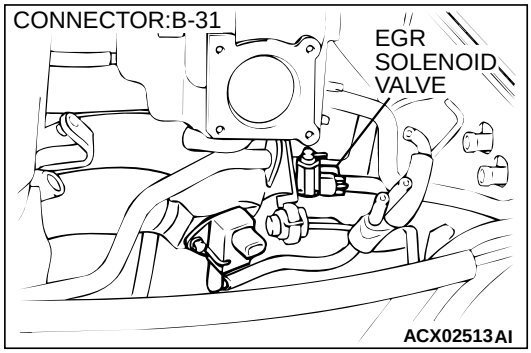
YES : Go to Step 9.
NO : Go to Step 7.



STEP 7. Check connector C-49 at ECM <M/T> or connector C-50 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 8.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



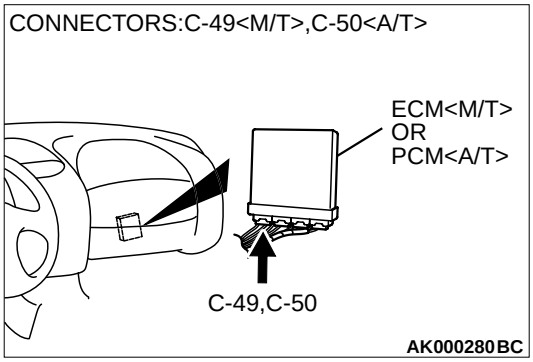
STEP 8. Check for open circuit and short circuit to ground between EGR solenoid connector B-31 (terminal 2) and ECM connector C-49 (terminal 6) <M/T> or PCM connector C-50 (terminal 6) <A/T>.

NOTE: Check harness after checking intermediate connector B-13.If intermediate connectors is damaged, repair or replace them.Refer to GROUP 00E, Harness Connector Inspection P.00E-2.Then go to Step 12.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 12.

NO : Repair it. Then go to Step 12.

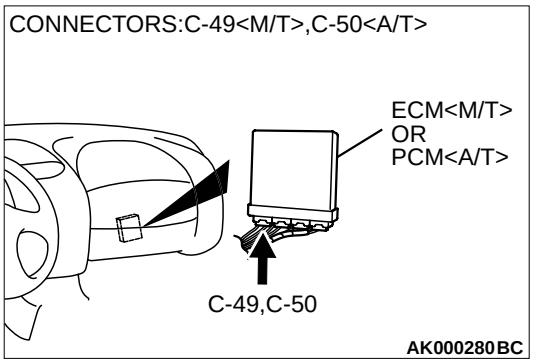


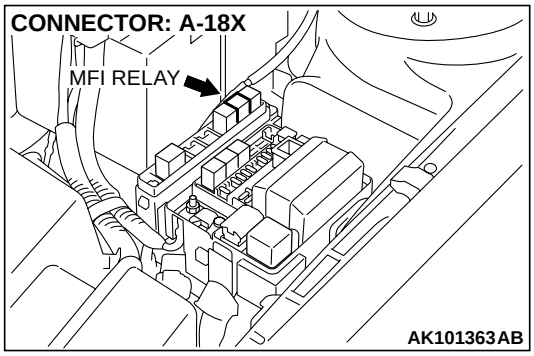
STEP 9. Check connector C-49 at ECM <M/T> or connector C-50 at PCM <A/T> for damage.

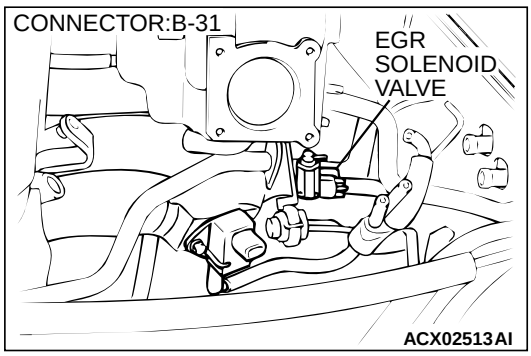
Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.





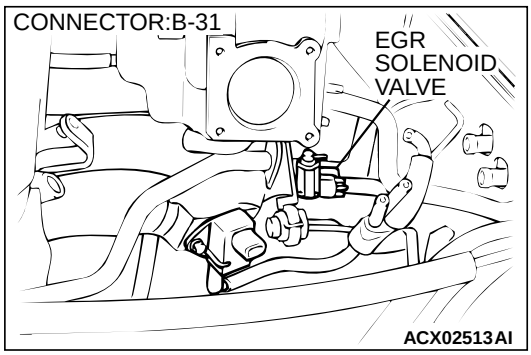


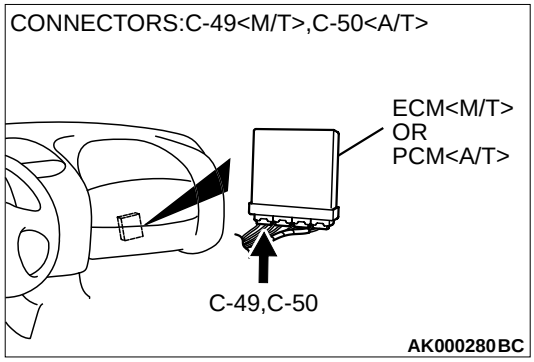
STEP 10. Check for harness damage between MFI relay connector A-18X (terminal 4) and EGR solenoid connector B-101 (terminal 1).

NOTE: Check harness after checking intermediate connector B-13.If intermediate connectors is damaged, repair or replace them.Refer to GROUP 00E, Harness Connector Inspection P.00E-2.Then go to Step 12.

Q: Is the harness wire in good condition?

YES : Go to Step 11.
NO : Repair it. Then go to Step 12.





STEP 11. Check for harness damage between EGR solenoid connector B-31 (terminal 2) and ECM connector C-49 (terminal 6) <M/T> or PCM connector C-50 (terminal 6) <A/T>.

NOTE: Check harness after checking intermediate connector B-13.If intermediate connectors is damaged, repair or replace them.Refer to GROUP 00E, Harness Connector Inspection P.00E-2.Then go to Step 12.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 12.
NO : Repair it. Then go to Step 12.

STEP 12. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0403 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0421: Warm Up Catalyst Efficiency Below Threshold

TECHNICAL DESCRIPTION

- The signal from the rear heated oxygen sensor differs from the front heated oxygen sensor. That is because the catalytic converter purifies exhaust gas. When the catalytic converter has deteriorated, the signal from the front heated oxygen sensor becomes similar to the rear heated oxygen sensor.
- The ECM <M/T> or PCM <A/T> compares the output of the front and rear heated oxygen sensor signals.

DTC SET CONDITIONS

Check Conditions

- Engine speed is lower than 3,000 r/min.
- Volume air flow sensor output frequency is at between 63 and 169 Hz.
- The throttle valve is open.
- More than 3 seconds has elapsed after the three above-mentioned conditions have been met.
- Intake air temperature is higher than –10°C (14°F).
- Barometric pressure is higher than 76 kPa (11 psi).
- Under the closed loop air/fuel ratio control.
- Vehicle speed is 1.5 km/h (0.93 mph) or more.
- The ECM<M/T> or PCM<A/T> monitors for this condition for 7 cycles of 10 second each during the drive cycle.
- Short-term fuel trim is at between –25 and +25 percent.
- The cumulative volume air flow sensor output frequency is higher than 4,000 Hz.

Judgment Criteria

- The heated oxygen sensor (rear) signal frequency divided by heated oxygen sensor (front) signal frequency = 0.8 or more.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Catalytic converter deteriorated.
- Heated oxygen sensor failed.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

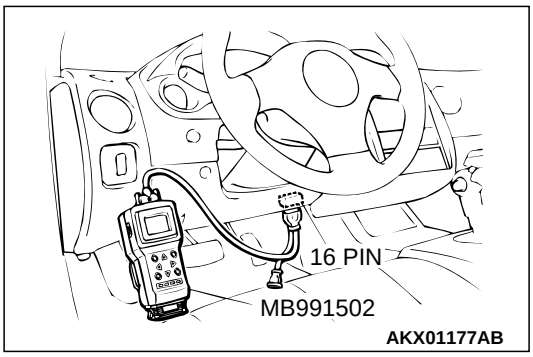
Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Check the exhaust leaks.

Q: Are there any abnormalities?

YES : Go to Step 2.
NO : Repair it. Then go to Step 7.



STEP 2. Using scan tool MB991502, check data list item 59: Heated Oxygen Sensor (rear).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

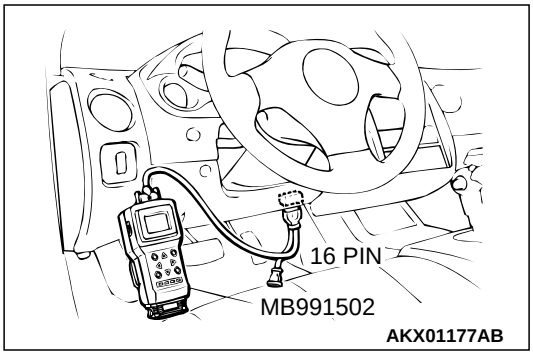
(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 59, Heated Oxygen Sensor (rear).
- Warming up the engine. When the engine is revved, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 3.

NO : Refer to, DTC P0136 – Heated Oxygen Sensor Circuit (sensor 2) P.13A-160, DTC P0137 – Heated Oxygen Sensor Circuit Low Voltage (sensor 2) P.13A-170, DTC P0138 – Heated Oxygen Sensor Circuit High Voltage (sensor 2) P.13A-175, DTC P0139 – Heated Oxygen Sensor Circuit Slow Response (sensor 2) P.13A-178.



STEP 3. Using scan tool MB991502, check data list item 11: Heated Oxygen Sensor (front).

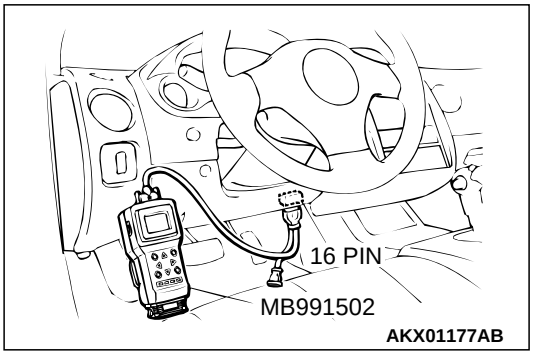
(1) Start the engine and run at idle.
(2) Set scan tool MB991502 to the data reading mode for item 11, Heated Oxygen Sensor (front).
- Warming up the engine. When the engine is revved, the output voltage should be 0.6 to 1.0 volt.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 4.

NO : Refer to, DTC P0130 – Heated Oxygen Sensor Circuit (sensor 1) P.13A-126, DTC P0131 – Heated Oxygen Sensor Circuit Low Voltage (sensor 1) P.13A-136, DTC P0132 – Heated Oxygen Sensor Circuit High Voltage (sensor 1) P.13A-140, DTC P0133 – Heated Oxygen Sensor Circuit Slow Response (sensor 1) P.13A-143, DTC P0134 – Heated Oxygen Sensor Circuit No Activity Detected (sensor 1) P.13A-146.



STEP 4. Using scan tool MB991502, check data list item 11: Heated Oxygen Sensor (front).

(1) Start the engine and run at idle.
(2) Set scan tool MB991502 to the data reading mode for item 11, Heated Oxygen Sensor (front).
(3) Keep the engine speed at 2,000 r/min.
- 0 – 0.4 and 0.6 – 1.0 volt should alternate 15 times or more within 10 seconds.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 5.
NO : Replace the heated oxygen sensor (front). Then go to Step 7.

STEP 5. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 3 – Catalytic Converter Monitor P.13A-5.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0421 is output?

YES : Replace the catalytic converter. Then go to Step 6.
NO : The inspection is complete.

STEP 6. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 3 – Catalytic Converter Monitor P.13A-5.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0421 is output?

YES : Replace the ECM or PCM. Then go to Step 7.
NO : The inspection is complete.

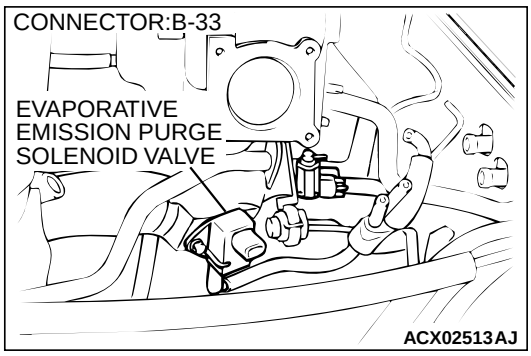
STEP 7. Test the OBD-II drive cycle.

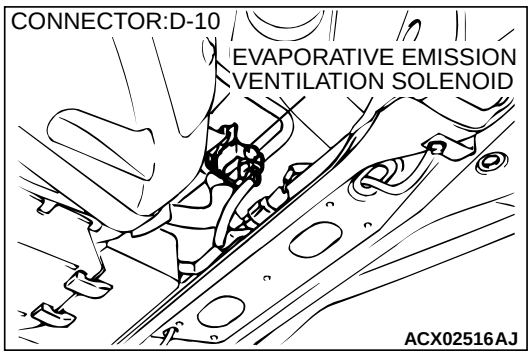
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 3 – Catalytic Converter Monitor P.13A-5.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0421 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0441: Evaporative Emission Control System Incorrect Purge Flow





TECHNICAL DESCRIPTION

- ECM <M/T> or PCM <A/T> detects stuck open of evaporative emission purge solenoid valve and stuck close of evaporative emission ventilation solenoid valve by pressure change in fuel tank.
- Stuck open of evaporative emission purge solenoid valve is judged through monitoring leak of evaporative emission control system.
- Stuck close of evaporative emission ventilation solenoid valve is judged after 20 seconds of end of monitoring leak of evaporative emission control system, or of usual operation of evaporative emission purge solenoid from ON to OFF.

DTC SET CONDITIONS

Check Conditions

- ON duty cycle of the evaporative emission purge solenoid is 0 percent.
- 20 seconds have elapsed from the time the duty cycle of the evaporative emission purge solenoid has turned to 0 percent.

Judgment Criteria

- The pressure in the fuel tank is –2 kPa (0.29 psi) or less for 0.1 second.

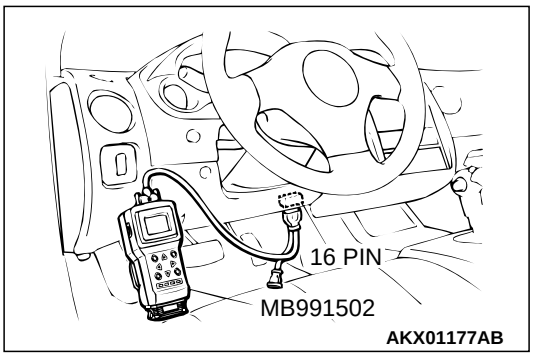
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Evaporative emission purge solenoid failed.
- Evaporative emission ventilation solenoid failed.
- Choking up of hose between evaporative emission canister and evaporative emission ventilation solenoid.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



STEP1. Using scan tool MB991502, check actuator test item 08: Evaporative Emission Purge Solenoid.

⚠ CAUTION

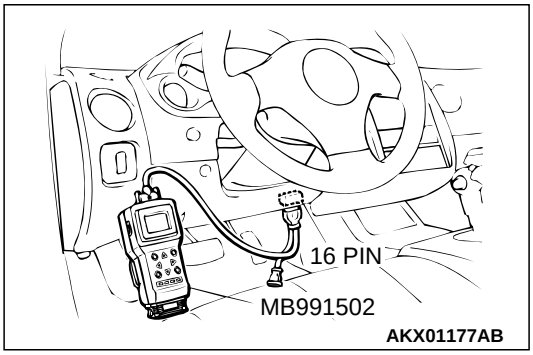
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the actuator test mode for item 08, Evaporative emission purge solenoid.
- An operation sound should be heard and vibration should be felt when the evaporative emission purge solenoid is operated.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the solenoid operating properly?

YES : Go to Step 2.
NO : Replace the evaporative emission purge solenoid. Then go to Step 4.



STEP 2. Using scan tool MB991502, check actuator test item 29: Evaporative Emission Ventilation Solenoid.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991502 to the actuator test mode for item 29, Evaporative emission ventilation solenoid.
- An operation sound should be heard and vibration should be felt when the evaporative emission ventilation solenoid is operated.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the solenoid operating properly?

YES : Go to Step 3.
NO : Replace the evaporative emission ventilation solenoid. Then go to Step 4.

STEP 3. Check for clogging in the vent hose and air filter

Q: Are there any clogs?

YES : Repair or replace it. Then go to Step 4.
NO : Refer to, DTC P0451 – Evaporative Emission Control System Pressure Sensor Range/Performance P.13A-299, DTC P0452 – Evaporative Emission Control System Pressure Sensor Low Input P.13A-316, DTC P0453 – Evaporative Emission Control System Pressure Sensor High Input P.13A-332.

STEP 4. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 1 – Evaporative Emission Control System Leak Monitor P.13A-5.
(2) Read the diagnostic trouble code.

Q: Is diagnostic trouble code P0441 set?

YES : Retry the troubleshooting.
NO : This diagnosis is complete.

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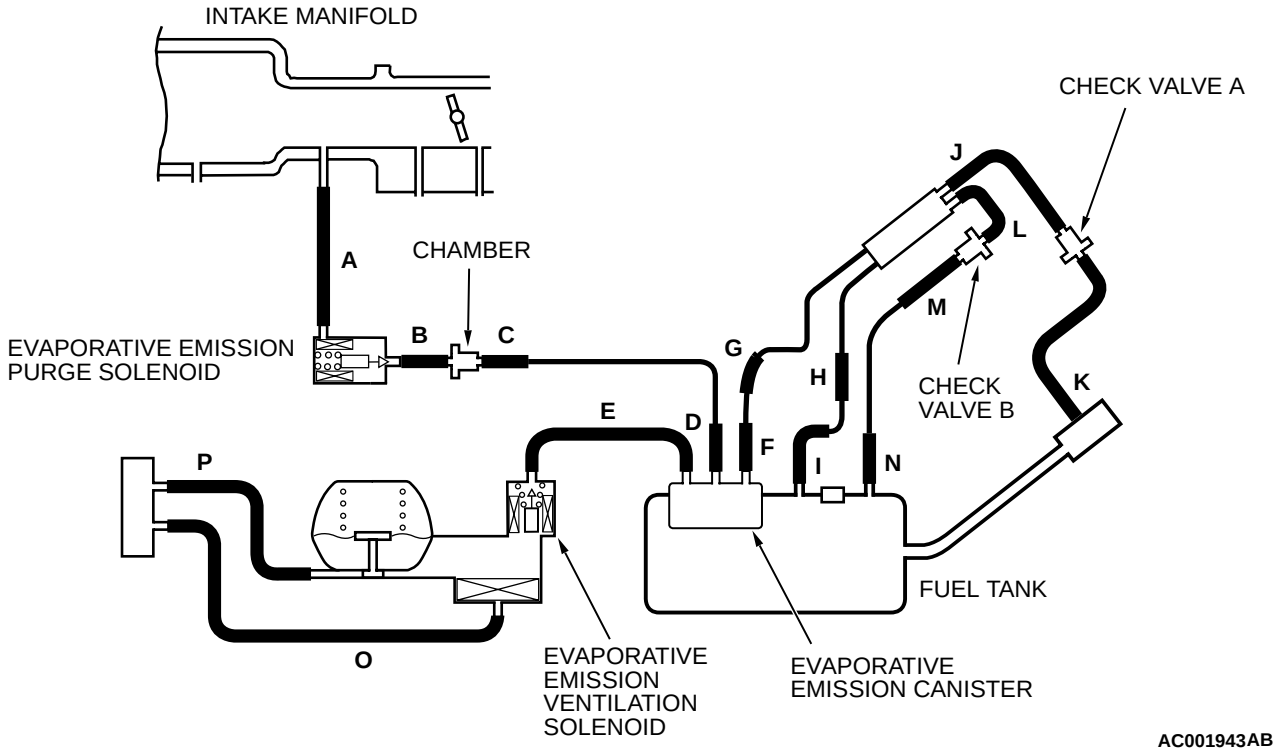
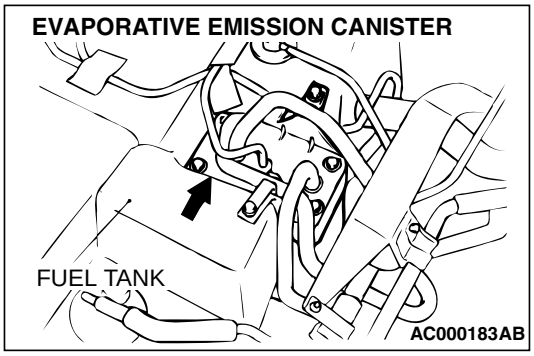
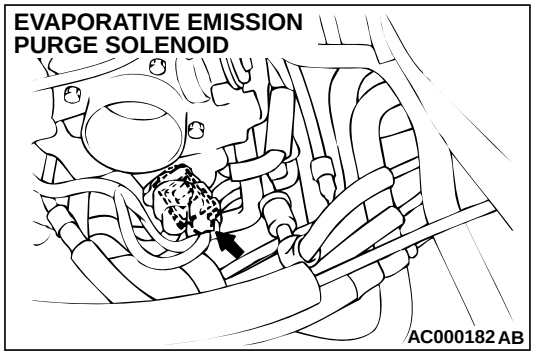
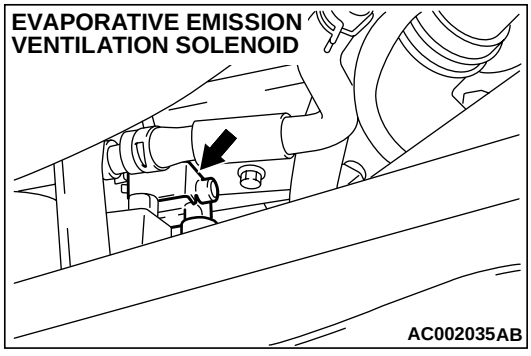
DTC P0442: Evaporative Emission Control System Leak Detected (Small Leak)

SYSTEM DIAGRAM









TECHNICAL DESCRIPTION

- To judge if there is leak in the fuel system, ECM <M/T> or PCM <A/T> measure the change of the pressure inside the fuel tank.
- The ECM <M/T> or PCM <A/T> turns on the evaporative emission ventilation solenoid to shot off the evaporative emission canister outlet port.

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- Then the evaporative emission purge solenoid is driven to set the fuel system into a negative pressure.
- When the fuel system develops a vacuum of 2 kPa (0.29 psi), the evaporative emission purge solenoid is turned "off" and the fuel system vacuum is maintained at 2 kPa (0.29 psi).
- The ECM <M/T> or PCM <A/T> determines if there is leak in the fuel system by measuring the change of vacuum inside the fuel tank.
- The test is stopped when fuel vapor pressure is judged as too high.

DTC SET CONDITIONS

Remaining fuel amount is 15 – 40 percent (fuel level sensor output voltage is 1.4 – 2.4 volts)

Test Conditions A: At Start up
- Intake air temperature is 36°C (97°F) or less when the engine is started.
- The engine coolant temperature 36°C (97°F) or less when the engine is started.

Test Conditions B: For Test to Run
- The fuel temperature is 36°C (97°F) or less.
- With in 800 seconds after the engine is started.
- Engine coolant temperature is higher than 60°C (140°F).
- Power steering pressure switch: "OFF"
- Barometric pressure is above 76 kPa (11 psi).
- Fuel tank differential pressure sensor output voltage is 1 to 4 volts.
- Vehicle speed is 20 km/h (12.4 mph) or more.

Test Conditions C: For Test to Stop
- Intake air temperature is less than –10°C (14°F).
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the pressure rises higher 451 Pa (0.065 psi).
- The pressure fluctuation width is higher than 647 Pa (0.094 psi).

Judgment Criteria
- Internal pressure of the fuel tank has changed more than 785 Pa (0.114 psi) in 20 seconds after the tank and vapor line were closed.

NOTE: The monitoring time depends on the fuel level and the temperature in the fuel tank (75 – 125 seconds).

DTC SET CONDITIONS

Remaining fuel amount is 40 – 85 percent (fuel level sensor output voltage is 2.4 – 3.7 volts)

Test Conditions A: At Start up
- Intake air temperature is 36°C (97°F) or less when the engine is started.
- The engine coolant temperature 36°C (97°F) or less when the engine is started.

Test Conditions B: For Test to Run
- The fuel temperature is 36°C (97°F) or less.
- Barometric pressure is above 76 kPa (11 psi).
- Fuel tank differential pressure sensor output voltage is 1 to 4 volts.

Test Conditions C: For Test to Stop
- Intake air temperature is less than –10°C (14°F).
- Engine coolant temperature is less than 20°C (68°F).
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the pressure rises higher 324 Pa (0.047 psi).

Judgment Criteria
- Internal pressure of the fuel tank has changed more than 1.9 kPa (0.28 psi) in 128 seconds after the tank and vapor line were closed.

NOTE: The monitoring time depends on the fuel level and the temperature in the fuel tank (10 – 14 minutes).

TROUBLESHOOTING HINTS

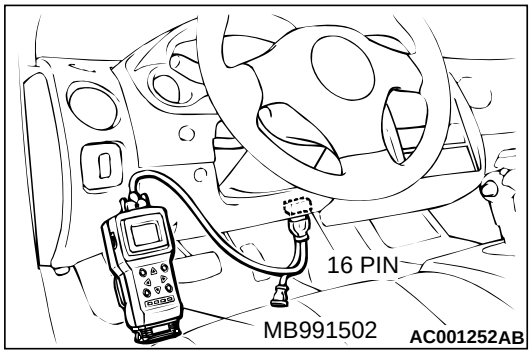
The most likely causes for this code to be set are:
- Loose fuel cap.
- Fuel cap relief pressure is incorrect.
- Evaporative emission canister seal is faulty.
- Fuel tank, purge line or vapor line seal failed.
- Evaporative emission ventilation solenoid failed.

OVERVIEW OF TROUBLESHOOTING
- To determine the cause of DTC P0442, a performance test is needed. The performance test uses a mechanical vacuum gauge and scan tool MB991502 set on the fuel tank differential pressure sensor (TANK PRES SNER 73.) The mechanical gauge reading is used to verify scan tool MB991502 reading. A comparison of the mechanical gauge to scan tool MB991502 determines the problem in the system.
- Prior to doing the performance test, several simple inspections are needed to exclude some possibilities of the symptom.

DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check evaporative emission system monitor test.



⚠ CAUTION
- **To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.**
- **With this monitor, the ECM <M/T> or PCM <A/T> automatically increases the engine speed to 1,600 r/min or more. Check that the transaxle is set to "neutral" <M/T> or "P" <A/T> position.**

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTCs using the scan tool MB991502.
(4) Check that the fuel cap is securely closed. (Tighten until three clicks are heard.)
(5) Start the engine.
(6) Select "System Test," and press the "YES" key.
(7) Select "Evap Leak Mon," and press the "YES" key.
(8) During the monitor, keep the accelerator pedal at the idling position.

NOTE: If the engine speed does not reach 2,000 r/min during the monitor test, adjustment of the Speed Adjusting Screw may be needed. Refer to P.13A-577. And adjust to the standard value.

(9) Keep the engine speed and engine load within the specified range. When the monitor test starts, the "In Progress" item on scan tool MB991502 will change from "NO" to "YES."
(10) Turn the ignition switch to the "LOCK" (OFF) position, and disconnect scan tool MB991502.

Q: What is displayed on the scan tool MB991502?

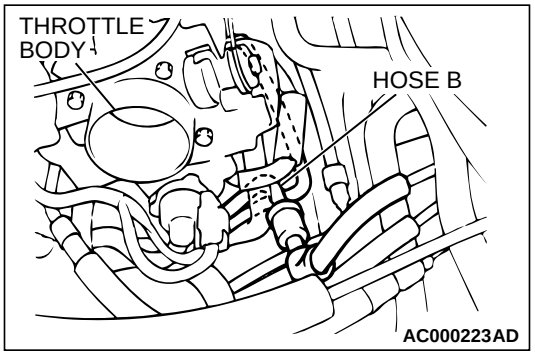
"Evap Leak Mon. Completed Test Passed" : The evaporative emission system is working properly at this time. Explain to customer that improperly tightened fuel cap can cause MIL to turn on, and return the vehicle.

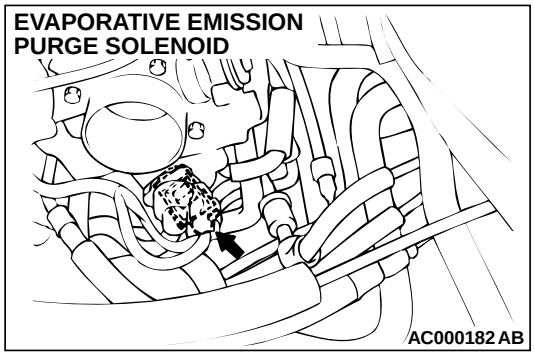
"Evap Leak Mon. Completed. Test Failed and DTCs Set" : A malfunction has been detected during the monitor test. Go to Step 2.

"Evap Lead Mon. discontinued. Retest again from the first" : The monitor was discontinued for a certain reason (vehicle speed input from computer, engine speed and engine load deviating from specified range). Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the monitoring from the Step 1.

STEP 2. Check evaporative emission purge solenoid for leaks.

(1) Remove the battery.
(2) Remove the air intake hose. (Refer to GROUP 15, Air Cleaner P.15-6.)
(3) Disconnect hose B from the evaporative emission purge solenoid side, and connect a hand vacuum pump to the nipple of the evaporative emission purge solenoid.
(4) Apply a pressure on the hand vacuum pump, and confirm that air is maintained.
(5) Disconnect the hand vacuum pump, and connect hose B to the evaporative emission purge solenoid.



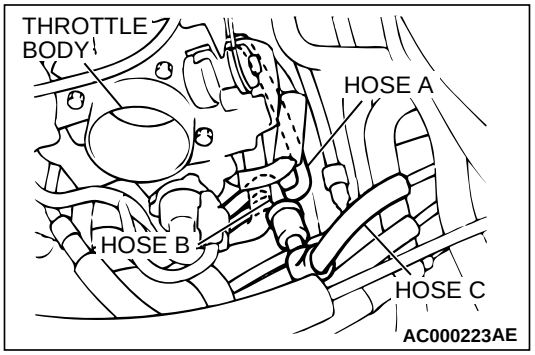


Q: Is the evaporative emission purge solenoid in good condition?

YES : Go to Step 3.
NO : Replace the evaporative emission purge solenoid. Then go to Step 18.

STEP 3. Check for leaks in the evaporator line hose A to hose C.

The leakage test with a hand vacuum pump on each hose from hose A to hose C.

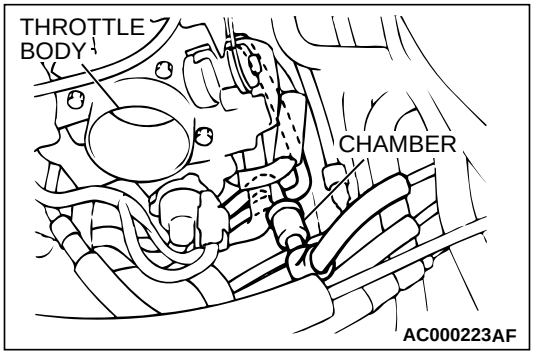


Q: Are the hoses in good condition?

YES : Go to Step 4.
NO : Replace the inferior hose. Then go to Step 18.

STEP 4. Check for leaks in the chamber.

(1) Connect a hand vacuum pump to the nipple.
(2) Plug the other nipple.
(3) Apply vacuum with the hand vacuum pump, and confirm that the applied vacuum does not fluctuate.



Q: Is the chamber in good condition?

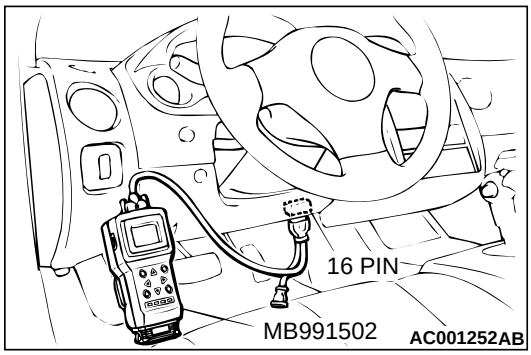
YES : Go to Step 5.
NO : Replace the chamber. Then go to Step 18.

TSB Revision

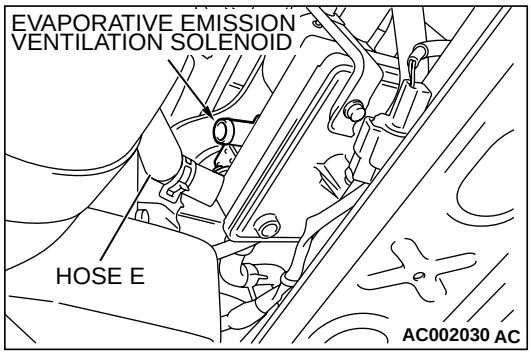
STEP 5. Check the evaporative emission ventilation solenoid using scan tool MB991502. (Actuator test item 29)

⚠ CAUTION

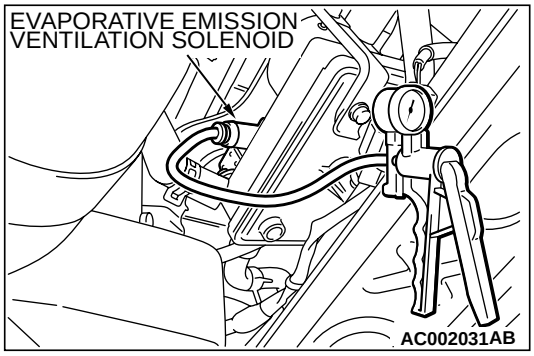
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.



(1) Connect scan tool MB991502 to the data link connector.



(2) Disconnect the hose E from the evaporative emission ventilation solenoid side.

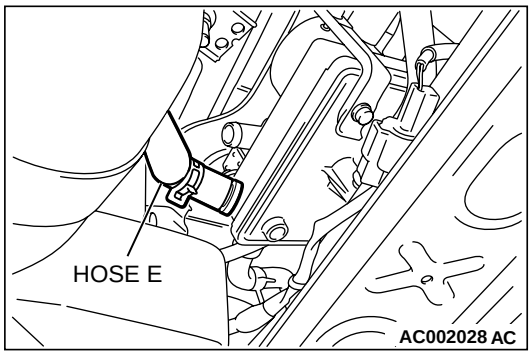


(3) Connect the hand vacuum pump to the nipple of the evaporative emission ventilation solenoid from which the hoses have been disconnected.
(4) Turn the ignition switch to the "ON" position.
(5) Set scan tool MB991502 to actuator test mode for item 29: Evaporative Emission Ventilation Solenoid. When the evaporative emission ventilation solenoid is operated, apply a pressure on the hand vacuum pump and confirm that air is maintained.
(6) Turn the ignition switch to the "LOCK" (OFF) position, and disconnect scan tool MB991502.
(7) Disconnect the hand vacuum pump, and connect hose E to the evaporative emission canister.

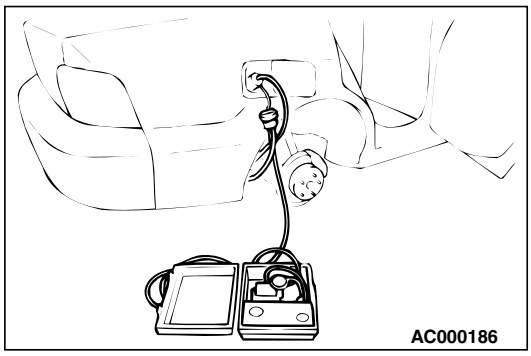
Q: Is the evaporative emission ventilation solenoid in good condition?

YES : Go to Step 6.
NO : Replace the evaporative emission ventilation solenoid. Then go to Step 18.

STEP 6. Pressure test for evaporator line from hose D to hose N.



(1) Remove the module bracket mounting bolts, and disconnect hose E from the evaporative emission ventilation solenoid side, and plug the hoses from which the hoses have been disconnected.
(2) Confirm that the evaporative emission system pressure pump (Miller number 6872A) is operating properly. Perform the self-test as described in the manufacturer's instructions.



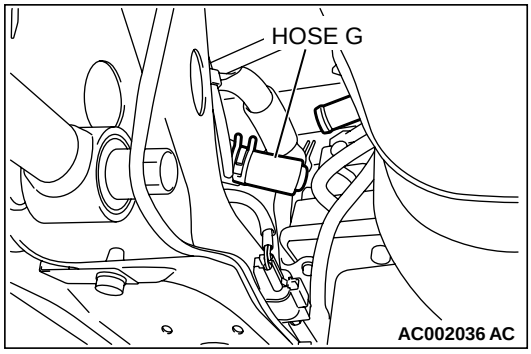
(3) Connect an evaporative emission system pressure pump to the fuel filler neck.
(4) Pressure test the system to determine whether any leaks are present.

NOTE: "Pressure test" in this procedure refers to the I/M240 Simulation Test (8 simple steps) described in the evaporative emission system pressure pump (Miller number 6872A) manufacturer's instructions located in the lid of the pump box.

Q: Are the evaporator line in good condition?

YES : Go to Step 17.
NO : Go to Step 7.

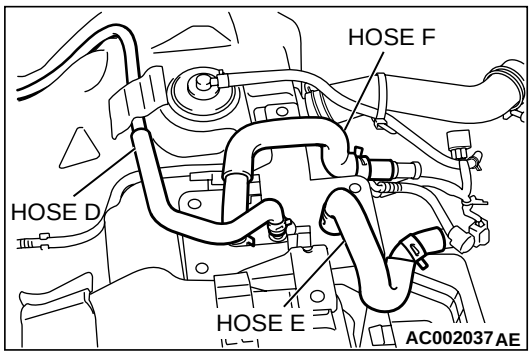
STEP 7. Pressure test for evaporator line from hose G to hose N.



(1) Disconnect hose G from the evaporative emission canister side, and plug the hose from which the pipes have been disconnected.
(2) Perform the pressure test again.

Q: Are the evaporator line in good condition?

YES : Go to Step 8.
NO : Go to Step 10.



STEP 8. Check for leaks in the evaporator line hose D to hose F.

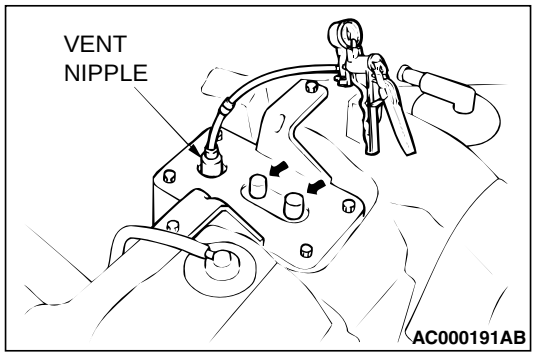
(1) Remove the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.)

(2) The leakage test with a hand vacuum pump on each hose from hose D to hose F.

Q: Are the hoses in good condition?

YES : Go to Step 9.

NO : Replace that hose, reinstall the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 18.



STEP 9. Check for leaks in the evaporative emission canister.

(1) Connect a hand vacuum pump to the vent nipple of the evaporative emission canister.

(2) Plug the other two nipples or loop a hose between the other nipples.

(3) Apply a vacuum with the hand vacuum pump, and confirm that the applied vacuum does not fluctuate.

Q: Is the evaporation emission canister in good condition?

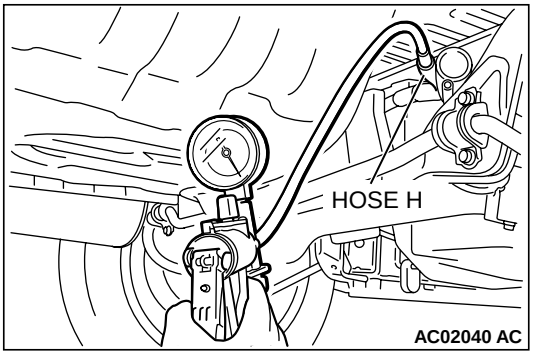
YES : Go to Step 18.

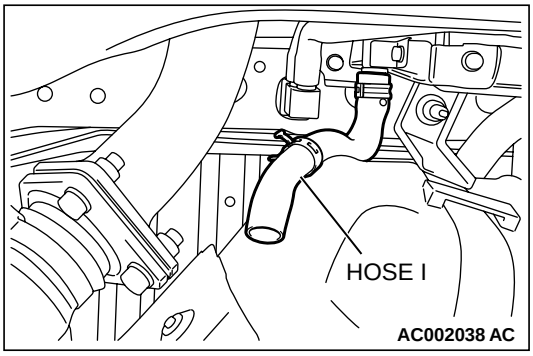
NO : Replace the evaporative emission canister (Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve P.17-110,) and reinstall the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 18.

STEP 10. Check for leaks in the evaporator line from hose H and hose I.

(1) Remove the fuel filler neck protector. (Refer to GROUP 13C, Fuel Tank P.13C-11.)

(2) Disconnect hose H at the liquid separator, and then connect a hand vacuum pump to the hose.





(3) Disconnect hose I at the fuel tank side, and then plug the hose.

(4) Apply vacuum with the hand vacuum pump, and confirm that the applied vacuum does not fluctuate.

Q: Are the evaporator line in good condition?

YES : Go to Step 11.

NO : Replace that hose, reinstall the fuel filler neck protector. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 18.

STEP11. Check for leaks in the evaporator line hose G, J, K, L and M.

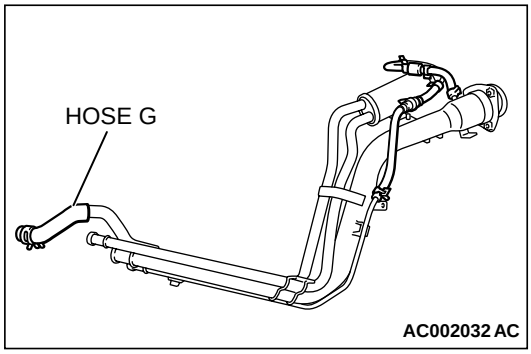
(1) Remove the fuel tank and fuel filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.)

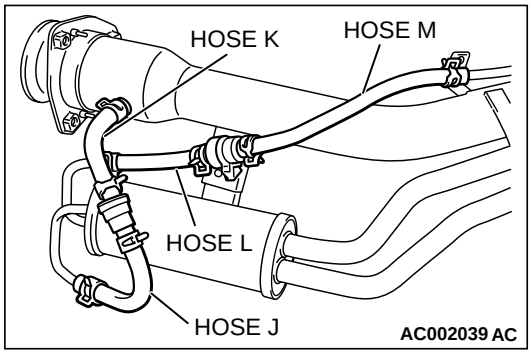
(2) The leakage test with a hand vacuum pump on each hose from hose G, J, K, L and M.

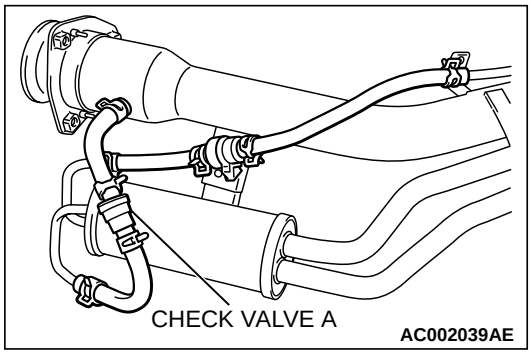
Q: Are the hoses in good condition?

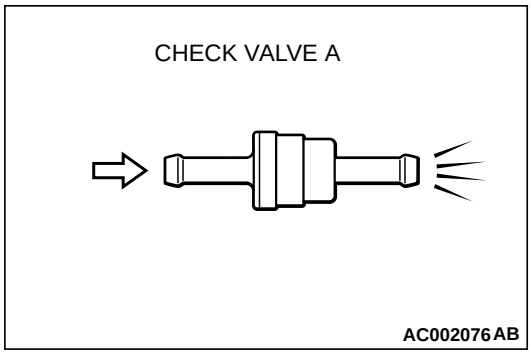
YES : Go to Step 12.

NO : Replace the hose, reinstall the fuel tank and fuel filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 18.







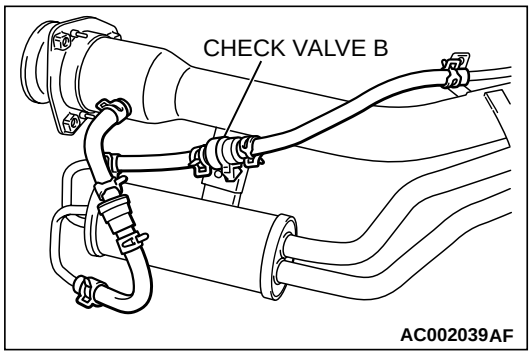


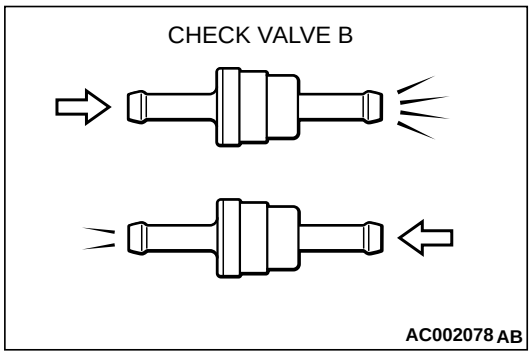
STEP 12. Check the check valve A.

(1) Only when you blow the check valve from the direction shown, it should pass air.
(2) When you blow the check valve, air should leak from the check valve body.

Q: Is the check valve A in good condition?

YES : Go to Step 13.
NO : Replace the check valve A, reinstall the fuel tank and fuel filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 18.



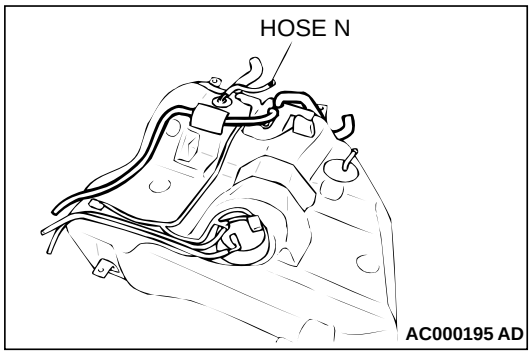


STEP 13. Check the check valve B.

(1) When you blow the check valve from the arrow direction shown above, it should pass more air.
(2) When you blow the check valve from the arrow direction shown below, it should pass less air.
(3) When you blow the check valve, on air should leak from the check valve body.

Q: Is the check valve B in good condition?

YES : Go to Step 14.
NO : Replace the check valve B, reinstall the fuel tank and fuel filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 18.



STEP 14. Check for leaks in the evaporator line hose N.

(1) The leakage test with a hand vacuum pump on each hose from hose N.

Q: Is the hose in good condition?

YES : Go to Step 15.

NO : Replace the hose, reinstall the fuel tank and fuel filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 18.

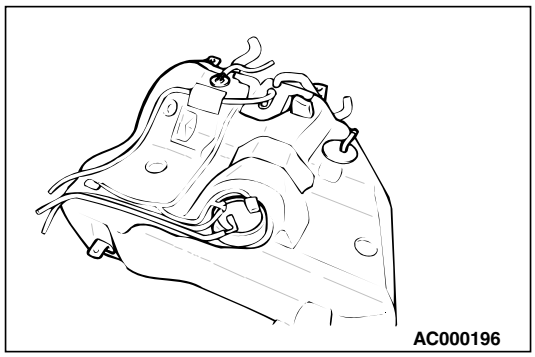
STEP 15. Visually check for cracks in the fuel filler neck assembly.

Visually check for cracks in the fuel filler neck assembly.

Q: Is the fuel filler neck assembly in good condition?

YES : Go to Step 16.

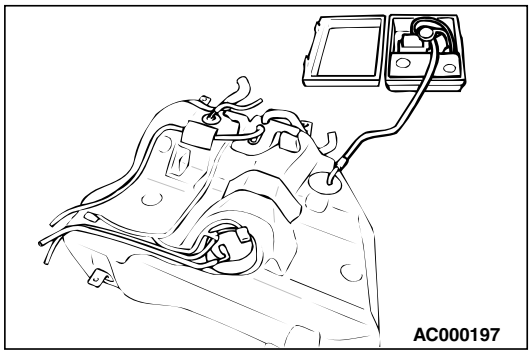
NO : Replace the fuel filler neck assembly, reinstall the fuel tank and fuel filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 18.



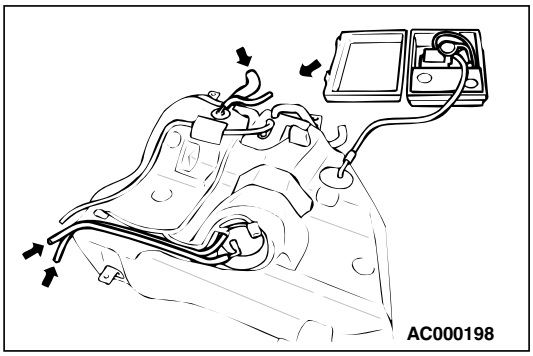
STEP 16. Check for leaks in the fuel tank.

(1) Visually check for cracks and leaks, etc.

NOTE: Carefully check the fuel pump assembly and the inner pressure sensor installation section in the fuel tank.



(2) Connect an evaporative emission system pressure pump to the leveling valve nipple.



(3) Plug the filler hose, feed pipe, return pipe and rollover valve nipple connected to the fuel tank.

NOTE: If these items are not securely plugged here, the fuel could leak in the next step.

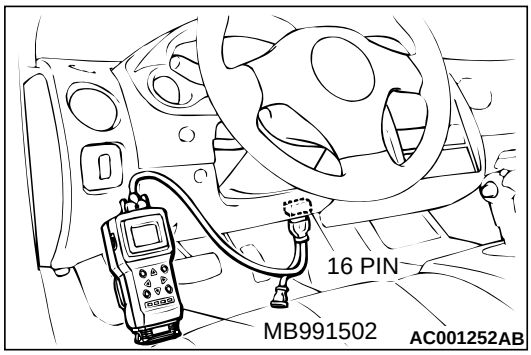
(4) Apply pressure with the evaporative emission system pressure pump.

(5) In the pressurized state, check for the leak by applying soap water, etc. to each section.

Q: Is the fuel tank in good condition?

YES : Go to Step 17.

NO : Replace the fuel tank, reinstall the fuel tank and fuel filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 18.



STEP 17. Using scan tool MB991502, check evaporative emission system monitor test.

⚠ CAUTION

- **To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.**
- **With this monitor, the ECM <M/T> or PCM <A/T> automatically increases the engine speed to 1,600 r/min or more. Check that the transaxle is set to "neutral" <M/T> or "P" <A/T> position.**

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTCs using scan tool MB991502.
(4) Check that the fuel cap is securely closed. (Tighten until three clicks are heard.)
(5) Start the engine.
(6) Select "System Test," and press the "YES" key.
(7) Select "Evap Leak Mon," and press the "YES" key.
(8) During the monitor, keep the accelerator pedal at the idling position.

NOTE: If the engine speed does not reach 2,000 r/min during the monitor test, adjustment of the Speed Adjusting Screw may be needed. Refer to P.13A-577. And adjust to the standard value.

(9) Keep the engine speed and engine load within the specified range. When the monitor test starts, the "In Progress" item on the scan tool MB991502 will change from "NO" to "YES."
(10) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991502.

Q: What is displayed on scan tool MB991502?

"Evap Leak Mon. Completed. Test Passed" : The evaporative emission system is working properly at this time. Then go to Step 18 .

"Evap Leak Mon. Completed. Test Failed and DTCs Set" : Replace the ECM <M/T> or PCM <A/T>. Then go to Step 18.

"Evap Lead Mon. discontinued. Retest again from the first" : The monitor was discontinued for a certain reason (vehicle speed input from ECM <M/T> or PCM <A/T>, engine speed and engine load deviating from specified range). Turn the ignition switch to the "LOCK" (OFF) position once, and recheck evaporative emission system monitor test.

STEP 18. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 1 - Evaporative Emission Control System Leak Monitor P.13A-5.
(2) Read the diagnostic trouble code.

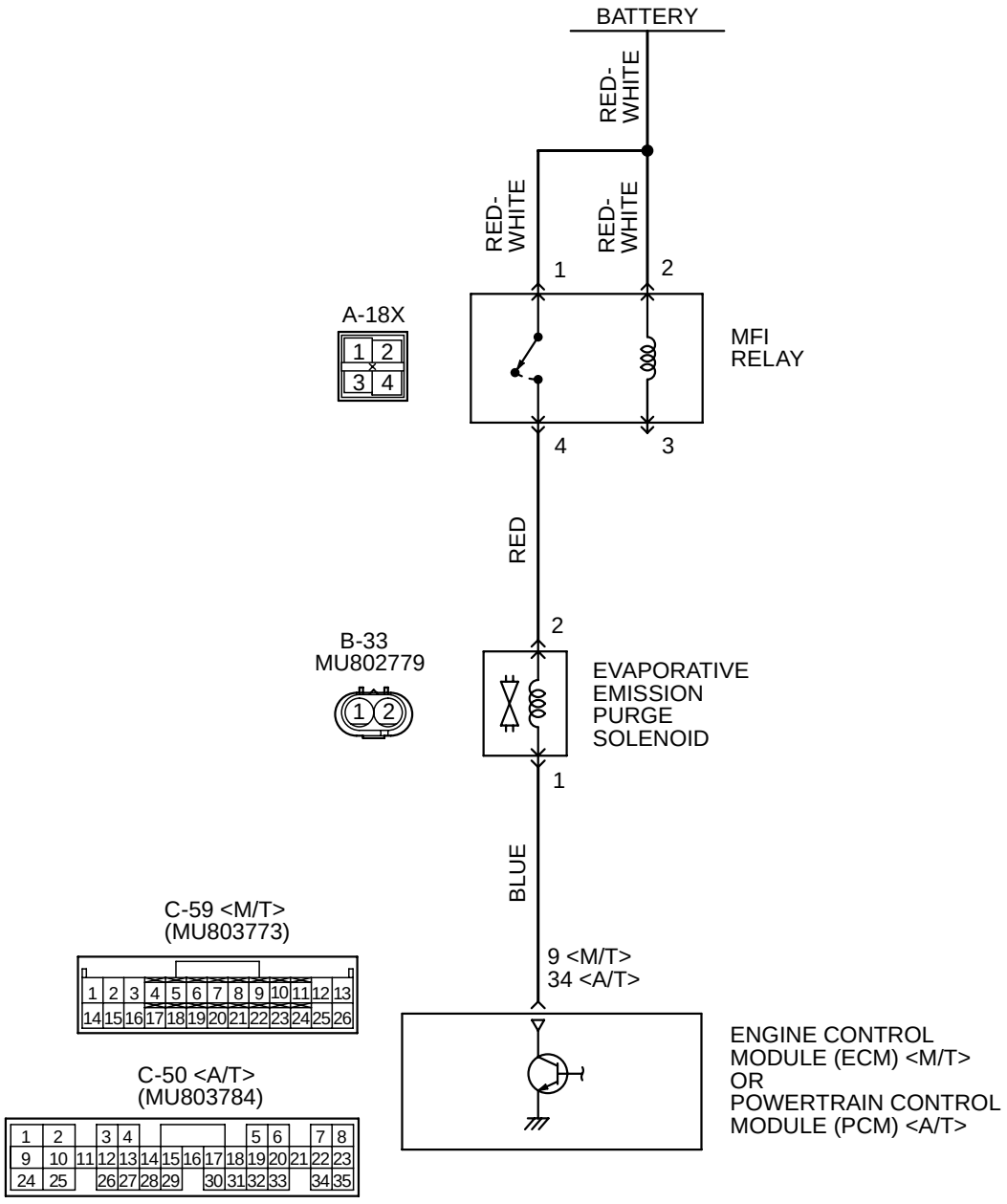
Q: Is diagnostic trouble code P0442 set?

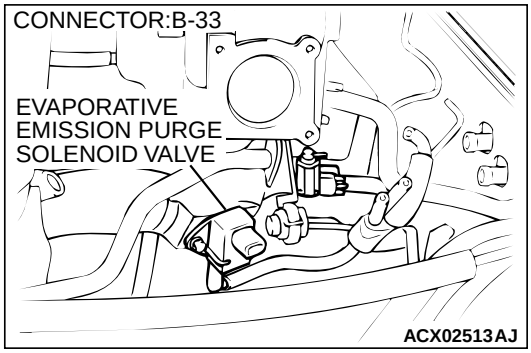
YES : Go to Step 1.
NO : This diagnosis is complete.

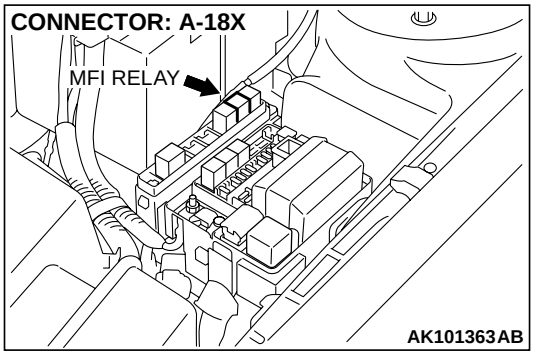
TSB Revision

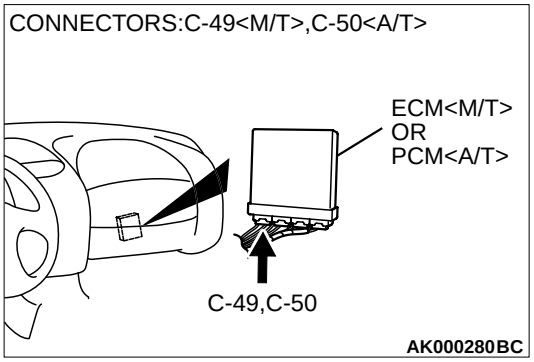
DTC P0443: Evaporative Emission Control System Purge Control Valve Circuit

Evaporative Emission Purge Solenoid Circuit









CIRCUIT OPERATION

- Power to the evaporative emission purge solenoid power is supplied from the MFI relay (terminal 4).
- The ECM <M/T> or PCM <A/T> controls ground evaporative emission purge solenoid by turning the power transistor in the ECM <M/T> or PCM <A/T> "ON" and "OFF".

TECHNICAL DESCRIPTION

- To judge if there is open circuit in the evaporative emission purge solenoid drive circuit, ECM <M/T> or PCM <A/T> measures the surge voltage of the evaporative emission purge solenoid coil.
- The ECM <M/T> or PCM <A/T> drives the evaporative emission purge solenoid. After the solenoid is turned off, the ECM <M/T> or PCM <A/T> will check if the solenoid coil produces a surge voltage of 2 V or more.

DTC SET CONDITIONS

Check Conditions

- Engine is being cranked.
- Battery positive voltage is at between 10 and 16 volts.

Judgment Criteria

- The evaporative emission purge solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 0.2 second.
- The ECM<M/T> or PCM<A/T> monitors for this condition once during the drive cycle.

Check Conditions

- Battery positive voltage is at between 10 and 16 volts.
- ON duty cycle of the evaporative emission purge solenoid is between 10 and 90 percent.
- ON duty cycle of the EGR solenoid is 0 percent.
- Evaporative emission ventilation solenoid is OFF.
- More than 1 second has elapsed after the above mentioned conditions have been met.

Judgment Criteria

- The evaporative emission purge solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 1 second. When the evaporative emission purge solenoid is turned OFF.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Evaporative emission purge solenoid failed.
- Open or shorted evaporative emission purge solenoid circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

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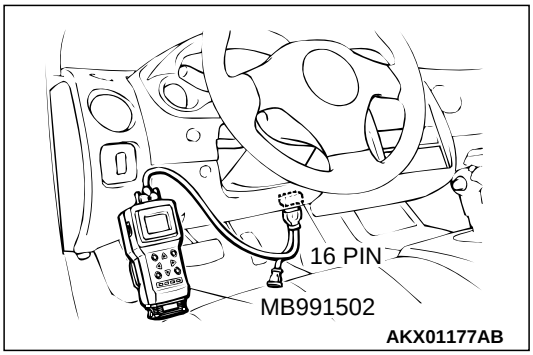
DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check actuator test item 08: Evaporative Emission Purge Solenoid.



⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

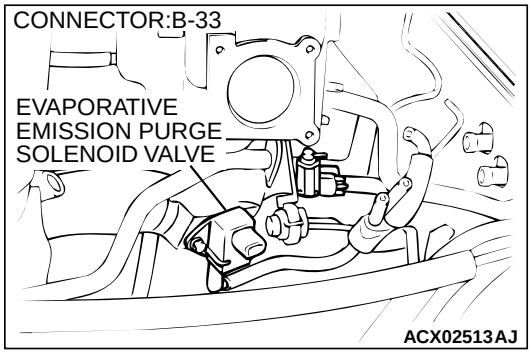
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the actuator test mode for item 08, Evaporative emission purge solenoid.
- An operation sound should be heard and vibration should be felt when the evaporative emission purge solenoid is operated.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the solenoid operating properly?

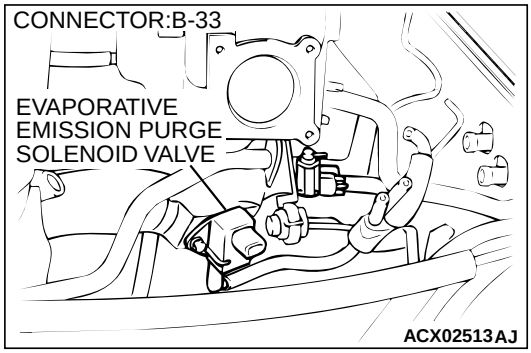
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Go to Step 2.

STEP 2. Check connector B-33 at the evaporative emission purge solenoid for damage.



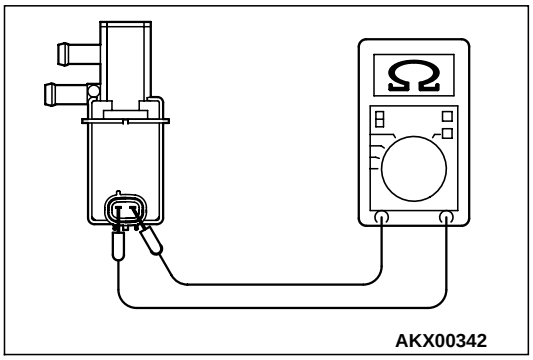
Q: Is the connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



STEP 3. Check the evaporative emission purge solenoid.

(1) Disconnect the evaporative emission purge solenoid connector B-33.



(2) Measure the resistance between evaporative emission purge solenoid side connector terminal 1 and 2.

Standard value: 30 – 34 Ω [at 20°C (68°F)]

Q: Is the resistance at the standard value?

YES : Go to Step 4.

NO : Replace the evaporative emission purge solenoid. Then go to Step 12.

STEP 4. Check the power supply voltage at evaporative emission purge solenoid harness side connector B-33.

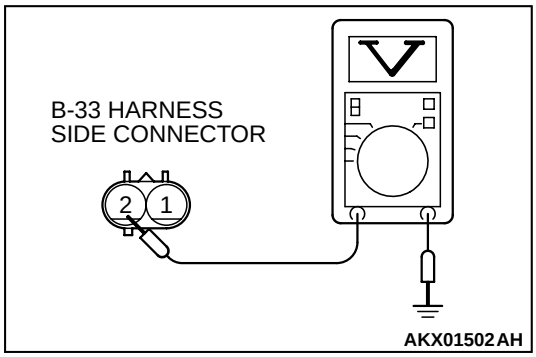
(1) Disconnect the connector B-33 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between terminal 2 and ground.

- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the voltage normal?

YES : Go to Step 6.

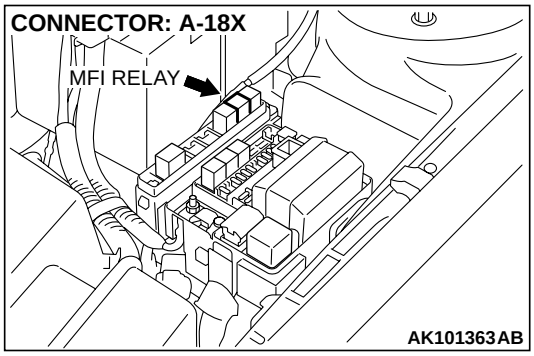
NO : Go to Step 5.

STEP 5. Check connector A-18X at MFI relay for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between MFI relay connector A-18X terminal 4 and evaporative emission purge solenoid connector B-33 terminal 2 because of open circuit or short circuit to ground. Then go to Step 12.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



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STEP 6. Check the power supply voltage at ECM connector C-49 <M/T> or PCM connector <A/T> C-50 by backprobing.

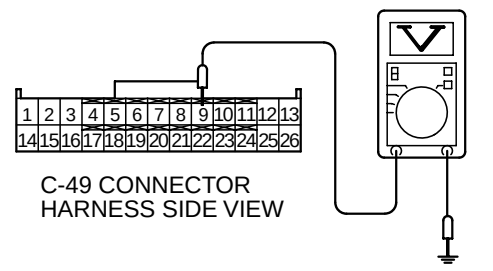
(1) Do not disconnect the connector C-49 <M/T> or C-50 <A/T>.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 9 <M/T> or 34 <A/T> and ground by backprobing.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 9.
NO : Go to Step 7.

<M/T>



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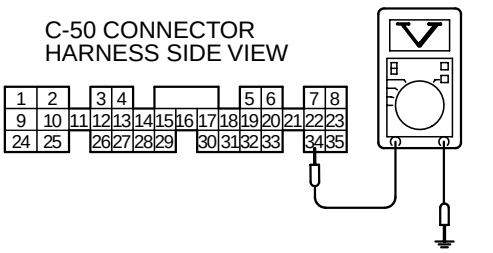
<A/T>



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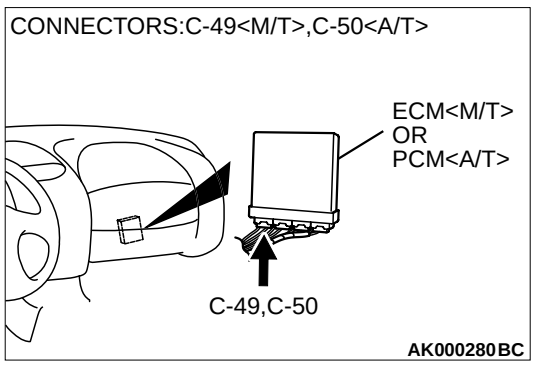
STEP 7. Check connector C-49 at ECM <M/T> or connector C-50 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 8.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



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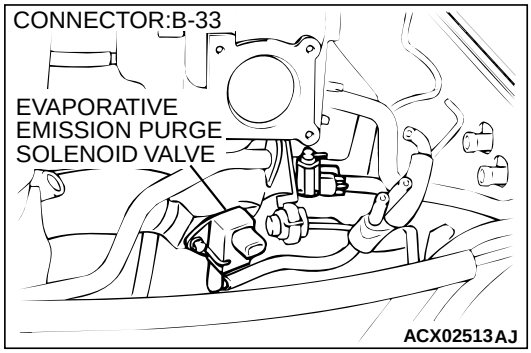
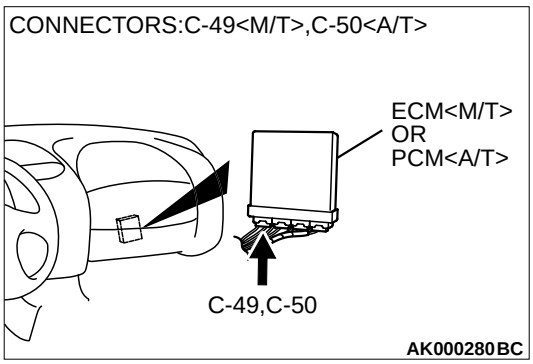
STEP 8. Check for open circuit and short circuit to ground between evaporative emission purge solenoid connector B-33 (terminal 1) and ECM connector C-49 (terminal 9) <M/T> or PCM connector C-50 (terminal 34) <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 12.

NO : Repair it. Then go to Step 12.



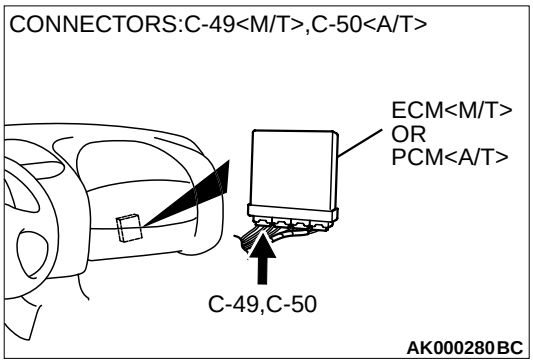


STEP 9. Check connector C-49 at ECM <M/T> or connector C-50 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

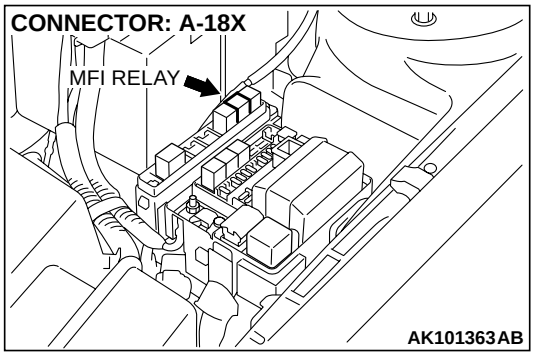


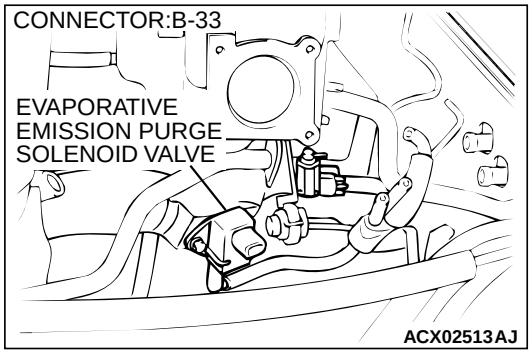
STEP 10. Check for harness damage between MFI relay connector A-18X (terminal 4) and evaporative emission purge solenoid connector B-33 (terminal 2).

Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair it. Then go to Step 12.



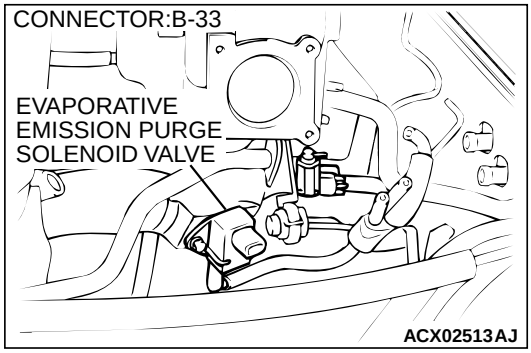


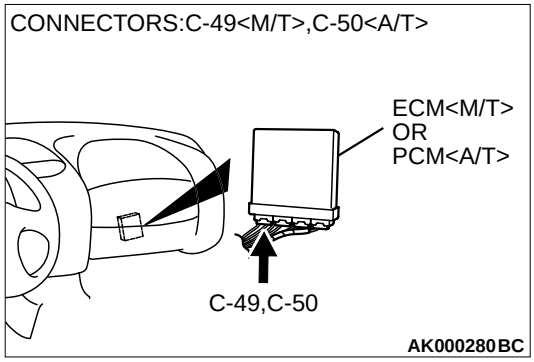
STEP 11. Check for harness damage between evaporative emission purge solenoid connector B-33 (terminal 1) and ECM connector C-49 (terminal 9) <M/T> or PCM connector C-50 (terminal 34) <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 12.

NO : Repair it. Then go to Step 12.





STEP 12. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.

(2) Check the diagnostic trouble code (DTC).

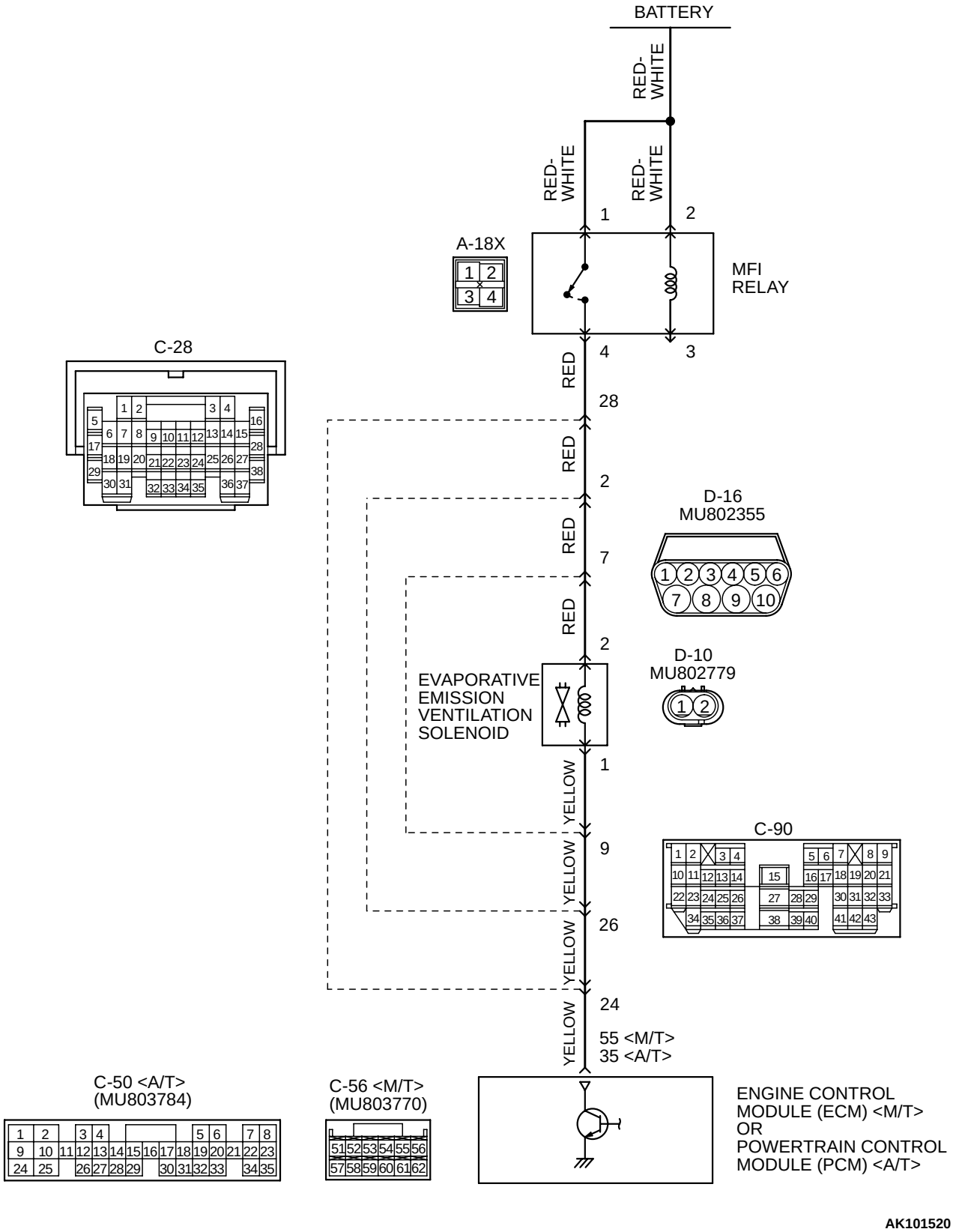
Q: Is the DTC P0443 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0446: Evaporative Emission Control System Vent Control Malfunction

Evaporative Emission Ventilation Solenoid Circuit



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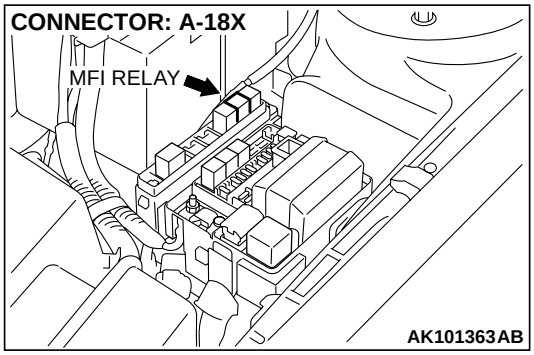

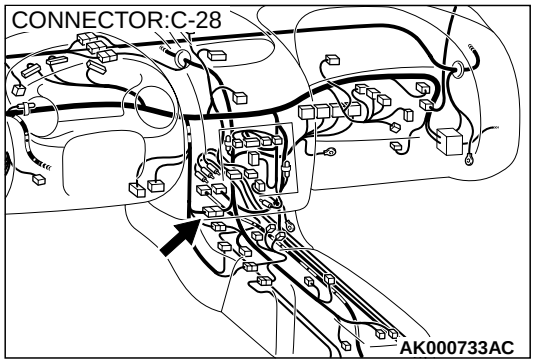

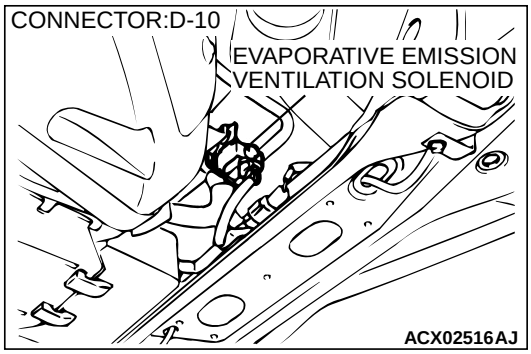

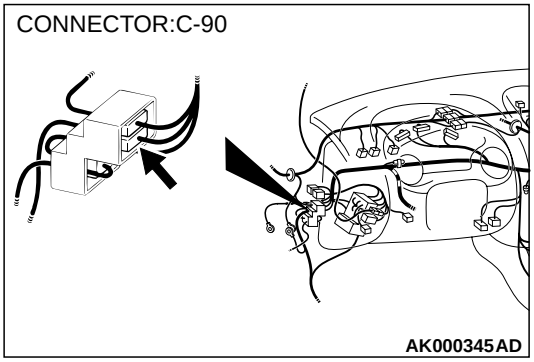

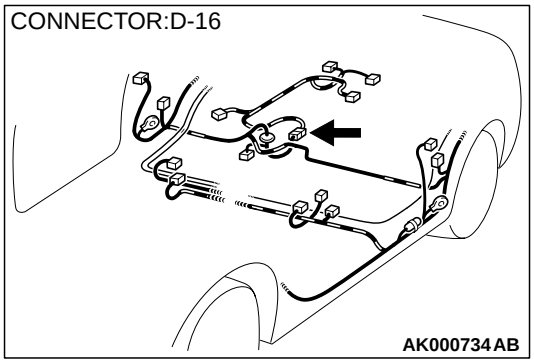

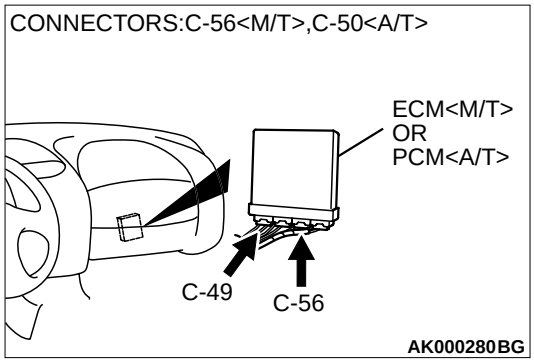

CIRCUIT OPERATION

- The evaporative emission ventilation solenoid power is supplied from the MFI relay (terminal 4).
- The ECM <M/T> or PCM <A/T> controls the evaporative emission ventilation solenoid ground by turning the power transistor in the ECM <M/T> or PCM <A/T> ON and OFF.

TECHNICAL DESCRIPTION

- To judge if there is open circuit in the evaporative emission ventilation solenoid drive circuit, ECM <M/T> or PCM <A/T> measures the surge voltage of the evaporative emission ventilation solenoid coil.
- The ECM <M/T> or PCM <A/T> drives the evaporative emission ventilation solenoid for 30 milliseconds. After the solenoid is turned off, the ECM <M/T> or PCM <A/T> will check if the solenoid coil produces a surge voltage of 2 V or more.

DTC SET CONDITIONS

Check Conditions

- Engine is being cranked.
- Battery positive voltage is at between 10 and 16 volts.

Judgment Criteria

- The evaporative emission ventilation solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 0.2 second.
- The ECM<M/T> or PCM<A/T> monitors for this condition once during the drive cycle.

Check Conditions

- Battery positive voltage is at between 10 and 16 volts.
- ON duty cycle the evaporative emission purge solenoid is 0 percent.
- ON duty cycle of the EGR solenoid is 0 percent.
- Evaporative emission ventilation solenoid is ON.

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- More than 1 second has elapsed after the above mentioned conditions have been met.

Judgment Criteria

- The evaporative emission ventilation solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 1 second. When the evaporative emission ventilation solenoid is turned OFF.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

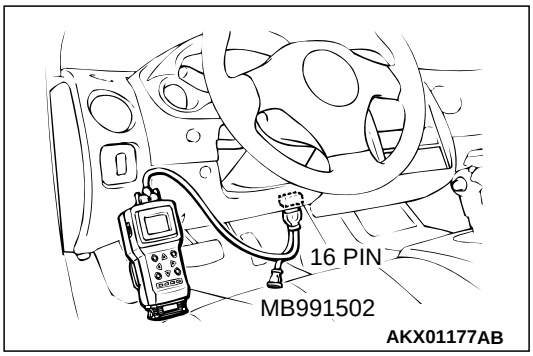
- Evaporative emission ventilation solenoid failed.
- Open or shorted evaporative emission ventilation solenoid circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check actuator test item 29: Evaporative Emission Ventilation Solenoid.



⚠ CAUTION

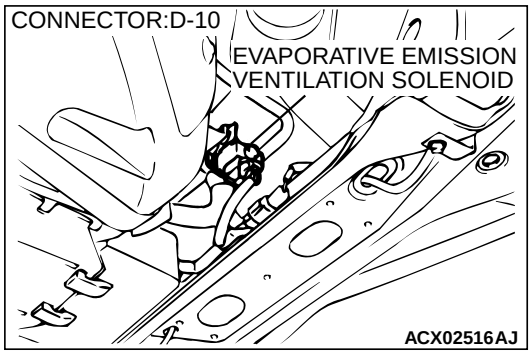
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the actuator test mode for item 29, Evaporative emission ventilation solenoid.
  - An operation sound should be heard and vibration should be felt when the evaporative emission ventilation solenoid is operated.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the solenoid operating properly?

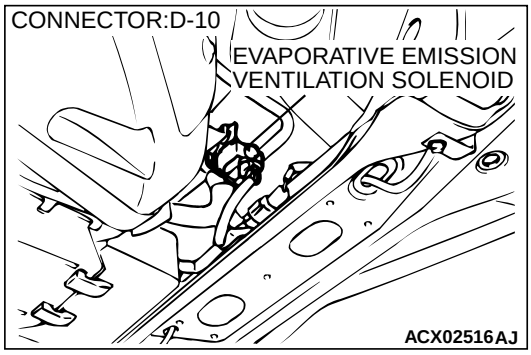
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Go to Step 2.

STEP 2. Check connector D-10 at the evaporative emission ventilation solenoid for damage.



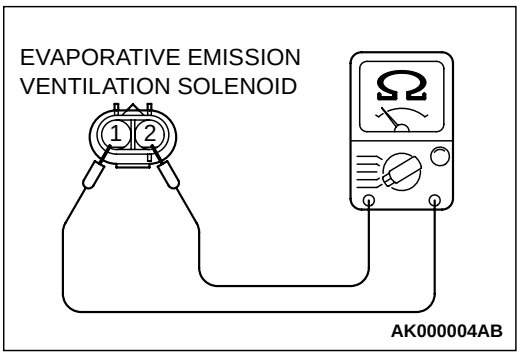
Q: Is the connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



STEP 3. Check the evaporative emission ventilation solenoid.

(1) Disconnect the evaporative emission ventilation solenoid connector D-10.



(2) Measure the resistance between evaporative emission ventilation solenoid side connector terminal 1 and 2.

Standard value: 17 – 21 Ω [at 20°C (68°F)]

Q: Is the resistance at the standard value?

YES : Go to Step 4.

NO : Replace the over vent valve module. Then go to Step 12.

STEP 4. Check the power supply voltage at evaporative emission ventilation solenoid harness side connector D-10.

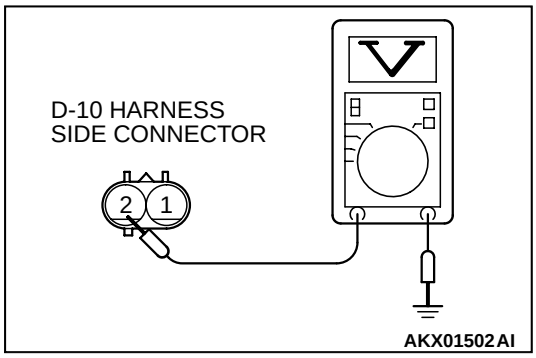
(1) Disconnect the connector D-10 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between terminal 2 and ground.

- Voltage should be battery positive voltage.

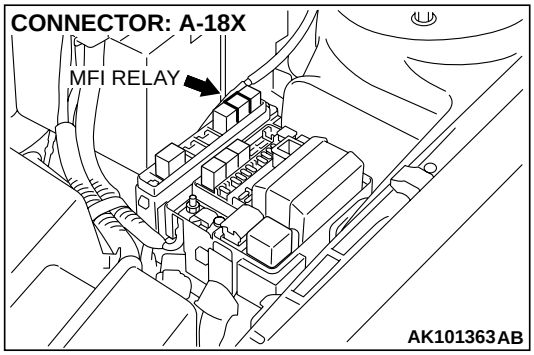
(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the voltage normal?

YES : Go to Step 6.

NO : Go to Step 5.



STEP 5. Check connector A-18X at MFI relay for damage.

Q: Is the connector in good condition?

YES : Check connectors D-16, C-90 and C-28 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connectors are in good condition, repair harness wire between MFI relay connector A-18X terminal 4 and evaporative emission ventilation solenoid connector D-10 terminal 2 because of open circuit or short circuit to ground. Then go to Step 12.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 6. Check the power supply voltage at ECM connector C-56 <M/T> or PCM connector C-50 <A/T> by backprobing.

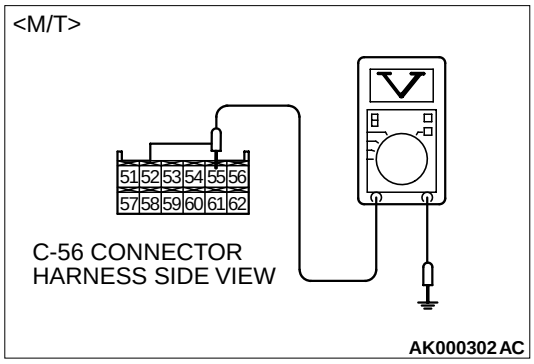
(1) Do not disconnect the connector C-56 <M/T> or C-50 <A/T>.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 55 <M/T> or 35 <A/T> and ground by backprobing.
- Voltage should be battery positive voltage.

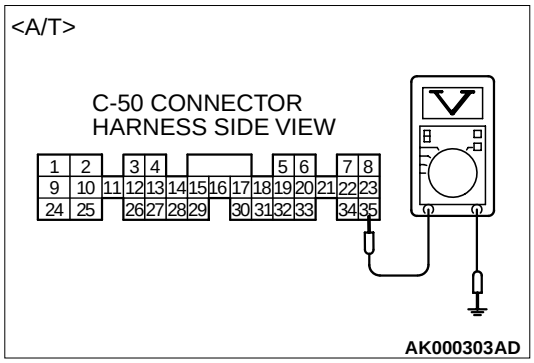
(4) Turn the ignition switch to the "LOCK" (OFF) position.

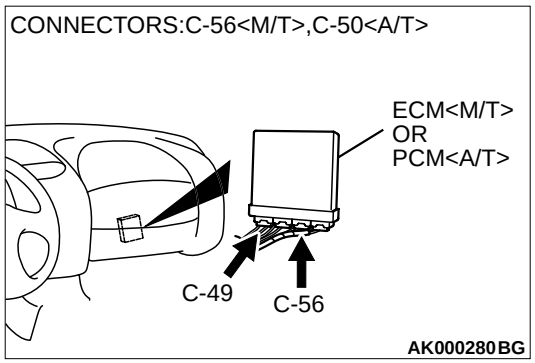
Q: Is the voltage normal?

YES : Go to Step 9.

NO : Go to Step 7.





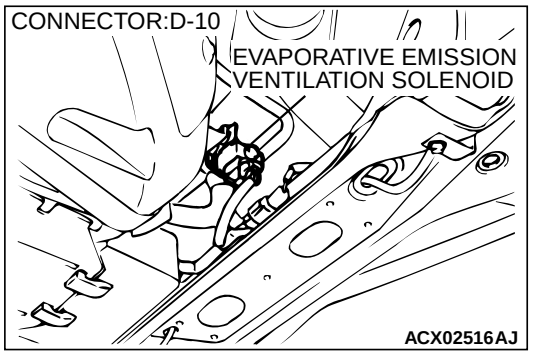


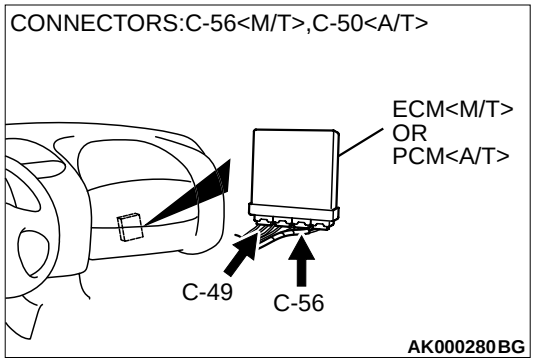
STEP 7. Check connector C-56 at ECM <M/T> or connector C-50 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.





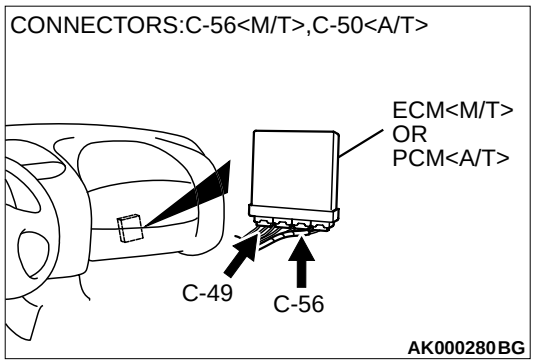
STEP 8. Check for open circuit and short circuit to ground between evaporative emission ventilation solenoid connector D-10 (terminal 1) and ECM connector C-56 (terminal 55) <M/T> or PCM connector C-50 (terminal 35) <A/T>.

NOTE: Check harness after checking intermediate connectors D-16, C-90 and C-28. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 12.

NO : Repair it. Then go to Step 12.

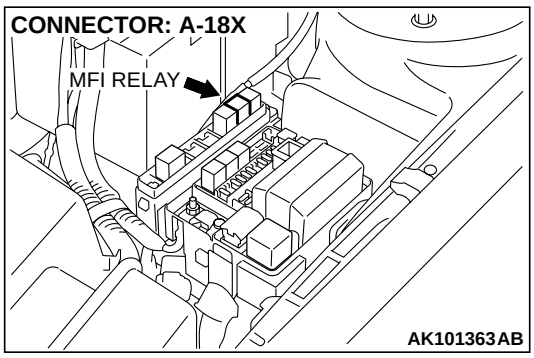


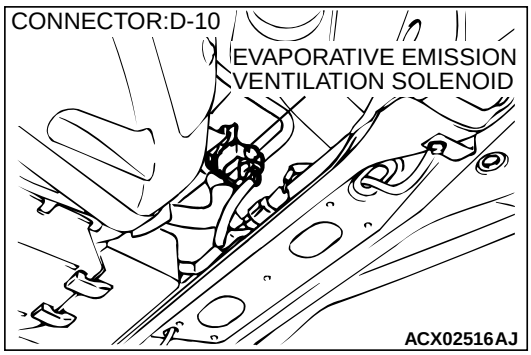
STEP 9. Check connector C-56 at ECM <M/T> or connector C-50 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.





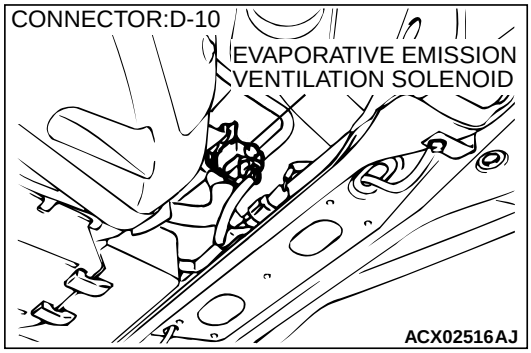
STEP 10. Check for harness damage between MFI relay connector A-18X (terminal 4) and evaporative emission ventilation solenoid connector D-10 (terminal 2).

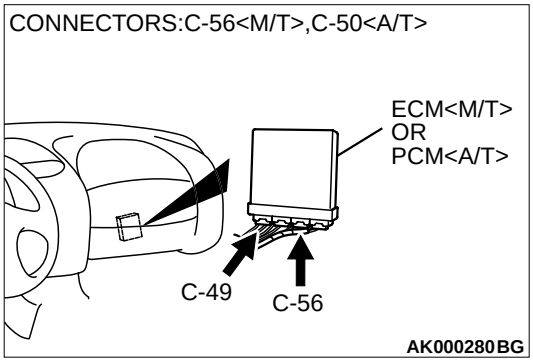
NOTE: Check harness after checking intermediate connectors D-16, C-90 and C-28. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair it. Then go to Step 12.





STEP 11. Check for harness damage between evaporative emission ventilation solenoid connector D-10 (terminal 1) and ECM connector C-56 (terminal 55) <M/T> or PCM connector C-50 (terminal 35) <A/T>.

NOTE: Check harness after checking intermediate connectors D-16, C-90 and C-28. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 12.
NO : Repair it. Then go to Step 12.

STEP 12. Test the OBD-II drive cycle.

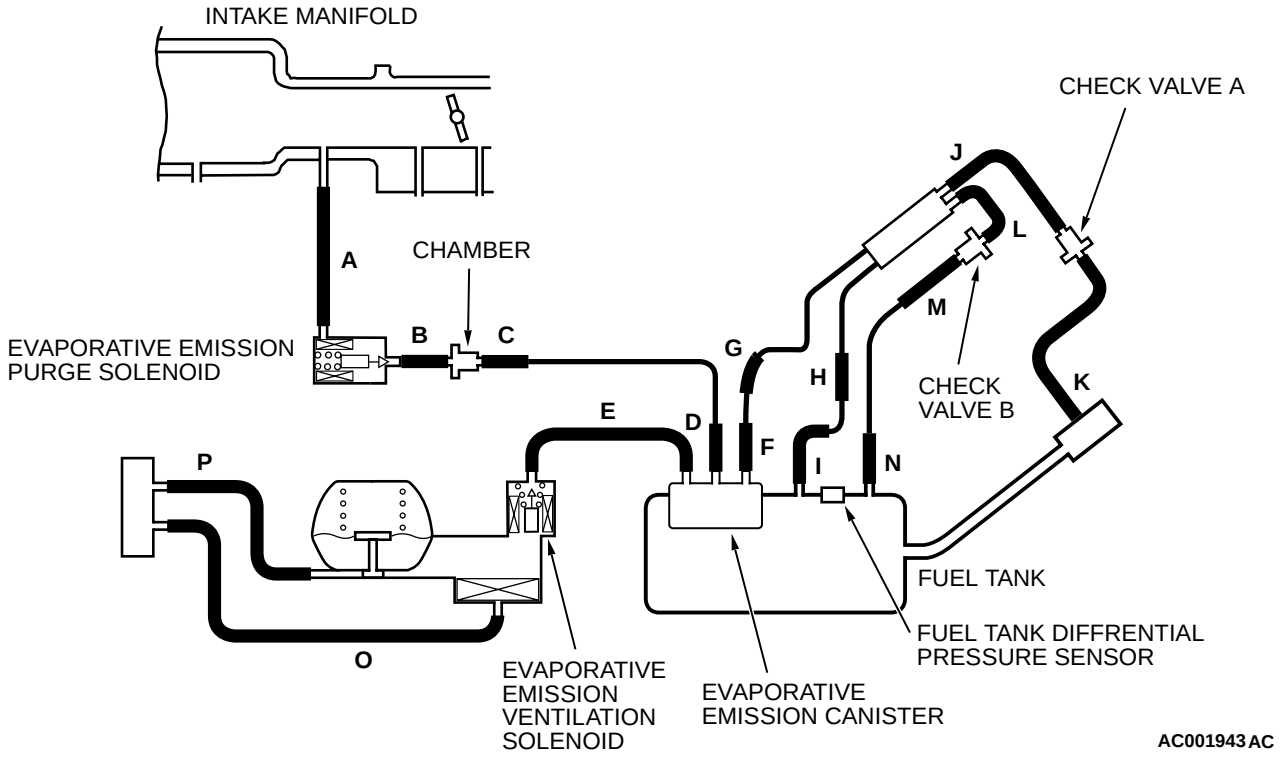
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0446 is output?

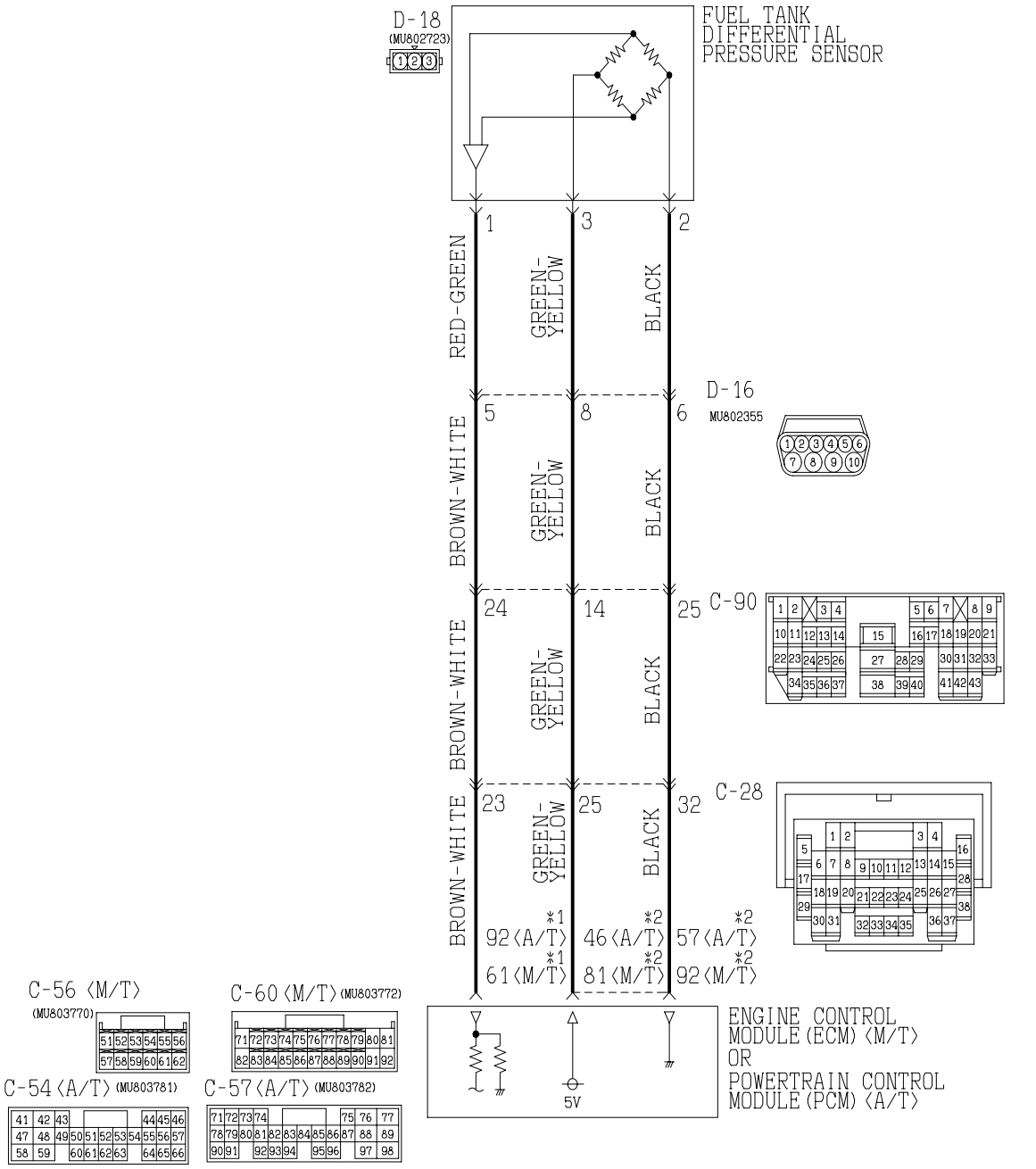
YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0451: Evaporative Emission Control System Pressure Sensor Range/Performance

SYSTEM DIAGRAM



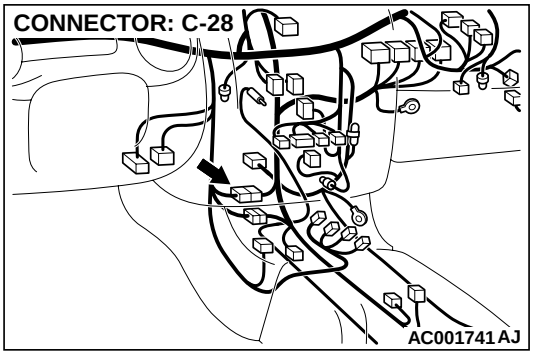
Fuel Tank Differential Pressure Sensor Circuit

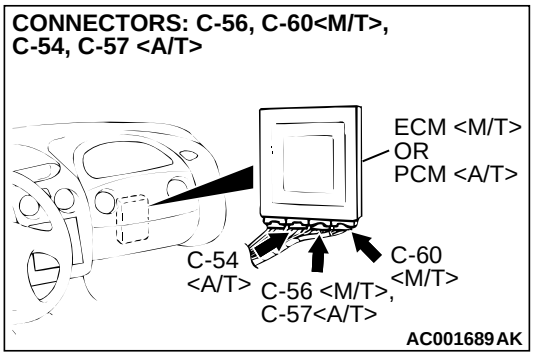


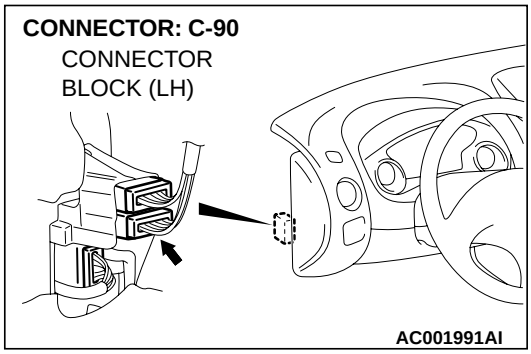
NOTE
*1:ECM connector C-56〈M/T〉or PCM connector C-57〈A/T〉
*2:ECM connector C-60〈M/T〉or PCM connector C-54〈A/T〉

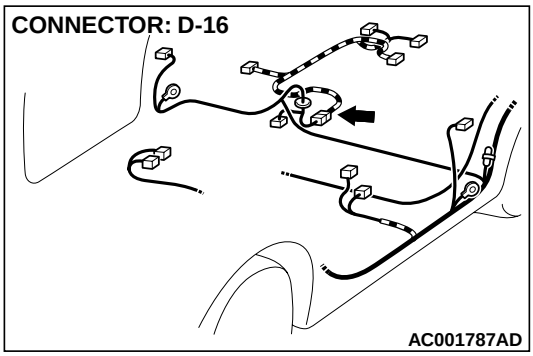
W2S18M01AA

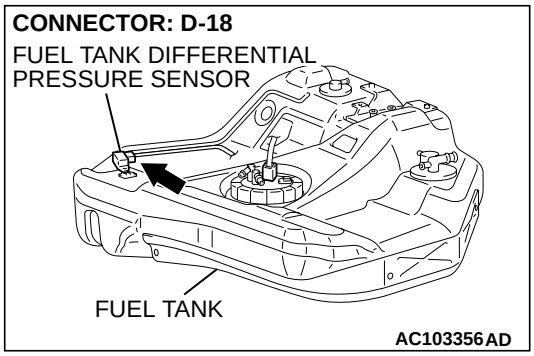
TSB Revision











CIRCUIT OPERATION

- A 5-volt voltage is supplied to the power terminal of the fuel tank differential pressure sensor (terminal 3) from the ECM (terminal 81) <M/T> or PCM (terminal 46) <A/T>. The ground terminal (terminal 2) is grounded with the ECM (terminal 92) <M/T> or PCM (terminal 57) <A/T>.
- A voltage proportional to the pressure in the fuel tank is sent from the output terminal of the fuel tank differential pressure sensor (terminal 1) to the ECM (terminal 61) <M/T> or PCM (terminal 92) <A/T>.

TECHNICAL DESCRIPTION

- To judge if the fuel tank differential pressure sensor is defective, the ECM <M/T> or PCM <A/T> monitors the fuel tank differential pressure sensor output voltage.
- Based on the test conditions and judgment criteria, the ECM <M/T> or PCM <A/T> judges if the fuel tank differential pressure sensor output voltage is normal.

DTC SET CONDITIONS

Test Conditions: Electrical noise

- Throttle valve is closed.
- Vehicle speed is 1.5 km/h (0.9 mph) or less.

Judgment Criteria

- The event that the output voltage from the fuel tank differential pressure sensor changes by 0.2 volts or more (i.e. sudden pressure fluctuation) is counted at least twenty times during one engine idling, and then consecutively eight times during normal driving condition.

NOTE: If the number of the sudden pressure fluctuation does not reach twenty during one engine idling, the counter will be reset to zero. If the ignition switch is turned off, it will be also reset to zero.

NOTE: The conditions for deviating from idling operation are as follows:

- *Engine speed is higher than 2,500 r/min.*
- *Vehicle speed is 15 km/h (9.3 mph) or more.*
- *Volumetric efficiency is 55 percent or more.*

TROUBLESHOOTING HINTS

The most likely causes for this code to be set are:

- Fuel tank differential pressure sensor failed.
- Damaged harness in the fuel tank differential pressure sensor circuit.
- ECM <M/T> or PCM <A/T> failed.

OVERVIEW OF TROUBLESHOOTING

- DTC P0451 can be set if either of the following conditions occur:
  1. Faulty fuel differential pressure sensor, related circuit, or ECM <M/T> or PCM <A/T>.
- To check a system blockage, do a performance test which uses a mechanical vacuum gauge and scan tool MB991502 set on the fuel tank differential pressure sensor (TANK PRS SNSR 73.)
  The mechanical gauge reading is used to verify scan tool MB991502 reading.
  A comparison of the mechanical gauge to scan tool MB991502 determines the problem in the system.

DIAGNOSIS

Required Special Tools:

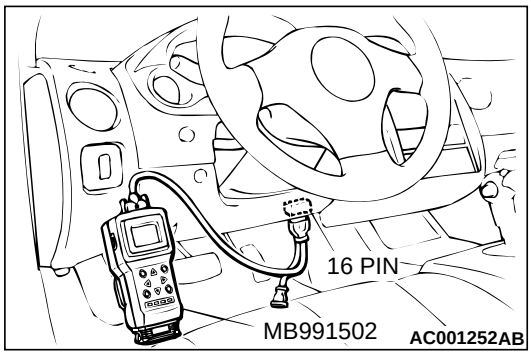
- MB991502: Scan Tool (MUT-II)
- MB991658: Test Harness Set
- MB991709: Test Harness Set

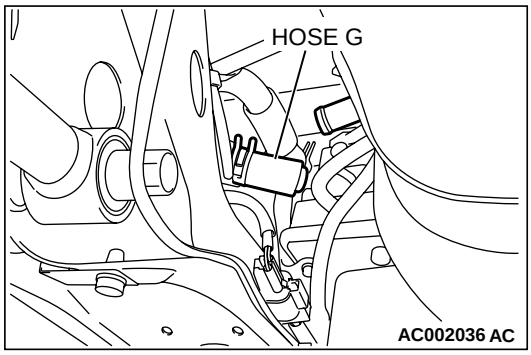
STEP 1. Using scan tool MB991502, check data list item 73: Fuel Tank Differential Pressure Sensor.

⚠ CAUTION

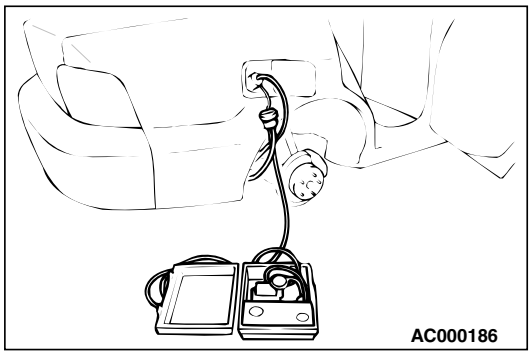
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.





(2) Disconnect hose G from the evaporative emission canister side, and plug the hose from which the pipes have been disconnected.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Set scan tool MB991502 to the data reading mode for item 73, Fuel Tank Differential Pressure Sensor.
- The fuel tank pressures should be −1.5 to 1.5 kPa (−285 to 285 inHg.)

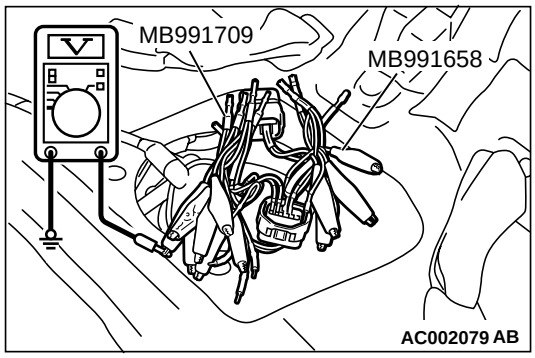


(6) Connect an evaporative emission system pressure pump to the fuel filler neck, and apply pressure.
- The scan tool reading should increase.

(7) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991502.

Q: Is the scan tool reading within the specified value?

YES : Go to Step 22.
NO : Go to Step 2.



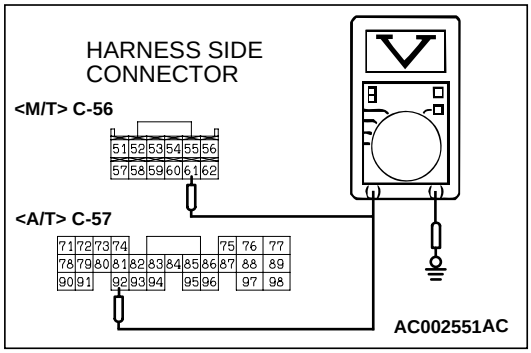
STEP 2. Check the output circuit voltage at intermediate connector D-16.

(1) Remove the rear seat cushion. (Refer to GROUP 52, Rear Seat P.52A-20.)
(2) Remove the protector.
(3) Disconnect intermediate connector D-16.
(4) Use special tools (MB991658 and MB991709) to connect terminals 5, 6 and 8 between connectors of the intermediate connector respectively.
(5) Turn the ignition switch to the "ON" position.
(6) Remove the fuel cap.
(7) Measure the voltage between terminal 5 and ground.
- Voltage should be between 2.0 and 3.0 volts.

(8) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Remove the special tools and connect intermediate connector D-16. Then go to Step 3 .
NO : Go to Step 6.



STEP 3. Check the output circuit voltage at ECM connector C-57 <M/T> or PCM connector C-57 <A/T> by backprobing.

(1) Do not disconnect the ECM connector C-56 <M/T> or PCM connector C-57 <A/T>.
(2) Turn the ignition switch to the "ON" position.
(3) Remove the fuel cap.
(4) Measure the voltage between terminal 61 <M/T> or terminal 92 <A/T> and ground by backprobing.
- Voltage should be between 2.0 and 3.0 volts.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

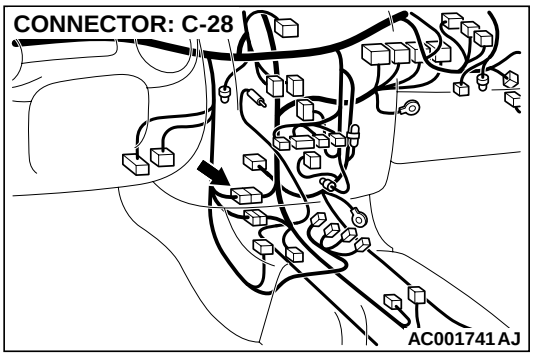
YES : Go to Step 21.
NO : Go to Step 4.

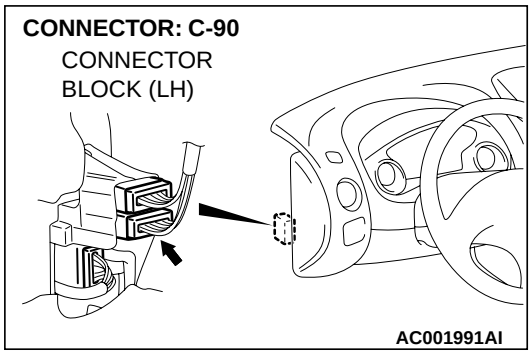
STEP 4. Check connectors C-28, C-90, D-16 at intermediate connector and C-56 at ECM <M/T> or C-57 at PCM <A/T> for damage.

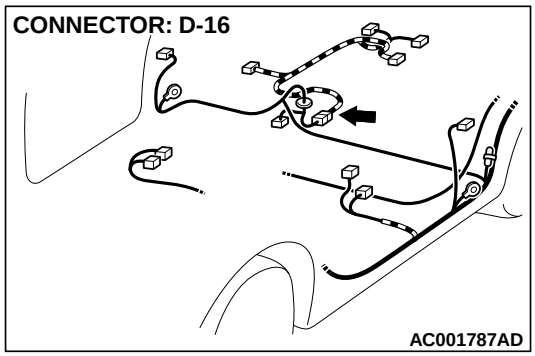
Q: Are the connectors in good condition?

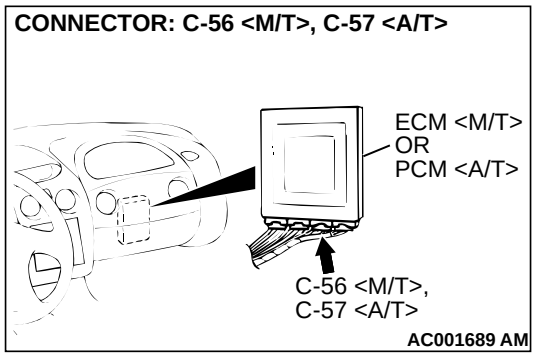
YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.







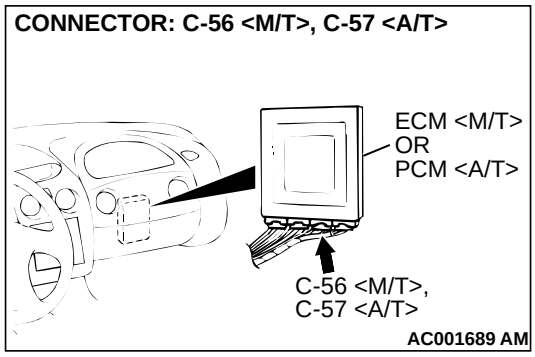


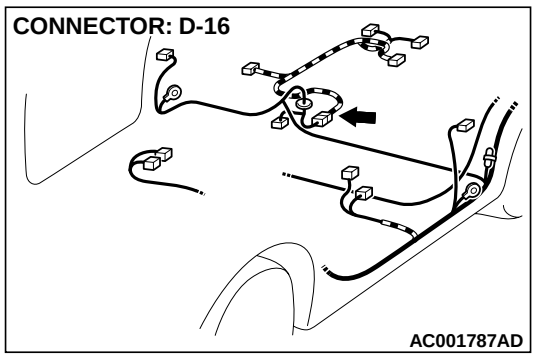
STEP 5. Check the harness wire between ECM connector C-56 terminal 61 <M/T> or PCM connector C-57 terminal 92 <A/T> and intermediate connector D-16 terminal 5 for damage.

Q: Is the harness wire in good condition?

YES : Go to Step 22.

NO : Repair it. Then go to 22.





STEP 6. Check the 5-volt supply circuit voltage at intermediate connector D-16.

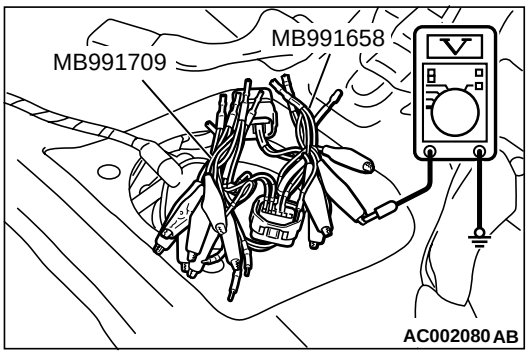
(1) Use special tools (MB991658 and MB991709) to connect terminals 5, 6 and 8 between connectors of the intermediate connector D-16 respectively.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 8 and ground.
- Voltage should be between 4.8 and 5.2 volts.

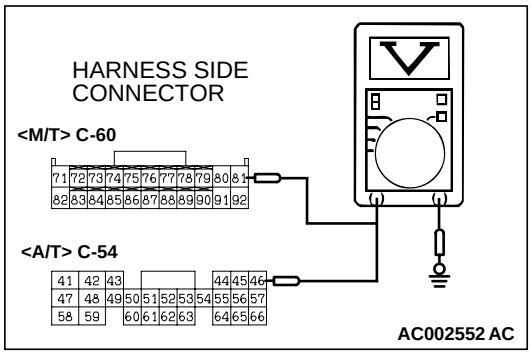
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 11.

NO : Remove the special tools and connect intermediate connector D-16. Then go to Step 7 .





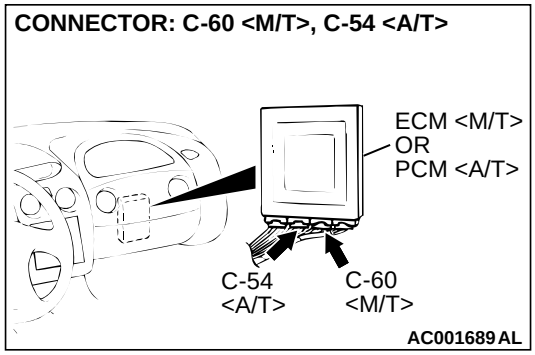
STEP 7. Check the 5-volt supply circuit voltage at ECM connector C-60 <M/T> or PCM connector C-54 <A/T> by backprobing.

(1) Do not disconnect ECM connector C-60 <M/T> or PCM connector C-54 <A/T>.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 81 <M/T> or terminal 46 <A/T> and ground by backprobing.
- Voltage should be between 4.8 and 5.2 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

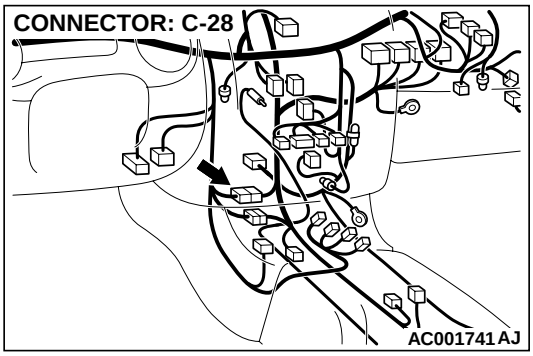
YES : Go to Step 9.
NO : Go to Step 8.

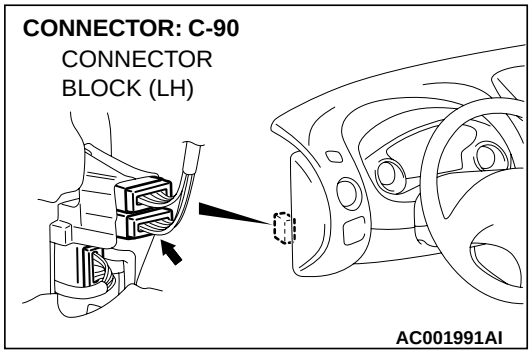


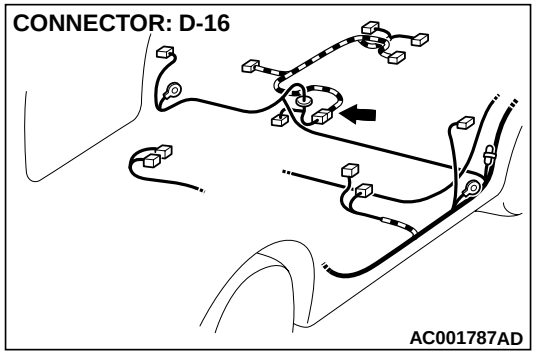
STEP 8. Check connector C-60 at ECM <M/T> or C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 21.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.







STEP 9. Check connectors C-28, C-90, D-16 at intermediate connector for damage.

Q: Are the connectors in good condition?

YES : Go to Step 10.

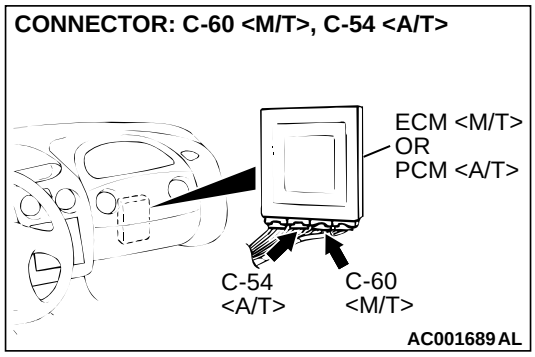
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.

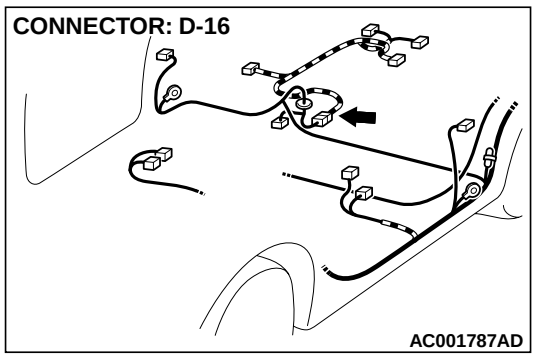
STEP 10. Check the harness wire between ECM connector C-60 terminal 81 <M/T> or PCM connector C-54 terminal 46 <A/T> and intermediate connector D-16 terminal 8 for damage.

Q: Is the harness wire in good condition?

YES : Go to Step 22.

NO : Repair it. Then go to 22.

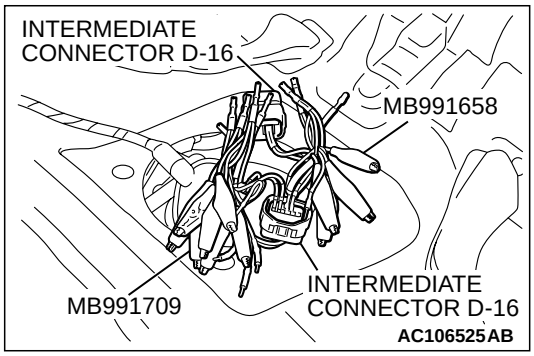




STEP 11. Check the circuit voltage at intermediate connector D-16.

(1) Use special tools (MB991658 and MB991709) to connect terminals 5 and 8 between connectors of the intermediate connector D-16 respectively.

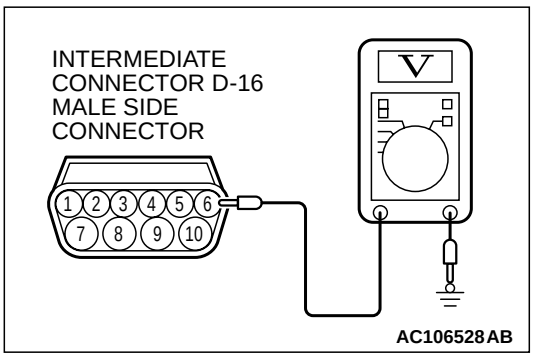
(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage at the male side connector between terminal 6 and ground.
- Voltage should be between 0.5 and 4.8 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

(5) Remove the special tools and connect intermediate connector D-16.



Q: Is the voltage normal?

YES : Go to Step 12.

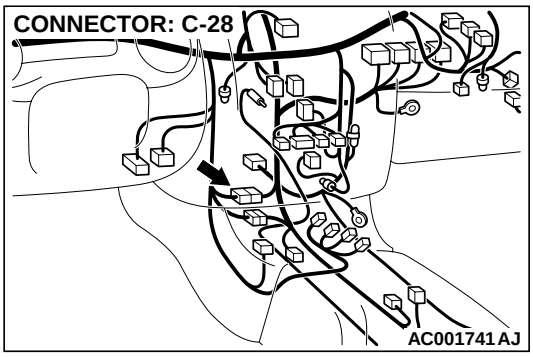
NO : Go to Step 15.

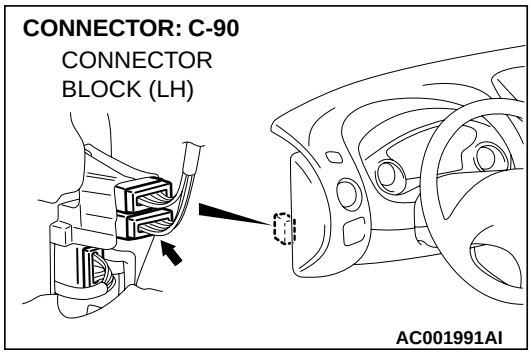
STEP 12. Check connectors C-28, C-90, D-16 at intermediate connector and C-60 at ECM <M/T> or C-54 at PCM <A/T> for damage.

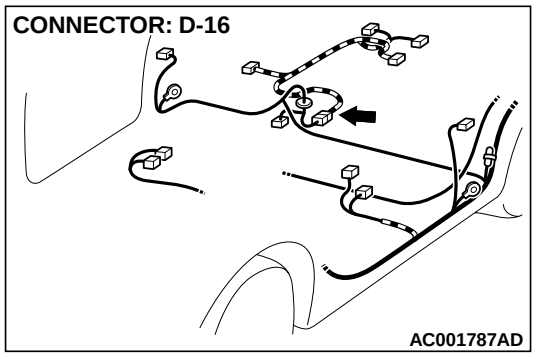
Q: Are the connectors in good condition?

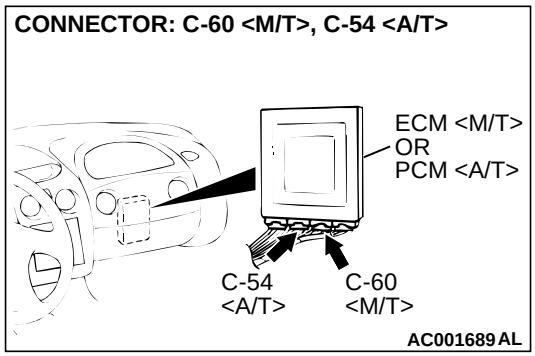
YES : Go to Step 13.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.







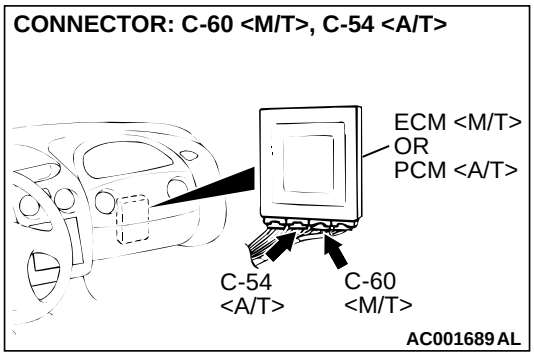


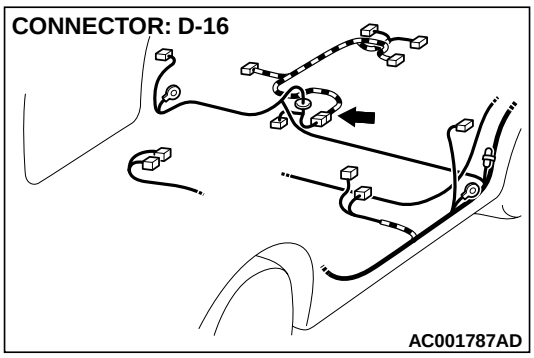
STEP 13. Check the harness wire between ECM connector C-60 terminal 92 <M/T> or PCM connector C-54 terminal 57 <A/T> and intermediate connector D-16 terminal 6 for damage.

Q: Is the harness wire in good condition?

YES : Go to Step 14.

NO : Repair it. Then go to 22.





STEP 14. Check the ground voltage at ECM connector C-60 <M/T> or PCM connector C-54 <A/T> by backprobing.

(1) Do not disconnect ECM connector C-60 <M/T> or PCM connector C-54 <A/T>.

(2) Turn the ignition switch to the "ON" position.

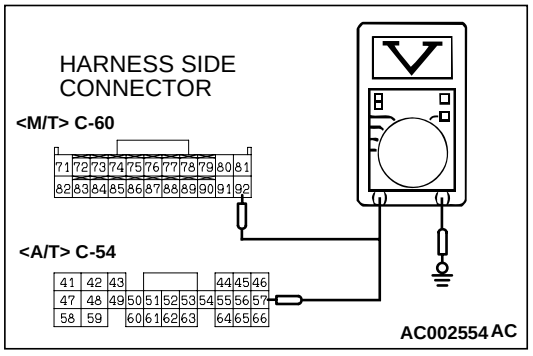
(3) Measure the voltage between terminal 92 <M/T> or terminal 57 <A/T> and ground by backprobing.
- The voltage should be 0.5 volt or less.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 18.

NO : Go to Step 21.

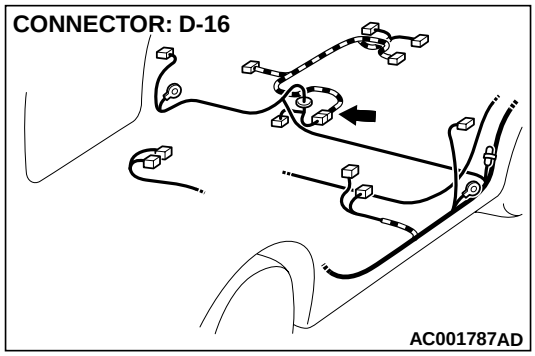


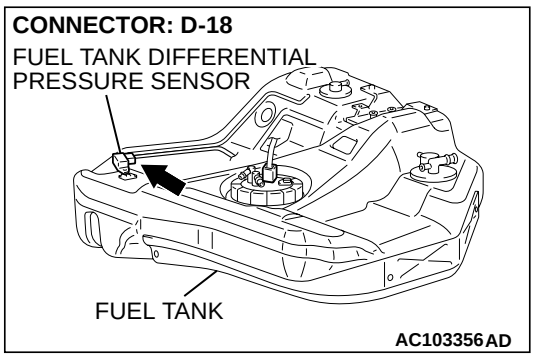
STEP 15. Check connectors D-16 at intermediate connector and D-18 at fuel tank differential pressure sensor for damage.

Q: Are the connectors in good condition?

YES : Go to Step 16.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.



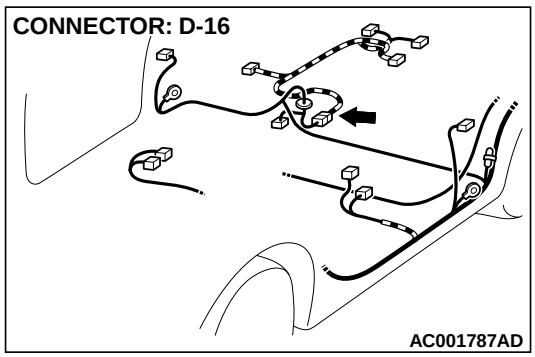


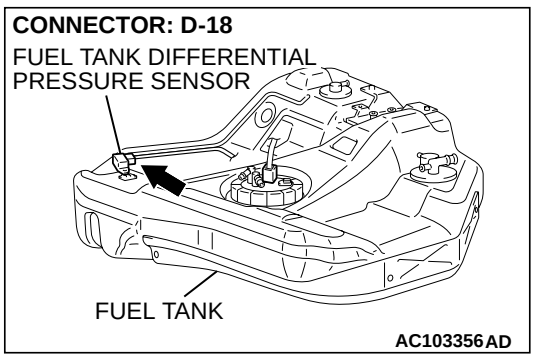
STEP 16. Check the harness wire between intermediate connector D-16 terminal 8 and fuel tank differential pressure sensor connector D-18 terminal 3 for damage.

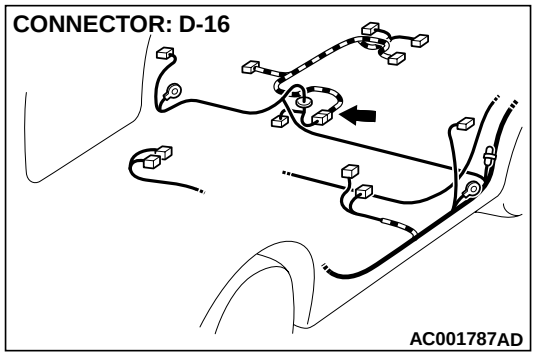
Q: Is the harness wire in good condition?

YES : Go to Step 17.

NO : Repair it. Then go to 22.





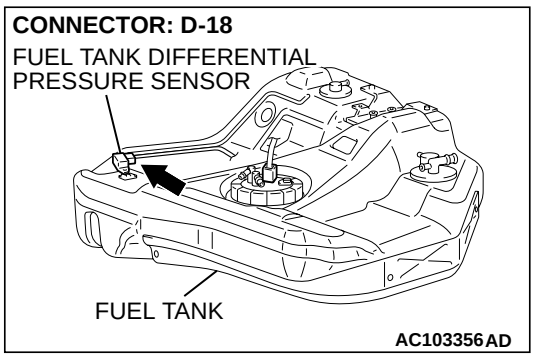


STEP 17. Check the harness wire between intermediate connector D-16 terminal 6 and fuel tank differential pressure sensor connector D-18 terminal 2 for damage.

Q: Is the harness wire in good condition?

YES : Replace the fuel tank differential pressure sensor. Then go to 22.

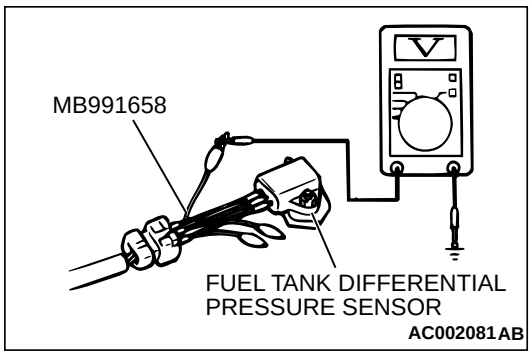
NO : Repair it. Then go to 22.



STEP 18. Check the output circuit voltage at fuel tank differential pressure sensor connector D-18.

(1) Remove the center exhaust pipe. (Refer to GROUP 15, Exhaust Pipe, Main Muffler and Catalytic Converter P.15-21.)
(2) Remove the fuel band assembly, tilt the fuel tank.
(3) Disconnect fuel tank differential pressure sensor connector D-18.
(4) Use special tool (MB991658) to connect terminals 1, 2 and 3 of the disconnected sensor connector and those of the harness side connector respectively.
(5) Turn the ignition switch to the "ON" position.
(6) Remove the fuel cap.
(7) Measure the voltage between terminal 1 and ground.
- Voltage should be between 2.0 and 3.0 volts.

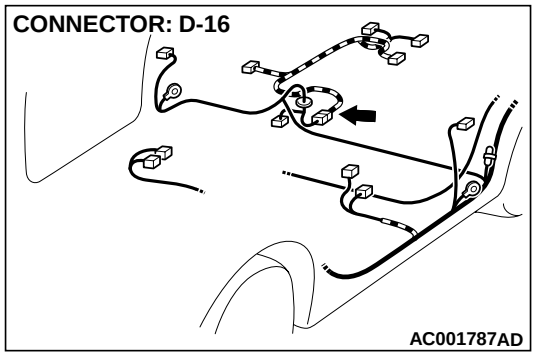
(8) Turn the ignition switch to the "LOCK" (OFF) position.

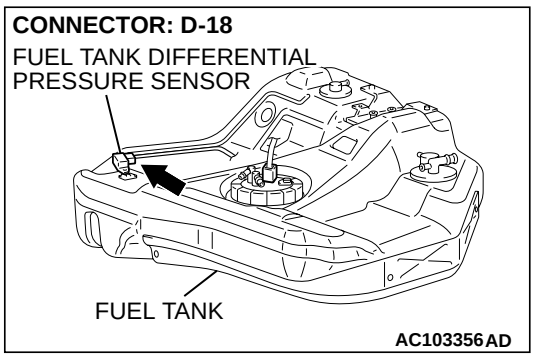


Q: Is the voltage normal?

YES : Remove the special tool and connect fuel tank differential pressure sensor connector D-18. Then go to Step 19.

NO : Replace the fuel tank differential pressure sensor. Then go to 22.



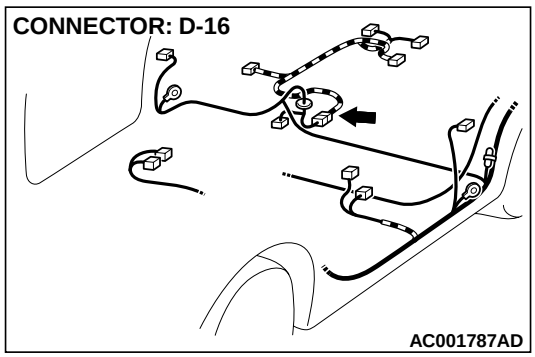


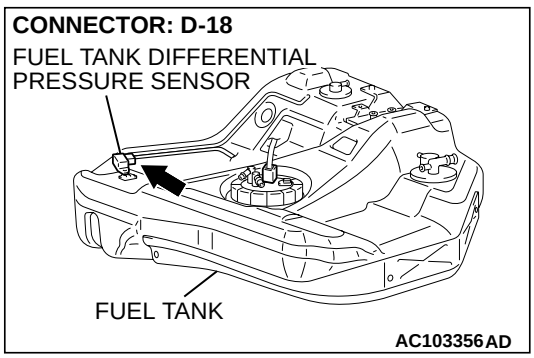
STEP 19. Check connectors D-16 at intermediate connector and D-18 at fuel tank differential pressure sensor for damage.

Q: Are the connectors in good condition?

YES : Go to Step 20.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.





STEP 20. Check the harness wire between intermediate connector D-16 terminal 5 and fuel tank differential pressure sensor connector D-18 terminal 1 for damage.

Q: Is the harness wire in good condition?

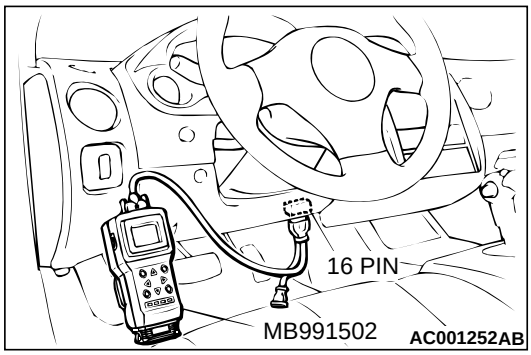
YES : Go to Step 22.

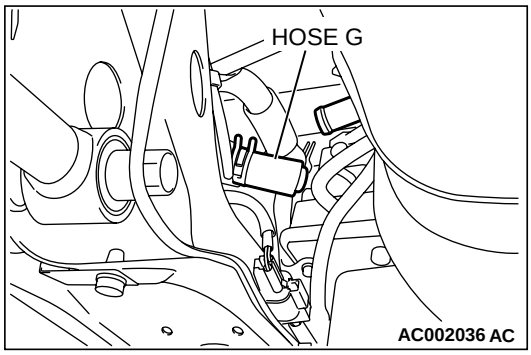
NO : Repair it. Then go to 22.

STEP 21. Using scan tool MB991502, check data list item 73: Fuel Tank Differential Pressure Sensor.

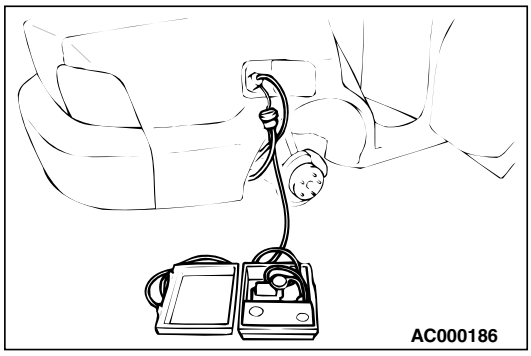
⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.





(2) Disconnect hose G from the evaporative emission canister side, and plug the hose from which the pipes have been disconnected.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Set scan tool MB991502 to the data reading mode for item 73, Fuel Tank Differential Pressure Sensor.
- The fuel tank pressures should be –1.5 to 1.5kPa (–285 to 285 inHg.)



(6) Connect an evaporative emission system pressure pump to the fuel filler neck, and apply pressure.
- The scan tool reading should increase.

(7) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991502.

Q: Is the scan tool reading within the specified value?

YES : This malfunction is intermittent malfunction. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6. Then go to Step 22.
NO : Replace the ECM <M/T> or PCM <A/T>. Then go to Step 22.

STEP 22. Test the OBD-II drive cycle.

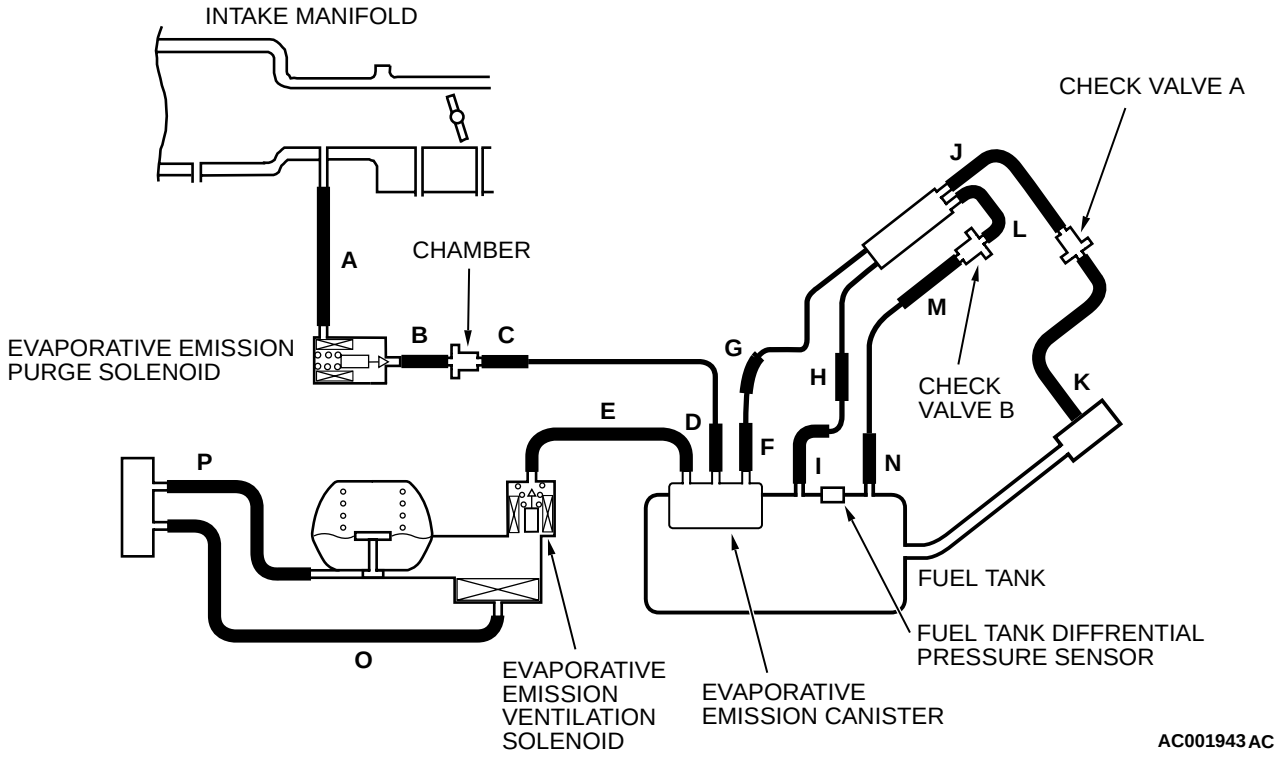
(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 1 - Evaporative Emission Control System Leak Monitor P.13A-5.
(2) Read the diagnostic trouble code.

Q: Is diagnostic trouble code P0451 set?

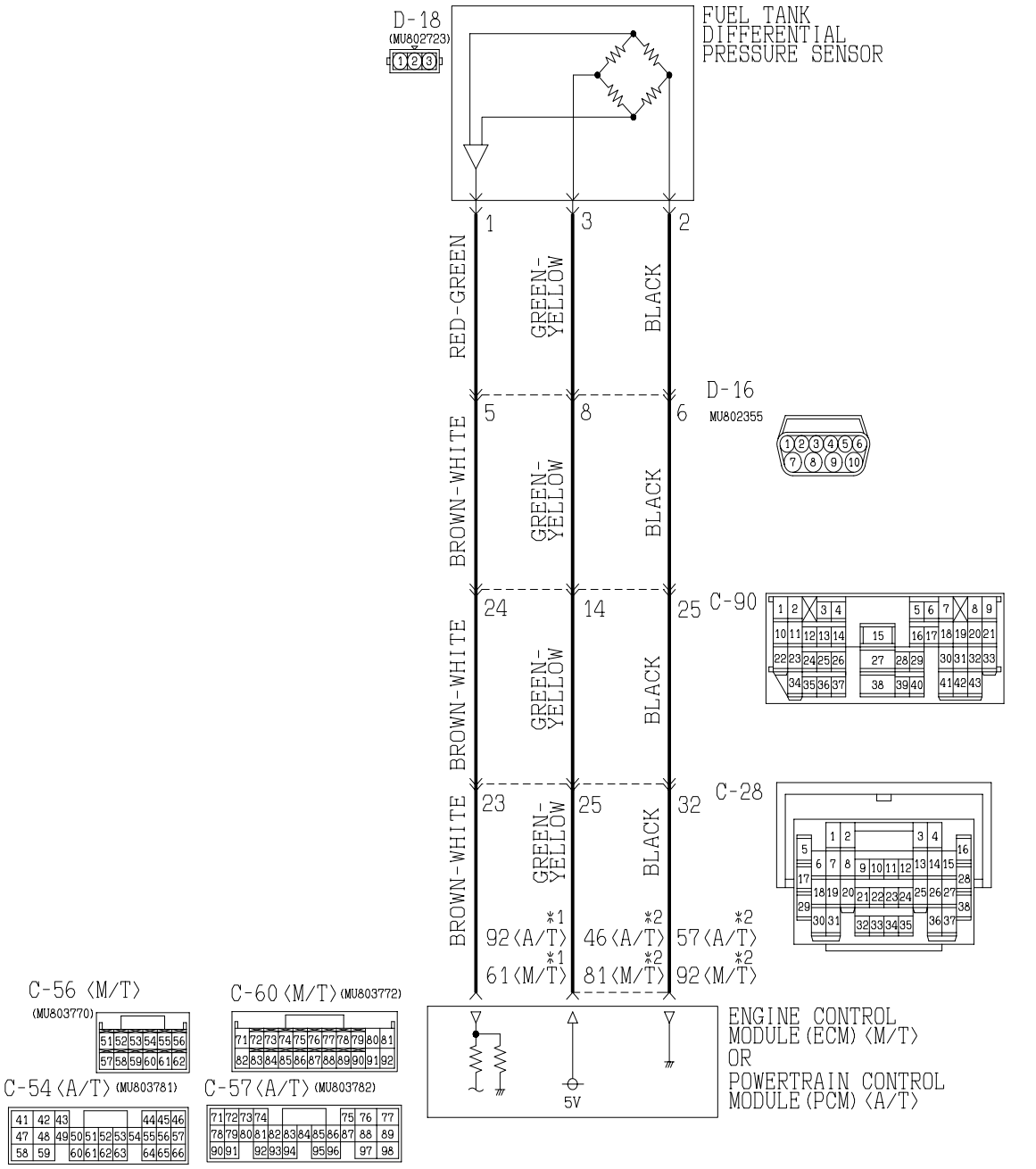
YES : Go to Step 2.
NO : This diagnosis is complete.

DTC P0452: Evaporative Emission Control System Pressure Sensor Low Input

SYSTEM DIAGRAM



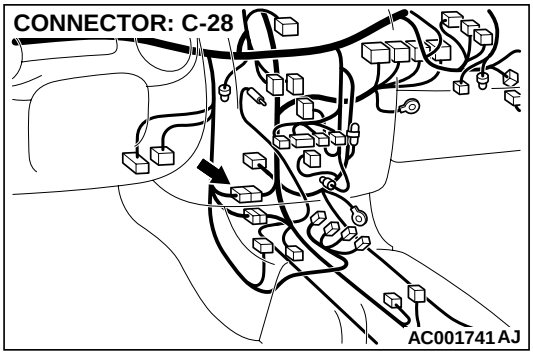
Fuel Tank Differential Pressure Sensor Circuit

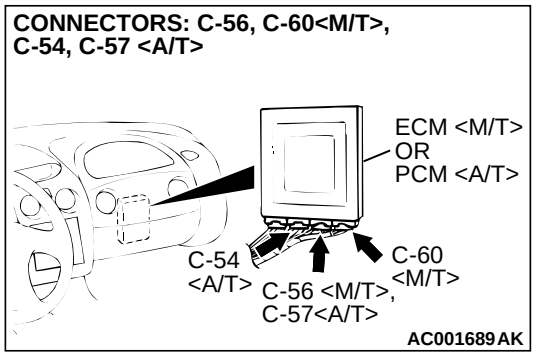


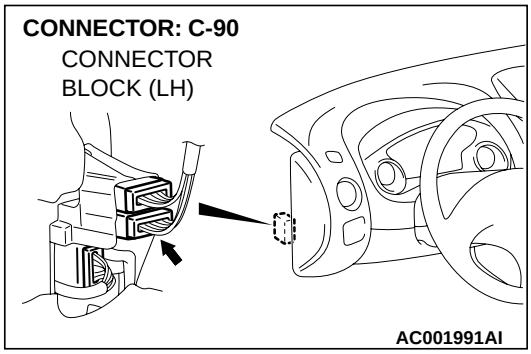
NOTE
*1:ECM connector C-56〈M/T〉or PCM connector C-57〈A/T〉
*2:ECM connector C-60〈M/T〉or PCM connector C-54〈A/T〉

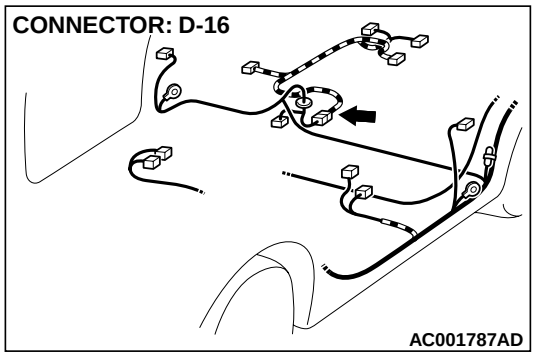
W2S18M01AA

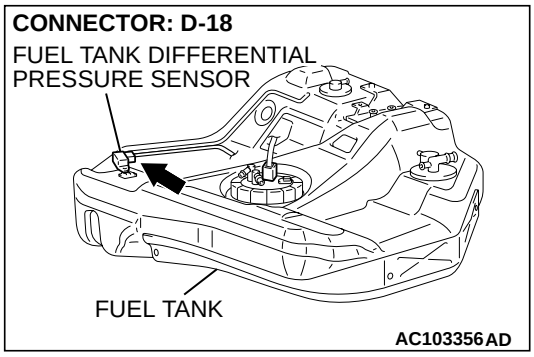
TSB Revision











CIRCUIT OPERATION

- A 5-volt voltage is supplied to the power terminal of the fuel tank differential pressure sensor (terminal 3) from the ECM (terminal 81) <M/T> or PCM (terminal 46) <A/T>. The ground terminal (terminal 2) is grounded with the ECM (terminal 92) <M/T> or PCM (terminal 57) <A/T>.
- A voltage proportional to the pressure in the fuel tank is sent from the output terminal of the fuel tank differential pressure sensor (terminal 1) to the ECM (terminal 61) <M/T> or PCM (terminal 92) <A/T>.

TECHNICAL DESCRIPTION

- To judge if the fuel tank differential pressure sensor is defective, the ECM <M/T> or PCM <A/T> monitors the fuel tank differential pressure sensor output voltage.
- Based on the test conditions and judgment criteria, the ECM <M/T> or PCM <A/T> judges if the fuel tank differential pressure sensor output voltage is normal.

DTC SET CONDITIONS

Test Conditions: For Test to Run

- Intake air temperature is higher than 5°C (41°C).
- Engine speed is 1,600 r/min or more.
- Volumetric efficiency is between 20 and 80 percent.

Judgment Criteria

- When the evaporative emission purge solenoid is off, the fuel differential pressure sensor output voltage remains 1.0 volt or less for ten seconds.

TROUBLESHOOTING HINTS

The most likely causes for this code to be set are:

- Fuel tank differential pressure sensor failed.

TSB Revision

- Open fuel tank differential pressure sensor circuit, or loose connector.
- ECM <M/T> or PCM <A/T> failed.

OVERVIEW OF TROUBLESHOOTING

- The DTC P0452 can be set if either of the following conditions occur:
  1. Faulty fuel differential pressure sensor, related circuit, or ECM <M/T> or PCM <A/T>.
- To check a system blockage, do a performance test which uses a mechanical vacuum gauge and scan tool MB991502 set on the fuel tank differential pressure sensor (TANK PRS SNSR 73.)
  The mechanical gauge reading is used to verify scan tool MB991502 reading.
  A comparison of the mechanical gauge to scan tool MB991502 determines the problem in the system.

DIAGNOSIS

Required Special Tools:

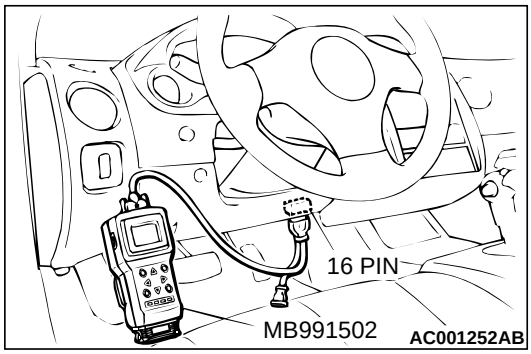
- MB991502: Scan Tool (MUT-II)
- MB991658: Test Harness Set
- MB991709: Test Harness Set

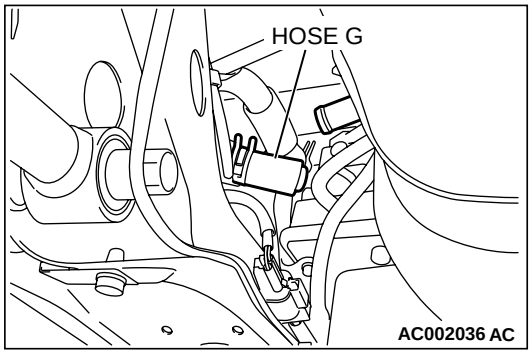
STEP 1. Using scan tool MB991502, check data list item 73: Fuel Tank Differential Pressure Sensor.

⚠ CAUTION

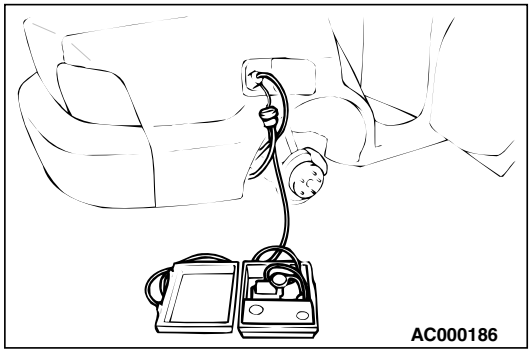
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.





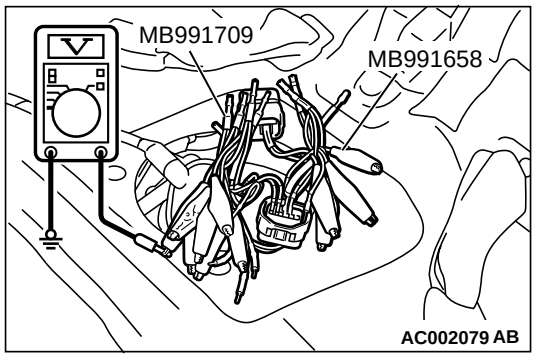
(2) Disconnect hose G from the evaporative emission canister side, and plug the hose from which the pipes have been disconnected.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Set scan tool MB991502 to the data reading mode for item 73, Fuel Tank Differential Pressure Sensor.
  - The fuel tank pressures should be −1.5 to 1.5 kPa (−285 to 285 inHg.)



(6) Connect an evaporative emission system pressure pump to the fuel filler neck, and apply pressure.
  - The scan tool reading should increase.
(7) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991502.

Q: Is the scan tool reading within the specified value?

YES : Go to Step 22.
NO : Go to Step 2.



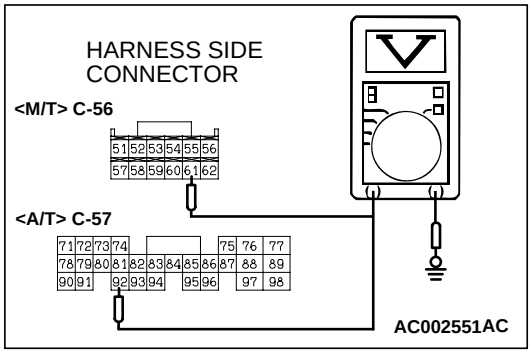
STEP 2. Check the output circuit voltage at intermediate connector D-16.

(1) Remove the rear seat cushion. (Refer to GROUP 52, Rear Seat P.52A-20.)
(2) Remove the protector.
(3) Disconnect intermediate connector D-16.
(4) Use special tools (MB991658 and MB991709) to connect terminals 5, 6 and 8 between connectors of the intermediate connector respectively.
(5) Turn the ignition switch to the "ON" position.
(6) Remove the fuel cap.
(7) Measure the voltage between terminal 5 and ground.
- Voltage should be between 2.0 and 3.0 volts.

(8) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Remove the special tools and connect intermediate connector D-16. Then go to Step 3 .
NO : Go to Step 6.



STEP 3. Check the output circuit voltage at ECM connector C-57 <M/T> or PCM connector C-57 <A/T> by backprobing.

(1) Do not disconnect the ECM connector C-56 <M/T> or PCM connector C-57 <A/T>.
(2) Turn the ignition switch to the "ON" position.
(3) Remove the fuel cap.
(4) Measure the voltage between terminal 61 <M/T> or terminal 92 <A/T> and ground by backprobing.
- Voltage should be between 2.0 and 3.0 volts.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

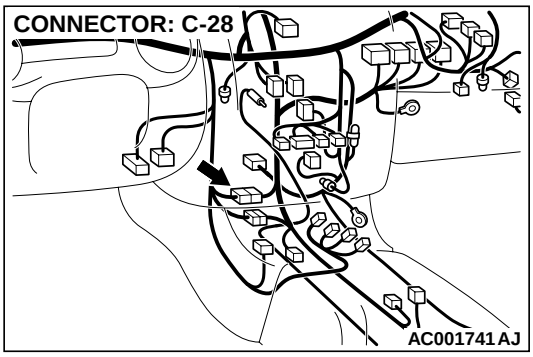
YES : Go to Step 21.
NO : Go to Step 4.

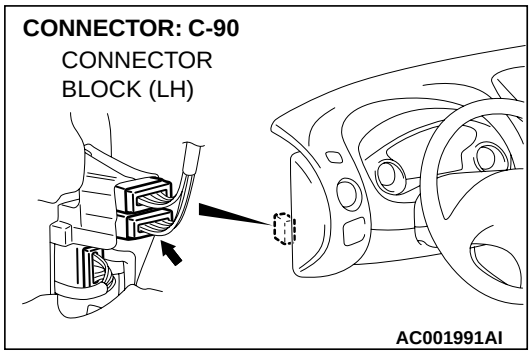
STEP 4. Check connectors C-28, C-90, D-16 at intermediate connector and C-56 at ECM <M/T> or C-57 at PCM <A/T> for damage.

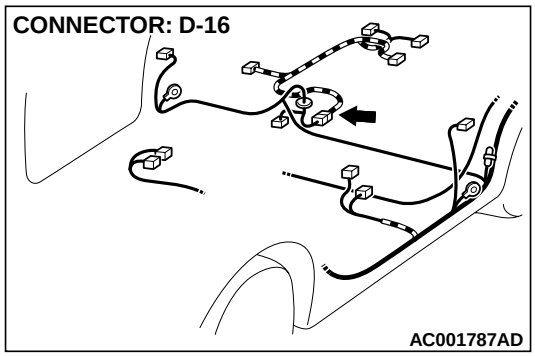
Q: Are the connectors in good condition?

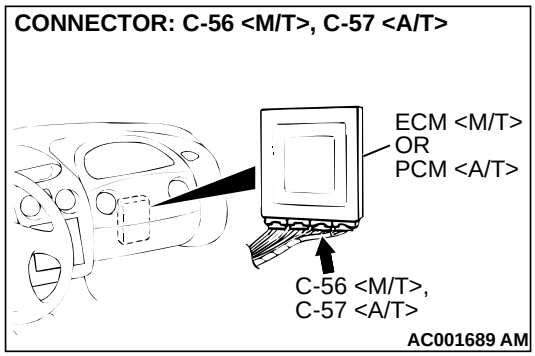
YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.







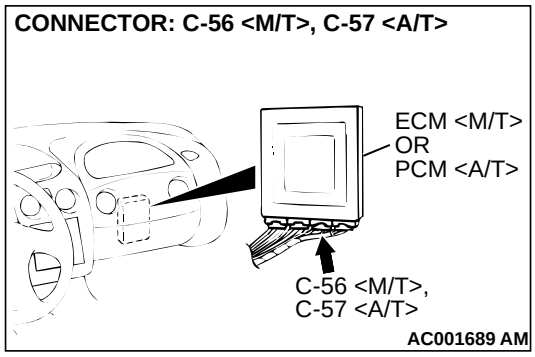


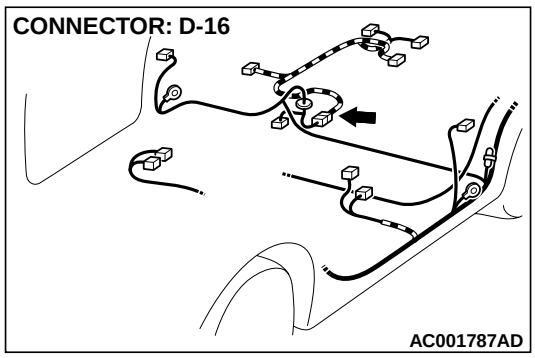
STEP 5. Check the harness wire between ECM connector C-56 terminal 61 <M/T> or PCM connector C-57 terminal 92 <A/T> and intermediate connector D-16 terminal 5 for damage.

Q: Is the harness wire in good condition?

YES : Go to Step 22.

NO : Repair it. Then go to 22.





STEP 6. Check the 5-volt supply circuit voltage at intermediate connector D-16.

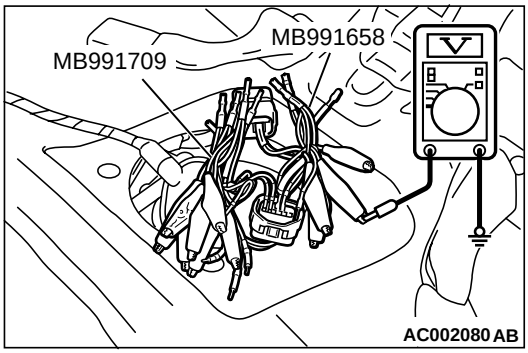
(1) Use special tools (MB991658 and MB991709) to connect terminals 5, 6 and 8 between connectors of the intermediate connector D-16 respectively.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 8 and ground.
- Voltage should be between 4.8 and 5.2 volts.

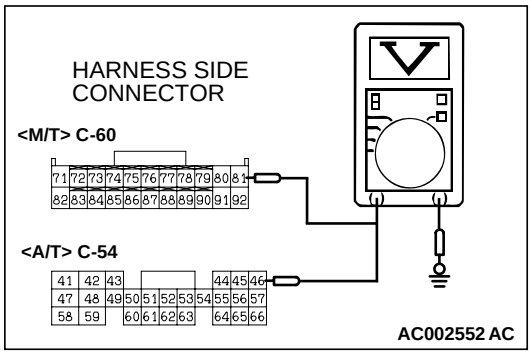
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 11.

NO : Remove the special tools and connect intermediate connector D-16. Then go to Step 7 .





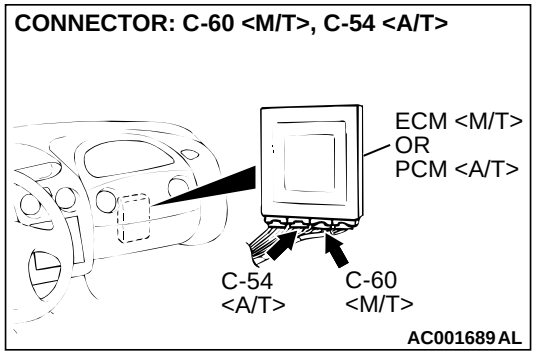
STEP 7. Check the 5-volt supply circuit voltage at ECM connector C-60 <M/T> or PCM connector C-54 <A/T> by backprobing.

(1) Do not disconnect ECM connector C-60 <M/T> or PCM connector C-54 <A/T>.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 81 <M/T> or terminal 46 <A/T> and ground by backprobing.
- Voltage should be between 4.8 and 5.2 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

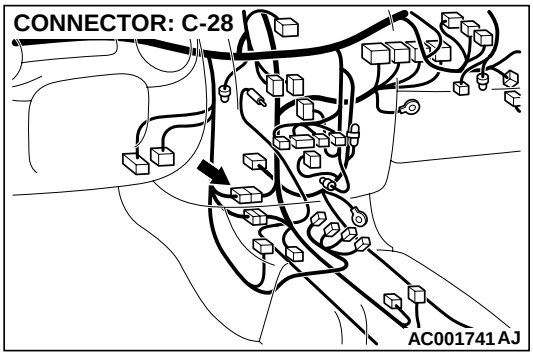
YES : Go to Step 9.
NO : Go to Step 8.

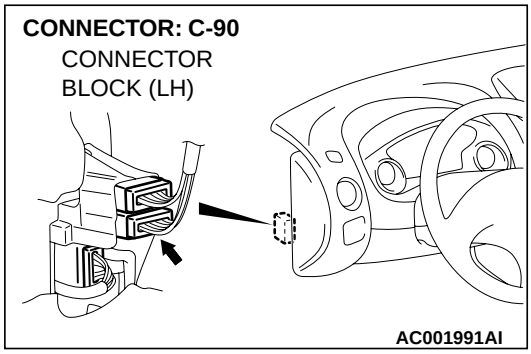


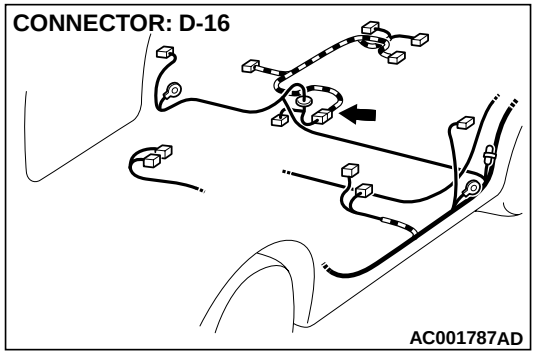
STEP 8. Check connector C-60 at ECM <M/T> or C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 21.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.







STEP 9. Check connectors C-28, C-90, D-16 at intermediate connector for damage.

Q: Are the connectors in good condition?

YES : Go to Step 10.

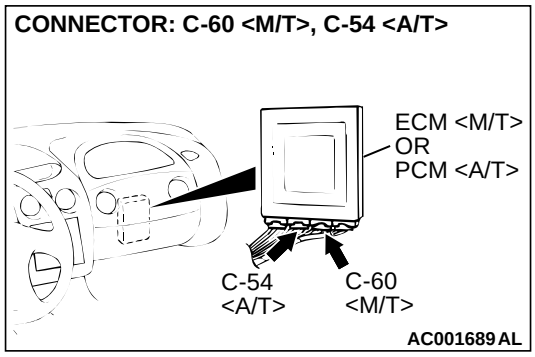
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.

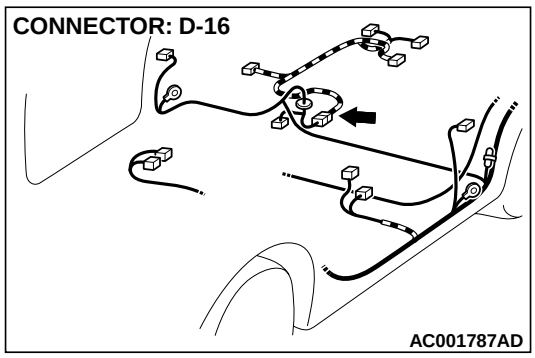
STEP 10. Check the harness wire between ECM connector C-60 terminal 81 <M/T> or PCM connector C-54 terminal 46 <A/T> and intermediate connector D-16 terminal 8 for damage.

Q: Is the harness wire in good condition?

YES : Go to Step 22.

NO : Repair it. Then go to 22.

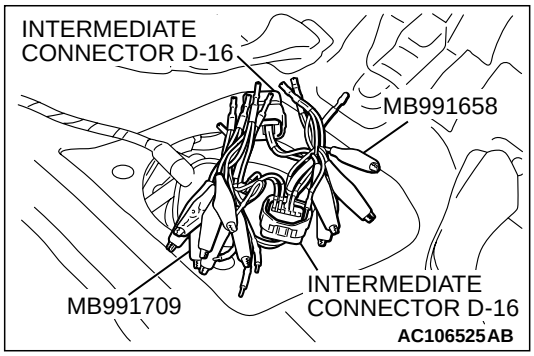




STEP 11. Check the circuit voltage at intermediate connector D-16.

(1) Use special tools (MB991658 and MB991709) to connect terminals 5 and 8 between connectors of the intermediate connector D-16 respectively.

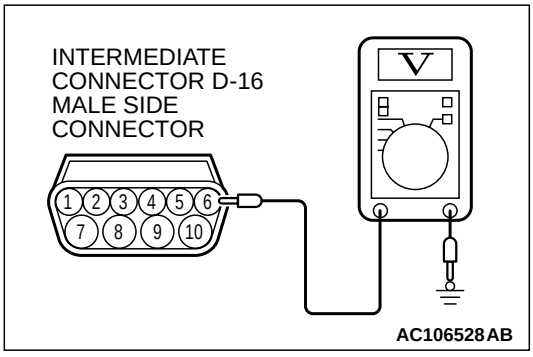
(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage at the male side connector between terminal 6 and ground.
- Voltage should be between 0.5 and 4.8 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

(5) Remove the special tools and connect intermediate connector D-16.



Q: Is the voltage normal?

YES : Go to Step 12.

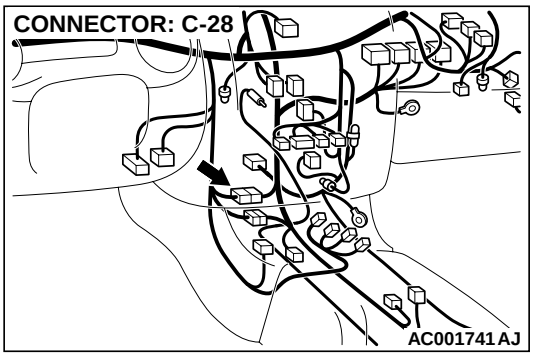
NO : Go to Step 15.

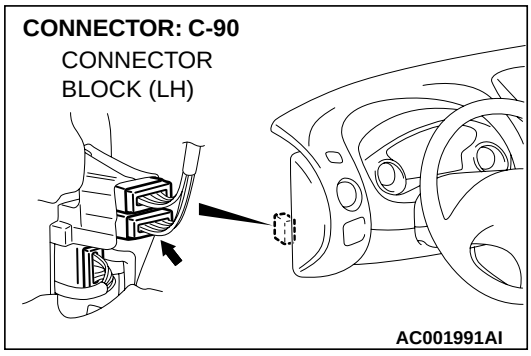
STEP 12. Check connectors C-28, C-90, D-16 at intermediate connector and C-60 at ECM <M/T> or C-54 at PCM <A/T> for damage.

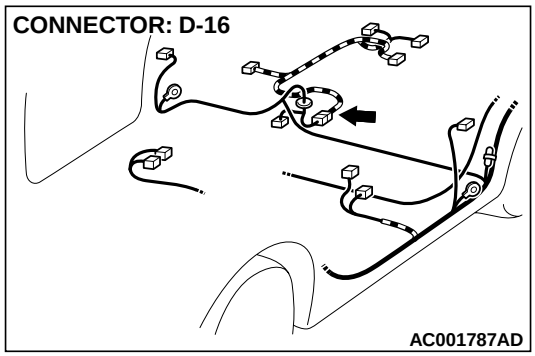
Q: Are the connectors in good condition?

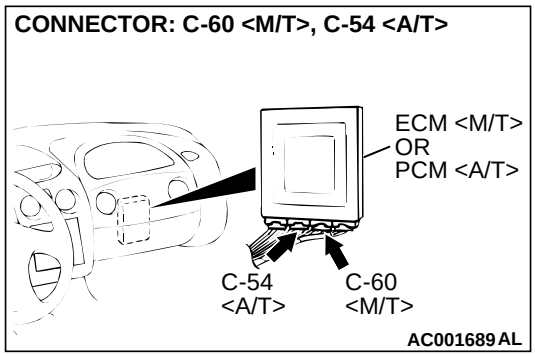
YES : Go to Step 13.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.







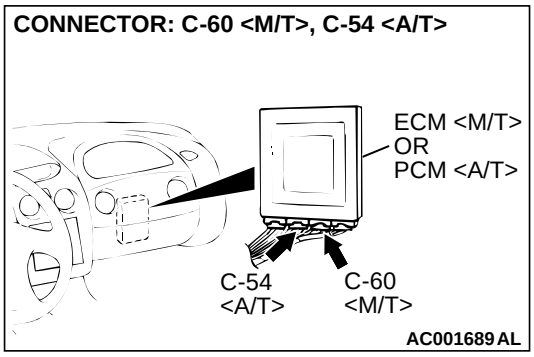


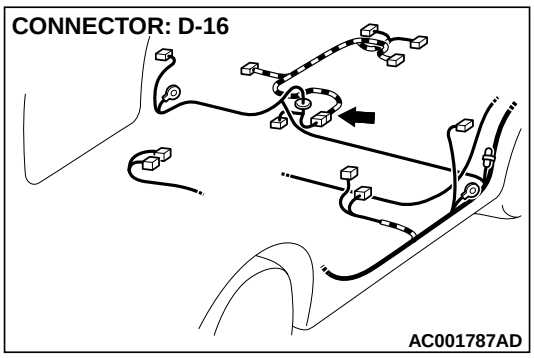
STEP 13. Check the harness wire between ECM connector C-60 terminal 92 <M/T> or PCM connector C-54 terminal 57 <A/T> and intermediate connector D-16 terminal 6 for damage.

Q: Is the harness wire in good condition?

YES : Go to Step 14.

NO : Repair it. Then go to 22.





STEP 14. Check the ground voltage at ECM connector C-60 <M/T> or PCM connector C-54 <A/T> by backprobing.

(1) Do not disconnect ECM connector C-60 <M/T> or PCM connector C-54 <A/T>.

(2) Turn the ignition switch to the "ON" position.

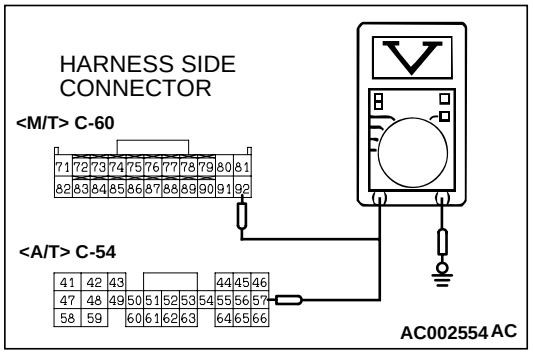
(3) Measure the voltage between terminal 92 <M/T> or terminal 57 <A/T> and ground by backprobing.
- The voltage should be 0.5 volt or less.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 18.

NO : Go to Step 21.

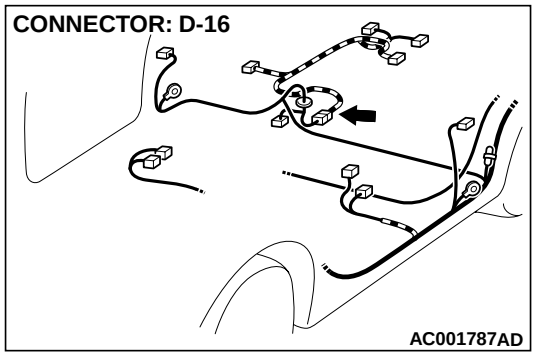


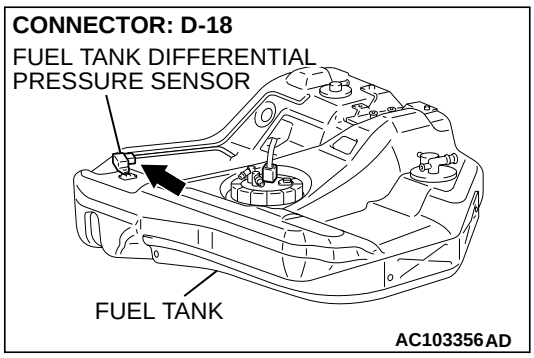
STEP 15. Check connectors D-16 at intermediate connector and D-18 at fuel tank differential pressure sensor for damage.

Q: Are the connectors in good condition?

YES : Go to Step 16.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.



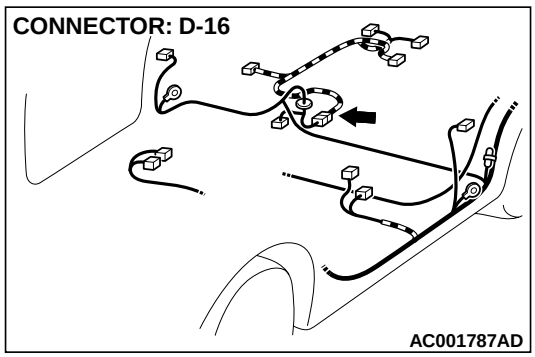


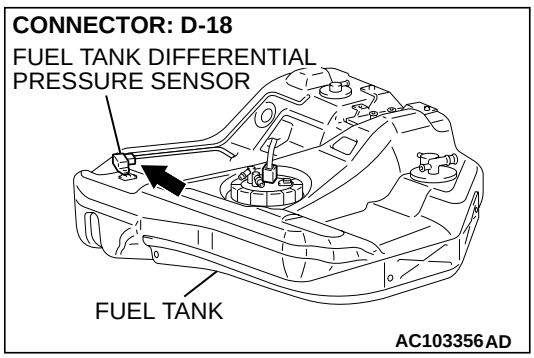
STEP 16. Check the harness wire between intermediate connector D-16 terminal 8 and fuel tank differential pressure sensor connector D-18 terminal 3 for damage.

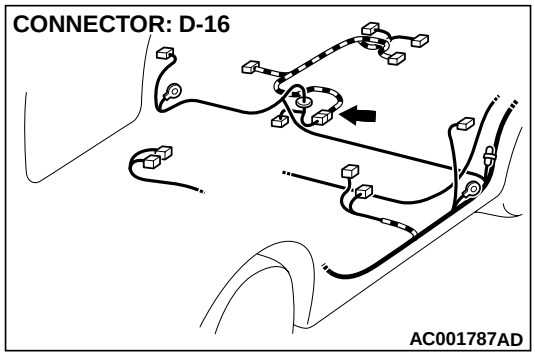
Q: Is the harness wire in good condition?

YES : Go to Step 17.

NO : Repair it. Then go to 22.





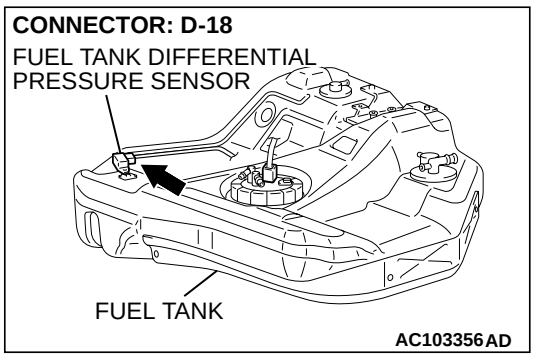


STEP 17. Check the harness wire between intermediate connector D-16 terminal 6 and fuel tank differential pressure sensor connector D-18 terminal 2 for damage.

Q: Is the harness wire in good condition?

YES : Replace the fuel tank differential pressure sensor. Then go to 22.

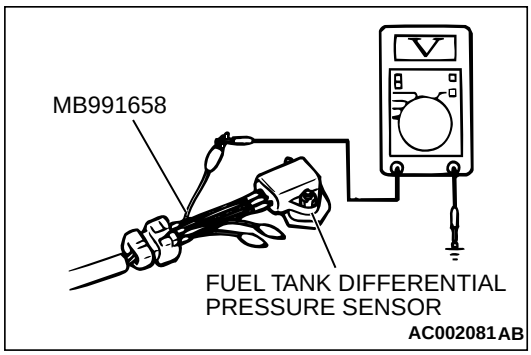
NO : Repair it. Then go to 22.



STEP 18. Check the output circuit voltage at fuel tank differential pressure sensor connector D-18.

(1) Remove the center exhaust pipe. (Refer to GROUP 15, Exhaust Pipe, Main Muffler and Catalytic Converter P.15-21.)
(2) Remove the fuel band assembly, tilt the fuel tank.
(3) Disconnect fuel tank differential pressure sensor connector D-18.
(4) Use special tool (MB991658) to connect terminals 1, 2 and 3 of the disconnected sensor connector and those of the harness side connector respectively.
(5) Turn the ignition switch to the "ON" position.
(6) Remove the fuel cap.
(7) Measure the voltage between terminal 1 and ground.
- Voltage should be between 2.0 and 3.0 volts.

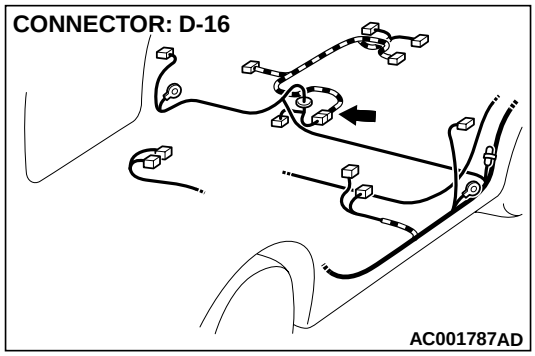
(8) Turn the ignition switch to the "LOCK" (OFF) position.

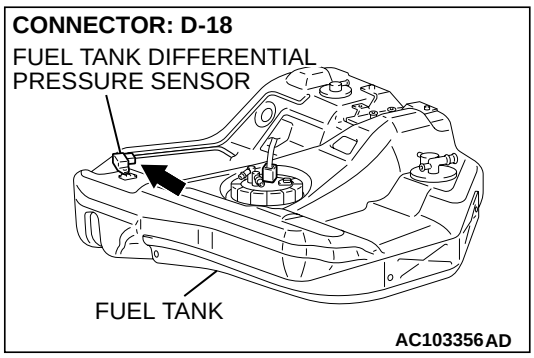


Q: Is the voltage normal?

YES : Remove the special tool and connect fuel tank differential pressure sensor connector D-18. Then go to Step 19.

NO : Replace the fuel tank differential pressure sensor. Then go to 22.



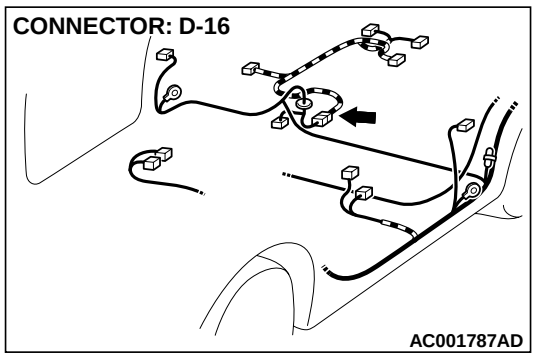


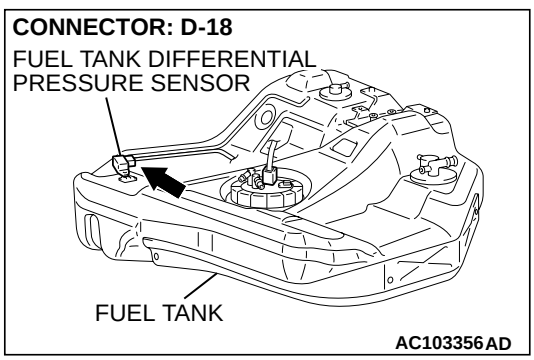
STEP 19. Check connectors D-16 at intermediate connector and D-18 at fuel tank differential pressure sensor for damage.

Q: Are the connectors in good condition?

YES : Go to Step 20.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.





STEP 20. Check the harness wire between intermediate connector D-16 terminal 5 and fuel tank differential pressure sensor connector D-18 terminal 1 for damage.

Q: Is the harness wire in good condition?

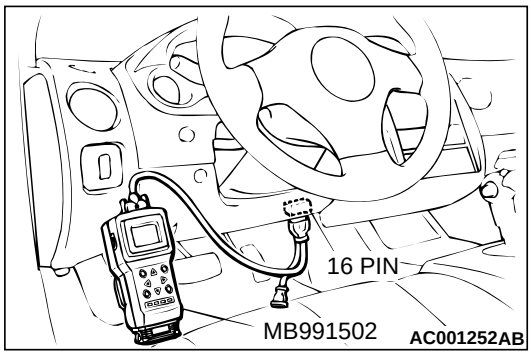
YES : Go to Step 22.

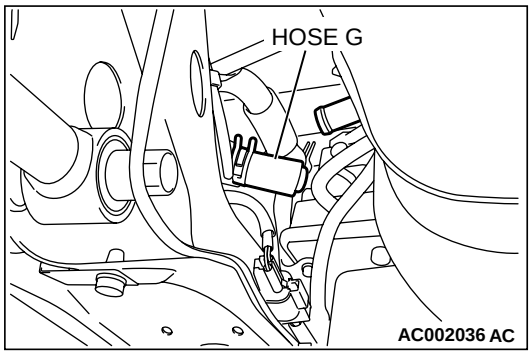
NO : Repair it. Then go to 22.

STEP 21. Using scan tool MB991502, check data list item 73: Fuel Tank Differential Pressure Sensor.

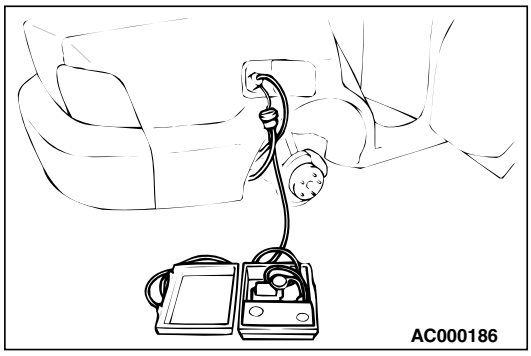
⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.





(2) Disconnect hose G from the evaporative emission canister side, and plug the hose from which the pipes have been disconnected.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Set scan tool MB991502 to the data reading mode for item 73, Fuel Tank Differential Pressure Sensor.
- The fuel tank pressures should be –1.5 to 1.5kPa (–285 to 285 inHg.)



(6) Connect an evaporative emission system pressure pump to the fuel filler neck, and apply pressure.
- The scan tool reading should increase.

(7) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991502.

Q: Is the scan tool reading within the specified value?

YES : This malfunction is intermittent malfunction. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6. Then go to Step 22.
NO : Replace the ECM <M/T> or PCM <A/T>. Then go to Step 22.

STEP 22. Test the OBD-II drive cycle.

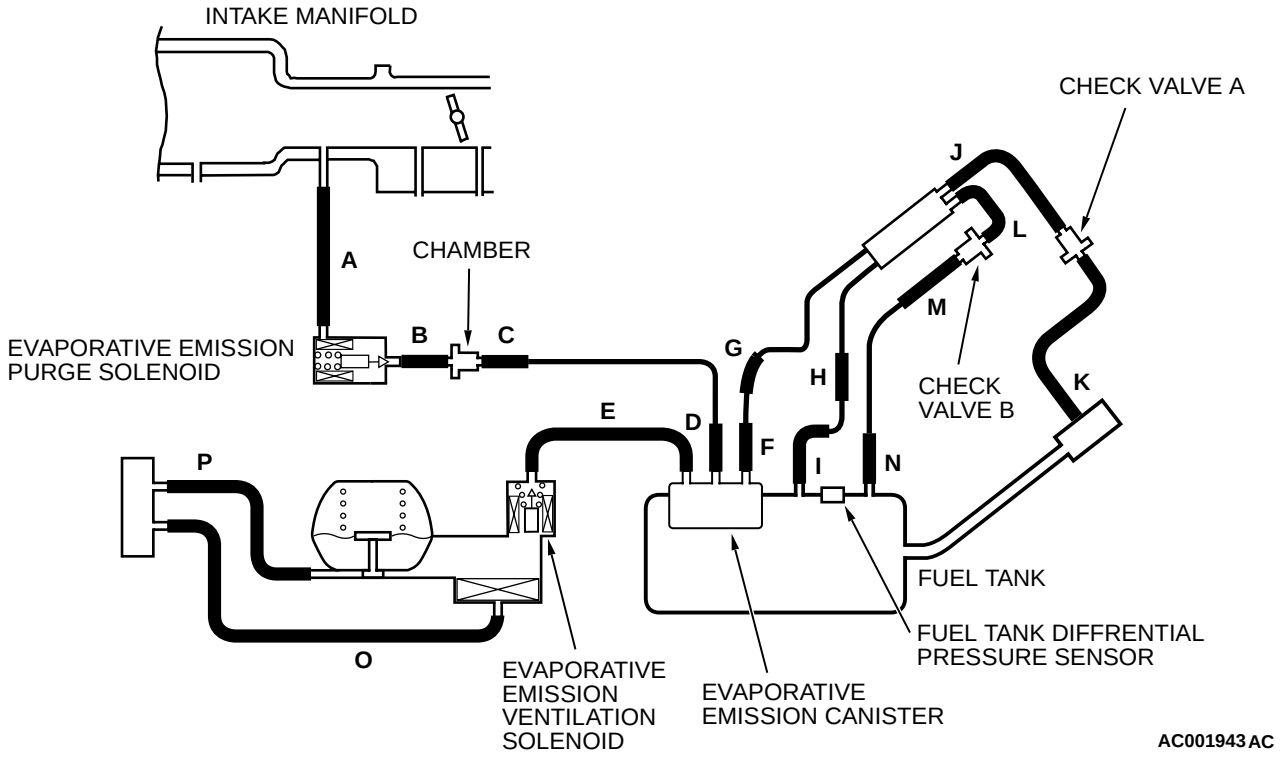
(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 1 - Evaporative Emission Control System Leak Monitor P.13A-5.
(2) Read the diagnostic trouble code.

Q: Is diagnostic trouble code P0452 set?

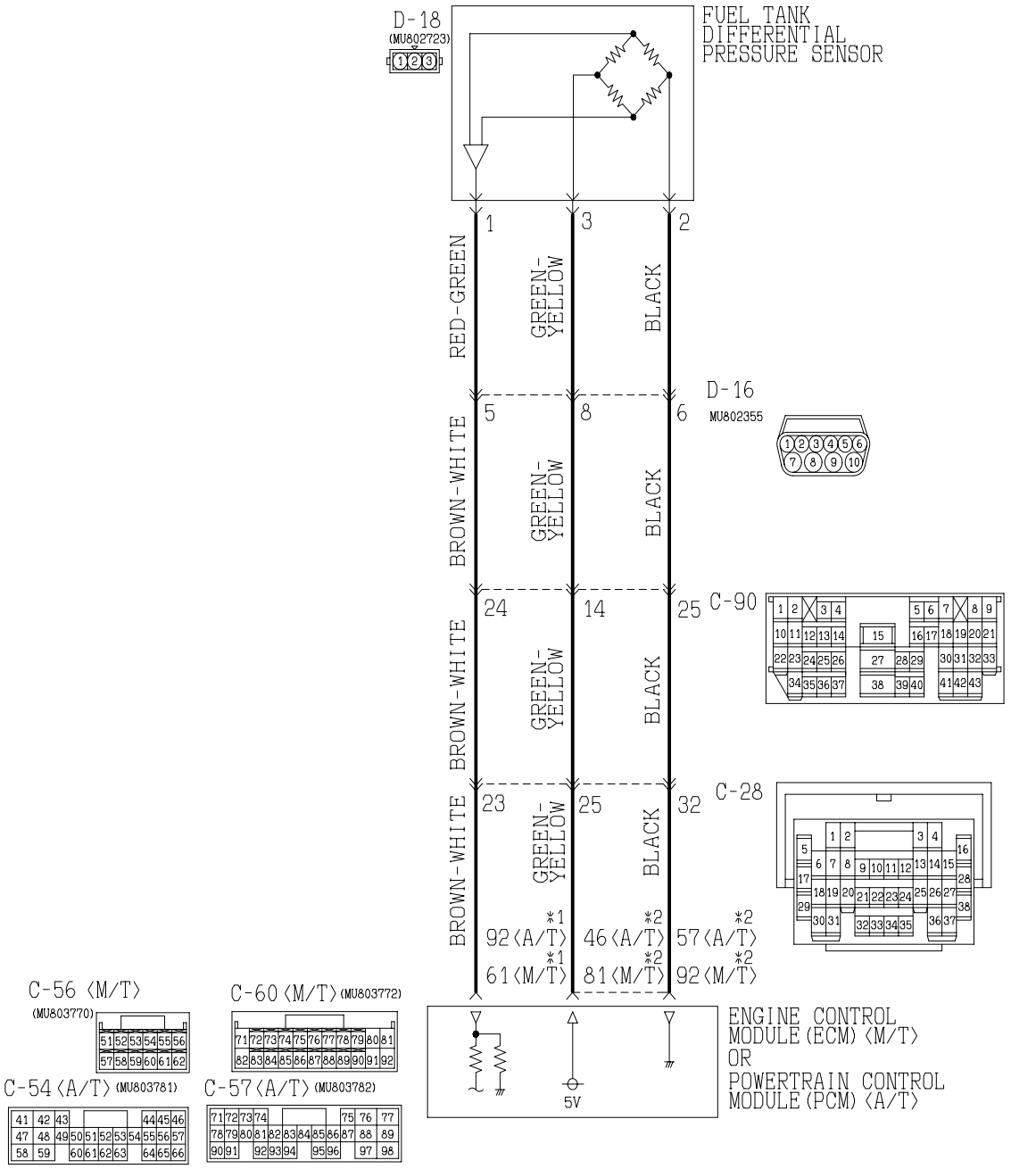
YES : Go to Step 2.
NO : This diagnosis is complete.

DTC P0453: Evaporative Emission Control System Pressure Sensor High Input

SYSTEM DIAGRAM

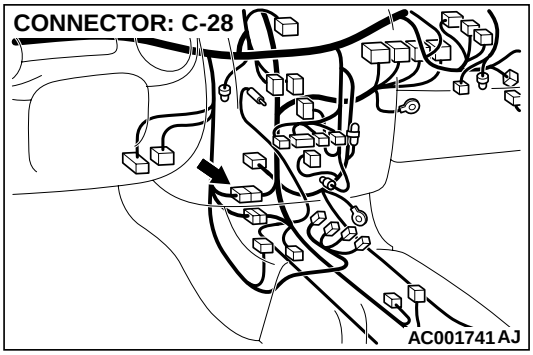


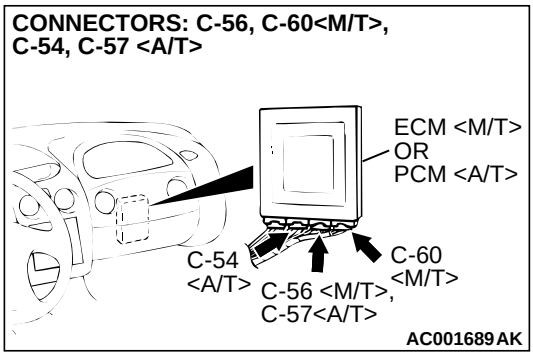
Fuel Tank Differential Pressure Sensor Circuit

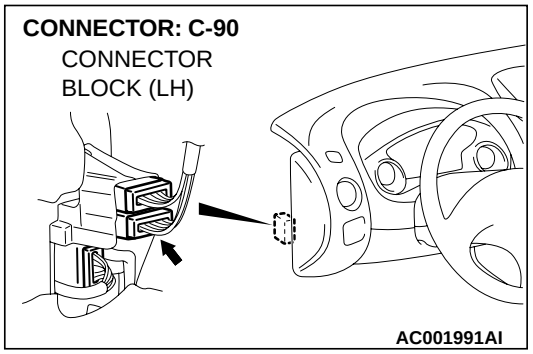


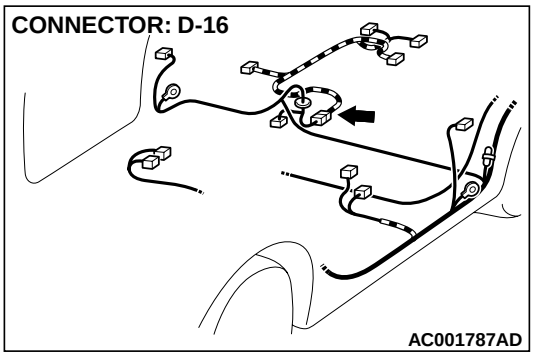
NOTE
*1:ECM connector C-56〈M/T〉or PCM connector C-57〈A/T〉
*2:ECM connector C-60〈M/T〉or PCM connector C-54〈A/T〉

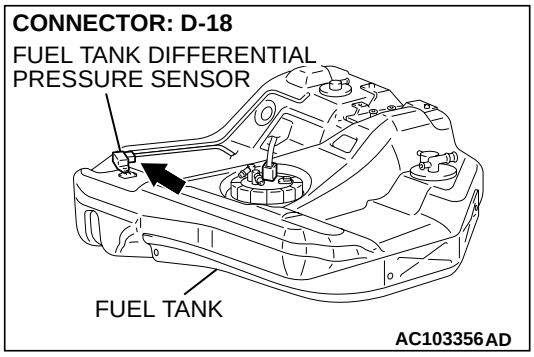
W2S18M01AA











CIRCUIT OPERATION

- A 5-volt voltage is supplied to the power terminal of the fuel tank differential pressure sensor (terminal 3) from the ECM (terminal 81) <M/T> or PCM (terminal 46) <A/T>. The ground terminal (terminal 2) is grounded with the ECM (terminal 92) <M/T> or PCM (terminal 57) <A/T>.
- A voltage proportional to the pressure in the fuel tank is sent from the output terminal of the fuel tank differential pressure sensor (terminal 1) to the ECM (terminal 61) <M/T> or PCM (terminal 92) <A/T>.

TECHNICAL DESCRIPTION

- To judge if the fuel tank differential pressure sensor is defective, the ECM <M/T> or PCM <A/T> monitors the fuel tank differential pressure sensor output voltage.
- Based on the test conditions and judgment criteria, the ECM <M/T> or PCM <A/T> judges if the fuel tank differential pressure sensor output voltage is normal.

DTC SET CONDITIONS

Test Conditions: For Test to Run

- Intake air temperature is at between 5°C (41°F) and 45°C (113°F) or more.
- Engine speed is 1,600 r/min or more.
- Volumetric efficiency is between 20 and 80 percent.

Judgment Criteria

- When the evaporative emission purge solenoid valve is activating at 100 percent ratio, the fuel differential pressure sensor output voltage remains 4.0 volts or more for ten seconds.

TROUBLESHOOTING HINTS

The most likely causes for this code to be set are:

- Fuel tank differential pressure sensor failed.
- Open fuel tank differential pressure sensor circuit, or loose connector.
- ECM <M/T> or PCM <A/T> failed.

OVERVIEW OF TROUBLESHOOTING

- The DTC P0453 can be set if either of the following conditions occur:
  1. Faulty fuel differential pressure sensor, related circuit, or ECM <M/T> or PCM <A/T>.
- To check a system blockage, do a performance test which uses a mechanical vacuum gauge and scan tool MB991502 set on the fuel tank differential pressure sensor (TANK PRS SNSR 73.)
  The mechanical gauge reading is used to verify scan tool MB991502 reading.
  A comparison of the mechanical gauge to scan tool MB991502 determines the problem in the system.

DIAGNOSIS

Required Special Tools:

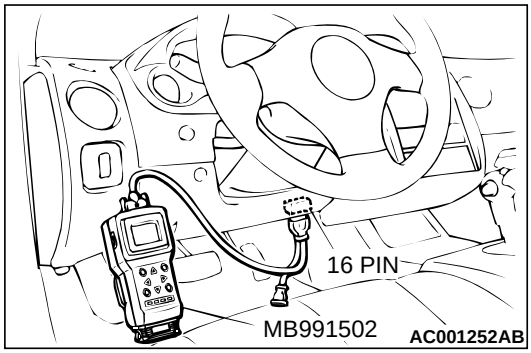
- MB991502: Scan Tool (MUT-II)
- MB991658: Test Harness Set
- MB991709: Test Harness Set

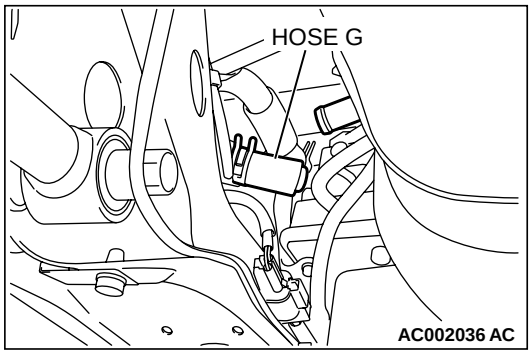
STEP 1. Using scan tool MB991502, check data list item 73: Fuel Tank Differential Pressure Sensor.

⚠ CAUTION

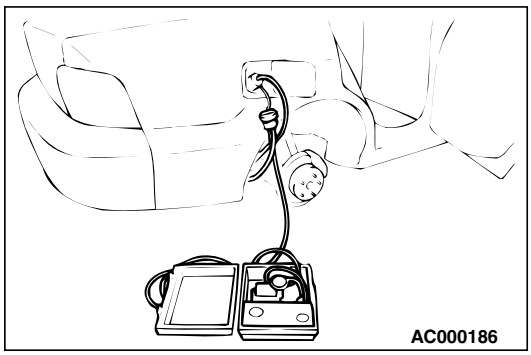
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.





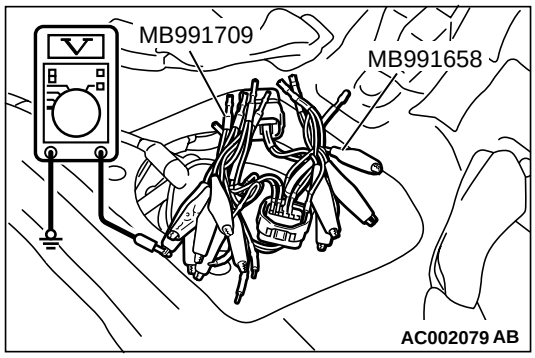
(2) Disconnect hose G from the evaporative emission canister side, and plug the hose from which the pipes have been disconnected.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Set scan tool MB991502 to the data reading mode for item 73, Fuel Tank Differential Pressure Sensor.
  - The fuel tank pressures should be –1.5 to 1.5 kPa (–285 to 285 inHg.)



(6) Connect an evaporative emission system pressure pump to the fuel filler neck, and apply pressure.
  - The scan tool reading should increase.
(7) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991502.

Q: Is the scan tool reading within the specified value?

YES : Go to Step 22.
NO : Go to Step 2.



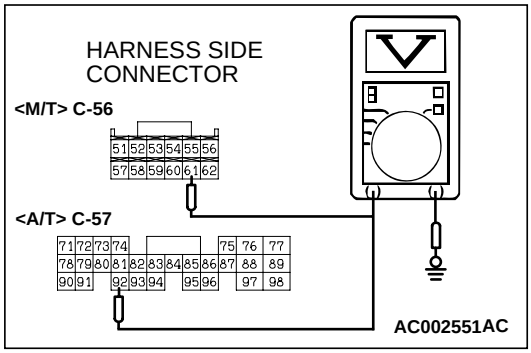
STEP 2. Check the output circuit voltage at intermediate connector D-16.

(1) Remove the rear seat cushion. (Refer to GROUP 52, Rear Seat P.52A-20.)
(2) Remove the protector.
(3) Disconnect intermediate connector D-16.
(4) Use special tools (MB991658 and MB991709) to connect terminals 5, 6 and 8 between connectors of the intermediate connector respectively.
(5) Turn the ignition switch to the "ON" position.
(6) Remove the fuel cap.
(7) Measure the voltage between terminal 5 and ground.
- Voltage should be between 2.0 and 3.0 volts.

(8) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Remove the special tools and connect intermediate connector D-16. Then go to Step 3 .
NO : Go to Step 6.



STEP 3. Check the output circuit voltage at ECM connector C-57 <M/T> or PCM connector C-57 <A/T> by backprobing.

(1) Do not disconnect the ECM connector C-56 <M/T> or PCM connector C-57 <A/T>.
(2) Turn the ignition switch to the "ON" position.
(3) Remove the fuel cap.
(4) Measure the voltage between terminal 61 <M/T> or terminal 92 <A/T> and ground by backprobing.
- Voltage should be between 2.0 and 3.0 volts.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

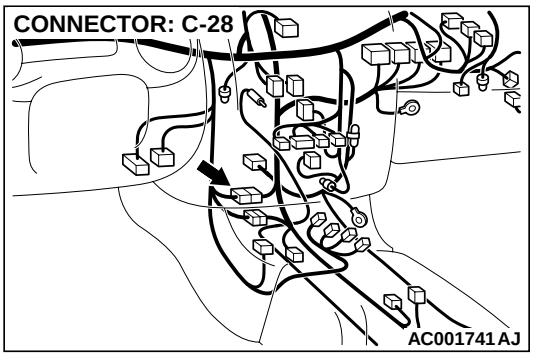
YES : Go to Step 21.
NO : Go to Step 4.

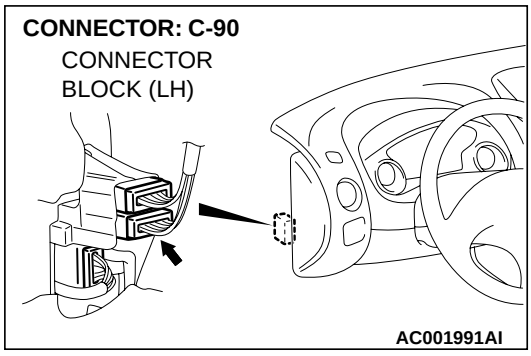
STEP 4. Check connectors C-28, C-90, D-16 at intermediate connector and C-56 at ECM <M/T> or C-57 at PCM <A/T> for damage.

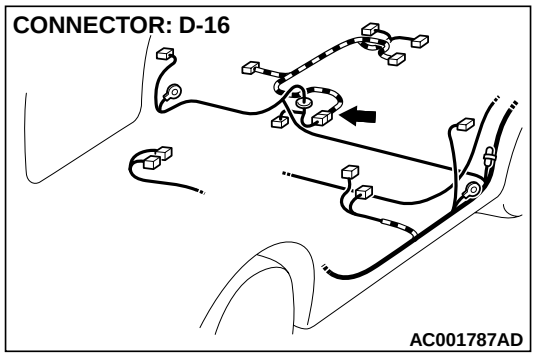
Q: Are the connectors in good condition?

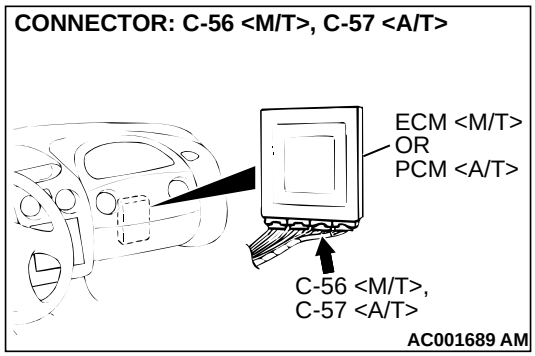
YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.







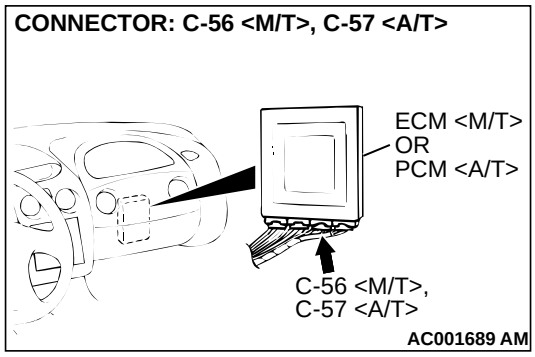


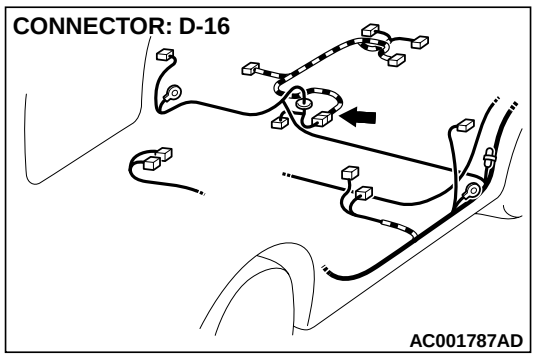
STEP 5. Check the harness wire between ECM connector C-56 terminal 61 <M/T> or PCM connector C-57 terminal 92 <A/T> and intermediate connector D-16 terminal 5 for damage.

Q: Is the harness wire in good condition?

YES : Go to Step 22.

NO : Repair it. Then go to 22.





STEP 6. Check the 5-volt supply circuit voltage at intermediate connector D-16.

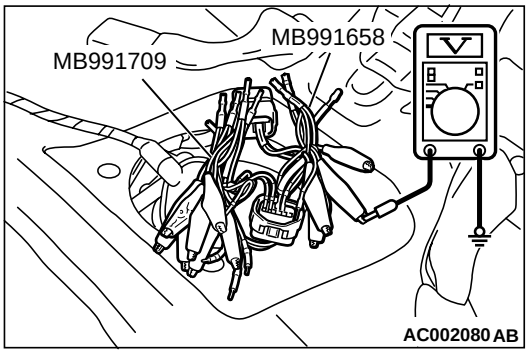
(1) Use special tools (MB991658 and MB991709) to connect terminals 5, 6 and 8 between connectors of the intermediate connector D-16 respectively.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 8 and ground.
- Voltage should be between 4.8 and 5.2 volts.

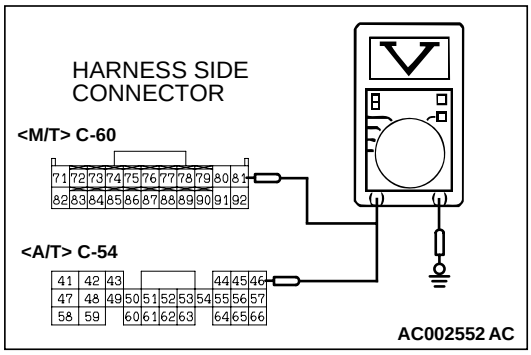
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 11.

NO : Remove the special tools and connect intermediate connector D-16. Then go to Step 7 .





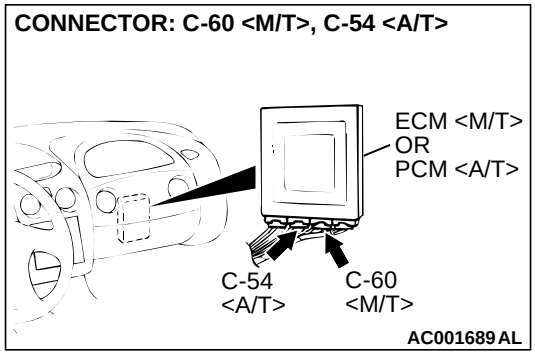
STEP 7. Check the 5-volt supply circuit voltage at ECM connector C-60 <M/T> or PCM connector C-54 <A/T> by backprobing.

(1) Do not disconnect ECM connector C-60 <M/T> or PCM connector C-54 <A/T>.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 81 <M/T> or terminal 46 <A/T> and ground by backprobing.
- Voltage should be between 4.8 and 5.2 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

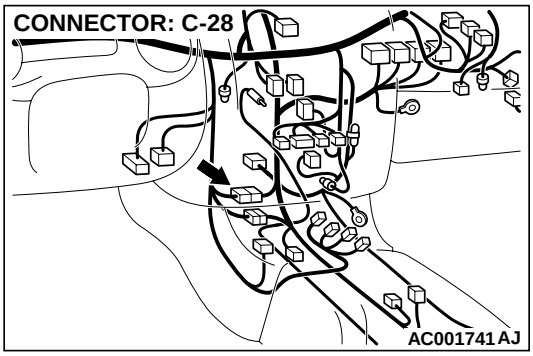
YES : Go to Step 9.
NO : Go to Step 8.

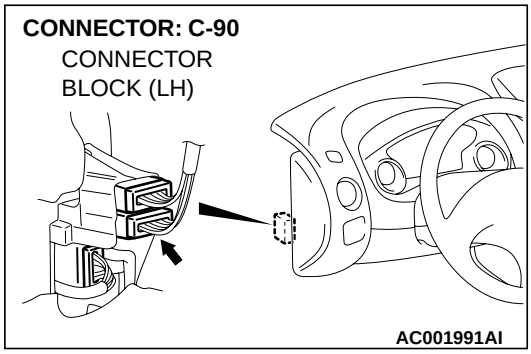


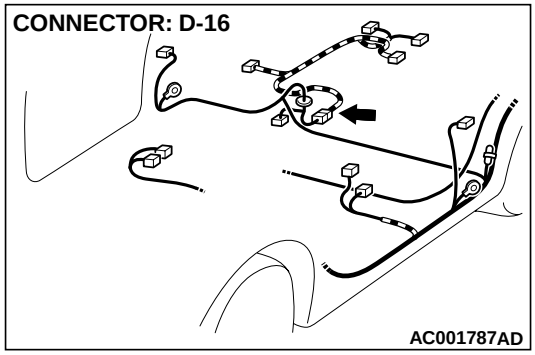
STEP 8. Check connector C-60 at ECM <M/T> or C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 21.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.







STEP 9. Check connectors C-28, C-90, D-16 at intermediate connector for damage.

Q: Are the connectors in good condition?

YES : Go to Step 10.

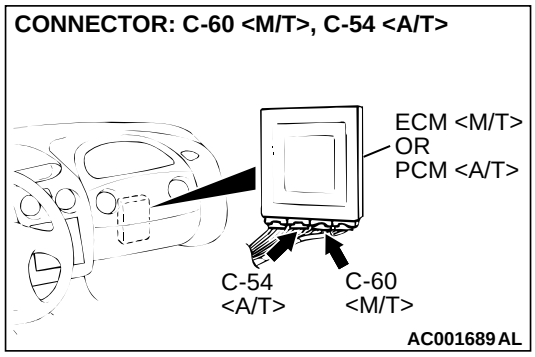
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.

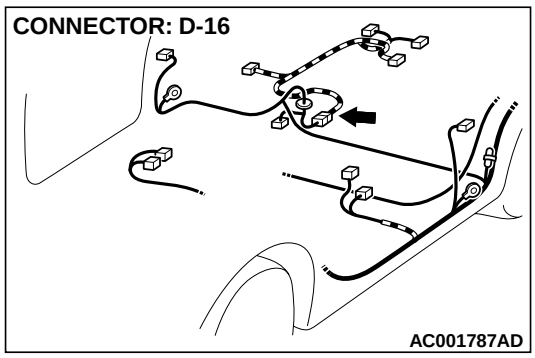
STEP 10. Check the harness wire between ECM connector C-60 terminal 81 <M/T> or PCM connector C-54 terminal 46 <A/T> and intermediate connector D-16 terminal 8 for damage.

Q: Is the harness wire in good condition?

YES : Go to Step 22.

NO : Repair it. Then go to 22.

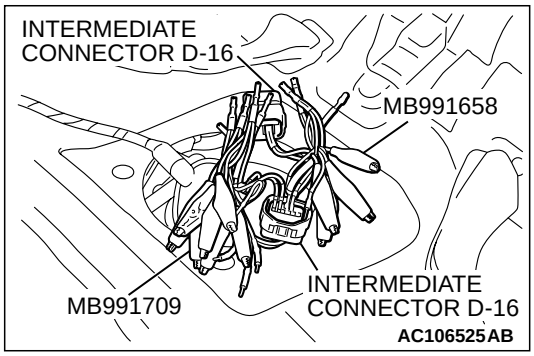




STEP 11. Check the circuit voltage at intermediate connector D-16.

(1) Use special tools (MB991658 and MB991709) to connect terminals 5 and 8 between connectors of the intermediate connector D-16 respectively.

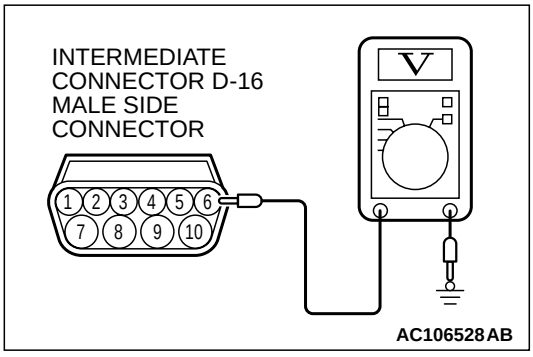
(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage at the male side connector between terminal 6 and ground.
- Voltage should be between 0.5 and 4.8 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

(5) Remove the special tools and connect intermediate connector D-16.



Q: Is the voltage normal?

YES : Go to Step 12.

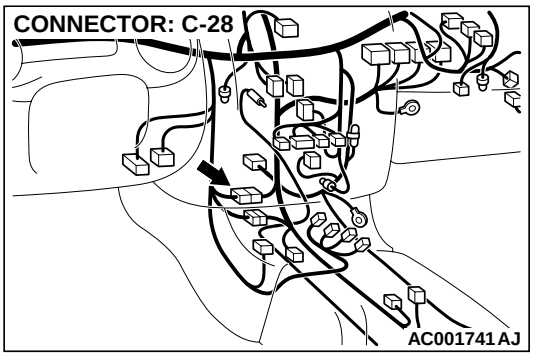
NO : Go to Step 15.

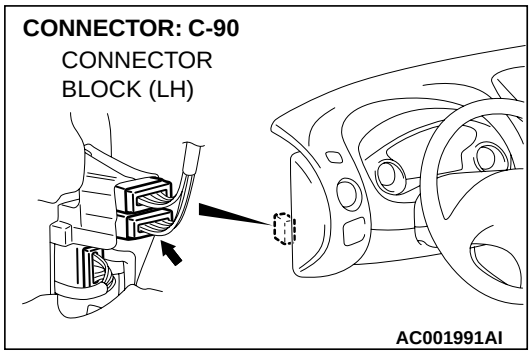
STEP 12. Check connectors C-28, C-90, D-16 at intermediate connector and C-60 at ECM <M/T> or C-54 at PCM <A/T> for damage.

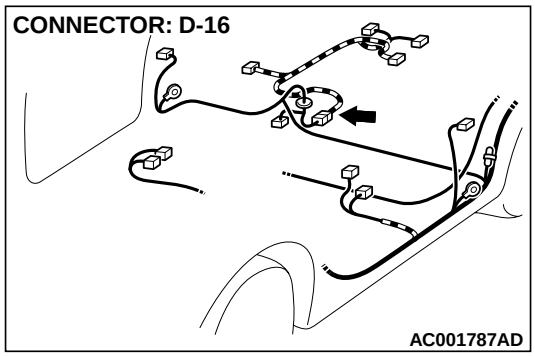
Q: Are the connectors in good condition?

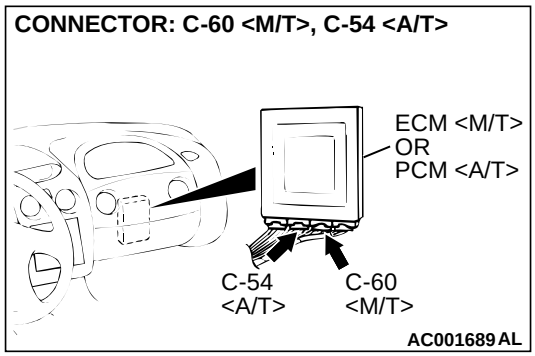
YES : Go to Step 13.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.







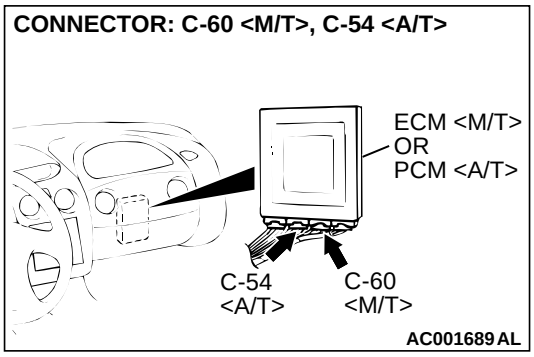


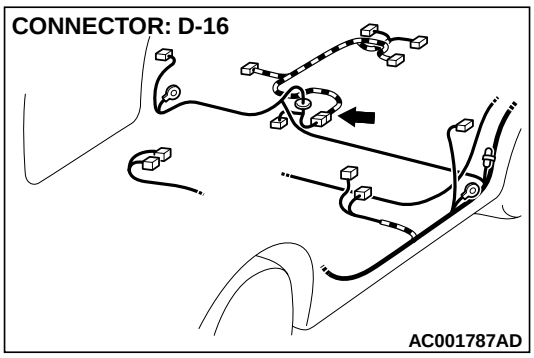
STEP 13. Check the harness wire between ECM connector C-60 terminal 92 <M/T> or PCM connector C-54 terminal 57 <A/T> and intermediate connector D-16 terminal 6 for damage.

Q: Is the harness wire in good condition?

YES : Go to Step 14.

NO : Repair it. Then go to 22.





STEP 14. Check the ground voltage at ECM connector C-60 <M/T> or PCM connector C-54 <A/T> by backprobing.

(1) Do not disconnect ECM connector C-60 <M/T> or PCM connector C-54 <A/T>.

(2) Turn the ignition switch to the "ON" position.

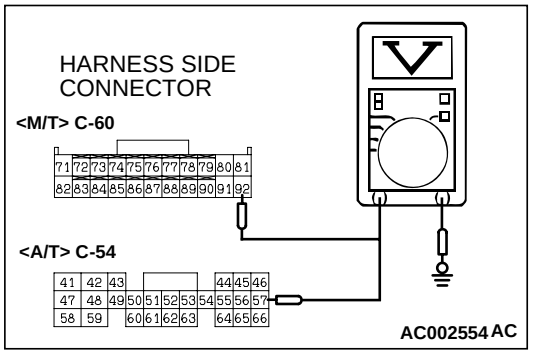
(3) Measure the voltage between terminal 92 <M/T> or terminal 57 <A/T> and ground by backprobing.
- The voltage should be 0.5 volt or less.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 18.

NO : Go to Step 21.

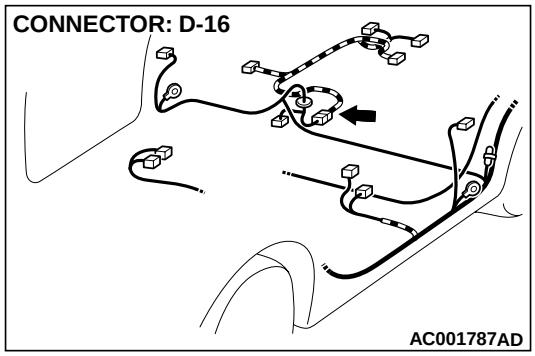


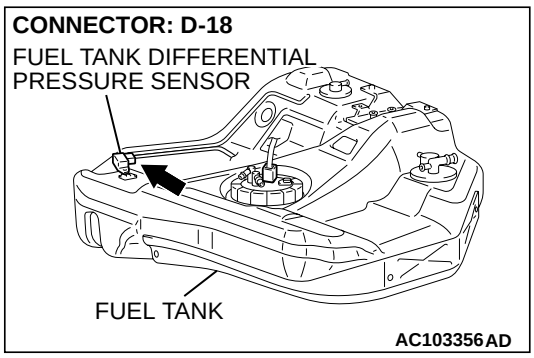
STEP 15. Check connectors D-16 at intermediate connector and D-18 at fuel tank differential pressure sensor for damage.

Q: Are the connectors in good condition?

YES : Go to Step 16.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.



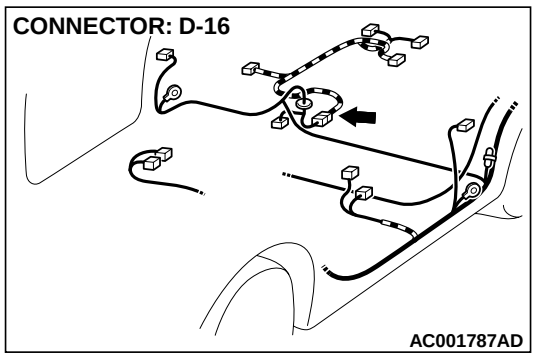


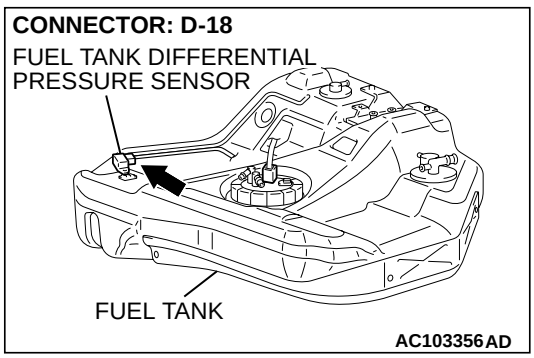
STEP 16. Check the harness wire between intermediate connector D-16 terminal 8 and fuel tank differential pressure sensor connector D-18 terminal 3 for damage.

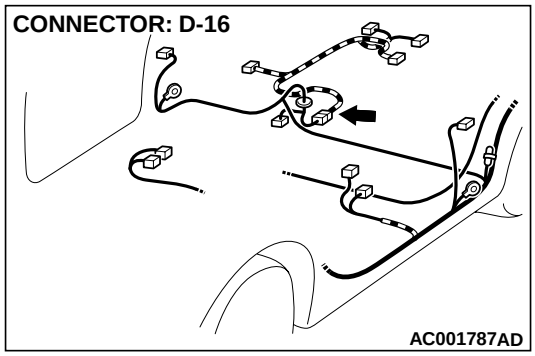
Q: Is the harness wire in good condition?

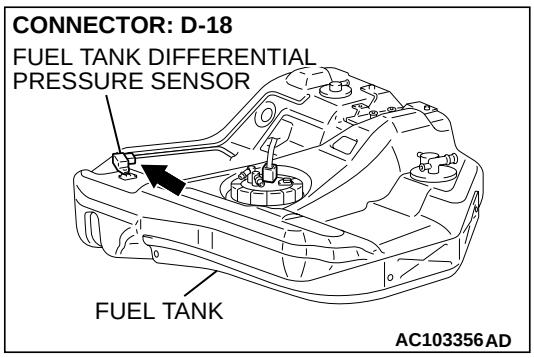
YES : Go to Step 17.

NO : Repair it. Then go to 22.







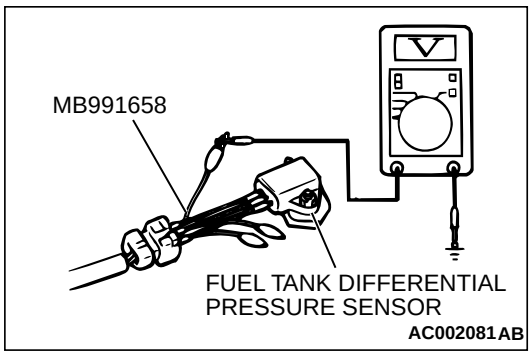


STEP 17. Check the harness wire between intermediate connector D-16 terminal 6 and fuel tank differential pressure sensor connector D-18 terminal 2 for damage.

Q: Is the harness wire in good condition?

YES : Replace the fuel tank differential pressure sensor. Then go to 22.

NO : Repair it. Then go to 22.



STEP 18. Check the output circuit voltage at fuel tank differential pressure sensor connector D-18.

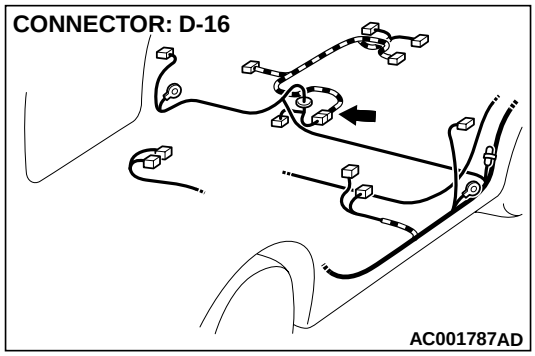
(1) Remove the center exhaust pipe. (Refer to GROUP 15, Exhaust Pipe, Main Muffler and Catalytic Converter P.15-21.)
(2) Remove the fuel band assembly, tilt the fuel tank.
(3) Disconnect fuel tank differential pressure sensor connector D-18.
(4) Use special tool (MB991658) to connect terminals 1, 2 and 3 of the disconnected sensor connector and those of the harness side connector respectively.
(5) Turn the ignition switch to the "ON" position.
(6) Remove the fuel cap.
(7) Measure the voltage between terminal 1 and ground.
- Voltage should be between 2.0 and 3.0 volts.

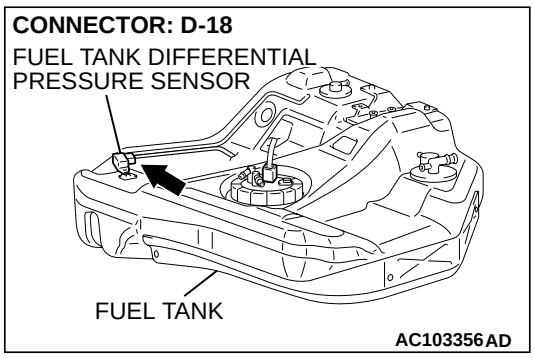
(8) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Remove the special tool and connect fuel tank differential pressure sensor connector D-18. Then go to Step 19.

NO : Replace the fuel tank differential pressure sensor. Then go to 22.



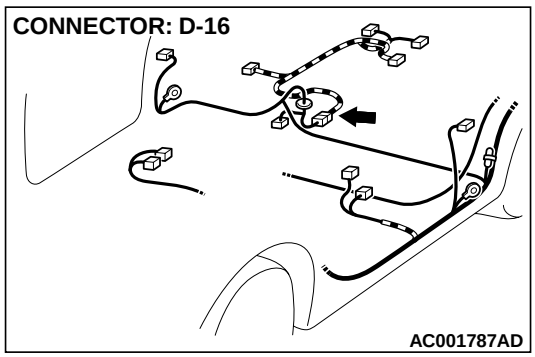


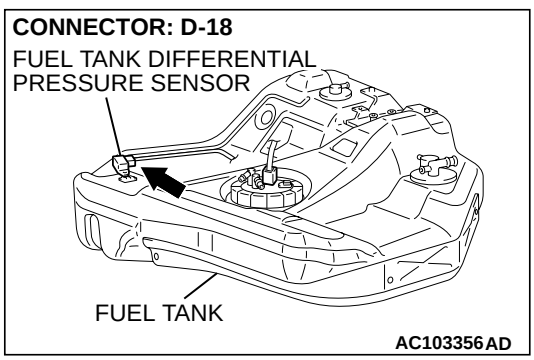
STEP 19. Check connectors D-16 at intermediate connector and D-18 at fuel tank differential pressure sensor for damage.

Q: Are the connectors in good condition?

YES : Go to Step 20.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.





STEP 20. Check the harness wire between intermediate connector D-16 terminal 5 and fuel tank differential pressure sensor connector D-18 terminal 1 for damage.

Q: Is the harness wire in good condition?

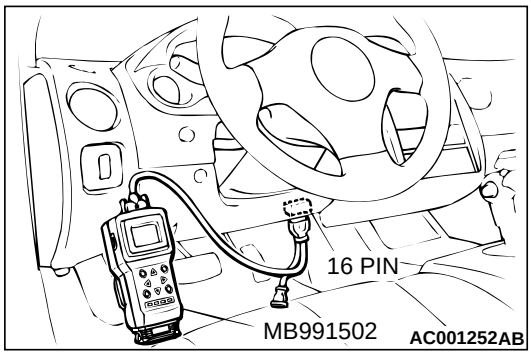
YES : Go to Step 22.

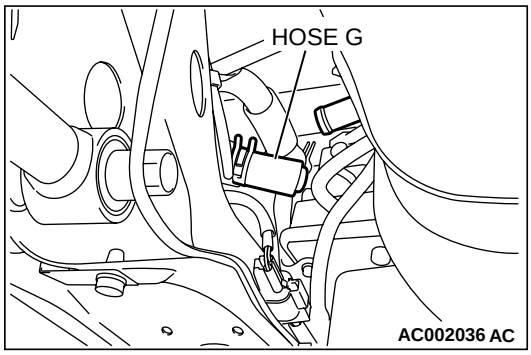
NO : Repair it. Then go to 22.

STEP 21. Using scan tool MB991502, check data list item 73: Fuel Tank Differential Pressure Sensor.

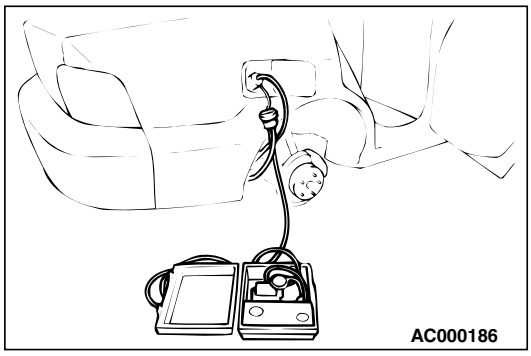
⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.





(2) Disconnect hose G from the evaporative emission canister side, and plug the hose from which the pipes have been disconnected.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Set scan tool MB991502 to the data reading mode for item 73, Fuel Tank Differential Pressure Sensor.
- The fuel tank pressures should be –1.5 to 1.5kPa (–285 to 285 inHg.)



(6) Connect an evaporative emission system pressure pump to the fuel filler neck, and apply pressure.
- The scan tool reading should increase.

(7) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991502.

Q: Is the scan tool reading within the specified value?

YES : This malfunction is intermittent malfunction. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6. Then go to Step 22.
NO : Replace the ECM <M/T> or PCM <A/T>. Then go to Step 22.

STEP 22. Test the OBD-II drive cycle.

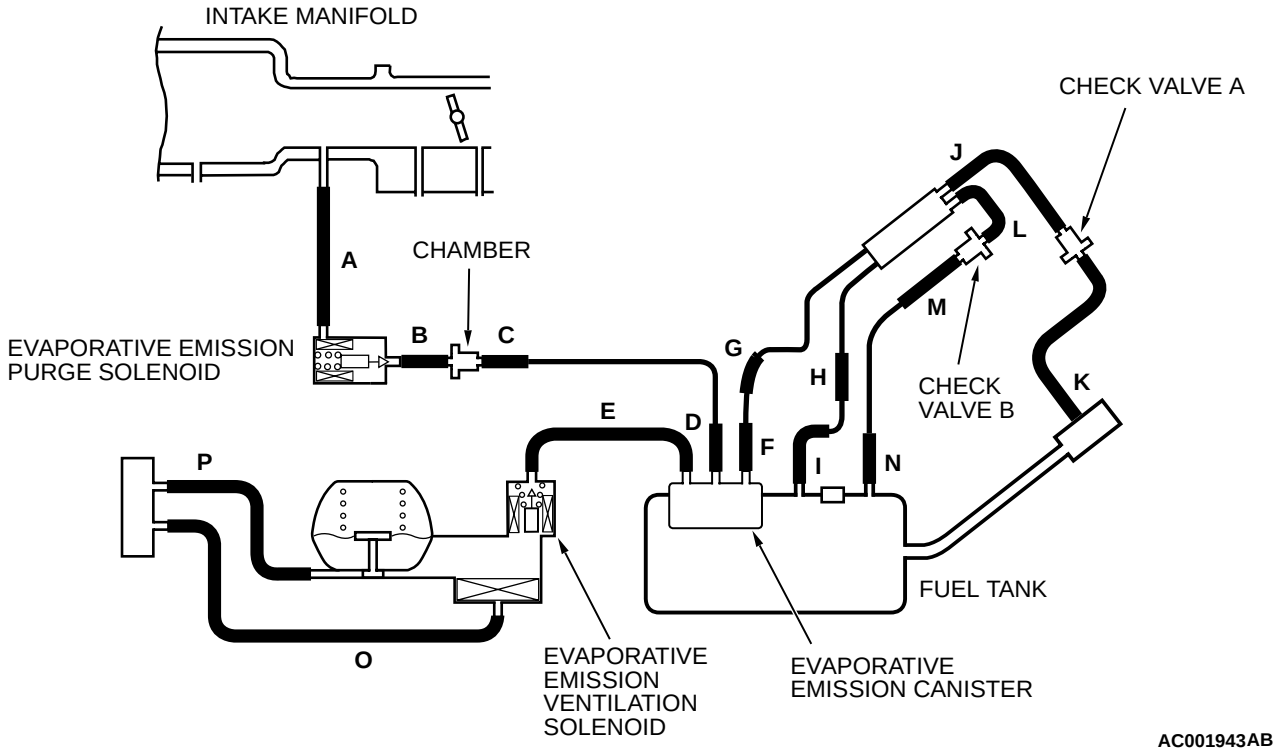
(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 1 - Evaporative Emission Control System Leak Monitor P.13A-5.
(2) Read the diagnostic trouble code.

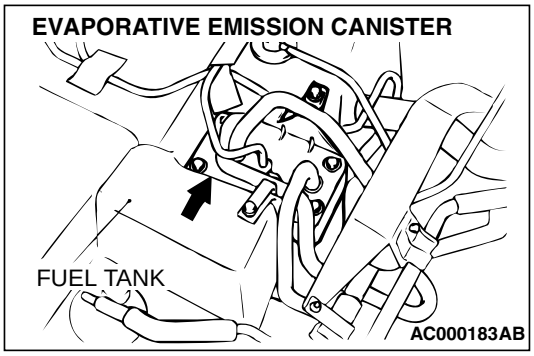
Q: Is diagnostic trouble code P0453 set?

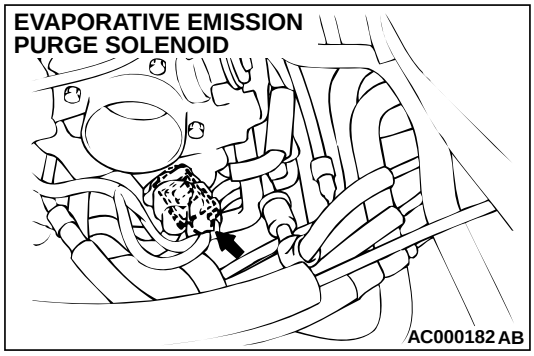
YES : Go to Step 2.
NO : This diagnosis is complete.

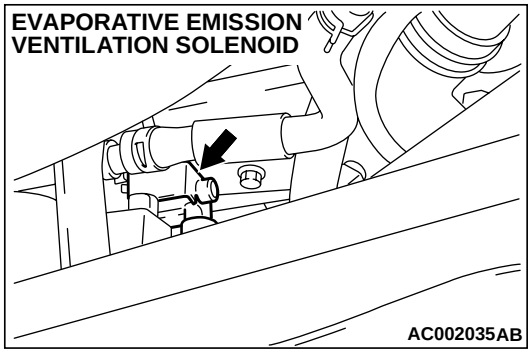
DTC P0455: Evaporative Emission Control System Leak Detected (Gross Leak)

SYSTEM DIAGRAM









TECHNICAL DESCRIPTION

- To judge if there is leak or clog in the fuel system, the ECM <M/T> or PCM <A/T> measures the change of the pressure inside the fuel tank.
- The ECM <M/T> or PCM <A/T> turns on the evaporative emission ventilation solenoid to shut off the evaporative emission canister outlet port.

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- Then the evaporative emission purge solenoid is driven to set the fuel system into a negative pressure.
- When the fuel system develops a vacuum of 2 kPa (0.29 psi), the evaporative emission purge solenoid is turned "off" and the fuel system vacuum is maintained at 2 kPa (0.29 psi).
- The ECM <M/T> or PCM <A/T> determines if there is leak or clog in the fuel system by measuring the change of vacuum inside the fuel tank.
- The test is stopped when fuel vapor pressure is judged as too high.

DTC SET CONDITIONS

Test Conditions A: At Start up
- Intake air temperature is 36°C (97°F) or less when the engine is started.
- The engine coolant temperature 36°C (97°F) or less when the engine is started.

Test Conditions B: For Test to Run
- The engine coolant temperature 60°C (140°F) or more <i.e. the amount of remaining fuel is 15 – 40 percent>.
- The engine coolant temperature 20°C (68°F) or more <i.e. the amount of remaining fuel is 40 – 85 percent>.
- Engine speed is 1,600 r/min or more.
- Barometric pressure is above 76 kPa (11 psi).
- Volumetric efficiency is between 20 and 80 percent.
- The fuel temperature is 36°C (97°F) or less.
- Fuel tank differential pressure sensor output voltage 1 – 4 volts.

Test Conditions C: For Test to Stop
- Intake air temperature is less than 5°C (41°F).
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the pressure rises higher 451 Pa (0.065 psi) <i.e. the amount of remaining fuel is 15 – 40 percent>.
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the pressure rises higher 324 Pa (0.047 psi) <i.e. the amount of remaining fuel is 40 – 85 percent>.

Judgment Criteria
- The fuel tank internal pressure is 2 kPa (0.29 psi) or more after the evaporative emission purge solenoid has been driven when the fuel tank and vapor line were closed.

NOTE: The monitoring time (150 seconds) depends on the fuel level and the temperature in the fuel tank.

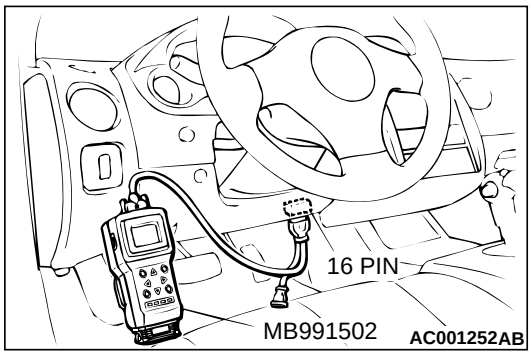
TROUBLESHOOTING HINTS

The most likely causes for this code to be set are:
- Loose fuel cap.
- Fuel cap relief pressure is incorrect.
- Fuel overflow limiter valve failed.
- Purge line or vapor line is clogged.
- Fuel tank, purge line or vapor line seal failed.
- Evaporative emission purge solenoid failed.
- Evaporative emission ventilation solenoid failed.
- Fuel tank differential pressure sensor failed.
- Evaporative emission canister seal is faulty.
- Evaporative emission canister is clogged.

OVERVIEW OF TROUBLESHOOTING
- To determine the cause of DTC P0455, a performance test is needed. The performance test uses a mechanical vacuum gauge and scan tool MB991502 set on the fuel tank differential pressure sensor (TANK PRES SNER 73.) The mechanical gauge reading is used to verify scan tool MB991502 reading. A comparison of the mechanical gauge reading to scan tool MB991502 reading determines the reading problem in the system.
- Prior to doing the performance test, several simple inspections are needed to exclude some possibilities of the symptom.

DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check evaporative emission system monitor test.

⚠ CAUTION

- **To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.**
- **With this monitor, the ECM <M/T> or PCM <A/T> automatically increases the engine speed to 1,600 r/min or more. Check that the transaxle is set to "neutral" <M/T> or "P" <A/T> position.**

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTCs using the scan tool MB991502.
(4) Check that the fuel cap is securely closed. (Tighten until three clicks are heard.)
(5) Start the engine.
(6) Select "System Test," and press the "YES" key.
(7) Select "Evap Leak Mon," and press the "YES" key.
(8) During the monitor, keep the accelerator pedal at the idling position.

NOTE: If the engine speed does not reach 2,000 r/min during the monitor test, adjustment of the Speed Adjusting Screw may be needed. Refer to P.13A-577. And adjust to the standard value.

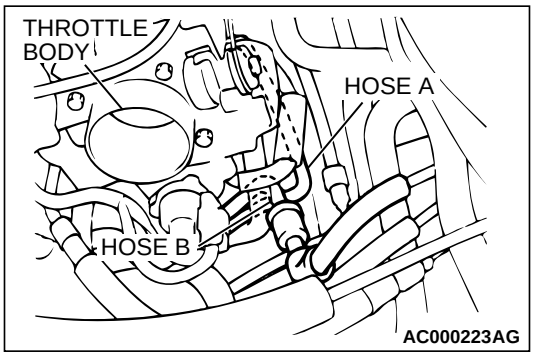
(9) Keep the engine speed and engine load within the specified range. When the monitor test starts, the "In Progress" item on scan tool MB991502 will change from "NO" to "YES."

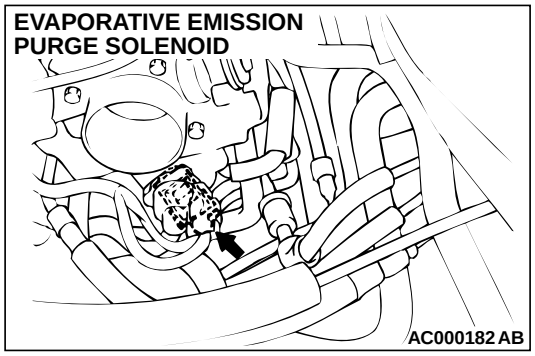
Q: What is displayed on scan tool MB991502?

"Evap Leak Mon. Completed. Test Passed" : The evaporative emission system is working properly at this time. Explain to customer that improperly tightened fuel cap can cause MIL to turn on, and return the vehicle.

"Evap Leak Mon. Completed. Test Failed and DTCs Set" : A malfunction has been detected during the monitor test. Go to Step 2.

"Evap Lead Mon. discontinued. Retest again from the first" : The monitor was discontinued for a certain reason (vehicle speed input from computer, engine speed and engine load deviating from specified range). Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the monitoring from the Step 1.



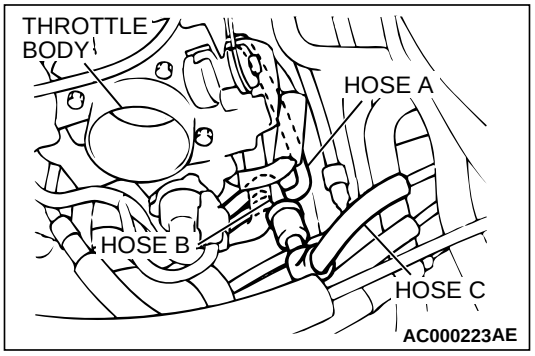


STEP 2. Using scan tool MB991502, check solenoid for clogging of the purge control.

(1) Disconnect hoses A and B from the evaporative emission purge solenoid side, and connect the hand vacuum pump to the evaporative emission purge solenoid instead of hose B.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to actuator test mode for item 08: Evaporative Emission Purge Solenoid. When the evaporative emission purge solenoid is operated, apply a pressure on the hand vacuum pump and confirm that air is blown from the other side nipple.
(4) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991502.
(5) Disconnect the hand vacuum pump, and connect hoses A and B to the evaporative emission purge solenoid.

Q: Is the solenoid in good condition?

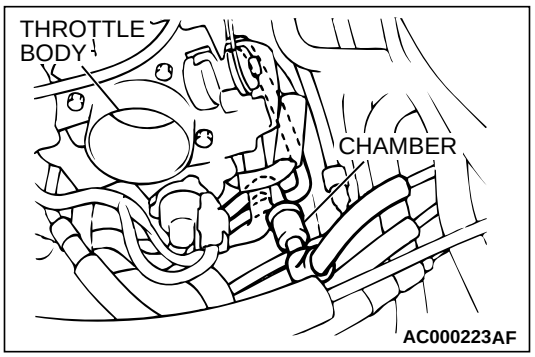
YES : Go to Step 3.
NO : Replace the evaporative emission purge solenoid. Then go to Step 27.



STEP 3. Check for leaks and clogging in the evaporator line hose A to hose C.

Q: Are the hoses in good condition?

YES : Go to Step 4.
NO : Replace the inferior hose. Then go to Step 27.



STEP 4. Check for leaks and clogging in the chamber.

(1) When you blow the chamber, it should pass less air.
(2) When you blow the chamber, on air should leak from the chamber body.

Q: Is the chamber in good condition?

YES : Go to Step 5.
NO : Replace the chamber. Then go to Step 27.

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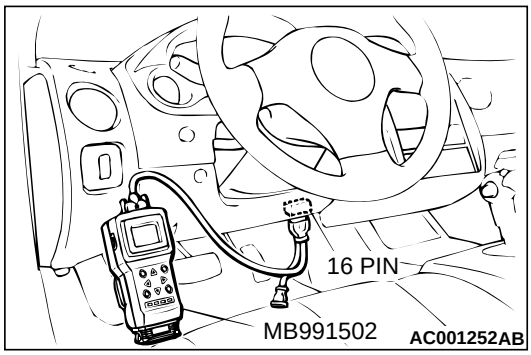
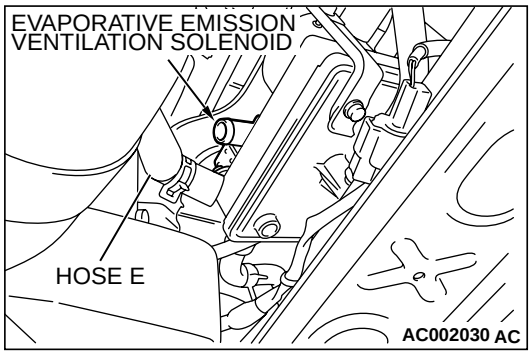
STEP 5. Check the evaporative emission ventilation solenoid using scan tool MB991502.

⚠ CAUTION

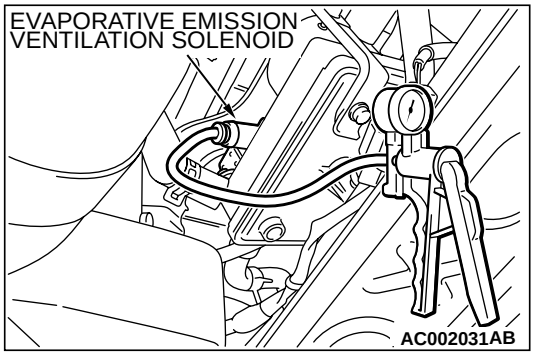
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.





(2) Disconnect hose E from the evaporative emission ventilation solenoid side, and connect a hand vacuum pump.
(3) Turn the ignition switch to the "ON" position.
(4) Set scan tool MB991502 to actuator test mode for item 29: Evaporative Emission Ventilation Solenoid. When the evaporative emission ventilation solenoid is operated, apply a pressure on the hand vacuum pump and confirm that air is maintained.
(5) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991502.
(6) Disconnect the hand vacuum pump, and connect hose E to the evaporative emission canister.

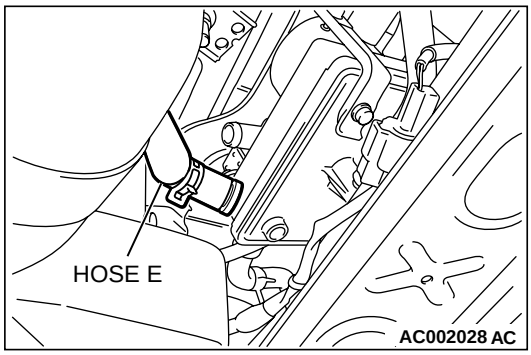


Q: Is the solenoid valve in good condition?

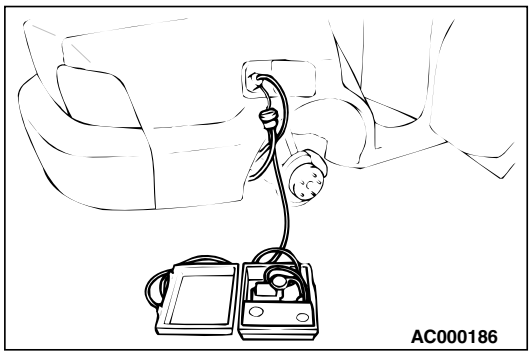
YES : Go to Step 6.

NO : Replace the evaporative emission ventilation solenoid. Then go to Step 27.

STEP 6. Pressure test for leaks in the evaporator line from hose D to hose N.



(1) Disconnect hose E from the evaporative emission ventilation solenoid side, and plug the hoses.
(2) Remove the fuel cap.



(3) Connect the evaporative emission system pressure pump to the fuel filler neck.
(4) Apply a pressure on the evaporative emission system pressure pump, and confirm that air is maintained.

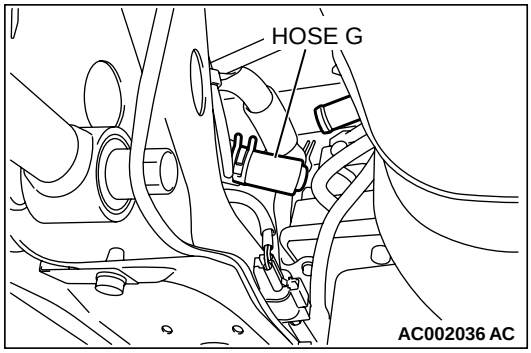
NOTE: "Pressure test" in this procedure refers to the I/M240 Simulation Test (8 simple steps) described in the evaporative emission system pressure pump (Miller number 6872A) manufacture's instructions located in the lid of the pump box.

(5) Disconnect the evaporative emission system pressure pump, and reinstall the fuel cap.
(6) Connect hose E to the evaporator line.

Q: Is air maintained?

YES : Go to Step 17.
NO : Go to Step 7.

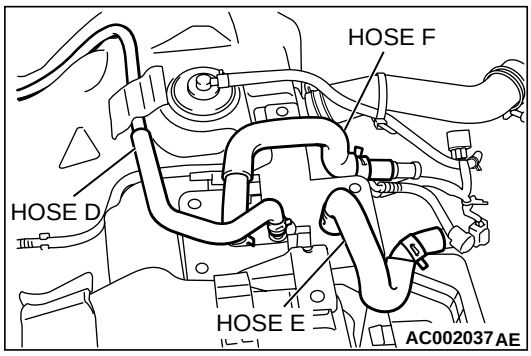
STEP 7. Pressure test for leaks in the evaporator line from hose G to hose N.



(1) Disconnect hose G from the evaporative emission canister side, and plug the hose.
(2) Perform the pressure test again.

Q: Is air maintained?

YES : Go to Step 10.
NO : Go to Step 8.



STEP 8. Check for leaks in the evaporator line from hose D to hose F.

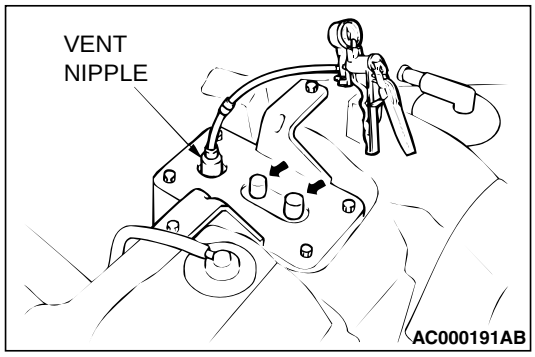
(1) Remove the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.)

(2) The leakage test with a hand vacuum pump on each hose from hose D to hose F.

Q: Are the hoses in good condition?

YES : Go to Step 9.

NO : Replace the inferior hose, and reinstall the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 27.



STEP 9. Check for leaks in the evaporative emission canister.

(1) Connect a hand vacuum pump to the vent nipple of the evaporative emission canister.

(2) Plug the other two nipples or loop a hose between the other nipples.

(3) Apply a vacuum with the hand vacuum pump, and confirm that air is maintained.

Q: Is the evaporative emission canister in good condition?

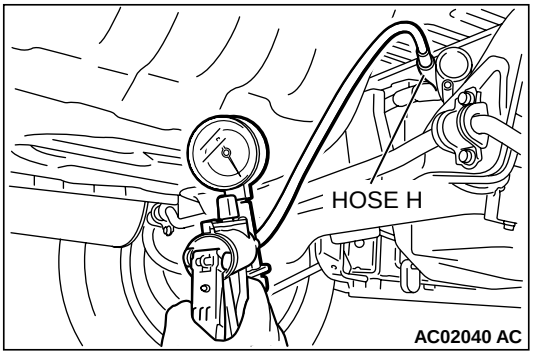
YES : Go to Step 27.

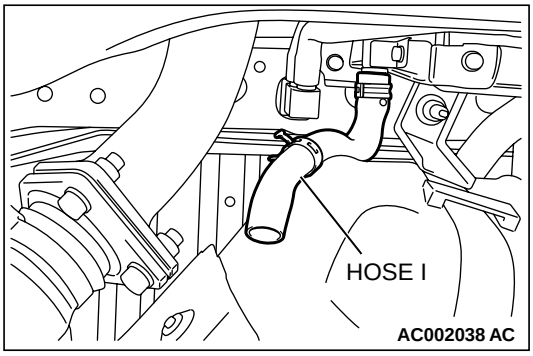
NO : Replace the evaporative emission canister (Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve P.17-110,) and reinstall the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 27.

STEP 10. Check for leaks in the evaporator line from hose H to hose I.

(1) Remove the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.)

(2) Disconnect hose H at the liquid separator side, and then connect a hand vacuum pump to the hose.





(3) Plug the hose I at the fuel tank side.

(4) Apply vacuum by using the hand vacuum pump, and confirm that the applied vacuum does not fluctuate.

Q: Is air maintained?

YES : Go to Step 11.

NO : Replace the inferior hose, and reinstall the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 27.

STEP 11. Check for leaks in the evaporator line hose G, J, K, L and hose M.

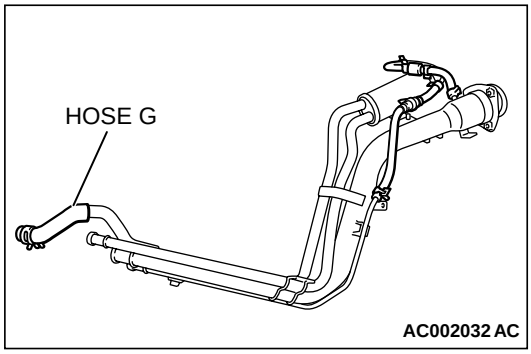
(1) Remove the filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.)

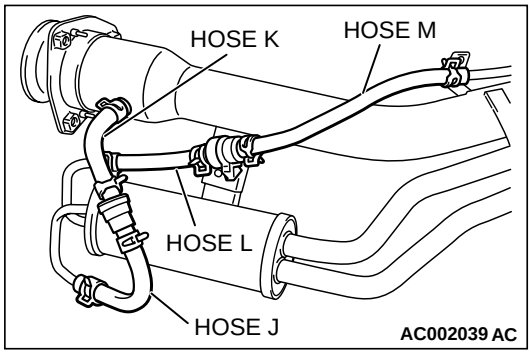
(2) The leakage test with a hand vacuum pump on each hose from hoses G, J, K, L and M.

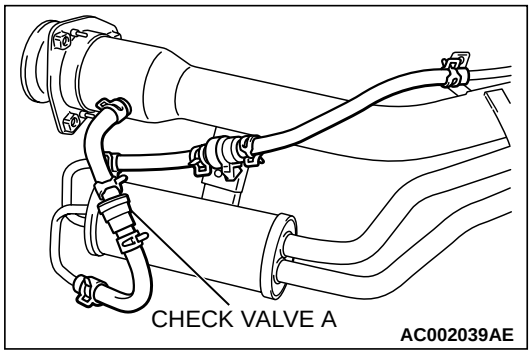
Q: Are the hoses in good condition?

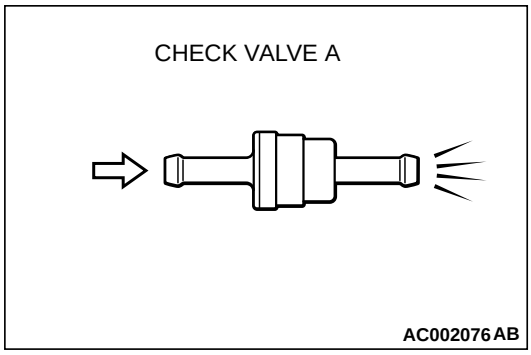
YES : Go to Step 12.

NO : Replace the inferior hose, and reinstall the filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 27.







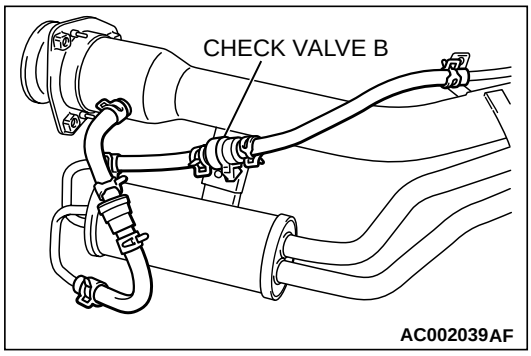


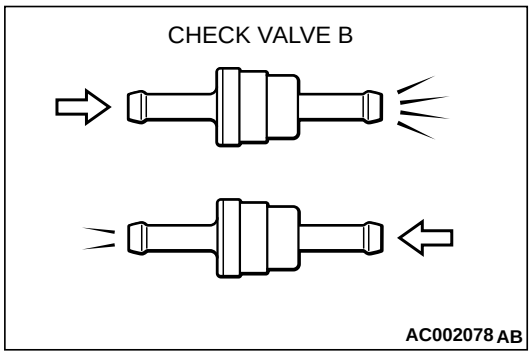
STEP 12. Check the check valve A.

(1) Only when you blow the check valve from the direction shown, it should pass air.
(2) When you blow the check valve, air should leak from the check valve body.

Q: Is check valve A in good condition?

YES : Go to Step 13.
NO : Replace the check valve A, and reinstall the filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 27.



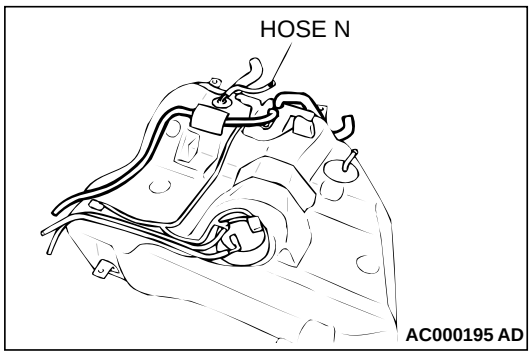


STEP 13. Check the check valve B.

(1) When you blow the check valve from the arrow direction shown above, it should pass more air.
(2) When you blow the check valve from the arrow direction shown below, it should pass less air.
(3) When you blow the check valve, air should leak from the check valve body.

Q: Is check valve B in good condition?

YES : Go to Step 14.
NO : Replace the check valve B, and reinstall the filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 27.



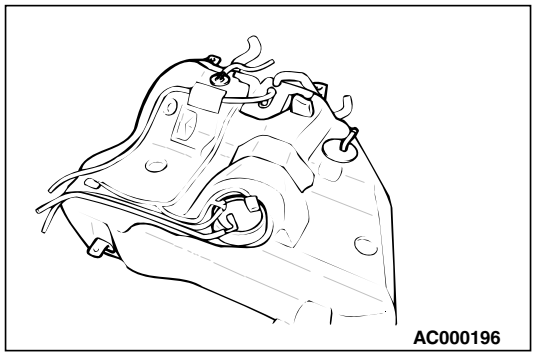
STEP 14. Check for leaks in the evaporator line from hose N.

(1) The leakage test with a hand vacuum pump on the hose N.

Q: Is the hose N in good condition?

YES : Go to Step 15.

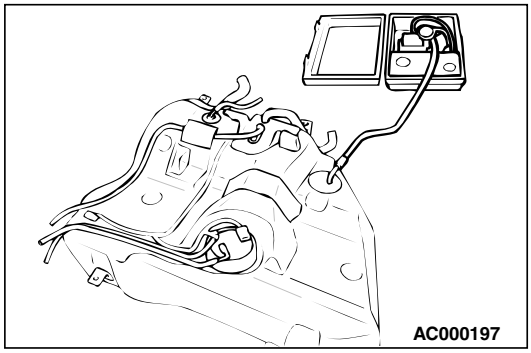
NO : Replace the hose N, and reinstall the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 27.



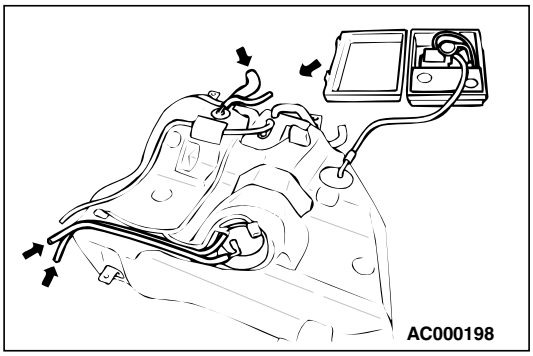
STEP 15. Check for leaks in the fuel tank.

(1) Visually check for cracks and leaks, etc.

NOTE: Carefully check the fuel pump assembly and the inner pressure sensor installation section in the fuel tank.



(2) Connect an evaporative emission system pressure pump to the leveling valve nipple.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(3) Plug the filler hose, feed pipe, return pipe and rollover valve nipple connected to the fuel tank.

NOTE: If these items are not securely plugged here, the fuel could leak in the next step.

(4) Apply pressure with the evaporative emission system pressure pump.

(5) In the pressurized state, check for the leak by applying soap water, etc. to each section.

Q: Are there any leaks?

There are leaks at the fuel pump module or the fuel tank differential pressure sensor section. : . After reassemble the leaked parts, check again that there are no leaks. Then reinstall the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 27.

There are leaks at the fuel tank. : . Replace the fuel tank, reinstall the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 27.

There are no leaks. : . Then go to Step 16.

STEP 16. Visually check for cracks in the fuel tank filler neck.

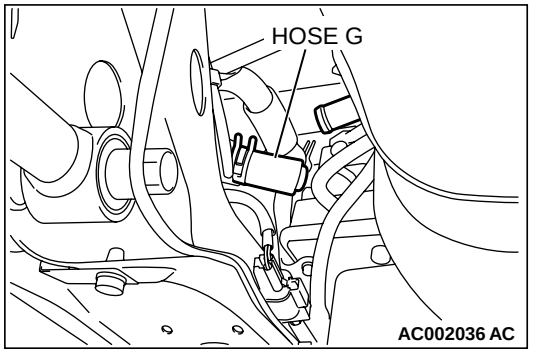
(1) Visually check for cracks in the fuel tank filler neck.

Q: Is the fuel filler neck assembly in good condition?

YES : Reinstall the fuel tank and fuel filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 27.

NO : Replace the fuel tank filler neck assembly and reinstall the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 27.

STEP17. Pressure test for clogging in the evaporator line from hose G to hose N.



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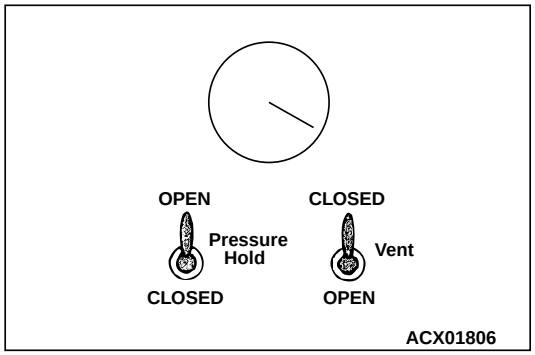
(1) Disconnect hose G from the evaporative emission canister side, and unplug the hose G.



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(2) On the EVAP pressure pump, set the pressure/hold valve to OPEN, and set the vent valve to CLOSED. Turn the pump timer to ON. You can reset the timer as required. (These settings are listed under "Leak Test" in the pump instructions.)

(3) Air should pass through hose G.

Q: Is air blown from hose G?

YES : Connect the hose G. Then go to Step 18.

NO : Go to Step 22.

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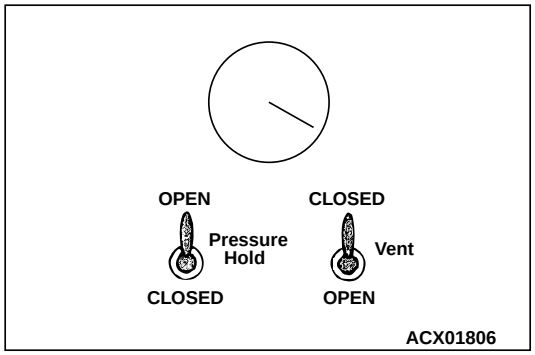
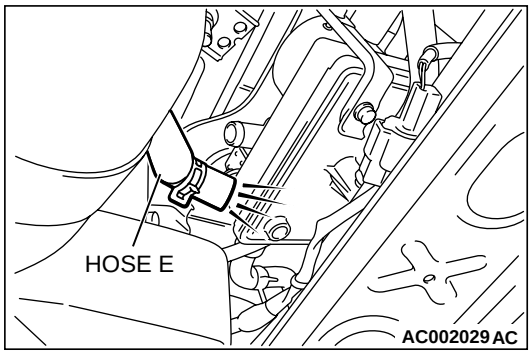
STEP18. Pressure test for clogging in the evaporator line from hose D to hose F.

(1) Unplug hose E.

(2) On the EVAP pressure pump, set the pressure/hold valve to OPEN, and set the vent valve to CLOSED. Turn the pump timer to ON. You can reset the timer as required. (These settings are listed under "Leak Test" in the pump instructions.)



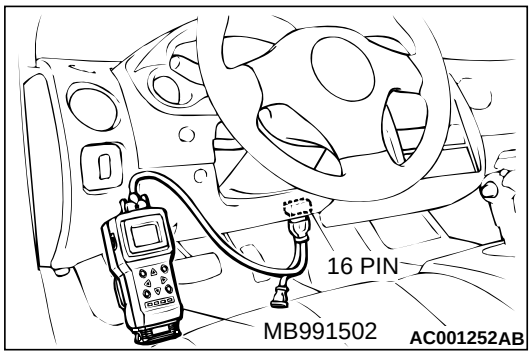


(3) Air should pass through hose E.

Q: Is air blown from hose E?

YES : Connect the hose E. Then go to Step 19.

NO : Go to Step 20.



STEP 19. Using scan tool MB991502, check evaporative emission system monitor test.

⚠ CAUTION

- **To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.**
- **With this monitor, the ECM <M/T> or PCM <A/T> automatically increases the engine speed to 1,600 r/min or more. Check that the transaxle is set to "neutral" <M/T> or "P" <A/T> position.**

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTCs using scan tool MB991502.
(4) Check that the fuel cap is securely closed. (Tighten until three clicks are heard.)
(5) Start the engine.
(6) Select "System Test," and press the "YES" key.
(7) Select "Evap Leak Mon," and press the "YES" key.
(8) During the monitor, keep the accelerator pedal at the idling position.

NOTE: If the engine speed does not reach 2,000 r/min during the monitor test, adjustment of the Speed Adjusting Screw may be needed. Refer to P.13A-577. And adjust to the standard value.

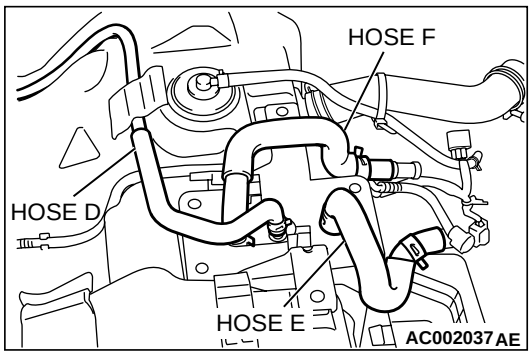
(9) Keep the engine speed and engine load within the specified range. When the monitor test starts, the "In Progress" item on the scan tool MB991502 will change from "NO" to "YES."
(10) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991502.

Q: What is displayed on scan tool MB991502?

"Evap Leak Mon. Completed. Test Passed" : The evaporative emission system is working properly at this time. Then go to Step 27 .

"Evap Leak Mon. Completed. Test Failed and DTCs Set" : Replace the ECM <M/T> or PCM <A/T>. Then go to Step 27.

"Evap Lead Mon. discontinued. Retest again from the first" : The monitor was discontinued for a certain reason (vehicle speed input from ECM <M/T> or PCM <A/T>, engine speed and engine load deviating from specified range). Turn the ignition switch to the "LOCK" (OFF) position once, and recheck evaporative emission system monitor test.

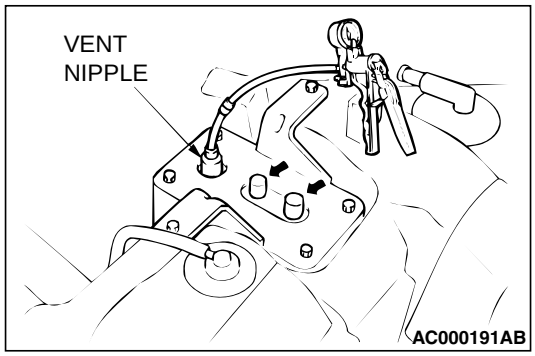


STEP 20. Check for clogging in the evaporator line hose D to F.

(1) Remove the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.)
(2) The clogging test with a hand vacuum pump on each hose from hose D to F.

Q: Are the hoses good condition?

YES : Go to Step 21.
NO : Replace the inferior hose, reinstall the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 27.



STEP 21. Check for clogging in the evaporative emission canister.

(1) Connect a hand vacuum pump to the vent nipple of the evaporative emission canister.
(2) Plug the other two nipples or loop a hose between the other nipples.
(3) Apply a pressure on the vacuum pump.
(4) When each nipple is unplugged, air should pass through the unplugged nipple.

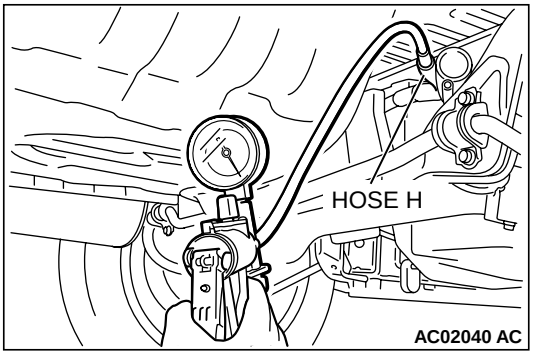
Q: Is the evaporative emission canister in good condition?

YES : Reinstall the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 27.
NO : Replace the evaporative emission canister (Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve P.17-110,) and reinstall the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 27.

STEP 22. Check for clogging in the evaporator line from hose H to hose I.

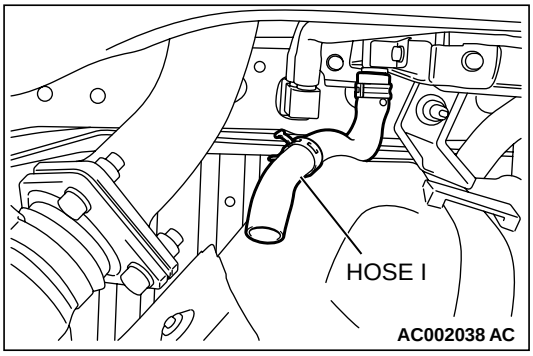
(1) Remove the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.)

(2) Disconnect hose H at the liquid separator side, and then connect a hand vacuum pump to the hose.



(3) Unplug the hose I at the fuel tank side.

(4) Apply a pressure on the vacuum pump, air should pass through the hose I.



Q: Are the hoses good condition?

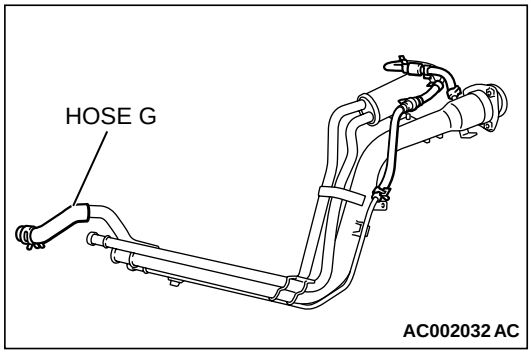
YES : Go to Step 23.

NO : Replace the inferior hose, and reinstall the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 27.

STEP 23. Check for clogging in the evaporator line hose G, J, K, L and hose M.

(1) Remove the filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.)

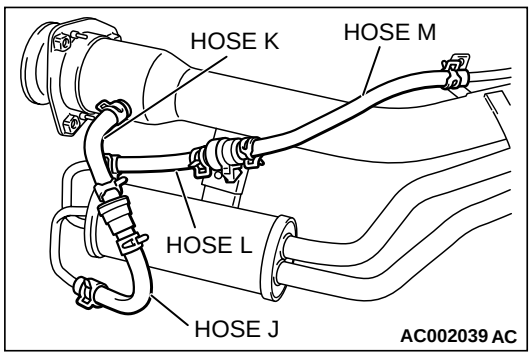
(2) The clogging test with a hand vacuum pump on each hose from hoses G, J, K, L and M.

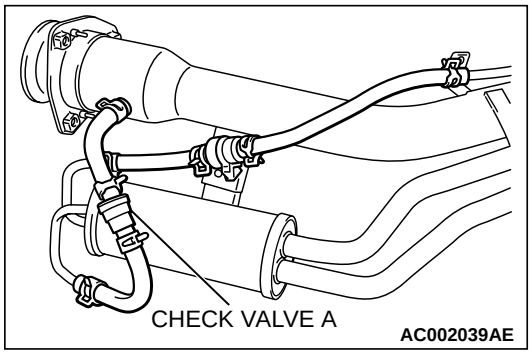


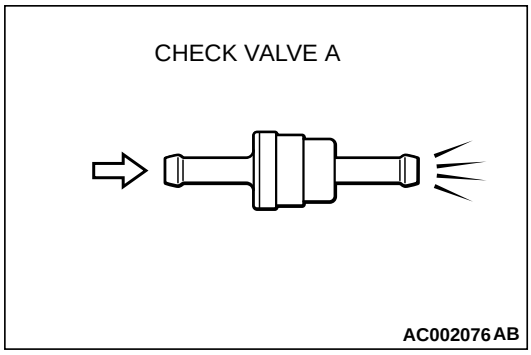
Q: Are the hoses in good condition?

YES : Go to Step 24.

NO : Replace the inferior hose, and reinstall the filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 27.





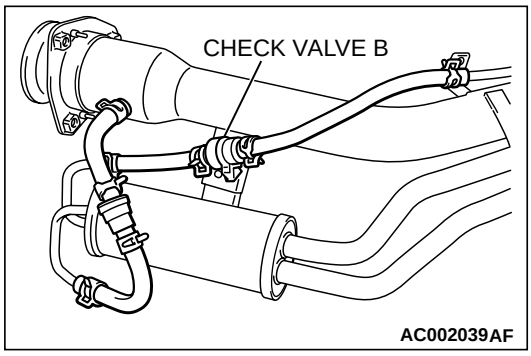


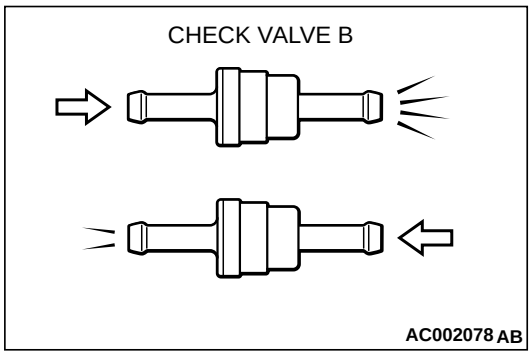
STEP 24. Check the check valve A.

(1) Only when you blow the check valve from the direction shown, it should pass air.
(2) When you blow the check valve, air should leak from the check valve body.

Q: Is check valve A in good condition?

YES : Go to Step 25.
NO : Replace check valve A, and reinstall the filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 27.



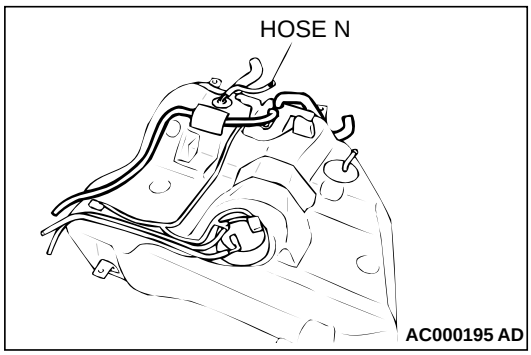


STEP 25. Check the check valve B.

(1) When you blow the check valve from the arrow direction shown above, it should pass more air.
(2) When you blow the check valve from the arrow direction shown below, it should pass less air.
(3) When you blow the check valve, air should leak from the check valve body.

Q: Is check valve B in good condition?

YES : Go to Step 26.
NO : Replace the check valve B, and reinstall the filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 27.



STEP 26. Check for clogging in the evaporator line from hose N.

(1) The clogging test with a hand vacuum pump on the hose N.

Q: Is the hose N in good condition?

YES : Go to Step 27.

NO : Replace the hose N, and reinstall the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 27.

STEP 27. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 1 - Evaporative Emission Control System Leak Monitor P.13A-5.

(2) Read the diagnostic trouble code.

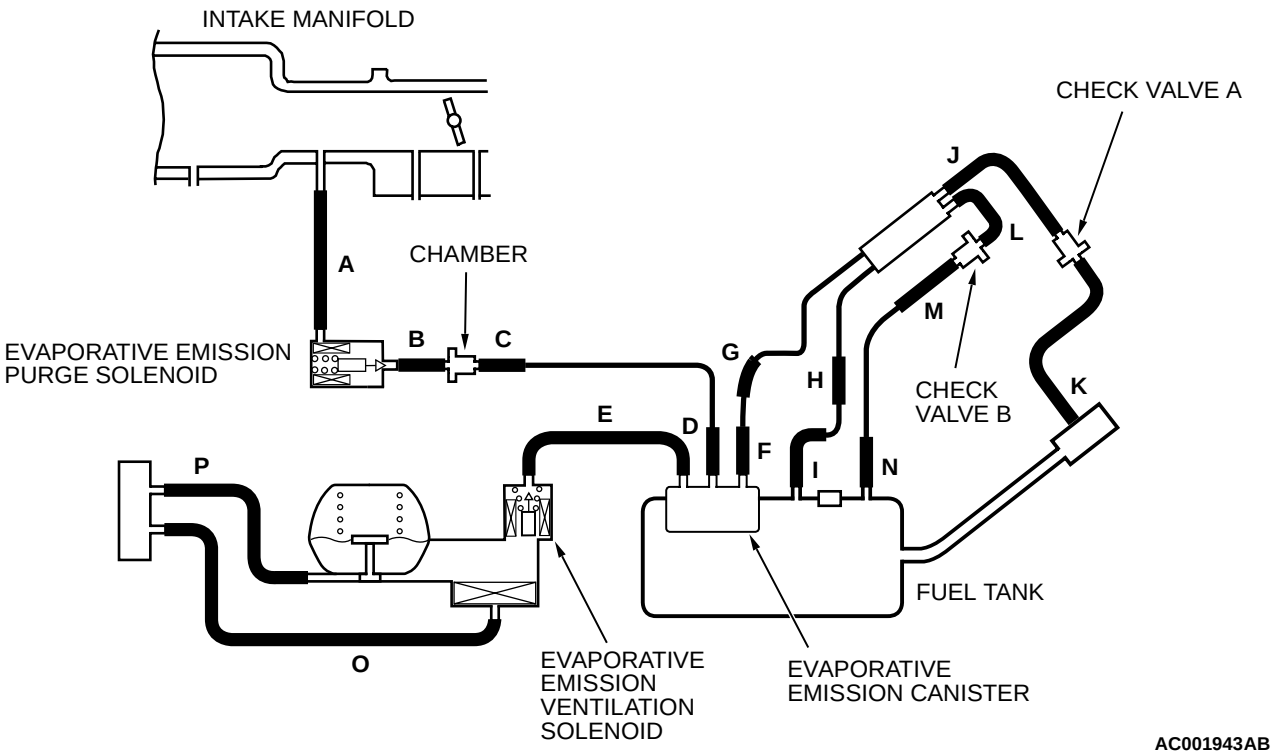
Q: Is diagnostic trouble code P0455 set?

YES : Go to Step 1.

NO : This diagnosis is complete.

DTC P0456: Evaporative Emission Control System Leak Detected (Very Small Leak)

SYSTEM DIAGRAM



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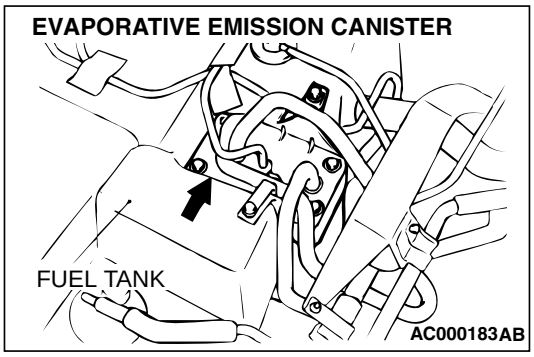

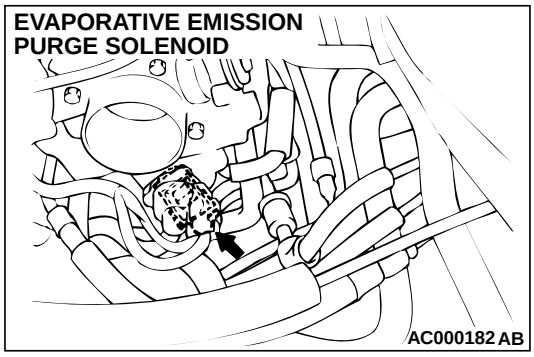

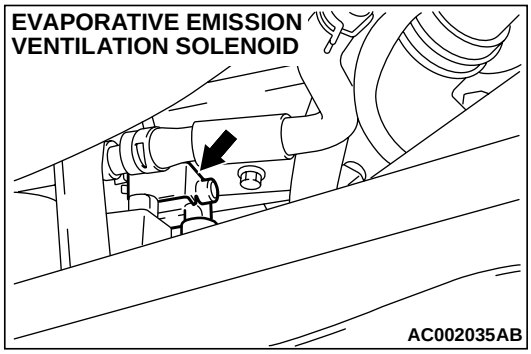

TECHNICAL DESCRIPTION

- To judge if there is leak in the fuel system, ECM <M/T> or PCM <A/T> measure the change of the pressure inside the fuel tank.
- The ECM <M/T > or PCM <A/T> turns on the evaporative emission ventilation solenoid valve to shot off the evaporative emission canister outlet port.
- Then the evaporative emission purge solenoid valve is driven to set the fuel system into a negative pressure.
- When the fuel system develops a vacuum of 2 kPa (0.29 psi), the evaporative emission purge solenoid valve is turned "off" and the fuel system vacuum is maintained at 2 kPa (0.29 psi).
- The ECM <M/T> or PCM <A/T> determines if there is leak in the fuel system by measuring the change of vacuum inside the fuel tank.
- The test is stopped when fuel vapor pressure is judged as too high.

DTC SET CONDITIONS

Test Conditions A: At Start up

- The fuel level sensor output voltage is 2.4 – 3.7 volts when the engine starts (i.e. the amount of remaining fuel is 40 – 85 percent)
- Intake air temperature is 36°C (97°F) or less when the engine is started.
- The engine coolant temperature 36°C (97°F) or less when the engine is started.

Test Conditions B: For Test to Run

- Barometric pressure is above 76 kPa (11 psi).
- The fuel temperature is 33°C (91°F) or less
- Fuel tank differential pressure sensor output voltage is 1 to 4 volts.

Test Conditions C: For Test to Stop

- Engine coolant temperature is less than 20°C (68°F).
- Intake air temperature is less than –10°C (14°F).
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the pressure rises higher 324 Pa (0.047 psi).

Judgment Criteria

- Internal pressure of the fuel tank fluctuate 1177 – 1373 Pa (0.171 – 0.199 psi) or more in 10 seconds after the tank and vapor line were closed.

NOTE: The monitoring time depends on the fuel level and the temperature in the fuel tank (10 – 14 minutes.)

TROUBLESHOOTING HINTS

The most likely causes for this code to be set are:

- Loose fuel cap.
- Fuel cap relief pressure is incorrect.
- Evaporative emission canister seal is faulty.
- Fuel tank, purge line or vapor line seal failed.
- Evaporative emission ventilation solenoid valve failed.

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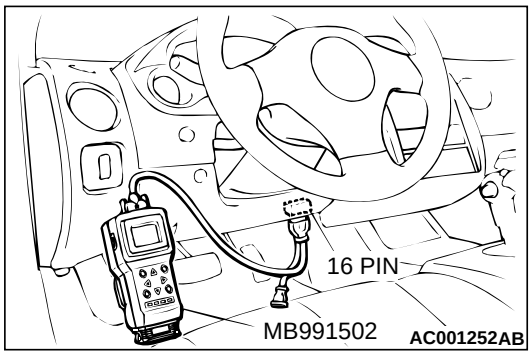
OVERVIEW OF TROUBLESHOOTING

- To determine the cause of DTC P0456, a performance test is needed. The performance test uses a mechanical vacuum gauge and scan tool MB991502 set on the fuel tank differential pressure sensor (TANK PRES SNER 73.) The mechanical gauge reading is used to verify scan tool MB991502 reading. A comparison of the mechanical gauge to scan tool MB991502 determines the problem in the system.
- Prior to doing the performance test, several simple inspections are needed to exclude some possibilities of the symptom.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check evaporative emission system monitor test.

⚠ CAUTION

- **To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.**
- **With this monitor, the ECM <M/T> or PCM <A/T> automatically increases the engine speed to 1,600 r/min or more. Check that the transaxle is set to "neutral" <M/T> or "P" <A/T> position.**

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTCs using the scan tool MB991502.
(4) Check that the fuel cap is securely closed. (Tighten until three clicks are heard.)
(5) Start the engine.
(6) Select "System Test," and press the "YES" key.
(7) Select "Evap Leak Mon," and press the "YES" key.
(8) During the monitor, keep the accelerator pedal at the idling position.

NOTE: If the engine speed does not reach 2,000 r/min during the monitor test, adjustment of the Speed Adjusting Screw may be needed. Refer to P.13A-577. And adjust to the standard value.

(9) Keep the engine speed and engine load within the specified range. When the monitor test starts, the "In Progress" item on scan tool MB991502 will change from "NO" to "YES."
(10) Turn the ignition switch to the "LOCK" (OFF) position, and disconnect scan tool MB991502.

Q: What is displayed on the scan tool MB991502?

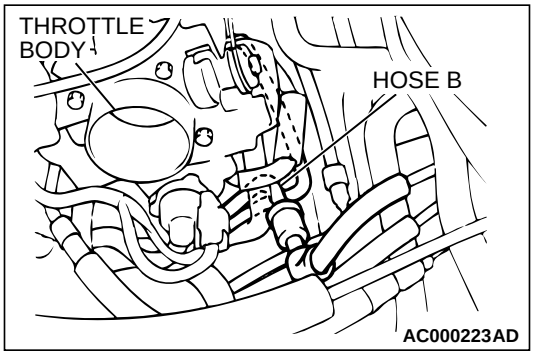
"Evap Leak Mon. Completed Test Passed" : The evaporative emission system is working properly at this time. Explain to customer that improperly tightened fuel cap can cause MIL to turn on, and return the vehicle.

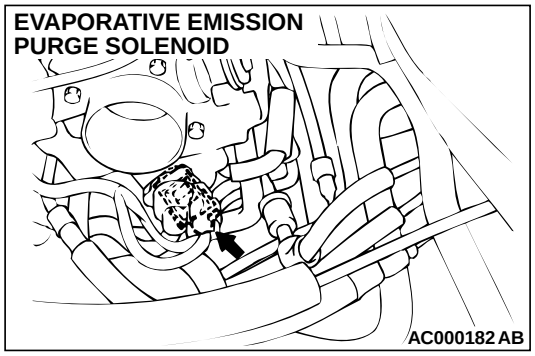
"Evap Leak Mon. Completed. Test Failed and DTCs Set" : A malfunction has been detected during the monitor test. Go to Step 2.

"Evap Lead Mon. discontinued. Retest again from the first" : The monitor was discontinued for a certain reason (vehicle speed input from computer, engine speed and engine load deviating from specified range). Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the monitoring from the Step 1.

STEP 2. Check evaporative emission purge solenoid for leaks.

(1) Remove the battery.
(2) Remove the air intake hose. (Refer to GROUP 15, Air Cleaner P.15-6.)
(3) Disconnect hose B from the evaporative emission purge solenoid side, and connect a hand vacuum pump to the nipple of the evaporative emission purge solenoid.
(4) Apply a pressure on the hand vacuum pump, and confirm that air is maintained.
(5) Disconnect the hand vacuum pump, and connect hose B to the evaporative emission purge solenoid.



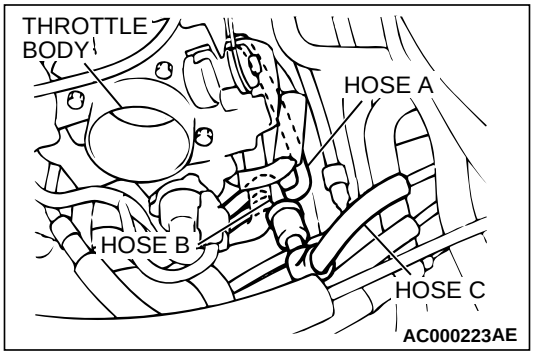


Q: Is the evaporative emission purge solenoid in good condition?

YES : Go to Step 3.
NO : Replace the evaporative emission purge solenoid. Then go to Step 18.

STEP 3. Check for leaks in the evaporator line hose A to hose C.

The leakage test with a hand vacuum pump on each hose from hose A to hose C.

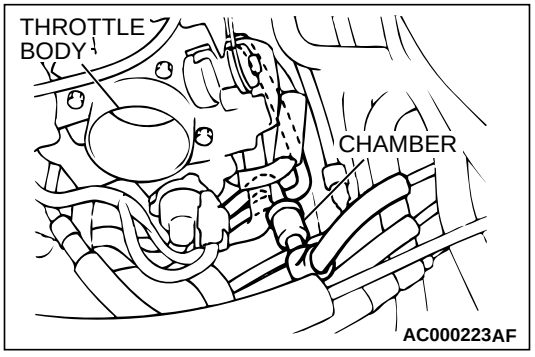


Q: Are the hoses in good condition?

YES : Go to Step 4.
NO : Replace the inferior hose. Then go to Step 18.

STEP 4. Check for leaks in the chamber.

(1) Connect a hand vacuum pump to the nipple.
(2) Plug the other nipple.
(3) Apply vacuum with the hand vacuum pump, and confirm that the applied vacuum does not fluctuate.



Q: Is the chamber in good condition?

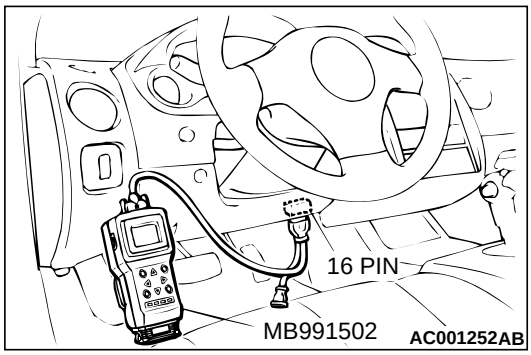
YES : Go to Step 5.
NO : Replace the chamber. Then go to Step 18.

TSB Revision

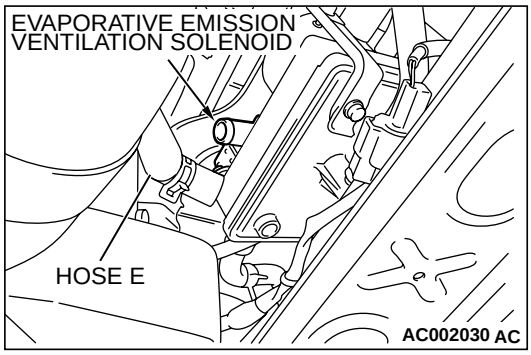
STEP 5. Check the evaporative emission ventilation solenoid using scan tool MB991502. (Actuator test item 29)

⚠ CAUTION

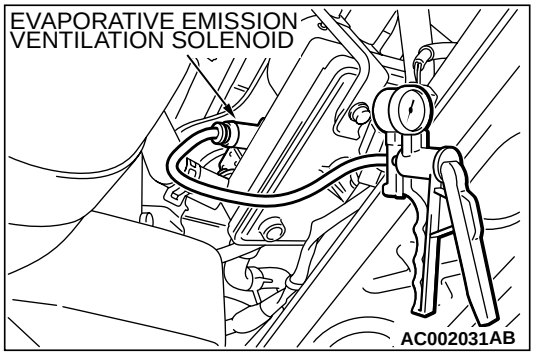
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.



(1) Connect scan tool MB991502 to the data link connector.



(2) Disconnect the hose E from the evaporative emission ventilation solenoid side.

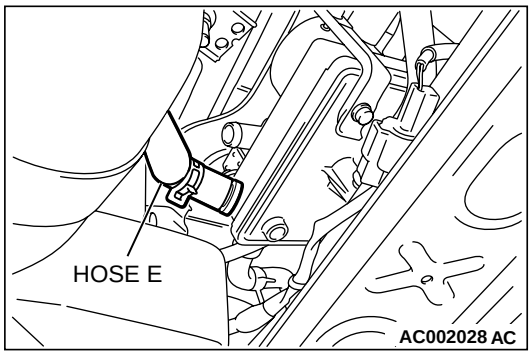


(3) Connect the hand vacuum pump to the nipple of the evaporative emission ventilation solenoid from which the hoses have been disconnected.
(4) Turn the ignition switch to the "ON" position.
(5) Set scan tool MB991502 to actuator test mode for item 29: Evaporative Emission Ventilation Solenoid. When the evaporative emission ventilation solenoid is operated, apply a pressure on the hand vacuum pump and confirm that air is maintained.
(6) Turn the ignition switch to the "LOCK" (OFF) position, and disconnect scan tool MB991502.
(7) Disconnect the hand vacuum pump, and connect hose E to the evaporative emission canister.

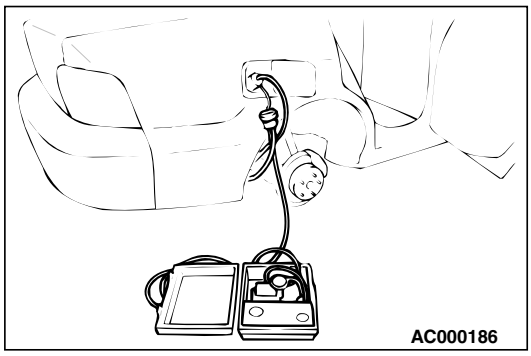
Q: Is the evaporative emission ventilation solenoid in good condition?

YES : Go to Step 6.
NO : Replace the evaporative emission ventilation solenoid. Then go to Step 18.

STEP 6. Pressure test for evaporator line from hose D to hose N.



(1) Remove the module bracket mounting bolts, and disconnect hose E from the evaporative emission ventilation solenoid side, and plug the hoses from which the hoses have been disconnected.
(2) Confirm that the evaporative emission system pressure pump (Miller number 6872A) is operating properly. Perform the self-test as described in the manufacturer's instructions.



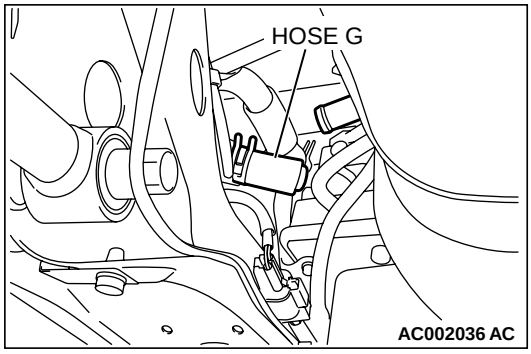
(3) Connect an evaporative emission system pressure pump to the fuel filler neck.
(4) Pressure test the system to determine whether any leaks are present.

NOTE: "Pressure test" in this procedure refers to the I/M240 Simulation Test (8 simple steps) described in the evaporative emission system pressure pump (Miller number 6872A) manufacturer's instructions located in the lid of the pump box.

Q: Are the evaporator line in good condition?

YES : Go to Step 17.
NO : Go to Step 7.

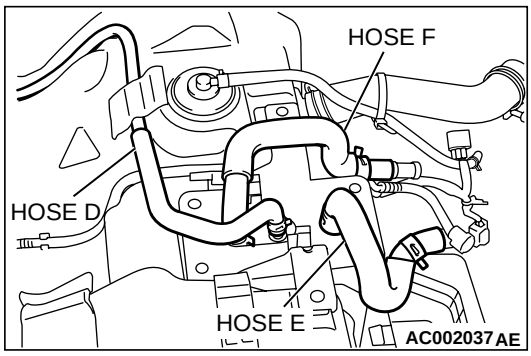
STEP 7. Pressure test for evaporator line from hose G to hose N.



(1) Disconnect hose G from the evaporative emission canister side, and plug the hose from which the pipes have been disconnected.
(2) Perform the pressure test again.

Q: Are the evaporator line in good condition?

YES : Go to Step 8.
NO : Go to Step 10.



STEP 8. Check for leaks in the evaporator line hose D to hose F.

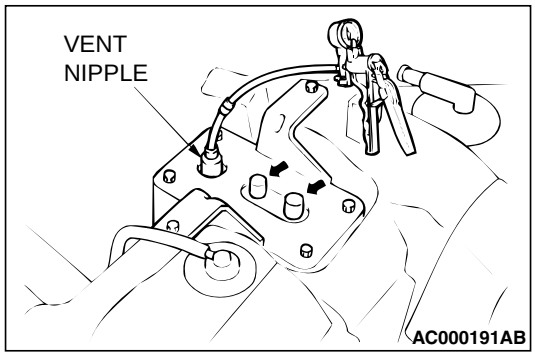
(1) Remove the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.)

(2) The leakage test with a hand vacuum pump on each hose from hose D to hose F.

Q: Are the hoses in good condition?

YES : Go to Step 9.

NO : Replace that hose, reinstall the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 18.



STEP 9. Check for leaks in the evaporative emission canister.

(1) Connect a hand vacuum pump to the vent nipple of the evaporative emission canister.

(2) Plug the other two nipples or loop a hose between the other nipples.

(3) Apply a vacuum with the hand vacuum pump, and confirm that the applied vacuum does not fluctuate.

Q: Is the evaporation emission canister in good condition?

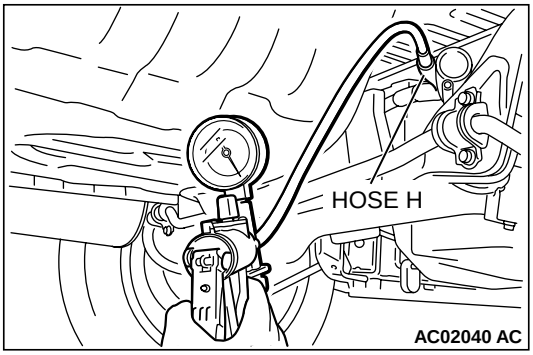
YES : Go to Step 18.

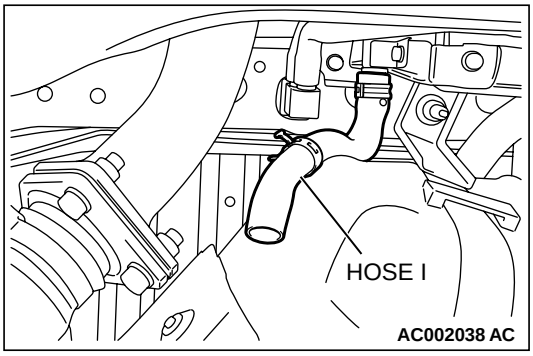
NO : Replace the evaporative emission canister (Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve P.17-110,) and reinstall the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 18.

STEP 10. Check for leaks in the evaporator line from hose H and hose I.

(1) Remove the fuel filler neck protector. (Refer to GROUP 13C, Fuel Tank P.13C-11.)

(2) Disconnect hose H at the liquid separator, and then connect a hand vacuum pump to the hose.





(3) Disconnect hose I at the fuel tank side, and then plug the hose.

(4) Apply vacuum with the hand vacuum pump, and confirm that the applied vacuum does not fluctuate.

Q: Are the evaporator line in good condition?

YES : Go to Step 11.

NO : Replace that hose, reinstall the fuel filler neck protector. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 18.

STEP11. Check for leaks in the evaporator line hose G, J, K, L and M.

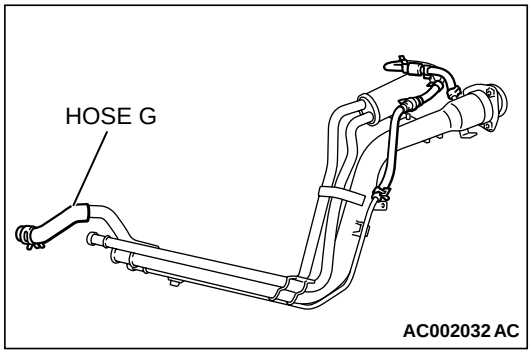
(1) Remove the fuel tank and fuel filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.)

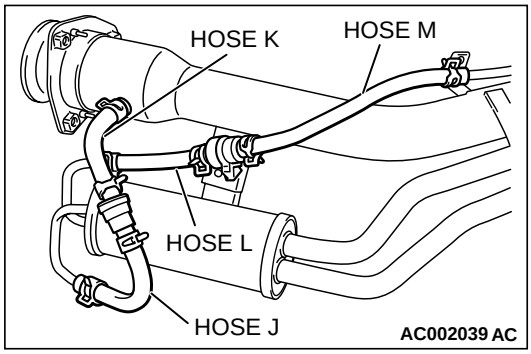
(2) The leakage test with a hand vacuum pump on each hose from hose G, J, K, L and M.

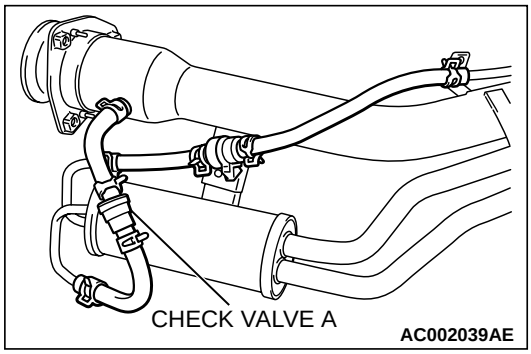
Q: Are the hoses in good condition?

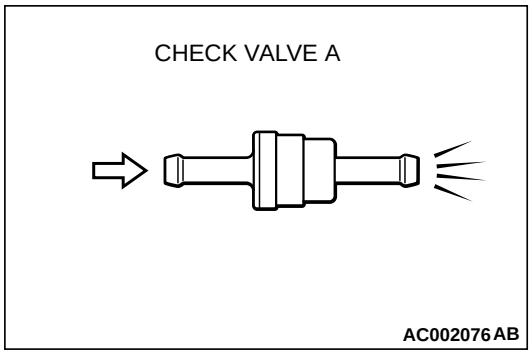
YES : Go to Step 12.

NO : Replace the hose, reinstall the fuel tank and fuel filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 18.







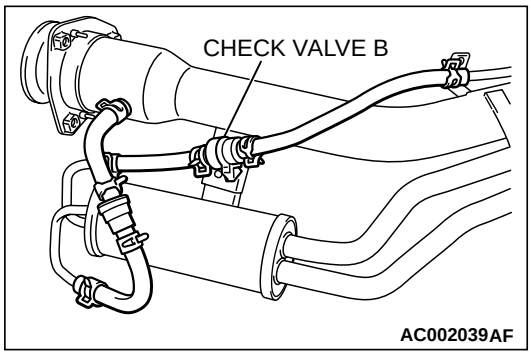


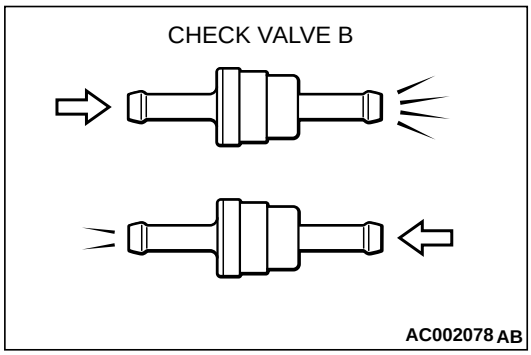
STEP 12. Check the check valve A.

(1) Only when you blow the check valve from the direction shown, it should pass air.
(2) When you blow the check valve, air should leak from the check valve body.

Q: Is the check valve A in good condition?

YES : Go to Step 13.
NO : Replace the check valve A, reinstall the fuel tank and fuel filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 18.



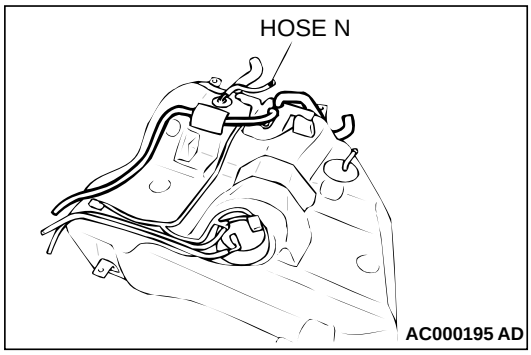


STEP 13. Check the check valve B.

(1) When you blow the check valve from the arrow direction shown above, it should pass more air.
(2) When you blow the check valve from the arrow direction shown below, it should pass less air.
(3) When you blow the check valve, on air should leak from the check valve body.

Q: Is the check valve B in good condition?

YES : Go to Step 14.
NO : Replace the check valve B, reinstall the fuel tank and fuel filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 18.



STEP 14. Check for leaks in the evaporator line hose N.

(1) The leakage test with a hand vacuum pump on each hose from hose N.

Q: Is the hose in good condition?

YES : Go to Step 15.

NO : Replace the hose, reinstall the fuel tank and fuel filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 18.

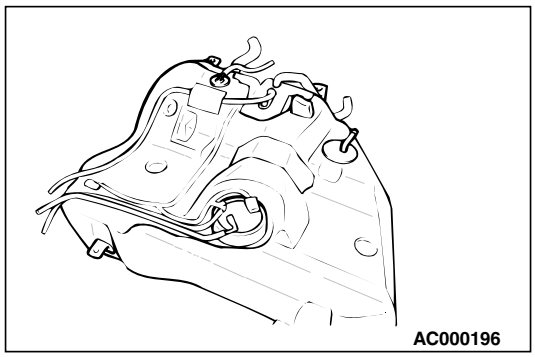
STEP 15. Visually check for cracks in the fuel filler neck assembly.

Visually check for cracks in the fuel filler neck assembly.

Q: Is the fuel filler neck assembly in good condition?

YES : Go to Step 16.

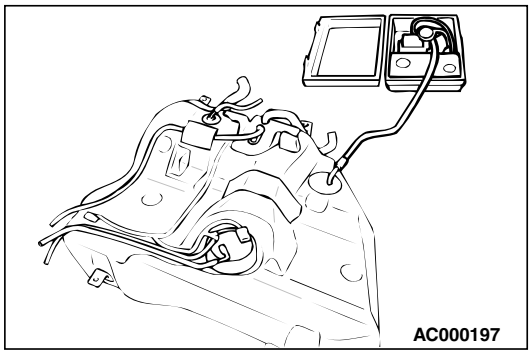
NO : Replace the fuel filler neck assembly, reinstall the fuel tank and fuel filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 18.



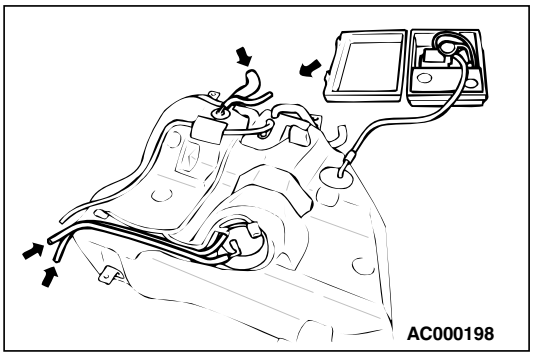
STEP 16. Check for leaks in the fuel tank.

(1) Visually check for cracks and leaks, etc.

NOTE: Carefully check the fuel pump assembly and the inner pressure sensor installation section in the fuel tank.



(2) Connect an evaporative emission system pressure pump to the leveling valve nipple.



(3) Plug the filler hose, feed pipe, return pipe and rollover valve nipple connected to the fuel tank.

NOTE: If these items are not securely plugged here, the fuel could leak in the next step.

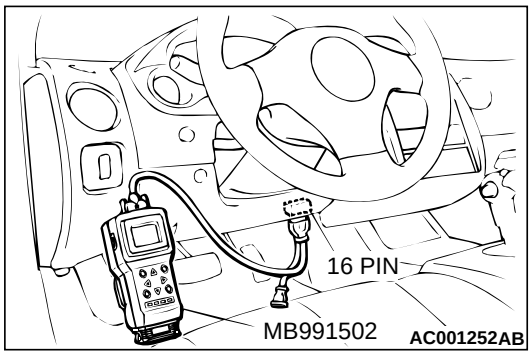
(4) Apply pressure with the evaporative emission system pressure pump.

(5) In the pressurized state, check for the leak by applying soap water, etc. to each section.

Q: Is the fuel tank in good condition?

YES : Go to Step 17.

NO : Replace the fuel tank, reinstall the fuel tank and fuel filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 18.



STEP 17. Using scan tool MB991502, check evaporative emission system monitor test.

⚠ CAUTION

- **To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.**
- **With this monitor, the ECM <M/T> or PCM <A/T> automatically increases the engine speed to 1,600 r/min or more. Check that the transaxle is set to "neutral" <M/T> or "P" <A/T> position.**

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTCs using scan tool MB991502.
(4) Check that the fuel cap is securely closed. (Tighten until three clicks are heard.)
(5) Start the engine.
(6) Select "System Test," and press the "YES" key.
(7) Select "Evap Leak Mon," and press the "YES" key.
(8) During the monitor, keep the accelerator pedal at the idling position.

NOTE: If the engine speed does not reach 2,000 r/min during the monitor test, adjustment of the Speed Adjusting Screw may be needed. Refer to P.13A-577. And adjust to the standard value.

(9) Keep the engine speed and engine load within the specified range. When the monitor test starts, the "In Progress" item on the scan tool MB991502 will change from "NO" to "YES."
(10) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991502.

Q: What is displayed on scan tool MB991502?

"Evap Leak Mon. Completed. Test Passed" : The evaporative emission system is working properly at this time. Then go to Step 18 .

"Evap Leak Mon. Completed. Test Failed and DTCs Set" : Replace the ECM <M/T> or PCM <A/T>. Then go to Step 18.

"Evap Lead Mon. discontinued. Retest again from the first" : The monitor was discontinued for a certain reason (vehicle speed input from ECM <M/T> or PCM <A/T>, engine speed and engine load deviating from specified range). Turn the ignition switch to the "LOCK" (OFF) position once, and recheck evaporative emission system monitor test.

STEP 18. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 1 - Evaporative Emission Control System Leak Monitor P.13A-5.
(2) Read the diagnostic trouble code.

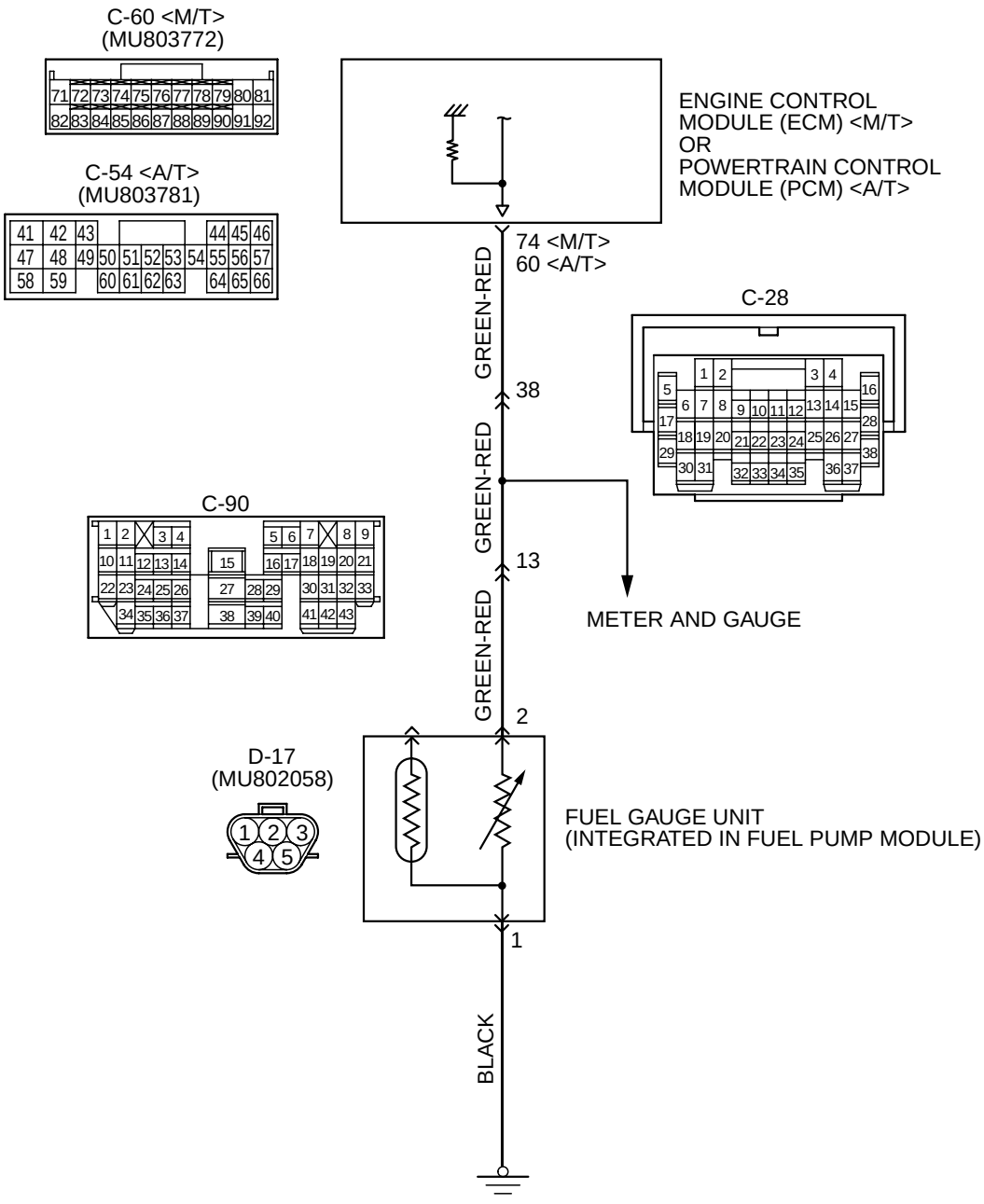
Q: Is diagnostic trouble code P0456 set?

YES : Go to Step 1.
NO : This diagnosis is complete.

TSB Revision

DTC P0461: Fuel Level Sensor Circuit Range/Performance

Fuel Gauge Unit Circuit



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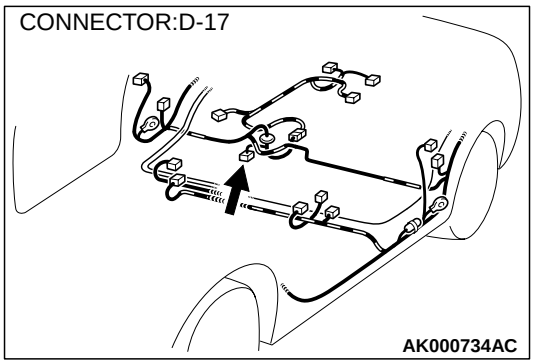
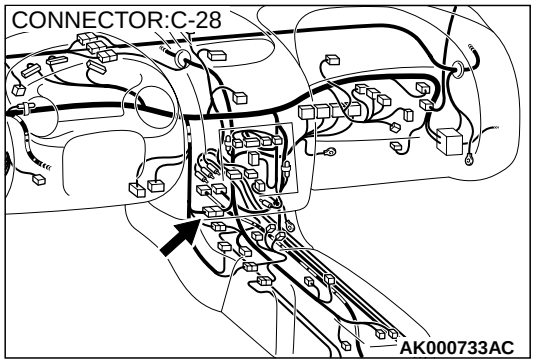
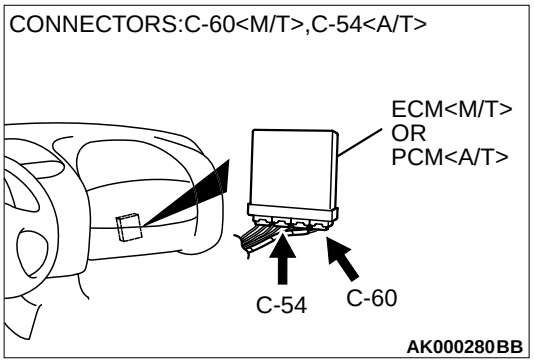
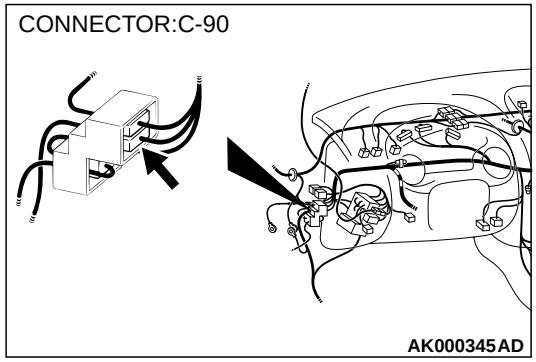








CIRCUIT OPERATION

- The fuel gauge drive signal is input in ECM (terminal 74) <M/T> or PCM (terminal 60) <A/T>.

TECHNICAL DESCRIPTION

- Branch the drive signal from the fuel gauge circuit, and input it into ECM <M/T> or PCM<A/T>.
- The ECM <M/T> or PCM<A/T> detects the amount of fuel left in the fuel tank with this signal, and also controls the fuel level warning light.

DTC SET CONDITIONS

Check Conditions, Judgement Criteria

- When the fuel consumption calculated from the operation time of the injector amounts to 20 litter, the diversity of the amount of fuel in tank calculated from the fuel level sensor is 2 litter or less.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

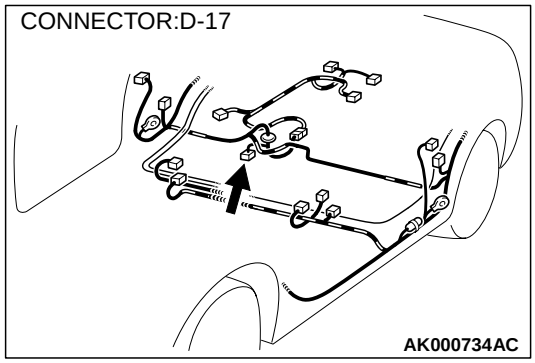
- Fuel gauge unit failed.
- Open or shorted fuel gauge unit circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

STEP 1. Check fuel gauge.

Q: Is the fuel gauge functioning?

YES : Go to Step 3.
NO : Go to Step 2.



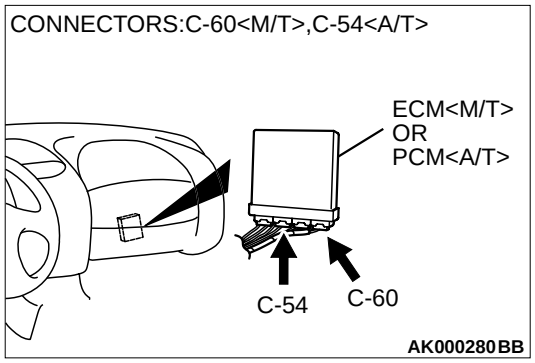
STEP 2. Check for short circuit to ground between fuel gauge unit connector D-17 terminal 2 and ECM connector C-60 terminal 74 <M/T> or PCM connector C-54 terminal 60 <A/T>.

NOTE: Check harness after checking intermediate connectors C-90, and C-28. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.

Q: Is the harness wire in good condition?

YES : Refer to GROUP 54A, Combination Meter P.54A-103.

NO : Repair it. Then go to Step 6.

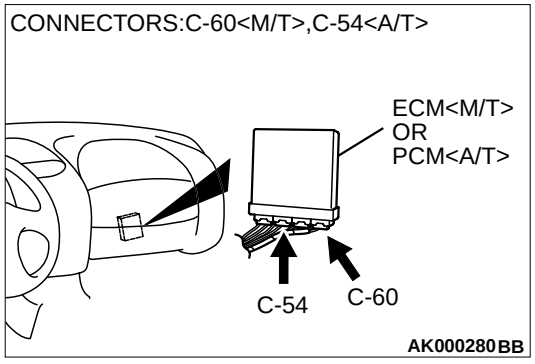


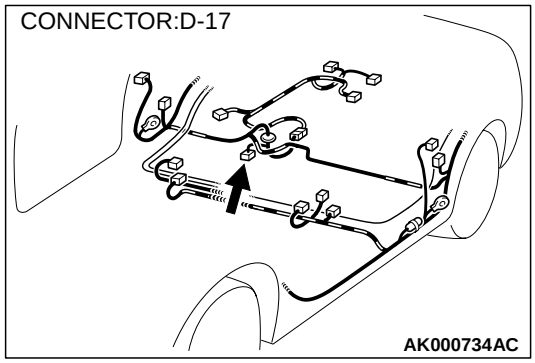
STEP 3. Check connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

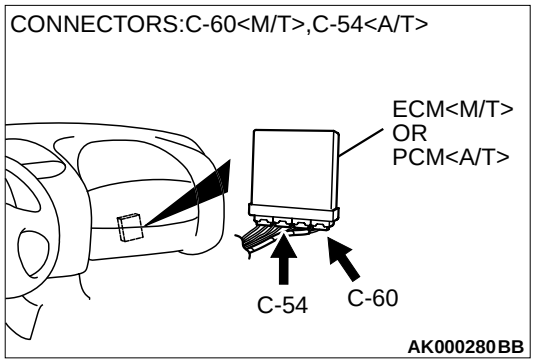
Q: Is the connector in good condition?

YES : Go to Step 4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.







STEP 4. Check for open circuit or harness damage between fuel gauge unit connector D-17 terminal 2 and ECM connector C-60 terminal 74 <M/T> or PCM connector C-54 terminal 60 <A/T>.

NOTE: Check harness after checking intermediate connectors C-90, and C-28. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.

Q: Is the harness wire in good condition?

YES : Go to Step 5.
NO : Repair it. Then go to Step 6.

STEP 5. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0461 is output?

YES : Replace the ECM or PCM. Then go to Step 6.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

STEP 6. Test the OBD-II drive cycle.

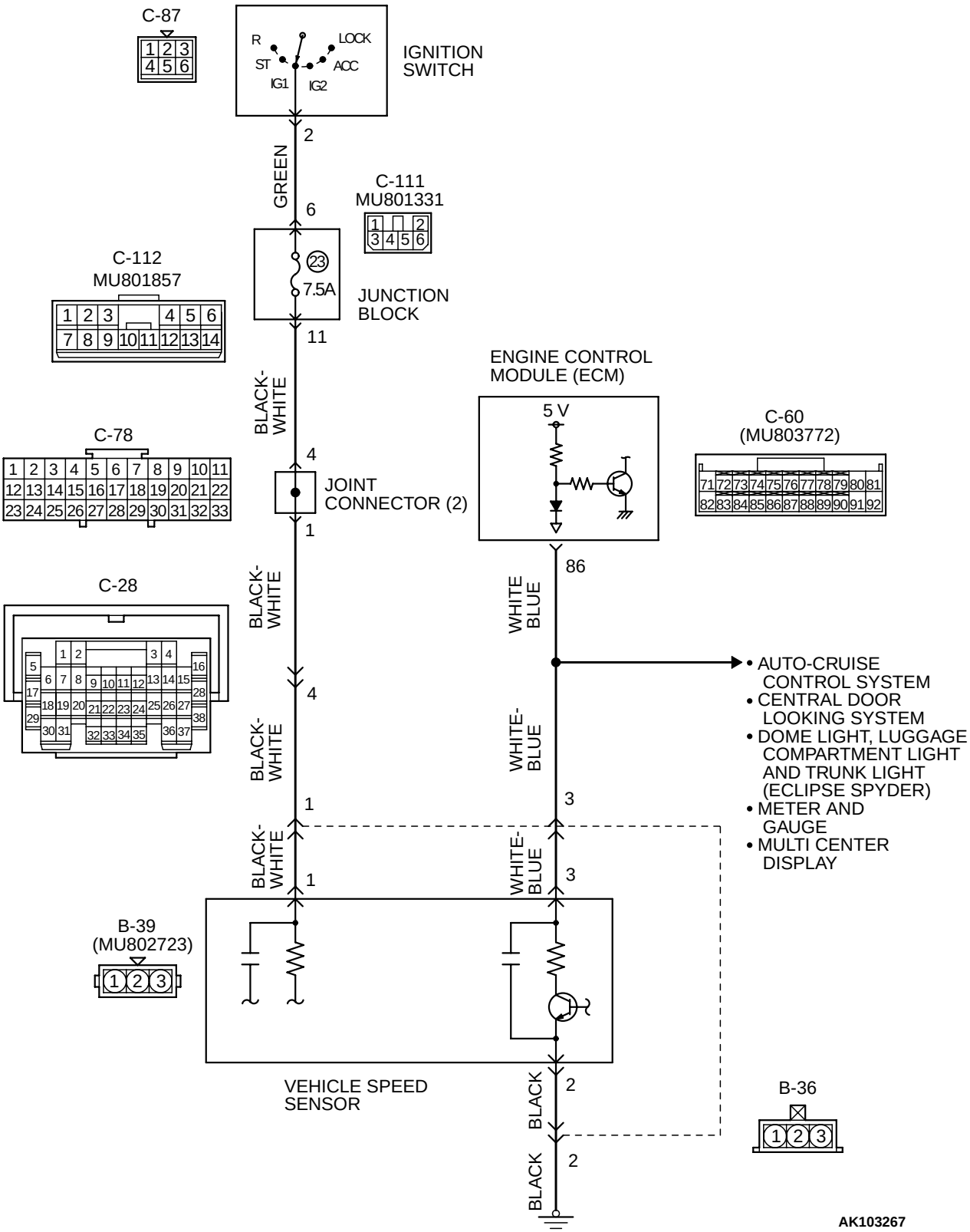
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0461 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0500: Vehicle Speed Sensor Malfunction <M/T>

Vehicle Speed Sensor Circuit



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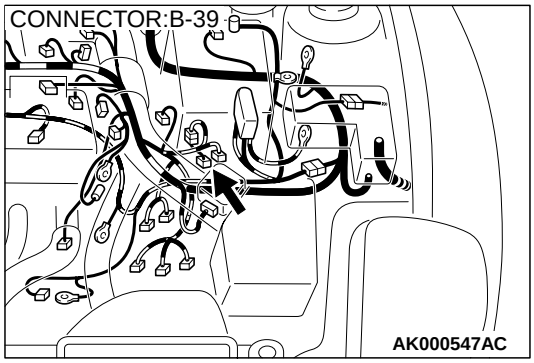

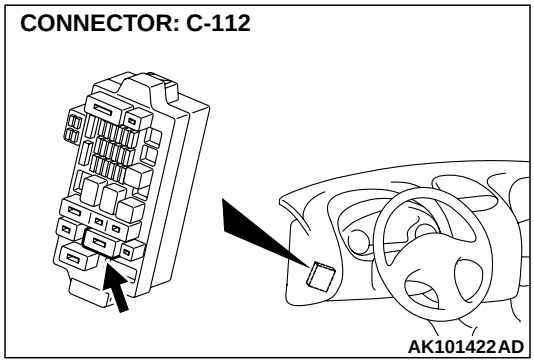

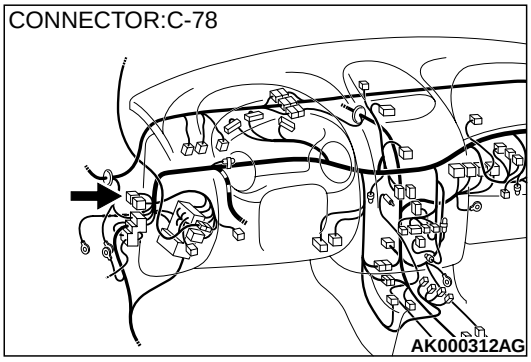

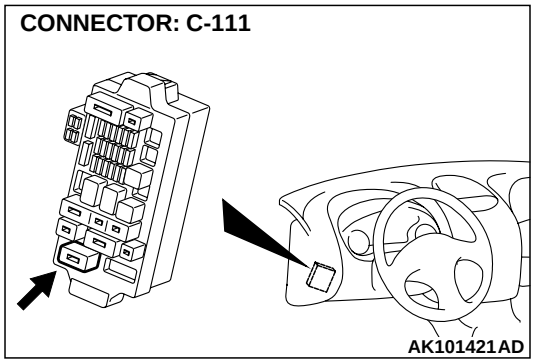

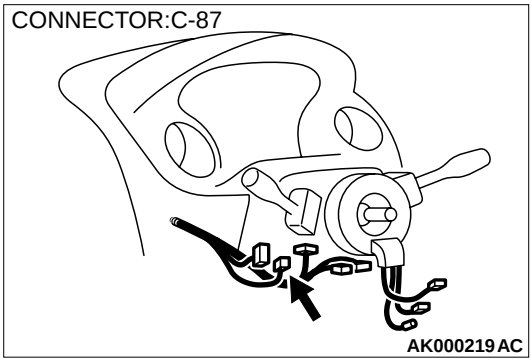

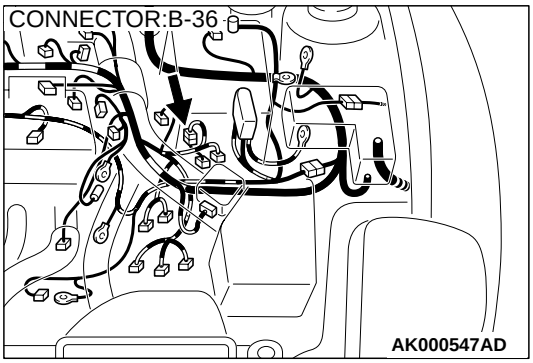

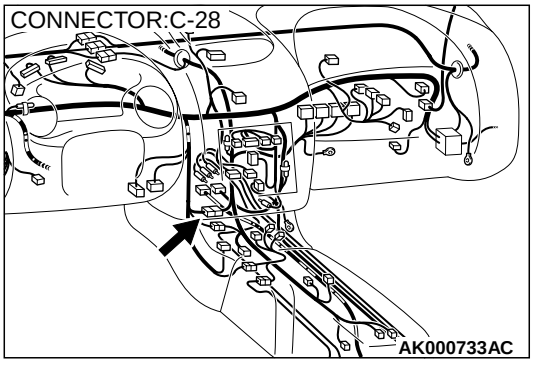

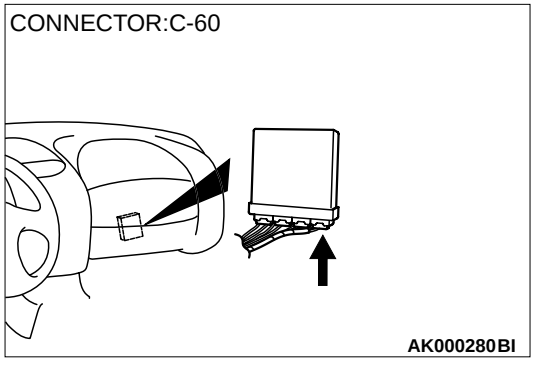

CIRCUIT OPERATION

- A 5-volt voltage is applied to the vehicle speed sensor output terminal (terminal 3) from the ECM (terminal 86). The vehicle speed sensor generates a pulse signal when the output terminal is opened and grounded.

TECHNICAL DESCRIPTION

- The vehicle speed sensor converts the vehicle speed into pulse signals and inputs them to the ECM.
- The vehicle speed sensor outputs a pulse signal while the vehicle is driven.
- The ECM checks whether the pulse signal is output.

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DTC SET CONDITIONS

Check Conditions

- 2 seconds or more have passed the starting sequence was completed.
- Engine speed is at between 2,000 and 4,000 r/min.
- Volumetric efficiency is at between 48 and 65 percent.

Judgement Criteria

- Vehicle speed sensor output voltage has not changed (no pulse signal is input) for 2 seconds.

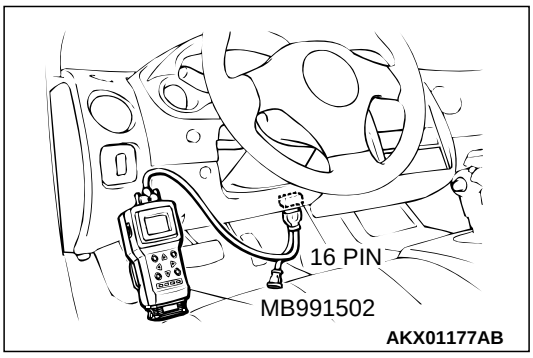
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Vehicle speed sensor failed.
- Open or shorted vehicle speed sensor circuit, or loose connector.
- ECM failed.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 24: Vehicle Speed Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine.
(3) Set scan tool MB991502 to the data reading mode for item 24, Vehicle Speed Sensor.
  - Check that the speedometer and MUT-II display speed match when traveling at a vehicle speed of 40 km/h (25 mph).
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Go to Step 2.

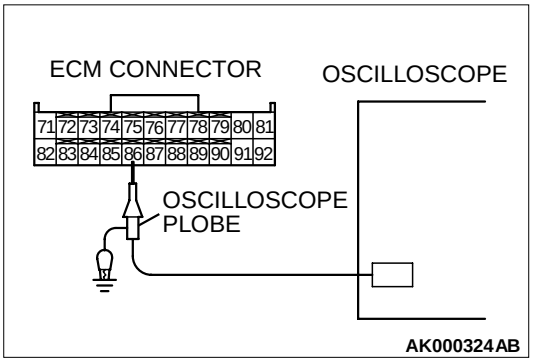
STEP 2. Check speed meter.

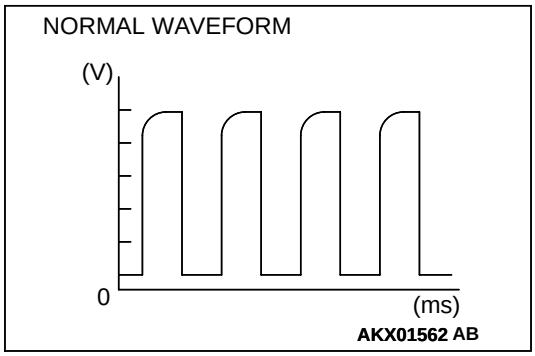
Q: Is the speed meter functioning?

YES : Go to Step 3.
NO : Go to Step 8.

STEP 3. Using the oscilloscope, check the sensor output voltage at ECM connector C-60.

(1) Do not disconnect the ECM connector C-60.
(2) Disconnect the combination meter connector and auto-cruise control-ECU connector.
(3) Connect the oscilloscope probe to ECM terminal 86 by backprobing.
(4) Start the engine.





(5) Check the waveform.
- The waveform should show a pattern similar to the illustration while the vehicle is being moved.

(6) Turn the ignition switch to the "LOCK" (OFF) position.

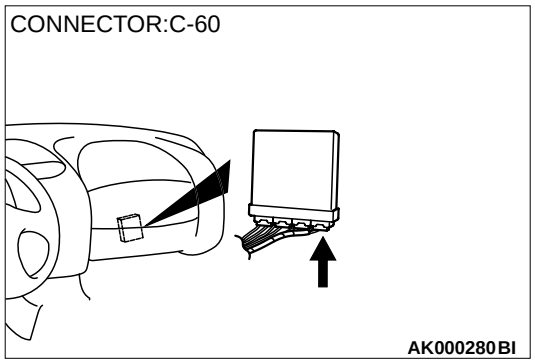
Q: Is the waveform normal?

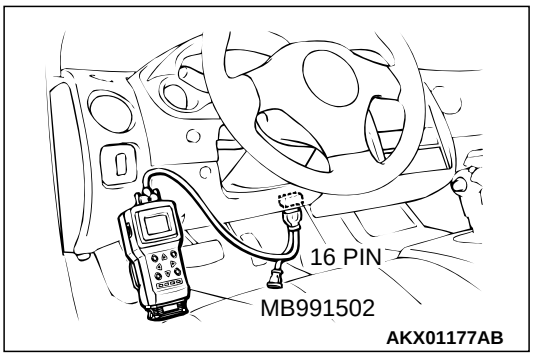
YES : Go to Step 4.
NO : Go to Step 6.

STEP 4. Check connector C-60 at ECM for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 17.





STEP 5. Using scan tool MB991502, check data list item 24: Vehicle Speed Sensor.

⚠ CAUTION

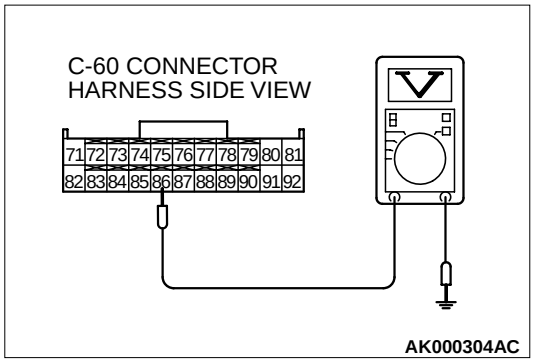
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine.
(3) Set scan tool MB991502 to the data reading mode for item 24, Vehicle Speed Sensor.
- Check that the speedometer and MUT-II display speed match when traveling at a vehicle speed of 40 km/h (25 mph).

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Replace the ECM. Then go to Step 17.



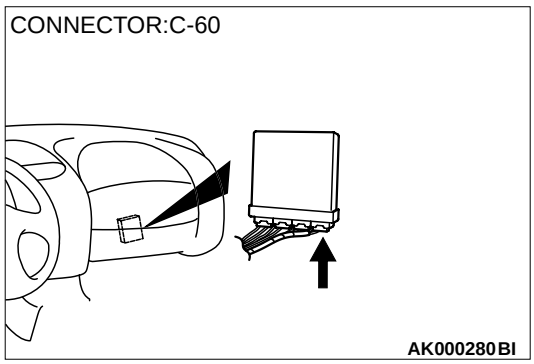
STEP 6. Check the sensor supply voltage at ECM connector C-60 by backprobing.

(1) Do not disconnect the ECM connector C-60.
(2) Disconnect the vehicle speed sensor connector B-39.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the voltage between terminal 86 and ground by backprobing.
- Voltage should be between 4.8 and 5.2 volts.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

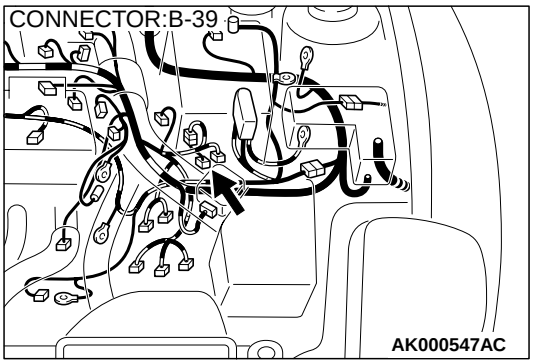
YES : Go to Step 7.
NO : Replace the ECM. Then go to Step 17.



STEP 7. Check connector C-60 at ECM for damage.

Q: Is the connector in good condition?

YES : Check connector B-36 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between vehicle speed sensor connector B-39 terminal 3 and ECM connector C-60 terminal 86 because of open circuit. Then go to Step 17.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 17.

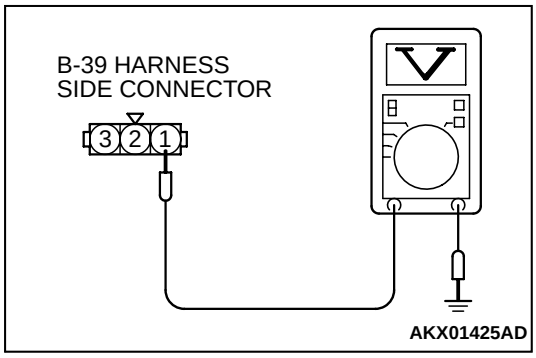


STEP 8. Check connector B-39 at vehicle speed sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 17.



STEP 9. Check the power supply voltage at vehicle speed sensor harness side connector B-39.

(1) Disconnect the connector B-39 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between terminal 1 and ground.

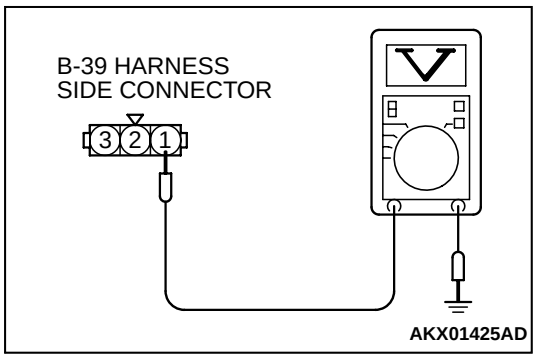
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 10.

NO : Check connectors B-36, C-28, C-78, C-112 and C-111 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connectors are in good condition, repair harness wire between ignition switch connector C-87 terminal 2 and vehicle speed sensor connector B-39 terminal 1 because of open circuit or short circuit to ground. Then go to Step 17.



STEP 10. Check the continuity at vehicle speed sensor harness side connector B-39.

(1) Disconnect the connector B-39 and measure at the harness side.

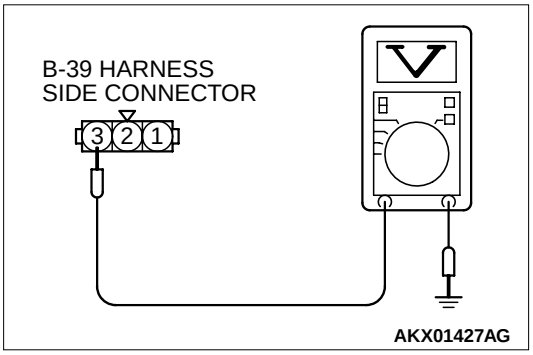
(2) Check for the continuity between terminal 2 and ground.

- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 11.

NO : Check connector B-36 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between vehicle speed sensor connector B-39 terminal 2 and ground because of open circuit or harness damage. Then go to Step 17.



STEP 11. Check the sensor supply voltage at vehicle speed sensor harness side connector B-39.

(1) Disconnect the vehicle speed sensor connector B-39 and measure at the harness side.
(2) Disconnect the combination meter connector and auto-cruise control-ECU connector.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the voltage between terminal 3 and ground.
- Voltage should be between 4.8 and 5.2 volts.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 12.

NO : Check connector B-36 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between vehicle speed sensor connector B-39 terminal 3 and ECM connector C-60 terminal 86 because of short circuit to ground or harness damage. Then go to Step 17.

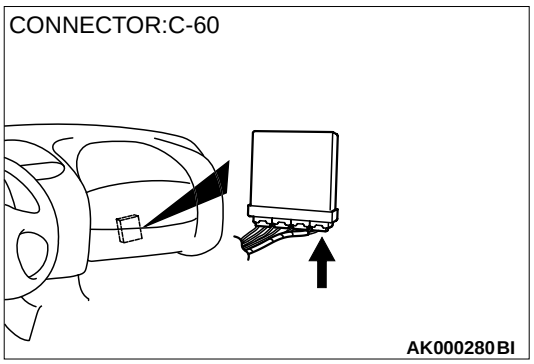
STEP 12. Check the vehicle speed sensor.

Refer to GROUP 54A, Combination Metre – Inspection – Vehicle Speed Sensor Check P.54A-237.

Q: Is the vehicle speed sensor normal?

YES : Go to Step 13.

NO : Replace the vehicle speed sensor. Then go to Step 17.

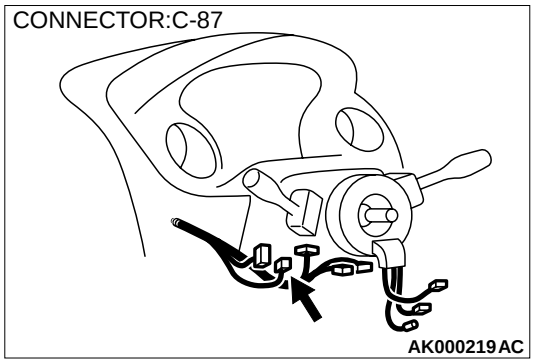


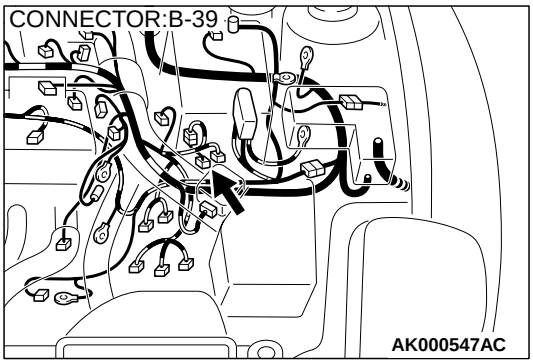
STEP 13. Check connector C-60 at ECM for damage.

Q: Is the connector in good condition?

YES : Go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 17.





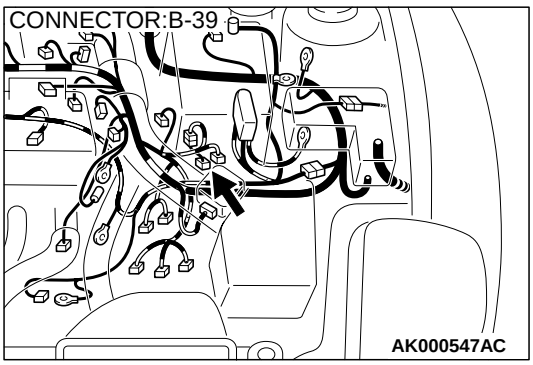
STEP 14. Check for harness damage between ignition switch connector C-87 (terminal 2) and vehicle speed sensor connector B-39 (terminal 1).

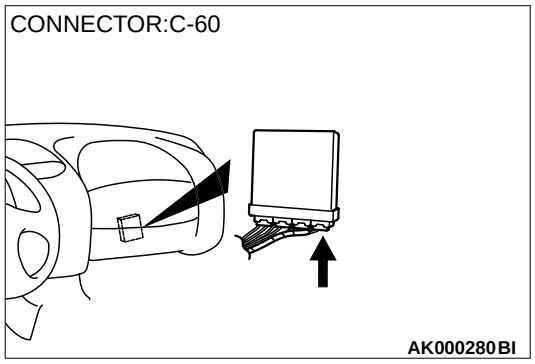
NOTE: Check harness after checking intermediate connectors B-36, C-28, C-78, B-112 and C-111. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 17.

Q: Is the harness wire in good condition?

YES : Go to Step 15.

NO : Repair it. Then go to Step 17.





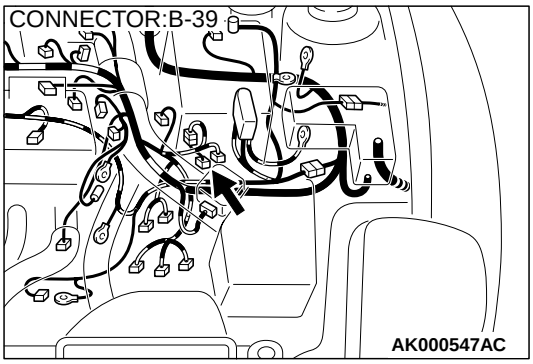
STEP 15. Check for harness damage between vehicle speed sensor connector B-39 (terminal 3) and ECM connector C-60 (terminal 86).

NOTE: Check harness after checking intermediate connector B-36. If intermediate connector is damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 17.

Q: Is the harness wire in good condition?

YES : Go to Step 16.

NO : Repair it. Then go to Step 17.



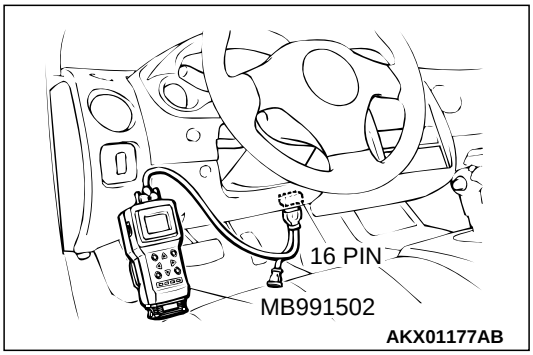
STEP 16. Check for harness damage between vehicle speed sensor connector B-39 (terminal 2) and ground.

NOTE: Check harness after checking intermediate connector B-36. If intermediate connector is damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 17.

Q: Is the harness wire in good condition?

YES : Check for harness wire between vehicle speed sensor connector B-39 terminal 3 and other system because of short circuit to ground. Then go to Step 17.

NO : Repair it. Then go to Step 17.



STEP 17. Using scan tool MB991502, check data list item 24: Vehicle Speed Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine.
(3) Set scan tool MB991502 to the data reading mode for item 24, Vehicle Speed Sensor.
- Check that the speedometer and MUT-II display speed match when traveling at a vehicle speed of 40 km/h (25 mph).

(4) Turn the ignition switch to the "LOCK" (OFF) position.

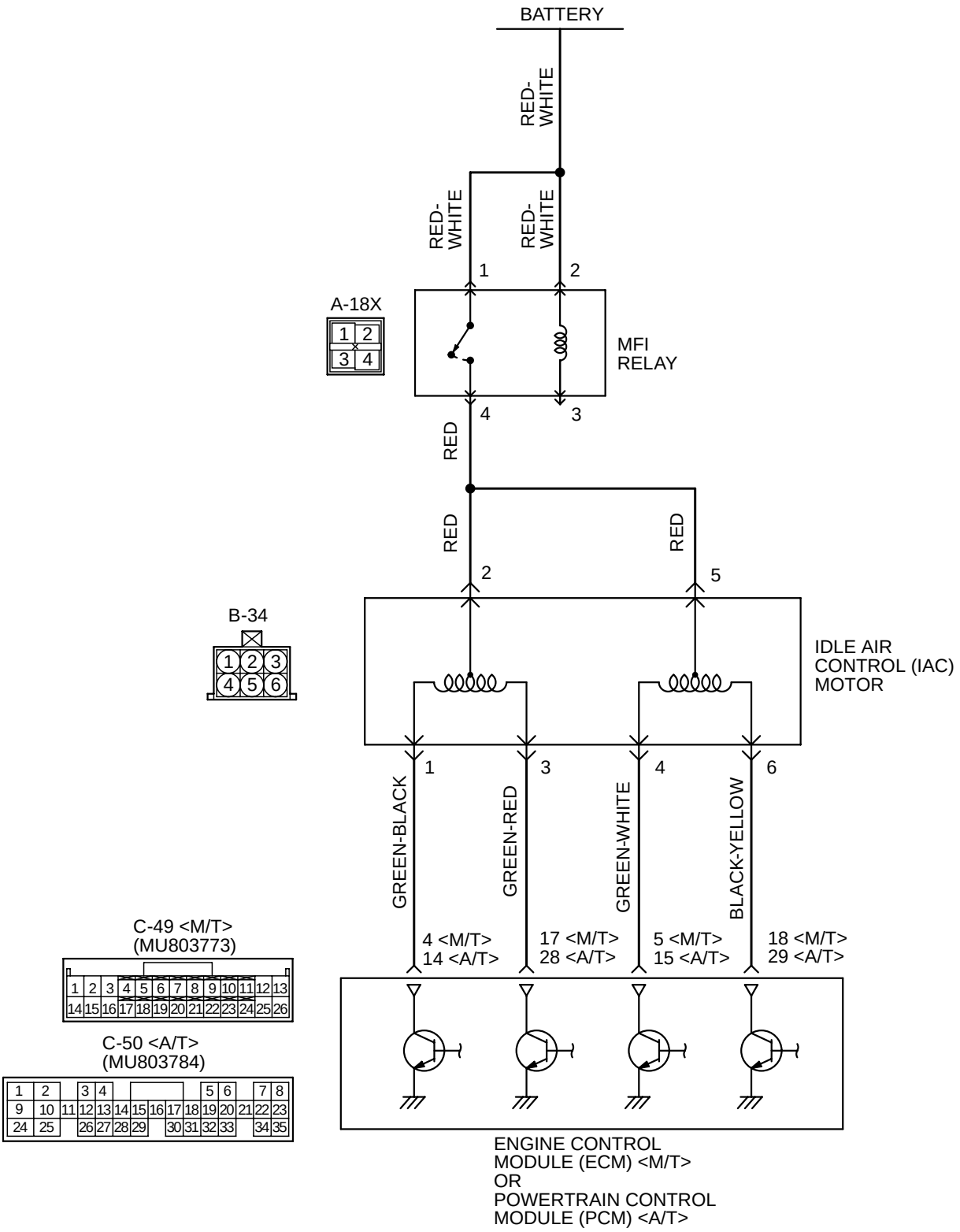
Q: Is the sensor operating properly?

YES : The inspection is complete.

NO : Retry the troubleshooting.

DTC P0506: Idle Control System RPM Lower Than Expected

Idle Air Control (IAC) Motor Circuit



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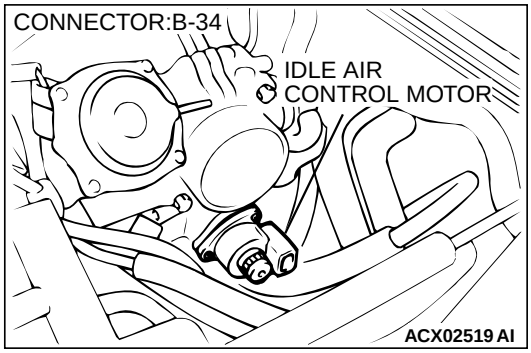
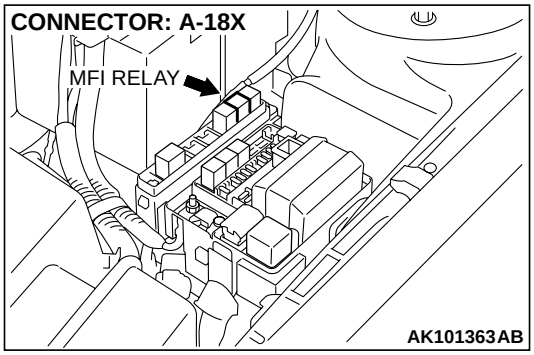
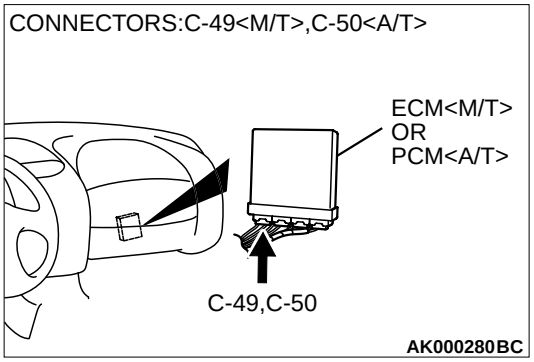






CIRCUIT OPERATION

- The idle air control motor power is supplied from the MFI relay (terminal 4).
- The ECM (terminals 4, 5, 17, 18) <M/T> or PCM (terminals 14, 15, 28, 29) <A/T> drives the stepper motor by sequentially turning "ON" the power transistors in the ECM <M/T> or PCM <A/T> and providing ground to the idle air control motor (terminals 1, 3, 4, 6).

TECHNICAL DESCRIPTION

- The amount of air taken in during idling is regulated by the opening and closing of the servo valve located in the air passage that bypasses the throttle body.
- If there is a malfunction of the IAC system, the actual engine speed will not be identical to the target engine speed.
- The ECM <M/T> or PCM <A/T> checks the difference between the actual engine speed and the target engine speed.

DTC SET CONDITIONS

Check Conditions

- Under the closed loop idle speed control.
- Engine coolant temperature is more than 77°C (171°F).
- Battery positive voltage is higher than 10 volts.
- Power steering pressure switch: "OFF".
- Volumetric efficiency is lower than 40 percent.
- Barometric pressure is higher than 76 kPa (11 psi).
- Intake air temperature is higher than –10°C (14°F).
- 25 seconds have elapsed from the start of the previous monitoring.
- Target idle air control motor position is more than 100 steps.

Judgment Criteria

- The actual idle speed is more than 100 r/min lower than the target idle speed for 12 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

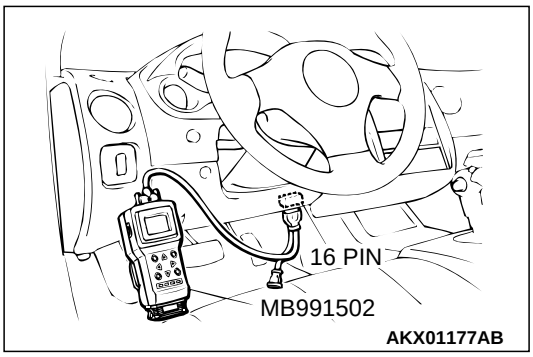
- Idle air control motor failed.
- Open or shorted idle air control motor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools

- MB991502: Scan Tool (MUT-II)
- MB991709: Test harness Set

TSB Revision



STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502, read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

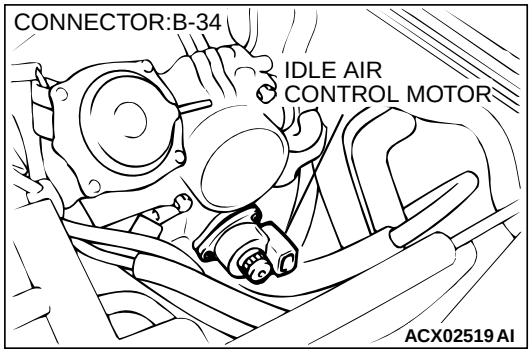
Q: Is the diagnostic trouble code other than P0506 output?

YES : Refer to, Diagnostic Trouble Code Chart P.13A-22.
NO : Go to Step 2.

STEP 2. Check the throttle body. (throttle valve area)

Q: Is the throttle valve area dirty?

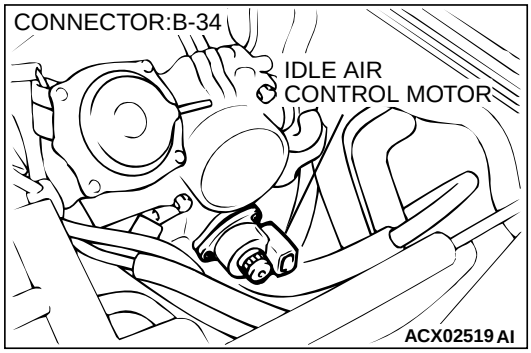
YES : Perform cleaning. Refer to, Throttle body (throttle valve area) cleaning P.13A-575. Then go to Step 14.
NO : Go to Step 3.



STEP 3. Check connector B-34 at idle air control motor for damage.

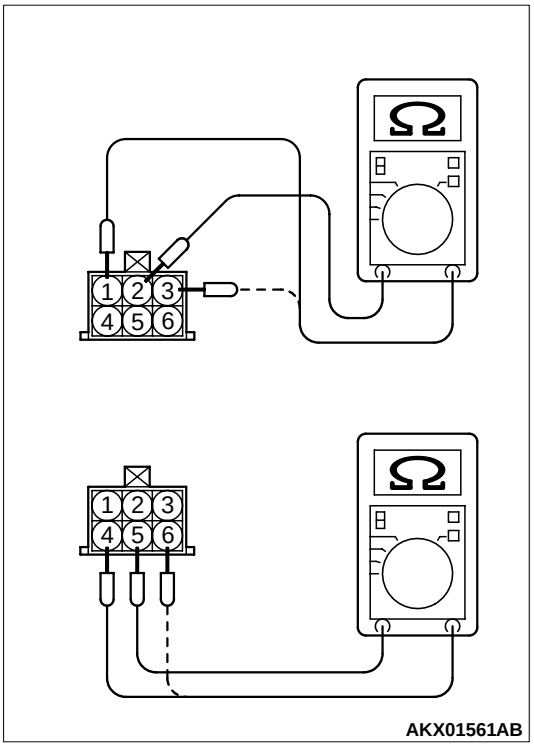
Q: Is the connector in good condition?

YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP 4. Check the idle air control motor coil resistance.

(1) Disconnect the idle air control motor connector B-34.



(2) Measure the resistance between idle air control motor connector terminal 2 and either terminal 1 or terminal 3.

Standard value: 28 – 33 ohm [at 20°C (68°F)]

(3) Measure the resistance between idle air control motor connector terminal 5 and either terminal 4 or terminal 6.

Standard value: 28 – 33 ohm [at 20°C (68°F)]

Q: Is the resistance normal?

YES : Go to Step 5.

NO : Replace the idle air control motor. Then go to Step 14.

STEP 5. Check the power supply voltage at idle air control motor harness side connector B-34.

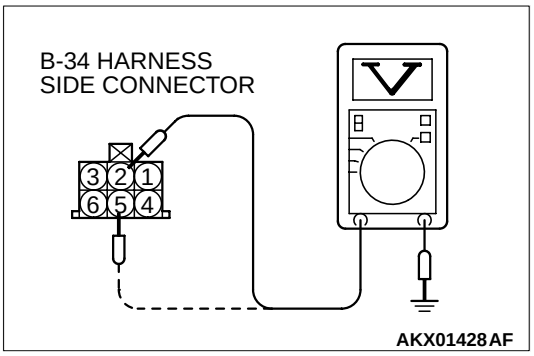
(1) Disconnect the connector B-34 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between terminal 2, 5 and ground.

- Voltage should be battery positive voltage.

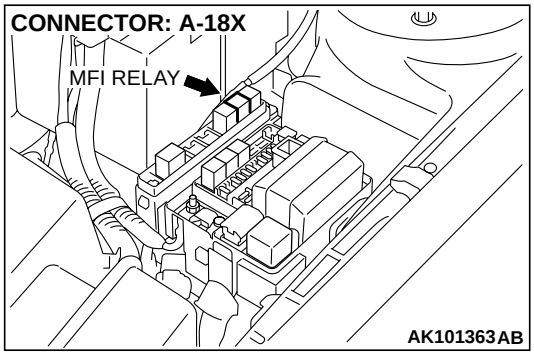
(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the voltage normal?

YES : Go to Step 7.

NO : Go to Step 6.

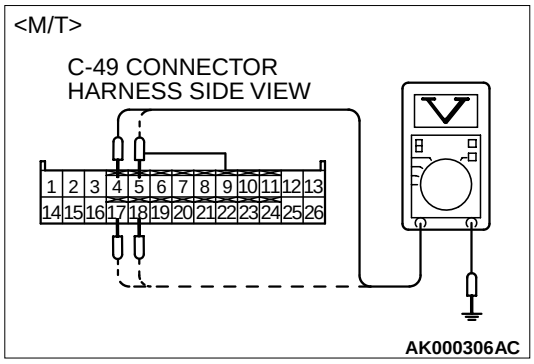


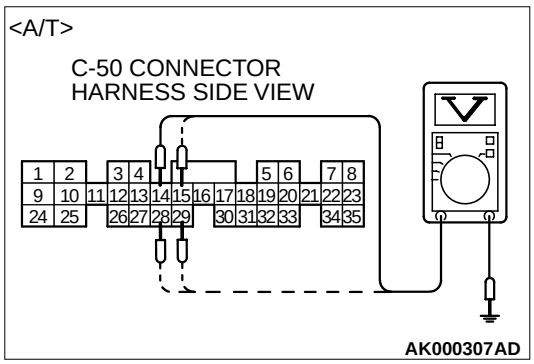
STEP 6. Check connector A-18X at MFI relay for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between MFI relay connector A-18X terminal 4 and idle air control motor connector B-34 terminal 2, 5 because of open circuit or short circuit to ground. Then go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.





STEP 7. Check the power supply voltage at ECM connector C-49 <M/T> or PCM connector C-50 <A/T> by backprobing.

(1) Do not disconnect the connector C-49 <M/T> or C-50 <A/T>.

(2) Measure the voltage between terminal (4, 5, 17, 18) <M/T> or (14, 15, 28, 29) <A/T> and ground by backprobing.

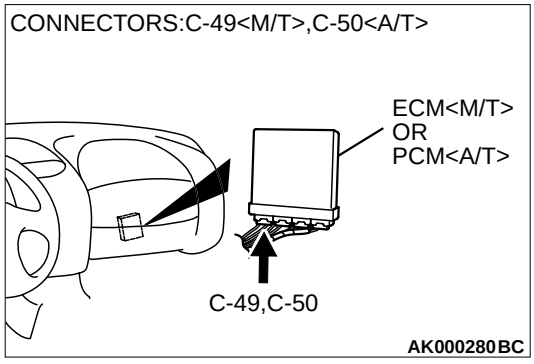
- The voltage is 1volt or lower for approximately 3 seconds, then changes to the battery positive voltage when the Ignition switch is turned from the "LOCK" (OFF) position to the "ON" position.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 10.

NO : Go to Step 8.



STEP 8. Check connector C-49 at ECM <M/T> or connector C-50 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

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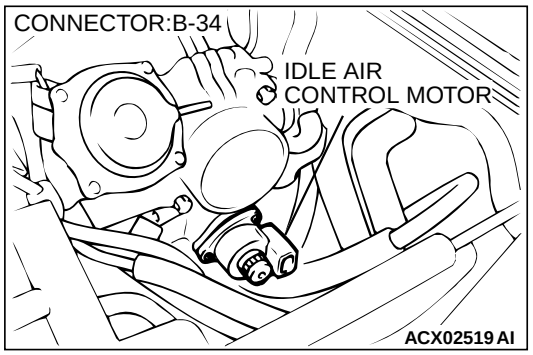
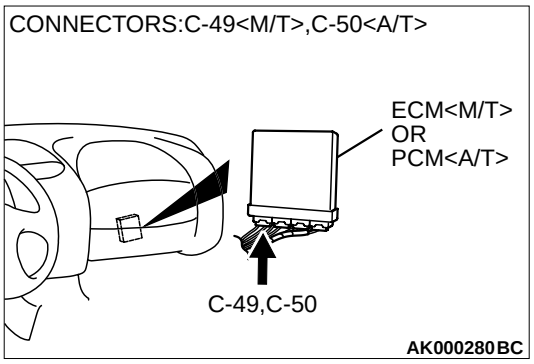


STEP 9. Check for open circuit and short circuit to ground between idle air control motor connector B-34 and ECM connector C-49 <M/T> or PCM connector C-50 <A/T>.

a. Idle air control motor connector B-34 terminal 1 and ECM connector C-49 terminal 4 <M/T> or PCM connector C-50 terminal 14 <A/T>.
b. Idle air control motor connector B-34 terminal 3 and ECM connector C-49 terminal 17 <M/T> or PCM connector C-50 terminal 28 <A/T>.
c. Idle air control motor connector B-34 terminal 4 and ECM connector C-49 terminal 5 <M/T> or PCM connector C-50 terminal 15 <A/T>.
d. Idle air control motor connector B-34 terminal 6 and ECM connector C-49 terminal 18 <M/T> or PCM connector C-50 terminal 29 <A/T>.

Q: Is the harness wire in good condition?

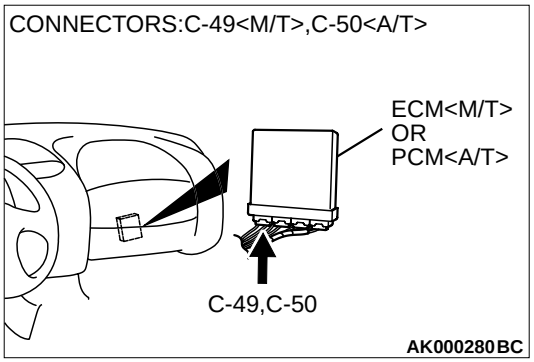
YES : Replace the ECM or PCM. Then go to Step 14.
NO : Repair it. Then go to Step 14.



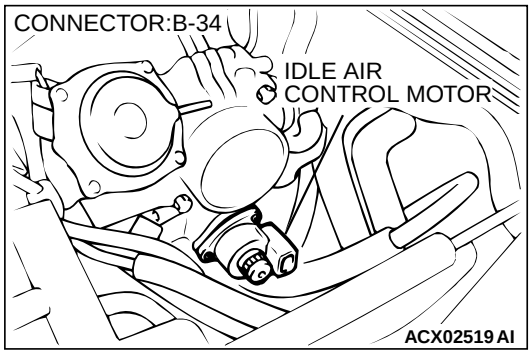
STEP 10. Check connector C-49 at ECM <M/T> or connector C-50 at PCM <A/T> for damage.

Q: Is the connector in good condition?

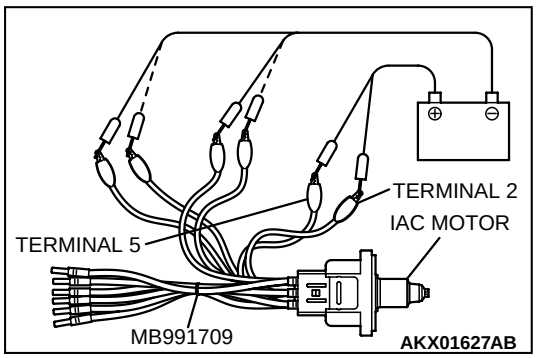
YES : Go to Step 11.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



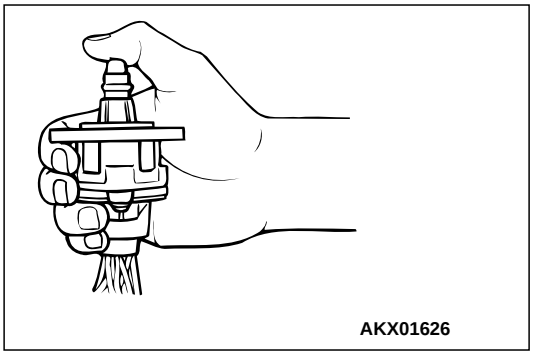
STEP 11. Check the idle air control motor operation using special tool MB991709.



(1) Remove the idle air control motor.



(2) Connect special tool MB991709 to the idle air control motor. (All terminals should be connected.)
(3) Use the jumper wires to connect terminal 2 of the idle air control motor connector to the positive battery terminal.



(4) Check the ensure that the motor operates when the terminals 1 and 3 of the idle air control motor connector are respectively connected to the negative battery terminal using a jumper wire.
- Vibration should be present at each application of voltage to test clip combination.

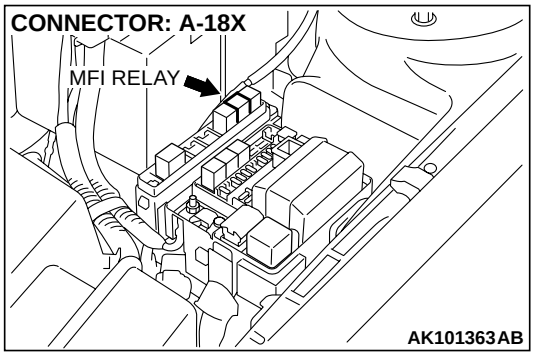
(5) Then. Use jumper wires to connect the terminal 5 of the idle air control motor connector to the positive battery terminal.
(6) Check the ensure that the motor operates when the terminals 4 and 6 of the idle air control motor connector are respectively connected to the negative battery terminal using a jumper wire.
- Vibration should be present at each application of voltage to test clip combination.

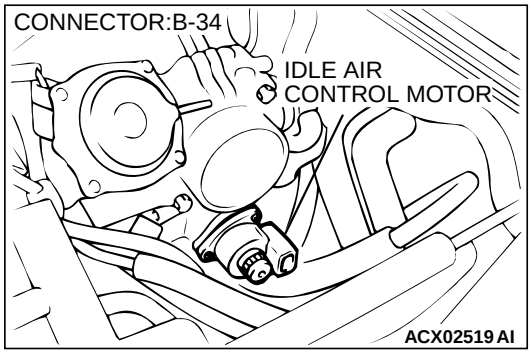
(7) Install the idle air control motor. Refer to, Throttle Body – Disassembly and Assembly P.13A-593.

Q: Is the idle air control motor operating properly?

YES : Go to Step 12.
NO : Replace the idle air control motor. Then go to Step 14.

STEP 12. Check for harness damage between MFI relay connector A-18X (terminal 4) and idle air control motor connector B-34 (terminal 2, 5).



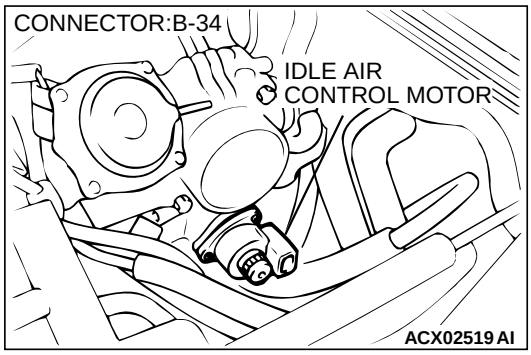


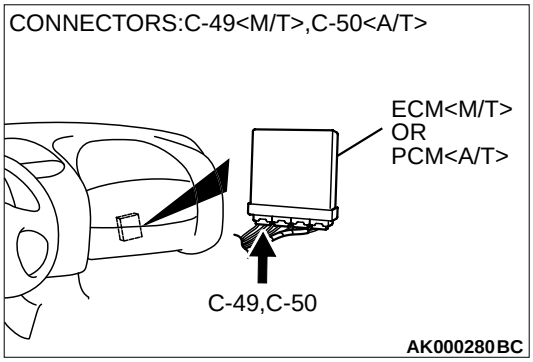
Q: Is the harness wire in good condition?

YES : Go to Step 13.

NO : Repair it. Then go to Step 14.

STEP 13. Check for harness damage between idle air control motor connector B-34 and ECM connector C-49 <M/T> or PCM connector C-50 <A/T>.





a. Idle air control motor connector B-34 terminal 1 and ECM connector C-49 terminal 4 <M/T> or PCM connector C-50 terminal 14 <A/T>.
b. Idle air control motor connector B-34 terminal 3 and ECM connector C-49 terminal 17 <M/T> or PCM connector C-50 terminal 28 <A/T>.
c. Idle air control motor connector B-34 terminal 4 and ECM connector C-49 terminal 5 <M/T> or PCM connector C-50 terminal 15 <A/T>.
d. Idle air control motor connector B-34 terminal 6 and ECM connector C-49 terminal 18 <M/T> or PCM connector C-50 terminal 29 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 14.

NO : Repair it. Then go to Step 14.

STEP 14. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.

(2) Check the diagnostic trouble code (DTC).

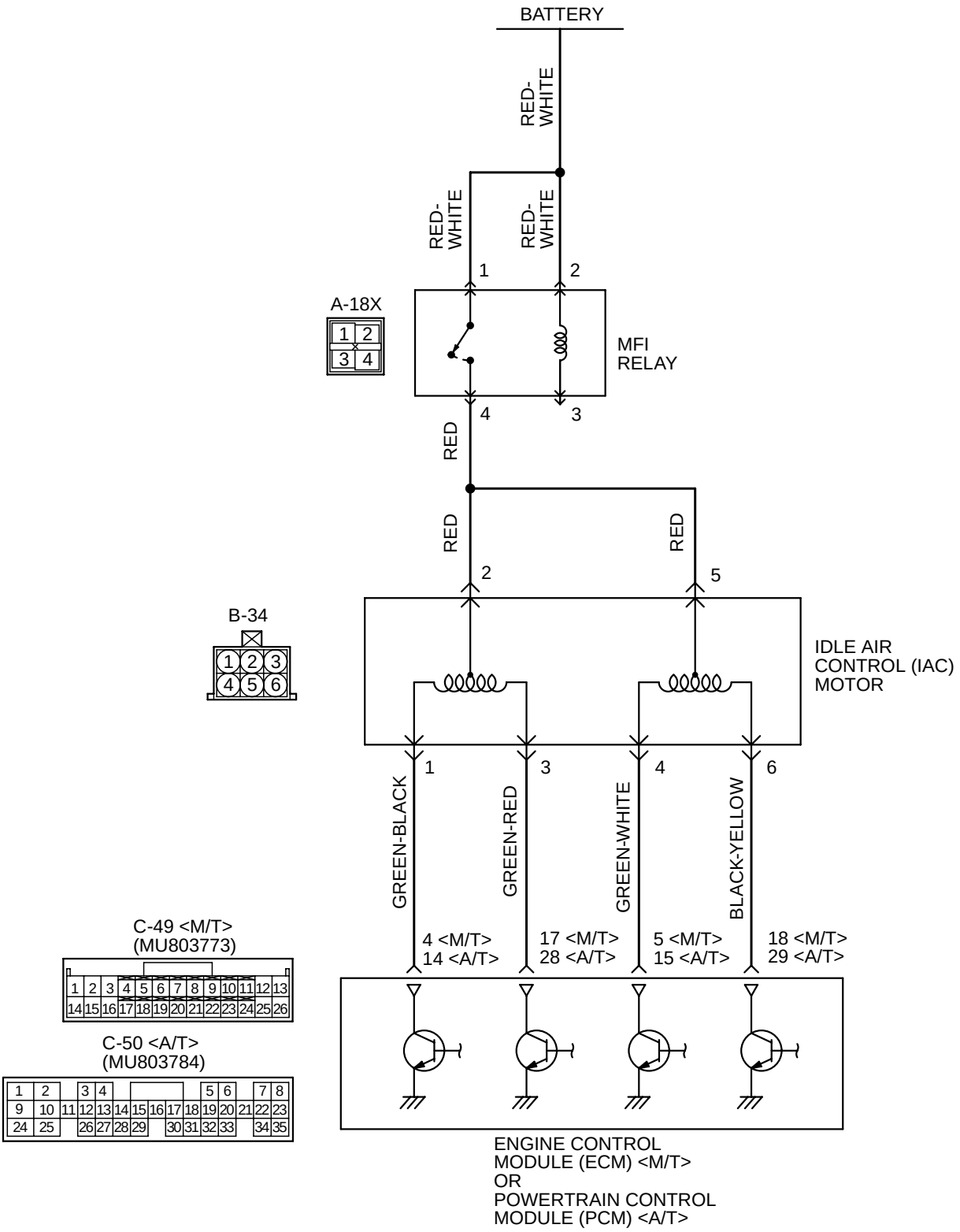
Q: Is the DTC P0506 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0507: Idle Control System RPM Higher Than Expected

Idle Air Control (IAC) Motor Circuit



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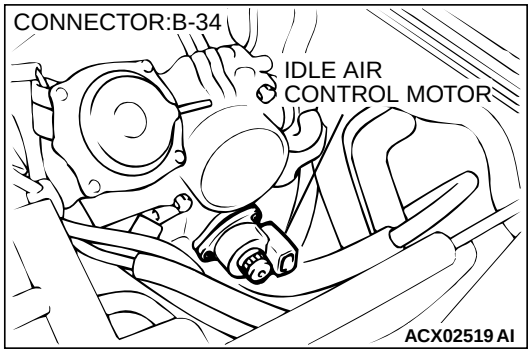
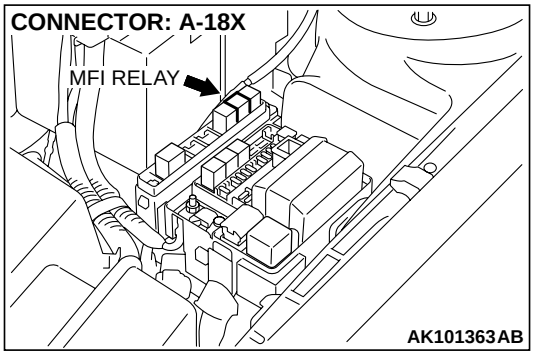
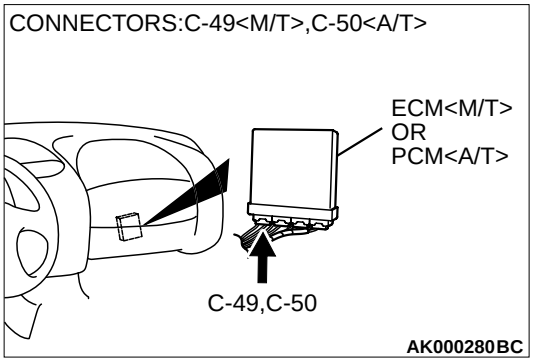






CIRCUIT OPERATION

- The idle air control motor power is supplied from the MFI relay (terminal 4).
- The ECM (terminals 4, 5, 17, 18) <M/T> or PCM (terminals 14, 15, 28, 29) <A/T> drives the stepper motor by sequentially turning "ON" the power transistors in the ECM <M/T> or PCM <A/T> and providing ground to the idle air control motor (terminals 1, 3, 4, 6).

TECHNICAL DESCRIPTION

- The amount of air taken in during idling is regulated by the opening and closing of the servo valve located in the air passage that bypasses the throttle body.
- If there is a malfunction of the IAC system, the actual engine speed will not be identical to the target engine speed.
- The ECM <M/T> or PCM <A/T> checks the difference between the actual engine speed and the target engine speed.

DTC SET CONDITIONS

Check Conditions

- Vehicle speed has reached 1.5 km/h (0.93 mph) or more at least once.
- Under the closed loop idle speed control.
- Engine coolant temperature is higher than 77°C (171°F).
- Battery positive voltage is higher than 10 volts.
- Barometric pressure is higher than 76 kPa (11 psi).
- Intake air temperature is higher than –10°C (14°F).
- 25 seconds have elapsed from the start of the previous monitoring.
- Target idle air control motor position is 0 steps.

Judgment Criteria

- Actual idle speed has continued to be higher than the target idle speed by 200 r/min (300 r/min*) or more for 12 seconds.
  *: Specs in parentheses are applicable if the maximum air temperature during the previous operation was more than 45°C (113°F).

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

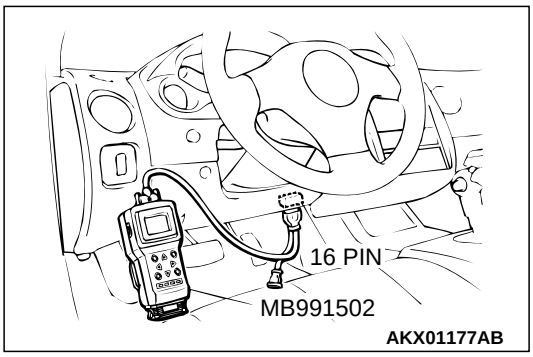
- Idle air control motor failed.
- Open or shorted idle air control motor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools

- MB991502: Scan Tool (MUT-II)
- MB991709: Test harness Set

TSB Revision



STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502, read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the diagnostic trouble code other than P0507 output?

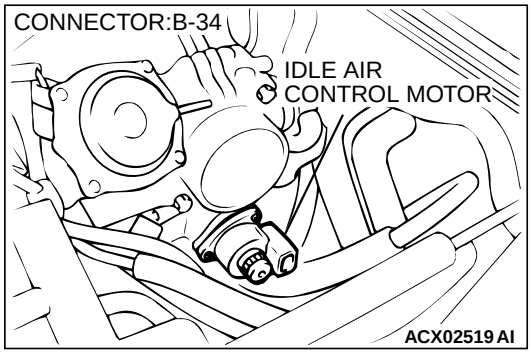
YES : Refer to, Diagnostic Trouble Code Chart P.13A-22.
NO : Go to Step 2.

STEP 2. Check the intake system vacuum leak.

Q: Are there any abnormalities?

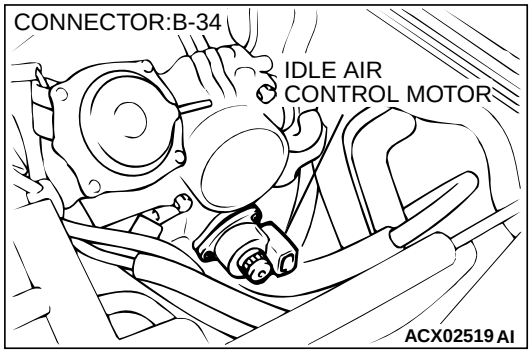
YES : Go to Step 3.
NO : Repair or replace it. Then go to Step 14.

STEP 3. Check connector B-34 at idle air control motor for damage.



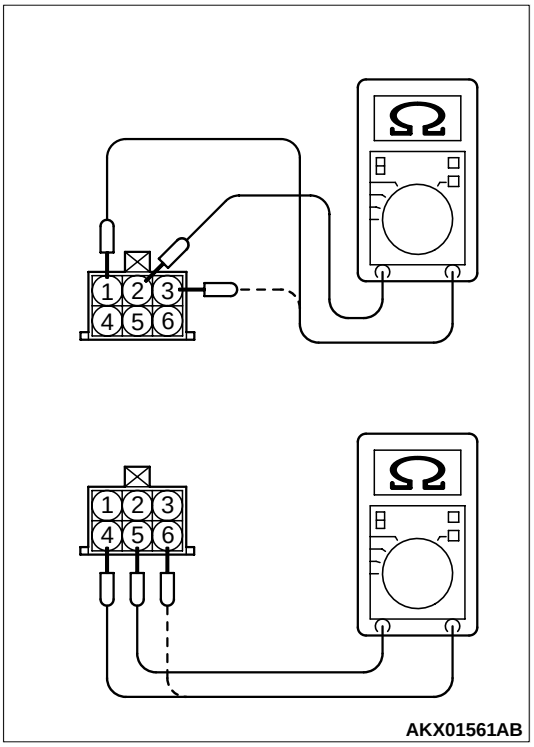
Q: Is the connector in good condition?

YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP 4. Check the idle air control motor coil resistance.

(1) Disconnect the idle air control motor connector B-34.



(2) Measure the resistance between idle air control motor connector terminal 2 and either terminal 1 or terminal 3.

Standard value: 28 – 33 ohm [at 20°C (68°F)]

(3) Measure the resistance between idle air control motor connector terminal 5 and either terminal 4 or terminal 6.

Standard value: 28 – 33 ohm [at 20°C (68°F)]

Q: Is the resistance normal?

YES : Go to Step 5.

NO : Replace the idle air control motor. Then go to Step 14.

STEP 5. Check the power supply voltage at idle air control motor harness side connector B-34.

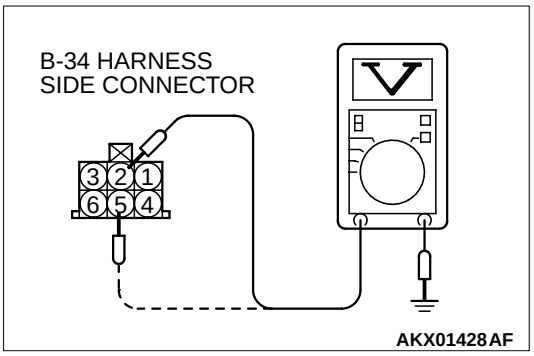
(1) Disconnect the connector B-34 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between terminal 2, 5 and ground.

- Voltage should be battery positive voltage.

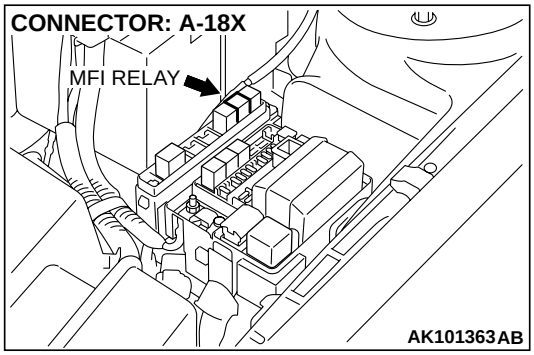
(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the voltage normal?

YES : Go to Step 7.

NO : Go to Step 6.

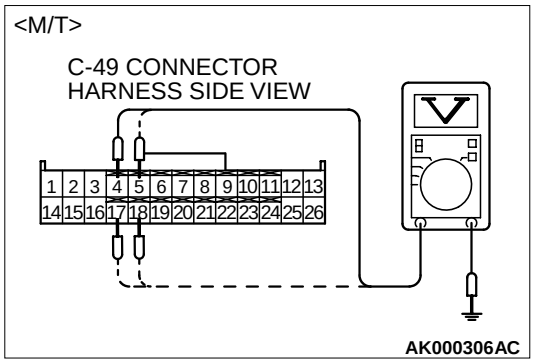


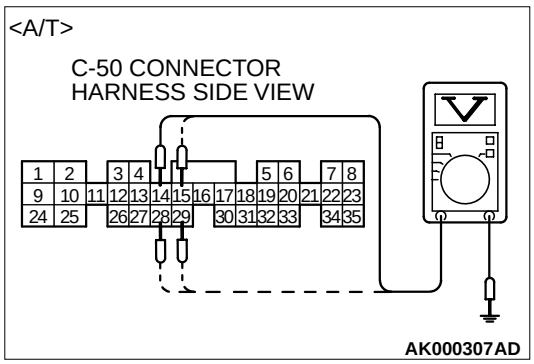
STEP 6. Check connector A-18X at MFI relay for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between MFI relay connector A-18X terminal 4 and idle air control motor connector B-34 terminal 2, 5 because of open circuit or short circuit to ground. Then go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.





STEP 7. Check the power supply voltage at ECM connector C-49 <M/T> or PCM connector C-50 <A/T> by backprobing.

(1) Do not disconnect the connector C-49 <M/T> or C-50 <A/T>.

(2) Measure the voltage between terminal (4, 5, 17, 18) <M/T> or (14, 15, 28, 29) <A/T> and ground by backprobing.

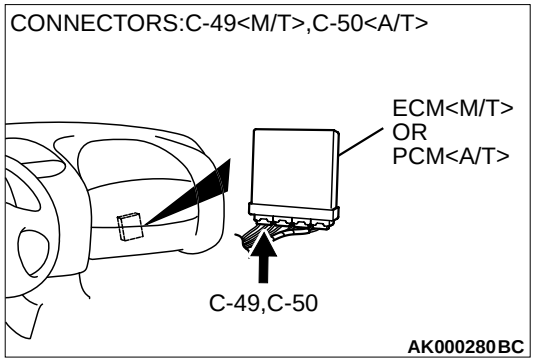
- The voltage is 1 V or lower for approximately 3 seconds, then changes to the battery positive voltage when the Ignition switch is turned from the "LOCK" (OFF) position to the "ON" position.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 10.

NO : Go to Step 8.

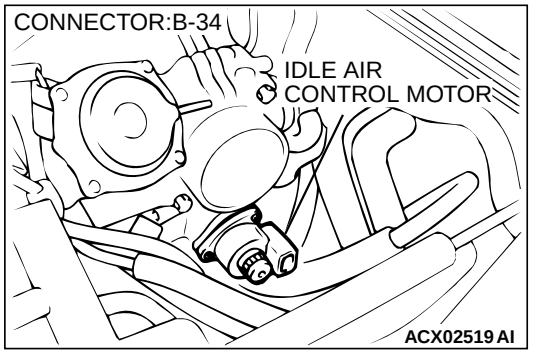


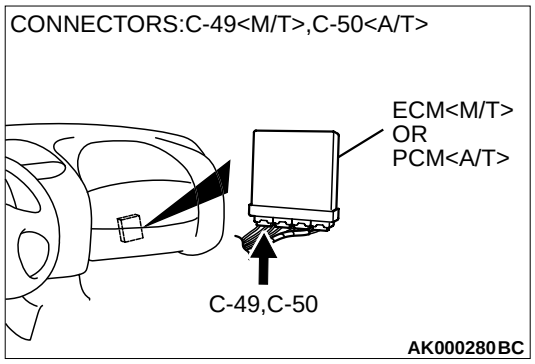
STEP 8. Check connector C-49 at ECM <M/T> or connector C-50 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



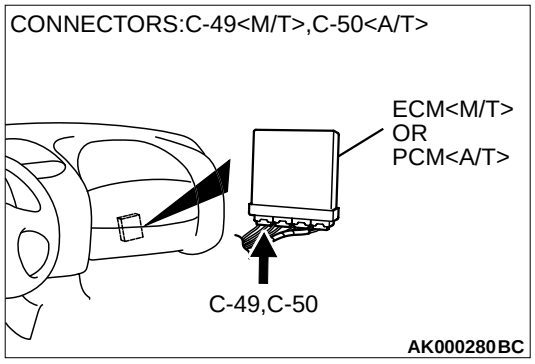


STEP 9. Check for open circuit and short circuit to ground between idle air control motor connector B-34 and ECM connector C-49 <M/T> or PCM connector C-50 <A/T>.

a. Idle air control motor connector B-34 terminal 1 and ECM connector C-49 terminal 4 <M/T> or PCM connector C-50 terminal 14 <A/T>.
b. Idle air control motor connector B-34 terminal 3 and ECM connector C-49 terminal 17 <M/T> or PCM connector C-50 terminal 28 <A/T>.
c. Idle air control motor connector B-34 terminal 4 and ECM connector C-49 terminal 5 <M/T> or PCM connector C-50 terminal 15 <A/T>.
d. Idle air control motor connector B-34 terminal 6 and ECM connector C-49 terminal 18 <M/T> or PCM connector C-50 terminal 29 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 14.
NO : Repair it. Then go to Step 14.

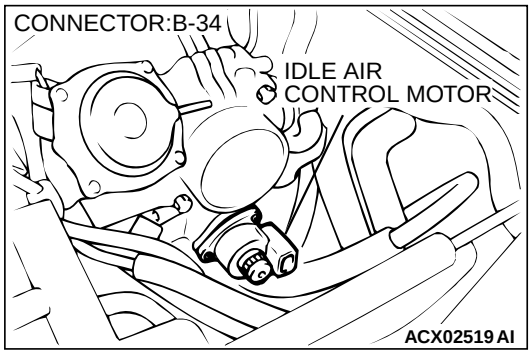


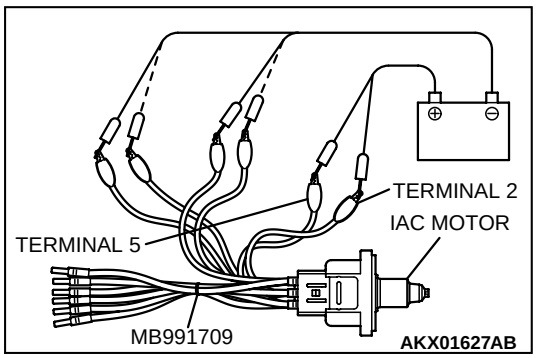
STEP 10. Check connector C-49 at ECM <M/T> or connector C-50 at PCM <A/T> for damage.
Q: Is the connector in good condition?

YES : Go to Step 11.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

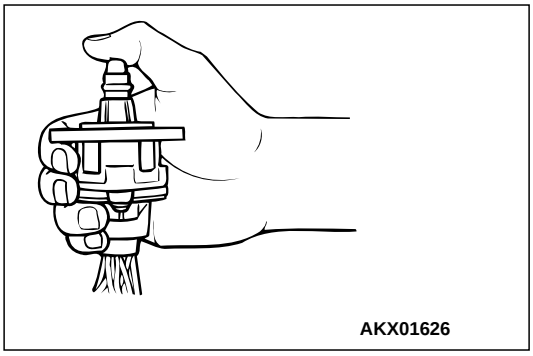
STEP 11. Check the idle air control motor operation using special tool MB991709.

(1) Remove the idle air control motor.





(2) Connect special tool MB991709 to the idle air control motor. (All terminals should be connected.)
(3) Use the jumper wires to connect terminal 2 of the idle air control motor connector to the positive battery terminal.



(4) Check the ensure that the motor operates when the terminals 1 and 3 of the idle air control motor connector are respectively connected to the negative battery terminal using a jumper wire.
- Vibration should be present at each application of voltage to test clip combination.

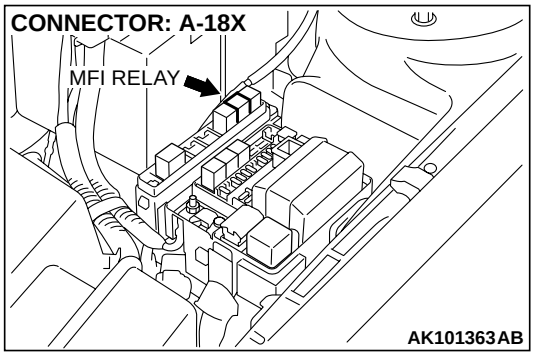
(5) Then use jumper wires to connect the terminal 5 of the idle air control motor connector to the positive battery terminal.
(6) Check the ensure that the motor operates when the terminals 4 and 6 of the idle air control motor connector are respectively connected to the negative battery terminal using a jumper wire.
- Vibration should be present at each application of voltage to test clip combination.

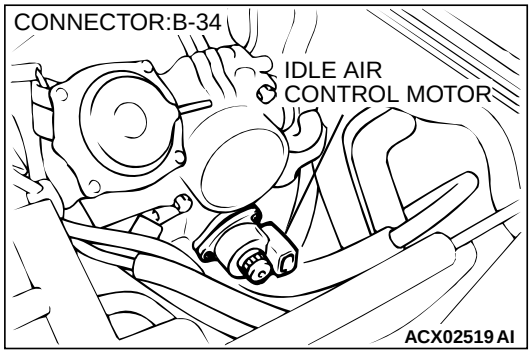
(7) Install the idle air control motor. Refer to, Throttle Body – Disassembly and Assembly P.13A-593.

Q: Is the idle air control motor operating properly?

YES : Go to Step 12.
NO : Replace the idle air control motor. Then go to Step 14.

STEP 12. Check for harness damage between MFI relay connector A-18X (terminal 4) and idle air control motor connector B-34 (terminal 2, 5).



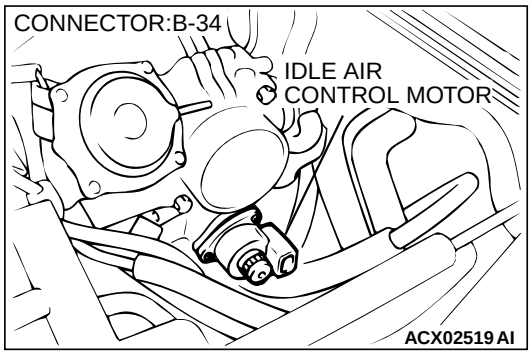


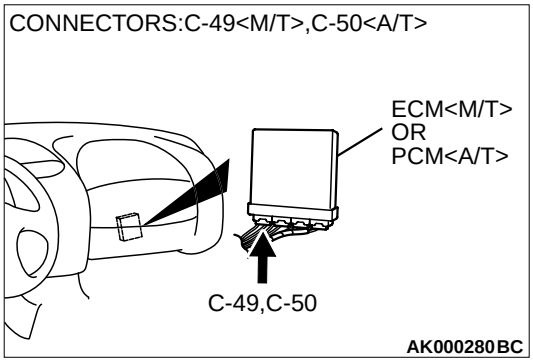
Q: Is the harness wire in good condition?

YES : Go to Step 13.

NO : Repair it. Then go to Step 14.

STEP 13. Check for harness damage between idle air control motor connector B-34 and ECM connector C-49 <M/T> or PCM connector C-50 <A/T>.





a. Idle air control motor connector B-34 terminal 1 and ECM connector C-49 terminal 4 <M/T> or PCM connector C-50 terminal 14 <A/T>.
b. Idle air control motor connector B-34 terminal 3 and ECM connector C-49 terminal 17 <M/T> or PCM connector C-50 terminal 28 <A/T>.
c. Idle air control motor connector B-34 terminal 4 and ECM connector C-49 terminal 5 <M/T> or PCM connector C-50 terminal 15 <A/T>.
d. Idle air control motor connector B-34 terminal 6 and ECM connector C-49 terminal 18 <M/T> or PCM connector C-50 terminal 29 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 14.

NO : Repair it. Then go to Step 14.

STEP 14. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0507 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0513: Immobilizer Malfunction

TECHNICAL DESCRIPTION

- ECM <M/T> or PCM <A/T> monitors the communication condition with the immobilizer-ECU and the message from the immobilizer-ECU, and when the abnormality is found, ECM <M/T> or PCM <A/T> makes the engine not to start.

DTC SET CONDITIONS

Check Conditions

- Ignition switch: ON

Judgment Criteria

- When the communication error between ECM <M/T> or PCM <A/T> and the immobilizer-ECU continues for 2 seconds or more.

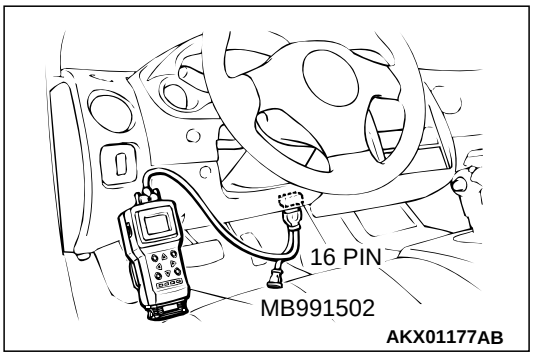
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Malfunction of harness or connector.
- Malfunction of immobilizer-ECU.
- Malfunction of ECM <M/T> or PCM <A/T>.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, read the immobilizer diagnostic trouble code (DTC).

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

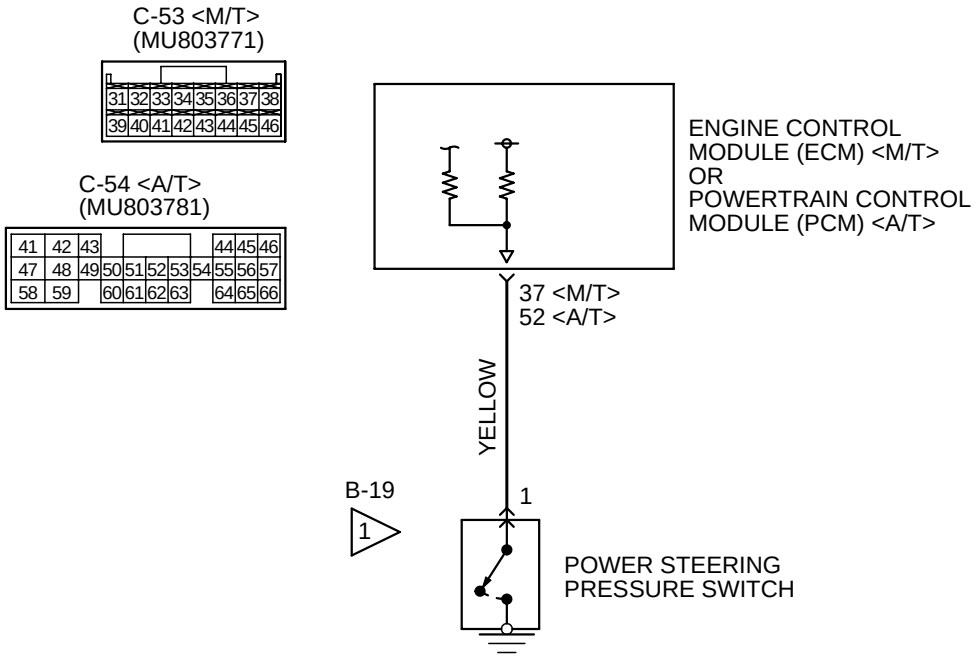
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the immobilizer system-DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the immobilizer system-DTC is output?

YES : Refer to GROUP 54A, Ignition Switch and Immobilizer System – Diagnostic Trouble Code Chart P.54A-11.
NO : If DTC P0513 is output again after the MFI-DTC has been erased, replace the ECM <M/T> or PCM <A/T>. Then check that the DTC P0513 does not reset.

DTC P0551: Power Steering Pressure Sensor Circuit Range/Performance

Power Steering Pressure Switch Circuit



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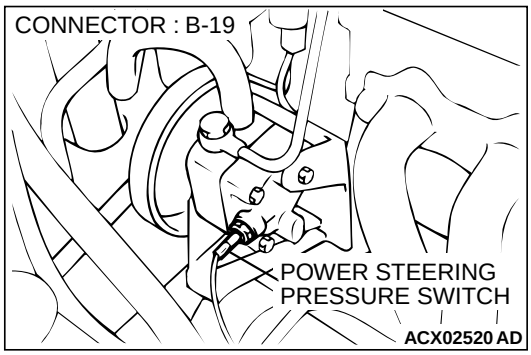
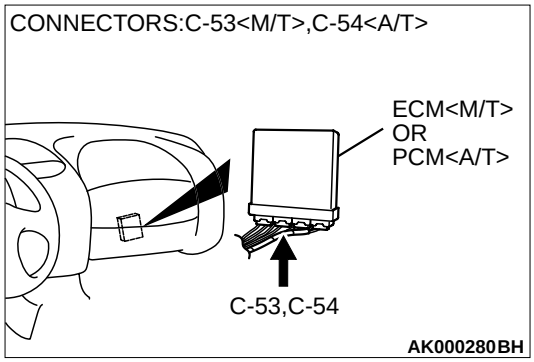




CIRCUIT OPERATION

- A battery positive voltage is applied to the power steering pressure switch output terminal (terminal 1) from the ECM (terminal 37) or PCM (terminal 52) <A/T> via the resistor in the ECM <M/T> or PCM <A/T>.

TECHNICAL DESCRIPTION

- The power steering pressure switch converts the existence of a power steering load into a high/low voltage, and inputs it into the ECM <M/T> or PCM <A/T>.
- When the steering wheel is turned, hydraulic pressure rises. The power steering pressure switch closes, and the applied battery positive voltage will be grounded. With this, the power steering pressure switch output voltage will fluctuate between 12 volts and 0 volt.
- While driving with the steering wheel held straight, the power steering pressure switch turns "OFF".
- The ECM <M/T> or PCM <A/T> checks whether the power steering pressure switch turns "OFF" or "ON" during driving.

TSB Revision

DTC SET CONDITIONS

Check Conditions

- Engine coolant temperature is higher than 30°C (86°F).
- Drive for 4 seconds or more with the vehicle speed is 50 km/h (31 mph) or more. Stop the vehicle [vehicle speed is 1.5 km/h (0.93 mph) or less]. Repeat 10 times or more.

Judgment Criteria

- Power steering pressure switch continues to be "ON".

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

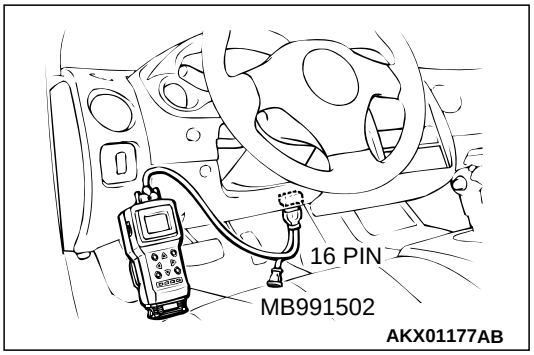
- Power steering pressure switch failed.
- Open or shorted power steering pressure switch circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools

- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check data list item 27: Power Steering Pressure Switch.



⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

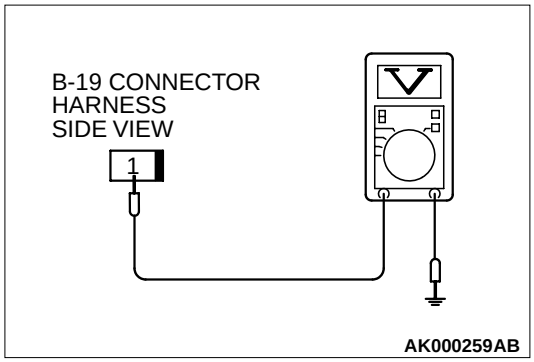
(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 27, Power Steering Pressure Switch.
- If the steering wheel is stopped while idling, "OFF" will be displayed.
- If the steering wheel is steered while idling, "ON" will be displayed.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Go to Step 2.

STEP 2. Check the power supply voltage at power steering pressure switch connector B-19 by backprobing.

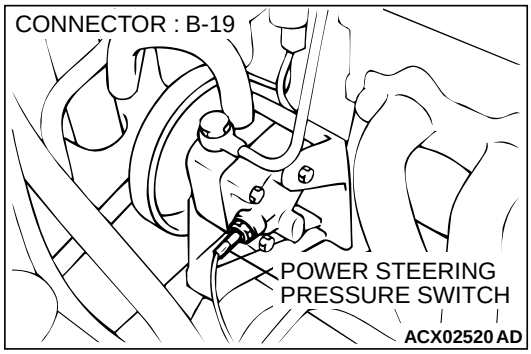


(1) Do not disconnect the connector B-19.
(2) Start the engine and run at idle.
(3) Measure the voltage between terminal 1 and ground by backprobing.
- When steering wheel is stationary, voltage should be battery positive voltage.
- When steering wheel is turned, voltage should be 1 volt or less.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 3.
NO : Go to Step 5.

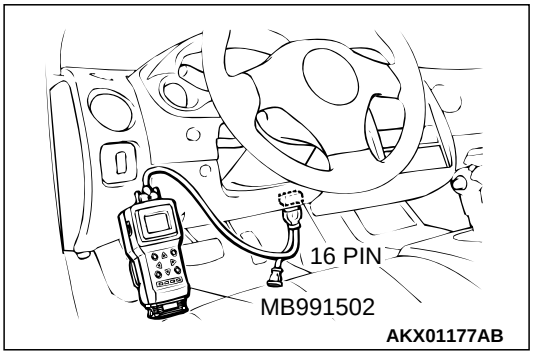


STEP 3. Check connector B-19 at power steering pressure switch for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP 4. Using scan tool MB991502, check data list item 27: Power Steering Pressure Switch.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

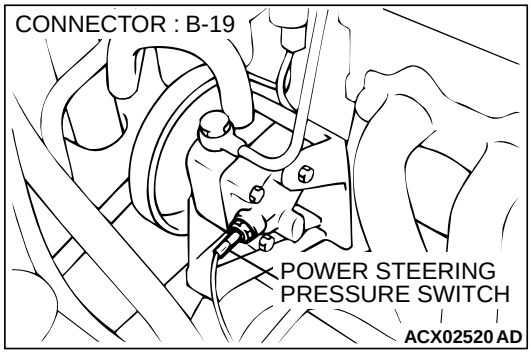
(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 27, Power Steering Pressure Switch.
- If the steering wheel is stopped while idling, "OFF" will be displayed.
- If the steering wheel is steered while idling, "ON" will be displayed.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00E-2.

NO : Replace the ECM or PCM. Then go to Step 14.

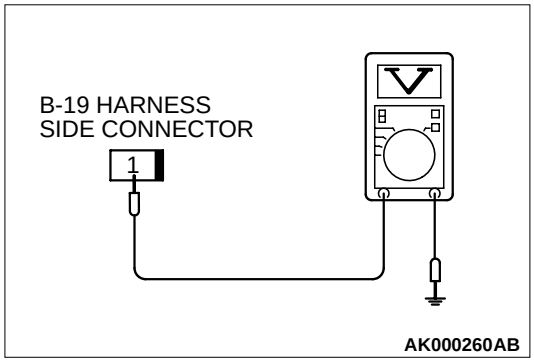


STEP 5. Check connector B-19 at power steering pressure switch for damage.

Q: Is the connector in good condition?

YES : Go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



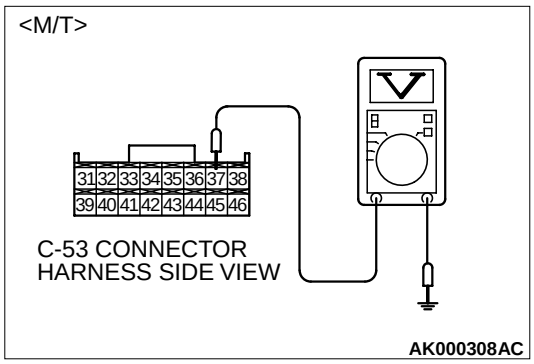
STEP 6. Check the power supply voltage at power steering pressure switch harness side connector B-19.

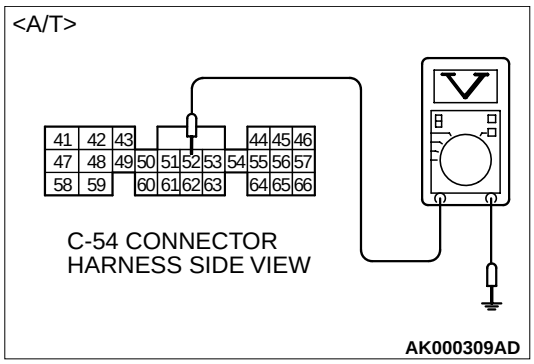
(1) Disconnect the connector B-19 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 1 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 11.
NO : Go to Step 7.





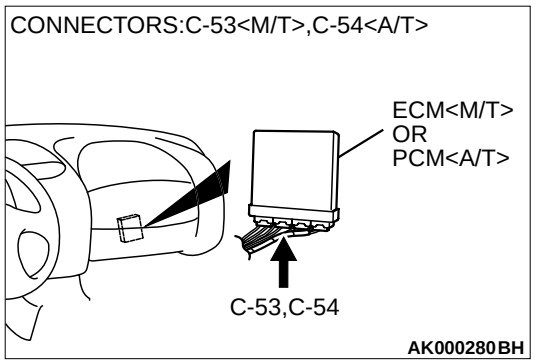
STEP 7. Check the power supply voltage at ECM connector C-53 <M/T> or PCM connector C-54 <A/T> by backprobing.

(1) Do not disconnect the ECM connector C-53 <M/T> or PCM connector C-54 <A/T>.
(2) Disconnect the power steering pressure switch connector B-19.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the voltage between terminal 37 <M/T> or 52 <A/T> and ground by backprobing.
- Voltage should be between battery positive voltage.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 8.
NO : Go to Step 9.

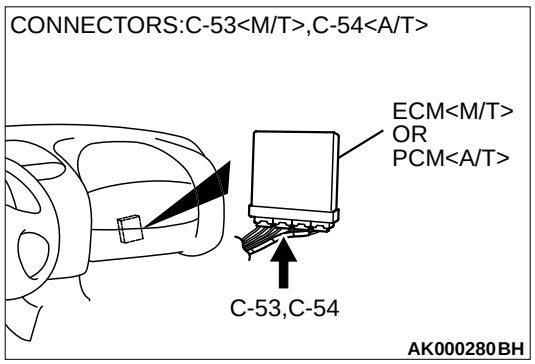


STEP 8. Check connector C-53 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between power steering pressure switch connector B-19 terminal 1 and ECM connector C-53 terminal 37 <M/T> or PCM connector C-54 terminal 52 <A/T> because of open circuit. Then go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



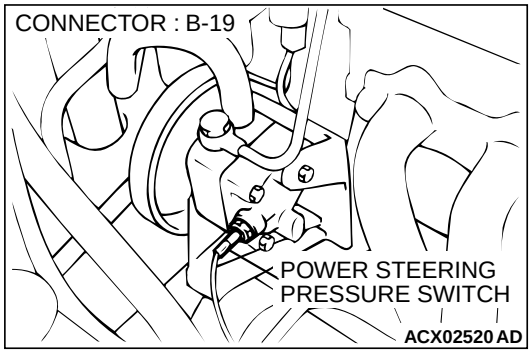
STEP 9. Check connector C-53 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

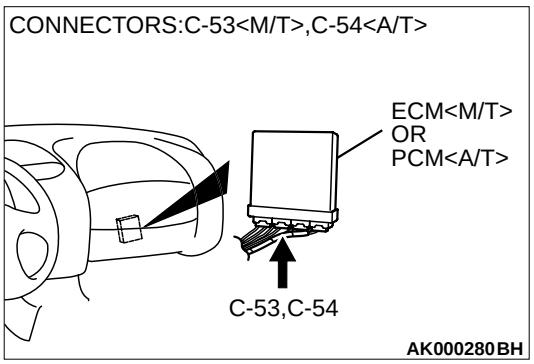
Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

STEP 10. Check for short circuit to ground between power steering pressure switch connector B-19 (terminal 1) and ECM connector C-53 (terminal 37) <M/T> or PCM connector C-54 (terminal 52) <A/T>.



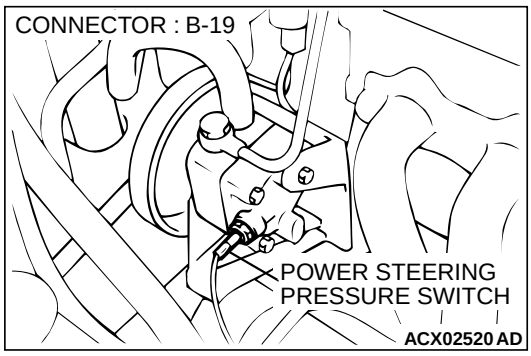


Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 14.
NO : Repair it. Then go to Step 14.

STEP 11. Replace the power steering pressure switch.

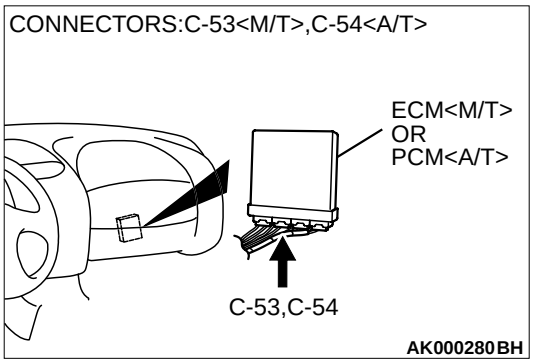
(1) Replace the power steering pressure switch.
(2) Check the trouble symptoms.
(3) Check the diagnostic trouble code (DTC).



Q: Is the DTC P0551 is output?

YES : Go to Step 12.
NO : Go to Step 14.

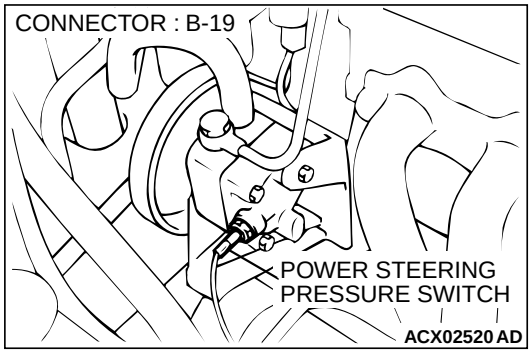
STEP 12. Check connector C-53 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

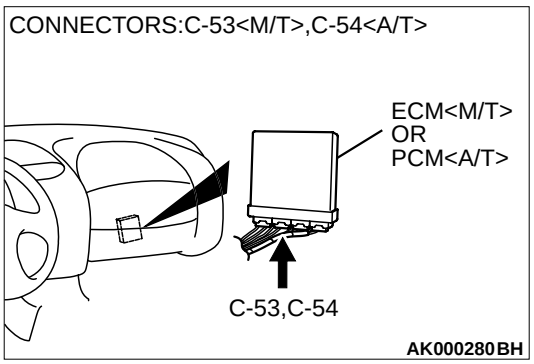


Q: Is the connector in good condition?

YES : Go to Step 13.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

STEP 13. Check for harness damage between power steering pressure switch connector B-19 (terminal 1) and ECM connector C-53 (terminal 37) <M/T> or PCM connector C-54 (terminal 52) <A/T>.

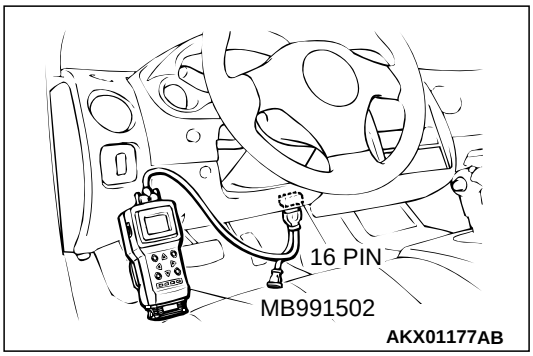




Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 14.
NO : Repair it. Then go to Step 14.

STEP 14. Using scan tool MB991502, check data list item 27: Power Steering Pressure Switch.



⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 27, Power Steering Pressure Switch.
- If the steering wheel is stopped while idling, "OFF" will be displayed.
- If the steering wheel is steered while idling, "ON" will be displayed.

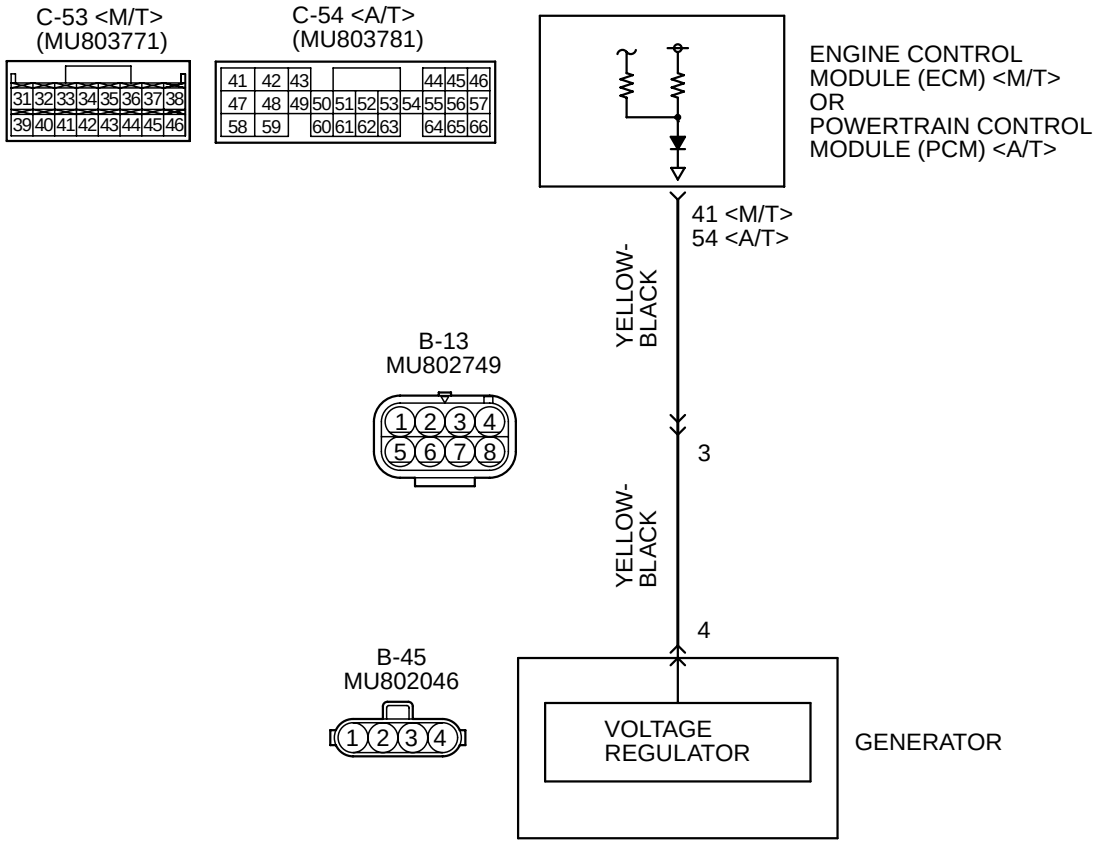
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the switch operating properly?

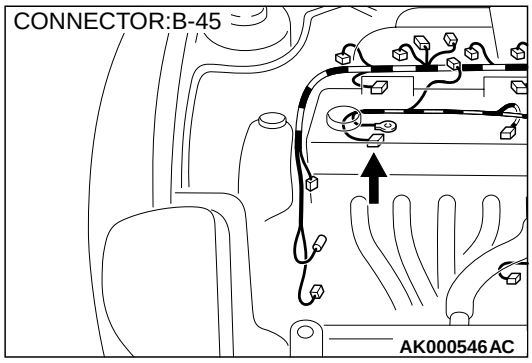
YES : The inspection is complete.
NO : Retry the troubleshooting.

DTC P0622: Generator FR Terminal Circuit Malfunction

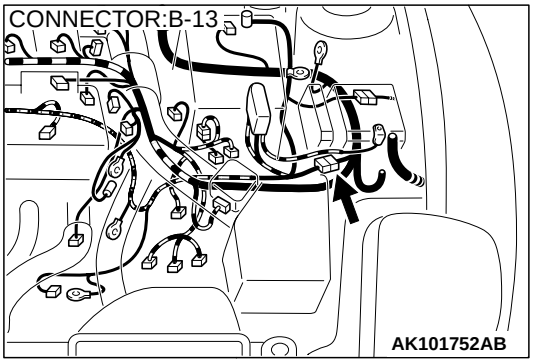
Generator Circuit



AK000672

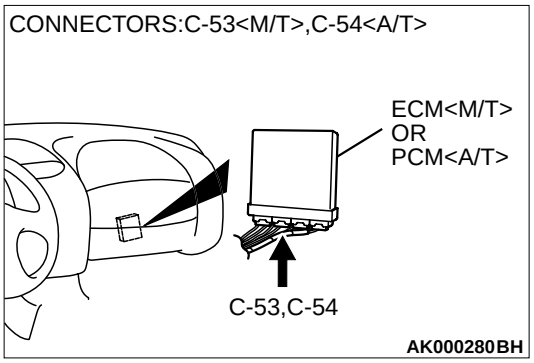


AK000546AC



AK101752AB

TSB Revision



CIRCUIT OPERATION

- The ECM (terminal 41) <M/T> or PCM (terminal 54) <A/T> apply a battery positive voltage into the generator FR terminal 4 via resistance inside the unit.

TECHNICAL DESCRIPTION

- When the generator field coils are controlled, the generator FR terminal inputs signal to the ECM <M/T> or PCM <A/T>.
- The ECM <M/T> or PCM <A/T> detects the generator output with the input signal, and controls the idle air control motor according to the generator output.

DTC SET CONDITIONS

Check Conditions

- Engine speed is higher than 50 r/min.

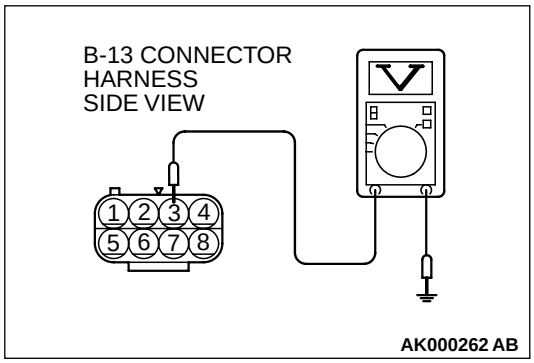
Judgement Criteria

- Input voltage from the generator FR terminal has continued to be approximately battery positive voltage for 20 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set area:)

- Open circuit in generator FR terminal circuit.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS



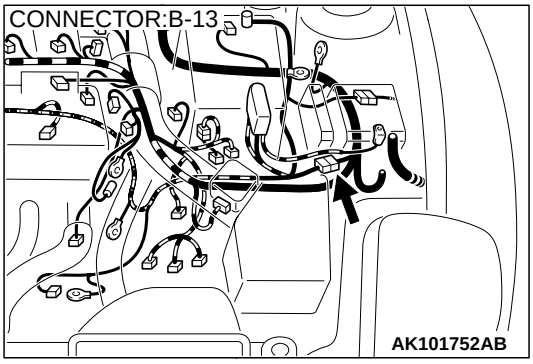
STEP 1. Check the voltage at generator intermediate connector B-13 by backprobing.

(1) Do not disconnect the connector B-13.
(2) Start the engine and run at idle.
(3) Measure the voltage between terminal 3 and ground by backprobing.
  a. Engine: warming up
  b. Radiator fan: stopped
  c. Headlight switch: OFF to ON
  d. Rear defogger switch: OFF to ON
  e. Stoplight switch: OFF to ON
  - Voltage should be drops.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 2.
NO : Go to Step 4.



STEP 2. Check connector B-13 at generator intermediate connector for damage.

Q: Is the connector in good condition?

YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

STEP 3. Check the trouble symptoms.

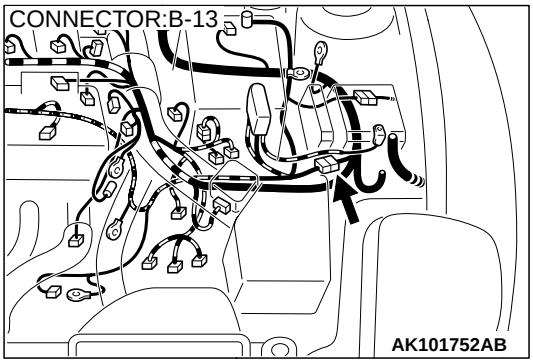
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.

(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P1500 is output?

YES : Replace the ECM or PCM. Then go to Step 11.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

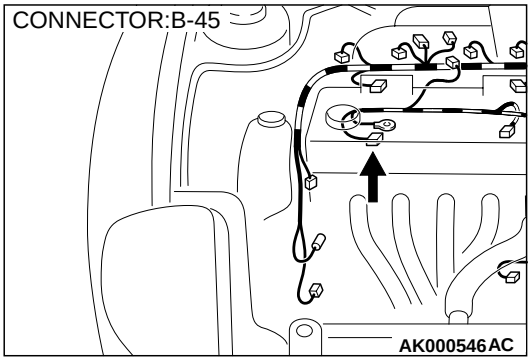


STEP 4. Check connector B-13 at generator intermediate connector for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

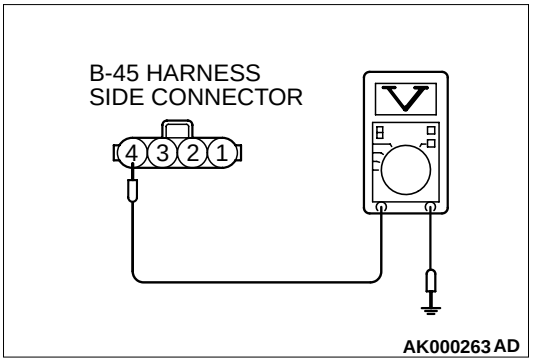


STEP 5. Check connector B-45 at generator connector for damage.

Q: Is the connector in good condition?

YES : Go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.



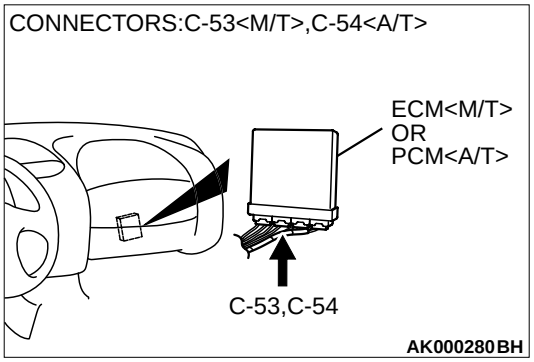
STEP 6. Check the voltage at generator harness side connector B-45.

(1) Disconnect the connector B-45 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 4 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 9.
NO : Go to Step 7.

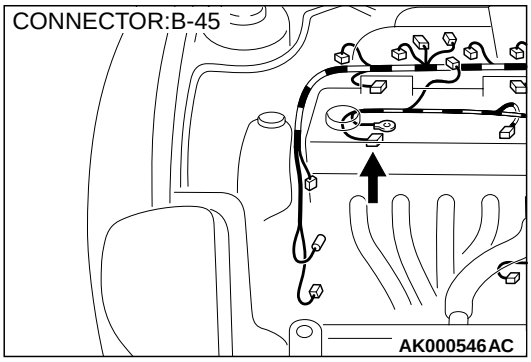


STEP 7. Check connector C-53 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 8.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

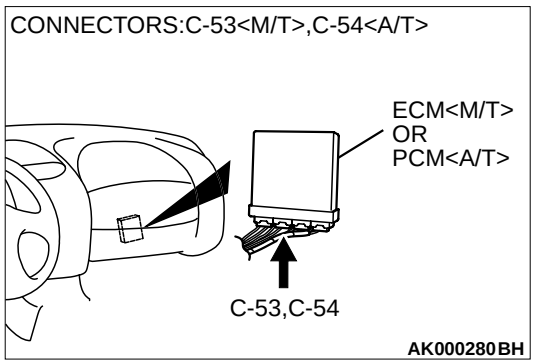
STEP 8. Check for open circuit and short circuit to ground between generator connector B-45 (terminal 4) and ECM connector C-53 (terminal 41) <M/T> or PCM connector C-54 (terminal 54) <A/T>.



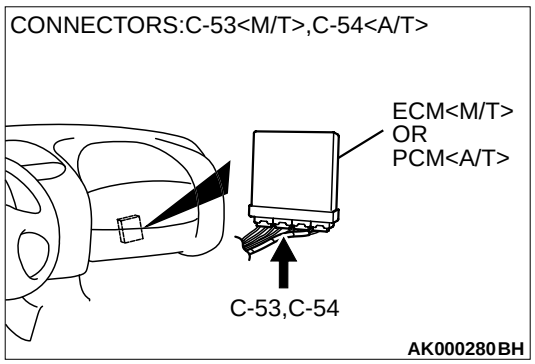
Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 11.

NO : Repair it. Then go to Step 11.



STEP 9. Check connector C-53 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

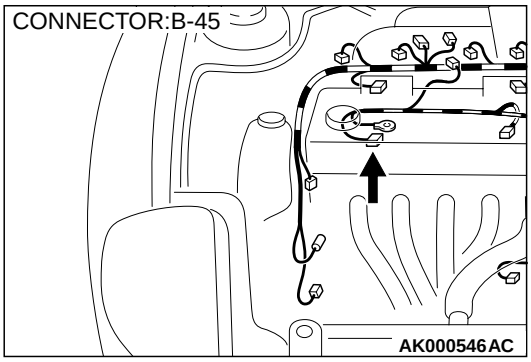


Q: Is the connector in good condition?

YES : Go to Step 10.

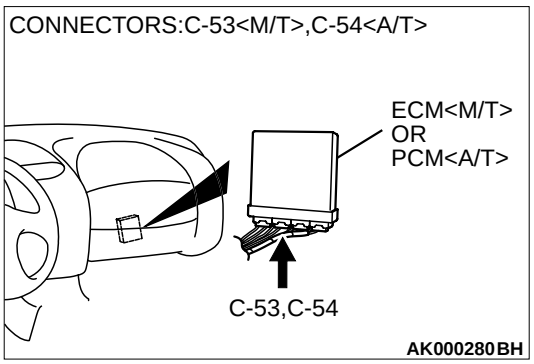
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

STEP 10. Check for harness damage between generator connector B-45 (terminal 4) and ECM connector C-53 (terminal 41) <M/T> or PCM connector C-54 (terminal 54) <A/T>.



Q: Is the harness wire in good condition?

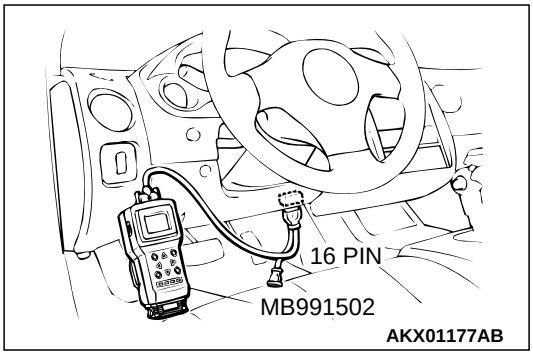
YES : Replace the generator. Then go to Step 11.
NO : Repair it. Then go to Step 11.



STEP 11. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

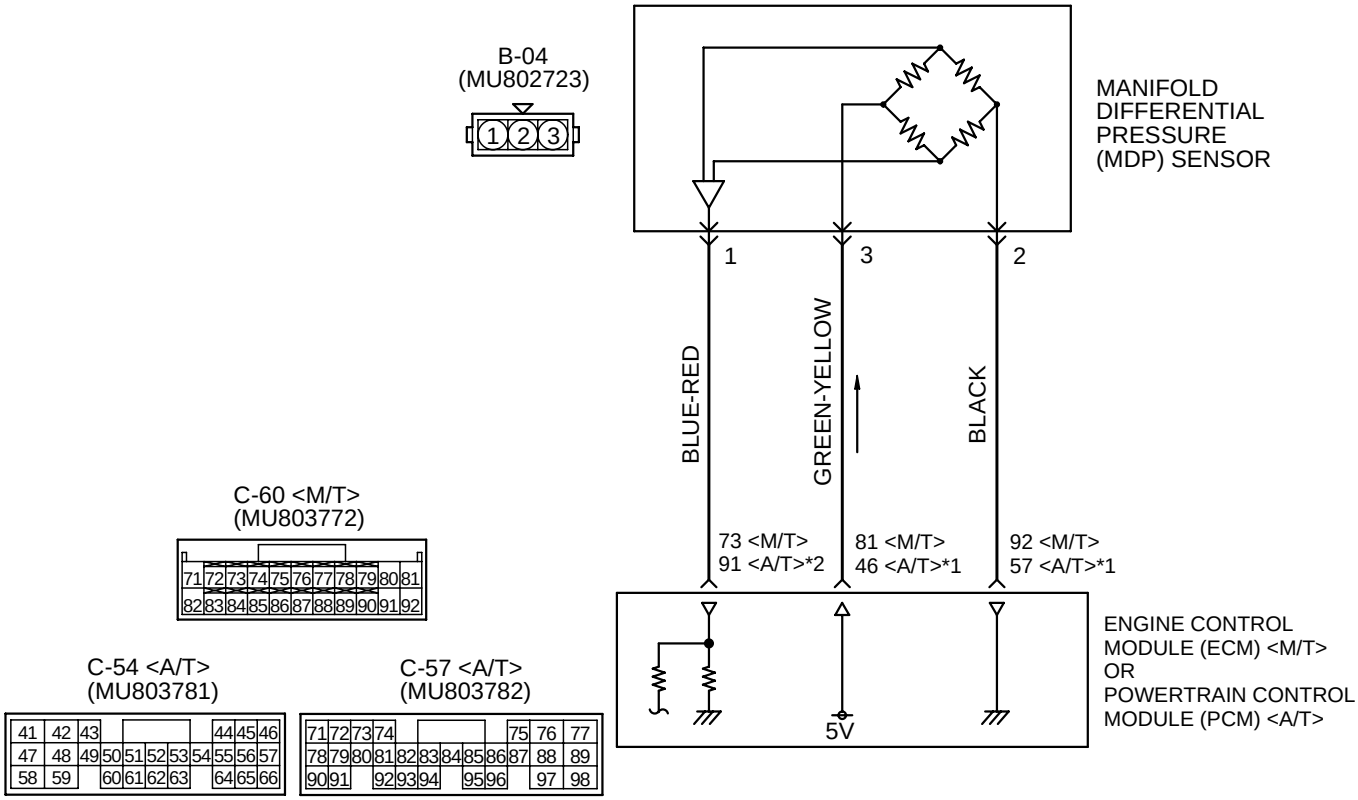


Q: Is the DTC P0622 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

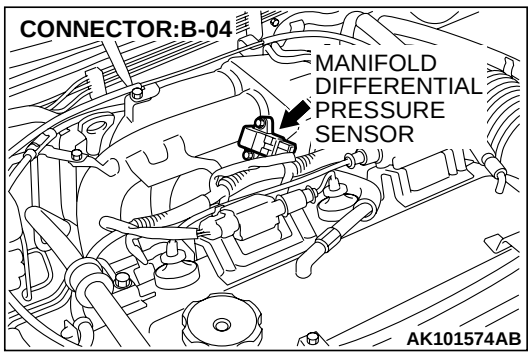
DTC P1400: Manifold Differential Pressure Sensor Circuit Malfunction

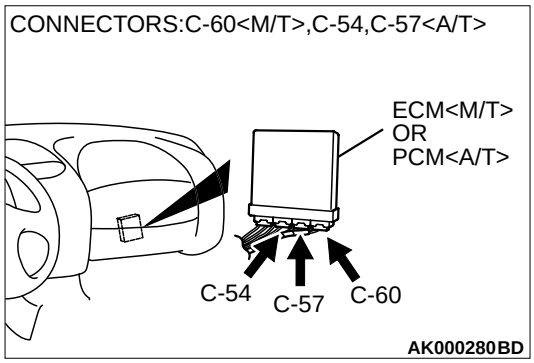
Manifold Differenntial Pressure Sensor Circuit



NOTE
*1:PCM connector C-54 <A/T>
*2:PCM connector C-57 <A/T>

AK000671





CIRCUIT OPERATION

- A 5-volt voltage is applied on the manifold differential pressure sensor power terminal (terminal 3) from the ECM (terminal 81) <M/T> or PCM (terminal 46) <A/T>. The ground terminal (terminal 2) is grounded with the ECM (terminal 92) <M/T> or PCM (terminal 57) <A/T>.
- A voltage proportional to the pressure in the intake manifold plenum is sent from the manifold differential pressure sensor output terminal (terminal 1) to the ECM (terminal 73) <M/T> or PCM (terminal 91) <A/T>.

TECHNICAL DESCRIPTION

- The manifold differential pressure sensor outputs a voltage which corresponds to the negative pressure in the intake manifold.
- The ECM <M/T> or PCM <A/T> checks whether the voltage output by manifold differential pressure sensor is within a specified range.

DTC SET CONDITIONS

Check Conditions

- 8 minutes or more have passed after starting the engine. Note that this is only if the engine coolant temperature is less than 0°C (32°F) when starting.
- Engine coolant temperature is higher than 45°C (113°F).
- Intake air temperature is higher than 0°C (32°F).
- Volumetric efficiency is between 30 and 45 percent.

Judgment Criteria

- Manifold differential pressure sensor output voltage has continued to be higher than 4.6 volts [corresponding to an absolute pressure of 118 kPa (17 psi) or higher] for 2 seconds.

or

- Manifold differential pressure sensor output voltage has continued to be lower than 0.1 volt [corresponding to an absolute pressure of 2.4 kPa (0.3 psi) or lower] for 2 seconds.

Check Conditions

- 8 minutes or more have passed after starting the engine. Note that this is only if the engine coolant temperature is 0°C (32°F) or more when starting.
- Engine coolant temperature is higher than 45°C (113°F).
- Intake air temperature is higher than 0°C (32°F).
- Volumetric efficiency is lower than 30 percent.

Judgment Criteria

- Manifold differential pressure sensor output voltage has continued to be higher than 4.2 volts [corresponding to an absolute pressure of 108 kPa (16 psi) or higher] for 2 seconds.

Check Conditions

- 8 minutes or more have passed after starting the engine. Note that this is only if the engine coolant temperature is 0°C (32°F) or more when starting.
- Engine coolant temperature is higher than 45°C (113°F).
- Intake air temperature is higher than 0°C (32°F).
- Volumetric efficiency is higher than 70 percent.

Judgment Criteria

- Manifold differential pressure sensor output voltage has continued to be lower than 1.8 volts [corresponding to an absolute pressure of 46 kPa (4.6 psi) or lower] for 2 seconds.

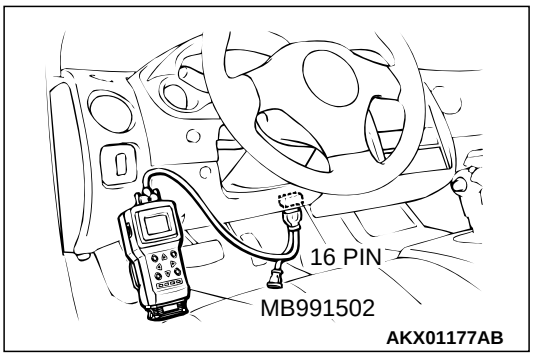
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Manifold differential pressure sensor failed.
- Open or shorted manifold differential pressure sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 95: Manifold Differential Pressure Sensor.

⚠ CAUTION

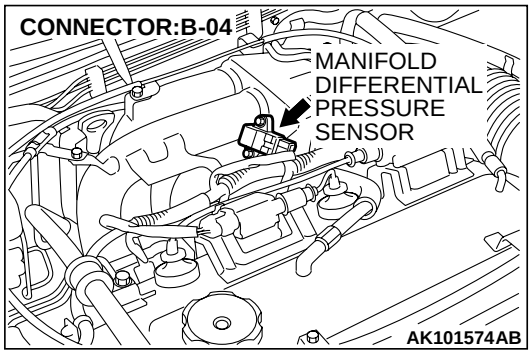
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 95, Manifold Differential Pressure Sensor.
- While engine is idling, pressure should be between 62 and 76 kPa.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

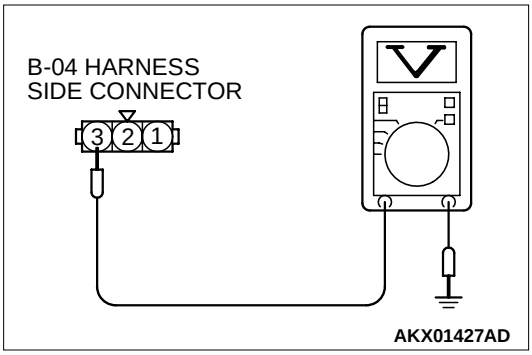
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Go to Step 2.



STEP 2. Check connector B-04 at manifold differential pressure sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



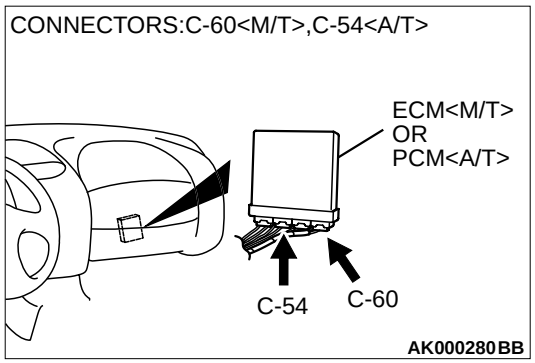
STEP 3. Check the sensor supply voltage at manifold differential pressure sensor harness side connector B-04.

(1) Disconnect the connector B-04 and measure at the harness side.
(2) Turn the ignition switch to "ON" position.
(3) Measure the voltage between terminal 3 and ground.
- Voltage should be between 4.8 and 5.2 volts.

(4) Turn the ignition switch to "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 6.
NO : Go to Step 4.

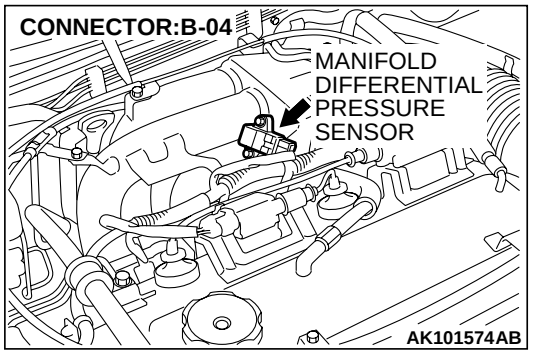


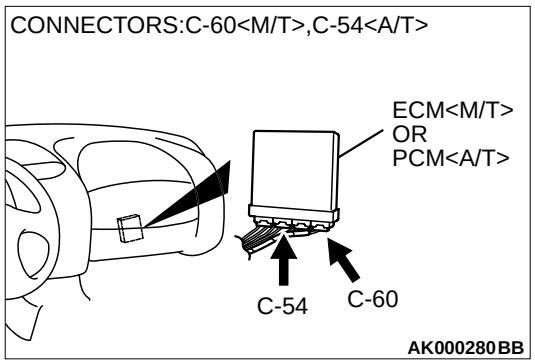
STEP 4. Check connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



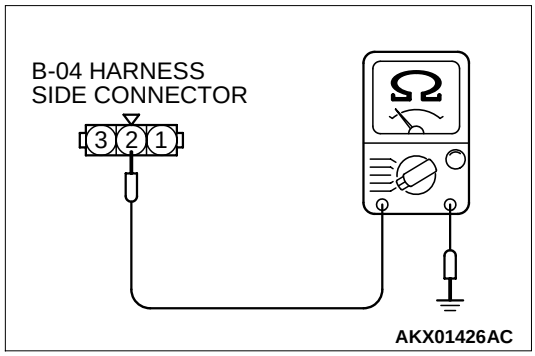


STEP 5. Check for open circuit and short circuit to ground between manifold differential pressure sensor connector B-04 (terminal 3) and ECM connector C-60 (terminal 81) <M/T> or PCM connector C-54 (terminal 46) <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 12.

NO : Repair it. Then go to Step 12.



STEP 6. Check the continuity at manifold differential pressure sensor harness side connector B-04.

(1) Disconnect the connector B-04 and measure at the harness side.

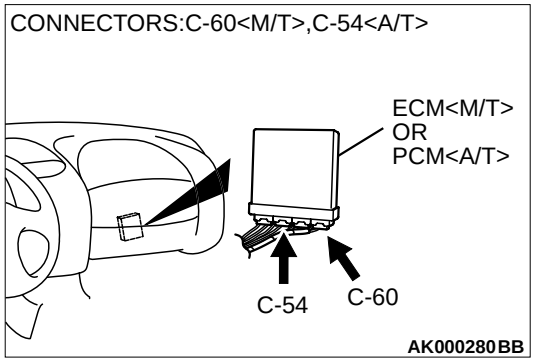
(2) Measure the continuity between terminal 2 and ground.

- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 9.

NO : Go to Step 7.



STEP 7. Check connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

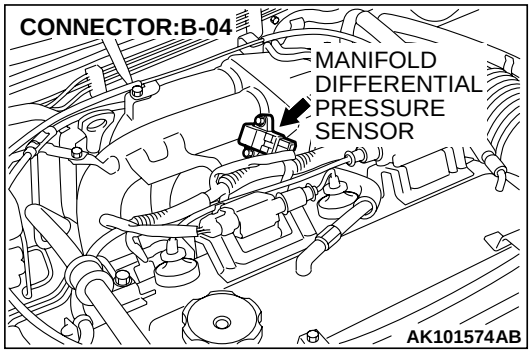
Q: Is the connector in good condition?

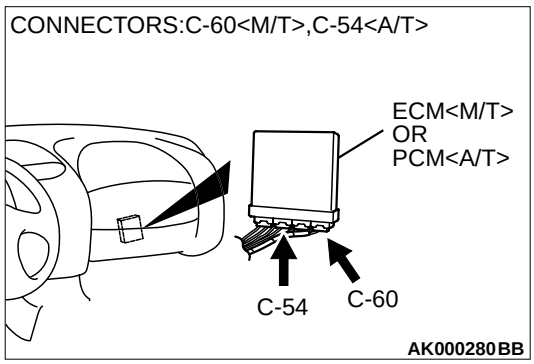
YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 8. Check for open circuit and harness damage between manifold differential pressure sensor connector B-04 (terminal 2) and ECM connector C-60 (terminal 92) <M/T> or PCM connector C-54 (terminal 57) <A/T>.
Q: Is the harness wire in good condition?

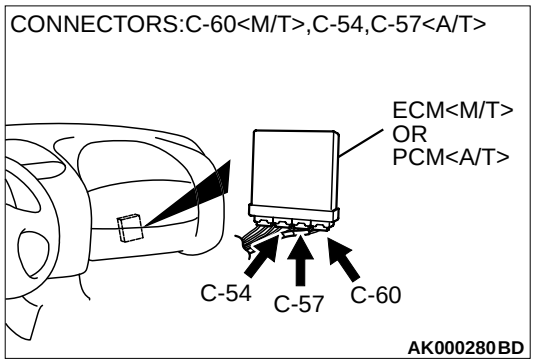
YES : Replace the ECM or PCM. Then go to Step 12.
NO : Repair it. Then go to Step 12.

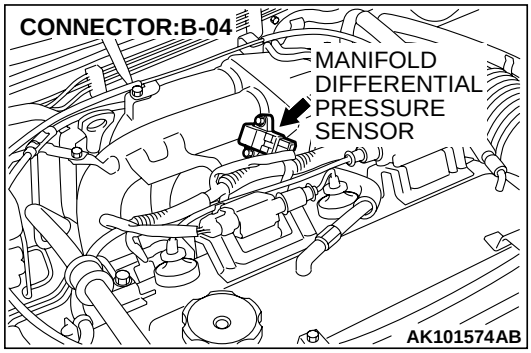


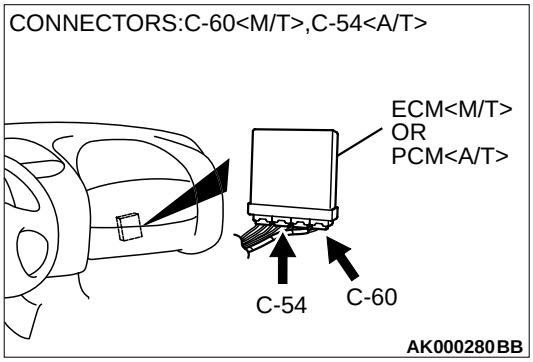


STEP 9. Check connector C-60 at ECM <M/T> or connector C-54, C-57 at PCM <A/T> for damage.
Q: Is the connector in good condition?

YES : Go to Step 10.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.







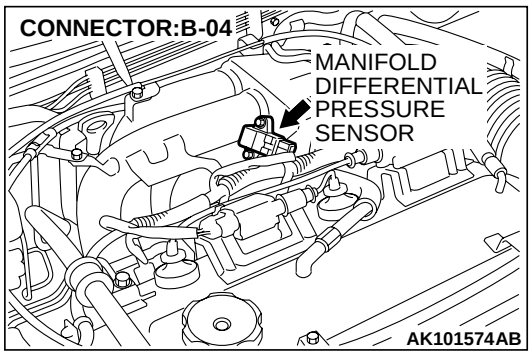
STEP 10. Check for harness damage between manifold differential pressure sensor connector B-04 (terminal 3) and ECM connector C-60 (terminal 81) <M/T> or PCM connector C-54 (terminal 46) <A/T>.

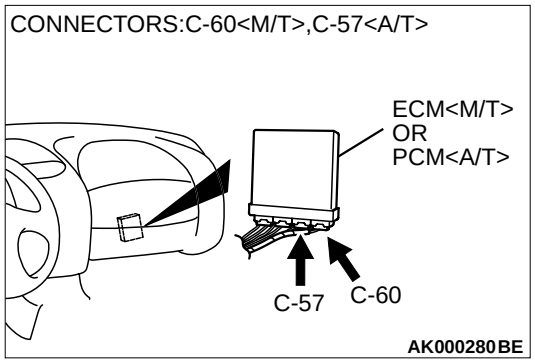
Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair it. Then go to Step 12.

STEP 11. Check for open circuit and short circuit to ground and harness damage between manifold differential pressure sensor connector B-04 (terminal 1) and ECM connector C-60 (terminal 73) <M/T> or PCM connector C-57 (terminal 91) <A/T>.





Q: Is the harness wire in good condition?

YES : Replace the manifold differential pressure sensor. Then go to Step 12.

NO : Repair it. Then go to Step 12.

STEP 12. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13A-5.

(2) Check the diagnostic trouble code (DTC).

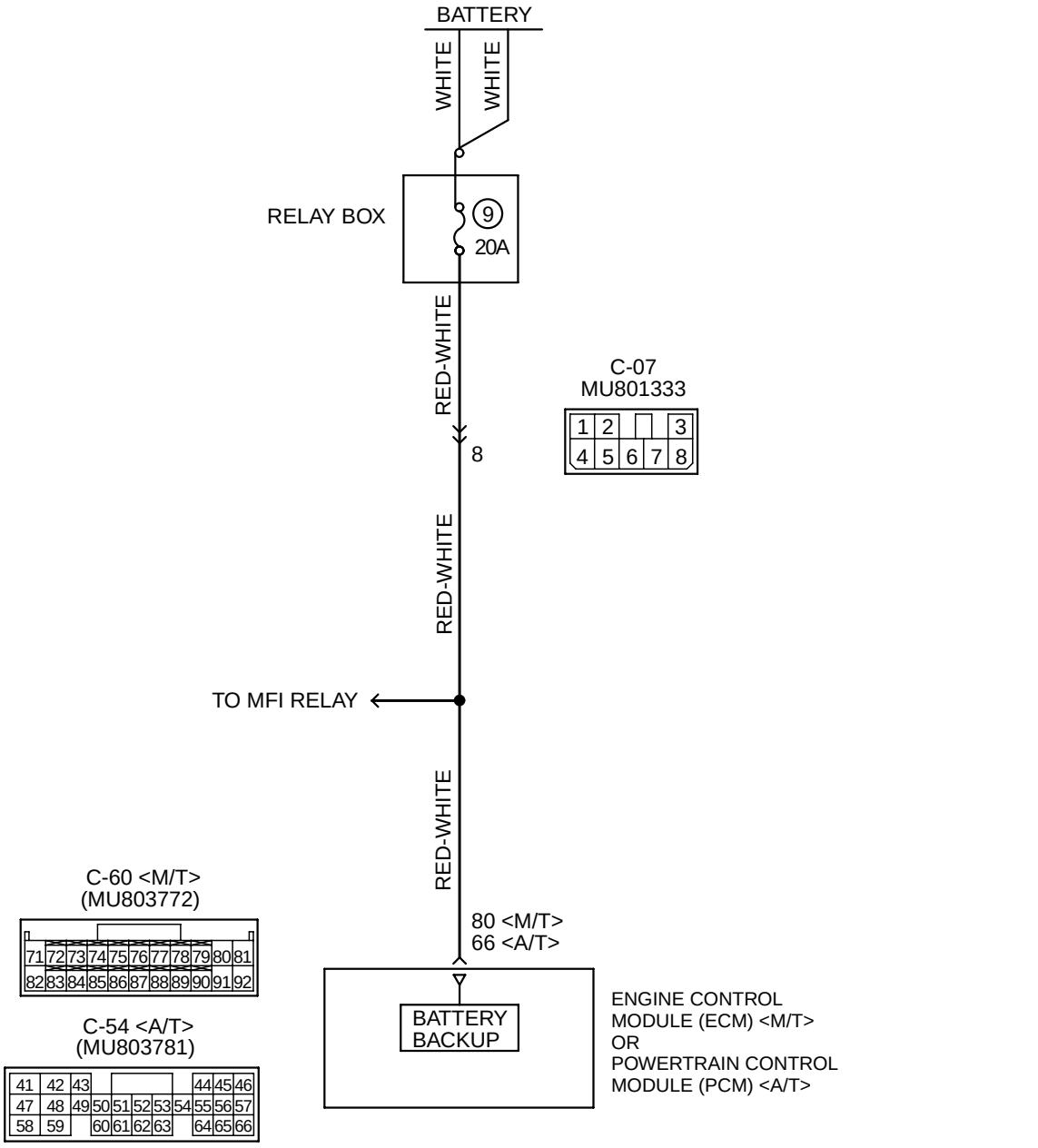
Q: Is the DTC P1400 is output?

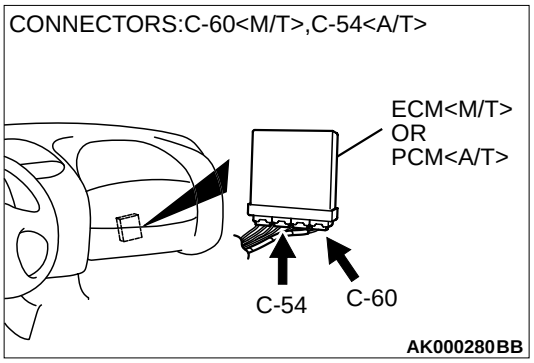
YES : Retry the troubleshooting.

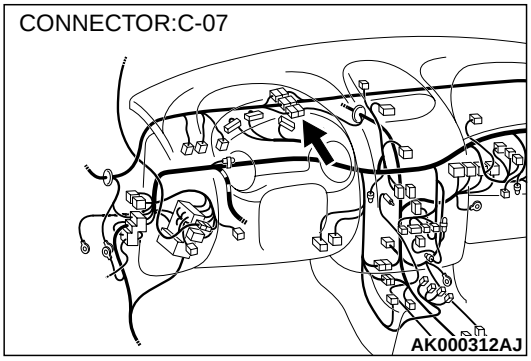
NO : The inspection is complete.

DTC P1603: Battery Backup Line Malfunction

Battery Backup Circuit







TECHNICAL DESCRIPTION

- The ECM <M/T> or PCM <A/T> is checks the open circuit of battery backup line.

NOTE: When the system detects an open circuit in the battery backup line, it makes 1 failure judgment of other diagnostic trouble codes (DTCs).

DTC SET CONDITIONS

Check Conditions

- Starting sequence was completed.
- Battery positive voltage is higher than 10 volts.

Judgement Criteria

- Battery backup line voltage has continued to be 6 volts or lower for 2 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

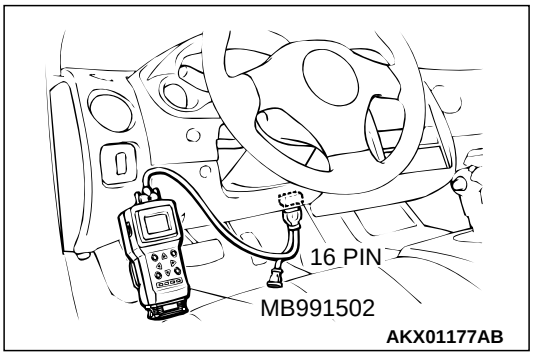
- Open or shorted battery backup line, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).



⚠ CAUTION

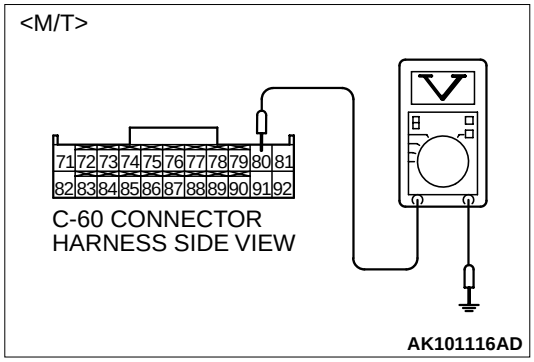
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

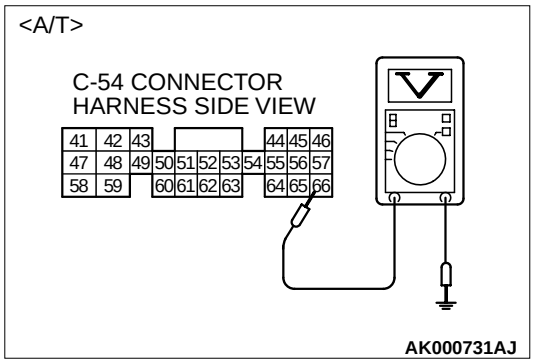
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTC.
(4) Start the engine and run it at idle.
(5) Read the DTC.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC P1603 is output?

YES : Go to Step 2.
NO : The inspection is complete.

TSB Revision





STEP 2. Check the backup power supply voltage at ECM connector C-60 <M/T> or PCM connector C-54 <A/T> by backprobing.

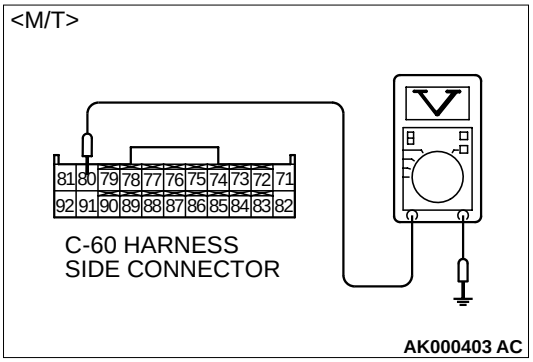
(1) Do not disconnect the ECM connector C-60 <M/T> or PCM connector C-54 <A/T>.

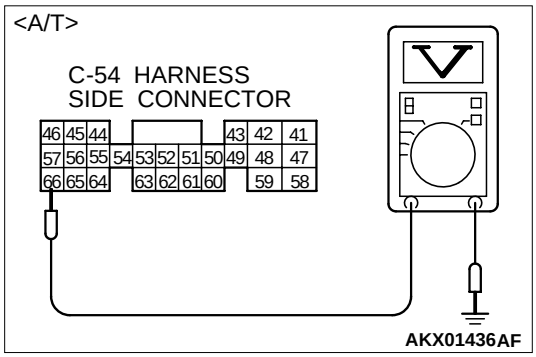
(2) Measure the voltage between terminal 80 <M/T> or 66 <A/T> and ground by backprobing.
- Voltage should be battery positive voltage.

Q: Is the voltage normal?

YES : Go to Step 5.

NO : Go to Step 3.





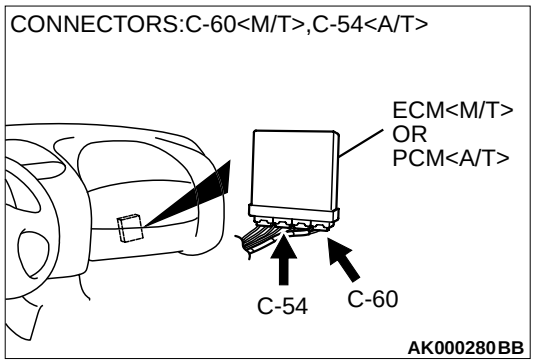
STEP 3. Check the backup power supply voltage at ECM harness side connector C-60 <M/T> or PCM harness side connector C-54 <A/T>.

(1) Disconnect the ECM connector C-60 <M/T> or PCM connector C-54 <A/T> and measure at the harness side.
(2) Measure the voltage between terminal 80 <M/T> or 66 <A/T> and ground.
- Voltage should be battery positive voltage.

Q: Is the voltage normal?

YES : Go to Step 4.

NO : Check connector C-07 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector are in good condition, repair harness wire between relay box (9) and ECM connector C-60 (terminal 80) <M/T> or PCM connector C-54 (terminal 66) <A/T> because of open circuit or short circuit to ground. Then go to Step 6.

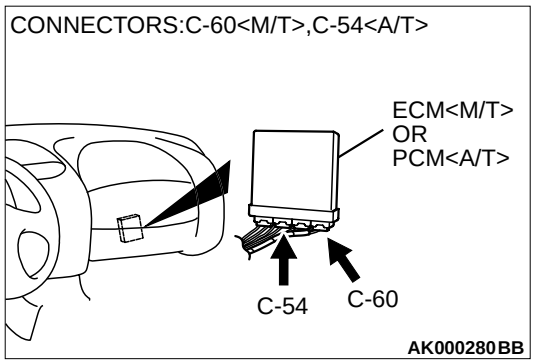


STEP 4. Check connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Check connector C-07 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector are in good condition, repair harness wire between relay box (9) and ECM connector C-60 terminal 80 <M/T> or PCM connector C-54 terminal 66 <A/T> because of harness damage. Then go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.

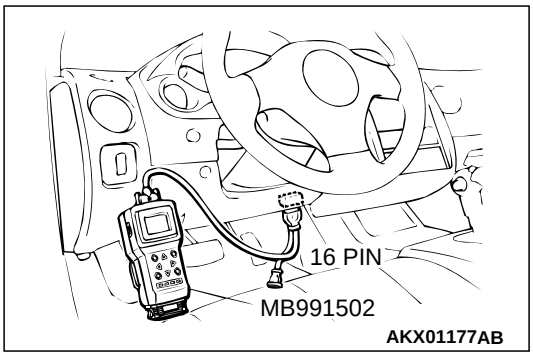


STEP 5. Check connector C-60 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Replace the ECM or PCM. Then go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.



STEP 6. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC P1603 is output?

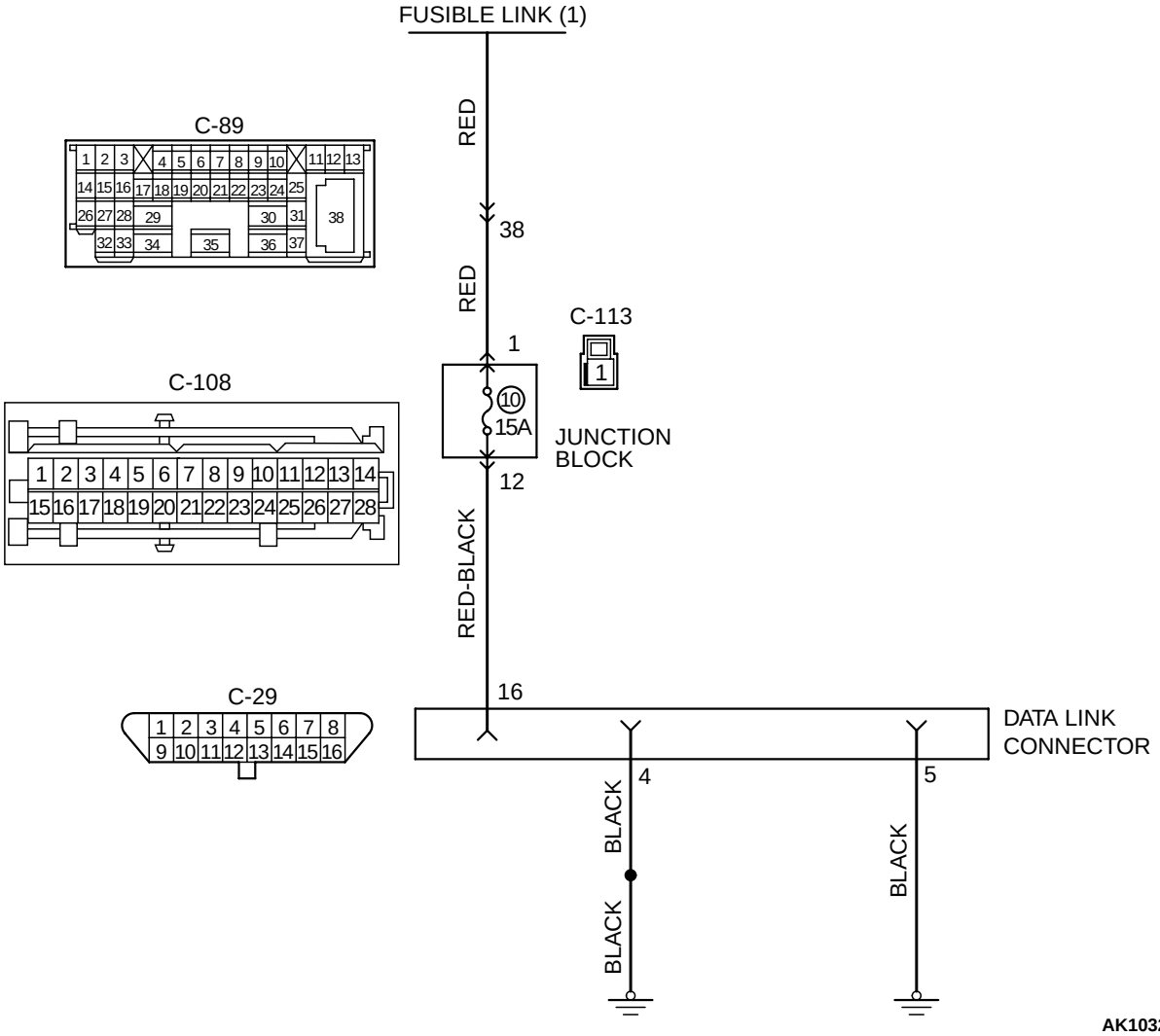
YES : Retry the troubleshooting.

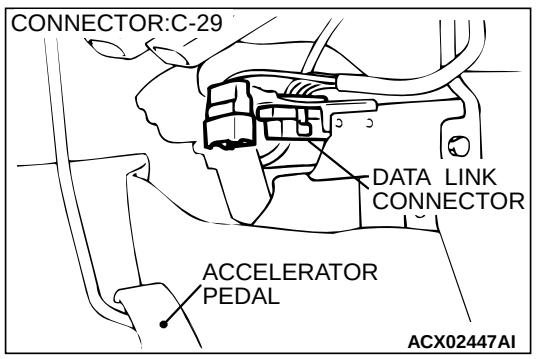
NO : The inspection is complete.

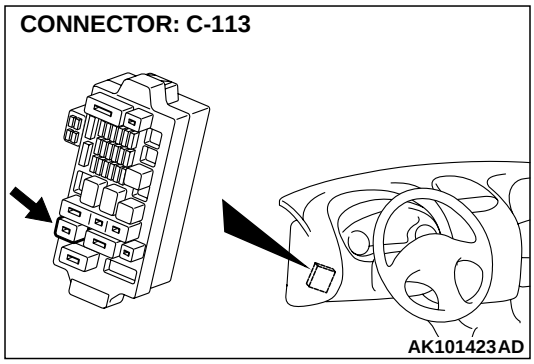
SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Communication with Scan Tool Is Not Possible. (Comunication with All Systems Is Not Possible.)

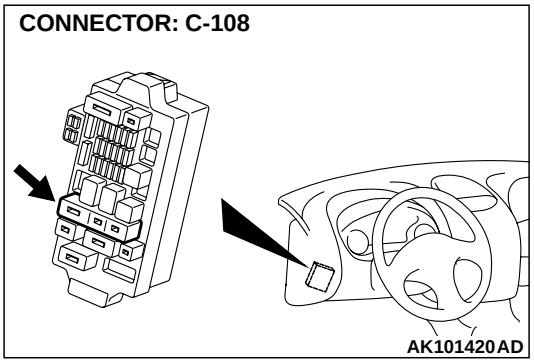
Data Link Connector Circuit

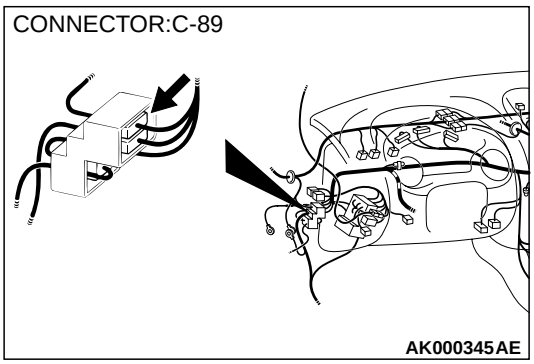






TSB Revision





CIRCUIT OPERATION

- A battery positive voltage is applied on the data link connector power terminal (terminal 16). The ground terminals (terminal 4, 5) are grounded to the vehicle body.

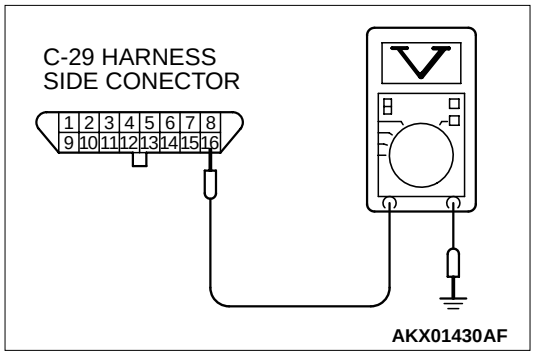
COMMENT

- The cause is probably a defect in power supply system (including ground) for the on-board diagnostic test mode line.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the data link connector.
- Damaged harness wire.

DIAGNOSIS



STEP 1. Check the power supply voltage at data link connector C-29.

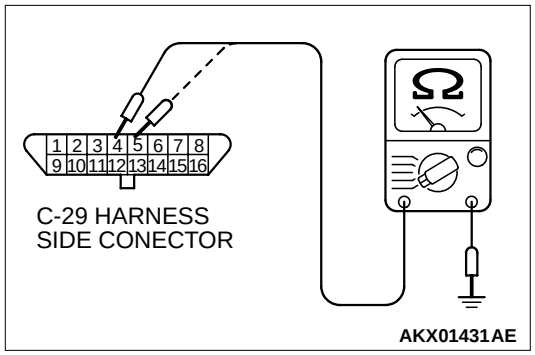
(1) Measure voltage between terminal 16 and ground.

- Voltage should be battery positive voltage.

Q: Is the voltage normal?

YES : Go to step 2.

NO : Check harness connectors C-108, C-113 and C-89 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connectors are in good condition, repair harness wire between fusible link (1) and data link connector C-29 terminal 16 because of open circuit. Then confirm that the malfunction symptom is eliminated.



STEP 2. Check the continuity at data link connector C-29.

(1) Check for the continuity between terminal 4, 5 and ground.

- Should be less than 2 ohm.

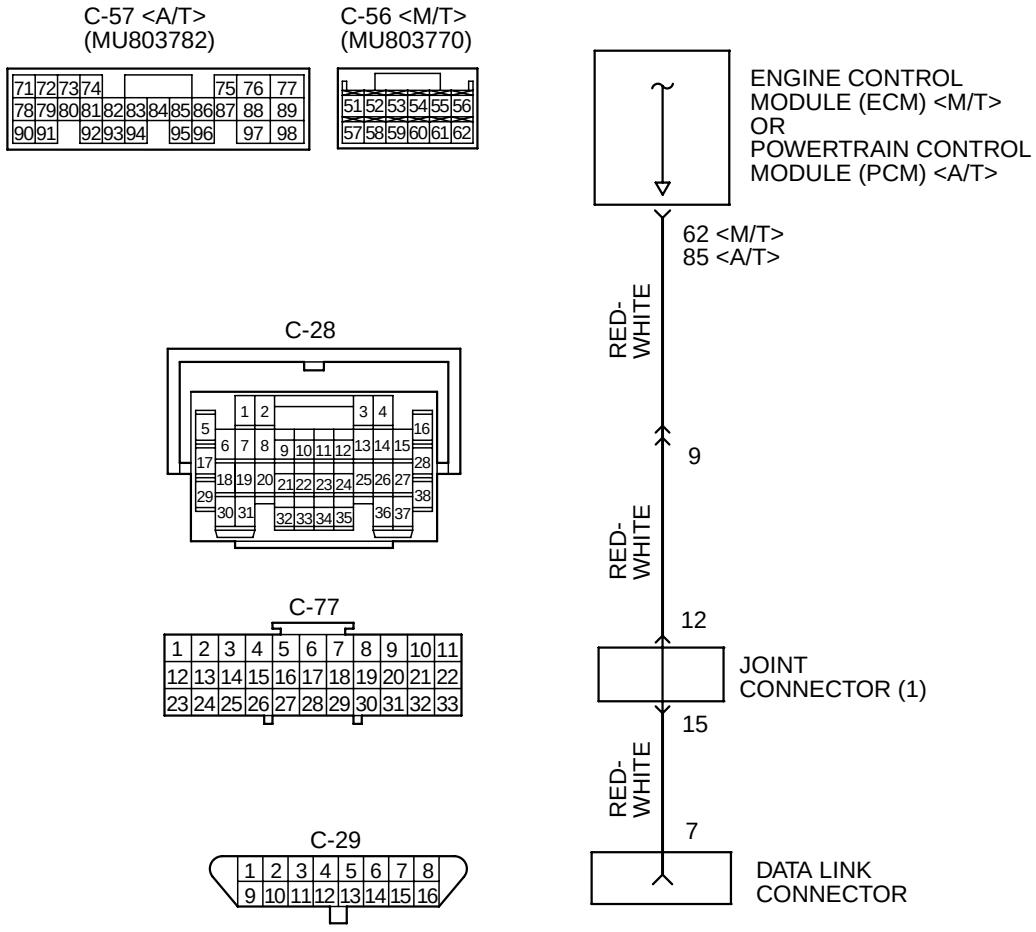
Q: Is the continuity normal?

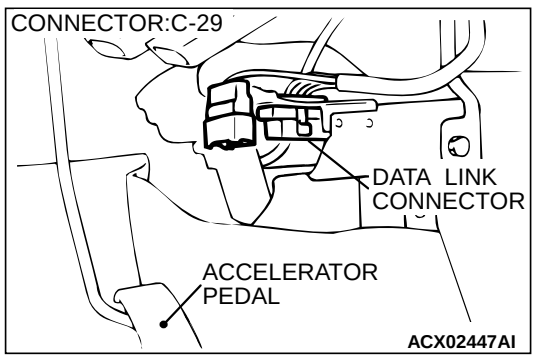
YES : Replace the scan tool. Then confirm that the malfunction symptom is eliminated.

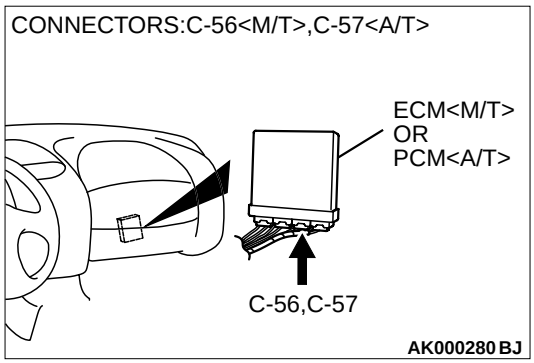
NO : Repair harness wire between data link connector C-29 terminal 4, 5 and ground because of open circuit or harness damage. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 2: Communication with Scan Tool Is Not Possible (Communication with ECM or PCM Only Is Not Possible)

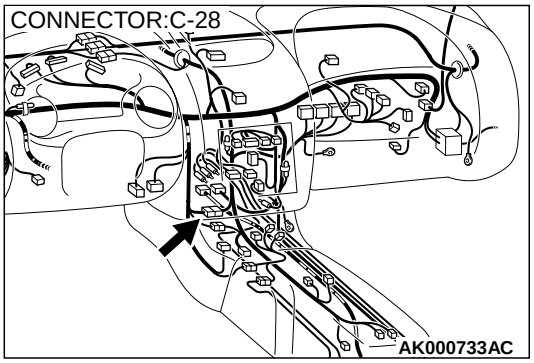
Data Link Connector Circuit

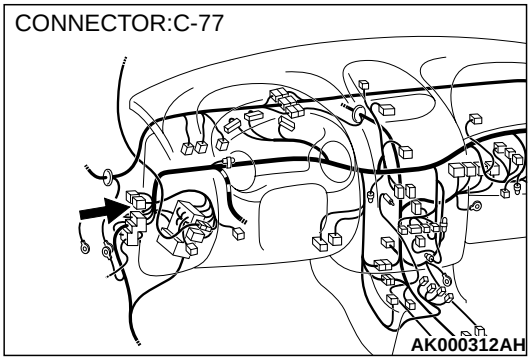






TSB Revision





CIRCUIT OPERATION

- A diagnostic output is made from the ECM (terminal 62) <M/T> or PCM (terminal 85) <A/T> to the diagnostic output terminal (terminal 7) of the data link connector.

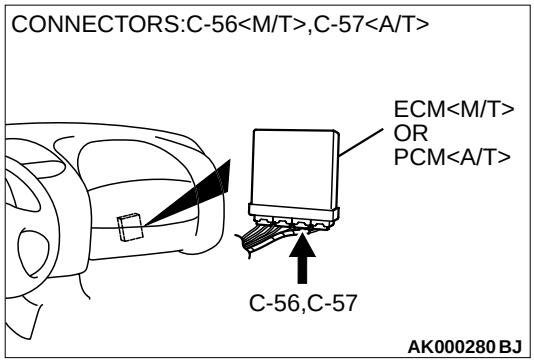
COMMENT

- No power supply to ECM <M/T> or PCM <A/T>.
- Defective ground circuit of ECM <M/T> or PCM <A/T>.
- Defective ECM <M/T> or PCM <A/T>.
- Improper communication line between ECM <M/T> or PCM <A/T> and scan tool.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of ECM <M/T> or PCM <A/T> power supply circuit.
- Malfunction of the ECM <M/T> or PCM <A/T>.
- Open circuit between ECM <M/T> or PCM <A/T> and data link connector.

DIAGNOSIS

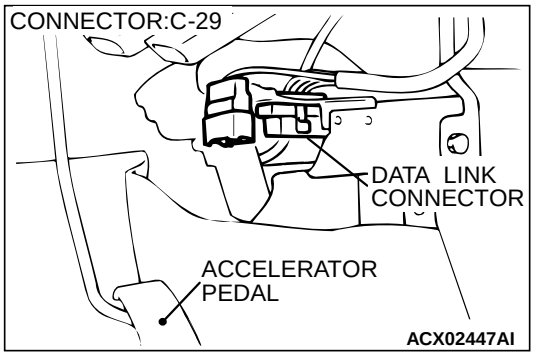


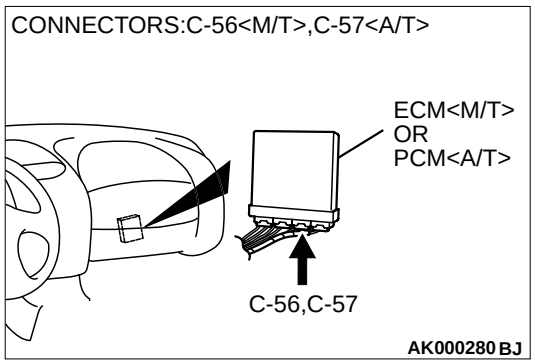
STEP 1. Check connector C-56 at ECM <M/T> or connector C-57 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.





STEP 2. Check for open circuit, short circuit to ground and harness damage between data link connector C-29 (terminal 7) and ECM connector C-56 (terminal 62) <M/T> or PCM connector C-57 (terminal 85) <A/T>.

NOTE: Check harness after checking intermediate connectors C-28 and C-77. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then check that the malfunction is eliminated.

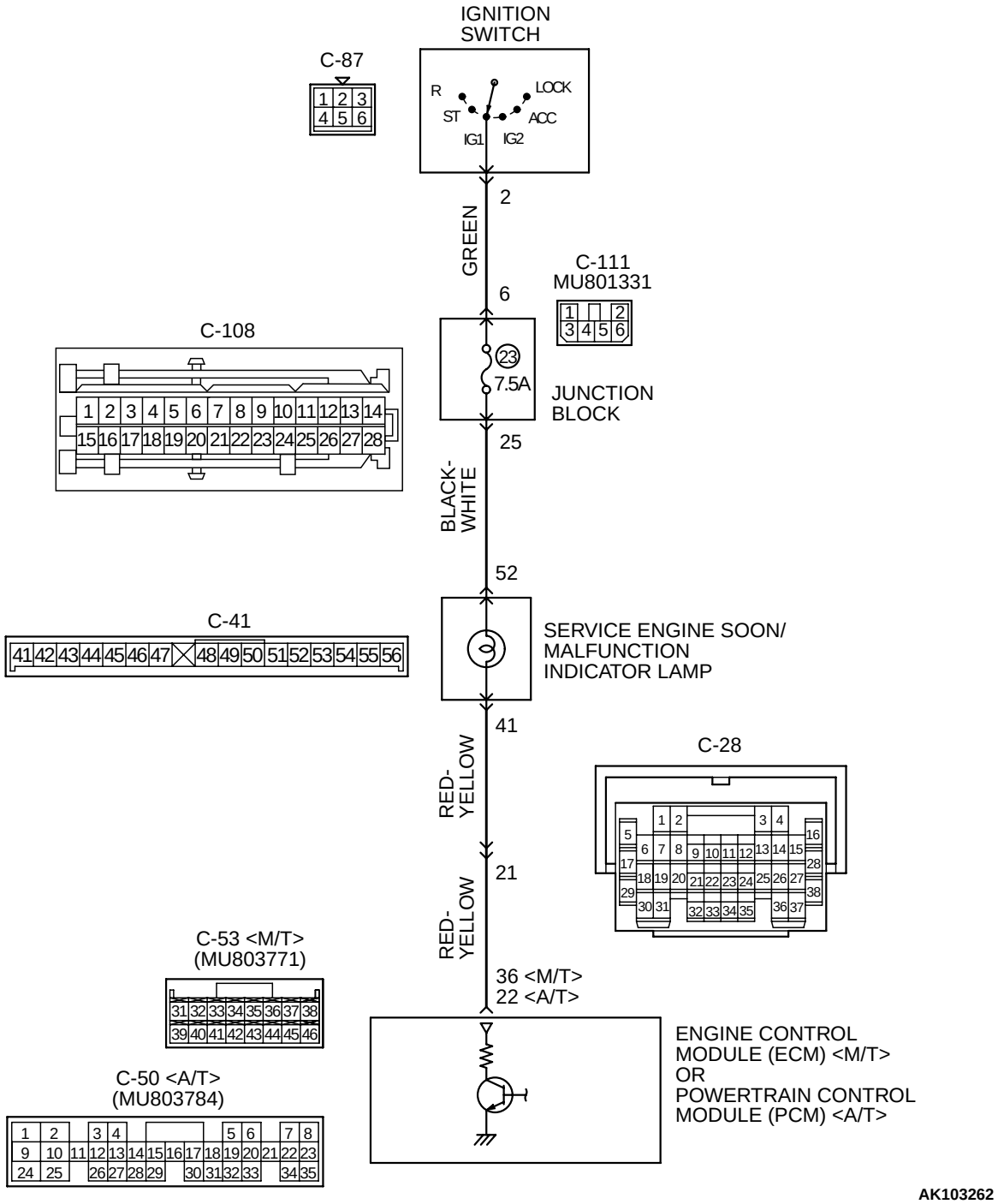
Q: Is the harness wire in good condition?

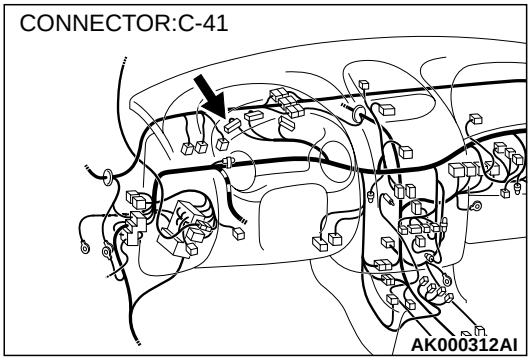
YES : Refer to, INSPECTION PROCEDURE 29 – Power Supply System and Ignition Switch – IG System P.13A-505.

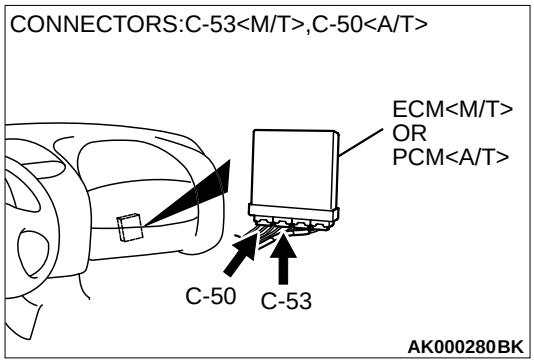
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

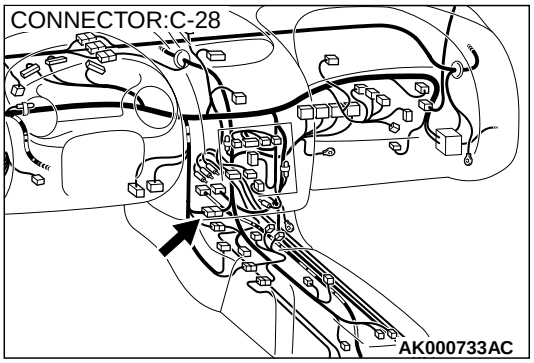
INSPECTION PROCEDURE 3: The Service Engine Soon/Malfunction Indicator Lamp Does Not Illuminate Right after the Ignition Switch Is Turned to the "ON" Position.

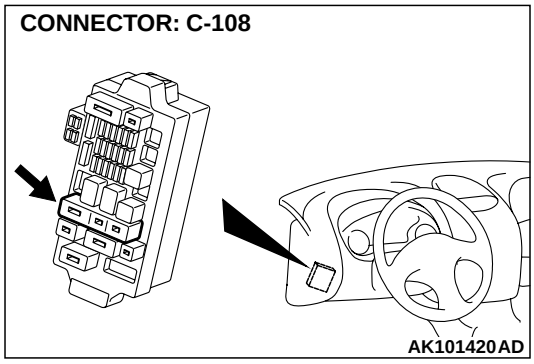
Service Engine Soon/Malfunction Indicator Lamp Circuit

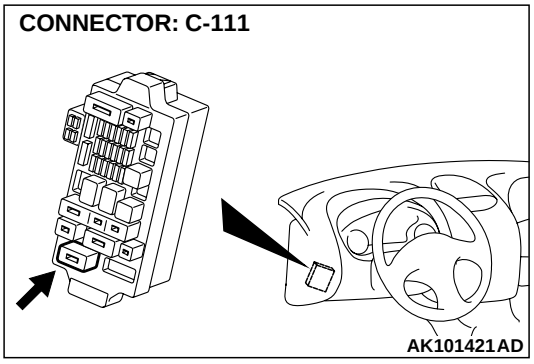


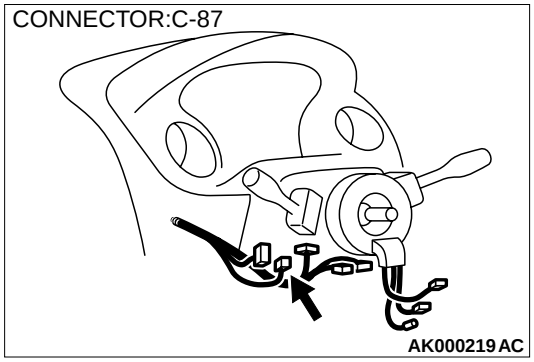












CIRCUIT OPERATION

- The service engine soon/malfunction indicator lamp power is supplied from the ignition switch.
- The ECM <M/T> or PCM <A/T> controls the ground of the service engine soon/malfunction indicator lamp by turning the power transistor in the ECM <M/T> or PCM <A/T> ON and OFF.

COMMENT

- The ECM <M/T> or PCM <A/T> causes the service engine soon/malfunction indicator lamp to illuminate for 5 seconds immediately after the ignition switch is turned to the "ON" position occurred.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

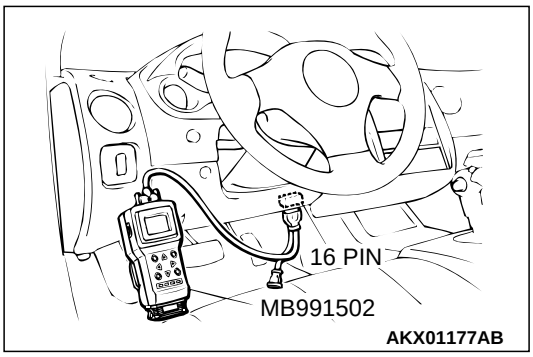
- Burnt-out bulb.
- Defective service engine soon/malfunction indicator lamp circuit.
- Malfunction of the ECM <M/T> or PCM <A/T>.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

TSB Revision



STEP 1. Using scan tool MB991502, check data list item 16: Power Supply Voltage.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before. connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 16, Power Supply Voltage.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 2.
NO : Refer to INSPECTION PROCEDURE 29 – Power Supply System and Ignition Switch – IG System P.13A-505.

STEP 2. Check the burned-out bulb.

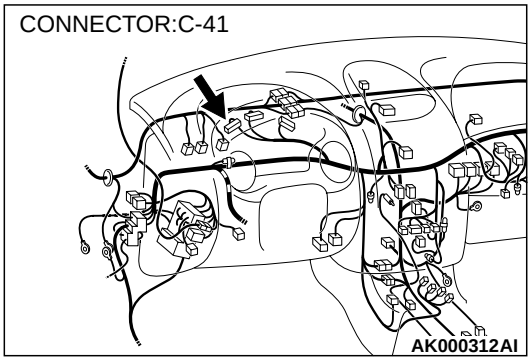
Q: Is the valve normal?

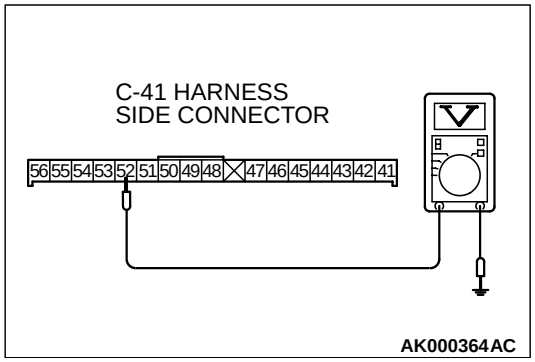
YES : Go to step 3.
NO : Replace the bulb. Then confirm that the malfunction symptom is eliminated.

STEP 3. Check connector C-41 at the combination meter for damage.

Q: Is the connector in good condition?

YES : Go to step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.





STEP 4. Check the power supply voltage at combination meter harness side connector C-41.

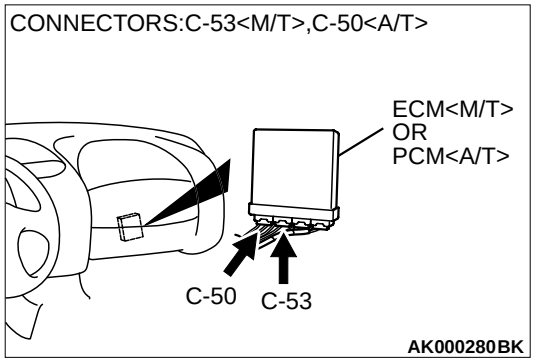
(1) Disconnect the connector C-41 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 52 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 5.

NO : Check harness connectors C-108 and C-111 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connectors are in good condition, repair harness wire between ignition switch connector C-87 terminal 2 and combination meter connector C-41 terminal 52 because of open circuit. Then confirm that the malfunction symptom is eliminated.

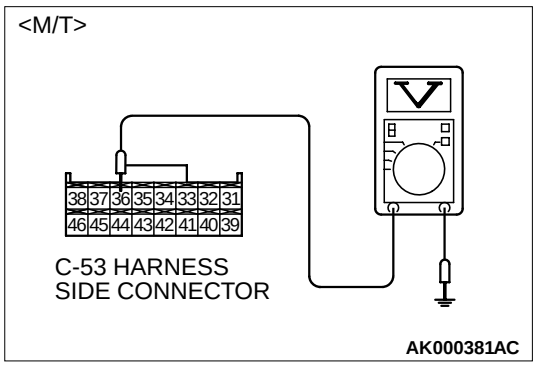


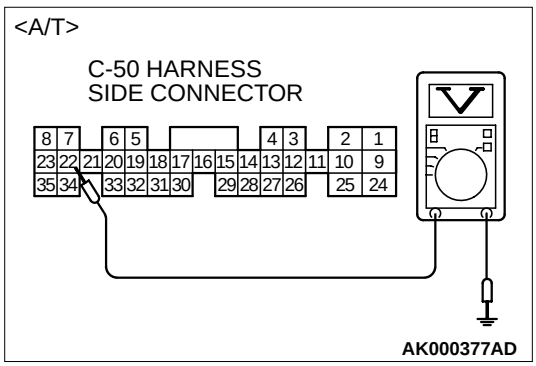
STEP 5. Check connector C-53 at ECM <M/T> or connector C-50 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.





STEP 6. Check the power supply voltage ECM connector C-53 <M/T> or PCM connector C-50 <A/T>.

(1) Disconnect the connector C-53 <M/T> or C-50 <A/T> and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 36 <M/T> or 22 <A/T> and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

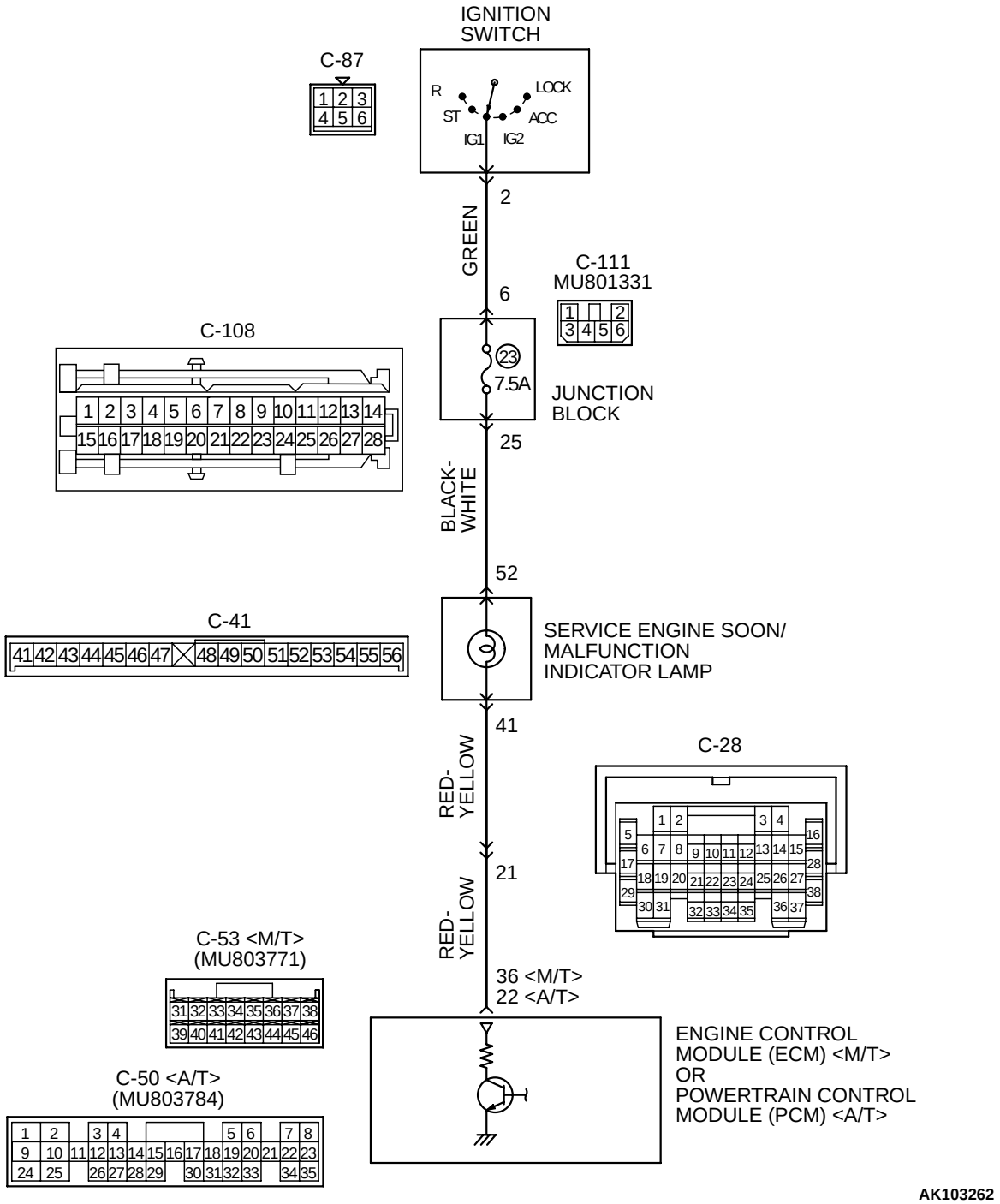
Q: Is the voltage normal?

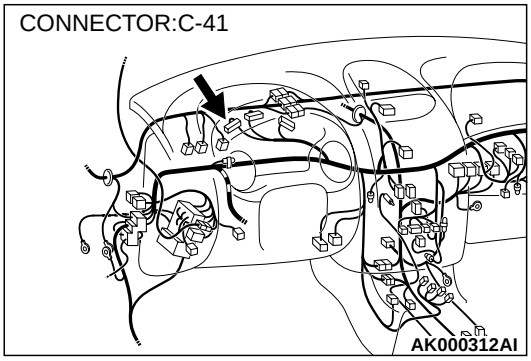
YES : Replace the ECM or PCM. Then confirm that the malfunction symptom is eliminated.

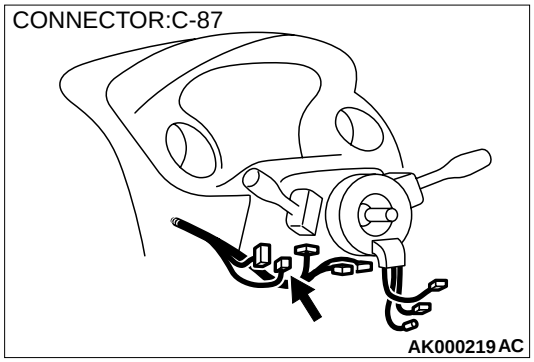
NO : Check harness connectors C-28 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connectors is in good condition, repair harness wire between combination meter connector C-41 terminal 41 and ECM connector C-53 terminal 36 <M/T> or PCM connector C-50 terminal 22 <A/T> because of open circuit. Then confirm that the malfunction symptom is eliminated.

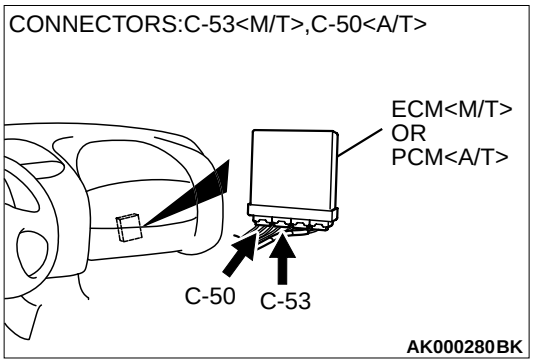
INSPECTION PROCEDURE 4: The Service Engine Soon/Malfunction Indicator Lamp Remains Illuminated and Never Goes Out.

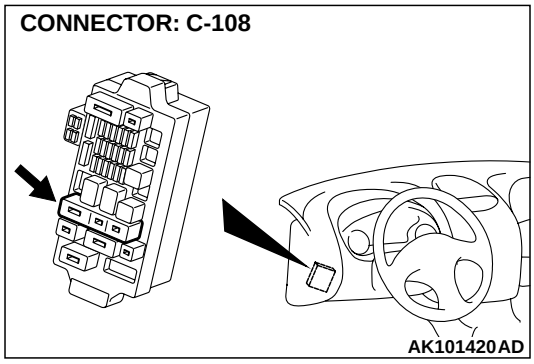
Service Engine Soon/Malfunction Indicator Lamp Circuit

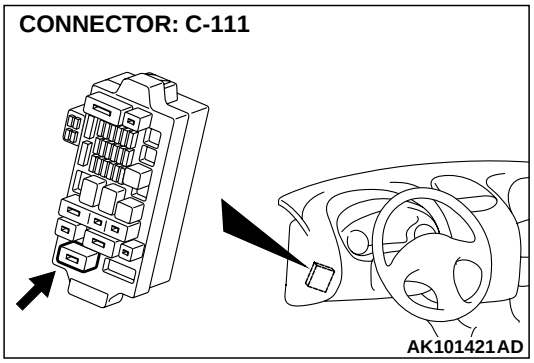


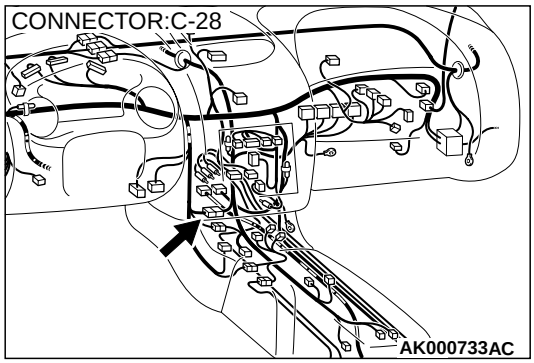












CIRCUIT OPERATION

- The service engine soon/malfunction indicator lamp power is supplied from the ignition switch.
- The ECM <M/T> or PCM <A/T> controls the ground of the service engine soon/malfunction indicator lamp by turning the power transistor in the ECM <M/T> or PCM <A/T> ON and OFF.

COMMENT

- In cases such as the above, the cause is probably that the ECM <M/T> or PCM <A/T> is detecting a problem in a sensor or actuator, or that one of the malfunctions listed at right has probably occurred.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

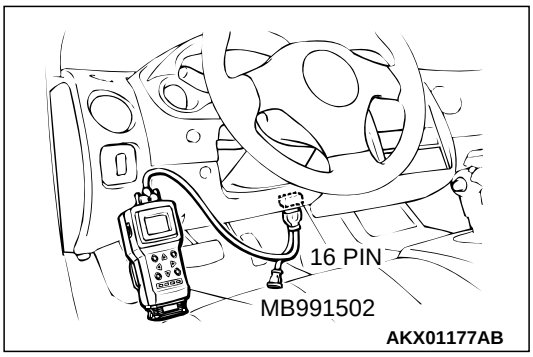
- Short-circuit between the service engine soon/malfunction indicator lamp and ECM <M/T> or PCM <A/T>.
- Malfunction of the ECM <M/T> or PCM <A/T>.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

TSB Revision



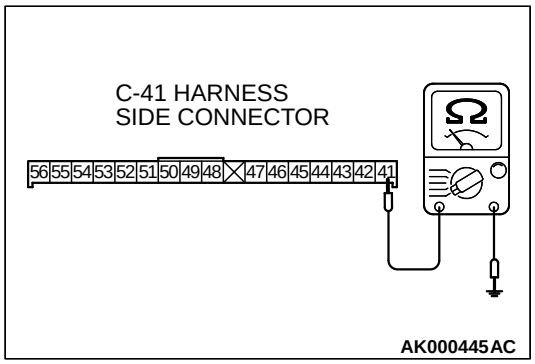
STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?

YES : Refer to Diagnostic Trouble Code Chart P.13A-22.
NO : Go to Step. 2.



STEP 2. Check the continuity at combination meter harness side connector C-41.

(1) Disconnect the connector C-41 and measure at the harness side.
(2) Check for the continuity between terminal 41 and ground.
- Should be open loop.

Q: Is the continuity normal?

YES : Replace the ECM or PCM. Then confirm that the malfunction symptom is eliminated.
NO : Check harness connectors C-28 at the intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connectors is in good condition, repair harness wire between combination meter connector C-41 terminal 41 and ECM connector C-53 terminal 36 <M/T> or PCM connector C-50 terminal 22 <A/T> because of short circuit to ground. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 5: Cranks, Won't Start

Cranks, Won't Start Circuit
- Refer to, Ignition circuit system P.13A-535.

CIRCUIT OPERATION
- Refer to, Ignition circuit system P.13A-535.

COMMENT
- In cases such as the above, the cause is probably no spark, fuel delivery, or fuel quality problems. In addition, foreign materials (water, kerosene, etc.) may be mixed with the fuel.

TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Malfunction of the ignition system.
- Malfunction of the fuel pump system.
- Malfunction of the injector system.
- Malfunction of the ECM <M/T> or PCM <A/T>.
- Contaminated fuel.

TSB Revision

DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)

STEP 1. Check the Battery positive voltage.

(1) Measure the Battery positive voltage during cranking.
- The voltage should be 8 volts or more.

Q: Is the voltage normal?

YES : Go to Step 2.
NO : Check the battery. Refer to GROUP 54A, Battery – Battery check P.54A-5. Then confirm that the malfunction symptom is eliminated.

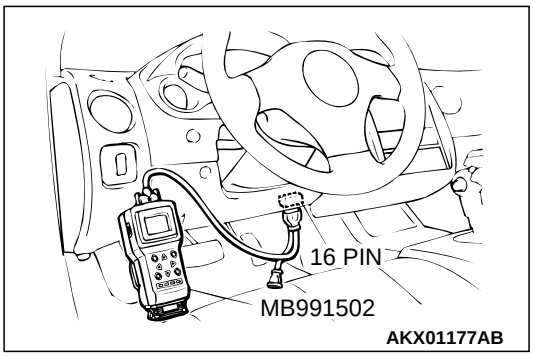
STEP 2. Check the timing belt for breaks.

Q: Is the timing belt good condition?

YES : Go to Step 3.
NO : Replace timing belt. Then confirm that the malfunction symptom is eliminated.

STEP 3 Using scan tool MB991502, check data list.

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

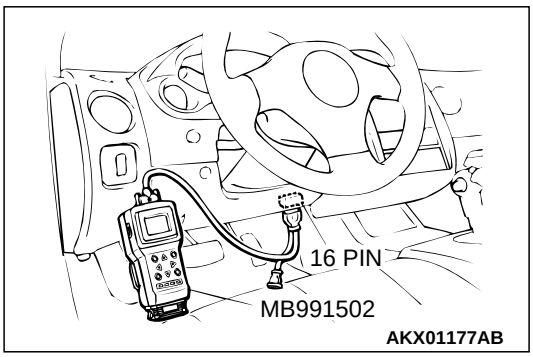


(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the following items in the data List. Refer to Data List Reference Table P.13A-544.
   a. Item 16: Power Supply Voltage.
   b. Item 22: Crankshaft Position Sensor.
   c. Item 21: Engine Coolant Temperature Sensor.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 4.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

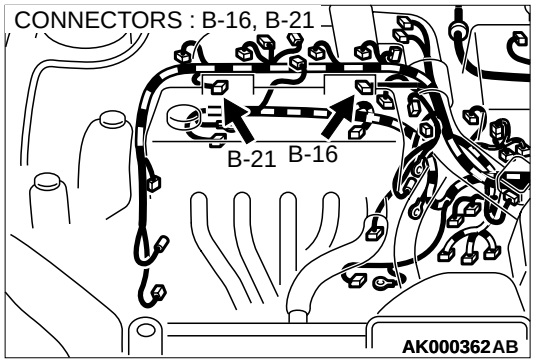
STEP 4. Using scan tool MB991502, check actuator test.



(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the actuator test. Refer to Actuator Test Reference Table P.13A-553.
   a. Item 07: Fuel pump.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Go to Step 5.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.



STEP 5. Check the ignition system.

(1) Connect the timing light to terminal 1 of the ignition coil connector B-16 or B-20, in order.
(2) Crank the engine.
- The timing light flashes.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Does the timing light flash?

YES : Go to Step 6.
NO : Refer to INSPECTION PROCEDURE 33 – Ignition Circuit System P.13A-535.

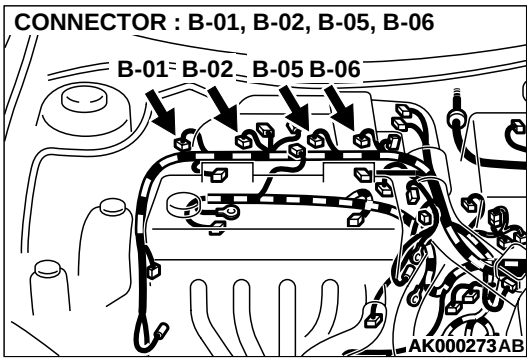
STEP 6. Check the ignition timing.

(1) Check the ignition timing at cranking.

Standard value: 5° BTDC ± 3°

Q: Is the ignition timing normal?

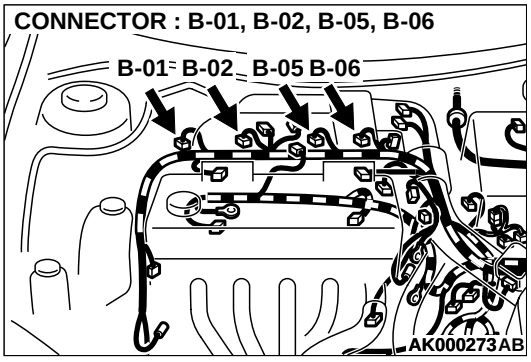
YES : Go to Step 7.
NO : Check that the crankshaft position sensor and timing belt cover are in the correct position. Then confirm that the malfunction symptom is eliminated.



STEP 7. Check harness connector B-01 or B-02 or B-05 or B-06 at injector for damage.

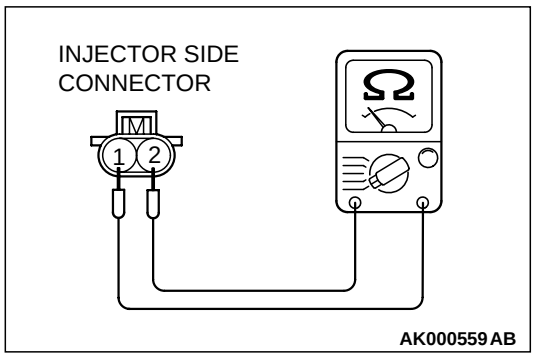
Q: Is the harness connector in good condition?

YES : Go to Step 8.
NO : : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.



STEP 8. Check the injector.

(1) Disconnect the injector connector B-01, B-02, B-05, B-06.



(2) Measure the resistance between each injector side connector terminal 1 and 2.

Standard value: 13 – 16 ohm [at 20°C (68°F)]

Q: Is the resistance standard value?

YES : Go to Step 9.

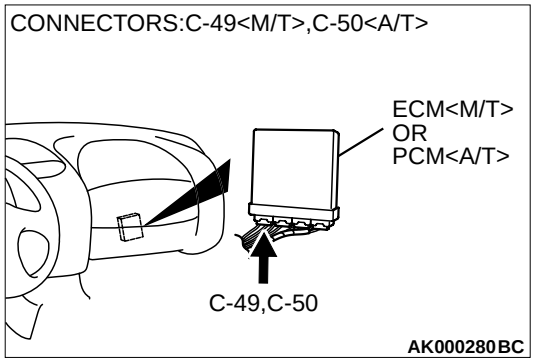
NO : Repair the injector. Then confirm that the malfunction symptom is eliminated.

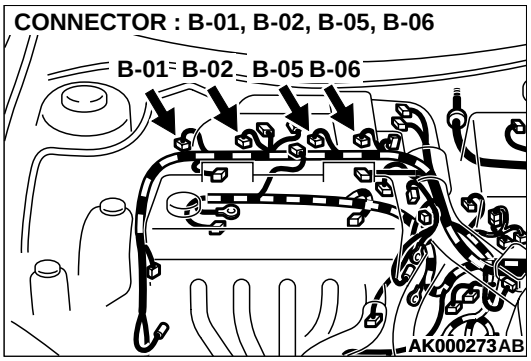
STEP 9. Check connector C-49 at ECM <M/T> or connector C-50 at PCM <A/T> for damage.

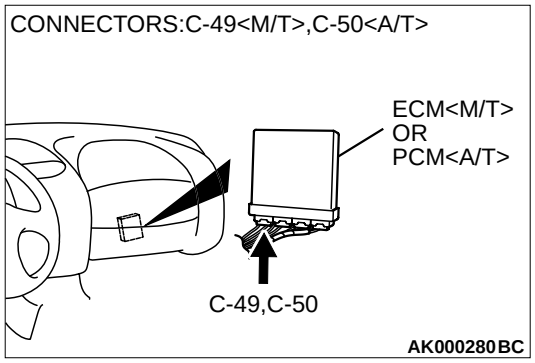
Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.







STEP 10. Check for harness damage between injector connector and ECM <M/T> or PCM <A/T> connector.

a. Check the harness wire between injector connector B-01 terminal 2 and ECM connector C-49 terminal 1 <M/T> or PCM connector C-50 terminal 1 <A/T> when checking No. 1 cylinder.
b. Check the harness wire between injector connector B-02 terminal 2 and ECM connector C-49 terminal 14 <M/T> or PCM connector C-50 terminal 9 <A/T> when checking No. 2 cylinder.
c. Check the harness wire between injector connector B-05 terminal 2 and ECM connector C-49 terminal 2 <M/T> or PCM connector C-50 terminal 24 <A/T> when checking No. 3 cylinder.
d. Check the harness wire between injector connector B-06 terminal 2 and ECM connector C-49 terminal 15 <M/T> or PCM connector C-50 terminal 2 <A/T> when checking No. 4 cylinder.

Q: Is the harness wire in good condition?

YES : Check the following items, and repair or replace the defective items.
a. Check the ignition coil, spark plugs, spark plug cables.
b. Check if the injectors are clogged.
c. Check if fuel is contaminated.
d. Check compression.

Then confirm that the malfunction symptom is eliminated.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 6: Fires Up and Dies.

COMMENT

- In such cases as the above, the cause is usually improper air/fuel mixture. It is possible, though less likely, that the spark plugs are generating sparks but the sparks are weak.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the ignition system.
- Malfunction of the injector system.
- Contaminated fuel.
- Poor compression.
- Malfunction of the ECM <M/T> or PCM <A/T>.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Check the battery positive voltage.

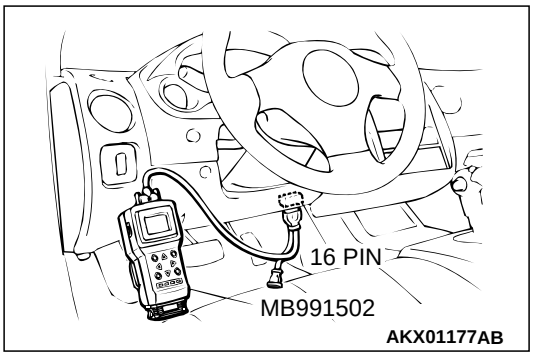
(1) Measure the battery positive voltage during cranking.
- The voltage should be 8 volts or more.

Q: Is the voltage normal?

YES : Go to Step 2.
NO : Refer to GROUP 8A, Battery – Battery check P.54A-5.

STEP 2. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

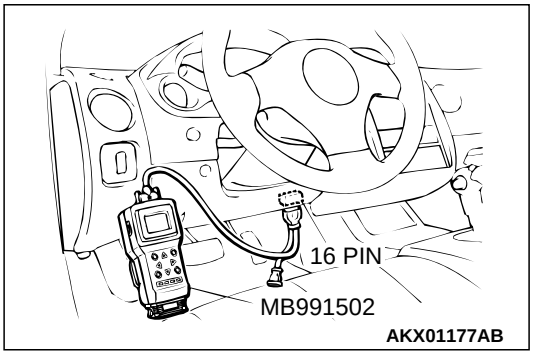


(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart P.13A-22.
NO : Go to Step 3.

STEP 3. Using scan tool MB991502, check actuator test.

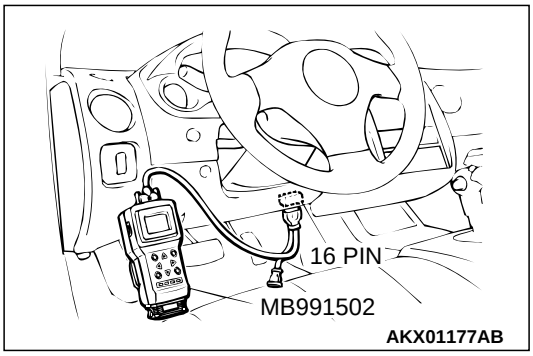


(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the actuator test. Refer to, Actuator Test Reference Table P.13A-553.
   a. Item 07: Fuel Pump.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Go to Step 4.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 4. Using scan tool MB991502, check data list.



(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the data list. Refer to, Data List Reference Table P.13A-544.
   a. Item 21: Engine Coolant Temperature Sensor.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 5.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

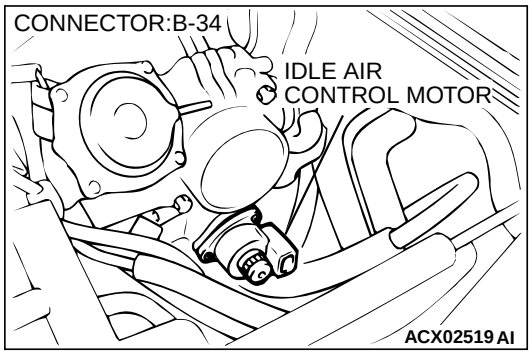
STEP 5. Check the engine start-ability.

(1) Depress the accelerator pedal slightly, and start the engine.

Q: Is the start ability good?

YES : Go to Step 6.
NO : Go to Step 7.

STEP 6. Check the idle air control (IAC) motor operation sound.



(1) Check that the engine coolant temperature is 20°C (68°F) or below.

NOTE: If necessary, you can disconnect the engine coolant temperature sensor connector and connect the harness side of the connector to another engine coolant temperature sensor that is at 20°C (68°F) or below.

(2) Check that the operation sound of the IAC motor can be heard after the ignition is switched to the "ON" position (but without starting the engine).
- An operation sound is heard.

Q: Did you hear the operation sound?

YES : Refer to, Clean the throttle valve area P.13A-575.
NO : Refer to DTC P0506 Idle Control System RPM Lower Than Expected P.13A-390, DTC P0507 Idle Control System RPM Higher Than Expected P.13A-399.

STEP 7. Check the ignition timing.

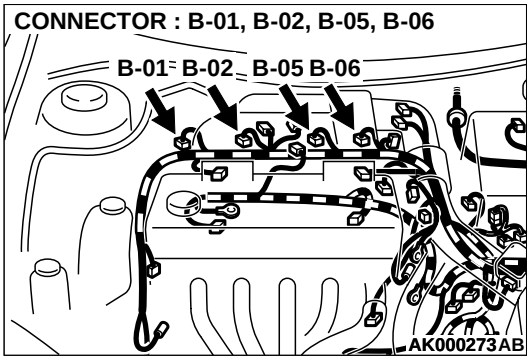
(1) Check the ignition timing at cranking.

Standard value: 5° BTDC ± 3°

Q: Is the ignition timing normal?

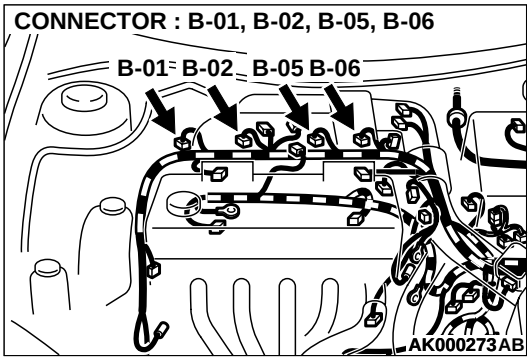
YES : Go to Step 8.
NO : Check that the crankshaft position sensor and timing belt cover are in the correct position. Then confirm that the malfunction symptom is eliminated.

STEP 8. Check harness connector B-01 or B-02 or B-05 or B-06 at injector for damage.



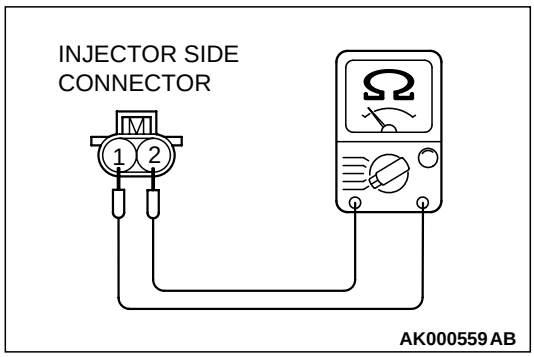
Q: Is the harness connector in good condition?

YES : Go to Step 9.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.



STEP 9. Check the injector.

(1) Disconnect the injector connector B-01, B-02, B-05, B-06.



(2) Measure the resistance between each injector side connector terminal 1 and 2.

Standard value: 13 – 16 ohm [at 20°C (68°F)]

Q: Is the resistance standard value?

YES : Go to Step 10.

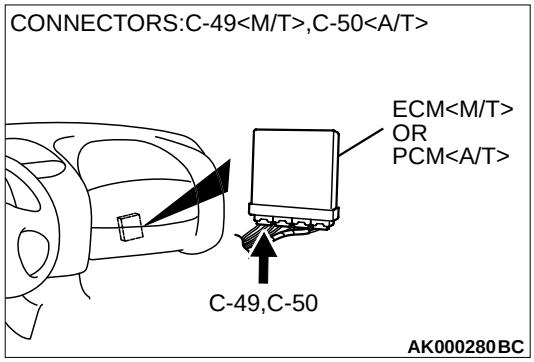
NO : Repair the injector. Then confirm that the malfunction symptom is eliminated.

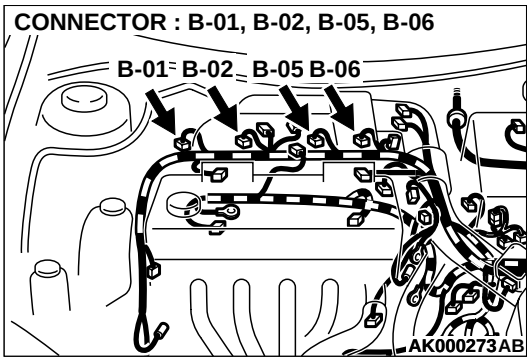
STEP 10. Check connector C-49 at ECM <M/T> or connector C-50 at PCM <A/T> for damage.

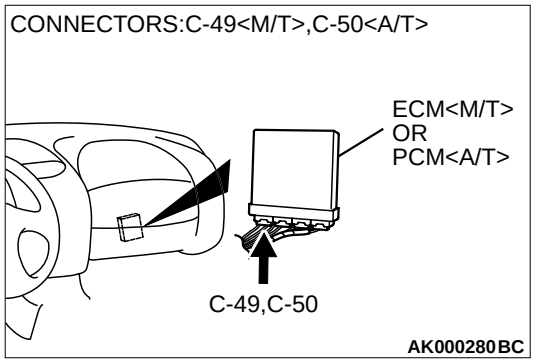
Q: Is the connector in good condition?

YES : Go to Step 11.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.







STEP 11. Check for harness damage between injector connector and ECM <M/T> or PCM <A/T> connector.

a. Check the harness wire between injector connector B-01 terminal 2 and ECM connector C-49 terminal 1 <M/T> or PCM connector C-50 terminal 1 <A/T> when checking No. 1 cylinder.
b. Check the harness wire between injector connector B-02 terminal 2 and ECM connector C-49 terminal 14 <M/T> or PCM connector C-50 terminal 9 <A/T> when checking No. 2 cylinder.
c. Check the harness wire between injector connector B-05 terminal 2 and ECM connector C-49 terminal 2 <M/T> or PCM connector C-50 terminal 24 <A/T> when checking No. 3 cylinder.
d. Check the harness wire between injector connector B-06 terminal 2 and ECM connector C-49 terminal 15 <M/T> or PCM connector C-50 terminal 2 <A/T> when checking No. 4 cylinder.

Q: Is the harness wire in good condition?

YES : Check the following items, and repair or replace the defective items.
a. Check the ignition coil, spark plugs, spark plug cables.
b. Check if the injectors are clogged.
c. Check compression pressure.
d. Check fuel lines for clogging.
e. Check if the foreign materials (water, kerosene, etc.) got into fuel.

Then confirm that the malfunction symptom is eliminated.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 7: Hard Starting

COMMENT

- In cases such as the above, the cause is usually either weak spark, improper air-fuel mixture or low compression.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the ignition system.
- Malfunction of the injector system.
- Poor fuel quality. (Contamination)
- Poor compression.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Check the battery positive voltage.

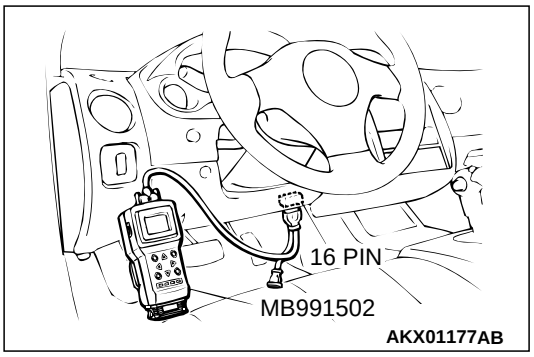
(1) Measure the battery positive voltage during cranking.
- The voltage is 8 volts or more.

Q: Is the voltage normal?

YES : Go to Step 2.
NO : Refer to GROUP 54A, Batter – Battery check P.54A-5.

STEP 2. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

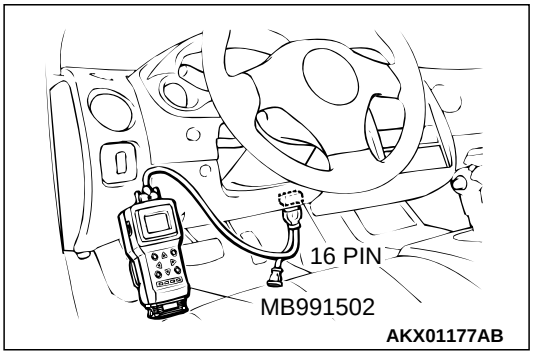


(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?

YES : Refer to Diagnostic Trouble Code Chart P.13A-22.
NO : Go to Step 3.

STEP 3. Using scan tool MB991502, check actuator test.

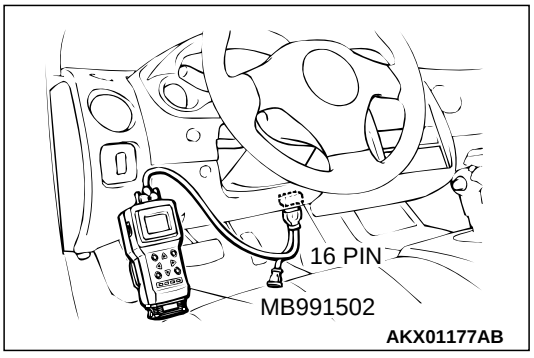


(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the actuator test. Refer to Actuator Test Reference Table P.13A-553.
   a. Item 07: Fuel Pump.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Go to Step 4.
NO : Repair or Replace. Then confirm that the malfunction symptom is eliminated.

STEP 4. Using scan tool MB991502, check data list.



(1) Turn the ignition switch the "ON" position.
(2) Check the following items in the data list. Refer to Data List Reference Table P.13A-22.
   a. Item 21: Engine Coolant Temperature Sensor.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 5.
NO : Repair or Replace. Then confirm that the malfunction symptom is eliminated.

STEP 5. Check the ignition timing.

(1) Check the ignition timing at cranking.

Standard value: 5° BTDC ± 3°

Q: Is the ignition timing normal?

YES : Go to Step 6.

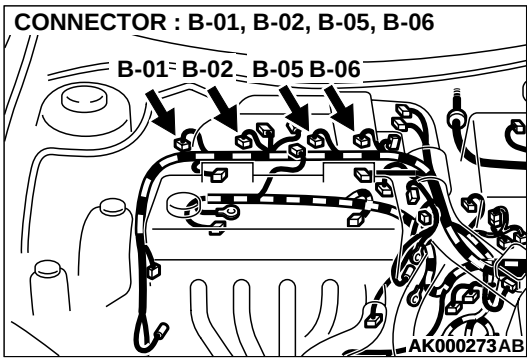
NO : Check that the crankshaft position sensor and timing belt cover are in the correct position. Then confirm that the malfunction symptom is eliminated.

STEP 6. Check harness connector B-01 or B-02 or B-05 or B-06 at injector for damage.

Q: Is the harness connector in good condition?

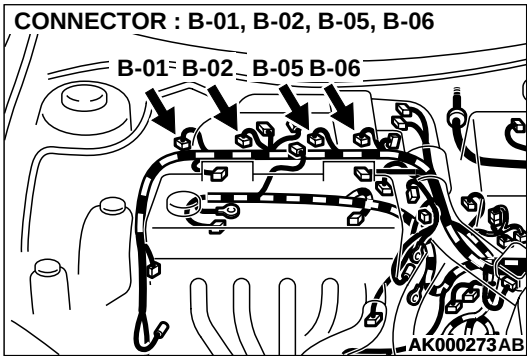
YES : Go to Step 7.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.



STEP 7. Check the injector.

(1) Disconnect the injector connector B-01, B-02, B-05, B-06.



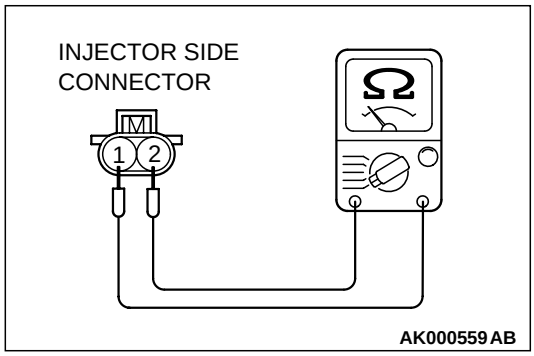
(2) Measure the resistance between each injector side connector terminal 1 and 2.

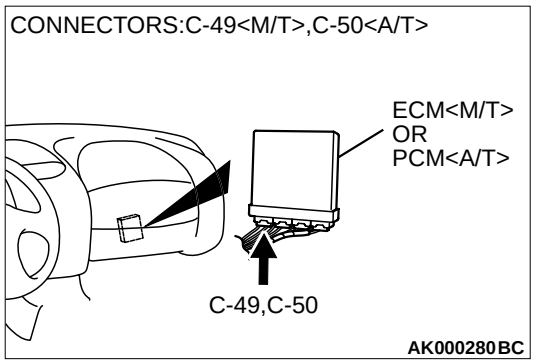
Standard value: 13 – 16 ohm [at 20°C (68°F)]

Q: Is the resistance standard value?

YES : Go to Step 8.

NO : Repair the injector. Then confirm that the malfunction symptom is eliminated.



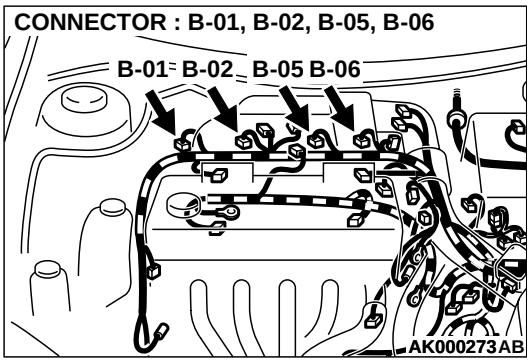


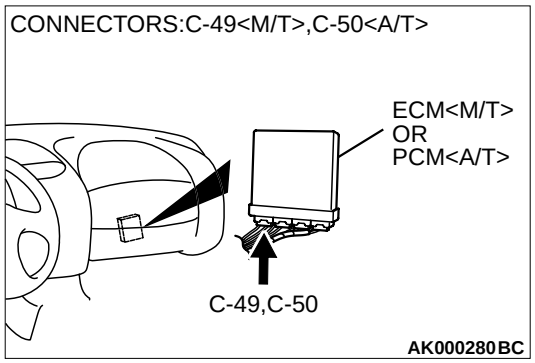
STEP 8. Check connector C-49 at ECM <M/T> or connector C-50 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.





STEP 9. Check for harness damage between injector connector and ECM <M/T> or PCM <A/T> connector.

a. Check the harness wire between injector connector B-01 terminal 2 and ECM connector C-49 terminal 1 <M/T> or PCM connector C-50 terminal 1 <A/T> when checking No. 1 cylinder.

b. Check the harness wire between injector connector B-02 terminal 2 and ECM connector C-49 terminal 14 <M/T> or PCM connector C-50 terminal 9 <A/T> when checking No. 2 cylinder.

c. Check the harness wire between injector connector B-05 terminal 2 and ECM connector C-49 terminal 2 <M/T> or PCM connector C-50 terminal 24 <A/T> when checking No. 3 cylinder.

d. Check the harness wire between injector connector B-06 terminal 2 and ECM connector C-49 terminal 15 <M/T> or PCM connector C-50 terminal 2 <A/T> when checking No. 4 cylinder.

Q: Is the harness wire in good condition?

YES : Check the following items, and repair or replace the defective items.

a. Check the ignition coil, spark plugs, spark plug cables.
b. Check if the injectors are clogged.
c. Check compression pressure.
d. Check if the foreign materials (water, kerosene, etc.) got into fuel.

Then confirm that the malfunction symptom is eliminated.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 8: Unstable Idle (Rough Idle, Hunting).

COMMENT

- In cases such as the above, the cause is probably the air/fuel mixture or idle air control motor. Other systems affecting idle quality include the ignition system and compression.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the ignition system.
- Malfunction of air/fuel ratio control system.
- Malfunction of the IAC system.
- Malfunction of the evaporative emission purge solenoid system.
- Poor compression pressure.
- Vacuum leak.
- Malfunction of the EGR solenoid system.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Check if the battery terminal is disconnected.

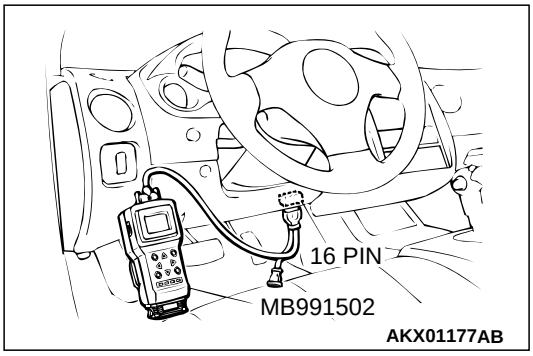
Q: Has the battery terminal been disconnected lately?

YES : Start the engine and let it run at idle for approximate 10 minutes after engine warm up. Then, if a malfunction occurs, go to Step 2.
NO : Go to Step 2.

STEP 2. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch is to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart P.13A-22.
NO : Go to Step 3.

STEP 3. Check the engine idling state.

Q: Is it hunting remarkably?

YES : Go to Step 4.
NO : Go to Step 5.

STEP 4. Check the following items.

(1) Carry out the following cleaning.
   a. Clean the throttle valve area. Refer to P.13A-575.

(2) After cleaning, confirm that the malfunction symptom is eliminated.

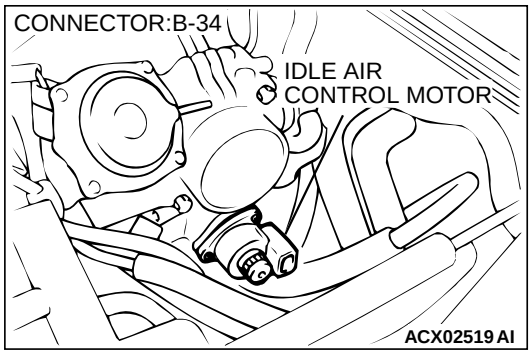
Q: Is the malfunction symptom resolved?

YES : The check is completed.

NO : Check the following items, and repair or replace the defective items.
   a. Broken intake manifold gasket.
   b. Broken air intake hose.
   c. Broken vacuum hose.
   d. Positive crankcase ventilation valve does not operate.

Then confirm that the malfunction symptom is eliminated.

STEP 5. Check the idle air control (IAC) motor operation sound.



(1) Check that the engine coolant temperature is 20°C (68°F) or below.

NOTE: Disconnecting the engine coolant temperature sensor connector and connecting the harness side of the connector to another engine coolant temperature sensor that is at 20°C (68°F) or below is also okay.

(2) Check the operation sound of the IAC motor can be heard after the ignition is switched to the "ON" position (but without starting the engine).
   • An operation sound is heard.

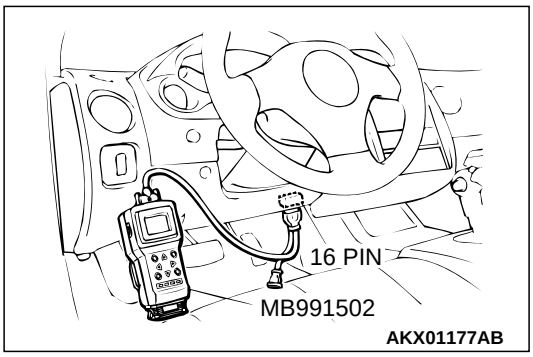
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Did you hear the operation sound?

YES : Go to Step 6.

NO : Refer to, DTC P0506 – Idle Control System RPM Lower Than Expected P.13A-390, DTC P0507 – Idle Control System RPM Higher Than Expected P.13A-399.

STEP 6. Using scan tool MB991502, check actuator test items 01, 02, 03, 04: Injector.



⚠ CAUTION

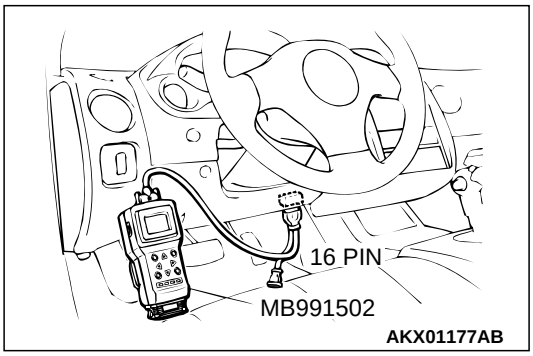
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check following items in the actuator test. Refer to, Actuator Test Reference Table P.13A-553.
  a. Item 01, 02, 03, 04: Injector.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Go to Step 7.
NO : Refer to, DTC P0201, P0202, P0203, P0204 – Injector Circuit Malfunction P.13A-216.

STEP 7. Using scan tool MB991502, check data list.

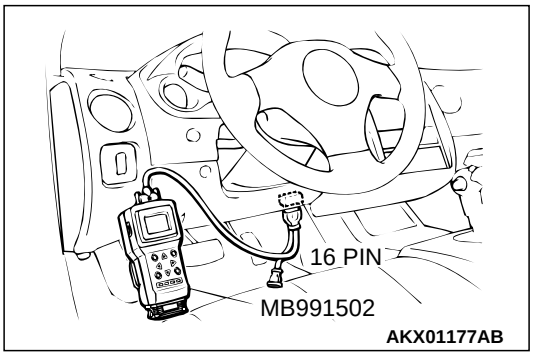


(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the data list. Refer to, Data List Reference Table P.13A-544.
  a. Item 13: Intake Air Temperature Sensor.
  b. Item 25: Barometric Pressure Sensor.
  c. Item 21: Engine Coolant Temperature Sensor.
  d. Item 59: Heated Oxygen Sensor (rear).
  e. Item 11: Heated Oxygen Sensor (front).
  f. Item 27: Power Steering Pressure Switch.
  g. Item 28: A/C Switch.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 8.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

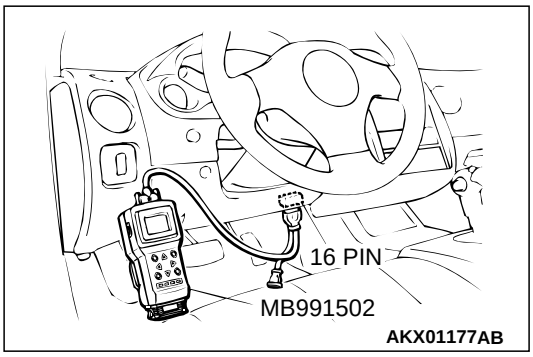
STEP 8. Using scan tool MB991502, check actuator test.



(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the actuator test. Refer to, Actuator Test Reference Table P.13A-553.
  a. Item 08: Evaporative Emission Purge Solenoid.
  b. Item 10: EGR Solenoid.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 9.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

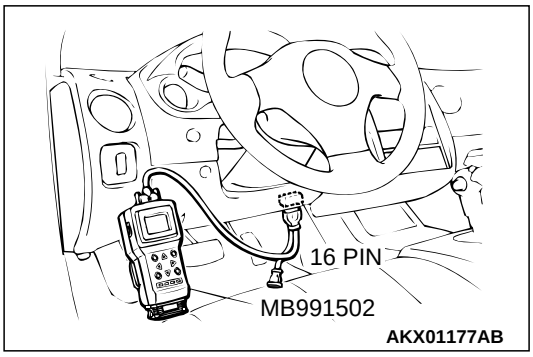


STEP 9. Using scan tool MB991502, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the data list. Refer to, Data List Reference Table P.13A-544.
  a. Item 45: Idle Air Control Motor Position.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Go to Step 10.
NO : Adjust the basic idle speed. Refer to, Basic Idle Speed Adjustment P.13A-577. After adjusting, confirm.



STEP 10. Using scan tool MB991502, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items of the data list. Refer to, Data List Reference Table P.13A-544.
  a. Item 11: Heated Oxygen Sensor (front).
  - Voltage should fluctuate between 0 – 0.4 volts and 0.6 – 1.0 volts while idling after the engine has been warmed.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 12.
NO : Go to Step 11.

STEP 11. Check the fuel pressure.

Refer to, Fuel Pressure Test P.13A-578.

Q: Is the fuel pressure normal?

YES : a. Check the following items, and repair or replace the defective items.
  - Vacuum leak.
  - Broken intake manifold gasket.
  - Broken air intake hose.
  - Broken vacuum hose.
  - Positive crankcase ventilation valve does not operate.

  b. Injector clogged.

  Then confirm that the malfunction symptom is eliminated.

NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 12. Check the ignition timing.
Refer to GROUP 11A, On-vehicle Service – Ignition Timing Check P.11A-6.

Q: Is the ignition timing normal?

YES : Check the following items, and repair or replace the defective items.
a. Check the ignition coil, spark plugs, spark plug cables.
b. Check the purge control system.
c. Check compression pressure.
d. Check if the foreign materials (water, kerosene, etc.) got into fuel.
e. Check the EGR control system.
Then confirm that the malfunction symptom is eliminated.

NO : Check that the crankshaft position sensor and timing belt cover are in the correct position. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 9: Idle speed is high (improper idle speed).

COMMENT
- In such cases as the above, the cause is probably that the intake air volume during idle is too great.

TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Malfunction of the IAC system.
- Malfunction of the throttle body.

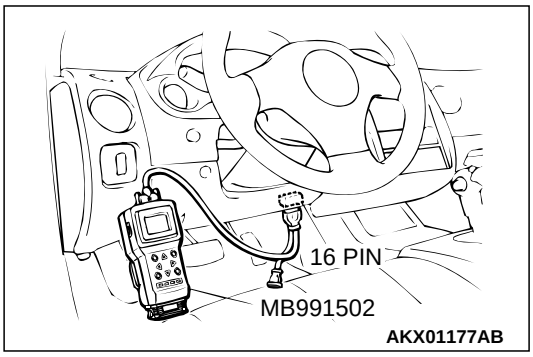
DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).

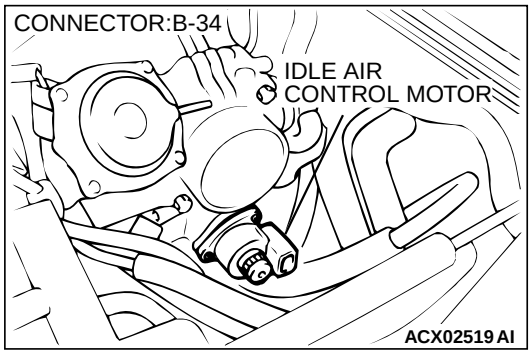
⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart P.13A-22.
NO : Go to Step 2.



STEP 2. Check the idle air control (IAC) motor operation sound.

(1) Check that the engine coolant temperature is 20°C (68°F) or below.

NOTE: Disconnecting the engine coolant temperature sensor connector and connecting the harness side of the connector to another engine coolant temperature sensor that is at 20°C (68°F) or below is also okay.

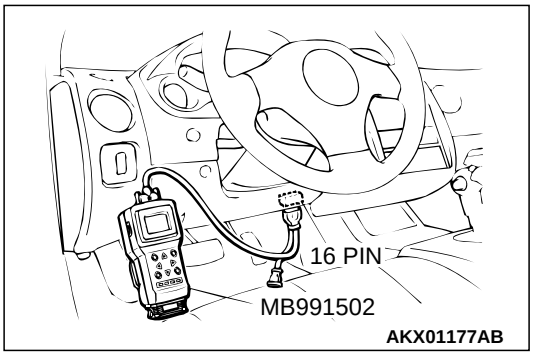
(2) Check the operation sound of the IAC motor can be heard after the ignition is switched to the "ON" position (but without starting the engine).
- An operation sound should be heard.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Did you hear the operation sound?

YES : Go to Step 3.

NO : Refer to, DTC P0506 – Idle Control System RPM Lower Than Expected P.13A-390, DTC P0507 – Idle Control System RPM Higher Than Expected P.13A-399.



STEP 3. Using scan tool MB991502, check data list.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.

(2) Turn the ignition switch to the "ON" position.

(3) Check the following items in the data list. Refer to, Data List Reference Table P.13A-544.
a. Item 21: Engine Coolant Temperature Sensor.
b. Item 28: A/C Switch.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 4.

NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 4. Adjust the basic idle speed.

Refer to, Basic Idle Speed Adjustment for the adjustment procedure P.13A-577.

Standard value: 700 ± 50 r/min

Q: Is the Idle speed normal?

YES : Refer to, Clean the throttle valve area P.13A-575.

NO : The check is completed.

INSPECTION PROCEDURE 10: Idle Speed Is Low (Improper Idle Speed).

COMMENT

- In cases such as the above, the cause is probably that the intake air volume during idle is too small.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

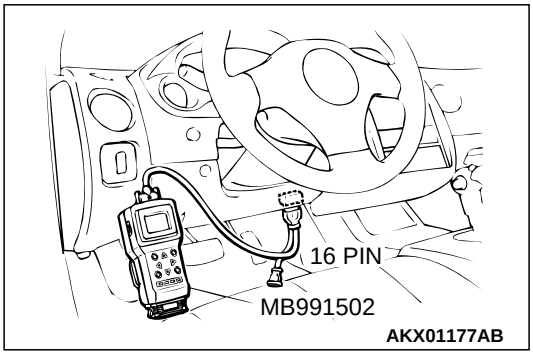
- Malfunction of the IAC system.
- Malfunction of the throttle body.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).



⚠ CAUTION

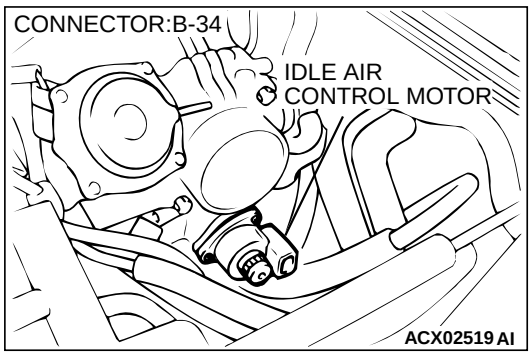
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC output?

YES : Refer to, Diagnostic Trouble Code Chart P.13A-22.
NO : Go to Step 2.

STEP 2. Check the idle air control (IAC) motor operation sound.



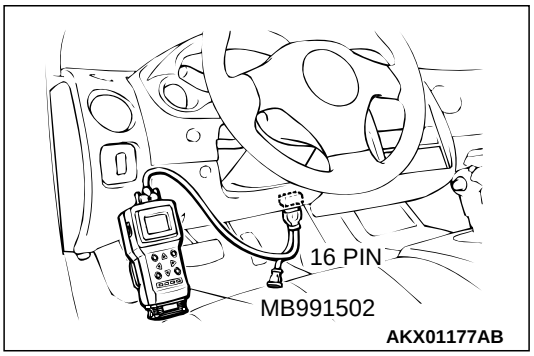
(1) Check that the engine coolant temperature is 20°C (68°F) or below.

NOTE: If necessary, you can disconnect the engine coolant temperature sensor connector and connect the harness side of the connector to another engine coolant temperature sensor that is at 20°C (68°F) or below.

(2) Check that the operation sound of the IAC motor can be heard after the ignition is switched to the "ON" position (but without starting the engine).
   - An operation sound should be heard.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Did you hear the operation sound?

YES : Go to Step 3.
NO : Refer to, DTC P0506 – Idle Control System RPM Lower Than Expected P.13A-390, DTC P0507 – Idle Control System RPM Higher Than Expected P.13A-399.



STEP 3. Using scan tool MB991502, check data list.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the following items in the data list. Refer to, Data List Reference Table P.13A-544.
  a. Item 21: Engine Coolant Temperature Sensor.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 4.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 4. Adjust the basic idle speed.

Refer to, Basic Idle Speed Adjustment for the adjustment procedure P.13A-577.

Standard value: 700 ± 50 r/min

Q: Is the idle speed normal?

YES : Refer to, Clean the throttle valve area P.13A-575.
NO : The check is completed.

INSPECTION PROCEDURE 11: When the engine is cold, it stalls at idle (die out).

COMMENT

- In such cases as the above, the air/fuel mixture may be inappropriate when the engine is cold.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the IAC system.
- Malfunction of the throttle body.
- Malfunction of the injector system.
- Malfunction of the ignition system.

DIAGNOSIS

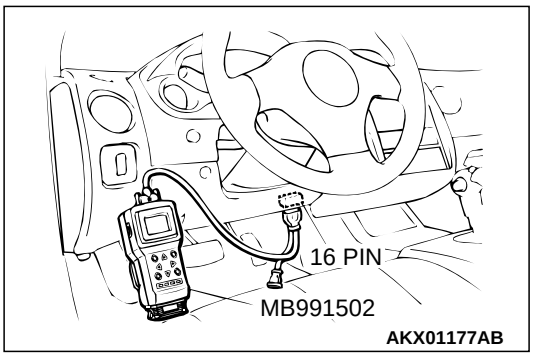
Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Check if the battery terminal is disconnected.

Q: Has the battery terminal been disconnected lately?

YES : Start the engine and let it run at idle for approximate 10 minutes after engine warm up. Then, if a malfunction occurs, go to step 2.
NO : Go to Step 2.



STEP 2. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart P.13A-22.
NO : Go to Step 3.

STEP 3. Checking by operating the accelerator pedal.

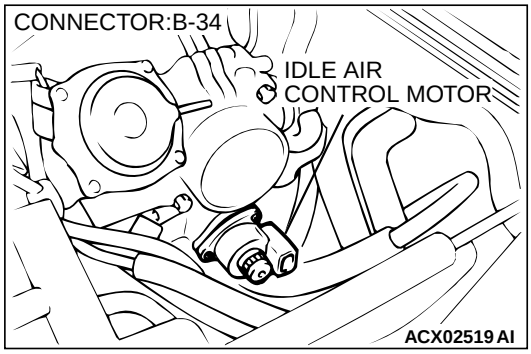
Q: Does the engine stall right after the accelerator pedal is released?

YES : Refer to, Clean the throttle valve area P.13A-575.
NO : Go to Step 4.

STEP 4. Check the engine idling.

Q: Is the idling good enough after warm up?

YES : Go to Step 5.
NO : Refer to, INSPECTION PROCEDURE 8 – Unstable Idle (Rough Idle, Hunting) P.13A-458.



STEP 5. Check the idle air control (IAC) motor operation sound.

(1) Check that the engine coolant temperature is 20°C (68°F) or below.

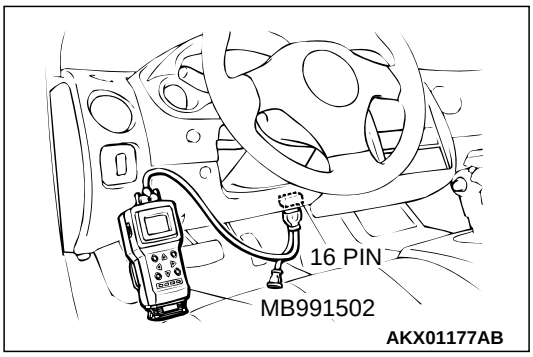
NOTE: If necessary, you can disconnect the engine coolant temperature sensor connector and connect the harness side of the connector to another engine coolant temperature sensor that is at 20°C (68°F) or below.

(2) Check the operation sound of the IAC motor can be heard after the ignition is switched to the "ON" position (but without starting the engine).
- An operation sound should be heard.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Did you hear the operation sound?

YES : Go to Step 6.
NO : Refer to, DTC P0506 – Idle Control System RPM Lower Than Expected P.13A-390, DTC P0507 – Idle Control System RPM Higher Than Expected P.13A-399.



STEP 6. Using scan tool MB991502, check actuator test items 01, 02, 03, 04: Injector.

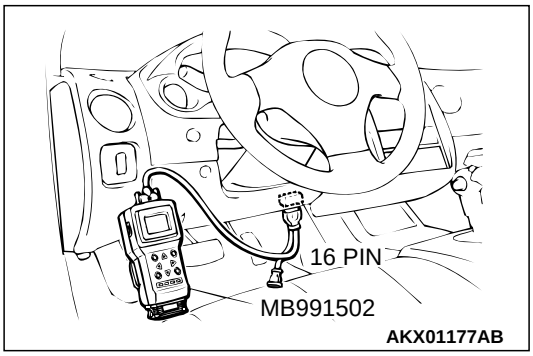
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check following items in the actuator test. Refer to, Actuator Test Reference Table P.13A-553.
  a. Item 01, 02, 03, 04: Injector.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Go to Step 7.
NO : Refer to, DTC P0201, P0202, P0203, P0204 – Injector Circuit Malfunction P.13A-216.



STEP 7. Using scan tool MB991502, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the data list. Refer to, Data List Reference Table P.13A-544.
  a. Item 21: Engine Coolant Temperature Sensor.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 8.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 8. Check the fuel pressure.

Refer to, Fuel Pressure Test P.13A-578.

Q: Is the fuel pressure normal?

YES : Go to Step 9.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 9. Check the ignition timing.
Refer to GROUP 11A, On-vehicle Service – Ignition Timing Check P.11A-6.

Q: Is the ignition timing normal?

YES : Check the following items, and repair or replace the defective items.
a. Check the ignition coil, spark plugs, spark plug cables.
b. Check compression pressure.
c. Check the engine oil viscosity.
Then confirm that the malfunction symptom is eliminated.

NO : Check that the crankshaft position sensor and timing belt cover are in the correct position. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 12: When the Engine Is Hot, It Stalls at Idle (Die Out).

COMMENT
- In cases such as the above, the ignition system, air/fuel mixture, idle air control motor or compression pressure may be faulty. In addition, if the engine suddenly stalls, the cause may also be a loose connector.

TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Malfunction of the ignition system.
- Malfunction of air/fuel ratio control system.
- Malfunction of the IAC system.
- Vacuum leak.
- Improper connector contact.

DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)

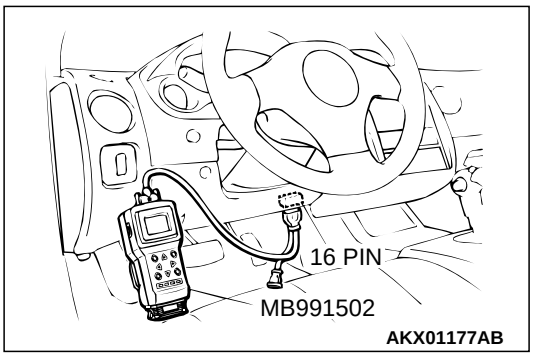
STEP 1. Check if the battery terminal is disconnected.

Q: Has the battery terminal been disconnected lately?

YES : Start the engine and let it run at idle for approximate 10 minutes after engine warm up. Then, if a malfunction occurs, go to step 2.

NO : Go to Step 2.

STEP 2. Using scan tool MB991502, read the diagnostic trouble code (DTC).



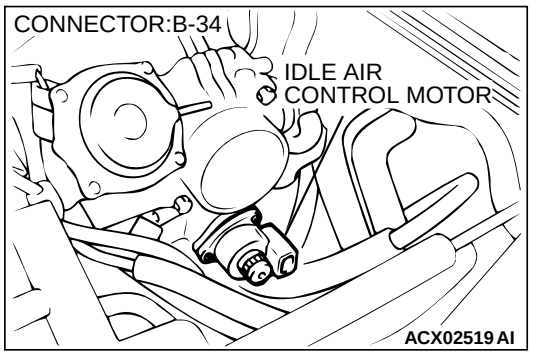
⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart P.13A-22.
NO : Go to Step 3.

STEP 3. Check the idle air control (IAC) motor operation sound.



(1) Check that the engine coolant temperature is 20°C (68°F) or below.

NOTE: If necessary, you can disconnect the engine coolant temperature sensor connector and connect the harness side of the connector to another engine coolant temperature sensor that is at 20°C (68°F) or below.

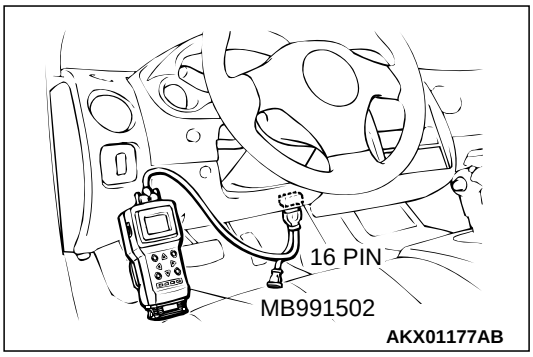
(2) Check that the operation sound of the IAC motor can be heard after the ignition is switched to the "ON" position (but without starting the engine).
- An operation sound should be heard.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Did you hear the operation sound?

YES : Go to Step 4.
NO : Refer to, DTC P0506 – Idle Control System RPM Lower Than Expected P.13A-390, DTC P0507 – Idle Control System RPM Higher Than Expected P.13A-399.

STEP 4. Using scan tool MB991502, check actuator test items 01, 02, 03, 04: Injector.



⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check following items in the actuator test. Refer to, Actuator Test Reference Table P.13A-553.
   a. Item 01, 02, 03, 04: Injector.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Go to Step 5.
NO : Refer to, DTC P0201, P0202, P0203, P0204 – Injector Circuit Malfunction P.13A-216.

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STEP 5. Checking by operating the accelerator pedal.

Q: Does the engine stall right after the accelerator pedal is released?

YES : Refer to, Clean the throttle valve area P.13A-575.
NO : Go to Step 6.

STEP 6. Engine stall reproduction test.

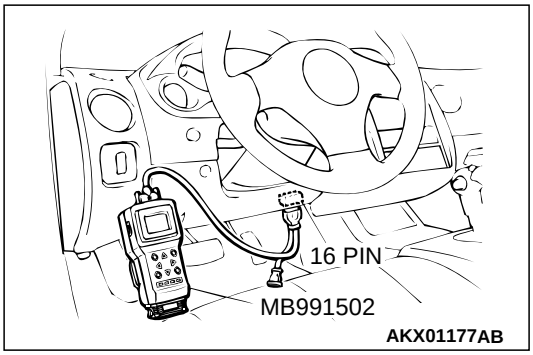
Q: Is it easy to reproduce the engine stall?

YES : Go to Step 7.
NO : Check if the following signals change suddenly by wiggling the circuit harness and connectors.
a. Crankshaft position sensor signal.
b. Volume air flow sensor signal.
c. Injector drive signal.
d. Primary and secondary ignition signal.
e. Fuel pump drive signal.
f. PCM or ECM power supply voltage.

Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 7. Using scan tool MB991502, check data list.

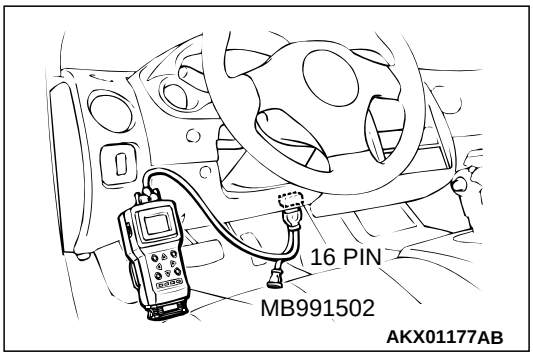
⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.



(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the following items in the data list. Refer to, Data List Reference Table P.13A-544.
a. Item 13: Intake Air Temperature Sensor.
b. Item 25: Barometric Pressure Sensor.
c. Item 21: Engine Coolant Temperature Sensor.
d. Item 59: Heated Oxygen Sensor (rear).
e. Item 11: Heated Oxygen Sensor (front).
f. Item 27: Power Steering Pressure Switch.
g. Item 28: A/C Switch.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 8.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

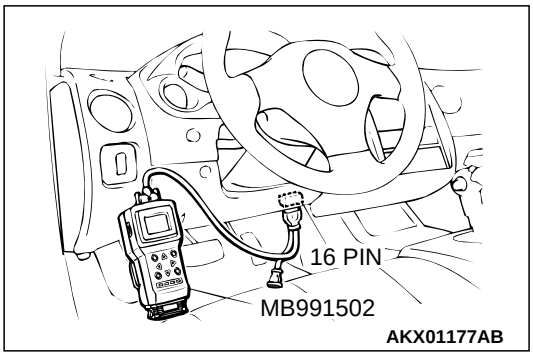


STEP 8. Using scan tool MB991502, check actuator test.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the actuator test. Refer to, Actuator Test Reference Table P.13A-553.
   a. Item 10: EGR Solenoid.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Go to Step 9.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.



STEP 9. Using scan tool MB991502, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items of the data list. Refer to, Data List Reference Table P.13A-544.
   a. Item 11: Heated Oxygen Sensor (front).
   - Fluctuates between 0 – 0.4 volts and 0.6 – 1.0 volts while idling after the engine has been warmed.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

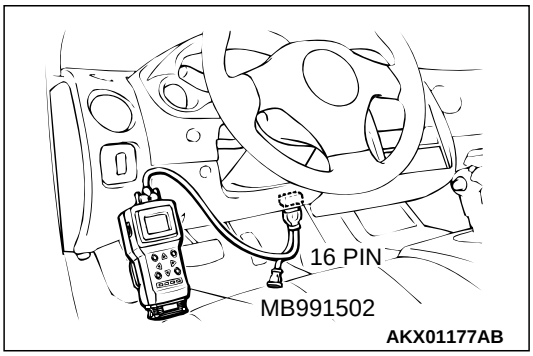
YES : Go to Step 12.
NO : Go to Step 10.

STEP 10. Check the fuel pressure.

Refer to, Fuel Pressure Test P.13A-578.

Q: Is the fuel pressure normal?

YES : Go to Step 11.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.



STEP 11. Using scan tool MB991502, check data list.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the following items in the data list. Refer to, Data List Reference Table P.13A-544.
  a. Item 45: Idle Air Control Motor Position.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Check the following items, and repair or replace the defective items.
  a. Vacuum leak.
    - Broken intake manifold gasket.
    - Broken air intake hose.
    - Broken vacuum hose.
    - Positive crankcase ventilation valve does not operate.
  b. Injector clogged.

Then confirm that the malfunction symptom is eliminated.

NO : Adjusting the basic idle speed. Refer to, Basic Idle Speed Adjustment P.13A-577.

STEP 12. Check the ignition timing.

Refer to GROUP 11A, On-vehicle Service – Ignition Timing Check P.11A-6.

Q: Is the ignition timing normal?

YES : Check the following items, and repair or replace the defective items.
  a. Check the ignition coil, spark plugs, spark plug cables.
  b. Check if the injectors are clogged.
  c. Check compression pressure.
  d. Check if the foreign materials (water, kerosene, etc.) got into fuel.

Then confirm that the malfunction symptom is eliminated.

NO : Check that the crankshaft position sensor and timing cover are in the correct position. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 13: The Engine Stalls when Accelerating (Pass Out).

COMMENT

- In case such as the above, the cause is probably misfiring due to a weak spark, or an inappropriate air/fuel mixture when the accelerator pedal.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

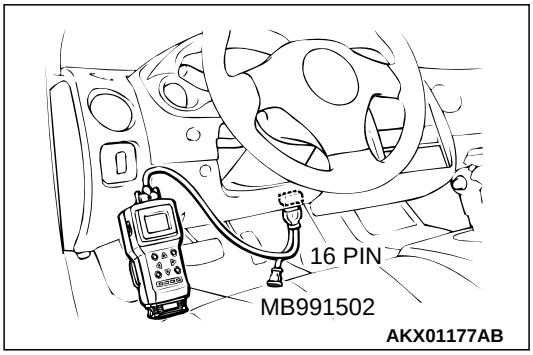
- Vacuum leak.
- Malfunction of the ignition system.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).



⚠ CAUTION

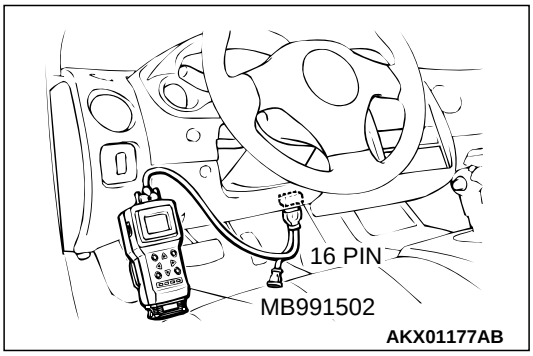
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart P.13A-22.
NO : Go to Step 2.

STEP 2. Using scan tool MB991502, check actuator test.



(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the actuator test. Refer to, Actuator Test Reference Table P.13A-553.
  a. Item 10: EGR Solenoid.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Check the following items, and repair or replace the defective items.
  a. Check the ignition coil, spark plugs, spark plug cables.
  b. Check for vacuum leaks.
    - Broken intake manifold gasket.
    - Broken or disconnected vacuum hose.
    - Improper operation of the PCV valve.
    - Broken air intake hose.

  Then confirm that the malfunction symptom is eliminated.

NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 14: The engine stalls when decelerating.

COMMENT

- The intake air volume may be insufficient due to a defective idle air control motor system.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the IAC system.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Check if the battery terminal is disconnected.

Q: Has the battery terminal been disconnected lately?

YES : Start the engine and let it run at idle for approximate 10 minutes after engine warm up. Then if a malfunction occurs, go to step 2.

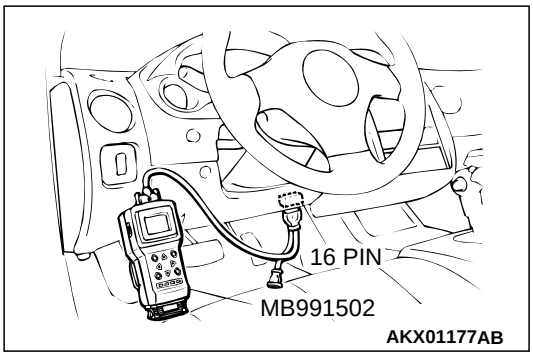
NO : Go to Step 2.

STEP 2. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.



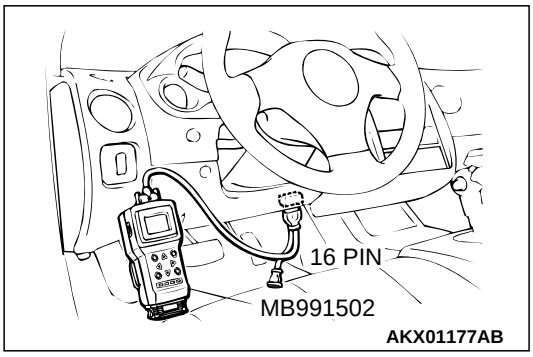
Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart P.13A-22.

NO : Go to Step 3.

STEP 3. Using scan tool MB991502, check data list.

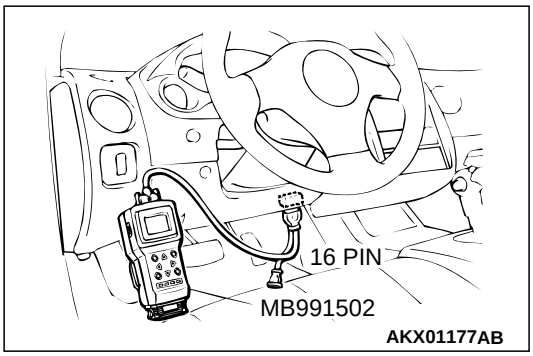
(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the data list. Refer to, Data List Reference Table P.13A-544.
   a. Item 14: Throttle Position Sensor.
(3) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the sensor operating properly?

YES : Go to Step 4.

NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

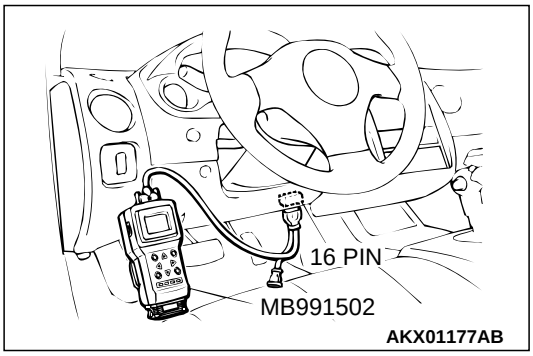


STEP 4. Using scan tool MB991502, check actuator test.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the actuator test. Refer to, Actuator Test Reference Table P.13A-553.
  a. Item 10: EGR Solenoid.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Go to Step 5.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.



STEP 5. Using scan tool MB991502, check data list item 45: Idle Air Control Position.

(1) Start the engine and run at idle.
(2) Set scan tool MB991502 to the data reading mode for item 45, Idle Air Control Position.
  a. The idle air control motor should drop to the 0 – 2 position during deceleration (from 1,000 r/min or more).
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operation properly?

YES : Check the following items, and repair, replace or clean the defective sections.
  a. Check the ignition coil, spark plugs, spark plug cables.
  b. Check the throttle valve area.
Then confirm that the malfunction symptom is eliminated.
NO : Refer to, DTC P0500 – Vehicle Speed Sensor <M/T>P.13A-381 or refer to GROUP 23A, Automatic Transaxle Diagnosis – Diagnostic Trouble Code Procedures – DTC 23 Output Shaft Speed Sensor System <A/T>P.23A-115 .

INSPECTION PROCEDURE 15: Hesitation, sag or stumble.

COMMENT

- In cases such as the above, the ignition system, air/fuel mixture or compression pressure may be defective.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

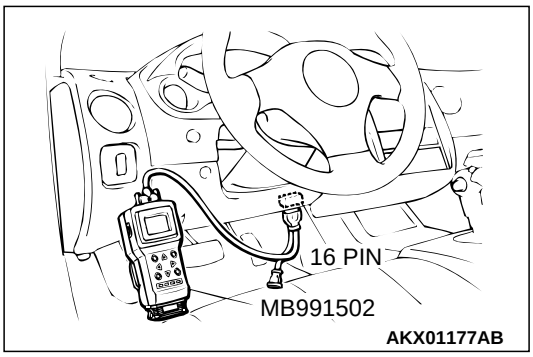
- Malfunction of the ignition system.
- Malfunction of air/fuel ratio control system.
- Malfunction of the fuel supply system.
- Malfunction of the EGR solenoid system.
- Poor compression pressure.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).



⚠ CAUTION

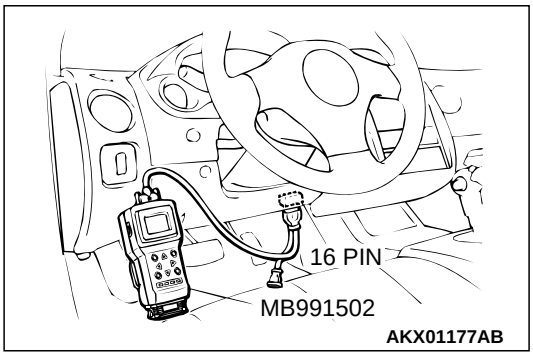
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart P.13A-22.
NO : Go to Step 2.

STEP 2. Using scan tool MB991502, check actuator test items 01, 02, 03, 04: Injector.



(1) Check following items in the actuator test. Refer to, Actuator Test Reference Table P.13A-553.
   a. Item 01, 02, 03, 04: Injector.
(2) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

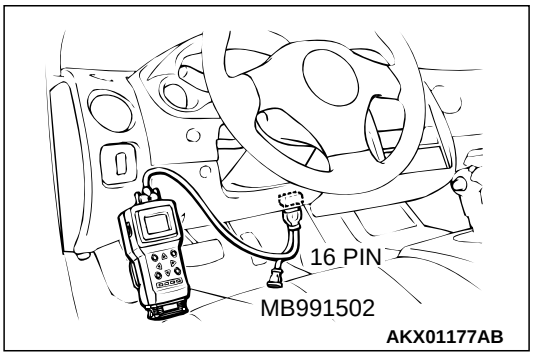
YES : Go to Step 3.
NO : Refer to, DTC P0201, P0202, P0203, P0204 – Injector Circuit Malfunction P.13A-216.

STEP 3. Check the ignition timing.

(1) Refer to GROUP 11A, On-vehicle Service – Ignition Timing Check P.11A-6.

Q: Is the ignition timing normal?

YES : Go to Step 4.
NO : Check that the crankshaft position sensor and timing belt cover are in the correct position. Then confirm that the malfunction symptom is eliminated.



STEP 4. Using scan tool MB991502, check data list.

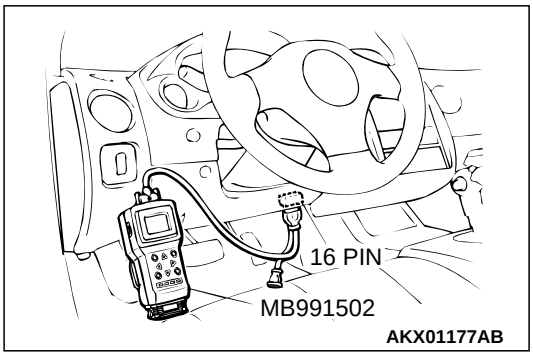
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the following items in the data list. Refer to, Data List Reference Table P.13A-544.
  a. Item 13: Intake Air Temperature Sensor.
  b. Item 25: Barometric pressure Sensor.
  c. Item 21: Engine Coolant Temperature Sensor.
  d. Item 14: Throttle Position Sensor.
  e. Item 59: Heated Oxygen Sensor (rear).
  f. Item 11: Heated Oxygen Sensor (front).
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 5.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

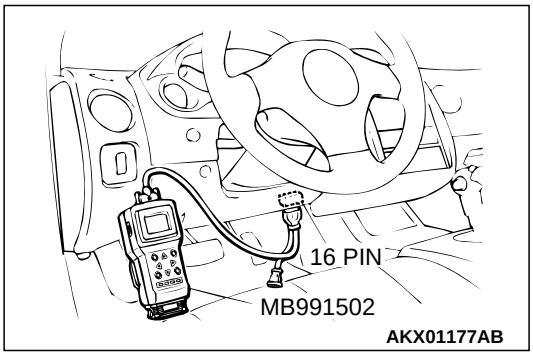


STEP 5. Using scan tool MB991502, check actuator test.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the actuator test. Refer to, Actuator Test Reference Table P.13A-553.
  a. Item 10: EGR Solenoid.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Go to Step 6.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.



STEP 6. Using scan tool MB991502, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items of data list. Refer to, Data List Reference Table P.13A-544.
  a. Item 11: Heated Oxygen Sensor (front).
  - Voltage should fluctuate between 0 – 0.4 volts and 0.6 – 1.0 volts while idling after the engine has warmed-up.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 8.
NO : Go to Step 7.

STEP 7. Check the fuel pressure.
Refer to, Fuel Pressure Test P.13A-578.

Q: Is the fuel pressure normal?

YES : Check the following items, and repair or replace the defective items.
a. Vacuum leak.
- Broken intake manifold gasket.
- Broken air intake hose.
- Broken vacuum hose.
- Positive crankcase ventilation valve does not operate.

b. Injector clogged.

Then confirm that the malfunction symptom is eliminated.

NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 8. Check the fuel pressure.
Refer to, Fuel Pressure Test P.13A-578.

Q: Is the fuel pressure normal?

YES : Check the following items, and repair or replace the defective items.
a. Check the ignition coil, spark plugs, spark plug cables.
b. Check the EGR system.
c. Check compression pressure.
d. Check the fuel filter or fuel line for clogging.

Then confirm that the malfunction symptom is eliminated.

NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

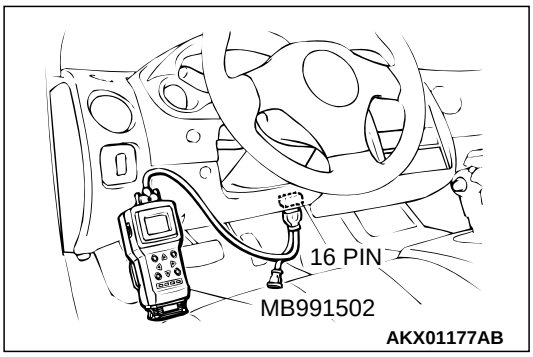
INSPECTION PROCEDURE 16: Acceleration shock.

COMMENT
- There may be an ignition leak accompanying the increase in the spark plug demand voltage during acceleration.

TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Malfunction of the ignition system.

DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart P.13A-22.
NO : Check the following items, and repair or replace the defective items.
a. Check the ignition coil, spark plugs, spark plug cables.
b. Check for occurrence of ignition leak.
Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 17: Deceleration Shock

COMMENT

- There may be a sudden change in air flow through the IAC, causing the vehicle to decelerate rapidly for an instant.

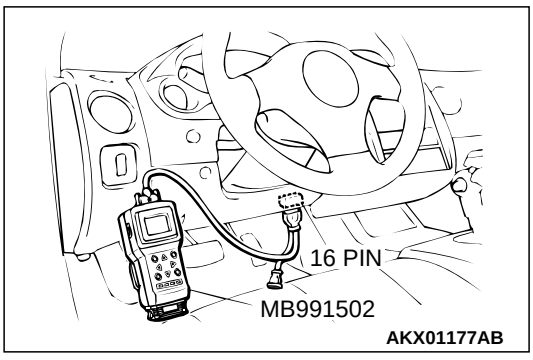
TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the IAC system.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



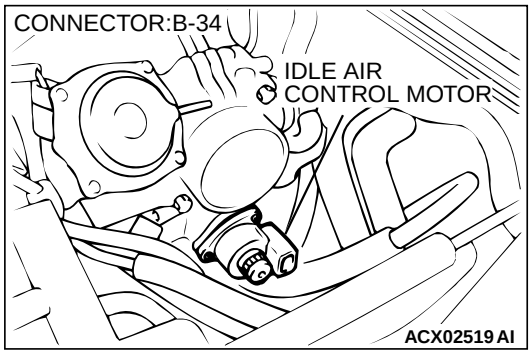
STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart P.13A-22.
NO : Go To Step 2.



STEP 2. Check the idle air control (IAC) motor operation sound.

(1) Check that the engine coolant temperature is 20°C (68°F) or below.

NOTE: If necessary, you can disconnect the engine coolant temperature sensor connector and connect the harness side of the connector to another engine coolant temperature sensor that is at 20°C (68°F) or below.

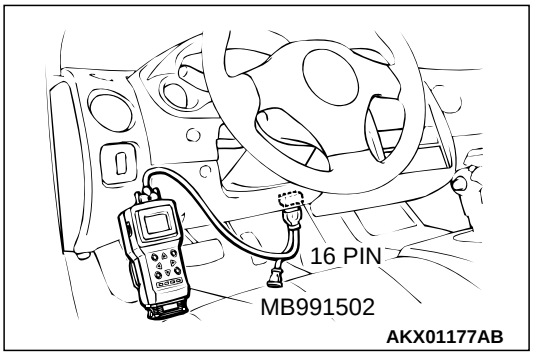
(2) Check the operation sound of the IAC motor can be heard after the ignition is switched to the "ON" position (but without starting the engine).
- An operation sound should heard.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Did you hear the operation sound?

YES : Go to Step 3.

NO : Refer to, DTC P0506 – Idle Control System RPM Lower Than Expected P.13A-390, DTC P0507 – Idle Control System RPM Higher Than Expected P.13A-399.



STEP 3. Using scan tool MB991502, check data list.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.

(2) Turn the ignition switch to the "ON" position.

(3) Check the following items in the data list. Refer to, Data List Reference Table P.13A-544.

a. Item 14: Throttle Position Sensor.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Refer to, Clean the throttle valve area P.13A-575.

NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 18: Poor acceleration.

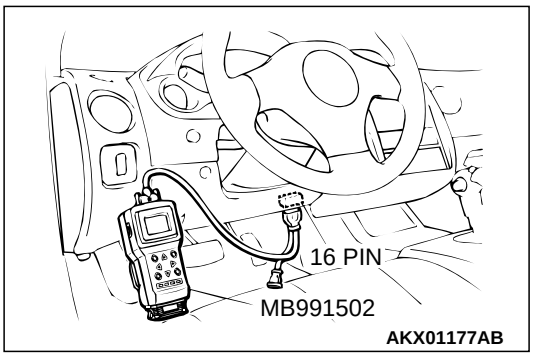
COMMENT
- Defective ignition system, abnormal air/fuel ratio, poor compression pressure, etc. are suspected.

TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Malfunction of the ignition system.
- Malfunction of air/fuel ratio control system.
- Malfunction of the fuel supply system.
- Poor compression pressure.
- Clogged exhaust system.

DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)

TSB Revision



STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).

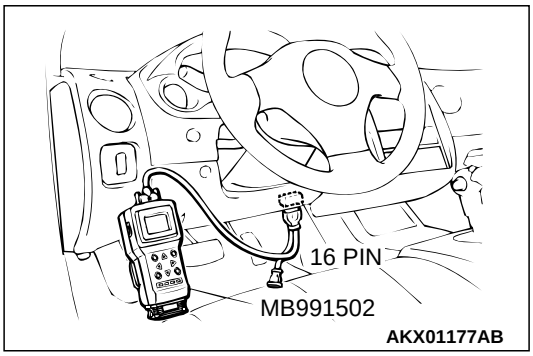
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart P.13A-22.
NO : Go to Step 2.



STEP 2. Using scan tool MB991502, check actuator test items 01, 02, 03, 04: Injector.

(1) Turn the ignition switch to the "ON" position.
(2) Check following items in the actuator test. Refer to, Actuator Test Table P.13A-553.
  a. Item 01, 02, 03, 04: Injector.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

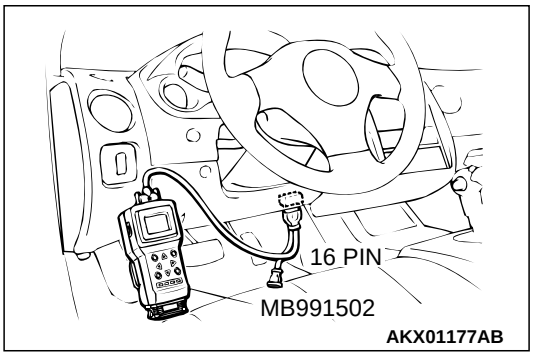
YES : Go to Step 3.
NO : Refer to, DTC P0201, P0202, P0203, P0204 – Injector Circuit Malfunction P.13A-216.

STEP 3. Check the ignition timing.

Refer to GROUP 11A, On-vehicle Service – Ignition Timing Check P.11A-6.

Q: Is the ignition timing normal?

YES : Go to Step 4.
NO : Check that the crankshaft position sensor and timing belt cover are in the correct position. Then confirm that the malfunction symptom is eliminated.



STEP 4. Using scan tool MB991502, check data list.

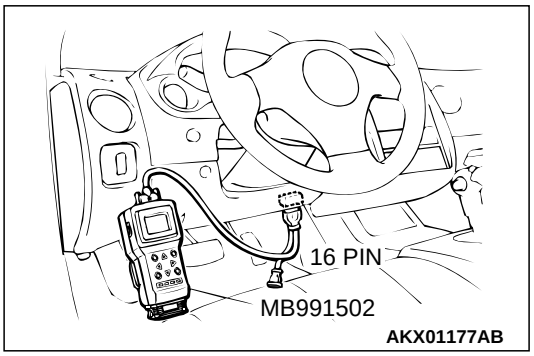
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the following items in the data list. Refer to, Data List Reference Table P.13A-544.
   a. Item 13: Intake Air Temperature Sensor.
   b. Item 25: Barometric Pressure Sensor.
   c. Item 21: Engine Coolant Temperature Sensor.
   d. Item 14: Throttle Position Sensor.
   e. Item 59: Heated Oxygen Sensor (rear).
   f. Item 11: Heated Oxygen Sensor (front).
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 5.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

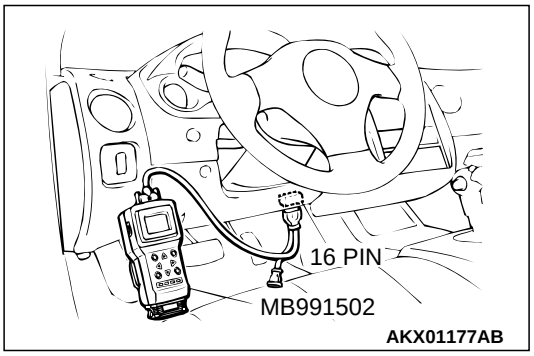


STEP 5. Using scan tool MB991502, check actuator test.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the actuator test. Refer to, Actuator Test Reference Table P.13A-553.
   a. Item 10: EGR Solenoid.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 6.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.



STEP 6. Using scan tool MB991502, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items of data list. Refer to, Data List Reference Table P.13A-544.
   a. Item 11: Heated Oxygen Sensor (front).
   - Voltage should fluctuate between 0 – 0.4 volts and 0.6 – 1.0 volts while idling after the engine has been warmed.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 8.
NO : Go to Step 7.

STEP 7. Check the fuel pressure.
Refer to, Fuel Pressure Test P.13A-578.

Q: Is the fuel pressure normal?

YES : Check the following items, and repair or replace the defective items.
a. Vacuum leak.
- Broken intake manifold gasket.
- Broken air intake hose.
- Broken vacuum hose.
- Positive crankcase ventilation valve does not operate.

b. Injector clogged.

Then confirm that the malfunction symptom is eliminated.

NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 8. Check the fuel pressure.
Refer to, Fuel Pressure Test P.13A-578.

Q: Is the fuel pressure normal?

YES : Check the following items, and repair or replace the defective items.
a. Check the ignition coil, spark plugs, spark plug cables.
b. Check compression pressure.
c. Check the fuel filter or fuel line for clogging.
d. Broken air intake hose.
e. Clogged air cleaner.
f. Clogged exhaust system.

Then confirm that the malfunction symptom is eliminated.

NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 19: Surge.

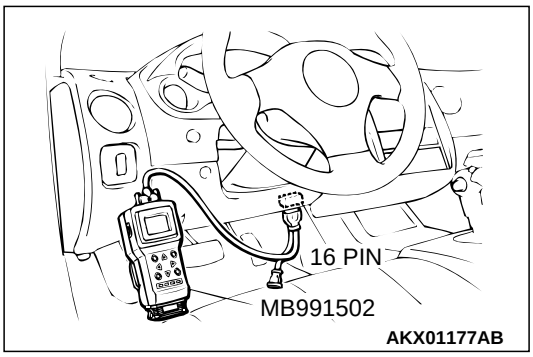
COMMENT
- Defective ignition system, abnormal air/fuel ratio, etc. are suspected.

TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Malfunction of the ignition system.
- Malfunction of air/fuel ratio control system.
- Malfunction of the EGR solenoid system.

DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).



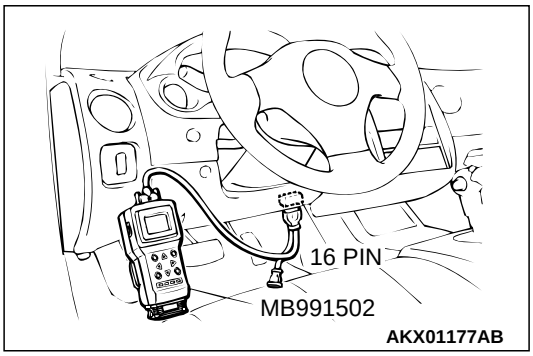
⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "ON" position.

Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart P.13A-22.
NO : Go to Step 2.

STEP 2. Using scan tool MB991502, check actuator test items 01, 02, 03, 04: Injector.



(1) Turn the ignition switch to the "ON" position.
(2) Check following items in the actuator test. Refer to, Actuator Test Reference Table P.13A-553.
   a. Item 01, 02, 03, 04: Injector.
(3) Turn the ignition switch to the "ON" position.

Q: Is the actuator operating properly?

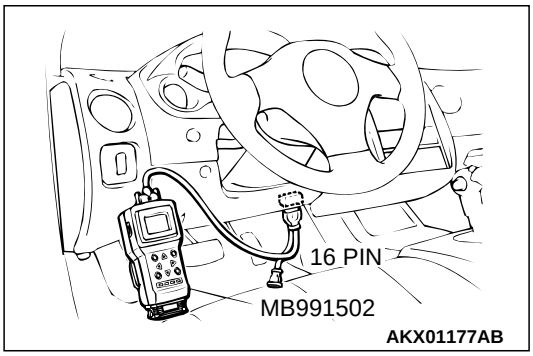
YES : Go to Step 3.
NO : Refer to, DTC P0201, P0202, P0203, P0204 – Injector Circuit Malfunction P.13A-216.

STEP 3. Check the ignition timing.

Refer to GROUP 11A, On-vehicle Service – Ignition Timing Check P.11A-6.

Q: Is the ignition timing normal?

YES : Go to Step 4.
NO : Check that the crankshaft position sensor and timing belt cover are in the correct position. Then confirm that the malfunction symptom is eliminated.



STEP 4. Using scan tool MB991502, check data list.

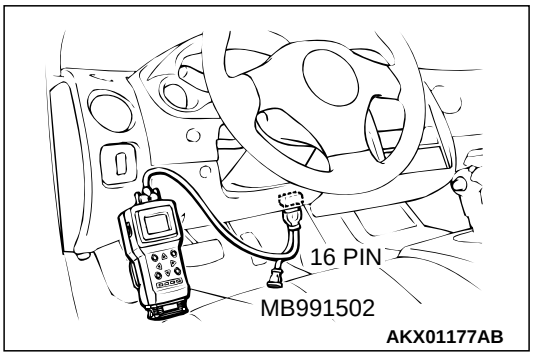
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the following items in the data list. Refer to, Data List Reference Table P.13A-544.
  a. Item 13: Intake Air Temperature Sensor.
  b. Item 25: Barometric pressure Sensor.
  c. Item 21: Engine Coolant Temperature Sensor.
  d. Item 14: Throttle Position Sensor.
  e. Item 59: Heated Oxygen Sensor (rear).
  f. Item 11: Heated Oxygen Sensor (front).
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 5.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

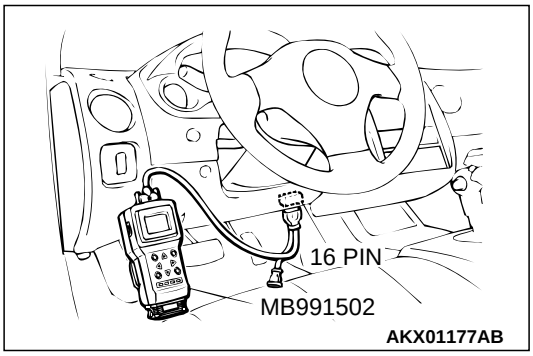


STEP 5. Using scan tool MB991502, check actuator test.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the actuator test. Refer to, Actuator Test Reference Table P.13A-553.
  a. Item 10: EGR Solenoid.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Go to Step 6.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.



STEP 6. Using scan tool MB991502, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items of data list. Refer to, Data List Reference Table P.13A-544.
  a. Item 11: Heated Oxygen Sensor (front).
  - Voltage should fluctuate between 0 – 0.4 volts and 0.6 – 1.0 volts while idling after the engine has been warmed.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 8.
NO : Go to Step 7.

STEP 7. Check the fuel pressure.
Refer to, Fuel Pressure Test P.13A-578.

Q: Is the fuel pressure normal?

YES : Check the following items, and repair or replace the defective items.
a. Vacuum leak.
- Broken intake manifold gasket.
- Broken air intake hose.
- Broken vacuum hose.
- Positive crankcase ventilation valve does not operate.

b. Injector clogged.

Then confirm that the malfunction symptom is eliminated.

NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 8. Check the fuel pressure.
Refer to, Fuel Pressure Test P.13A-578.

Q: Is the fuel pressure normal?

YES : Check the following items, and repair or replace the defective items.
a. Check the ignition coil, spark plugs, spark plug cables.
b. Check the EGR system.

Then confirm that the malfunction symptom is eliminated.

NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

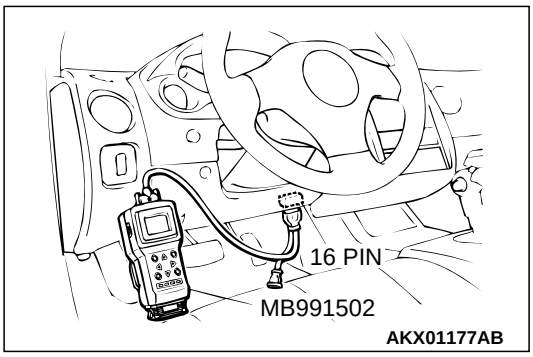
INSPECTION PROCEDURE 20: Knocking

COMMENT
- Incase such as the above, the cause is probably that the detonation control is defective or the heat value of the spark plug is inappropriate.

TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Defective knock sensor.
- Incorrect heat value of the spark plug.

DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)



STEP 1. Using the scan tool MB991502, read the diagnostic trouble code (DTC).

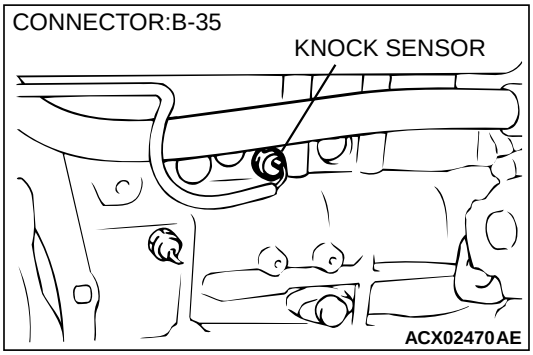
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart P.13A-22.
NO : Go to Step 2.



STEP 2. Check the ignition timing.

(1) The ignition timing should retard more when knock sensor connector B-35 is disconnected than when it is connected.

Q: When the knock sensor connector B-35 was disconnected, was the ignition timing delayed?

YES : Check the following items, and repair or replace the defective items.
a. Check the spark plugs.
b. Fuel quality, octane level.
c. Check if the foreign materials (water, kerosene, etc.) got into fuel.

Then confirm that the malfunction symptom is eliminated.

NO : Refer to, DTC P0325 – Knock Sensor Circuit Malfunction P.13A-231.

INSPECTION PROCEDURE 21: Dieseling.

COMMENT

- Fuel leakage from injectors is suspected, or carbon build up.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Fuel leakage from injectors.

DIAGNOSIS

STEP 1. Check the injectors for fuel leakage.

Replace the leaking injector. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 22: Too high CO and HC concentration when idling

COMMENT

- Abnormal air/fuel ratio is suspected.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of air/fuel ratio control system.
- Deteriorated catalyst.

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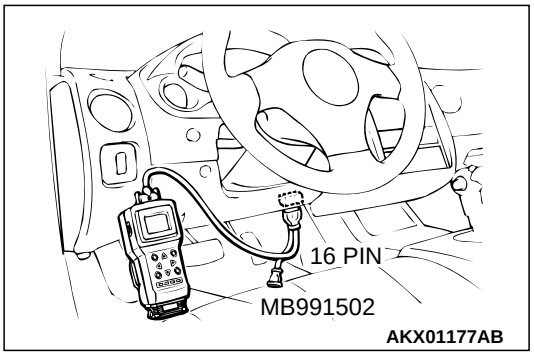
DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).



⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart P.13A-22.
NO : Go to Step 2.

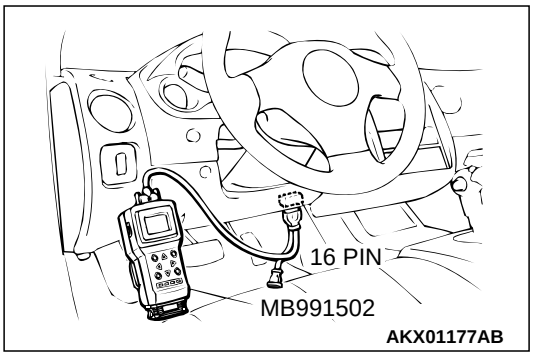
STEP 2. Check the ignition timing.

Refer to GROUP 11A, On-vehicle Service – Ignition Timing Check P.11A-6.

Q: Is the ignition timing normal?

YES : Go to Step 3.
NO : Check that the crankshaft position sensor and timing belt cover are in the correct position. Then confirm that the malfunction symptom is eliminated.

STEP 3. Using scan tool MB991502, check data list.

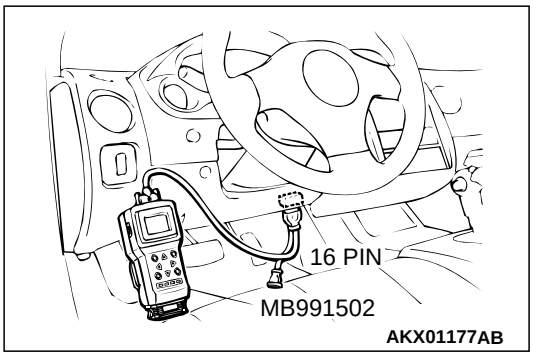


⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the following items in the data list. Refer to, Data List Reference Table P.13A-544.
   a. Item 21: Engine Coolant Temperature Sensor.
   b. Item 13: Intake Air Temperature Sensor.
   c. Item 25: Barometric pressure Sensor.
   d. Item 59: Heated Oxygen Sensor (rear).
   e. Item 11: Heated Oxygen Sensor (front).
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 4.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.



STEP 4. Using scan tool MB991502, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items of the data list. Refer to, Data List Reference Table P.13A-544.
  a. Item 11: Heated Oxygen Sensor (front).
  - Voltage should fluctuate between 0 – 0.4 volts and 0.6 – 1.0 volts while idling after the engine has been warmed.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Replace the heated oxygen sensor (front). Then confirm that the malfunction symptom is eliminated. If not resolved, go to step 6.
NO : Go to Step 5.

STEP 5. Check the fuel pressure.

Refer to, Fuel Pressure Test P.13A-578.

Q: Is the fuel pressure normal?

YES : Go to Step 6.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 6. Check the following items.

(1) Check the following items, and repair or replace the defective items.
  a. Check the injectors for fuel leakage.
  b. Check the ignition coil, spark plugs, spark plug cables.
  c. Check compression pressure.
  d. Check the positive crank case ventilation system.
  e. Check the evaporative emission control system.
  f. Check the EGR system.
(2) Then check the malfunction symptom.

Q: Is the malfunction symptom is eliminated.

YES : The check is completed.
NO : Replace the catalytic converter. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 23: Transient, Mass Emission Tailpipe Test Failure.

COMMENT

- The test is failed when the air/fuel ratio is not controlled to the ideal air/fuel ratio. This occurs due to the feedback control by heated oxygen sensor signals, insufficient EGR flow rate, or deteriorated catalyst.

NOTE: If the three-way catalyst temperature is low when checking the exhaust gas, the three-way catalyst cannot sufficiently clean the emissions. Warm up the engine sufficiently before checking the exhaust, and check immediately.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of air/fuel ratio control system.
- Malfunction of the EGR system.
- Deteriorated catalyst.

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DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)

STEP 1. Check the exhaust gas with the engine at normal operating temperature.

Q: After enough warm up, was the exhaust gas checked enough?

YES : Go to Step 2.
NO : Check it again after enough warm up.

STEP 2. Check the following items.

(1) Check the following items.
   a. Check all vacuum hoses and connectors.
   b. Check electrical wires and connectors for obvious problems.
   c. Check the exhaust system for missing or damaged parts.

Q: Are they normal?

YES : Go to Step 3.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 3. Check the drive ability.

(1) Check if the malfunction symptom described on the symptom chart is occurring.

Q: Is the drive – ability normal?

YES : Go to Step 4.
NO : Refer to, Trouble Symptom Chart P.13A-25.

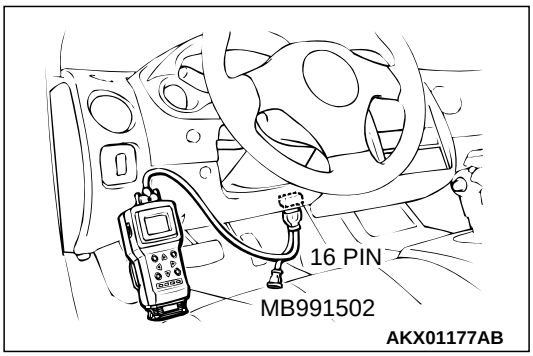
STEP 4. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart P.13A-22.
NO : Go to Step 5.



STEP 5. Check the ignition timing.

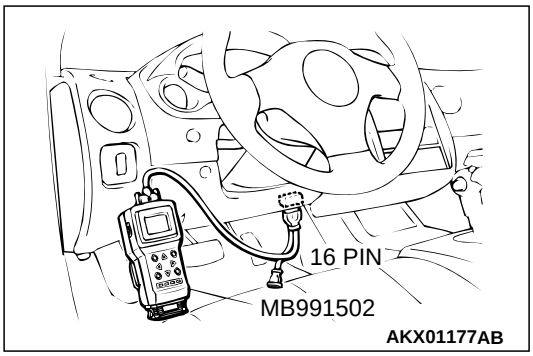
Refer to GROUP 11A, On-vehicle Service – Ignition Timing Check P.11A-6.

Q: Is the ignition timing normal?

YES : Go to Step 6.

NO : Check that the crankshaft position sensor and timing belt cover are in the correct position. Then confirm that the malfunction symptom is eliminated.

STEP 6. Using scan tool MB991502, check data list.



⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

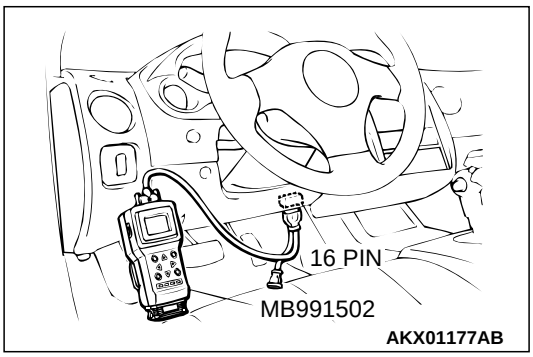
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the following items in the data list. Refer to, Data List Reference Table P.13A-544.
   a. Item 21: Engine Coolant Temperature Sensor.
   b. Item 13: Intake Air Temperature Sensor.
   c. Item 25: Barometric pressure Sensor.
   d. Item 59: Heated Oxygen Sensor (rear).
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 7.

NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 7. Using scan tool MB991502, check data list item 11: heated oxygen sensor (front).

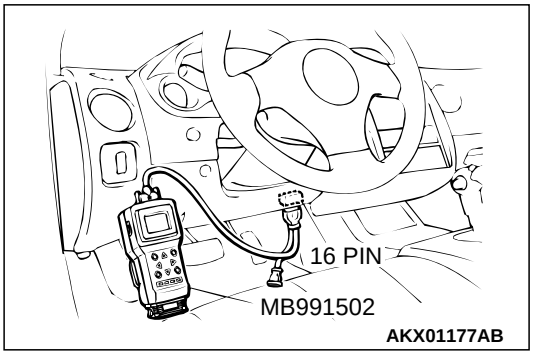


(1) Start the engine and run at idle.
(2) Set scan tool MB991502 to the data reading mode for item 11, Heated Oxygen Sensor (front).
   - Warm up the engine. When the engine is decelerated suddenly from 4,000 r/min, the output voltage should increase from 200 mV or less to 600 – 1,000 mV in a few seconds.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 8.

NO : Refer to,DTC P0130 – Heated Oxygen Sensor Circuit (sensor 1) P.13A-126, DTC P0131 – Heated Oxygen Sensor Circuit Low Voltage (sensor 1) P.13A-136, DTC P0132 – Heated Oxygen Sensor Circuit High Voltage (sensor 1) P.13A-140, DTC P0133 – Heated Oxygen Sensor Circuit Slow Response (sensor 1) P.13A-143, DTC P0134 – Heated Oxygen Sensor Circuit No Activity Detected (sensor 1) P.13A-146.



STEP 8. Using scan tool MB991502, check data list item 11: Heated oxygen sensor (front).

(1) Start the engine and run at idle.
(2) Set scan tool MB991502 to the data reading mode for item 11, Heated Oxygen Sensor (front).
- Voltage should fluctuate between 0 – 0.4 volts and 0.6 – 1.0 volts while after the engine has been warmed.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

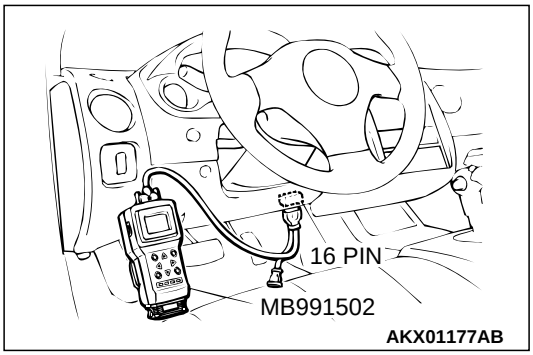
YES : Go to Step 9.
NO : Go to Step 11.

STEP 9. Check the EGR system.

Refer to GROUP 17, Emission Control System – EGR System Check P.17-106.

Q: Is the EGR system normal?

YES : Go to Step 10.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.



STEP 10. Using scan tool MB991502, check data list item 59: Heated oxygen sensor (rear).

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 59, Heated Oxygen Sensor (rear).
- Average voltage should be 0.6 volts or less, when idling.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 12.
NO : Replace the heated oxygen sensor (front). Then confirm that the malfunction symptom is eliminated.

STEP 11. Check the fuel pressure.

Refer to, Fuel Pressure Test P.13A-578.

Q: Is the fuel pressure normal?

YES : Go to Step 12.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 12. Check the following items.

(1) Check the following items, and repair or replace the defective items.
   a. Check the injectors for fuel leakage.
   b. Check the ignition coil, spark plugs, spark plug cables.
   c. Check compression pressure.
   d. Check the positive crankcase ventilation system.
   e. Check the evaporative emission control system.

(2) Then check the malfunction symptom.

Q: Is the malfunction symptom is eliminated?

YES : The check is completed.

NO : Replace the catalytic converter. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 24: Purge Flow Test of the Evaporative Emission Canister Failure.

COMMENT

- The test fails when the purge line or purge port is clogged or if the evaporative emission purge solenoid fails.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Purge line or purge port is clogged.
- Malfunction of the evaporative emission purge solenoid.
- Evaporative emission canister is clogged.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION

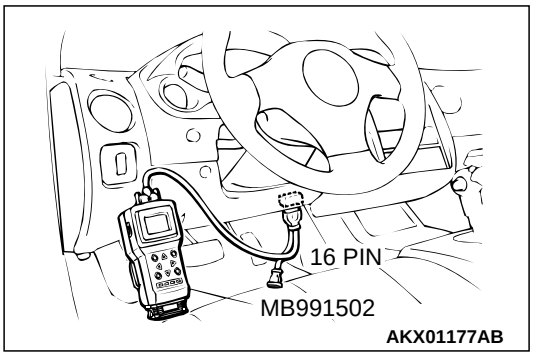
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart P.13A-22.

NO : Refer to GROUP 17, Emission Control System – Purge Control System Check (Purge Flow Check) P.17-100.



INSPECTION PROCEDURE 25: Pressure Test of the Evaporative System Failure.

COMMENT
- The test fails if there is a leak from the fuel tank or vapor line.

TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Loose fuel tank filler tube cap.
- Broken seal in fuel tank, vapor line evaporative emission canister.

DIAGNOSIS

STEP 1. Check the evaporative emission purge solenoid
Refer to GROUP 17, Emission Control System – Evaporative Emission Purge Solenoid Check P.17-101.

Q: Is the evaporative emission purge solenoid normal?

YES : Go to Step 2.

NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 2. Check the evaporative emission ventilation solenoid.
Refer to GROUP 17, Emission Control System – Evaporative Emission Ventilation Solenoid Check P.17-103.

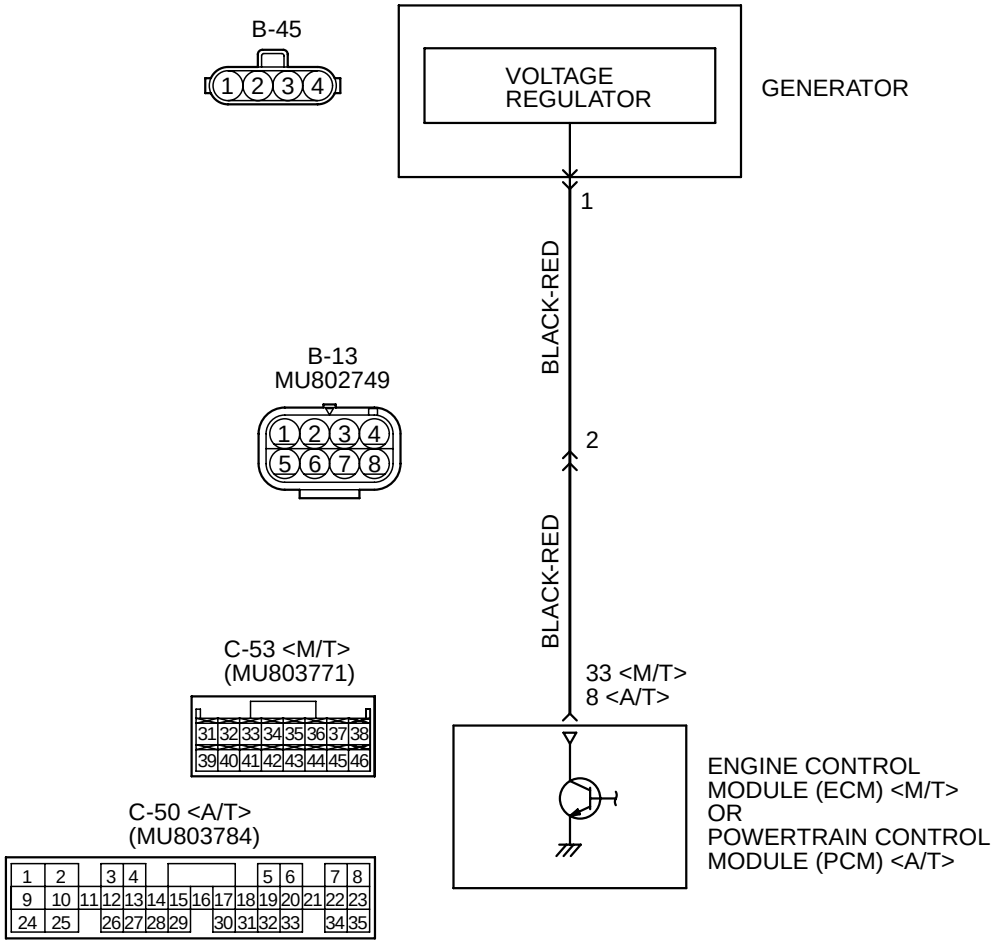
Q: Is the evaporative emission ventilation solenoid normal?

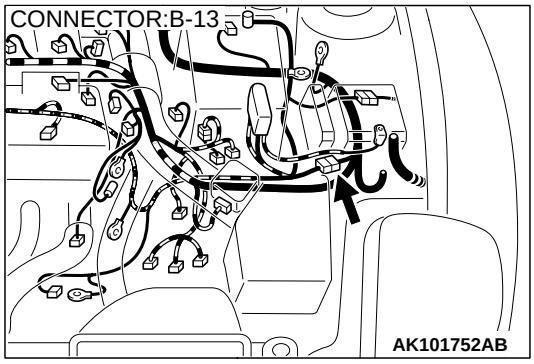
YES : Check the following items, and repair or replace the defective items.
a. Check for leaks from the vapor line or evaporative emission canister.
b. Check for leaks from the fuel tank.
Then confirm that the malfunction symptom is eliminated.

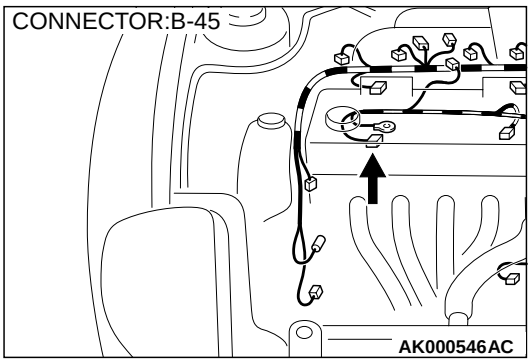
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 26: Generator output voltage is low (approximately 12.3 volts)

Generator Circuit







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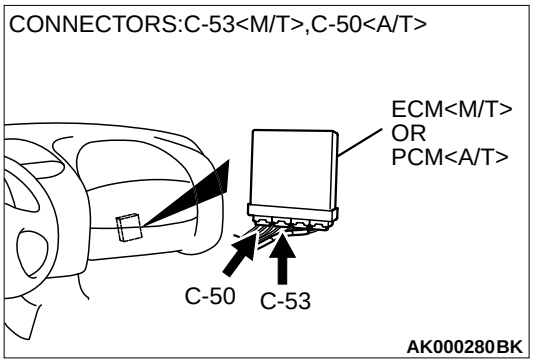


CIRCUIT OPERATION

- The EMC <M/T> or PCM <A/T> controls generator out put current by duty-controlling continuity between the generator G terminal (terminal 1) and ground.

TROUBLESHOOTING HINTS (The most likely causes for this charging system:)

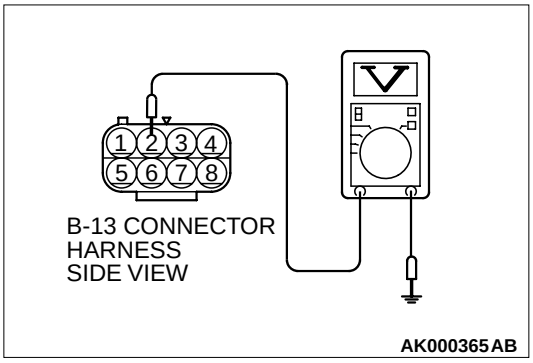
- Malfunction of the charging system.
- Short circuit in the harness between generator G terminal and ECM <M/T> or PCM <A/T>.
- ECM <M/T> or PCM <A/T> failed.

DIAGNOSIS

STEP 1. Check the voltage at generator intermediate connector B-13 by backprobing.

(1) Do not disconnect the connector B-13.
(2) Start the engine and run at idle.
(3) Measure the voltage between terminal 2 and ground by backprobing.
  a. Engine: warming up
  b. Radiator fan: stopped
  c. Headlight switch: OFF to ON
  d. Rear defogger switch: OFF to ON
  e. Stoplight switch: OFF to ON
  - Voltage rises by 0.2 – 3.5 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.



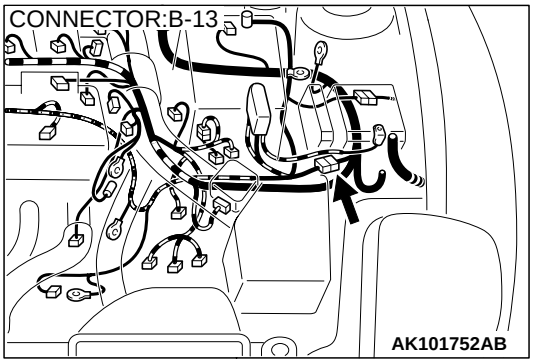
Q: Is the voltage normal?

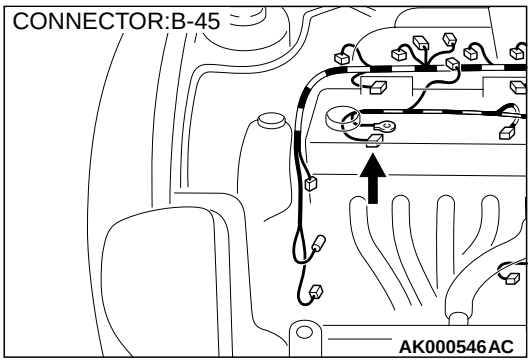
YES : Replace the generator. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 2.

STEP 2. Check connector B-13 at generator intermediate connector for damage.

Q: Is the connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.



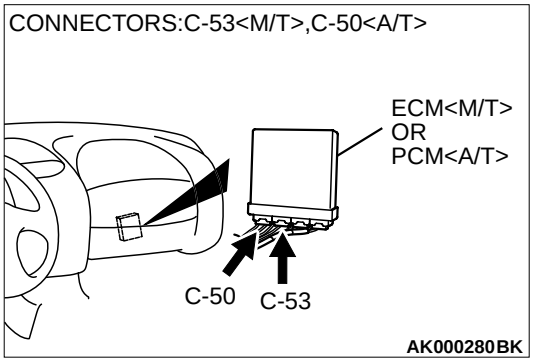


STEP 3. Check connector B-45 at generator connector for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

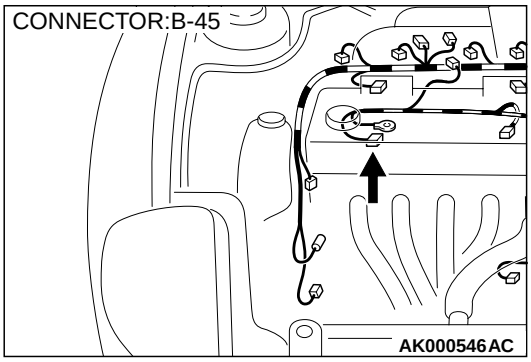


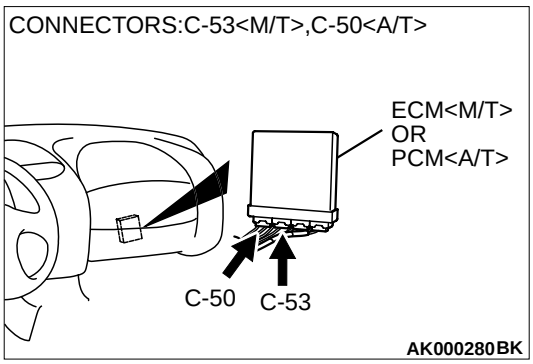
STEP 4. Check connector C-53 at ECM <M/T> or connector C-50 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.





STEP 5. Check for open circuit and short circuit to ground and harness damage between generator connector B-45 (terminal 1) and ECM connector C-53 (terminal 33) <M/T> or PCM connector C-50 (terminal 8) <A/T>.

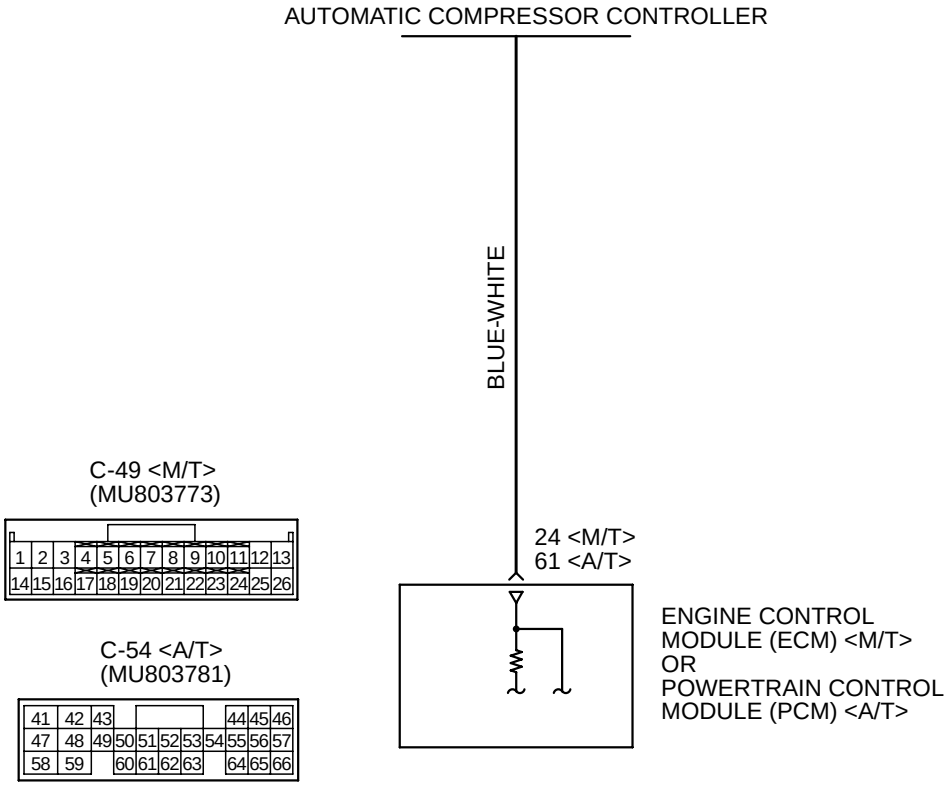
Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then confirm that the malfunction symptom is eliminated.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 27: Incorrect Idle Speed When the A/C is Operating (A/C Switch 2 Signal)

A/C Switch 2 signal Circuit



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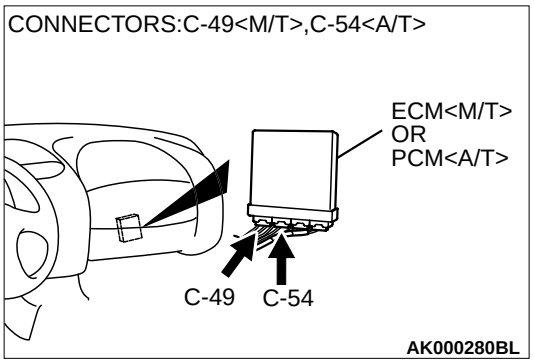


CIRCUIT OPERATION

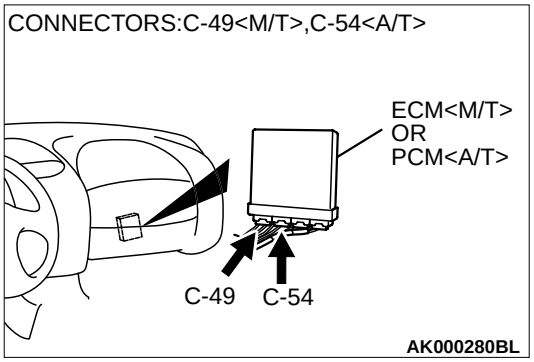
- The ECM <M/T> or PCM <A/T> increases the engine idle speed by driving the IAC motor when the automatic compressor-ECU sends a "A/C on" signal to the module.
- The automatic compressor-ECU detects how the air conditioning is applying load to the engine, and converts the information to a voltage signal (High voltage = low load, Low voltage = high load). This voltage signal is called "A/C switch 2 signal". The ECM <M/T> or PCM <A/T> receives

this A/C switch 2 signal from the automatic compressor controller through terminal 24 <M/T> or terminal 61 <A/T>, and determines the idle-up speed according to the high or low air conditioning load.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Malfunction of the A/C control system.
- Open or shorted circuit, or improper connector contact.
- ECM <M/T> or PCM <A/T> failed.

DIAGNOSIS

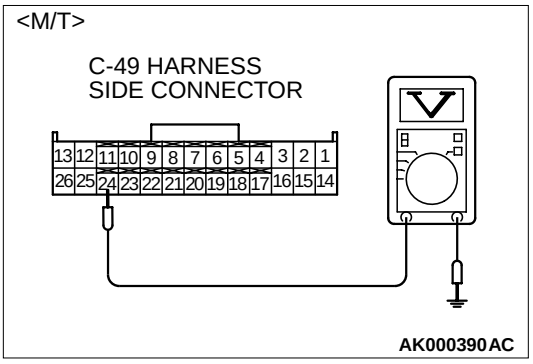


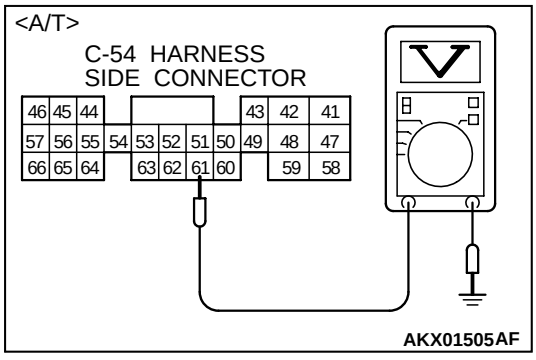
STEP 1. Check connector C-49 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.





STEP 2. Check the output voltage at ECM harness side connector C-49 <M/T> or PCM harness side connector C-54 <A/T>.

(1) Disconnect the connector C-49 <M/T> or C-54 <A/T> and measure at the harness side.
(2) Start the engine and run at idle.
(3) Turn the A/C switch "ON".
(4) Measure the voltage between terminal 24 <M/T> or 61 <A/T> and ground.
- If atmospheric air temperature is 15°C (59°F) or less, the voltage should be 1 volt or less.
- If atmospheric air temperature is 18°C (65.4°F) more, the voltage should be battery positive voltage.

(5) Turn the A/C switch "OFF".
(6) Turn the ignition switch to the "LOCK" (OFF) position.

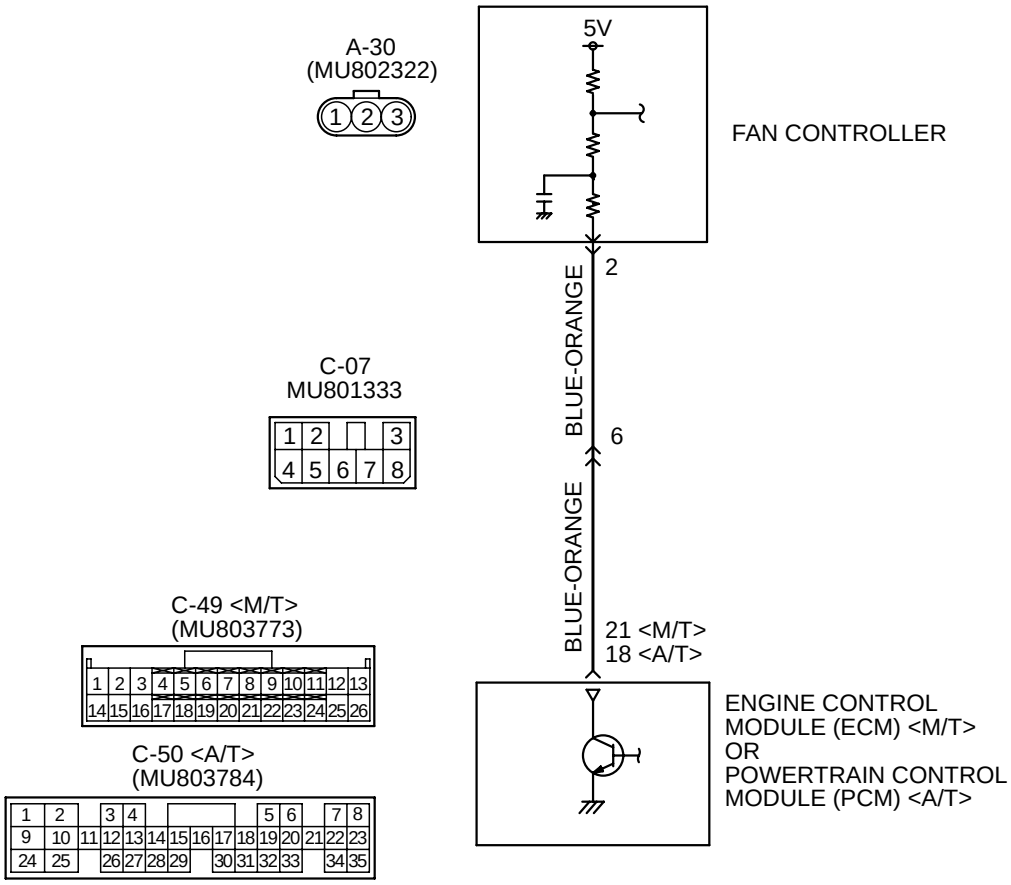
Q: Is the voltage normal?

YES : Replace the ECM or PCM. Then confirm that the malfunction symptom is eliminated.

NO : Refer to GROUP 55, Introduction To Heater, Air Conditioning And Ventilation Diagnosis P.55-5.

INSPECTION PROCEDURE 28: Fans (radlator fan) is inoperative

Radiator fan, A/C condenser fan Circuit



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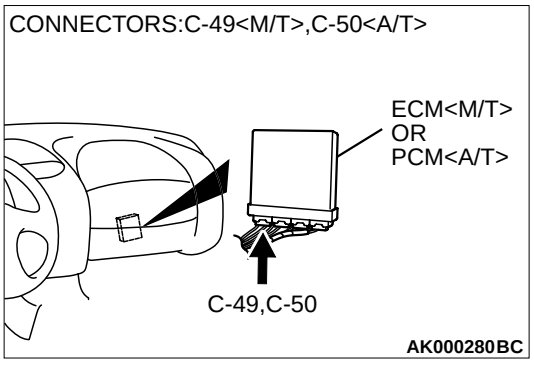

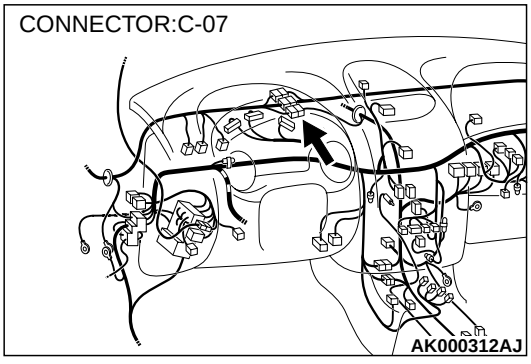

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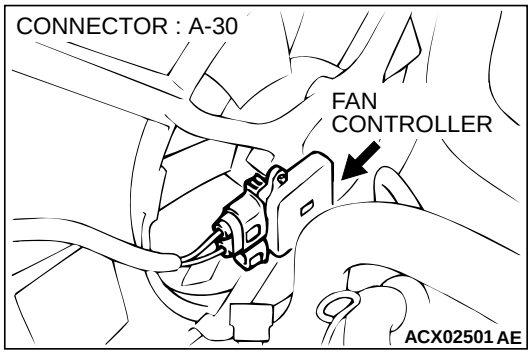


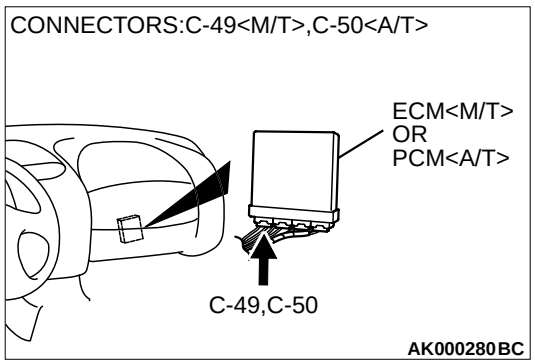
CIRCUIT OPERATION

- The ECM <M/T> or PCM <A/T> sends a duty signal to the fan controller according to engine coolant temperature, vehicle speed, and the condition of the A/C switch. (The closer the average voltage at the terminal comes to five volts, the higher the fan speed becomes.)

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

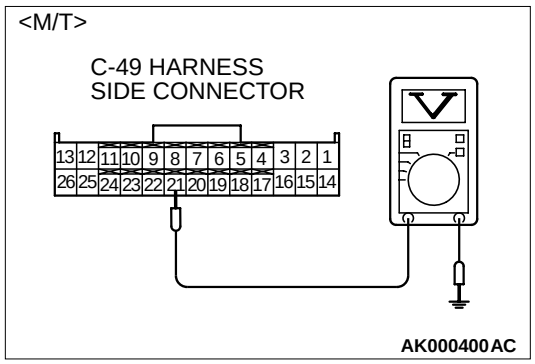
- Malfunction of the fan motor relay.
- Malfunction of the fan motor.
- Malfunction of the fan controller.
- Improper connector contact, open or short-circuited harness wire.
- ECM <M/T> or PCM <A/T> failed.

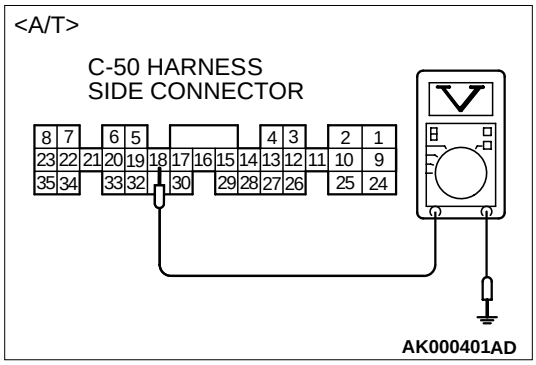
DIAGNOSIS



STEP 1. Check connector C-49 at ECM <M/T> or connector C-50 at PCM <A/T> for damage.
Q: Is the connector in good condition?

YES : Go to Step 2.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.





STEP 2. Check the output voltage at ECM harness side connector C-49 <M/T> or PCM harness side connector C-50 <A/T>.

(1) Disconnect the connector C-49 <M/T> or C-50 <A/T> and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 21 <M/T> or 18 <A/T> and ground.
- Voltage should be between 4.8 and 5.2 volts. (Fan rotates at high speed.)

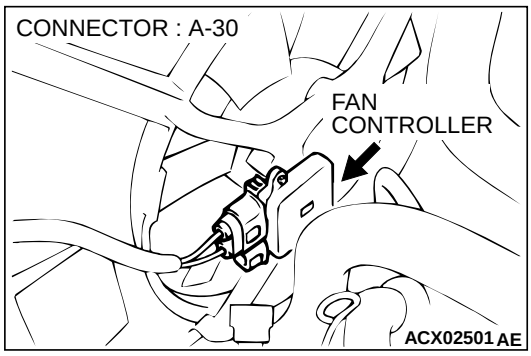
(4) Connect a jumper cable between 21 <M/T> or 18 <A/T> and ground.
- The fan should stop.

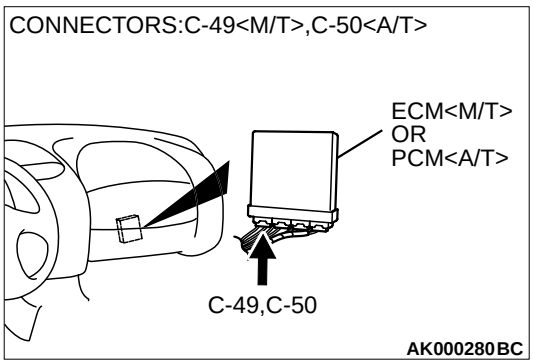
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage and fan condition normal?

YES : Replace the ECM or PCM. Then confirm that the malfunction symptom is eliminated.

NO : Go to Step 3.





STEP 3. Check for open circuit and short circuit to ground and harness damage between fan controller A-30 (terminal 2) and ECM connector C-49 (terminal 21) <M/T> or PCM connector C-50 (terminal 18) <A/T>.

NOTE: Check harness after checking intermediate connector C-07. If intermediate connector is damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

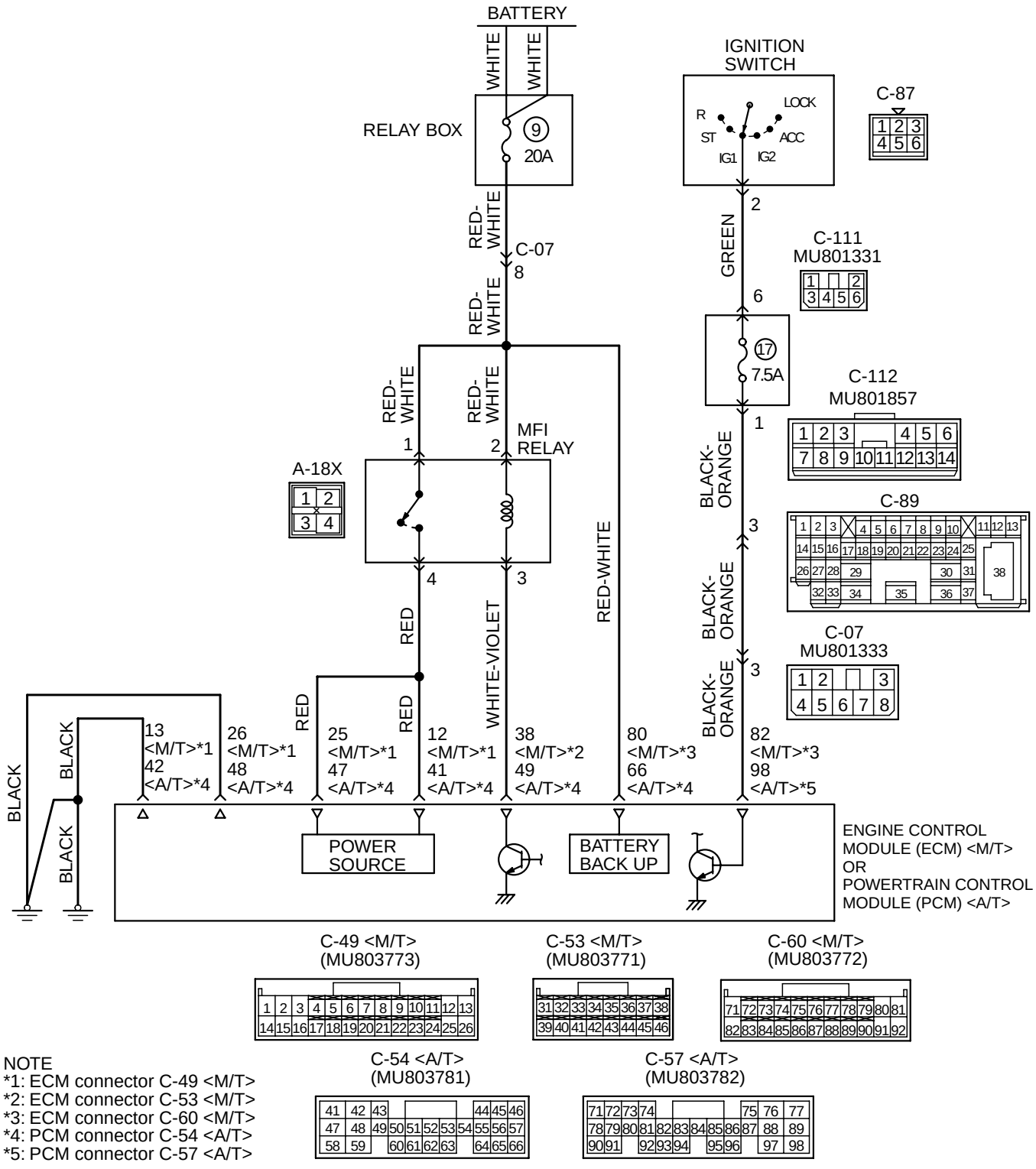
Q: Is the harness wire in good condition?

YES : Refer to GROUP 14 – Engine Cooling Diagnosis – Symptom Chart P.14-3.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 29: Power supply system and ignition switch – IG system.

Power Supply and Ignition Switch-IG Circuit



NOTE
*1: ECM connector C-49 <M/T>
*2: ECM connector C-53 <M/T>
*3: ECM connector C-60 <M/T>
*4: PCM connector C-54 <A/T>
*5: PCM connector C-57 <A/T>

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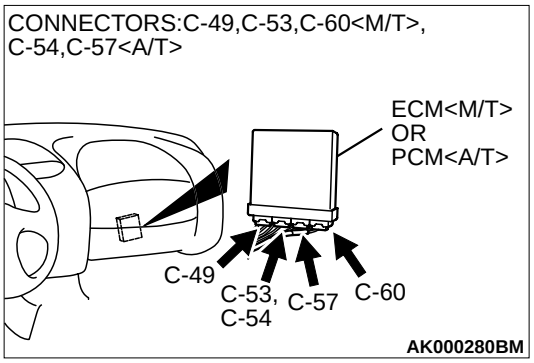
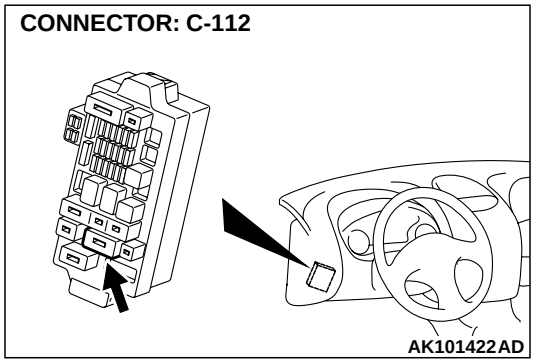
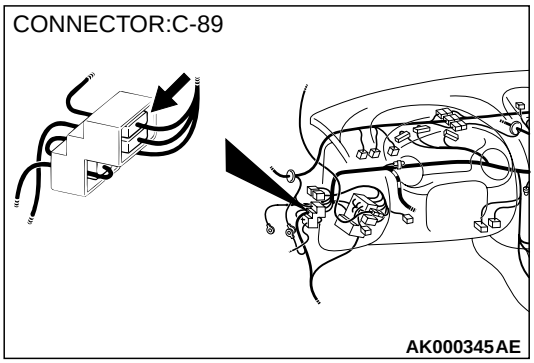
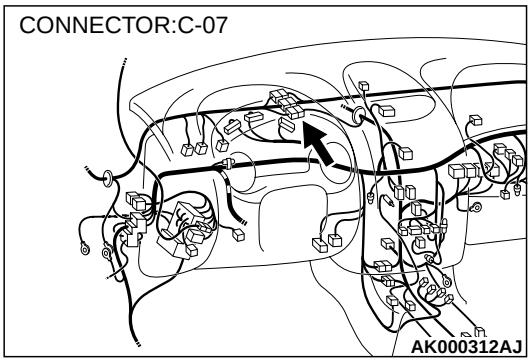
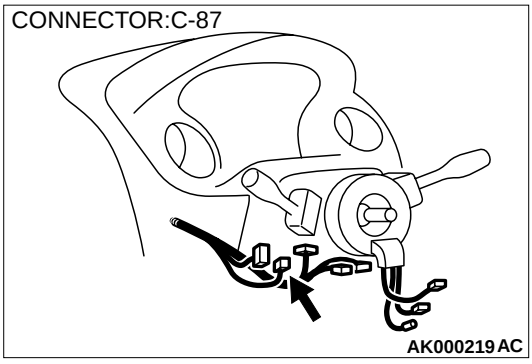
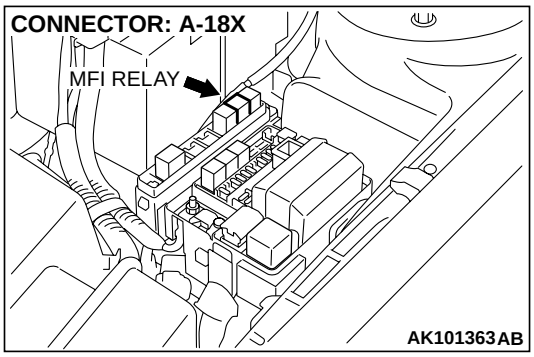


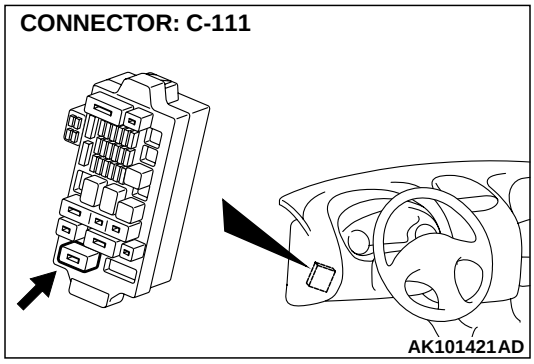












CIRCUIT OPERATION

- Battery positive voltage is applied to the MFI relay (terminals 3, 4).
- When the ignition switch is turned to the "ON" position, the battery positive voltage is applied to the ECM (terminal 82) <M/T> or PCM (terminal 98) <A/T>. When the battery positive voltage is applied, the ECM <M/T> or PCM <A/T> turns the power transistor in the ECM <M/T> or PCM <A/T> "ON" and grounds the MFI relay coil. With this, the MFI relay turns "ON" and the battery positive voltage is supplied to the ECM (terminal 12, 25) <M/T> or PCM (terminal 41, 47) <A/T> from the MFI relay (terminal 1).
- Battery positive voltage is constantly supplied to the ECM (terminal 80) <M/T> or PCM (terminal 66) <A/T> as the backup power.

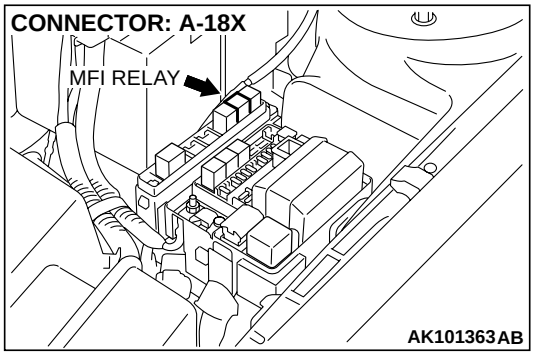
TSB Revision

- The ECM (terminal 13, 26) <M/T> or PCM (terminals 42, 48) <A/T> is grounded to the vehicle body.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Malfunction of the ignition switch.
- Malfunction of the MFI relay.
- Improper connector contact, open circuit or short-circuited harness wire.
- Disconnected ECM <M/T> or PCM <A/T> ground wire.
- Malfunction of the ECM <M/T> or PCM <A/T>.

DIAGNOSIS



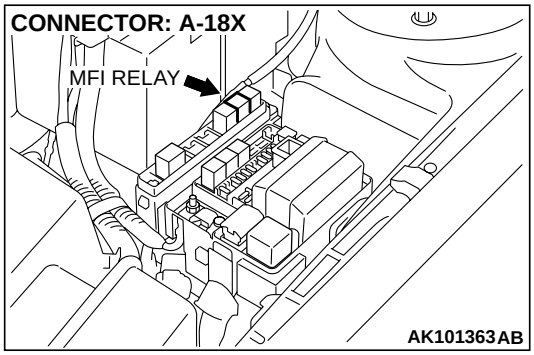
STEP 1. Check connector A-18X at MFI relay for damage.
Q: Is the connector in good condition?

YES : Go to Step 2.

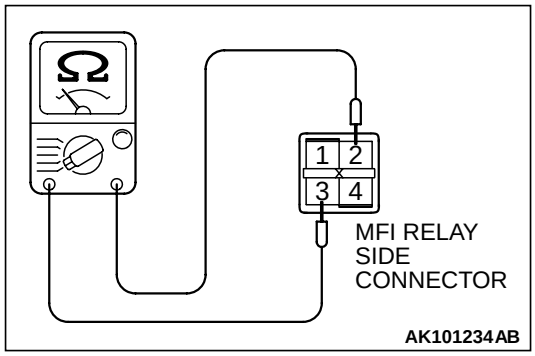
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

STEP 2. Check the MFI relay.

(1) Remove the MFI relay.

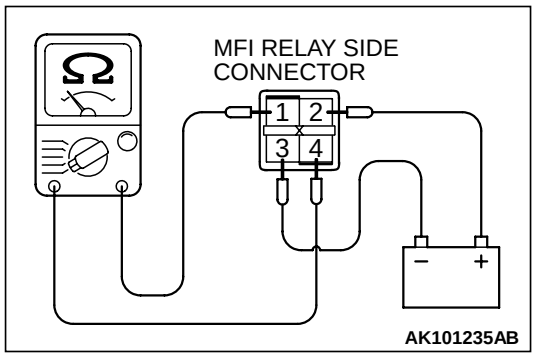


(2) Check for continuity between the MFI relay terminals 2 and 3.
- There should be continuity. (approximately 70 Ω)



(3) Use jumper wires to connect MFI relay terminal 2 to the positive battery terminal and terminal 3 to the negative battery terminal.

(4) Check the continuity between the MFI relay terminals 1 and 4 while connecting and disconnecting the jumper wire at the negative battery terminal.
- Should be less than 2 ohm. (Negative battery terminal connected)
- Should be open loop. (Negative battery terminal disconnected)

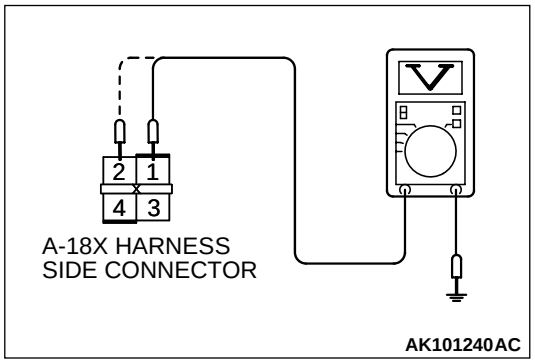


(5) Install the MFI relay.

Q: Is the voltage normal?

YES : Go to Step 3.

NO : Replace the MFI relay. Then confirm that the malfunction symptom is eliminated.



STEP 3. Check the power supply voltage at MFI relay harness side connector A-18X.

(1) Disconnect the connector A-18X and measure at the harness side.

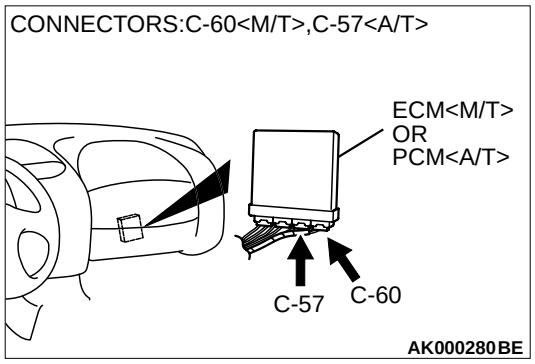
(2) Measure the voltage between terminal 1, 2 and ground.

- Voltage should be battery positive voltage.

Q: Is the voltage normal?

YES : Go to Step 4.

NO : Check harness connector C-07 at intermediate connector for damage, and repair or replace as required. Refer to, GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between relay box (9) and MFI relay connector A-18X (terminal 1, 2) because of open circuit. Then confirm that the malfunction symptom is eliminated.

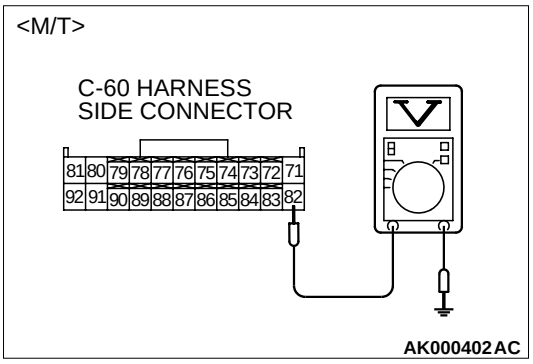


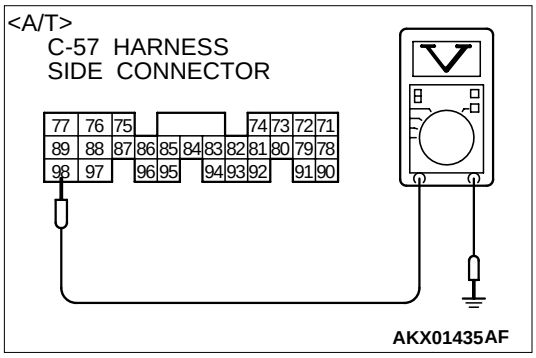
STEP 4. Check connector C-60 at ECM <M/T> or connector C-57 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.





STEP 5. Check the ignition switch-IG signal voltage at ECM harness side connector C-60 <M/T> or PCM harness side connector C-57 <A/T>.

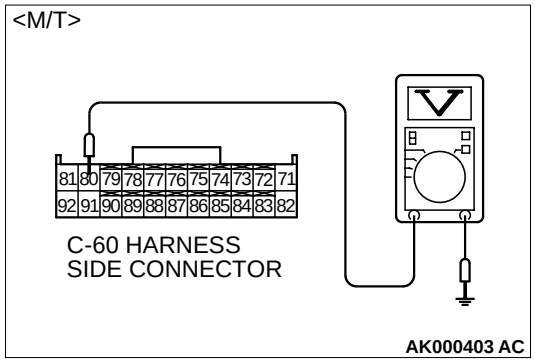
(1) Disconnect the connector C-60 <M/T> or C-57 <A/T> and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 82 <M/T> or 98 <A/T> and ground.
- Voltage should be battery positive voltage.

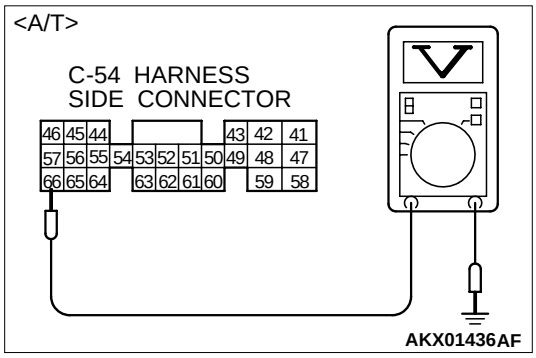
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 6.

NO : Check harness connector C-07, C-89, C-111 and C-112 at intermediate connector for damage, and repair or replace as required. Refer to, GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connectors are in good condition, repair harness wire between ignition switch connector C-87 (terminal 2) and ECM connector C-60 (terminal 82) <M/T> or PCM connector C-57 (terminal 98) <A/T> because of open circuit. Then confirm that the malfunction symptom is eliminated.





STEP 6. Check the backup power supply voltage at ECM harness side connector C-60 <M/T> or PCM harness side connector C-54 <A/T>.

(1) Disconnect the connector C-60 <M/T> or C-54 <A/T> and measure at the harness side.

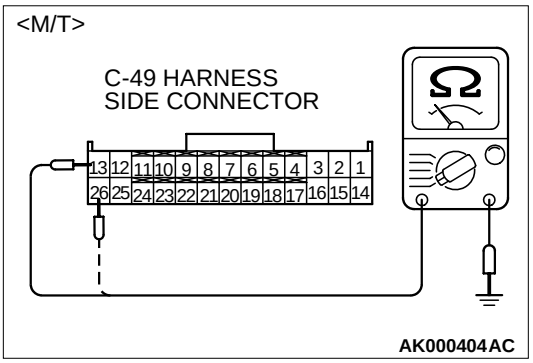
(2) Measure the voltage between terminal 80 <M/T> or 66 <A/T> and ground.

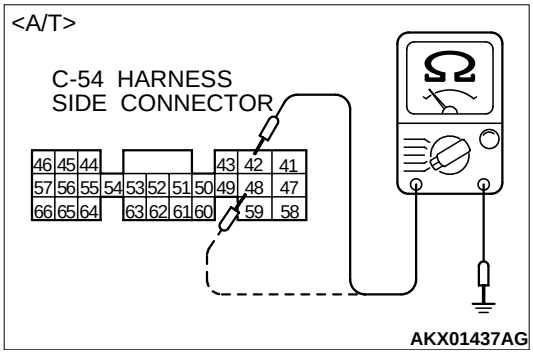
- Voltage should be battery positive voltage.

Q: Is the voltage normal?

YES : Go to Step 7.

NO : Check harness connector C-07 at intermediate connector for damage, and repair or replace as required. Refer to, GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connectors are in good condition, repair harness wire between relay box (9) and ECM connector C-60 (terminal 80) <M/T> or PCM connector C-54 (terminal 66) <A/T> because of open circuit. Then confirm that the malfunction symptom is eliminated.





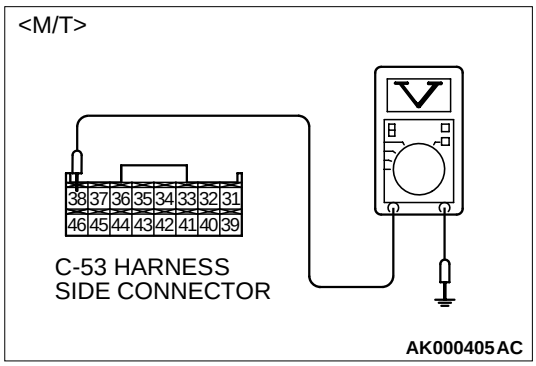
STEP 7. Check the continuity at ECM harness side connector C-49 <M/T> or PCM harness side connector C-54 <A/T>.

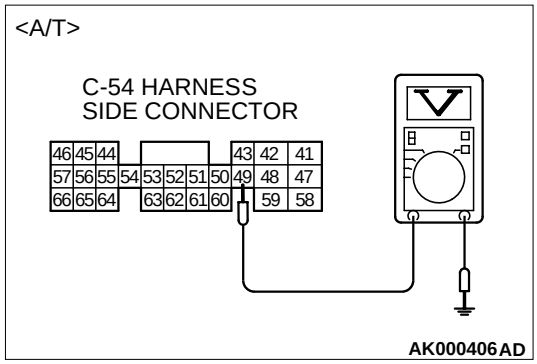
(1) Disconnect the connector C-49 <M/T> or C-54 <A/T> and measure at the harness side.
(2) Check for the continuity between terminal (13, 26) <M/T> or (42, 48) <A/T> and ground.
- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 8.

NO : Repair harness wire between ECM connector C-49 (terminal 13, 26) <M/T> or PCM connector C-54 (terminal 42, 48) <A/T> and ground because of open circuit. Then confirm that the malfunction symptom is eliminated.





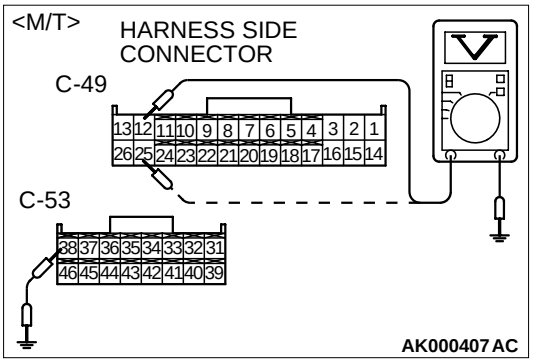
STEP 8. Check the power supply voltage at ECM harness side connector C-53 <M/T> or PCM harness side connector C-54 <A/T>.

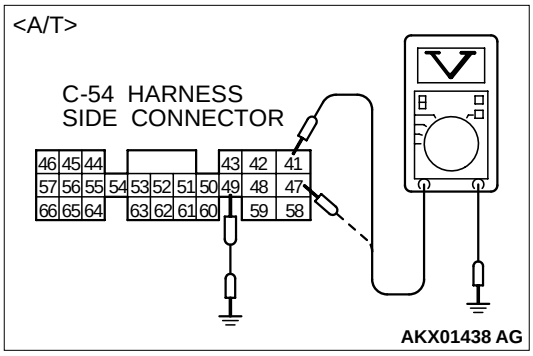
(1) Disconnect the connector C-53 <M/T> or C-54 <A/T> and measure at the harness side.
(2) Measure the voltage between terminal 38 <M/T> or 49 <A/T> and ground.
- Voltage should be battery positive voltage.

Q: Is the voltage normal?

YES : Go to Step 9.

NO : Repair harness wire between MFI relay connector A-18X terminal 3 and ECM connector C-53 (terminal 38) <M/T> or PCM connector C-54 (terminal 49) <A/T> because of open circuit. Then confirm that the malfunction symptom is eliminated.





STEP 9. Check the power supply voltage at ECM harness side connector C-49, C-53 <M/T> or PCM harness side connector C-54 <A/T>.

(1) Disconnect the connector C-49, C-53 <M/T> or C-54 <A/T> and measure at the harness side.
(2) Using a jumper wire, connect terminal 38 <M/T> or 49 <A/T> to ground.
(3) Measure the voltage between terminal (12, 25) <M/T> or (41, 47) <A/T> and ground.
- Voltage should be battery positive voltage.

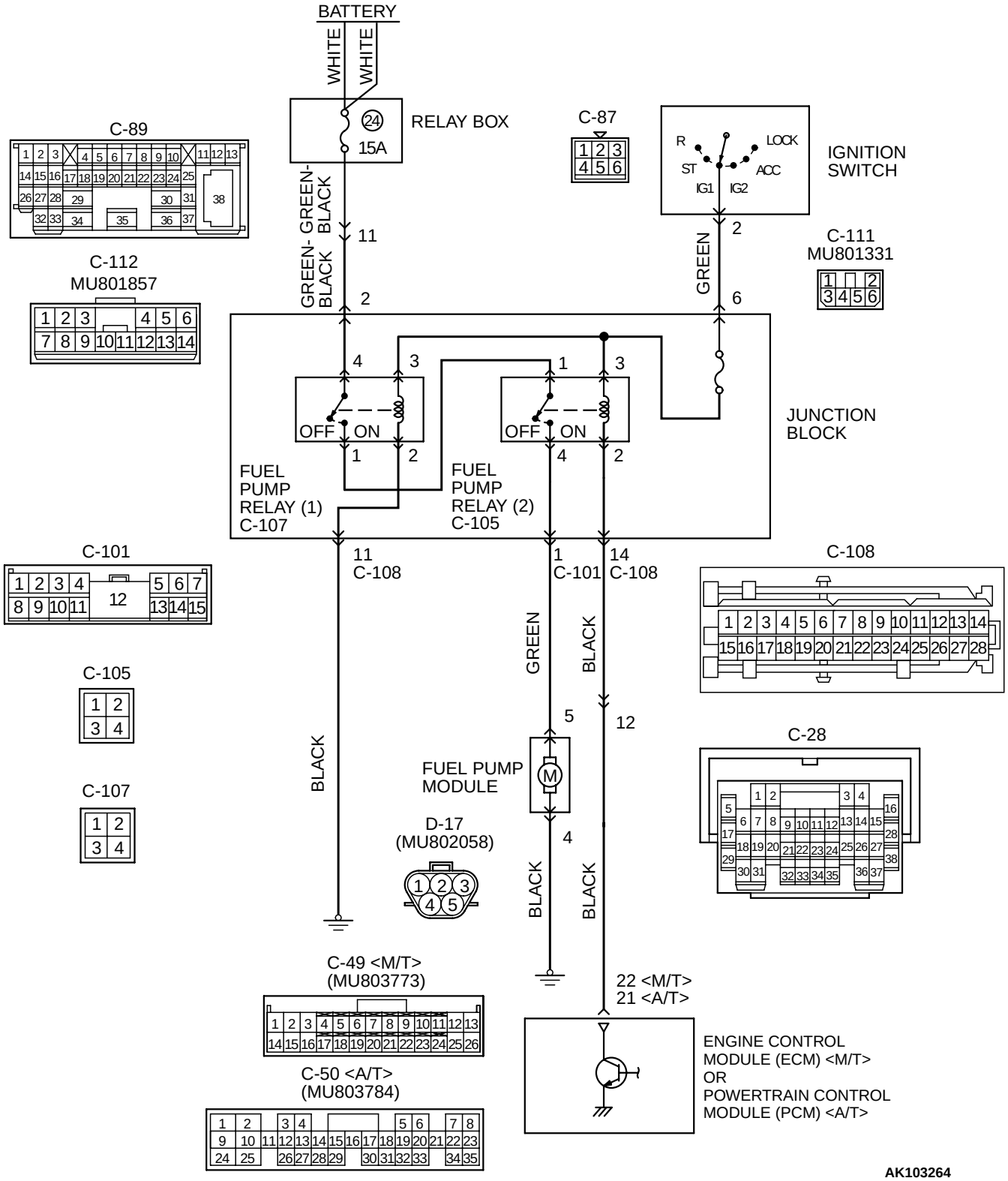
Q: Is the voltage normal?

YES : Replace the ECM or PCM. Then confirm that the malfunction symptom is eliminated.

NO : Repair harness wire between MFI relay connector A-18X terminal 4 and ECM connector C-49 (terminal 12, 25) <M/T> or PCM connector C-54 (terminal 41, 47) <A/T> because of open circuit. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 30: Fuel pump system.

Fuel Pump Circuit



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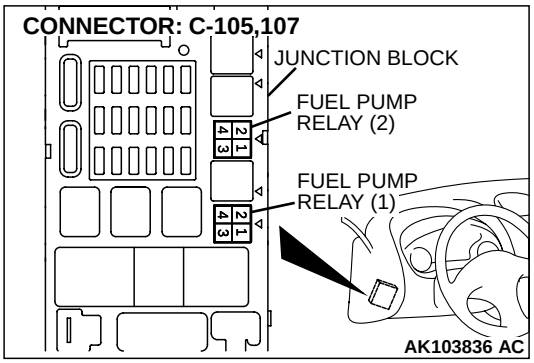
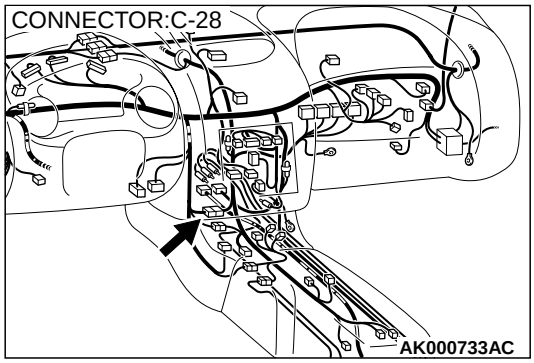
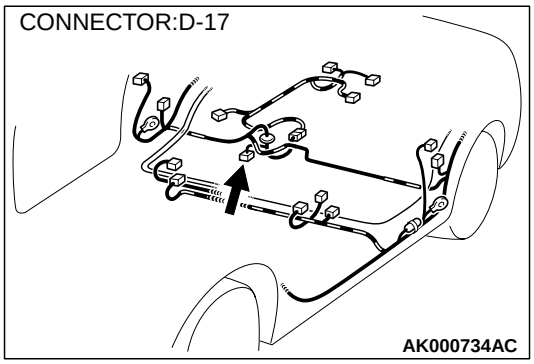
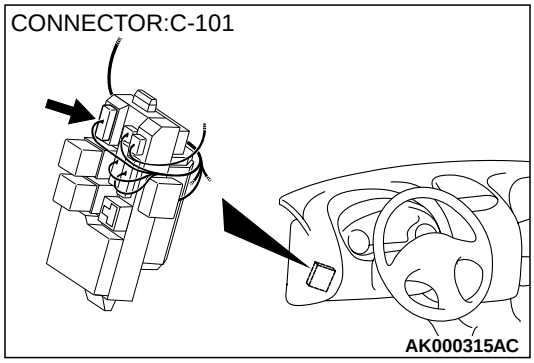
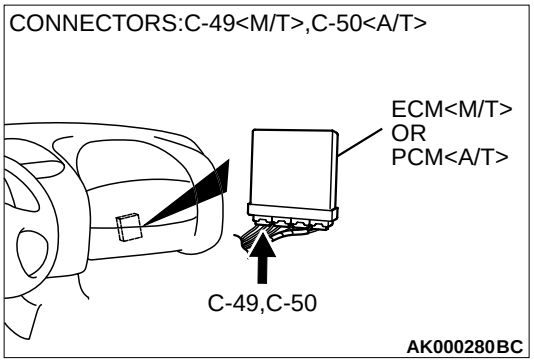
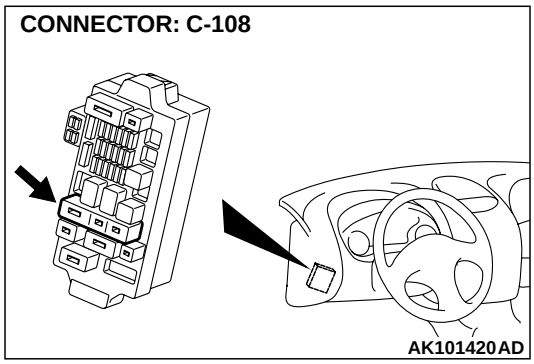

CONNECTOR: C-105,107
JUNCTION BLOCK
FUEL PUMP RELAY (2)
FUEL PUMP RELAY (1)
AK103836 AC

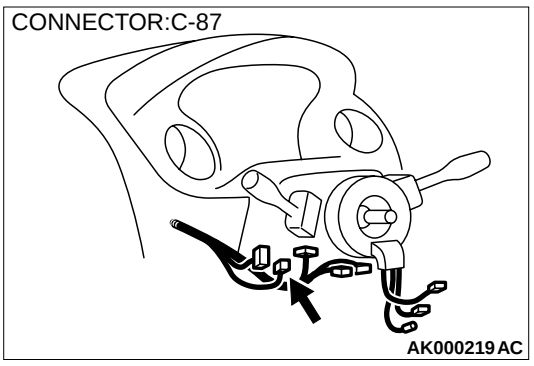

CONNECTOR:C-28
AK000733AC

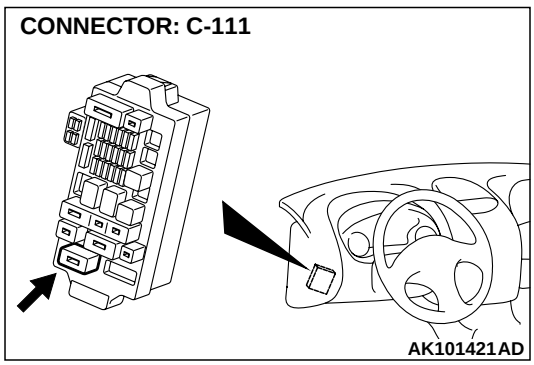

CONNECTOR:D-17
AK000734AC

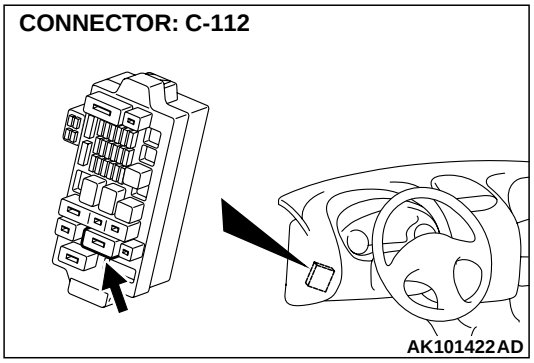

CONNECTOR:C-101
AK000315AC

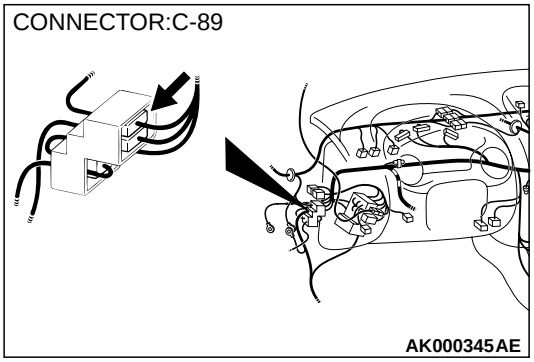

CONNECTORS:C-49<M/T>,C-50<A/T>
ECM<M/T> OR PCM<A/T>
C-49,C-50
AK000280BC


CONNECTOR: C-108
AK101420AD


CONNECTOR:C-87
AK000219AC


CONNECTOR: C-111
AK101421AD





CIRCUIT OPERATION

- Battery positive voltage is applied to the fuel pump relay 1 (terminal 3) from the ignition switch-IG.
  Ground is provided through terminal 2 to chassis ground.
- When the ignition switch is turned to the "ON" position, the battery positive voltage is applied to the fuel pump relay 2 (terminal 1) from the fuel pump relay 1 (terminal 1).
- A battery positive voltage is applied on the fuel pump relay 2 (terminal 3) from the ignition switch-IG.
- During cranking and while the engine is running, the ECM <M/T> or PCM <A/T> turns the power transistor in the ECM <M/T> or PCM <A/T> ON to ground the fuel pump relay 2 coil. With this, the fuel pump relay turns ON, and the battery positive voltage is supplied to the fuel pump from the fuel pump relay 2 (terminal 4).

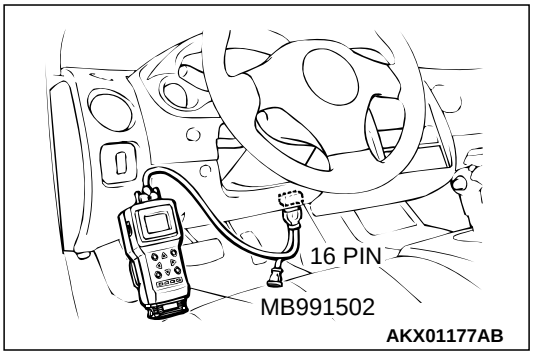
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Malfunction of the fuel pump relay.
- Malfunction of the fuel pump.
- Improper connector contact, open or short-circuited harness wire.
- Malfunction of the ECM <M/T> or PCM <A/T>.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check actuator test item 07: Fuel Pump.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the actuator test mode for item 07, Fuel Pump.
  - An operation sound of the fuel pump should be heard.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the fuel pump operating properly?

YES : That this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6.

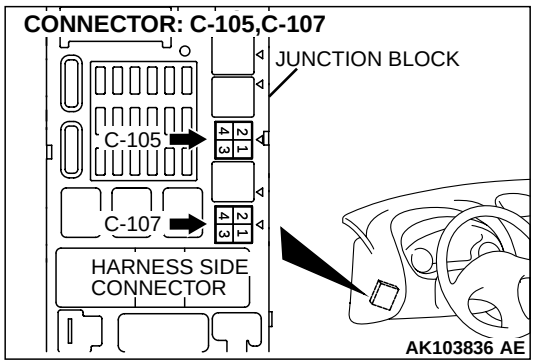
NO : Go to Step 2.

STEP 2. Check connector C-107 at fuel pump relay 1 and connector C-105 at fuel pump relay 2 for damage.

Q: Is the connector in good condition?

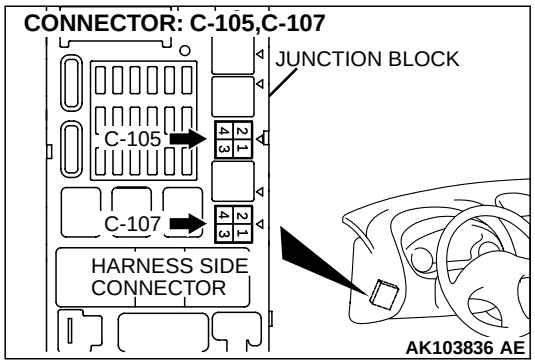
YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.



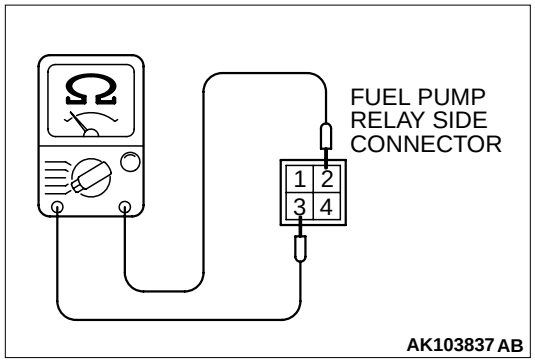
STEP 3. Check the fuel pump relay 1 and 2.

(1) Remove the fuel pump relay.



(2) Check for continuity between the fuel pump relay terminals 2 and 3.

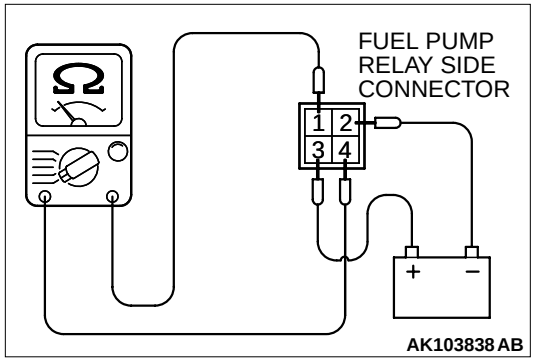
- There should be continuity. (approximately 70 Ω)



(3) Use jumper wires to connect fuel pump relay terminal 3 to the positive battery terminal and terminal 2 to the negative battery terminal.

(4) Check the continuity between the fuel pump relay terminals 1 and 4 while connecting and disconnecting the jumper wire at the negative battery terminal.

- Should be less than 2 ohm. (Negative battery terminal connected)
- Should be open loop. (Negative battery terminal disconnected)



(5) Install the fuel pump relay.

Q: Is the resistance normal?

YES : Go to Step 4.

NO : Replace the fuel pump relay. Then confirm that the malfunction symptom is eliminated.

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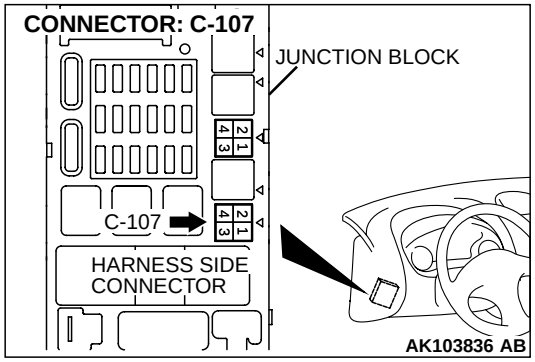
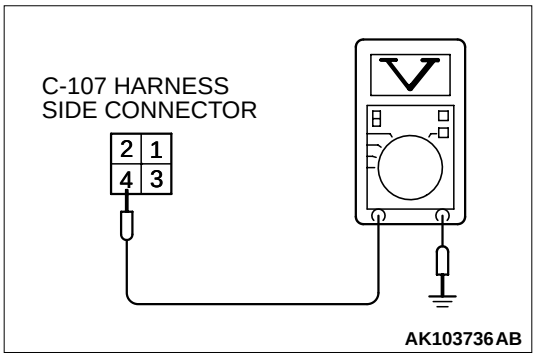




STEP 4. Check the power supply voltage at fuel pump relay 1 harness side connector C-107.

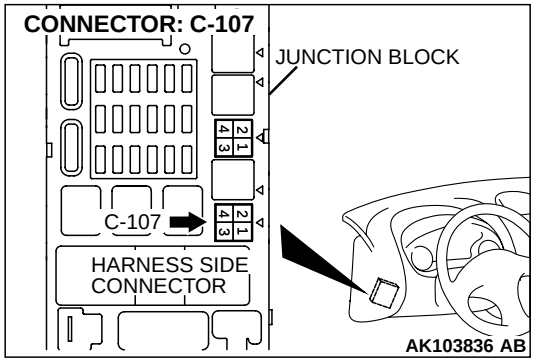
(1) Disconnect the connector C-107 and measure at the harness side.

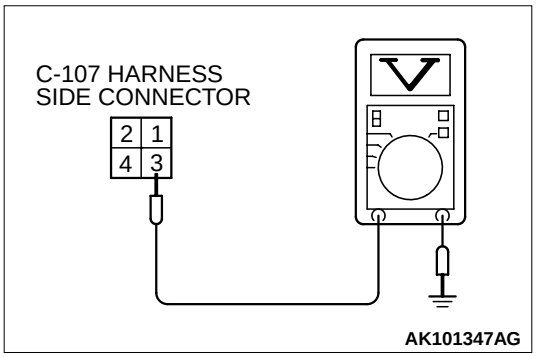
(2) Measure the voltage between terminal 4 and ground.
- Voltage should be battery positive voltage.

Q: Is the voltage normal?

YES : Go to Step 5.

NO : Check harness connectors C-89 and C-112 at intermediate connector for damage, and repair or replace as required. Refer to, GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connectors are in good condition, repair harness wire between relay box (24) and fuel pump relay 1 connector C-107 terminal 4 because of open circuit. Then confirm that the malfunction symptom is eliminated.





STEP 5. Check the power supply voltage at fuel pump relay 1 harness side connector C-107.

(1) Disconnect the connector C-107 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 3 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

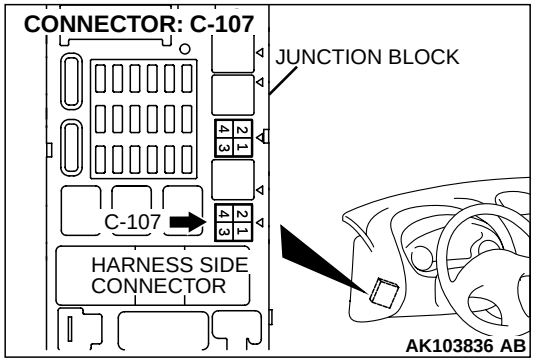
Q: Is the voltage normal?

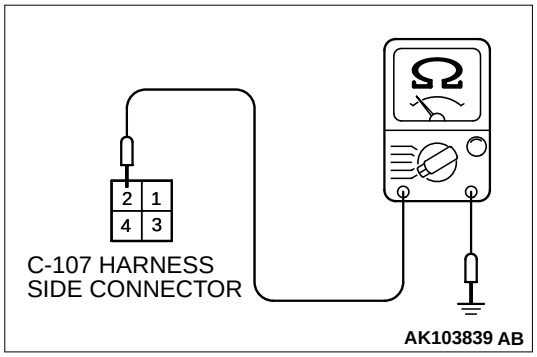
YES : Go to Step 6.

NO : Check harness connector C-111 at intermediate connector for damage, and repair or replace as required. Refer to, GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between ignition switch connector C-87 (terminal 2) and fuel pump relay 1 connector C-107 (terminal 3) because of open circuit. Then confirm that the malfunction symptom is eliminated.

STEP 6. Check the continuity at fuel pump relay 1 harness side connector C-107.

(1) Disconnect the connector C-107 and measure at the harness side.





(2) Check for the continuity between terminal 2 and ground.
- Should be less than 2 ohm.

Q: Is the continuity normal?

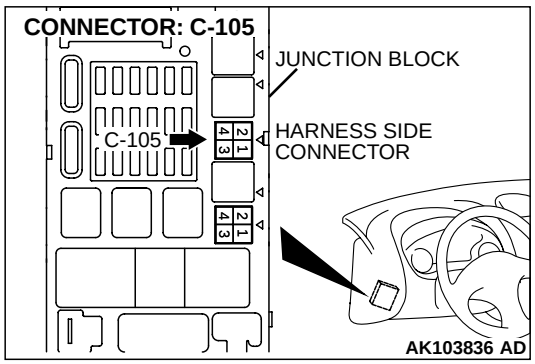
YES : Go to Step 7.

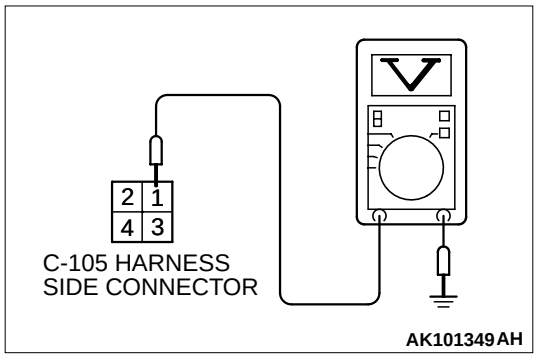
NO : Check harness connector C-101 at intermediate connector for damage, and repair or replace as required. Refer to, GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connectors are in good condition, repair harness wire between fuel pump relay 1 connector C-107 (terminal 2) and ground because of open circuit. Then confirm that the malfunction symptom is eliminated.

STEP 7. Check the power supply voltage at fuel pump relay 2 harness side connector C-105.

(1) Disconnect the connector C-105 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.



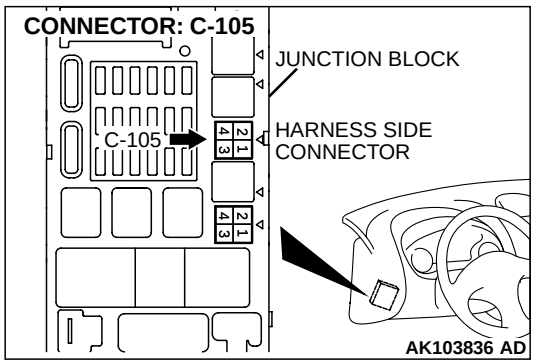


(3) Measure the voltage between terminal 1 and ground.
- Voltage should be battery positive voltage.

Q: Is the voltage normal?

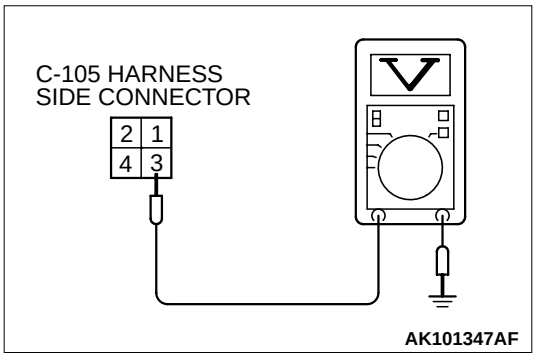
YES : Go to Step 8.

NO : Repair harness wire between fuel pump relay 1 connector C-107 (terminal 1) and fuel pump relay 2 connector C-105 (terminal 1) because of open circuit. Then confirm that the malfunction symptom is eliminated.



STEP 8. Check the power supply voltage at fuel pump relay 2 harness side connector C-105.

(1) Disconnect the connector C-105 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.



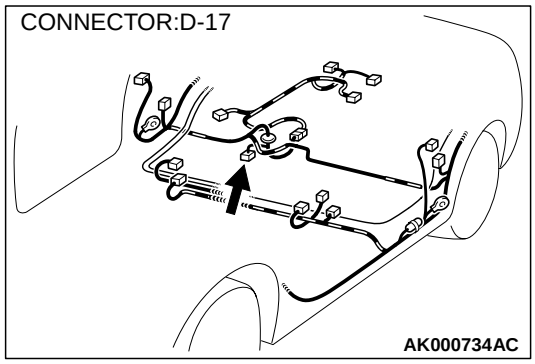
(3) Measure the voltage between terminal 3 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 9.

NO : Check harness connector C-111 at intermediate connector for damage, and repair or replace as required. Refer to, GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between ignition switch connector C-87 (terminal 2) and fuel pump relay 2 connector C-105 (terminal 3) because of open circuit. Then confirm that the malfunction symptom is eliminated.

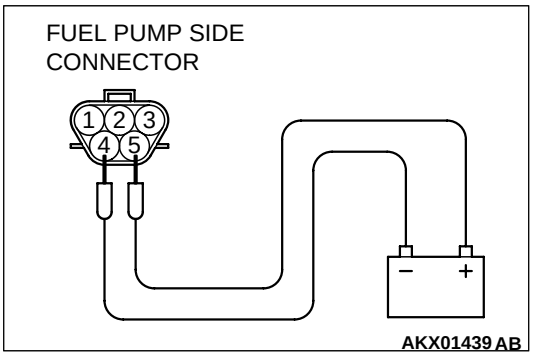


STEP 9. Check connector D-17 at fuel pump for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

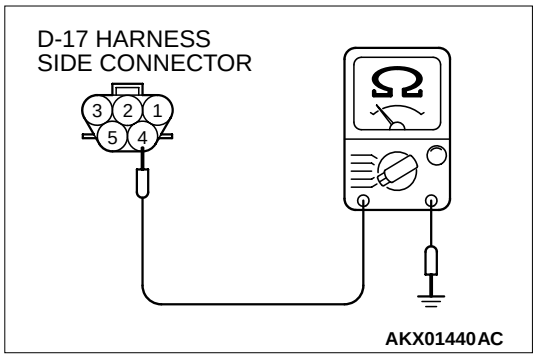


STEP 10. Check the fuel pump operation.

(1) Disconnect fuel pump connector D-17.
(2) Use jumper wires to connect fuel pump connector terminal 5 to the positive battery terminal and terminal 4 to the negative battery terminal.
- An operating sound of the fuel pump should be heard.

Q: Is the fuel pump operating properly?

YES : Go to Step 11.
NO : Replace the fuel pump. Then confirm that the malfunction symptom is eliminated.

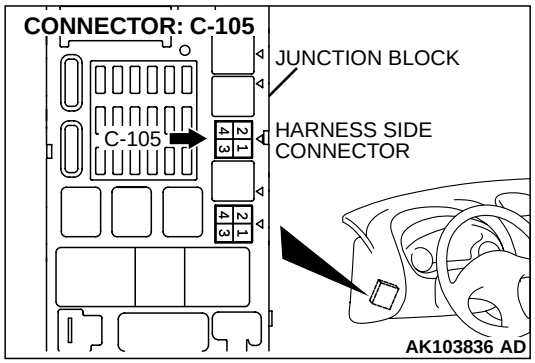


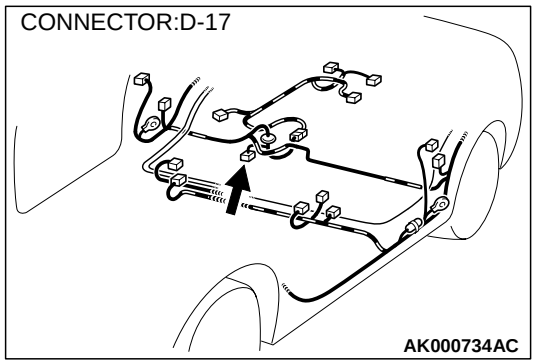
STEP 11. Check the continuity at fuel pump harness side connector D-17.

(1) Disconnect the connector D-17 and measure at the harness side.
(2) Check for the continuity between terminal 4 and ground.
- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 12.
NO : Repair harness wire damage between fuel pump connector D-17 (terminal 4) and ground because of open circuit or harness damage. Then confirm that the malfunction symptom is eliminated.





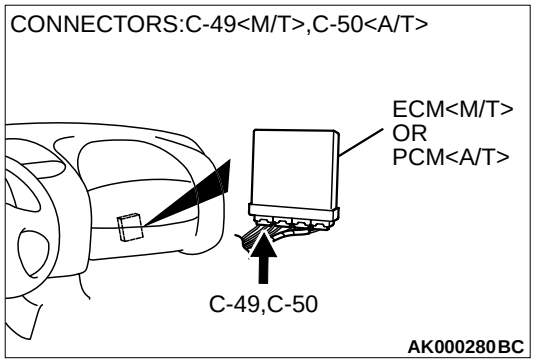
STEP 12. Check for open circuit and short circuit to ground and harness damage between fuel pump relay 2 connector C-105 (terminal 4) and fuel pump connector D-17 (terminal 5).

NOTE: Check harness after checking intermediate connector C-101. If intermediate connectors are damaged, repair or replace them. After to GROUP 00E, Harness Connector Inspection P.00E-2. Then check that the malfunction is eliminated.

Q: Is the harness wire in good condition?

YES : Go to Step 13.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.

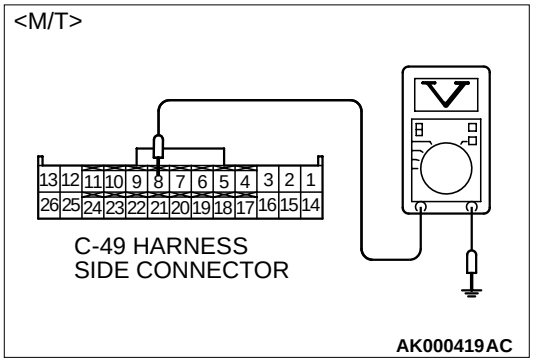


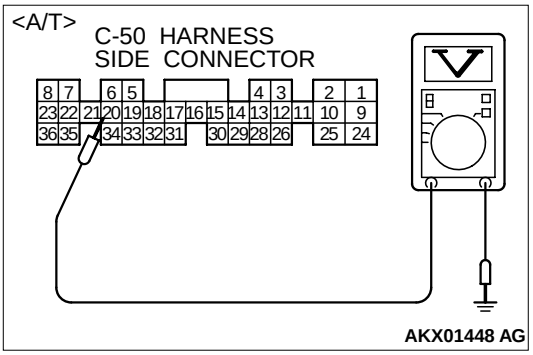
STEP 13. Check connector C-49 at ECM <M/T> or connector C-50 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.





STEP 14. Check the power supply voltage at ECM connector C-49 <M/T> or PCM connector C-50 <A/T>.

(1) Disconnect the connector C-49 <M/T> or C-50 <A/T> and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 22 <M/T> or 21 <A/T> and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

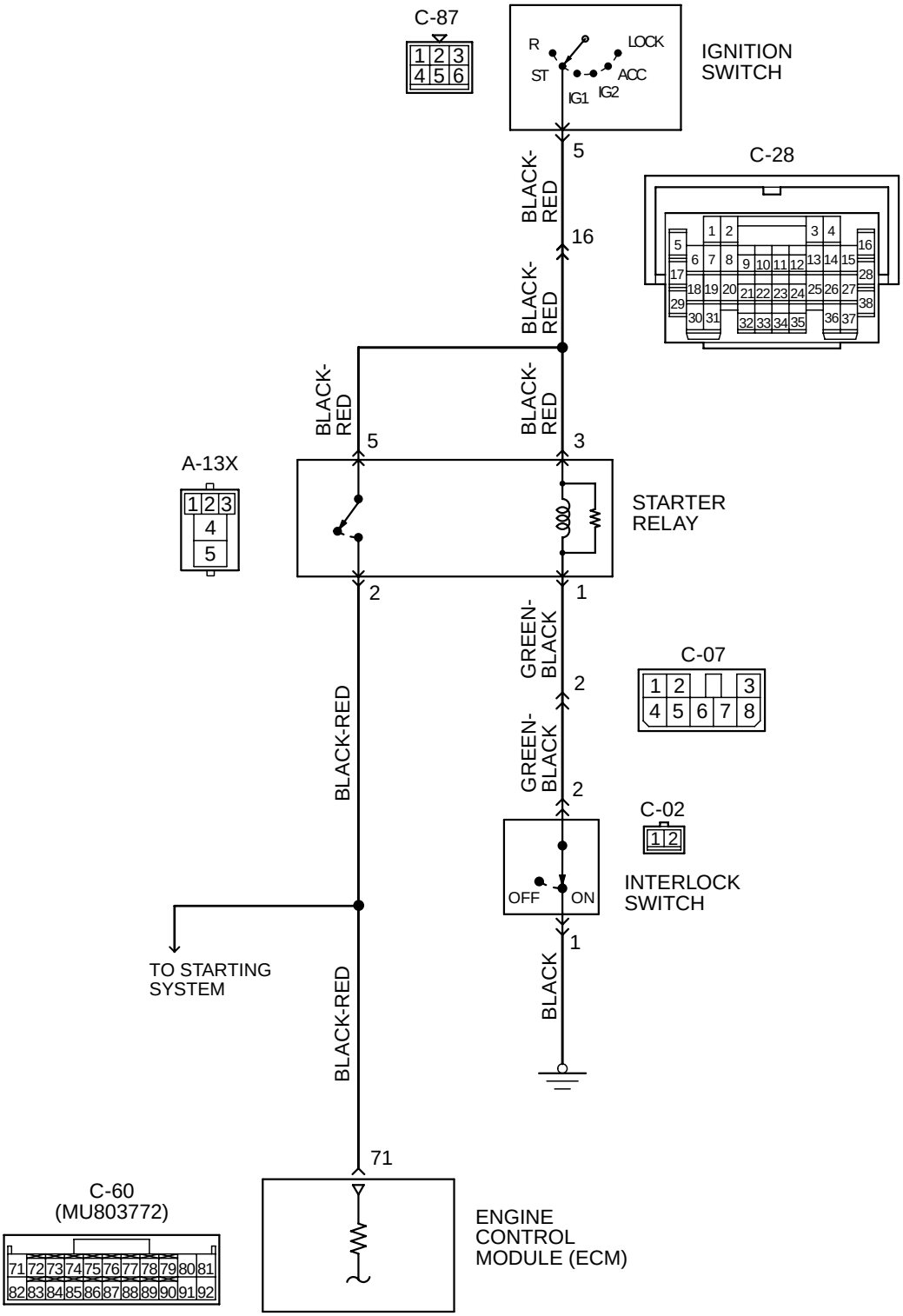
Q: Is the voltage normal?

YES : Replace the ECM or PCM. Then confirm that the malfunction symptom is eliminated.

NO : Check harness connector C-28 and C-108 at intermediate connector for damage, and repair or replace as required. Refer to, GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connectors are in good condition, repair harness wire between fuel pump relay 2 connector C-105 (terminal 2) and ECM connector C-49 (terminal 22) <M/T> or PCM connector C-50 (terminal 21) <A/T> because of open circuit. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 31: Ignition Switch-ST System. <M/T>

Ignition Switch-ST Circuit



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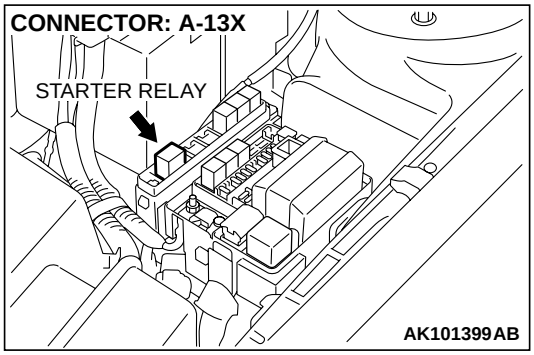
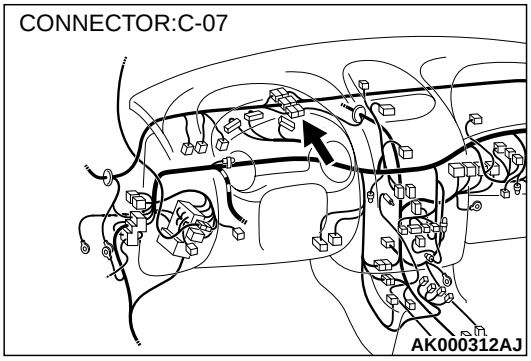
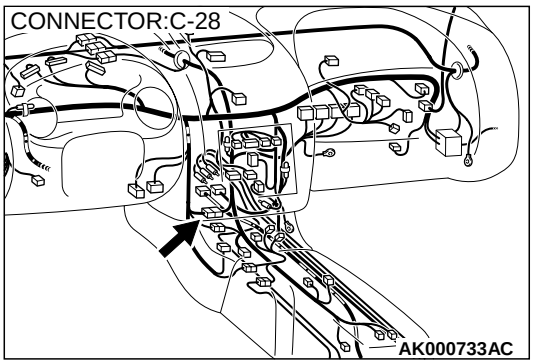
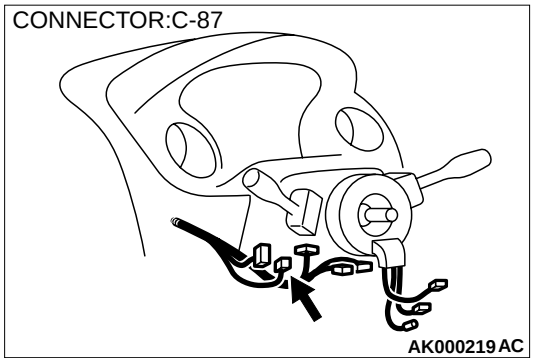
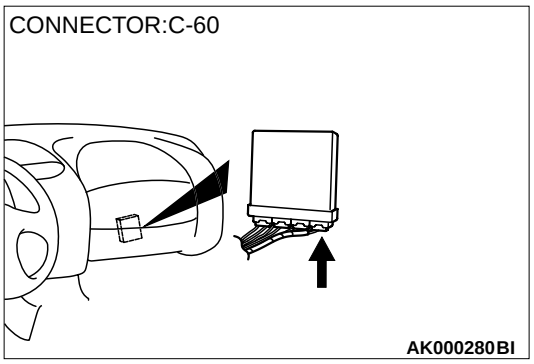
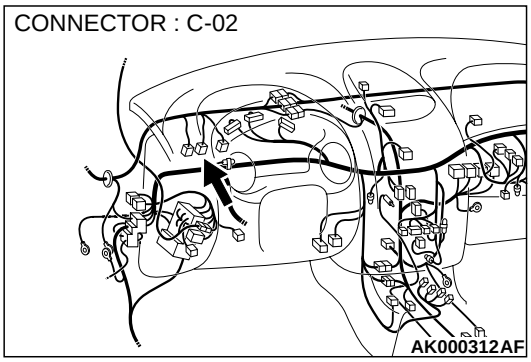












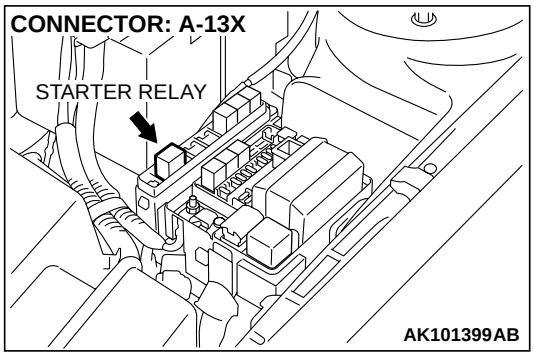
CIRCUIT OPERATION

- The battery positive voltage is supplied to the ECM (terminal 71) via the starter relay during engine cranking. With this, the ECM detects that the engine is being cranked.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the ignition switch.
- Malfunction of the starter relay.
- Improper connector contact, open circuit or short-circuited harness wire.
- Malfunction of the ECM.

DIAGNOSIS



STEP 1. Check connector A-13X at starter relay for damage.

Q: Is the connector in good condition?

YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

STEP 2. Check the starter relay.

Refer to GROUP 16, Starting system – On-vehicle Service – Starter relay check P.16-24.

Q: Are there any abnormalities?

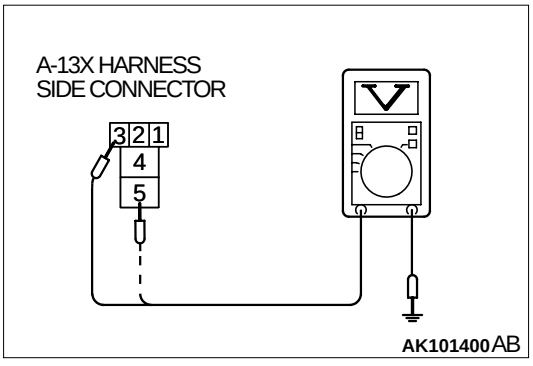
YES : Go to Step 3.

NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 3. Check the power supply voltage at starter relay connector A-13X.

(1) Disconnect the connector A-13X and measure at the harness side.
(2) Turn the ignition switch to the "START" position.
(3) Measure the voltage between terminal 3, 5 and ground.
- Voltage should be battery positive voltage.

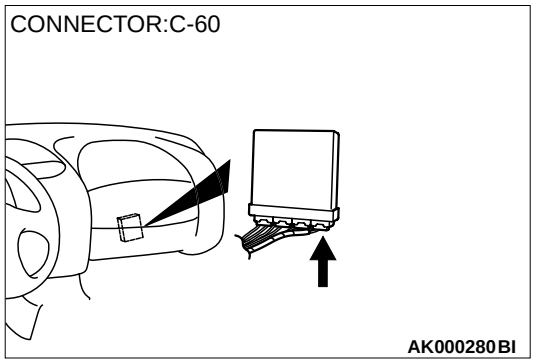
(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the voltage normal?

YES : Go to Step 4.

NO : Check connector C-28 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between ignition switch connector C-87 terminal 5 and starter relay connector A-13X terminal 3, 5 because of open circuit. Then confirm that the malfunction symptom is eliminated.

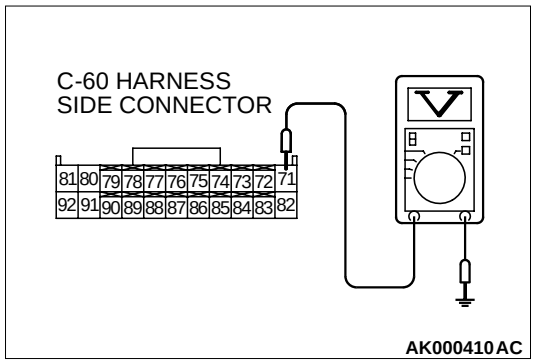


STEP 4. Check connector C-60 at ECM for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.



STEP 5. Check the power supply voltage at ECM connector C-60.

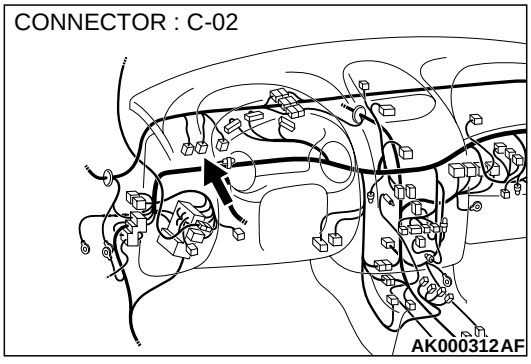
(1) Disconnect the connector C-60 and measure at the harness side.
(2) Turn the ignition switch to the "START" position.
(3) Measure the voltage between terminal 71 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 6.

NO : Repair harness wire between starter relay connector A-13X terminal 2 and ECM connector C-60 terminal 71 because of open circuit. Then confirm that the malfunction symptom is eliminated.



STEP 6. Check connector C-02 at interlock switch for damage.

Q: Is the connector in good condition?

YES : Go to Step 7.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

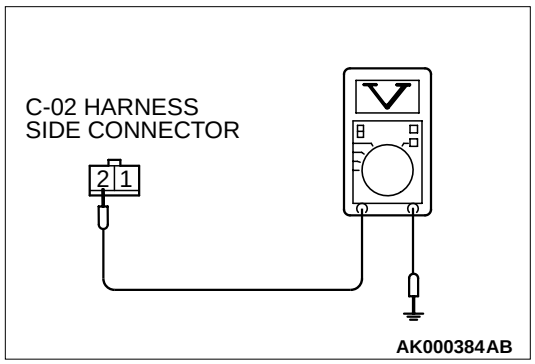
STEP 7. Check the interlock switch.

Refer to GROUP 21A, On-vehicle Service – Interlock switch check and adjustment P.21A-9.

Q: Are there any abnormalities?

YES : Go to Step 8.

NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.



STEP 8. Check the power supply voltage at interlock switch connector C-02.

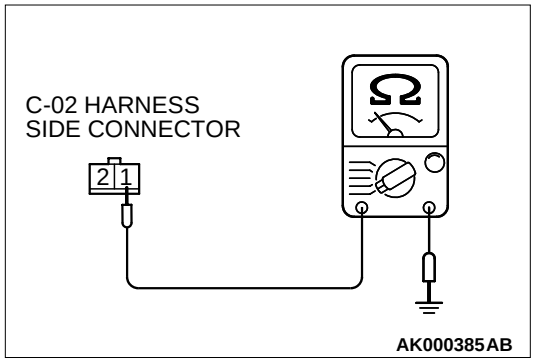
(1) Disconnect the connector C-02 and measure at the harness side.
(2) Turn the ignition switch to the "START" position.
(3) Measure the voltage between terminal 2 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 9.

NO : Check connector C-07 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connectors is in good condition, repair harness wire between starter relay connector A-13X terminal 1 and interlock switch connector C-02 terminal 2 because of open circuit. Then confirm that the malfunction symptom is eliminated.



STEP 9. Check the continuity at interlock switch harness side connector C-02.

(1) Disconnect the connector C-02 and measure at the harness side.
(2) Check for the continuity between terminal 1 and ground.
- Should be less than 2 ohm.

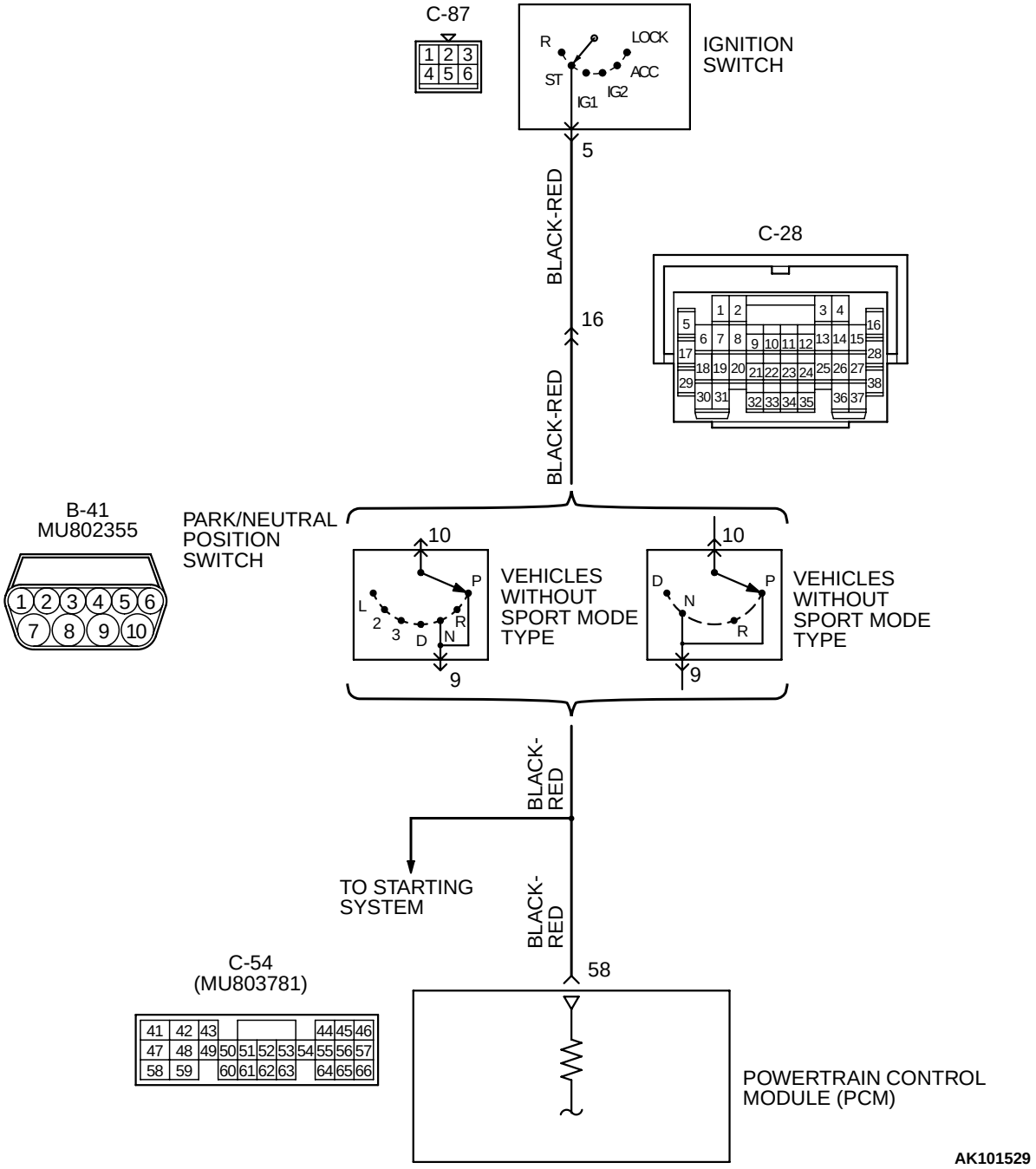
Q: Is the continuity normal?

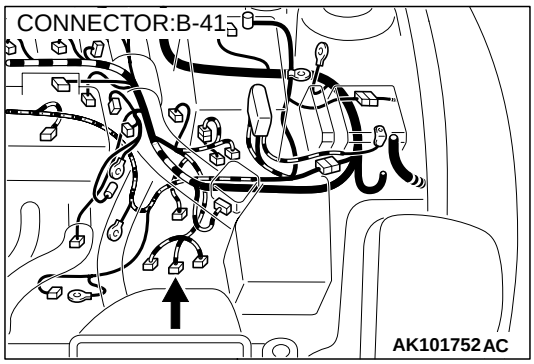
YES : Replace the ECM. Then confirm that the malfunction symptom is eliminated.

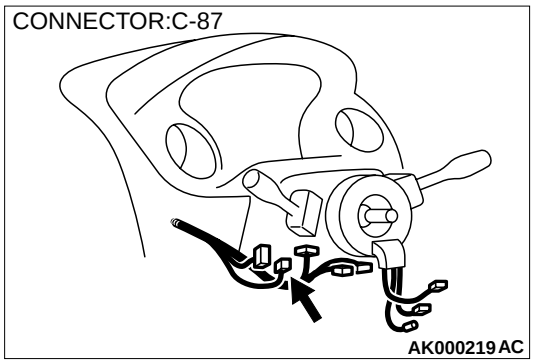
NO : Repair harness wire between interlock switch connector C-02 terminal 1 and ground because of open circuit or harness damage. Then confirm that the malfunction symptom is eliminated.

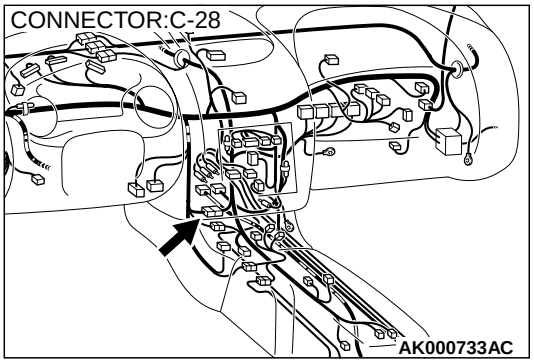
INSPECTION PROCEDURE 32: Ignition Switch – ST System and Park/Neutral Position Switch System. <A/T>

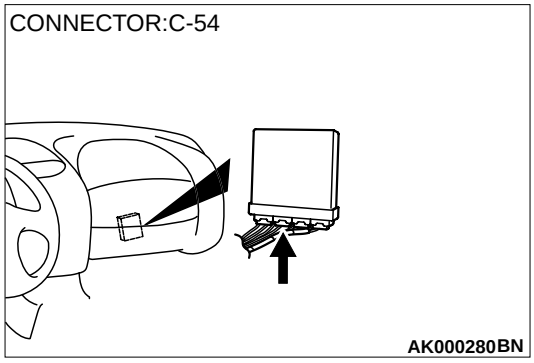
Ignition Switch-ST and Park/Neutral Position Switch Circuit











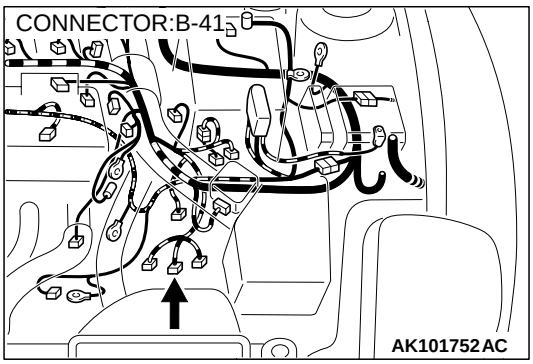
COMMENT

- If the selector lever is moved to "P" or "N" range and the ignition switch is turned to "START" position, battery positive voltage is supplied to PCM (terminal 58) through the ignition switch and park/neutral position switch. Because of this, the PCM detects that the engine is cranking.
- The park/neutral position switch detects the selector lever position (P, N or other ranges) and converts it to a voltage signal (high or low). Then the park/neutral position switch sends that signal to the PCM.

TROUBLESHOOTING HINTS (The most likely caused for this code to be set are:)

- Malfunction of the ignition switch.
- Malfunction of the park/neutral position switch.
- Improper connector contact, open circuit or short-circuit in the harness wire.
- Malfunction of the PCM.

DIAGNOSIS



STEP 1. Check connector B-41 at park/neutral position switch for damage.

Q: Is the connector in good condition?

YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

STEP 2. Check the park/neutral position switch.

Refer to GROUP 23A, On-vehicle Service – Essential Service – Park/Neutral Position Switch Continuity Check P.23A-351.

Q: Are there any abnormalities?

YES : Go to Step 3.

NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 3. Check the power supply voltage at park/neutral position switch connector B-41.

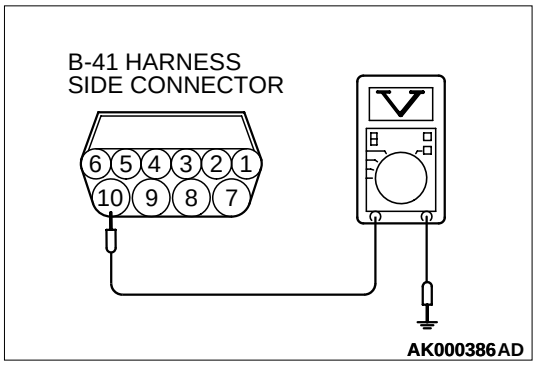
(1) Disconnect the connector B-41 and measure at the harness side.

(2) Turn the ignition switch to the "START" position.

(3) Measure the voltage between terminal 10 and ground.

- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the voltage normal?

YES : Go to Step 4.

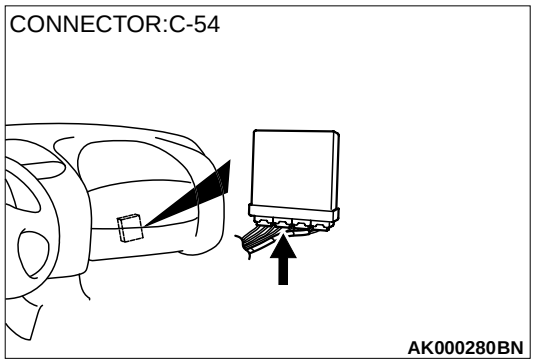
NO : Check connector C-28 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between ignition switch connector C-87 terminal 5 and park/neutral position switch connector B-41 terminal 10 because of open circuit. Then confirm that the malfunction symptom is eliminated.

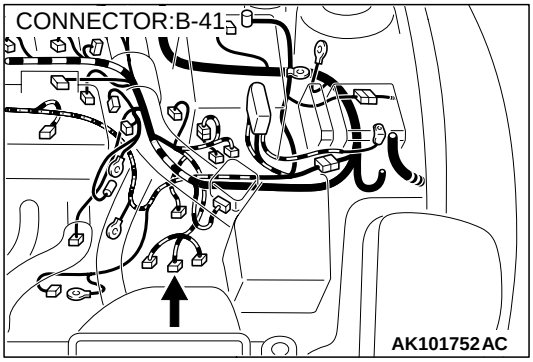
STEP 4. Check connector C-54 at PCM for damage.

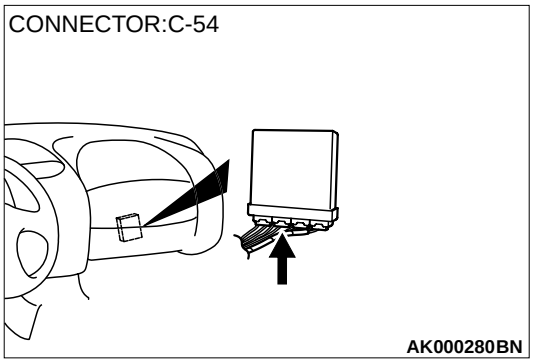
Q: Is the connector in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.







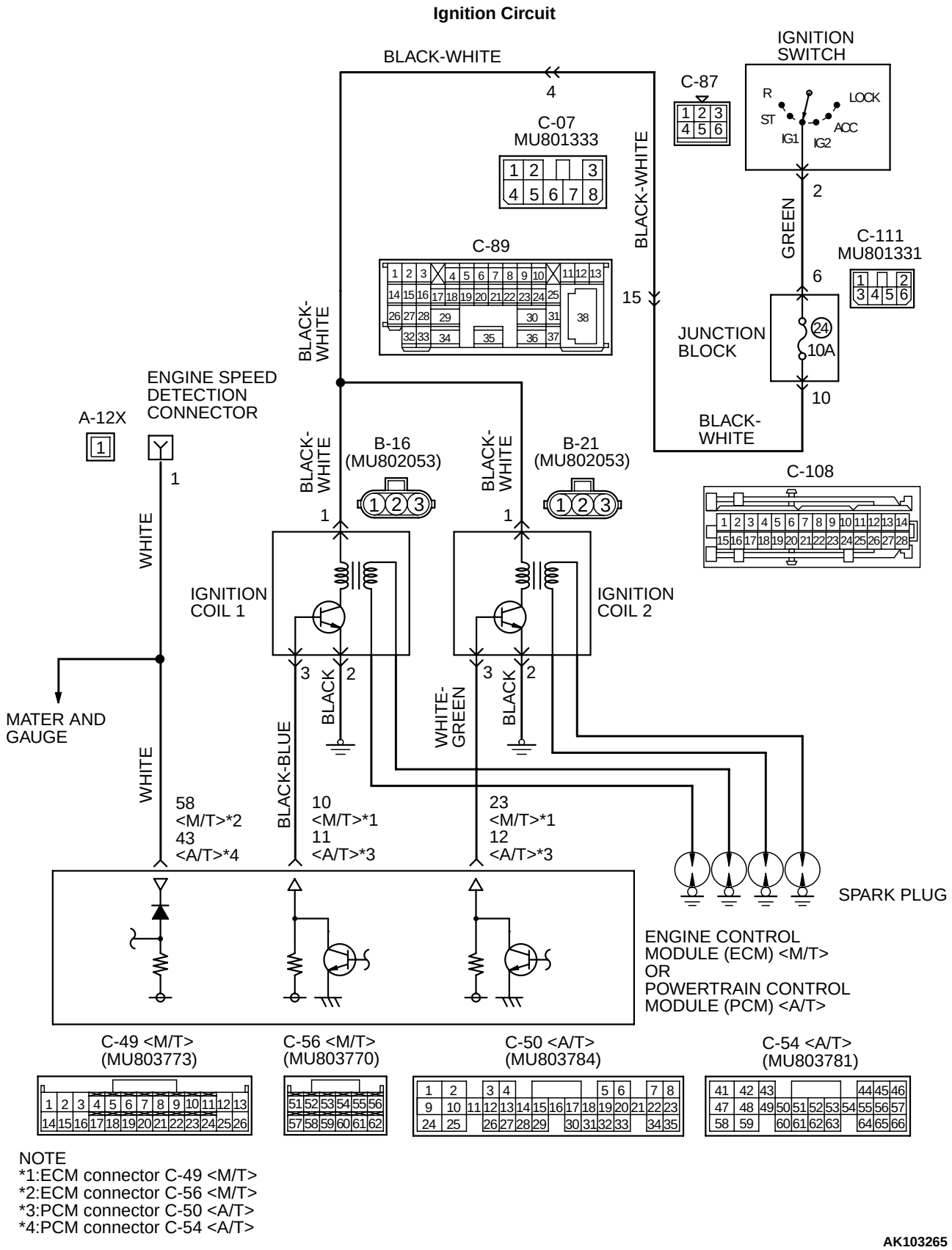
STEP 5. Check for open circuit and short circuit to ground and harness damage between park/neutral position switch connector B-41 (terminal 9) and PCM connector C-54 (terminal 58).

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then confirm that the malfunction symptom is eliminated.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 33: Ignition Circuit System



NOTE
*1:ECM connector C-49 <M/T>
*2:ECM connector C-56 <M/T>
*3:PCM connector C-50 <A/T>
*4:PCM connector C-54 <A/T>

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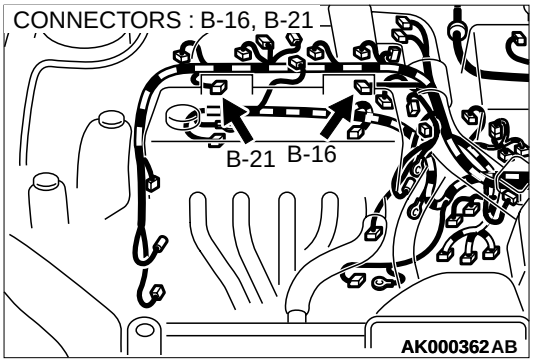

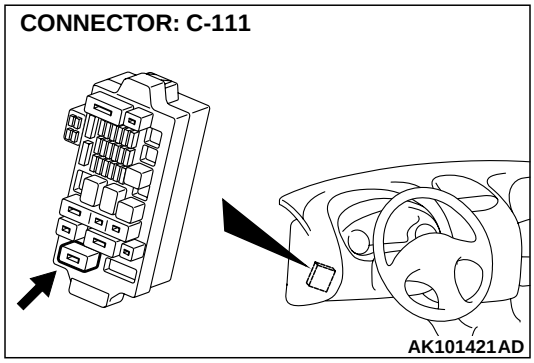

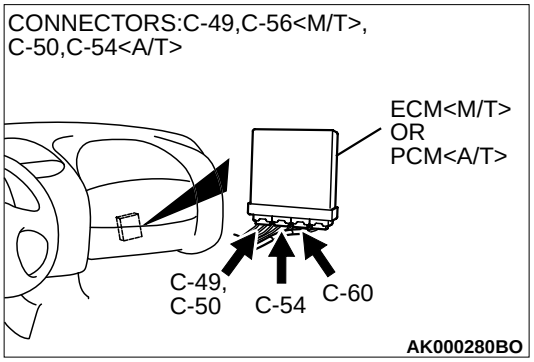

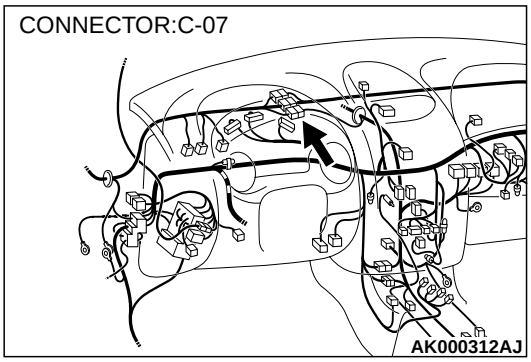

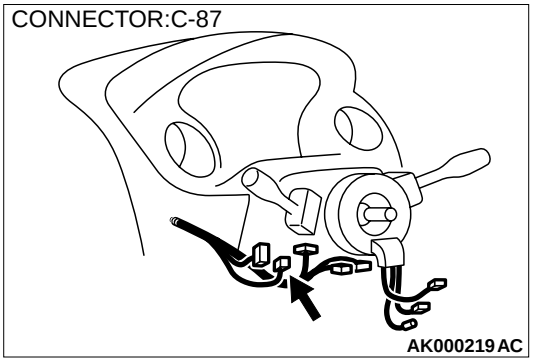

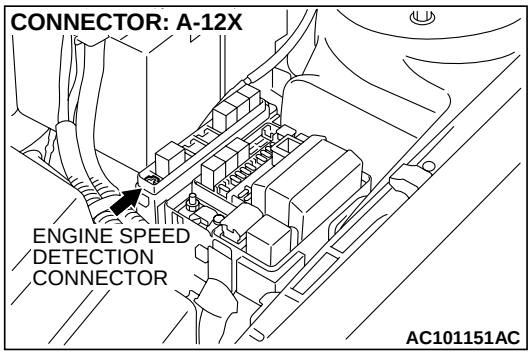

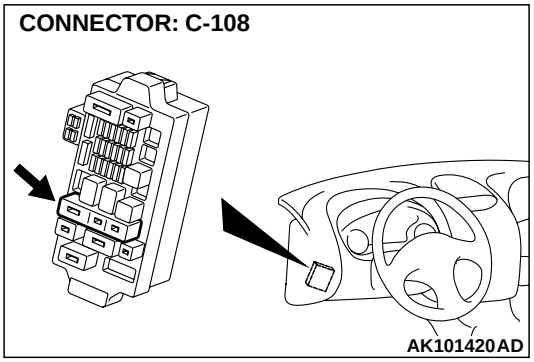

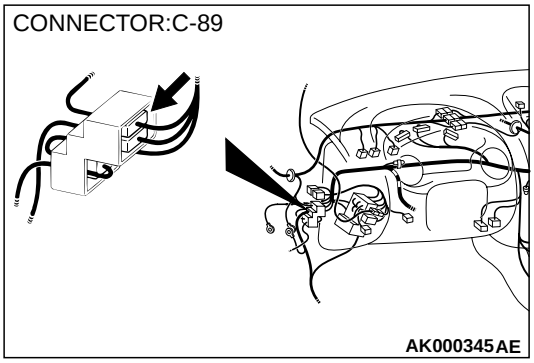

CIRCUIT OPERATION

- The ignition coil is energized by Battery positive voltage from the ignition switch.
- When the ECM <M/T> or PCM <A/T> turns off its internal power transistor, battery positive voltage is applied to the ignition power transistor (terminal 3) inside the ignition coil, causing the ignition power transistor to be turned on.
- If the ignition power transistor is turned on, the primary circuit of the ignition coil is energized by grounding the ignition coil through terminal 2, causing the primary current to flow to the ignition coil.

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TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the ignition coil.
- Malfunction of the ignition power transistor.
- Improper connector contact, open circuit or short-circuited harness wire.
- Malfunction of the ECM <M/T> or PCM <A/T>.

DIAGNOSIS

STEP 1. Check the ignition coil.

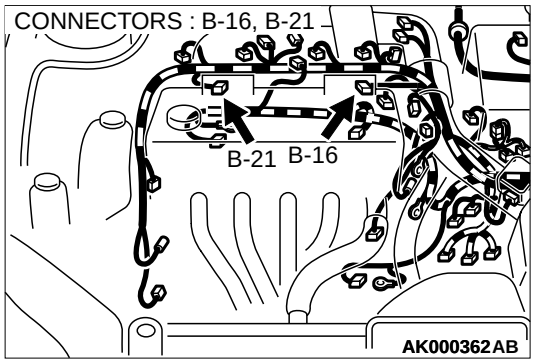
Refer to GROUP 16, Ignition System – On-vehicle service – Ignition Coil Check P.16-36.

Q: Are there any abnormalities?

YES : Go to Step 2.

NO : Replace the ignition coil. Then confirm that the malfunction symptom is eliminated.

STEP 2. Check harness connector B-16, B-21 at ignition coil for damage.



Q: Is the harness connector in good condition?

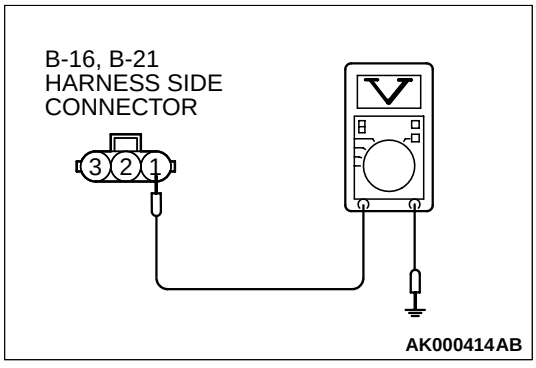
YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

STEP 3. Check the power supply voltage at ignition coil connectors B-16, B-21.

(1) Disconnect the connector B-16, B-21 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 1 and ground.
- Voltage should be battery positive voltage.

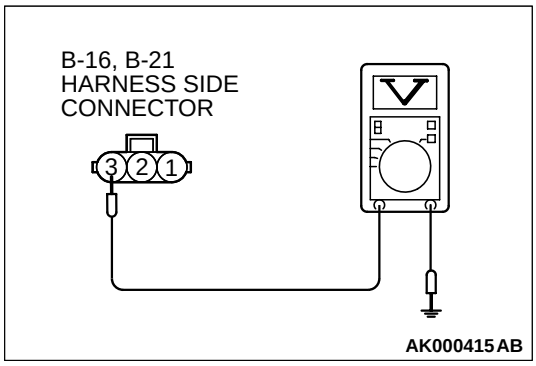
(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the voltage normal?

YES : Go to Step 4.

NO : Check the connector C-07, C-89, C-108 and C-111 at intermediate connectors for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector are in good condition, repair harness wire between ignition switch connectors C-87 terminal 2 and ignition coil connectors B-16, B-21 terminals 1 because of open circuit. Then confirm that the malfunction symptom is eliminated.



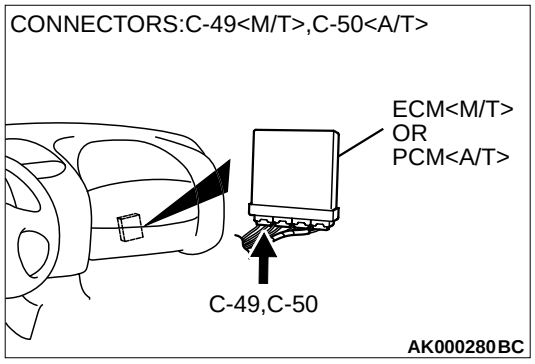
STEP 4. Check the circuit at ignition coil harness side connector B-16, B-21.

(1) Disconnect the connectors B-16, B-21 and measure at the harness side.
(2) Engine cranking.
(3) Measure the voltage between terminal 3 and ground.
- Voltage should be 0.3 and 3.0 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

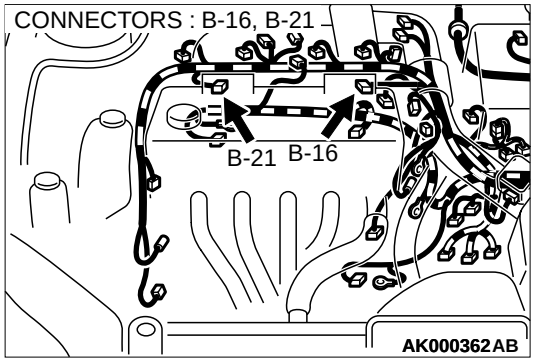
YES : Go to Step 7.
NO : Go to Step 5.

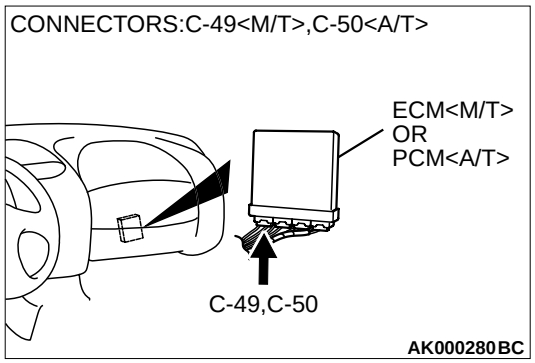


STEP 5. Check connector C-49 at ECM <M/T> or connector C-50 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 6.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.



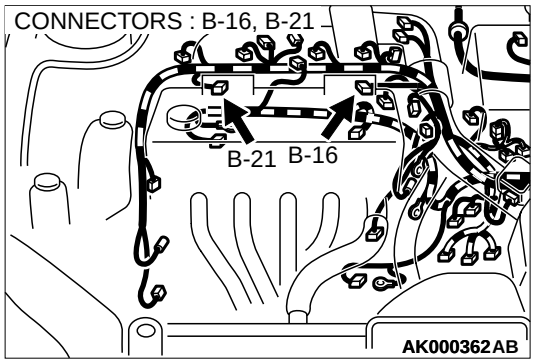


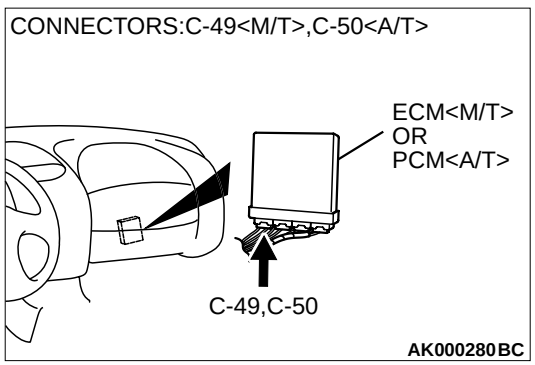
STEP 6. Check for open circuit and short circuit to ground between ignition coil connector and ECM connector <M/T> or PCM connector <A/T>.

a. Check the harness wire between ignition coil connector B-16 terminal 3 and ECM connector C-49 terminal 10 <M/T> or PCM connector C-50 terminal 11 <A/T> when checking ignition coil 1.
b. Check the harness wire between ignition coil connector B-21 terminal 3 and ECM connector C-49 terminal 23 <M/T> or PCM connector C-50 terminal 12 <A/T> when checking ignition coil 2.

Q: Is the harness wire in good condition?

YES : Replace the PCM. Then confirm that the malfunction symptom is eliminated.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.





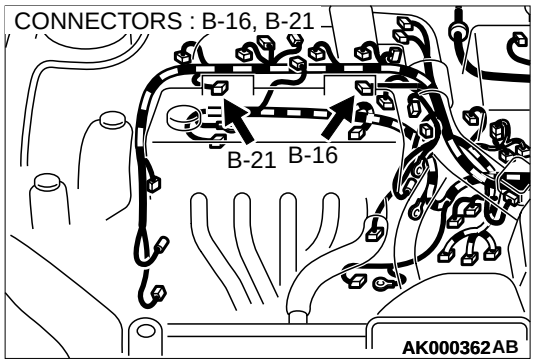
STEP 7. Check for harness damage between ignition coil connector and ECM connector <M/T> or PCM connector <A/T>.

a. Check the harness wire between ignition coil connector B-16 terminal 3 and ECM connector C-49 terminal 10 <M/T> or PCM connector C-50 terminal 11 <A/T> when checking ignition coil 1.
b. Check the harness wire between ignition coil connector B-21 terminal 3 and ECM connector C-49 terminal 23 <M/T> or PCM connector C-50 terminal 12 <A/T> when checking ignition coil 2.

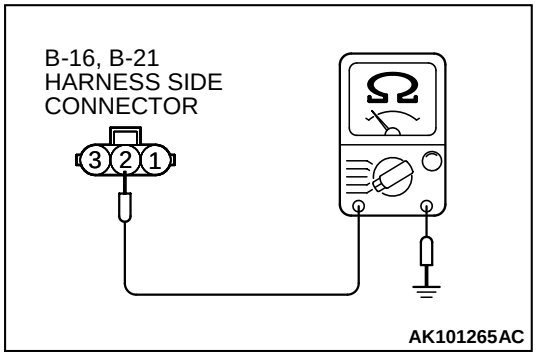
Q: Is the harness wire in good condition?

YES : Go to Step 8.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 8. Check for continuity at ignition coil harness side connector B-16, B-21.



(1) Disconnect the connectors B-16, B-21 and measure at the harness side.



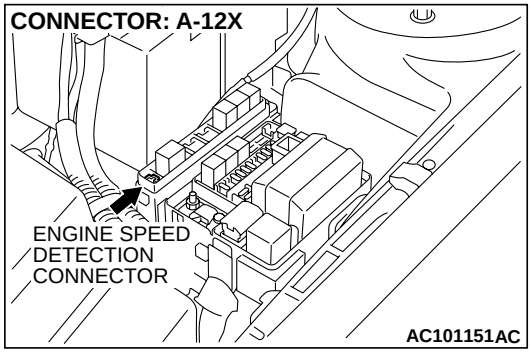
(2) Check for continuity between terminal 2 and ground.
- Should be less than 2 ohm.

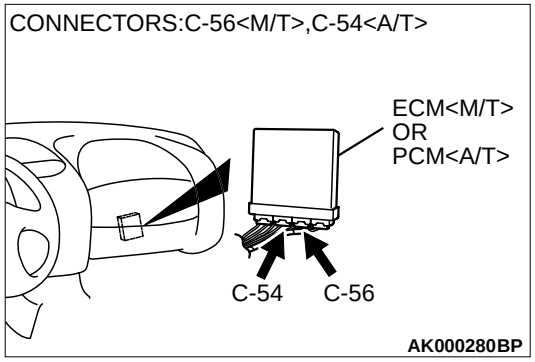
Q: Is the continuity normal?

YES : Go to Step 9.

NO : Repair harness wire between ignition coil connector B-16, B-21 terminal 2 and ground because of open circuit or harness damage. Then confirm that the malfunction symptom is eliminated.

STEP 9. Check connector A-12X at engine speed detection and connector C-56 at ECM <M/T> or connector C-54 at PCM <A/T> for damage.

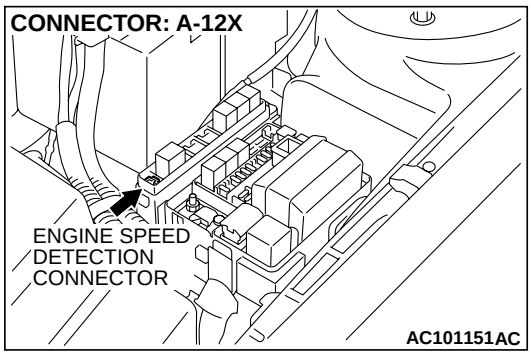


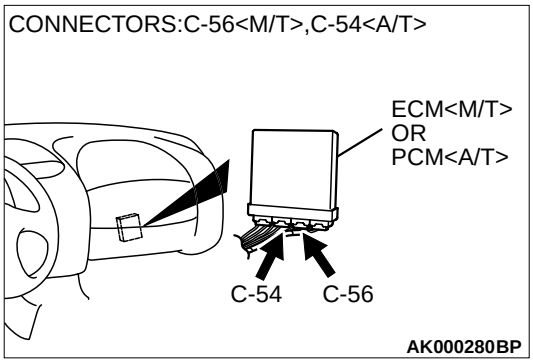


Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.





STEP 10. Check for open circuit and short circuit to ground and harness damage between engine speed detection connector A-12X and ECM connector C-56 (terminal 58) <M/T> or PCM connector C-54 (terminal 43) <A/T>

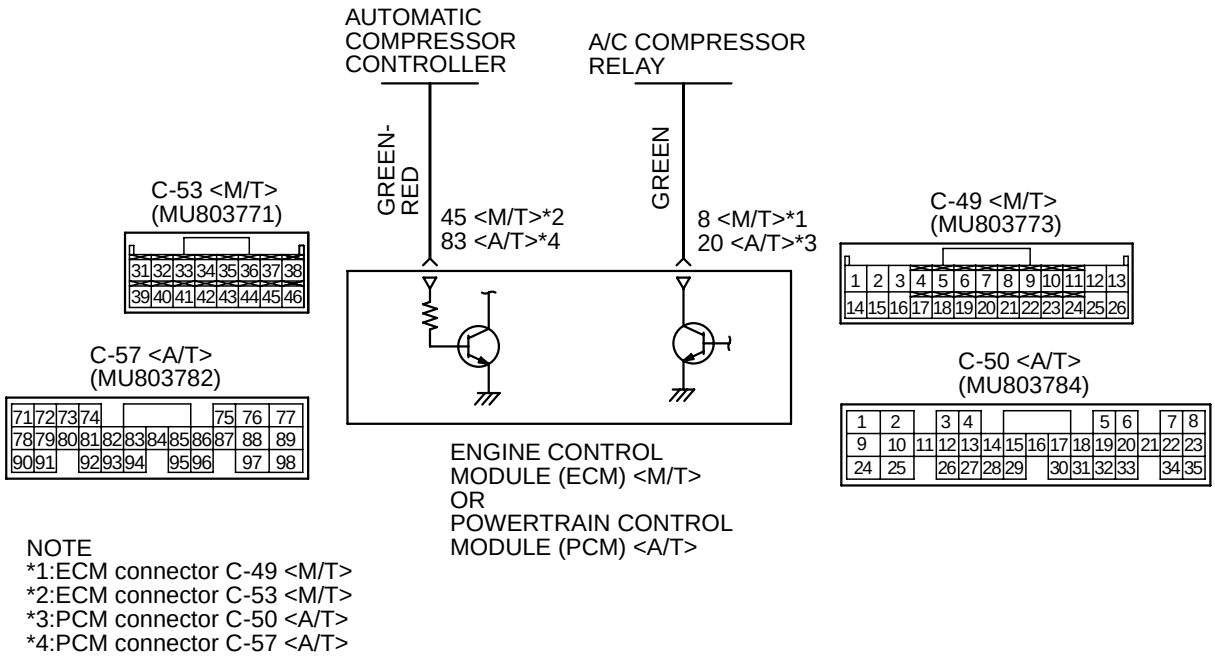
Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then confirm that the malfunction symptom is eliminated.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.

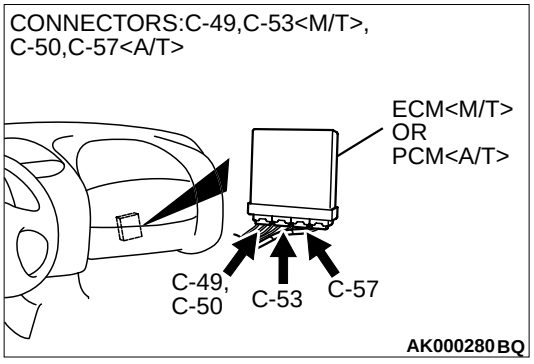
INSPECTION PROCEDURE 34: A/C system.

A/C Circuit



NOTE
*1:ECM connector C-49 <M/T>
*2:ECM connector C-53 <M/T>
*3:PCM connector C-50 <A/T>
*4:PCM connector C-57 <A/T>

AK000684



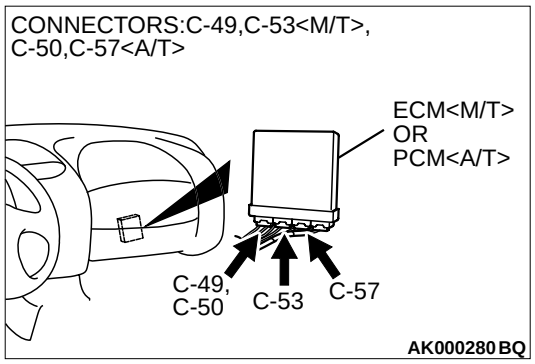
COMMENT

- When the A/C is "ON", the battery positive voltage is applied on the ECM (terminal 45) <M/T> PCM (terminal 83) <A/T> from the automatic compressor controller.
  When battery positive voltage is applied to the ECM <M/T> or PCM <A/T>, the ECM <M/T> or PCM <A/T> turns "ON" the power transistor in the ECM <M/T> or PCM <A/T>. The ECM <M/T> or PCM <A/T> delays A/C engagement momentarily while it increases idle rpm. Then the A/C compressor clutch relay coil will be energized.
  With this, the A/C compressor clutch relay turns "ON", and the A/C compressor clutch functions.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the A/C control system.
- Malfunction of the A/C switch.
- Improper connector contact, open circuit or short-circuited harness wire.
- Malfunction of the ECM <M/T> or PCM <A/T>.

DIAGNOSIS

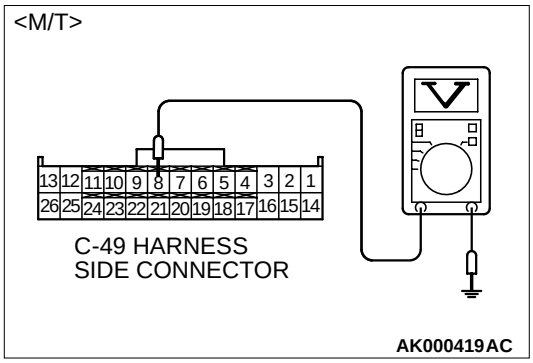


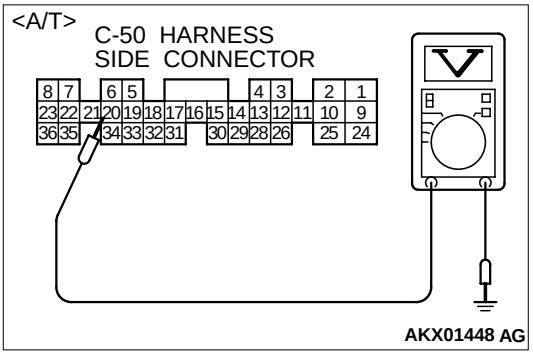
STEP 1. Check connector C-49, C-53 at ECM <M/T> or connector C-50, C-57 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.





STEP 2. Check the circuit at ECM connector C-49 <M/T> or PCM connector C-50 <A/T>.

(1) Disconnect the connectors C-49 <M/T> or C-50 <A/T> and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 8 <M/T> or 20 <A/T> and ground.
- Voltage should be battery positive voltage.

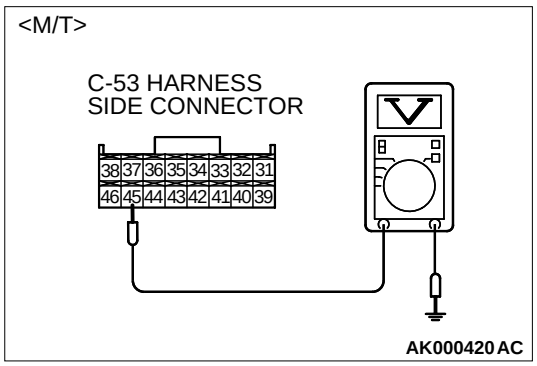
(4) Using a jumper wire, connect terminal 8 <M/T> or 20 <A/T> to ground.
- A/C compressor relay should turn "ON".

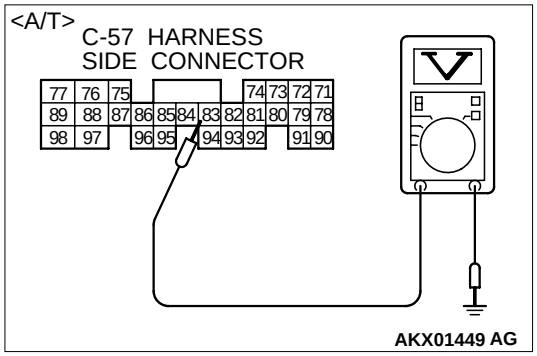
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage and A/C compressor relay condition normal?

YES : Go to Step 3.

NO : Refer to GROUP 55, Heating and air conditioning – Introduction To Heater, Air Conditioning And Ventilation Diagnosis P.55-5. Then confirm that the malfunction symptom is eliminated.





STEP 3. Check the circuit at ECM connector C-53 <M/T> or PCM connector C-57 <A/T>.

(1) Disconnect the connectors C-53 <M/T> or C-57 <A/T> and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 45 <M/T> or 83 <A/T> and ground.
- Voltage should be 1 volt or less when the A/C switch is "OFF".
- Voltage should be battery positive voltage when the A/C switch is "ON".

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Replace the ECM or PCM. Then confirm that the malfunction symptom is eliminated.

NO : Refer to GROUP 55, Heating and air conditioning – Introduction To Heater, Air Conditioning And Ventilation Diagnosis P.55-5.

DATA LIST REFERENCE TABLE

M1131152000177

⚠ CAUTION

- **When shifting the select lever to D range, the brakes should be applied so that the vehicle does not move forward.**
- **Driving tests always need two persons: one driver and one observer.**

NOTE:

**1: If the idle speed is lower than the standard value on a very cold engine [approximately –20°C (–4°F)] even when the IAC motor is fully opened, the air volume limiter built in the throttle body could be defective.*

**2: In a new vehicle [driven approximately 500 km (311 mile) or less], the step of the stepper motor is sometimes 30 steps greater than the standard value.*

**3: The injector drive time represents the time when the cranking speed is at 250 r/min or below when the power supply voltage is 11 volts.*

**4: In a new vehicle [driven approximately 500 km (311 mile) or less], the injector drive time is sometimes 10% longer than the standard time.*

**5: In a new vehicle [driven approximately 500 km (311 mile) or less], the volume air flow sensor output frequency is sometimes 10% higher than the standard frequency.*

**6: GST items. [Data list items consist of MUT-II items and GST items. GST items can be accessed through the use of a general scan tool (GST). When MUT-II (MB991502) is used, MUT-II items appear alphabetically; then, GST items appear alphabetically. The black and white characters of the GST items are inverted from the MUT-II items.]*

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
A/C RELAY	49	A/C compressor clutch relay	• Engine: idling • A/C switch: "OFF"		OFF	Procedure No. 34	P.13A-542
			• Engine: idling • A/C switch: "ON"	A/C compressor clutch is not operating	OFF		
				A/C compressor clutch is operating	ON		
A/C SWITCH	28	A/C switch	• Engine: idling • A/C switch: OFF		OFF	Procedure No. 34	P.13A-542
			• Engine: idling • A/C switch: ON	A/C compressor clutch is not operating	OFF		
				A/C compressor clutch is operating	ON		
BARO SENSOR	25	Barometric pressure sensor	Ignition switch: "ON"	At altitude of 0 m (0 ft)	101 kPa	Code No. P0106, P0107, P0108	P.13A-42, P.13A-47, P.13A-58
				At altitude of 600 m (1,969 ft)	95 kPa		
				At altitude of 1,200 m (3,937 ft)	88 kPa		
				At altitude of 1,800 m (5,906 ft)	81 kPa		
BATT VOLTAGE	16	power supply voltage	Ignition switch: "ON"		Battery positive voltage	Procedure No. 29	P.13A-505

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
CRANK SENSOR	22	Crankshaft position sensor *1	• Engine: cranking • Tachometer: connected		Engine speeds displayed on the scan tool and tachometer are identical	Code No. P0335	P.13A-236
			Engine: idling	Engine coolant temperature is –20°C (–4°F)	1,275 – 1,475 r/min		
				Engine coolant temperature is 0°C (32°F)	1,220 – 1,420 r/min		
				Engine coolant temperature is 20°C (68°F)	1,100 – 1,300 r/min		
				Engine coolant temperature is 40°C (104°F)	930 – 1,130 r/min		
				Engine coolant temperature is 80°C (176°F)	600 – 800 r/min		
CRANK. SIGNAL	18	Cranking signal (ignition switch-ST)	Ignition switch: "ON"	Engine: stopped	OFF	Procedure No. 31 <M/T> Procedure No. 32 <A/T>	P.13A-526 <M/T> P.13A-531 <A/T>
				Engine: cranking	ON		
ECT SENSOR	21	Engine coolant temperature sensor	Ignition switch: "ON" or with engine running	Engine coolant temperature is –20°C (–4°F)	–20°C (–4°F)	Code No. P0116, P0117, P0118	P.13A-80, P.13A-88, P.13A-92
				Engine coolant temperature is 0°C (32°F)	0°C (32°F)		
				Engine coolant temperature is 20°C (68°F)	20°C (68°F)		
				Engine coolant temperature is 40°C (104°F)	40°C (104°F)		
				Engine coolant temperature is 80°C (176°F)	80°C (176°F)		

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
ECT SENSOR	21*6	Engine coolant temperature sensor	Ignition switch: "ON" or with engine running	Engine coolant temperature is –20°C (–4°F)	–20°C (4°F)	Code No. P0116, P0117, P0118	P.13A-80, P.13A-88, P.13A-92
				Engine coolant temperature is 0°C (32°F)	0°C (32°F)		
				Engine coolant temperature is 20°C (68°F)	20°C (68°F)		
				Engine coolant temperature is 40°C (104°F)	40°C (104°F)		
				Engine coolant temperature is 80°C (176°F)	80°C (176°F)		
ENGINE LOAD	87*6	Calculation load value	Engine: warming up	Engine is idling	12 – 32 %	–	–
				2,500 r/min	10 – 30 %		
ENGINE SPEED	22*6	Crankshaft position sensor *1	• Engine: cranking • Tachometer: connected		Engine speeds displayed on the scan tool and tachometer are identical.	Code No. P0335	P.13A-236
			Engine: idling	Engine coolant temperature is –20°C (–4°F)	1,275 – 1,475 r/min		
				Engine coolant temperature is 0°C (32°F)	1,220 – 1,420 r/min		
				Engine coolant temperature is 20°C (68°F)	1,100 – 1,300 r/min		
				Engine coolant temperature is 40°C (104°F)	930 – 1,130 r/min		
				Engine coolant temperature is 80°C (176°F)	600 – 800 r/min		
FUEL TEMP	4A	Fuel tempreature sensor	In cooled srateignittion switch: "ON"		approximately the same as the outdoor temperature	Code No. P0181, P0182, P0183	P.13A-198,P.13A-205,P.13A-210

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
HO2S BANK2 S1	11	Heated oxygen sensor (front)	Engine: Warming up (air/fuel mixture is made leaner when decelerating, and is made richer when revving.)	When the engine is running at 4,000 r/min, decelerate suddenly	200 mV or less	Code No. P0130, P0131, P0132, P0133, P0134	P.13A-126, P.13A-136, P.13A-140, P.13A-143, P.13A-146
				When engine is suddenly raced	600 – 1,000 mV		
			Engine: Warming up (the heated oxygen sensor signal is used to check the air/fuel mixture ratio, and control condition is also checked by the ECM <M/T> or PCM <A/T>)	Engine is idling 2,500 r/min	Voltage changes repeatedly between 400 mV or less and 600 – 1,000 mV		
HO2S BANK2 S1	A3*6	Heated oxygen sensor (front)	Engine: Warming up (air/fuel mixture is made leaner when decelerating, and is made richer when revving.)	When the engine at 4,000 r/min, decelerate suddenly	0.2 V or less	Code No. P0130, P0131, P0132, P0133, P0134	P.13A-126, P.13A-136, P.13A-140, P.13A-143, P.13A-146
				When engine is suddenly	0.6 – 1 V		
			Engine: Warming up (the heated oxygen sensor signal is used to check the air/fuel mixture ratio, and control condition is also checked by the ECM <M/T> or PCM <A/T>)	Engine is idling 2,500 r/min	Voltage changes repeatedly between 0.4 V or less and 0.6 – 1 V.		

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
HO2S BANK2 S2	59	Heated oxygen sensor (rear)	Engine: warming up	Revving	0 and 600 – 1,000 mV alternate.	Code No. P0136, P0137, P0138, P0139	P.13A-160, P.13A-170, P.13A-175, P.13A-178
HO2S BANK2 S2	A4*6	Heated oxygen sensor (rear)	Engine: warming up	Revving	0 and 0.6 – 1 V alternate.	Code No. P0136, P0137, P0138, P0139	P.13A-160, P.13A-170, P.13A-175, P.13A-178
IAC VALVE POS	45	Idle air control (stepper) position *2	• Engine coolant temperature : 80 – 95°C (176 – 203°F) • Lights, electric cooling fan and all accessories : OFF • Transaxle: neutral (A/T: "P" range) • Engine: idling (when A/C switch is ON. A/C compressor should be operating)	A/C switch: OFF	2 – 25 STEP	–	–
				A/C switch: OFF → ON	Increases by 10 – 70 STEP		
				• A/C switch: "OFF" • Selector lever: "N" to "D" range	Increases by 5 – 50 STEP		

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
IAT SENSOR	13	Intake air temperature sensor	Ignition switch: "ON" or with engine running	Intake air temperature is –20 °C (–4°F)	–20°C (–4°F)	Code No. P0111, P0112, P0113	P.13A-65, P.13A-70, P.13A-74
				Intake air temperature is 0°C (32°F)	0°C (32°F)		
				Intake air temperature is 20°C (68°F)	20°C (68°F)		
				Intake air temperature is 40°C (104°F)	40°C (104°F)		
				Intake air temperature is 80°C (176°F)	80°C (176°F)		
IAT SENSOR	13*6	Intake air temperature sensor	Ignition switch: "ON" or with engine running	Intake air temperature is –20 °C (–4°F)	–20°C (–4°F)	Code No. P0111, P0112, P0113	P.13A-65, P.13A-70, P.13A-74
				Intake air temperature is 0°C (32°F)	0°C (32°F)		
				Intake air temperature is 20°C (68°F)	20°C (68°F)		
				Intake air temperature is 40°C (104°F)	40°C (104°F)		
				Intake air temperature is 80°C (176°F)	80°C (176°F)		
IG. TIMING ADV	44	Ignition coils and ignition power transistor	• Engine: warming up • Timing light is set (to check actual ignition timing)	Engine is idling	2 – 18°BTDC	–	–
				2,500 r/min	22 – 42°BTDC		
IG. TIMING ADV	44*6	Ignition coils and ignition power transistor	• Engine: warming up • Timing light is set (to check actual ignition timing)	Engine is idling	2 – 18 deg	–	–
				2,500 r/min	22 – 42 deg		

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
INJECTORS B2	41	Injectors*3	Engine: cranking	When engine coolant temperature is 0°C (32°F)	21.4 – 32.0 mS	–	–
				When engine coolant temperature is 20°C (68°F)	11.5 – 17.3 mS		
				When engine coolant temperature is 80°C (176°F)	9.8 – 14.6 mS		
		Injectors*4	• Engine coolant temperature : 80 – 95°C (176 – 203°F) • Lights, electric cooling fan and all accessories : OFF • Transaxle: neutral (A/T: "P" range)	Engine is idling	1.7 – 2.9 mS		
				2,500 r/min	1.5 – 2.7 mS		
				When engine is suddenly revved	Increases		
LONG TRIM B1	81*6	Long-term fuel trim	Engine: warming up, 2,500 r/min without any load (during closed loop)		–12.5 – 12.5 %	Code No. P0171, P0172	P.13A-188, P.13A-194
MANIFOLD SNSR	95	Manifold differential pressure sensor	Engine: warming up, idling		64 – 78 kPa	Code No. P1400	P.13A-421
PSP SWITCH	27	Power steering pressure switch	Engine: idling	Steering wheel stationary	OFF	Code No. P0551	P.13A-408
				Steering wheel turning	ON		
SHORT TRIM B1	82*6	Short-term fuel trim	Engine: warming up, 2,500 r/min without any load (during closed loop)		–25 – 16.8 %	Code No. P0171, P0172	P.13A-188, P.13A-194
SYS. STATUS B1	88*6	Fuel control condition	Engine: warming up	2,500 r/min	Closed loop	–	–
				When engine is suddenly revved	Open loop – drive condition		

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
TANK PRS. SNSR	73	Fuel tank differential pressure sensor	• Ignition switch: "ON" • Fuel tank filler tube cap removal		–3.3 – 3.3 kPa	–	–
TP SENSOR	14	Throttle position sensor	Ignition switch: "ON"	Set to idle position	535 – 735 mV	Code No. P0121, P0122, P0123	P.13A-98, P.13A-106, P.13A-112
				Gradually open	Increases in proportion to throttle opening angle		
				Open fully	4,500 – 5,500 mV		
TP SENSOR	8A*6	Throttle position sensor	Ignition switch: "ON"	Set to idle position	6 – 20 %	Code No. P0121, P0122, P0123	P.13A-98, P.13A-106, P.13A-112
				Gradually open	Increases in proportion to throttle opening angle		
				Open fully	80 – 100 %		
VAF RESET SIG	34	Volume air flow sensor reset signal	Engine: warming up	Engine is iding	ON	–	–
				2,500 r/min	OFF		
VAF SENSOR	12	Volume air flow sensor (mass air flow rate) *5	• Engine coolant temperature : 80 – 95°C (176 – 203°F) • Lights, electric cooling fan and all accessories : OFF • Transaxle: neutral (A/T: "P" range)	Engine is idling	12 – 38 Hz	–	–
				2,500 r/min	55 – 95 Hz		
				Engine is revved	Frequency (or air flow volume) increases in response to revving		

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
VAF SENSOR	12*6	Volume air flow sensor (mass air flow rate) *5	• Engine coolant temperature : 80 – 95°C (176 – 203°F) • Lights, electric cooling fan and all accessories : OFF • Transaxle: neutral (A/T: "P" range)	Engine is idling	1.7 – 4.2 gm/s	–	–
				2,500 r/min	7.9 – 12.1 gm/s		
				Engine is revved	Frequency (or air flow volume) increases in response to revving		
VSS	24*6	Vehicle speed sensor <M/T>	Drive at 40 km/h (25 mph).		Approximately 40 km/h (25 mph)	Code No. P0500	P.13A-381

ACTUATOR TEST REFERENCE TABLE

M1131152500064

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	DRIVE CONTENTS	INSPECTION REQUIREMENT	NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
BASIC TIMING	17*	Basic ignition timing	Set to ignition timing adjustment mode	• Engine: idling • Connect timing light	5° BTDC	–	–
EGR SOLENOID	10	EGR solenoid	Solenoid valve turns from OFF to ON.	Ignition switch: "ON"	Clicks when solenoid valve is driven.	Code No. P0403	P.13A-259
EVAP PURGE SOL	08	Evaporative emission purge solenoid	Solenoid valve turns from OFF to ON.	Ignition switch: "ON"	Clicks when solenoid valve is driven.	Code No. P0443	P.13A-283
EVAP VENT SOL	29	Evaporative emission ventilation solenoid	Solenoid valve turns from OFF to ON.	Ignition switch: "ON"	Clicks when solenoid valve is driven.	Code No. P0446	P.13A-291

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	DRIVE CONTENTS	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
FUEL PUMP	07	Fuel pump	Fuel pump operates and fuel is recirculated	• Engine: cranking • Fuel pump: activated Inspect according to both the above conditions	Pinch the return hose with fingers to feel the pulse of the fuel being recirculated	Pulse is felt	Procedure No. 30	P.13A-515
					Listen near the fuel tank for the sound of fuel pump operation	Sound of operation is heard		
NO. 1 INJECTOR	01	Injectors	Cut fuel to No. 1 injector	Engine: warm, idle (cut the fuel supply to each injector in turn and check cylinders which don't affect idling.)		Idling condition becomes different (becomes unstable)	Code No. P0201, P0202, P0203, P0204	P.13A-216
NO. 2 INJECTOR	02		Cut fuel to No. 2 injector					
NO. 3 INJECTOR	03		Cut fuel to No. 3 injector					
NO. 4 INJECTOR	04		Cut fuel to No. 4 injector					
RADIAT. FAN LO	21	Fan controller	Drive the fan motor	Ignition switch: "ON"		Radiator fan and condenser fan rotate at high speed	Procedure No. 28	P.13A-501

*NOTE: *: Continues for 27 minutes. Can be released by pressing the CLEAR key.*

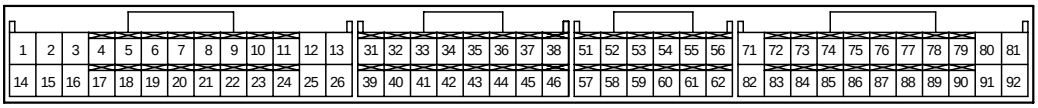
CHECK AT THE ENGINE CONTROL MODULE (ECU) <M/T> OR POWERTRAIN CONTROL MODULE (PCM) <A/T>

M1131153700094

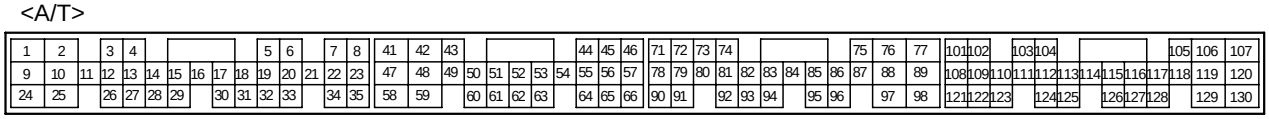
TERMINAL VOLTAGE CHECK CHART

ECM <M/T> or PCM <A/T> Connector Terminal Arrangement

<M/T>



<A/T>



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TERMINAL NO. <M/T>	TERMINAL NO. <A/T>	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
1	1	No.1 injector	• Engine: warming up, idling • Suddenly depress the accelerator pedal		From 11 – 14 V momentarily drops slightly
14	9	No.2 injector			
2	24	No.3 injector			
15	2	No.4 injector			
4	14	Stepper motor coil <A1>	• Engine: warming up, idling • A/C switch: OFF → ON • Headlight switch: OFF → ON		B+ ⇔ 1 V or less (changes repeatedly)
17	28	Stepper motor coil <A2>			
5	15	Stepper motor coil <B1>			
18	29	Stepper motor coil <B2>			
6	6	EGR solenoid	Ignition switch: "ON"		B+
			• Engine: idling • Suddenly depress the accelerator pedal.		From B+, momentarily drops
8	20	A/C compressor clutch relay	• Engine: idling • A/C switch: OFF → ON (A/C compressor is operating)		B+ → 1 V or less as A/C clutch cycles
9	34	Evaporative emission purge solenoid	Ignition switch: "ON"		B+
			Engine: warm up, 3,000 r/min		3 – 13 V
10	11	Ignition coil – No. 1, No. 4 (Ignition power transistor)	Engine: 3,000 r/min		0.3 – 3.0 V
23	12	Ignition coil – No. 2, No. 3 (Ignition power transistor)			
12	41	Power supply	Ignition switch: "ON"		B+
25	47				
19	19	Volume air flow sensor reset signal	Engine: idling		0 – 1 V
			Engine: 3,000 r/min		6 – 9 V
21	18	Fan controller	Radiator fan and condenser fan are not operating		0 – 0.3 V
			Radiator fan and condenser fan are operating		0.7 V or more
22	21	Fuel pump relay	Ignition switch: "ON"		B+
			Engine: idling		1 V or less
24	61	A/C switch 2	Engine: idling Outside air temperature: 25°C or more	when A/C is MAX. COOL condition (when the load by A/C is high)	1 V or less
				when A/C is MAX. HOT condition (when the load by A/C is low)	B+

TERMINAL NO. <M/T>	TERMINAL NO. <A/T>	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
33	8	Generator G terminal	Engine: warming up, idling (radiator fan: stopped) Headlight: OFF to ON Rear defogger switch: OFF to ON Stoplight switch: OFF to ON		Voltage rises by 0.2 – 3.5 V
36	22	Service engine soon/malfunction indicator lamp	Ignition switch: "LOCK" (OFF) → "ON"		1 V or less → 9 – 13 V (after several seconds have elapsed)
37	52	Power steering pressure switch	Engine: warming up, idling	When steering wheel is stationary	B+
				When steering wheel is turned	1 V or less
38	49	MFI relay (power supply)	Ignition switch: "OFF"		B+
			Ignition switch: "ON"		1 V or less
41	54	Generator FR terminal	Engine: warming up, idling (radiator fan: stopped) Headlight: OFF to ON		Voltage drops
			Rear defogger switch: OFF to ON Stop light switch: OFF to ON		
45	83	A/C switch	Engine: idling	Turn the A/C switch OFF	1 V or less
				Turn the A/C switch ON (A/C compressor is operating)	B+
54	26	Heated oxygen sensor heater (rear)	Engine: warming up, idling		1 V or less
			Engine: Revving		B+
55	35	Evaporative emission ventilation solenoid	Ignition switch: "ON"		B+
			Carry out the Actuator test to drive the solenoid valve		For approximately Six seconds 1 V or less
58	43	Tachometer signal	Engine: 3,000 r/min		0.3 – 3.0 V
60	3	Heated oxygen sensor heater (front)	Engine: warming up, idling		9 – 11 V
			Engine: Revving		9 – 11 V → B+ (momentarily)
61	92	Fuel tank differential pressure sensor	Engine: idling		1.2 – 3.8 V
71	58	Ignition switch-ST	Engine: cranking		8 V or more

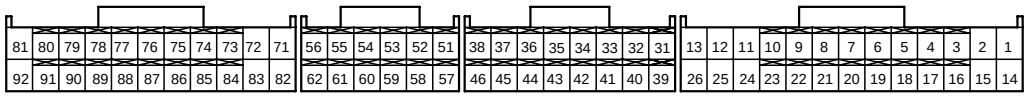
TERMINAL NO. <M/T>	TERMINAL NO. <A/T>	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
72	64	Intake air temperature sensor	Ignition switch: "ON"	When Intake air temperature is –20°C (–4°F)	3.8 – 4.4 V
				When Intake air temperature is 0°C (32°F)	3.2 – 3.8 V
				When Intake air temperature is 20°C (68°F)	2.3 – 2.9 V
				When Intake air temperature is 40°C (104°F)	1.5 – 2.1 V
				When Intake air temperature is 60°C (140°F)	0.8 – 1.4 V
				When Intake air temperature is 80°C (176°F)	0.4 – 1.0 V
73	91	Manifold differential pressure sensor	Engine: idling		0.8 – 2.4 V
			• Engine: idling • Suddenly depress the accelerator pedal		Rises from 0.8 – 2.4 V suddenly
75	73	Heated oxygen sensor (rear)	• Engine: warming up • Revving		0 and 0.6 – 1.0 V alternates
76	71	Heated oxygen sensor (front)	• Engine: warming, 2,500 r/min (check using a digital type voltmeter)		0 ⇔ 0.8 V (changes repeatedly)
77	51	Fuel temperature sensor	Ignition switch: "ON"	When fuel temperature is 0°C (32°F)	2.7 – 3.1 V
				When fuel temperature is 20°C (68°F)	2.1 – 2.5 V
				When fuel temperature is 40°C (104°F)	1.6 – 2.0 V
				When fuel temperature is 80°C (176°F)	0.8 – 1.2 V
80	66	Backup power supply	Ignition switch: "LOCK" (OFF)		B+
81	46	Sensor supplied voltage	Ignition switch: "ON"		4.5 – 5.5 V
82	98	Ignition switch-IG	Ignition switch: "ON"		B+
83	44	Engine coolant temperature sensor	Ignition switch: "ON"	When engine coolant temperature is –20°C (–4°F)	3.9 – 4.5 V
				When engine coolant temperature is 0°C (32°F)	3.2 – 3.8 V
				When engine coolant temperature is 20°C (68°F)	2.3 – 2.9 V
				When engine coolant temperature is 40°C (104°F)	1.3 – 1.9 V
				When engine coolant temperature is 60°C (140°F)	0.7 – 1.3 V
				When engine coolant temperature is 80°C (176°F)	0.3 – 0.9 V

TERMINAL NO. <M/T>	TERMINAL NO. <A/T>	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
84	78	Throttle position sensor	Ignition switch: "ON" (check for smooth voltage increase as throttle is moved from idle position to wide open throttle)	Idle	0.335 – 0.935 V
				Wide open throttle	4.4 – 5.3 V
85	55	Barometric pressure sensor	Ignition switch: "ON"	When altitude is 0 m (0 ft)	3.7 – 4.3 V
				When altitude is 600 m (1,969 ft)	3.4 – 4.0 V
				When altitude is 1,200 m (3,937 ft)	3.2 – 3.8 V
				When altitude is 1,800 m (5,906 ft)	2.9 – 3.5 V
86	–	Vehicle speed sensor	• Ignition switch: "ON" • Move the vehicle slowly forward		0 ⇔ 8 – 12 V (changes repeatedly)
87	79	Idle position signal	Ignition switch: "ON"	Set throttle valve to idle position	0 – 1 V
				Open throttle slightly	4 V or more
88	56	Camshaft position sensor	Engine: cranking		0.4 – 3.0 V
			Engine: idling		1.5 – 3.0 V
89	45	Crankshaft position sensor	Engine: cranking		0.4 – 4.0 V
			Engine: idling		1.5 – 2.5 V
90	65	Volume air flow sensor	Engine: idling		2.2 – 3.2 V
			Engine: 2,500 r/min		

TERMINAL RESISTANCE AND CONTINUITY CHECK

ECM <M/T> or PCM <A/T> Connector Terminal Arrangement

<M/T>



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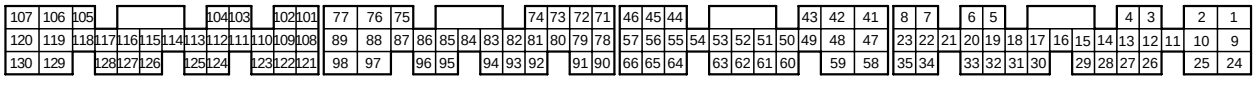

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TERMINAL NO.	TERMINAL NO.	INSPECTION ITEM	NORMAL CONDITION (INSPECTION CONDITION)
1 – 12	1 – 41	No. 1 injector	13 – 16 Ω [at 20°C (68°F)]
14 – 12	9 – 41	No. 2 injector	
2 – 12	24 – 41	No. 3 injector	
15 – 12	2 – 41	No. 4 injector	

TSB Revision

TERMINAL NO.	TERMINAL NO.	INSPECTION ITEM	NORMAL CONDITION (INSPECTION CONDITION)
4 – 12	14 – 41	Stepper motor coil (A1)	28 – 33 Ω [at 20°C (68°F)]
17 – 12	28 – 41	Stepper motor coil (A2)	
5 – 12	15 – 41	Stepper motor coil (B1)	
18 – 12	29 – 41	Stepper motor coil (B2)	
6 – 12	6 – 41	EGR solenoid	29 – 35 Ω [at 20°C (68°F)]
9 – 12	34 – 41	Evaporative emission purge solenoid	30 – 34 Ω [at 20°C (68°F)]
13 – Body ground	42 – Body ground	ECM or PCM ground	Continuity (approximately 0 Ω)
26 – Body ground	48 – Body ground	ECM or PCM ground	
54 – 12	26 – 41	Heated oxygen sensor heater (rear)	11 – 18 Ω [at 20°C (68°F)]
55 – 12	35 – 41	Evaporative emission ventilation solenoid	17 – 21 Ω [at 20°C (68°F)]
60 – 12	3 – 41	Heated oxygen sensor heater (front)	4.5 – 8.0 Ω [at 20°C (68°F)]
72 – 92	57 – 64	Intake air temperature sensor	13 – 17 kΩ [when intake air temperature is –20°C (–4°F)]
			5.3 – 6.7 kΩ [when intake air temperature is 0°C (32°F)]
			2.3 – 3.0 kΩ [when intake air temperature is 20°C (68°F)]
			1.0 – 1.5 kΩ [when intake air temperature is 40°C (104°F)]
			0.56 – 0.76 kΩ [when intake air temperature is 60°C (140°F)]
			0.30 – 0.42 kΩ [when intake air temperature is 80°C (176°F)]
83 – 92	44 – 57	Engine coolant temperature sensor	14 – 17 kΩ [when engine coolant temperature is –20°C (–4°F)]
			5.1 – 6.5 kΩ [when engine coolant temperature is 0°C (32°F)]
			2.1 – 2.7 kΩ [when engine coolant temperature is 20°C (68°F)]
			0.9 – 1.3 kΩ [when engine coolant temperature is 40°C (104°F)]
			0.48 – 0.68 kΩ [when engine coolant temperature is 60°C (140°F)]
			0.26 – 0.36 kΩ [when engine coolant temperature is 80°C (176°F)]

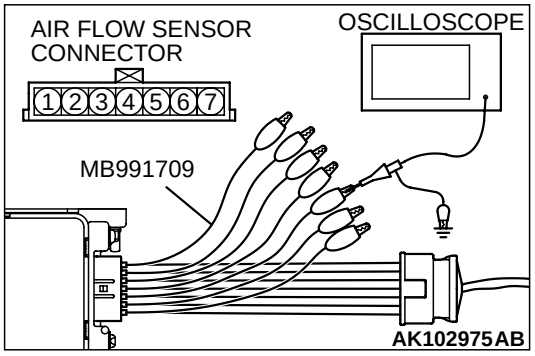
INSPECTION PROCEDURE USING AN OSCILLOSCOPE

M1131154500167

VOLUME AIR FLOW SENSOR

Required Special Tool:

- MB991709: Test Harness Set



Measurement Method

1. Disconnect the volume air flow sensor connector, and connect the test harness special tool (MB991709) in between. (All terminals should be connected.)
2. Connect the oscilloscope probe to volume air flow sensor connector terminal 3.

Alternate method (Test harness not available)

<M/T>

Connect the oscilloscope probe to ECM terminal 90.

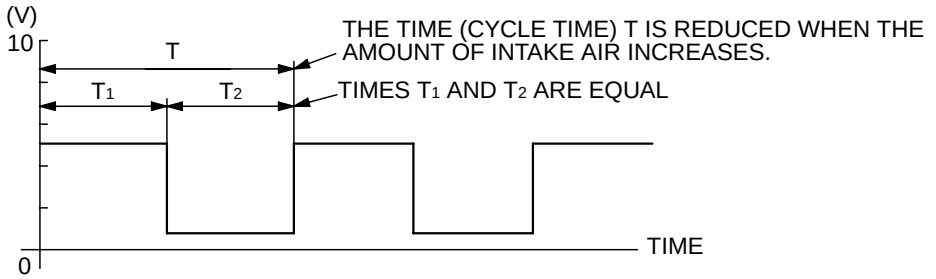
<A/T>

Connect the oscilloscope probe to PCM terminal 65.

Standard Wave Pattern

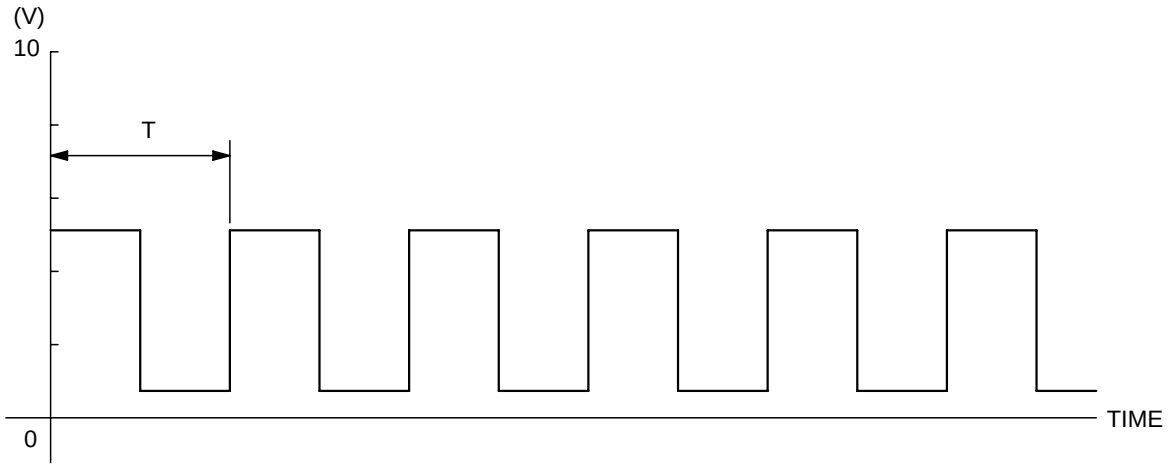
Observation conditions	
Function	**Special pattern**
Pattern height	Low
Pattern selector	Display
Engine r/min	Idle speed

Standard wave pattern



Observation conditions
Rev engine, observe T_1 and T_2 remain equal.

Standard wave pattern



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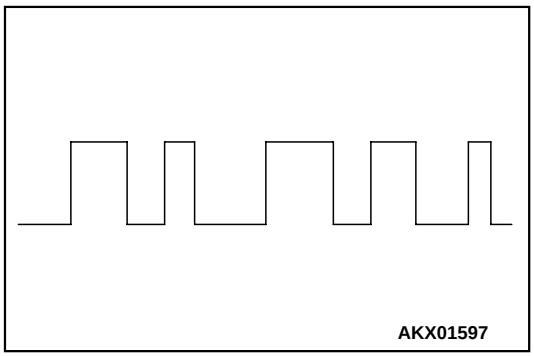
Wave Pattern Observation Points

Check that cycle time T becomes shorter and the frequency increases when the engine speed is increased.

Examples of Abnormal Wave Patterns

Example 1



Cause of problem

- Sensor interface malfunction.

Wave pattern characteristics

- Rectangular wave pattern is output even when the engine is not started.

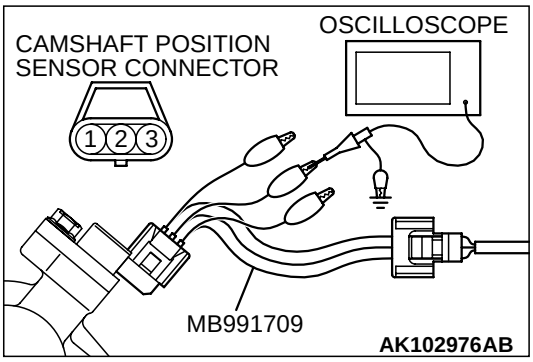
Example 2

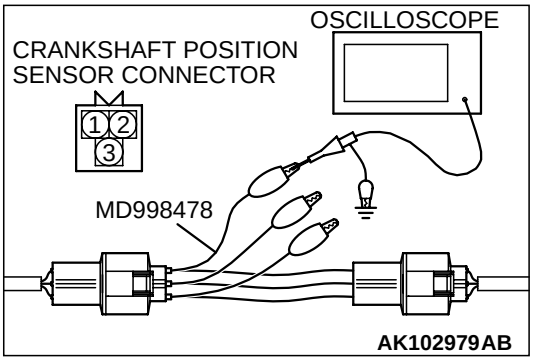
Cause of problem

- Damaged rectifier or vortex generation column.

Wave pattern characteristics

- Unstable wave pattern with non-uniform frequency. An ignition leak will distort the wave pattern temporarily, even if the volume air flow sensor is normal.





CAMSHAFT POSITION SENSOR AND CRANKSHAFT POSITION SENSOR

Required Special Tools:

- MB991709: Test Harness Set
- MD998478: Test Harness

Measurement Method

1. Disconnect the camshaft position sensor connector, and connect the test harness special tool (MB991709) in between. (All terminals should be connected.)
2. Connect the oscilloscope probe to camshaft position sensor connector terminal 2.
3. Disconnect the crankshaft position sensor connector, and connect the test harness special tool (MD998478) in between.
4. Connect the oscilloscope probe to crankshaft position sensor connector terminal 2 (black clip of special tool).

Alternate method (Test harness not available)

<M/T>

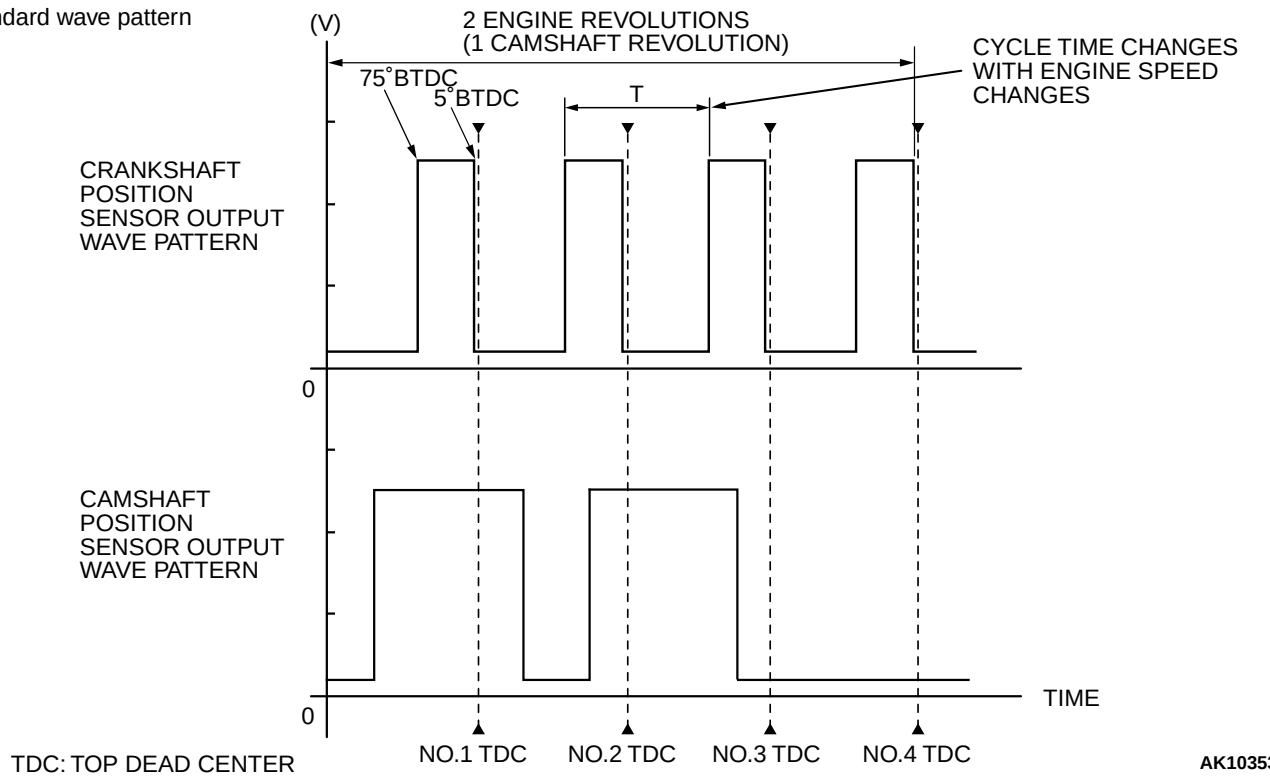
1. Connect the oscilloscope probe to ECM terminal 88. (Check the camshaft position sensor signal wave pattern.)
2. Connect the oscilloscope probe to ECM terminal 89. (Check the crankshaft position sensor signal wave pattern.)

<A/T>

1. Connect the oscilloscope probe to PCM terminal 56. (Check the camshaft position sensor signal wave pattern.)
2. Connect the oscilloscope probe to PCM terminal 45. (Check the crankshaft position sensor signal wave pattern.)

Standard Wave Pattern

Observation conditions	
Function	**Special pattern**
Pattern height	Low
Pattern selector	Display
Engine r/min	Idle speed

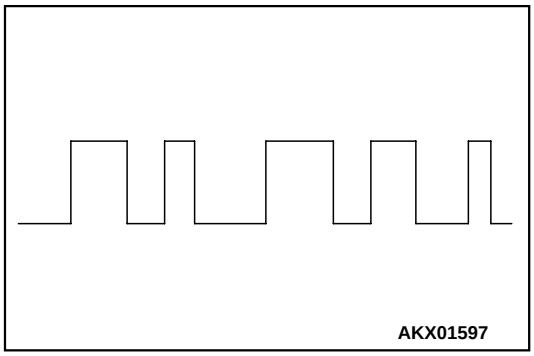


Wave Pattern Observation Points

Check that cycle time T becomes shorter when the engine speed increased.

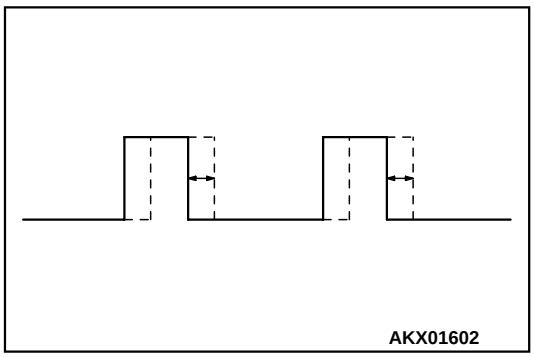
Examples of Abnormal Wave Patterns

Example 1



- Cause of problem
  Sensor interface malfunction.
- Wave pattern characteristics
  Rectangular wave pattern is output even when the engine is not started.

Example 2

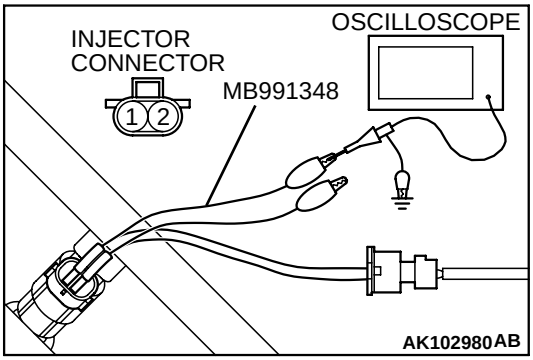


- Cause of problem
  Loose timing belt.
  Abnormality in sensor disc.
- Wave pattern characteristics
  Wave pattern is displaced to the left or right.

INJECTOR

Required Special Tools:

- MD991348: Test Harness Set



Measurement Method

1. Disconnect the injector connector, and connect the test harness special tool MB991348 in between. (All terminals should be connected.)
2. Connect the oscilloscope probe to injector connector terminal 2.

Alternate method (Test harness not available)

<M/T>

1. Connect the oscilloscope probe to ECM terminal 1. (When checking the number 1 cylinder.)
2. Connect the oscilloscope probe to ECM terminal 14. (When checking the number 2 cylinder.)
3. Connect the oscilloscope probe to ECM terminal 2. (When checking the number 3 cylinder.)
4. Connect the oscilloscope probe to ECM terminal 15. (When checking the number 4 cylinder.)

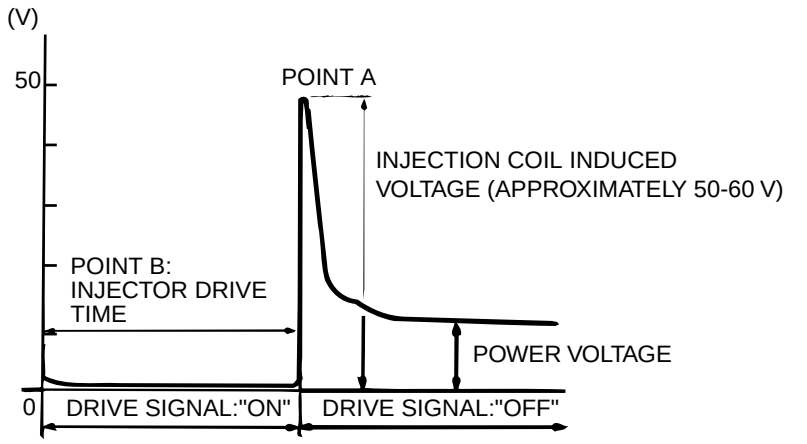
<A/T>

1. Connect the oscilloscope probe to PCM terminal 1. (When checking the number 1 cylinder.)
2. Connect the oscilloscope probe to PCM terminal 9. (When checking the number 2 cylinder.)
3. Connect the oscilloscope probe to PCM terminal 24. (When checking the number 3 cylinder.)
4. Connect the oscilloscope probe to PCM terminal 2. (When checking the number 4 cylinder.)

Standard Wave Pattern

Observation conditions	
Function	**Special pattern**
Pattern height	Variable
Variable knob	Adjust while viewing the wave pattern
Pattern selector	Display
Engine r/min	Idle speed

Standard wave pattern



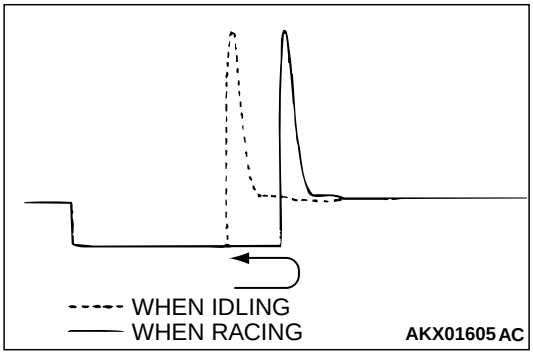
Wave Pattern Observation Points

Point A: Height of injector coil induced voltage.

CONTRAST WITH STANDARD WAVE PATTERN	PROBABLE CAUSE
Injector coil induced voltage is low or doesn't appear at all	Short in the injector solenoid

Point B: Injector drive time

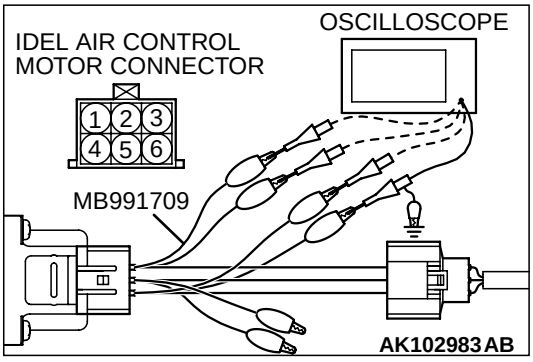
1. The injector drive time should be synchronized with the scan tool tester display.
2. When the engine is suddenly revved, the drive time will be greatly extended at first, but the drive time will soon return to original length.



IDLE AIR CONTROL MOTOR (STEPPER MOTOR)

Required Special Tool:

- MB991709: Test Harness Set



Measurement Method

1. Disconnect the idle air control motor connector, and connect the test harness special tool, MB991709 in between. (All terminals should be connected.)
2. Connect the oscilloscope probe to the idle air control motor connector terminal 1, terminal 3, terminal 4 and terminal 6, respectively.

Alternate method (Test harness not available)

<M/T>

Connect the oscilloscope probe to ECM terminals 4, 5, 17 and 18.

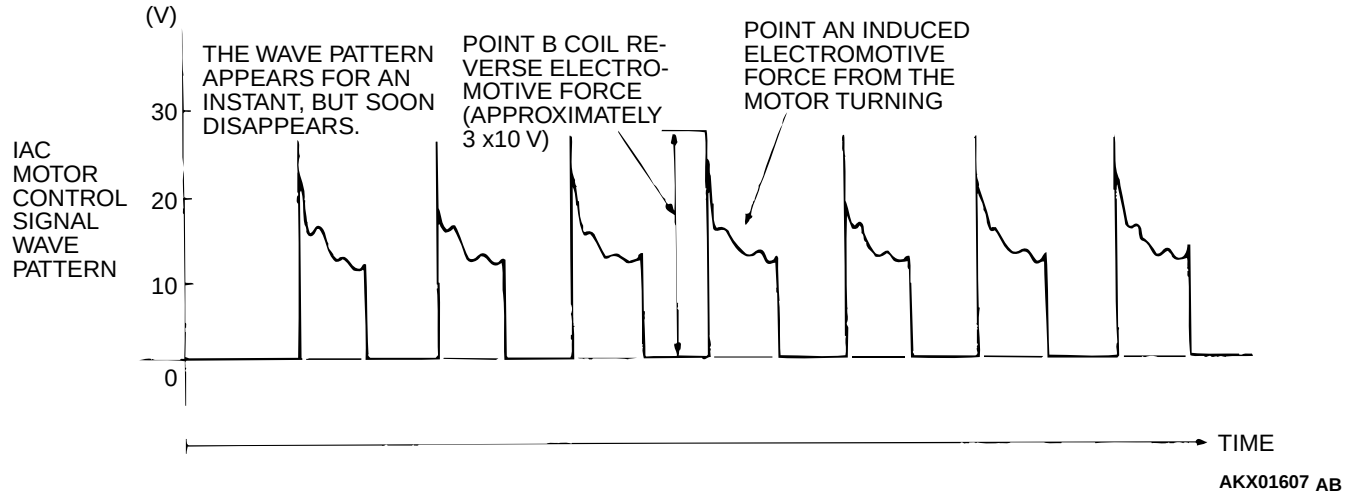
<A/T>

Connect the oscilloscope probe to PCM terminals 14, 15, 28 and 29.

Standard Wave Pattern

Observation conditions	
Function	**Special pattern**
Pattern height	High
Pattern selector	Display
Engine condition	Turn the ignition switch from "LOCK" (OFF) to "ON" position (without starting the engine).
	While the engine is idling, turn the A/C switch to "ON".
	Immediately after starting the warm the engine (approximately one minute).

Standard wave pattern



Wave Pattern Observation Points

Check that the standard wave pattern appears when the idle air control motor is operating.

Point A:

Presence or absence of induced electromotive force from the motor turning. (Refer to abnormal wave pattern.)

CONTRAST WITH STANDARD WAVE PATTERN	PROBABLE CAUSE
Induced electromotive force does not appear or is extremely small	Malfunction of motor

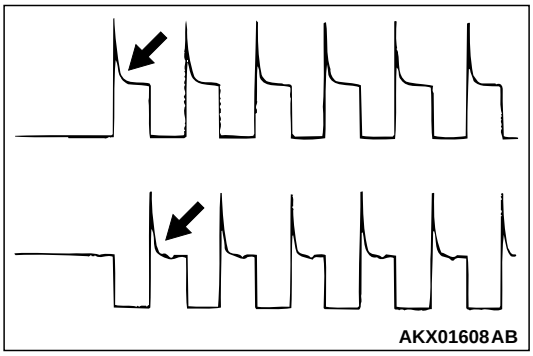
Point B:

Height of coil back electromotive force

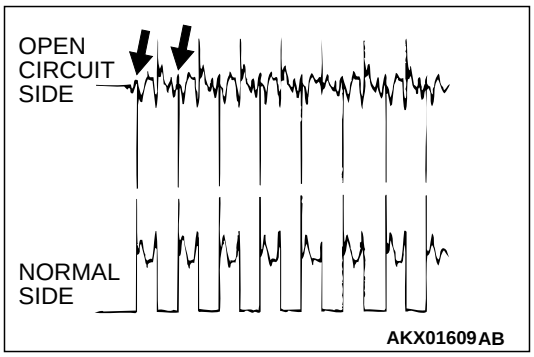
CONTRAST WITH STANDARD WAVE PATTERN	PROBABLE CAUSE
Coil reverse electromotive force does not appear or is extremely small	Short in the coil

Examples of Abnormal Wave Patterns

Example 1



- Cause of problem
  Malfunction of motor. (Motor is not operating.)
- Wave pattern characteristics
  Induced electromotive force from the motor turning does not appear.



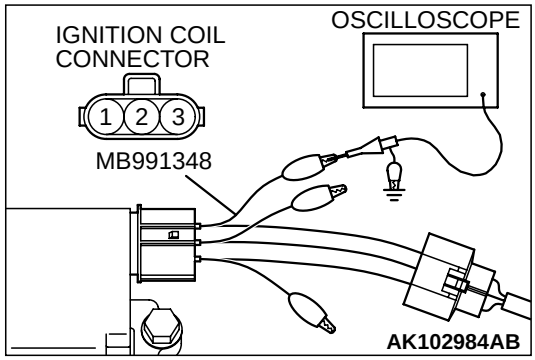
Example 2

- Cause of problem
  Open circuit in the line between the idle air control motor and the ECM or PCM.
- Wave pattern characteristics
  Current is not supplied to the motor coil on the open circuit side. (Voltage does not drop to 0 volt.) Furthermore, the induced electromotive force wave pattern at the normal side is slightly different from the normal wave pattern.

IGNITION COIL AND IGNITION POWER TRANSISTOR

Required Special Tool:

- MB991348: Test Harness Set



Measurement Method

1. Disconnect the ignition coil connector, and connect test harness special tool, MB991348, in between. (All terminals should be connected.)
2. Connect the oscilloscope probe to ignition coil connector terminal 3.

Alternate method (Test harness not available)

<M/T>

Connect the oscilloscope probe to ECM terminal 10 (for number 1 – number 4), terminal 23 (for number 2 – number 3) respectively.

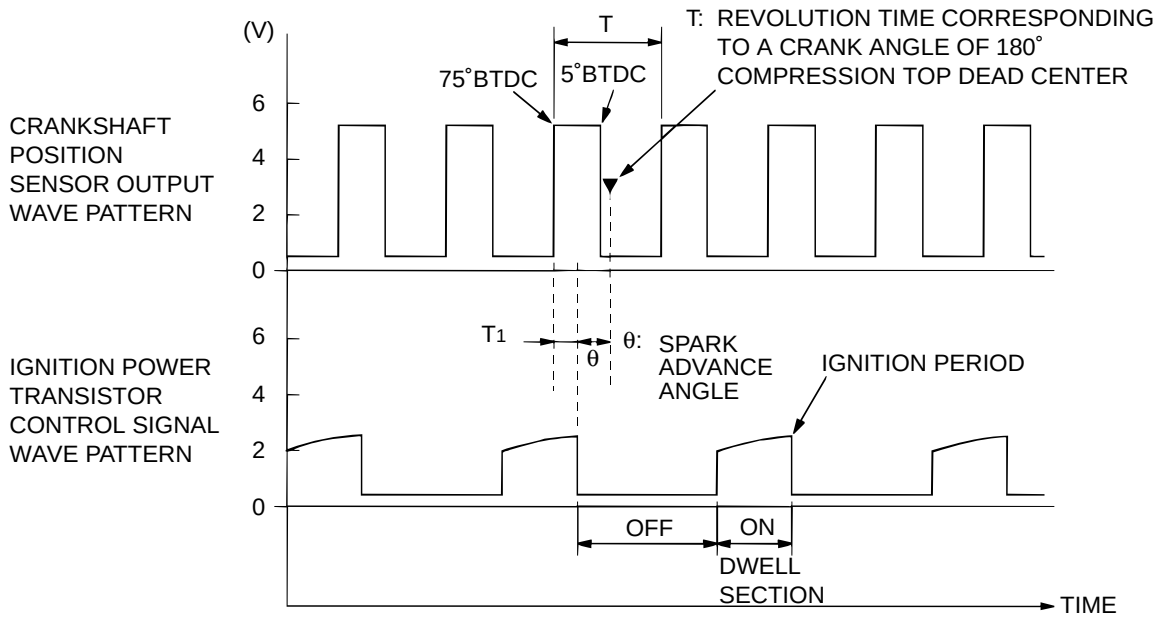
<A/T>

Connect the oscilloscope probe to PCM terminals 11 (for number 1 – number 4), terminal 12 (for number 2 – number 3) respectively.

Standard Wave Pattern

Observation conditions	
Function	**Special pattern**
Pattern height	Low
Pattern selector	Display
Engine r/min	Approximately 1,200 r/min

Standard wave pattern



T1: TIME COMPUTED BY THE ECM or PCM

AK000068 AB

Wave Pattern Observation Points

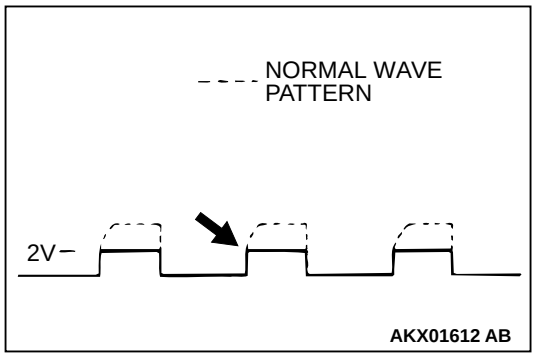
Point: Condition of wave pattern build-up section and maximum voltage (Refer to abnormal wave pattern examples 1 and 2.

CONDITION OF WAVE PATTERN BUILD-UP SECTION AND MAXIMUM VOLTAGE	PROBABLE CAUSE
Rises from approximate 2 volts to approximate 4.5 volts at the top-right	Normal
2-volt rectangular wave	Open-circuit in ignition primary circuit
Rectangular wave at power voltage	Ignition power transistor malfunction

Examples of Abnormal Wave Patterns

Example 1 (Wave pattern during engine cranking)

- Cause of problem
  Open-circuit in ignition primary circuit
- Wave pattern characteristics
  Top-right part of the build-up section cannot be seen, and voltage value is approximately 2 volts too low.



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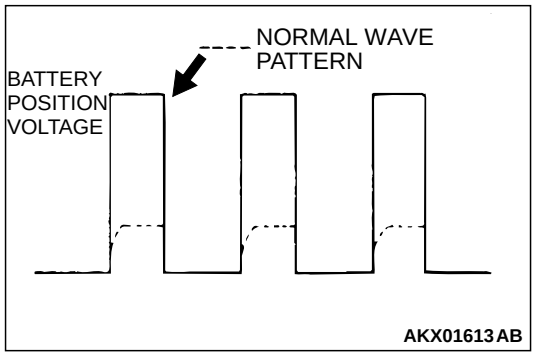
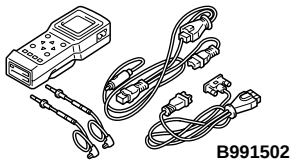
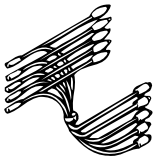
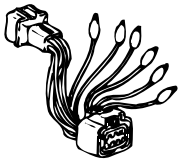


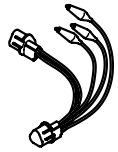
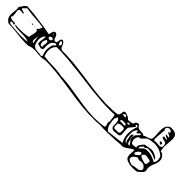
Example 2 (Wave pattern during engine cranking)

- Cause of problem
  Malfunction in ignition power transistor
- Wave pattern characteristics
  Power voltage results when the ignition power transistor is ON.

SPECIAL TOOLS

M1131000600085

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 B991502	MB991502 Scan tool <MUT-II>	MB991496-OD	• Reading diagnostic trouble code • MFI system inspection
MB991348	MB991348 Test harness set	MB991348-01	• Adjustment of throttle position sensor • Inspection using an oscilloscope
	MB991709 Test harness set	MB991709-01	• Inspection using an oscilloscope • Inspection of idle air control motor
 MB991658	MB991658 Test harness set	Tool not available	Inspection of heated oxygen sensor
	MD998463 Test harness (6 pin, square)	MD998463-01	Inspection using an oscilloscope

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
	MD998464 Test harness (4 pin, square)	MD998464-01	• Inspection of heated oxygen sensor • Inspection using an oscilloscope
	MD998478 Test harness (3 pin, triangle)	MD998478-01	Inspection using an oscilloscope
	MD998709 Adaptor hose	MIT210196	Measurement of fuel pressure
	MD998742 Hose adaptor	MD998742-01	
 MB991637	MB991637 Fuel pressure gauge set	Tool not available	

ON-VEHICLE SERVICE

COMPONENT LOCATION

M1131002100280

NAME	SYMBOL	NAME	SYMBOL
Air conditioning compressor clutch relay	J	Heated oxygen sensor (front)	N
Camshaft position sensor	I	Heated oxygen sensor (rear)	V
Crankshaft position sensor	K	Idle air control motor	F
Data link connector	T	Ignition coil	M
EGR solenoid	C	Injector	B
Engine control module (ECM) <M/T>	U	Knock sensor	D
Engine coolant temperature sensor	H	Manifold differential pressure sensor	A
Engine speed detection connector	J	Multiport fuel injection (MFI) relay	J
Evaporative emission purge solenoid	C	Park/neutral position switch <A/T>	P

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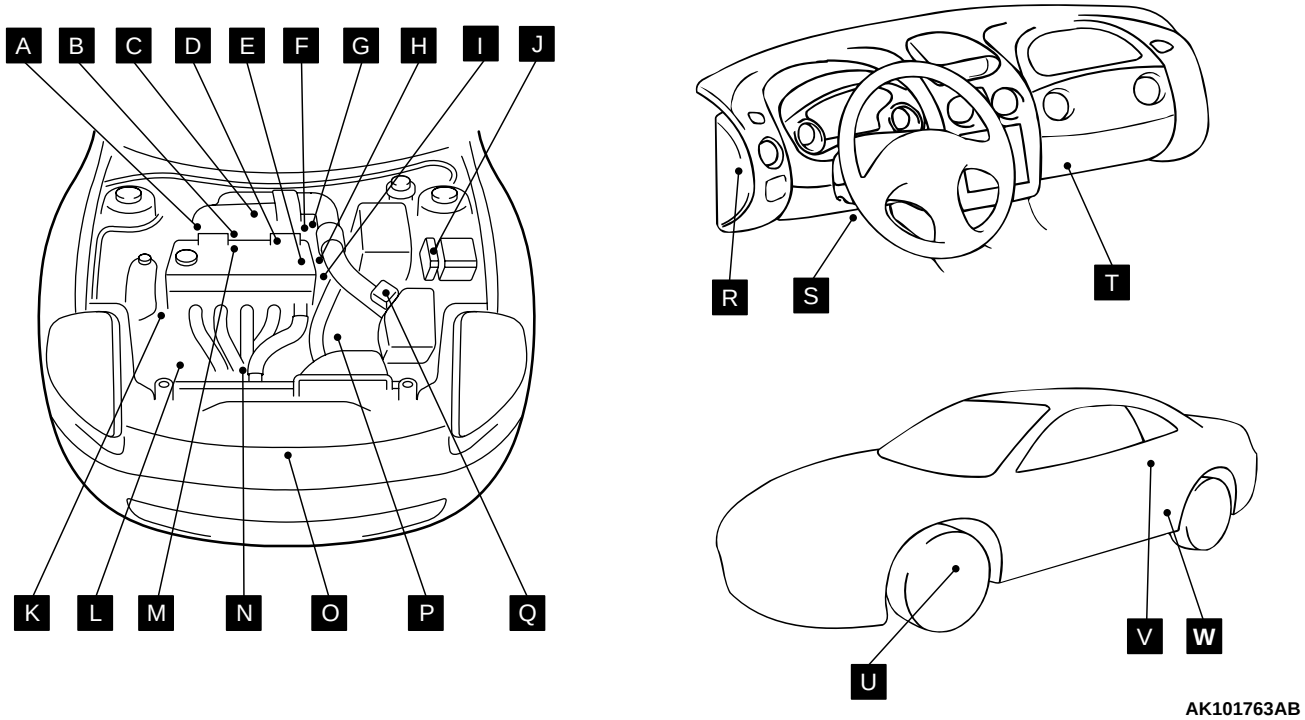
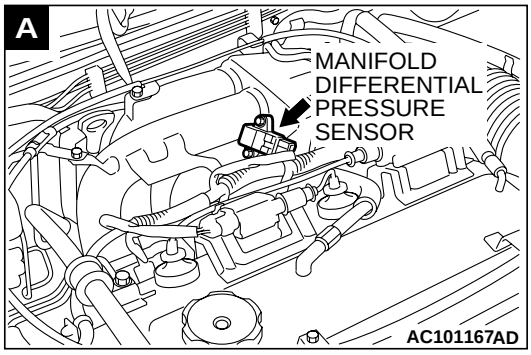
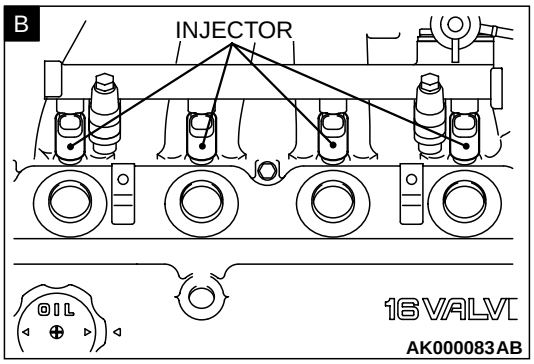
NAME	SYMBOL	NAME	SYMBOL
Evaporative emission ventilation solenoid	X	Powertrain control module (PCM) <A/T>	U
Fan controller	O	Power steering pressure switch	L
Fuel tank differential pressure sensor	W	Throttle position sensor	G
Fuel temperature sensor	W	Vehicle speed sensor <M/T>	E
Fuel pump relay 1, 2	S	Volume air flow sensor (with built-in intake air temperature sensor and barometric pressure sensor)	Q







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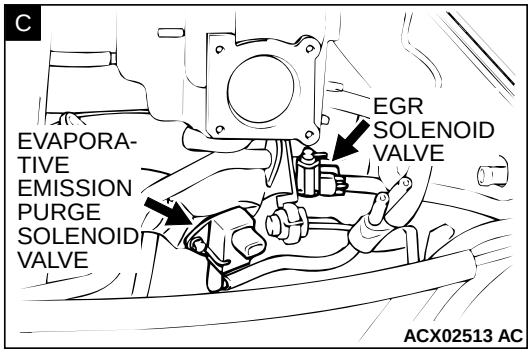

ACX02513 AC

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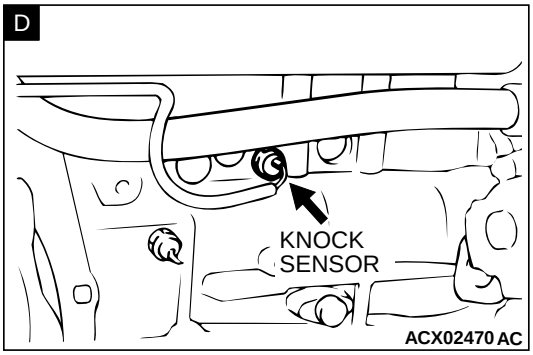

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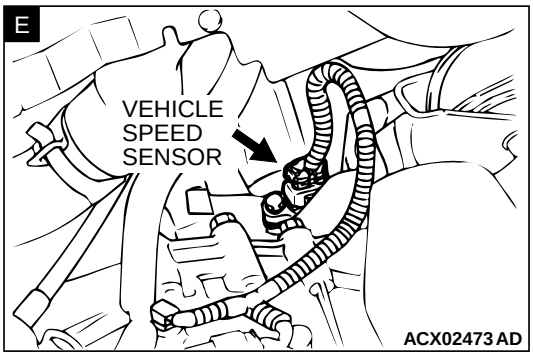

ACX02473 AD

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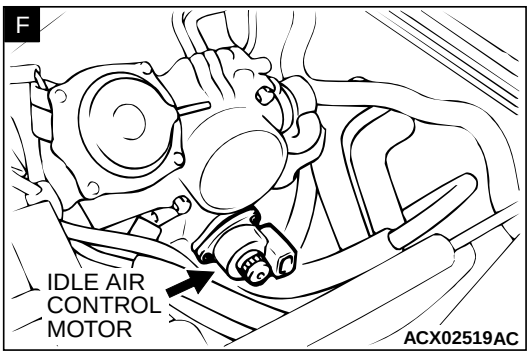

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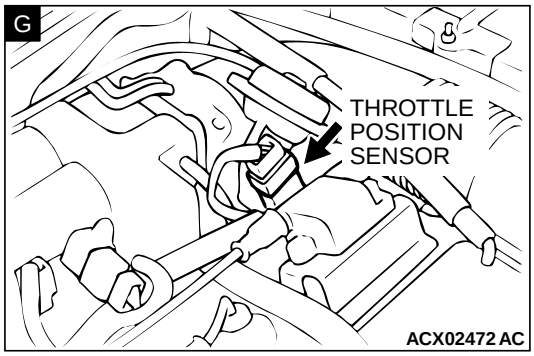

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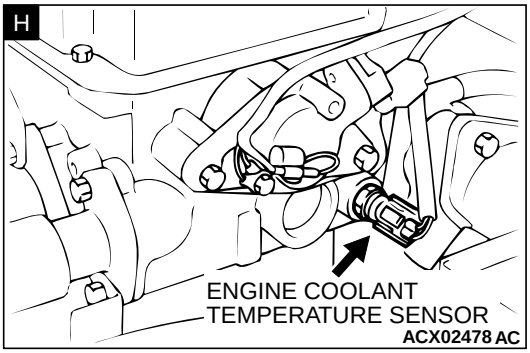

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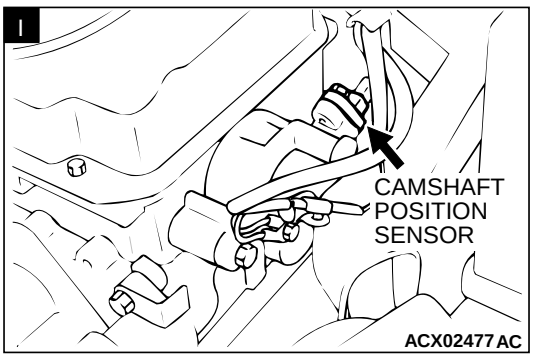

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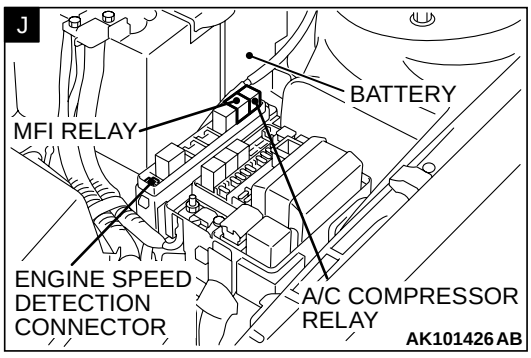

AK101426 AB

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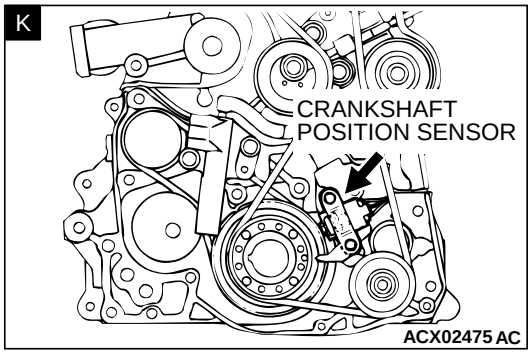

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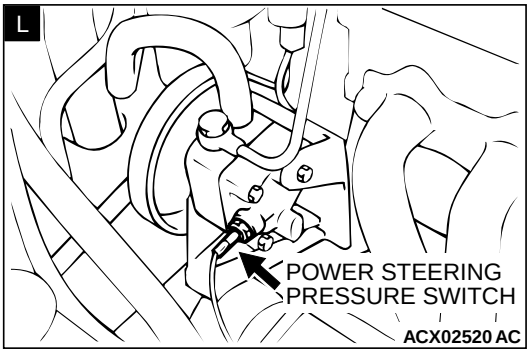

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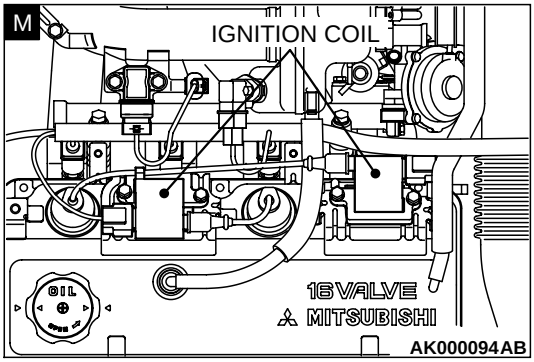

AK000094 AB

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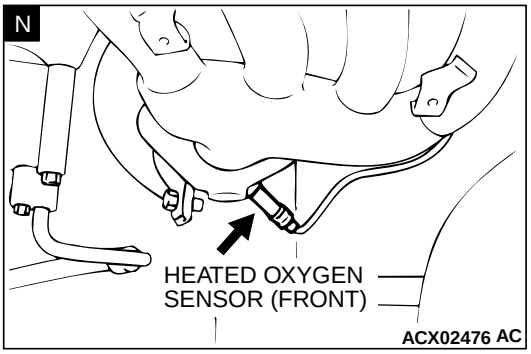

ACX02476 AC

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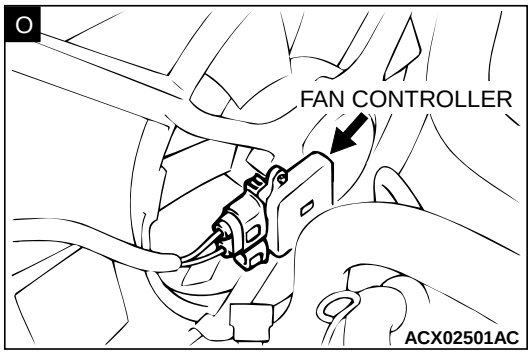

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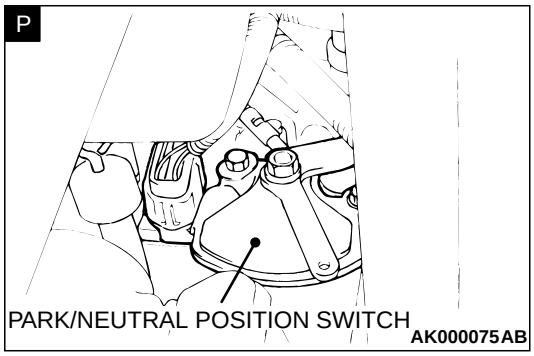

AK000075 AB

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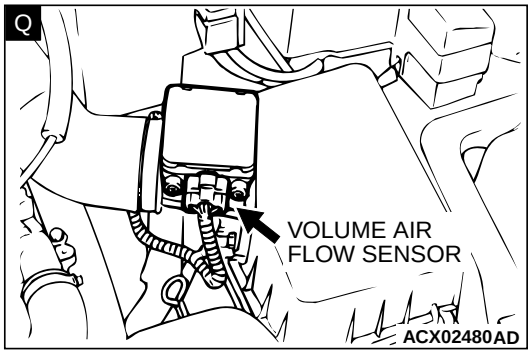

ACX02480 AD

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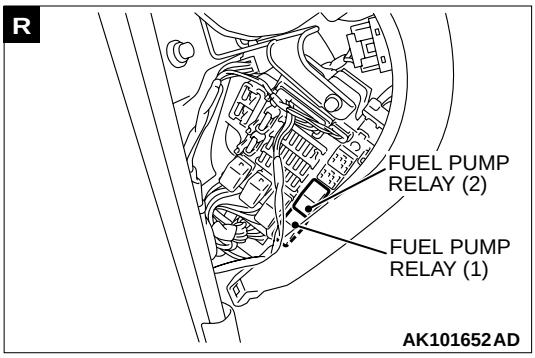

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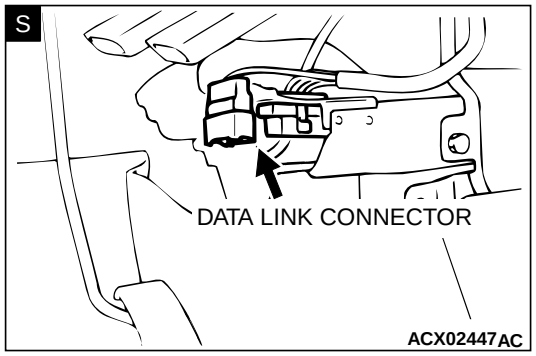
S



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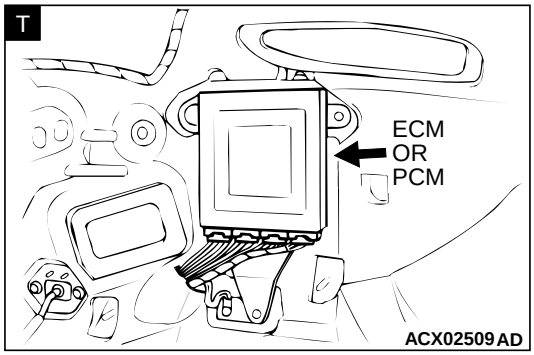

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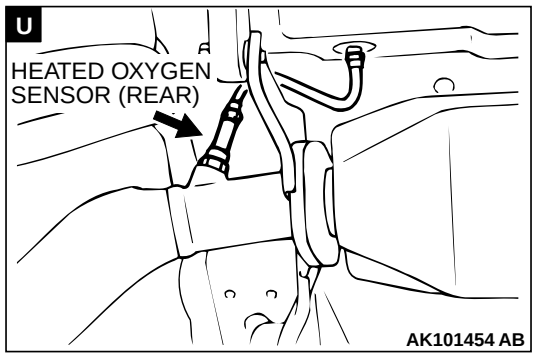

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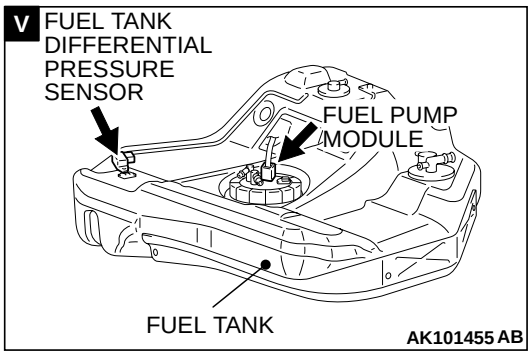

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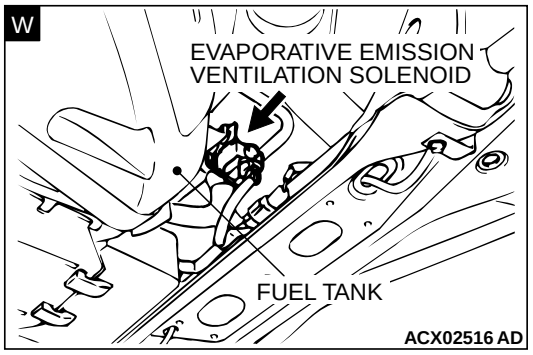


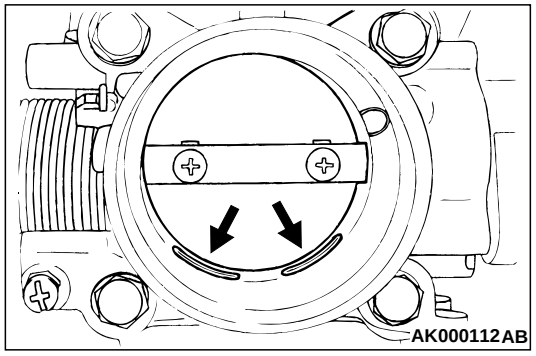
THROTTLE BODY (THROTTLE VALVE AREA) CLEANING

M1131001000105

1. Start the engine and warm it up until the coolant is heated to 80°C (176°F) or higher. Then stop the engine.
2. Remove the air intake hose from the throttle body.

⚠ CAUTION

Do not allow cleaning solvent to enter the bypass passage.



3. Plug the bypass passage inlet (arrow) of the throttle body.
4. Spray cleaning solvent into the valve through the throttle body intake port and leave it for approximately five minutes.
5. Start the engine, rev it several times and then idle it for about one minute. If the idling speed becomes unstable (or if the engine stalls) due to the bypass passage being plugged, slightly open the throttle valve to keep the engine running.
6. If the throttle valve deposits are not removed, repeat steps 4 and 5.
7. Unplug the bypass passage inlet.

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8. Attach the air intake hose.
9. Use the scan tool to erase any diagnostic trouble code.
10. Adjust the basic idle speed. (Refer to P.13A-577.)

⚠ WARNING

Battery posts, terminals and related accessories contain lead and lead compounds. WASH HANDS AFTER HANDLING.

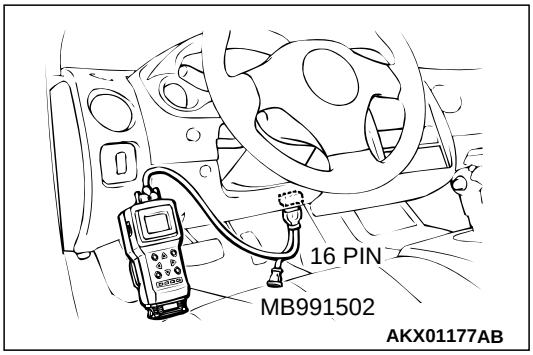
NOTE: If the engine hunts while idling after adjustment of the basic idle speed, disconnect the negative cable from the battery for 10 seconds or more, and then reconnect it and run the engine at idle for about 10 minutes after the engine is warmed up.

THROTTLE POSITION SENSOR ADJUSTMENT

M1131001100038

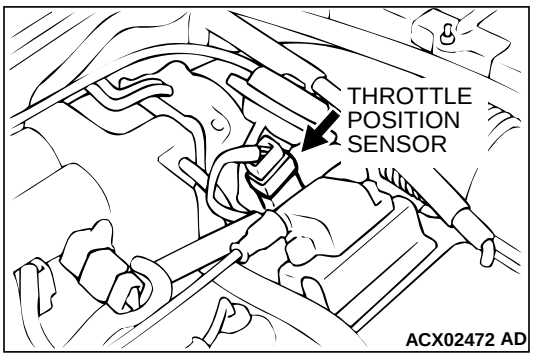
Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991348: Test Harness Set



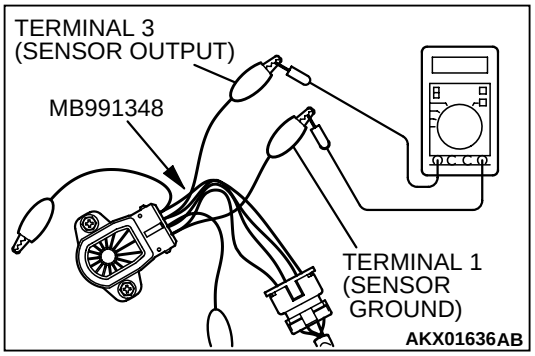
⚠ CAUTION

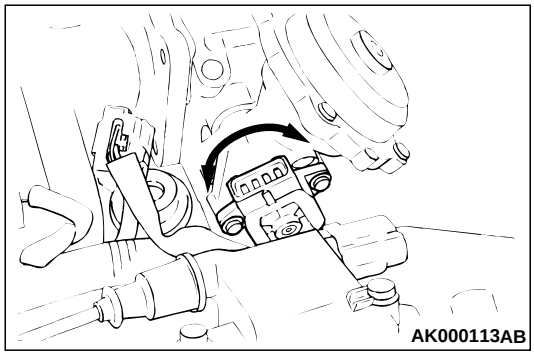
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting the scan tool MB991502.



1. Connect scan tool MB991502 to the data link connector. When not using scan tool follow the steps below.
   (1) Disconnect the throttle position sensor connector, and connect the special tool MB991348 in between. (All terminals should be connected.)
   (2) Connect a digital voltmeter between throttle position sensor terminal 3 (sensor output) and terminal 1 (sensor ground).
2. Turn the ignition switch to the "ON" position (but do not start the engine).
3. Check the throttle position sensor output voltage.

   Standard value: 535 – 735 mV




AK000113AB

4. If not within the standard value range, adjust by loosening throttle position sensor mounting bolts and turning the throttle position sensor body. After adjusting, tighten the bolts securely.
5. Turn the ignition switch to the "LOCK" (OFF) position.
6. Disconnect scan tool MB991502. When the scan tool is not used, remove special tool MB991348, and connect the throttle position sensor connector.

BASIC IDLE SPEED ADJUSTMENT

M1131001800219

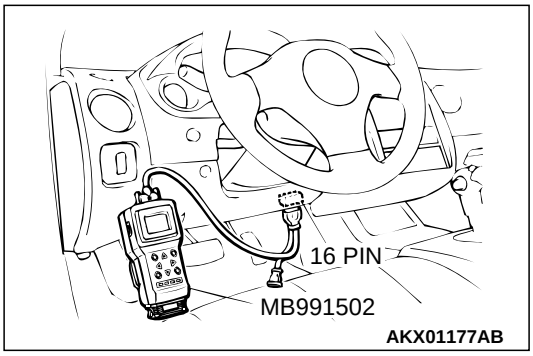
Required Special Tool:

- MB991502: Scan Tool (MUT-II)

NOTE: The standard idle speed has been adjusted with the speed adjusting screw (SAS), by the manufacturer, and there should be no need for readjustment.

NOTE: If the adjustment has been changed by mistake, the idle speed may become too high or the idle speed may drop too low when loads A/C, defogger, etc. are placed on the engine. If this occurs, adjust by the following procedure.

NOTE: The adjustment, if made, should be made after first confirming that the spark plugs, the injectors, the idle air control motor, compression, etc., are all normal.



AKX01177AB

1. The vehicle should be prepared as follows before the inspection and adjustment.
   - Engine coolant temperature: 80 – 95° C(176 – 203°F)
   - Lights, electric cooling fan and accessories: OFF
   - Transaxle: Neutral (A/T for "P" range)

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

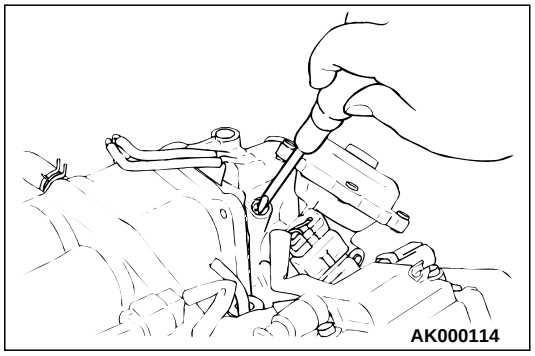
2. Connect scan tool MB991502 to the data link connector (16-pin).
3. Start the engine and run at idle.
4. Select the item number 30 of the scan tool Actuator test.

   NOTE: Use the scan tool to hold the IAC motor at the basic step to adjust the basic idle speed.
5. Check the idle speed.

   Standard value: 700 ± 50 r/min

   NOTE: The engine speed may be 20 to 100 r/min lower than indicated above for a new vehicle [driven approximately 500 km (300 mile) or less], but no adjustment is necessary.

   NOTE: If the engine stalls or the engine speed is low even though the vehicle has been driven approximately 500 km (300 mile) or more, it is probable that deposits are adhered to the throttle valve, so clean it. (Refer to P.13A-575)


AK000114

6. If not within the standard value range, turn the speed adjusting screw (SAS) to make the necessary adjustment.
7. Press the scan tool clear key, and release the IAC motor Actuator test mode.
8. Turn the ignition switch to the "LOCK" (OFF) position.
   NOTE: Unless the IAC motor is released, the Actuator test mode will continue for 27 minutes.
9. Disconnect scan tool MB991502.
10. Start the engine again and let it idle for about 10 minutes. Check that the idling condition is normal.

FUEL PRESSURE TEST

M1131001900090

Required Special Tools:

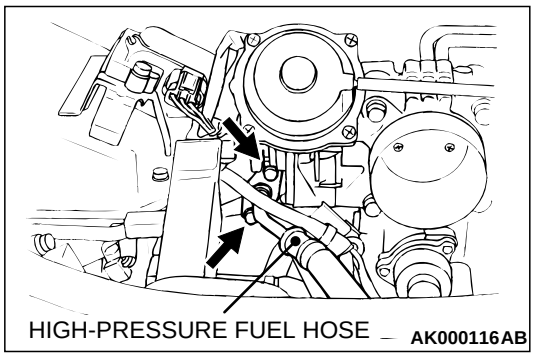
- MB991502: Scan Tool (MUT-II)
- MB991637: Fuel Pressure Gauge Set
- MD998709: Adaptor Hose
- MD998742: Hose Adaptor

1. Release residual pressure from the fuel line to prevent fuel spray. (Refer to P.13A-580.)

⚠ WARNING

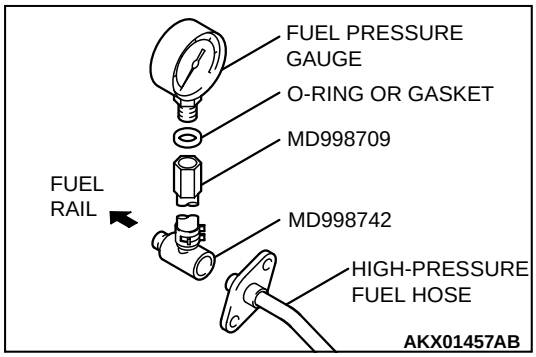
To prevent a fire, cover the hose connection with shop towels to prevent splashing of fuel that could be caused by some residual pressure in the fuel pipe line.

2. Disconnect the high-pressure fuel hose at the fuel rail side.
3. Assemble the fuel pressure measurement tools as follows.



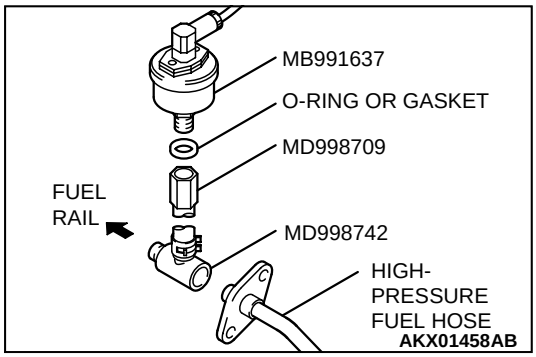
<When using the fuel pressure gauge>

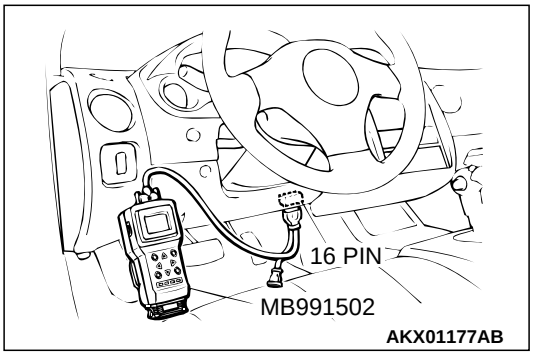
1. Remove the union joint and bolt from special tool MD998709 (adaptor hose) and instead attach special tool MD998742 (hose adaptor) to the adaptor hose.
2. Place a suitable O-ring or gasket on assembled special tools MD998709 and MD998742 and install the fuel pressure gauge.
3. Install the assembled fuel pressure measurement tools between the fuel rail and high-pressure fuel hose.

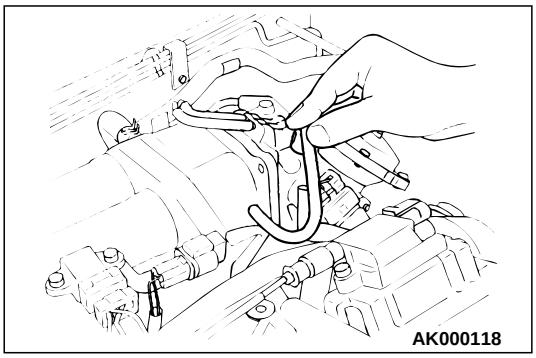


<When using the special tool MB991637 (fuel pressure gauge set)>

1. Remove the union joint and bolt from special tool MD998709 (adaptor hose) and instead attach special tool MD998742 (hose adaptor) to the adaptor hose.
2. Install special tool MB991637 (fuel pressure gauge set) to assembled special tools MD998709 and MD998742 via a gasket.
3. Install the assembled fuel pressure measurement tools between the fuel rail and the high-pressure fuel hose.







⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

4. Connect scan tool MB991502 to the data link connector.
5. Use the Actuator test 07 to drive the fuel pump. Check that there is no fuel leaking from any section when the fuel pump is operating.
6. Stop the fuel pump.
7. Start the engine and run at idle.
8. Measure fuel pressure while the engine is running at idle.
   Standard value: Approximately 270 kPa (38 psi) at curb idle
9. Disconnect the vacuum hose from the fuel pressure regulator and measure fuel pressure with the hose end closed with your finger.
   Standard value: 330 – 350 kPa (47 – 50 psi) at curb idle
10. Check to see that fuel pressure at idle does not drop even after the engine has been revved several times.
11. Revving the engine repeatedly, hold the fuel return hose lightly with your fingers to feel that fuel pressure is present in the return hose.
    NOTE: If the fuel flow rate is low, there will be no fuel pressure in the return hose.
12. If any of fuel pressure measured in steps 10 to 13 is out of specification, troubleshoot and repair according to the table below.

SYMPTOM	PROBABLE CAUSE	REMEDY
• Fuel pressure too low • Fuel pressure drops after racing • No fuel pressure in fuel return hose	Clogged fuel filter	Replace fuel filter
	Fuel leaking to return side due to poor fuel regulator valve seating or settled spring	Replace fuel pressure regulator
	Low fuel pump delivery pressure	Replace fuel pump
Fuel pressure too high	Binding valve in fuel pressure regulator	Replace fuel pressure regulator
	Clogged fuel return hose or pipe	Clean or replace hose or pipe
Same fuel pressure when vacuum hose is connected and when disconnected	Damaged vacuum hose or clogged nipple	Replace vacuum hose or clean nipple
	Defective fuel pressure regulator	Replace fuel pressure regulator

13. Stop the engine and observe fuel pressure gauge reading. It is normal if the reading does not drop within two minutes. If it does, observe the rate of drop and troubleshoot and repair according to the table below. Start, then stop the engine.
    (1) Squeeze the fuel return line closed to confirm leak-down occurs from defective fuel pressure regulator.

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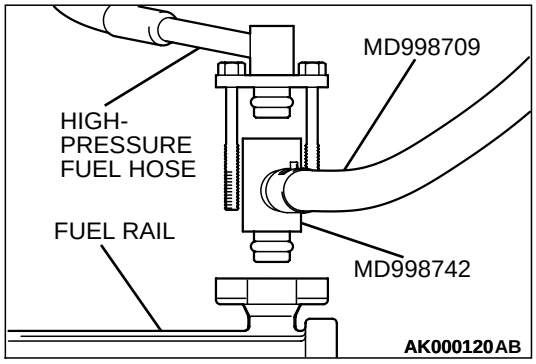
(2) Squeeze the fuel supply line closed to confirm leak-down occurs from defective fuel pump check valve.
(3) If pressure continues to drop with both fuel lines squeezed closed, injector(s) are leaking.

SYMPTOM	PROBABLE CAUSE	REMEDY
Fuel pressure drops gradually after engine is stopped	Leaky injector	Replace injector
	Leaky fuel regulator valve seat	Replace fuel pressure regulator
Fuel pressure drops sharply immediately after engine is stopped	Check valve in fuel pump is held open	Replace fuel pump



14.Release residual pressure from the fuel pipe line. (Refer to P.13A-580.)

⚠ ***WARNING***
Cover the hose connection with shop towels to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.

15.Remove the fuel pressure gauge, and special tools MD998709 and MD998742 from the fuel rail.
16.Replace the O-ring at the end of the high-pressure fuel hose with a new one.
17.Fit the high-pressure fuel hose into the fuel rail and tighten the bolts to specified torque.

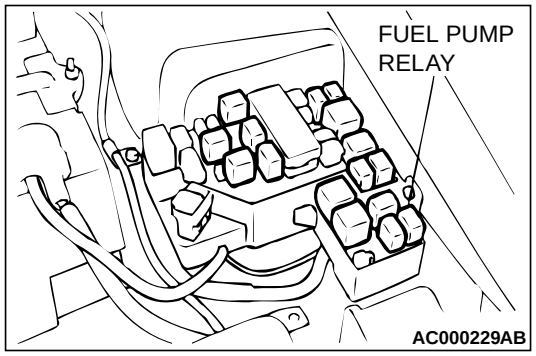
Tightening torque: 4.9 ± 1.0 (44 ± 8 in-lb)

18.Check for fuel leaks.
(1) Use scan tool MB991502 to operate the fuel pump.
(2) Check the fuel line for leaks, and repair as needed.
19.Disconnect scan tool MB991502.

FUEL PUMP CONNECTOR DISCONNECTION (HOW TO REDUCE PRESSURIZED FUEL LINES)

M1131000900332

⚠ ***WARNING***
When removing the fuel pipe, etc., release fuel pressure to prevent fuel spray.

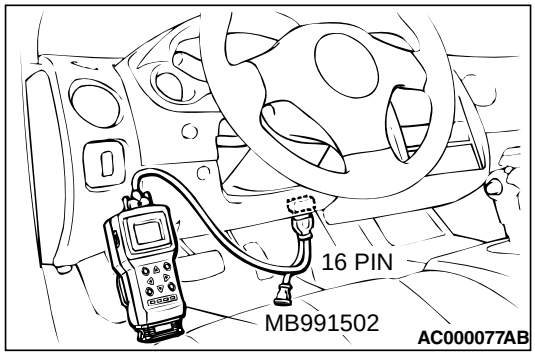


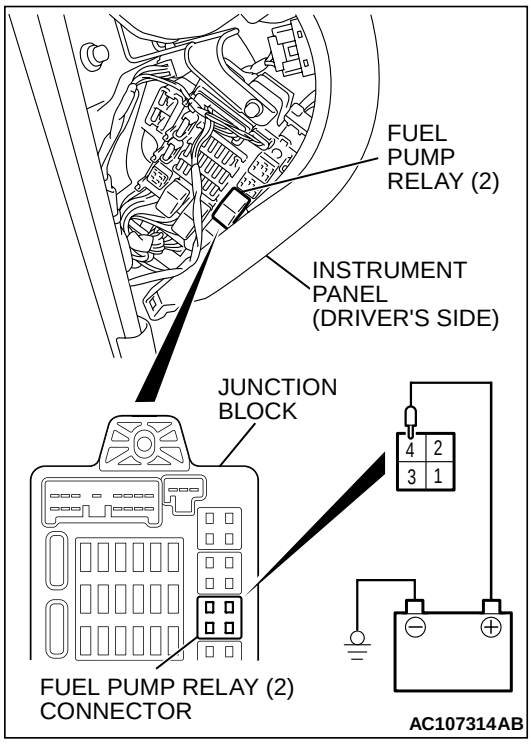
1. Disconnect the fuel pump relay.
2. Start the engine and let it run until it stops naturally. Turn the ignition switch to the "LOCK" (OFF) position.
3. Connect the fuel pump relay.

FUEL PUMP OPERATION CHECK

M1131002000368

Required Special Tool:
MB991502: Scan Tool (MUT-II)





⚠ CAUTION

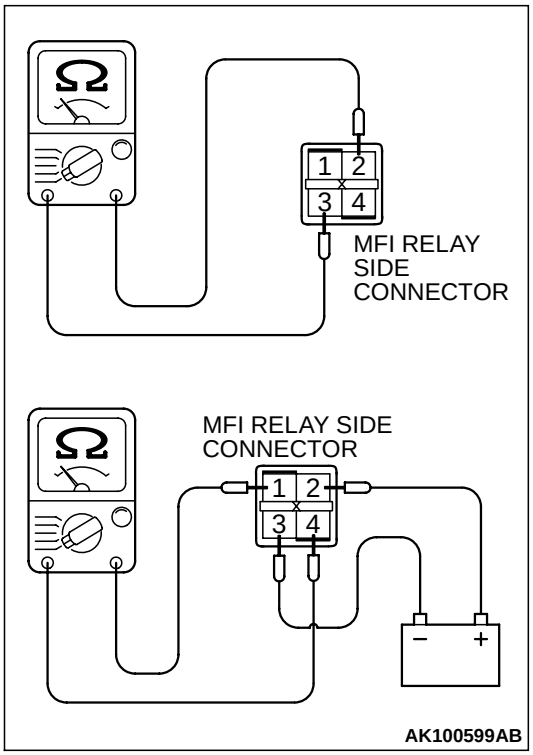
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

1. Check the operating of the fuel pump by using scan tool MB991502 to force-drive the fuel pump.
2. If the fuel pump will not operate, check by using the following procedure. If normal, check the fuel pump drive circuit.
   (1) Turn the ignition switch to the "LOCK" (OFF) position.
   (2) Remove the instrument panel side cover (driver's side).
   (3) Remove the fuel pump relay (2), and apply battery voltage to junction block side connector terminal number 4. Check that an operating sound can be heard from the fuel pump.

   NOTE: As the fuel pump is an in-tank type, the fuel pump sound is hard to hear. Remove the fuel tank filler tube cap and check from the tank inlet.
   (4) Check for fuel pressure by pinching the fuel hose with fingertips.
   (5) Install the fuel pump relay (2) and instrument panel side cover (driver's side).

MULTIPORT FUEL INJECTION (MFI) RELAY CONTINUITY CHECK

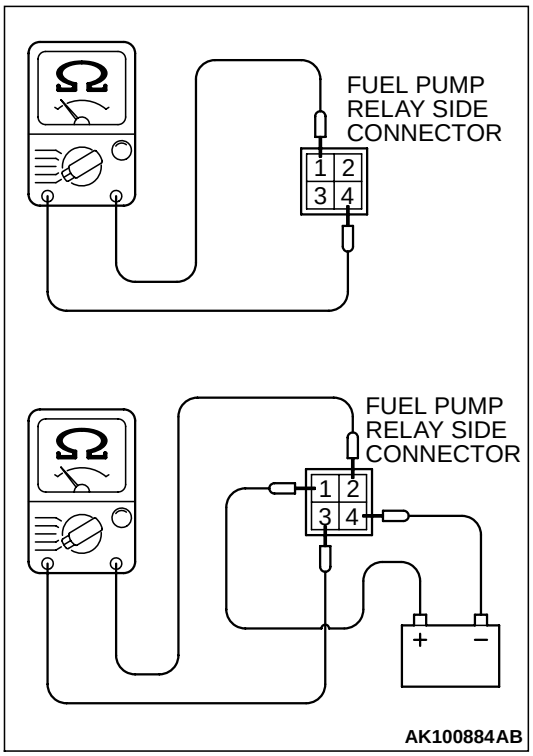
M1131050000011



BATTERY VOLTAGE	TERMINAL NO. TO BE CONNECTED TO BATTERY	TERMINAL NO. TO BE CONDUCTED
Not supplied	–	2 – 3
Supplied	2 – 3	1 – 4

FUEL PUMP RELAY CONTINUITY CHECK

M1131033000018



BATTERY VOLTAGE	TERMINAL NO. TO BE CONNECTED TO BATTERY	TERMINAL NO. TO BE CONDUCTED
Not supplied	–	1 – 4
Supplied	1 – 4	2 – 3

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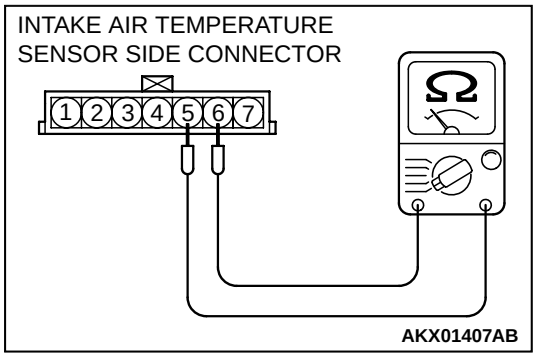
INTAKE AIR TEMPERATURE SENSOR CHECK

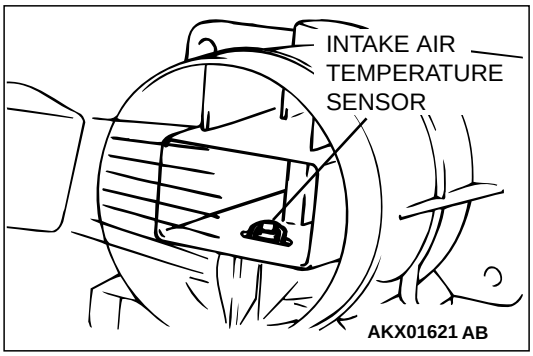
M1131002800148



1. Disconnect the volume air flow sensor connectors.
2. Measure resistance between terminals 5 and 6.

   Standard value:
   13 – 17 kΩ [at –20°C (–4°F)]
   5.3 – 6.7 kΩ [at 0°C (32°F)]
   2.3 – 3.0 kΩ [at 20°C (68°F)]
   1.0 – 1.5 kΩ [at 40°C (104°F)]
   0.56 – 0.76 kΩ [at 60°C (140°F)]
   0.30 – 0.42 kΩ [at 80°C (176°F)]

3. If not within specifications, replace the volume air flow sensor.



4. Measure resistance while heating the sensor using a hair dryer.

Normal condition:

TEMPERATURE	RESISTANCE (kΩ)
Higher	Smaller

5. If resistance does not decrease as heat increases, replace the volume air flow sensor assembly.

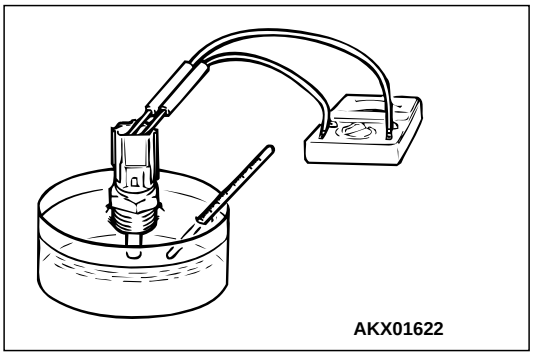
ENGINE COOLANT TEMPERATURE SENSOR CHECK

M1131003100142

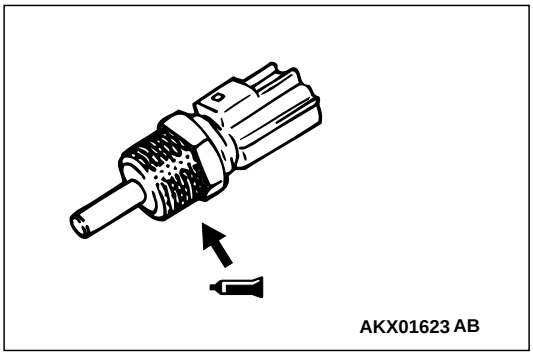
⚠ CAUTION
Be careful not to touch the connector (resin section) with the tool when removing and installing.

1. Drain engine coolant, then remove the engine coolant temperature sensor.
2. With the temperature sensing portion of engine coolant temperature sensor immersed in hot water, check the resistance.

   Standard value:
   14 – 17 kΩ [at –20°C (–4°F)]
   5.1 – 6.5 kΩ [at 0°C (32°F)]
   2.1 – 2.7 kΩ [at 20°C (68°F)]
   0.9 – 1.3 kΩ [at 40°C (104°F)]
   0.48 – 0.68 kΩ [at 60°C (140°F)]
   0.26 – 0.36 kΩ [at 80°C (176°F)]



3. If resistance deviates from the standard value greatly, replace the sensor.

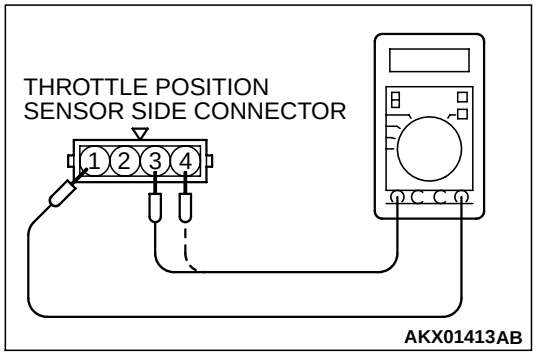


4. Apply 3M™ AAD part number 8731 or equivalent to threaded portion.
5. Install the engine coolant temperature sensor and tighten it to the specified torque.

   Tightening torque: 29 ± 10 N·m (22 ± 7 ft-lb)

THROTTLE POSITION SENSOR CHECK

M1131003200202



Required Special Tool:

- MB991348: Test Harness Set

Checking the Terminal Resistance

1. Disconnect the throttle position sensor connector.
2. Measure resistance between the throttle position sensor side connector terminal 1 and terminal 4.

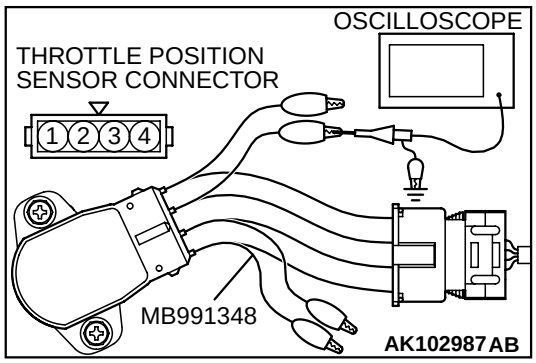
   Standard value: 3.5 – 6.5 kΩ
3. Measure resistance between the throttle position sensor side connector terminal 1 and terminal 3.

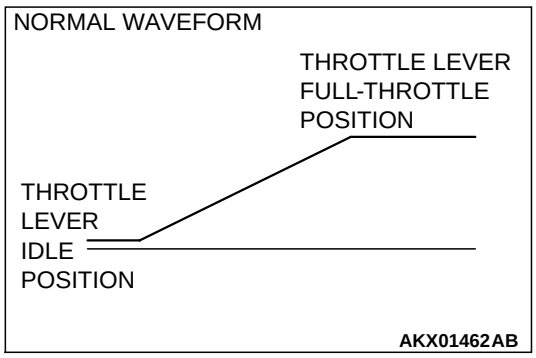
Normal condition:

Throttle valve slowly open until fully open from the idle position	Changes smoothly in proportion to the opening angle of the throttle valve

4. If resistance is outside the standard value, or if it doesn't change smoothly, replace the throttle position sensor.

   NOTE: After replacement, the throttle position sensor should be adjusted. (Refer to P.13A-576.)





Check using oscilloscope

1. Disconnect the throttle position sensor connector and connect the test harness special tool (MB991348) in between.(All terminals should be connected.)
2. Connect the oscilloscope probe to the throttle position sensor side connector terminal 3.
3. Turn the ignition switch "ON" position.
4. Slowly move the throttle lever from the idle position to the full-throttle position and check then if the waveform is free from any noise.
5. If any noise is recognized, replace the throttle position sensor.

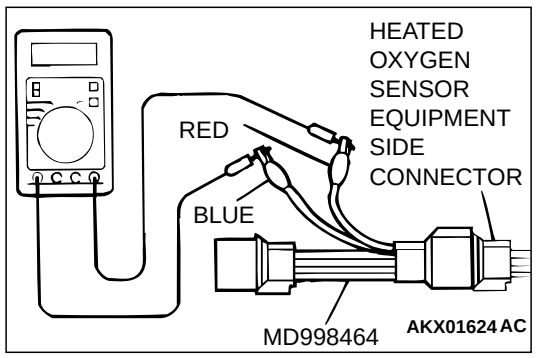
   NOTE: After replacement, the throttle position sensor should be adjusted. (Refer to P.13A-576.)

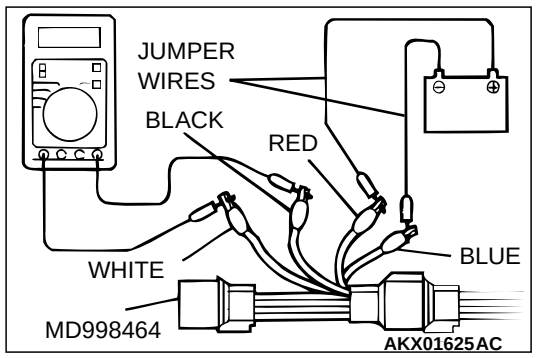
HEATED OXYGEN SENSOR CHECK

M1131005000248

Required Special Tools:

- MB991658: Test Harness Set
- MD998464: Test Harness





<Heated oxygen sensor (front)>

1. Using the scan tool MB991502, observe HO_2S reading. If values are unsatisfactory, or if Scan tool is not available, use the following procedure:
   (1) Disconnect the heated oxygen sensor connector and connect special tool MD998464 to the connector on the heated oxygen sensor side.
   (2) Make sure that there is continuity [4.5 – 8.0 Ω at 20°C (68°F)] between terminal 1 (red clip of special tool) and terminal 3 (blue clip of special tool) on the heated oxygen sensor connector
   (3) If there is no continuity, replace the heated oxygen sensor.
   (4) Warm up the engine until engine coolant is 80°C (176°F) or higher.

⚠ CAUTION

Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor.

   (5) Use the jumper wires to connect terminal 1 (red clip) of the heated oxygen sensor connector to the positive battery terminal and terminal 3 (blue clip) to the negative battery terminal.
   (6) Connect a digital voltage meter between terminal 2 (black clip) and terminal 4 (white clip).

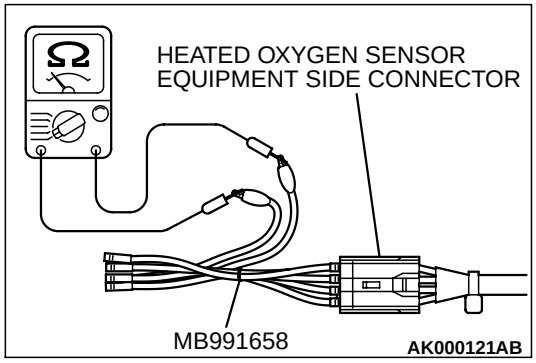
2. While repeatedly revving the engine, measure the heated oxygen sensor output voltage.

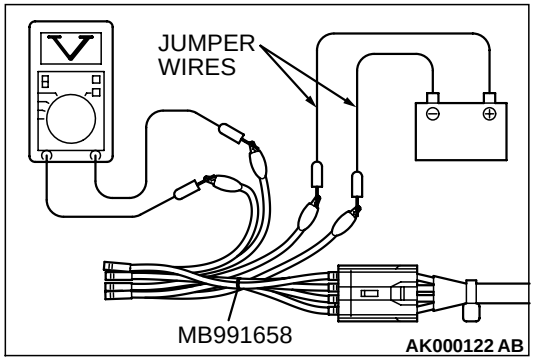
Standard value:

ENGINE	HEATED OXYGEN SENSOR OUTPUT VOLTAGE	REMARKS
When revving engine	0.6 – 1.0 V	If you make the air/fuel ratio rich by revving the engine repeatedly, a normal heated oxygen sensor will output a voltage of 0.6 – 1.0 V.

3. If the sensor is defective, replace the heated oxygen sensor.

NOTE: For removal and installation of the heated oxygen sensor, refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-21.





<Heated oxygen sensor (rear)>

1. Using scan tool MB991502, observe HO_2S reading. If values are unsatisfactory, or if Scan tool is not available, use the following procedure:
   (1) Disconnect the heated oxygen sensor connector and connect special tool MB991658 to the connector on the heated oxygen sensor side.
   (2) Make sure that there is continuity [11 – 18 Ω at 20°C (68° F)] between terminal 5 and terminal 6 on the heated oxygen sensor connector
   (3) If there is no continuity, replace the heated oxygen sensor.
   (4) Warm up the engine until engine coolant is 80° C (176°F) or higher.

⚠ CAUTION

Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor.

   (5) Use the jumper wires to connect terminal 5 of the heated oxygen sensor connector to the positive battery terminal and terminal 6 to the negative battery terminal.
   (6) Connect a digital voltage meter between terminal 3 and terminal 4.
2. While repeatedly revving the engine, measure the heated oxygen sensor output voltage.

Standard value:

ENGINE	HEATED OXYGEN SENSOR OUTPUT VOLTAGE	REMARKS
When revving engine	0.6 – 1.0 V	If you make the air/fuel ratio rich by revving the engine repeatedly, a normal heated oxygen sensor will output a voltage of 0.6 – 1.0 V.

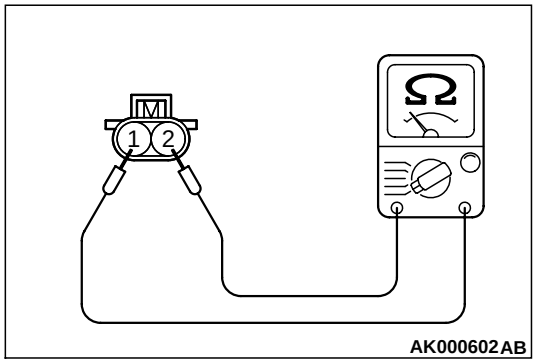
3. If the sensor is defective, replace the heated oxygen sensor.

NOTE: For removal and installation of the heated oxygen sensor, refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-21.

INJECTOR CHECK

M1131005200082

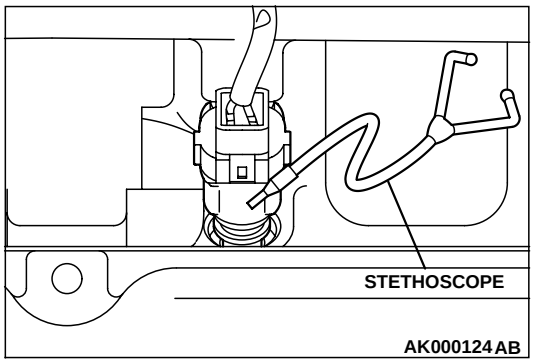
Measurement of Resistance between Terminals



1. Disconnect the injector connector.
2. Measure resistance between terminals.

   Standard value: 13 – 16 Ω [at 20°C (68°F)]
3. If not within specification, replace the injector.
4. Install the injector connector

Checking operation sound



Using a stethoscope or long blade screwdriver, check the operation sound ("tick-tick-tick") of injectors during idling or during cranking. Check that as the engine speed increases, the frequency of the operating sound also increases.

1. If the injector you are checking is not operating, you may hear the operating sound of the other injectors.
2. If no operating sound is heard from the injector that is being checked, check the injector drive circuit. If there is nothing wrong with the circuit, a defective injector or engine control module (ECM) <M/T> or powertrain control module (PCM) <A/T> is suspected.

IDLE AIR CONTROL MOTOR (STEPPER MOTOR) CHECK

M1131005400075

Required Special Tool:

- MB991709: Test Harness Set

Checking the Operation Sound

1. Check that the engine coolant temperature is 20°C (68°F) or below.

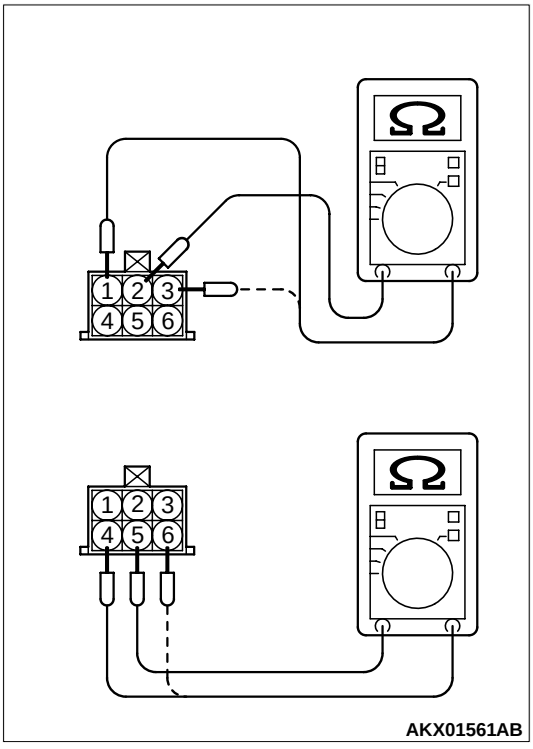
   NOTE: If necessary, you can disconnect the engine coolant temperature sensor connector and connect the harness-side of the connector to another engine coolant temperature sensor that is at 20°C (68°F) or below.
2. Check that the operation sound of the stepper motor can be heard after the ignition is switched ON (but do not start the engine).
3. If the operation sound cannot be heard, check the stepper motor's activation circuit. If the circuit is normal, it is probable that there is a malfunction of the stepper motor or engine control module (ECM) <M/T> or powertrain control module (PCM) <A/T>.

Checking the Coil Resistance

1. Disconnect the idle air control motor connector.
2. Measure resistance between terminal 2 and either terminal 1 or terminal 3 of the connector at the idle air control motor side.

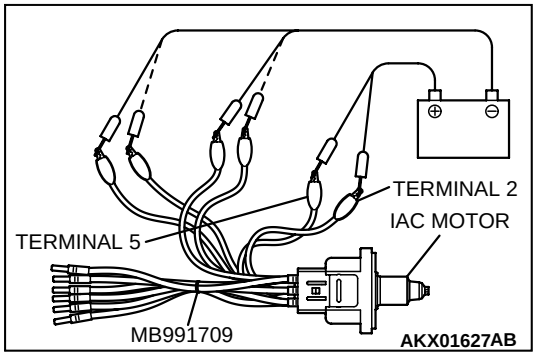
   Standard value: 28 – 33 Ω [at 20°C (68°F)]
3. If resistance is not within the standard value, replace the IAC motor.
4. Measure the resistance between terminal 5 and either terminal 6 or terminal 4 of the connector at the idle air control motor side.

   Standard value: 28 – 33 Ω [at 20°C (68°F)]
5. If resistance is not within the standard value, replace the IAC motor.

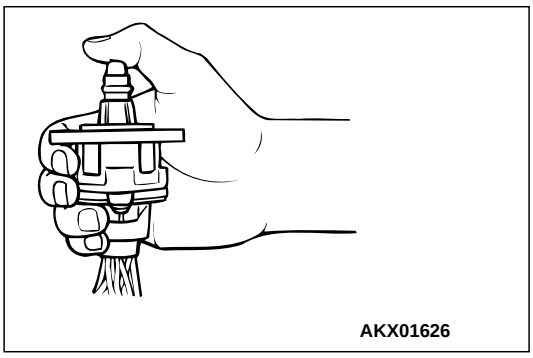


<Operation Check>

1. Remove the throttle body.
2. Remove the idle air control motor.
3. Connect special tool MB991709 to the idle air control motor connector.



4. Connect the positive (+) terminal of a power supply (approximately 6 volts) to terminal 2 and the terminal 5.
5. Connect the negative (–) terminal of the power supply to each clip as described in the following steps. Then check whether or not the stepper motor vibrates slightly as it operates.
   (1) Connect the negative terminal of the power supply to terminal 1 and terminal 4.
   (2) Connect the negative terminal of the power supply to terminal 3 and terminal 4.
   (3) Connect the negative terminal of the power supply to terminal 3 and terminal 6.
   (4) Connect the negative terminal of the power supply to terminal 1 and terminal 6.
   (5) Connect the negative terminal of the power supply to terminal 1 and terminal 4.
   (6) Repeat the tests in sequence from (5) to (1) to test opposite movement of the IAC.
6. If vibration is detected during the test, the stepper motor can be considered to be normal.



EVAPORATIVE EMISSION PURGE SOLENOID CHECK

M1131005600057

Refer to GROUP 17, Emission Control System – Evaporative Emission Control System – Evaporative Emission Purge Solenoid Check P.17-101.

EGR SOLENOID CHECK

M1131005700054

Refer to GROUP 17, Emission Control System – Exhaust Gas Recirculation (EGR) System – EGR Solenoid Check P.17-109.

EVAPORATVE EMISSION VENTILATION SOLENOID CHECK

M1131012800031

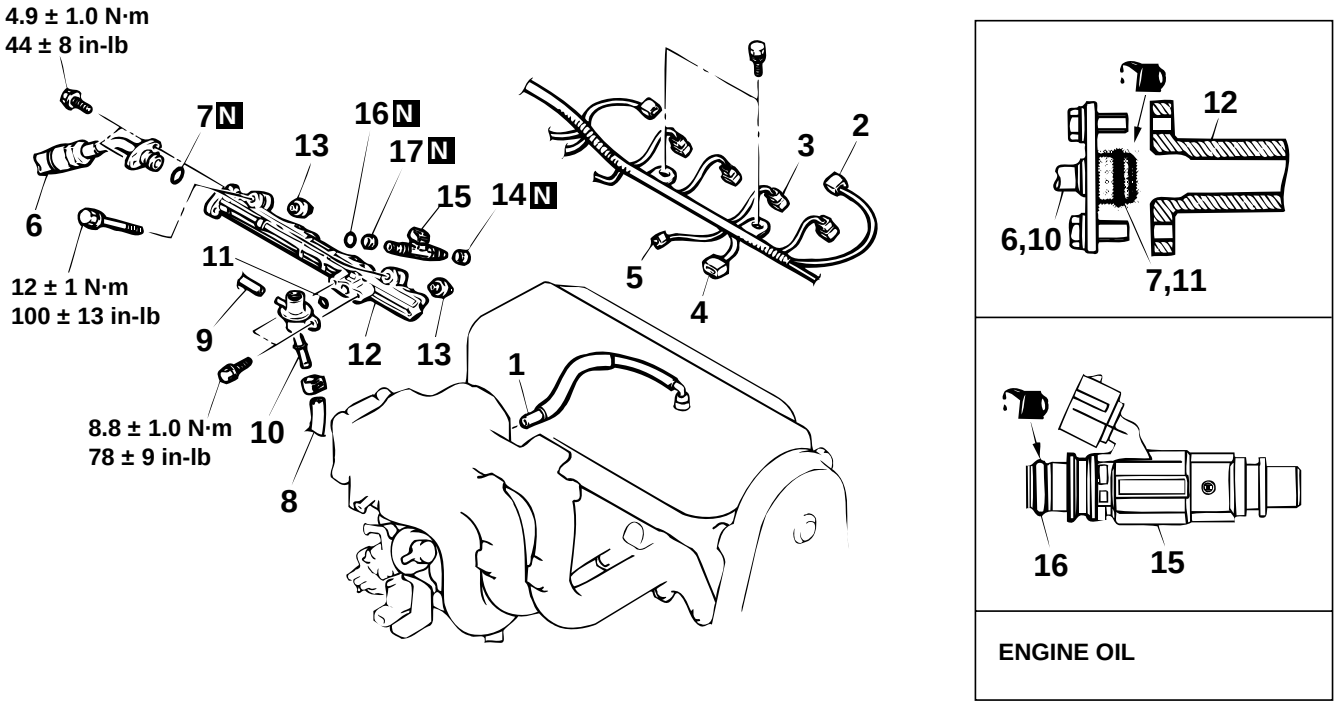
Refer to GROUP 17, Emission Control System – Evaporative Emission Canister and Fuel Tank Pressure Relief Valve – Fuel Tank Pressure Relief Valve Inspection P.17-111.

INJECTOR

REMOVAL AND INSTALLATION

M1131007100296

Pre-removal Operation	Post-installation Operation
• Fuel Discharge Prevention (Refer to P.13A-580.) • Engine Coolant Draining [Refer to GROUP 00, Maintenance Service – Engine Coolant (Change) P.00-56.] • Air Cleaner Removal (Refer to GROUP 15, Air Cleaner P.15-6.) • Throttle Body Removal (Refer to P.13A-592.)	• Throttle Body Installation (Refer to P.13A-592.) • Air Cleaner Installation (Refer to GROUP 15, Air Cleaner P.15-6.) • Engine Coolant Refilling [Refer to GROUP 00, Maintenance Service – Engine Coolant (Change) P.00-56.] • Fuel Leakage Inspection.



AC000231AB

REMOVAL STEPS

1. PCV HOSE CONNECTION
2. IGNITION COIL CONNECTOR
3. INJECTOR CONNECTOR
4. IGNITION FAILURE SENSOR CONNECTOR
5. MANIFOLD DIFFERENTIAL PRESSURE SENSOR CONNECTOR

>>A<< 6. HIGH-PRESSURE FUEL HOSE CONNECTION

7. O-RING

REMOVAL STEPS (Continued)

8. FUEL HOSE CONNECTION
9. VACUUM HOSE CONNECTION

>>A<< 10. FUEL PRESSURE REGULATOR

11. O-RING

<<A>> 12. FUEL RAIL

13. INSULATORS
14. INSULATORS

<<A>> >>A<< 15. INJECTORS

16. O-RINGS
17. GROMMETS

REMOVAL SERVICE POINT

<<A>> FUEL RAIL/INJECTORS REMOVAL

⚠ CAUTION

Do not drop the injector.

Remove the fuel rail with the injectors attached to it.

TSB Revision

INSTALLATION SERVICE POINT

>>A<< INJECTORS/FUEL PRESSURE REGULATOR/HIGH-PRESSURE FUEL HOSE INSTALLATION

⚠ CAUTION

Do not let the engine oil get into the fuel rail will be damaged.

1. Apply a drop of new engine oil to the O-ring.
2. Turn the injector. To the right and left to install to the fuel rail. Repeat for fuel pressure regulator and high-pressure fuel hose.
   Be careful not to damage the O-ring. After installing, check that the item turns smoothly.
3. If it dose not turn smoothly, the O-ring may be trapped, remove the item, re-install it into the fuel rail and check again.
4. Tighten the fuel pressure regulator and high-pressure fuel hose to the specified torque.

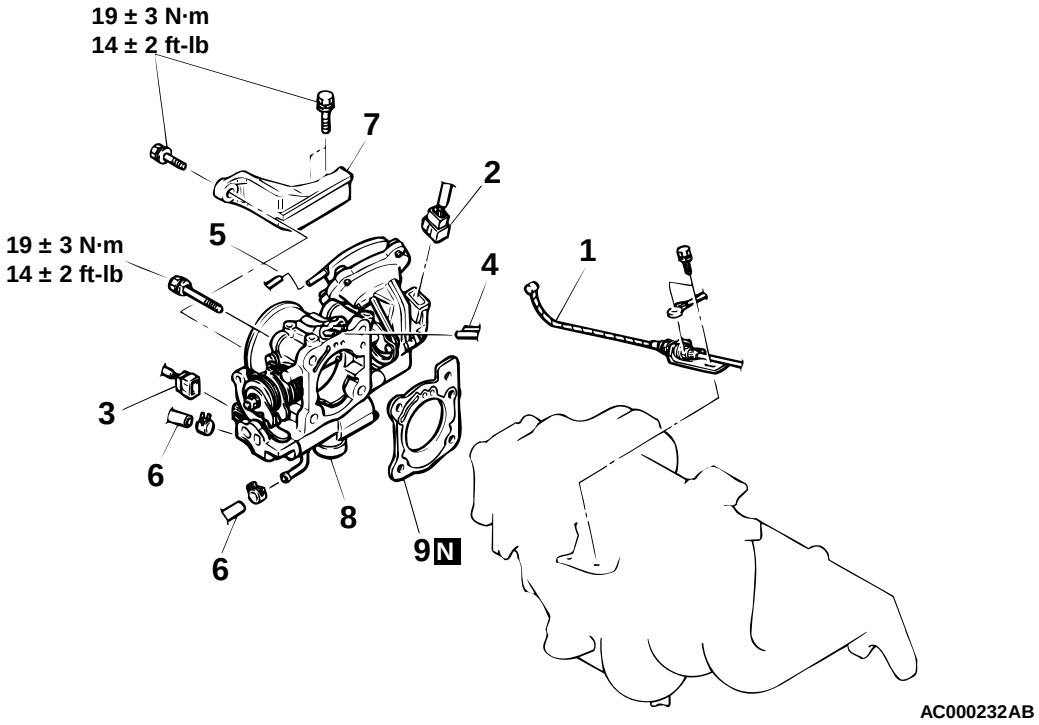
   Tightening torque:
   8.8 ± 1.0 N·m (78 ± 9 in-lb) <Fuel pressure regulator>
   4.9 ± 1.0 N·m (44 ± 8 in-lb) <High-pressure fuel hose>

THROTTLE BODY ASSEMBLY

REMOVAL AND INSTALLATION

M1131007700306

Pre-removal Operation	Post-installation Operation
• Engine Coolant Draining [Refer to GROUP 00, Maintenance Service – Engine Coolant (Change) P.00-56.] • Air Cleaner Removal (Refer to GROUP 15, Air Cleaner P.15-6.)	• Air Cleaner Installation (Refer to GROUP 15, Air Cleaner P.15-6.) • Engine Coolant Refilling [Refer to GROUP 00, Maintenance Service – Engine Coolant (Change) P.00-56.] • Accelerator Cable Adjustment (Refer to GROUP 17, On-vehicle Service – Accelerator Cable Adjustment P.17-5.)



AC000232AB

REMOVAL STEPS
1. ACCELERATOR CABLE CONNECTION
2. THROTTLE POSITION SENSOR CONNECTOR
3. IDLE AIR CONTROL MOTOR CONNECTOR
4. VACUUM HOSE CONNECTION

REMOVAL STEPS (Continued)
5. VACUUM HOSE CONNECTION <VEHICLES WITH AUTO-CRUISE CONTROL SYSTEM>
6. WATER HOSE CONNECTION
7. THROTTLE BODY STAY
8. THROTTLE BODY
>>A<< 9. THROTTLE BODY GASKET

TSB Revision

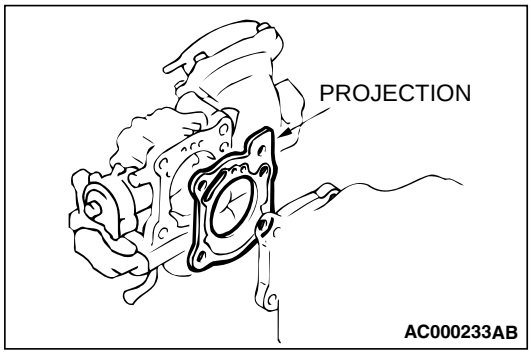
INSTALLATION SERVICE POINT

>>A<< THROTTLE BODY GASKET INSTALLATION

⚠ CAUTION

Poor idling etc. may result if the throttle body gasket is installed incorrectly.

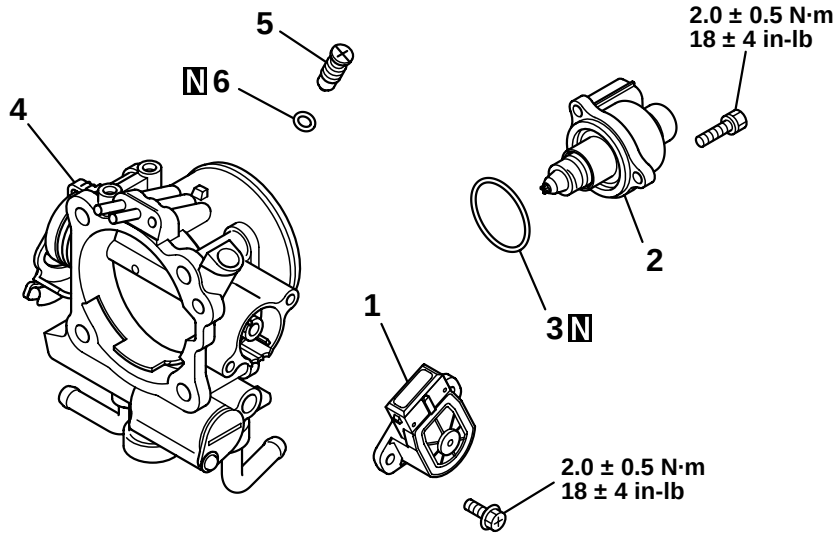
Install the throttle body gasket as shown in the illustration.



DISASSEMBLY AND ASSEMBLY

M1131009700302

<VEHICLES WITHOUT AUTO-CRUSE CONTROL SYSTEM>



AK000589AD

REMOVAL STEPS

<<A>> >>A<< 1. THROTTLE POSITION SENSOR
2. IDLE AIR CONTROL MOTOR
3. O-RING
<<B>> 4. THROTTLE BODY

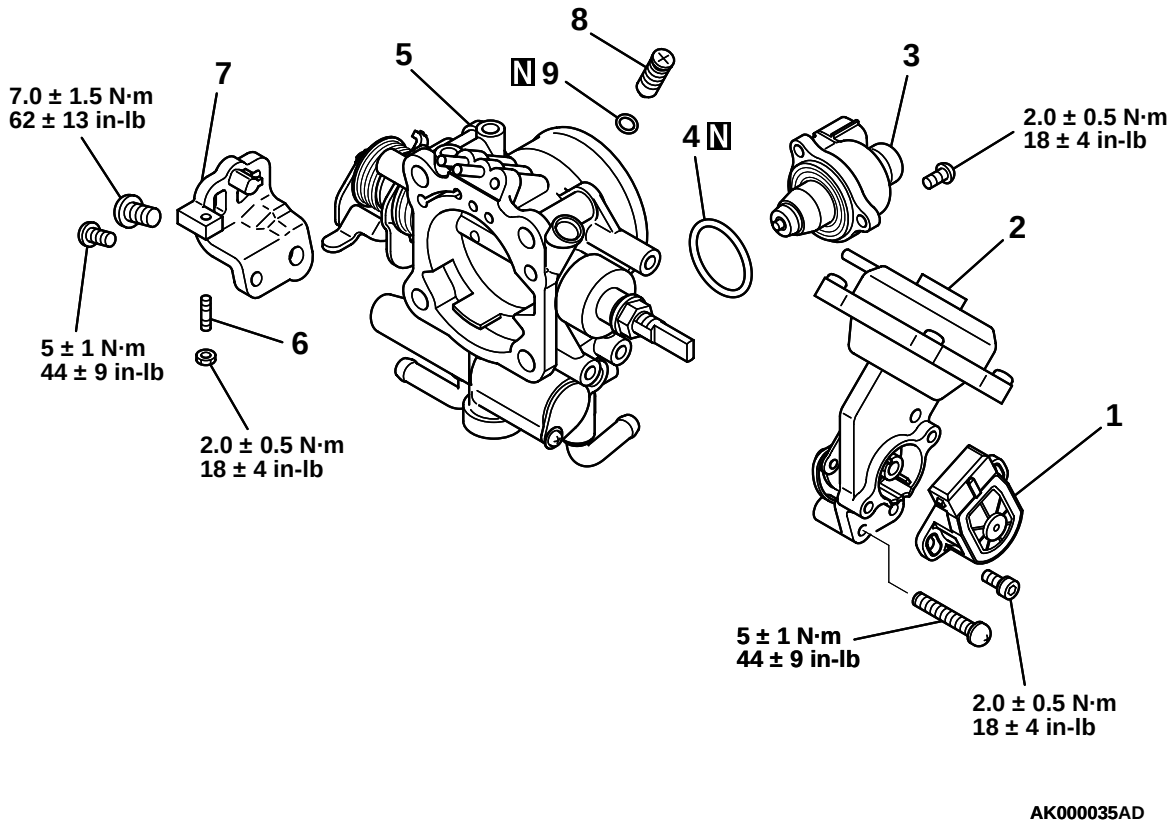
REMOVAL STEPS (Continued)

5. SPEED ADJUSTING SCREW
6. O-RING

NOTE: IF THE ADJUSTING SCREW WAS HAPPEN TO HAVE BEEN REMOVED, PERFOM SPEED ADJUSTING SCREW ADJUSTMENT.

TSB Revision

<VEHICLES WITH AUTO-CRUSE CONTROL SYSTEM>



REMOVAL STEPS

<<A>> >>A<< 1. THROTTLE POSITION SENSOR
2. LEVER ASSEMBLY
3. IDLE AIR CONTROL MOTOR
4. O-RING
<<B>> 5. THROTTLE BODY
6. THROTTLE SPEED ADJUSTING SCREW
7. BRACKET

REMOVAL STEPS (Continued)

8. SPEED ADJUSTING SCREW
9. O-RING

NOTE: IF THE ADJUSTING SCREW WAS HAPPEN TO HAVE BEEN REMOVED, PERFOM SPEED ADJUSTING SCREW ADJUSTMENT.

DISASSEMBLY SERVICE POINTS

<<A>> THROTTLE POSITION SENSOR DISASSEBLY

1. Do not disassemble the sensor and motor.
2. Do not clean the sensor and motor by dipping them into cleaning solvent. Clean them with shop towel.

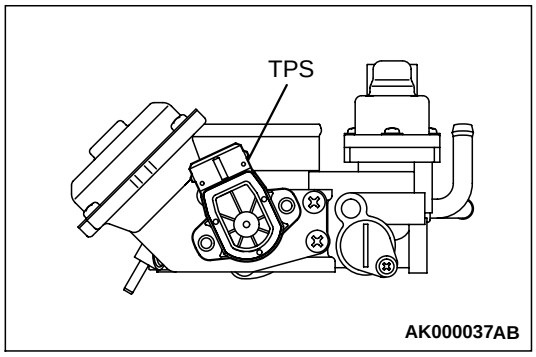
<<B>> THROTTLE BODY DISASSEMBLY

1. Do not disassemble the throttle body.
2. Check if the vacuum port or passage is clogged. Use compressed air to clean the vacuum passage.

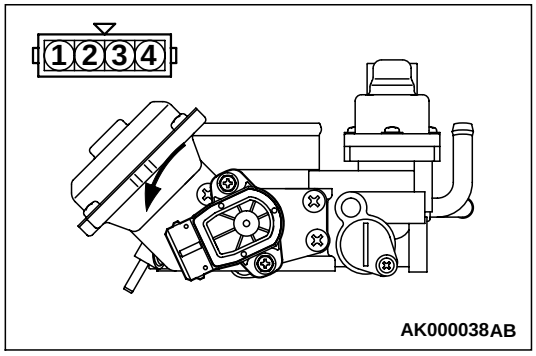
ASSEMBLY SERVICE POINT

>>A<< THROTTLE POSITION SENSOR (TPS) INSTALLATION

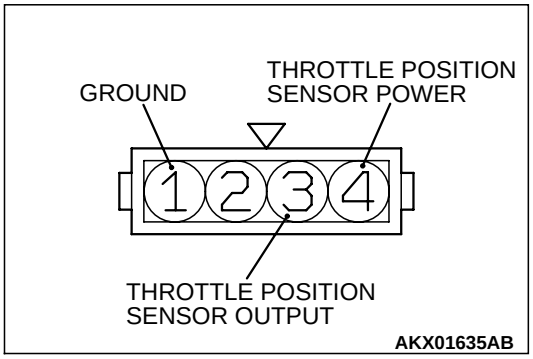
1. Install the throttle position sensor to the throttle body as shown in the illustration.



2. Turn the throttle position sensor 90 degrees counterclockwise to set it, and tighten the screws.



3. Connect an ohmmeter between terminals 1 (ground) and 3 (output), or between terminals 3 (output) and 4 (power). Then, make sure that the resistance changes smoothly when the throttle valve is slowly moved to the fully open position.



SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1131011600324

ITEM	SPECIFICATION
Engine coolant temperature sensor	29 ± 10 N·m (22 ± 7 ft-lb)
Fuel pressure regulator	8.8 ± 1.0 N·m (78 ± 9 in-lb)
Fuel rail mounting bolt	12 ± 1 N·m (100 ± 13 in-lb)
High-pressure fuel hose	4.9 ± 1.0 N·m (44 ± 8 in-lb)
Idle air control motor	2.0 ± 0.5 N·m (18 ± 4 in-lb)
Lever assembly	4.9 ± 1 N·m (43 ± 9 in-lb)
Throttle body bracket M6	4.9 ± 1.0 N·m (43 ± 9 in-lb)
Throttle body bracket M8	6.9 ± 1.5 N·m (61 ± 13 in-lb)
Throttle body mounting bolt	19 ± 3 N·m (14 ± 2 ft-lb)
Throttle body stay mounting bolt	19 ± 3 N·m (14 ± 2 ft-lb)
Throttle position sensor	2.0 ± 0.5 N·m (18 ± 4 in-lb)
Throttle speed adjusting screw mounting nut	2.0 ± 0.5 N·m (18 ± 4 in-lb)

GENERAL SPECIFICATIONS

M1131000200300

ITEMS		SPECIFICATIONS
Throttle body	Throttle bore mm (in.)	54 (2.1)
	Throttle position sensor	Variable resistor type
	Idle air control motor	Stepper motor (stepper motor type by-pass air control system with the air volume limiter)
Engine control module (ECM) <M/T>	Identification model No.	E6T35774
Powertrain control module (PCM) <A/T>	Identification model No.	E6T35485<Vehicles without sports mode type 4A/T> E6T35487<Vehicles with sports mode type 4A/T>

ITEMS		SPECIFICATIONS
Sensors	Volume air flow sensor	Karman vortex type
	Barometric pressure sensor	Semiconductor type
	Intake air temperature sensor	Thermistor type
	Engine coolant temperature sensor	Thermistor type
	Heated oxygen sensor	Zirconia type
	Vehicle speed sensor <M/T>	Electromagnetic resistance element type
	Park/neutral position switch <A/T>	Contact switch type
	Camshaft position sensor	Electromagnetic resistance element type
	Crankshaft position sensor	Hall element type
	Knock sensor	Piezoelectric type
	Power steering pressure switch	Contact switch type
	Manifold differential pressure sensor	Semiconductor type
Actuators	Multiport fuel injection (MFI) relay	Contact switch type
	Fuel pump relay	Contact switch type
	Injector type and number	Electromagnetic type, 4
	Injector identification mark	CDH240
	EGR solenoid	Duty cycle type solenoid valve
	Evaporative emission purge solenoid	Duty cycle type solenoid valve
Fuel pressure regulator	Regulator pressure kPa (psi)	335 (47.6)

SERVICE SPECIFICATIONS

M1131000300192

ITEMS		STANDARD VALUE
Throttle position sensor adjusting voltage mV		535 – 735
Basic idle speed r/min		700 ± 50
Fuel pressure kPa (psi)	Vacuum hose disconnected	330 – 350 (47 – 50) at curb idle
	Vacuum hose connected	Approximately 270 (38) at curb idle
Intake air temperature sensor resistance kΩ	–20°C (–4°F)	13 – 17
	0°C (32°F)	5.3 – 6.7
	20°C (86°F)	2.3 – 3.0
	40°C (104°F)	1.0 – 1.5
	60°C (140°F)	0.56 – 0.76
	80°C (176°F)	0.30 – 0.42

ITEMS		STANDARD VALUE
Engine coolant temperature sensor resistance kΩ	–20°C (–4°F)	14 – 17
	0°C (32°F)	5.1 – 6.5
	20°C (86°F)	2.1 – 2.7
	40°C (104°F)	0.9 – 1.3
	60°C (140°F)	0.48 – 0.68
	80°C (176°F)	0.26 – 0.36
Throttle position sensor resistance kΩ		3.5 – 6.5
Heated oxygen sensor output voltage V		0.6 – 1.0
Heated oxygen sensor heater resistance Ω	<Front>	4.5 – 8.0
	<Rear>	11 – 18
Injector coil resistance Ω		13 – 16 [at 20°C (68°F)]
Idle air control motor coil resistance Ω		28 – 33 [at 20°C (68°F)]

SEALANT AND ADHESIVE

M1131000500022

ITEM	SPECIFIED SEALANT
Engine coolant temperature sensor threaded portion	3M™ AAD part number 8731or equivalent

GROUP 13B

MULTIPORT FUEL INJECTION (MFI) <3.0L>

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Continued on next page

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GENERAL INFORMATION

M1131000100325

The Multiport Fuel Injection System consists of sensors which detect the engine conditions, the ENGINE CONTROL MODULE (ECM) <M/T>/POWERTRAIN CONTROL MODULE (PCM) <A/T> which controls the system based on signals from these sensors, and actuators which operate under the control of the ECM <M/T>/PCM <A/T>. The ECM <M/T>/PCM <A/T> carries out activities such as fuel injection control, idle air control, and ignition timing control. In addition, the ECM <M/T>/PCM <A/T> is equipped with several diagnostic test modes which simplify troubleshooting when a problem develops.

FUEL INJECTION CONTROL

The injection drive times and injector timing are controlled so that the optimum air/fuel mixture is supplied to the engine to correspond to the continually-changing engine operation conditions. A single injector is mounted at the intake port of each cylinder. Fuel is sent under pressure from the fuel tank to the fuel injectors by the fuel pump, with the pressure being regulated by the fuel pressure regulator. The regulated fuel is distributed to each of the injectors. Fuel injection is normally carried out once for each cylinder for every two rotations of the crankshaft. The firing order is 1-2-3-4-5-6. Each cylinder has a dedicated fuel injector. This is called multiport. The ECM <M/T>/PCM <A/T> provides a richer air/fuel mixture by carrying out "open-loop" control when the engine is cold or operating under high load conditions in order to maintain engine performance. In addition, when the engine is under normal operating temperature after warming-up, the ECM <M/T>/PCM <A/T> controls the air/fuel mixture by using the heated oxygen sensor signal to carry out "closed-loop" control. The closed-loop control achieves the theoretical air/fuel mixture ratio where the catalytic converter can obtains the maximum cleaning performance.

IDLE AIR CONTROL

The idle speed is kept at the optimum speed by controlling the amount of air that bypasses the throttle valve in accordance with changes in idling conditions and engine load during idling. The ECM <M/T>/PCM <A/T> drives the idle air control (IAC) motor to keep the engine running at the pre-set idle target speed in accordance with the engine coolant temperature and A/C and other electrical load. In addition, when the A/C switch is turned off and on while the engine is idling, the IAC motor adjusts the throttle valve bypass air amount according to the engine load conditions to avoid fluctuations in the engine speed.

IGNITION TIMING CONTROL

The ignition power transistor located in the ignition primary circuit turns ON and OFF to control the primary current flow to the ignition coil. This controls the ignition timing to provide the optimum ignition timing with respect to the engine operating conditions. The ignition timing is determined by the ECM <M/T>/PCM <A/T> from engine speed, intake air volume, engine coolant temperature, and atmospheric pressure.

DIAGNOSTIC TEST MODE

- When an abnormality is detected in one of the sensors or actuators related to emission control, the SERVICE ENGINE SOON/MALFUNCTION INDICATOR LAMP illuminates to warn the driver.
- When an abnormality is detected in one of the sensors or actuators, a diagnostic trouble code corresponding to the abnormality is stored in the ECM <M/T>/PCM <A/T>.
- The RAM data inside the ECM <M/T>/PCM <A/T> that is related to the sensors and actuators can be read with the scan tool. In addition, the actuators can be controlled by scan tool MUT-II (MB991502) under certain circumstances.

OTHER CONTROL FUNCTIONS

- **Fuel Pump Control**
  Turns the fuel pump relay ON so that current is supplied to the fuel pump while the engine is cranking or running.
- **A/C Compressor Clutch Relay Control**
  Turns the compressor clutch of the A/C ON and OFF.
- **Fan Relay Control**
  The radiator fan and condenser fan speeds are controlled in response to the engine coolant temperature and vehicle speed.
- **Generator Output Current Control**
  Prevents generator output current from increasing suddenly and idle speed from dropping at times such as when the headlights are turned on.
- **Variable Induction Control**
  Turns the solenoid of the variable induction ON and OFF.
- **Evaporative Emission Purge Control**
  (Refer to GROUP 17, Emission Control System – Evaporative Emission Control System – General Information.P.17-97)
- **EGR Control**
  (Refer to GROUP 17, Emission Control System – Exhaust Gas Recirculation (EGR) System – General Information.P.17-103)

MALTIPORT FUEL INJECTION (MFI) SYSTEM DIAGRAM

<Without variable induction system>

SENSE

- ★1 LEFT BANK HEATED OXYGEN SENSOR (FRONT)
- ★2 VOLUME AIR FLOW SENSOR
- ★3 INTAKE AIR TEMPERATURE SENSOR
- ★4 THROTTLE POSITION SENSOR
- ★5 CAMSHAFT POSITION SENSOR
- ★6 CRANKSHAFT POSITION SENSOR
- ★7 BAROMETRIC PRESSURE SENSOR
- ★8 ENGINE COOLANT TEMPERATURE SENSOR
- ★9 LEFT BANK HEATED OXYGEN SENSOR (REAR)
- ★10 RIGHT BANK HEATED OXYGEN SENSOR (FRONT)
- ★11 RIGHT BANK HEATED OXYGEN SENSOR (REAR)
- ★12 MANIFOLD DIFFERENTIAL PRESSURE SENSOR
- ★13 FUEL TANK DIFFERENTIAL PRESSURE SENSOR
- ★14 FUEL TEMPERATURE SENSOR
- ★15 FUEL LEVEL SENSOR

- ● POWER SUPPLY
- ● VEHICLE SPEED SENSOR <M/T>
- ● OUTPUT SHAFT SPEED SENSOR <A/T>
- ● A/C SWITCH
- ● PARK/NEUTRAL POSITION SWITCH <A/T>
- ● POWER STEERING PRESSURE SWITCH
- ● IGNITION SWITCH - ST
- ● KNOCK SENSOR

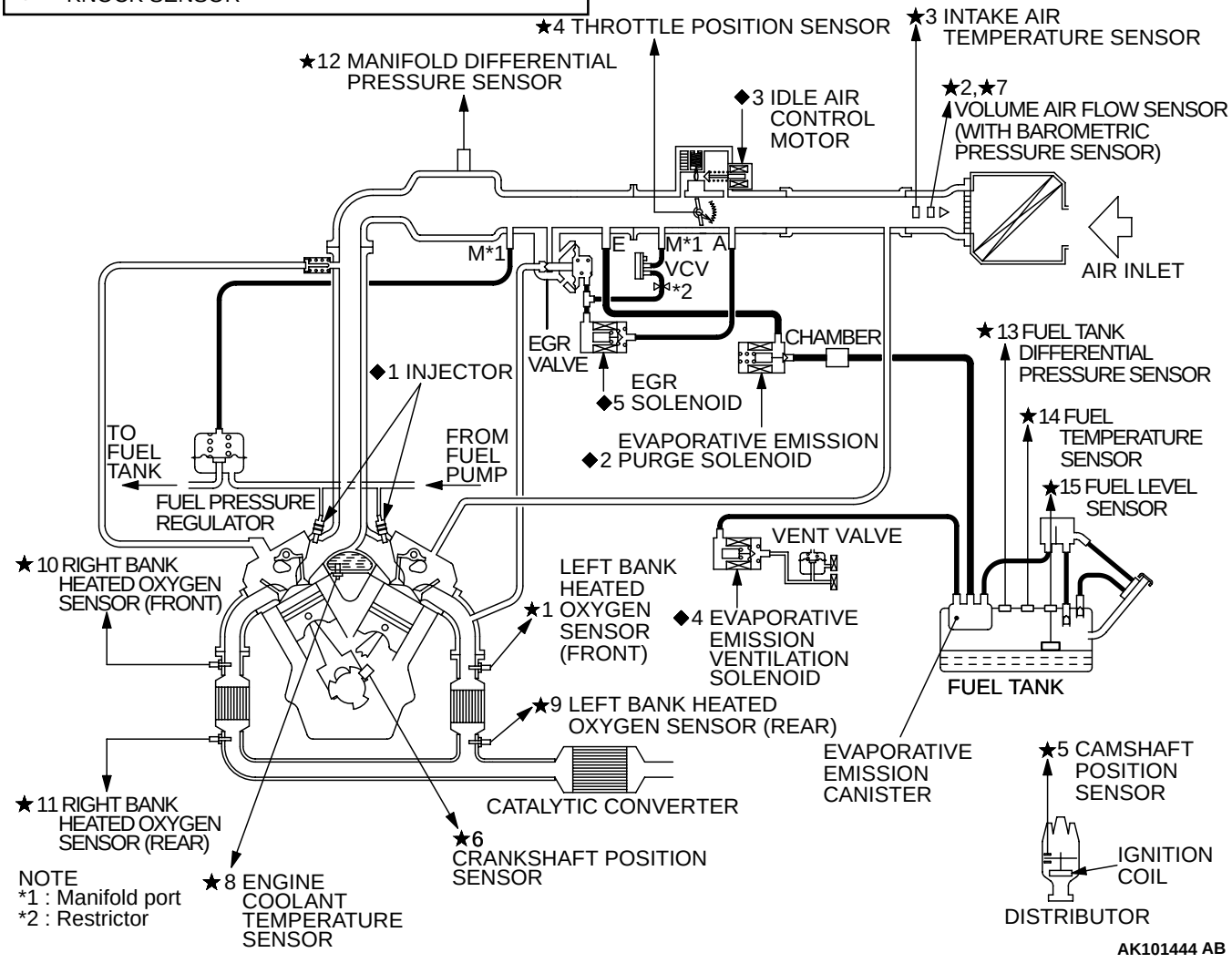
DECIDE

ECM<M/T>
PCM<A/T>

ACT

- ◆1 INJECTOR
- ◆2 EVAPORATIVE EMISSION PURGE SOLENOID
- ◆3 IDLE AIR CONTROL MOTOR
- ◆4 EGR SOLENOID
- ◆5 EVAPORATIVE EMISSION VENTILATION SOLENOID

- ● FUEL PUMP RELAY 1, 2
- ● MULTIPORT FUEL INJECTION (MFI) RELAY
- ● A/C COMPRESSER CLUTCH RELAY
- ● SERVICE ENGINE SOON/ MALFUNCTION INDICATOR LAMP
- ● DIAGNOSTIC OUTPUT



*NOTE: For the vacuum hose routing, refer to GROUP 17, vacuum hoses**P.17-89**.*

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<With variable induction system>

SENSE

- ★1 LEFT BANK HEATED OXYGEN SENSOR (FRONT)
- ★2 VOLUME AIR FLOW SENSOR
- ★3 INTAKE AIR TEMPERATURE SENSOR
- ★4 THROTTLE POSITION SENSOR
- ★5 CAMSHAFT POSITION SENSOR
- ★6 CRANKSHAFT POSITION SENSOR
- ★7 BAROMETRIC PRESSURE SENSOR
- ★8 ENGINE COOLANT TEMPERATURE SENSOR
- ★9 LEFT BANK HEATED OXYGEN SENSOR (REAR)
- ★10 RIGHT BANK HEATED OXYGEN SENSOR (FRONT)
- ★11 RIGHT BANK HEATED OXYGEN SENSOR (REAR)
- ★12 MANIFOLD DIFFERENTIAL PRESSURE SENSOR
- ★13 FUEL TANK DIFFERENTIAL PRESSURE SENSOR
- ★14 FUEL TEMPERATURE SENSOR
- ★15 FUEL LEVEL SENSOR

- ● POWER SUPPLY
- ● VEHICLE SPEED SENSOR <M/T>
- ● OUTPUT SHAFT SPEED SENSOR <A/T>
- ● A/C SWITCH
- ● PARK/NEUTRAL POSITION SWITCH <A/T>
- ● POWER STEERING PRESSURE SWITCH
- ● IGNITION SWITCH - ST
- ● KNOCK SENSOR

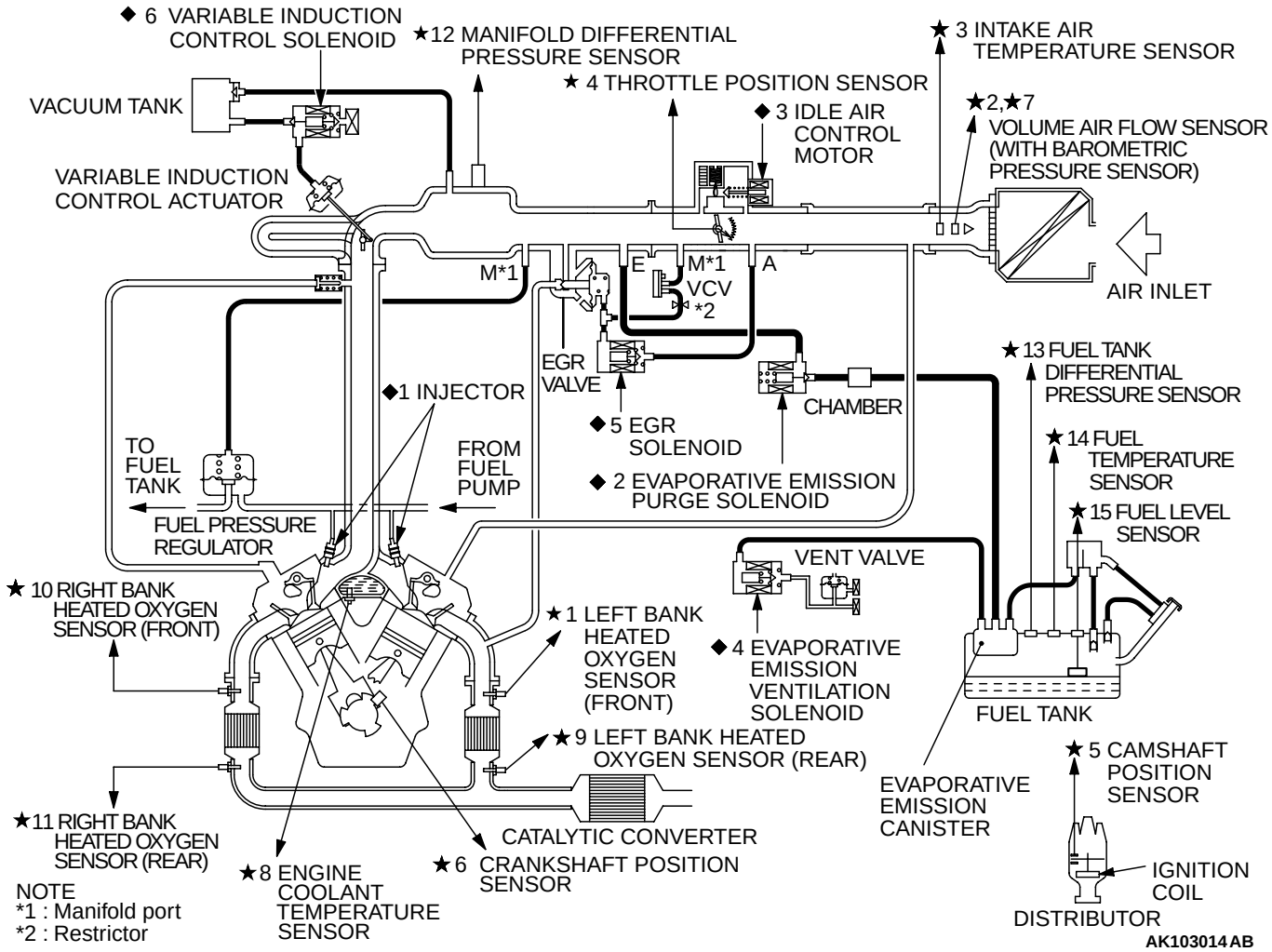
DECIDE

ECM<M/T>
PCM<A/T>

ACT

- ◆ 1 INJECTOR
- ◆ 2 EVAPORATIVE EMISSION PURGE SOLENOID
- ◆ 3 IDLE AIR CONTROL MOTOR
- ◆ 4 EGR SOLENOID
- ◆ 5 EVAPORATIVE EMISSION VENTILATION SOLENOID
- ◆ 6 VARIABLE INDUCTION CONTROL SOLENOID

- ● FUEL PUMP RELAY 1, 2
- ● MULTIPORT FUEL INJECTION (MFI) RELAY
- ● A/C COMPRESSER CLUTCH RELAY
- ● SERVICE ENGINE SOON/ MALFUNCTION INDICATOR LAMP
- ● DIAGNOSTIC OUTPUT



*NOTE: For the vacuum hose routing, refer to GROUP 17, vacuum hoses**P.17-89* .

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MULTIPORT FUEL INJECTION (MFI) DIAGNOSIS

TROUBLESHOOTING STRATEGY

M1131150000104

NOTE: If a DTC is erased, its "freeze frame" data will be also erased and the readiness test status will be reset. Store the "freeze frame" data before erasing the DTC.

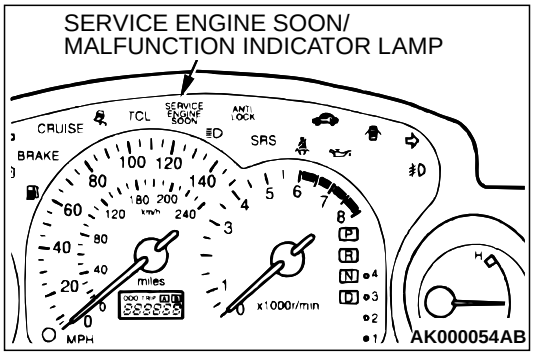
Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure to have exhausted most of the possible ways to find an MFI fault.

1. Gather as much information as possible about the complaint from the customer.
2. Verify that the condition described by the customer exists.
3. Check the vehicle for any MFI Diagnostic Trouble Code (DTC).
4. If you cannot verify the condition and there are no DTCs, the malfunction is intermittent. For information on how to cope with intermittent malfunctions, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to cope with Intermittent Malfunction P.00-6.
5. If you can verify the condition but there are no DTCs, or the system cannot communicate with the scan tool, refer to the trouble symptom classification table.
6. If there is a DTC, record the number of the code, then erase the code from the memory using the scan tool.
7. Reconfirm the malfunction symptom and carry out a test drive with the drive cycle pattern.
8. If DTC is set again, carry out an inspection with the inspection procedure for diagnostic trouble codes of that code.
9. If DTC is not set again, the malfunction is intermittent. For information on how to cope with intermittent malfunctions, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to cope with Intermittent Malfunction P.00-6.
10. After repairs are completed, conduct a road test duplicating the complaint set conditions to confirm the malfunction has been connected.

NOTE: If the engine control module (ECM) <M/T> or powertrain control module (PCM) <A/T> is replaced, Immobilizer Encrypted Code Registration should be carried out. Refer to GROUP 54A, Ignition Switch – On-vehicle Service – Immobilizer Encrypted Code Registration P.54A-28.

TROUBLE CODE DIAGNOSIS

M1131150500165



SERVICE ENGINE SOON/MALFUNCTION INDICATOR LAMP

Among the on-board diagnostic items, a Service Engine Soon/Malfunction Indicator Lamp illuminates to notify the driver of an emission control malfunction.

However, when an irregular signal returns to normal and the powertrain control module judges that it has returned to normal, the Service Engine Soon/Malfunction Indicator Lamp is switched off.

Moreover, when the ignition switch is turned off, the lamp is switched off. Even if the ignition switch is turned on again, the lamp does not illuminate until the malfunction is detected.

Immediately after the ignition switch is turned on, the Service Engine Soon/Malfunction Indicator Lamp is lit for 20 seconds to indicate that the Service Engine Soon/Malfunction Indicator Lamp operates normally.

Items Indicated by the Service Engine Soon/Malfunction Indicator Lamp

DTC NO.	ITEMS
-	Engine control module (ECM) <M/T> or Powertrain control module (PCM) <A/T> malfunction
P0101	Volume air flow circuit range/performance problem
P0102	Volume air flow circuit low input
P0106*	Barometric pressure circuit range/performance problem
P0107	Barometric pressure circuit low input
P0108	Barometric pressure circuit high input
P0111	Intake air temperature circuit range/performance problem
P0112	Intake air temperature circuit low input
P0113	Intake air temperature circuit high input
P0116	Engine coolant temperature circuit range/performance problem
P0117	Engine coolant temperature circuit low input
P0118	Engine coolant temperature circuit high input
P0121	Throttle position sensor circuit range/performance problem
P0122	Throttle position sensor circuit low input
P0123	Throttle position sensor circuit high input
P0125	Insufficient coolant temperature for closed loop fuel control
P0128	Coolant thermostat (Coolant temperature below thermostat regulating temperature)
P0130	Heated oxygen sensor circuit (bank 1 sensor 1)
P0131	Heated oxygen sensor circuit high voltage (bank 1 sensor 1)
P0132	Heated oxygen sensor circuit high voltage (bank 1 sensor 1)
P0133	Heated oxygen sensor circuit slow response (bank 1 sensor 1)
P0134*	Heated oxygen sensor circuit no activity detected (bank 1 sensor 1)
P0135	Heated oxygen sensor heater circuit (bank 1 sensor 1)
P0136	Heated oxygen sensor circuit (bank 1 sensor 2)
P0137	Heated oxygen sensor circuit low voltage (bank 1 sensor 2)
P0138	Heated oxygen sensor circuit high voltage (bank 1 sensor 2)
P0139	Heated oxygen sensor circuit slow response (bank 1 sensor 2)
P0141	Heated oxygen sensor heater circuit (bank 1 sensor 2)
P0150	Heated oxygen sensor circuit (bank 2 sensor 1)
P0151	Heated oxygen sensor circuit low voltage (bank 2 sensor 1)
P0152	Heated oxygen sensor circuit high voltage (bank 2 sensor 1)
P0153	Heated oxygen sensor circuit slow response (bank 2 sensor 1)
P0154*	Heated oxygen sensor circuit no activity detected (bank 2 sensor 1)
P0155	Heated oxygen sensor heater circuit (bank 2 sensor 1)
P0156	Heated oxygen sensor circuit (bank 2 sensor 2)
P0157	Heated oxygen sensor circuit low voltage (bank 2 sensor 2)
P0158	Heated oxygen sensor circuit high voltage (bank 2 sensor 2)
P0159	Heated oxygen sensor circuit slow response (bank 2 sensor 2)

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DTC NO.	ITEMS
P0161	Heated oxygen sensor heater circuit (bank 2 sensor 2)
P0171	System too lean (bank 1)
P0172	System too rich (bank 1)
P0174	System too lean (bank 2)
P0175	System too rich (bank 2)
P0181	Fuel temperature sensor circuit range/performance
P0182	Fuel temperature sensor circuit low input
P0183	Fuel temperature sensor circuit high input
P0201	Injector circuit – cylinder 1
P0202	Injector circuit – cylinder 2
P0203	Injector circuit – cylinder 3
P0204	Injector circuit – cylinder 4
P0205	Injector circuit – cylinder 5
P0206	Injector circuit – cylinder 6
P0300	Random/multiple cylinder misfire detected
P0301	Cylinder 1 misfire detected
P0302	Cylinder 2 misfire detected
P0303	Cylinder 3 misfire detected
P0304	Cylinder 4 misfire detected
P0305	Cylinder 5 misfire detected
P0306	Cylinder 6 misfire detected
P0335	Crankshaft position sensor circuit
P0340	Camshaft position sensor circuit
P0401	Exhaust gas recirculation flow insufficient detected
P0403	Exhaust gas recirculation control circuit
P0421	Warm up catalyst efficiency below threshold (bank 1)
P0431	Warm up catalyst efficiency below threshold (bank 2)
P0441	Evaporative emission control system incorrect purge flow
P0442	Evaporative emission control system leak detected (Small leak)
P0443	Evaporative emission control system purge control valve circuit
P0446	Evaporative emission control system vent control circuit
P0451	Evaporative emission control system pressure sensor range/performance
P0452	Evaporative emission control system pressure sensor low input
P0453	Evaporative emission control system pressure sensor high input
P0455	Evaporative emission control system leak detected (Gross leak)
P0456	Evaporative emission control system leak detected (Very small leak)
P0461	Fuel level sensor circuit range/performance
P0500	Vehicle speed sensor malfunction <M/T>
P0506	Idle control system RPM lower than expected
P0507	Idle control system RPM higher than expected

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DTC NO.	ITEMS
P0513	Immobilizer malfunction
P0551	Power steering pressure sensor circuit range/performance
P0660	Variable induction control circuit malfunction
P0705	Transmission range sensor circuit malfunction (RPNDL input)
P0712	Transmission fluid temperature sensor circuit low input
P0713	Transmission fluid temperature sensor circuit high input
P0715	Input/Turbine speed sensor circuit
P0720	Output speed sensor circuit
P0731	Gear 1 incorrect ratio
P0732	Gear 2 incorrect ratio
P0733	Gear 3 incorrect ratio
P0734	Gear 4 incorrect ratio
P0736	Gear R incorrect ratio
P0741	Torque converter clutch circuit performance or stuck off
P0742	Torque converter clutch circuit stuck on
P0743	Torque converter clutch circuit electrical
P0753	Shift solenoid "A" electrical
P0758	Shift solenoid "B" electrical
P0763	Shift solenoid "C" electrical
P0768	Shift solenoid "D" electrical
P1400	Manifold differential pressure sensor circuit malfunction
P1603*	Battery backup circuit malfunction
P1751	A/T control relay malfunction

NOTE: If the Service Engine Soon/Malfunction Indicator Lamp illuminates because of a malfunction of the engine control module (ECM) <M/T> or powertrain control module (PCM) <A/T>, communication between scan tool MUT-II (MB991502) and the ECM <M/T> or PCM <A/T> is impossible. In this case, the diagnostic trouble code cannot be read.

NOTE: After the ECM <M/T> or PCM <A/T> has detected a malfunction, the Service Engine Soon/Malfunction Indicator Lamp illuminates when the engine is next turned on and the same malfunction is re-detected. However, for items marked with a "" in the DTC NO. column, the Service Engine Soon/Malfunction Indicator Lamp illuminates on the first detection of the malfunction.*

NOTE: After the Service Engine Soon/Malfunction Indicator Lamp illuminates, it will be switched off under the following conditions.

- *When the ECM <M/T> or PCM <A/T> monitored the power train malfunction three times* and met set condition requirements, it detected no malfunction. *: In this case, "one time" indicates from engine start to stop.*
- *For misfiring or a fuel trim malfunction, when driving conditions (engine speed, engine coolant temperature, etc.) are similar to those when the malfunction was first recorded.*

NOTE: Sensor 1 indicates the sensor mounted at a position closest to the engine, and sensor 2 indicates the sensor mounted at the position second closest to the engine.

NOTE: Bank 1 indicates the right bank side cylinder, and bank 2 indicates the left bank side cylinder.

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HOW TO READ AND ERASE DIAGNOSTIC TROUBLE CODE

Refer to GROUP 13A, Trouble code diagnosis – How to Read and Erase Diagnostic Trouble Codes P.13A-5.

PROVISIONAL DTCs [MUT-II OBD-II Test Mode-Results (Mode 5)]

Refer to GROUP 13A,Trouble code diagnosis – Provisional DTCs [MUT-II OBD-II Test Mode-Results (Mode 5)]P.13A-5.

MODE 6 REFERENCE TABLE

The engine powertrain control module (ECM) <M/T> or powertrain control module (PCM) <A/T> monitors the condition of emission control system.

By selecting MODE 6 using scan tool, Test Result and Limit Value (minimum) *1 or (maximum) *2 about the main items of emission control system which ECM <M/T> or PCM <A/T> monitors can be confirmed. The value at the last monitoring is output by ECM <M/T> or PCM <A/T> as a test result.

TEST ID	MONITORING ITEM	SIMPLE TECHNICAL DESCRIPTION	INDICATION OF SCAN TOOL	CONVERSION COEFFICIENT IN USING GENERAL SCAN TOOL
01	Catalyst monitor (Bank 1)	ECM <M/T> or PCM <A/T> monitors the deterioration of catalyst at right bank side by the output frequency ratio between right bank heated oxygen sensor (front) and right bank heated oxygen sensor (rear).	Catalyst Frequency Ratio Bank 1 Test Result and Limit Value (max.)	× 0.0039
02	Catalyst monitor (Bank 2)	ECM <M/T> or PCM <A/T> monitors the deterioration of catalyst at left bank side by the output frequency ratio between left bank heated oxygen sensor (front) and left bank heated oxygen sensor (rear).	Catalyst Frequency Ratio Bank 2 Test Result and Limit Value (max.)	× 0.0039
03	EGR monitor	ECM <M/T> or PCM <A/T> monitors the operation of EGR system by the pressure difference of intake manifold between before and after introduction of EGR using the manifold differential pressure sensor.	EGR Monitor Pressure Value Test Result and Limit Value (min.) kPa	× 0.43 kPa
06	Evaporation leak monitor (Small leak)	ECM <M/T> or PCM <A/T> monitors the leak of fuel evaporation gas by the reduction of vacuum in tank after appointed time using the fuel tank differential pressure sensor after making the fuel tank and the fuel line vacuum.	EVAP Leak Mon. 1mm Pressure Value Test Result and Limit Value (max.) kPa	× 0.032 kPa

TEST ID	MONITORING ITEM	SIMPLE TECHNICAL DESCRIPTION	INDICATION OF SCAN TOOL	CONVERSION COEFFICIENT IN USING GENERAL SCAN TOOL
07	Evaporation leak monitor (Gross leak)	ECM <M/T> or PCM <A/T> monitors the leak of fuel evaporation gas by checking whether the pressure can be reduced (the amount of pressure reduction) using the fuel tank differential pressure sensor after sealing the fuel tank and the fuel line.	EVAP Leak Mon. Gross Pressure Value Test Result and Limit Value (min.) kPa	× 0.032 kPa
08	Evaporation leak monitor (Very small leak)	ECM <M/T> or PCM <A/T> monitors the leak of fuel evaporation gas by the reduction of vacuum in tank after appointed time using the fuel tank differential pressure sensor after making the fuel tank and the fuel line vacuum.	EVAP Leak Mon. 0.5mm Pressure Value Test Result and Limit Value (max.) kPa	× 0.032 kPa
09	Right bank heated oxygen sensor (front) monitor (Rich/ Lean Switching)	ECM <M/T> or PCM <A/T> monitors the deteriorated condition of the right bank heated oxygen sensor (front) by checking the lean/ rich Switching frequency of the right bank heated oxygen sensor (front).	HO2S B1 SENSOR1 Rich/Lean Switching Count Test Result and Limit Value (min.)	× 1 count
0A	Left bank heated oxygen sensor (front) monitor (Rich/ Lean Switching)	ECM <M/T> or PCM <A/T> monitors the deteriorated condition of the left bank heated oxygen sensor (front) by checking the lean/ rich Switching frequency of the left bank heated oxygen sensor (front).	HO2S B2 SENSOR1 Rich/Lean Switching Count Test Result and Limit Value (min.)	× 1 count
0B	Right bank heated oxygen sensor (rear) monitor (Voltage)	ECM <M/T> or PCM <A/T> checks the output voltage of the right bank heated oxygen sensor (rear) in order to monitor whether the heated oxygen sensor (rear) output is stuck.	HO2S B1 SENSOR2 Change in Volt Test Result and Limit Value (min.)	× 19.5 mV
0C	Left bank heated oxygen sensor (rear) monitor (Voltage)	ECM <M/T> or PCM <A/T> checks the output voltage of the left bank heated oxygen sensor (rear) in order to monitor whether the left bank heated oxygen sensor (rear) output is stuck.	HO2S B2 SENSOR2 Change in Volt Test Result and Limit Value (min.)	× 19.5 mV

*NOTE: *1: Minimum value: The test fails if test value is less than this value.*

*NOTE: *2: Maximum value: The test fails if test value is greater than this value.*

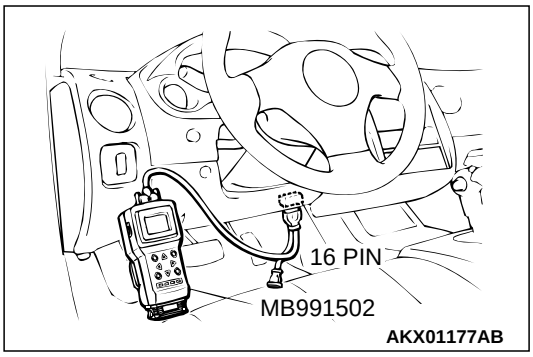
DIAGNOSTIC BY DIAGNOSTIC TEST MODE II (INCREASED SENSITIVITY)

Refer to GROUP 13A, Trouble code diagnosis – Diagnostic by Diagnostic Test Mode II (Increased Sensitivity) P.13A-5.

INSPECTION USING SCAN TOOL MB991502, DATA LIST AND ACTUATOR TESTING

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

1. Connect scan tool MB991502 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Carry out inspection by means of the data list and the actuator test function. If there is an abnormality, check and repair the chassis harnesses and components. Refer to Data List Reference Table. Refer to Actuator Test Reference Table P.13B-654.
4. Re-check using scan tool MB991502 and check to be sure that the abnormal input and output have returned to normal because of the repairs.
5. Erase the diagnostic trouble code (s).
6. Turn the ignition switch to the "LOCK" (OFF) position.
7. Disconnect scan tool MB991502 from the data link connector.
8. Start the engine again and do a test drive to confirm that the problem is eliminated.

ON-BOARD DIAGNOSTICS

The engine control module (ECM) <M/T> or powertrain control module (PCM) <A/T> monitors the input/output signals (some signals all the time and others under specified conditions) of the ECM <M/T> or PCM <A/T>. When a malfunction continues for a specified time or longer after the irregular signal is initially monitored, the ECM <M/T> or PCM <A/T> judges that a malfunction has occurred. After the ECM <M/T> or PCM <A/T> first detects a malfunction, a diagnostic trouble code is recorded when the engine is restarted and the same malfunction is re-detected. However, for items marked with a "*", a diagnostic trouble code is recorded on the first detection of the malfunction. There are 92 diagnostic items. The diagnostic results can be read out with a scan tool. Since memorization of the diagnostic trouble codes is backed up directly by the battery, the diagnostic results are memorized even if the ignition key is turned off. The diagnostic trouble codes will, however, be erased when the battery terminal or the ECM <M/T> or PCM <A/T> connector is disconnected. In addition, the diagnostic trouble code can also be erased by turning the ignition switch to "ON" position and sending the diagnostic trouble code erase signal from scan tool MUT-II (MB991502) to the ECM <M/T> or PCM <A/T>.

NOTE: If the sensor connector is disconnected with the ignition switch turned on, the diagnostic trouble code is memorized. In this case, send the diagnostic trouble code erase signal to the ECM <M/T> or PCM <A/T> in order to erase the diagnostic memory.

The 92 diagnostic items are all indicated sequentially from the smallest code number. The ECM <M/T> or PCM <A/T> records the engine operating condition when the diagnostic trouble code is set. This data is called "freeze frame" data. This data can be read by using the scan tool, and can then be used in simulation tests for troubleshooting. Data items are as follows.

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NOTE: If the ECM <M/T> or PCM <A/T> detects multiple malfunctions, the ECM <M/T> or PCM <A/T> stores the data for only the first item that was detected.

However, if the ECM <M/T> or PCM <A/T> detects a misfire or a fuel system malfunction, ECM <M/T> or PCM <A/T> stores the data by giving priority to the misfire or fuel system malfunction, regardless of the order in which the malfunction was detected.

NOTE: As for diagnostic trouble code P1603, "freeze frame" data is not memorized.

MUT-II SCAN TOOL DISPLAY	ITEM NO.	DATA ITEM	UNIT or STATE
ECT SENSOR	21	Engine coolant temperature sensor	°C or °F
ENGINE LOAD	87	Calculation load value	%
ENGINE SPEED	22	Crankshaft position sensor	r/min
IAT SENSOR	13	Intake air temperature sensor	°C or °F
IG. TIMING ADV	44	Ignition coils and ignition power transistor	deg
LONG TRIM B1	81	Long-term fuel compensation	%
LONG TRIM B2	83	Long-term fuel compensation	%
SHORT TRIM B1	82	Short-term fuel compensation	%
SHORT TRIM B2	84	Short-term fuel compensation	%
SYS. STATUS B1	88	Fuel control condition (right bank)	• Open loop • Closed loop • Open loop-drive condition • Open loop-DTC set • Closed loop-O_2 (rear) failed
SYS. STATUS B2	89	Fuel control condition (left bank)	• Open loop • Closed loop • Open loop-drive condition • Open loop-DTC set • Closed loop-O_2 (rear) failed
TP SENSOR	8A	Throttle position sensor	%
VAF SENSOR	12	Volume air flow sensor (mass air flow rate)	gm/s
VSS	24	Vehicle speed sensor	km/h or mph

OBD- II DRIVE CYCLE

All kinds of diagnostic trouble codes (DTCs) can be monitored by carrying out a test drive according to the following six drive cycle pattern. In other words, doing such a drive regenerates any kind of trouble which involves illuminating the Service Engine Soon/Malfunction Indicator Lamp and verifies the repair procedure has eliminated the trouble (the Service Engine Soon/Malfunction Indicator Lamp is no longer illuminated).

⚠ CAUTION

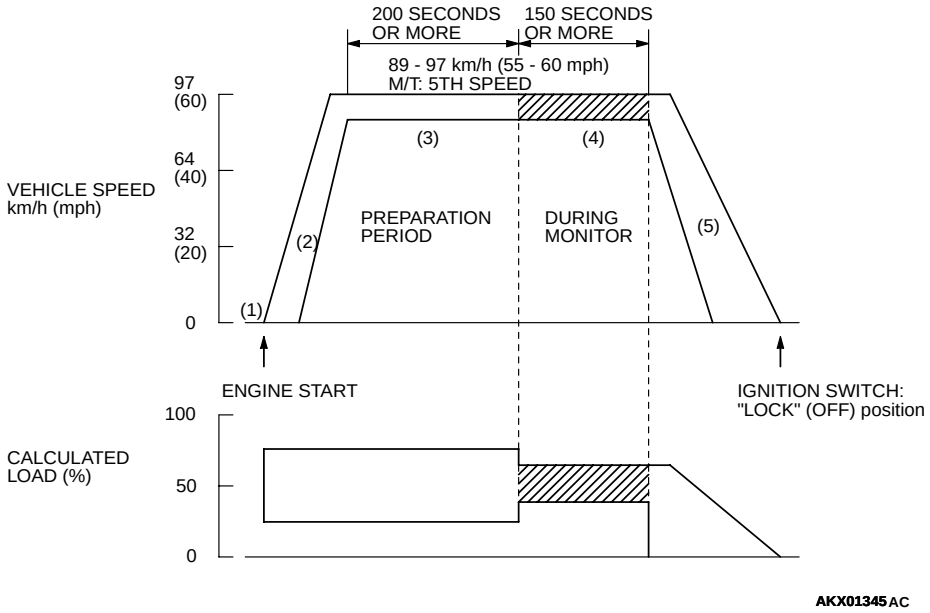
Two technicians should always be in the vehicle when carrying out a test drive.

NOTE: Check that the diagnosis trouble code (DTC) is not output before traveling in the drive cycle pattern. Erase the DTC if it has been output.

DRIVE CYCLE PATTERN LIST

PROCEDURE	MONITOR ITEM		DIAGNOSTIC TROUBLE CODE (DTC)
1	Evaporative emission control system leak monitor		P0441, P0442, P0451, P0452, P0453, P0455, P0456
2	Fuel trim monitor		P0171, P0172, P0174, P0175
3	Catalytic converter monitor		P0421, P0431
4	Heated oxygen sensor monitor		P0133, P0139, P0153, P0159
5	Exhaust gas recirculation (EGR) system monitor		P0401
6	Other monitor	Main components	P0134, P0154, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0506, P0507,P1400
		Sensors and switches	P0101, P0102, P0106, P0107, P0108, P0111, P0112, P0113, P0116, P0117, P0118, P0121, P0122, P0123, P0125, P0181, P0182, P0183, P0325, P0335, P0340, P0461
		Wire breakage and short circuit	P0130, P0131,P0132, P0135, P0136, P0137, P0138, P0141, P0150, P0151, P0152, P0155, P0156, P0157, P0158, P0161, P0201, P0202, P0203, P0204, P0205, P0206, P0403, P0443, P0446

PROCEDURE 1

EVAPORATIVE EMISSION CONTROL SYSTEM LEAK MONITOR	
DTC	P0441, P0442, P0451, P0452, P0453, P0455, P0456
Drive cycle pattern	One drive [from start to ignition switch to the "LOCK" (OFF) position] will be completed while traveling with the following drive pattern. It will take 8 minutes. You must complete this drive twice. *NOTE: . Vehicle speed and throttle opening angle should be within the shaded range. Test drive must be completed within 16 minutes of "Key on."* 
Inspection conditions	• Engine coolant temperature: 30°C (75°F) or less (The engine is stopped before the test drive is started) • Atmospheric temperature: 5 – 45°C (41 – 113°F) • Condition of A/T: Selector lever D range • Test may not run if fuel tank is over 2/3 full.
Test procedure	1. Engine: start 2. Accelerate until the vehicle speed is 89 – 97 km/h (55 – 60 mph). 3. Travel for 200 seconds or more while keeping the vehicle speed at 89 – 97 km/h (55 – 60 mph). (M/T = 5th speed) 4. While keeping the accelerator pedal opening degree constant, keep the vehicle speed at 89 – 97 km/h (55 – 60 mph) and travel for 150 seconds or more. (During monitor) 5. Return the vehicle to the shop, then turn the ignition switch to the "LOCK" (OFF) position. 6. Confirm that the diagnostic trouble code (DTC) is not output. 7. If DTC P0441 is output, refer to DTC P0441 – Evaporative Emission Control System Incorrect Purge Flow P.13B-351. If DTC P0442 is output, refer to DTC P0442 – Evaporative Emission Control System Leak Detected (Small Leak) P.13B-353. If DTC P0451 is output, refer to DTC P0451 – Evaporative Emission Control System Pressure Sensor Range/performance P.13B-383. If DTC P0452 is output, refer to DTC P0452 – Evaporative Emission Control System Pressure Sensor Low Input P.13B-400. If DTC P0453 is output, refer to DTC P0453 – Evaporative Emission Control System Pressure Sensor High Input P.13B-416. If DTC P0455 is output, refer to DTC P0455 – Evaporative Emission Control System Leak Detected (Gross Leak) P.13B-432. If DTC P0456 is output, refer to DTC P0456 – Evaporative Emission Control System Leak Detected (Very Small Leak) P.13B-451.

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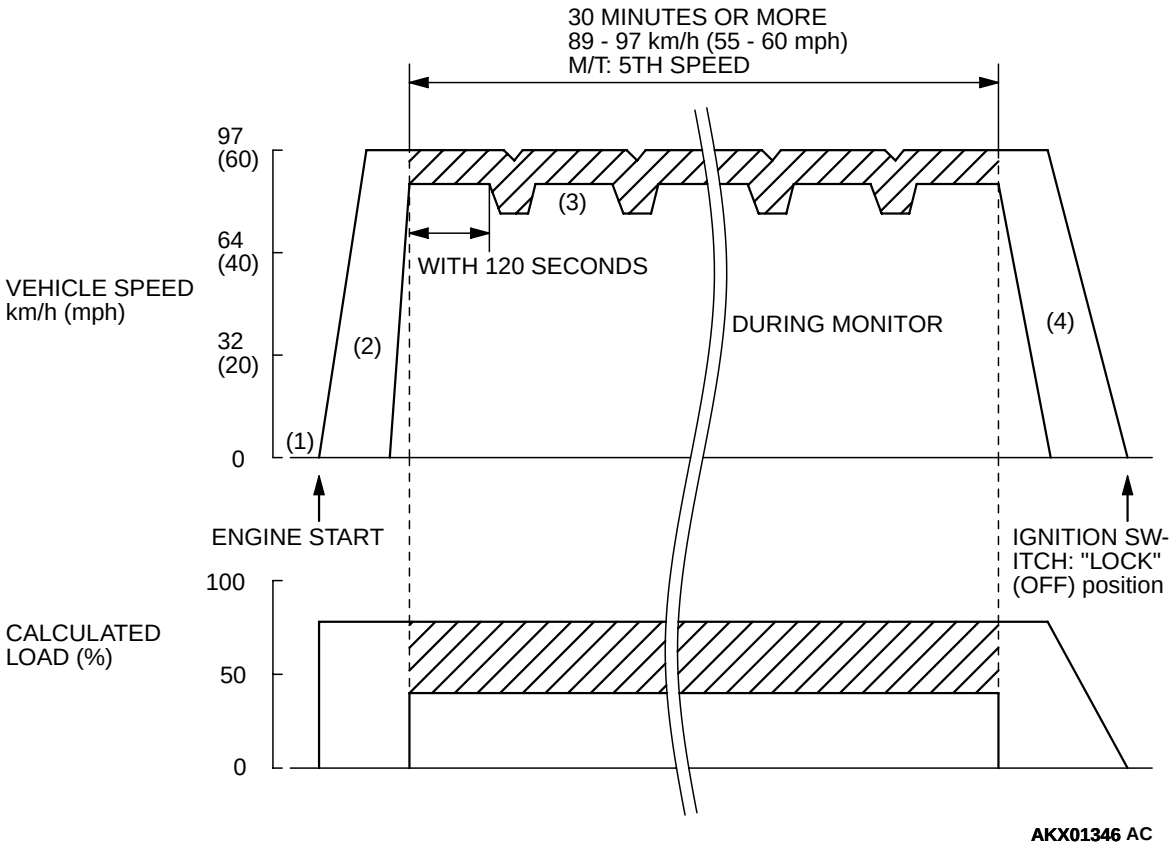
PROCEDURE 2

FUEL TRIM MONITOR	
DTC	P0171, P0172,P0174, P0175
Drive cycle pattern	This monitor [from start to ignition switch to the "LOCK" (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 35 minutes. You must complete this drive twice. *NOTE: Vehicle speed and throttle opening angle should be within the shaded range.* 
Inspection conditions	• Engine coolant temperature: 80 – 97°C (176 - 207°F) • Atmospheric temperature: -10 – 60°C (14 – 140°F) • Condition of A/T: Selector lever D range
Test procedure	1. Engine: start 2. Accelerate until the vehicle speed is 89 – 97 km/h (55 – 60 mph). 3. Travel for 30 minutes or more while keeping the vehicle speed at 89 – 97 km/h (55 - 60 mph). (M/T = 5th speed) Carry out one gradual acceleration /deceleration, returning to a speed of 50 – 60 mph within 120 seconds. (During monitor) 4. Return the vehicle to the shop, then turn the ignition switch to the "LOCK" (OFF) position. 5. Confirm that the diagnostic trouble code (DTC) is not output. 6. If DTC P0171 is output, refer to DTC P0171 – System too lean (Bank1) P.13B-245. If DTC P0172 is output, refer to DTC P0172 – System too rich (Bank1) P.13B-252. If DTC P0174 is output, refer to DTC P0174 – System too lean (Bank2) P.13B-256. If DTC P0175 is output, refer to DTC P0175 – System too rich (Bank2) P.13B-262.

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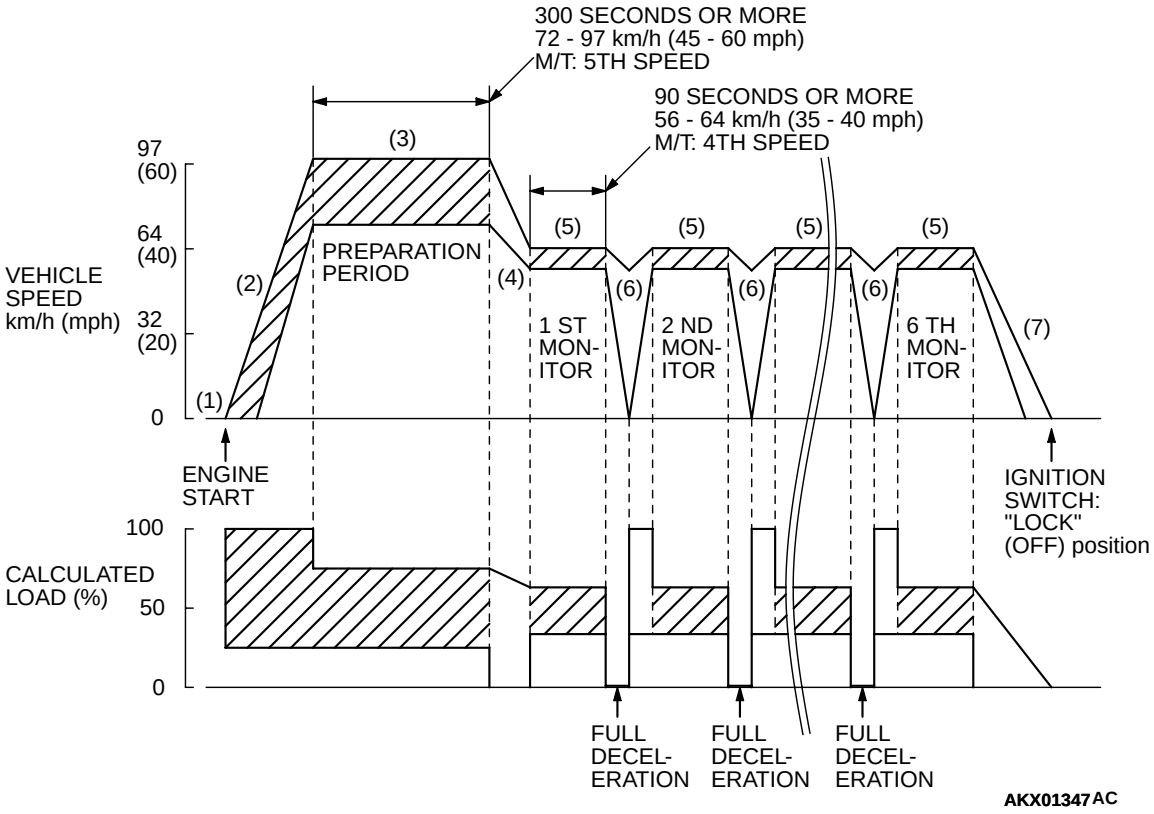
PROCEDURE 3

CATALYTIC CONVERTER MONITOR	
DTC	P0421, P0431
Drive cycle pattern	This monitor [from start to ignition switch to the "LOCK" (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 20 minutes. You must complete this drive twice. *NOTE: . Vehicle speed and throttle opening angle should be within the shaded range.* 
Inspection conditions	• Atmospheric temperature: –10°C (14°F) or more • A/C switch: OFF • Condition of A/T: Selector lever D range
Test procedure	1. Engine: start 2. Accelerate until the vehicle speed is 72 km/h (45 mph). 3. Travel for 300 seconds or more while keeping the vehicle speed at 72 – 97 km/h (45 - 60 mph). (M/T = 5ht speed) 4. Decelerate until the vehicle speed is within 56 – 64 km/h (35 – 40 mph). 5. While keeping the accelerator pedal opening degree constant, keep the vehicle speed at 56 – 64 km/h (35 – 40 mph) and travel for 90 seconds or more. (During monitor) 6. Fully close the throttle and decelerate, and keep the deceleration state for 10 seconds. Then, quickly accelerate until the vehicle speed reaches 56 – 64 km/h (35 – 40 mph). Then, repeat steps 5 and 6, and complete six monitoring sessions. 7. Return the vehicle to the shop, then turn the ignition switch to the "LOCK" (OFF) position. 8. Confirm that the diagnostic trouble code (DTC) is not output. 9. 9. If DTC P0421 is output, refer to DTC P0421 – Warm Up Catalyst Efficiency Below Threshold (Bank 1) P.13B-346. If DTC P0431 is output, refer to DTC P0431 – Warm Up Catalyst Efficiency Below Threshold (Bank 2) P.13B-348.

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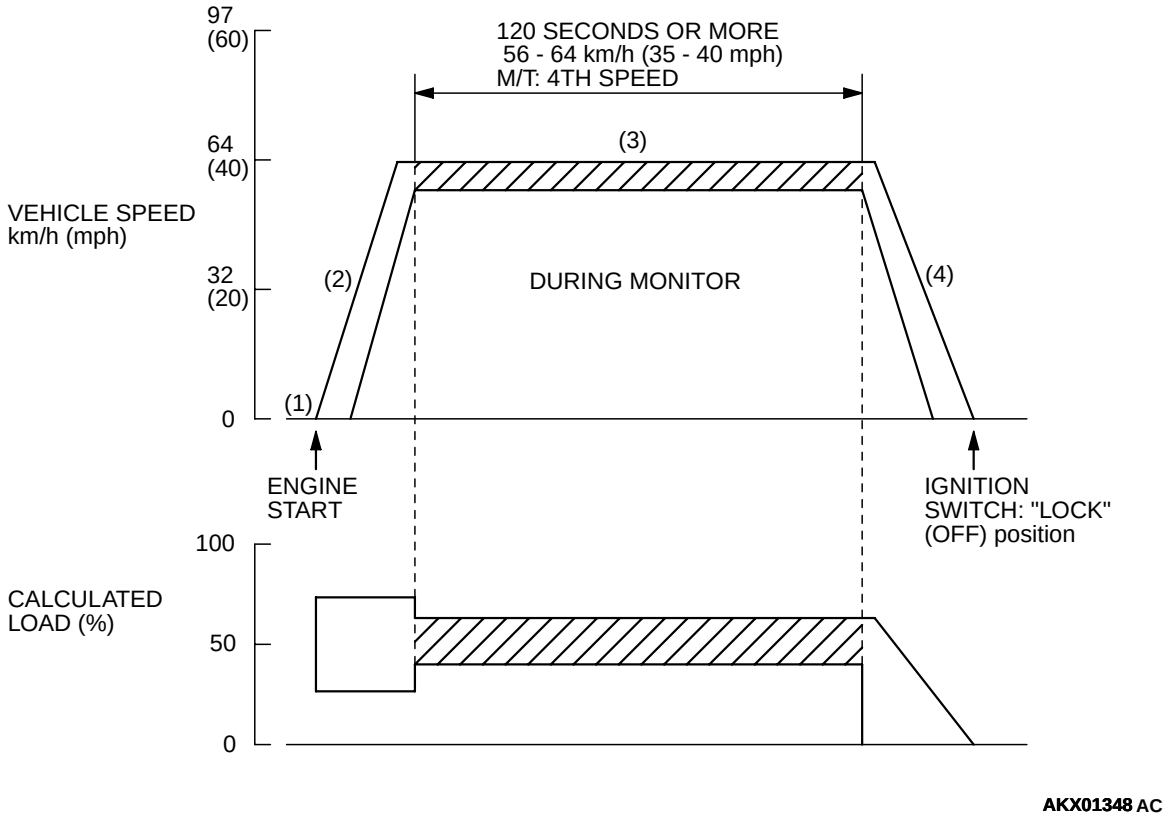
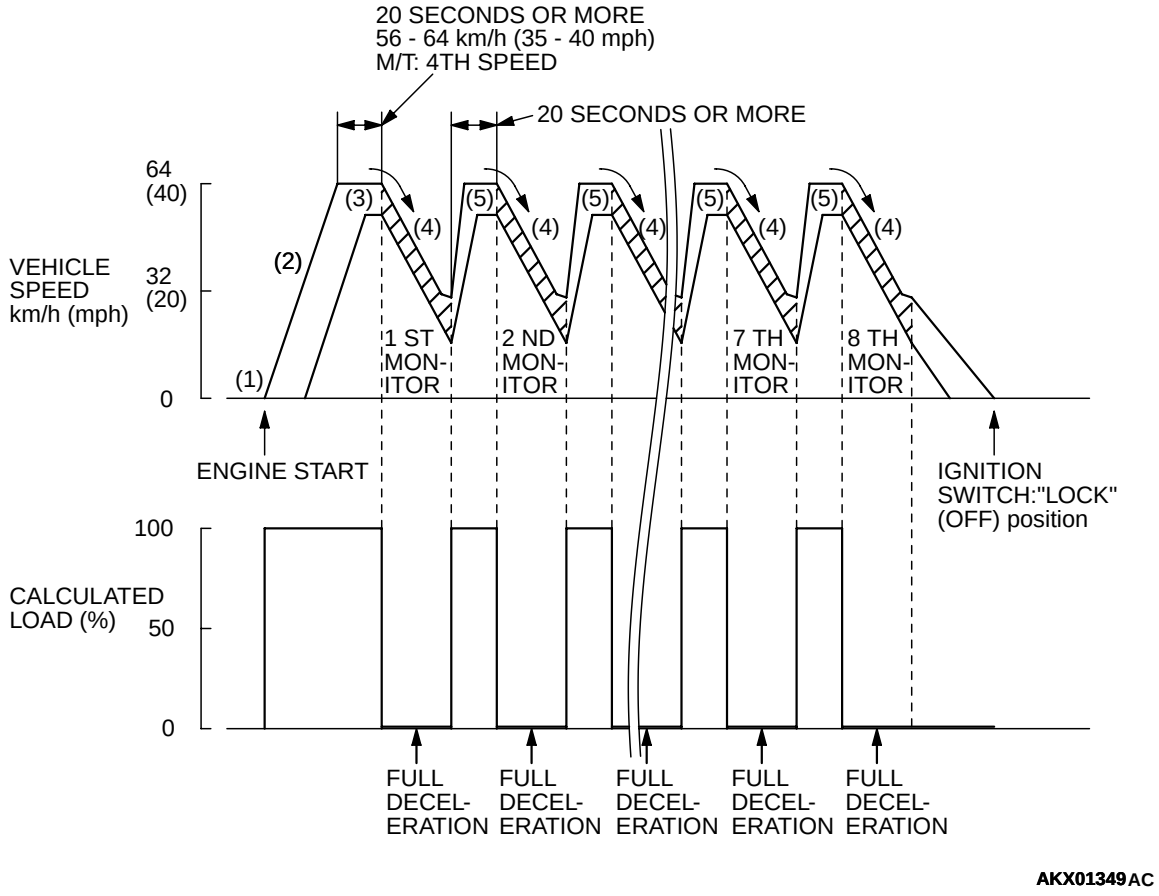
PROCEDURE 4

HEATED OXYGEN SENSOR MONITOR	
DTC	P0133, P0139, P0153, P0159
Drive cycle pattern	This monitor [from start to ignition switch to the "LOCK" (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 5 minutes. You must complete this drive twice. *NOTE: Vehicle speed and throttle opening angle should be within the shaded range.*  AKX01348 AC
Inspection conditions	• Engine coolant temperature: 80°C (176°F) or more • Atmospheric temperature: –10°C (14°F) or more • Condition of A/T: Selector lever D range
Test procedure	Engine: start Accelerate until the vehicle speed is 56 – 64 km/h (35 – 40 mph). While keeping the accelerator pedal opening degree constant (M/T = 4th speed), keep the vehicle speed at 56 – 64 km/h (35 – 40 mph) and travel for 120 seconds or more. (During monitor) Return the vehicle to the shop, then turn the ignition switch to the "LOCK" (OFF) position. Confirm that the diagnostic trouble code (DTC) is not output. If DTC P0133 is output, refer to DTC P0133 – Heated Oxygen Sensor Circuit Slow Response (Bank 1 Sensor 1) P.13B-140. If DTC P0139 is output, refer to DTC P0139 – Heated Oxygen Sensor Circuit Slow Response (Bank 1 Sensor 2) P.13B-174. If DTC P0153 is output, refer to DTC P0153 – Heated Oxygen Sensor Circuit Slow Response (Bank 2 Sensor 1) P.13B-202. If DTC P0159 is output, refer to DTC P0159 – Heated Oxygen Sensor Circuit Slow Response (Bank 2 Sensor 2) P.13B-236.

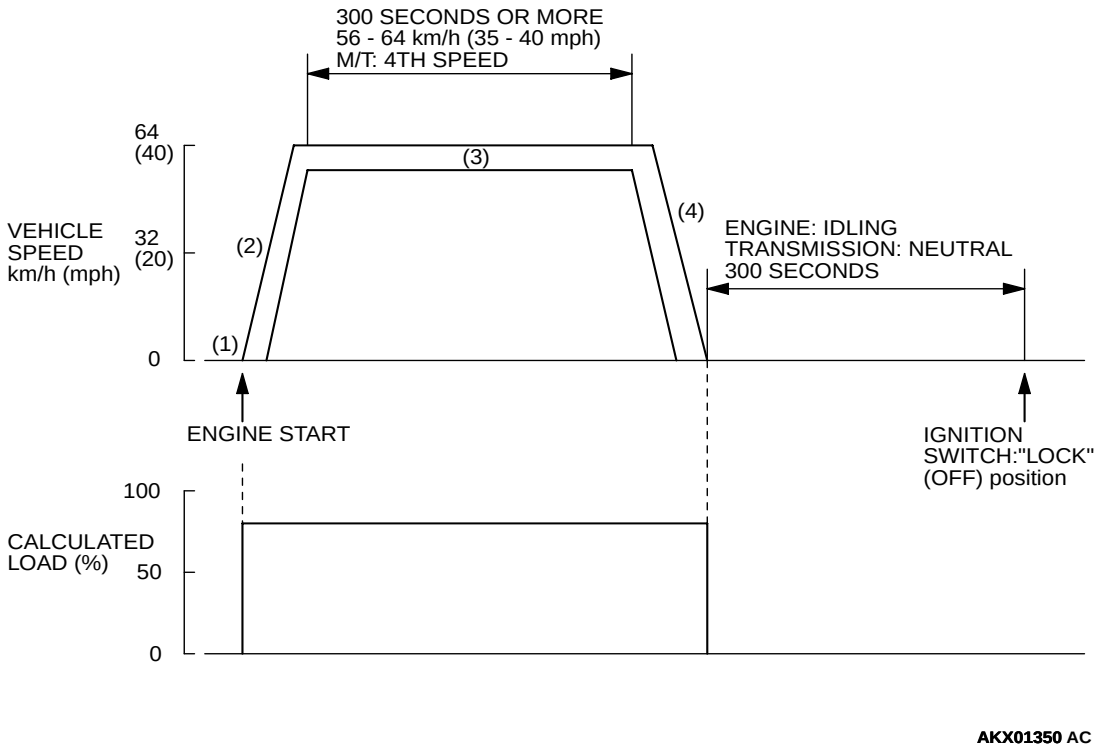
TSB Revision

PROCEDURE 5

EXHAUST GAS RECIRCULATION (EGR) SYSTEM MONITOR	
DTC	P0401
Drive cycle pattern	This monitor [from start to ignition switch to the "LOCK" (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 10 minutes. You must complete this drive twice. *NOTE: Vehicle speed and throttle opening angle should be within the shadedrange.*  AKX01349AC
Inspection conditions	• Engine coolant temperature: 80°C (176°F) or more • Atmospheric temperature: 5°C (41°F) or more • A/C switch: OFF • Condition of A/T: Selector lever D range
Test procedure	1. Engine: start 2. Accelerate until the vehicle speed is 56 – 64 km/h (35 – 40 mph). 3. Travel for 20 seconds or more while keeping the vehicle speed at 56 – 64 km/h (35 – 40 mph). (M/T = 4th speed) 4. Fully close the throttle from an engine speed of 2,000 – 3,000 r/min, and decelerate to approx. 900 r/min without applying the brakes. Do not steer the handle or turn the light ON/OFF during this time. (During monitor) 5. Accelerate until the vehicle speed reaches 56 – 64 km/h (35 – 40 mph), and travel for 20 seconds or more. Then, repeat steps 4 and 5 and complete 8 monitor sessions. 6. Return the vehicle to the shop, then turn the ignition switch to the "LOCK" (OFF) position. 7. Confirm that the diagnostic trouble code (DTC) is not output. 8. If DTC P0401 is output, refer to DTC P0401 – Exhaust Gas Recirculation Flow Insufficient detected P.13B-336.

TSB Revision

PROCEDURE 6

OTHER MONITOR (Main components, sensors and switches, wire breakage and short circuit)	
DTC	• Main components: P0134, P0154, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0506, P0507, P1400 • Sensors and switches: P0101, P0102, P0106, P0107, P0108, P0111, P0112, P0113, P0116, P0117, P0118, P0121, P0122, P0123, P0125, P0181, P0182, P0183, P0325, P0335, P0340, P0461 • Wire breakage and short circuit: P0130, P0131, P0132, P0135, P0136, P0137, P0138, P0141, P0150, P0151, P0152, P0155, P0156, P0157, P0158, P0161, P0201, P0202, P0203, P0204, P0205, P0206, P0403, P0443, P0446
Drive cycle pattern	This monitor [from start to ignition switch to the "LOCK" (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 10 minutes. You must complete this drive twice. *NOTE: . Drive according to the graph below.* 
Inspection conditions	• Engine coolant temperature: 80°C (176°F) or more • Atmospheric temperature: 5°C (41°F) or more • Condition of A/T: Selector lever D range
Test procedure	Engine: start Accelerate until the vehicle speed is 56 – 64 km/h (35 – 40 mph), and travel for 300 seconds or more. (M/T = 4th speed) Return the vehicle to the shop. After stopping the vehicle, continue idling for 300 seconds, and then turn the ignition switch to the "LOCK" (OFF) position. Moreover, the vehicle should be set to the following conditions for idling. • A/C switch: OFF • Lights and all accessories: OFF • Transaxle: P range • Steering wheel: Straightforward position Confirm that the diagnostic trouble code (DTC) is not output. If a DTC is displayed, refer to Diagnostic Trouble Code Chart P.13B-22.

TSB Revision

READINESS TEST STATUS

Purpose

The Readiness function also referred as I/M Readiness or I/M Flags indicate if a full diagnostic check has been "Completed" (is "Ready") for each non-continuous monitor. Enhanced I/M State Emission Programs will use the Readiness status (Codes) to see if the vehicle is ready for OBD II testing. "Incomplete" (Not Ready) codes will be one of the triggers for I/M failure.

Overview

The engine control module (ECM) <M/T> or powertrain control module (PCM) <A/T> monitors the following main diagnosis items and records whether the evaluation was completed or is incomplete. The Readiness codes were established for the I/M programs, thereby confirming that the vehicle was not tampered with by erasing the DTC's before I/M testing. The Readiness and DTC codes can be reset by disconnecting the battery or by erasing the codes with a scan tool. For this reason all Readiness codes must read "Complete" before I/M testing. When the monitors run and complete, the MUT II will record the Readiness Code as "Complete" (General Scan Tools record as "Ready"). If the monitor did not run completely, the system then reads as "Incomplete" (General Scan Tools record as "Not Ready").

When the monitors run and complete, the MUT II will record the Readiness Code as "Complete" (General Scan Tools record as "Ready"). If the monitor did not run completely, the system then reads as "Incomplete" (General Scan Tools record as "Not Ready"). When the vehicle is operating normally and the OBD II Drive Cycle is carried out, Readiness Code will set as "Complete" on the first drive cycle. If during the first drive cycle a fault is detected then, a second drive is required before the Readiness Code will "Complete". If the fault is still there, then a DTC will set.

- Catalyst: P0421, P0431
- Evaporative system: P0442, P0455, P0456
- Heated oxygen sensor: P0133, P0153
- Heated oxygen sensor heater: P0135, P0141, P0155, P0161
- EGR system: P0401

After the Readiness is "Complete", the technician is assured that any DTC's associated with that monitor will be displayed if the system has a problem. That is why some State's I/M programs require the Readiness Code as "Complete" before they check for DTC's.

NOTE: After a repair is mode for a DTC the technician should drive the OBD II drive cycle checking that the MUT II records all Readiness as "Complete".

FAIL-SAFE FUNCTION REFERENCE TABLE

M1131153000028

When the main sensor malfunctions are detected by the diagnostic test mode, the vehicle is controlled by means of the following defaults.

MALFUNCTION ITEM	CONTROL CONTENTS DURING MALFUNCTION
Volume air flow sensor	1. Uses the throttle position sensor signal and engine speed signal (crankshaft position sensor signal) for basic injector drive time and basic ignition timing from the pre-set mapping. 2. Fixes the IAC motor in the appointed position so idle air control is not performed.
Intake air temperature sensor	Controls as if the intake air temperature is 25°C (77°F).
Throttle position sensor	No increase in fuel injection amount during acceleration due to the unreliable throttle position sensor signal.
Engine coolant temperature sensor	Controls as if the engine coolant temperature is 80°C (176°F). (This control will be continued until the ignition switch is turned to the "LOCK" (OFF) position even though the sensor signal returns to normal.)
Camshaft position sensor	Injects fuel simultaneously into all cylinders. (After the ignition switch is turned to the "ON" position, the No.1 cylinder top dead center is not detected at all.)
Barometric pressure sensor	Controls as if the barometric pressure is 101 kPa (30 in Hg).

MALFUNCTION ITEM	CONTROL CONTENTS DURING MALFUNCTION
Knock sensor	Switches the ignition timing from ignition timing for high octane to ignition timing for standard octane fuel.
Communication line with transaxle control CPU	No ignition timing retard control (overall engine-transaxle control) achieved when transaxle speeds are changed.
Generator FR terminal	Does not restrict the generator output with respect to electrical load.
Heated oxygen sensor <front>	Air/fuel ratio closed loop control is not performed.
Heated oxygen sensor <rear>	Performs the closed loop control of the air/fuel ratio by using only the signal of the heated oxygen sensor (front) installed on the front side of the catalytic converter.
Misfire detection	The ECM <M/T> or PCM <A/T> stops supplying fuel to the cylinder with the highest misfiring rate if a misfiring that could damage the catalytic converter is detected.

DIAGNOSTIC TROUBLE CODE CHART

M1131151000163

DTC CODE	DIAGNOSTIC ITEMS	REFERENCE PAGE
P0101	Volume air flow circuit range/performance problem	P.13B-29
P0102	Volume air flow circuit low input	P.13B-35
P0106*	Barometric pressure circuit range/performance problem	P.13B-42
P0107	Barometric pressure circuit low input	P.13B-46
P0108	Barometric pressure circuit high input	P.13B-56
P0111	Intake air temperature circuit range/performance problem	P.13B-62
P0112	Intake air temperature circuit low input	P.13B-67
P0113	Intake air temperature circuit high input	P.13B-71
P0116	Engine coolant temperature circuit range/performance problem	P.13B-77
P0117	Engine coolant temperature circuit low input	P.13B-85
P0118	Engine coolant temperature circuit high input	P.13B-89
P0121	Throttle position sensor circuit range/performance problem	P.13B-95
P0122	Throttle position sensor circuit low input	P.13B-103
P0123	Throttle position sensor circuit high input	P.13B-109
P0125	Insufficient coolant temperature for closed loop fuel control	P.13B-114
P0128	Coolant thermostat (coolant temperature below thermostat regulating temperature)	P.13B-121
P0130	Heated oxygen sensor circuit (bank 1 sensor 1)	P.13B-122
P0131	Heated oxygen sensor circuit high voltage (bank 1 sensor 1)	P.13B-132
P0132	Heated oxygen sensor circuit high voltage (bank 1 sensor 1)	P.13B-137
P0133	Heated oxygen sensor circuit slow response (bank 1 sensor 1)	P.13B-140
P0134*	Heated oxygen sensor circuit no activity detected (bank 1 sensor 1)	P.13B-143
P0135	Heated oxygen sensor heater circuit (bank 1 sensor 1)	P.13B-149
P0136	Heated oxygen sensor circuit (bank 1 sensor 2)	P.13B-156

DTC CODE	DIAGNOSTIC ITEMS	REFERENCE PAGE
P0137	Heated oxygen sensor circuit low voltage (bank 1 sensor 2)	P.13B-166
P0138	Heated oxygen sensor circuit high voltage (bank 1 sensor 2)	P.13B-171
P0139	Heated oxygen sensor circuit slow response (bank 1 sensor 2)	P.13B-174
P0141	Heated oxygen sensor heater circuit (bank 1 sensor 2)	P.13B-177
P0150	Heated oxygen sensor circuit (bank 2 sensor 1)	P.13B-184
P0151	Heated oxygen sensor circuit low voltage (bank 2 sensor 1)	P.13B-194
P0152	Heated oxygen sensor circuit high voltage (bank 2 sensor 1)	P.13B-199
P0153	Heated oxygen sensor circuit slow response (bank 2 sensor 1)	P.13B-202
P0154*	Heated oxygen sensor circuit no activity detected (bank 2 sensor 1)	P.13B-205
P0155	Heated oxygen sensor heater circuit (bank 2 sensor 1)	P.13B-211
P0156	Heated oxygen sensor circuit (bank 2 sensor 2)	P.13B-218
P0157	Heated oxygen sensor circuit low voltage (bank 2 sensor 2)	P.13B-228
P0158	Heated oxygen sensor circuit high voltage (bank 2 sensor 2)	P.13B-233
P0159	Heated oxygen sensor circuit slow response (bank 2 sensor 2)	P.13B-236
P0161	Heated oxygen sensor heater circuit (bank 2 sensor 2)	P.13B-239
P0171	System too lean (bank 1)	P.13B-245
P0172	System too rich (bank 1)	P.13B-252
P0174	System too lean (bank 2)	P.13B-256
P0175	System too rich (bank 2)	P.13B-262
P0181	Fuel temperature sensor circuit range/performance	P.13B-266
P0182	Fuel temperature sensor circuit low input	P.13B-273
P0183	Fuel temperature sensor circuit high input	P.13B-277
P0201	Injector circuit-cylinder 1	P.13B-283
P0202	Injector circuit-cylinder 2	P.13B-292
P0203	Injector circuit-cylinder 3	P.13B-283
P0204	Injector circuit-cylinder 4	P.13B-292
P0205	Injector circuit-cylinder 5	P.13B-283
P0206	Injector circuit-cylinder 6	P.13B-292
P0300	Random/multiple cylinder misfire detected	P.13B-298
P0301	Cylinder 1 misfire detected	P.13B-304
P0302	Cylinder 2 misfire detected	P.13B-304
P0303	Cylinder 3 misfire detected	P.13B-304
P0304	Cylinder 4 misfire detected	P.13B-304
P0305	Cylinder 5 misfire detected	P.13B-304
P0306	Cylinder 6 misfire detected	P.13B-304
P0325	Knock sensor circuit	P.13B-309

DTC CODE	DIAGNOSTIC ITEMS		REFERENCE PAGE
P0335	Crankshaft position sensor circuit		P.13B-315
P0340	Camshaft position sensor circuit		P.13B-327
P0401	Exhaust gas recirculation flow insufficient detected		P.13B-336
P0403	Exhaust gas recirculation control circuit		P.13B-338
P0421	Warm up catalyst efficiency below threshold (bank 1)		P.13B-346
P0431	Warm up catalyst efficiency below threshold (bank 2)		P.13B-348
P0441	Evaporative emission control system incorrect purge flow		P.13B-351
P0442	Evaporative emission control system leak detected (Small leak)		P.13B-353
P0443	Evaporative emission control system purge control valve circuit		P.13B-367
P0446	Evaporative emission control system vent control circuit		P.13B-375
P0451	Evaporative emission control system pressure sensor range/performance		P.13B-383
P0452	Evaporative emission control system pressure sensor low input		P.13B-400
P0453	Evaporative emission control system pressure sensor high input		P.13B-416
P0455	Evaporative emission control system leak detected (Gross leak)		P.13B-432
P0456	Evaporative emission control system leak detected (Very small leak)		P.13B-451
P0461	Fuel level sensor circuit range/performance		P.13B-465
P0500	Vehicle speed signal malfunction <M/T>		P.13B-469
P0506	Idle control system RPM lower than expected		P.13B-478
P0507	Idle control system RPM higher than expected		P.13B-487
P0513	Immobilizer malfunction		P.13B-495
P0551	Power steering pressure sensor circuit range/performance		P.13B-496
P0622	Generator FR terminal circuit malfunction		P.13B-504
P0660	Variable induction control circuit malfunction		P.13B-510
P0705	Transmission range sensor circuit malfunction (PRNDL input)	• A/T DTC No. 27 (Park/Neutral position switch system: Open circuit) • A/T DTC No. 28 (Park/Neutral position switch system: Short circuit)	P.23A-40
P0712	Transmission fluid temperature sensor circuit low input	• A/T DTC No. 16 (Oil temperature sensor system: Short circuit)	P.23A-40
P0713	Transmission fluid temperature sensor circuit high input	• A/T DTC No.15 (Oil temperature sensor system: Open circuit)	P.23A-40
P0715	Input/turbine speed sensor circuit	• A/T DTC No. 22 (Input shaft speed sensor system: Short circuit/Open circuit)	P.23A-40
P0720	Output speed sensor circuit	• A/T DTC No. 23 (Output shaft speed sensor system: Short circuit/Open circuit)	P.23A-40
P0731	Gear 1 incorrect ratio	• A/T DTC No. 41 (1st gear incorrect ratio)	P.23A-40
P0732	Gear 2 incorrect ratio	• A/T DTC No. 42 (2nd gear incorrect ratio)	P.23A-40

DTC CODE	DIAGNOSTIC ITEMS		REFERENCE PAGE
P0733	Gear 3 incorrect ratio	• A/T DTC No. 43 (3rd gear incorrect ratio)	P.23A-40
P0734	Gear 4 incorrect ratio	• A/T DTC No. 44 (4th gear incorrect ratio)	P.23A-40
P0736	Gear R incorrect ratio	• A/T DTC No. 46 (Reverse gear incorrect ratio)	P.23A-40
P0741	Torque converter clutch circuit performance or stuck off	• A/T DTC No. 52 (Torque converter clutch solenoid system: Defective system)	P.23A-40
P0742	Torque converter clutch circuit stuck on	• A/T DTC No. 53 (Torque converter clutch solenoid system: Lock-up stuck on)	P.23A-40
P0743	Torque converter clutch circuit electrical	• A/T DTC No. 36 (Torque converter clutch solenoid system: Short circuit/Open circuit)	P.23A-40
P0753	Shift solenoid "A" electrical	• A/T DTC No. 31 (Low and reverse solenoid valve system: Short circuit/Open circuit)	P.23A-40
P0758	Shift solenoid "B" electrical	• A/T DTC No. 32 (Underdrive solenoid valve system: Short circuit/Open circuit)	P.23A-40
P0763	Shift solenoid "C" electrical	• A/T DTC No. 33 (Second solenoid valve system: Short circuit/Open circuit)	P.23A-40
P0768	Shift solenoid "D" electrical	• A/T DTC No. 34 (Overdrive solenoid valve system: Short circuit/Open circuit)	P.23A-40
P1400	Manifold differential pressure sensor circuit malfunction		P.13B-518
P1603*	Battery backup circuit malfunction		P.13B-525
P1751	A/T control relay malfunction	• A/T DTC No. 54 (A/T control relay system: Short circuit to ground /open circuit)	P.23A-40

NOTE: Do not replace the engine control module (ECM) <M/T> or powertrain control module (PCM) <A/T> until a through terminal check reveals there are no short/open circuits.

NOTE: Check that the ECM <M/T> or PCM <A/T> ground circuit is normal before checking for the cause of the problem.

NOTE: After the ECM <M/T> or PCM <A/T> detects a malfunction, a diagnostic trouble code is recorded the next time the engine is started and the same malfunction is re-detected. However, for items marked with a "", the diagnostic trouble code is recorded on the first detection of the malfunction.*

NOTE: Sensor 1 indicates the sensor mounted at a position closest to the engine, and sensor 2 indicates the sensor mounted at the position second closest to the engine.

NOTE: Bank 1 indicates the right bank side cylinder, and Bank 2 indicates the left bank side cylinder.

SYMPTOM CHART

M1131151500157

NOTE: Check that the engine control module (ECM) <M/T> or powertrain control module (PCM) <A/T> ground circuit is normal before checking for the cause of the problem.

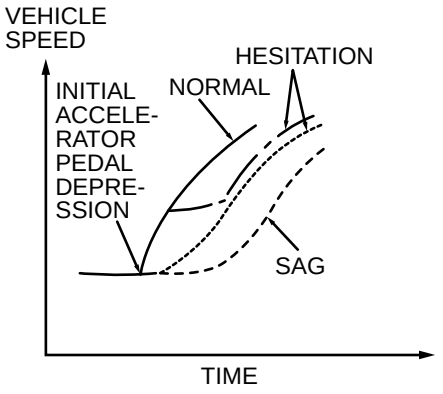
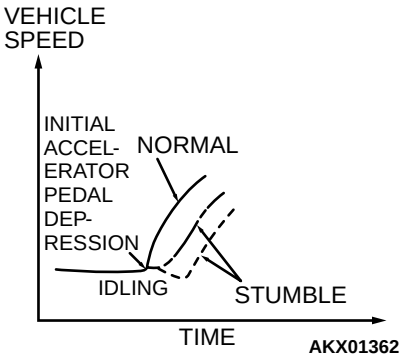
SYMPTOMS		INSPECTION PROCEDURE	REFERENCE PAGE
Communication with scan tool is impossible	Communication with all systems is not possible	1	P.13B-530
	Communication with ECM <M/T> or PCM <A/T> only is not possible	2	P.13B-532
Service engine soon/ malfunction indicator lamp and related parts	The service engine soon/malfunction indicator lamp does not illuminate right after the ignition switch is turned to the "ON" position	3	P.13B-535
	The service engine soon/malfunction indicator lamp remains illuminated and never goes out	4	P.13B-540
Starting	Cranks, won't start	5	P.13B-542
	Starts up and dies	6	P.13B-548
	Hard starting	7	P.13B-554
Idling stability (improper idling)	Unstable idle (rough idle, hunting)	8	P.13B-560
	Idle speed is high (improper idle speed)	9	P.13B-565
	Idle speed is low (improper idle speed)	10	P.13B-566
Idling stability (engine stalls)	When the engine is cold, it stalls at idle (die out)	11	P.13B-568
	When the engine is hot, it stalls at idle (die out)	12	P.13B-570
	The engine stalls when accelerating (pass out)	13	P.13B-575
	The engine stalls when decelerating	14	P.13B-576
Driving	Hesitation, sag or stumble	15	P.13B-577
	Acceleration shock	16	P.13B-580
	Deceleration shock	17	P.13B-581
	Poor acceleration	18	P.13B-582
	Surge	19	P.13B-585
	Knocking	20	P.13B-588
Dieseling (Run-on)		21	P.13B-589
Too high CO and HC concentration when idling		22	P.13B-590
IM240 test failure	Transient, mass emission tailpipe test failure	23	P.13B-592
	Purge flow test of the evaporative emission canister failure	24	P.13B-597
	Pressure test of the evaporative system failure	25	P.13B-598
Generator output voltage is low (approximately 12.3 volts)		26	P.13B-599
Improper idle speed when the A/C is on (A/C switch 2 signal)		27	P.13B-602
Fans (radiator fan, A/C condenser fan) are inoperative		28	P.13B-604
Power supply system and ignition switch-IG system		29	P.13B-607

TSB Revision

SYMPTOMS	INSPECTION PROCEDURE	REFERENCE PAGE
Fuel pump system	30	P.13B-614
Ignition switch – ST system <M/T>	31	P.13B-624
Ignition switch-ST system and park/neutral position switch system <A/T>	32	P.13B-629
Ignition circuit system	33	P.13B-633
A/C system	34	P.13B-638

PROBLEM SYMPTOMS TABLE (FOR YOUR INFORMATION)

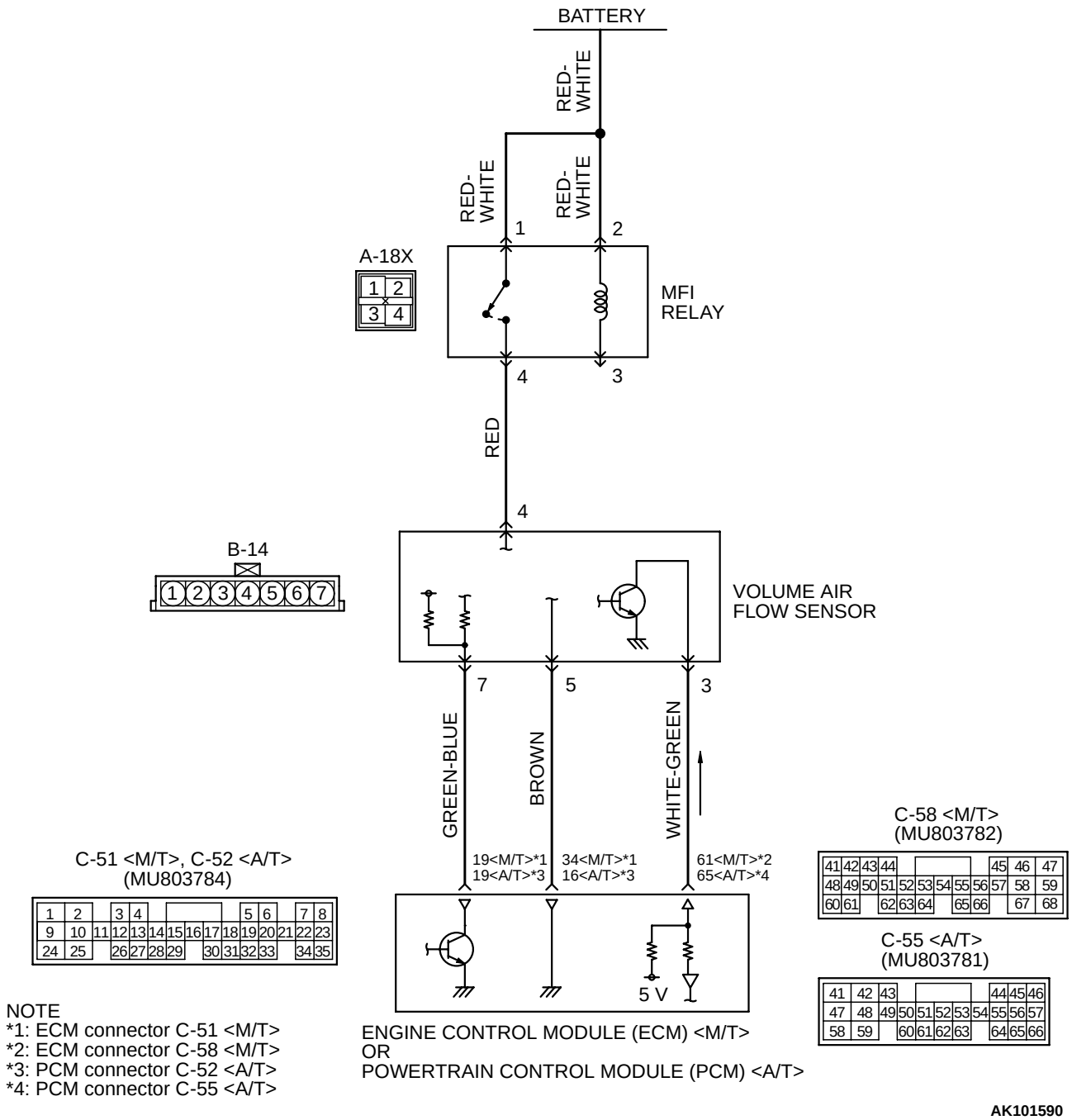
ITEMS		SYMPTOM
Starting	Won't start	The starter is used to crank the engine, but there is no combustion within the cylinders, and the engine won't start.
	Starts up and dies	The engine starts, but then the engine soon stalls.
	Hard starting	Engine starts after cranking a while.
Idling stability	Hunting	Engine speed doesn't remain constant; changes at idle.
	Rough idle	Usually, a judgement can be based upon the movement of the tachometer pointer, and the vibration transmitted to the steering wheel, shift lever, body, etc.
	Incorrect idle speed	The engine doesn't idle at the usual correct speed.
	Engine stall (die out)	The engine stalls when the foot is taken from the accelerator pedal, regardless of whether the vehicle is moving or not.
	Engine stall (pass out)	The engine stalls when the accelerator pedal is depressed or while it is being used.

ITEMS		SYMPTOM
Driving	Hesitation Sag	" Hesitation " is the delay in response of the vehicle speed (engine speed). This occurs when the accelerator is depressed in order to accelerate from the speed at which the vehicle is now traveling, or a temporary drop in vehicle speed (engine speed) during such acceleration. Serious hesitation is called "sag". 
	Poor acceleration	Poor acceleration is inability to obtain an acceleration corresponding to the degree of throttle opening, even though acceleration is smooth or the inability to reach maximum speed.
	Stumble	Engine speed increase is delayed when the accelerator pedal is initially depressed for acceleration. 
	Shock	The feeling of a comparatively large impact or vibration when the engine is accelerated or decelerated.
	Surge	This is slight acceleration and deceleration feel usually felt during steady, light throttle cruise. Most notable under light loads.
	Knocking	A sharp sound during driving like a hammer striking the cylinder walls.
Stopping	Dieseling (run on)	The condition in which the engine continues to run after the ignition switch is turned to the "LOCK" (OFF) position. Also called " dieseling".

DIAGNOSTIC TROUBLE CODE PROCEDURES

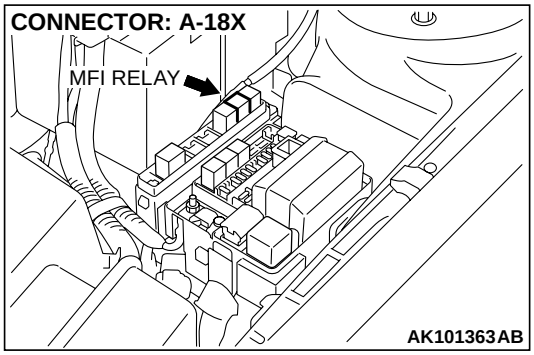
DTC P0101: Volume Air Flow Circuit Range/Performance Ploblem

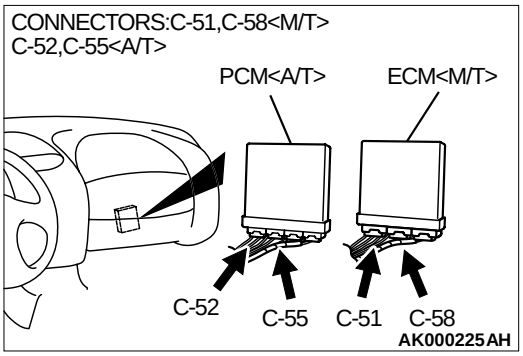
Volume Air Flow Sensor Circuit

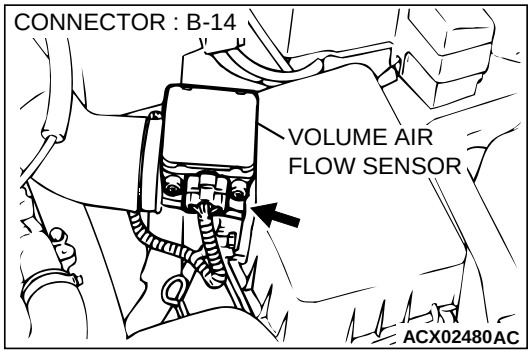


NOTE
*1: ECM connector C-51 <M/T>
*2: ECM connector C-58 <M/T>
*3: PCM connector C-52 <A/T>
*4: PCM connector C-55 <A/T>

TSB Revision







CIRCUIT OPERATION

- The volume air flow sensor power is supplied from the MFI relay (terminal 4), and the ground is provided on the ECM (terminal 34) <M/T> or PCM (terminal 16) <A/T>.
- 5-volt power is applied to the volume air flow sensor output terminal (terminal 3) from the ECM (terminal 61) <M/T> or PCM (terminal 65) <A/T>. The volume air flow sensor generates a pulse signal when the output terminal and ground are opened/closed (opened/short).

TECHNICAL DESCRIPTION

- While the engine is running, the volume air flow sensor outputs a pulse signal which corresponds to the volume of air flow.
- The ECM <M/T> or PCM <A/T> checks whether the frequency of this signal output by the volume air flow sensor while the engine is running is at or above the set value.
- When the throttle position sensor output voltage is low, the ECM <M/T> or PCM <A/T> causes the power transistor to be "ON" to send an air flow sensor reset signal to the air flow sensor. In response to the reset signal, the air flow sensor resets the filter circuit and improves the ability of the air flow sensor to measure the amount of air in a small air intake region.

DTC SET CONDITIONS

Check Conditions

- Throttle position sensor output voltage is 1.5 volts or higher.
- Engine speed is higher than 2,000 r/min.

Judgement Criteria

- Volume air flow sensor output frequency has continued to be 60 Hz or lower for 2 seconds.

Check Conditions

- Throttle position sensor output voltage is 2 volts or lower.
- Engine speed is lower than 2,000 r/min.

Judgement Criteria

- Volume air flow sensor output frequency has continued to be 800 Hz or higher for 2 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

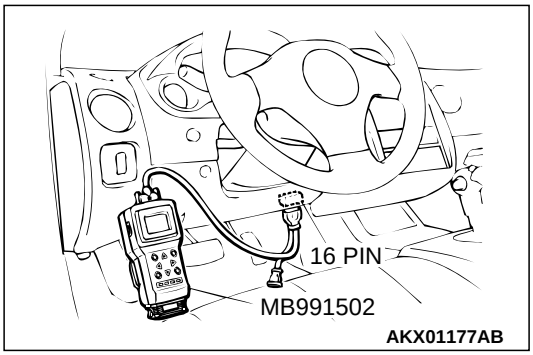
- Volume air flow sensor failed.
- Open or shorted volume air flow sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>
- Air leak between volume air flow sensor and throttle body.

DIAGNOSIS

Required Special Tools

- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check data list item 12: Volume Air Flow Sensor.



⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

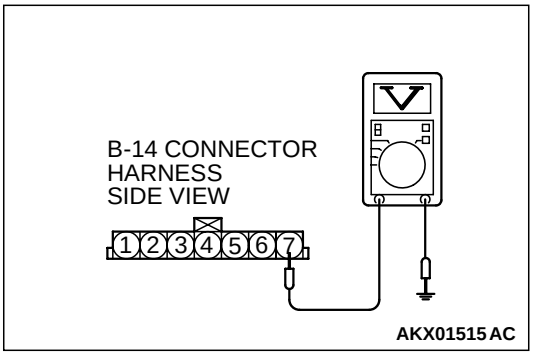
(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 12, Volume Air Flow Sensor.
(4) Warm up the engine to normal operating temperature: 80°C to 96°C (176°F to 205°F).
- The standard value during idling should be 10 Hz or more.
- When the engine is revved, the frequency should increase according to the increase in engine speed.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Go to Step 2.

STEP 2. Check the reset signal voltage at volume air flow sensor connector B-14 by backprobing.

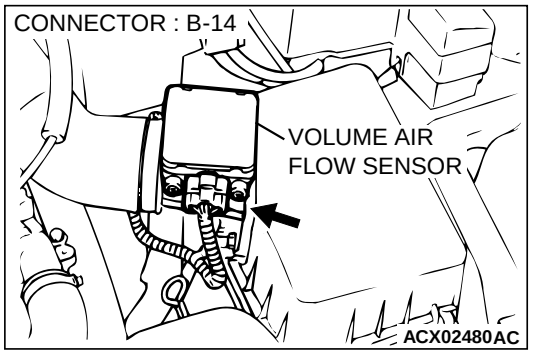


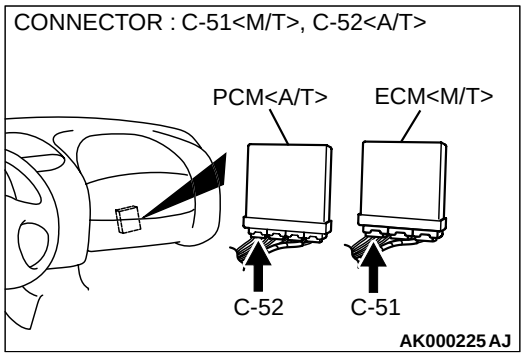
(1) Do not disconnect the connector B-14.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 7 and ground by backprobing.
- Voltage should be between 6.0 and 9.0 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 5.
NO : Go to Step 3.



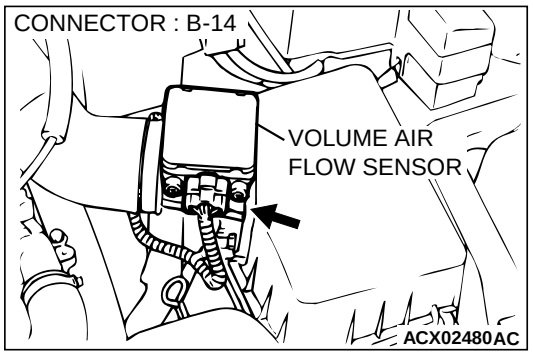


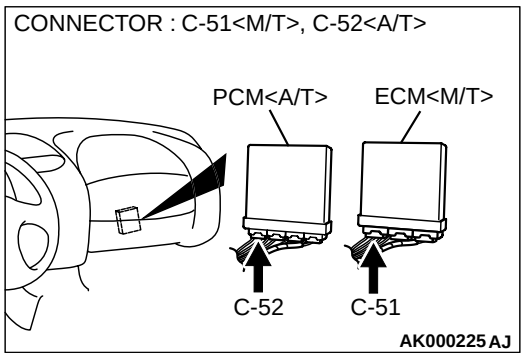
STEP 3. Check connector B-14 at volume air flow sensor and connector C-51 at ECM <M/T> or connector C-52 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.



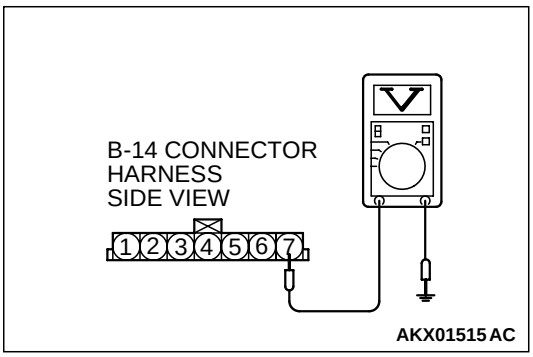


STEP 4. Check for short circuit to ground between volume air flow sensor connector B-14 terminal 7 and ECM connector C-51 terminal 19 <M/T> or PCM connector C-52 terminal 19 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the volume air flow sensor. Then go to Step 9.

NO : Repair it. Then go to Step 9.



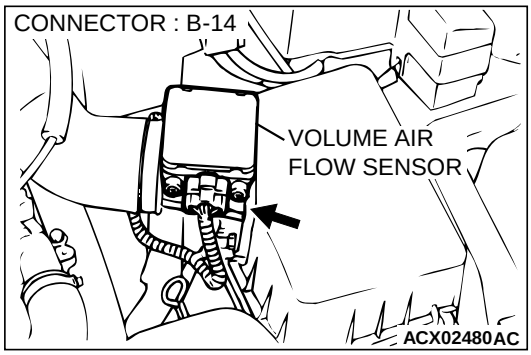
STEP 5. Check the reset signal voltage at volume air flow sensor connector B-14 by backprobing.

(1) Do not disconnect the connector B-14.
(2) Start the engine and run at idle.
(3) Measure the voltage between terminal 7 and ground by backprobing.
- When the engine idling, voltage should be 1.0 volt or less.
- When the engine speed is 3,000 r/min, voltage should be between 6.0 and 9.0 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

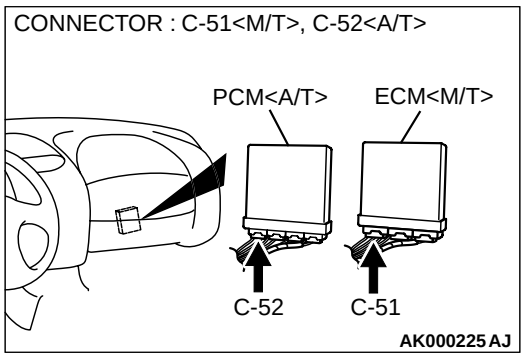
YES : Go to Step 8.
NO : Go to Step 6.



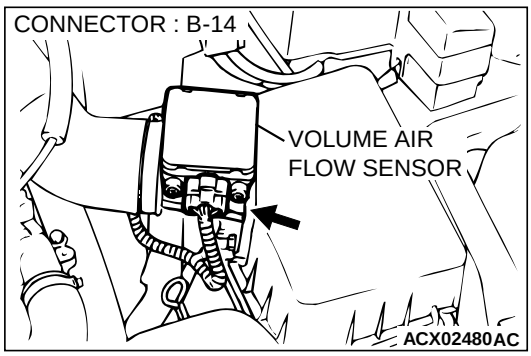
STEP 6. Check connector B-14 at volume air flow sensor and connector C-51 at ECM <M/T> or connector C-52 at PCM <A/T> for damage.

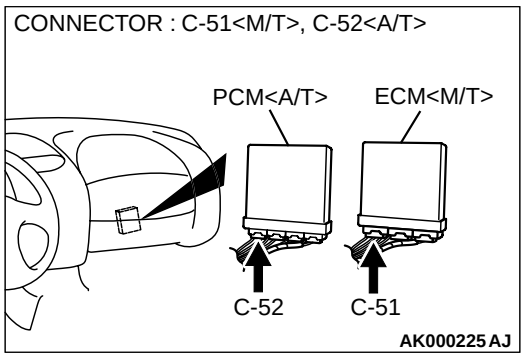
Q: Is the connector in good condition?

YES : Go to Step 7.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.



STEP 7. Check for open circuit and harness damage between volume air flow sensor connector B-14 terminal 7 and ECM connector C-51 terminal 19 <M/T> or PCM connector C-52 terminal 19 <A/T>.

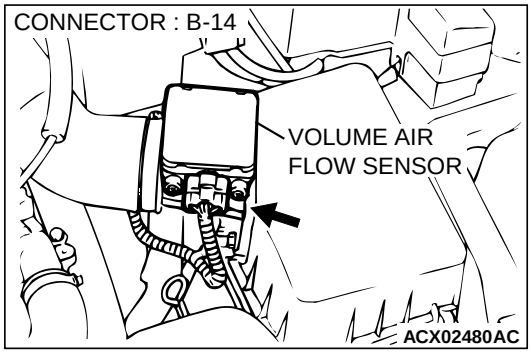




Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 9.
NO : Repair it. Then go to Step 9.

STEP 8. Replace the volume air flow sensor.



(1) Replace the volume air flow sensor.
(2) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13B-6.
(3) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0101 is output?

YES : Replace the ECM or PCM. Then go to Step 9.
NO : The inspection is complete.

STEP 9. Test the OBD-II drive cycle.

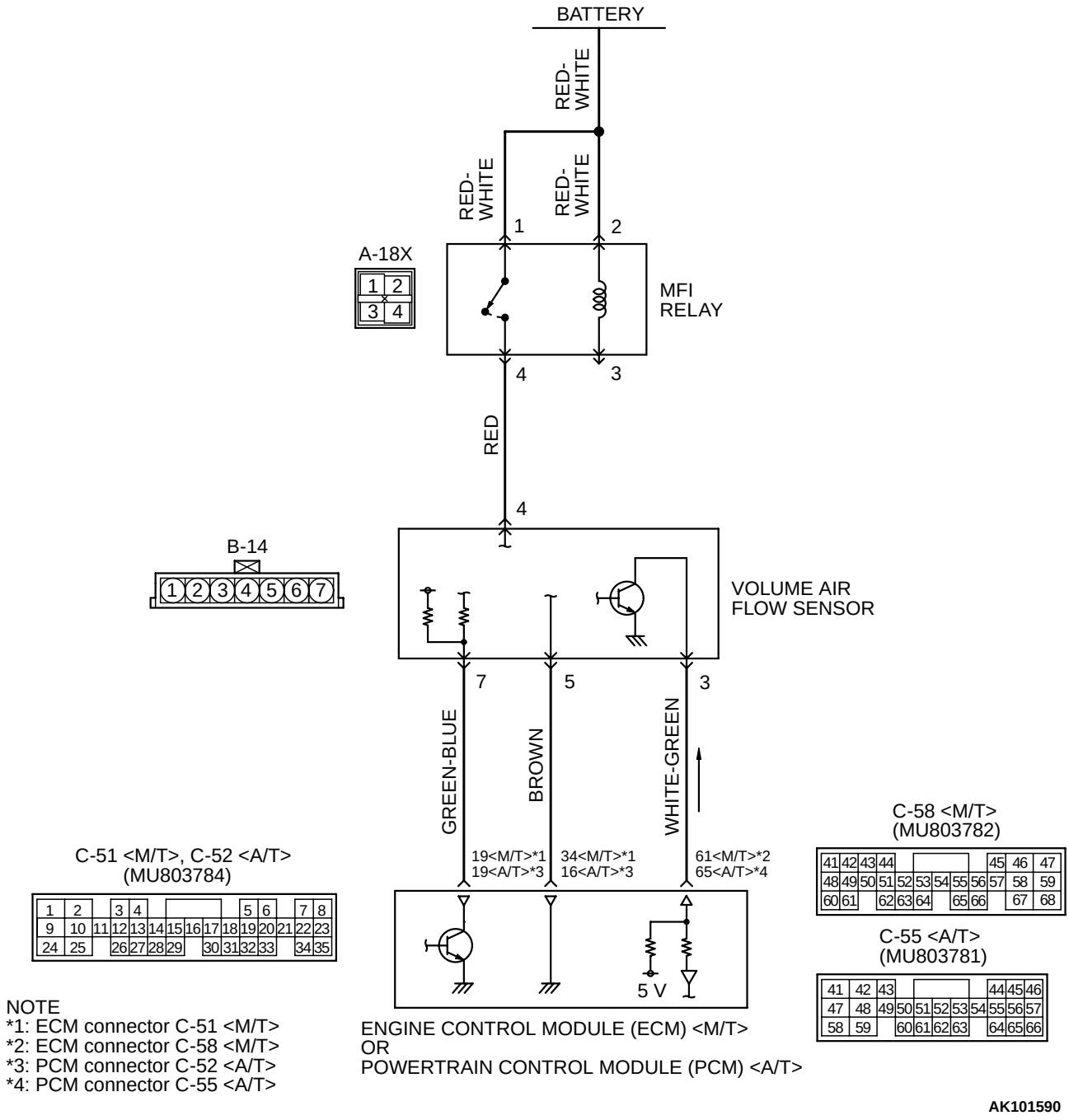
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0101 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0102: Volume Air Flow Circuit Low Input

Volume Air Flow Sensor Circuit



NOTE
*1: ECM connector C-51 <M/T>
*2: ECM connector C-58 <M/T>
*3: PCM connector C-52 <A/T>
*4: PCM connector C-55 <A/T>

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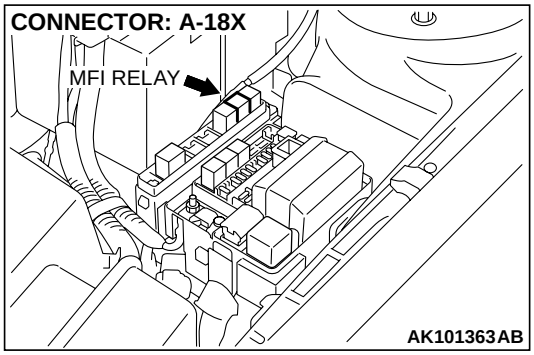
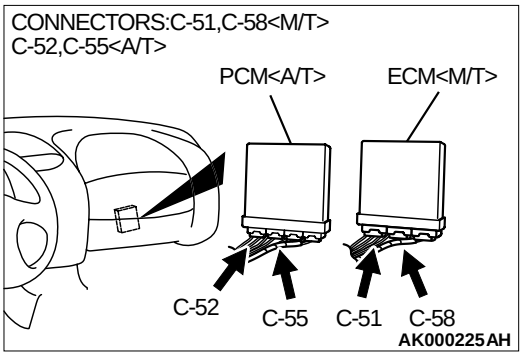
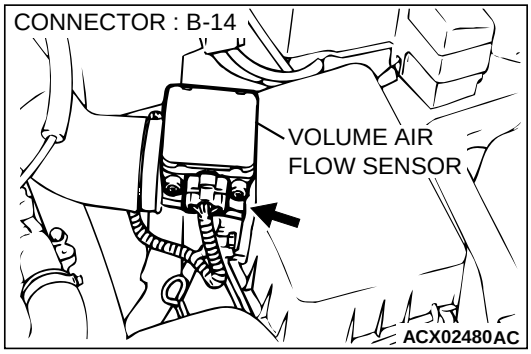






CIRCUIT OPERATION

- The volume air flow sensor power is supplied from the MFI relay (terminal 4), and the ground is provided on the ECM (terminal 34) <M/T> or PCM (terminal 16) <A/T>.
- 5-volt power is applied to the volume air flow sensor output terminal (terminal 3) from the ECM (terminal 61) <M/T> or PCM (terminal 65) <A/T>. The volume air flow sensor generates a pulse signal when the output terminal and ground are opened/closed (opened/short).

TECHNICAL DESCRIPTION

- While the engine is running, the volume air flow sensor outputs a pulse signal which corresponds to the volume of air flow.
- The ECM <M/T> or PCM <A/T> checks whether the frequency of this signal output by the volume air flow sensor while the engine is running is at or above the set value.

DTC SET CONDITIONS

Check Conditions

- Engine speed is higher than 500 r/min.

Judgement Criteria

- Volume air flow sensor output frequency has continued to be 3.3 Hz or lower for 2 seconds.

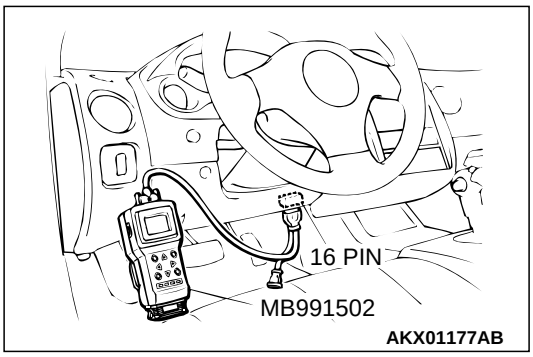
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Volume air flow sensor failed.
- Open or shorted volume air flow sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>
- Air leak between volume air flow sensor and throttle body.

DIAGNOSIS

Required Special Tools

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 12: Volume Air Flow Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

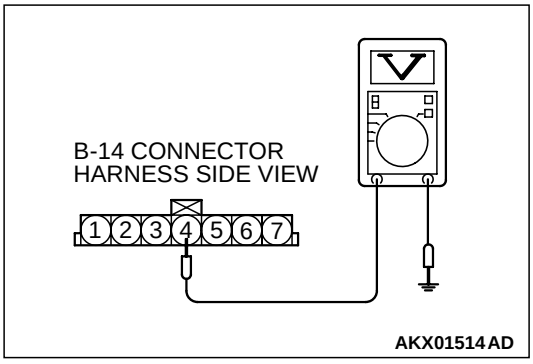
(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 12, Volume Air Flow Sensor.
(4) Warm up the engine to normal operating temperature: 80°C to 96°C (176°F to 205°F).
- The standard value during idling should be 10 Hz or more.
- When the engine is revved, the frequency should increase according to the increase in engine speed.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

NO : Go to Step 2.



STEP 2. Check the power supply voltage at volume air flow sensor connector B-14 by backprobing.

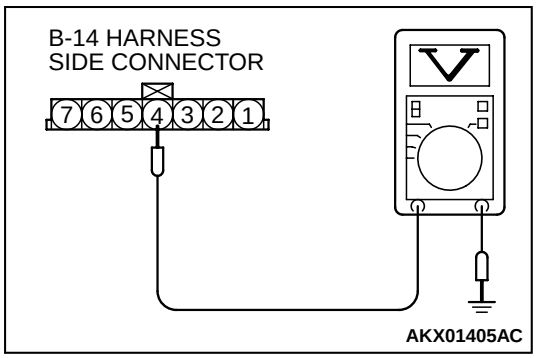
(1) Do not disconnect the connector B-14.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 4 and ground by backprobing.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 5.

NO : Go to Step 3.



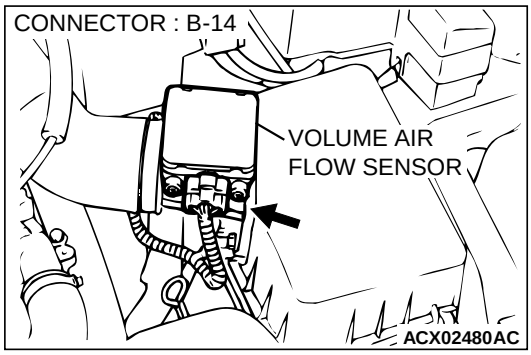
STEP 3. Check the power supply voltage at volume air flow sensor harness side connector B-14.

(1) Disconnect the connector B-14 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 4 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

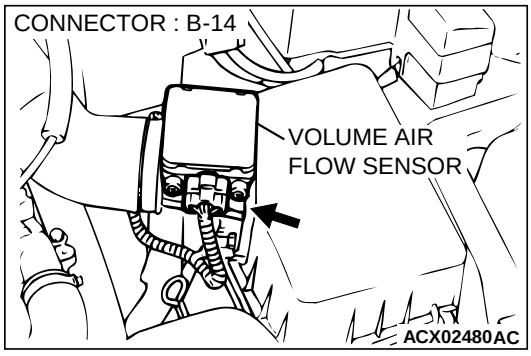
YES : Go to Step 4.
NO : Repair harness wire between MFI relay connector A-18X terminal 4 and volume air flow sensor connector B-14 terminal 4 because of open circuit or short circuit to ground. Then go to Step 13.



STEP 4. Check connector B-14 at the volume air flow sensor for damage.

Q: Is the connector in good condition?

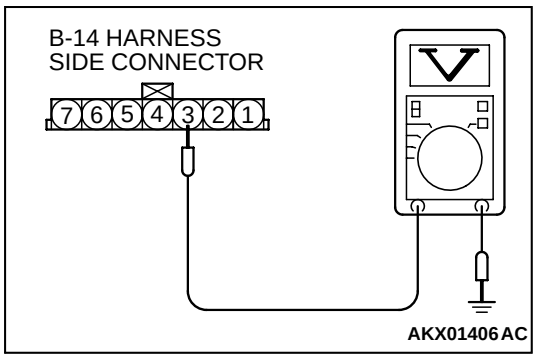
YES : Repair harness wire between MFI relay connector A-18X terminal 4 and volume air flow sensor connector B-14 terminal 4 because of harness damage. Then go to Step 13.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 13.



STEP 5. Check connector B-14 at volume air flow sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 6.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 13.



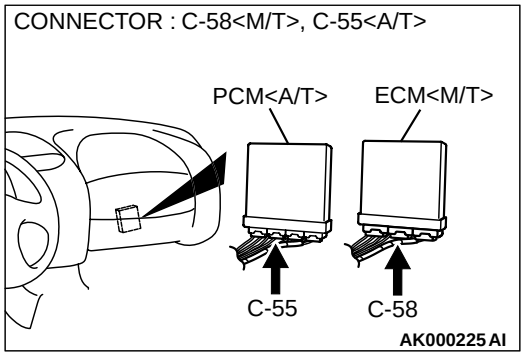
STEP 6. Check the sensor supply voltage at volume air flow sensor harness side connector B-14.

(1) Disconnect the connector B-14 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 3 and ground.
- Voltage should be between 4.8 and 5.2 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 9.
NO : Go to Step 7.

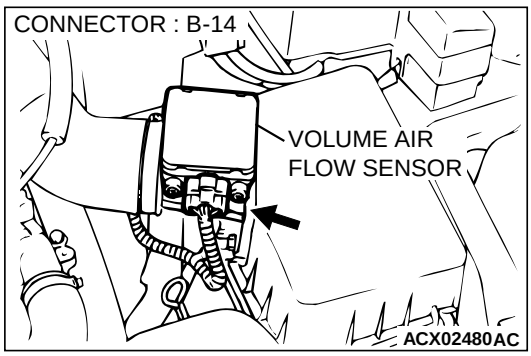


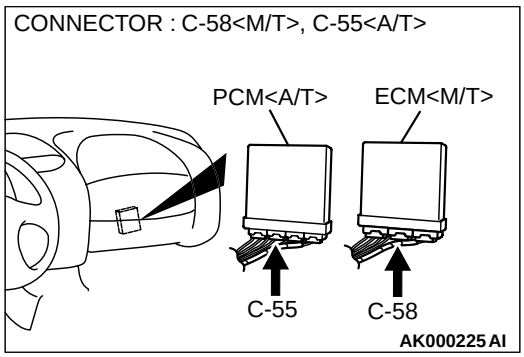
STEP 7. Check connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 8.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 13.

STEP 8. Check for short circuit to ground between volume air flow sensor connector B-14 terminal 3 and ECM connector C-58 terminal 61 <M/T> or PCM connector C-55 terminal 65 <A/T>.



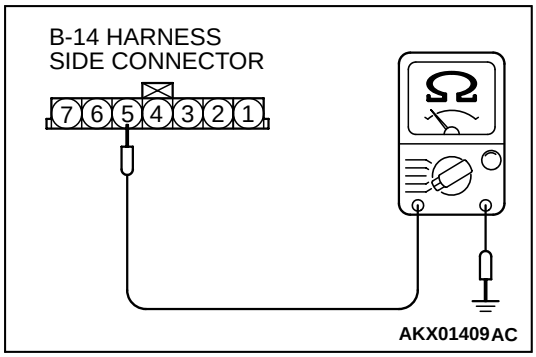


Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 13.
NO : Repair it. Then go to Step 13.

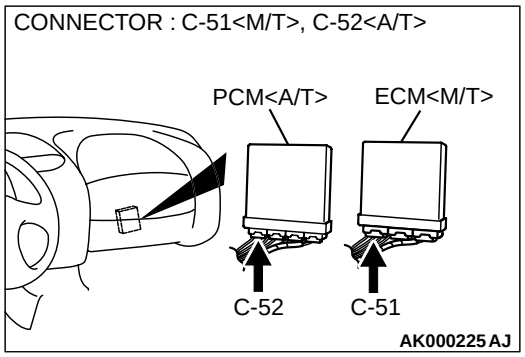
STEP 9. Check the continuity at volume air flow sensor harness side connector B-14.

(1) Disconnect the connector B-14 and measure at the harness side.
(2) Check for the continuity between terminal 5 and ground.
- Should be less than 2 ohm.



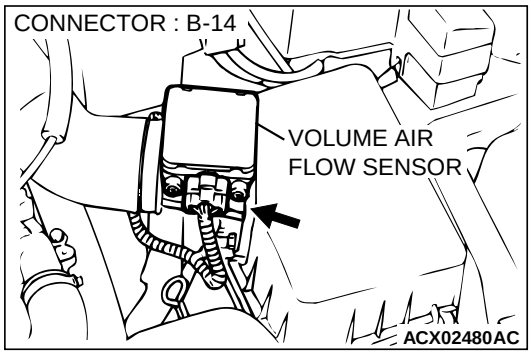
Q: Is the continuity normal?

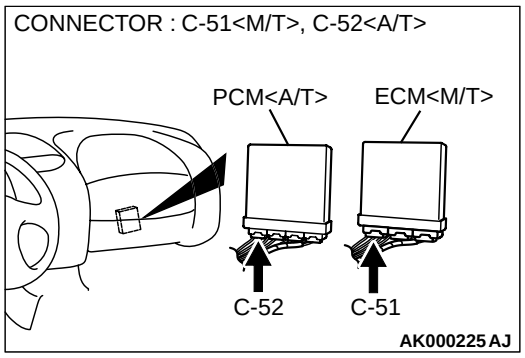
YES : Go to Step 12.
NO : Go to Step 10.



STEP 10. Check connector C-51 at ECM <M/T> or connector C-52 at PCM <A/T> for damage.
Q: Is the connector in good condition?

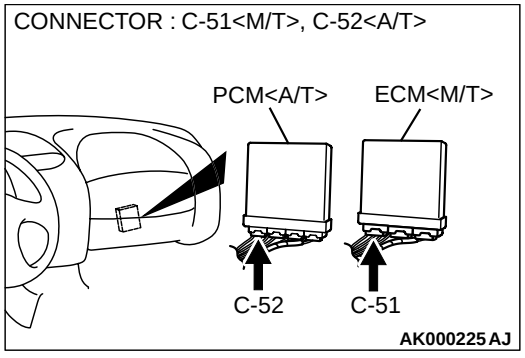
YES : Go to Step 11.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 13.





STEP 11. Check for open circuit and harness damage between volume air flow sensor connector B-14 terminal 5 and ECM connector C-51 terminal 34 <M/T> or PCM connector C-52 terminal 16 <A/T>.
Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 13.
NO : Repair it. Then go to Step 13.



STEP 12. Check connector C-51 at ECM <M/T> or connector C-52 at PCM <A/T> for damage.
Q: Is the connector in good condition?

YES : Replace the volume air flow sensor. Then go to Step 13.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 13.

TSB Revision

STEP 13. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13B-6.

(2) Check the diagnostic trouble code (DTC).

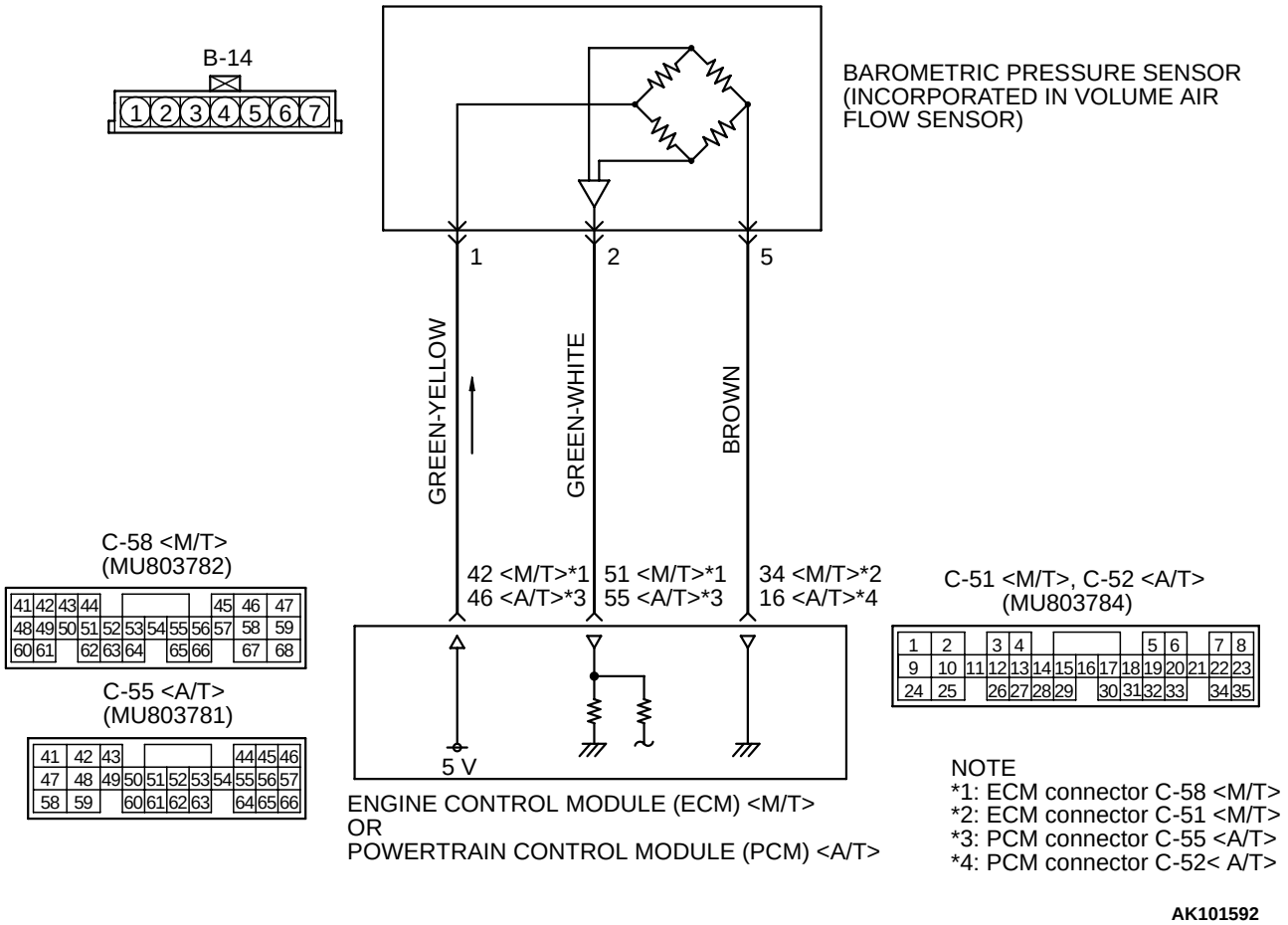
Q: Is the DTC P0102 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0106: Barometric Pressure Circuit Range/Performance Problem

Barometric Pressure Sensor Circuit



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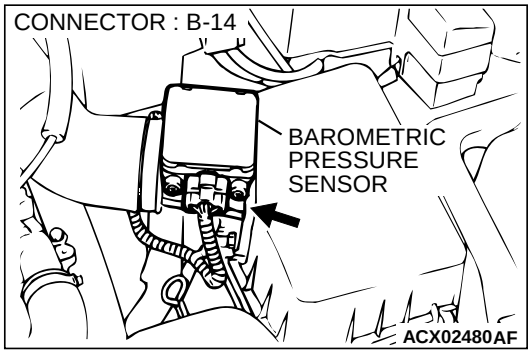
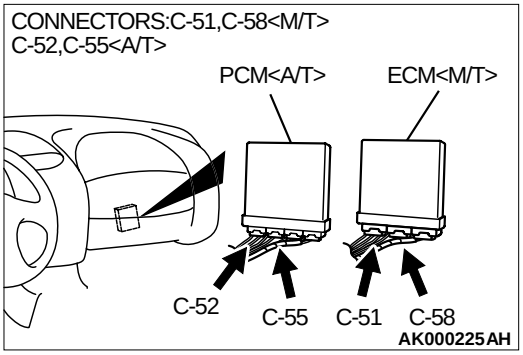




TSB Revision

CIRCUIT OPERATION

- A 5-volt voltage is supplied to the barometric pressure sensor power terminal (terminal 1) from the ECM (terminal 42) <M/T> or PCM (terminal 46) <A/T>. The ground terminal (terminal 5) is grounded with ECM (terminal 34) <M/T> or PCM (terminal 16) <A/T>.
- A voltage that is proportional to the atmospheric pressure is sent to the ECM (terminal 51) <M/T> or PCM (terminal 55) <A/T> from the barometric pressure sensor output terminal (terminal 2).

TECHNICAL DESCRIPTION

- The barometric pressure sensor outputs a voltage which corresponds to the barometric pressure.
- The ECM <M/T> or PCM <A/T> checks whether this voltage is within a specified range.

DTC SET CONDITIONS

Check Conditions

- Barometric pressure is lower than 76 kPa (11 psi).

Judgement Criteria

- During 15 times of driving, the changes in the sensor output voltage should be 0.015 volt [equivalent to 0.4 kPa (0.06 psi)] or less.
- Make sure that the engine coolant temperature is 72°C (162°F) or higher during each of the 15 times of driving. Also, during each of the 15 times of driving, make sure that after the engine has been started, the engine coolant temperature has increased for 23°C (41°F) or higher.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

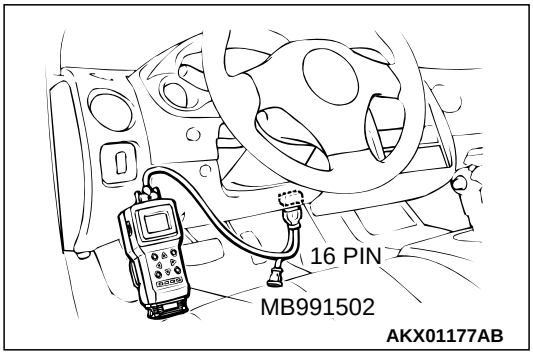
- Barometric pressure sensor failed.
- Open or shorted barometric pressure sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools

- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).



⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

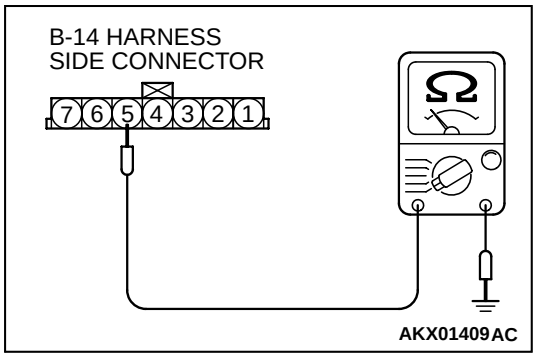
Q: Is the DTC P0107 is output?

YES : Refer to, DTC P0107 – Barometric Pressure Circuit Low Input P.13B-46.
NO : Go to Step 2.

STEP 2. Check connector B-14 at the barometric pressure sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.

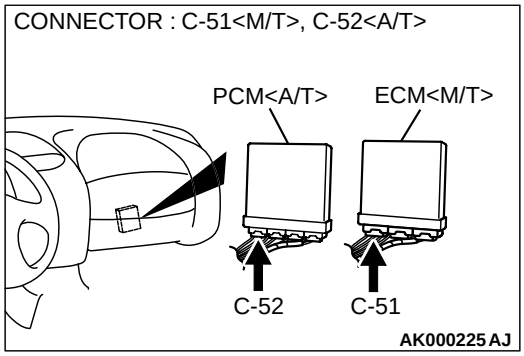


STEP 3. Check the continuity at barometric pressure sensor harness side connector B-14.

(1) Disconnect the connector B-14 and measure at the harness side.
(2) Check for the continuity between terminal 5 and ground.
- Should be less than 2 ohm.

Q: Is the continuity normal?

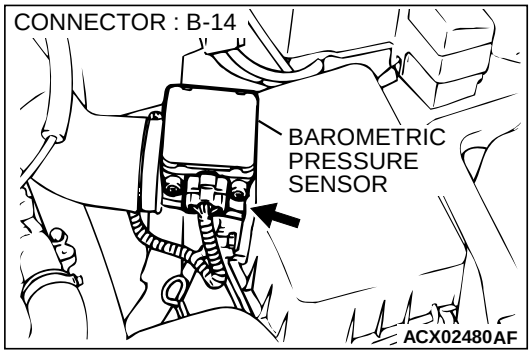
YES : Go to Step 6.
NO : Go to Step 4.

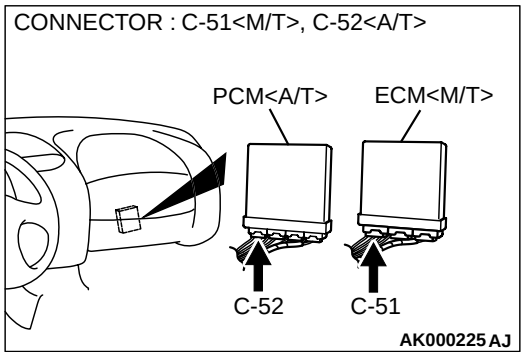


STEP 4. Check connector C-51 at ECM <M/T> or connector C-52 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.

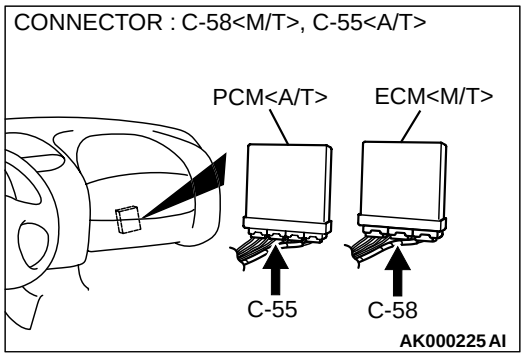




STEP 5. Check for open circuit and harness damage between barometric pressure sensor connector B-14 and ECM connector C-51 <M/T> or PCM connector C-52 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 9.
NO : Repair it. Then go to Step 9.

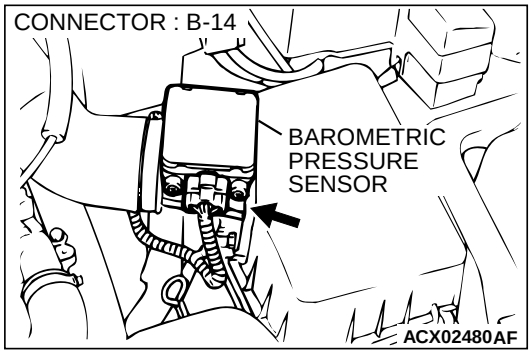


STEP 6. Check connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 7.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.

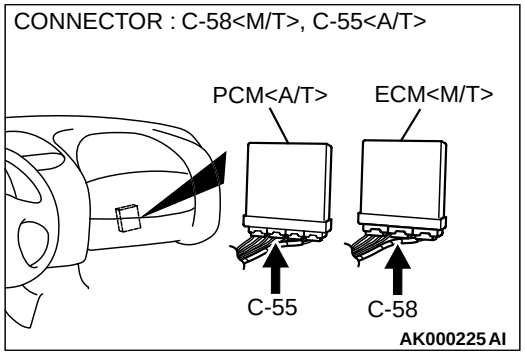


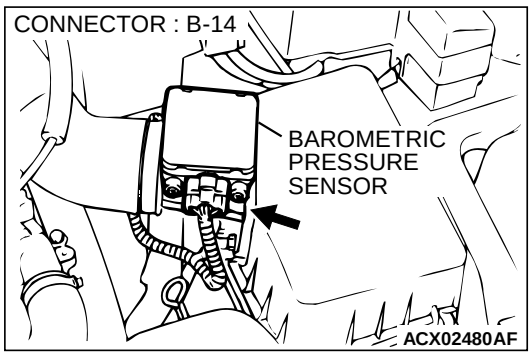
STEP 7. Check for open circuit and harness damage between barometric pressure sensor connector B-14 and ECM connector C-58 <M/T> or PCM connector C-55 <A/T>.

Q: Is the harness wire in good condition?

YES : Go to Step 8.

NO : Repair it. Then go to Step 9.





STEP 8. Replace the barometric pressure sensor.

(1) Replace the barometric pressure sensor.

(2) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13B-6.

(3) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0106 is output?

YES : Replace the ECM or PCM. Then go to Step 9.

NO : The inspection is complete.

STEP 9. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13B-6.

(2) Check the diagnostic trouble code (DTC).

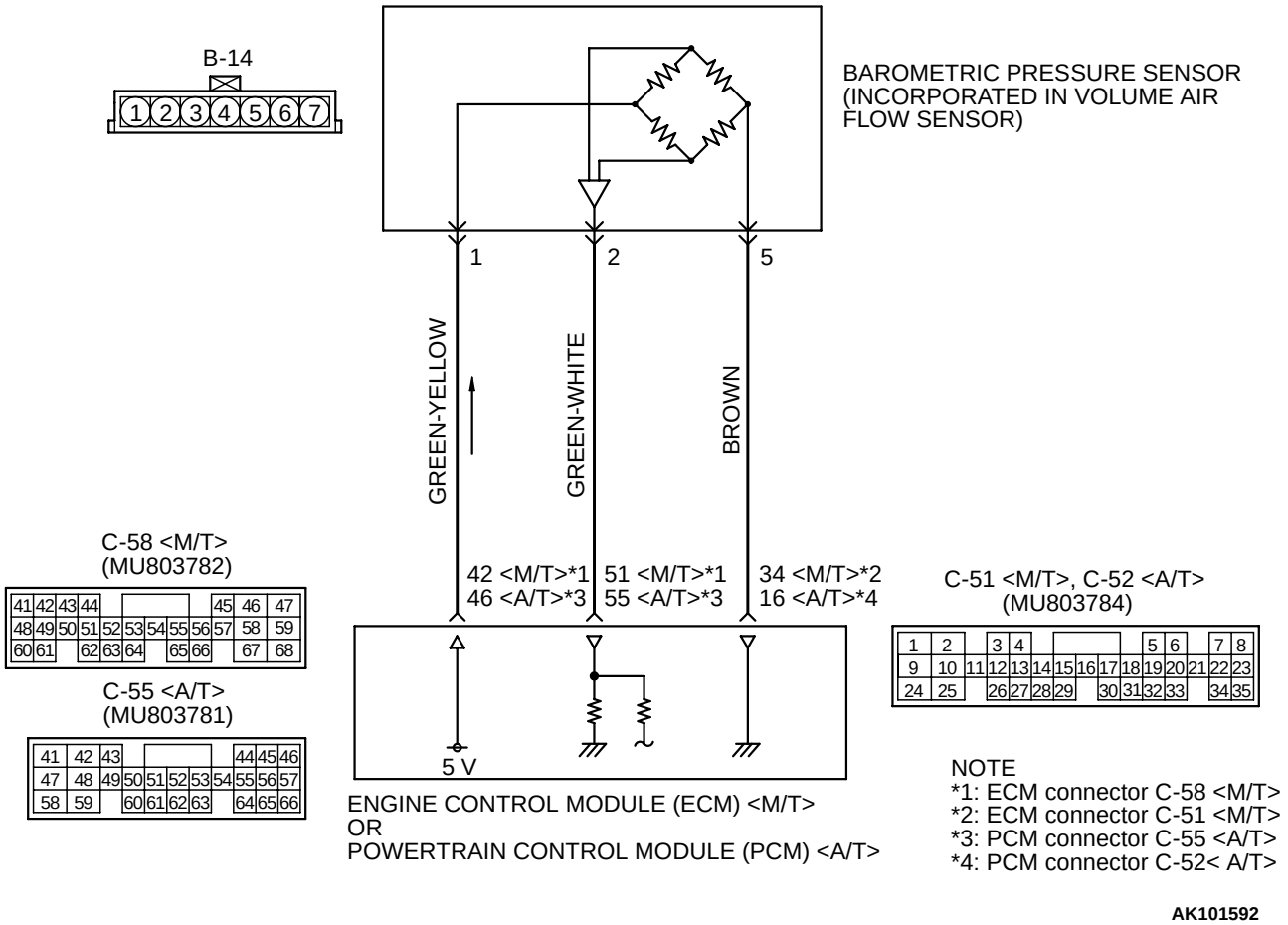
Q: Is the DTC P0106 is output?

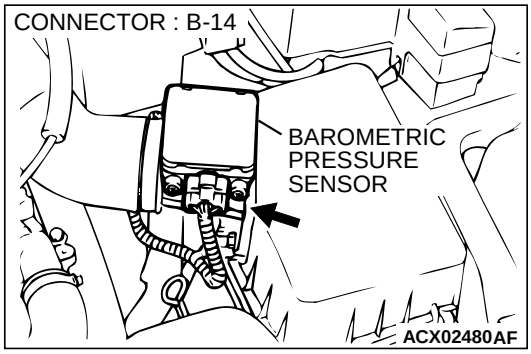
YES : Retry the troubleshooting.

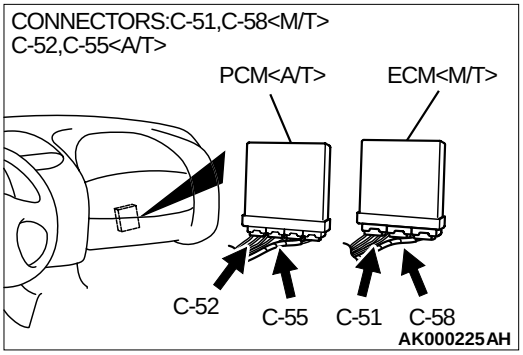
NO : The inspection is complete.

DTC P0107: Barometric Pressure Circuit Low Input

Barometric Pressure Sensor Circuit







TSB Revision

CIRCUIT OPERATION

- A 5-volt voltage is supplied to the barometric pressure sensor power terminal (terminal 1) from the ECM (terminal 42) <M/T> or PCM (terminal 46) <A/T>. The ground terminal (terminal 5) is grounded with ECM (terminal 34) <M/T> or PCM (terminal 16) <A/T>.
- A voltage that is proportional to the atmospheric pressure is sent to the ECM (terminal 51) <M/T> or PCM (terminal 55) <A/T> from the barometric pressure sensor output terminal (terminal 2).

TECHNICAL DESCRIPTION

- The barometric pressure sensor outputs a voltage which corresponds to the barometric pressure.
- The ECM <M/T> or PCM <A/T> checks whether this voltage is within a specified range.

DTC SET CONDITIONS

Check Conditions

- 2 seconds or more have passed since the starting sequence was completed.
- Battery positive voltage is higher than 8 volts.

Judgement Criteria

- Barometric pressure sensor output has continued to be 49 kPa (7.2 psi) or lower approximately 15,000 ft above sea level for 10 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Barometric pressure sensor failed.
- Open or shorted barometric pressure sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

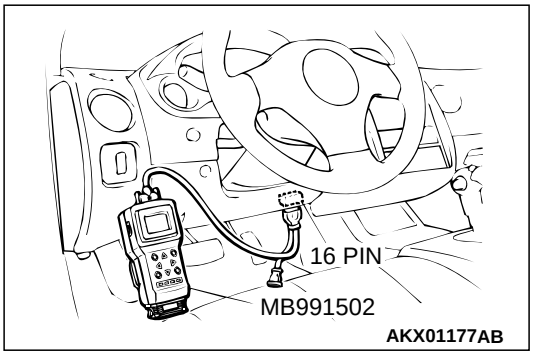
STEP 1. Using scan tool MB991502, check data list item 25: Barometric Pressure Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 25, Barometric Pressure Sensor.
  - When altitude is 0 m (0 foot), 101 kPa.
  - When altitude is 600 m (1,969 feet), 95 kPa.
  - When altitude is 1,200 m (3,937 feet), 88 kPa.
  - When altitude is 1,800 m (5,906 feet), 81 kPa.

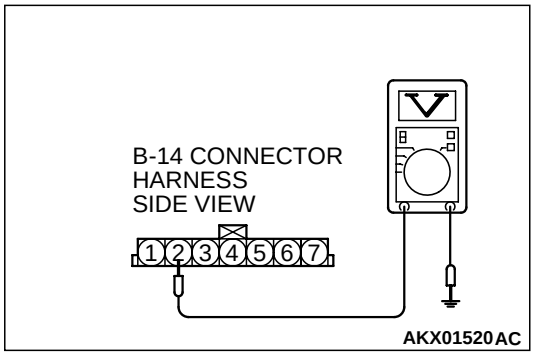
(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

NO : Go to Step 2.



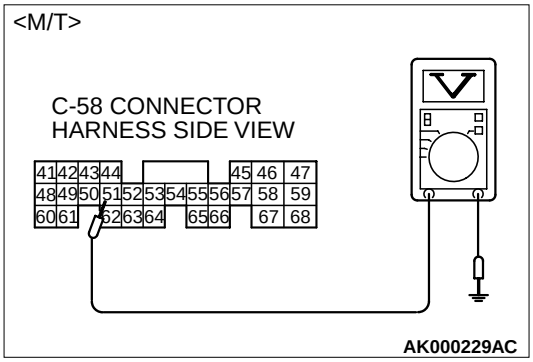
STEP 2. Check the sensor output voltage at barometric pressure sensor connector B-14 by backprobing.

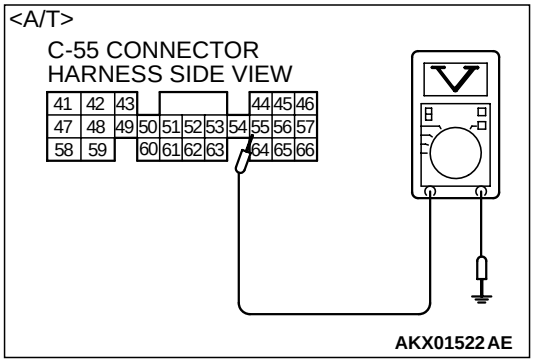
(1) Do not disconnect the connector B-14.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 2 and ground by backprobing.
- When altitude is 0 m (0 foot), voltage should be 3.7 and 4.3 volts.
- When altitude is 600 m (1,969 feet), voltage should be 3.4 and 4.0 volts.
- When altitude is 1,200 m (3,937 feet), voltage should be 3.2 and 3.8 volts.
- When altitude is 1,800 m (5,906 feet), voltage should be 2.9 and 3.5 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 3.
NO : Go to Step 7.





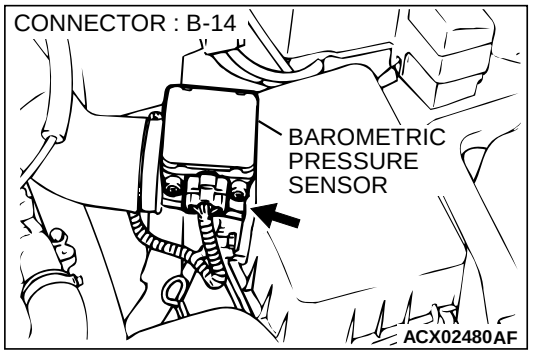
STEP 3. Check the sensor output voltage at ECM connector C-58 <M/T> or PCM connector C-55 <A/T> by backprobing.

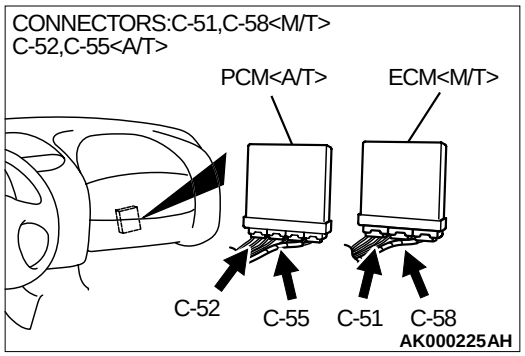
(1) Do not disconnect the connector C-58 <M/T> or C-55 <A/T>.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 51 <M/T> or terminal 55 <A/T> and ground by backprobing.
- When altitude is 0 m (0 foot), voltage should be 3.7 and 4.3 volts.
- When altitude is 600 m (1,969 feet), voltage should be 3.4 and 4.0 volts.
- When altitude is 1,200 m (3,937 feet), voltage should be 3.2 and 3.8 volts.
- When altitude is 1,800 m (5,906 feet), voltage should be 2.9 and 3.5 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 4.
NO : Go to Step 6.



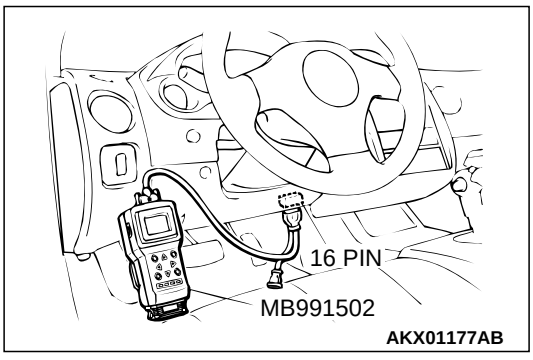


STEP 4. Check connector B-14 at the barometric pressure sensor and connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 18.



STEP 5. Using scan tool MB991502, check data list item 25: Barometric Pressure Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

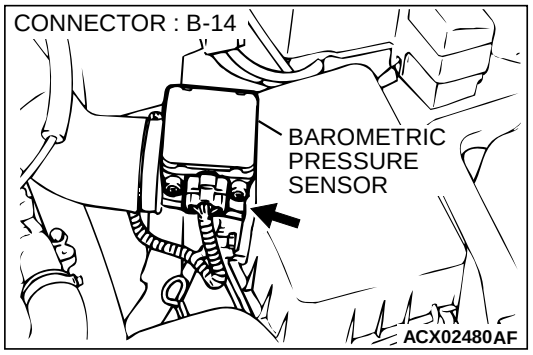
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 25, Barometric Pressure Sensor.
- When altitude is 0 m (0 foot), 101 kPa.
- When altitude is 600 m (1,969 feet), 95 kPa.
- When altitude is 1,200 m (3,937 feet), 88 kPa.
- When altitude is 1,800 m (5,906 feet), 81 kPa.

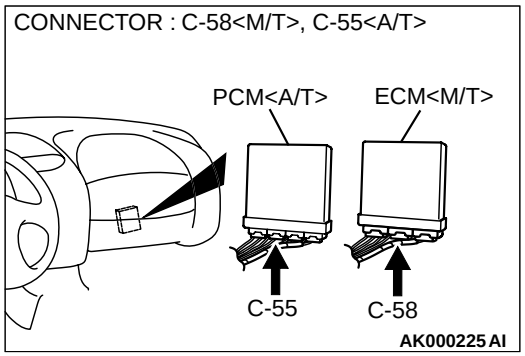
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

NO : Replace the ECM or PCM. Then go to Step 18.



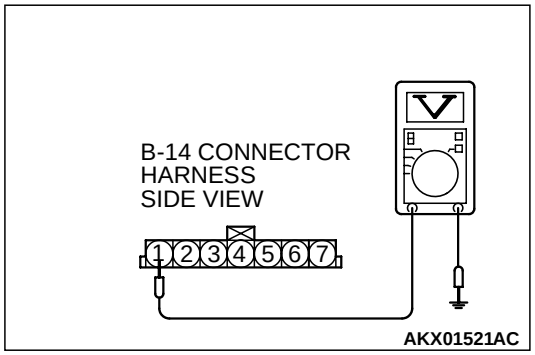


STEP 6. Check connector B-14 at the barometric pressure sensor and connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between barometric pressure sensor connector B-14 terminal 2 and ECM connector C-58 terminal 51 <M/T> or PCM connector C-55 terminal 55 <A/T> because of open circuit or harness damage. Then go to Step 18.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 18.



STEP 7. Check the sensor supply voltage at barometric pressure sensor connector B-14 by backprobing.

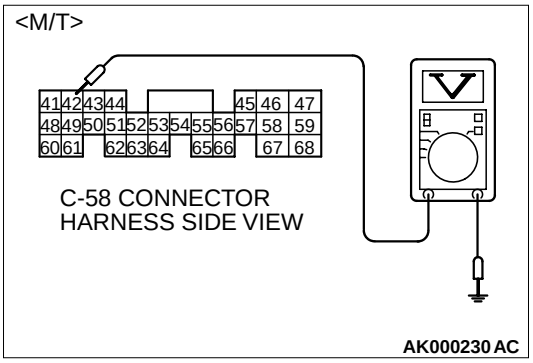
(1) Do not disconnect the connector B-14.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 1 and ground by backprobing.
- Voltage should be between 4.8 and 5.2 volts.

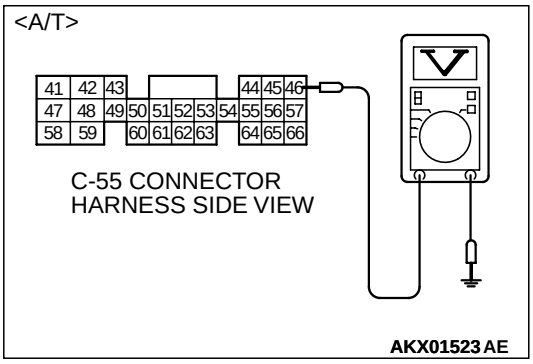
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 12.

NO : Go to Step 8.





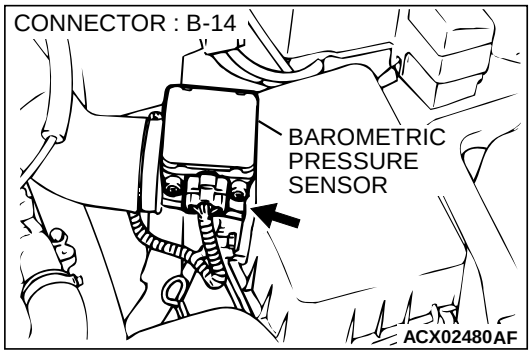
STEP 8. Check the sensor supply voltage at ECM connector C-58 <M/T> or PCM connector C-55 <A/T> by backprobing.

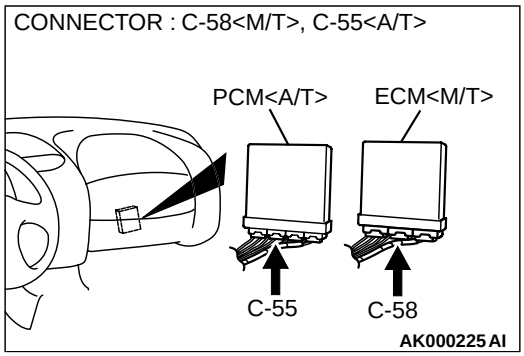
(1) Do not disconnect the connector C-58 <M/T> or C-55 <A/T>.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 42 <M/T> or 46 <A/T> and ground by backprobing.
- Voltage should be between 4.8 and 5.2 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 9.
NO : Go to Step 10.



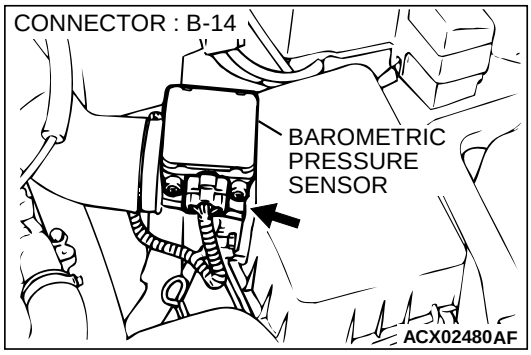


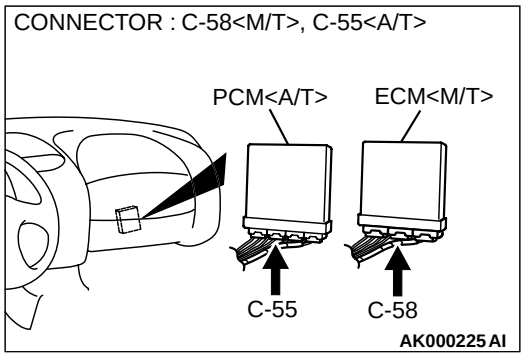
STEP 9. Check connector B-14 at the barometric pressure sensor and connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between barometric pressure sensor connector B-14 terminal 1 and ECM connector C-58 terminal 42 <M/T> or PCM connector C-55 terminal 46 <A/T> because of open circuit or harness damage. Then go to Step 18.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 18.





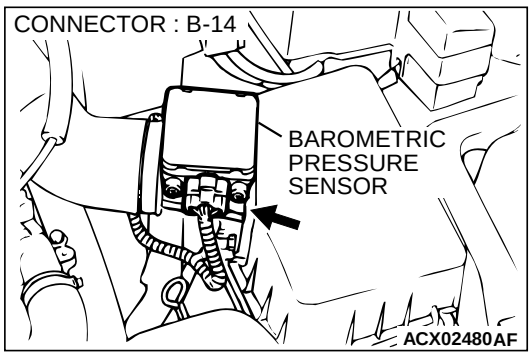
STEP 10. Check connector B-14 at the barometric pressure sensor and connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

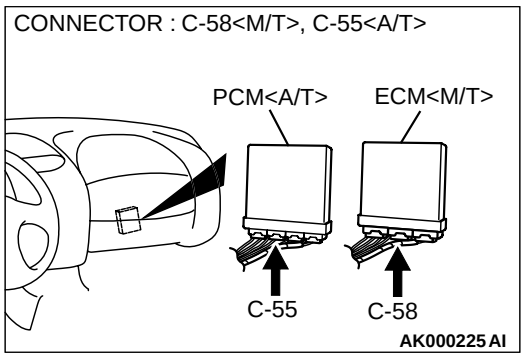
Q: Is the connector in good condition?

YES : Go to Step 11.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 18.

STEP 11. Check for short circuit to ground between barometric pressure sensor connector B-14 terminal 1 and ECM connector C-58 terminal 42 <M/T> or PCM connector C-55 terminal 46 <A/T>.





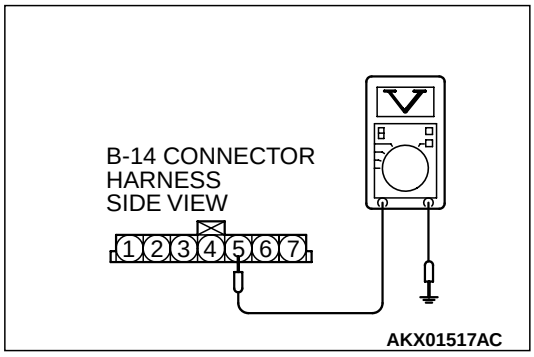
Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 18.
NO : Repair it. Then go to Step 18.

STEP 12. Check the ground voltage at barometric pressure sensor connector B-14 by backprobing.

(1) Do not disconnect the connector B-14.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 5 and ground by backprobing.
- Voltage should be 0.5 volt or less.

(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the voltage normal?

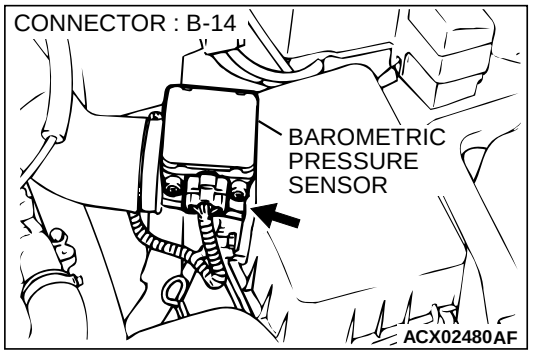
YES : Go to Step 15.
NO : Go to Step 13.

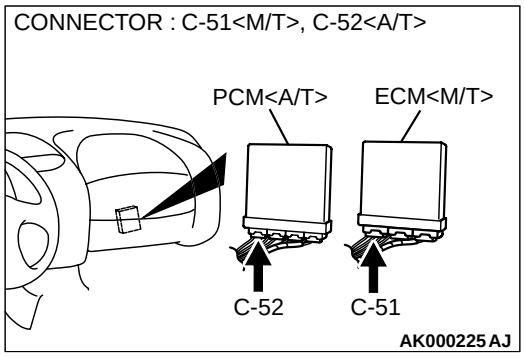
STEP 13. Check connector B-14 at the barometric pressure sensor and connector C-51 at ECM <M/T> or connector C-52 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 18.



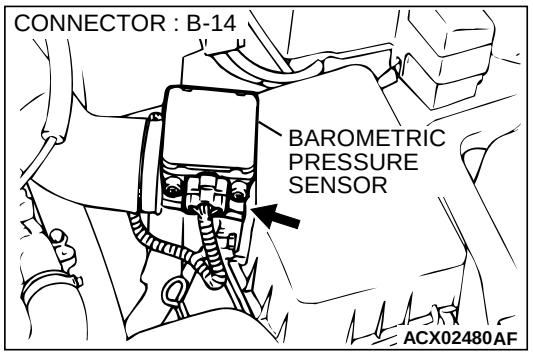


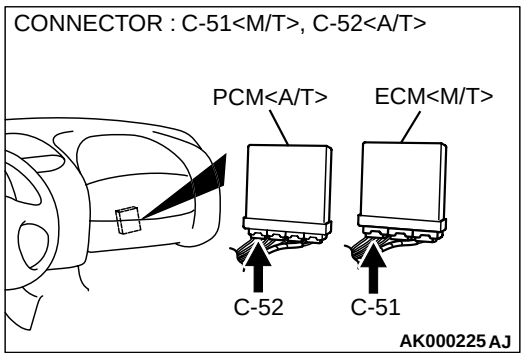
STEP 14. Check for harness damage between barometric pressure sensor connector B-14 terminal 5 and ECM connector C-51 terminal 34 <M/T> or PCM connector C-52 terminal 16 <A/T>.

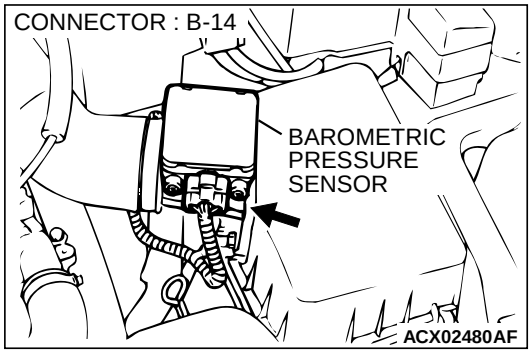
Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 18.

NO : Repair it. Then go to Step 18.





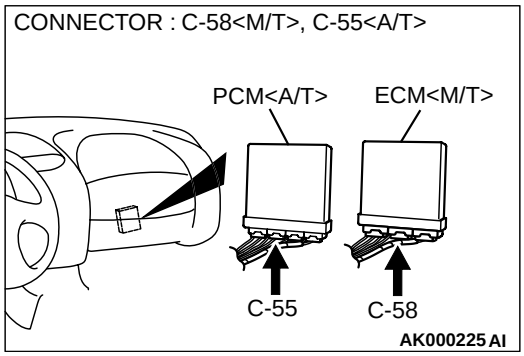


STEP 15. Check connector B-14 at barometric pressure sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 16.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 18.

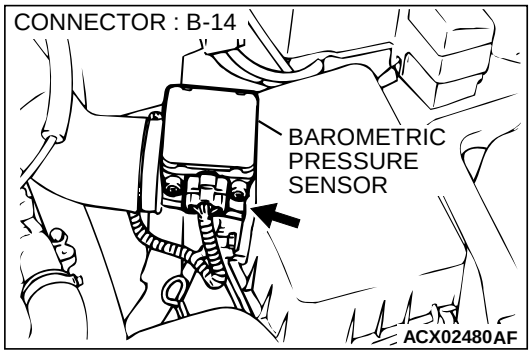


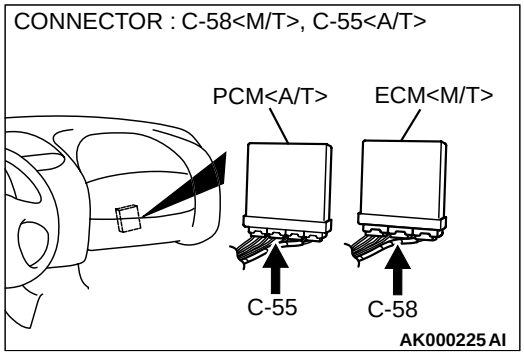
STEP 16. Check connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 17.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 18.





STEP 17. Check for short circuit to ground and harness damage between barometric pressure sensor connector B-14 terminal 2 and ECM connector C-58 terminal 51 <M/T> or PCM connector C-55 terminal 55 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the volume air flow sensor. Then go to Step 18.

NO : Repair it. Then go to Step 18.

TSB Revision

STEP 18. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13B-6.

(2) Check the diagnostic trouble code (DTC).

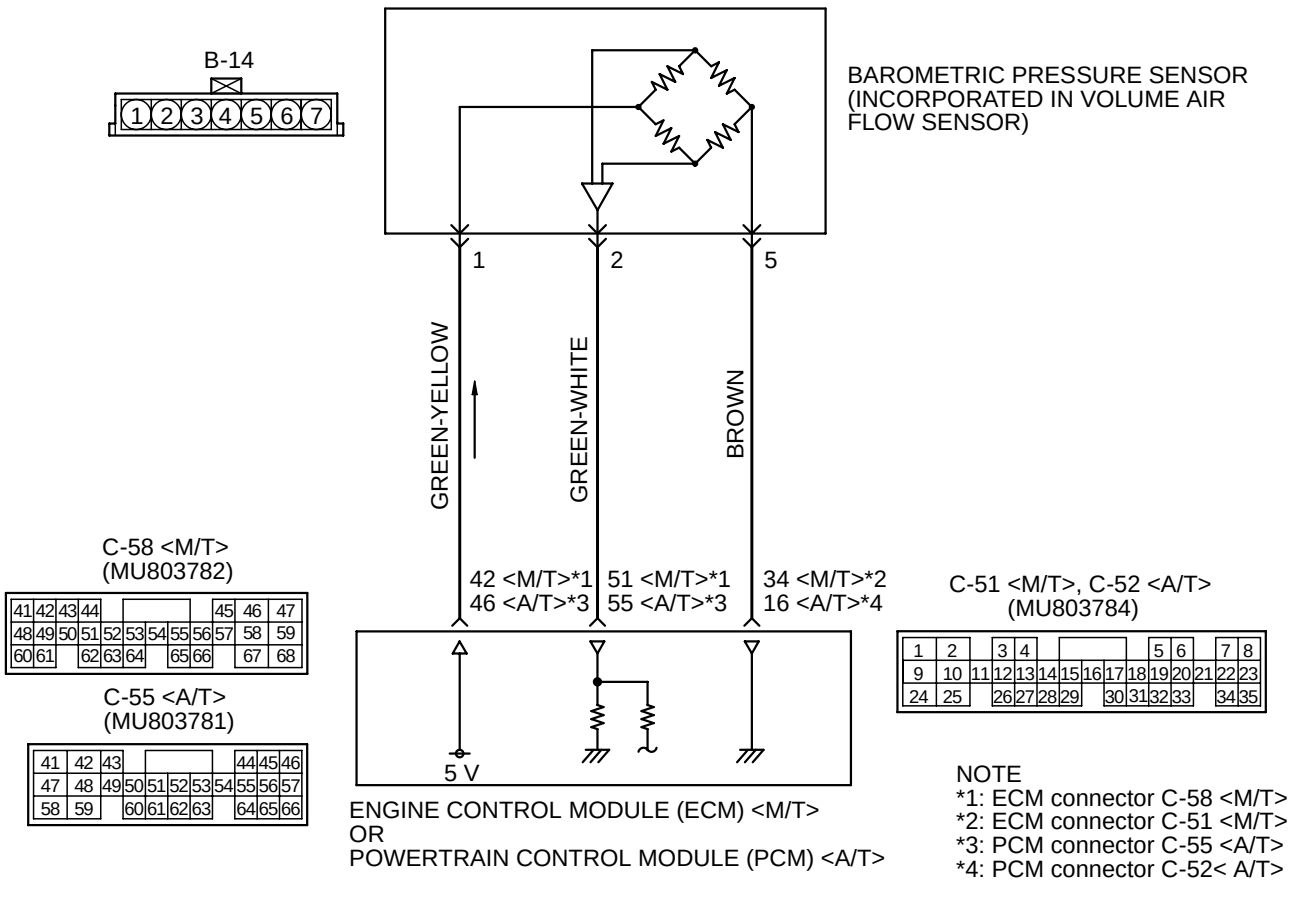
Q: Is the DTC P0107 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0108: Barometric Pressure Circuit High Input

Barometric Pressure Sensor Circuit



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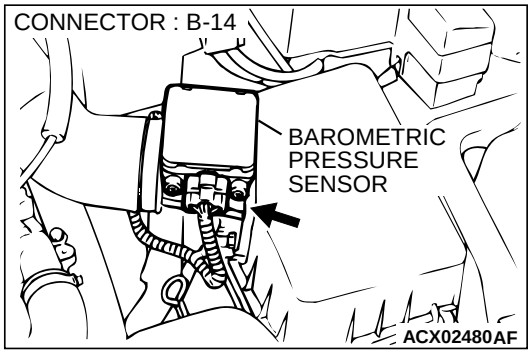
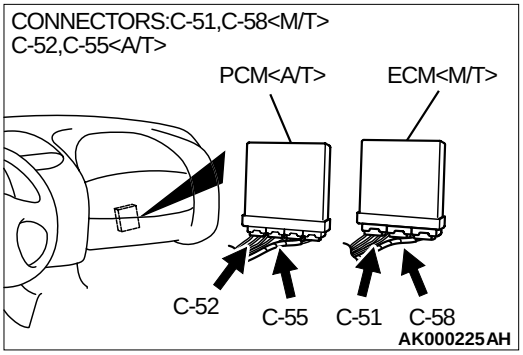




TSB Revision

CIRCUIT OPERATION

- A 5-volt voltage is supplied to the barometric pressure sensor power terminal (terminal 1) from the ECM (terminal 42) <M/T> or PCM (terminal 46) <A/T>. The ground terminal (terminal 5) is grounded with ECM (terminal 34) <M/T> or PCM (terminal 16) <A/T>.
- A voltage that is proportional to the atmospheric pressure is sent to the ECM (terminal 51) <M/T> or PCM (terminal 55) <A/T> from the barometric pressure sensor output terminal (terminal 2).

TECHNICAL DESCRIPTION

- The barometric pressure sensor outputs a voltage which corresponds to the barometric pressure.
- The ECM <M/T> or PCM <A/T> checks whether this voltage is within a specified range.

DTC SET CONDITIONS

Check Conditions

- 2 seconds or more have passed since the starting sequence was completed.
- Battery positive voltage is higher than 8 volts.

Judgement Criteria

- Barometric pressure sensor output has continued to be 113 kPa (16 psi) or higher approximately 4,000 ft below sea level for 10 seconds.

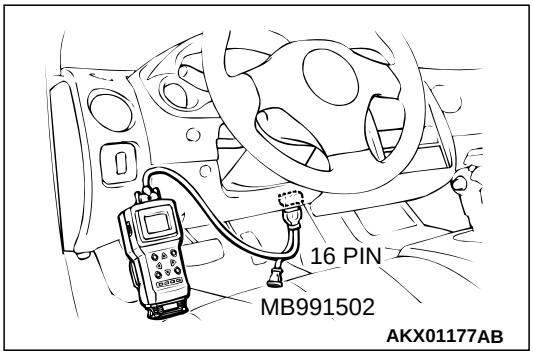
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Barometric pressure sensor failed.
- Open or shorted barometric pressure sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 25: Barometric Pressure Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

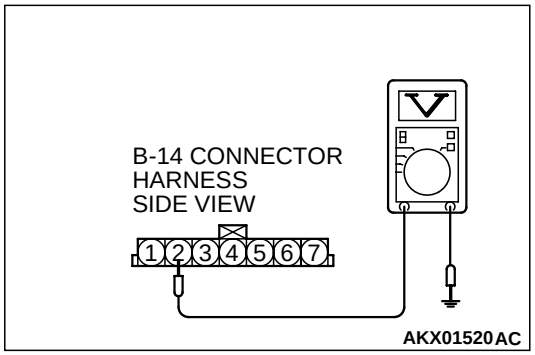
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 25, Barometric Pressure Sensor.
  - When altitude is 0 m (0 foot), 101 kPa.
  - When altitude is 600 m (1,969 feet), 95 kPa.
  - When altitude is 1,200 m (3,937 feet), 88 kPa.
  - When altitude is 1,800 m (5,906 feet), 81 kPa.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

NO : Go to Step 2.



STEP 2. Check the sensor output voltage at barometric pressure sensor connector B-14 by backprobing.

(1) Do not disconnect the connector B-14.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 2 and ground by backprobing.
- When altitude is 0 m (0 foot), voltage should be 3.7 and 4.3 volts.
- When altitude is 600 m (1,969 feet), voltage should be 3.4 and 4.0 volts.
- When altitude is 1,200 m (3,937 feet), voltage should be 3.2 and 3.8 volts.
- When altitude is 1,800 m (5,906 feet), voltage should be 2.9 and 3.5 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

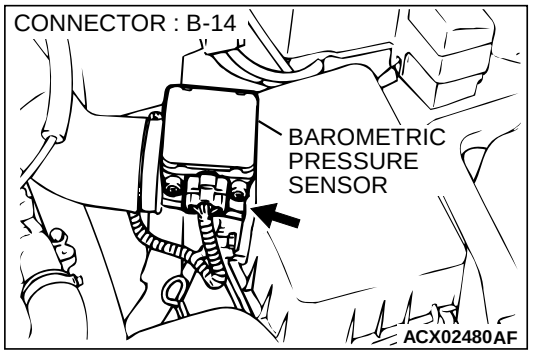
Q: Is the voltage normal?

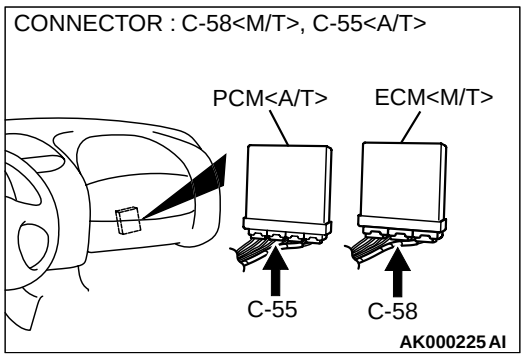
YES : Go to Step 3.
NO : Go to Step 5.

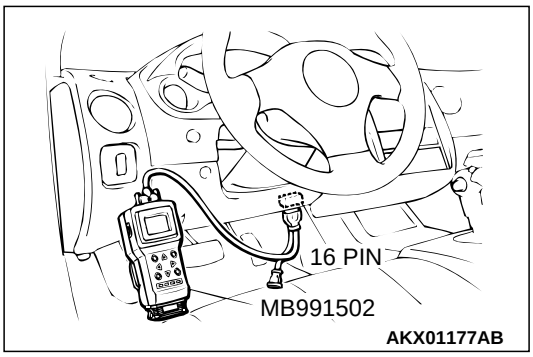
STEP 3. Check connector B-14 at the barometric pressure sensor and connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.







STEP 4. Using scan tool MB991502, check data list item 25: Barometric Pressure Sensor.

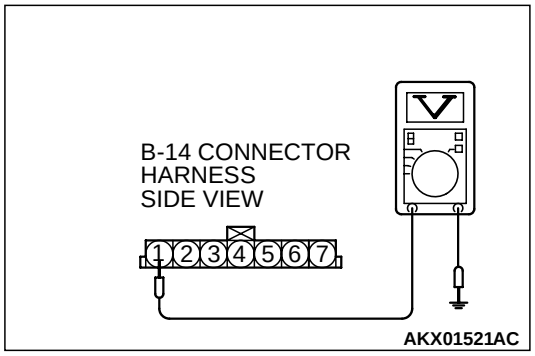
⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 25, Barometric Pressure Sensor.
- When altitude is 0 m (0 foot), 101 kPa.
- When altitude is 600 m (1,969 feet), 95 kPa.
- When altitude is 1,200 m (3,937 feet), 88 kPa.
- When altitude is 1,800 m (5,906 feet), 81 kPa.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Replace the ECM or PCM. Then go to Step 12.



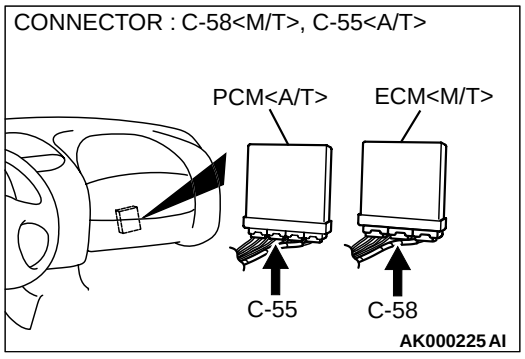
STEP 5. Check the sensor supply voltage at barometric pressure sensor connector B-14 by backprobing.

(1) Do not disconnect the connector B-14.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 1 and ground by backprobing.
- Voltage should be between 4.8 and 5.2 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

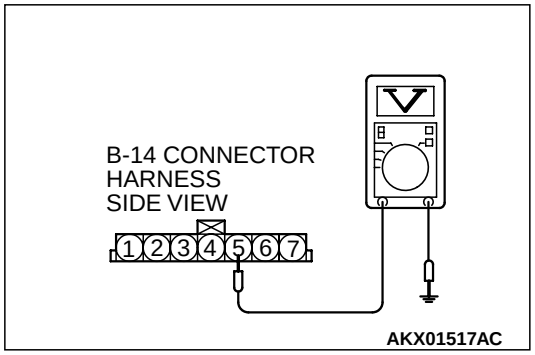
YES : Go to Step 7.
NO : Go to Step 6.



STEP 6. Check connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Replace the ECM or PCM. Then go to Step 12.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



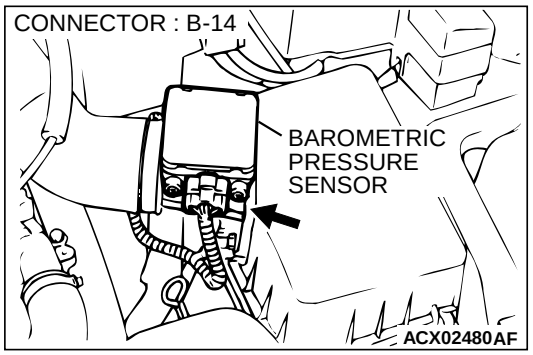
STEP 7. Check the ground voltage at barometric pressure sensor connector B-14 by backprobing.

(1) Do not disconnect the connector B-14.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 5 and ground by backprobing.
- Voltage should be 0.5 volt or less.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

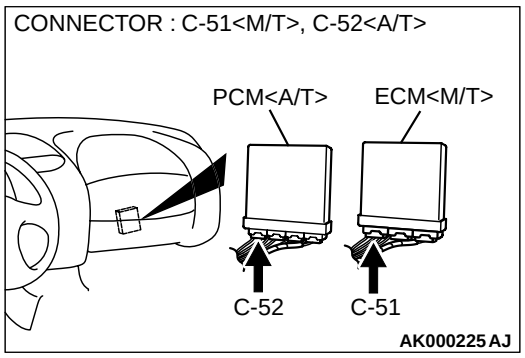
YES : Go to Step 10.
NO : Go to Step 8.

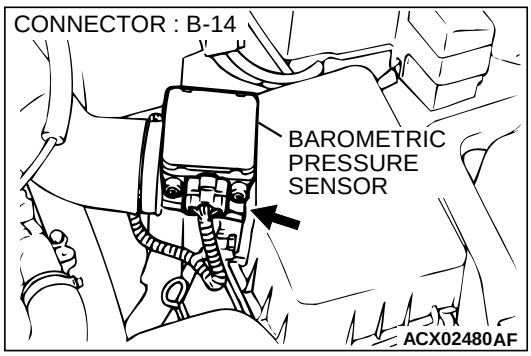


STEP 8. Check connector B-14 at the barometric pressure sensor and connector C-51 at ECM <M/T> or connector C-52 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 9.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



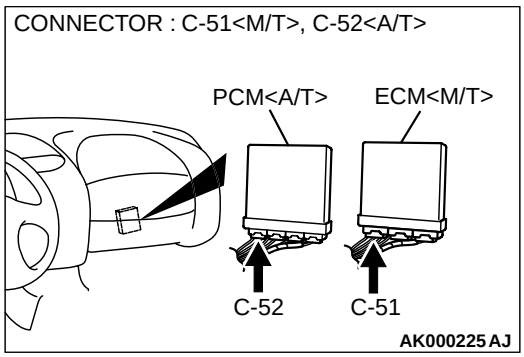


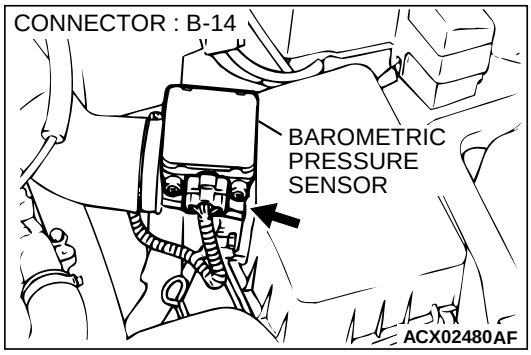
STEP 9. Check for open circuit between barometric pressure sensor connector B-14 terminal 5 and ECM connector C-51 terminal 34 <M/T> or PCM connector C-52 terminal 16 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 12.

NO : Repair it. Then go to Step 12.



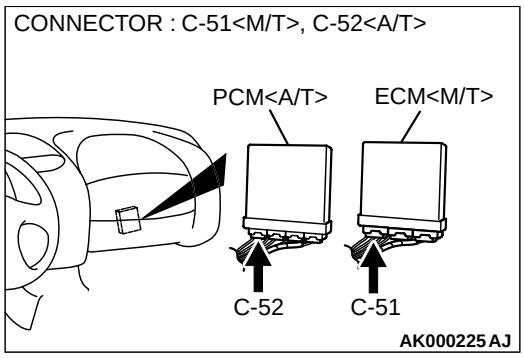


STEP 10. Check connector B-14 at barometric pressure sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 11.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



STEP 11. Check connector C-51 at ECM <M/T> or connector C-52 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Replace the volume air flow sensor. Then go to Step 12.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

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STEP 12. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13B-6.

(2) Check the diagnostic trouble code (DTC).

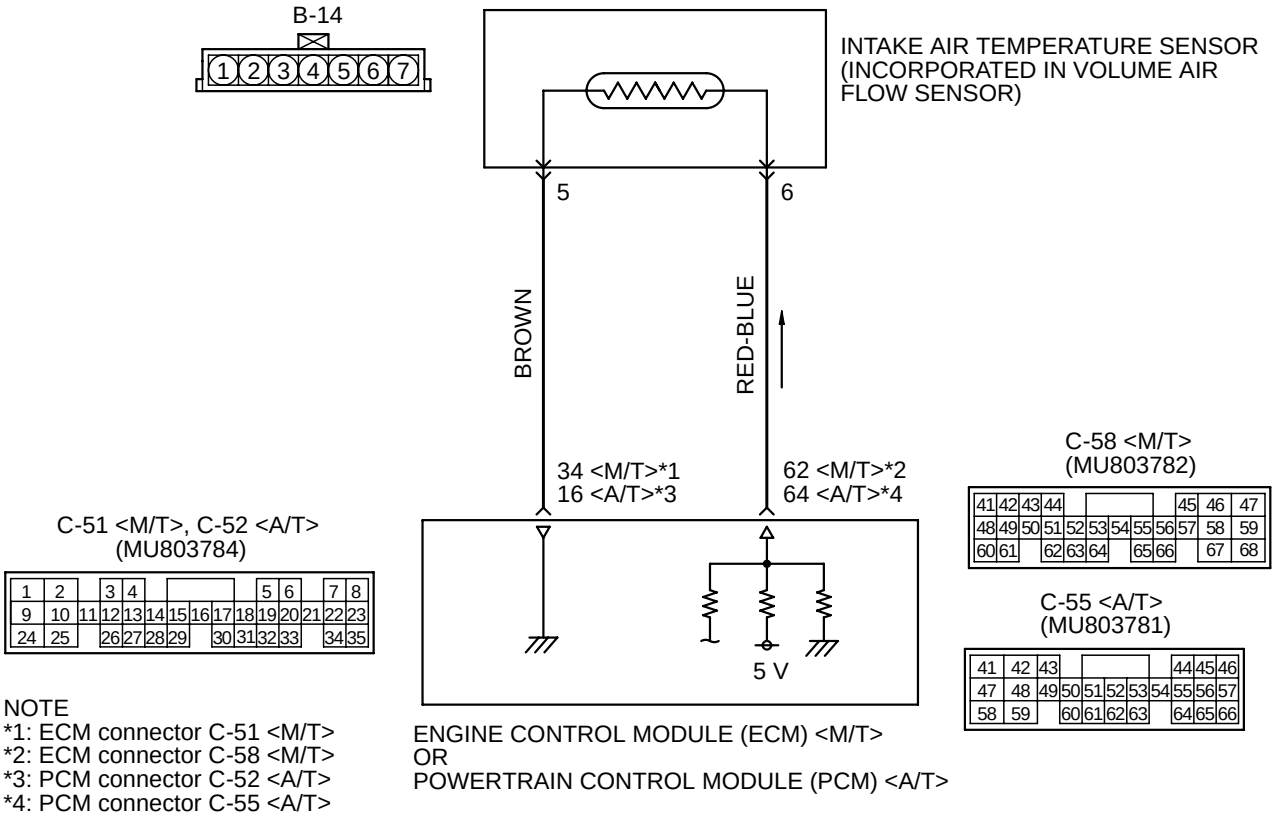
Q: Is the DTC P0108 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0111: Intake Air Temperature Circuit Range/Performance Problem

Intake Air Temperature Sensor Circuit



NOTE
*1: ECM connector C-51 <M/T>
*2: ECM connector C-58 <M/T>
*3: PCM connector C-52 <A/T>
*4: PCM connector C-55 <A/T>

ENGINE CONTROL MODULE (ECM) <M/T>
OR
POWERTRAIN CONTROL MODULE (PCM) <A/T>

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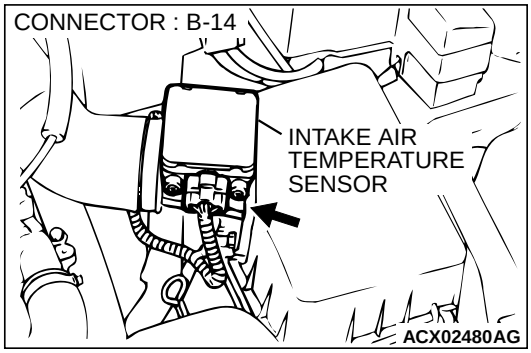
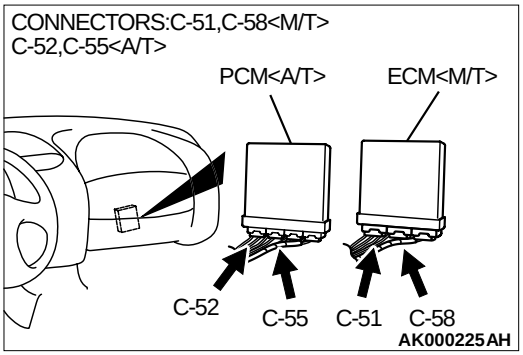




TSB Revision

CIRCUIT OPERATION

- Approximately 5 volts are applied to the intake air temperature sensor output terminal (terminal 6) from the ECM (terminal 62) <M/T> or PCM (terminal 64) <A/T> via the resistor in the ECM <M/T> or PCM <A/T>. The ground terminal (terminal 5) is grounded with ECM (terminal 34) <M/T> or PCM (terminal 16) <A/T>.
- The intake air temperature sensor is a negative temperature coefficient type of resistor. When the intake air temperature rises, the resistance decreases.
- The intake air temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases.

TECHNICAL DESCRIPTION

- The intake air temperature sensor converts the intake air temperature to a voltage.
- The ECM <M/T> or PCM <A/T> checks whether this voltage is within a specified range.

DTC SET CONDITIONS

Check Conditions

- Engine coolant temperature is higher than 76°C (169°F).
- Repeat 5 or more times: drive[*1], stop[*2].

  Drive[*1]: vehicle speed higher than 50 km/h (31 mph) lasting a total of more than 60 seconds.

  Stop[*2]: vehicle speed lower than 1.5 km/h (0.9 mph) lasting more than 30 seconds.

Judgement Criteria

- Changes in the intake air temperature is lower than 1°C (1.8°F).

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Intake air temperature sensor failed.
- Open or shorted intake air temperature sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

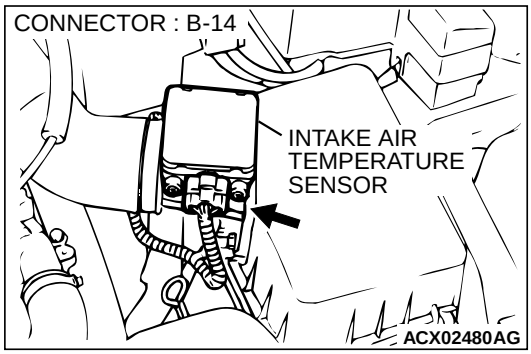
Required Special Tools

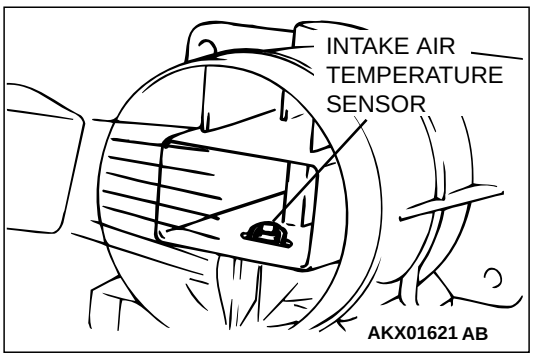
- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check data list item 13: Intake Air Temperature Sensor.

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Remove the air intake hose from the volume air flow sensor.
(3) Turn the ignition switch to the "ON" position.
(4) Set scan tool MB991502 to the data reading mode for item 13, Intake Air Temperature Sensor.





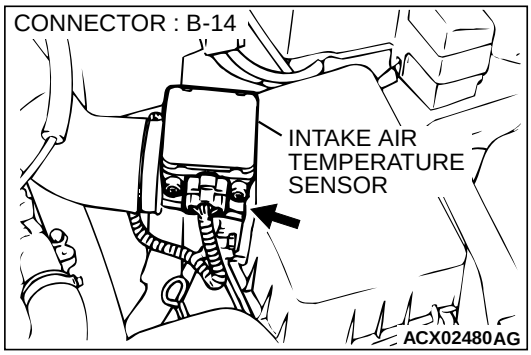
(5) Heating the sensor using a hair drier.
  - The indicated temperature increases.

  NOTE: Do not allow it to increase over 80°C (176°F).
(6) Turn the ignition switch to the "LOCK" (OFF) position.
(7) Attach the air intake hose.

Q: Is the sensor operating properly?

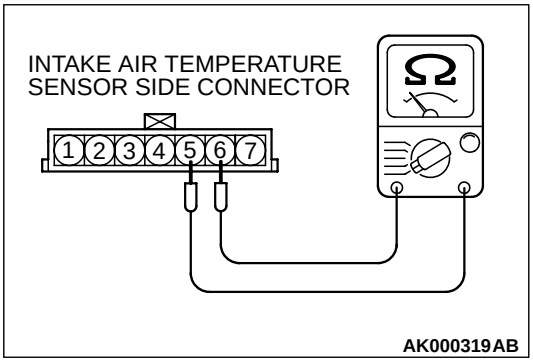
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

NO : Go to Step 2.

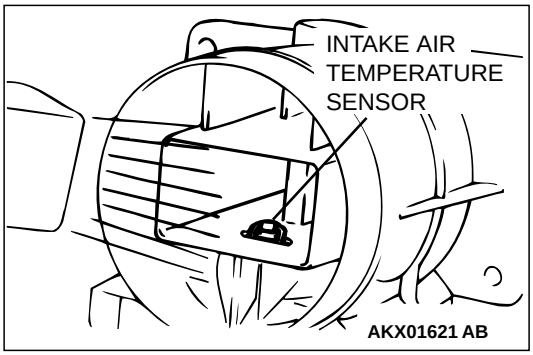


STEP 2. Check the intake air temperature sensor.

(1) Disconnect the intake air temperature sensor connector B-14.



(2) Measure the resistance between intake air temperature sensor side connector terminal 5 and 6.



(3) Measure resistance while heating the sensor using a hair drier.

Standard value:
13 – 17 kΩ [at –20°C (–4°F)]
5.3 – 6.7 kΩ [at 0°C (32°F)]
2.3 – 3.0 kΩ [at 20°C (68°F)]
1.0 – 1.5 kΩ [at 40°C (104°F)]
0.56 – 0.76 kΩ [at 60°C (140°F)]
0.30 – 0.42 kΩ [at 80°C (176°F)]

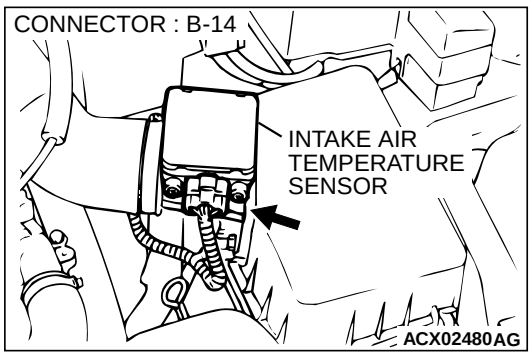
Q: Is the resistance at the standard value?

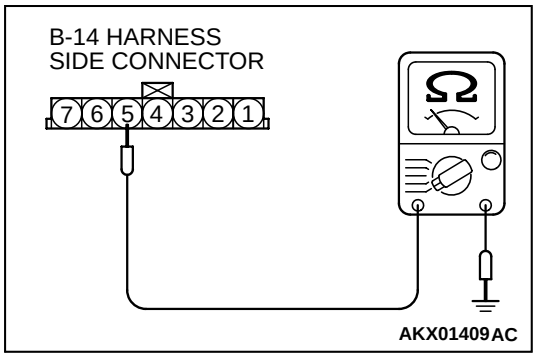
YES : Go to Step 3.
NO : Replace the volume air flow sensor. Then go to Step 9.

STEP 3. Check connector B-14 at the intake air temperature sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.





STEP 4. Check the continuity at intake air temperature sensor harness side connector B-14.

(1) Disconnect the connector B-14 and measure at the harness side.

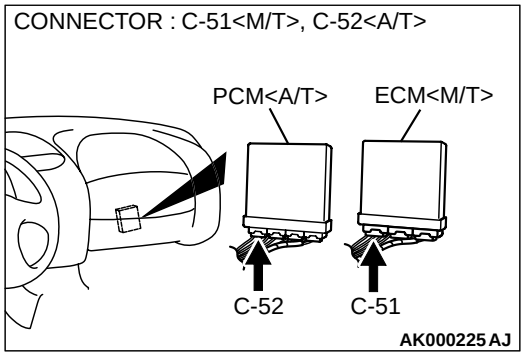
(2) Check for the continuity between terminal 5 and ground.

- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 7.

NO : Go to Step 5.

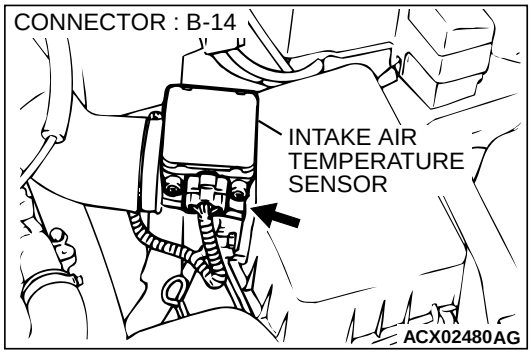


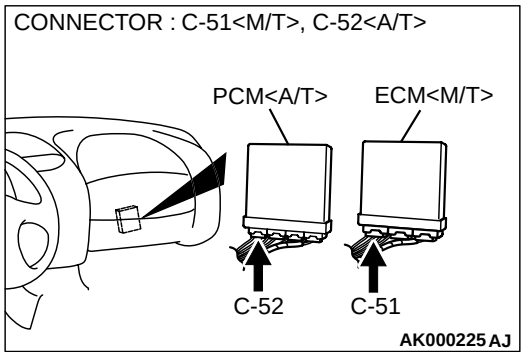
STEP 5. Check connector C-51 at ECM <M/T> or connector C-52 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.



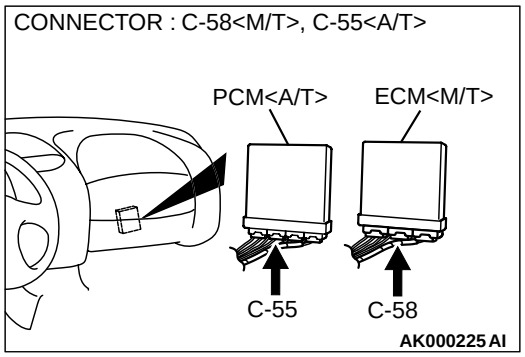


STEP 6. Check for open circuit and harness damage between intake air temperature sensor connector B-14 and ECM connector C-51 <M/T> or PCM connector C-52 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 9.

NO : Repair it. Then go to Step 9.

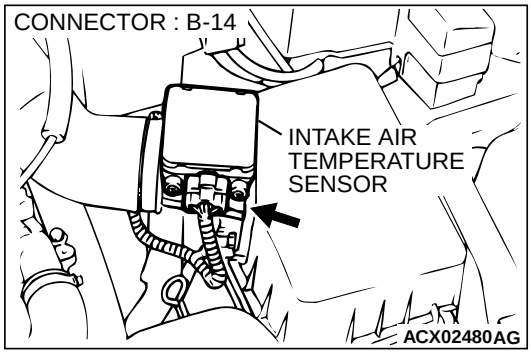


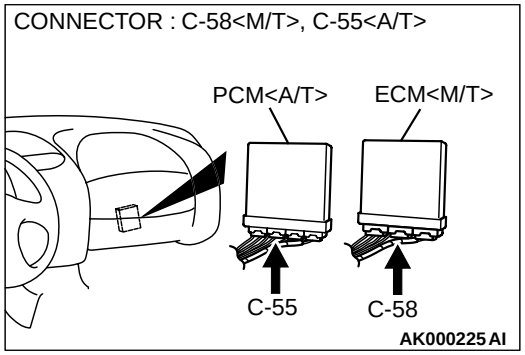
STEP 7. Check connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.





STEP 8. Check for open circuit and harness damage between intake air temperature sensor connector B-14 and ECM connector C-58 <M/T> or PCM connector C-55 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 9.

NO : Repair it. Then go to Step 9.

STEP 9. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13B-6.

(2) Check the diagnostic trouble code (DTC).

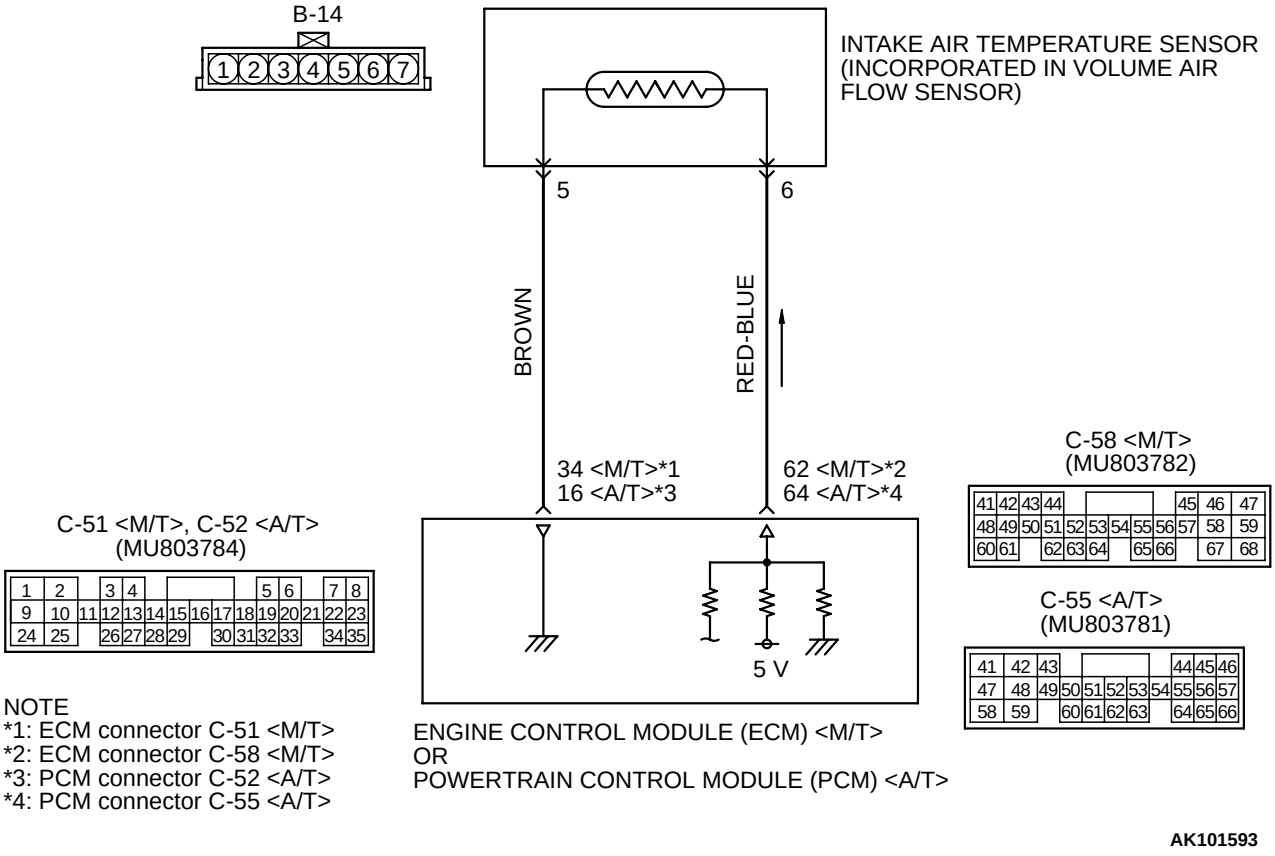
Q: Is the DTC P0111 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

TC P0112: Intake air temperature Circuit Low Input

Intake Air Temperature Sensor Circuit



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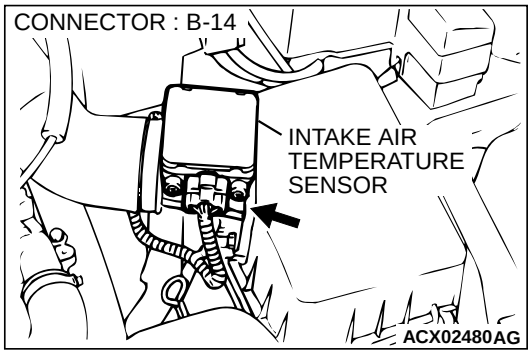

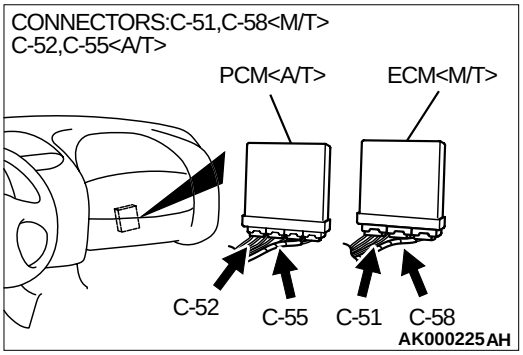

CIRCUIT OPERATION

- Approximately 5 volts are applied to the intake air temperature sensor output terminal (terminal 6) from the ECM (terminal 62) <M/T> or PCM (terminal 64) <A/T> via the resistor in the ECM <M/T> or PCM <A/T>. The ground terminal (terminal 5) is grounded with ECM (terminal 34) <M/T> or PCM (terminal 16) <A/T>.
- The intake air temperature sensor is a negative temperature coefficient type of resistor. When the intake air temperature rises, the resistance decreases.
- The intake air temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases.

TECHNICAL DESCRIPTION

- The intake air temperature sensor converts the intake air temperature to a voltage.
- The ECM <M/T> or PCM <A/T> checks whether this voltage is within a specified range.

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DTC SET CONDITIONS

Check Conditions

- 2 seconds or more have passed since the starting sequence was completed.

Judgement Criteria

- Intake air temperature sensor output voltage has continued to be 0.2 volt or lower [corresponding to an air intake temperature of 115°C (239°F) or higher] for 2 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

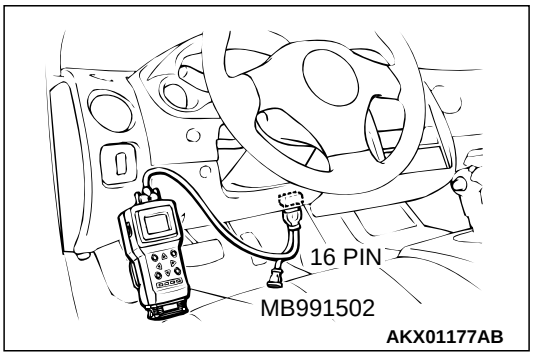
- Intake air temperature sensor failed.
- Open or shorted intake air temperature sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools

- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check data list item 13: Intake Air Temperature Sensor.



⚠ CAUTION

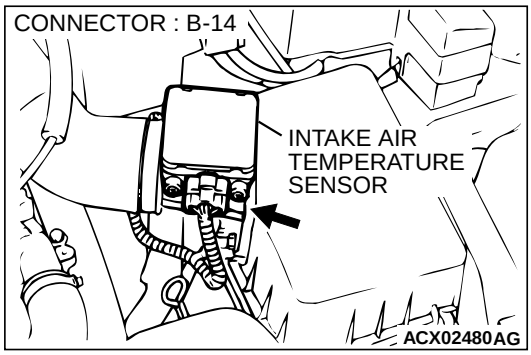
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 13, Intake Air Temperature Sensor.
  - The intake air temperature and temperature shown with the scan tool should approximately match.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

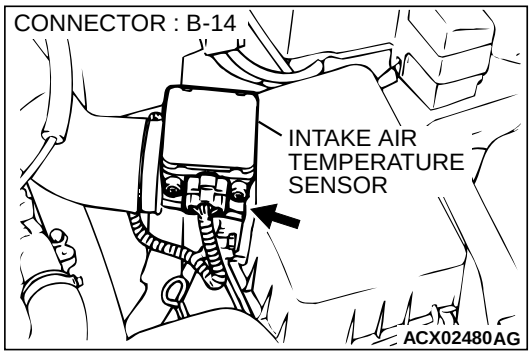
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Go to Step 2.

STEP 2. Check connector B-14 at the intake air temperature sensor for damage.



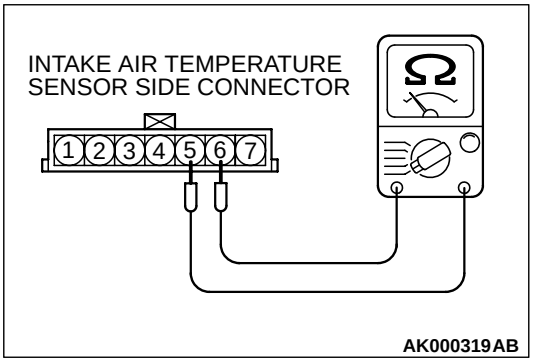
Q: Is the connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.



STEP 3. Check the intake air temperature sensor.

(1) Disconnect the intake air temperature sensor connector B-14.



(2) Measure the resistance between intake air temperature sensor side connector terminal 5 and 6.
- There should be continuity. (0.30 – 1.0 kΩ)

Q: Is the resistance normal?

YES : Go to Step 4.

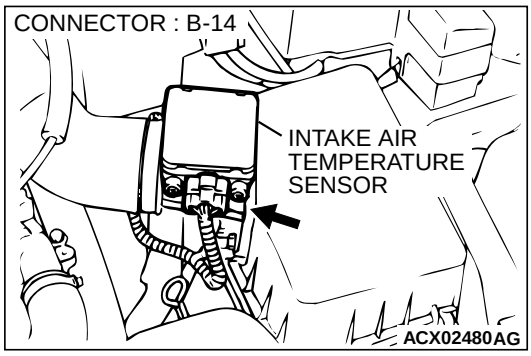
NO : Replace the volume air flow sensor. Then go to Step 6.

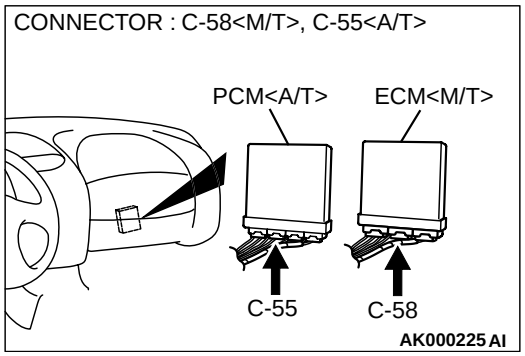
STEP 4. Check for short circuit to ground between intake air temperature sensor connector B-14 and ECM connector C-58 <M/T> or PCM connector C-55 <A/T>.

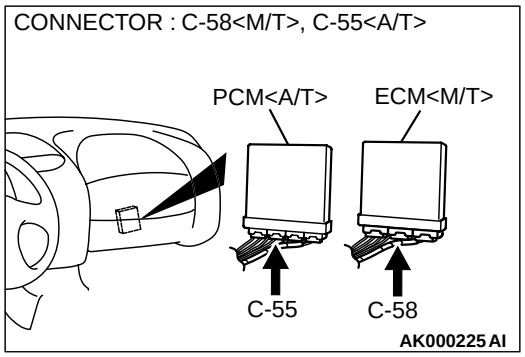
Q: Is the harness wire in good condition?

YES : Go to Step 5.

NO : Repair it. Then go to Step 6.







STEP 5. Check connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Replace the ECM or PCM. Then go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.

STEP 6. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13B-6.

(2) Check the diagnostic trouble code (DTC).

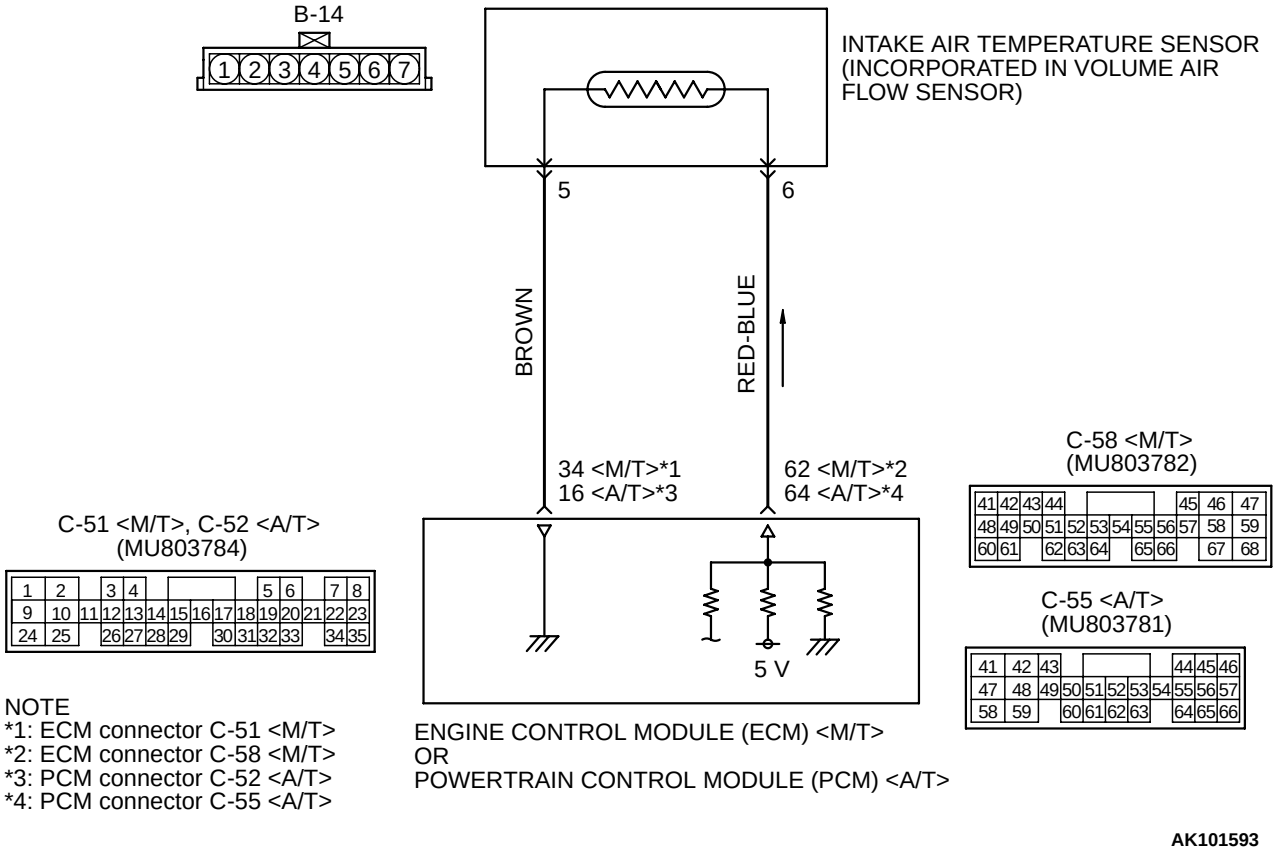
Q: Is the DTC P0112 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0113: Intake air temperature Circuit High Input

Intake Air Temperature Sensor Circuit



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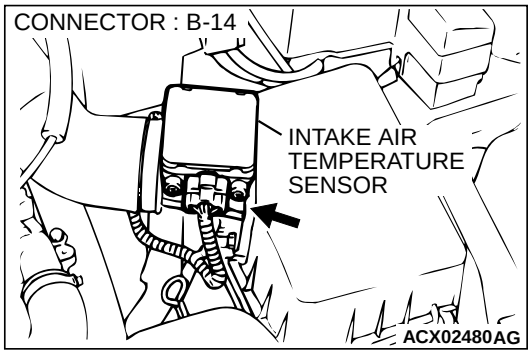
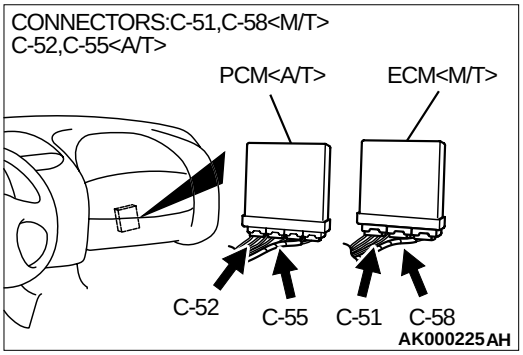




CIRCUIT OPERATION

- Approximately 5 volts are applied to the intake air temperature sensor output terminal (terminal 6) from the ECM (terminal 62) <M/T> or PCM (terminal 64) <A/T> via the resistor in the ECM <M/T> or PCM <A/T>. The ground terminal (terminal 5) is grounded with ECM (terminal 34) <M/T> or PCM (terminal 16) <A/T>.
- The intake air temperature sensor is a negative temperature coefficient type of resistor. When the intake air temperature rises, the resistance decreases.
- The intake air temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases.

TECHNICAL DESCRIPTION

- The intake air temperature sensor converts the intake air temperature to a voltage.
- The ECM <M/T> or PCM <A/T> checks whether this voltage is within a specified range.

TSB Revision

DTC SET CONDITIONS

Check Conditions

- 2 seconds or more have passed since the starting sequence was completed.

Judgement Criteria

- Intake air temperature sensor output voltage has continued to be 4.5 volts or higher [corresponding to an air intake temperature of –40°C (–104°F) or lower] for 2 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

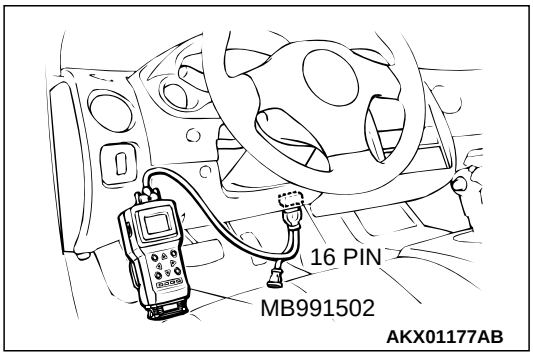
- Intake air temperature sensor failed.
- Open or shorted intake air temperature sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools

- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check data list item 13: Intake Air Temperature Sensor.



⚠ CAUTION

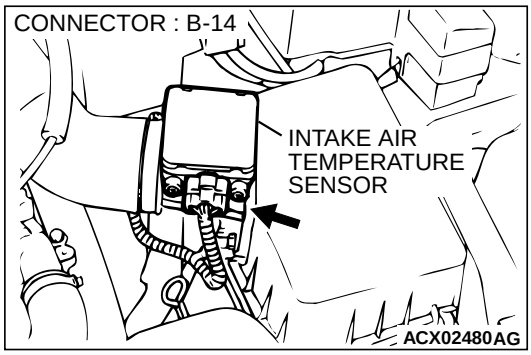
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 13, Intake Air Temperature Sensor.
  - The intake air temperature and temperature shown with the scan tool should approximately match.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

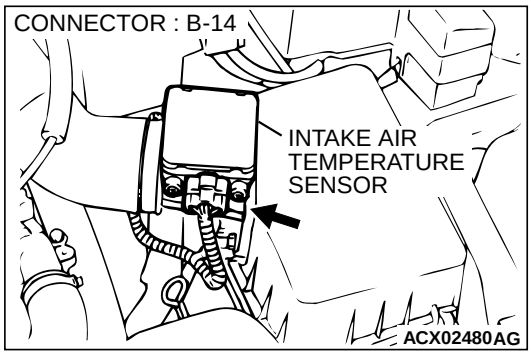
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Go to Step 2.

STEP 2. Check connector B-14 at the intake air temperature sensor for damage.



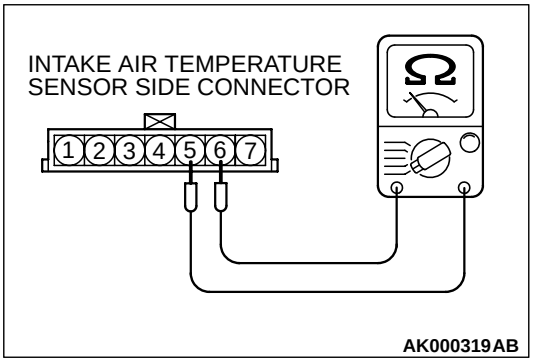
Q: Is the connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.



STEP 3. Check the intake air temperature sensor.

(1) Disconnect the intake air temperature sensor connector B-14.



(2) Measure the resistance between intake air temperature sensor side connector terminal 5 and 6.
- There should be continuity. (0.30 – 1.0 kΩ)

Q: Is the resistance normal?

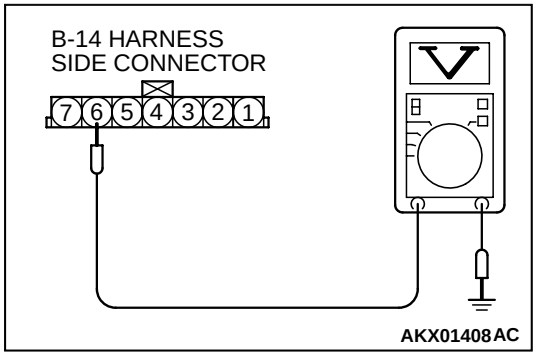
YES : Go to Step 4.

NO : Replace the volume air flow sensor. Then go to Step 11.

STEP 4. Check the sensor supply voltage at intake air temperature sensor harness side connector B-14.

(1) Disconnect the connector B-14 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 6 and ground.
- Voltage should be between 4.5 and 4.9 volts.

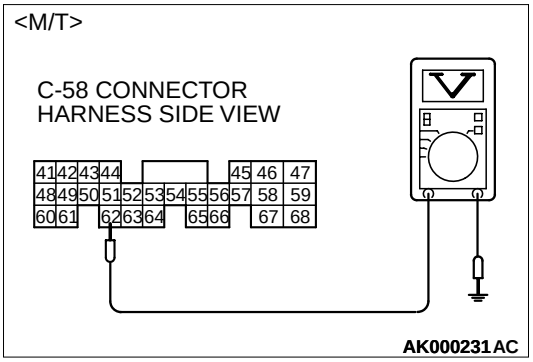
(4) Turn the ignition switch to the "LOCK" (OFF) position.

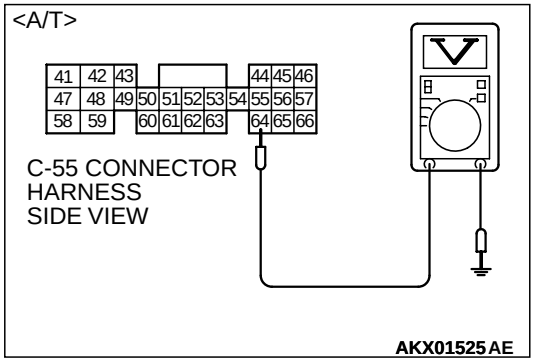


Q: Is the voltage normal?

YES : Go to Step 8.

NO : Go to Step 5.





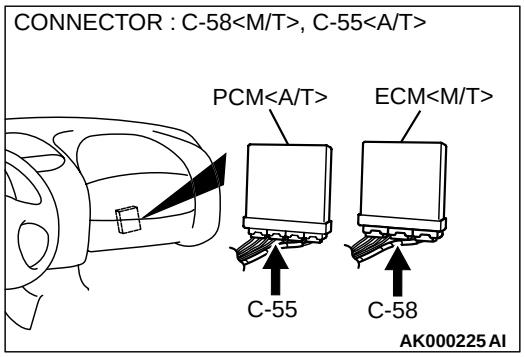
STEP 5. Check the sensor supply voltage at ECM connector C-58 <M/T> or PCM connector C-55 <A/T> by backprobing.

(1) Do not disconnect the ECM connector C-58 <M/T> or PCM connector C-55 <A/T>.
(2) Disconnect the intake air temperature sensor connector B-14.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the voltage between terminal 62 <M/T> or 64 <A/T> and ground by backprobing.
- Voltage should be between 4.5 and 4.9 volts.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

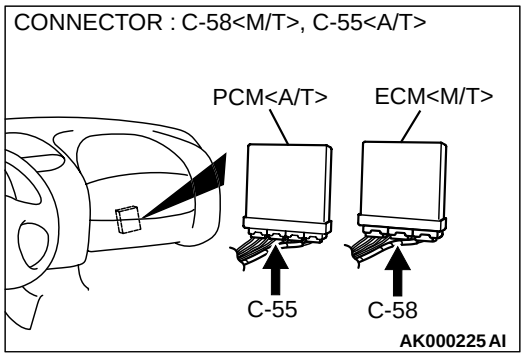
YES : Go to Step 6.
NO : Go to Step 7.



STEP 6. Check connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between intake air temperature sensor connector B-14 and ECM connector C-58 <M/T> or PCM connector C-55 <A/T> because of open circuit. Then go to Step 11.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

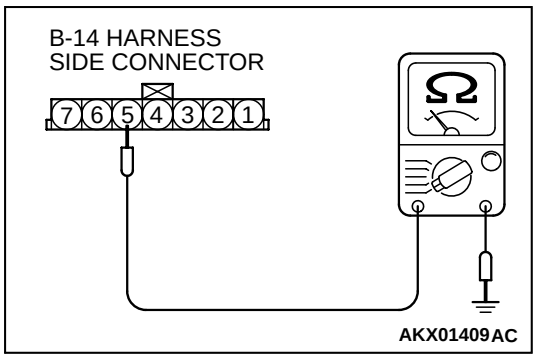


STEP 7. Check connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Replace the ECM or PCM. Then go to Step 11.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.



STEP 8. Check the continuity at intake air temperature sensor harness side connector B-14.

(1) Disconnect the connector B-14 and measure at the harness side.

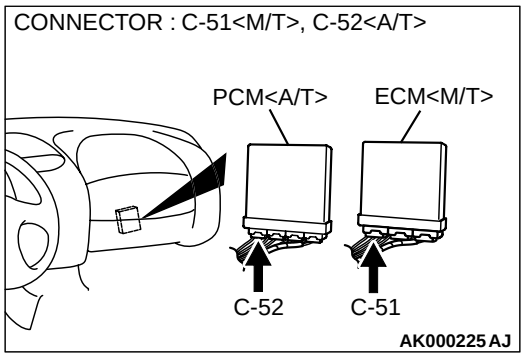
(2) Check for the continuity between terminal 5 and ground.

- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Replace the ECM or PCM. Then go to Step 11.

NO : Go to Step 9.

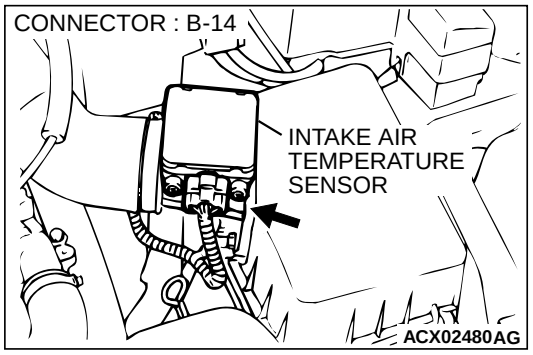


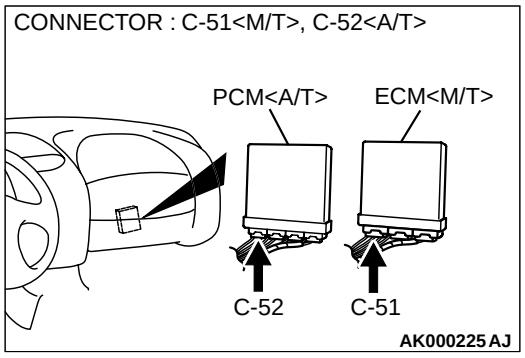
STEP 9. Check connector C-51 at ECM <M/T> or connector C-52 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.





STEP 10. Check for open circuit between intake air temperature sensor connector B-14 and ECM connector C-51 <M/T> or PCM connector C-52 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 11.

NO : Repair it. Then go to Step 11.

STEP 11. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13B-6.

(2) Check the diagnostic trouble code (DTC).

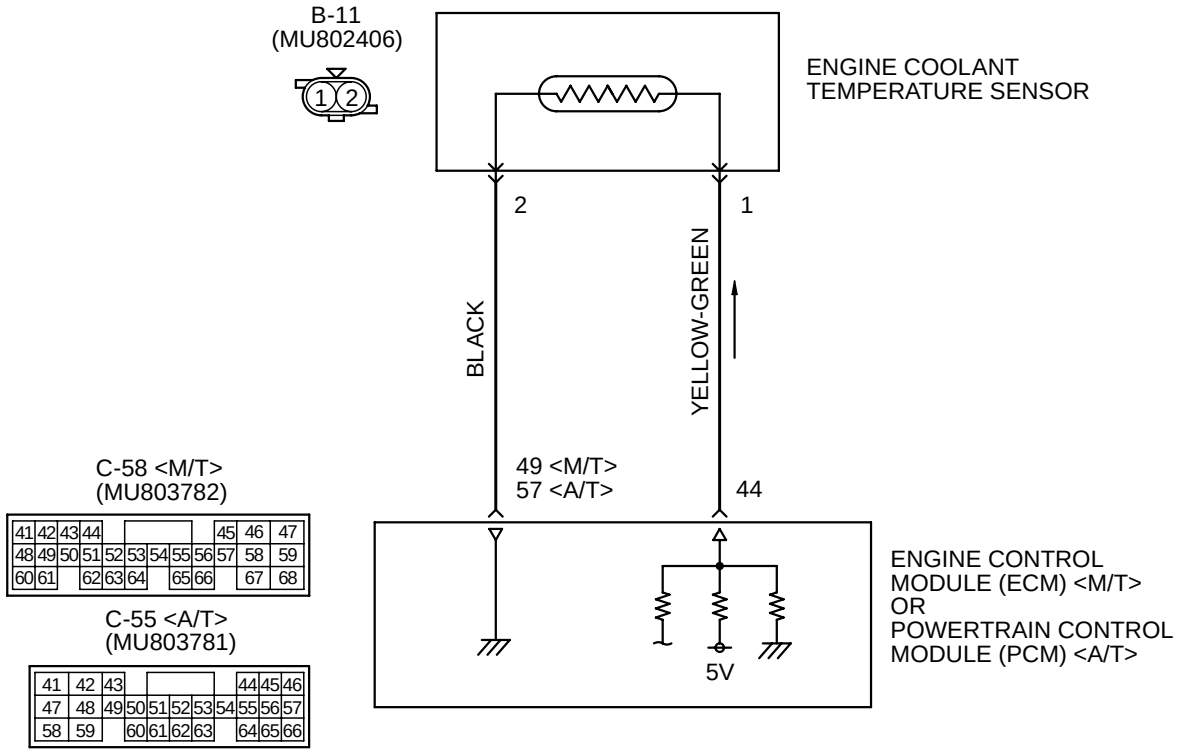
Q: Is the DTC P0113 is output?

YES : Retry the troubleshooting.

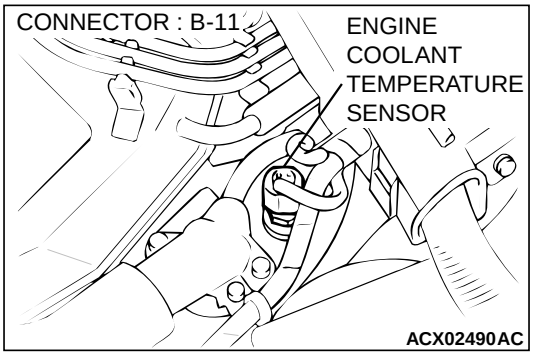
NO : The inspection is complete.

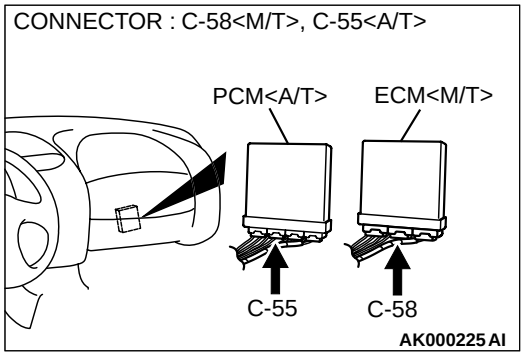
DTC P0116: Engine Coolant Temperature Circuit Range/Performance Problem

Engine Coolant Temperature Sensor Circuit



AK000688





CIRCUIT OPERATION

- 5-volt voltage is applied to the engine coolant temperature sensor output terminal (terminal 1) from the ECM (terminal 44) <M/T> or PCM (terminal 44) <A/T> via the resistor in the ECM <M/T> or PCM <A/T>. The ground terminal (terminal 2) is grounded with ECM (terminal 49) <M/T> or (terminal 57) <A/T>.
- The engine coolant temperature sensor is a negative temperature coefficient type of resistor. It has the characteristic that when the engine coolant temperature rises the resistor decreases.
- The engine coolant temperature sensor output voltage increases when the resistor increases and decreases when the resistor decreases.

TSB Revision

TECHNICAL DESCRIPTION

- The engine coolant temperature sensor converts the engine coolant temperature to a voltage and output it.
- The ECM <M/T> or PCM <A/T> checks whether this voltage is within a specified range.

DTC SET CONDITIONS

Check Conditions

- Engine coolant temperature was 7°C (45°F) or more immediately before the engine was stopped at the last drive.
- Engine coolant temperature was 7°C (45°F) or more when the engine started.

Judgement Criteria

- Engine coolant temperature fluctuates within 1°C (1.8°F) after 5 minutes have passed since the engine was started.
- However, time is not counted if any of the following conditions are met.
  1. Intake air temperature is 60°C (140°F) or more.
  2. Volume air flow sensor output frequency is 70 Hz or less.
  3. During fuel shut-off operation.
- The ECM <M/T> or PCM <A/T> monitors for this condition once during the drive cycle.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

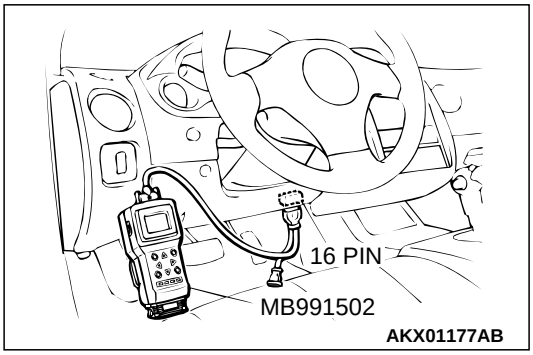
- Engine coolant temperature sensor failed.
- Open or shorted engine coolant temperature sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check data list item 21: Engine Coolant Temperature Sensor.



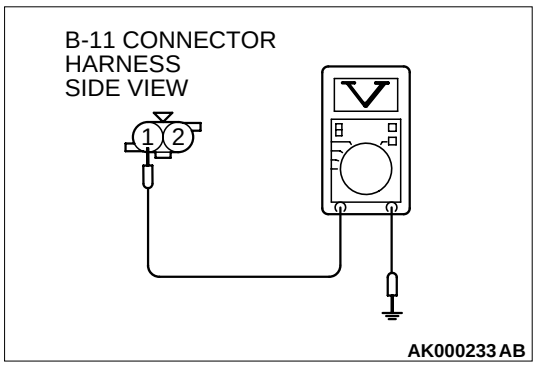
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 21, Engine Coolant Temperature Sensor.
  - The engine coolant temperature and temperature shown with the scan tool should approximately match.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Go to Step 2.



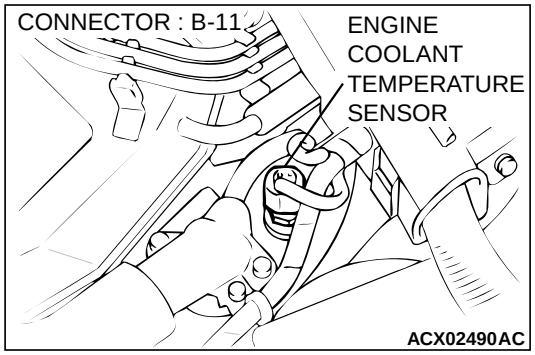
STEP 2. Check the sensor output voltage at engine coolant temperature sensor connector B-11 by backprobing.

(1) Do not disconnect the connector B-11.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 1 and ground by backprobing.
- When engine coolant temperature is –20°C (–4°F), voltage should be 3.9 and 4.5 volts.
- When engine coolant temperature is 0°C (32°F), voltage should be 3.2 and 3.8 volts.
- When engine coolant temperature is 20°C (68°F), voltage should be 2.3 and 2.9 volts.
- When engine coolant temperature is 40°C (104°F), voltage should be 1.3 and 1.9 volts.
- When engine coolant temperature is 60°C (140°F), voltage should be 0.7 and 1.3 volts.
- When engine coolant temperature is 80°C (176°F), voltage should be 0.3 and 0.9 volt.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

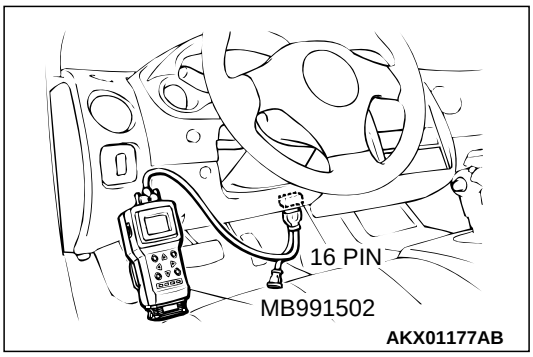
YES : Go to Step 3.
NO : Go to Step 5.



STEP 3. Check connector B-11 at the engine coolant temperature sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP 4. Using scan tool MB991502, check data list item 21: Engine Coolant Temperature Sensor.

⚠ CAUTION

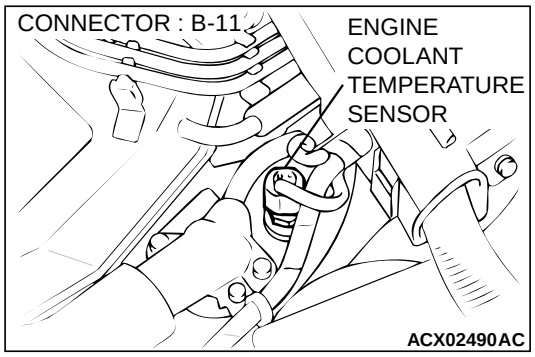
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 21, Engine Coolant Temperature Sensor.
- The engine coolant temperature and temperature shown with the scan tool should approximately match.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

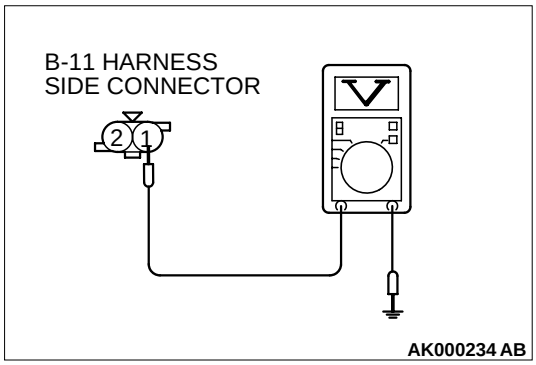
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Replace the ECM or PCM. Then go to Step 14.



STEP 5. Check connector B-11 at engine coolant temperature sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 6.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



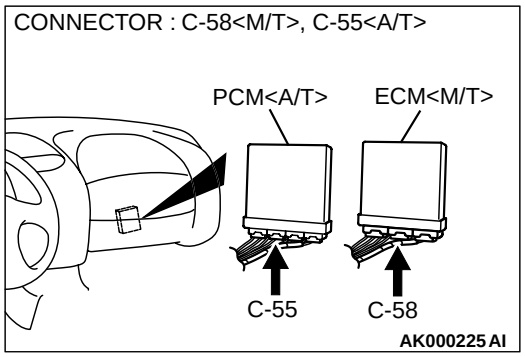
STEP 6. Check the sensor supply voltage at engine coolant temperature sensor harness side connector B-11.

(1) Disconnect the connector B-11 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 1 and ground.
- Voltage should be between 4.5 and 4.9 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 8.
NO : Go to Step 7.

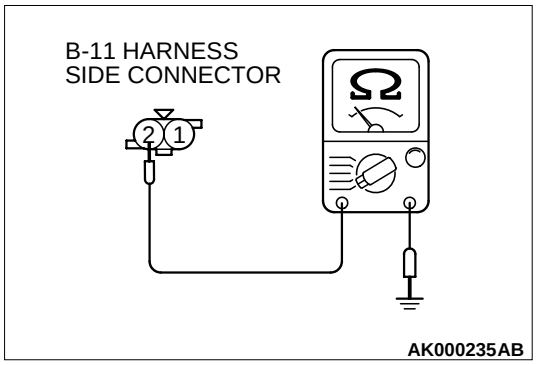


STEP 7. Check connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Replace the ECM or PCM. Then go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP 8. Check the continuity at engine coolant temperature sensor harness side connector B-11.

(1) Disconnect the connector B-11 and measure at the harness side.

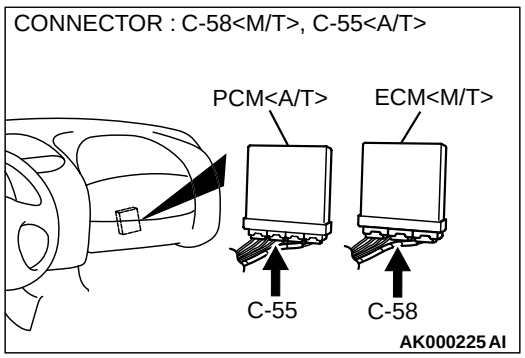
(2) Check for the continuity between terminal 2 and ground.

- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 11.

NO : Go to Step 9.

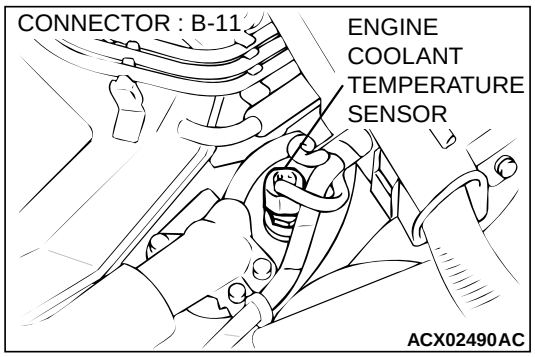


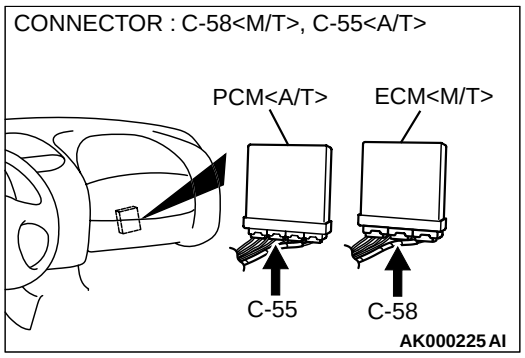
STEP 9. Check connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



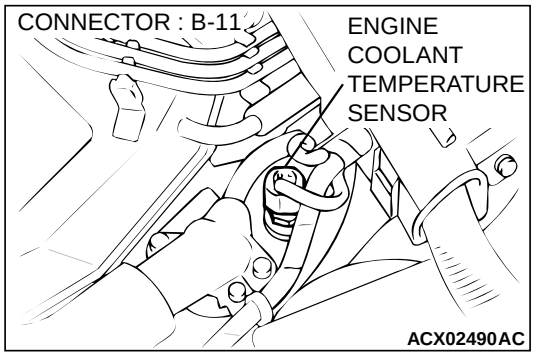


STEP 10. Check for harness damage between engine coolant temperature sensor connector B-11 terminal 2 and ECM connector C-58 terminal 49 <M/T> or PCM connector C-55 terminal 57 <A/T>.

Q: Is the harness wire in good condition?

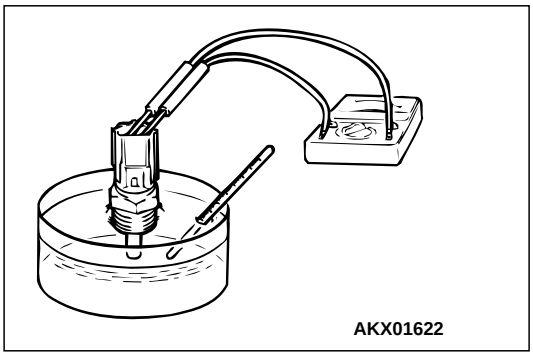
YES : Replace the ECM or PCM. Then go to Step 14.

NO : Repair it. Then go to Step 14.



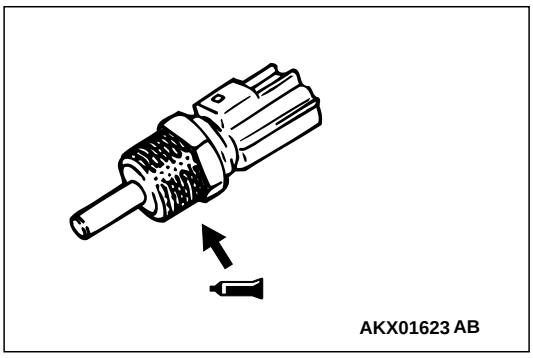
STEP 11. Check the engine coolant temperature sensor.

(1) Disconnect the engine coolant temperature sensor connector B-11.
(2) Remove the engine coolant temperature sensor.



(3) With the temperature sensing portion of engine coolant temperature sensor immersed in hot water, check resistance.

Standard value:
14 – 17 kΩ [at –20°C (–4°F)]
5.1 – 6.5 kΩ [at 0°C (32°F)]
2.1 – 2.7 kΩ [at 20°C (68°F)]
0.9 – 1.3 kΩ [at 40°C (104°F)]
0.48 – 0.68 kΩ [at 60°C (140°F)]
0.26 – 0.36 kΩ [at 80°C (176°F)]



(4) Apply 3M™ AAD part number 8731 or equivalent on the screw section of the engine coolant temperature sensor.
(5) Install the engine coolant temperature sensor, and tighten to the specified torque.

Tightening torque: 29 ± 10 N·m (22 ± 7 ft-lb)

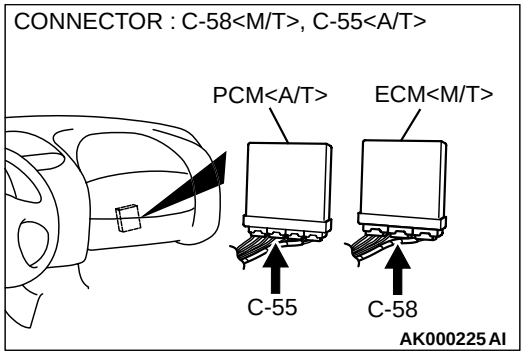
Q: Is the resistance at the standard value?

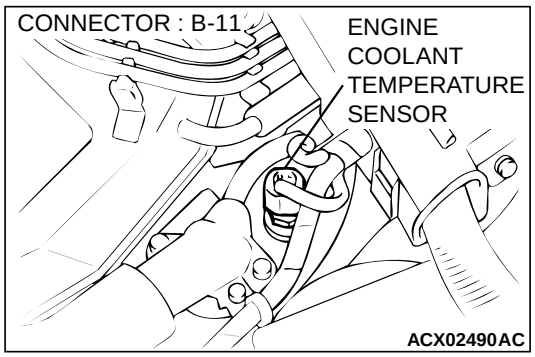
YES : Go to Step 12.
NO : Replace the engine coolant temperature sensor. Then go to Step 14.

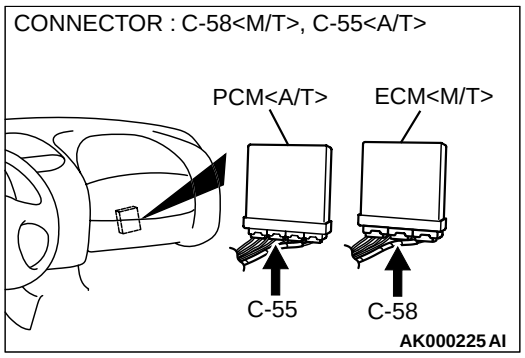
STEP 12. Check connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 13.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.







STEP 13. Check for harness damage between engine coolant temperature sensor connector B-11 terminal 1 and ECM connector C-58 terminal 44 <M/T> or PCM connector C-55 terminal 44 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 14.

NO : Repair it. Then go to Step 14.

STEP 14. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13B-6.

(2) Check the diagnostic trouble code (DTC).

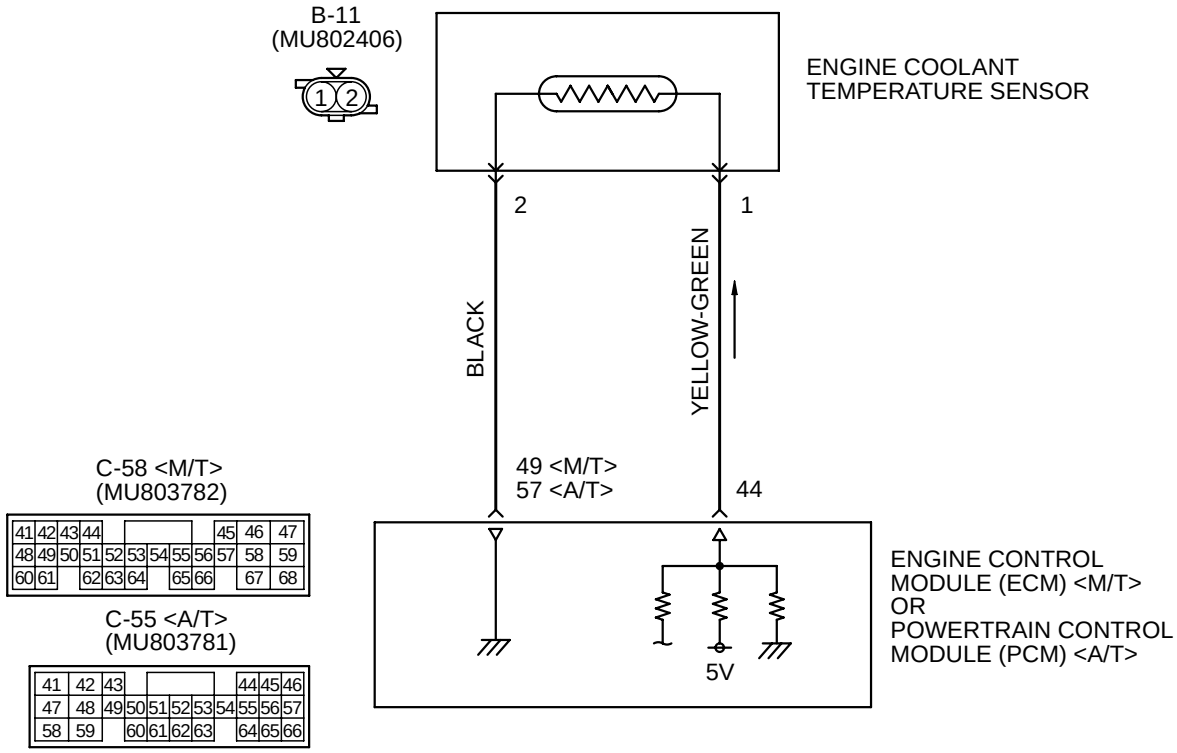
Q: Is the DTC P0116 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0117: Engine Coolant Temperature Circuit Low Input

Engine Coolant Temperature Sensor Circuit



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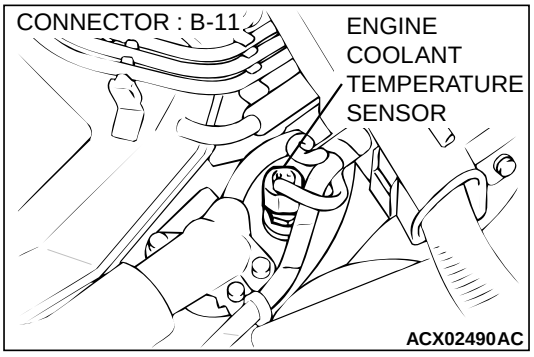
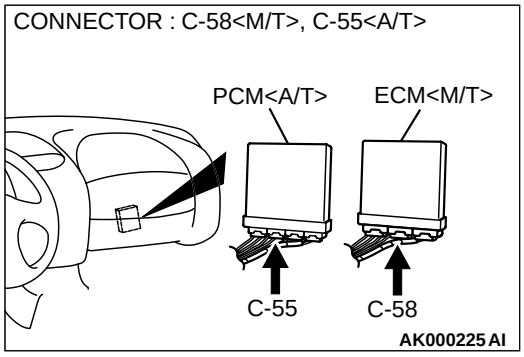




CIRCUIT OPERATION

- 5-volt voltage is applied to the engine coolant temperature sensor output terminal (terminal 1) from the ECM (terminal 44) <M/T> or PCM (terminal 44) <A/T> via the resistor in the ECM <M/T> or PCM <A/T>. The ground terminal (terminal 2) is grounded with ECM (terminal 49) <M/T> or (terminal 57) <A/T>.
- The engine coolant temperature sensor is a negative temperature coefficient type of resistor. It has the characteristic that when the engine coolant temperature rises the resistor decreases.
- The engine coolant temperature sensor output voltage increases when the resistor increases and decreases when the resistor decreases.

TSB Revision

TECHNICAL DESCRIPTION

- The engine coolant temperature sensor converts the engine coolant temperature to a voltage and output it.
- The ECM <M/T> or PCM <A/T> checks whether this voltage is within a specified range.

DTC SET CONDITIONS

Check Conditions

- 2 seconds or more have passed since the staring sequence was completed.

Judgement Criteria

- Engine coolant temperature sensor output voltage has continued to be 0.1 volt or lower [corresponding to a coolant temperature of 140°C (284°F) or higher] for 2 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

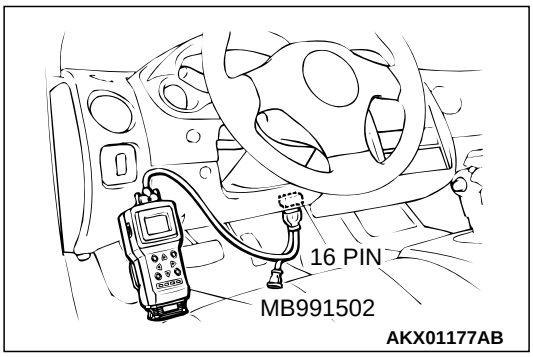
- Engine coolant temperature sensor failed.
- Open or shorted engine coolant temperature sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools

- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check data list item 21: Engine Coolant Temperature Sensor.



⚠ CAUTION

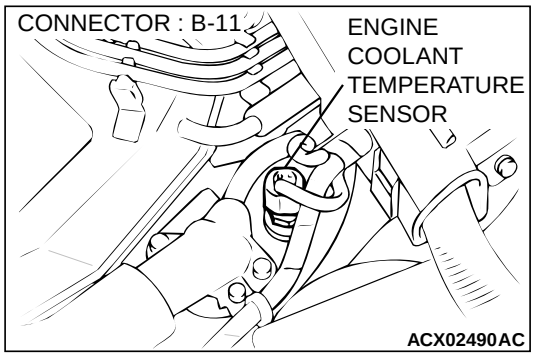
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 21, Engine Coolant Temperature Sensor.
  - The engine coolant temperature and temperature shown with the scan tool should approximately match.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

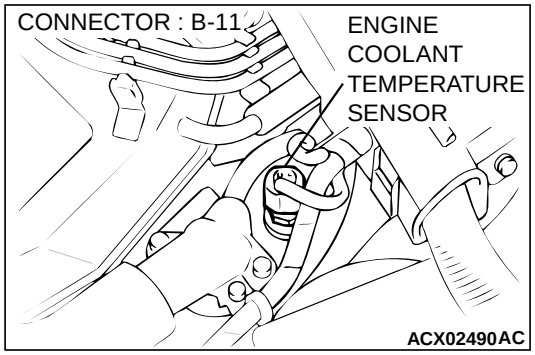
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Go to Step 2.

STEP 2. Check connector B-11 at the engine coolant temperature sensor for damage.



Q: Is the connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.

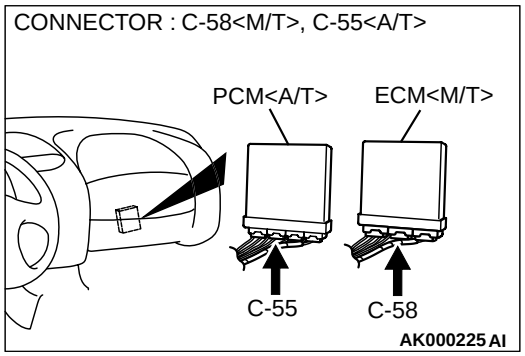


STEP 3. Check for short circuit to ground between engine coolant temperature sensor connector B-11 and ECM connector C-58 <M/T> or PCM connector C-55 <A/T>.

Q: Is the harness wire in good condition?

YES : Go to Step 4.

NO : Repair it. Then go to Step 6.

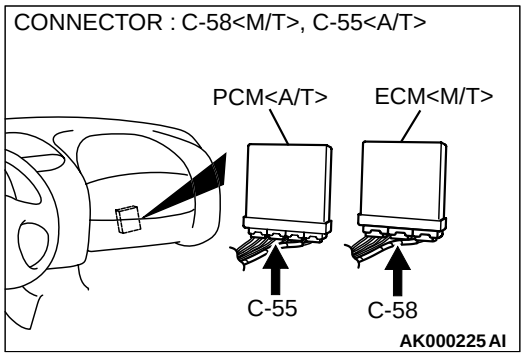


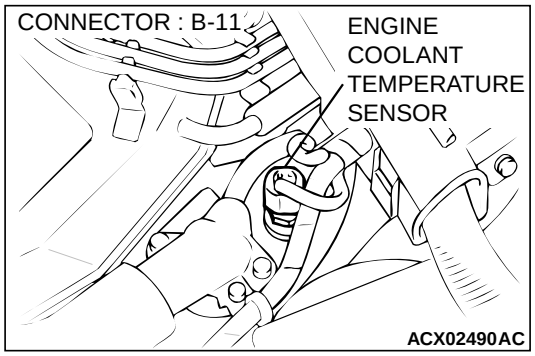
STEP 4. Check connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.

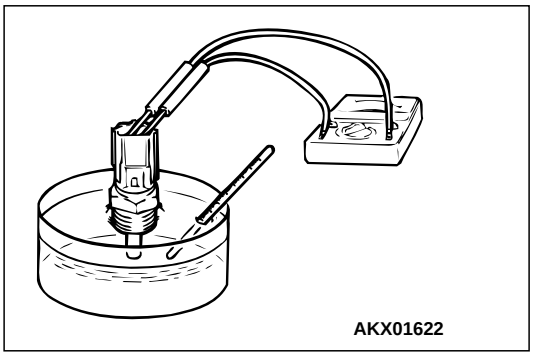
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.





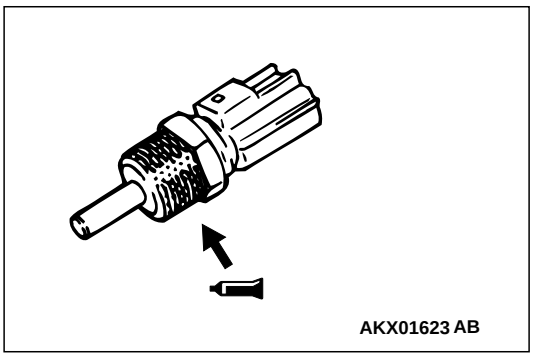
STEP 5. Check the engine coolant temperature sensor.

(1) Disconnect the engine coolant temperature sensor connector B-11.
(2) Remove the engine coolant temperature sensor.



(3) With the temperature sensing portion of engine coolant temperature sensor immersed in hot water, check resistance.

Standard value:
14 – 17 kΩ [at –20°C (–4°F)]
5.1 – 6.5 kΩ [at 0°C (32°F)]
2.1 – 2.7 kΩ [at 20°C (68°F)]
0.9 – 1.3 kΩ [at 40°C (104°F)]
0.48 – 0.68 kΩ [at 60°C (140°F)]
0.26 – 0.36 kΩ [at 80°C (176°F)]



(4) Apply 3M™ AAD part number 8731 or equivalent on the screw section of the engine coolant temperature sensor.
(5) Install the engine coolant temperature sensor, and tighten to the specified torque.

Tightening torque: 29 ± 10 N·m (22 ± 7 ft-lb)

Q: Is the resistance at the standard value?

YES : Replace the ECU or PCM. Then go to Step 6.
NO : Replace the engine coolant temperature sensor. Then go to Step 6.

STEP 6. Test the OBD-II drive cycle.

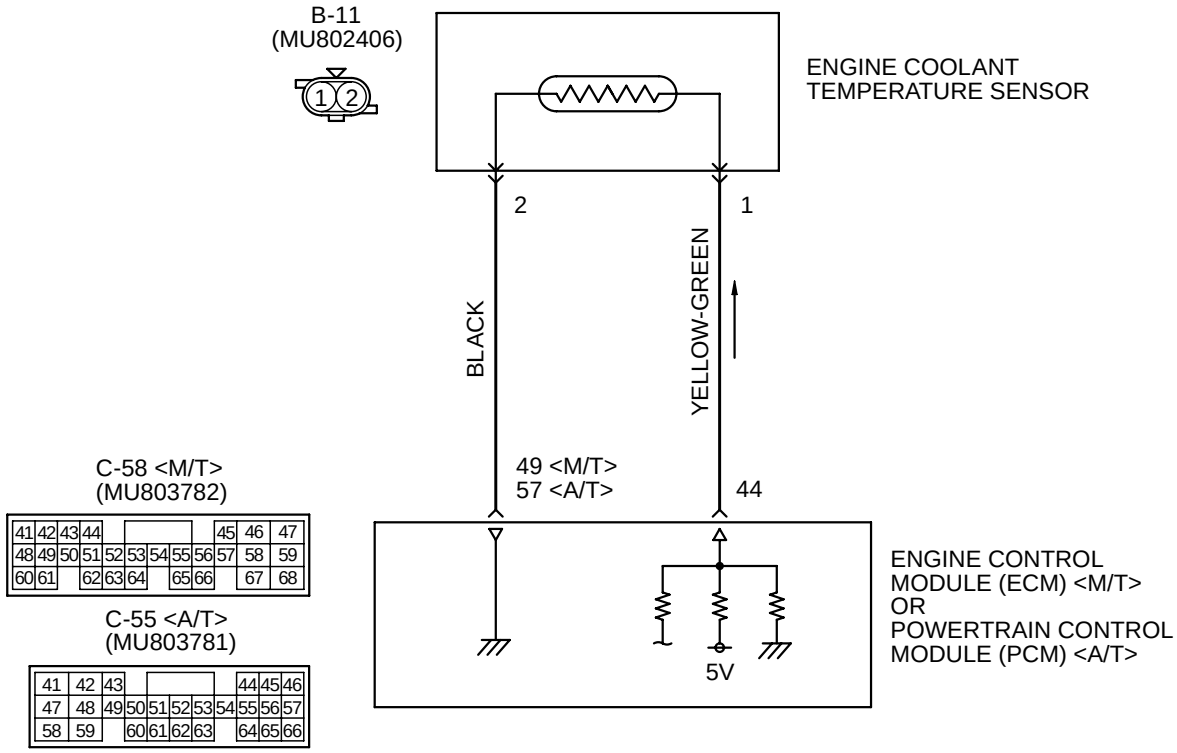
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0117 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0118: Engine Coolant Temperature Circuit High Input

Engine Coolant Temperature Sensor Circuit



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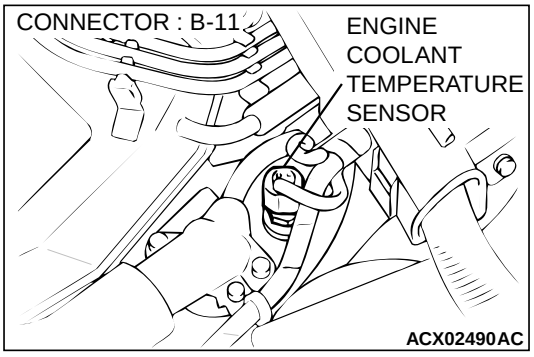
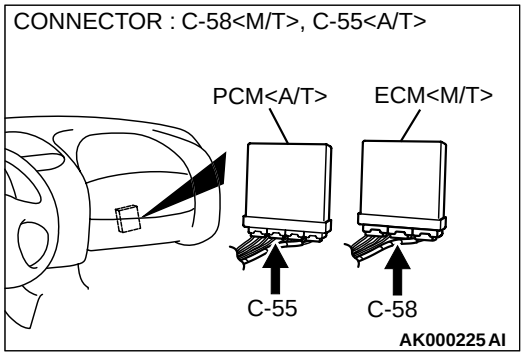




CIRCUIT OPERATION

- 5-volt voltage is applied to the engine coolant temperature sensor output terminal (terminal 1) from the ECM (terminal 44) <M/T> or PCM (terminal 44) <A/T> via the resistor in the ECM <M/T> or PCM <A/T>. The ground terminal (terminal 2) is grounded with ECM (terminal 49) <M/T> or (terminal 57) <A/T>.
- The engine coolant temperature sensor is a negative temperature coefficient type of resistor. It has the characteristic that when the engine coolant temperature rises the resistor decreases.
- The engine coolant temperature sensor output voltage increases when the resistor increases and decreases when the resistor decreases.

TSB Revision

TECHNICAL DESCRIPTION

- The engine coolant temperature sensor converts the engine coolant temperature to a voltage and output it.
- The ECM <M/T> or PCM <A/T> checks whether this voltage is within a specified range.

DTC SET CONDITIONS

Check Conditions

- 2 seconds or more have passed since the staring sequence was completed.

Judgement Criteria

- Engine coolant temperature sensor output voltage has continued to be 4.6 volts or higher [corresponding to a coolant temperature of –45°C (–113°F) or lower] for 2 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

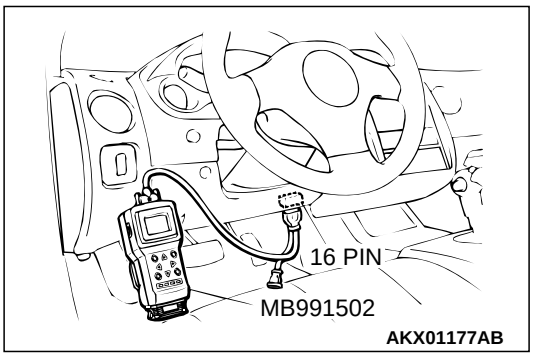
- Engine coolant temperature sensor failed.
- Open or shorted engine coolant temperature sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools

- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check data list item 21: Engine Coolant Temperature Sensor.



⚠ CAUTION

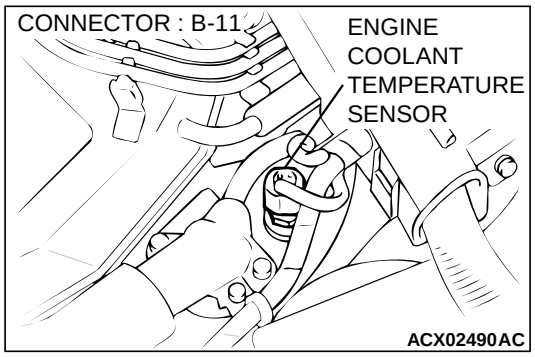
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 21, Engine Coolant Temperature Sensor.
  - The engine coolant temperature and temperature shown with the scan tool should approximately match.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

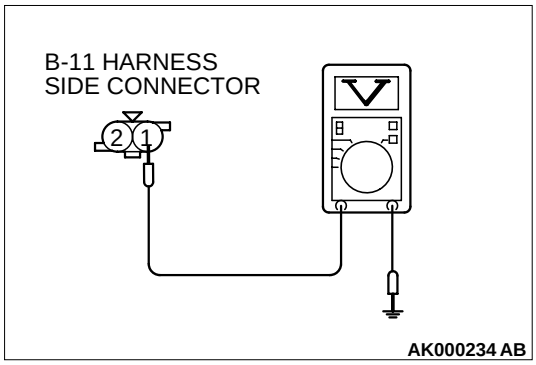
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Go to Step 2.

STEP 2. Check connector B-11 at the engine coolant temperature sensor for damage.



Q: Is the connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.



STEP 3. Check the sensor supply voltage at engine coolant temperature sensor harness side connector B-11.

(1) Disconnect the connector B-11 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 1 and ground.
- Voltage should be between 4.5 and 4.9 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 7.
NO : Go to Step 4.

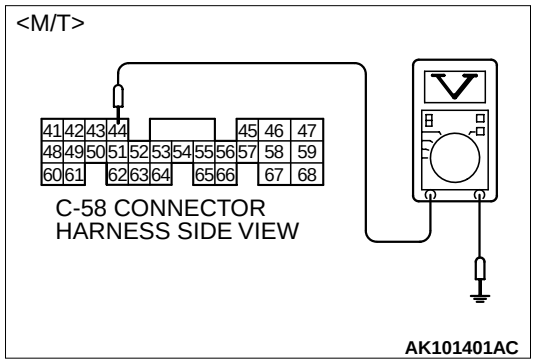
STEP 4. Check the sensor supply voltage at ECM connector C-58 <M/T> or PCM connector C-55 <A/T> by backprobing.

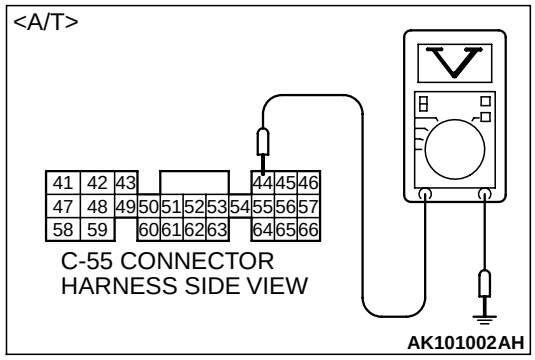
(1) Do not disconnect the ECM connector C-58 <M/T> or PCM connector C-55 <A/T>.
(2) Disconnect the engine coolant temperature sensor connector B-11.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the voltage between terminal 44 and ground by backprobing.
- Voltage should be between 4.5 and 4.9 volts.

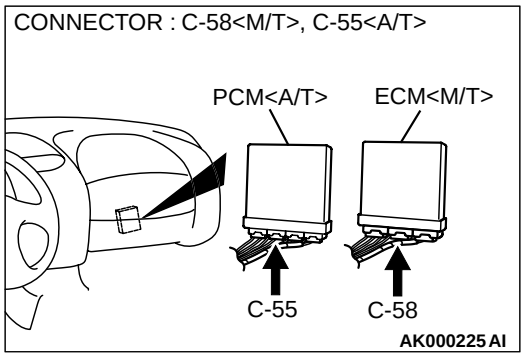
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 5.
NO : Go to Step 6.





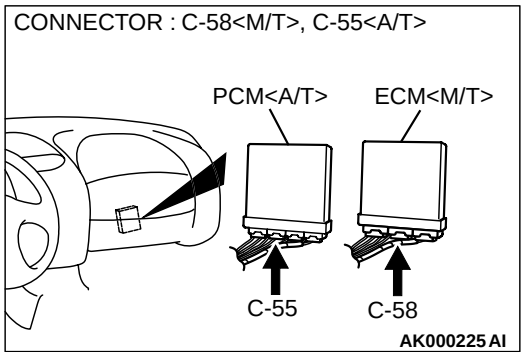


STEP 5. Check connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between engine coolant temperature sensor connector B-11 and ECM connector C-58 <M/T> or PCM connector C-55 <A/T> because of open circuit. Then go to Step 11.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

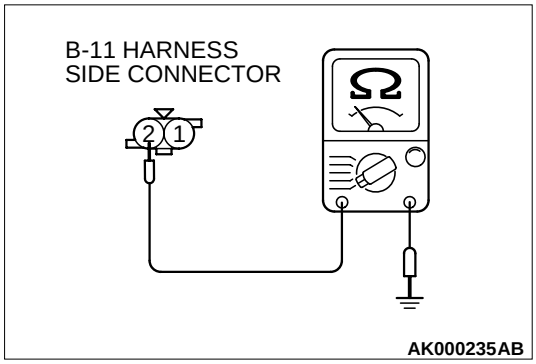


STEP 6. Check connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Replace the ECM or PCM. Then go to Step 11.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.



STEP 7. Check the continuity at engine coolant temperature sensor harness side connector B-11.

(1) Disconnect the connector B-11 and measure at the harness side.

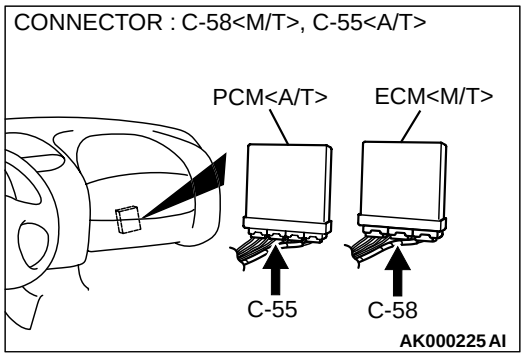
(2) Check for the continuity between terminal 2 and ground.

- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 10.

NO : Go to Step 8.

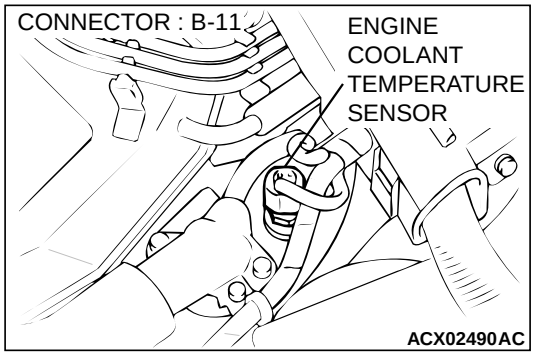


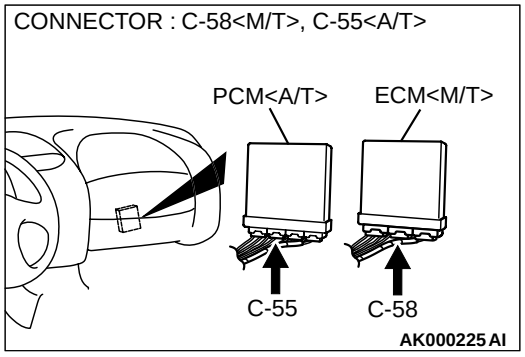
STEP 8. Check connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.



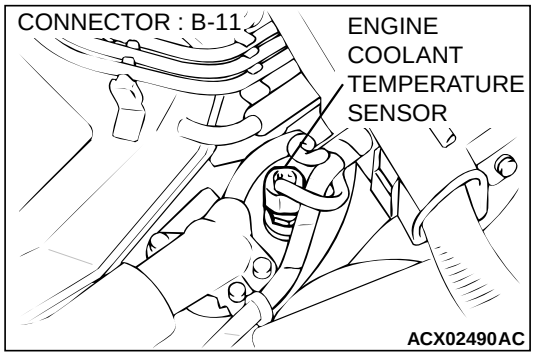


STEP 9. Check for open circuit between engine coolant sensor connector B-11 terminal 2 and ECM connector C-58 terminal 49 <M/T> or PCM connector C-55 terminal 57 <A/T>.

Q: Is the harness wire in good condition?

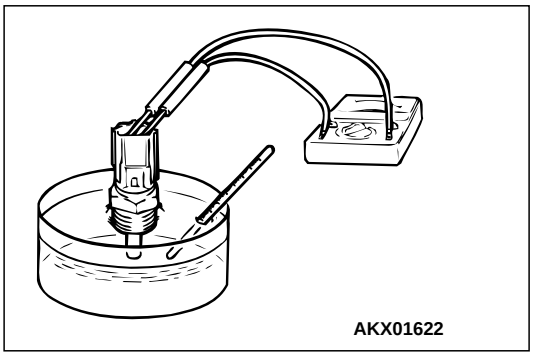
YES : Replace the ECM or PCM. Then go to Step 11.

NO : Repair it. Then go to Step 11.



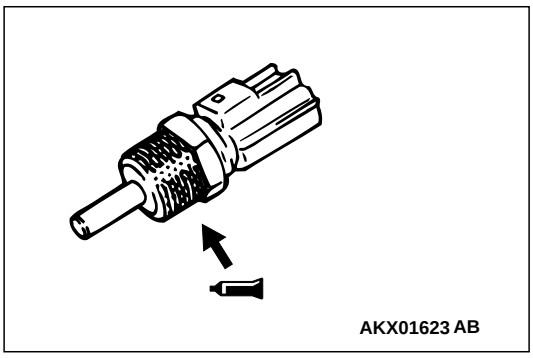
STEP 10. Check the engine coolant temperature sensor.

(1) Disconnect the engine coolant temperature sensor connector B-11.
(2) Remove the engine coolant temperature sensor.



(3) With the temperature sensing portion of engine coolant temperature sensor immersed in hot water, check resistance.

Standard value:
14 – 17 kΩ [at –20°C (–4°F)]
5.1 – 6.5 kΩ [at 0°C (32°F)]
2.1 – 2.7 kΩ [at 20°C (68°F)]
0.9 – 1.3 kΩ [at 40°C (104°F)]
0.48 – 0.68 kΩ [at 60°C (140°F)]
0.26 – 0.36 kΩ [at 80°C (176°F)]



(4) Apply 3M™ AAD part number 8731 or equivalent on the screw section of the engine coolant temperature sensor.
(5) Install the engine coolant temperature sensor, and tighten to the specified torque.

Tightening torque: 29 ± 10 N·m (22 ± 7 ft-lb)

Q: Is the resistance at the standard value?

YES : Replace the ECU or PCM. Then go to Step 11.
NO : Replace the engine coolant temperature sensor. Then go to Step 11.

STEP 11. Test the OBD-II drive cycle.

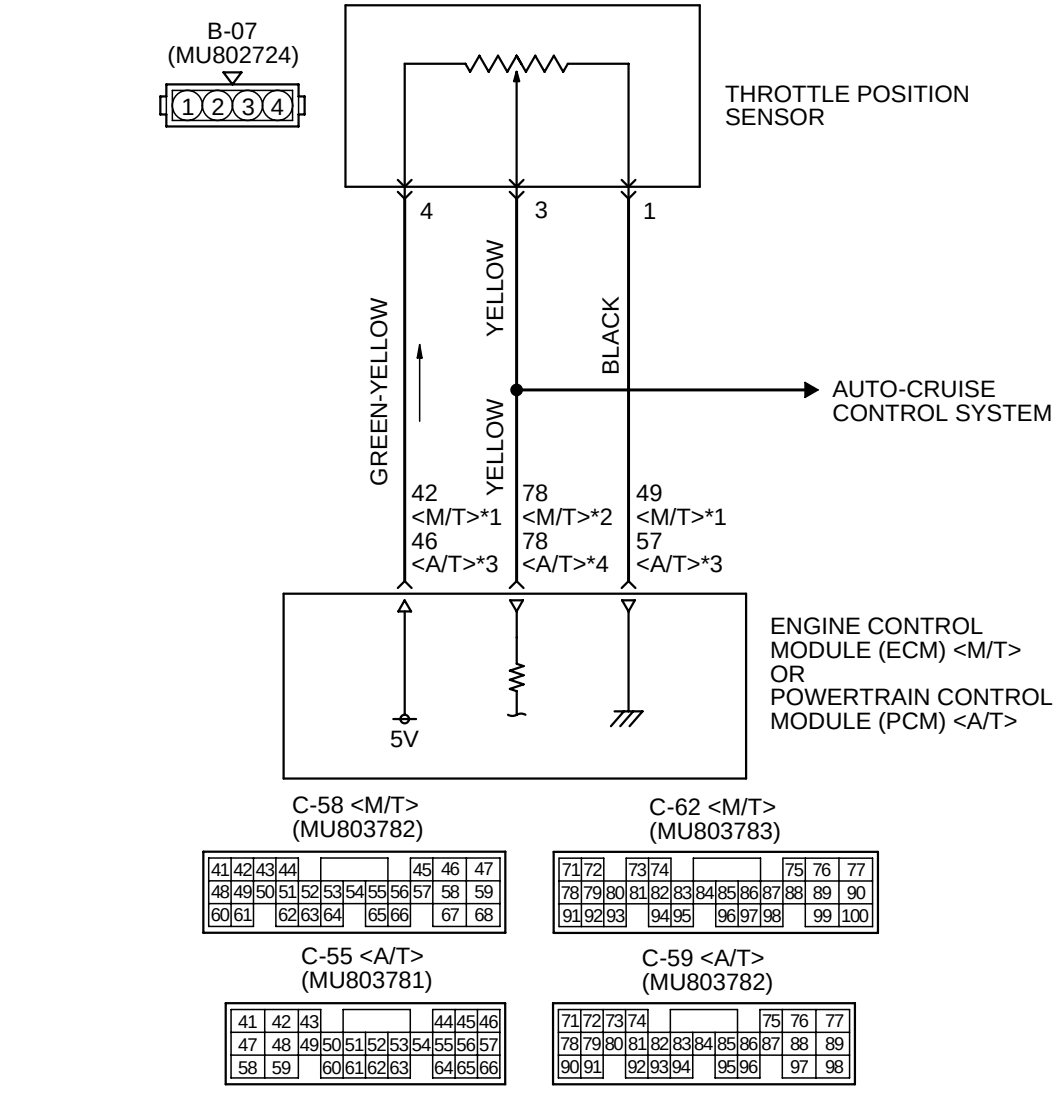
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0118 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0121: Throttle Position Sensor Circuit Range/Performance Problem

Throttle Position Sensor (TPS) Circuit



NOTE
*1:ECM connector C-58 <M/T>
*2:ECM connector C-62 <M/T>
*3:PCM connector C-55 <A/T>
*4:PCM connector C-59 <A/T>

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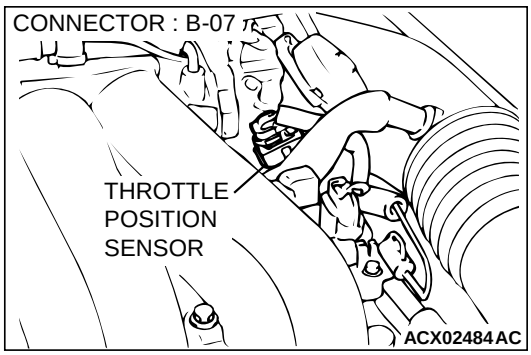
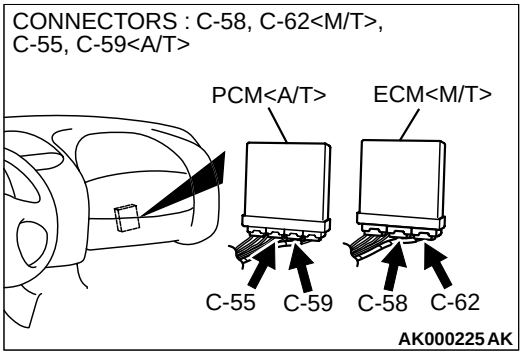




TSB Revision

CIRCUIT OPERATION

- A 5-volt power supply is applied on the TPS power terminal (terminal 4) from the ECM (terminal 42) <M/T> or PCM (terminal 46) <A/T>. The ground terminal (terminal 1) is grounded with ECM (terminal 49) <M/T> or PCM (terminal 57) <A/T>.
- When the throttle valve shaft is turned from the idle position to the fully opened position, the resistor between the TPS output terminal (terminal 3) and ground terminal will increase according to the rotation.

TECHNICAL DESCRIPTION

- The TPS outputs voltage which corresponds to the throttle valve opening angle.
- The ECM <M/T> or PCM <A/T> checks whether the voltage is within a specified range.

DTC SET CONDITIONS

Check Conditions

- 2 seconds or more have passed since the staring sequence was completed.
- Engine speed is higher than 2,000 r/min.
- Volumetric efficiency is higher than 60 percent.

Judgement Criteria

- TPS output voltage has continued to be 0.8 volt or lower for 2 seconds.

Check Conditions

- 2 seconds or more have passed since the staring sequence was completed.
- Engine speed is lower than 3,000 r/min.
- Volumetric efficiency is lower than 30 percent.

Judgement Criteria

- TPS output voltage has continued to be 4.6 volts or higher for 2 seconds.

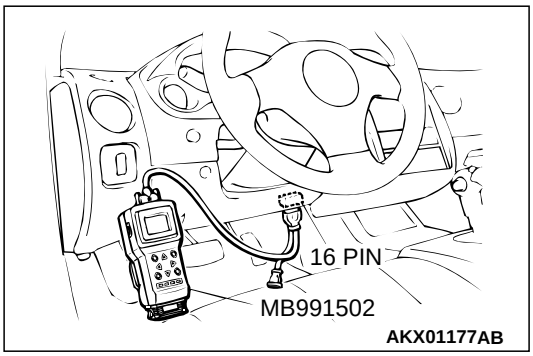
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- TPS failed or maladjusted.
- Open or shorted TPS circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 14: Throttle Position Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

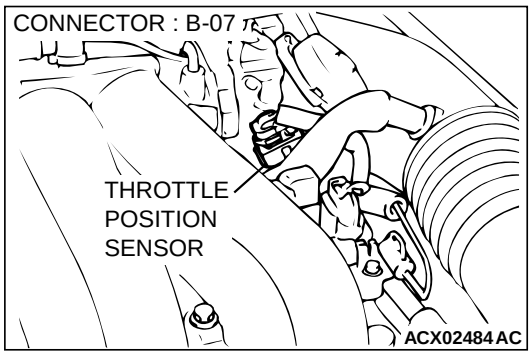
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 14, Throttle Position Sensor.
  - With the throttle valve in the idle position, voltage should be between 0.535 and 0.735 volt.
  - With the throttle valve in the full-open position, voltage should be between 4.5 and 5.5 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

NO : Go to Step 2.

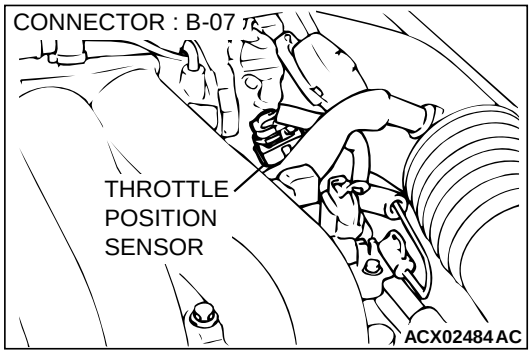


STEP 2. Check connector B-07 at throttle position sensor for damage.

Q: Is the connector in good condition?

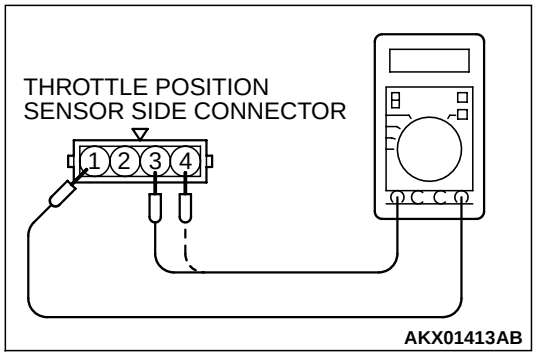
YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP3. Check the throttle position sensor.

(1) Disconnect the connector B-07.



(2) Measure the resistance between throttle position sensor side connector terminal 1 and 4.

Standard value: 3.5 – 6.5 kΩ

(3) Measure resistance between the throttle position sensor side connector terminal 1 and 3.

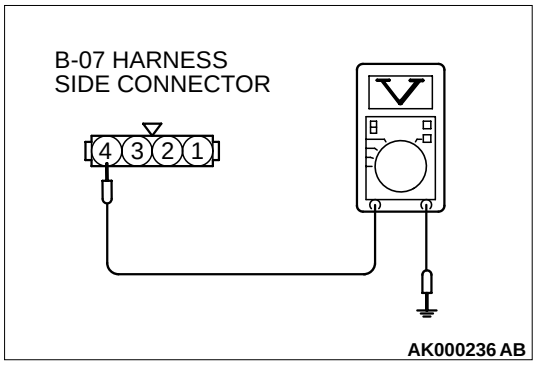
(4) Move the throttle valve from the idle position to the full-open position.

- Resistance should change smoothly in proportion to the opening angle of the throttle valve.

Q: Is the resistance normal?

YES : Go to Step 4.

NO : Replace the throttle position sensor. Refer to P.13B-690, Throttle Body. Then go to Step 14.



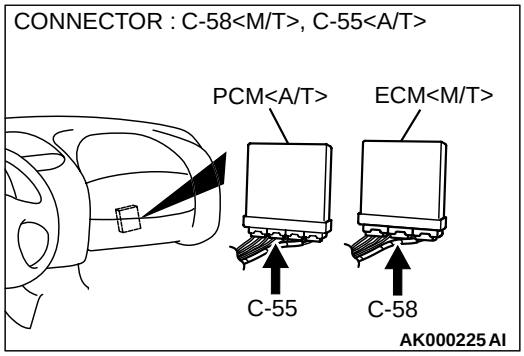
STEP 4. Check the sensor supply voltage at throttle position sensor harness side connector B-07.

(1) Disconnect the connector B-07 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 4 and ground.
- Voltage should be between 4.8 and 5.2 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 7.
NO : Go to Step 5.

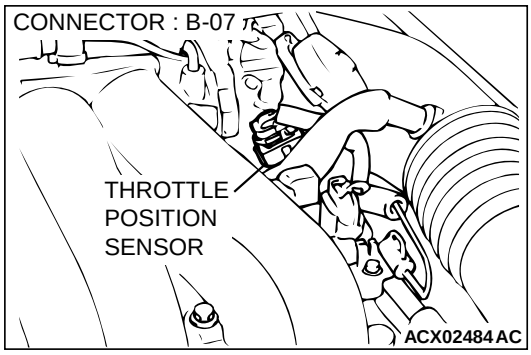


STEP 5. Check connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

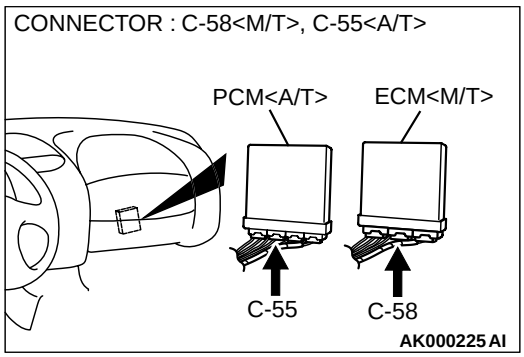
YES : Go to Step 6.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

STEP 6. Check for harness damage between throttle position sensor connector B-07 terminal 4 and ECM connector C-58 terminal 42 <M/T> or PCM connector C-55 terminal 46 <A/T>.



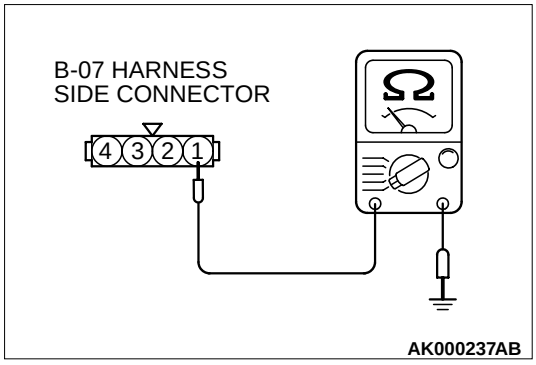
Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 14.
NO : Repair it. Then go to Step 14.



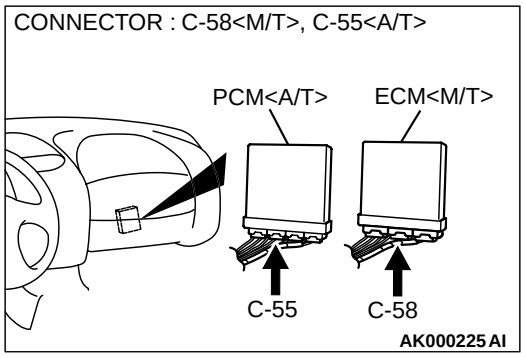
STEP 7. Check the continuity at throttle position sensor harness side connector B-07.

(1) Disconnect the connector B-07 and measure at the harness side.
(2) Measure the continuity between terminal 1 and ground.
- Should be less than 2 ohm.



Q: Is the continuity normal?

YES : Go to Step 10.
NO : Go to Step 8.

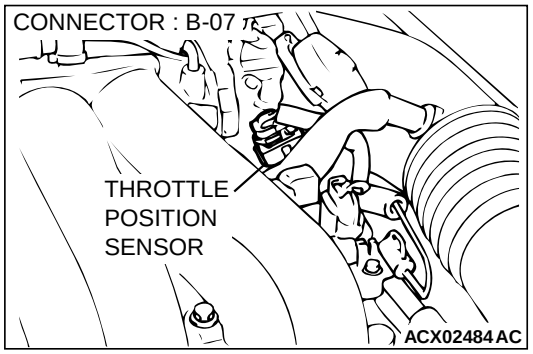


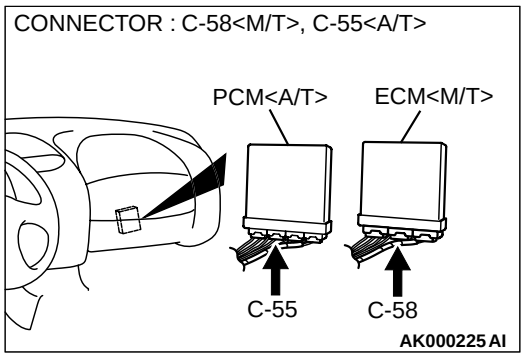
STEP 8. Check connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



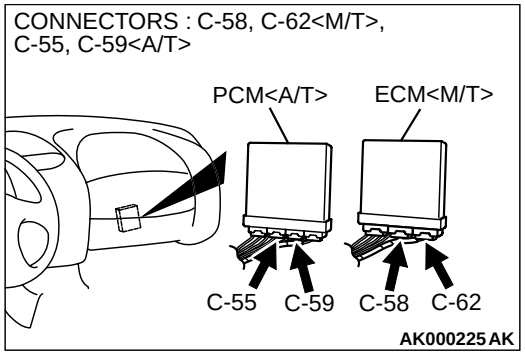


STEP 9. Check for open circuit and harness damage between throttle position sensor connector B-07 terminal 1 and ECM connector C-58 terminal 49 <M/T> or PCM connector C-55 terminal 57 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 14.

NO : Repair it. Then go to Step 14.



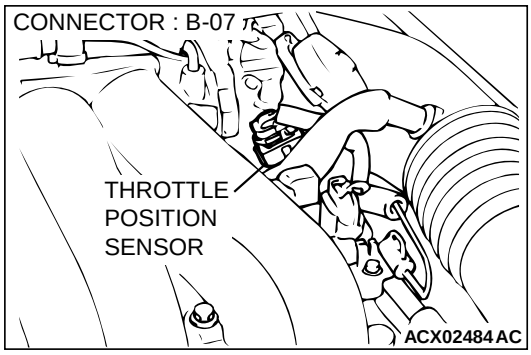
STEP 10. Check connector C-58, C-62 at ECM <M/T> or connector C-55, C-59 at PCM <A/T> for damage.

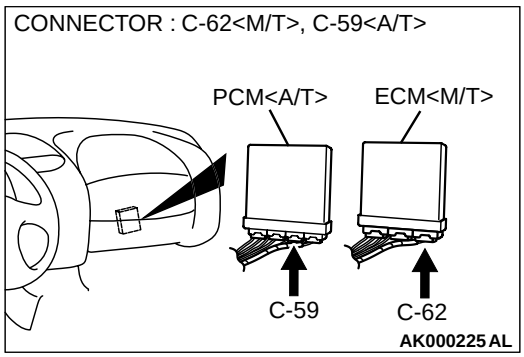
Q: Is the connector in good condition?

YES : Go to Step 11.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

TSB Revision





STEP 11. Check for harness damage between throttle position sensor connector B-07 terminal 3 and ECM connector C-62 terminal 78 <M/T> or PCM connector C-59 terminal 78 <A/T>.

Q: Is the harness wire in good condition?

YES : Go to Step 12.

NO : Repair it. Then go to Step 14.

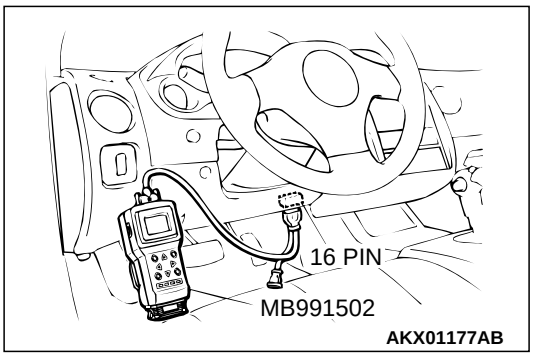
STEP 12. Check the maladjusted throttle position sensor.

Refer to, Throttle Position Sensor Adjustment P.13B-677.

Q: Is the output voltage normal?

YES : Go to Step 13.

NO : Adjust it. Then go to Step 14.



STEP 13. Using scan tool MB991502, check data list item 14: Throttle Position Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 14, Throttle Position Sensor.
- With the throttle valve in the idle position, voltage should be between 0.535 and 0.735 volt.
- With the throttle valve in the full-open position, voltage should be between 4.5 and 5.5 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Replace the ECM or PCM. Then go to Step 14.

STEP 14. Test the OBD-II drive cycle.

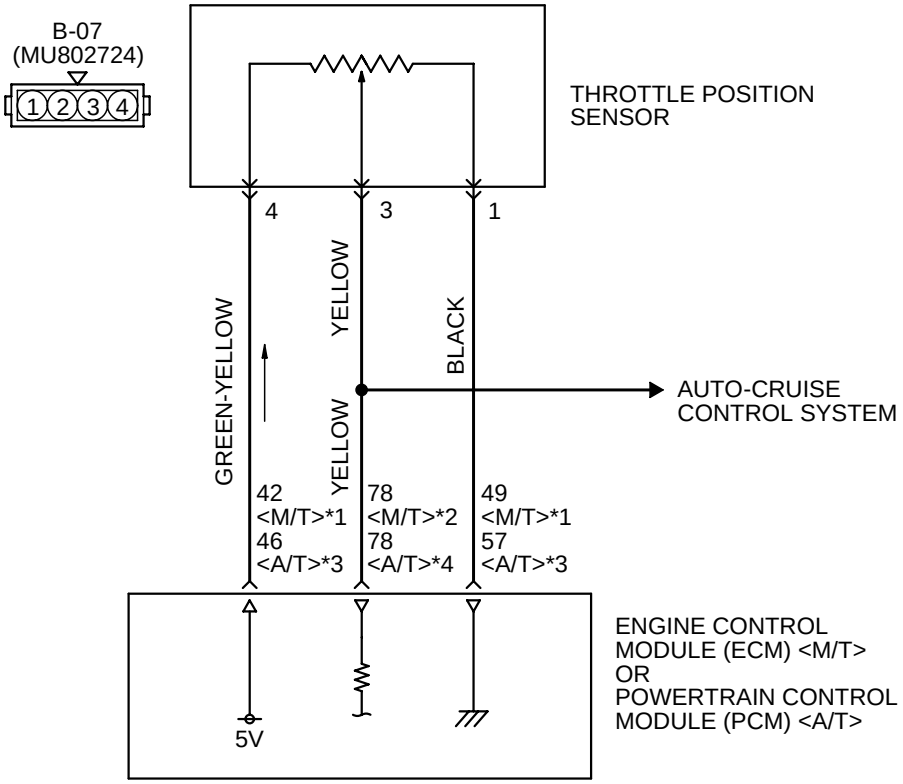
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0121 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0122: Throttle Position Sensor Circuit Low Input

Throttle Position Sensor (TPS) Circuit



C-58 <M/T> (MU803782)

41	42	43	44					45	46	47	
48	49	50	51	52	53	54	55	56	57	58	59
60	61		62	63	64		65	66		67	68

C-62 <M/T> (MU803783)

71	72		73	74					75	76	77
78	79	80	81	82	83	84	85	86	87	88	89	90
91	92	93		94	95		96	97	98		99	100

C-55 <A/T> (MU803781)

41	42	43				44	45	46		
47	48	49	50	51	52	53	54	55	56	57
58	59		60	61	62	63		64	65	66

C-59 <A/T> (MU803782)

71	72	73	74					75	76	77	
78	79	80	81	82	83	84	85	86	87	88	89
90	91		92	93	94		95	96		97	98

NOTE
*1:ECM connector C-58 <M/T>
*2:ECM connector C-62 <M/T>
*3:PCM connector C-55 <A/T>
*4:PCM connector C-59 <A/T>

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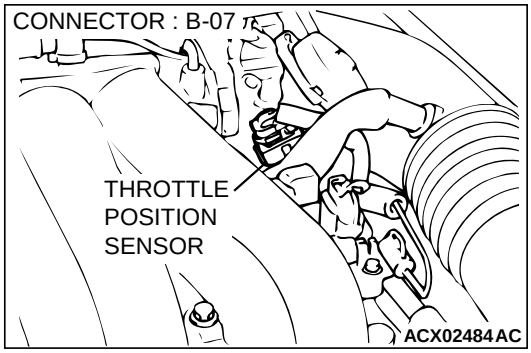
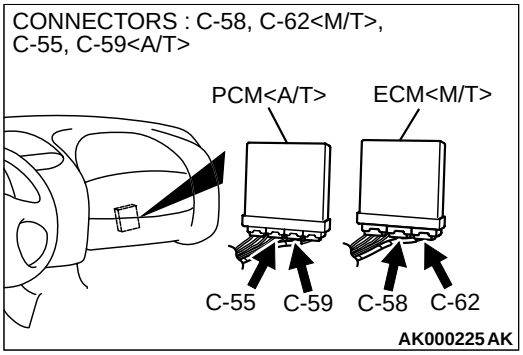




TSB Revision

CIRCUIT OPERATION

- A 5-volt power supply is applied on the TPS power terminal (terminal 4) from the ECM (terminal 42) <M/T> or PCM (terminal 46) <A/T>. The ground terminal (terminal 1) is grounded with ECM (terminal 49) <M/T> or PCM (terminal 57) <A/T>.
- When the throttle valve shaft is turned from the idle position to the fully opened position, the resistor between the TPS output terminal (terminal 3) and ground terminal will increase according to the rotation.

TECHNICAL DESCRIPTION

- The TPS outputs voltage which corresponds to the throttle valve opening angle.
- The ECM <M/T> or PCM <A/T> checks whether the voltage is within a specified range. In addition, it checks that the voltage output does not become too high while the engine is at idle.

DTC SET CONDITIONS

Check Conditions

- 2 seconds or more have passed since the starting sequence was completed.

Judgement Criteria

- TPS output voltage has continued to be 0.2 volt or lower for 2 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- TPS failed or maladjusted.
- Open or shorted TPS circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools

- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check data list item 14: Throttle Position Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

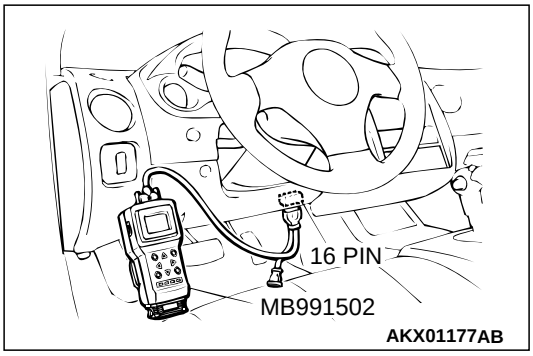
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 14, Throttle Position Sensor.
  - With the throttle valve in the idle position, voltage should be between 0.535 and 0.735 volt.
  - With the throttle valve in the full-open position, voltage should be between 4.5 and 5.5 volts.

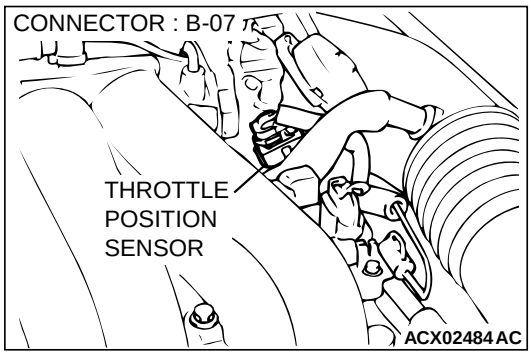
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

NO : Go to Step 2.



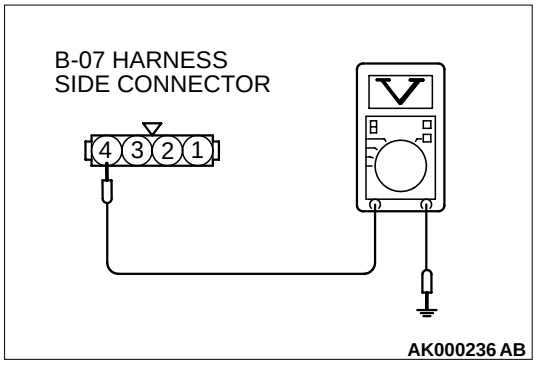


STEP 2. Check connector B-07 at throttle position sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.



STEP 3. Check the sensor supply voltage at throttle position sensor harness side connector B-07.

(1) Disconnect the connector B-07 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between terminal 4 and ground.

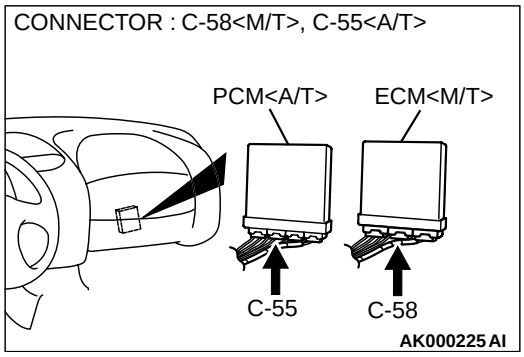
- Voltage should be between 4.8 and 5.2 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 6.

NO : Go to Step 4.



STEP 4. Check connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.

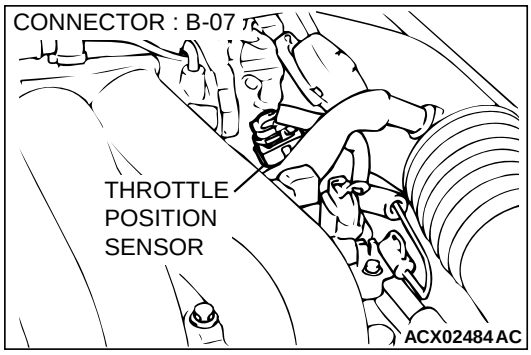
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

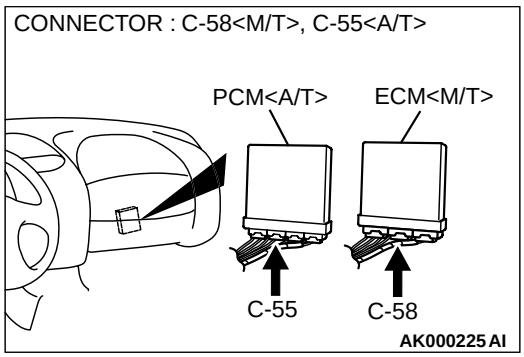
STEP 5. Check for open circuit and short circuit to ground between throttle position sensor connector B-07 terminal 4 and ECM connector C-58 terminal 42 <M/T> or PCM connector C-55 terminal 46 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 11.

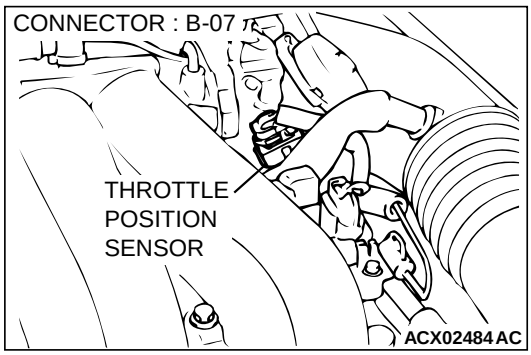
NO : Repair it. Then go to Step 11.

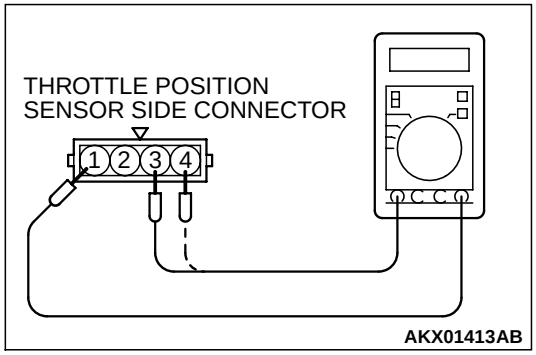




STEP 6. Check the throttle position sensor.

(1) Disconnect the connector B-07.





(2) Measure the resistance between throttle position sensor side connector terminal 1 and 4.

Standard value: 3.5 – 6.5 kΩ

(3) Measure resistance between the throttle position sensor side connector terminal 1 and 3.

(4) Move the throttle valve from the idle position to the full-open position.

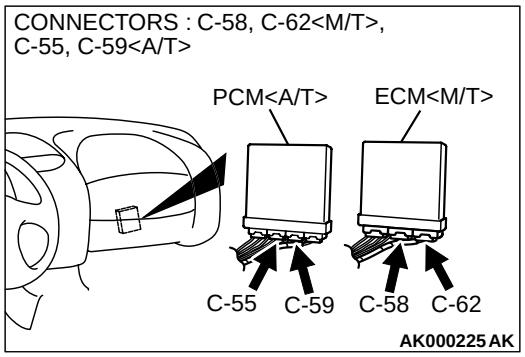
- Resistance should change smoothly in proportion to the opening angle of the throttle valve.

Q: Is the resistance normal?

YES : Go to Step 7.

NO : Replace the throttle position sensor. Refer to P.13B-690, Throttle Body. Then go to Step 11.

TSB Revision

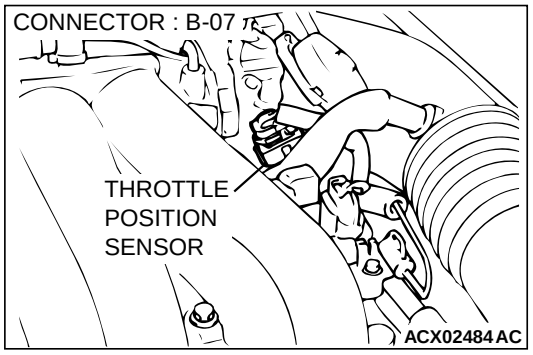


STEP 7. Check connector C-58, C-62 at ECM <M/T> or connector C-55, C-59 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

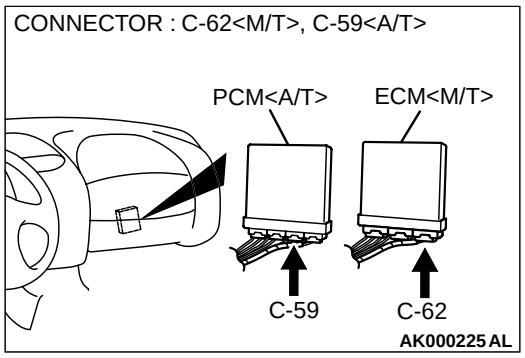


STEP 8. Check for open circuit and short circuit to ground between throttle position sensor connector B-07 terminal 3 and ECM connector C-62 terminal 78 <M/T> or PCM connector C-59 terminal 78 <A/T>.

Q: Is the harness wire in good condition?

YES : Go to Step 9.

NO : Repair it. Then go to Step 11.



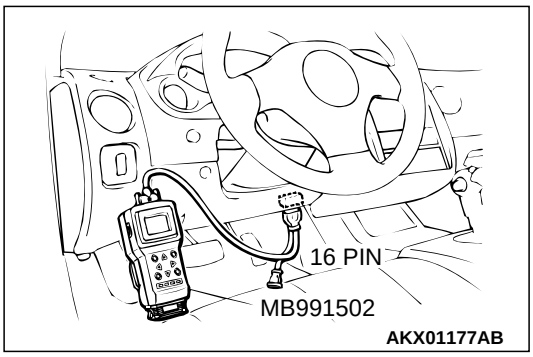
STEP 9. Check for short circuit to ground between throttle position sensor connector and auto-cruise control-ECU.

Refer to GROUP 17, Auto Cruise Control System – Diagnostic Trouble Code Chart P.17-11.

Q: Is the harness wire in good condition?

YES : Go to Step 10.

NO : Repair it. Then go to Step 11.



STEP 10. Using scan tool MB991502, check data list item 14: Throttle Position Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 14, Throttle Position Sensor.
- With the throttle valve in the idle position, voltage should be between 0.535 and 0.735 volt.
- With the throttle valve in the full-open position, voltage should be between 4.5 and 5.5 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Replace the ECM or PCM. Then go to Step 11.

STEP 11. Test the OBD-II drive cycle.

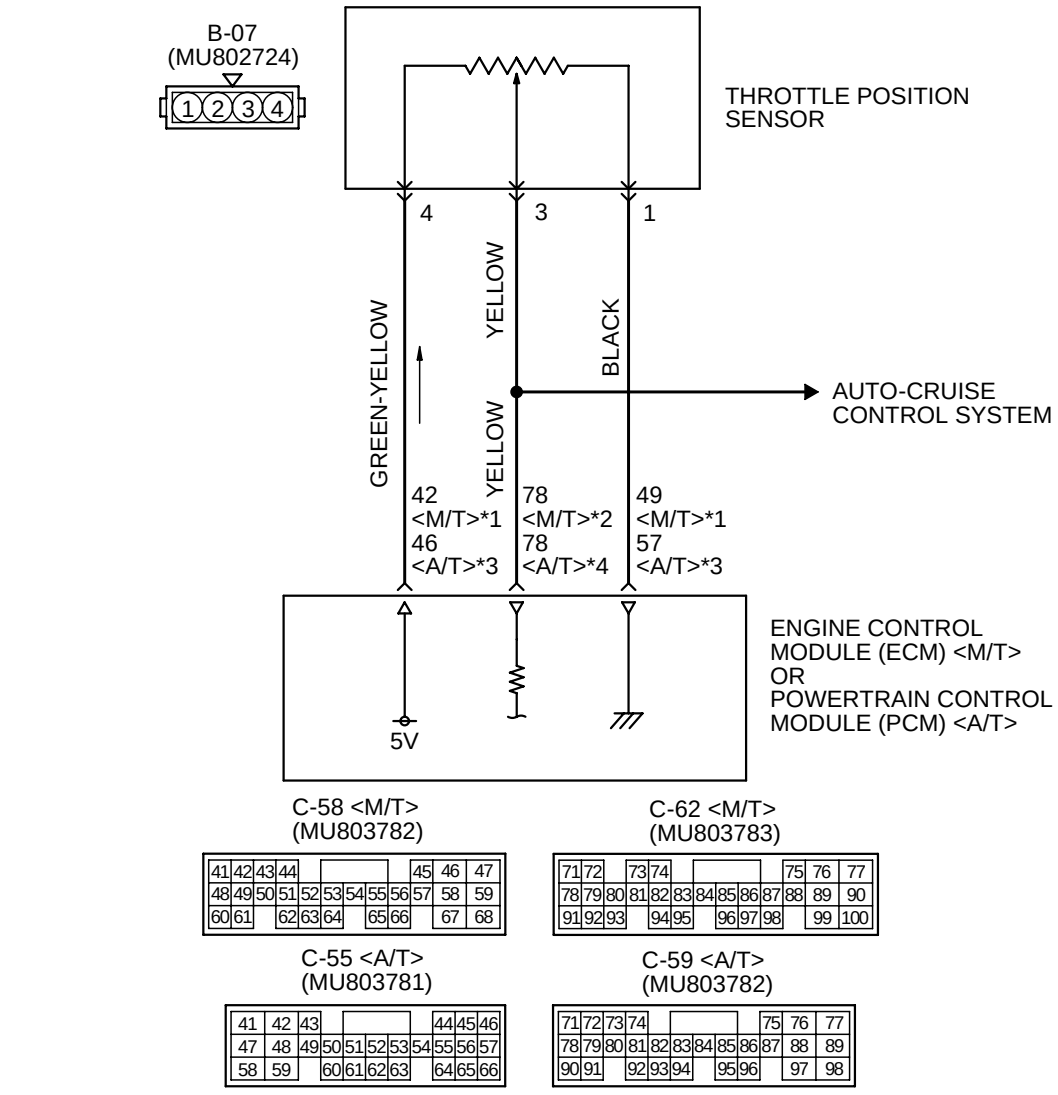
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0122 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0123: Throttle Position Sensor Circuit High Input

Throttle Position Sensor (TPS) Circuit



NOTE
*1:ECM connector C-58 <M/T>
*2:ECM connector C-62 <M/T>
*3:PCM connector C-55 <A/T>
*4:PCM connector C-59 <A/T>

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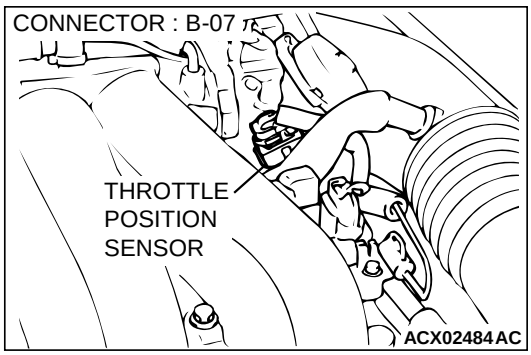

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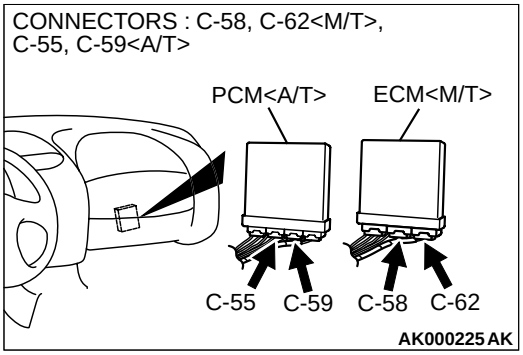

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TSB Revision

CIRCUIT OPERATION

- A 5-volt power supply is applied on the TPS power terminal (terminal 4) from the ECM (terminal 42) <M/T> or PCM (terminal 46) <A/T>. The ground terminal (terminal 1) is grounded with ECM (terminal 49) <M/T> or PCM (terminal 57) <A/T>.
- When the throttle valve shaft is turned from the idle position to the fully opened position, the resistor between the TPS output terminal (terminal 3) and ground terminal will increase according to the rotation.

TECHNICAL DESCRIPTION

- The TPS outputs voltage which corresponds to the throttle valve opening angle.
- The ECM <M/T> or PCM <A/T> checks whether the voltage is within a specified range. In addition, it checks that the voltage output does not become too high while the engine is at idle.

DTC SET CONDITIONS

Check Conditions

- 2 seconds or more have passed since the starting sequence was completed.
- Engine speed is lower than 1,000 r/min.
- Volumetric efficiency is lower than 60 percent.

Judgement Criteria

- TPS output voltage has continued to be 2 volts or higher for 2 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- TPS failed or maladjusted.
- Open or shorted TPS circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

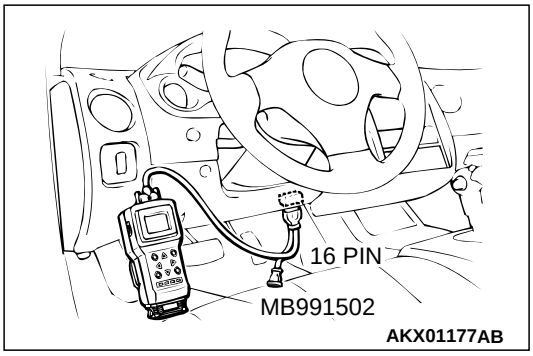
Required Special Tools

- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check data list item 14: Throttle Position Sensor.

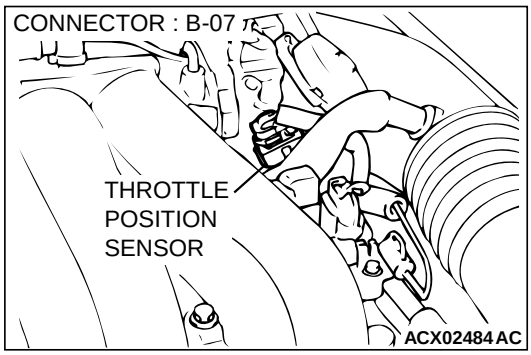
⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 14, Throttle Position Sensor.
  - With the throttle valve in the idle position, voltage should be between 0.535 and 0.735 volt.
  - With the throttle valve in the full-open position, voltage should be between 4.5 and 5.5 volts.
(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Go to Step 2.

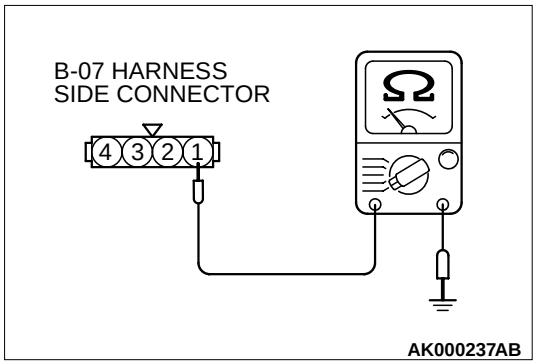


STEP 2. Check connector B-07 at throttle position sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.



STEP 3. Check the continuity at throttle position sensor harness side connector B-07.

(1) Disconnect the connector B-07 and measure at the harness side.

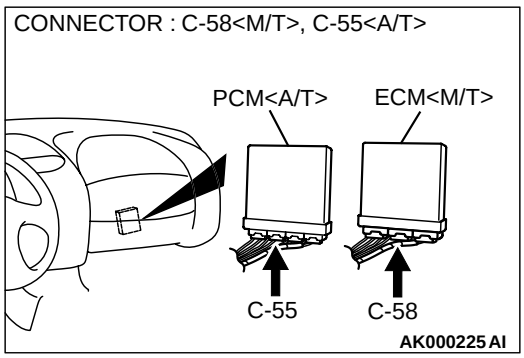
(2) Measure the continuity between terminal 1 and ground.

- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 6.

NO : Go to Step 4.



STEP 4. Check connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.

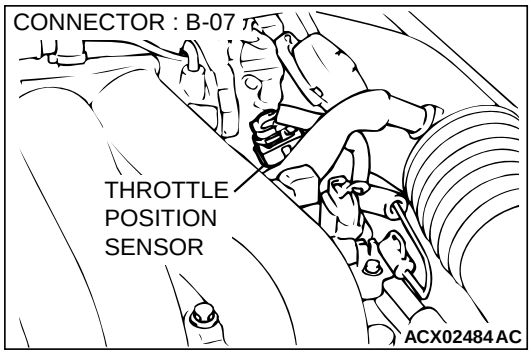
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.

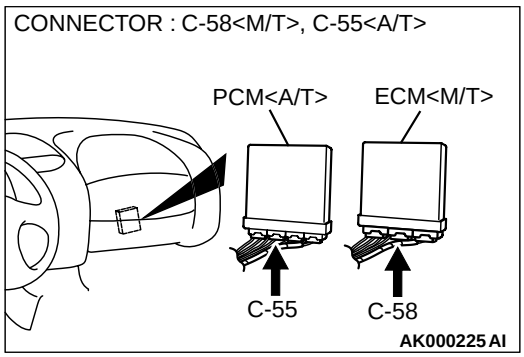
STEP 5. Check for open circuit and harness damage between throttle position sensor connector B-07 terminal 1 and ECM connector C-58 terminal 49 <M/T> or PCM connector C-55 terminal 57 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 8.

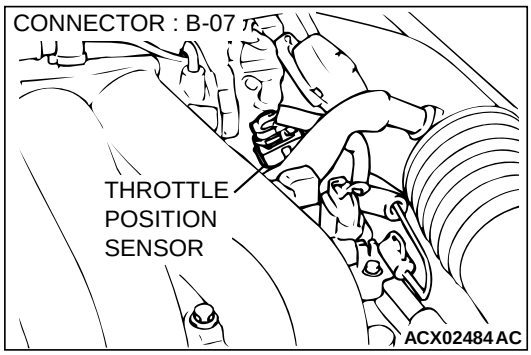
NO : Repair it. Then go to Step 8.

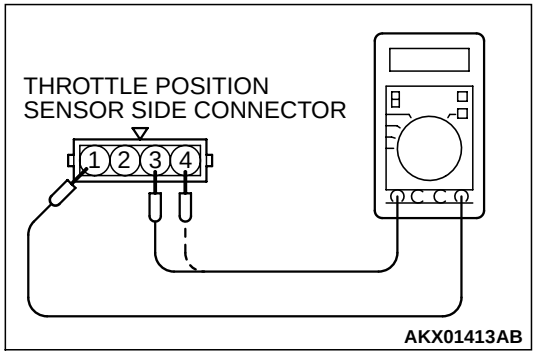




STEP 6. Check the throttle position sensor.

(1) Disconnect the connector B-07.





(2) Measure the resistance between throttle position sensor side connector terminal 1 and 4.

Standard value: 3.5 – 6.5 kΩ

(3) Measure resistance between the throttle position sensor side connector terminal 1 and 3.

(4) Move the throttle valve from the idle position to the full-open position.

- Resistance should change smoothly in proportion to the opening angle of the throttle valve.

Q: Is the resistance normal?

YES : Go to Step 7.

NO : Replace the throttle position sensor. Refer to P.13B-690, Throttle Body. Then go to Step 8.

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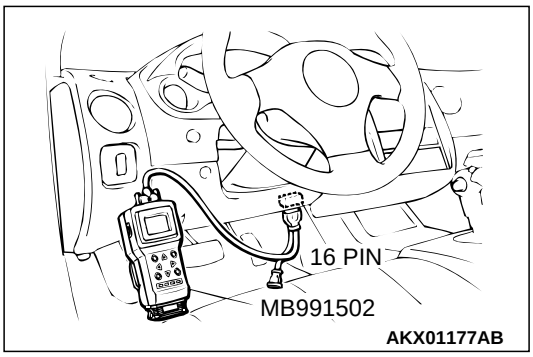


STEP 7. Using scan tool MB991502, check data list item 14: Throttle Position Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 14, Throttle Position Sensor.
- With the throttle valve in the idle position, voltage should be between 0.535 and 0.735 volt.
- With the throttle valve in the full-open position, voltage should be between 4.5 and 5.5 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Replace the ECM or PCM. Then go to Step 8.

STEP 8. Test the OBD-II drive cycle.

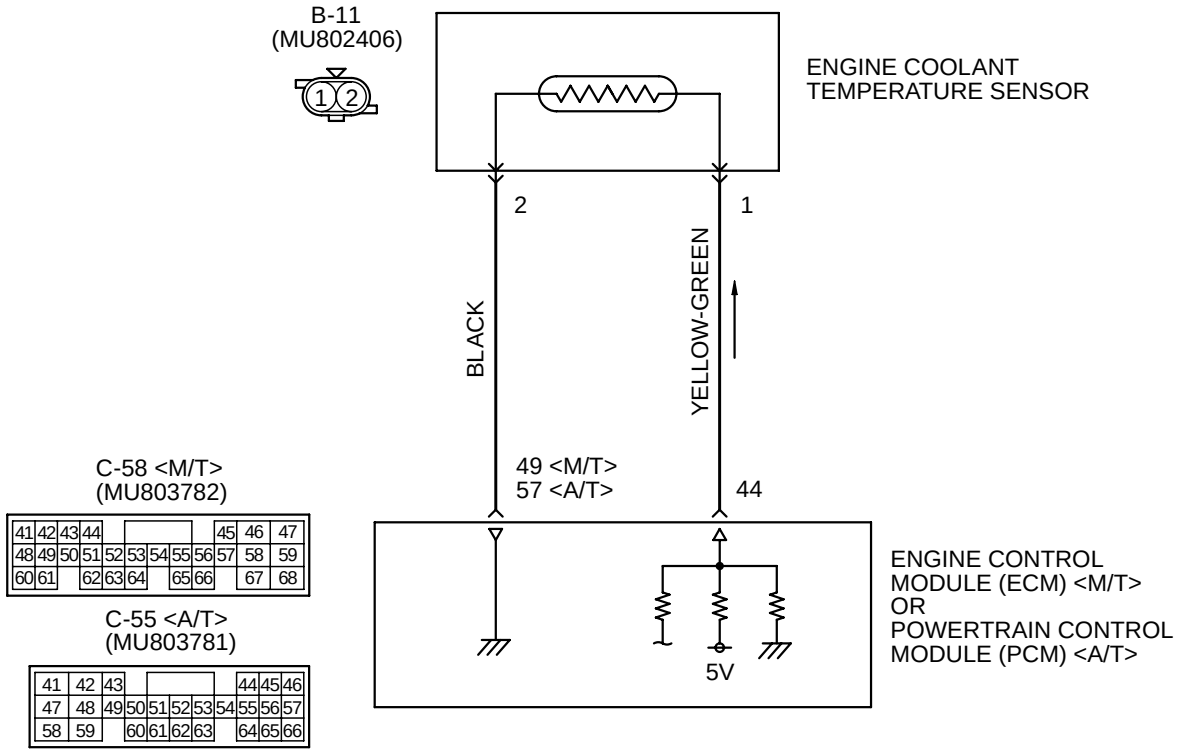
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0123 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0125: Insufficient Coolant Temperature for Closed Loop Fuel Control

Engine Coolant Temperature Sensor Circuit



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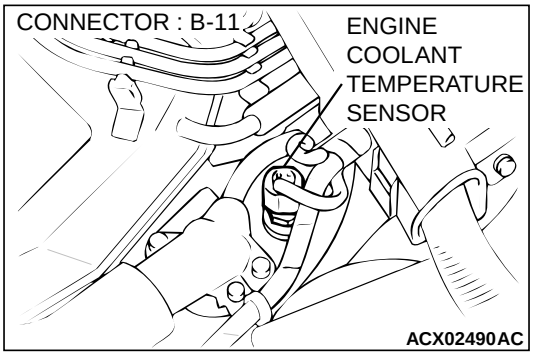

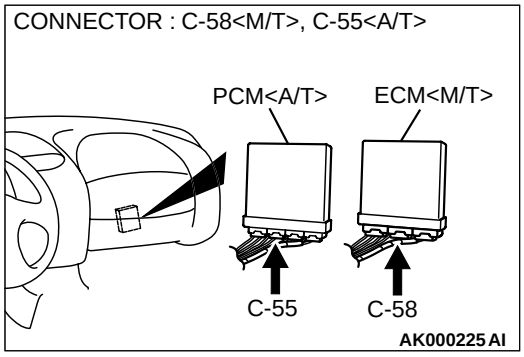

CIRCUIT OPERATION

- 5-volt voltage is applied to the engine coolant temperature sensor output terminal (terminal 1) from the ECM (terminal 44) <M/T> or PCM (terminal 44) <A/T> via the resistor in the ECM <M/T> or PCM <A/T>. The ground terminal (terminal 2) is grounded with ECM (terminal 49) <M/T> or (terminal 57) <A/T>.
- The engine coolant temperature sensor is a negative temperature coefficient type of resistor. It has the characteristic that when the engine coolant temperature rises the resistor decreases.
- The engine coolant temperature sensor output voltage increases when the resistor increases and decreases when the resistor decreases.

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TECHNICAL DESCRIPTION

- The engine coolant temperature sensor converts the engine coolant temperature to a voltage and output it.
- The ECM <M/T> or PCM <A/T> checks whether this voltage is within a specified range.

DTC SET CONDITIONS

Check Conditions, Judgement Criteria

- Engine coolant temperature decreases from higher than 40°C (104°F) to lower than 40°C (104°F).
- Then the engine coolant temperature has continued to be 40°C (104°F) or lower for 5 minutes.

Check Conditions, Judgement Criteria

- About 60 – 300 seconds have passed for the engine coolant temperature to rise to about 7°C (45°F) after starting sequence was completed.
- However, time is not counted when fuel is shut off.

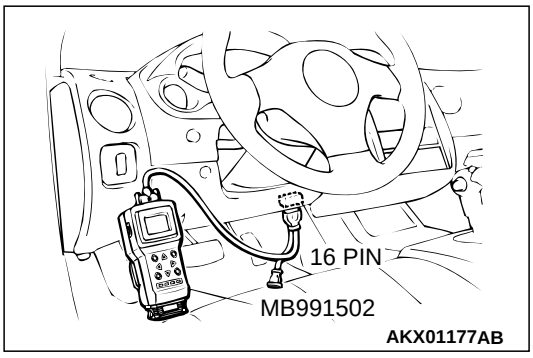
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Engine coolant temperature sensor failed.
- Open or shorted engine coolant temperature sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools

- MB991502: Scan Tool (MUT-II)



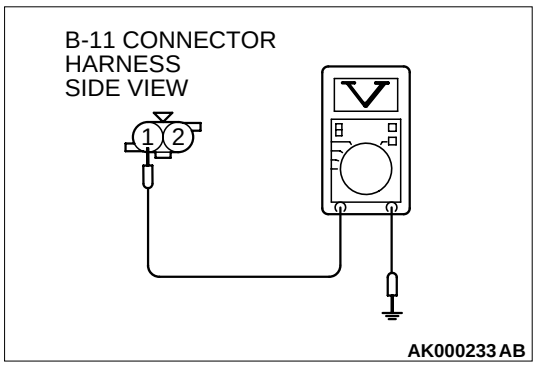
STEP 1. Using scan tool MB991502, check data list item 21: Engine Coolant Temperature Sensor.

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 21, Engine Coolant Temperature Sensor.
  - The engine coolant temperature and temperature shown with the scan tool should approximately match.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Go to Step 2.



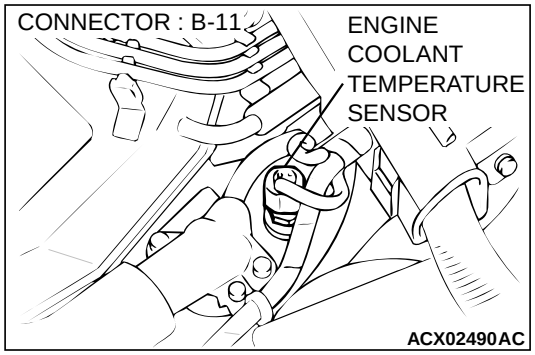
STEP 2. Check the sensor output voltage at engine coolant temperature sensor connector B-11 by backprobing.

(1) Do not disconnect the connector B-11.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 1 and ground by backprobing.
- When engine coolant temperature is –20°C (–4°F), voltage should be 3.9 and 4.5 volts.
- When engine coolant temperature is 0°C (32°F), voltage should be 3.2 and 3.8 volts.
- When engine coolant temperature is 20°C (68°F), voltage should be 2.3 and 2.9 volts.
- When engine coolant temperature is 40°C (104°F), voltage should be 1.3 and 1.9 volts.
- When engine coolant temperature is 60°C (140°F), voltage should be 0.7 and 1.3 volts.
- When engine coolant temperature is 80°C (176°F), voltage should be 0.3 and 0.9 volt.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

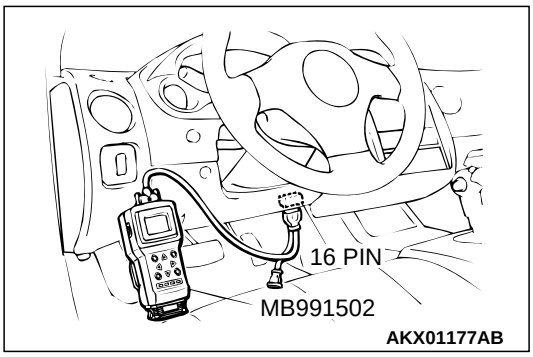
YES : Go to Step 3.
NO : Go to Step 5.



STEP 3. Check connector B-11 at the engine coolant temperature sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP 4. Using scan tool MB991502, check data list item 21: Engine Coolant Temperature Sensor.

⚠ CAUTION

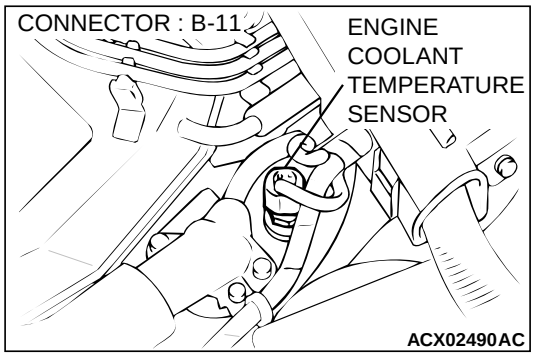
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 21, Engine Coolant Temperature Sensor.
- The engine coolant temperature and temperature shown with the scan tool should approximately match.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

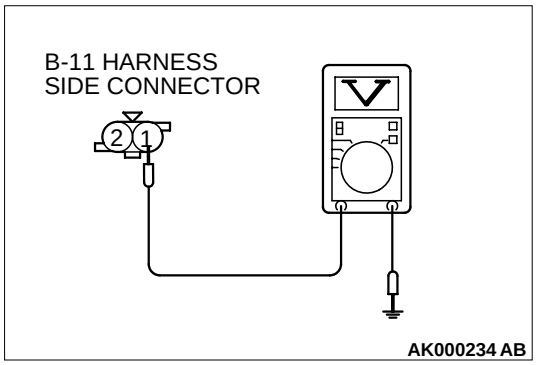
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Replace the ECM or PCM. Then go to Step 14.



STEP 5. Check connector B-11 at engine coolant temperature sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 6.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



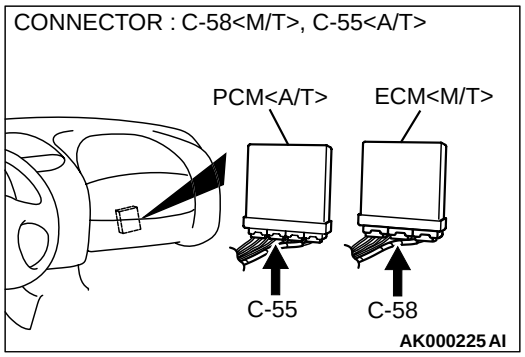
STEP 6. Check the sensor supply voltage at engine coolant temperature sensor harness side connector B-11.

(1) Disconnect the connector B-11 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 1 and ground.
- Voltage should be between 4.5 and 4.9 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 8.
NO : Go to Step 7.

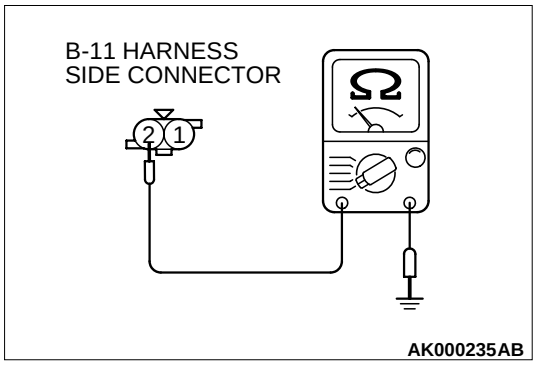


STEP 7. Check connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Replace the ECM or PCM. Then go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP 8. Check the continuity at engine coolant temperature sensor harness side connector B-11.

(1) Disconnect the connector B-11 and measure at the harness side.

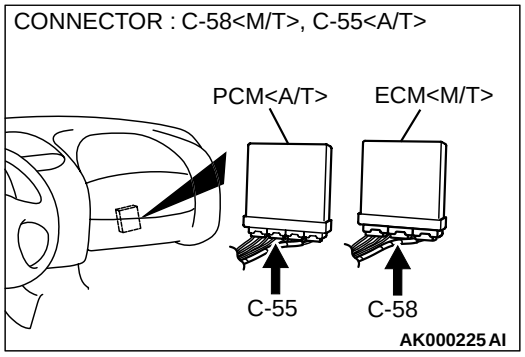
(2) Check for the continuity between terminal 2 and ground.

- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 11.

NO : Go to Step 9.

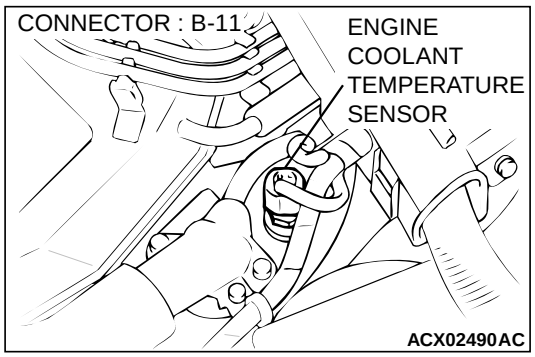


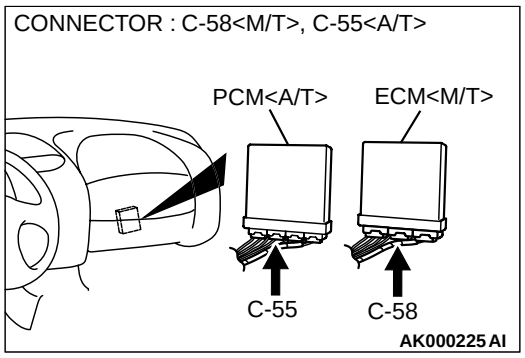
STEP 9. Check connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



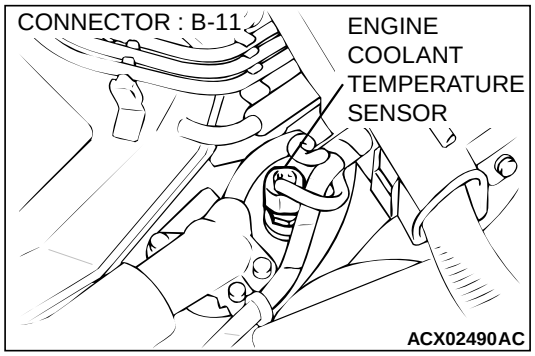


STEP 10. Check for harness damage between engine coolant temperature sensor connector B-11 terminal 2 and ECM connector C-58 terminal 49 <M/T> or PCM connector C-55 terminal 57 <A/T>.

Q: Is the harness wire in good condition?

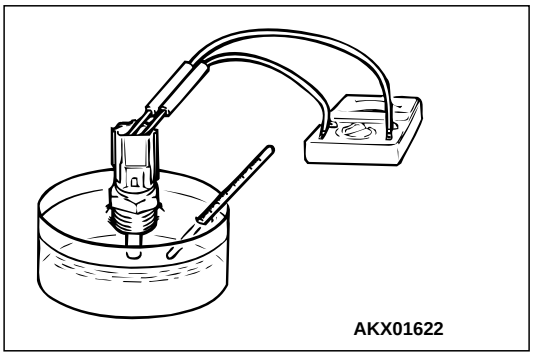
YES : Replace the ECM or PCM. Then go to Step 14.

NO : Repair it. Then go to Step 14.



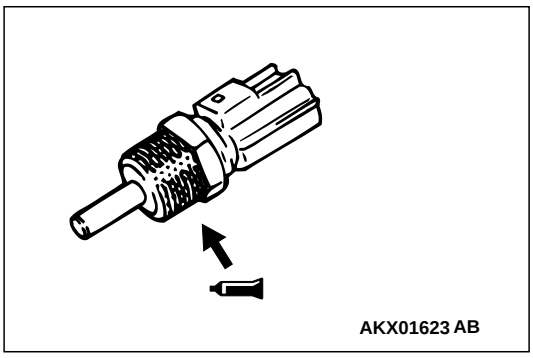
STEP 11. Check the engine coolant temperature sensor.

(1) Disconnect the engine coolant temperature sensor connector B-11.
(2) Remove the engine coolant temperature sensor.



(3) With the temperature sensing portion of engine coolant temperature sensor immersed in hot water, check resistance.

Standard value:
14 – 17 kΩ [at –20°C (–4°F)]
5.1 – 6.5 kΩ [at 0°C (32°F)]
2.1 – 2.7 kΩ [at 20°C (68°F)]
0.9 – 1.3 kΩ [at 40°C (104°F)]
0.48 – 0.68 kΩ [at 60°C (140°F)]
0.26 – 0.36 kΩ [at 80°C (176°F)]



(4) Apply 3M™ AAD part number 8731 or equivalent on the screw section of the engine coolant temperature sensor.
(5) Install the engine coolant temperature sensor, and tighten to the specified torque.

Tightening torque: 29 ± 10 N·m (22 ± 7 ft-lb)

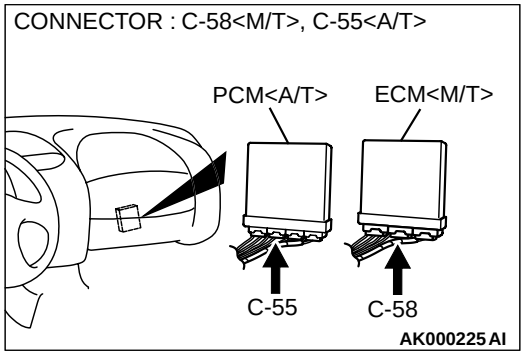
Q: Is the resistance at the standard value?

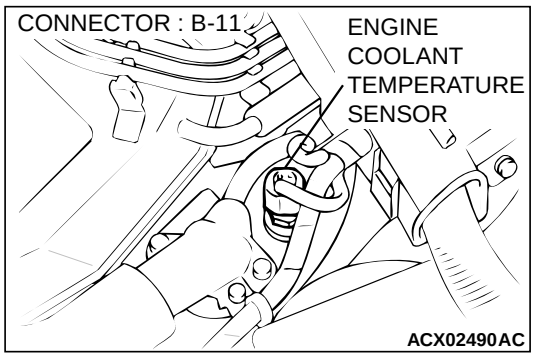
YES : Go to Step 12.
NO : Replace the engine coolant temperature sensor. Then go to Step 14.

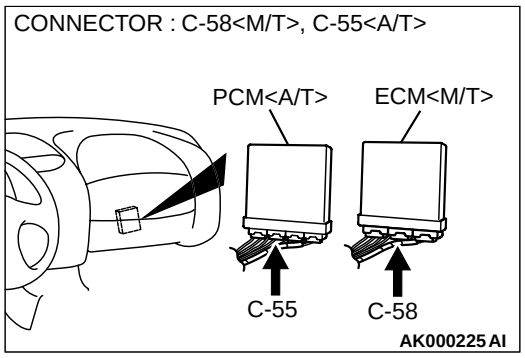
STEP 12. Check connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 13.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.







STEP 13. Check for harness damage between engine coolant temperature sensor connector B-11 terminal 1 and ECM connector C-58 terminal 44 <M/T> or PCM connector C-55 terminal 44 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 14.
NO : Repair it. Then go to Step 14.

STEP 14. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0125 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0128 : Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)

TECHNICAL DESCRIPTION

- The ECM <M/T> or PCM <A/T> checks the time for the engine coolant temperature to reach the judgment temperature.

DTC SET CONDITIONS

Check Conditions

- Engine coolant temperature is between –10°C (14°F) and 77°C (171°F) when the engine is started.
- The engine coolant temperature – intake air temperature is 5°C (9°F) or less when the engine is started.
- The intake air temperature when the engine is started – intake air temperature is 5°C (9°F) or less.
- The volume air flow sensors output frequency is in the low frequency (50 – 100Hz or less) state for 300 seconds or less.

Judgment Criteria

- The time for the engine coolant temperature to rise to 77°C (171°F) takes longer than approximately 14 to 21 minutes.
- The ECM <M/T> or PCM <A/T> monitors for this condition once during the drive cycle.

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TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- The thermostat is faulty
- ECM <M/T> failed.
- PCM <A/T> failed.

DIAGNOSIS

STEP 1. Check the cooling system.

Refer to GROUP 14, Engine Cooling Diagnosis P.14-3.

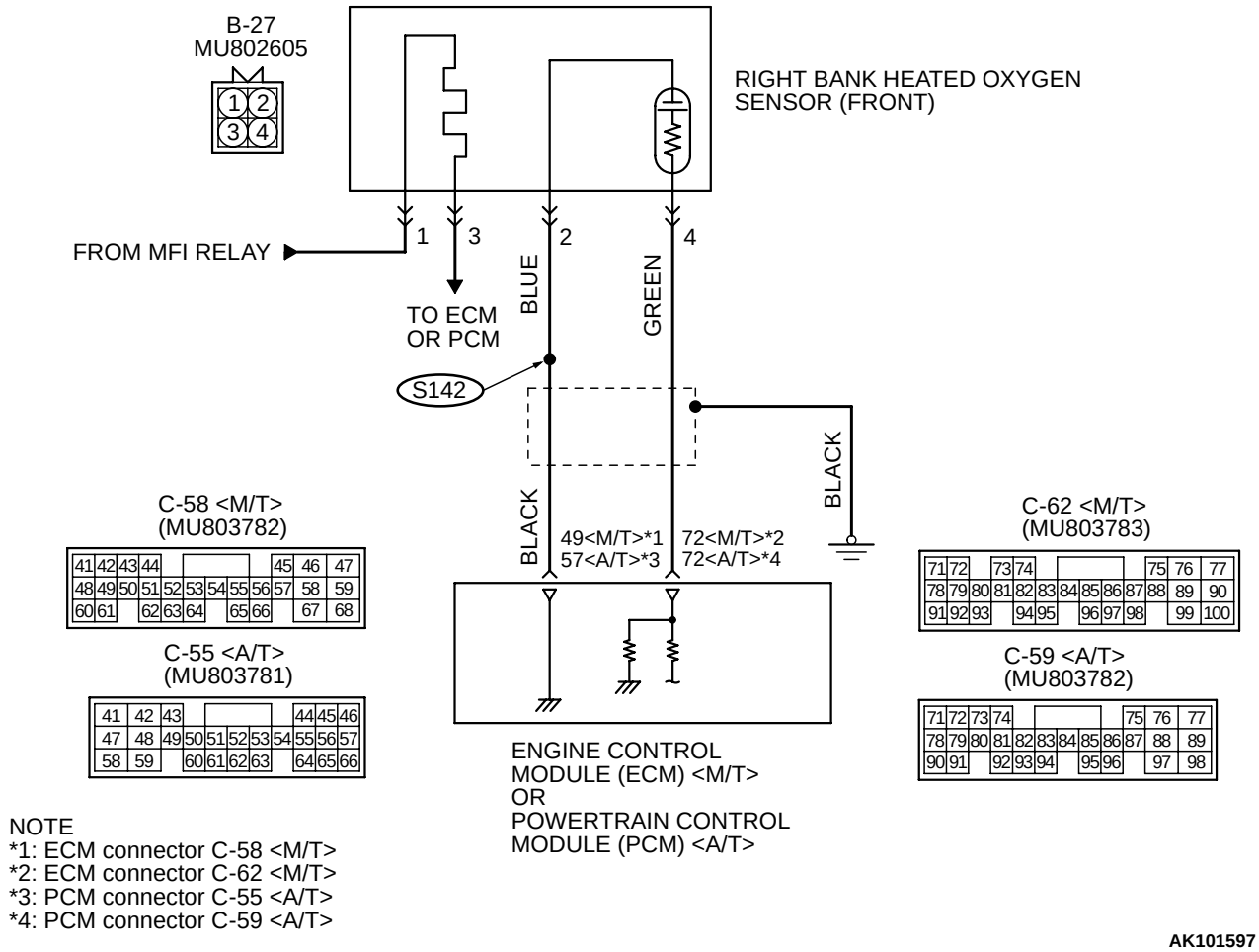
Q: Is the cooling system normal?

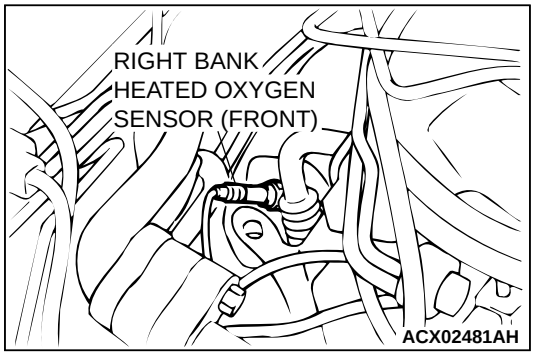
YES : Replace the ECM <M/T> or PCM<A/T>. Then check that the DTC P0128 does not reset.

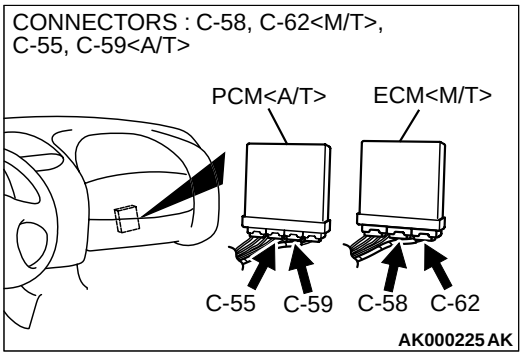
NO : Repair it. Then check that the DTC P0128 does not reset.

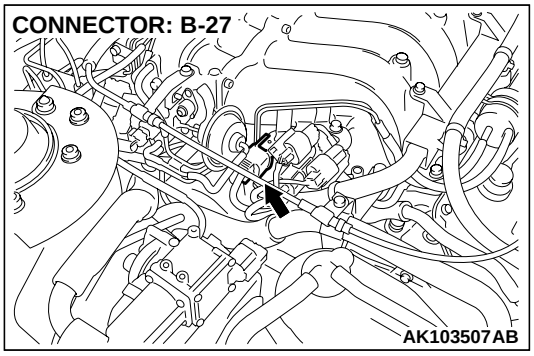
DTC P0130: Heated Oxygen Sensor Circuit (bank 1, sensor 1)

Right Bank Heated Oxygen Sensor (front) Circuit









CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal 72) <M/T> or PCM (terminal 72) <A/T> from the output terminal (terminal 4) of the right bank heated oxygen sensor (front).
- Terminal 2 of the right bank heated oxygen sensor (front) is grounded with ECM (terminal 49) <M/T> or PCM (terminal 57) <A/T>.

TECHNICAL DESCRIPTION

- The right bank heated oxygen sensor (front) detects the concentration of oxygen in the exhaust gas; it converts those data to voltage, and inputs the resulting signals to the ECM <M/T> or PCM <A/T>.
- When the right bank heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response becomes poor.
- The ECM <M/T> or PCM <A/T> forcibly varies the air/fuel mixture to make it leaner and richer, and checks the response speed of the right bank heated oxygen sensor (front). In addition, the ECM <M/T> or PCM <A/T> also checks for an open circuit in the right bank heated oxygen sensor (front) output line.

DTC SET CONDITIONS

Check Conditions

- 3 minutes or more have passed since the starting sequence was completed.
- Right bank heated oxygen sensor (front) signal voltage has continued to be 0.2 volt or lower.
- Engine coolant temperature is higher than 76°C (169°F).
- Engine speed is higher than 1,200 r/min.
- Volumetric efficiency is higher than 25 percent.
- Monitoring time: 7 seconds.

Judgment Criteria

- Input voltage supplied to the ECM <M/T> or PCM <A/T> interface circuit is higher than 4.5 volts when 5 volts is applied to the right bank heated oxygen sensor (front) output line via a resistor.
- The ECM <M/T> or PCM <A/T> monitors for this condition once during the drive cycle.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

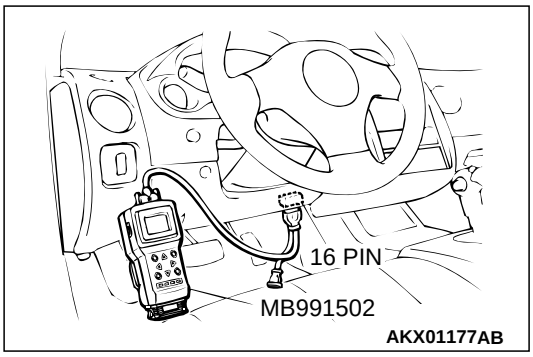
- Right bank heated oxygen sensor (front) deteriorated.
- Open circuit in right bank heated oxygen sensor (front) output line.
- Open circuit in right black heated oxygen sensor (front) ground line.
- ECM failed. <M/T>
- PCM failed. <A/T>

TSB Revision

DIAGNOSIS

Required Special Tools:
- MB991502: Scan Tool (MUT-II)
- MD998464: Test Harness

STEP 1. Using scan tool MB991502, check data list item 39: Heated Oxygen Sensor Bank 1, Sensor 1 (right front).



⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

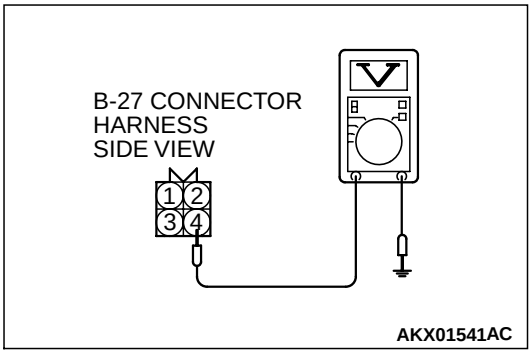
(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 39, Heated Oxygen Sensor Bank 1, Sensor 1 (right front).
- Warming up the engine. When the engine is revved, the output voltage should be 0.6 to 1.0 volt.
- Warming up the engine. When the engine is idling, the output voltage should repeat 0.4 volt and 0.6 to 1.0 volt alternately.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Go to Step 2.

STEP 2. Check the sensor output voltage at right bank heated oxygen sensor (front) connector B-27 by backprobing.

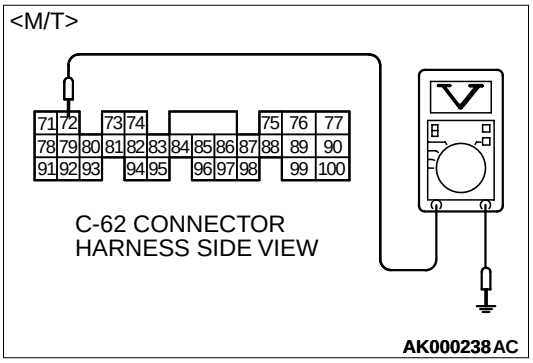


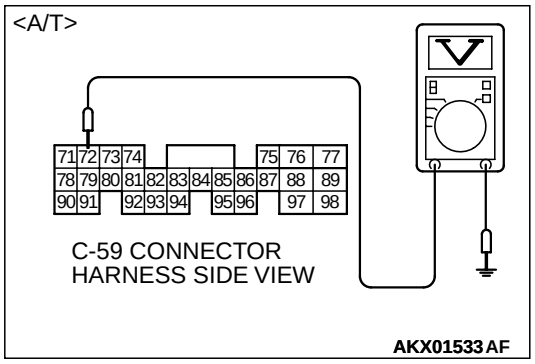
(1) Do not disconnect the connector B-27.
(2) Start the engine and run at idle.
(3) Measure the voltage between terminal 4 and ground by backprobing.
- Warming up the engine. When the engine is 2,500 r/min, the output voltage should repeat 0 to 0.8 volt alternately.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 3.
NO : Go to Step 7.





STEP 3. Check the sensor output voltage at ECM connector C-62 <M/T> or PCM connector C-59 <A/T> by backprobing.

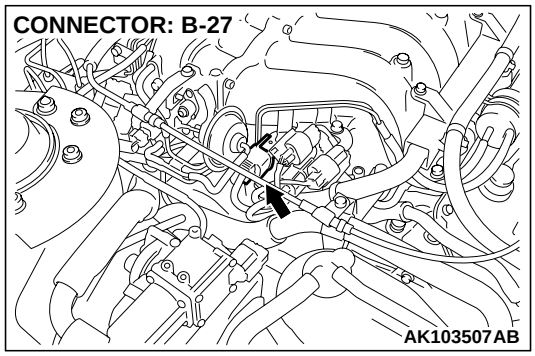
(1) Do not disconnect the connector C-62 <M/T> or C-59 <A/T>.
(2) Start the engine and run at idle.
(3) Measure the voltage between terminal 72 and ground by backprobing.
- Warming up the engine. When the engine is 2,500 r/min, the output voltage should repeat 0 to 0.8 volt alternately.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 4.
NO : Go to Step 6.

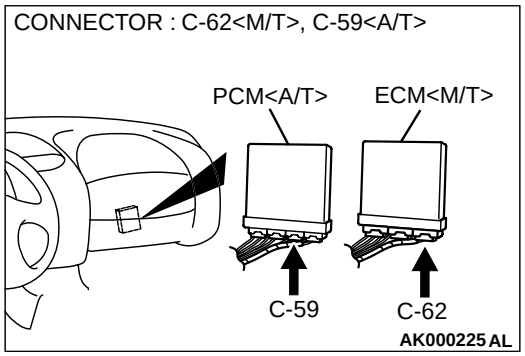
STEP 4. Check connector B-27 at right bank heated oxygen sensor (front) and connector C-62 at ECM <M/T> or connector C-59 at PCM <A/T> for damage.



Q: Is the connector in good condition?

YES : Go to Step 5.

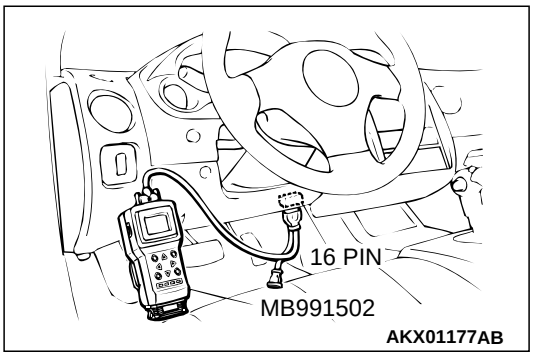
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 15.



STEP 5. Using scan tool MB991502, check data list item 39: Heated Oxygen Sensor Bank 1, Sensor 1 (right front).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.



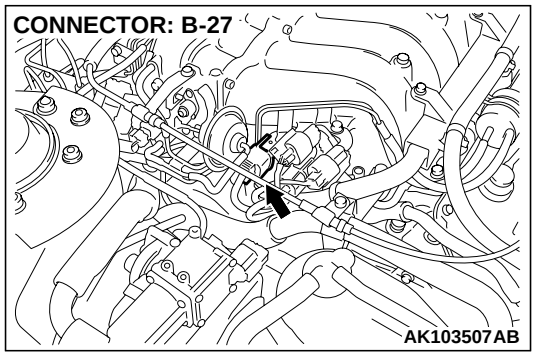
(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 39, Heated Oxygen Sensor Bank 1, Sensor 1 (right front).
- Warming up the engine. When the engine is revved, the output voltage should be 0.6 to 1.0 volt.
- Warming up the engine. When the engine is idling, the output voltage should repeat 0.4 volt and 0.6 to 1.0 volt alternately.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

NO : Replace the ECM or PCM. Then go to Step 15.

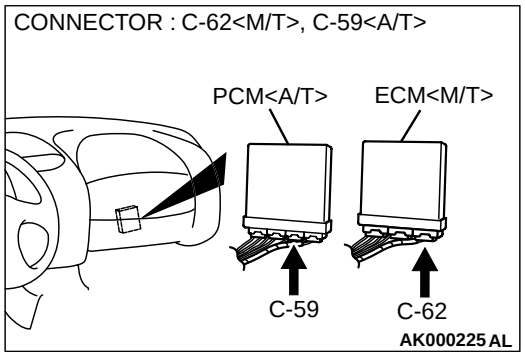


STEP 6. Check connector B-27 at right bank heated oxygen sensor (front) and connector C-62 at ECM <M/T> or connector C-59 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between right bank heated oxygen sensor (front) connector B-27 terminal 4 and ECM connector C-62 terminal 72 <M/T> or PCM connector C-59 terminal 72 <A/T> because of open circuit or harness damage. Then go to Step 15.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 15.

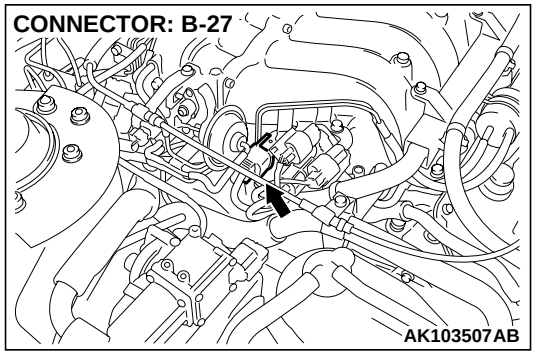


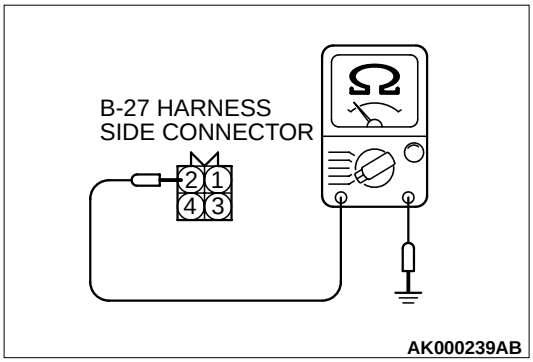
STEP 7. Check connector B-27 at right bank heated oxygen sensor (front) for damage.

Q: Is the connector in good condition?

YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 15.





STEP 8. Check the continuity at right bank heated oxygen sensor (front) harness side connector B-27.

(1) Disconnect the connector B-27 and measure at the harness side.

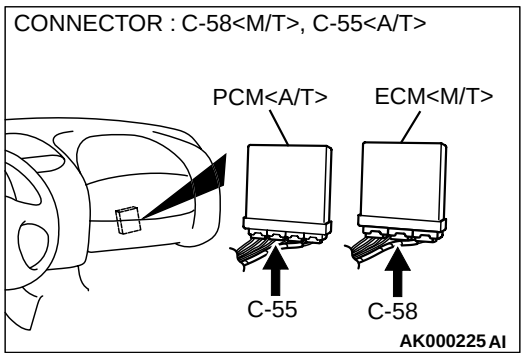
(2) Check for the continuity between terminal 2 and ground.

- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 11.

NO : Go to Step 9.



STEP 9. Check connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

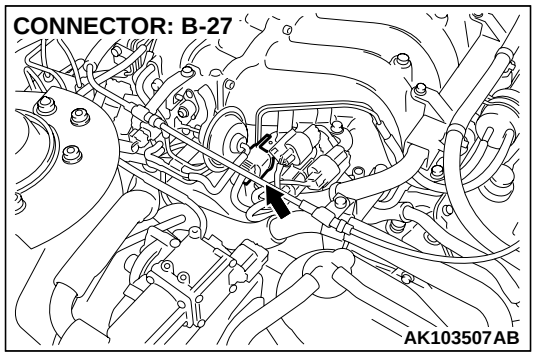
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 15.

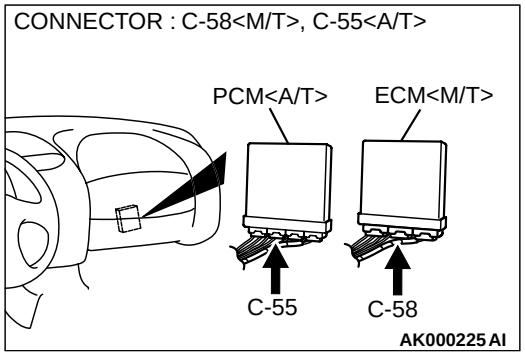
STEP 10. Check for open circuit and harness damage between right bank heated oxygen sensor (front) connector B-27 terminal 2 and ECM connector C-58 terminal 49 <M/T> or PCM connector C-55 terminal 57 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 15.

NO : Repair it. Then go to Step 15.



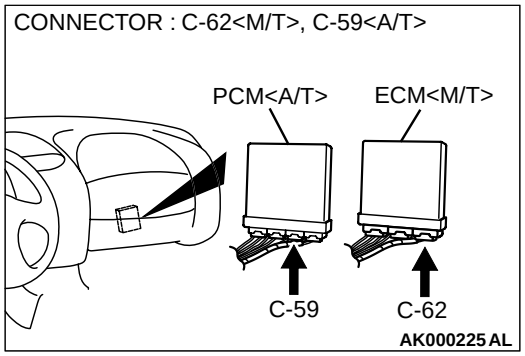


STEP 11. Check connector C-62 at ECM <M/T> or connector C-59 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 12.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 15.

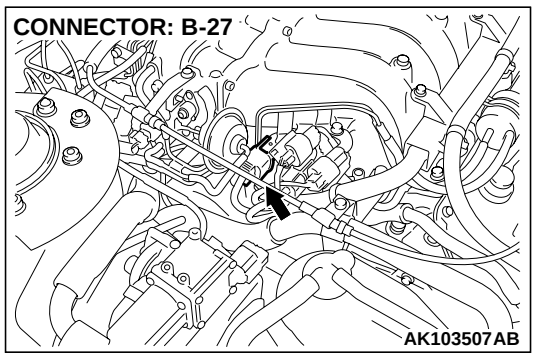


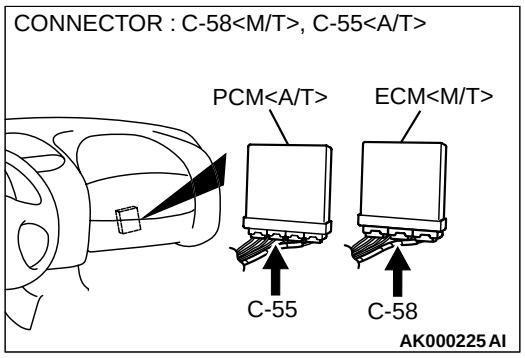
STEP 12. Check for harness damage between right bank heated oxygen sensor (front) connector B-27 terminal 2 and ECM connector C-58 terminal 49 <M/T> or PCM connector C-55 terminal 57 <A/T>.

Q: Is the harness wire in good condition?

YES : Go to Step 13.

NO : Repair it. Then go to Step 15.



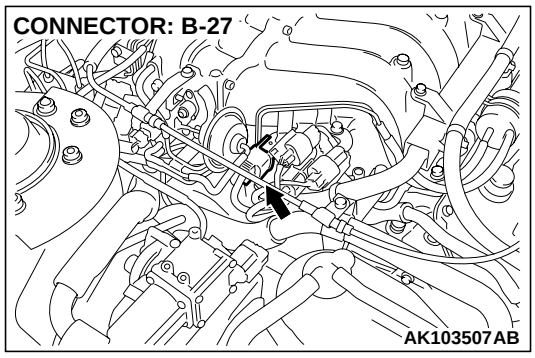


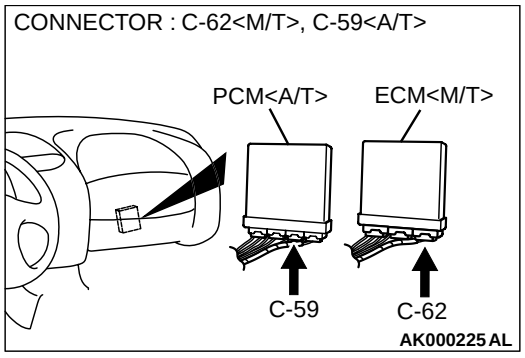
STEP 13. Check for short circuit to ground and harness damage between right bank heated oxygen sensor (front) connector B-27 terminal 4 and ECM connector C-62 terminal 72 <M/T> or PCM connector C-59 terminal 72 <A/T>.

Q: Is the harness wire in good condition?

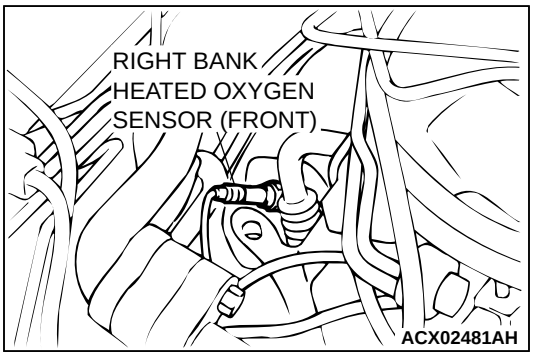
YES : Go to Step 14.

NO : Repair it. Then go to Step 15.



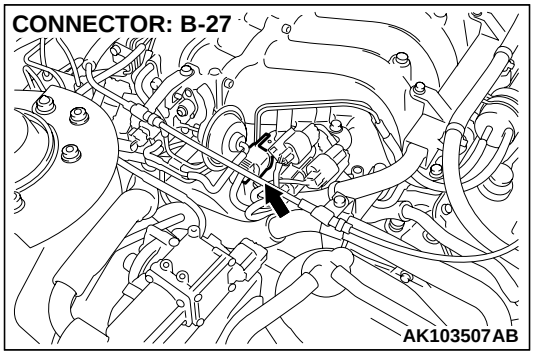


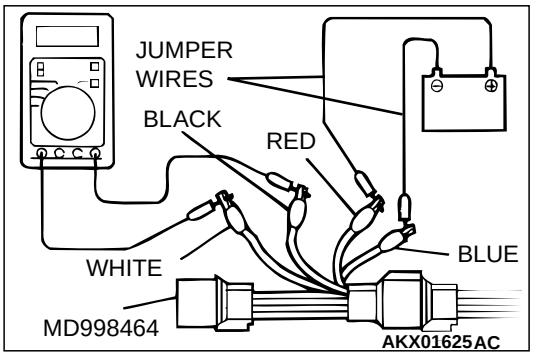
STEP 14. Check the right bank heated oxygen sensor (front).



(1) Disconnect the right bank heated oxygen sensor (front) connector B-27 and connect test harness special tool, MD998464, to the connector on the right bank heated oxygen sensor (front) side.
(2) Warm up the engine until engine coolant 80°C (176°F) or higher.

⚠ CAUTION
Be very careful when connecting the jumper wires; incorrect connection can damage the right bank heated oxygen sensor (front).





(3) Use the jumper wires to connect terminal 1 (red clip) to the positive battery terminal and terminal 3 (blue clip) to the negative battery terminal.
(4) Connect a digital volt meter between terminal 2 (black clip) and terminal 4 (white clip).
(5) While repeatedly revving the engine, measure the right bank heated oxygen sensor (front) output voltage.

Standard value: 0.6 – 1.0 V

Q: Is the voltage at the standard value?

YES : Replace the ECM or PCM. Then go to Step 15.
NO : Replace the right bank heated oxygen sensor (front). Then go to Step 15.

STEP 15. Test the OBD-II drive cycle.

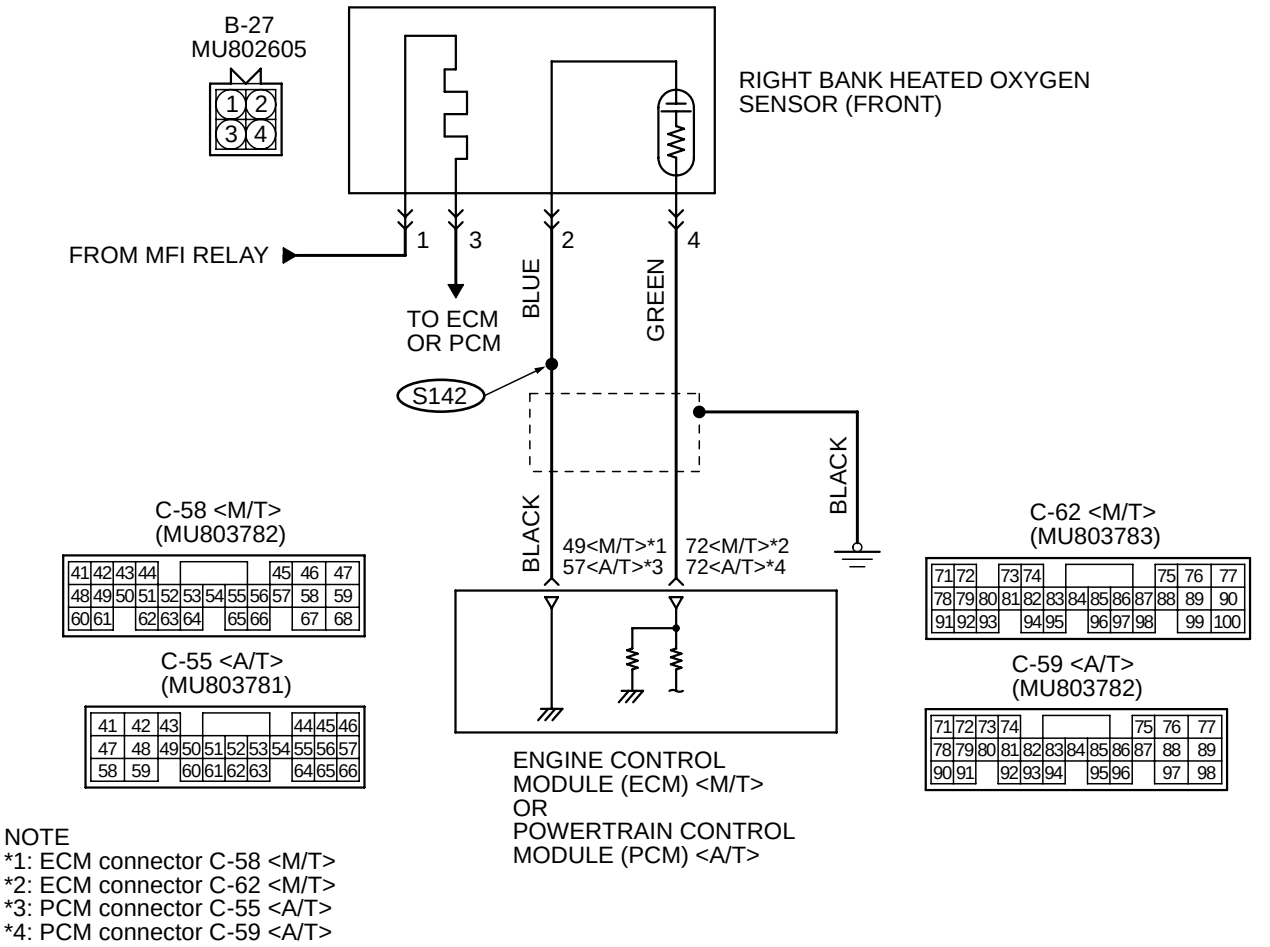
(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 6 – Other Monitor P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0130 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0131: Heated Oxygen Sensor Circuit Low Voltag (bank 1, sensor 1)

Right Bank Heated Oxygen Sensor (front) Circuit



NOTE
*1: ECM connector C-58 <M/T>
*2: ECM connector C-62 <M/T>
*3: PCM connector C-55 <A/T>
*4: PCM connector C-59 <A/T>

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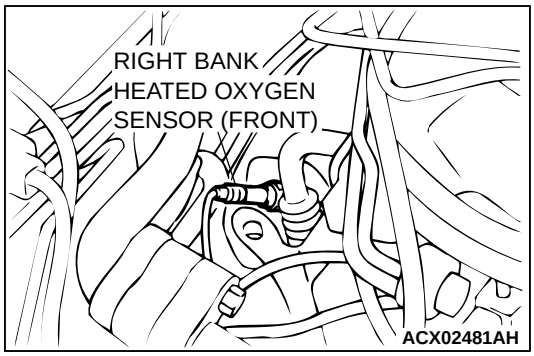

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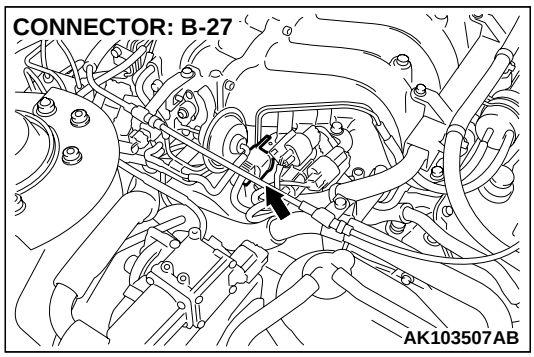

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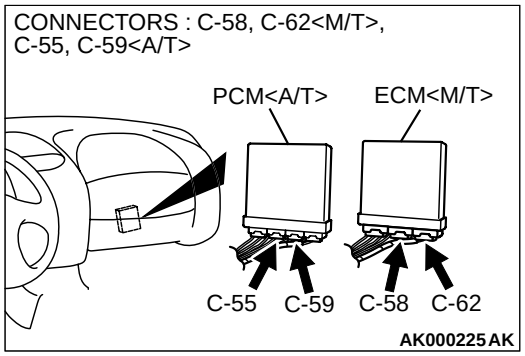
TSB Revision



CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal 72) <M/T> or PCM (terminal 72) <A/T> from the output terminal (terminal 4) of the right bank heated oxygen sensor (front).
- Terminal 2 of the right bank heated oxygen sensor (front) is grounded with ECM (terminal 49) <M/T> or PCM (terminal 57) <A/T>.

TECHNICAL DESCRIPTION

- The right bank heated oxygen sensor (front) detects the concentration of oxygen in the exhaust gas; it converts those data to voltage, and inputs the resulting signals to the ECM <M/T> or PCM <A/T>.
- When the right bank heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response becomes poor.
- The ECM <M/T> or PCM <A/T> forcibly varies the air/fuel mixture to make it leaner and richer, and checks the response speed of the right bank heated oxygen sensor (front). In addition, the ECM <M/T> or PCM <A/T> also checks for an open circuit in the right bank heated oxygen sensor (front) output line.

DTC SET CONDITIONS

Check Conditions

- 3 minutes or more have passed since the starting sequence was completed.
- Right bank heated oxygen sensor (front) signal voltage has continued to be 0.2 volt or lower.
- Engine coolant temperature is higher than 76°C (169°F).
- Engine speed is higher than 1,200 r/min.
- Volumetric efficiency is higher than 25 percent.
- Volume air flow sensor output frequency is 75 Hz or more.
- At least 20 seconds have passed since fuel shut off control was canceled.
- After the ignition switch is turned ON, the changes in the output voltage of the right bank heated oxygen sensor (front) is lower than 0.078 volt.
- Monitoring time: 10 seconds.

Judgement Criteria

- Making the air/fuel ratio 15 percent for 10 seconds richer does not result in raising the heated oxygen sensor (front) output voltage beyond 0.2 volt.
- The ECM <M/T> or PCM <A/T> monitors for this condition once during the drive cycle.

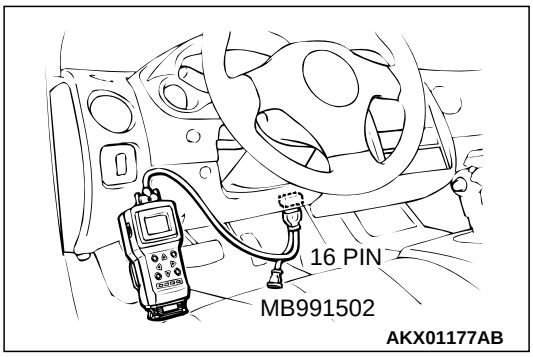
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Right bank heated oxygen sensor (front) failed.
- Short circuit in right bank heated oxygen sensor (front) output line.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MD998464: Test Harness



STEP 1. Using scan tool MB991502, check data list item 39: Heated Oxygen Sensor Bank 1, Sensor 1 (right front).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 39, Heated Oxygen Sensor Bank 1, Sensor 1 (right front).
- Warming up the engine. When the engine is revved, the output voltage should be 0.6 to 1.0 volt.
- Warming up the engine. When the engine is idling, the output voltage should repeat 0.4 volt and 0.6 to 1.0 volt alternately.

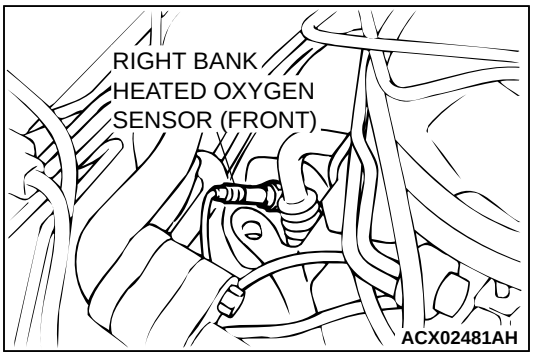
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

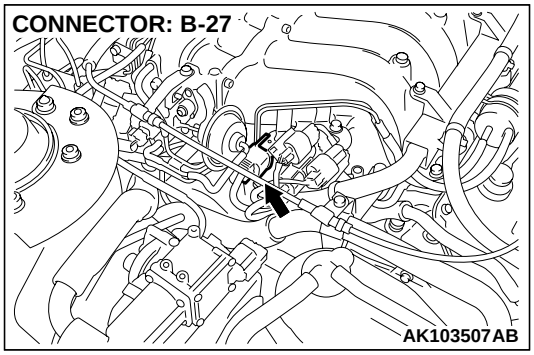
NO : Go to Step 2.

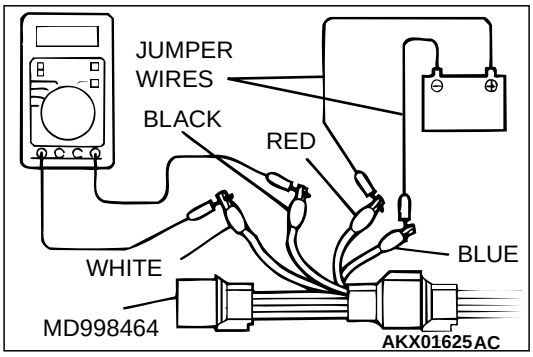
STEP 2. Check the right bank heated oxygen sensor (front).



(1) Disconnect the right bank heated oxygen sensor (front) connector B-27 and connect test harness special tool, MD998464, to the connector on the right bank heated oxygen sensor (front) side.
(2) Warm up the engine until engine coolant 80°C (176°F) or higher.

⚠ CAUTION
Be very careful when connecting the jumper wires; incorrect connection can damage the right bank heated oxygen sensor (front).





(3) Use the jumper wires to connect terminal 1 (red clip) to the positive battery terminal and terminal 3 (blue clip) to the negative battery terminal.
(4) Connect a digital volt meter between terminal 2 (black clip) and terminal 4 (white clip).
(5) While repeatedly revving the engine, measure the right bank heated oxygen sensor (front) output voltage.

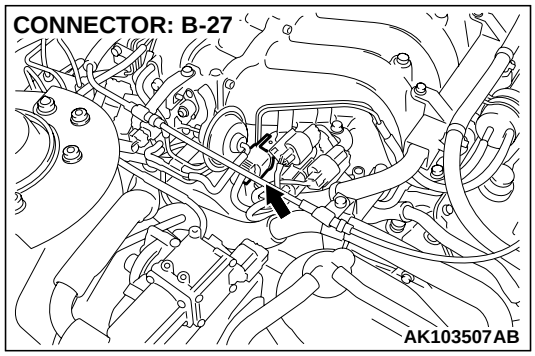
Standard value: 0.6 – 1.0 volt

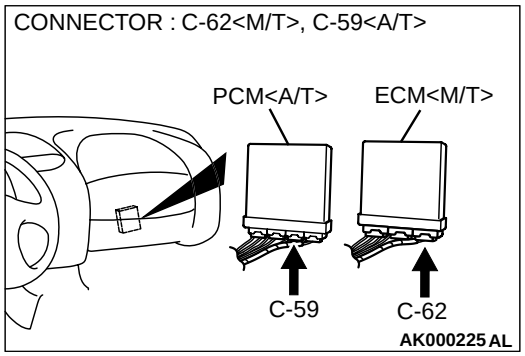
Q: Is the voltage at the standard value?

YES : Go to Step 3.
NO : Replace the right bank heated oxygen sensor (front). Then go to Step 5.

STEP 3. Check connector B-27 at right bank heated oxygen sensor (front) and connector C-62 at ECM <M/T> or connector C-59 at PCM <A/T> for damage.
Q: Is the connector in good condition?

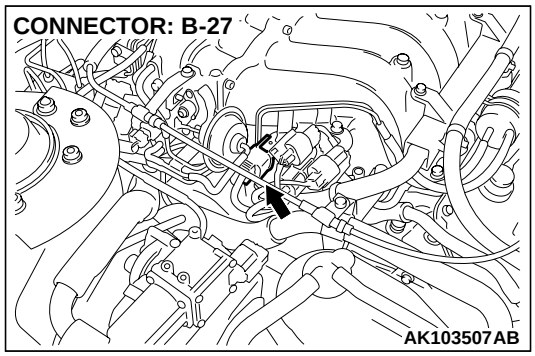
YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.

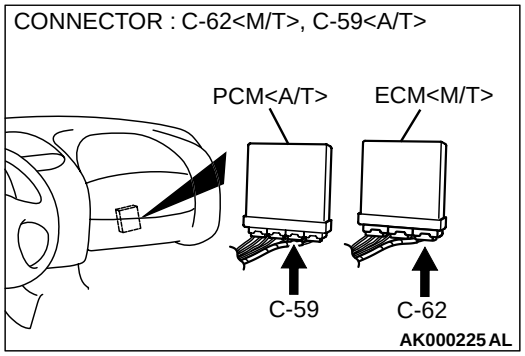




STEP 4. Check for short circuit to ground between right bank heated oxygen sensor (front) connector B-27 terminal 4 and ECM connector C-62 terminal 72 <M/T> or PCM connector C-59 terminal 72 <A/T>.
Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 5.
NO : Repair it. Then go to Step 5.





STEP 5. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13B-6.

(2) Check the diagnostic trouble code (DTC).

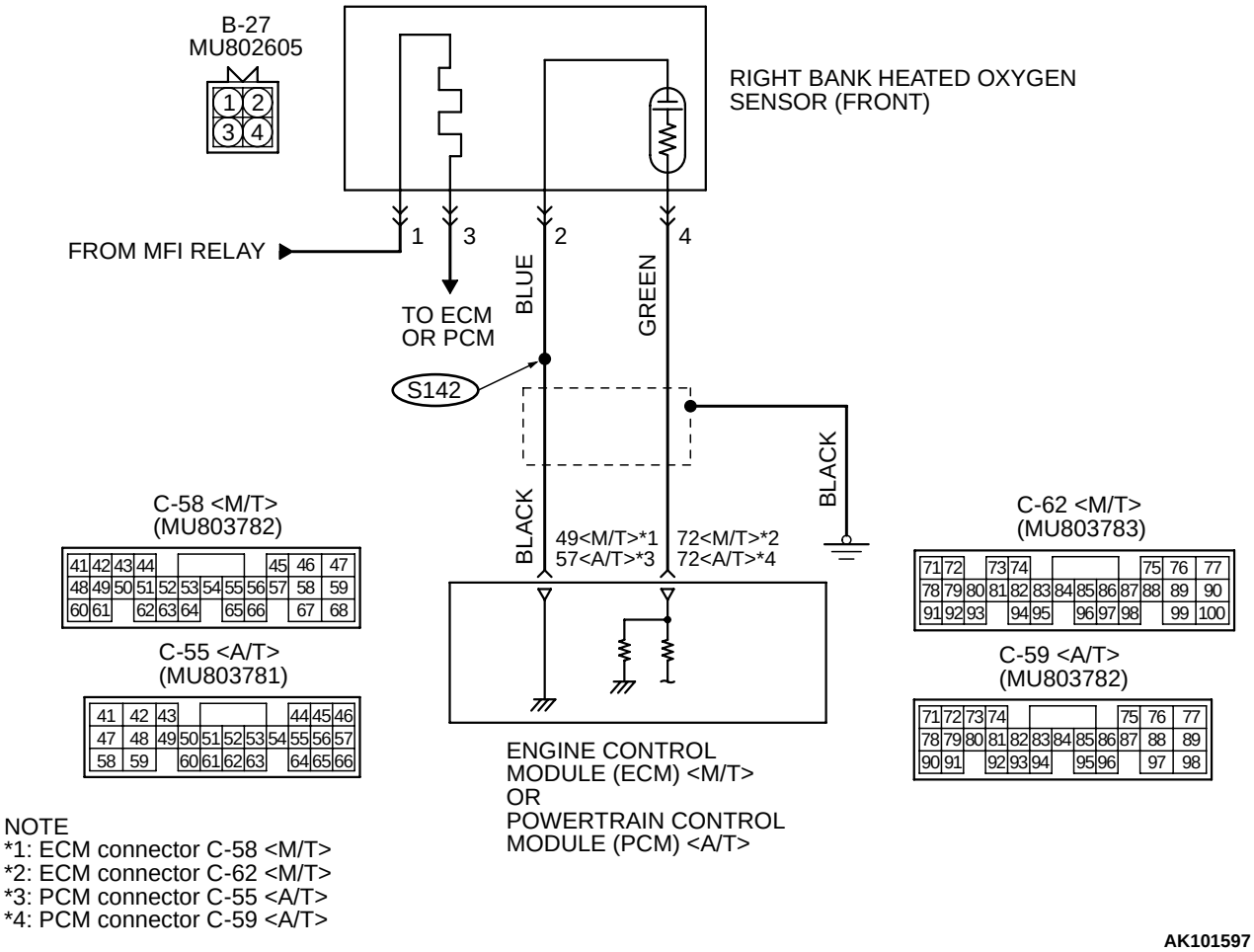
Q: Is the DTC P0131 is output?

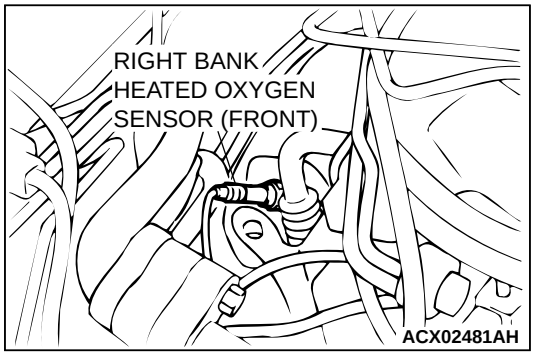
YES : Retry the troubleshooting.

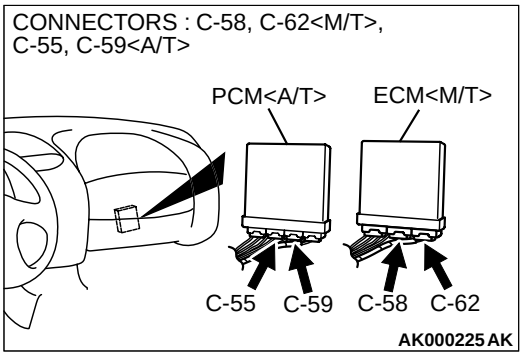
NO : The inspection is complete.

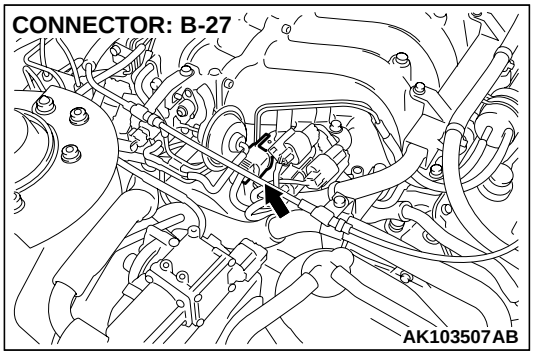
DTC P0132: Heated Oxygen Sensor Circuit High Voltag (bank 1, sensor 1)

Right Bank Heated Oxygen Sensor (front) Circuit









CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal 72) <M/T> or PCM (terminal 72) <A/T> from the output terminal (terminal 4) of the right bank heated oxygen sensor (front).
- Terminal 2 of the right bank heated oxygen sensor (front) is grounded with ECM (terminal 49) <M/T> or PCM (terminal 57) <A/T>.

TECHNICAL DESCRIPTION

- The right bank heated oxygen sensor (front) detects the concentration of oxygen in the exhaust gas; it converts those data to voltage, and inputs the resulting signals to the ECM <M/T> or PCM <A/T>.
- When the right bank heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response becomes poor.
- The ECM <M/T> or PCM <A/T> forcibly varies the air/fuel mixture to make it leaner and richer, and checks the response speed of the right bank heated oxygen sensor (front). In addition, the ECM <M/T> or PCM <A/T> also checks for an open circuit in the right bank heated oxygen sensor (front) output line.

DTC SET CONDITIONS

Check Conditions

- 2 seconds or more have passed since the starting sequence was completed.

Judgment Criteria

- Right bank heated oxygen sensor (front) output voltage has continued to be 1.2 volts or higher for 2 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Short circuit in right bank heated oxygen sensor (front) output line.
- ECM failed. <M/T>
- PCM failed. <A/T>

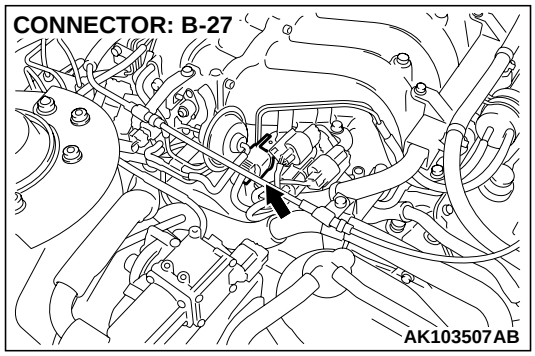
DIAGNOSIS

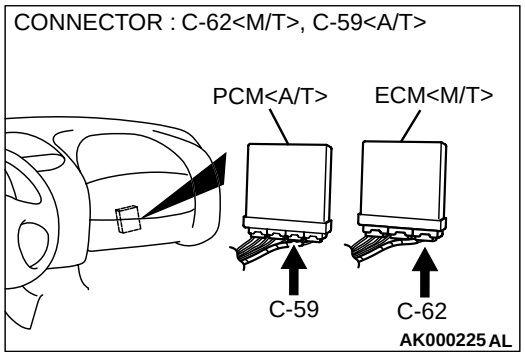
Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Check connector B-27 at right bank heated oxygen sensor (front) and connector C-62 at ECM <M/T> or connector C-59 at PCM <A/T> for damage.
Q: Is the connector in good condition?

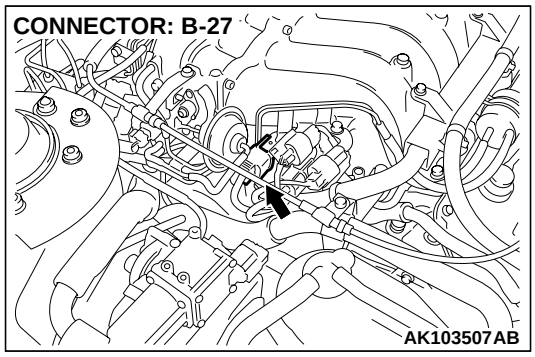
YES : Go to Step 2.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 3.

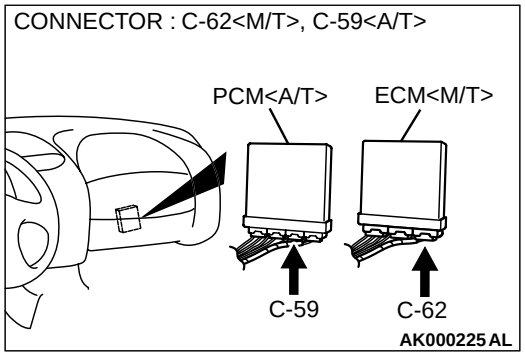




STEP 2. Check for short circuit to power supply between right bank heated oxygen sensor (front) connector B-27 terminal 4 and ECM connector C-62 terminal 72 <M/T> or PCM connector C-59 terminal 72 <A/T>.
Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 3.
NO : Repair it. Then go to Step 3.





STEP 3. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 6 – Other Monitor P.13B-6.

(2) Check the diagnostic trouble code (DTC).

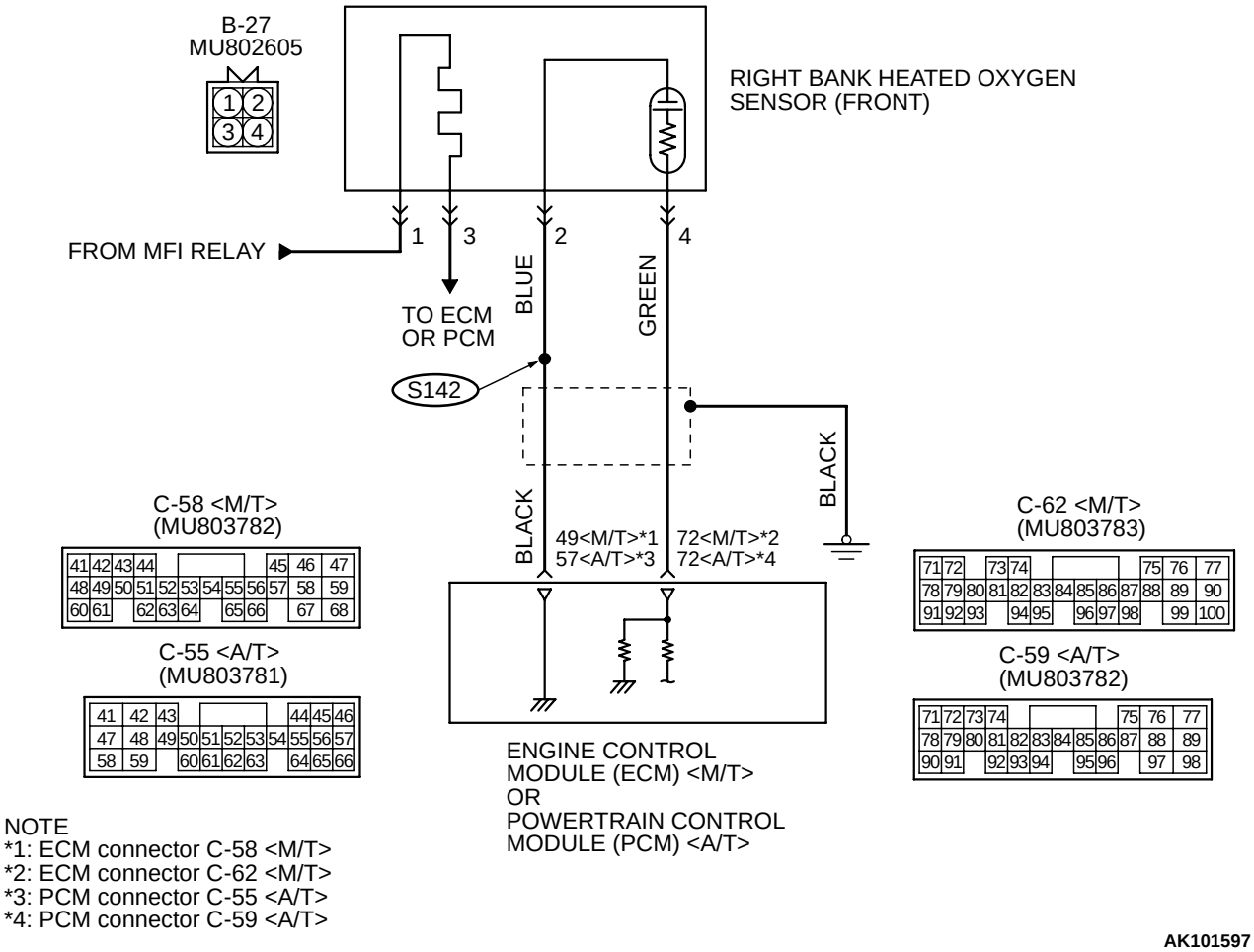
Q: Is the DTC P0132 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0133: Heated Oxygen Sensor Circuit Slow Responce (bank 1, sensor 1)

Right Bank Heated Oxygen Sensor (front) Circuit



NOTE
*1: ECM connector C-58 <M/T>
*2: ECM connector C-62 <M/T>
*3: PCM connector C-55 <A/T>
*4: PCM connector C-59 <A/T>

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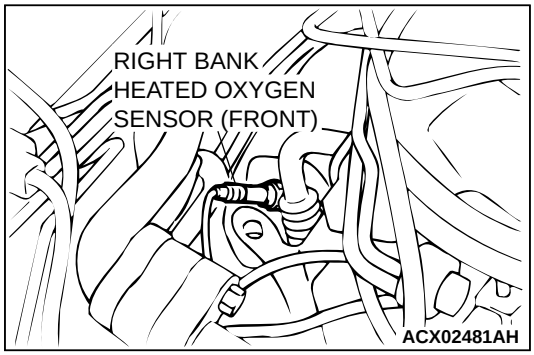
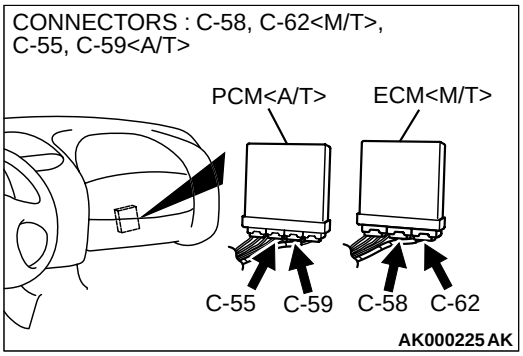
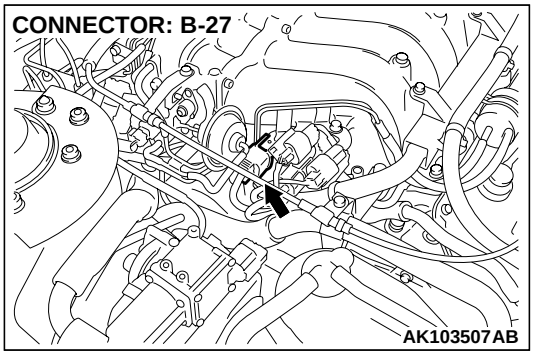






CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal 72) <M/T> or PCM (terminal 72) <A/T> from the output terminal (terminal 4) of the right bank heated oxygen sensor (front).
- Terminal 2 of the right bank heated oxygen sensor (front) is grounded with ECM (terminal 49) <M/T> or PCM (terminal 57) <A/T>.

TECHNICAL DESCRIPTION

- The right bank heated oxygen sensor (front) detects the concentration of oxygen in the exhaust gas; it converts those data to voltage, and inputs the resulting signals to the ECM <M/T> or PCM <A/T>.
- When the right bank heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response becomes poor.
- The ECM <M/T> or PCM <A/T> forcibly varies the air/fuel mixture to make it leaner and richer, and checks the response speed of the right bank heated oxygen sensor (front). In addition, the ECM <M/T> or PCM <A/T> also checks for an open circuit in the right bank heated oxygen sensor (front) output line.

DTC SET CONDITIONS

Check Conditions

- Engine coolant temperature is higher than 50°C (122°F).
- Engine speed is at between 1,250 and 3,000 r/min.
- Volumetric efficiency is at between 20 and 60 percent.
- Under the closed loop air/fuel control.
- The throttle valve is open.
- Short-term fuel trim is higher than –30 and lower than +25 percent.
- More than 3 seconds have elapsed after the abovementioned conditions have been met.
- The ECM <M/T> or PCM <A/T> monitors for this condition for 7 cycles of 12 second each during the drive cycle.

Judgment Criteria

- The right bank heated oxygen sensor (front) sends "lean" and "rich" signals alternately 11 times or less for 12 seconds.

  NOTE: If the sensor switch time is longer than the Judgment Criteria due to the MUT-II OBD-II test Mode – H02S Test Results, it is assumed that the heated oxygen sensor has deteriorated. If it is short, it is assumed that the harness is damaged or has a short circuit.
  If the heated oxygen sensor signal voltage has not changed even once (lean/rich) after the DTC was erased, the sensor switch time will display as 0 seconds.

TSB Revision

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

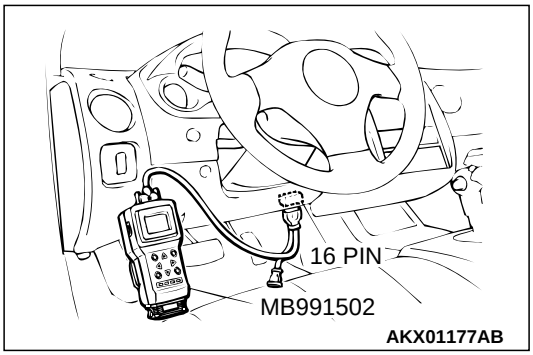
- Right bank heated oxygen sensor (front) deteriorated.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check data list item 39: Heated Oxygen Sensor Bank 1, Sensor 1 (right front).



⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 39, Heated Oxygen Sensor Bank 1, Sensor 1 (right front).
(4) Warm up the engine, 2500r/min.
  - Output voltage repeats 0.4 volt or less and 0.6 – 1.0 volt 10 times or more within 10 seconds.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Replace the right bank heated oxygen sensor (front). Then go to Step 2.

STEP 2. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 4 – Heated Oxygen Sensor Monitor P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0133 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0134: Heated Oxygen Sensor Circuit No Activity Detected (bank 1, sensor 1)

HEATED OXYGEN SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1, SENSOR 1) CIRCUIT

- Refer to DTC P0132 – Heated Oxygen Sensor Circuit High Voltage (bank 1, sensor 1) P.13B-137.
- Refer to DTC P0201, P0203, P0205 – Injector Circuit P.13B-283.

CIRCUIT OPERATION

- Refer to DTC P0132 – Heated Oxygen Sensor Circuit High Voltage (bank 1, sensor 1) P.13B-137.
- Refer to DTC P0201, P0203, P0205 – Injector Circuit P.13B-283.

TECHNICAL DESCRIPTION

- The ECM <M/T> or PCM <A/T> effects air/fuel ratio feedback control in accordance with the signals from the right bank heated oxygen sensor (front).
- If the right bank heated oxygen sensor (front) has deteriorated, corrections will be made by the right bank heated oxygen sensor (rear).
- DTC P0134 becomes stored in memory if a failure is detected in the above air/fuel ratio feedback control system.

DTC SET CONDITIONS

Check Area

- 30 seconds or more have passed since the starting sequence was completed.
- Engine coolant temperature is higher than 76°C (169°F).
- Engine speed is higher than 1,200 r/min.
- Volumetric efficiency is at between 30 and 95 percent.
- Throttle position sensor output voltage is lower then 4 volts.
- Except while fuel is being shut off.
- Monitoring time: 30 seconds.

Judgment Criteria

- Right bank heated oxygen sensor (front) output voltage does not get across 0.5 volt within about 30 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

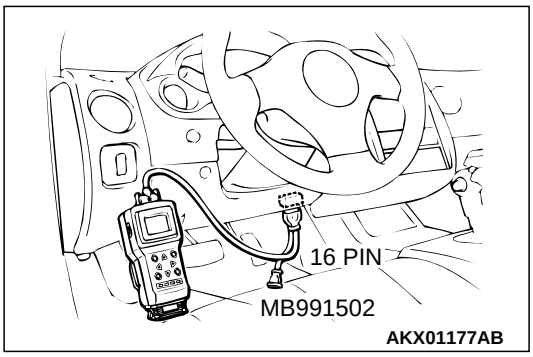
- Right bank heated oxygen sensor (front) deteriorated.
- Open circuit in right bank heated oxygen sensor (front) output line.
- Open circuit in right black heated oxygen sensor (front) ground line.

  NOTE: When the right bank heated oxygen sensor (front) begins to deteriorate, the right bank heated oxygen sensor output voltage will deviate from the voltage when the sensor was new (normally 0.5 volt at stoichiometric ratio). This deviation will be corrected by the right bank heated oxygen sensor (rear).
  If the right bank heated oxygen sensor (rear) responds poorly because it has deteriorated, it will improperly correct the right bank heated oxygen sensor (front). Thus, even when closed loop control is being effected, the fluctuation of the right bank heated oxygen sensor (front) output voltage decreases, without intersecting with 0.5 volt. As a result, there is a possibility of DTC P0134 becoming registered.
- ECM failed. <M/T>
- PCM failed. <M/T>

DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MD998464: Test Harness



STEP 1. Using scan tool MB991502, check data list item 69: Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 69, Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).
- Warming up the engine. When the engine is revved, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 2.
NO : Refer to, DTC P0137 – Heated Oxygen Sensor Circuit Low Voltage (bank 1, sensor 2) P.13B-166, DTC P0138 – Heated Oxygen Sensor Circuit High Voltage (bank 1, sensor 2) P.13B-171, DTC P0139 – Heated Oxygen Sensor Circuit Slow Response (bank 1, sensor 2) P.13B-174.

STEP 2. Check the exhaust leaks.

Q: Are there any abnormalities?

YES : Go to Step 3.
NO : Repair it. Then go to Step 14.

STEP 3. Check the intake system vacuum leak.

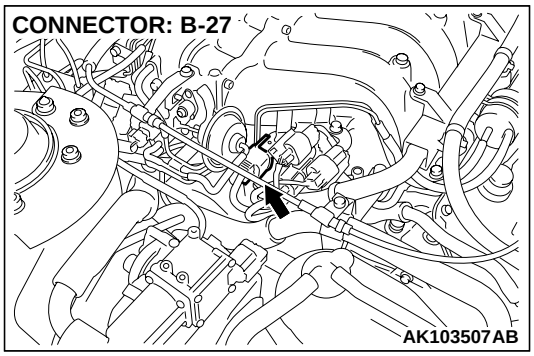
Q: Are there any abnormalities?

YES : Go to Step 4.
NO : Repair it. Then go to Step 14.

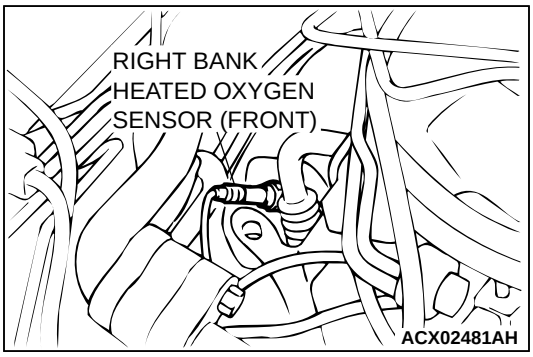
STEP 4. Check connector B-27 at the right bank heated oxygen sensor (front) for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

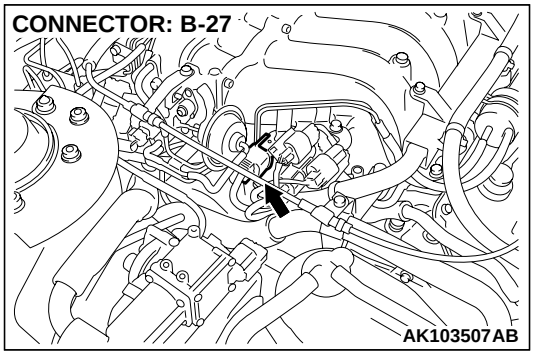


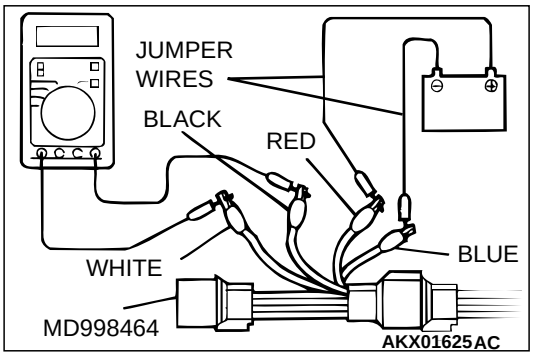
STEP 5. Check the right bank heated oxygen sensor (front).



(1) Disconnect the right bank heated oxygen sensor (front) connector B-27 and connect test harness special tool, MD998464 to the connector on the right bank heated oxygen sensor (front) side.
(2) Warm up the engine until engine coolant 80°C (176°F) or higher.

⚠ CAUTION
Be very careful when connecting the jumper wires; incorrect connection can damage the right bank heated oxygen sensor (front).





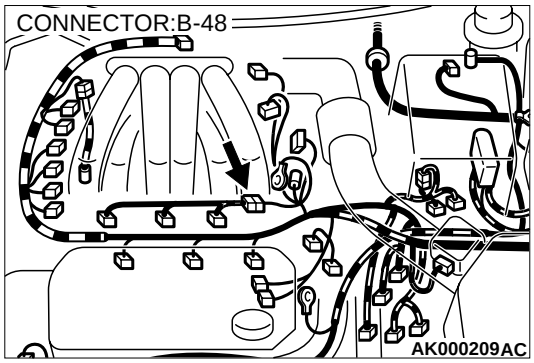
(3) Use the jumper wires to connect terminal 1 (red clip) to the positive battery terminal and terminal 3 (blue clip) to the negative battery terminal.
(4) Connect a digital volt meter between terminal 2 (black clip) and terminal 4 (white clip).
(5) While repeatedly revving the engine, measure the right bank heated oxygen sensor (front) output voltage.

Standard value: 0.6 – 1.0 V

Q: Is the voltage at the standard value?

YES : Go to Step 6.
NO : Replace the right bank heated oxygen sensor (front). Then go to Step 14.

STEP 6. Check connector B-48 at injector intermediate connector for damage.

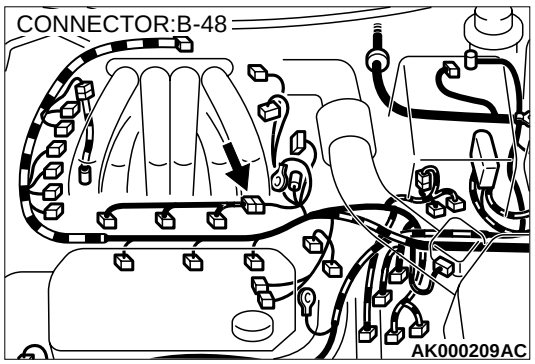


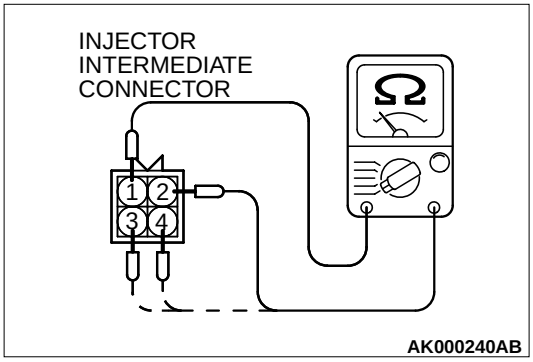
Q: Is the connector in good condition?

YES : Go to Step 7.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

STEP 7. Check the right bank injector resistance at intermediate connector B-48.

(1) Disconnect the injector intermediate connector B-48.





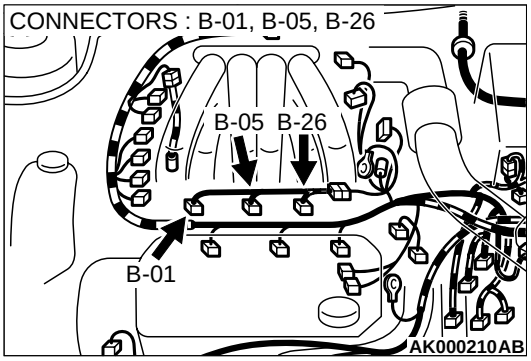
(2) Measure the resistance between each injector side connector terminal.
   a. Measure the resistance between terminal 1 and 2 when measuring No. 1 cylinder.
   b. Measure the resistance between terminal 1 and 3 when measuring No. 3 cylinder.
   c. Measure the resistance between terminal 1 and 4 when measuring No. 5 cylinder.
   - Resistance should be between 13 and 16 ohm [at 20°C (68°F)].

Q: Is the resistance normal?

YES : Go to Step 10.
NO : Go to Step 8.

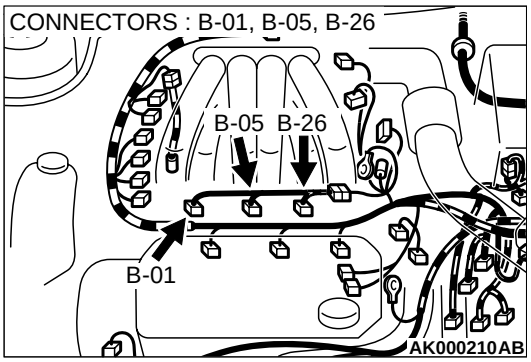
STEP 8. Check connector B-01, B-05, B-26 at right bank injector for damage.

(1) Remove the intake manifold.
(2) Check the right bank injector connector, which deviates from the standard value at Step 7.



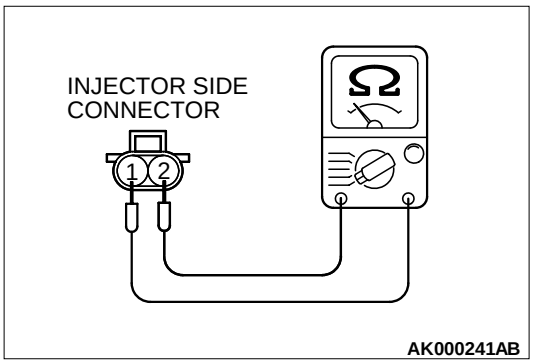
Q: Is the connector in good condition?

YES : Go to Step 9.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP 9. Check the right bank injector.

(1) Check the right bank injector connector, which deviates from the standard value at Step 7.



(2) Measure the resistance between injector side connector terminal 1 and 2.

Standard value: 13 – 16 ohm [at 20°C (68°F)]

Q: Is the resistance standard value?

YES : Repair harness wire between injector intermediate connector and right bank injector connector because of harness damage. Then go to Step 14.

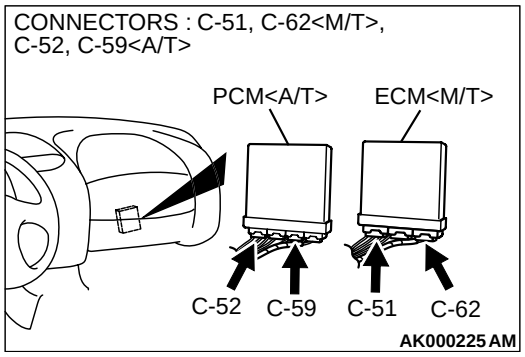
NO : Replace the injector. Then go to Step 14.

STEP 10. Check connector C-51, C-62 at ECM <M/T> or connector C-52, C-59 at PCM <A/T> for damage.

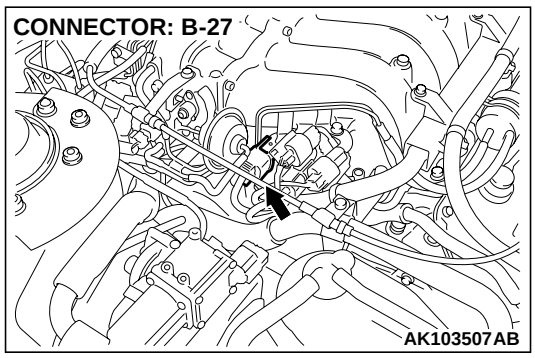
Q: Is the connector in good condition?

YES : Go to Step 11.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



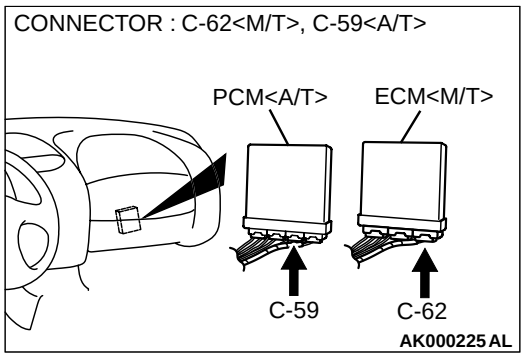
STEP 11. Check for harness damage between right bank heated oxygen sensor (front) connector B-27 terminal 4 and ECM connector C-62 terminal 72 <M/T> or PCM connector C-59 terminal 72 <A/T>.



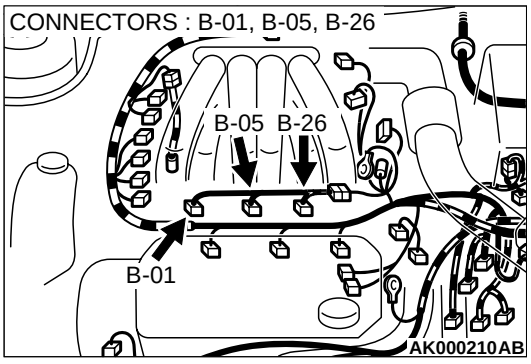
Q: Is the harness wire in good condition?

YES : Go to Step 12.

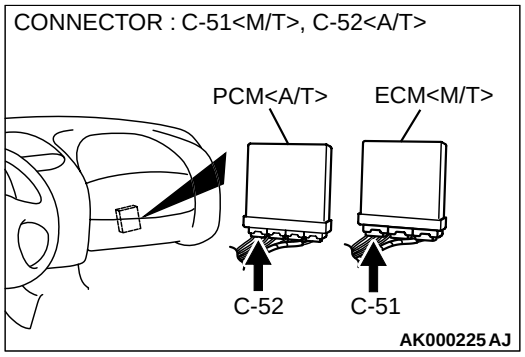
NO : Repair it. Then go to Step 14.



STEP 12. Check for harness damage between right bank injector connector and ECM connector <M/T> or PCM connector <A/T>.



a. Check the harness wire between right bank injector connector B-01 terminal 2 and ECM connector C-51 terminal 1 <M/T> or PCM connector C-52 terminal 1 <A/T> when checking No. 1 cylinder.
b. Check the harness wire between right bank injector connector B-05 terminal 2 and ECM connector C-51 terminal 24 <M/T> or PCM connector C-52 terminal 24 <A/T> when checking No. 3 cylinder.
c. Check the harness wire between right bank injector connector B-26 terminal 2 and ECM connector C-51 terminal 10 <M/T> or PCM connector C-52 terminal 10 <A/T> when checking No. 5 cylinder.



Q: Is the harness wire in good condition?

YES : Go to Step 13.

NO : Repair it. Then go to Step 14.

STEP 13. Check the fuel pressure.
Refer to P.13B-680, Fuel Pressure Test.

Q: Is the fuel pressure normal?

YES : Replace the ECM or PCM. Then go to Step 14.
NO : Repair it. Then go to Step 14.

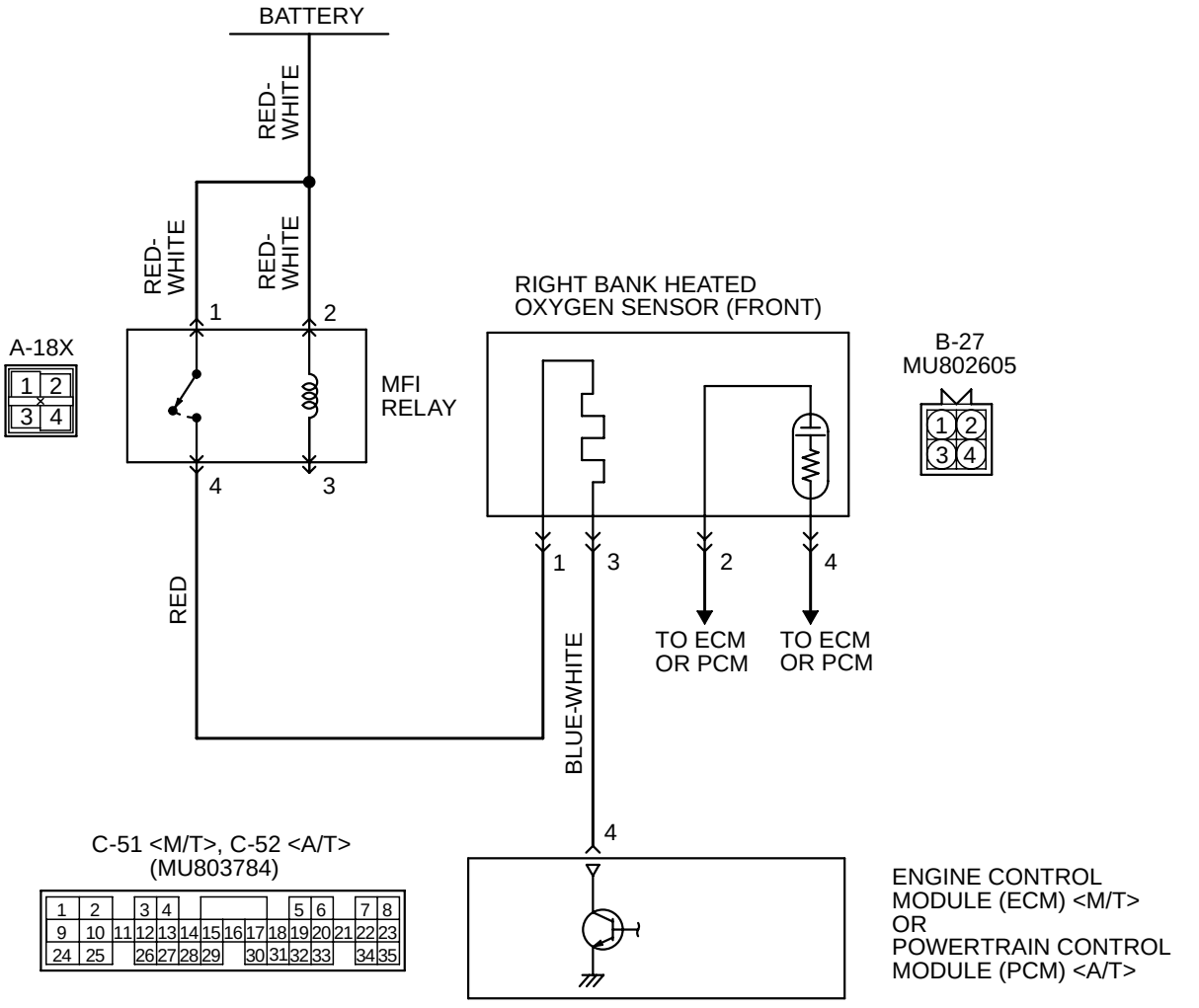
STEP 14. Test the OBD-II drive cycle.
(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 6 – Other Monitor P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0134 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0135: Heated Oxygen Sensor Heater Circuit (bank 1, sensor 1)

Right Bank Heated Oxygen Sensor (front) Heater Circuit



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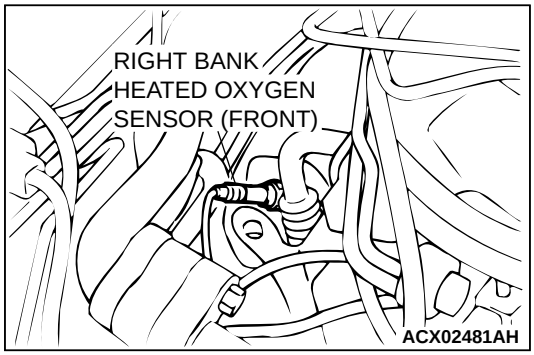
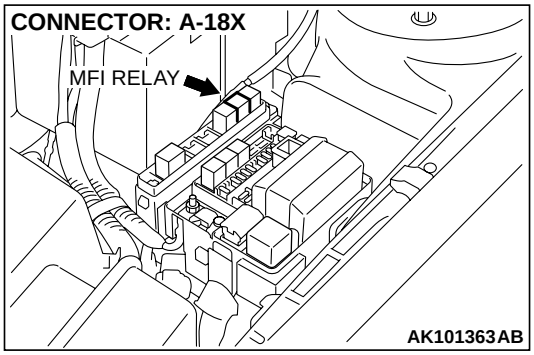
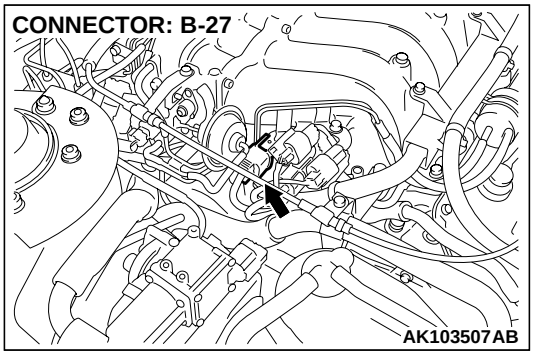
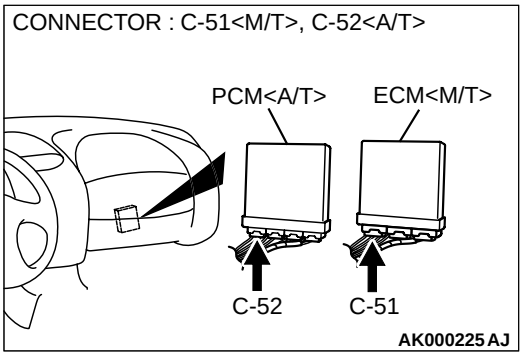








CIRCUIT OPERATION

- Power is supplied from the MFI relay (terminal 4) to the right bank heated oxygen sensor (front) heater.
- The ECM (terminal 4) <M/T> or PCM (terminal 4) <A/T> controls continuity to the right bank heated oxygen sensor (front) heater by turning the power transistor in the ECM <M/T> or PCM <A/T> "ON" and "OFF".

TECHNICAL DESCRIPTION

- The ECM <M/T> or PCM <A/T> checks whether the heater current is within a specified range when the heater is energized.

DTC SET CONDITIONS

Check Conditions

- 60 seconds have elapsed from the start of the previous monitoring.
- Engine coolant temperature is higher than 20°C (68°F).
- While the right bank heated oxygen sensor (front) heater is on.
- Battery positive voltage is at between 11 and 16 volts.

Judgment Criteria

- Heater current of the right bank heated oxygen sensor (front) heater has continued to be lower than 0.16 ampere or higher than 7.5 ampere for 4 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Open or shorted right bank heated oxygen sensor (front) heater circuit.
- Open circuit in right bank heated oxygen sensor (front) heater.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tool:

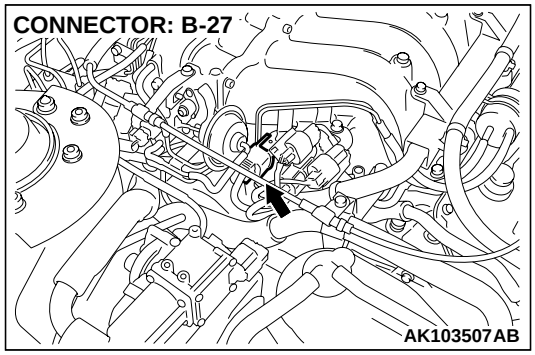
- MD998464: Test Harness

STEP 1. Check connector B-27at the right bank heated oxygen sensor (front) for damage.

Q: Is the connector in good condition?

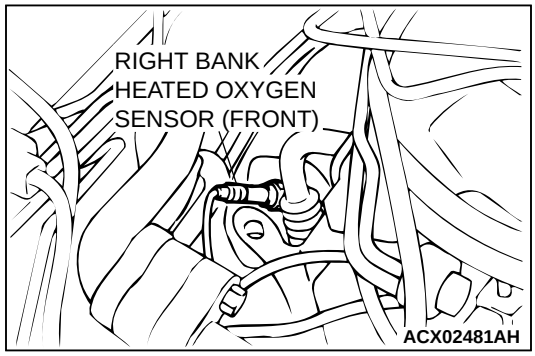
YES : Go to Step 2.

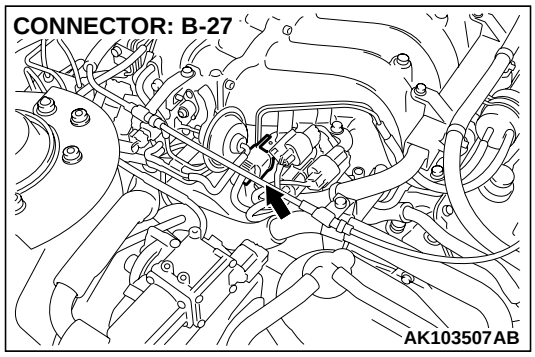
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

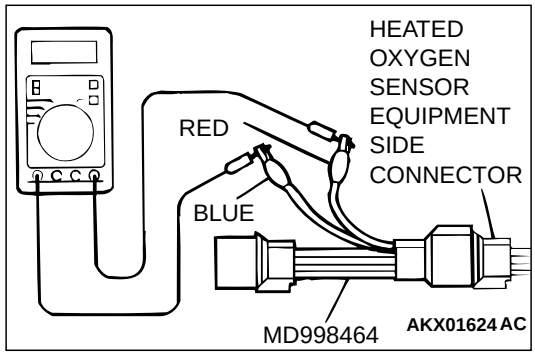


STEP 2. Check the right bank heated oxygen sensor (front).

(1) Disconnect right bank heated oxygen sensor (front) connector B-27 and connect test harness special tool, MD998464, to the connector on the right bank heated oxygen (front) sensor side.







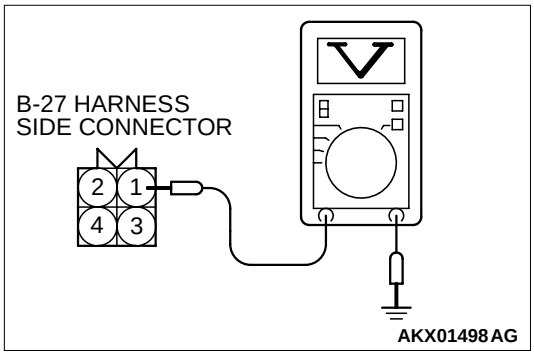
(2) Measure the resistance between heated oxygen sensor connector terminal 1 (red clip) and terminal 3 (blue clip).

Standard value: 4.5 – 8.0 ohm [at 20°C (68°F)]

Q: Is the resistance normal?

YES : Go to Step 3.

NO : Replace the right bank heated oxygen sensor (front). Then go to Step 12.



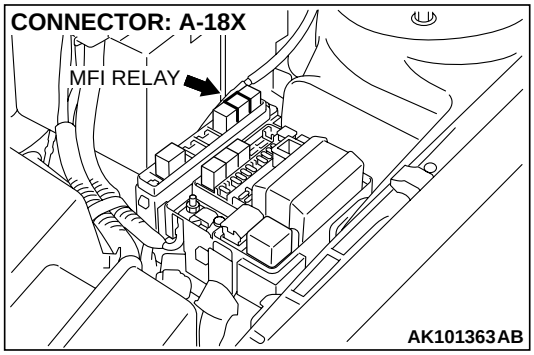
STEP 3. Check the power supply voltage at right bank heated oxygen sensor (front) harness side connector B-27.

(1) Disconnect the connector B-27 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 1 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

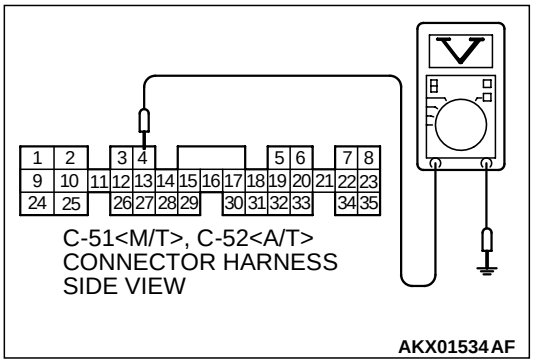
YES : Go to Step 5.
NO : Go to Step 4.



STEP 4. Check connector A-18X at the MFI relay for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between MFI relay connector A-18X terminal 4 and right bank heated oxygen sensor (front) connector B-27 terminal 1 because of open circuit or short circuit to ground Then go to Step 12.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



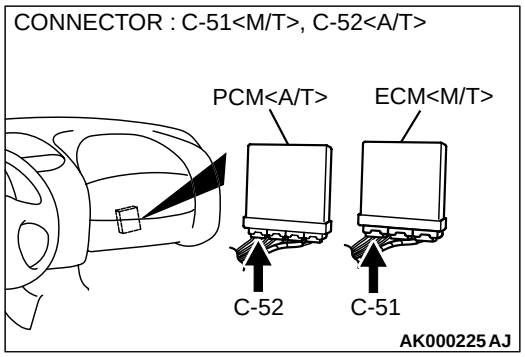
STEP 5. Check the power supply voltage at ECM connector C-51 <M/T> or PCM connector C-52 <A/T> by backprobing.

(1) Do not disconnect the connector C-51 <M/T> or C-52 <A/T>.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 4 and ground by backprobing.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 8.
NO : Go to Step 6.

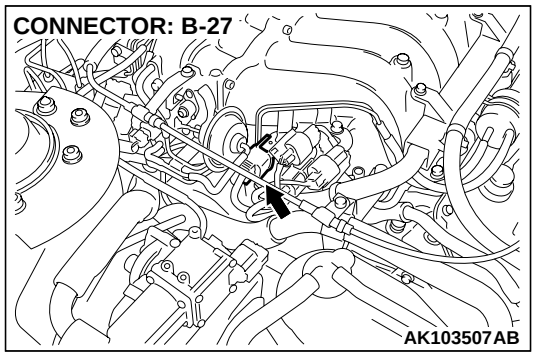


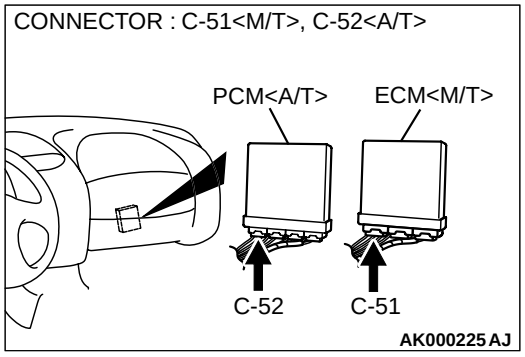
STEP 6. Check connector C-51 at ECM <M/T> or connector C-52 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 7.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



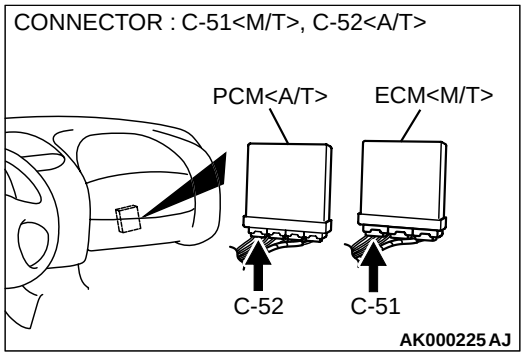


STEP 7. Check for open circuit or short circuit to ground between right bank heated oxygen sensor (front) connector B-27 terminal 3 and ECM connector C-51 terminal 4 <M/T> or PCM connector C-52 terminal 4 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 12.

NO : Repair it. Then go to Step 12.



STEP 8. Check connector C-51 at ECM <M/T> or connector C-52 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 9.

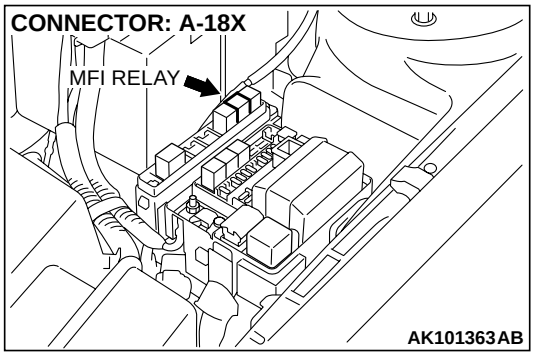
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

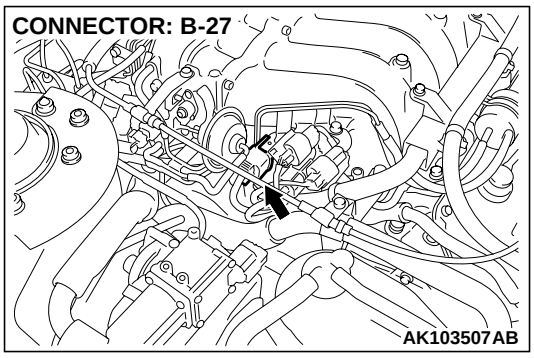
STEP 9. Check for harness damage between MFI relay connector A-18X terminal 4 and right bank heated oxygen sensor (front) connector B-27 terminal 1.

Q: Is the harness wire in good condition?

YES : Go to Step 10.

NO : Repair it. Then go to Step 12.



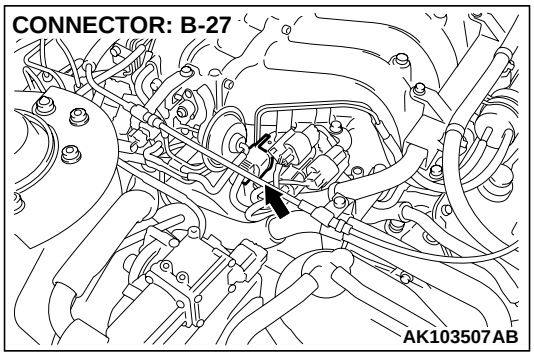


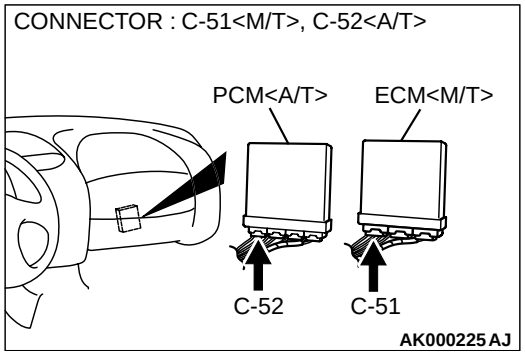
STEP 10. Check for harness damage between right bank heated oxygen sensor (front) connector B-27 terminal 3 and ECM connector C-51 terminal 4 <M/T> or PCM connector C-52 terminal 4 <A/T>.

Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair it. Then go to Step 12.





STEP 11. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 6 – Other Monitor P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0135 is output?

YES : Replace the ECM or PCM. Then go to Step 12.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

STEP 12. Test the OBD-II drive cycle.

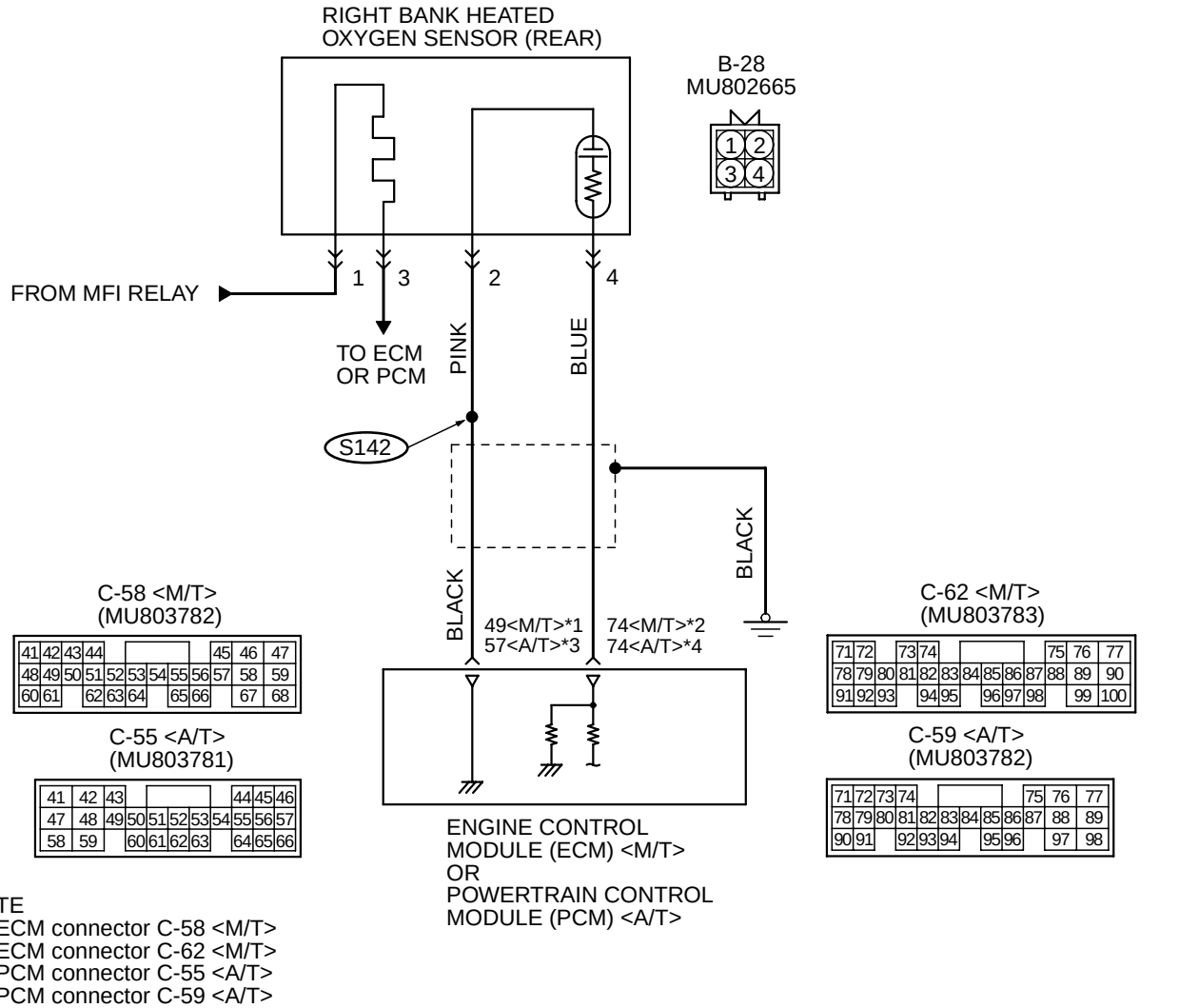
(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 6 – Other Monitor P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0135 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0136: Heated Oxygen Sensor Circuit (bank 1, sensor 2)

Right Bank Heated Oxygen Sensor (rear) Circuit



NOTE
*1: ECM connector C-58 <M/T>
*2: ECM connector C-62 <M/T>
*3: PCM connector C-55 <A/T>
*4: PCM connector C-59 <A/T>

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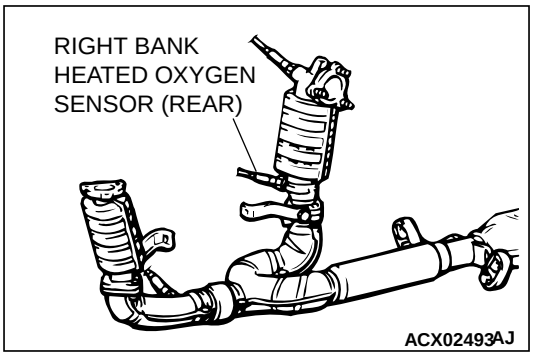
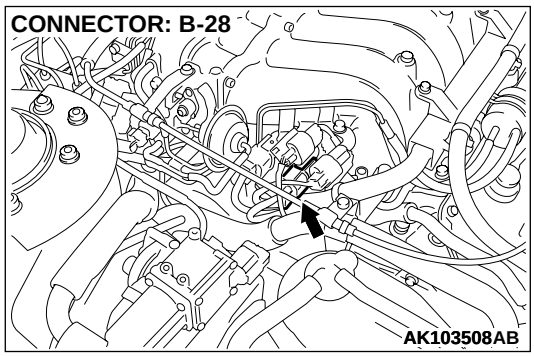
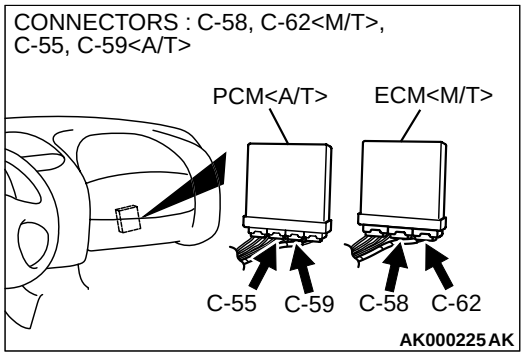




TSB Revision



CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal 74) <M/T> or PCM (terminal 74) <A/T> from the output terminal (terminal 4) of the right bank heated oxygen sensor (rear).
- Terminal 2 of the right bank heated oxygen sensor (rear) is grounded with ECM (terminal 49) <M/T> or PCM (terminal 57) <A/T>.

TECHNICAL DESCRIPTION

- The output signal of the right bank heated oxygen sensor (front) is compensated by the output signal of the right bank heated oxygen sensor (rear).
- The ECM <M/T> or PCM <A/T> checks for an open circuit in the right bank heated oxygen sensor (rear) output line.

DTC SET CONDITIONS

Check Conditions

- 3 minutes or more have passed since the starting sequence was completed.
- Right bank heated oxygen sensor (rear) signal voltage has continued to be 0.15 volt or lower.
- Engine coolant temperature is higher than 76°C (169°F).
- Engine speed is higher than 1,200 r/min.
- Volumetric efficiency is higher than 25 percent.
- Monitoring time: 7 seconds.

Judgment Criteria

- Input voltage supplied to the ECM <M/T> or PCM <A/T> interface circuit is higher than 4.5 volts when 5 volts is applied to the right bank heated oxygen sensor (rear) output line via a resistor.
- The ECM <M/T> or PCM <A/T> monitors for this condition once during the drive cycle.

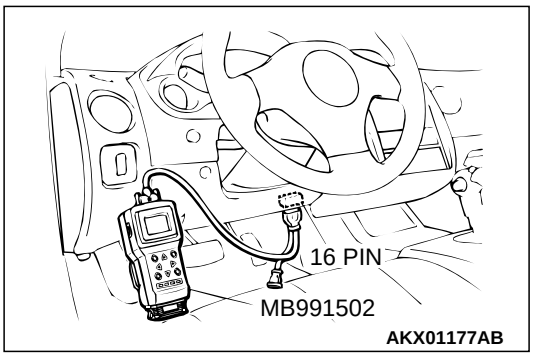
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Right bank heated oxygen sensor (rear) failed.
- Open circuit in right bank heated oxygen sensor (rear) output line.
- Open circuit in right bank heated oxygen sensor (rear) ground line.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991316: Test Harness



STEP 1. Using scan tool MB991502, check data list item 69: Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).

⚠ CAUTION

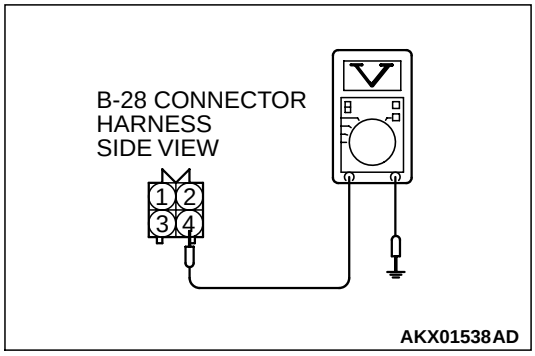
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 69, Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).
- Warming up the engine. When the engine is revved, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Go to Step 2.



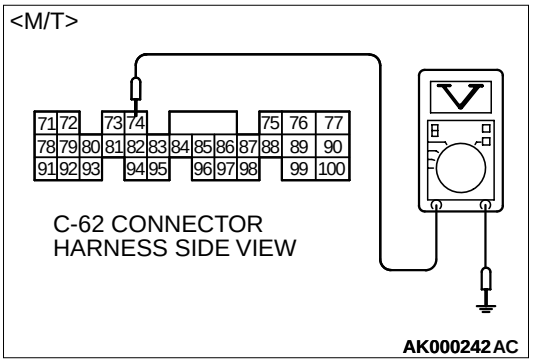
STEP 2. Check the sensor output voltage at right bank heated oxygen sensor (rear) connector B-28 by backprobing.

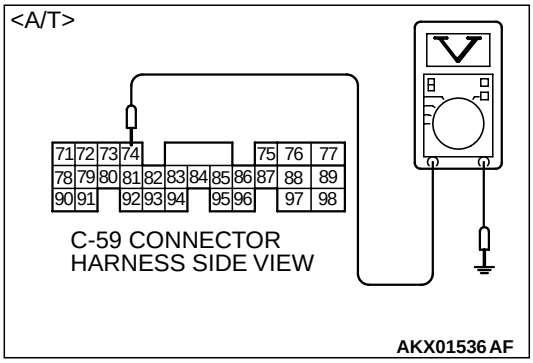
(1) Do not disconnect the connector B-28.
(2) Start the engine and run at idle.
(3) Measure the voltage between terminal 4 and ground by backprobing.
- Warming up the engine. When the engine is revved, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 3.
NO : Go to Step 7.





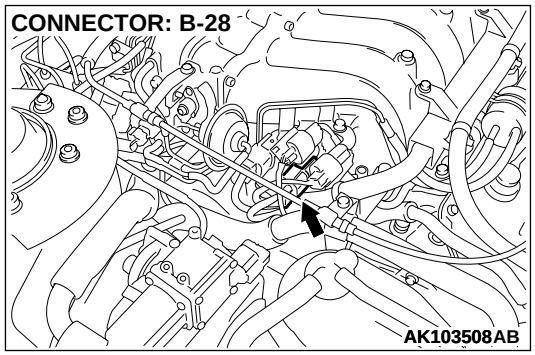
STEP 3. Check the sensor output voltage at ECM connector C-62 <M/T> or PCM connector C-59 <A/T> by backprobing.

(1) Do not disconnect the connector C-62 <M/T> or C-59 <A/T>.
(2) Start the engine and run at idle.
(3) Measure the voltage between terminal 74 and ground by backprobing.
- Warming up the engine. When the engine is 2,500 r/min, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 4.
NO : Go to Step 6.

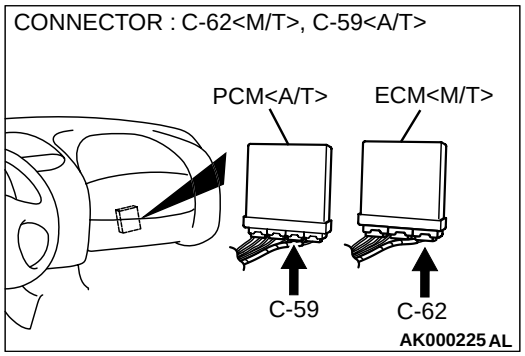


STEP 4. Check connector B-28 at right bank heated oxygen sensor (rear) and connector C-62 at ECM <M/T> or connector C-59 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 15.



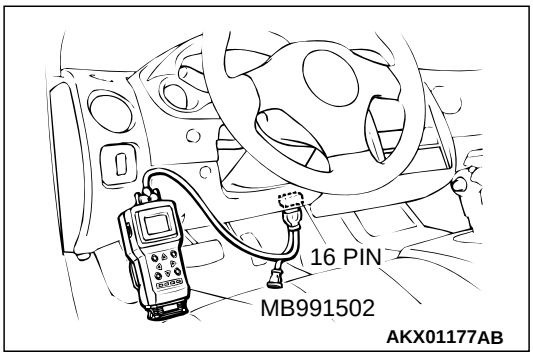
STEP 5. Using scan tool MB991502, check data list item 69: Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 69, Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).
- Warming up the engine. When the engine is revved, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.

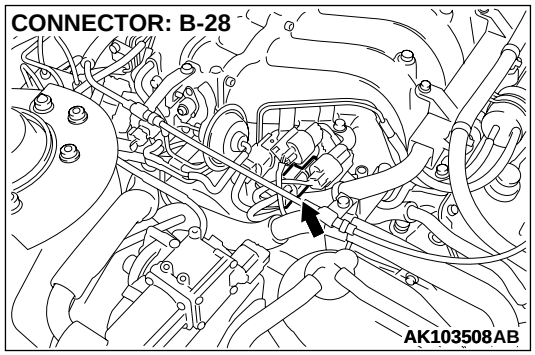
(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

NO : Replace the ECM or PCM. Then go to Step 15.

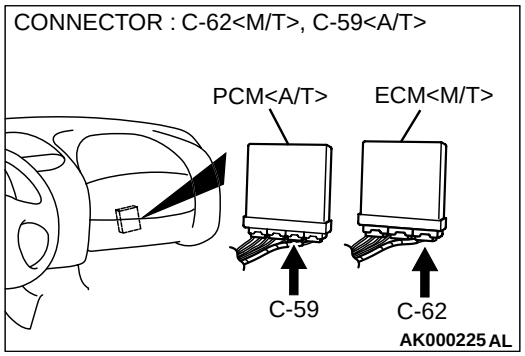


STEP 6. Check connector B-28 at right bank heated oxygen sensor (rear) and connector C-62 at ECM <M/T> or connector C-59 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between right bank heated oxygen sensor (rear) connector B-28 terminal 4 and ECM connector C-62 terminal 74 <M/T> or PCM connector C-59 terminal 74 <A/T> because of open circuit or harness damage. Then go to Step 15.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 15.

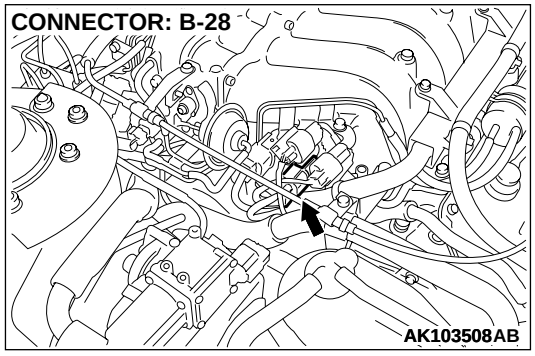


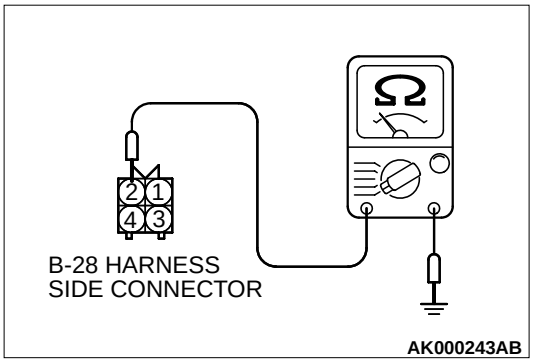
STEP 7. Check connector B-28 at right bank heated oxygen sensor (rear) for damage.

Q: Is the connector in good condition?

YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 15.





STEP 8. Check the continuity at right bank heated oxygen sensor (rear) harness side connector B-28.

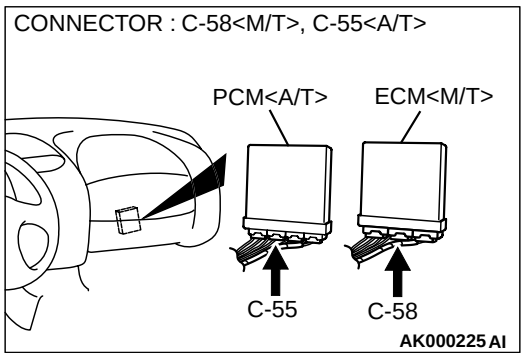
(1) Disconnect the connector B-28 and measure at the harness side.

(2) Check for the continuity between terminal 2 and ground.
- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 11.

NO : Go to Step 9.



STEP 9. Check connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

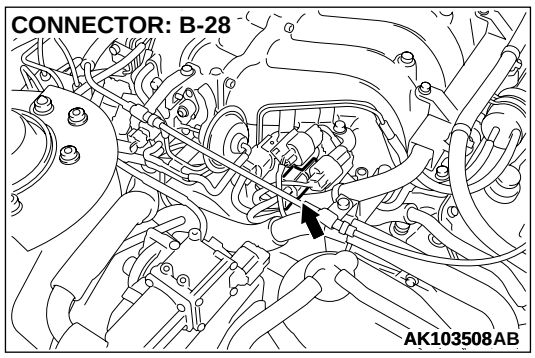
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 15.

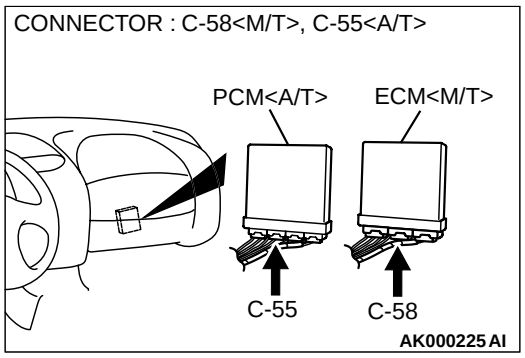
STEP 10. Check for open circuit and harness damage between right bank heated oxygen sensor (rear) connector B-28 terminal 2 and ECM connector C-58 terminal 49 <M/T> or PCM connector C-55 terminal 57 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 15.

NO : Repair it. Then go to Step 15.



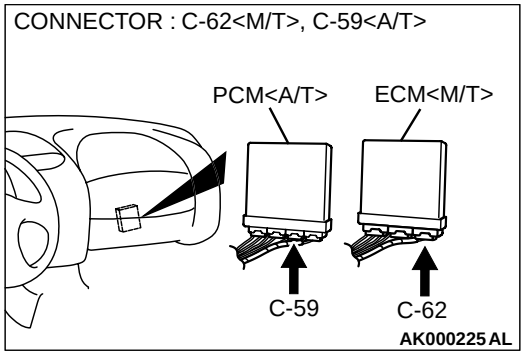


STEP 11. Check connector C-62 at ECM <M/T> or connector C-59 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 12.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 15.

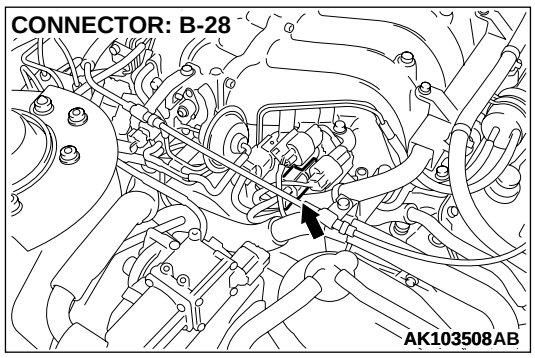


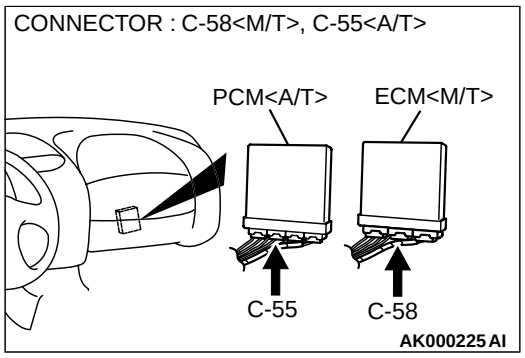
STEP 12. Check for harness damage between right bank heated oxygen sensor (rear) connector B-28 terminal 2 and ECM connector C-58 terminal 49 <M/T> or PCM connector C-55 terminal 57 <A/T>.

Q: Is the harness wire in good condition?

YES : Go to Step 13.

NO : Repair it. Then go to Step 15.



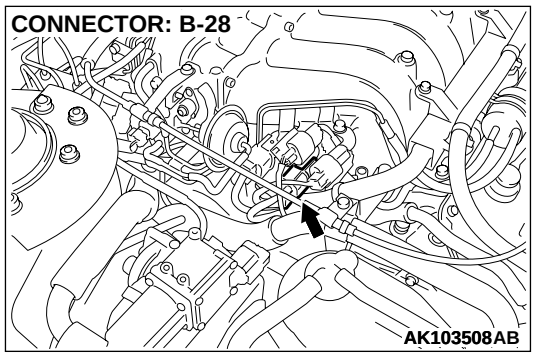


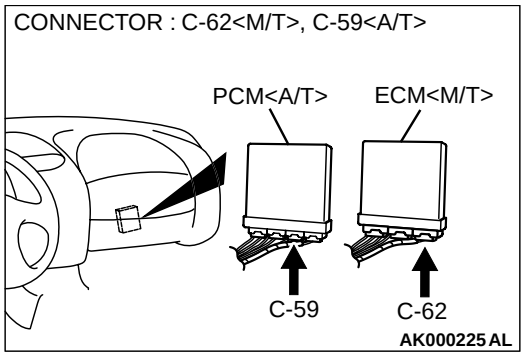
STEP 13. Check for short circuit to ground and harness damage between right bank heated oxygen sensor (rear) connector B-28 terminal 4 and ECM connector C-62 terminal 74 <M/T> or PCM connector C-59 terminal 74 <A/T>.

Q: Is the harness wire in good condition?

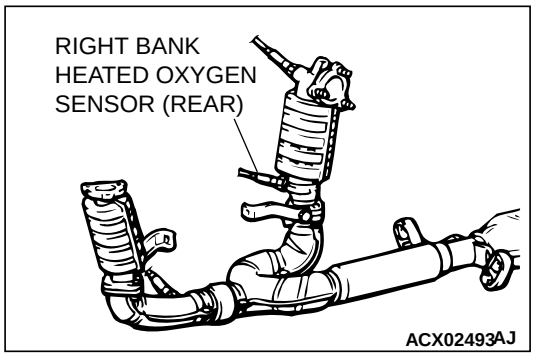
YES : Go to Step 14.

NO : Repair it. Then go to Step 15.



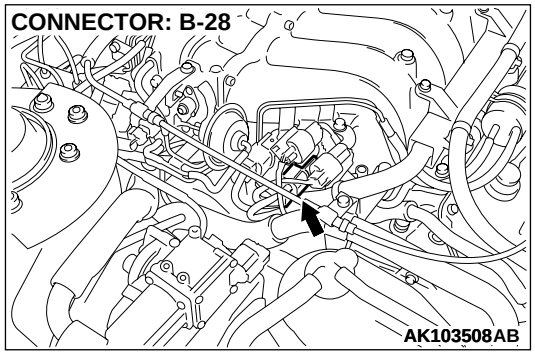


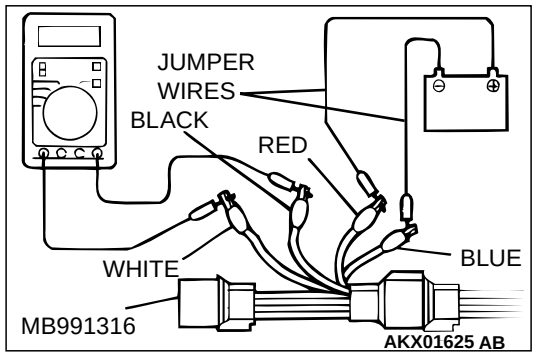
STEP 14. Check the right bank heated oxygen sensor (rear).



(1) Disconnect the right bank heated oxygen sensor (rear) connector B-28 and connect test harness special tool, MB991316, to the connector on the right bank heated oxygen sensor (front) side.
(2) Warm up the engine until engine coolant 80°C (176°F) or higher.

⚠ CAUTION
Be very careful when connecting the jumper wires; incorrect connection can damage the right bank heated oxygen sensor (rear).





(3) Use the jumper wires to connect terminal 1 (red clip) to the positive battery terminal and terminal 3 (blue clip) to the negative battery terminal.
(4) Connect a digital volt meter between terminal 2 (black clip) and terminal 4 (white clip).
(5) While repeatedly revving the engine, measure the right bank heated oxygen sensor (rear) output voltage.

Standard value: 0.6 – 1.0 V

Q: Is the voltage at the standard value?

YES : Replace the ECM or PCM. Then go to Step 15.
NO : Replace the right bank heated oxygen sensor (rear). Then go to Step 15.

STEP 15. Test the OBD-II drive cycle.

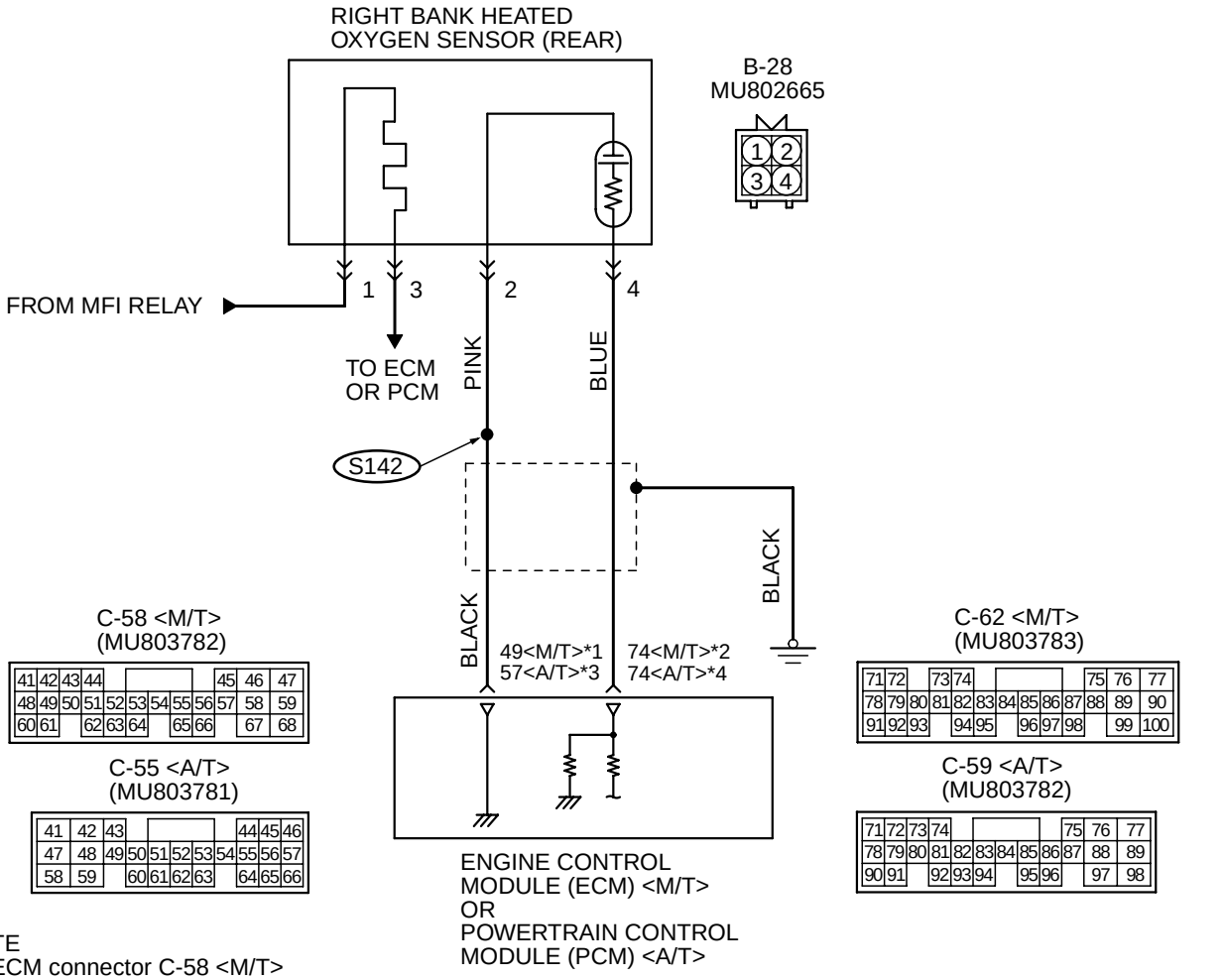
(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 6 – Other Monitor P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0136 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0137: Heated Oxygen Sensor Circuit Low Voltage (bank 1, sensor 2)

Right Bank Heated Oxygen Sensor (rear) Circuit



NOTE
*1: ECM connector C-58 <M/T>
*2: ECM connector C-62 <M/T>
*3: PCM connector C-55 <A/T>
*4: PCM connector C-59 <A/T>

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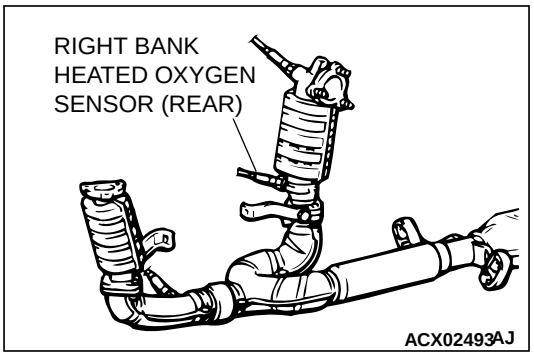
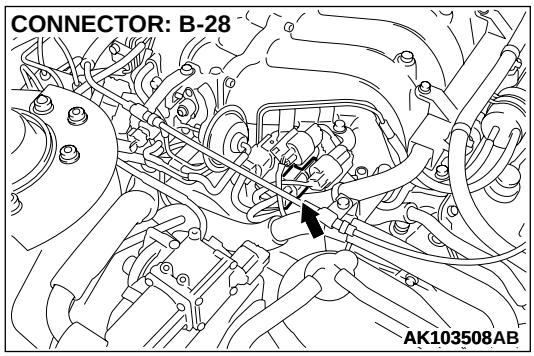
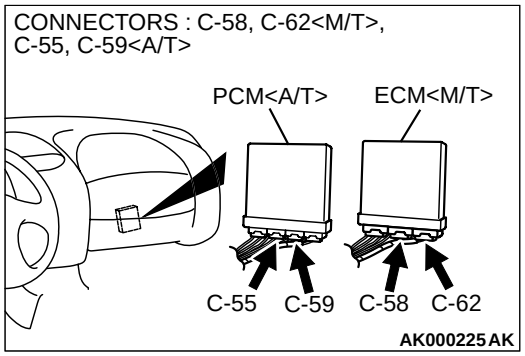




TSB Revision



CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal 74) <M/T> or PCM (terminal 74) <A/T> from the output terminal (terminal 4) of the right bank heated oxygen sensor (rear).
- Terminal 2 of the right bank heated oxygen sensor (rear) is grounded with ECM (terminal 49) <M/T> or PCM (terminal 57) <A/T>.

TECHNICAL DESCRIPTION

- The output signal of the right bank heated oxygen sensor (front) is compensated by the output signal of the right bank heated oxygen sensor (rear).
- The ECM <M/T> or PCM <A/T> checks for an open circuit in the right bank heated oxygen sensor (rear) output line.

DTC SET CONDITIONS

Check Conditions

- 3 minutes or more have passed since the starting sequence was completed.
- Right bank heated oxygen sensor (rear) signal voltage has continued to be 0.15 volt or lower.
- Engine coolant temperature is higher than 76°C (169°F).
- Engine speed is higher than 1,200 r/min.
- Volumetric efficiency is higher than 25 percent.
- Volume air flow sensor output frequency is 75 Hz or more.
- At least 20 seconds have passed since fuel shut off control was canceled.
- The right bank heated oxygen sensor (front) outputs 0.5 volts or more.
- After the ignition switch is turned ON, the changes in the output voltage of the right bank heated oxygen sensor (rear) is lower than 0.078 volt.
- Monitoring time: 10 seconds.

Judgement Criteria

- Making the air/fuel ratio 15 percent for 10 seconds richer does not result in raising the heated oxygen sensor (rear) output voltage beyond 0.15 volt.
- The ECM <M/T> or PCM <A/T> monitors for this condition once during the drive cycle.

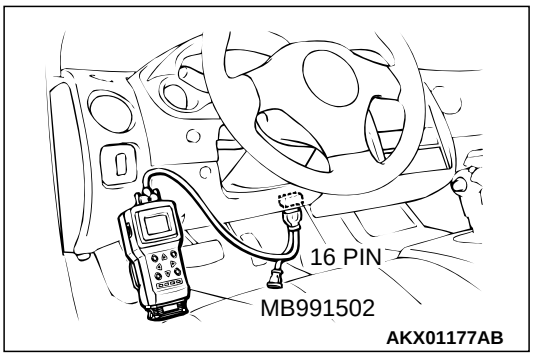
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Right bank heated oxygen sensor (rear) failed.
- Short circuit in right bank heated oxygen sensor (rear) output line.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991316: Test Harness Set



STEP 1. Using scan tool MB991502, check data list item 69: Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

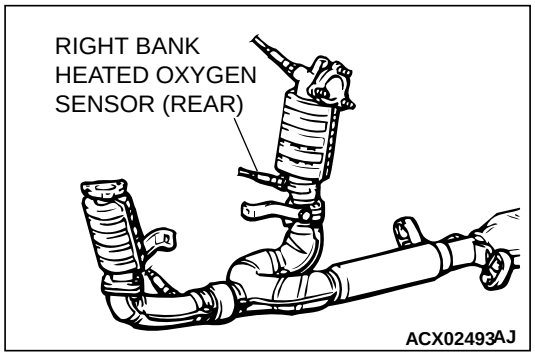
(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 69, Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).
- Warming up the engine. When the engine is revved, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.

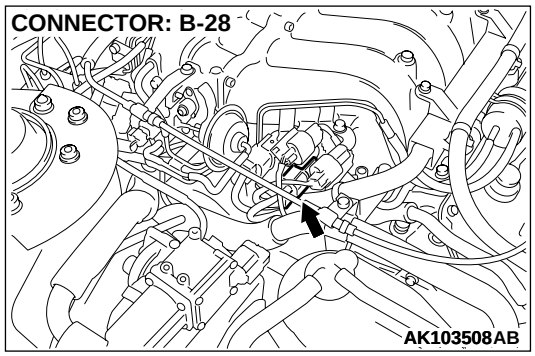
(4) Turn the ignition switch to the "LOCK" (OFF) position.

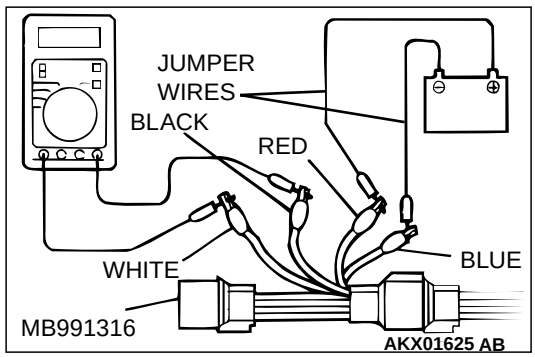
Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

NO : Go to Step 2.







STEP 2. Check the right bank heated oxygen sensor (rear).

(1) Disconnect the right bank heated oxygen sensor (rear) connector B-28 and connect test harness special tool, MB991316, to the connector on the right bank heated oxygen sensor (front) side.

(2) Warm up the engine until engine coolant 80°C (176°F) or higher.

⚠ CAUTION

Be very careful when connecting the jumper wires; incorrect connection can damage the right bank heated oxygen sensor (rear).

(3) Use the jumper wires to connect terminal 1 (red clip) to the positive battery terminal and terminal 3 (blue clip) to the negative battery terminal.

(4) Connect a digital volt meter between terminal 2 (black clip) and terminal 4 (white clip).

(5) While repeatedly revving the engine, measure the right bank heated oxygen sensor (rear) output voltage.

Standard value: 0.6 – 1.0 volt

Q: Is the voltage at the standard value?

YES : Go to Step 3.

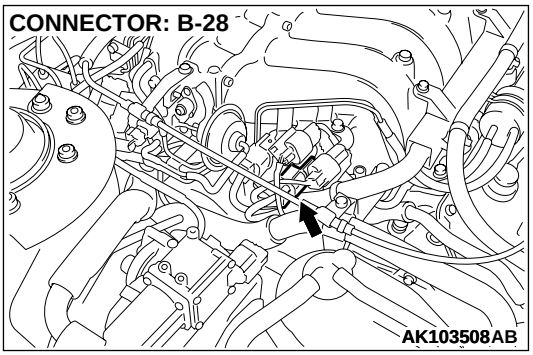
NO : Replace the right bank heated oxygen sensor (rear). Then go to Step 5.

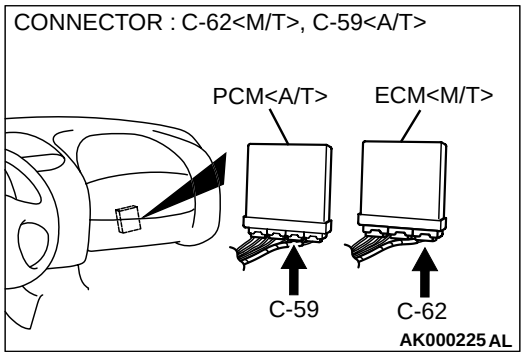
STEP 3. Check connector B-28 at right bank heated oxygen sensor (rear) and connector C-62 at ECM <M/T> or connector C-59 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.



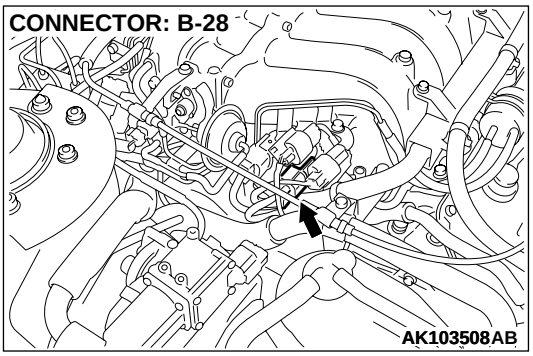


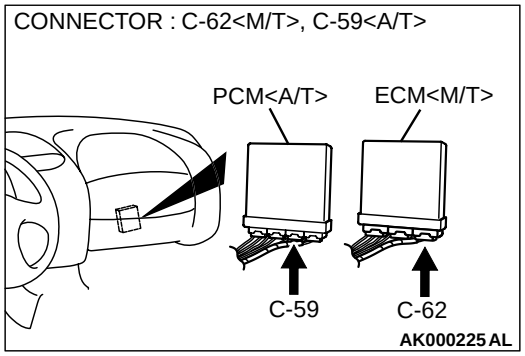
STEP 4. Check for short circuit to ground between right bank heated oxygen sensor (rear) connector B-28 terminal 4 and ECM connector C-62 terminal 74 <M/T> or PCM connector C-59 terminal 74 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 5.

NO : Repair it. Then go to Step 5.





STEP 5. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13B-6.

(2) Check the diagnostic trouble code (DTC).

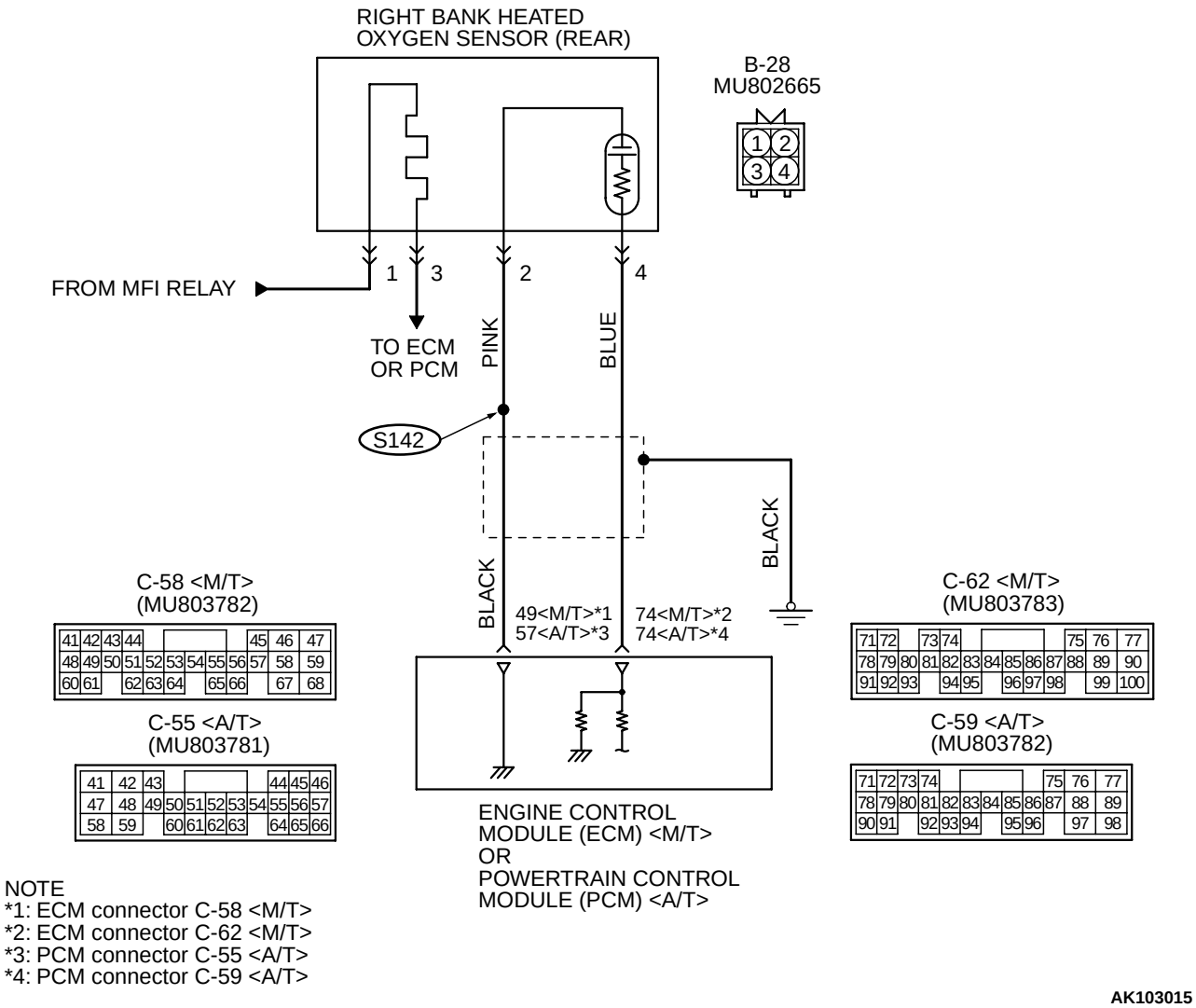
Q: Is the DTC P0137 is output?

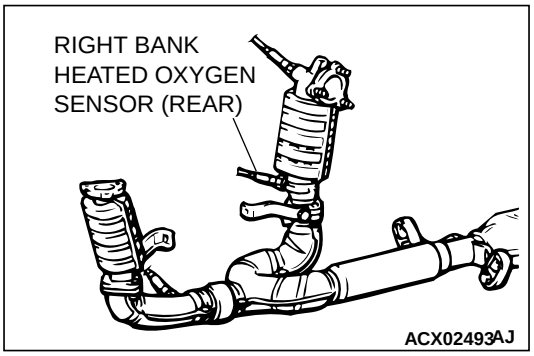
YES : Retry the troubleshooting.

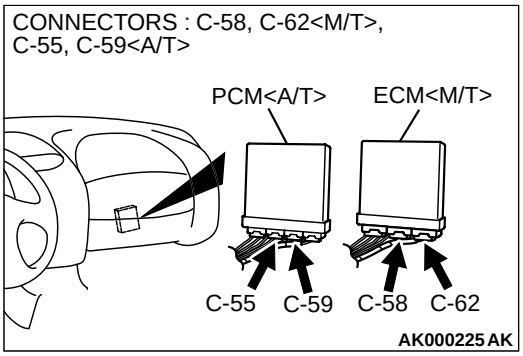
NO : The inspection is complete.

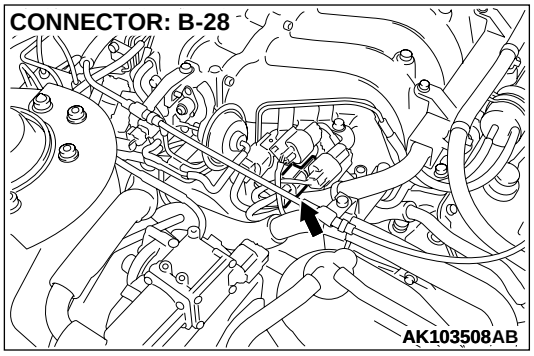
DTC P0138: Heated Oxygen Sensor Circuit High Voltage (bank 1, sensor 2)

Right Bank Heated Oxygen Sensor (rear) Circuit









CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal 74) <M/T> or PCM (terminal 74) <A/T> from the output terminal (terminal 4) of the right bank heated oxygen sensor (rear).
- Terminal 2 of the right bank heated oxygen sensor (rear) is grounded with ECM (terminal 49) <M/T> or PCM (terminal 57) <A/T>.

TECHNICAL DESCRIPTION

- The output signal of the right bank heated oxygen sensor (front) is compensated by the output signal of the right bank heated oxygen sensor (rear).
- The ECM <M/T> or PCM <A/T> checks for an open circuit in the right bank heated oxygen sensor (rear) output line.

DTC SET CONDITIONS

Check Conditions

- 2 seconds or more have passed since the starting sequence was completed.

Judgment Criteria

- Right bank heated oxygen sensor (rear) output voltage has continued to be 1.2 volts or higher for 2 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Short circuit in right bank heated oxygen sensor (rear) ground line.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

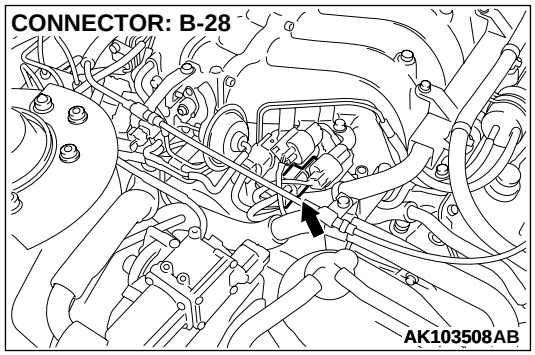
Required Special Tool:

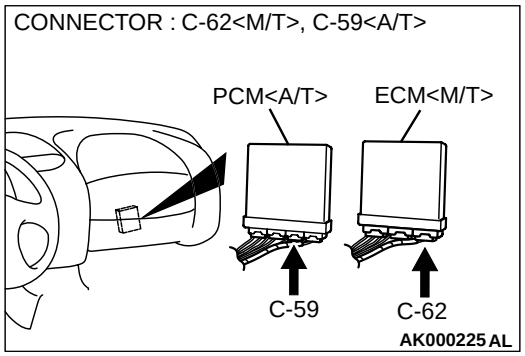
- MB991502: Scan Tool (MUT-II)

TSB Revision

STEP 1. Check connector B-28 at right bank heated oxygen sensor (rear) and connector C-62 at ECM <M/T> or connector C-59 at PCM <A/T> for damage.
Q: Is the connector in good condition?

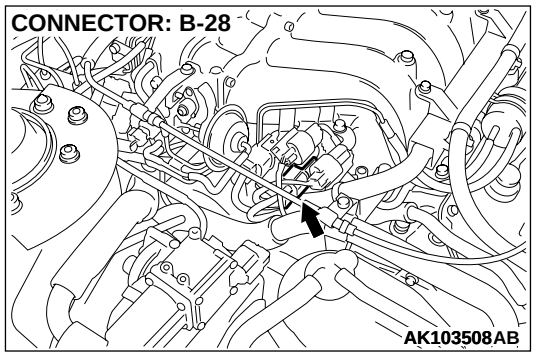
YES : Go to Step 2.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 3.

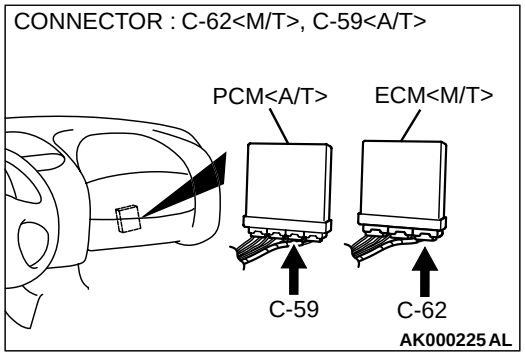




STEP 2. Check for short circuit to power supply between right bank heated oxygen sensor (rear) connector B-28 terminal 4 and ECM connector C-62 terminal 74 <M/T> or PCM connector C-59 terminal 74 <A/T>.
Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 3.
NO : Repair it. Then go to Step 3.





STEP 3. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 6 – Other Monitor P.13B-6.

(2) Check the diagnostic trouble code (DTC).

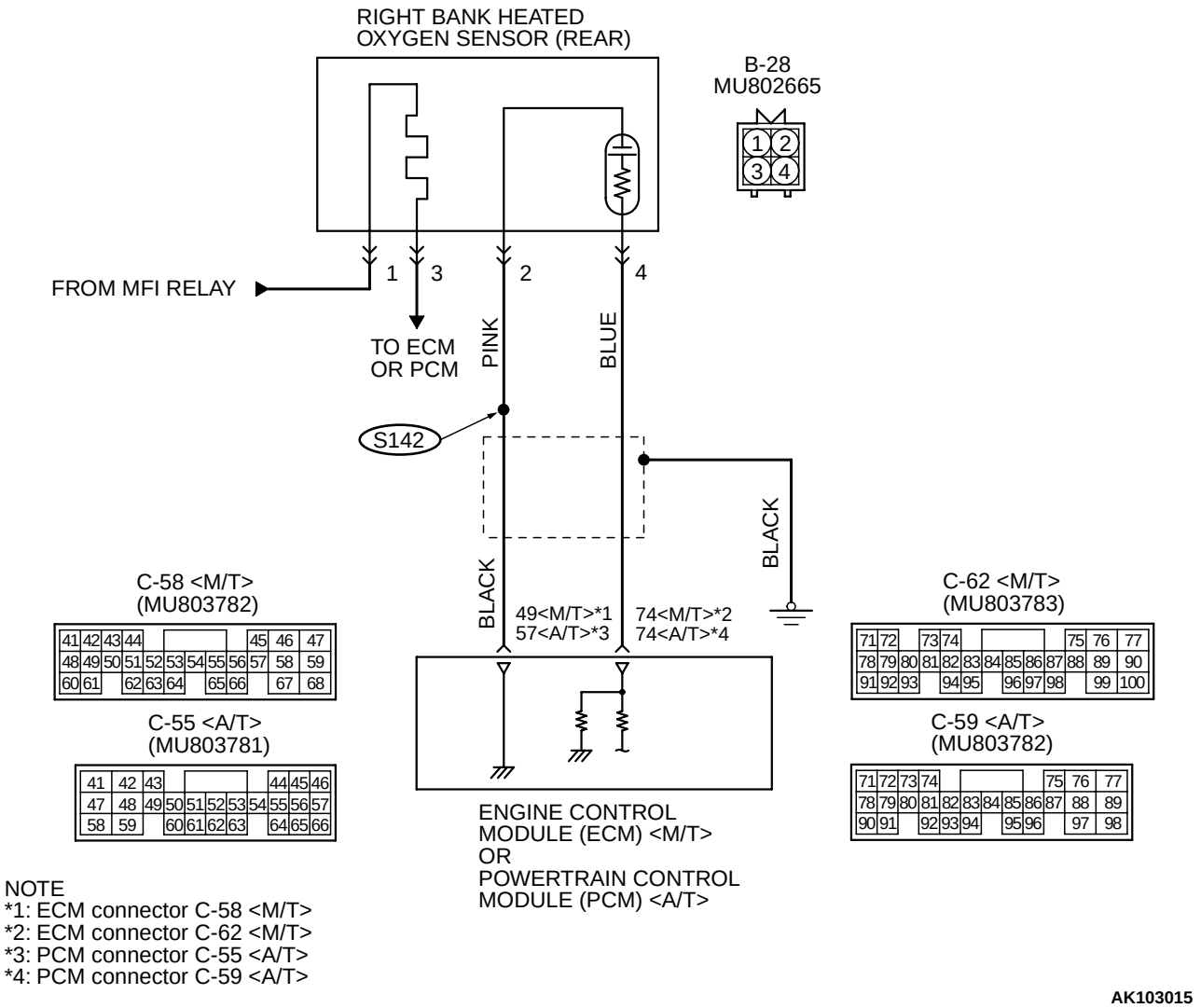
Q: Is the DTC P0138 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0139: Heated Oxygen Sensor Circuit Slow Responce (bank 1, sensor 2)

Right Bank Heated Oxygen Sensor (rear) Circuit



NOTE
*1: ECM connector C-58 <M/T>
*2: ECM connector C-62 <M/T>
*3: PCM connector C-55 <A/T>
*4: PCM connector C-59 <A/T>

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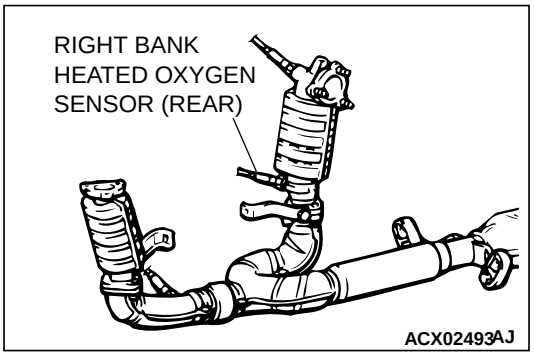
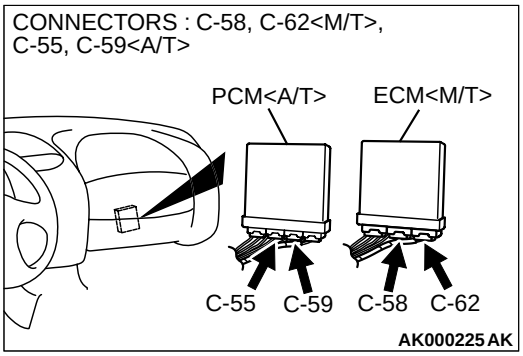
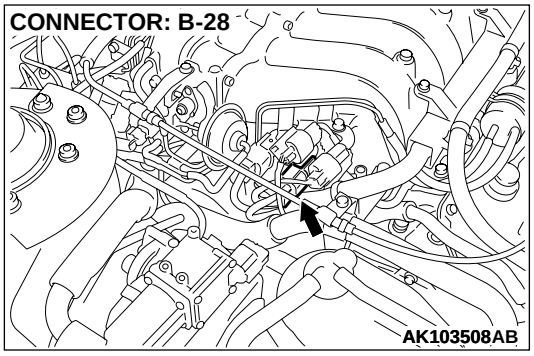






CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal 74) <M/T> or PCM (terminal 74) <A/T> from the output terminal (terminal 4) of the right bank heated oxygen sensor (rear).
- Terminal 2 of the heated oxygen sensor (rear) is grounded with ECM (terminal 49) <M/T> or PCM (terminal 57) <A/T>.

TECHNICAL DESCRIPTION

- The output signal of the right bank heated oxygen sensor (front) is compensated by the output signal of the right bank heated oxygen sensor (rear).
- The ECM <M/T> or PCM <A/T> checks for an open circuit in the right bank heated oxygen sensor (rear) output line.

DTC SET CONDITIONS

Check Conditions

- Engine coolant temperature is higher than 76°C (169°F).
- The right bank heated oxygen sensor (front) is active.
- The cumulative volume air flow sensor output frequency is higher than 4,000 Hz.
- Repeat 3 or more times: drive[*1], stop[*2].

  Drive[*1]:
  - Engine speed is higher than 1,500 r/min.
  - Volumetric efficiency is higher than 40 percent.
  - Vehicle speed is higher than 30 km/h (18.7 mph).
  - A total of more than 10 seconds have elapsed with the above mentioned conditions, and more than 2 seconds have elapsed with the fuel shut off.

  Stop[*2]:
  - Vehicle speed is lower than 1.5 km/h (0.9 mph).

Judgement Criteria

- Change in the output voltage of the right bank heated oxygen sensor (rear) is lower than 0.312 volt.

  NOTE: Monitoring stops after fuel has been shut off for more than 38 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

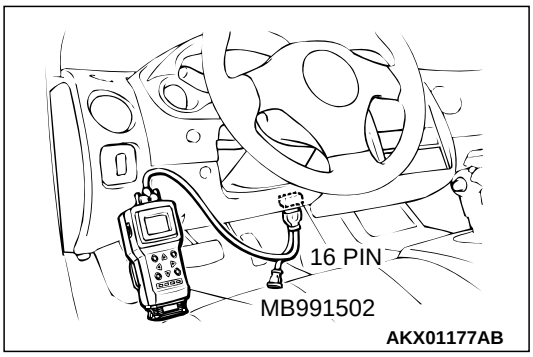
- Right bank heated oxygen sensor (rear) failed.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

TSB Revision



STEP 1. Using scan tool MB991502, check data list item 69: Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 69, Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).
(4) Warm up the engine.
- After increasing the output voltage 0.15 volt or more by the engine revving, finish it. Then confirm that the output voltage reduces to 0.15 volt or less within 3 seconds.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Replace the right bank heated oxygen sensor (rear). Then go to Step 2.

STEP 2. Test the OBD-II drive cycle.

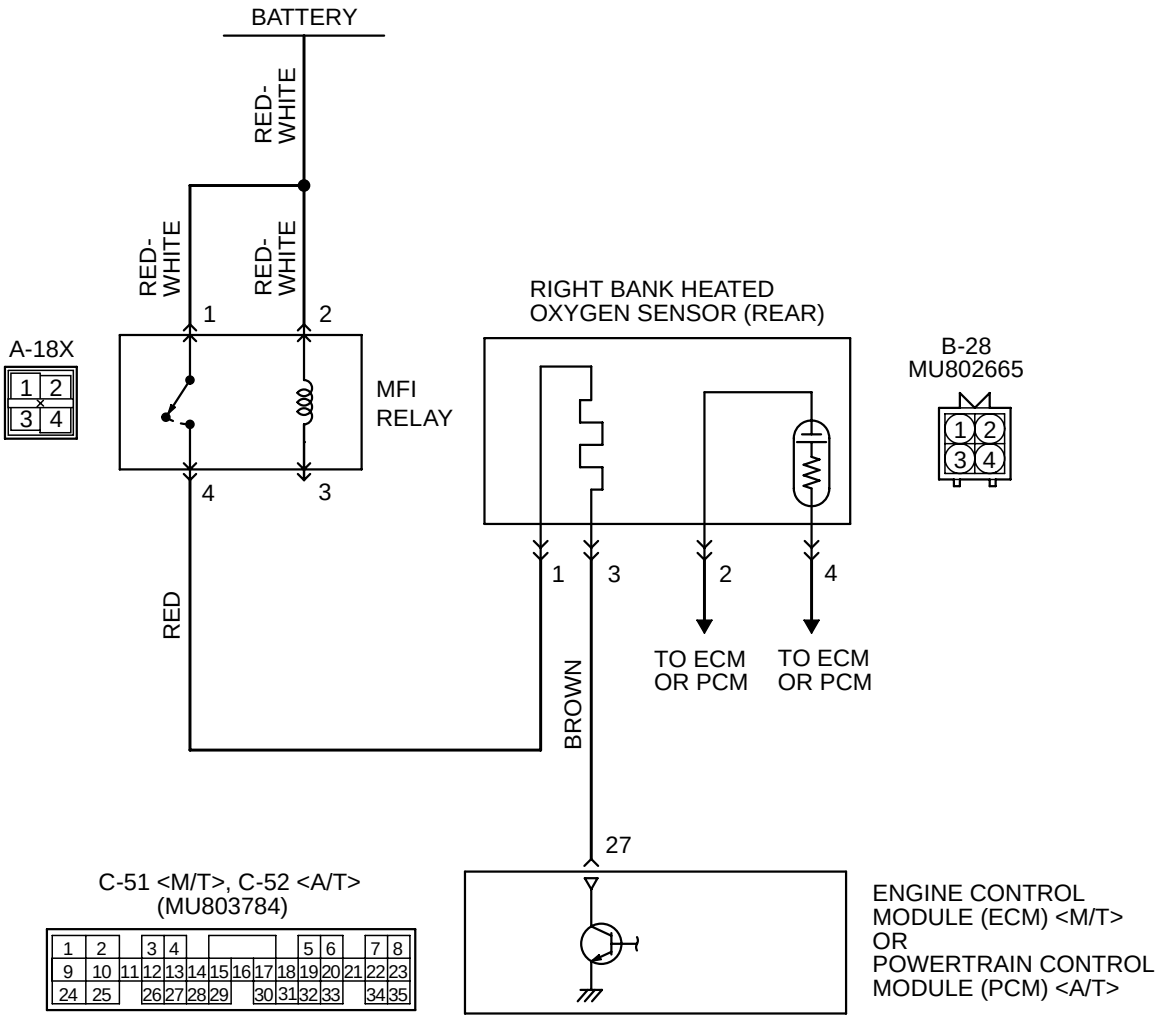
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 4 – Heated Oxygen Sensor Monitor P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0139 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0141: Heated Oxygen Sensor Heater Circuit (bank 1, sensor 2)

Right Bank Heated Oxygen Sensor (rear) Heater Circuit



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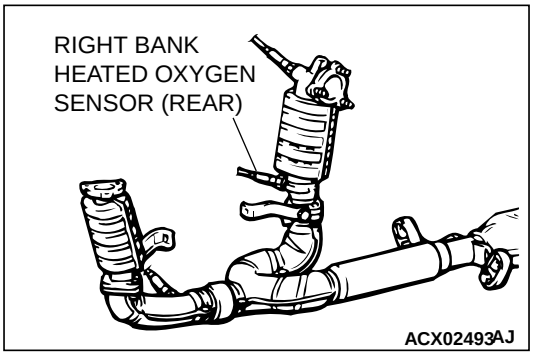
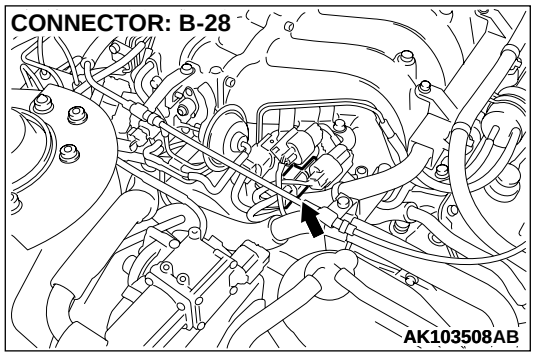
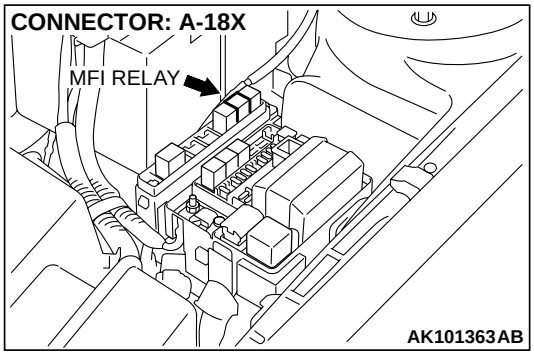
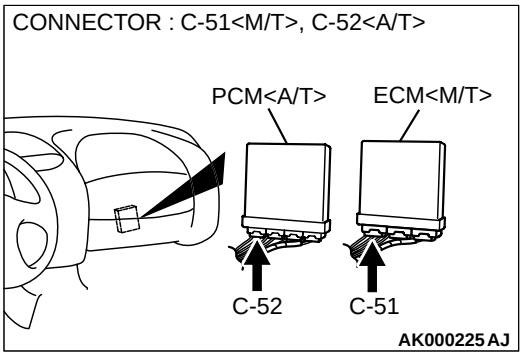




TSB Revision





CIRCUIT OPERATION

- Power is supplied from the MFI relay (terminal 4) to the right bank heated oxygen sensor (rear) heater.
- The ECM (terminal 27) <M/T> or PCM (terminal 27) <A/T> controls continuity to the right bank heated oxygen sensor (rear) heater by turning the power transistor in the ECM <M/T> or PCM <A/T> "ON" and "OFF."

BACKGROUND

- The ECM <M/T> or PCM <A/T> checks whether the heater current is within a specified range when the heater is energized.

DTC SET CONDITIONS

Check Conditions

- 60 seconds have elapsed from the start of the previous monitoring.
- Engine coolant temperature is higher than 20°C (68°F).
- While the right bank heated oxygen sensor (rear) heater is on.
- Battery positive voltage is at between 11 and 16 volts.

Judgment Criteria

- Heater current of the right bank heated oxygen sensor (rear) heater has continued to be lower than 0.16 ampere or higher than 5.0 ampere for 4 seconds.

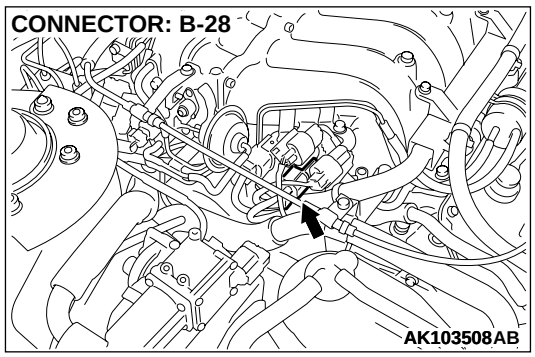
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Open or shorted right bank heated oxygen sensor (rear) heater circuit.
- Open circuit in right bank heated oxygen sensor (rear) heater.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

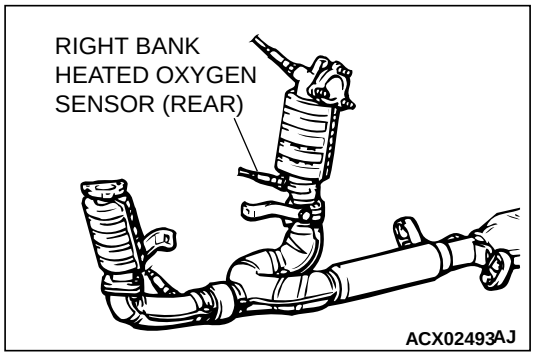
Required Special Tool:

- MB991316: Test Harness



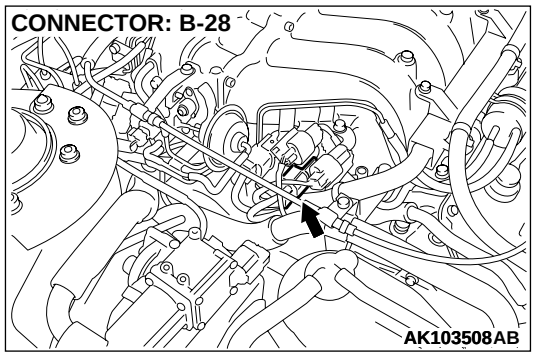
STEP 1. Check connector B-28 at the right bank heated oxygen sensor (rear) for damage.
Q: Is the connector in good condition?

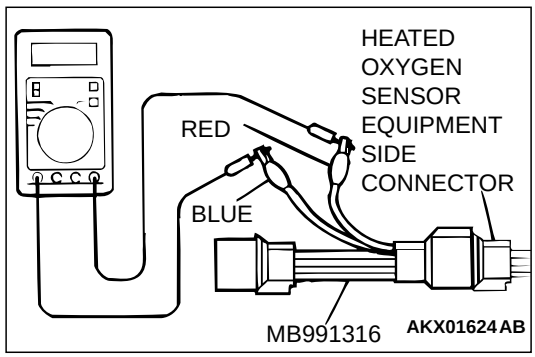
YES : Go to Step 2.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



STEP 2. Check the right bank heated oxygen sensor (rear).

(1) Disconnect right bank heated oxygen sensor (rear) connector B-28 and connect test harness special tool, MB991316, to the connector on the right bank heated oxygen (rear) sensor side.





(2) Measure the resistance between heated oxygen sensor connector terminal 1 (red clip) and terminal 3 (blue clip).

Standard value: 11 – 18 ohm [at 20°C (68°F)]

Q: Is the resistance normal?

YES : Go to Step 3.

NO : Replace the right bank heated oxygen sensor (rear). Then go to Step 12.

STEP 3. Check the power supply voltage at right bank heated oxygen sensor (rear) harness side connector B-28.

(1) Disconnect the connector B-28 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between terminal 1 and ground.

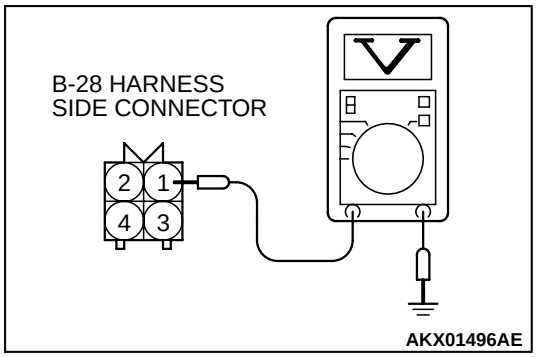
- Voltage should be battery positive voltage.

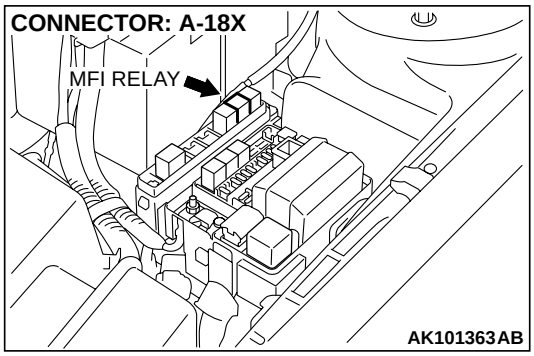
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 5.

NO : Go to Step 4.



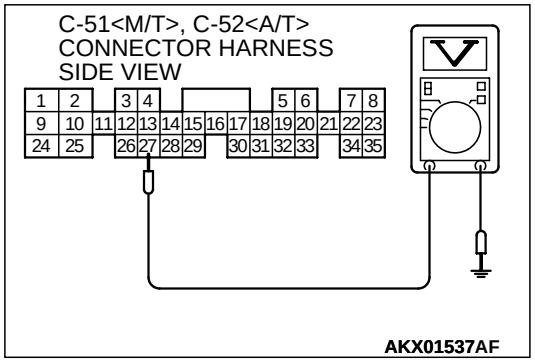


STEP 4. Check harness connector A-18X at the MFI relay for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between MFI relay connector A-18X terminal 4 and right bank heated oxygen sensor (rear) connector B-28 terminal 1 because of open circuit or short circuit to ground. Then go to Step 12.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



STEP 5. Check the power supply voltage at ECM connector C-51 <M/T> or PCM connector C-52 <A/T> by backprobing.

(1) Do not disconnect the connector C-51 <M/T> or C-52 <A/T>.

(2) Turn the ignition switch to the "ON" position.

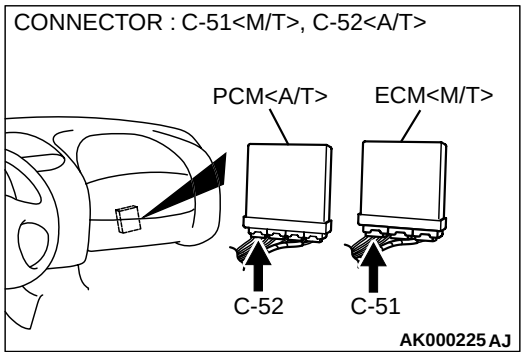
(3) Measure the voltage between terminal 27 and ground by backprobing.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 8.

NO : Go to Step 6.



STEP 6. Check connector C-51 at ECM <M/T> or connector C-52 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 7.

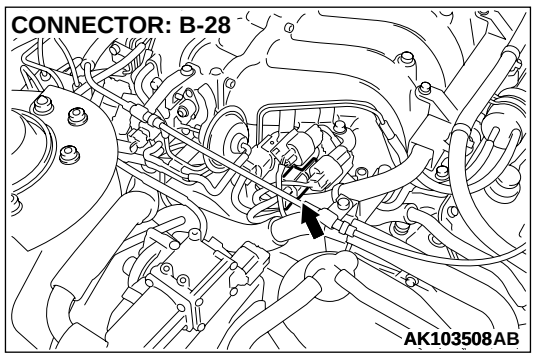
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

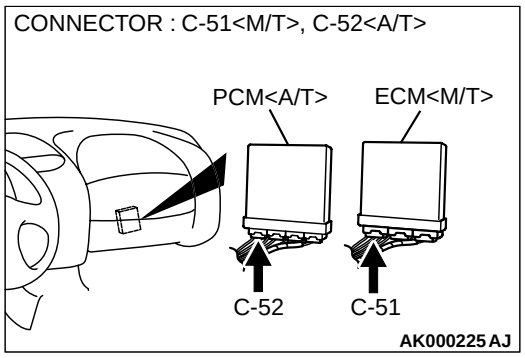
STEP 7. Check for open circuit or short circuit to ground between right bank heated oxygen sensor (rear) connector B-28 terminal 3 and ECM connector C-51 terminal 27 <M/T> or PCM connector C-52 terminal 27 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 12.

NO : Repair it. Then go to Step 12.



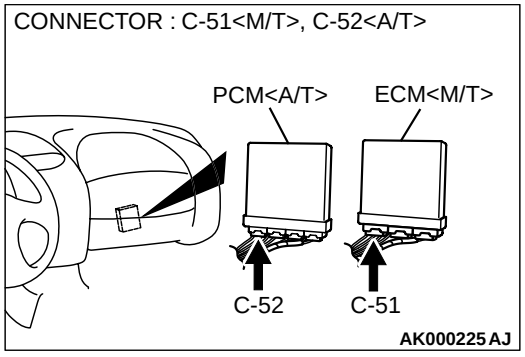


STEP 8. Check connector C-51 at ECM <M/T> or connector C-52 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

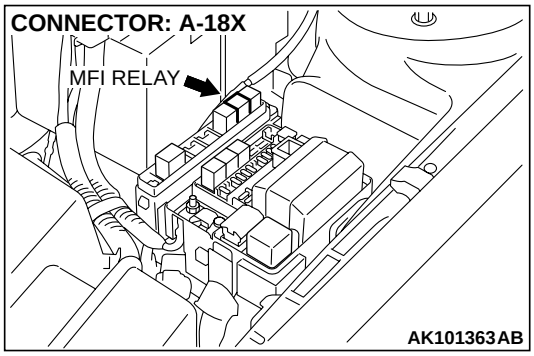


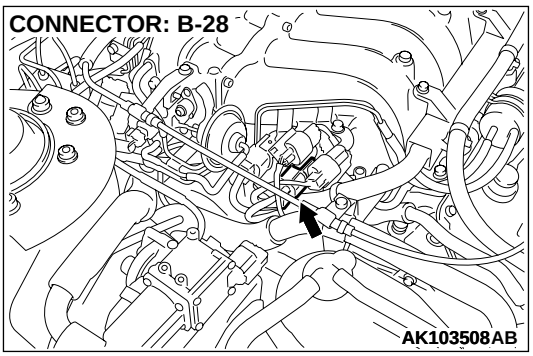
STEP 9. Check for harness damage between MFI relay connector A-18X terminal 4 and right bank heated oxygen sensor (rear) connector B-28 terminal 1.

Q: Is the harness wire in good condition?

YES : Go to Step 10.

NO : Repair it. Then go to Step 12.



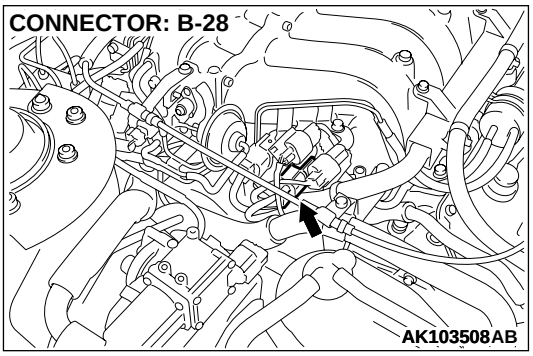


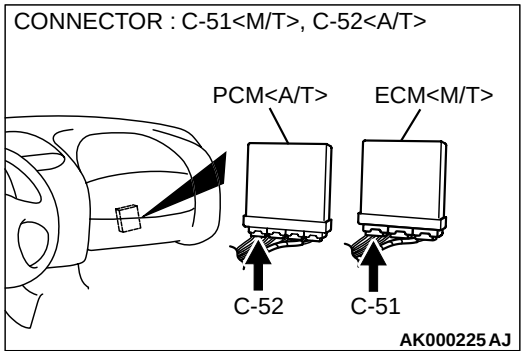
STEP 10. Check for harness damage between right bank heated oxygen sensor (rear) connector B-28 terminal 3 and ECM connector C-51 terminal 27 <M/T> or PCM connector C-52 terminal 27 <A/T>.

Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair it. Then go to Step 12.





STEP 11. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 6 – Other Monitor P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0141 is output?

YES : Replace the ECM or PCM. Then go to Step 12.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

STEP 12. Test the OBD- II drive cycle.

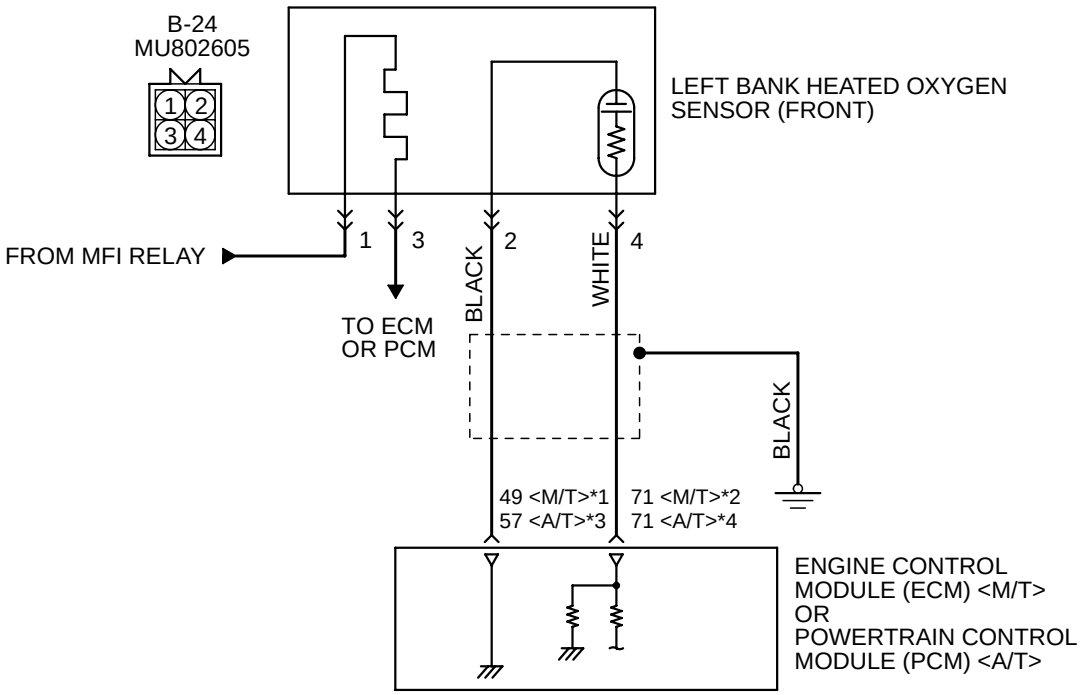
(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 6 – Other Monitor P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0141 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0150: Heated Oxygen Sensor Circuit (bank 2, sensor 1)

Left Bank Heated Oxygen Sensor (front) Circuit



C-58 <M/T> (MU803782)

41	42	43	44					45	46	47		
48	49	50	51	52	53	54	55	56	57	58	59	
60	61		62	63	64		65	66		67	68	

C-62 <M/T> (MU803783)

71	72		73	74					75	76	77	
78	79	80	81	82	83	84	85	86	87	88	89	90
91	92	93		94	95		96	97	98		99	100

C-55 <A/T> (MU803781)

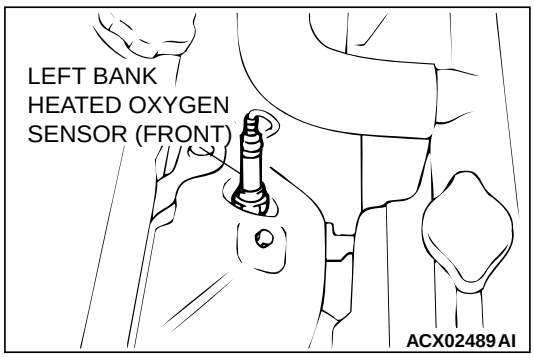
41	42	43					44	45	46	
47	48	49	50	51	52	53	54	55	56	57
58	59		60	61	62	63		64	65	66

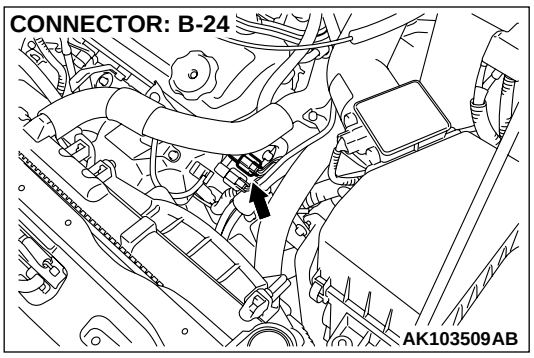
C-59 <A/T> (MU803782)

71	72	73	74					75	76	77
78	79	80	81	82	83	84	85	86	87	88	89
90	91		92	93	94		95	96		97	98

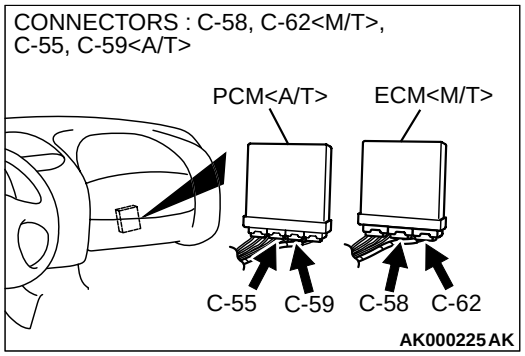
NOTE
*1:ECM connector C-58 <M/T>
*2:ECM connector C-62 <M/T>
*3:PCM connector C-55 <A/T>
*4:PCM connector C-59 <A/T>

AK000694





TSB Revision



CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal 71) <M/T> or PCM (terminal 71) <A/T> from the output terminal (terminal 4) of the left bank heated oxygen sensor (front).
- Terminal 2 of the left bank heated oxygen sensor (front) is grounded with ECM (terminal 49) <M/T> or PCM (terminal 57) <A/T>.

TECHNICAL DESCRIPTION

- The left bank heated oxygen sensor (front) detects the concentration of oxygen in the exhaust gas; it converts that data to voltage, and sends it to the ECM <M/T> or PCM <A/T>.
- When the left bank heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response deteriorates also.
- The ECM <M/T> or PCM <A/T> varies the air/fuel mixture to make it leaner and richer, and checks the response speed of the left bank heated oxygen sensor (front). In addition, the ECM <M/T> or PCM <A/T> also checks for an open circuit in the left bank heated oxygen sensor (front) output line.

DTC SET CONDITIONS

Check Conditions

- 3 minutes or more have passed since the starting sequence was completed.
- Left bank heated oxygen sensor (front) signal voltage has continued to be 0.2 volt or lower.
- Engine coolant temperature is higher than 76°C (169°F).
- Engine speed is higher than 1,200 r/min.
- Volumetric efficiency is higher than 25 percent.
- Monitoring time: 7 seconds.

Judgment Criteria

- Input voltage supplied to the ECM <M/T> or PCM <A/T> interface circuit is higher than 4.5 volts when 5 volts is applied to the left bank heated oxygen sensor (front) output line via a resistor.
- The ECM <M/T> or PCM <A/T> monitors for this condition once during the drive cycle.

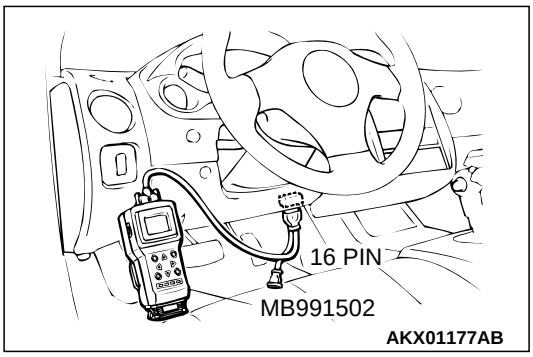
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Left bank heated oxygen sensor (front) deteriorated.
- Open circuit in left bank heated oxygen sensor (front) output line.
- Open circuit in left bank heated oxygen sensor (front) ground line.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MD998464: Test Harness



STEP 1. Using scan tool MB991502, check data list item 11: Heated Oxygen Sensor Bank 2, Sensor 1 (left front).

⚠ CAUTION

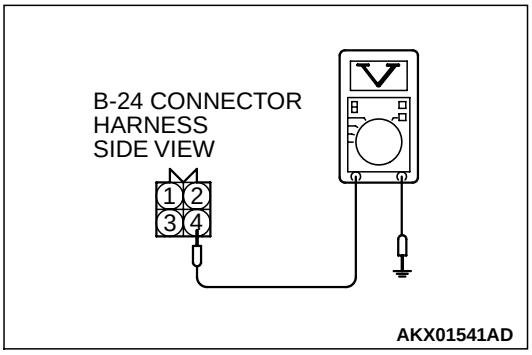
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 11, Heated Oxygen Sensor Bank 2, Sensor 1 (left front).
- Warming up the engine. When the engine is revved, the output voltage should be 0.6 to 1.0 volt.
- Warming up the engine. When the engine is idling, the output voltage should repeat 0.4 volt and 0.6 to 1.0 volt alternately.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Go to Step 2.



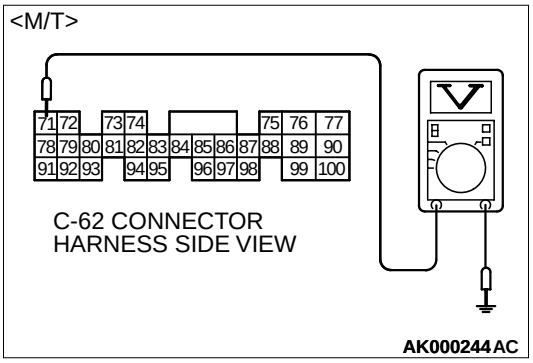
STEP 2. Check the sensor output voltage at left bank heated oxygen sensor (front) connector B-24 by backprobing.

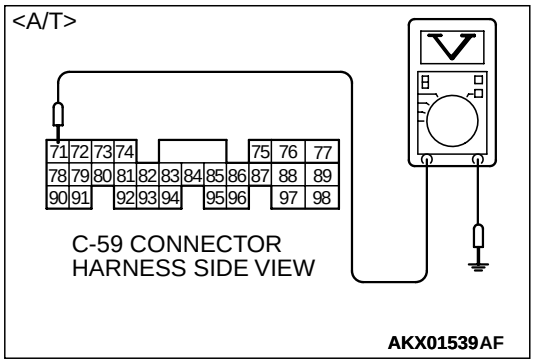
(1) Do not disconnect the connector B-24.
(2) Start the engine and run at idle.
(3) Measure the voltage between terminal 4 and ground by backprobing.
- Warming up the engine. When the engine is 2,500 r/min, the output voltage should repeat 0 to 0.8 volt alternately.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 3.
NO : Go to Step 7.





STEP 3. Check the sensor output voltage at ECM connector C-62 <M/T> or PCM connector C-59 <A/T> by backprobing.

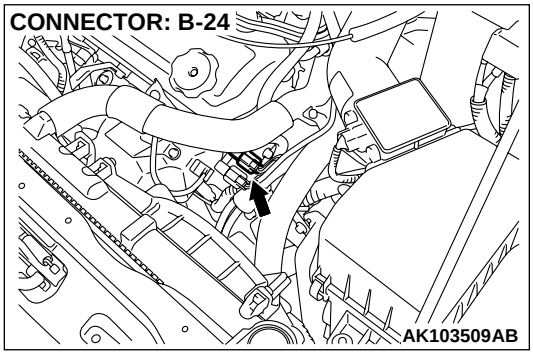
(1) Do not disconnect the connector C-62 <M/T> or C-59 <A/T>.
(2) Start the engine and run at idle.
(3) Measure the voltage between terminal 71 and ground by backprobing.
- Warming up the engine. When the engine is 2,500 r/min, the output voltage should repeat 0 to 0.8 volt alternately.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 4.
NO : Go to Step 6.

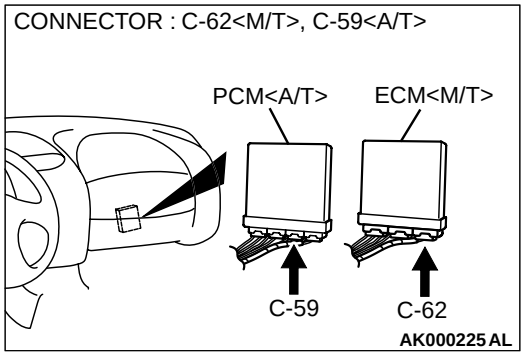
STEP 4. Check connector B-24 at left bank heated oxygen sensor (front) and connector C-62 at ECM <M/T> or connector C-59 at PCM <A/T> for damage.



Q: Is the connector in good condition?

YES : Go to Step 5.

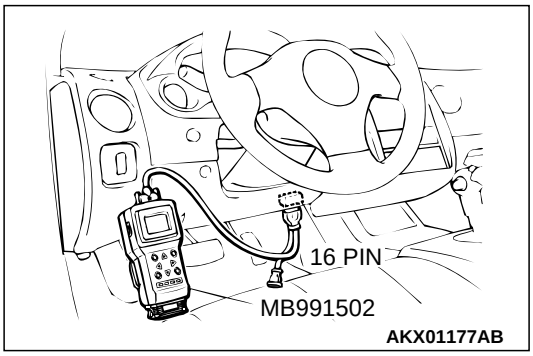
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 15.



STEP 5. Using scan tool MB991502, check data list item 11: Heated Oxygen Sensor Bank 2, Sensor 1 (left front).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.



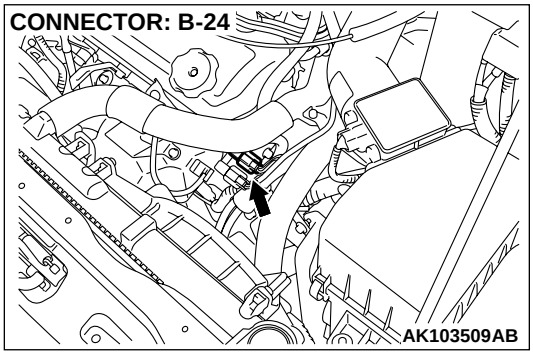
(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 11, Heated Oxygen Sensor Bank 2, Sensor 1 (left front).
- Warming up the engine. When the engine is revved, the output voltage should be 0.6 to 1.0 volt.
- Warming up the engine. When the engine is idling, the output voltage should repeat 0.4 volt and 0.6 to 1.0 volt alternately.

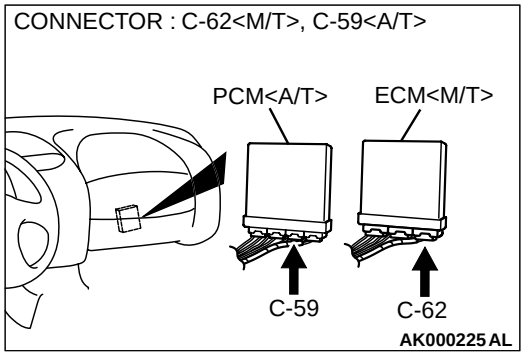
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

NO : Replace the ECM or PCM. Then go to Step 15.



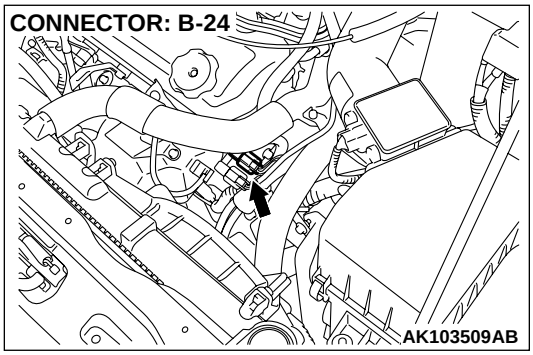


STEP 6. Check connector B-24 at left bank heated oxygen sensor (front) and connector C-62 at ECM <M/T> or connector C-59 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between left bank heated oxygen sensor (front) connector B-24 terminal 4 and ECM connector C-62 terminal 71 <M/T> or PCM connector C-59 terminal 71 <A/T> because of open circuit or harness damage. Then go to Step 15.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 15.

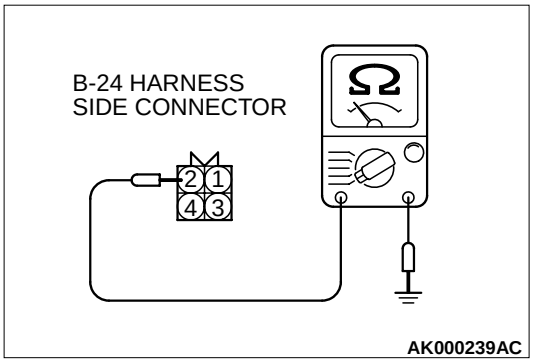


STEP 7. Check connector B-24 at left bank heated oxygen sensor (front) for damage.

Q: Is the connector in good condition?

YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 15.



STEP 8. Check the continuity at left bank heated oxygen sensor (front) harness side connector B-24.

(1) Disconnect the connector B-24 and measure at the harness side.

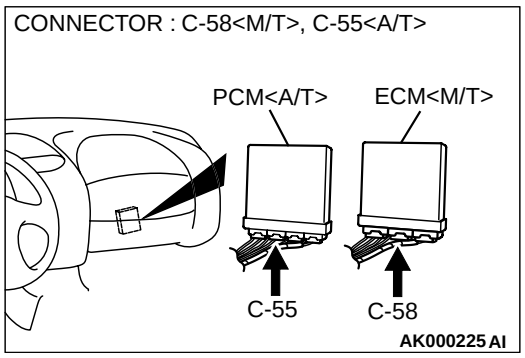
(2) Check for the continuity between terminal 2 and ground.

- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 11.

NO : Go to Step 9.



STEP 9. Check connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

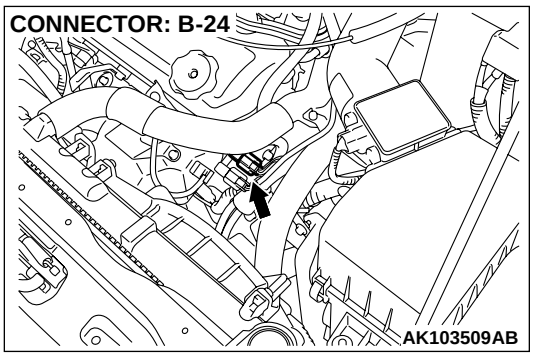
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 15.

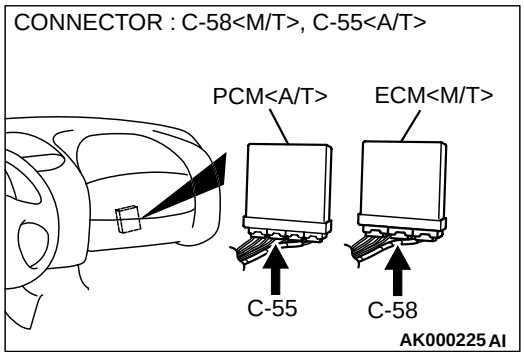
STEP 10. Check for open circuit and harness damage between left bank heated oxygen sensor (front) connector B-24 terminal 2 and ECM connector C-58 terminal 49 <M/T> or PCM connector C-55 terminal 57 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 15.

NO : Repair it. Then go to Step 15.



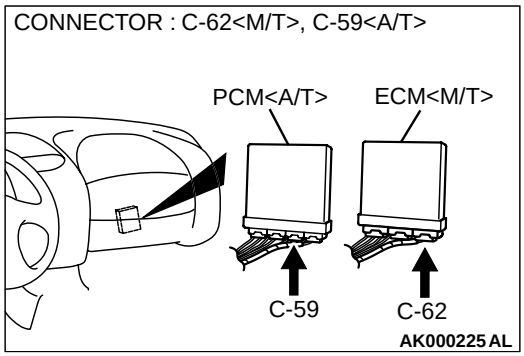


STEP 11. Check connector C-62 at ECM <M/T> or connector C-59 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 12.

NO : Repair or replace it. Refer to GROUP 00E, Harress Connector Inspection P.00E-2. Then go to Step 15.

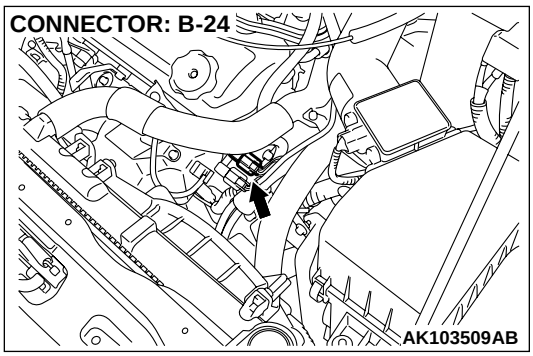


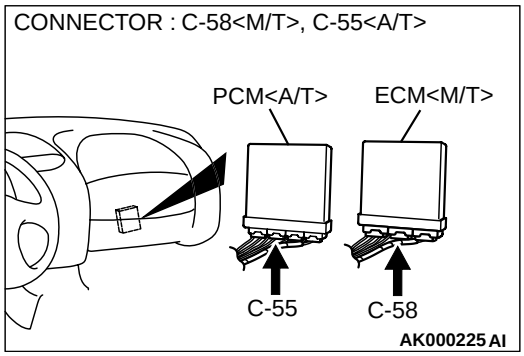
STEP 12. Check for harness damage between left bank heated oxygen sensor (front) connector B-24 terminal 2 and ECM connector C-58 terminal 49 <M/T> or PCM connector C-55 terminal 57 <A/T>.

Q: Is the harness wire in good condition?

YES : Go to Step 13.

NO : Repair it. Then go to Step 15.



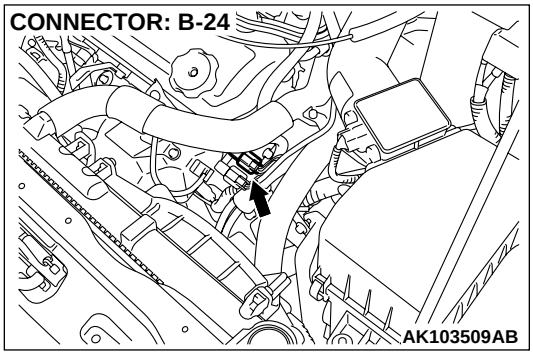


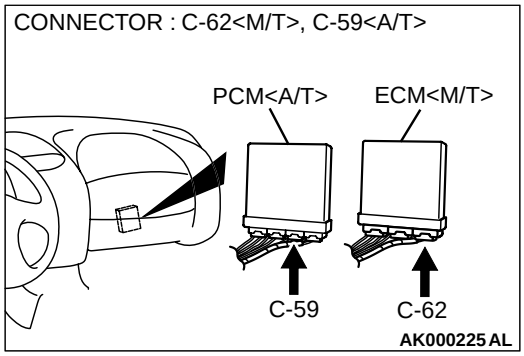
STEP 13. Check for short circuit to ground and harness damage between left bank heated oxygen sensor (front) connector B-24 terminal 4 and ECM connector C-62 terminal 71 <M/T> or PCM connector C-59 terminal 71 <A/T>.

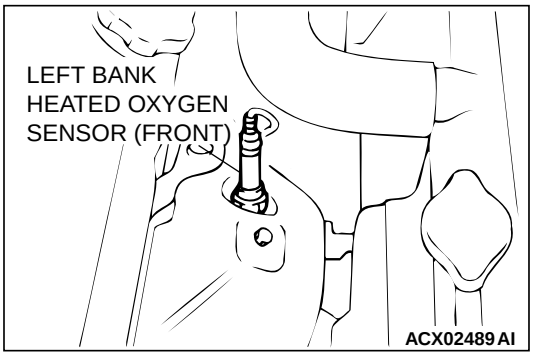
Q: Is the harness wire in good condition?

YES : Go to Step 14.

NO : Repair it. Then go to Step 15.







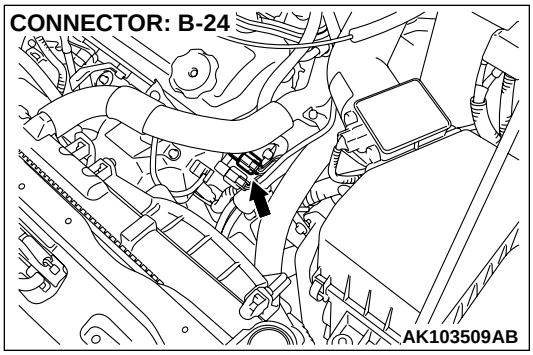
STEP 14. Check the left bank heated oxygen sensor (front).

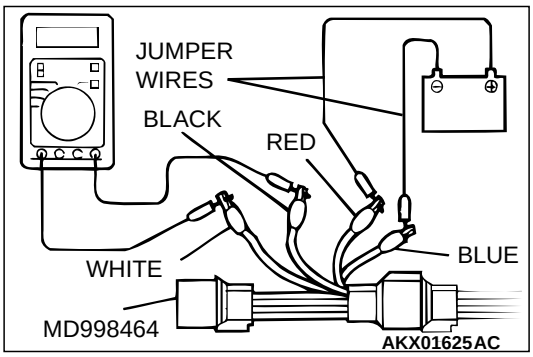
(1) Disconnect the left bank heated oxygen sensor (front) connector B-24 and connect test harness special tool, MD998464, to the connector on the left bank heated oxygen sensor (front) side.

(2) Warm up the engine until engine coolant 80°C (176°F) or higher.

⚠ CAUTION

Be very careful when connecting the jumper wires; incorrect connection can damage the left bank heated oxygen sensor (front).





(3) Use the jumper wires to connect terminal 1 (red clip) to the positive battery terminal and terminal 3 (blue clip) to the negative battery terminal.

(4) Connect a digital volt meter between terminal 2 (black clip) and terminal 4 (white clip).

(5) While repeatedly revving the engine, measure the left bank heated oxygen sensor (front) output voltage.

Standard value: 0.6 – 1.0 V

Q: Is the voltage at the standard value?

YES : Replace the ECM or PCM. Then go to Step 15.

NO : Replace the left bank heated oxygen sensor (front). Then go to Step 15.

STEP 15. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 6 – Other Monitor P.13B-6.

(2) Check the diagnostic trouble code (DTC).

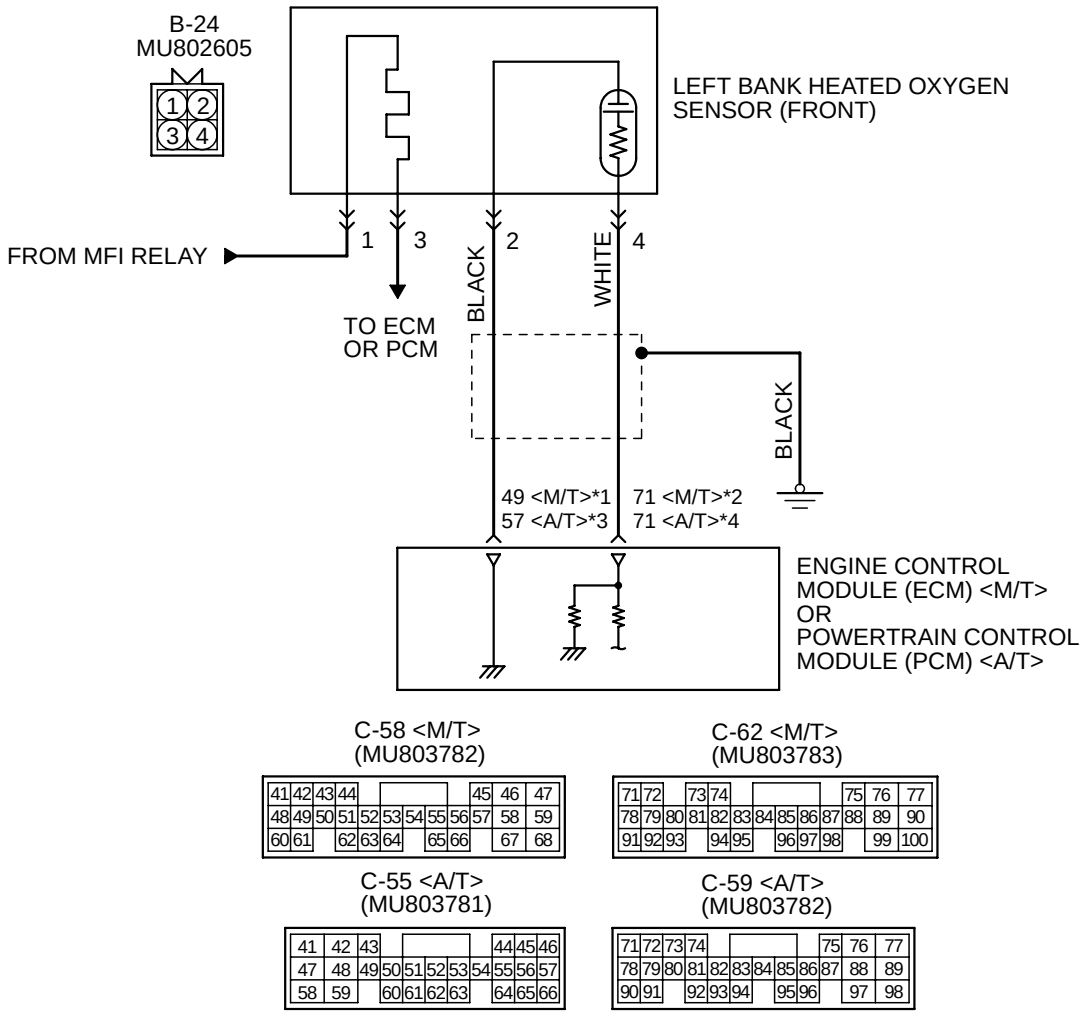
Q: Is the DTC P0150 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0151: Heated Oxygen Sensor Circuit Low Voltage (bank 2, sensor 1)

Left Bank Heated Oxygen Sensor (front) Circuit



NOTE
*1:ECM connector C-58 <M/T>
*2:ECM connector C-62 <M/T>
*3:PCM connector C-55 <A/T>
*4:PCM connector C-59 <A/T>

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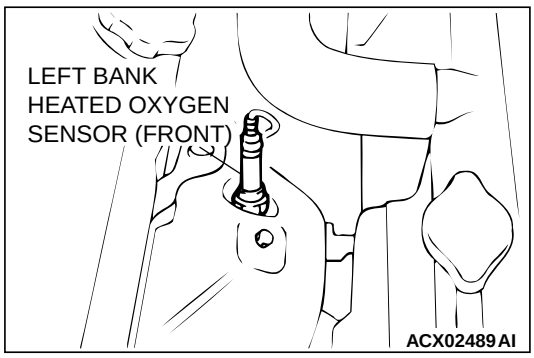
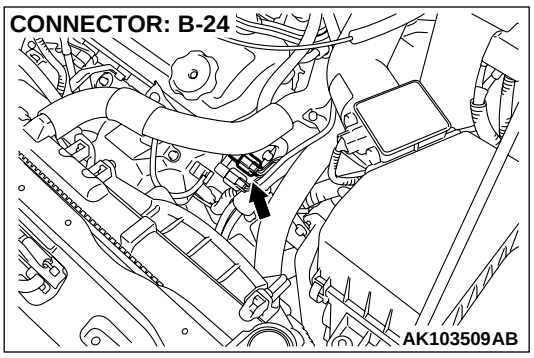
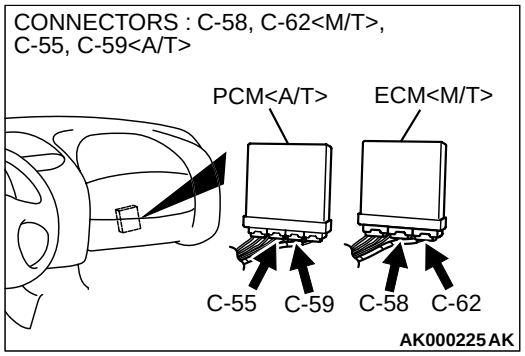




TSB Revision



CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal 71) <M/T> or PCM (terminal 71) <A/T> from the output terminal (terminal 4) of the left bank heated oxygen sensor (front).
- Terminal 2 of the left bank heated oxygen sensor (front) is grounded with ECM (terminal 49) <M/T> or PCM (terminal 57) <A/T>.

TECHNICAL DESCRIPTION

- The left bank heated oxygen sensor (front) detects the concentration of oxygen in the exhaust gas; it converts that data to voltage, and sends it to the ECM <M/T> or PCM <A/T>.
- When the left bank heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response deteriorates also.
- The ECM <M/T> or PCM <A/T> varies the air/fuel mixture to make it leaner and richer, and checks the response speed of the left bank heated oxygen sensor (front). In addition, the ECM <M/T> or PCM <A/T> also checks for an open circuit in the left bank heated oxygen sensor (front) output line.

DTC SET CONDITIONS

Check Conditions

- 3 minutes or more have passed since the starting sequence was completed.
- Left bank heated oxygen sensor (front) signal voltage has continued to be 0.2 volt or lower.
- Engine coolant temperature is higher than 76°C (169°F).
- Engine speed is higher than 1,200 r/min.
- Volumetric efficiency is higher than 25 percent.
- Volume air flow sensor output frequency is 75 Hz or more.
- At least 20 seconds have passed since fuel shut off control was canceled.
- After the ignition switch is turned ON, the changes in the output voltage of the left bank heated oxygen sensor (front) is lower than 0.078 volt.
- Monitoring time: 10 seconds.

Judgement Criteria

- Making the air/fuel ratio 15 percent for 10 seconds richer does not result in raising the heated oxygen sensor (front) output voltage beyond 0.15 volt.
- The ECM <M/T> or PCM <A/T> monitors for this condition once during the drive cycle.

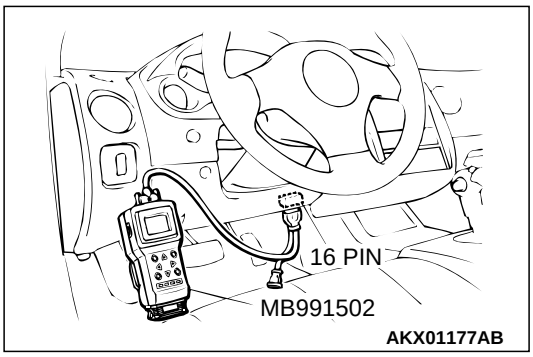
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Left bank heated oxygen sensor (front) failed.
- Short circuit in left bank heated oxygen sensor (front) output line.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MD998464: Test Harness



STEP 1. Using scan tool MB991502, check data list item 11: Heated Oxygen Sensor Bank 2, Sensor 1 (left front).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

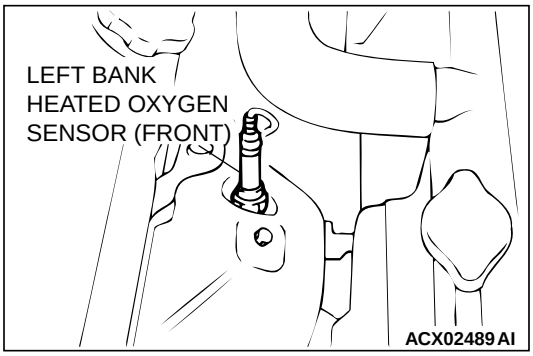
(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 11, Heated Oxygen Sensor Bank 2, Sensor 1 (left front).
- Warming up the engine. When the engine is revved, the output voltage should be 0.6 to 1.0 volt.
- Warming up the engine. When the engine is idling, the output voltage should repeat 0.4 volt and 0.6 to 1.0 volt alternately.

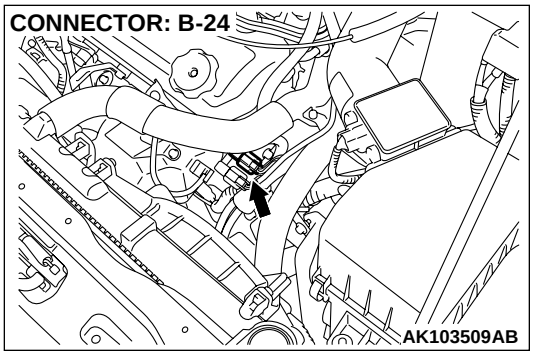
(4) Turn the ignition switch to the "LOCK" (OFF) position.

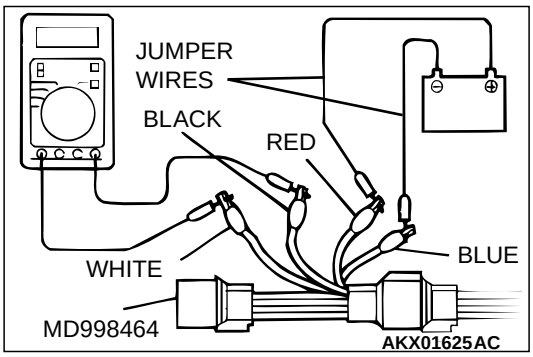
Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

NO : Go to Step 2.







STEP 2. Check the left bank heated oxygen sensor (front).

(1) Disconnect the left bank heated oxygen sensor (front) connector B-24 and connect test harness special tool, MD998464, to the connector on the left bank heated oxygen sensor (front) side.

(2) Warm up the engine until engine coolant 80°C (176°F) or higher.

⚠ CAUTION

Be very careful when connecting the jumper wires; incorrect connection can damage the right bank heated oxygen sensor (front).

(3) Use the jumper wires to connect terminal 1 (red clip) to the positive battery terminal and terminal 3 (blue clip) to the negative battery terminal.

(4) Connect a digital volt meter between terminal 2 (black clip) and terminal 4 (white clip).

(5) While repeatedly revving the engine, measure the left bank heated oxygen sensor (front) output voltage.

Standard value: 0.6 – 1.0 volt

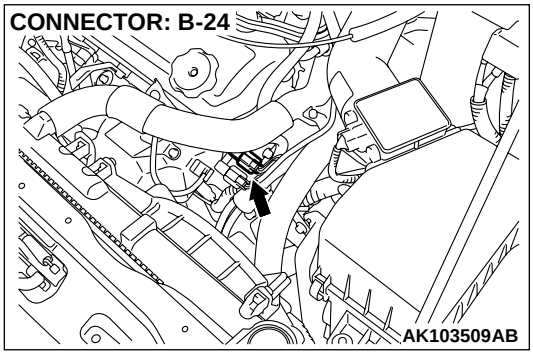
Q: Is the voltage at the standard value?

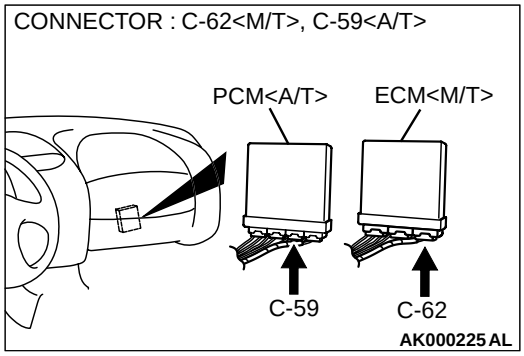
YES : Go to Step 3.

NO : Replace the left bank heated oxygen sensor (front). Then go to Step 5.

STEP 3. Check connector B-24 at left bank heated oxygen sensor (front) and connector C-62 at ECM <M/T> or connector C-59 at PCM <A/T> for damage.
Q: Is the connector in good condition?

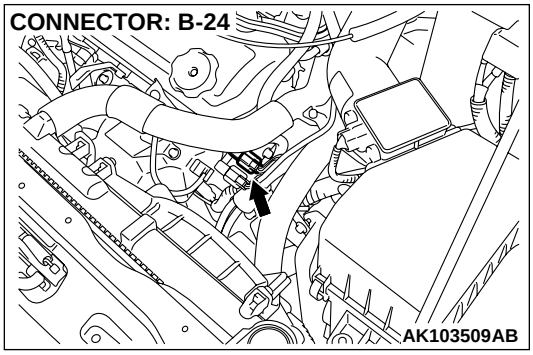
YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.

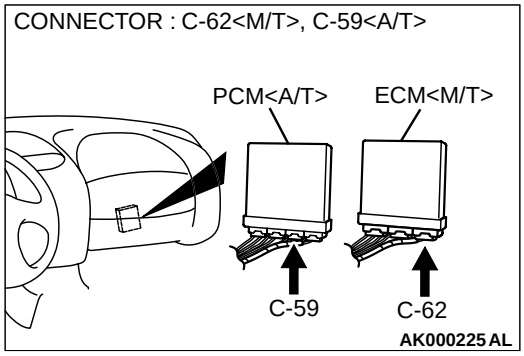




STEP 4. Check for short circuit to ground between left bank heated oxygen sensor (front) connector B-24 terminal 4 and ECM connector C-62 terminal 71 <M/T> or PCM connector C-59 terminal 71 <A/T>.
Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 5.
NO : Repair it. Then go to Step 5.





STEP 5. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13B-6.

(2) Check the diagnostic trouble code (DTC).

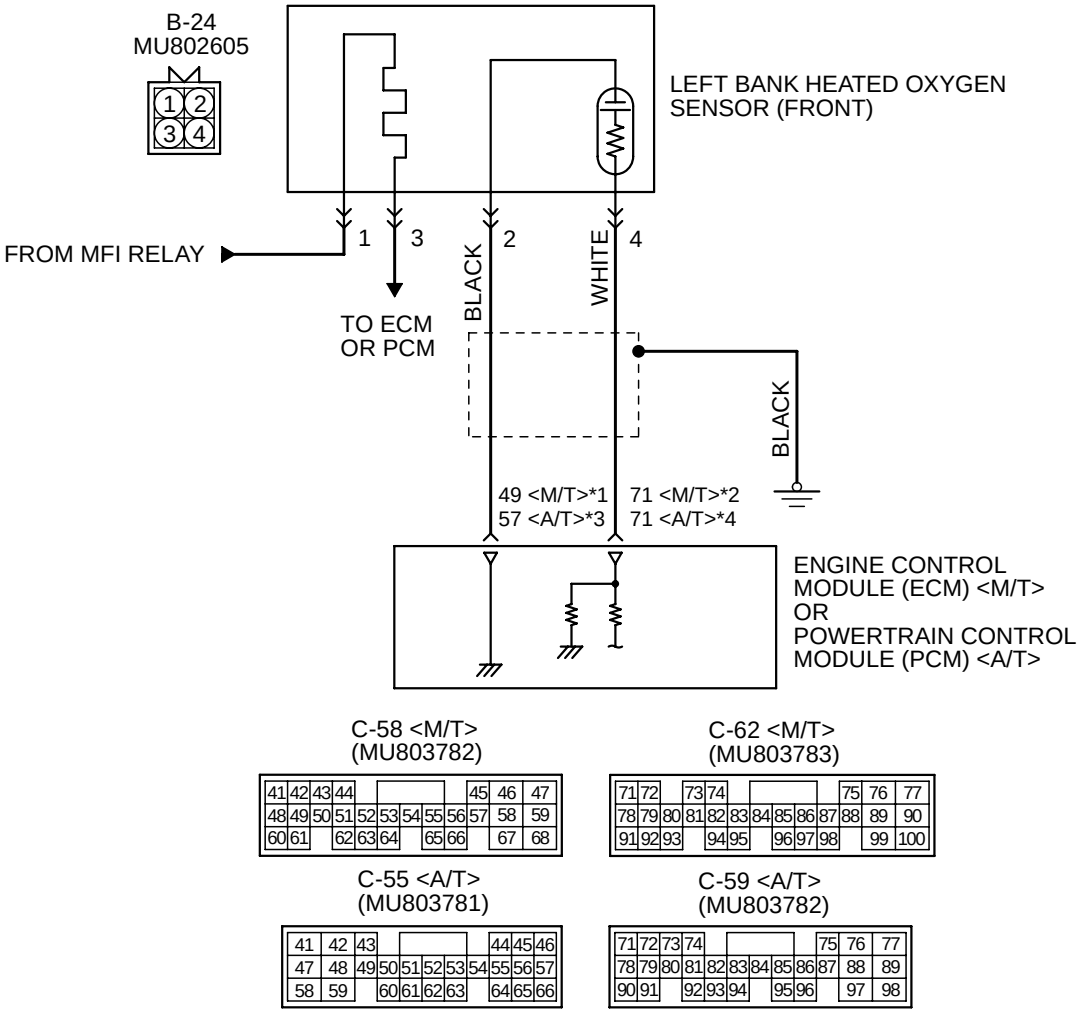
Q: Is the DTC P0151 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0152: Heated Oxygen Sensor Circuit High Voltage (bank 2, sensor 1)

Left Bank Heated Oxygen Sensor (front) Circuit



NOTE
*1:ECM connector C-58 <M/T>
*2:ECM connector C-62 <M/T>
*3:PCM connector C-55 <A/T>
*4:PCM connector C-59 <A/T>

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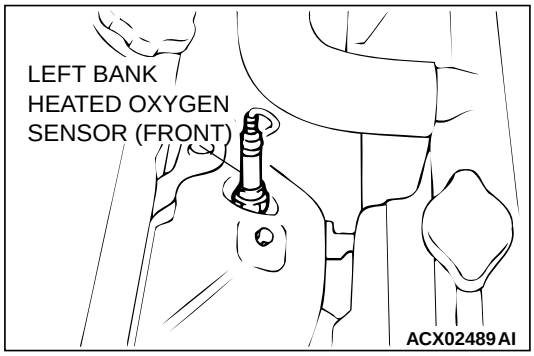
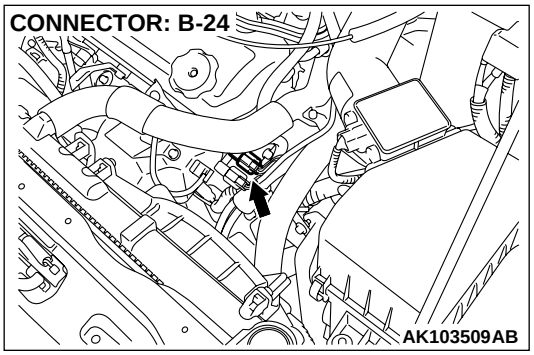
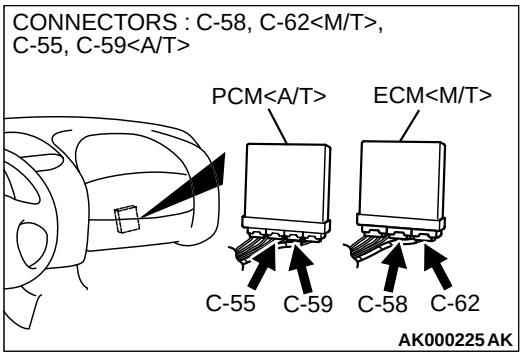






CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal 71) <M/T> or PCM (terminal 71) <A/T> from the output terminal (terminal 4) of the left bank heated oxygen sensor (front).
- Terminal 2 of the left bank heated oxygen sensor (front) is grounded with ECM (terminal 49) <M/T> or PCM (terminal 57) <A/T>.

TECHNICAL DESCRIPTION

- The left bank heated oxygen sensor (front) detects the concentration of oxygen in the exhaust gas; it converts that data to voltage, and sends it to the ECM <M/T> or PCM <A/T>.
- When the left bank heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response deteriorates also.
- The ECM <M/T> or PCM <A/T> varies the air/fuel mixture to make it leaner and richer, and checks the response speed of the left bank heated oxygen sensor (front). In addition, the ECM <M/T> or PCM <A/T> also checks for an open circuit in the left bank heated oxygen sensor (front) output line.

DTC SET CONDITIONS

Check Conditions

- 2 seconds or more have passed since the starting sequence was completed.

Judgment Criteria

- Left bank heated oxygen sensor (front) output voltage has continued to be 1.2 volts or higher for 2 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Short circuit in left bank heated oxygen sensor (front) output line.
- ECM failed. <M/T>
- PCM failed. <A/T>

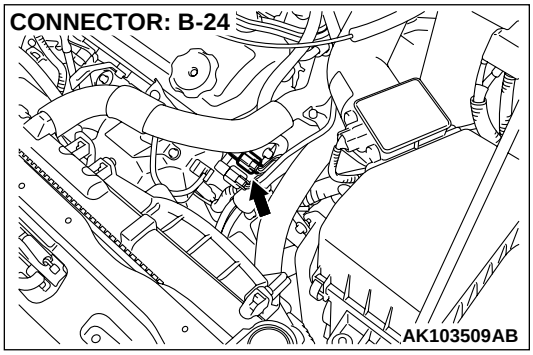
DIAGNOSIS

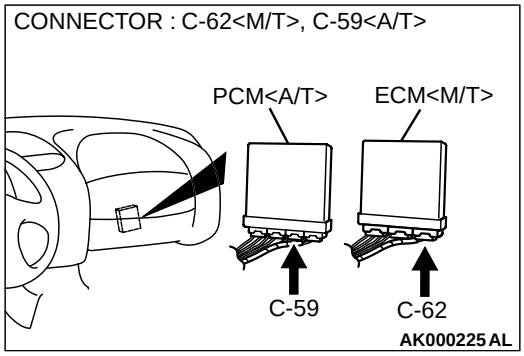
Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Check connector B-24 at left bank heated oxygen sensor (front) and connector C-62 at ECM <M/T> or connector C-59 at PCM <A/T> for damage.
Q: Is the connector in good condition?

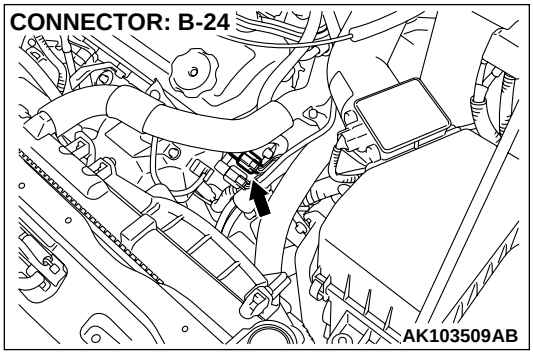
YES : Go to Step 2.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 3.

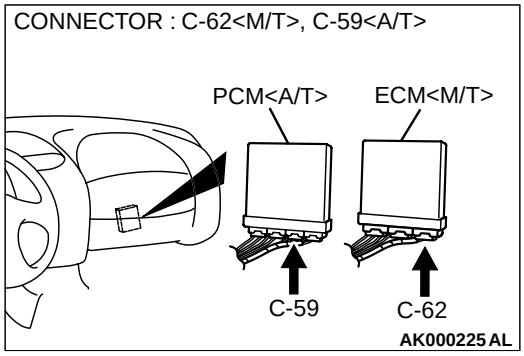




STEP 2. Check for short circuit to power supply between left bank heated oxygen sensor (front) connector B-24 terminal 4 and ECM connector C-62 terminal 71 <M/T> or PCM connector C-59 terminal 71 <A/T>.
Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 3.
NO : Repair it. Then go to Step 3.





STEP 3. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 6 – Other Monitor P.13B-6.

(2) Check the diagnostic trouble code (DTC).

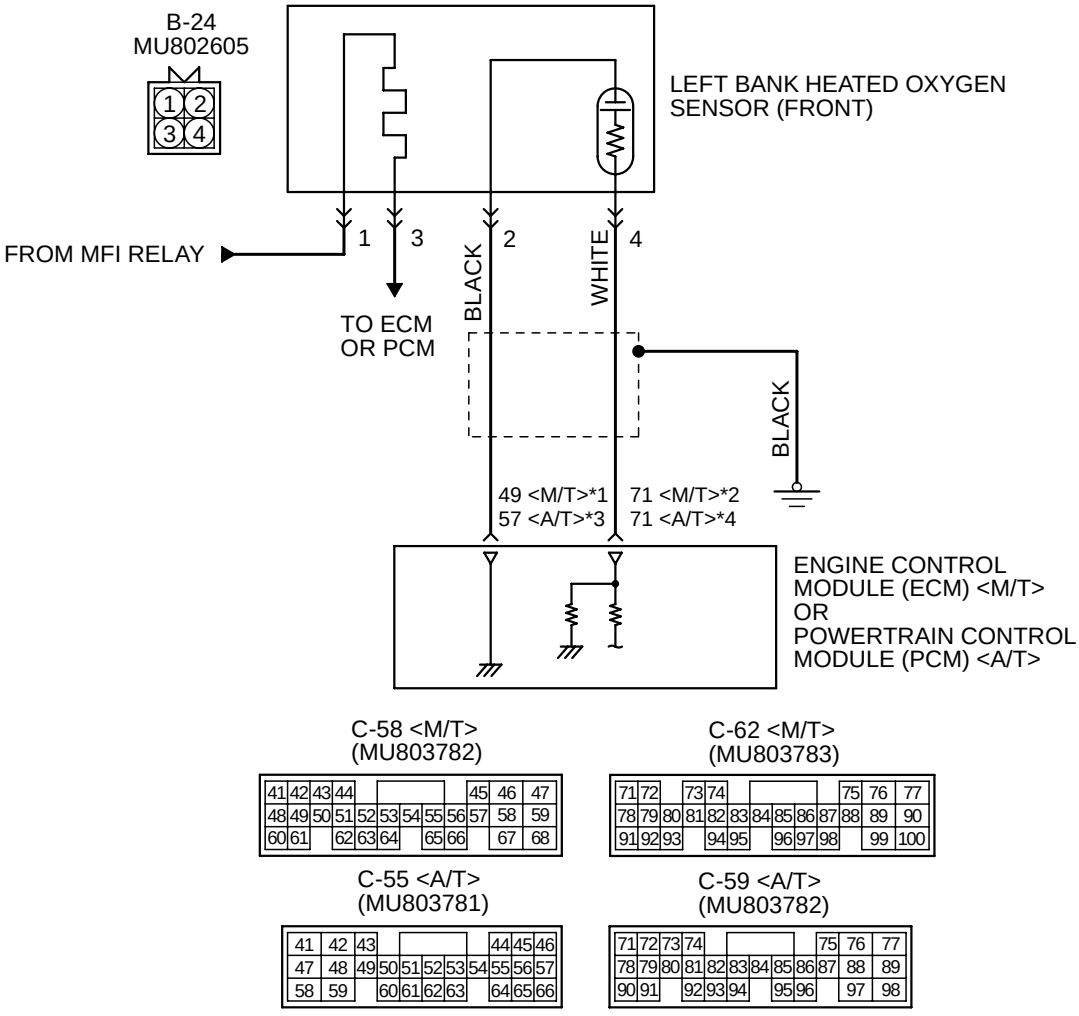
Q: Is the DTC P0152 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0153: Heated Oxygen Sensor Circuit Slow Responce (bank 2, sensor 1)

Left Bank Heated Oxygen Sensor (front) Circuit



NOTE
*1:ECM connector C-58 <M/T>
*2:ECM connector C-62 <M/T>
*3:PCM connector C-55 <A/T>
*4:PCM connector C-59 <A/T>

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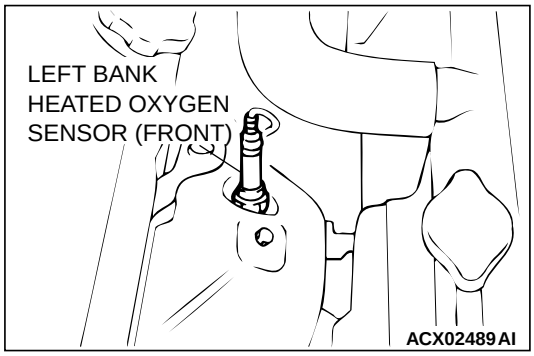
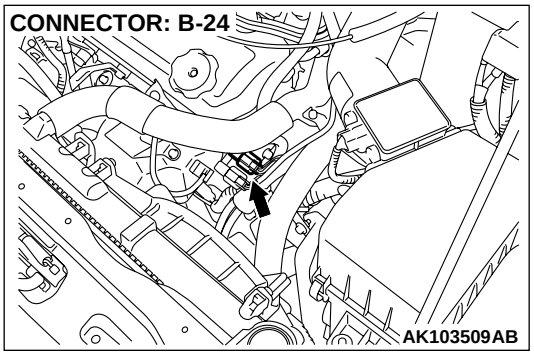
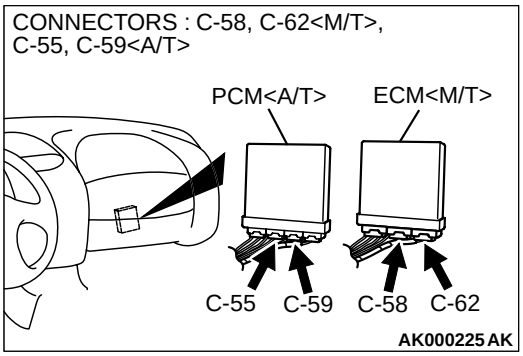
TSB Revision







CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal 71) <M/T> or PCM (terminal 71) <A/T> from the output terminal (terminal 4) of the left bank heated oxygen sensor (front).
- Terminal 2 of the left bank heated oxygen sensor (front) is grounded with ECM (terminal 49) <M/T> or PCM (terminal 57) <A/T>.

TECHNICAL DESCRIPTION

- The left bank heated oxygen sensor (front) detects the concentration of oxygen in the exhaust gas; it converts that data to voltage, and sends it to the ECM <M/T> or PCM <A/T>.
- When the left bank heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response deteriorates also.
- The ECM <M/T> or PCM <A/T> varies the air/fuel mixture to make it leaner and richer, and checks the response speed of the left bank heated oxygen sensor (front). In addition, the ECM <M/T> or PCM <A/T> also checks for an open circuit in the left bank heated oxygen sensor (front) output line.

DTC SET CONDITIONS

Check Conditions

- Engine coolant temperature is higher than 50°C (122°F).
- Engine speed is at between 1,250 and 3,000 r/min.
- Volumetric efficiency is at between 20 and 60 percent.
- Under the closed loop air/fuel control.
- The throttle valve is open.
- Short-term fuel trim is higher than –30 and lower than +25 percent.
- More than 3 seconds have elapsed after the abovementioned conditions have been met.
- The ECM <M/T> or PCM <A/T> monitors for this condition for 7 cycles of 12 second each during the drive cycle.

Judgment Criteria

- The left bank heated oxygen sensor (front) sends "lean" and "rich" signals alternately 11 times or less for 12 seconds.

  NOTE: If the sensor switch time is longer than the Judgment Criteria due to the MUT-II OBD-II test Mode – H02S Test Results, it is assumed that the heated oxygen sensor has deteriorated. If it is short, it is assumed that the harness wire is broken or has a short circuit.
  If the heated oxygen sensor signal voltage has not changed even once (lean/rich) after the DTC was erased, the sensor switch time will display as 0 seconds.

TSB Revision

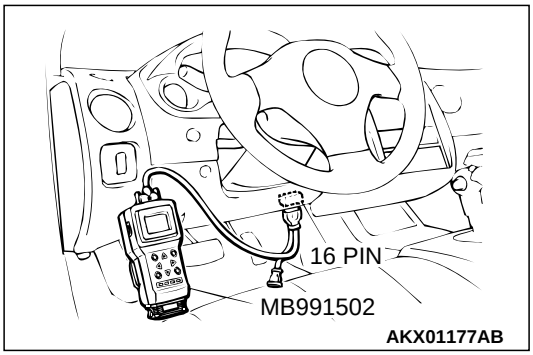
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Left bank heated oxygen sensor (front) deteriorated.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 11: Heated Oxygen Sensor Bank 2, Sensor 1 (left front).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 11, Heated Oxygen Sensor Bank 2, Sensor 1 (left front).
(4) Warm up the engine, 2,500r/min.
- Output voltage repeats 0.4 volt or less and 0.6 – 1.0 volt 10 times or more within 10 seconds.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6.
NO : Replace the left bank heated oxygen sensor (front). Then go to Step 2.

STEP 2. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 4 – Heated Oxygen Sensor Monitor P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0153 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0154: Heated Oxygen Sensor No Activity Detected (bank 2, sensor 1)

HEATED OXYGEN SENSOR CIRCUIT NO ACTIVITY DETECTED (bank 2, sensor 1) CIRCUIT

- Refer to DTC P0152 – Heated Oxygen Sensor Circuit High Voltage (bank 2, sensor 1) P.13B-199.
- Refer to DTC P0202, P0204, P0206 – Injector Circuit P.13B-292.

CIRCUIT OPERATION

- Refer to DTC P0152 – Heated Oxygen Sensor Circuit High Voltage (bank 2, sensor 1) P.13B-199.
- Refer to DTC P0202, P0204, P0206 – Injector Circuit P.13B-292.

TECHNICAL DESCRIPTION

- The ECM <M/T> or PCM <A/T> effects air/fuel ratio feedback control in accordance with the signals from the left bank heated oxygen sensor (front).
- If the left bank heated oxygen sensor (front) has deteriorated, corrections will be made by the left bank heated oxygen sensor (rear).
- DTC P0154 becomes stored in memory if a failure is detected in the above air/fuel ratio feedback control system.

DTC SET CONDITIONS

Check Area

- 30 seconds or more have passed since the starting sequence was completed.
- Engine coolant temperature is higher than 76°C (169°F).
- Engine speed is higher than 1,200 r/min.
- Volumetric efficiency is at between 30 and 95 percent.
- Throttle position sensor output voltage is lower then 4 volts.
- Except while fuel is being shut off.
- Monitoring time: 30 seconds.

Judgment Criteria

- Light bank heated oxygen sensor (front) output voltage does not get across 0.5 volt within about 30 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

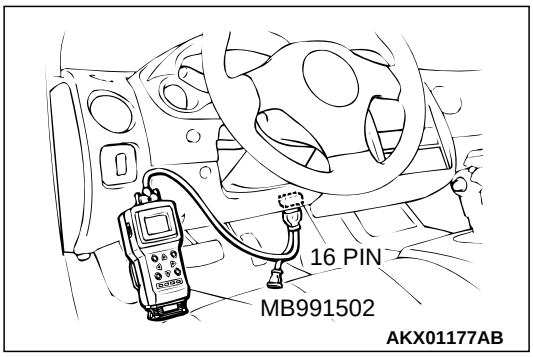
- Left bank heated oxygen sensor (front) deteriorated.
- Open circuit in left bank heated oxygen sensor (front) output line.
- Open circuit in left bank heated oxygen sensor (front) ground line.

  NOTE: When the left bank heated oxygen sensor (front) begins to deteriorate, the left bank heated oxygen sensor output voltage will deviate from the voltage when the sensor was new (normally 0.5 volt at stoichiometric ratio). This deviation will be corrected by the left bank heated oxygen sensor (rear).
  If the left bank heated oxygen sensor (rear) responds poorly because it has deteriorated, it will improperly correct the left bank heated oxygen sensor (front). Thus, even when closed loop control is being effected, the fluctuation of the left bank heated oxygen sensor (front) output voltage decreases, without intersecting with 0.5 volt. As a result, there is a possibility of DTC P0154 becoming registered.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB998464: Test Harness



STEP 1. Using scan tool MB991502, check data list item 59: Heated Oxygen Sensor Bank 2, Sensor 2 (left rear).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 59, Heated Oxygen Sensor Bank 2, Sensor 2 (left rear).
- Warming up the engine. When the engine is revved, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 2.
NO : Refer to, DTC P0157 – Heated Oxygen Sensor Circuit Low Voltage (bank 2, sensor 2) P.13B-228, DTC P0158 – Heated Oxygen Sensor Circuit High Voltage (bank 2, sensor 2) P.13B-233, DTC P0159 – Heated Oxygen Sensor Circuit Slow Response (bank 2, sensor 2) P.13B-236.

STEP 2. Check the exhaust leaks.

Q: Are there any abnormalities?

YES : Go to Step 3.
NO : Repair it. Then go to Step 12.

STEP 3. Check the intake system vacuum leak.

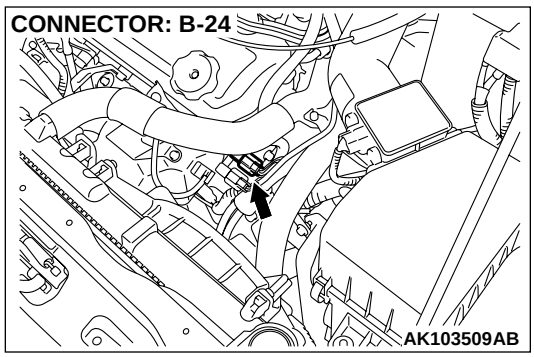
Q: Are there any abnormalities?

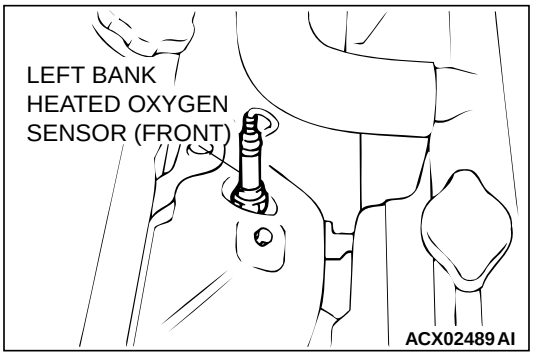
YES : Go to Step 4.
NO : Repair it. Then go to Step 12.

STEP 4. Check connector B-24 at the left bank heated oxygen sensor (front) for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.





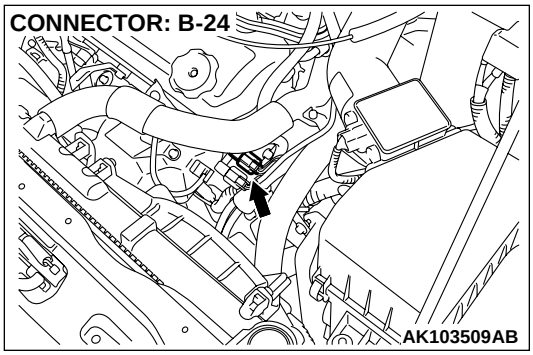
STEP 5. Check the left bank heated oxygen sensor (front).

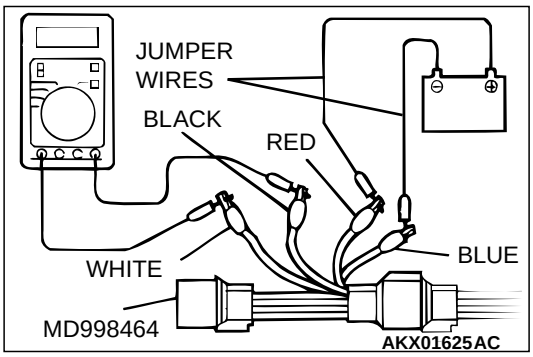
(1) Disconnect the left bank heated oxygen sensor (front) connector B-24 and connect test harness special tool MD998464 to the connector on the left bank heated oxygen sensor (front) side.

(2) Warm up the engine until engine coolant 80°C (176°F) or higher.

⚠ CAUTION

Be very careful when connecting the jumper wires; incorrect connection can damage the left bank heated oxygen sensor (front).





(3) Use the jumper wires to connect terminal 1 (red clip) to the positive battery terminal and terminal 3 (blue clip) to the negative battery terminal.

(4) Connect a digital volt meter between terminal 2 (black clip) and terminal 4 (white clip).

(5) While repeatedly revving the engine, measure the left bank heated oxygen sensor (front) output voltage.

Standard value: 0.6 – 1.0 V

Q: Is the voltage at the standard value?

YES : Go to Step 6.

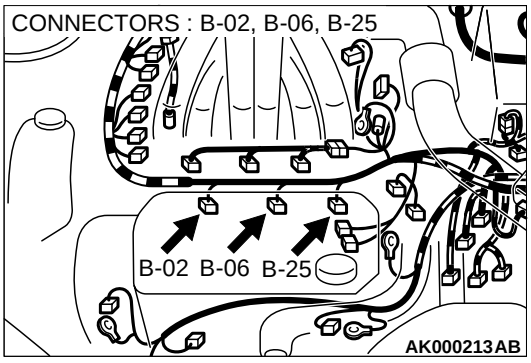
NO : Replace the left bank heated oxygen sensor (front). Then go to Step 12.

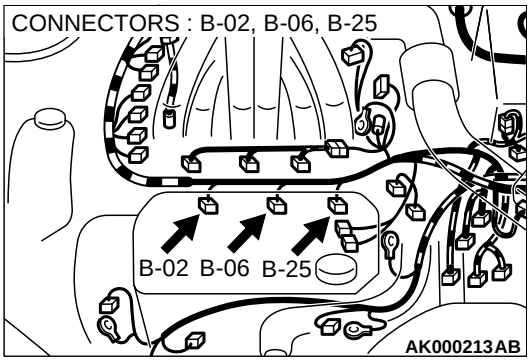
STEP 6. Check connector B-02, B-06, B-25 at left bank injector for damage.

Q: Is the connector in good condition?

YES : Go to Step 7.

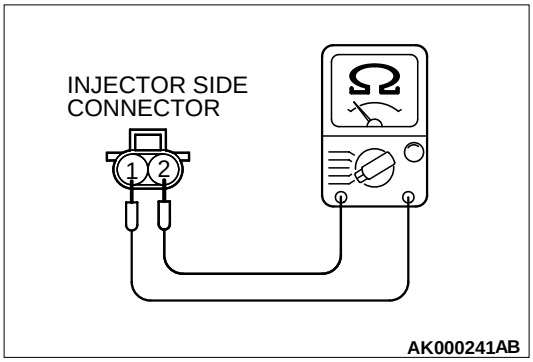
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.





STEP 7. Check the left bank injector.

(1) Disconnect the left bank injector connector B-02, B-06, B-25.



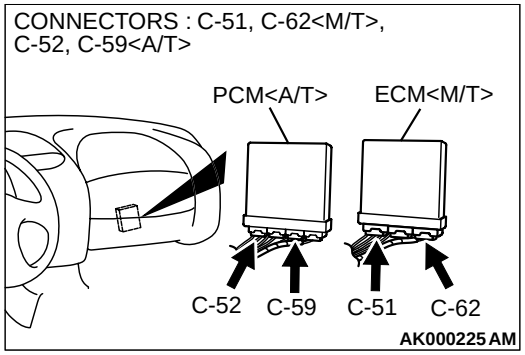
(2) Measure the resistance between each injector side connector terminal 1 and 2.

Standard value: 13 – 16 ohm [at 20°C (68°F)]

Q: Is the resistance standard value?

YES : Go to Step 8.

NO : Replace the faulty injector. Then go to Step 12.



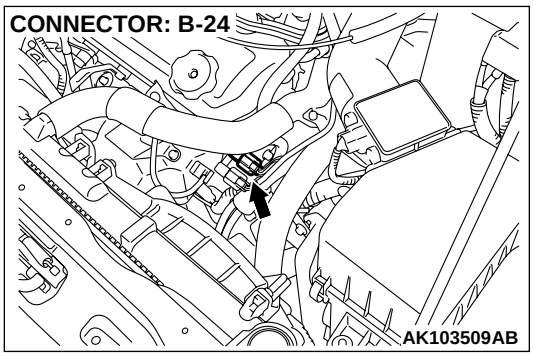
STEP 8. Check connector C-51, C-62 at ECM <M/T> or connector C-59, C-52 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

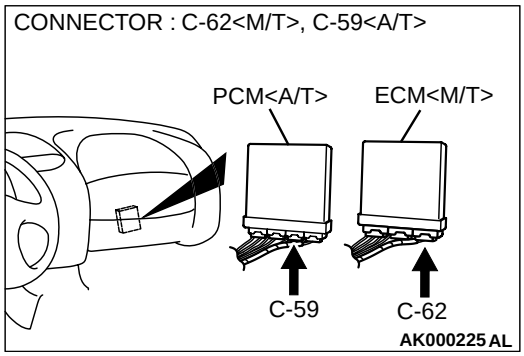
STEP 9. Check for harness damage between left bank heated oxygen sensor (front) connector B-24 terminal 4 and ECM connector C-62 terminal 71 <M/T> or PCM connector C-59 terminal 71 <A/T>.



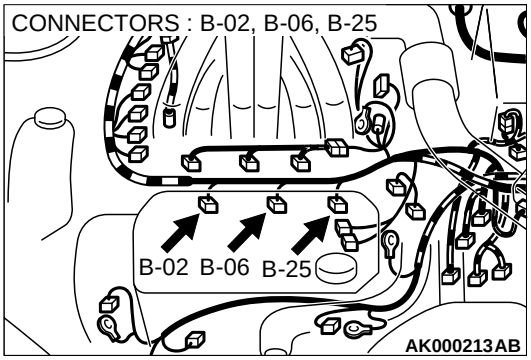
Q: Is the harness wire in good condition?

YES : Go to Step 10.

NO : Repair it. Then go to Step 12.



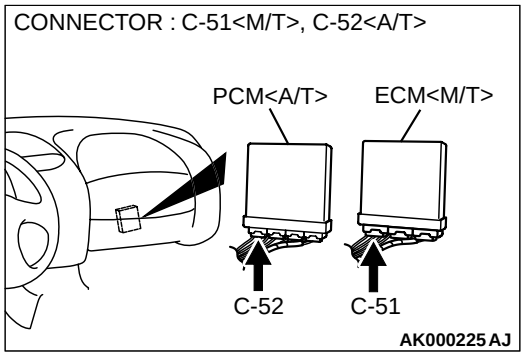
STEP 10. Check for harness damage between left bank injector connector and ECM connector <M/T> or PCM connector <A/T>.



a. Check the harness wire between injector connector B-02 terminal 2 and ECM connector C-51 terminal 9 <M/T> or PCM connector C-52 terminal 9 <A/T> when checking No. 2 cylinder.

b. Check the harness wire between injector connector B-06 terminal 2 and ECM connector C-51 terminal 2 <M/T> or PCM connector C-52 terminal 2 <A/T> when checking No. 4 cylinder.

c. Check the harness wire between injector connector B-25 terminal 2 and ECM connector C-51 terminal 25 <M/T> or PCM connector C-52 terminal 25 <A/T> when checking No. 6 cylinder.



Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair it. Then go to Step 12.

STEP 11. Check the fuel pressure.
Refer to Fuel Pressure Test P.13B-680.

Q: Is the fuel pressure normal?

YES : Replace the ECM or PCM. Then go to Step 12.
NO : Repair or replace it. Then go to Step 12.

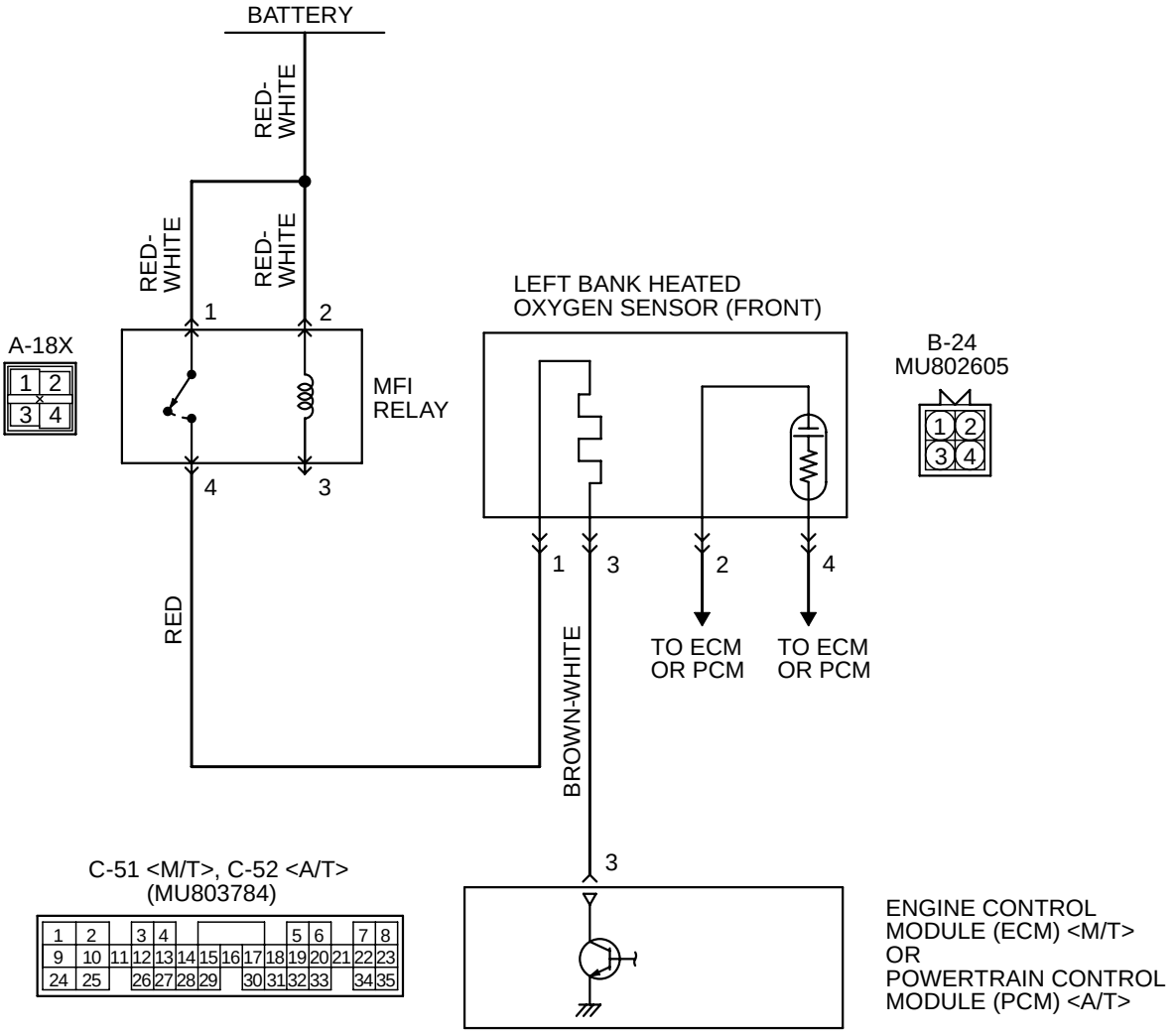
STEP 12. Test the OBD-II drive cycle.
(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 6 – Other Monitor P.13B-6.
(2) Check the diagnostic trouble code (DTC).

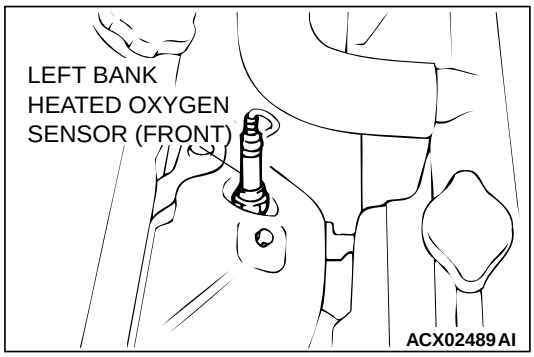
Q: Is the DTC P0154 is output?

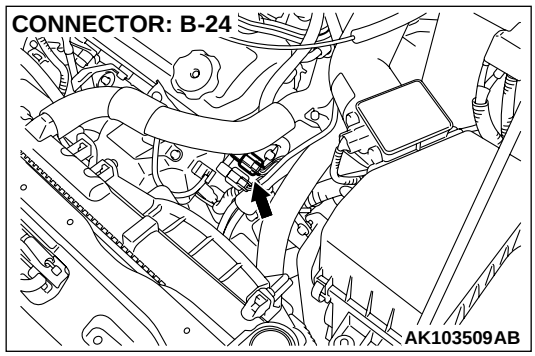
YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0155: Heated Oxygen Sensor Heater Circuit (bank 2, sensor 1)

Left Bank Heated Oxygen Sensor (front) Heater Circuit







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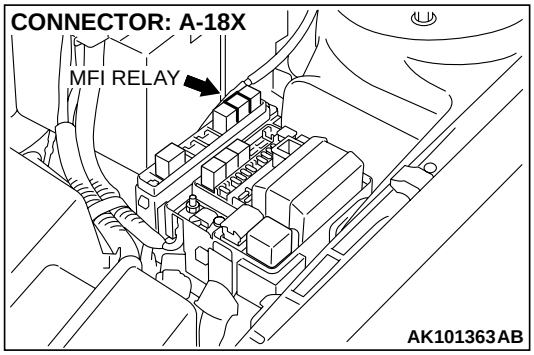
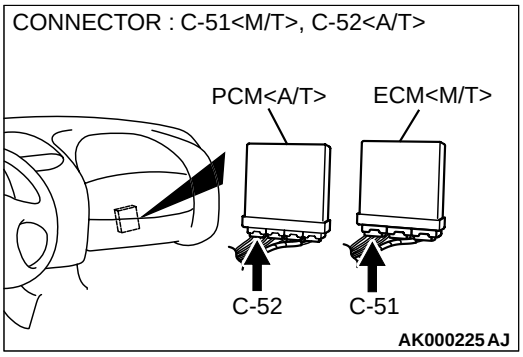




CIRCUIT OPERATION
- Power is supplied from the MFI relay (terminal 4) to the left bank heated oxygen sensor (front) heater.
- The ECM (terminal 3) <M/T> or PCM (terminal 3) <A/T> controls continuity to the left bank heated oxygen sensor (front) heater by turning the power transistor in the ECM <M/T> or PCM <A/T> "ON" and "OFF".

TECHNICAL DESCRIPTION
- The ECM <M/T> or PCM <A/T> checks whether the heater current is within a specified range when the heater is energized.

DTC SET CONDITIONS

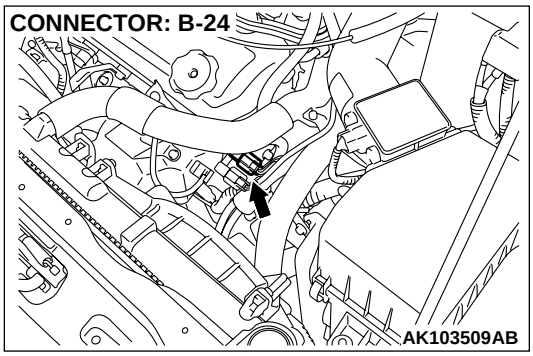
Check Conditions
- 60 seconds have elapsed from the start of the previous monitoring.
- Engine coolant temperature is higher than 20°C (68°F).
- While the left bank heated oxygen sensor (front) heater is on.
- Battery positive voltage is at between 11 and 16 volts.

Judgment Criteria
- Heater current of the left bank heated oxygen sensor (front) heater has continued to be lower than 0.16 ampere or higher than 7.5 ampere for 4 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Open or shorted left bank heated oxygen sensor (front) heater circuit.
- Open circuit in left bank heated oxygen sensor (front) heater.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

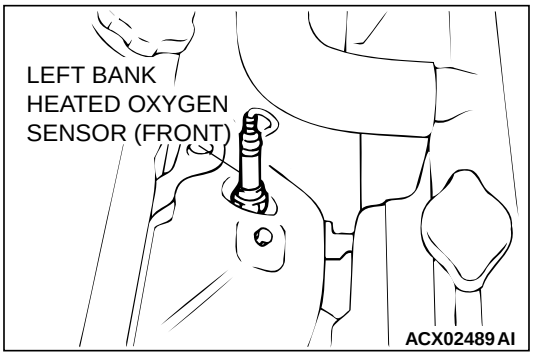
Required Special Tool:
- MB998464: Test Harness Set



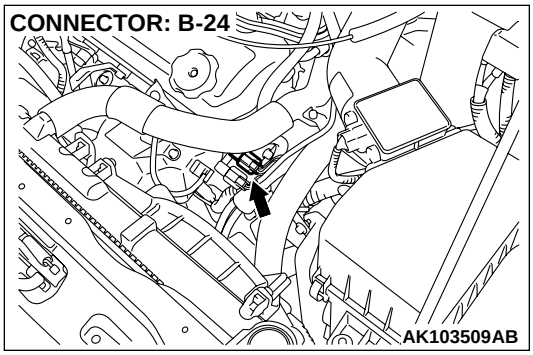
STEP 1. Check connector B-24 at the left bank heated oxygen sensor (front) for damage.
Q: Is the harness connector in good condition?

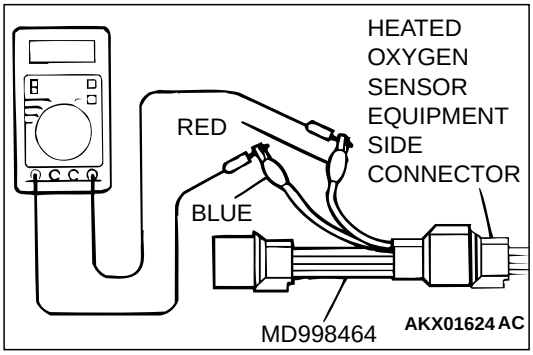
YES : Go to Step 2.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 2. Check the left bank heated oxygen sensor (front).



(1) Disconnect left bank heated oxygen sensor (front) connector B-24 and connect test harness special tool, MD998464, to the connector on the left bank heated oxygen (front) sensor side.





(2) Measure the resistance between heated oxygen sensor connector terminal 1 (red clip) and terminal 3 (blue clip).

Standard value: 4.5 – 8.0 ohm [at 20°C (68°F)]

Q: Is the resistance normal?

YES : Go to Step 3.

NO : Replace the left bank heated oxygen sensor (front). Then go to Step 12.

STEP 3. Check the power supply voltage at left bank heated oxygen sensor (front) harness side connector B-24.

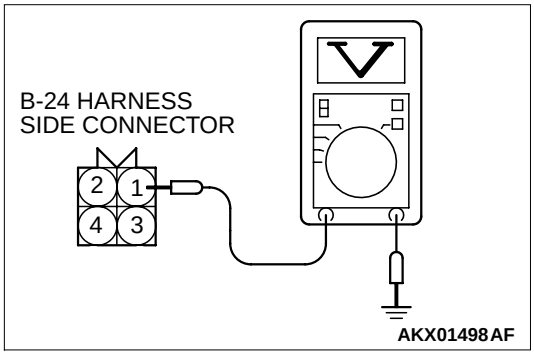
(1) Disconnect the connector B-24 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between terminal 1 and ground.

- Voltage should be battery positive voltage.

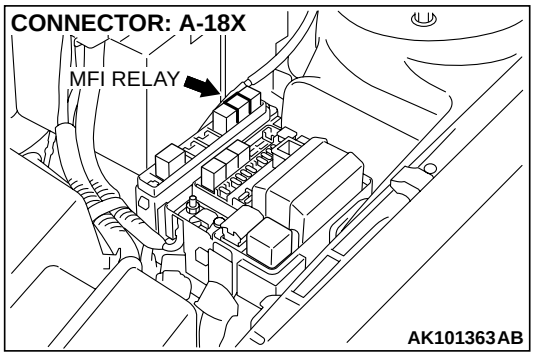
(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the voltage normal?

YES : Go to Step 5.

NO : Go to Step 4.

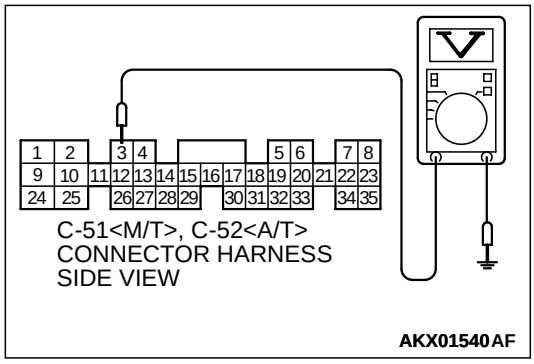


STEP 4. Check connector A-18X at the MFI relay for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between MFI relay connector A-18X terminal 4 and left bank heated oxygen sensor (front) connector B-24 terminal 1 because of open circuit or short circuit to ground. Then go to Step 12.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



STEP 5. Check the power supply voltage at ECM connector C-51 <M/T> or PCM connector C-52 <A/T> by backprobing.

(1) Do not disconnect the connector C-51 <M/T> or C-52 <A/T>.

(2) Turn the ignition switch to the "ON" position.

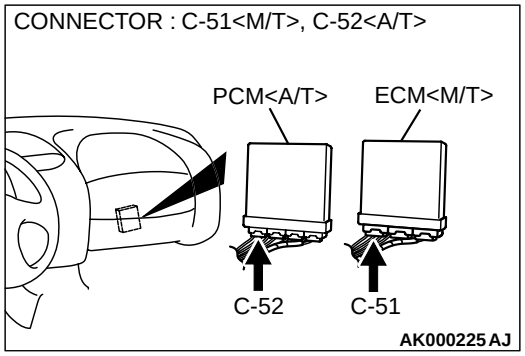
(3) Measure the voltage between terminal 3 and ground by backprobing.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 8.

NO : Go to Step 6.



STEP 6. Check connector C-51 at ECM <M/T> or connector C-52 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 7.

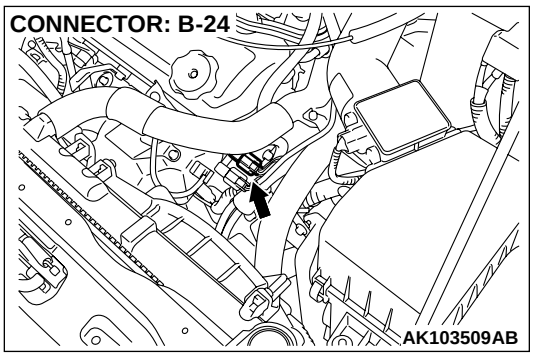
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

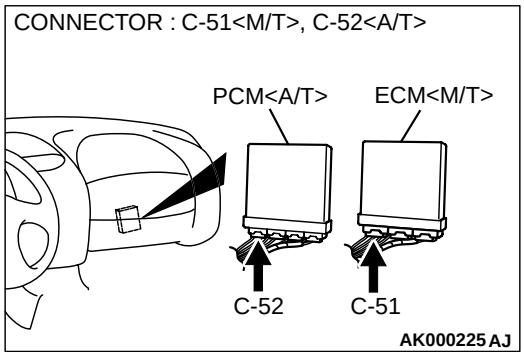
STEP 7. Check for open circuit or short circuit to ground between left bank heated oxygen sensor (front) connector B-24 terminal 3 and ECM connector C-51 terminal 3 <M/T> or PCM connector C-52 terminal 3 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 12.

NO : Repair it. Then go to Step 12.



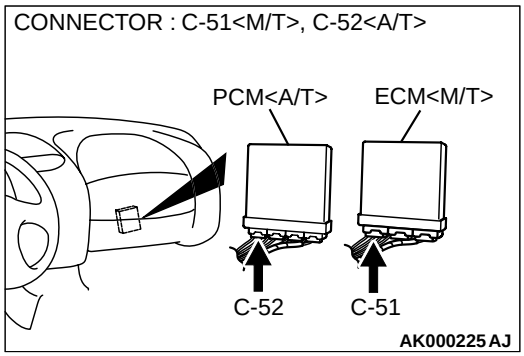


STEP 8. Check connector C-51 at ECM <M/T> or connector C-52 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

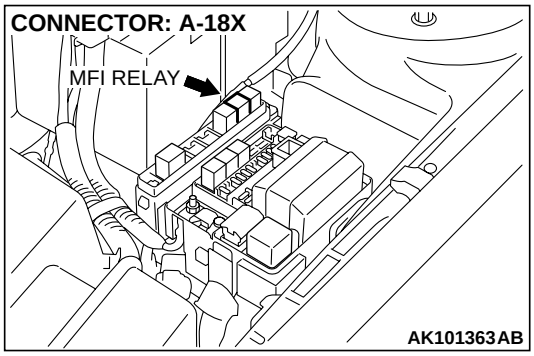


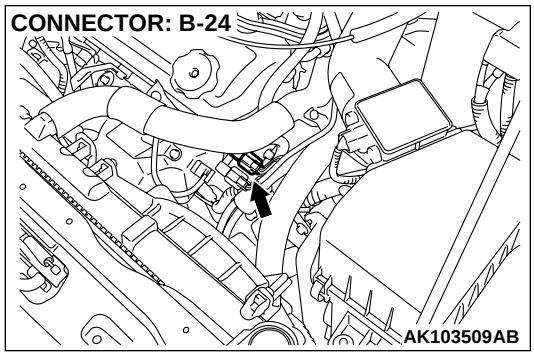
STEP 9. Check for harness damage between MFI relay connector A-18X terminal 4 and left bank heated oxygen sensor (front) connector B-24 terminal 1.

Q: Is the harness wire in good condition?

YES : Go to Step 10.

NO : Repair it. Then go to Step 12.



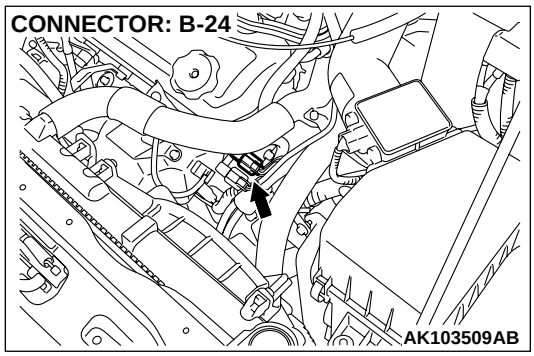


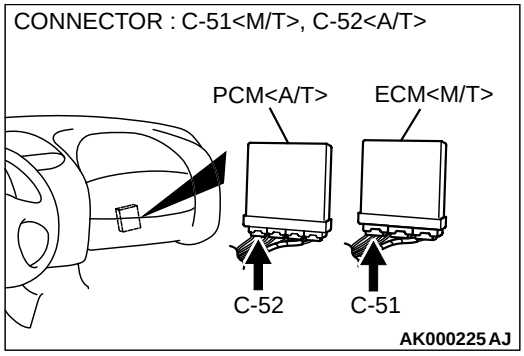
STEP 10. Check for harness damage between left bank heated oxygen sensor (front) connector B-24 terminal 3 and ECM connector C-51 terminal 3 <M/T> or PCM connector C-52 terminal 3 <A/T>.

Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair it. Then go to Step 12.





STEP 11. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 6 – Other Monitor P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0155 is output?

YES : Replace the ECM or PCM. Then go to Step 12.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

STEP 12. Test the OBD-II drive cycle.

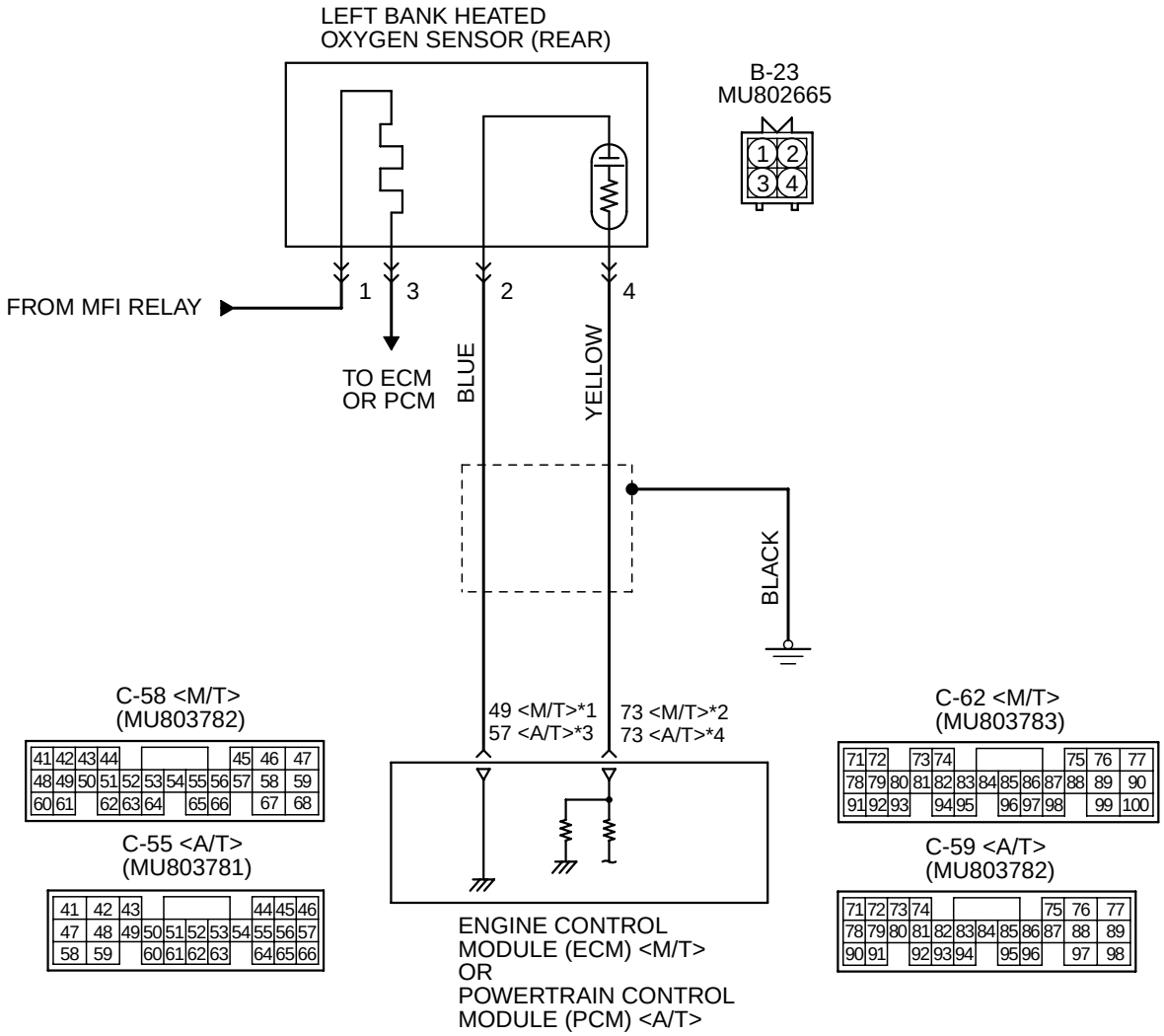
(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 6 – Other Monitor P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0155 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0156: Heated Oxygen Sensor Circuit (bank 2, sensor 2)

Left Bank Heated Oxygen Sensor (rear) Circuit



NOTE
*1:ECM connector C-58 <M/T>
*2:ECM connector C-62 <M/T>
*3:PCM connector C-55 <A/T>
*4:PCM connector C-59 <A/T>

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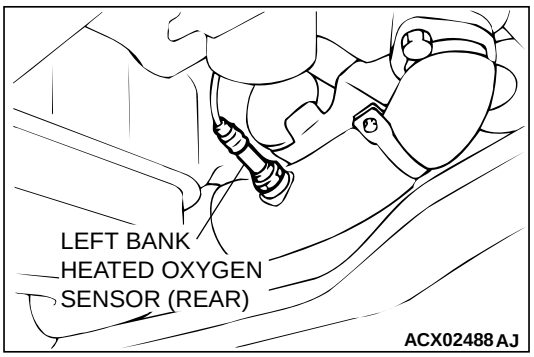
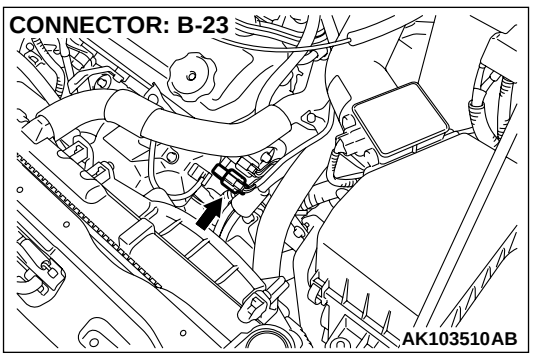
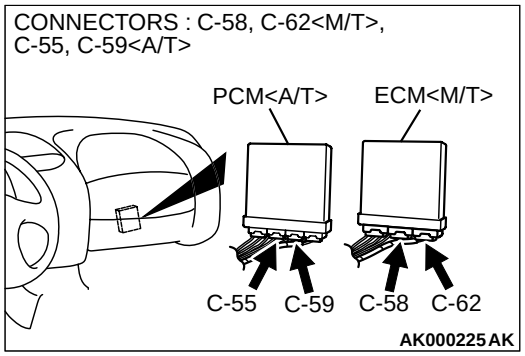




TSB Revision



CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal 73) <M/T> or PCM (terminal 73) <A/T> from the output terminal (terminal 4) of the left bank heated oxygen sensor (rear).
- Terminal 2 of the left bank heated oxygen sensor (rear) is grounded with ECM (terminal 49) <M/T> or PCM (terminal 57) <A/T>.

TECHNICAL DESCRIPTION

- The output signal of the left bank heated oxygen sensor (front) is compensated by the output signal of the left bank heated oxygen sensor (rear).
- The ECM <M/T> or PCM <A/T> checks for an open circuit in the left bank heated oxygen sensor (rear) output line.

DTC SET CONDITIONS

Check Conditions

- 3 minutes or more have passed since the starting sequence was completed.
- Left bank heated oxygen sensor (rear) signal voltage has continued to be 0.15 volt or lower.
- Engine coolant temperature is higher than 76°C (169°F).
- Engine speed is higher than 1,200 r/min.
- Volumetric efficiency is higher than 25 percent.
- Monitoring time: 7 seconds.

Judgment Criteria

- Input voltage supplied to the ECM <M/T> or PCM <A/T> interface circuit is higher than 4.5 volts when 5 volts is applied to the left bank heated oxygen sensor (rear) output line via a resistor.
- The ECM <M/T> or PCM <A/T> monitors for this condition once during the drive cycle.

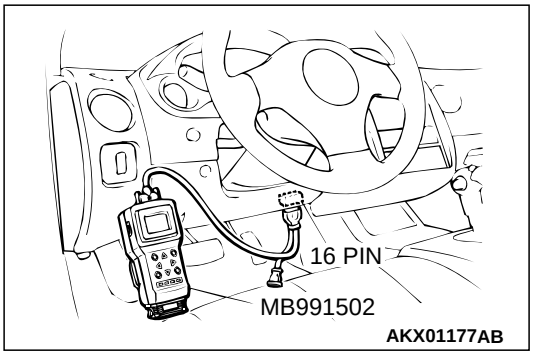
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Left bank heated oxygen sensor (rear) failed.
- Open circuit in left bank heated oxygen sensor (rear) output line.
- Open circuit in left bank heated oxygen sensor (rear) ground line.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991316: Test Harness



STEP 1. Using scan tool MB991502, check data list item 59: Heated Oxygen Sensor Bank 2, Sensor 2 (left rear).

⚠ CAUTION

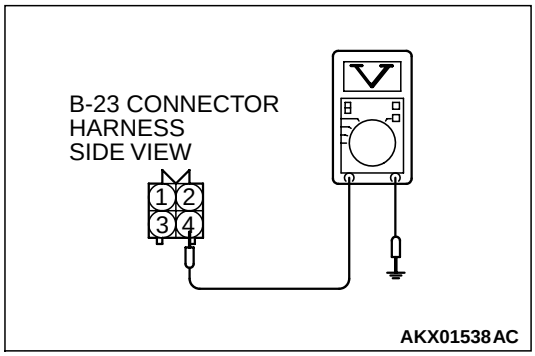
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 59, Heated Oxygen Sensor Bank 2, Sensor 2 (let rear).
- Warming up the engine. When the engine is revved, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Go to Step 2.



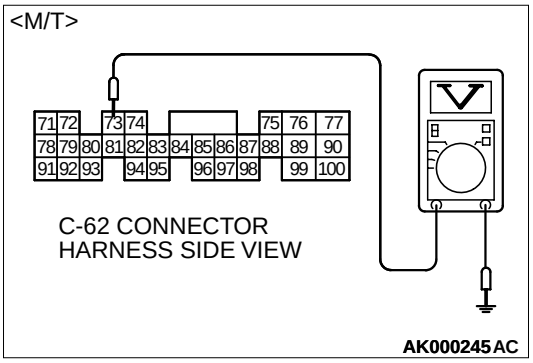
STEP 2. Check the sensor output voltage at left bank heated oxygen sensor (rear) connector B-23 by backprobing.

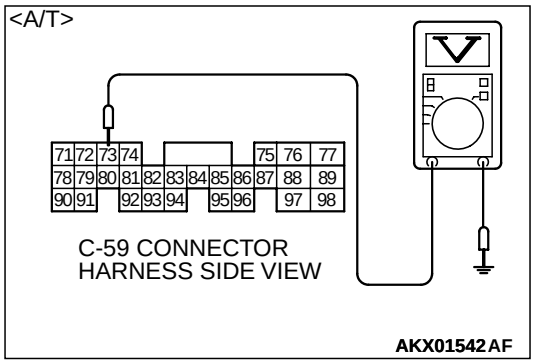
(1) Do not disconnect the connector B-23.
(2) Start the engine and run at idle.
(3) Measure the voltage between terminal 4 and ground by backprobing.
- Warming up the engine. When the engine is revved, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 3.
NO : Go to Step 7.





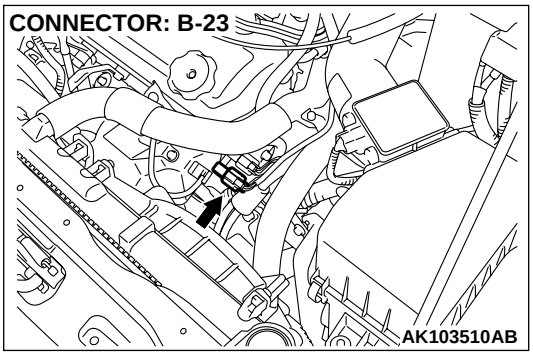
STEP 3. Check the sensor output voltage at ECM connector C-62 <M/T> or PCM connector C-59 <A/T> by backprobing.

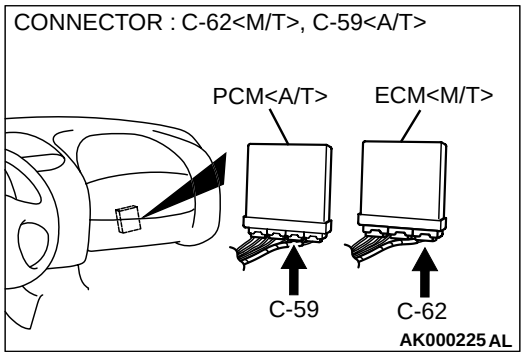
(1) Do not disconnect the connector C-62 <M/T> or C-59 <A/T>.
(2) Start the engine and run at idle.
(3) Measure the voltage between terminal 73 and ground by backprobing.
- Warming up the engine. When the engine is 2,500 r/min, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 4.
NO : Go to Step 6.



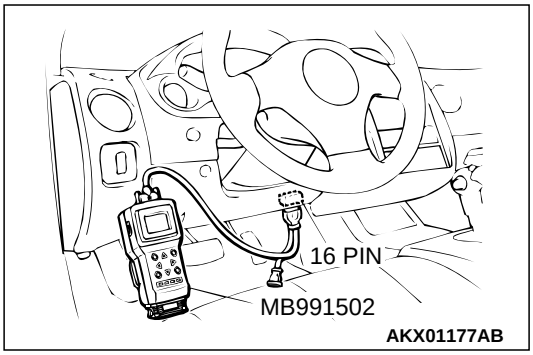


STEP 4. Check connector B-23 at left bank heated oxygen sensor (rear) and connector C-62 at ECM <M/T> or connector C-59 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 15.



STEP 5. Using scan tool MB991502, check data list item 59: Heated Oxygen Sensor Bank 2, Sensor 2 (left rear).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

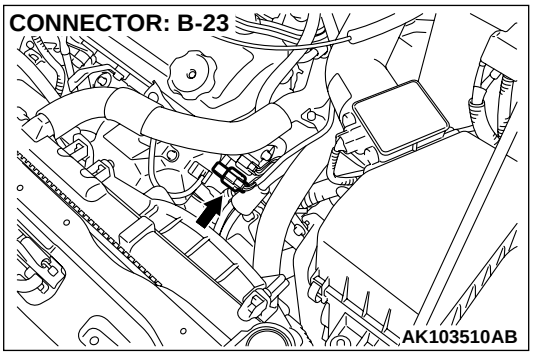
(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 59, Heated Oxygen Sensor Bank 2, Sensor 2 (left rear).
- Warming up the engine. When the engine is revved, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

NO : Replace the ECM or PCM. Then go to Step 15.

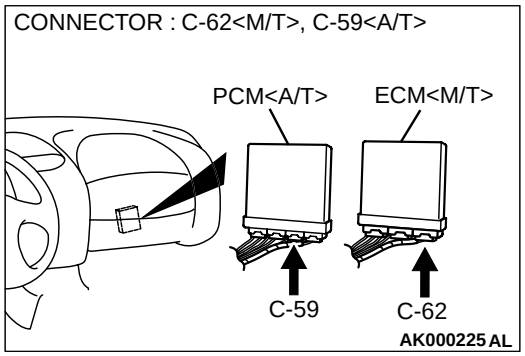


STEP 6. Check connector B-23 at left bank heated oxygen sensor (rear) and connector C-62 at ECM <M/T> or connector C-59 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between left bank heated oxygen sensor (rear) connector B-23 terminal 4 and ECM connector C-62 terminal 73 <M/T> or PCM connector C-59 terminal 73 <A/T> because of open circuit or harness damage. Then go to Step 15.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 15.

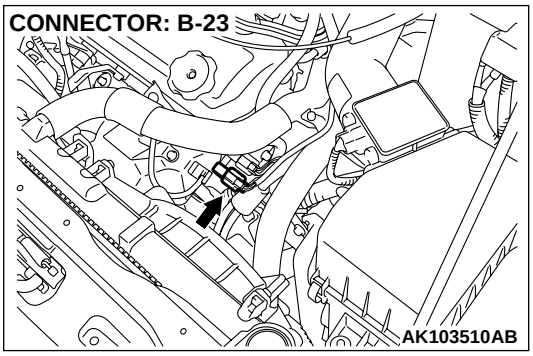


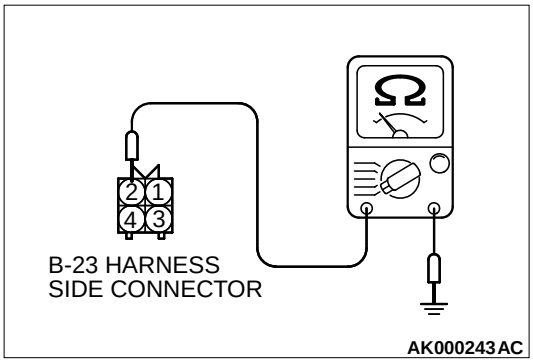
STEP 7. Check connector B-23 at left bank heated oxygen sensor (rear) for damage.

Q: Is the connector in good condition?

YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 15.





STEP 8. Check the continuity at left bank heated oxygen sensor (rear) harness side connector B-23.

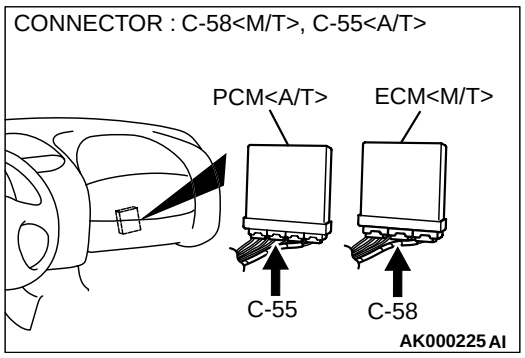
(1) Disconnect the connector B-23 and measure at the harness side.

(2) Check for the continuity between terminal 2 and ground.
- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 11.

NO : Go to Step 9.



STEP 9. Check connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

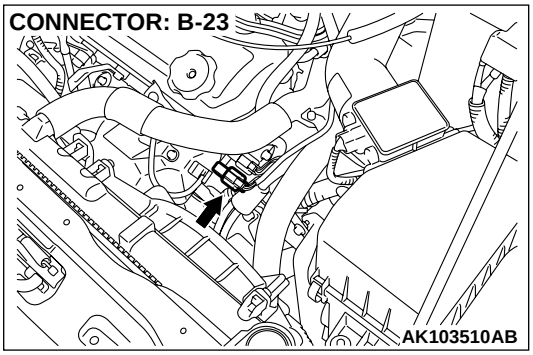
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 15.

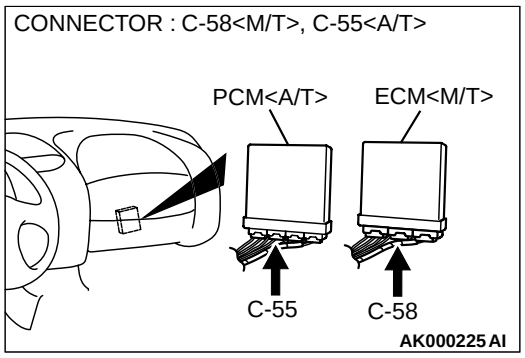
STEP 10. Check for open circuit and harness damage between left bank heated oxygen sensor (rear) connector B-23 terminal 2 and ECM connector C-58 terminal 49 <M/T> or PCM connector C-55 terminal 57 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 15.

NO : Repair it. Then go to Step 15.



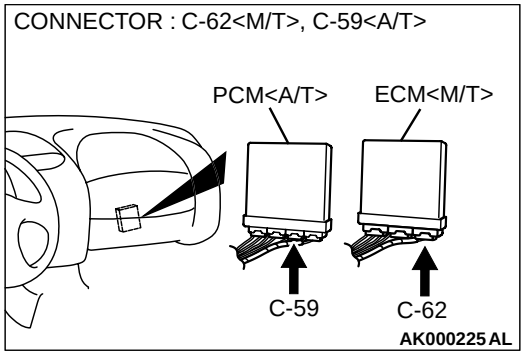


STEP 11. Check connector C-62 at ECM <M/T> or connector C-59 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 12.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 15.

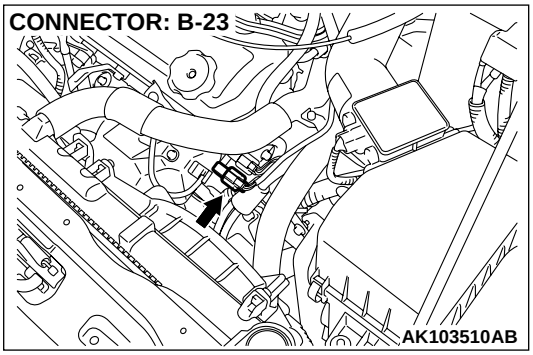


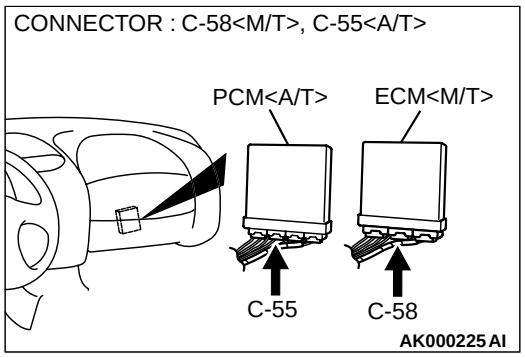
STEP 12. Check for harness damage between left bank heated oxygen sensor (rear) connector B-23 terminal 2 and ECM connector C-58 terminal 49 <M/T> or PCM connector C-55 terminal 57 <A/T>.

Q: Is the harness wire in good condition?

YES : Go to Step 13.

NO : Repair it. Then go to Step 15.



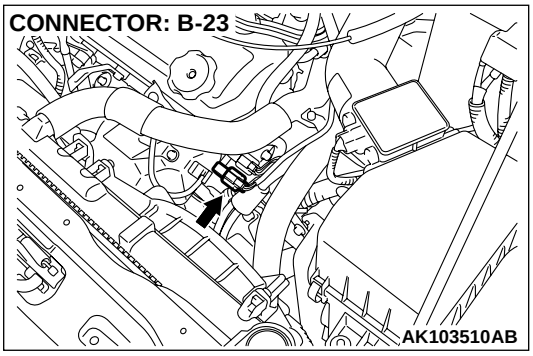


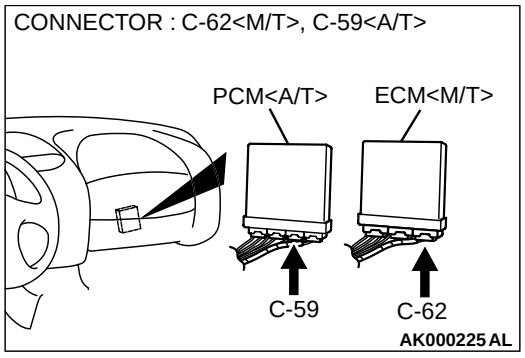
STEP 13. Check for short circuit to ground and harness damage between left bank heated oxygen sensor (rear) connector B-23 terminal 4 and ECM connector C-62 terminal 73 <M/T> or PCM connector C-59 terminal 73 <A/T>.

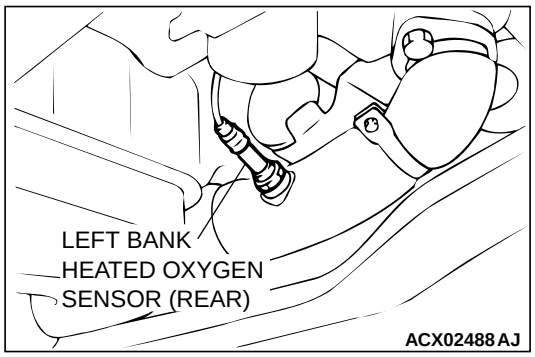
Q: Is the harness wire in good condition?

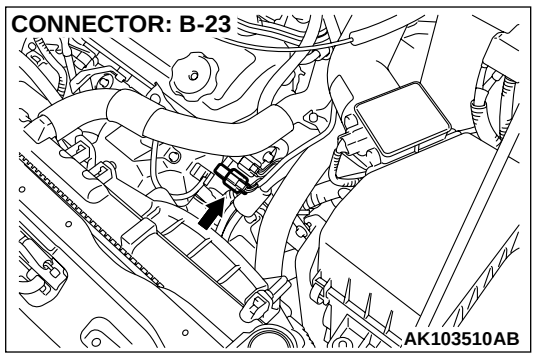
YES : Go to Step 14.

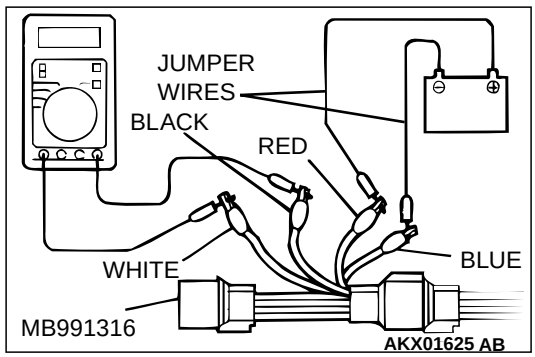
NO : Repair it. Then go to Step 15.











STEP 14. Check the left bank heated oxygen sensor (rear).

(1) Disconnect the left bank heated oxygen sensor (rear) connector B-23 and connect test harness special tool, MB991316, to the connector on the left bank heated oxygen sensor (front) side.

(2) Warm up the engine until engine coolant 80°C (176°F) or higher.

⚠ CAUTION

Be very careful when connecting the jumper wires; incorrect connection can damage the left bank heated oxygen sensor (rear).

(3) Use the jumper wires to connect terminal 1 (red clip) to the positive battery terminal and terminal 3 (blue clip) to the negative battery terminal.

(4) Connect a digital volt meter between terminal 2 (black clip) and terminal 4 (white clip).

(5) While repeatedly revving the engine, measure the left bank heated oxygen sensor (rear) output voltage.

Standard value: 0.6 – 1.0 V

Q: Is the voltage at the standard value?

YES : Replace the ECM or PCM. Then go to Step 15.

NO : Replace the left bank heated oxygen sensor (rear). Then go to Step 15.

STEP 15. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 6 – Other Monitor P.13B-6.

(2) Check the diagnostic trouble code (DTC).

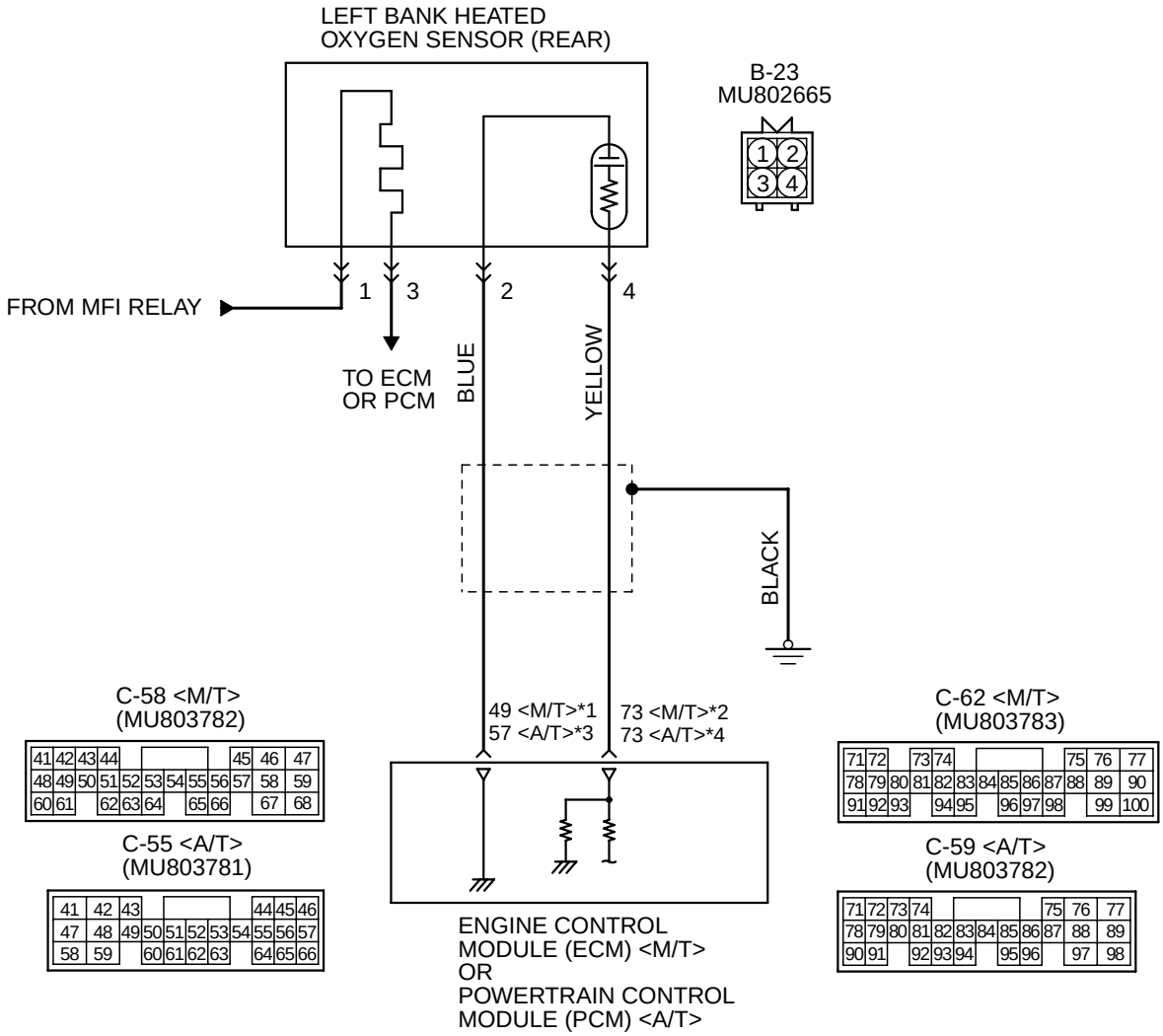
Q: Is the DTC P0156 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0157: Heated Oxygen Sensor Circuit Low Voltage (bank 2, sensor 2)

Left Bank Heated Oxygen Sensor (rear) Circuit



NOTE
*1:ECM connector C-58 <M/T>
*2:ECM connector C-62 <M/T>
*3:PCM connector C-55 <A/T>
*4:PCM connector C-59 <A/T>

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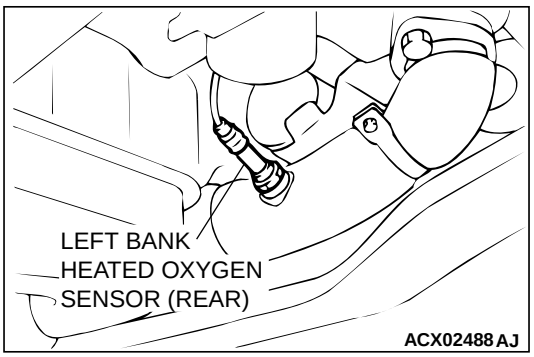
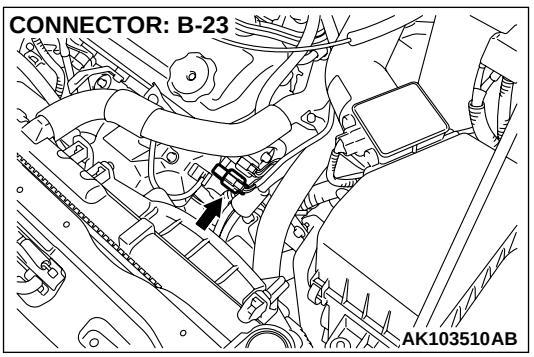
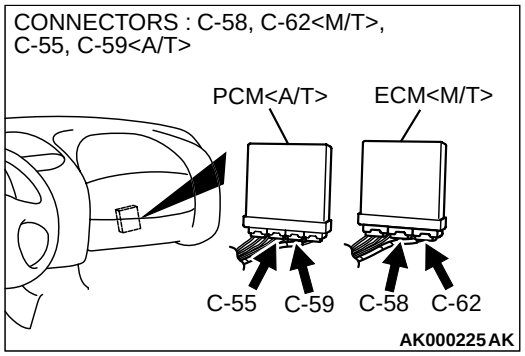




TSB Revision



CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal 73) <M/T> or PCM (terminal 73) <A/T> from the output terminal (terminal 4) of the left bank heated oxygen sensor (rear).
- Terminal 2 of the left bank heated oxygen sensor (rear) is grounded with ECM (terminal 49) <M/T> or PCM (terminal 57) <A/T>.

TECHNICAL DESCRIPTION

- The output signal of the heated oxygen sensor (front) is compensated by the output signal of the left bank heated oxygen sensor (rear).
- The ECM <M/T> or PCM <A/T> checks for an open circuit in the left bank heated oxygen sensor (rear) output line.

DTC SET CONDITIONS

Check Conditions

- 3 minutes or more have passed since the starting sequence was completed.
- Left bank heated oxygen sensor (rear) signal voltage has continued to be 0.15 volt or lower.
- Engine coolant temperature is higher than 76°C (169°F).
- Engine speed is higher than 1,200 r/min.
- Volumetric efficiency is higher than 25 percent.
- Volume air flow sensor output frequency is 75 Hz or more.
- At least 20 seconds have passed since fuel shut off control was canceled.
- The left bank heated oxygen sensor (front) outputs 0.5 volts or more.
- After the ignition switch is turned ON, the changes in the output voltage of the left bank heated oxygen sensor (rear) is lower than 0.078 volt.
- Monitoring time: 10 seconds.

Judgement Criteria

- Making the air/fuel ratio 15 percent for 10 seconds richer does not result in raising the heated oxygen sensor (rear) output voltage beyond 0.15 volt.
- The ECM <M/T> or PCM <A/T> monitors for this condition once during the drive cycle.

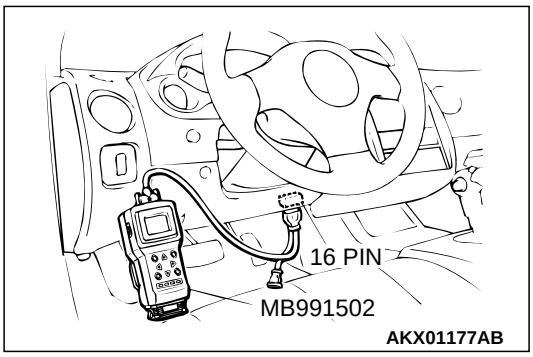
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Left bank heated oxygen sensor (rear) failed.
- Short circuit in left bank heated oxygen sensor (rear) output line.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools

- MB991502: Scan Tool (MUT-II)
- MB991316: Test Harness Set



STEP 1. Using scan tool MB991502, check data list item 59: Heated Oxygen Sensor Bank 2, Sensor 2 (left rear).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

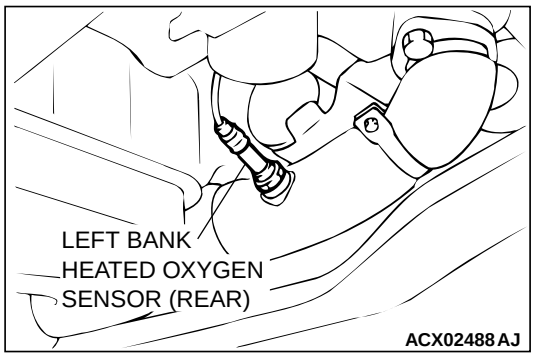
(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 59, Heated Oxygen Sensor Bank 2, Sensor 2 (left rear).
- Warming up the engine. When the engine is revved, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.

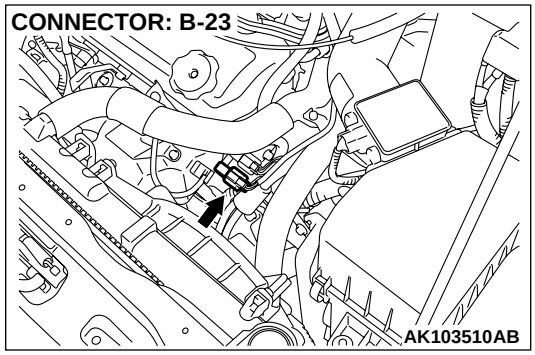
(4) Turn the ignition switch to the "LOCK" (OFF) position.

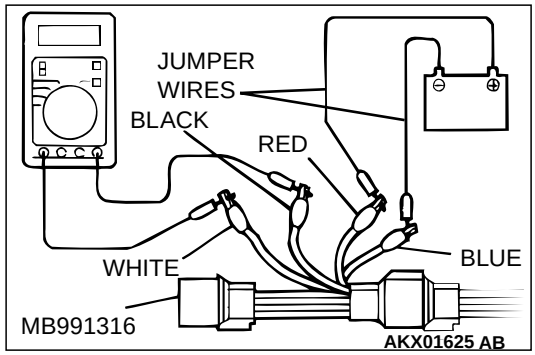
Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

NO : Go to Step 2.







STEP 2. Check the left bank heated oxygen sensor (rear).

(1) Disconnect the left bank heated oxygen sensor (rear) connector B-23 and connect test harness special tool, MB991316, to the connector on the left bank heated oxygen sensor (front) side.

(2) Warm up the engine until engine coolant 80°C (176°F) or higher.

⚠ CAUTION

Be very careful when connecting the jumper wires; incorrect connection can damage the right bank heated oxygen sensor (rear).

(3) Use the jumper wires to connect terminal 1 (red clip) to the positive battery terminal and terminal 3 (blue clip) to the negative battery terminal.

(4) Connect a digital volt meter between terminal 2 (black clip) and terminal 4 (white clip).

(5) While repeatedly revving the engine, measure the left bank heated oxygen sensor (rear) output voltage.

Standard value: 0.6 – 1.0 volt

Q: Is the voltage at the standard value?

YES : Go to Step 3.

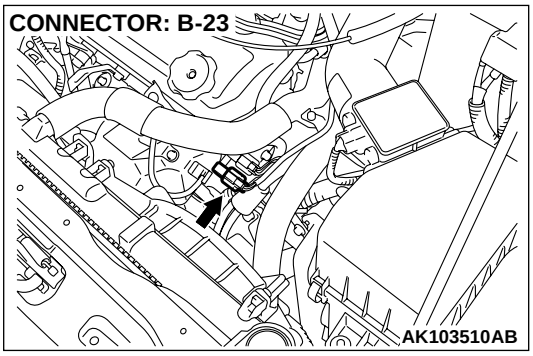
NO : Replace the left bank heated oxygen sensor (rear). Then go to Step 5.

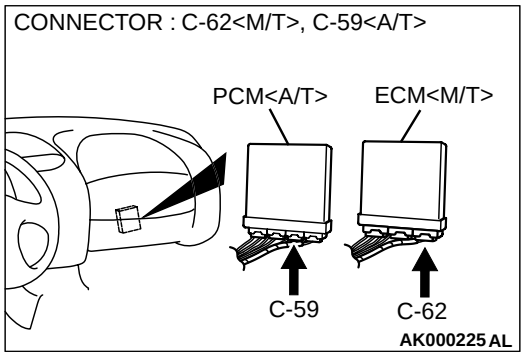
STEP 3. Check connector B-23 at left bank heated oxygen sensor (rear) and connector C-62 at ECM <M/T> or connector C-59 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.



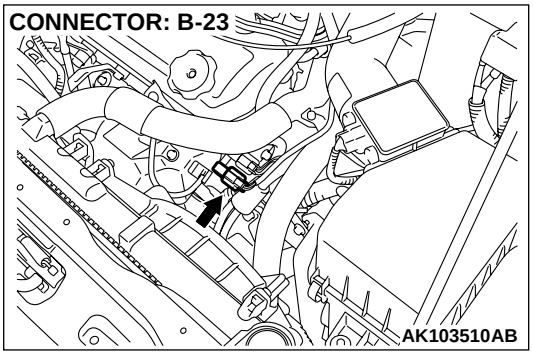


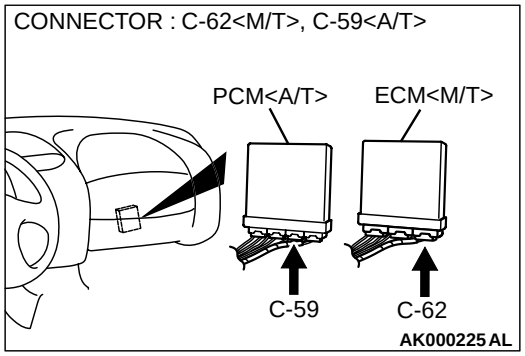
STEP 4. Check for short circuit to ground between left bank heated oxygen sensor (rear) connector B-23 terminal 4 and ECM connector C-62 terminal 73 <M/T> or PCM connector C-59 terminal 73 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 5.

NO : Repair it. Then go to Step 5.





STEP 5. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13B-6.

(2) Check the diagnostic trouble code (DTC).

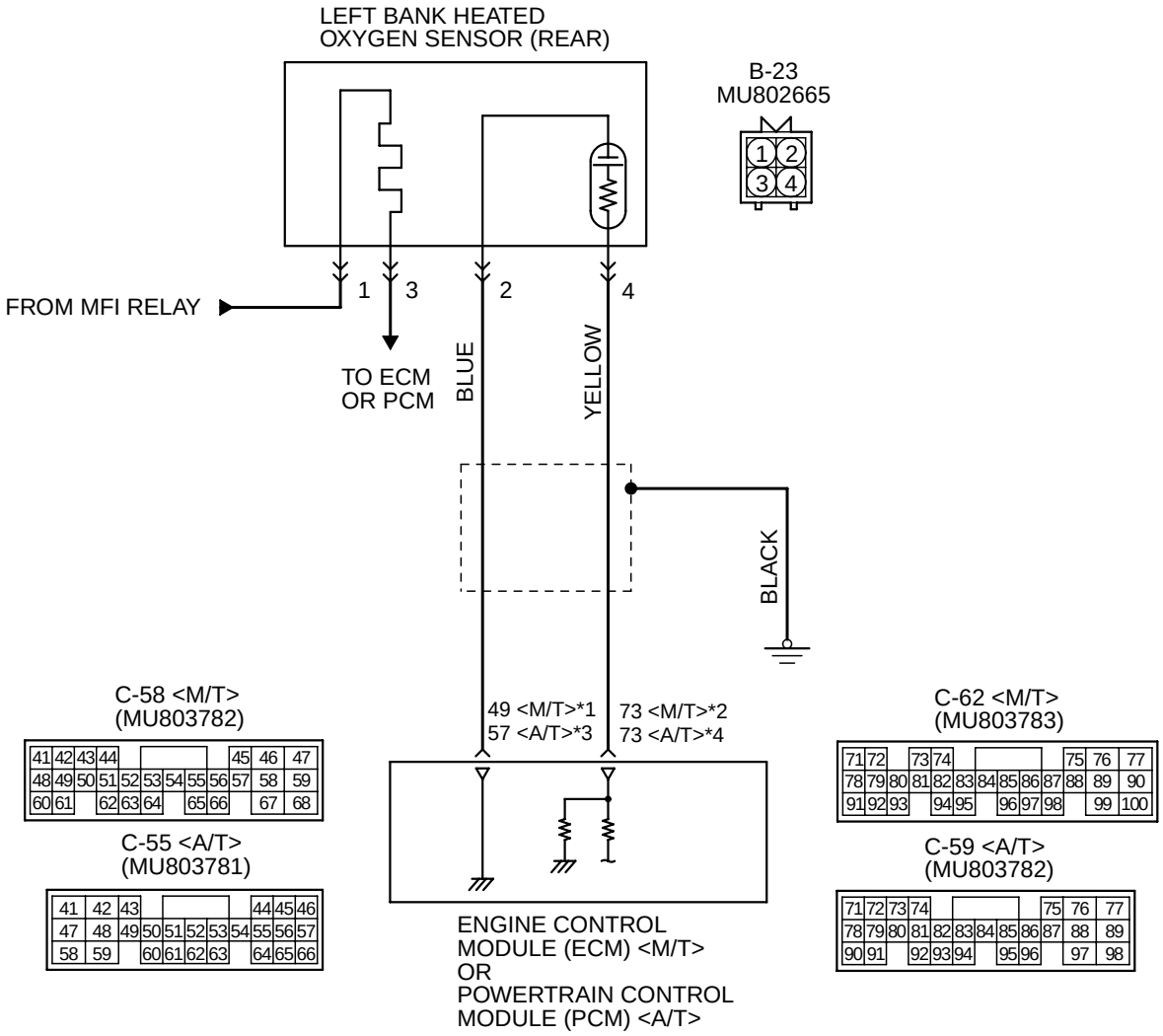
Q: Is the DTC P0157 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0158: Heated Oxygen Sensor Circuit High Voltage (bank 2, sensor 2)

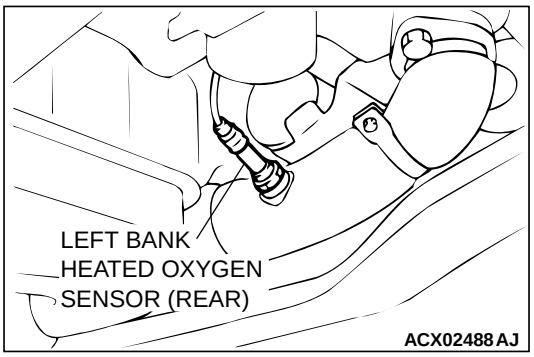
Left Bank Heated Oxygen Sensor (rear) Circuit

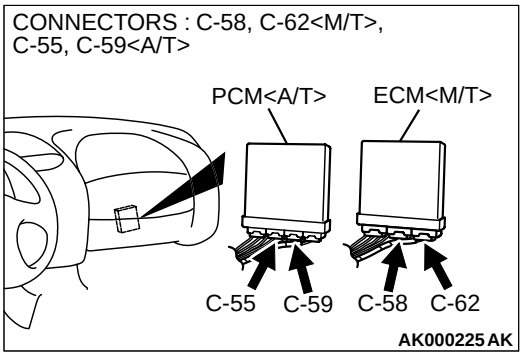


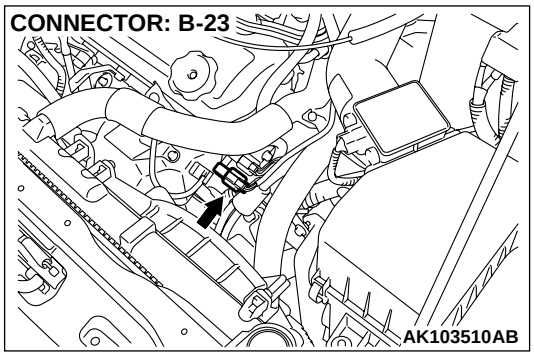
NOTE
*1:ECM connector C-58 <M/T>
*2:ECM connector C-62 <M/T>
*3:PCM connector C-55 <A/T>
*4:PCM connector C-59 <A/T>

AK103016

TSB Revision







CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal 73) <M/T> or PCM (terminal 73) <A/T> from the output terminal (terminal 4) of the left bank heated oxygen sensor (rear).
- Terminal 2 of the left bank heated oxygen sensor (rear) is grounded with ECM (terminal 49) <M/T> or PCM (terminal 57) <A/T>.

TECHNICAL DESCRIPTION

- The output signal of the left bank heated oxygen sensor (front) is compensated by the output signal of the left bank heated oxygen sensor (rear).
- The ECM <M/T> or PCM <A/T> checks for an open circuit in the left bank heated oxygen sensor (rear) output line.

DTC SET CONDITIONS

Check Conditions

- 2 seconds or more have passed since the starting sequence was completed.

Judgment Criteria

- Left bank heated oxygen sensor (rear) output voltage has continued to be 1.2 volts or higher for 2 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Short circuit in left bank heated oxygen sensor (rear) output line.
- ECM failed. <M/T>
- PCM failed. <A/T>

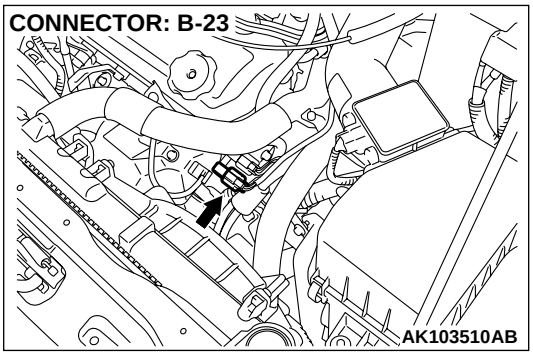
DIAGNOSIS

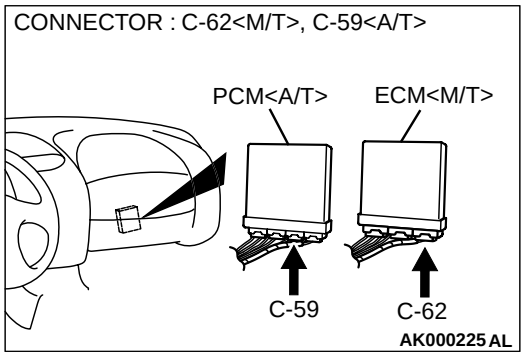
Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Check connector B-23 at left bank heated oxygen sensor (rear) and connector C-62 at ECM <M/T> or connector C-59 at PCM <A/T> for damage.
Q: Is the connector in good condition?

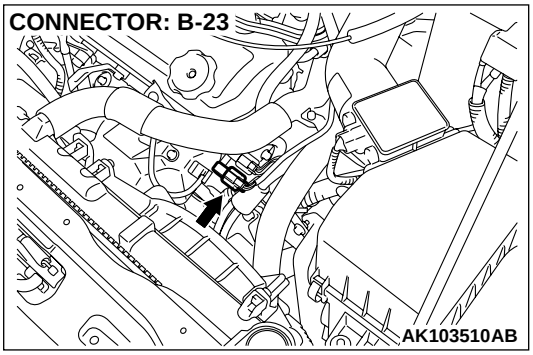
YES : Go to Step 2.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 3.

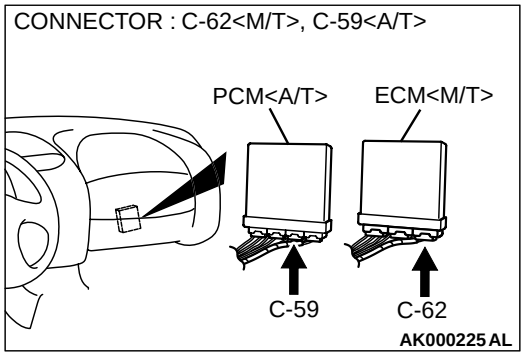




STEP 2. Check for short circuit to power supply between left bank heated oxygen sensor (rear) connector B-23 terminal 4 and ECM connector C-62 terminal 73 <M/T> or PCM connector C-59 terminal 73 <A/T>.
Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 3.
NO : Repair it. Then go to Step 3.





STEP 3. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 6 – Other Monitor P.13B-6.

(2) Check the diagnostic trouble code (DTC).

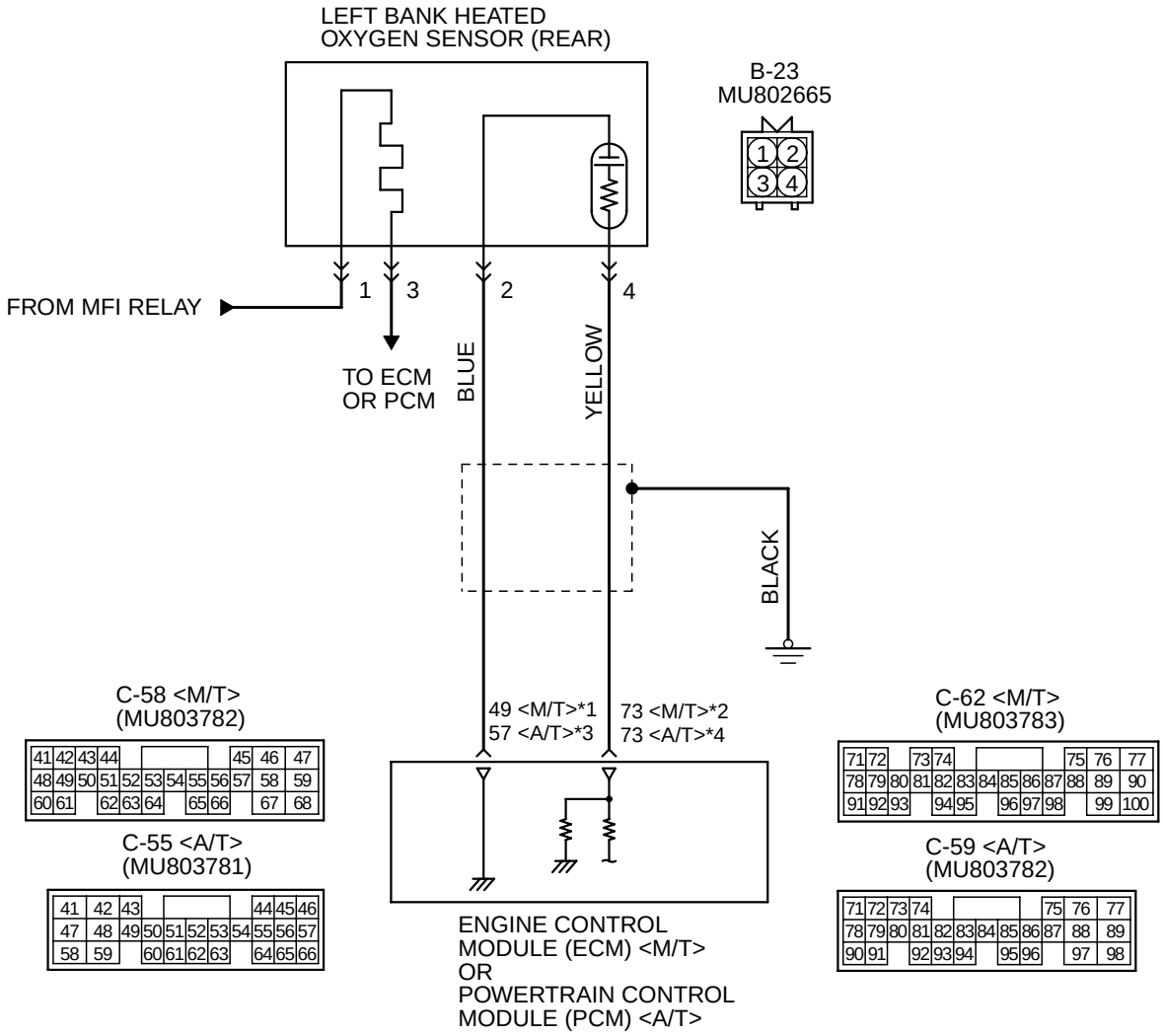
Q: Is the DTC P0158 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0159: Heated Oxygen Sensor Circuit Slow Responce (bank 2, sensor 2)

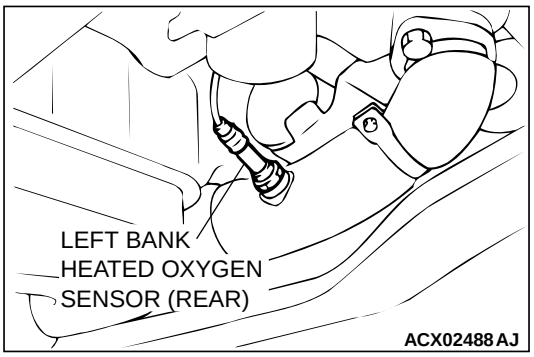
Left Bank Heated Oxygen Sensor (rear) Circuit

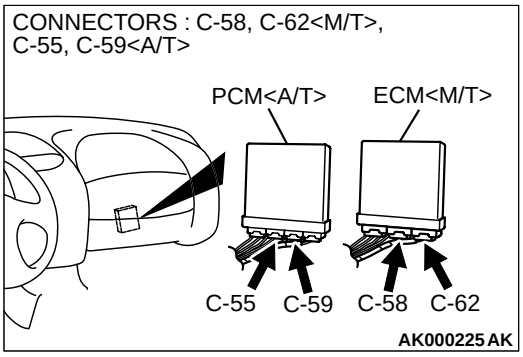


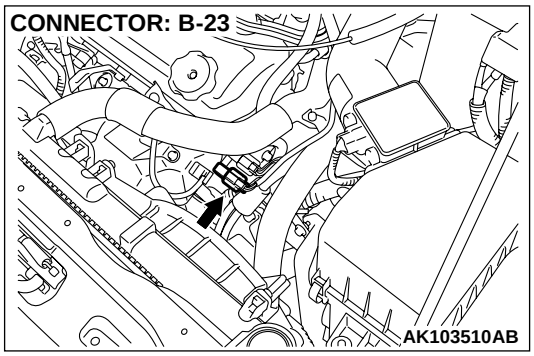
NOTE
*1:ECM connector C-58 <M/T>
*2:ECM connector C-62 <M/T>
*3:PCM connector C-55 <A/T>
*4:PCM connector C-59 <A/T>

AK103016

TSB Revision







CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal 73) <M/T> or PCM (terminal 73) <A/T> from the output terminal (terminal 4) of the left bank heated oxygen sensor (rear).
- Terminal 2 of the left bank heated oxygen sensor (rear) is grounded with ECM (terminal 49) <M/T> or PCM (terminal 57) <A/T>.

TECHNICAL DESCRIPTION

- The output signal of the left bank heated oxygen sensor (front) is compensated by the output signal of the left bank heated oxygen sensor (rear).
- The ECM <M/T> or PCM <A/T> checks for an open circuit in the left bank heated oxygen sensor (rear) output line.

DTC SET CONDITIONS

Check Conditions

- Engine coolant temperature is higher than 76°C (169°F).
- The left bank heated oxygen sensor (front) is active.
- The cumulative volume air flow sensor output frequency is higher than 4,000 Hz.
- Repeat 3 or more times: drive[*1], stop[*2].

  Drive[*1]:
  - Engine speed is higher than 1,500 r/min.
  - Volumetric efficiency is higher than 40 percent.
  - Vehicle speed is higher than 30 km/h (18.7 mph).
  - A total of more than 10 seconds have elapsed with the above mentioned conditions, and more than 2 seconds have elapsed with the fuel shut off.

  Stop[*2]:
  - Vehicle speed is lower than 1.5 km/h (0.9 mph) .

Judgement Criteria

- Change in the output voltage of the left bank heated oxygen sensor (rear) is lower than 0.312 volt.

  NOTE: Monitoring stops after fuel has been shut off for more than 38 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

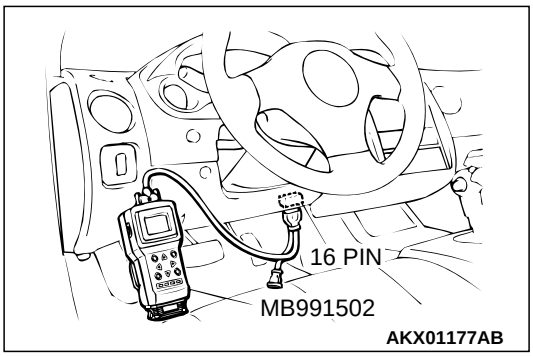
- Left bank heated oxygen sensor (rear) failed.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

TSB Revision



STEP 1. Using scan tool MB991502, check data list item 59: Heated Oxygen Sensor Bank 2, Sensor 2 (left rear).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 59, Heated Oxygen Sensor Bank 2, Sensor 2 (left rear).
(4) Warm up the engine.
- After increasing the output voltage 0.15 volt or more by the engine revving, finish it. Then confirm that the output voltage reduces to 0.15 volt or less within 3 seconds.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Replace the left bank heated oxygen sensor (rear). Then go to Step 2.

STEP 2. Test the OBD-II drive cycle.

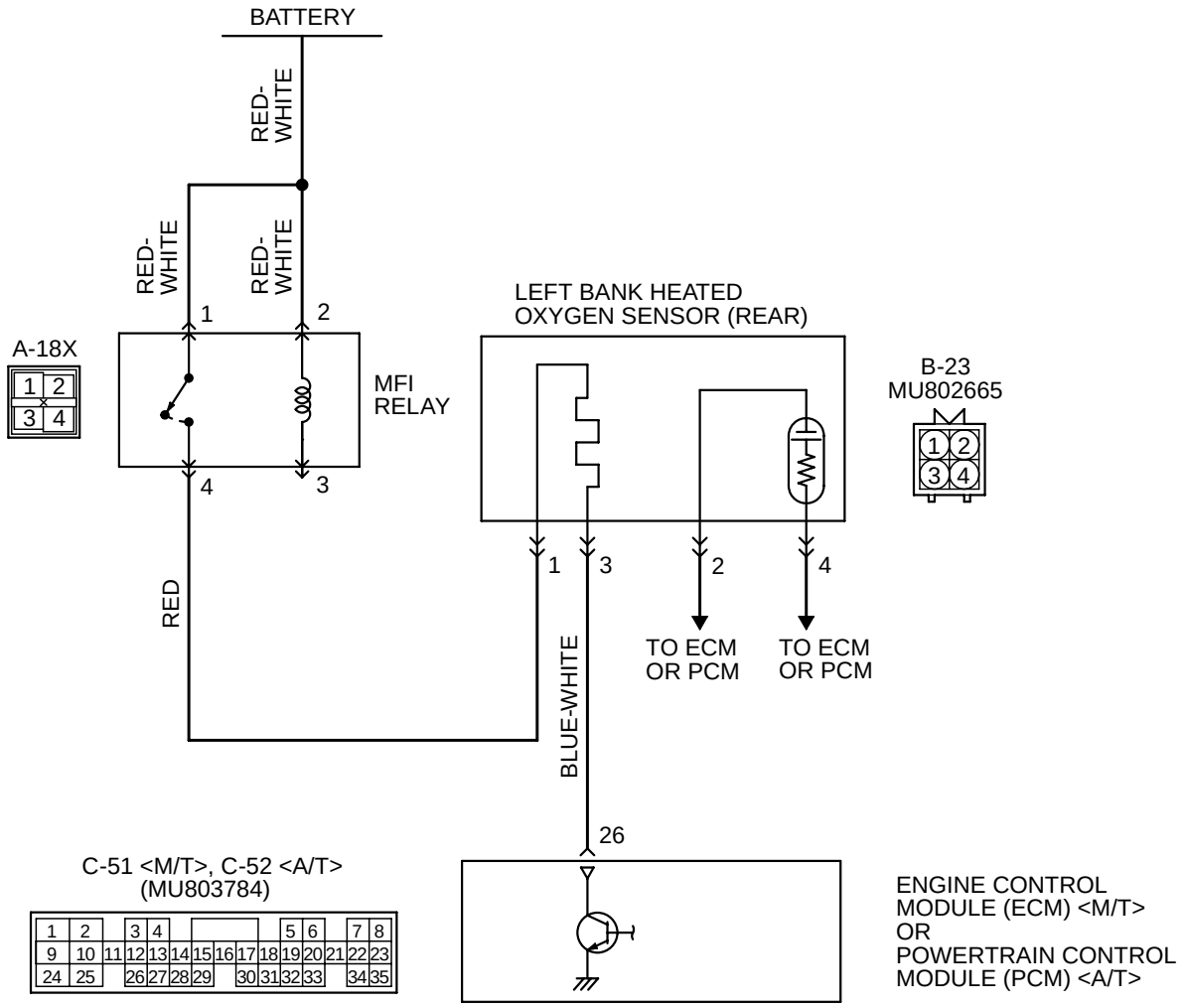
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 4 – Heated Oxygen Sensor Monitor P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0159 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0161: Heated Oxygen Sensor Heater Circuit (bank 2, sensor 2)

Left Bank Heated Oxygen Sensor (rear) Heater Circuit



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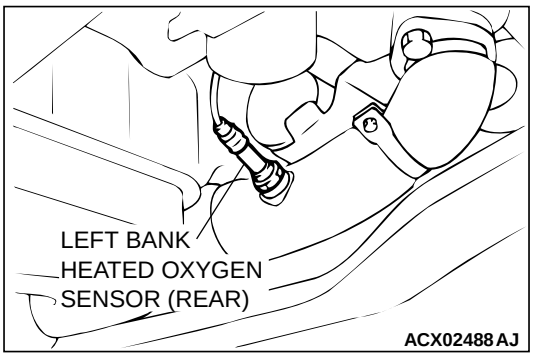

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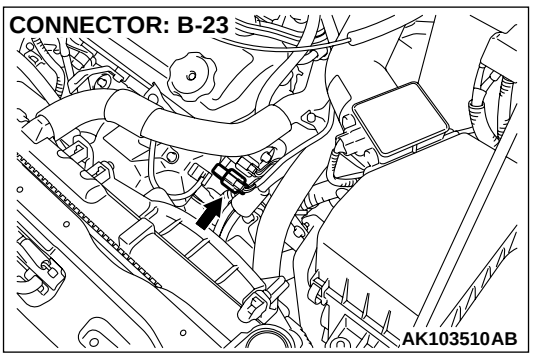

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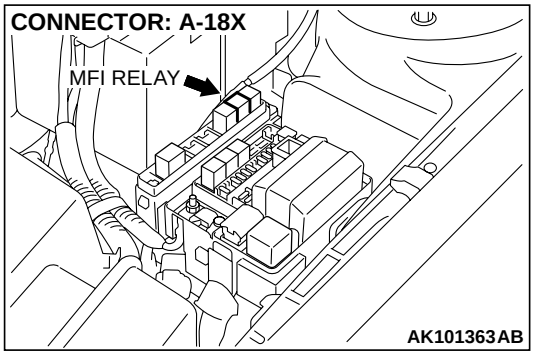
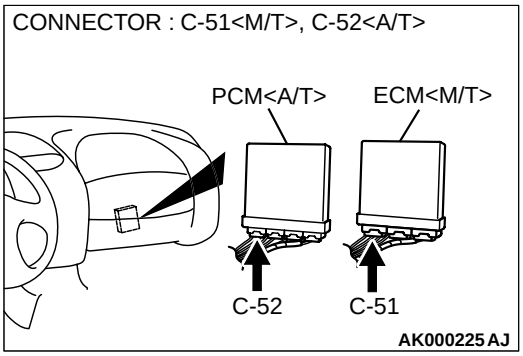
TSB Revision





CIRCUIT OPERATION

- Power is supplied from the MFI relay (terminal 4) to the left bank heated oxygen sensor (rear) heater.
- The ECM (terminal 26) <M/T> or PCM (terminal 26) <A/T> controls continuity to the left bank heated oxygen sensor (rear) heater by turning the power transistor in the ECM <M/T> or PCM <A/T> "ON" and "OFF".

BACKGROUND

- The ECM <M/T> or PCM <A/T> checks whether the heater current is within a specified range when the heater is energized.

DTC SET CONDITIONS

Check Conditions

- 60 seconds have elapsed from the start of the previous monitoring.
- Engine coolant temperature is higher than 20°C (68°F).
- While the left bank heated oxygen sensor (rear) heater is on.
- Battery positive voltage is between 11 and 16 volts.

Judgment Criteria

- Heater current of the left bank heated oxygen sensor (rear) heater has continued to be lower than 0.16 ampere or higher than 5.0 ampere for 4 seconds.

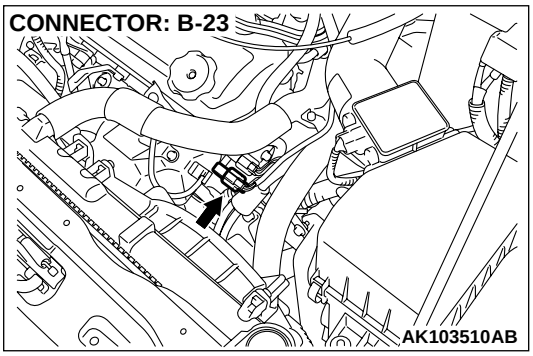
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Open or shorted left bank heated oxygen sensor (rear) heater circuit.
- Open circuit in left bank heated oxygen sensor (rear) heater.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

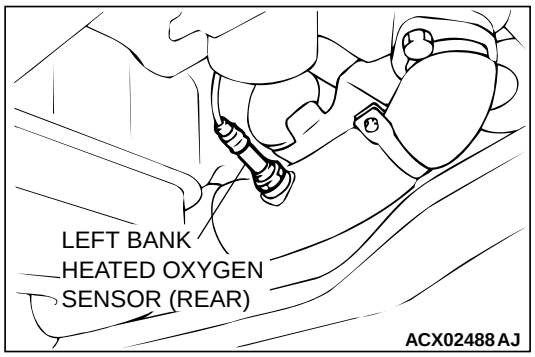
Required Special Tool:

- MB991316: Test Harness Set



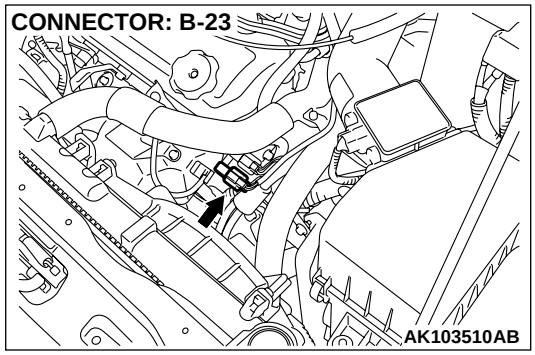
STEP 1. Check connector B-23 at the left bank heated oxygen sensor (rear) for damage.
Q: Is the connector in good condition?

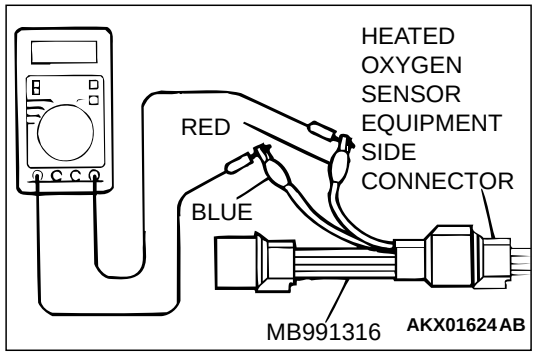
YES : Go to Step 2.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



STEP 2. Check the left bank heated oxygen sensor (rear).

(1) Disconnect left bank heated oxygen sensor (rear) connector B-23 and connect test harness special tool, MB991316, to the connector on the left bank heated oxygen (rear) sensor side.





(2) Measure the resistance between heated oxygen sensor connector terminal 1 (red clip) and terminal 3 (blue clip).

Standard value: 11 – 18 ohm [at 20°C (68°F)]

Q: Is the resistance normal?

YES : Go to Step 3.

NO : Replace the left bank heated oxygen sensor (rear). Then go to Step 12.

STEP 3. Check the power supply voltage at left bank heated oxygen sensor (rear) harness side connector B-23.

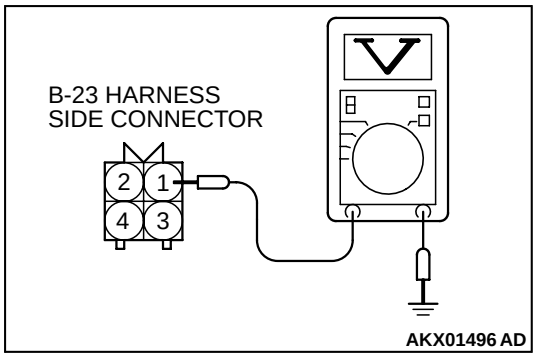
(1) Disconnect the connector B-23 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between terminal 1 and ground.

- Voltage should be battery positive voltage.

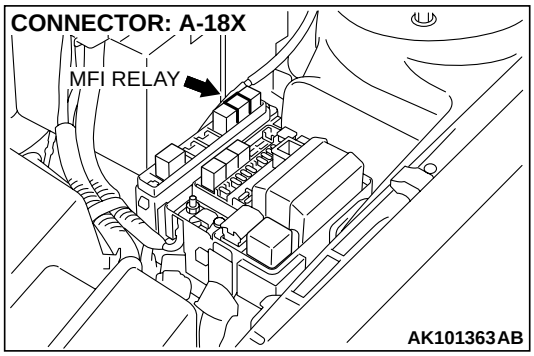
(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the voltage normal?

YES : Go to Step 5.

NO : Go to Step 4.

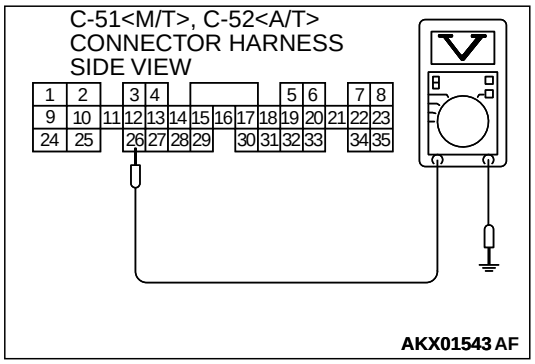


STEP 4. Check connector A-18X at the MFI relay for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between MFI relay connector A-18X terminal 4 and left bank heated oxygen sensor (rear) connector B-23 terminal 1 because of open circuit or short circuit to ground. Then go to Step 12.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



STEP 5. Check the power supply voltage at ECM connector C-51 <M/T> or PCM connector C-52 <A/T> by backprobing.

(1) Do not disconnect the connector C-51 <M/T> or C-52 <A/T>.

(2) Turn the ignition switch to the "ON" position.

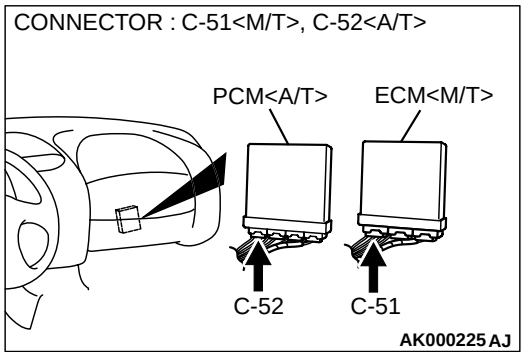
(3) Measure the voltage between terminal 26 and ground by backprobing.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 8.

NO : Go to Step 6.



STEP 6. Check connector C-51 at ECM <M/T> or connector C-52 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 7.

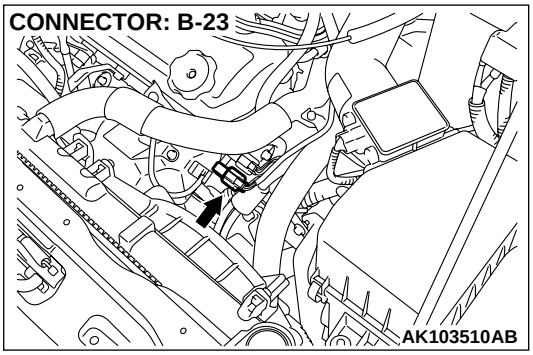
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

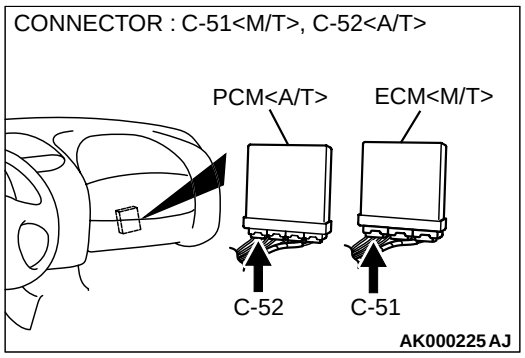
STEP 7. Check for open circuit or short circuit to ground between left bank heated oxygen sensor (rear) connector B-23 terminal 3 and ECM connector C-51 terminal 26 <M/T> or PCM connector C-52 terminal 26 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 12.

NO : Repair it. Then go to Step 12.



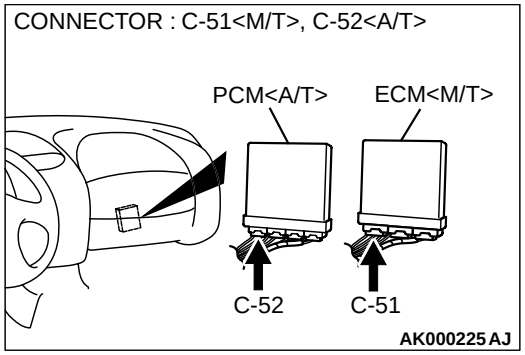


STEP 8. Check connector C-51 at ECM <M/T> or connector C-52 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

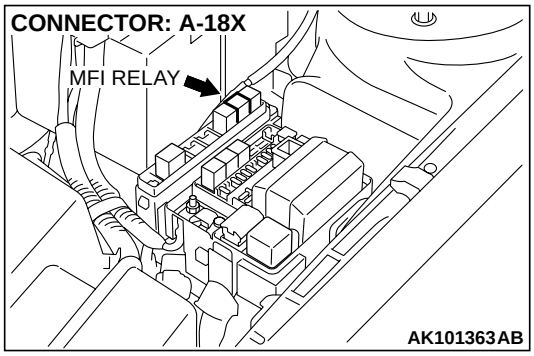


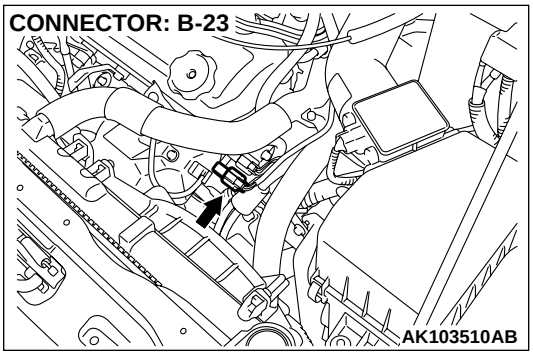
STEP 9. Check for harness damage between MFI relay connector A-18X terminal 4 and left bank heated oxygen sensor (rear) connector B-23 terminal 1.

Q: Is the harness wire in good condition?

YES : Go to Step 10.

NO : Repair it. Then go to Step 12.



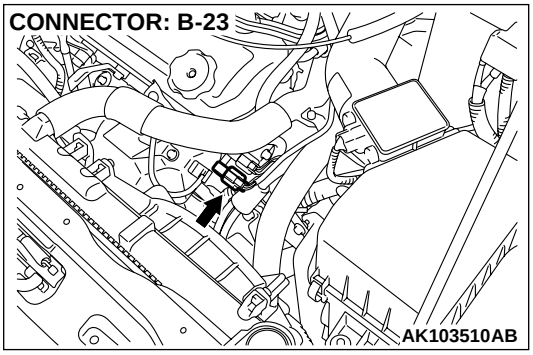


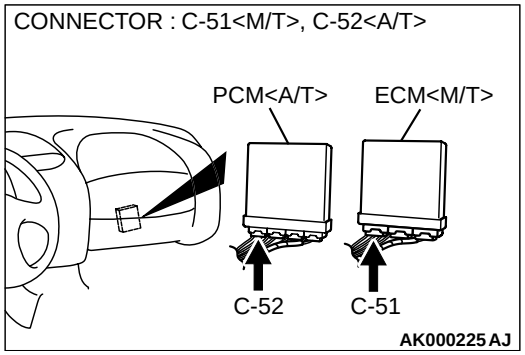
STEP 10. Check for harness damage between left bank heated oxygen sensor (rear) connector B-23 terminal 3 and ECM connector C-51 terminal 26 <M/T> or PCM connector C-52 terminal 26 <A/T>.

Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair it. Then go to Step 12.





STEP 11. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 6 – Other Monitor P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0161 is output?

YES : Replace the ECM or PCM. Then go to Step 12.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

STEP 12. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 6 – Other Monitor P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0161 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0171: System too Lean (bank 1)

System too Lean (bank 1) Circuit

- Refer to DTC P0201, P0203, P0205 – Injector Circuit P.13B-283.

CIRCUIT OPERATION

- Refer to DTC P0201, P0203, P0205 – Injector Circuit P.13B-283.

TECHNICAL DESCRIPTION

- If a malfunction occurs in the fuel system, the fuel trim value becomes too large.
- The ECM <M/T> or PCM <A/T> checks whether the fuel trim value is within a specified range.

DTC SET CONDITIONS

Check Area

- Engine coolant temperature is lower than approximately 100°C (212°F) when the engine is started.
- Intake air temperature is lower than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 77°C (171°F).
- Volume air flow sensor output frequency is 75 Hz or more.

Judgment Criteria

- Long-term fuel trim has continued to be higher than +12.5 percent for 5 seconds.

or

- Short-term fuel trim has continued to be higher than +7.4 percent for 5 seconds.

Check Area

- Engine coolant temperature is lower than approximately 100°C (212°F) when the engine is started.
- Intake air temperature is lower than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 77°C (171°F).
- Volume air flow sensor output frequency is 75 Hz or less.

Judgment Criteria

- Long-term fuel trim has continued to be higher than +12.5 percent for 5 seconds.

or

- Short-term fuel trim has continued to be higher than +12.5 percent for 5 seconds.

Check Area

- Engine coolant temperature is higher than approximately 100°C (212°F) when the engine is started.
- Intake air temperature is higher than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 77°C (171°F).

- Volume air flow sensor output frequency is 75 Hz or more.

Judgment Criteria
- Long-term fuel trim has continued to be higher than +12.5 percent for 5 seconds.

or
- Short-term fuel trim has continued to be higher than +17.6 percent for 5 seconds.

Check Area
- Engine coolant temperature is higher than approximately 100°C (212°F) when the engine is started.
- Intake air temperature is higher than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 77°C (171°F).
- Volume air flow sensor output frequency is 75 Hz or less.

Judgment Criteria
- Long-term fuel trim has continued to be higher than +12.5 percent for 5 seconds.

or
- Short-term fuel trim has continued to be higher than +22.3 percent for 5 seconds.

Check Area
- Engine coolant temperature is higher than 77°C (171°F).
- Under the closed loop air/fuel ratio control.

Judgment Criteria
- Long-term fuel trim has continued to be +12.5 percent for 5 seconds.

or
- Short-term fuel trim has continued to be +25.0 percent for 5 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Volume air flow sensor failed.
- Injector (Number 1, 3, 5) failed.
- Incorrect fuel pressure.
- Air drawn in from gaps in gasket, seals, etc.
- Right bank heated oxygen sensor failed.
- Engine coolant temperature sensor failed.
- Intake air temperature sensor failed.
- Barometric pressure sensor failed.
- Use of incorrect or contaminated fuel.
- ECU failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools
- MB991502: Scan Tool (MUT-II)

STEP 1. Check the exhaust leaks.

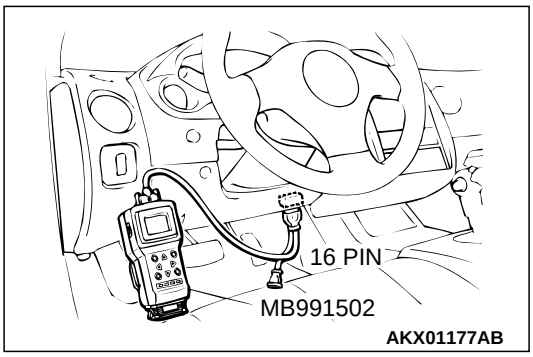
Q: Are there any abnormalities?

YES : Go to Step 2.
NO : Repair it. Then go to Step 16.

STEP 2. Check the intake system vacuum leak.

Q: Are there any abnormalities?

YES : Go to Step 3.
NO : Repair it. Then go to Step 16.



STEP 3. Using scan tool MB991502, check data list item 12: Volume Air Flow Sensor.

⚠ CAUTION

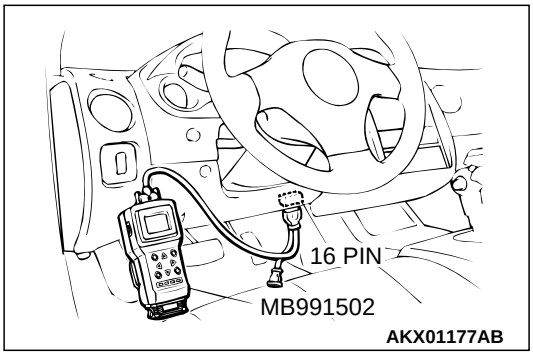
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 12, Volume Air Flow Sensor.
(4) Warm up the engine to normal operating temperature: 80°C to 96°C (176°F to 205°F).
- When idling, between 17 and 46 Hz (between 2.2 and 5.7 g/s).
- When 2,500 r/min, between 63 and 103 Hz (between 9.0 and 14.7 g/s).

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 4.
NO : Refer to DTC P0101 – Volume Air Flow Circuit Range/Performance Problem P.13B-29, DTC P0102 – Volume Air Flow Circuit Low Input P.13B-35.



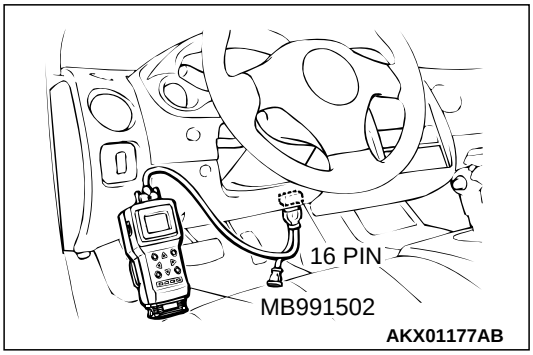
STEP 4. Using scan tool MB991502, check data list item 13: Intake Air Temperature Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991502 to the data reading mode for item 13, Intake Air Temperature Sensor.
- The intake air temperature and temperature shown with the scan tool should approximately match.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 5.
NO : Refer to DTC P0111 – Intake Air Temperature Circuit Range/Performance Problem P.13B-62, DTC P0112 – Intake Air Temperature Circuit Low Input P.13B-67, DTC P0113 – Intake Air Temperature Circuit High Input P.13B-71.



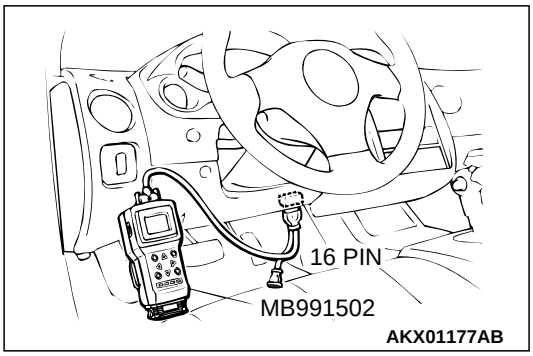
STEP 5. Using scan tool MB991502, check data list item 21: Engine Coolant Temperature Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991502 to the data reading mode for item 21, Engine Coolant Temperature Sensor.
- The engine coolant temperature and temperature shown with the scan tool should approximately match.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 6.
NO : Refer to DTC P0116 – Engine Coolant Temperature Circuit Range/Performance Problem P.13B-77, DTC P0117 – Engine Coolant Temperature Circuit Low Input P.13B-85, DTC P0118 – Engine Coolant Temperature Circuit High Input P.13B-89.



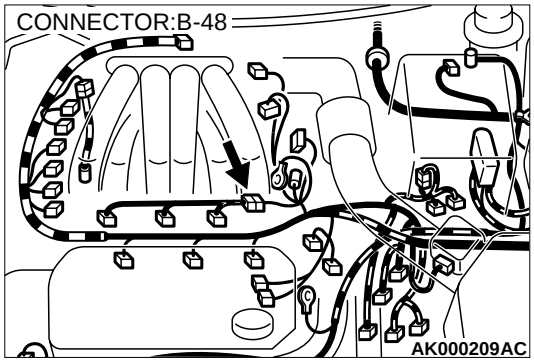
STEP 6. Using scan tool MB991502, check data list item 25: Barometric Pressure Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991502 to the data reading mode for item 25, Barometric Pressure Sensor.
- When altitude is 0 m (0 foot), 101 kPa.
- When altitude is 600 m (1,969 feet), 95 kPa.
- When altitude is 1,200 m (3,937 feet), 88 kPa.
- When altitude is 1,800 m (5,906 feet), 81 kPa.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 7.
NO : Refer to DTC P0106 – Barometric Pressure Circuit Range/Performance Problem P.13B-42, DTC P0107 – Barometric Pressure Circuit Low Input P.13B-46, DTC P0108 – Barometric Pressure Circuit High Input P.13B-56.



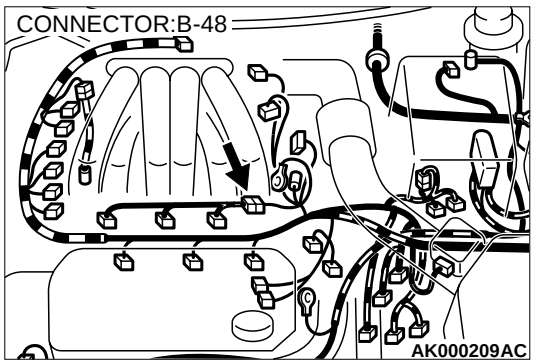
STEP 7. Check connector B-48 at injector intermediate connector for damage.

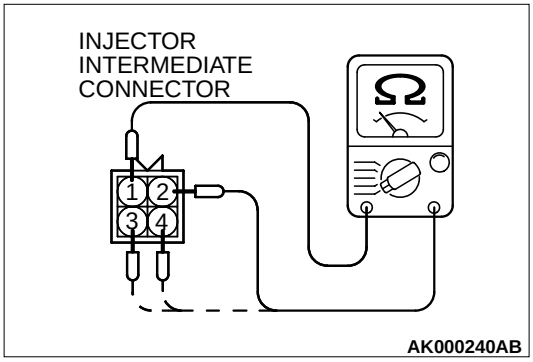
Q: Is the connector in good condition?

YES : Go to Step 8.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 16.

STEP 8. Check the right bank injector resistance at intermediate connector B-48.

(1) Disconnect the injector intermediate connector B-48.





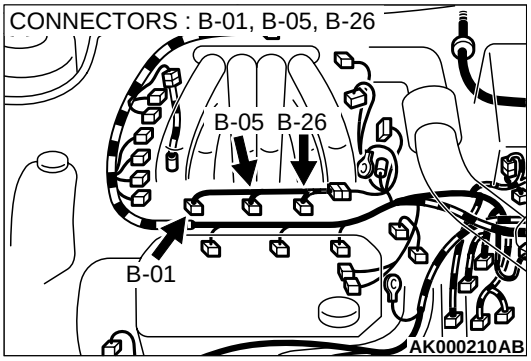
(2) Measure the resistance between each male connector side connector terminal.
   a. Measure the resistance between terminal 1 and 2 when measuring No. 1 cylinder.
   b. Measure the resistance between terminal 1 and 3 when measuring No. 3 cylinder.
   c. Measure the resistance between terminal 1 and 4 when measuring No. 5 cylinder.
   - Resistance should be between 13 and 16 ohm [at 20°C (68°F)].

Q: Is the resistance normal?

YES : Go to Step 11.
NO : Go to Step 9.

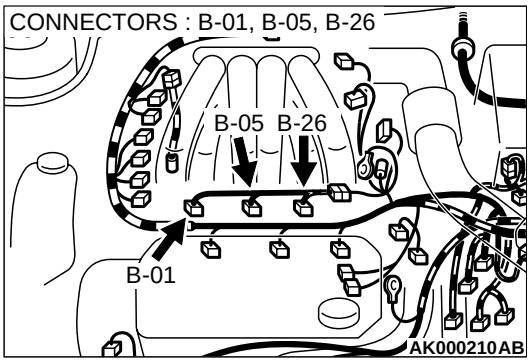
STEP 9. Check connector B-01, B-05, B-26 at right bank injector for damage.

(1) Remove the intake manifold.
(2) Check the injector connector, which deviates from the standard value at Step 8.



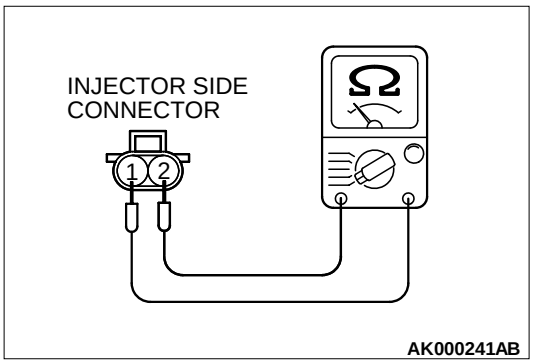
Q: Is the connector in good condition?

YES : Go to Step 10.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 16.



STEP 10. Check the right bank injector.

(1) Disconnect the right bank injector connector, which deviates from the standard value at Step 8.



(2) Measure the resistance between injector side connector terminal 1 and 2.

Standard value: 13 – 16 ohm [at 20°C (68°F)]

Q: Is the resistance standard value?

YES : Repair harness wire between injector intermediate connector and right bank injector connector because of harness damage. Then go to Step 16.

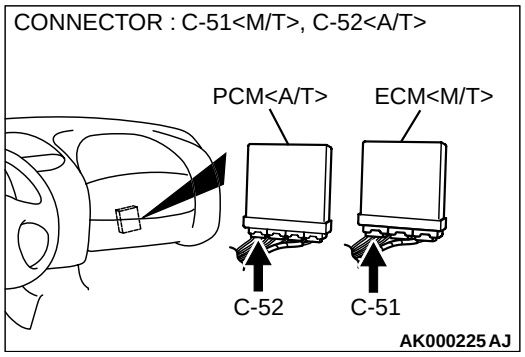
NO : Replace the injector. Then go to Step 16.

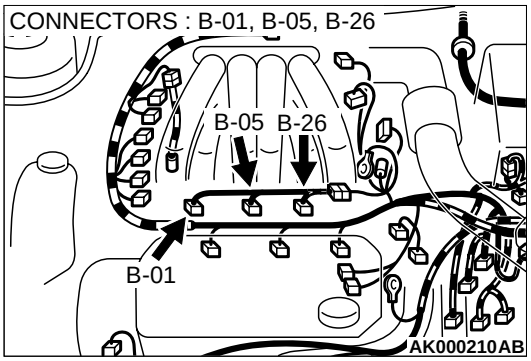
STEP 11. Check connector C-51 at ECM <M/T> or connector C-52 at PCM <A/T> for damage.

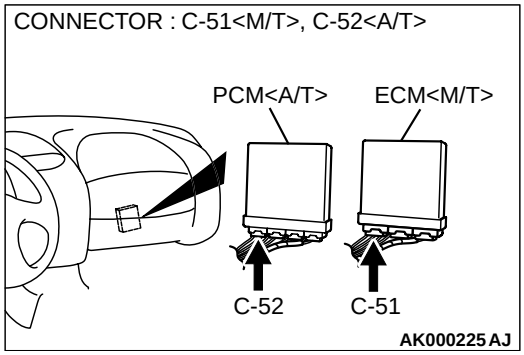
Q: Is the connector in good condition?

YES : Go to Step 12.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 16.







STEP 12. Check for harness damage between right bank injector connector and ECM connector <M/T> or PCM connector <A/T>.

a. Check the harness wire between injector connector B-01 terminal 2 and ECM connector C-51 terminal 1 <M/T> or PCM connector C-52 terminal 1 <A/T> when checking No. 1 cylinder.
b. Check the harness wire between injector connector B-05 terminal 2 and ECM connector C-51 terminal 24 <M/T> or PCM connector C-52 terminal 24 <A/T> when checking No. 3 cylinder.
c. Check the harness wire between injector connector B-26 terminal 2 and ECM connector C-51 terminal 10 <M/T> or PCM connector C-52 terminal 10 <A/T> when checking No. 5 cylinder.

Q: Is the harness wire in good condition?

YES : Go to Step 13.
NO : Repair it. Then go to Step 16.

STEP 13. Check the fuel pressure.

Refer to Fuel Pressure Test P.13B-680.

Q: Is the fuel pressure normal?

YES : Go to Step 14.
NO : Repair or replace it. Then go to Step 16.

STEP 14. Check for entry of foreign matter (water, kerosene, etc.) into fuel.

Q: Are there any abnormalities?

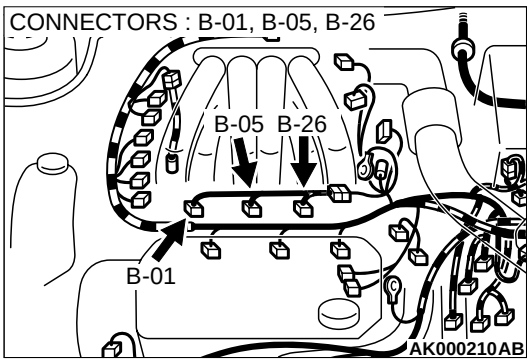
YES : Go to Step 15.
NO : Replace the fuel. Then go to Step 16.

STEP 15. Replace the right bank injector.

(1) Replace the right bank injector.
(2) Carry out a test drive with the drive cycle pattern. Refer to Procedure 2 – Fuel Trim Monitor P.13B-6.
(3) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0171 is output?

YES : Replace the ECM or PCM. Then go to Step 16.
NO : The inspection is complete.



STEP 16. Test the OBD-II drive cycle.
(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 2 – Fuel Trim Monitor P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0171 is output?
YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0172: System too Rich (bank 1)

System too Rich (bank 1) Circuit
- Refer to DTC P0201, P0203, P0205 – Injector Circuit P.13B-283.

CIRCUIT OPERATION
- Refer to DTC P0201, P0203, P0205 – Injector Circuit P.13B-283.

TECHNICAL DESCRIPTION
- If a malfunction occurs in the fuel system, the fuel trim value becomes too small.
- The ECM <M/T> or PCM <A/T> checks whether the fuel trim value is within a specified range.

DTC SET CONDITIONS

Check Area
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 77°C (171°F).
- Volume air flow sensor output frequency is 75 Hz or more.

Judgment Criteria
- Long-term fuel trim has continued to be lower than –12.5 percent for 5 seconds.

or
- Short-term fuel trim has continued to be lower than –7.4 percent for 5 seconds.

Check Area
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 77°C (171°F).
- Volume air flow sensor output frequency is 75 Hz or less.

Judgment Criteria
- Long-term fuel trim has continued to be lower than –12.5 percent for 5 seconds.

or
- Short-term fuel trim has continued to be lower than –12.5 percent for 5 seconds.

Check Area
- Engine coolant temperature is higher than 77°C (171°F).
- Under the closed loop air/fuel ratio control.

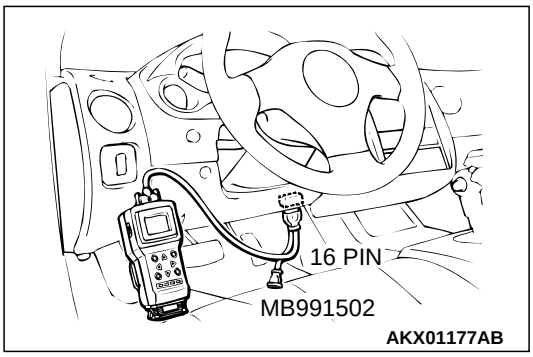
Judgment Criteria
- Long-term fuel trim has continued to be –12.5 percent for 5 seconds.

or
- Short-term fuel trim has continued to be –30 percent for 5 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Volume air flow sensor failed.
- Injector (Number 1, 3, 5) failed.
- Incorrect fuel pressure.
- Right bank heated oxygen sensor failed.
- Engine coolant temperature sensor failed.
- Intake air temperature sensor failed.
- Barometric pressure sensor failed.
- Exhaust leak.
- Use of incorrect or contaminated fuel.
- ECU failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools
- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 12: Volume Air Flow Sensor.

⚠ CAUTION

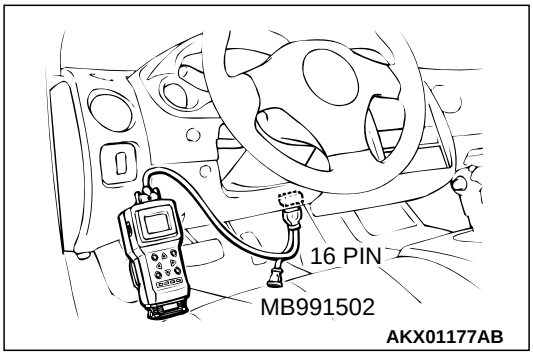
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 12, Volume Air Flow Sensor.
(4) Warm up the engine to normal operating temperature: 80°C to 96°C (176°F to 205°F).
- When idling, between 17 and 46 Hz (between 2.2 and 5.7 g/s).
- When 2,500 r/min, between 63 and 103 Hz (between 9.0 and 14.7 g/s).

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 2.
NO : Refer to DTC P0101 – Volume Air Flow Circuit Range/Performance Problem P.13B-29, DTC P0102 – Volume Air Flow Circuit Low Input P.13B-35.



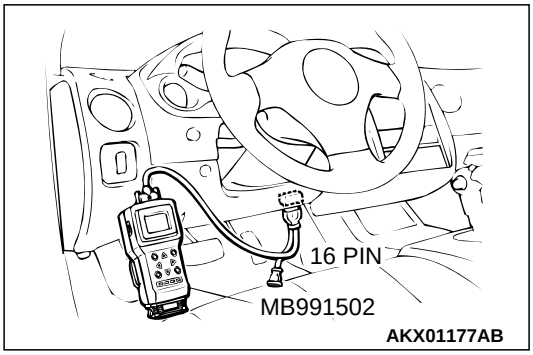
STEP 2. Using scan tool MB991502, check data list item 13: Intake Air Temperature Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991502 to the data reading mode for item 13, Intake Air Temperature Sensor.
- The intake air temperature and temperature shown with the scan tool should approximately match.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 3.
NO : Refer to DTC P0111 – Intake Air Temperature Circuit Range/Performance Problem P.13B-62, DTC P0112 – Intake Air Temperature Circuit Low Input P.13B-67, DTC P0113 – Intake Air Temperature Circuit High Input P.13B-71.



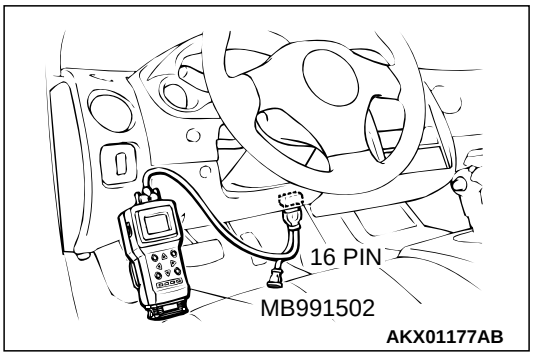
STEP 3. Using scan tool MB991502, check data list item 21: Engine Coolant Temperature Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991502 to the data reading mode for item 21, Engine Coolant Temperature Sensor.
- The engine coolant temperature and temperature shown with the scan tool should approximately match.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 4.
NO : Refer to DTC P0116 – Engine Coolant Temperature Circuit Range/Performance Problem P.13B-77, DTC P0117 – Engine Coolant Temperature Circuit Low Input P.13B-85, DTC P0118 – Engine Coolant Temperature Circuit High Input P.13B-89.



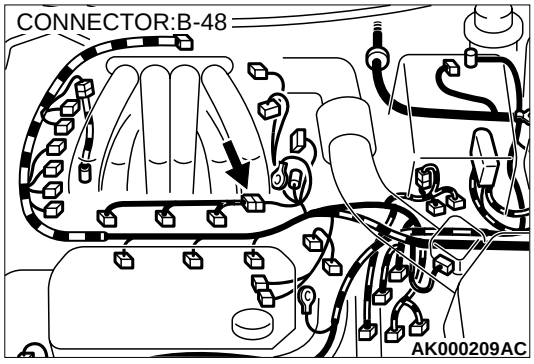
STEP 4. Using scan tool MB991502, check data list item 25: Barometric Pressure Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991502 to the data reading mode for item 25, Barometric Pressure Sensor.
- When altitude is 0 m (0 foot), 101 kPa.
- When altitude is 600 m (1,969 feet), 95 kPa.
- When altitude is 1,200 m (3,937 feet), 88 kPa.
- When altitude is 1,800 m (5,906 feet), 81 kPa.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 5.
NO : Refer to DTC P0106 – Barometric Pressure Circuit Range/Performance Problem P.13B-42, DTC P0107 – Barometric Pressure Circuit Low Input P.13B-46, DTC P0108 – Barometric Pressure Circuit High Input P.13B-56.

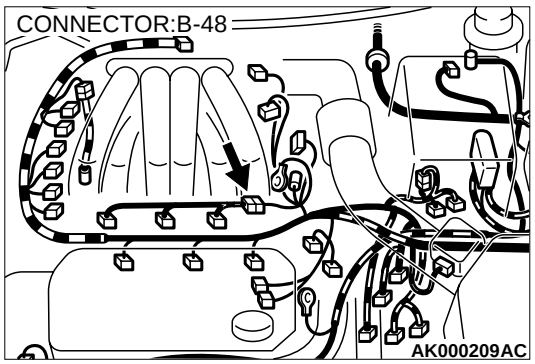


STEP 5. Check connector B-48 at injector intermediate connector for damage.

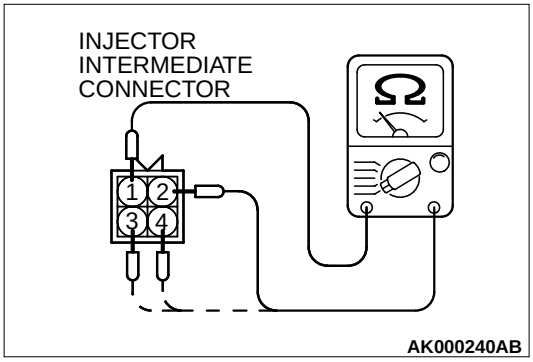
Q: Is the connector in good condition?

YES : Go to Step 6.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

STEP 6. Check the right bank injector resistance at intermediate connector B-48.



(1) Disconnect the injector intermediate connector B-48.

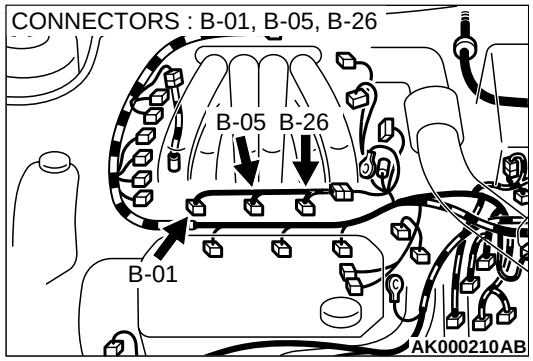


(2) Measure the resistance between each male connector side connector terminal.
   a. Measure the resistance between terminal 1 and 2 when measuring No. 1 cylinder.
   b. Measure the resistance between terminal 1 and 3 when measuring No. 3 cylinder.
   c. Measure the resistance between terminal 1 and 4 when measuring No. 5 cylinder.
   - Resistance should be between 13 and 16 ohm [at 20°C (68°F)]

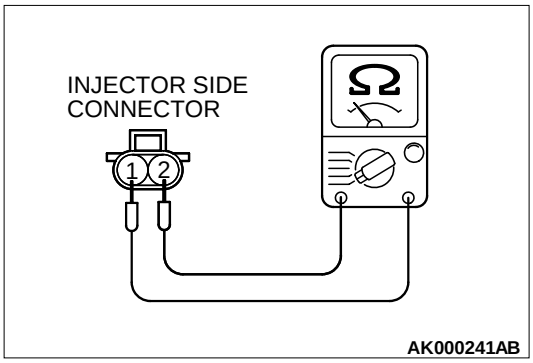
Q: Is the resistance normal?

YES : Go to Step 8.
NO : Go to Step 7.

STEP 7. Check the right bank injector.



(1) Disconnect the right bank injector connector, which deviates from the standard value at Step 6.



(2) Measure the resistance between injector side connector terminal 1 and 2.

Standard value: 13 – 16 ohm [at 20°C (68°F)]

Q: Is the resistance standard value?

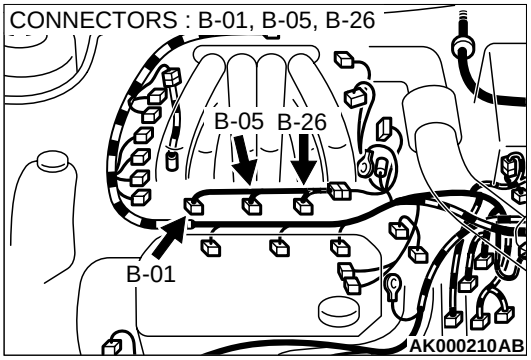
YES : Repair harness wire between injector intermediate connector and right bank injector connector because of harness damage. Then go to Step 10.
NO : Replace the injector. Then go to Step 10.

STEP 8. Check the fuel pressure.
Refer to Fuel Pressure Test P.13B-680.

Q: Is the fuel pressure normal?
YES : Go to Step 9.
NO : Repair or replace it. Then go to Step 10.

STEP 9. Replace the right bank injector.
(1) Replace the right bank injector.
(2) Carry out a test drive with the drive cycle pattern. Refer to Procedure 2 – Fuel Trim Monitor P.13B-6.
(3) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0172 is output?
YES : Replace the ECM or PCM. Then go to Step 10.
NO : The inspection is complete.



STEP 10. Test the OBD-II drive cycle.
(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 2 – Fuel Trim Monitor P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0172 is output?
YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0174: System too Lean (bank 2)

System too Lean (bank 2) Circuit
- Refer to DTC P0202, P0204, P0206 – Injector Circuit P.13B-292.

CIRCUIT OPERATION
- Refer to DTC P0202, P0204, P0206 – Injector Circuit P.13B-292.

TECHNICAL DESCRIPTION
- If a malfunction occurs in the fuel system, the fuel trim value becomes too large.
- The ECM <M/T> or PCM <A/T> checks whether the fuel trim value is within a specified range.

DTC SET CONDITIONS

Check Area
- Engine coolant temperature is lower than approximately 100°C (212°F) when the engine is started.
- Intake air temperature is lower than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 77°C (171°F).
- Volume air flow sensor output frequency is 75 Hz or more.

Judgment Criteria
- Long-term fuel trim has continued to be higher than +12.5 percent for 5 seconds.

or

- Short-term fuel trim has continued to be higher than +7.4 percent for 5 seconds.

Check Area
- Engine coolant temperature is lower than approximately 100°C (212°F) when the engine is started.
- Intake air temperature is lower than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.

TSB Revision

- Engine coolant temperature is higher than 77°C (171°F).
- Volume air flow sensor output frequency is 75 Hz or less.

Judgment Criteria
- Long-term fuel trim has continued to be higher than +12.5 percent for 5 seconds.

or
- Short-term fuel trim has continued to be higher than +12.5 percent for 5 seconds.

Check Area
- Engine coolant temperature is higher than approximately 100°C (212°F) when the engine is started.
- Intake air temperature is higher than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 77°C (171°F).
- Volume air flow sensor output frequency is 75 Hz or more.

Judgment Criteria
- Long-term fuel trim has continued to be higher than +12.5 percent for 5 seconds.

or
- Short-term fuel trim has continued to be higher than +17.6 percent for 5 seconds.

Check Area
- Engine coolant temperature is higher than approximately 100°C (212°F) when the engine is started.
- Intake air temperature is higher than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 77°C (171°F).
- Volume air flow sensor output frequency is 75 Hz or less.

Judgment Criteria
- Long-term fuel trim has continued to be higher than +12.5 percent for 5 seconds.

or
- Short-term fuel trim has continued to be higher than +22.3 percent for 5 seconds.

Check Area
- Engine coolant temperature is higher than 77°C (171°F).
- Under the closed loop air/fuel ratio control.

Judgment Criteria
- Long-term fuel trim has continued to be +12.5 percent for 5 seconds.

or
- Short-term fuel trim has continued to be +25.0 percent for 5 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Volume air flow sensor failed.
- Injector (Number 2, 4, 6) failed.
- Incorrect fuel pressure.
- Air drawn in from gaps in gasket, seals, etc.
- Left bank heated oxygen sensor failed.
- Engine coolant temperature sensor failed.
- Intake air temperature sensor failed.
- Barometric pressure sensor failed.
- Use of incorrect or contaminated fuel.
- ECU failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools
- MB991502: Scan Tool (MUT-II)

STEP 1. Check the exhaust leaks.

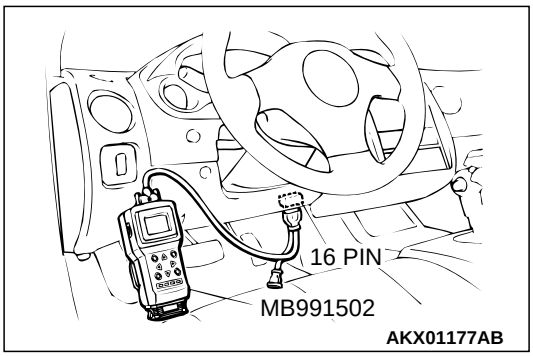
Q: Are there any abnormalities?

YES : Go to Step 2.
NO : Repair it. Then go to Step 14.

STEP 2. Check the intake system vacuum leak.

Q: Are there any abnormalities?

YES : Go to Step 3.
NO : Repair it. Then go to Step 14.



STEP 3. Using scan tool MB991502, check data list item 12: Volume Air Flow Sensor.

⚠ CAUTION

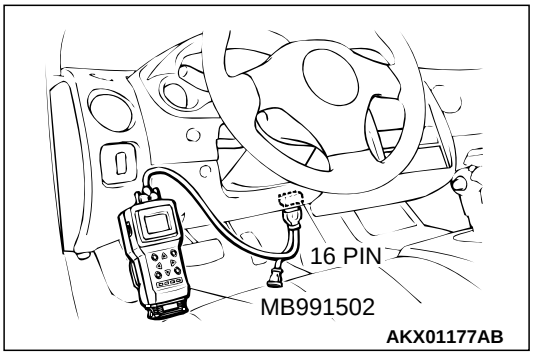
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 12, Volume Air Flow Sensor.
(4) Warm up the engine to normal operating temperature: 80°C to 96°C (176°F to 205°F).
- When idling, between 17 and 46 Hz (between 2.2 and 5.7 g/s).
- When 2,500 r/min, between 63 and 103 Hz (between 9.0 and 14.7 g/s).

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 4.
NO : Refer to DTC P0101 – Volume Air Flow Circuit Range/Performance Problem P.13B-29, DTC P0102 – Volume Air Flow Circuit Low Input P.13B-35.



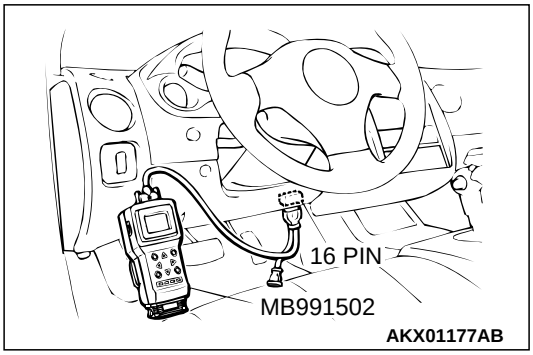
STEP 4. Using scan tool MB991502, check data list item 13: Intake Air Temperature Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991502 to the data reading mode for item 13, Intake Air Temperature Sensor.
- The intake air temperature and temperature shown with the scan tool should approximately match.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 5.
NO : Refer to DTC P0111 – Intake Air Temperature Circuit Range/Performance Problem P.13B-62, DTC P0112 – Intake Air Temperature Circuit Low Input P.13B-67, DTC P0113 – Intake Air Temperature Circuit High Input P.13B-71.



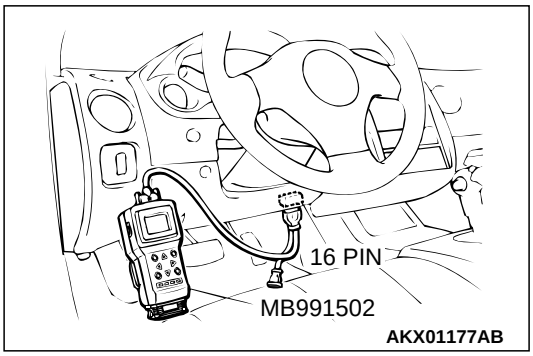
STEP 5. Using scan tool MB991502, check data list item 21: Engine Coolant Temperature Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991502 to the data reading mode for item 21, Engine Coolant Temperature Sensor.
- The engine coolant temperature and temperature shown with the scan tool should approximately match.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 6.
NO : Refer to DTC P0116 – Engine Coolant Temperature Circuit Range/Performance Problem P.13B-77, DTC P0117 – Engine Coolant Temperature Circuit Low Input P.13B-85, DTC P0118 – Engine Coolant Temperature Circuit High Input P.13B-89.



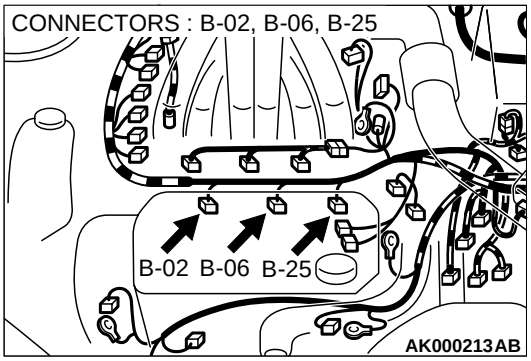
STEP 6. Using scan tool MB991502, check data list item 25: Barometric Pressure Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991502 to the data reading mode for item 25, Barometric Pressure Sensor.
- When altitude is 0 m (0 foot), 101 kPa.
- When altitude is 600 m (1,969 feet), 95 kPa.
- When altitude is 1,200 m (3,937 feet), 88 kPa.
- When altitude is 1,800 m (5,906 feet), 81 kPa.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

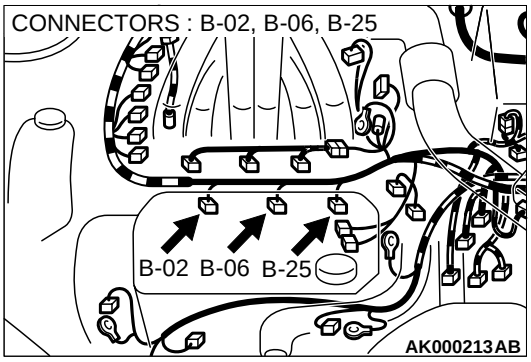
YES : Go to Step 7.
NO : Refer to DTC P0106 – Barometric Pressure Circuit Range/Performance Problem P.13B-42, DTC P0107 – Barometric Pressure Circuit Low Input P.13B-46, DTC P0108 – Barometric Pressure Circuit High Input P.13B-56.



STEP 7. Check connector B-02, B-06, B-25 at left bank injector for damage.

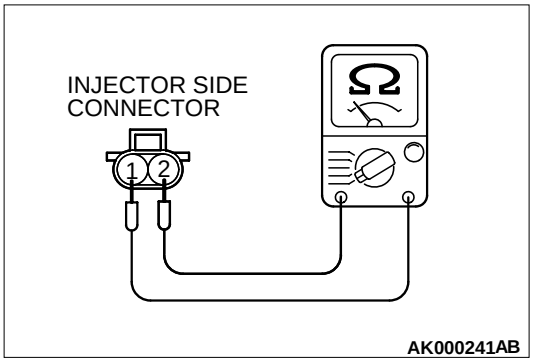
Q: Is the connector in good condition?

YES : Go to Step 8.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP 8. Check the left bank injector.

(1) Disconnect the left bank injector connector B-02, B-06, B-25.



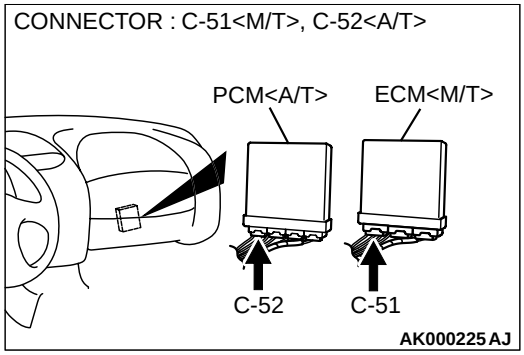
(2) Measure the resistance between each injector side connector terminal 1 and 2.

Standard value: 13 – 16 ohm [at 20°C (68°F)]

Q: Is the resistance standard value?

YES : Go to Step 9.

NO : Replace the faulty injector. Then go to Step 14.

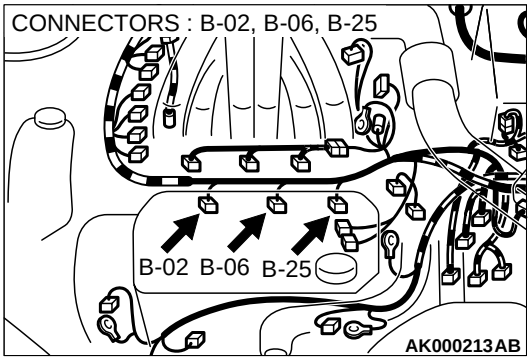


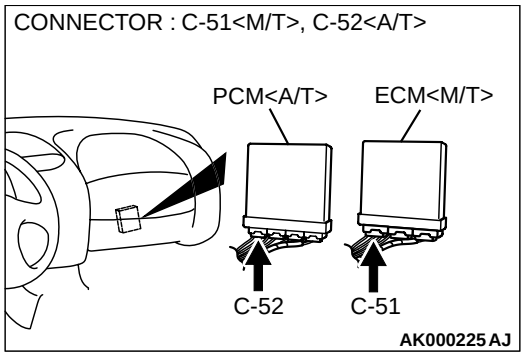
STEP 9. Check connector C-51 at ECM <M/T> or connector C-52 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.





STEP 10. Check for harness damage between left bank injector connector and ECM connector <M/T> or PCM connector <A/T>.

a. Check the harness wire between injector connector B-02 terminal 2 and ECM connector C-51 terminal 9 <M/T> or PCM connector C-52 terminal 9 <A/T> when checking No. 2 cylinder injector.
b. Check the harness wire between injector connector B-06 terminal 2 and ECM connector C-51 terminal 2 <M/T> or PCM connector C-52 terminal 2 <A/T> when checking No. 4 cylinder injector.
c. Check the harness wire between injector connector B-25 terminal and 2 ECM connector C-51 terminal 25 <M/T> or PCM connector C-52 terminal 25 <A/T> when checking No. 6 cylinder injector.

Q: Is the harness wire in good condition?

YES : Go to Step 11.
NO : Repair it. Then go to Step 14.

STEP 11. Check the fuel pressure.

Refer to Fuel Pressure Test P.13B-680.

Q: Is the fuel pressure normal?

YES : Go to Step 12.
NO : Repair or replace it. Then go to Step 14.

STEP 12. Check for entry of foreign matter (water, kerosene, etc.) into fuel.

Q: Are there any abnormalities?

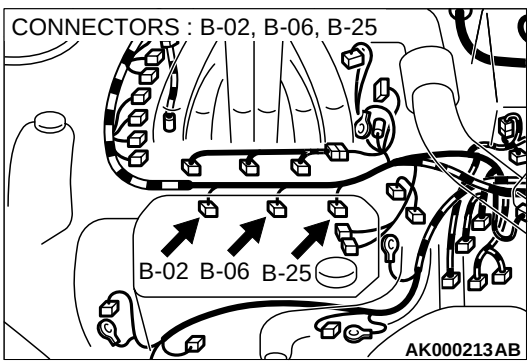
YES : Go to Step 13.
NO : Replace the fuel. Then go to Step 14.

STEP 13. Replace the left bank injector.

(1) Replace the left bank injector.
(2) Carry out a test drive with the drive cycle pattern. Refer to Procedure 2 – Fuel Trim Monitor P.13B-6.
(3) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0174 is output?

YES : Replace the ECM or PCM. Then go to Step 14.
NO : The inspection is complete.



STEP 14. Test the OBD-II drive cycle.
(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 2 – Fuel Trim Monitor P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0174 is output?
YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0175: System too Rich (bank 2)

System too Rich (bank 2) Circuit
- Refer to DTC P0202, P0204, P0206 – Injector Circuit P.13B-292.

CIRCUIT OPERATION
- Refer to DTC P0202, P0204, P0206 – Injector Circuit P.13B-292.

TECHNICAL DESCRIPTION
- If a malfunction occurs in the fuel system, the fuel trim value becomes too small.
- The ECM <M/T> or PCM <A/T> checks whether the fuel trim value is within a specified range.

DTC SET CONDITIONS

Check Area
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 77°C (171°F).
- Volume air flow sensor output frequency is 75 Hz or more.

Judgment Criteria
- Long-term fuel trim has continued to be lower than –12.5 percent for 5 seconds.

or
- Short-term fuel trim has continued to be lower than –7.4 percent for 5 seconds.

Check Area
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 77°C (171°F).
- Volume air flow sensor output frequency is 75 Hz or less.

Judgment Criteria
- Long-term fuel trim has continued to be lower than –12.5 percent for 5 seconds.

or
- Short-term fuel trim has continued to be lower than –12.5 percent for 5 seconds.

Check Area
- Engine coolant temperature is higher than 77°C (171°F).
- Under the closed loop air/fuel ratio control.

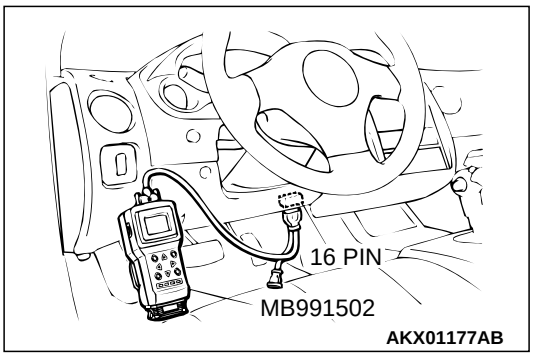
Judgment Criteria
- Long-term fuel trim has continued to be –12.5 percent for 5 seconds.

or
- Short-term fuel trim has continued to be –7.4 percent for 5 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Volume air flow sensor failed.
- Injector (Number 2, 4, 6) failed.
- Incorrect fuel pressure.
- Left bank heated oxygen sensor failed.
- Engine coolant temperature sensor failed.
- Intake air temperature sensor failed.
- Barometric pressure sensor failed.
- Exhaust leak.
- Use of incorrect or contaminated fuel.
- ECU failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools
- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 12: Volume Air Flow Sensor.

⚠ CAUTION

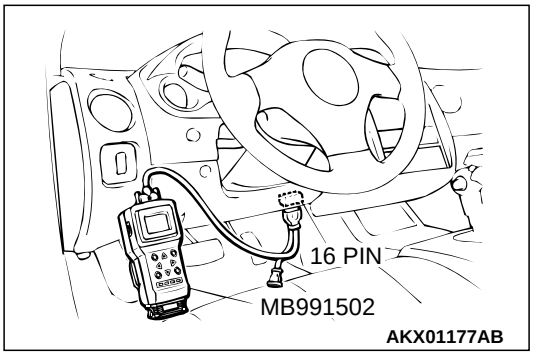
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 12, Volume Air Flow Sensor.
(4) Warm up the engine to normal operating temperature: 80°C to 96°C (176°F to 205°F).
- When idling, between 17 and 46 Hz (between 2.2 and 5.7 g/s).
- When 2,500 r/min, between 63 and 103 Hz (between 9.0 and 14.7 g/s).

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 2.
NO : Refer to DTC P0101 – Volume Air Flow Circuit Range/Performance Problem P.13B-29, DTC P0102 – Volume Air Flow Circuit Low Input P.13B-35.



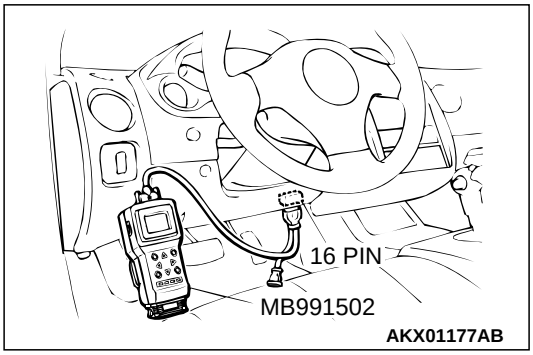
STEP 2. Using scan tool MB991502, check data list item 13: Intake Air Temperature Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991502 to the data reading mode for item 13, Intake Air Temperature Sensor.
- The intake air temperature and temperature shown with the scan tool should approximately match.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 3.
NO : Refer to DTC P0111 – Intake Air Temperature Circuit Range/Performance Problem P.13B-62, DTC P0112 – Intake Air Temperature Circuit Low Input P.13B-67, DTC P0113 – Intake Air Temperature Circuit High Input P.13B-71.



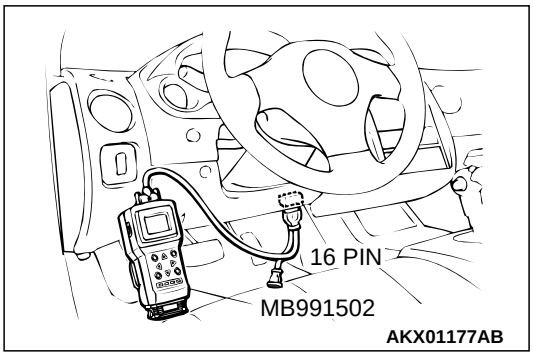
STEP 3. Using scan tool MB991502, check data list item 21: Engine Coolant Temperature Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991502 to the data reading mode for item 21, Engine Coolant Temperature Sensor.
- The engine coolant temperature and temperature shown with the scan tool should approximately match.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 4.
NO : Refer to DTC P0116 – Engine Coolant Temperature Circuit Range/Performance Problem P.13B-77, DTC P0117 – Engine Coolant Temperature Circuit Low Input P.13B-85, DTC P0118 – Engine Coolant Temperature Circuit High Input P.13B-89.



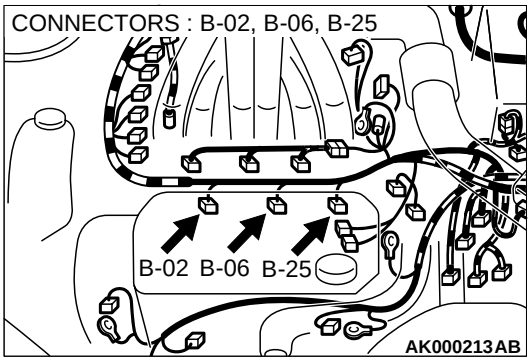
STEP 4. Using scan tool MB991502, check data list item 25: Barometric Pressure Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991502 to the data reading mode for item 25, Barometric Pressure Sensor.
- When altitude is 0 m (0 foot), 101 kPa.
- When altitude is 600 m (1,969 feet), 95 kPa.
- When altitude is 1,200 m (3,937 feet), 88 kPa.
- When altitude is 1,800 m (5,906 feet), 81 kPa.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

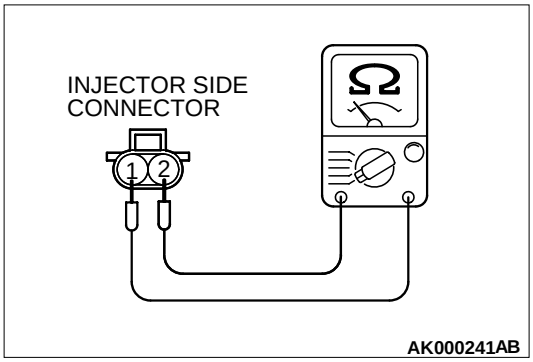
Q: Is the sensor operating properly?

YES : Go to Step 5.
NO : Refer to DTC P0106 – Barometric Pressure Circuit Range/Performance Problem P.13B-42, DTC P0107 – Barometric Pressure Circuit Low Input P.13B-46, DTC P0108 – Barometric Pressure Circuit High Input P.13B-56.



STEP 5. Check the left bank injector.

(1) Disconnect the left bank injector connector B-02, B-06, B-25.



(2) Measure the resistance between each injector side connector terminal 1 and 2.

Standard value: 13 – 16 ohm [at 20°C (68°F)]

Q: Is the resistance standard value?

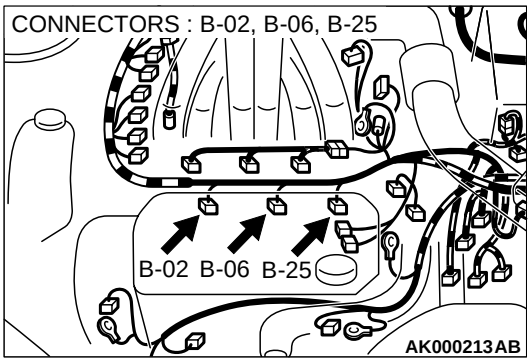
YES : Go to Step 6.
NO : Replace the faulty injector. Then go to Step 8.

STEP 6. Check the fuel pressure.

Refer to Fuel Pressure Test P.13B-680.

Q: Is the fuel pressure normal?

YES : Go to Step 7.
NO : Repair or replace it. Then go to Step 8.



STEP 7. Replace the left bank injector.

(1) Replace the left bank injector.
(2) Carry out a test drive with the drive cycle pattern. Refer to Procedure 2 – Fuel Trim Monitor P.13B-6.
(3) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0175 is output?

YES : Replace the ECM or PCM. Then go to Step 8.
NO : The inspection is complete.

STEP 8. Test the OBD-II drive cycle.

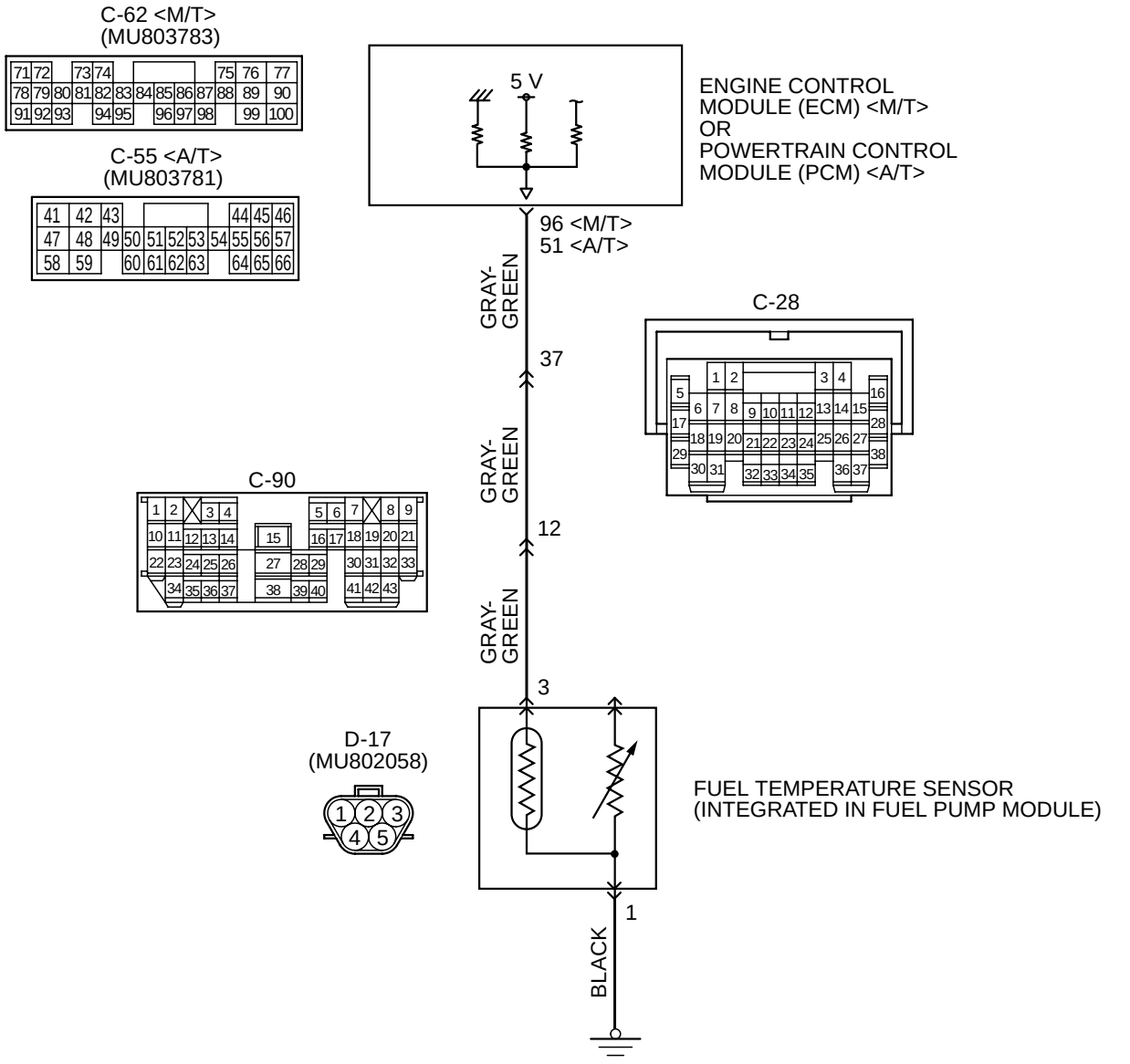
(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 2 – Fuel Trim Monitor P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0175 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0181: Fuel Temperature Sensor Circuit Range/Performance

Fuel Temperature Sensor Circuit



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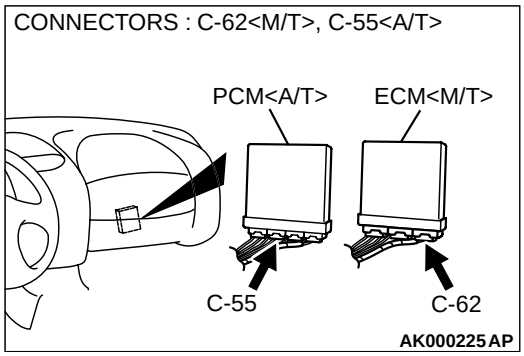

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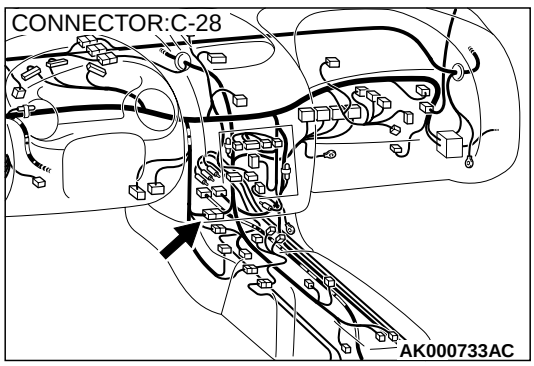

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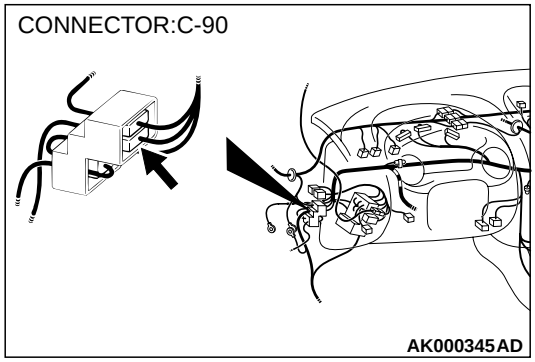
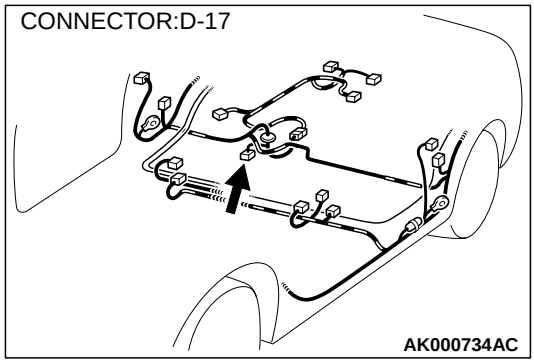




CIRCUIT OPERATION
- 5-volt voltage is applied to the fuel temperature sensor output terminal (terminal 3) from the ECM (terminal 96) <M/T> or PCM (terminal 51) <A/T> via the resistor in the ECM <M/T> or PCM <A/T>.
- The fuel temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases. The ground terminal (terminal 1) is grounded to the vehicle body.

TECHNICAL DESCRIPTION
- The fuel temperature sensor converts the fuel temperature to a voltage.
- The ECM <M/T> or PCM<A/T> detects the fuel temperature in the fuel tank with this output voltage.

DTC SET CONDITIONS

Check Conditions
- The engine coolant temperature – intake air temperature is 5°C (9°F) or less when the engine is started.
- The engine coolant temperature is between – 10°C (14°F) and 36°C (97°F) when the engine is started.
- Engine coolant temperature is higher than 60°C (140°F).
- Maximum vehicle speed is higher than 30 km/h (17 mph) after the starting sequence has been completed.

Judgement Criteria
- The fuel temperature – engine coolant temperature is 15°C (27°F) or more when the engine is started.

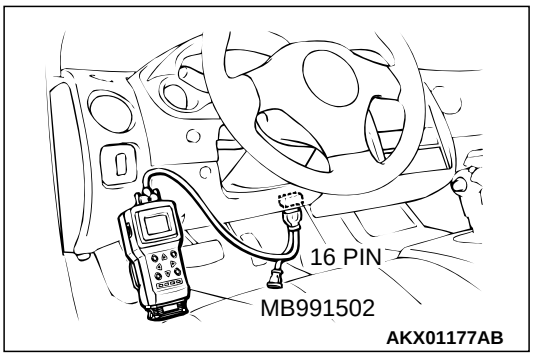
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Fuel temperature sensor failed.
- Open or shorted fuel temperature sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

NOTE: A diagnostic trouble code (DTC) could be output if the engine coolant is changed as indicated below. Because this is not a failure, the DTC must be erased.
Make sure to test drive the vehicle in accordance with the drive cycle pattern in order to verify that a DTC will not be output.

- *The engine and the radiator have been flushed repeatedly when the engine coolant temperature was high (or the fuel temperature was high).*

DIAGNOSIS

Required Special Tools
- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 4A: Fuel Temperature Sensor.

⚠ CAUTION

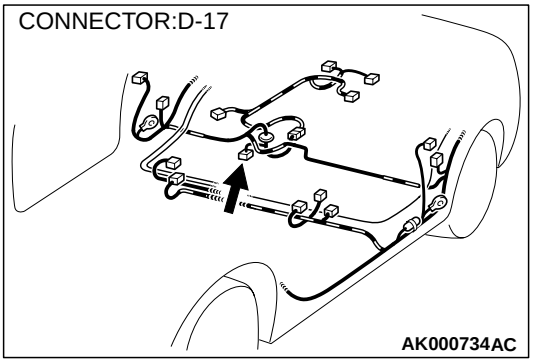
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 4A, Fuel Temperature Sensor.
- Approximately the same as the outside temperature when the engine is cooled.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

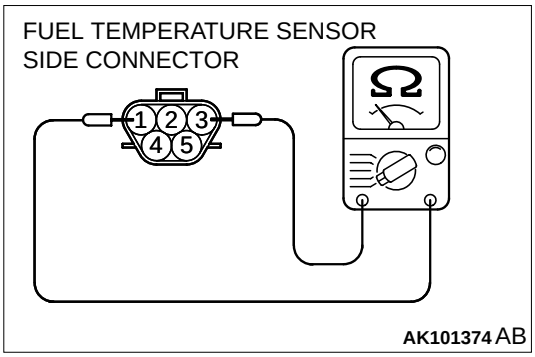
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Go to Step 2.



STEP 2. Check connector D-17 at the fuel temperature sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



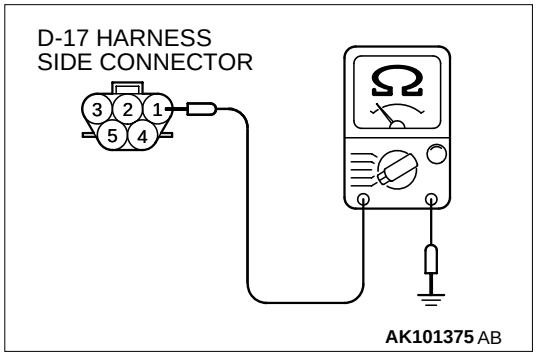
STEP 3. Check the fuel temperature sensor.

(1) Disconnect the fuel temperature sensor connector D-17
(2) Measure the resistance between terminal 1 and 3 of the fuel temperature sensor.

Standard value:
0.5 – 12.0 kΩ

Q: Is the resistance at the standard value?

YES : Go to Step 4.
NO : Replace the fuel temperature sensor. Then go to Step 12.

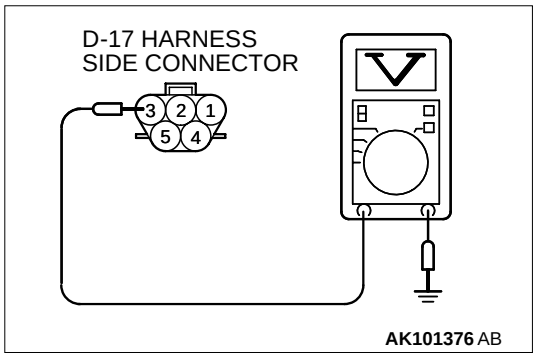


STEP 4. Check the continuity at fuel temperature sensor harness side connector D-17.

(1) Disconnect the connector D-17 and measure at the harness side.
(2) Check for the continuity between terminal 1 and ground.
- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 5.
NO : Repair harness wire between fuel temperature sensor connector D-17 terminal 1 and ground because of open circuit or harness damage. Then go to Step 12.

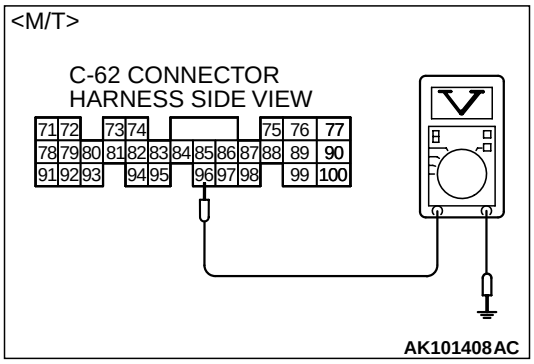


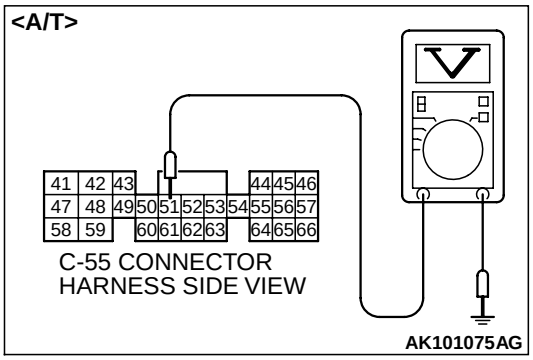
STEP 5. Check the sensor supply voltage at fuel temperature sensor harness side connector D-17.

(1) Disconnect the connector D-17 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 3 and ground.
- Voltage should be between 4.5 and 4.9 volts
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 6.
NO : Go to Step 10.





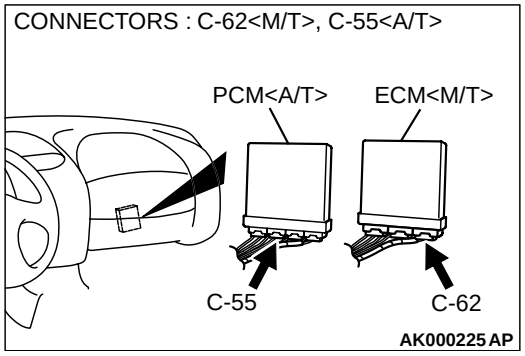
STEP 6. Check the sensor supply voltage at ECM connector C-62 <M/T> or PCM connector C-55 <A/T> by backprobing.

(1) Do not disconnect the ECM connector C-62 <M/T> or PCM connector C-55 <A/T>.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 96 <M/T> or terminal 51 <A/T> and ground by backprobing.
- When fuel temperature is 0°C (32°F), voltage should be 2.7 and 3.1 volts.
- When fuel temperature is 20°C (68°F), voltage should be 2.1 and 2.5 volts.
- When fuel temperature is 40°C (104°F), voltage should be 1.6 and 2.0 volts.
- When fuel temperature is 80°C (176°F), voltage should be 0.8 and 1.2 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

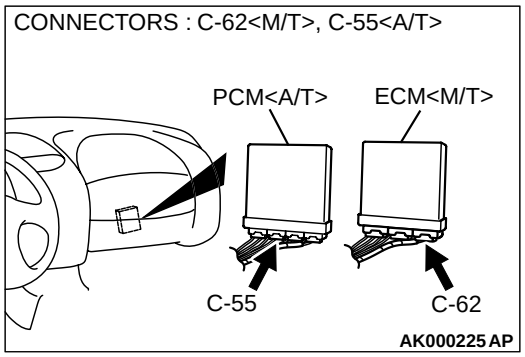
YES : Go to Step 7.
NO : Go to Step 8.



STEP 7. Check connector C-62 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Check connector C-28 and C-90 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector are in good condition, repair harness wire between fuel gauge unit connector D-17 terminal 3 and ECM connector C-62 terminal 96 <M/T> or PCM connector C-55 terminal 51 <A/T> because of open circuit. Then go to Step 12.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

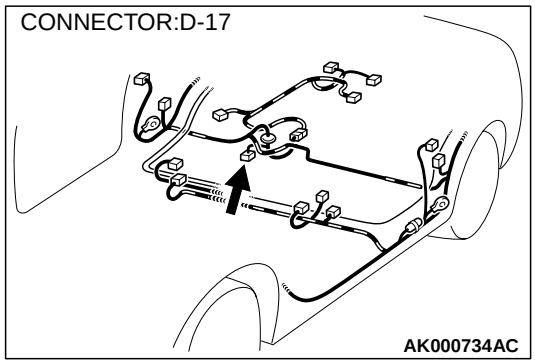


STEP 8. Check connector C-62 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

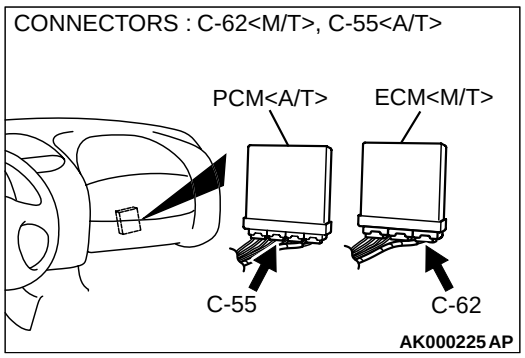


STEP 9. Check for short circuit to ground between fuel gauge unit connector D-17 terminal 3 and ECM connector C-62 terminal 96 <M/T> or PCM connector C-55 terminal 51 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 12.

NO : Repair it. Then go to Step 12.

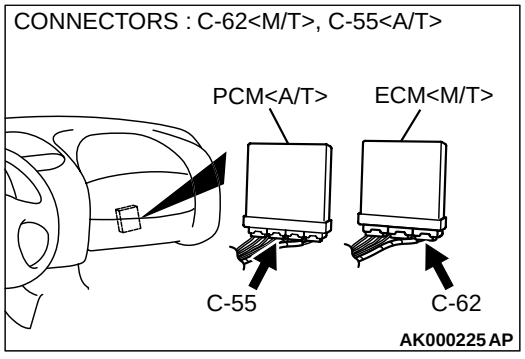


STEP 10. Check connector C-62 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 11.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



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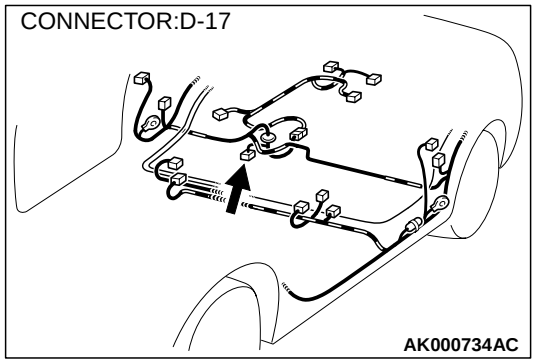
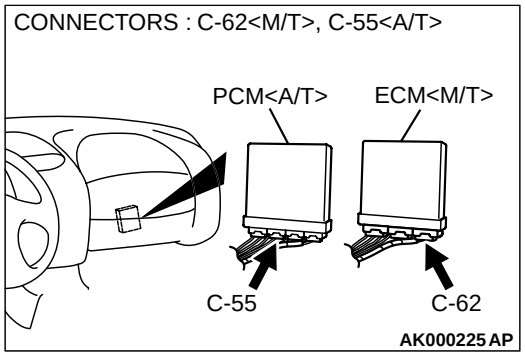




STEP 11. Check for harness damage between fuel temperature sensor connector D-17 terminal 3 and ECM connector C-62 terminal 96 <M/T> or PCM connector C-55 terminal 51 <A/T>.

NOTE: Check harness after checking intermediate connector C-28 and C-90. If intermediate connector are damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 12.
NO : Repair it. Then go to Step 12.

STEP 12. Test the OBD-II drive cycle.

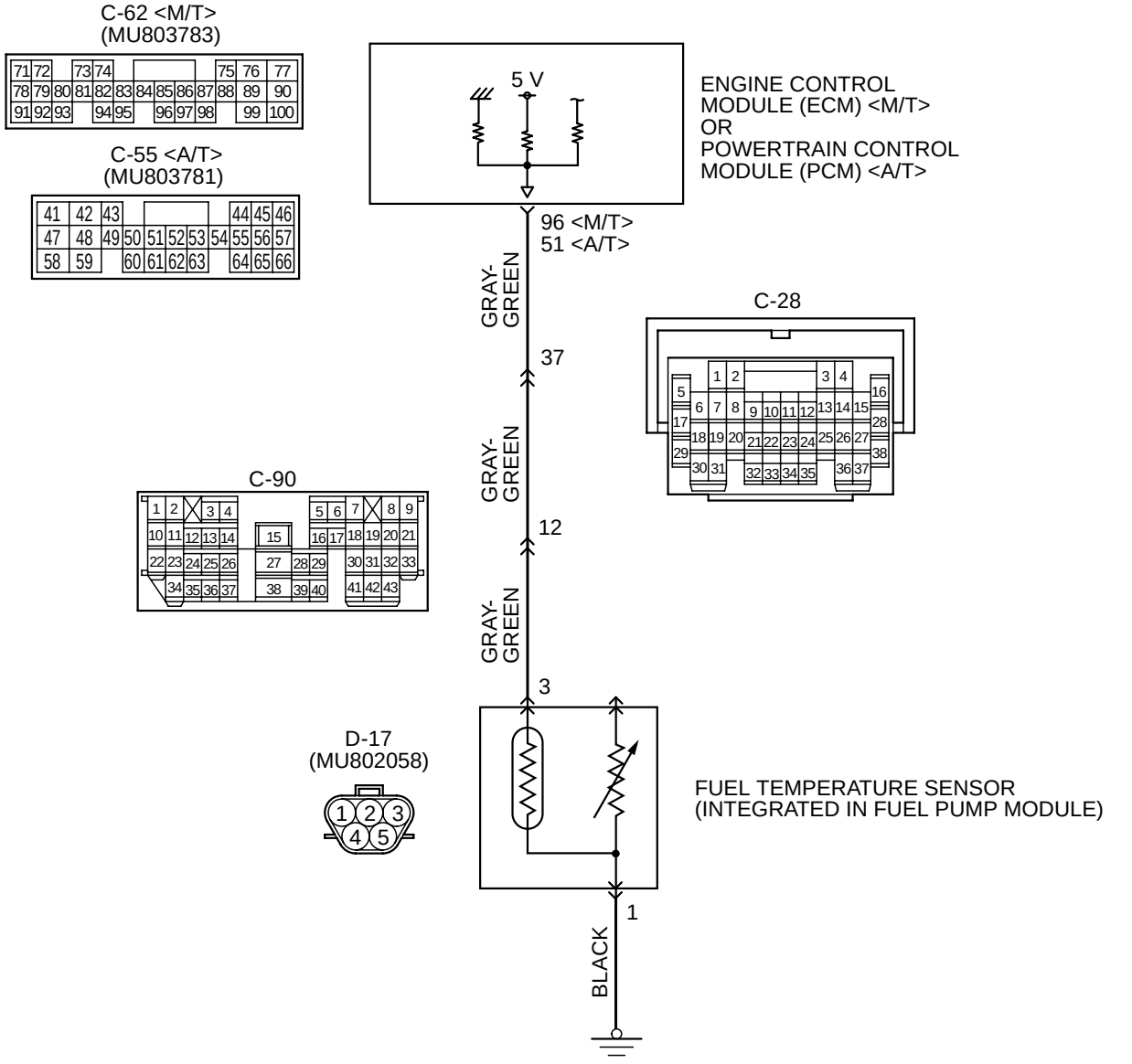
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0181 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0182: Fuel Temperature Sensor Circuit Low Input

Fuel Temperature Sensor Circuit



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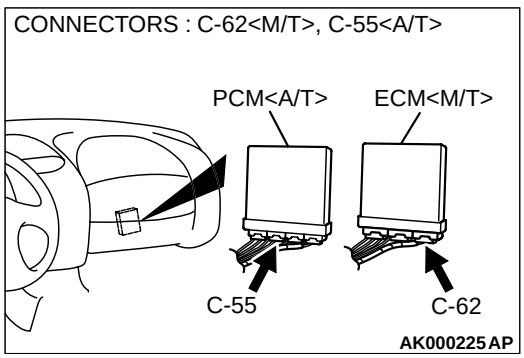

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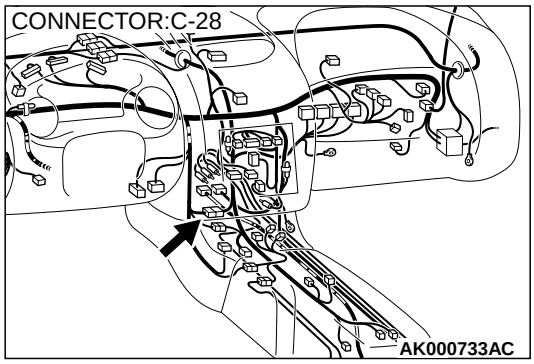

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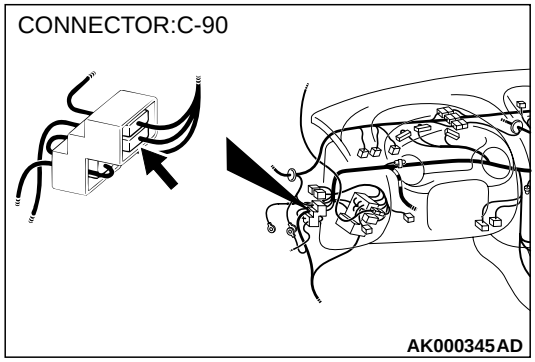
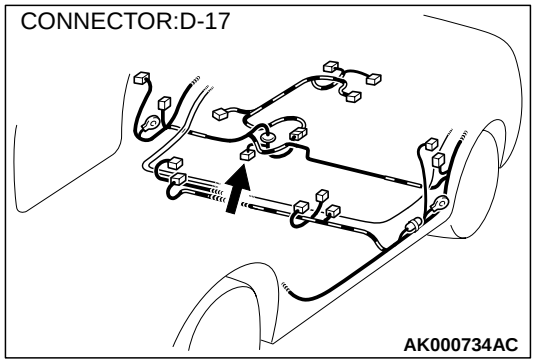




CIRCUIT OPERATION

- 5-volt voltage is applied to the fuel temperature sensor output terminal (terminal 3) from the ECM (terminal 96) <M/T> or PCM (terminal 51) <A/T> via the resistor in the ECM <M/T> or PCM <A/T>.
- The fuel temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases. The ground terminal (terminal 1) is grounded to the vehicle body.

TECHNICAL DESCRIPTION

- The fuel temperature sensor converts the fuel temperature to a voltage.
- The ECM <M/T> or PCM<A/T> detects the fuel temperature in the fuel tank with this output voltage.

DTC SET CONDITIONS

Check Conditions

- 2 seconds or more have passed since the starting sequence was completed.

Judgement Criteria

- Sensor output voltage has continued to be 0.1 volt or lower for 2 seconds.

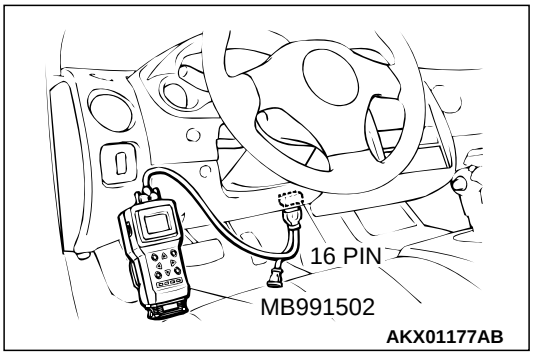
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Fuel temperature sensor failed.
- Open or shorted fuel temperature sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 4A: Fuel Temperature Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 4A, Fuel Temperature Sensor.
  - Approximately the same as the outside temperature when the engine is cooled.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

NO : Go to Step 2.

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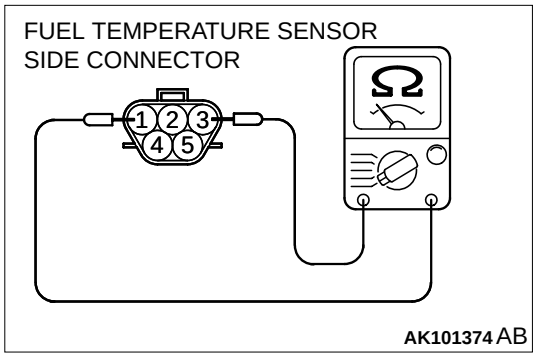


STEP 2. Check the fuel temperature sensor.

(1) Disconnect the fuel temperature sensor connector D-17

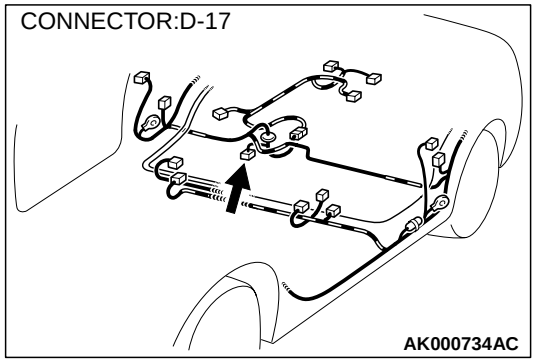
(2) Measure the resistance between terminal 1 and 3 of the fuel temperature sensor.

Standard value:
0.5 – 12.0 kΩ

Q: Is the resistance at the standard value?

YES : Go to Step 3.

NO : Replace the fuel temperature sensor. Then go to Step 5.

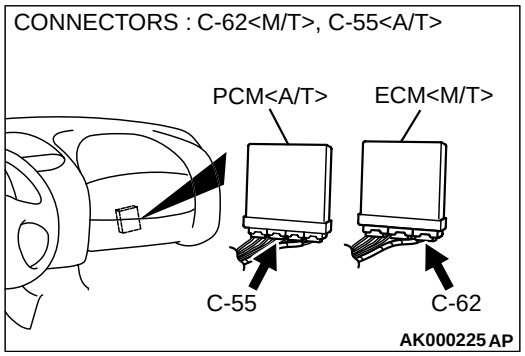


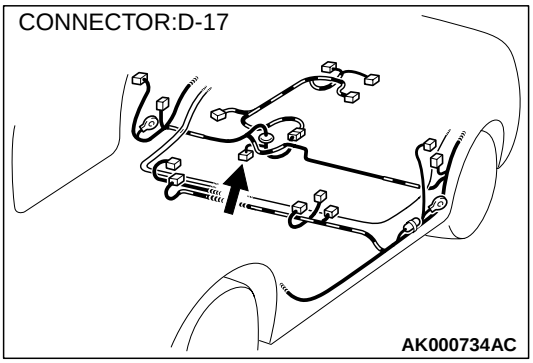
STEP 3. Check connector D-17 at the fuel temperature sensor and connector C-62 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

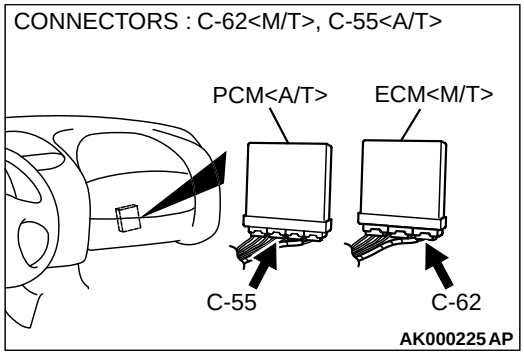
Q: Is the connector in good condition?

YES : Go to Step 4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.







STEP 4. Check for short circuit to ground between fuel temperature sensor connector D-17 and ECM connector C-62 <M/T> or PCM connector C-55 <A/T>.

NOTE: Check harness after checking intermediate connector C-28 and C-90. If intermediate connector are damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 5.
NO : Repair it. Then go to Step 5.

STEP 5. Test the OBD-II drive cycle.

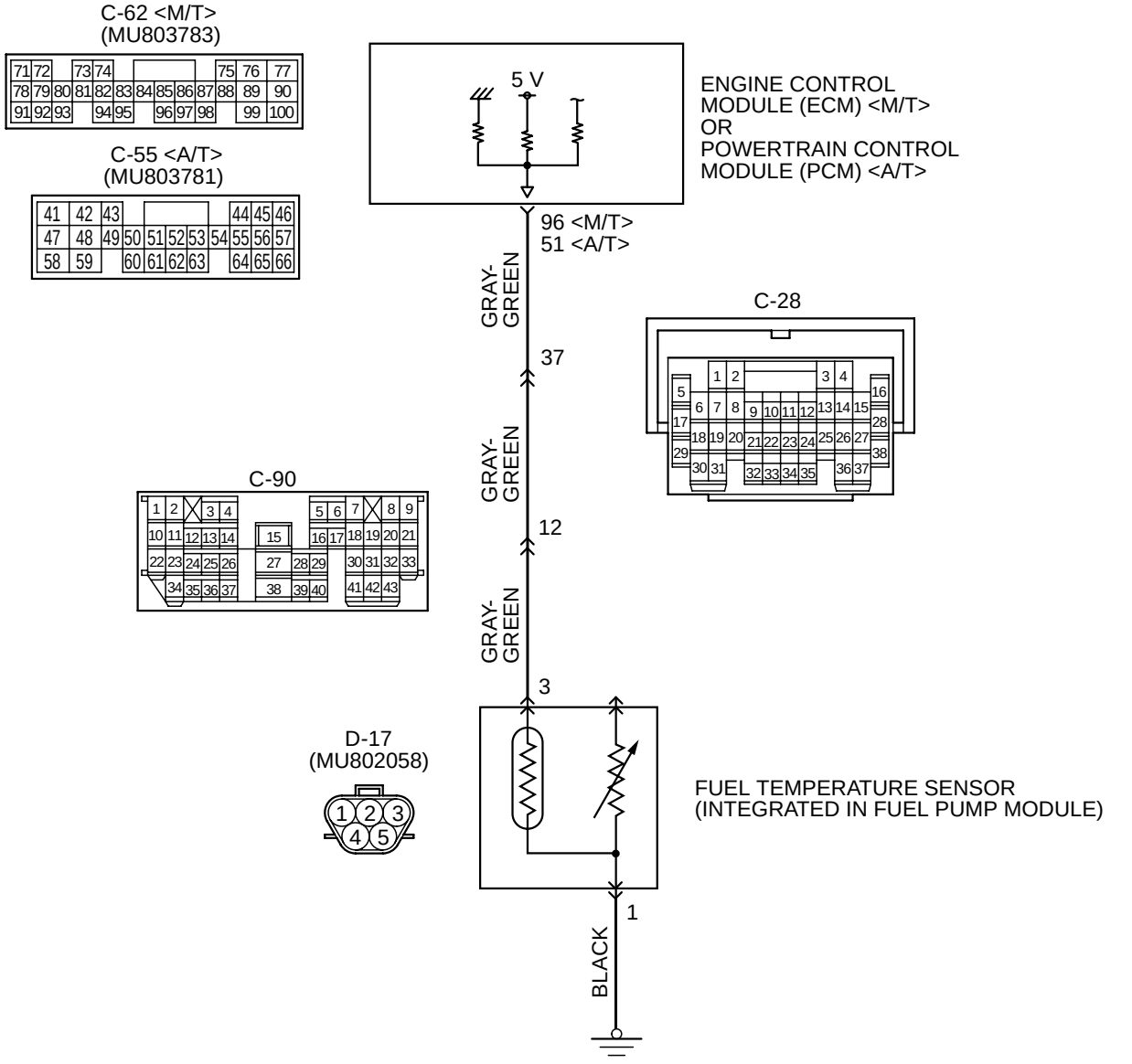
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0182 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0183: Fuel Temperature Sensor Circuit High Input

Fuel Temperature Sensor Circuit



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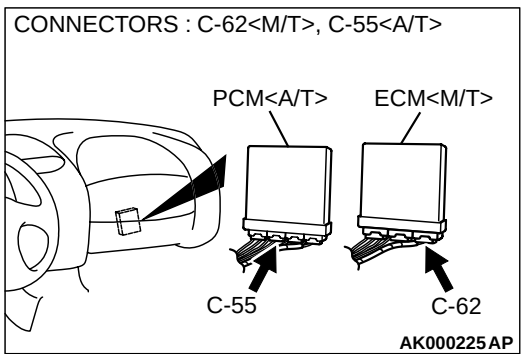

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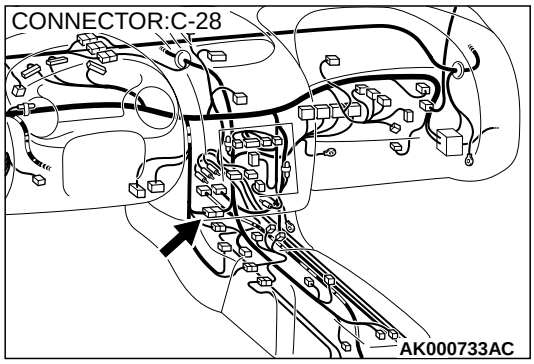

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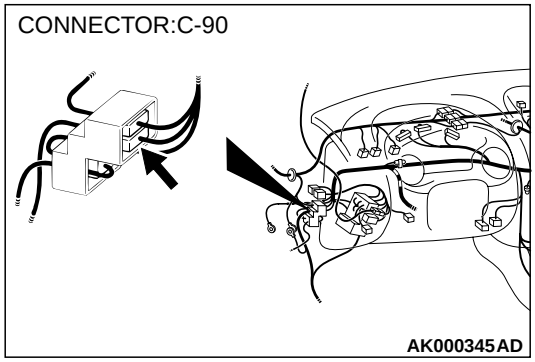
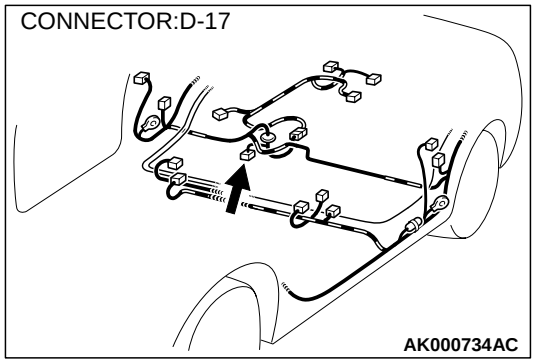
TSB Revision





CIRCUIT OPERATION

- 5-volt voltage is applied to the fuel temperature sensor output terminal (terminal 3) from the ECM (terminal 96) <M/T> or PCM (terminal 51) <A/T> via the resistor in the ECM <M/T> or PCM <A/T>.
- The fuel temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases. The ground terminal (terminal 1) is grounded to the vehicle body.

TECHNICAL DESCRIPTION

- The fuel temperature sensor converts the fuel temperature to a voltage.
- The ECM <M/T> or PCM<A/T> detects the fuel temperature in the fuel tank with this output voltage.

DTC SET CONDITIONS

Check Conditions

- 2 seconds or more have passed since the starting sequence was completed.

Judgement Criteria

- Sensor output voltage has continued to be 4.6 volts or higher for 2 seconds.

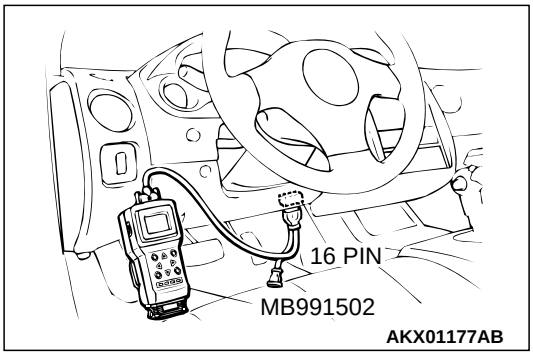
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Fuel temperature sensor failed.
- Open or shorted fuel temperature sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 4A: Fuel Temperature Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

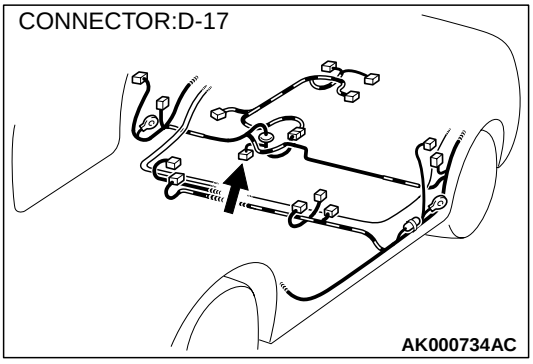
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 4A, Fuel Temperature Sensor.
  - Approximately the same as the outside temperature when the engine is cooled.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

NO : Go to Step 2.

TSB Revision

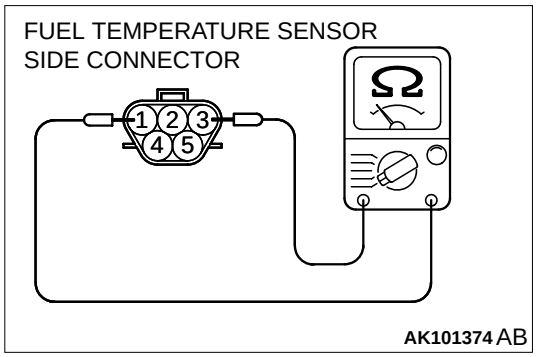


STEP 2. Check connector D-17 at the fuel temperature sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.



STEP 3. Check the fuel temperature sensor.

(1) Disconnect the fuel temperature sensor connector D-17

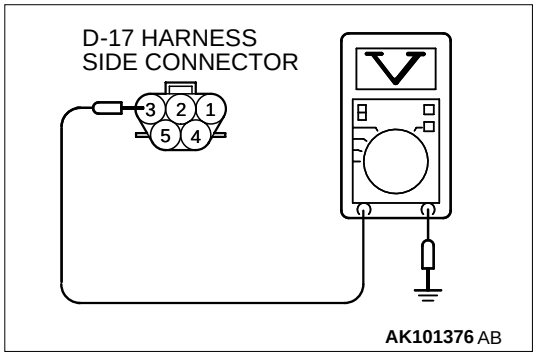
(2) Measure the resistance between terminal 1 and 3 of the fuel temperature sensor.

Standard value:
0.5 – 12.0 kΩ

Q: Is the resistance at the standard value?

YES : Go to Step 4.

NO : Replace the fuel temperature sensor. Then go to Step 11.



STEP 4. Check the sensor supply voltage at fuel temperature sensor harness side connector D-17.

(1) Disconnect the connector D-17 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between terminal 3 and ground.

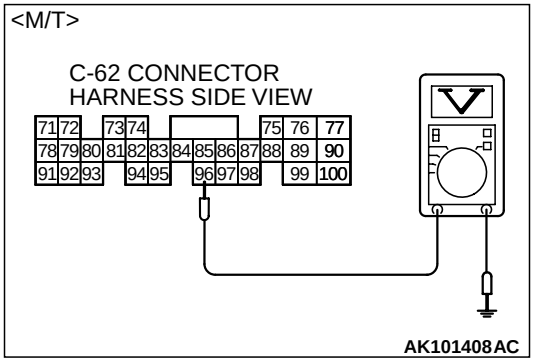
- Voltage should be between 4.5 and 4.9 volts

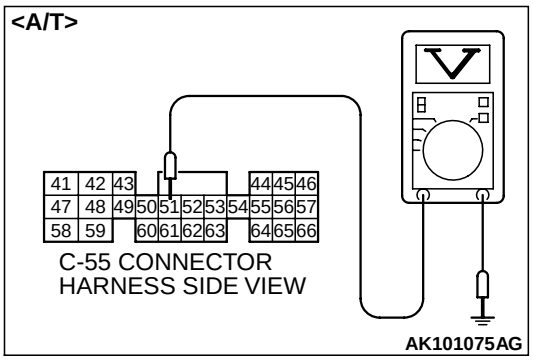
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 8.

NO : Go to Step 5.





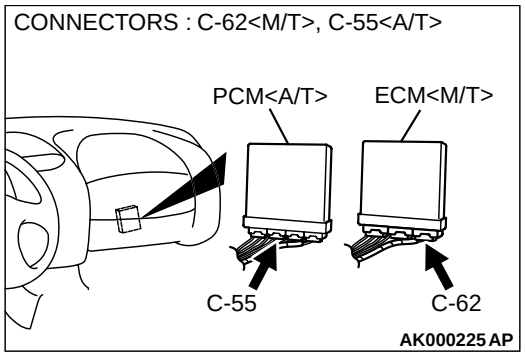
STEP 5. Check the sensor supply voltage at ECM connector C-62 <M/T> or PCM connector C-55 <A/T> by backprobing.

(1) Do not disconnect the ECM connector C-62 <M/T> or PCM connector C-55 <A/T>.
(2) Disconnect the fuel temperature sensor connector D-17.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the voltage between terminal 96 <M/T> or 51 <A/T> and ground by backprobing.
- Voltage should be between 4.5 and 4.9 volts.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 6.
NO : Go to Step 7.

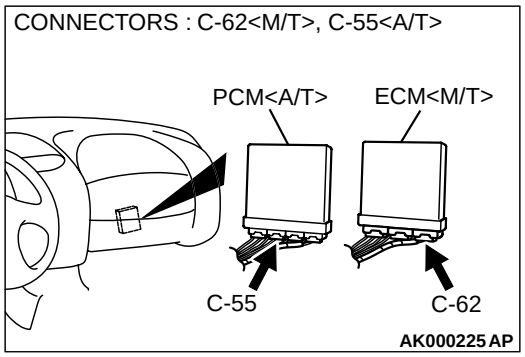


STEP 6. Check connector C-62 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

NOTE: Check harness after checking intermediate connector C-28 and C-90. If intermediate connector are damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

Q: Is the connector in good condition?

YES : Repair harness wire between fuel temperature sensor connector D-17 terminal 3 and ECM connector C-62 terminal 96 <M/T> or PCM connector C-55 terminal 51 <A/T> because of open circuit. Then go to Step 11.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

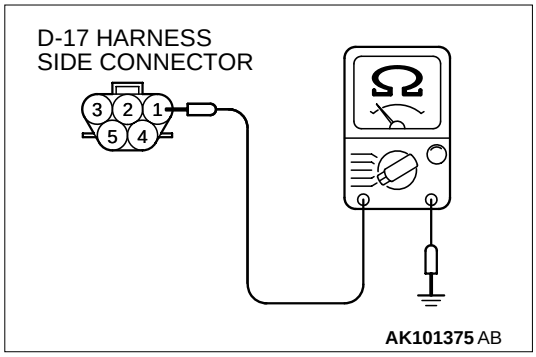


STEP 7. Check connector C-62 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Replace the ECM or PCM. Then go to Step 11.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.



STEP 8. Check the continuity at fuel temperature sensor harness side connector D-17.

(1) Disconnect the connector D-17 and measure at the harness side.

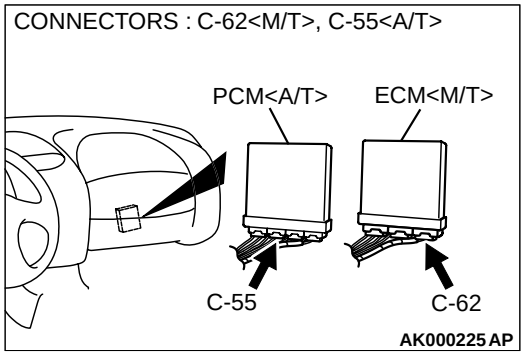
(2) Check for the continuity between terminal 1 and ground.

- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 9.

NO : Repair harness wire between fuel temperature sensor connector D-17 terminal 1 and ground because of open circuit or harness damage. Then go to Step 11.

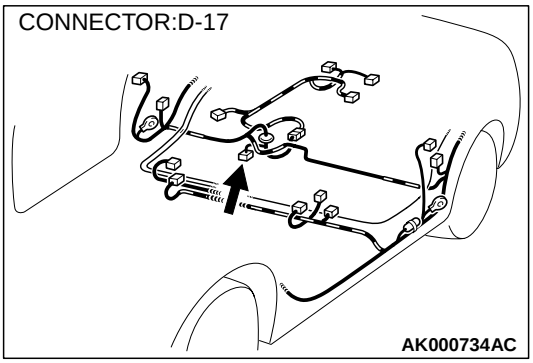


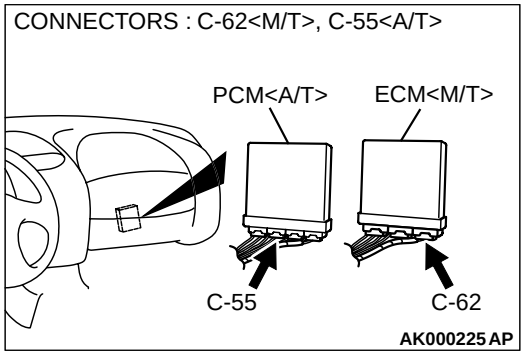
STEP 9. Check connector C-62 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.





STEP 10. Check for open circuit and harness damage between fuel temperature sensor connector D-17 and ECM connector C-62 <M/T> or PCM connector C-55.

NOTE: Check harness after checking intermediate connector C-28 and C-90. If intermediate connector are damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 11.
NO : Repair it. Then go to Step 11.

STEP 11. Test the OBD-II drive cycle.

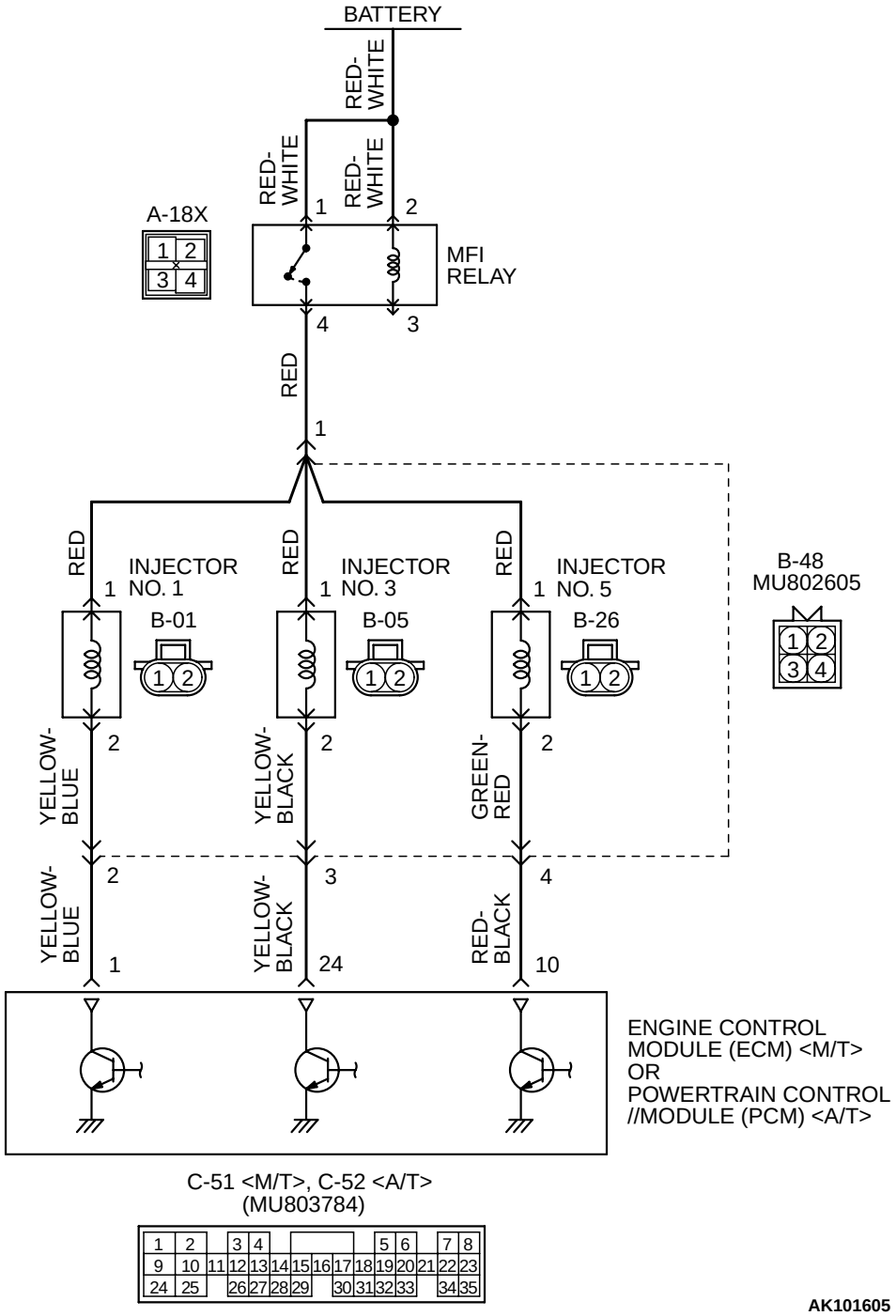
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0183 is output?

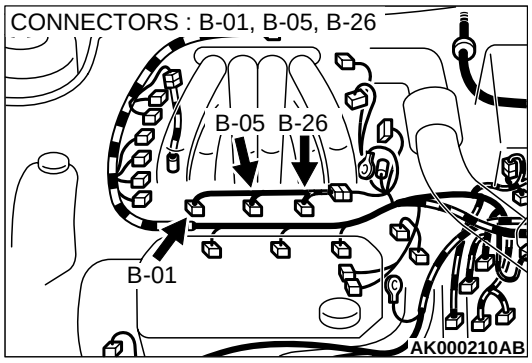
YES : Retry the troubleshooting.
NO : The inspection is complete.

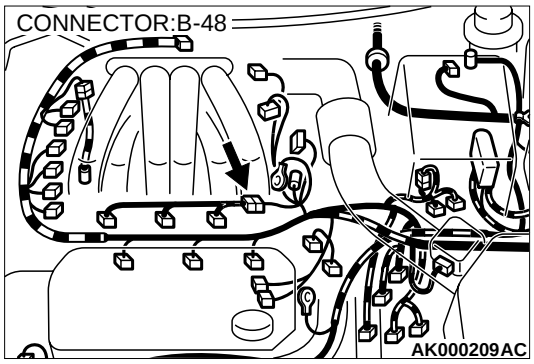
DTC P0201: Injector Circuit Malfunction - Cylinder 1, DTC P0203: Injector Circuit Malfunction - Cylinder 3, DTC P0205: Injector Circuit Malfunction - Cylinder 5

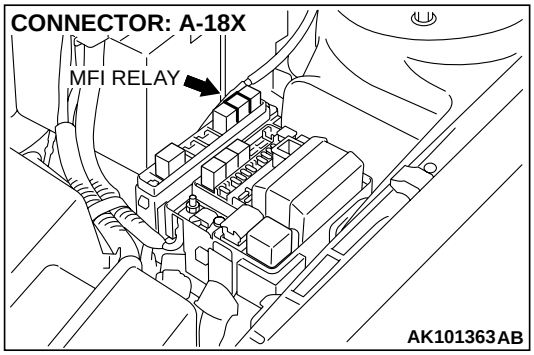
Injector Circuit - Cylinder 1, 3, 5

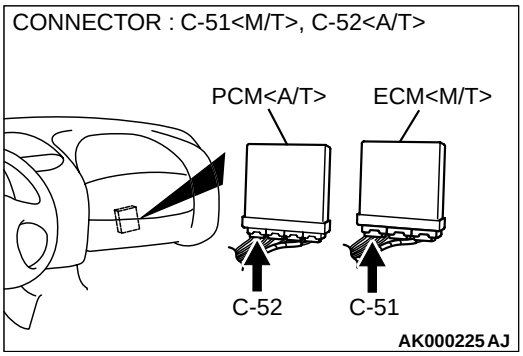


TSB Revision









CIRCUIT OPERATION

- The injector power is supplied from the MFI relay (terminal 4).
- The ECM <M/T> or PCM <A/T> controls the injector by turning the power transistor in the ECM <M/T> or PCM <A/T> "ON" and "OFF".

TECHNICAL DESCRIPTION

- The amount of fuel injected by the injector is controlled by the amount of continuity time the coil is grounded by the ECM <M/T> or PCM <A/T>.
- A surge voltage is generated when the injectors are driven and the current flowing to the injector coil is shut off.
- The ECM <M/T> or PCM <A/T> checks this surge voltage.

DTC SET CONDITIONS

Check Area

- Engine speed is lower than 1,000 r/min.
- Throttle position sensor output voltage is lower than 1.16 volts.

Judgment Criteria

- Injector coil surge voltage (battery positive voltage + 2 volts) has not been detected for 2 seconds.

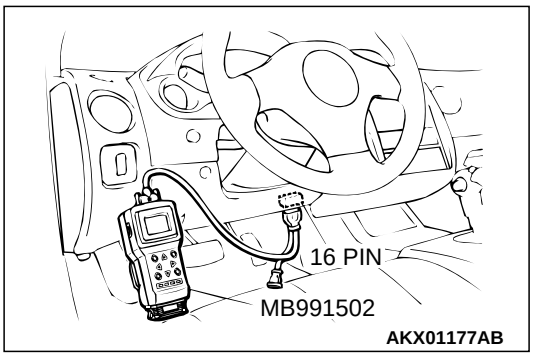
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Injector failed.
- Open or shorted injector circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools

- MB991502: Scan Tool (MUT-II)
- MD998464: Test Harness



STEP 1. Using scan tool MB991502, check actuator test item 01, 03, 05: Injectors.

⚠ CAUTION

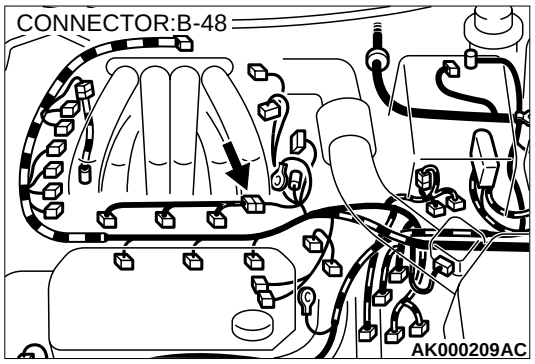
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the actuator testing mode for item 01, 03, 05 Injectors.
(4) Warm up the engine to normal operating temperature: 80°C to 96°C (176°F to 205°F).
- Does the idle state worsen when the injector is cut off. (Does idling become unstable or does the engine stall)

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Go to Step 2.

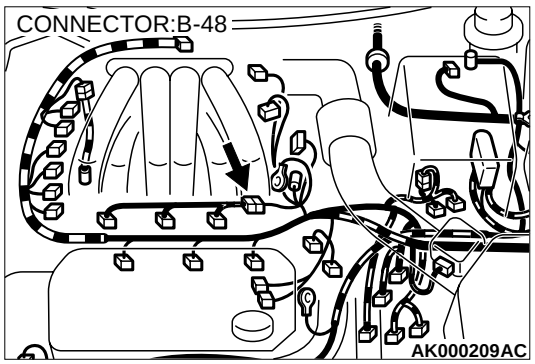


STEP 2. Check connector B-48 at injector intermediate connector for damage.

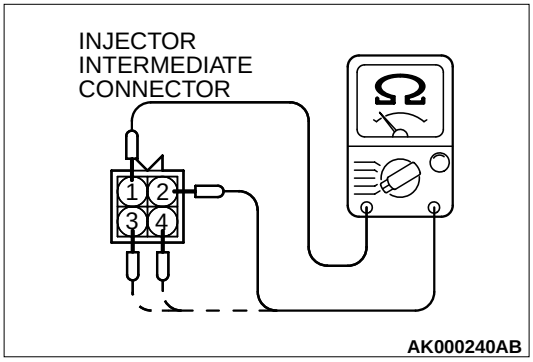
Q: Is the connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 3. Check the injector resistance at injector intermediate connector B-48.



(1) Disconnect the injector intermediate connector B-48.

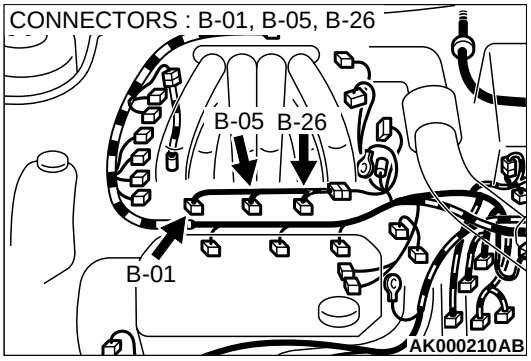


(2) Measure the resistance between each male connector side terminal.
   a. Measure the resistance between terminal 1 and 2 when measuring No. 1 cylinder.
   b. Measure the resistance between terminal 1 and 3 when measuring No. 3 cylinder.
   c. Measure the resistance between terminal 1 and 4 when measuring No. 5 cylinder.
   - Resistance should be between 13 and 16 ohm.

Q: Is the resistance normal?

YES : Go to Step 6.
NO : Go to Step 4.

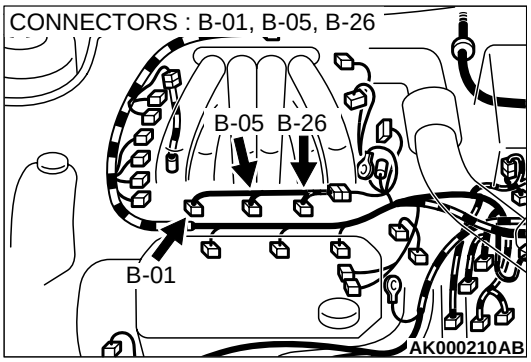
STEP 4. Check the connector at injector for damage.



(1) Remove the intake manifold.
   a. Check the connector B-01 when checking No. 1 cylinder.
   b. Check the connector B-05 when checking No. 3 cylinder.
   c. Check the connector B-26 when checking No. 5 cylinder.

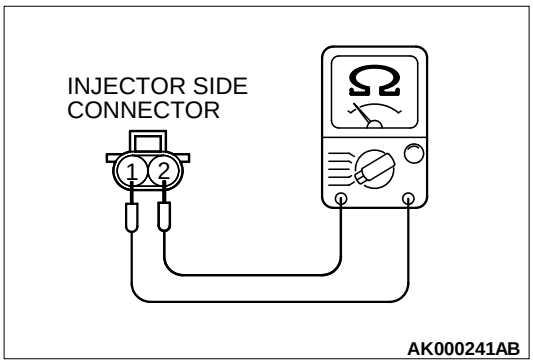
Q: Is the harness connector in good condition?

YES : Go to Step 5.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



STEP 5. Check the injector.

(1) Disconnect the injector connector B-01 <No. 1 cylinder> or B-05 <No. 3 cylinder> or B-26 <No. 5 cylinder>.



(2) Measure the resistance between injector side connector terminal 1 and 2.

Standard value: 13 – 16 ohm [at 20°C (68°F)]

Q: Is the resistance standard value?

YES : Repair harness wire between injector intermediate connector and injector connector because of open circuit or short circuit to ground or harness damage.

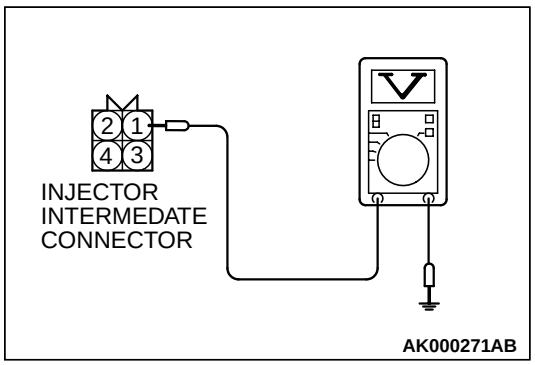
a. Repair harness wire between injector intermediate connector B-48 terminal 1 and injector connector B-01 terminal 1 and harness wire between injector connector B-01 terminal 2 and injector intermediate connector B-48 terminal 2 when checking No. 1 cylinder.

b. Repair harness wire between injector intermediate connector B-48 terminal 1 and injector connector B-05 terminal 1 and harness wire between injector connector B-05 terminal 2 and injector intermediate connector B-48 terminal 3 when checking No. 3 cylinder.

c. Repair harness wire between injector intermediate connector B-48 terminal 1 and injector connector B-26 terminal 1 and harness wire between injector connector B-26 terminal 2 and injector intermediate connector B-48 terminal 4 when checking No. 5 cylinder.

Then go to Step 12.

NO : Replace the injector. Then go to Step 12.



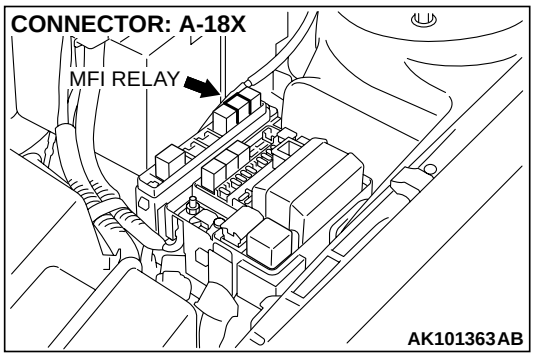
STEP 6. Check the power supply voltage at injector intermediate connector B-48.

(1) Disconnect the connector B-48 and measure at the female connector side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 1 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

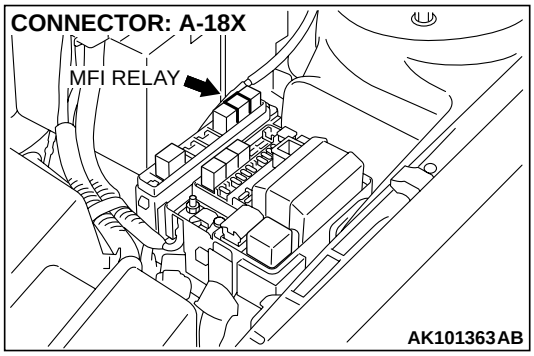
YES : Go to Step 8.
NO : Go to Step 7.

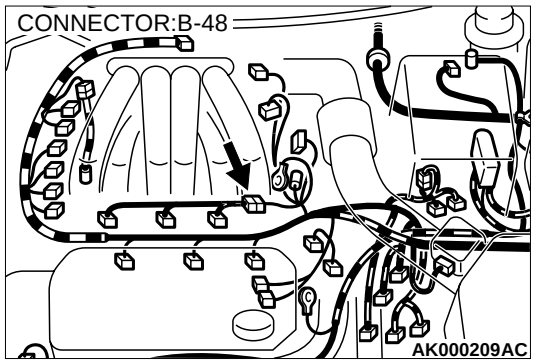


STEP 7. Check connector A-18X at MFI relay for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between MFI relay connector A-18X terminal 4 and injector intermediate connector B-48 terminal 1 because of open circuit or short circuit to ground. Then go to Step 12.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



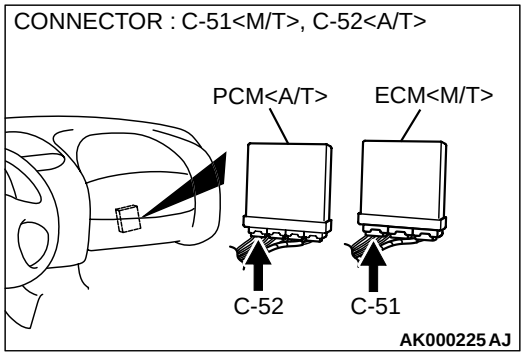


STEP 8. Check for harness damage between MFI relay connector A-18X terminal 4 and injector intermediate connector B-48 terminal 1.

Q: Is the harness wire in good condition?

YES : Go to Step 9.

NO : Repair it. Then go to Step 12.

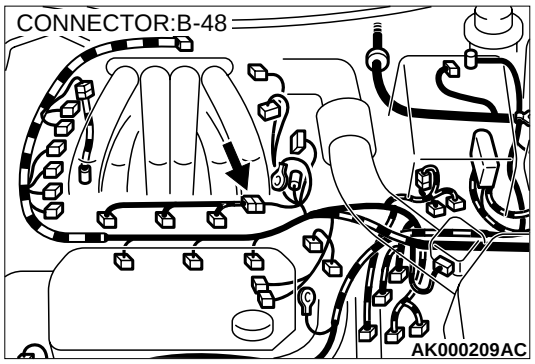


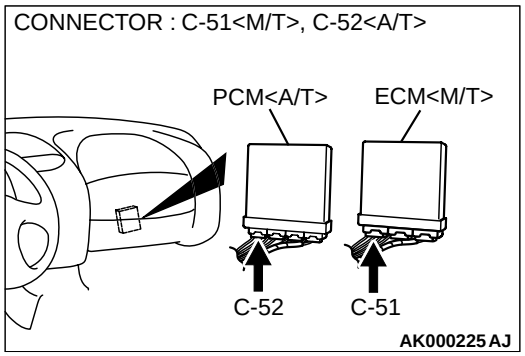
STEP 9. Check connector C-51 at ECM <M/T> or connector C-52 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



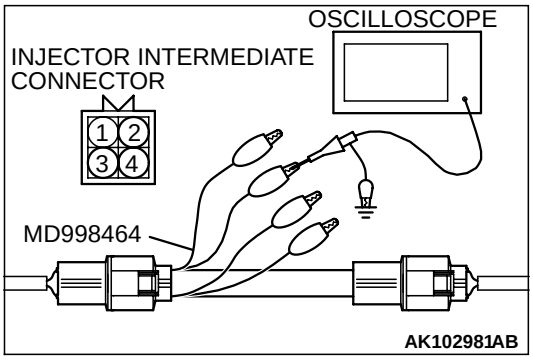


STEP 10. Check for open circuit and short circuit to ground and harness damage between injector intermediate connector and ECM connector <M/T> or PCM connector <A/T>.

a. Check the harness wire between intermediate connector B-48 terminal 2 and ECM connector C-51 terminal 1 <M/T> or PCM connector C-52 terminal 1 <A/T> when checking No. 1 cylinder.
b. Check the harness wire between intermediate connector B-48 terminal 3 and ECM connector C-51 terminal 24 <M/T> or PCM connector C-52 terminal 24 <A/T> when checking No. 3 cylinder.
c. Check the harness wire between intermediate connector B-48 terminal 4 and ECM connector C-51 terminal 10 <M/T> or PCM connector C-52 terminal 10 <A/T> when checking No. 5 cylinder.

Q: Is the harness wire in good condition?

YES : Go to Step 11.
NO : Repair it. Then go to Step 12.



STEP 11. Using the oscilloscope, check the injector.

(1) Disconnect the injector intermediate connector B-48 and connect the test harness special tool (MD998464) inbetween.

(2) Connect the oscilloscope probe to each injector intermediate connector terminal to oscilloscope each cylinder:
- Terminal 2 (black clip) when checking No. 1 cylinder.
- Terminal 3 (blue clip) when checking No. 3 cylinder.
- Terminal 4 (white clip) when checking No. 5 cylinder.

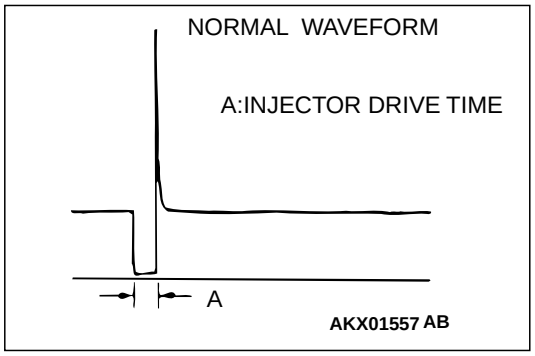
NOTE: When measuring with the ECM or PCM side connector, connect an oscilloscope probe to the each of the following terminals.

- *ECM or PCM terminal 1 when checking No. 1 cylinder injector.*
- *ECM or PCM terminal 24 when checking No. 3 cylinder injector.*
- *ECM or PCM terminal 10 when checking No. 5 cylinder. injector.*

(3) Start the engine and run at idle.

(4) Measure the waveform.
- The waveform should show a normal pattern similar to the illustration.

(5) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the waveform normal?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

NO : Replace the ECM or PCM. Then go to Step 12.

STEP 12. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 6 – Other Monitor P.13B-6.

(2) Check the diagnostic trouble code (DTC).

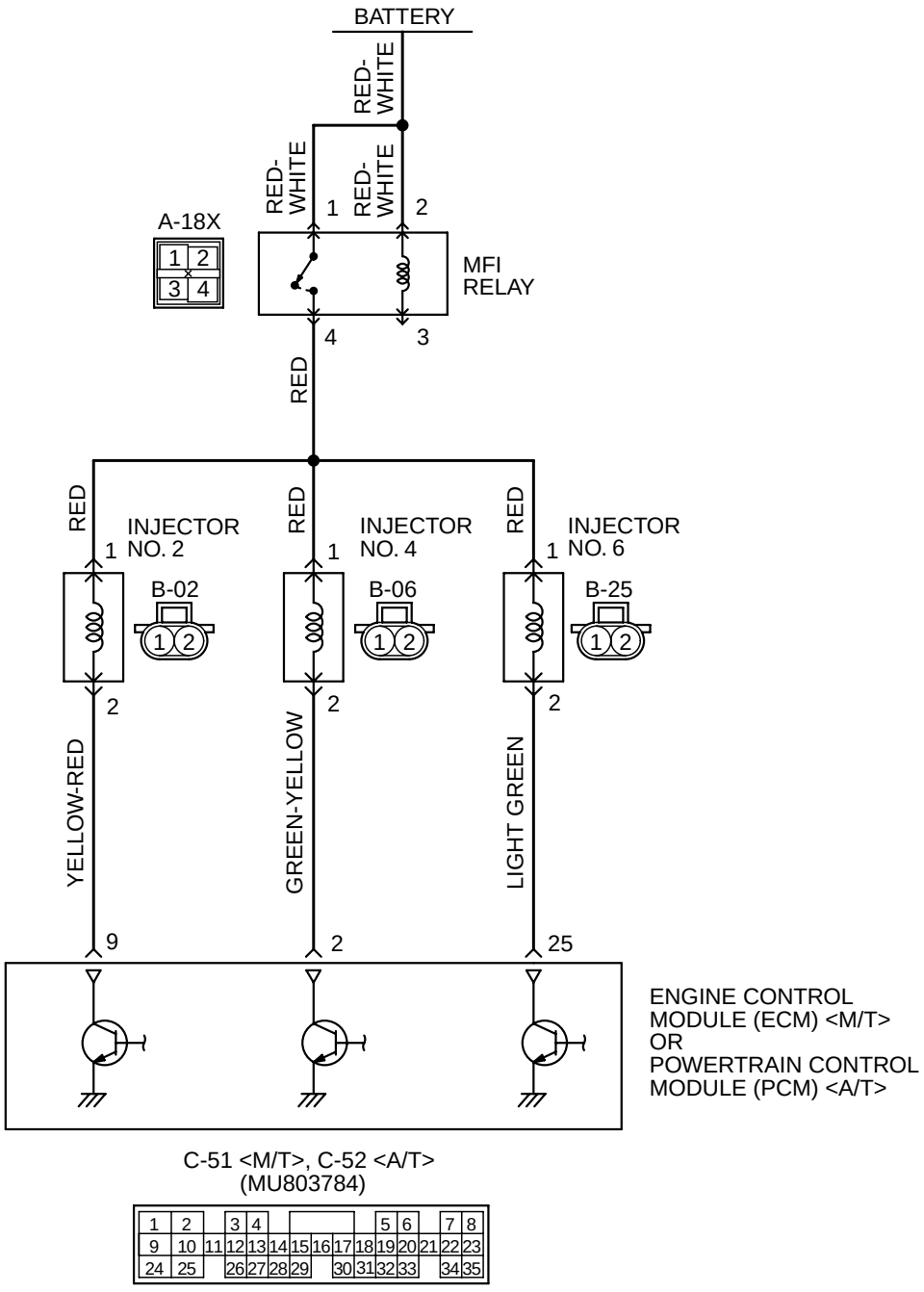
Q: Is the DTC P0201, P0203, P0205 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0202: Injector Circuit Malfunction - Cylinder 2, DTC P0204: Injector Circuit Malfunction - Cylinder 4, DTC P0206: Injector Circuit Malfunction - Cylinder 6

Injector Circuit - Cylinder 2, 4, 6



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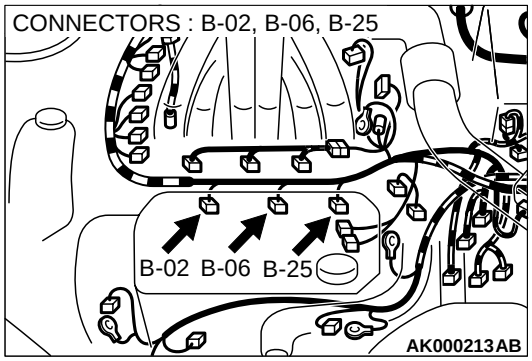
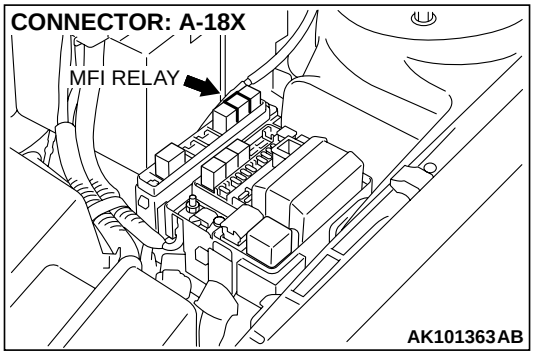
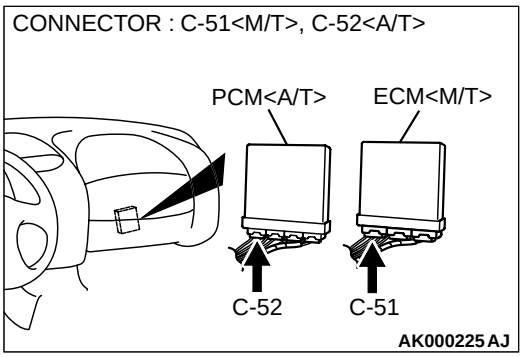






CIRCUIT OPERATION

- The injector power is supplied from the MFI relay (terminal 4).
- The ECM <M/T> or PCM <A/T> controls the injector by turning the power transistor in the ECM <M/T> or PCM <A/T> "ON" and "OFF".

TECHNICAL DESCRIPTION

- The amount of fuel injected by the injector is controlled by the amount of continuity time the coil is grounded by the ECM <M/T> or PCM <A/T>.
- A surge voltage is generated when the injectors are driven and the current flowing to the injector coil is shut off.
- The ECM <M/T> or PCM <A/T> checks this surge voltage.

DTC SET CONDITIONS

Check Area

- Engine speed is lower than 1,000 r/min.
- Throttle position sensor output voltage is lower than 1.16 volts.

Judgment Criteria

- Injector coil surge voltage (battery positive voltage + 2 volts) has not been detected for 2 seconds.

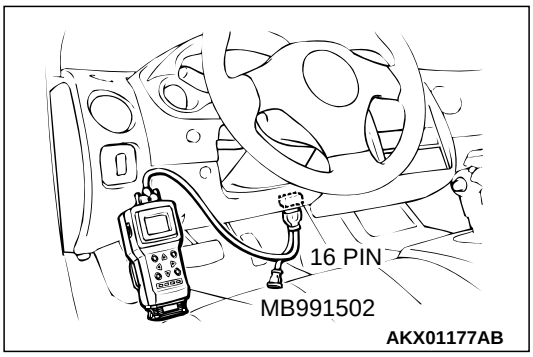
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Injector failed.
- Open or shorted injector circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check actuator test item 02, 04, 06: Injectors.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

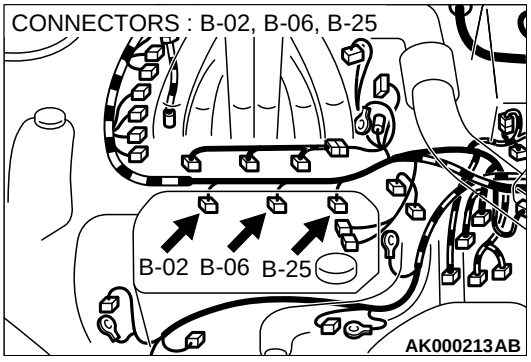
(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the actuator testing mode for item 02, 04, 06 Injectors.
(4) Warm up the engine to normal operating temperature: 80°C to 96°C (176°F to 205°F).
- Does the idle state worsen when the injector is cut off. (Does idling become unstable or does the engine stall)

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

NO : Go to Step 2.



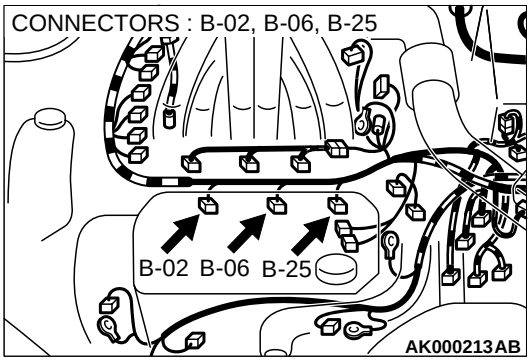
STEP 2. Check the connector at injector for damage.

a. Check the connector B-02 when checking No. 2 cylinder.
b. Check the connector B-06 when checking No. 4 cylinder.
c. Check the connector B-25 when checking No. 6 cylinder.

Q: Is the connector in good condition?

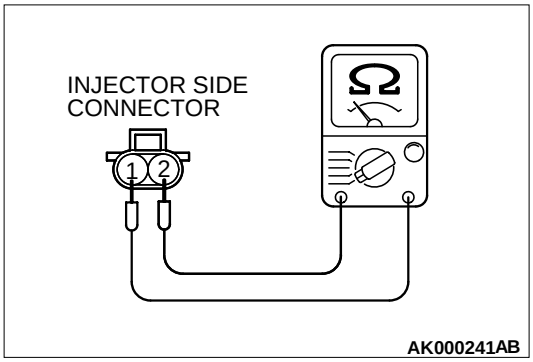
YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.



STEP 3. Check the injector.

(1) Disconnect the injector connector B-02 <No. 2 cylinder> or B-06 <No. 4 cylinder> or B-25 <No. 6 cylinder>.



(2) Measure the resistance between injector side connector terminal 1 and 2.

Standard value: 13 – 16 ohm [at 20°C (68°F)]

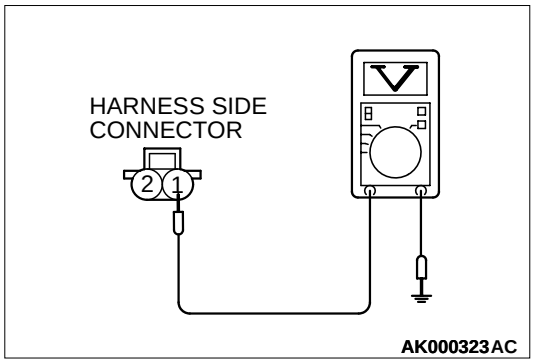
Q: Is the resistance standard value?

YES : Go to Step 4.
NO : Replace the injector. Then go to Step 10.

STEP 4. Check the power supply voltage at injector connector.

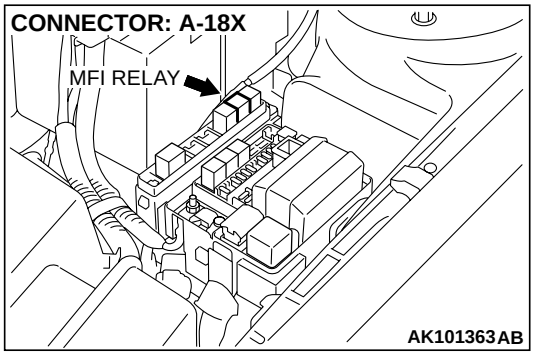
(1) Disconnect connector B-02 <No. 2 cylinder> or B-06 <No. 4 cylinder> or B-25 <No. 6 cylinder> and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 1 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the voltage normal?

YES : Go to Step 6.
NO : Go to Step 5.



STEP 5. Check connector A-18X at MFI relay for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between MFI relay connector and injector connector because of open circuit or short circuit to ground.

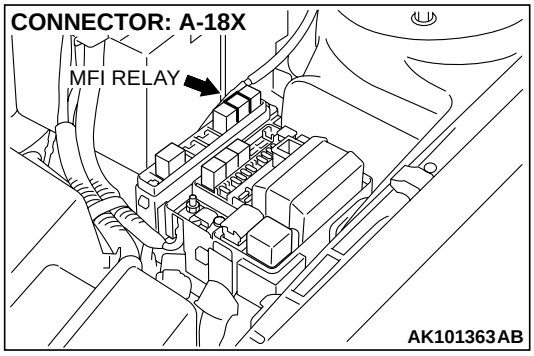
a. Repair harness wire between MFI relay connector A-18X terminal 4 and injector connector B-02 terminal 1 when checking No. 2 cylinder.

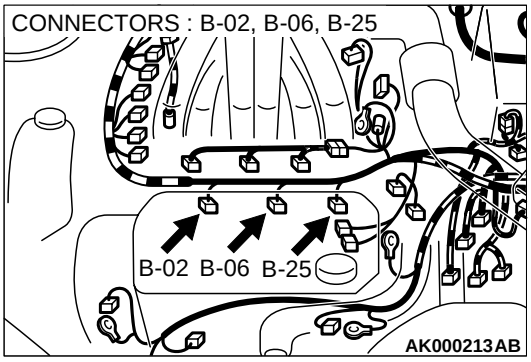
b. Repair harness wire between MFI relay connector A-18X terminal 4 and injector connector B-06 terminal 1 when checking No. 4 cylinder.

c. Repair harness wire between MFI relay connector A-18X terminal 4 and injector connector B-25 terminal 1 when checking No. 6 cylinder.

Then go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.





STEP 6. Check for harness damage between MFI relay connector and injector connector.

a. Check the harness wire between MFI relay connector A-18X terminal 4 and injector connector B-02 terminal 1 when checking No. 2 cylinder.

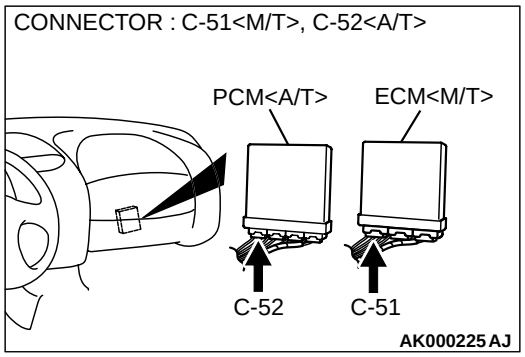
b. Check the harness wire between MFI relay connector A-18X terminal 4 and injector connector B-06 terminal 1 when checking No. 4 cylinder.

c. Check the harness wire between MFI relay connector A-18X terminal 4 and injector connector B-25 terminal 1 when checking No. 6 cylinder.

Q: Is the harness wire in good condition?

YES : Go to Step 7.

NO : Repair it. Then go to Step 10.

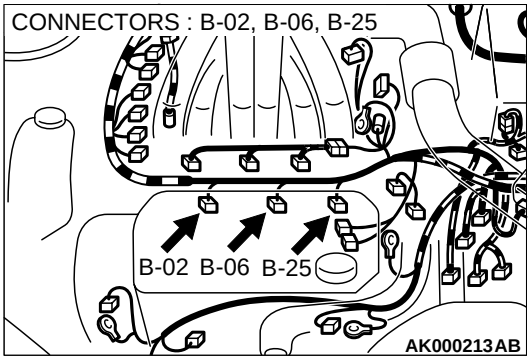


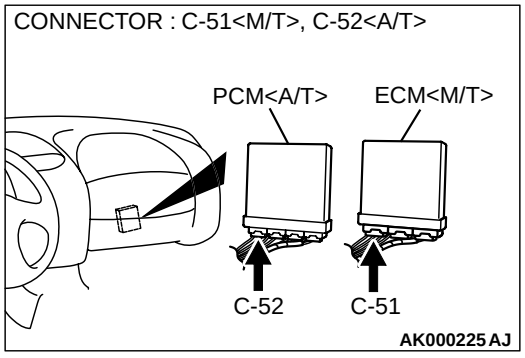
STEP 7. Check connector C-51 at ECM <M/T> or connector C-52 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.





STEP 8. Check for open circuit and short circuit to ground and harness damage between injector connector and ECM connector <M/T> or PCM connector <A/T>.

a. Check the harness wire between injector connector B-02 terminal 2 and ECM connector C-51 terminal 9 <M/T> or PCM connector C-52 terminal 9 <A/T> when checking No. 2 cylinder.

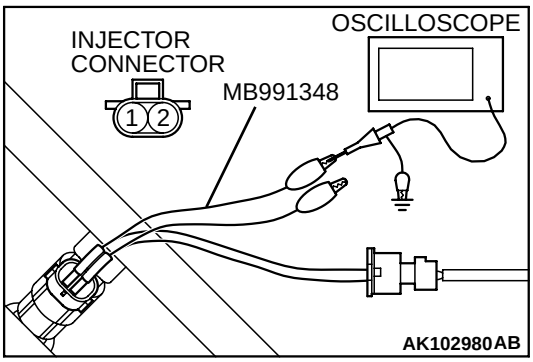
b. Check the harness wire between injector connector B-06 terminal 2 and ECM connector C-51 terminal 2 <M/T> or PCM connector C-52 terminal 2 <A/T> when checking No. 4 cylinder.

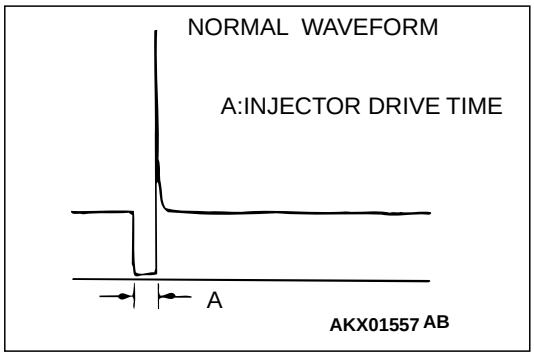
c. Check the harness wire between injector connector B-25 terminal 2 and ECM connector C-51 terminal 25 <M/T> or PCM connector C-52 terminal 25 <A/T> when checking No. 6 cylinder.

Q: Is the harness wire in good condition?

YES : Go to Step 9.

NO : Repair it. Then go to Step 10.





STEP 9. Using the oscilloscope, check the injector.

(1) Disconnect the injector connector B-02 <No. 2 cylinder> or B-06 <No. 4 cylinder> or B-25 <No. 6 cylinder> and connect the test harness special tool (MB991348) inbetween. (All terminals should be connected)

(2) Connect the oscilloscope probe to the injector side connector terminal 2.

NOTE: When measuring with the ECM or PCM side connector, connect an oscilloscope probe to the each of the following terminals.

- *ECM or PCM terminal 9 when checking No. 2 cylinder.*
- *ECM or PCM terminal 2 when checking No. 4 cylinder.*
- *ECM or PCM terminal 25 when checking No. 6 cylinder.*

(3) Start the engine and run at idle.

(4) Measure the waveform.
- The waveform should show a normal pattern similar to the illustration.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the waveform normal?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

NO : Replace the ECM or PCM. Then go to Step 10.

STEP 10. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 6 – Other Monitor P.13B-6.

(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0202, P0204, P0206 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0300: Random/Multiple Cylinder Misfire Detected

Random Misfire Circuit

- Refer to DTC P0201, P0203, P0205 – Injector Circuit P.13B-283.
- Refer to DTC P0202, P0204, P0206 – Injector Circuit P.13B-292.

CIRCUIT OPERATION

- Refer to DTC P0201, P0203, P0205 – Injector Circuit P.13B-283.
- Refer to DTC P0202, P0204, P0206 – Injector Circuit P.13B-292.

TECHNICAL DESCRIPTION

- If a misfire occurs while the engine is running, the engine speed changes for an instant.
- The ECM <M/T> or PCM <A/T> checks for such changes in engine speed.

DTC SET CONDITIONS

Check Conditions

- Engine speed is between 440 and 6,000 r/min.
- Engine coolant temperature is higher than –10°C (14°F).
- Intake air temperature is higher than –10°C (14°F).

TSB Revision

- Barometric pressure is higher than 76 kPa (11 psi).
- Volumetric efficiency is at between 30 and 60 percent.
- Adaptive learning is complete for the vane which generates a crankshaft position signal.
- While the engine is running, excluding gear shifting, deceleration, sudden acceleration/deceleration and A/C compressor switching.
- The throttle deviation is –0.059 v/10 ms to +0.059 v/10 ms.

Judgement Criteria (change in the angular acceleration of the crankshaft is used for misfire detection).

- Misfire has occurred more frequently than allowed during the last 200 revolutions [when the catalyst temperature is higher than 950°C (1742°F)].

or

- Misfire has occurred in 20 or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

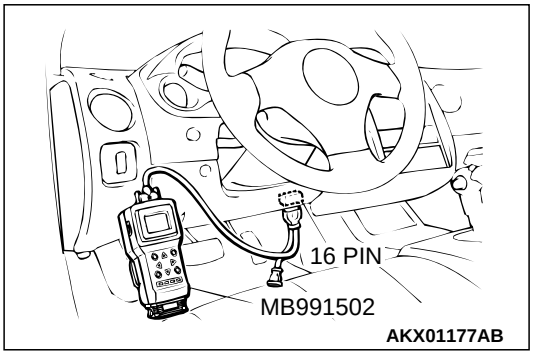
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Ignition system related part (s) failed.
- Poor crankshaft position sensor.
- Incorrect air/fuel ratio.
- Low compression pressure.
- Skipping of timing belt teeth.
- EGR system and EGR valve failed.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



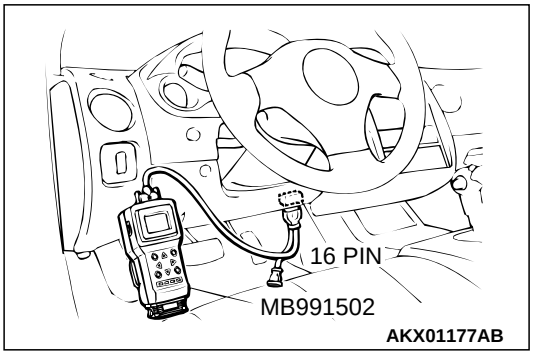
STEP 1. Using scan tool MB991502, check data list item 22: Crankshaft Position Sensor.

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 22, Crankshaft Position Sensor.
(4) Check the waveform of the crankshaft position sensor while keeping the engine speed constant.
  - The pulse width should be constant.
(5) Turn the ignition switch to "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 2.
NO : Refer to DTC P0335 – Crankshaft Position Sensor Circuit Malfunction P.13B-315.



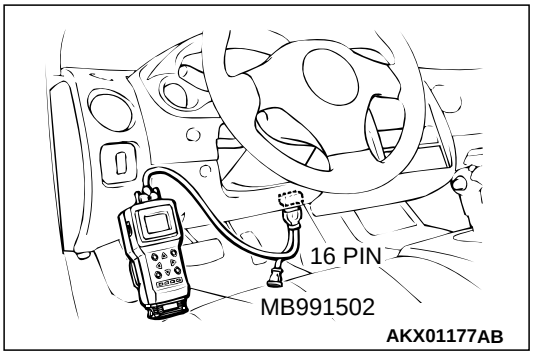
STEP 2. Using scan tool MB991502, check data list item 81: Long-Term Fuel Compensation (trim) Bank 1.

(1) Start the engine and run at idle.
(2) Set scan tool MB991502 to the data reading mode for item 81, Long-Term Fuel Compensation (trim) Bank 1.
- The fuel trim should be between –12.5 and +12.5 when the load is 2,500 r/min (during closed loop) after the engine is warmed.

(3) Turn the ignition switch to "LOCK" (OFF) position.

Q: Is the specification normal?

YES : Go to Step 3.
NO : Refer to DTC P0171 – System too Lean (bank 1) P.13B-245, DTC P0172 – System too Rich (bank 1) P.13B-252, DTC P0174 – System too Lean (bank 2) P.13B-256, DTC P0175 – System too Rich (bank 2) P.13B-262.



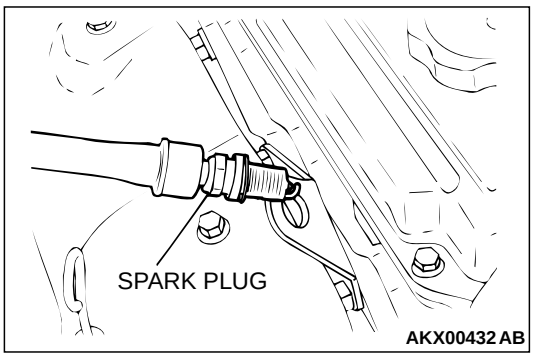
STEP 3. Using scan tool MB991502, check data list item 82: Short-Term Fuel Compensation (trim) Bank 1.

(1) Start the engine and run at idle.
(2) Set scan tool MB991502 to the data reading mode for item 82, Short-Term Fuel Compensation (trim) Bank 1.
- The fuel trim should be between –25 and +25 when the load is 2,500 r/min (during closed loop) after the engine is warmed.

(3) Turn the ignition switch to "LOCK" (OFF) position.

Q: Is the specification normal?

YES : Go to Step 4.
NO : Refer to DTC P0171 – System too Lean (bank 1) P.13B-245, DTC P0172 – System too Rich (bank 1) P.13B-252, DTC P0174 – System too Lean (bank 2) P.13B-256, DTC P0175 – System too Rich (bank 2) P.13B-262.

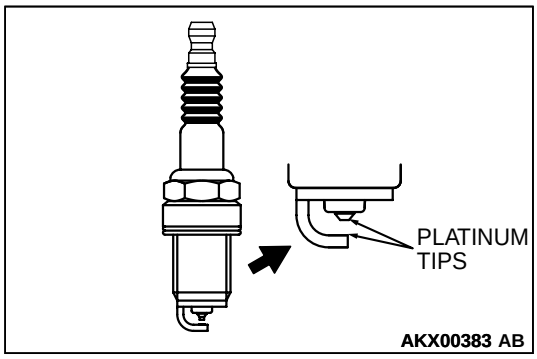


STEP 4. Check the ignition coil spark.

(1) Check each ignition coil spark.
(2) Remove the intake manifold.
(3) Remove the spark plug and connect to the spark plug cable.
(4) Ground the spark plug side electrode securely.
- When the engine is cranked, the spark plug should spark.

Q: Did it spark?

YES : Go to Step 7.
NO : Go to Step 5.



STEP 5. Check the spark plugs.

⚠ CAUTION

Do not attempt to adjust the gap of the platinum plug. Cleaning of the platinum plug may result in damage to the platinum tips. Therefore, if carbon deposits must be removed, use a plug cleaner and complete cleaning within 20 seconds to protect the electrode. Do not use a wire brush.

(1) Check the plug gap and replace if the limit is exceeded.

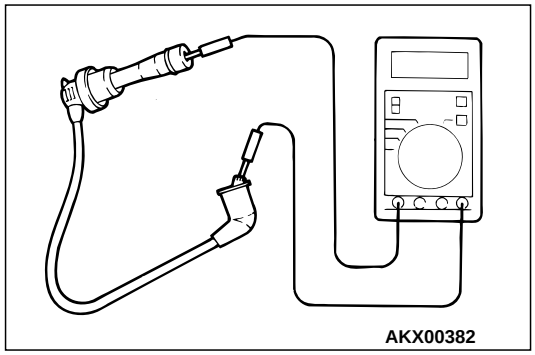
Standard value: 1.0 – 1.1 mm (0.039 – 0.043 inch)

Limit: 1.3 mm (0.051 inch)

Q: Is the plug gap at the standard value?

YES : Go to Step 6.

NO : Replace the faulty spark plug. Then go to Step 13.



STEP 6. Check the spark plug cable.

(1) Check the cap and coating for cracks.

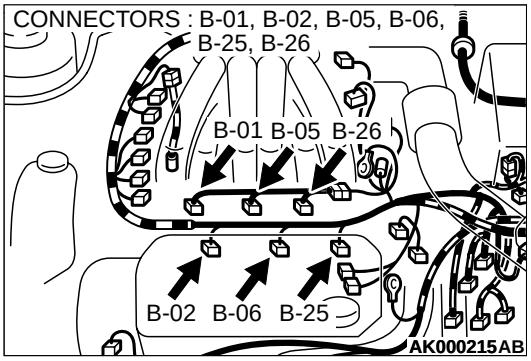
(2) Measure the resistance.

Limit: maximum 22 kΩ

Q: Is the resistance normal?

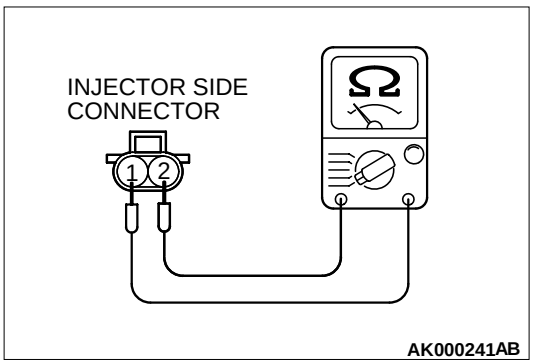
YES : Refer to INSPECTION PROCEDURE 33 – Ignition Circuit System P.13B-633.

NO : Replace the faulty spark plug cable. Then go to Step 13.



STEP 7. Check the injector.

(1) Disconnect the injector connector.



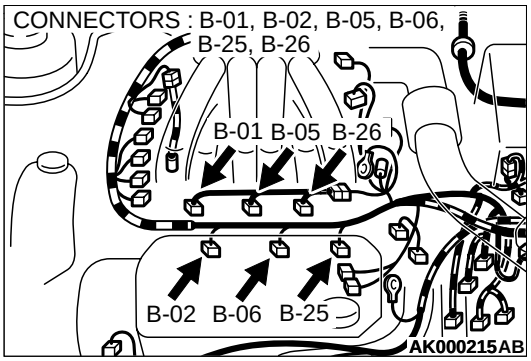
(2) Measure the resistance between each injector side connector terminal 1 and 2.

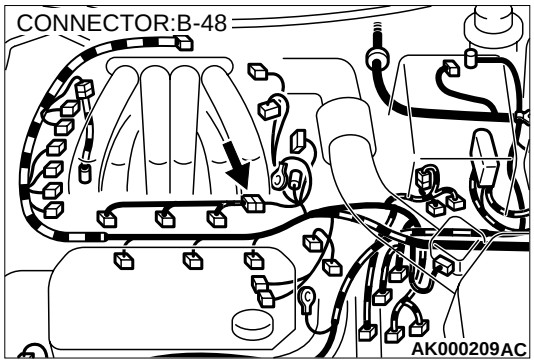
Standard value: 13 – 16 ohm [at 20°C (68°F)]

Q: Is the resistance standard value?

YES : Go to Step 8.

NO : Replace the faulty injector. Then go to Step 13.



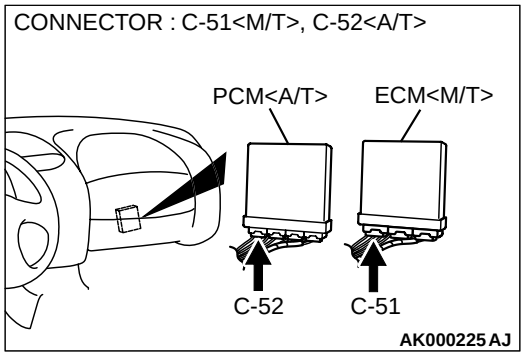


STEP 8. Check connector B-01, B-02, B-05, B-06, B-25, B-26 at injector and connector B-48 at injector intermediate connector for damage.

Q: Is the connector in good condition?

YES : Go to Step 9.

NO : Repair or replace the faulty injector. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 13.

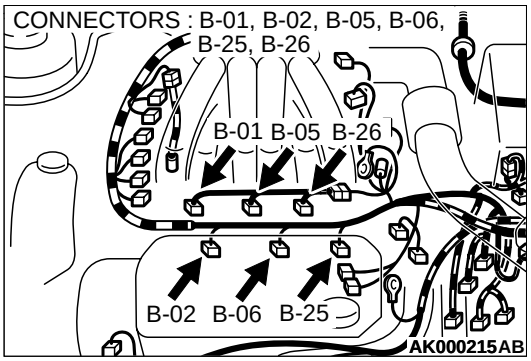


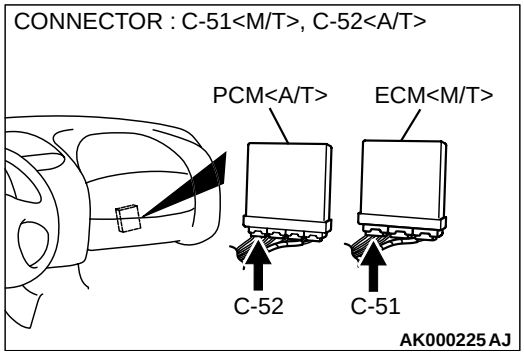
STEP 9. Check connector C-51 at ECM <M/T> or connector C-52 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 13.





STEP 10. Check for harness damage between injector connector and ECM connector <M/T> or PCM connector <A/T>.

a. Check the harness wire between injector connector B-01 terminal 2 and ECM connector C-51 terminal 1 <M/T> or PCM connector C-52 terminal 1 <A/T> when checking No. 1 cylinder.
b. Check the harness wire between injector connector B-02 terminal 2 and ECM connector C-51 terminal 9 <M/T> or PCM connector C-52 terminal 9 <A/T> when checking No. 2 cylinder.
c. Check the harness wire between injector connector B-05 terminal 2 and ECM connector C-51 terminal 24 <M/T> or PCM connector C-52 terminal 24 <A/T> when checking No. 3 cylinder.
d. Check the harness wire between injector connector B-06 terminal 2 and ECM connector C-51 terminal 2 <M/T> or PCM connector C-52 terminal 2 <A/T> when checking No. 4 cylinder.
e. Check the harness wire between injector connector B-26 terminal 2 and ECM connector C-51 terminal 10 <M/T> or PCM connector C-52 terminal 10 <A/T> when checking No. 5 cylinder.
f. Check the harness wire between injector connector B-25 terminal 2 and ECM connector C-51 terminal 25 <M/T> or PCM connector C-52 terminal 25 <A/T> when checking No. 6 cylinder.

Q: Is the harness wire in good condition?

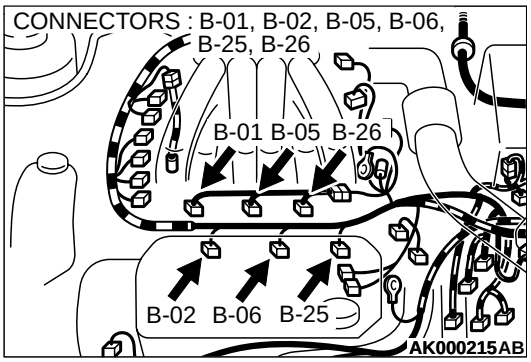
YES : Go to Step 11.
NO : Repair it. Then go to Step 13.

STEP 11. Check the following items.

(1) Check the following items, and repair or replace the defective component.
   a. Check for skipped timing belt teeth.
   b. Check compression.
   c. EGR valve failed.

Q: Are there any abnormalities?

YES : Go to Step 12.
NO : Repair or replace it. Then go to Step 13.



STEP 12. Replace the injector.

(1) Replace the injector.
(2) Carry out a test drive with the drive cycle pattern. Refer to Procedure 6 – Other Monitor P.13B-6.
(3) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0300 is output?

YES : Replace the ECM or PCM. Then go to Step 13.
NO : The inspection is complete.

STEP 13. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 6 – Other Monitor P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0300 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0301: Cylinder 1 Misfire Detected, DTC P0302: Cylinder 2 Misfire Detected, DTC P0303: Cylinder 3 Misfire Detected, DTC P0304: Cylinder 4 Misfire Detected, DTC P0305: Cylinder 5 Misfire Detected, DTC P0306 Cylinder 6 Misfire Detected

Misfire Detected Circuit

- Refer to DTC P0201, P0203, P0205 – Injector Circuit P.13B-283.
- Refer to DTC P0202, P0204, P0206 – Injector Circuit P.13B-292.

CIRCUIT OPERATION

- Refer to DTC P0201, P0203, P0205 – Injector Circuit P.13B-283.
- Refer to DTC P0202, P0204, P0206 – Injector Circuit P.13B-292.

TECHNICAL DESCRIPTION

- If a misfire occurs while the engine is running, the engine speed changes for an instant.
- The ECM <M/T> or PCM <A/T> checks for such changes in engine speed.

DTC SET CONDITIONS

Check Conditions

- Engine speed is between 440 and 6,000 r/min.
- Engine coolant temperature is higher than –10°C (14°F).
- Intake air temperature is higher than –10°C (14°F).
- Barometric pressure is higher than 76 kPa (11 psi).
- Volumetric efficiency is at between 30 and 60 percent.
- Adaptive learning is complete for the vane which generates a crankshaft position signal.
- While the engine is running, excluding gear shifting, deceleration, sudden acceleration/deceleration and A/C compressor switching.
- The throttle deviation is –0.059 v/10 ms to +0.059 v/10 ms.

Judgement Criteria (change in the angular acceleration of the crankshaft is used for misfire detection).

- Misfire has occurred more frequently than allowed during the last 200 revolutions [when the catalyst temperature is higher than 950°C (1,742°F)].

or

- Misfire has occurred in 20 or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

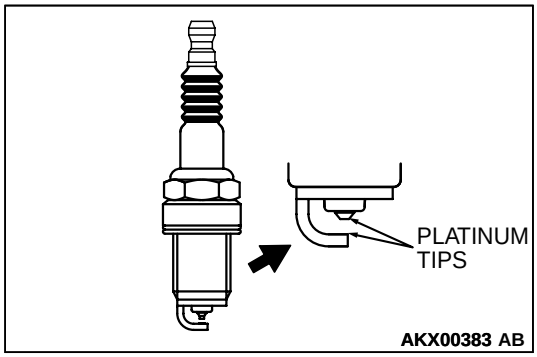
- Ignition system related part (s) failed.
- Low compression pressure.
- Injector failed.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Check the spark plugs.



⚠ CAUTION

Do not attempt to adjust the gap of the platinum plug. Cleaning of the platinum plug may result in damage to the platinum tips. Therefore, if carbon deposits must be removed, use a plug cleaner and complete cleaning within 20 seconds to protect the electrode. Do not use a wire brush.

(1) For the right bank cylinder, remove the intake manifold.
(2) Check the plug gap and replace if the limit is exceeded.

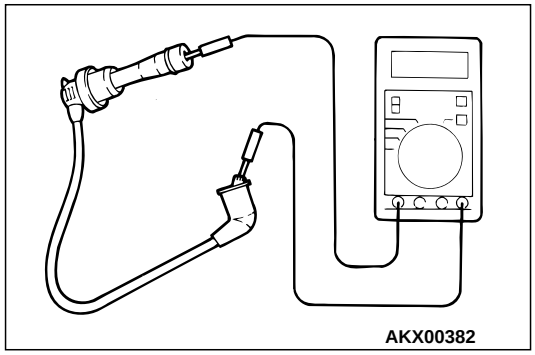
Standard value: 1.0 – 1.1 mm (0.039 – 0.043 inch)

Limit: 1.3 mm (0.051 inch)

Q: Is the plug gap at the standard value?

YES : Go to Step 2.
NO : Replace the spark plug. Then go to Step 9.

STEP 2. Check the spark plug cable.

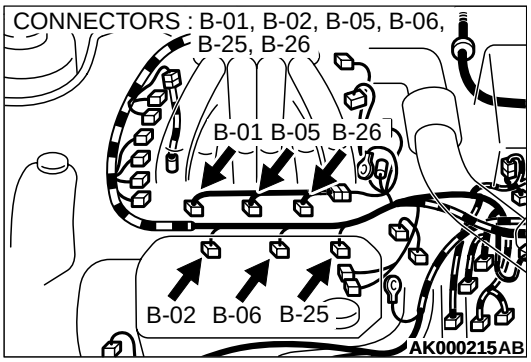


(1) Check the cap and coating for cracks.
(2) Measure the resistance.

Limit: maximum 22 kΩ

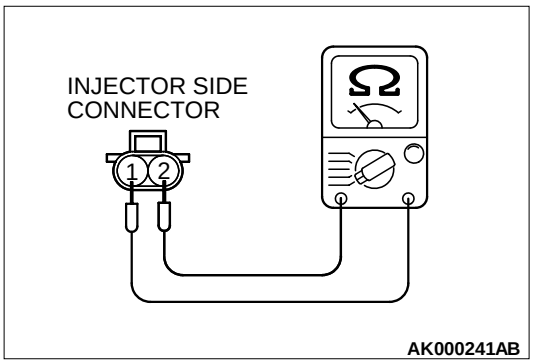
Q: Is the resistance normal?

YES : Go to Step 3.
NO : Replace the spark plug cable. Then go to Step 9.



STEP 3. Check the injector.

(1) Disconnect the injector connector B-01 <No. 1 cylinder>, B-02 <No. 2 cylinder>, B-05 <No. 3 cylinder>, B-06 <No. 4 cylinder>, B-26 <No. 5 cylinder>, B-25 <No. 6 cylinder>.



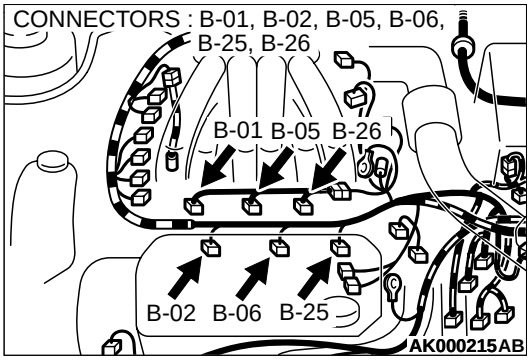
(2) Measure the resistance between injector side connector terminal 1 and 2.

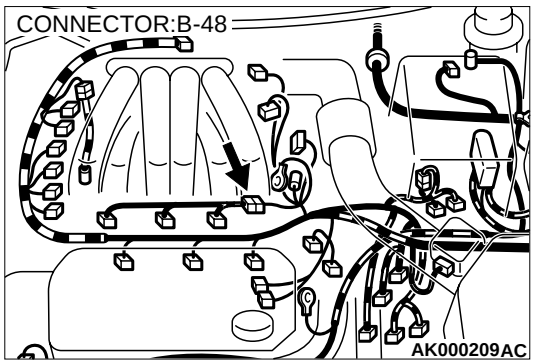
Standard value: 13 – 16 ohm [at 20°C (68°F)]

Q: Is the resistance standard value?

YES : Go to Step 4.

NO : Replace the injector. Then go to Step 9.





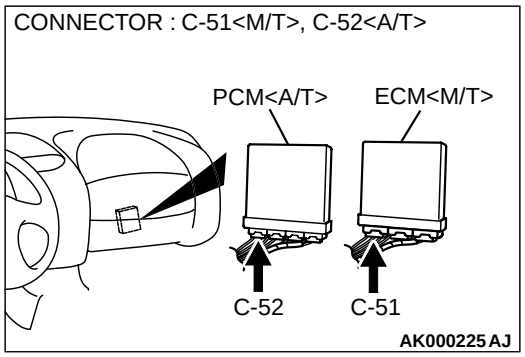
STEP 4. Check connector at injector and injector intermediate connector for damage.

a. Check the connector B-01 at injector and connector B-48 at injector intermediate connector when checking No. 1 cylinder.
b. Check the connector B-02 at injector when checking No. 2 cylinder.
c. Check the connector B-05 at injector and connector B-48 at injector intermediate connector when checking No. 3 cylinder.
d. Check the connector B-06 at injector when checking No. 4 cylinder.
e. Check the connector B-26 at injector and connector B-48 at injector intermediate connector when checking No. 5 cylinder.
f. Check the connector B-25 at injector when checking No. 6 cylinder.

Q: Is the connector in good condition?

YES : Go to Step 5.

NO : Repair or replace the injector. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.

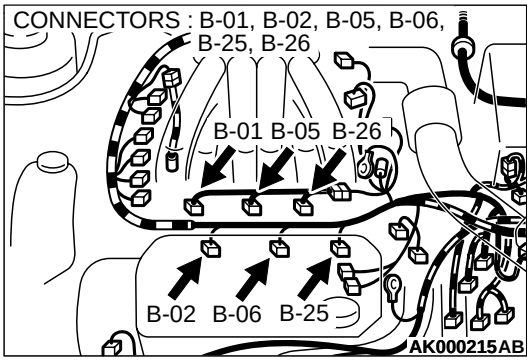


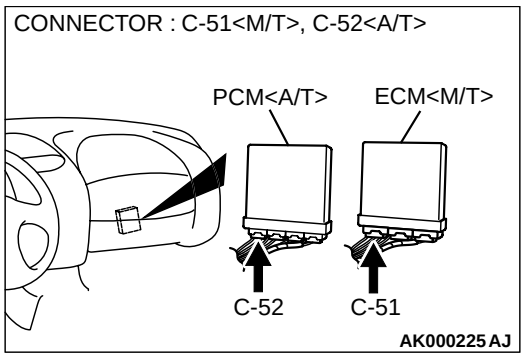
STEP 5. Check connector C-51 at ECM <M/T> or connector C-52 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.





STEP 6. Check for harness damage between injector connector and ECM connector <M/T> or PCM connector <A/T>.

a. Check the harness wire between injector connector B-01 terminal 2 and ECM connector C-51 terminal 1 <M/T> or PCM connector C-52 terminal 1 <A/T> when checking No. 1 cylinder.

b. Check the harness wire between injector connector B-02 terminal 2 and ECM connector C-51 terminal 9 <M/T> or PCM connector C-52 terminal 9 <A/T> when checking No. 2 cylinder.

c. Check the harness wire between injector connector B-05 terminal 2 and ECM connector C-51 terminal 24 <M/T> or PCM connector C-52 terminal 24 <A/T> when checking No. 3 cylinder.

d. Check the harness wire between injector connector B-06 terminal 2 and ECM connector C-51 terminal 2 <M/T> or PCM connector C-52 terminal 2 <A/T> when checking No. 4 cylinder.

e. Check the harness wire between injector connector B-26 terminal 2 and ECM connector C-51 terminal 10 <M/T> or PCM connector C-52 terminal 10 <A/T> when checking No. 5 cylinder.

f. Check the harness wire between injector connector B-25 terminal 2 and ECM connector C-51 terminal 25 <M/T> or PCM connector C-52 terminal 25 <A/T> when checking No. 6 cylinder.

Q: Is the harness wire in good condition?

YES : Go to Step 7.

NO : Repair it. Then go to Step 9.

STEP 7. Check the compression.

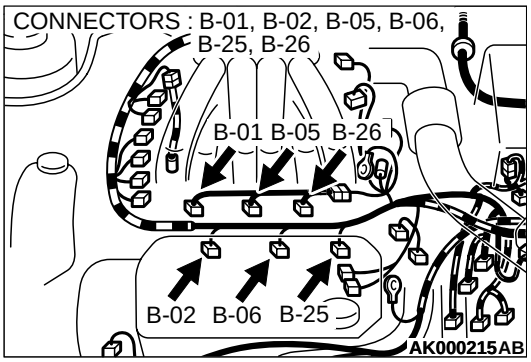
Refer to GROUP 9C, On-Vehicle Service – Compression Pressure Check P.11C-7.

Q: Are there any abnormalities?

YES : Go to Step 8.

NO : Repair or replace it. Then go to Step 9.

TSB Revision



STEP 8. Replace the injector.

(1) Replace the injector.
(2) Carry out a test drive with the drive cycle pattern. Refer to Procedure 6 – Other Monitor P.13B-6.
(3) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0301, P0302, P0303, P0304, P0305, P0306 is output?

YES : Replace the ECM or PCM. Then go to Step 9.
NO : The inspection is complete.

STEP 9. Test the OBD-II drive cycle.

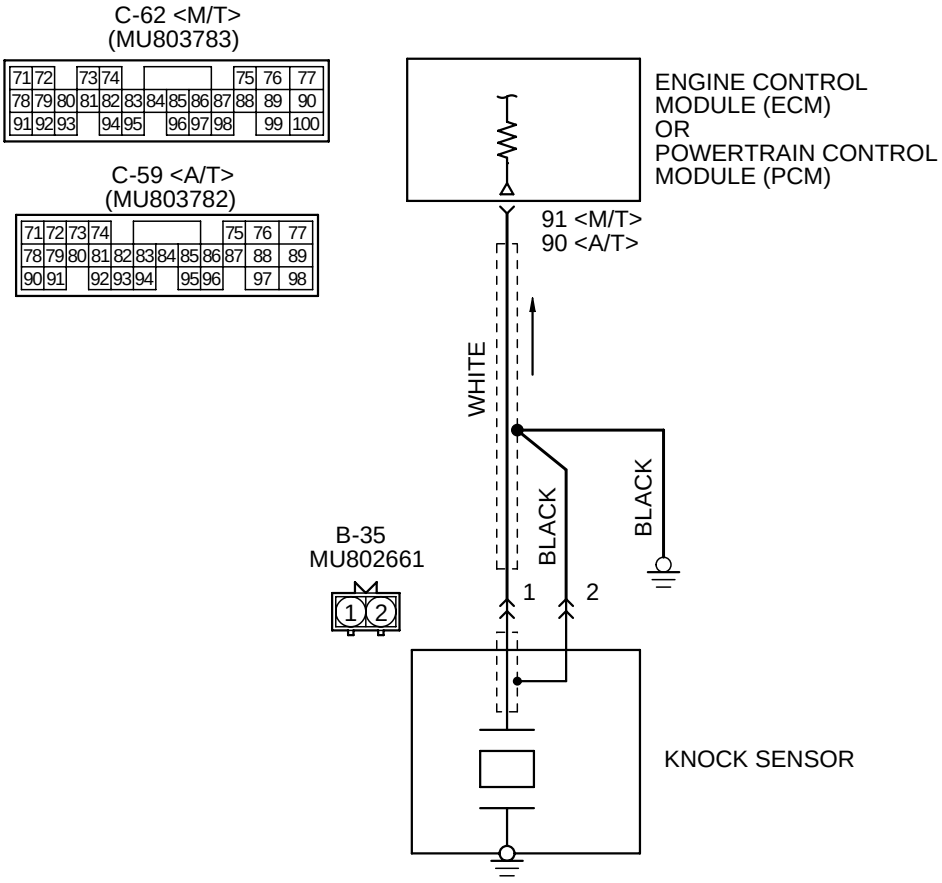
(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 6 – Other Monitor P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0301, P0302, P0303, P0304, P0305, P0306 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0325: Knock Sensor Circuit

Knock Sensor Circuit



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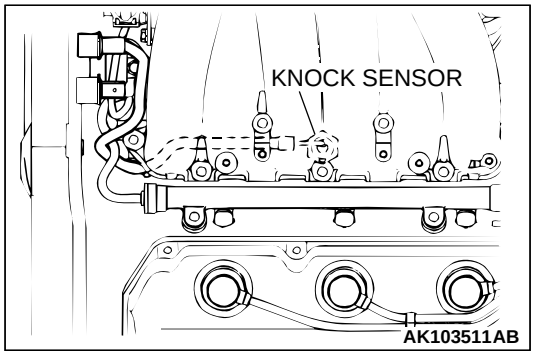

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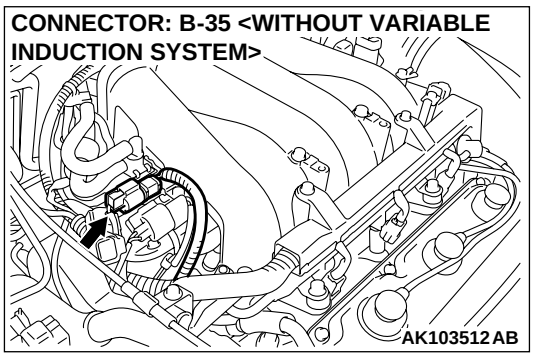

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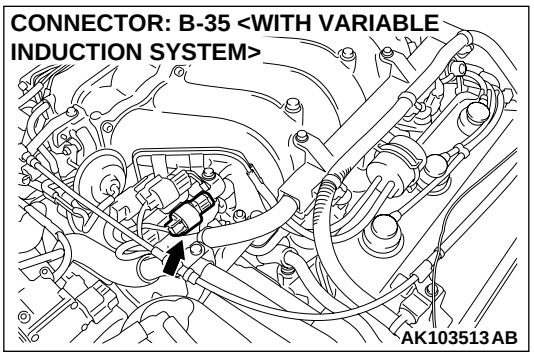
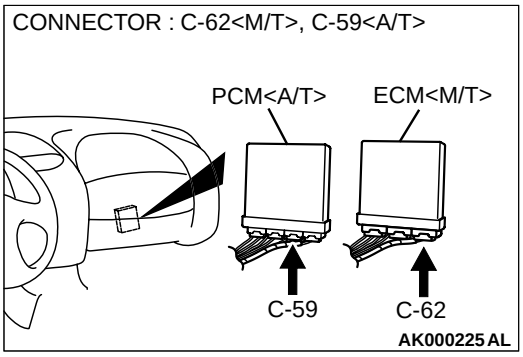
TSB Revision





CIRCUIT OPERATION

- The knock sensor sends a signal voltage to the ECM (terminal 91) <M/T> or PCM (terminal 90) <A/T>.

TECHNICAL DESCRIPTION

- The knock sensor converts the vibration of the cylinder block into a voltage and outputs it. If there is a malfunction of the knock sensor, the voltage output will not change.
- The ECM <M/T> or PCM <A/T> checks whether the voltage output changes.

DTC SET CONDITIONS

Check Conditions

- 2 seconds or more have passed since the starting sequence was completed.
- Engine speed is higher than 3,000 r/min.

Judgment Criteria

- Knock sensor output voltage (knock sensor peak voltage in each 1/3 turn of the crankshaft) has not changed more than 0.06 volt in the last consecutive 200 periods.

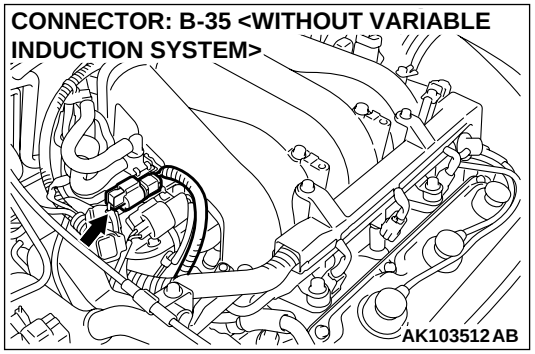
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

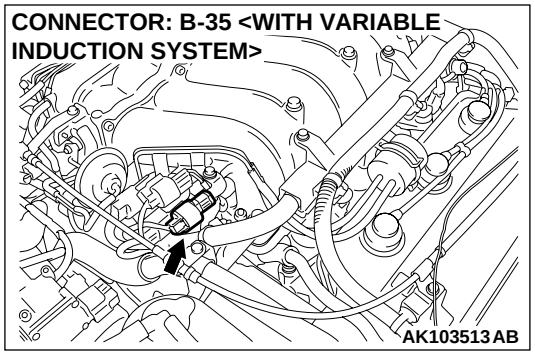
- Knock sensor failed.
- Open or shorted knock sensor circuit, or loose connector.
- ECM <M/T> failed.
- PCM <A/T> failed.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



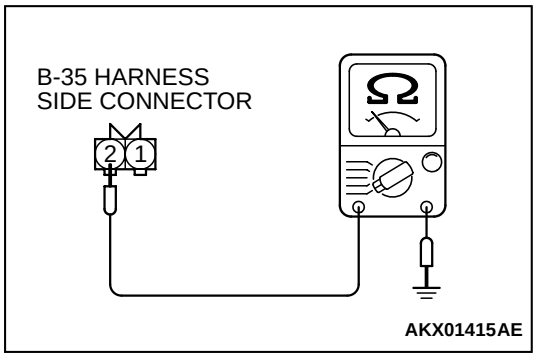


STEP 1. Check connector B-35 at the knock sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.



STEP 2. Check the continuity at knock sensor harness side connector B-35.

(1) Disconnect the connector B-35 and measure at the harness side.

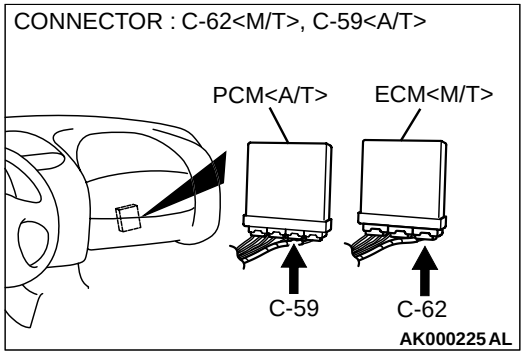
(2) Check for the continuity between terminal 2 and ground.

- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 3.

NO : Repair harness wire between knock sensor connector B-35 terminal 2 and ground because of open circuit or harness damage. Then go to Step 6.



STEP 3. Check connector C-62 at ECM <M/T> or connector C-59 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.

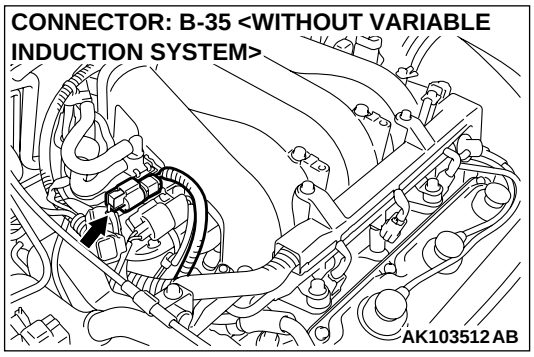
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.

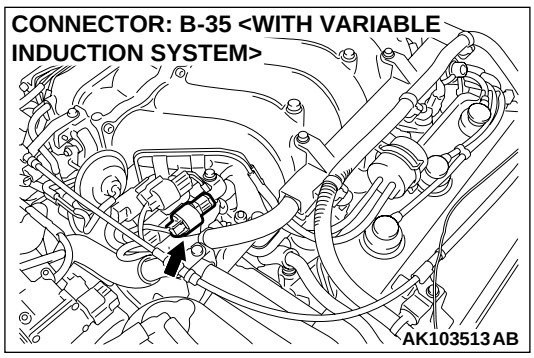
STEP 4. Check for open circuit and short circuit to ground and harness damage between knock sensor connector B-35 terminal 1 and ECM connector C-62 terminal 91 <M/T> or PCM connector C-59 terminal 90 <A/T>.

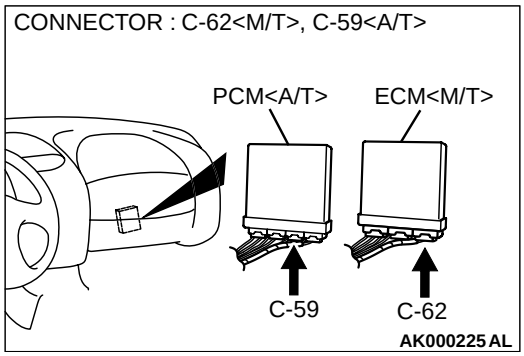
Q: Is the harness wire in good condition?

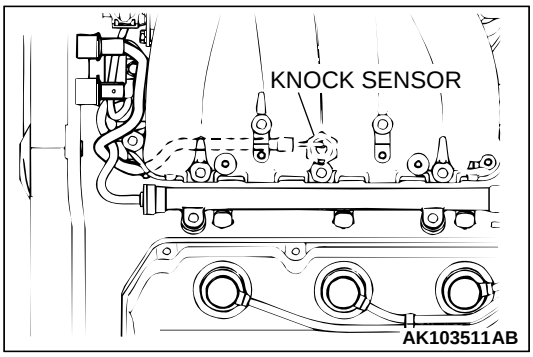
YES : Go to Step 5.

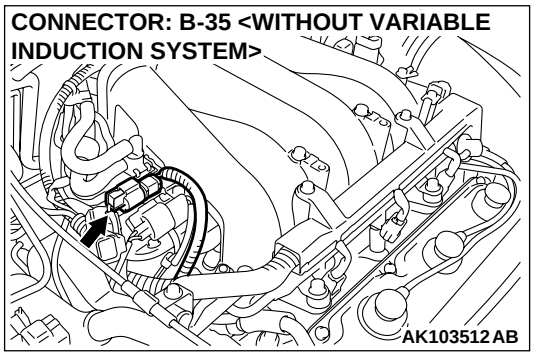
NO : Repair it. Then go to Step 6.

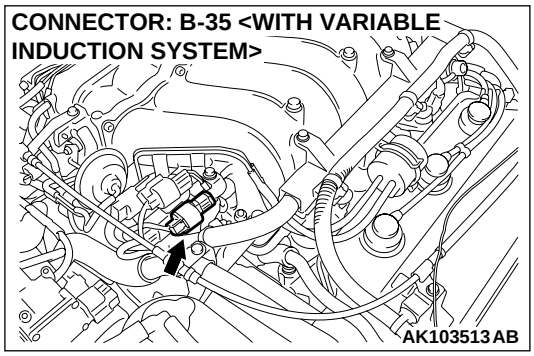


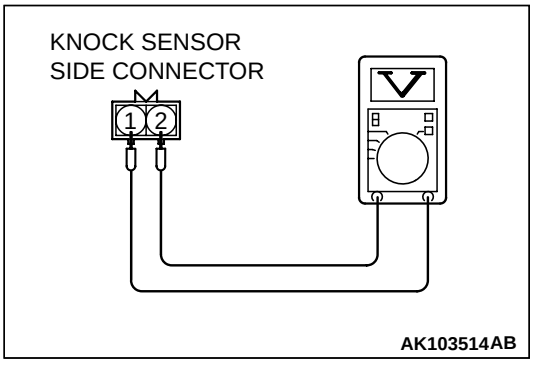












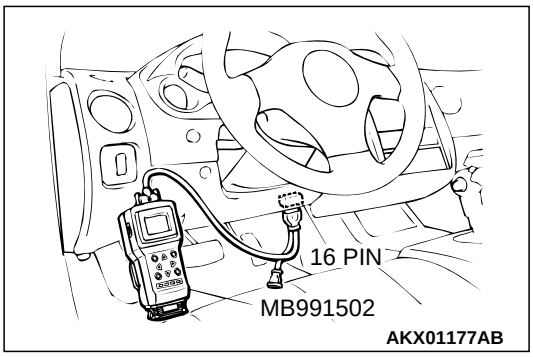
STEP 5. Check the knock sensor.

(1) Disconnect the knock sensor connector B-35.
(2) Start the engine and run at idle.
(3) Measure the voltage between knock sensor side connector terminal 1(output) and 2(ground).
(4) Gradually increase the engine speed.
- The voltage increases with the increase in the engine speed.

(5) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the sensor operating properly?

YES : Replace the ECM or PCM. Then go to Step 6.
NO : Replace the knock sensor. Then go to Step 6.



STEP 6. Using scan tool MB991502, read the diagnostic trouble code(DTC).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTC.
(4) Test drive under the following conditions:
- Engine speed: 3000 – 5000r/min
- Engine load: 40 % or more
- Drive a minimum of 3 seconds after the above conditions have been met.

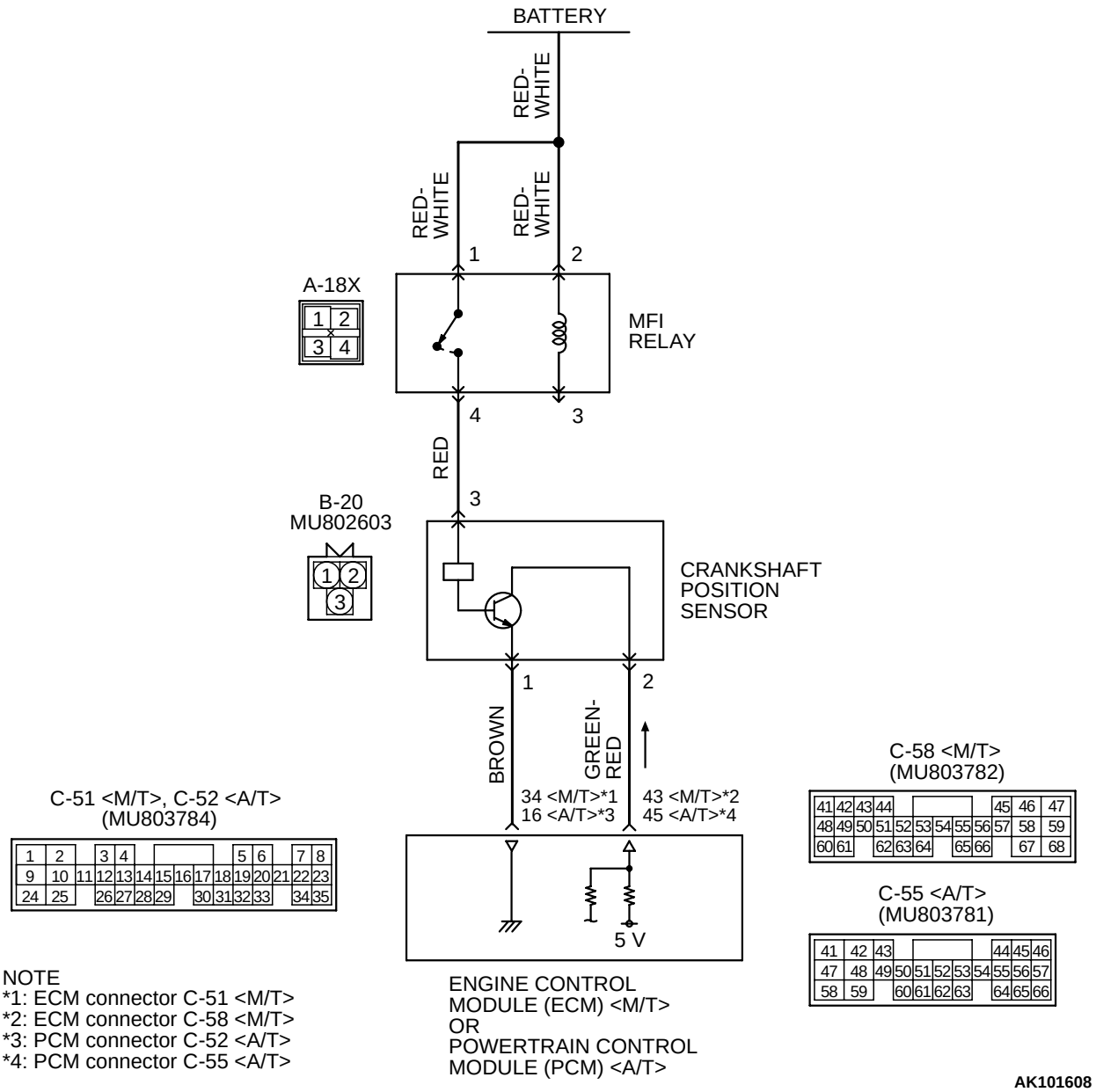
(5) After completing the test drive, read the DTC.Turn the ignition switch to the "LOCK"(OFF) position.

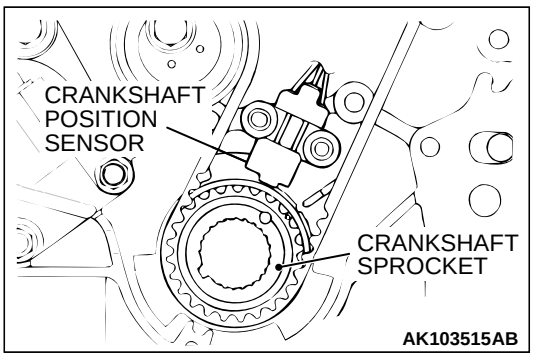
Q: Is the DTC P0325 is output?

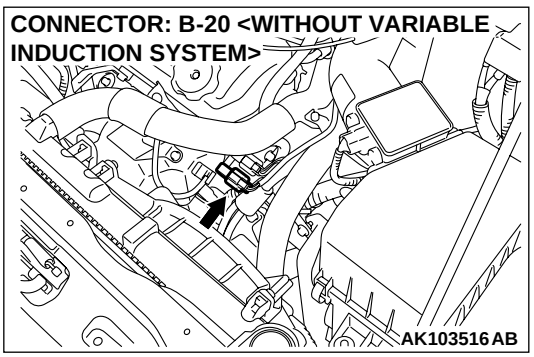
YES : The inspection is complete.
NO : Retry the troubleshooting.

DTC P0335: Crankshaft Position Sensor Circuit

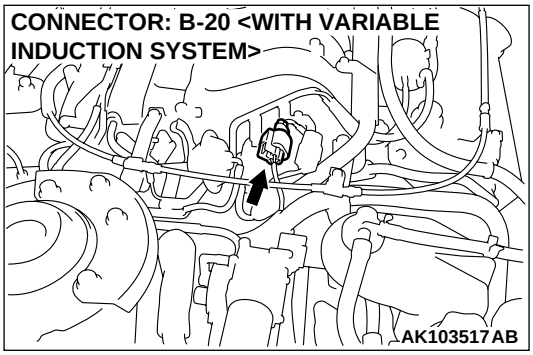
Crankshaft Position Sensor Circuit

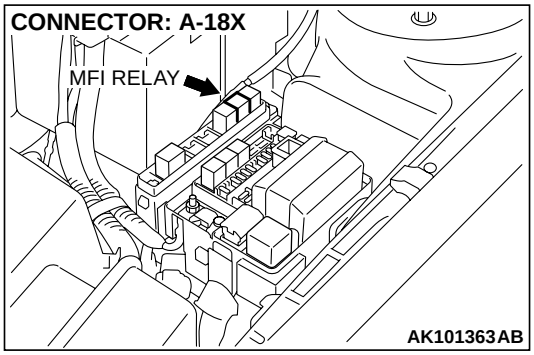


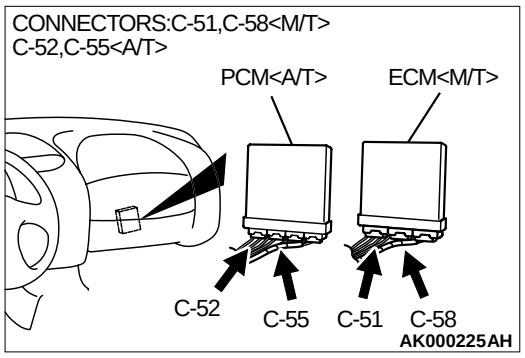




TSB Revision







CIRCUIT OPERATION

- The crankshaft position sensor power is supplied from the MFI relay (terminal 4).
- Terminal 1 of the crankshaft position sensor is grounded with ECM (terminal 34) <M/T> or PCM (terminal 16) <A/T>.
- A 5-volt voltage is applied on the crankshaft position sensor output terminal (terminal 2) from the ECM (terminal 43) <M/T> or PCM (terminal 45) <A/T>. The crankshaft position sensor generates a pulse signal when the output terminal is opened and grounded.

TECHNICAL DESCRIPTION

- The crankshaft position sensor detects the crank angle (position) of each cylinder, and converts that data to pulse signals, which are then input to the ECM <M/T> or PCM <A/T>.
- When the engine is running, the crankshaft position sensor outputs a pulse signal.
- The ECM <M/T> or PCM <A/T> checks whether pulse signal is input while the engine is cranking.

DTC SET CONDITIONS

Check Conditions

- Engine is being cranked.

Judgment Criteria

- Crankshaft position sensor output voltage has not changed (no pulse signal is input) for 2 seconds.

Check Conditions, Judgment Criteria

- Normal signal pattern has not been input for cylinder identification from the crankshaft position sensor signal and camshaft position sensor signal for 2 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

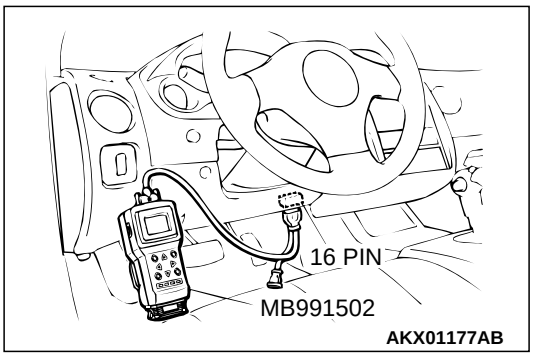
- Crankshaft position sensor failed.
- Open or shorted crankshaft position sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

TSB Revision



STEP 1. Using scan tool MB991502, check data list item 22: Crankshaft Position Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 22, Crankshaft Position Sensor.
- The tachometer and engine speed indicated on the scan tool should much.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

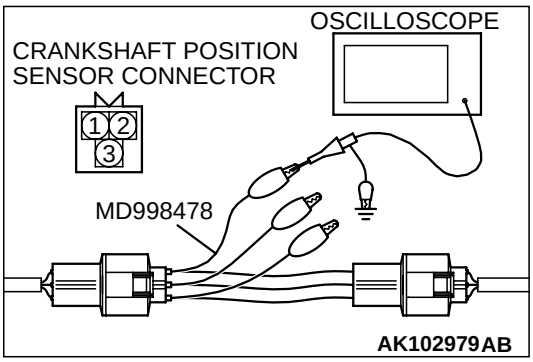
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Go to Step 2.

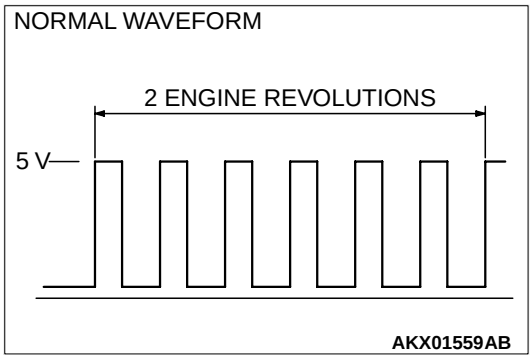
STEP 2. Using the oscilloscope, check the crankshaft position sensor.

(1) Disconnect the crankshaft position sensor connector, and connect the test harness special tool (MD998478) in between.
(2) Connect the oscilloscope probe to crankshaft position sensor connector terminal 2 (bank clip of special tool).

NOTE: Connect the oscilloscope plobe to terminal 43 <M/T> or terminal 45 <A/T> by backprobing when measuring with the ECM or PCM connector.

(3) Start the engine and run at idle.



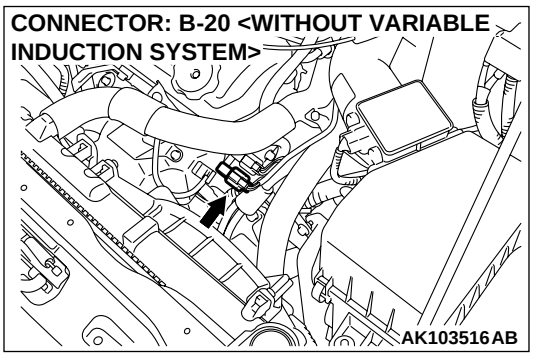


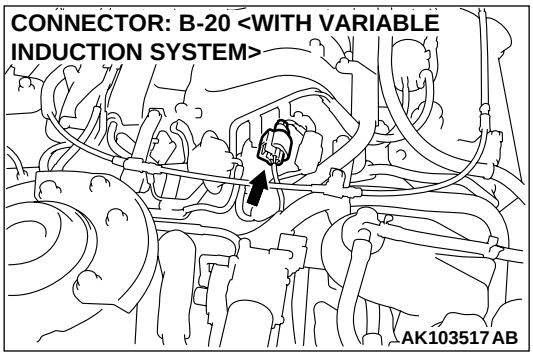
(4) Check the waveform.
- The waveform should show a pattern similar to the illustration.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the waveform normal?

YES : Go to Step 3.
NO : Go to Step 5.



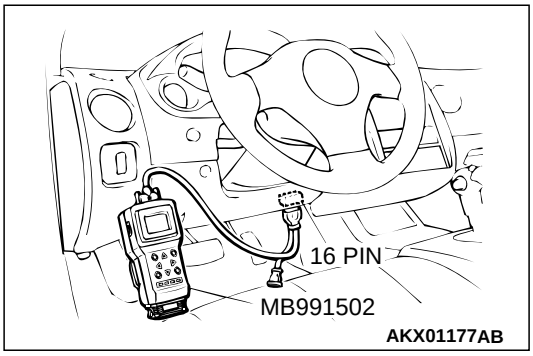


STEP 3. Check connector B-20 at the crankshaft position sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 21.



STEP 4. Using scan tool MB991502, check data list item 22: Crankshaft Position Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

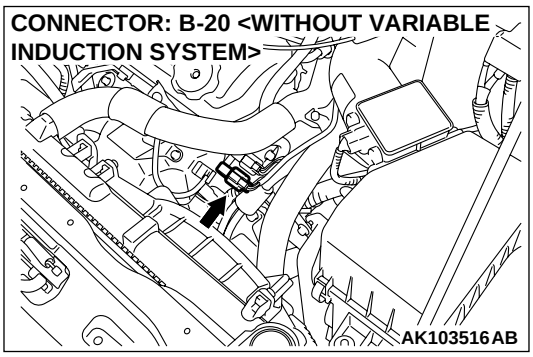
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 22, Crankshaft Position Sensor.
- The tachometer and engine speed indicated on the scan tool should much.

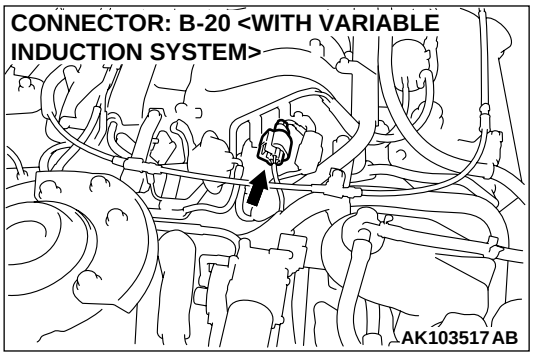
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

NO : Replace the ECM or PCM. Then go to Step 21.



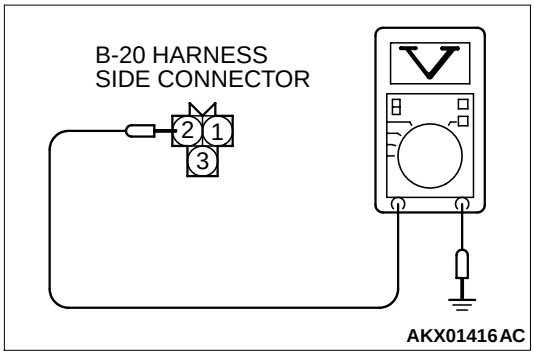


STEP 5. Check connector B-20 at the crankshaft position sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 21.



STEP 6. Check the sensor supply voltage at crankshaft position sensor harness side connector B-20.

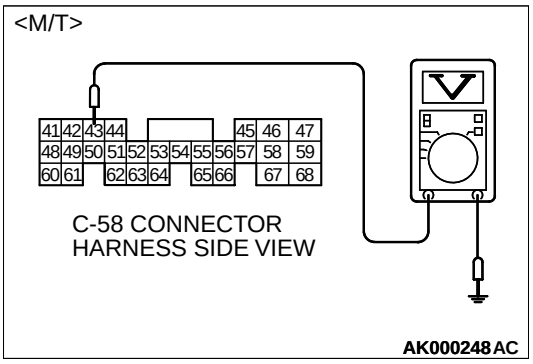
(1) Disconnect the connector B-20 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 2 and ground.
- Voltage should be between 4.8 and 5.2 volts.

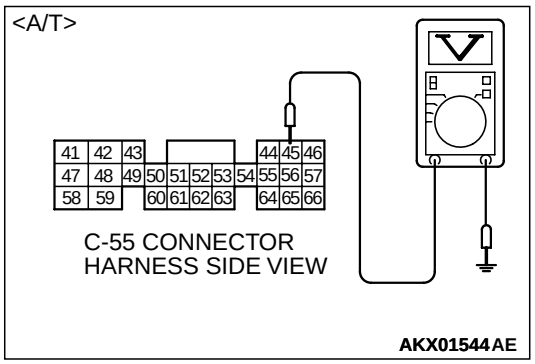
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 11.

NO : Go to Step 7.





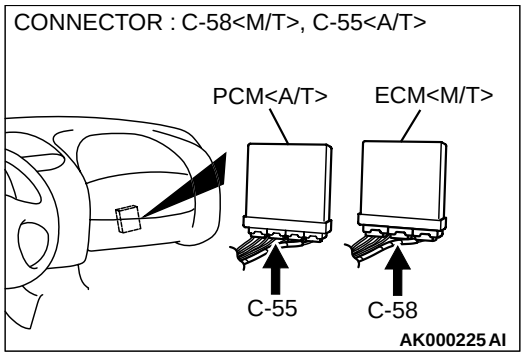
STEP 7. Check the sensor supply voltage at ECM connector C-58 <M/T> or PCM connector C-55 <A/T> by backprobing.

(1) Do not disconnect the ECM connector C-58 <M/T> or PCM connector C-55 <A/T>.
(2) Disconnect the crankshaft position sensor connector B-20.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the voltage between terminal 43 <M/T> or 45 <A/T> and ground by backprobing.
- Voltage should be between 4.8 and 5.2 volts.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

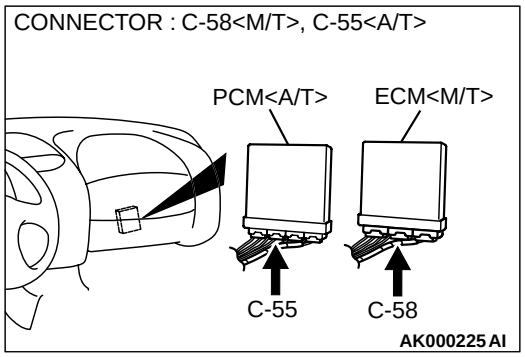
YES : Go to Step 8.
NO : Go to Step 9.



STEP 8. Check connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Repair it because of open circuit between crankshaft position sensor connector B-20 terminal 2 and ECM connector C-58 terminal 43 <M/T> or PCM connector C-55 terminal 45 <A/T>. Then go to Step 21.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 21.

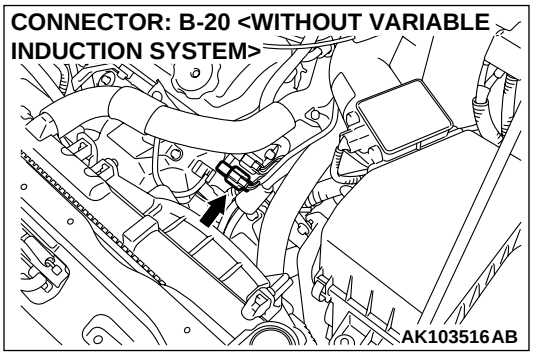


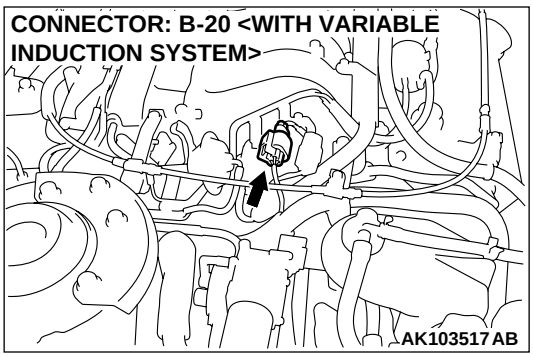
STEP 9. Check connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 21.



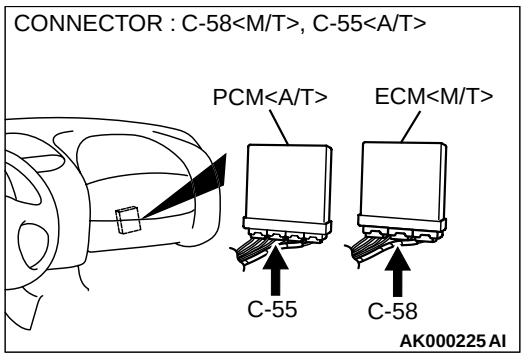


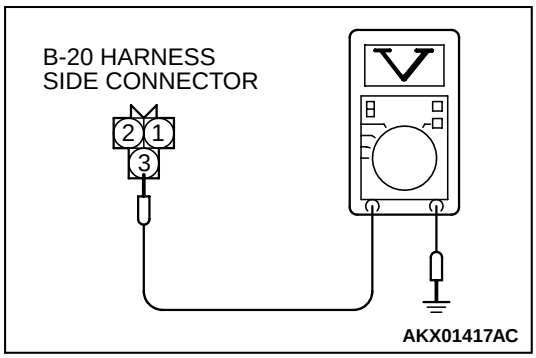
STEP 10. Check for short circuit to ground between crankshaft position sensor connector B-20 terminal 2 and ECM connector C-58 terminal 43 <M/T> or PCM connector C-55 terminal 45 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 21.

NO : Repair it. Then go to Step 21.





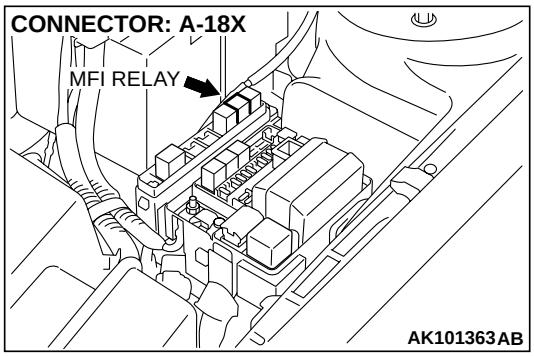
STEP 11. Check the power supply voltage at crankshaft position sensor harness side connector B-20.

(1) Disconnect the connector B-20 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 3 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

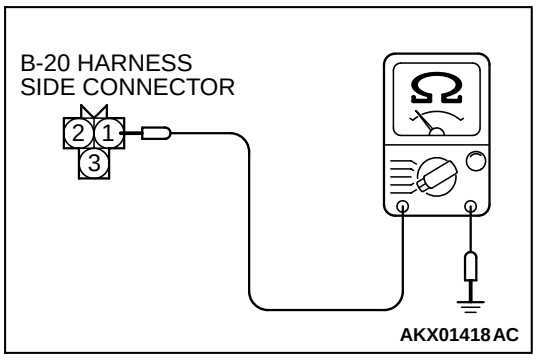
YES : Go to Step 13.
NO : Go to Step 12.



STEP 12. Check connector A-18X at MFI relay for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between MFI relay connector A-18X terminal 4 and crankshaft position sensor connector B-20 terminal 3 because of open circuit or short circuit to ground. Then go to Step 21.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 21.

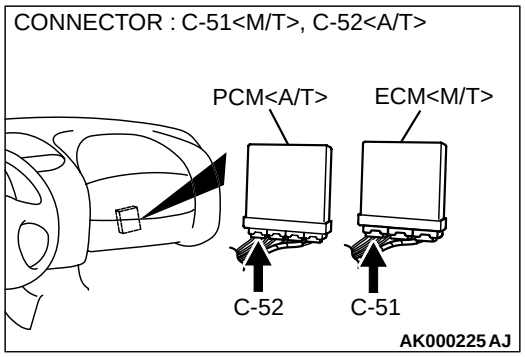


STEP 13. Check the continuity at crankshaft position sensor harness side connector B-20.

(1) Disconnect the connector B-20 and measure at the harness side.
(2) Check for the continuity between terminal 1 and ground.
- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 16.
NO : Go to Step 14.

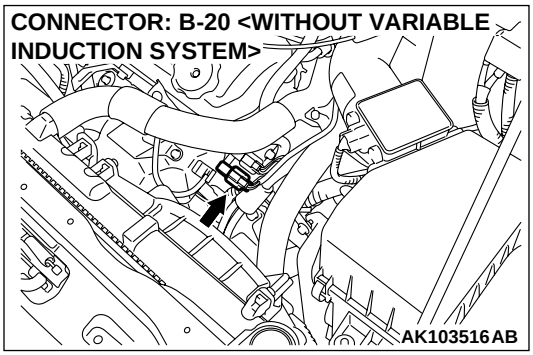


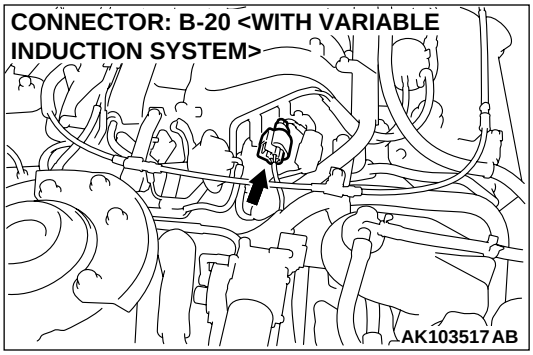
STEP 14. Check connector C-51 at ECM <M/T> or connector C-52 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 15.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 21.



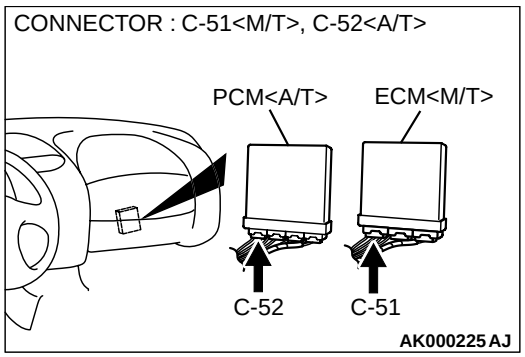


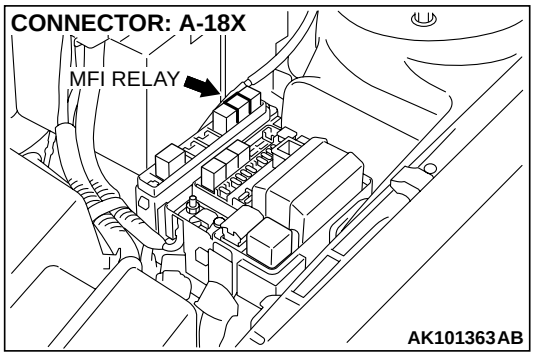
STEP 15. Check for open circuit and harness damage between crankshaft position sensor connector B-20 terminal 1 and ECM connector C-51 terminal 34 <M/T> or PCM connector C-52 terminal 16 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 21.

NO : Repair it. Then go to Step 21.



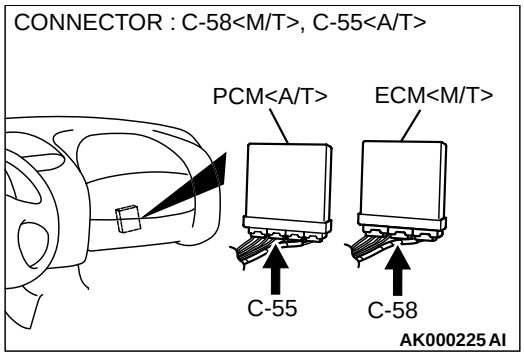


STEP 16. Check connector A-18X at the MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 17.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 21.

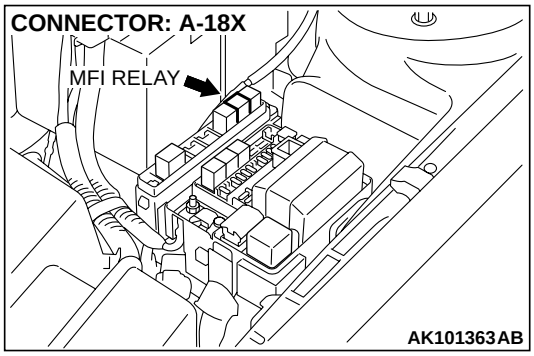


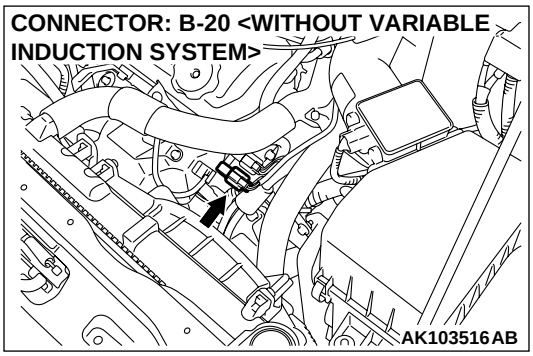
STEP 17. Check connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

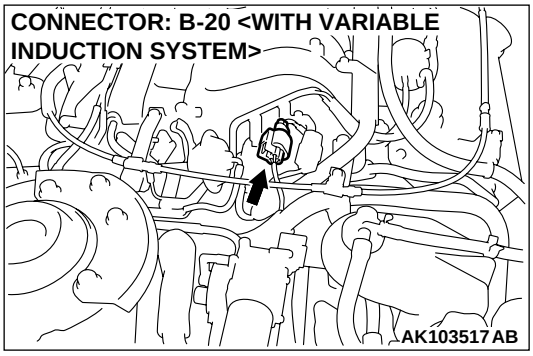
Q: Is the connector in good condition?

YES : Go to Step 18.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 21.







STEP 18. Check for harness damage between MFI relay connector A-18X terminal 4 and crankshaft position sensor connector B-20 terminal 3.

Q: Is the harness wire in good condition?

YES : Go to Step 19.

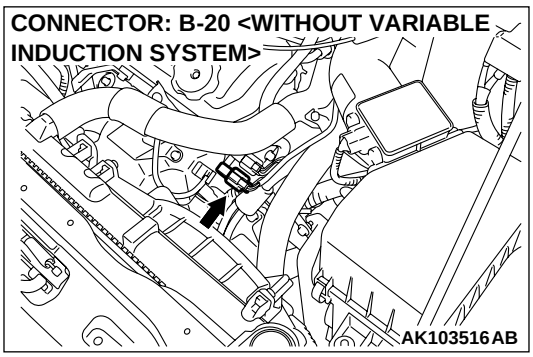
NO : Repair it. Then go to Step 21.

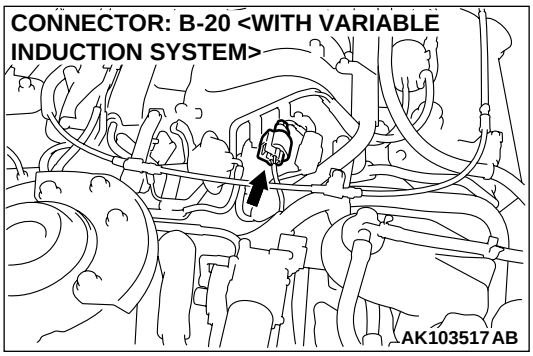
STEP 19. Check for harness damage between crankshaft position sensor connector B-20 terminal 2 and ECM connector C-58 terminal 43 <M/T> or PCM connector C-55 terminal 45 <A/T>.

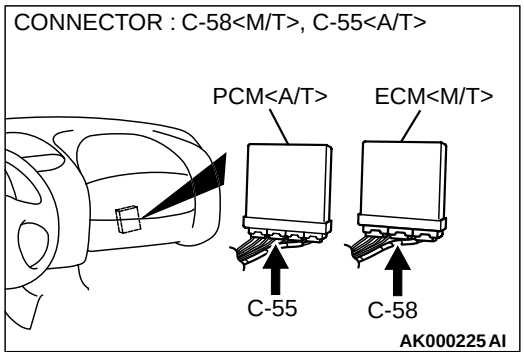
Q: Is the harness wire in good condition?

YES : Go to Step 20.

NO : Repair it. Then go to Step 21.







STEP 20. Check the crankshaft sensing blade.

Q: Is the crankshaft sensing blade in a good condition?

YES : Replace the crankshaft position sensor. Then go to Step 21.

NO : Repair it. Then go to Step 21.

STEP 21. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13B-6.

(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0335 is output?

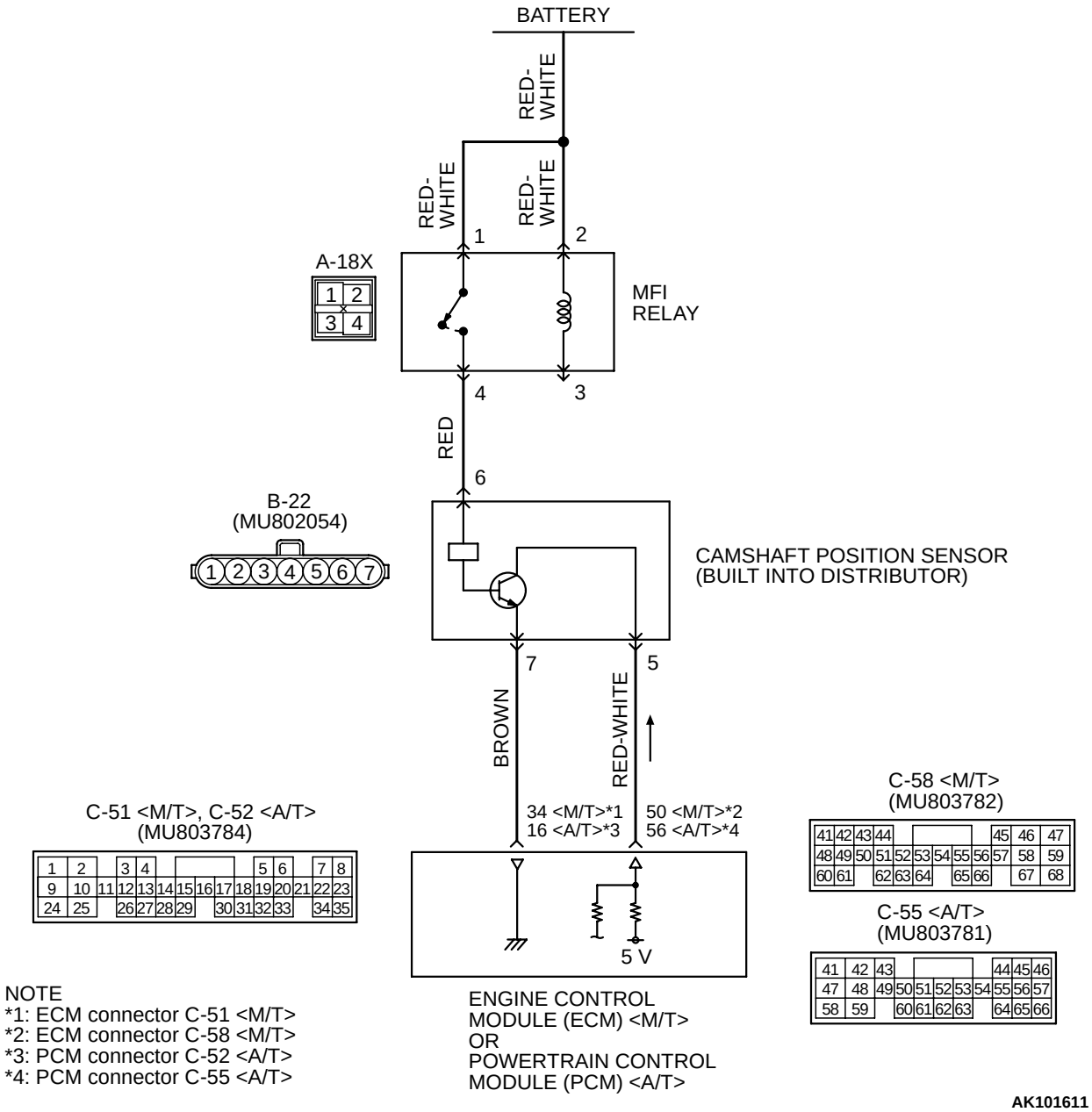
YES : Retry the troubleshooting.

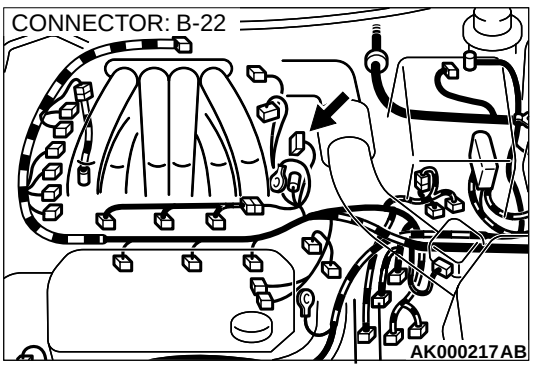
NO : The inspection is complete.

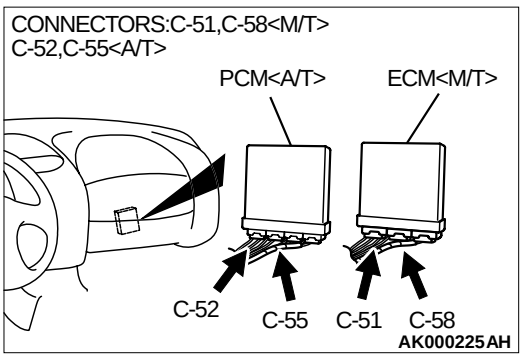
TSB Revision

DTC P0340: Camshaft Position Sensor Circuit

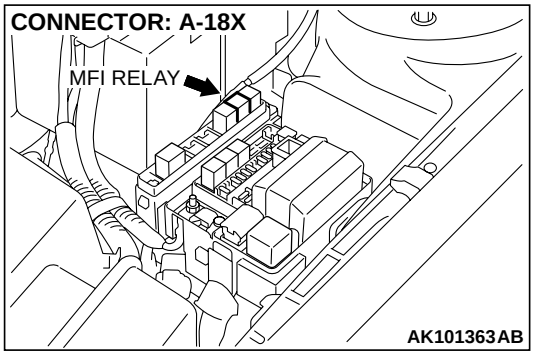
Camshaft Position Sensor Circuit







TSB Revision



CIRCUIT OPERATION

- The camshaft position sensor power is supplied from the MFI relay (terminal 4).
- Terminal 7 of the camshaft position sensor is grounded with ECM (terminal 34) <M/T> or PCM (terminal 16) <A/T>.
- A 5-volt voltage is applied on the camshaft position sensor output terminal (terminal 5) from the ECM (terminal 50) <M/T> or PCM (terminal 56) <A/T>. The camshaft position sensor generates a pulse signal when the output terminal is opened and grounded.

TECHNICAL DESCRIPTION

- The camshaft position sensor functions to detect the top dead center position of the number 1 cylinder and to convert that data to pulse signals that are input to the ECM <M/T> or PCM <A/T>.
- When the engine is running, the camshaft position sensor outputs a pulse signal.
- The ECM <M/T> or PCM <A/T> checks whether pulse signal is input while the engine is cranking.

DTC SET CONDITIONS

Check Conditions

- Engine speed is higher than 50 r/min.

Judgment Criteria

- Camshaft position sensor output voltage has not changed (no pulse signal is input) for 2 seconds.

Check Conditions

- Engine speed is higher than 50 r/min.

Judgment Criteria

- Normal signal pattern has not been input for cylinder identification from the crankshaft position sensor signal and camshaft position sensor signal for 2 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Camshaft position sensor failed.
- Open or shorted camshaft position sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tool:

- MB991348: Test Harmess Set

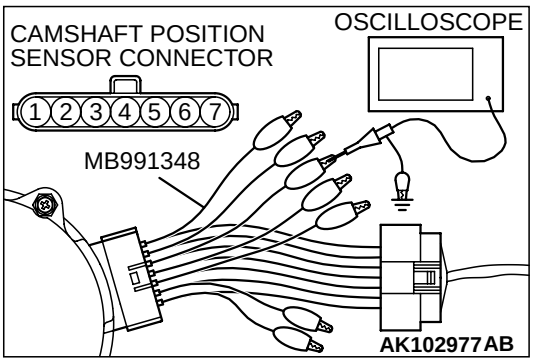
STEP 1. Using the oscilloscope, check the camshaft position sensor.

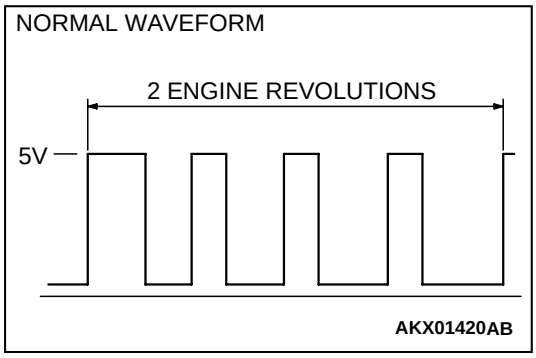
(1) Disconnect the camshaft position sensor connector B-22, and connect test harness special tool (MB991348) in between. (All terminals should be connected.)

(2) Connect the oscilloscope probe to the camshaft position sensor side connector terminal 5.

NOTE: When measuring with the ECM or PCM side connector, connect an oscilloscope probe to terminal 50 <M/T> or terminal 56 <A/T>.

(3) Start the engine and run at idle.





(4) Check the waveform.
- The waveform should show a pattern similar to the illustration.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

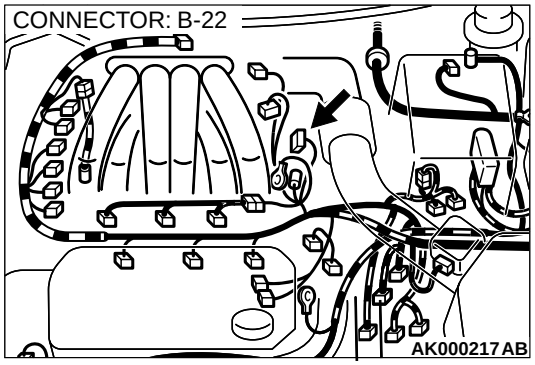
Q: Is the waveform normal?

YES : Go to Step 2.
NO : Go to Step 4.

STEP 2. Check connector B-22 at camshaft position sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.



STEP 3. Check the trouble symptoms.

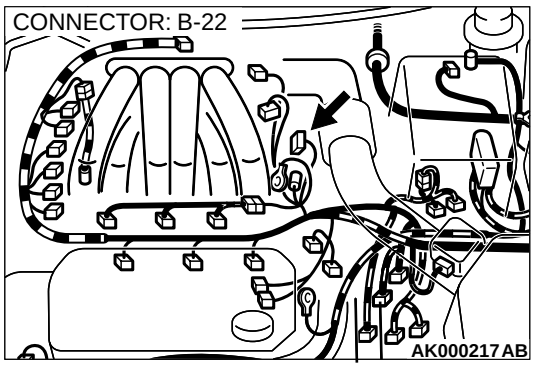
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13B-6.

(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0340 is output?

YES : Replace the ECM or PCM. Then go to Step 20.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

TSB Revision

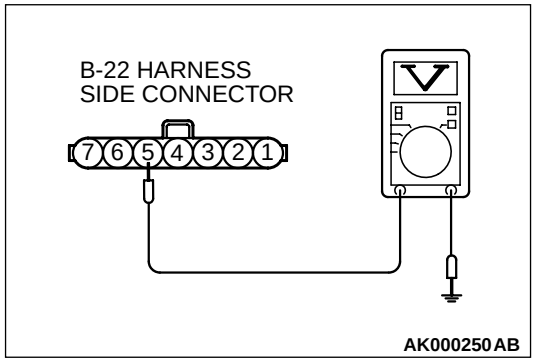


STEP 4. Check connector B-22 at camshaft position sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.



STEP 5. Check the sensor supply voltage at camshaft position sensor connector B-22.

(1) Disconnect the connector B-22 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 5 and ground.
- Voltage should be between 4.8 and 5.2 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 10.

NO : Go to Step 6.

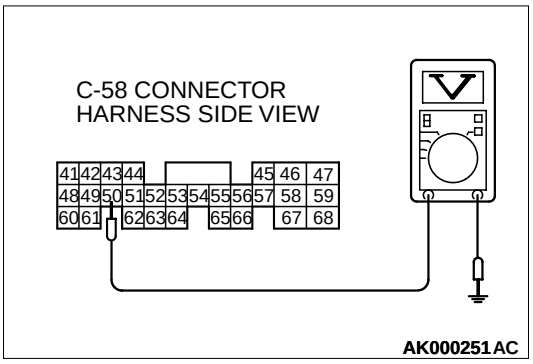
STEP 6. Check the sensor supply voltage at ECM connector C-58 <M/T> or PCM connector C-55 <A/T> by backprobing.

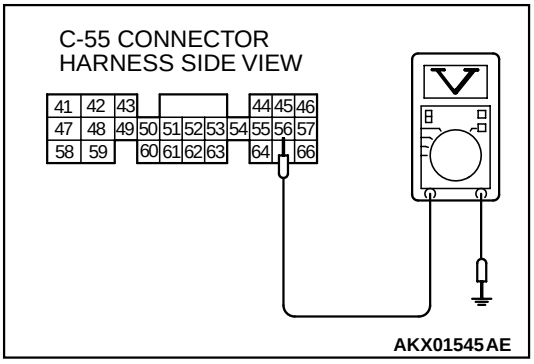
(1) Do not disconnect the ECM connector C-58 <M/T> or PCM connector C-55 <A/T>.
(2) Disconnect the camshaft position sensor connector B-22.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the voltage between terminal 50 <M/T> or 56 <A/T> and ground by backprobing.
- Voltage should be between 4.8 and 5.2 volts.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 7.
NO : Go to Step 8.

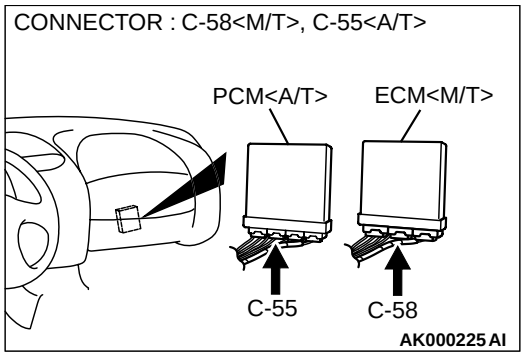


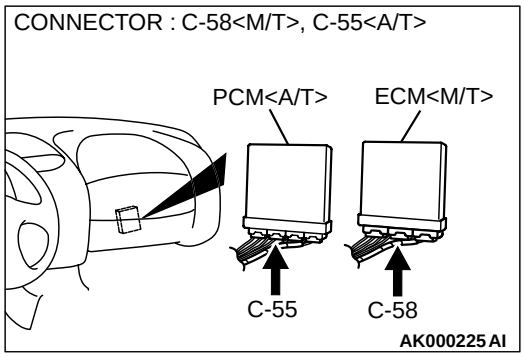


STEP 7. Check connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between camshaft position sensor connector B-22 terminal 5 and ECM connector C-58 terminal 50 <M/T> or PCM connector C-55 terminal 56 <A/T> because of open circuit. Then go to Step 20.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.



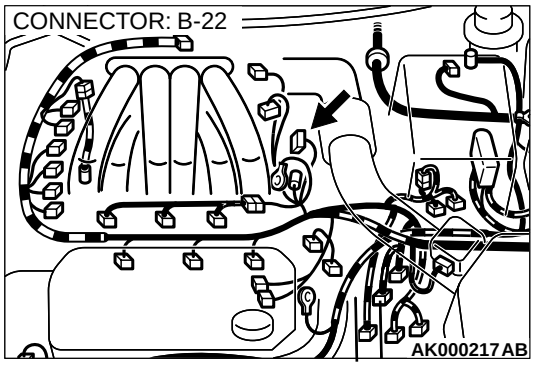


STEP 8. Check connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

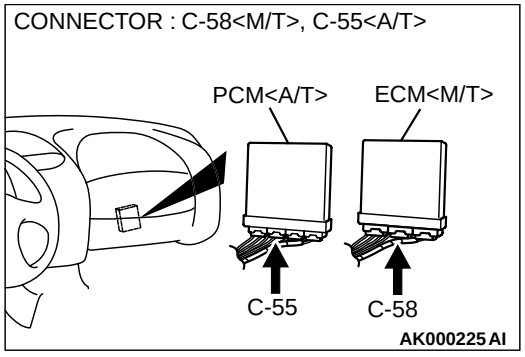


STEP 9. Check for short circuit to ground between camshaft position sensor connector B-22 terminal 5 and ECM connector C-58 terminal 50 <M/T> or PCM connector C-55 terminal 56 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 20.

NO : Repair it. Then go to Step 20.



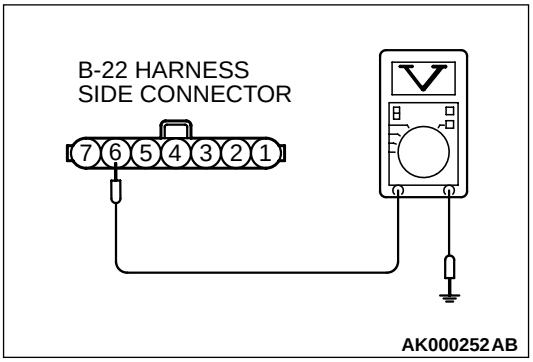
STEP 10. Check the power supply voltage at camshaft position sensor connector B-22.

(1) Disconnect the connector B-22 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 6 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

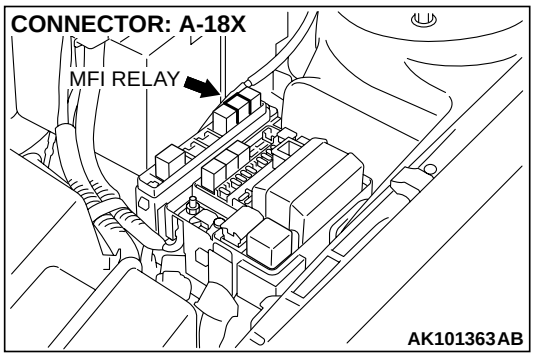
YES : Go to Step 12.
NO : Go to Step 11.



STEP 11. Check connector A-18X at MFI relay for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between MFI relay connector A-18X terminal 4 and camshaft position sensor connector B-22 terminal 6 because of open circuit or short circuit to ground. Then go to Step 20.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

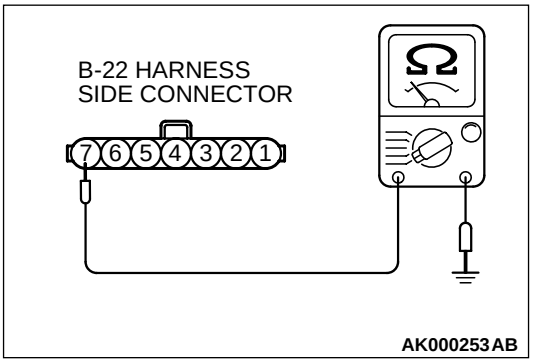


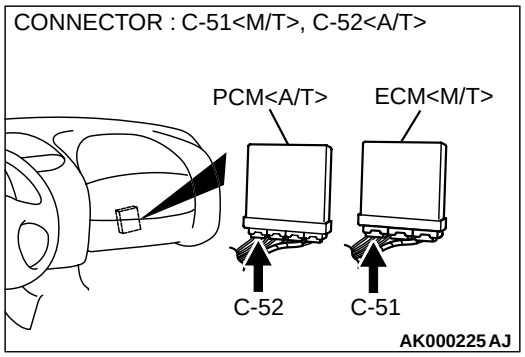
STEP 12. Check the continuity at camshaft position sensor connector B-22.

(1) Disconnect the connector B-22 and measure at the harness side.
(2) Check for the continuity between terminal 7 and ground.
- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 15.
NO : Go to Step 13.



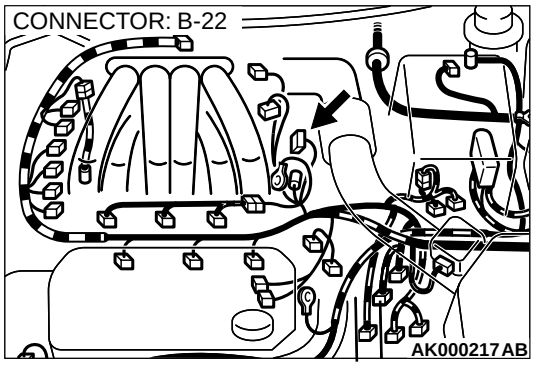


STEP 13. Check connector C-51 at ECM <M/T> or connector C-52 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

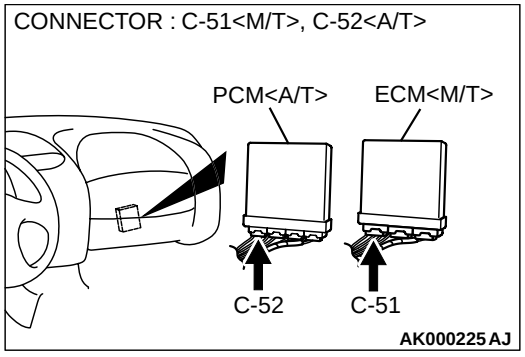


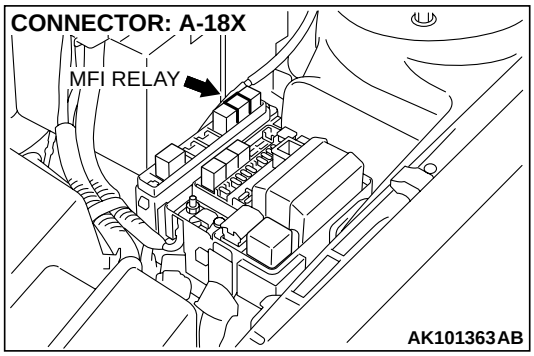
STEP 14. Check for open circuit and harness damage between camshaft position sensor connector B-22 terminal 7 and ECM connector C-51 terminal 34 <M/T> or PCM connector C-52 terminal 16 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 20.

NO : Repair it. Then go to Step 20.



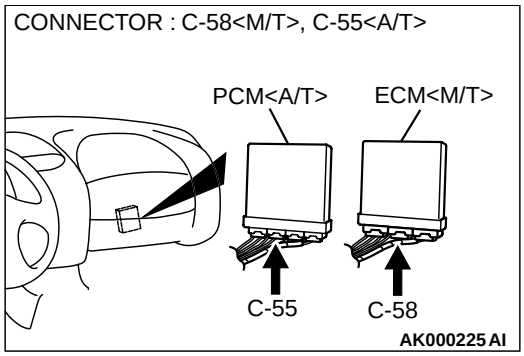


STEP 15. Check connector A-18X at the MFI relay for damage.

Q: Is the connector in good condition?

YES : Go to Step 16.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

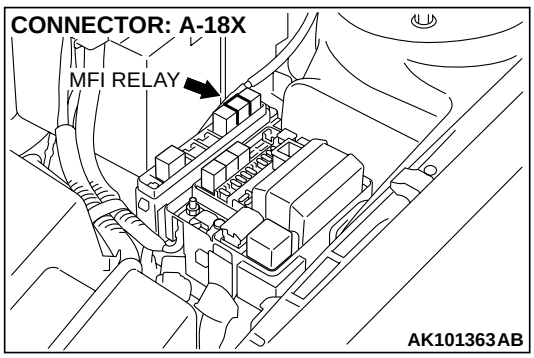


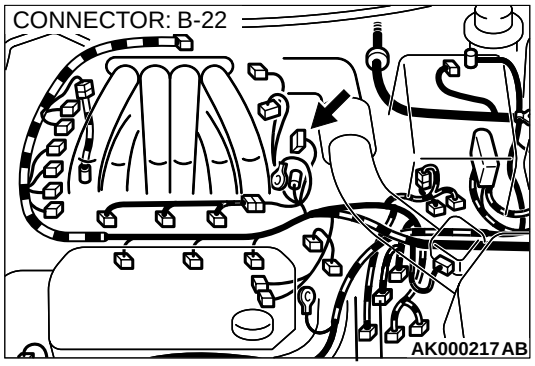
STEP 16. Check connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 17.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.



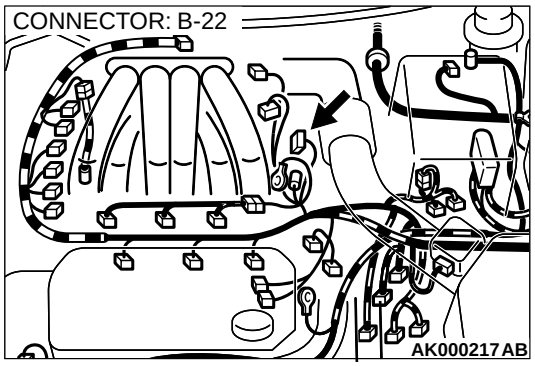


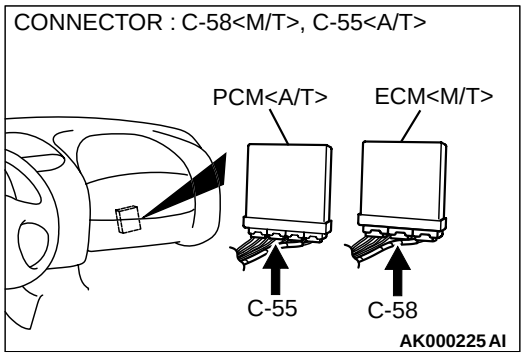
STEP 17. Check for harness damage between MFI relay connector A-18X terminal 4 and camshaft position sensor connector B-22 terminal 6.

Q: Is the harness wire in good condition?

YES : Go to Step 18.

NO : Repair it. Then go to Step 20.





STEP 18. Check for harness damage between camshaft position sensor connector B-22 terminal 5 and ECM connector C-58 terminal 50 <M/T> or PCM connector C-55 terminal 56 <A/T>.

Q: Is the harness wire in good condition?

YES : Go to Step 19.
NO : Repair it. Then go to Step 20.

STEP 19. Check the distributor installation.

Q: Is the distributor installation in a good condition?

YES : Replace the distributor. Then go to Step 20.
NO : Repair it. Then go to Step 20.

STEP 20. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0340 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0401: Exhaust Gas Recirculation Flow Insufficient Detected

TECHNICAL DESCRIPTION

- When the EGR solenoid switches from "OFF" to "ON" while the engine is running, EGR gas flows.
- The ECM <M/T> or PCM <A/T> checks how the EGR gas flow signal changes.

DTC SET CONDITIONS

Check Conditions

- At least 20 seconds have passed since the last monitor was complete.
- Engine coolant temperature is higher than 76°C (169°F).
- Engine speed is at between 1,000 and 1,650 <M/T> or 910 and 1,650 <A/T> r/min.

TSB Revision

- Intake air temperature is higher than 0°C (32°F).
- Barometric pressure is higher than 76 kPa (11 psi).
- Vehicle speed is 1.5 km/h (0.9 mph) <M/T> or 30 km/h (18.7 mph) <A/T> or more.
- At least 90 seconds have passed since manifold differential pressure sensor output voltage fluctuated 1.5 volts or more.
- The throttle valve is closed.
- Volumetric efficiency is lower than 18 <M/T> or 28 <A/T> percent.
- While fuel is being shut off. <M/T>
- The ECM <M/T> or PCM <A/T> monitors for this condition for 3 cycles of 2 seconds each during the drive cycle.

Judgement Criteria

- When intake manifold pressure fluctuations width is lower than 2.6 kPa (0.38 psi). When the EGR solenoid is turned ON.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- EGR valve does not open.
- EGR control vacuum is too low.
- EGR solenoid failed.
- Open or shorted EGR solenoid circuit, or loose connector.
- Manifold differential pressure sensor failed.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Check the EGR system.

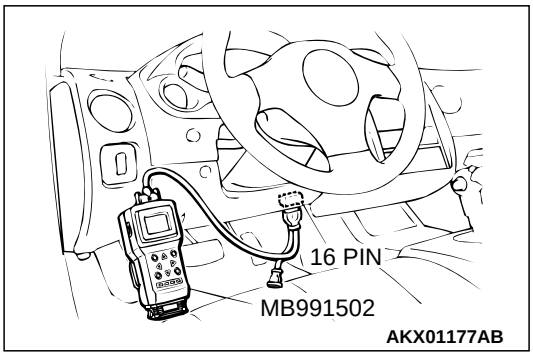
Refer to GROUP 17, Emission Control System – Exhaust Gas Recirculation (EGR) System – EGR System Check P.00-6.

Q: Are there any abnormalities?

YES : Go to Step 2.
NO : Repair it. Then go to Step 3.

STEP 2. Using scan tool MB991502, check data list item 95: Manifold Differential Pressure Sensor.

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.



(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 95, Manifold Differential Pressure Sensor.
(4) Warm up the engine to normal operating temperature: 80°C to 96°C (176°F to 205°F).
    - Should be between 62 – 76 kPa at engine idling.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Clean the EGR valve and EGR passage. Then go to Step 3.
NO : Refer to, DTC P1400 – Manifold Differential Pressure Sensor Circuit Malfunction P.00E-2.

STEP 3. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 5 – Exhaust Gas Recirculation (EGR) System Monitor P.00E-2.

(2) Check the diagnostic trouble code (DTC).

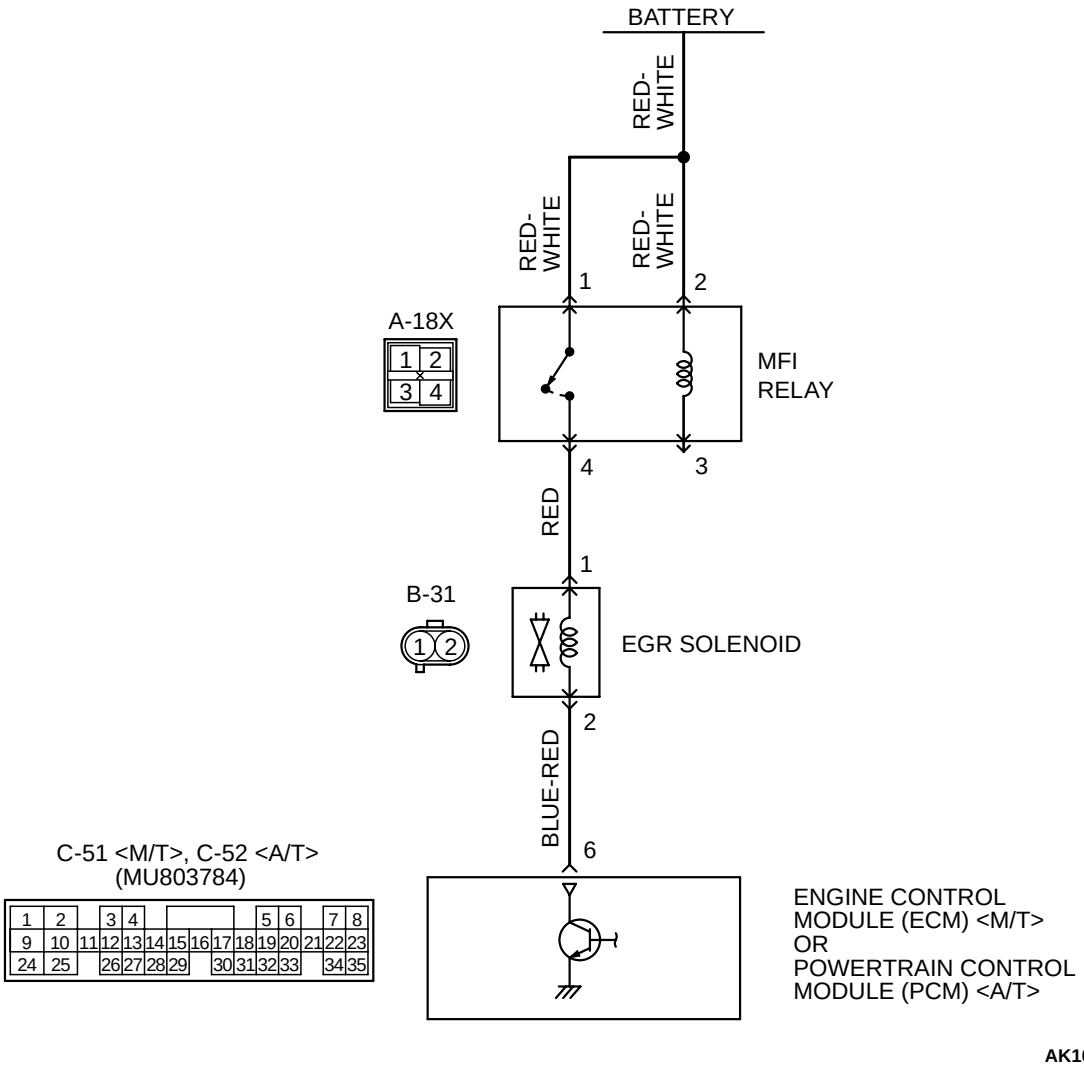
Q: Is the DTC P0401 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0403: Exhaust Gas Recirculation Control Circuit

EGR Solenoid Circuit



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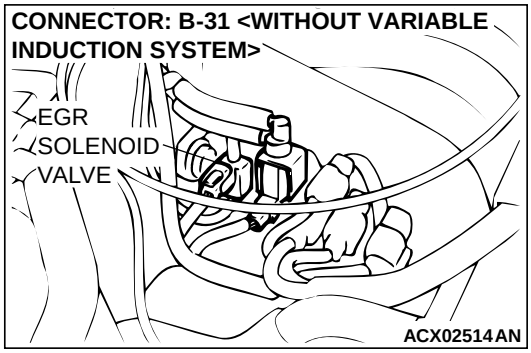
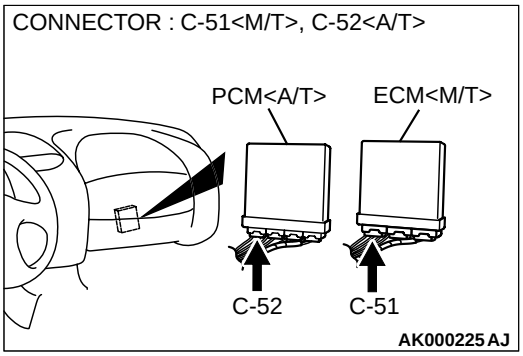
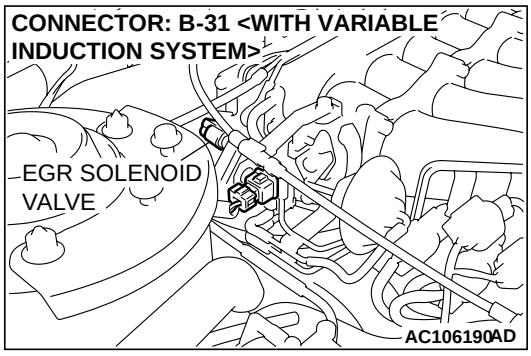
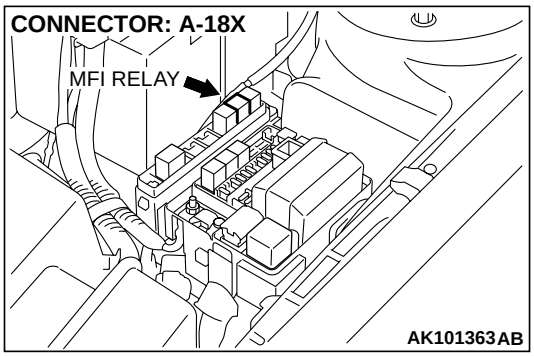








CIRCUIT OPERATION
- The EGR solenoid power is supplied from the MFI relay (terminal 4).
- The ECM <M/T> or PCM <A/T> controls the EGR solenoid ground by turning the power transistor in the ECM <M/T> or PCM <A/T> "ON" and "OFF".

TECHNICAL DESCRIPTION
- To judge if there is open circuit in the EGR solenoid drive circuit, ECM <M/T> or PCM <A/T> measures the surge voltage of the EGR solenoid coil.
- The ECM <M/T> or PCM <A/T> drives the EGR solenoid. After the solenoid is turned off, the ECM <M/T> or PCM <A/T> will check if the solenoid coil produces a surge voltage of 2 V or more.

DTC SET CONDITIONS

Check Conditions
- Engine is being cranked.
- Battery positive voltage is at between 10 and 16 volts.

Judgment Criteria
- The EGR solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 0.2 second.
- The ECM <M/T> or PCM <A/T> monitors for this condition once during the drive cycle.

Check Conditions
- Battery positive voltage is at between 10 and 16 volts.
- ON duty cycle of the EGR solenoid is between 10 and 90 percent.
- ON duty cycle of the evaporative emission purge solenoid is 0 percent.
- Evaporative emission ventilation solenoid is OFF.
- More than 1 second has elapsed after the above mentioned conditions have been met.

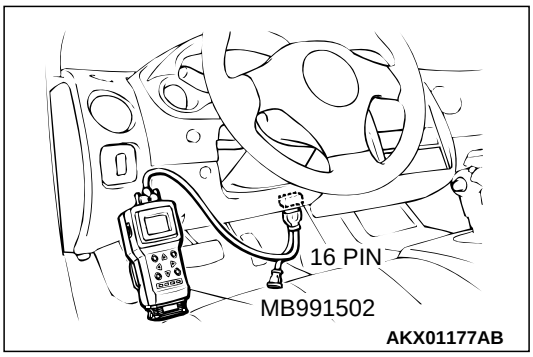
Judgment Criteria
- The EGR solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 1 second. When the EGR solenoid is turned OFF.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- EGR solenoid failed.
- Open or shorted EGR solenoid circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)

TSB Revision



STEP 1. Using scan tool MB991502, check actuator test item 10: EGR solenoid.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

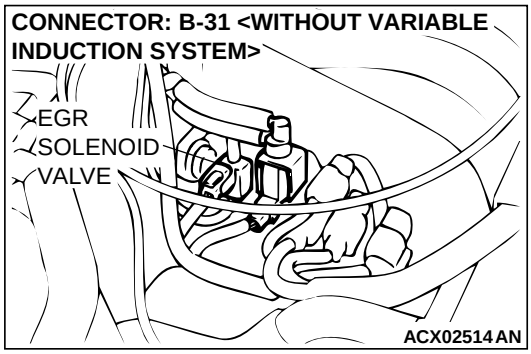
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the actuator test mode for item 10, EGR solenoid.
- An operation sound should be heard and vibration should be felt when the EGR solenoid is operated.

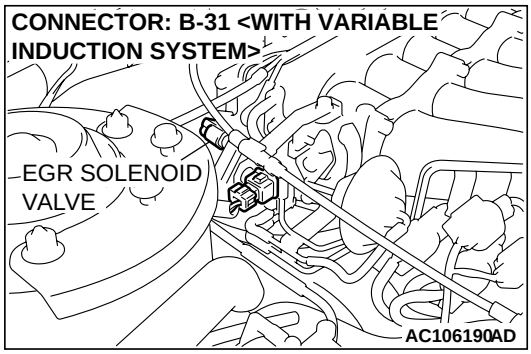
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the solenoid operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

NO : Go to Step 2.





STEP 2. Check connector B-31 at the EGR solenoid for damage.

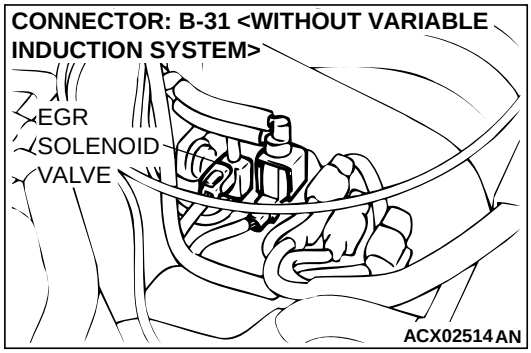
Q: Is the connector in good condition?

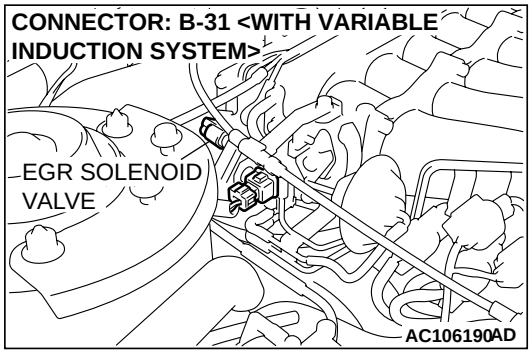
YES : Go to Step 3.

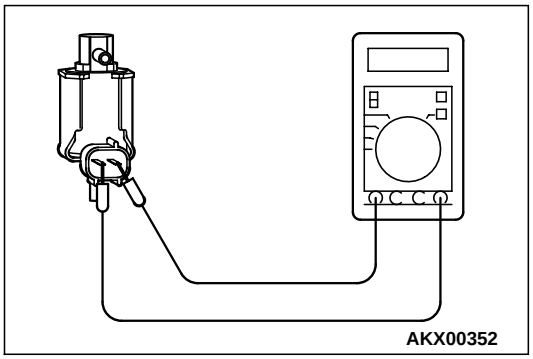
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 3 Check the EGR solenoid.

(1) Disconnect the EGR solenoid connector B-31.







(2) Measure the resistance between EGR solenoid side connector terminal 1 and 2.

Standard value: 29 – 35 Ω [at 20°C (68°F)]

Q: Is the resistance at the standard value?

YES : Go to Step 4.

NO : Replace the EGR solenoid. Then go to Step 12.

STEP 4. Check the power supply voltage at EGR solenoid harness side connector B-31.

(1) Disconnect the connector B-31 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between terminal 1 and ground.

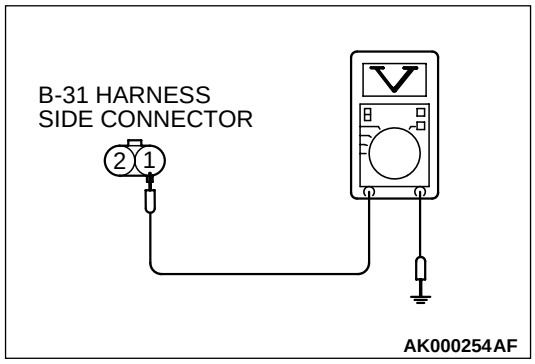
- Voltage should be battery positive voltage.

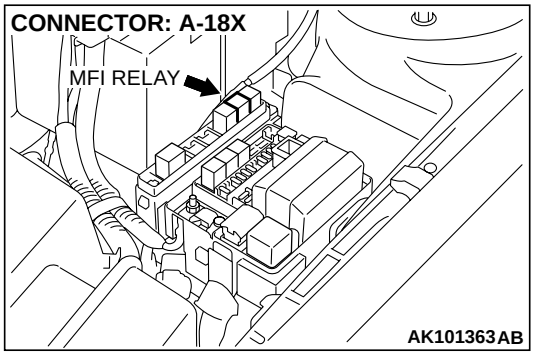
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 6.

NO : Go to Step 5.



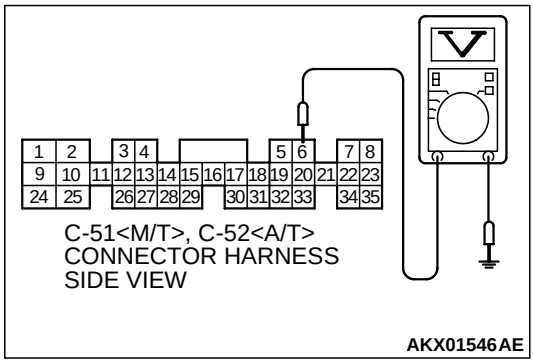


STEP 5. Check connector A-18X at MFI relay for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between MFI relay connector A-18X terminal 4 and EGR solenoid connector B-31 terminal 1 because of open circuit or short circuit to ground. Then go to Step 12.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



STEP 6. Check the power supply voltage at ECM connector C-51 <M/T> or PCM connector C-52 <A/T> by backprobing.

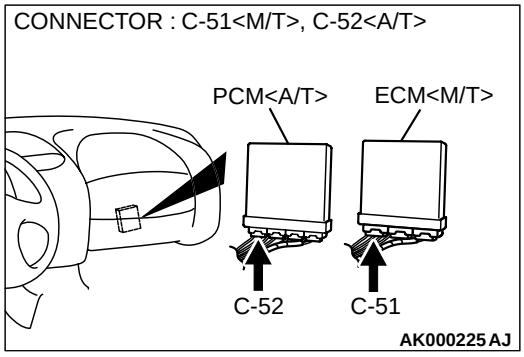
(1) Do not disconnect the connector C-51 <M/T> or C-52 <A/T>.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 6 and ground by backprobing.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 9.

NO : Go to Step 7.



STEP 7. Check connector C-51 at ECM <M/T> or connector C-52 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 8.

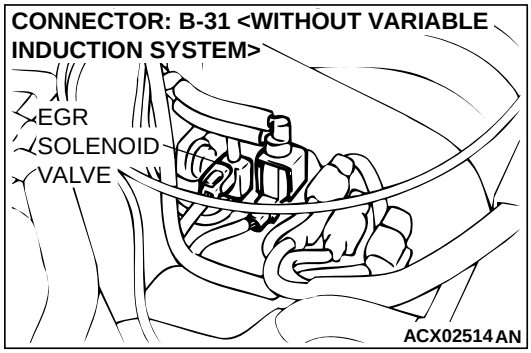
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

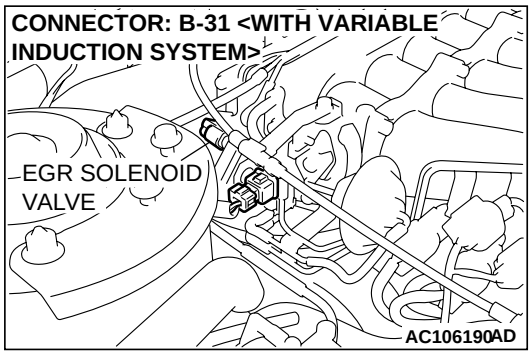
STEP 8. Check for open circuit and short circuit to ground between EGR solenoid connector B-31 terminal 2 and ECM connector C-51 terminal 6 <M/T> or PCM connector C-52 terminal 6 <A/T>.

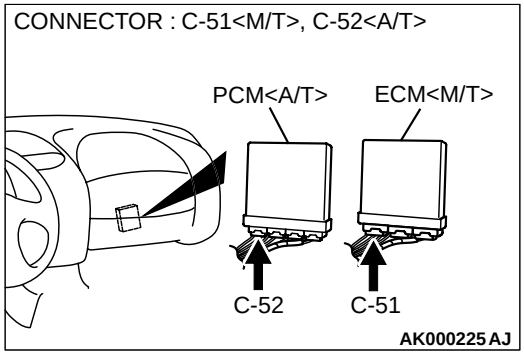
Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 12.

NO : Repair it. Then go to Step 12.





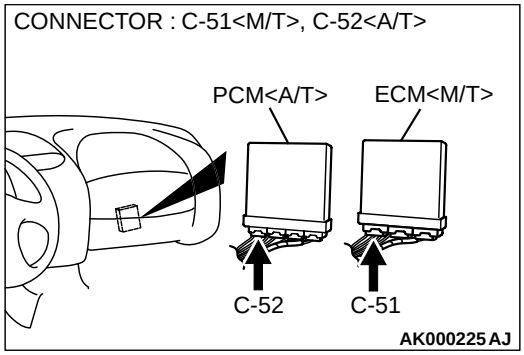


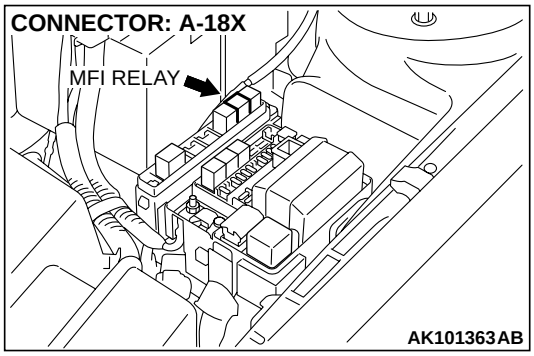
STEP 9. Check connector C-51 at ECM <M/T> or connector C-52 at PCM <A/T> for damage.

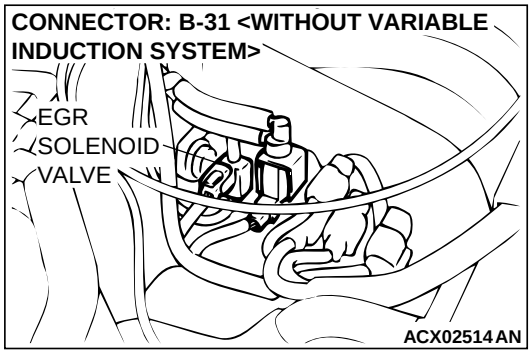
Q: Is the connector in good condition?

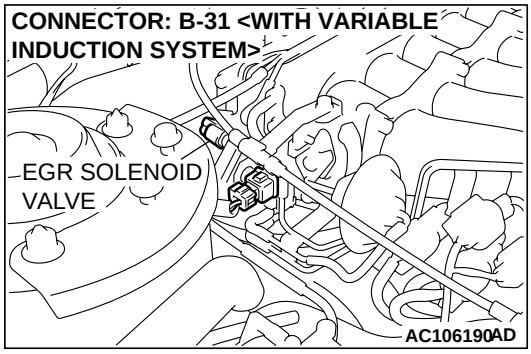
YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.









STEP 10. Check for harness damage between MFI relay connector A-18X terminal 4 and EGR solenoid connector B-31 terminal 1.

Q: Is the harness wire in good condition?

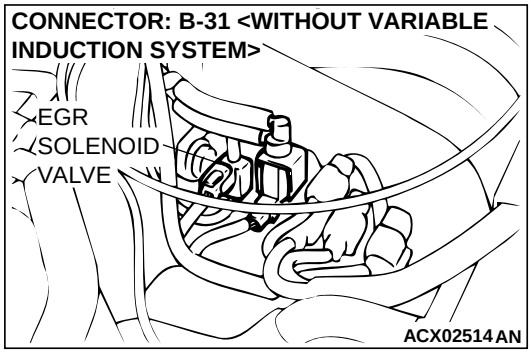
YES : Go to Step 11.

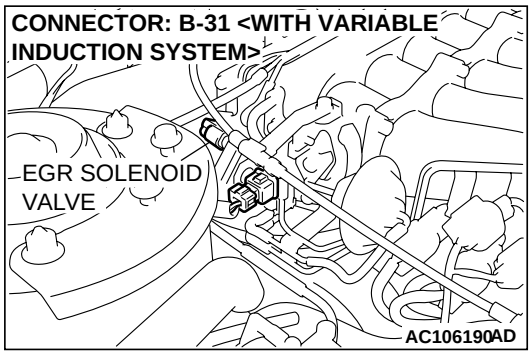
NO : Repair it. Then go to Step 12.

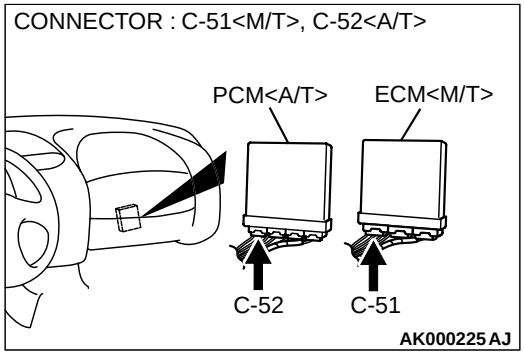
STEP 11. Check for harness damage between EGR solenoid connector B-31 terminal 2 and ECM connector C-51 terminal 6 <M/T> or PCM connector C-52 terminal 6 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 12.
NO : Repair it. Then go to Step 12.







STEP 12. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0403 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0421: Warm Up Catalyst Efficiency Below Threshold (bank 1)

TECHNICAL DESCRIPTION

- The signal from the rear heated oxygen sensor differs from the front heated oxygen sensor. That is because the catalytic converter purifies exhaust gas. When the catalytic converter has deteriorated, the signal from the front heated oxygen sensor becomes similar to the rear heated oxygen sensor.
- The ECM <M/T> or PCM <A/T> compares the output of the front and rear heated oxygen sensor signals.

DTC SET CONDITIONS

Check Conditions

- Engine speed is lower than 3,000 r/min.
- The throttle valve is open.
- Volume air flow sensor output frequency is between 69 and 169 Hz.
- More than 3 seconds have elapsed after the abovementioned three conditions have been met.
- Intake air temperature is higher than −10°C (14°F).
- Barometric pressure is higher than 76 kPa (11 psi).
- Under the closed loop air/fuel ratio control.
- Vehicle speed is 1.5 km/h (0.93 mph) or more.
- The ECM <M/T> or PCM <A/T> monitors for this condition for 7 cycles of 12 second each during the drive cycle.
- Short-term fuel trim is higher than −30 percent and lower than +25 percent.
- The cumulative volume air flow sensor output frequency is higher than 4,000 Hz.

Judgment Criteria

- The right bank heated oxygen sensor (rear) signal frequency divided by right bank heated oxygen sensor (front) signal frequency = 0.8 or more.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Right bank side catalytic converter deteriorated.
- Right bank heated oxygen sensor failed.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

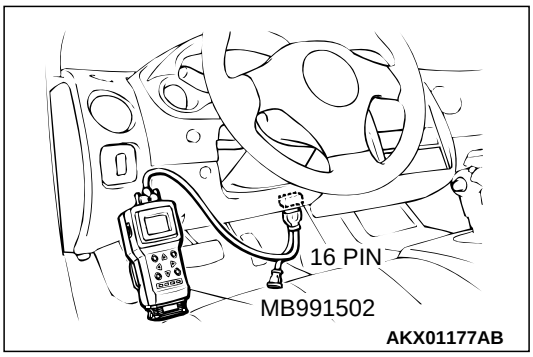
Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Check the exhaust leaks.

Q: Are there any abnormalities?

YES : Go to Step 2.
NO : Repair it. Then go to Step 7.



STEP 2. Using scan tool MB991502, check data list item 69: Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

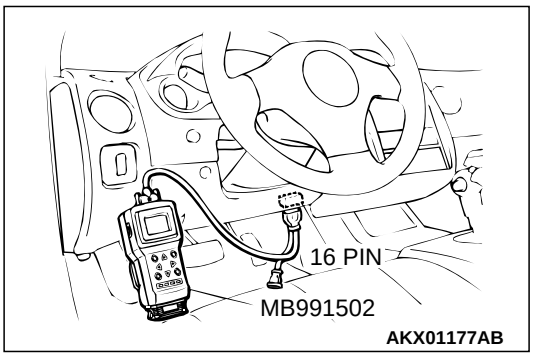
(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 69, Heated Oxygen Sensor Bank 1, Sensor 2 (right rear).
- Warming up the engine. When the engine is revved, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 3.

NO : Refer to DTC P0136 – Heated Oxygen Sensor Circuit (bank 1, sensor 2) P.13B-156, DTC P0137 – Heated Oxygen Sensor Circuit Low Voltage (bank 1, sensor 2) P.13B-166, DTC P0138 – Heated Oxygen Sensor Circuit High Voltage (bank 1, sensor 2) P.13B-171, DTC P0139 – Heated Oxygen Sensor Circuit Slow Response (bank 1, sensor 2) P.13B-174.



STEP 3. Using scan tool MB991502, check data list item 39: Heated Oxygen Sensor Bank 1, Sensor 1 (right front).

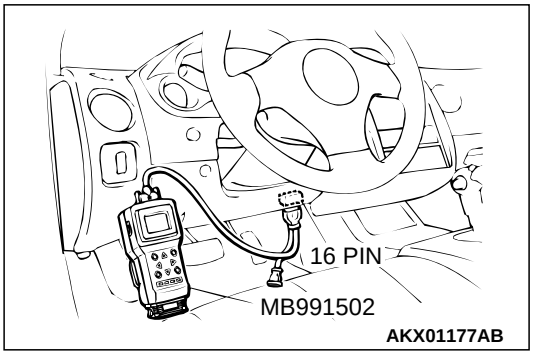
(1) Start the engine and run at idle.
(2) Set scan tool MB991502 to the data reading mode for item 39, Heated Oxygen Sensor Bank 1, Sensor 1 (right front).
- Warming up the engine. When the engine is revved, the output voltage should be 0.6 to 1.0 volt.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 4.

NO : Refer to DTC P0130 – Heated Oxygen Sensor Circuit (bank 1, sensor 1) P.13B-122, DTC P0131 – Heated Oxygen Sensor Circuit Low Voltage (bank 1, sensor 1) P.13B-132, DTC P0133 – Heated Oxygen Sensor Circuit Slow Response (bank 1, sensor 1) P.13B-140, DTC P0134 – Heated Oxygen Sensor No Activity Detected (bank 1, sensor 1) P.13B-143 .



STEP 4. Using scan tool MB991502, check data list item 39: Heated Oxygen Sensor Bank 1, Sensor 1 (right front).

(1) Start the engine and run at idle.
(2) Set scan tool MB991502 to the data reading mode for item 39, Heated Oxygen Sensor Bank 1, Sensor 1 (right front).
(3) Keep the engine speed at 2,000 r/min.
- 0 – 0.4 and 0.6 – 1.0 volt should alternate 15 times or more within 10 seconds.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 5.
NO : Replace the right bank heated oxygen sensor (front). Then go to Step 7.

STEP 5. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 3 – Catalytic Converter Monitor P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0421 is output?

YES : Replace the right bank side catalytic converter. Then go to Step 6.
NO : The inspection is complete.

STEP 6. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 3 – Catalytic Converter Monitor P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0421 is output?

YES : Replace the ECM or PCM. Then go to Step 7.
NO : The inspection is complete.

STEP 7. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 3 – Catalytic Converter Monitor P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0421 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0431: Warm Up Catalyst Efficiency Below Threshold (bank 2)

TECHNICAL DESCRIPTION

- The signal from the rear heated oxygen sensor differs from the front heated oxygen sensor. That is because the catalytic converter purifies exhaust gas. When the catalytic converter has deteriorated, the signal from the front heated oxygen sensor becomes similar to the rear heated oxygen sensor.
- The ECM <M/T> or PCM <A/T> compares the output of the front and rear heated oxygen sensor signals.

DTC SET CONDITIONS

Check Conditions

- Engine speed is lower than 3,000 r/min.
- The throttle valve is open.

TSB Revision

- Volume air flow sensor output frequency is between 69 and 169 Hz.
- More than 3 seconds have elapsed after the abovementioned three conditions have been met.
- Intake air temperature is higher than –10°C (14°F).
- Barometric pressure is higher than 76 kPa (11 psi).
- Under the closed loop air/fuel ratio control.
- Vehicle speed is 1.5 km/h (0.93 mph) or more.
- The ECM <M/T> or PCM <A/T> monitors for this condition for 7 cycles of 12 second each during the drive cycle.
- Short-term fuel trim is higher than –30 percent and lower than +25 percent.
- The cumulative volume air flow sensor output frequency is higher than 4,000 Hz.

Judgment Criteria

- The left bank heated oxygen sensor (rear) signal frequency divided by left bank heated oxygen sensor (front) signal frequency = 0.8 or more.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Left bank side catalytic converter deteriorated.
- Left bank heated oxygen sensor failed.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

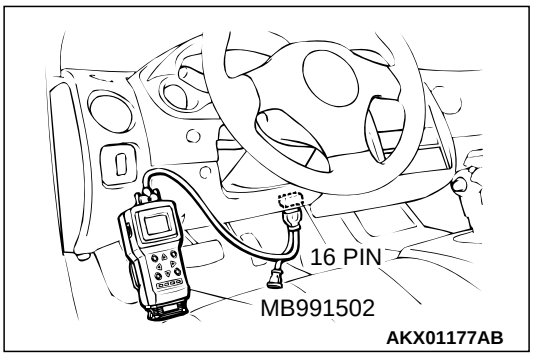
STEP 1. Check the exhaust leaks.

Q: Are there any abnormalities?

YES : Go to Step 2.
NO : Repair it. Then go to Step 7.

STEP 2. Using scan tool MB991502, check data list item 59: Heated Oxygen Sensor Bank 2, Sensor 2 (left rear).

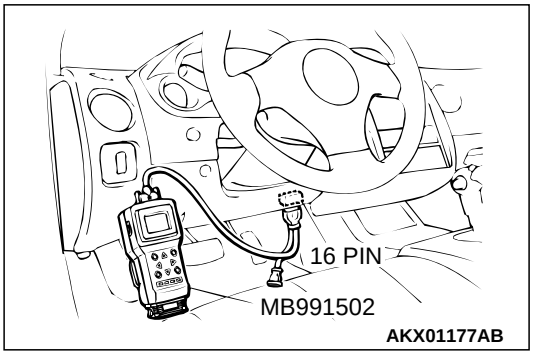
⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.



(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 59, Heated Oxygen Sensor Bank 2, Sensor 2 (left rear).
  - Warming up the engine. When the engine is revved, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 3.
NO : Refer to DTC P0156 – Heated Oxygen Sensor Circuit (bank 2, sensor 2) P.13B-218, DTC P0157 – Heated Oxygen Sensor Circuit Low Voltage (bank 2, sensor 2) P.13B-228, DTC P0158 – Heated Oxygen Sensor Circuit High Voltage (bank 2, sensor 2) P.13B-233, DTC P0159 – Heated Oxygen Sensor Circuit Slow Response (bank 2, sensor 2) P.13B-236.



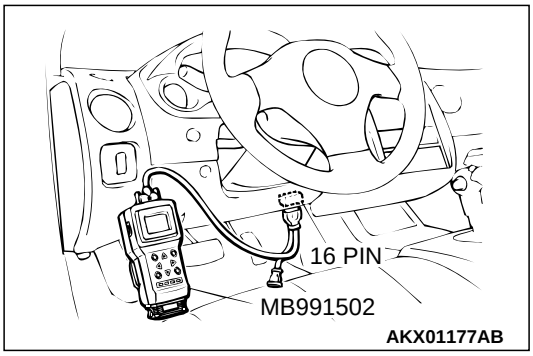
STEP 3. Using scan tool MB991502, check data list item 11: Heated Oxygen Sensor Bank 2, Sensor 1 (left front).

(1) Start the engine and run at idle.
(2) Set scan tool MB991502 to the data reading mode for item 11, Heated Oxygen Sensor Bank 2, Sensor 1 (left front).
- Warming up the engine. When the engine is revved, the output voltage should be 0.6 to 1.0 volt.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 4.
NO : Refer to DTC P0150 – Heated Oxygen Sensor Circuit (bank 2, sensor 1) P.13B-184, DTC P0151 – Heated Oxygen Sensor Circuit Low Voltage (bank 2, sensor 1) P.13B-194, DTC P0152 – Heated Oxygen Sensor Circuit High Voltage (bank 2, sensor 1) P.13B-199, DTC P0153 – Heated Oxygen Sensor Circuit Slow Response (bank 2, sensor 1) P.13B-202, DTC P0154 – Heated Oxygen Sensor No Activity Detected (bank 2, sensor 1) P.13B-205 .



STEP 4. Using scan tool MB991502, check data list item 11: Heated Oxygen Sensor Bank 2, Sensor 1 (left front).

(1) Start the engine and run at idle.
(2) Set scan tool MB991502 to the data reading mode for item 11, Heated Oxygen Sensor Bank 2, Sensor 1 (left front).
(3) Keep the engine speed at 2,000 r/min.
- 0 – 0.4 and 0.6 – 1.0 volt should alternate 15 times or more within 10 seconds.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 5.
NO : Replace the left bank heated oxygen sensor (front). Then go to Step 7.

STEP 5. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 3 – Catalytic Converter Monitor P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0431 is output?

YES : Replace the left bank side catalytic converter. Then go to Step 6.
NO : The inspection is complete.

STEP 6. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 3 – Catalytic Converter Monitor P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0431 is output?

YES : Replace the ECM or PCM. Then go to Step 7.
NO : The inspection is complete.

TSB Revision

STEP 7. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 3 – Catalytic Converter Monitor P.13B-6.

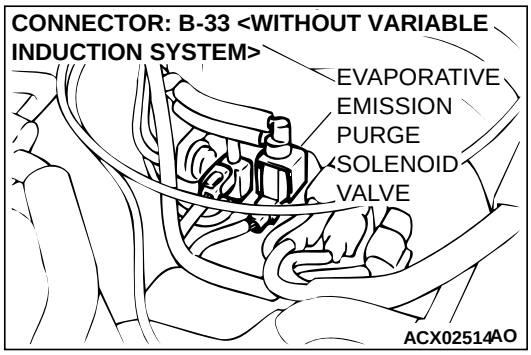
(2) Check the diagnostic trouble code (DTC).

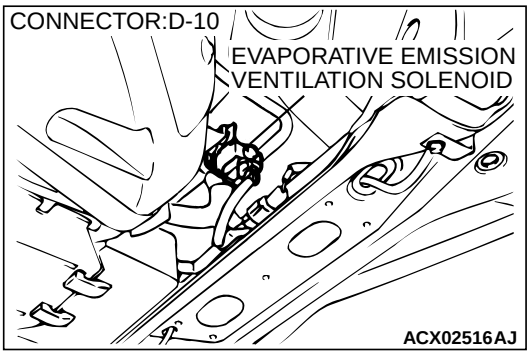
Q: Is the DTC P0431 is output?

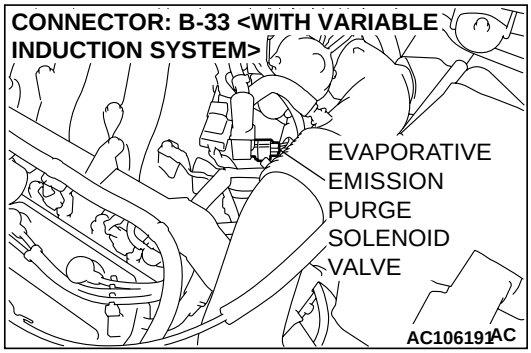
YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0441: Evaporative Emission Control System Incorrect Purge Flow







TECHNICAL DESCRIPTION

- ECM <M/T> or PCM <A/T> detects stuck open of evaporative emission purge solenoid valve and stuck close of evaporative emission ventilation solenoid valve by pressure change in fuel tank.
- Stuck open of evaporative emission purge solenoid valve is judged through monitoring leak of evaporative emission control system.
- Stuck close of evaporative emission ventilation solenoid valve is judged after 20 seconds of end of monitoring leak of evaporative emission control system, or of usual operation of evaporative emission purge solenoid from ON to OFF.

DTC SET CONDITIONS

Check Conditions

- ON duty cycle of the evaporative emission purge solenoid is 0 percent.
- 20 seconds have elapsed from the time the duty cycle of the evaporative emission purge solenoid has turned to 0 percent.

Judgment Criteria

- The pressure in the fuel tank is –2 kPa (0.29 psi) or less for 0.1 second.

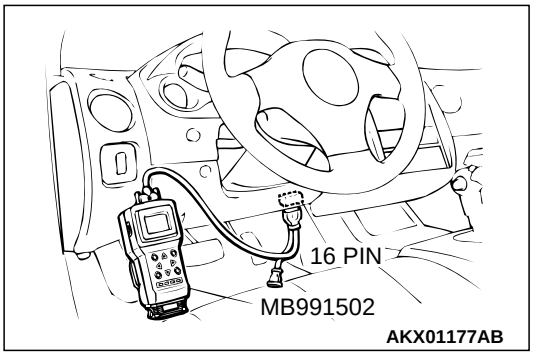
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Evaporative emission purge solenoid failed.
- Evaporative emission ventilation solenoid failed.
- Choking up of hose between evaporative emission canister and evaporative emission ventilation solenoid.

DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)

STEP1. Using scan tool MB991502, check actuator test item 08: Evaporative Emission Purge Solenoid.



⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

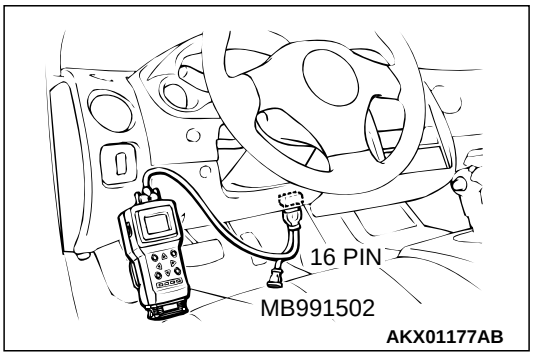
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the actuator test mode for item 08, Evaporative emission purge solenoid.
- An operation sound should be heard and vibration should be felt when the evaporative emission purge solenoid is operated.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the solenoid operating properly?

YES : Go to Step 2.
NO : Replace the evaporative emission purge solenoid. Then go to Step 4.

STEP 2. Using scan tool MB991502, check actuator test item 29: Evaporative Emission Ventilation Solenoid.



(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991502 to the actuator test mode for item 29, Evaporative emission ventilation solenoid.
- An operation sound should be heard and vibration should be felt when the evaporative emission ventilation solenoid is operated.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the solenoid operating properly?

YES : Go to Step 3.
NO : Replace the evaporative emission ventilation solenoid. Then go to Step 4.

STEP 3. Check for clogging in the vent hose and air filter

Q: Are there any clogs?

YES : Repair or replace it. Then go to Step 4.
NO : Refer to, DTC P0451 – Evaporative Emission Control System Pressure Sensor Range/Performance P.13B-383, DTC P0452 – Evaporative Emission Control System Pressure Sensor Low Input P.13B-400, DTC P0453 – Evaporative Emission Control System Pressure Sensor High Input P.13B-416.

STEP 4 Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 1 – Evaporative Emission Control System Leak Monitor P.13B-6.

(2) Read the diagnostic trouble code.

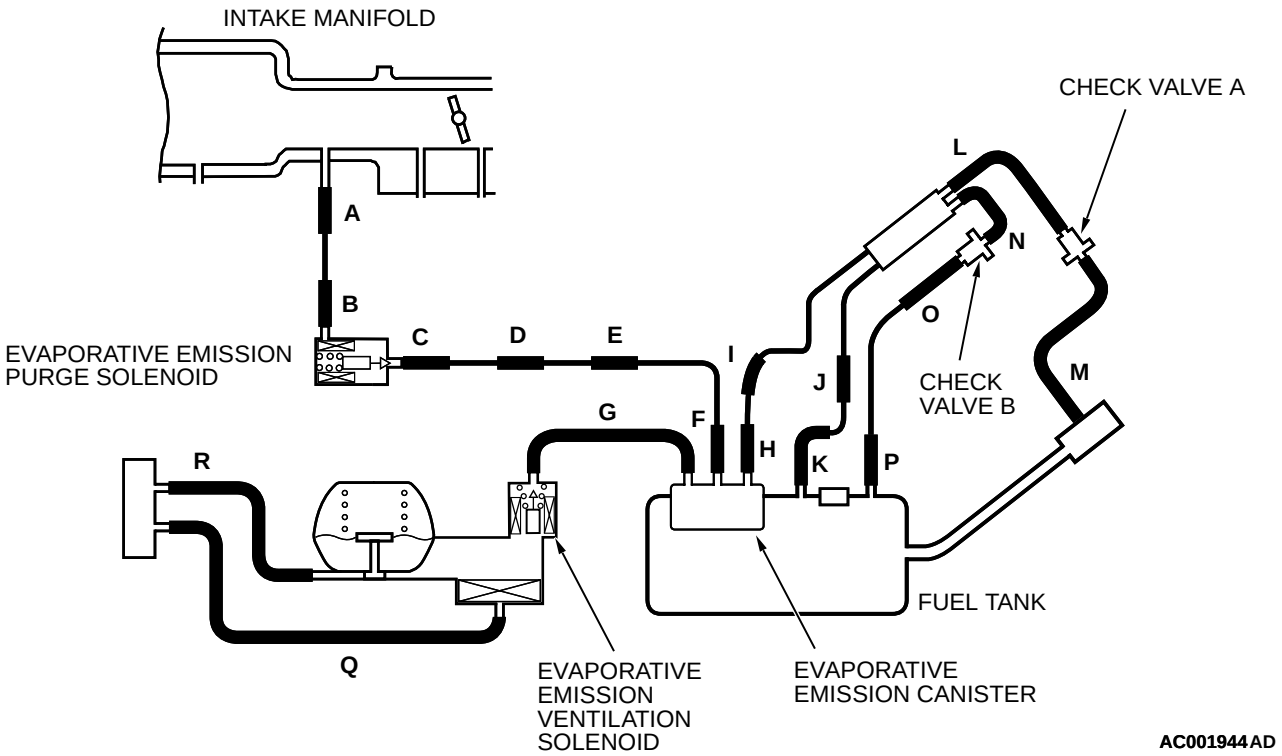
Q: Is diagnostic trouble code P0441 set?

YES : Retry the troubleshooting.

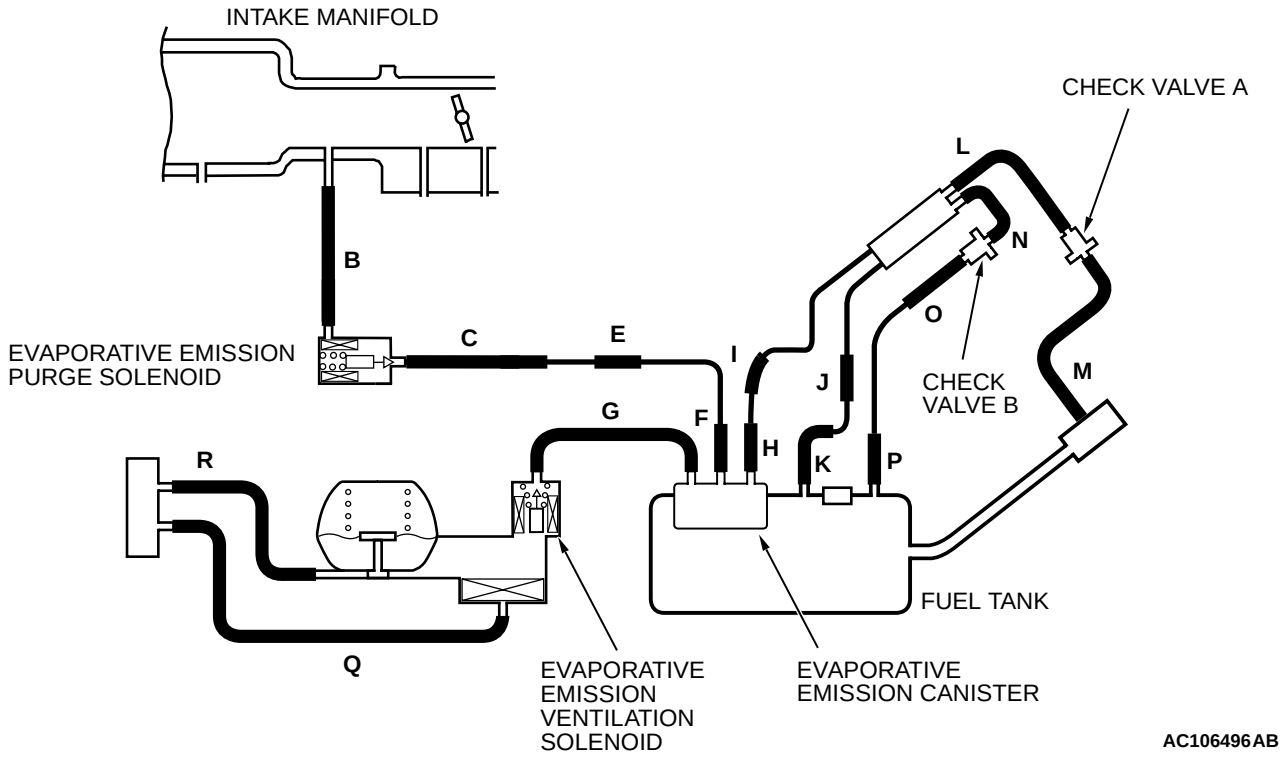
NO : This diagnosis is complete.

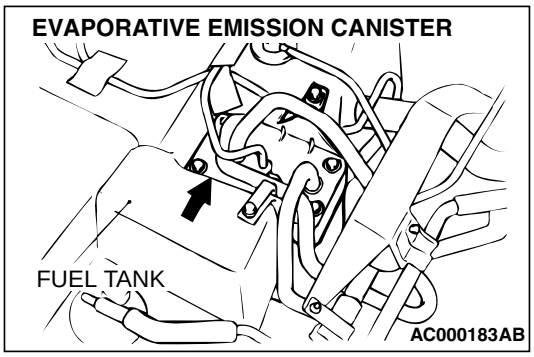
DTC P0442: Evaporative Emission Control System Leak Detected (Small Leak)

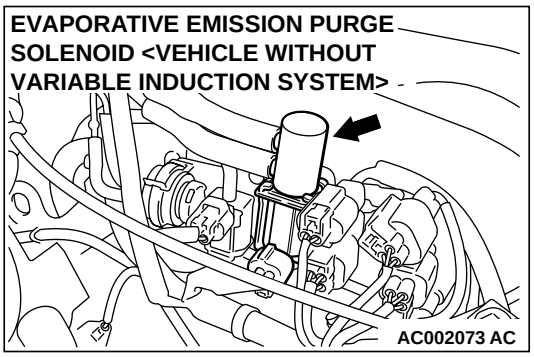
SYSTEM DIAGRAM <VEHICLE WITHOUT VARIABLE INDUCTION SYSTEM>

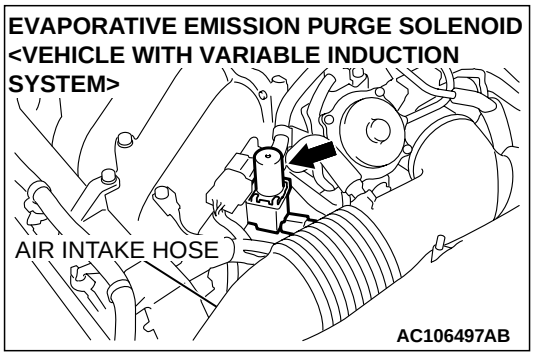


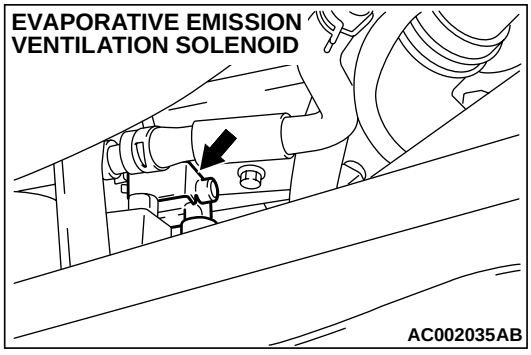
SYSTEM DIAGRAM <VEHICE WITH VARIABLE INDUCTION SYSTEM>











TECHNICAL DESCRIPTION

- To judge if there is leak in the fuel system, ECM <M/T> or PCM <A/T> measure the change of the pressure inside the fuel tank.
- The ECM <M/T> or PCM <A/T> turns on the evaporative emission ventilation solenoid to shot off the evaporative emission canister outlet port.
- Then the evaporative emission purge solenoid is driven to set the fuel system into a negative pressure.
- When the fuel system develops a vacuum of 2 kPa (0.29 psi), the evaporative emission purge solenoid is turned "OFF" and the fuel system vacuum is maintained at 2 kPa (0.29 psi).

TSB Revision

- The ECM <M/T> or PCM <A/T> determines if there is leak in the fuel system by measuring the change of vacuum inside the fuel tank.
- The test is stopped when fuel vapor pressure is judged as too high.

DTC SET CONDITIONS
Remaining fuel amount is 15 – 40 percent (fuel level sensor output voltage is 1.4 – 2.4 volts)

Test Conditions A: At Start up
- Intake air temperature is 36°C (97°F) or less when the engine is started.
- The engine coolant temperature 36°C (97°F) or less when the engine is started.

Test Conditions B: For Test to Run
- The fuel temperature is 36°C (97°F) or less.
- With in 800 seconds after the engine is started.
- Engine coolant temperature is higher than 60°C (140°F).
- Power steering pressure switch: "OFF"
- Barometric pressure is above 76 kPa (11 psi).
- Fuel tank differential pressure sensor output voltage is 1 to 4 volts.
- Vehicle speed is 20 km/h (12.4 mph) or more.

Test Conditions C: For Test to Stop
- Intake air temperature is less than –10°C (14°F).
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the pressure rises higher 451 Pa (0.065 psi).
- The pressure fluctuation width is higher than 647 Pa (0.094 psi).

Judgment Criteria
- Internal pressure of the fuel tank has changed more than 785 Pa (0.114 psi) in 20 seconds after the tank and vapor line were closed.

NOTE: The monitoring time depends on the fuel level and the temperature in the fuel tank (75 – 125 seconds).

DTC SET CONDITIONS
Remaining fuel amount is 40 – 85 percent (fuel level sensor output voltage is 2.4 – 3.7 volts)

Test Conditions A: At Start up
- Intake air temperature is 36°C (97°F) or less when the engine is started.
- The engine coolant temperature 36°C (97°F) or less when the engine is started.

Test Conditions B: For Test to Run
- The fuel temperature is 36°C (97°F) or less.
- Engine coolant temperature is less than 20°C (68°F).
- Barometric pressure is above 76 kPa (11 psi).
- Fuel tank differential pressure sensor output voltage is 1 to 4 volts.

Test Conditions C: For Test to Stop
- Intake air temperature is less than –10°C (14°F).
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the pressure rises higher 324 Pa (0.047 psi).

Judgment Criteria
- Internal pressure of the fuel tank has changed more than 1.9 kPa (0.28 psi) in 128 seconds after the tank and vapor line were closed.

NOTE: The monitoring time depends on the fuel level and the temperature in the fuel tank (10 – 14 minutes).

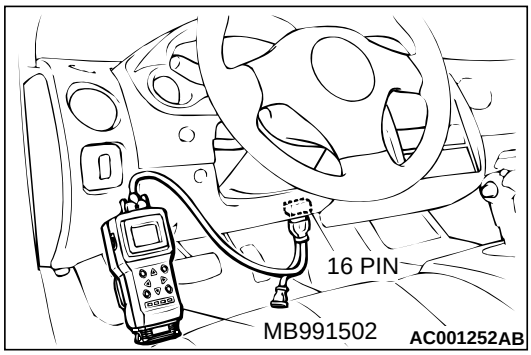
TROUBLESHOOTING HINTS

The most likely causes for this code to be set are:
- Loose fuel cap.
- Fuel cap relief pressure is incorrect.
- Evaporative emission canister seal is faulty.
- Fuel tank, purge line or vapor line seal failed.
- Evaporative emission ventilation solenoid failed.

OVERVIEW OF TROUBLESHOOTING
- To determine the cause of DTC P0442, a performance test is needed. The performance test uses a mechanical vacuum gauge and scan tool MB991502 set on the fuel tank differential pressure sensor (TANK PRES SNER 73.) The mechanical gauge reading is used to verify scan tool MB991502 reading. A comparison of the mechanical gauge to scan tool MB991502 determines the problem in the system.
- Prior to doing the performance test, several simple inspections are needed to exclude some possibilities of the symptom.

DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check evaporative emission system monitor test.

⚠ CAUTION

- **To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.**
- **With this monitor, the ECM <M/T> or PCM <A/T> automatically increases the engine speed to 1,600 r/min or more. Check that the transaxle is set to "neutral" <M/T> or "P" <A/T> position.**

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTCs using scan tool MB991502.
(4) Check that the fuel cap is securely closed. (Tighten until three clicks are heard.)
(5) Start the engine.
(6) Select "System Test," and press the "YES" key.
(7) Select "Evap Leak Mon," and press the "YES" key.
(8) During the monitor, keep the accelerator pedal at the idling position.

NOTE: If the engine speed does not reach 2,000 r/min during the monitor test, adjustment of the Speed Adjusting Screw may be needed. Refer to P.13B-679. And adjust to the standard value.

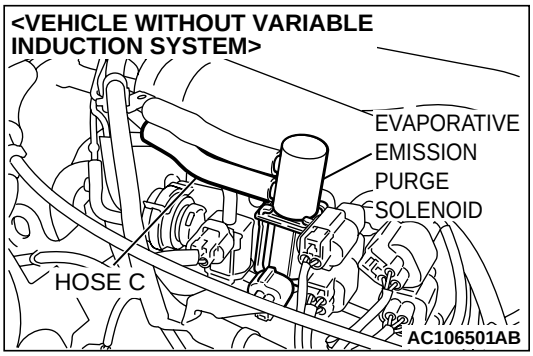
(9) Keep the engine speed and engine load within the specified range. When the monitor test starts, the "In Progress" item on the scan tool MB991502 will change from "NO" to "YES"
(10) Turn the ignition switch to the "LOCK" (OFF) position, and disconnect scan tool MB991502.

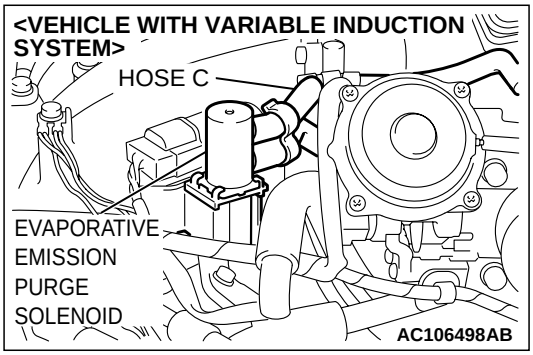
Q: What is displayed on the scan tool MB991507?

"Evap Leak Mon. Completed Test Passed" : The evaporative emission system is working properly at this time. Explain to customer that improperly tightened fuel cap can cause MIL to turn on, and return the vehicle.

"Evap Leak Mon. Completed. Test Failed and DTCs Set" : A malfunction has been detected during the monitor test. Go to Step 2.

"Evap Lead Mon. discontinued. Retest again from the first" : The monitor was discontinued for a certain reason (vehicle speed input from computer, engine speed and engine load deviating from specified range). Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the monitoring from the Step 1.



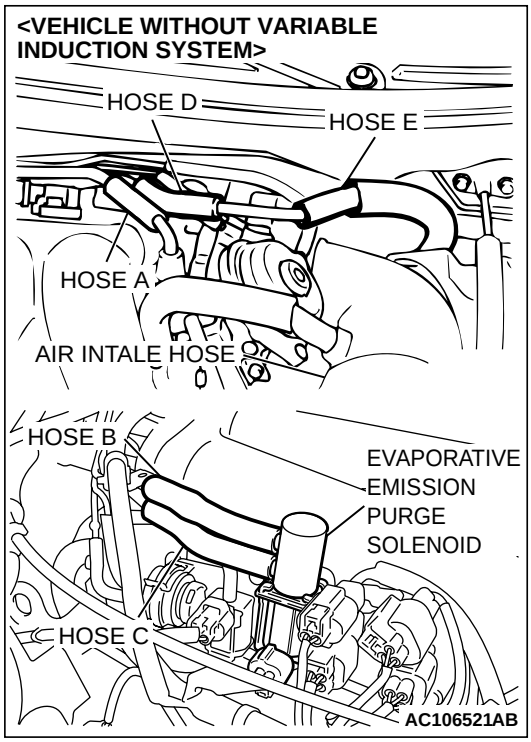


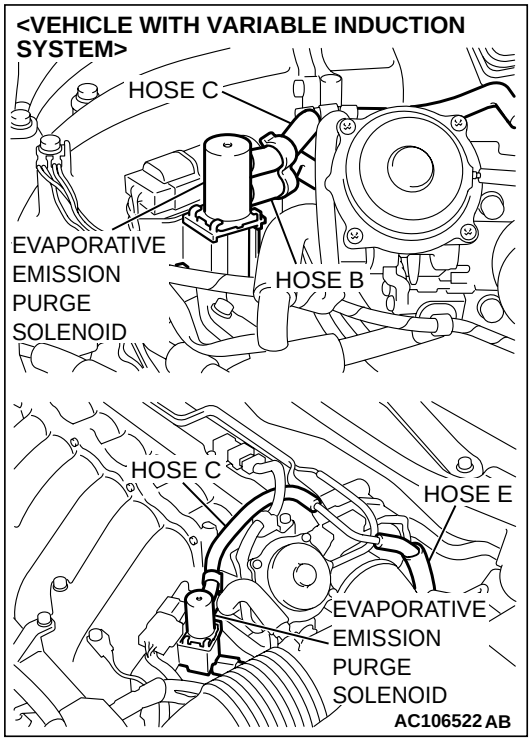
STEP 2. Check evaporative emission purge solenoid for leaks.

(1) Remove the battery.
(2) Remove the air intake hose. (Refer to GROUP 15, Air Cleaner P.15-6.)
(3) Disconnect hose C from the evaporative emission purge solenoid side, and connect a hand vacuum pump to the nipple of the evaporative emission purge solenoid.
(4) Apply a pressure on the hand vacuum pump, and confirm that air is maintained.
(5) Disconnect the hand vacuum pump, and connect hose C to the evaporative emission purge solenoid.

Q: Is the evaporative emission purge solenoid in good condition?

YES : Go to Step 3.
NO : Replace the evaporative emission purge solenoid. Then go to Step 17.





STEP 3. Check for leaks in the evaporator line hose A to hose E <Vehicle without Variable Induction System> or hose B, C, E <Vehicle with Variable Induction System>.

The leakage test with a hand vacuum pump on each hose from hose A to hose E <vehicle without Variable Induction System> or hose B, C, E <vehicle with Variable Induction System>.

Q: Are the hoses in good condition?

YES : Go to Step 4.

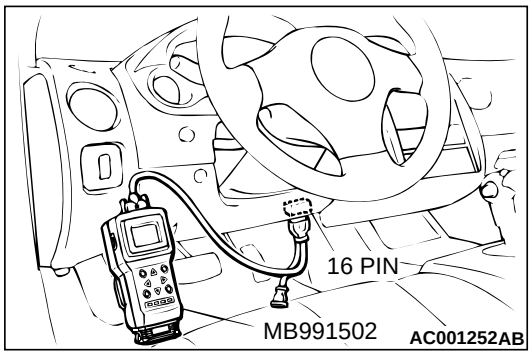
NO : Replace the inferior hose. Then go to Step 17.

STEP 4. Check the evaporative emission ventilation solenoid using scan tool MB991502. (Actuator test item 29)

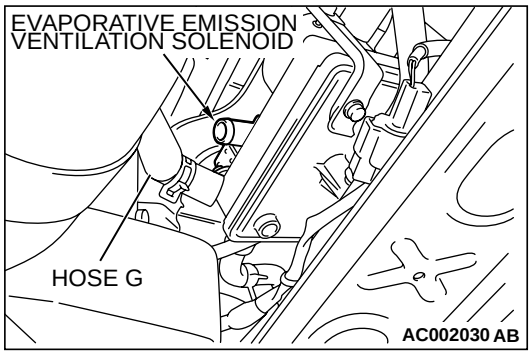
⚠ CAUTION

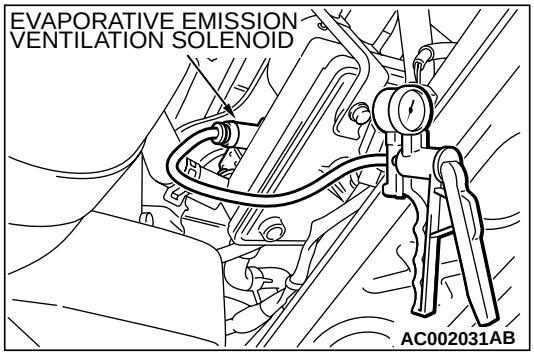
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.



(2) Disconnect the hose G from the evaporative emission ventilation solenoid side.

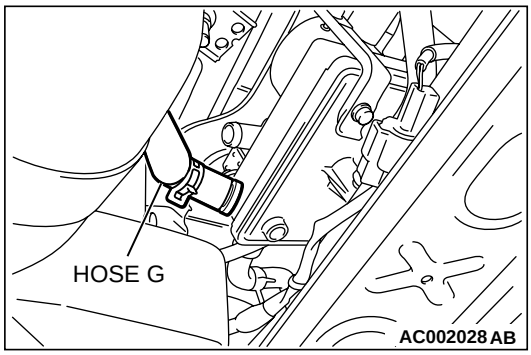




(3) Connect the hand vacuum pump to the nipple of the evaporative emission ventilation solenoid from which the hoses have been disconnected.
(4) Turn the ignition switch to the "ON" position.
(5) Set scan tool MB991502 to actuator test mode for item 29: Evaporative Emission Ventilation Solenoid. When the evaporative emission ventilation solenoid is operated, apply a pressure on the hand vacuum pump and confirm that air is maintained.
(6) Turn the ignition switch to the "LOCK" (OFF) position, and disconnect scan tool MB991502.
(7) Disconnect the hand vacuum pump, and connect hose G to the evaporative emission canister.

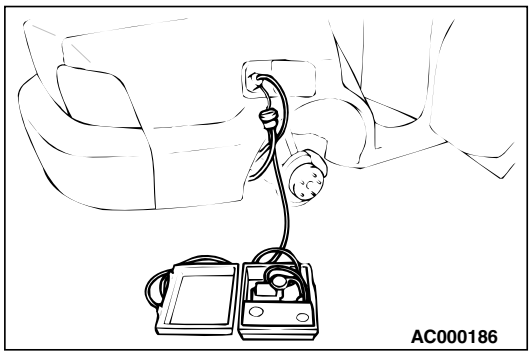
Q: Is the evaporative emission ventilation solenoid in good condition?

YES : Go to Step 5.
NO : Replace the evaporative emission ventilation solenoid. Then go to Step 17.



STEP 5. Pressure test for evaporator line from hose F to hose P.

(1) Remove the module bracket mounting bolts, and disconnect hose G from the evaporative emission ventilation solenoid side, and plug the hoses from which the hoses have been disconnected.
(2) Confirm that the evaporative emission system pressure pump (Miller number 6872A) is operating properly. Perform the self-test as described in the manufacturer's instructions.

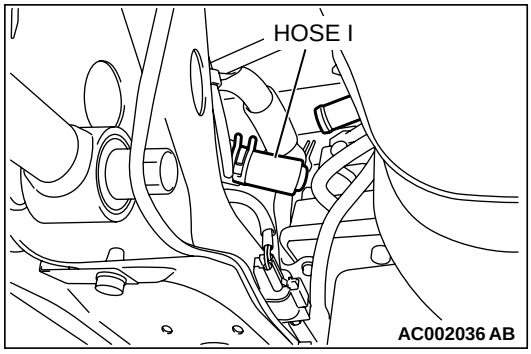


(3) Connect an evaporative emission system pressure pump to the fuel filler neck.
(4) Pressure test the system to determine whether any leaks are present.

NOTE: "Pressure test" in this procedure refers to the I/M240 Simulation Test (8 simple steps) described in the evaporative emission system pressure pump (Miller number 6872A) manufacturer's instructions located in the lid of the pump box.

Q: Are the evaporator line in good condition?

YES : Go to Step 16.
NO : Go to Step 6.

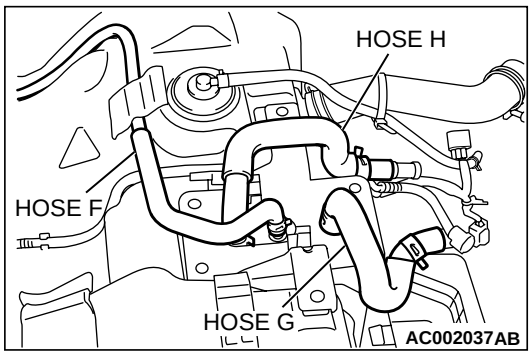


STEP 6. Pressure test for evaporator line from hose I to hose P.

(1) Disconnect hose I from the evaporative emission canister side, and plug the hose from which the pipes have been disconnected.
(2) Perform the pressure test again.

Q: Are the evaporator line in good condition?

YES : Go to Step 7.
NO : Go to Step 9.



STEP 7. Check for leaks in the evaporator line hose F to hose H.

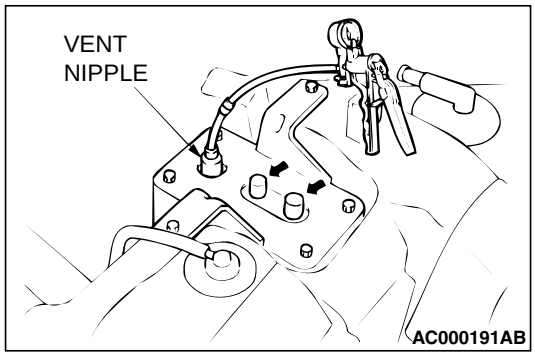
(1) Remove the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.)

(2) The leakage test with a hand vacuum pump on each hose from hose F to hose H.

Q: Are the hoses in good condition?

YES : Go to Step 8.

NO : Replace that hose, reinstall the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 17.



STEP 8. Check for leaks in the evaporative emission canister.

(1) Connect a hand vacuum pump to the vent nipple of the evaporative emission canister.

(2) Plug the other two nipples or loop a hose between the other nipples.

(3) Apply a vacuum with the hand vacuum pump, and confirm that the applied vacuum does not fluctuate.

Q: Is the evaporation emission canister in good condition?

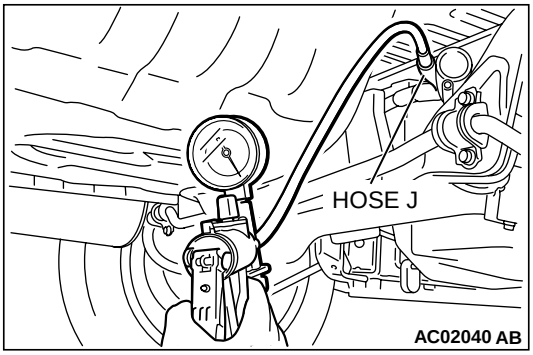
YES : Go to Step 17.

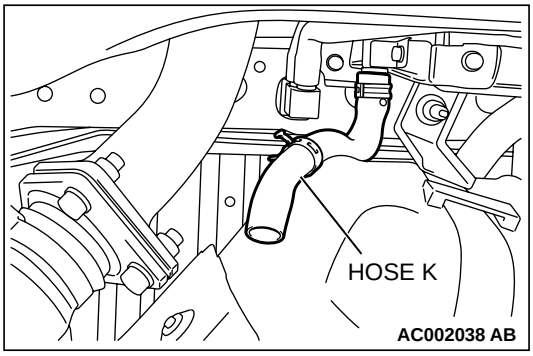
NO : Replace the evaporative emission canister, reinstall the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 17.

STEP 9. Check for leaks in the evaporator line from hose J and hose K.

(1) Remove the fuel filler neck protector. (Refer to GROUP 13C, Fuel Tank P.13C-11.)

(2) Disconnect hose J at the liquid separator, and then connect a hand vacuum pump to the hose.





(3) Disconnect hose K at the fuel tank side, and then plug the hose.

(4) Apply vacuum with the hand vacuum pump, and confirm that the applied vacuum does not fluctuate.

Q: Are the evaporator line in good condition?

YES : Go to Step 10.

NO : Replace that hose, reinstall the fuel filler neck protector. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 17.

STEP10. Check for leaks in the evaporator line hose I, L, M, N and O.

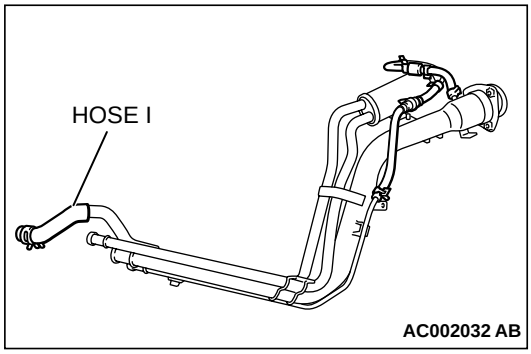
(1) Remove the fuel tank and fuel filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.)

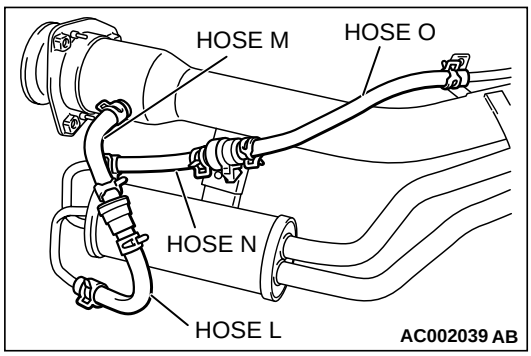
(2) The leakage test with a hand vacuum pump on each hose from hose I, L, M, N and O.

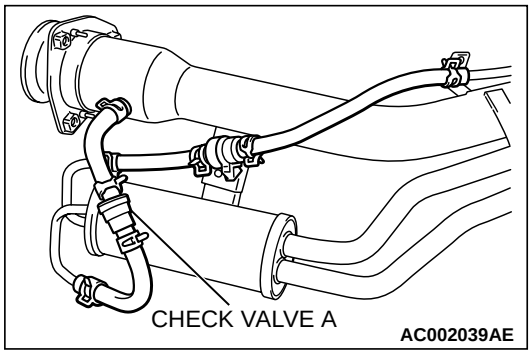
Q: Are the hoses in good condition?

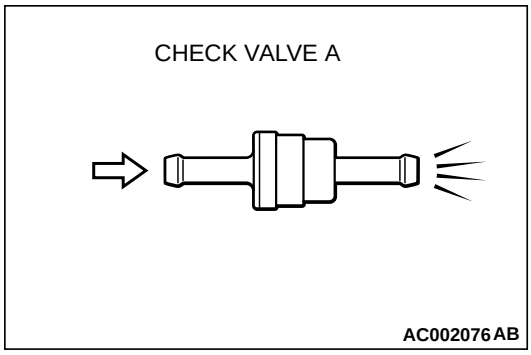
YES : Go to Step 11.

NO : Replace the hose, reinstall the fuel tank and fuel filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 17.







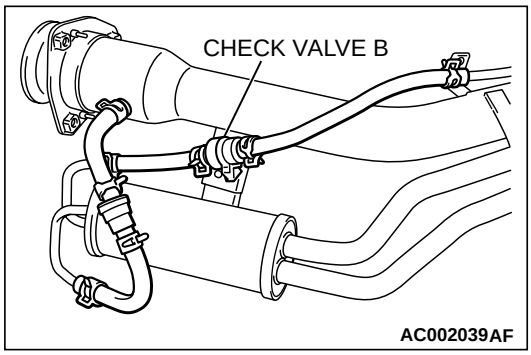


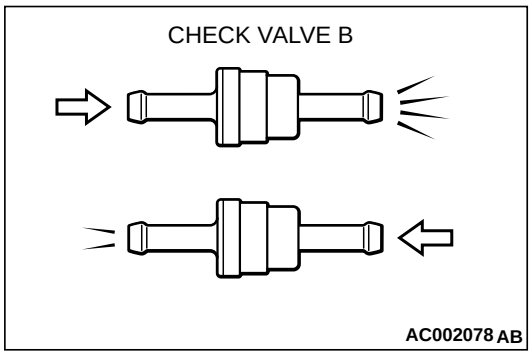
STEP 11. Check the check valve A.

(1) Only when you blow the check valve from the direction shown, it should pass air.
(2) When you blow the check valve, air should leak from the check valve body.

Q: Is the check valve A in good condition?

YES : Go to Step 12.
NO : Replace the check valve A, reinstall the fuel tank and fuel filler neck assembly. Then go to Step 17.



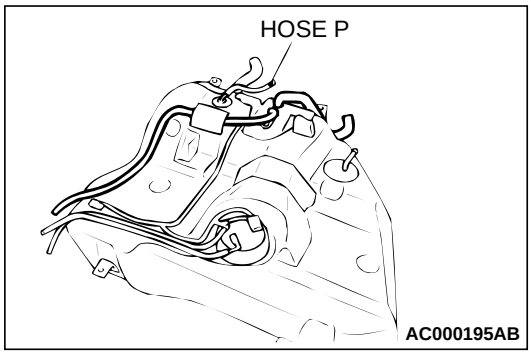


STEP 12. Check the check valve B.

(1) When you blow the check valve from the arrow direction shown above, it should pass more air.
(2) When you blow the check valve from the arrow direction shown below, it should pass less air.
(3) When you blow the check valve, air should leak from the check valve body.

Q: Is the check valve B in good condition?

YES : Go to Step 13.
NO : Replace the check valve B, reinstall the fuel tank and fuel filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 17.



STEP 13. Check for leaks in the evaporator line hose P.

(1) The leakage test with a hand vacuum pump on each hose from hose P.

Q: Is the hose in good condition?

YES : Go to Step 14.

NO : Replace the hose, reinstall the fuel tank and fuel filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 17.

STEP 14. Visually check for cracks in the fuel filler neck assembly.

Visually check for cracks in the fuel filler neck assembly.

Q: Is the fuel filler neck assembly in good condition?

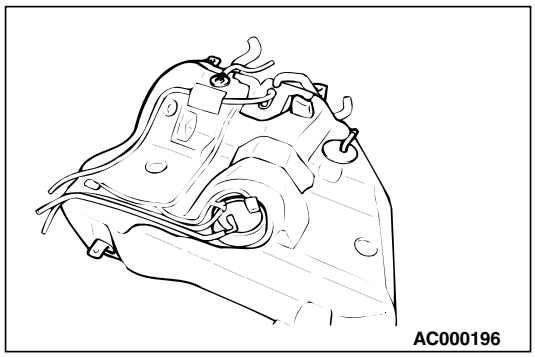
YES : Go to Step 15.

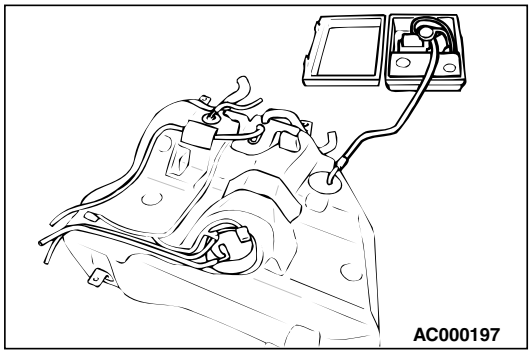
NO : Replace the fuel filler neck assembly, reinstall the fuel tank and fuel filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 17.

STEP 15. Check for leaks in the fuel tank.

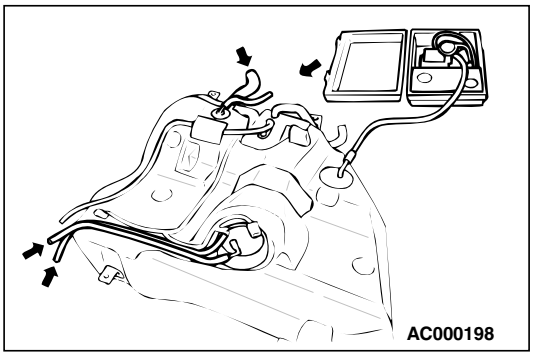
(1) Visually check for cracks and leaks, etc.

NOTE: Carefully check the fuel pump assembly and the inner pressure sensor installation section in the fuel tank.





(2) Connect an evaporative emission system pressure pump to the leveling valve nipple.



(3) Plug the filler hose, feed pipe, return pipe and rollover valve nipple connected to the fuel tank.

NOTE: If these items are not securely plugged here, the fuel could leak in the next step.

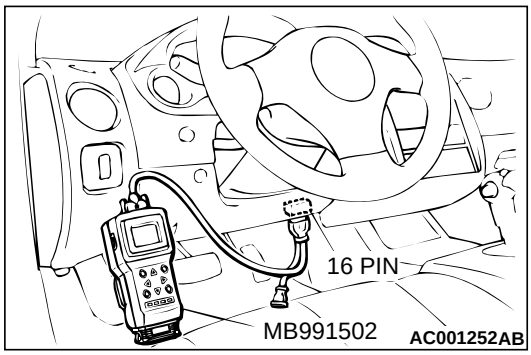
(4) Apply pressure with the evaporative emission system pressure pump.

(5) In the pressurized state, check for the leak by applying soap water, etc. to each section.

Q: Is the fuel tank in good condition?

YES : Go to Step 16.

NO : Replace the fuel tank, reinstall the fuel tank and fuel filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 17.



STEP 16. Using scan tool MB991502, check evaporative emission system monitor test.

⚠ CAUTION

- **To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.**
- **With this monitor, the ECM <M/T> or PCM <A/T> automatically increases the engine speed to 1,600 r/min or more. Check that the transaxle is set to "neutral" <M/T> or "P" <A/T> position.**

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTCs using scan tool MB991502.
(4) Check that the fuel cap is securely closed. (Tighten until three clicks are heard.)
(5) Start the engine.
(6) Select "System Test," and press the "YES" key.
(7) Select "Evap Leak Mon," and press the "YES" key.
(8) During the monitor, keep the accelerator pedal at the idling position.

NOTE: If the engine speed does not reach 2,000 r/min during the monitor test, adjustment of the Speed Adjusting Screw may be needed. Refer to P.13B-679. And adjust to the standard value.

(9) Keep the engine speed and engine load within the specified range. When the monitor test starts, the "In Progress" item on the scan tool MB991502 will change from "NO" to "YES."
(10) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991502.

Q: What is displayed on scan tool MB991502?

"Evap Leak Mon. Completed. Test Passed" : The evaporative emission system is working properly at this time. Then go to Step 17.

"Evap Leak Mon. Completed. Test Failed and DTCs Set" : Replace the ECM <M/T> or PCM <A/T>. Then go to Step 17.

"Evap Lead Mon. discontinued. Retest again from the first" : The monitor was discontinued for a certain reason (vehicle speed input from ECM <M/T> or PCM <A/T>, engine speed and engine load deviating from specified range). Turn the ignition switch to the "LOCK" (OFF) position once, and recheck evaporative emission system monitor test.

STEP 17. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 1 - Evaporative Emission Control System Leak Monitor P.13B-6.
(2) Read the diagnostic trouble code.

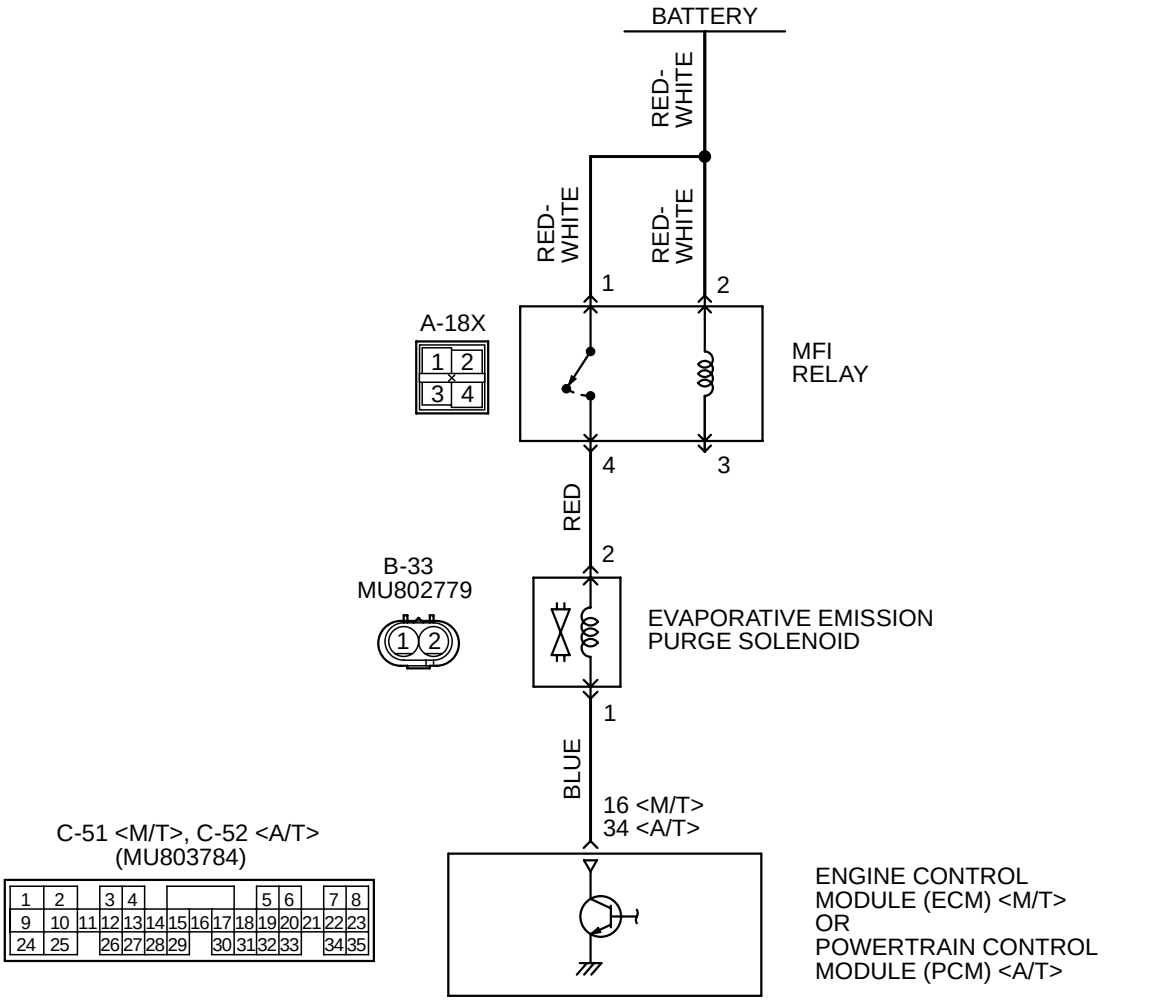
Q: Is diagnostic trouble code P0442 set?

YES : Go to Step 1.
NO : This diagnosis is complete.

TSB Revision

DTC P0443: Evaporative Emission Control System Purge Control Valve Circuit

Evaporative Emission Purge Solenoid Circuit



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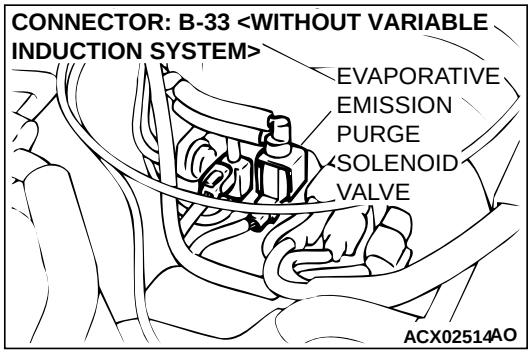
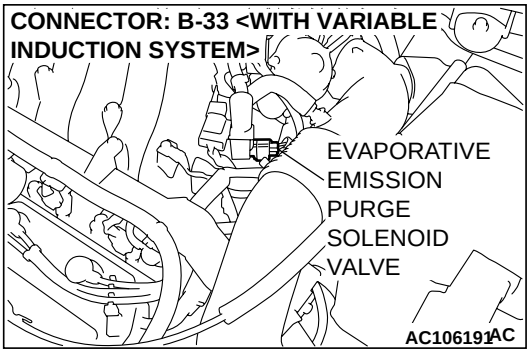
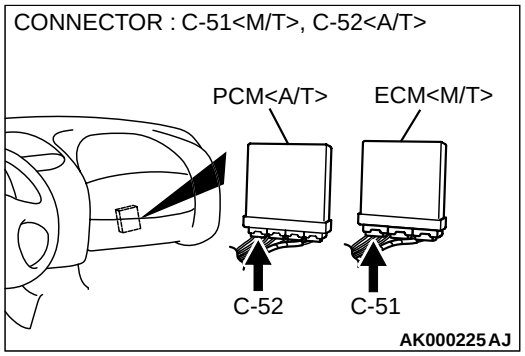
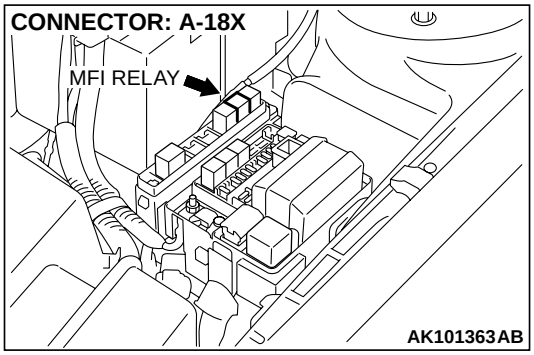








CIRCUIT OPERATION

- Power to the evaporative emission purge solenoid power is supplied from the MFI relay (terminal 4).
- The ECM <M/T> or PCM <A/T> controls ground evaporative emission purge solenoid by turning the power transistor in the ECM <M/T> or PCM <A/T> "ON" and "OFF".

TECHNICAL DESCRIPTION

- To judge if there is open circuit in the evaporative emission purge solenoid drive circuit, ECM <M/T> or PCM <A/T> measures the surge voltage of the evaporative emission purge solenoid coil.
- The ECM <M/T> or PCM <A/T> drives the evaporative emission purge solenoid. After the solenoid is turned off, the ECM <M/T> or PCM <A/T> will check if the solenoid coil produces a surge voltage of 2 V or more.

DTC SET CONDITIONS

Check Conditions

- Engine is being cranked.
- Battery positive voltage is at between 10 and 16 volts.

Judgment Criteria

- The evaporative emission purge solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 0.2 second.
- The ECM <M/T> or PCM <A/T> monitors for this condition once during the drive cycle.

Check Conditions

- Battery positive voltage is at between 10 and 16 volts.
- ON duty cycle of the evaporative emission purge solenoid is between 10 and 90 percent.
- ON duty cycle of the EGR solenoid is 0 percent.
- Evaporative emission ventilation solenoid is OFF.
- More than 1 second has elapsed after the above mentioned conditions have been met.

Judgment Criteria

- The evaporative emission purge solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 1 second. When the evaporative emission purge solenoid is turned OFF.

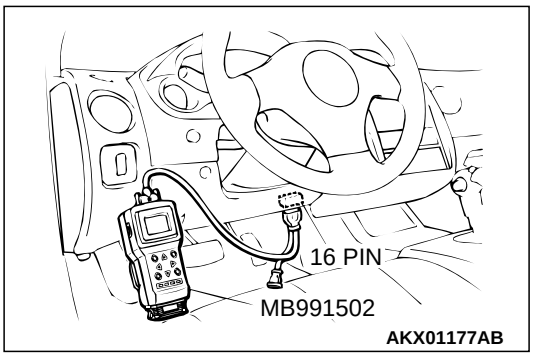
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Evaporative emission purge solenoid failed.
- Open or shorted evaporative emission purge solenoid circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check actuator test item 08: Evaporative Emission Purge Solenoid.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the actuator test mode for item 08, Evaporative emission purge solenoid.
- An operation sound should be heard and vibration should be felt when the evaporative emission purge solenoid is operated.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the solenoid operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

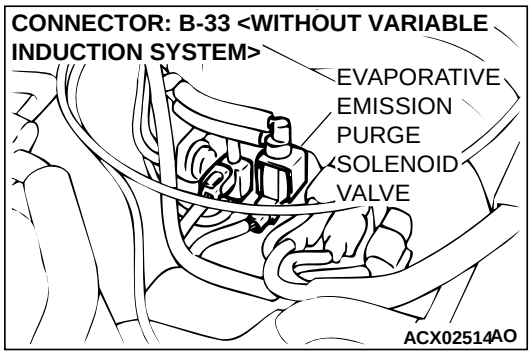
NO : Go to Step 2.

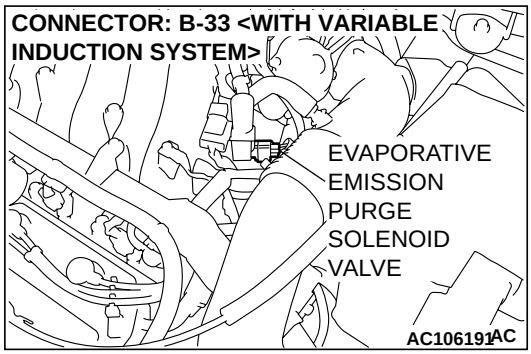
STEP 2. Check connector B-33 at the evaporative emission purge solenoid for damage.

Q: Is the connector in good condition?

YES : Go to Step 3.

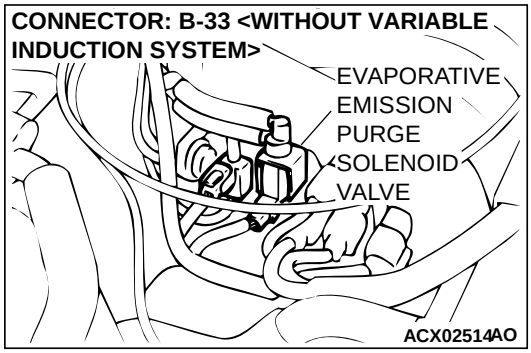
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

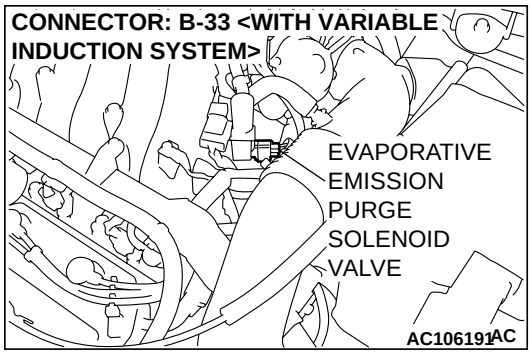


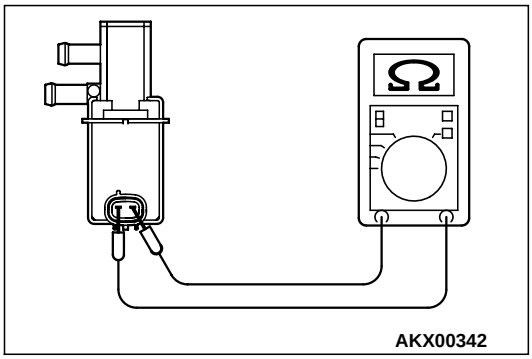


STEP 3. Check the evaporative emission purge solenoid.

(1) Disconnect the evaporative emission purge solenoid connector B-33.







(2) Measure the resistance between evaporative emission purge solenoid side connector terminal 1 and 2.

Standard value: 30 – 34 Ω [at 20°C (68°F)]

Q: Is the resistance at the standard value?

YES : Go to Step 4.

NO : Replace the evaporative emission purge solenoid. Then go to Step 12.

STEP 4. Check the power supply voltage at evaporative emission purge solenoid harness side connector B-33.

(1) Disconnect the connector B-33 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between terminal 2 and ground.

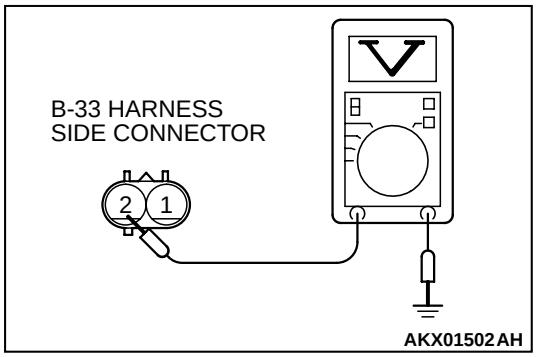
- Voltage should be battery positive voltage.

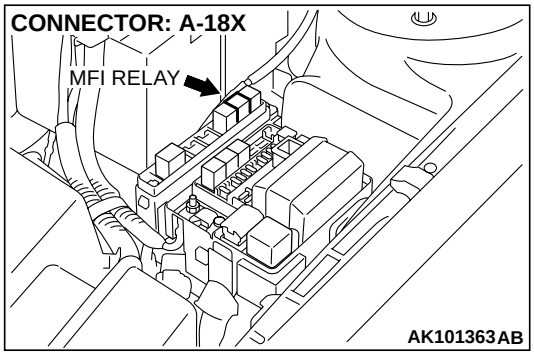
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 6.

NO : Go to Step 5.





STEP 5. Check connector A-18X at MFI relay for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between MFI relay connector A-18X terminal 4 and evaporative emission purge solenoid connector B-33 terminal 2 because of open circuit or short circuit to ground. Then go to Step 12.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 6. Check the power supply voltage at ECM connector C-51 <M/T> or PCM connector <A/T> C-52 by backprobing.

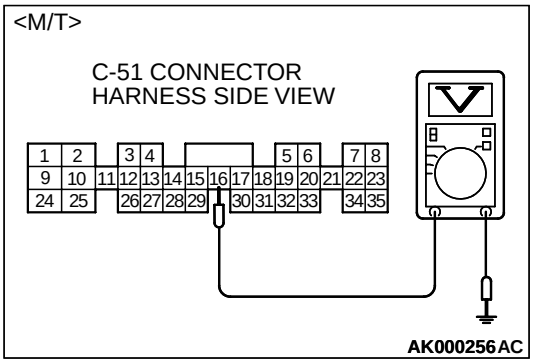
(1) Do not disconnect the connector C-51 <M/T> or C-52 <A/T>.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 16 <M/T> or 34 <A/T> and ground by backprobing.
- Voltage should be battery positive voltage.

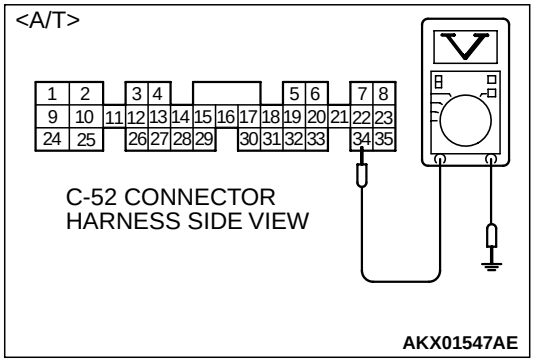
(4) Turn the ignition switch to the "LOCK" (OFF) position.

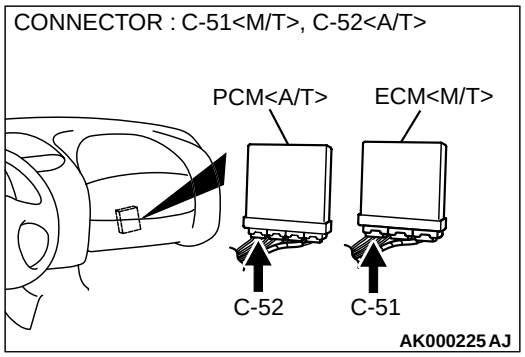
Q: Is the voltage normal?

YES : Go to Step 9.

NO : Go to Step 7.





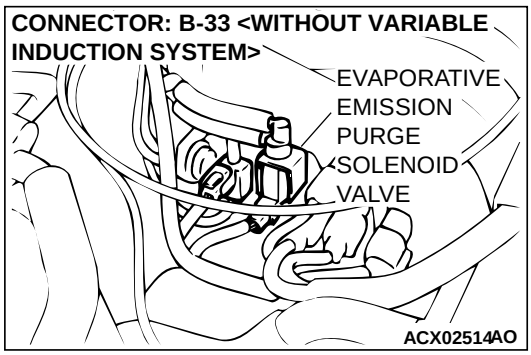


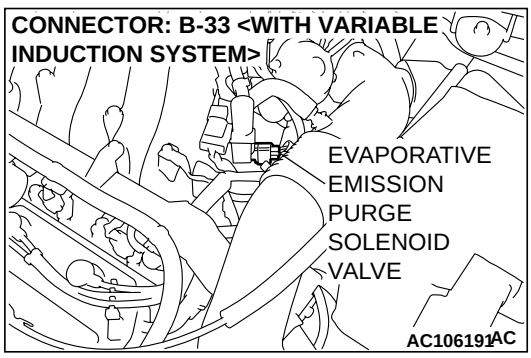
STEP 7. Check connector C-51 at ECM <M/T> or connector C-52 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



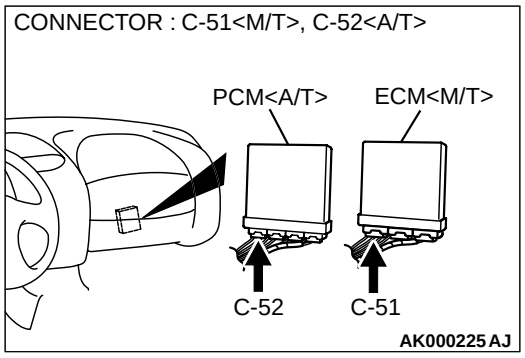


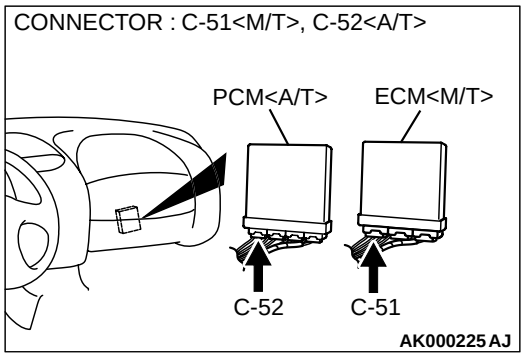
STEP 8. Check for open circuit and short circuit to ground between evaporative emission purge solenoid connector B-33 terminal 1 and ECM connector C-51 terminal 16 <M/T> or PCM connector C-52 terminal 34 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 12.

NO : Repair it. Then go to Step 12.



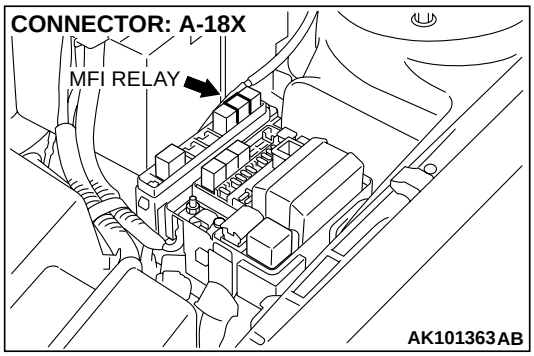


STEP 9. Check connector C-51 at ECM <M/T> or connector C-52 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

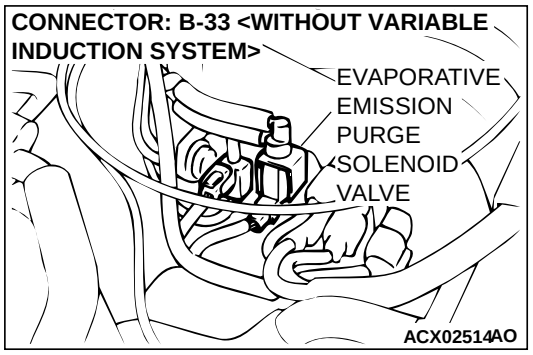


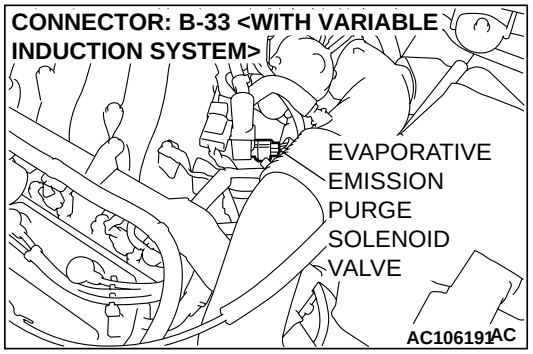
STEP 10. Check for harness damage between MFI relay connector A-18X terminal 4 and evaporative emission purge solenoid connector B-33 terminal 2.

Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair it. Then go to Step 12.

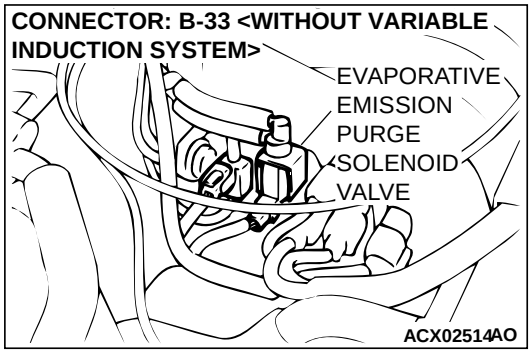


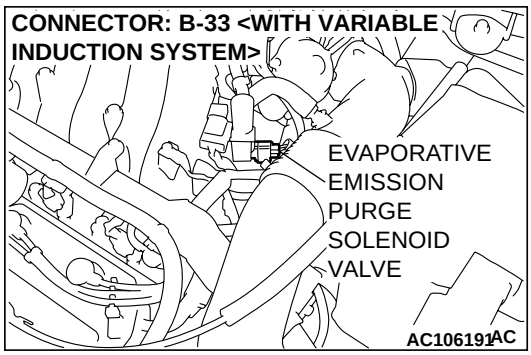


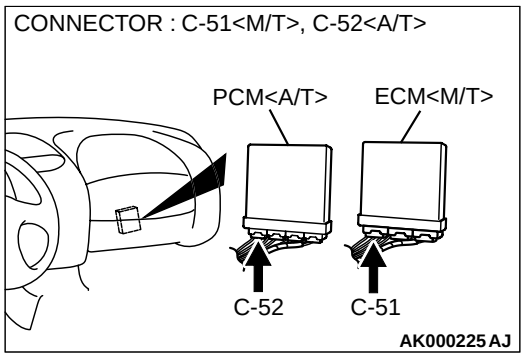
STEP 11. Check for harness damage between evaporative emission purge solenoid connector B-33 terminal 1 and ECM connector C-51 terminal 16 <M/T> or PCM connector C-52 terminal 34 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 12.
NO : Repair it. Then go to Step 12.







STEP 12. Test the OBD-II drive cycle.

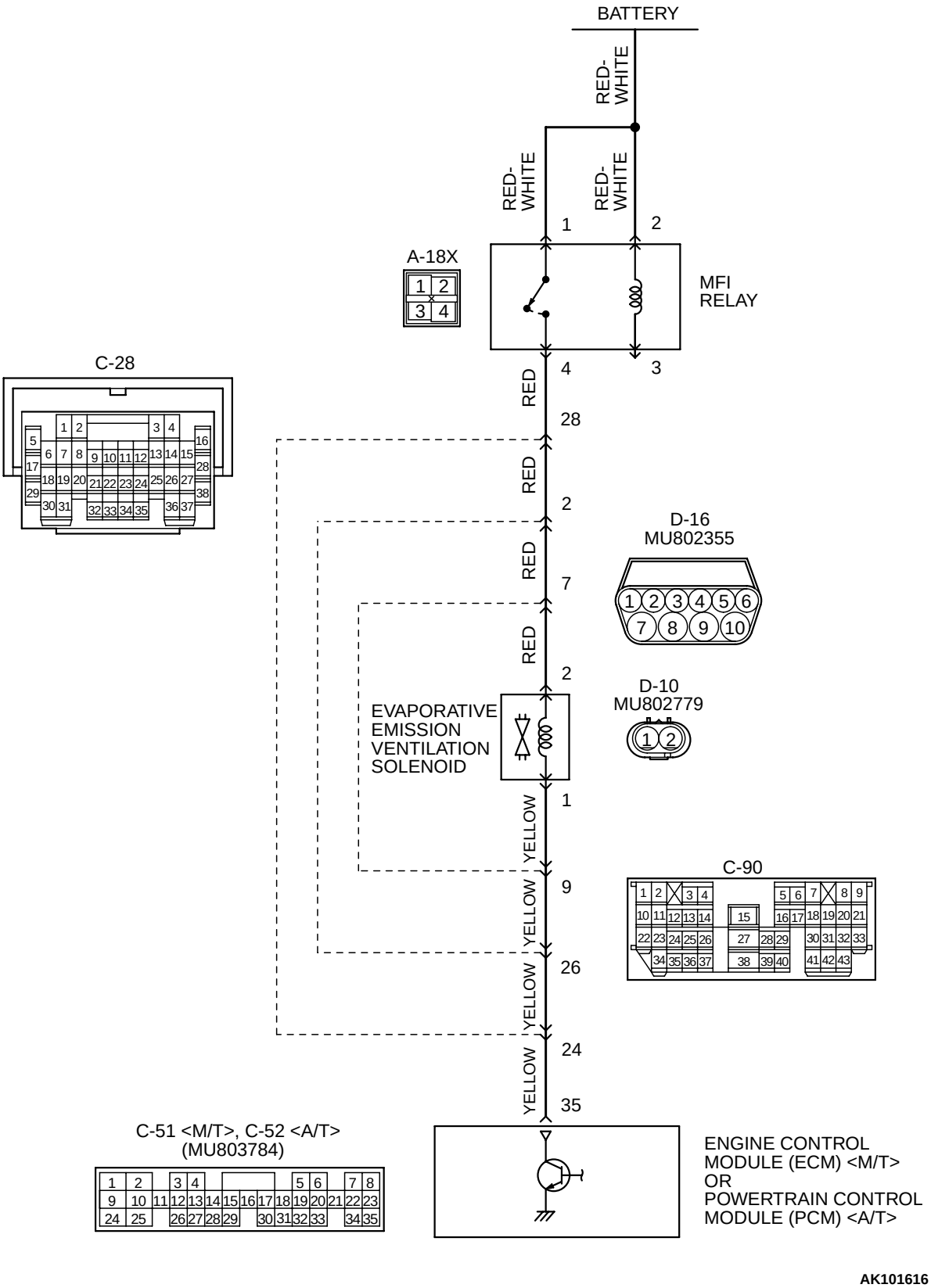
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0443 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0446: Evaporative Emission Control System Vent Control Circuit

Evaporative Emission Ventilation Solenoid Circuit



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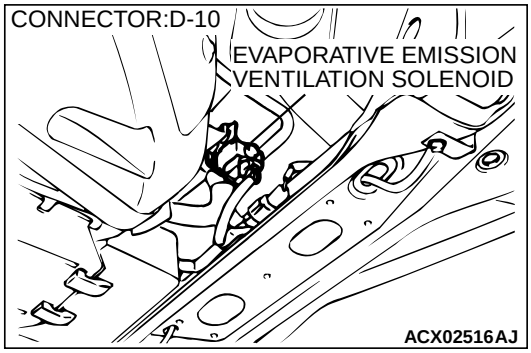
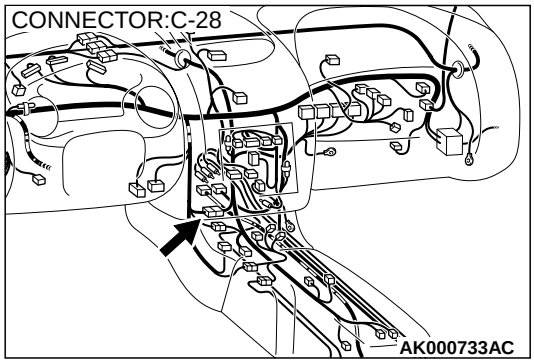
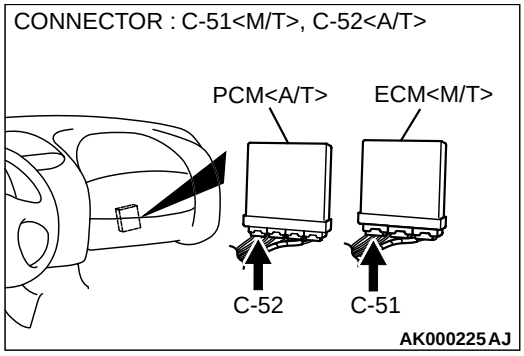
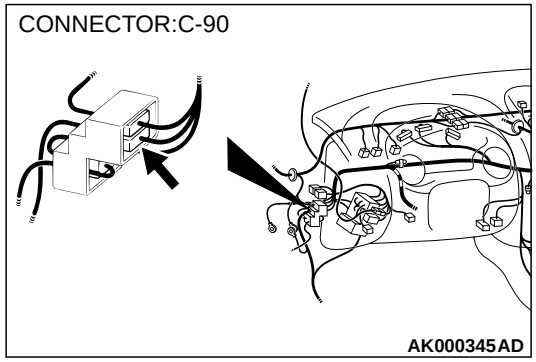
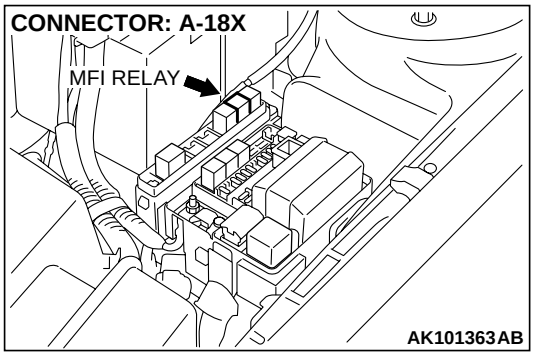
TSB Revision

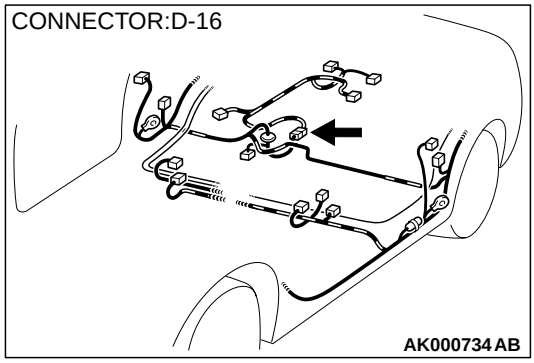












CIRCUIT OPERATION

- The evaporative emission ventilation solenoid power is supplied from the MFI relay (terminal 4).
- The ECM <M/T> or PCM <A/T> controls the evaporative emission ventilation solenoid ground by turning the power transistor in the ECM <M/T> or PCM <A/T> ON and OFF.

TECHNICAL DESCRIPTION

- To judge if there is open circuit in the evaporative emission ventilation solenoid drive circuit, ECM <M/T> or PCM <A/T> measures the surge voltage of the evaporative emission ventilation solenoid coil.
- The ECM <M/T> or PCM <A/T> drives the evaporative emission ventilation solenoid. After the solenoid is turned off, the ECM <M/T> or PCM <A/T> will check if the solenoid coil produces a surge voltage of 2 V or more.

DTC SET CONDITIONS

Check Conditions

- Engine is being cranked.
- Battery positive voltage is at between 10 and 16 volts.

Judgment Criteria

- The evaporative emission ventilation solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 0.2 second.
- The ECM <M/T> or PCM <A/T> monitors for this condition once during the drive cycle.

Check Conditions

- Battery positive voltage is at between 10 and 16 volts.
- ON duty cycle of the evaporative emission purge solenoid is 0 percent.
- ON duty cycle of the EGR solenoid is 0 percent.
- Evaporative emission ventilation solenoid is ON.

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- More than 1 second has elapsed after the above mentioned conditions have been met.

Judgment Criteria

- The evaporative emission ventilation solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 1 second. When the evaporative emission ventilation solenoid is turned OFF.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

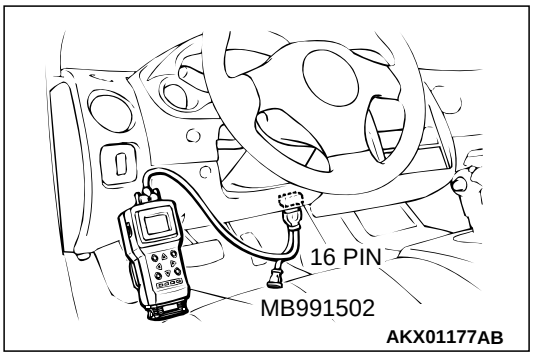
- Evaporative emission ventilation solenoid failed.
- Open or shorted evaporative emission ventilation solenoid circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check actuator test item 29: Evaporative Emission Ventilation Solenoid.



⚠ CAUTION

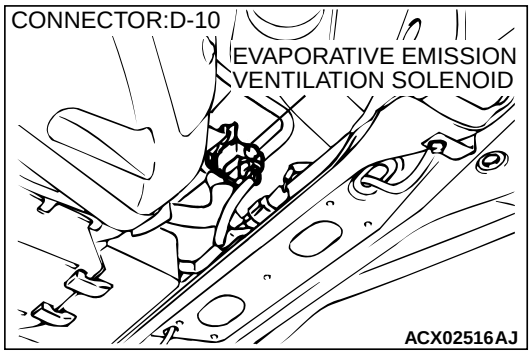
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the actuator test mode for item 29, Evaporative emission ventilation solenoid.
  - An operation sound should be heard and vibration should be felt when the evaporative emission ventilation solenoid is operated.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the solenoid operating properly?

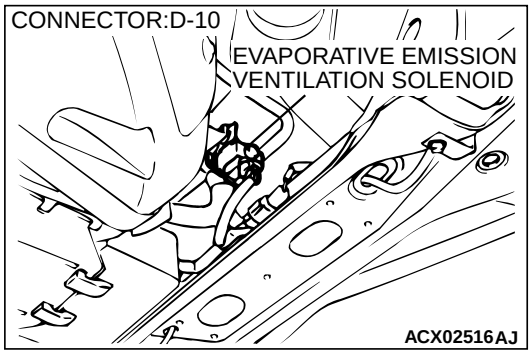
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Go to Step 2.

STEP 2 Check connector D-10 at the evaporative emission ventilation solenoid for damage.



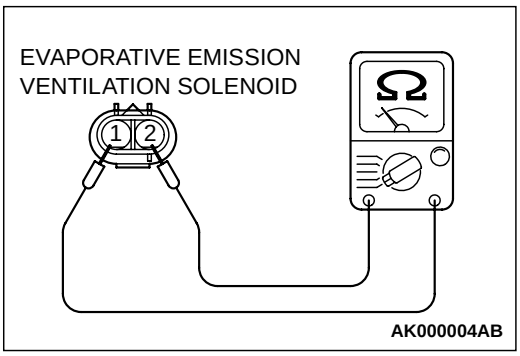
Q: Is the connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



STEP 3 Check the evaporative emission ventilation solenoid.

(1) Disconnect the evaporative emission ventilation solenoid connector D-10.



(2) Measure the resistance between evaporative emission ventilation solenoid side connector terminal 1 and 2.

Standard value: 17 – 21 Ω [at 20°C (68°F)]

Q: Is the resistance at the standard value?

YES : Go to Step 4.

NO : Replace the over vent valve module. Then go to Step 12.

STEP 4. Check the power supply voltage at evaporative emission ventilation solenoid harness side connector D-10.

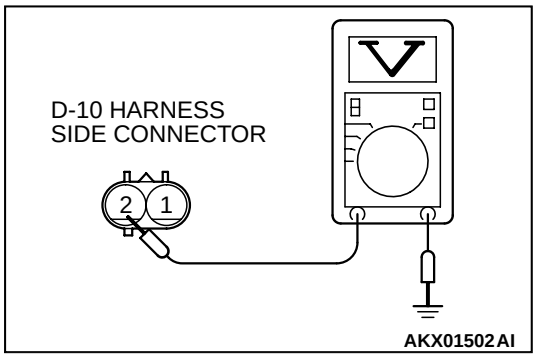
(1) Disconnect the connector D-10 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between terminal 2 and ground.

- Voltage should be battery positive voltage.

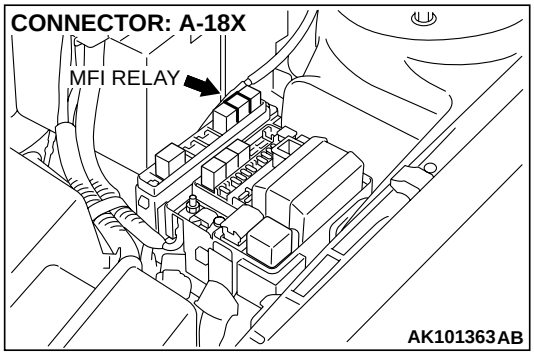
(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the voltage normal?

YES : Go to Step 6.

NO : Go to Step 5.



STEP 5. Check connector A-18X at MFI relay for damage.

Q: Is the connector in good condition?

YES : Check connectors C-28, C-90 and D-16 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connectors are in good condition, repair harness wire between MFI relay connector A-18X terminal 4 and evaporative emission ventilation solenoid connector D-10 terminal 2 because of open circuit or short circuit to ground. Then go to Step 12.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

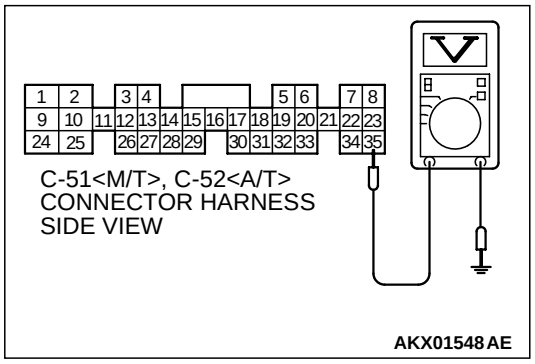
STEP 6. Check the power supply voltage at ECM connector C-51 <M/T> or PCM connector C-52 <A/T> by backprobing.

(1) Do not disconnect the connector C-51 <M/T> or C-52 <A/T>.

(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between terminal 35 and ground by backprobing.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the voltage normal?

YES : Go to Step 9.

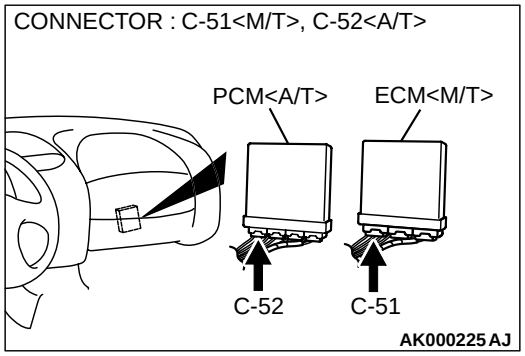
NO : Go to Step 7.

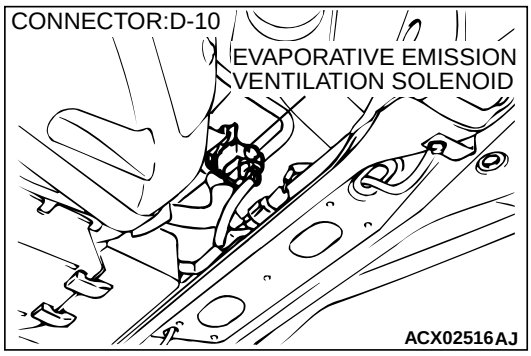
STEP 7. Check connector C-51 at ECM <M/T> or connector C-52 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.





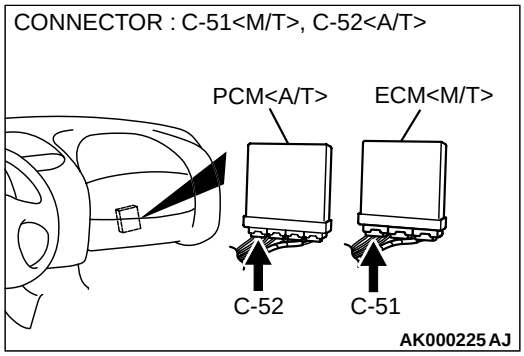
STEP 8. Check for open circuit and short circuit to ground between evaporative emission ventilation solenoid connector D-10 terminal 1 and ECM connector C-51 terminal 35 <M/T> or PCM connector C-52 terminal 35 <A/T>.

NOTE: Check harness after checking intermediate connectors C-28, C-90 and D-16. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 12.

NO : Repair it. Then go to Step 12.

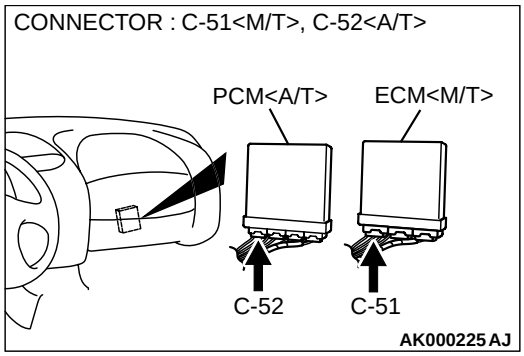


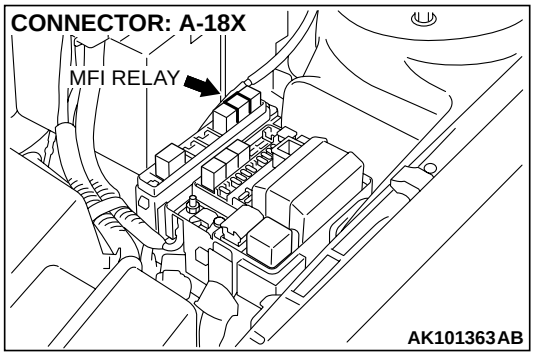
STEP 9. Check connector C-51 at ECM <M/T> or connector C-52 at PCM <A/T> for damage.

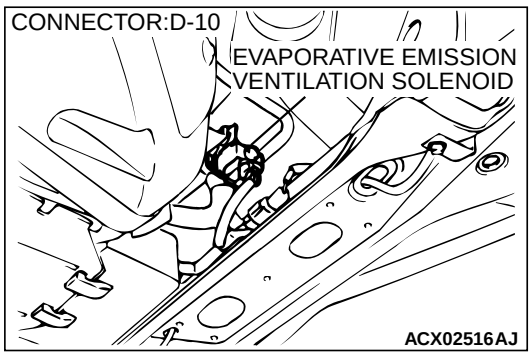
Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.







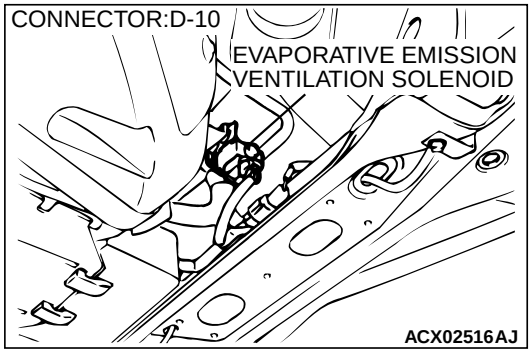
STEP 10. Check for harness damage between MFI relay connector A-18X terminal 4 and evaporative emission ventilation solenoid connector D-10 terminal 2.

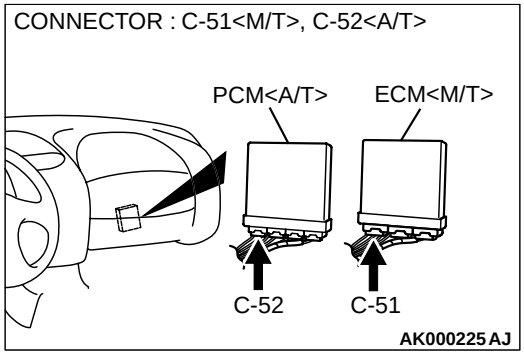
NOTE: Check harness after checking intermediate connectors C-28, C-90 and D-16. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair it. Then go to Step 12.





STEP 11. Check for harness damage between evaporative emission ventilation solenoid connector D-10 terminal 1 and ECM connector C-51 terminal 35 <M/T> or PCM connector C-52 terminal 35 <A/T>.

NOTE: Check harness after checking intermediate connectors C-28, C-90 and D-16. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 12.

NO : Repair it. Then go to Step 12.

STEP 12. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13B-6.

(2) Check the diagnostic trouble code (DTC).

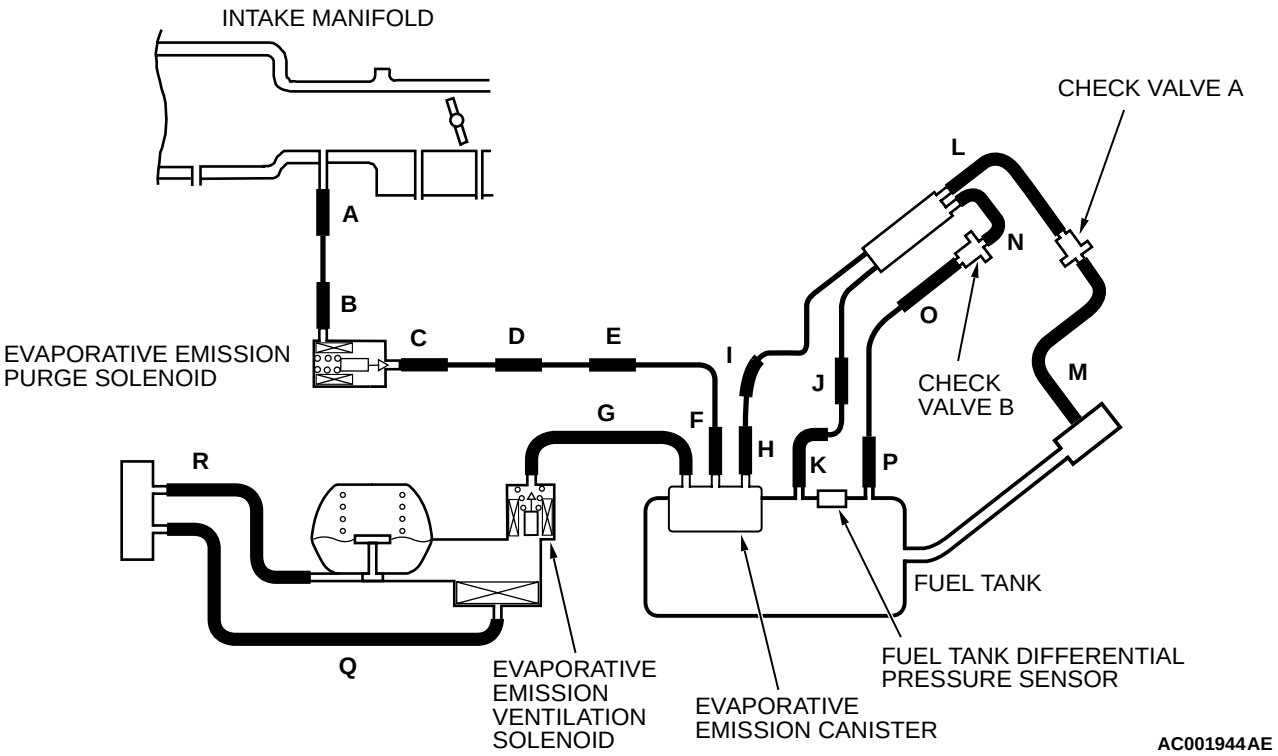
Q: Is the DTC P0446 is output?

YES : Retry the troubleshooting.

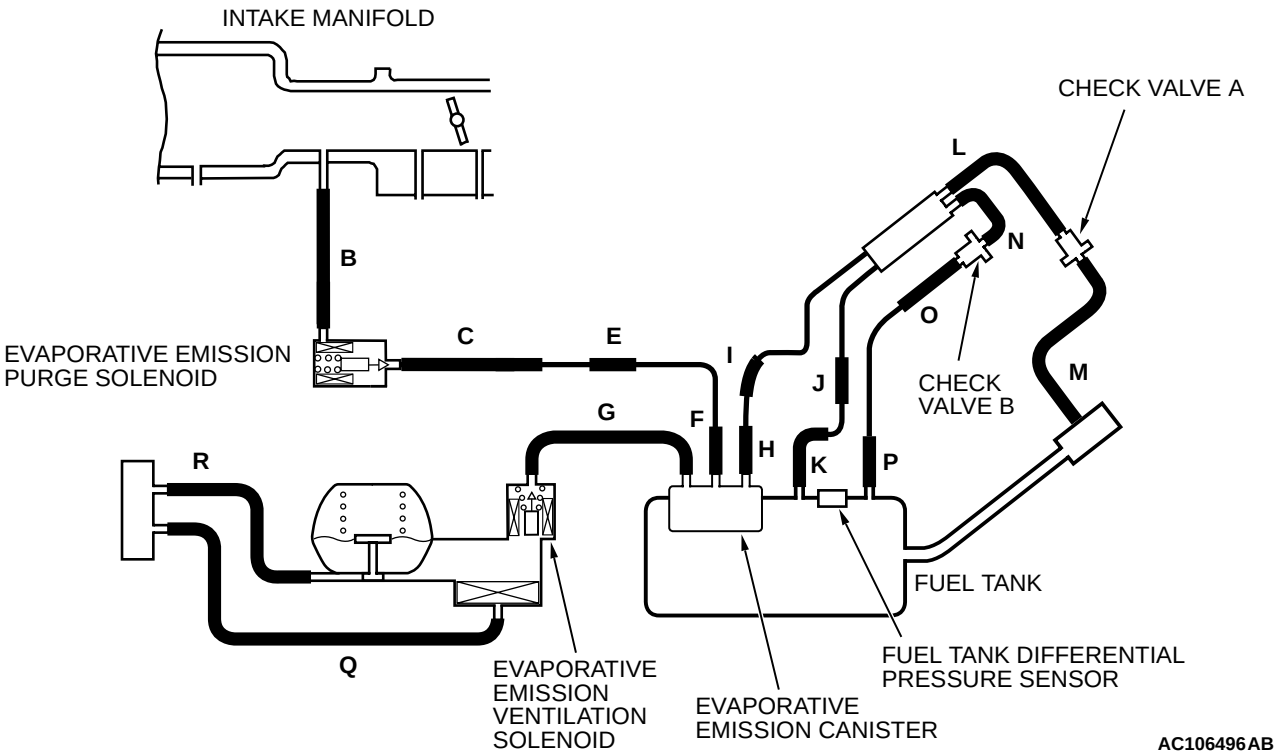
NO : The inspection is complete.

DTC P0451: Evaporative Emission Control System Pressure Sensor Range/Performance

SYSTEM DIAGRAM <VEHICLE WITHOUT VARIABLE INDUCTION SYSTEM>

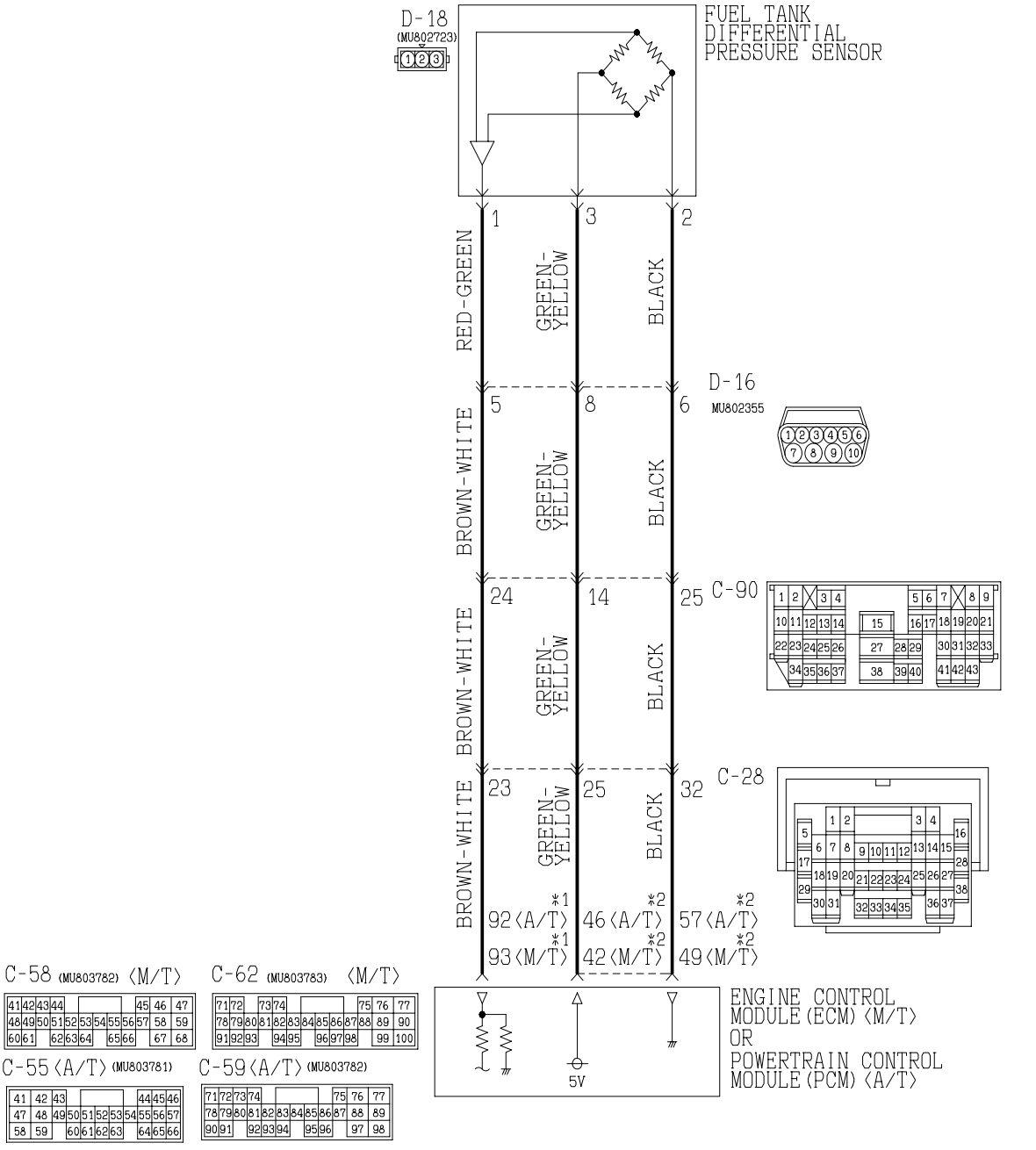


SYSTEM DIAGRAM <VEHICLE WITH VARIABLE INDUCTION SYSTEM>



TSB Revision

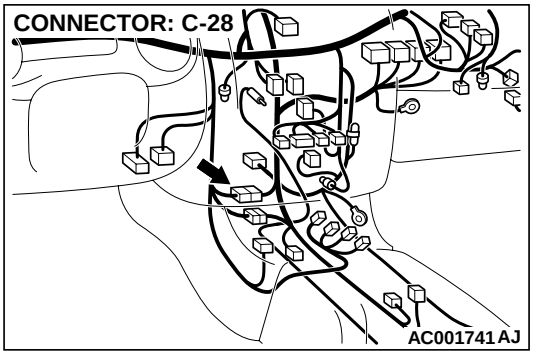
Fuel Tank Differential Pressure Sensor Circuit

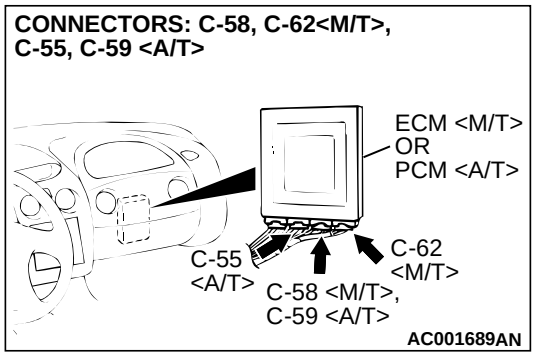


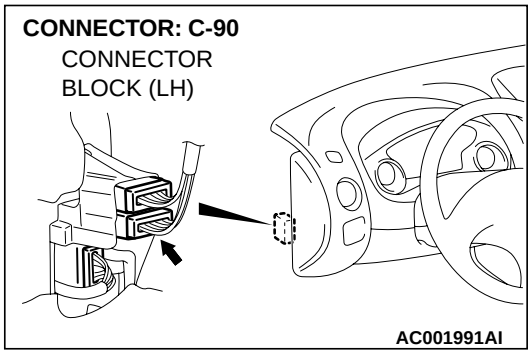
NOTE
*1:ECM connector C-58〈M/T〉or PCM connector C-59〈A/T〉
*2:ECM connector C-62〈M/T〉or PCM connector C-55〈A/T〉

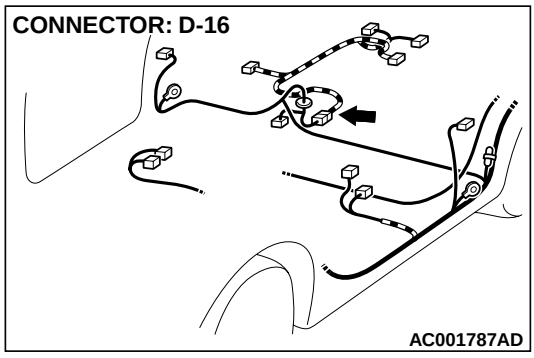
W2S18M02AA

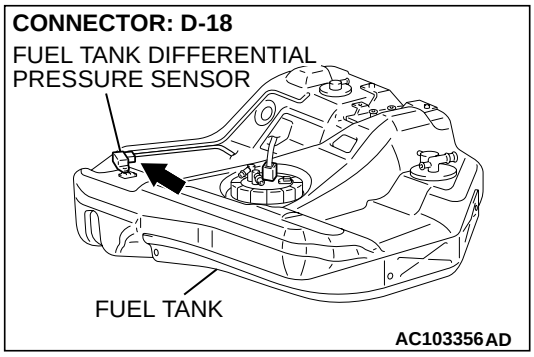
TSB Revision











CIRCUIT OPERATION

- A 5-volt voltage is supplied to the power terminal of the fuel tank differential pressure sensor (terminal 3) from the ECM (terminal 42) <M/T> or PCM (terminal 46) <A/T>. The ground terminal (terminal 2) is grounded with the ECM (terminal 49) <M/T> or PCM (terminal 57) <A/T>.
- A voltage proportional to the pressure in the fuel tank is sent from the output terminal of the fuel tank differential pressure sensor (terminal 1) to the ECM (terminal 93) <M/T> or PCM (terminal 92) <A/T>.

TECHNICAL DESCRIPTION

- To judge if the fuel tank differential pressure sensor is defective, the ECM <M/T> or PCM <A/T> monitors the fuel tank differential pressure sensor output voltage.
- Based on the test conditions and judgment criteria, the ECM <M/T> or PCM <A/T> judges if the fuel tank differential pressure sensor output voltage is normal.

DTC SET CONDITIONS

Test Conditions: Electrical noise

- Throttle valve is closed.
- Vehicle speed is 1.5 km/h (0.9 mph) or less.

Judgment Criteria

- The event that the output voltage from the fuel tank differential pressure sensor changes by 0.2 volts or more (i.e. sudden pressure fluctuation) is counted at least twenty times during one engine idling, and then consecutively eight times during normal driving condition.

NOTE: If the number of the sudden pressure fluctuation does not reach twenty during one engine idling, the counter will be reset to zero. If the ignition switch is turned off, it will be also reset to zero.

NOTE: The conditions for deviating from idling operation are as follows:

- *Engine speed is higher than 2,500 r/min.*
- *Vehicle speed is 15 km/h (9.3 mph) or more.*
- *Volumetric efficiency is 55 percent or more.*

TROUBLESHOOTING HINTS

The most likely causes for this code to be set are:

- Fuel tank differential pressure sensor failed.
- Damaged harness in the fuel tank differential pressure sensor circuit.
- ECM <M/T> or PCM <A/T> failed.

OVERVIEW OF TROUBLESHOOTING

- DTC P0451 can be set if either of the following conditions occur:
  1. Faulty fuel differential pressure sensor, related circuit, or ECM <M/T> or PCM <A/T>.
- To check a system blockage, do a performance test which uses a mechanical vacuum gauge and scan tool MB991502 set on the fuel tank differential pressure sensor (TANK PRS SNSR 73.)
  The mechanical gauge reading is used to verify scan tool MB991502 reading.
  A comparison of the mechanical gauge to scan tool MB991502 determines the problem in the system.

DIAGNOSIS

Required Special Tools:

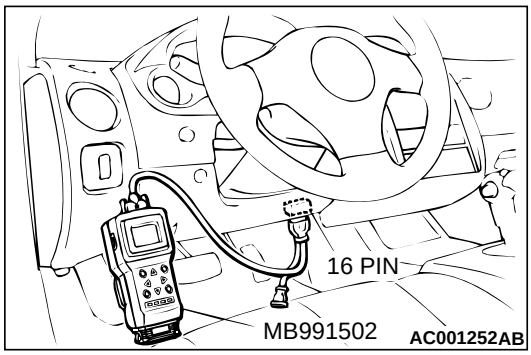
- MB991502: Scan Tool (MUT-II)
- MB991658: Test Harness Set
- MB991709: Test Harness Set

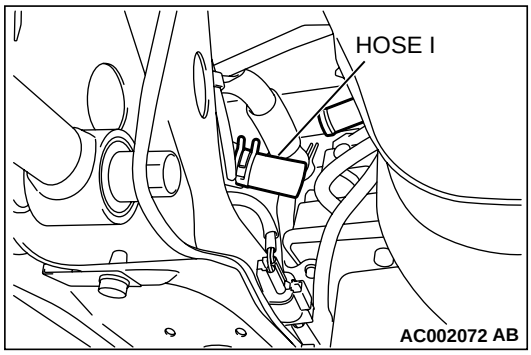
STEP 1. Using scan tool MB991502, check data list item 73: Fuel Tank Differential Pressure Sensor.

⚠ CAUTION

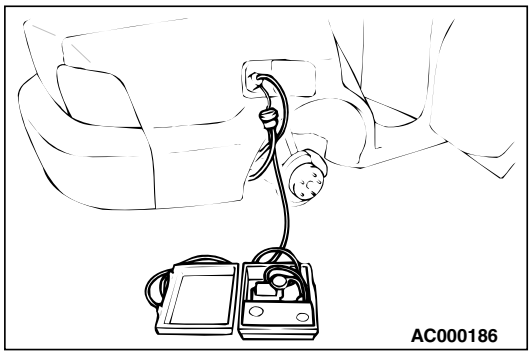
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.





(2) Disconnect hose I from the evaporative emission canister side, and plug the hose from which the pipes have been disconnected.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Set scan tool MB991502 to the data reading mode for item 73, Fuel Tank Differential Pressure Sensor.
- The fuel tank pressures should be −1.5 to 1.5kPa (−285 to 285 inHg.)

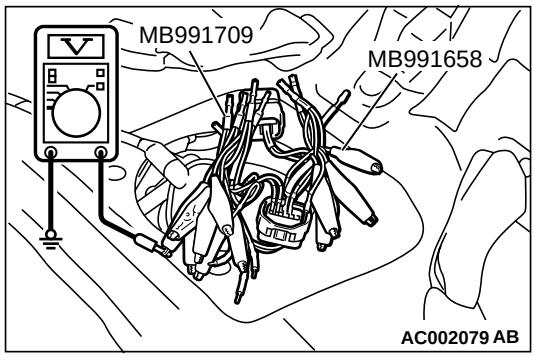


(6) Connect an evaporative emission system pressure pump to the fuel filler neck, and apply pressure.
- The scan tool reading should increase.

(7) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991502.

Q: Is the scan tool reading within the specified value?

YES : Go to Step 22.
NO : Go to Step 2.



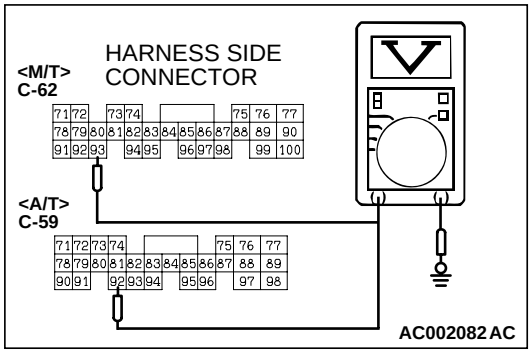
STEP 2. Check the output circuit voltage at intermediate connector D-16.

(1) Remove the rear seat cushion. (Refer to GROUP 52, Rear Seat P.52A-20.)
(2) Remove the protector.
(3) Disconnect intermediate connector D-16.
(4) Use special tools (MB991658 and MB991709) to connect terminals 5, 6 and 8 between connectors of the intermediate connector respectively.
(5) Turn the ignition switch to the "ON" position.
(6) Remove the fuel cap.
(7) Measure the voltage between terminal 5 and ground.
- Voltage should be between 2.0 and 3.0 volts.

(8) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Remove the special tools and connect intermediate connector D-16. Then go to Step 3.
NO : Go to Step 6.



STEP 3. Check the output circuit voltage at ECM connector C-62 <M/T> or PCM connector C-59 <A/T> by backprobing.

(1) Do not disconnect the ECM connector C-62 <M/T> or PCM connector C-59 <A/T>.
(2) Turn the ignition switch to the "ON" position.
(3) Remove the fuel cap.
(4) Measure the voltage between terminal 93 <M/T> or terminal 92 <A/T> and ground by backprobing.
- Voltage should be between 2.0 and 3.0 volts.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

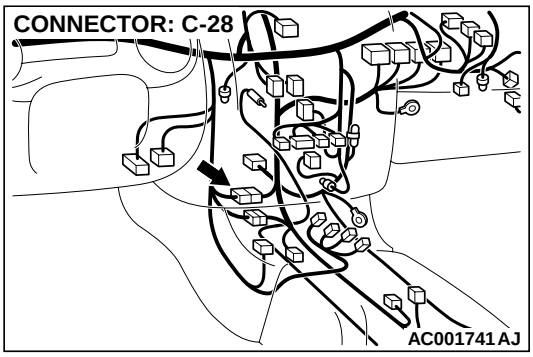
YES : Go to Step 21.
NO : Go to Step 4.

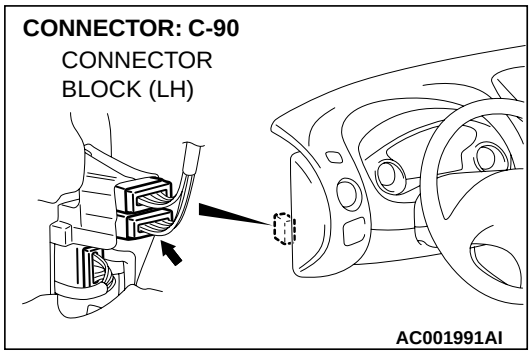
STEP 4. Check connectors C-28, C-90, D-16 at intermediate connector and C-62 at ECM <M/T> or C-59 at PCM <A/T> for damage.

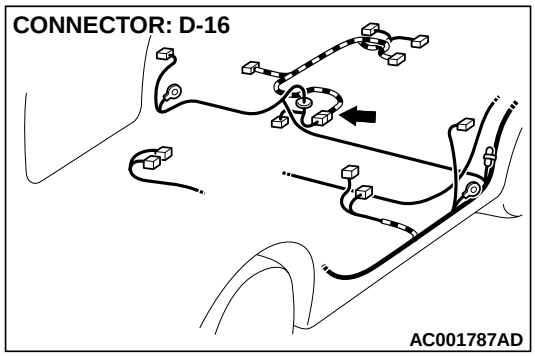
Q: Are the connectors in good condition?

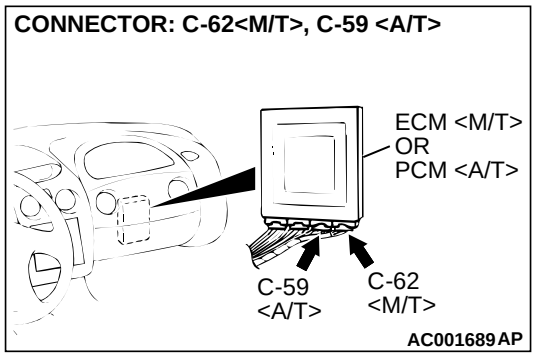
YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.







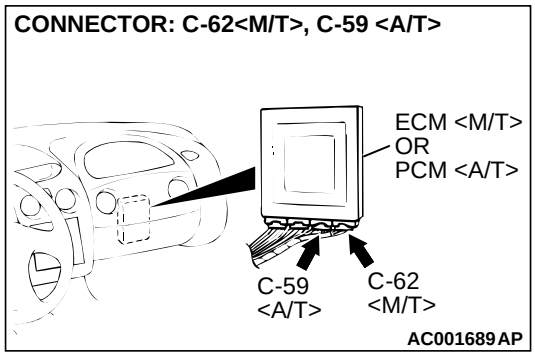


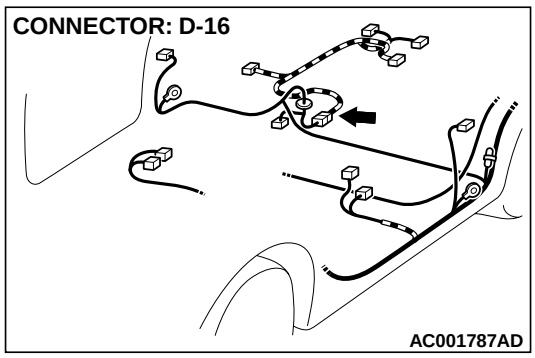
STEP 5. Check the harness wire between ECM connector C-62 terminal 93 <M/T> or PCM connector C-59 terminal 92 <A/T> and intermediate connector D-16 terminal 5 for damage.

Q: Is the harness wire in good condition?

YES : Go to Step 22.

NO : Repair it. Then go to 22.





STEP 6. Check the 5-volt supply circuit voltage at intermediate connector D-16.

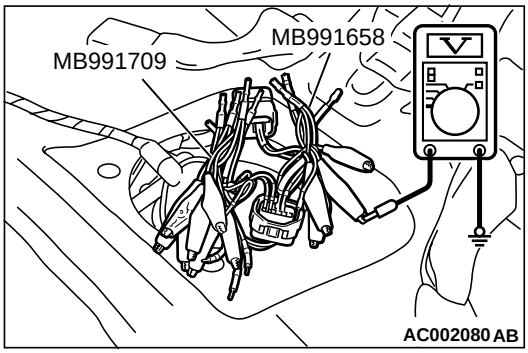
(1) Use special tools (MB991658 and MB991709) to connect terminals 5, 6 and 8 between connectors of the intermediate connector D-16 respectively.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 8 and ground.
- Voltage should be between 4.8 and 5.2 volts.

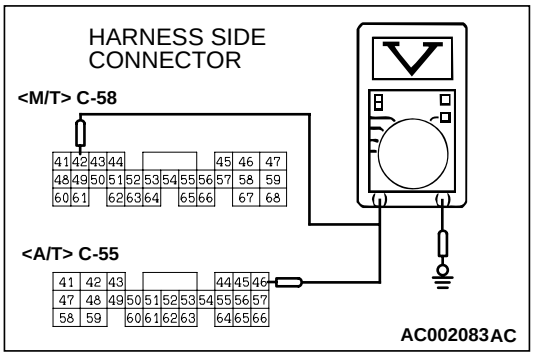
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 11.

NO : Remove the special tools and connect intermediate connector D-16. Then go to Step 7.





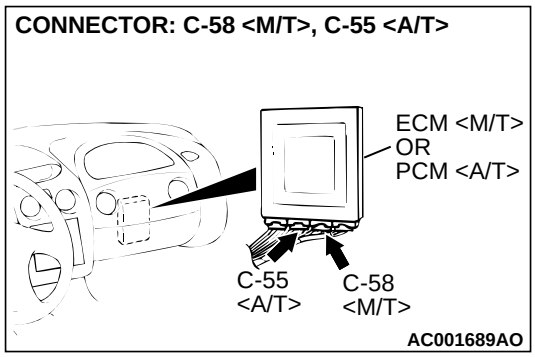
STEP 7. Check the 5-volt supply circuit voltage at ECM connector C-58 <M/T> or PCM connector C-55 <A/T> by backprobing.

(1) Do not disconnect ECM connector C-58 <M/T> or PCM connector C-55 <A/T>.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 42 <M/T> or terminal 46 <A/T> and ground by backprobing.
- Voltage should be between 4.8 and 5.2 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

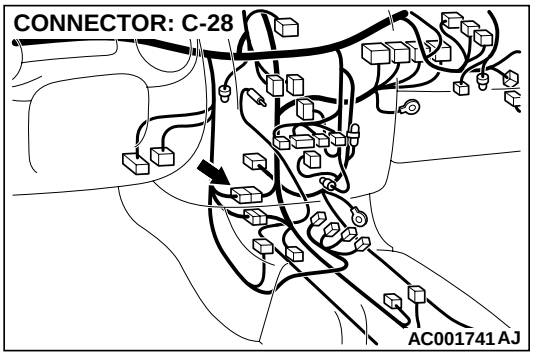
YES : Go to Step 9.
NO : Go to Step 8.

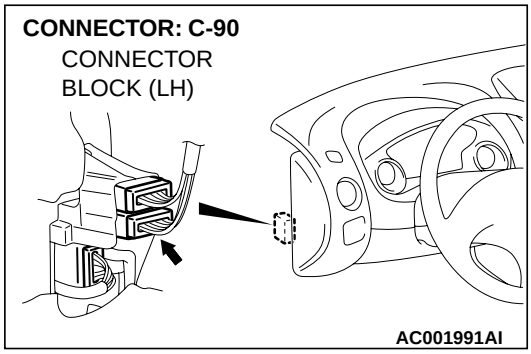


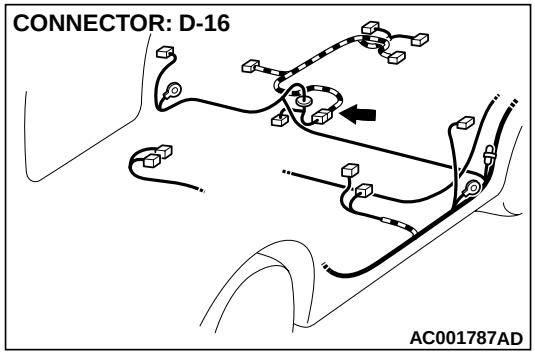
STEP 8. Check connector C-58 at ECM <M/T> or C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 21.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.







STEP 9. Check connectors C-28, C-90, D-16 at intermediate connector for damage.

Q: Are the connectors in good condition?

YES : Go to Step 10.

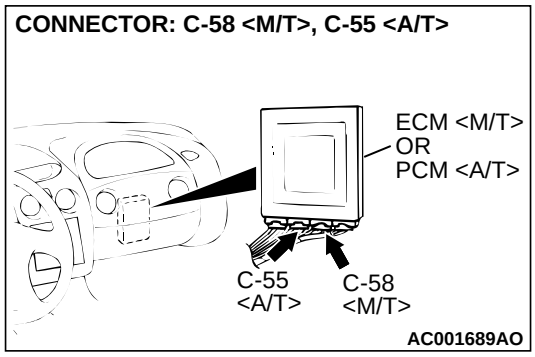
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.

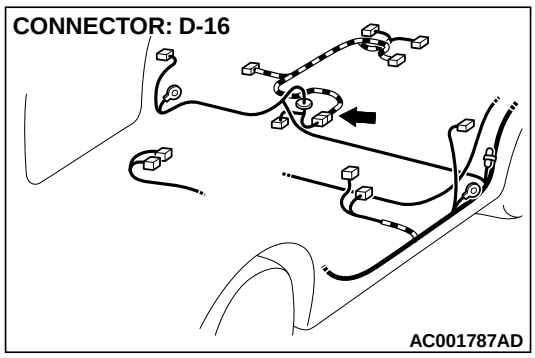
STEP 10. Check the harness wire between ECM connector C-58 terminal 42 <M/T> or PCM connector C-55 terminal 46 <A/T> and intermediate connector D-16 terminal 8 for damage.

Q: Is the harness wire in good condition?

YES : Go to Step 22.

NO : Repair it. Then go to 22.

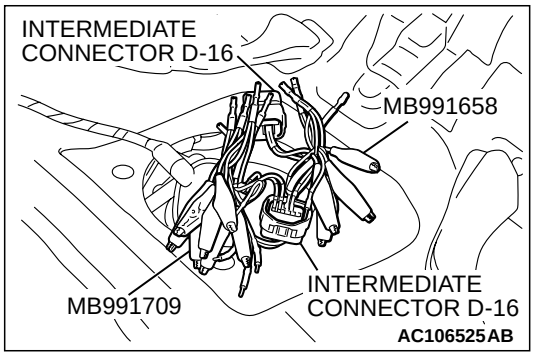




STEP 11. Check the circuit voltage at intermediate connector D-16.

(1) Use special tools (MB991658 and MB991709) to connect terminals 5 and 8 between connectors of the intermediate connector D-16 respectively.

(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage at the male side connector between terminal 6 and ground.
- Voltage should be between 0.5 and 4.8 volts.

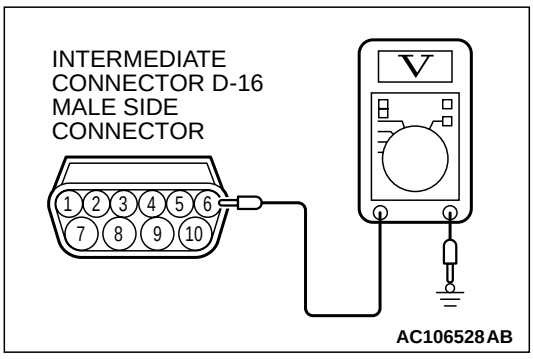
(4) Turn the ignition switch to the "LOCK" (OFF) position.

(5) Remove the special tools and connect intermediate connector D-16.

Q: Is the voltage normal?

YES : Go to Step 12.

NO : Go to Step 15.

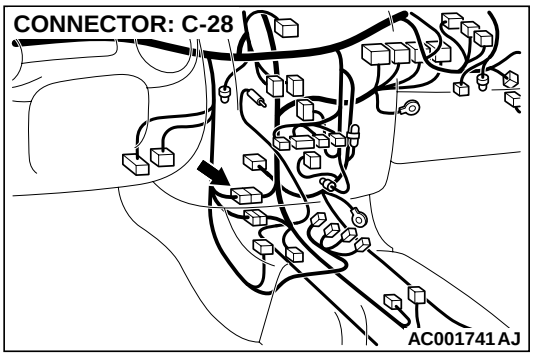


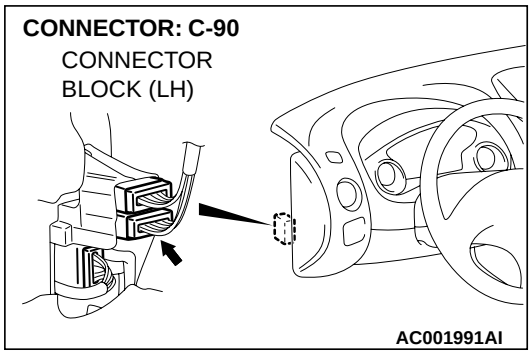
STEP 12. Check connectors C-28, C-90, D-16 at intermediate connector and C-58 at ECM <M/T> or C-55 at PCM <A/T> for damage.

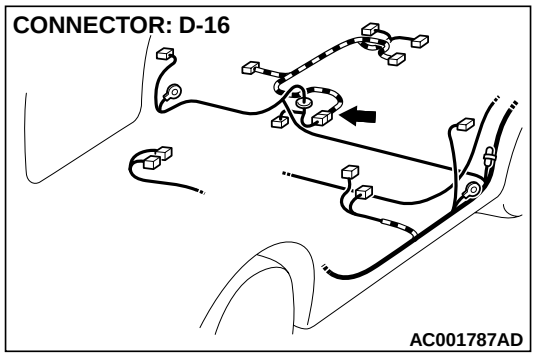
Q: Are the connectors in good condition?

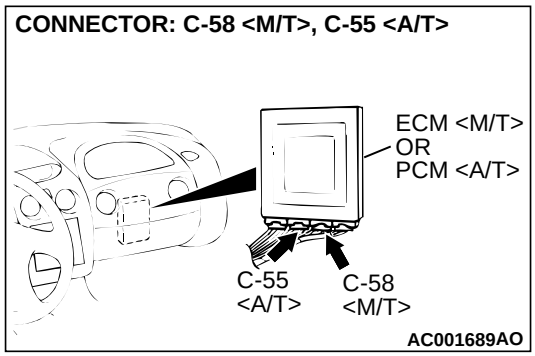
YES : Go to Step 13.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.







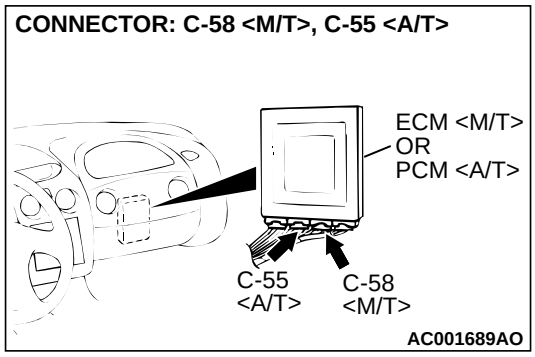


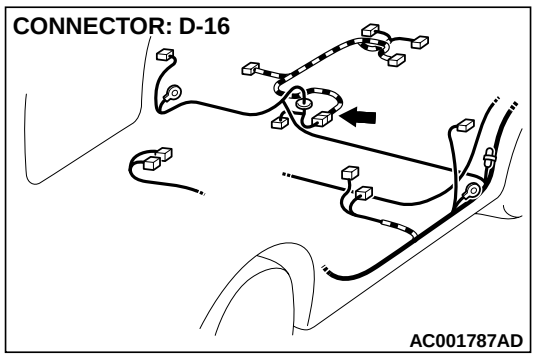
STEP 13. Check the harness wire between ECM connector C-58 terminal 49 <M/T> or PCM connector C-55 terminal 57 <A/T> and intermediate connector D-16 terminal 6 for damage.

Q: Is the harness wire in good condition?

YES : Go to Step 14.

NO : Repair it. Then go to 22.





STEP 14. Check the ground voltage at ECM connector C-58 <M/T> or PCM connector C-55 <A/T> by backprobing.

(1) Do not disconnect ECM connector C-58 <M/T> or PCM connector C-55 <A/T>.

(2) Turn the ignition switch to the "ON" position.

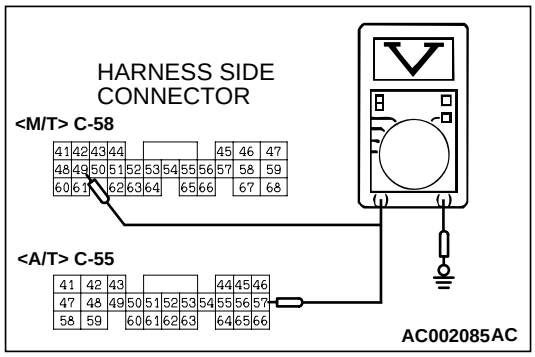
(3) Measure the voltage between terminal 49 <M/T> or terminal 57 <A/T> and ground by backprobing.
- The voltage should be 0.5 volt or less.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 18.

NO : Go to Step 21.

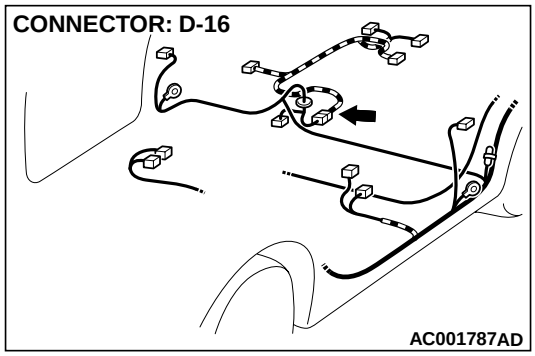


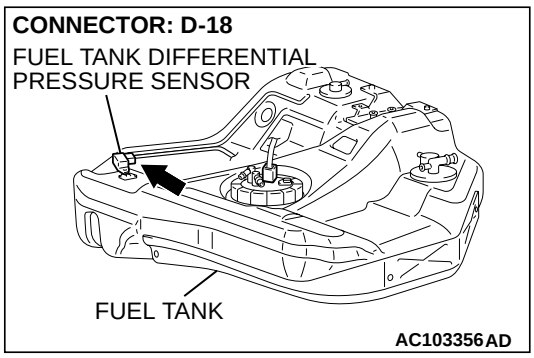
STEP 15. Check connectors D-16 at intermediate connector and D-18 at fuel tank differential pressure sensor for damage.

Q: Are the connectors in good condition?

YES : Go to Step 16.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.



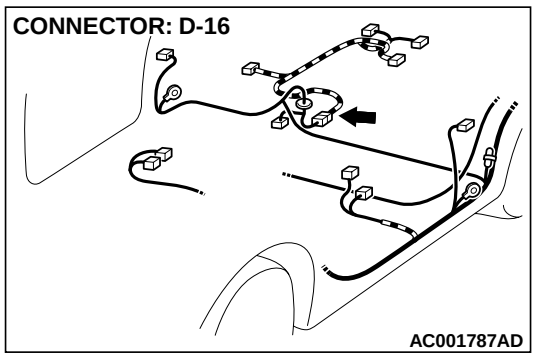


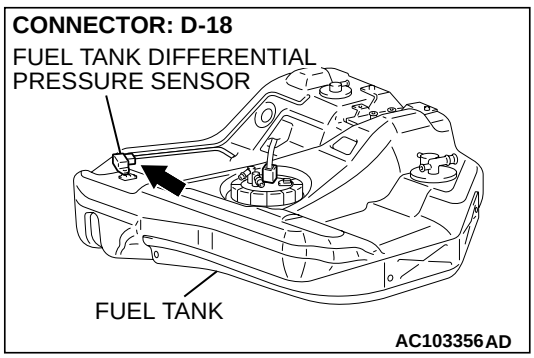
STEP 16. Check the harness wire between intermediate connector D-16 terminal 8 and fuel tank differential pressure sensor connector D-18 terminal 3 for damage.

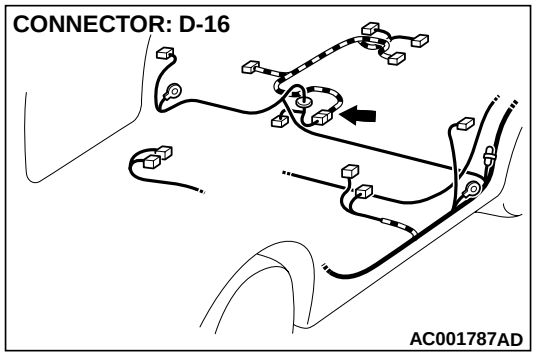
Q: Is the harness wire in good condition?

YES : Go to Step 17.

NO : Repair it. Then go to 22.





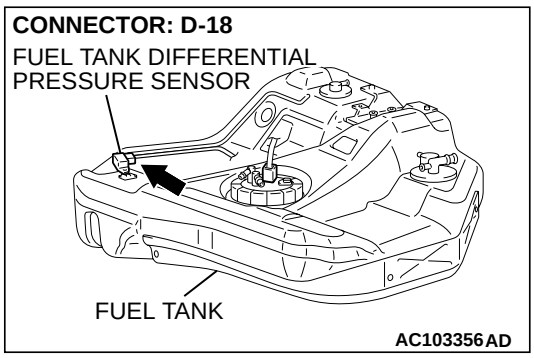


STEP 17. Check the harness wire between intermediate connector D-16 terminal 6 and fuel tank differential pressure sensor connector D-18 terminal 2 for damage.

Q: Is the harness wire in good condition?

YES : Replace the fuel tank differential pressure sensor. Then go to Step 22.

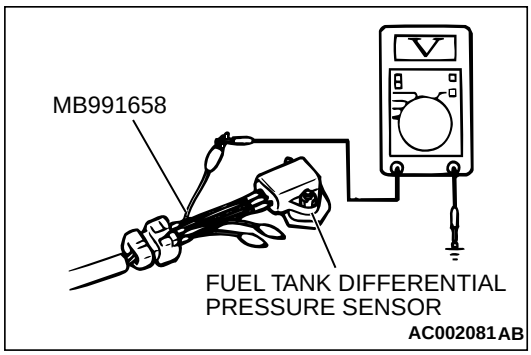
NO : Repair it. Then go to 22.



STEP 18. Check the output circuit voltage at fuel tank differential pressure sensor connector D-18.

(1) Remove the center exhaust pipe. (Refer to GROUP 15, Exhaust Pipe, Main Muffler and Catalytic Converter P.15-22.)
(2) Remove the fuel band assembly, tilt the fuel tank.
(3) Disconnect fuel tank differential pressure sensor connector D-18.
(4) Use special tool (MB991658) to connect terminals 1, 2 and 3 of the disconnected sensor connector and those of the harness side connector respectively.
(5) Turn the ignition switch to the "ON" position.
(6) Remove the fuel cap.
(7) Measure the voltage between terminal 1 and ground.
- Voltage should be between 2.0 and 3.0 volts.

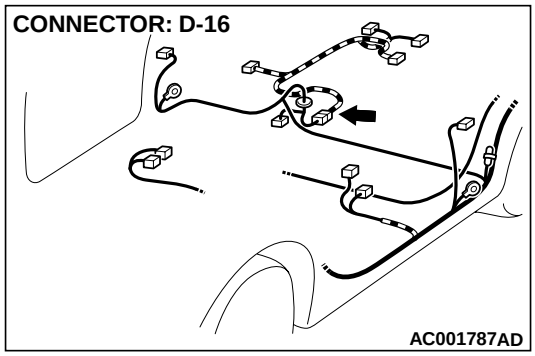
(8) Turn the ignition switch to the "LOCK" (OFF) position.

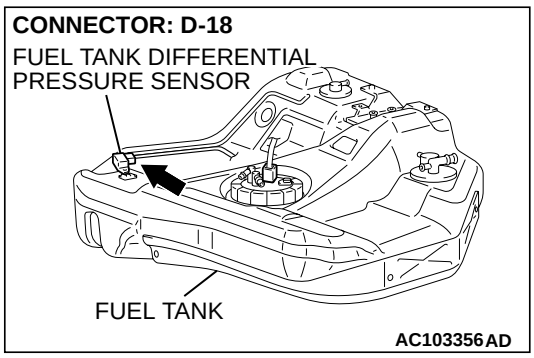


Q: Is the voltage normal?

YES : Remove the special tool and connect fuel tank differential pressure sensor connector D-18. Then go to Step 19.

NO : Replace the fuel tank differential pressure sensor. Then go to 22.



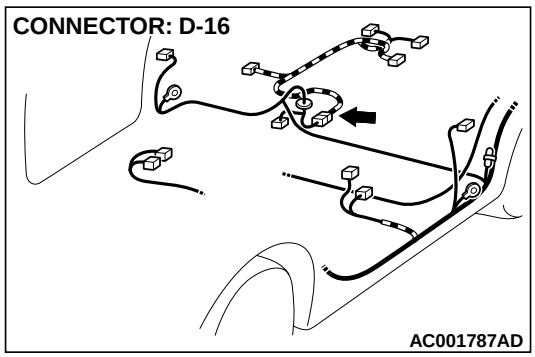


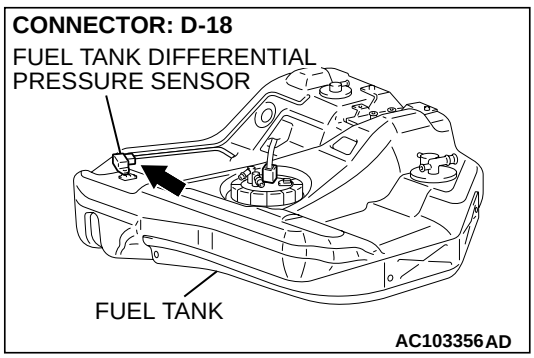
STEP 19. Check connectors D-16 at intermediate connector and D-18 at fuel tank differential pressure sensor for damage.

Q: Are the connectors in good condition?

YES : Go to Step 20.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.





STEP 20. Check the harness wire between intermediate connector D-16 terminal 5 and fuel tank differential pressure sensor connector D-18 terminal 1 for damage.

Q: Is the harness wire in good condition?

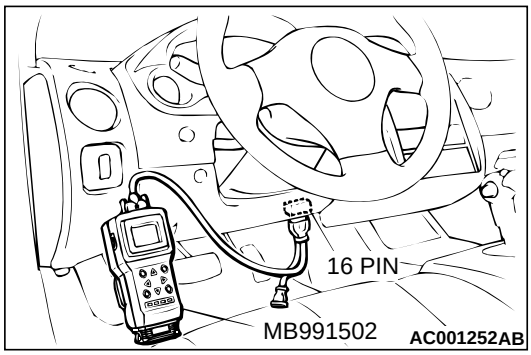
YES : Replace the fuel tank differential pressure sensor. Then go to Step 22.

NO : Repair it. Then go to 22.

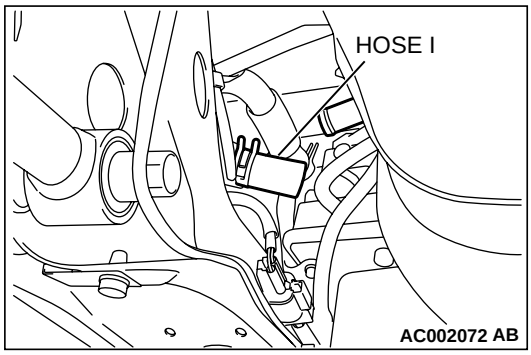
STEP 21. Using scan tool MB991502, check data list item 73: Fuel Tank Differential Pressure Sensor.

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.

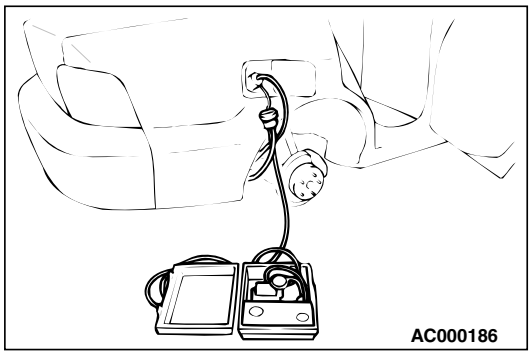


(2) Disconnect hose I from the evaporative emission canister side, and plug the hose from which the pipes have been disconnected.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Set scan tool MB991502 to the data reading mode for item 73, Fuel Tank Differential Pressure Sensor.
- The fuel tank pressures should be –1.5 to 1.5kPa (–285 to 285 inHg.)



(6) Connect an evaporative emission system pressure pump to the fuel filler neck, and apply pressure.
- The scan tool reading should increase.

(7) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991502.



Q: Is the scan tool reading within the specified value?

YES : This malfunction is intermittent malfunction. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6. Then go to Step 22.
NO : Replace the ECM <M/T> or PCM <A/T>. Then go to Step 22.

STEP 22. Test the OBD-II drive cycle.

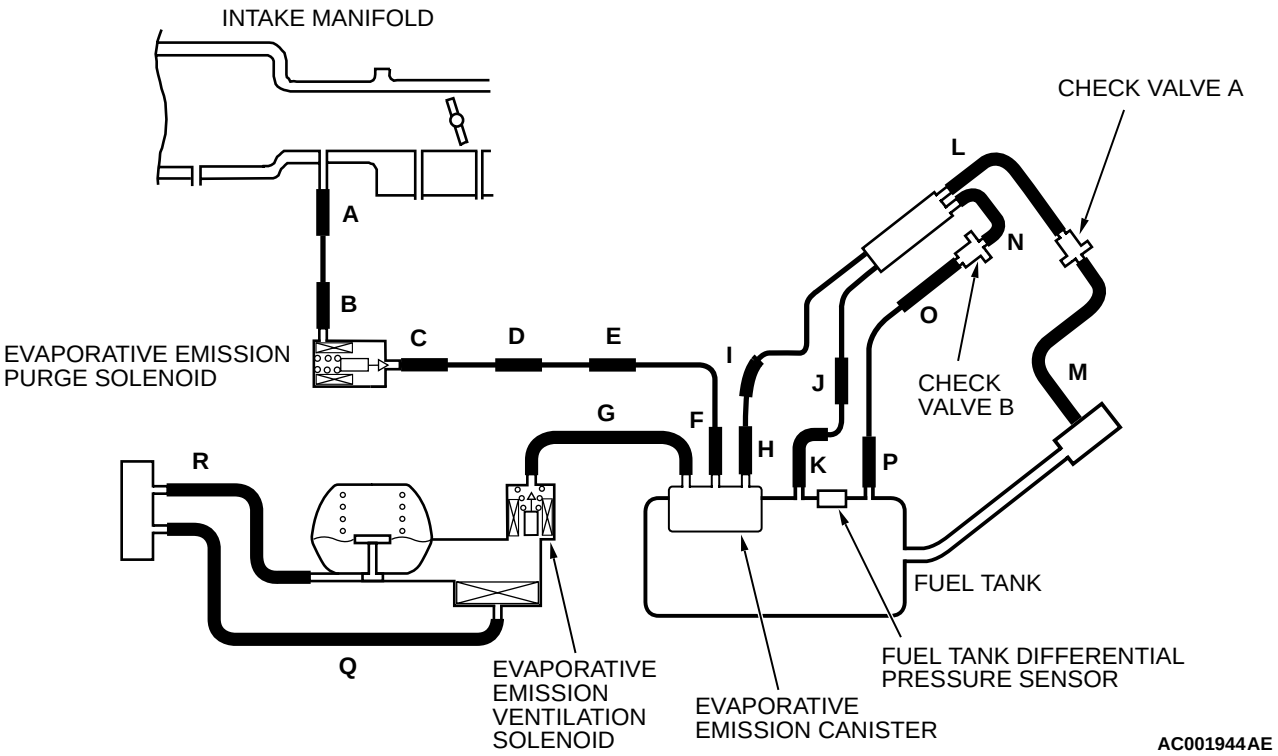
(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 1 - Evaporative Emission Control System Leak Monitor P.13B-6.
(2) Read the diagnostic trouble code.

Q: Is diagnostic trouble code P0451 set?

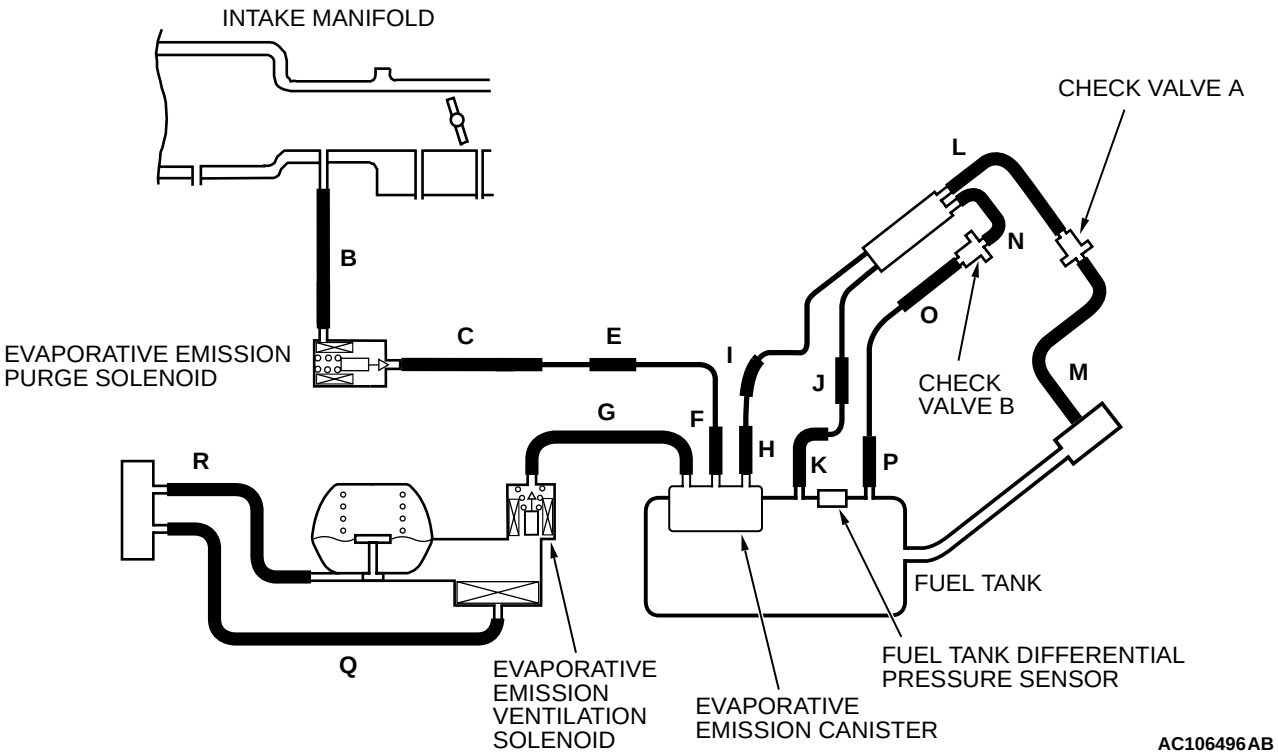
YES : Go to Step 2.
NO : This diagnosis is complete.

DTC P0452: Evaporative Emission Control System Pressure Sensor Low Input

SYSTEM DIAGRAM <VEHICLE WITHOUT VARIABLE INDUCTION SYSTEM>

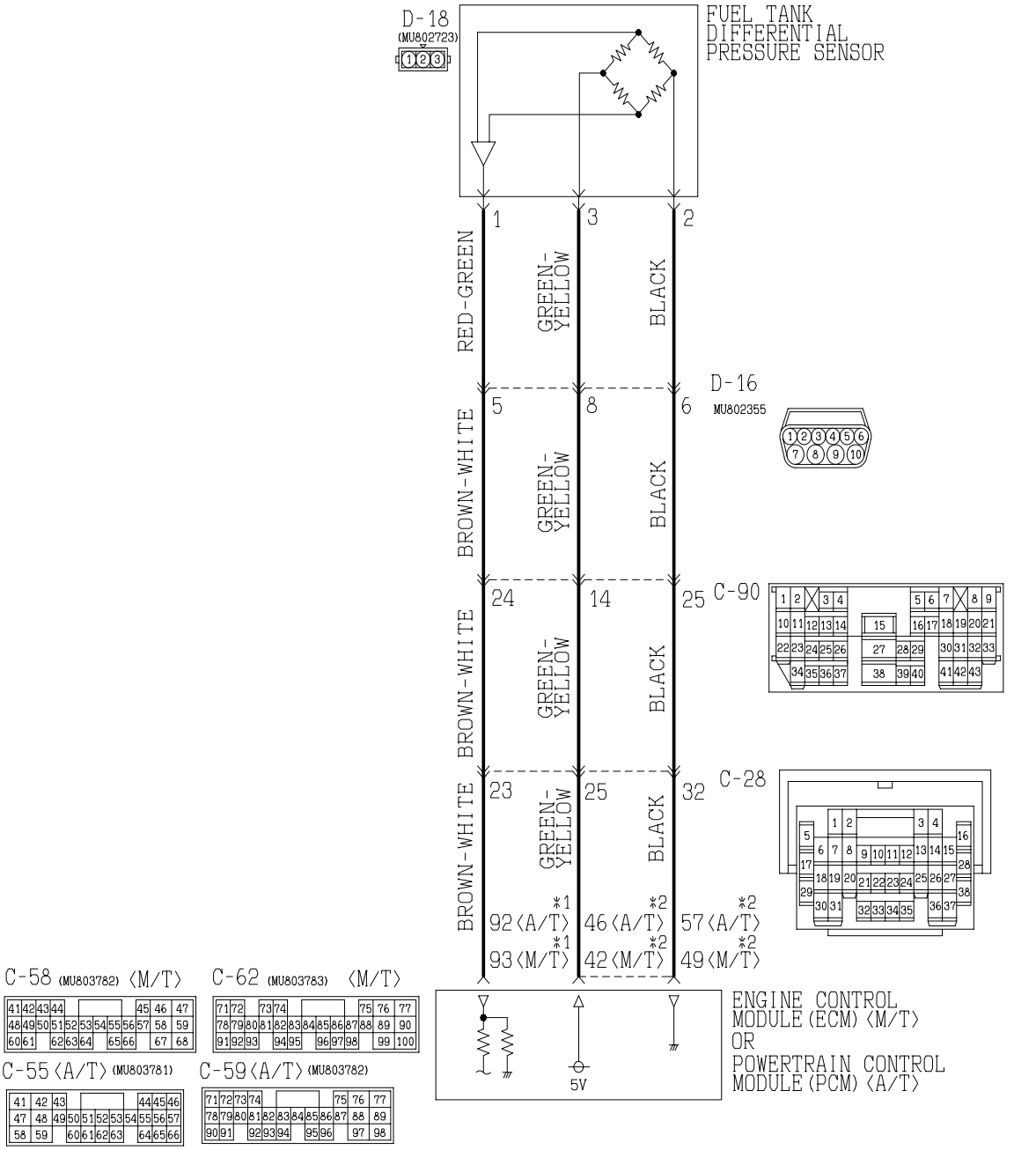


SYSTEM DIAGRAM <VEHICLE WITH VARIABLE INDUCTION SYSTEM>



TSB Revision

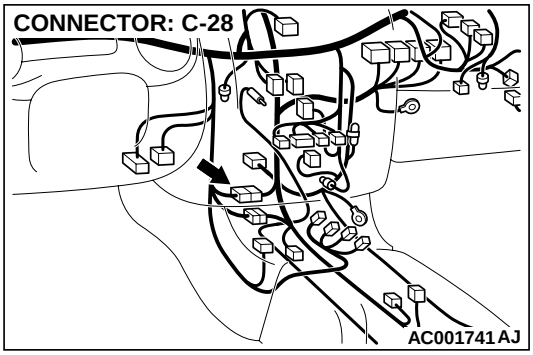
Fuel Tank Differential Pressure Sensor Circuit

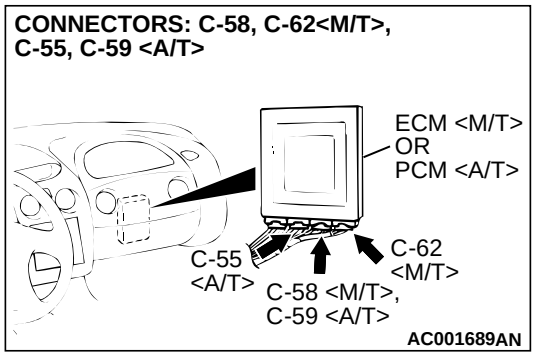


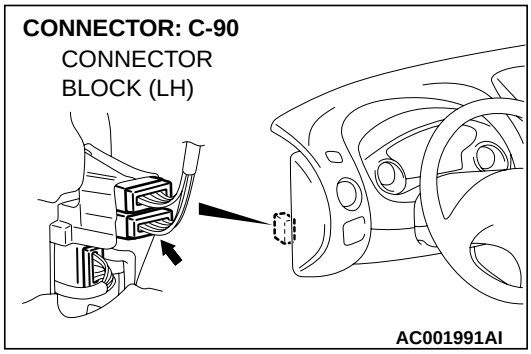
NOTE
*1:ECM connector C-58〈M/T〉or PCM connector C-59〈A/T〉
*2:ECM connector C-62〈M/T〉or PCM connector C-55〈A/T〉

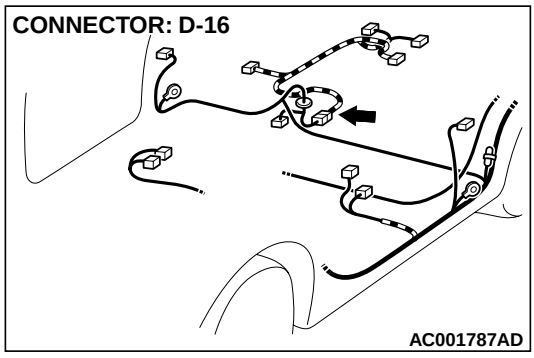
W2S18M02AA

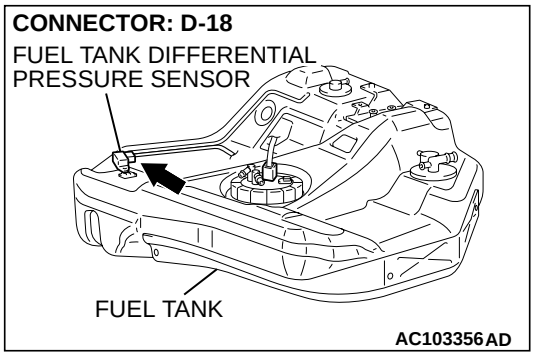
TSB Revision











CIRCUIT OPERATION

- A 5-volt voltage is supplied to the power terminal of the fuel tank differential pressure sensor (terminal 3) from the ECM (terminal 42) <M/T> or PCM (terminal 46) <A/T>. The ground terminal (terminal 2) is grounded with the ECM (terminal 49) <M/T> or PCM (terminal 57) <A/T>.
- A voltage proportional to the pressure in the fuel tank is sent from the output terminal of the fuel tank differential pressure sensor (terminal 1) to the ECM (terminal 93) <M/T> or PCM (terminal 92) <A/T>.

TECHNICAL DESCRIPTION

- To judge if the fuel tank differential pressure sensor is defective, the ECM <M/T> or PCM <A/T> monitors the fuel tank differential pressure sensor output voltage.
- Based on the test conditions and judgment criteria, the ECM <M/T> or PCM <A/T> judges if the fuel tank differential pressure sensor output voltage is normal.

DTC SET CONDITIONS

Test Conditions: For Test to Run

- Intake air temperature is higher than 5°C (41°C).
- Engine speed is 1,600 r/min or more.
- Volumetric efficiency is between 25 and 80 percent.

Judgment Criteria

- When the evaporative emission purge solenoid is off, the fuel differential pressure sensor output voltage remains 1.0 volt or less for ten seconds.

TROUBLESHOOTING HINTS

The most likely causes for this code to be set are:

- Fuel tank differential pressure sensor failed.

TSB Revision

- Open fuel tank differential pressure sensor circuit, or loose connector.
- ECM <M/T> or PCM <A/T> failed.

OVERVIEW OF TROUBLESHOOTING

- The DTC P0452 can be set if either of the following conditions occur:
  1. Faulty fuel differential pressure sensor, related circuit, or ECM <M/T> or PCM <A/T>.
- To check a system blockage, do a performance test which uses a mechanical vacuum gauge and scan tool MB991502 set on the fuel tank differential pressure sensor (TANK PRS SNSR 73.)
  The mechanical gauge reading is used to verify scan tool MB991502 reading.
  A comparison of the mechanical gauge to scan tool MB991502 determines the problem in the system.

DIAGNOSIS

Required Special Tools:

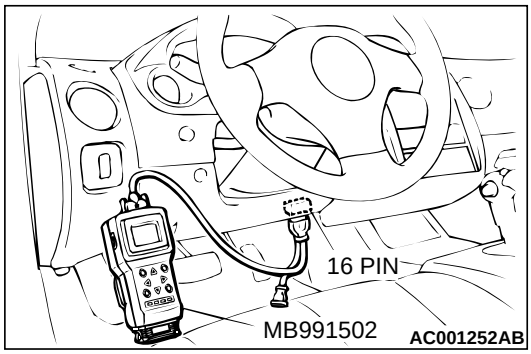
- MB991502: Scan Tool (MUT-II)
- MB991658: Test Harness Set
- MB991709: Test Harness Set

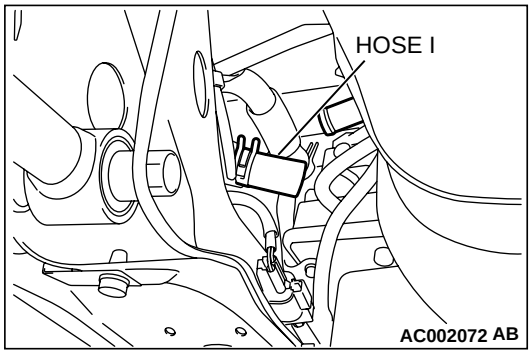
STEP 1. Using scan tool MB991502, check data list item 73: Fuel Tank Differential Pressure Sensor.

⚠ CAUTION

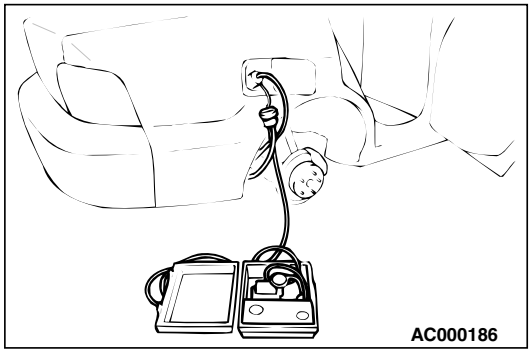
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.





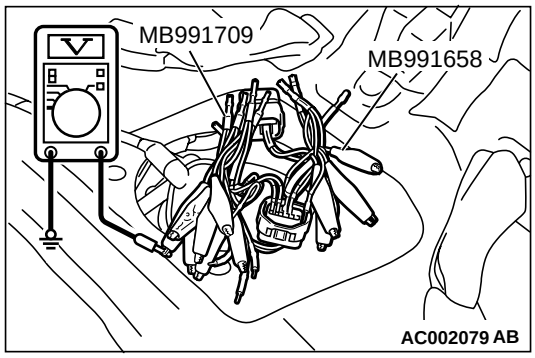
(2) Disconnect hose I from the evaporative emission canister side, and plug the hose from which the pipes have been disconnected.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Set scan tool MB991502 to the data reading mode for item 73, Fuel Tank Differential Pressure Sensor.
  - The fuel tank pressures should be −1.5 to 1.5kPa (−285 to 285 inHg.)



(6) Connect an evaporative emission system pressure pump to the fuel filler neck, and apply pressure.
  - The scan tool reading should increase.
(7) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991502.

Q: Is the scan tool reading within the specified value?

YES : Go to Step 22.
NO : Go to Step 2.



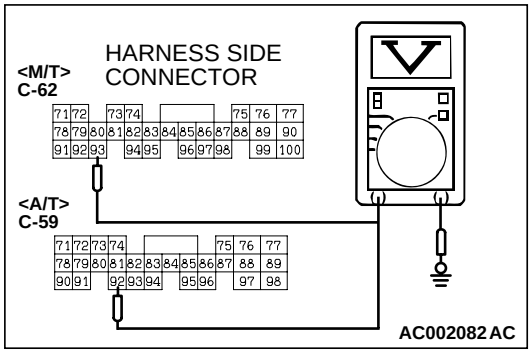
STEP 2. Check the output circuit voltage at intermediate connector D-16.

(1) Remove the rear seat cushion. (Refer to GROUP 52, Rear Seat P.52A-20.)
(2) Remove the protector.
(3) Disconnect intermediate connector D-16.
(4) Use special tools (MB991658 and MB991709) to connect terminals 5, 6 and 8 between connectors of the intermediate connector respectively.
(5) Turn the ignition switch to the "ON" position.
(6) Remove the fuel cap.
(7) Measure the voltage between terminal 5 and ground.
- Voltage should be between 2.0 and 3.0 volts.

(8) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Remove the special tools and connect intermediate connector D-16. Then go to Step 3.
NO : Go to Step 6.



STEP 3. Check the output circuit voltage at ECM connector C-62 <M/T> or PCM connector C-59 <A/T> by backprobing.

(1) Do not disconnect the ECM connector C-62 <M/T> or PCM connector C-59 <A/T>.
(2) Turn the ignition switch to the "ON" position.
(3) Remove the fuel cap.
(4) Measure the voltage between terminal 93 <M/T> or terminal 92 <A/T> and ground by backprobing.
- Voltage should be between 2.0 and 3.0 volts.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

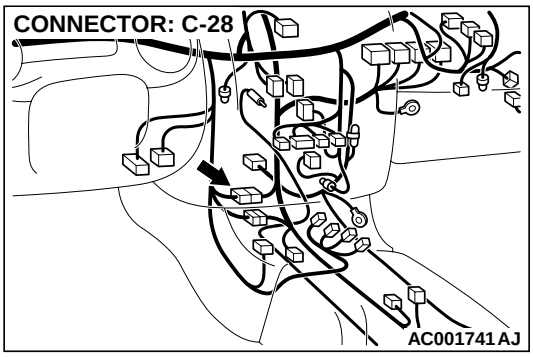
YES : Go to Step 21.
NO : Go to Step 4.

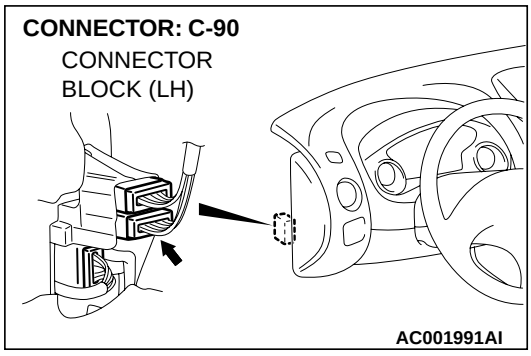
STEP 4. Check connectors C-28, C-90, D-16 at intermediate connector and C-62 at ECM <M/T> or C-59 at PCM <A/T> for damage.

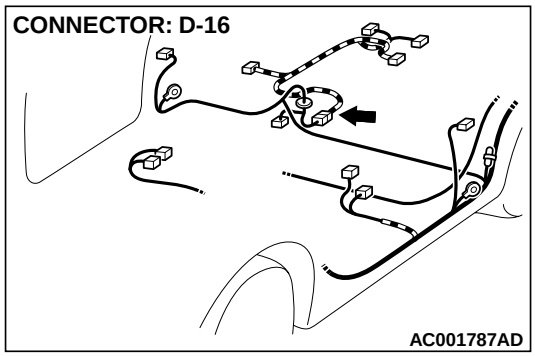
Q: Are the connectors in good condition?

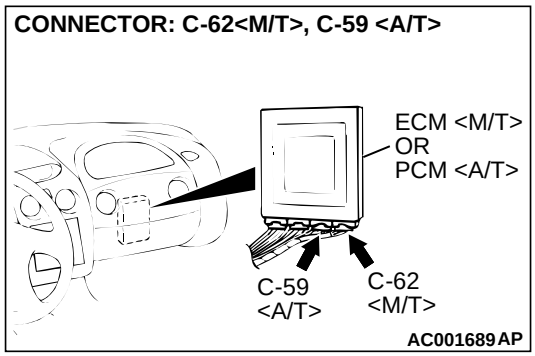
YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.







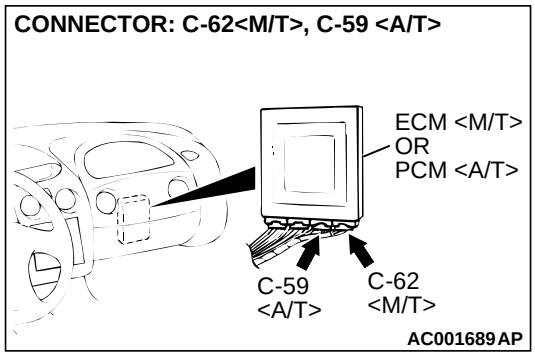


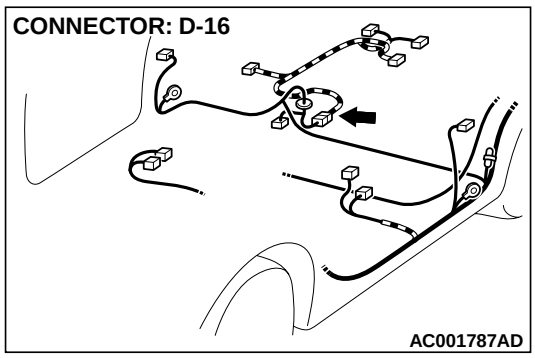
STEP 5. Check the harness wire between ECM connector C-62 terminal 93 <M/T> or PCM connector C-59 terminal 92 <A/T> and intermediate connector D-16 terminal 5 for damage.

Q: Is the harness wire in good condition?

YES : Go to Step 22.

NO : Repair it. Then go to 22.





STEP 6. Check the 5-volt supply circuit voltage at intermediate connector D-16.

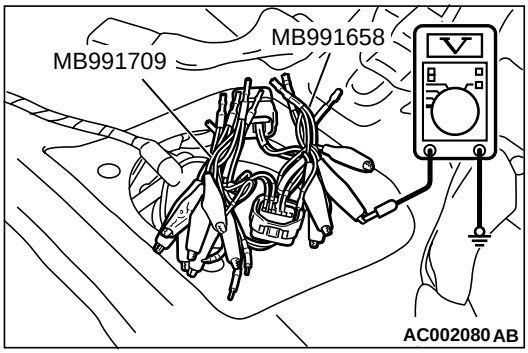
(1) Use special tools (MB991658 and MB991709) to connect terminals 5, 6 and 8 between connectors of the intermediate connector D-16 respectively.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 8 and ground.
- Voltage should be between 4.8 and 5.2 volts.

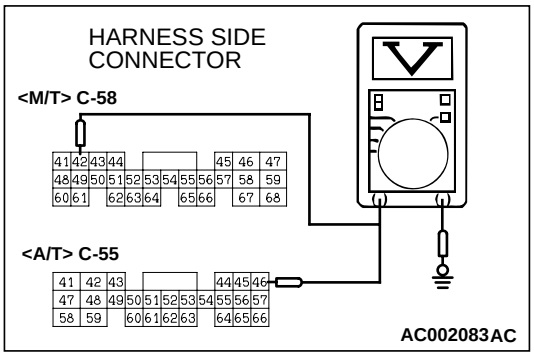
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 11.

NO : Remove the special tools and connect intermediate connector D-16. Then go to Step 7.





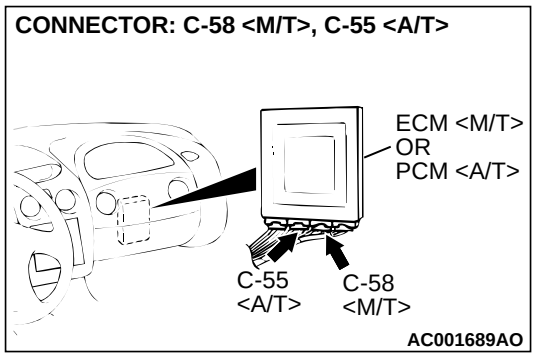
STEP 7. Check the 5-volt supply circuit voltage at ECM connector C-58 <M/T> or PCM connector C-55 <A/T> by backprobing.

(1) Do not disconnect ECM connector C-58 <M/T> or PCM connector C-55 <A/T>.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 42 <M/T> or terminal 46 <A/T> and ground by backprobing.
- Voltage should be between 4.8 and 5.2 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

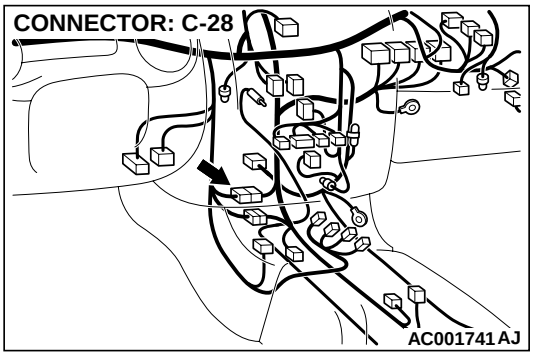
YES : Go to Step 9.
NO : Go to Step 8.

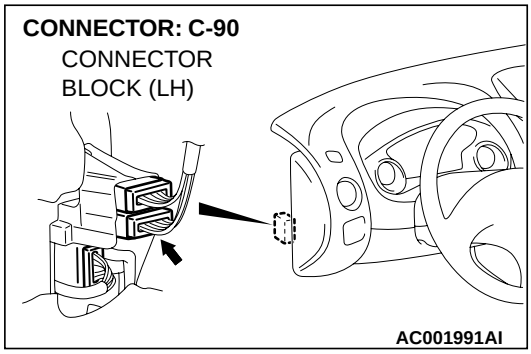


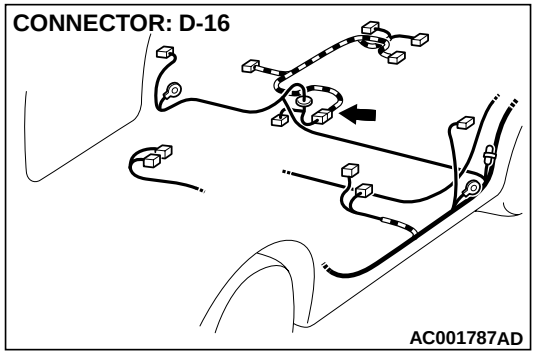
STEP 8. Check connector C-58 at ECM <M/T> or C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 21.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.







STEP 9. Check connectors C-28, C-90, D-16 at intermediate connector for damage.

Q: Are the connectors in good condition?

YES : Go to Step 10.

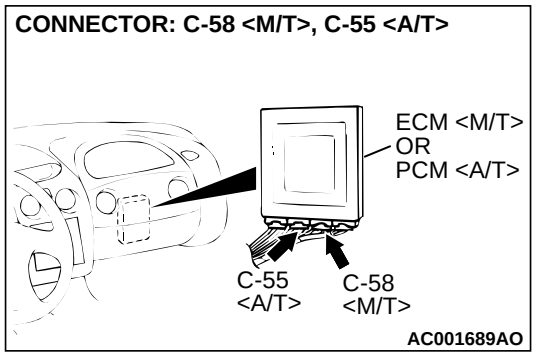
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.

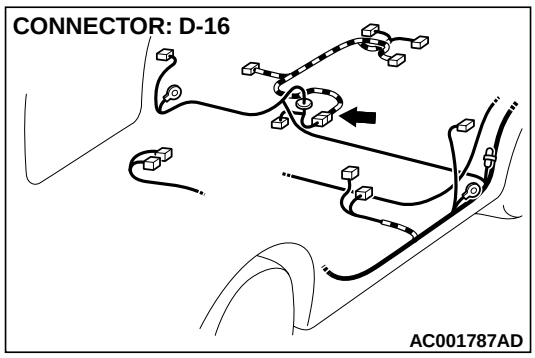
STEP 10. Check the harness wire between ECM connector C-58 terminal 42 <M/T> or PCM connector C-55 terminal 46 <A/T> and intermediate connector D-16 terminal 8 for damage.

Q: Is the harness wire in good condition?

YES : Go to Step 22.

NO : Repair it. Then go to 22.

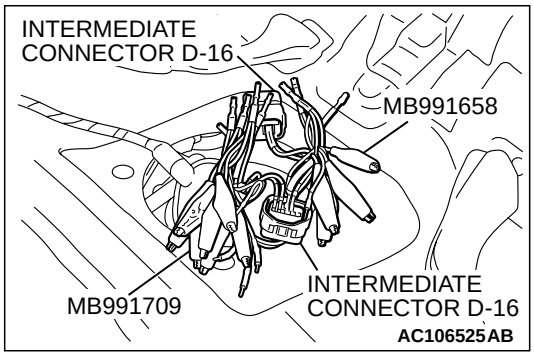




STEP 11. Check the circuit voltage at intermediate connector D-16.

(1) Use special tools (MB991658 and MB991709) to connect terminals 5 and 8 between connectors of the intermediate connector D-16 respectively.

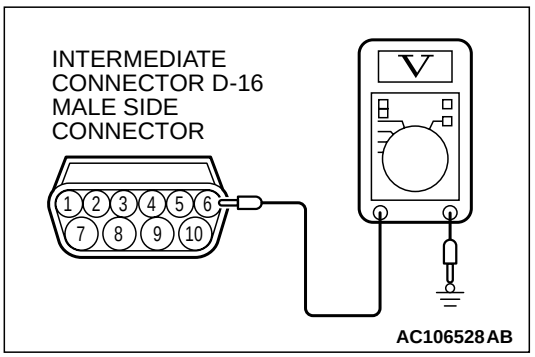
(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage at the male side connector between terminal 6 and ground.
- Voltage should be between 0.5 and 4.8 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

(5) Remove the special tools and connect intermediate connector D-16.



Q: Is the voltage normal?

YES : Go to Step 12.

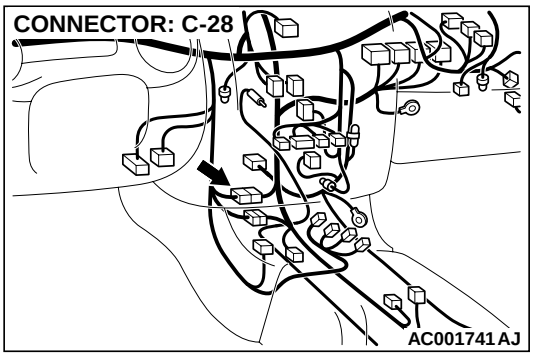
NO : Go to Step 15.

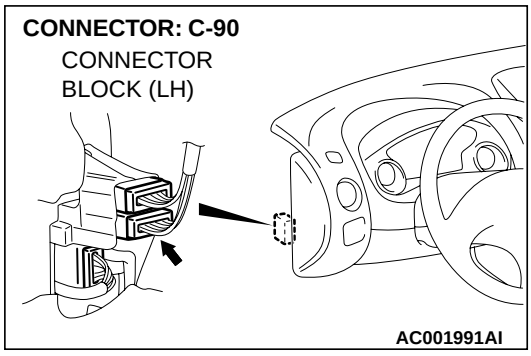
STEP 12. Check connectors C-28, C-90, D-16 at intermediate connector and C-58 at ECM <M/T> or C-55 at PCM <A/T> for damage.

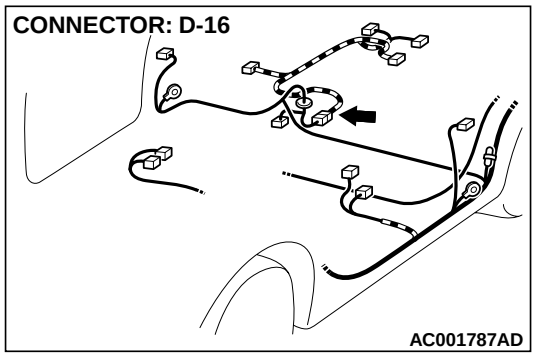
Q: Are the connectors in good condition?

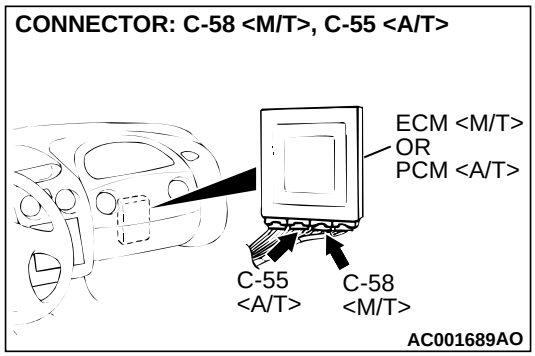
YES : Go to Step 13.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.







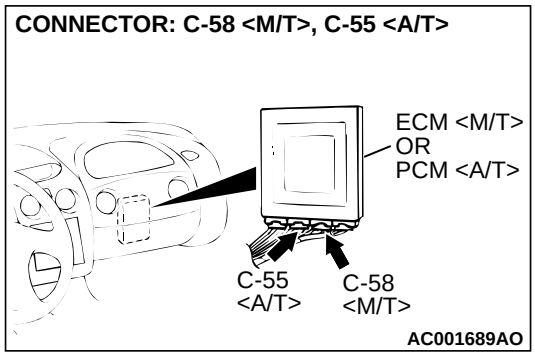


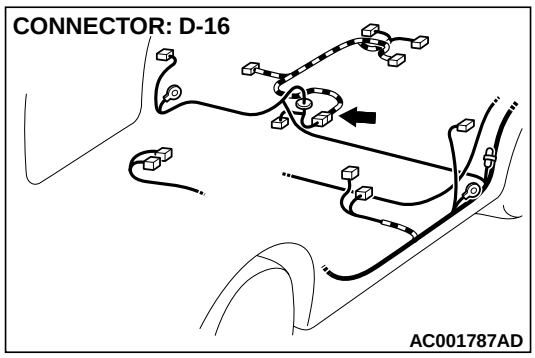
STEP 13. Check the harness wire between ECM connector C-58 terminal 49 <M/T> or PCM connector C-55 terminal 57 <A/T> and intermediate connector D-16 terminal 6 for damage.

Q: Is the harness wire in good condition?

YES : Go to Step 14.

NO : Repair it. Then go to 22.





STEP 14. Check the ground voltage at ECM connector C-58 <M/T> or PCM connector C-55 <A/T> by backprobing.

(1) Do not disconnect ECM connector C-58 <M/T> or PCM connector C-55 <A/T>.

(2) Turn the ignition switch to the "ON" position.

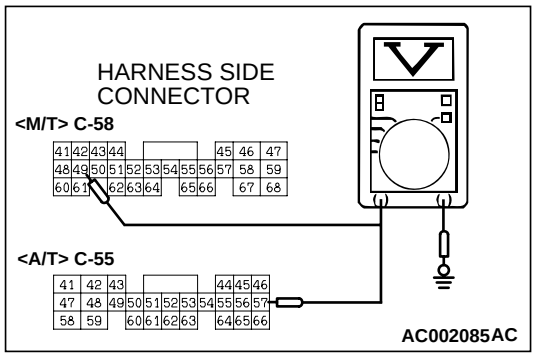
(3) Measure the voltage between terminal 49 <M/T> or terminal 57 <A/T> and ground by backprobing.
- The voltage should be 0.5 volt or less.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 18.

NO : Go to Step 21.

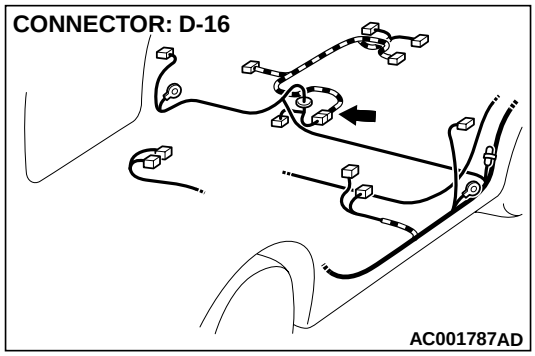


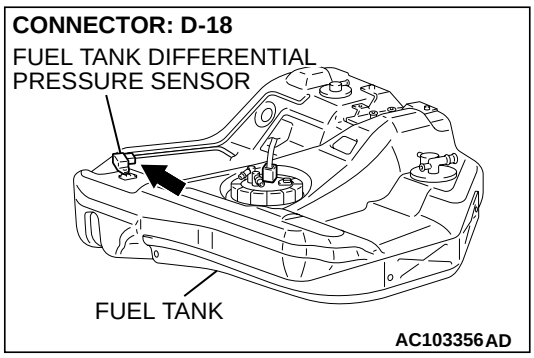
STEP 15. Check connectors D-16 at intermediate connector and D-18 at fuel tank differential pressure sensor for damage.

Q: Are the connectors in good condition?

YES : Go to Step 16.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.



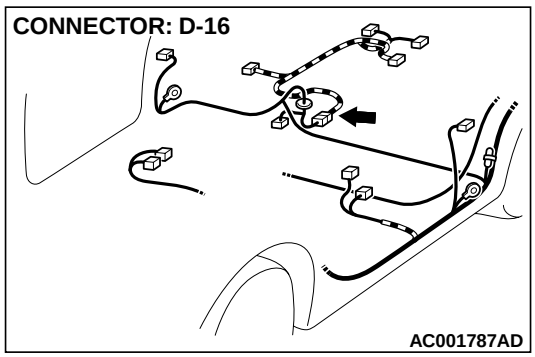


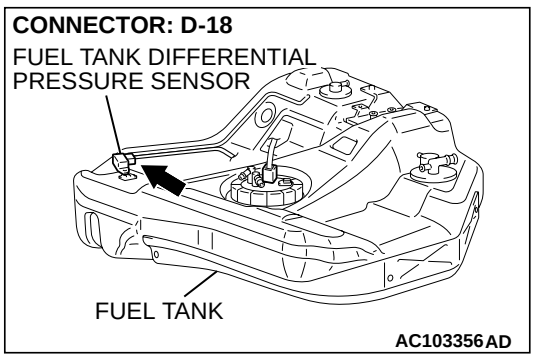
STEP 16. Check the harness wire between intermediate connector D-16 terminal 8 and fuel tank differential pressure sensor connector D-18 terminal 3 for damage.

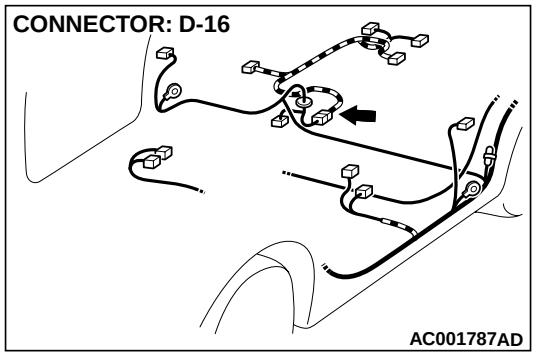
Q: Is the harness wire in good condition?

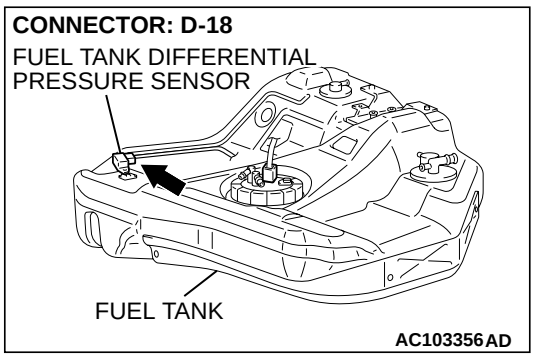
YES : Go to Step 17.

NO : Repair it. Then go to 22.







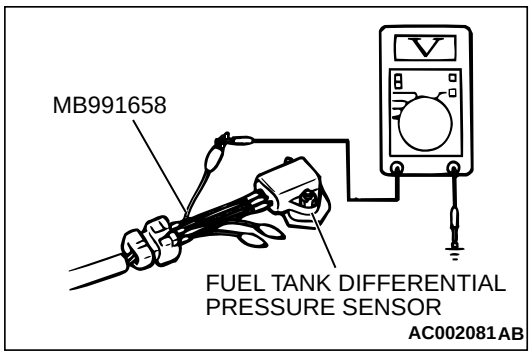


STEP 17. Check the harness wire between intermediate connector D-16 terminal 6 and fuel tank differential pressure sensor connector D-18 terminal 2 for damage.

Q: Is the harness wire in good condition?

YES : Replace the fuel tank differential pressure sensor. Then go to Step 22.

NO : Repair it. Then go to 22.



STEP 18. Check the output circuit voltage at fuel tank differential pressure sensor connector D-18.

(1) Remove the center exhaust pipe. (Refer to GROUP 15, Exhaust Pipe, Main Muffler and Catalytic Converter P.15-22.)
(2) Remove the fuel band assembly, tilt the fuel tank.
(3) Disconnect fuel tank differential pressure sensor connector D-18.
(4) Use special tool (MB991658) to connect terminals 1, 2 and 3 of the disconnected sensor connector and those of the harness side connector respectively.
(5) Turn the ignition switch to the "ON" position.
(6) Remove the fuel cap.
(7) Measure the voltage between terminal 1 and ground.
- Voltage should be between 2.0 and 3.0 volts.

(8) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Remove the special tool and connect fuel tank differential pressure sensor connector D-18. Then go to Step 19.

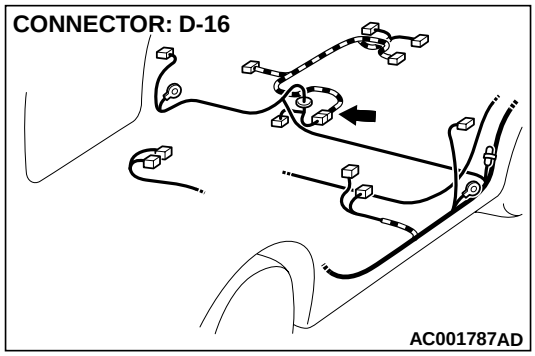
NO : Replace the fuel tank differential pressure sensor. Then go to 22.

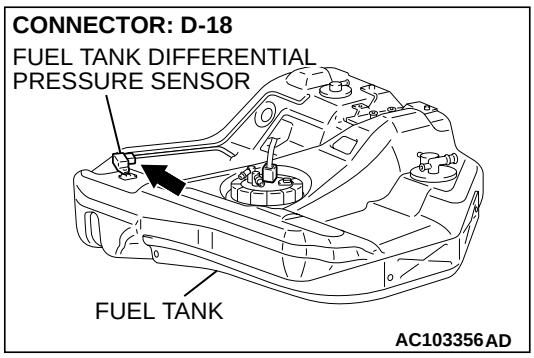
STEP 19. Check connectors D-16 at intermediate connector and D-18 at fuel tank differential pressure sensor for damage.

Q: Are the connectors in good condition?

YES : Go to Step 20.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.



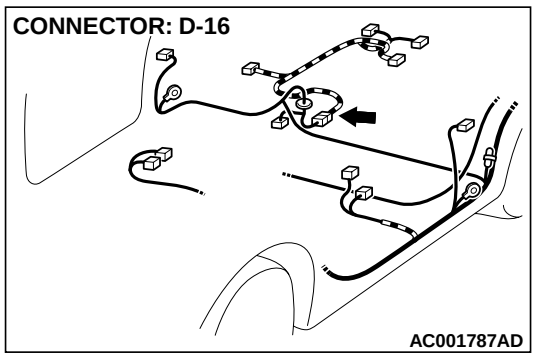


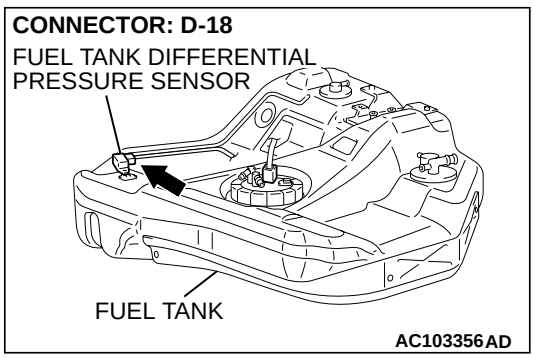
STEP 20. Check the harness wire between intermediate connector D-16 terminal 5 and fuel tank differential pressure sensor connector D-18 terminal 1 for damage.

Q: Is the harness wire in good condition?

YES : Replace the fuel tank differential pressure sensor. Then go to Step 22.

NO : Repair it. Then go to 22.

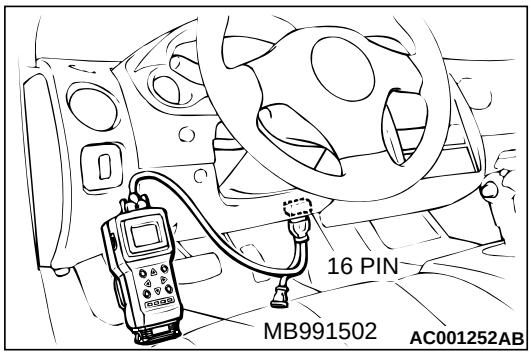




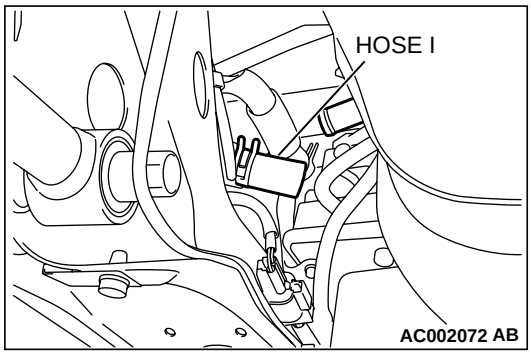
STEP 21. Using scan tool MB991502, check data list item 73: Fuel Tank Differential Pressure Sensor.

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.

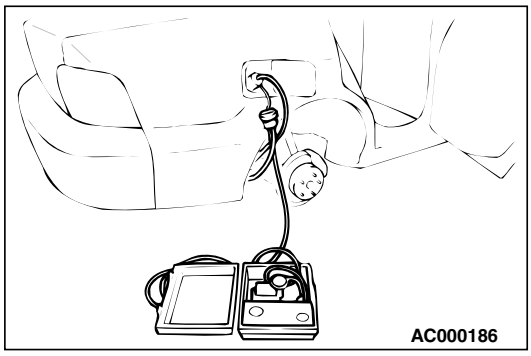


(2) Disconnect hose I from the evaporative emission canister side, and plug the hose from which the pipes have been disconnected.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Set scan tool MB991502 to the data reading mode for item 73, Fuel Tank Differential Pressure Sensor.
- The fuel tank pressures should be –1.5 to 1.5kPa (–285 to 285 inHg.)



(6) Connect an evaporative emission system pressure pump to the fuel filler neck, and apply pressure.
- The scan tool reading should increase.

(7) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991502.



Q: Is the scan tool reading within the specified value?

YES : This malfunction is intermittent malfunction. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6. Then go to Step 22.
NO : Replace the ECM <M/T> or PCM <A/T>. Then go to Step 22.

STEP 22. Test the OBD-II drive cycle.

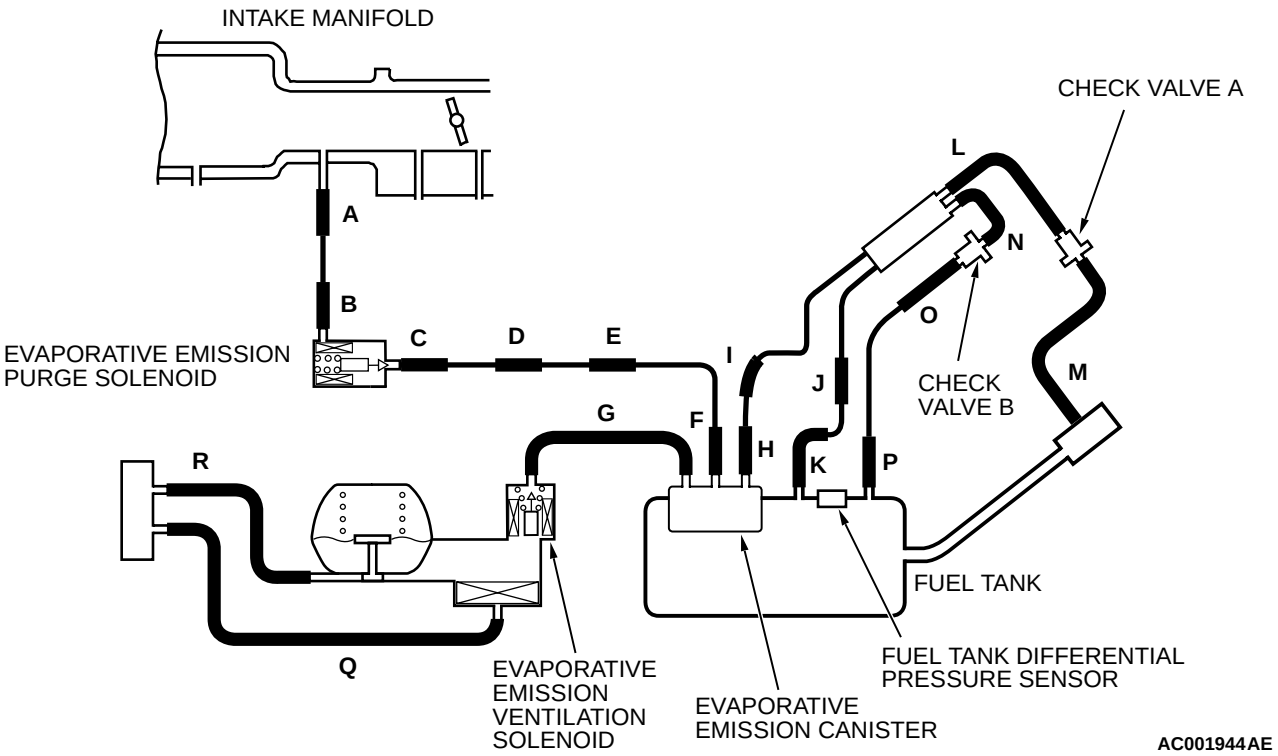
(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 1 - Evaporative Emission Control System Leak Monitor P.13B-6.
(2) Read the diagnostic trouble code.

Q: Is diagnostic trouble code P0452 set?

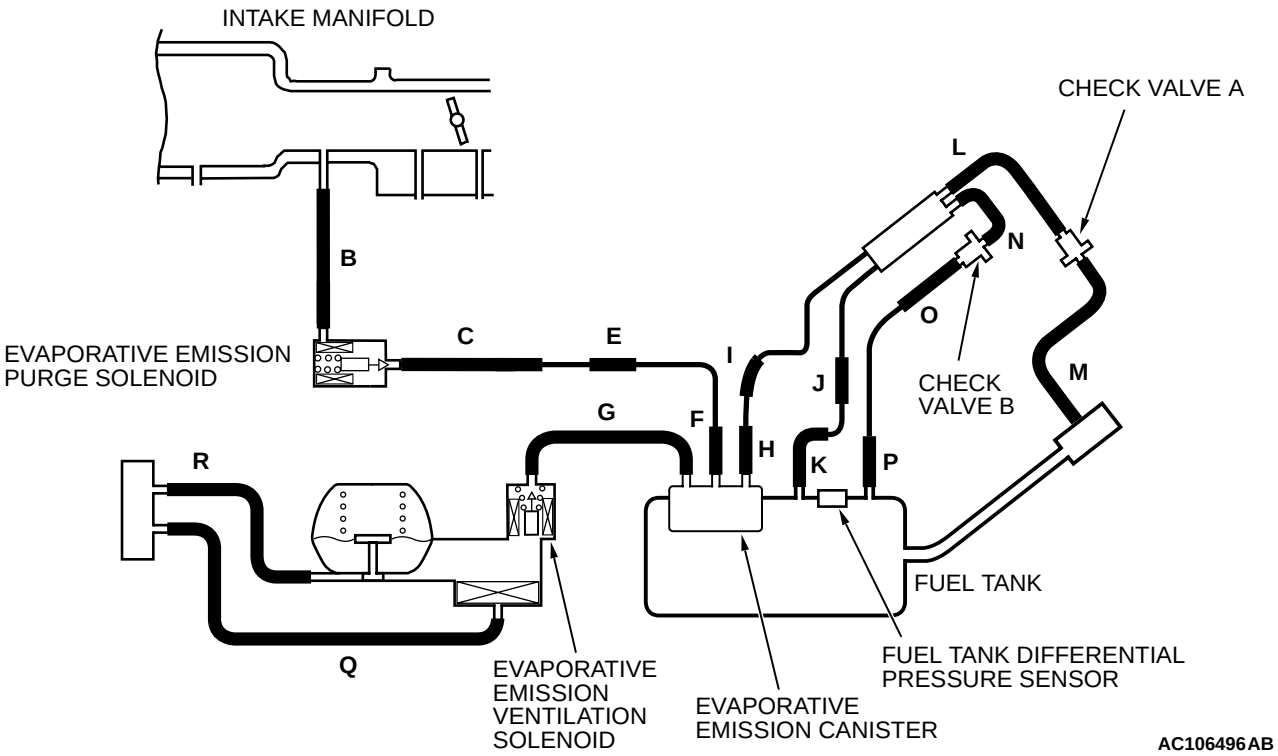
YES : Go to Step 2.
NO : This diagnosis is complete.

DTC P0453: Evaporative Emission Control System Pressure Sensor High Input

SYSTEM DIAGRAM <VEHICLE WITHOUT VARIABLE INDUCTION SYSTEM>

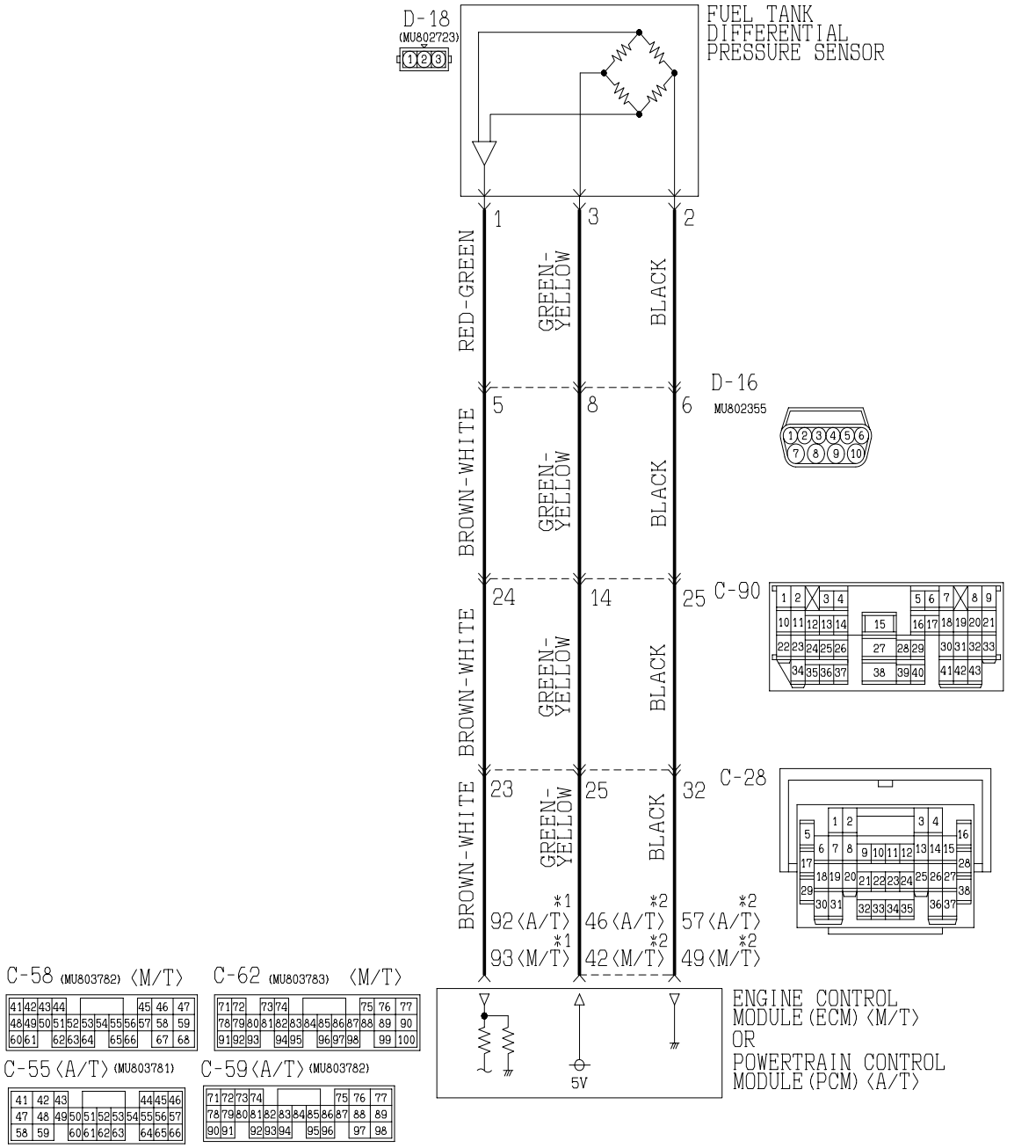


SYSTEM DIAGRAM <VEHICLE WITH VARIABLE INDUCTION SYSTEM>



TSB Revision

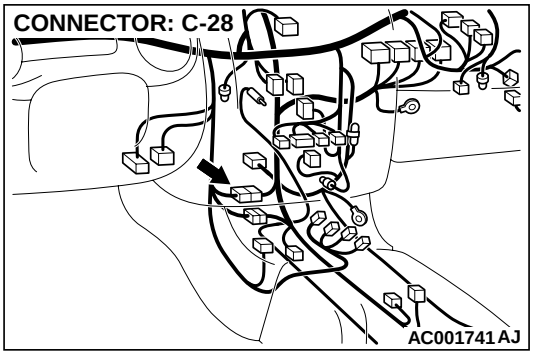
Fuel Tank Differential Pressure Sensor Circuit

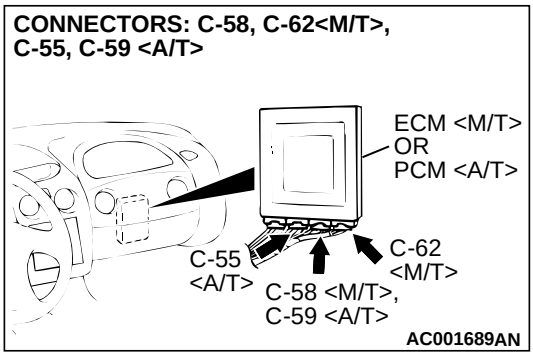


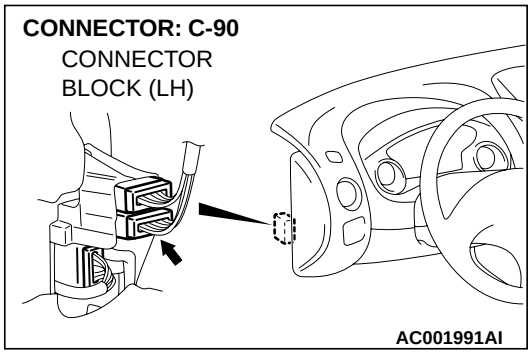
NOTE
*1:ECM connector C-58〈M/T〉or PCM connector C-59〈A/T〉
*2:ECM connector C-62〈M/T〉or PCM connector C-55〈A/T〉

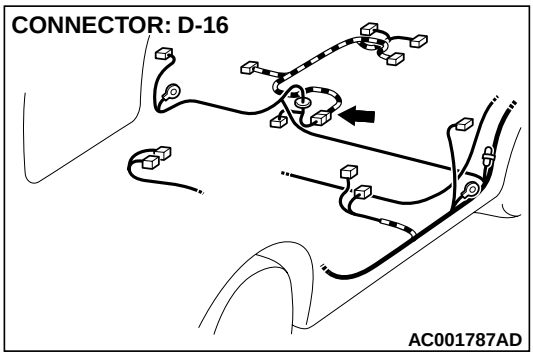
W2S18M02AA

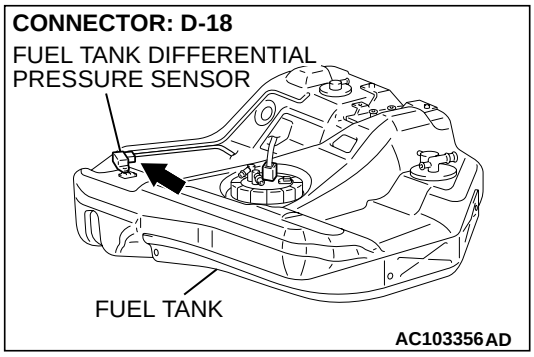
TSB Revision











CIRCUIT OPERATION

- A 5-volt voltage is supplied to the power terminal of the fuel tank differential pressure sensor (terminal 3) from the ECM (terminal 42) <M/T> or PCM (terminal 46) <A/T>. The ground terminal terminal 2 is grounded with the ECM (terminal 49) <M/T> or PCM (terminal 57) <A/T>.
- A voltage proportional to the pressure in the fuel tank is sent from the output terminal of the fuel tank differential pressure sensor (terminal 1) to the ECM (terminal 93) <M/T> or PCM (terminal 92) <A/T>.

TECHNICAL DESCRIPTION

- To judge if the fuel tank differential pressure sensor is defective, the ECM <M/T> or PCM <A/T> monitors the fuel tank differential pressure sensor output voltage.
- Based on the test conditions and judgment criteria, the ECM <M/T> or PCM <A/T> judges if the fuel tank differential pressure sensor output voltage is normal.

DTC SET CONDITIONS

Test Conditions: For Test to Run

- Intake air temperature is at between 5°C (41°F) and 45°C (113°F) or more.
- Engine speed is 1,600 r/min or more.
- Volumetric efficiency is between 25 and 80 percent.

Judgment Criteria

- When the evaporative emission purge solenoid valve is activating at 100 percent ratio, the fuel differential pressure sensor output voltage remains 4.0 volts or more for ten seconds.

TSB Revision

TROUBLESHOOTING HINTS

The most likely causes for this code to be set are:

- Fuel tank differential pressure sensor failed.
- Open fuel tank differential pressure sensor circuit, or loose connector.
- ECM <M/T> or PCM <A/T> failed.

OVERVIEW OF TROUBLESHOOTING

- The DTC P0453 can be set if either of the following conditions occur:
  1. Faulty fuel differential pressure sensor, related circuit, or ECM <M/T> or PCM <A/T>.
- To check a system blockage, do a performance test which uses a mechanical vacuum gauge and scan tool MB991502 set on the fuel tank differential pressure sensor (TANK PRS SNSR 73.)
  The mechanical gauge reading is used to verify scan tool MB991502 reading.
  A comparison of the mechanical gauge to scan tool MB991502 determines the problem in the system.

DIAGNOSIS

Required Special Tools:

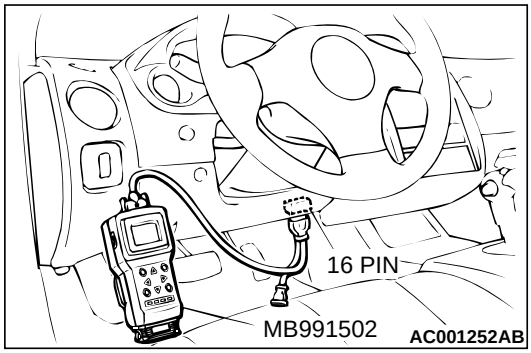
- MB991502: Scan Tool (MUT-II)
- MB991658: Test Harness Set
- MB991709: Test Harness Set

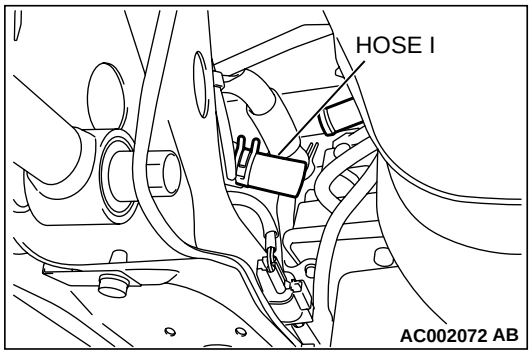
STEP 1. Using scan tool MB991502, check data list item 73: Fuel Tank Differential Pressure Sensor.

⚠ CAUTION

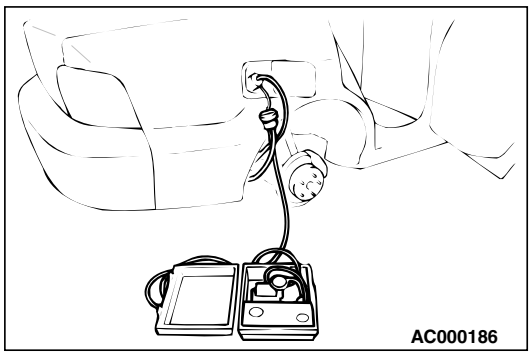
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.





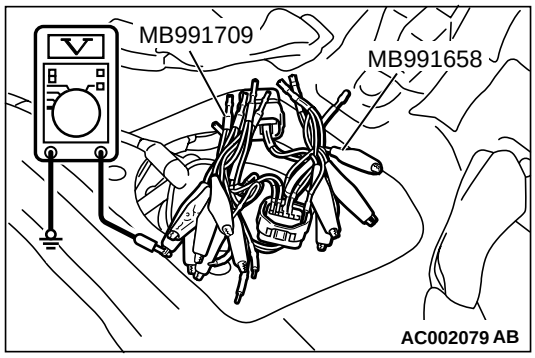
(2) Disconnect hose I from the evaporative emission canister side, and plug the hose from which the pipes have been disconnected.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Set scan tool MB991502 to the data reading mode for item 73, Fuel Tank Differential Pressure Sensor.
  - The fuel tank pressures should be −1.5 to 1.5kPa (−285 to 285 inHg.)



(6) Connect an evaporative emission system pressure pump to the fuel filler neck, and apply pressure.
  - The scan tool reading should increase.
(7) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991502.

Q: Is the scan tool reading within the specified value?

YES : Go to Step 22.
NO : Go to Step 2.



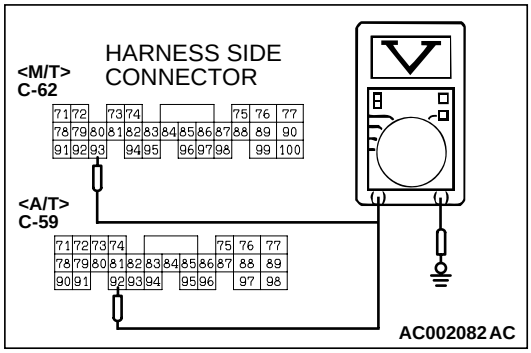
STEP 2. Check the output circuit voltage at intermediate connector D-16.

(1) Remove the rear seat cushion. (Refer to GROUP 52, Rear Seat P.52A-20.)
(2) Remove the protector.
(3) Disconnect intermediate connector D-16.
(4) Use special tools (MB991658 and MB991709) to connect terminals 5, 6 and 8 between connectors of the intermediate connector respectively.
(5) Turn the ignition switch to the "ON" position.
(6) Remove the fuel cap.
(7) Measure the voltage between terminal 5 and ground.
- Voltage should be between 2.0 and 3.0 volts.

(8) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Remove the special tools and connect intermediate connector D-16. Then go to Step 3.
NO : Go to Step 6.



STEP 3. Check the output circuit voltage at ECM connector C-62 <M/T> or PCM connector C-59 <A/T> by backprobing.

(1) Do not disconnect the ECM connector C-62 <M/T> or PCM connector C-59 <A/T>.
(2) Turn the ignition switch to the "ON" position.
(3) Remove the fuel cap.
(4) Measure the voltage between terminal 93 <M/T> or terminal 92 <A/T> and ground by backprobing.
- Voltage should be between 2.0 and 3.0 volts.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

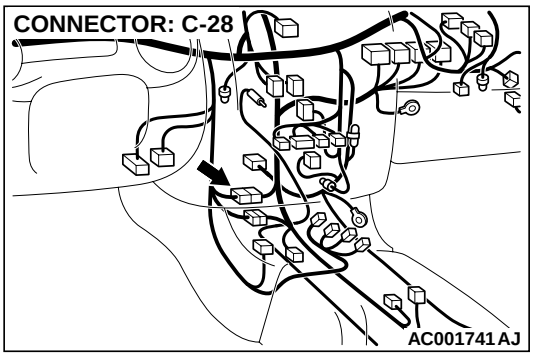
YES : Go to Step 21.
NO : Go to Step 4.

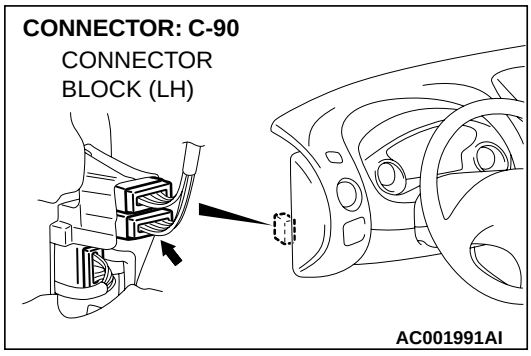
STEP 4. Check connectors C-28, C-90, D-16 at intermediate connector and C-62 at ECM <M/T> or C-59 at PCM <A/T> for damage.

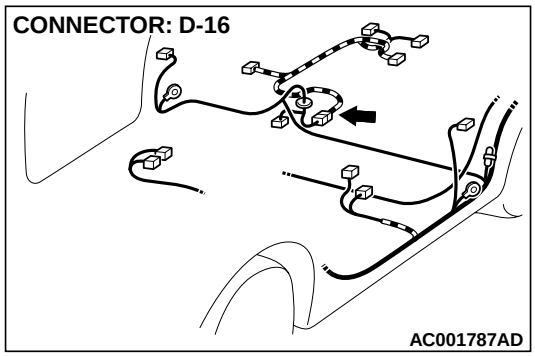
Q: Are the connectors in good condition?

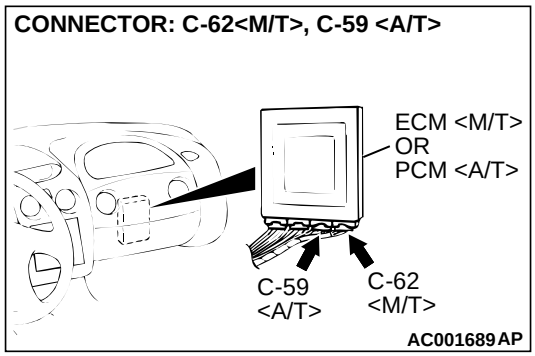
YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.







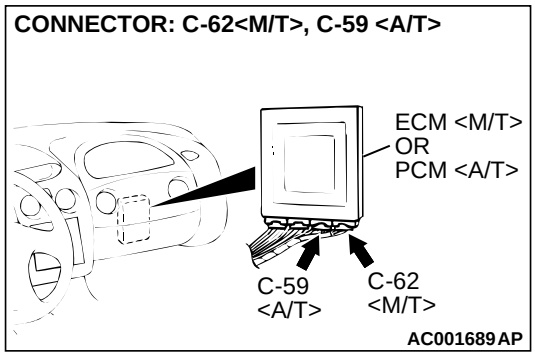


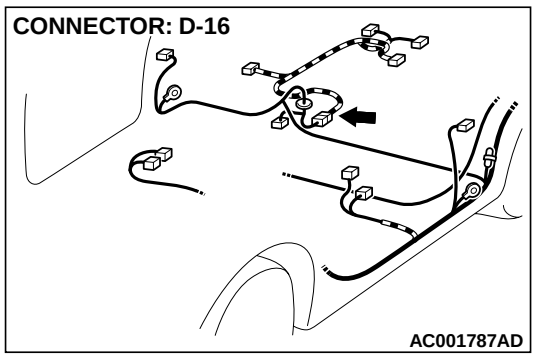
STEP 5. Check the harness wire between ECM connector C-62 terminal 93 <M/T> or PCM connector C-59 terminal 92 <A/T> and intermediate connector D-16 terminal 5 for damage.

Q: Is the harness wire in good condition?

YES : Go to Step 22.

NO : Repair it. Then go to 22.





STEP 6. Check the 5-volt supply circuit voltage at intermediate connector D-16.

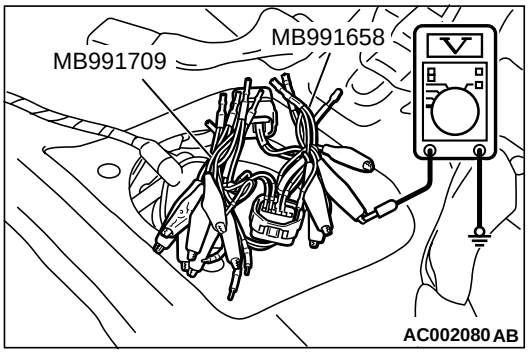
(1) Use special tools (MB991658 and MB991709) to connect terminals 5, 6 and 8 between connectors of the intermediate connector D-16 respectively.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 8 and ground.
- Voltage should be between 4.8 and 5.2 volts.

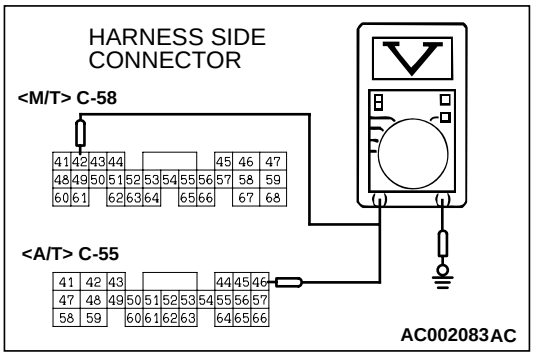
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 11.

NO : Remove the special tools and connect intermediate connector D-16. Then go to Step 7.





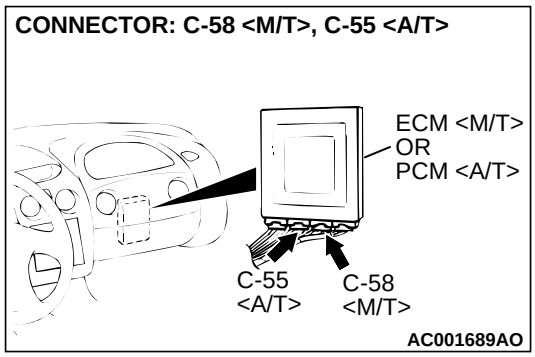
STEP 7. Check the 5-volt supply circuit voltage at ECM connector C-58 <M/T> or PCM connector C-55 <A/T> by backprobing.

(1) Do not disconnect ECM connector C-58 <M/T> or PCM connector C-55 <A/T>.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 42 <M/T> or terminal 46 <A/T> and ground by backprobing.
- Voltage should be between 4.8 and 5.2 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

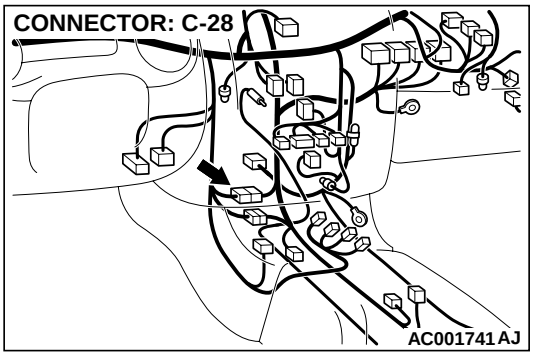
YES : Go to Step 9.
NO : Go to Step 8.

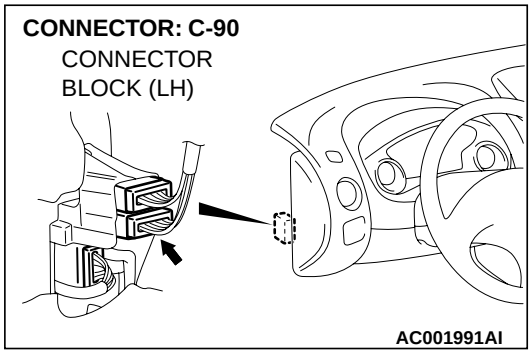


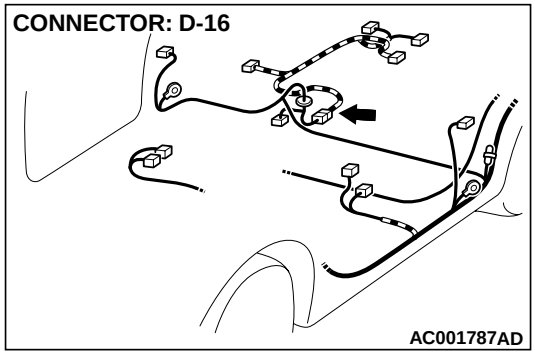
STEP 8. Check connector C-58 at ECM <M/T> or C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 21.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.







STEP 9. Check connectors C-28, C-90, D-16 at intermediate connector for damage.

Q: Are the connectors in good condition?

YES : Go to Step 10.

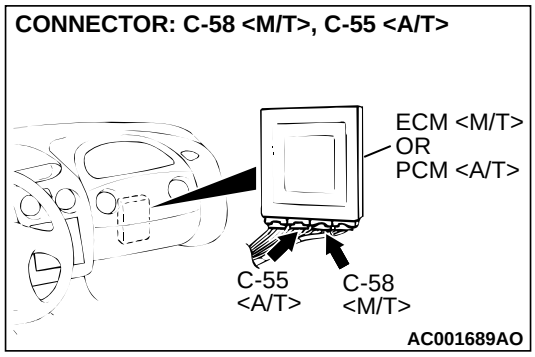
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.

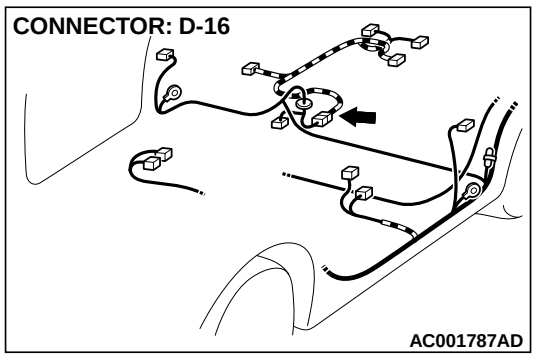
STEP 10. Check the harness wire between ECM connector C-58 terminal 42 <M/T> or PCM connector C-55 terminal 46 <A/T> and intermediate connector D-16 terminal No.8 for damage.

Q: Is the harness wire in good condition?

YES : Go to Step 22.

NO : Repair it. Then go to 22.

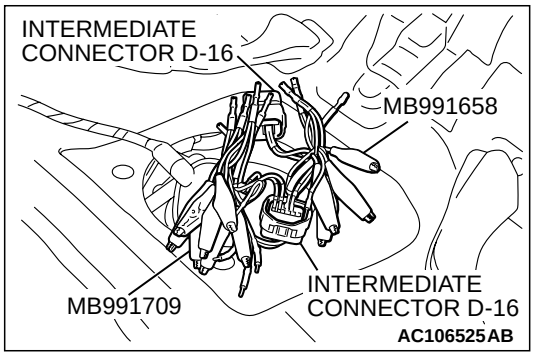




STEP 11. Check the circuit voltage at intermediate connector D-16.

(1) Use special tools (MB991658 and MB991709) to connect terminals 5 and 8 between connectors of the intermediate connector D-16 respectively.

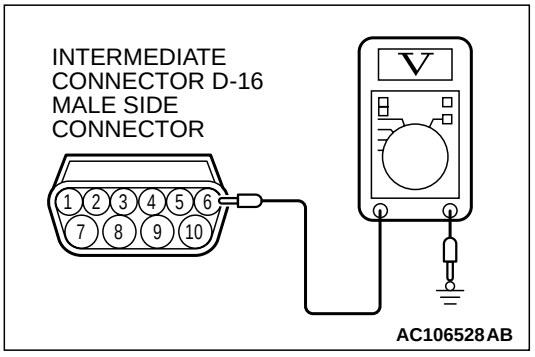
(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage at the male side connector between terminal 6 and ground.
- Voltage should be between 0.5 and 4.8 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

(5) Remove the special tools and connect intermediate connector D-16.



Q: Is the voltage normal?

YES : Go to Step 12.

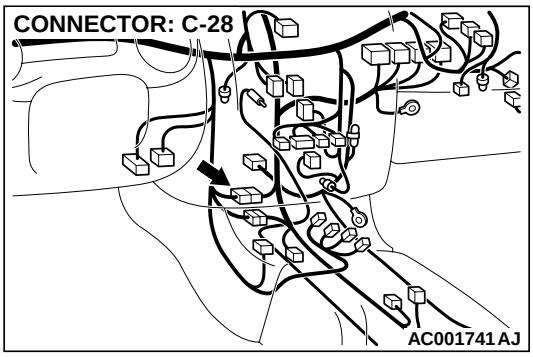
NO : Go to Step 15.

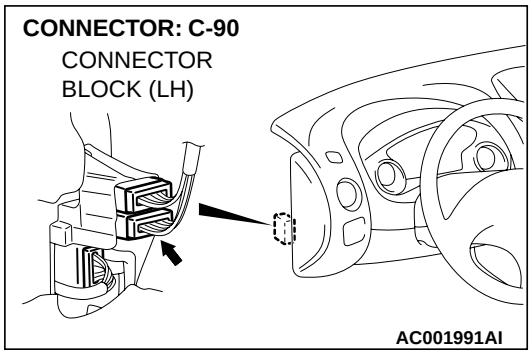
STEP 12. Check connectors C-28, C-90, D-16 at intermediate connector and C-58 at ECM <M/T> or C-55 at PCM <A/T> for damage.

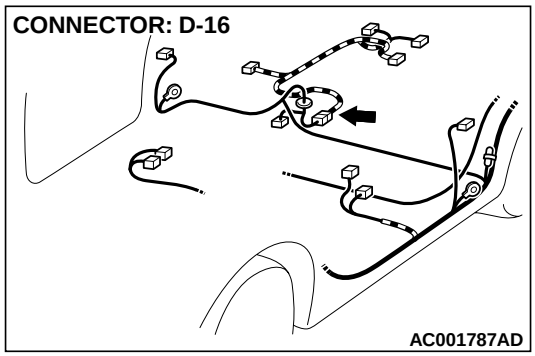
Q: Are the connectors in good condition?

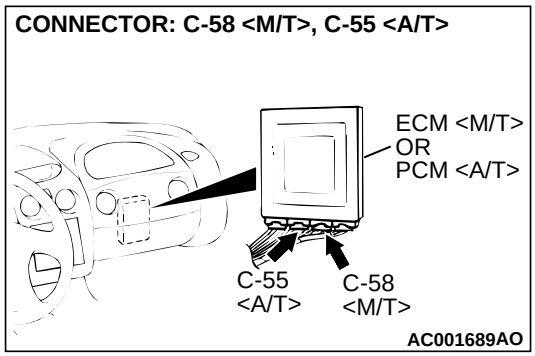
YES : Go to Step 13.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.







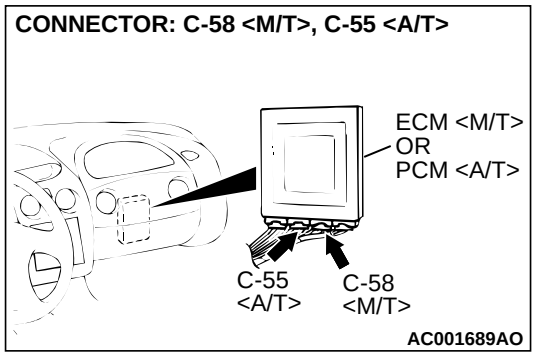


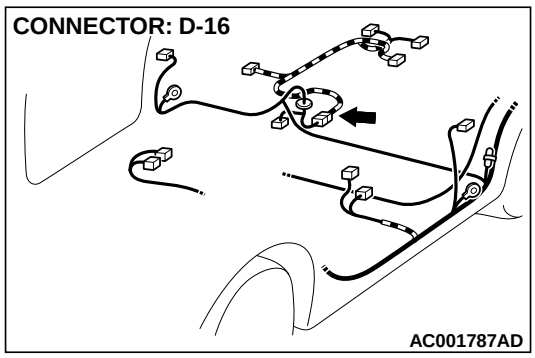
STEP 13. Check the harness wire between ECM connector C-58 terminal 49 <M/T> or PCM connector C-55 terminal 57 <A/T> and intermediate connector D-16 terminal 6 for damage.

Q: Is the harness wire in good condition?

YES : Go to Step 14.

NO : Repair it. Then go to 22.





STEP 14. Check the ground voltage at ECM connector C-58 <M/T> or PCM connector C-55 <A/T> by backprobing.

(1) Do not disconnect ECM connector C-58 <M/T> or PCM connector C-55 <A/T>.

(2) Turn the ignition switch to the "ON" position.

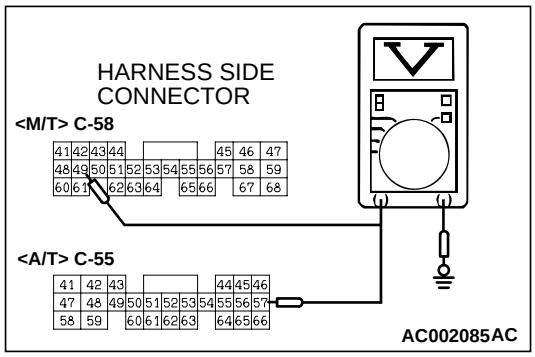
(3) Measure the voltage between terminal 49 <M/T> or terminal 57 <A/T> and ground by backprobing.
- The voltage should be 0.5 volt or less.

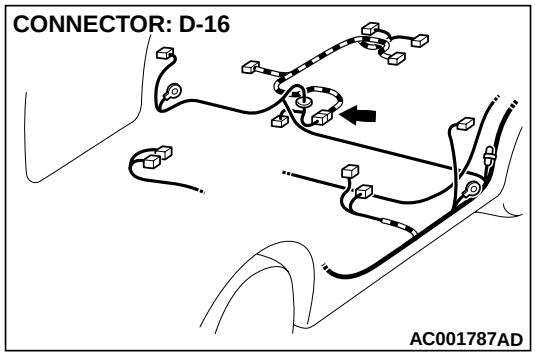
(4) Turn the ignition switch to the "LOCK" (OFF) position.

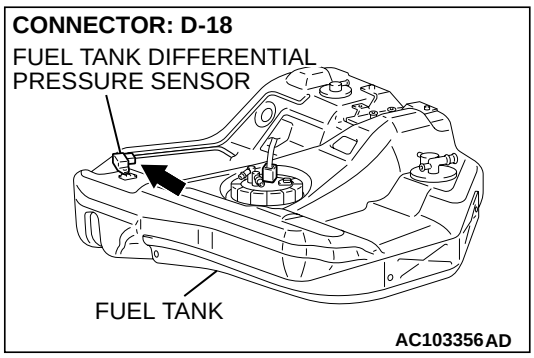
Q: Is the voltage normal?

YES : Go to Step 18.

NO : Go to Step 21.





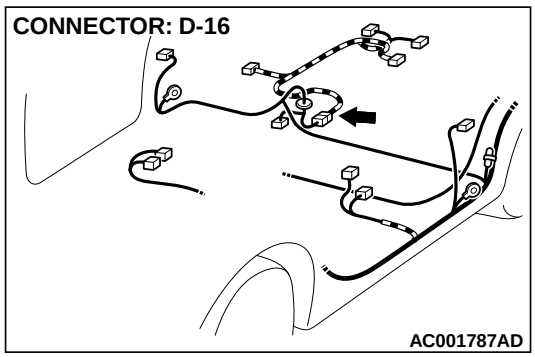


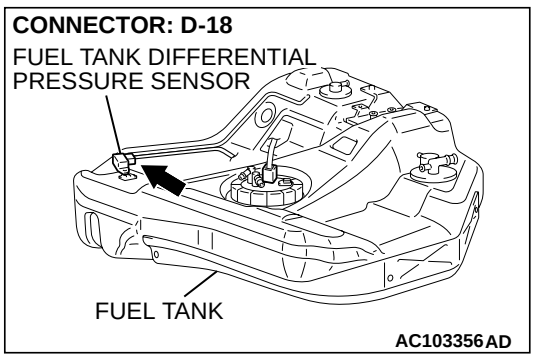
STEP 15. Check connectors D-16 at intermediate connector and D-18 at fuel tank differential pressure sensor for damage.

Q: Are the connectors in good condition?

YES : Go to Step 16.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.



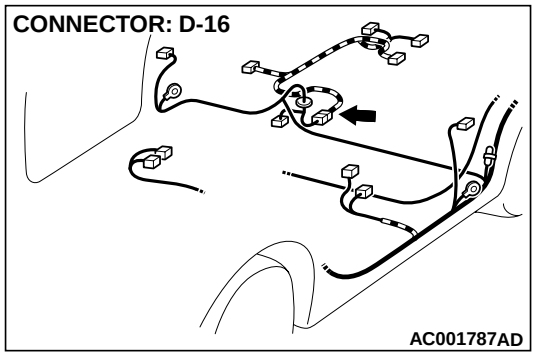


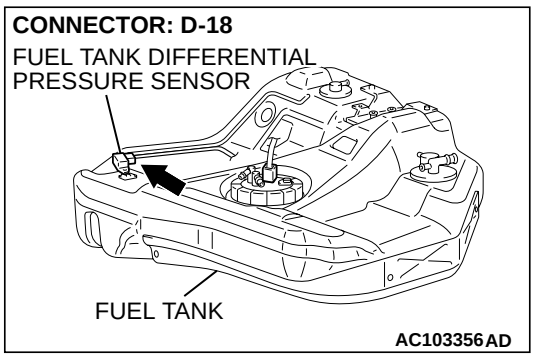
STEP 16. Check the harness wire between intermediate connector D-16 terminal 8 and fuel tank differential pressure sensor connector D-18 terminal 3 for damage.

Q: Is the harness wire in good condition?

YES : Go to Step 17.

NO : Repair it. Then go to 22.



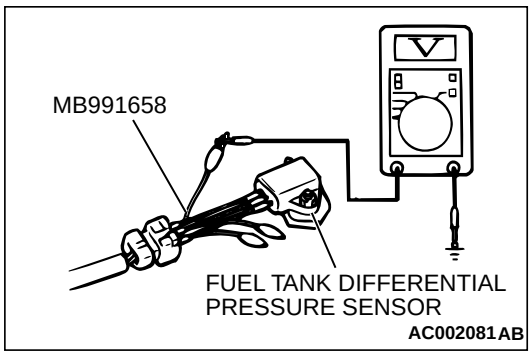


STEP 17. Check the harness wire between intermediate connector D-16 terminal 6 and fuel tank differential pressure sensor connector D-18 terminal 2 for damage.

Q: Is the harness wire in good condition?

YES : Replace the fuel tank differential pressure sensor. Then go to Step 22.

NO : Repair it. Then go to 22.



STEP 18. Check the output circuit voltage at fuel tank differential pressure sensor connector D-18.

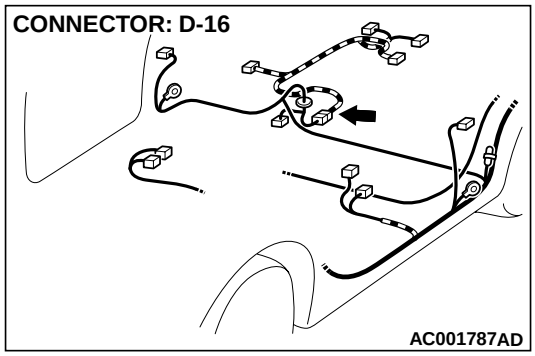
(1) Remove the center exhaust pipe. (Refer to GROUP 15, Exhaust Pipe, Main Muffler and Catalytic Converter P.15-22.)
(2) Remove the fuel band assembly, tilt the fuel tank.
(3) Disconnect fuel tank differential pressure sensor connector D-18.
(4) Use special tool (MB991658) to connect terminals 1, 2 and 3 of the disconnected sensor connector and those of the harness side connector respectively.
(5) Turn the ignition switch to the "ON" position.
(6) Remove the fuel cap.
(7) Measure the voltage between terminal 1 and ground.
- Voltage should be between 2.0 and 3.0 volts.

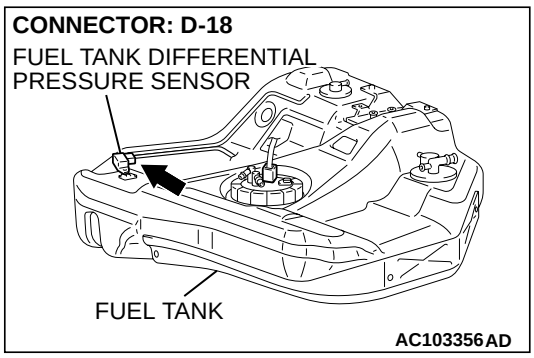
(8) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Remove the special tool and connect fuel tank differential pressure sensor connector D-18. Then go to Step 19.

NO : Replace the fuel tank differential pressure sensor. Then go to 22.



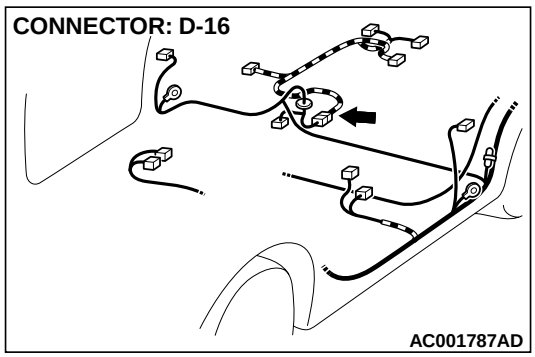


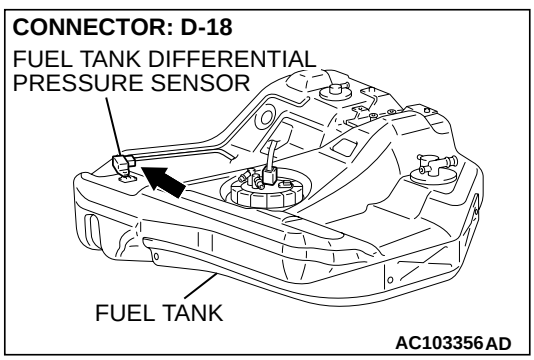
STEP 19. Check connectors D-16 at intermediate connector and D-18 at fuel tank differential pressure sensor for damage.

Q: Are the connectors in good condition?

YES : Go to Step 20.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 22.





STEP 20. Check the harness wire between intermediate connector D-16 terminal 5 and fuel tank differential pressure sensor connector D-18 terminal 1 for damage.

Q: Is the harness wire in good condition?

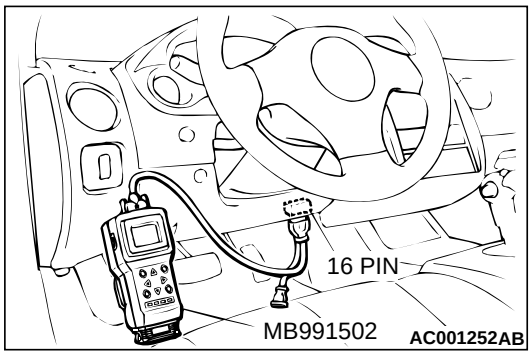
YES : Replace the fuel tank differential pressure sensor. Then go to Step 22.

NO : Repair it. Then go to 22.

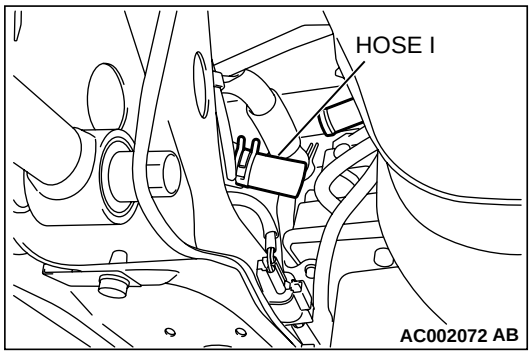
STEP 21. Using scan tool MB991502, check data list item 73: Fuel Tank Differential Pressure Sensor.

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.

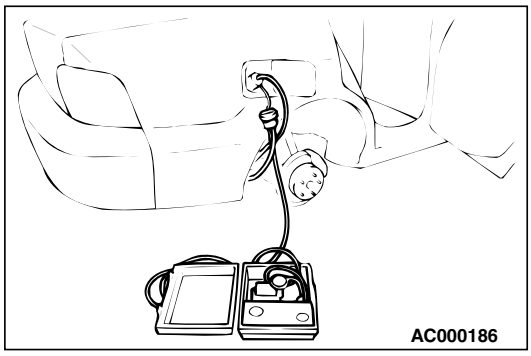


(2) Disconnect hose I from the evaporative emission canister side, and plug the hose from which the pipes have been disconnected.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Set scan tool MB991502 to the data reading mode for item 73, Fuel Tank Differential Pressure Sensor.
- The fuel tank pressures should be –1.5 to 1.5kPa (–285 to 285 inHg.)



(6) Connect an evaporative emission system pressure pump to the fuel filler neck, and apply pressure.
- The scan tool reading should increase.

(7) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991502.



Q: Is the scan tool reading within the specified value?

YES : This malfunction is intermittent malfunction. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6. Then go to Step 22.
NO : Replace the ECM <M/T> or PCM <A/T>. Then go to Step 22.

STEP 22. Test the OBD-II drive cycle.

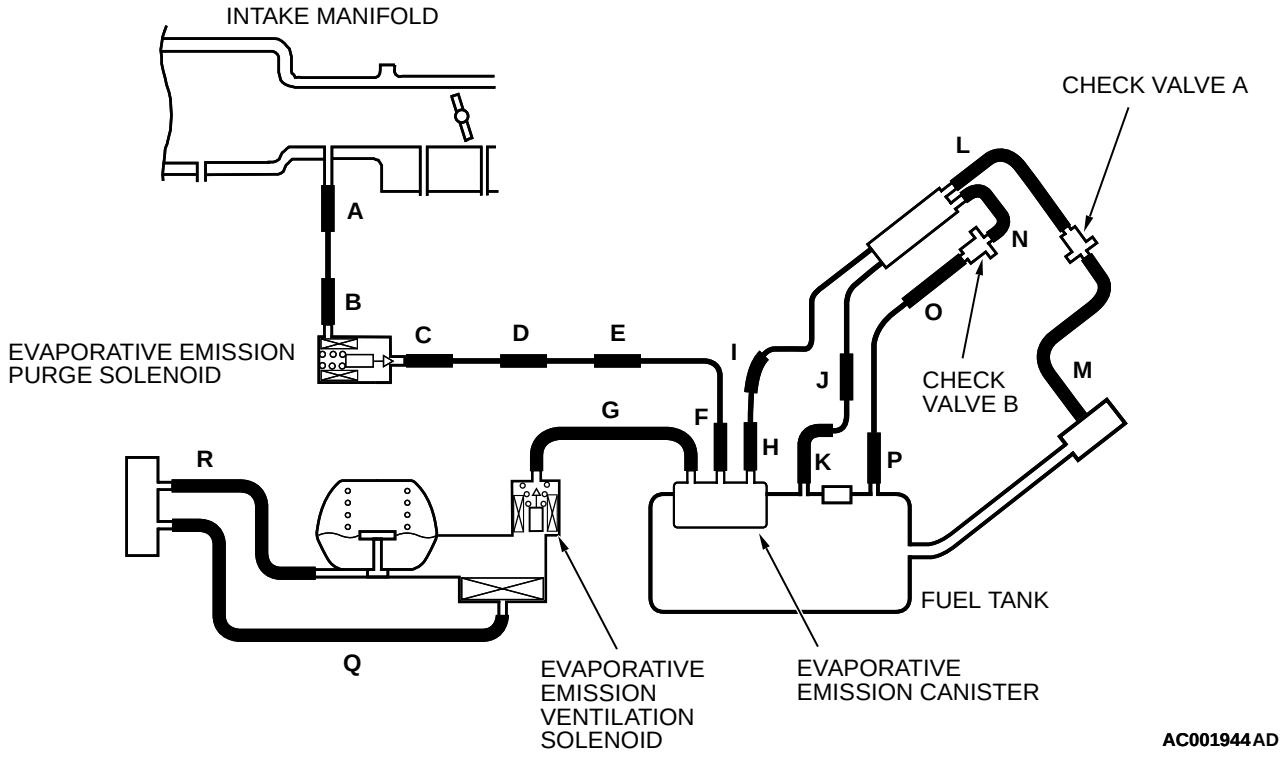
(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 1 - Evaporative Emission Control System Leak Monitor P.13B-6.
(2) Read the diagnostic trouble code.

Q: Is diagnostic trouble code P0453 set?

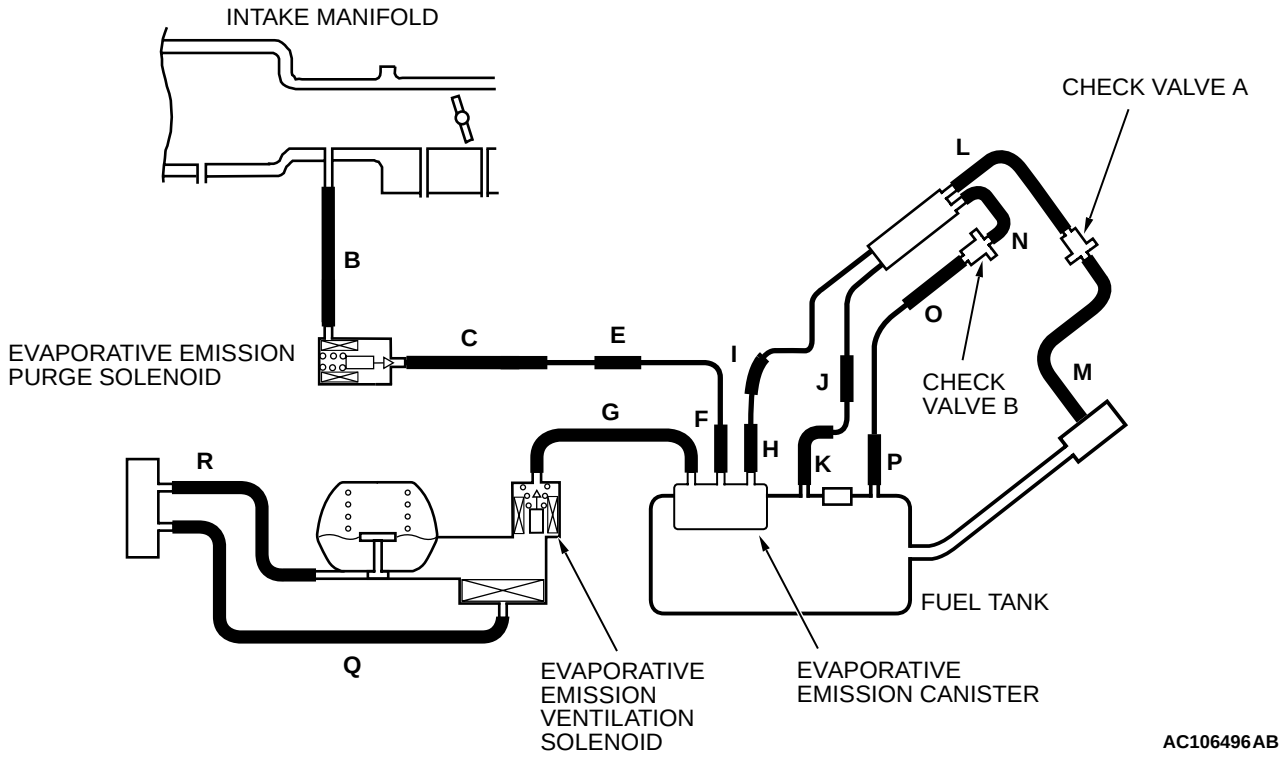
YES : Go to Step 2.
NO : This diagnosis is complete.

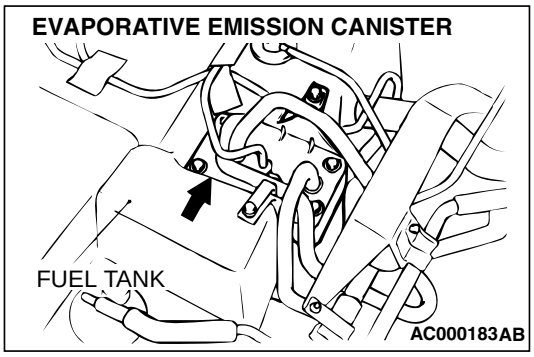
DTC P0455: Evaporative Emission Control System Leak Detected (Gross Leak)

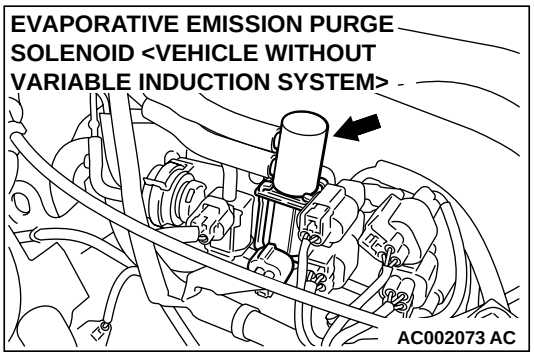
SYSTEM DIAGRAM <VEHICLE WITHOUT VARIABLE INDUCTION SYSTEM>

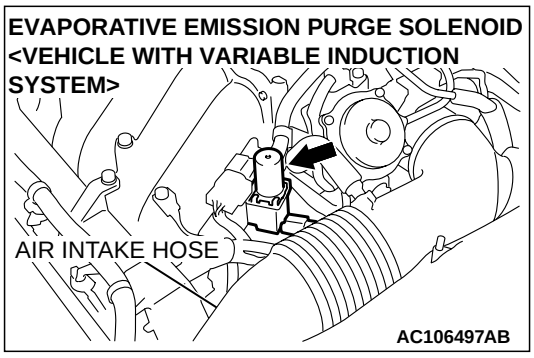


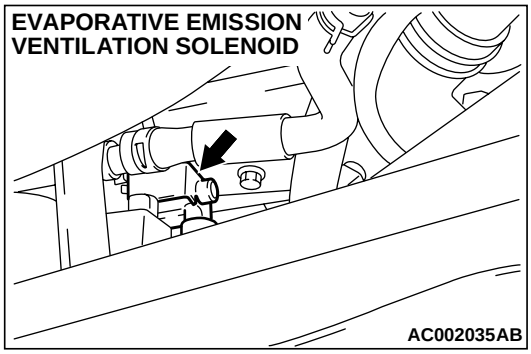
SYSTEM DIAGRAM <VEHICE WITH VARIABLE INDUCTION SYSTEM>











TECHNICAL DESCRIPTION

- To judge if there is leak or clog in the fuel system, the ECM <M/T> or PCM <A/T> measures the change of the pressure inside the fuel tank.
- The ECM <M/T> or PCM <A/T> turns on the evaporative emission ventilation solenoid to shut off the evaporative emission canister outlet port.
- Then the evaporative emission purge solenoid is driven to set the fuel system into a negative pressure.
- When the fuel system develops a vacuum of 2 kPa (0.29 psi), the evaporative emission purge solenoid is turned "OFF" and the fuel system vacuum is maintained at 2 kPa (0.29 psi).
- The ECM <M/T> or PCM <A/T> determines if there is leak or clog in the fuel system by measuring the change of vacuum inside the fuel tank.
- The test is stopped when fuel vapor pressure is judged as too high.

DTC SET CONDITIONS

Test Conditions A: At Start up

- Intake air temperature is 36°C (97°F) or less when the engine is started.
- The engine coolant temperature 36°C (97°F) or less when the engine is started.

Test Conditions B: For Test to Run

- The engine coolant temperature 60°C (140°F) or more <i.e. the amount of remaining fuel is 15 – 40 percent>.
- The engine coolant temperature 20°C (68°F) or more <i.e. the amount of remaining fuel is 40 – 85 percent>.
- Engine speed is 1,600 r/min or more.
- Barometric pressure is above 76 kPa (11 psi).
- Volumetric efficiency is between 20 and 70 percent.
- The fuel temperature is 36°C (97°F) or less.
- Fuel tank differential pressure sensor output voltage 1 – 4 volts.

Test Conditions C: For Test to Stop

- Intake air temperature is less than 5°C (41°F).
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the pressure rises higher 451 Pa (0.065 psi) <i.e. the amount of remaining fuel is 15 – 40 percent>.
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the pressure rises higher 324 Pa (0.047 psi) <i.e. the amount of remaining fuel is 40 – 85 percent>.

Judgment Criteria

- The fuel tank internal pressure is 2 kPa (0.29 psi) or more after the evaporative emission purge solenoid has been driven when the fuel tank and vapor line were closed.

NOTE: The monitoring time (136 seconds) depends on the fuel level and the temperature in the fuel tank.

TSB Revision

TROUBLESHOOTING HINTS

The most likely causes for this code to be set are:

- Loose fuel cap.
- Fuel cap relief pressure is incorrect.
- Fuel overflow limiter valve failed.
- Purge line or vapor line is clogged.
- Fuel tank, purge line or vapor line seal failed.
- Evaporative emission purge solenoid failed.
- Evaporative emission ventilation solenoid failed.
- Fuel tank differential pressure sensor failed.
- Evaporative emission canister seal is faulty.
- Evaporative emission canister is clogged.

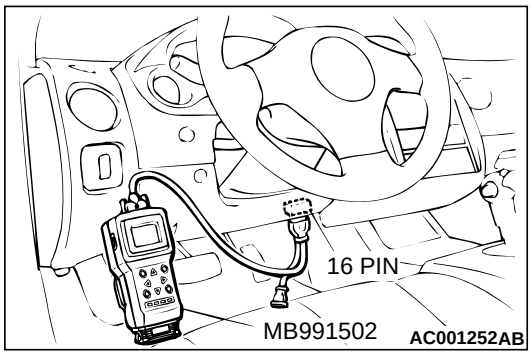
OVERVIEW OF TROUBLESHOOTING

- To determine the cause of DTC P0455, a performance test is needed. The performance test uses a mechanical vacuum gauge and scan tool MB991502 set on the fuel tank differential pressure sensor (TANK PRES SNER 73.) The mechanical gauge reading is used to verify scan tool MB991502 reading. A comparison of the mechanical gauge reading to scan tool MB991502 reading determines the reading problem in the system.
- Prior to doing the performance test, several simple inspections are needed to exclude some possibilities of the symptom.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check evaporative emission system monitor test.

⚠ CAUTION

- **To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.**
- **With this monitor, the ECM <M/T> or PCM <A/T> automatically increases the engine speed to 1,600 r/min or more. Check that the transaxle is set to "neutral" <M/T> or "P" <A/T> position.**

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTCs using the scan tool MB991502.
(4) Check that the fuel cap is securely closed. (Tighten until three clicks are heard.)
(5) Start the engine.
(6) Select "System Test," and press the "YES" key.
(7) Select "Evap Leak Mon," and press the "YES" key.
(8) During the monitor, keep the accelerator pedal at the idling position.

NOTE: If the engine speed does not reach 2,000 r/min during the monitor test, adjustment of the Speed Adjusting Screw may be needed. Refer to P.13B-679. And adjust to the standard value.

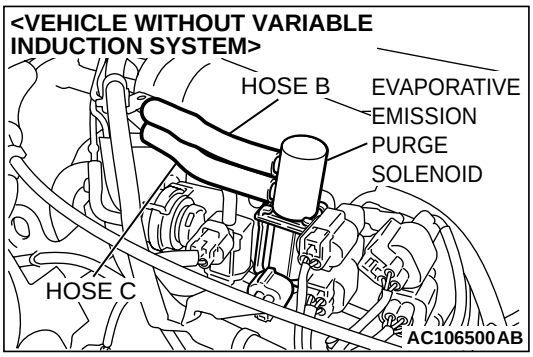
(9) Keep the engine speed and engine load within the specified range. When the monitor test starts, the "In Progress" item on the scan tool MB991502 will change from "NO" to "YES."

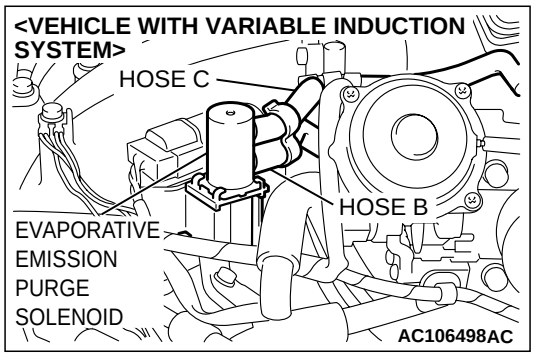
Q: What is displayed on the scan tool MB991502?

"Evap Leak Mon. Completed Test Passed" : The evaporative emission system is working properly at this time. Explain to customer that improperly tightened fuel cap can cause MIL to turn on, and return the vehicle.

"Evap Leak Mon. Completed. Test Failed and DTCs Set" : A malfunction has been detected during the monitor test. Go to Step 2.

"Evap Lead Mon. discontinued. Retest again from the first" : The monitor was discontinued for a certain reason (vehicle speed input from computer, engine speed and engine load deviating from specified range). Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the monitoring from the Step 1.





STEP 2. Using scan tool MB991502, check solenoid for clogging of the purge control.

(1) Disconnect hoses B and C from the evaporative emission purge solenoid side, and connect the hand vacuum pump to the evaporative emission purge solenoid instead of hose C.
(2) Set scan tool MB991502 to actuator test mode for item 08: Evaporative Emission Purge Solenoid. When the evaporative emission purge solenoid is operated, apply a pressure on the hand vacuum pump and confirm that air is blown from the other side nipple.
(3) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991502.
(4) Disconnect the hand vacuum pump, and connect hoses B and C to the evaporative emission purge solenoid.

Q: Is the solenoid in good condition?

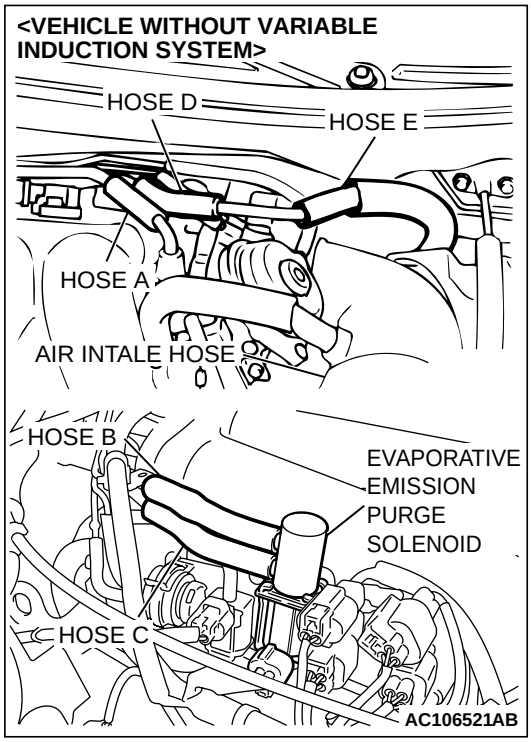
YES : Go to Step 3.
NO : Replace the evaporative emission purge solenoid. Then go to Step 26.

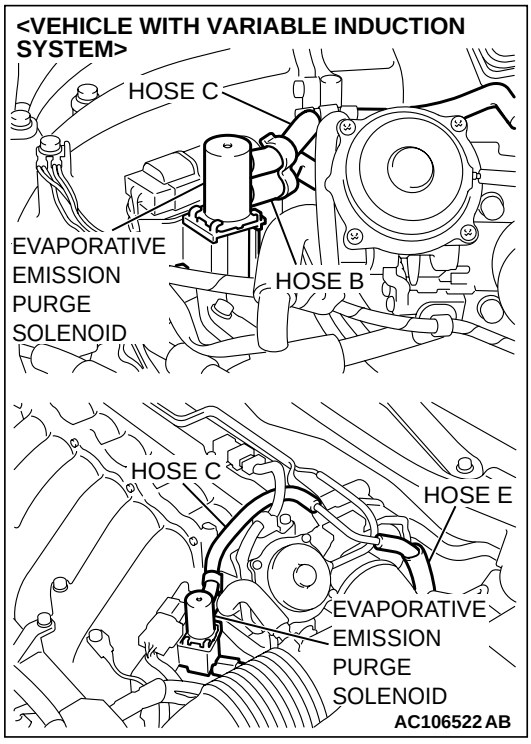
STEP 3. Check for leaks and clogging in the evaporator line hose A to hose E <Vehicle without Variable Induction System> or hose B, C, E <Vehicle with Variable Induction System>.

Q: Are the hoses in good condition?

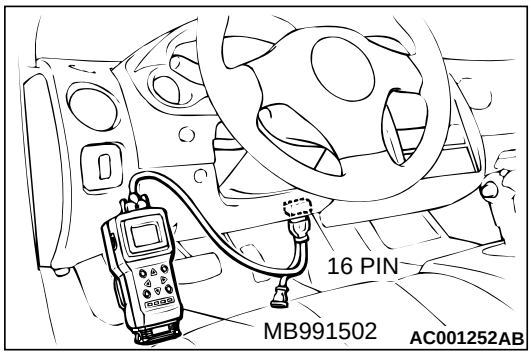
YES : Go to Step 4.

NO : Replace the inferior hose. Then go to Step 26.



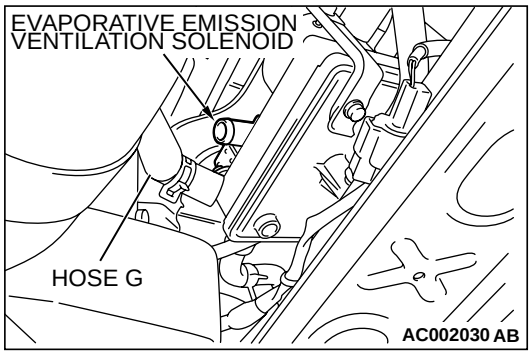


STEP 4. Check the evaporative emission ventilation solenoid using scan tool MB991502.

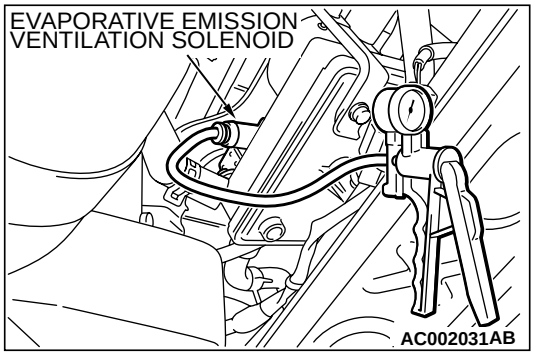


⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.



(2) Disconnect the hose G from the evaporative emission ventilation solenoid side.

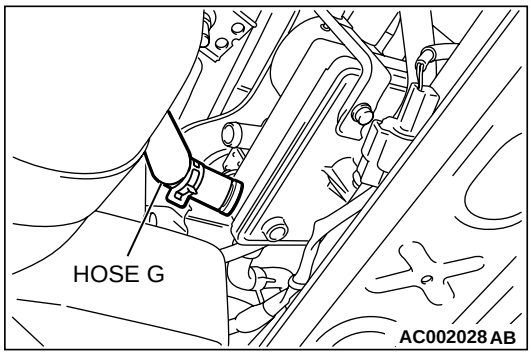


(3) Connect the hand vacuum pump to the nipple of the evaporative emission ventilation solenoid from which the hoses have been disconnected.
(4) Turn the ignition switch to the "ON" position.
(5) Set scan tool MB991502 to actuator test mode for item 29: Evaporative Emission Ventilation Solenoid. When the evaporative emission ventilation solenoid is operated, apply a pressure on the hand vacuum pump and confirm that air is maintained.
(6) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991502.
(7) Disconnect the hand vacuum pump, and connect hose G to the evaporative emission canister.

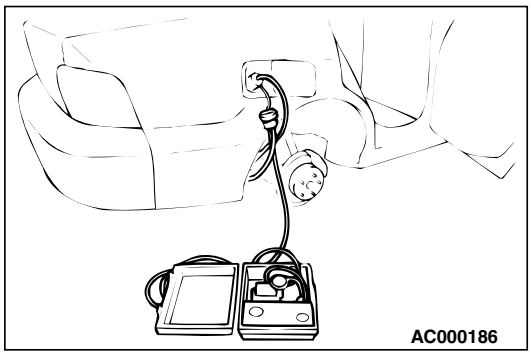
Q: Is the solenoid valve in good condition?

YES : Go to Step 5.
NO : Replace the evaporative emission ventilation solenoid. Then go to Step 26.

STEP5. Pressure test for leaks in the evaporator line from hose F to hose P.



(1) Disconnect hose G from the evaporative emission ventilation solenoid side, and plug the hoses.
(2) Remove the fuel cap.



(3) Connect the evaporative emission system pressure pump to the fuel filler neck.
(4) Apply a pressure on the evaporative emission system pressure pump, and confirm that air is maintained.

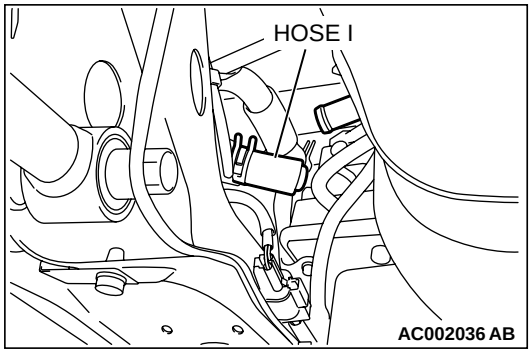
NOTE: "Pressure test" in this procedure refers to the I/M240 Simulation Test (8 simple steps) described in the evaporative emission system pressure pump (Miller number 6872A) manufacture's instructions located in the lid of the pump box.

(5) Disconnect the evaporative emission system pressure pump, and reinstall the fuel cap.
(6) Connect hose G to the evaporator line.

Q: Is air maintained?

YES : Go to Step 16.
NO : Go to Step 6.

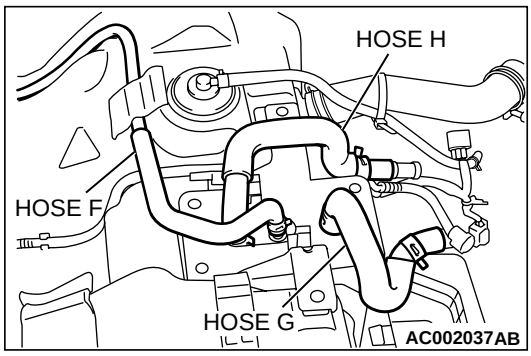
STEP 6. Pressure test for leaks in the evaporator line from hose I to hose P.



(1) Disconnect hose I from the evaporative emission canister side, and plug the hose.
(2) Perform the pressure test again.

Q: Is air maintained?

YES : Go to Step 9.
NO : Go to Step 7.



STEP 7. Check for leaks in the evaporator line from hose F to hose H.

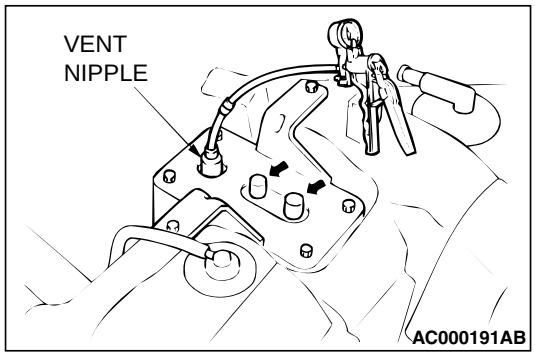
(1) Remove the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.)

(2) The leakage test with a hand vacuum pump on each hose from hose F to hose H.

Q: Are the hoses in good condition?

YES : Go to Step 8.

NO : Replace the inferior hose, and reinstall the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 26.



STEP 8. Check for leaks in the evaporative emission canister.

(1) Connect a hand vacuum pump to the vent nipple of the evaporative emission canister.

(2) Plug the other two nipples or loop a hose between the other nipples.

(3) Apply a vacuum with the hand vacuum pump, and confirm that air is maintained.

Q: Is the evaporative emission canister in good condition?

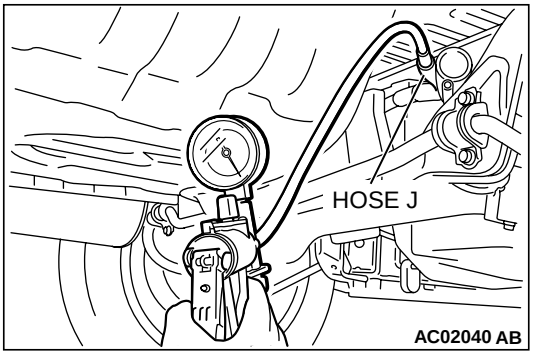
YES : Go to Step 26.

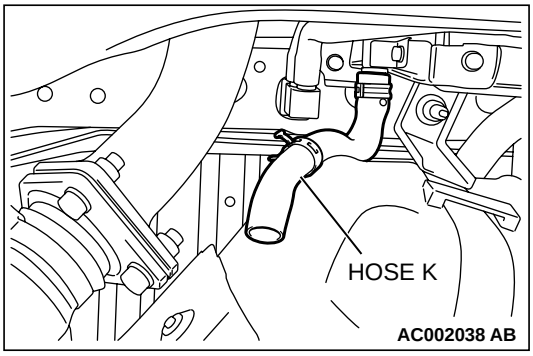
NO : Replace the evaporative emission canister (Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve P.17-110,) and reinstall the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 26.

STEP 9. Check for leaks in the evaporator line from hose J to hose K.

(1) Remove the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.)

(2) Disconnect hose J at the liquid separator side, and then connect a hand vacuum pump to the hose.





(3) Plug the hose K at the fuel tank side.

(4) Apply vacuum by using the hand vacuum pump, and confirm that the applied vacuum does not fluctuate.

Q: Is air maintained?

YES : Go to Step 10.

NO : Replace the inferior hose, and reinstall the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 26.

STEP10. Check for leaks in the evaporator line hose I, L, M, N and O.

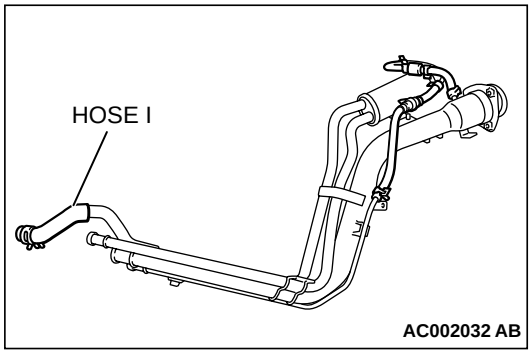
(1) Remove the fuel tank and fuel filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.)

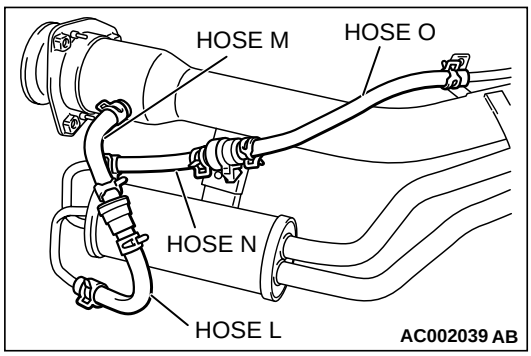
(2) The leakage test with a hand vacuum pump on each hose from hose I, L, M, N and O.

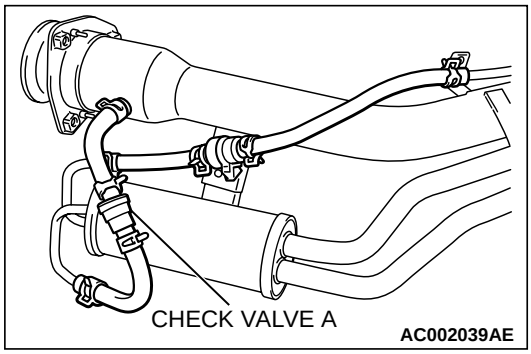
Q: Are the hoses in good condition?

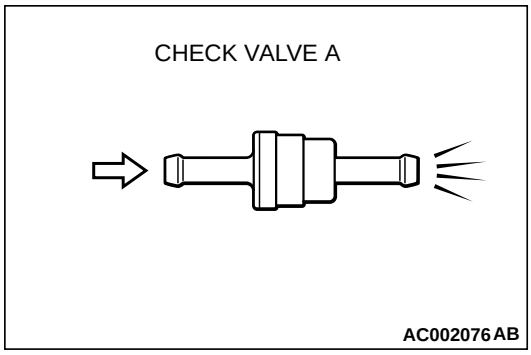
YES : Go to Step 11.

NO : Replace the inferior hose, reinstall the fuel tank and fuel filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 26.







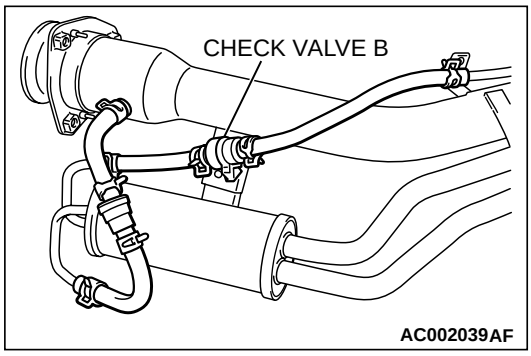


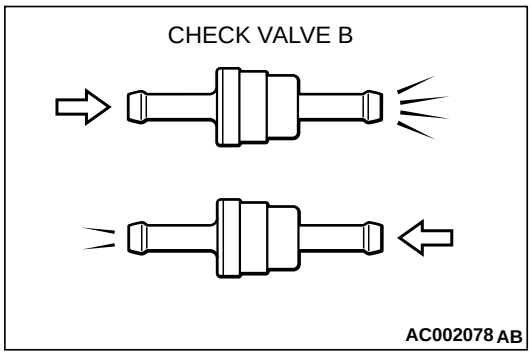
STEP 11. Check the check valve A.

(1) Only when you blow the check valve from the direction shown, it should pass air.
(2) When you blow the check valve, air should leak from the check valve body.

Q: Is check valve A in good condition?

YES : Go to Step 12.
NO : Replace the check valve A, and reinstall the filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 26.



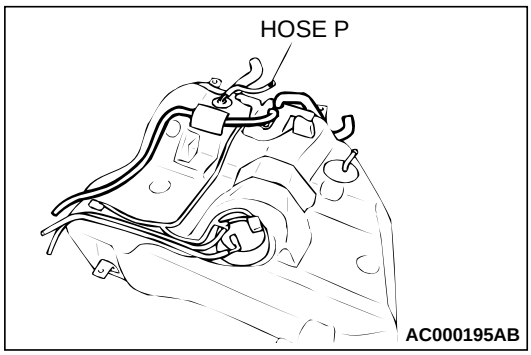


STEP 12. Check the check valve B.

(1) When you blow the check valve from the arrow direction shown above, it should pass more air.
(2) When you blow the check valve from the arrow direction shown below, it should pass less air.
(3) When you blow the check valve, air should leak from the check valve body.

Q: Is check valve B in good condition?

YES : Go to Step 13.
NO : Replace the check valve B, and reinstall the filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 26.



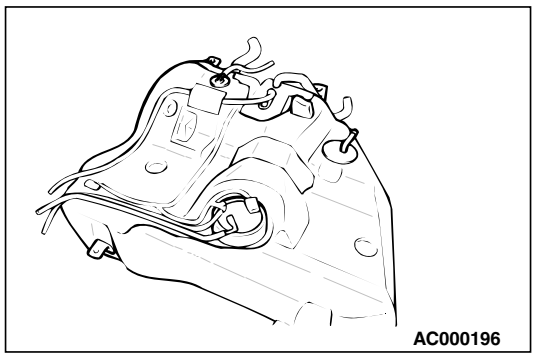
STEP 13. Check for leaks in the evaporator line from hose P.

(1) The leakage test with a hand vacuum pump on the hose P.

Q: Is the hose P in good condition?

YES : Go to Step 14.

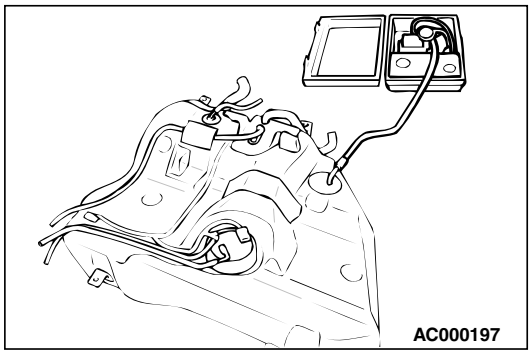
NO : Replace the hose N, and reinstall the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 26.



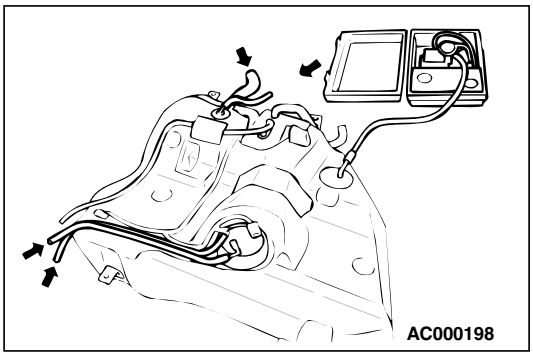
STEP 14. Check for leaks in the fuel tank.

(1) Visually check for cracks and leaks, etc.

NOTE: Carefully check the fuel pump assembly and the inner pressure sensor installation section in the fuel tank.


AC000197

(2) Connect an evaporative emission system pressure pump to the leveling valve nipple.


AC000198

(3) Plug the filler hose, feed pipe, return pipe and rollover valve nipple connected to the fuel tank.

NOTE: If these items are not securely plugged here, the fuel could leak in the next step.

(4) Apply pressure with the evaporative emission system pressure pump.

(5) In the pressurized state, check for the leak by applying soap water, etc. to each section.

Q: Are there any leaks?

There are leaks at the fuel pump module or the fuel tank differential pressure sensor section. : After reassemble the leaked parts, check again that there are no leaks. Then reinstall the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 26.

There are leaks at the fuel tank. : Replace the fuel tank, reinstall the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 26.

There are no leaks. : Then go to Step 15.

STEP 15. Visually check for cracks in the fuel tank filler neck.

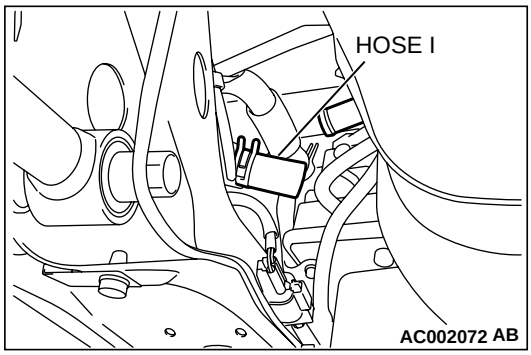
(1) Visually check for cracks in the fuel tank filler neck.

Q: Is the fuel filler neck assembly in good condition?

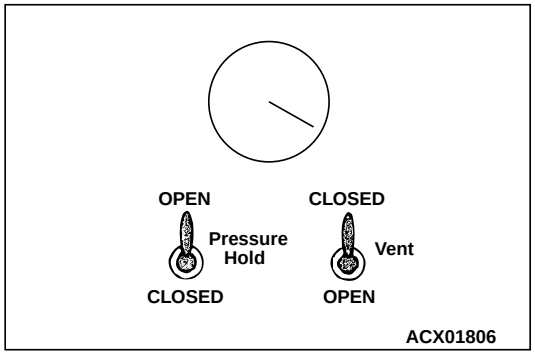
YES : Reinstall the fuel tank and fuel filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 26.

NO : Replace the fuel tank filler neck assembly and reinstall the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 26.

STEP16. Pressure test for clogging in the evaporator line from hose I to hose P.



(1) Disconnect hose I from the evaporative emission canister side, and unplug the hose I.



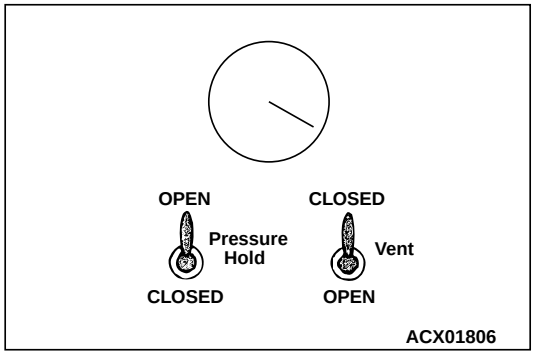
(2) On the EVAP pressure pump, set the pressure/hold valve to OPEN, and set the vent valve to CLOSED. Turn the pump timer to ON. You can reset the timer as required. (These settings are listed under "Leak Test" in the pump instructions.)
(3) Air should pass through hose G.

Q: Is air blown from hose I?

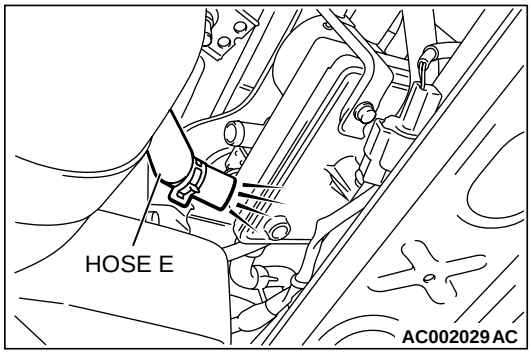
YES : Connect the hose I. Then go to Step 17.
NO : Go to Step 21.

STEP17. Pressure test for clogging in the evaporator line from hose F to hose H.

(1) Unplug hose G.



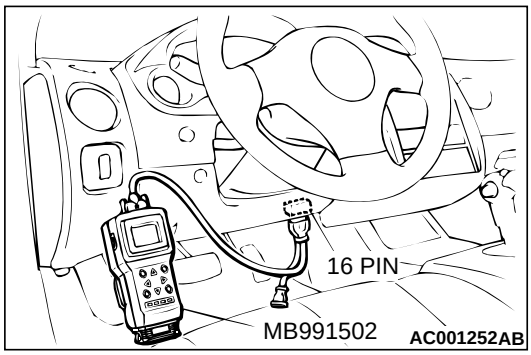
(2) On the EVAP pressure pump, set the pressure/hold valve to OPEN, and set the vent valve to CLOSED. Turn the pump timer to ON. You can reset the timer as required. (These settings are listed under "Leak Test" in the pump instructions.)



(3) Air should pass through hose G.

Q: Is air blown from hose G?

YES : Connect the hose G. Then go to Step 18.
NO : Go to Step 19.



STEP 18. Using scan tool MB991502, check evaporative emission system monitor test.

⚠ CAUTION

- **To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.**
- **With this monitor, the ECM <M/T> or PCM <A/T> automatically increases the engine speed to 1,600 r/min or more. Check that the transaxle is set to "neutral" <M/T> or "P" <A/T> position.**

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTCs using scan tool MB991502.
(4) Check that the fuel cap is securely closed. (Tighten until three clicks are heard.)
(5) Start the engine.
(6) Select "System Test," and press the "YES" key.
(7) Select "Evap Leak Mon," and press the "YES" key.
(8) During the monitor, keep the accelerator pedal at the idling position.

NOTE: If the engine speed does not reach 2,000 r/min during the monitor test, adjustment of the Speed Adjusting Screw may be needed. Refer to P.13B-679. And adjust to the standard value.

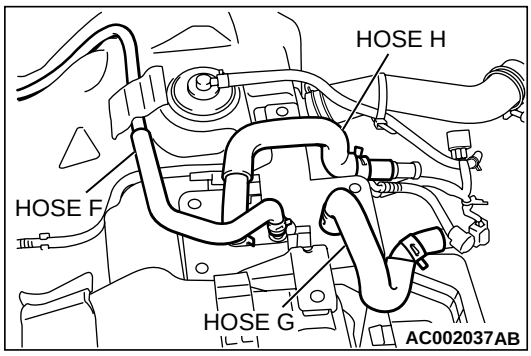
(9) Keep the engine speed and engine load within the specified range. When the monitor test starts, the "In Progress" item on the scan tool MB991502 will change from "NO" to "YES."
(10) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991502.

Q: What is displayed on scan tool MB991502?

"Evap Leak Mon. Completed. Test Passed" : The evaporative emission system is working properly at this time. Then go to Step 26 .

"Evap Leak Mon. Completed. Test Failed and DTCs Set" : Replace the ECM <M/T> or PCM <A/T>. Then go to Step 26.

"Evap Lead Mon. discontinued. Retest again from the first" : The monitor was discontinued for a certain reason (vehicle speed input from ECM <M/T> or PCM <A/T>, engine speed and engine load deviating from specified range). Turn the ignition switch to the "LOCK" (OFF) position once, and recheck evaporative emission system monitor test.

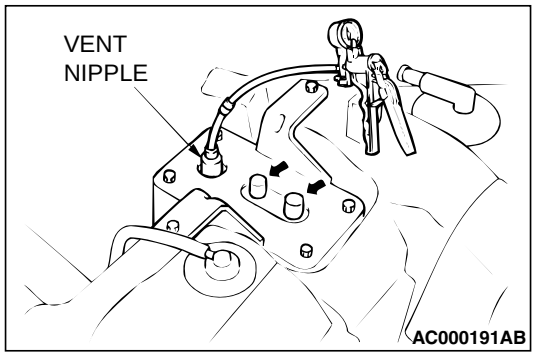


STEP 19. Check for clogging in the evaporator line hose F to H.

(1) Remove the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.)
(2) The clogging test with a hand vacuum pump on each hose from hose F to H.

Q: Are the hoses good condition?

YES : Go to Step 20.
NO : Replace the inferior hose, reinstall the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 26.



STEP 20. Check for clogging in the evaporative emission canister.

(1) Connect a hand vacuum pump to the vent nipple of the evaporative emission canister.
(2) Plug the other two nipples or loop a hose between the other nipples.
(3) Apply a pressure on the vacuum pump.
(4) When each nipple is unplugged, air should pass through the unplugged nipple.

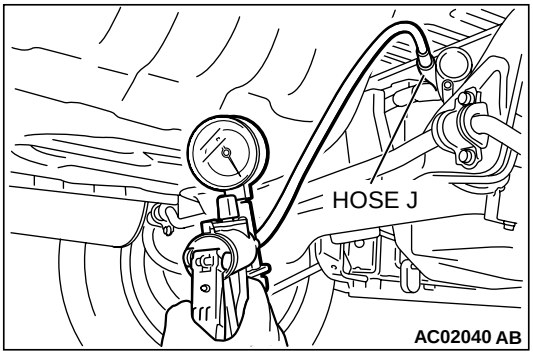
Q: Is the evaporative emission canister in good condition?

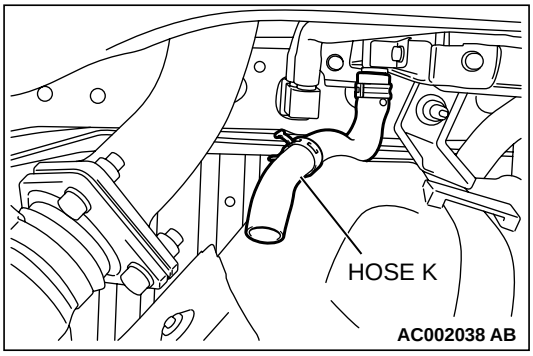
YES : Reinstall the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 26.
NO : Replace the evaporative emission canister (Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve P.17-110,) and reinstall the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 26.

STEP 21. Check for clogging in the evaporator line from hose J to hose K.

(1) Remove the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.)

(2) Disconnect hose J at the liquid separator side, and then connect a hand vacuum pump to the hose.





(3) Unplug the hose K at the fuel tank side.

(4) Apply a pressure on the vacuum pump, air should pass through the hose K.

(5)

Q: Are the hoses good condition?

YES : Go to Step 22.

NO : Replace the inferior hose, and reinstall the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 26.

STEP 22. Check for clogging in the evaporator line hose I, L, M, N and hose O.

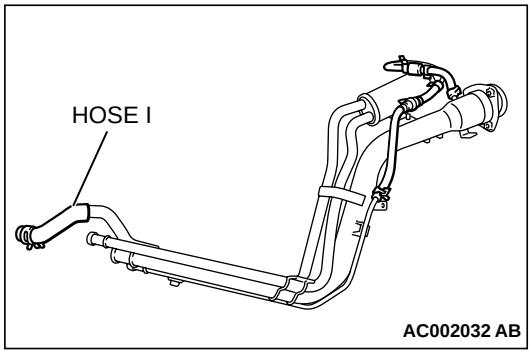
(1) Remove the filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.)

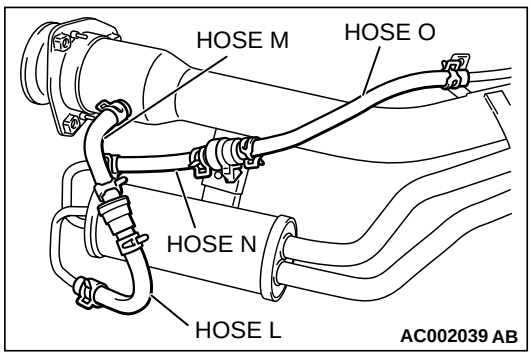
(2) The clogging test with a hand vacuum pump on each hose from hoses I, L, M, N and O.

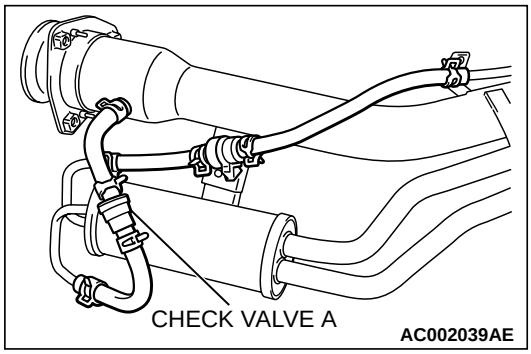
Q: Are the hoses in good condition?

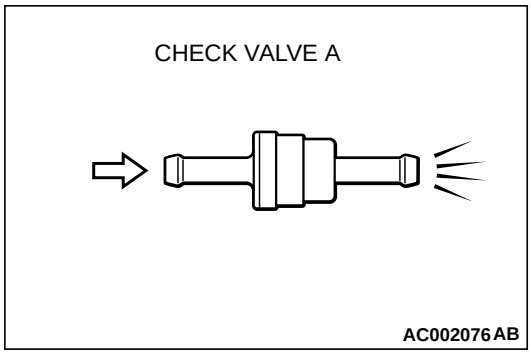
YES : Go to Step 23.

NO : Replace the inferior hose, and reinstall the filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 26.







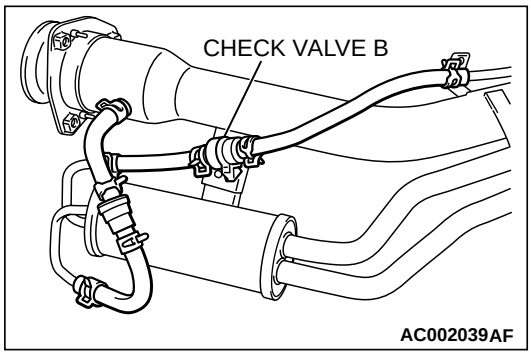


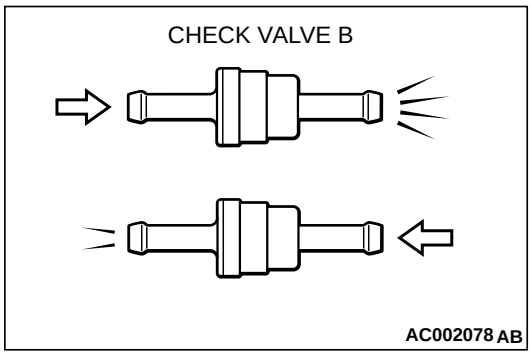
STEP 23. Check the check valve A.

(1) Only when you blow the check valve from the direction shown, it should pass air.
(2) When you blow the check valve, air should leak from the check valve body.

Q: Is check valve A in good condition?

YES : Go to Step 24.
NO : Replace check valve A, and reinstall the filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 26.



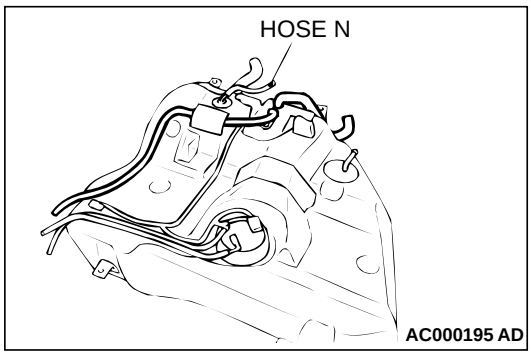


STEP 24. Check the check valve B.

(1) When you blow the check valve from the arrow direction shown above, it should pass more air.
(2) When you blow the check valve from the arrow direction shown below, it should pass less air.
(3) When you blow the check valve, air should leak from the check valve body.

Q: Is check valve B in good condition?

YES : Go to Step 25.
NO : Replace the check valve B, and reinstall the filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 26.



STEP 25. Check for clogging in the evaporator line from hose N.

(1) The clogging test with a hand vacuum pump on the hose N.

Q: Is the hose N in good condition?

YES : Go to Step 26.

NO : Replace the hose N, and reinstall the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 26.

STEP 26. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 1 - Evaporative Emission Control System Leak Monitor P.13B-6.

(2) Read the diagnostic trouble code.

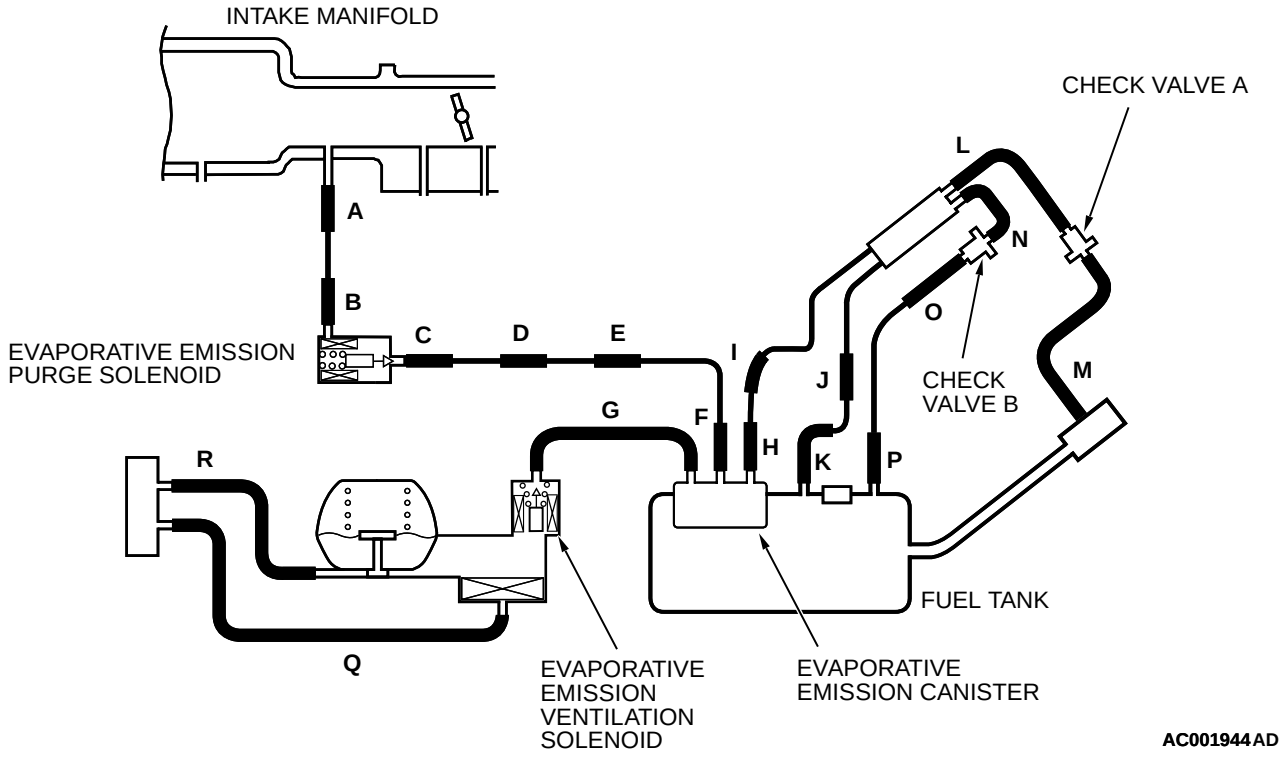
Q: Is diagnostic trouble code P0455 set?

YES : Go to Step 1.

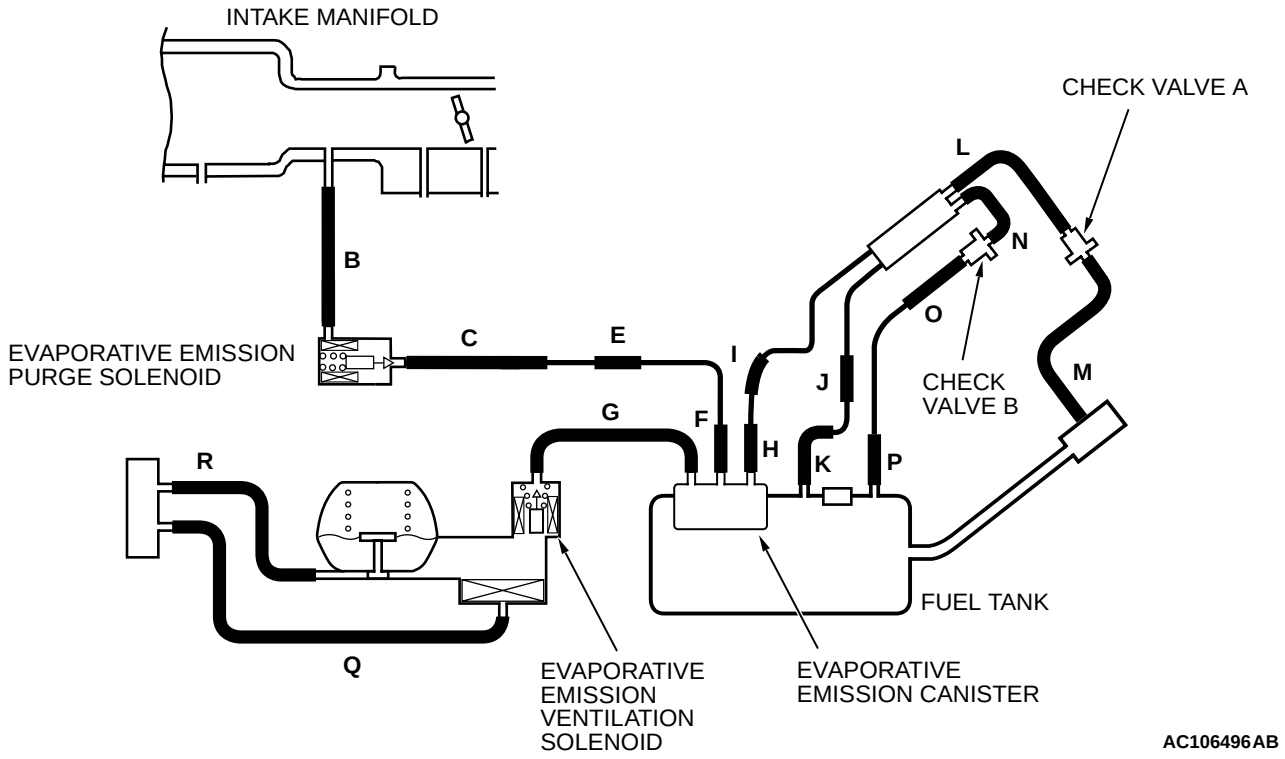
NO : This diagnosis is complete.

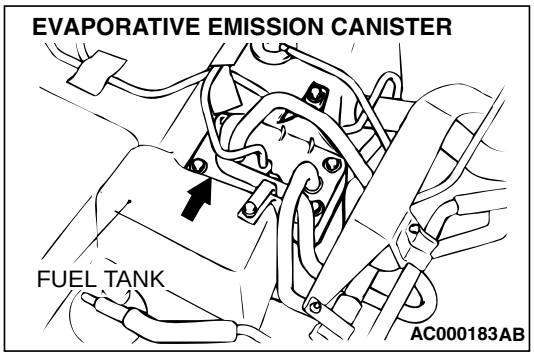
DTC P0456: Evaporative Emission Control System Leak Detected (Very Small Leak)

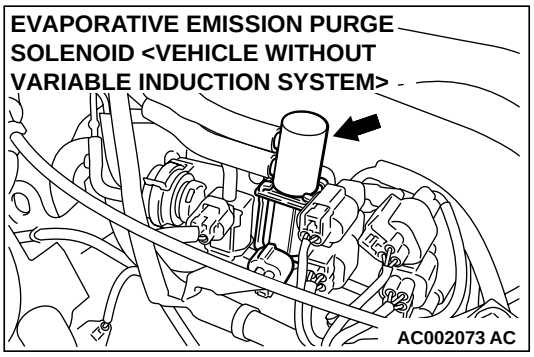
SYSTEM DIAGRAM <VEHICLE WITHOUT VARIABLE INDUCTION SYSTEM>

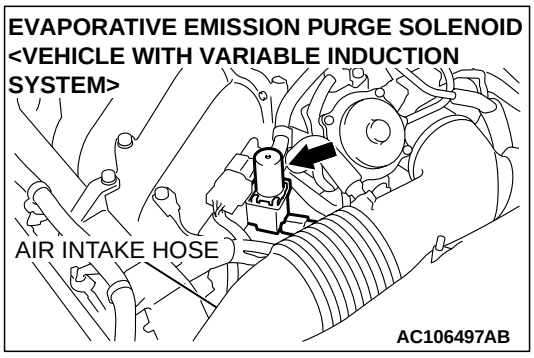


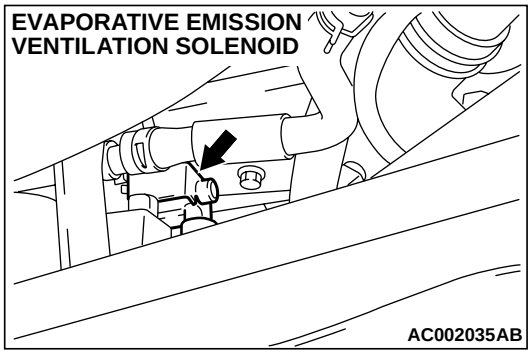
SYSTEM DIAGRAM <VEHICE WITH VARIABLE INDUCTION SYSTEM>











TECHNICAL DESCRIPTION

- To judge if there is leak in the fuel system, ECM <M/T> or PCM <A/T> measure the change of the pressure inside the fuel tank.
- The ECM <M/T > or PCM <A/T> turns on the evaporative emission ventilation solenoid valve to shot off the evaporative emission canister outlet port.
- Then the evaporative emission purge solenoid valve is driven to set the fuel system into a negative pressure.
- When the fuel system develops a vacuum of 2 kPa (0.29 psi), the evaporative emission purge solenoid valve is turned "OFF" and the fuel system vacuum is maintained at 2 kPa (0.29 psi).
- The ECM <M/T> or PCM <A/T> determines if there is leak in the fuel system by measuring the change of vacuum inside the fuel tank.
- The test is stopped when fuel vapor pressure is judged as too high.

DTC SET CONDITIONS

Test Conditions A: At Start up

- The fuel level sensor output voltage is 2.4 – 3.7 volts when the engine starts (i.e. the amount of remaining fuel is 40 – 85 percent)
- Intake air temperature is 36°C (97°F) or less when the engine is started.
- The engine coolant temperature 36°C (97°F) or less when the engine is started.

Test Conditions B: For Test to Run

- Barometric pressure is above 76 kPa (11 psi).
- The fuel temperature is 33°C (91°F) or less
- Fuel tank differential pressure sensor output voltage is 1 to 4 volts.

Test Conditions C: For Test to Stop

- Engine coolant temperature is less than 20°C (68°F).
- Intake air temperature is less than –10°C (14°F).
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the pressure rises higher 324 Pa (0.047 psi).

Judgment Criteria

- Internal pressure of the fuel tank fluctuate 1177 – 1373 Pa (0.171 – 0.199 psi) or more in 128 seconds after the tank and vapor line were closed.

NOTE: The monitoring time depends on the fuel level and the temperature in the fuel tank (10 – 14 minutes.)

TROUBLESHOOTING HINTS

The most likely causes for this code to be set are:

- Loose fuel cap.
- Fuel cap relief pressure is incorrect.
- Evaporative emission canister seal is faulty.
- Fuel tank, purge line or vapor line seal failed.
- Evaporative emission ventilation solenoid failed.

TSB Revision

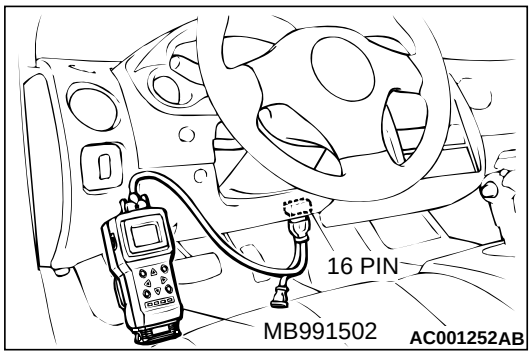
OVERVIEW OF TROUBLESHOOTING

- To determine the cause of DTC P0456, a performance test is needed. The performance test uses a mechanical vacuum gauge and scan tool MB991502 set on the fuel tank differential pressure sensor (TANK PRES SNER 73.) The mechanical gauge reading is used to verify scan tool MB991502 reading. A comparison of the mechanical gauge to scan tool MB991502 determines the problem in the system.
- Prior to doing the performance test, several simple inspections are needed to exclude some possibilities of the symptom.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check evaporative emission system monitor test.

⚠ CAUTION

- **To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.**
- **With this monitor, the ECM <M/T> or PCM <A/T> automatically increases the engine speed to 1,600 r/min or more. Check that the transaxle is set to "neutral" <M/T> or "P" <A/T> position.**

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTCs using scan tool MB991502.
(4) Check that the fuel cap is securely closed. (Tighten until three clicks are heard.)
(5) Start the engine.
(6) Select "System Test," and press the "YES" key.
(7) Select "Evap Leak Mon," and press the "YES" key.
(8) During the monitor, keep the accelerator pedal at the idling position.

NOTE: If the engine speed does not reach 2,000 r/min during the monitor test, adjustment of the Speed Adjusting Screw may be needed. Refer to P.13B-679. And adjust to the standard value.

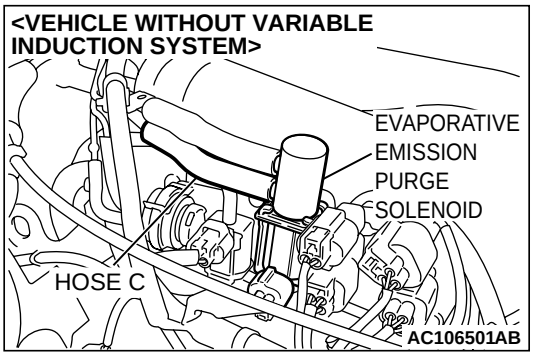
(9) Keep the engine speed and engine load within the specified range. When the monitor test starts, the "In Progress" item on the scan tool MB991502 will change from "NO" to "YES."
(10) Turn the ignition switch to the "LOCK" (OFF) position, and disconnect scan tool MB991502.

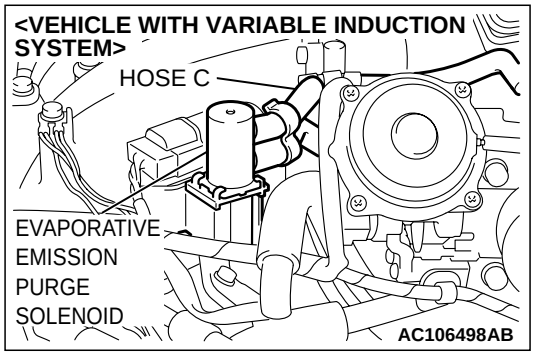
Q: What is displayed on the scan tool MB991507?

"Evap Leak Mon. Completed Test Passed" : The evaporative emission system is working properly at this time. Explain to customer that improperly tightened fuel cap can cause MIL to turn on, and return the vehicle.

"Evap Leak Mon. Completed. Test Failed and DTCs Set" : A malfunction has been detected during the monitor test. Go to Step 2.

"Evap Lead Mon. discontinued. Retest again from the first" : The monitor was discontinued for a certain reason (vehicle speed input from computer, engine speed and engine load deviating from specified range). Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the monitoring from the Step 1.



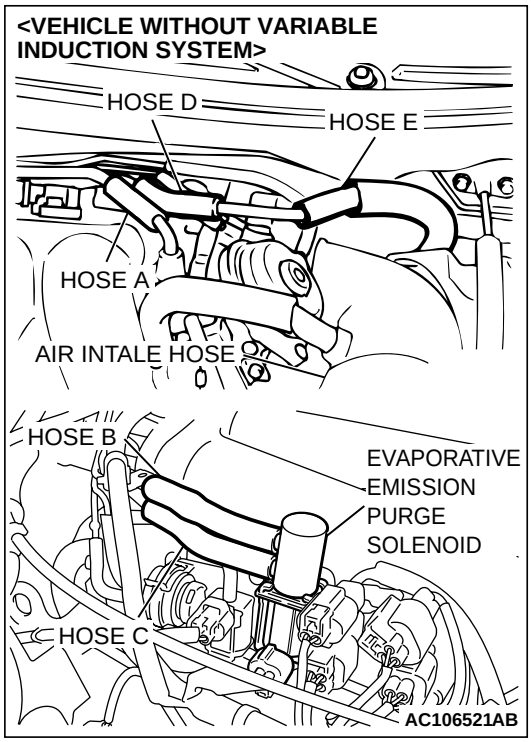


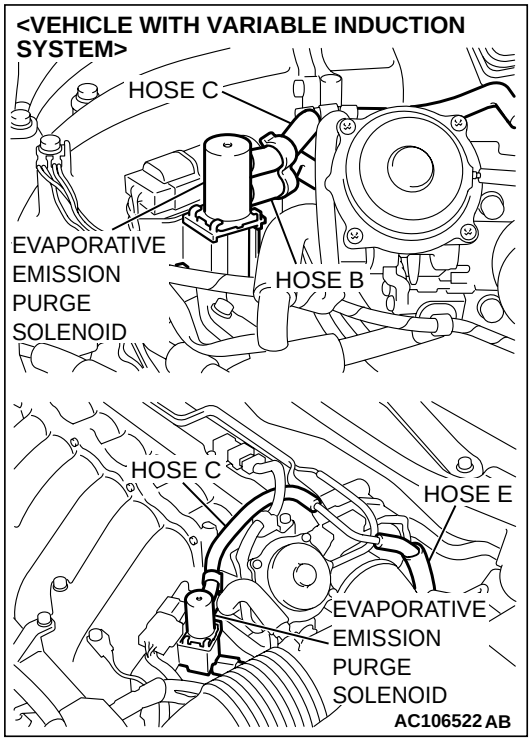
STEP 2. Check evaporative emission purge solenoid for leaks.

(1) Remove the battery.
(2) Remove the air intake hose. (Refer to GROUP 15, Air Cleaner P.15-6.)
(3) Disconnect hose C from the evaporative emission purge solenoid side, and connect a hand vacuum pump to the nipple of the evaporative emission purge solenoid.
(4) Apply a pressure on the hand vacuum pump, and confirm that air is maintained.
(5) Disconnect the hand vacuum pump, and connect hose C to the evaporative emission purge solenoid.

Q: Is the evaporative emission purge solenoid in good condition?

YES : Go to Step 3.
NO : Replace the evaporative emission purge solenoid. Then go to Step 17.





STEP 3. Check for leaks in the evaporator line hose A to hose E <Vehicle without Variable Induction System> or hose B, C, E <Vehicle with Variable Induction System>.

The leakage test with a hand vacuum pump on each hose from hose A to hose E <vehicle without Variable Induction System> or hose B, C, E <vehicle with Variable Induction System>.

Q: Are the hoses in good condition?

YES : Go to Step 4.

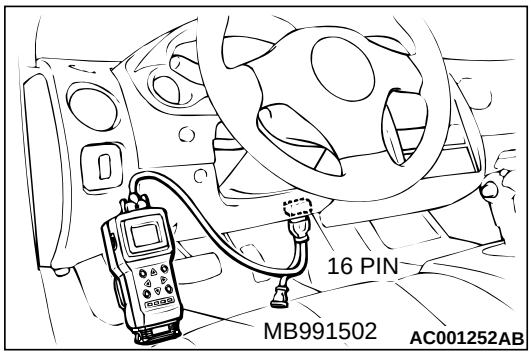
NO : Replace the inferior hose. Then go to Step 17.

STEP 4. Check the evaporative emission ventilation solenoid using scan tool MB991502. (Actuator test item 29)

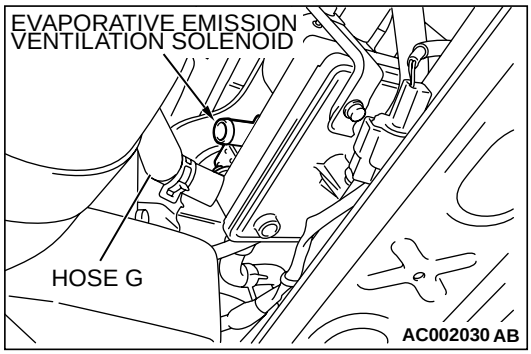
⚠ CAUTION

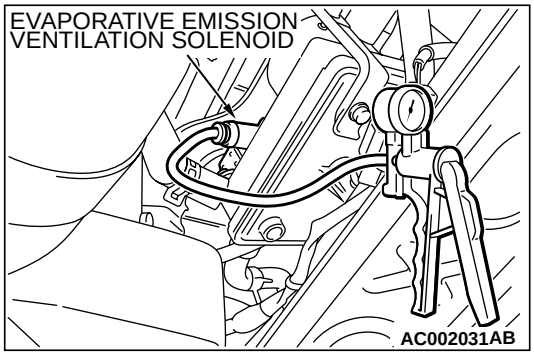
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.



(2) Disconnect the hose G from the evaporative emission ventilation solenoid side.

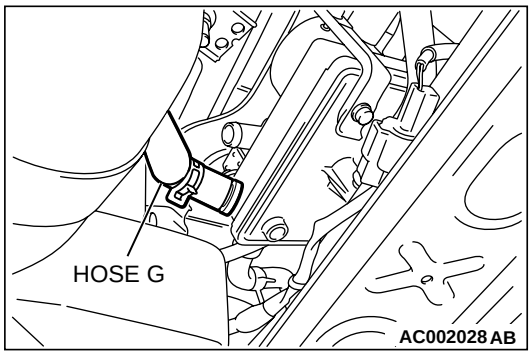




(3) Connect the hand vacuum pump to the nipple of the evaporative emission ventilation solenoid from which the hoses have been disconnected.
(4) Turn the ignition switch to the "ON" position.
(5) Set scan tool MB991502 to actuator test mode for item 29: Evaporative Emission Ventilation Solenoid. When the evaporative emission ventilation solenoid is operated, apply a pressure on the hand vacuum pump and confirm that air is maintained.
(6) Turn the ignition switch to the "LOCK" (OFF) position, and disconnect scan tool MB991502.
(7) Disconnect the hand vacuum pump, and connect hose G to the evaporative emission canister.

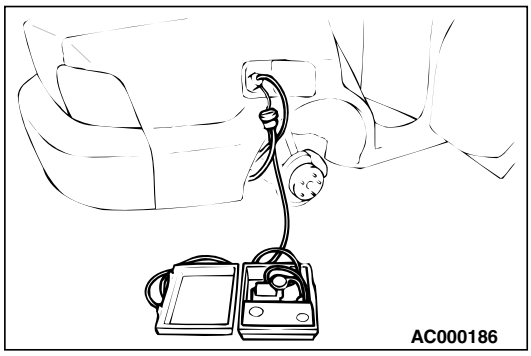
Q: Is the evaporative emission ventilation solenoid in good condition?

YES : Go to Step 5.
NO : Replace the evaporative emission ventilation solenoid. Then go to Step 17.



STEP 5. Pressure test for evaporator line from hose F to hose P.

(1) Remove the module bracket mounting bolts, and disconnect hose G from the evaporative emission ventilation solenoid side, and plug the hoses from which the hoses have been disconnected.
(2) Confirm that the evaporative emission system pressure pump (Miller number 6872A) is operating properly. Perform the self-test as described in the manufacturer's instructions.

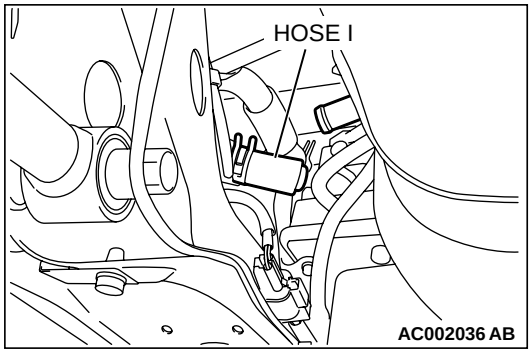


(3) Connect an evaporative emission system pressure pump to the fuel filler neck.
(4) Pressure test the system to determine whether any leaks are present.

NOTE: "Pressure test" in this procedure refers to the I/M240 Simulation Test (8 simple steps) described in the evaporative emission system pressure pump (Miller number 6872A) manufacturer's instructions located in the lid of the pump box.

Q: Are the evaporator line in good condition?

YES : Go to Step 16.
NO : Go to Step 6.

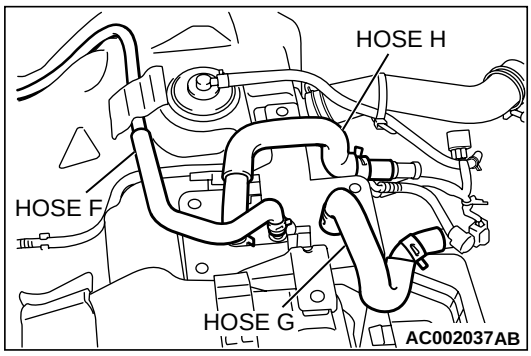


STEP 6. Pressure test for evaporator line from hose I to hose P.

(1) Disconnect hose I from the evaporative emission canister side, and plug the hose from which the pipes have been disconnected.
(2) Perform the pressure test again.

Q: Are the evaporator line in good condition?

YES : Go to Step 7.
NO : Go to Step 9.



STEP 7. Check for leaks in the evaporator line hose F to hose H.

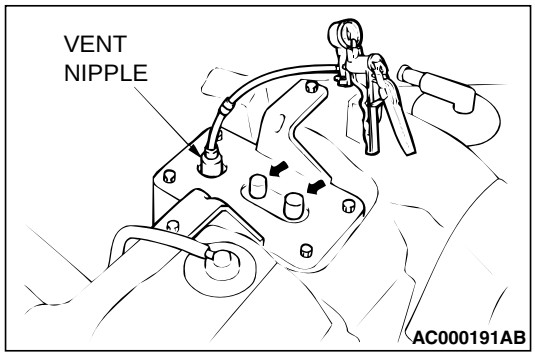
(1) Remove the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.)

(2) The leakage test with a hand vacuum pump on each hose from hose F to hose H.

Q: Are the hoses in good condition?

YES : Go to Step 8.

NO : Replace that hose, reinstall the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 17.



STEP 8. Check for leaks in the evaporative emission canister.

(1) Connect a hand vacuum pump to the vent nipple of the evaporative emission canister.

(2) Plug the other two nipples or loop a hose between the other nipples.

(3) Apply a vacuum with the hand vacuum pump, and confirm that the applied vacuum does not fluctuate.

Q: Is the evaporation emission canister in good condition?

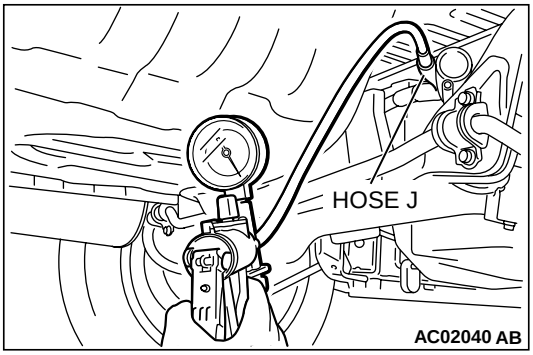
YES : Go to Step 17.

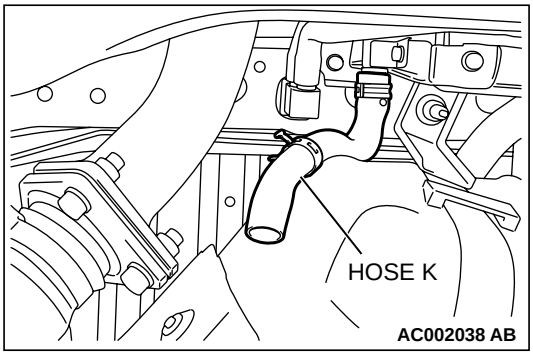
NO : Replace the evaporative emission canister, reinstall the fuel tank. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 17.

STEP 9. Check for leaks in the evaporator line from hose J and hose K.

(1) Remove the fuel filler neck protector. (Refer to GROUP 13C, Fuel Tank P.13C-11.)

(2) Disconnect hose J at the liquid separator, and then connect a hand vacuum pump to the hose.





(3) Disconnect hose K at the fuel tank side, and then plug the hose.

(4) Apply vacuum with the hand vacuum pump, and confirm that the applied vacuum does not fluctuate.

Q: Are the evaporator line in good condition?

YES : Go to Step 10.

NO : Replace that hose, reinstall the fuel filler neck protector. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 17.

STEP10. Check for leaks in the evaporator line hose I, L, M, N and O.

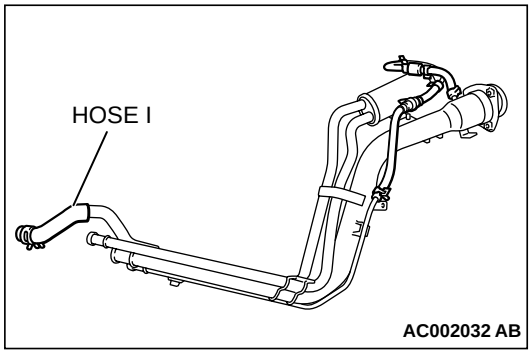
(1) Remove the fuel tank and fuel filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.)

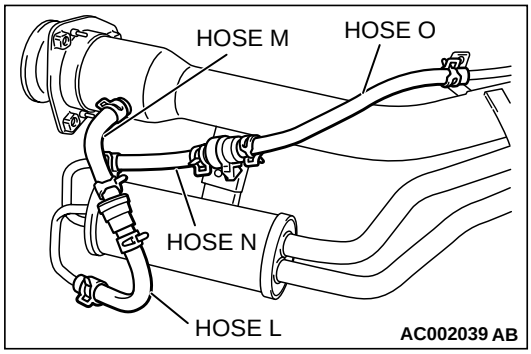
(2) The leakage test with a hand vacuum pump on each hose from hose I, L, M, N and O.

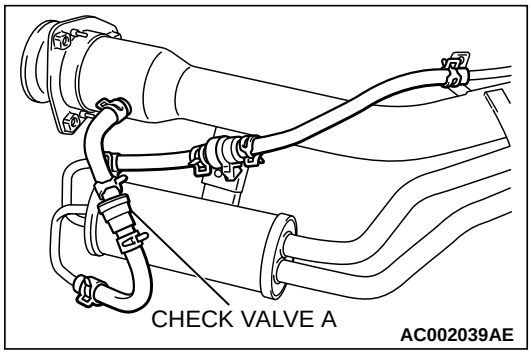
Q: Are the hoses in good condition?

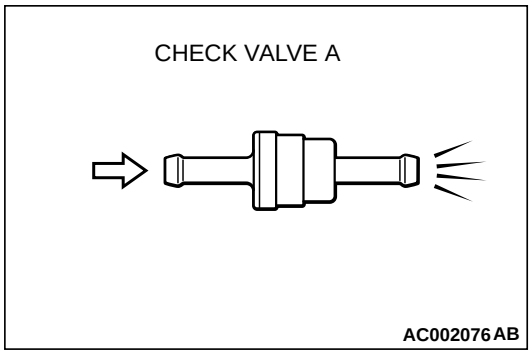
YES : Go to Step 11.

NO : Replace the hose, reinstall the fuel tank and fuel filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 17.







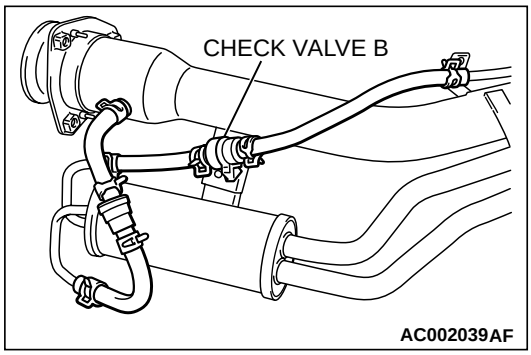


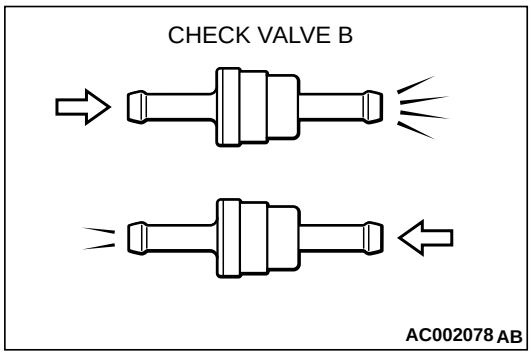
STEP 11. Check the check valve A.

(1) Only when you blow the check valve from the direction shown, it should pass air.
(2) When you blow the check valve, air should leak from the check valve body.

Q: Is the check valve A in good condition?

YES : Go to Step 12.
NO : Replace the check valve A, reinstall the fuel tank and fuel filler neck assembly. Then go to Step 17.



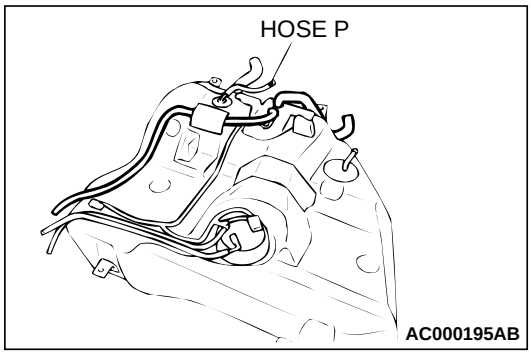


STEP 12. Check the check valve B.

(1) When you blow the check valve from the arrow direction shown above, it should pass more air.
(2) When you blow the check valve from the arrow direction shown below, it should pass less air.
(3) When you blow the check valve, air should leak from the check valve body.

Q: Is the check valve B in good condition?

YES : Go to Step 13.
NO : Replace the check valve B, reinstall the fuel tank and fuel filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 17.



STEP 13. Check for leaks in the evaporator line hose P.

(1) The leakage test with a hand vacuum pump on each hose from hose P.

Q: Is the hose in good condition?

YES : Go to Step 14.

NO : Replace the hose, reinstall the fuel tank and fuel filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 17.

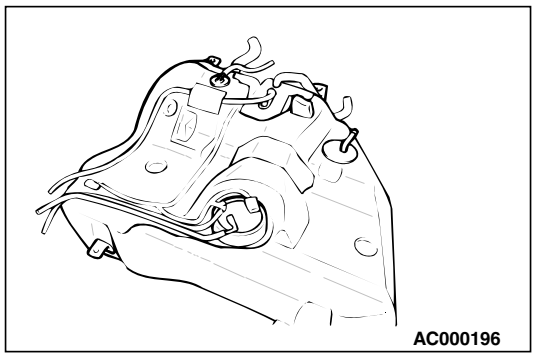
STEP 14. Visually check for cracks in the fuel filler neck assembly.

Visually check for cracks in the fuel filler neck assembly.

Q: Is the fuel filler neck assembly in good condition?

YES : Go to Step 15.

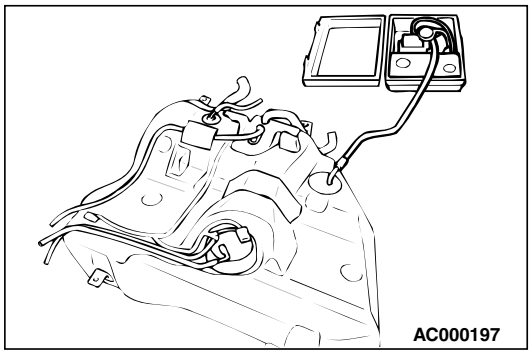
NO : Replace the fuel filler neck assembly, reinstall the fuel tank and fuel filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 17.



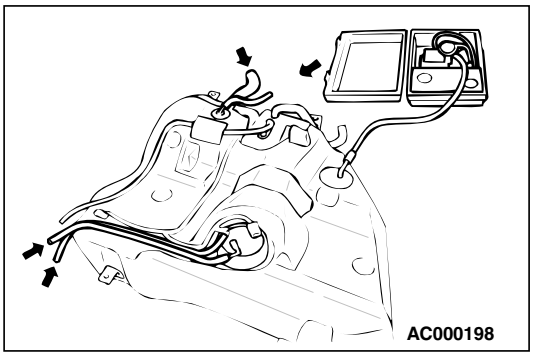
STEP 15. Check for leaks in the fuel tank.

(1) Visually check for cracks and leaks, etc.

NOTE: Carefully check the fuel pump assembly and the inner pressure sensor installation section in the fuel tank.



(2) Connect an evaporative emission system pressure pump to the leveling valve nipple.



(3) Plug the filler hose, feed pipe, return pipe and rollover valve nipple connected to the fuel tank.

NOTE: If these items are not securely plugged here, the fuel could leak in the next step.

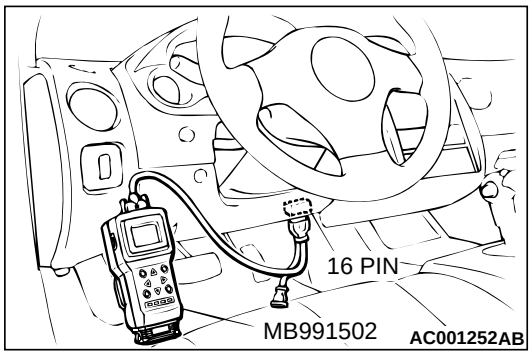
(4) Apply pressure with the evaporative emission system pressure pump.

(5) In the pressurized state, check for the leak by applying soap water, etc. to each section.

Q: Is the fuel tank in good condition?

YES : Go to Step 16.

NO : Replace the fuel tank, reinstall the fuel tank and fuel filler neck assembly. (Refer to GROUP 13C, Fuel Tank P.13C-11.) Then go to Step 17.



STEP 16. Using scan tool MB991502, check evaporative emission system monitor test.

⚠ CAUTION

- **To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.**
- **With this monitor, the ECM <M/T> or PCM <A/T> automatically increases the engine speed to 1,600 r/min or more. Check that the transaxle is set to "neutral" <M/T> or "P" <A/T> position.**

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTCs using scan tool MB991502.
(4) Check that the fuel cap is securely closed. (Tighten until three clicks are heard.)
(5) Start the engine.
(6) Select "System Test," and press the "YES" key.
(7) Select "Evap Leak Mon," and press the "YES" key.
(8) During the monitor, keep the accelerator pedal at the idling position.

NOTE: If the engine speed does not reach 2,000 r/min during the monitor test, adjustment of the Speed Adjusting Screw may be needed. Refer to P.13B-679. And adjust to the standard value.

(9) Keep the engine speed and engine load within the specified range. When the monitor test starts, the "In Progress" item on the scan tool MB991502 will change from "NO" to "YES."
(10) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991502.

Q: What is displayed on scan tool MB991502?

"Evap Leak Mon. Completed. Test Passed" : The evaporative emission system is working properly at this time. Then go to Step 17.

"Evap Leak Mon. Completed. Test Failed and DTCs Set" : Replace the ECM <M/T> or PCM <A/T>. Then go to Step 17.

"Evap Lead Mon. discontinued. Retest again from the first" : The monitor was discontinued for a certain reason (vehicle speed input from ECM <M/T> or PCM <A/T>, engine speed and engine load deviating from specified range). Turn the ignition switch to the "LOCK" (OFF) position once, and recheck evaporative emission system monitor test.

STEP 17. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 1 - Evaporative Emission Control System Leak Monitor P.13B-6.
(2) Read the diagnostic trouble code.

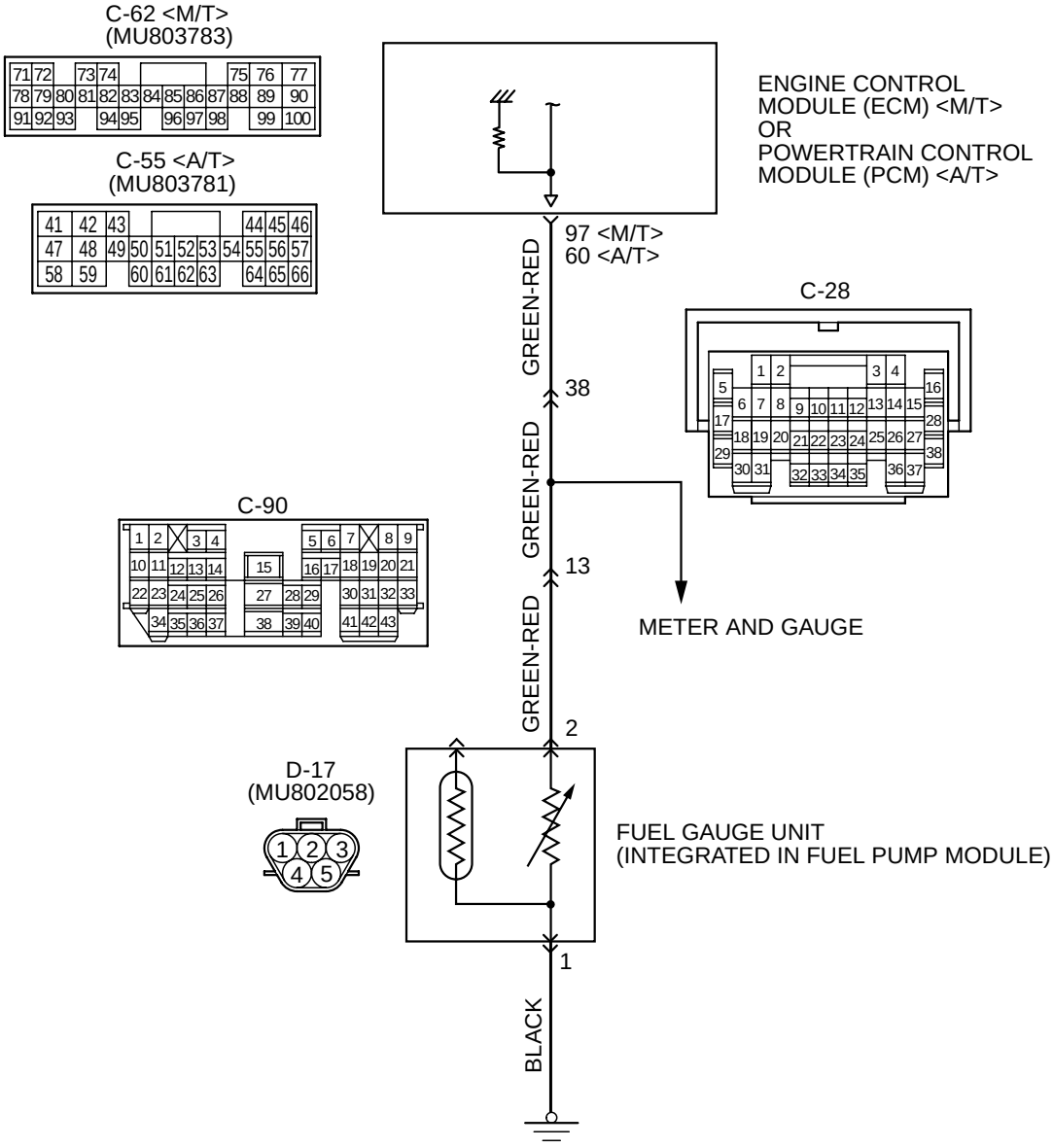
Q: Is diagnostic trouble code P0456 set?

YES : Go to Step 1.
NO : This diagnosis is complete.

TSB Revision

DTC P0461: Fuel Level Sensor Circuit Range/Performance

Fuel Gauge Unit Circuit



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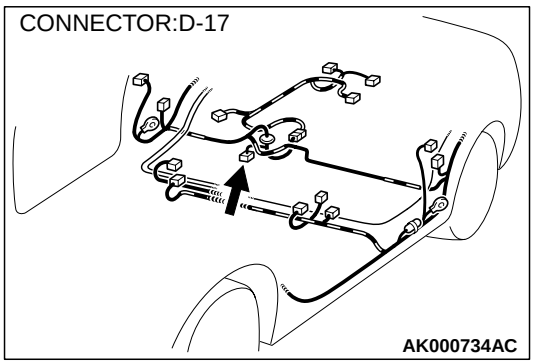
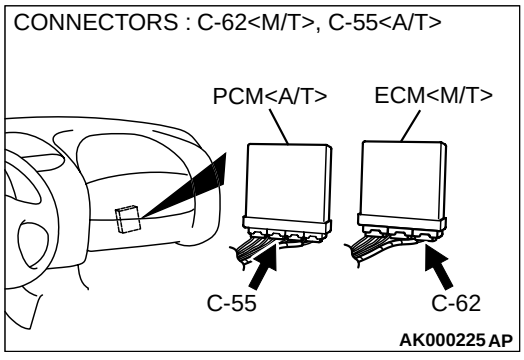
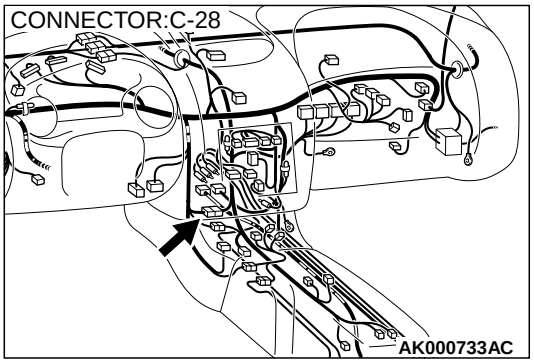
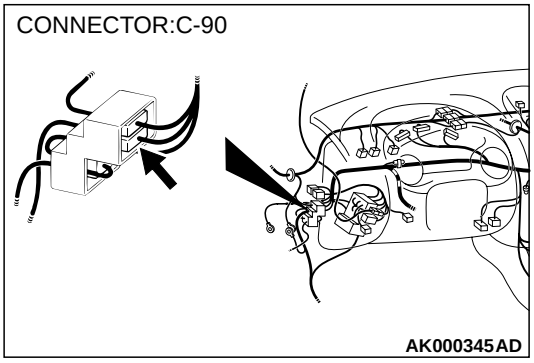




TSB Revision





CIRCUIT OPERATION

- The fuel gauge drive signal is input in ECM (terminal 97) <M/T> or PCM (terminal 60) <A/T>.

TECHNICAL DESCRIPTION

- Branch the drive signal from the fuel gauge circuit, and input it into ECM <M/T> or PCM <A/T>.
- The ECM <M/T> or PCM <A/T> detects the amount of fuel left in the fuel tank with this signal, and also controls the fuel level warning light.

DTC SET CONDITIONS

Check Conditions, Judgement Criteria

- When the fuel consumption calculated from the operation time of the injector amounts to 20 litter, the diversity of the amount of fuel in tank calculated from the fuel level sensor is 2 litter or less.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

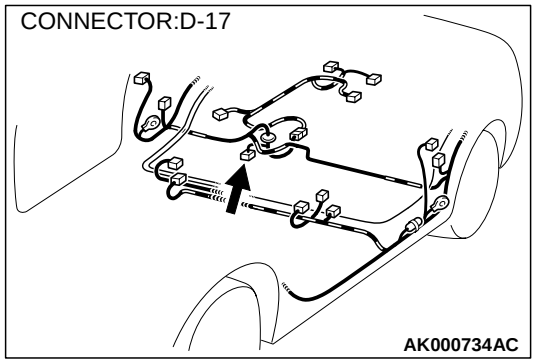
- Fuel gauge unit failed.
- Open or shorted fuel gauge unit circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

STEP 1. Check fuel gauge.

Q: Is the fuel gauge functioning?

YES : Go to Step 3.
NO : Go to Step 2.



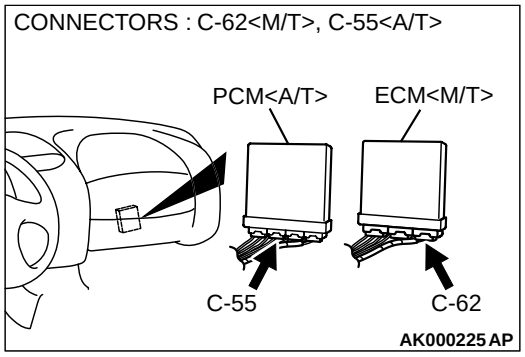
STEP 2. Check for short circuit to ground between fuel gauge unit connector D-17 terminal 2 and ECM connector C-62 terminal 97 <M/T> or PCM connector C-55 terminal 60 <A/T>.

NOTE: Check harness after checking intermediate connectors C-90, and C-28. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.

Q: Is the harness wire in good condition?

YES : Refer to GROUP 54A, Combination Meter P.54A-103.

NO : Repair it. Then go to Step 6.

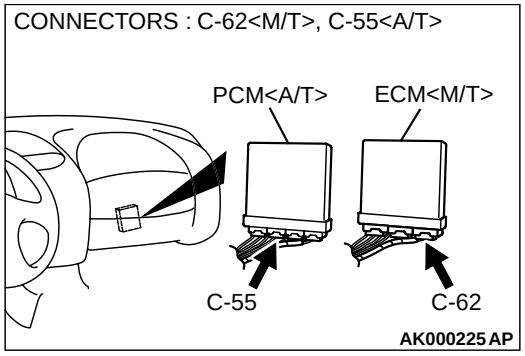


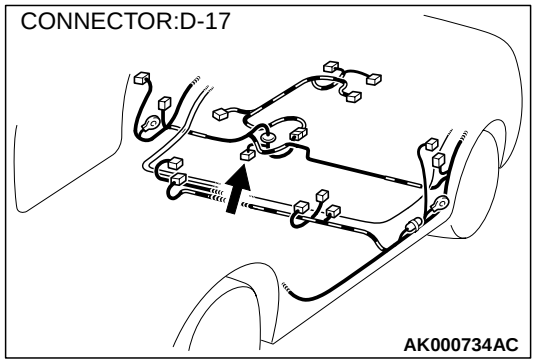
STEP 3. Check connector C-62 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

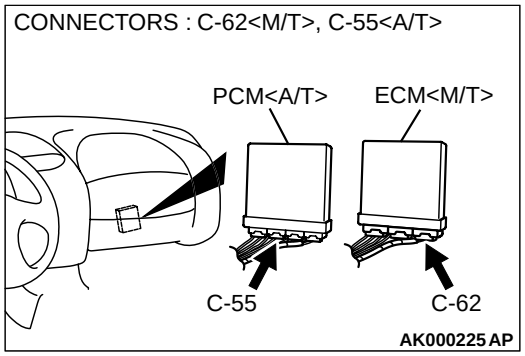
Q: Is the connector in good condition?

YES : Go to Step 4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.







STEP 4. Check for open circuit or harness damage between fuel gauge unit connector D-17 terminal 2 and ECM connector C-62 terminal 97 <M/T> or PCM connector C-55 terminal 60 <A/T>.

NOTE: Check harness after checking intermediate connectors C-90, and C-28. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.

Q: Is the harness wire in good condition?

YES : Go to Step 5.
NO : Repair it. Then go to Step 6.

STEP 5. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0461 is output?

YES : Replace the ECM or PCM. Then go to Step 6.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

STEP 6. Test the OBD-II drive cycle.

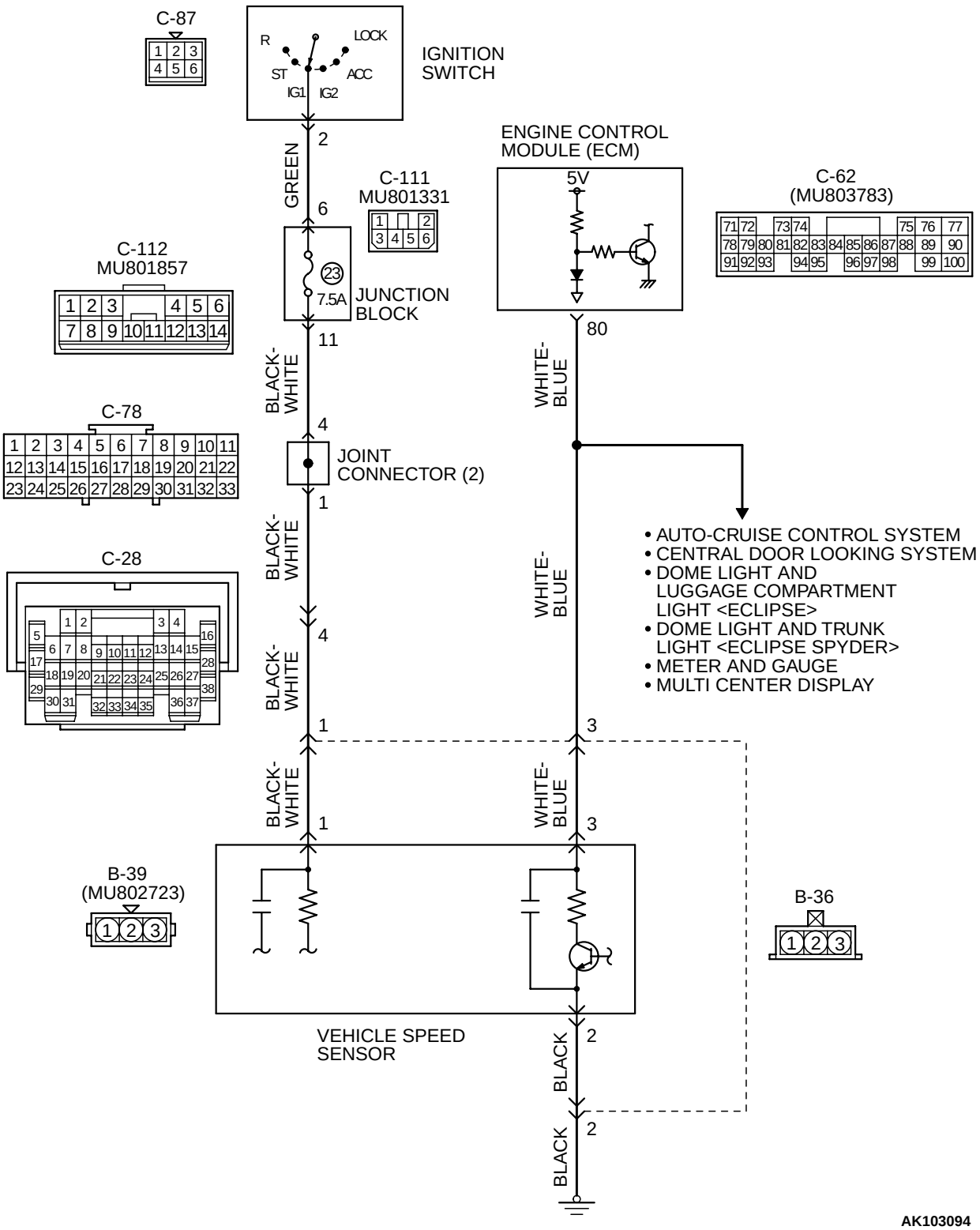
(1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0461 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0500: Vehicle Speed Sensor <M/T>

Vehicle Speed Sensor Circuit



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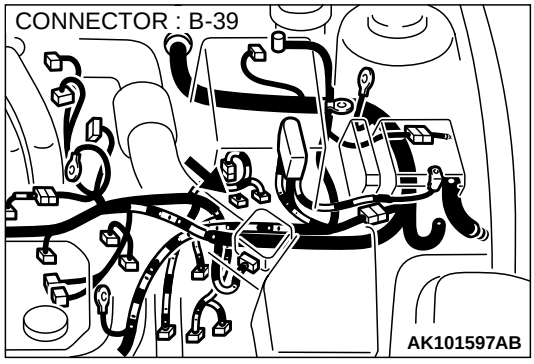

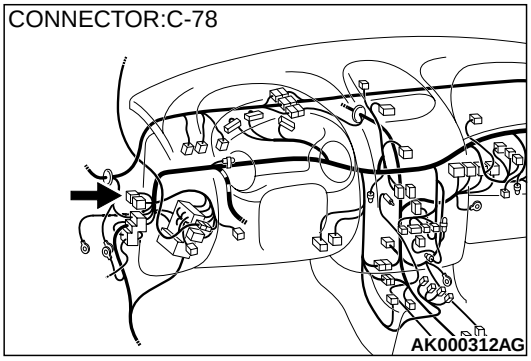

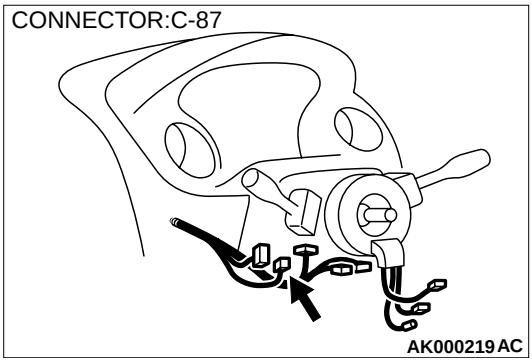

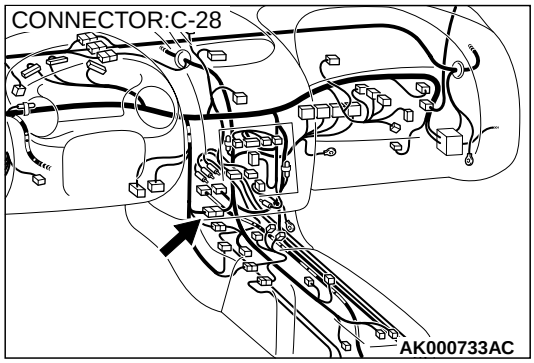

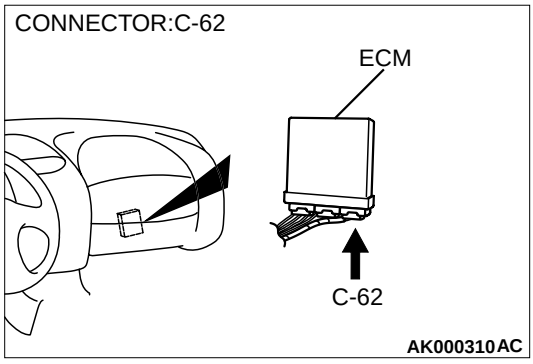

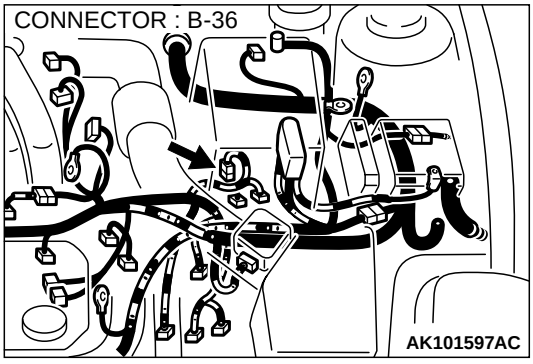

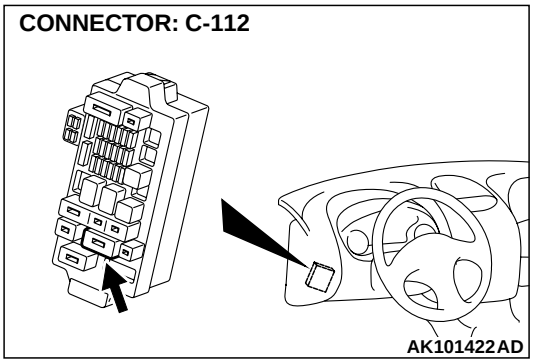

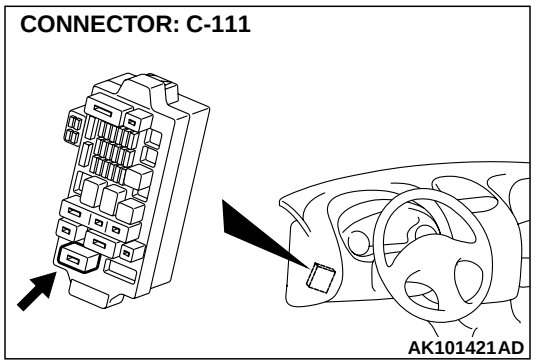

CIRCUIT OPERATION

- A 5-volt voltage is applied to the vehicle speed sensor output terminal (terminal 3) from the ECM (terminal 80). The vehicle speed sensor generates a pulse signal when the output terminal is opened and grounded.

TECHNICAL DESCRIPTION

- The vehicle speed sensor converts the vehicle speed into pulse signals and inputs them to the ECM.
- The vehicle speed sensor outputs a pulse signal while the vehicle is driven.
- The ECM checks whether the pulse signal is output.

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DTC SET CONDITIONS

Check Conditions

- 2 seconds or more have passed the starting sequence was completed.
- Engine speed is at between 2,100 and 4,000 r/min.
- Volumetric efficiency is at between 40 and 70 percent.

Judgement Criteria

- Vehicle speed sensor output voltage has not changed (no pulse signal is input) for 2 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

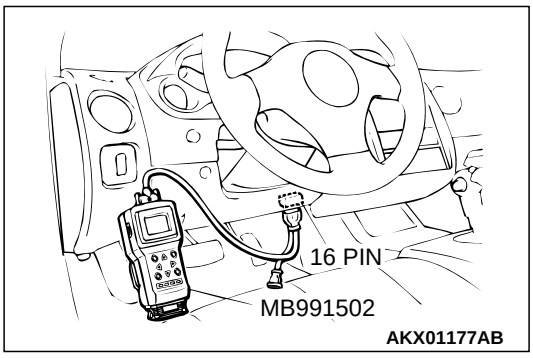
- Vehicle speed sensor failed.
- Open or shorted vehicle speed sensor circuit, or loose connector.
- ECM failed.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check data list item 24: Vehicle Speed Sensor.



⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine.
(3) Set scan tool MB991502 to the data reading mode for item 24, Vehicle Speed Sensor.
  - Check that the speedometer and MUT-II display speed match when traveling at a vehicle speed of 40 km/h (25 mph).
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Go to Step 2.

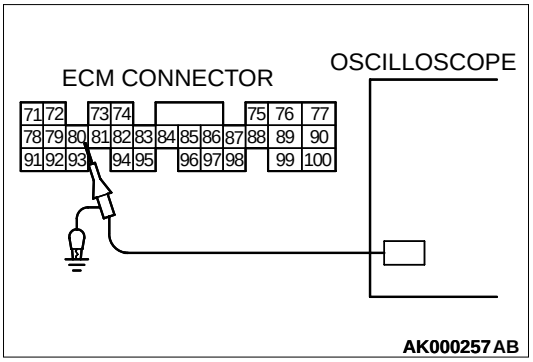
STEP 2. Check speed meter.

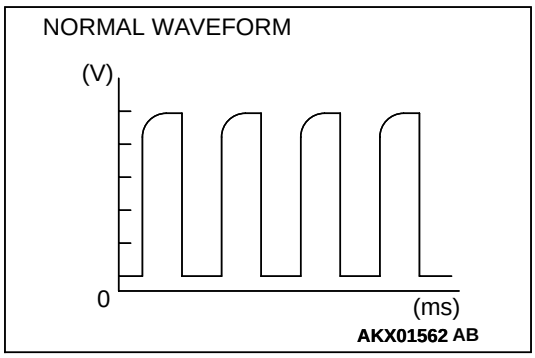
Q: Is the speed meter functioning?

YES : Go to Step 3.
NO : Go to Step 8.

STEP 3. Using the oscilloscope, check the sensor output voltage at ECM connector C-62.

(1) Do not disconnect the ECM connector C-62.
(2) Disconnect the combination meter connector and auto-cruise control-ECU connector.
(3) Connect the oscilloscope probe to terminal 80 of the ECM by backprobing.
(4) Start the engine.





(5) Check the waveform.
- The waveform should show a pattern similar to the illustration while the vehicle is being moved.

(6) Turn the ignition switch to the "LOCK" (OFF) position.

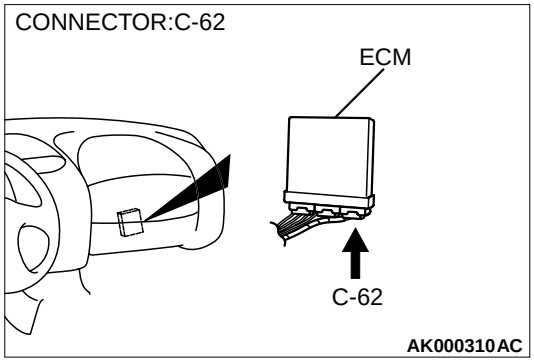
Q: Is the waveform normal?

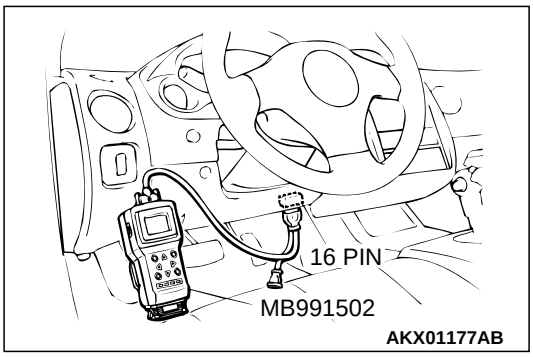
YES : Go to Step 4.
NO : Go to Step 6.

STEP 4. Check connector C-62 at ECM for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 17.





STEP 5. Using scan tool MB991502, check data list item 24: Vehicle Speed Sensor.

⚠ CAUTION

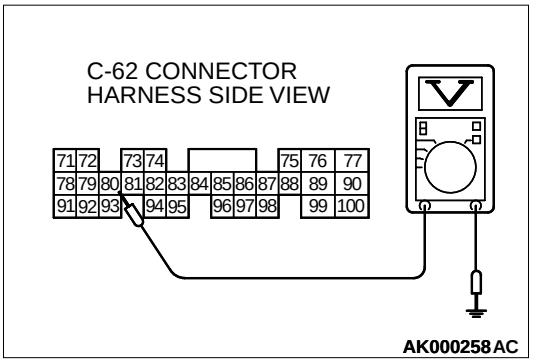
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine.
(3) Set scan tool MB991502 to the data reading mode for item 24, Vehicle Speed Sensor.
- Check that the speedometer and MUT-II display speed match when traveling at a vehicle speed of 40 km/h (25 mph).

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00E-2.
NO : Replace the ECM. Then go to Step 17.



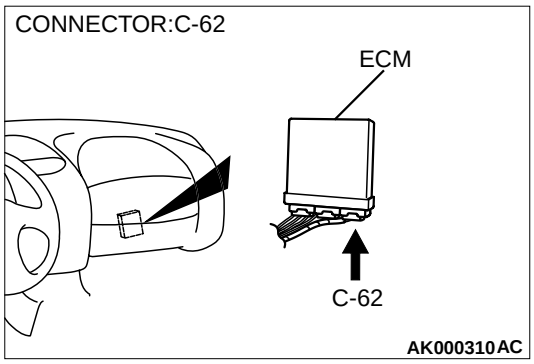
STEP 6. Check the sensor supply voltage at ECM connector C-62 by backprobing.

(1) Do not disconnect the ECM connector C-62.
(2) Disconnect the vehicle speed sensor connector B-39.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the voltage between terminal 80 and ground by backprobing.
- Voltage should be between 4.8 and 5.2 volts.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

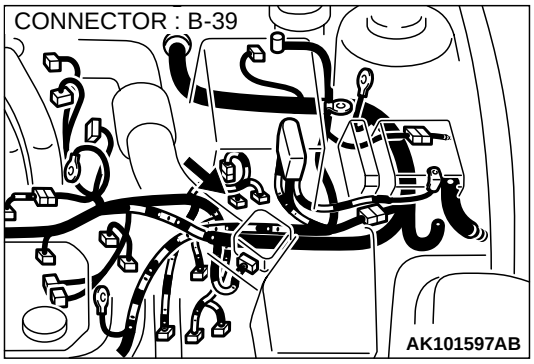
YES : Go to Step 7.
NO : Replace the ECM. Then go to Step 17.



STEP 7. Check connector C-62 at ECM for damage.

Q: Is the connector in good condition?

YES : Check connector B-36 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between vehicle speed sensor connector B-39 terminal 3 and ECM connector C-62 terminal 80 because of open circuit. Then go to Step 17.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 17.

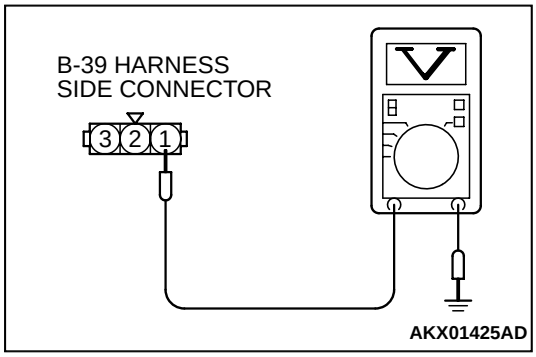


STEP 8. Check connector B-39 at vehicle speed sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 17.



STEP 9. Check the power supply voltage at vehicle speed sensor harness side connector B-39.

(1) Disconnect the connector B-39 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between terminal 1 and ground.

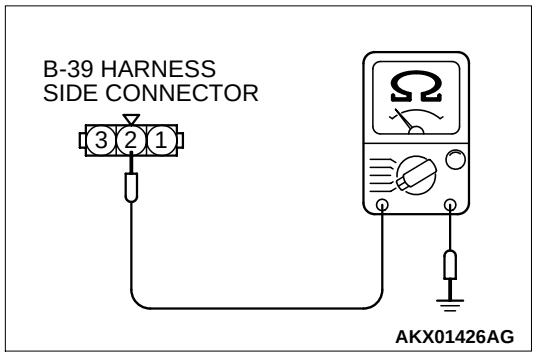
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 10.

NO : Check connectors B-36, C-28, C-78, C-112 and C-111 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connectors are in good condition, repair harness wire between ignition switch connector C-87 terminal 2 and vehicle speed sensor connector B-39 terminal 1 because of open circuit or short circuit to ground. Then go to Step 17.



STEP 10. Check the continuity at vehicle speed sensor harness side connector B-39.

(1) Disconnect the connector B-39 and measure at the harness side.

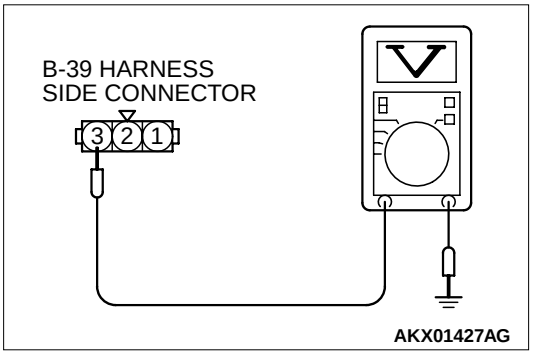
(2) Check for the continuity between terminal 2 and ground.

- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 11.

NO : Check connector B-36 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.13B-6. If intermediate connector is in good condition, repair harness wire between vehicle speed sensor connector B-39 terminal 2 and ground because of open circuit or harness damage. Then go to Step 17.



STEP 11. Check the sensor supply voltage at vehicle speed sensor harness side connector B-39.

(1) Disconnect the vehicle speed sensor connector B-39 and measure at the harness side.
(2) Disconnect the combination meter connector and auto-cruise control-ECU connector.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the voltage between terminal 3 and ground.
- Voltage should be between 4.8 and 5.2 volts.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 12.

NO : Check connector B-36 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between vehicle speed sensor connector B-39 terminal 3 and ECM connector C-62 terminal 80 because of short circuit to ground or harness damage. Then go to Step 17.

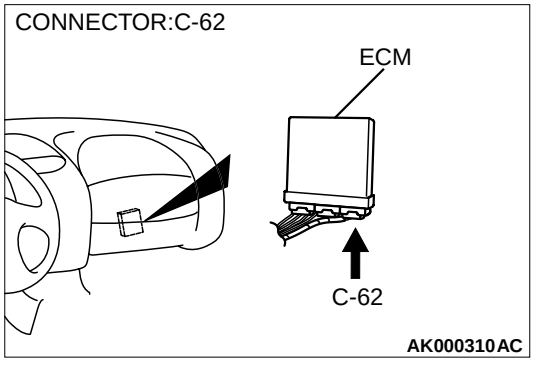
STEP 12. Check the vehicle speed sensor.

Refer to GROUP 54, Combination Metres Assembly and Vehicle Speed Sensor – Combination Metres Assembly and Vehicle Speed Sensor – Inspection P.54A-106.

Q: Is the vehicle speed sensor normal?

YES : Go to Step 13.

NO : Replace the vehicle speed sensor. Then go to Step 17.



STEP 13. Check connector C-62 at ECM for damage.

Q: Is the connector in good condition?

YES : Go to Step 14.

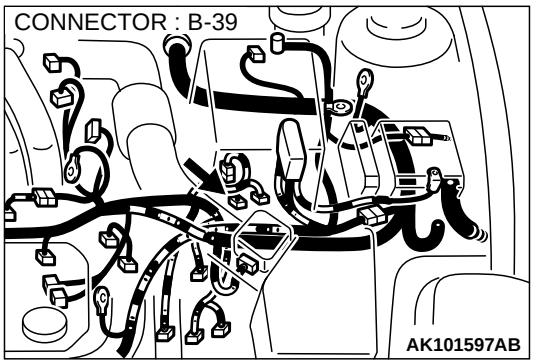
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 17.

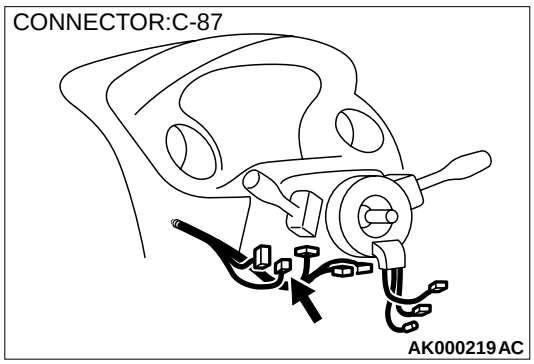
STEP 14. Check for harness damage between ignition switch connector C-87 terminal 2 and vehicle speed sensor connector B-39 terminal 1.

NOTE: Check harness after checking intermediate connectors B-36, C-28, C-78, C-112 and C-111. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 17.

Q: Is the harness wire in good condition?

YES : Go to Step 15.
NO : Repair it. Then go to Step 17.



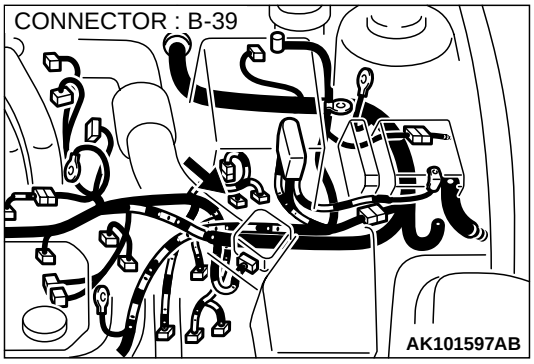


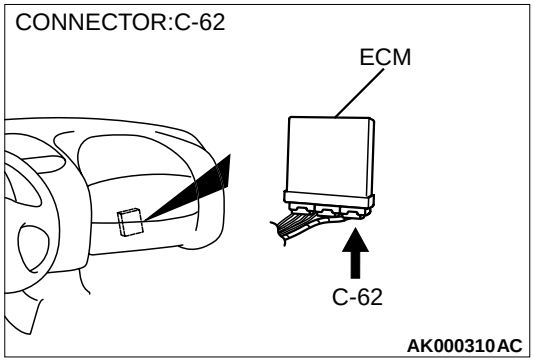
STEP 15. Check for harness damage between vehicle speed sensor connector B-39 terminal 3 and ECM connector C-62 terminal 80.

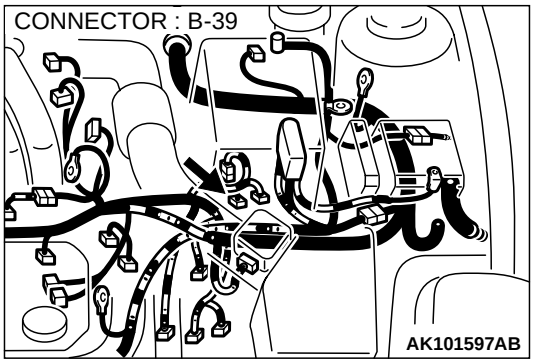
NOTE: Check harness after checking intermediate connector B-39 If intermediate connector is damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 17.

Q: Is the harness wire in good condition?

YES : Go to Step 16.
NO : Repair it. Then go to Step 17.







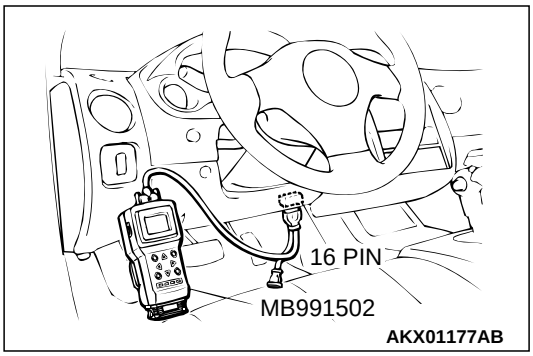
STEP 16. Check for harness damage between vehicle speed sensor connector B-39 terminal 2 and ground.

NOTE: Check harness after checking intermediate connector B-36 If intermediate connector is damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 17.

Q: Is the harness wire in good condition?

YES : Check for harness wire between vehicle speed sensor connector B-39 terminal 3 and other system because of short circuit to ground. Then go to Step 17.

NO : Repair it. Then go to Step 17.



STEP 17. Using scan tool MB991502, check data list item 24: Vehicle Speed Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine.
(3) Set scan tool MB991502 to the data reading mode for item 24, Vehicle Speed Sensor.
- Check that the speedometer and MUT-II display speed match when traveling at a vehicle speed of 40 km/h (25 mph).

(4) Turn the ignition switch to the "LOCK" (OFF) position.

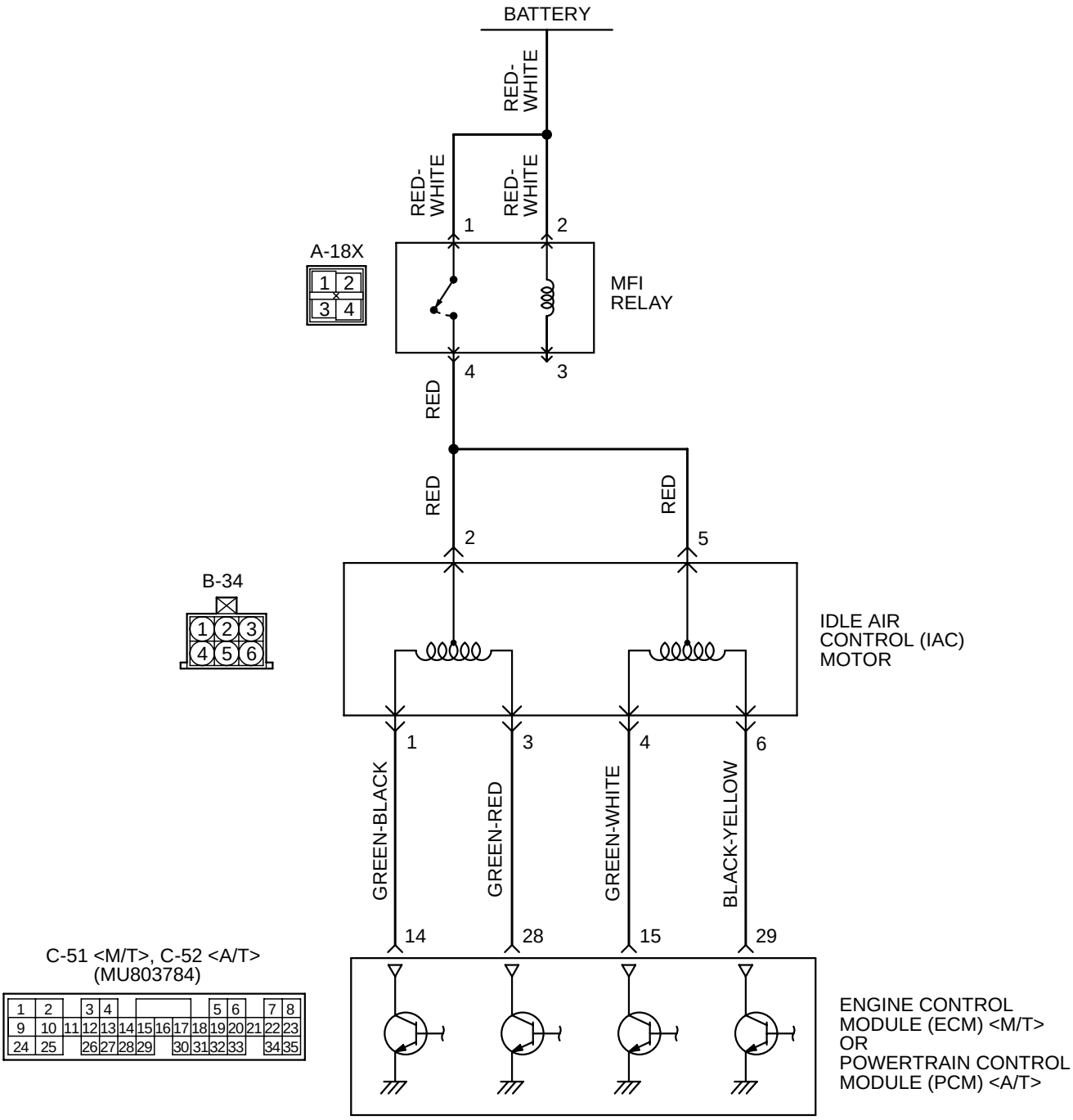
Q: Is the sensor operating properly?

YES : The inspection is complete.

NO : Retry the troubleshooting.

DTC P0506: Idle Control System RPM Lower Than Expected

Idle Air Control (IAC) Motor Circuit



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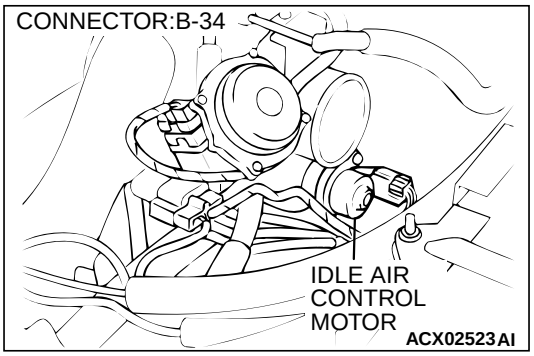
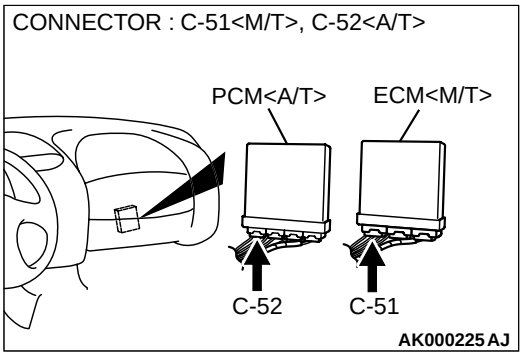
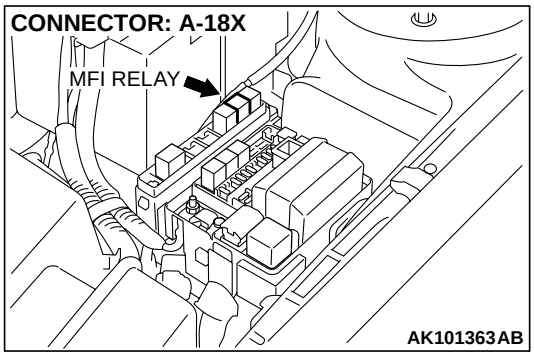






CIRCUIT OPERATION

- The idle air control motor power is supplied from the MFI relay (terminal 4).
- The ECM (terminals 14, 15, 28, 29) <M/T> or PCM (terminals 14, 15, 28, 29) <A/T> drives the stepper motor by sequentially turning "ON" the power transistors in the ECM <M/T> or PCM <A/T> and providing ground to the idle air control motor (terminals 1, 3, 4, 6).

TECHNICAL DESCRIPTION

- The amount of air taken in during idling is regulated by the opening and closing of the servo valve located in the air passage that bypasses the throttle body.
- If there is a malfunction of the IAC system, the actual engine speed will not be identical to the target engine speed.
- The ECM <M/T> or PCM <A/T> checks the difference between the actual engine speed and the target engine speed.

DTC SET CONDITIONS

Check Conditions

- Under the closed loop idle speed control.
- The engine coolant temperature is more than approximately 77°C (171°F).
- Battery positive voltage is higher than 10 volts.
- Power steering pressure switch: "OFF".
- Volumetric efficiency is lower than 40 percent.
- Barometric pressure is higher than 76 kPa (11 psi).
- Intake air temperature is higher than −10°C (14°F).
- 60 seconds have elapsed from the start of the previous monitoring.
- Target idle air control motor position is more than 100 steps.

Judgment Criteria

- The actual idle speed is more than 100 r/min lower than the target idle speed for 12 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

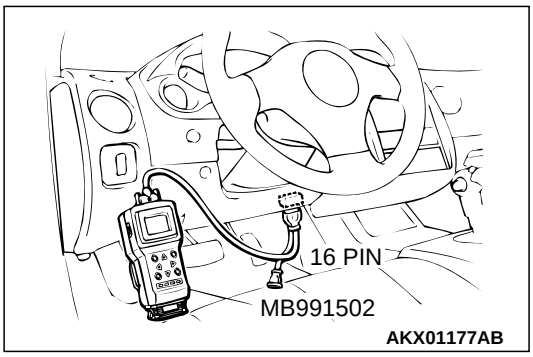
- Idle air control motor failed.
- Open or shorted idle air control motor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools

- MB991502: Scan Tool (MUT-II)
- MB991709: Test Harness

TSB Revision



STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502, read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the diagnostic trouble code other than P0506 output?

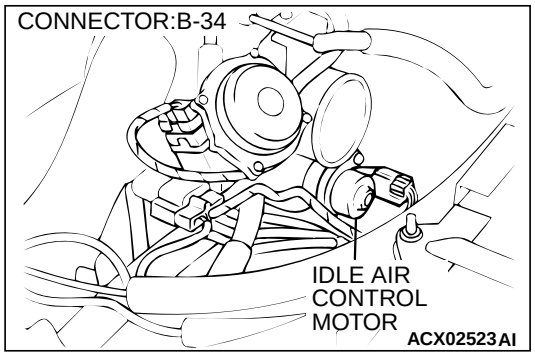
YES : Refer to Diagnostic Trouble Code Chart P.13B-22.
NO : Go to Step 2.

STEP 2. Check the throttle body (throttle valve area).

Q: Is the throttle valve area dirty?

YES : Perform cleaning. Refer to Throttle body (throttle valve area) cleaning P.13B-677. Then go to Step 14.
NO : Go to Step 3.

STEP 3. Check connector B-34 at idle air control motor for damage.

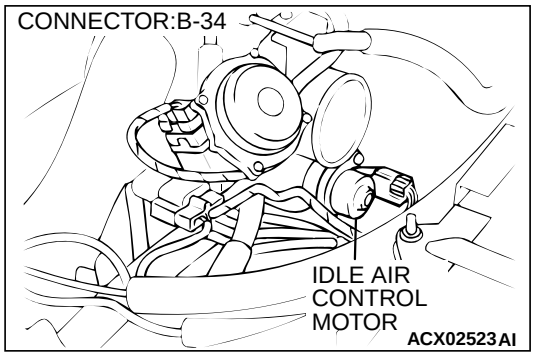


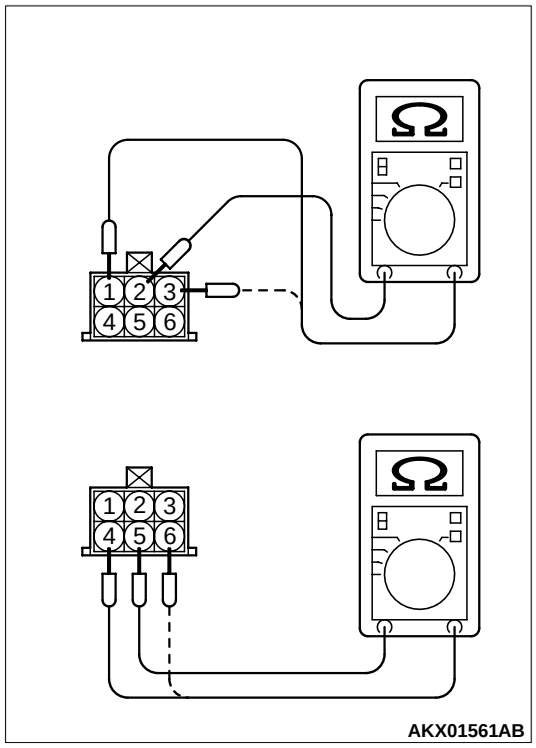
Q: Is the connector in good condition?

YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

STEP 4. Check the idle air control motor coil resistance.

(1) Disconnect the idle air control motor connector B-34.





(2) Measure the resistance between idle air control motor connector terminal 2 and either terminal 1 or terminal 3.

Standard value: 28 – 33 ohm [at 20°C (68°F)]

(3) Measure the resistance between idle air control motor connector terminal 5 and either terminal 4 or terminal 6.

Standard value: 28 – 33 ohm [at 20°C (68°F)]

Q: Is the resistance normal?

YES : Go to Step 5.

NO : Replace the idle air control motor. Then go to Step 14.

STEP 5. Check the power supply voltage at idle air control motor harness side connector B-34.

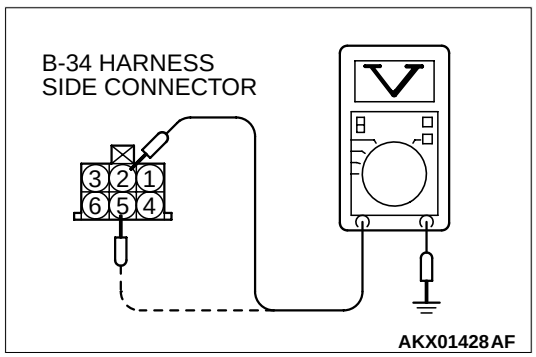
(1) Disconnect the connector B-34 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between terminal 2, 5 and ground.

- Voltage should be battery positive voltage.

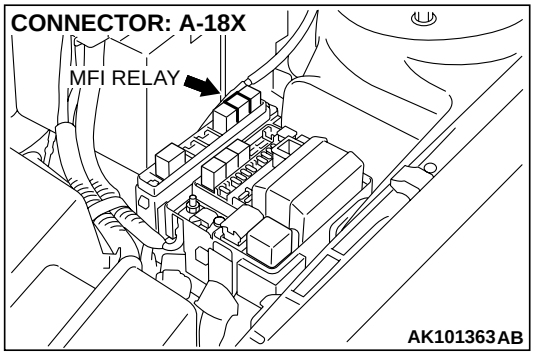
(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the voltage normal?

YES : Go to Step 7.

NO : Go to Step 6.

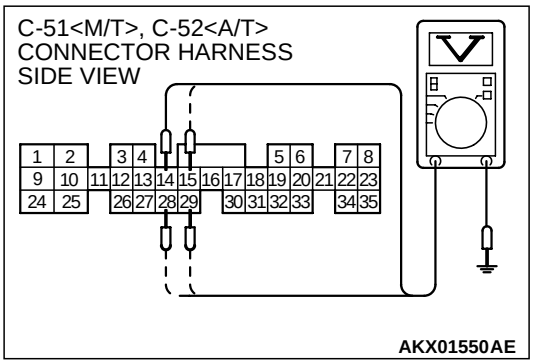


STEP 6. Check connector A-18X at MFI relay for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between MFI relay connector A-18X terminal 4 and idle air control motor connector B-34 terminal 2, 5 because of open circuit or short circuit to ground. Then go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP 7. Check the power supply voltage at ECM connector C-51 <M/T> or PCM connector C-52 <A/T> by backprobing.

(1) Do not disconnect the connector C-51 <M/T> or C-52 <A/T>.

(2) Measure the voltage between terminal 14, 15, 28, 29 and ground by backprobing.

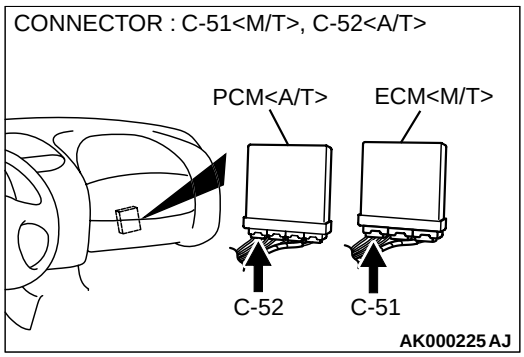
- The voltage is 1V or lower for approximately 3 seconds, then changes to the battery positive voltage when the Ignition switch is turned from the "LOCK" (OFF) position to the "ON" position.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 10.

NO : Go to Step 8.

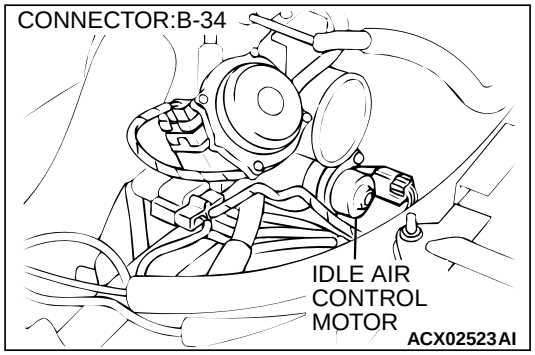


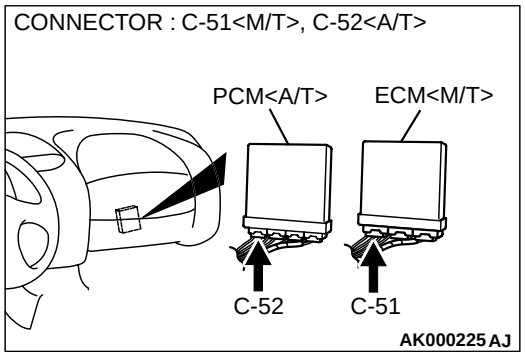
STEP 8. Check connector C-51 at ECM <M/T> or connector C-52 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



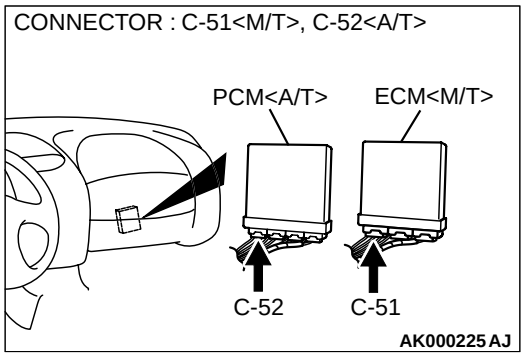


STEP 9. Check for open circuit and short circuit to ground between idle air control motor connector B-34 and ECM connector C-51 <M/T> or PCM connector C-52 <A/T>.

a. Idle air control motor connector B-34 terminal 1 and ECM connector C-51 terminal 14 <M/T> or PCM connector C-52 terminal 14 <A/T>.
b. Idle air control motor connector B-34 terminal 3 and ECM connector C-51 terminal 28 <M/T> or PCM connector C-52 terminal 28 <A/T>.
c. Idle air control motor connector B-34 terminal 4 and ECM connector C-51 terminal 15 <M/T> or PCM connector C-52 terminal 15 <A/T>.
d. Idle air control motor connector B-34 terminal 6 and ECM connector C-51 terminal 29 <M/T> or PCM connector C-52 terminal 29 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 14.
NO : Repair it. Then go to Step 14.

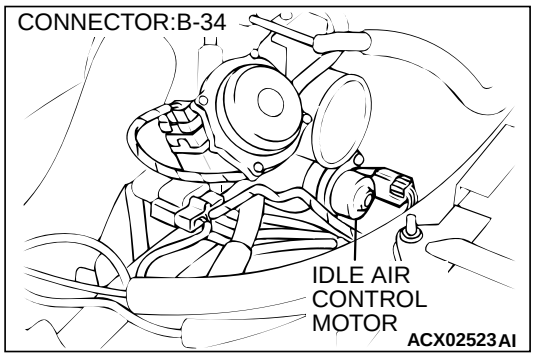


STEP 10. Check connector C-51 at ECM <M/T> or connector C-52 at PCM <A/T> for damage.

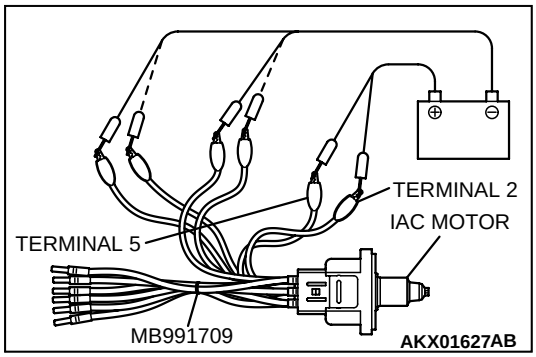
Q: Is the connector in good condition?

YES : Go to Step 11.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

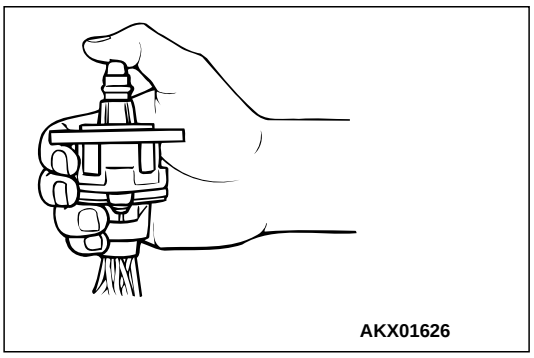
STEP 11. Check the idle air control motor operation using special tool MB991709.



(1) Remove the idle air control motor.



(2) Connect special tool MB991709 to the idle air control motor. (All terminals should be connected.)
(3) Use the jumper wires to connect terminal 2 of the idle air control motor connector to the battery (+) terminal.



(4) Check the ensure that the motor operates when the terminals 1 and 3 of the idle air control motor connector are respectively connected to the battery (–) terminal using a jumper wire.
- Vibration should be present at each application of voltage to test clip combination.

(5) Then. Use jumper wires to connect the terminal 5 of the idle air control motor connector to the battery (+) terminal.
(6) Check the ensure that the motor operates when the terminals 4 and 6 of the idle air control motor connector are respectively connected to the battery (–) terminal using a jumper wire.
- Vibration should be present at each application of voltage to test clip combination.

(7) Install the idle air control motor. Refer to Throttle Body – Disassembly and Assembly P.13B-690.

Q: Is the idle air control motor operating properly?

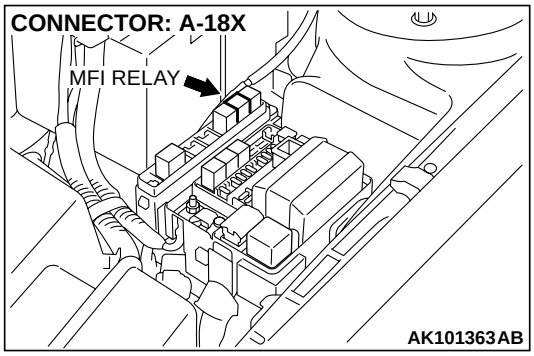
YES : Go to Step 12.
NO : Replace the idle air control motor. Then go to Step 14.

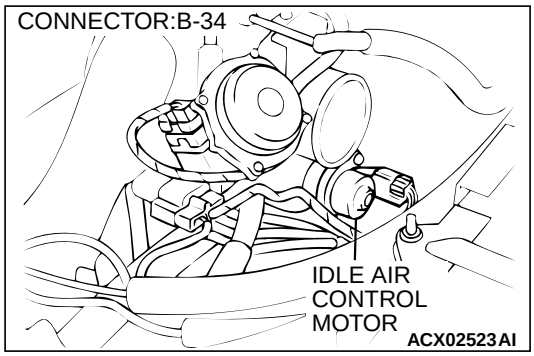
STEP 12. Check for harness damage between MFI relay connector A-18X terminal 4 and idle air control motor connector B-34 terminal 2, 5.

Q: Is the harness wire in good condition?

YES : Go to Step 13.

NO : Repair it. Then go to Step 14.





STEP 13. Check for harness damage between idle air control motor connector B-34 and ECM connector C-51 <M/T> or PCM connector C-52 <A/T>.

a. Idle air control motor connector B-34 terminal 1 and ECM connector C-51 terminal 14 <M/T> or PCM connector C-52 terminal 14 <A/T>.

b. Idle air control motor connector B-34 terminal 3 and ECM connector C-51 terminal 28 <M/T> or PCM connector C-52 terminal 28 <A/T>.

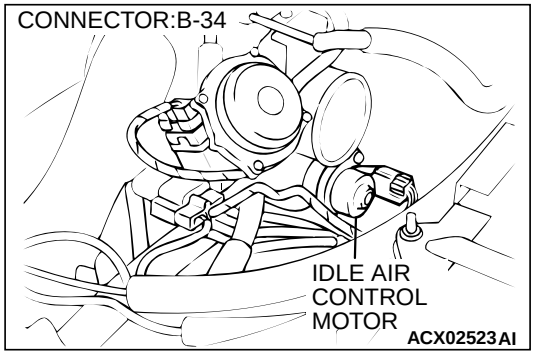
c. Idle air control motor connector B-34 terminal 4 and ECM connector C-51 terminal 15 <M/T> or PCM connector C-52 terminal 15 <A/T>.

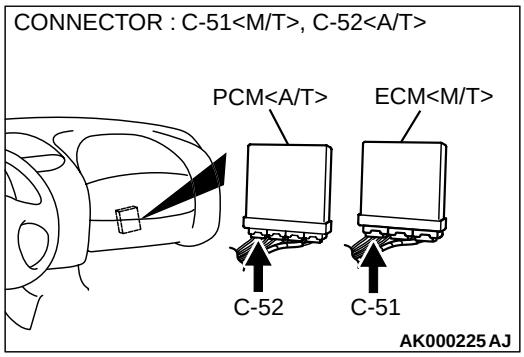
d. Idle air control motor connector B-34 terminal 6 and ECM connector C-51 terminal 29 <M/T> or PCM connector C-52 terminal 29 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 14.

NO : Repair it. Then go to Step 14.





STEP 14. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 6 – Other Monitor P.13B-6.

(2) Check the diagnostic trouble code (DTC).

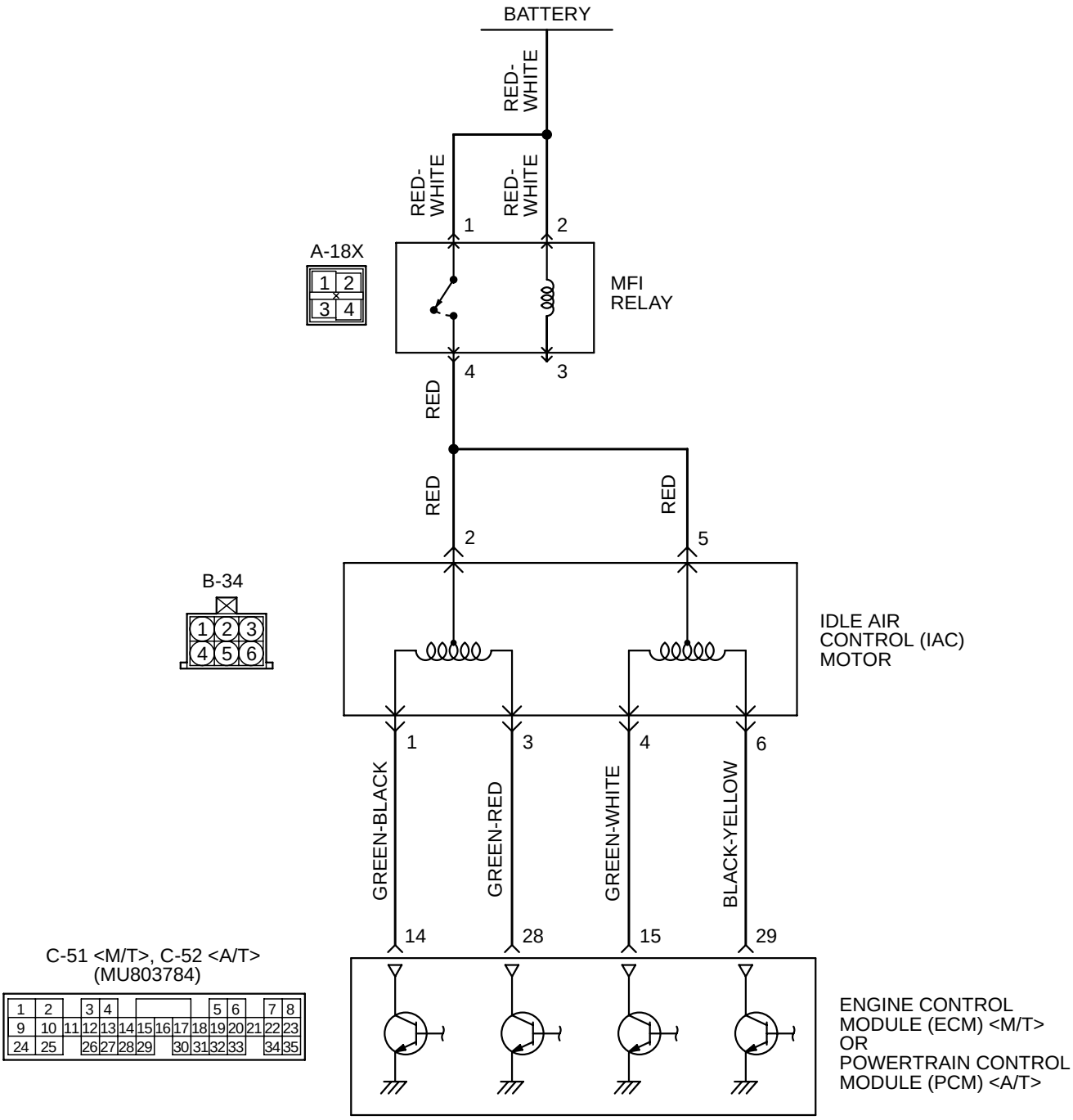
Q: Is the DTC P0506 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0507: Idle Control System RPM Higher Than Expected

Idle Air Control (IAC) Motor Circuit



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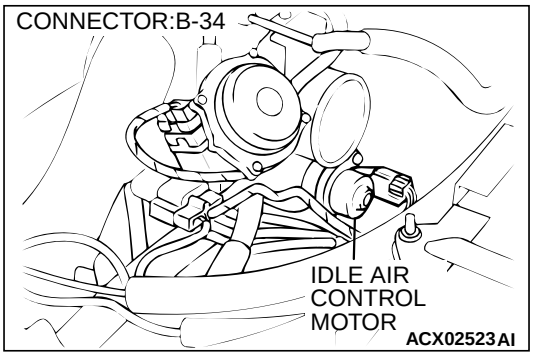
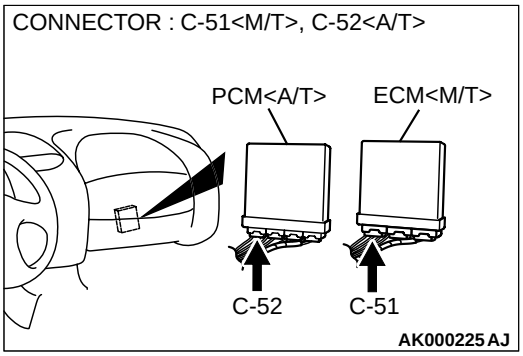
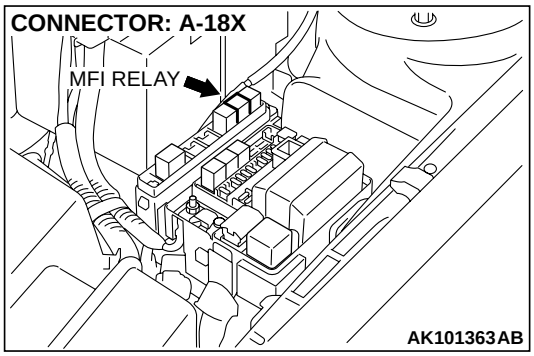
TSB Revision







CIRCUIT OPERATION

- The idle air control motor power is supplied from the MFI relay (terminal 4).
- The ECM (terminals 14, 15, 28, 29) <M/T> or PCM (terminals 14, 15, 28, 29) <A/T> drives the stepper motor by sequentially turning "ON" the power transistors in the ECM <M/T> or PCM <A/T> and providing ground to the idle air control motor (terminals 1, 3, 4, 6).

TECHNICAL DESCRIPTION

- The amount of air taken in during idling is regulated by the opening and closing of the servo valve located in the air passage that bypasses the throttle body.
- If there is a malfunction of the IAC system, the actual engine speed will not be identical to the target engine speed.
- The ECM <M/T> or PCM <A/T> checks the difference between the actual engine speed and the target engine speed.

DTC SET CONDITIONS

Check Conditions

- Vehicle speed has reached 1.5 km/h (0.93 mph) or more at least once.
- Under the closed loop idle speed control.
- Engine coolant temperature is higher than 77°C (171°F).
- Battery positive voltage is higher than 10 volts.
- Barometric pressure is higher than 76 kPa (11 psi).
- Intake air temperature is higher than −10°C (14°F).
- 60 seconds have elapsed from the start of the previous monitoring.
- Target idle air control motor position is 0 steps.

Judgment Criteria

- Actual idle speed has continued to be higher than the target idle speed by 200 r/min (300 r/min*) or more for 12 seconds.
  *: Specs in parentheses are applicable if the maximum air temperature during the previous operation was more than 45°C (113°F).

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

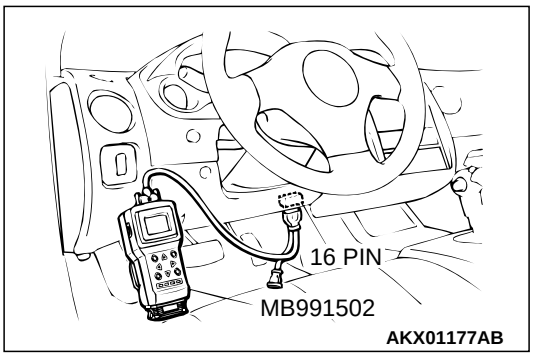
- Idle air control motor failed.
- Open or shorted idle air control motor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools

- MB991502: Scan Tool (MUT-II)
- MB991709: Test Harness

TSB Revision



STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502, read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the diagnostic trouble code other than P0507 output?

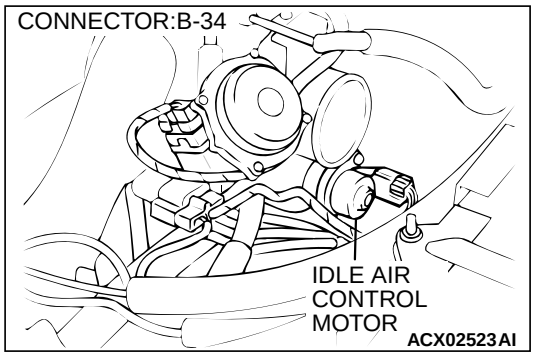
YES : Refer to Diagnostic Trouble Code Chart P.13B-22.
NO : Go to Step 2.

STEP 2. Check the intake system vacuum leak.

Q: Are there any abnormalities?

YES : Go to Step 3.
NO : Repair or replace it. Then go to Step 14.

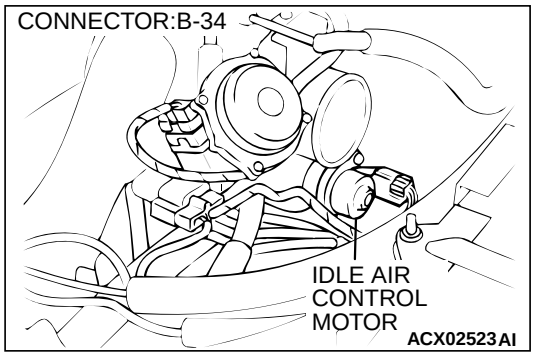
STEP 3. Check connector B-34 at idle air control motor for damage.



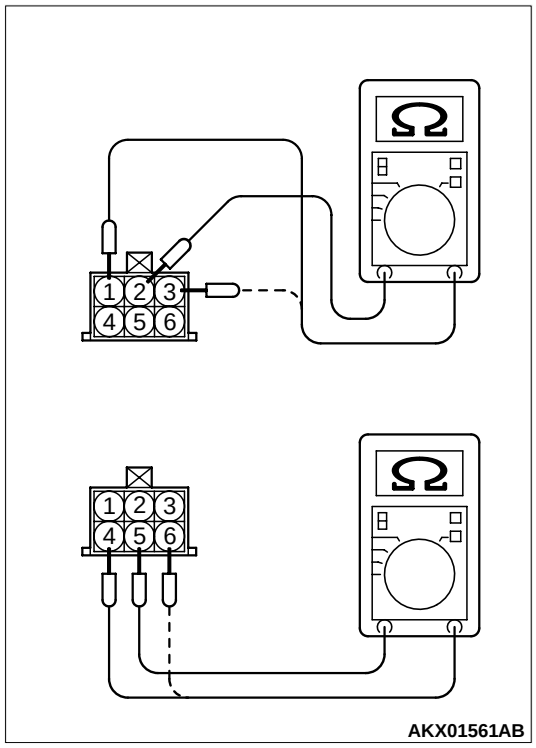
Q: Is the connector in good condition?

YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

STEP 4. Check the idle air control motor coil resistance.



(1) Disconnect the idle air control motor connector B-34.



(2) Measure the resistance between idle air control motor connector terminal 2 and either terminal 1 or terminal 3.

Standard value: 28 – 33 ohm [at 20°C (68°F)]

(3) Measure the resistance between idle air control motor connector terminal 5 and either terminal 4 or terminal 6.

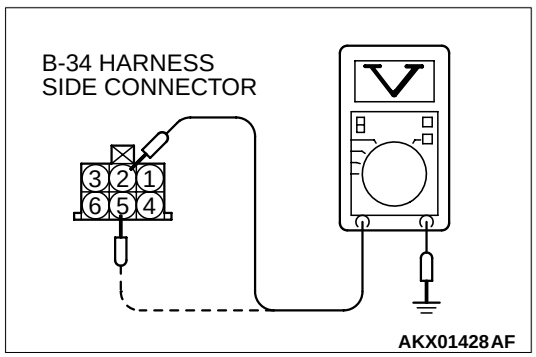
Standard value: 28 – 33 ohm [at 20° C (68° F)]

Q: Is the resistance normal?

YES : Go to Step 5.

NO : Replace the idle air control motor. Then go to Step 14.

STEP 5. Check the power supply voltage at idle air control motor harness side connector B-34.



(1) Disconnect the connector B-34 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between terminal 2, 5 and ground.

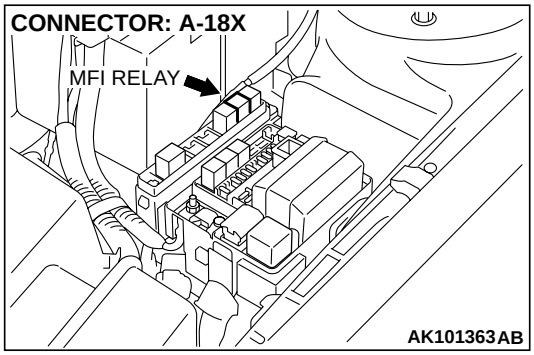
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 7.

NO : Go to Step 6.

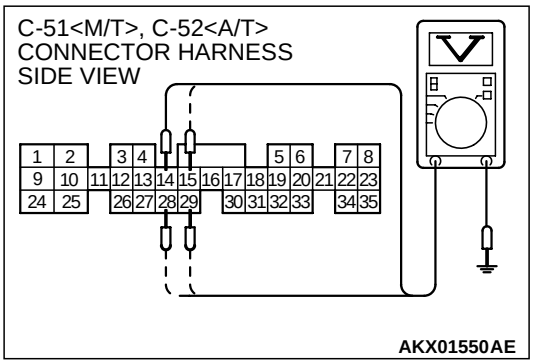


STEP 6. Check connector A-18X at MFI relay for damage.

Q: Is the connector in good condition?

YES : Repair harness wire between MFI relay connector A-18X terminal 4 and idle air control motor connector B-34 terminal 2, 5 because of open circuit or short circuit to ground. Then go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP 7. Check the power supply voltage at ECM connector C-51 <M/T> or PCM connector C-52 <A/T> by backprobing.

(1) Do not disconnect the connector C-51 <M/T> or C-52 <A/T>.

(2) Measure the voltage between terminal 14, 15, 28, 29 and ground by backprobing.

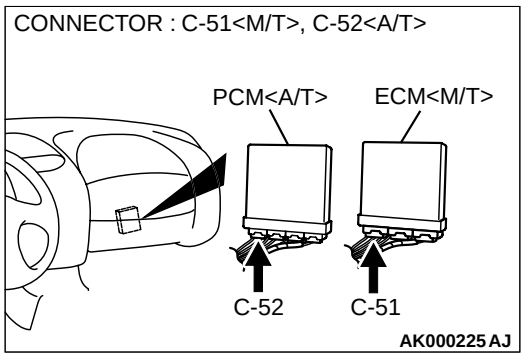
- The voltage is 1V or lower for approximately 3 seconds, then changes to the battery positive voltage when the Ignition switch is turned from the "LOCK" (OFF) position to the "ON" position.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 10.

NO : Go to Step 8.

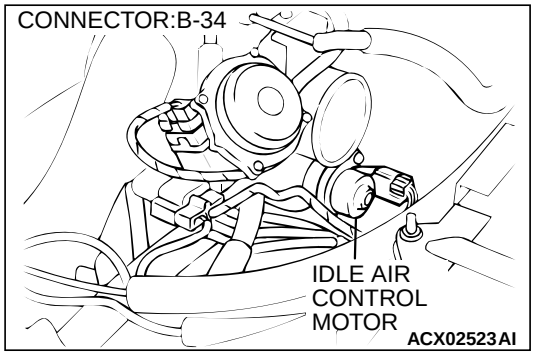


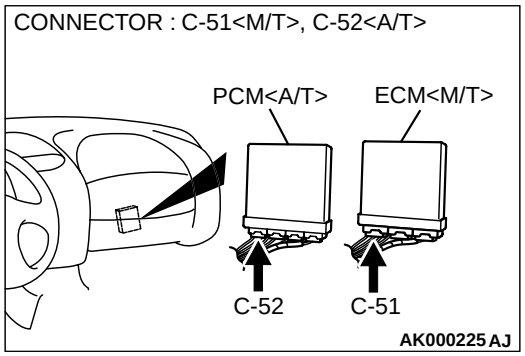
STEP 8. Check connector C-51 at ECM <M/T> or connector C-52 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



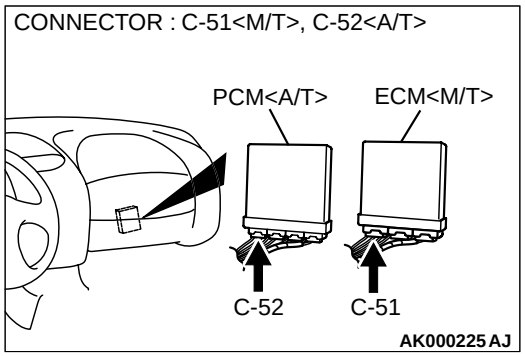


STEP 9. Check for open circuit and short circuit to ground between idle air control motor connector B-34 and ECM connector C-51 <M/T> or PCM connector C-52 <A/T>.

a. Idle air control motor connector B-34 terminal 1 and ECM connector C-51 terminal 14 <M/T> or PCM connector C-52 terminal 14 <A/T>.
b. Idle air control motor connector B-34 terminal 3 and ECM connector C-51 terminal 28 <M/T> or PCM connector C-52 terminal 28 <A/T>.
c. Idle air control motor connector B-34 terminal 4 and ECM connector C-51 terminal 15 <M/T> or PCM connector C-52 terminal 15 <A/T>.
d. Idle air control motor connector B-34 terminal 6 and ECM connector C-51 terminal 29 <M/T> or PCM connector C-52 terminal 29 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 14.
NO : Repair it. Then go to Step 14.

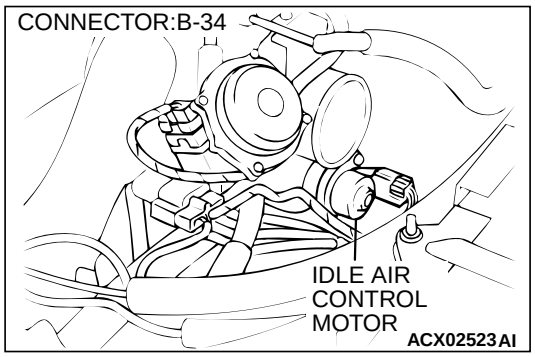


STEP 10. Check connector C-51 at ECM <M/T> or connector C-52 at PCM <A/T> for damage.

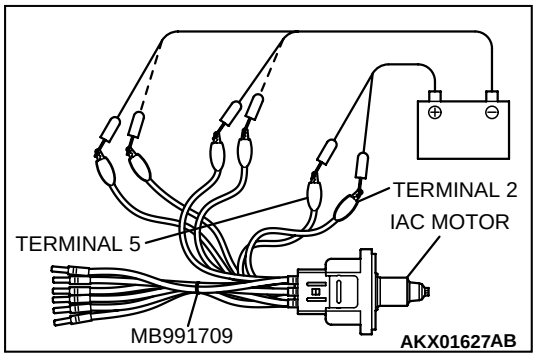
Q: Is the connector in good condition?

YES : Go to Step 11.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

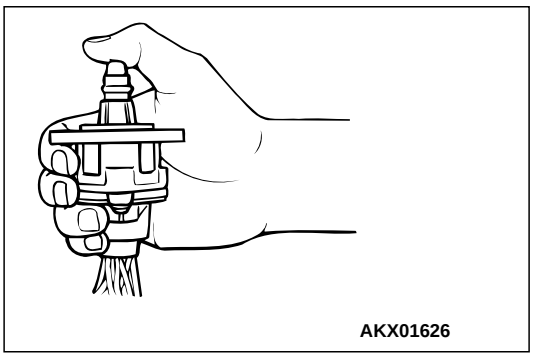
STEP 11. Check the idle air control motor operation using special tool MB991709.



(1) Remove the idle air control motor.



(2) Connect special tool MB991709 to the idle air control motor. (All terminals should be connected.)
(3) Use the jumper wires to connect terminal 2 of the idle air control motor connector to the battery (+) terminal.



(4) Check the ensure that the motor operates when the terminals 1 and 3 of the idle air control motor connector are respectively connected to the battery (–) terminal using a jumper wire.
  - Vibration should be present at each application of voltage to test clip combination.

(5) Then. Use jumper wires to connect the terminal 5 of the idle air control motor connector to the battery (+) terminal.
(6) Check the ensure that the motor operates when the terminals 4 and 6 of the idle air control motor connector are respectively connected to the battery (–) terminal using a jumper wire.
  - Vibration should be present at each application of voltage to test clip combination.

(7) Install the idle air control motor. Refer to Throttle Body – Disassembly and Assembly P.13B-690.

Q: Is the idle air control motor operating properly?

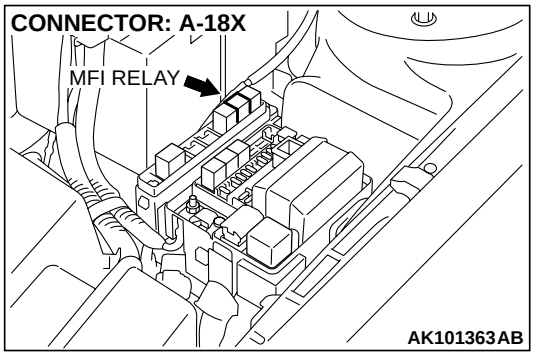
YES : Go to Step 12.
NO : Replace the idle air control motor. Then go to Step 14.

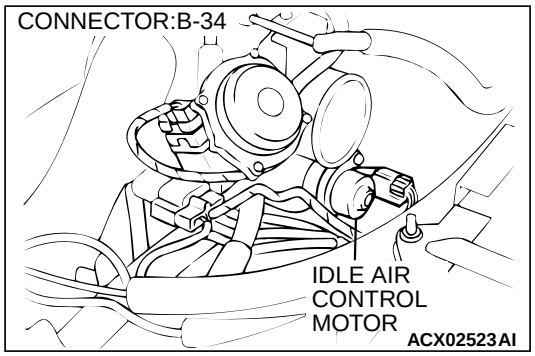
STEP 12. Check for harness damage between MFI relay connector A-18X terminal 4 and idle air control motor connector B-34 terminal 2, 5.

Q: Is the harness wire in good condition?

YES : Go to Step 13.

NO : Repair it. Then go to Step 14.





STEP 13. Check for harness damage between idle air control motor connector B-34 and ECM connector C-51 <M/T> or PCM connector C-52 <A/T>.

a. Idle air control motor connector B-34 terminal 1 and ECM connector C-51 terminal 14 <M/T> or PCM connector C-52 terminal 14 <A/T>.

b. Idle air control motor connector B-34 terminal 3 and ECM connector C-51 terminal 28 <M/T> or PCM connector C-52 terminal 28 <A/T>.

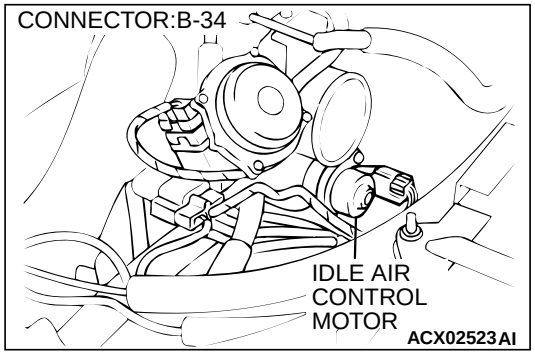
c. Idle air control motor connector B-34 terminal 4 and ECM connector C-51 terminal 15 <M/T> or PCM connector C-52 terminal 15 <A/T>.

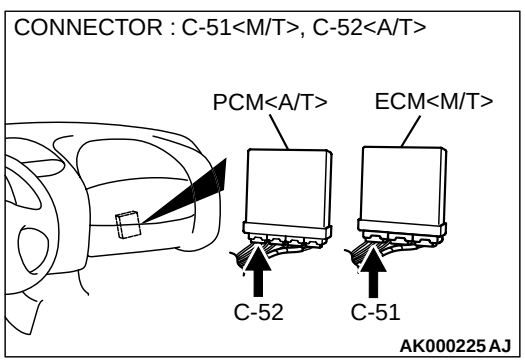
d. Idle air control motor connector B-34 terminal 6 and ECM connector C-51 terminal 29 <M/T> or PCM connector C-52 terminal 29 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 14.

NO : Repair it. Then go to Step 14.





STEP 14. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 6 – Other Monitor P.13B-6.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0507 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0513: Immobilizer Malfunction

TECHNICAL DESCRIPTION

- ECM <M/T> or PCM <A/T> monitors the communication condition with the immobilizer-ECU and the message from the immobilizer-ECU, and when the abnormality is found, ECM <M/T> or PCM <A/T> makes the engine not to start.

DTC SET CONDITIONS

Check Conditions

- Ignition switch: ON

Judgment Criteria

- When the communication error between ECM <M/T> or PCM <A/T> and the immobilizer-ECU continues for 2 seconds or more.

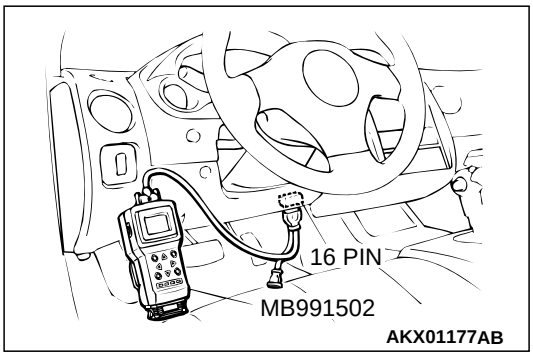
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Malfunction of harness or connector.
- Malfunction of immobilizer-ECU.
- Malfunction of ECM <M/T> or PCM <A/T>.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, read the immobilizer diagnostic trouble code (DTC).

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

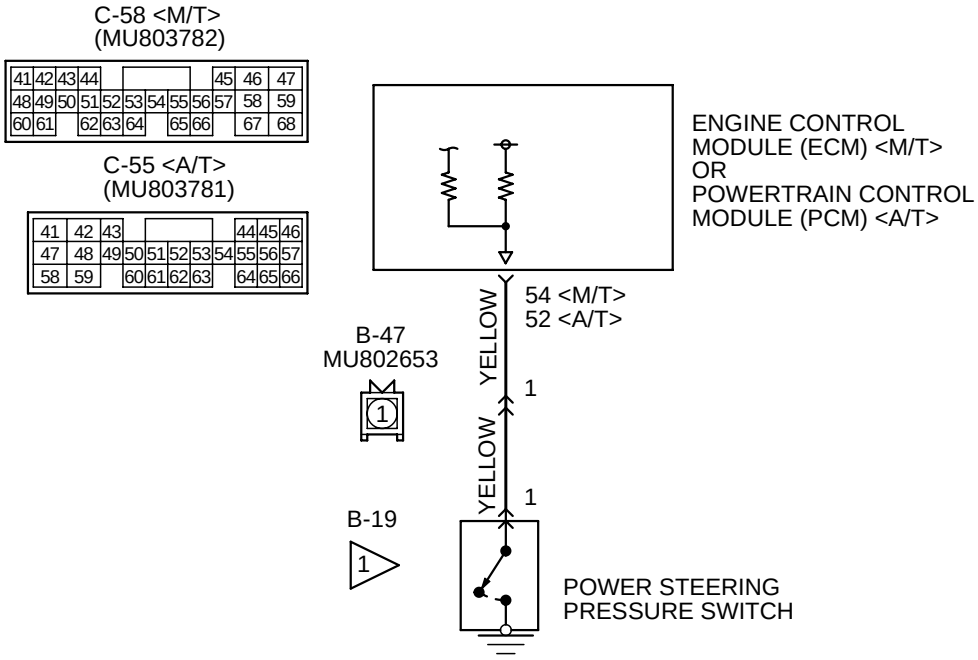
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the immobilizer system-DTC
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the immobilizer system-DTC is output?

YES : Refer to GROUP 54A, Ignition Switch and Immobilizer System – Diagnostic Trouble Code Chart P.54A-11.
NO : If DTC P0513 is output again after the MFI-DTC has been erased, replace the ECM <M/T> or PCM <A/T>. Then check that the DTC P0513 does not reset.

DTC P0551: Power Steering Pressure Sensor Circuit Range/Performance

Power Steering Pressure Switch Circuit



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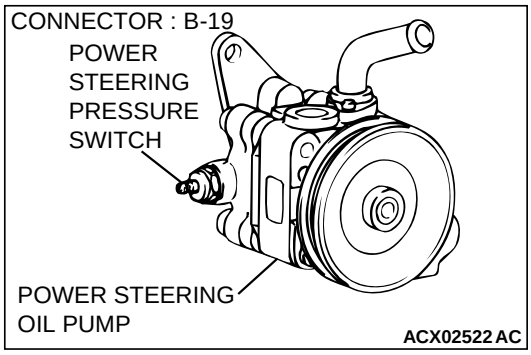

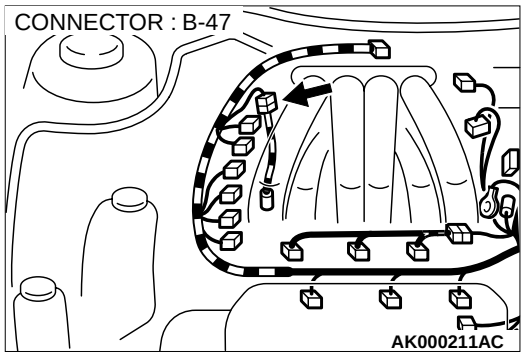

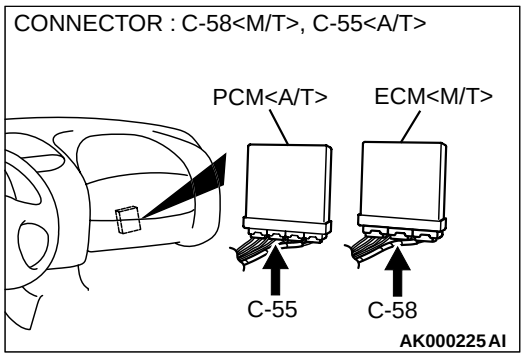

CIRCUIT OPERATION

- A battery positive voltage is applied to the power steering pressure switch output terminal (terminal 1) from the ECM (terminal 54) or PCM (terminal 52) <A/T> via the resistor in the ECM <M/T> or PCM <A/T>.

TECHNICAL DESCRIPTION

- The power steering pressure switch converts the existence of a power steering load into a high/low voltage, and inputs it into the ECM <M/T> or PCM <A/T>.

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- When the steering wheel is turned, hydraulic pressure rises. The power steering pressure switch closes, and the applied battery positive voltage will be grounded. With this, the power steering pressure switch output voltage will fluctuate between 12 volts and 0 volt.
- While driving with the steering wheel held straight, the power steering pressure switch turns "OFF".
- The ECM <M/T> or PCM <A/T> checks whether the power steering pressure switch turns "OFF" or "ON" during driving.

DTC SET CONDITIONS

Check Conditions

- Engine coolant temperature is higher than 30°C (86°F).
- Drive for 4 seconds or more with the vehicle speed is 50 km/h (31 mph) or more. Stop the vehicle [vehicle speed is 1.5 km/h (0.93 mph) or less]. Repeat 10 times or more.

Judgment Criteria

- Power steering pressure switch continues to be "ON".

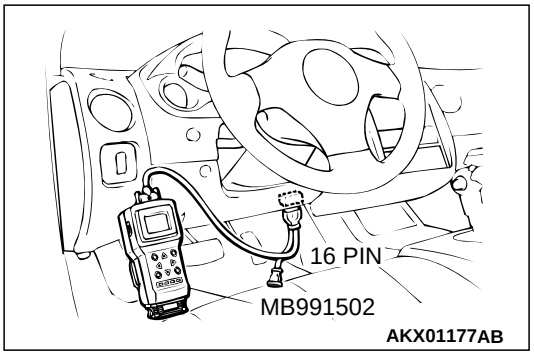
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Power steering pressure switch failed.
- Open or shorted power steering pressure switch circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools

- MB991502: Scan Tool (MUT-II)



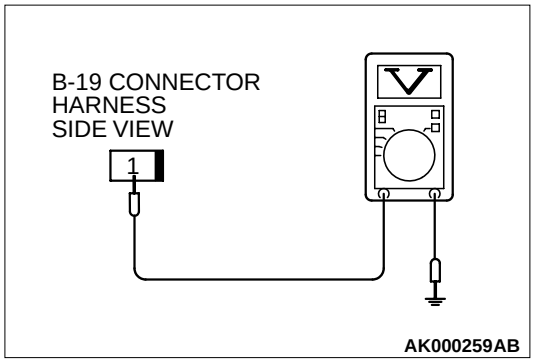
STEP 1. Using scan tool MB991502, check data list item 27: Power Steering Pressure Switch.

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 27, Power Steering Pressure Switch.
  - If the steering wheel is stopped while idling, "OFF" will be displayed.
  - If the steering wheel is steered while idling, "ON" will be displayed.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Go to Step 2.



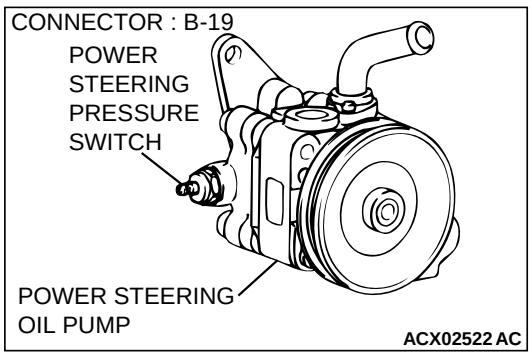
STEP 2. Check the power supply voltage at power steering pressure switch connector B-19 by backprobing.

(1) Do not disconnect the connector B-19.
(2) Start the engine and run at idle.
(3) Measure the voltage between terminal 1 and ground by backprobing.
- When steering wheel is stationary, voltage should be battery positive voltage.
- When steering wheel is turned, voltage should be 1 volt or less.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

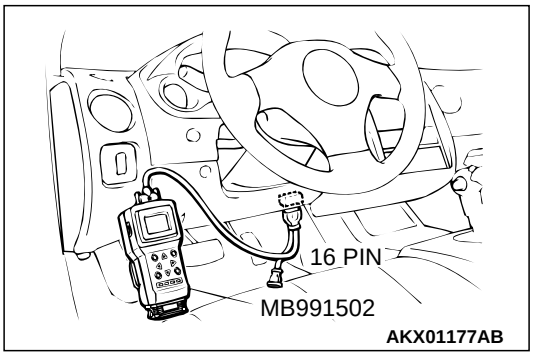
YES : Go to Step 3.
NO : Go to Step 5.



STEP 3. Check connector B-19 at power steering pressure switch for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP 4. Using scan tool MB991502, check data list item 27: Power Steering Pressure Switch.

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 27, Power Steering Pressure Switch.
- If the steering wheel is stopped while idling, "OFF" will be displayed.
- If the steering wheel is steered while idling, "ON" will be displayed.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Replace the ECM or PCM. Then go to Step 14.

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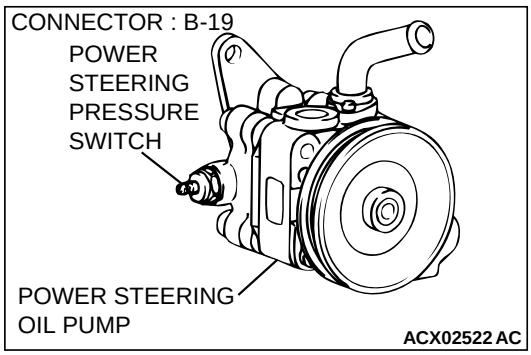
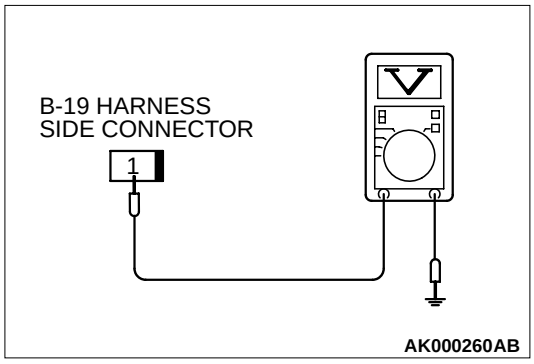


STEP 5. Check connector B-19 at power steering pressure switch for damage.

Q: Is the connector in good condition?

YES : Go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP 6. Check the power supply voltage at power steering pressure switch harness side connector B-19.

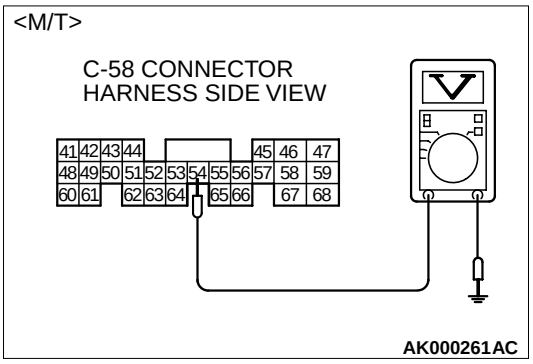
(1) Disconnect the connector B-19 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 1 and ground.
- Voltage should be battery positive voltage.

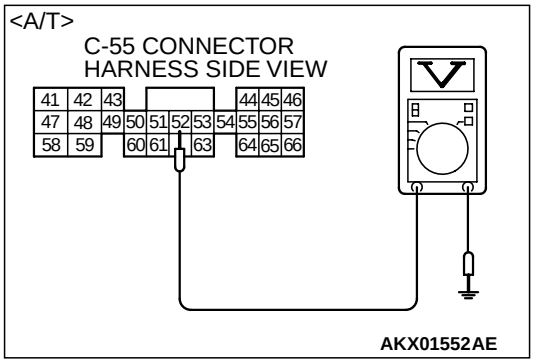
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 11.

NO : Go to Step 7.





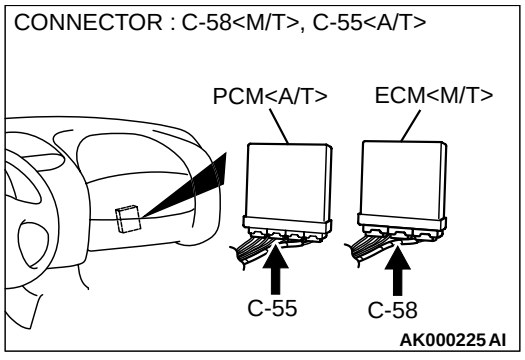
STEP 7. Check the power supply voltage at ECM connector C-58 <M/T> or PCM connector C-55 <A/T> by backprobing.

(1) Do not disconnect the ECM connector C-58 <M/T> or PCM connector C-55 <A/T>.
(2) Disconnect the power steering pressure switch connector B-19.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the voltage between terminal 54 <M/T> or 52 <A/T> and ground by backprobing.
- Voltage should be between battery positive voltage.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

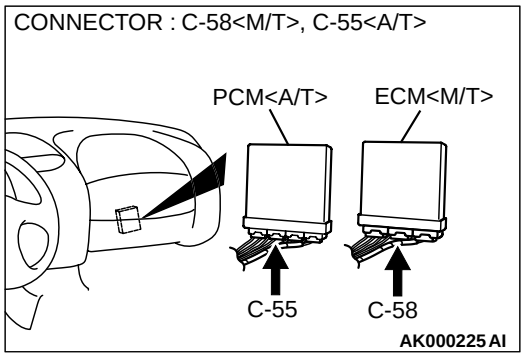
YES : Go to Step 8.
NO : Go to Step 9.



STEP 8. Check connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Check connector B-47 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between power steering pressure switch connector B-19 terminal 1 and ECM connector C-58 terminal 54 <M/T> or PCM connector C-55 terminal 52 <A/T> because of open circuit. Then go to Step 14.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

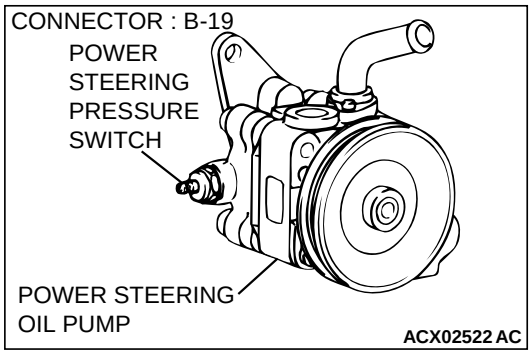


STEP 9. Check connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



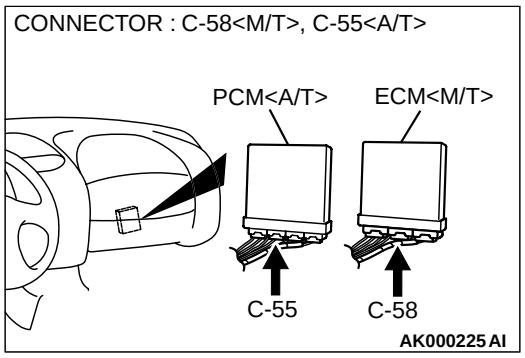
STEP 10. Check for short circuit to ground between power steering pressure switch connector B-19 terminal 1 and ECM connector C-58 terminal 54 <M/T> or PCM connector C-55 terminal 52 <A/T>.

NOTE: Check harness after checking intermediate connector B-47. If intermediate connector is damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 14.

NO : Repair it. Then go to Step 14.



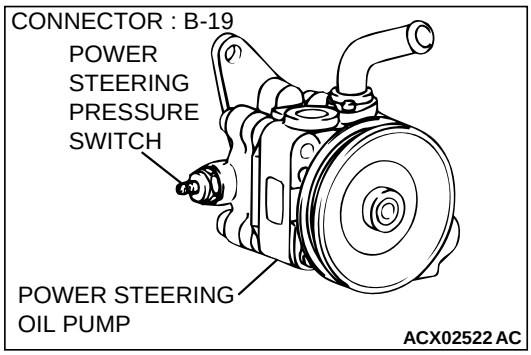
STEP 11. Replace the power steering pressure switch.

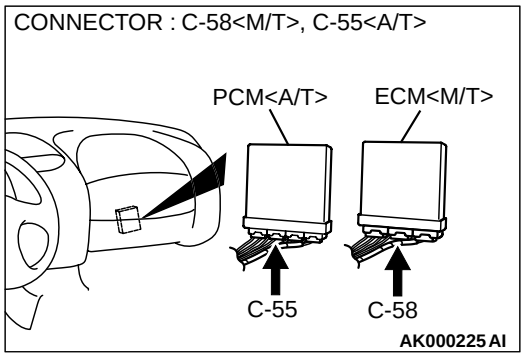
(1) Replace the power steering pressure switch.
(2) Check the trouble symptoms.
(3) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0551 is output?

YES : Go to Step 12.

NO : Go to Step 14.



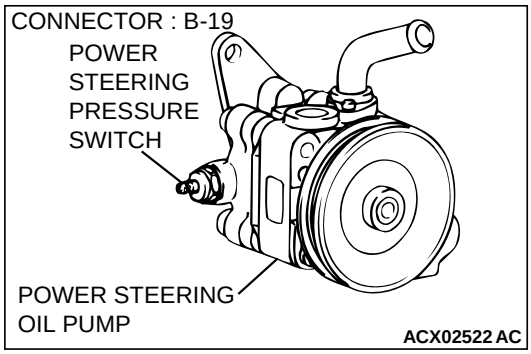


STEP 12. Check connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 13.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



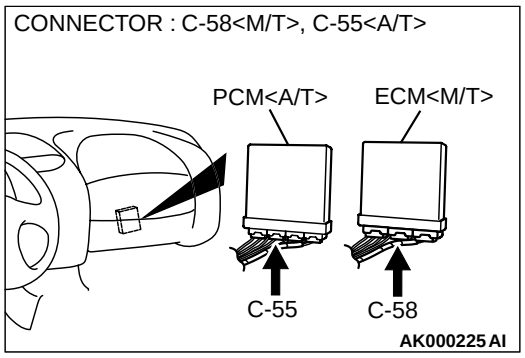
STEP 13. Check for harness damage between power steering pressure switch connector B-19 terminal 1 and ECM connector C-58 terminal 54 <M/T> or PCM connector C-55 terminal 52 <A/T>.

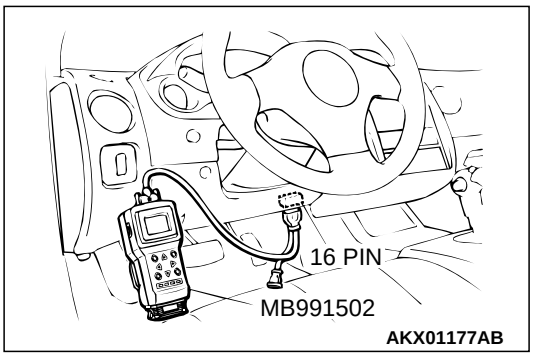
NOTE: Check harness after checking intermediate connector B-47. If intermediate connector is damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 14.

NO : Repair it. Then go to Step 14.





STEP 14. Using scan tool MB991502, check data list item 27: Power Steering Pressure Switch.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 27, Power Steering Pressure Switch.
- If the steering wheel is stopped while idling, "OFF" will be displayed.
- If the steering wheel is steered while idling, "ON" will be displayed.

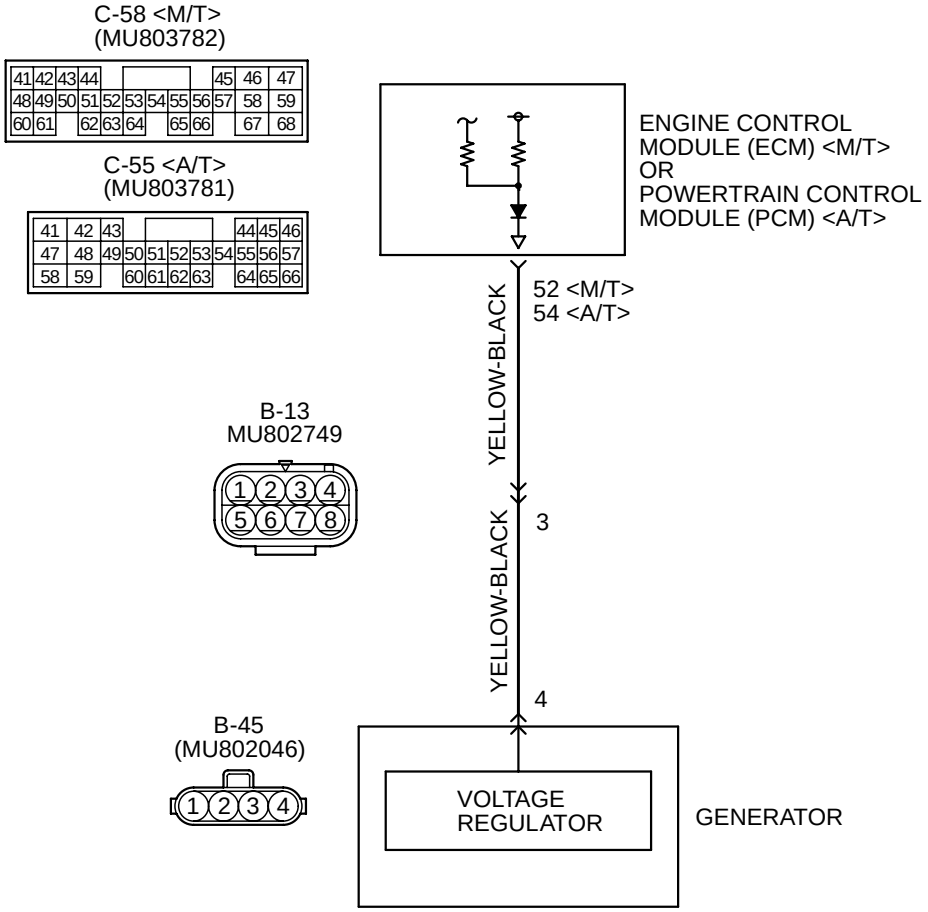
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the switch operating properly?

YES : The inspection is complete.
NO : Retry the troubleshooting.

DTC P0622: Generator FR Terminal Circuit Malfunction

Generator Circuit



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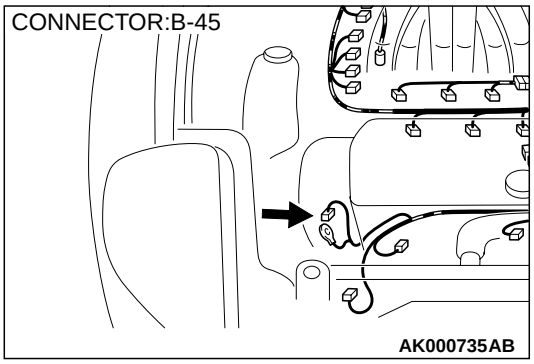
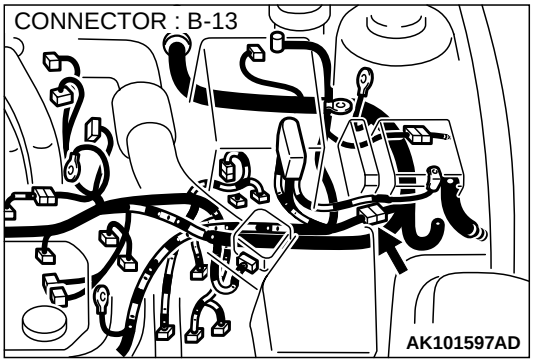
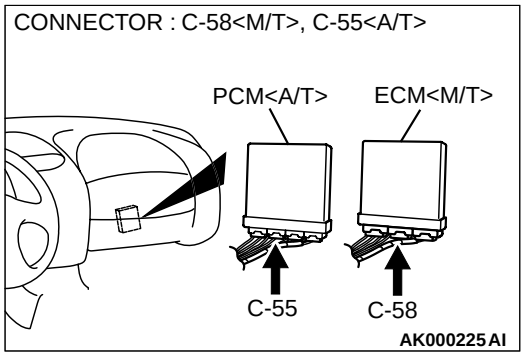




TSB Revision



CIRCUIT OPERATION

- The ECM (terminal 52) <M/T> or PCM (terminal 54) <A/T> apply a battery positive voltage into the generator FR terminal 4 via resistance inside the unit.

TECHNICAL DESCRIPTION

- When the generator field coils are controlled, the generator FR terminal inputs signal to the ECM <M/T> or PCM <A/T>.
- The ECM <M/T> or PCM <A/T> detects the generator output with the input signal, and controls the idle air control motor according to the generator output.

DTC SET CONDITIONS

Check Conditions

- Engine speed is higher than 50 r/min.

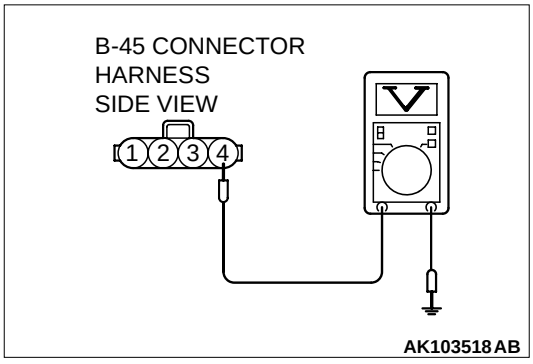
Judgement Criteria

- Input voltage from the generator FR terminal has continued to be approximately battery positive voltage for 20 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set area:)

- Open circuit in generator FR terminal circuit.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS



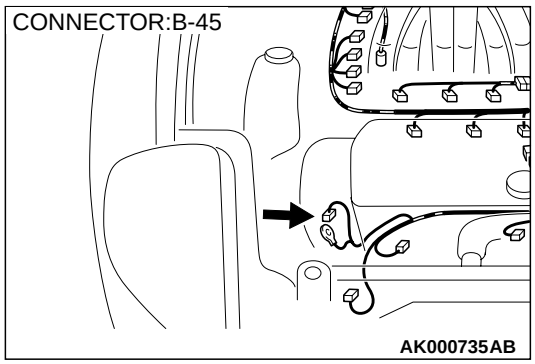
STEP 1. Check the voltage at generator connector B-45 by backprobing.

(1) Do not disconnect the connector B-45.
(2) Start the engine and run at idle.
(3) Measure the voltage between terminal 4 and ground by backprobing.
  a. Engine: warming up
  b. Radiator fan: stopped
  c. Headlight switch: OFF to ON
  d. Rear defogger switch: OFF to ON
  e. Stoplight switch: OFF to ON
  - Voltage should be drops.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 2.
NO : Go to Step 4.

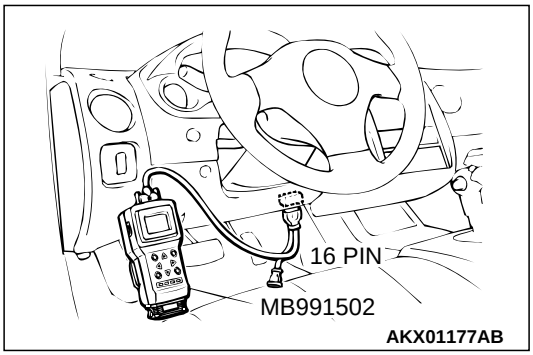


STEP 2. Check connector B-45 at generator connector for damage.

Q: Is the connector in good condition?

YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.



STEP 3. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION

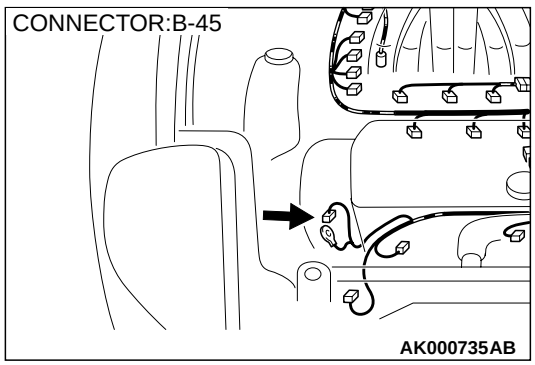
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC P0622 is output?

YES : Replace the ECM or PCM. Then go to Step 10.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

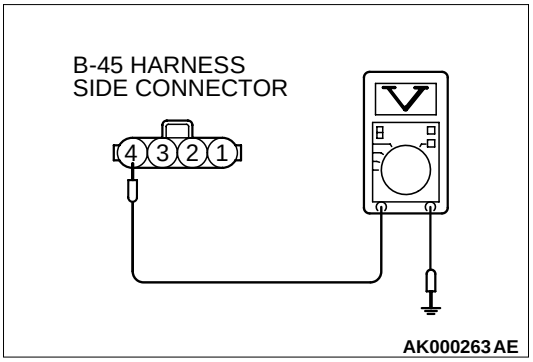


STEP 4. Check connector B-45 at generator intermediate connector for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.



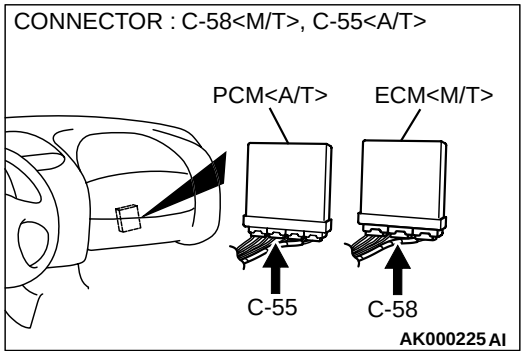
STEP 5. Check the voltage at generator harness side connector B-45.

(1) Disconnect the connector B-45 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 4 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 8.
NO : Go to Step 6.



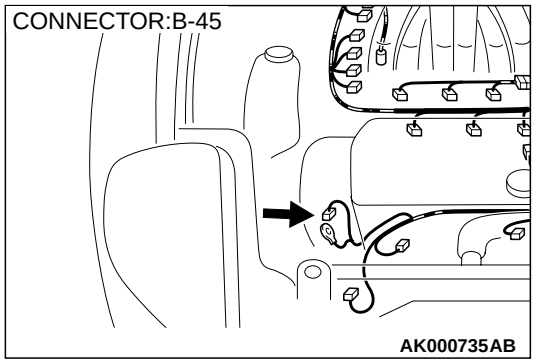
STEP 6. Check connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

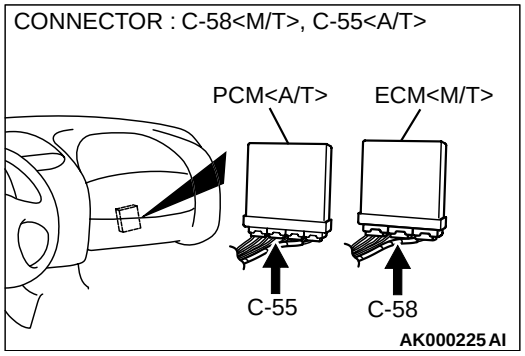
Q: Is the connector in good condition?

YES : Go to Step 7.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

STEP 7. Check for open circuit and short circuit to ground between generator connector B-45 terminal 4 and ECM connector C-58 terminal 52 <M/T> or PCM connector C-55 terminal 54 <A/T>.

NOTE: Check harness after checking intermediate connector B-13. If intermediate connector is damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.



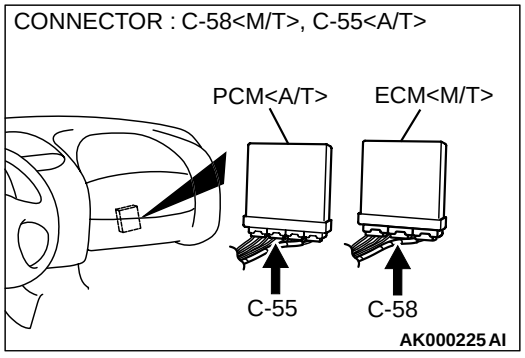


Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 10.

NO : Repair it. Then go to Step 10.

STEP 8. Check connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.



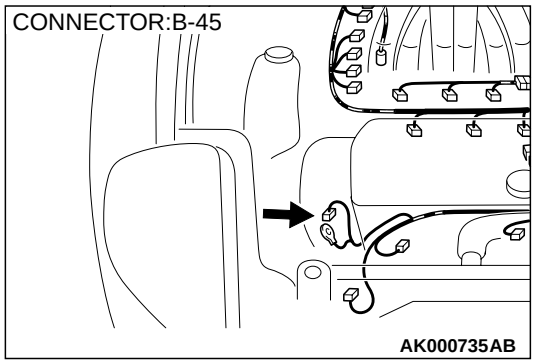
Q: Is the connector in good condition?

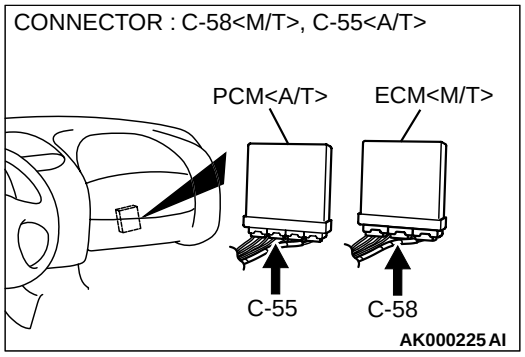
YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

STEP 9. Check for harness damage between generator connector B-45 terminal 4 and ECM connector C-58 terminal 52 <M/T> or PCM connector C-55 terminal 54 <A/T>.

NOTE: Check harness after checking intermediate connector B-13. If intermediate connector is damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.





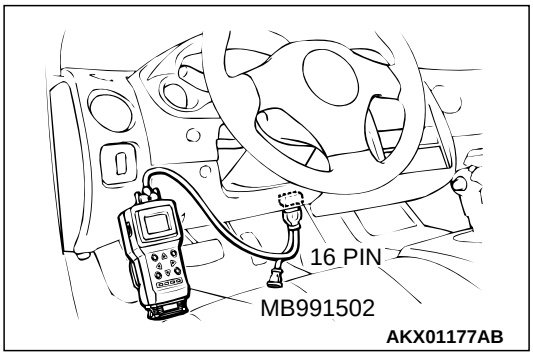
Q: Is the harness wire in good condition?

YES : Replace the generator. Then go to Step 10.
NO : Repair it. Then go to Step 10.

STEP 10. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

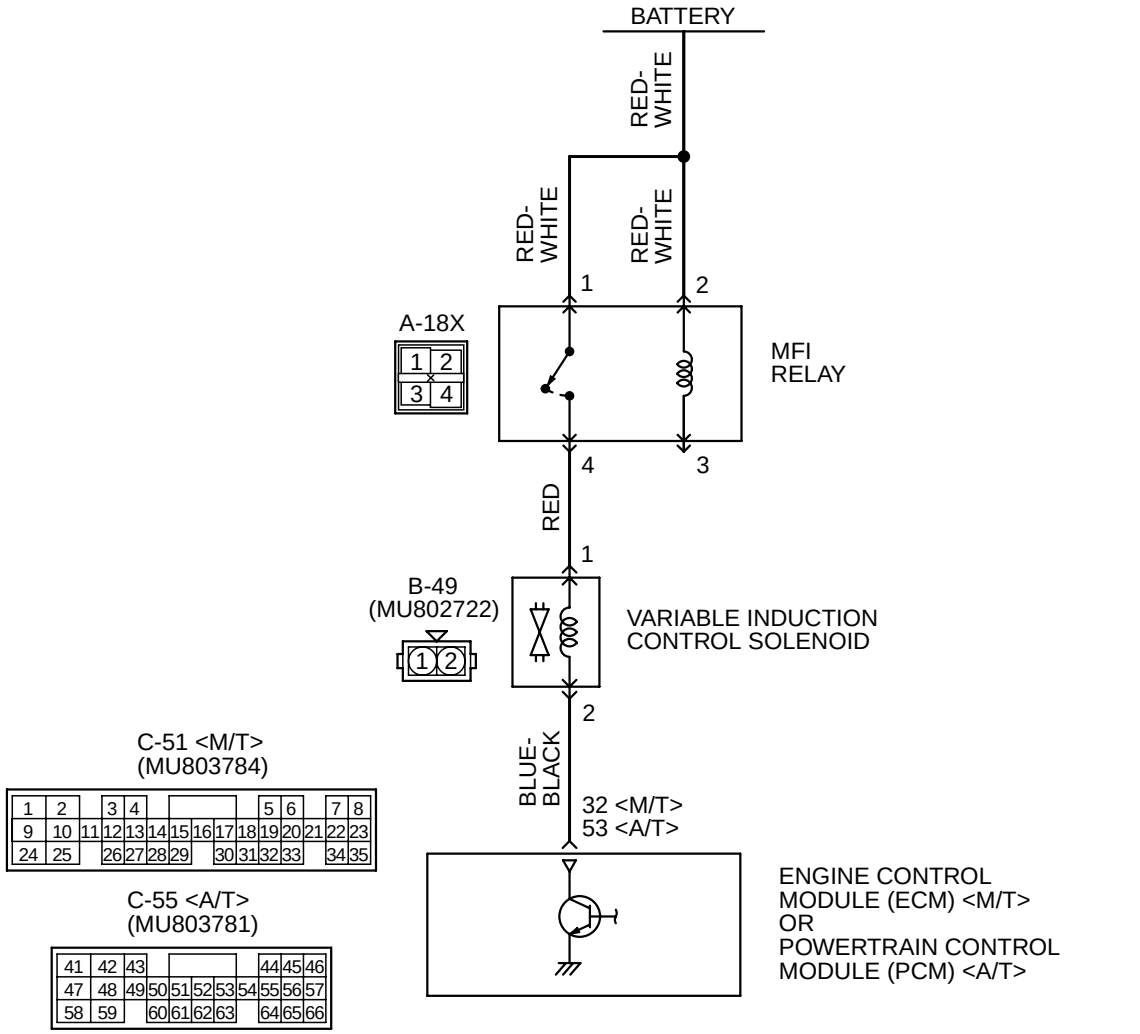


Q: Is the DTC P0622 is output?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0660: Variable Induction Control Circuit Malfunction

Variable Induction Control Solenoid Circuit



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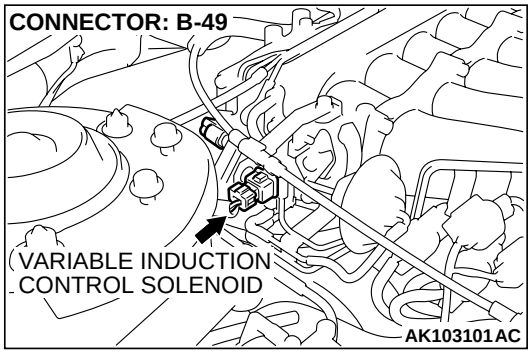

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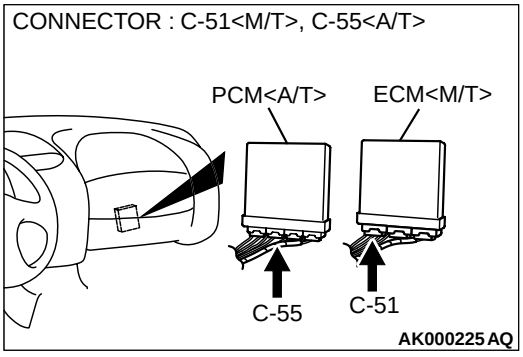

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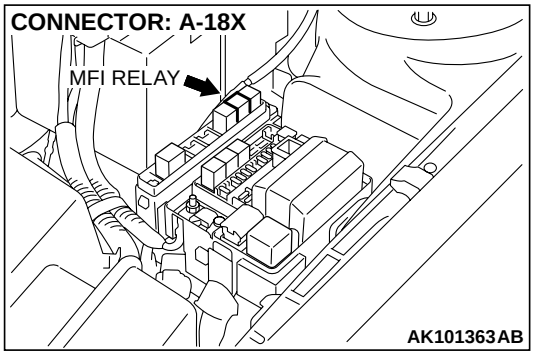


CIRCUIT OPERATION

- Power to the variable induction control solenoid power is supplied from the MFI relay (terminal 4).
- The ECM <M/T> or PCM <A/T> controls ground variable induction control solenoid by turning the power transistor in the ECM <M/T> or PCM <A/T> "ON" and "OFF".

TECHNICAL DESCRIPTION

- To judge if there is open circuit in the variable induction control solenoid drive circuit, ECM <M/T> or PCM <A/T> measures the surge voltage of the variable induction control solenoid coil.
- The ECM <M/T> or PCM <A/T> drives the variable induction control solenoid. After the solenoid is turned off, the ECM <M/T> or PCM <A/T> will check if the solenoid coil produces a surge voltage of 2 V or more.

DTC SET CONDITIONS

Check Conditions

- Engine is being cranked.
- Battery positive voltage is at between 10 and 16 volts.

Judgment Criteria

- The variable induction control solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 0.2 second.
- The ECM <M/T> or PCM <A/T> monitors for this condition once during the drive cycle.

Check Conditions

- Battery positive voltage is at between 10 and 16 volts.
- Variable induction control solenoid is ON.
- More than 1 second has elapsed after the above mentioned conditions have been met.

Judgment Criteria

- The variable induction control solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 1 second. When the variable induction control solenoid is turned OFF.

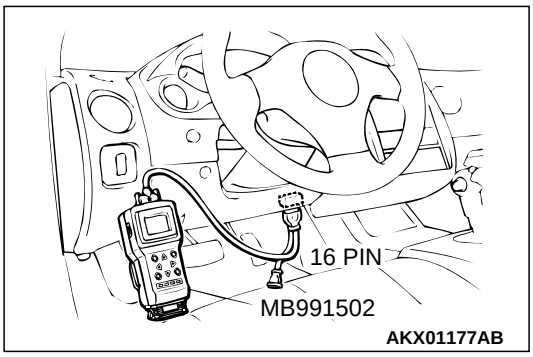
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Variable induction control solenoid failed.
- Open or shorted variable induction control solenoid circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check actuator test item 11: Variable Induction control Solenoid.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

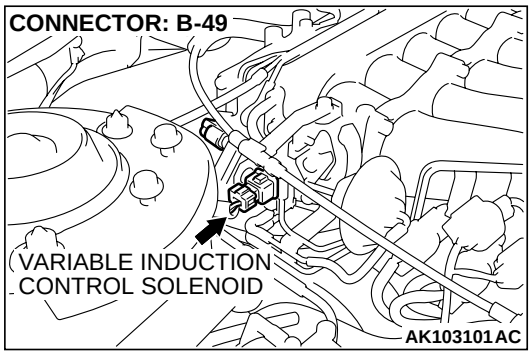
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the actuator test mode for item 11, Variable induction control solenoid.
- An operation sound should be heard and vibration should be felt when the variable induction control solenoid is operated.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the solenoid operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.

NO : Go to Step 2.

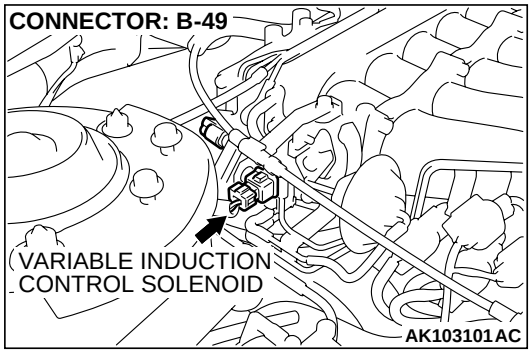


STEP 2. Check connector B-49 at the variable induction control solenoid for damage.

Q: Is the connector in good condition?

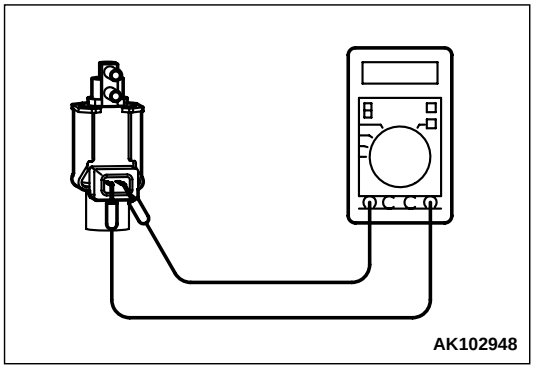
YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



STEP 3. Check the variable induction control solenoid.

(1) Disconnect the variable induction control solenoid connector B-49.



(2) Measure the resistance between variable induction control solenoid side connector terminal 1 and 2.

Standard value: 29 – 35 Ω [at 20°C (68°F)]

Q: Is the resistance at the standard value?

YES : Go to Step 4.

NO : Replace the variable induction control solenoid. Then go to Step 12.

STEP 4. Check the power supply voltage at variable induction control solenoid harness side connector B-49.

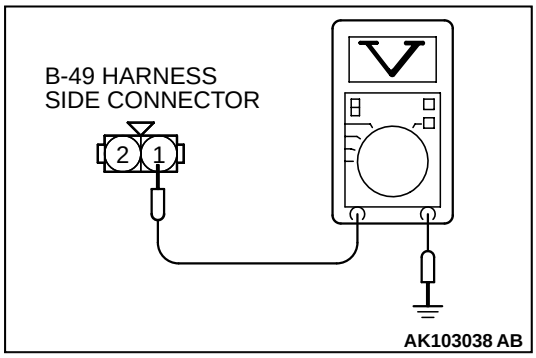
(1) Disconnect the connector B-49 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between terminal 1 and ground.

- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the voltage normal?

YES : Go to Step 6.

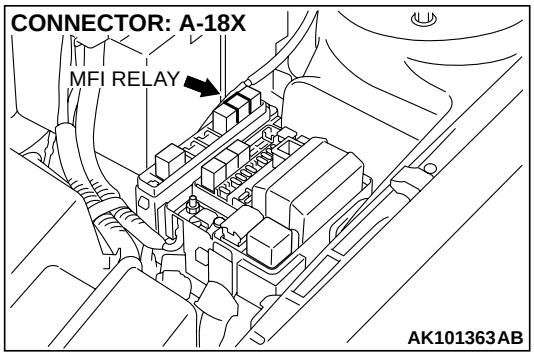
NO : Go to Step 5.

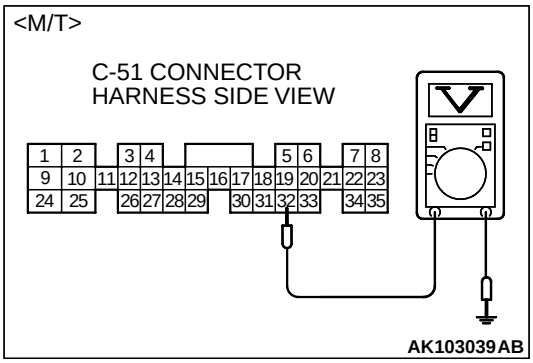
STEP 5. Check connector A-18X at MFI relay for damage.

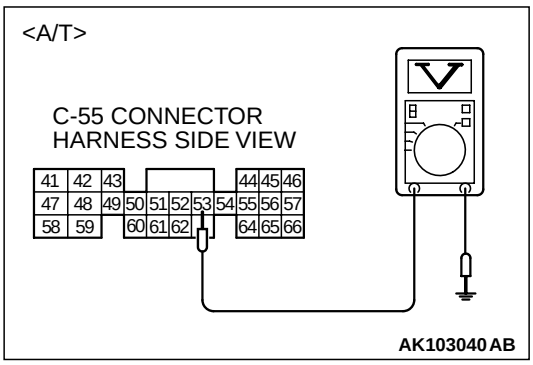
Q: Is the connector in good condition?

YES : Repair harness wire between MFI relay connector A-18X terminal 4 and variable induction control solenoid connector B-49 terminal 1 because of open circuit or short circuit to ground. Then go to Step 12.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.







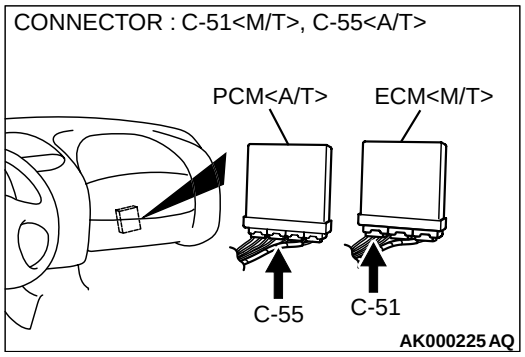
STEP 6. Check the power supply voltage at ECM connector C-51 <M/T> or PCM connector C-55 <A/T> by backprobing.

(1) Do not disconnect the connector C-51 <M/T> or C-55 <A/T>.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 32 <M/T> or 53 <A/T> and ground by backprobing.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 9.
NO : Go to Step 7.



STEP 7. Check connector C-51 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

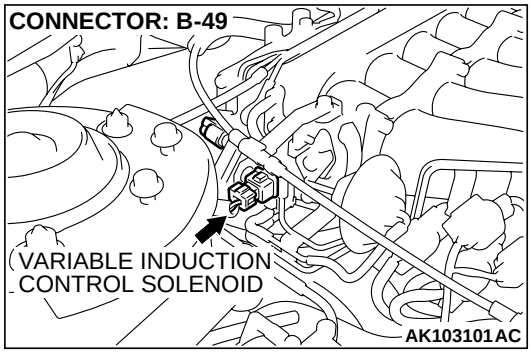
YES : Go to Step 8.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

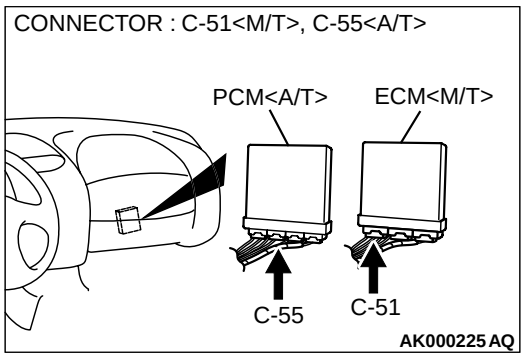
STEP 8. Check for open circuit and short circuit to ground between variable induction control solenoid connector B-49 terminal 2 and ECM connector C-51 terminal 32 <M/T> or PCM connector C-55 terminal 53 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 12.

NO : Repair it. Then go to Step 12.



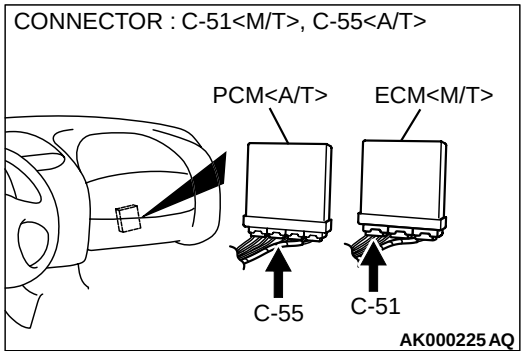


STEP 9. Check connector C-51 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

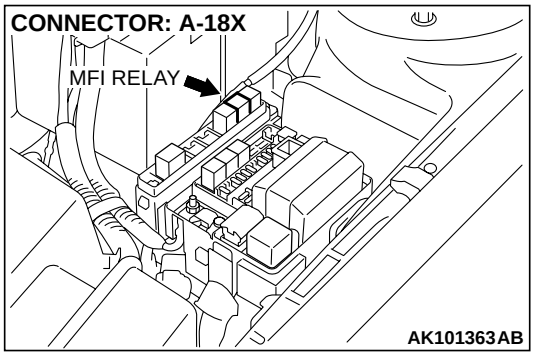


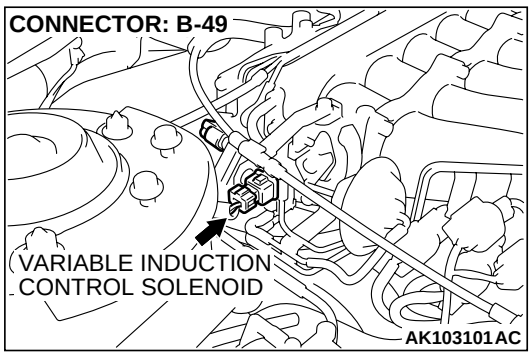
STEP 10. Check for harness damage between MFI relay connector A-18X terminal 4 and variable induction control solenoid connector B-49 terminal 1.

Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair it. Then go to Step 12.



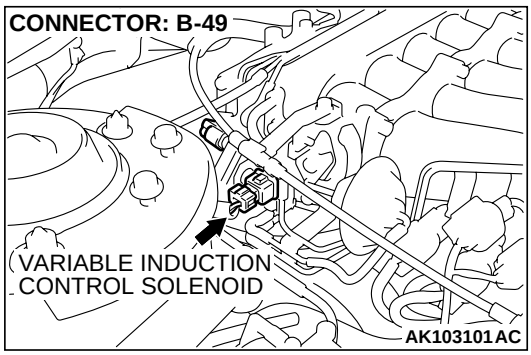


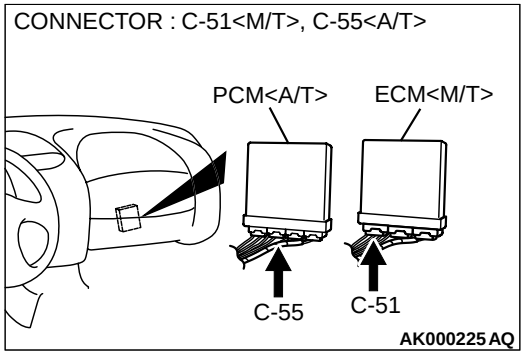
STEP 11. Check for harness damage between variable induction control solenoid connector B-49 terminal 2 and ECM connector C-51 terminal 32 <M/T> or PCM connector C-55 terminal 53 <A/T>.

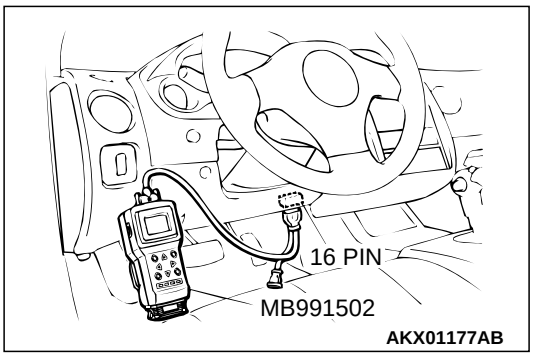
Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 12.

NO : Repair it. Then go to Step 12.







STEP 12. Using scan tool MB991502, check actuator test item 11: Variable Induction control Solenoid.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the actuator test mode for item 11, Variable induction control solenoid.
- An operation sound should be heard and vibration should be felt when the variable induction control solenoid is operated.

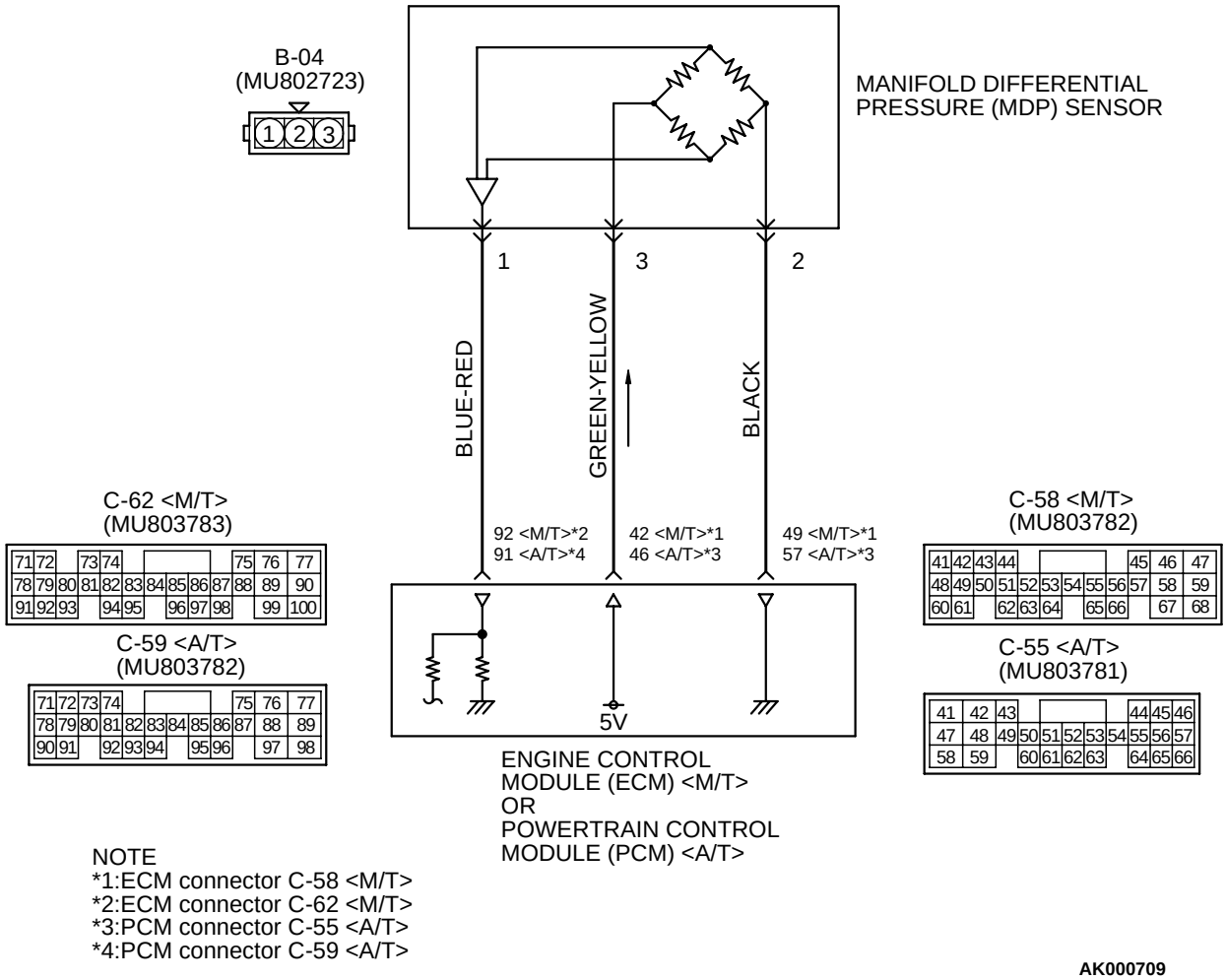
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the solenoid operating properly?

YES : The inspection is complete.
NO : Retry the troubleshooting.

DTC P1400: Manifold Defferential Pressure Sensor

Manifold Differential Pressure Sensor Circuit



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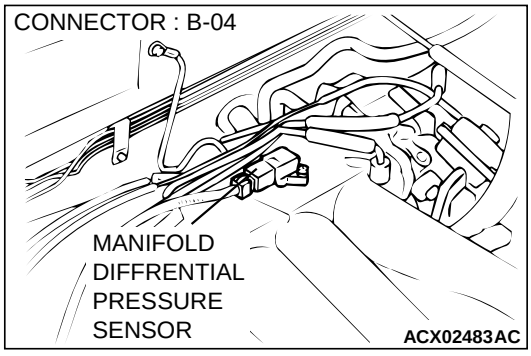
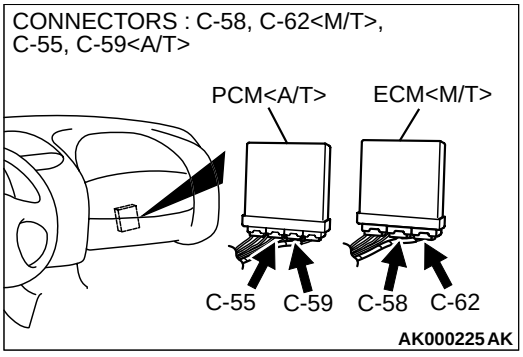




CIRCUIT OPERATION

- A 5-volt voltage is applied on the manifold differential pressure sensor power terminal (terminal 3) from the ECM (terminal 42) <M/T> or PCM (terminal 46) <A/T>. The ground terminal (terminal 2) is grounded with the ECM (terminal 49) <M/T> or PCM (terminal 57) <A/T>.
- A voltage proportional to the pressure in the intake manifold plenum is sent from the manifold differential pressure sensor output terminal (terminal 1) to the ECM (terminal 92) <M/T> or PCM (terminal 91) <A/T>.

TSB Revision

TECHNICAL DESCRIPTION

- The manifold differential pressure sensor outputs a voltage which corresponds to the negative pressure in the intake manifold.
- The ECM <M/T> or PCM <A/T> checks whether the voltage output by manifold differential pressure sensor is within a specified range.

DTC SET CONDITIONS

Check Conditions

- 8 minutes or more have passed after starting the engine. Note that this is only if the engine coolant temperature is less than 0°C (32°F) when starting.
- Engine coolant temperature is higher than 45°C (113°F).
- Intake air temperature is higher than 0°C (32°F).
- Volumetric efficiency is between 30 and 55 percent.

Judgment Criteria

- Manifold differential pressure sensor output voltage has continued to be higher than 4.6 volts [corresponding to an absolute pressure of 118 kPa (17 psi) or higher] for 2 seconds.

or

- Manifold differential pressure sensor output voltage has continued to be lower than 0.1 volt [corresponding to an absolute pressure of 2.4 kPa (0.3 psi) or lower] for 2 seconds.

Check Conditions

- 8 minutes or more have passed after starting the engine. Note that this is only if the engine coolant temperature is 0°C (32°F) or more when starting.
- Engine coolant temperature is higher than 45°C (113°F).
- Intake air temperature is higher than 0°C (32°F).
- Volumetric efficiency is lower than 30 percent.

Judgment Criteria

- Manifold differential pressure sensor output voltage has continued to be higher than 4.2 volts [corresponding to an absolute pressure of 108 kPa (16 psi) or higher] for 2 seconds.

Check Conditions

- 8 minutes or more have passed after starting the engine. Note that this is only if the engine coolant temperature is 0°C (32°F) or more when starting.
- Engine coolant temperature is higher than 45°C (113°F).
- Intake air temperature is higher than 0°C (32°F).
- Volumetric efficiency is higher than 70 percent.

Judgment Criteria

- Manifold differential pressure sensor output voltage has continued to be lower than 1.8 volts [corresponding to an absolute pressure of 46 kPa (4.6 psi) or lower] for 2 seconds.

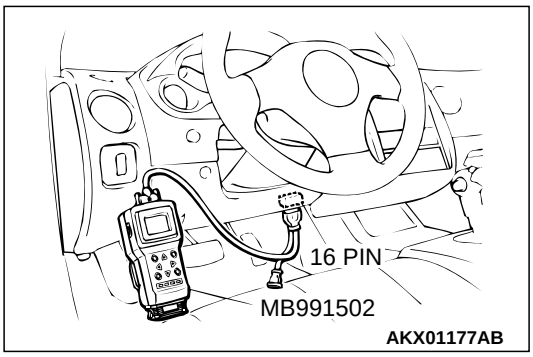
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Manifold differential pressure sensor failed.
- Open or shorted manifold differential pressure sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tools

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 95: Manifold Differential Pressure Sensor.

⚠ CAUTION

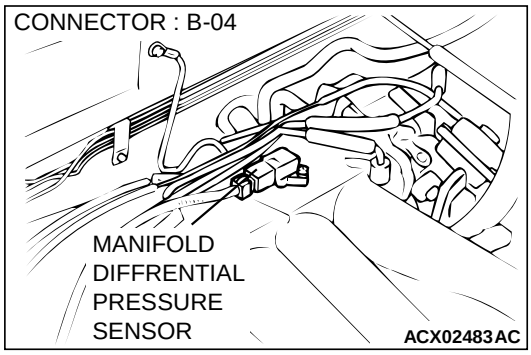
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 95, Manifold Differential Pressure Sensor.
- While engine is idling, pressure should be between 62 and 76 kPa.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

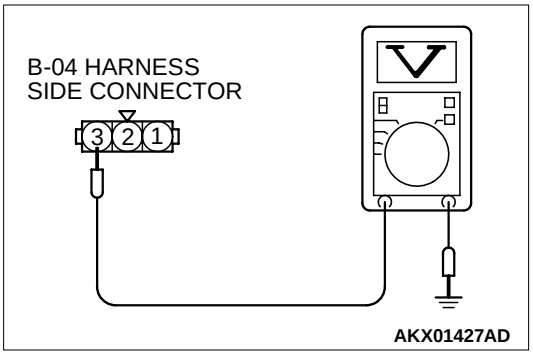
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-6.
NO : Go to Step 2.



STEP 2. Check connector B-04 at manifold differential pressure sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



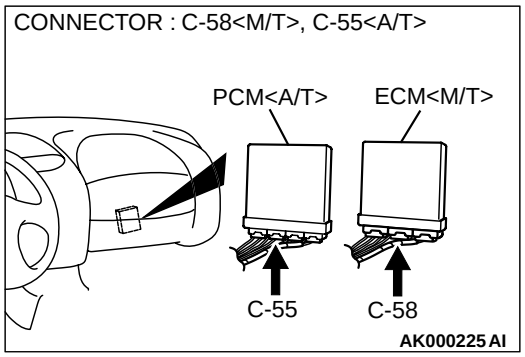
STEP 3. Check the sensor supply voltage at manifold differential pressure sensor harness side connector B-04.

(1) Disconnect the connector B-04 and measure at the harness side.
(2) Turn the ignition switch to "ON" position.
(3) Measure the voltage between terminal 3 and ground.
- Voltage should be between 4.8 and 5.2 volts.

(4) Turn the ignition switch to "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 6.
NO : Go to Step 4.

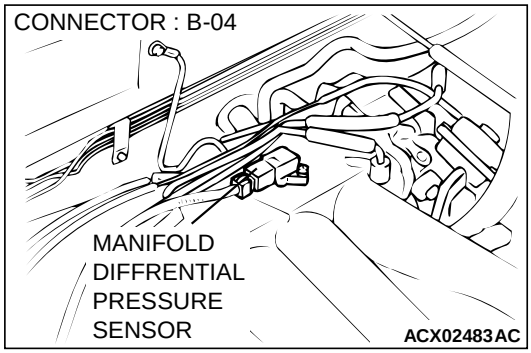


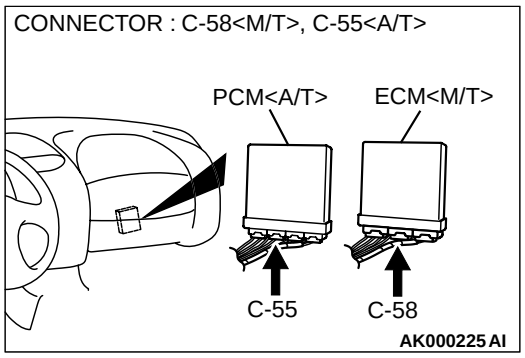
STEP 4. Check connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



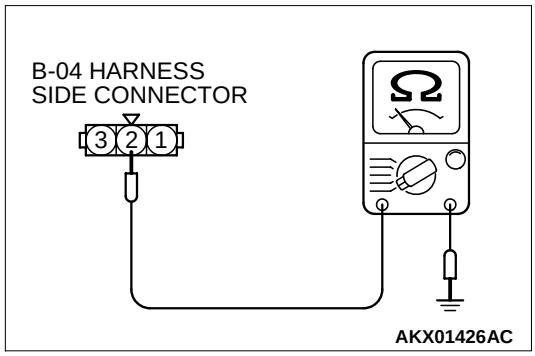


STEP 5. Check for open circuit and short circuit to ground between manifold differential pressure sensor connector B-04 terminal 3 and ECM connector C-58 terminal 42 <M/T> or PCM connector C-55 terminal 46 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 12.

NO : Repair it. Then go to Step 12.



STEP 6. Check the continuity at manifold differential pressure sensor harness side connector B-04.

(1) Disconnect the connector B-04 and measure at the harness side.

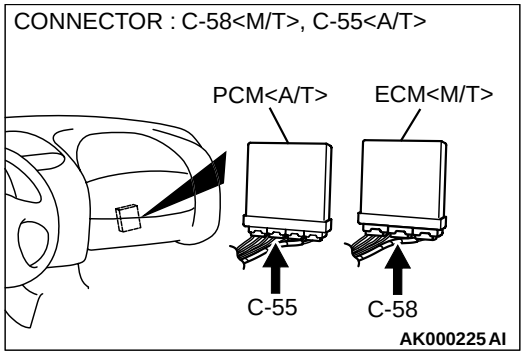
(2) Measure the continuity between terminal 2 and ground.

- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 9.

NO : Go to Step 7.



STEP 7. Check connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 8.

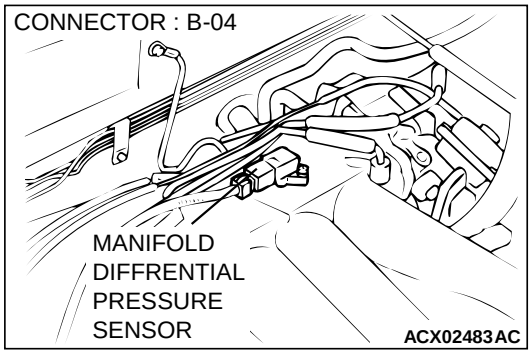
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

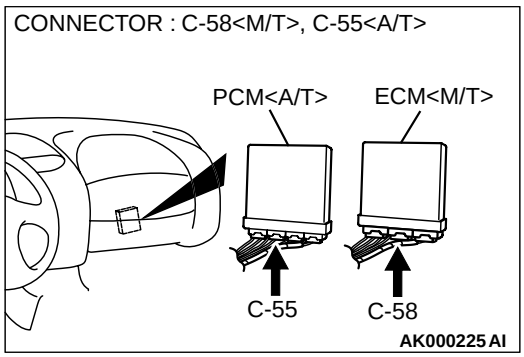
STEP 8. Check for open circuit and harness damage between manifold differential pressure sensor connector B-04 terminal 2 and ECM connector C-58 terminal 49 <M/T> or PCM connector C-55 terminal 57 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then go to Step 12.

NO : Repair it. Then go to Step 12.



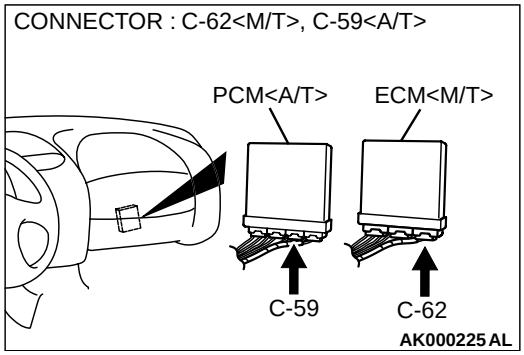


STEP 9. Check connector C-62 at ECM <M/T> or connector C-59 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

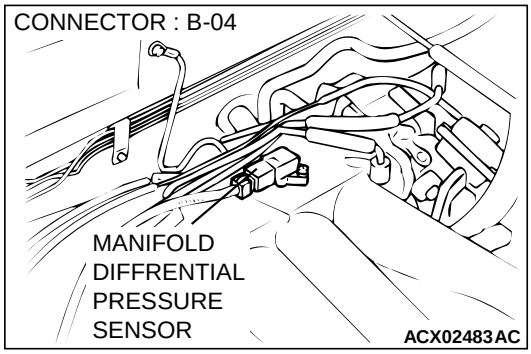


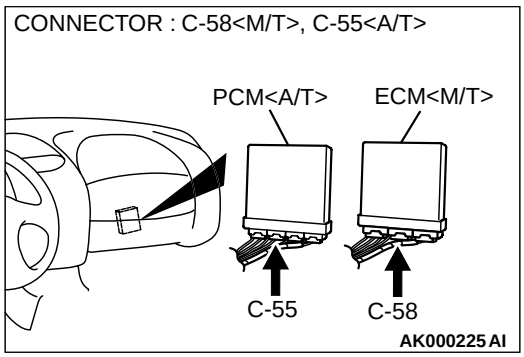
STEP 10. Check for harness damage between manifold differential pressure sensor connector B-04 terminal 3 and ECM connector C-58 terminal 42 <M/T> or PCM connector C-55 terminal 46 <A/T>.

Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair it. Then go to Step 12.



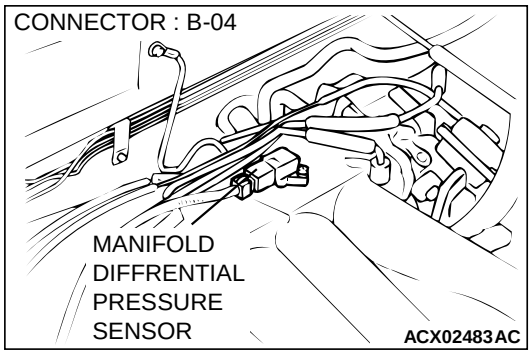


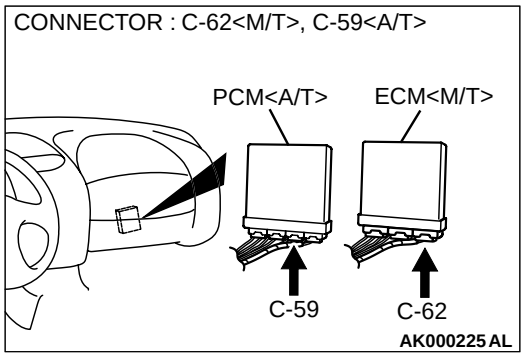
STEP 11. Check for open circuit and short circuit to ground and harness damage between manifold differential pressure sensor connector B-04 terminal 1 and ECM connector C-62 terminal 92 <M/T> or PCM connector C-59 terminal 91 <A/T>.

Q: Is the harness wire in good condition?

YES : Replace the manifold differential pressure sensor. Then go to Step 12.

NO : Repair it. Then go to Step 12.





TSB Revision

STEP 12. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Procedure 6 – Other Monitor P.13B-6.

(2) Check the diagnostic trouble code (DTC).

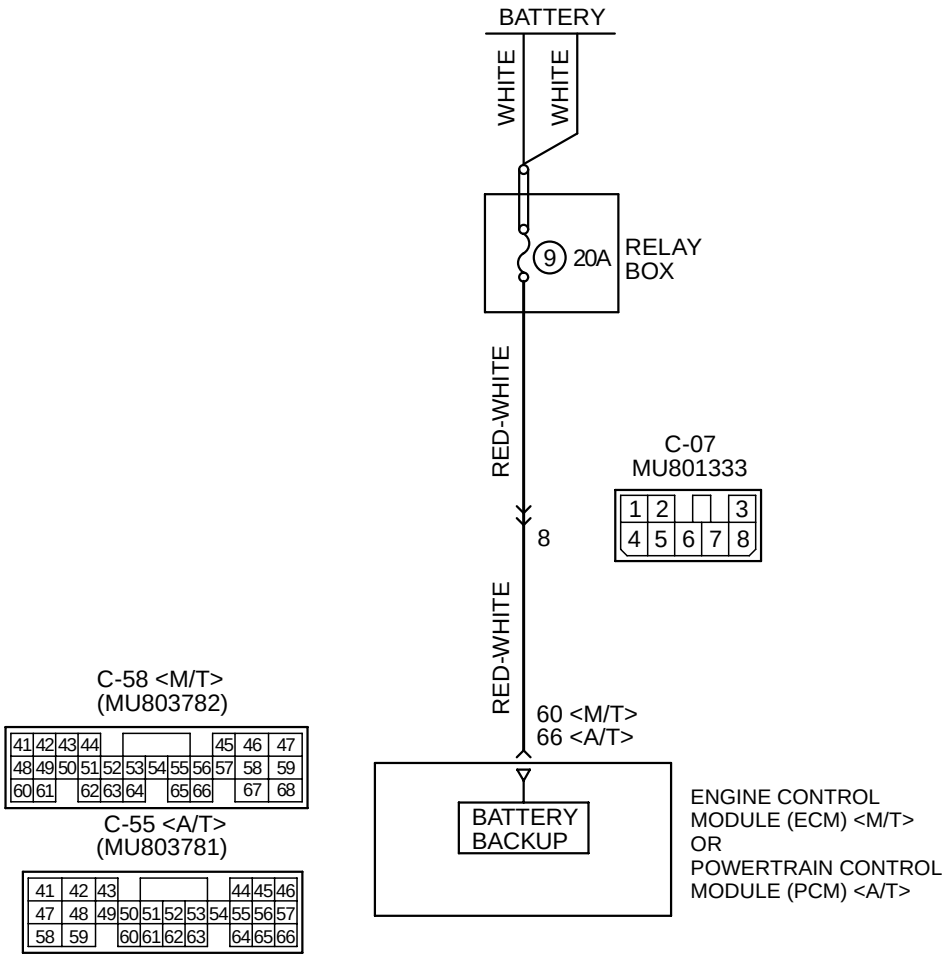
Q: Is the DTC P1400 is output?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P1603: Battery Backup Circuit Malfunction

Battery Backup Circuit



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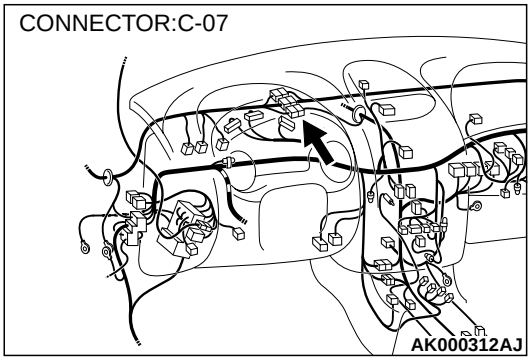
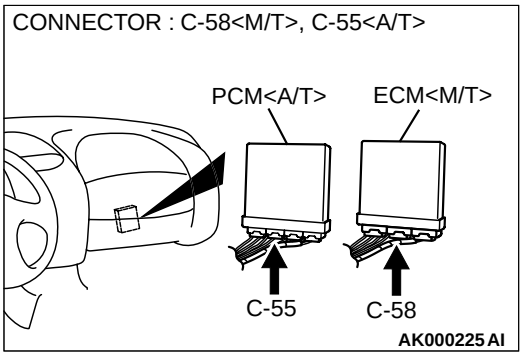




TECHNICAL DESCRIPTION

- The ECM <M/T> or PCM <A/T> is checks the open circuit of battery backup line.

NOTE: When the system detects an open circuit in the battery backup line, it makes 1 failure judgment of other diagnostic trouble codes (DTCs).

DTC SET CONDITIONS

Check Conditions

- Starting sequence was completed.
- Battery positive voltage is higher than 10 volts.

Judgement Criteria

- Battery backup line voltage has continued to be 6 volts or lower for 2 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

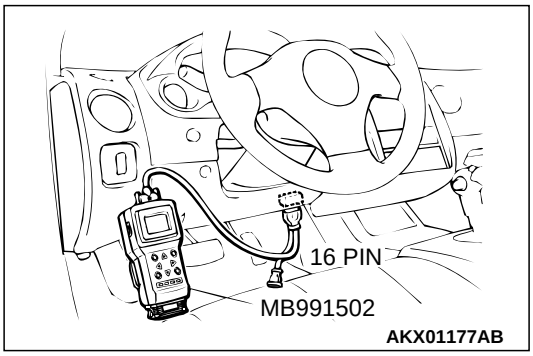
- Open or shorted battery backup line, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).



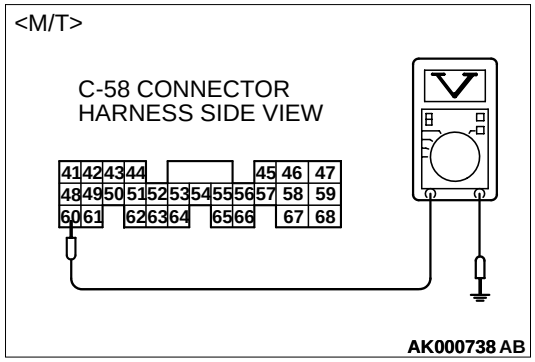
⚠ CAUTION

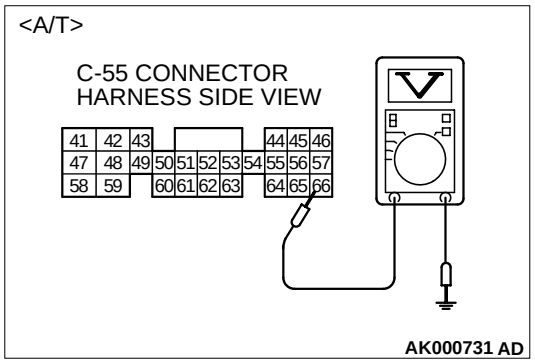
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTC.
(4) Start the engine and run it at idle.
(5) Read the DTC.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC P1603 is output?

YES : Go to Step 2.
NO : The inspection is complete.



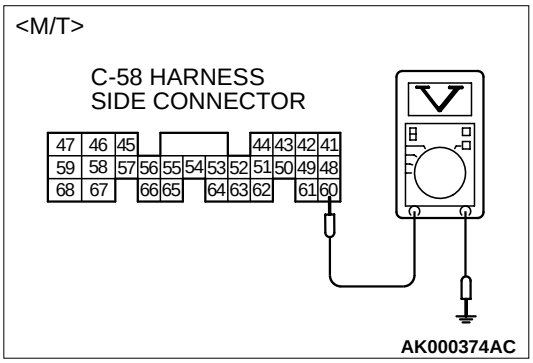


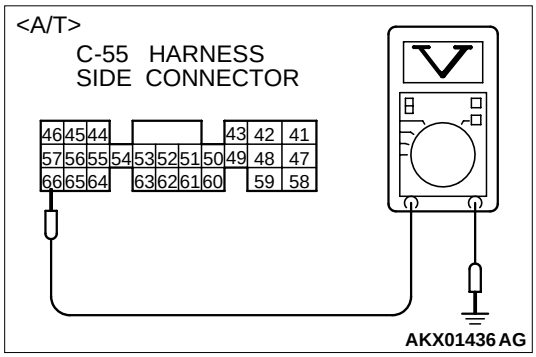
STEP 2. Check the backup power supply voltage at ECM connector C-58 <M/T> or PCM connector C-55 <A/T> by backprobing.

(1) Do not disconnect the ECM connector C-58 <M/T> or PCM connector C-55 <A/T>.
(2) Measure the voltage between terminal 60 <M/T> or 66 <A/T> and ground by backprobing.
- Voltage should be battery positive voltage.

Q: Is the voltage normal?

YES : Go to Step 5.
NO : Go to Step 3.





STEP 3. Check the backup power supply voltage at ECM harness side connector C-58 <M/T> or PCM harness side connector C-55 <A/T>.

(1) Disconnect the ECM connector C-58 <M/T> or PCM connector C-55 <A/T> and measure at the harness side.

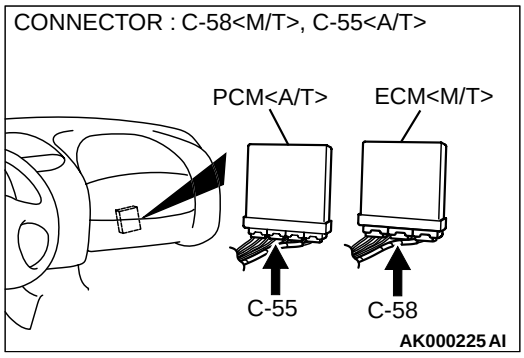
(2) Measure the voltage between terminal 60 <M/T> or 66 <A/T> and ground.

- Voltage should be battery positive voltage.

Q: Is the voltage normal?

YES : Go to Step 4.

NO : Check connectors C-07 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector are in good condition, repair harness wire between battery and ECM connector C-58 <M/T> terminal 60 or PCM connector C-55 <A/T> terminal 66 because of open circuit or short circuit to ground. Then go to Step 6.

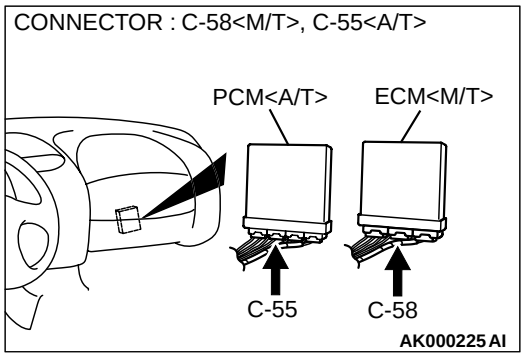


STEP 4. Check connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Check connectors C-07 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector are in good condition, repair harness wire between battery and ECM connector C-58 <M/T> terminal 60 or PCM connector C-55 <A/T> terminal 66 because of harness damage. Then go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.

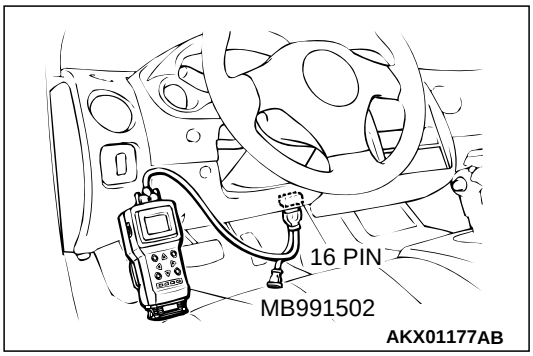


STEP 5. Check connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Replace the ECM or PCM. Then go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.



STEP 6. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC P1603 is output?

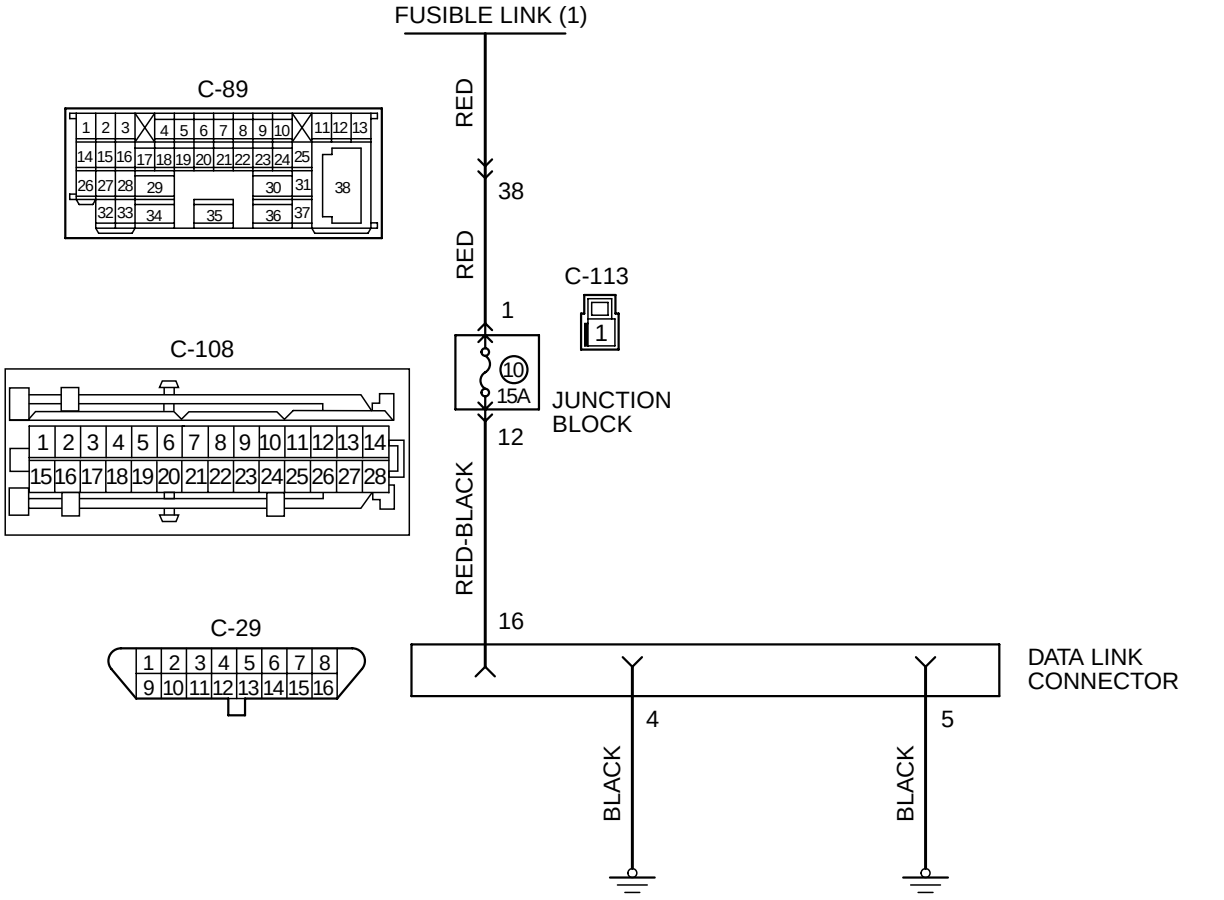
YES : Retry the troubleshooting.

NO : The inspection is complete.

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Communication with Scan Tool Is Not Possible. (Comunication with All Systems Is Not Possible.)

Data Link Connector Circuit



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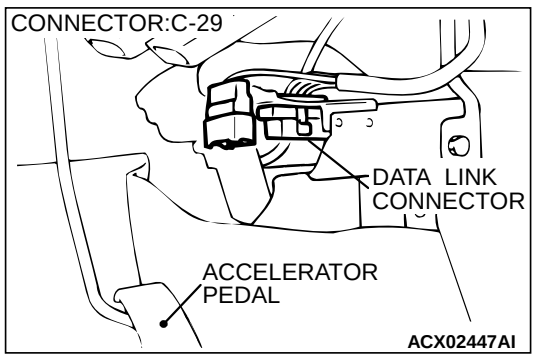

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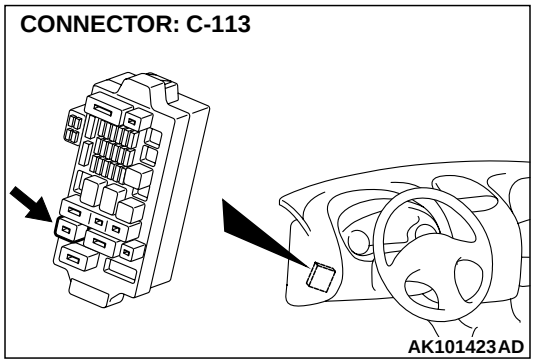
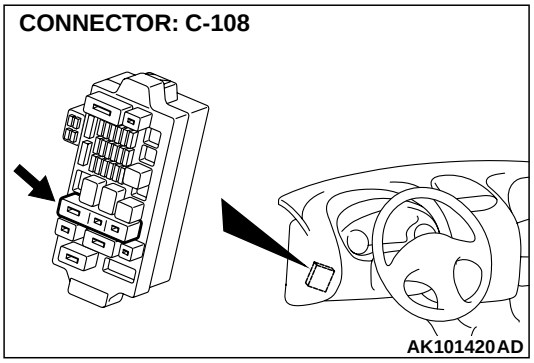
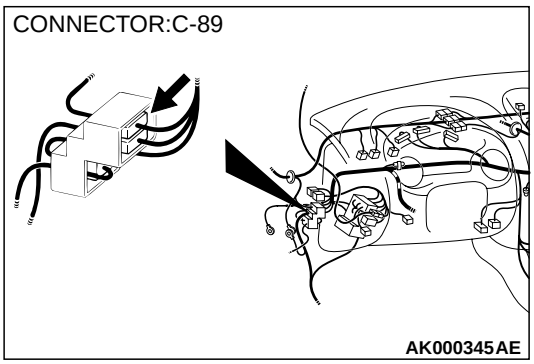


AK101423AD

TSB Revision





CIRCUIT OPERATION

- A battery positive voltage is applied on the data link connector power terminal (terminal 16). The ground terminals (terminal 4, 5) are grounded to the vehicle body.

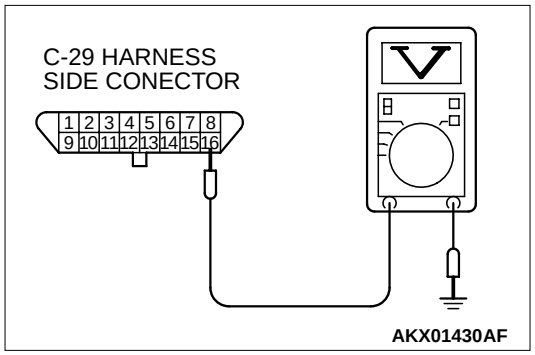
COMMENT

- The cause is probably a defect in power supply system (including ground) for the on-board diagnostic test mode line.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the data link connector.
- Damaged harness wire.

DIAGNOSIS



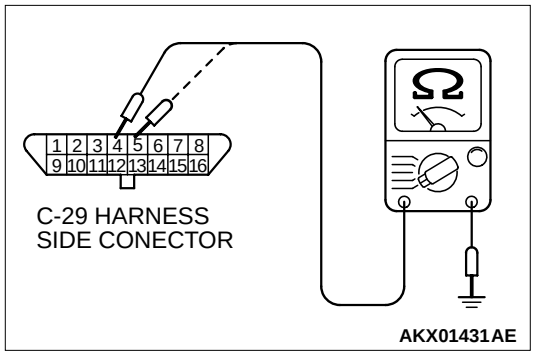
STEP 1. Check the power supply voltage at data link connector C-29.

(1) Measure voltage between terminal 16 and ground.
- Voltage should be battery positive voltage.

Q: Is the voltage normal?

YES : Go to step 2.

NO : Check harness connectors C-108, C-113 and C-89 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connectors are in good condition, repair harness wire between fusible link (1) and data link connector C-29 terminal 16 because of open circuit. Then confirm that the malfunction symptom is eliminated.



STEP 2. Check the continuity at data link connector C-29.

(1) Check for the continuity between terminal 4, 5 and ground.
- Should be less than 2 ohm.

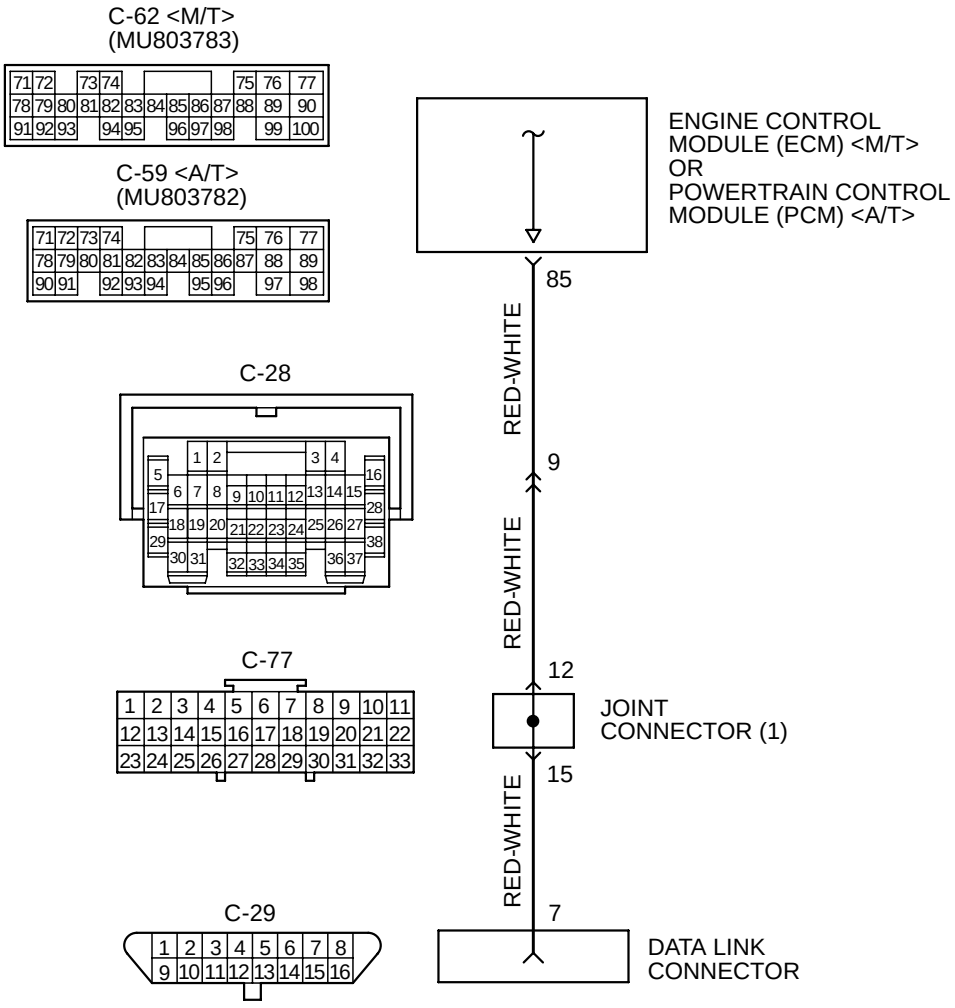
Q: Is the continuity normal?

YES : Replace the scan tool. Then confirm that the malfunction symptom is eliminated.

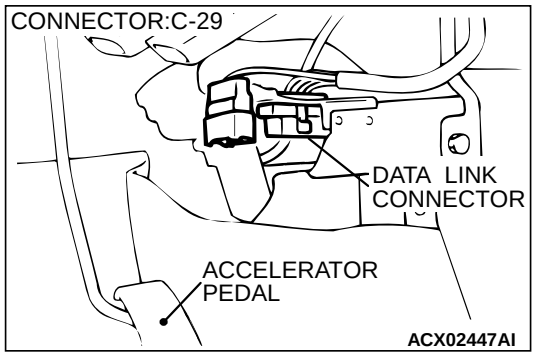
NO : Repair harness wire between data link connector C-29 terminal 4, 5 and ground because of open circuit or harness damage. Then confirm that the malfunction symptom is eliminated.

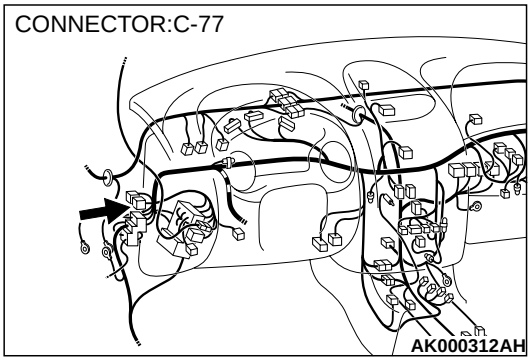
INSPECTION PROCEDURE 2: Scan Tool Communication with ECM or PCM Is Not Possible.

Data Link Connector Circuit

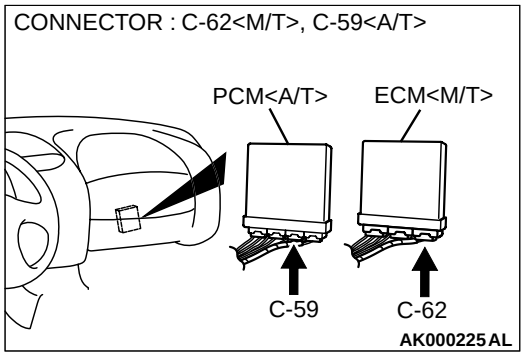


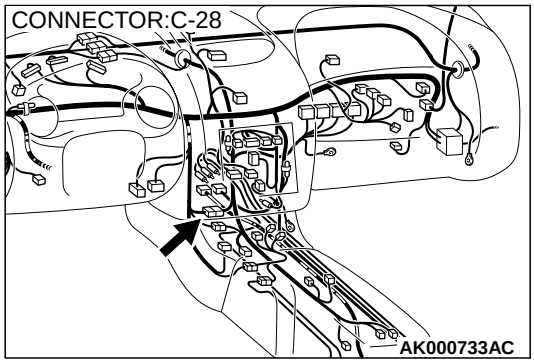
AK101633





TSB Revision





CIRCUIT OPERATION

- A diagnostic output is made from the ECM (terminal 85) <M/T> or PCM (terminal 85) <A/T> to the diagnostic output terminal (terminal 7) of the data link connector.

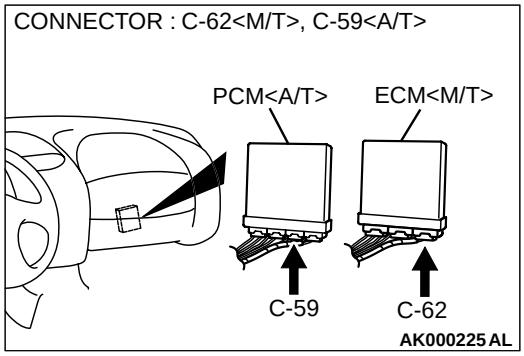
COMMENT

- No power supply to ECM <M/T> or PCM <A/T>.
- Defective ground circuit of ECM <M/T> or PCM <A/T>.
- Defective ECM <M/T> or PCM <A/T>.
- Improper communication line between ECM <M/T> or PCM <A/T> and scan tool.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of ECM <M/T> or PCM <A/T> power supply circuit.
- Malfunction of the ECM <M/T> or PCM <A/T>.
- Open circuit between ECM <M/T> or PCM <A/T> and data link connector.

DIAGNOSIS

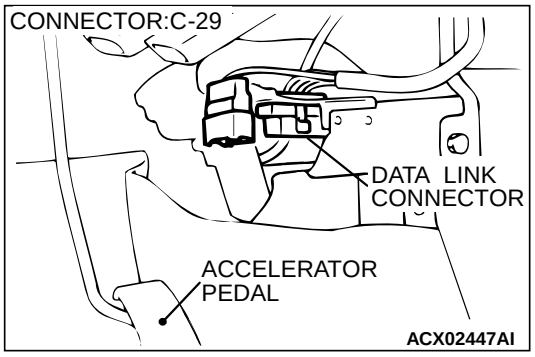


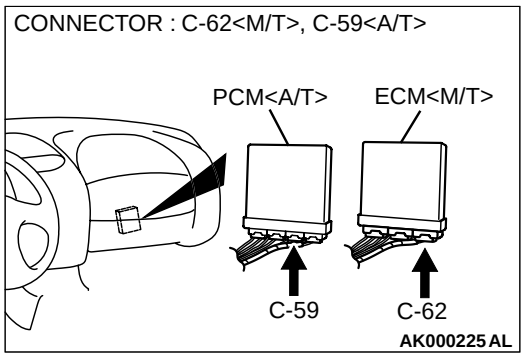
STEP 1. Check connector C-62 at ECM <M/T> or connector C-59 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.





STEP 2. Check for open circuit, short circuit to ground and harness damage between data link connector C-29 terminal 7 and ECM connector C-62 terminal 85 <M/T> or PCM connector C-59 terminal 85 <A/T>.

NOTE: Check harness after checking intermediate connectors C-77 and C-28. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then check that the malfunction is eliminated.

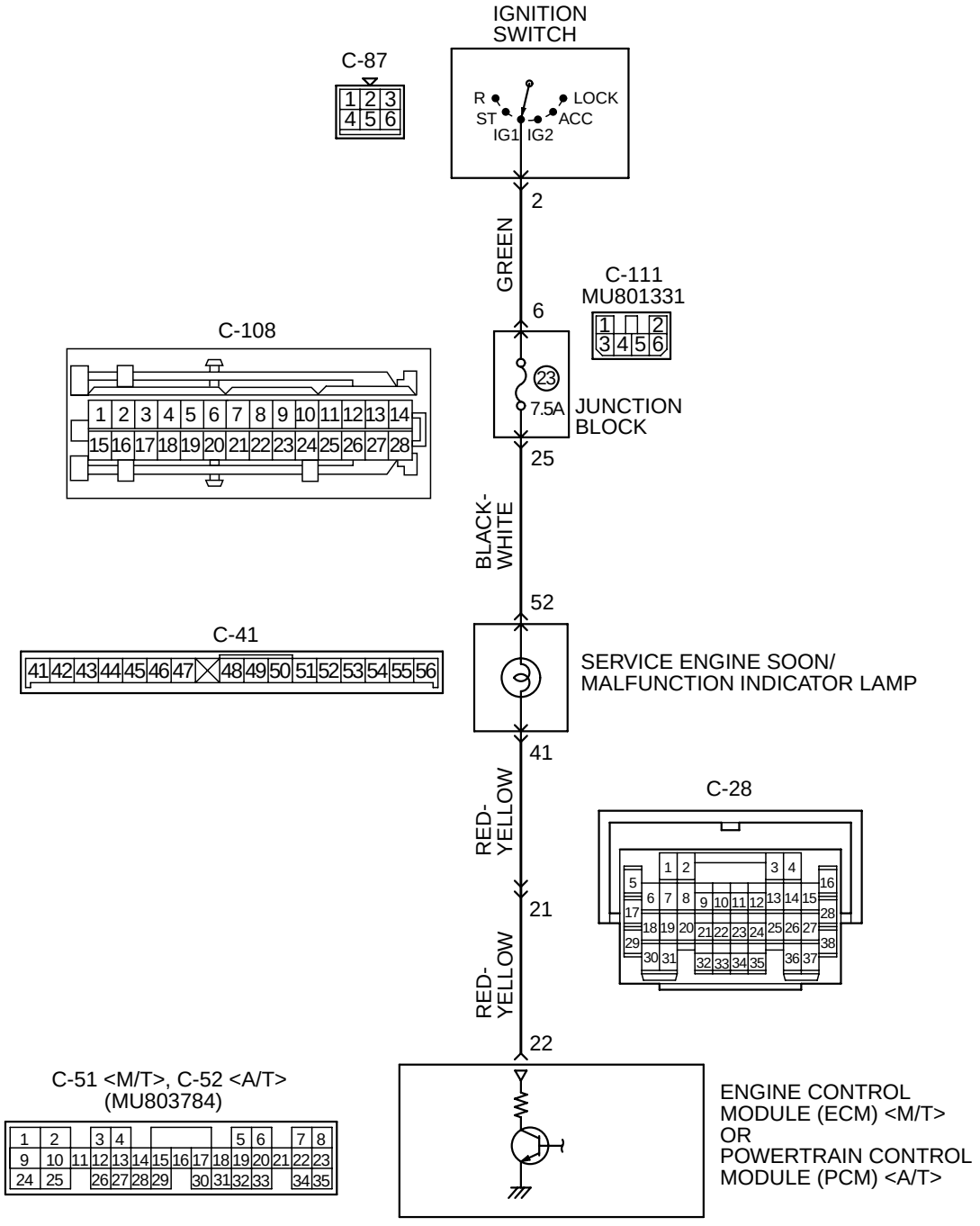
Q: Is the harness wire in good condition?

YES : Refer to, INSPECTION PROCEDURE 29 – Power Supply System and Ignition Switch – IG System P.13B-607.

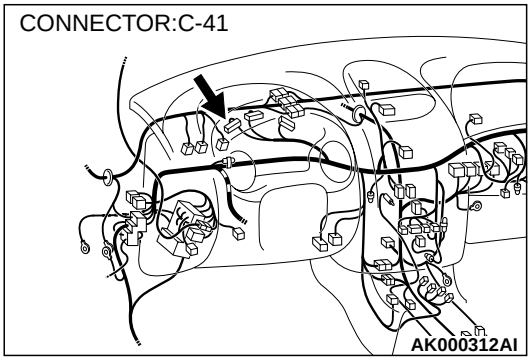
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

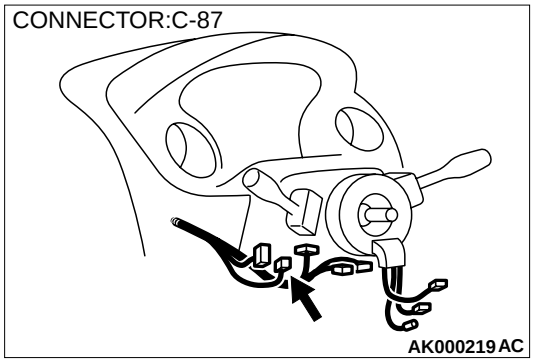
INSPECTION PROCEDURE 3: The Service Engine Soon/Malfunction Indicator Lamp Does Not Illuminate Right after the Ignition Switch Is Turned to the "ON" Position.

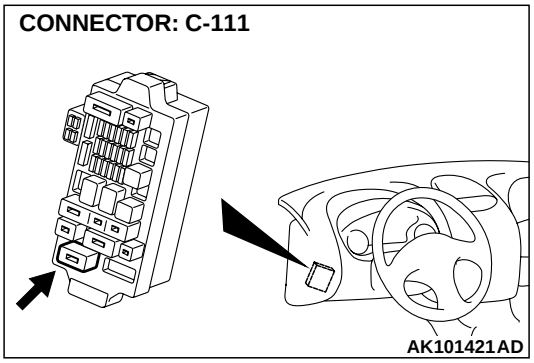
Service Engine Soon/Malfunction Indicator Lamp Circuit

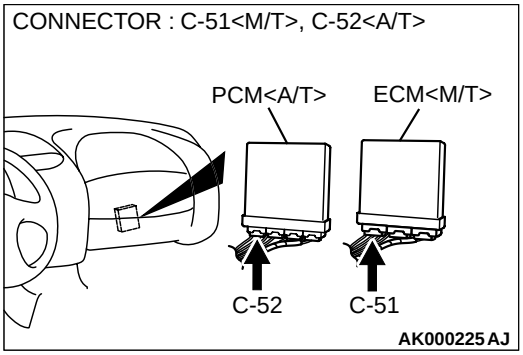


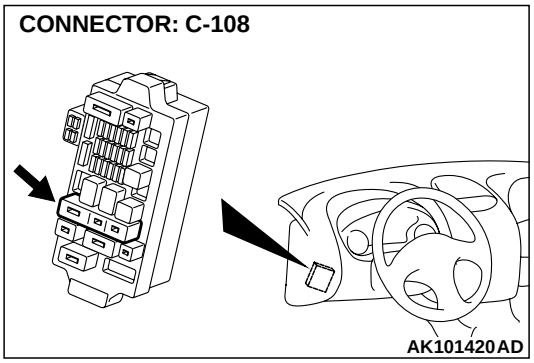
TSB Revision

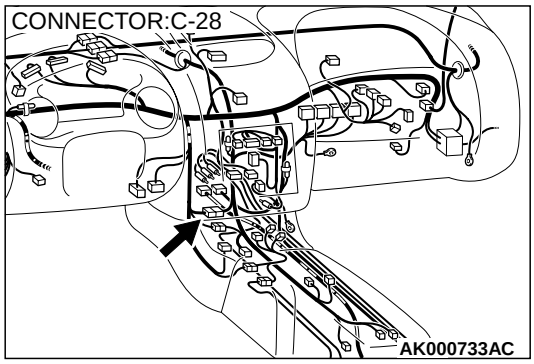












CIRCUIT OPERATION

- The service engine soon/malfunction indicator lamp power is supplied from the ignition switch.
- The ECM <M/T> or PCM <A/T> controls the ground of the service engine soon/malfunction indicator lamp by turning the power transistor in the ECM <M/T> or PCM <A/T> ON and OFF.

COMMENT

- The ECM <M/T> or PCM <A/T> causes the service engine soon/malfunction indicator lamp to illuminate for 5 seconds immediately after the ignition switch is turned to the "ON" position occurred.

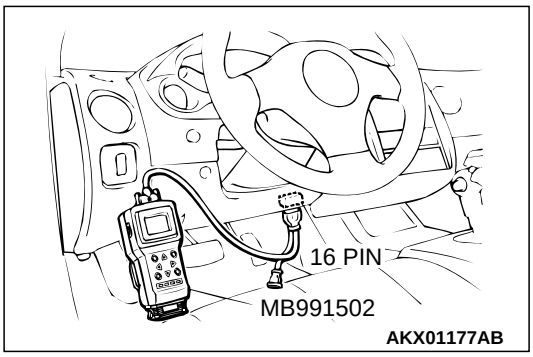
TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Burnt-out bulb.
- Defective service engine soon/malfunction indicator lamp circuit.
- Malfunction of the ECM <M/T> or PCM <A/T>.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 16: Power Supply Voltage.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before. connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 16, Power Supply Voltage.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 2.
NO : Refer to INSPECTION PROCEDURE 29 – Power Supply System and Ignition Switch – IG System P.13B-607.

STEP 2. Check the burned-out bulb.

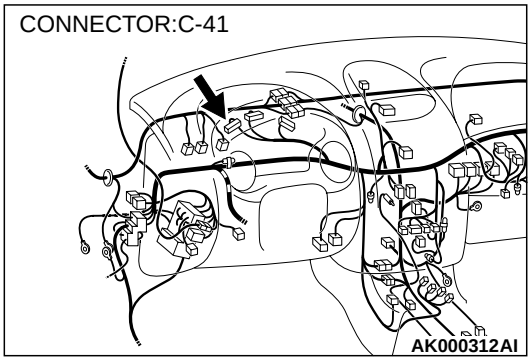
Q: Is the valve normal?

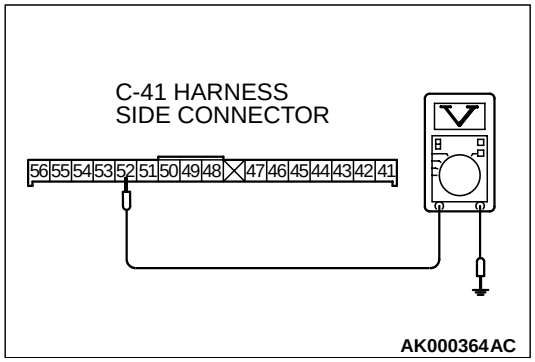
YES : Go to step 3.
NO : Replace the bulb. Then confirm that the malfunction symptom is eliminated.

STEP 3. Check connector C-41 at the combination meter for damage.

Q: Is the connector in good condition?

YES : Go to step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.





STEP 4. Check the power supply voltage at combination meter harness side connector C-41.

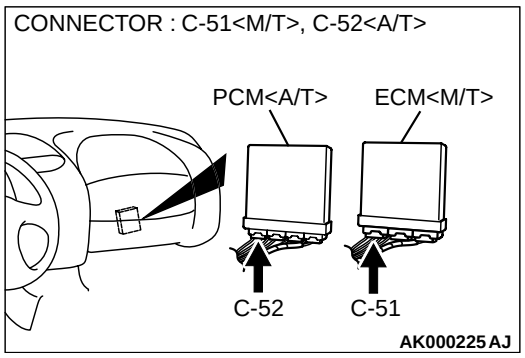
(1) Disconnect the connector C-41 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 52 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 5.

NO : Check harness connectors C-108 and C-111 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connectors are in good condition, repair harness wire between ignition switch connector C-87 terminal 2 and combination meter connector C-41 terminal 52 because of open circuit. Then confirm that the malfunction symptom is eliminated.

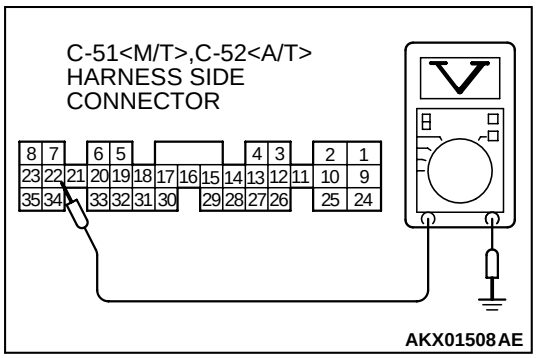


STEP 5. Check connector C-51 at ECM <M/T> or connector C-52 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.



STEP 6. Check the power supply voltage ECM connector C-51 <M/T> or PCM connector C-52 <A/T>.

(1) Disconnect the connector C-51 <M/T> or C-52 <A/T> and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 22 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

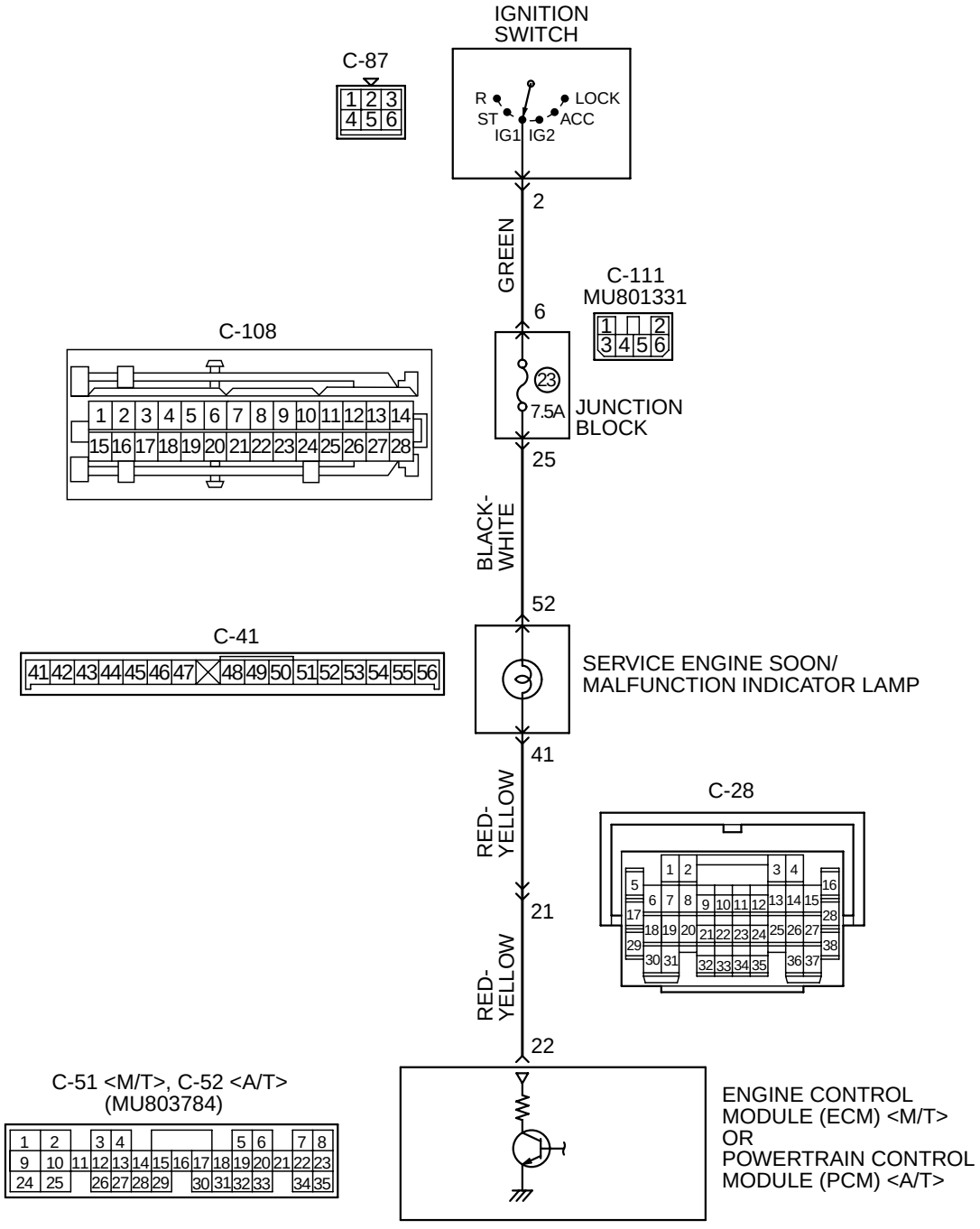
Q: Is the voltage normal?

YES : Replace the ECM or PCM. Then confirm that the malfunction symptom is eliminated.

NO : Check harness connectors C-28 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connectors is in good condition, repair harness wire between combination meter connector C-41 terminal 41 and ECM connector C-51 terminal 22 <M/T> or PCM connector C-52 terminal 22 <A/T> because of open circuit. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 4: The Service Engine Soon/Malfunction Indicator Lamp Remains Illuminated and Never Goes Out.

Service Engine Soon/Malfunction Indicator Lamp Circuit



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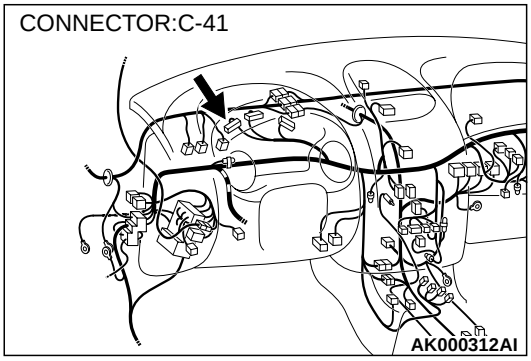
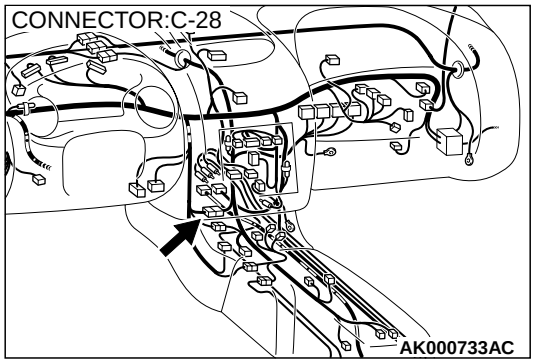
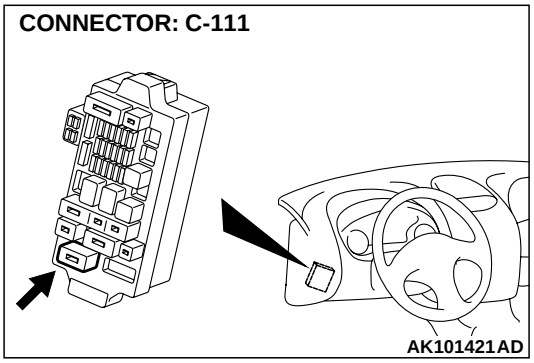
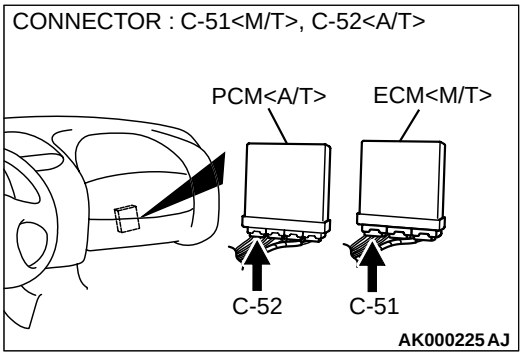
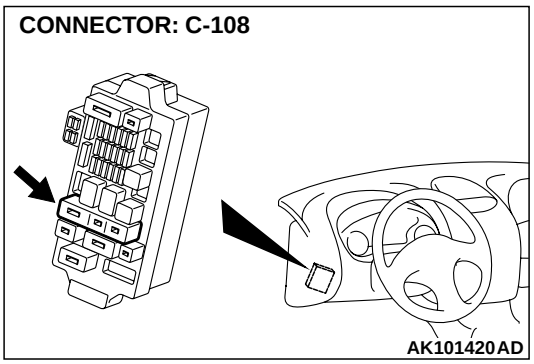
TSB Revision

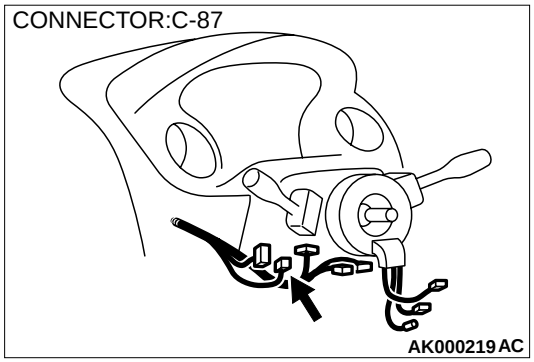












CIRCUIT OPERATION

- The service engine soon/malfunction indicator lamp power is supplied from the ignition switch.
- The ECM <M/T> or PCM <A/T> controls the ground of the service engine soon/malfunction indicator lamp by turning the power transistor in the ECM <M/T> or PCM <A/T> ON and OFF.

COMMENT

- In cases such as the above, the cause is probably that the ECM <M/T> or PCM <A/T> is detecting a problem in a sensor or actuator, or that one of the malfunctions listed at right has probably occurred.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

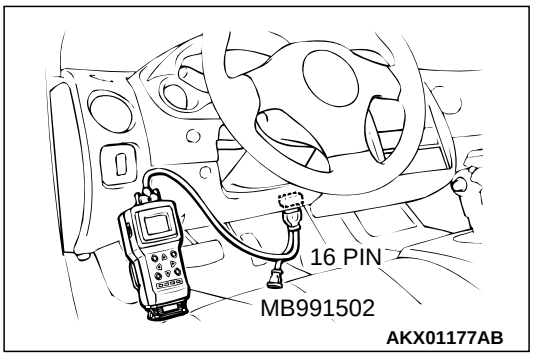
- Short-circuit between the service engine soon/malfunction indicator lamp and ECM <M/T> or PCM <A/T>.
- Malfunction of the ECM <M/T> or PCM <A/T>.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

TSB Revision



STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).

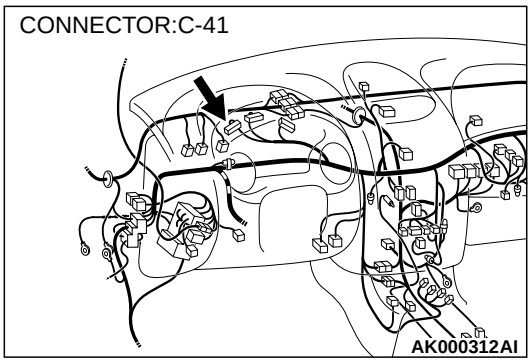
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?

YES : Refer to Diagnostic Trouble Code Chart P.13B-22.
NO : Go to Step. 2.



STEP 2. Check the continuity at combination meter harness side connector C-41.

(1) Disconnect the connector C-41 and measure at the harness side.
(2) Check for the continuity between terminal 41 and ground.
- Should be open loop.

Q: Is the continuity normal?

YES : Replace the ECM or PCM. Then confirm that the malfunction symptom is eliminated.
NO : Check harness connectors C-28 at the intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connectors is in good condition, repair harness wire between combination meter connector C-41 terminal 41 and ECM connector C-51 terminal 22 <M/T> or PCM connector C-52 terminal 22 <A/T> because of short circuit to ground. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 5: Cranks, Won't Start

Cranks, Won't Start Circuit
- Refer to, Ignition circuit system P.13B-633.

CIRCUIT OPERATION
- Refer to, Ignition circuit system P.13B-633.

COMMENT
- In cases such as the above, the cause is probably no spark, fuel delivery, or fuel quality problems. In addition, foreign materials (water, kerosene, etc.) may be mixed with the fuel.

TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Malfunction of the ignition system.
- Malfunction of the fuel pump system.
- Malfunction of the injector system.
- Malfunction of the ECM <M/T> or PCM <A/T>.
- Contaminated fuel.

DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)

STEP 1. Check the Battery positive voltage.

(1) Measure the Battery positive voltage during cranking.
- A tachometer move.

Q: Does a tachometer move?

YES : Go to Step 2.
NO : Check the battery. Refer to GROUP 54A, Battery – Battery check P.54A-5. Then confirm that the malfunction symptom is eliminated.

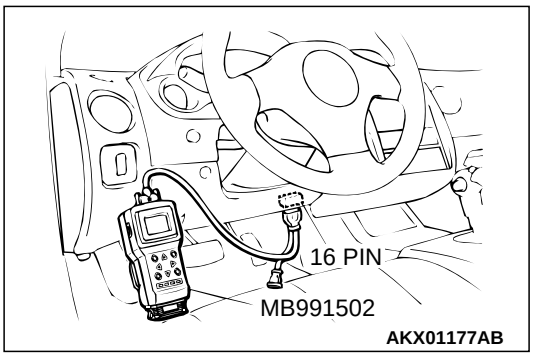
STEP 2. Check the timing belt for breaks.

Q: Is the timing belt good condition?

YES : Go to Step 3.
NO : Replace timing belt. Then confirm that the malfunction symptom is eliminated.

STEP 3 Using scan tool MB991502, check data list.

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

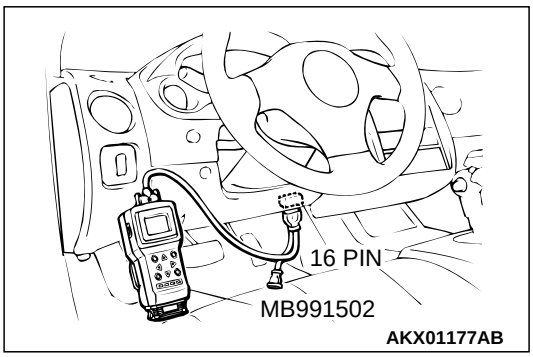


(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the following items in the data List. Refer to Data List Reference Table P.13B-640.
   a. Item 16: Power Supply Voltage.
   b. Item 22: Crankshaft Position Sensor.
   c. Item 21: Engine Coolant Temperature Sensor.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 4.
NO : Repair or replace.Then confirm that the malfunction symptom is eliminated.

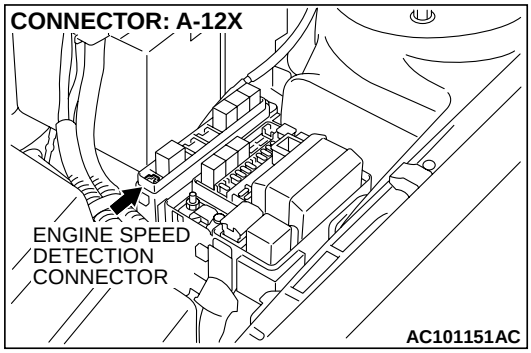
STEP 4. Using scan tool MB991502, check actuator test.



(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the actuator test. Refer to Actuator Test Reference Table P.13B-654.
   a. Item 07: Fuel pump.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Go to Step 5.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.



STEP 5. Check the ignition system.

(1) Connect the tachometer to engine speed detection connector A-12X terminal 1.
(2) Crank the engine.
- A tachometer moves.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Does a tachometer move?

YES : Go to Step 6.
NO : Refer to INSPECTION PROCEDURE 33 – Ignition Circuit System P.13B-633.

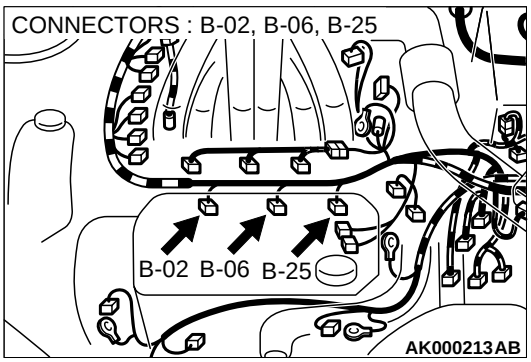
STEP 6. Check the ignition timing.

(1) Check the ignition timing at cranking.

Standard value: 5°BTDC ± 3°

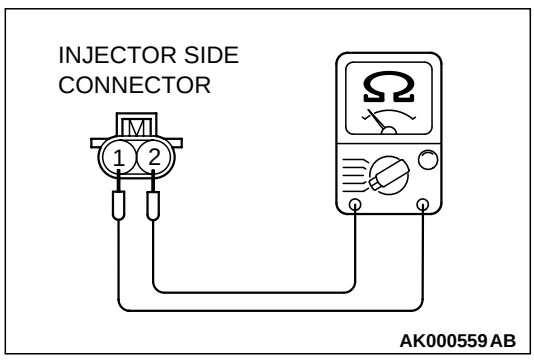
Q: Is the ignition timing normal?

YES : Go to Step 7.
NO : Check that the crankshaft position sensor and timing belt cover are in the correct position. Then confirm that the malfunction symptom is eliminated.



STEP 7. Check the left bank injector.

(1) Disconnect the left bank injector connector B-02, B-06, B-25.



(2) Measure the resistance between each injector side connector terminal 1 and 2.

Standard value: 13 – 16 ohm [at 20°C (68°F)]

Q: Is the resistance standard value?

YES : Go to Step 8.
NO : Replace the faulty injector. Then confirm that the malfunction symptom is eliminated.

STEP 8. Check the right bank injector resistance at injector intermediate connector B-48.

(1) Disconnect the injector intermediate connector B-48.

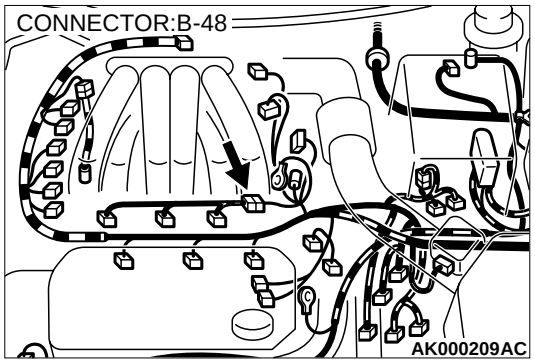
(2) Measure the resistance between each male connector side terminal.

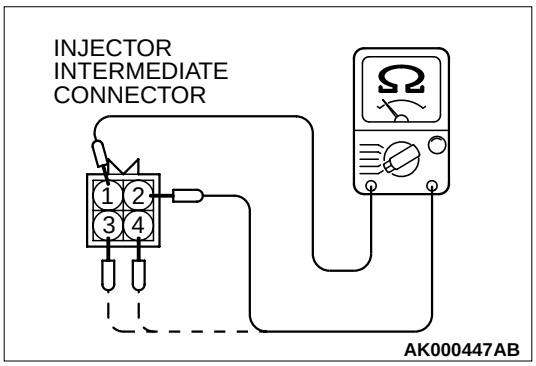
a. Measure the resistance between terminal 1 and 2 when measuring No. 1 cylinder injector.

b. Measure the resistance between terminal 1 and 3 when measuring No. 3 cylinder injector.

c. Measure the resistance between terminal 1 and 4 when measuring No. 5 cylinder injector.

- Resistance should be between 13 and 16 ohm [at 20°C (68°F)].





Q: Is the resistance normal?

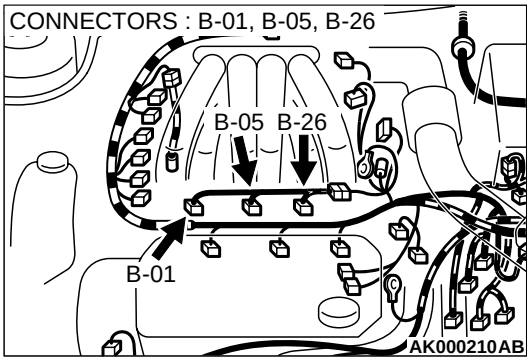
YES : Go to Step 11.

NO : Go to Step 9.

STEP 9. Check the right bank injector.

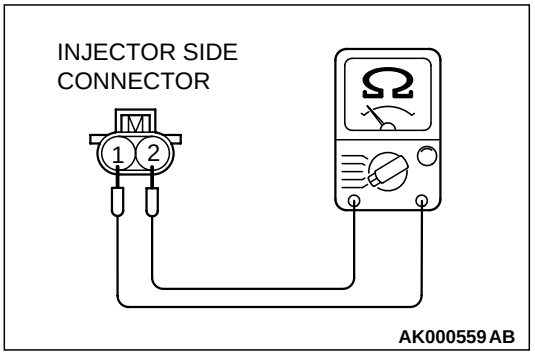
(1) Remove the intake manifold.

(2) Disconnect the right bank injector connector, which deviates from the standard value at Step 8.



(3) Measure the resistance between injector side connector terminal 1 and 2.

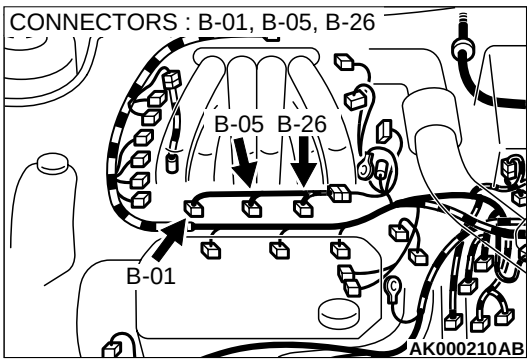
Standard value: 13 – 16 ohm [at 20°C (68°F)]



Q: Is the resistance standard value?

YES : Go to Step 10.

NO : Replace the injector. Then confirm that the malfunction symptom is eliminated.



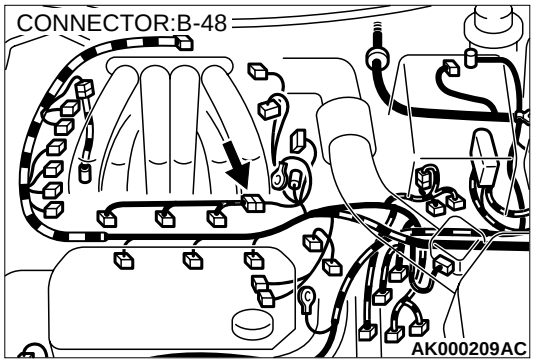
STEP 10. Check connector B-01 or B-05 or B-26 at right bank injector for damage.

(1) Check the injector connector, which deviates from the standard value at Step 8.

Q: Is the connector in good condition?

YES : Repair harness wire between injector intermediate connector and right bank injector connector because of harness damage. Then confirm that the malfunction symptom is eliminated.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

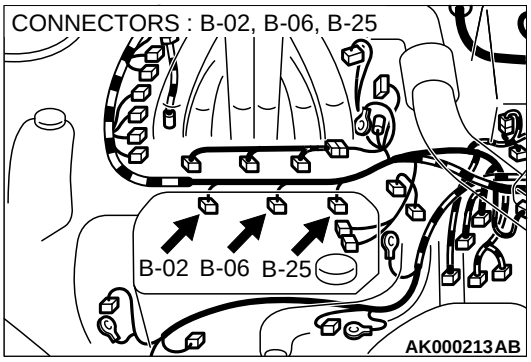


STEP 11. Check connector B-48 at injector intermediate connector for damage.

Q: Is the connector in good condition?

YES : Go to Step 12.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

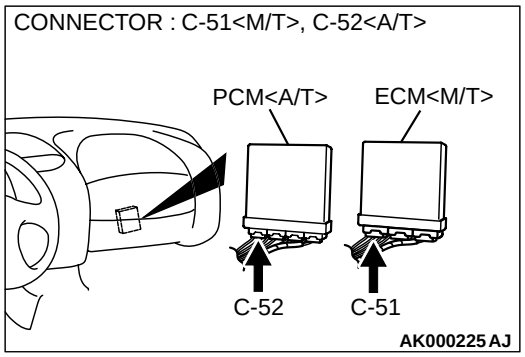


STEP 12. Check connector B-02, B-06, B-25 at left bank injector for damage.

Q: Is the connector in good condition?

YES : Go to Step 13.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

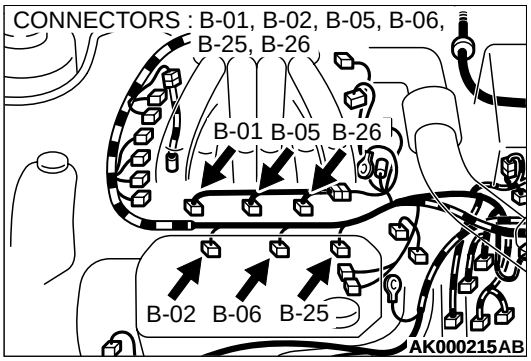


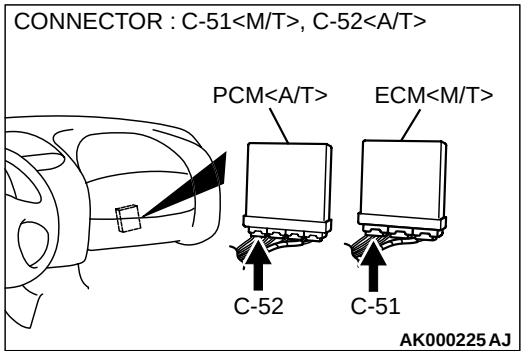
STEP 13. Check connector C-51 at ECM <M/T> or connector C-52 <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.





STEP 14. Check for harness damage between injector connector and ECM connector <M/T> or PCM connector <A/T>.

a. Check the harness wire between injector connector B-01 terminal 2 and ECM connector C-51 terminal 1 <M/T> or PCM connector C-52 terminal 1 <A/T> when checking No. 1 cylinder injector.
b. Check the harness wire between injector connector B-02 terminal 2 and ECM connector C-51 terminal 9 <M/T> or PCM connector C-52 terminal 9 <A/T> when checking No. 2 cylinder injector.
c. Check the harness wire between injector connector B-05 terminal 2 and ECM connector C-51 terminal 24 <M/T> or PCM connector C-52 terminal 24 <A/T> when checking No. 3 cylinder injector.
d. Check the harness wire between injector connector B-06 terminal 2 and ECM connector C-51 terminal 2 <M/T> or PCM connector C-52 terminal 2 <A/T> when checking No. 4 cylinder injector.
e. Check the harness wire between injector connector B-26 terminal 2 and ECM connector C-51 terminal10 <M/T> or PCM connector C-52 terminal 10 <A/T> when checking No. 5 cylinder injector.
f. Check the harness wire between injector connector B-25 terminal 2 and ECM connector C-51 terminal 25 <M/T> or PCM connector C-52 terminal 25 <A/T> when checking No. 6 cylinder injector.

Q: Is the harness wire in good condition?

YES : Check the following items, and repair or replace the defective items.
a. Check the ignition coil, spark plugs, spark plug cables.
b. Check if the injectors are clogged.
c. Check if fuel is contaminated.
d. Check compression.
Then confirm that the malfunction symptom is eliminated.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 6: Starts Up and Dies.

COMMENT

- In such cases as the above, the cause is usually improper air/fuel mixture. It is possible, though less likely, that the spark plugs are generating sparks but the sparks are weak.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the ignition system.
- Malfunction of the injector system.
- Contaminated fuel.
- Poor compression.
- Malfunction of the ECM <M/T> or PCM <A/T>.

TSB Revision

DIAGNOSIS

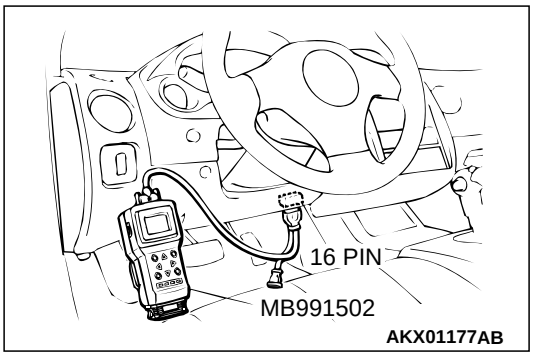
Required Special Tool:
- MB991502: Scan Tool (MUT-II)

STEP 1. Check the battery positive voltage.
(1) Measure the battery positive voltage during cranking.
- The voltage should be 8 volts or more.

Q: Is the voltage normal?
YES : Go to Step 2.
NO : Refer to GROUP 54A, Battery – Battery check P.54A-5.

STEP 2. Using scan tool MB991502, read the diagnostic trouble code (DTC).

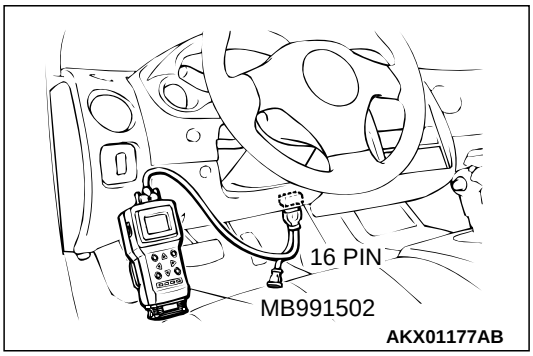
⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.



(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?
YES : Refer to, Diagnostic Trouble Code Chart P.13B-22.
NO : Go to Step 3.

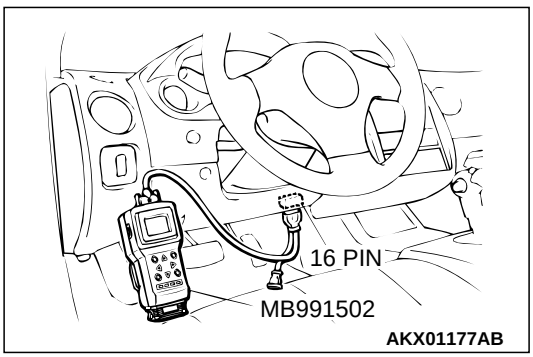
STEP 3. Using scan tool MB991502, check actuator test.



(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the actuator test. Refer to, Actuator Test Reference Table P.13B-654.
a. Item 07: Fuel Pump.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?
YES : Go to Step 4.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 4. Using scan tool MB991502, check data list.



(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the data list. Refer to, Data List Reference Table P.13B-640.
a. Item 21: Engine Coolant Temperature Sensor.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?
YES : Go to Step 5.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

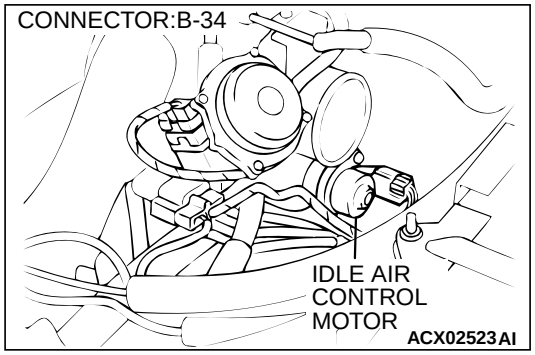
STEP 5. Check the engine start-ability.

(1) Depress the accelerator pedal slightly, and start the engine.

Q: Is the start ability good?

YES : Go to Step 6.
NO : Go to Step 7.

STEP 6. Check the idle air control (IAC) motor operation sound.



(1) Check that the engine coolant temperature is 20°C (68°F) or below.

NOTE: If necessary, you can disconnect the engine coolant temperature sensor connector and connect the harness side of the connector to another engine coolant temperature sensor that is at 20°C (68°F) or below.

(2) Check that the operation sound of the IAC motor can be heard after the ignition is switched to the "ON" position (but without starting the engine).
- An operation sound is heard.

Q: Did you hear the operation sound?

YES : Refer to, Clean the throttle valve area P.13B-677.
NO : Refer to DTC P0506 Idle Control System RPM Lower Than Expected P.13B-478, DTC P0507 Idle Control System RPM Higher Than Expected P.13B-487.

STEP 7. Check the ignition timing.

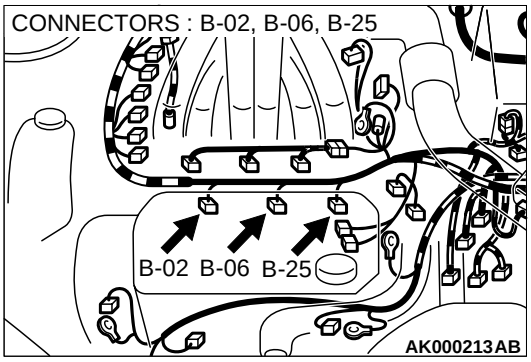
(1) Check the ignition timing at cranking.

Standard value: 5° BTDC ± 3°

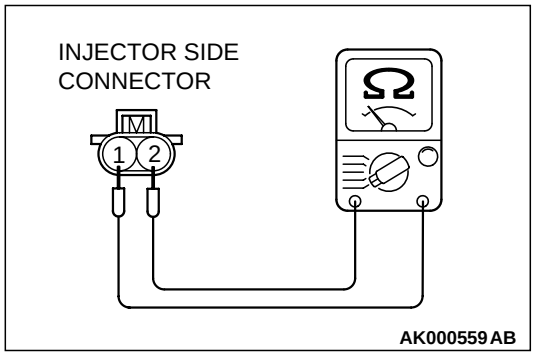
Q: Is the ignition timing normal?

YES : Go to Step 8.
NO : Check that the crankshaft position sensor and timing belt cover are in the correct position. Then confirm that the malfunction symptom is eliminated.

STEP 8. Check the left bank injector.



(1) Disconnect the left bank injector connector B-02, B-06, B-25.



(2) Measure the resistance between each injector side connector terminals 1 and 2.

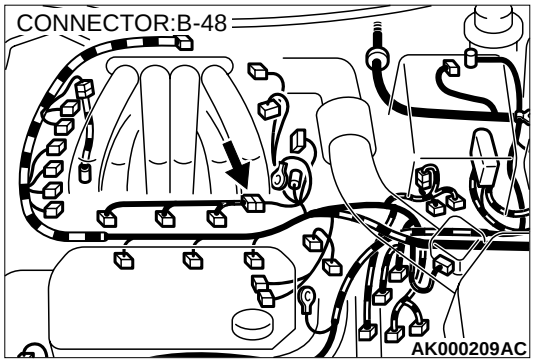
Standard value: 13 – 16 ohm [at 20°C (68°F)]

Q: Is the resistance standard value?

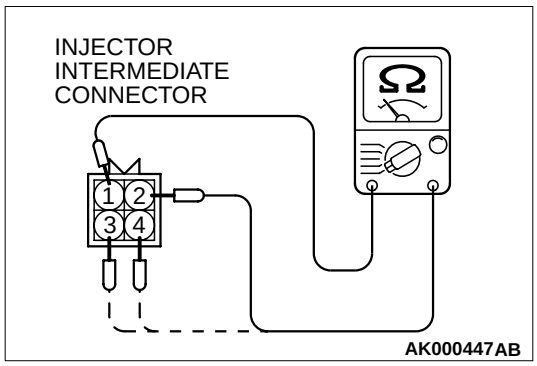
YES : Go to Step 9.

NO : Replace the faulty injector. Then confirm that the malfunction symptom is eliminated.

STEP 9. Check the right bank injector resistance at injector intermediate connector B-48.



(1) Disconnect the injector intermediate connector B-48.



(2) Measure the resistance between each male connector side terminal.

a. Measure the resistance between terminal 1 and 2 when measuring No. 1 cylinder injector.

b. Measure the resistance between terminal 1 and 3 when measuring No. 3 cylinder injector.

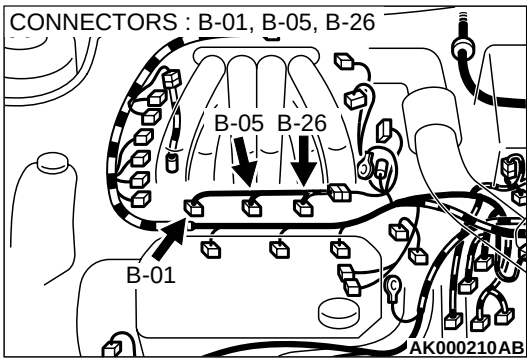
c. Measure the resistance between terminal 1 and 4 when measuring No. 5 cylinder injector.

- Resistance should be between 13 and 16 ohm [at 20°C (68°F)].

Q: Is the resistance normal?

YES : Go to Step 12.

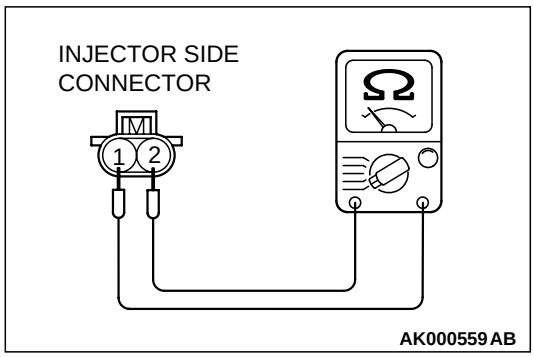
NO : Go to Step 10.



STEP 10. Check the right bank injector.

(1) Remove the intake manifold.

(2) Disconnect the right bank injector connector, which deviates from the standard value at Step 9.



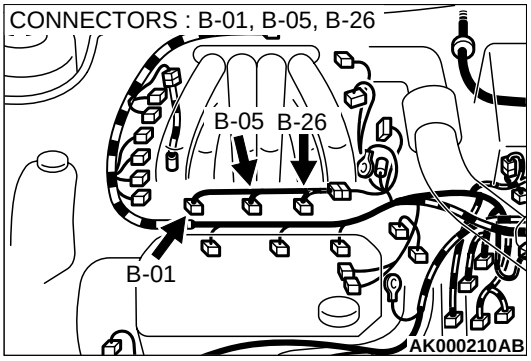
(3) Measure the resistance between injector side connector terminals 1 and 2.

Standard value: 13 – 16 ohm [at 20°C (68°F)]

Q: Is the resistance standard value?

YES : Go to Step 11.

NO : Replace the injector. Then confirm that the malfunction symptom is eliminated.



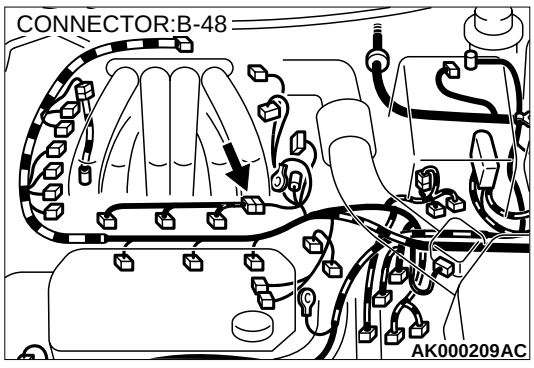
STEP 11. Check connector B-01 or B-05 or B-26 at right bank injector for damage.

(1) Check the injector connector, which deviates from the standard value at Step 9.

Q: Is the connector in good condition?

YES : Repair harness wire between injector intermediate connector and right bank injector connector because of harness damage. Then confirm that the malfunction symptom is eliminated.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

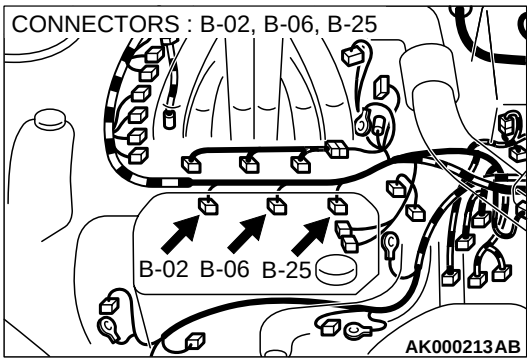


STEP 12. Check connector B-48 at injector intermediate connector for damage.

Q: Is the connector in good condition?

YES : Go to Step 13.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

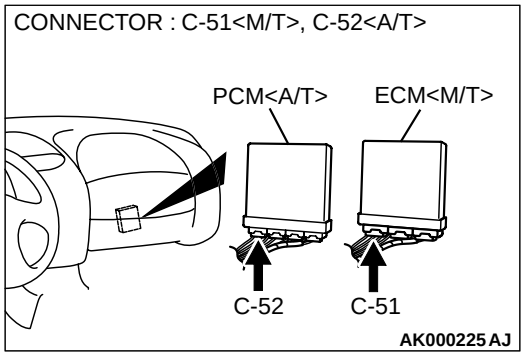


STEP 13. Check connector B-02, B-06, B-25 at left bank injector for damage.

Q: Is the connector in good condition?

YES : Go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

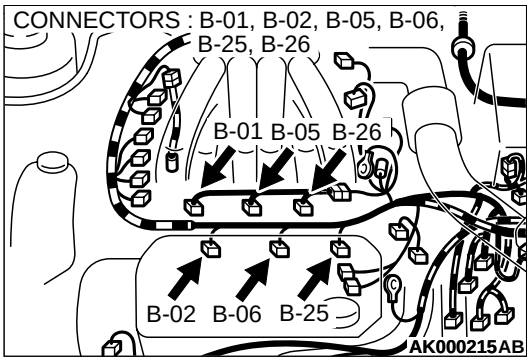


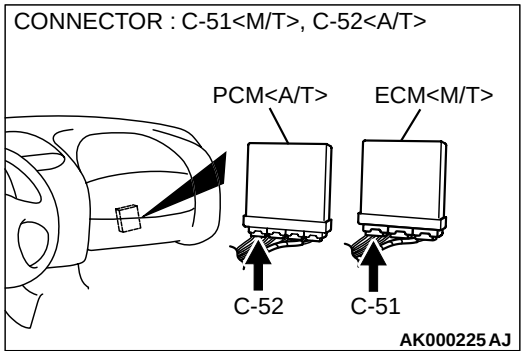
STEP 14. Check connector C-51 at ECM <M/T> or connector C-52 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 15.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.





STEP 15. Check for harness damage between injector connector and ECM connector <M/T> or PCM connector <A/T>.

a. Check the harness wire between injector connector B-01 terminal 2 and ECM connector C-51 terminal 1 <M/T> or PCM connector C-52 terminal 1 <A/T> when checking No. 1 cylinder injector.
b. Check the harness wire between injector connector B-02 terminal 2 and ECM connector C-51 terminal 9 <M/T> or PCM connector C-52 terminal 9 <A/T> when checking No. 2 cylinder injector.
c. Check the harness wire between injector connector B-05 terminal 2 and ECM connector C-51 terminal 24 <M/T> or PCM connector C-52 terminal 24 <A/T> when checking No. 3 cylinder injector.
d. Check the harness wire between injector connector B-06 terminal 2 and ECM connector C-51 terminal 2 <M/T> or PCM connector C-52 terminal 2 <A/T> when checking No. 4 cylinder injector.
e. Check the harness wire between injector connector B-26 terminal 2 and ECM connector C-51 terminal 10 <M/T> or PCM connector C-52 terminal 10 <A/T> when checking No. 5 cylinder injector.
f. Check the harness wire between injector connector B-25 terminal 2 and ECM connector C-51 terminal 25 <M/T> or PCM connector C-52 terminal 25 <A/T> when checking No. 6 cylinder injector.

Q: Is the harness wire in good condition?

YES : Check the following items, and repair or replace the defective items.
a. Check the ignition coil, spark plugs, spark plug cables.
b. Check if the injectors are clogged.
c. Check compression pressure.
d. Check fuel lines for clogging.
e. Check if the foreign materials (water, kerosene, etc.) got into fuel.

Then confirm that the malfunction symptom is eliminated.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 7: Hard Starting

COMMENT

- In cases such as the above, the cause is usually either weak spark, improper air-fuel mixture or low compression.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the ignition system.
- Malfunction of the injector system.
- Poor fuel quality. (Contamination)
- Poor compression.

TSB Revision

DIAGNOSIS

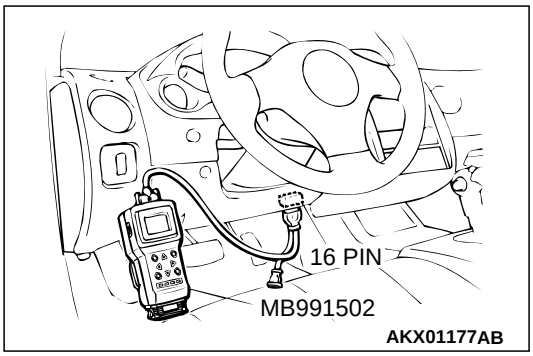
Required Special Tool:
- MB991502: Scan Tool (MUT-II)

STEP 1. Check the battery positive voltage.
(1) Measure the battery positive voltage during cranking.
- The voltage is 8 volts or more.

Q: Is the voltage normal?
YES : Go to Step 2.
NO : Refer to GROUP 54A, Battery – Battery check P.54A-5.

STEP 2. Using scan tool MB991502, read the diagnostic trouble code (DTC).

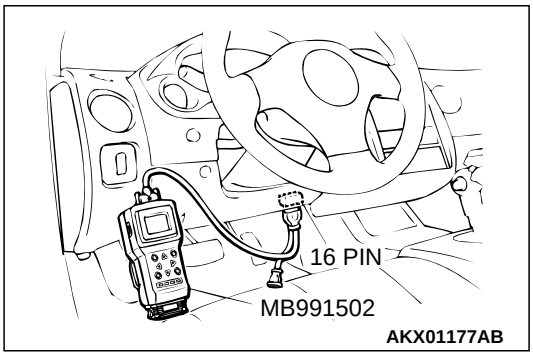
⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.



(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?
YES : Refer to Diagnostic Trouble Code Chart P.13B-22.
NO : Go to Step 3.

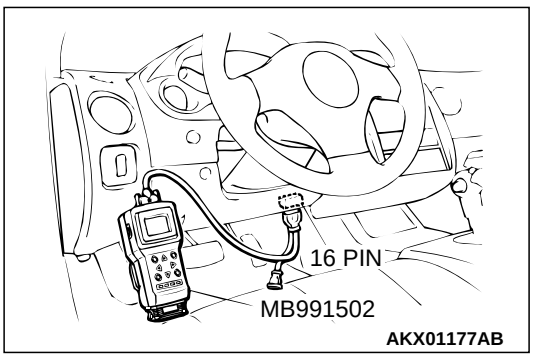
STEP 3. Using scan tool MB991502, check actuator test.



(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the actuator test. Refer to Actuator Test Reference Table P.13B-654.
   a. Item 07: Fuel Pump.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?
YES : Go to Step 4.
NO : Repair or Replace. Then confirm that the malfunction symptom is eliminated.

STEP 4. Using scan tool MB991502, check data list.



(1) Turn the ignition switch the "ON" position.
(2) Check the following items in the data list. Refer to Data List Reference Table P.13B-640.
   a. Item 21: Engine Coolant Temperature Sensor.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?
YES : Go to Step 5.
NO : Repair or Replace. Then confirm that the malfunction symptom is eliminated.

TSB Revision

STEP 5. Check the ignition timing.

(1) Check the ignition timing at cranking.

Standard value: 5°BTDC ± 3°

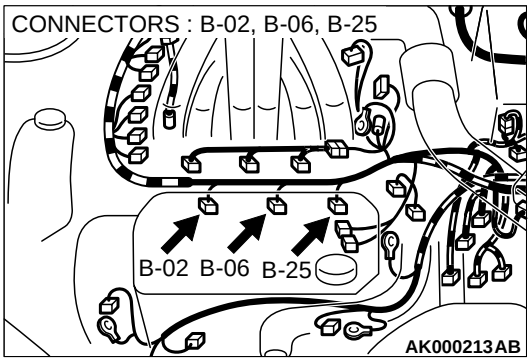
Q: Is the ignition timing normal?

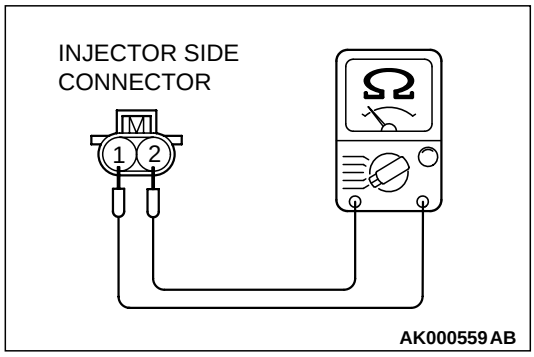
YES : Go to Step 6.

NO : Check that the crankshaft position sensor and timing belt cover are in the correct position. Then confirm that the malfunction symptom is eliminated.

STEP 6. Check the left bank injector.

(1) Disconnect the left bank injector connector B-02, B-06, B-25.





(2) Measure the resistance between each injector side connector terminals 1 and 2.

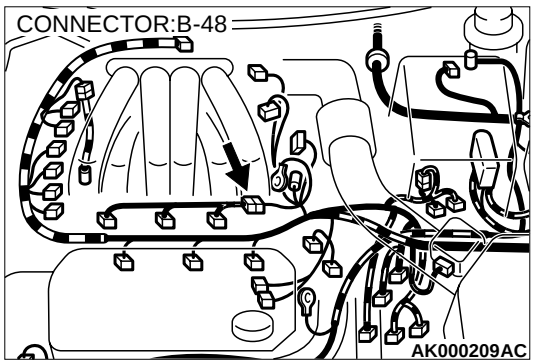
Standard value: 13 – 16 ohm [at 20°C (68°F)]

Q: Is the resistance standard value?

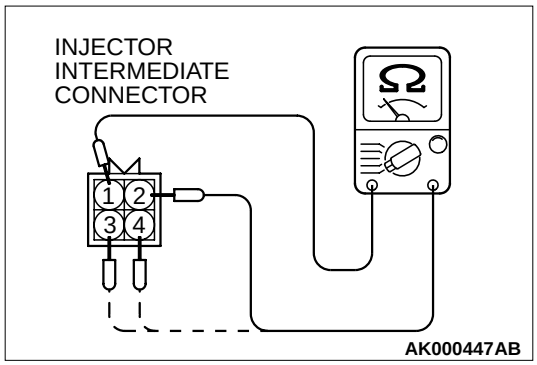
YES : Go to Step 7.

NO : Replace the faulty injector. Then confirm that the malfunction symptom is eliminated.

STEP 7. Check the right bank injector resistance at injector intermediate connector B-48.



(1) Disconnect the injector intermediate connector B-48.



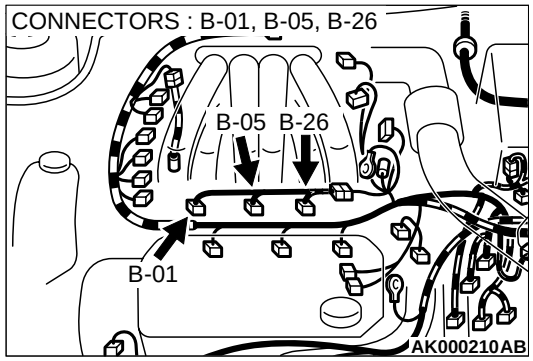
(2) Measure the resistance between each male connector side terminal.
   a. Measure the resistance between terminal 1 and 2 when measuring No. 1 cylinder injector.
   b. Measure the resistance between terminal 1 and 3 when measuring No. 3 cylinder injector.
   c. Measure the resistance between terminal 1 and 4 when measuring No. 5 cylinder injector.

   Resistance should be between 13 and 16 ohm [at 20°C (68°F)].

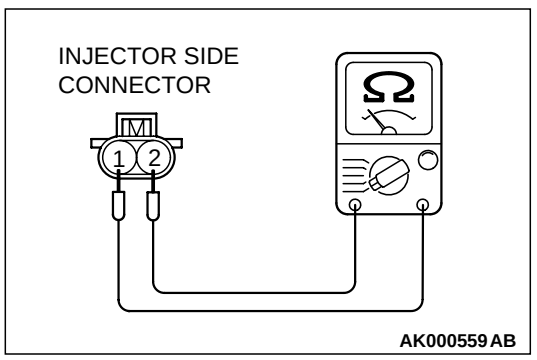
Q: Is the resistance normal?

YES : Go to Step 10.
NO : Go to Step 8.

STEP 8. Check the right bank injector.



(1) Remove the intake manifold.
(2) Disconnect the right bank injector connector, which deviates from the standard value at Step 7.

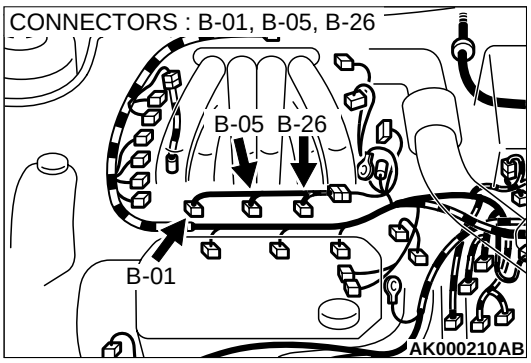


(3) Measure the resistance between injector side connector terminals 1 and 2.

Standard value: 13 – 16 ohm [at 20°C (68°F)]

Q: Is the resistance standard value?

YES : Go to Step 9.
NO : Replace the injector. Then confirm that the malfunction symptom is eliminated.



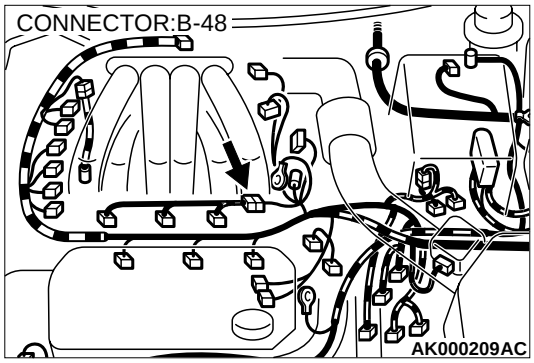
STEP 9. Check connector B-01 or B-05 or B-26 at right bank injector for damage.

(1) Check the injector connector, which deviated from the standard value listed in Step 7.

Q: Is the connector in good condition?

YES : Repair harness wire between injector intermediate connector and right bank injector connector because of harness damage. Then confirm that the malfunction symptom is eliminated.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

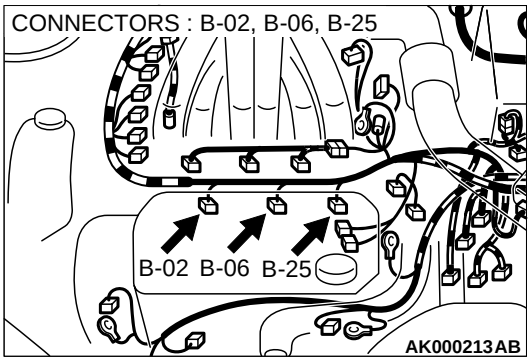


STEP 10. Check connector B-48 at the injector intermediate connector for damage.

Q: Is the connector in good condition?

YES : Go to Step 11.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

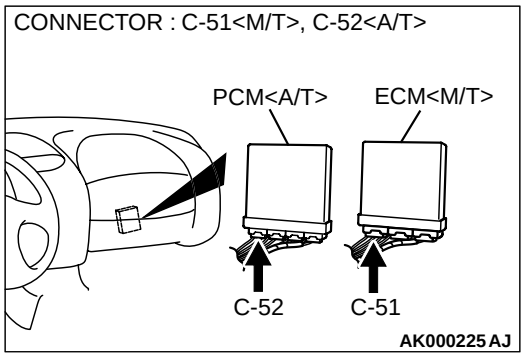


STEP 11. Check connector B-02, B-06, B-25 at the left bank injector for damage.

Q: Is the connector in good condition?

YES : Go to Step 12.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

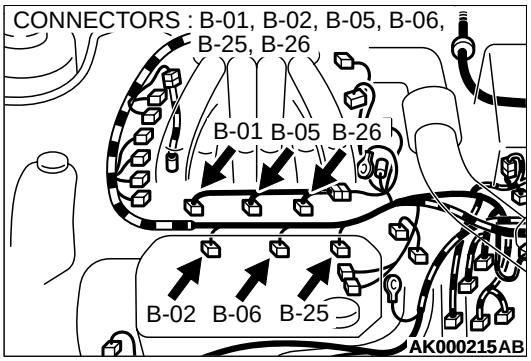


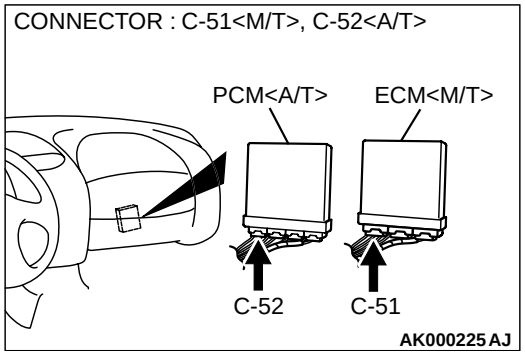
STEP 12. Check the connector C-51 at the ECM <M/T> or connector C-52 at the PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 13.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.





STEP 13. Check for harness damage between injector connector and ECM connector <M/T> or PCM connector <A/T>.

a. Check the harness wire between injector connector B-01 terminal 2 and ECM connector C-51 terminal 1 <M/T> or PCM connector C-52 terminal 1 <A/T> when checking No. 1 cylinder injector.
b. Check the harness wire between injector connector B-02 terminal 2 and ECM connector C-51 terminal 9 <M/T> or PCM connector C-52 terminal 9 <A/T> when checking No. 2 cylinder injector.
c. Check the harness wire between injector connector B-05 terminal 2 and ECM connector C-51 terminal 24 <M/T> or PCM connector C-52 terminal 24 <A/T> when checking No. 3 cylinder injector.
d. Check the harness wire between injector connector B-06 terminal 2 and ECM connector C-51 terminal 2 <M/T> or PCM connector C-52 terminal 2 <A/T> when checking No. 4 cylinder injector.
e. Check the harness wire between injector connector B-26 terminal 2 and ECM connector C-51 terminal 10 <M/T> or PCM connector C-52 terminal 10 <A/T> when checking No. 5 cylinder injector.
f. Check the harness wire between injector connector B-25 terminal 2 and ECM connector C-51 terminal 25 <M/T> or PCM connector C-52 terminal 25 <A/T> when checking No. 6 cylinder injector.

Q: Is the harness wire in good condition?

YES : Check the following items, and repair or replace the defective items.
a. Check the ignition coil, spark plugs, spark plug cables.
b. Check if the injectors are clogged.
c. Check the compression pressure.
d. Check if the foreign materials (water, kerosene, etc.) got into fuel.

Then confirm that the malfunction symptom is eliminated.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 8: Unstable Idle (Rough Idle, Hunting).

COMMENT

- In cases such as the above, the cause is probably the air/fuel mixture or idle air control motor. Other systems affecting idle quality include the ignition system and compression.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the ignition system.
- Malfunction of air/fuel ratio control system.
- Malfunction of the IAC system.
- Malfunction of the evaporative emission purge solenoid system.
- Poor compression pressure.
- Vacuum leak.
- Malfunction of the EGR solenoid system.

TSB Revision

DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)

STEP 1. Check if the battery terminal is disconnected.

Q: Has the battery terminal been disconnected lately?

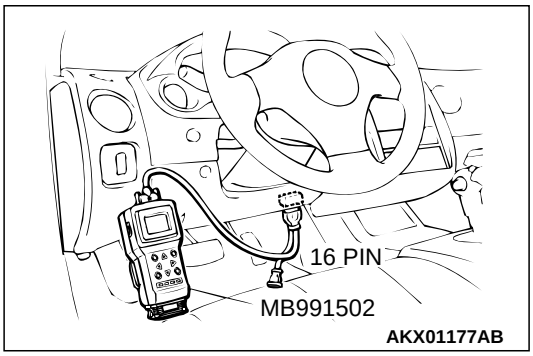
YES : Start the engine and let it run at idle for approximate 10 minutes after engine warm up. Then, if a malfunction occurs, go to Step 2.

NO : Go to Step 2.

STEP 2. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch is to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.



(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart P.13B-22.

NO : Go to Step 3.

STEP 3. Check the engine idling state.

Q: Is it hunting remarkably?

YES : Go to Step 4.

NO : Go to Step 5.

STEP 4. Check the following items.

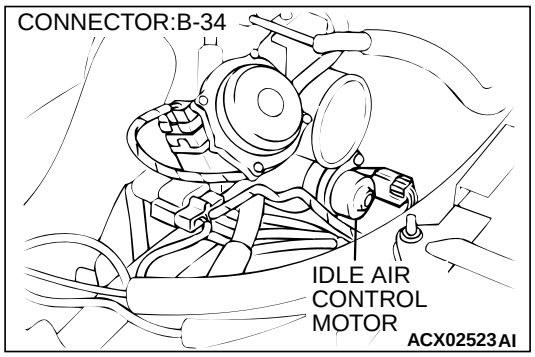
(1) Carry out the following cleaning.
  a. Clean the throttle valve area. Refer to P.13B-677.
(2) After cleaning, confirm that the malfunction symptom is eliminated.

Q: Is the malfunction symptom resolved?

YES : The check is completed.

NO : Check the following items, and repair or replace the defective items.
  a. Broken intake manifold gasket.
  b. Broken air intake hose.
  c. Broken vacuum hose.
  d. Positive crankcase ventilation valve does not operate.

Then confirm that the malfunction symptom is eliminated.



STEP 5. Check the idle air control (IAC) motor operation sound.

(1) Check that the engine coolant temperature is 20°C (68°F) or below.

NOTE: Disconnecting the engine coolant temperature sensor connector and connecting the harness side of the connector to another engine coolant temperature sensor that is at 20°C (68°F) or below is also okay.

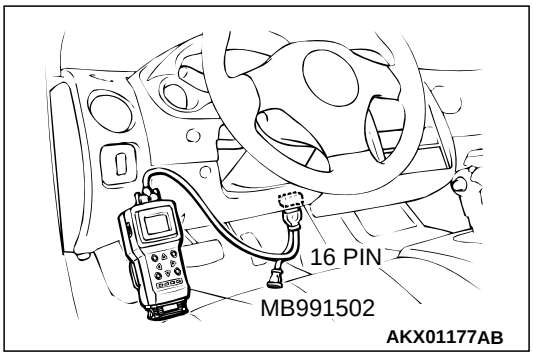
(2) Check the operation sound of the IAC motor can be heard after the ignition is switched to the "ON" position (but without starting the engine).
- An operation sound is heard.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Did you hear the operation sound?

YES : Go to Step 6.

NO : Refer to, DTC P0506 – Idle Control System RPM Lower Than Expected P.13B-478, DTC P0507 – Idle Control System RPM Higher Than Expected P.13B-487.



STEP 6. Using scan tool MB991502, check actuator test items 01, 02, 03, 04, 05, 06: Injector.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.

(2) Turn the ignition switch to the "ON" position.

(3) Check following items in the actuator test. Refer to, Actuator Test Reference Table P.13B-654.

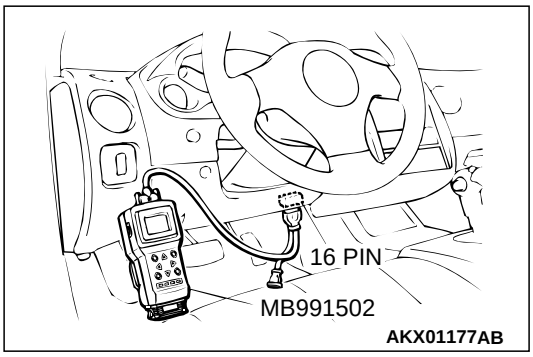
a. Item 01, 02, 03, 04, 05, 06: Injector.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Go to Step 7.

NO : Refer to, DTC P0201, P0203, P0205 – Injector Circuit P.13B-283, DTC P0202, P0204, P0206 – Injector Circuit P.13B-292.

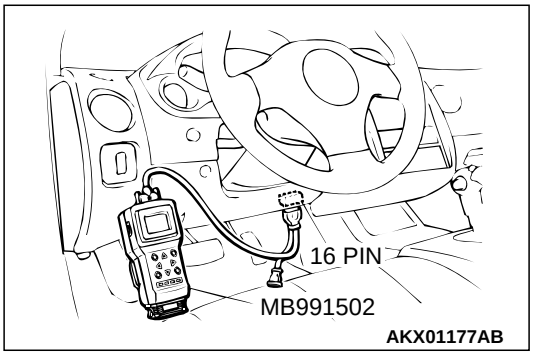


STEP 7. Using scan tool MB991502, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the data list. Refer to, Data List Reference Table P.13B-640.
   a. Item 13: Intake Air Temperature Sensor.
   b. Item 25: Barometric Pressure Sensor.
   c. Item 21: Engine Coolant Temperature Sensor.
   d. Item 69: Right Bank Heated Oxygen Sensor (rear).
   e. Item 39: Right Bank Heated Oxygen Sensor (front).
   f. Item 59: Left Bank Heated Oxygen Sensor (rear).
   g. Item 11: Left Bank Heated Oxygen Sensor (front).
   h. Item 27: Power Steering Pressure Switch.
   i. Item 28: A/C Switch.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 8.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

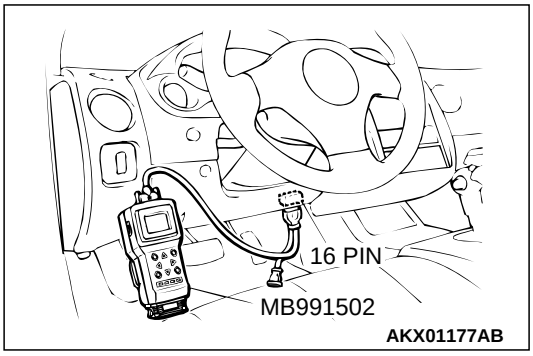


STEP 8. Using scan tool MB991502, check actuator test.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the actuator test. Refer to, Actuator Test Reference Table P.13B-654.
   a. Item 08: Evaporative Emission Purge Solenoid.
   b. Item 10: EGR Solenoid.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 9.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

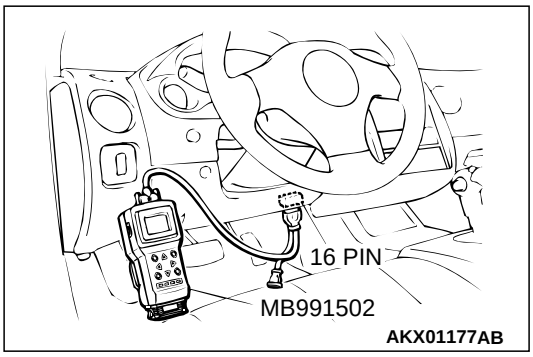


STEP 9. Using scan tool MB991502, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the data list. Refer to, Data List Reference Table P.13B-640.
   a. Item 45: Idle Air Control Motor Position.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Go to Step 10.
NO : Adjust the basic idle speed. Refer to, Basic Idle Speed Adjustment P.13B-679. After adjusting, confirm.



STEP 10. Using scan tool MB991502, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items of the data list. Refer to, Data List Reference Table P.13B-640.
   a. Item 39: Right Bank Heated Oxygen Sensor (front).
   b. Item 11: Left Bank Heated Oxygen Sensor (front).
   - Voltage should fluctuate between 0 – 0.4 volts and 0.6 – 1.0 volts while idling after the engine has been warmed.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 12.
NO : Go to Step 11.

STEP 11. Check the fuel pressure.

Refer to, Fuel Pressure Test P.13B-680.

Q: Is the fuel pressure normal?

YES : a. Check the following items, and repair or replace the defective items.
- Vacuum leak.
- Broken intake manifold gasket.
- Broken air intake hose.
- Broken vacuum hose.
- Positive crankcase ventilation valve does not operate.

b. Injector clogged.

Then confirm that the malfunction symptom is eliminated.

NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 12. Check the ignition timing.

Refer to GROUP 11C, On-vehicle Service – Ignition Timing Check P.11C-5.

Q: Is the ignition timing normal?

YES : Check the following items, and repair or replace the defective items.
   a. Check the ignition coil, spark plugs, spark plug cables.
   b. Check the purge control system.
   c. Check compression pressure.
   d. Check if the foreign materials (water, kerosene, etc.) got into fuel.
   e. Check the EGR control system.

Then confirm that the malfunction symptom is eliminated.

NO : Check that the crankshaft position sensor and timing belt cover are in the correct position. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 9: Idle speed is high (improper idle speed).

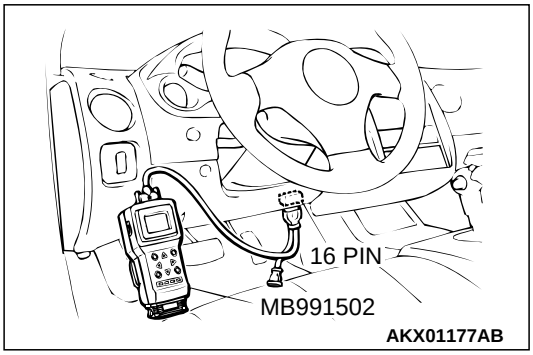
COMMENT
- In such cases as the above, the cause is probably that the intake air volume during idle is too great.

TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Malfunction of the IAC system.
- Malfunction of the throttle body.

DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).



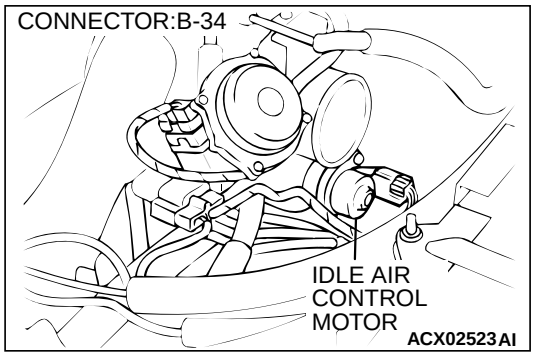
⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart P.13B-22.
NO : Go to Step 2.

STEP 2. Check the idle air control (IAC) motor operation sound.



(1) Check that the engine coolant temperature is 20°C (68°F) or below.

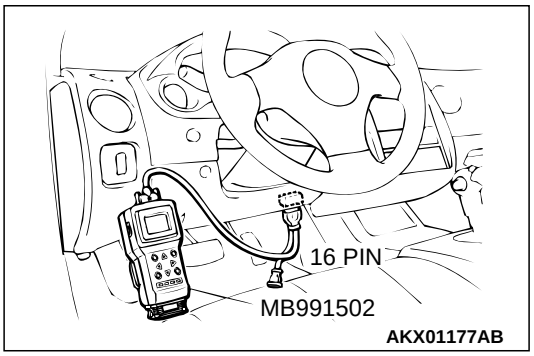
NOTE: Disconnecting the engine coolant temperature sensor connector and connecting the harness side of the connector to another engine coolant temperature sensor that is at 20°C (68°F) or below is also okay.

(2) Check the operation sound of the IAC motor can be heard after the ignition is switched to the "ON" position (but without starting the engine).
- An operation sound should be heard.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Did you hear the operation sound?

YES : Go to Step 3.
NO : Refer to, DTC P0506 – Idle Control System RPM Lower Than Expected P.13B-478, DTC P0507 – Idle Control System RPM Higher Than Expected P.13B-487.



STEP 3. Using scan tool MB991502, check data list.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the following items in the data list. Refer to, Data List Reference Table P.13B-640.
  a. Item 21: Engine Coolant Temperature Sensor.
  b. Item 28: A/C Switch.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 4.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 4. Adjust the basic idle speed.

Refer to, Basic Idle Speed Adjustment for the adjustment procedure P.13B-679.

Standard value: 700 ± 50 r/min

Q: Is the Idle speed normal?

YES : Refer to, Clean the throttle valve area P.13B-677.
NO : The check is completed.

INSPECTION PROCEDURE 10: Idle Speed Is Low (Improper Idle Speed).

COMMENT

- In cases such as the above, the cause is probably that the intake air volume during idle is too small.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

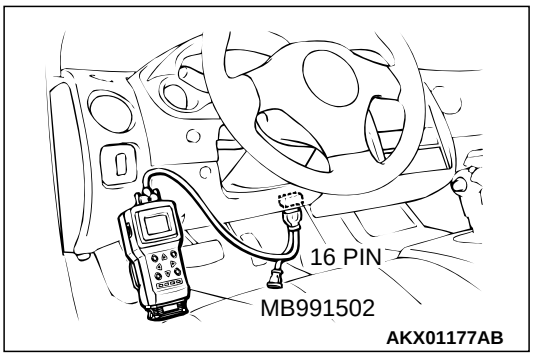
- Malfunction of the IAC system.
- Malfunction of the throttle body.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).



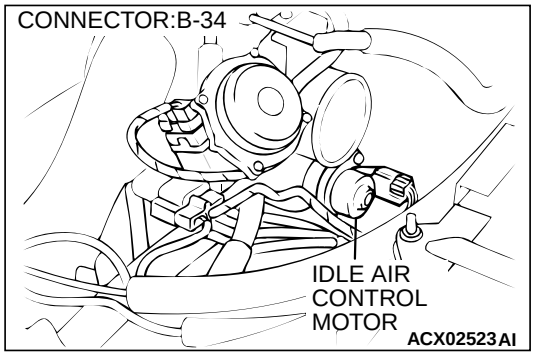
⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC output?

YES : Refer to, Diagnostic Trouble Code Chart P.13B-22.
NO : Go to Step 2.

STEP 2. Check the idle air control (IAC) motor operation sound.



(1) Check that the engine coolant temperature is 20°C (68°F) or below.

NOTE: If necessary, you can disconnect the engine coolant temperature sensor connector and connect the harness side of the connector to another engine coolant temperature sensor that is at 20°C (68°F) or below.

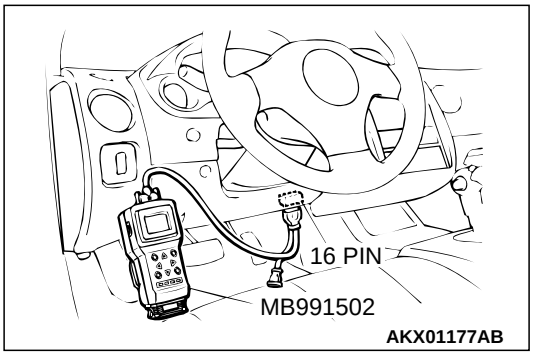
(2) Check that the operation sound of the IAC motor can be heard after the ignition is switched to the "ON" position (but without starting the engine).
- An operation sound should be heard.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Did you hear the operation sound?

YES : Go to Step 3.
NO : Refer to, DTC P0506 – Idle Control System RPM Lower Than Expected P.13B-478, DTC P0507 – Idle Control System RPM Higher Than Expected P.13B-487.

STEP 3. Using scan tool MB991502, check data list.



⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the following items in the data list. Refer to, Data List Reference Table P.13B-640.
   a. Item 21: Engine Coolant Temperature Sensor.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 4.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

TSB Revision

STEP 4. Adjust the basic idle speed.
Refer to, Basic Idle Speed Adjustment for the adjustment procedure P.13B-679.

Standard value: 700 ± 50 r/min

Q: Is the idle speed normal?

YES : Refer to, Clean the throttle valve area P.13B-677.
NO : The check is completed.

INSPECTION PROCEDURE 11: When the engine is cold, it stalls at idle (die out).

COMMENT

- In such cases as the above, the air/fuel mixture may be inappropriate when the engine is cold.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the IAC system.
- Malfunction of the throttle body.
- Malfunction of the injector system.
- Malfunction of the ignition system.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Check if the battery terminal is disconnected.

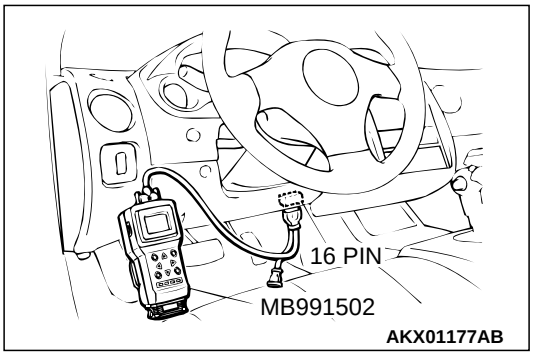
Q: Has the battery terminal been disconnected lately?

YES : Start the engine and let it run at idle for approximate 10 minutes after engine warm up. Then, if a malfunction occurs, go to step 2.
NO : Go to Step 2.

STEP 2. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart P.13B-22.
NO : Go to Step 3.

STEP 3. Checking by operating the accelerator pedal.

Q: Does the engine stall right after the accelerator pedal is released?

YES : Refer to, Clean the throttle valve area P.13B-677.
NO : Go to Step 4.

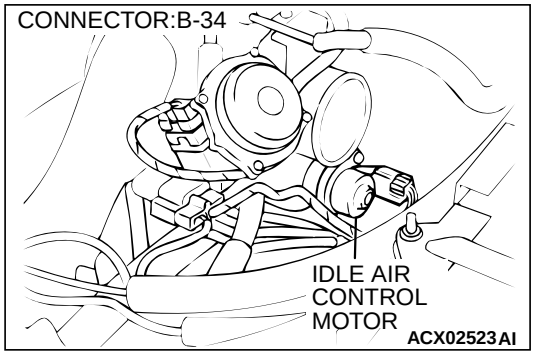
STEP 4. Check the engine idling.

Q: Is the idling good enough after warm up?

YES : Go to Step 5.

NO : Refer to, INSPECTION PROCEDURE 8 – Unstable Idle (Rough Idle, Hunting) P.13B-560.

STEP 5. Check the idle air control (IAC) motor operation sound.



(1) Check that the engine coolant temperature is 20°C (68°F) or below.

NOTE: If necessary, you can disconnect the engine coolant temperature sensor connector and connect the harness side of the connector to another engine coolant temperature sensor that is at 20°C (68°F) or below.

(2) Check the operation sound of the IAC motor can be heard after the ignition is switched to the "ON" position (but without starting the engine).
- An operation sound should be heard.

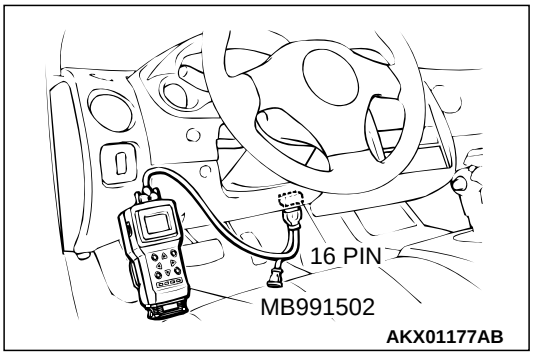
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Did you hear the operation sound?

YES : Go to Step 6.

NO : Refer to, DTC P0506 – Idle Control System RPM Lower Than Expected P.13B-478, DTC P0507 – Idle Control System RPM Higher Than Expected P.13B-487.

STEP 6. Using scan tool MB991502, check actuator test items 01, 02, 03, 04, 05, 06: Injector.



⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.

(2) Turn the ignition switch to the "ON" position.

(3) Check following items in the actuator test. Refer to, Actuator Test Reference Table P.13B-654.

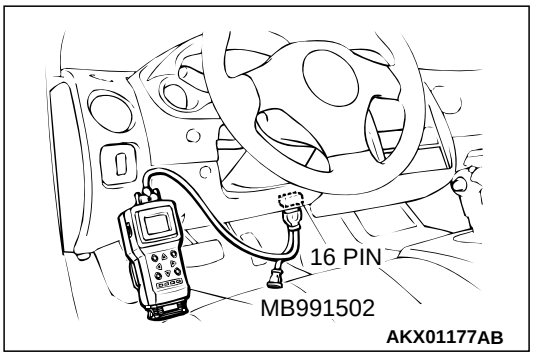
a. Item 01, 02, 03, 04, 05, 06: Injector.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Go to Step 7.

NO : Refer to, DTC P0201, P0203, P0205 – Injector Circuit P.13B-283, DTC P0202, P0204, P0206 – Injector Circuit P.13B-292.



STEP 7. Using scan tool MB991502, check data list.
(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the data list. Refer to, Data List Reference Table P.13B-640.
  a. Item 21: Engine Coolant Temperature Sensor.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?
YES : Go to Step 8.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 8. Check the fuel pressure.
Refer to, Fuel Pressure Test P.13B-680.

Q: Is the fuel pressure normal?
YES : Go to Step 9.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 9. Check the ignition timing.
Refer to GROUP 11C, On-vehicle Service – Ignition Timing Check P.11C-5.

Q: Is the ignition timing normal?
YES : Check the following items, and repair or replace the defective items.
  a. Check the ignition coil, spark plugs, spark plug cables.
  b. Check compression pressure.
  c. Check the engine oil viscosity.
Then confirm that the malfunction symptom is eliminated.
NO : Check that the crankshaft position sensor and timing belt cover are in the correct position. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 12: When the Engine Is Hot, It Stalls at Idle (Die Out).

COMMENT
- In cases such as the above, the ignition system, air/fuel mixture, idle air control motor or compression pressure may be faulty. In addition, if the engine suddenly stalls, the cause may also be a loose connector.

TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Malfunction of the ignition system.
- Malfunction of air/fuel ratio control system.
- Malfunction of the IAC system.
- Vacuum leak.
- Improper connector contact.

DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)

TSB Revision

STEP 1. Check if the battery terminal is disconnected.

Q: Has the battery terminal been disconnected lately?

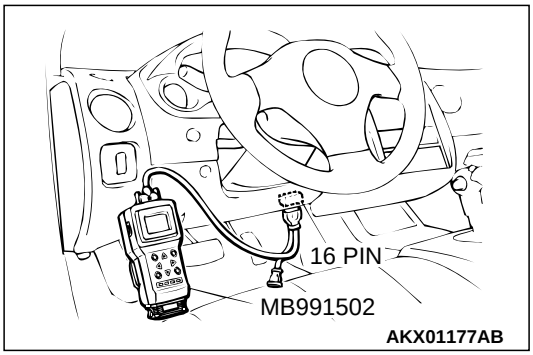
YES : Start the engine and let it run at idle for approximate 10 minutes after engine warm up. Then, if a malfunction occurs, go to step 2.

NO : Go to Step 2.

STEP 2. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.



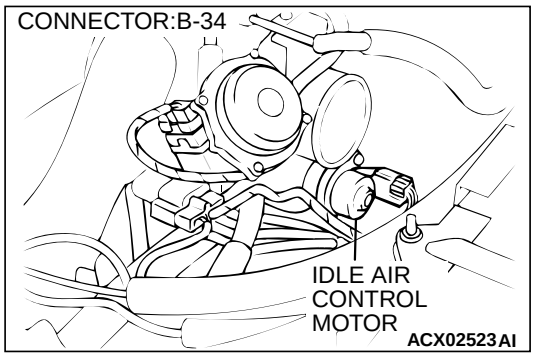
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart P.13B-22.

NO : Go to Step 3.

STEP 3. Check the idle air control (IAC) motor operation sound.



(1) Check that the engine coolant temperature is 20°C (68°F) or below.

NOTE: If necessary, you can disconnect the engine coolant temperature sensor connector and connect the harness side of the connector to another engine coolant temperature sensor that is at 20°C (68°F) or below.

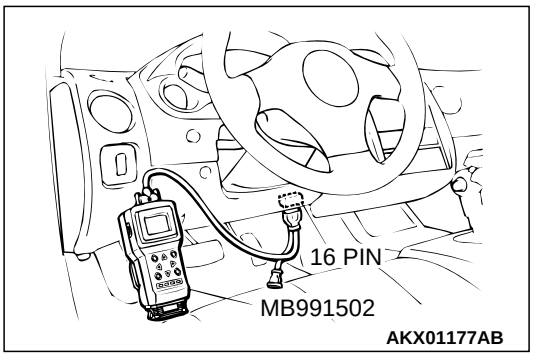
(2) Check that the operation sound of the IAC motor can be heard after the ignition is switched to the "ON" position (but without starting the engine).
- An operation sound should be heard.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Did you hear the operation sound?

YES : Go to Step 4.

NO : Refer to, DTC P0506 – Idle Control System RPM Lower Than Expected P.13B-478, DTC P0507 – Idle Control System RPM Higher Than Expected P.13B-487.



STEP 4. Using scan tool MB991502, check actuator test items 01, 02, 03, 04, 05, 06: Injector.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check following items in the actuator test. Refer to, Actuator Test Reference Table P.13B-654.
  a. Item 01, 02, 03, 04, 05, 06: Injector.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Go to Step 5.
NO : Refer to, DTC P0201, P0203, P0205 – Injector Circuit P.13B-283, DTC P0202, P0204, P0206 – Injector Circuit P.13B-292.

STEP 5. Checking by operating the accelerator pedal.

Q: Does the engine stall right after the accelerator pedal is released?

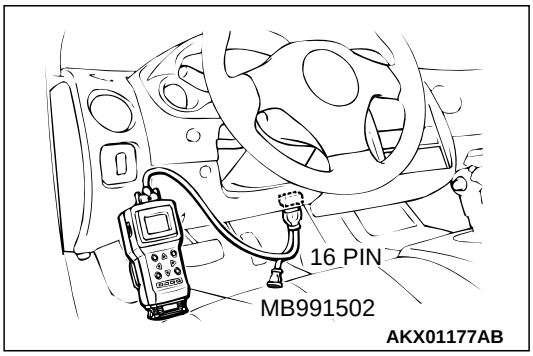
YES : Refer to, Clean the throttle valve area P.13B-677.
NO : Go to Step 6.

STEP 6. Engine stall reproduction test.

Q: Is it easy to reproduce the engine stall?

YES : Go to Step 7.
NO : Check if the following signals change suddenly by wiggling the circuit harness and connectors.
  a. Crankshaft position sensor signal.
  b. Volume air flow sensor signal.
  c. Injector drive signal.
  d. Primary and secondary ignition signal.
  e. Fuel pump drive signal.
  f. PCM or ECM power supply voltage.

Repair or replace. Then confirm that the malfunction symptom is eliminated.



STEP 7. Using scan tool MB991502, check data list.

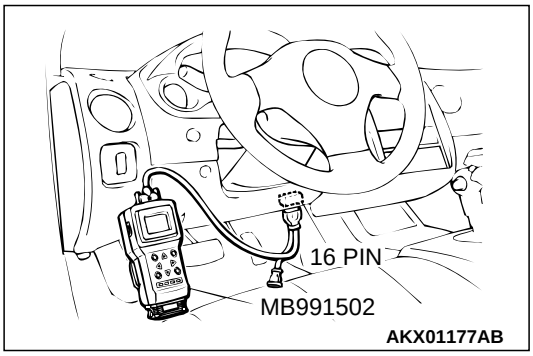
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the following items in the data list. Refer to, Data List Reference Table P.13B-640.
  a. Item 13: Intake Air Temperature Sensor.
  b. Item 25: Barometric Pressure Sensor.
  c. Item 21: Engine Coolant Temperature Sensor.
  d. Item 69: Right Bank Heated Oxygen Sensor (rear).
  e. Item 39: Right Bank Heated Oxygen Sensor (front).
  f. Item 59: Left Bank Heated Oxygen Sensor (rear).
  g. Item 11: Left Bank Heated Oxygen Sensor (front).
  h. Item 27: Power Steering Pressure Switch.
  i. Item 28: A/C Switch.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 8.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

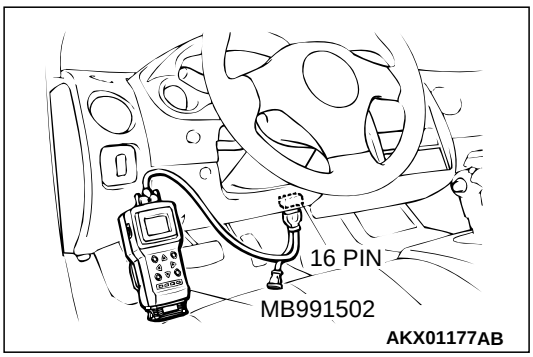


STEP 8. Using scan tool MB991502, check actuator test.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the actuator test. Refer to, Actuator Test Reference Table P.13B-654.
  a. Item 10: EGR Solenoid.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Go to Step 9.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.



STEP 9. Using scan tool MB991502, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items of the data list. Refer to, Data List Reference Table P.13B-640.
  a. Item 39: Right Bank Heated Oxygen Sensor (front).
  b. Item 11: Left Bank Heated Oxygen Sensor (front).
  - Fluctuates between 0 – 0.4 volts and 0.6 – 1.0 volts while idling after the engine has been warmed.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

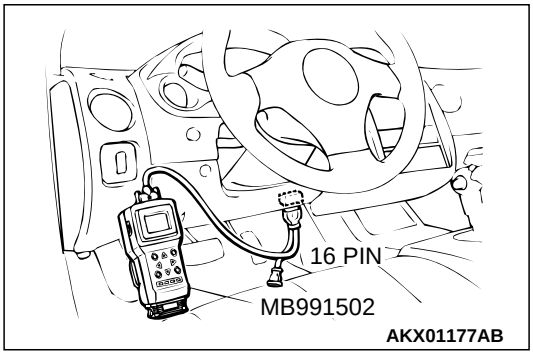
YES : Go to Step 12.
NO : Go to Step 10.

STEP 10. Check the fuel pressure.
Refer to, Fuel Pressure Test P.13B-680.

Q: Is the fuel pressure normal?

YES : Go to Step 11.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 11. Using scan tool MB991502, check data list.



⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the following items in the data list. Refer to, Data List Reference Table P.13B-640.
  a. Item 45: Idle Air Control Motor Position.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Check the following items, and repair or replace the defective items.
  a. Vacuum leak.
    - Broken intake manifold gasket.
    - Broken air intake hose.
    - Broken vacuum hose.
    - Positive crankcase ventilation valve does not operate.
  b. Injector clogged.

Then confirm that the malfunction symptom is eliminated.
NO : Adjusting the basic idle speed. Refer to, Basic Idle Speed Adjustment P.13B-679.

STEP 12. Check the ignition timing.
Refer to GROUP 11C, On-vehicle Service – Ignition Timing Check P.11C-5.

Q: Is the ignition timing normal?

YES : Check the following items, and repair or replace the defective items.
  a. Check the ignition coil, spark plugs, spark plug cables.
  b. Check if the injectors are clogged.
  c. Check compression pressure.
  d. Check if the foreign materials (water, kerosene, etc.) got into fuel.

Then confirm that the malfunction symptom is eliminated.
NO : Check that the crankshaft position sensor and timing cover are in the correct position. Then confirm that the malfunction symptom is eliminated.

TSB Revision

INSPECTION PROCEDURE 13: The Engine Stalls when Accelerating (Pass Out).

COMMENT

- In case such as the above, the cause is probably misfiring due to a weak spark, or an inappropriate air/fuel mixture when the accelerator pedal.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

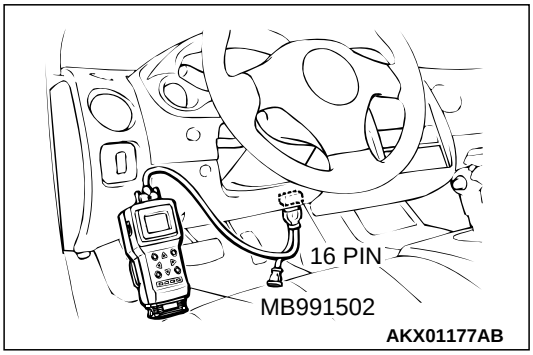
- Vacuum leak.
- Malfunction of the ignition system.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).



⚠ CAUTION

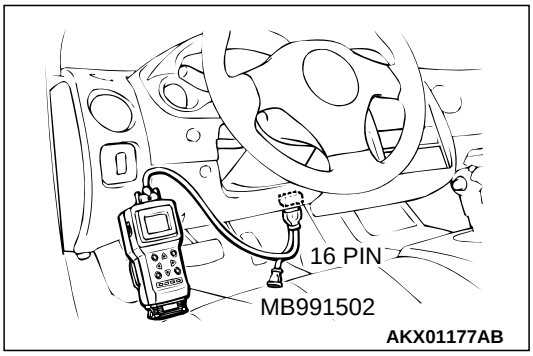
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart P.13B-22.
NO : Go to Step 2.

STEP 2. Using scan tool MB991502, check actuator test.



(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the actuator test. Refer to, Actuator Test Reference Table P.13B-654.
  a. Item 10: EGR Solenoid.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Check the following items, and repair or replace the defective items.
  a. Check the ignition coil, spark plugs, spark plug cables.
  b. Check for vacuum leaks.
    - Broken intake manifold gasket.
    - Broken or disconnected vacuum hose.
    - Improper operation of the PCV valve.
    - Broken air intake hose.

  Then confirm that the malfunction symptom is eliminated.

NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 14: The engine stalls when decelerating.

COMMENT

- The intake air volume may be insufficient due to a defective idle air control motor system.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the IAC system.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Check if the battery terminal is disconnected.

Q: Has the battery terminal been disconnected lately?

YES : Start the engine and let it run at idle for approximate 10 minutes after engine warm up. Then if a malfunction occurs, go to step 2.

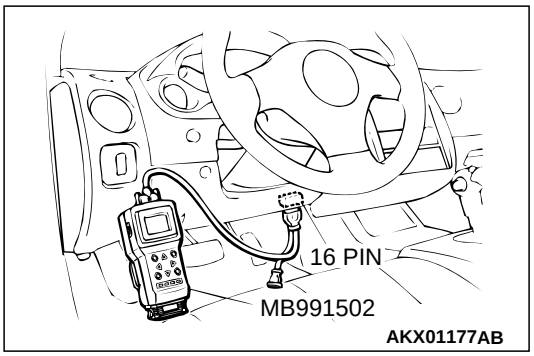
NO : Go to Step 2.

STEP 2. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.



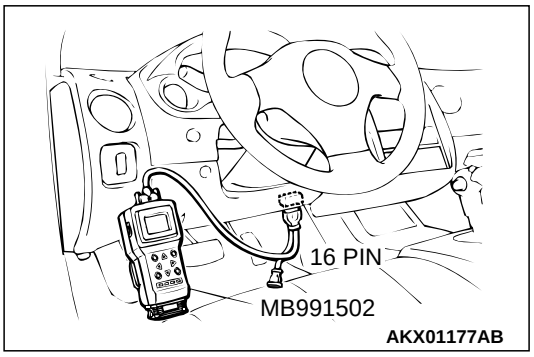
Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart P.13B-22.

NO : Go to Step 3.

STEP 3. Using scan tool MB991502, check data list.

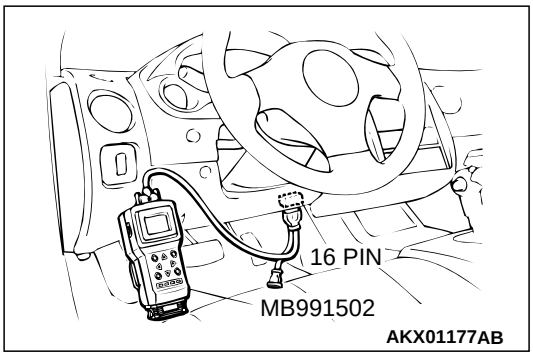
(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the data list. Refer to, Data List Reference Table P.13B-640.
   a. Item 14: Throttle Position Sensor.
(3) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the sensor operating properly?

YES : Go to Step 4.

NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

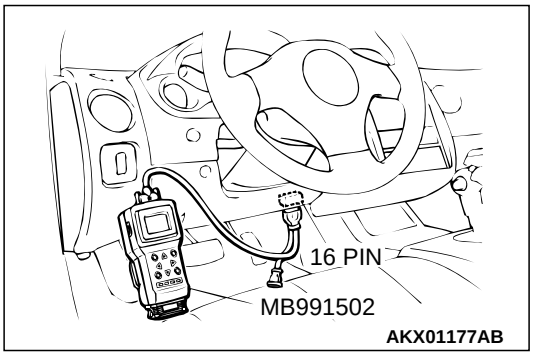


STEP 4. Using scan tool MB991502, check actuator test.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the actuator test. Refer to, Actuator Test Reference Table P.13B-654.
  a. Item 10: EGR Solenoid.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Go to Step 5.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.



STEP 5. Using scan tool MB991502, check data list item 45: Idle Air Control Position.

(1) Start the engine and run at idle.
(2) Set scan tool MB991502 to the data reading mode for item 45, Idle Air Control Position.
  a. The idle air control motor should drop to the 0 – 2 position during deceleration (from 1,000 r/min or more).
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operation properly?

YES : Check the following items, and repair, replace or clean the defective sections.
  a. Check the ignition coil, spark plugs, spark plug cables.
  b. Check the throttle valve area.
Then confirm that the malfunction symptom is eliminated.
NO : Refer to, DTC P0500 – Vehicle Speed Sensor <M/T> P.13B-469, or GROUP 23A, Automatic Transaxle Diagnosis – Diagnostic Trouble Code Procedures – DTC 23 Output Shaft Speed System <A/T>P.23A-115.

INSPECTION PROCEDURE 15: Hesitation, sag or stumble.

COMMENT

- In cases such as the above, the ignition system, air/fuel mixture or compression pressure may be defective.

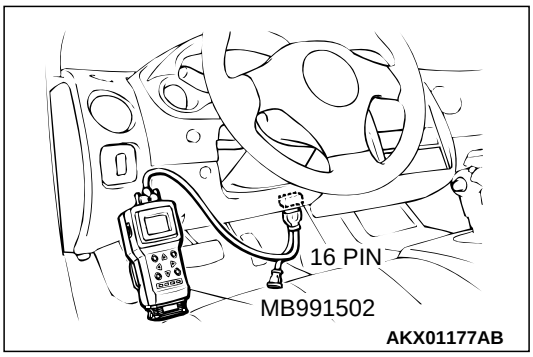
TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the ignition system.
- Malfunction of air/fuel ratio control system.
- Malfunction of the fuel supply system.
- Malfunction of the EGR solenoid system.
- Poor compression pressure.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).

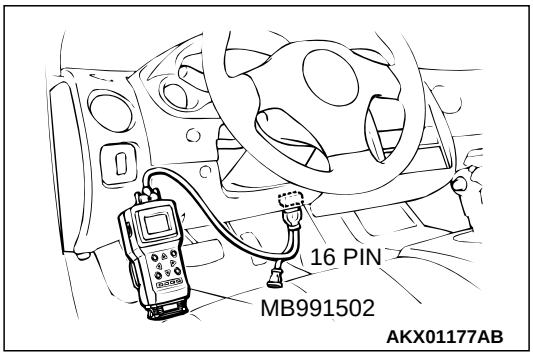
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart P.13B-22.
NO : Go to Step 2.



STEP 2. Using scan tool MB991502, check actuator test items 01, 02, 03, 04, 05, 06: Injector.

(1) Check following items in the actuator test. Refer to, Actuator Test Reference Table P.13B-654.
  a. Item 01, 02, 03, 04, 05, 06: Injector.
(2) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

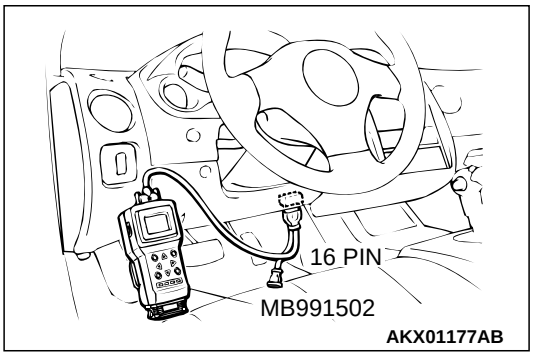
YES : Go to Step 3.
NO : Refer to, DTC P0201, P0203, P0205 – Injector Circuit P.13B-283, DTC P0202, P0204, P0206 – Injector Circuit P.13B-292.

STEP 3. Check the ignition timing.

(1) Refer to GROUP 11C, On-vehicle Service – Ignition Timing Check P.11C-5.

Q: Is the ignition timing normal?

YES : Go to Step 4.
NO : Check that the crankshaft position sensor and timing belt cover are in the correct position. Then confirm that the malfunction symptom is eliminated.



STEP 4. Using scan tool MB991502, check data list.

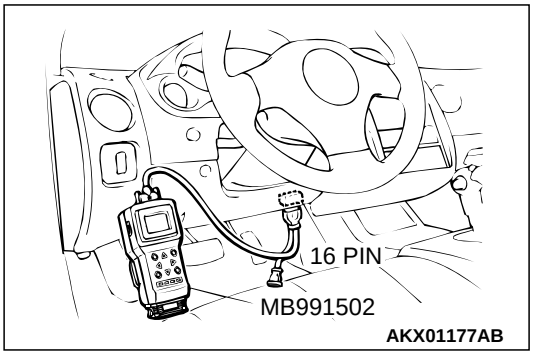
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the following items in the data list. Refer to, Data List Reference Table P.13B-640.
  a. Item 13: Intake Air Temperature Sensor.
  b. Item 25: Barometric pressure Sensor.
  c. Item 21: Engine Coolant Temperature Sensor.
  d. Item 14: Throttle Position Sensor.
  e. Item 69: Right Bank Heated Oxygen Sensor (rear).
  f. Item 39: Right Bank Heated Oxygen Sensor (front).
  g. Item 59: Left Bank Heated Oxygen Sensor (rear).
  h. Item 11: Left Bank Heated Oxygen Sensor (front).
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 5.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

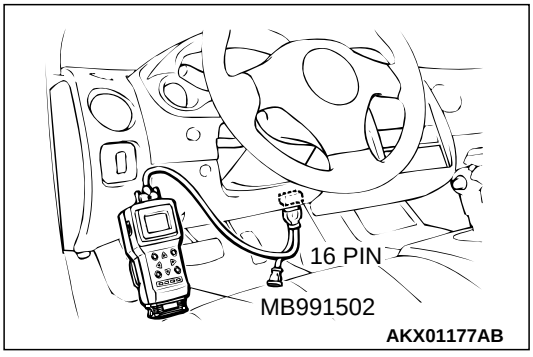


STEP 5. Using scan tool MB991502, check actuator test.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the actuator test. Refer to, Actuator Test Reference Table P.13B-654.
  a. Item 10: EGR Solenoid.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Go to Step 6.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.



STEP 6. Using scan tool MB991502, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items of data list. Refer to, Data List Reference Table P.13B-640.
  a. Item 39: Right Bank Heated Oxygen Sensor (front).
  b. Item 11: Left Bank Heated Oxygen Sensor (front).
  - Voltage should fluctuate between 0 – 0.4 volt and 0.6 – 1.0 volt while idling after the engine has warmed-up.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 8.
NO : Go to Step 7.

STEP 7. Check the fuel pressure.
Refer to, Fuel Pressure Test P.13B-680.

Q: Is the fuel pressure normal?

YES : Check the following items, and repair or replace the defective items.
a. Vacuum leak.
- Broken intake manifold gasket.
- Broken air intake hose.
- Broken vacuum hose.
- Positive crankcase ventilation valve does not operate.

b. Injector clogged.

Then confirm that the malfunction symptom is eliminated.

NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 8. Check the fuel pressure.
Refer to, Fuel Pressure Test P.13B-680.

Q: Is the fuel pressure normal?

YES : Check the following items, and repair or replace the defective items.
a. Check the ignition coil, spark plugs, spark plug cables.
b. Check the EGR system.
c. Check compression pressure.
d. Check the fuel filter or fuel line for clogging.

Then confirm that the malfunction symptom is eliminated.

NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

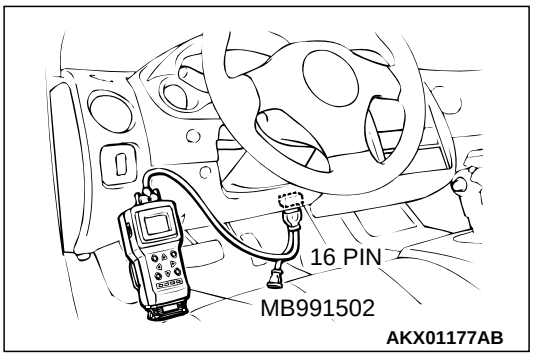
INSPECTION PROCEDURE 16: Acceleration shock.

COMMENT
- There may be an ignition leak accompanying the increase in the spark plug demand voltage during acceleration.

TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Malfunction of the ignition system.

DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart P.13B-22.
NO : Check the following items, and repair or replace the defective items.
a. Check the ignition coil, spark plugs, spark plug cables.
b. Check for occurrence of ignition leak.
Then confirm that the malfunction symptom is eliminated.

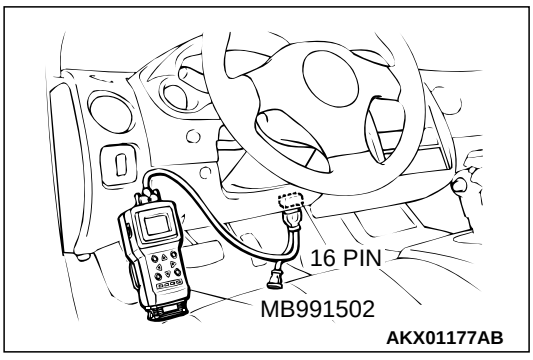
INSPECTION PROCEDURE 17: Deceleration Shock

COMMENT
- There may be a sudden change in air flow through the IAC, causing the vehicle to decelerate rapidly for an instant.

TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Malfunction of the IAC system.

DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)



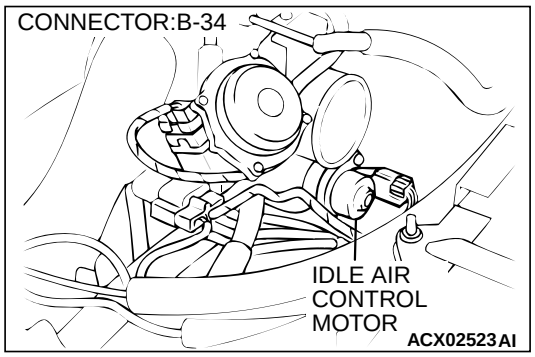
STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart P.13B-22.
NO : Go To Step 2.



STEP 2. Check the idle air control (IAC) motor operation sound.

(1) Check that the engine coolant temperature is 20°C (68°F) or below.

NOTE: If necessary, you can disconnect the engine coolant temperature sensor connector and connect the harness side of the connector to another engine coolant temperature sensor that is at 20°C (68°F) or below.

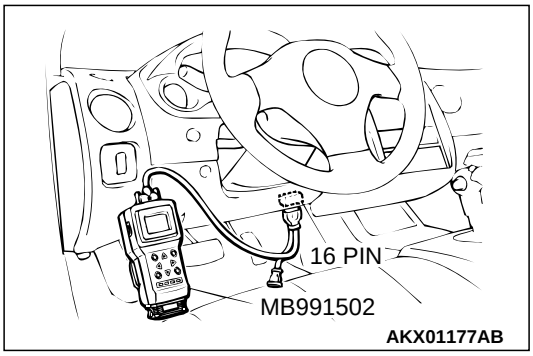
(2) Check the operation sound of the IAC motor can be heard after the ignition is switched to the "ON" position (but without starting the engine).
- An operation sound should heard.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Did you hear the operation sound?

YES : Go to Step 3.

NO : Refer to, DTC P0506 – Idle Control System RPM Lower Than Expected P.13B-478, DTC P0507 – Idle Control System RPM Higher Than Expected P.13B-487.



STEP 3. Using scan tool MB991502, check data list.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.

(2) Turn the ignition switch to the "ON" position.

(3) Check the following items in the data list. Refer to, Data List Reference Table P.13B-640.

a. Item 14: Throttle Position Sensor.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Refer to, Clean the throttle valve area P.13B-677.

NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 18: Poor acceleration.

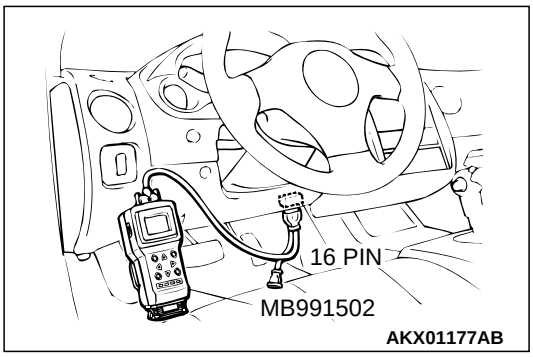
COMMENT
- Defective ignition system, abnormal air/fuel ratio, poor compression pressure, etc. are suspected.

TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Malfunction of the ignition system.
- Malfunction of air/fuel ratio control system.
- Malfunction of the fuel supply system.
- Poor compression pressure.
- Clogged exhaust system.

DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)

TSB Revision



STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).

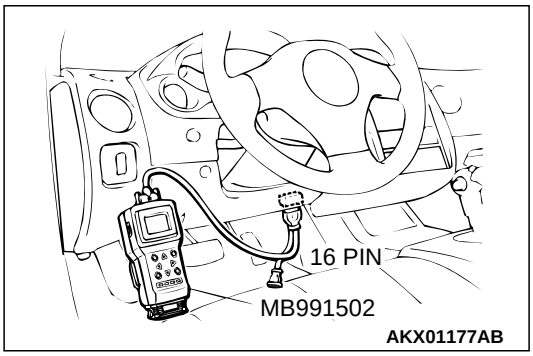
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart P.13B-22.
NO : Go to Step 2.



STEP 2. Using scan tool MB991502, check actuator test items 01, 02, 03, 04, 05, 06: Injector.

(1) Turn the ignition switch to the "ON" position.
(2) Check following items in the actuator test. Refer to, Actuator Test Table P.13B-654.
  a. Item 01, 02, 03, 04, 05, 06: Injector.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

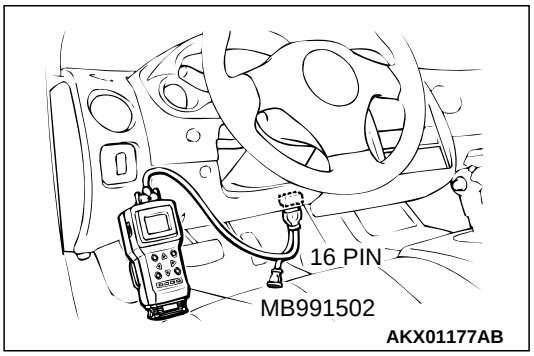
YES : Go to Step 3.
NO : Refer to, DTC P0201, P0203, P0205 – Injector Circuit P.13B-283, DTC P0202, P0204, P0206 – Injector Circuit P.13B-292.

STEP 3. Check the ignition timing.

Refer to GROUP 11C, On-vehicle Service – Ignition Timing Check P.11C-5.

Q: Is the ignition timing normal?

YES : Go to Step 4.
NO : Check that the crankshaft position sensor and timing belt cover are in the correct position. Then confirm that the malfunction symptom is eliminated.



STEP 4. Using scan tool MB991502, check data list.

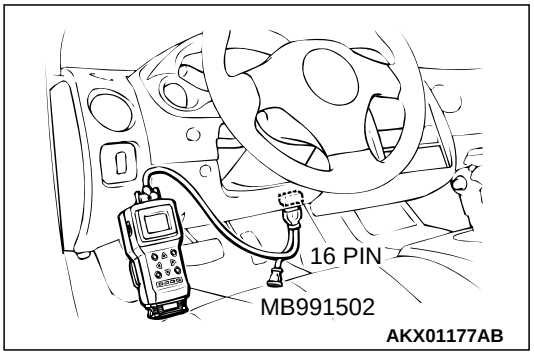
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the following items in the data list. Refer to, Data List Reference Table P.13B-640.
   a. Item 13: Intake Air Temperature Sensor.
   b. Item 25: Barometric Pressure Sensor.
   c. Item 21: Engine Coolant Temperature Sensor.
   d. Item 14: Throttle Position Sensor.
   e. Item 69: Right Bank Heated Oxygen Sensor (rear).
   f. Item 39: Right Bank Heated Oxygen Sensor (front).
   g. Item 59: Left Bank Heated Oxygen Sensor (rear).
   h. Item 11: Left Bank Heated Oxygen Sensor (front).
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 5.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

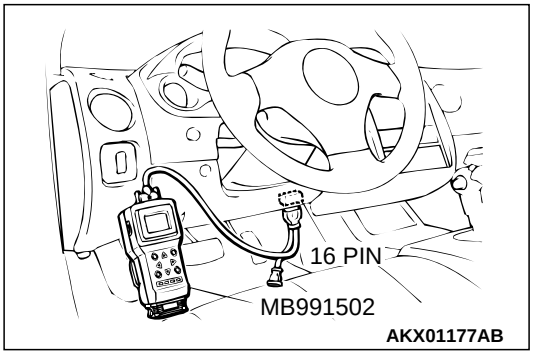


STEP 5. Using scan tool MB991502, check actuator test.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the actuator test. Refer to, Actuator Test Reference Table P.13B-654.
   a. Item 10: EGR Solenoid.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 6.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.



STEP 6. Using scan tool MB991502, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items of data list. Refer to, Data List Reference Table P.13B-640.
   a. Item 39: Right Bank Heated Oxygen Sensor (front).
   b. Item 11: Left Bank Heated Oxygen Sensor (front).
   • Voltage should fluctuate between 0 – 0.4 volt and 0.6 – 1.0 volt while idling after the engine has been warmed.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 8.
NO : Go to Step 7.

STEP 7. Check the fuel pressure.
Refer to, Fuel Pressure Test P.13B-680.

Q: Is the fuel pressure normal?

YES : Check the following items, and repair or replace the defective items.
a. Vacuum leak.
- Broken intake manifold gasket.
- Broken air intake hose.
- Broken vacuum hose.
- Positive crankcase ventilation valve does not operate.

b. Injector clogged.

Then confirm that the malfunction symptom is eliminated.

NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 8. Check the fuel pressure.
Refer to, Fuel Pressure Test P.13B-680.

Q: Is the fuel pressure normal?

YES : Check the following items, and repair or replace the defective items.
a. Check the ignition coil, spark plugs, spark plug cables.
b. Check compression pressure.
c. Check the fuel filter or fuel line for clogging.
d. Broken air intake hose.
e. Clogged air cleaner.
f. Clogged exhaust system.

Then confirm that the malfunction symptom is eliminated.

NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

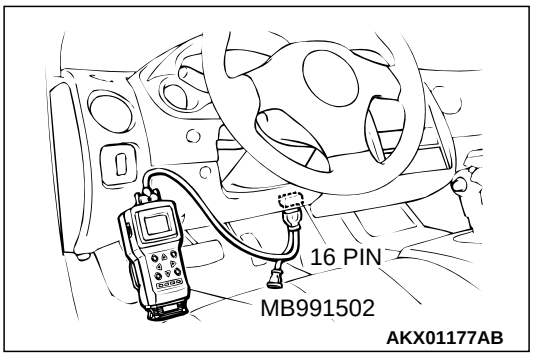
INSPECTION PROCEDURE 19: Surge.

COMMENT
- Defective ignition system, abnormal air/fuel ratio, etc. are suspected.

TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Malfunction of the ignition system.
- Malfunction of air/fuel ratio control system.
- Malfunction of the EGR solenoid system.

DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).

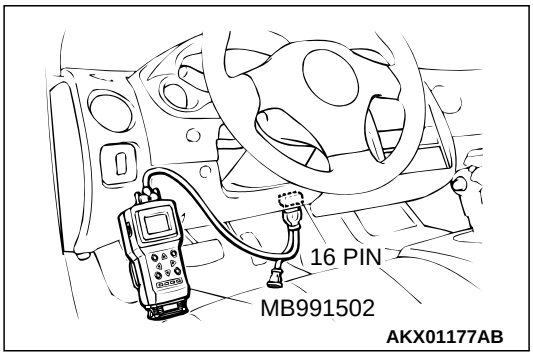
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "ON" position.

Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart P.13B-22.
NO : Go to Step 2.



STEP 2. Using scan tool MB991502, check actuator test items 01, 02, 03, 04, 05, 06: Injector.

(1) Turn the ignition switch to the "ON" position.
(2) Check following items in the actuator test. Refer to, Actuator Test Reference Table P.13B-654.
  a. Item 01, 02, 03, 04, 05, 06: Injector.
(3) Turn the ignition switch to the "ON" position.

Q: Is the actuator operating properly?

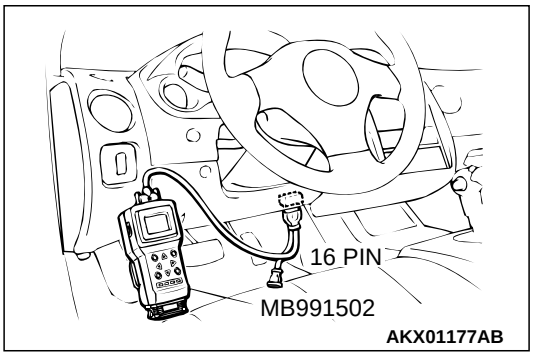
YES : Go to Step 3.
NO : Refer to, DTC P0201, P0203, P0205 – Injector Circuit P.13B-283, DTC P0202, P0204, P0206 – Injector Circuit P.13B-292.

STEP 3. Check the ignition timing.

Refer to GROUP 11C, On-vehicle Service – Ignition Timing Check P.11C-5.

Q: Is the ignition timing normal?

YES : Go to Step 4.
NO : Check that the crankshaft position sensor and timing belt cover are in the correct position. Then confirm that the malfunction symptom is eliminated.



STEP 4. Using scan tool MB991502, check data list.

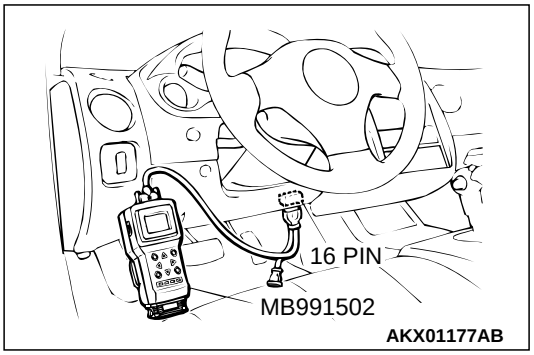
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the following items in the data list. Refer to, Data List Reference Table P.13B-640.
  a. Item 13: Intake Air Temperature Sensor.
  b. Item 25: Barometric pressure Sensor.
  c. Item 21: Engine Coolant Temperature Sensor.
  d. Item 14: Throttle Position Sensor.
  e. Item 69: Right Bank Heated Oxygen Sensor (rear).
  f. Item 39: Right Bank Heated Oxygen Sensor (front).
  g. Item 59: Left Bank Heated Oxygen Sensor (rear).
  h. Item 11: Left Bank Heated Oxygen Sensor (front).
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 5.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

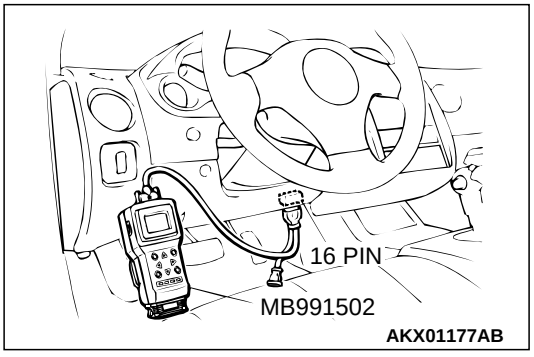


STEP 5. Using scan tool MB991502, check actuator test.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the actuator test. Refer to, Actuator Test Reference Table P.13B-654.
  a. Item 10: EGR Solenoid.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Go to Step 6.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.



STEP 6. Using scan tool MB991502, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items of data list. Refer to, Data List Reference Table P.13B-640.
  a. Item 39: Right Bank Heated Oxygen Sensor (front).
  b. Item 11: Left Bank Heated Oxygen Sensor (front).
  - Voltage should fluctuate between 0 – 0.4 volt and 0.6 – 1.0 volt while idling after the engine has been warmed.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 8.
NO : Go to Step 7.

STEP 7. Check the fuel pressure.
Refer to, Fuel Pressure Test P.13B-680.

Q: Is the fuel pressure normal?

YES : Check the following items, and repair or replace the defective items.
a. Vacuum leak.
- Broken intake manifold gasket.
- Broken air intake hose.
- Broken vacuum hose.
- Positive crankcase ventilation valve does not operate.

b. Injector clogged.

Then confirm that the malfunction symptom is eliminated.

NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 8. Check the fuel pressure.
Refer to, Fuel Pressure Test P.13B-680.

Q: Is the fuel pressure normal?

YES : Check the following items, and repair or replace the defective items.
a. Check the ignition coil, spark plugs, spark plug cables.
b. Check the EGR system.

Then confirm that the malfunction symptom is eliminated.

NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

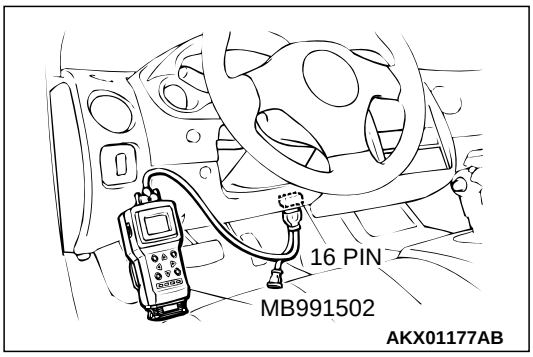
INSPECTION PROCEDURE 20: Knocking

COMMENT
- Incase such as the above, the cause is probably that the detonation control is defective or the heat value of the spark plug is inappropriate.

TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Defective knock sensor
- Incorrect heat value of the spark plug.

DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)



STEP 1. Using the scan tool MB991502, read the diagnostic trouble code (DTC).

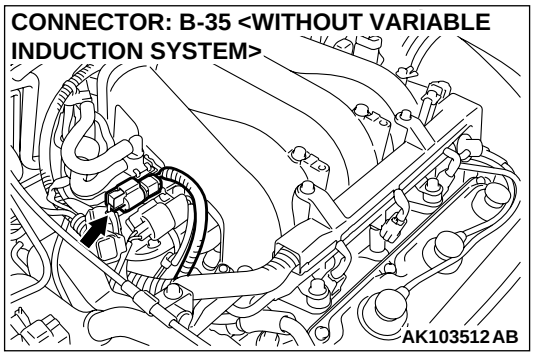
⚠ CAUTION

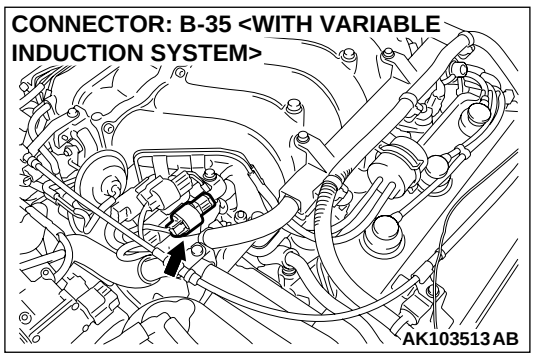
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart P.13B-22.
NO : Go to Step 2.





STEP 2. Check the ignition timing.

(1) The ignition timing should retard more when knock sensor connector B-35 is disconnected than when it is connected.

Q: When the knock sensor connector B-35 was disconnected, was the ignition timing delayed?

YES : Check the following items, and repair or replace the defective items.
a. Check the spark plugs.
b. Fuel quality, octane level.
c. Check if the foreign materials (water, kerosene, etc.) got into fuel.

Then confirm that the malfunction symptom is eliminated.

NO : Refer to, DTC P0325 – Knock Sensor Circuit P.13B-309.

INSPECTION PROCEDURE 21: Dieseling.

COMMENT

- Fuel leakage from injectors is suspected, or carbon build up.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Fuel leakage from injectors.

DIAGNOSIS

STEP 1. Check the injectors for fuel leakage.

Replace the leaking injector. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 22: Too high CO and HC concentration when idling

COMMENT
- Abnormal air/fuel ratio is suspected.

TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Malfunction of air/fuel ratio control system.
- Deteriorated catalyst.

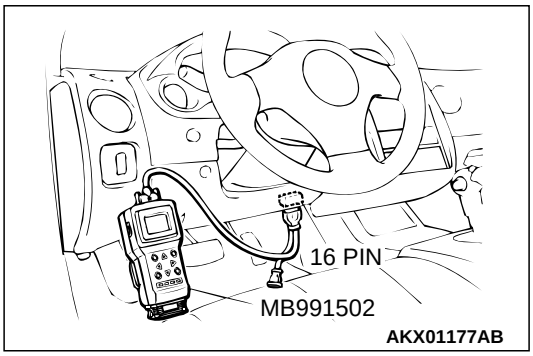
DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.



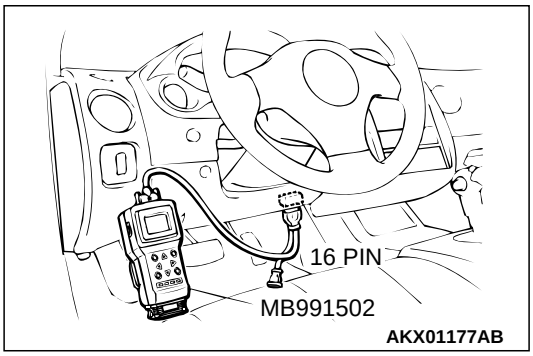
Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart P.13B-22.
NO : Go to Step 2.

STEP 2. Check the ignition timing.
Refer to GROUP 11C, On-vehicle Service – Ignition Timing Check P.11C-5.

Q: Is the ignition timing normal?

YES : Go to Step 3.
NO : Check that the crankshaft position sensor and timing belt cover are in the correct position. Then confirm that the malfunction symptom is eliminated.



STEP 3. Using scan tool MB991502, check data list.

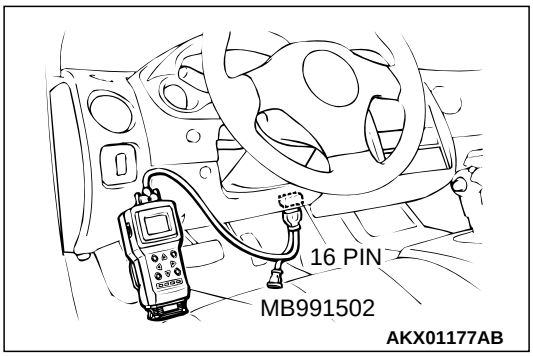
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the following items in the data list. Refer to, Data List Reference Table P.13B-640.
  a. Item 21: Engine Coolant Temperature Sensor.
  b. Item 13: Intake Air Temperature Sensor.
  c. Item 25: Barometric pressure Sensor.
  d. Item 69: Right Bank Heated Oxygen Sensor (rear).
  e. Item 39: Right Bank Heated Oxygen Sensor (front).
  f. Item 59: Left Bank Heated Oxygen Sensor (rear).
  g. Item 11: Left Bank Heated Oxygen Sensor (front).
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 4.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.



STEP 4. Using scan tool MB991502, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items of the data list. Refer to, Data List Reference Table P.13B-640.
  a. Item 39: Right Bank Heated Oxygen Sensor (front).
  b. Item 11: Left Bank Heated Oxygen Sensor (front).
  - Voltage should fluctuate between 0 – 0.4 volt and 0.6 – 1.0 volt while idling after the engine has been warmed.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Replace the heated oxygen sensor (front). Then confirm that the malfunction symptom is eliminated. If not resolved, go to step 6.
NO : Go to Step 5.

STEP 5. Check the fuel pressure.

Refer to, Fuel Pressure Test P.13B-680.

Q: Is the fuel pressure normal?

YES : Go to Step 6.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 6. Check the following items.

(1) Check the following items, and repair or replace the defective items.
   a. Check the injectors for fuel leakage.
   b. Check the ignition coil, spark plugs, spark plug cables.
   c. Check compression pressure.
   d. Check the positive crank case ventilation system.
   e. Check the evaporative emission control system.
   f. Check the EGR system.

(2) Then check the malfunction symptom.

Q: Is the malfunction symptom is eliminated.

YES : The check is completed.

NO : Replace the catalytic converter. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 23: Transient, Mass Emission Tailpipe Test Failure.

COMMENT

- The test is failed when the air/fuel ratio is not controlled to the ideal air/fuel ratio. This occurs due to the feedback control by heated oxygen sensor signals, insufficient EGR flow rate, or deteriorated catalyst.

NOTE: If the three-way catalyst temperature is low when checking the exhaust gas, the three-way catalyst cannot sufficiently clean the emissions. Warm up the engine sufficiently before checking the exhaust, and check immediately.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of air/fuel ratio control system.
- Malfunction of the EGR system.
- Deteriorated catalyst.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Check the exhaust gas with the engine at normal operating temperature.

Q: After enough warm up, was the exhaust gas checked enough?

YES : Go to Step 2.

NO : Check it again after enough warm up.

STEP 2. Check the following items.

(1) Check the following items.

a. Check all vacuum hoses and connectors.

b. Check electrical wires and connectors for obvious problems.

c. Check the exhaust system for missing or damaged parts.

Q: Are they normal?

YES : Go to Step 3.

NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 3. Check the drive ability.

(1) Check if the malfunction symptom described on the symptom chart is occurring.

Q: Is the drive – ability normal?

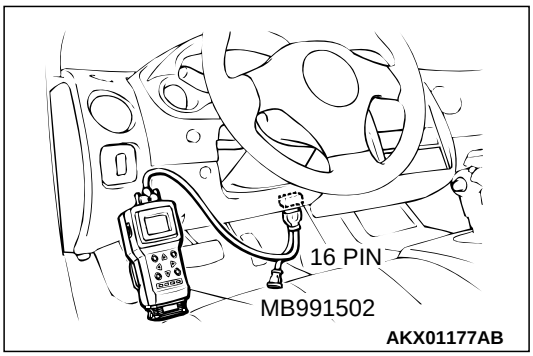
YES : Go to Step 4.

NO : Refer to, Trouble Symptom Chart P.13B-26.

STEP 4. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.



(1) Connect scan tool MB991502 to the data link connector.

(2) Turn the ignition switch to the "ON" position.

(3) Read the DTC.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart P.13B-22.

NO : Go to Step 5.

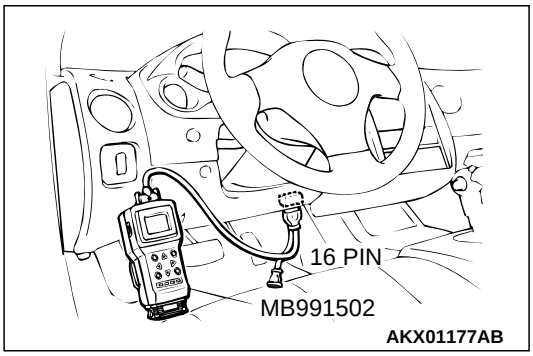
STEP 5. Check the ignition timing.

Refer to GROUP 11C, On-vehicle Service – Ignition Timing Check P.11C-5.

Q: Is the ignition timing normal?

YES : Go to Step 6.

NO : Check that the crankshaft position sensor and timing belt cover are in the correct position. Then confirm that the malfunction symptom is eliminated.



STEP 6. Using scan tool MB991502, check data list.

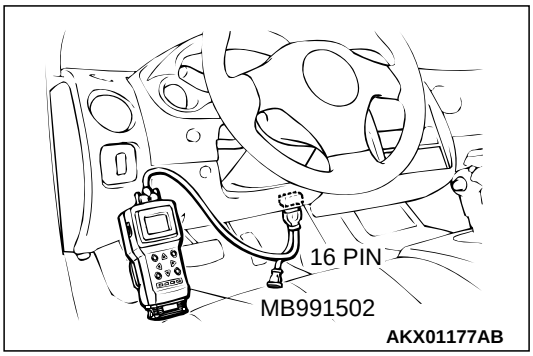
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the following items in the data list. Refer to, Data List Reference Table P.13B-640.
   a. Item 21: Engine Coolant Temperature Sensor.
   b. Item 13: Intake Air Temperature Sensor.
   c. Item 25: Barometric pressure Sensor.
   d. Item 69: Right Bank Heated Oxygen Sensor (rear).
   e. Item 59: Left Bank Heated Oxygen Sensor (rear).
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 7.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

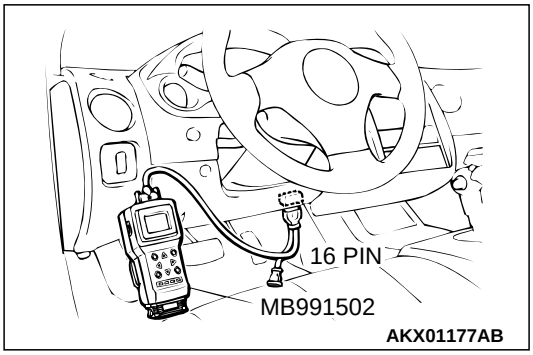


STEP 7. Using scan tool MB991502, check data list item 39: Right Bank heated oxygen sensor (front).

(1) Start the engine and run at idle.
(2) Set scan tool MB991502 to the data reading mode for item 39, Right Bank Heated Oxygen Sensor (front).
   • Warm up the engine. When the engine is decelerated suddenly from 4,000 r/min, the output voltage should increase from 200 mV or less to 600 – 1,000 mV in a few seconds.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 8.
NO : Refer to, DTC P0130 – Heated Oxygen Sensor Circuit (bank 1, sensor 1) P.13B-122, DTC P0131 – Heated Oxygen Sensor Circuit Low Voltage (bank 1, sensor 1) P.13B-132, DTC P0132 – Heated Oxygen Sensor Circuit High Voltage (bank 1, sensor 1) P.13B-137, DTC P0133 – Heated Oxygen Sensor Circuit Slow Response (bank 1, sensor 1) P.13B-140, DTC P0134 – Heated Oxygen Sensor Circuit No Activity Detected (bank 1, sensor 1) P.13B-143.



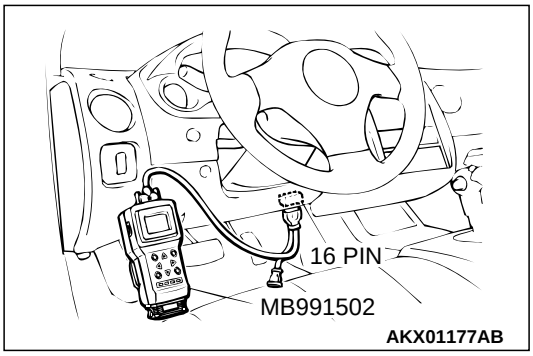
STEP 8. Using scan tool MB991502, check data list item 11: Left Bank Heated oxygen sensor (front).

(1) Start the engine and run at idle.
(2) Set scan tool MB991502 to the data reading mode for item 11, Left Bank Heated Oxygen Sensor (front).
- Output voltage should be 0.6 – 1.0 volt when sudden revving.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 9.
NO : Refer to, DTC P0150 – Heated Oxygen Sensor Circuit (bank 2, sensor 1) P.13B-184, DTC P0151 – Heated Oxygen Sensor Circuit Low Voltage (bank 2, sensor 1) P.13B-194, DTC P0152 – Heated Oxygen Sensor Circuit High Voltage (bank 2, sensor 1) P.13B-199, DTC P0153 – Heated Oxygen Sensor Circuit Slow Response (bank 2, sensor 1) P.13B-202, DTC P0154 – Heated Oxygen Sensor Circuit No Activity Detected (bank 2, sensor 1) P.13B-205.



STEP 9. Using scan tool MB991502, check data list item 39: Right Bank Heated oxygen sensor (front).

(1) Start the engine and run at idle.
(2) Set scan tool MB991502 to the data reading mode for item 39, Right Bank Heated Oxygen Sensor (front).
- Voltage should fluctuate between 0 – 0.4 volt and 0.6 – 1.0 volt while after the engine has been warmed.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

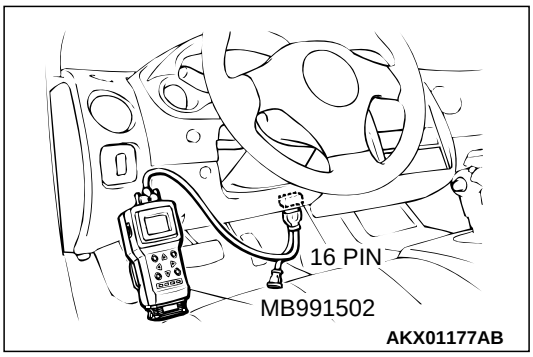
YES : Go to Step 10.
NO : Go to Step 12.

STEP 10. Check the EGR system.

Refer to GROUP 17, Emission Control System – EGR System Check P.17-106.

Q: Is the EGR system normal?

YES : Go to Step 11.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.



STEP 11. Using scan tool MB991502, check data list item 69: Right Bank Heated oxygen sensor (rear).

⚠ CAUTION

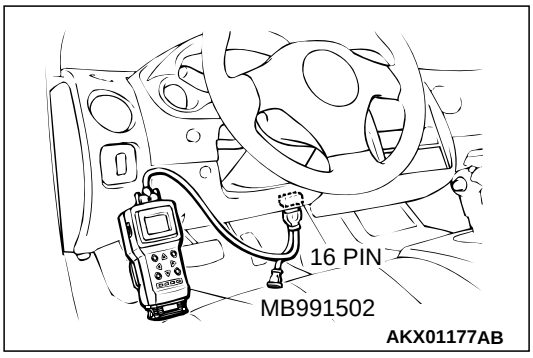
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 69, Right Bank Heated Oxygen Sensor (rear).
- Average voltage should be 0.6 volt or less, when idling.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 16.
NO : Replace the right bank heated oxygen sensor (front). Then confirm that the malfunction symptom is eliminated.



STEP 12. Using scan tool MB991502, check data list item 11: Left Bank Heated oxygen sensor (front).

(1) Start the engine and run at idle.
(2) Set scan tool MB991502 to the data reading mode for item 11, Left Bank Heated Oxygen Sensor (front).
- Warm up the engine. When the engine is decelerated suddenly from 4,000 r/min, the output voltage should increase from 200 mV or less to 600 – 1,000 mV in a few seconds.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

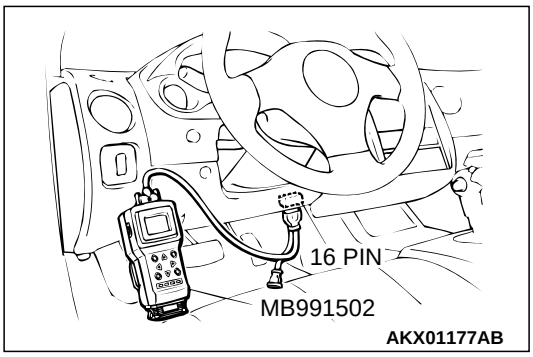
YES : Go to Step 13.
NO : Go to Step 15.

STEP 13. Check the EGR system.

Refer to GROUP 17, Emission Control System – EGR System Check P.17-106.

Q: Is the EGR system normal?

YES : Go to Step 14.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.



STEP 14. Using scan tool MB991502, check data list item 59: Left Bank Heated oxygen sensor (rear).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to the data reading mode for item 59, Left Bank Heated Oxygen Sensor (rear).
- Average voltage should be 0.6 volt or less, when idling.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 16.
NO : Replace the left bank heated oxygen sensor (front). Then confirm that the malfunction symptom is eliminated.

STEP 15. Check the fuel pressure.

Refer to, Fuel Pressure Test P.13B-680.

Q: Is the fuel pressure normal?

YES : Go to Step 16.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 16. Check the following items.

(1) Check the following items, and repair or replace the defective items.
a. Check the injectors for fuel leakage.
b. Check the ignition coil, spark plugs, spark plug cables.
c. Check compression pressure.
d. Check the positive crankcase ventilation system.
e. Check the evaporative emission control system.
(2) Then check the malfunction symptom.

Q: Is the malfunction symptom is eliminated?

YES : The check is completed.
NO : Replace the catalytic converter. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 24: Purge Flow Test of the Evaporative Emission Canister Failure.

COMMENT

- The test fails when the purge line or purge port is clogged or if the evaporative emission purge solenoid fails.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Purge line or purge port is clogged.
- Malfunction of the evaporative emission purge solenoid.
- Evaporative emission canister is clogged.

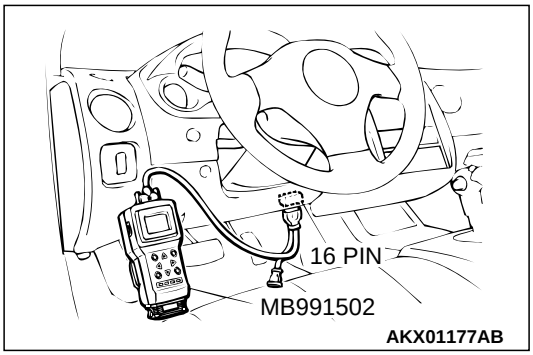
TSB Revision

DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.



(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart P.13B-22.
NO : Refer to GROUP 17, Emission Control System – Purge Control System Check (Purge Flow Check) P.17-100.

INSPECTION PROCEDURE 25: Pressure Test of the Evaporative System Failure.

COMMENT
- The test fails if there is a leak from the fuel tank or vapor line.

TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Loose fuel tank filler tube cap.
- Broken seal in fuel tank, vapor line evaporative emission canister.

DIAGNOSIS

STEP 1. Check the evaporative emission purge solenoid.
Refer to GROUP 17, Emission Control System – Evaporative Emission Purge Solenoid Check P.17-101.

Q: Is the evaporative emission purge solenoid normal?

YES : Go to Step 2.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

STEP 2. Check the evaporative emission ventilation solenoid.
Refer to GROUP 17, Emission Control System – Evaporative Emission Ventilation Solenoid Check P.17-103.

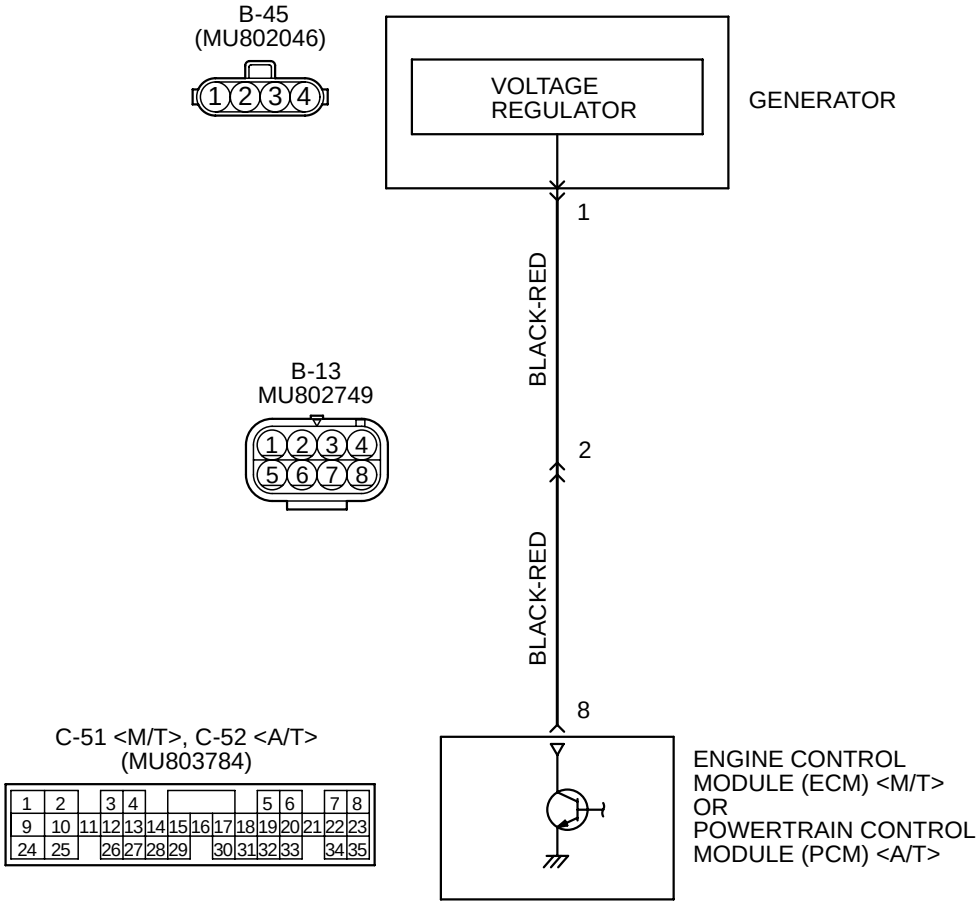
Q: Is the evaporative emission ventilation solenoid normal?

YES : Check the following items, and repair or replace the defective items.
a. Check for leaks from the vapor line or evaporative emission canister.
b. Check for leaks from the fuel tank.
Then confirm that the malfunction symptom is eliminated.
NO : Repair or replace. Then confirm that the malfunction symptom is eliminated.

TSB Revision

INSPECTION PROCEDURE 26: Generator output voltage is low (approximately 12.3 volts)

Generator Circuit



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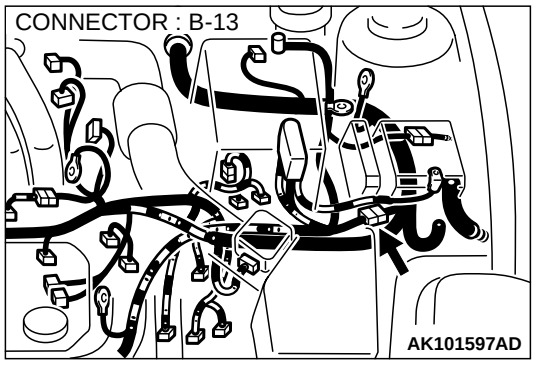
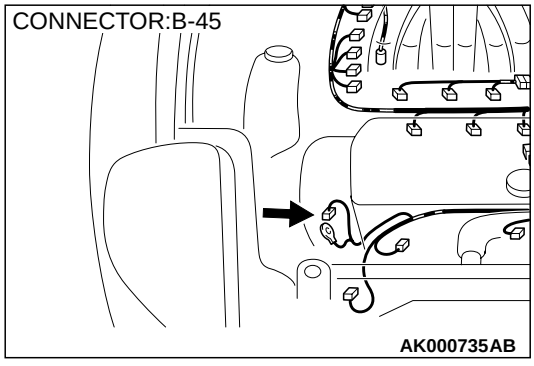
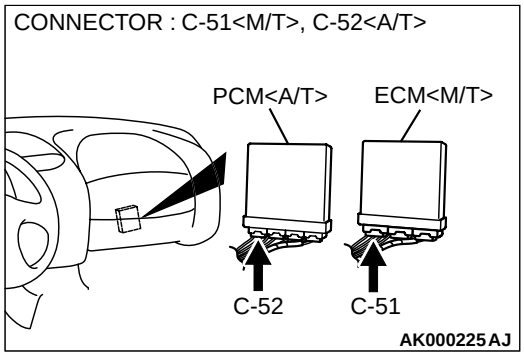




TSB Revision



CIRCUIT OPERATION

- The ECM <M/T> or PCM <A/T> controls generator out put current by duty-controlling continuity between the generator G terminal (terminal 1) and ground.

TROUBLESHOOTING HINTS (The most likely causes for this charging system:)

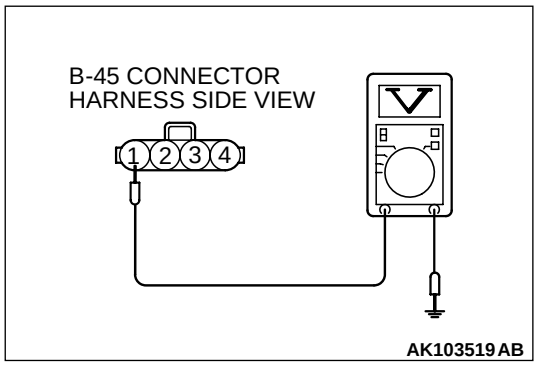
- Malfunction of the charging system.
- Short circuit in the harness between generator G terminal and ECM <M/T> or PCM <A/T>.
- ECM <M/T> or PCM <A/T> failed.

DIAGNOSIS

STEP 1. Check the voltage at generator connector B-45 by backprobing.

(1) Do not disconnect the connector B-45.
(2) Start the engine and run at idle.
(3) Measure the voltage between terminal 1 and ground by backprobing.
  a. Engine: warming up
  b. Radiator fan: stopped
  c. Headlight switch: OFF to ON
  d. Rear defogger switch: OFF to ON
  e. Stoplight switch: OFF to On
  - Voltage rises by 0.2 – 3.5 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.



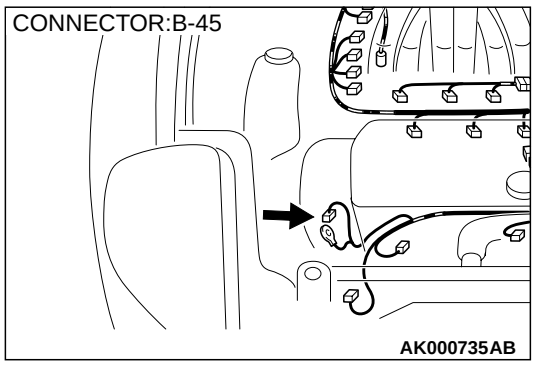
Q: Is the voltage normal?

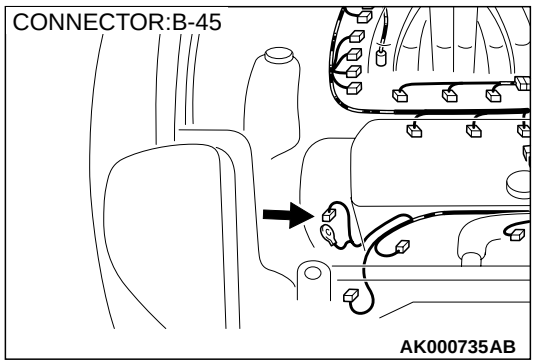
YES : Go to Step 2.
NO : Go to Step 3.

STEP 2. Check connector B-45 at generator connector for damage.

Q: Is the connector in good condition?

YES : Replace the generator. Then confirm that the malfunction symptom is eliminated.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.



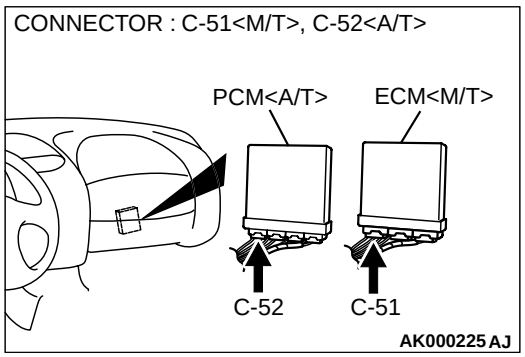


STEP 3. Check connector B-45 at generator connector for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

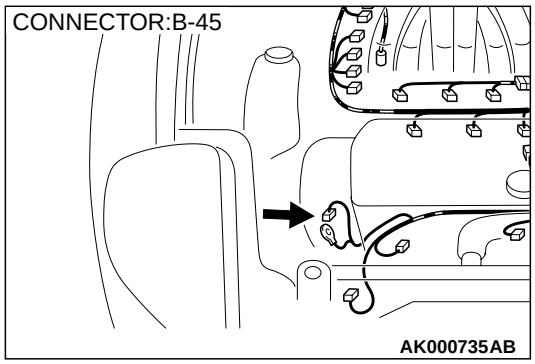


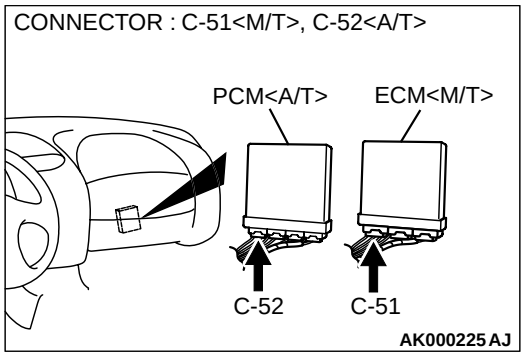
STEP 4. Check connector C-51 at ECM <M/T> or connector C-52 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.





STEP 5. Check for open circuit and short circuit to ground and harness damage between generator connector B-45 terminal 1 and ECM connector C-51 terminal 8 <M/T> or PCM connector C-52 terminal 8 <A/T>.

NOTE: Check harness after checking intermediate connector B-13. If intermediate connector is damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then check that the malfunction is eliminated.

Q: Is the harness wire in good condition?

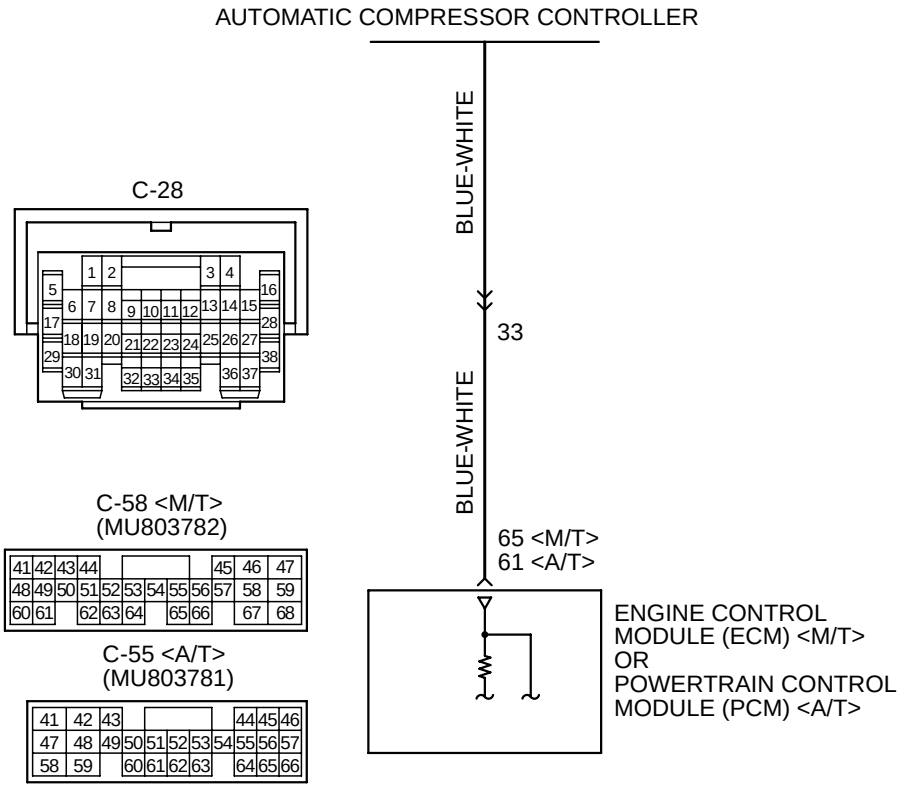
YES : Replace the ECM or PCM. Then confirm that the malfunction symptom is eliminated.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.

TSB Revision

INSPECTION PROCEDURE 27: Incorrect Idle Speed When the A/C is Operating (A/C Switch 2 Signal)

A/C Switch 2 Signal



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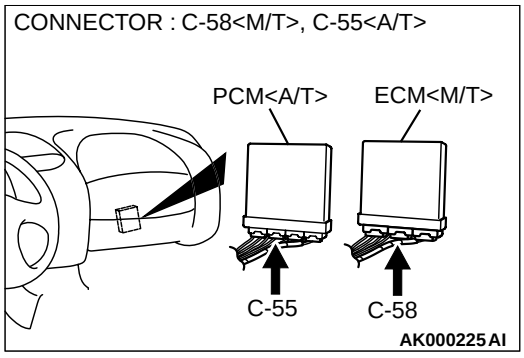
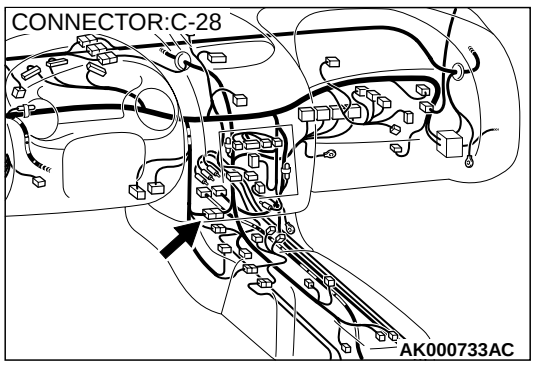




CIRCUIT OPERATION

- The ECM <M/T> or PCM <A/T> increases the engine idle speed by driving the IAC motor when the automatic compressor-ECU sends a "A/C on" signal to the module.
- The automatic compressor-ECU detects how the air conditioning is applying load to the engine, and converts the information to a voltage signal (High voltage = low load, Low voltage = high load). This voltage signal is called "A/C switch 2 signal". The ECM <M/T> or PCM <A/T> receives this A/C switch 2 signal from the automatic compressor controller through terminal 65 <M/T> or terminal 61 <A/T>, and determines the idle-up speed according to the high or low air conditioning load.

TSB Revision

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Malfunction of the A/C control system.
- Open or shorted circuit, or improper connector contact.
- ECM <M/T> or PCM <A/T> failed.

DIAGNOSIS

STEP 1. Check connector C-58 at ECM <M/T> or connector C-55 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

STEP 2. Check the output voltage at ECM harness side connector C-58 <M/T> or PCM harness side connector C-55 <A/T>.

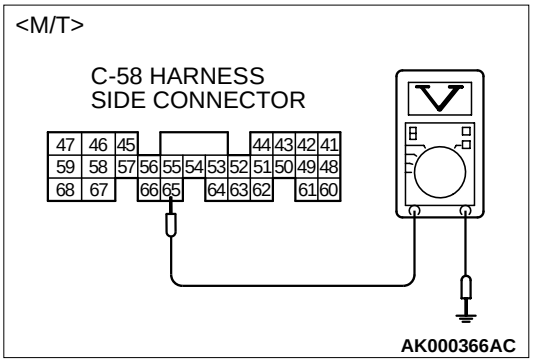
(1) Disconnect the connector C-58 <M/T> or C-55 <A/T> and measure at the harness side.
(2) Start the engine and run at idle.
(3) Turn the A/C switch "ON".
(4) Measure the voltage between terminal 65 <M/T> or 61 <A/T> and ground.
- If atmospheric air temperature is 15°C (59°F) or less, the voltage should be 1 volt or less.
- If atmospheric air temperature is 18°C (65.4°F) or more, the voltage should be battery positive voltage.

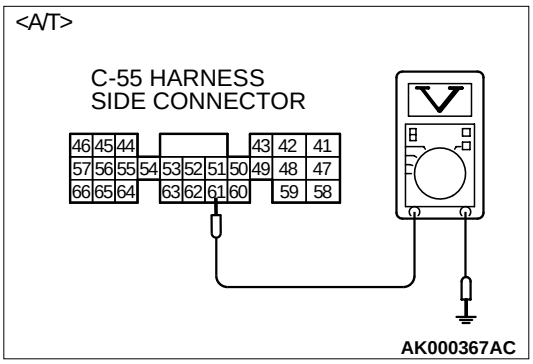
(5) Turn the A/C switch "OFF".
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Replace the ECM or PCM. Then confirm that the malfunction symptom is eliminated.

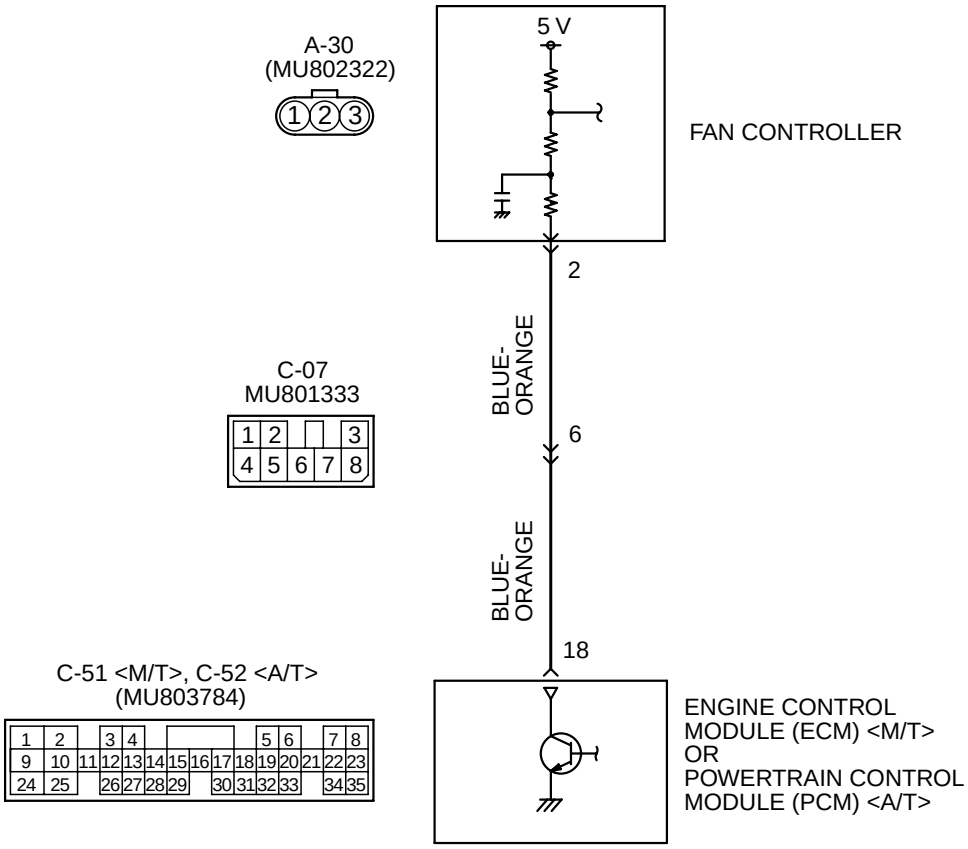
NO : Refer to GROUP 55, Introduction To Heater, Air Conditioning And Ventilation Diagnosis P.55-5.





INSPECTION PROCEDURE 28: Fans (radlator fan, A/C condenser fan) are inoperative

Radiator Fan, A/C Condenser Fan Circuit



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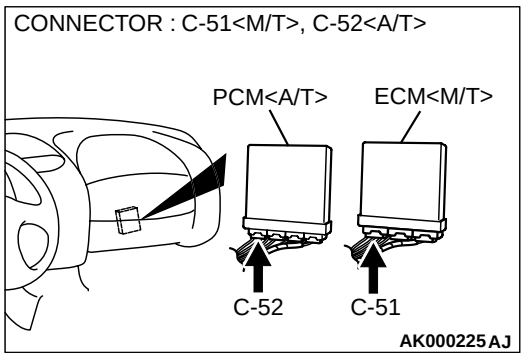

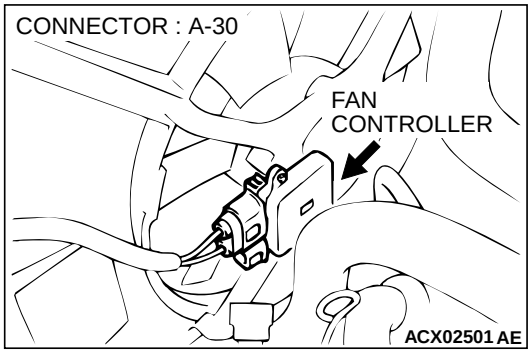

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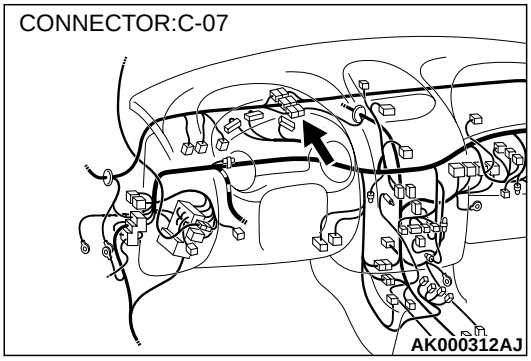


CIRCUIT OPERATION

- The PCM sends a duty signal to the fan controller according to engine coolant temperature, vehicle speed, and the condition of the A/C switch. (The closer the average voltage at the terminal comes to five volts, the higher the fan speed becomes.)

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Malfunction of the fan motor relay.
- Malfunction of the fan motor.
- Malfunction of the fan controller.
- Improper connector contact, open or short-circuited harness wire.
- ECM <M/T> or PCM <A/T> failed.

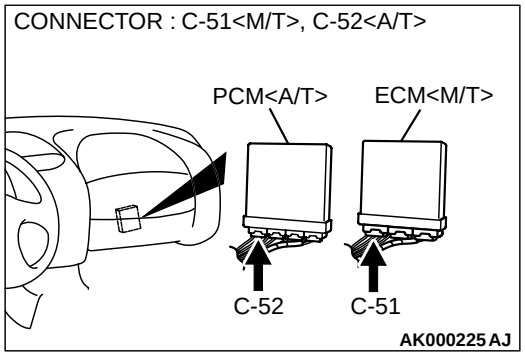
DIAGNOSIS

STEP 1. Check connector C-51 at ECM <M/T> or connector C-52 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.



STEP 2. Check the output voltage at ECM harness side connector C-51 <M/T> or PCM harness side connector C-52 <A/T>.

(1) Disconnect the connector C-51 <M/T> or C-52 <A/T> and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 18 and ground.
- Voltage should be between 4.8 and 5.2 volts. (Fan rotates at high speed.)

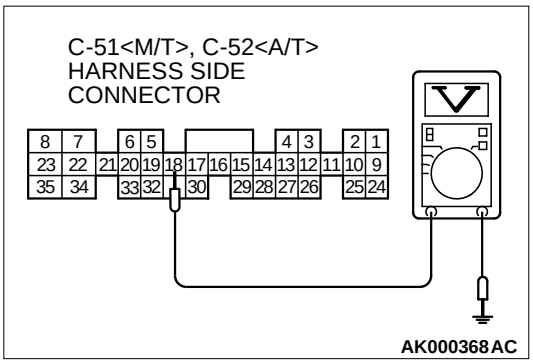
(4) Connect a jumper cable between 18 and ground.
- The fan should stop.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

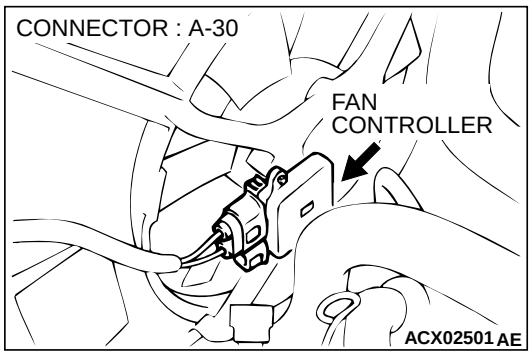
Q: Is the voltage and fan condition normal?

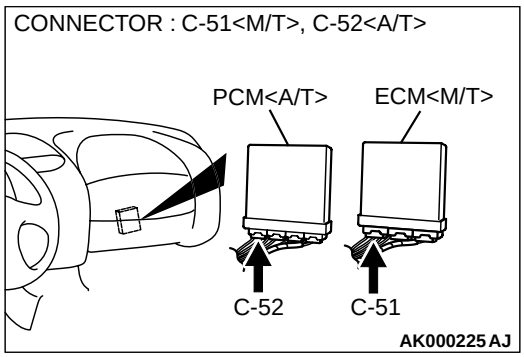
YES : Replace the ECM or PCM. Then confirm that the malfunction symptom is eliminated.

NO : Go to Step 3.



TSB Revision





STEP 3. Check for open circuit and short circuit to ground and harness damage between fan controller A-30 terminal 2 and ECM connector C-51 terminal 18 <M/T> or PCM connector C-52 terminal 18 <A/T>.

NOTE: Check harness after checking intermediate connector C-07. If intermediate connector is damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

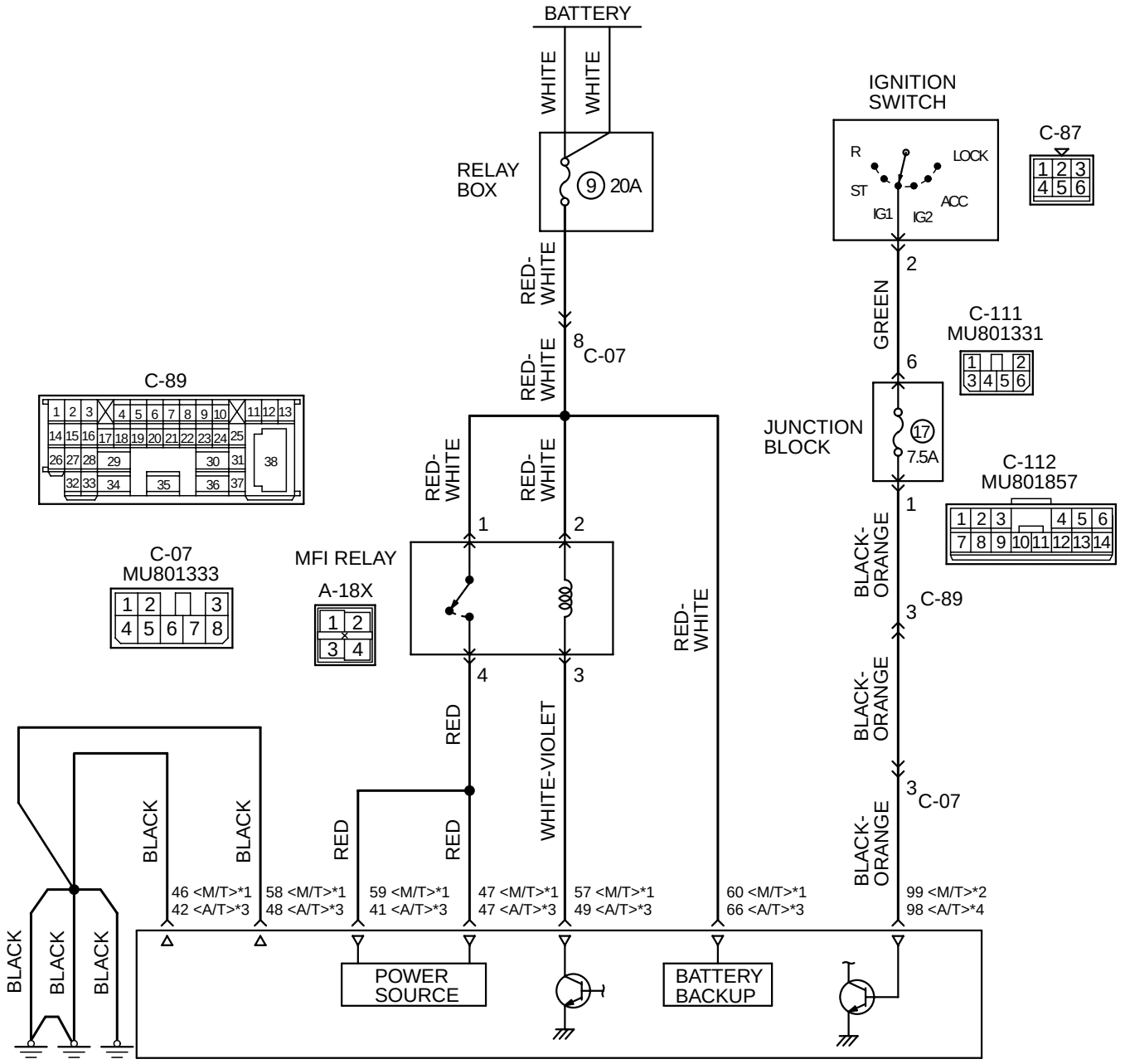
Q: Is the harness wire in good condition?

YES : Refer to GROUP 14 – Engine Cooling Diagnosis – Symptom Chart P.14-3.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 29: Power supply system and ignition switch – IG system.

Power Supply and Ignition Switch-IG Circuit



ENGINE CONTROL MODULE (ECM) <M/T> OR POWERTRAIN CONTROL MODULE (PCM) <A/T>

C-58 <M/T> (MU803782)

41	42	43	44						45	46	47	
48	49	50	51	52	53	54	55	56	57	58	59	
60	61		62	63	64		65	66		67	68	

C-62 <M/T> (MU803783)

71	72		73	74						75	76	77
78	79	80	81	82	83	84	85	86	87	88	89	90
91	92	93		94	95		96	97	98		99	100

C-55 <A/T> (MU803781)

41	42	43				44	45	46		
47	48	49	50	51	52	53	54	55	56	57
58	59		60	61	62	63		64	65	66

C-59 <A/T> (MU803782)

71	72	73	74				75	76	77	
78	79	80	81	82	83	84	85	86	87	88	89
90	91		92	93	94		95	96		97	98

NOTE
*1:ECM connector C-58 <M/T>
*2:ECM connector C-62 <M/T>
*3:PCM connector C-55 <A/T>
*4:PCM connector C-59 <A/T>

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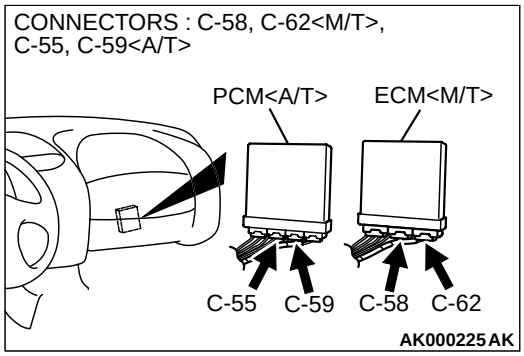
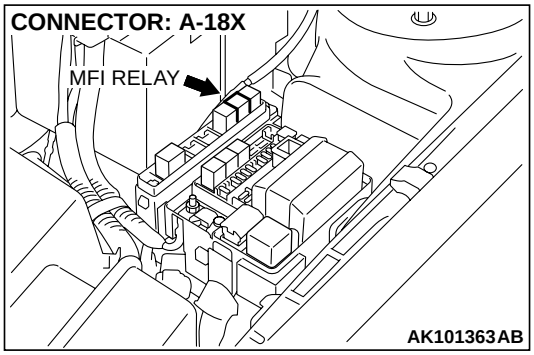
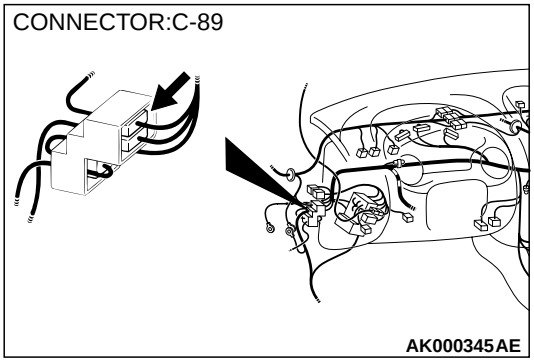
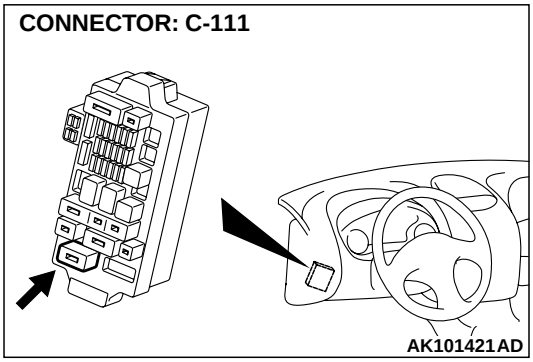
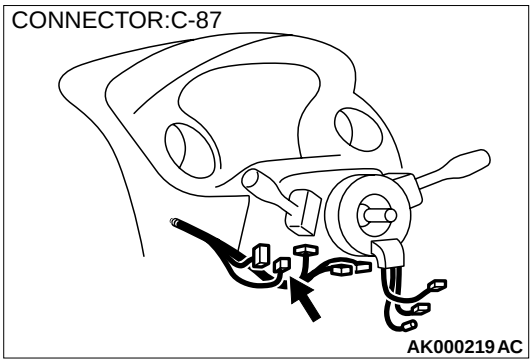
TSB Revision

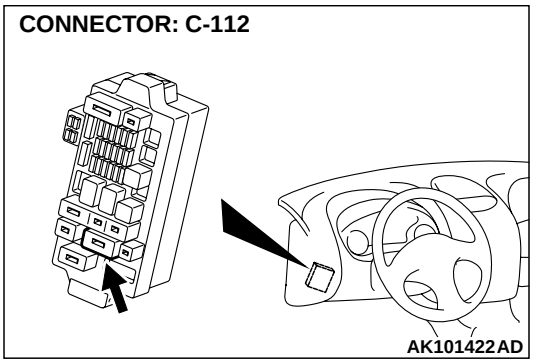


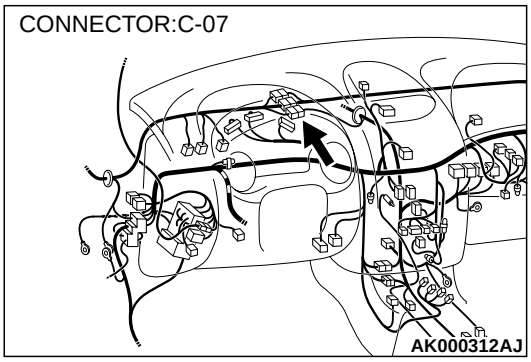












CIRCUIT OPERATION

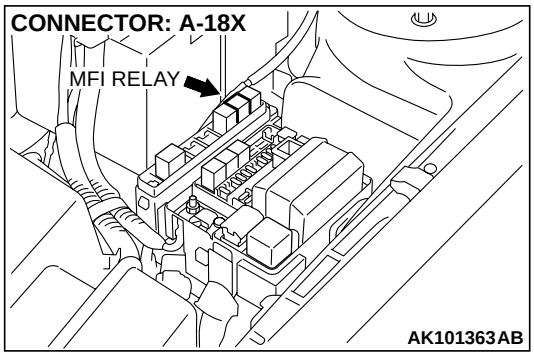
- Battery positive voltage is applied to the MFI relay (terminals 1, 2).
- When the ignition switch is turned to the "ON" position, the battery positive voltage is applied to the ECM (terminal 99) <M/T> or PCM (terminal 98) <A/T>. When the battery positive voltage is applied, the ECM <M/T> or PCM <A/T> turns the power transistor in the ECM <M/T> or PCM <A/T> "ON" and grounds the MFI relay coil. With this, the MFI relay turns "ON" and the battery positive voltage is supplied to the ECM (terminal 47, 59) <M/T> or PCM (terminal 41, 47) <A/T> from the MFI relay (terminal 4).
- Battery positive voltage is constantly supplied to the ECM (terminal 60) <M/T> or PCM (terminal 66) <A/T> as the backup power.
- The ECM (terminal 46, 58) <M/T> or PCM (terminals 42, 48) <A/T> is grounded to the vehicle body.

TSB Revision

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Malfunction of the ignition switch.
- Malfunction of the MFI relay.
- Improper connector contact, open circuit or short-circuited harness wire.
- Disconnected ECM <M/T> or PCM <A/T> ground wire.
- Malfunction of the ECM <M/T> or PCM <A/T>.

DIAGNOSIS

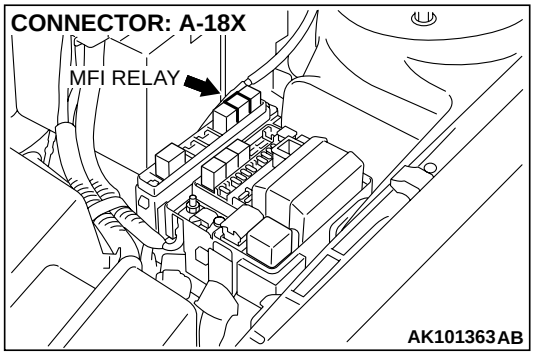


STEP 1. Check connector A-18X at MFI relay for damage.

Q: Is the connector in good condition?

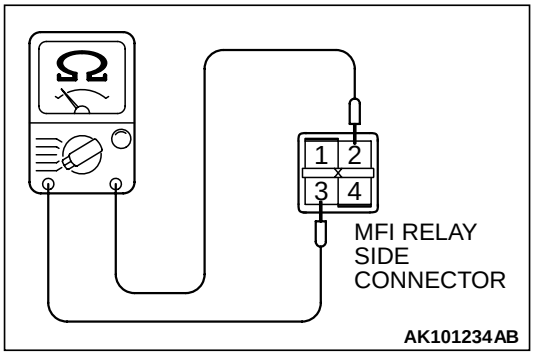
YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.



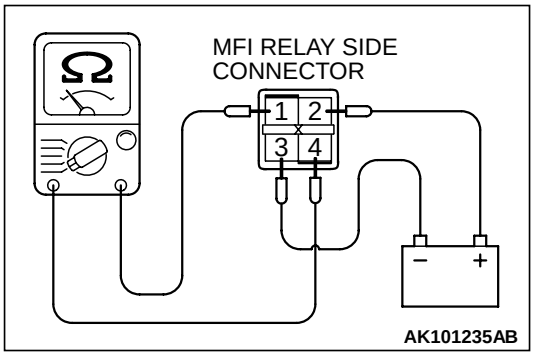
STEP 2. Check the MFI relay.

(1) Remove the MFI relay.



(2) Check for continuity between the MFI relay terminals 2 and 3.
- There should be continuity. (approximately 70 Ω)

(3) Use jumper wires to connect MFI relay terminal 2 to the positive battery terminal and terminal 3 to the negative battery terminal.



(4) Check the continuity between the MFI relay terminals 1 and 4 while connecting and disconnecting the jumper wire at the negative battery terminal.
- Should be less than 2 ohm. (Negative battery terminal connected)
- Should be open loop. (Negative battery terminal disconnected)

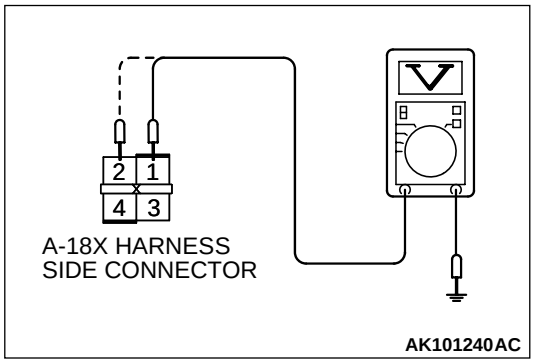
(5) Install the MFI relay.

Q: Is the voltage normal?

YES : Go to Step 3.

NO : Replace the MFI relay. Then confirm that the malfunction symptom is eliminated.

TSB Revision



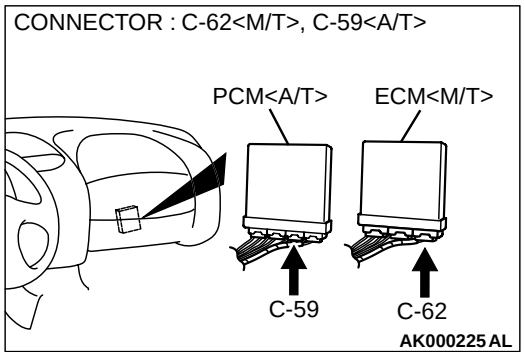
STEP 3. Check the power supply voltage at MFI relay harness side connector A-18X.

(1) Disconnect the connector A-18X and measure at the harness side.
(2) Measure the voltage between terminal 1, 2 and ground.
- Voltage should be battery positive voltage.

Q: Is the voltage normal?

YES : Go to Step 4.

NO : Check harness connector C-07 at intermediate connector for damage, and repair or replace as required. Refer to, GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between fusible link (3) and MFI relay connector A-18X terminal 1, 2 because of open circuit. Then confirm that the malfunction symptom is eliminated.

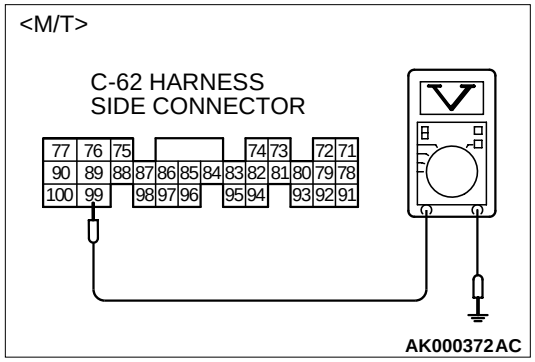


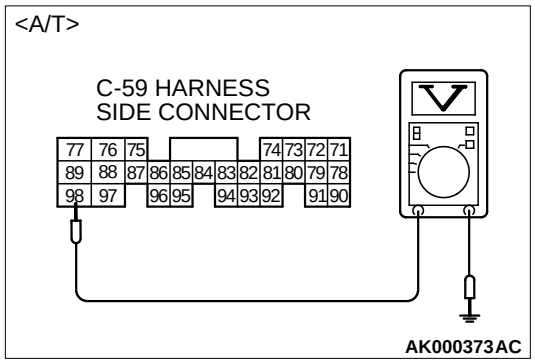
STEP 4. Check connector C-62 at ECM <M/T> or connector C-59 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.





STEP 5. Check the ignition switch – IG signal voltage at ECM harness side connector C-62 <M/T> or PCM harness side connector C-59 <A/T>.

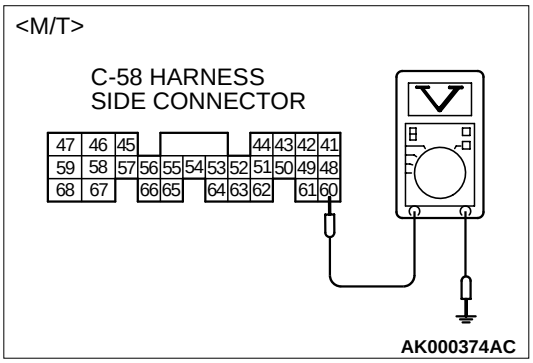
(1) Disconnect the connector C-62 <M/T> or C-59 <A/T> and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 99 <M/T> or 98 <A/T> and ground.
- Voltage should be battery positive voltage.

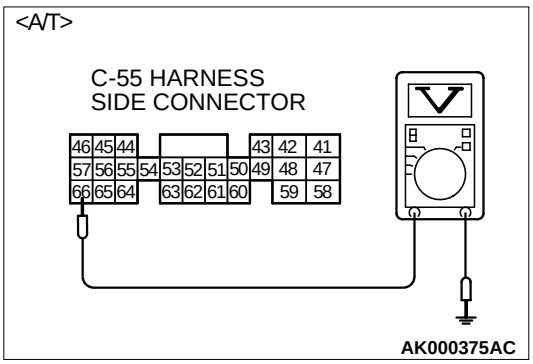
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 6.

NO : Check harness connector C-07, C-89, C-112 and C-111 at intermediate connector for damage, and repair or replace as required. Refer to, GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connectors are in good condition, repair harness wire between ignition switch connector C-87 terminal 2 and ECM connector C-62 terminal 99 <M/T> or PCM connector C-59 terminal 98 <A/T> because of open circuit. Then confirm that the malfunction symptom is eliminated.



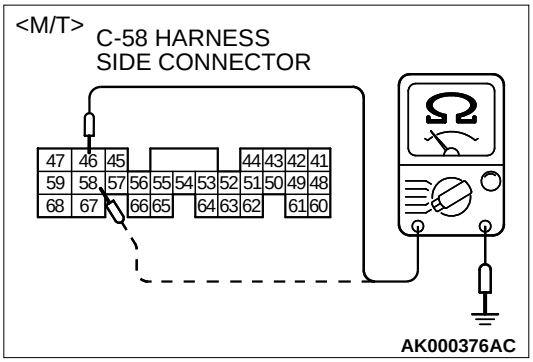


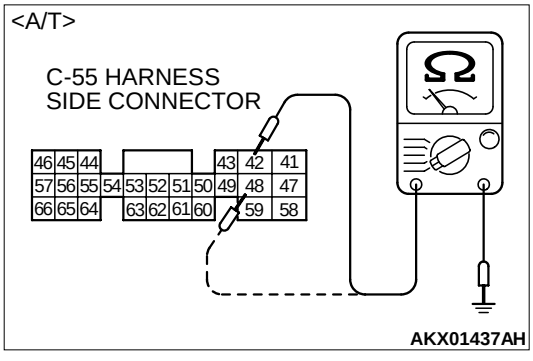
STEP 6. Check the backup power supply voltage at ECM harness side connector C-58 <M/T> or PCM harness side connector C-55 <A/T>.

(1) Disconnect the connector C-58 <M/T> or C-55 <A/T> and measure at the harness side.
(2) Measure the voltage between terminal 60 <M/T> or 66 <A/T> and ground.
- Voltage should be battery positive voltage.

Q: Is the voltage normal?

YES : Go to Step 7.
NO : Check harness connector C-07 at intermediate connector for damage, and repair or replace as required. Refer to, GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connectors are in good condition, repair harness wire between fusible link (3) and ECM connector C-58 terminal 60 <M/T> or PCM connector C-55 terminal 66 <A/T> because of open circuit. Then confirm that the malfunction symptom is eliminated.





STEP 7. Check the continuity at ECM harness side connector C-58 <M/T> or PCM harness side connector C-55 <A/T>.

(1) Disconnect the connector C-58 <M/T> or C-55 <A/T> and measure at the harness side.
(2) Check for the continuity between terminal (46, 58) <M/T> or (42, 48) <A/T> and ground.
- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 8.
NO : Repair harness wire between ECM connector C-58 terminal (46, 58) <M/T> or PCM connector C-55 terminal (42, 48) <A/T> and ground because of open circuit or harness damage. Then confirm that the malfunction symptom is eliminated.

TSB Revision

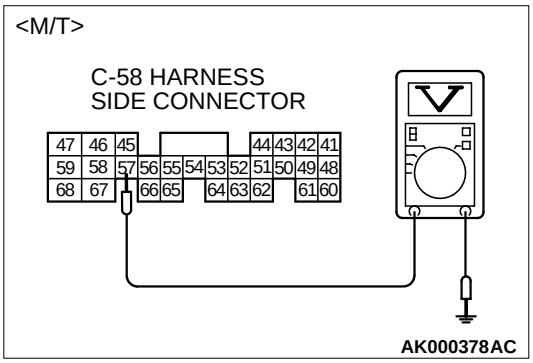
STEP 8. Check the power supply voltage at ECM harness side connector C-58 <M/T> or PCM harness side connector C-55 <A/T>.

(1) Disconnect the connector C-58 <M/T> or C-55 <A/T> and measure at the harness side.
(2) Measure the voltage between terminal 57 <M/T> or 49 <A/T> and ground.
- Voltage should be battery positive voltage.

Q: Is the voltage normal?

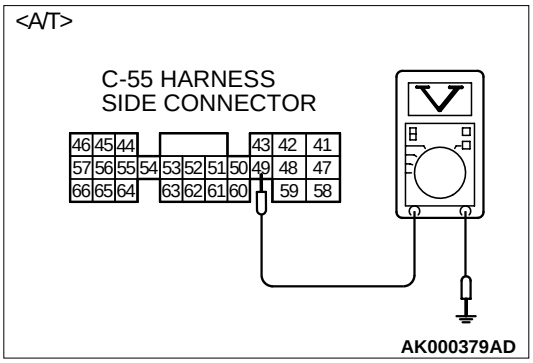
YES : Go to Step 9.
NO : Repair harness wire between MFI relay connector A-18X terminal 3 and ECM connector C-58 terminal 57 <M/T> or PCM connector C-55 terminal 49 <A/T> because of open circuit. Then confirm that the malfunction symptom is eliminated.

<M/T>



AK000378AC

<A/T>



AK000379AD

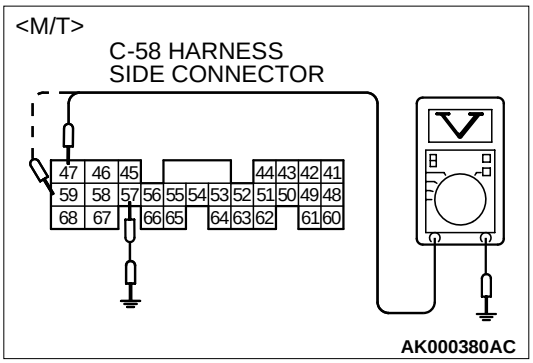
STEP 9. Check the power supply voltage at ECM harness side connector C-58 <M/T> or PCM harness side connector C-55 <A/T>.

(1) Disconnect the connector C-58 <M/T> or C-55 <A/T> and measure at the harness side.
(2) Using a jumper wire, connect terminal 57 <M/T> or 49 <A/T> to ground.
(3) Measure the voltage between terminal (47, 59) <M/T> or (41, 47) <A/T> and ground.
- Voltage should be battery positive voltage.

Q: Is the voltage normal?

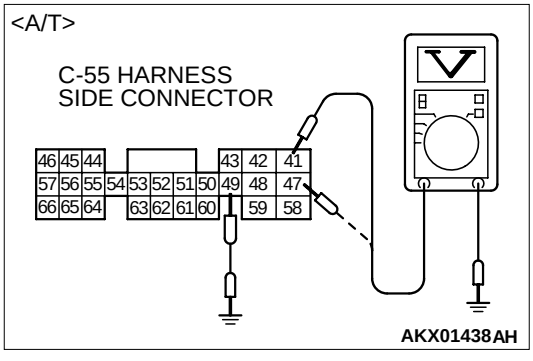
YES : Replace the ECM or PCM. Then confirm that the malfunction symptom is eliminated.
NO : Repair harness wire between MFI relay connector A-18X terminal 4 and ECM connector C-58 terminal (47, 59) <M/T> or PCM connector C-55 terminal (41, 47) <A/T> because of open circuit. Then confirm that the malfunction symptom is eliminated.

<M/T>



AK000380AC

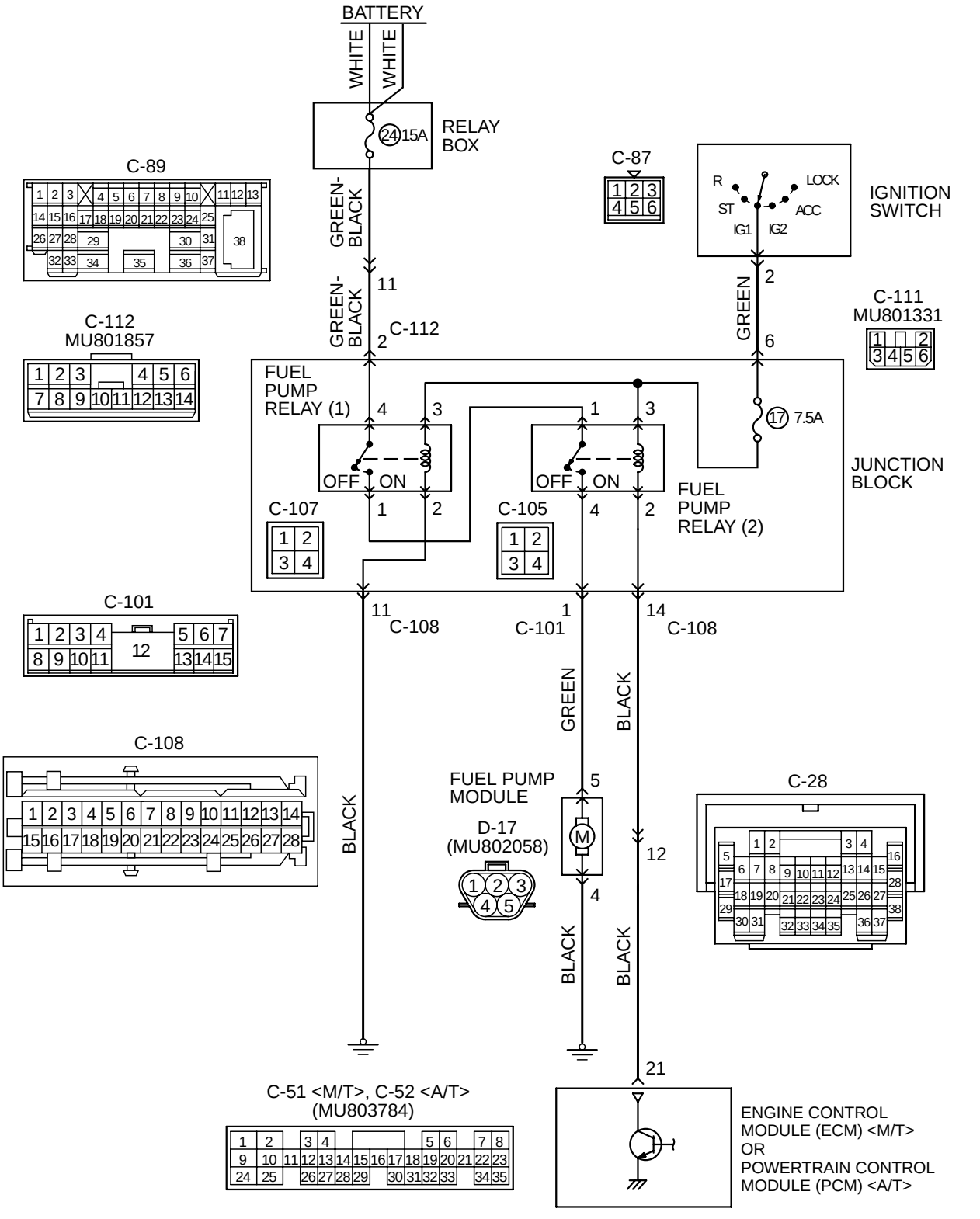
<A/T>



AKX01438AH

INSPECTION PROCEDURE 30: Fuel pump system.

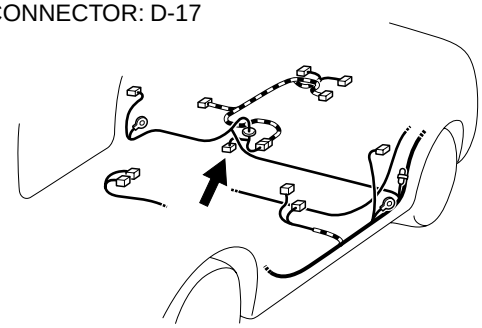
Fuel Pump Circuit



AK103099

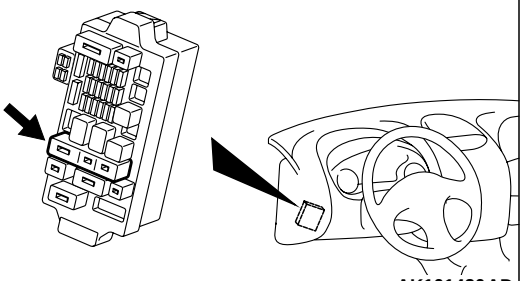
TSB Revision

CONNECTOR: D-17



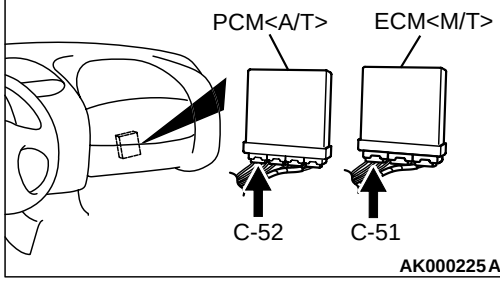
AK000344AC

CONNECTOR: C-108



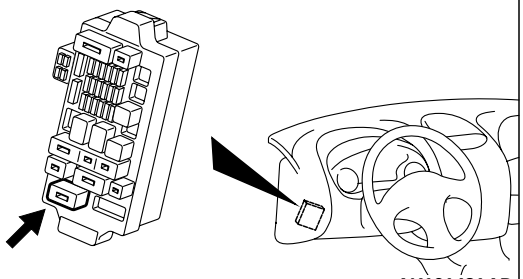
AK101420AD

CONNECTOR : C-51<M/T>, C-52<A/T>



AK000225AJ

CONNECTOR: C-111



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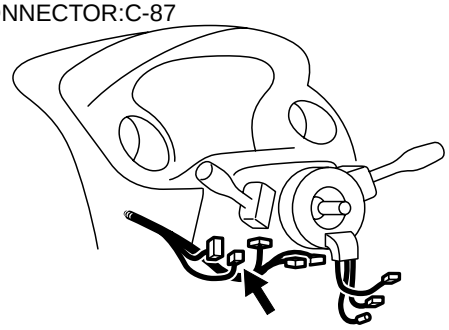
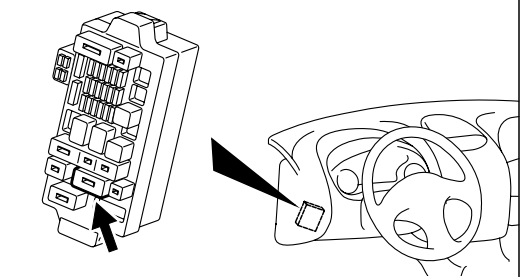
CONNECTOR:C-87



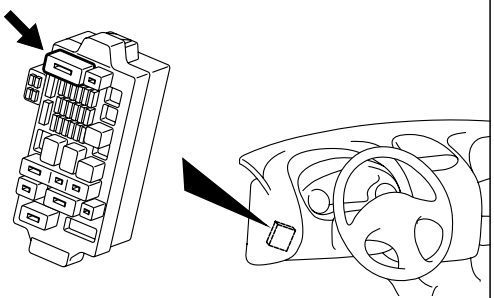
AK000219AC

CONNECTOR: C-112



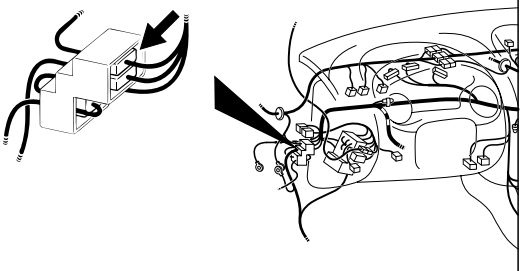
AK101422AD

CONNECTOR: C-101



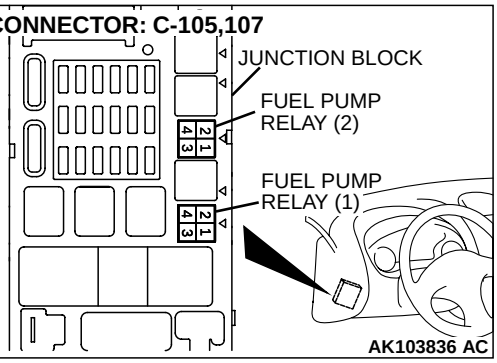
AK101412AI

CONNECTOR:C-89



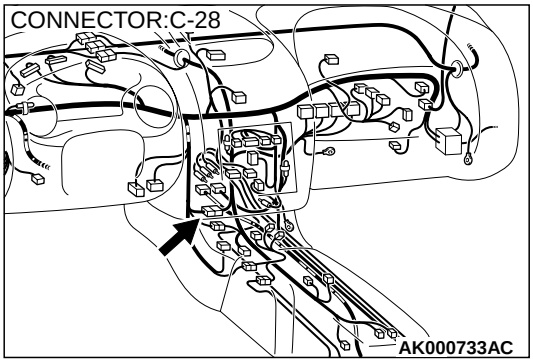
AK000345AE

CONNECTOR: C-105,107



AK103836AC

CONNECTOR:C-28



AK000733AC

TSB Revision

CIRCUIT OPERATION

- Battery positive voltage is applied to the fuel pump relay 1 (terminal 3) from the ignition switch-IG.
  Ground is provided through terminal 2 to chassis ground.
- When the ignition switch is turned to the "ON" position, the battery positive voltage is applied to the fuel pump relay 2 (terminal 1) from the fuel pump relay 1 (terminal 1).
- A battery positive voltage is applied on the fuel pump relay 2 (terminal 3) from the ignition switch-IG.
- During cranking and while the engine is running, the ECM <M/T> or PCM <A/T> turns the power transistor in the ECM <M/T> or PCM <A/T> ON to ground the fuel pump relay 2 coil. With this, the fuel pump relay turns ON, and the battery positive voltage is supplied to the fuel pump from the fuel pump relay 2 (terminal 4).

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

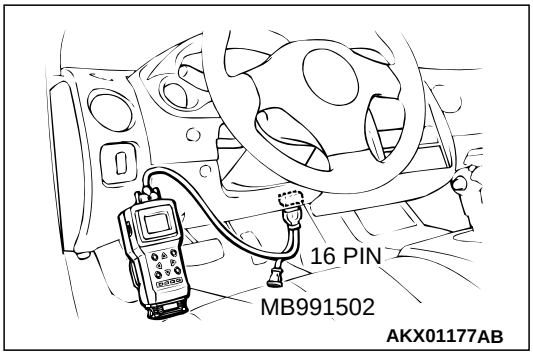
- Malfunction of the fuel pump relay 1 and 2.
- Malfunction of the fuel pump.
- Improper connector contact, open or short-circuited harness wire.
- Malfunction of the ECM <M/T> or PCM <A/T>.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check actuator test item 07: Fuel Pump.



⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

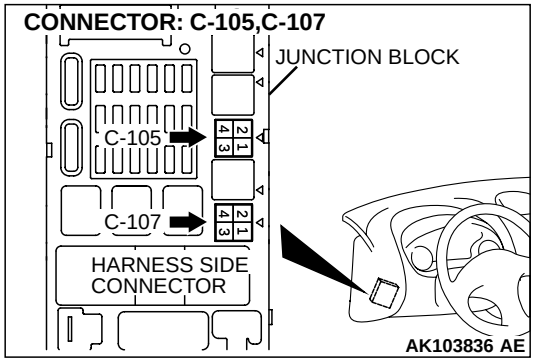
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the actuator test mode for item 07, Fuel Pump.
  - An operation sound of the fuel pump should be heard.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the fuel pump operating properly?

YES : That this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6.
NO : Go to Step 2.

STEP 2. Check connector C-107 at fuel pump relay 1 and connector C-105 at fuel pump relay 2 for damage.

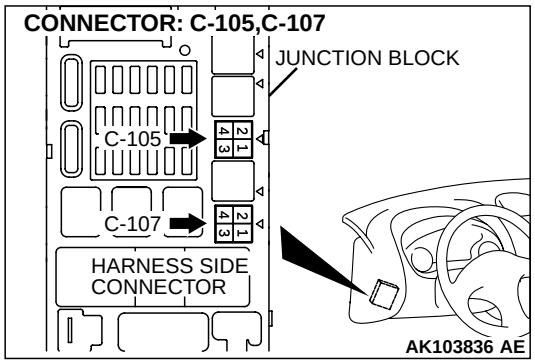


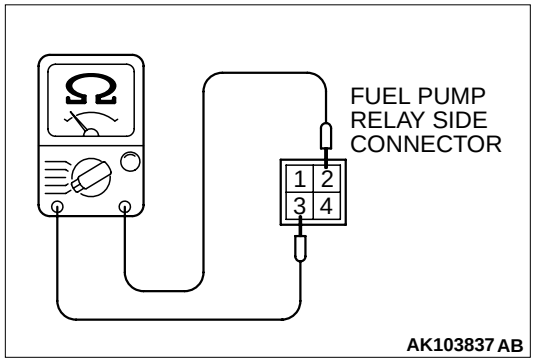
Q: Is the connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

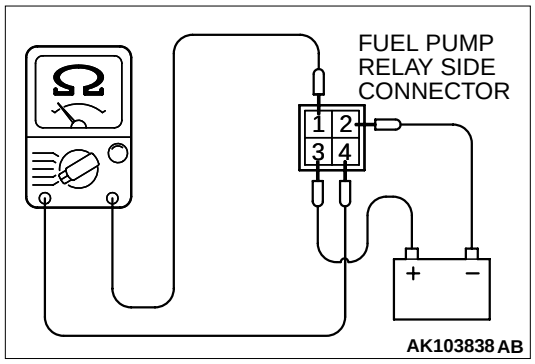
STEP 3. Check the fuel pump relay 1 and 2.

(1) Remove the fuel pump relay 1 and 2.





(2) Check for continuity between the each fuel pump relay terminals 2 and 3.
- There should be continuity. (approximately 70 Ω)



(3) Use jumper wires to connect each fuel pump relay terminal 3 to the positive battery terminal and terminal 2 to the negative battery terminal.
(4) Check the continuity between the each fuel pump relay terminals 1 and 4 while connecting and disconnecting the jumper wire at the negative battery terminal.
- Should be less than 2 ohm. (Negative battery terminal connected)
- Should be open loop. (Negative battery terminal disconnected)

(5) Install the fuel pump relay 1 and 2.

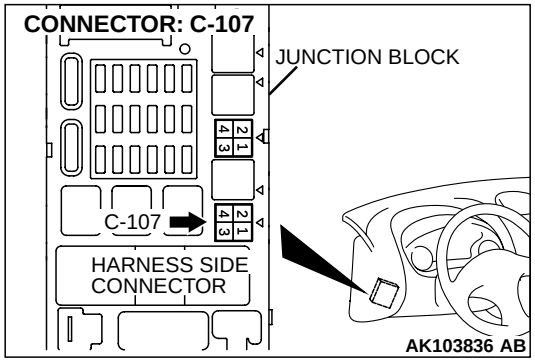
Q: Is the resistance normal?

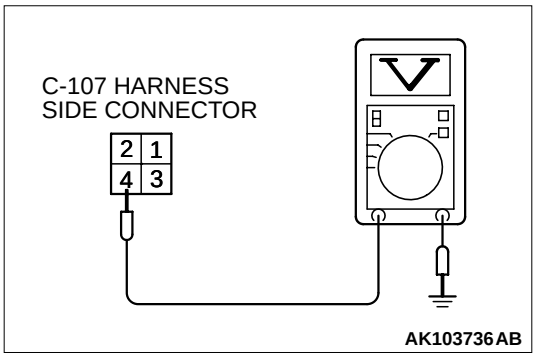
YES : Go to Step 4.

NO : Replace the fuel pump relay 1 and/or 2. Then confirm that the malfunction symptom is eliminated.

STEP 4. Check the power supply voltage at fuel pump relay 1 harness side connector C-107.

(1) Disconnect the connector C-107 and measure at the harness side.





(2) Measure the voltage between terminal 4 and ground.
- Voltage should be battery positive voltage.

Q: Is the voltage normal?

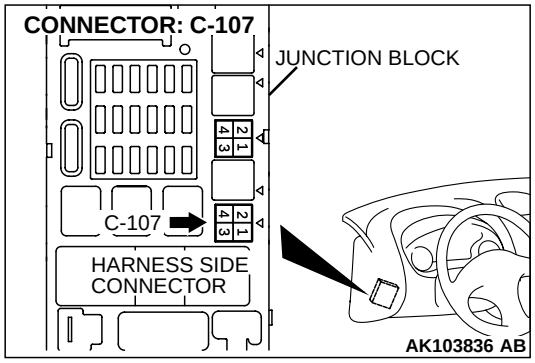
YES : Go to Step 5.

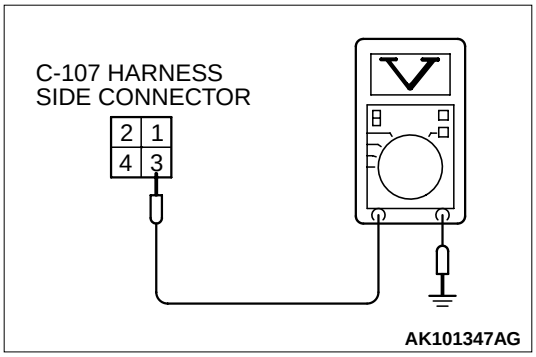
NO : . Check harness connectors C-89 and C-112 at intermediate connector for damage, and repair or replace as required. Refer to, GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connectors are in good condition, repair harness wire between dedicated fuse and fuel pump relay 1 connector C-107 terminal 4 because of open circuit. Then confirm that the malfunction symptom is eliminated.

STEP 5. Check the power supply voltage at fuel pump relay 1 harness side connector C-107.

(1) Disconnect the connector C-107 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.





(3) Measure the voltage between terminal 3 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

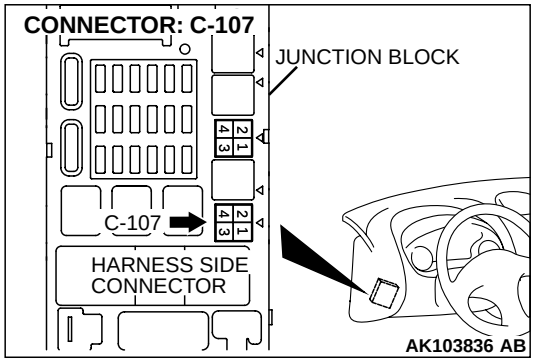
Q: Is the voltage normal?

YES : Go to Step 6.

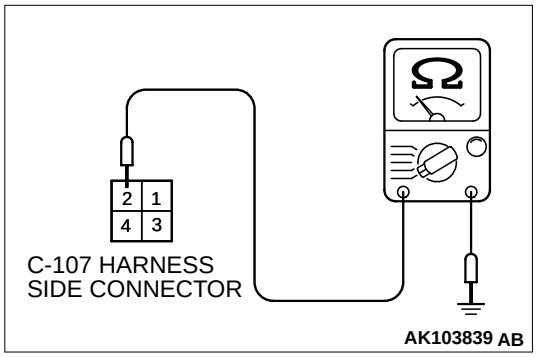
NO : Check harness connector C-111 at intermediate connector for damage, and repair or replace as required. Refer to, GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between ignition switch connector C-87 terminal 2 and fuel pump relay 1 connector C-107 terminal 3 because of open circuit. Then confirm that the malfunction symptom is

eliminated.

STEP 6. Check the continuity at fuel pump relay 1 harness side connector C-107.



(1) Disconnect the connector C-107 and measure at the harness side.



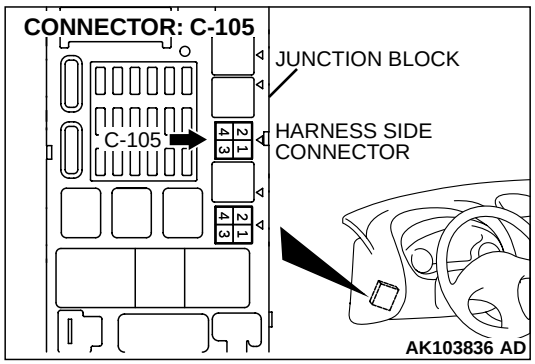
(2) Check for the continuity between terminal 2 and ground.
- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 7.

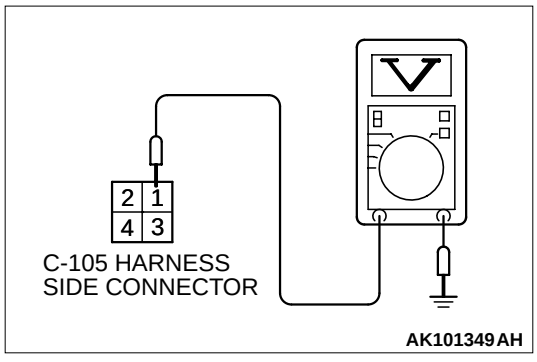
NO : Check harness connectors C-108 at intermediate connector for damage, and repair or replace as required. Refer to, GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connectors are in good condition, repair harness wire between fuel pump relay 1 connector C-107 terminal 2 and ground because of open circuit. Then confirm that the malfunction symptom is eliminated.

STEP 7. Check the power supply voltage at fuel pump relay 2 harness side connector C-105.



(1) Disconnect the connector C-105 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.

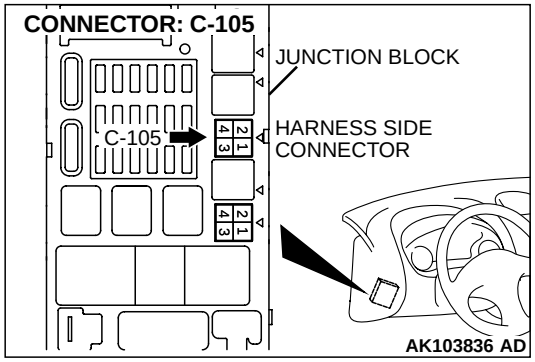


(3) Measure the voltage between terminal 1 and ground.
- Voltage should be battery positive voltage.

Q: Is the voltage normal?

YES : Go to Step 8.

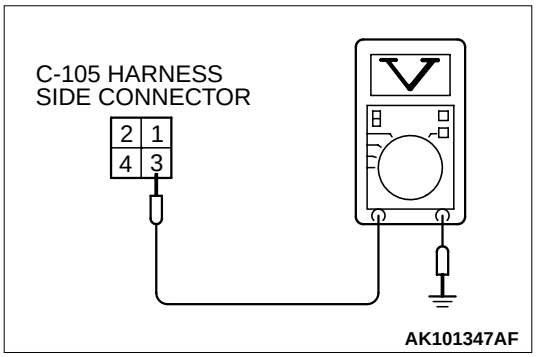
NO : Repair harness wire between fuel pump relay 1 connector C-107 terminal 1 and fuel pump relay 2 connector C-105 terminal 1 because of open circuit. Then confirm that the malfunction symptom is eliminated.



STEP 8. Check the power supply voltage at fuel pump relay 2 harness side connector C-105.

(1) Disconnect the connector C-105 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.



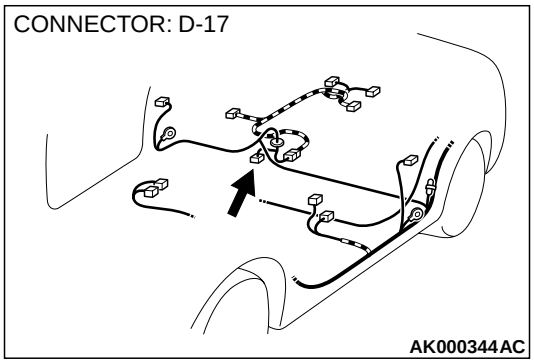
(3) Measure the voltage between terminal 3 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 9.

NO : Check harness connector C-111 at intermediate connector for damage, and repair or replace as required. Refer to, GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between ignition switch connector C-87 terminal 2 and fuel pump relay 2 connector C-105 terminal 3 because of open circuit. Then confirm that the malfunction symptom is eliminated.

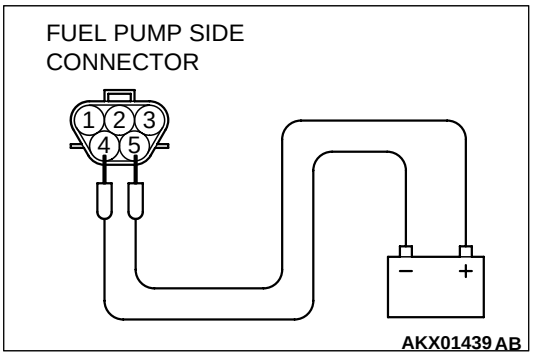


STEP 9. Check connector D-17 at fuel pump for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

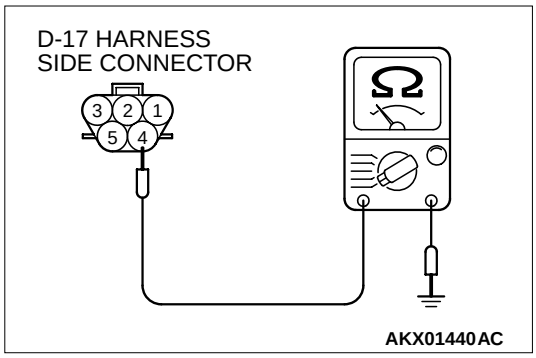


STEP 10. Check the fuel pump operation.

(1) Disconnect fuel pump connector D-17.
(2) Use jumper wires to connect fuel pump connector terminal 5 to the positive battery terminal and terminal 4 to the negative battery terminal.
- An operating sound of the fuel pump should be heard.

Q: Is the fuel pump operating properly?

YES : Go to Step 11.
NO : Replace the fuel pump. Then confirm that the malfunction symptom is eliminated.

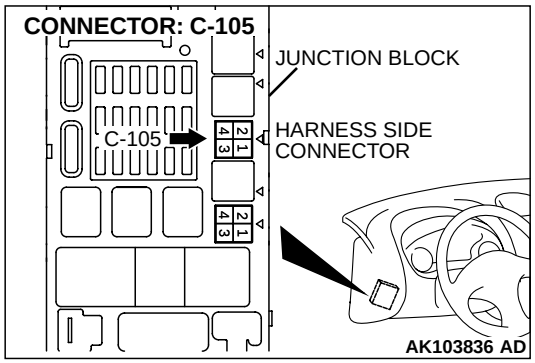


STEP 11. Check the continuity at fuel pump harness side connector D-17.

(1) Disconnect the connector D-17 and measure at the harness side.
(2) Check for the continuity between terminal 4 and ground.
- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 12.
NO : Repair harness wire damage between fuel pump connector D-17 terminal 4 and ground because of open circuit or harness damage. Then confirm that the malfunction symptom is eliminated.



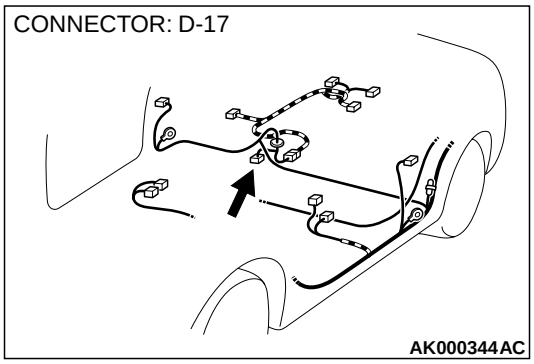
STEP 12. Check for open circuit and short circuit to ground and harness damage between fuel pump relay 2 connector C-105 terminal 4 and fuel pump connector D-17 terminal 5.

NOTE: Check harness after checking intermediate connectors C-101. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then check that the malfunction is eliminated.

Q: Is the harness wire in good condition?

YES : Go to Step 13.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.

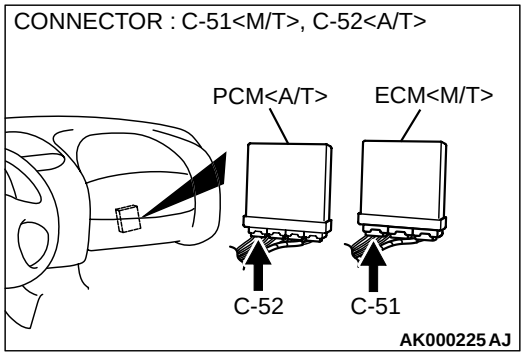


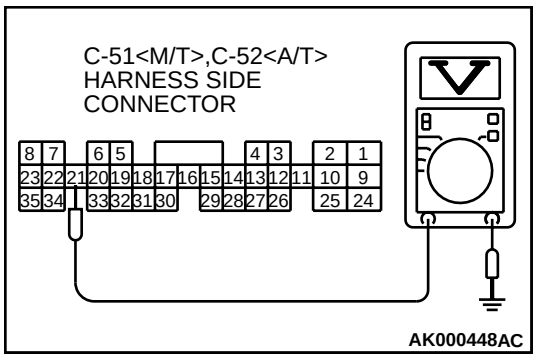
STEP 13. Check connector C-51 at ECM <M/T> or connector C-52 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.





STEP 14. Check the power supply voltage at ECM connector C-51 <M/T> or PCM connector C-52 <A/T>.

(1) Disconnect the connector C-51 <M/T> or C-52 <A/T> and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 21 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

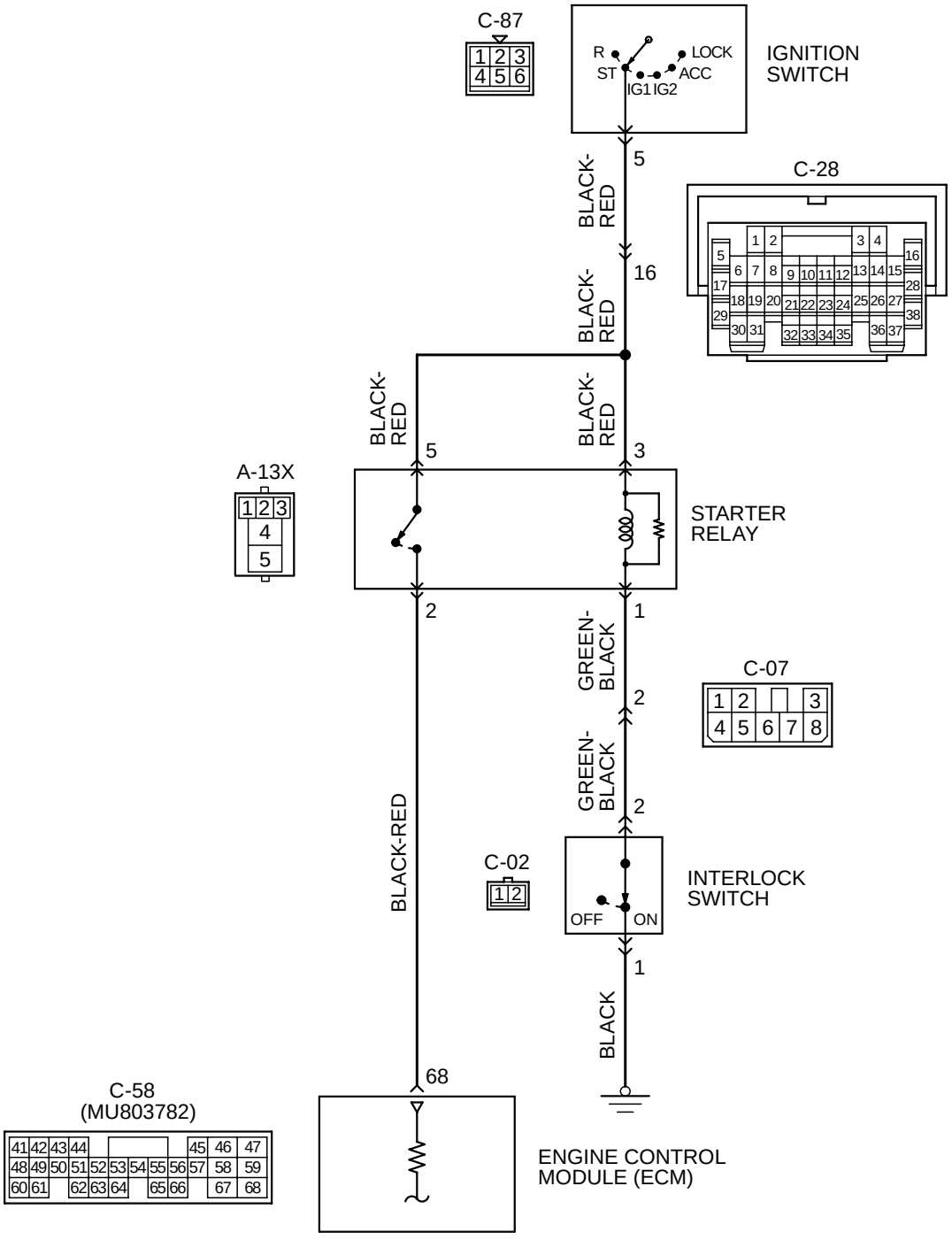
Q: Is the voltage normal?

YES : Replace the ECM or PCM. Then confirm that the malfunction symptom is eliminated.

NO : Check harness connectors C-28 and C-108 at intermediate connector for damage, and repair or replace as required. Refer to, GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connectors are in good condition, repair harness wire between fuel pump relay 2 connector C-105 terminal 2 and ECM connector C-51 terminal 21 <M/T> or PCM connector C-52 terminal 21 <A/T> because of open circuit. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 31: Ignition Switch – ST System. <M/T>

Ignition Switch-ST Circuit



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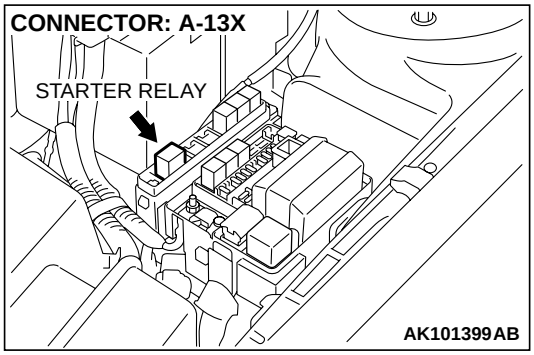
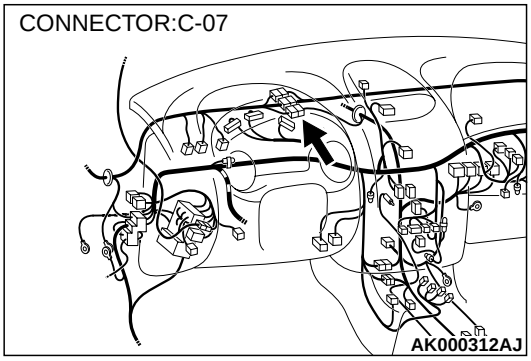
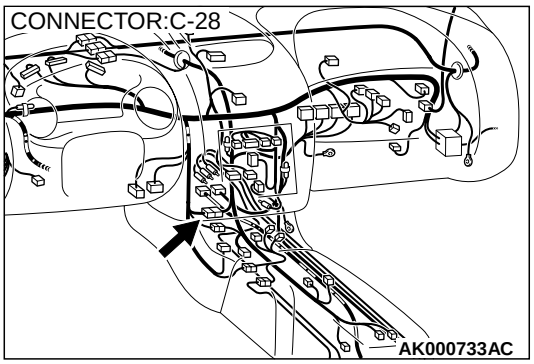
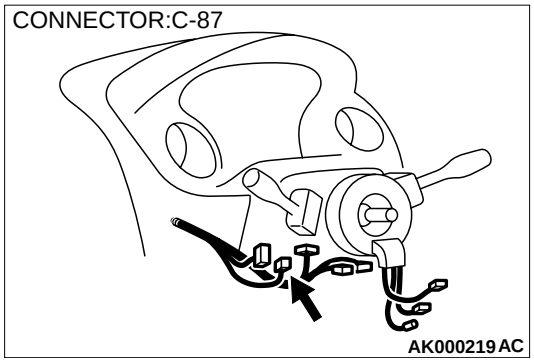
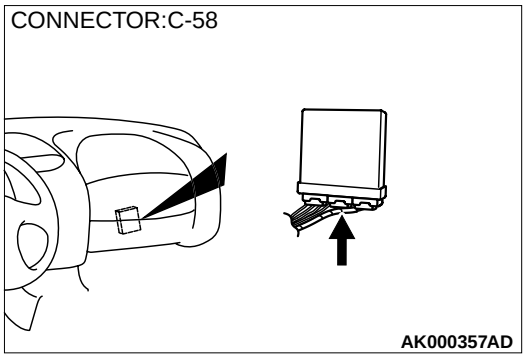
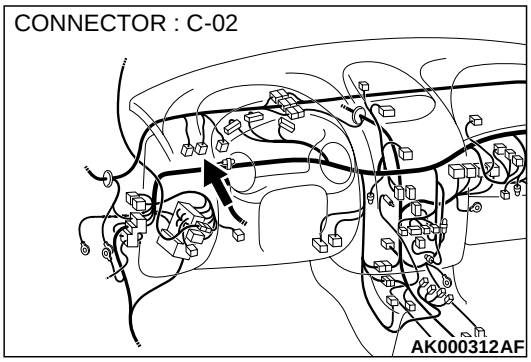












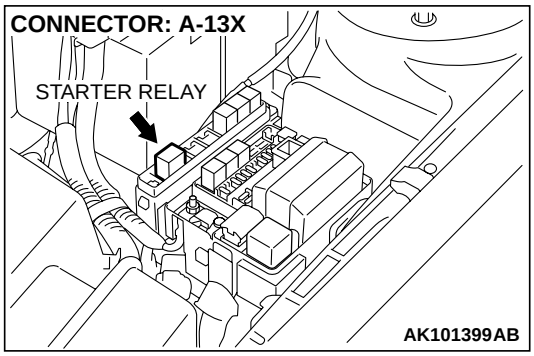
CIRCUIT OPERATION

- The battery positive voltage is supplied to the ECM (terminal 68) via the starter relay during engine cranking. With this, the ECM detects that the engine is being cranked.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the ignition switch.
- Malfunction of the starter relay.
- Improper connector contact, open circuit or short-circuited harness wire.
- Malfunction of the ECM.

DIAGNOSIS



STEP 1. Check connector A-13X at starter relay for damage.

Q: Is the connector in good condition?

YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

STEP 2. Check the starter relay.

Refer to GROUP 16, Starting system – On-vehicle Service – Starter relay check P.16-24.

Q: Are there any abnormalities?

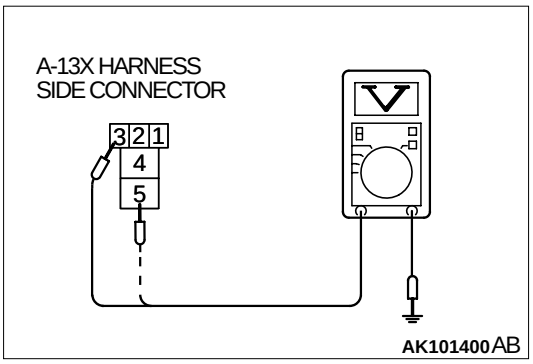
YES : Go to Step 3.

NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 3. Check the power supply voltage at starter relay connector A-13X.

(1) Disconnect the connector A-13X and measure at the harness side.
(2) Turn the ignition switch to the "START" position.
(3) Measure the voltage between terminal 3, 5 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the voltage normal?

YES : Go to Step 4.

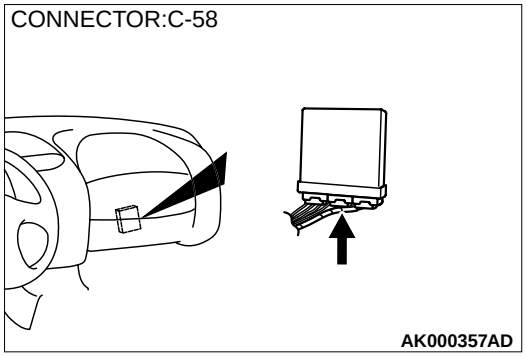
NO : Repair harness wire between ignition switch connector C-87 terminal 5 and starter relay connector A-13X terminal 3, 5 because of open circuit. Then confirm that the malfunction symptom is eliminated.

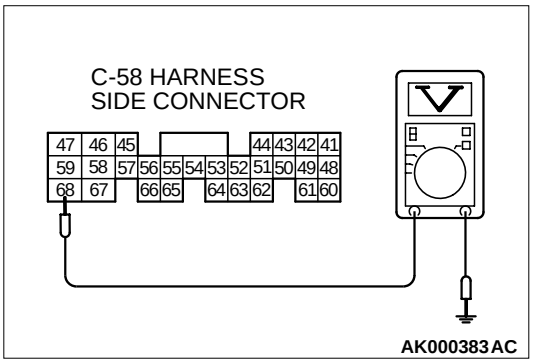
STEP 4. Check connector C-58 at ECM for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.





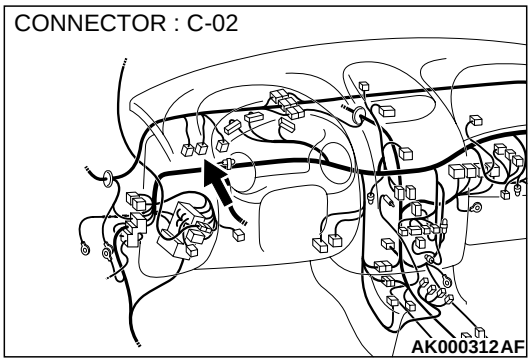
STEP 5. Check the power supply voltage at ECM connector C-58.

(1) Disconnect the connector C-58 and measure at the harness side.
(2) Turn the ignition switch to the "START" position.
(3) Measure the voltage between terminal 68 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 6.
NO : Repair harness wire between starter relay connector A-13X terminal 2 and ECM connector C-58 terminal 68 because of open circuit. Then confirm that the malfunction symptom is eliminated.



STEP 6. Check connector C-02 at interlock switch for damage.

Q: Is the connector in good condition?

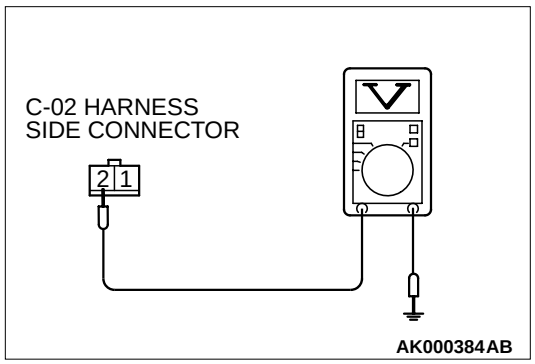
YES : Go to Step 7.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

STEP 7. Check the interlock switch.

Refer to GROUP 21A, On-vehicle Service – Interlock switch check and adjustment P.21A-9.

Q: Are there any abnormalities?

YES : Go to Step 8.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.



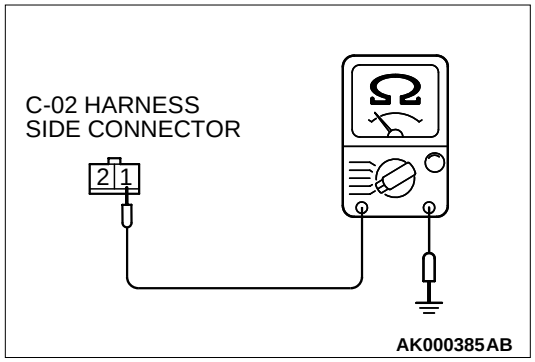
STEP 8. Check the power supply voltage at interlock switch connector C-02.

(1) Disconnect the connector C-02 and measure at the harness side.
(2) Turn the ignition switch to the "START" position.
(3) Measure the voltage between terminal 2 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 9.
NO : Check connector C-07 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connectors is in good condition, repair harness wire between starter relay connector A-13X terminal 1 and interlock switch connector C-02 terminal 2 because of open circuit. Then confirm that the malfunction symptom is eliminated.



STEP 9. Check the continuity at interlock switch harness side connector C-02.

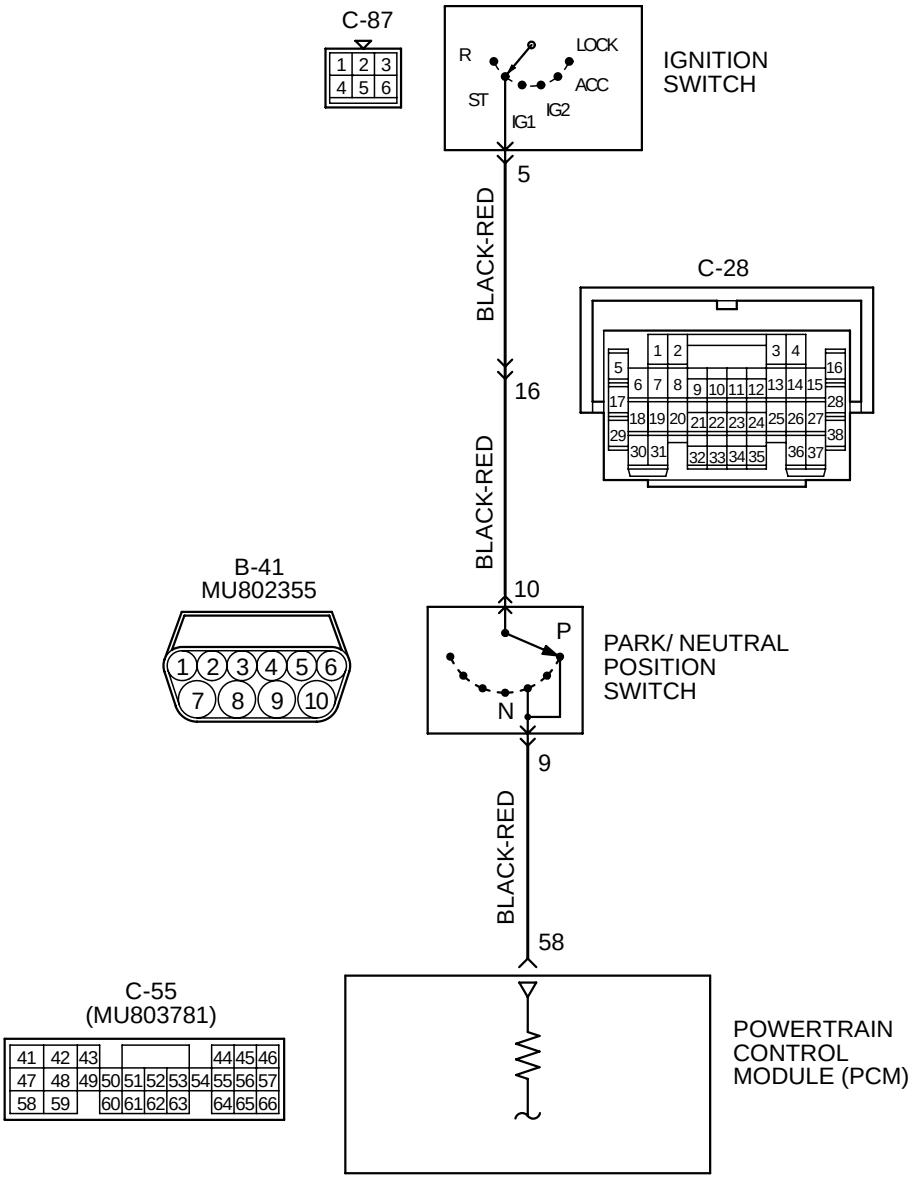
(1) Disconnect the connector C-02 and measure at the harness side.
(2) Check for the continuity between terminal 1 and ground.
- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Replace the ECM. Then confirm that the malfunction symptom is eliminated.
NO : Repair harness wire between interlock switch connector C-02 terminal 1 and ground because of open circuit or harness damage. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 32: Ignition Switch – ST System and Park/Neutral Position Switch System. <A/T>

Ignition Switch-ST and Park/Neutral Position Switch Circuit



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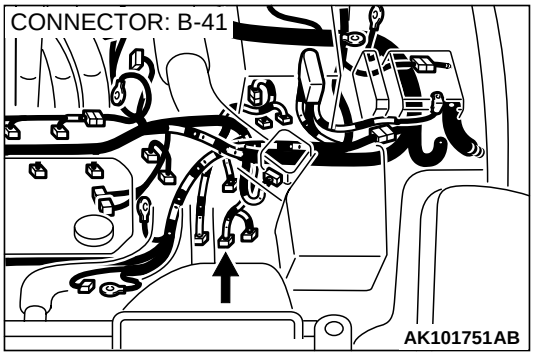

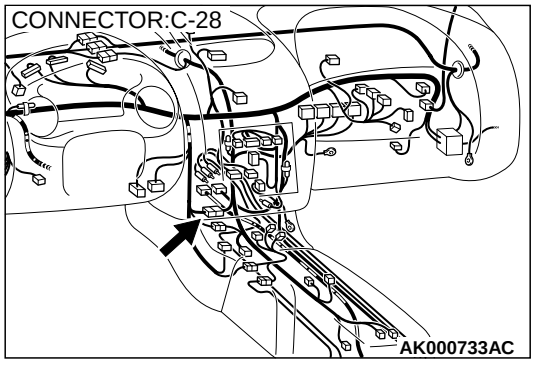

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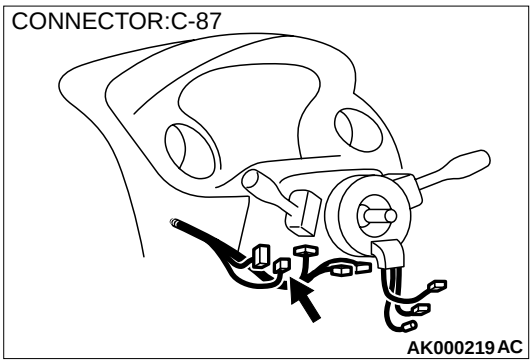
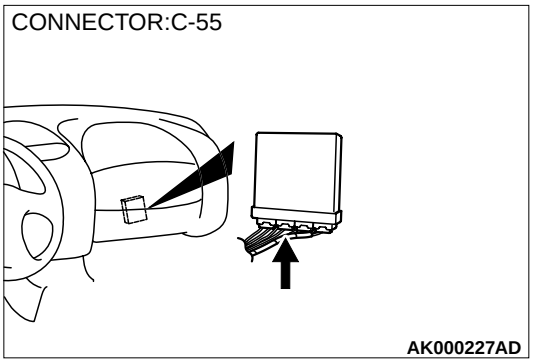




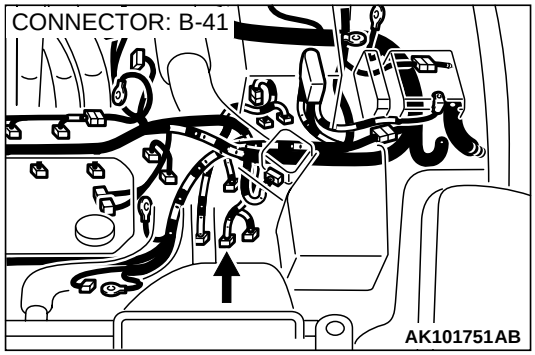
COMMENT

- If the selector lever is moved to "P" or "N" range and the ignition switch is turned to "START" position, battery positive voltage is supplied to PCM (terminal 58) through the ignition switch and park/neutral position switch. Because of this, the PCM detects that the engine is cranking.
- The park/neutral position switch detects the selector lever position (P, N or other ranges) and converts it to a voltage signal (high or low). Then the park/neutral position switch sends that signal to the PCM.

TROUBLESHOOTING HINTS (The most likely caused for this code to be set are:)

- Malfunction of the ignition switch.
- Malfunction of the park/neutral position switch.
- Improper connector contact, open circuit or short-circuit in the harness wire.
- Malfunction of the PCM.

DIAGNOSIS



STEP 1. Check connector B-41 at park/neutral position switch for damage.

Q: Is the connector in good condition?

YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

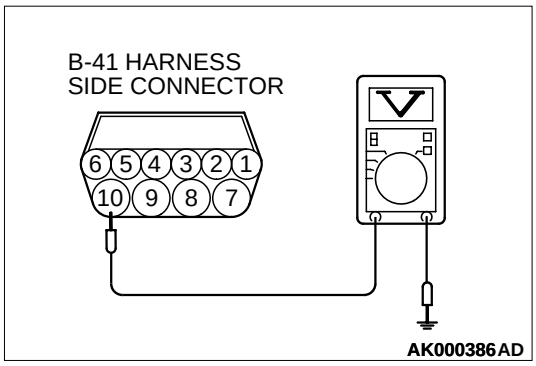
STEP 2. Check the park/neutral position switch.

Refer to GROUP 23A, On-vehicle Service – Essential Service – Park/neutral position switch continuity check P.23A-353.

Q: Are there any abnormalities?

YES : Go to Step 3.

NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.



STEP 3. Check the power supply voltage at park/neutral position switch connector B-41.

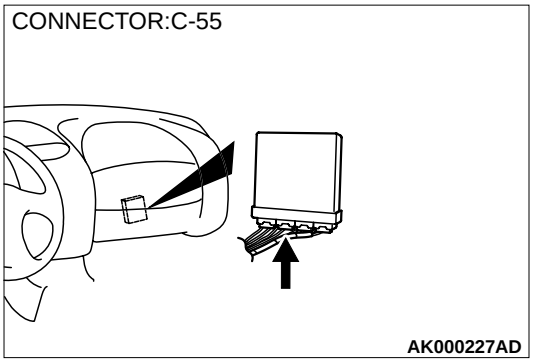
(1) Disconnect the connector B-41 and measure at the harness side.
(2) Turn the ignition switch to the "START" position.
(3) Measure the voltage between terminal 10 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 4.

NO : Check connector C-28 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between ignition switch connector C-87 terminal 5 and park/neutral position switch connector B-41 terminal 10 because of open circuit. Then confirm that the malfunction symptom is eliminated.

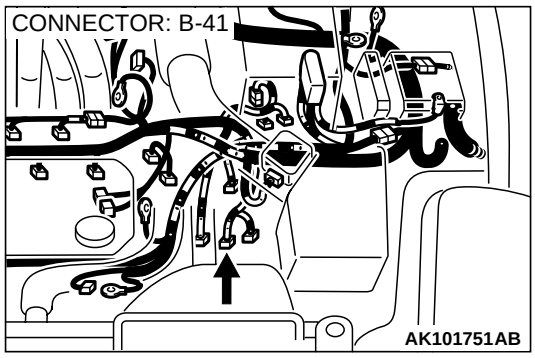


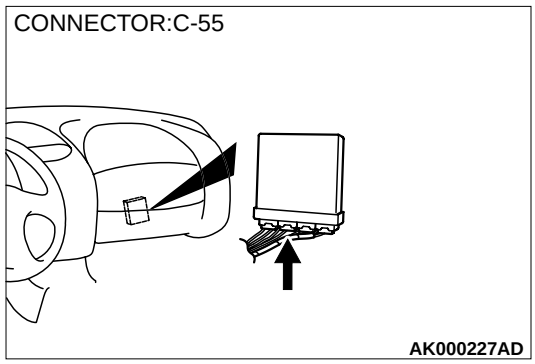
STEP 4. Check connector C-55 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.





STEP 5. Check for open circuit and short circuit to ground and harness damage between park/neutral position switch connector B-41 terminal 9 and PCM connector C-55 terminal 58.

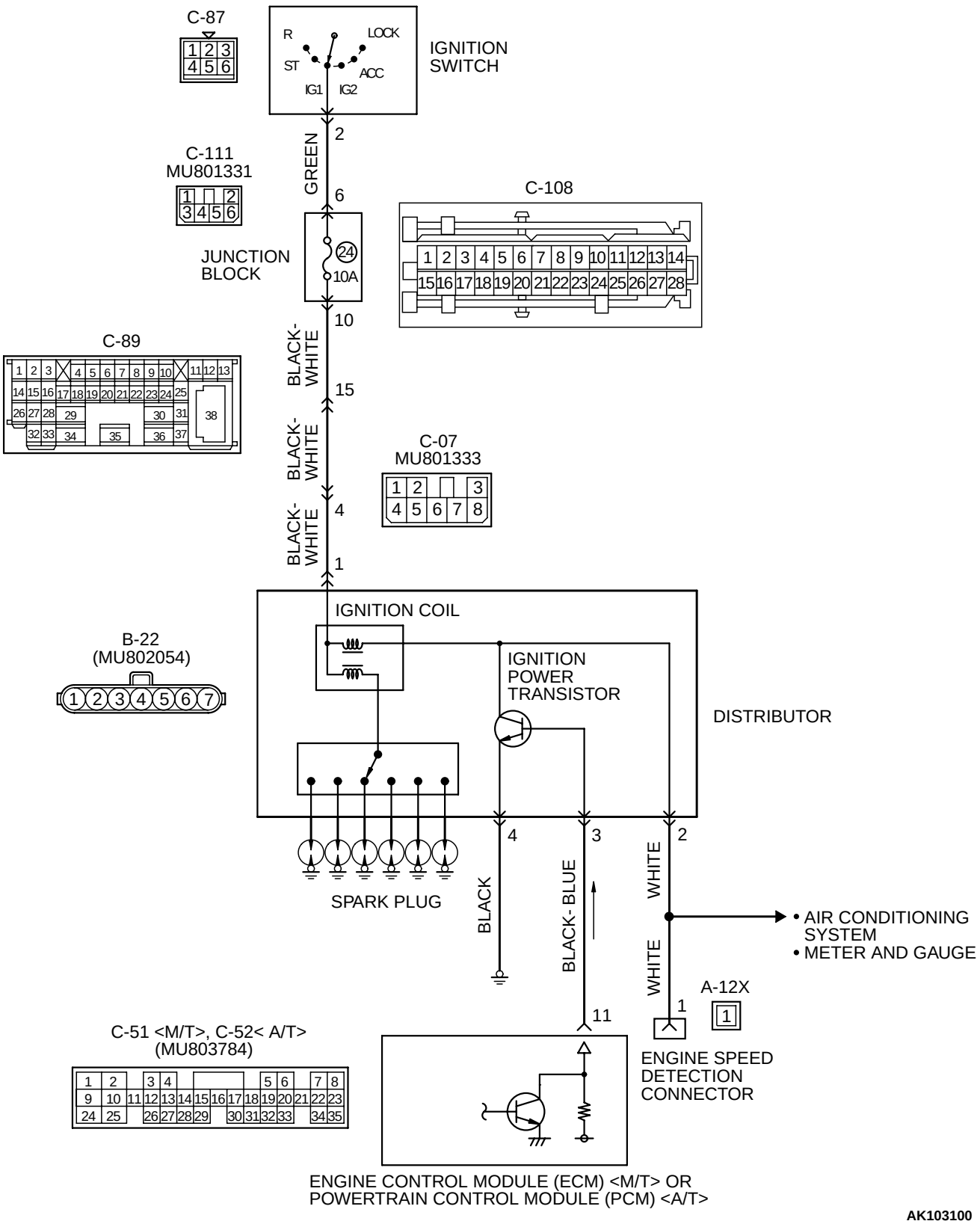
Q: Is the harness wire in good condition?

YES : Replace the PCM. Then confirm that the malfunction symptom is eliminated.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 33: Ignition Circuit System

Ignition Circuit



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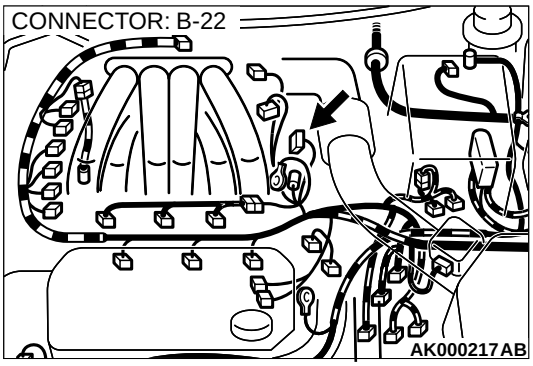

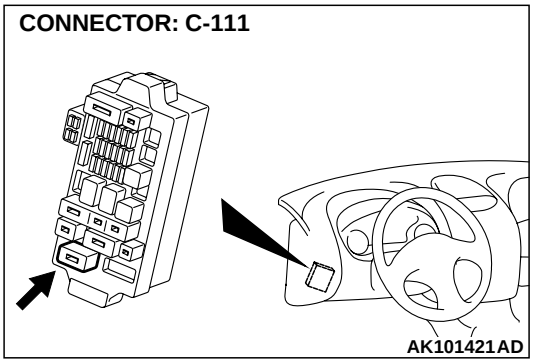

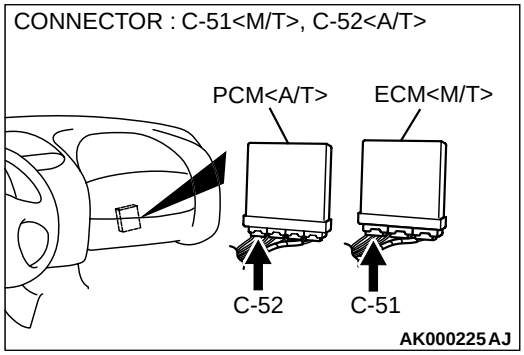

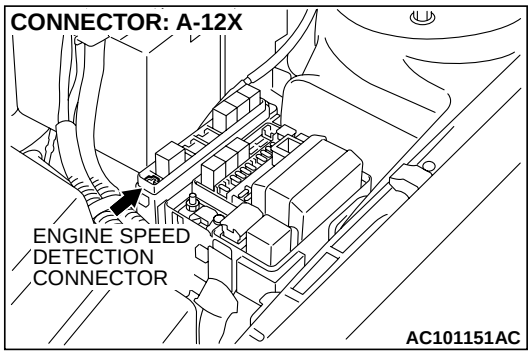

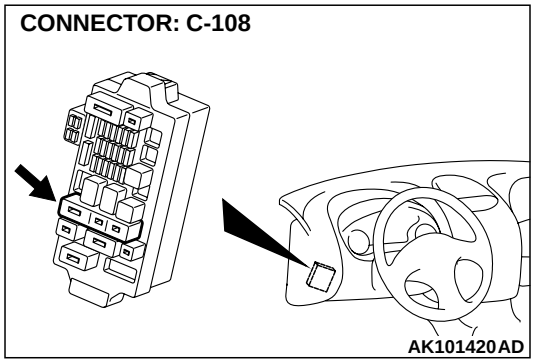

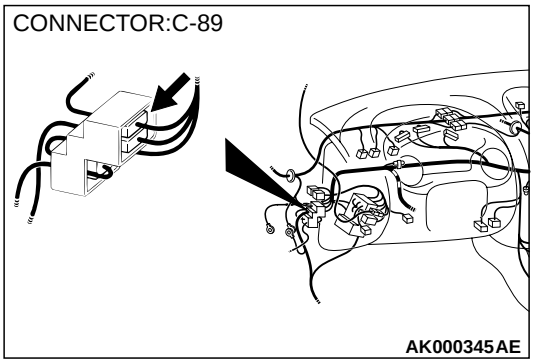

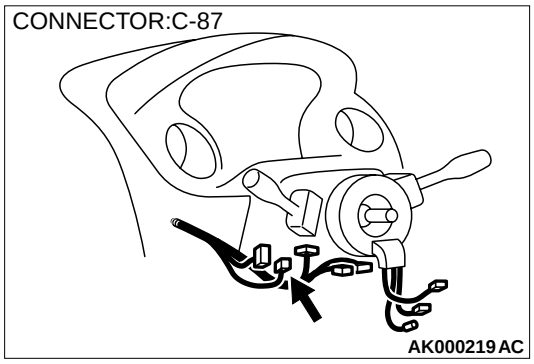

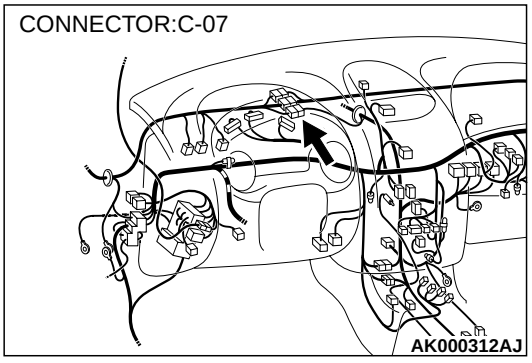

CIRCUIT OPERATION

- The battery positive voltage is applied on the ignition coil by the ignition switch-IG.
- When the ECM <M/T> or PCM <A/T> turns the power transistor in the ECM <M/T> or PCM <A/T> "OFF", battery positive voltage is applied on the ignition power transistor (terminals 3), and the ignition power transistor turns "ON".
- When the ignition power transistor turns on, the ignition coil's primary circuit is grounded by the ignition power transistor terminal 4. Then the primary current flows to the ignition coil.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the ignition coil.
- Malfunction of the ignition power transistor.
- Improper connector contact, open circuit or short-circuited harness wire.
- Malfunction of the ECM <M/T> or PCM <A/T>.

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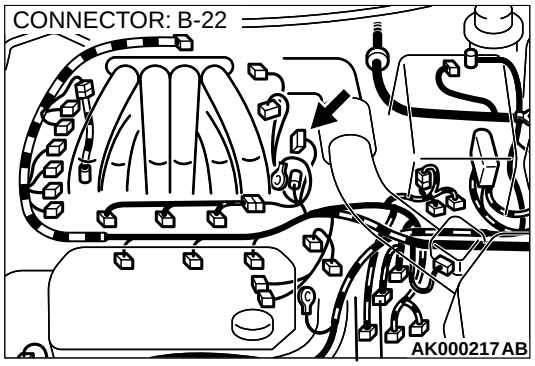
DIAGNOSIS



STEP 1. Check connector B-22 at distributor for damage.
Q: Is the connector in good condition?
YES : Go to Step 2.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

STEP 2. Check the ignition coil.
Refer to GROUP 16, Ignition System – On-vehicle service – Ignition coil check P.16-37.

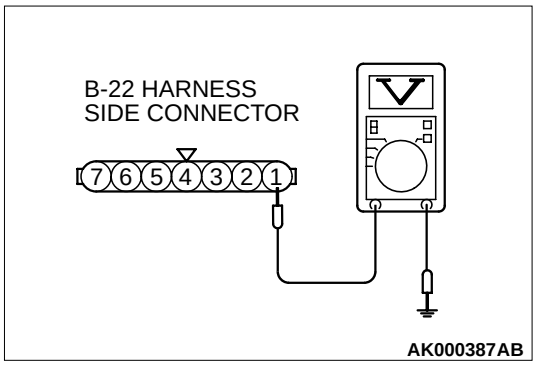
Q: Are there any abnormalities?
YES : Go to Step 3.
NO : Repair the ignition coil. Then confirm that the malfunction symptom is eliminated.

STEP 3. Check the ignition power transistor.
Refer to GROUP 16, Ignition System – On-vehicle service – Power transistor check P.16-37.

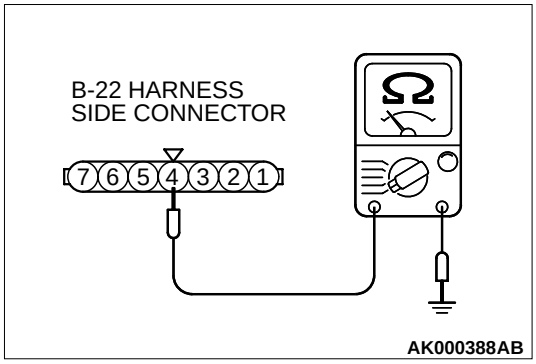
Q: Are there any abnormalities?
YES : Go to Step 4.
NO : Repair the ignition power transistor. Then confirm that the malfunction symptom is eliminated.

STEP 4. Check the power supply voltage at distributor connector B-22.
(1) Disconnect the connector B-22 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 1 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the voltage normal?
YES : Go to Step 5.
NO : Check connector C-07, C-89, C-108 and C-111 at intermediate connectors for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connectors are in good condition, repair harness wire between ignition switch connector C-87 terminal 2 and distributor connector B-22 terminal 1 because of open circuit. Then confirm that the malfunction symptom is eliminated.



STEP 5. Check the continuity at distributor harness side connector B-22.

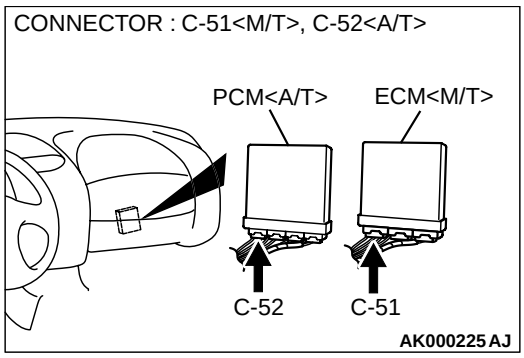
(1) Disconnect the connector B-22 and measure at the harness side.

(2) Check for the continuity between terminal 4 and ground.
- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 6.

NO : Repair harness wire between distributor connector B-22 terminal 4 and ground because of open circuit or harness damage. Then confirm that the malfunction symptom is eliminated.



STEP 6. Check connector C-51 at ECM <M/T> or connector C-52 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 7.

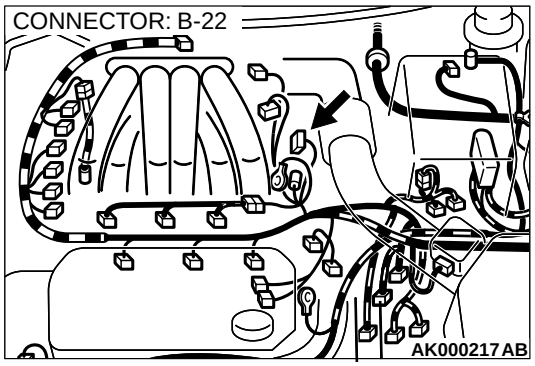
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

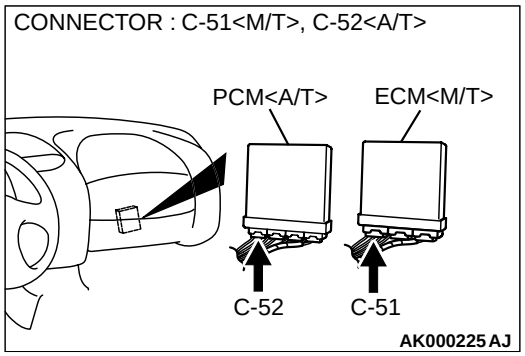
STEP 7. Check for open circuit between distributor connector B-22 terminal 3 and ECM connector C-51 terminal 11 <M/T> or PCM connector C-52 terminal 11 <A/T>.

Q: Is the harness wire in good condition?

YES : Go to Step 8.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.



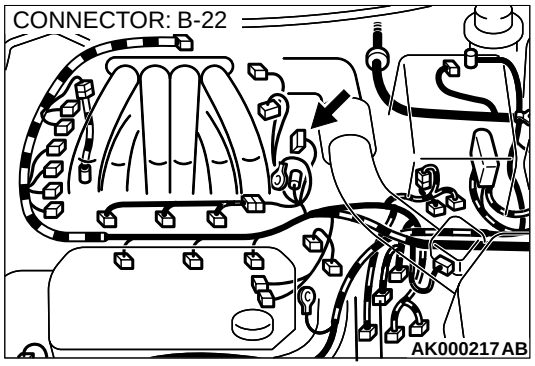


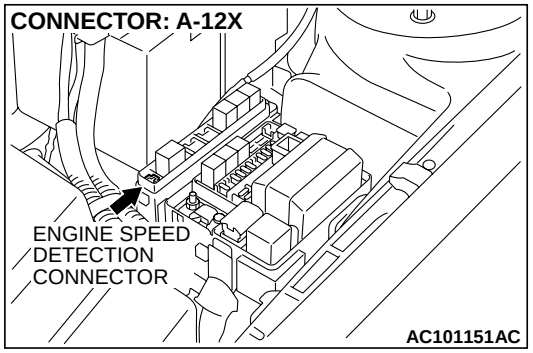
STEP 8. Check for open circuit between distributor connector B-22 terminal 2 and engine speed detection connector A-12X terminal 1.

Q: Is the harness wire in good condition?

YES : Replace the ECM or PCM. Then confirm that the malfunction symptom is eliminated.

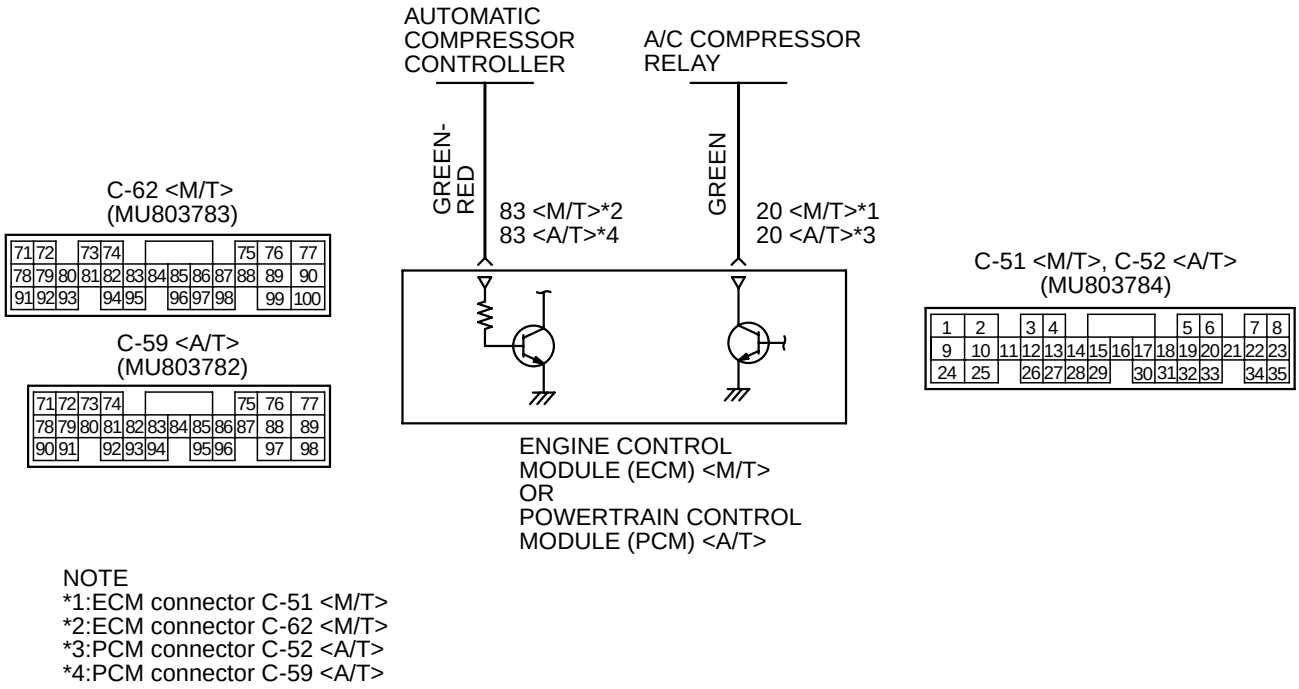
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

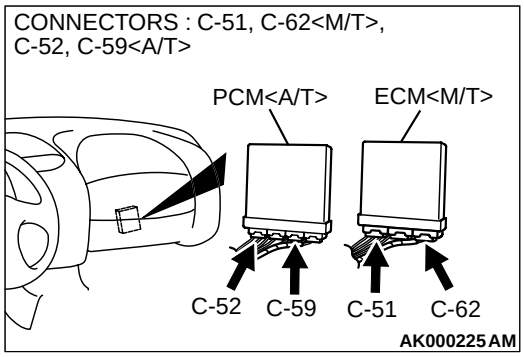




INSPECTION PROCEDURE 34: A/C system.

A/C Circuit





COMMENT

- When the A/C is "ON", the battery positive voltage is applied on the ECM (terminal 83) <M/T> PCM (terminal 83) <A/T> from the automatic compressor controller.
  When battery positive voltage is applied to the ECM <M/T> or PCM <A/T>, the ECM <M/T> or PCM <A/T> turns "ON" the power transistor in the ECM <M/T> or PCM <A/T>. The ECM <M/T> or PCM <A/T> delays A/C engagement momentarily while it increases idle rpm. Then the A/C compressor clutch relay coil will be energized.
  With this, the A/C compressor clutch relay turns "ON", and the A/C compressor clutch functions.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the A/C control system.
- Malfunction of the A/C switch.
- Improper connector contact, open circuit or short-circuited harness wire.
- Malfunction of the ECM <M/T> or PCM <A/T>.

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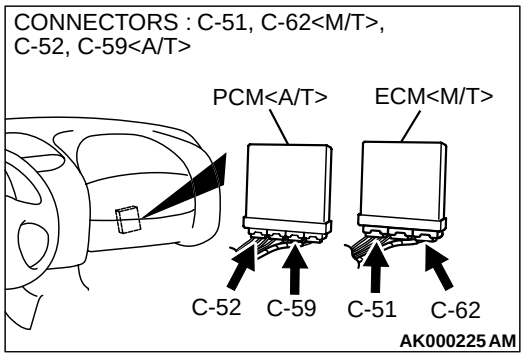
DIAGNOSIS

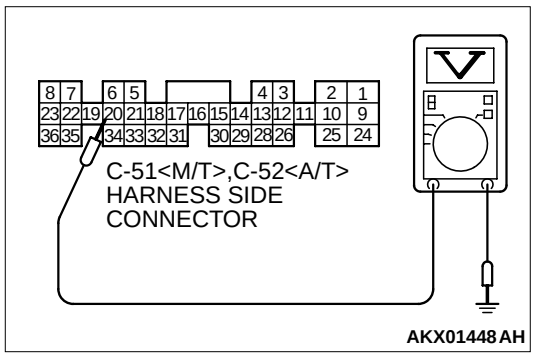


STEP 1. Check connector C-51, C-62 at ECM <M/T> or connector C-52, C-59 at PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.



STEP 2. Check the circuit at ECM connector C-51 <M/T> or PCM connector C-52 <A/T>.

(1) Disconnect the connectors C-51 <M/T> or C-52 <A/T> and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 20 and ground.
- Voltage should be battery positive voltage.

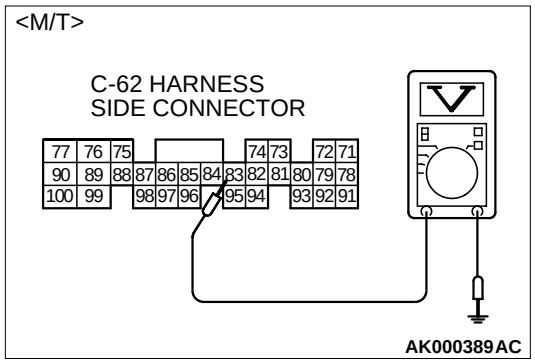
(4) Using a jumper wire, connect terminal 20 to ground.
- A/C compressor relay should turn "ON".

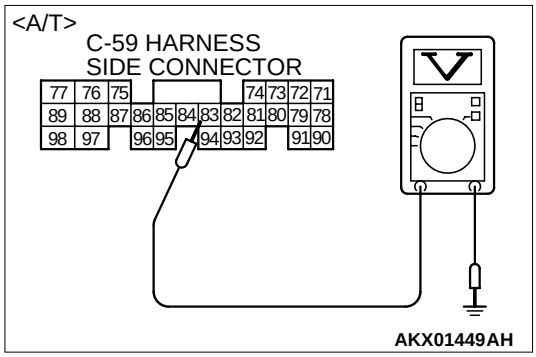
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage and A/C compressor relay condition normal?

YES : Go to Step 3.

NO : Refer to GROUP 55, Diagnosis – Introduction To Heater, Air Conditioning And Ventilation Diagnosis P.55-5. Then confirm that the malfunction symptom is eliminated.





STEP 3. Check the circuit at ECM connector C-62 <M/T> or PCM connector C-59.

(1) Disconnect the connectors C-62 <M/T> or C-59 <A/T> and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 83 and ground.
- Voltage should be 1 volt or less when the A/C switch is "OFF".
- Voltage should be battery positive voltage when the A/C switch is "ON".

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Replace the ECM or PCM. Then confirm that the malfunction symptom is eliminated.

NO : Refer to GROUP 55, Diagnosis – Introduction To Heater, Air Conditioning And Ventilation Diagnosis P.55-5.

DATA LIST REFERENCE TABLE

M1131152000166

⚠ CAUTION

- **When shifting the select lever to D range, the brakes should be applied so that the vehicle does not move forward.**
- **Driving tests always need two persons: one driver and one observer.**

NOTE: Sensor 1 indicates the sensor mounted at a position closest to the engine, and sensor 2 indicates the sensor mounted at the position second close to the engine.

NOTE: Bank 1 indicates the right bank cylinder, and bank 2 indicates the left bank cylinder.

*NOTE: *1: If the idle speed is lower than the standard value on a very cold engine [approximately -20°C (-4°F)] even when the IAC motor is fully opened, the air volume limiter built in the throttle body could be defective.*

*NOTE: *2: In a new vehicle [driven approximately 500 km (311 mile) or less], the step of the stepper motor is sometimes 30 steps greater than the standard value.*

*NOTE: *3: The injector drive time represents the time when the cranking speed is at 250 r/min or below when the power supply voltage is 11 volts.*

*NOTE: *4: In a new vehicle [driven approximately 500 km (311 mile) or less], the injector drive time is sometimes 10% longer than the standard time.*

*NOTE: *5: In a new vehicle [driven approximately 500 km (311 mile) or less], the volume air flow sensor output frequency is sometimes 10% higher than the standard frequency.*

*NOTE: *6: Applicable to GST*

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
A/C RELAY	49	A/C compressor clutch relay	• Engine: warming up, idling • A/C switch: "OFF"		OFF	Procedure No. 34	P.13B-638
			• Engine: warming up, idling • A/C switch: "ON"	A/C compressor clutch is not operating	OFF		
				A/C compressor clutch is not operating	ON		
A/C SWITCH	28	A/C switch	• Engine: warming up, idling • A/C switch: "OFF"		OFF	Procedure No. 34	P.13B-638
			• Engine: warming up, idling • A/C switch: "ON"	A/C compressor clutch is not operating	OFF		
				A/C compressor clutch is not operating	ON		
BARO SENSOR	25	Barometric pressure sensor	Ignition switch: "ON"	At altitude of 0 m (0 ft)	101 kPa	Code No. P0106, P0107, P0108	P.13B-42, P.13B-46, P.13B-56
				At altitude of 600 m (1,969 ft)	95 kPa		
				At altitude of 1,200 m (3,937 ft)	88 kPa		
				At altitude of 1,800 m (5,906 ft)	81 kPa		
BATT VOLTAGE	16	power supply voltage	Ignition switch: "ON"		Battery positive voltage	Procedure No. 29	P.13B-607

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
CRANK SENSOR	22	Crankshaft position sensor*1	• Engine: cranking • Tachometer: connected		Engine speeds displayed on the scan tool and tachometer are identical.	Code No. P0335	P.13B-315
			Engine: idling	Engine coolant temperature is -20°C (-4°F)	1,300 – 1,500 r/min		
				Engine coolant temperature is 0°C (32°F)	1,300 – 1,500 r/min		
				Engine coolant temperature is 20°C (68°F)	1,300 – 1,500 r/min		
				Engine coolant temperature is 40°C (104°F)	1,040 – 1,240 r/min		
				Engine coolant temperature is 80°C (176°F)	600 – 800 r/min		
CRANK SENSOR 2	38	Crankshaft position sensor	• Engine: cranking (at less than 2,000 r/min) • Tachometer: connected		The speeds indicated by the scan tool and tachometer match.	Code No. P0335	P.13B-315
CRANK. SIGNAL	18	Cranking signal (ignition switch-ST)	Ignition switch: "ON"	Engine: stopped	OFF	Procedure No. 31 <M/T> Procedure No. 32 <A/T>	P.13B-624 <M/T> P.13B-629 <A/T>
				Engine: cranking	ON		

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
ECT SENSOR	21	Engine coolant temperature sensor	Ignition switch: "ON" or with engine running	Engine coolant temperature is –20°C (–4°F)	–20°C (–4°F)	Code No. P0116, P0117, P0118	P.13B-77, P.13B-85, P.13B-89
				Engine coolant temperature is 0°C (32°F)	0°C (32°F)		
				Engine coolant temperature is 20°C (68°F)	20°C (68°F)		
				Engine coolant temperature is 40°C (104°F)	40°C (104°F)		
				Engine coolant temperature is 80°C (176°F)	80°C (176°F)		
ECT SENSOR	21*6	Engine coolant temperature sensor	Ignition switch: "ON" or with engine running	Engine coolant temperature is –20°C (–4°F)	–20°C (–4°F)	Code No. P0116, P0117, P0118	P.13B-77, P.13B-85, P.13B-89
				Engine coolant temperature is 0°C (32°F)	0°C (32°F)		
				Engine coolant temperature is 20°C (68°F)	20°C (68°F)		
				Engine coolant temperature is 40°C (104°F)	40°C (104°F)		
				Engine coolant temperature is 80°C (176°F)	80°C (176°F)		
ENGINE LOAD	37	Volumetric efficiency	• Engine coolant temperature : 80 – 95 (176 – 203°F) • Lights, electric cooling fan and all accessories : OFF • Transaxle: neutral (A/T: "P" range)	Engine is idling	15 – 35%	–	–
				2,500 r/min	15 – 35%		
				Racing	Volumetric efficiency increases according to amount of revving.		
ENGINE LOAD	87*6	Calculation load value	Engine: warming up	Engine is idling	10 – 30%	–	–
				2,500 r/min	10 – 30%		

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MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
ENGINE SPEED	22*6	Crankshaft position sensor*1	• Engine: cranking • Tachometer: connected		Engine speeds displayed on the scan tool and tachometer are identical.	Code No. P0335	P.13B-315
			Engine: idling	Engine coolant temperature is –20°C (–4°F)	1,300 – 1,500 r/min		
				Engine coolant temperature is 0°C (32°F)	1,300 – 1,500 r/min		
				Engine coolant temperature is 20°C (68°F)	1,300 – 1,500 r/min		
				Engine coolant temperature is 40°C (104°F)	1,040 – 1,240 r/min		
				Engine coolant temperature is 80°C (176°F)	600 – 800 r/min		
FUEL TEMP	4A	Fuel temperature sensor	In cooled srate ignition switch: "ON"		approximately the same as the outdoor temperature	Code No. P0181, P0182, P0183	P.13B-266, P.13B-273, P.13B-277

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
HO2S BANK1 S1	39	Heated oxygen sensor (bank 1, sensor 1)	Engine: warming up (Air/fuel mixture is made leaner when decelerating, and is made richer when revving.)	When the engine is running at 4,000 r/min, decelerated suddenly.	200 mV or less	Code No. P0130, P0131, P0132, P0133, P0134	P.13B-122, P.13B-132, P.13B-137, P.13B-140, P.13B-143
				When engine is suddenly.	600 – 1,000 mV		
			Engine: warming up (the heated oxygen sensor signal is used to check the air/fuel mixture ratio, and control condition is also checked by the PCM <A/T> or ECM <M/T>.)	Engine is idling 2,500 r/min	Voltage changes repeatedly between 400 mv or less and 600 – 1,000 mV.		
HO2S BANK1 S1	A1*6	Heated oxygen sensor (bank 1, sensor 1)	Engine: warming up (Air/fuel mixture is made leaner when decelerating, and is made richer when revving.)	When the engine is running at 4,000 r/min, decelerate suddenly	0.2 V or less	Code No. P0130, P0131, P0132, P0133, P0134	P.13B-122, P.13B-132, P.13B-137, P.13B-140, P.13B-143
				When engine is suddenly	0.6 – 1 V		
			Engine: warming up (the heated oxygen sensor signal is used to check the air/fuel mixture ratio, and control condition is also checked by the PCM <A/T> or ECM <M/T>.)	Engine is idling 2,500 r/min	Voltage changes repeatedly between 0.4 V or less and 0.6 – 1 V.		

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MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
HO2S BANK1 S2	69	Heated oxygen sensor (bank 1, sensor 2)	Engine: warming up	Revving	0 and 600 – 1,000 mV alternate.	Code No. P0136, P0137, P0138, P0139	P.13B-156, P.13B-166, P.13B-171, P.13B-174
HO2S BANK1 S2	A2*6	Heated oxygen sensor (bank 1, sensor 2)	Engine: warming up	Revving	0 and 0.6 – 1 V alternate.	Code No. P0136, P0137, P0138, P0139	P.13B-156, P.13B-166, P.13B-171, P.13B-174
HO2S BANK2 S1	11	Heated oxygen sensor (bank 2, sensor 1)	Engine: Warm (air/fuel mixture is made leaner when decelerating, and is made richer when revving.)	When the engine is running at 4,000 r/min, decelerated suddenly.	200 mV or less	Code No. P0150, P0151, P0152, P0153, P0154	P.13B-184, P.13B-194, P.13B-199, P.13B-202, P.13B-205
				when engine is suddenly raced.	600 – 1,000 mV		
			Engine: Warm (the heated oxygen sensor signal is used to check the air/fuel mixture ratio, and control condition is also checked by the PCM <A/T> or ECM <M/T>)	Engine is idling 2,500 r/min	Voltage alternates between 400 mV or less and 600 – 1,000 mV.		

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
HO2S BANK2 S1	A3*6	Heated oxygen sensor (bank 2, sensor 1)	Engine: Warm (air/fuel mixture is made leaner when decelerating, and is made richer when revving.)	When the engine is running at 4,000 r/min, decelerated suddenly.	0.2 V or less	Code No. P0150, P0151, P0152, P0153, P0154	P.13B-184, P.13B-194, P.13B-199, P.13B-202, P.13B-205
				When engine is suddenly raced	0.6 – 1 V		
			Engine: Warm (the heated oxygen sensor signal is used to check the air/fuel mixture ratio, and control condition is also checked by the PCM <A/T> or ECM <M/T>)	Engine is idling	Voltage alternates between 0.4 V or less and 0.6 – 1 V.		
				2,500 r/min			
HO2S BANK2 S2	59	Heated oxygen sensor (bank 2, sensor 2)	Engine: warming up	Revving	0 and 600 – 1,000 mV alternate.	Code No. P0156, P0157, P0158, P0159	P.13B-218, P.13B-228, P.13B-233, P.13B-236
HO2S BANK2 S2	A4*6	Heated oxygen sensor (bank 2, sensor 2)	Engine: warming up	Revving	0 and 0.6 – 1 V alternate.	Code No. P0156, P0157, P0158, P0159	P.13B-218, P.13B-228, P.13B-233, P.13B-236

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
IAC VALVE POS	45	Idle air control (stepper) position*2	• Engine coolant temperature : 80 – 95°C (176 – 203°F) • Lights, electric cooling fan and all accessories : OFF • Transaxle: neutral (A/T: "P" range) • Engine: idling (when A/C switch is "ON. "A/C compressor should be operating)	A/C switch: "OFF"	2 – 25 STEP	–	–
				A/C switch: "OFF"→"ON"	Increases by 10 – 70 STEP		
				• A/C switch: "OFF" • Selector lever: "N" to "D" range	Increases by 5 – 50 STEP		
IAT SENSOR	13	Intake air temperature sensor	Ignition switch: "ON" or with engine running	Intake air temperature is –20°C (–4°F)	–20°C (–4°F)	Code No. P0111, P0112, P0113	P.13B-62, P.13B-67, P.13B-71
				Intake air temperature is 0°C (32°F)	0°C (32°F)		
				Intake air temperature is 20°C (68°F)	20°C (68°F)		
				Intake air temperature is 40°C (104°F)	40°C (104°F)		
				Intake air temperature is 80°C (176°F)	80°C (176°F)		

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
IAT SENSOR	13*6	Intake air temperature sensor	Ignition switch: "ON" or with engine running	Intake air temperature is –20°C (–4°F)	–20°C (–4°F)	Code No. P0111, P0112, P0113	P.13B-62, P.13B-67, P.13B-71
				Intake air temperature is 0°C (32°F)	0°C (32°F)		
				Intake air temperature is 20°C (68°F)	20°C (68°F)		
				Intake air temperature is 40°C (104°F)	40°C (104°F)		
				Intake air temperature is 80°C (176°F)	80°C (176°F)		
IG. TIMING ADV	44	Ignition coils and ignition power transistor	• Engine: warming up • Timing light is set (to check actual ignition timing)	Engine is idling	7 – 23° BTDC	–	–
				2,500 r/min	28 – 48° BTDC		
IG. TIMING ADV	44*6	Ignition coils and ignition power transistor	• Engine: warming up • Timing light is set (to check actual ignition timing)	Engine is idling	7 – 23 deg	–	–
				2,500 r/min	28 – 48 deg		

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
INJECTOR B1	47	Injectors (bank 1)*3	Engine: cranking	When engine coolant temperature is 0°C (32°F)	13.2 – 19.8 mS	–	–
				When engine coolant temperature is 20°C (68°F)	33.2 – 49.8 mS		
				When engine coolant temperature is 80°C (176°F)	8.2 – 12.4 mS		
		Injectors (bank 1)*4	• Engine coolant temperature : 80 – 95°C (176 – 203°F) • Lights, electric cooling fan and all accessories : OFF • Transaxle: neutral (A/T "P" range)	Engine is idling	2.1 – 3.3 mS		
				2,500 r/min	1.8 – 3.0 mS		
				When engine is suddenly revved	Increases		

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
INJECTOR B2	41	Injectors (bank 2)*3	Engine: cranking	When engine coolant temperature is 0°C (32°F)	13.2 – 19.8 mS	–	–
				When engine coolant temperature is 20°C (68°F)	33.2 – 49.8 mS		
				When engine coolant temperature is 80°C (176°F)	8.2 – 12.4 mS		
		Injectors (bank 2)*4	• Engine coolant temperature : 80 – 95°C (176 – 203°F) • Lights, electric cooling fan and all accessories : OFF • Transaxle: neutral (A/T: "P" range)	Engine is idling	2.1 – 3.3 mS		
				2,500 r/min	1.8 – 3.0 mS		
				When engine is suddenly revved	Increases		
LONG TRIM B1	81*6	Long-term fuel compensation (bank 1)	Engine: warming up, 2,500 r/min without any load (during closed loop)		–12.5 – 12.5%	Code No. P0171, P0172	P.13B-245, P.13B-252
LONG TRIM B2	83*6	Long-term fuel compensation (bank 2)	Engine: warming up, 2,500 r/min without any load (during closed loop)		–12.5 – 12.5%	Code No. P0174, P0175	P.13B-256, P.13B-262
MANIFOLD SNSR	95	Manifold differential pressure sensor	Engine: warming up, idling		22.6 – 36.0 kPa	Code No. P1400	P.13B-518
PSP SWITCH	27	Power steering pressure switch	Engine: idling	Steering wheel stationary	OFF	Code No. P0551	P.13B-496
				Steering wheel turning	ON		
SHORT TRIM B1	82*6	Short-term fuel compensation (bank 1)	Engine: warming up, 2,500 r/min without any load (during closed loop)		–25 – 25%	Code No. P0171, P0172	P.13B-245, P.13B-252

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MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
SHORT TRIM B2	84*6	Short-term fuel compensation (bank 2)	Engine: warming up, 2,500 r/min without any load (during closed loop)		–25 – 25%	Code No. P0174, P0175	P.13B-256, P.13B-262
SYS. STATUS B1	88*6	Fuel control condition (bank 1)	Engine: warming up	2,500 r/min	Closed loop	–	–
				When engine is suddenly revved	Open loop – drive condition		
SYS, STATUS B2	89*6	Fuel control condition (bank 2)	Engine: warming up	2,500 r/min	Closed loop	–	–
				When engine is suddenly revved	Open loop – drive condition		
TANK PRS. SNSR	73	Fuel tank differential pressure sensor	• Ignition switch: "ON" • Fuel cap removal		–3.3 – 3.3 kPa	–	–
TP SENSOR	14	Throttle position sensor	Ignition switch: "ON"	Set to idle position	535 – 735 mV	Code No. P0121, P0122, P0123	P.13B-95, P.13B-103, P.13B-109
				Gradually open	Increases in proportion to throttle opening angle		
				Open fully	4,500 – 5,500 mV		
TP SENSOR	8A*6	Throttle position sensor	Ignition switch: "ON"	Set to idle position	6 – 20%	Code No. P0121, P0122, P0123	P.13B-95, P.13B-103, P.13B-109
				Gradually open	Increases in proportion to throttle opening angle		
				Open fully	80 – 100%		
VAF RESET SIG	34	Volume air flow sensor reset signal	Engine: warming up	Engine is idling	ON	–	–
				2,500 r/min	OFF		

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
VAF SENSOR	12	Volume air flow sensor (mass air flow rate)*5	• Engine coolant temperature : 80 – 95°C (176 – 203°F) • Lights, electric cooling fan and all accessories : "OFF" • Transaxle: neutral (A/T: "P" range)	Engine is idling	17 – 46 HZ	–	–
				2,500 r/min	63 – 103 Hz		
				Engine is revved	Frequency (or air flow volume) increases in response to revving		
VAF SENSOR	12*6	Volume air flow sensor (mass air flow rate)*5	• Engine coolant temperature : 80 – 95°C (176 – 203°F) • Lights, electric cooling fan and all accessories : "OFF" • Transaxle: neutral (A/T: "P" range)	Engine is idling	2.2 – 5.7 gm/s	–	–
				2,500 r/min	9.0 – 14.7 gm/s		
				Engine is revved	Frequency (or air flow volume) increases in response to revving		
VSS	24*6	Vehicle speed sensor <M/T>	Drive at 40 km/h (25 mph).		Approximately 40 km/h (25 mph)	Code No. P0500	P.13B-469

ACTUATOR TEST REFERENCE TABLE

M1131152500149

*NOTE: *: Continues for 27 minutes. Can be released by pressing the CLEAR key.*

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	DRIVE CONTENTS	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
EGR SOLENOID	10	EGR solenoid	Solenoid valve turns from OFF to ON.	Ignition switch: "ON"		Clicks when solenoid valve is driven.	Code No. P0403	P.13B-338
EVAP PURGE	08	Evaporative emission purge solenoid	Solenoid valve turns from OFF to ON.	Ignition switch: "ON"		Clicks when solenoid valve is driven.	Code No. P0443	P.13B-367
EVAP VENT	29	Evaporative emission ventilation solenoid	Solenoid valve turns from OFF to ON.	Ignition switch: "ON"		Clicks when solenoid valve is driven.	Code No.P0446	P.13B-375
FUEL PUMP	07	Fuel pump	Fuel pump operates and fuel is recirculated	• Ignition switch: "ON" • Fuel pump: activated Inspect according to both the above conditions	Pinch the return hose with fingers to feel the pulse of the fuel being recirculated	Pulse is felt	Procedure No. 29	P.13B-614
					Listen near the fuel tank for the sound of fuel pump operation	Sound of operation is heard		
IG 5° BTDC	17*	Basic ignition timing	Set to ignition timing adjustment mode	• Engine: idling • Connect timing light		5°BTDC	–	–

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	DRIVE CONTENTS	INSPECTION REQUIREMENT	NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
NO. 1 INJECTOR	01	Injectors	Cut fuel to No. 1 injector	Engine: warm, idle (cut the fuel supply to each injector in turn and check cylinders which don't affect idling.)	Idling condition becomes different (becomes unstable)	Code No. P0201	P.13B-283
NO. 2 INJECTOR	02		Cut fuel to No. 2 injector			Code No. P0202	P.13B-292
NO. 3 INJECTOR	03		Cut fuel to No. 3 injector			Code No. P0203	P.13B-283
NO. 4 INJECTOR	04		Cut fuel to No. 4 injector			Code No. P0204	P.13B-292
NO. 5 INJECTOR	05		Cut fuel to No. 5 injector			Code No. P0205	P.13B-283
NO. 6 INJECTOR	06		Cut fuel to No. 6 injector			Code No. P0206	P.13B-292
RADIAT. FAN LO	21	Fan controller	Drive the fan motor	Ignition switch: "ON"	Radiator fan and A/C condenser fan rotate at high speed	Procedure No. 27	P.13B-604
VIC SOLENOID	11	Variable induction control solenoid	Solenoid valve turns from OFF to ON.	Ignition switch: "ON"	Clicks when solenoid valve is driven	Code No. P0660	P.13B-510

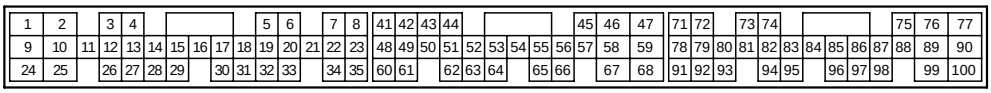
CHECK AT THE ENGINE CONTROL MODULE (ECU) <M/T> OR POWERTRAIN CONTROL MODULE (PCM) <A/T>

M1131153700027

TERMINAL VOLTAGE CHECK CHART

ECM <M/T> or PCM <A/T> Connector Terminal Arrangement

<M/T>



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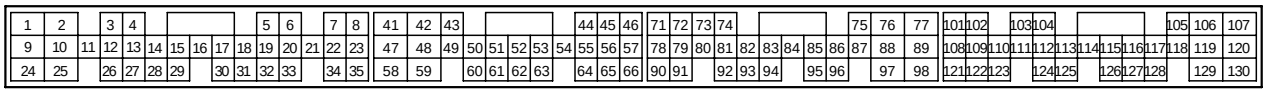

AK000057 AB

TERMINAL NO. <M/T>	TERMINAL NO. <A/T>	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)	NORMAL CONDITION
1	1	No.1 injector	• Engine: warming up, idling • Suddenly depress the accelerator pedal	From 11 – 14 V momentarily drops slightly
9	9	No.2 injector		
24	24	No.3 injector		
2	2	No.4 injector		
10	10	No.5 injector		
25	25	No.6 injector		

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TERMINAL NO. <M/T>	TERMINAL NO. <A/T>	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)	NORMAL CONDITION
3	3	Left bank heated oxygen sensor heater (front)	Engine: warming up, idling	9 – 11 V
			Engine: Revving	9 – 11 V → B+ (momentarily)
4	4	Right bank heated oxygen sensor heater (front)	Engine: warming up, idling	9 – 11 V
			Engine: Revving	B+
6	6	EGR solenoid	Ignition switch: "ON"	B+
			• Engine: idling • Suddenly depress the accelerator pedal.	From B+, drops momentarily
8	8	Generator G terminal	• Engine: warming up, idling (radiator fan: stopped) • Headlight: OFF to ON • Rear defogger switch: OFF to ON • Stop light switch: OFF to ON	Voltage rises by 0.2 – 3.5 V
52	54	Generator FR terminal	• Engine: warming up, idling (radiator fan: stopped) • Headlight: OFF to ON • Rear defogger switch: OFF to ON • Stop light switch: OFF to ON	Voltage drops
11	11	Ignition power transistor	Engine: 3,000 r/min	0.3 – 3.0 V
14	14	Stepper motor coil <A1>	• Engine: warming up, idling • A/C switch: OFF → ON • Headlight switch: OFF → ON	B+ ⇔ 1 V or less (changes repeatedly)
28	28	Stepper motor coil <A2>		
15	15	Stepper motor coil <B1>		
29	29	Stepper motor coil <B2>		
18	18	Fan controller	Radiator fan and A/C condenser fan are not operating	0 – 0.3V
			Radiator fan and A/C condenser fan are operating	0.7 V or more
19	19	Volume air flow sensor reset signal	Engine: idling	0 – 1 V
			Engine: 3,000 r/min	6 – 9 V
21	21	Fuel pump relay	Ignition switch: "ON"	B+
			Engine: idling	0 – 3V
20	20	A/C compressor clutch relay	• Engine: idling • A/C switch: OFF→ ON (A/C compressor is operating)	B+ → 1 v or less as A/C clutch cycles
22	22	Service engine soon/malfunction indicator lamp	Ignition switch: "OFF" → "ON"	1 V or less → 9 – 13 V (after several seconds have elapsed)

TERMINAL NO. <M/T>	TERMINAL NO. <A/T>	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
26	26	Left bank heated oxygen sensor heater (rear)	Engine: warming up, idling		1 V or less
			Engine: Revving		B+
27	27	Right bank heated oxygen sensor heater (rear)	Engine: warming up, idling		1 V or less
			Engine: Revving		B+
16	34	Evaporative emission purge solenoid	Ignition switch: "ON"		B+
			Engine: warm up, 3,000 r/min		3 – 13 V
35	35	Evaporative emission ventilation solenoid	Ignition switch: "ON"		B+
			Carry out the Actuator test to drive the solenoid valve		For approx. six seconds 1 V or less
44	44	Engine coolant temperature sensor	Ignition switch: "ON"	When engine coolant temperature is –20°C (–4°F)	3.9 – 4.5 V
				When engine coolant temperature is 0°C (32°F)	3.2 – 3.8 V
				When engine coolant temperature is 20°C (68°F)	2.3 – 2.9 V
				When engine coolant temperature is 40°C (104°F)	1.3 – 1.9 V
				When engine coolant temperature is 60°C (140°F)	0.7 – 1.3 V
				When engine coolant temperature is 80°C (176°F)	0.3 – 0.9 V
43	45	Crankshaft position sensor	Engine: cranking		0.4 – 4.0 V
			Engine: idling		1.5 – 2.5 V
42	46	Sensor supplied voltage	Ignition switch: "ON"		4.5 – 5.5 V
47	41	Power supply	Ignition switch: "ON"		B+
59	47				
57	49	MFI relay (power supply)	Ignition switch: "OFF"		B+
			Ignition switch: "ON"		1V or less
96	51	Fuel temperature sensor	Ignition switch: "ON"	When fuel temperature is 0°C (32°F)	2.7 – 3.1 V
				When fuel temperature is 20°C (68°F)	2.1 – 2.5 V
				When fuel temperature is 40°C (104°F)	1.6 – 2.0 V
				When fuel temperature is 80°C (176°F)	0.8 – 1.2 V
54	52	Power steering pressure switch	Engine: warming up, idling	When steering wheel is stationary	B+
				When steering wheel is turned	1 V or less

TERMINAL NO. <M/T>	TERMINAL NO. <A/T>	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
32	53	Variable induction control solenoid	Engine: idling		1 V or less
			Engine: 5,000 r/min		B+
51	55	Barometric pressure sensor	Ignition switch: "ON"	When altitude is 0 m (0 ft)	3.7 – 4.3 V
				When altitude is 600 m (1,969 ft)	3.4 – 4.0 V
				When altitude is 1,200 m (3,937 ft)	3.2 – 3.8 V
				When altitude is 1,800 m (5,906 ft)	2.9 – 3.5 V
50	56	Camshaft position sensor	Engine: cranking		0.4 – 3.0 V
			Engine: idling		0.5 – 2.0 V
68	58	Ignition switch-ST	Engine: cranking		8 V or more
65	61	A/C switch 2	• Engine: idling • Outside air temperature: 25°C or more	When A/C is maximum cooling condition (when the load by A/C is high)	B+
				When A/C is maximum heating condition (when the load by A/C is low)	1 V or less
62	64	Intake air temperature sensor	Ignition switch: "ON"	When Intake air temperature is –20°C (–4°F)	3.8 – 4.4 V
				When Intake air temperature is 0°C (32°F)	3.2 – 3.8 V
				When Intake air temperature is 20°C (68°F)	2.3 – 2.9 V
				When Intake air temperature is 40°C (104°F)	1.5 – 2.1 V
				When Intake air temperature is 60°C (140°F)	0.8 – 1.4 V
				When Intake air temperature is 80°C (176°F)	0.4 – 1.0 V
61	65	Volume air flow sensor	Engine: idling		2.2 – 3.2 V
			Engine: 2,500 r/min		
60	66	Backup power supply	Ignition switch: "LOCK" (OFF)		B+
71	71	Left bank heated oxygen sensor (front)	• Engine: warming up, 2,500 r/min (check using a digital voltmeter)		0 ⇔ 0.8 V (changes repeatedly)
72	72	Right bank heated oxygen sensor (front)	• Engine: warming up, 2,500 r/min (check using a digital voltmeter)		0 ⇔ 0.8 V (changes repeatedly)
73	73	Left bank heated oxygen sensor (rear)	• Engine: warming up • Revving		0 and 0.6 – 1.0 V alternates

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TERMINAL NO. <M/T>	TERMINAL NO. <A/T>	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
74	74	Right bank heated oxygen sensor (rear)	• Engine: warming up • Revving		0 and 0.6 – 1.0 V alternates
78	78	Throttle position sensor	Ignition switch: "ON" (check for smooth voltage increase as throttle is moved from idle position to wide open throttle)	Idling	0.535 – 0.735 V
				Wide open throttle	4.5 – 5.5 V
79	79	Idle position signal	Ignition switch: "ON"	Set throttle valve to idle position	0 – 1 V
				Open throttle slightly	4 V or more
80	–	Vehicle speed sensor	• Ignition switch: "ON" • Move the vehicle slowly forward		0 ⇔ 8 –12 V (changes repeatedly)
83	83	A/C switch	Engine: idling	Turn the A/C switch OFF	1V or less
				Turn the A/C switch ON (A/C compressor is operating)	B+
92	91	Manifold differential pressure sensor	Engine: idling		0.8 – 2.4 V
			• Engine: idling • Suddenly depress the accelerator pedal		Rises from 0.8 – 2.4 V suddenly
93	92	Fuel tank differential pressure sensor	Engine: idling		1.2 – 3.8 V
99	98	Ignition switch-IG	Ignition switch: "ON"		B+

TERMINAL RESISTANCE AND CONTINUITY CHECK

ECM <M/T> or PCM <A/T> Connector Terminal Arrangement

<M/T>

| | | | |

TERMINAL NO. <M/T>	TERMINAL NO. <A/T>	INSPECTION ITEM	NORMAL CONDITION (INSPECTION CONDITION)
1 – 47	1 – 41	No.1 injector	13 – 16 Ω [at 20°C (68°F)]
9 – 47	9 – 41	No.2 injector	
24 – 47	24 – 41	No.3 injector	
2 – 47	2 – 41	No.4 injector	
10 – 47	10 – 41	No.5 injector	
25 – 47	25 – 41	No.6 injector	
3 – 47	3 – 41	Left bank heated oxygen sensor heater (front)	4.5 – 8.0 Ω [at 20°C (68°F)]
4 – 47	4 – 41	Right bank heated oxygen sensor heater (front)	4.5 – 8.0 Ω [at 20°C (68°F)]
6 – 47	6 – 41	EGR solenoid	29 – 35 Ω [at 20°C (68°F)]
14 – 47	14 – 41	Stepper motor coil (A1)	28 – 33 Ω [at 20°C (68°F)]
28 – 47	28 – 41	Stepper motor coil (A2)	
15 – 47	15 – 41	Stepper motor coil (B1)	
29 – 47	29 – 41	Stepper motor coil (B2)	
26 – 47	26 – 41	Left bank heated oxygen sensor heater (rear)	11 – 18 Ω [at 20°C (68°F)]
27 – 47	27 – 41	Right bank heated oxygen sensor heater (rear)	11 – 18 Ω [at 20°C (68°F)]
16 – 47	34 – 41	Evaporative emission purge solenoid	30 – 34 Ω [at 20°C (68°F)]
35 – 47	35 – 41	Evaporative emission ventilation solenoid	17 – 21 Ω [at 20°C (68°F)]
46 – Body ground	42 – Body ground	ECM or PCM ground	Continuity (0 Ω)
58 – Body ground	48 – Body ground	ECM or PCM ground	
44 – 49	44 – 57	Engine coolant temperature sensor	14 – 17 kΩ [when engine coolant temperature is –20°C (–4°F)]
			5.1 – 6.5 kΩ [when engine coolant temperature is 0°C (32°F)]
			2.1 – 2.7 kΩ [when engine coolant temperature is 20°C (68°F)]
			0.9 – 1.3 kΩ [when engine coolant temperature is 40°C (104°F)]
			0.48 – 0.68 kΩ [when engine coolant temperature is 60°C (140°F)]
			0.26 – 0.36 kΩ [when engine coolant temperature is 80°C (176°F)]
32 – 47	53 – 41	Variable induction control solenoid	29 – 35 Ω [at 20°C (68°F)]

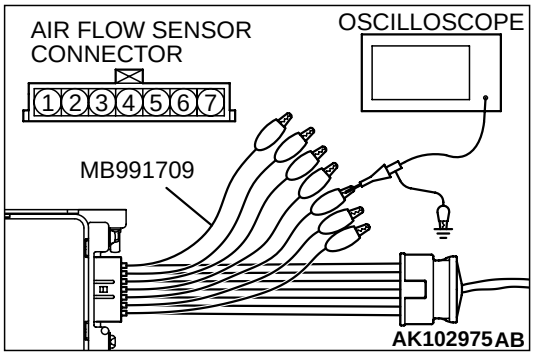
TERMINAL NO. <M/T>	TERMINAL NO. <A/T>	INSPECTION ITEM	NORMAL CONDITION (INSPECTION CONDITION)
62 – 49	64 – 57	Intake air temperature sensor	13 – 17 kΩ [when intake air temperature is –20°C (–4°F)]
			5.3 – 6.7 kΩ [when intake air temperature is 0°C (32°F)]
			2.3 – 3.0 kΩ [when intake air temperature is 20°C (68°F)]
			1.0 – 1.5 kΩ [when intake air temperature is 40°C (104°F)]
			0.56 – 0.76 kΩ [when intake air temperature is 60°C (140°F)]
			0.30 – 0.42 kΩ [when intake air temperature is 80°C (176°F)]

INSPECTION PROCEDURE USING AN OSCILLOSCOPE

M1131154500156

VOLUME AIR FLOW SENSOR

Required Special Tool:
- MB991709: Test Harness



Measurement Method
1. Disconnect the volume air flow sensor connector, and connect the test harness special tool (MB991709) in between. (All terminals should be connected.)
2. Connect the oscilloscope probe to volume air flow sensor connector terminal 3.

Alternate method (Test harness not available)

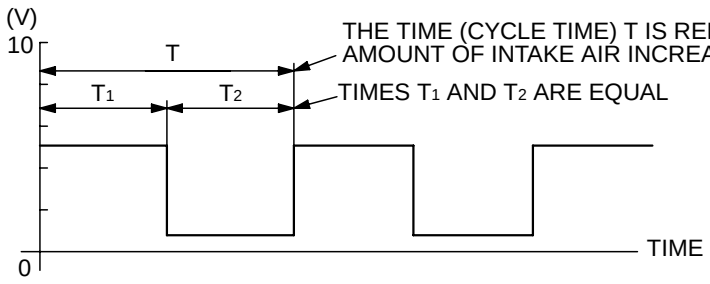
<M/T>
1. Connect the oscilloscope probe to ECM terminal 61.

<A/T>
1. Connect the oscilloscope probe to PCM terminal 65.

Standard Wave Pattern

Observation conditions	
Function	**Special pattern**
Pattern height	Low
Pattern selector	Display
Engine r/min	Idle speed

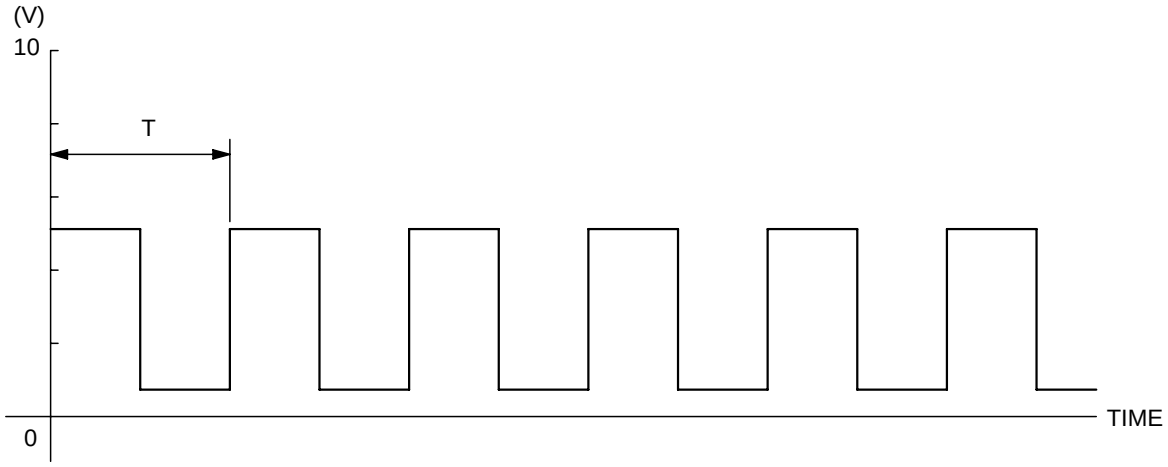
Standard wave pattern



AKX01595 AB

Observation conditions
Rev engine, observe T1 and T2 remain equal.

Standard wave pattern



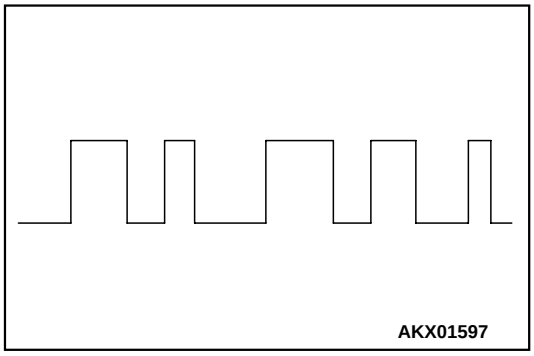
AKX01596 AB

Wave Pattern Observation Points

1. Check that cycle time T becomes shorter and the frequency increases when the engine speed is increased.

Examples of Abnormal Wave Patterns

Example 1



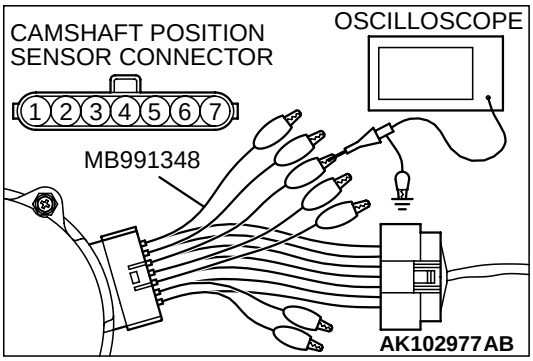
- Cause of problem
  Sensor interface malfunction.
- Wave pattern characteristics
  Rectangular wave pattern is output even when the engine is not started.

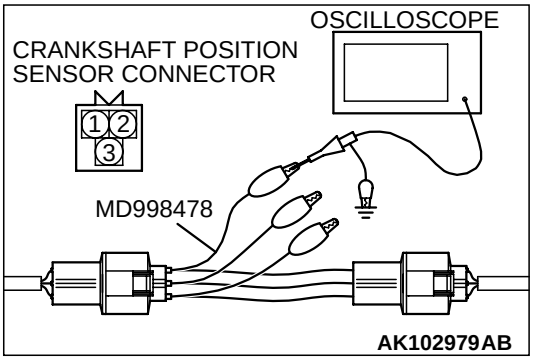
TSB Revision

Example 2

- Cause of problem
  Damaged rectifier or vortex generation column.
- Wave pattern characteristics
  Unstable wave pattern with non-uniform frequency. An ignition leak will distort the wave pattern temporarily, even if the volume air flow sensor is normal.

CAMSHAFT POSITION SENSOR AND CRANKSHAFT POSITION SENSOR





Required Special Tools:

- MB991348: Test Harness
- MD998478: Test Harness

Measurement Method

1. Disconnect the camshaft position sensor connector, and connect the test harness special tool (MB991348) in between. (All terminals should be connected.)
2. Connect the oscilloscope probe to camshaft position sensor connector terminal 5.
3. Disconnect the crankshaft position sensor connector, and connect the test harness special tool (MD998478) in between.
4. Connect the oscilloscope probe to crankshaft position sensor connector terminal 2 (black clip of special tool).

Alternate method (Test harness not available)

<M/T>

1. Connect the oscilloscope probe to ECM terminal 50. (Check the camshaft position sensor signal wave pattern.)
2. Connect the oscilloscope probe to ECM terminal 43. (Check the crankshaft position sensor signal wave pattern.)

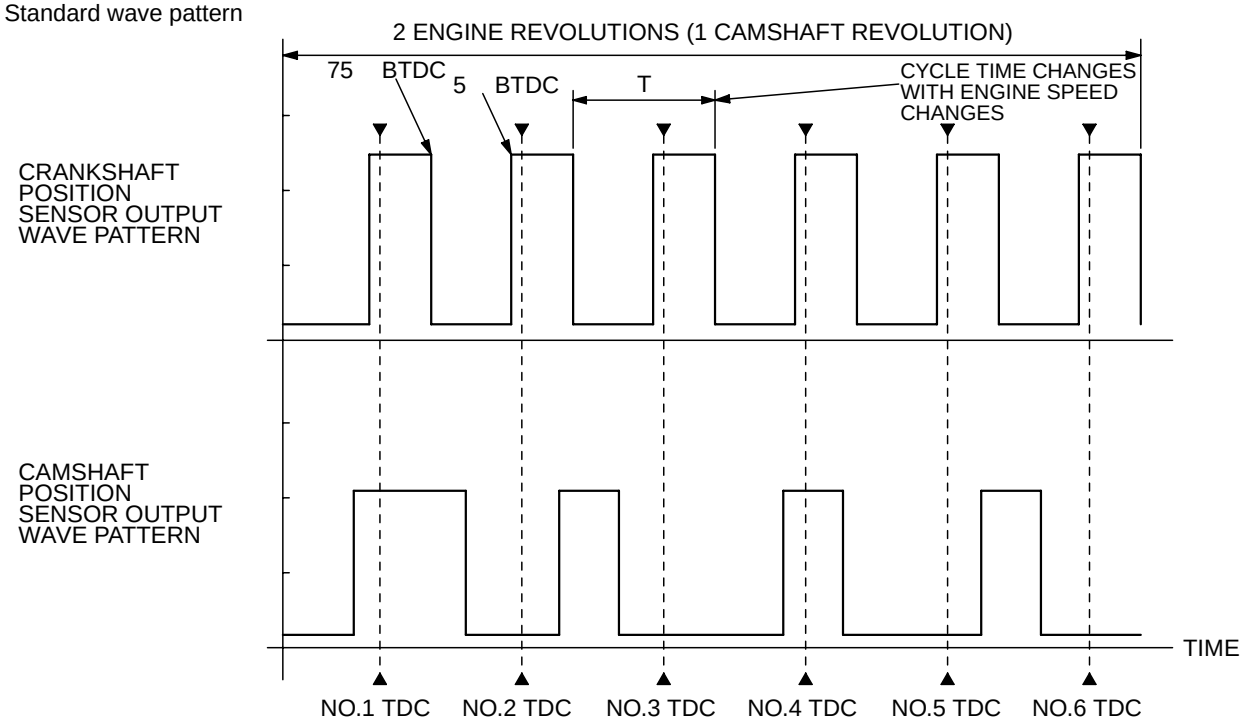
<A/T>

1. Connect the oscilloscope probe to PCM terminal 56. (Check the camshaft position sensor signal wave pattern.)
2. Connect the oscilloscope probe to PCM terminal 45. (Check the crankshaft position sensor signal wave pattern.)

Standard Wave Pattern

Observation conditions	
Function	**Special pattern**
Pattern height	Low
Pattern selector	Display
Engine r/min	Idle speed

Standard wave pattern



TDC: TOP DEAD CENTER

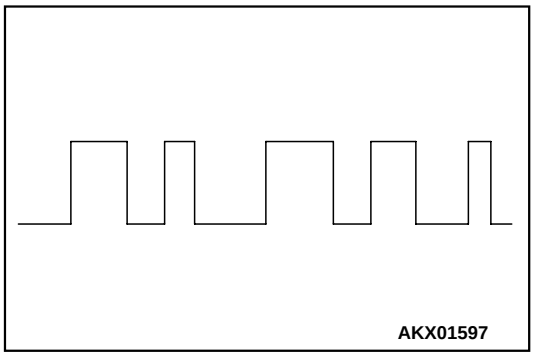
AKX01600 AB

Wave Pattern Observation Points

1. Check that cycle time T becomes shorter when the engine speed increased.

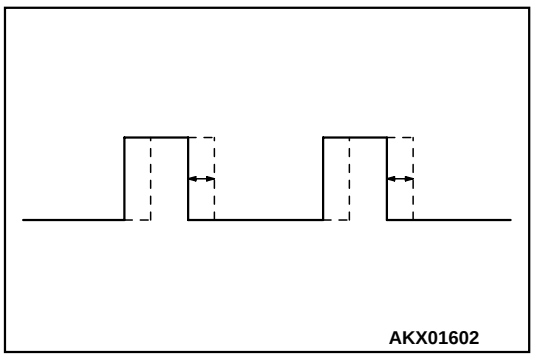
Examples of Abnormal Wave Patterns

Example 1



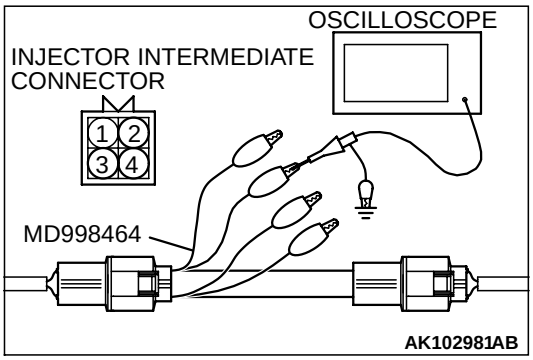
- Cause of problem
  Sensor interface malfunction.
- Wave pattern characteristics
  Rectangular wave pattern is output even when the engine is not started.

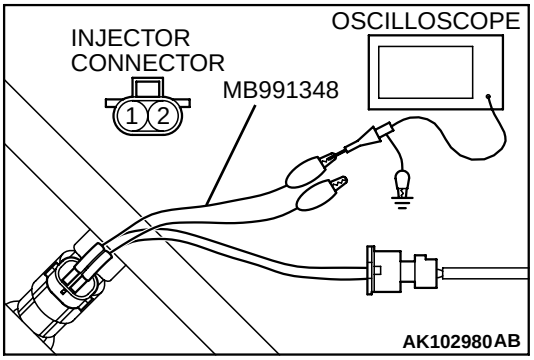
Example 2



- Cause of problem
  Loose timing belt.
  Abnormality in sensor disc.
- Wave pattern characteristics
  Wave pattern is displaced to the left or right.

INJECTOR





Required Special Tools:

- MB991348: Test Harness
- MD998464: Test Harness

Measurement Method

<Measure at the right bank (number 1, 3, 5 cylinders)>

1. Disconnect the injector intermediate connector, and connect the test harness special tool (MD998464) in between.
2. Connect the oscilloscope probe to each injector intermediate connector terminal to analyze each cylinder:
   - Terminal 2 (black clip of special tool) for the number 1 cylinder
   - Terminal 3 (blue clip) for the number 3 cylinder
   - Terminal 4 (white clip) for the number 5 cylinder

<Measure at the right bank (number 2, 4, 6 cylinders)>

1. Disconnect the injector connector, and connect the test harness special tool (MB991348) in between. (All terminals should be connected.)
2. Connect the oscilloscope probe to injector connector terminal 2.

Alternate method (Test harness not available)

1. Connect the oscilloscope probe to ECM <M/T> or PCM <A/T> terminal 1. (When checking the number 1 cylinder.)
2. Connect the oscilloscope probe to ECM <M/T> or PCM <A/T> terminal 9. (When checking the number 2 cylinder.)
3. Connect the oscilloscope probe to ECM <M/T> or PCM <A/T> terminal 24. (When checking the number 3 cylinder.)
4. Connect the oscilloscope probe to ECM <M/T> or PCM <A/T> terminal 2. (When checking the number 4 cylinder.)
5. Connect the oscilloscope probe to ECM <M/T> or PCM <A/T> terminal 10. (When checking the number 5 cylinder.)
6. Connect the oscilloscope probe to ECM <M/T> or PCM <A/T> terminal 25. (When checking the number 6 cylinder.)

Standard Wave Pattern

Observation conditions	
Function	**Special pattern**
Pattern height	Variable
Variable knob	Adjust while viewing the wave pattern
Pattern selector	Display
Engine r/min	Idle speed

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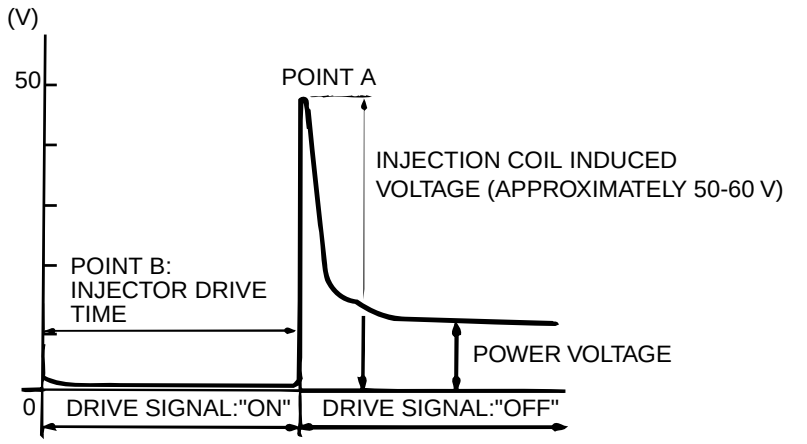
Standard wave pattern



AKX01604 AB

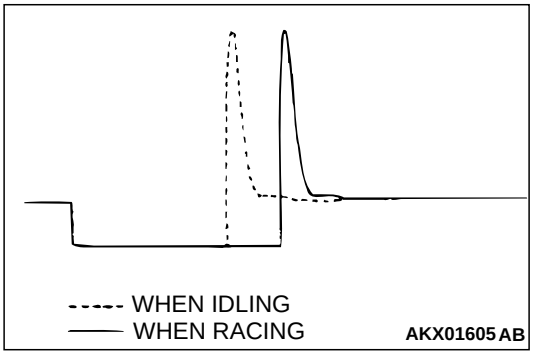
Wave Pattern Observation Points

Point A: Height of injector coil induced voltage.

CONTRAST WITH STANDARD WAVE PATTERN	PROBABLE CAUSE
Injector coil induced voltage is low or doesn't appear at all	Short in the injector solenoid

Point B: Injector drive time

1. The injector drive time should be synchronized with the scan tool tester display.
2. When the engine is suddenly revved, the drive time will be greatly extended at first, but the drive time will soon return to original length.

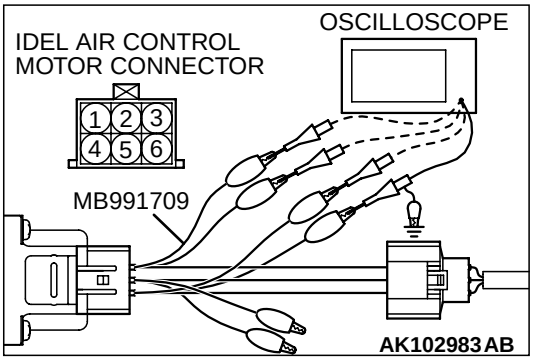


AKX01605 AB

IDLE AIR CONTROL MOTOR (STEPPER MOTOR)

Required Special Tool:

- MB991709: Test Harness



Measurement Method

1. Disconnect the idle air control motor connector, and connect the test harness special tool (MB991709) in between. (All terminals should be connected.)
2. Connect the oscilloscope probe to the idle air control motor connector terminal 1, terminal 3, terminal 4 and terminal 6, respectively.

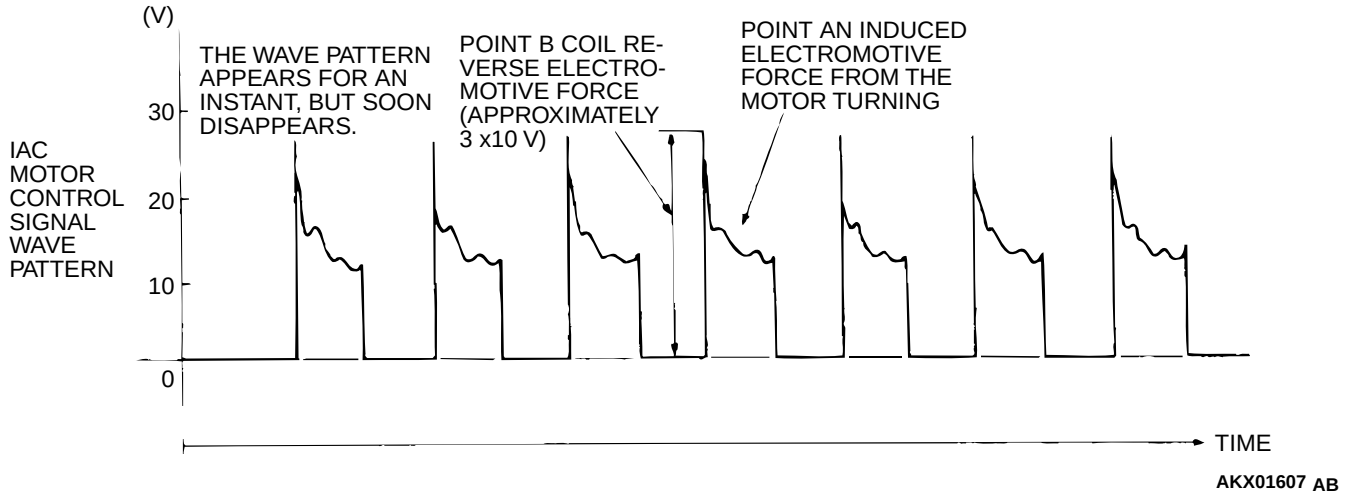
Alternate method (Test harness not available)

1. Connect the oscilloscope probe to ECM <M/T> or PCM <A/T> terminals 14, 15, 28 and 29.

Standard Wave Pattern

Observation conditions	
Function	**Special pattern**
Pattern height	High
Pattern selector	Display
Engine condition	Turn the ignition switch from "OFF" to "ON" (without starting the engine).
	While the engine is idling, turn the A/C switch to "ON."
	Immediately after starting the warm the engine (approximately one minute).

Standard wave pattern



Wave Pattern Observation Points

1. Check that the standard wave pattern appears when the idle air control motor is operating.
   Point A:

Presence or absence of induced electromotive force from the motor turning. (Refer to abnormal wave pattern.)

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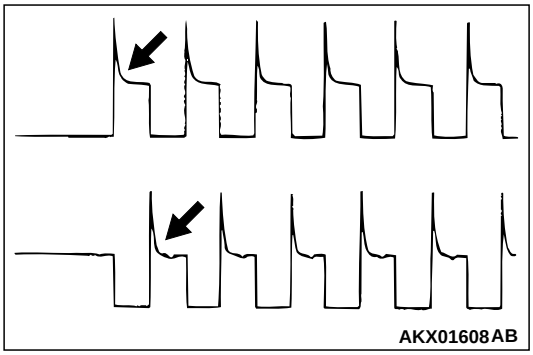
CONTRAST WITH STANDARD WAVE PATTERN	PROBABLE CAUSE
Induced electromotive force does not appear or is extremely small	Malfunction of motor

Point B:
Height of coil back electromotive force

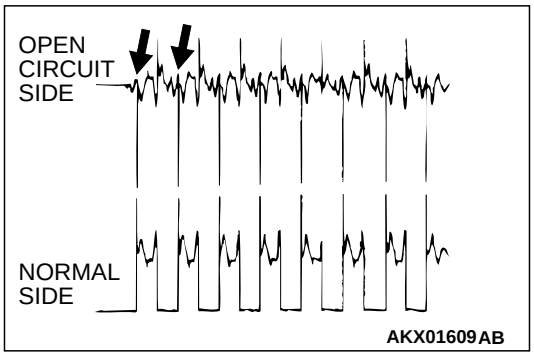
CONTRAST WITH STANDARD WAVE PATTERN	PROBABLE CAUSE
Coil reverse electromotive force does not appear or is extremely small	Short in the coil

Examples of Abnormal Wave Patterns



Example 1

- Cause of problem
  Malfunction of motor. (Motor is not operating.)
- Wave pattern characteristics
  Induced electromotive force from the motor turning does not appear.



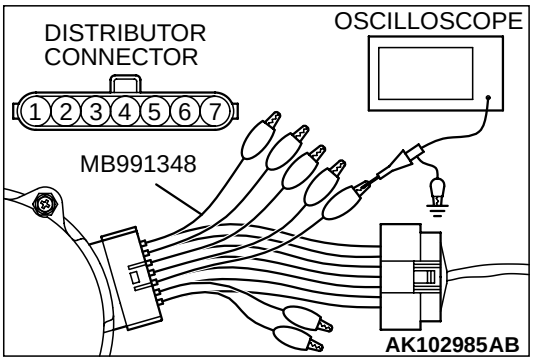
Example 2

- Cause of problem
  Open circuit in the line between the idle air control motor and the ECM <M/T> or PCM <A/T>.
- Wave pattern characteristics
  Current is not supplied to the motor coil on the open circuit side. (Voltage does not drop to 0 volt.) Furthermore, the induced electromotive force wave pattern at the normal side is slightly different from the normal wave pattern.

IGNITION COIL AND IGNITION POWER TRANSISTOR

Required Special Tool:

- MB991348: Test Harness Set



Measurement Method

1. Disconnect the connector, and connect test harness special tool, (MB991348), in between. (All terminals should be connected.)
2. Connect the oscilloscope probe to ignition coil connector terminal 3.

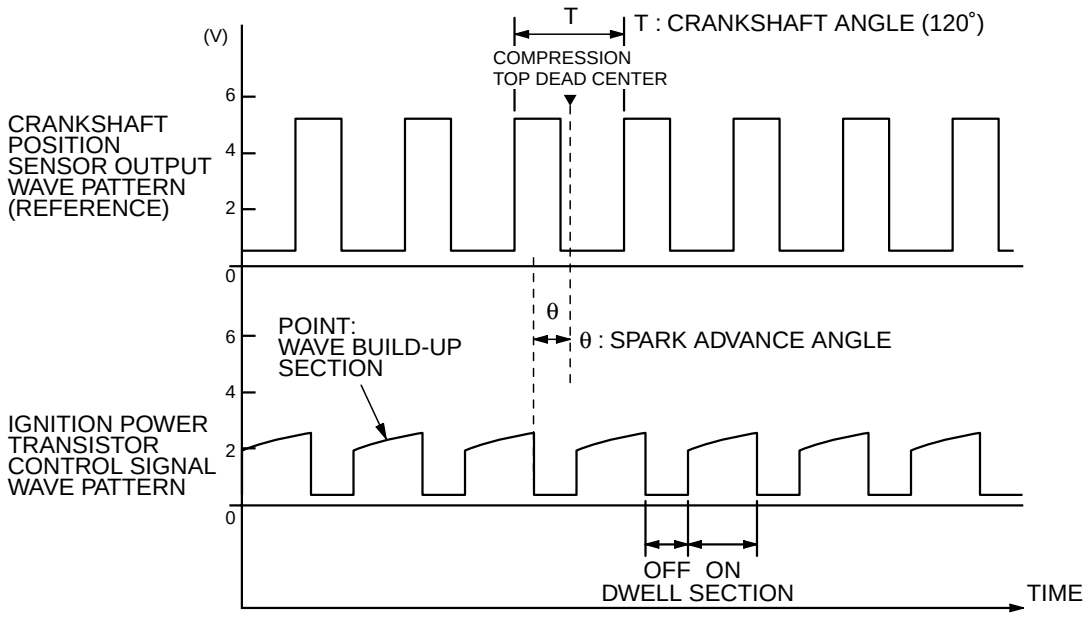
Alternate method (Test harness not available)

1. Connect the oscilloscope probe to ECM <M/T> or PCM <A/T> terminal 11.

Standard Wave Pattern

Observation conditions	
Function	**Special pattern**
Pattern height	Low
Pattern selector	Display
Engine r/min	Approximately 1,200 r/min

Standard wave pattern



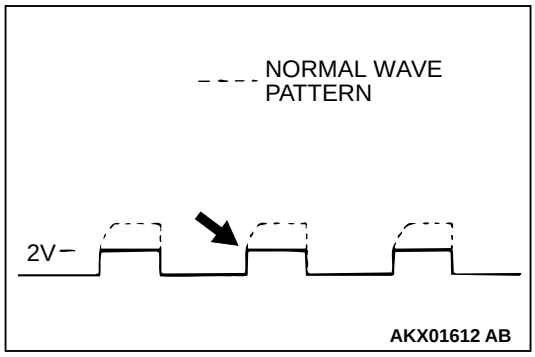
Wave Pattern Observation Points

Point: Condition of wave pattern build-up section and maximum voltage (Refer to abnormal wave pattern examples 1 and 2.

TSB Revision

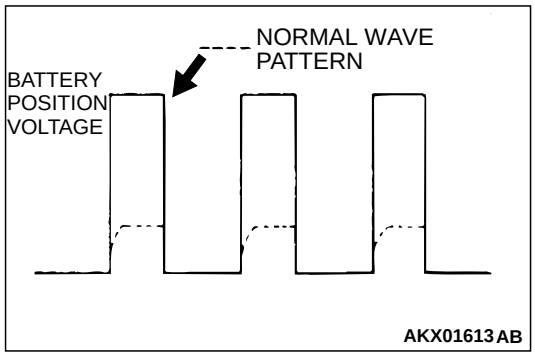
CONDITION OF WAVE PATTERN BUILD-UP SECTION AND MAXIMUM VOLTAGE	PROBABLE CAUSE
Rises from approximate 2 volts to approximate 4.5 volts at the top-right	Normal
2-volt rectangular wave	Open-circuit in ignition primary circuit
Rectangular wave at power voltage	Ignition power transistor malfunction

Examples of Abnormal Wave Patterns



Example 1 (Wave pattern during engine cranking)

- Cause of problem
  Open-circuit in ignition primary circuit
- Wave pattern characteristics
  Top-right part of the build-up section cannot be seen, and voltage value is approximately 2 volts too low.

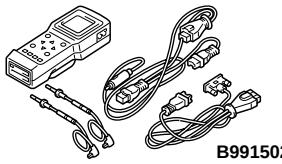
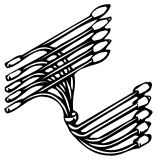


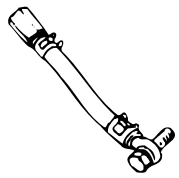
Example 2 (Wave pattern during engine cranking)

- Cause of problem
  Malfunction in ignition power transistor
- Wave pattern characteristics
  Power voltage results when the ignition power transistor is ON.

SPECIAL TOOLS

M1131000600063

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 B991502	MB991502 Scan tool <MUT-II>	DRB-III W/CH8425	• Reading diagnostic trouble code • MFI system inspection • Measurement of fuel pressure
MB991348	MB991348 Test harness set	General Service Tool (Jumpers) 8468	• Adjustment of throttle position sensor • Inspection using an oscilloscope
	MB991709 Test harness set	General Service Tool (Jumpers) 8469	• Inspection using an oscilloscope • Inspection of idle air control motor
 MB991658	MB991658 Test harness set	General Service Tool (Jumpers) 8467	Inspection of heated oxygen sensor
	MD998464 Test harness (4 pin, square)	General Service Tool (Jumpers)	• Inspection of heated oxygen sensor • Inspection using an oscilloscope
	MB991316 Test harness (4 pin, square)	General Service Tool (Jumpers)	• Inspection of heated oxygen sensor
	MD998478 Test harness (3 pin, triangle)	General Service Tool (Jumpers)	Inspection using an oscilloscope

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
	MD998709 Adaptor hose	-	Measurement of fuel pressure
	MD998742 Hose adaptor	MD998742	
 MB991637	MB991637 Fuel pressure gauge set	-	

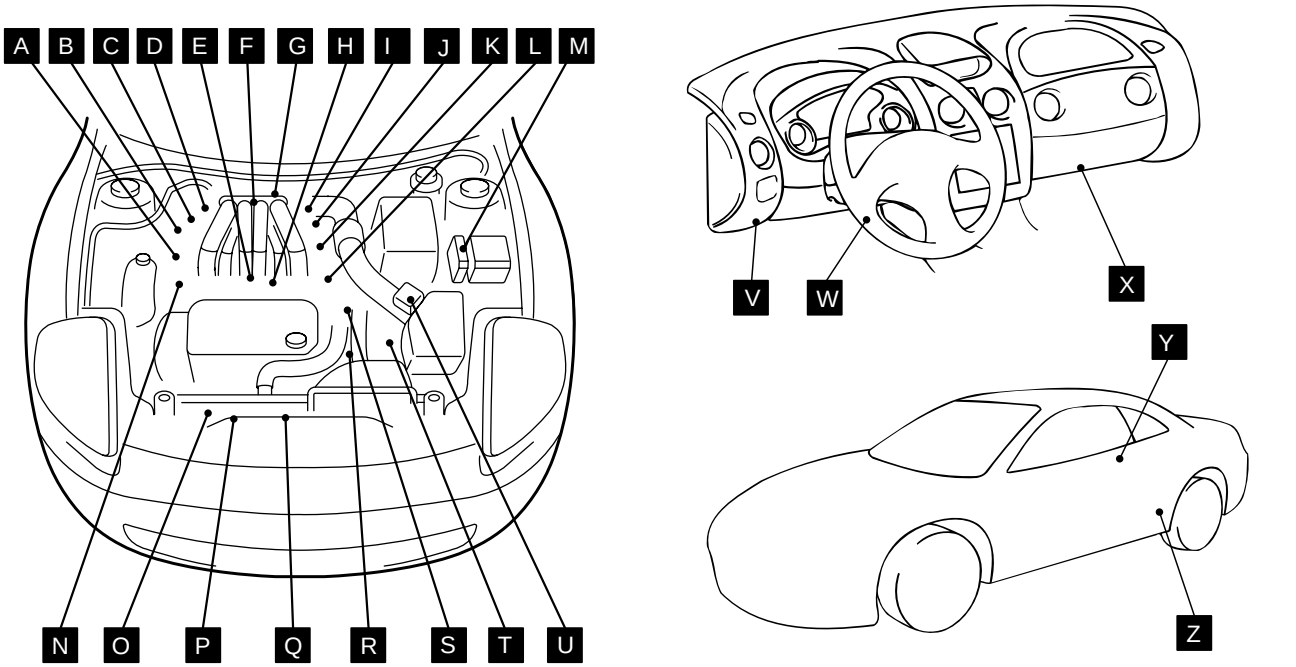
ON-VEHICLE SERVICE

COMPONENT LOCATION

M1131002100332

NAME	SYMBOL	NAME	SYMBOL
Air conditioning compressor clutch relay	M	Injector	H
Crankshaft position sensor	N	Knock sensor	E
Data link connector	W	Left bank heated oxygen sensor (front)	P
Distributor (built-in camshaft position sensor and ignition coil)	L	Left bank heated oxygen sensor (rear)	O
EGR solenoid	B	Manifold differential pressure sensor	G
Engine control module (ECM) <M/T>	X	Multiport fuel injection (MFI) relay	M
Engine coolant temperature sensor	S	Park/neutral position switch <A/T>	T
Engine speed detection connector	M	Powertrain control module <A/T>	X
Evaporative emission purge solenoid <without variable induction system>	B	Power steering pressure switch	A
Evaporative emission purge solenoid <with variable induction system>	K	Right bank heated oxygen sensor (front)	D
Evaporative emission ventilation solenoid	Z	Right bank heated oxygen sensor (rear)	F
Fan controller	Q	Throttle position sensor	I
Fuel tank differential pressure sensor	Y	Variable induction control solenoid <with variable induction system>	C

NAME	SYMBOL	NAME	SYMBOL
Fuel pump module (Fuel temperature sensor)	Y	Variable induction control solenoid <with variable induction system>	R
Fuel pump relay 1, 2	V	Volume air flow sensor (with built-in intake air temperature sensor and barometric pressure sensor)	U
Idle air control motor	J		



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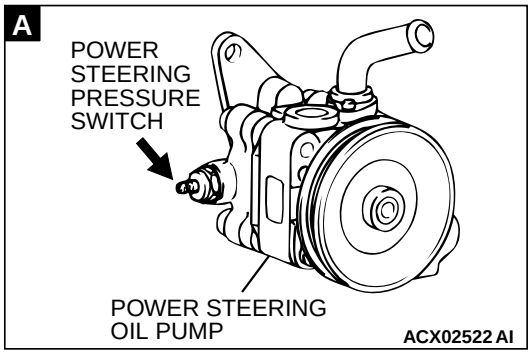

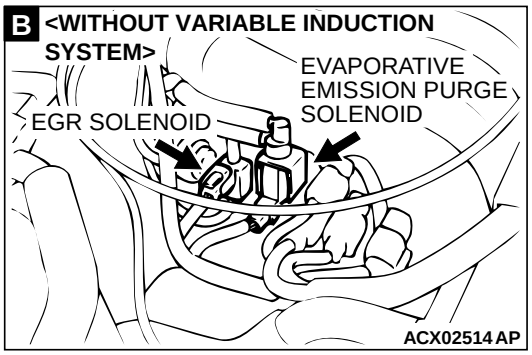

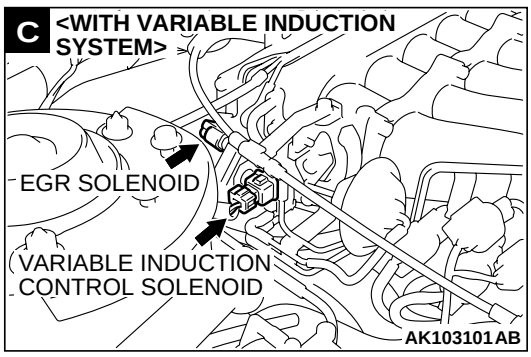

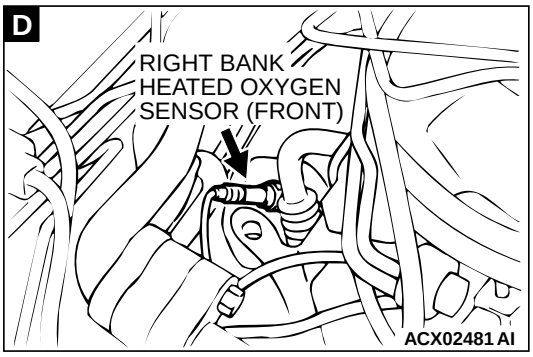

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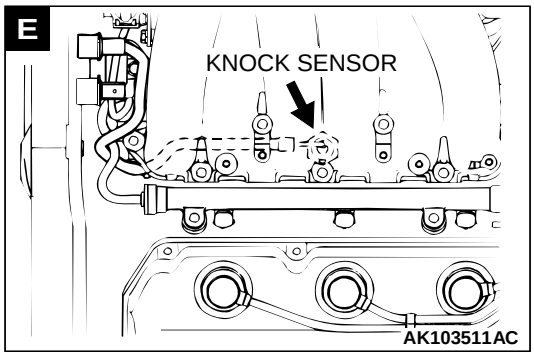
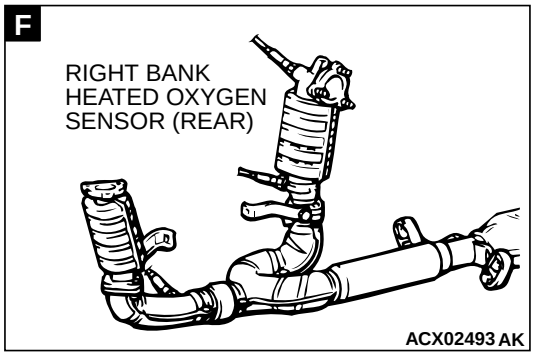
E



F



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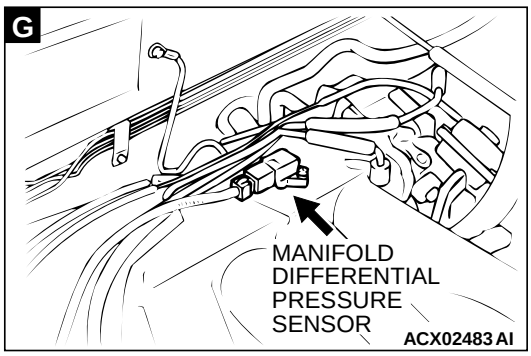
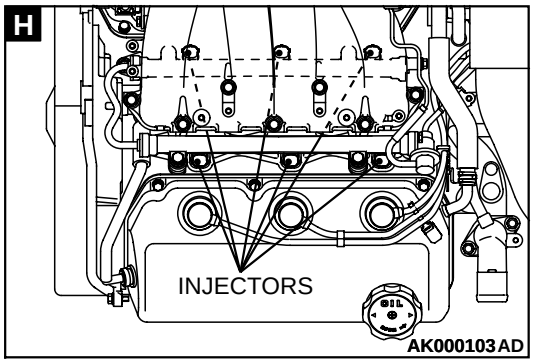


H



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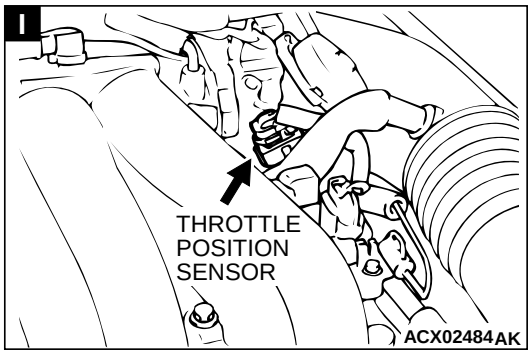

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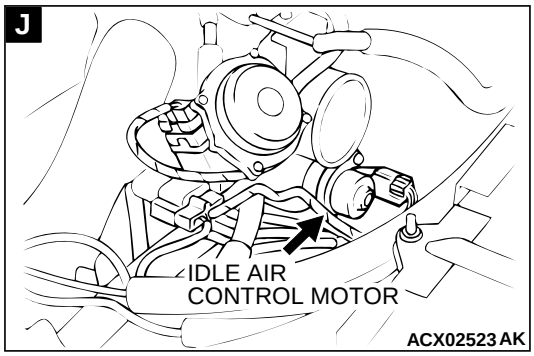

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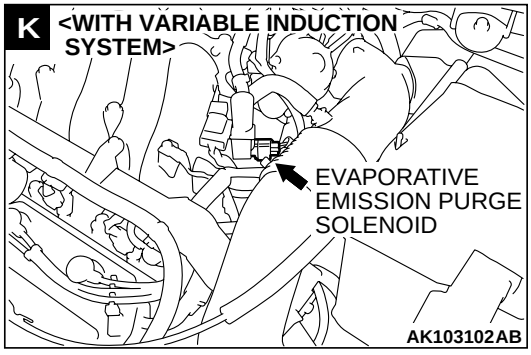

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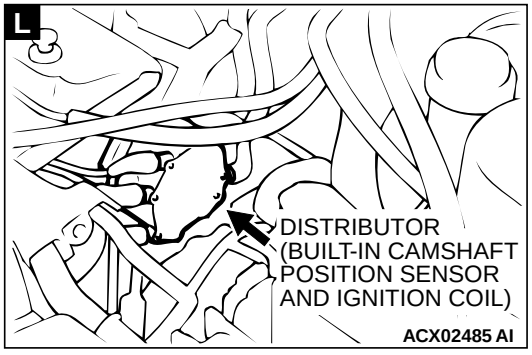

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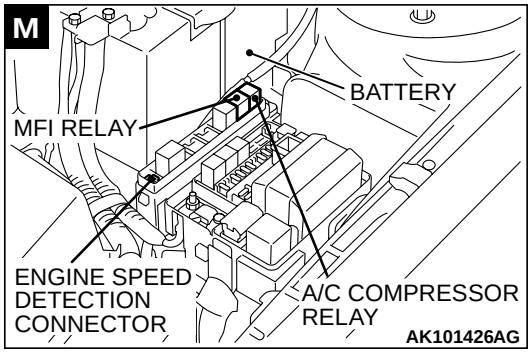
BATTERY
MFI RELAY
ENGINE SPEED DETECTION CONNECTOR
A/C COMPRESSOR RELAY
AK101426AG

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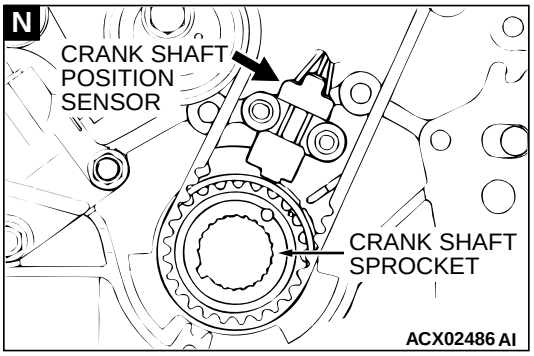
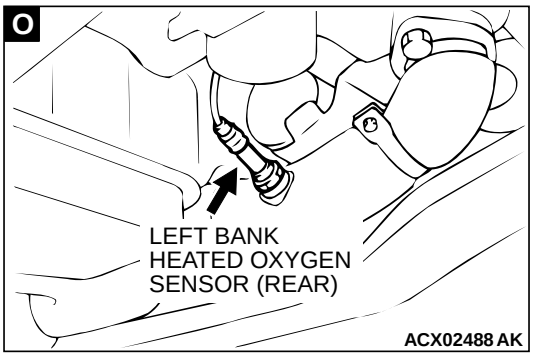

CRANK SHAFT POSITION SENSOR
CRANK SHAFT SPROCKET
ACX02486 AI

O


LEFT BANK HEATED OXYGEN SENSOR (REAR)
ACX02488 AK

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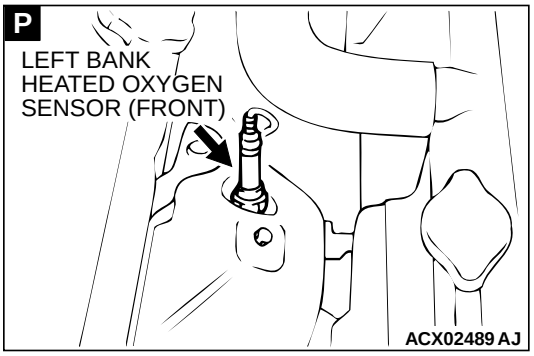
LEFT BANK HEATED OXYGEN SENSOR (FRONT)
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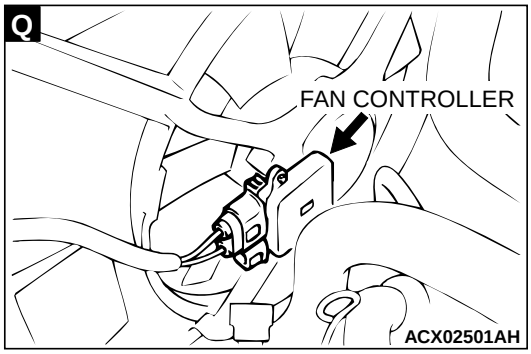
FAN CONTROLLER
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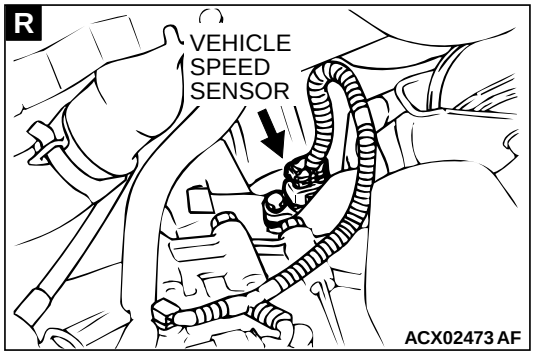
R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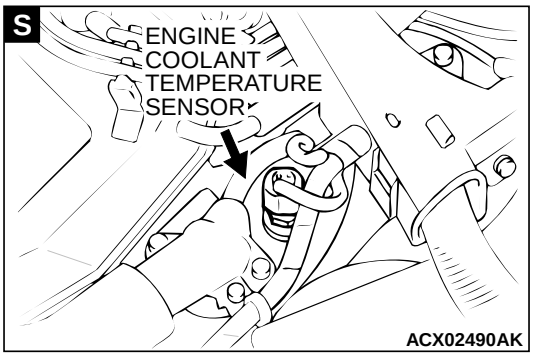
ENGINE COOLANT TEMPERATURE SENSOR
ACX02490AK

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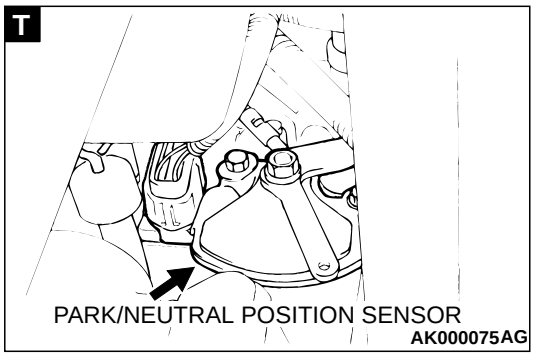
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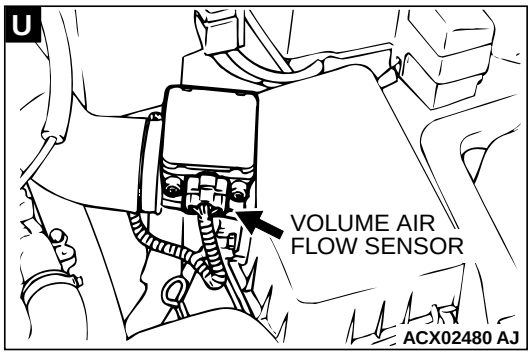

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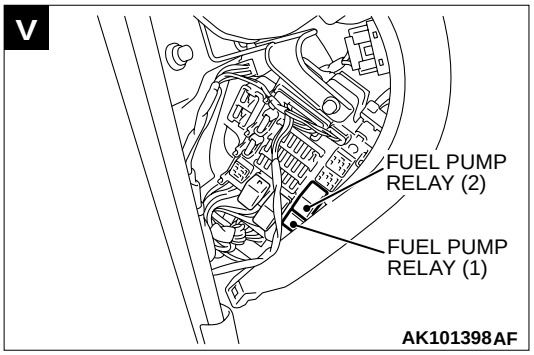

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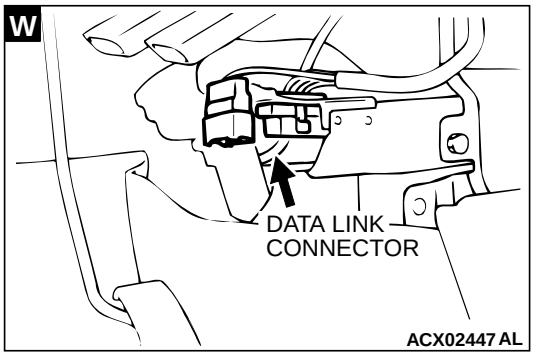

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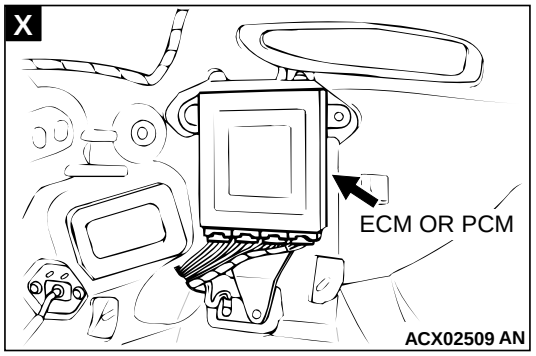

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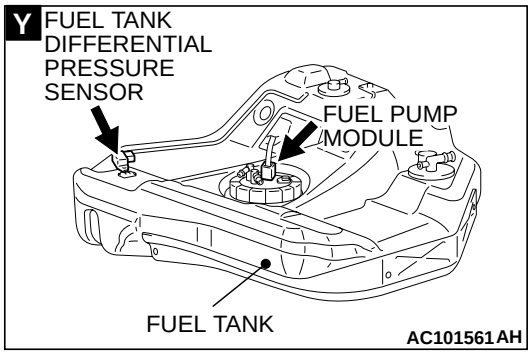

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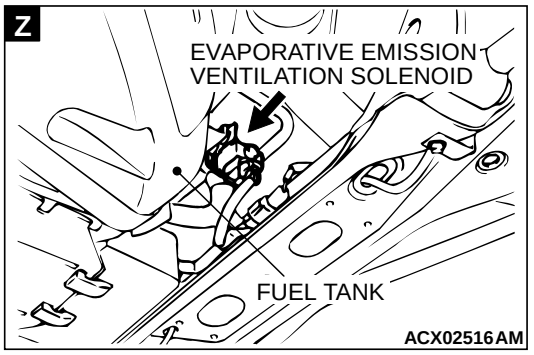

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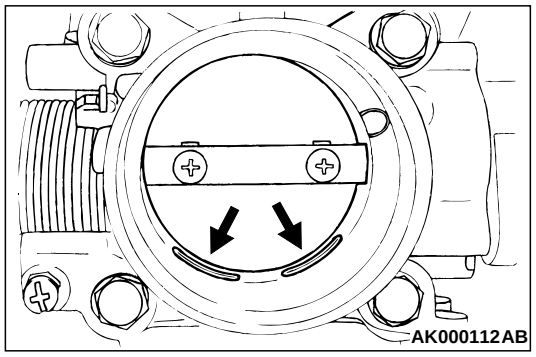
THROTTLE BODY (THROTTLE VALVE AREA) CLEANING

M1131001000064

1. Start the engine and warm it up until the coolant is heated to 80°C (176°F) or higher. Stop the engine.
2. Remove the air intake hose from the throttle body.

⚠ CAUTION

Do not allow cleaning solvent to enter the bypass passage.



3. Plug the bypass passage inlet (arrow) of the throttle body.
4. Spray cleaning solvent into the valve through the throttle body intake port and leave it for approximately five minutes.
5. Start the engine, rev it several times and then idle it for about one minute. If the idling speed becomes unstable (or if the engine stalls) due to the bypass passage being plugged, slightly open the throttle valve to keep the engine running.
6. If the throttle valve deposits are not removed, repeat steps 4 and 5.
7. Unplug the bypass passage inlet.
8. Attach the air intake hose.
9. Use scan tool MB991502 to erase any diagnostic trouble code.
10. Adjust the basic idle speed. (Refer to P.13B-679.)

⚠ WARNING

Battery posts, terminals and related accessories contain lead and lead compounds. WASH HANDS AFTER HANDLING.

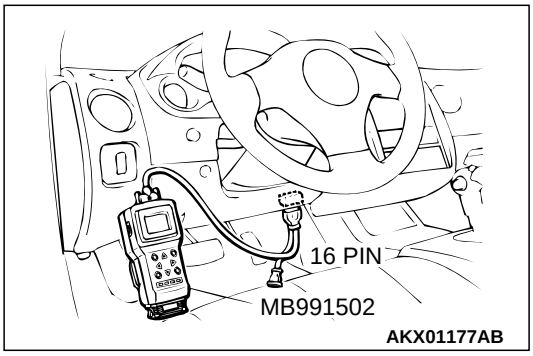
NOTE: If the engine hunts while idling after adjustment of the basic idle speed, disconnect the negative cable from the battery for 10 seconds or more, and then reconnect it and run the engine at idle for about 10 minutes after the engine is warmed up.

THROTTLE POSITION SENSOR ADJUSTMENT

M1131001100049

Required Special Tools:

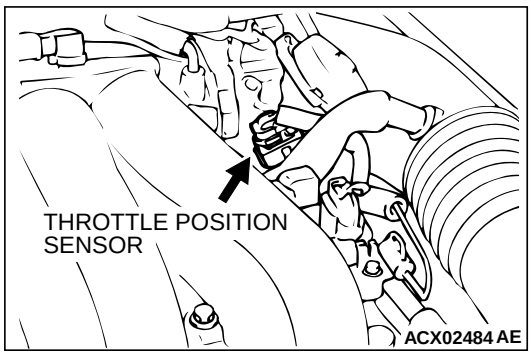
- MB991502: Scan Tool (MUT-II)
- MB991348: Test Harness Set

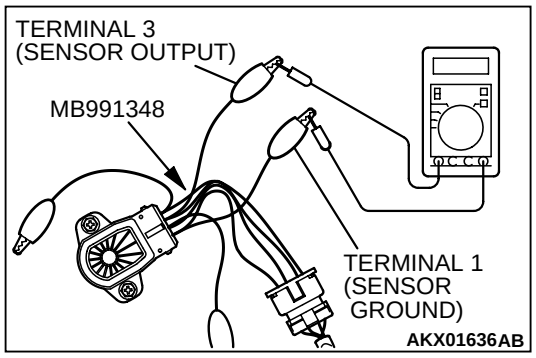


⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

1. Connect scan tool MB991502 to the data link connector. When not using the scan tool, proceed as follows.





   (1) Disconnect the throttle position sensor connector, and connect the special tool MB991348 in between. (All terminals should be connected.)
   (2) Connect a digital voltmeter between throttle position sensor terminal 3 (sensor output) and terminal 1 (sensor ground).
2. Turn the ignition switch to the "ON" position (but do not start the engine).
3. Check the throttle position sensor output voltage.

   Standard value: 535 – 735 mV
4. If not within the standard value range, adjust by loosening throttle position sensor mounting bolts and turning the throttle position sensor body. After adjusting, tighten the bolts securely.
5. Turn the ignition switch to the "LOCK" (OFF) position.
6. Disconnect scan tool MB991502, and connect the throttle position sensor connector. When the scan tool is not used, remove special tool MB991348, and connect the throttle position sensor connector.

BASIC IDLE SPEED ADJUSTMENT

M1131001800208

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

NOTE: The standard idling speed has been adjusted with the speed adjusting screw (SAS), by the manufacturer. There should be no need for readjustment.

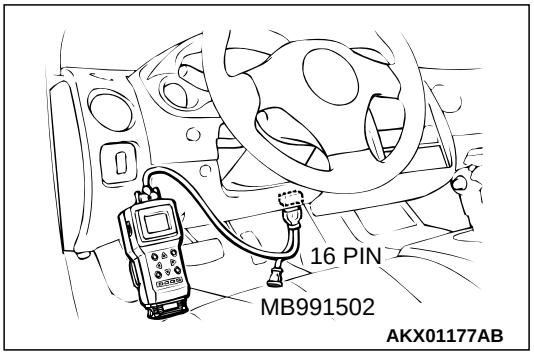
NOTE: If the adjustment has been changed by mistake, the idle speed may become too high or the idle speed may drop too low when loads A/C, defogger, etc. are placed on the engine. If this occurs, adjust by the following procedure.

NOTE: The adjustment, if made, should be made after first confirming that the spark plugs, the injectors, the idle air control motor, compression, etc., are all normal.

1. The vehicle should be prepared as follows before the inspection and adjustment.
   - Engine coolant temperature: 80 – 95°C (176 – 203°F)
   - Lights, electric cooling fan and accessories: OFF
   - Transaxle: Neutral ("P" range on vehicle with A/T)

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.



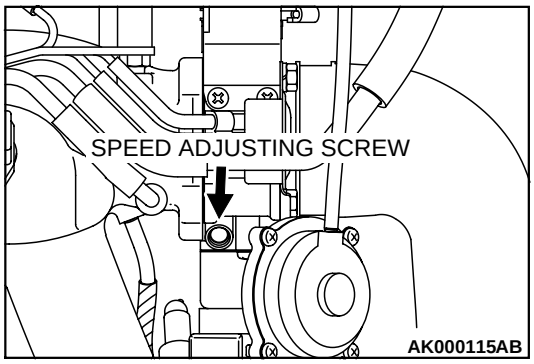
2. Connect scan tool MB991502 to the data link connector (16-pin).
3. Start the engine and run at idle.
4. Select the item number 30 of the scan tool Actuator test.

   NOTE: Use the scan tool to hold the IAC motor at the basic step to adjust the basic idle speed.
5. Check the idle speed.

   NOTE: The engine speed may be 20 to 100 r/min lower than indicated above for a new vehicle [driven approximately 500 km (300 mile) or less], but no adjustment is necessary.

   NOTE: If the engine stalls or the engine speed is low even though the vehicle has been driven approximately 500 km (300 mile) or more, it is probable that deposits are adhered to the throttle valve, so clean it. (Refer to P.13B-677 .)

   Standard value: 700 + 50 r/min



6. If not within the standard value range, turn the speed adjusting screw (SAS) to make the necessary adjustment.
7. Press the scan tool clear key, and release the IAC motor Actuator test mode.
8. Turn the ignition switch to the "LOCK" (OFF) position.

   NOTE: Unless the IAC motor is released, the Actuator test mode will continue for 27 minutes.
9. Disconnect scan tool MB991502.
10. Start the engine again and let it idle for about 10 minutes. Check that the idling condition is normal.

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FUEL PRESSURE TEST

M1131001900056

Required Special Tools:

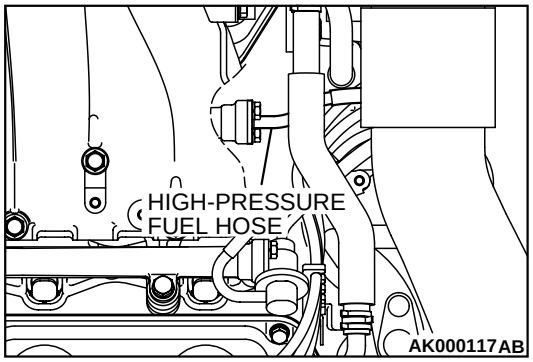
- MB991502: Scan Tool (MUT-II)
- MB991637: Fuel Pressure Gauge Set
- MD998709: Adaptor Hose
- MD998742: Hose Adaptor

1. Release residual pressure from the fuel line to prevent fuel spray. (Refer to P.13B-682 .)

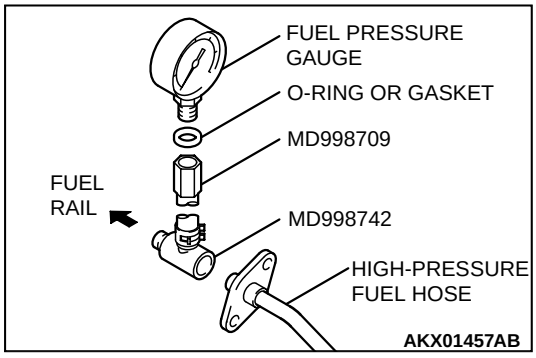
⚠ ***WARNING***

To prevent a fire, cover the hose connection with shop towels to prevent splashing of fuel that could be caused by some residual pressure in the fuel pipe line.

2. Disconnect the high-pressure fuel hose at the fuel rail side.
3. Assemble the fuel pressure measurement tools as follows.

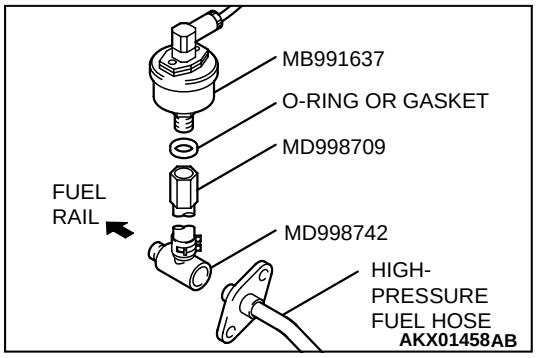


<When using the fuel pressure gauge>



1. Remove the union joint and bolt from special tool MD998709 (adaptor hose) and instead attach special tool MD998742 (hose adaptor) to the adaptor hose.
2. Place a suitable O-ring or gasket on the assembled special tools MD998709 and MD998742 and install the fuel pressure gauge.
3. Install the assembled fuel pressure measurement tools between the fuel rail and high-pressure fuel hose.

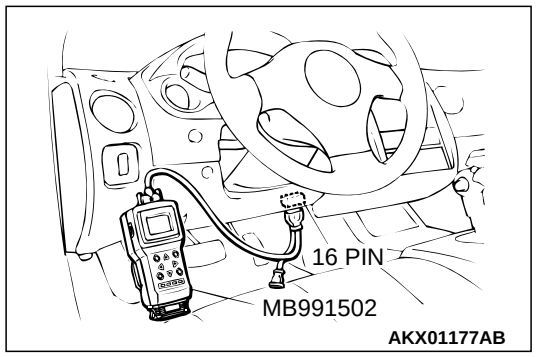
<When using the special tool MB991637 (fuel pressure gauge set)>



1. Remove the union joint and bolt from special tool MD998709 (adaptor hose) and instead attach special tool MD998742 (hose adaptor) to the adaptor hose.
2. Install special tool MB991637 (fuel pressure gauge set) into assembled special tools MD998709 and MD998742 via a gasket.
3. Install the assembled fuel pressure measurement tools between the fuel rail and the high-pressure fuel hose.

⚠ **CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.



4. Connect scan tool MB991502 to the data link connector.
5. Use Actuator test 07 to drive the fuel pump. Check that there is no fuel leaking from any section when the fuel pump is operating.
6. Stop the fuel pump.
7. Start the engine and run at idle.

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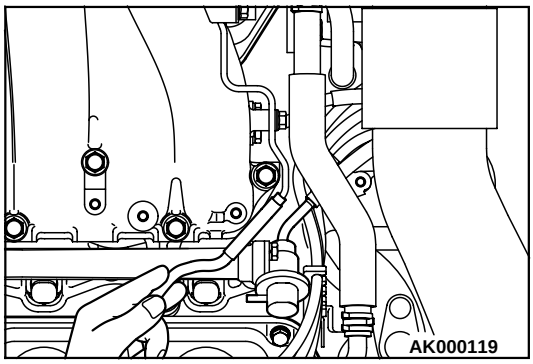

8. Measure fuel pressure while the engine is running at idle.
   Standard value: Approximately 270 kPa (38 psi) at curb idle
9. Disconnect the vacuum hose (blue stripe) from the fuel pressure regulator and measure fuel pressure with the hose end closed with your finger.
   Standard value: 330 – 350 kPa (47 – 50 psi) at curb idle
10. Check to see that fuel pressure at idle does not drop even after the engine has been revved several times.
11. Revving the engine repeatedly, hold the fuel return hose lightly with your fingers to feel that fuel pressure is present in the return hose.
    NOTE: If the fuel flow rate is low, there will be no fuel pressure in the return hose.
12. If any of fuel pressure measured in steps 8 to 11 is out of specification, troubleshoot and repair according to the table below.

SYMPTOM	PROBABLE CAUSE	REMEDY
• Fuel pressure too low • Fuel pressure drops after racing • No fuel pressure in fuel return hose	Clogged fuel filter	Replace fuel filter
	Fuel leaking to return side due to poor fuel regulator valve seating or settled spring	Replace fuel pressure regulator
	Low fuel pump delivery pressure	Replace fuel pump
Fuel pressure too high	Binding valve in fuel pressure regulator	Replace fuel pressure regulator
	Clogged fuel return hose or pipe	Clean or replace hose or pipe
Same fuel pressure when vacuum hose is connected and when disconnected	Damaged vacuum hose or clogged nipple	Replace vacuum hose or clean nipple
	Defective fuel pressure regulator	Replace fuel pressure regulator

13. Stop the engine and observe fuel pressure gauge reading. It is normal if the reading does not drop within two minutes. If it does, observe the rate of drop and troubleshoot and repair according to the table below. Start, then stop the engine.
    (1) Squeeze the fuel return line closed to confirm leak-down occurs from defective fuel pressure regulator.
    (2) Squeeze the fuel supply line closed to confirm leak-down occurs from defective fuel pump check valve.
    (3) If pressure continues to drop with both fuel lines squeezed closed, injector (s) are leaking.

SYMPTOM	PROBABLE CAUSE	REMEDY
Fuel pressure drops gradually after engine is stopped	Leaky injector	Replace injector
	Leaky fuel regulator valve seat	Replace fuel pressure regulator
Fuel pressure drops sharply immediately after engine is stopped	Check valve in fuel pump is held open	Replace fuel pump

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14.Release residual pressure from the fuel pipe line. (Refer to P.13B-682 .)

⚠ WARNING

Cover the hose connection with shop towels to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.

15.Remove the fuel pressure gauge, and special tools MD998709, MD998742 and MB991637 from the fuel rail.

16.Replace the O-ring at the end of the high-pressure fuel hose with a new one.

17.Fit the high-pressure fuel hose into the fuel rail and tighten the bolts to specified torque.

Tightening torque: 4.9 ± 1.0 N·m (43 ± 8 in-lb)

18.Check for fuel leaks.

(1) Use scan tool MB991502 to operate the fuel pump.

(2) Check the fuel line for leaks and repair as needed.

19.Disconnect scan tool MB991502.

FUEL PUMP CONNECTOR DISCONNECTION (HOW TO REDUCE PRESSURIZED FUEL LINES)

M1131000900343

Refer to GROUP 13A, On-vehicle Service – Fuel Pump Relay Disconnection (How to Reduce Pressurized Fuel Lines) P.13A-580.

FUEL PUMP OPERATION CHECK

M1131002000379

Refer to GROUP 13A, On-vehicle Service – Fuel Pump Operation Check P.13A-581.

MULTIPORT FUEL INJECTION (MFI) RELAY CONTINUITY CHECK

M1131050000044

Refer to GROUP 13A, On-vehicle Service – Multiport Fuel Injection (MFI) Relay Continuity Check P.13A-582.

FUEL PUMP RELAY CONTINUITY CHECK

M1131033000041

Refer to GROUP 13A, On-vehicle Service – Fuel Pump Relay Continuity Check P.13A-582.

INTAKE AIR TEMPERATURE SENSOR CHECK

M1131002800085

Refer to GROUP 13A, On-vehicle Service – Intake Air Temperature Sensor Check P.13A-583.

ENGINE COOLANT TEMPERATURE SENSOR CHECK

M1131003100089

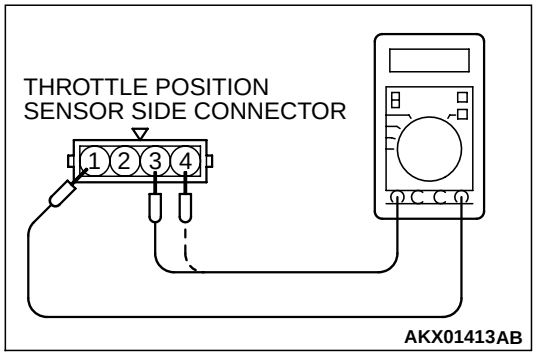
Refer to GROUP 13A, On-vehicle Service – Engine Coolant Temperature Sensor Check P.13A-583.

THROTTLE POSITION SENSOR CHECK

M1131003200213

Required Special Tool:

- MB991348: Test Harness Set



Checking the Terminal Resistance

1. Disconnect the throttle position sensor connector.
2. Measure the resistance between throttle position sensor side connector terminals 1 and 4.

   Standard value: 3.5 – 6.5 kΩ
3. Measure the resistance between throttle position sensor side connector terminals 1 and terminal 3.

Normal condition:

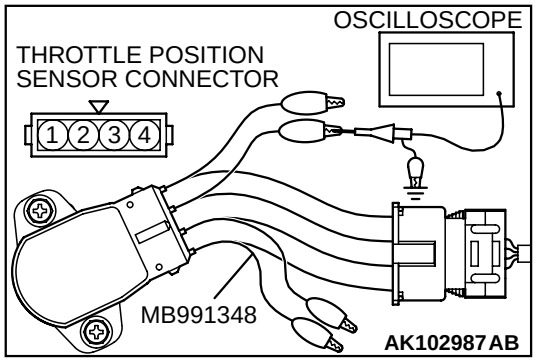
Throttle valve slowly open until fully open from the idle position	Changes smoothly in proportion to the opening angle of the throttle valve

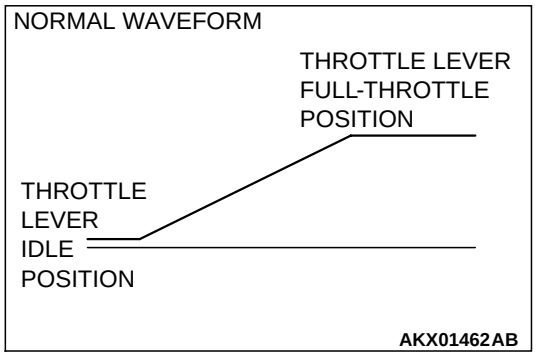
4. If the resistance is outside the standard value, or if it doesn't change smoothly, replace the throttle position sensor.

   NOTE: After replacement, the throttle position sensor should be adjusted. (Refer to P.13B-677 .)

Check using oscilloscope

1. Disconnect the throttle position sensor connector and connect the test harness special tool (MB991348) in between. (All terminals should be connected.)
2. Connect the oscilloscope probe to the throttle position sensor side connector terminal 3.
3. Turn the ignition switch to the "ON" position.





4. Slowly move the throttle lever from the idle position to the full-throttle position and check then if the waveform is free from any noise.
5. If any noise is recognized, replace the throttle position sensor.

   NOTE: After replacement, the throttle position sensor should be adjusted. (Refer to P.13B-677 .)

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HEATED OXYGEN SENSOR CHECK

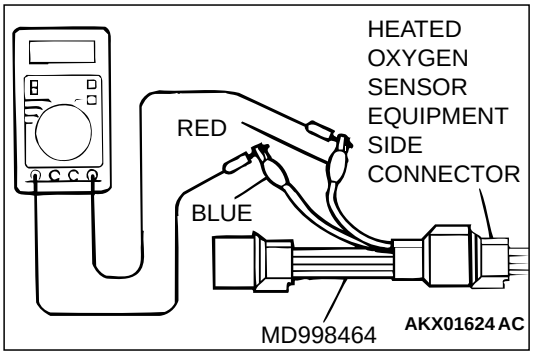
M1131005000237

Required Special Tools:

- MD998464: Test Harness
- MB991316: Test Harness
- MB991658: Test Harness Set

<Right bank and left bank heated oxygen sensor (front)>

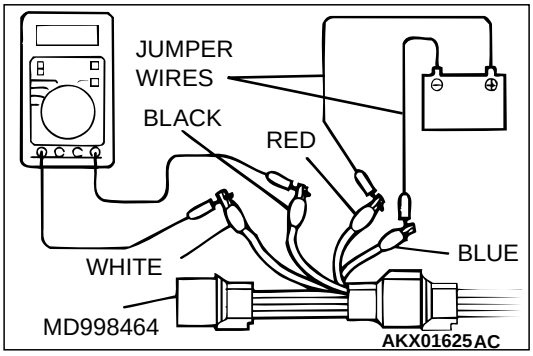
1. Use scan tool MB991502, observe HO_2S reading. If values are unsatisfactory, or if the scan tool is not available, use the following procedure:
   (1) Disconnect the heated oxygen sensor connector and connect special tool MD998464 to the connector on the heated oxygen sensor side.
   (2) Make sure that there is continuity [4.5 – 8.0 ohm at 20°C (68°F)] between terminal 1 (red clip of special tool) and terminal 3 (blue clip of special tool) on the heated oxygen sensor connector.
   (3) If there is no continuity, replace the heated oxygen sensor.
   (4) Warm up the engine until engine coolant is 80°C (176°F) or higher.



⚠ CAUTION

Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor.

   (5) Use the jumper wires to connect terminal 1 (red clip) of the heated oxygen sensor connector to the positive battery terminal and terminal 3 (blue clip) to the negative battery terminal.
   (6) Connect a digital voltage meter between terminal 2 (black clip) and terminal 4 (white clip).



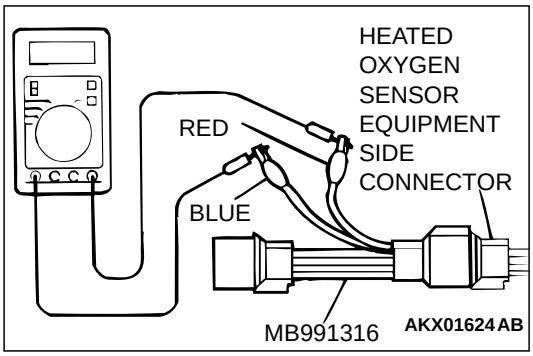
2. While repeatedly revving the engine, measure the heated oxygen sensor output voltage.

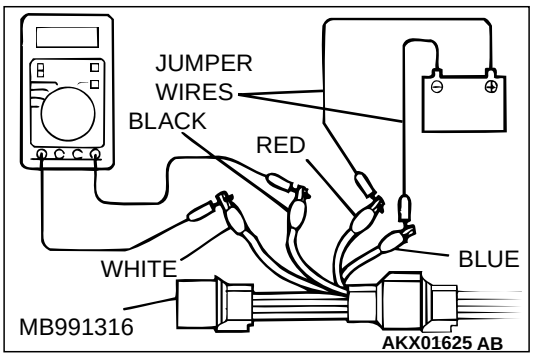
   Standard value:

ENGINE	HEATED OXYGEN SENSOR OUTPUT VOLTAGE	REMARKS
When revving engine	0.6 – 1.0 volt	If you make the air/fuel ratio rich by revving the engine repeatedly, a normal heated oxygen sensor will output a voltage of 0.6 – 1.0 volt.

3. If the sensor is defective, replace the heated oxygen sensor.

NOTE: For removal and installation of the heated oxygen sensor, refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-22.





<Right bank and left bank heated oxygen sensor (rear)>

1. Use scan tool MB991502, observe HO2S reading. If values are unsatisfactory, or if the scan tool is not available, use the following procedure:
   (1) Disconnect the heated oxygen sensor connector and connect special tool MB991316 to the connector on the heated oxygen sensor side.
   (2) Make sure that there is continuity [11 – 18 ohm at 20°C (68°F)] between terminal 1 (red clip of special tool) and terminal 3 (blue clip of special tool) on the heated oxygen sensor connector.
   (3) If there is no continuity, replace the heated oxygen sensor.
   (4) Warm up the engine until engine coolant is 80°C (176°F) or higher.

⚠ CAUTION
Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor.

   (5) Use the jumper wires to connect terminal 1 (red clip) of the heated oxygen sensor connector to the positive battery terminal and terminal 3 (blue clip) to the negative battery terminal.
   (6) Connect a digital voltage meter between terminal 2 (black clip) and terminal 4 (white clip).
2. While repeatedly revving the engine, measure the heated oxygen sensor output voltage.

   Standard value:

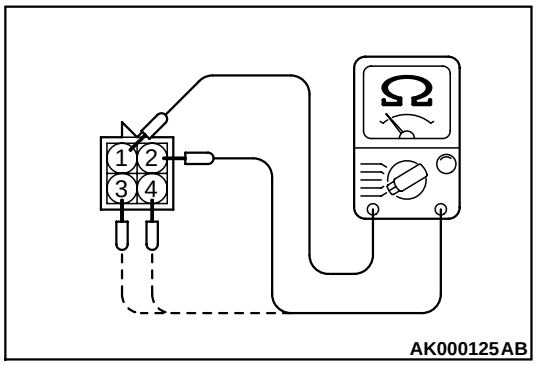
ENGINE	HEATED OXYGEN SENSOR OUTPUT VOLTAGE	REMARKS
When revving engine	0.6 – 1.0 volt	If you make the air/fuel ratio rich by revving the engine repeatedly, a normal heated oxygen sensor will output a voltage of 0.6 – 1.0 volt.

3. If the sensor is defective, replace the heated oxygen sensor.

NOTE: For removal and installation of the heated oxygen sensor, refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-22.

INJECTOR CHECK

M1131005200060



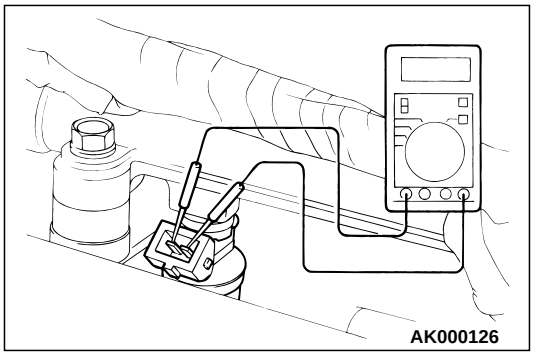
<Right bank side (number 1, 3, 5 cylinders)>

1. Disconnect the injector intermediate connector.
2. Measure the resistance between the injector intermediate connector terminals.

   Standard value:

INJECTOR NO.	MEASUREMENT TERMINAL	RESISTANCE
NO.1	1-2	13 – 16 Ω [20°C (68°F)]
NO.3	1-3	
NO.5	1-4	

3. Connect the injector intermediate connector.



<Left bank side (number 2, 4, 6 cylinders)>

1. Disconnect the injector connector.
2. Measure the resistance between injector side connector terminals 1 and 2.

   Standard value: 13 – 16 Ω [at 20 °C (68°F)]

3. Connect the injector connector.

IDLE AIR CONTROL MOTOR (STEPPER MOTOR) CHECK

M1131005400116

Refer to GROUP 13A, On-vehicle Service – Idle Air Control Motor (Stepper Motor) Check P.13A-588.

EVAPORATIVE EMISSION PURGE SOLENOID CHECK

M1131005600080

Refer to GROUP 17, Emission Control System – Evaporative Emission Control System – Evaporative Emission Purge Solenoid Check P.17-101.

EGR SOLENOID CHECK

M1131005700087

Refer to GROUP 17, Emission Control System – Exhaust Gas Recirculation (EGR) System - EGR Solenoid Check P.17-109.

EVAPORATVE EMISSION VENTILATION SOLENOID CHECK

M1131012800020

Refer to GROUP 17, Emission Control System – Evaporative Emission Canister and Fuel Tank Pressure Relief Valve – Fuel Tank Pressure Relief Valve Inspection P.17-111.

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VARIABLE INDUCTION CONTROL SOLENOID CHECK

M1131006500020

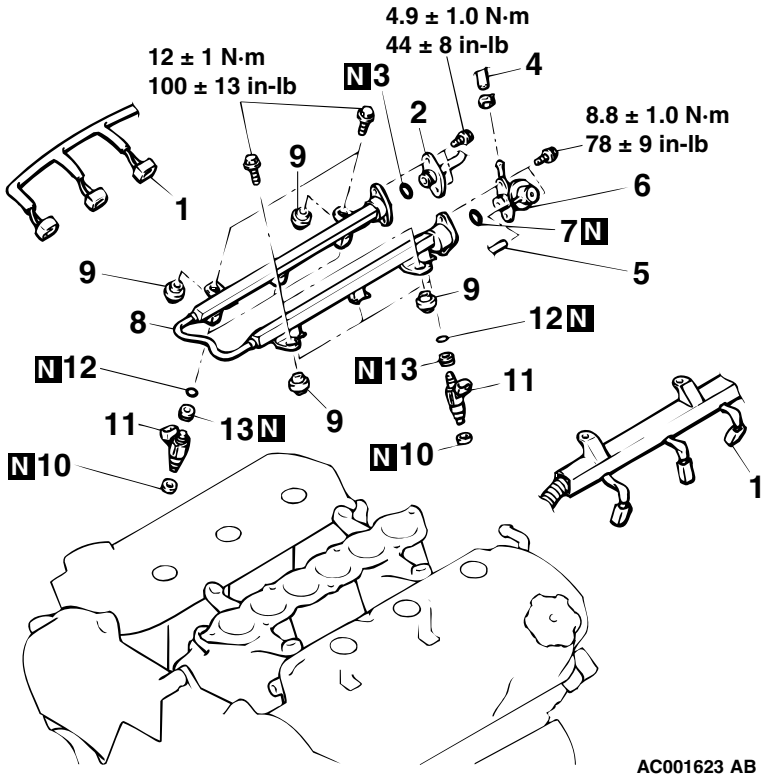
Refer to GROUP 15, Intake and Exhaust System – On-vehicle Service – Variable Induction Control (VIC) Solenoid Check P.15-4.

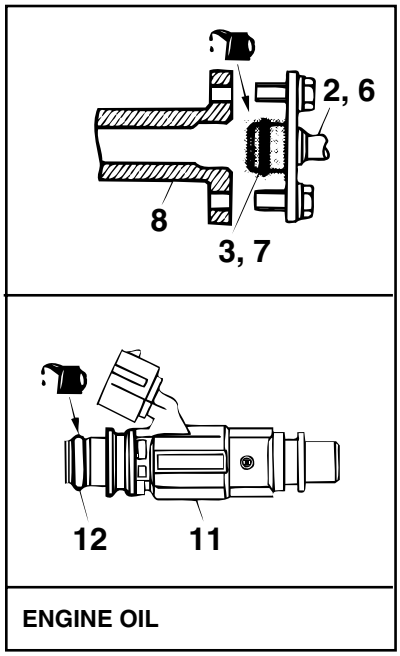
INJECTOR

REMOVAL AND INSTALLATION

M1131007100304

Pre-removal Operation	Post-installation Operation
• Fuel Pressure Reduction (Refer to P.13B-682.) • Engine Coolant Draining [Refer to GROUP 00, Maintenance Service – Engine Coolant (Change) P.00-56.] • Intake Manifold Plenum Removal (Refer to GROUP 15, Intake Manifold Plenum P.15-7.)	• Intake Manifold Plenum Installation (Refer to GROUP 15, Intake Manifold Plenum P.15-7.) • Engine Coolant Refilling [Refer to GROUP 00, Maintenance Service – Engine Coolant (Change) P.00-56.] • Fuel Leakage Inspection





ENGINE OIL

REMOVAL STEPS

1. INJECTOR CONNECTOR
>>A<< 2. HIGH-PRESSURE FUEL HOSE CONNECTION
3. O-RING
4. FUEL RETURN HOSE CONNECTION
5. VACUUM HOSE CONNECTION
>>A<< 6. FUEL PRESSURE REGULATOR

REMOVAL STEPS (Continued)

<<A>> 7. O-RING
8. FUEL RAIL
9. INSULATORS
10. INSULATORS
<<A>> >>A<< 11. INJECTORS
12. O-RING
13. GROMMETS

REMOVAL SERVICE POINT

<<A>> FUEL RAIL/INJECTORS REMOVAL

⚠ CAUTION

Do not drop the injector.

Remove the fuel rail with the injectors attached to it.

INSTALLATION SERVICE POINT

>>A<< INJECTORS/FUEL PRESSURE REGULATOR/HIGH-PRESSURE FUEL HOSE INSTALLATION

⚠ CAUTION

Do not allow the engine oil to enter the fuel rail, otherwise it will be damaged.

1. Apply a drop of new engine oil to the O-ring.
2. Turn the injector. To the right and left to install to the fuel rail. Repeat for fuel pressure regulator and high-pressure fuel hose.
   Be careful not to damage the O-ring. After installing, check that the item turns smoothly.
3. If it dose not turn smoothly, the O-ring may be trapped, remove the item, re-install it into the fuel rail and check again.
4. Tighten the fuel pressure regulator and high-pressure fuel hose to the specified torque.

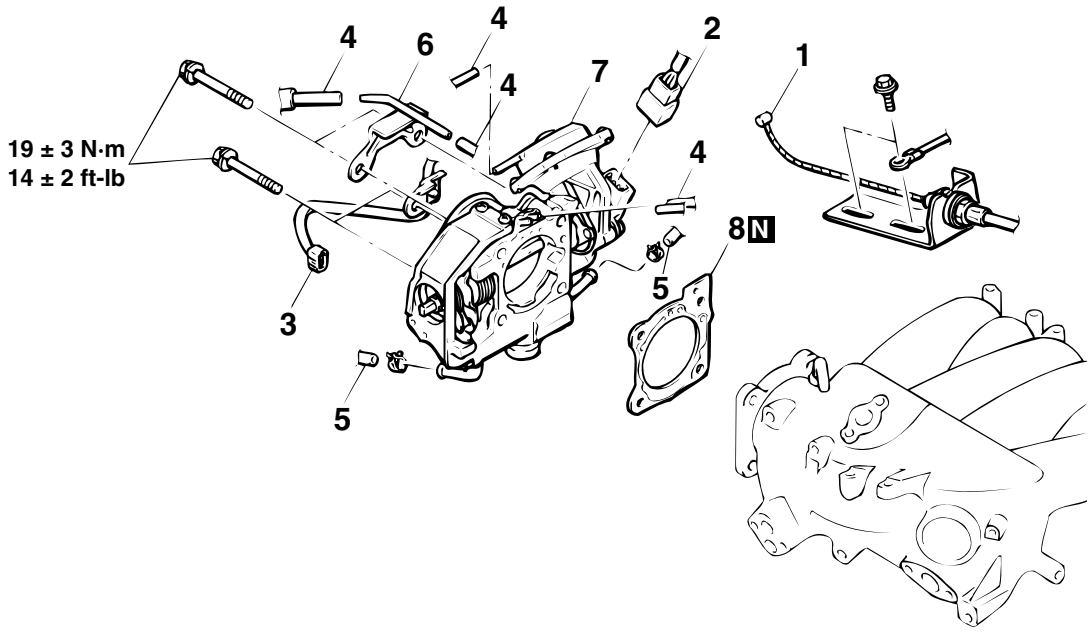
   Tightening torque:
   8.8 ± 1.0 N·m (78 ± 9 in-lb) <Fuel pressure regulator>
   4.9 ± 1.0 N·m (44 ± 8 in-lb) <High-pressure fuel hose>

THROTTLE BODY ASSEMBLY

REMOVAL AND INSTALLATION

M1131007700317

Pre-removal Operation	Post-installation Operation
• Engine Coolant Draining [Refer to GROUP 00, Maintenance Service – Engine Coolant (Change) P.00-56.] • Air Cleaner Removal (Refer to GROUP 15, Air Cleaner P.15-6.)	• Air Cleaner Installation (Refer to GROUP 15, Air Cleaner P.15-6.) • Engine Coolant Refilling [Refer to GROUP 00, Maintenance Service – Engine Coolant (Change) P.00-56.] • Accelerator Cable Adjustment (Refer to GROUP 17, On-vehicle Service – Accelerator Cable Check and Adjustment P.17-5.)



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REMOVAL STEPS

1. ACCELERATOR CABLE CONNECTION
2. THROTTLE POSITION SENSOR CONNECTOR
3. IDLE AIR CONTROL MOTOR CONNECTOR

REMOVAL STEPS (Continued)

4. VACUUM HOSE CONNECTION
5. WATER HOSE CONNECTION
6. VACUUM PIPE CONNECTION
7. THROTTLE BODY

>>A<< 8. THROTTLE BODY GASKET

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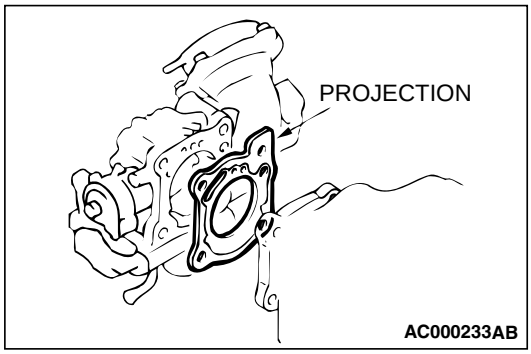
INSTALLATION SERVICE POINT

>>A<< THROTTLE BODY GASKET INSTALLATION

⚠ CAUTION

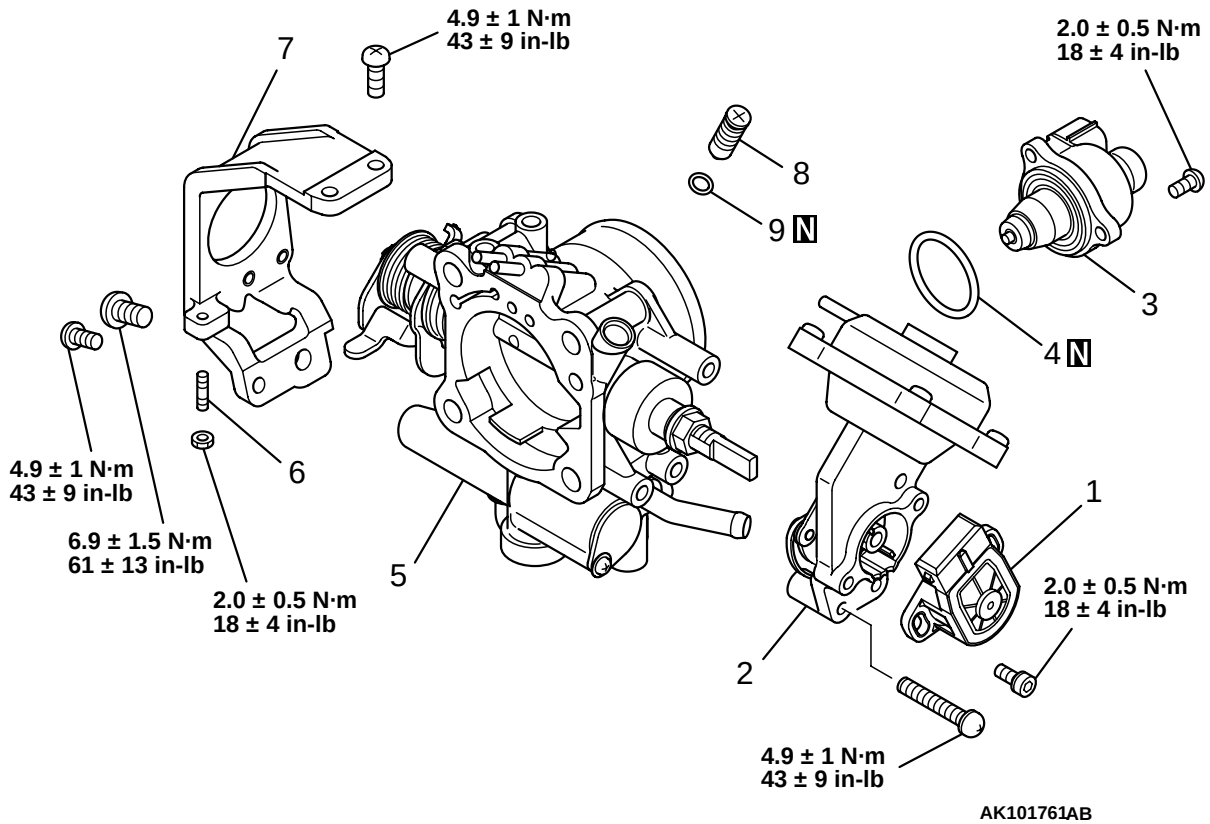
Poor idling etc. may result if the throttle body gasket is installed incorrectly.

Install the throttle body gasket as shown in the illustration.



DISASSEMBLY AND ASSEMBLY

M1131009700197



REMOVAL STEPS

<<A>> >>A<< 1. THROTTLE POSITION SENSOR
2. LEVER ASSEMBLY
3. IDLE AIR CONTROL MOTOR
4. O-RING
<<B>> 5. THROTTLE BODY
6. THROTTLE SPEED ADJUSTING SCREW

REMOVAL STEPS (Continued)

7. BRACKET
8. SPEED ADJUSTING SCREW
9. O-RING

NOTE: IF THE ADJUSTING SCREW WAS HAPPEN TO HAVE BEEN REMOVED, PERFORM SPEED ADJUSTING SCREW ADJUSTMENT.

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DISASSEMBLY SERVICE POINTS

<<A>> THROTTLE POSITION SENSOR DISASSEMBLY

1. Do not disassemble the sensor and motor.
2. Do not clean the sensor and motor by dipping them into cleaning solvent. Clean them with shop towel.

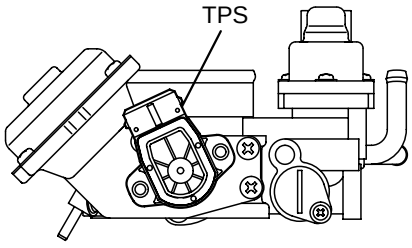
<<B>> THROTTLE BODY DISASSEMBLY

1. Do not disassemble the throttle body.
2. Check if the vacuum port or passage is clogged. Use compressed air to clean the vacuum passage.

ASSEMBLY SERVICE POINT

>>A<< THROTTLE POSITION SENSOR (TPS) INSTALLATION

1. Install the throttle position sensor to the throttle body as shown in the illustration.



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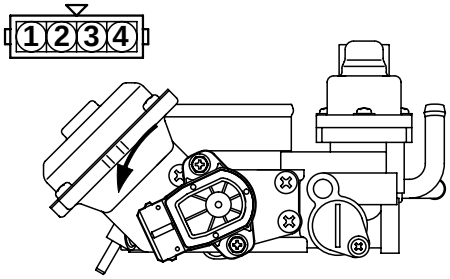
2. Turn the throttle position sensor 90 degrees counterclockwise to set it, and tighten the screws.



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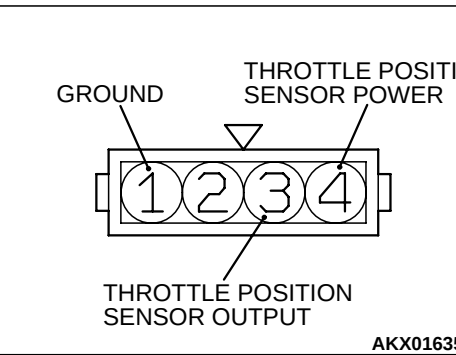
3. Connect an ohmmeter between terminals 1 (ground) and 3 (output), or between terminals 3 (output) and 4 (power). Then, make sure that the resistance changes smoothly when the throttle valve is slowly moved to the fully open position.



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SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATION

M1131011600335

ITEM	SPECIFICATION
Dashpot	3.4 ± 1.0 N·m (30 ± 9 in-lb)
Engine coolant temperature sensor	29 ± 10 N·m (22 ± 7 ft-lb)
Fuel rail mounting bolt	12 ± 1 N·m (100 ± 13 in-lb)
Fuel pressure regulator	8.8 ± 1.0 N·m (78 ± 9 in-lb)
High-pressure fuel hose	4.9 ± 1.0 N·m (44 ± 8 in-lb)
Idle air control motor	2.0 ± 0.5 N·m (18 ± 4 in-lb)
Lever assembly	4.9 ± 1.0 N·m (43 ± 9 in-lb)
Throttle body bracket M6	4.9 ± 1.0 N·m (44 ± 8 in-lb)
Throttle body bracket M8	6.9 ± 1.5 N·m (61 ± 13 in-lb)
Throttle body to intake manifold bolt	19 ± 3 N·m (14 ± 2 ft-lb)
Throttle position sensor	2.0 ± 0.5 N·m (18 ± 4 in-lb)
Throttle speed adjusting screw mounting bolt	2.0 ± 0.5 N·m (18 ± 4 in-lb)

GENERAL SPECIFICATIONS

M1131000200292

ITEMS		SPECIFICATIONS
Throttle body	Throttle bore mm (in.)	60 (2.4)
	Throttle position sensor	Variable resistor type
	Idle air control motor	Stepper motor (stepper motor type by-pass air control system with the air volume limiter)
Engine control module (ECM) <M/T>	Identification model No.	E6T35971 <Eclipse and Eclipse spyder without variable induction system> E6T35972 <Eclipse-with variable induction system> E6T35973 <Eclipse spyder-with variable induction system>
Powertrain control module (PCM) <A/T>	Identification model No.	E6T34184 <Eclipse and Eclipse spyder without variable induction system> E6T34187 <Eclipse-with variable induction system> E6T34186 <Eclipse spyder-with variable induction system>

ITEMS		SPECIFICATIONS
Sensors	Volume air flow sensor	Karman vortex type
	Barometric pressure sensor	Semiconductor type
	Intake air temperature sensor	Thermistor type
	Engine coolant temperature sensor	Thermistor type
	Heated oxygen sensor	Zirconia type
	Vehicle speed sensor <M/T>	Electromagnetic resistance element type
	Park/neutral position switch <A/T>	Contact switch type
	Camshaft position sensor	Electromagnetic resistance element type
	Crankshaft position sensor	Hall element type
	Knock sensor	Piezoelectric type
	Power steering pressure switch	Contact switch type
	Manifold differential pressure sensor	Semiconductor type
Actuators	Multiport fuel injection (MFI) relay	Contact switch type
	Fuel pump relay	Contact switch type
	Injector type and number	Electromagnetic type, 6
	Injector identification mark	CDH210
	EGR solenoid	Duty cycle type solenoid valve
	Evaporative emission purge solenoid	Duty cycle type solenoid valve
Fuel pressure regulator	Regulator pressure kPa (psi)	335 (47.6)

SERVICE SPECIFICATIONS

M1131000300181

ITEMS		STANDARD VALUE
Throttle position sensor adjusting voltage mV		535 – 735
Basic idle speed r/min		700 ± 50
Fuel pressure kPa (psi)	Vacuum hose disconnected	330 – 350 (47 – 50) at curb idle
	Vacuum hose connected	Approximately 270 (38) at curb idle
Intake air temperature sensor resistance kΩ	-20°C (-4°F)	13 – 17
	0°C (32°F)	5.3 – 6.7
	20°C (86°F)	2.3 – 3.0
	40°C (104°F)	1.0 – 1.5
	60°C (140°F)	0.56 – 0.76
	80°C (176°F)	0.30 – 0.42

ITEMS		STANDARD VALUE
Engine coolant temperature sensor resistance kΩ	-20°C (-4°F)	14 – 17
	0°C (32°F)	5.1 – 6.5
	20°C (68°F)	2.1 – 2.7
	40°C (104°F)	0.9 – 1.3
	60°C (140°F)	0.48 – 0.68
	80°C (176°F)	0.26 – 0.36
Throttle position sensor resistance kΩ		3.5 – 6.5
Heated oxygen sensor output voltage V		0.6 – 1.0
Heated oxygen sensor heater resistance Ω	Front	4.5 – 8.0
	Rear	11 – 18
Injector coil resistance Ω		13 – 16 [at 20°C (68°F)]
Idle air control motor coil resistance Ω		28 – 33 [at 20°C (68°F)]

SEALANT AND ADHESIVE

M1131000500022

ITEM	SPECIFIED SEALANT
Engine coolant temperature sensor threaded portion	3M™ AAD part number 8731or equivalent

GROUP 13C

FUEL SUPPLY

CONTENTS

GENERAL DESCRIPTION 13C-2

FUEL SUPPLY DIAGNOSIS 13C-3
- INTRODUCTION TO FUEL SUPPLY DIAGNOSIS 13C-3
- TROUBOLESHOOTING STRATEGY 13C-3
- SYMPTOM CHART 13C-3
- SYMPTOM PROCEDURES 13C-3

SPECIAL TOOLS 13C-8

ON-VEHICLE SERVICE 13C-9
- FUEL PUMP MODULE REPLACEMENT . . 13C-9

FUEL TANK 13C-11
- REMOVAL AND INSTALLATION 13C-11
- DISASSEMBLY AND ASSEMBLY 13C-14
- INSPECTION 13C-15

SPECIFICATIONS 13C-15
- FASTENER TIGHTENING SPECIFICATIONS 13C-15
- SERVICE SPECIFICATIONS 13C-15

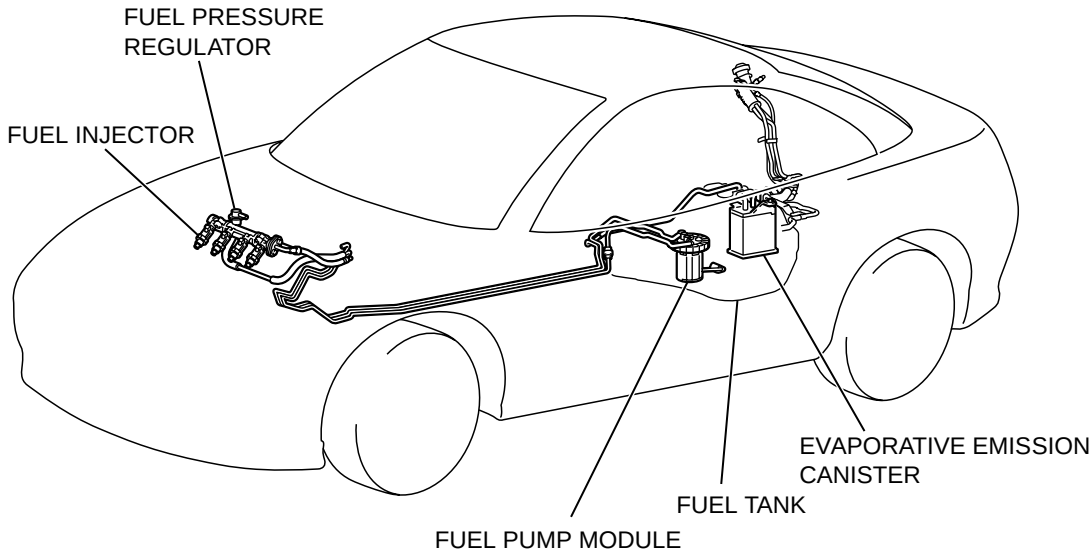
GENERAL DESCRIPTION

M1135000100208

- The fuel tank is located under the floor of the rear seats to provide increased safety and a wider luggage space.
- A plastic fuel tank has been adopted to reduce weight, and improve anti-corrosion effectiveness.

<4G6>

- A fuel pump module, which unifies fuel pump, fuel filter, reservoir cup and fuel gauge unit, has been adopted to lighten weight and improve serviceability.



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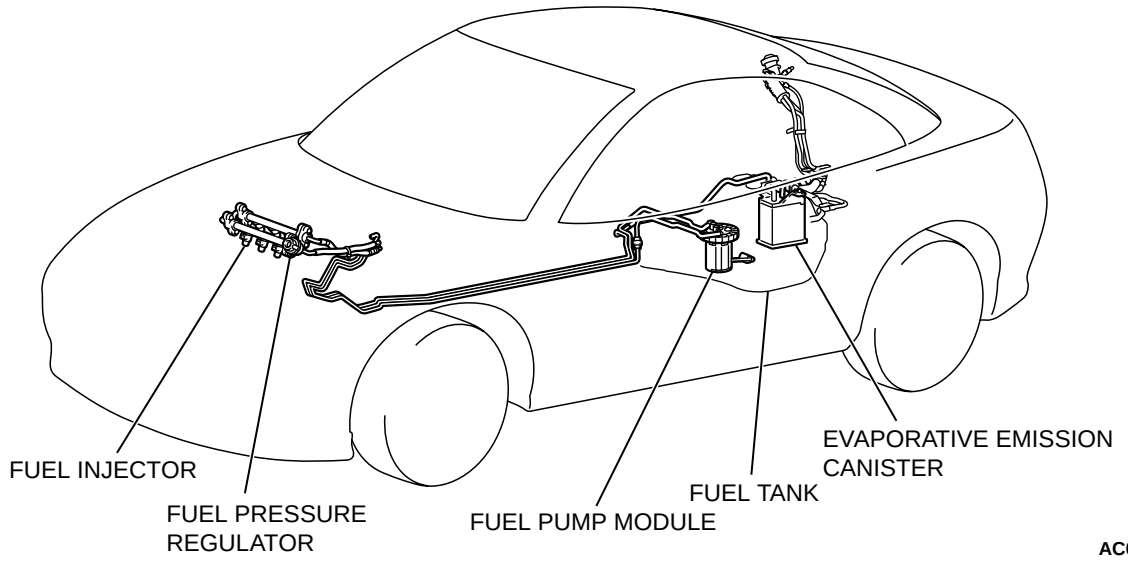

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FUEL SUPPLY DIAGNOSIS

INTRODUCTION TO FUEL SUPPLY DIAGNOSIS

M1135004000270

The fuel supply device is used to supply an appropriate mixture to the engine. The device is configured of the fuel tank, fuel filter, fuel pump and the fuel pipe that couples each part. An evaporative emission control system is also provided to prevent pollution from the evaporated fuel.

Engine malfunctions caused by insufficient fuel supply and evaporative emission control system operation malfunctions can be caused by faults in the vapor line, fuel pipe, hose, or fuel tank pressure control valve, etc.

TROUBOLESHOOTING STRATEGY

M1135004100181

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted most of the possible ways to find a fuel supply fault.

1. Gather information from the customer.
2. Verify that the condition described by the customer exists.
3. Find the malfunction by following the Symptom Chart.
4. Verify malfunction is eliminated.

SYMPTOM CHART

M1135004200263

SYMPTOM	INSPECTION PROCEDURE	REFERENCE PAGE
Engine malfunctions due to insufficient fuel supply	1	P.13C-3

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1 : Engine Malfunctions Due to Insufficient Fuel Supply

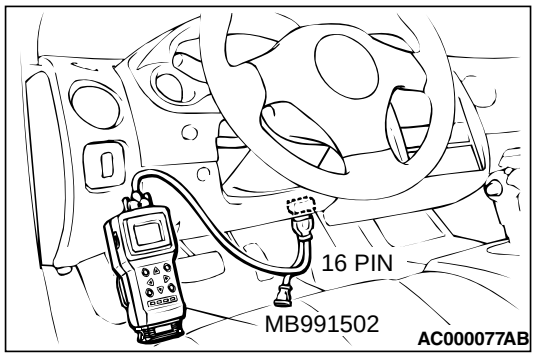
TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Injector failed.
- Open or shorted injector circuit, or loose connector.
- Bent, kinked or clogged fuel pipe or hose.
- Malfunction of fuel pump module.

DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991637: Fuel Pressure Gauge Set
- MD998709: Adaptor Hose
- MD998742: Hose Adaptor



STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC is output?

YES : Refer to, Diagnostic Trouble Code Chart <2.4L> (Refer to P.13A-22) , <3.0L> (Refer to P.13B-22.)

NO : Go to Step 2 .

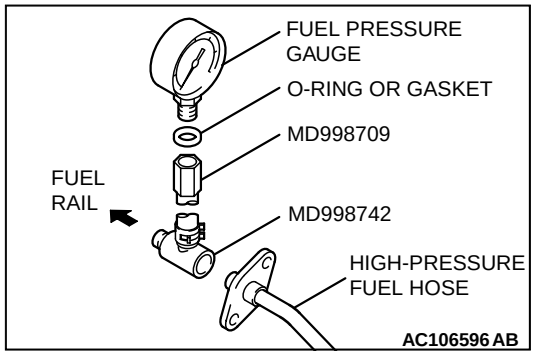
STEP 2. Check the fuel pressure.

(1) Release residual pressure from the fuel line to prevent fuel spray. <2.4L> (Refer to P.13A-580.) <3.0L> (Refer to P.13B-682.)

⚠ WARNING

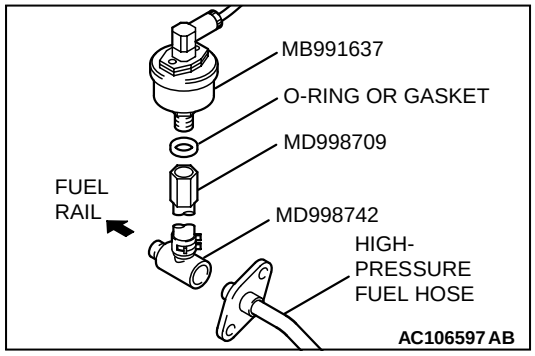
To prevent a fire, cover the hose connection with shop towels to prevent splashing of fuel that could be caused by some residual pressure in the fuel pipe line.

(2) Disconnect the high-pressure fuel hose at the fuel rail side.
(3) Assemble the fuel pressure measurement tools as follows.



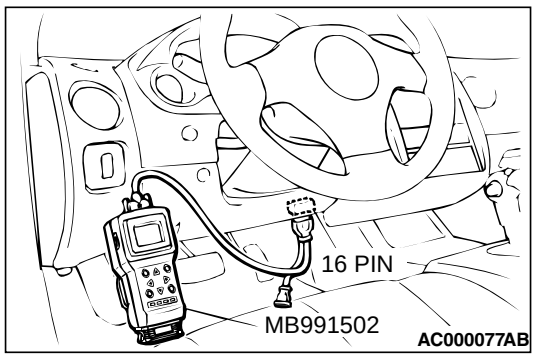
<When using the fuel pressure gauge>

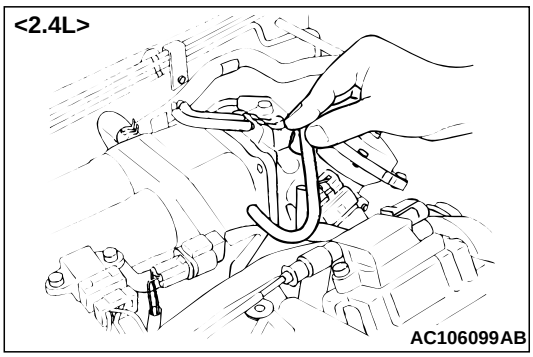
a. Remove the union joint and bolt from special tool MD998709 (adaptor hose) and instead attach special tool MD998742 (hose adaptor) to the adaptor hose.
b. Place a suitable O-ring or gasket on assembled special tools MD998709 and MD998742 and install the fuel pressure gauge.
c. Install the assembled fuel pressure measurement tools between the fuel rail and high-pressure fuel hose.

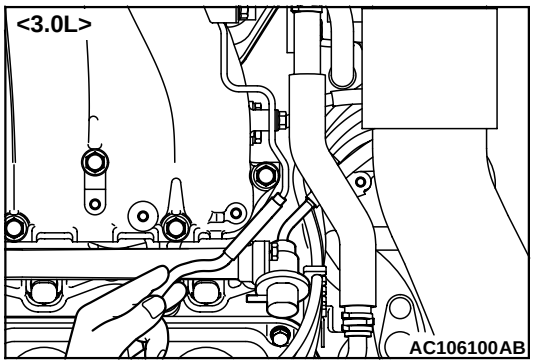


<When using the special tool MB991637 (fuel pressure gauge set)>

a. Remove the union joint and bolt from special tool MD998709 (adaptor hose) and instead attach special tool MD998742 (hose adaptor) to the adaptor hose.
b. Install special tool MB991637 (fuel pressure gauge set) to assembled special tools MD998709 and MD998742 via a gasket.
c. Install the assembled fuel pressure measurement tools between the fuel rail and the high-pressure fuel hose.







⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(4) Connect scan tool MB991502 to the data link connector.
(5) Use the Actuator test 07 to drive the fuel pump. Check that there is no fuel leaking from any section when the fuel pump is operating.
(6) Stop the fuel pump.
(7) Start the engine and run at idle.
(8) Measure fuel pressure while the engine is running at idle.

Standard value: Approximately 270 kPa (38 psi) at curb idle

(9) Disconnect the vacuum hose from the fuel pressure regulator and measure fuel pressure with the hose end closed with your finger.

Standard value: 330 – 350 kPa (47 – 50 psi) at curb idle

(10) Check to see that fuel pressure at idle does not drop even after the engine has been revved several times.
(11) Revving the engine repeatedly, hold the fuel return hose lightly with your fingers to feel that fuel pressure is present in the return hose.

NOTE: If the fuel flow rate is low, there will be no fuel pressure in the return hose.

(12) If any of fuel pressure measured in steps 10 to 13 is out of specification, troubleshoot and repair according to the table below.

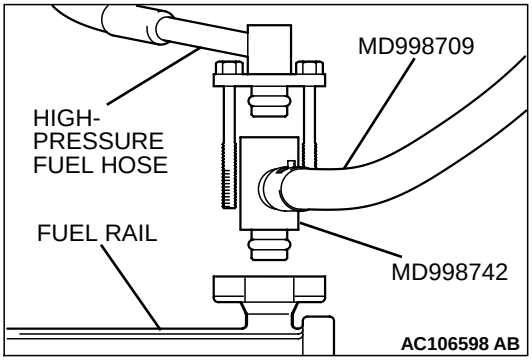
SYMPTOM	PROBABLE CAUSE	REMEDY
• Fuel pressure too low • Fuel pressure drops after racing • No fuel pressure in fuel return hose	Clogged fuel filter	Replace fuel filter
	Fuel leaking to return side due to poor fuel regulator valve seating or settled spring	Replace fuel pressure regulator
	Low fuel pump delivery pressure	Replace fuel pump
Fuel pressure too high	Binding valve in fuel pressure regulator	Replace fuel pressure regulator
	Clogged fuel return hose or pipe	Clean or replace hose or pipe
Same fuel pressure when vacuum hose is connected and when disconnected	Damaged vacuum hose or clogged nipple	Replace vacuum hose or clean nipple
	Defective fuel pressure regulator	Replace fuel pressure regulator

TSB Revision

(13)Stop the engine and observe fuel pressure gauge reading. It is normal if the reading does not drop within two minutes. If it does, observe the rate of drop and troubleshoot and repair according to the table below. Start, then stop the engine.
a. Squeeze the fuel return line closed to confirm leak-down occurs from defective fuel pressure regulator.
b. Squeeze the fuel supply line closed to confirm leak-down occurs from defective fuel pump check valve.
c. If pressure continues to drop with both fuel lines squeezed closed, injector(s) are leaking.

SYMPTOM	PROBABLE CAUSE	REMEDY
Fuel pressure drops gradually after engine is stopped	Leaky injector	Replace injector
	Leaky fuel regulator valve seat	Replace fuel pressure regulator
Fuel pressure drops sharply immediately after engine is stopped	Check valve in fuel pump is held open	Replace fuel pump

(14)Release residual pressure from the fuel pipe line. <2.4L> (Refer to P.13A-580.) <3.0L> (Refer to P.13B-682.)



⚠ ***WARNING***

Cover the hose connection with shop towels to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.

(15)Remove the fuel pressure gauge or special tool MB991637, and special tools MD998709 and MD998742 from the fuel rail.
(16)Replace the O-ring at the end of the high-pressure fuel hose with a new one.
(17)Fit the high-pressure fuel hose into the fuel rail and tighten the bolts to specified torque.

Tightening torque: 4.9 ± 1.0 N·m (44 ± 8 in-lb)

(18)Check for fuel leaks.
a. Use scan tool MB991502 to operate the fuel pump.
b. Check the fuel line for leaks, and repair as needed.
(19)Disconnect scan tool MB991502.

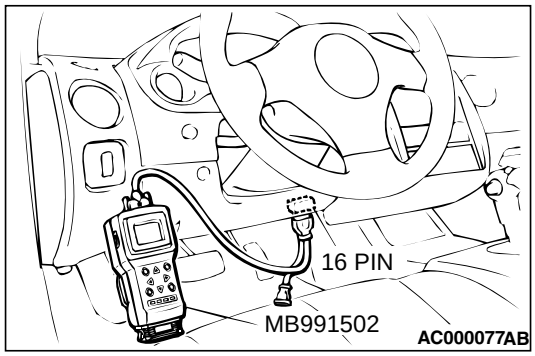
Q: Is the fuel pressure test in good condition?

YES : Go to Step 5.
NO : Repair or replace. Then go to Step 3.

STEP 3. Check for bending, twisting or clogging of the fuel pipe or hose.

Q: Are the fuel pipe and hose in good condition?

YES : Go to Step 4.
NO : Repair or replace. Then go to Step 6.

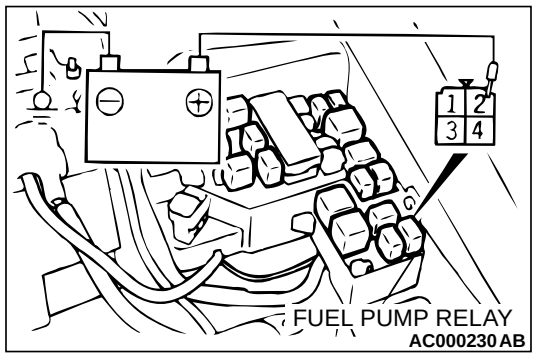


STEP 4. Check the fuel pump module operation.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Check the operating of the fuel pump by using scan tool MB991502 to force-drive the fuel pump.



(2) If the fuel pump will not operate, check by using the following procedure. If normal, check the fuel pump drive circuit.
   a. Turn the ignition switch to the "LOCK" (OFF) position.
   b. Remove the fuel pump relay, and apply battery voltage to harness-side connector terminal number 2. Check that an operating sound can be heard from the fuel pump.

      NOTE: As the fuel pump is an in-tank type, the fuel pump sound is hard to hear. Remove the fuel tank filler tube cap and check from the tank inlet.
   c. Check for fuel pressure by pinching the fuel hose with fingertips.
   d. Install the fuel pump relay.

Q: Is the fuel pump module operation in good condition?

YES : Then go to Step 5.
NO : Replace. Then go to Step 6.

STEP 5. Check the inside of the fuel tank for contamination and rust.

(1) Draining fuel.
(2) Fuel tank removal. (Refer to P.13C-11.)

Q: Is the fuel tank in good condition?

YES : Go to Step 6.
NO : Replace the fuel filter, and clean the fuel tank and fuel line. Then go to Step 6 .

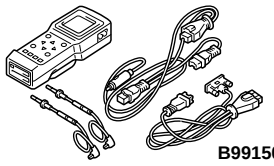
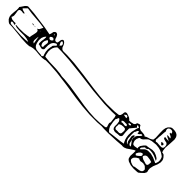
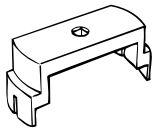
STEP 6. Check symptoms.

Q: Is the engine malfunction eliminated?

YES : Finish.
NO : Return to Step 1.

SPECIAL TOOLS

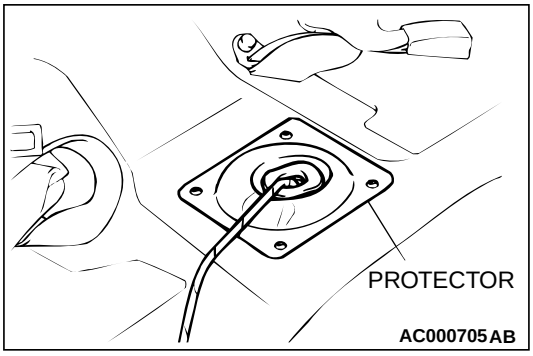
M1135000600184

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 B991502	MB991502 Scan tool <MUT-II>	MB991496-OD	• Reading diagnostic trouble code • MFI system inspection
	MD998709 Adaptor hose	MIT210196	Measurement of fuel pressure
	MD998742 Hose adaptor	MD998742-01	
MB991637	MB991637 Fuel pressure gauge set	Tool not available	
 MB991480	MB991480 Tank cap wrench	–	Cap removal and installation
MB991348	MB991348 Test harness set	–	Fuel tank differential pressure sensor check

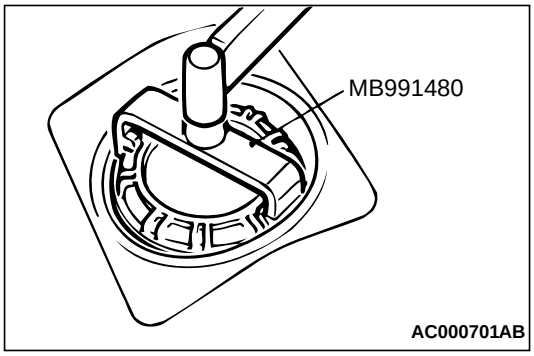
ON-VEHICLE SERVICE

FUEL PUMP MODULE REPLACEMENT

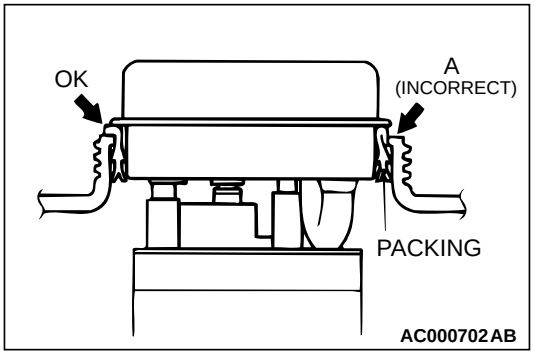
M1135004900091



1. Remove the rear seat cushion. (Refer to GROUP 52A – Rear Seat P.52A-20.)
2. Remove the protector.
3. Bleed the residual pressure from inside the fuel pipe line to prevent the fuel from spraying out. [Refer to GROUP 13A <2.4L> P.13A-580 , 13B <3.0L> P.13B-682 – On-vehicle Service – Fuel Pump Connector Disconnection (How to Reduce Pressurized Fuel Line.)]



4. Disconnect the hose and connector connections, and then use special tool MB991480 to remove the fuel pump module.



⚠ CAUTION

Install the packing to the fuel tank, and then install the fuel pump module to the fuel tank. Installing the packing to the fuel pump module will damage the packing lip when installing the fuel pump module to the fuel tank, and fuel leakage will occur.

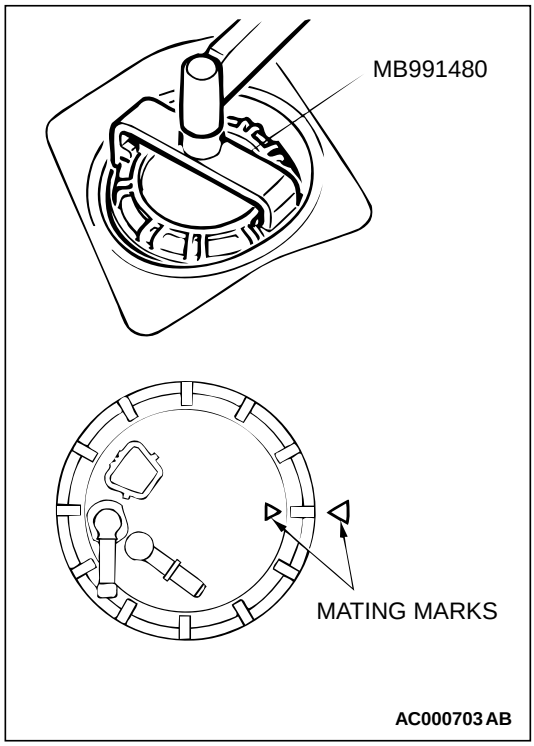
5. Check that the fuel tank is not damaged or deformed, and then securely install the packing to the fuel tank.

   NOTE: If the packing is damaged or deformed, replace with new packing.

⚠ CAUTION

- **Do not tilt the fuel pump module when installing.**
- **The packing should not be folded over as shown by "A" in the illustration.**

6. Apply soap water to the inside of the packing, and then install the fuel pump module.



⚠ CAUTION

When Tightening, be careful not to let the fuel pump module turn together with the cap. If the mating marks are misaligned, the float may measure a remaining amount of fuel in correctly, causing the low fuel warning light to malfunction.

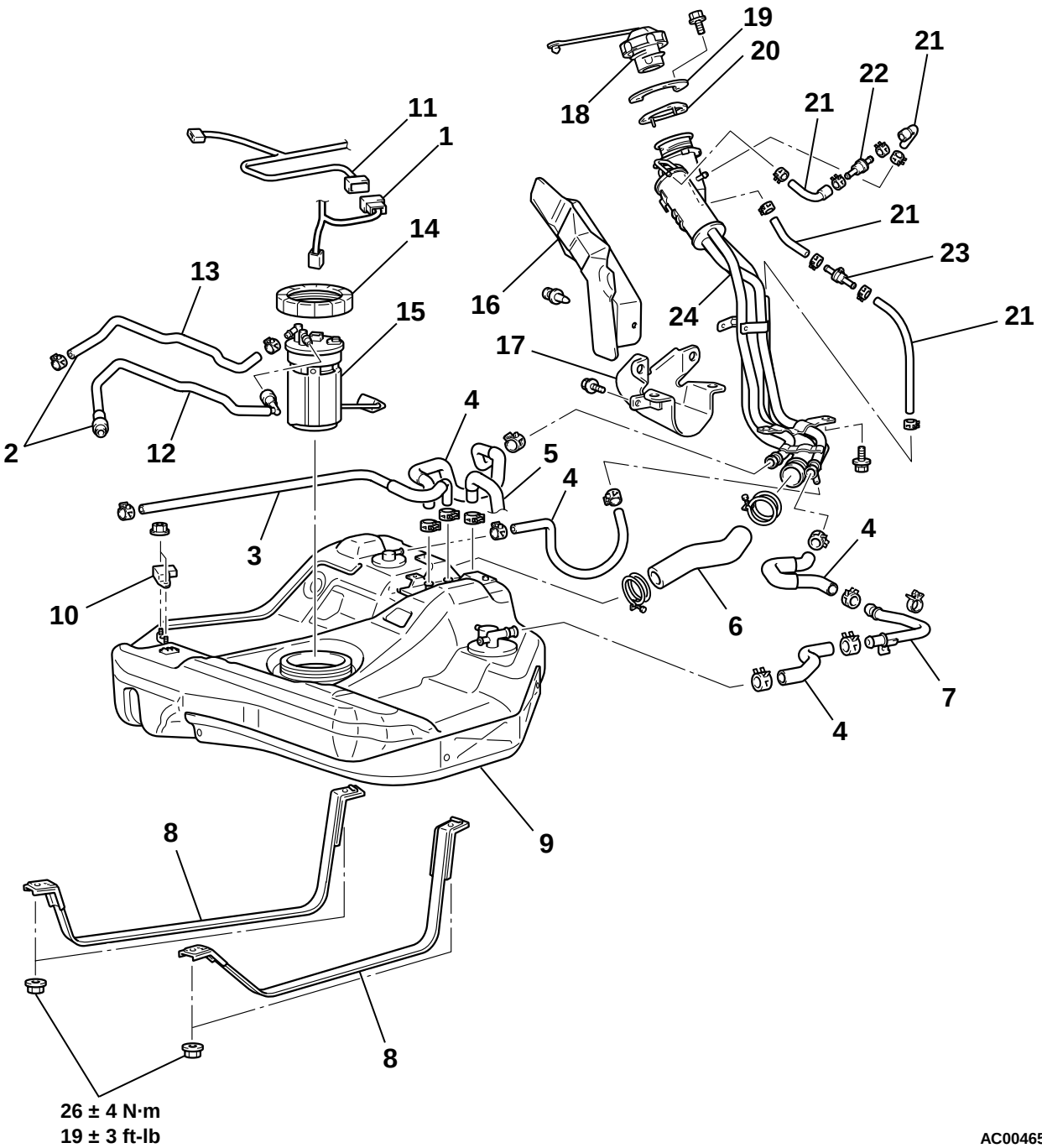
7. Use special tool MB991480 to align the mating marks on the fuel tank and fuel pump module, and tighten the cap.
8. Check for leaks from the installation section of the fuel pump module by the following procedure.
   (1) Apply soapy water to the inside diameter of the cap.
   (2) Choke the vapor hose and main hose, apply an internal pressure of 10 kPa (1.45 psi) or less from the return hose and check that no bubbles form in the soapy water.
9. Connect the connector, and then install the protector.
10. Install the rear seat cushion. (Refer to GROUP 52A – Rear Seat P.52A-20.)

FUEL TANK

FUEL TANK REMOVAL AND INSTALLATION

M1135001900199

Pre-removal Operation	Post-installation Operation
• Draining Fuel • Reduce the Inner Pressure of Fuel Line and Hose [Refer to GROUP 13A <2.4L>P.13A-580 , 13B <3.0L>P.13B-682 – On-vehicle Service – Fuel Pump Connector Disconnection (How to Reduce Pressurized Fuel Line).] • Center Exhaust Pipe Removal (Refer to GROUP 15 <2.4L>P.15-21 , <3.0L>P.15-22 .) • Evaporator Hose Removal (Refer to GROUP 17 – Evaporator P.17-110.)	• Evaporator Hose Installation (Refer to GROUP 17– Evaporator P.17-110.) • Center Exhaust Pipe Installation (Refer to GROUP 15 <2.4L>P.15-21 , <3.0L>P.15-22 .) • Refilling Fuel • Checking for Fuel Leaks



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TSB Revision

REMOVAL STEPS

1. BODY HARNESS CONNECTION
2. HOSE CONNECTION
3. PURGE HOSE
4. VAPOR HOSE
5. VENT HOSE
6. FILLER HOSE
7. PIPE ASSEMBLY
8. BAND ASSEMBLY
9. FUEL TANK ASSEMBLY
10. DIFFERENTIAL PRESSURE SENSOR
11. FUEL HARNESS

>>B<< 12. HIGH-PRESSURE FUEL HOSE

REMOVAL STEPS (Continued)

13. FUEL RETURN HOSE

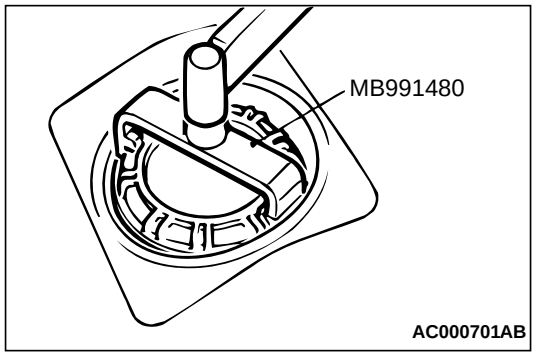
<<A>> >>A<< 14. CAP

15. FUEL PUMP MODULE
16. FILLER NECK PROTECTOR
17. FILLER NECK PROTECTOR
18. FUEL CAP
19. REINFORCEMENT
20. PACKING
21. VAPOR HOSE
22. CHECK VALVE ASSEMBLY (1WAY)
23. CHECK VALVE ASSEMBLY (2WAY)
24. FUEL FILLER NECK ASSEMBLY

REMOVAL SERVICE POINT

<<A>> CAP REMOVAL

Use special tool MB991480 to remove the cap.



INSTALLATION SERVICE POINTS

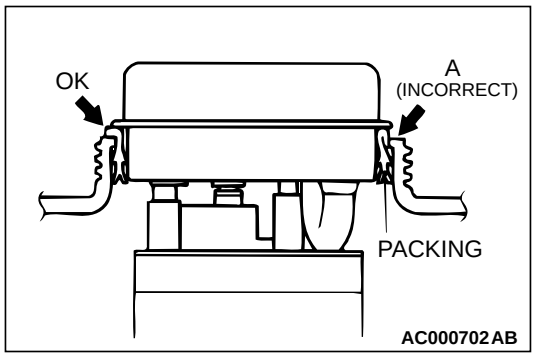
>>A<< CAP INSTALLATION

⚠ CAUTION

Install the packing to the fuel tank, and then install the fuel pump module to the fuel tank. Installing the packing to the fuel pump module will damage the packing lip when installing the fuel pump module to the fuel tank, and fuel leakage will occur.

1. Check that the fuel tank is not damaged or deformed, and then securely install the packing to the fuel tank.

   NOTE: If the packing is damaged or deformed, replace with new packing.

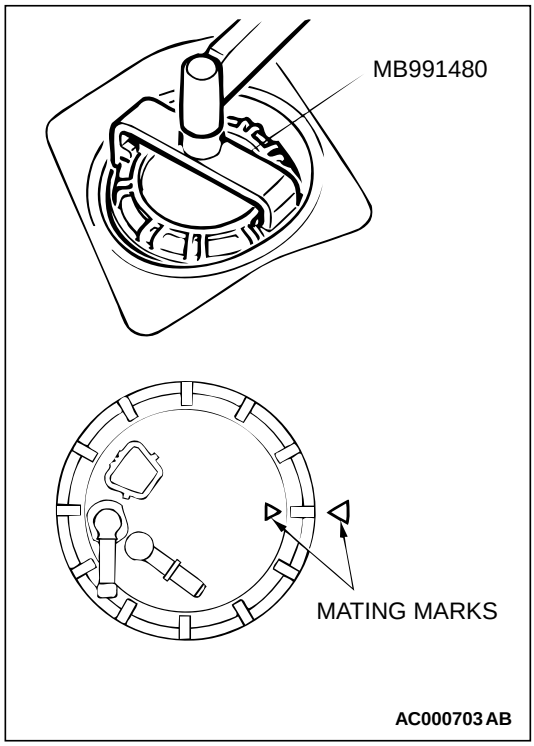


⚠ CAUTION

- **Do not tilt the fuel pump module when installing.**
- **The packing should not be folded over as shown by "A" in the illustration.**

2. Apply soap water to the inside of the packing, and then install the fuel pump module.

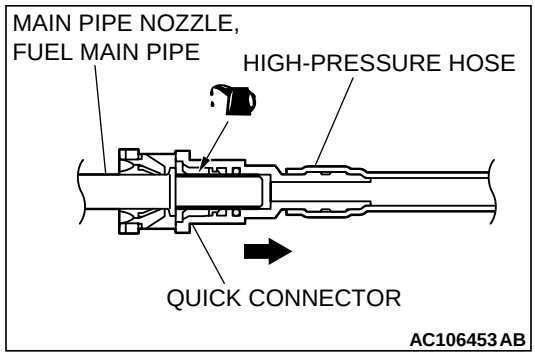
TSB Revision



⚠ CAUTION

When tightening, be careful not to let the fuel pump module turn together with the cap. If the mating marks are misaligned, the float may measure a remaining amount of fuel in correctly, causing the low fuel warning light to malfunction.

3. Use special tool MB991480 to align the mating marks on the fuel tank and fuel pump module, and tighten the cap.



>>B<< HIGH-PRESSURE FUEL HOSE INSTALLATION

⚠ CAUTION

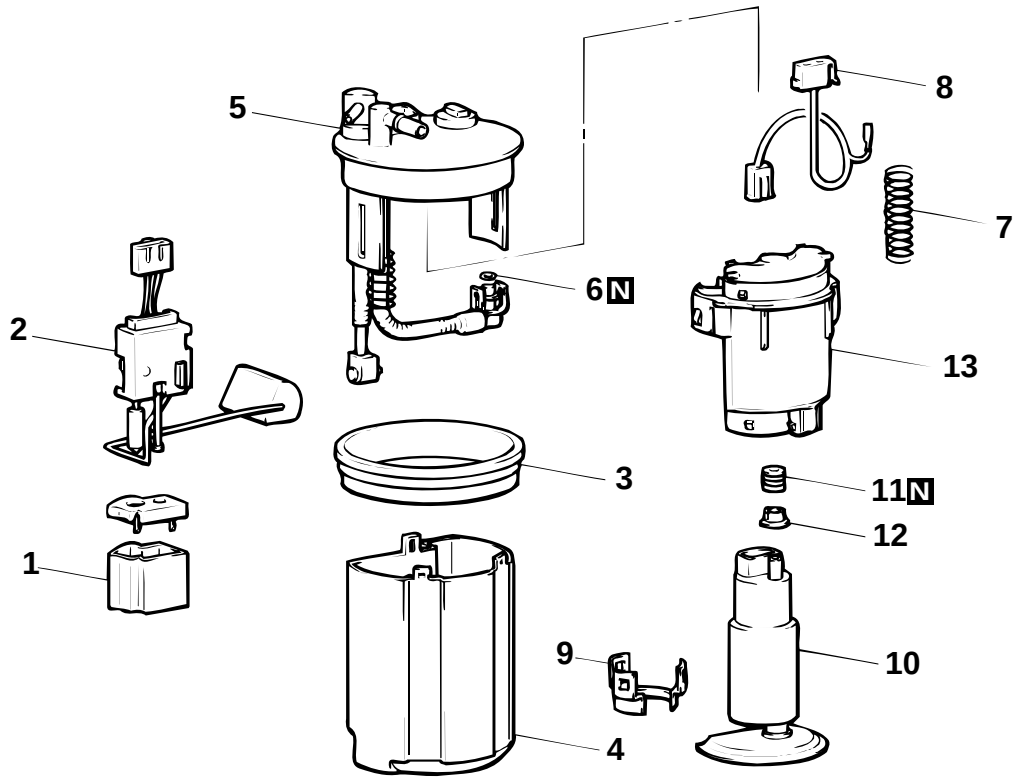
Connect the high-pressure hose, and then pull it gently in the direction of removal to check that the hose is firmly connected.

Apply clean engine oil to the tips of the main pipe nozzle and the fuel main pipe, and connect quick-joint connector of the high-pressure fuel hose to them.

DISASSEMBLY AND ASSEMBLY

M1135004600131

FUEL PUMP MODULE



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REMOVAL STEPS

1. THERMISTOR CASE
2. FUEL GAUGE UNIT
3. PACKING
4. RESERVOIR CUP
5. PUMP SUPPORT ASSEMBLY

>>A<< 6. O-RING

7. SPRING

REMOVAL STEPS (Continued)

8. PUMP HARNESS
9. LOCK BRACKET
10. FUEL PUMP

>>A<< 11. GROMMET

12. SPACER
13. FUEL FILTER

TSB Revision

ASSEMBLY SERVICE POINT

>>A<< GROMMET/O-RING INSTALLATION
Apply a film of gasoline to the grommet and O-ring to prevent them from damaging or deforming, and then install them.

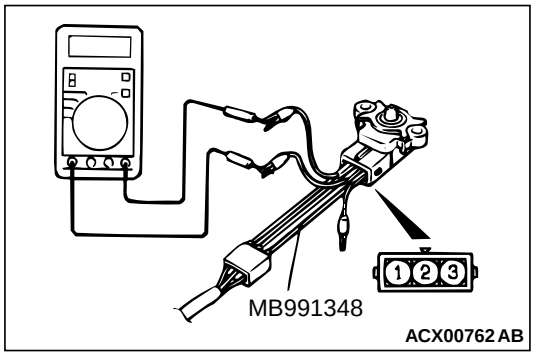
INSPECTION

M1135004700053

FUEL GAUGE UNIT CHECK

Refer to GROUP 54A – Combination Meter P.54A-103.

FUEL TANK DIFFERENTIAL PRESSURE SENSOR CHECK



1. Disconnect the fuel tank differential pressure sensor connector and connect special tool MB991348 between the terminals of the disconnected connector.
2. Turn the ignition switch to "ON" and measure the output voltage between terminals 2 and 3.

   Standard value: 2.0 – 3.0 V

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1135003900195

ITEMS		SPECIFICATION
Fuel supply	Band assembly nut	26 ± 4 N·m (19 ± 3 ft-lb)

SERVICE SPECIFICATIONS

M1135000300161

ITEMS	STANDARD VALUE
Fuel tank differential pressure sensor output voltage V	2.0 – 3.0

NOTES

GROUP 14

COOLING SYSTEM

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- SYMPTOM PROCEDURES 14-4

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- SERVICE SPECIFICATIONS 14-32
- COOLANT 14-32
- SEALANT 14-32

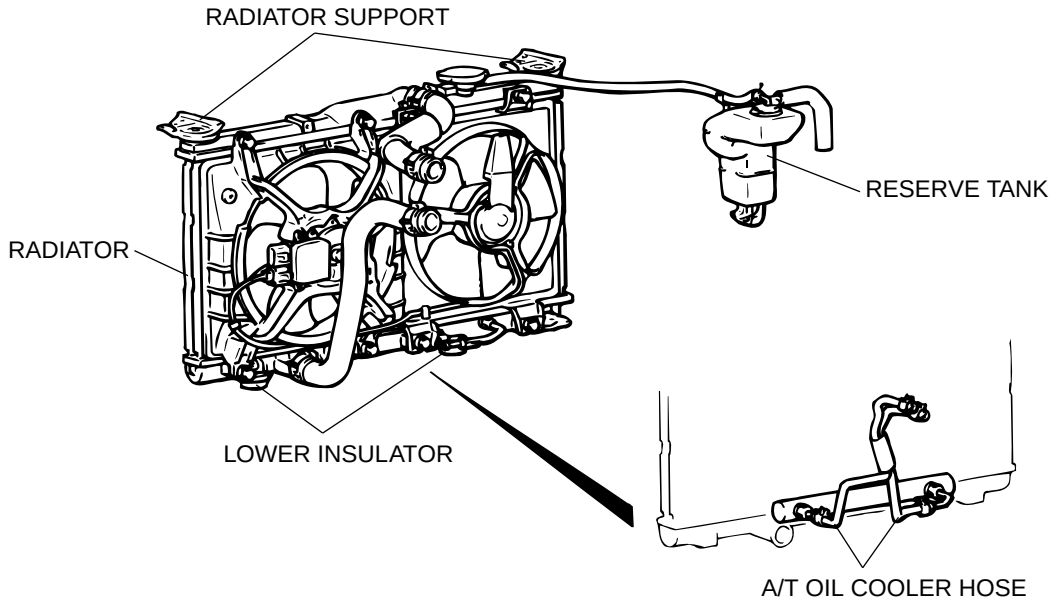
GENERAL DESCRIPTION

M1141000100207

The cooling system is designed to keep every part of the engine at appropriate temperature in whatever condition the engine may be operated. The cooling method is of the water-cooled, pressure forced circulation type in which the water pump pressurizes coolant and circulates it throughout the engine. If the coolant temperature exceeds the prescribed temperature, the thermostat opens to circulate the coolant through the radiator as well so that the heat absorbed by the coolant may be radiated into the air.

The water pump is of the centrifugal type and is driven by the drive belt from the crankshaft. The radiator is the corrugated fin, down flow type and is cooled by an electrical radiator fan. And if the engine coolant temperature reaches 110°C (230°F) or higher, the radiator fan control rotates the radiator fan for up to 5 minutes even after the ignition switch is turned to the "LOCK" (OFF) position [the fan stops its rotation when the engine coolant temperature decreases to 110°C (230°F) or lower].

CONSTRUCTION DIAGRAM



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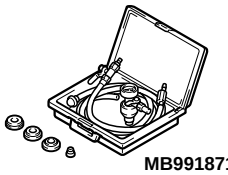
SPECIAL TOOL

M1141000600064

TOOL	TOOL NUMBER AND NAME	SUPERSSION	APPLICATION
 MB991871	MB991871 LLC changer	–	Coolant refilling

ENGINE COOLING DIAGNOSIS

INTRODUCTION

M1141005300217

The system cools the engine so that it does not overheat and maintains the engine at an optimum temperature. The system components are the radiator, water pump, thermostat, condenser fan assembly. Possible faults include low coolant, contamination, belt loosening and component damage.

TROUBLESHOOTING STRATEGY

M1141005200210

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure to find most of the engine cooling faults.

1. Gather information from the customer.
2. Verify that the condition described by the customer exists.
3. Find and repair the malfunction by following the SYMPTOM CHART.
4. Verify that the malfunction is eliminated.

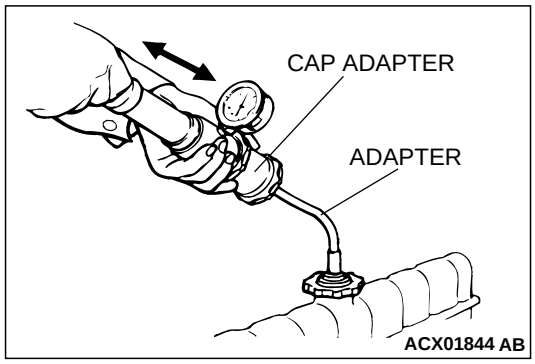
SYMPTOM CHART

M1141005600207

SYMPTOMS	INSPECTION PROCEDURE	REFERENCE PAGE
Coolant Leak	1	P.14-4
Engine Overheating	2	P.14-4
Radiator Fan and Condenser Fan do not Operate	3	P.14-6
Radiator Fan and Condenser Fan do not Change Speed or Stop	4	P.14-13
Radiator Fan does not Operate	5	P.14-16
Condenser Fan does not Operate	6	P.14-16

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Coolant Leak



DIAGNOSIS

STEP 1. Check for coolant leaks.

⚠ ***WARNING***

When pressure testing the cooling system, slowly release cooling system pressure to avoid getting burned by hot coolant.

⚠ **CAUTION**

- **Be sure to completely clean away any moisture from the places checked.**
- **When the tester is removed, be careful not to spill any coolant from it.**
- **When installing and removing the tester and when testing, be careful not to deform the filler neck of the radiator.**

Check that the coolant level is up to the filler neck. Install a radiator tester and apply 160 kPa (23 psi) pressure, and then check for leakage from the radiator hose or connections.

Q: Is leakage present from the radiator hose or connections?

YES : Repair or replace the appropriate part, then go to Step 2.

NO : There is no action to be taken.

STEP 2. Check symptoms.

Q: Can the symptom be reproduced?

YES : Return to Step 1.

NO : This diagnosis is complete.

INSPECTION PROCEDURE 2: Engine Overheating

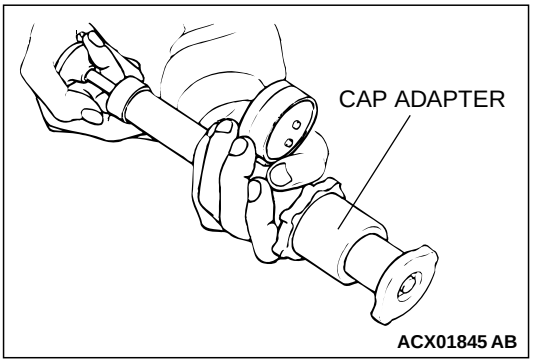
DIAGNOSIS

STEP 1. Remove the radiator cap and check for coolant contamination.

Q: Is the coolant contaminated with rust and oil?

YES : Replace it. Refer to GROUP 00, Maintenance Service – Engine Coolant (Change) P.00-56.

NO : There is no action to be taken, go to Step 2.



STEP 2. Check the radiator cap valve opening pressure.

NOTE: Be sure that the cap is clean before testing. Rust or other foreign material on the cap seal will cause an improper reading.

(1) Use a cap adapter to attach the cap to the tester.
(2) Increase the pressure until the gauge indicator stops moving.

Minimum limit: 64 kPa (9.2 psi)

Standard value: 73 – 103 kPa (11 – 15 psi)

Q: Does the reading remain at or above the minimum limit?

YES : Go to Step 3.
NO : Replace the radiator cap. Then go to Step 5.

STEP 3. Check thermostat operation.

Refer to P.14-24.

Q: Is the thermostat operate correctly?

YES : Go to Step 4.
NO : Replace the thermostat, then go to Step 5.

STEP 4. Check the drive belt for slippage or damage.

Refer to GROUP 00, Maintenance Service – Drive Belts (Check Condition) P.00-44.

Q: Is the drive belt loose or damaged?

YES : Adjust or replace the drive belt, then go to Step 5.
NO : There is no action to be taken.

STEP 5. Check symptoms.

Check the coolant temperature gauge.

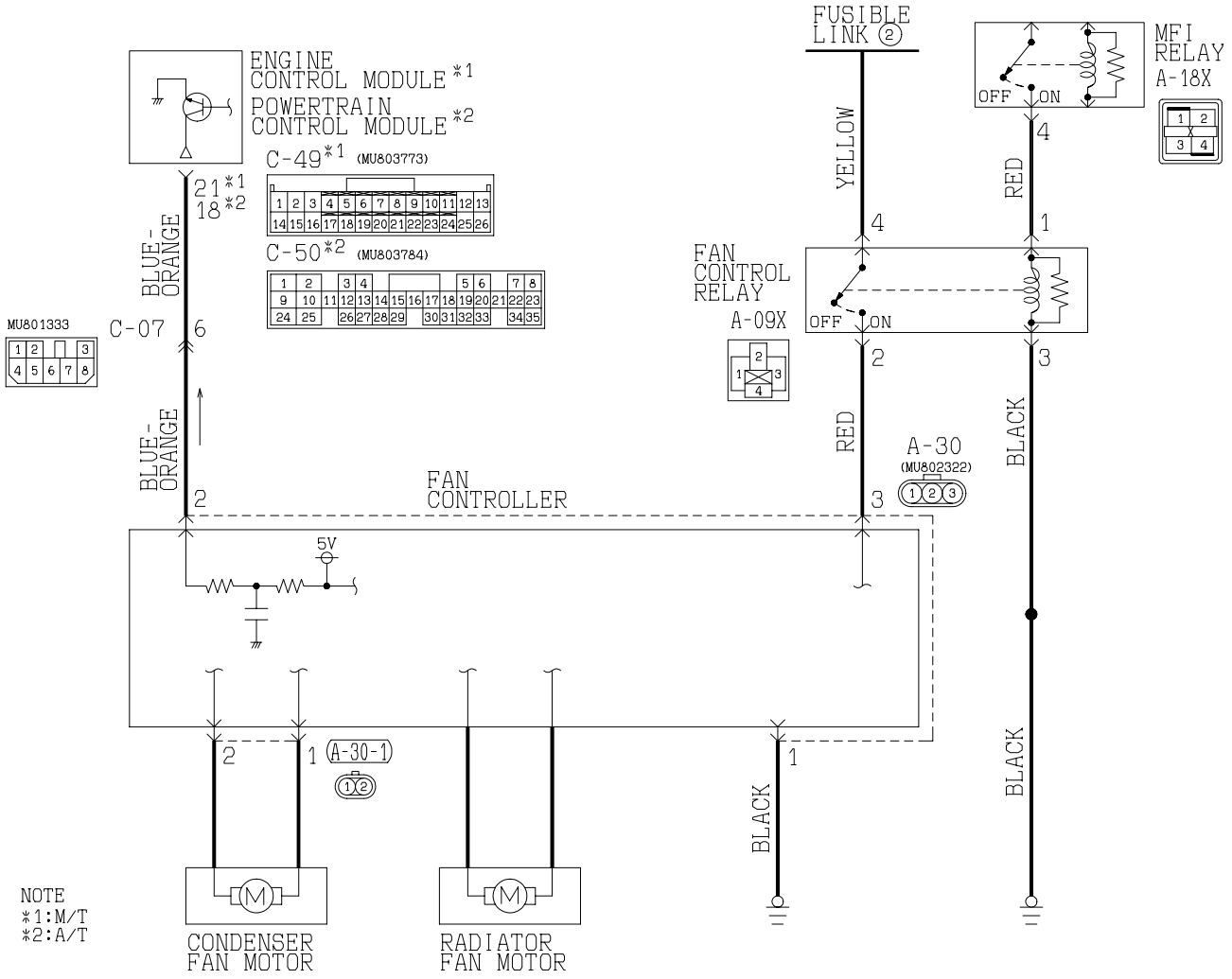
Q: Is the coolant temperature abnormally high?

YES : Return to Step 2.
NO : This diagnosis is complete.

INSPECTION PROCEDURE 3: Radiator Fan and Condenser Fan do not Operate

Radiator Fan and Condenser Driver Circut

<2.4L ENGINE>



W2S12M02AA
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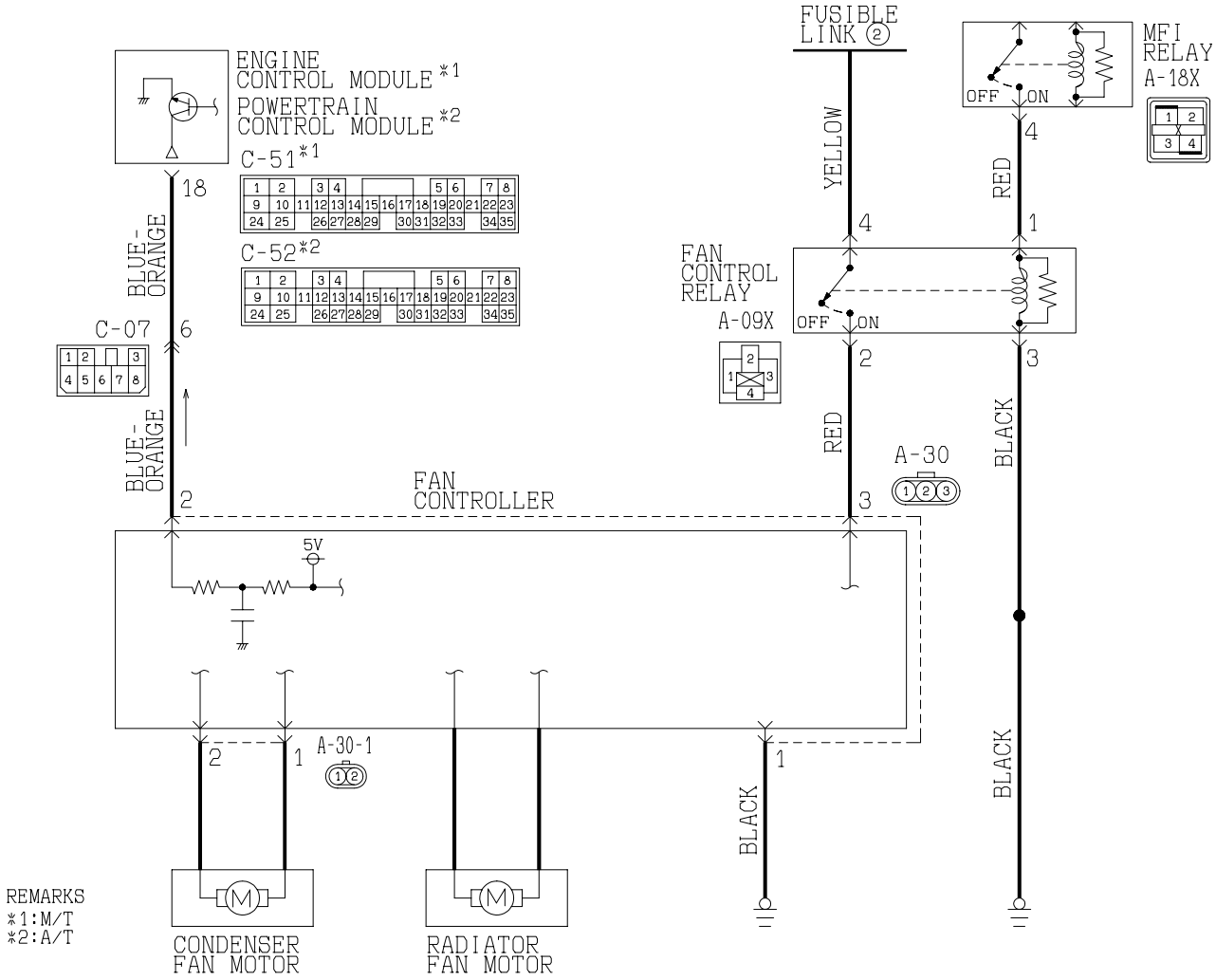
TSB Revision

<3.0L ENGINE>



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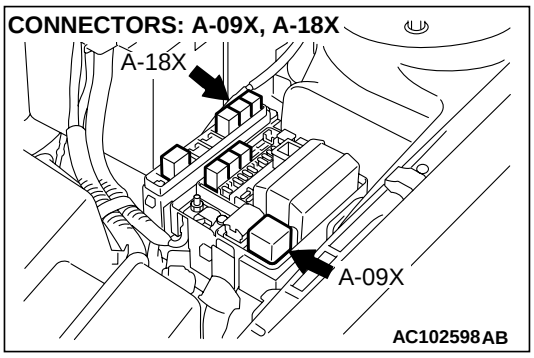
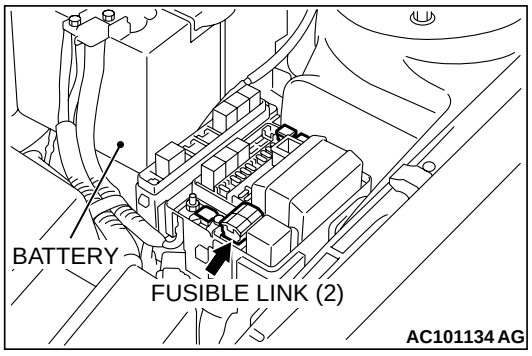
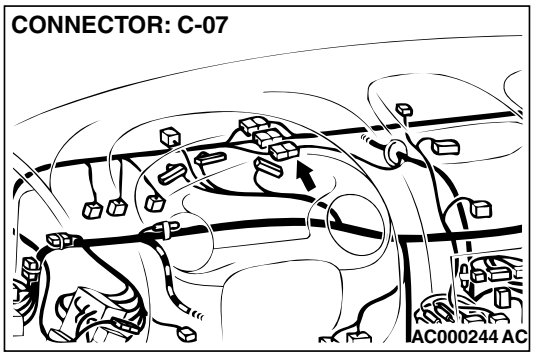


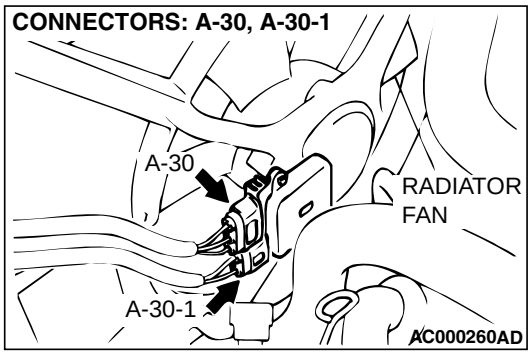
AC102598AB

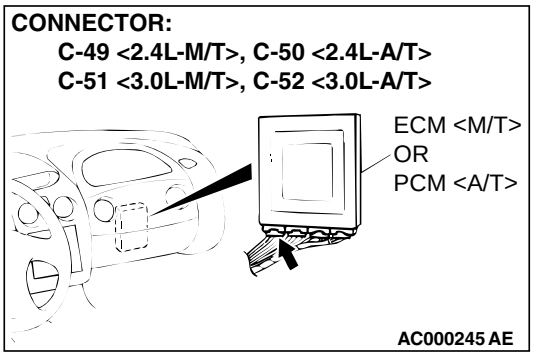


AC101134AG

TSB Revision







CIRCUIT OPERATION

- The fan controller is powered from fusible link number 2.
- The ECM <M/T> or PCM <A/T> judges the required revolution speed of radiator fan motor and condenser fan motor using the input signals transmitted from A/C switch, automatic compressor controller, vehicle speed sensor and engine coolant temperature sensor. The ECM <M/T> or PCM <A/T> activates the fan controller to drive the radiator fan motor and condenser fan motor.

TECHNICAL DESCRIPTION

- The cause could be a malfunction of the fan controller power supply or ground circuit.
- The cause could also be a malfunction of the fan controller or the ECM <M/T> or PCM <A/T>.

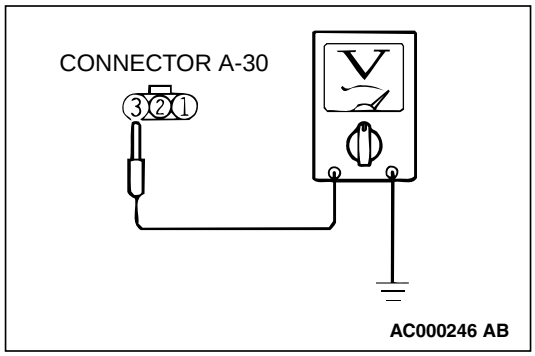
TROUBLESHOOTING HINTS

- Malfunction of fusible link
- Malfunction of fan control relay
- Malfunction of fan controller
- Malfunction of ECM <M/T> or PCM <A/T>
- Damaged wiring harness or connector

DIAGNOSIS

Required Special Tool:

- MB991223: Harness Set



STEP 1. Check the circuit at fan controller connector A-30 (terminal number 3).

(1) Disconnect fan controller connector A-30 (terminal number 3), and measure at the harness side connector.
(2) Measure the voltage between terminal number 3 and ground.
- When the ignition switch is turned to "ON" position, voltage should be battery positive voltage.

Q: Is the voltage battery positive voltage when the ignition switch is turned to "ON" position?

YES : Go to Step 7.
NO : Go to Step 2.

TSB Revision

STEP 2. Check the fan control relay.
Refer to P.14-20.

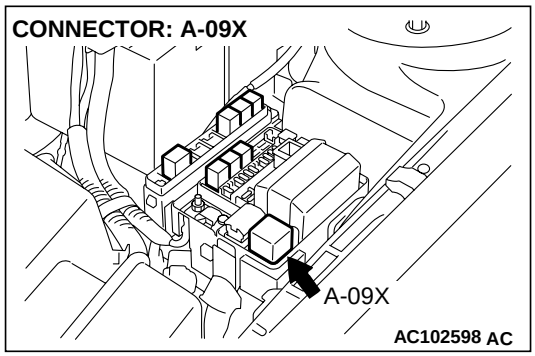
Q: Is the fan control relay in good condition?

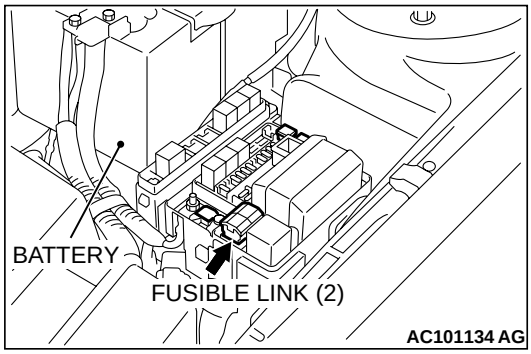
YES : Go to Step 3.
NO : Replace it, then go to Step 10.

STEP 3. Check for continuity between fusible link number 2 and fan control relay connector A-09X (terminal number 4).

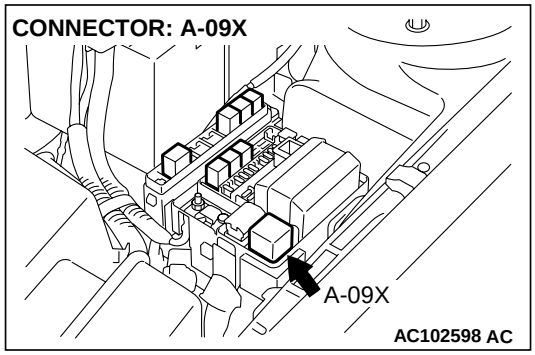
Q: Are the harness wires between fusible link number 2 and fan control relay connector A-09X (terminal number 4) damaged?

YES : Repair or replace them, then go to Step 12.
NO : Go to Step 4.



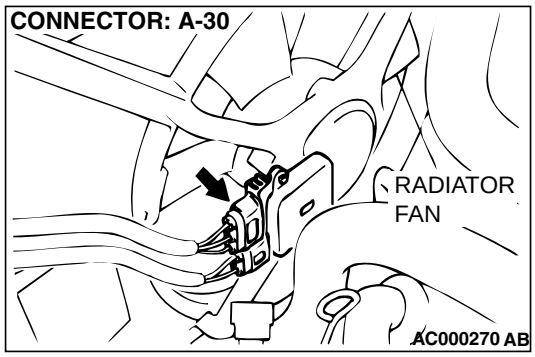


STEP 4. Check for continuity between fan control relay connector A-09X (terminal number 2) and fan controller connector A-30 (terminal number 3).

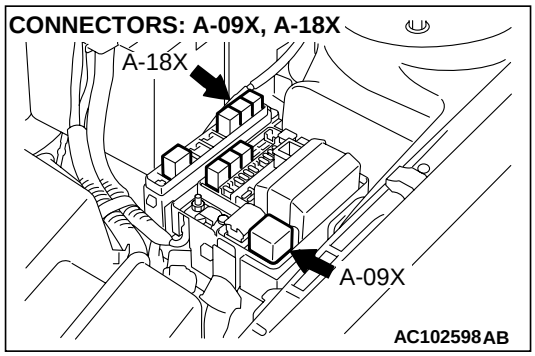


Q: Are the harness wires between fan control relay connector A-09X (terminal number 2) and fan controller connector A-30 (terminal number 3) damaged?

YES : Repair or replace them, then go to Step 12.
NO : Go to Step 5.



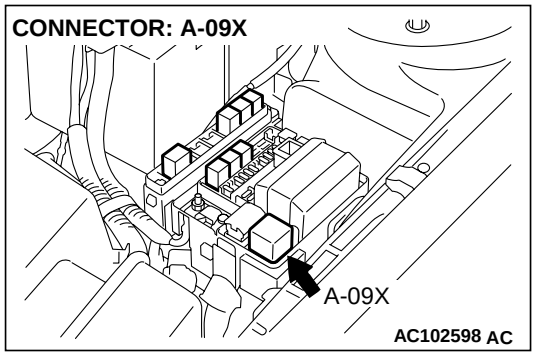
STEP 5. Check for continuity between MFI relay connector A-18X (terminal number 4) and fan control relay connector A-09X (terminal number 1).



Q: Are the harness wires between MFI relay connector A-18X (terminal number 4) and fan control relay connector A-09X (terminal number 1) damaged?

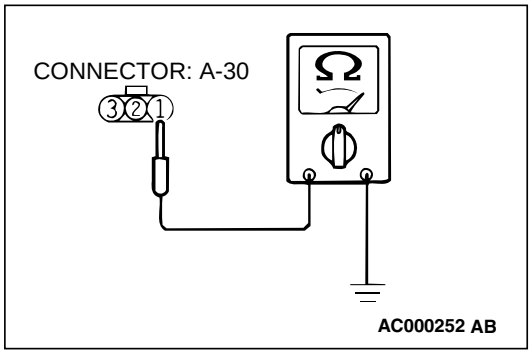
YES : Repair or replace them, then go to Step 12.
NO : Go to Step 6.

STEP 6. Check for continuity between fan control relay connector A-09X (terminal number 3) and ground.



Q: Are the harness wires between fan control relay connector A-09X (terminal number 3) and ground damaged?

YES : Repair or replace them, then go to Step 12.
NO : Go to Step 7.

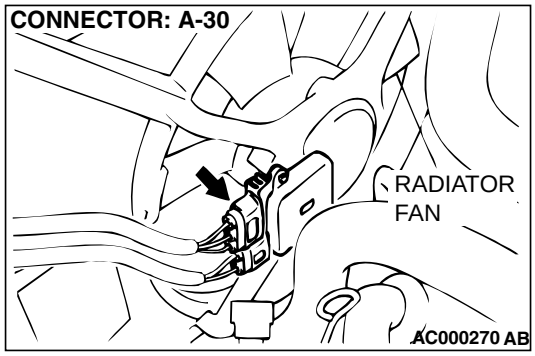


STEP 7. Check the circuit at fan controller connector A-30 (terminal number 1).

(1) Disconnect fan controller connector A-30 (terminal number 1), and measure at the harness side connector.
(2) Measure the resistance between terminal number 1 and ground.

Q: Is the resistance less than 2 ohm?

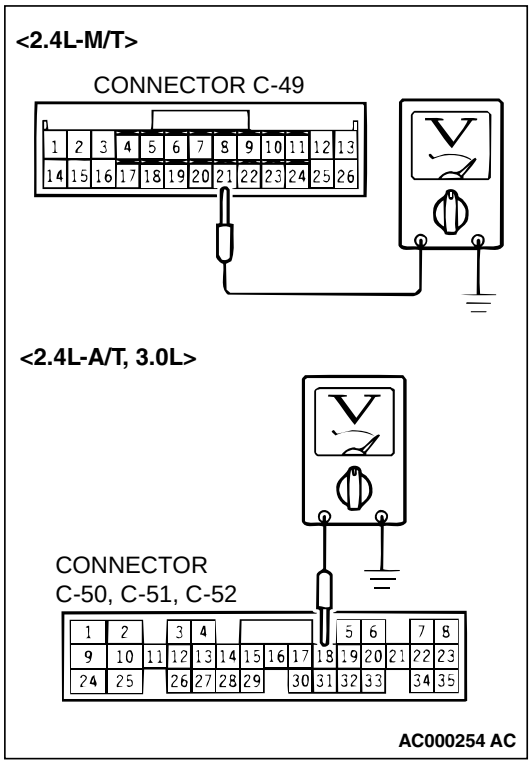
YES : Go to Step 9.
NO : Go to Step 8.



STEP 8. Check the harness wire between fan controller connector A-30 (terminal number 1) and ground.

Q: Are the harness wires between fan controller connector A-30 (terminal number 1) and ground damaged?

YES : Repair or replace them, then go to Step 12.
NO : Go to Step 9.



STEP 9. Check the circuit at ECM connector C-49 (terminal number 21) <2.4L-M/T>, C-51 (terminal number 18) <3.0L-M/T>or PCM connector C-50 (terminal number 18) <2.4L-A/T>, C-52 (terminal number 18) <3.0L-A/T>.

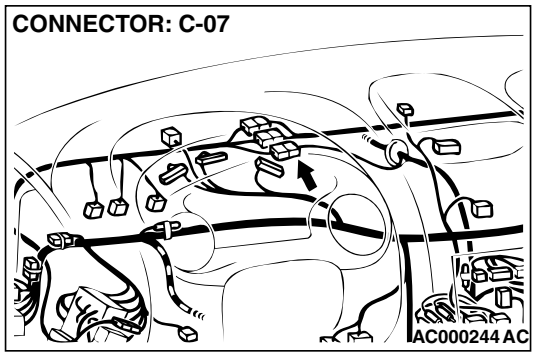
(1) Connect ECM connector C-49 (terminal number 21) <2.4L-M/T>, C-51 (terminal number 18) <3.0L-M/T> or PCM connector C-50 (terminal number 18) <2.4L-A/T>, C-52 (terminal number 18) <3.0L-A/T>.
(2) Start the engine and allow it to idle.
(3) Measure the voltage between terminal number 21 <2.4L-M/T> or 18 <2.4L-A/T, 3.0L> and ground.

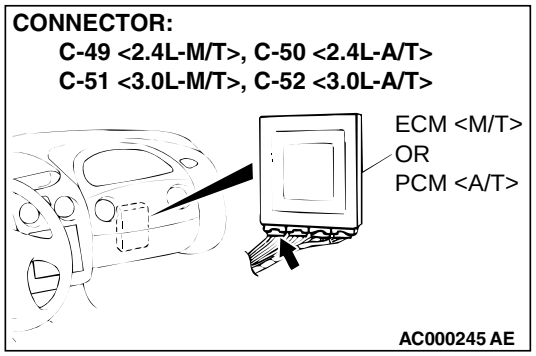
Q: Is the voltage 0.7 volt or more when the radiator fan is operating?

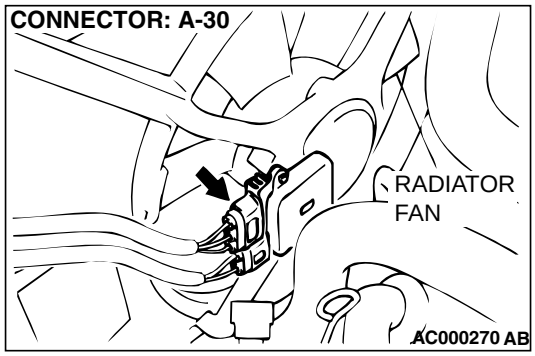
YES : Go to Step 11.
NO : Go to Step 10.

STEP 10. Check the harness wire between ECM connector C-49 (terminal number 21) <2.4L-M/T>, C-51 (terminal number 18) <3.0L-M/T> or PCM connector C-50 (terminal number 18) <2.4L-A/T>, C-52 (terminal number 18) <3.0L-A/T> and fan controller connector A-30 (terminal number 2).

NOTE: If intermediate connector C-07 (terminal number 6) is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

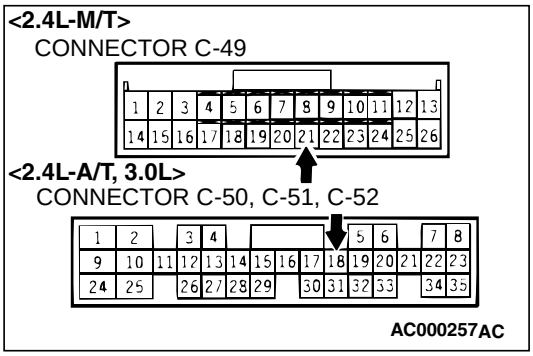






Q: Are the harness wires between ECM connector C-49 (terminal number 21) <2.4L-M/T>, C-51 (terminal number 18) <3.0L-M/T> or PCM connector C-50 (terminal number 18) <2.4L-A/T>, C-52 (terminal number 18) <3.0L-A/T> and fan controller connector A-30 (terminal number 2) damaged?

YES : Repair or replace them, then go to Step 12.
NO : Go to Step 11.



STEP 11. Check the fan control module at ECM connector C-49 (terminal number 21) <2.4L-M/T>, C-51 (terminal number 18) <3.0L-M/T> or PCM connector C-50 (terminal number 18) <2.4L-A/T>, C-52 (terminal number 18) <3.0L-A/T>.

(1) Disconnect ECM connector C-49 (terminal number 21) <2.4L-M/T>, C-51 (terminal number 18) <3.0L-M/T> or PCM connector C-50 (terminal number 18) <2.4L-A/T>, C-52 (terminal number 18) <3.0L-A/T>.
(2) Pull out pin 21 <2.4L-M/T> or 18 <2.4L-A/T, 3.0L> to disconnect it.
(3) Reconnect ECM connector C-49 (terminal number 21) <2.4L-M/T>, C-51 (terminal number 18) <3.0L-M/T> or PCM connector C-50 (terminal number 18) <2.4L-A/T>, C-52 (terminal number 18) <3.0L-A/T> with pin 21 <2.4L-M/T> or 18 <2.4L-A/T, 3.0L> still removed.
(4) Turn the ignition switch to "ON" position.

Q: Do the radiator fan motor and condenser fan motor operate?

YES : Replace the ECM <M/T> or PCM <A/T>. Then go to Step 12.
NO : Replace the radiator fan motor and fan control module assembly. Then go to Step 12 .

STEP 12. Check the symptoms.

Q: Do the radiator fan and condenser fan operate correctly?

YES : This diagnosis is complete.
NO : Return to Step 1.

INSPECTION PROCEDURE 4: Radiator Fan and Condenser Fan do not Change Speed or Stop

NOTE: if the engine coolant temperature reaches 110°C (230°F) or higher, the radiator fan control runs the radiator fan for up to 5 minutes even after the ignition switch is turned to the "LOCK" (OFF) position [the fan stops its rotation when the engine coolant temperature decreases to 110C (230F) or lower.]

Radiator Fan and Condenser Fan Drive Circuit
Refer to P.14-6.

CIRCUIT OPERATION

- The fan controller is powered from fusible link number 2.
- The ECM <M/T> or PCM <A/T> judges the required revolution speed of radiator fan motor and condenser fan motor using the input signals transmitted from A/C switch, automatic compressor controller, vehicle speed sensor and engine coolant temperature sensor. The ECM <M/T> or PCM <A/T> activates the fan controller to drive the radiator fan motor and condenser fan motor.

TECHNICAL DESCRIPTION

The fan controller has variable control of the radiator fan motor and the condenser fan motor speeds using signals transmitted from the ECM <M/T> or PCM <A/T>.

TROUBLESHOOTING HINTS

- Malfunction of fan control relay
- Malfunction of fan controller
- Malfunction of ECM <M/T> or PCM <A/T>

DIAGNOSIS

Required Special Tool:
MB991223: Harness Set

STEP 1. Check the fan control relay.
Refer to P.14-20.

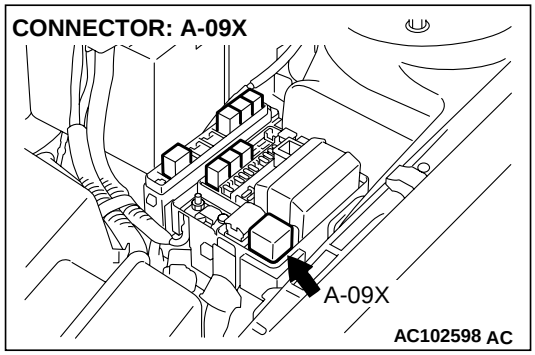
Q: Is the fan control relay in good condition?

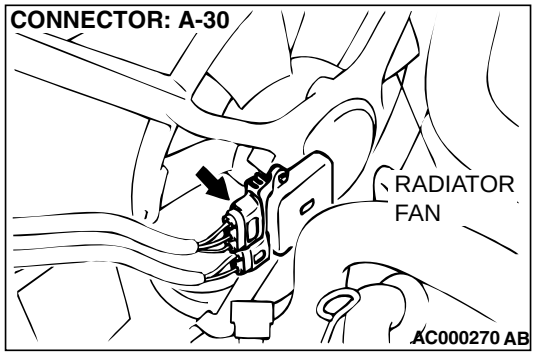
YES : Go to Step 2.
NO : Replace the part, then go to Step 6.

STEP 2. Check the harness wire between fan control relay connector A-09X (terminal number 2) and fan controller connector A-30 (terminal number 3).

Q: Are the harness wire between fan control relay connector A-09X (terminal number 2) and fan controller connector A-30 (terminal number 3) damaged?

YES : Repair or replace the part, then go to Step 6.
NO : Go to Step 3.



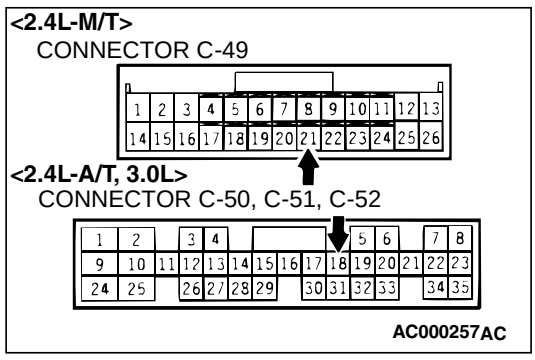


STEP 3. Check the circuit at ECM connector C-49 (terminal number 21) <2.4L-M/T>, C-51 (terminal number 18) <3.0L-M/T> or PCM connector C-50 (terminal number 18) <2.4L-A/T>, C-52 (terminal number 18) <3.0L-A/T>.

(1) Connect ECM connector C-49 (terminal number 21) <2.4L-M/T>, C-51 (terminal number 18) <3.0L-M/T> or PCM connector C-50 (terminal number 18) <2.4L-A/T>, C-52 (terminal number 18) <3.0L-A/T>.
(2) Start the engine and run it at idle. [Engine coolant temperature: 80°C (176°F) or less]
(3) Measure the voltage between terminal number 21 <2.4L-M/T> or 18 <2.4L-A/T, 3.0L> and ground.

Q: Is the voltage 0 – 0.3 volt when radiator fan is not operating?

YES : Go to Step 6.
NO : Go to Step 4.

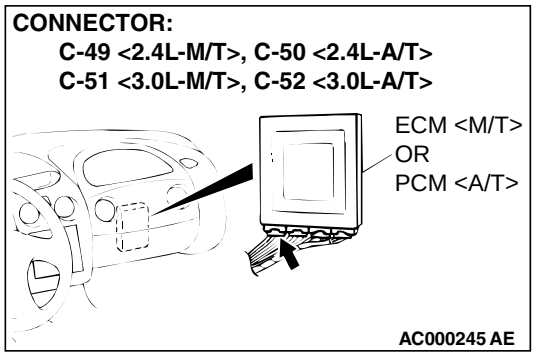


STEP 4. Check the harness wire between ECM connector C-49 (terminal number 21) <2.4L-M/T>, C-51 (terminal number 18) <3.0L-M/T> or PCM connector C-50 (terminal number 18) <2.4L-A/T>, C-52 (terminal number 18) <3.0L-A/T> and fan controller connector A-30 (terminal number 2).

NOTE: If intermediate connector C-07 (terminal number 6) is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

Q: Are the harness wires between ECM connector C-49 (terminal number 21) <2.4L-M/T>, C-51 (terminal number 18) <3.0L-M/T> or PCM connector C-50 (terminal number 18) <2.4L-A/T>, C-52 (terminal number 18) <3.0L-A/T> and fan controller connector A-30 (terminal number 2) damaged?

YES : Repair or replace them, then go to Step 6.
NO : Go to Step 5.

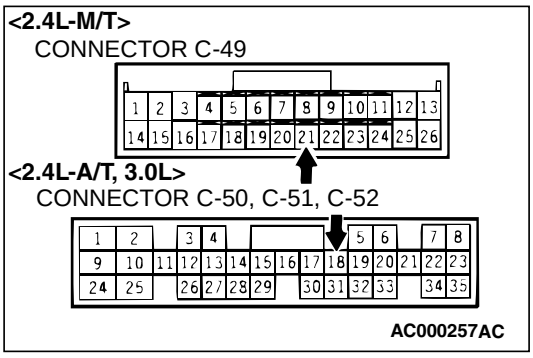


STEP 5. Check the fan controller at ECM connector C-49 (terminal number 21) <2.4L-M/T>, C-51 (terminal number 18) <3.0L-M/T> or PCM connector C-50 (terminal number 18) <2.4L-A/T>, C-52 (terminal number 18) <3.0L-A/T>.

(1) Disconnect ECM connector C-49 (terminal number 21) <2.4L-M/T>, C-51 (terminal number 18) <3.0L-M/T> or PCM connector C-50 (terminal number 18) <2.4L-A/T>, C-52 (terminal number 18) <3.0L-A/T>.
(2) Pull out the terminal number <2.4L-M/T> or 18 <2.4L-A/T, 3.0L> and connect it to the body ground.
(3) Reconnect ECM connector C-49 (terminal number 21) <2.4L-M/T>, C-51 (terminal number 18) <3.0L-M/T> or PCM connector C-50 (terminal number 18) <2.4L-A/T>, C-52 (terminal number 18) <3.0L-A/T> with pin 21 <2.4L-M/T> or 18 <2.4L-A/T, 3.0L> still removed.
(4) Turn the ignition switch to the " ON" position.

Q: Do the radiator fan motor and condenser fan motor stop?

YES : Replace the ECM <M/T> or PCM <A/T>. Then go to Step 6.
NO : Replace the radiator fan motor and fan controller assembly. Then go to Step 6 .



STEP 6. Check the symptoms.

Q: Do the radiator fan and condenser fan operate correctly?

YES : This diagnosis is complete.
NO : Return to Step 1.

INSPECTION PROCEDURE 5: Radiator Fan does not Operate

TECHNICAL DESCRIPTION
The cause could be a malfunction of the radiator fan motor or an open circuit between the fan controller and the radiator fan motor.

TROUBLESHOOTING HINTS
- Malfunction of radiator fan motor
- Malfunction of fan controller

DIAGNOSIS
Replace the radiator fan motor and fan controller assembly.

Q: Does the radiator fan operate correctly?

YES : There is no action to be taken?
NO : Repair the wiring harness between the fan controller and the radiator fan motor.

INSPECTION PROCEDURE 6: Condenser Fan does not Operate

Radiator Fan and Condenser Fan Drive Circuit
Refer to P.14-6.

CIRCUIT OPERATION
- The fan controller is powered from fusible link number 2.
- The ECM <M/T> or PCM <A/T> judges the required revolution speed of radiator fan motor and condenser fan motor using the input signals transmitted from A/C switch, automatic compressor controller, vehicle speed sensor and engine coolant temperature sensor. The ECM <M/T> or PCM <A/T> activates the fan controller to drive the radiator fan motor and condenser fan motor.

TECHNICAL DESCRIPTION
The cause could be a malfunction of the condenser fan motor or of the fan controller.

TROUBLESHOOTING HINTS
- Malfunction of condenser fan motor
- Malfunction of fan controller

DIAGNOSIS

STEP 1. Check the condenser fan motor.
Refer to GROUP 55, Condenser and Condenser Fan Motor P.55-51.

Q: Is the condenser fan in good condition?

YES : Go to Step 2.
NO : Replace the fan motor, then go to Step 3.

STEP 2. Check the fan controller.
Refer to P.14-19.

Q: Is the fan controller in good condition?

YES : Go to Step 3.
NO : Replace the fan controller, then go to Step 3.

STEP 3. Check the symptoms.

Q: Does the condenser fan operate correctly?

YES : This diagnosis is complete.
NO : Return to Step1.

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ON-VEHICLE SERVICE

ENGINE COOLANT LEAK CHECK

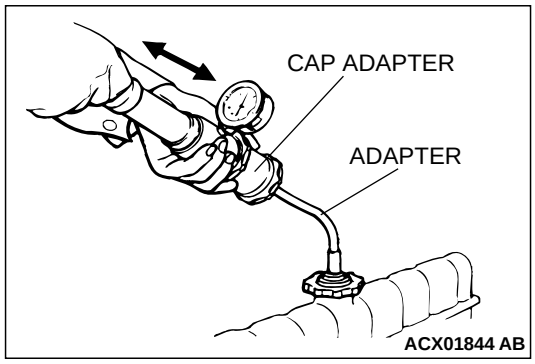
M1141001000173

⚠ *WARNING*

When pressure testing the cooling system, slowly release cooling system pressure to avoid getting burned by hot coolant.

⚠ **CAUTION**

- **Be sure to completely clean away any moisture from the places checked.**
- **When the tester is taken out, be careful not to spill any coolant from it.**
- **Be careful when installing and removing the tester and when testing not to deform the filler neck of the radiator.**

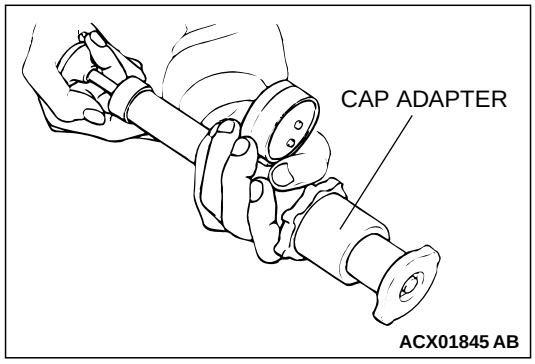


1. Check that the coolant level is up to the filler neck. Install a radiator cap tester and apply 160 kPa (23 psi) pressure, and then check for leakage from the radiator hose or connections.
2. If there is leakage, repair or replace the appropriate part.

RADIATOR CAP PRESSURE CHECK

M1141001300215

NOTE: Be sure that the cap is clean before testing, since rust or other foreign material on the cap seal will cause an improper indication.



1. Use a cap adapter to attach the cap to the tester.
2. Increase the pressure until the indicator of the gauge stops moving.

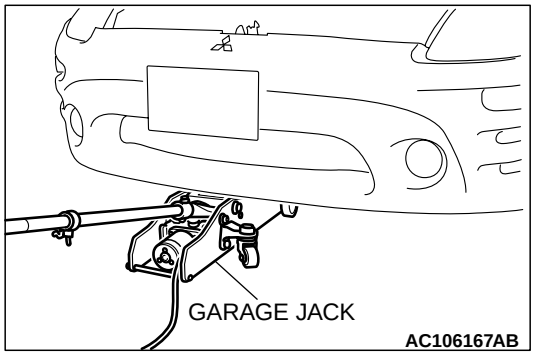
   Minimum limit: 64 kPa (9.2 psi)

   Standard value: 73 – 103 kPa (11 – 15 psi)
3. Replace the radiator cap if the reading does not remain at or above the limit.

ENGINE COOLANT REPLACEMENT

M1141001200229

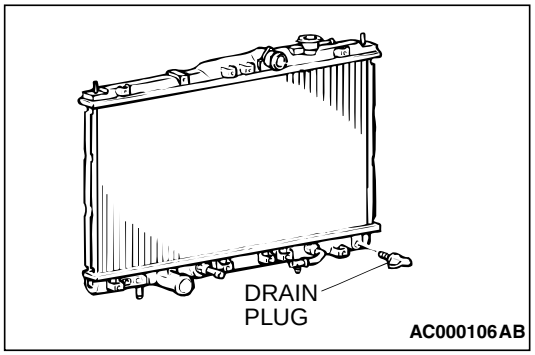
1. Turn the ignition switch to the "ON" position, and then rotate the heater control to the "MAX HOT" position.
2. Turn the ignition switch to the "LOCK" (OFF) position.
3. Raise the vehicle at the front with a garage jack.



⚠ CAUTION

When removing the radiator cap, use care to avoid contact with hot coolant or steam. Place a shop towel over the cap and turn the cap counterclockwise a little to let the pressure escape through the vinyl tube. After relieving the steam pressure, remove the cap by slowly turning it counterclockwise.

4. Remove the radiator cap, radiator drain plug and if equipped engine coolant drain plug to drain the coolant.
5. Remove the reserve tank and drain the coolant.
6. After completely draining the coolant, reinstall the drain plugs and flush the engine and radiator using a radiator cleaning fluid.
7. After the flushing is completed, completely drain the cleaning fluid and install the radiator and engine drain plugs.



⚠ CAUTION

Do not use alcohol or methanol anti-freeze or any engine coolants mixed with alcohol or methanol anti-freeze. The use of an improper anti-freeze can cause corrosion of the aluminum components.

8. By referring to the section on coolant, select an appropriate concentration for safe operating temperature within the range of 30 to 60 %. Use special tool MB991871 to refill the coolant. A convenient mixture is a 50 % water and 50 % antifreeze solution [freezing point: –31°C (–32.8 °F)].

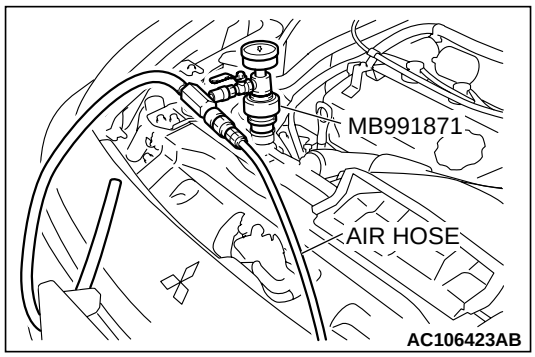
   Recommended antifreeze:

   MITSUBISHI GENUINE Part NO.MD970389 or equivalent

   Quantity:

   <2.4L Engine> 7.0 dm^3 (7.4 quarts)

   <3.0L Engine> 8.0 dm^3 (8.5 quarts)



9. Reinstall the radiator cap.

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10.Start the engine and let it warm up until the thermostat opens.
11.After repeatedly revving the engine up to 3,000 r/min several times, then stop the engine.
12.Remove the radiator cap after the engine has become cold, and pour in coolant up to the brim. Reinstall the cap.

⚠ CAUTION
Do not overfill the reserve tank.

13.Add coolant to the reserve tank between the "FULL" and "LOW" mark if necessary.

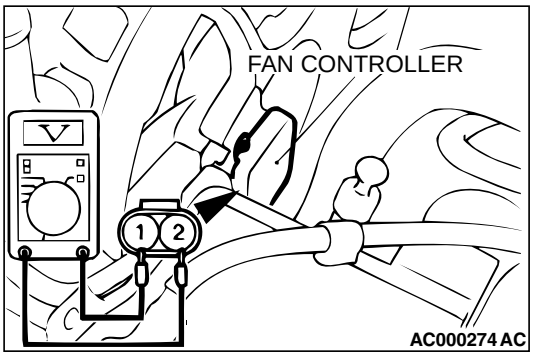
ENGINE COOLANT CONCENTRATION TEST

M1141001100192

Refer to GROUP 00, RECOMMENDED LUBRICANTS AND LUBRICANT CAPACITIES TABLE P.00-36.

FAN CONTROLLER CHECK

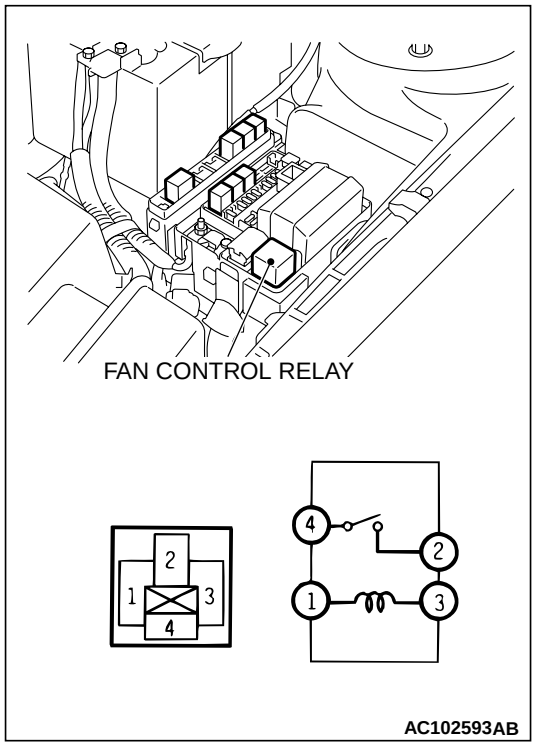
M1141006100120



1. Remove condenser fan motor connector.
2. Start the engine and run it at idle.
3. Turn the A/C switch to ON and maintain the coolant temperature at 80°C (176°F) or less.
4. When measuring the voltage between the fan controller-side connector terminals, check that the value changes repeatedly as indicated by (1) – (3) below.
   (1) 0 V
   (2) 8.2 ± 2.6 V
   (3) Battery positive voltage ± 2.6 V
5. If the voltage does not repeatedly change as indicated, replace the radiator fan motor and the fan controller assembly.

FAN CONTROL RELAY CONTINUITY CHECK

M1141006200138



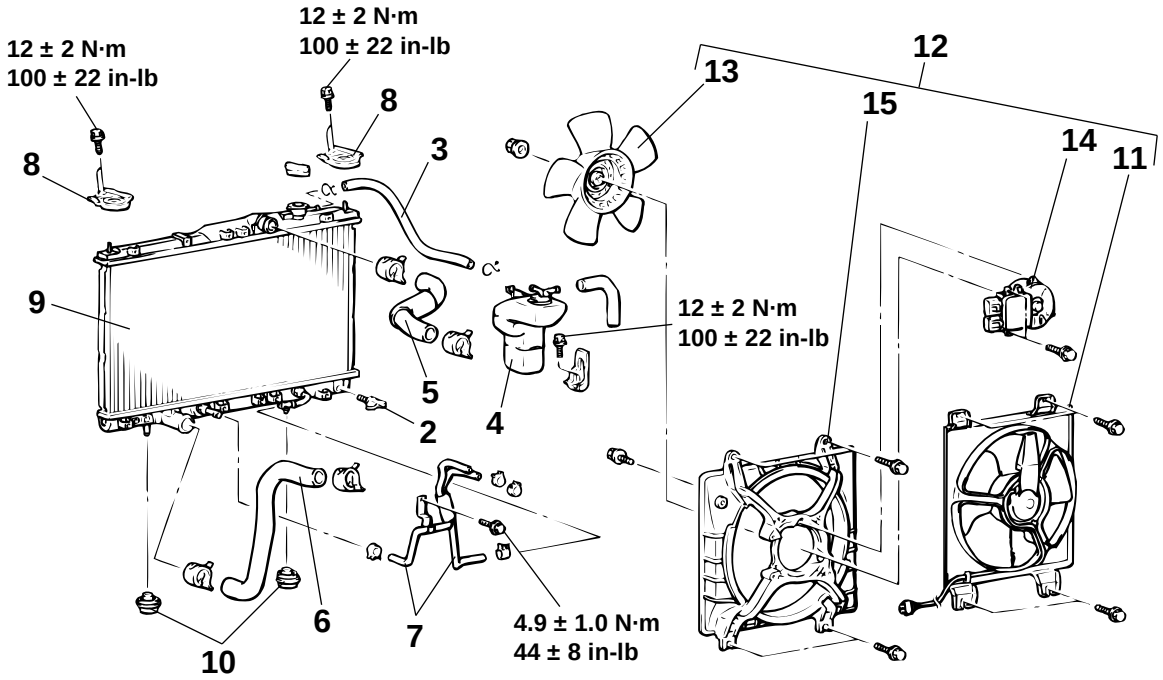
BATTERY VOLTAGE	TERMINAL NO. TO BE CONNECTED TO TESTER	CONTINUITY TEST RESULTS
Not applied	4 – 2	Open circuit
Connect terminal No.3 and battery (–) terminal. Connect terminal No.1 and battery (+) terminal.	4 – 2	Less than 2 ohm

RADIATOR

REMOVAL AND INSTALLATION

M1141001500208

Pre-removal Operation	Post-installation Operation
• Engine Coolant Draining [Refer to GROUP 00, Maintenance Service – Engine Coolant (Change) P.00-56.]	• A/T Fluid Supplying and Checking (Refer to GROUP 00, Maintenance Service – Automatic Transmission Fluid P.00-53.) • Engine Coolant Supplying [Refer to GROUP 00, Maintenance Service – Engine Coolant (Change) P.00-56.]



AC004073 AC

RADIATOR REMOVAL STEPS

1. RADIATOR CAP
2. DRAIN PLUG
3. RUBBER HOSE CONNECTION
4. RESERVE TANK ASSEMBLY

<<A>> >>A<< 5. RADIATOR UPPER HOSE

<<A>> >>A<< 6. RADIATOR LOWER HOSE

<<B>> 7. A/T OIL COOLER HOSE CONNECTION

8. RADIATOR SUPPORT
9. RADIATOR
10. LOWER INSULATOR
11. CONDENSER FAN MOTOR ASSEMBLY
12. RADIATOR FAN MOTOR ASSEMBLY
13. FAN

RADIATOR REMOVAL STEPS

14. RADIATOR FAN MOTOR
15. SHROUD

RADIATOR FAN MOTOR ASSEMBLY REMOVAL STEPS

1. RADIATOR CAP
2. DRAIN PLUG

<<A>> >>A<< 5. RADIATOR UPPER HOSE

11. CONDENSER FAN MOTOR ASSEMBLY
12. RADIATOR FAN MOTOR ASSEMBLY
13. FAN
14. RADIATOR FAN MOTOR
15. SHROUD

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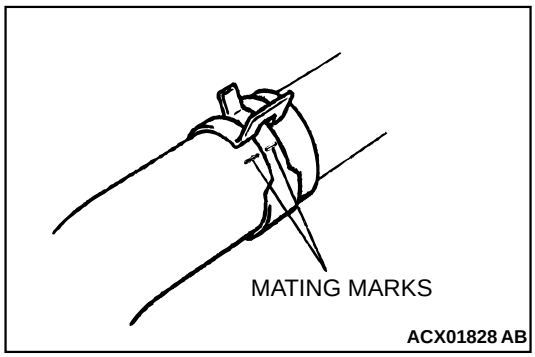
REMOVAL SERVICE POINTS

<<A>> RADIATOR UPPER HOSE/RADIATOR LOWER HOSE DISCONNECTION

Make mating marks on the radiator hose and the hose clamp. Disconnect the radiator hose.



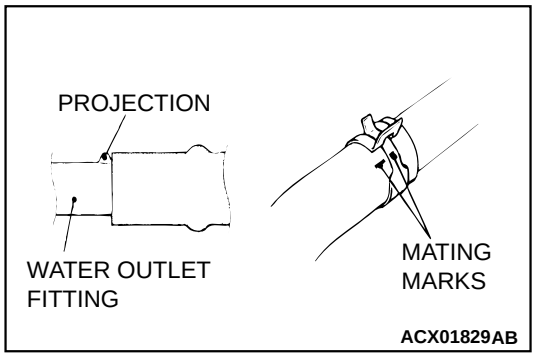
<<B>> A/T OIL COOLER HOSE REMOVAL

After removing the hose from the radiator, plug the hose and the radiator nipple to prevent dust or foreign particles from getting in.

INSTALLATION SERVICE POINT

>>A<< RADIATOR LOWER HOSE/RADIATOR UPPER HOSE CONNECTION

1. Insert each hose as far as the projection of the water inlet fitting.
2. Align the mating marks on the radiator hose and hose clamp, and then connect the radiator hose.



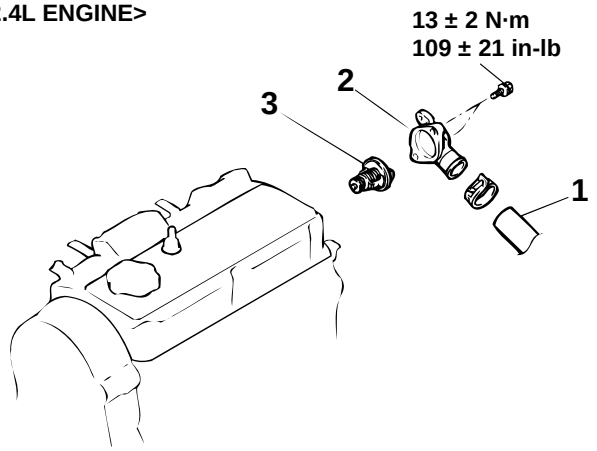
THERMOSTAT

REMOVAL AND INSTALLATION

M1141002400204

Pre-removal and Post-installation Operation
- Engine Coolant Draining and Supplying [Refer to GROUP 00, Maintenance Service – Engine Coolant (Change) P.00-56.]
- Air Cleaner Removal and Installation (Refer to GROUP 15, Air CleanerP.15-6.)

<2.4L ENGINE>



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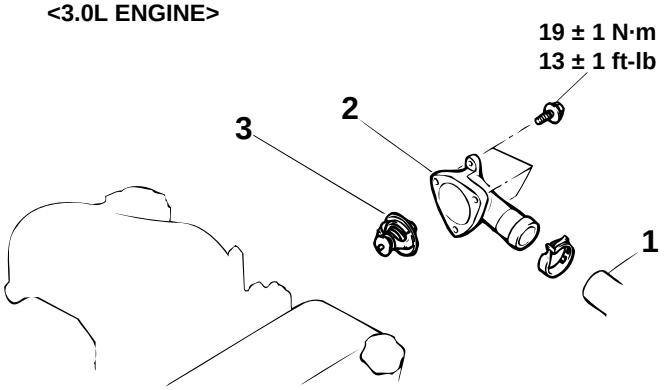


AC000278 AD

REMOVAL STEPS
<<A>> >>B<< 1. RADIATOR LOWER HOSE CONNECTION

REMOVAL STEPS (Continued)
2. WATER INLET FITTING
>>A<< 3. THERMOSTAT

REMOVAL SERVICE POINT

<<A>> RADIATOR LOWER HOSE DISCONNECTION
Place mating marks on the radiator lower hose and hose clamp before disconnection.

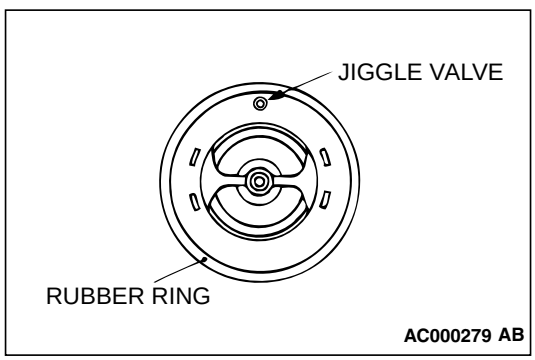
INSTALLATION SERVICE POINTS

>>A<< THERMOSTAT INSTALLATION

⚠ CAUTION

Make absolutely sure that no oil adheres to the rubber ring of the thermostat. Also be careful not to fold or scratch the rubber ring during installation.

Install the thermostat so that the jiggle valve is facing straight up. Be careful not to fold or scratch the rubber ring.



AC000279 AB

>>B<< RADIATOR LOWER HOSE CONNECTION

1. Insert each hose as far as the projection of the water inlet fitting.
2. Align the mating marks on the radiator hose and hose clamp, and then connect the radiator hose.

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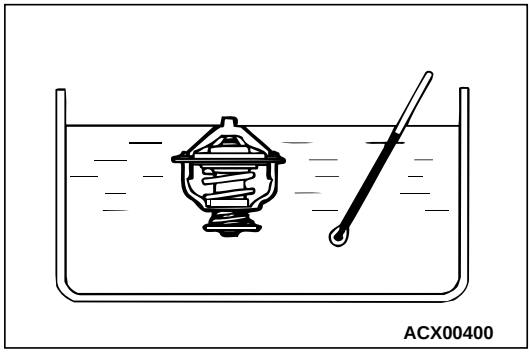
INSPECTION

M1141002500201

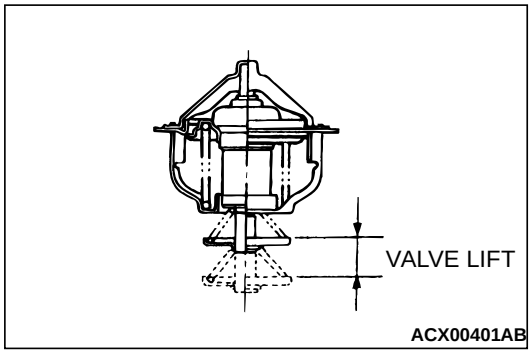
Thermostat Check


ACX00400

1. Immerse the thermostat in water, and heat the water while stirring. Check the thermostat valve opening temperature.

Standard value:

ITEMS	2.4L ENGINE	3.0L ENGINE	
		VEHICLE WITHOUT VARIABLE INDUCTION SYSTEM	VEHICLE WITH VARIABLE INDUCTION SYSTEM
Valve opening temperature °C (°F)	88 ± 1.5 (190 ± 3)	88 ± 1.5 (190 ± 3)	82 ± 1.5 (180 ± 3)



ACX00401AB

2. Check that the amount of valve lift is at the standard value when the water is at the full-opening temperature.

NOTE: Measure the valve height when the thermostat is fully closed, and use this measurement to compare the valve height when the thermostat is fully open.

Standard value:

ITEMS	2.4L ENGINE	3.0L ENGINE	
		VEHICLE WITHOUT VARIABLE INDUCTION SYSTEM	VEHICLE WITH VARIABLE INDUCTION SYSTEM
Full-opening temperature °C (°F)	100 (212)	100 (212)	95 (203)
Amount of valve lift mm (in)	8.5 (0.33) or more	9.0 (0.35) or more	9.0 (0.35) or more

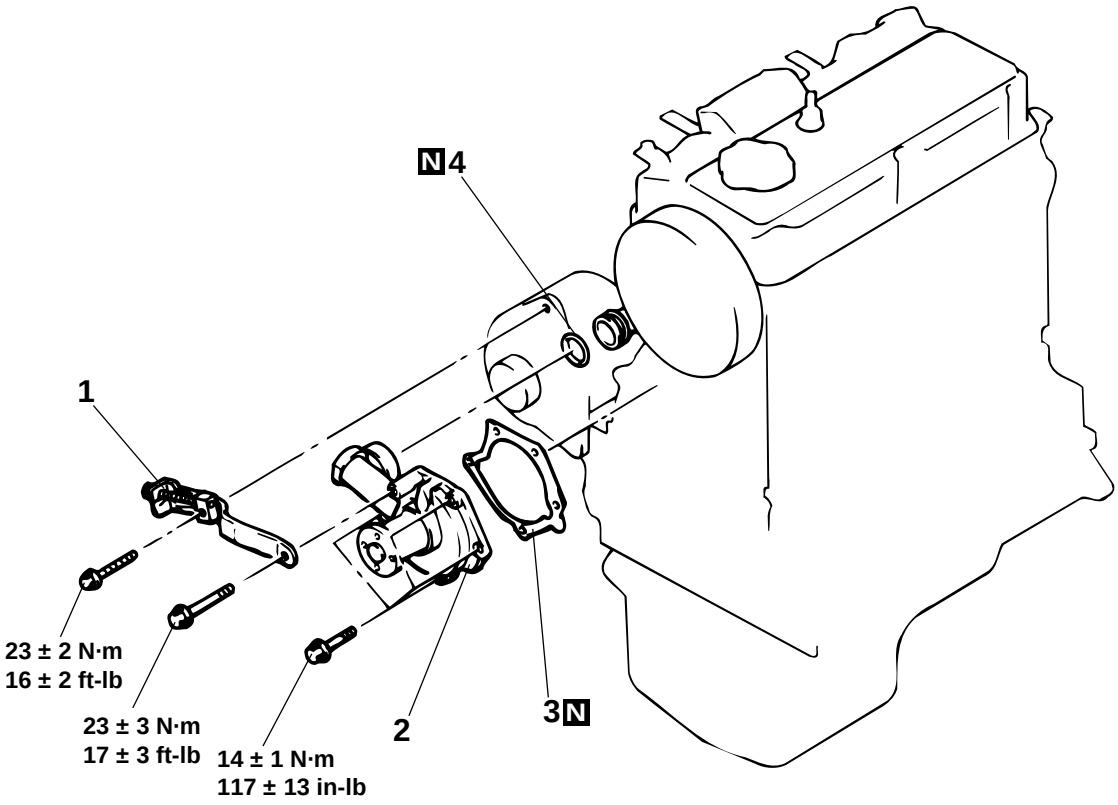
WATER PUMP

REMOVAL AND INSTALLATION

M1141002700227

<2.4L ENGINE>

Pre-removal and Post-installation Operation
- Engine Coolant Draining and Supplying [Refer to GROUP 00, Maintenance Service - Engine Coolant (Change) P.00-56.]
- Timing Belt Tensioner Pulley Removal and Installation (Refer to GROUP 11A, Timing Belt P.11A-32.)



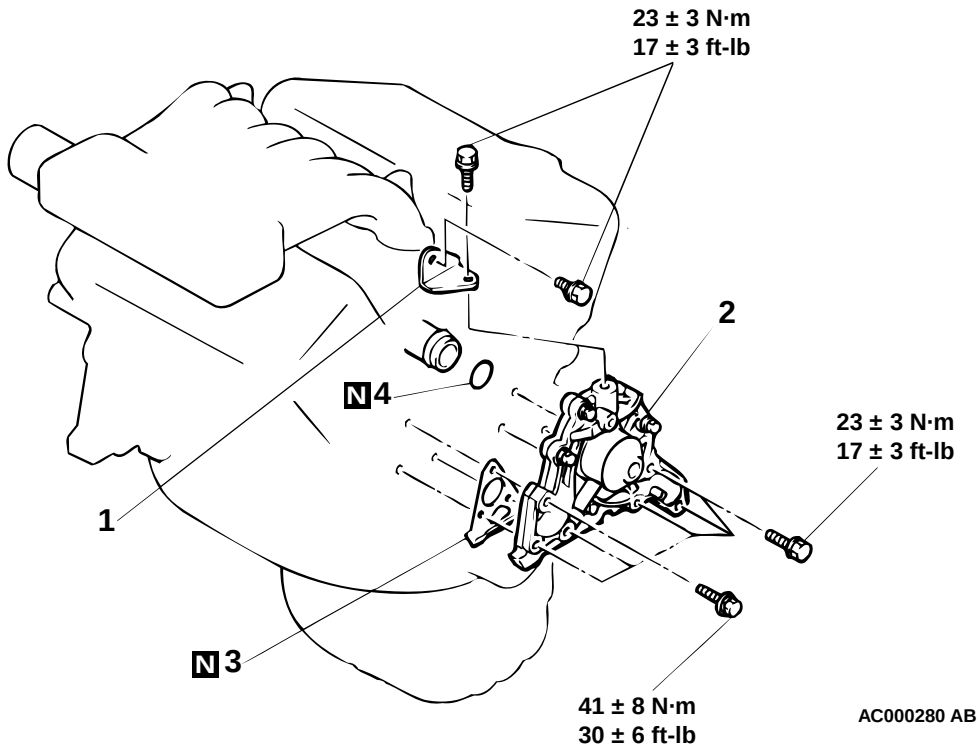
REMOVAL STEPS
1. GENERATOR BRACE
>>B<< 2. WATER PUMP ASSEMBLY

REMOVAL STEPS (Continued)
3. WATER PUMP GASKET
>>A<< 4. O-RING

TSB Revision

<3.0L ENGINE>

Pre-removal and Post-installation Operation
- Engine Coolant Draining and Supplying [Refer to GROUP 00, Maintenance Service – Engine Coolant (Change) P.00-56.]
- Timing Belt Removal and Installation (Refer to GROUP 11C, Timing Belt P.11C-37.)



REMOVAL STEPS
- THERMOSTAT (REFER TO P.14-23.)

1. BRACKET

REMOVAL STEPS (Continued)

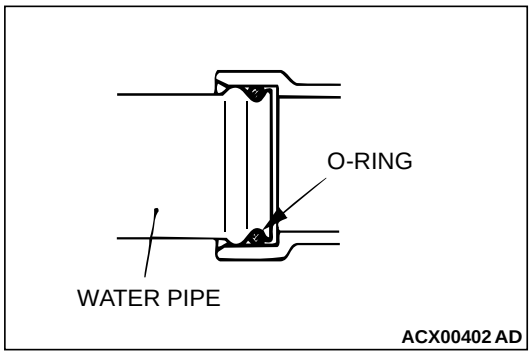
>>B<< 2. WATER PUMP ASSEMBLY
3. WATER PUMP GASKET
>>A<< 4. O-RING

INSTALLATION SERVICE POINTS

>>A<< O-RING INSTALLATION

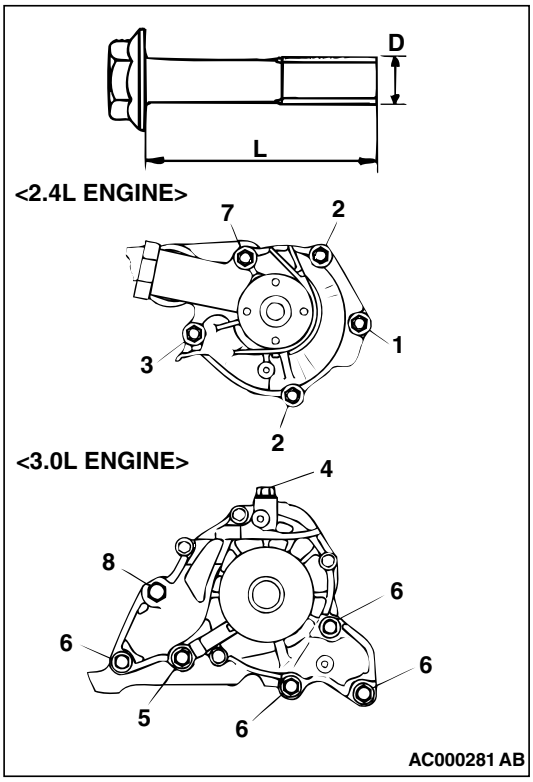
⚠ CAUTION
- **Care must be taken not to permit engine oil or other grease to adhere to the O-ring.**
- **When inserting the pipe, check to be sure that there is no sand, dirt, etc. on its inner surface.**

Rinse the mounting location of O-ring and water pipe with water, and install the O-ring and water pipe.



TSB Revision

>>B<< WATER PUMP ASSEMBLY INSTALLATION



NO.	HARDNESS CATEGORY (HEAD MARK)	BOLT DIAMETER(D) × LENGTH (L) mm (in)
1	4T	8 ×14 (0.3 × 0.6)
2		8 × 22 (0.3 × 0.9)
3		8 × 25 (0.3 × 1.0)
4	7T	8 × 14 (0.3 × 0.6)
5		8 × 20 (0.3 × 0.8)
6		8 × 25 (0.3 × 1.0)
7		8 × 60 (0.3 × 2.4)
8		10 × 38 (0.4 ×1.5)

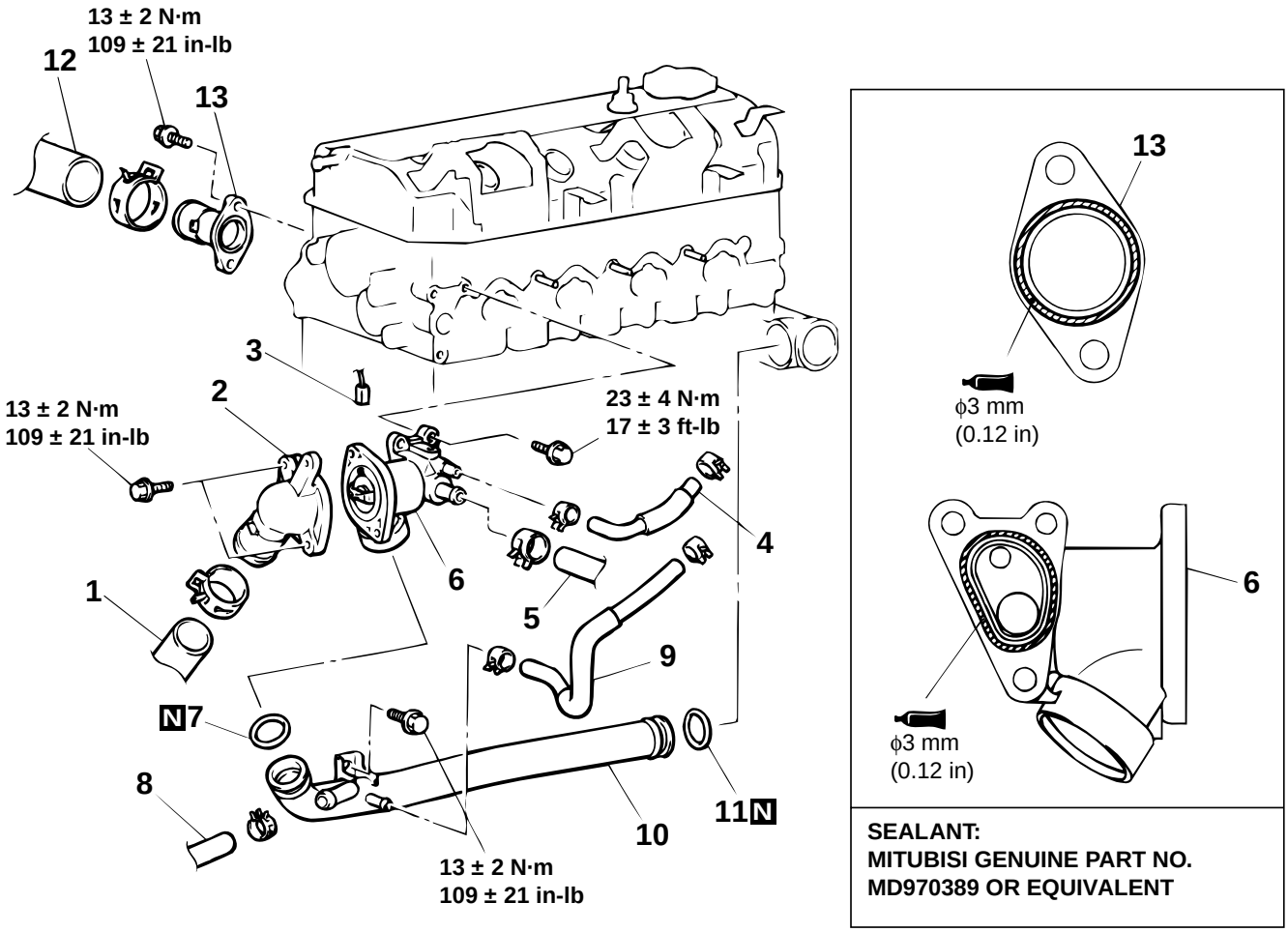
WATER HOSE AND WATER PIPE

REMOVAL AND INSTALLATION

M1141003300181

<2.4L ENGINE>

Pre-removal and Post-installation Operation
- Engine Coolant Draining and Supplying [Refer to GROUP 00, Maintenance Service – Engine Coolant (Change) P.00-56.]
- Thermostat Removal and Installation (Refer to P.14-23.)
- Exhaust Manifold Removal and Installation (Refer to GROUP 15, Exhaust Manifold P.15-17.)



AC000282 AB

REMOVAL STEPS

<<A>> >>B<< 1. RADIATOR LOWER HOSE CONNECTION
2. WATER INLET FITTING
3. ENGINE COOLANT TEMPERATURE GAUGE UNIT CONNECTOR
4. WATER HOSE
5. HEATER HOSE CONNECTION
>>A<< 6. THERMOSTAT CASE ASSEMBLY

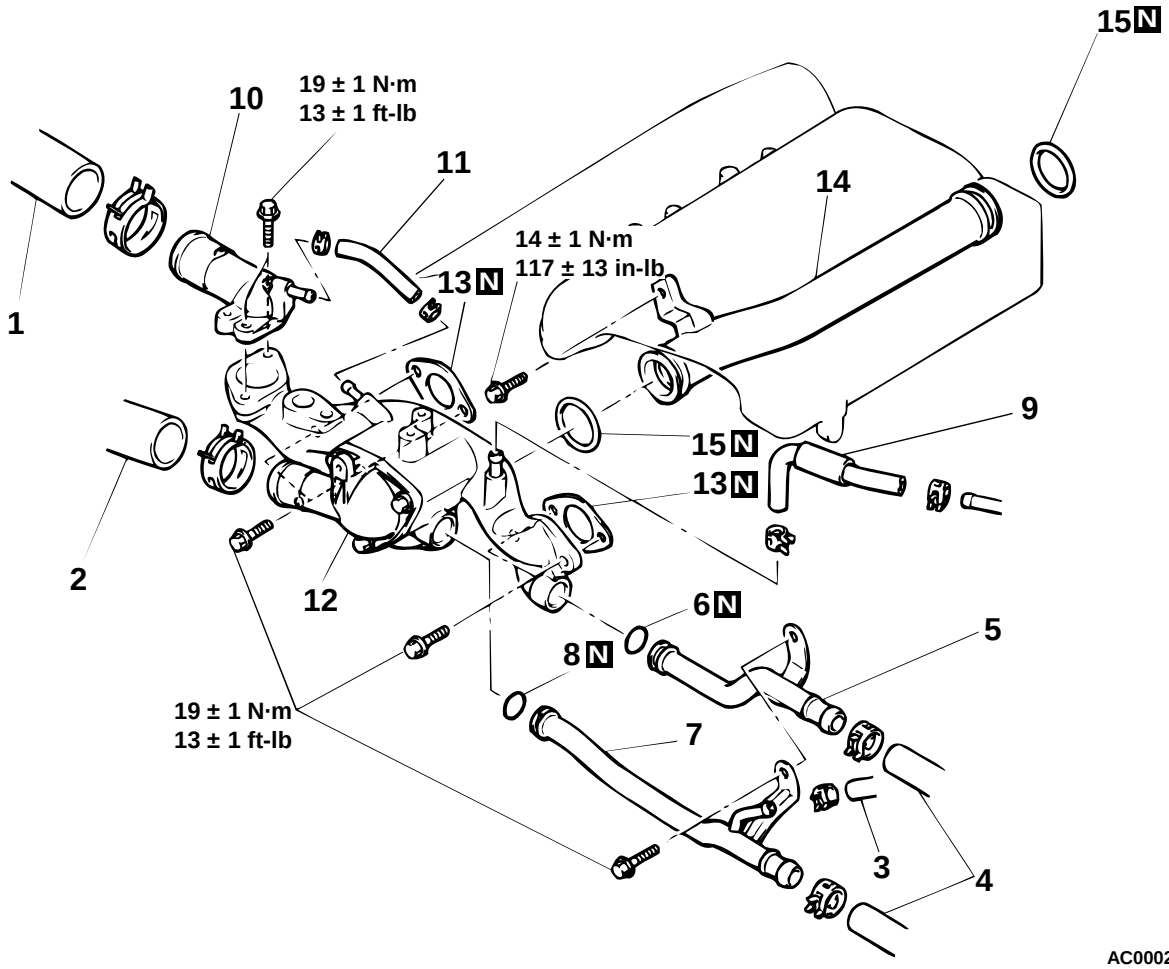
REMOVAL STEPS (Continued)

>>C<< 7. O-RING
8. HEATER HOSE CONNECTION
9. WATER HOSE
10. WATER INLET PIPE ASSEMBLY
>>C<< 11. O-RING
>>A<< >>B<< 12. RADIATOR UPPER HOSE CONNECTION
>>A<< 13. WATER OUTLET FITTING

TSB Revision

<3.0L ENGINE>

Pre-removal and Post-installation Operation
- Engine Coolant Draining and Supplying [Refer to GROUP 00, Maintenance Service – Engine Coolant (Change) P.00-56.]
- Intake Manifold Removal and Installation (Refer to GROUP15, Intake Manifold P.15-15.)
- Thermostat Removal and Installation (Refer to P.14-23.)
- Distributor Removal and Installation (Refer to GROUP 16, Distributor P.16-53.)



REMOVAL STEPS

<<A>> >>B<< 1. RADIATOR UPPER HOSE CONNECTION
<<A>> >>B<< 2. RADIATOR LOWER HOSE CONNECTION
3. WATER HOSE CONNECTION
4. HEATER HOSE CONNECTION
5. HEATER INLET PIPE A
>>C<< 6. O-RING
7. HEATER INLET PIPE B

REMOVAL STEPS (Continued)

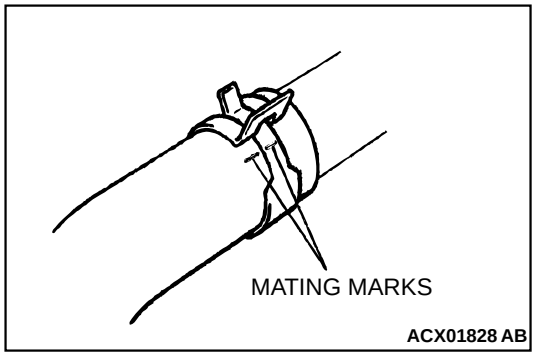
>>C<< 8. O-RING
9. WATER HOSE
10. WATER OUTLET FITTING
11. WATER HOSE
12. THERMOSTAT HOUSING ASSEMBLY
13. GASKET
14. WATER INLET PIPE
>>C<< 15. O-RING

TSB Revision

REMOVAL SERVICE POINT

<<A>> RADIATOR UPPER/LOWER HOSE DISCONNECTION

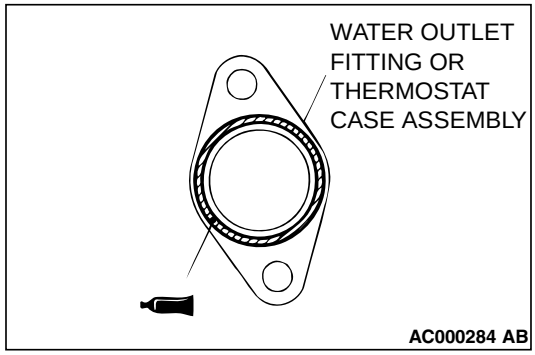
Make mating marks on the radiator hose and hose clamp. Disconnect the radiator hose.



INSTALLATION SERVICE POINTS

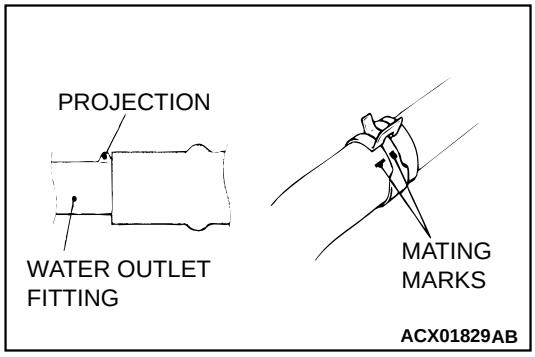
>>A<< WATER OUTLET FITTING <2.4L Engine>/THERMOSTAT CASE ASSEMBLY <2.4L Engine> INSTALLATION

Apply a continuous bead of MITSUBISHI GENUINE Sealant Part number MD970389 or equivalent to the thermostat housing mating surface.



>>B<< RADIATOR UPPER/LOWER HOSE CONNECTION

1. Insert each hose as far as the projection of the water outlet fitting.
2. Align the mating marks on the radiator hose and hose clamp, and then connect the radiator hose.

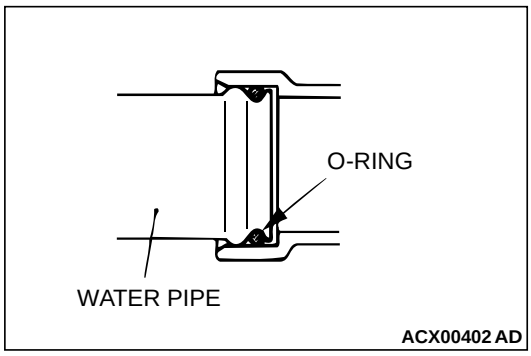


>>C<< O-RING INSTALLATION

⚠ CAUTION

Do not allow engine oil or other grease to adhere to the O-ring.

Install the O-ring to the water pipe, and coat the outer portion of the O-ring with water or engine coolant.



INSPECTION

M1141003400166

Water Pipe and Hose Check

Check the water pipe and hose for cracks, damage and clogs. Replace them if necessary.

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1141005000164

ITEM	SPECIFICATION
Radiator	
A/T oil cooler hose connection bolt <A/T>	4.9 ± 1.0 N·m (44 ± 8 in-lb)
Radiator support bolt	12 ± 2 N·m (100 ± 22 in-lb)
Reserve tank bolt	12 ± 2 N·m (100 ± 22 in-lb)
Thermostat	
Water inlet fitting bolt <2.4L ENGINE>	13 ± 2 N·m (109 ± 21 in-lb)
Water inlet fitting bolt <3.0L ENGINE>	19 ± 1 N·m (13 ± 1 ft-lb)
Water pump <2.4L ENGINE>	
Generator bolt	23 ± 2 N·m (16 ± 2 ft-lb)
Generator brace bolt	23 ± 3 N·m (17 ± 3 ft-lb)
Water pump bolt	14 ± 1 N·m (117 ± 13 in-lb)
Water pump <3.0L ENGINE>	
Water pump bolt	23 ± 3 N·m (17 ± 3 ft-lb)
Water pump bracket bolt	23 ± 3 N·m (17 ± 3 ft-lb)
Water pump gasket bolt	41 ± 8 N·m (30 ± 6 ft-lb)
Water hose and water pipe <2.4L ENGINE>	
Thermostat case bolt	23 ± 4 N·m (17 ± 3 ft-lb)
Water inlet fitting bolt	13 ± 2 N·m (109 ± 21 in-lb)
Water inlet pipe assembly bolt	13 ± 2 N·m (109 ± 21 in-lb)

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ITEM	SPECIFICATION
Water outlet fitting bolt	13 ± 2 N·m (109 ± 21 in-lb)
Water hose and water pipe <3.0L ENGINE>	
Heater inlet pipe bolt	19 ± 1 N·m (13 ± 1 ft-lb)
Thermostat housing bolt	19 ± 1 N·m (13 ± 1 ft-lb)
Water inlet pipe assembly bolt	14 ± 1 N·m (117 ± 13 in-lb)
Water outlet fitting bolt	19 ± 1 N·m (13 ± 1 ft-lb)

SERVICE SPECIFICATIONS

M1141000300212

ITEMS				STANDARD VALUE	LIMIT
High-pressure valve opening pressure of radiator cap kPa (psi)				73 – 103 (11 – 15)	64 (9.2)
Thermostat	Valve opening temperature of thermostat °C (°F)	2.4L Engine		88 ± 1.5 (190 ± 3)	-
		3.0L Engine	Vehicle without variable induction system	88 ± 1.5 (190 ± 3)	-
			Vehicle with variable induction system	82 ± 1.5 (180 ± 3)	-
	Full-opening temperature of thermostat °C (°F)	2.4L Engine		100 (212)	-
		3.0L Engine	Vehicle without variable induction system	100 (212)	-
			Vehicle with variable induction system	95 (203)	-
	Valve lift mm (in)	2.4L Engine		8.5 (0.33) or more	-
		3.0L Engine		9.0 (0.35) or more	-

COOLANT

M1141000400189

ITEMS		QUANTITY dm^3 (qt)
Mitsubishi Genuine Coolant or equivalent	2.4L Engine	7.0 (7.4)
	3.0L Engine	8.0 (8.5)

SEALANT

M1141000500164

ITEMS	SPECIFIED SEALANT	REMARKS
Thermostat case <2.4L Engine>, Water outlet fitting <2.4L Engine>	MITSUBISHI GENUINE Part No. MD970389 or equivalent	Semi-drying sealant

GROUP 15

INTAKE AND EXHAUST

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GENERAL DESCRIPTION

M1151000100242

The exhaust pipe is divided into five <3.0L Engine> or four <2.4L Engine> parts.

INTAKE AND EXHAUST DIAGNOSIS

INTRODUCTION

M1151006900202

The occurrence of exhaust leakage or abnormal noise is caused by cracks or strain in the gasket, or by when the exhaust pipe or muffler is damaged due to impacts during travel. The exhaust leaks from these sections and causes the exhaust noise to increase. There may be cases when there is interference with the body and vibration noise is generated.

TROUBLESHOOTING STRATEGY

M1151007000202

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted most of the possible ways to find an intake or exhaust fault.

1. Gather information from the customer.
2. Verify that the condition described by the customer exists.
3. Find the malfunction by following the SYMPTOM CHART.
4. Verify malfunction is eliminated.

SYMPTOM CHART

M1151007100191

SYMPTOMS	INSPECTION PROCEDURE	REFERENCE PAGE
Exhaust Leakage	1	P.15-2
Abnormal Noise	2	P.15-3

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Exhaust Leakage

DIAGNOSIS

STEP 1. Start the engine. Have an assistant stay in the driver's seat. Raise the vehicle on a hoist. Have the assistant rev the engine while searching for exhaust leaks.

Q: Is the exhaust leaking?
YES : Go to Step 2.
NO : This diagnosis is complete.

STEP 2. Check the gasket for cracks, damage.

Q: Is the gasket damaged?
YES : Replace the gasket, then go Step 1.
NO : Go to Step 3.

STEP 3. Check for loosening in each coupling section.

Q: Is there any loosening in each section?
YES : Tighten, then go to Step 1.
NO : There is no action to be taken.

INSPECTION PROCEDURE 2: Abnormal Noise

DIAGNOSIS

STEP 1. Start the engine. Have an assistant stay in the driver's seat. Raise the vehicle on a hoist. Have the assistant rev the engine while searching for exhaust leaks.

Q: Is any abnormal noise generated?
YES : Go to Step 2.
NO : This diagnosis is complete.

STEP 2. Check for missing parts in the muffler. Tap the muffler lightly to check for loose baffles, etc.

Q: Are there any missing parts in the muffler?
YES : Replace, then go to Step 1.
NO : Go to Step 3.

STEP 3. Check the hanger for cracks.

Q: Is the hanger cracked?
YES : Replace, then go to Step 1.
NO : Go to Step 4.

STEP 4. Check for interference of the pipes and muffler with the body.

Q: Are the pipes and muffler interfering with the body?
YES : Repair, then go to Step 1.
NO : Go to Step 5.

STEP 5. Check the heat protectors.

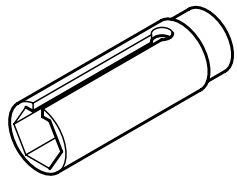
Q: Are any heat protectors loose or damaged?
YES : Tighten or replace, then go to Step 1.
NO : Go to Step 6.

STEP 6. Check the pipes, catalytic converters and muffler for damage.

Q: Are the pipes, catalytic converters and muffler damaged?
YES : Replace, then go to Step 1.
(For the removal of the catalytic converter, refer to GROUP 17 P.17-113.)
NO : There is no action to be taken.

SPECIAL TOOL

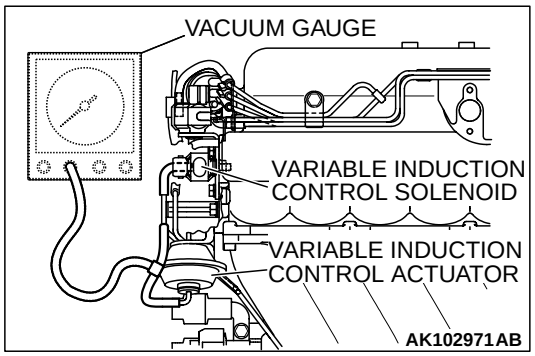
M1151000600214

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
	MD998770 Oxygen sensor wrench	MD998770-01 or general service tool	Heated oxygen sensor removal and installation

ON-VEHICLE SERVICE

VARIABLE INDUCTION CONTROL (VIC) SYSTEM CHECK <3.0L ENGINE – with VARIABLE INDUCTION CONTROL (VIC) system>

M1151001700021



1. Warm up the engine.
2. Disconnect the vacuum hose from the variable induction control actuator, and then connect a vacuum gauge via the Tee-fitting.
3. Start the engine and verify that a vacuum is applied to the vacuum gauge.
4. As described in the chart below, vary the engine speed to inspect the vacuum conditions. During this inspection, verify that the rod of the variable induction control actuator is operating.

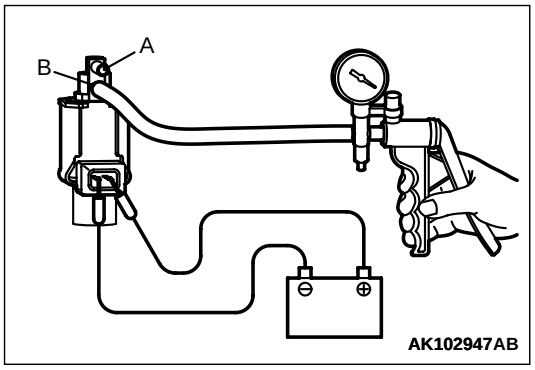
ENGINE SPEED	NORMAL CONDITION	CONTROL VALVE
4,000 rpm or less	Vacuum maintained	Closed
Form 4,000 rpm or less, engine is suddenly	Vacuum not change	Closed
4,250 rpm or more	Vacuum leaks	Open

VARIABLE INDUCTION CONTROL (VIC) SOLENOID CHECK <3.0L ENGINE – with VARIABLE INDUCTION CONTROL system>

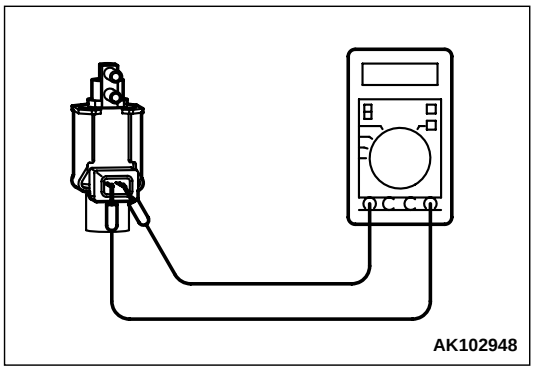
M1151010000019

1. Disconnect the vacuum hoses from the variable induction control solenoid.

   NOTE: When disconnecting the vacuum hose, always make sure that it can be reconnected at its original position.
2. Disconnect the harness connector.
3. Connect a hand vacuum pump to nipple (B) of the variable induction control solenoid.
4. As described in the chart below, check airtightness by applying a vacuum with voltage applied directly from the battery to the variable induction control solenoid, and without applying voltage.



BATTERY POSITIVE VOLTAGE	NIPPLE (A) CONDITION	NORMAL CONDITION
Applied	Open	Vacuum leaks
	Closed	Vacuum maintained
Not applied	Open	Vacuum leaks



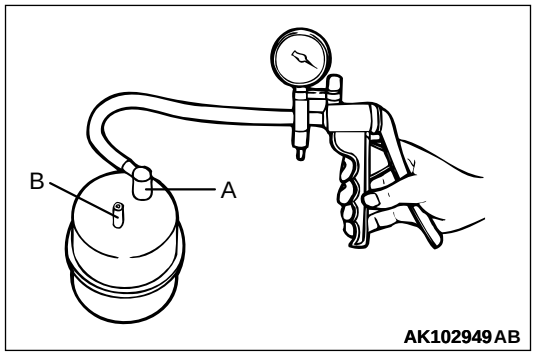
5. Measure the resistance between the terminals of the variable induction control solenoid.

   Standard value: 29 – 35 Ω [at 20°C (68°F)]

6. Replace solenoid resistance is out of specification.

VACUUM TANK CHECK <3.0L ENGINE – with VARIABLE INDUCTION CONTROL system>

M1151010100016



1. Disconnect the vacuum hoses from the vacuum tank.

   NOTE: When disconnecting the vacuum hose, always make sure that it can be reconnected at its original position.

2. Connect a hand vacuum pump to nipple "A" of the vacuum tank, apply a vacuum of 67 kPa (19.7 in. Hg), and verify that the vacuum is maintained.
3. Disconnect the hand vacuum pump from nipple "A" and connect it to nipple "B".
4. Block nipple "A" with your finger and apply a vacuum of 67 kPa (19.7 in. Hg) to nipple "B". Release your finger from nipple "A" and verify that the vacuum leaks immediately.
5. Replace the vacuum tank if it is faulty.

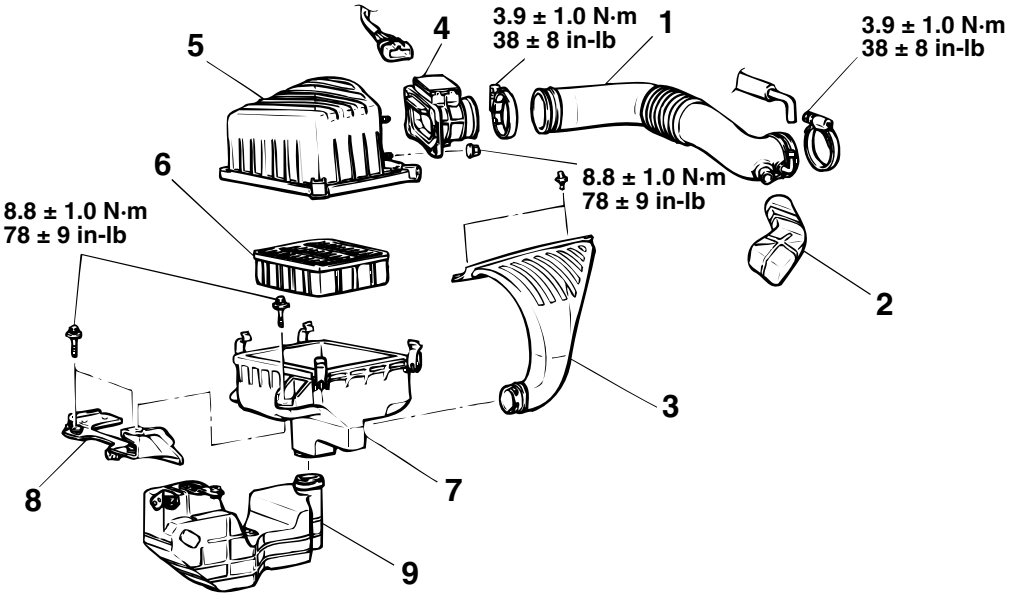
AIR CLEANER

REMOVAL AND INSTALLATION

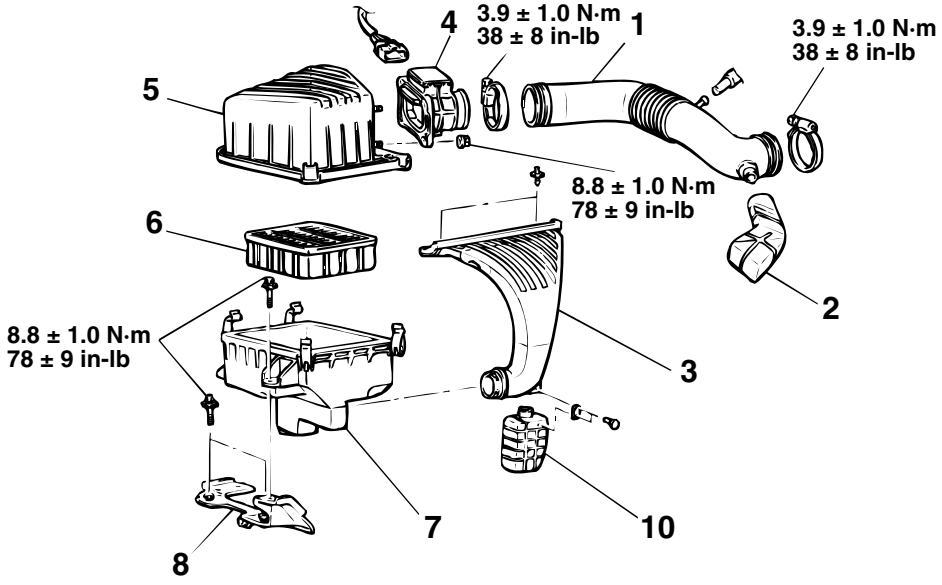
M1151002100204

Pre-removal and Post-installation Operation
Battery Removal and Installation (Refer to GROUP 54A, Battery P.54A-8.)

<2.4L ENGINE>



<3.0L ENGINE>



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REMOVAL STEPS
1. AIR INTAKE HOSE
2. RESONATOR A
3. AIR DUCT
4. AIR FLOW SENSOR ASSEMBLY
5. AIR CLEANER COVER

REMOVAL STEPS (Continued)
6. AIR CLEANER ELEMENT
7. AIR CLEANER BODY
8. AIR CLEANER BRACKET
9. RESONATOR B <2.4L ENGINE>
10. RESONATOR C <3.0L ENGINE>

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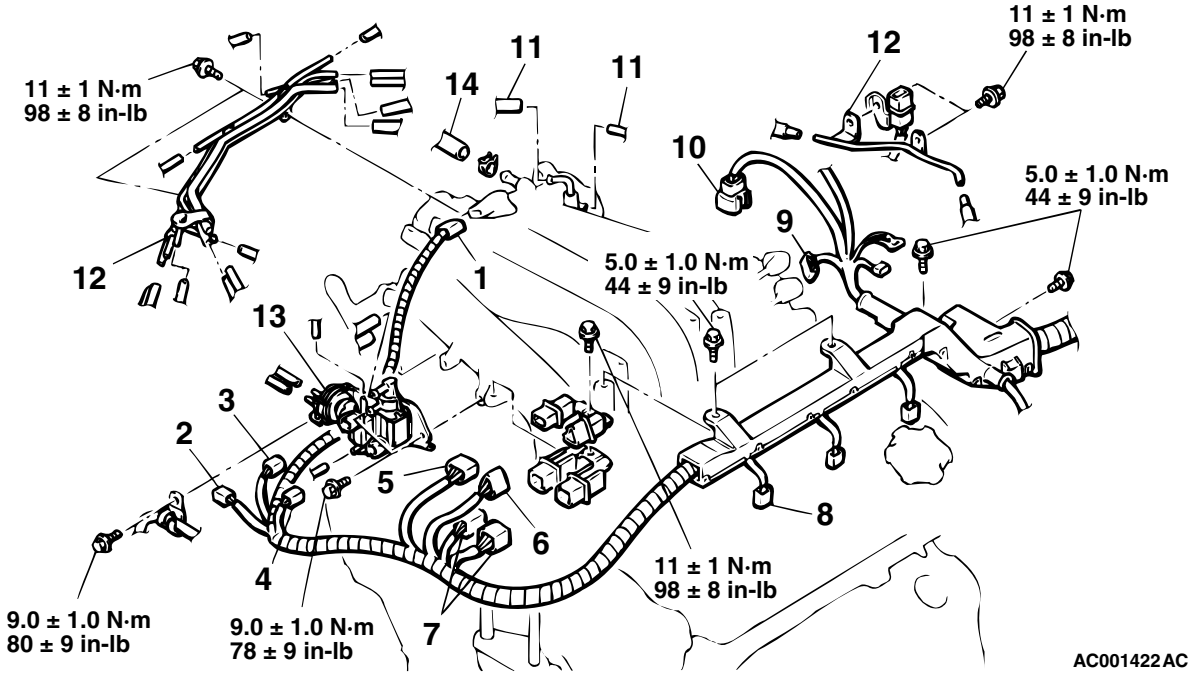
INTAKE MANIFOLD PLENUM

REMOVAL AND INSTALLATION

M1151002700109

Pre-removal Operation	Post-installation Operation
• Fuel Discharge Prevention [Refer to GROUP 13B, On-vehicle Service P.13A-580.] • Engine Coolant Draining [Refer to GROUP 00, Maintenance Service – Engine Coolant (Change) P.00-56.] • Strut Tower Bar Removal (Refer to GROUP 42, Strut Tower Bar P.42-11.) • Air Cleaner Removal (Refer to P.15-6.) • Throttle Body Removal (Refer to GROUP 13B, Throttle Body P.13B-689.)	• Throttle Body Installation (Refer to GROUP 13B, Throttle Body P.13B-689.) • Air Cleaner Installation (Refer to P.15-6.) • Engine Coolant Supplying [Refer to GROUP 00, Maintenance Service – Engine Coolant (Change) P.00-56.] • Strut Tower Bar Installation (Refer to GROUP 42, Strut Tower Bar P.42-11.) • Drive Belt Tension Adjustment [Refer to GROUP 00, Maintenance Service – Drive Belts (Check Condition) P.00-44.]

<Vehicle without Variable Induction Control (VIC) System>



REMOVAL STEPS

1. MANIFOLD DIFFERENTIAL PRESSURE SENSOR CONNECTOR
2. CONTROL WIRING HARNESS AND POWER STEERING WIRING HARNESS COMBINATION CONNECTOR
3. EGR SOLENOID VALVE CONNECTOR
4. EVAPORATIVE EMISSION PURGE SOLENOID VALVE CONNECTOR
5. KNOCK SENSOR CONNECTOR
6. CRANKSHAFT POSITION SENSOR CONNECTOR

REMOVAL STEPS (Continued)

7. RIGHT BANK HEATED OXYGEN SENSOR CONNECTOR
8. INJECTOR CONNECTOR
9. DISTRIBUTOR CONNECTOR
10. CONTROL WIRING HARNESS AND INJECTOR WIRING HARNESS COMBINATION CONNECTOR
11. VACUUM HOSE CONNECTION
12. VACUUM PIPE
13. EGR SOLENOID VALVE, EVAPORATIVE EMISSION PURGE SOLENOID VALVE AND VACUUM CONTROL VALVE
14. BRAKE BOOSTER VACUUM HOSE CONNECTION

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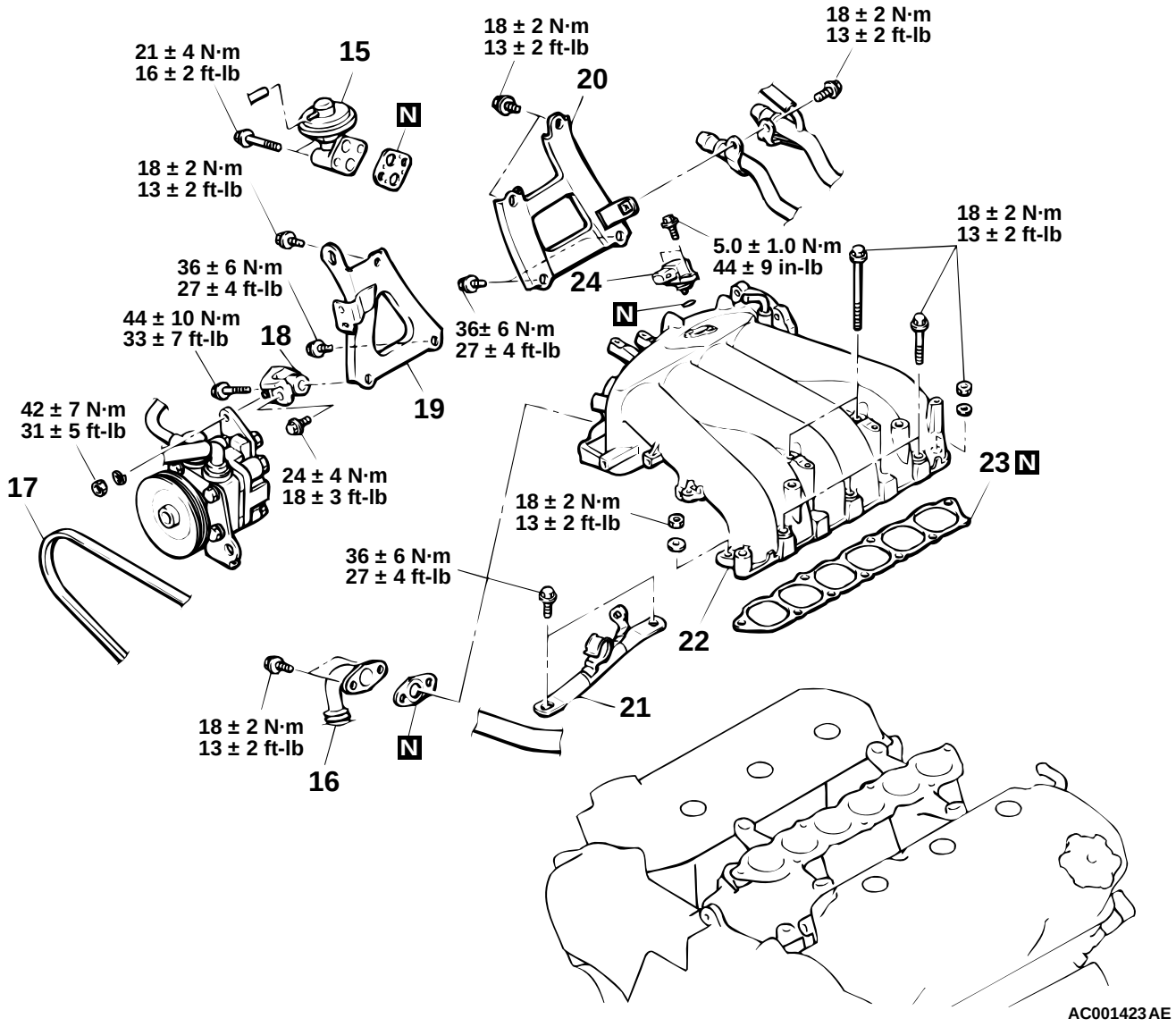

REMOVAL STEPS

15. EGR VALVE
16. EGR PIPE CONNECTION
17. DRIVE BELT <POWER STEERING OIL PUMP>
18. POWER STEERING OIL PUMP BRACKET STAY
19. INTAKE MANIFOLD PLENUM STAY, FRONT

REMOVAL STEPS (Continued)

20. INTAKE MANIFOLD PLENUM STAY, REAR
21. ENGINE MOUNT STAY
22. INTAKE MANIFOLD PLENUM
>>A<< 23. INTAKE MANIFOLD PLENUM GASKET
24. MANIFOLD DIFFERENTIAL PRESSURE SENSOR

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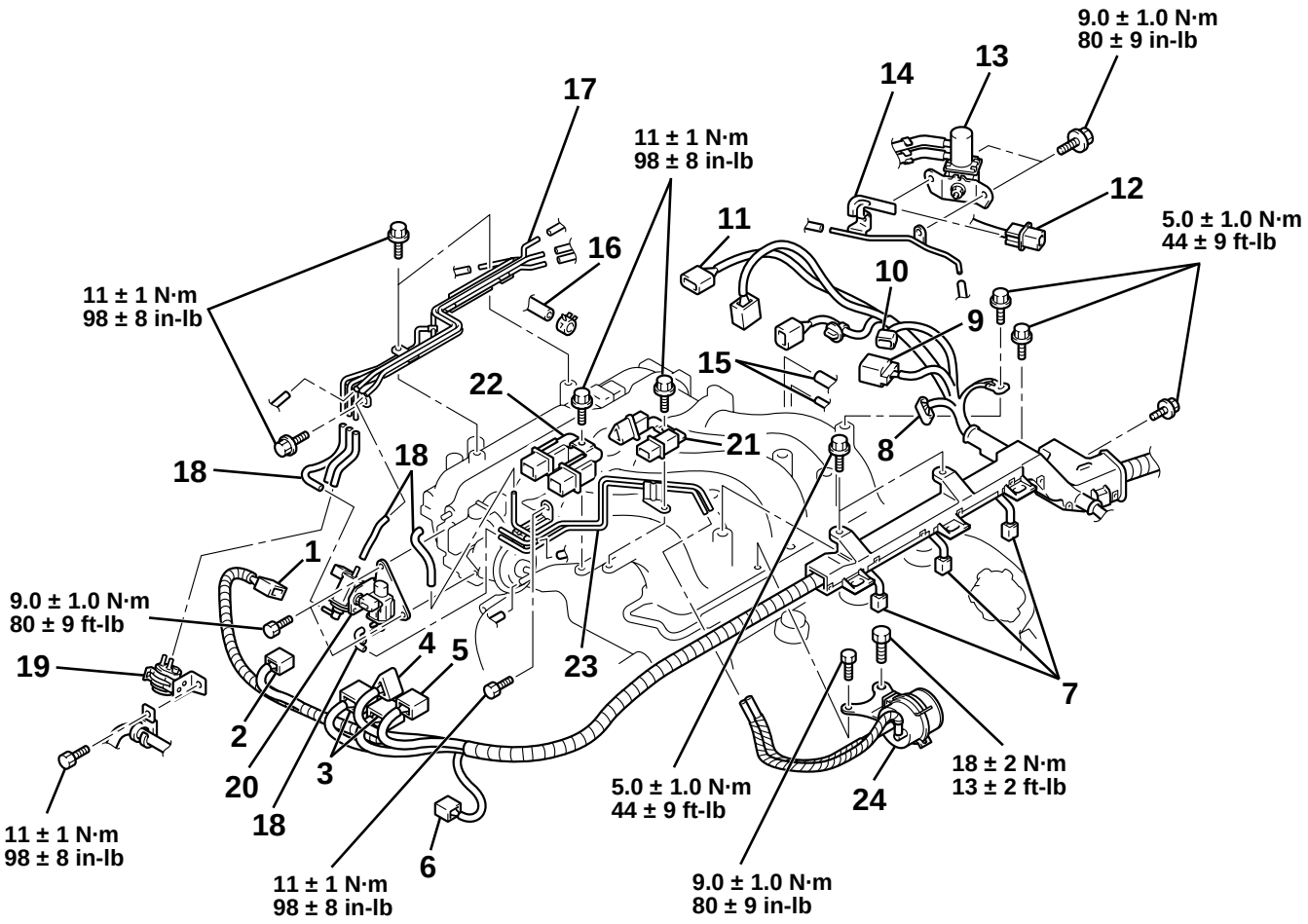
<Vehicle with Variable Induction (VIC) System>



REMOVAL STEPS

1. EGR SOLENOID VALVE CONNECTOR
2. VARIABLE INDUCTION CONTROL (VIC) SOLENOID VALVE CONNECTOR
3. RIGHT BANK HEATED OXYGEN SENSOR CONNECTOR
4. CRANKSHAFT POSITION SENSOR CONNECTOR
5. KNOCK SENSOR CONNECTOR
6. CONTROL WIRING HARNESS AND POWER STEERING WIRING HARNESS COMBINATION CONNECTOR
7. INJECTOR CONNECTOR
8. DISTRIBUTOR CONNECTOR
9. CONTROL WIRING HARNESS AND INJECTOR WIRING HARNESS COMBINATION CONNECTOR
10. EVAPORATIVE EMISSION PURGE SOLENOID VALVE CONNECTOR
11. MANIFOLD DIFFERENTIAL PRESSURE SENSOR CONNECTOR

REMOVAL STEPS (Continued)

12. CONTROL WIRING HARNESS AND INJECTOR WIRING HARNESS COMBINATION CONNECTOR
13. EVAPORATIVE EMISSION PURGE SOLENOID VALVE
14. VACUUM PIPE
15. VACUUM HOSE CONNECTION
16. BRAKE BOOSTER VACUUM HOSE CONNECTION
17. VACUUM PIPE
18. VACUUM HOSE
19. VACUUM CONTROL VALVE
20. EGR SOLENOID VALVE AND VARIABLE INDUCTION CONTROL (VIC) SOLENOID VALVE
21. KNOCK SENSOR CONNECTOR AND CRANKSHAFT POSITION SENSOR CONNECTOR BRACKET
22. RIGHT BANK HEATED OXYGEN SENSOR CONNECTOR BRACKET
23. VACUUM PIPE
24. VACUUM TANK

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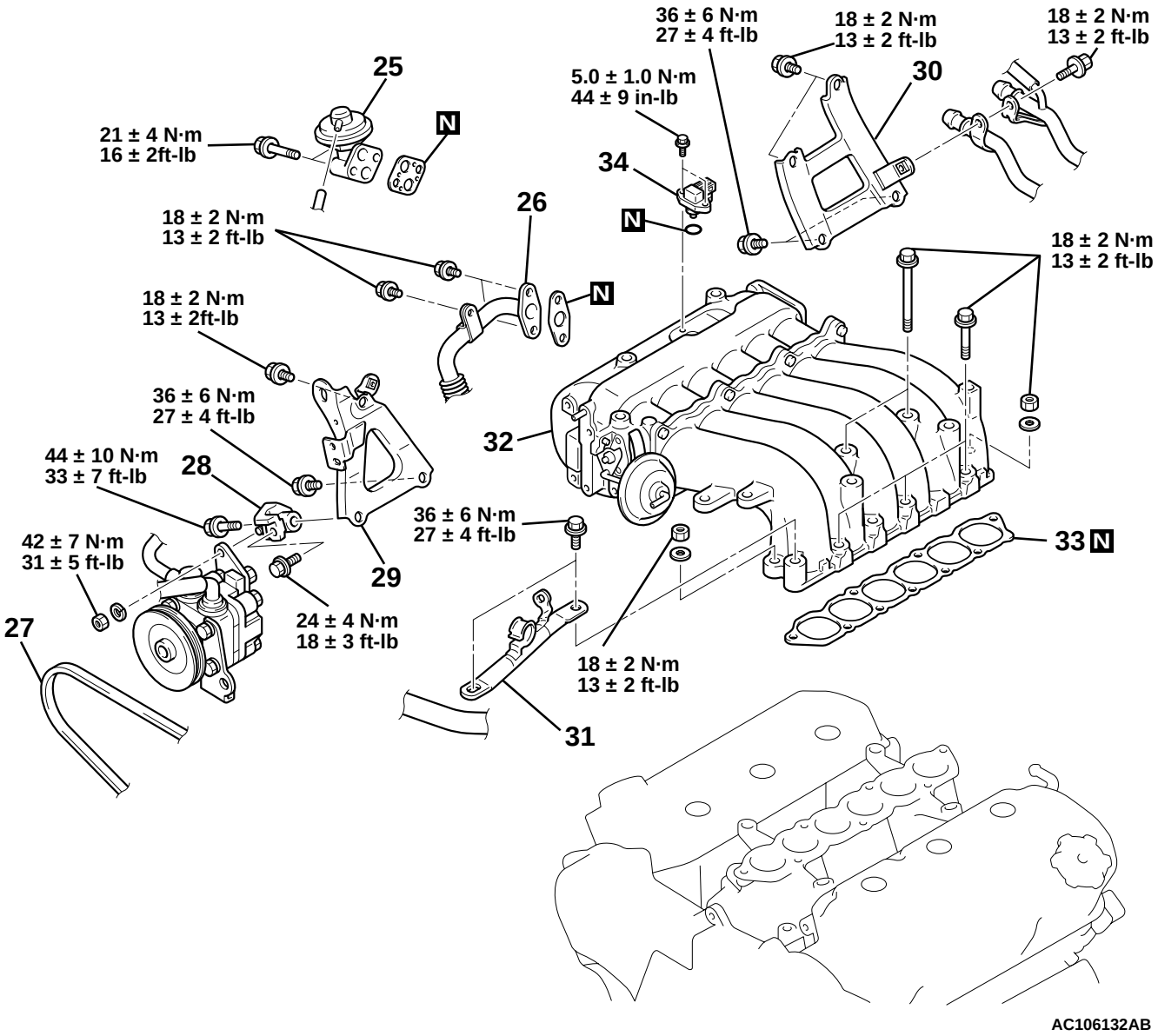

REMOVAL STEPS

25. EGR VALVE
26. EGR PIPE CONNECTION
27. DRIVE BELT <POWER STEERING OIL PUMP>
28. POWER STEERING OIL PUMP BRACKET STAY
29. INTAKE MANIFOLD PLENUM STAY, FRONT

REMOVAL STEPS (Continued)

30. INTAKE MANIFOLD PLENUM STAY, REAR
31. ENGINE MOUNT STAY
32. INTAKE MANIFOLD PLENUM
>>A<< 33. INTAKE MANIFOLD PLENUM GASKET
34. MANIFOLD DIFFERENTIAL PRESSURE SENSOR

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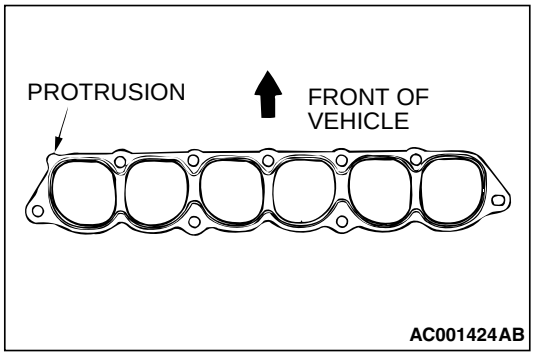
INSTALLATION SERVICE POINT

>>A<< INTAKE MANIFOLD PLENUM GASKET INSTALLATION

Install the gasket with the protrusion in the position illustrated.

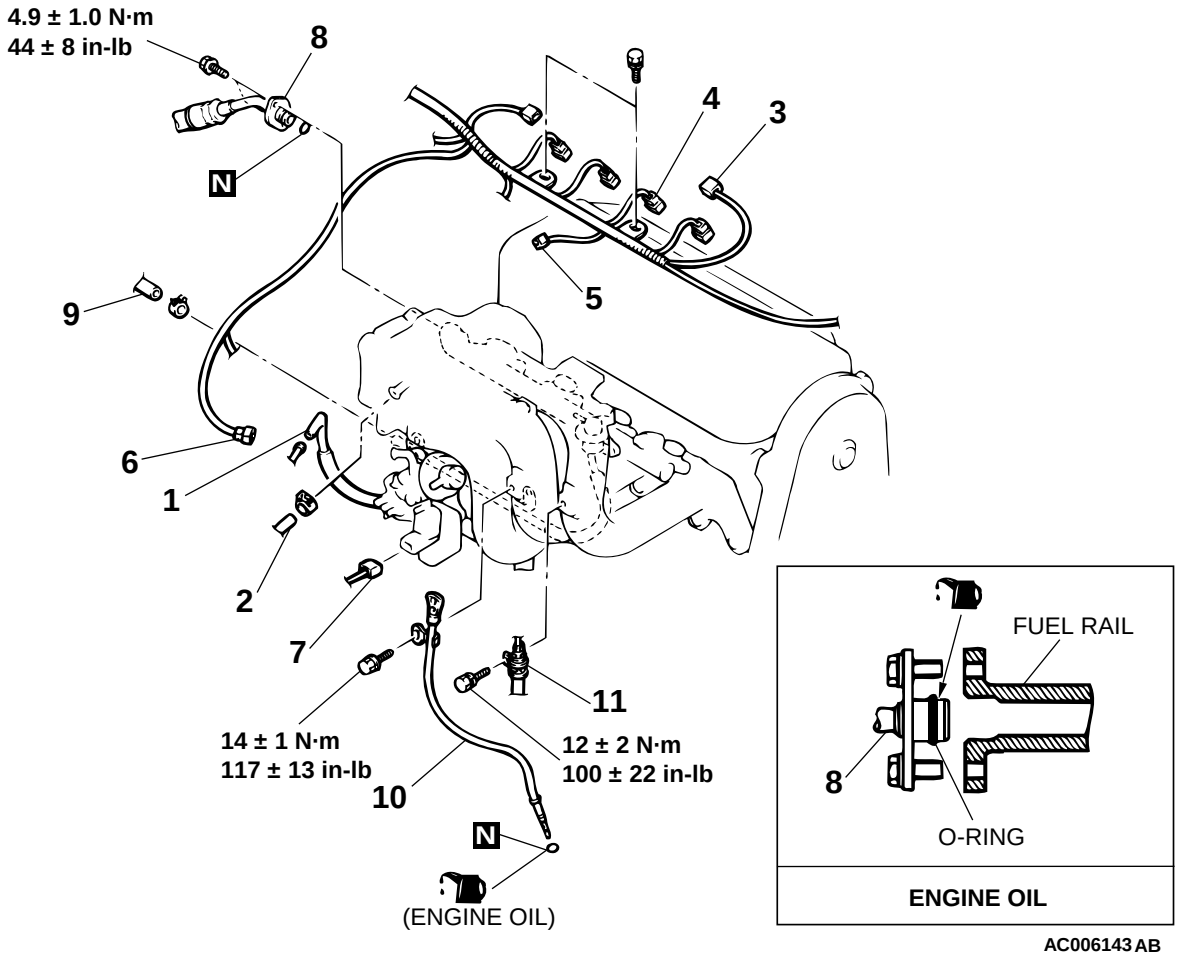


INTAKE MANIFOLD <2.4L>

REMOVAL AND INSTALLATION

M1151003000396

Pre-removal Operation	Post-installation Operation
• Fuel Discharge Prevention [Refer to GROUP 13A, On-vehicle Service – Fuel Pump Relay Disconnection (How to Reduce Pressurized Fuel Lines) P.13A-580.] • Engine Coolant Draining [Refer to GROUP 00, Maintenance Service – Engine Coolant (Change) P.00-56.] • Air Cleaner Removal (Refer to P.15-6.) • Throttle Body Removal (Refer to GROUP 13A, Throttle Body P.13A-592.) • Thermostat Case Assembly Removal (Refer to GROUP 14, Water Hose and Water Pipe P.14-28.)	• Thermostat Case Assembly Installation (Refer to GROUP 14, Water Hose and Water Pipe P.14-28.) • Throttle Body Installation (Refer to GROUP 13A, Throttle Body P.13A-592.) • Air Cleaner Installation (Refer to P.15-6.) • Engine Coolant Supplying [Refer to GROUP 00, Maintenance Service – Engine Coolant (Change) P.00-56.] • Fuel Leakage Inspection



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REMOVAL STEPS
1. PURGE HOSE CONNECTION
2. BRAKE BOOSTER VACUUM HOSE CONNECTION
3. IGNITION COIL CONNECTOR
4. INJECTOR CONNECTOR
5. MANIFOLD DIFFERENTIAL PRESSURE SENSOR CONNECTOR
6. EVAPORATIVE EMISSION PURGE SOLENOID VALVE CONNECTOR

REMOVAL STEPS (Continued)
7. EGR SOLENOID VALVE CONNECTOR

>>A<< 8. HIGH-PRESSURE FUEL HOSE CONNECTION
9. FUEL RETURN HOSE CONNECTION
10. OIL DIPSTICK AND DIPSTICK GUIDE
11. PRESSURE HOSE CONNECTION

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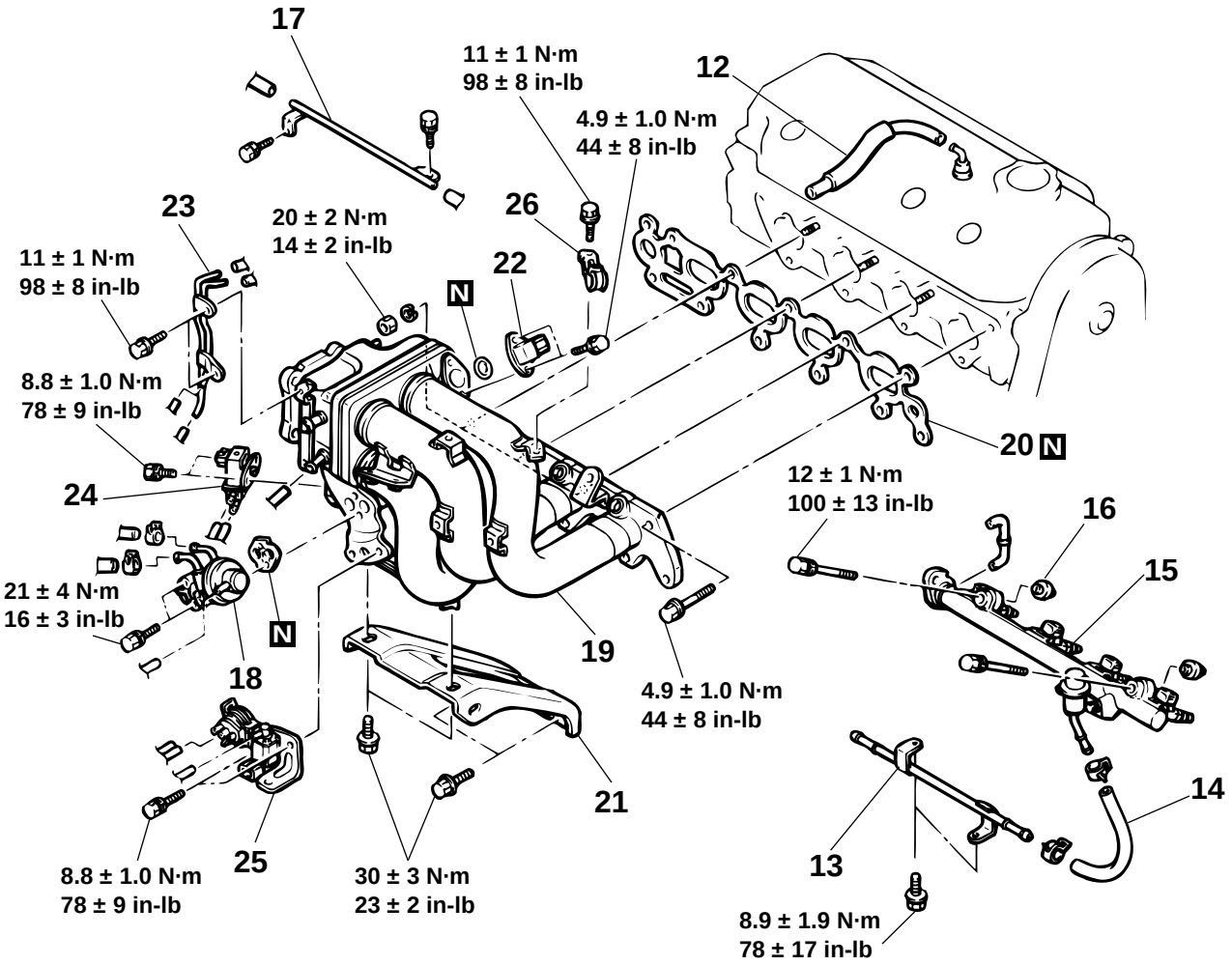

AC006039AC

REMOVAL STEPS

12. PCV HOSE
13. FUEL RETURN PIPE
14. FUEL HOSE

<<A>> 15. FUEL RAIL, INJECTOR AND FUEL PRESSURE REGULATOR

16. INSULATOR
17. VACUUM PIPE
18. EGR VALVE
19. INTAKE MANIFOLD
20. INTAKE MANIFOLD GASKET

REMOVAL STEPS (Continued)

21. INTAKE MANIFOLD STAY
22. MANIFOLD DIFFERENTIAL PRESSURE SENSOR
23. VACUUM PIPE
24. EVAPORATIVE EMISSION PURGE SOLENOID VALVE
25. EGR SOLENOID VALVE AND VACUUM CONTROL VALVE
26. ACCELERATOR CABLE CLAMP

REMOVAL SERVICE POINT

<<A>> FUEL RAIL, INJECTOR AND FUEL PRESSURE REGULATOR REMOVAL

⚠ CAUTION

Care must be taken when removing the fuel rail not to drop the injector.

Remove the fuel rail with the injectors and pressure regulator attached to it.

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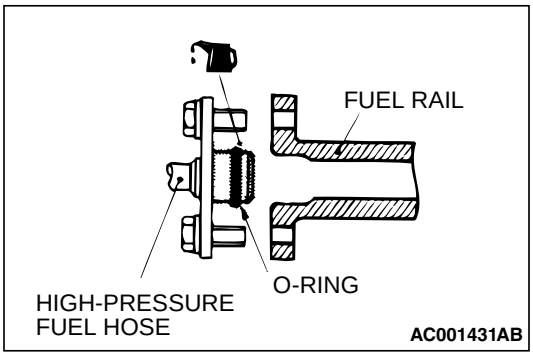


INSTALLATION SERVICE POINT

>>A<< HIGH-PRESSURE FUEL HOSE INSTALLATION

⚠ CAUTION

Be careful not to allow any engine oil to enter the fuel rail.

1. When connecting the high-pressure fuel hose to the fuel rail, apply a small amount of new engine oil to the O-ring and then insert the high-pressure fuel hose, being careful not to damage the O-ring.
2. While turning the high-pressure fuel hose to the left and right, install it to the fuel rail.
3. Check that the injector turns smoothly. If it does not turn smoothly, the O-ring may be trapped. Remove the high-pressure fuel hose and then re-insert it into the fuel rail and check again.

INSPECTION

M1151003100348

Check the following points; replace the part if a problem is found.

Intake Manifold Check

1. Check for damage or cracking of any part.
2. Clogging of the negative pressure (vacuum) outlet port, or clogging of the exhaust gas recirculation passages.
3. Using a straight edge and feeler gauge, check for distortion of the cylinder head installation surface.

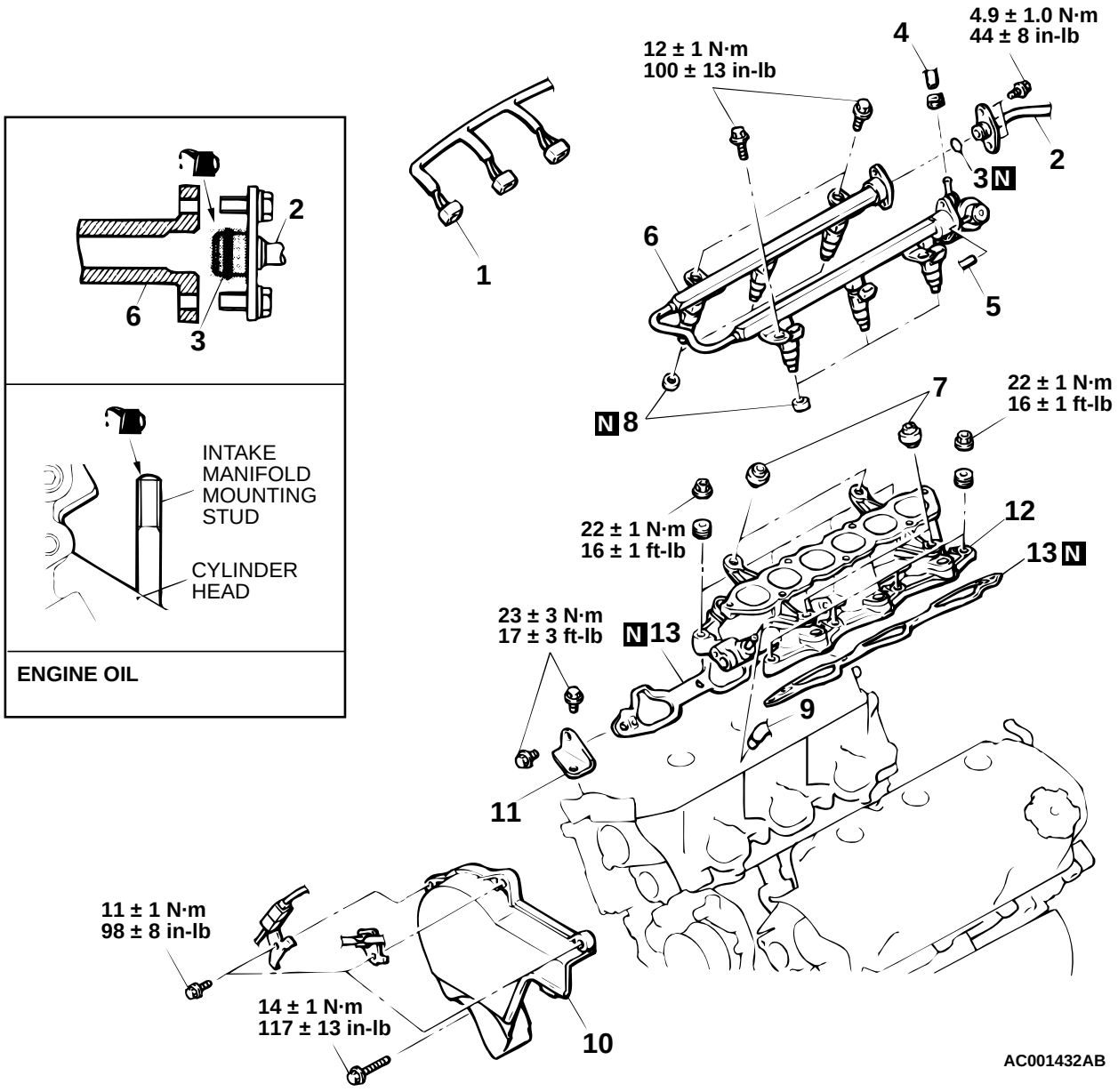
   Standard value: 0.15 mm (0.006 inch) or less
   Limit: 0.20 mm (0.008 inch)

INTAKE MANIFOLD <3.0L>

REMOVAL AND INSTALLATION

M1151003000404

Pre-removal Operation	Post-installation Operation
• Fuel Discharge Prevention [Refer to GROUP 13B, On-vehicle Service – Fuel Pump Relay Disconnection (How to Reduce Pressurized Fuel Lines) P.13A-580.] • Intake Manifold Plenum Removal (Refer to P.15-7.)	• Intake Manifold Plenum Installation (Refer to P.15-7.) • Fuel Leakage Inspection



REMOVAL STEPS

1. INJECTOR CONNECTOR
>>C<< 2. HIGH-PRESSURE FUEL HOSE CONNECTION
3. O-RING
4. FUEL RETURN HOSE CONNECTION
5. VACUUM HOSE CONNECTION
<<A>> 6. FUEL RAIL, INJECTOR AND FUEL PRESSURE REGULATOR

REMOVAL STEPS (Continued)

7. INSULATORS
8. INSULATORS
9. PCV HOSE CONNECTION
10. TIMING BELT FRONT UPPER COVER, RIGHT
11. BRACKET
>>B<< 12. INTAKE MANIFOLD
>>A<< 13. INTAKE MANIFOLD GASKET

TSB Revision

REMOVAL SERVICE POINT

<<A>> FUEL RAIL, INJECTOR AND FUEL PRESSURE REGULATOR REMOVAL

⚠ CAUTION

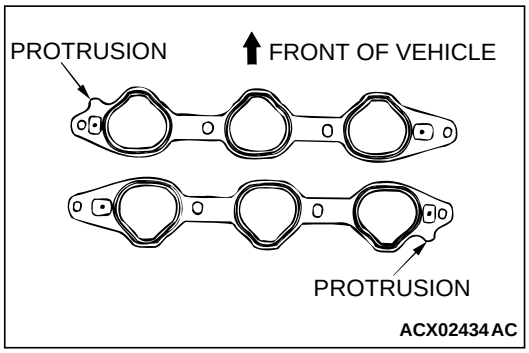
Care must be taken when removing the fuel rail not to drop the injector.

Remove the fuel rail with the injectors and pressure regulator attached to it.

INSTALLATION SERVICE POINTS

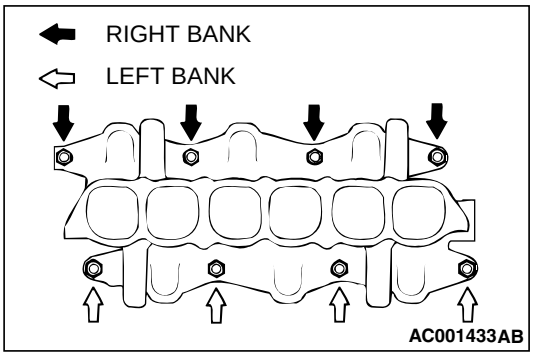
>>A<< INTAKE MANIFOLD GASKET INSTALLATION

Install the gasket with the protrusions in the position illustrated.



>>B<< INTAKE MANIFOLD INSTALLATION

1. Coat the intake manifold mounting studs with engine oil.
2. Tighten the intake manifold mounting nuts by the following procedure.



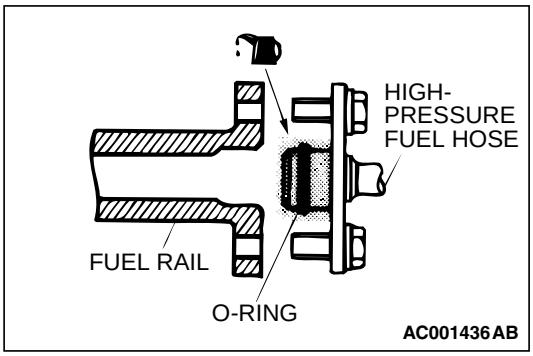
ORDER	MOUNTING NUTS	TIGHTENING TORQUE
1st	Right-bank nuts	6.4 ± 1.4 N·m (56 ± 13 in-lb)
2nd	Left-bank nuts	22 ± 1 N·m (16 ± 1 ft-lb)
3rd	Right-bank nuts	22 ± 1 N·m (16 ± 1 ft-lb)
4th	Left-bank nuts	22 ± 1 N·m (16 ± 1 ft-lb)
5th	Right-bank nuts	22 ± 1 N·m (16 ± 1 ft-lb)

>>C<< HIGH-PRESSURE FUEL HOSE INSTALLATION

⚠ CAUTION

Be careful not to allow any engine oil to enter the fuel rail.

1. When connecting the high-pressure fuel hose to the fuel rail, apply a small amount of new engine oil to the O-ring and then insert the high-pressure fuel hose, being careful not to damage the O-ring.
2. While turning the high-pressure fuel hose to the left and right, install it to the fuel rail.
3. Check that the injector turns smoothly. If it does not turn smoothly, the O-ring may be trapped. Remove the high-pressure fuel hose and then re-insert it into the fuel rail and check again.



INSPECTION

M1151003100359

Check the following points; replace the part if a problem is found.

Intake Manifold Check

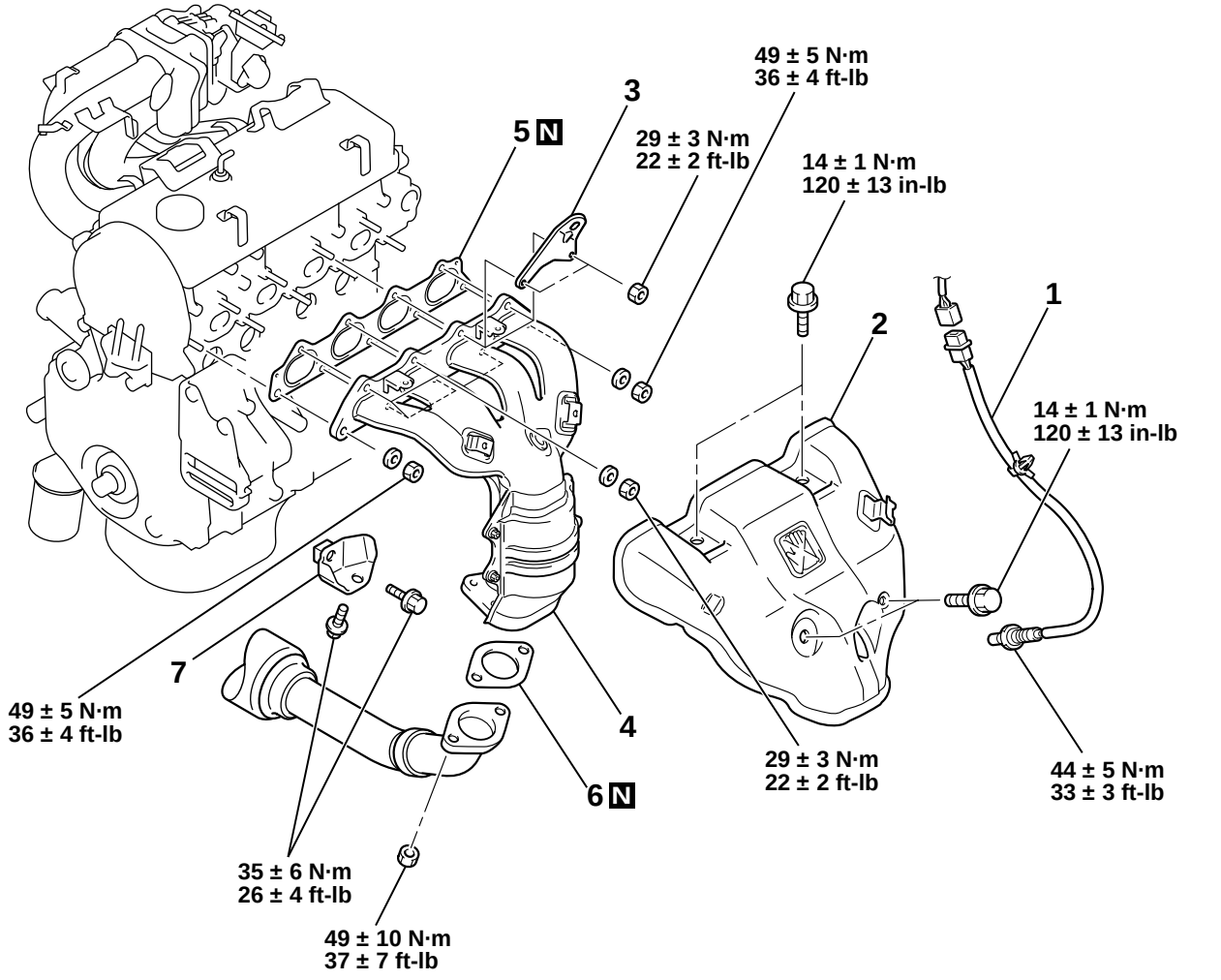
1. Check for damage or cracking of any part.
2. Check for obstruction of the negative pressure (vacuum) outlet port, and for obstruction of the water passage or gas passage.
3. Using a straight edge and feeler gauge, check for distortion of the cylinder head installation surface.

Standard value: 0.15 mm (0.006 inch) or less
Limit: 0.20 mm (0.008 inch)

EXHAUST MANIFOLD <2.4L>

REMOVAL AND INSTALLATION

M1151003300308



AC001808AD

TSB Revision

REMOVAL STEPS

<<A>> >>A<< 1. HEATED OXYGEN SENSOR (FRONT)
2. HEAT PROTECTOR
3. ENGINE HANGER

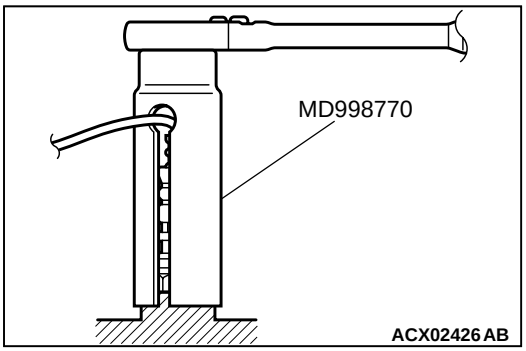
REMOVAL STEPS (Continued)

4. EXHAUST MANIFOLD
5. EXHAUST MANIFOLD GASKET
6. GASKET
7. EXHAUST MANIFOLD BRACKET

REMOVAL SERVICE POINT

<<A>> HEATED OXYGEN SENSOR (FRONT) REMOVAL

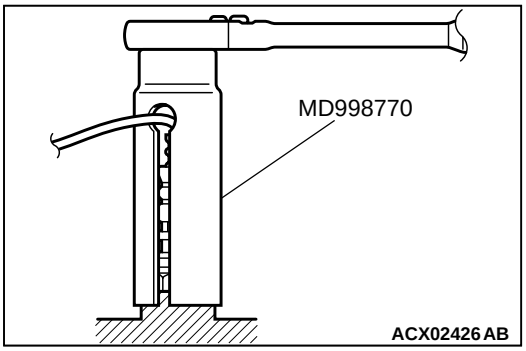
Use special tool MD998770 to remove the oxygen sensor.



INSTALLATION SERVICE POINT

>>A<< HEATED OXYGEN SENSOR (FRONT) INSTALLATION

Use special tool MD998770 to installation the oxygen sensor.



INSPECTION

M1151003400286

Check the following points; replace the part if a problem is found.

Exhaust Manifold Check

1. Check for damage or cracking of any part.
2. Using a straight edge and a feeler gauge, check for distortion of the cylinder head installation surface.

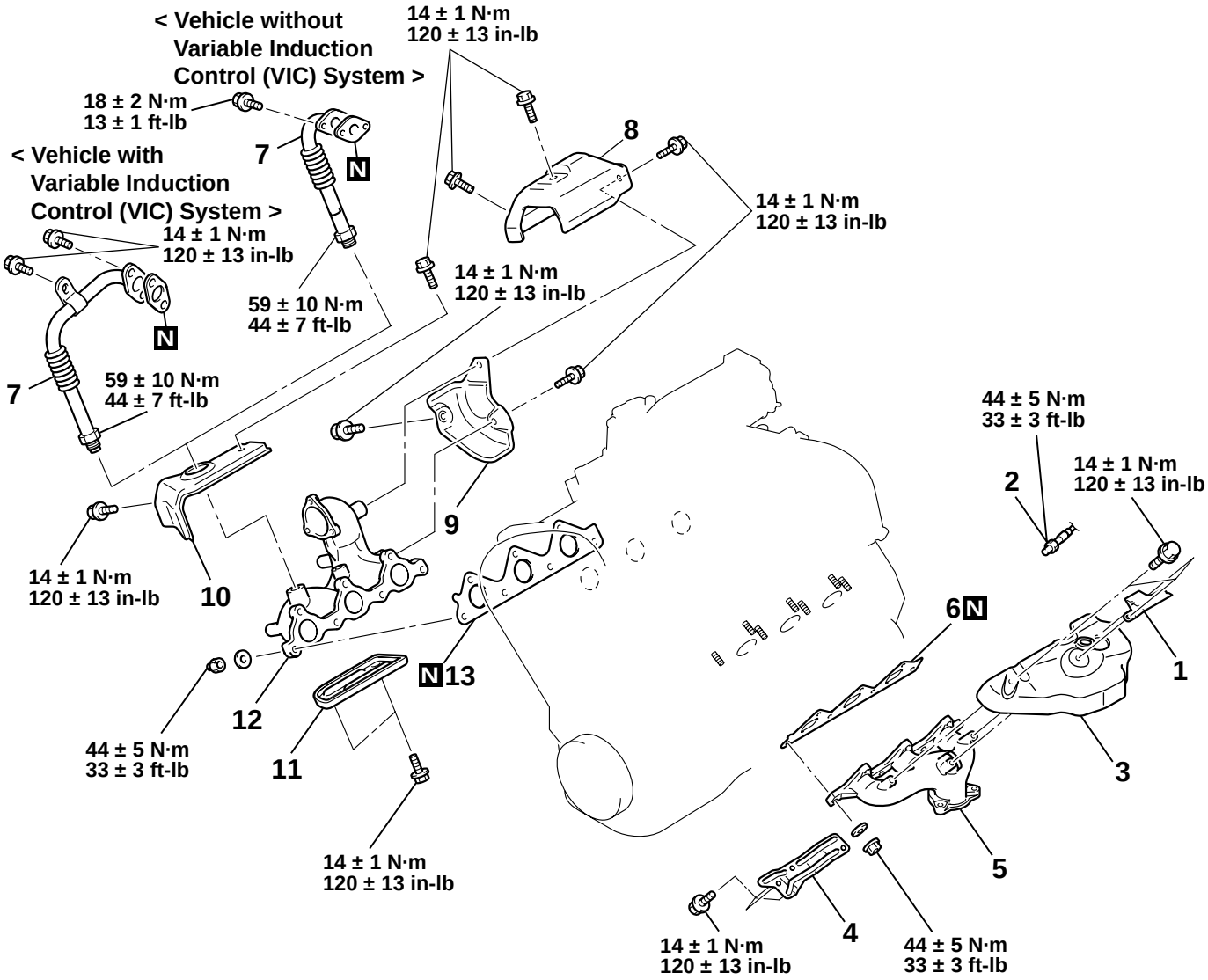
   Standard value: 0.15 mm (0.006 inch) or less
   Limit: 0.20 mm (0.008 inch)

EXHAUST MANIFOLD <3.0L>

REMOVAL AND INSTALLATION

M1151003300319

Pre-removal and Post-installation Operation
- Front Exhaust Pipe Removal and Installation (Refer to P.15-22.)
- Strut Tower Bar Removal and Installation (Refer to GROUP 42, Strut Tower Bar P.42-11.)
- Air Cleaner Removal and Installation (Refer to P.15-6.)
- Engine Oil Dipstick Guide, A/T Oil Dipstick Guide Removal and Installation
- Battery and Battery Tray Removal and Installation (Refer to GROUP 54A, Battery P.54A-8.)



AC106420AB

REMOVAL STEPS
1. HEAT UPPER PROTECTOR <LEFT BANK>

<<A>> >>A<< 2. LEFT BANK HEATED OXYGEN SENSOR (FRONT)
3. HEAT PROTECTOR <LEFT BANK>
4. HEAT LOWER PROTECTOR <LEFT BANK>

REMOVAL STEPS (Continued)
5. EXHAUST MANIFOLD <LEFT BANK>
6. EXHAUST MANIFOLD GASKET <LEFT BANK>

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REMOVAL STEPS (Continued)

- INTAKE MANIFOLD PLENUM <VEHICLE WITH VARIABLE INDUCTION CONTROL (VIC) SYSTEM> (REFER TO P.15-7.)
7. EGR PIPE
8. HEAT UPPER PROTECTOR <RIGHT BANK>
9. HEAT PROTECTOR <RIGHT BANK>

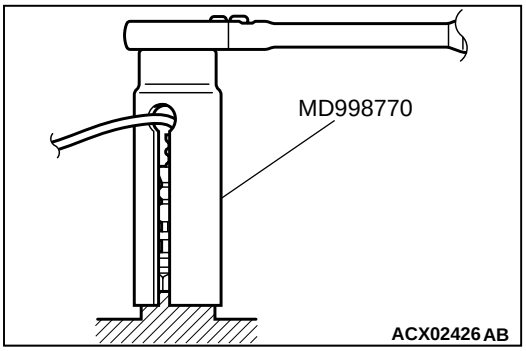
REMOVAL STEPS (Continued)

10. HEAT FRONT PROTECTOR <RIGHT BANK>
11. HEAT LOWER PROTECTOR <RIGHT BANK>
12. EXHAUST MANIFOLD <RIGHT BANK>
13. EXHAUST MANIFOLD GASKET <RIGHT BANK>

REMOVAL SERVICE POINT

<<A>> LEFT BANK HEATED OXYGEN SENSOR (FRONT) REMOVAL

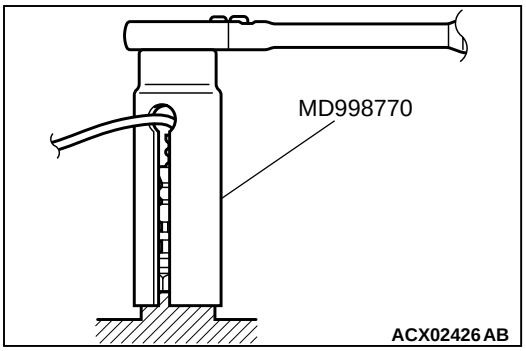
Use special tool MD998770 to remove the oxygen sensor.



INSTALLATION SERVICE POINT

>>A<< LEFT BANK HEATED OXYGEN SENSOR (FRONT) INSTALLATION

Use special tool MD998770 to installation the oxygen sensor.



INSPECTION

M1151003400305

Check the following points; replace the part if a problem is found.

EXhaust Manifold Check

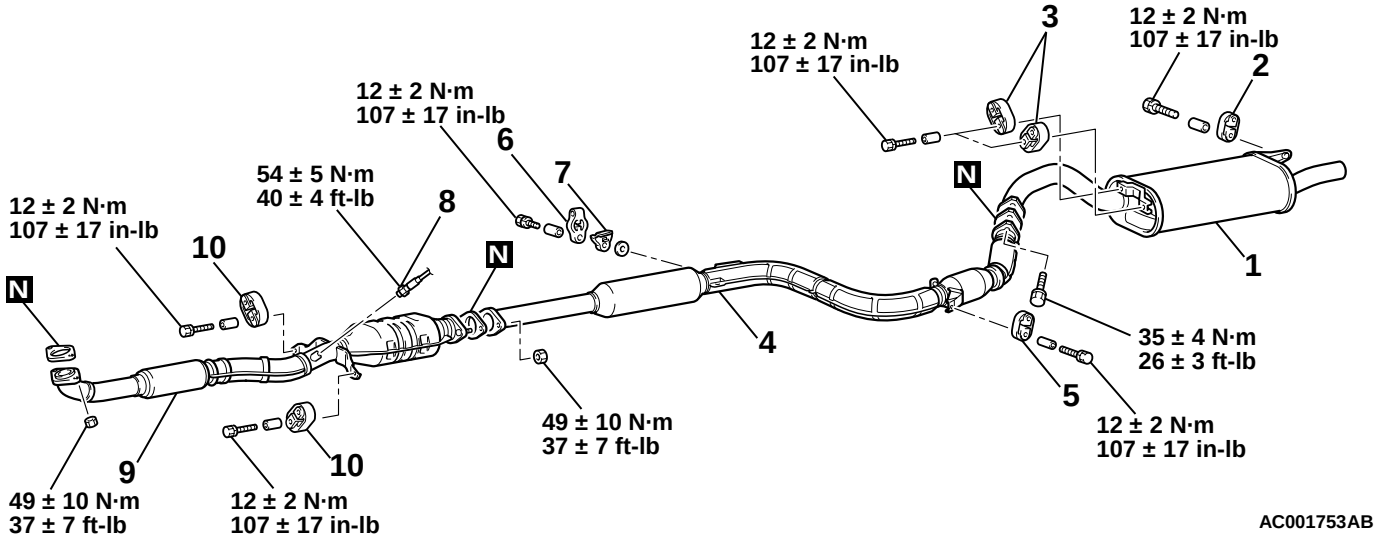
1. Check for damage or cracking of any part.
2. Using a straight edge and a feeler gauge, check for distortion of the cylinder head installation surface.

Standard value: 0.15 mm (0.006 inch) or less
Limit: 0.20 mm (0.008 inch)

EXHAUST PIPE, MAIN MUFFLER AND CATALYTIC CONVERTER<2.4L>

REMOVAL AND INSTALLATION

M1151005400196



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MAIN MUFFLER REMOVAL STEPS

1. MAIN MUFFLER
2. HANGER
3. HANGER

CENTER EXHAUST PIPE REMOVAL STEPS

4. CENTER EXHAUST PIPE
5. HANGER
6. HANGER

CENTER EXHAUST PIPE REMOVAL STEPS (Continued)

7. PROTECTOR

FRONT EXHAUST PIPE REMOVAL STEPS

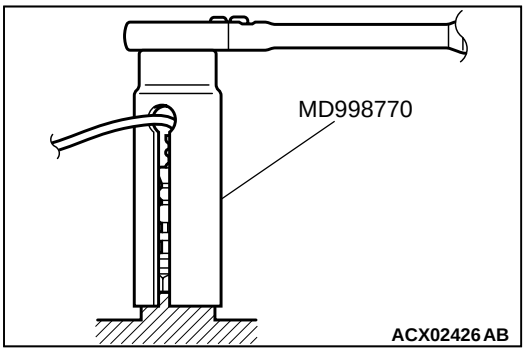
<<A>> >>A<<

8. HEATED OXYGEN SENSOR (REAR)
9. FRONT EXHAUST PIPE (CATALYTIC CONVERTER INCORPORATED)
10. HANGER

REMOVAL SERVICE POINT

<<A>> HEATED OXYGEN SENSOR (REAR) REMOVAL

Use special tool MD998770 to remove the oxygen sensor.



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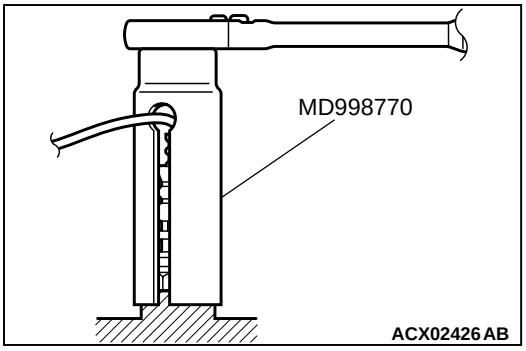
INSTALLATION SERVICE POINT

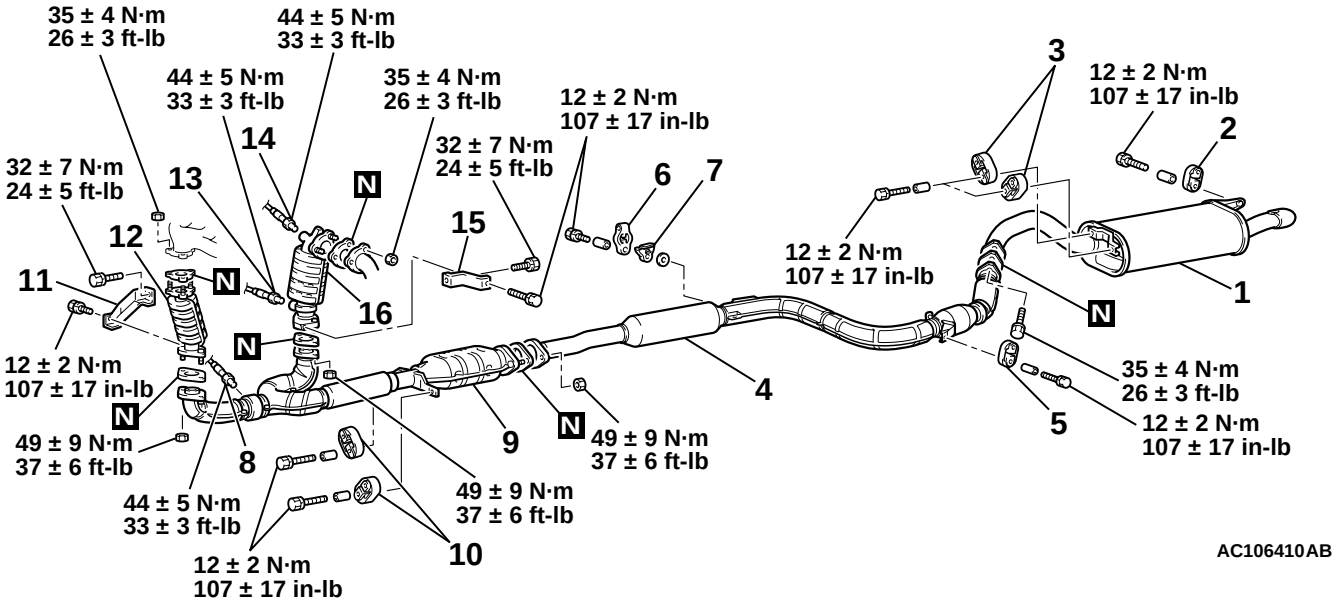
>>A<< HEATED OXYGEN SENSOR (REAR) INSTALLATION
Use special tool MD998770 to install the oxygen sensor.



EXHAUST PIPE, MAIN MUFFLER AND CATALYTIC CONVERTER<3.0L>

REMOVAL AND INSTALLATION

M1151005400204



MAIN MUFFLER REMOVAL STEPS
1. MAIN MUFFLER
2. HANGER
3. HANGER

CENTER EXHAUST PIPE REMOVAL STEPS
4. CENTER EXHAUST PIPE
5. HANGER
6. HANGER
7. PROTECTOR

FRONT EXHAUST PIPE REMOVAL STEPS
<<A>> >>A<< 8. LEFT BANK HEATED OXYGEN SENSOR (REAR)
9. FRONT EXHAUST PIPE (CATALYTIC CONVERTER INCORPORATED)
10. HANGER
11. EXHAUST FITTING STAY (LH)
12. FRONT CATALYTIC CONVERTER (LH)
<<A>> >>A<< 13. RIGHT BANK HEATED OXYGEN SENSOR (REAR)

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FRONT EXHAUST PIPE REMOVAL STEPS (Continued)

- INTAKE MANIFOLD PLENUM <VEHICLE WITH VARIABLE INDUCTION CONTROL (VIC) SYSTEM> (REFER TO P.15-7.)

<<A>> **>>A<<**

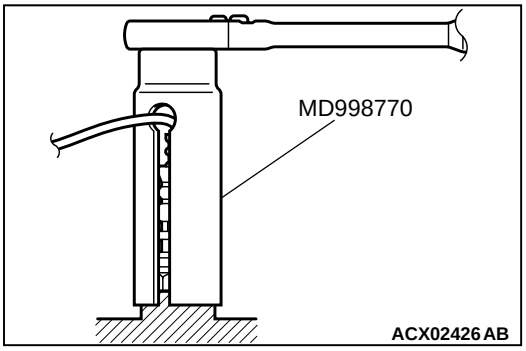
FRONT EXHAUST PIPE REMOVAL STEPS (Continued)

14. RIGHT BANK HEATED OXYGEN SENSOR (FRONT)
15. EXHAUST FITTING STAY (RH)
16. FRONT CATALYTIC CONVERTER (RH)

REMOVAL SERVICE POINT

<<A>> LEFT BANK HEATED OXYGEN SENSOR (REAR)/ RIGHT BANK HEATED OXYGEN SENSOR (REAR)/RIGHT BANK HEATED OXYGEN SENSOR (FRONT) REMOVAL

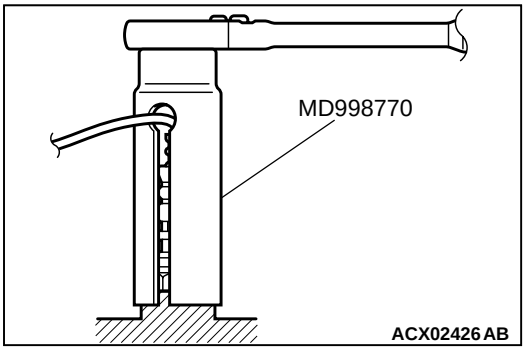
Use special tool MD998770 to remove the oxygen sensor.



INSTALLATION SERVICE POINT

>>A<< RIGHT BANK HEATED OXYGEN SENSOR (FRONT)/ RIGHT BANK HEATED OXYGEN SENSOR (REAR)/LEFT BANK HEATED OXYGEN SENSOR (REAR) INSTALLATION

Use special tool MD998770 to install the oxygen sensor.



SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1151006800205

ITEMS		SPECIFICATIONS
Air cleaner		
Air cleaner bolt		8.8 ± 1.0 N·m (78 ± 9 in-lb)
Air flow sensor nut		8.8 ± 1.0 N·m (78 ± 9 in-lb)
Air intake hose clamp bolt		3.9 ± 1.0 N·m (38 ± 8 in-lb)
Exhaust manifold <2.4L Engine>		
Engine hanger nut		29 ± 3 N·m (22 ± 2 ft-lb)
Exhaust manifold bracket bolt		35 ± 6 N·m (26 ± 4 ft-lb)
Exhaust manifold nut	M8	29 ± 3 N·m (22 ± 2 ft-lb)
	M10	49 ± 5 N·m (36 ± 4 ft-lb)
Front exhaust pipe nut		49 ± 10 N·m (37 ± 7 ft-lb)
Heat protector bolt		14 ± 1 N·m (120 ± 13 in-lb)
Heated oxygen sensor (front)		44 ± 5 N·m (33 ± 3 ft-lb)
Exhaust manifold <3.0L Engine>		
EGR pipe bolt		59 ± 10 N·m (44 ± 7 ft-lb)
EGR pipe gasket bolt		18 ± 2 N·m (13 ± 2 ft-lb)
Exhaust manifold nut		44 ± 5 N·m (33 ± 3 ft-lb)
Heat front protector <right bank> bolt		14 ± 1 N·m (120 ± 13 in-lb)
Heat lower protector <left bank> bolt		14 ± 1 N·m (120 ± 13 in-lb)
Heat lower protector <right bank> bolt		14 ± 1 N·m (120 ± 13 in-lb)
Heat protector <left bank> bolt		14 ± 1 N·m (120 ± 13 in-lb)
Heat protector <right bank> bolt		14 ± 1 N·m (120 ± 13 in-lb)
Heat upper protector <left bank> bolt		14 ± 1 N·m (120 ± 13 in-lb)
Heat upper protector <right bank> bolt		14 ± 1 N·m (120 ± 13 in-lb)
Left bank heated oxygen sensor (front)		44 ± 5 N·m (33 ± 3 ft-lb)
Exhaust pipe and main muffler <2.4L Engine>		
Center exhaust pipe bolt		35 ± 4 N·m (26 ± 3 ft-lb)
Front exhaust pipe nut		49 ± 10 N·m (37 ± 7 ft-lb)
Hanger bolt		12 ± 2 N·m (107 ± 17 in-lb)
Heated oxygen sensor (rear)		44 ± 5 N·m (33 ± 3 ft-lb)
Exhaust pipe and main muffler <3.0L Engine>		
Center exhaust pipe bolt		35 ± 4 N·m (26 ± 3 ft-lb)
Exhaust fitting stay (LH)	M8	12 ± 2 N·m (107 ± 17 in-lb)
	M12	32 ± 7 N·m (24 ± 5 ft-lb)
Exhaust fitting stay (RH)	M8	12 ± 2 N·m (107 ± 17 in-lb)
	M12	32 ± 7 N·m (24 ± 5 ft-lb)
Front catalytic converter (LH) nut		35 ± 4 N·m (26 ± 3 ft-lb)
Front catalytic converter (RH) nut		35 ± 4 N·m (26 ± 3 ft-lb)

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ITEMS		SPECIFICATIONS
Front exhaust pipe nut		49 ± 9 N·m (37 ± 6 ft-lb)
Hanger bolt		12 ± 2 N·m (107 ± 17 in-lb)
Left bank heated oxygen sensor (rear)		44 ± 5 N·m (33 ± 3 ft-lb)
Right bank heated oxygen sensor (front)		44 ± 5 N·m (33 ± 3 ft-lb)
Right bank heated oxygen sensor (rear)		44 ± 5 N·m (33 ± 3 ft-lb)
Intake manifold <2.4L Engine>		
Accelerator cable clamp bolt		11 ± 1 N·m (98 ± 8 in-lb)
EGR solenoid valve bolt		8.8 ± 1.0 N·m (78 ± 9 in-lb)
EGR valve bolt		21 ± 4 N·m (16 ± 3 ft-lb)
Evaporative emission purge solenoid valve bolt		8.8 ± 1.0 N·m (78 ± 9 in-lb)
Fuel rail bolt		12 ± 1 N·m (100 ± 13 in-lb)
High pressure fuel hose connection bolt		4.9 ± 1.0 N·m (44 ± 8 in-lb)
Intake manifold bolt		4.9 ± 1.0 N·m (44 ± 8 in-lb)
Intake manifold nut		20 ± 2 N·m (14 ± 2 ft-lb)
Intake manifold stay bolt		30 ± 3 N·m (23 ± 2 ft-lb)
Manifold differential pressure sensor and ignition failure sensor bolt		4.9 ± 1.0 N·m (44 ± 8 in-lb)
Oil dipstick guide bolt		14 ± 1 N·m (117 ± 13 in-lb)
Pressure hose bolt		12 ± 2 N·m (100 ± 22 in-lb)
Vacuum pipe bolt		11 ± 1 N·m (98 ± 8 in-lb)
Intake manifold <3.0L Engine>		
Bracket bolt		23 ± 3 N·m (17 ± 3 ft-lb)
Fuel rail bolt		12 ± 1 N·m (100 ± 13 in-lb)
High pressure fuel hose connection bolt		4.9 ± 1.0 N·m (44 ± 8 in-lb)
Intake manifold nut		22 ± 1 N·m (16 ± 1 ft-lb)
Timing belt front upper cover bolt	M6	11 ± 1 N·m (98 ± 8 in-lb)
	M8	14 ± 1 N·m (117 ± 13 in-lb)
Intake manifold plenum <3.0L Engine>		
Control wiring harness connector bracket bolt		5.0 ± 1.0 N·m (44 ± 9 in-lb)
EGR pipe connection bolt		18 ± 2 N·m (13 ± 2 ft-lb)
EGR valve bolt		21 ± 4 N·m (16 ± 2 ft-lb)
Engine mount stay bolt		36 ± 6 N·m (27 ± 4 ft-lb)
Evaporative emission purge solenoid valve bolt [Vehicle with variable induction control (VIC) system]		9.0 ± 1.0 N·m (80 ± 9 in-lb)
Ground wire attaching bolt [Vehicle with variable induction control (VIC) system]		5.0 ± 1.0 N·m (44 ± 9 in-lb)
Heater pipe bolt		18 ± 2 N·m (13 ± 2 ft-lb)
Intake manifold plenum bolt and nut		18 ± 2 N·m (13 ± 2 ft-lb)
Intake manifold plenum stay bolt, front and rear	M8	18 ± 2 N·m (13 ± 2 ft-lb)
	M10	36 ± 6 N·m (27 ± 4 ft-lb)
Manifold differential pressure sensor bolt		5.0 ± 1.0 N·m (44 ± 9 in-lb)

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ITEMS		SPECIFICATIONS
Power steering oil pump bracket stay bolt (bolt, washer assembly)		44 ± 10 N·m (33 ± 7 ft-lb)
Power steering oil pump bracket stay bolt (bolt, flange)		24 ± 4 N·m (18 ± 3 ft-lb)
Power steering oil pump nut		42 ± 7 N·m (31 ± 5 ft-lb)
Sensor connector assembly bolt		11 ± 1 N·m (98 ± 8 in-lb)
Vacuum control valve [Vehicle with variable induction control (VIC) system]		11 ± 1 N·m (98 ± 8 in-lb)
Vacuum pipe assembly bolt		11 ± 1 N·m (98 ± 8 in-lb)
Vacuum tank bolt [Vehicle with variable induction control (VIC) system]	M6	9.0 ± 1.0 N·m (80 ± 9 in-lb)
	M8	18 ± 2 N·m (13 ± 2 ft-lb)
Valve assembly bolt		9.0 ± 1.0 N·m (80 ± 9 in-lb)

SERVICE SPECIFICATION

M1151000300224

ITEM	STANDARD VALUE	LIMIT
Variable induction control solenoid coil resistance [at 20°C (68°F)] Ω	29 – 35	–
Manifold distortion of the installation surface mm (in)	0.15 (0.006) or less	0.20 (0.008)

GROUP 16

ENGINE ELECTRICAL

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SPECIFICATIONS **16-59**

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SERVICE SPECIFICATIONS 16-61

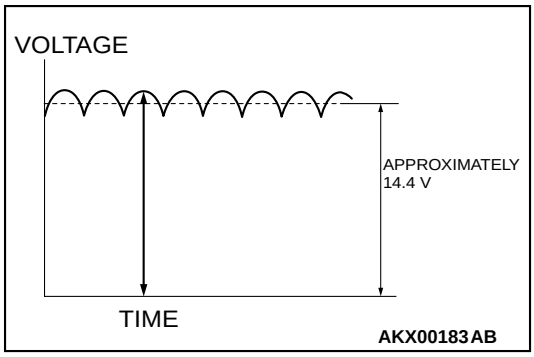
CHARGING SYSTEM

GENERAL DESCRIPTION

M1161000100094

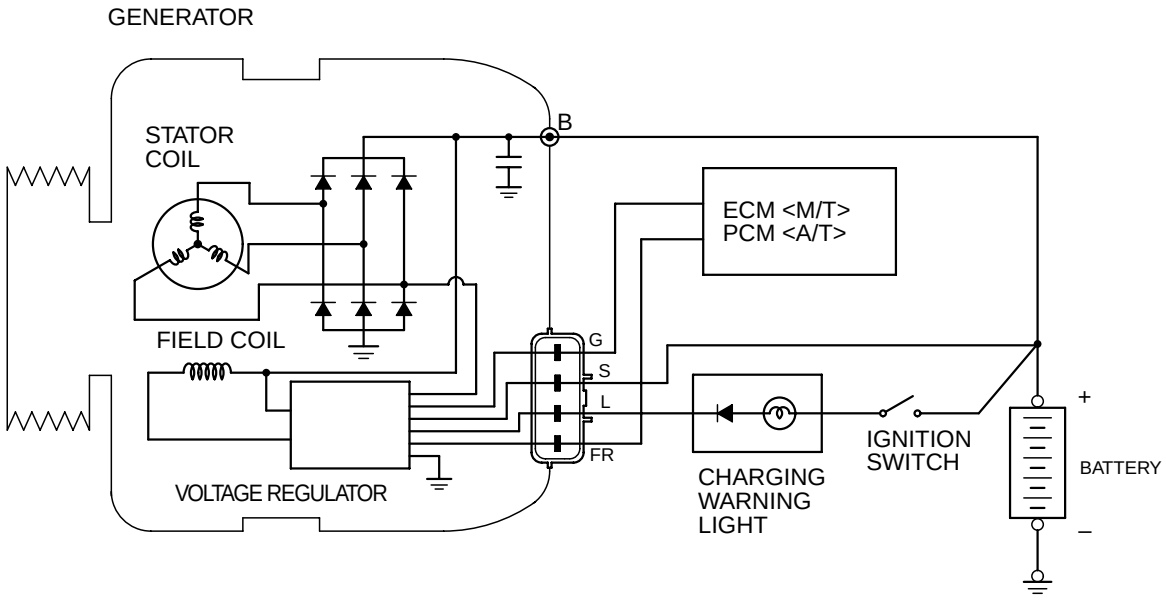
The charging system charges the battery with the generator output to keep the battery charged at a constant level during varying electrical load.

Operation



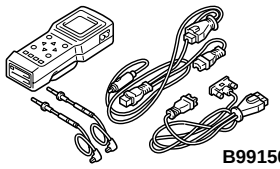
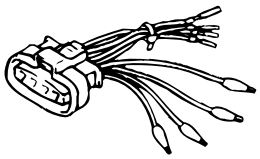
Rotation of the excited field coil generates AC voltage in the stator.
This alternating current is rectified through diodes to DC voltage having a waveform shown in the illustration at left.
The average output voltage fluctuates slightly with the generator load condition.

When the ignition switch is turned on, current flows in the field coil and initial excitation of the field coil occurs.
When the stator coil begins to generate power after the engine is started, the field coil is excited by the output current of the stator coil.
The generator output voltage rises as the field current increases and it falls as the field current decreases. When the battery positive voltage (generator S terminal voltage) reaches a regulated voltage of approximately 14.4 V, the field current is cut off.
When the battery positive voltage drops below the regulated voltage, the voltage regulator regulates the output voltage to a constant level by controlling the field current.
In addition, when the field current is constant, the generator output voltage rises as the engine speed increases.



SPECIAL TOOL

M1161000600055

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 B991502	MB991502 Scan tool (MUT-II)	MB991496-OD	Checking of engine idle speed
	MB991519 Generator harness connector	Tool not available	Checking of generator (S terminal voltage)

CHARGING SYSTEM DIAGNOSIS

M1161000700085

TROUBLESHOOTING HINTS

1. Charging warning light does not go on when the ignition switch is turned to ON, before the engine starts.
   - Check the bulb.
2. Charging warning light does not switch off after the engine starts.
   - Check the IC voltage regulator inside the generator.
3. Discharged or overcharged battery.
   - Check the IC voltage regulator inside the generator.
4. The charging warning light illuminates dimly.
   - Check the diode (inside the combination meter) for a short-circuit.

TROUBLESHOOTING GUIDE

The charging system troubleshooting guide is shown in the following chart.

STEP 1.

Q: Is the battery in good condition? (Refer to GROUP 54A, Battery – On-vehicle Service – Battery Check P.54A-5.)

YES : Go to Step 2.
NO : Charge or replace the battery.

STEP 2.

Q: Is the generator drive belt in good condition? (Refer to GROUP 00, Maintenance Service – Drive Belts P.00-44.)

YES : Go to Step 3.
NO : Adjust the belt tension or replace the belt.

STEP 3.

Q: Does the charging warning light brightly when the ignition switch is turned on?

YES : Go to Step 4.

NO :
- Check the ignition switch. (Refer to GROUP 54A, Ignition switch P.54A-236.)
- Check for burnt-out charging warning light.
- Check the generator. (Refer to Generator – Disassembly and assembly – Inspection P.16-19.)
- Check the charging warning light-related circuits.

STEP 4.

Q: Does the charging warning light go out after starting the engine?

YES : Go to Step 5.

NO : Check the generator (Refer to Generator – Disassembly and assembly – Inspection P.16-19.)

STEP 5.

Q: Is an oscilloscope available?

YES : Go to Step 6.

NO : Go to Step 7.

STEP 6.

Q: Dose the oscilloscope show a normal wave pattern? (Refer to Charging system – Wave pattern check using a oscilloscope P.16-11.)

YES : Go to Step 7.

NO : Check the generator. (Refer to Generator – Disassembly and assembly – Inspection P.16-19.)

STEP 7.
- Engine: 2,500 r/min
- Headlight: ON (high beam)
- Voltage between generator terminal B and the positive battery terminal
  OK: 0.5 V or less
- Voltage between the negative battery terminal and generator body
  OK: 0.5 V or less

Q: Are the generator output line and ground line in good condition?

YES : Go to Step 8.

NO : Check the generator output line and ground line.

STEP 8.

Q: Is the output current normal? (Refer to Charging system – On vehicle service – Output current test P.16-8.)

YES : Go to Step 9.
NO : Check the generator (Refer to Generator – Disassembly and assembly – Inspection P.16-19.)

STEP 9.

Q: Is the regulated voltage normal? (Refer to Charging system – On vehicle service – Regulated voltage test P.16-10.)

YES : Go to Step 10.
NO : Check the generator (Refer to Generator – Disassembly and assembly – Inspection P.16-19.)

STEP 10.

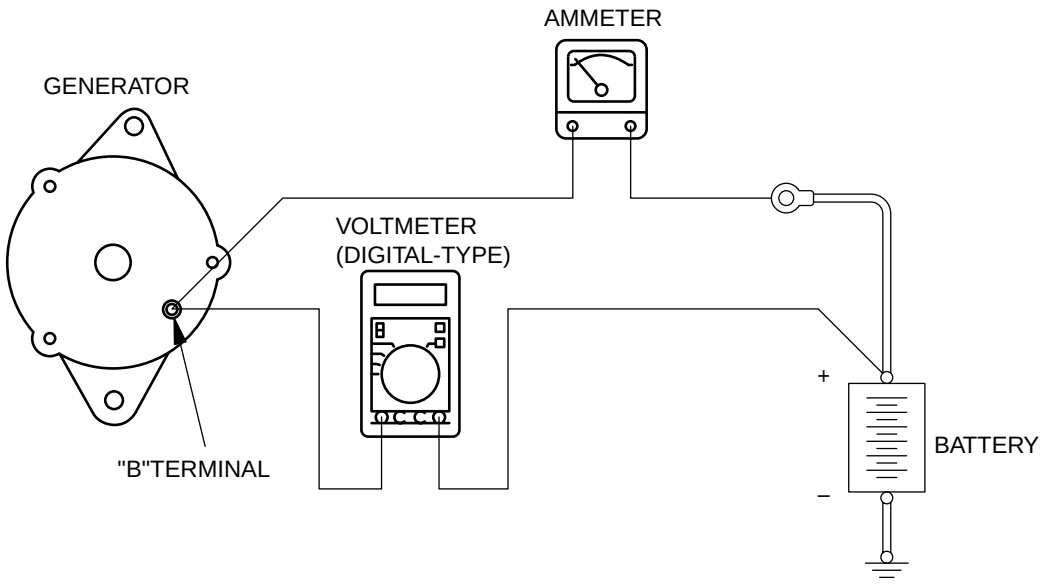
Q: Is the voltage drops in the generator output line normal?

YES : Generator is normal. Check other systems.
NO : Check the output line.

ON-VEHICLE SERVICE

GENERATOR OUTPUT LINE VOLTAGE DROP TEST

M1161000900067



AKX00185AB

Required Special Tool:
MB991502: Scan Tool (MUT-II)
This test determines whether the wiring from the generator "B" terminal to the positive battery terminal (including the fusible link) is in good condition or not:

1. Always be sure to check the following before the test.
   - Generator installation
   - Generator drive belt tension (Refer to GROUP 00, Maintenance Service – Drive Belts P.00-44.)
   - Fusible link
   - Abnormal noise from the generator while the engine is running

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2. Turn the ignition switch to the "LOCK" (OFF) position.

⚠ ***WARNING***

Battery posts, terminals and related accessories contain lead and lead compounds. WASH HANDS AFTER HANDLING.

3. Disconnect the negative battery cable.
4. Disconnect the generator output wire from the generator "B" terminal and connect a DC test ammeter with a range of 0 – 100 A in series between the "B" terminal and the disconnected output wire. (Connect the positive lead of the ammeter to the "B" terminal, and then connect the negative lead of the ammeter to the disconnected output wire.)

   NOTE: A clamp-type ammeter which enables measurements to be taken without disconnecting the generator output wire is recommended. If the voltage may have dropped due to a bad connection at generator "B" terminal and the generator "B" terminal is loosened when the test ammeter is connected, the connection will be completed at this time and the possibility of finding the problems will be reduced.
5. Connect a digital-type voltmeter between the generator "B" terminal and the positive battery terminal. (Connect the positive lead of the voltmeter to the "B" terminal, and then connect the negative lead of the voltmeter to the positive battery cable.)

⚠ ***WARNING***

Battery posts, terminals and related accessories contain lead and lead compounds. WASH HANDS AFTER HANDLING.

6. Reconnect the negative battery cable.
7. Connect a tachometer or scan tool MB991502.
8. Leave the hood open.
9. Start the engine.
10. With the engine running at 2,500 r/min, turn the headlights and other lights on and off to adjust the generator load so that the value displayed on the ammeter is slightly above 30 A.

    Limit value: maximum 0.3 V

    NOTE: When the generator output is high and the value displayed on the ammeter does not decrease to 30 A, set the value to 40 A. Read the value displayed on the voltmeter at this time. In this case the limit value becomes maximum 0.4 V.

    Adjust the engine speed by gradually decreasing it until the value displayed on the ammeter is 30 A. Take a reading of the value displayed on the voltmeter at this time.
11. If the value displayed on the voltmeter is above the limit value, there is probably a malfunction in the generator output wire. Check the wiring between the generator "B" terminal and the positive battery terminal (including fusible link).

    If a terminal is not sufficiently tight or if the harness has become discolored due to overheating, repair and then test again.
12. After the test, run the engine at idle.
13. Turn off all lights and turn the ignition switch to the "LOCK" (OFF) position.
14. Disconnect the tachometer or scan tool MB991502.

⚠ ***WARNING***

Battery posts, terminals and related accessories contain lead and lead compounds. WASH HANDS AFTER HANDLING.

15. Disconnect the negative battery cable.
16. Disconnect the ammeter and voltmeter and tachometer.
17. Connect the generator output wire to the generator "B" terminal.

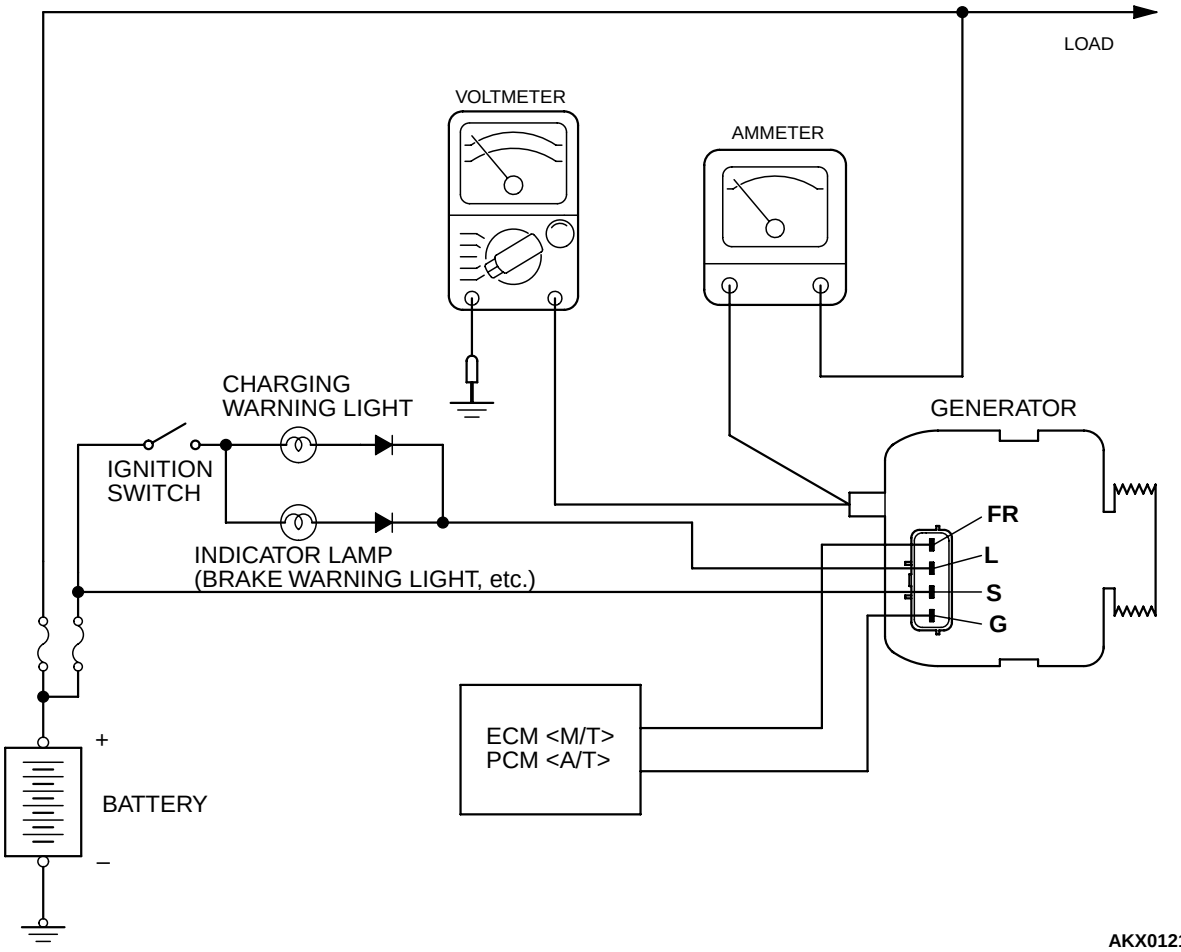
⚠ ***WARNING***

Battery posts, terminals and related accessories contain lead and lead compounds. WASH HANDS AFTER HANDLING.

18. Connect the negative battery cable.

OUTPUT CURRENT TEST

M1161001000119



Required Special Tool:

- MB991502: Scan Tool (MUT-II)

This test determines whether the generator outputs normal current.

1. Before the test, always be sure to check the following.
   - Generator installation
   - Battery (Refer to GROUP 54A, Battery – On-vehicle Service – Battery Check P.54A-5.)

     NOTE: The battery to be used should be slightly discharged. The load in a fully-charged battery will be insufficient and the test may not be able to be carried out correctly.
   - Generator drive belt tension (Refer to GROUP 00, Maintenance Service – Drive Belts P.00-44.)
   - Fusible link
   - Abnormal noise from the generator while the engine is running
2. Turn the ignition switch to the "LOCK" (OFF) position.

⚠ WARNING

Battery posts, terminals and related accessories contain lead and lead compounds. WASH HANDS AFTER HANDLING.

3. Disconnect the negative battery cable.

⚠ WARNING

Never use clips to connect the line. Loose connections (e.g. using clips) will lead to a serious accident because of high current.

4. Disconnect the generator output wire from the generator "B" terminal and connect a DC test ammeter with a range of 0 – 100 A in series between the "B" terminal and the disconnected output wire. (Connect the positive lead of the ammeter to the "B" terminal, and then connect the negative lead of the ammeter to the disconnected output wire.)

   NOTE: A clamp-type ammeter which enables measurements to be taken without disconnecting the generator output wire is recommended.

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5. Connect a voltmeter with a range of 0 – 20 V between the generator "B" terminal and the ground. (Connect the positive lead of the voltmeter to the "B" terminal, and then connect the negative lead of the voltmeter to the ground.)

⚠ ***WARNING***

Battery posts, terminals and related accessories contain lead and lead compounds. WASH HANDS AFTER HANDLING.

6. Connect the negative battery cable.
7. Connect a tachometer or scan tool MB991502.
8. Leave the hood open.
9. Check to be sure that the reading on the voltmeter is equal to the battery positive voltage.

   NOTE: If the voltage is 0 V, the cause is probably an open circuit in the wire or fusible link between the generator "B" terminal and the battery positive terminal.

10. After turning the light switch on and turning on the headlights, start the engine.

    NOTE: Because the current from the battery will soon drop after the engine is started, step 11 should be carried out as quickly as possible in order to obtain the maximum current output value.

11. Immediately after setting the headlights to high beam and turning the heater blower switch to the high revolution position, increase the engine speed to 2,500 r/min and read the maximum current output value displayed on the ammeter.

    Limit value: 70% of nominal current output

    NOTE: For the nominal current output, refer to the Generator Specifications.

    NOTE: The current output value will depend on the electrical load and the temperature of the generator body.

    NOTE: If the electrical load is small while testing, the specified level of current may not be output even though the generator is normal. In such cases, increase the electrical load by leaving the headlights turned on for some time to discharge the battery or by using the lighting system in another vehicle, and then test again.

    NOTE: The specified level of current also may not be output if the temperature of the generator body or the ambient temperature is too high. In such cases, cool the generator and then test again.

12. The reading on the ammeter should be above the limit value. If the reading is below the limit value and the generator output wire is normal, remove the generator from the engine and check the generator.
13. Run the engine at idle speed after the test.
14. Turn the ignition switch to the "LOCK" (OFF) position.
15. Disconnect the tachometer or scan tool MB991502.

⚠ ***WARNING***

Battery posts, terminals and related accessories contain lead and lead compounds. WASH HANDS AFTER HANDLING.

16. Disconnect the negative battery cable.
17. Disconnect the ammeter and voltmeter and tachometer.
18. Connect the generator output wire to the generator "B" terminal.

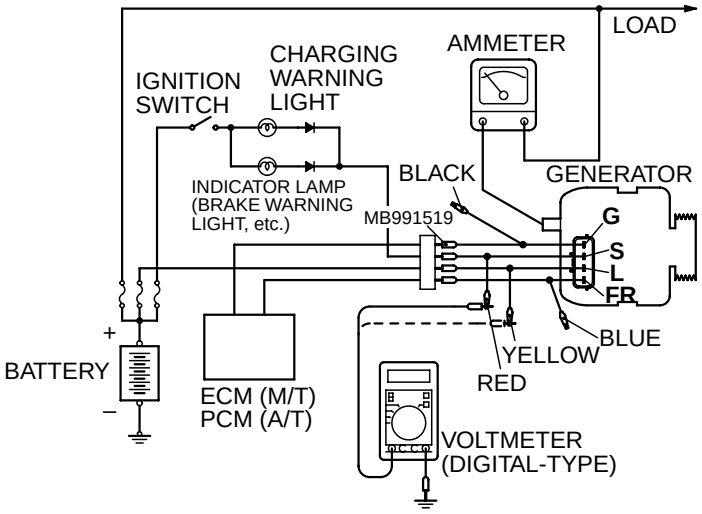
⚠ ***WARNING***

Battery posts, terminals and related accessories contain lead and lead compounds. WASH HANDS AFTER HANDLING.

19. Connect the negative battery cable.Before the test, always be sure to check the following.

REGULATED VOLTAGE TEST

M1161001100116



AKX01215 AB

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991519: Generator Harness Connector

This test determines whether the voltage regulator is correctly controlling the generator output voltage.

1. Always be sure to check the following before the test:
   - Generator installation
   - Check to be sure that the battery installed in the vehicle is fully charged. (Refer to GROUP 54A, Battery – On-vehicle Service – Battery Check P.54A-5.)
   - Generator drive belt tension (Refer to GROUP 00, Maintenance Service – Drive Belts P.00-44.)
   - Fusible link
   - Abnormal noise from the generator while the engine is running
2. Turn the ignition switch to the "LOCK" (OFF) position.

⚠ ***WARNING***

Battery posts, terminals and related accessories contain lead and lead compounds. WASH HANDS AFTER HANDLING.

3. Disconnect the negative battery cable.
4. Use the special tool (Generator harness connector: MB991519) to connect a digital-type voltmeter between the generator "S" terminal and the ground. (Connect the positive lead of the voltmeter to the "S" terminal, and then connect the negative lead of the voltmeter to a secure ground or to the negative battery terminal.)
5. Disconnect the generator output wire from the generator "B" terminal.
6. Connect a DC test ammeter with a range of 0 – 100 A in series between the "B" terminal and the disconnected output wire. (Connect the positive load of the ammeter to the "B" terminal, and then connect the negative lead of the ammeter to the disconnected output wire.)

⚠ ***WARNING***

Battery posts, terminals and related accessories contain lead and lead compounds. WASH HANDS AFTER HANDLING.

7. Reconnect the negative battery cable.
8. Connect a tachometer or the scan tool MB991502.
9. Turn the ignition switch to the "ON" position and check that the reading on the voltmeter is equal to the battery positive voltage.

   NOTE: If the voltage is 0 V, the cause is probably an open circuit in the wire or fusible link between the generator "S" terminal and the battery positive terminal.
10. Check to be sure that all lights and accessories are off.
11. Start the engine.
12. Increase the engine speed to 2,500 r/min.
13. Read the value displayed on the voltmeter when the current output by the generator becomes 10 A or less.

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14.If the voltage reading conforms to the value in the voltage regulation table, then the voltage regulator is operating normally.

If the voltage is outside the standard value, there is a malfunction of the voltage regulator or the generator (Refer to the following table).

15.After the test, lower the engine speed to the idle speed.

16.Turn the ignition switch to the "LOCK" (OFF) position.

⚠ WARNING

Battery posts, terminals and related accessories contain lead and lead compounds. WASH HANDS AFTER HANDLING.

17.Disconnect the negative battery cable.

18.Disconnect the ammeter, voltmeter and tachometer.

19.Connect the generator output wire to the generator "B" terminal.

⚠ WARNING

Battery posts, terminals and related accessories contain lead and lead compounds. WASH HANDS AFTER HANDLING.

20.Connect the negative battery cable.

VOLTAGE REGULATION TABLE

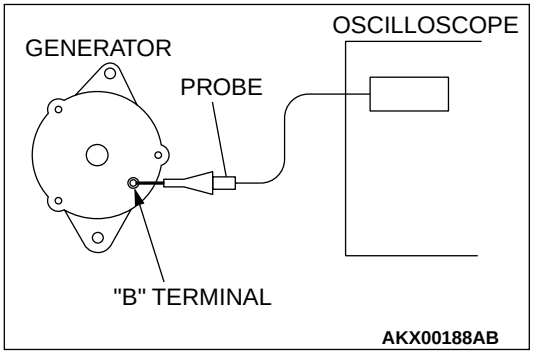
INSPECTION TERMINAL	VOLTAGE REGULATOR AMBIENT TEMPERATURE [°C (°F)]	STANDARD VALUE (V)
Terminal "S"	–20 (–4)	14.2 – 15.4
	20 (68)	13.9 – 14.9
	60 (140)	13.4 – 14.5
	80 (176)	13.1 – 14.5

WAVE PATTERN CHECK USING AN OSCILLOSCOPE

M1161001200049

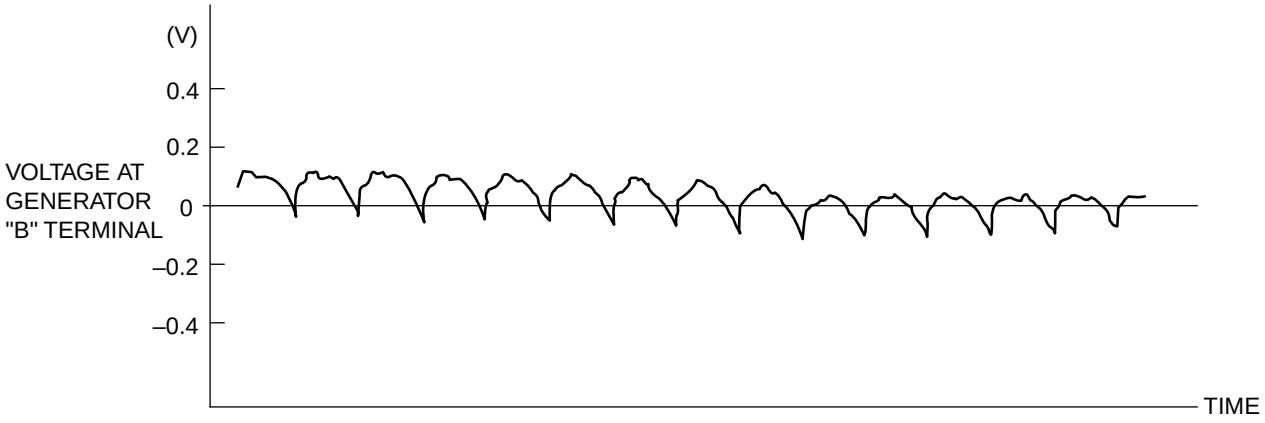
Measurement Method

Connect the oscilloscope probe to the generator "B" terminal.

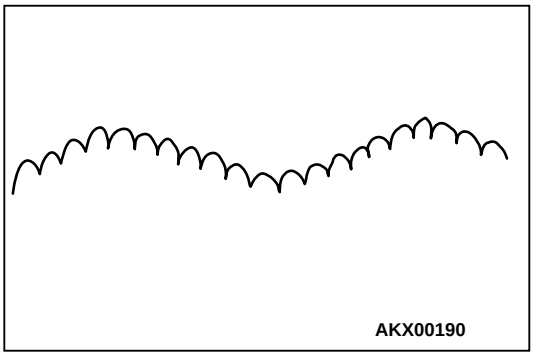


Standard Waveform

Observation Conditions	
FUNCTION	**SPECIAL PATTERNS**
Pattern height	Variable
Variable knob	Adjust while viewing the wave pattern
Pattern selector	Raster
Engine revolutions	Curb idle speed



AKX00189 AB



AKX00190

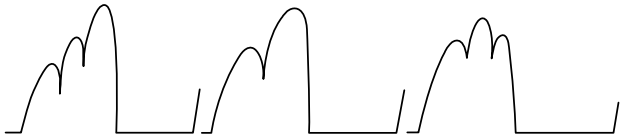
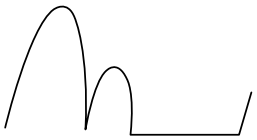
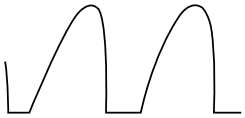
NOTE: The voltage waveform of the generator "B" terminal can undulate as shown at left. This waveform is produced when the regulator operates according to fluctuations in the generator load (current), and is normal for the generator. If the ripple height is abnormally high (approximately 2 V or more during idling), the wires between the generator B terminal and the battery have broken due to fuse blowing, etc. The generator is usually operating properly.

Abnormal Waveforms Examples

NOTE: The size of the waveform patterns can differ greatly, depending on the adjustment of the variable knob on the oscilloscope.

NOTE: Identification of abnormal waveforms is easier when there is a large output current (regulator is not operating). (Waveforms can be observed when the headlights are illuminated.)

NOTE: Check the conditions of the charging indicator light (illuminated/not illuminated) also, and carry out a total check.

ABNORMAL WAVEFORMS	PROBABLE CAUSE
Example 1  AKX00191	Open circuit in diode
Example 2  AKX00192	Short-circuit in diode
Example 3  AKX00193	Open circuit in stator coil
Example 4 AKX00194	Short-circuit in stator coil
Example 5 AKX00195	Open circuit in supplementary diode

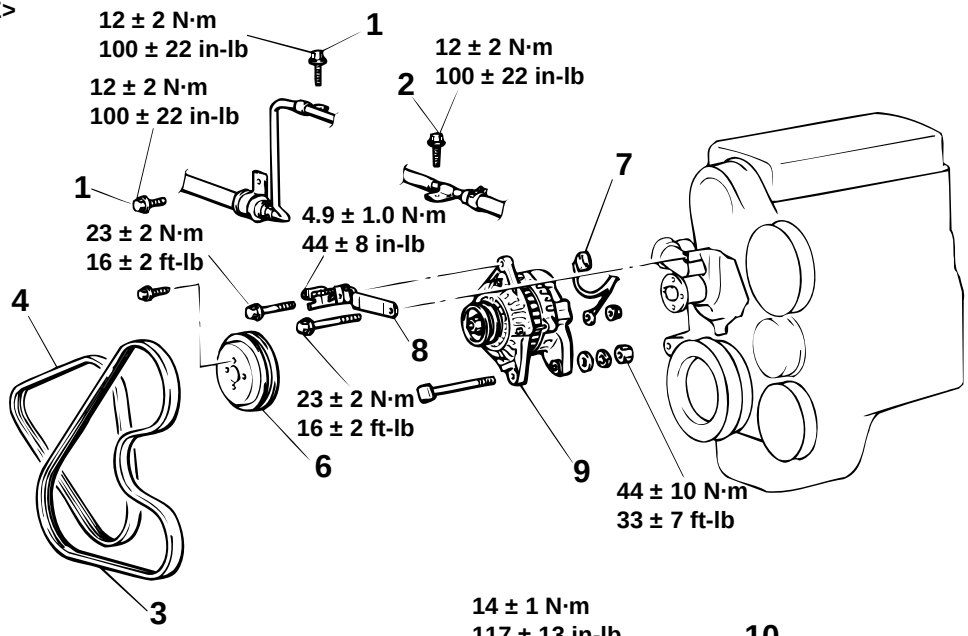
GENERATOR ASSEMBLY

REMOVAL AND INSTALLATION

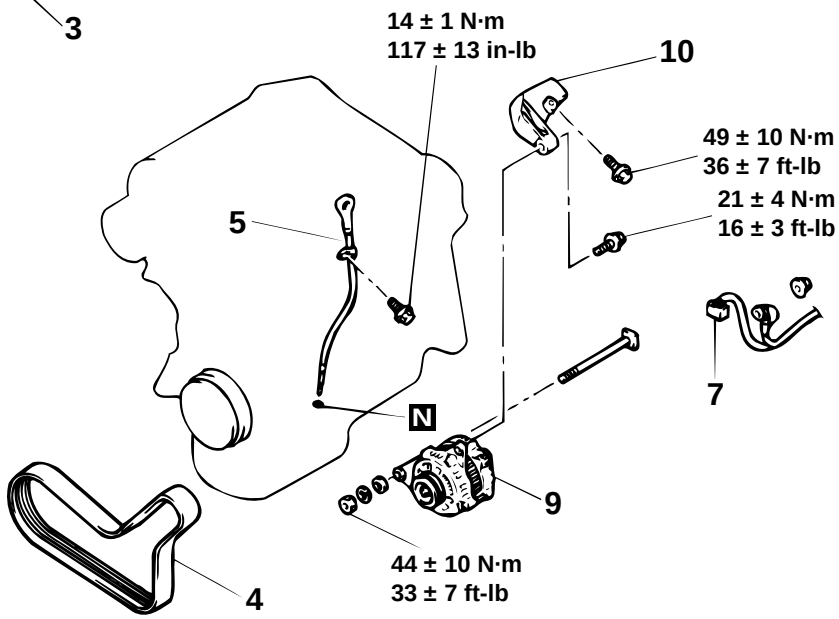
M1161001400214

Pre-removal Operation	Post-installation Operation
• Under Cover Removal • Engine Mount Bracket Removal (Refer to GROUP 32, Engine Mount P.32-4.)	• Engine Mount Bracket Installation (Refer to GROUP 32 P.32-4.) • Drive Belt Tension Adjustment (Refer to GROUP 00, Maintenance Service – Drive Belts P.00-44.) • Under Cover Installation

<2.4L ENGINE>



<3.0L ENGINE>



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REMOVAL STEPS

1. OIL PRESSURE HOSE AND TUBE ASSEMBLY CLAMP BOLTS <2.4L ENGINE>
2. OIL RETURN TUBE ASSEMBLY CLAMP BOLT <2.4L ENGINE>

<<A>>

3. DRIVE BELT (POWER STEERING, A/C) <2.4L ENGINE>
4. DRIVE BELT (GENERATOR)

REMOVAL STEPS (Continued)

5. OIL LEVEL GAUGE UNIT <3.0L ENGINE>
6. WATER PUMP PULLEY <2.4L ENGINE>
7. GENERATOR CONNECTOR
8. GENERATOR BRACE <2.4L ENGINE>

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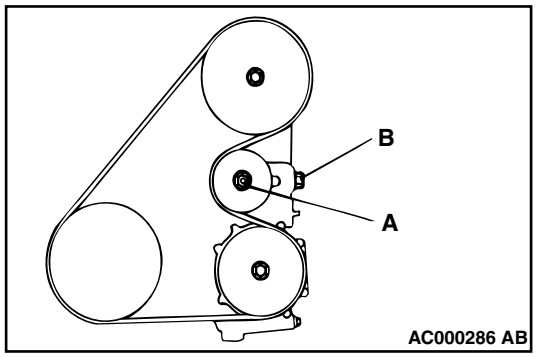
REMOVAL STEPS (Continued)

9. GENERATOR
10. GENERATOR BRACE <3.0L ENGINE>



REMOVAL SERVICE POINT

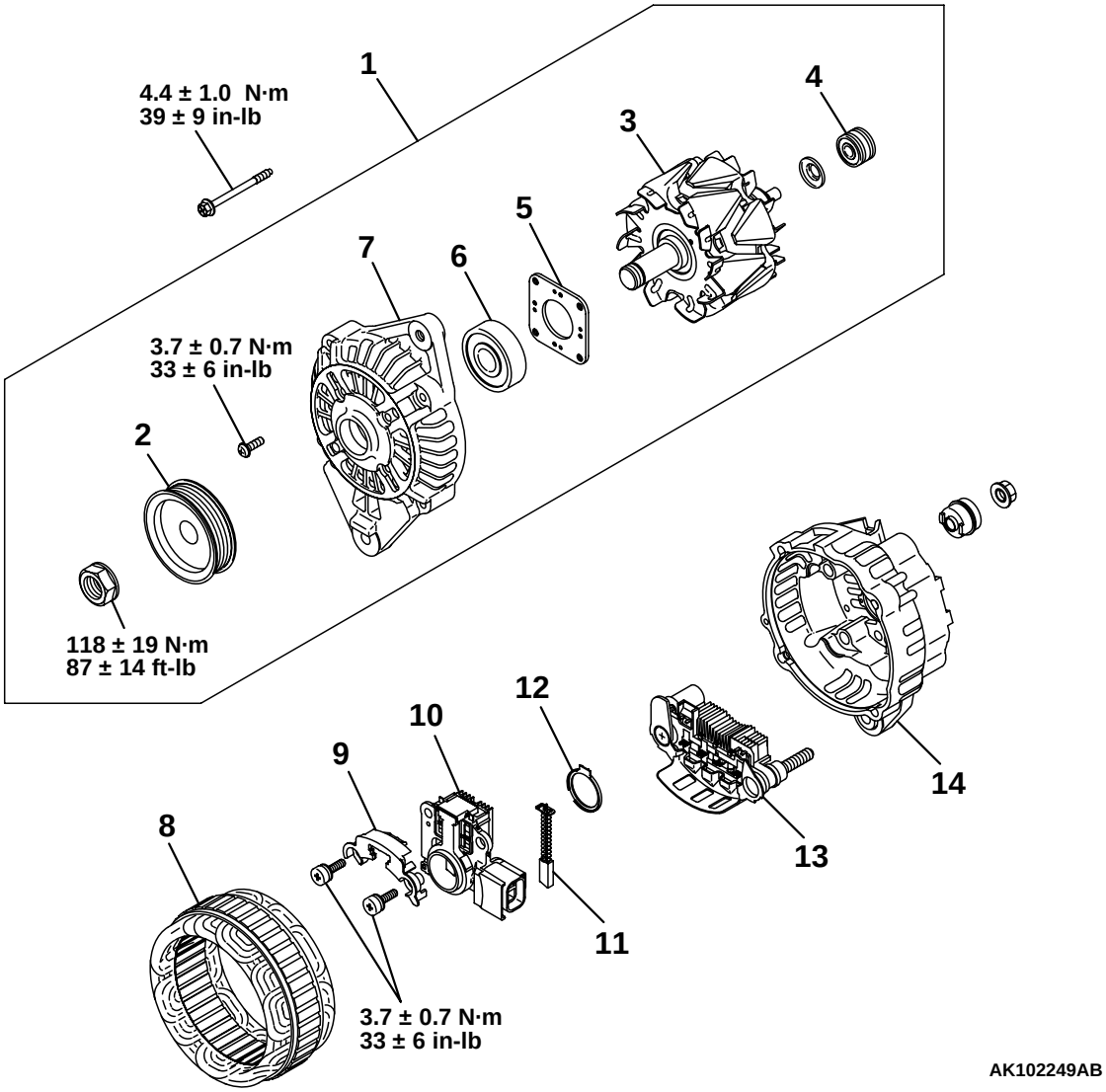
<<A>> DRIVE BELT (POWER STEERING, A/C) REMOVAL

1. Loosen nut "A" for holding the tension pulley.
2. Loosen bolt "B" for adjustments.
3. Remove the drive belt.

DISASSEMBLY AND ASSEMBLY

M1161001600070

<2.4L ENGINE>

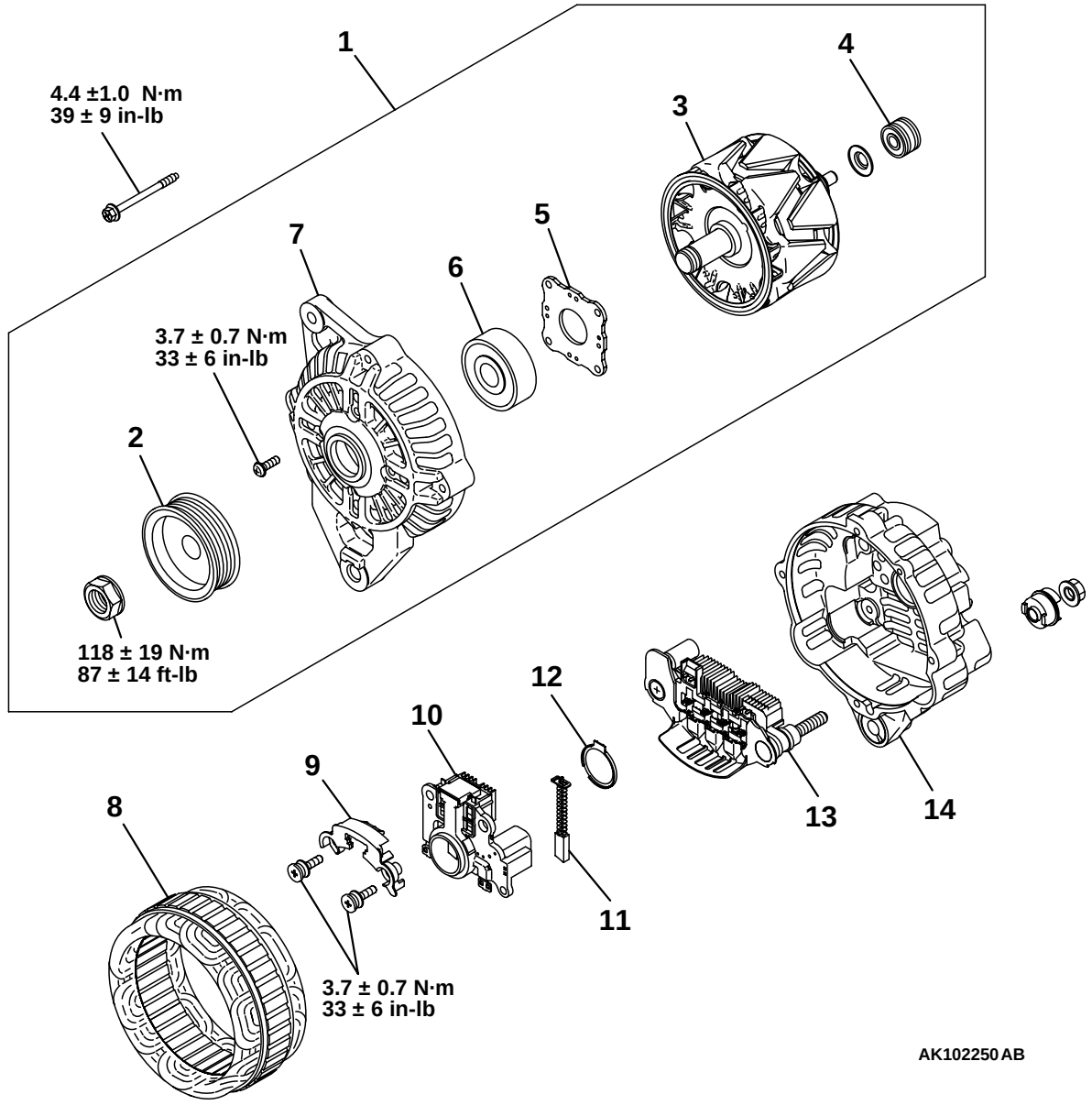


AK102249AB

		DISASSEMBLY STEPS
<<A>>		1. FRONT BRACKET ASSEMBLY
<<B>>		2. GENERATOR PULLEY
	>>B<<	3. ROTOR ASSEMBLY
		4. REAR BEARING
		5. BEARING RETAINER
		6. FRONT BEARING
		7. FRONT BRACKET

		DISASSEMBLY STEPS
<<C>>		8. STATOR
		9. PLATE
	>>A<<	10. REGULATOR ASSEMBLY
		11. BRUSH
		12. SLINGER
		13. RECTIFIER
		14. REAR BRACKET

<3.0L ENGINE>



		DISASSEMBLY STEPS
<<A>>	1.	FRONT BRACKET ASSEMBLY
<<B>>	2.	GENERATOR PULLEY
>>B<<	3.	ROTOR ASSEMBLY
	4.	REAR BEARING
	5.	BEARING RETAINER
	6.	FRONT BEARING
	7.	FRONT BRACKET

		DISASSEMBLY STEPS
<<C>>	8.	STATOR
	9.	PLATE
>>A<<	10.	REGULATOR ASSEMBLY
	11.	BRUSH
	12.	SLINGER
	13.	RECTIFIER
	14.	REAR BRACKET

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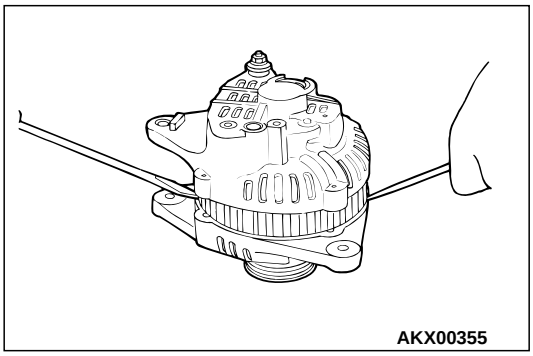
DISASSEMBLY SERVICE POINTS

<<A>> FRONT BRACKET ASSEMBLY REMOVAL

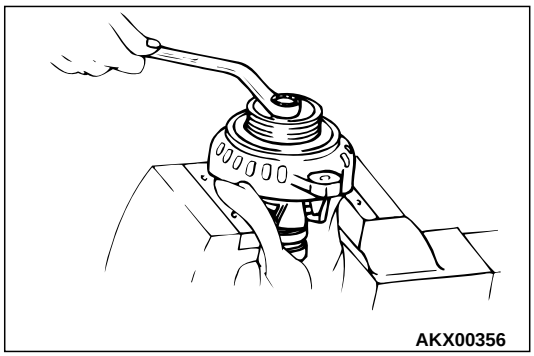

AKX00355

⚠ CAUTION

Do not insert a screwdriver too deep. The stator coil will be damaged.

Insert a flat-tipped screwdriver between the front bracket assembly and the stator core, and pry it downward to separate the stator and front bracket assembly.

<<B>> GENERATOR PULLEY REMOVAL

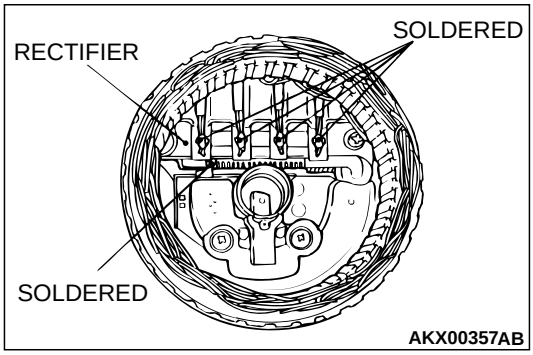

AKX00356

⚠ CAUTION

Make sure not to damage the rotor.

Set the pulley upward, clamp the rotor in a vise, and remove the pulley.

<<C>> STATOR REMOVAL



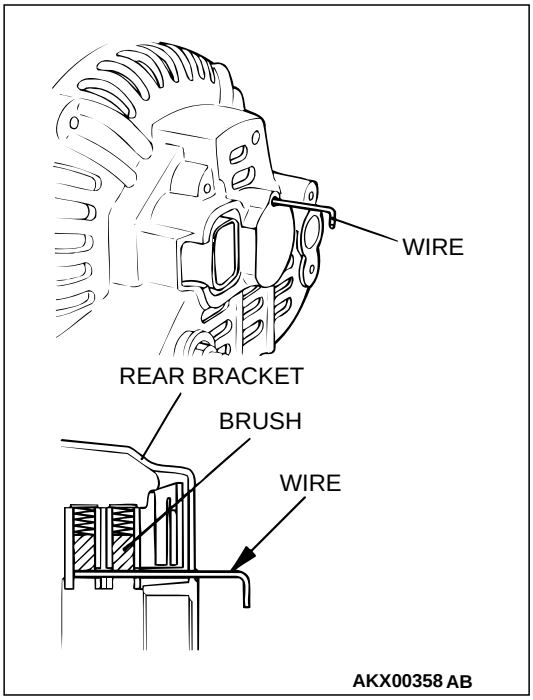
AKX00357AB

⚠ CAUTION

- **Check that the heat from the soldering iron is not transmitted to the diode for a long time.**
- **Use care that no undue force is exerted to leads of diodes.**

1. Use a soldering iron (180 to 250 W) to unsolder the stator. This work should complete within approximately four seconds to prevent heat from transferring to the diode.
2. When removing the rectifier from the regulator assembly, unsolder the points soldered on the rectifier.

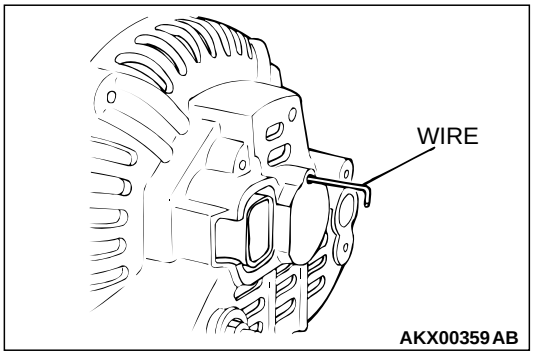
ASSEMBLY SERVICE POINTS



>>A<< REGULATOR ASSEMBLY INSTALLATION

After installing the regulator assembly, insert a wire through the hole provided on the rear bracket while pressing down on the brush, and secure the brush.

NOTE: By inserting a wire, the brush will be secured in place, and the installation of the rotor will be easier.

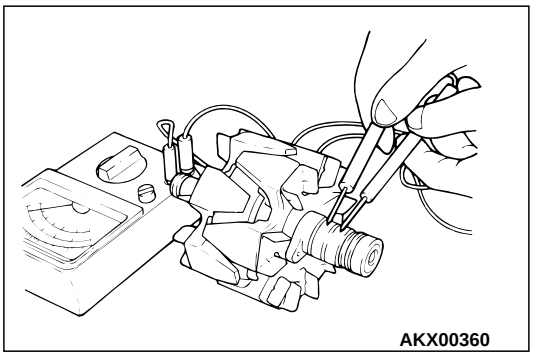


>>B<< ROTOR ASSEMBLY INSTALLATION

After installing the rotor, remove the wire used to secure the brush.

INSPECTION

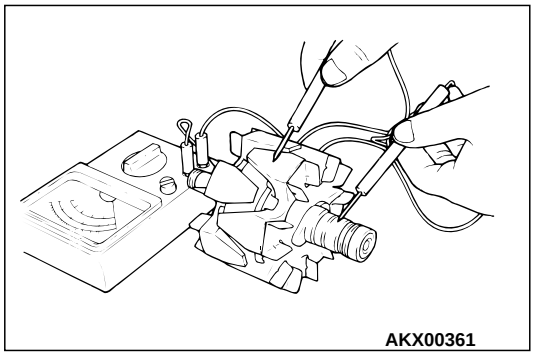
M1161001700022



ROTOR CHECK

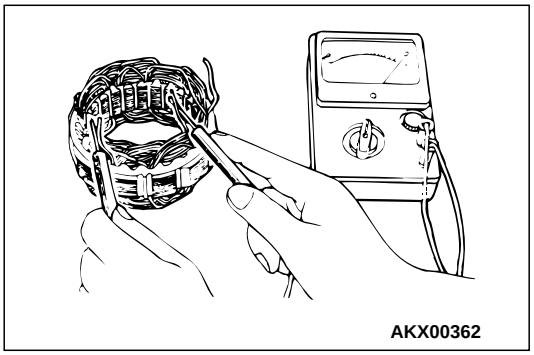
1. Check the continuity between the slip rings of the field coil. If the resistance value is not within the standard value, replace the rotor.

   Standard value: approximately 2 – 5 Ω

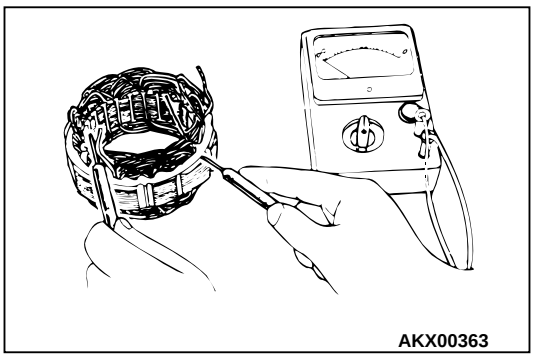

AKX00361

2. Check the continuity between the slip ring and the core. If there is continuity, replace the rotor.

STATOR CHECK

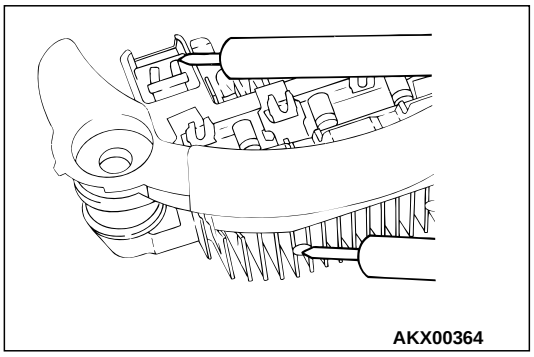

AKX00362

1. Check the continuity between the coil lead. If there is no continuity, replace the stator.

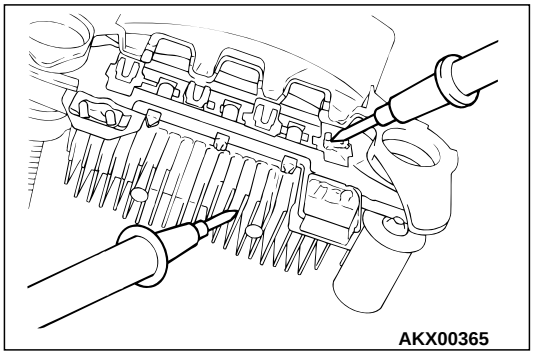

AKX00363

2. Check the continuity between the coil and the core. If there is continuity, replace the stator.

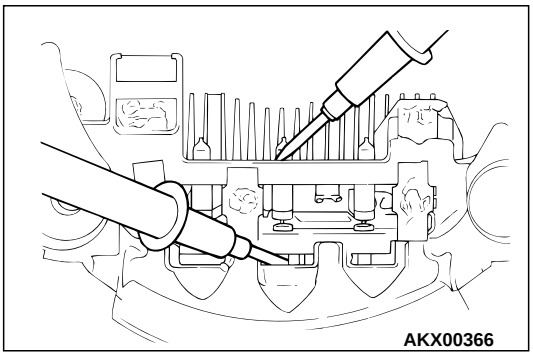
RECTIFIER CHECK


AKX00364

1. Check the continuity between the positive rectifier and the stator coil lead connection terminal with a tester. If there is continuity between the terminals, the diode is shorted, so replace the rectifier.

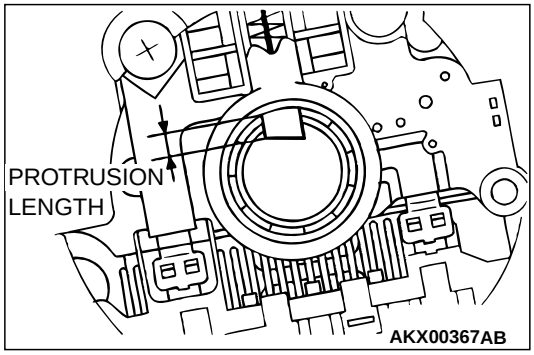

AKX00365

2. Check the continuity between the negative rectifier and the stator coil lead connection terminal with a tester. If there is continuity between the terminals, the diode is grounded, so replace the rectifier.


AKX00366

3. Check the continuity of the three diodes by connecting an ohmmeter to both ends of each diode. If there is continuity between the directions, or if there is no continuity, the diode is damaged, so replace the rectifier.

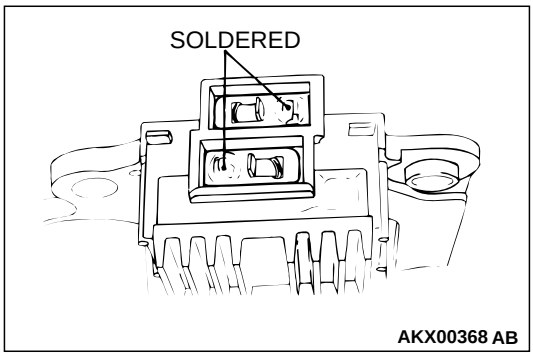
BRUSH CHECK



AKX00367AB

1. Replace the brush if the brush protrusion length shown in the illustration is below the minimum limit value.

   Minimum limit: 2 mm (0.08 inch)



AKX00368 AB

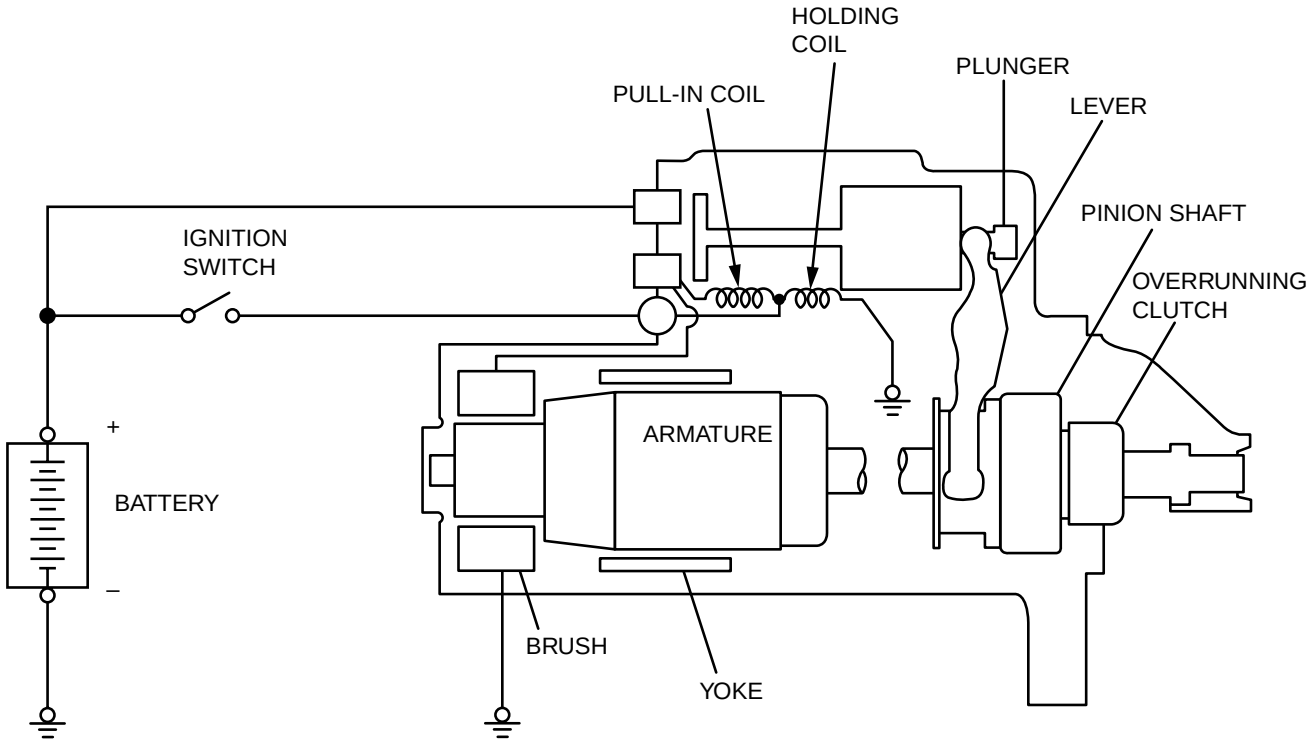
2. The brush can be removed by unsoldering the brush lead wire.
3. When installing a new brush, push the brush in to the brush holder, and solder the lead wire.

STARTING SYSTEM

GENERAL DESCRIPTION

M1162000100042

If the ignition switch is turned to the "START" position, current flows in the coil provided inside magnetic switch, attracting the plunger. When the plunger is attracted, the lever connected to the plunger is actuated to engage the starter clutch.
On the other hand, attracting the plunger will turn on the magnetic switch, allowing the B terminal and M terminal to conduct. Thus, current flows to engage the starter motor.
When the ignition switch is returned to the "ON" position after starting the engine, the starter clutch is disengaged from the ring gear.
An overrunning clutch is provided between the pinion and the armature shaft, to prevent damage to the starter.



AKX00196 AB

OPERATION

- For models equipped with M/T, the clutch pedal position switch contact is switched OFF when the clutch pedal is depressed. When the ignition switch is then switched to the "ST" position, electricity flows to the starter relay and the starter motor, the contact (magnetic switch) of the starter is switched ON and the starter motor is activated.

NOTE: If the ignition switch is switched to the "ST" position without the clutch pedal being depressed, electricity flows to the starter relay (coil), the clutch pedal position switch (contacts) and to ground, with the result that the contacts of the starter relay are switched OFF, and because the power to the starter motor is thereby interrupted, the starter motor in not activated.

TSB Revision

- For models equipped with A/T, when the ignition switch is switched to the "ST" position while the selector lever is at the "P" or "N" position, the contact (magnetic switch) of the starter is switched ON and the starter motor is activated.

DIAGNOSIS

M1162000700163

TROUBLESHOOTING HINTS

The starter motor does not operate at all.
- Check the starter (coil).
- Check for poor contact at the battery terminals and starter.
- Check the park/neutral position switch. <A/T>
- Check starter relay. <M/T>
- Check the clutch pedal position switch.
- Check the theft-alarm starter relay.

The starter motor doesn't stop
- Check the starter (magnetic switch).

TROUBLESHOOTING GUIDE

The starting system troubleshooting guide is shown in the following chart.

STEP 1.

Q: Is the battery in good condition? (Refer to GROUP 54A, Battery – On-vehicle Service – Battery Check P.54A-5).

YES : Go to Step 2.
NO : Charge or replace the battery.

STEP 2.
- Disconnect the starter motor S (solenoid) terminal connector.
- Using a jumper wire, apply battery positive voltage to the starter motor S (solenoid) terminal.
- Check the engine condition.
  OK: Turns normally

Q: Dose the starter motor operate normally?

YES :
- Check the ignition switch (Refer to GROUP 54A, Ignition Switch - Ignition Switch P.54A-236.)
- Check the starter relay.
- Check the park/neutral position switch. (Refer to GROUP 23A, On-vehicle Service – Essential Service P.23A-351.)
- Check the line between the battery and starter motor S (solenoid) terminal.

NO : Go to Step 3.

STEP 3.

- Check the cable between starter B (battery) terminal and battery positive terminal for connection and continuity.

Q: Is the starter cable in good condition?

YES : Go to Step 4.
NO : Repair or replace the cable.

STEP 4.

- Check the connection and the continuity of the cable between the starter motor body and the negative battery terminal.

Q: Is the ground line in good condition?

YES : Go to Step 5.
NO : Repair or replace the cable.

STEP 5.

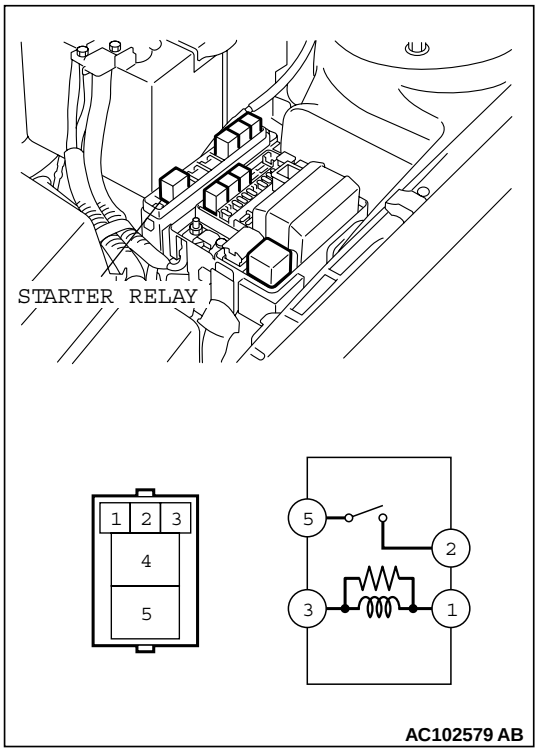
Q: Is the starter motor in good condition? (Refer to Starting system – Starter motor – Inspection P.16-25.)

YES : Excessive rotational resistance of the engine.
NO : Replace the starter motor.

ON-VEHICLE SERVICE

STARTER RELAY CHECK

M1162001400121



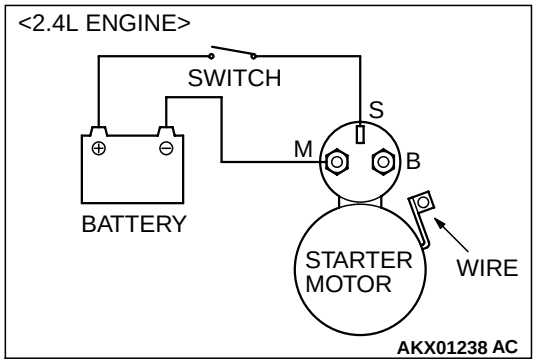
BATTERY VOLTAGE	TERMINAL NO. TO BE CONNECTED TO TESTER	CONTINUITY TEST RESULTS
Not applied	5 – 2	Open circuit
Connect terminal 1 to negative battery terminal. Connect terminal 3 to positive battery terminal.	5 – 2	Less than 2 ohm

STARTER MOTOR ASSEMBLY

INSPECTION

M1162001100056

PINION GAP ADJUSTMENT

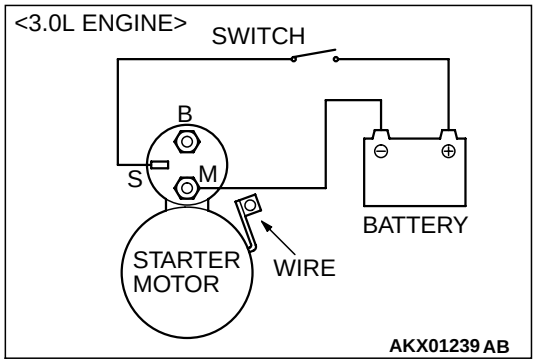


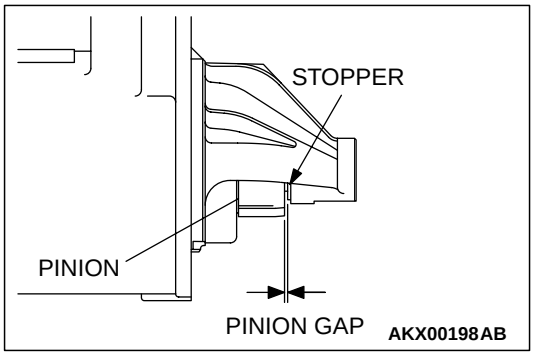
1. Disconnect the field coil wire from the M-terminal of the magnetic switch.
2. Connect a 12-volt battery between the S-terminal and M-terminal.

⚠ CAUTION

This test must be performed quickly (in less than 10 seconds) to prevent the coil from burning.

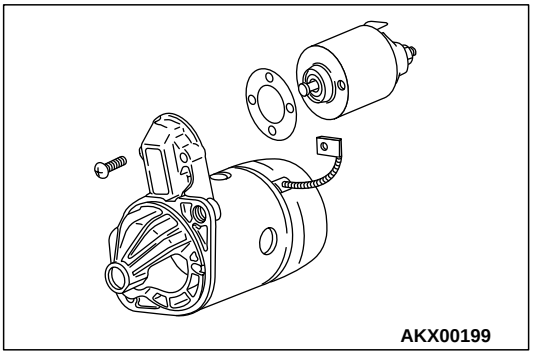
3. Set the switch to "ON", and the pinion will move out.





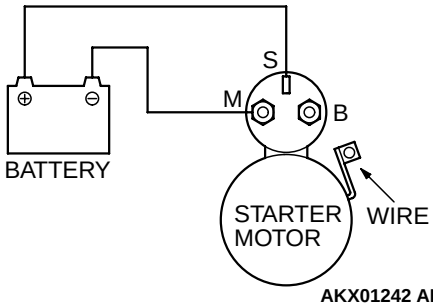
4. Check the pinion-to-stopper clearance (pinion gap) with a feeler gauge.

   Standard value: 0.5 – 2.0 mm (0.02 – 0.07 inch)



5. If the pinion gap is out of specification, adjust by adding or removing gasket(s) between the magnetic switch and front bracket.

<2.4L ENGINE>



AKX01242 AB

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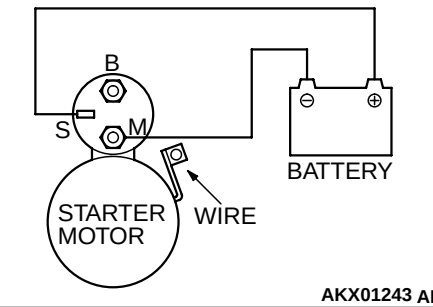


AKX01243 AB

MAGNETIC SWITCH PULL-IN TEST

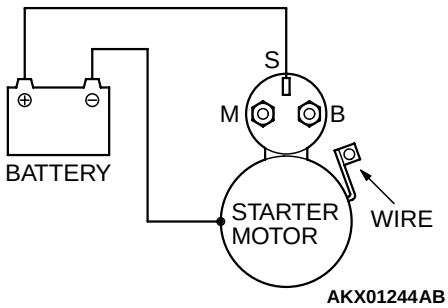
1. Disconnect the field coil wire from the M-terminal of the magnetic switch.

⚠ CAUTION

This test must be performed quickly (in less than 10 seconds) to prevent the coil from burning.

2. Connect a 12-volt battery between the S-terminal and M-terminal.
3. If the pinion moves out, the pull-in coil is good. If it doesn't, replace the magnetic switch.

<2.4L ENGINE>



AKX01244AB

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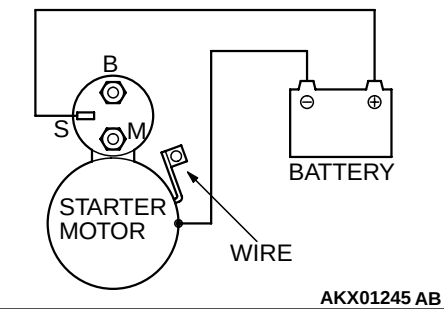


AKX01245 AB

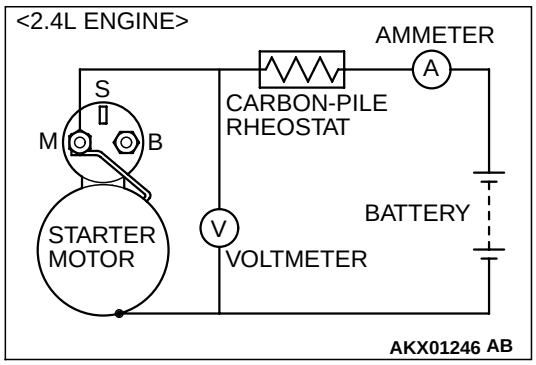
MAGNETIC SWITCH HOLD-IN TEST

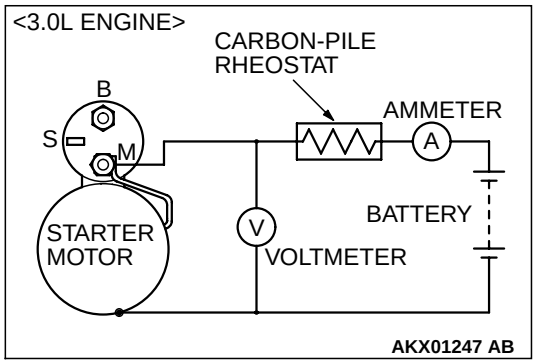
1. Disconnect the field coil wire from the M-terminal of the magnetic switch.

⚠ CAUTION

This test must be performed quickly (in less than 10 seconds) to prevent the coil from burning.

2. Connect a 12-volt battery between the S-terminal and body.
3. Manually pull out the pinion as far as the pinion stopper position.
4. If the pinion remains out, everything is operating properly. If the pinion moves in, the hold-in circuit is open. Replace the magnetic switch.

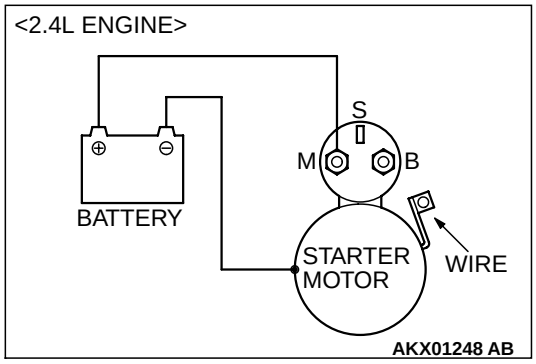


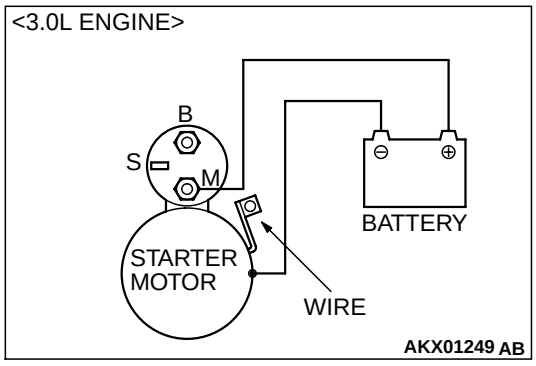


FREE RUNNING TEST

1. Place the starter motor in a vise equipped with soft jaws and connect a fully-charged 12-volt battery to the starter motor as follows:
2. Connect a test ammeter (100-ampere scale) and carbon pile rheostat in series between the positive battery terminal and starter motor terminal.
3. Connect a voltmeter (15-volt scale) across the starter motor.
4. Rotate carbon pile to full-resistance position.
5. Connect the battery cable from the negative battery terminal to the starter motor body.
6. Adjust the rheostat until the battery positive voltage shown by the voltmeter is 11 V.
7. Confirm that the maximum amperage is within the specifications and that the starter motor turns smoothly and freely.

   Current: maximum 90 Amps





MAGNETIC SWITCH RETURN TEST

1. Disconnect the field coil wire from the M-terminal of the magnetic switch.

⚠ CAUTION

This test must be performed quickly (in less than 10 seconds) to prevent the coil from burning.

2. Connect a 12-volt battery between the M-terminal and body.

⚠ WARNING

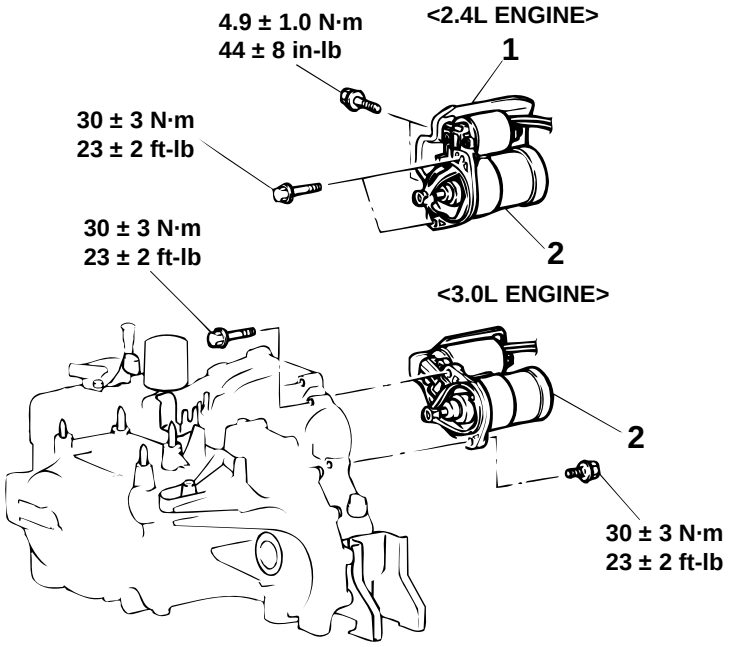
Be careful not to get your fingers caught when pulling out the pinion.

3. Pull the pinion out and release. If the pinion quickly returns to its original position, everything is operating properly. If it doesn't, replace the magnetic switch.

REMOVAL AND INSTALLATION

M1162001000220

Pre-removal and Post-installation Operation
- Air Cleaner Removal and Installation (Refer to GROUP 15, Air Cleaner P.15-6.)



AC000287 AB

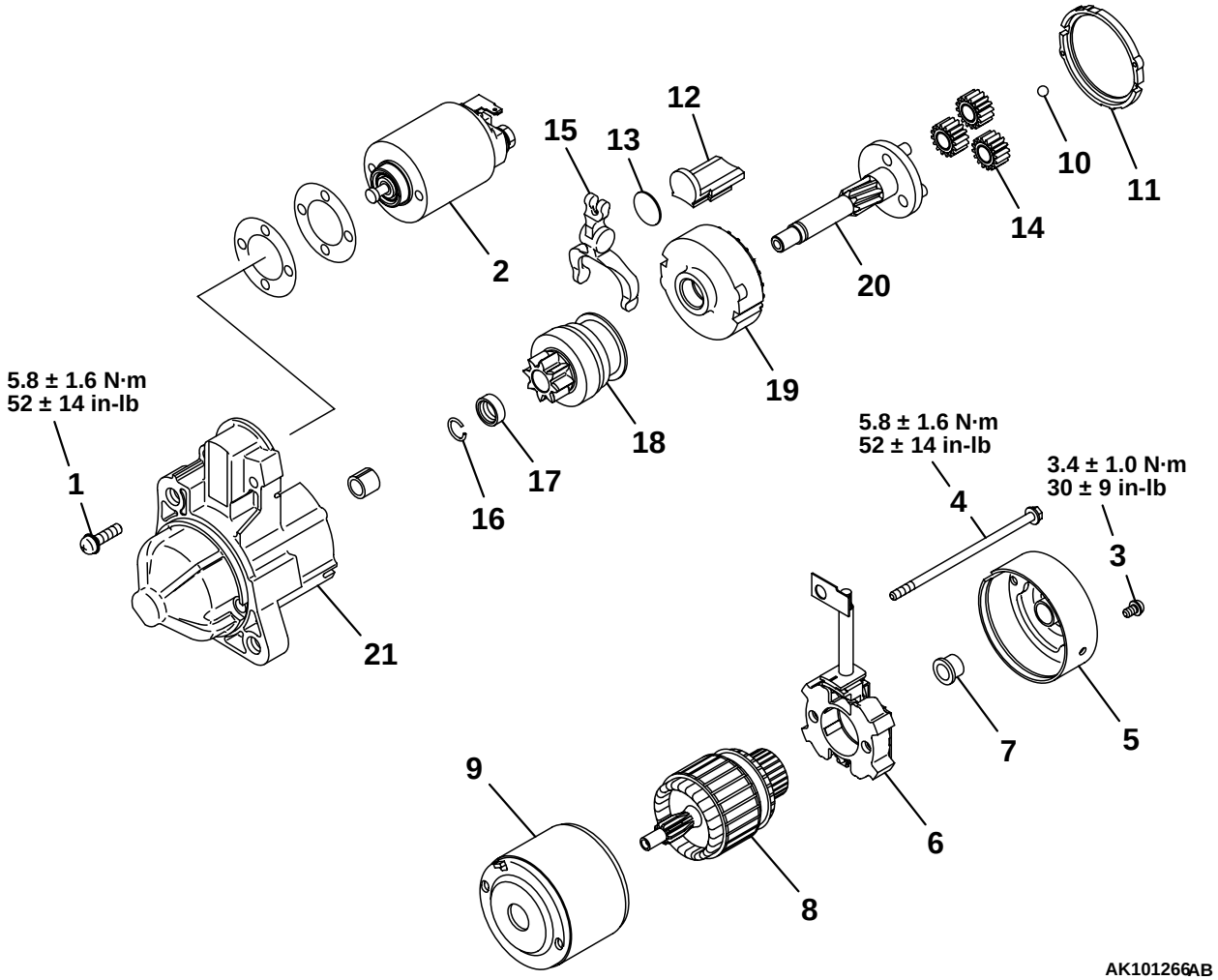
REMOVAL STEPS
1. STARTER COVER <2.4L ENGINE>
2. STARTER MOTOR

TSB Revision

DISASSEMBLY AND ASSEMBLY

M1162001200116

<2.4L ENGINE>



DISASSEMBLY STEPS

1. SCREW
2. MAGNETIC SWITCH
3. SCREW
4. SCREW
5. REAR BRACKET
6. BRUSH HOLDER ASSEMBLY
7. REAR BEARING

<<A>> 8. ARMATURE

9. YOKE ASSEMBLY

<<A>> 10. BALL

11. PACKING A

DISASSEMBLY STEPS

12. PACKING B
13. PLATE
14. PLANETARY GEAR
15. LEVER

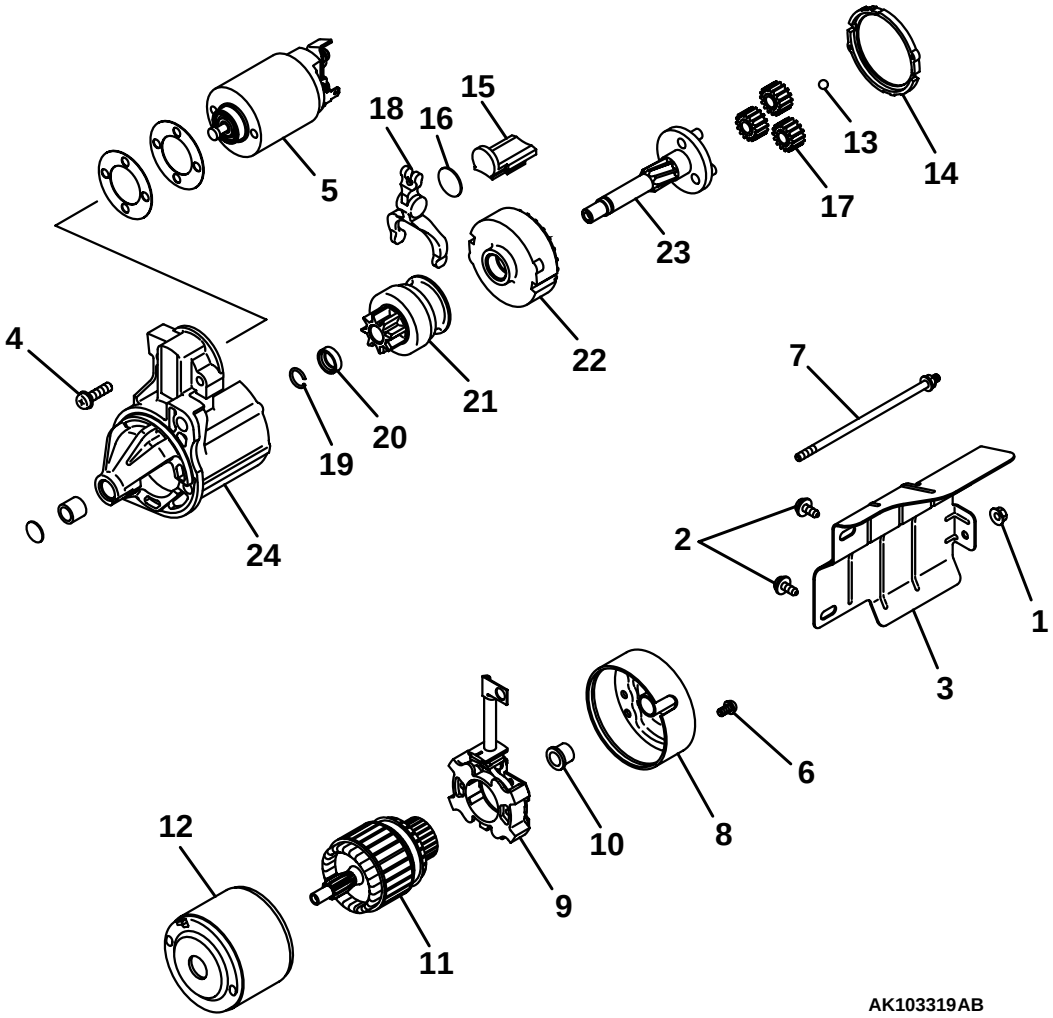
<<B>> >>A<< 16. SNAP RING

<<B>> >>A<< 17. STOP RING

18. OVERRUNNING CLUTCH
19. INTERNAL GEAR
20. PLANETARY GEAR HOLDER
21. FRONT BRACKET

TSB Revision

<3.0L ENGINE>



	DISASSEMBLY STEPS
	1. NUT
	2. BOLT
	3. COVER
	4. SCREW
	5. MAGNETIC SWITCH
	6. SCREW
	7. SCREW
	8. REAR BRACKET
	9. BRUSH
	10. REAR BEARING
<<A>>	11. ARMATURE
	12. YOKE ASSEMBLY

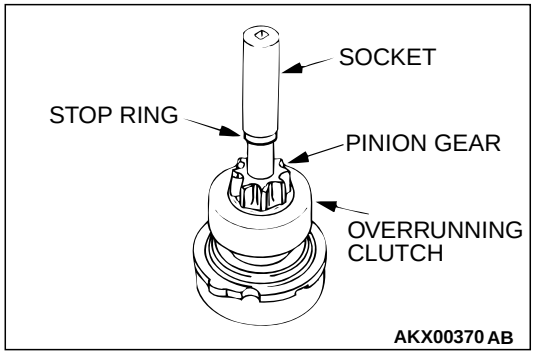
	DISASSEMBLY STEPS
<<A>>	13. BALL
	14. PACKING A
	15. PACKING B
	16. PLATE
	17. PLANETARY GEAR
	18. LEVER
<<B>> >>A<<	19. SNAP RING
<<B>> >>A<<	20. STOP RING
	21. OVERRUNNING CLUTCH
	22. INTERNAL GEAR
	23. PLANETARY GEAR HOLDER
	24. FRONT BRACKET

TSB Revision

DISASSEMBLY SERVICE POINTS

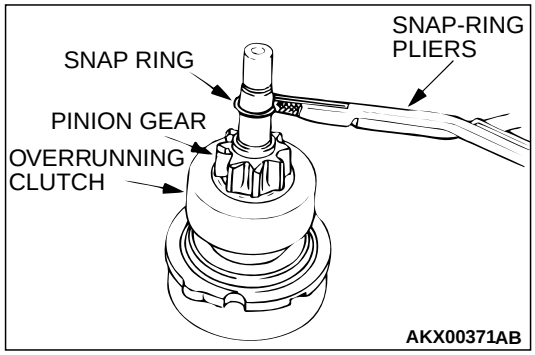
<<A>> ARMATURE AND BALL REMOVAL

⚠ CAUTION
When removing the armature, take care not to lose the ball (which is used as a bearing) in the armature end.



<<B>> SNAP RING AND STOP RING REMOVAL

1. Press a long socket wrench of appropriate size to the stop ring. Then tap the socket wrench to remove the stop ring to the pinion gear side.
2. After removing the snap ring (by using snap-ring pliers), remove the stop ring and the overrunning clutch.



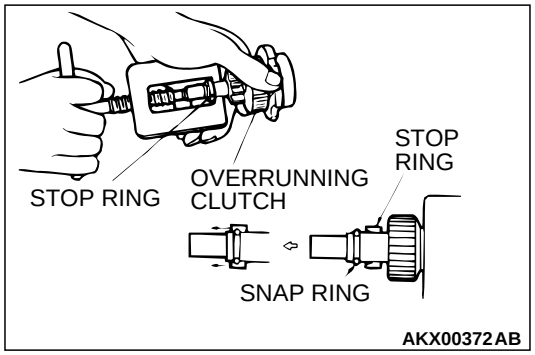
STARTER MOTOR PART CLEANING

1. Do not immerse parts in cleaning solvent. Immersing the yoke and field coil assembly and/or armature will damage insulation. Wipe these parts with a shop towel only.
2. Do not immerse the drive unit in cleaning solvent. Overrunning clutch is pre-lubricated at the factory and solvent will wash lubrication from the clutch.
3. The drive unit may be cleaned with a brush moistened with cleaning solvent and wiped dry with a shop towel.

ASSEMBLY SERVICE POINT

>>A<< STOP RING AND SNAP RING INSTALLATION

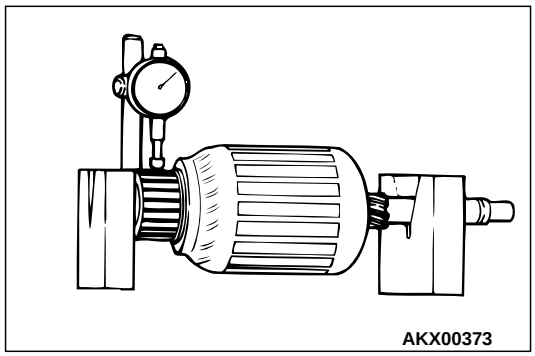
Using a suitable pulling tool, pull the overrunning clutch stop ring over the snap ring.



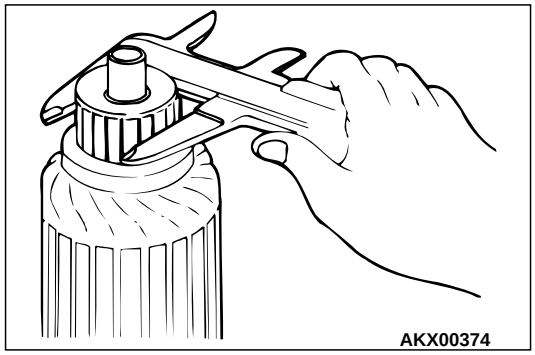
INSPECTION

M1162001300072

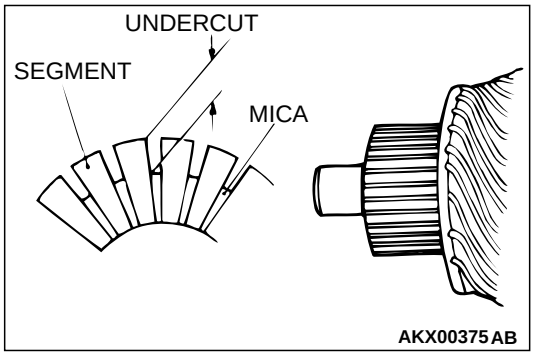
COMMUTATOR CHECK


AKX00373

1. Place the armature on a pair of V-blocks, and check the deflection by using a dial gauge.
   Standard value: 0.05 mm (0.002 inch)
   Limit: 0.1 mm (0.004 inch)


AKX00374

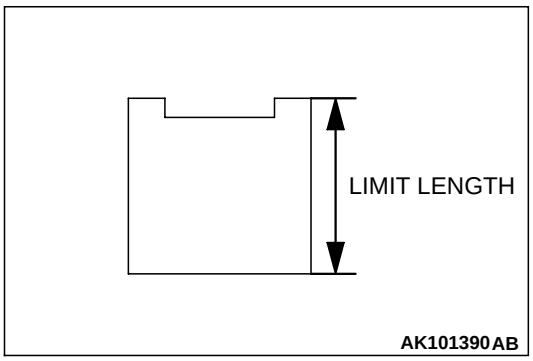
2. Check the outer diameter of the commutator.
   Standard value: 29.4 mm (1.16 inches)
   Minimum limit: 28.8 mm (1.13 inches)



AKX00375AB

3. Check the depth of the undercut between segments.
   Standard value: 0.5 mm (0.02 inch)
   Minimum limit: 0.2 mm (0.008 inch)

BRUSH CHECK



AK101390AB

1. Check the brush for roughness of the surface that contacts the commutator and check the brush length.Replace the brush holder if this measurement exceeds the limit.
   Minimum limit:
   7.0 mm (0.28 inch)
2. .In the case contacting surface has been corrected or the brush has been replaced, correct the contacting surface by winding sandpaper around the commutator

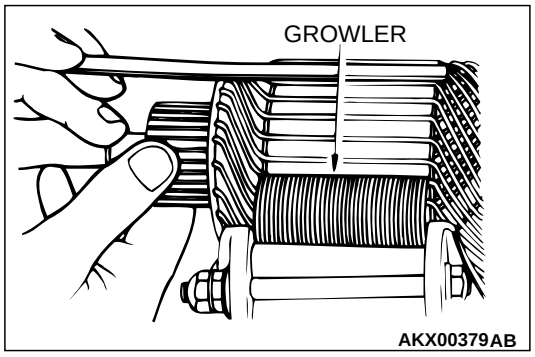
OVERRUNNING CLUTCH CHECK

1. While holding the clutch housing, rotate the pinion. The drive pinion should rotate smoothly in one direction, but should not rotate in opposite direction. If the clutch does not function properly, replace the overrunning clutch assembly.
2. Inspect the pinion for wear or burrs. If the pinion is worn or burred, replace the overrunning clutch assembly. If the pinion is damaged, also inspect the ring gear for wear or burrs.

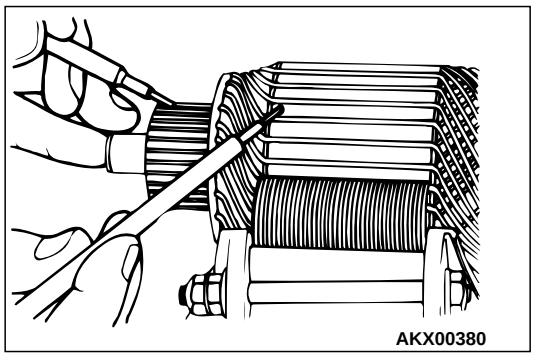
FRONT AND REAR BRACKET BUSHING CHECK

Inspect the bushing for wear or burrs. If the bushing is worn or burred, replace the front bracket assembly or rear bracket assembly.

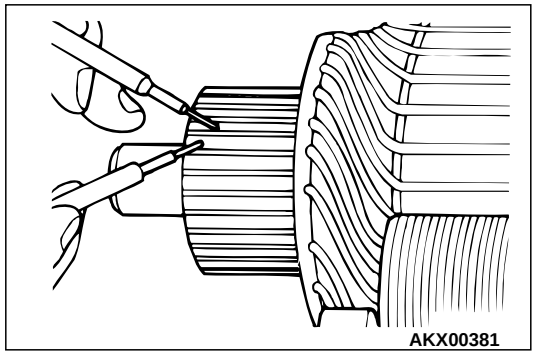
ARMATURE CHECK



1. Check that the armature coil is not grounded.
2. Place the armature in a growler.
3. Hold a thin steel blade parallel and just above while rotating the armature slowly in the growler. A shorted armature will cause a blade to vibrate and be attracted to the core. Replace the shorted armature.



4. Check the insulation between the armature coil cores and the commutator segments. They are normal if there is no continuity.



5. Check for continuity between the segments. The condition is normal if there is continuity.

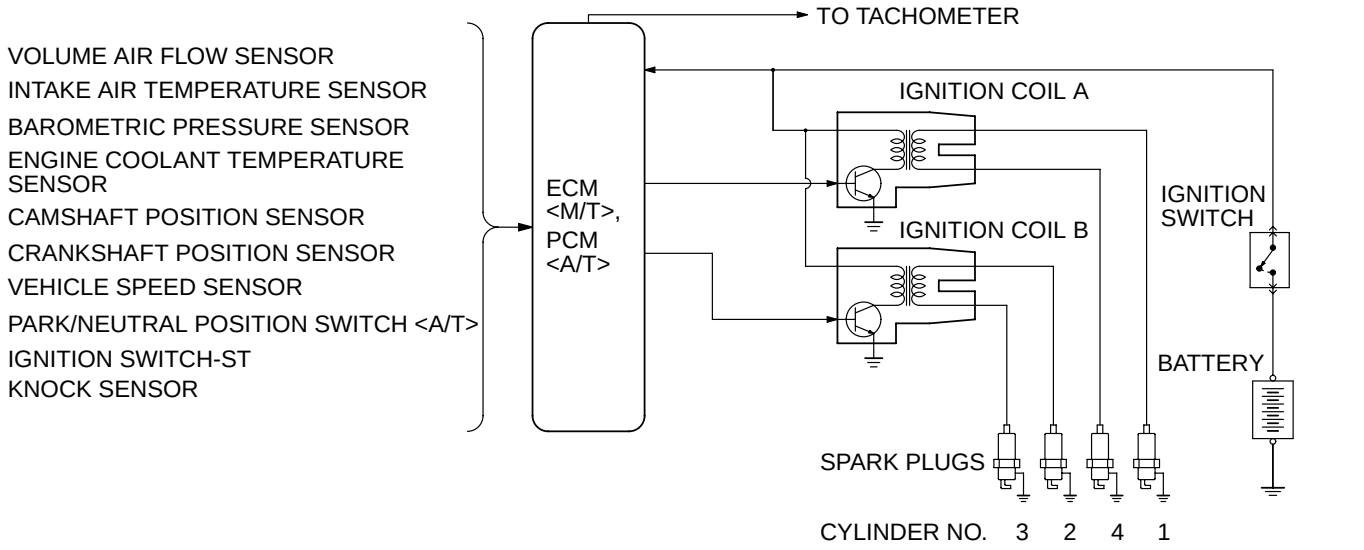
IGNITION SYSTEM

GENERAL DESCRIPTION

M1163000100131

<2.4L ENGINE>

This system is provided with two ignition coils (A and B) with built-in ignition power transistors for the number 1 and number 4 cylinders, and number 2 and number 3 cylinders respectively.
Interruption of the primary current flowing in the primary side of ignition coil A generates a high voltage in the secondary side of ignition coil A.
The high voltage thus generated is applied to the spark plugs of number 1 and number 4 cylinders to generate sparks. At the time that the sparks are generated at both spark plugs, if one cylinder is at the compression stroke, the other cylinder is at the exhaust stroke, so that ignition of the compressed air/fuel mixture occurs only for the cylinder which is at the compression stroke.
In the same way, when the primary current flowing in ignition coil B is interrupted, the high voltage thus generated is applied to the spark plugs of number 2 and number 3 cylinders.
The engine control module controls the two ignition power transistors to turn them alternately ON and OFF. This causes the primary currents in the ignition coils to be alternately interrupted and allowed to flow to fire the cylinders in the order 1 – 3 – 4 – 2.
The engine control module determines which ignition coil should be controlled by means of the signals from the camshaft position sensor which is incorporated in the camshaft and from the crankshaft position sensor which is incorporated in the crankshaft. It also detects the crankshaft position in order to provide ignition at the most appropriate timing in response to the engine operation conditions.
When the engine is cold or operated at high altitudes, the ignition timing is slightly advanced to provide optimum performance.

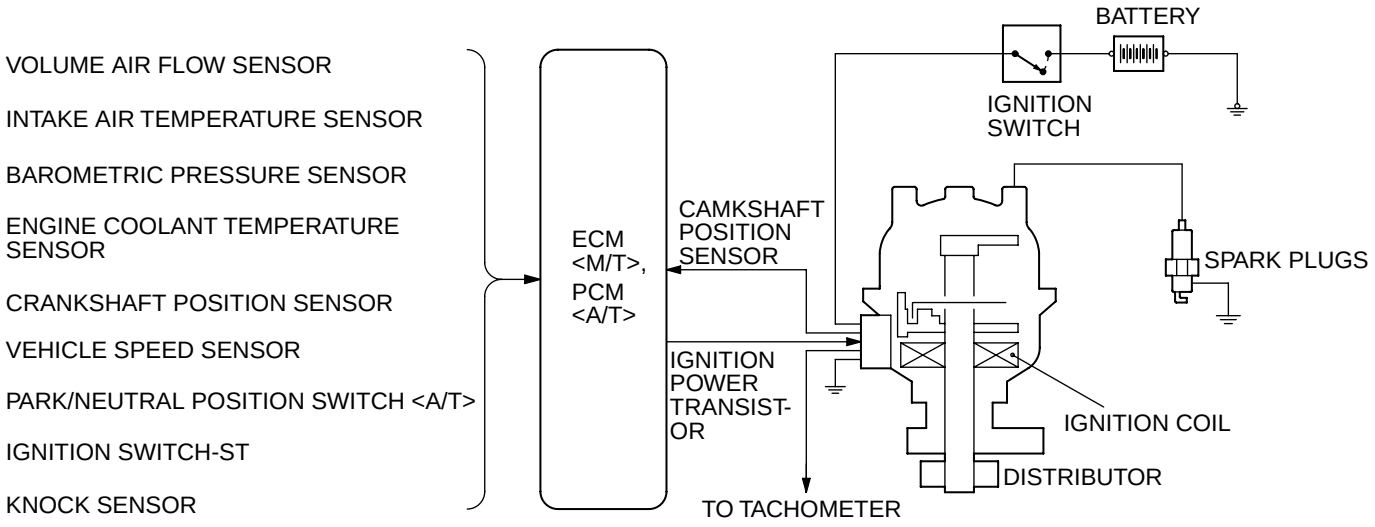


AK100055 AB

<3.0L Engine>

Interruption of the primary current flowing in the primary side of the ignition coil generates high voltage in the secondary side of the ignition coil. The high voltage thus generated is directed by the distributor to the applicable spark plug. The engine firing order is 1 – 2 – 3 – 4 – 5 – 6 cylinders.
On application of high voltage, the spark plug generates a spark to ignite the compressed air fuel mixture in the combustion chamber.

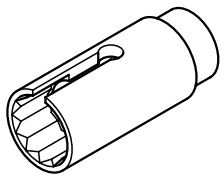
The engine control module makes and breaks the primary current of the ignition coil to regulate the ignition timing.
The engine control module detects the crankshaft position by the crankshaft position sensor. This sensor is installed at the front end of the crankshaft to provide ignition at the most appropriate timing for the engine operating condition.
When the engine is cold, the ignition timing is slightly advanced to provide optimum performance to the operating condition.



AKX01291AB

SPECIAL TOOLS

M1163000600051

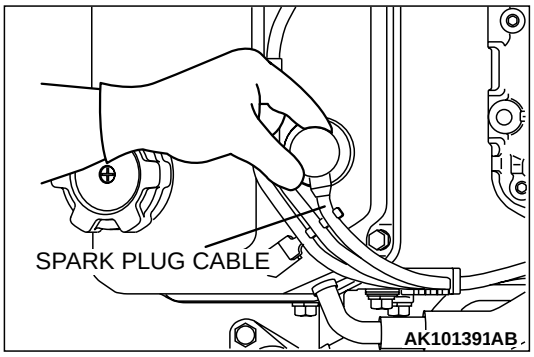
TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
MB991348	MB991348 Test harness set	Tool not available	Inspection of ignition primary voltage (Ignition power transistor connection)
	MD998773 Knock sensor wrench	MD998773-01	Knock sensor removal and installation

ON-VEHICLE SERVICE

SPARK PLUG CABLE TEST

M1163000900074

<3.0L ENGINE>



⚠ *WARNING*

Wear rubber gloves while performing this test.

1. Disconnect, one at a time, each of the spark plug cables while the engine is idling to check whether the engine's running performance changes or not.
2. If the engine performance does not change, check the resistance of the spark plug cable, and check the spark plug itself.

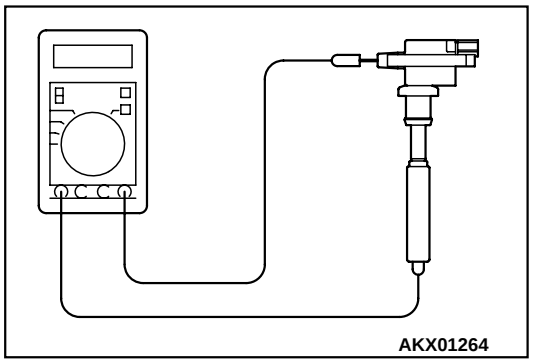
IGNITION COIL CHECK

M1163001200205

<2.4L ENGINE – With built-in ignition power transistor>

Check by the following procedure, and replace the coil if there is a malfunction.

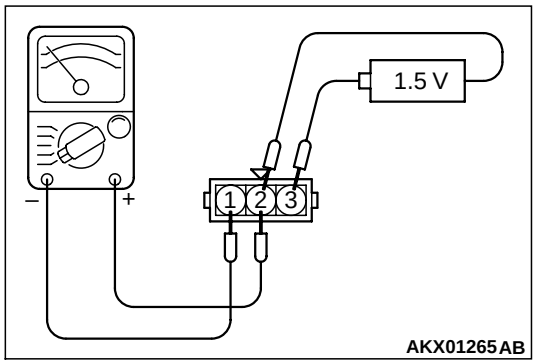
SECONDARY COIL RESISTANCE CHECK



Measure the resistance between the high-voltage terminals of the ignition coil.

Standard value: 8.5 – 11.5 kΩ

PRIMARY COIL AND IGNITION POWER TRANSISTOR CONTINUITY CHECK



NOTE: An analog-type ohmmeter should be used.

NOTE: Connect the negative probe of the ohmmeter to terminal 1.

⚠ **CAUTION**

This test must be performed quickly (in less than 10 seconds) to prevent coil from burning and ignition power transistor from breaking.

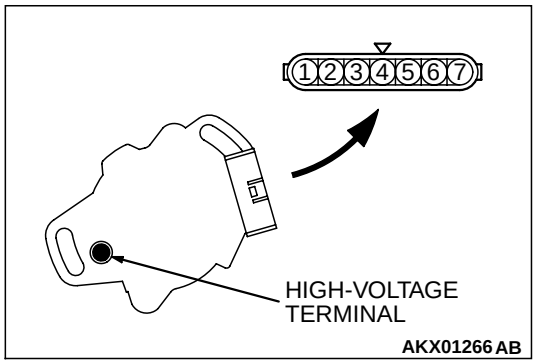
As described in the chart below, perform a continuity check on the ignition coil and power transistor.

1.5 V POWER SUPPLY BETWEEN 2 – 3	CONTINUITY BETWEEN 1 – 2
Current flowing	Yes
Current not flowing	No

IGNITION COIL CHECK

M1163001200078

<3.0L ENGINE>

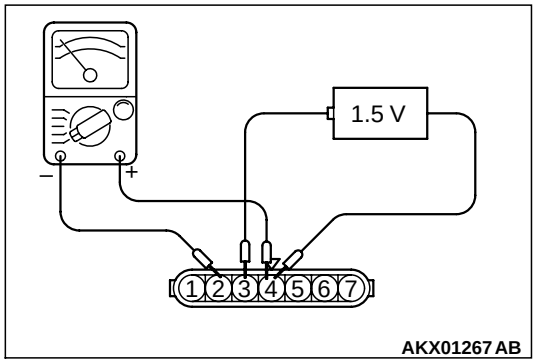


1. Measurement of the primary coil resistance
   Measure the resistance between connector terminals 1 and 2 of the distributor.
   Standard value: 0.56 – 0.68 Ω
2. Measurement of the secondary coil resistance
   Measure the resistance between the high-voltage terminal and connector terminal 1.
   Standard value: 9.4 – 12.8 kΩ

IGNITION COIL POWER TRANSISTOR CONTINUITY CHECK

M1163001300097

<3.0L ENGINE>



NOTE: An analog-type ohmmeter should be used.

NOTE: Connect the negative probe of the ohmmeter to terminal 2.

⚠ CAUTION

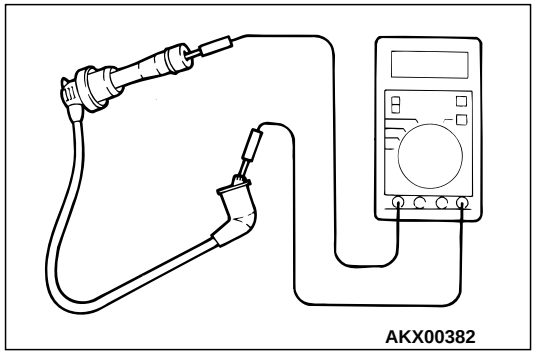
This test must be performed quickly (in less than 10 seconds) to prevent coil from burning and ignition power transistor from breaking.

As described in the chart below, perform a continuity check on the ignition coil power transistor. Replace the ignition power transistor if there is a malfunction.

1.5 V POWER SUPPLY BETWEEN 3 – 4	CONTINUITY BETWEEN 2 – 4
Current flowing	Yes
Current not flowing	No

SPARK PLUG CABLE RESISTANCE CHECK

M1163001400094



Measure the resistance of the all spark plug leads.

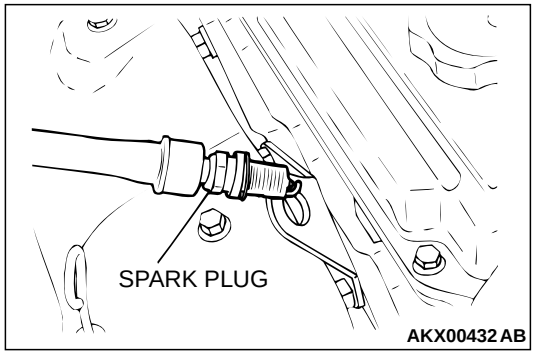
1. Check the cap and coating for cracks.
2. Measure the resistance.

   Limit: 19 kΩ

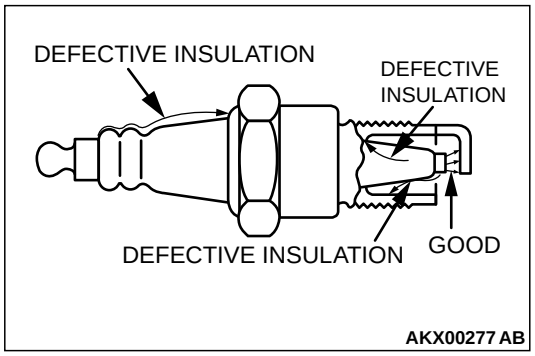
SPARK PLUG TEST

M1163001500091

<3.0L ENGINE>



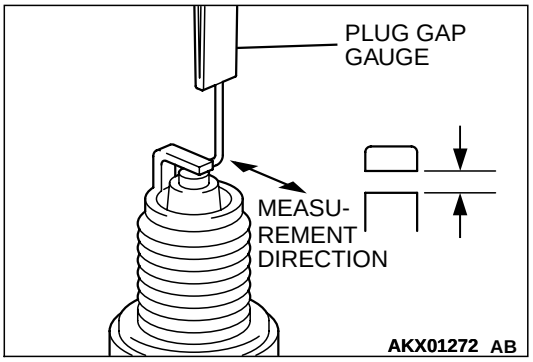
1. Remove the spark plug and connect to the spark plug cable.
2. Ground the spark plug outer electrode (body), and crank the engine.
   Check that there is an electrical discharge between the electrodes at this time.



SPARK PLUG CHECK AND CLEANING

M1163004300029

<2.4L ENGINE>



1. Check that the plug is not burned, that the insulator plug is not damaged, and that the seizure state is good.
2. If cleaning is required due to carbon deposits, etc., clean using a plug cleaner or wire brush, etc.
3. Check the plug gap using a plug gap gauge, and adjust if not within the standard value.

   Standard value: 1.0 – 1.1 mm (0.039 – 0.043 inch)

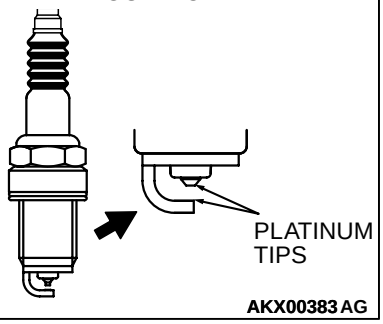
TSB Revision

SPARK PLUG CHECK AND CLEANING

M1163004300148

<3.0L ENGINE – without VARIABLE INDUCTION CONTROL (VIC) system>

<3.0L ENGINE – WITHOUT VIC>



⚠ CAUTION

- **Do not attempt to adjust the gap of the platinum plug.**
- **Cleaning of the platinum plug may result in damage to the platinum tips. Therefore, if carbon deposits must be removed, use a plug cleaner and complete cleaning within 20 seconds to protect the electrode. Do not use a wire brush.**

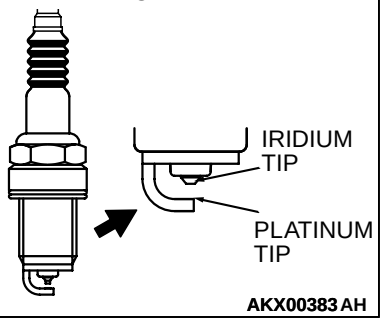
Check the plug gap and replace if the limit is exceeded.

Standard value: 1.0 – 1.1 mm (0.039 – 0.043 inch)

Limit: 1.3 mm (0.051 inch)

<3.0L ENGINE – with VARIABLE INDUCTION CONTROL (VIC) system>

<3.0L ENGINE – WITH VIC>



⚠ CAUTION

- **Do not attempt to adjust the gap of the iridium plug.**
- **Cleaning of the iridium plug may result in damage to the iridium and platinum tips. Therefore, if carbon deposits must be removed, use a plug cleaner and complete cleaning within 20 seconds to protect the electrode. Do not use a wire brush.**

Check the plug gap and replace if the limit is exceeded.

Standard value: 0.7 – 0.8 mm (0.028 – 0.031 inch)

Limit: 1.0 mm (0.039 inch)

CAMSHAFT POSITION SENSOR CHECK

M1163004400093

<2.4L ENGINE>

Refer to GROUP 13A, Multiport fuel injection (MFI) diagnosis – Diagnostic trouble code procedures – Camshaft position sensor circuit malfunction P.13A-247.

CRANK ANGLE SENSOR CHECK

M1163004500108

<2.4L ENGINE>

Refer to GROUP 13A, Multiport fuel injection (MFI) diagnosis – Diagnostic trouble code procedures – Crankshaft position sensor circuit malfunction P.13A-236.

CRANK ANGLE SENSOR CHECK

M1163004500119

<3.0L ENGINE>

Refer to GROUP 13B, Multiport fuel injection (MFI) diagnosis – Diagnostic trouble code procedures – Crankshaft position sensor circuit malfunction P.13A-236.

IGNITION SECONDARY VOLTAGE WAVE PATTERN CHECK USING A OSCILLOSCOPE

M1163001700073

<2.4L ENGINE>

MEASUREMENT METHOD

1. Clamp the spark plug cable (Number 1 or 3) with the secondary pickup.

   NOTE: Because of the two-cylinder simultaneous ignition system, the waves for two cylinders in each group appear during wave observation. However, wave observation is carried out for the cylinder (Number 1 or 3) with the spark plug cable which has been clamped by the secondary pickup.

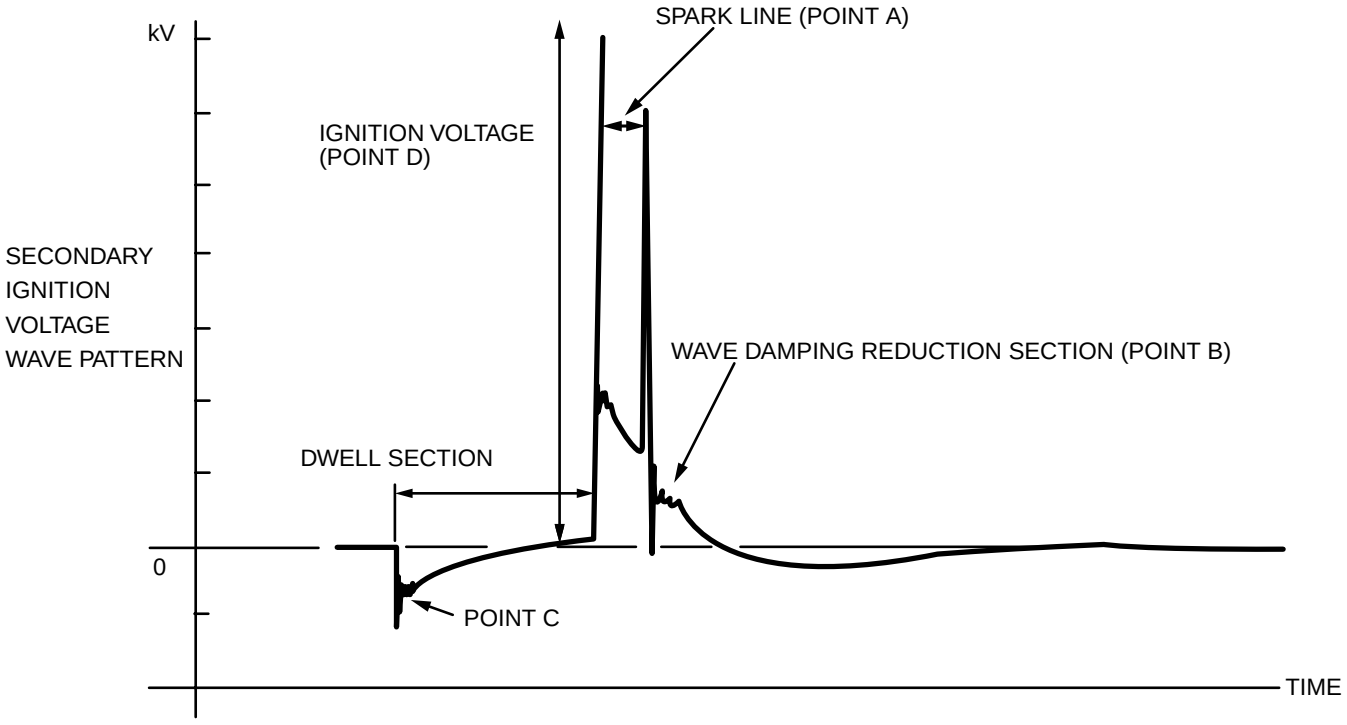
   NOTE: Identification of which cylinder wave pattern is displayed can be difficult, but the wave pattern of the cylinder which is clamped by the secondary pickup will be stable, so this can be used as a reference.

2. Clamp the spark plug cable (Number 1 or 3) with the trigger pickup.

   NOTE: Clamp the same spark plug cable as the one which has been clamped by the secondary pickup.

STANDARD WAVE PATTERN

Observation Conditions	
FUNCTION	**SECONDARY**
Pattern height	High (or low)
Pattern selector	Raster
Engine speed	Curb idle speed



AKX00278AB

Observation Conditions	
Pattern selector	Display
Pattern height	High (or low)
Engine speed	Curb idle speed

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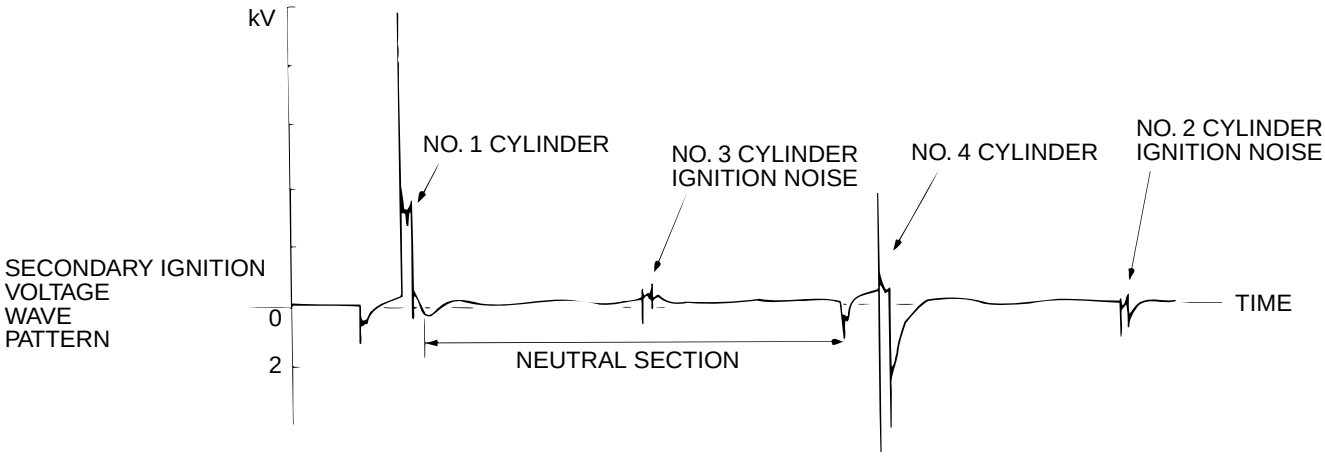


AKX01275AB

WAVEFORM OBSERVATION POINTS

NOTE: Abnormal waveform examples are shown subsequently.

Point A:

The height, length and slope of the spark line (refer to abnormal waveform examples 1, 2, 3 and 4) show the following trends.

SPARK LINE		PLUG GAP	CONDITION OF ELECTRODE	COMPRESSION FORCE	CONCENTRATION OF AIR MIXTURE	IGNITION TIMING	SPARK PLUG CABLE
Length	Long	Small	Normal	Low	Rich	Advanced	Leak
Length	Short	Large	Large wear	High	Lean	Retarded	High resistance
Height	High	Large	Large wear	High	Lean	Retarded	High resistance
Height	Low	Small	Normal	Low	Rich	Advanced	Leak
Slope		Large	Plug is fouled	–	–	–	–

Point B:

Number of vibrations in reduction vibration section (Refer to Abnormal Waveform Example 5)

NUMBER OF VIBRATIONS	COIL AND CAPACITOR
Three or more	Normal
Except above	Abnormal

Point C:

Number of vibrations at beginning of dwell section (Refer to Abnormal Waveform Example 5)

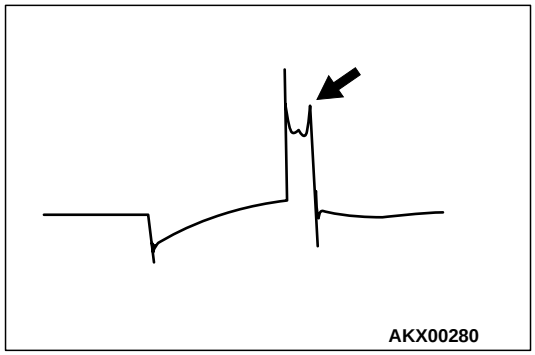
NUMBER OF VIBRATIONS	COIL
5 – 6 or higher	Normal
Except above	Abnormal

Point D:

Ignition voltage height (distribution per each cylinder) shows the following trends.

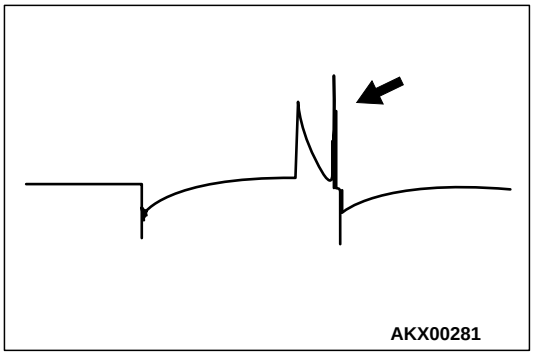
IGNITION VOLTAGE	PLUG GAP	CONDITION OF ELECTRODE	COMPRESSION FORCE	CONCENTRATION OF AIR MIXTURE	IGNITION TIMING	SPARK PLUG CABLE
High	Large	Large wear	High	Lean	Retarded	High resistance
Low	Small	Normal	Low	Rich	Advanced	Leak

ABNORMAL WAVEFORMS EXAMPLES



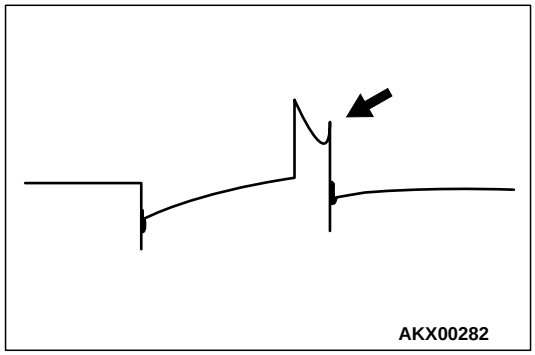
Example 1

- Wave characteristics
  Spark line is high and short.
- Cause of problem
  Spark plug gap is too large.



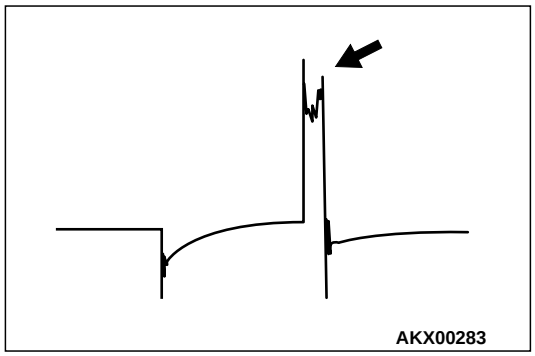
Example 2

- Wave characteristics
  Spark line is low and long, and is sloping. Also, the second half of the spark line is distorted. This could be a result of misfiring.
- Cause of problem
  Spark plug gap is too small.



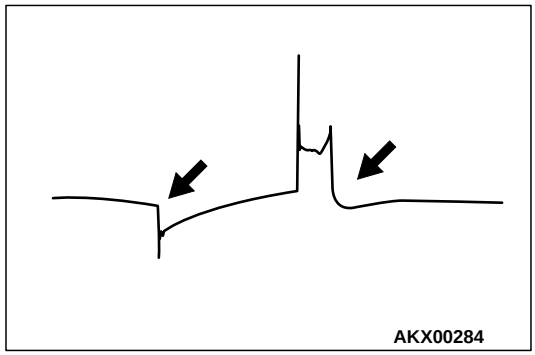
Example 3

- Wave characteristics
  Spark line is low and long, and is sloping. However, there is almost no spark line distortion.
- Cause of problem
  Spark plug gap is fouled.



Example 4

- Wave characteristics
  Spark line is high and short. Difficult to distinguish between this and abnormal wave pattern example 1.
- Cause of problem
  Spark plug cable is not properly connected. (Causing a dual ignition)



Example 5

- Wave characteristics
  No waves in wave damping section
- Cause of problem
  Layer short in ignition coil.

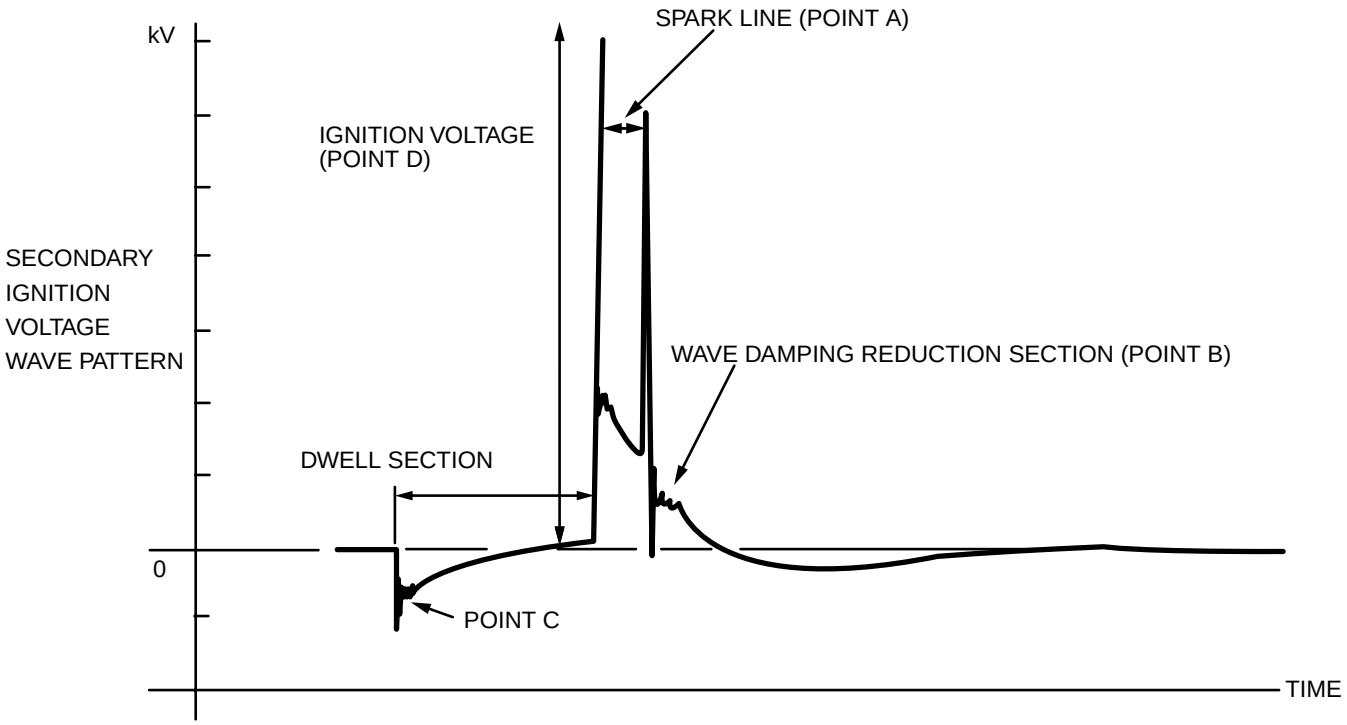
<3.0L ENGINE>

MEASUREMENT METHOD

1. Clamp the spark plug cable of the number 1 cylinder with the secondary pickup and check the wave patterns for each cylinder.
2. Connect the secondary pickup to the other cylinder in turn and check the wave patterns for each cylinder.

STANDARD WAVE PATTERN

Observation Conditions	
FUNCTION	**SECONDARY**
Pattern height	High (or low)
Pattern selector	Raster
Engine speed	Curb idle speed



AKX00278AB

WAVEFORM OBSERVATION POINTS

NOTE: Abnormal waveform examples are shown subsequently.

Point A:

The height, length and slope of the spark line (refer to abnormal waveform examples 1, 2, 3 and 4) show the following trends.

SPARK LINE		PLUG GAP	CONDITION OF ELECTRODE	COMPRESSION FORCE	CONCENTRATION OF AIR MIXTURE	IGNITION TIMING	SPARK PLUG CABLE
Length	Long	Small	Normal	Low	Rich	Advanced	Leak
Length	Short	Large	Large wear	High	Lean	Retarded	High resistance
Height	High	Large	Large wear	High	Lean	Retarded	High resistance
Height	Low	Small	Normal	Low	Rich	Advanced	Leak
Slope		Large	Plug is fouled	–	–	–	–

Point B:

Number of vibrations in reduction vibration section (Refer to Abnormal Waveform Example 5)

NUMBER OF VIBRATIONS	COIL AND CAPACITOR
Three or more	Normal
Except above	Abnormal

Point C:

Number of vibrations at beginning of dwell section (Refer to Abnormal Waveform Example 5)

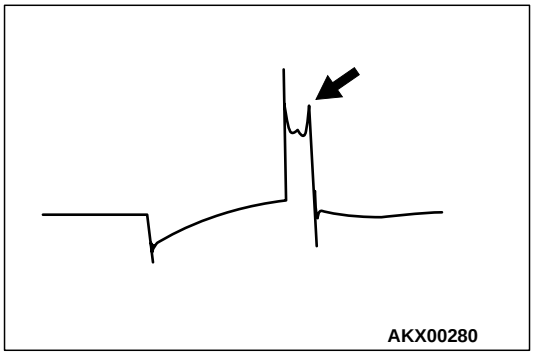
NUMBER OF VIBRATIONS	COIL
5 – 6 or higher	Normal
Except above	Abnormal

Point D:

Ignition voltage height (distribution per each cylinder) shows the following trends.

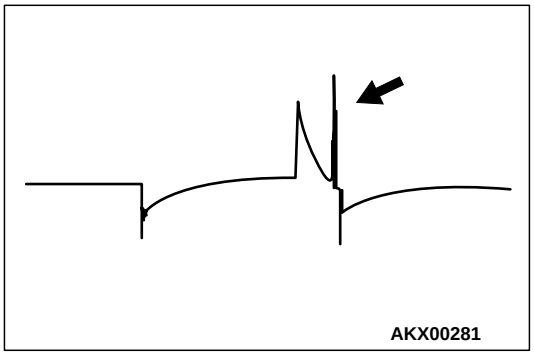
IGNITION VOLTAGE	PLUG GAP	CONDITION OF ELECTRODE	COMPRESSION FORCE	CONCENTRATION OF AIR MIXTURE	IGNITION TIMING	SPARK PLUG CABLE
High	Large	Large wear	High	Lean	Retarded	High resistance
Low	Small	Normal	Low	Rich	Advanced	Leak

ABNORMAL WAVEFORMS EXAMPLES



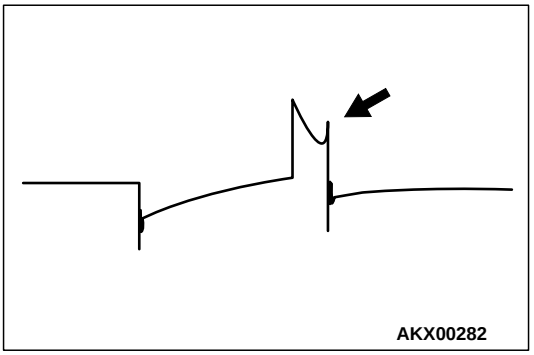
Example 1

- Wave characteristics
  Spark line is high and short.
- Cause of problem
  Spark plug gap is too large.



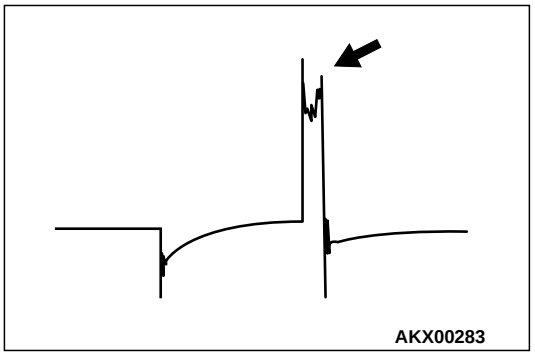
Example 2

- Wave characteristics
  Spark line is low and long, and is sloping. Also, the second half of the spark line is distorted. This could be a result of misfiring.
- Cause of problem
  Spark plug gap is too small.



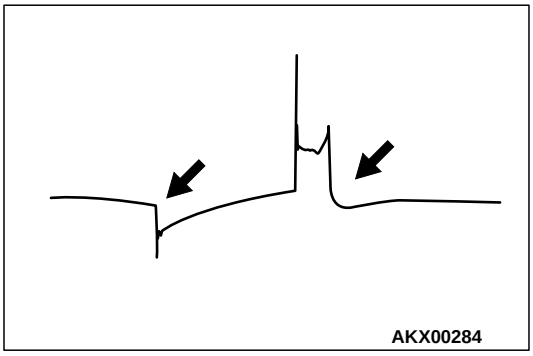
Example 3

- Wave characteristics
  Spark line is low and long, and is sloping. However, there is almost no spark line distortion.
- Cause of problem
  Spark plug gap is fouled.



Example 4

- Wave characteristics
  Spark line is high and short. Difficult to distinguish between this and abnormal wave pattern example 1.
- Cause of problem
  Spark plug cable is not properly connected. (Causing a dual ignition)



Example 5

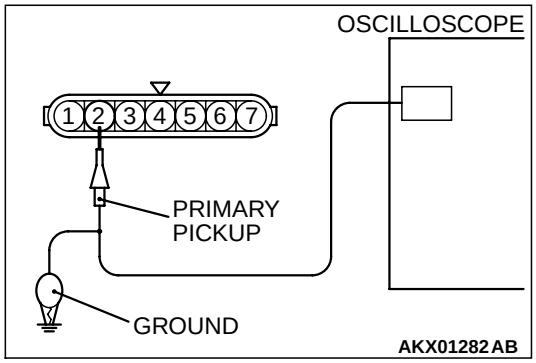
- Wave characteristics
  No waves in wave damping section
- Cause of problem
  Layer short in ignition coil.

IGNITION PRIMARY VOLTAGE WAVE PATTERN CHECK

M1163004600020

<3.0L ENGINE>

MEASUREMENT METHOD

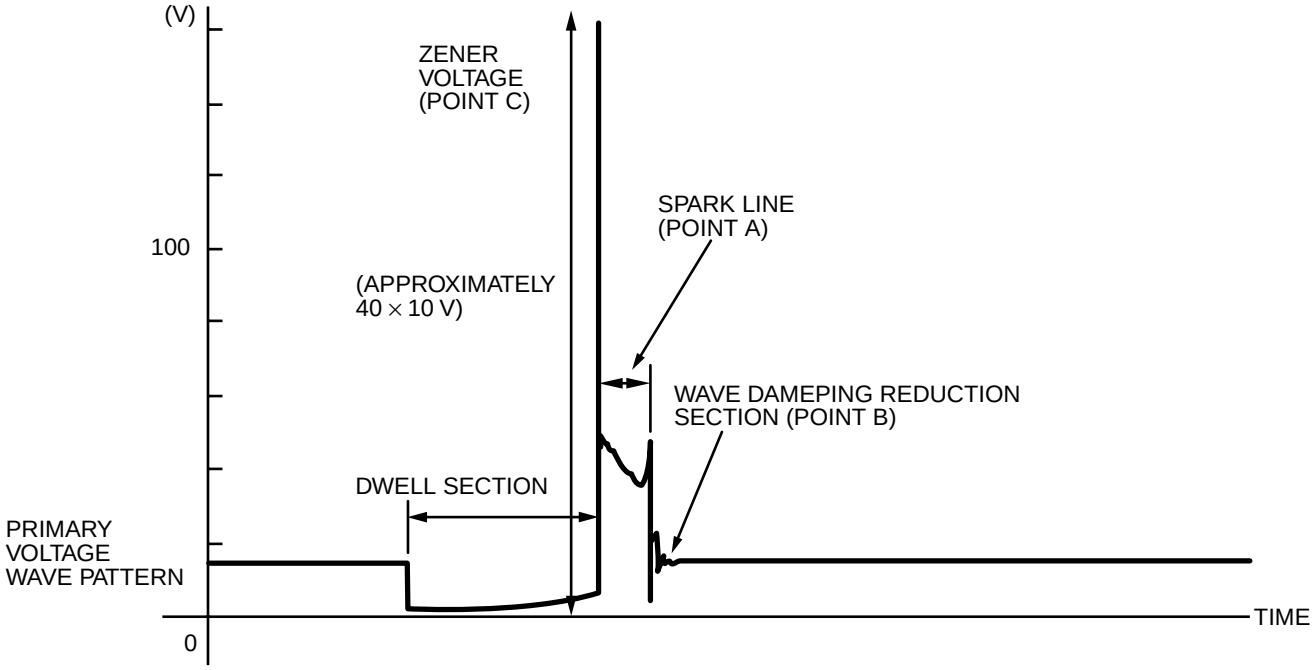


1. Disconnect the distributor connector and connect special tool (Test harness: MB991348) in between. (All of the terminals should be connected.)
2. Connect the analyzer primary pickup to the distributor connector terminal 2.
3. Connect the primary pickup ground terminal.
4. Clamp the spark plug cable with the trigger pickup.

   NOTE: The wave pattern of the cylinder clamped to the trigger pickup will appear at the left edge of the screen.

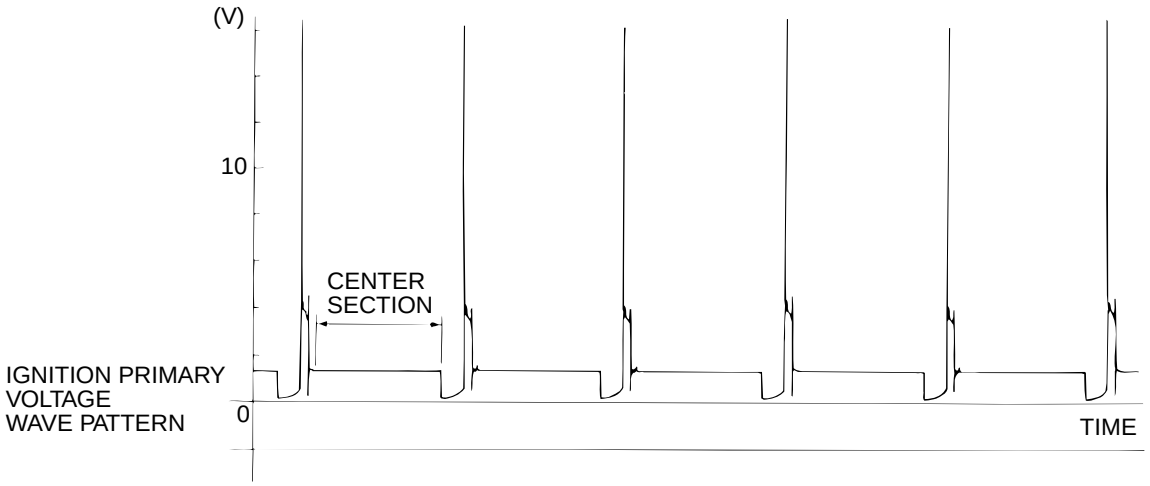
STANDARD WAVE PATTERN

OBSERVATION CONDITIONS	
FUNCTION	**SECONDARY**
Pattern height	High (or low)
Pattern selector	Raster
Engine speed	Curb idle speed



AKX00286AB

OBSERVATION CONDITIONS	
Pattern selector	Display
Pattern height	High (or low)
Engine speed	Curb idle speed



AKX01284AB

WAVEFORM OBSERVATION POINTS

NOTE: Abnormal waveform examples are shown subsequently.

Point A:

The height, length and slope of the spark line (refer to abnormal waveform examples 1, 2, 3 and 4) show the following trends.

SPARK LINE		PLUG GAP	CONDITION OF ELECTRODE	COMPRESSION FORCE	CONCENTRATION OF AIR MIXTURE	IGNITION TIMING	SPARK PLUG CABLE
Length	Long	Small	Normal	Low	Rich	Advanced	Leak
Length	Short	Large	Large wear	High	Lean	Retarded	High resistance
Height	High	Large	Large wear	High	Lean	Retarded	High resistance
Height	Low	Small	Normal	Low	Rich	Advanced	Leak
Slope		Large	Plug is fouled	–	–	–	–

Point B:

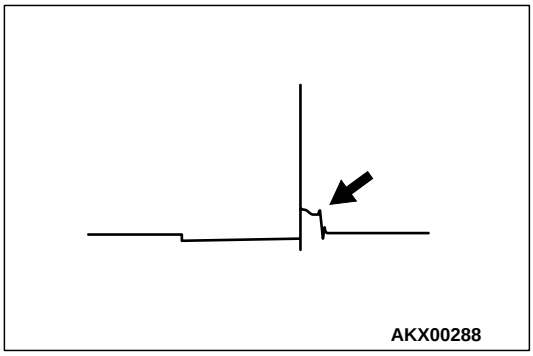
Number of vibrations in reduction vibration section (Refer to Abnormal Waveform Example 5)

NUMBER OF VIBRATIONS	COIL, CAPACITOR
Three or higher	Except above
Normal	Abnormal

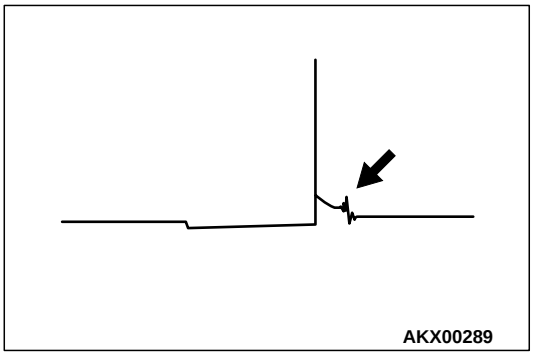
Point C:
Height of Zener voltage

HEIGHT OF ZENER VOLTAGE	PROBABLE CAUSE
High	Problem in zener diode
Low	Abnormal resistance in primary coil circuit

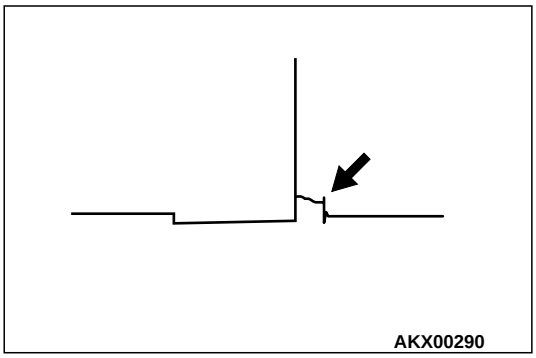
ABNORMAL WAVEFORMS EXAMPLES



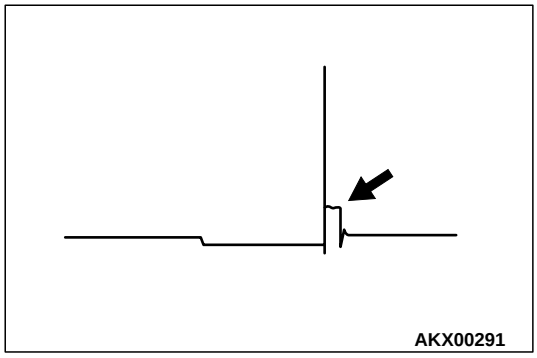
Example 1
- Wave characteristics
  Spark line is high and short.
- Cause of problem
  Spark plug gap is too large.



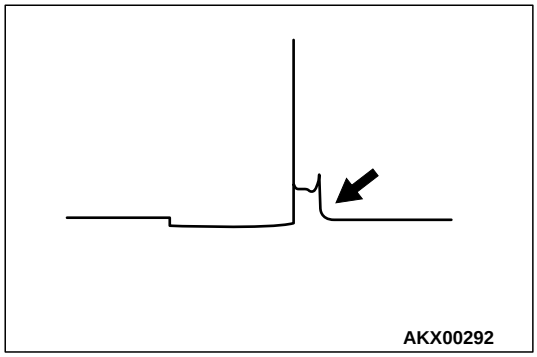
Example 2
- Wave characteristics
  Spark line is low and long, and is sloping.
  Also, the second half of the spark line is distorted. This could be a result of misfiring.
- Cause of problem
  Spark plug gap is too small.



Example 3
- Wave characteristics
  Spark line is low and long, and is sloping. However, there is almost no spark line distortion.
- Cause of problem
  Spark plug gap is fouled.



Example 4
- Wave characteristics
  Spark line is high and short
- Cause of problem
  Spark plug cable is not properly connected. (Causing a dual ignition)

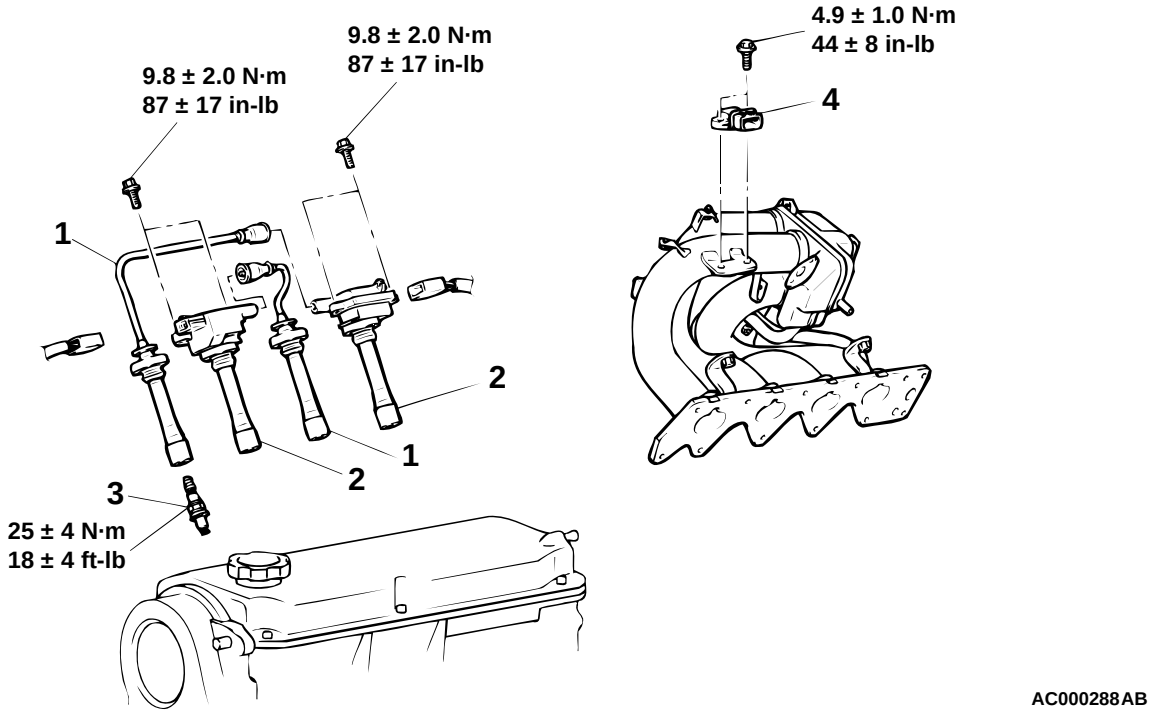


Example 5
- Wave characteristics
  No waves in wave damping section
- Cause of problem
  Layer short in ignition coil.

IGNITION COIL

REMOVAL AND INSTALLATION <2.4L ENGINE>

M1163004000200



REMOVAL STEPS
1. SPARK PLUG CABLE
2. IGNITION COIL ASSEMBLY

REMOVAL STEPS (Continued)
3. SPARK PLUG
4. IGNITION FAILURE SENSOR ASSEMBLY

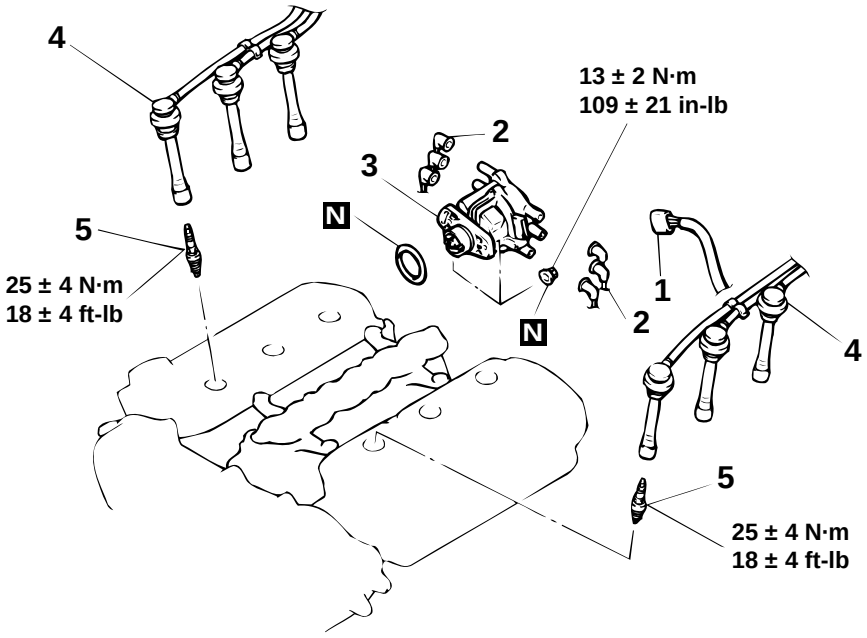
TSB Revision

DISTRIBUTOR ASSEMBLY

REMOVAL AND INSTALLATION <3.0L ENGINE>

M1163002000152

Pre-removal Operation	Post-installation Operation
• Air Cleaner Removal (Refer to GROUP 15 – Air Cleaner P.15-6.)	• Air Cleaner Installation (Refer to GROUP15 – Air Cleaner P.15-6.) • Ignition Timing Check (Refer to GROUP 11C, On-vehicle Service – Ignition Timing Check P.11C-5.)



AC000289 AB

REMOVAL STEPS

1. DISTRIBUTOR CONNECTOR
2. SPARK PLUG CABLE CONNECTION

>>A<< 3. DISTRIBUTOR

REMOVAL STEPS (Continued)

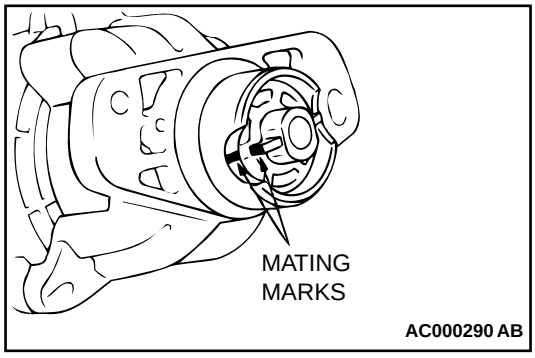
- INTAKE MANIFOLD PLENUM (REFER TO GROUP 15 – INTAKE MANIFOLD PLENUM P.15-7.)

4. SPARK PLUG CABLE
5. SPARK PLUG

INSTALLATION SERVICE POINT

>>A<< DISTRIBUTOR INSTALLATION

1. Set the number 1 cylinder to top dead compression center.
2. Align the mating marks on the distributor housing and coupling, and then install the distributor to the engine.
3. Check that the ignition timing is at the standard value. (Refer to GROUP 11C, On-vehicle - Ignition Timing Check P.11C-5.)



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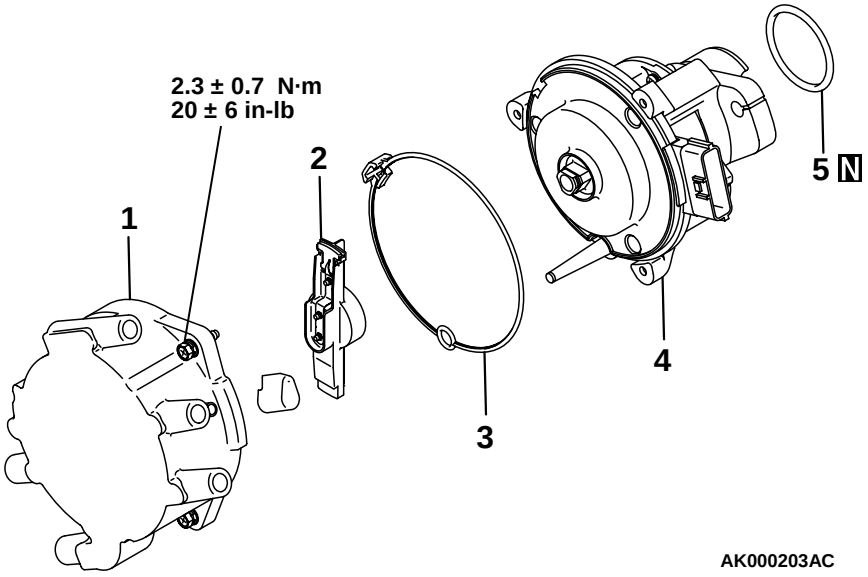
DISASSEMBLY AND ASSEMBLY

M1163002200059



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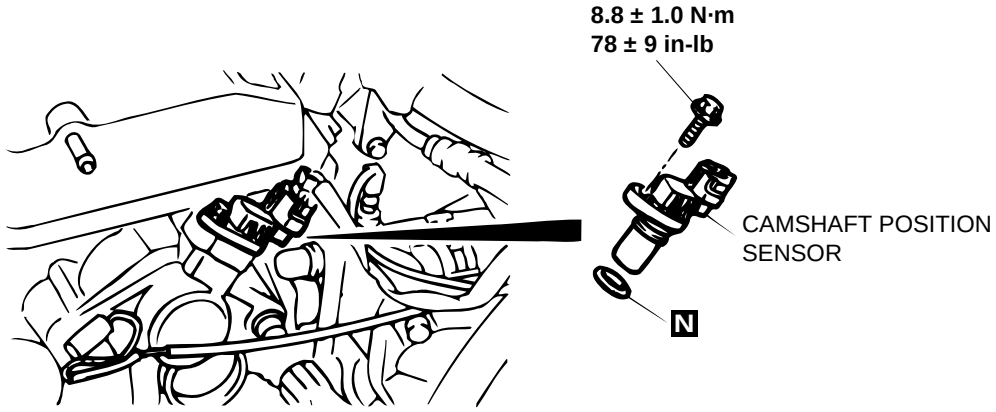
DISASSEMBLY STEPS
1. DISTRIBUTOR CAP
2. ROTOR
3. PACKING

DISASSEMBLY STEPS
4. DISTRIBUTOR HOUSING
5. O-RING

CAMSHAFT POSITION SENSOR

REMOVAL AND INSTALLATION <2.4L ENGINE>

M1163003400153



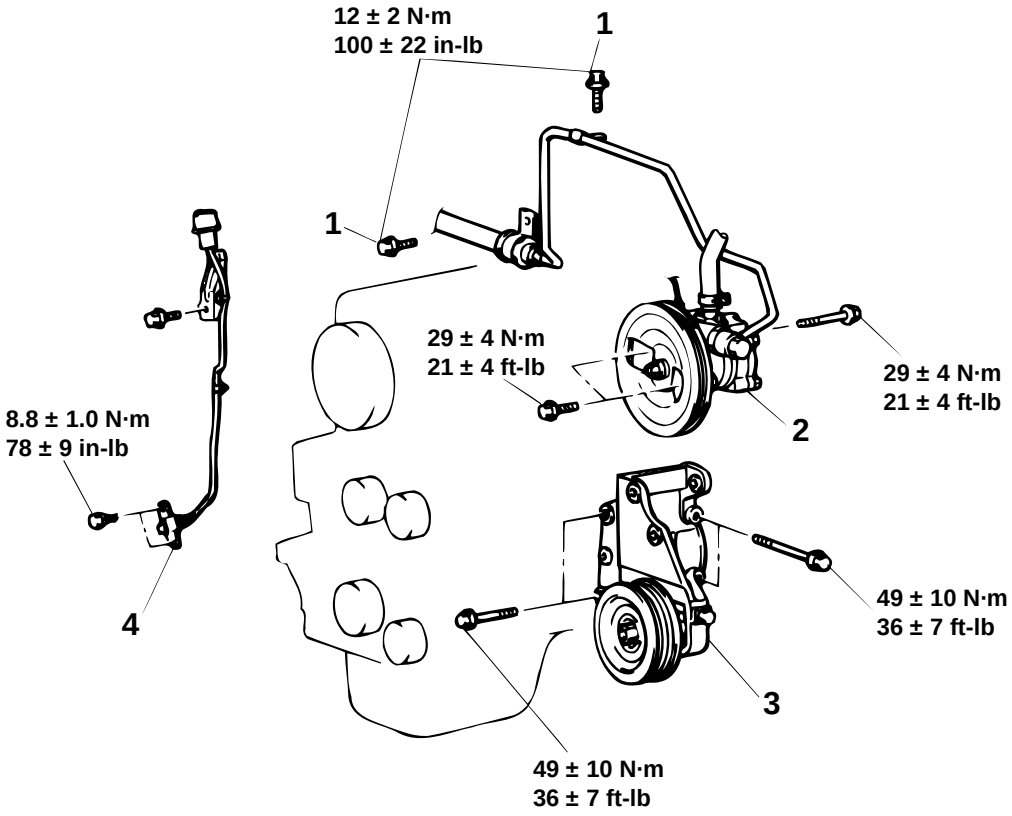
AC000291 AB

CRANKSHAFT POSITION SENSOR

REMOVAL AND INSTALLATION <2.4L ENGINE>

M1163003500268

Pre-removal and Post-installation Operation
- Timing Belt Removal and Installation (Refer to GROUP 11A, Timing Belt P.11A-32.)



AC000292 AB

REMOVAL STEPS
1. PRESSURE HOSE AND TUBE ASSEMBLY CONNECTION
2. POWER STEERING OIL PUMP ASSEMBLY

REMOVAL STEPS (Continued)
3. POWER STEERING OIL PUMP BRACKET
4. CRANKSHAFT POSITION SENSOR

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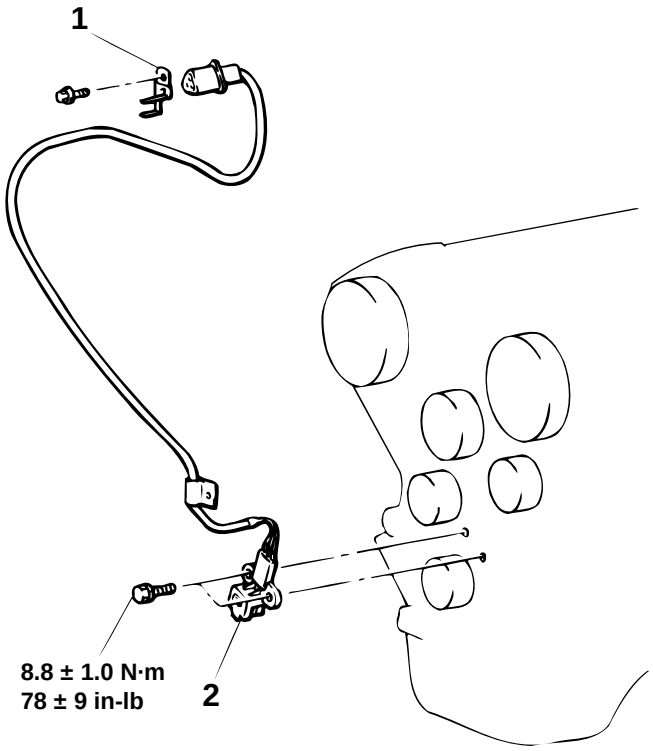
REMOVAL AND INSTALLATION <3.0L ENGINE>

M1163003500279

Pre-removal and Post-installation Operation
- Timing Belt Removal and Installation (Refer to GROUP11C, Timing Belt P.11C-37.)



AC000293 AB

REMOVAL STEPS
1. CLIP
2. CRANKSHAFT POSITION SENSOR

KNOCK SENSOR

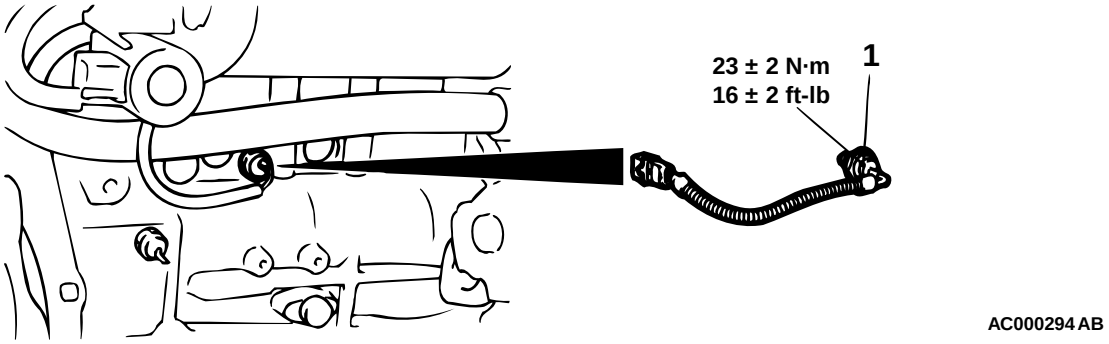
REMOVAL AND INSTALLATION <2.4L ENGINE>

M1163002800233

⚠ CAUTION

Do not drop or hit the knock sensor against other components. Internal damage may result, and the knock sensor will need to be replaced.

Pre-removal and Post-installation Operation
- Air Cleaner Removal and Installation (Refer to GROUP 15, Air Cleaner P.15-6.)
- Intake Manifold Stay Removal and Installation (Refer to GROUP 15, Intake Manifold P.15-12.)



REMOVAL

<<A>> >>A<< 1. KNOCK SENSOR

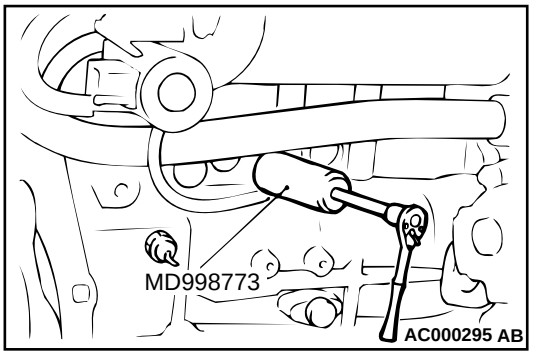
Required Special Tool:

MD998773: Knock Sensor Wrench

REMOVAL SERVICE POINT

<<A>> KNOCK SENSOR REMOVAL

Use special tool MD998773 to removal the knock sensor.



INSTALLATION SERVICE POINT

>>A<< KNOCK SENSOR INSTALLATION

Use special tool MD998773 to install the knock sensor.

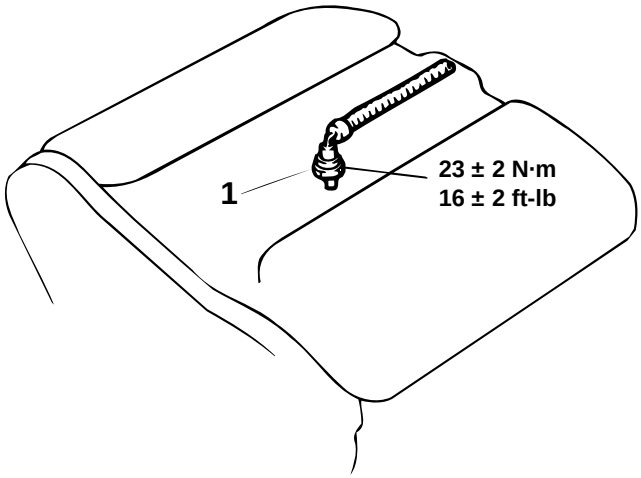
REMOVAL AND INSTALLATION <3.0L ENGINE>

M1163002800244

⚠ CAUTION

Do not drop or hit the knock sensor against other components. Internal damage may result, and the knock sensor will need to be replaced.

Pre-removal and Post-installation Operation
- Intake Manifold Removal and Installation (Refer to GROUP 15, Intake Manifold P.15-15.)



AC000296 AB

REMOVAL

<<A>> >>A<< 1. KNOCK SENSOR

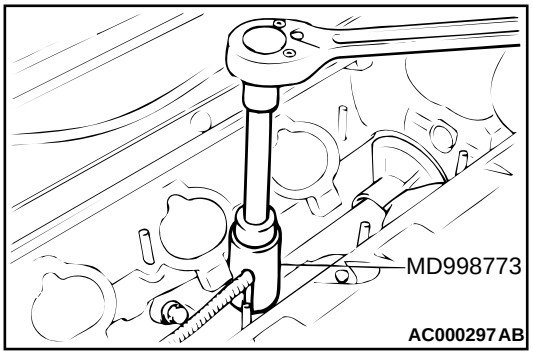
Required Special Tool:

MD998773: Knock Sensor Wrench

REMOVAL SERVICE POINT

<<A>> KNOCK SENSOR REMOVAL

Use special tool MD998773 to removal the knock sensor.



AC000297 AB

INSTALLATION SERVICE POINT

>>A<< KNOCK SENSOR INSTALLATION

Use special tool MD998773 to install the knock sensor.

TSB Revision

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1161002100324

ITEMS	SPECIFICATIONS
Charging system	
Bearing retainer	3.7 ± 0.7 N·m (33 ± 6 in-lb)
Front bracket assembly bolt	4.4 ± 1.0 N·m (39 ± 9 in-lb)
Generator bolt <2.4L ENGINE>	23 ± 2 N·m (16 ± 2 ft-lb)
Generator bolt <3.0L ENGINE>	21 ± 4 N·m (16 ± 3 ft-lb)
Generator brace bolt <2.4L ENGINE>	23 ± 2 N·m (16 ± 2 ft-lb)
Generator brace bolt <2.4L ENGINE>	4.9 ± 1.0 N·m (44 ± 8 in-lb)
Generator brace bolt <3.0L ENGINE>	49 ± 10 N·m (36 ± 7 ft-lb)
Generator nut	44 ± 10 N·m (33 ± 7 ft-lb)
Oil level gauge unit bolt <3.0L ENGINE>	14 ± 1 N·m (117 ± 13 in-lb)
Oil pressure hose and tube clamp bolt <2.4L ENGINE>	12 ± 2 N·m (100 ± 22 in-lb)
Oil return tube clamp bolt <2.4L ENGINE>	12 ± 2 N·m (100 ± 22 in-lb)
Regulator assembly	3.7 ± 0.7 N·m (33 ± 6 in-lb)
Starting system	
Cover bolt	5.8 ± 1.6 N·m (52 ± 14 in-lb)
Magnetic switch bolt	5.8 ± 1.6 N·m (52 ± 14 in-lb)
Rear bracket bolt	3.4 ± 1.0 N·m (30 ± 9 in-lb)
Stator bolt	30 ± 3 N·m (23 ± 2 ft-lb)
Starter cover bolt <2.4L ENGINE>	4.9 ± 1.0 N·m (44 ± 8 in-lb)
Starter screw	5.7 ± 1.5 N·m (51 ± 13 in-lb)
Ignition system	
Camshaft position sensor bolt <2.4L ENGINE>	8.8 ± 1.0 N·m (78 ± 9 in-lb)
Crankshaft position sensor bolt <2.4L ENGINE>	8.8 ± 1.0 N·m (78 ± 9 in-lb)
Crankshaft position sensor bolt <3.0L ENGINE>	8.8 ± 1.0 N·m (78 ± 9 in-lb)
Distributor cap <3.0L ENGINE>	2.3 ± 0.7 N·m (20 ± 6 in-lb)
Distributor nut <3.0L ENGINE>	13 ± 2 N·m (109 ± 21 in-lb)
Ignition coil bolt <2.4L ENGINE>	9.8 ± 2.0 N·m (87 ± 17 in-lb)
Ignition failure sensor bolt <2.4L ENGINE>	4.9 ± 1.0 N·m (44 ± 8 in-lb)
Knock sensor	23 ± 2 N·m (16 ± 2 ft-lb)
Power steering oil pump assembly bolt <2.4L ENGINE>	29 ± 4 N·m (21 ± 4 ft-lb)
Power steering oil pump bracket bolt <2.4L ENGINE>	49 ± 10 N·m (36 ± 7 ft-lb)
Pressure hose and tube connection bolt <2.4L ENGINE>	12 ± 2 N·m (100 ± 22 in-lb)
Spark plug	25 ± 4 N·m (18 ± 4 ft-lb)

GENERAL SPECIFICATIONS

M1161000200198

ITEMS	SPECIFICATIONS
Generator	
Type	Positive battery positive voltage sensing
Identification number <2.4L ENGINE>	A2TA5393ZC <M/T>, A3TB2291ZC <A/T>
Identification number <3.0L ENGINE>	A3TB3491ZC
Part No. <2.4L ENGINE>	MD357737 <M/T>, MD362870 <A/T>
Part No. <3.0L ENGINE>	MD373093
Rated output V/A <2.4L ENGINE>	12/90 <M/T>, 12/95 <A/T>
Rated output V/A <3.0L ENGINE>	12/85
Voltage regulator	Electronic built-in type
Starter motor	
Type	Reduction drive with planetary gear
Identification number <2.4L ENGINE>	M1T84883
Identification number <3.0L ENGINE>	M0T80784
Part No. <2.4L ENGINE>	MD356178
Part No. <3.0L ENGINE>	MD363633
Rated output kW/V <2.4L ENGINE>	1.4/12
Rated output kW/V <3.0L ENGINE>	1.2/12
No. of pinion teeth	8
Distributor <3.0L ENGINE>	
Type	Contact pointless with built-in ignition coil
Advance mechanism	Electronic
Firing order	1-2-3-4-5-6
Ignition coil <2.4L ENGINE>	
Type	Molded 2 coil
Ignition coil <3.0L ENGINE>	
Type	Molded single-coil built in distributor
Spark plugs <2.4L ENGINE>	
NGK	BKR5E-11
DENSO	K16PR-U11
CHAMPION	RC10YC4
Spark plugs <3.0L ENGINE – without VIC system>	
NGK	PFR5G-11
DENSO	PK16PR11
CHAMPION	RC10PYP4
Spark plugs <3.0L ENGINE – with VIC system>	
NGK	IFR6B
DENSO	SK20PR-B8
CHAMPION	–

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SERVICE SPECIFICATIONS

M1161000300214

ITEMS		STANDARD VALUE	LIMIT
Generator			
Regulated voltage (Ambient temperature at voltage regulator)	–20°C (–4°F)	14.2 – 15.4	–
	20°C (68°F)	13.9 – 14.9	–
	60°C (140°F)	13.4 – 14.5	–
	80°C (176°F)	13.1 – 14.5	–
Generator output line voltage drop (at 30 A) V		–	Maximum 0.3
Output current		–	70% of normal output current
Field coil resistance Ω		Approximately 2 – 5	–
Brush protrusion length mm (in)		–	Minimum 2 (0.08)
Starter motor			
Free running characteristics <2.4L ENGINE>	Terminal voltage V	11	–
	Current A	90	–
	Speed r/min	2,400 or more	–
Free running characteristics <3.0L ENGINE>	Terminal voltage V	11	–
	Current A	90	–
	Speed r/min	2,800 or more	–
Pinion gap mm (in)		0.5 – 2.0 (0.02 – 0.07)	–
Commutator run-out mm (in)		0.05 (0.002)	Minimum 0.1 (0.004)
Commutator diameter mm (in)		29.4 (1.16)	Minimum 28.8 (1.13)
Undercut depth mm (in)		0.5 (0.02)	Minimum 0.2 (0.008)
Ignition parts			
Ignition primary coil resistance at 20°C (68°F) Ω <3.0L ENGINE>		0.56 – 0.68	–
Ignition secondary coil resistance at 20°C (60°F) kΩ <2.4L ENGINE>		8.5 – 11.5	–
Ignition secondary coil resistance at 20°C (60°F) kΩ <3.0L ENGINE>		9.4 – 12.8	–
Spark plug gap mm (in) <2.4L ENGINE>		1.0 – 1.1 (0.039 – 0.043)	–
Spark plug gap mm (in) <3.0L ENGINE – without VIC system>		1.0 – 1.1 (0.039 – 0.043)	1.3 (0.051)
Spark plug gap mm (in) <3.0L ENGINE – with VIC system>		0.7 – 0.8 (0.028 – 0.031)	1.0 (0.039)
Resistor wire resistance kΩ		–	Maximum 19

NOTES

GROUP 17

ENGINE AND EMISSION CONTROL

CONTENTS

ENGINE CONTROL 17-4
- GENERAL DESCRIPTION 17-4

ENGINE CONTROL SYSTEM DIAGNOSIS 17-4
- INTRODUCTION TO ENGINE CONTROL SYSTEM DIAGNOSIS 17-4
- ENGINE CONTROL SYSTEM DIAGNOSTIC TROUBLESHOOTING STRATEGY . . . 17-4
- SYMPTOM CHART 17-4
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WARNINGS REGARDING SERVICING OF SUPPLEMENTAL RESTRAINT SYSTEM (SRS) EQUIPPED VEHICLES

⚠ WARNING

- ***Improper service or maintenance of any component of the SRS, or any SRS-related component, can lead to personal injury or death to service personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).***
- ***Service or maintenance of any SRS component or SRS-related component must be performed only at an authorized MITSUBISHI dealer.***
- ***MITSUBISHI dealer personnel must thoroughly review this manual, and especially its GROUP 52B - Supplemental Restraint System (SRS) before beginning any service or maintenance of any component of the SRS or any SRS-related component.***

NOTE
The SRS includes the following components: SRS air bag control unit, SRS warning light, front impact sensors, air bag module, clock spring, and interconnecting wiring. Other SRS-related components (that may have to be removed/installed in connection with SRS service or maintenance) are indicated in the table of contents by an asterisk (*).

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ENGINE CONTROL

GENERAL DESCRIPTION

M1171000100169

A cable-type accelerator mechanical suspended-type pedal has been adopted.

ENGINE CONTROL SYSTEM DIAGNOSIS

INTRODUCTION TO ENGINE CONTROL SYSTEM DIAGNOSIS

M1171002000157

If there is a malfunction in the engine control system, the accelerator cable, accelerator pedal or throttle lever may be faulty.

ENGINE CONTROL SYSTEM DIAGNOSTIC TROUBLESHOOTING STRATEGY

M1171002100176

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted most of the possible ways to find an engine control system fault.

1. Gather information from the customer.
2. Verify that the condition described by the customer exists.
3. Find the malfunction by following the Symptom Chart.
4. Verify that the malfunction is eliminated.

SYMPTOM CHART

M1171002200184

SYMPTOMS	INSPECTION PROCEDURE	REFERENCE PAGE
Throttle valve will not fully open or close	1	P.17-4
Accelerator pedal operation is not smooth (over acceleration)	2	P.17-5

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Throttle Valve will not Fully Open or Close

DIAGNOSIS

STEP 1. Check the accelerator cable adjustment.

Q: Is the accelerator cable properly adjusted?
YES : Go to Step 2.
NO : Adjust the accelerator cable by referring to P.17-5, and then go to Step 4.

STEP 2. Check the return spring.

Q: Is the return spring damaged or deformed?
YES : Go to Step 3.
NO : Replace, then go to Step 4.

STEP 3. Check the throttle lever.

Q: Is the throttle lever damaged or deformed?
YES : Replace, then go to Step 4.
NO : There is no action to be taken.

STEP 4. Check symptom.

Q: Does the throttle valve fully open and close?
YES : This diagnosis is complete.
NO : Return to Step 1.

INSPECTION PROCEDURE 2: Accelerator Pedal Operation is not Smooth (Over Acceleration)

DIAGNOSIS

STEP 1. Check the accelerator pedal.

Q: Is the accelerator pedal loose?
YES : Tighten, then go to Step 4.
NO : Go to Step 2.

STEP 2. Check the accelerator cable wiring.

Q: Is the accelerator cable routing bent sharply?
YES : Repair, then go to Step 4.
NO : Go to Step 3.

STEP 3. Check the accelerator cable lubricant.

Q: Is the accelerator cable lubricated sufficiently?
YES : There is no action to be taken.
NO : Refill or replace the lubricant, then go to Step 4.

STEP 4. Check symptom.

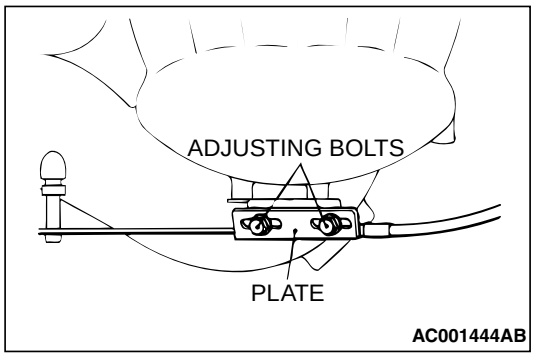
Q: Does the accelerator pedal work normally?
YES : This diagnosis is complete.
NO : Return to Step 1.

ON-VEHICLE SERVICE

ACCELERATOR CABLE CHECK AND ADJUSTMENT

M1171000900198

1. Turn A/C and lamps OFF.
   Inspect and adjust at no load.
2. Warm engine until stabilized at idle.
3. Confirm idle speed is at standard value.
   Standard value: 700 ± 100 r/min
4. Stop engine. [ignition switch: "LOCK" (OFF) position.]
5. Confirm there are no sharp bends in the accelerator cable.
6. Check the inner cable for correct slack.
   Standard value: 1.0 – 2.0 mm (0.04 – 0.08 inch)
7. If there is too much slack or no slack, adjust play by the following procedures.
   (1) Loosen the adjusting bolt to release the cable.
   (2) Move the plate until the inner cable play is at the standard value, and then tighten the adjusting bolt.
   (3) After adjusting, check that the throttle lever is touching the stopper.

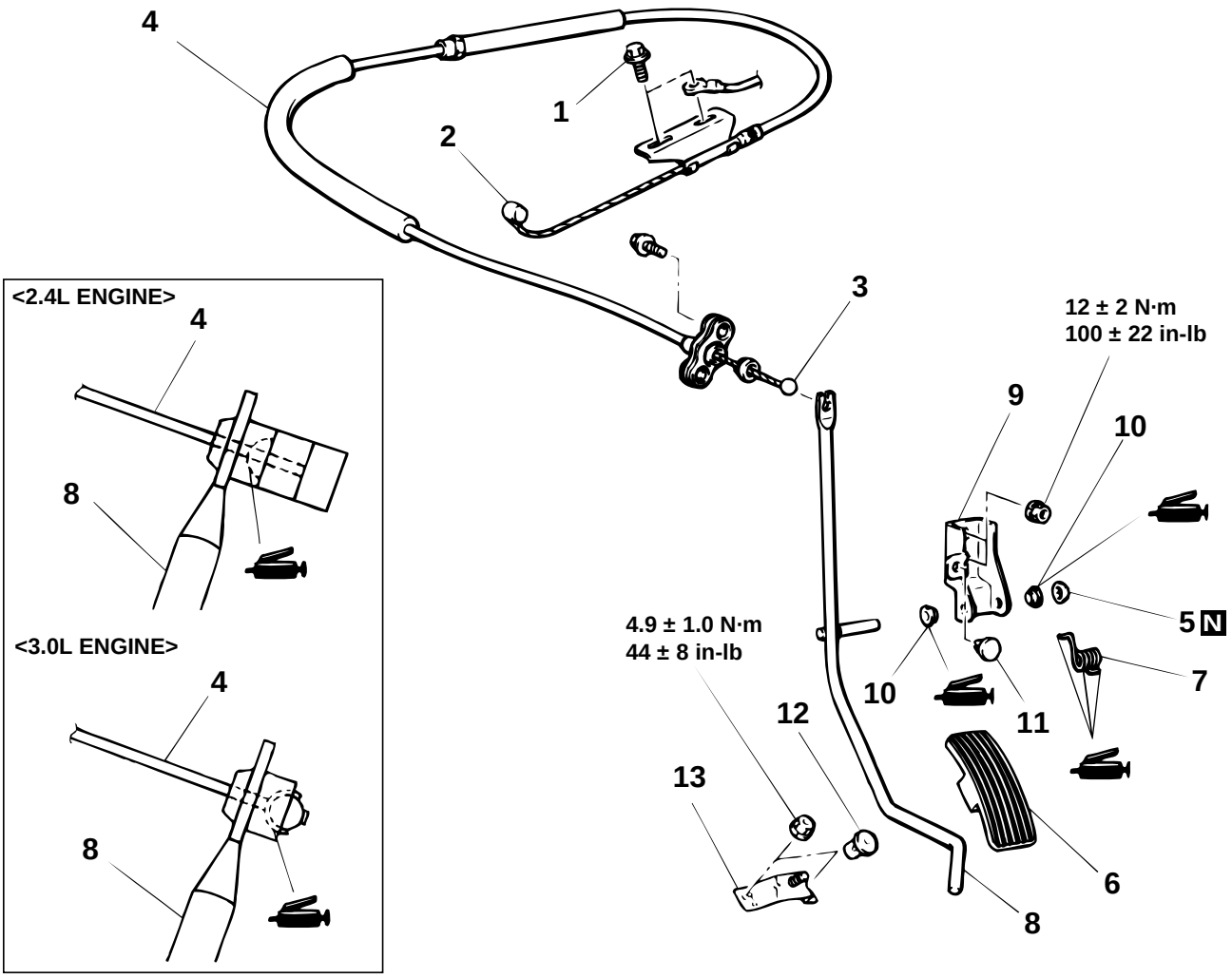


ACCELERATOR CABLE AND PEDAL

REMOVAL AND INSTALLATION

M1171001200211

Post-installation Operation
Adjusting the Accelerator Cable (Refer to P.17-5.)



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REMOVAL STEPS
1. ADJUSTING BOLT
2. INNER CABLE CONNECTION (THROTTLE LEVER SIDE)
3. INNER CABLE CONNECTION (ACCELERATOR PEDAL SIDE)
4. ACCELERATOR CABLE
5. PUSH-ON SPRING NUT
6. PEDAL PAD

REMOVAL STEPS (Continued)
7. SPRING
8. ACCELERATOR ARM ASSEMBLY
9. ACCELERATOR PEDAL BRACKET
10. BUSHING
11. STOPPER
12. ACCELERATOR PEDAL STOPPER
13. BRACKET

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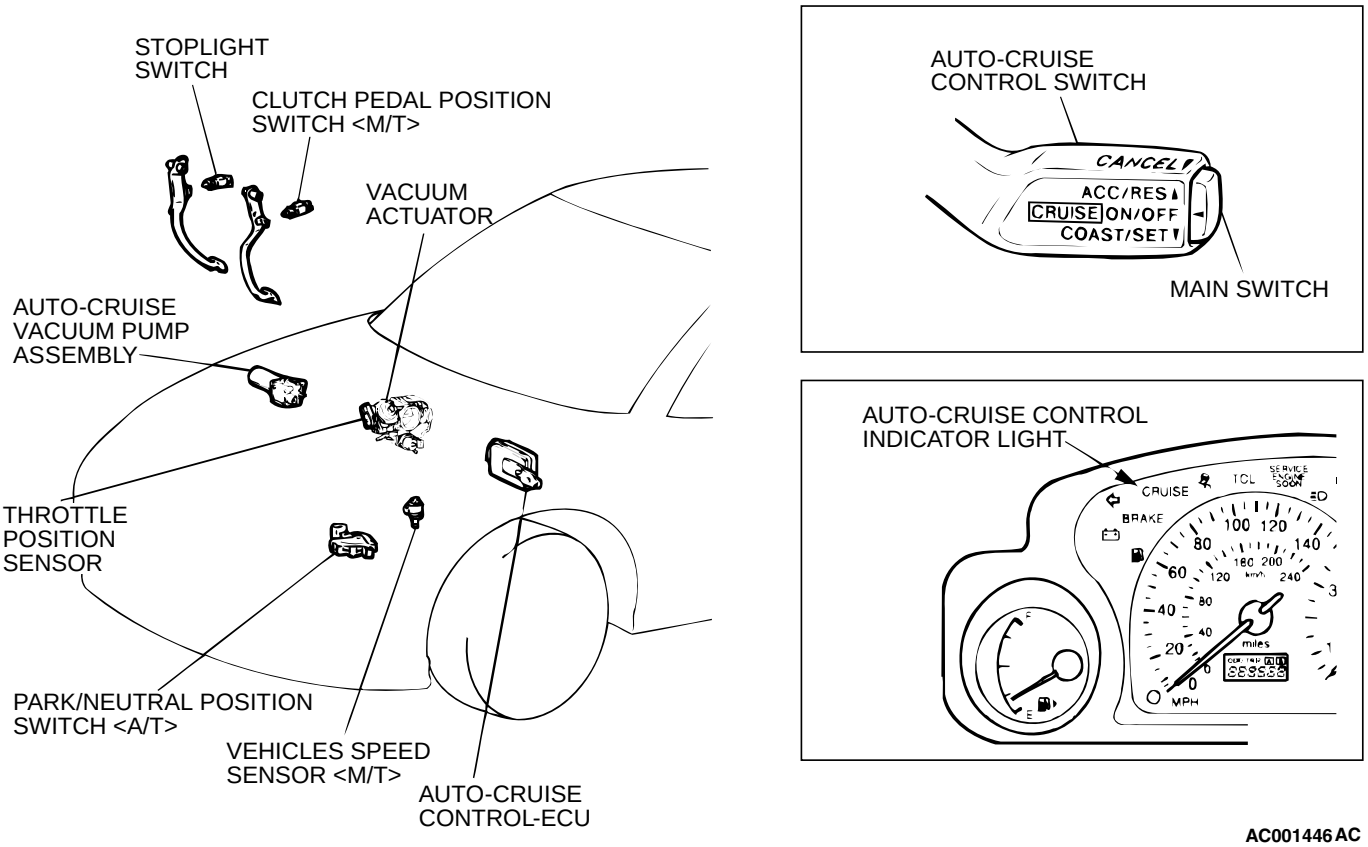
AUTO-CRUISE CONTROL

GENERAL DESCRIPTION

M1172000100151

By using the auto-cruise control, the driver can drive at the desired speed [in a range of approximately 40 – 200 km/h (25 – 124 mph)] without depressing the accelerator pedal.

CONSTRUCTION DIAGRAM



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AUTO-CRUISE CONTROL SYSTEM DIAGNOSIS

INTRODUCTION TO AUTO-CRUISE CONTROL SYSTEM DIAGNOSIS

M1172003300143

The auto-cruise control system allows driving without stepping on the accelerator pedal by setting a random speed between 40 km/h (25 mph) and 200 km/h (124 mph).

Problems in this system can be investigated by the following methods.

Auto-cruise control system diagnostic trouble codes

The auto-cruise control system consists of the auto-cruise control-ECU, control switches, sensors and vacuum pump.

The control switches and sensors monitor the state of the vehicle.

Based on input signals from those switches and sensors, the auto-cruise control-ECU activates the vacuum pump.

If the auto-cruise control-ECU detects a problem on any of those components, the ECU estimates where the problem may be occurring, and will output a diagnostic trouble code.

Diagnostic trouble codes cover the throttle position sensor, auto-cruise control switch, vehicle speed sensor <M/T>, auto-cruise control-ECU and vacuum pump.

AUTO-CRUISE CONTROL SYSTEM DIAGNOSTIC TROUBLESHOOTING STRATEGY

M1172002000150

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will check most of the possible causes of an auto-cruise control system problem.

1. Gather information from the customer.
2. Verify that the condition described by the customer exists.
3. Check the vehicle for any auto-cruise control system DTC.
4. If you can verify the condition but no auto-cruise control system DTCs are set, and the malfunction may be intermittent. Refer to Introduction, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-6.
5. If you can verify the condition but there are no auto-cruise control system DTCs, or the system cannot communicate with scan tool MB991502, refer to Symptom Chart P.17-43 and find the fault.
6. If there is an auto-cruise control system DTC, record the number of the code, then erase the code from vehicle memory using the scan tool.
7. Re-create the auto-cruise control system DTC set conditions to see if the same Auto-cruise Control System DTC will set again.
   - If the same Auto-cruise Control System DTC sets again, perform the diagnostic procedures for the set code. Refer to P.17-11, Auto-cruise Control System Diagnostic Trouble Code Chart.

AUTO-CRUISE CONTROL SYSTEM DIAGNOSTIC TROUBLE CODE DIAGNOSIS

M1172002100146

Retrieving Auto-cruise Control System Diagnostic Trouble Codes.

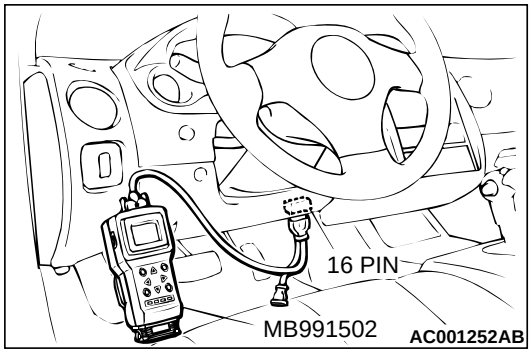
Using scan tool MB991502

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

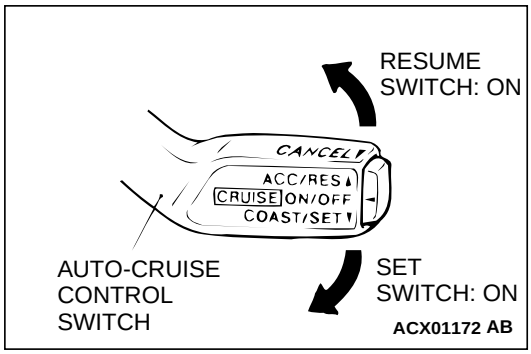
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.



1. Connect scan tool MB991502 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Use scan tool MB991502 to check for auto-cruise control system diagnostic trouble codes.
4. Turn the ignition switch to the "LOCK" (OFF) position.
5. Disconnect scan tool MB991502.

Using a Auto-cruise Control Indicator Light



1. Turn the ignition switch to the "ON" position while holding the auto-cruise control switch in the "SET" position (down). Then, within one second, more the auto-cruise control switch up to the "RES" position.
2. Read a diagnostic trouble code by observing the flash display pattern of the auto-cruise control indicator light in the combination meter.

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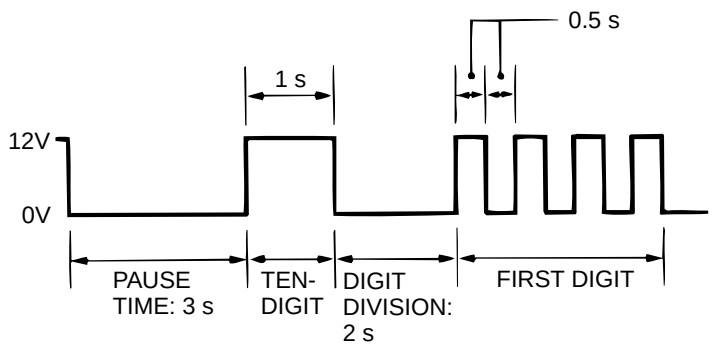
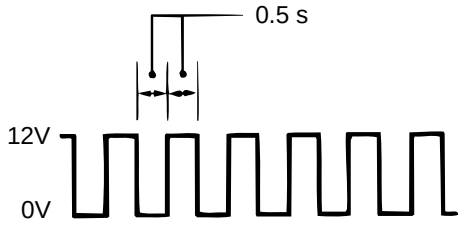
DIAGNOSTIC RESULT DISPLAY METHOD WHEN USING THE AUTO-CRUISE CONTROL INDICATOR LIGHT

WHEN THE DIAGNOSTIC TROUBLE CODE NO.14 IS OUTPUT	WHEN NO DIAGNOSTIC TROUBLE CODE IS OUTPUT
 ACX01173 AB	 CONTINUOUS ON AND OFF SIGNALS AT INTERVALS OF 0.5 s ACX01174 AB

NOTE: Other on-board diagnostic items are also output as voltage waveforms corresponding to diagnostic trouble code numbers.

Erasing Diagnostic Trouble Codes

The diagnostic trouble codes can be erased by the following procedure.

NOTE: The diagnostic trouble code will not be erased even if the negative battery terminal is disconnected.

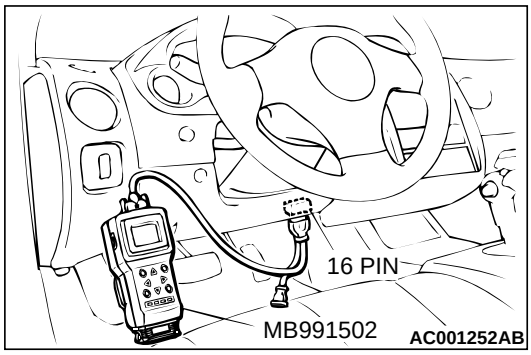
Using scan tool MB991502

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

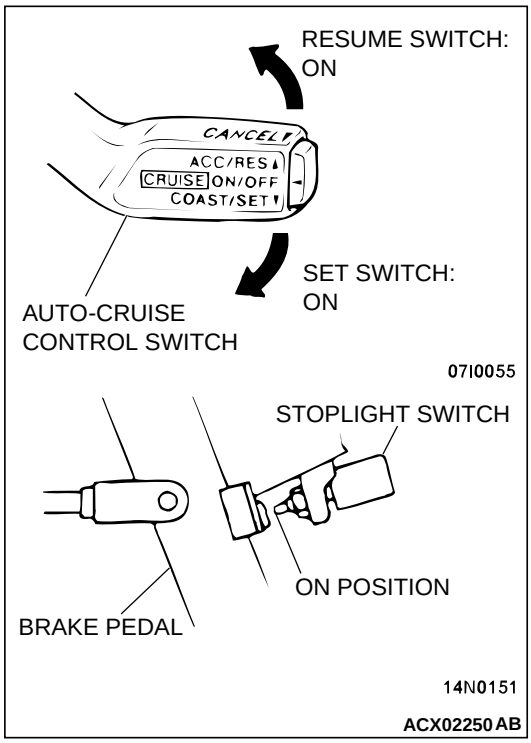
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.



AC001252AB

1. Connect scan tool MB991502 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Use scan tool MB991502 to check for auto-cruise control system diagnostic trouble codes.
4. Turn the ignition switch to the "LOCK" (OFF) position.
5. Disconnect scan tool MB991502.



Without using scan tool MB991502

1. Turn the ignition switch to the "ON" position while holding the auto-cruise control switch in the "SET" (down) position. Then, within one second, more the auto-cruise control switch up to the "RES" position.
2. Check to make sure the "CRUISE" light on the instrument panel is flashing.
3. Put the auto-cruise control switch in the "SET" (down) position.
   Depress the brake pedal and hold for five seconds or more.
   Release the brake pedal, auto-cruise control switch, then turn the ignition switch to the "LOCK" (OFF) position.
   The DTC(s) are now erased.

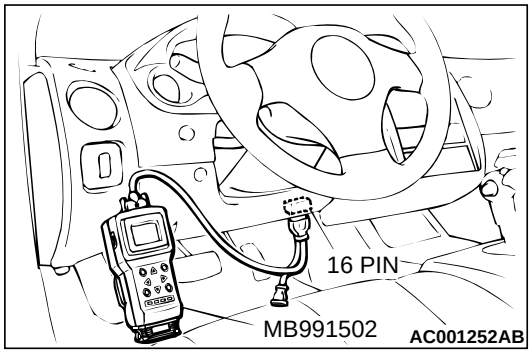
INSPECTION USING SCAN TOOL MB991502 DATA LIST

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.



1. Connect scan tool MB991502 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Carry out inspection by means of the data list.
   If there is an abnormality, check and repair the chassis harnesses and components. (Refer to P.17-77, Data List Reference Table.)
4. Re-check using scan tool MB991502 and check to be sure that the abnormal input and output have returned to normal because of the repairs.
5. Erase the diagnostic trouble code(s).
6. Turn the ignition switch to the "LOCK" (OFF) position.
7. Disconnect scan tool MB991502 from the data link connector.
8. Start the engine again and do a test drive to confirm that the problem is eliminated.

DIAGNOSTIC TROUBLE CODE CHART

M1172002200176

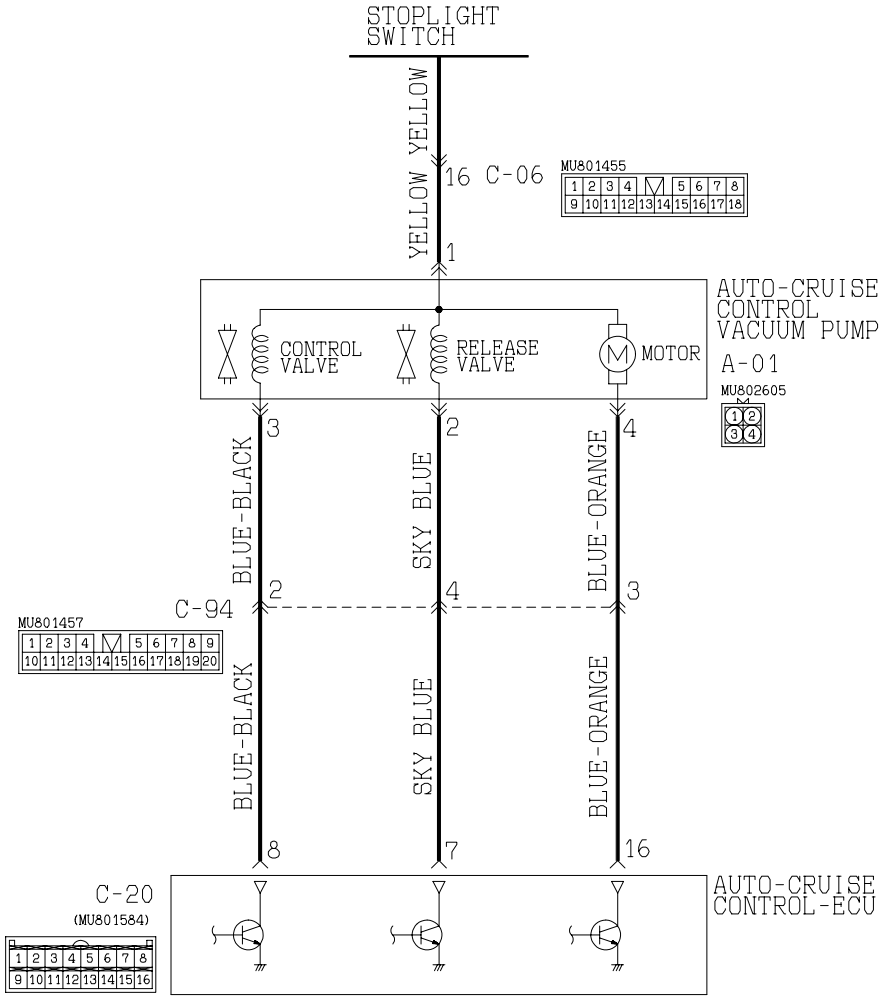
Check according to the inspection chart that is appropriate for the diagnostic trouble code.

DIAGNOSTIC TROUBLE CODE NO.	INSPECTION ITEM	REFERENCE PAGE
11	Auto-cruise vacuum pump drive system	P.17-12
12	Vehicle speed signal system <M/T>	P.17-17
	Vehicle speed signal system <A/T>	P.17-20
14	Stoplight switch system	P.17-23
15	Auto-cruise control switch system	P.17-32
16	Auto-cruise control-ECU system	P.17-39
17	Throttle position sensor system	P.17-39

DIAGNOSTIC TROBLE CODE PROCEDURES

DTC 11: Auto-cruise Vacuum Pump Drive System

Auto-cruise Vacuum Pump Drive System Circuit



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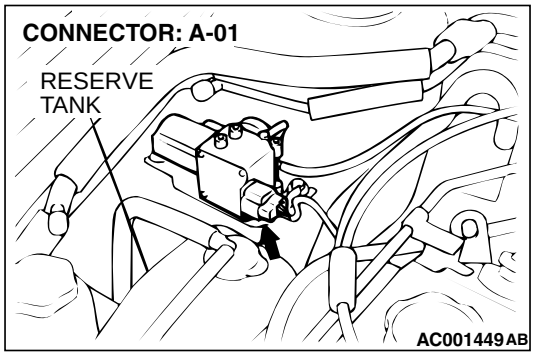

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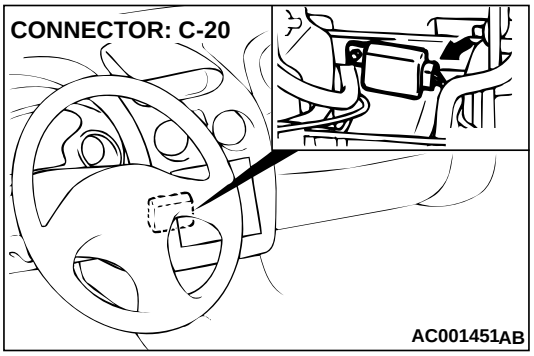

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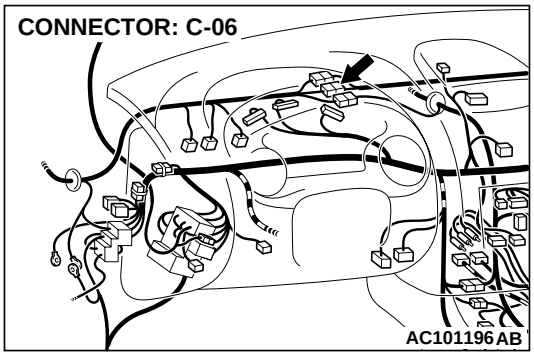
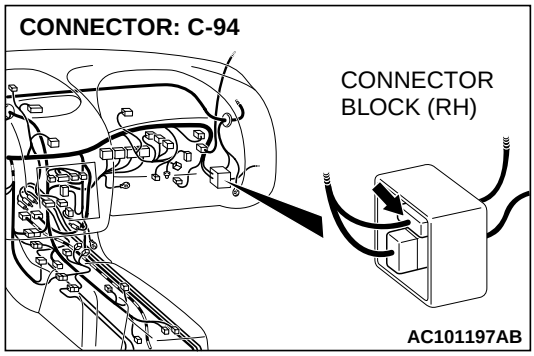




CIRCUIT OPERATION

This circuit activates the vacuum pump used to accelerate/decelerate, set, and cancel the vehicle speed.
The auto-cruise control-ECU controls the control valve, release valve, and motor by turning the transistor in the ECU on and off.

DTC SET CONDITIONS

Any drive signal for the release valve, control valve or motor is not input to the auto-cruise control-ECU.

TROUBLESHOOTING HINTS

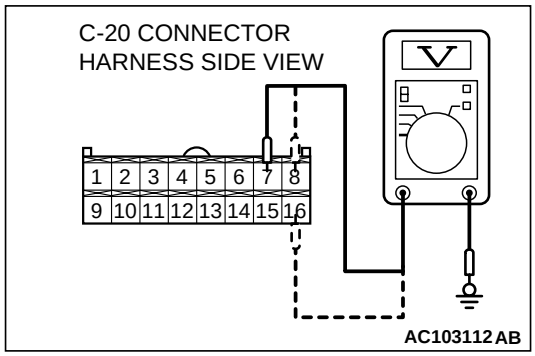
The most likely causes for this code to be set are:

- Malfunction of the auto-cruise vacuum pump.
- Damaged harness or connector.
- Malfunction of the auto-cruise control-ECU.

DIAGNOSIS

Required Special Tool:

- MB991223: Harness Set



STEP 1. Check the output circuit voltage at auto-cruise control-ECU connector C-20 (terminal numbers 7,8 and 16) by backprobing.

(1) Do not disconnect auto-cruise control-ECU connector C-20.
(2) Turn the ignition switch to the "ON" position and the auto-cruise control main switch to the "ON" position.
(3) Measure the voltage between terminal 7 and ground by backprobing.
- Voltage should be battery positive voltage.
  [When decelerating with the "SET" switch while driving at constant speed (Release valve open).]

(4) Measure the voltage between terminal 8 and ground by backprobing.
- Voltage should be battery positive voltage.
  [When decelerating with the "SET" switch while driving at constant speed. (Control valve open).]

(5) Measure the voltage between terminal 16 and ground by backprobing.
- Voltage should be battery positive voltage.
  (When the motor is stopped during a constant road speed.)

(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are all of the above values satisfied?

YES : Check that diagnostic trouble code 11 is not output. If diagnostic trouble code 11 is output, replace the auto-cruise control-ECU. (Refer to P.17-86.) Then check that diagnostic trouble code 11 is not.
NO : Go to Step 2.

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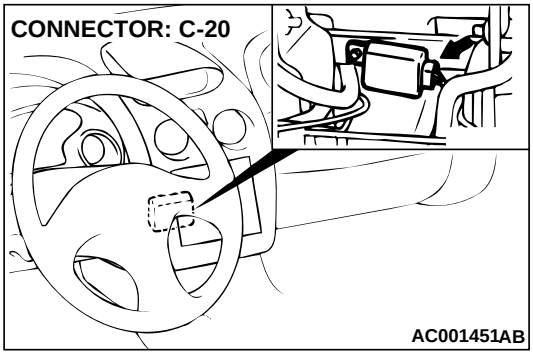
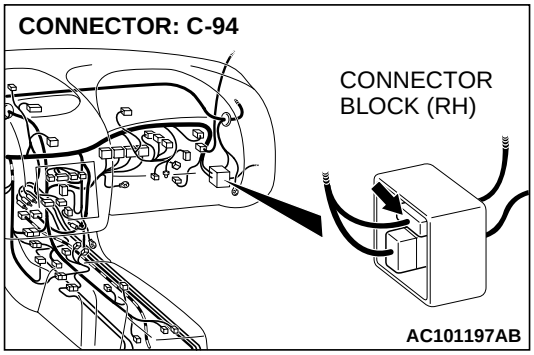


STEP 2. Check auto-cruise control-ECU connector C-20 and intermediate connector C-94.

Q: Is the connector damaged?

YES : Repair or replace connector.
Refer to GROUP 00E, Harness Connector Inspection P.00E-2.
Then check that diagnostic trouble code 11 is not output.

NO : Go to Step 3.

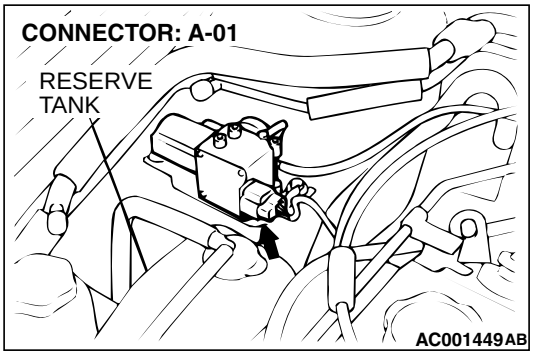


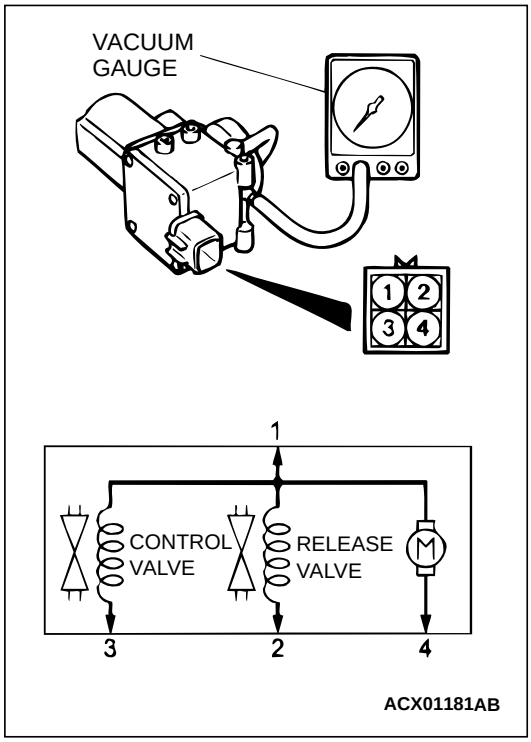
STEP 3. Check auto-cruise control vacuum pump connector A-01.

Q: Is the connector damaged?

YES : Repair or replace connector.
Refer to GROUP 00E, Harness Connector Inspection P.00E-2.
Then check that diagnostic trouble code 11 is not output.

NO : Go to Step 4.



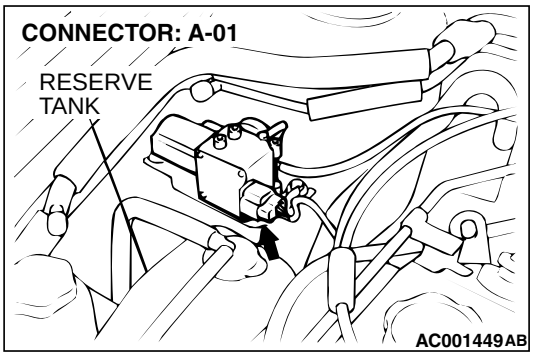


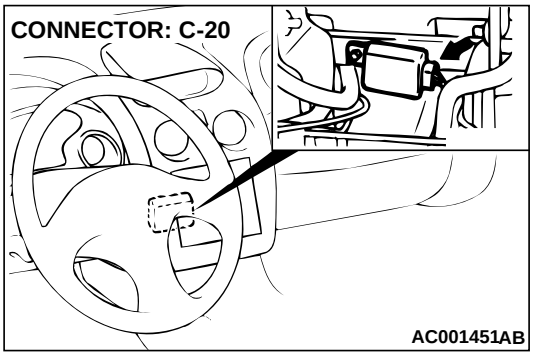
STEP 4. Check the auto-cruise vacuum pump.

(1) Disconnect the vacuum hose from the auto-cruise vacuum pump and connect a vacuum gauge to the vacuum pump.
(2) Disconnect the vacuum pump connector.
(3) Check the auto-cruise vacuum pump and valves according to the following procedure:
- Connect the positive battery terminal to auto-cruise vacuum pump connector terminal 1, and the negative battery terminal to terminals 2, 3, and 4.
  The vacuum gauge should read 27 kPa (8.0 in Hg) or more.
- The vacuum should be maintained when terminal 4 is disconnected from the negative battery terminal while terminals 1, 2, and 3 remain connected.
  Then the vacuum gauge should read 0 kPa (0 in Hg) when terminal 2 is disconnected from the negative battery terminal while terminals 1, and 3 remain connected.
- The vacuum should be maintained when terminal 4 is disconnected from the negative battery terminal while terminals 1, 2, and 3 remain connected.
  Then the vacuum gauge should read 0 kPa (0 in Hg) when terminal 3 is disconnected from the negative battery terminal while terminals 1, and 2 remain connected.

Q: Are all of the above values satisfied?

YES : Go to Step 5.
NO : Replace the auto-cruise vacuum pump. (Refer to P.17-86.)
Then check that diagnostic trouble code 11 is not output.





STEP 5. Check the harness wire between auto-cruise control vacuum pump connector A-01 (terminal numbers 2, 3 and 4) and auto-cruise control-ECU connector C-20 (terminal numbers 7, 8 and 16).

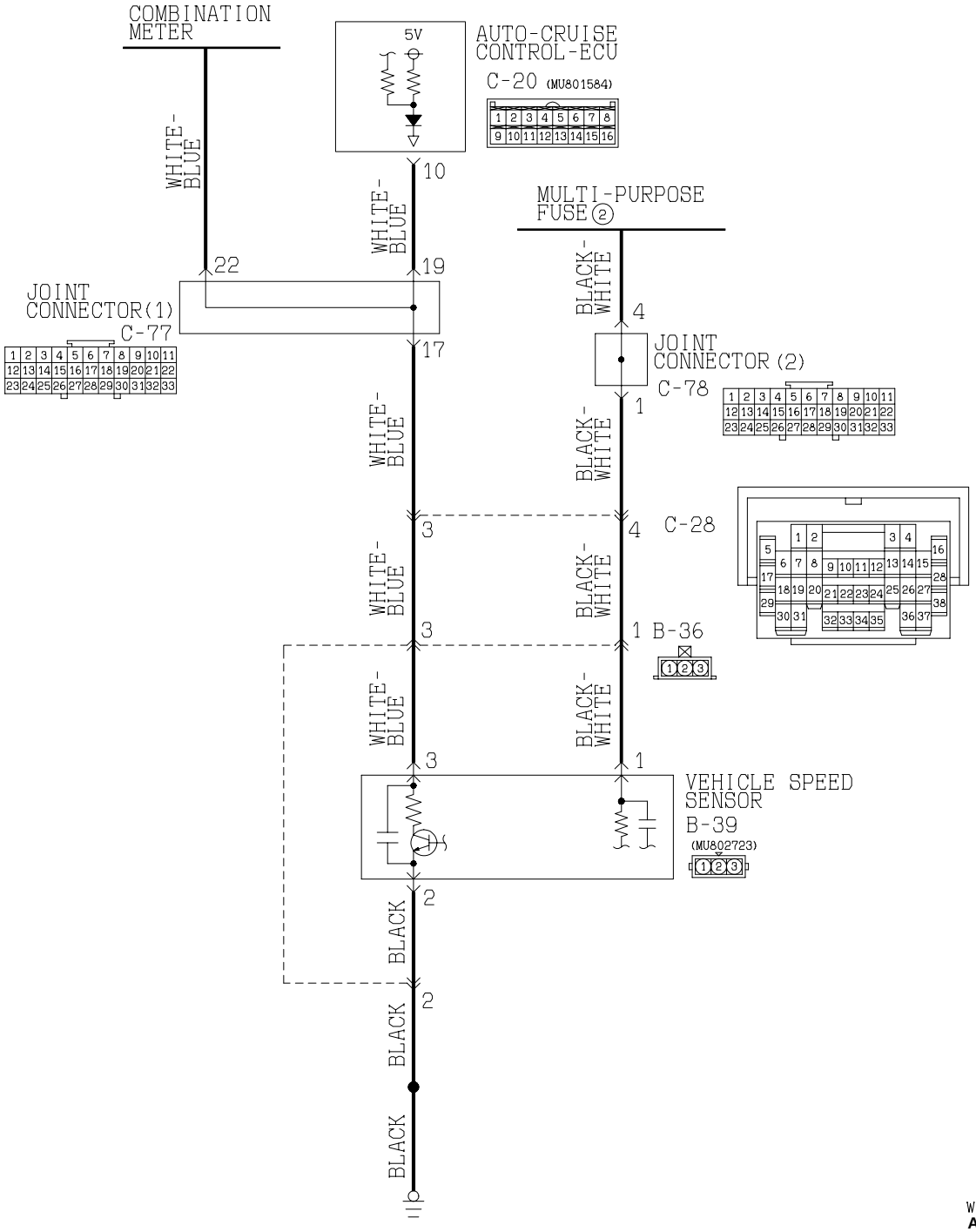
Q: Is any harness wire between auto-cruise control vacuum pump connector A-01 (terminal numbers 2, 3 and 4) and auto-cruise control-ECU connector C-20 (terminal numbers 7, 8 and 16) damaged?

YES : Repair the harness wire and then check that diagnostic trouble code 11 is not output.

NO : Check that diagnostic trouble code 11 is not output. If diagnostic trouble code 11 is output, replace the auto-cruise control-ECU. (Refer to P.17-86.) Then check that diagnostic trouble code 11 is not output.

DTC 12: Vehicle Speed Signal System <M/T>

Vehicle Speed Signal System Circuit



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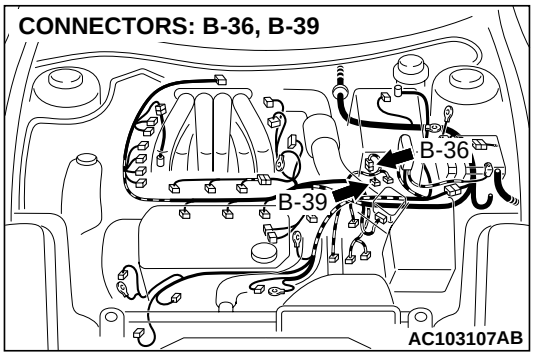
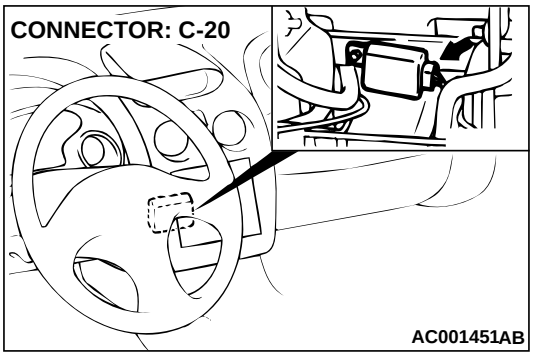
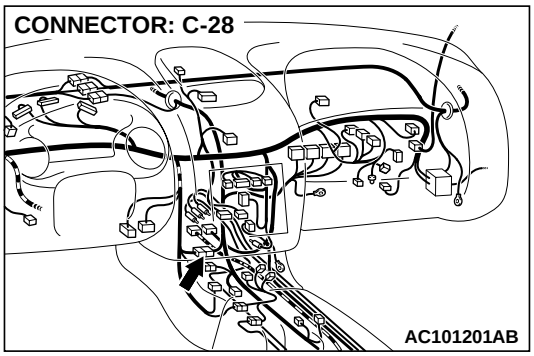
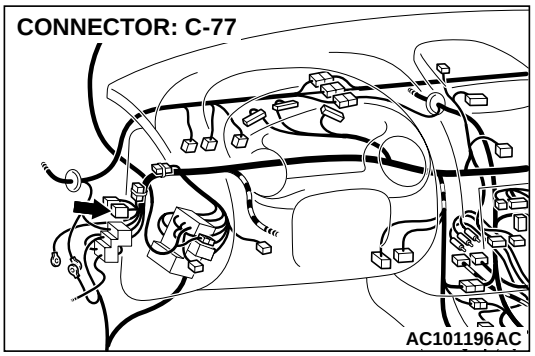








CIRCUIT OPERATION

This circuit checks the operation of the vehicle speed sensor.
When the vehicle moves forward and reverses, the sensor turns ON and OFF repeatedly.

DTC SET CONDITIONS

The vehicle speed signals from the vehicle speed sensor are not input to the auto-cruise control-ECU when the vehicle speed is 40 km/h (25 mph) or more.

TROUBLESHOOTING HINTS

The most likely causes for this code to be set are:

- Malfunction of the vehicle speed sensor.
- Damaged harness or connector.
- Malfunction of the auto-cruise control-ECU.

DIAGNOSIS

Required Special Tool:

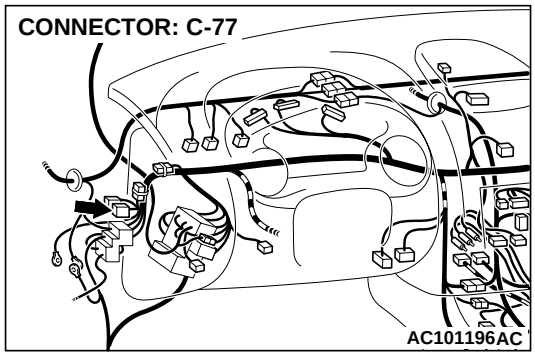
- MB991223: Harness Set

STEP 1. Check the speedometer.

Q: Does the speedometer work normally?

YES : Go to Step 2.

NO : Check the speedometer circuit and repair or replace as required.
(Refer to GROUP 54A, Combination Meter Assembly and Vehicle Speed Sensor P.54A-40.)

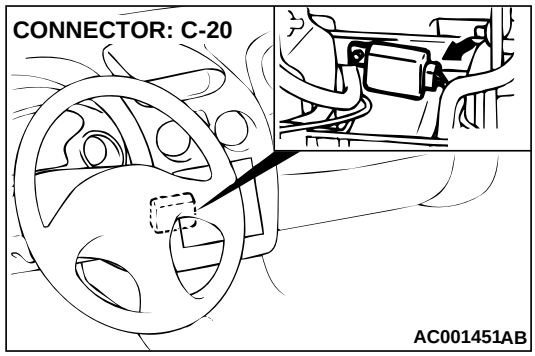


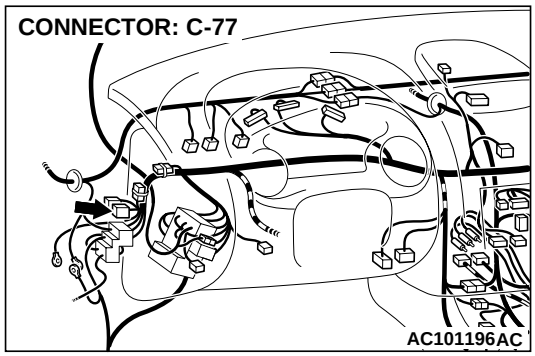
STEP 2. Check joint connector (1) C-77.

Q: Is the connector damaged?

YES : Repair or replace connector.
Refer to GROUP 00E, Harness Connector Inspection P.00E-2.
Then check that diagnostic trouble code 12 is not output.

NO : Go to Step 3.





STEP 3. Check the harness wire between auto-cruise control-ECU connector C-20 (terminal number 10) and joint connector (1) C-77 (terminal number 19).

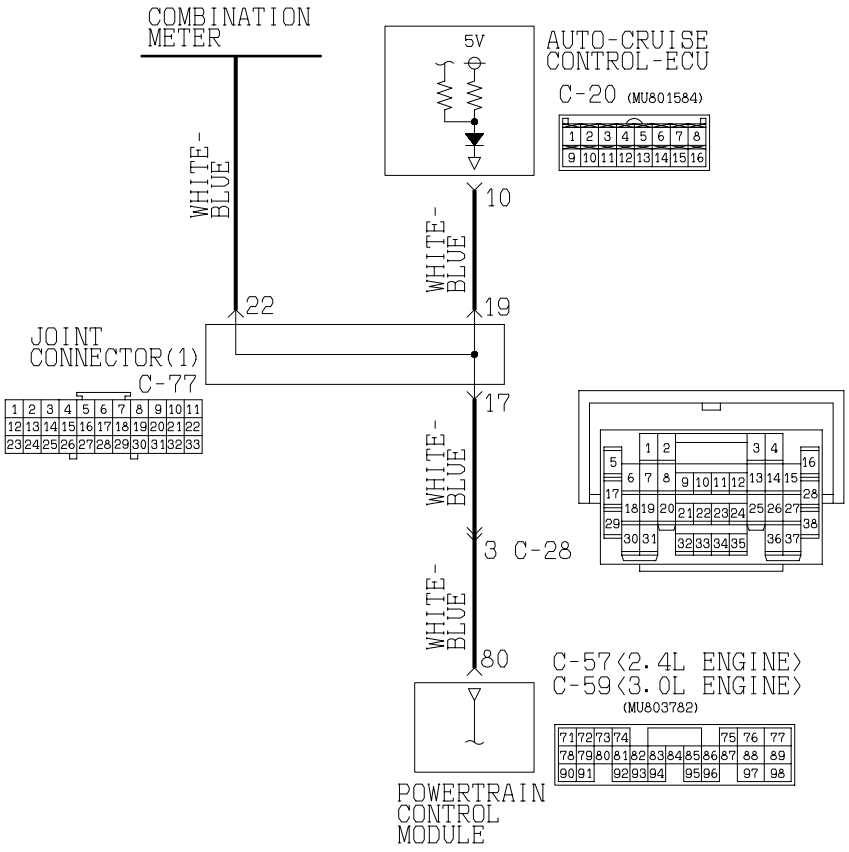
Q: Is any harness wire between auto-cruise control-ECU connector C-20 (terminal number 10) and joint connector (1) C-77 (terminal number 19) damaged?

YES : Repair the harness wire and then check that diagnostic trouble code 12 is not output.

NO : Check that diagnostic trouble code 12 is not output.
If diagnostic trouble code 12 is output, replace the auto-cruise control-ECU. (Refer to P.17-86.)
Then check that diagnostic trouble code 12 is not output.

DTC 12: Vehicle Speed Signal System <A/T>

Vehicle Speed Signal System Circuit



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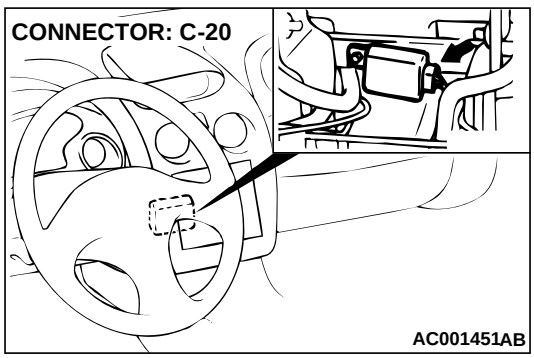

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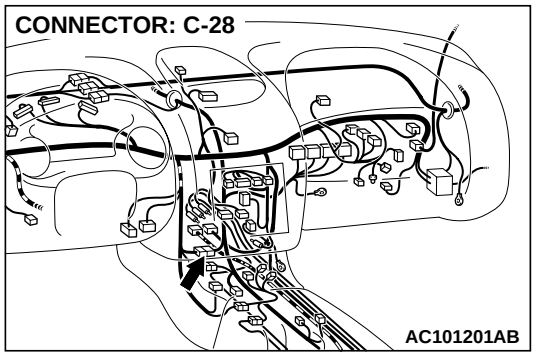

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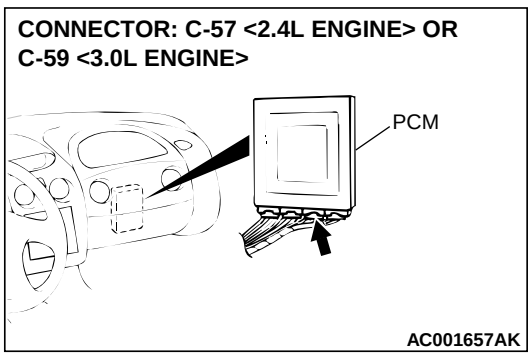

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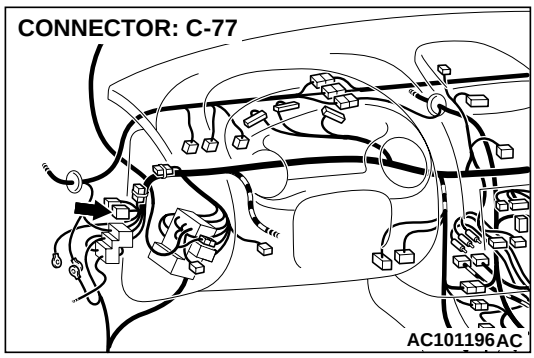

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CIRCUIT OPERATION

This circuit checks the vehicle speed signal. When the vehicle moves forward and reverses, the sensor turns ON and OFF repeatedly.

DTC SET CONDITIONS

The vehicle speed signals from the PCM are not input to the auto-cruise control-ECU when the vehicle speed is 40 km/h (25 mph) or more.

TROUBLESHOOTING HINTS

The most likely causes for this code to be set are:

- Malfunction of the output shaft speed sensor.
- Damaged harness or connector.
- Malfunction of the PCM.
- Malfunction of the auto-cruise control-ECU.

DIAGNOSIS

Required Special Tool:

- MB991223: Harness Set

STEP 1. Check the speedometer.

Q: Does the speedometer work normally?

YES : Go to Step 2.

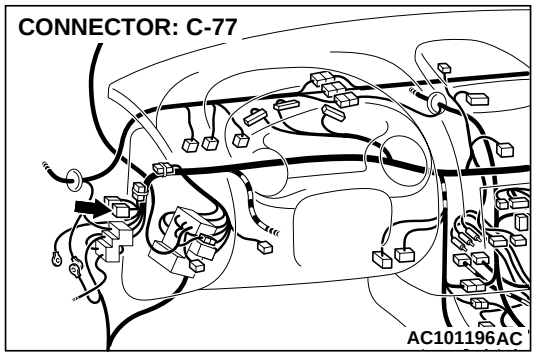
NO : Check the speedometer circuit and repair or replace as required.
(Refer to GROUP 54A, Combination Meter Assembly and Vehicle Speed Sensor P.54A-40.)

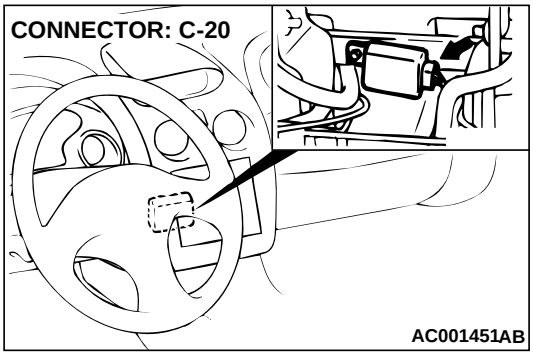
STEP 2. Check joint connector (1) C-77.

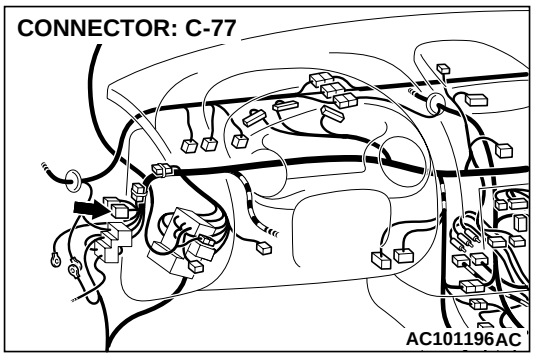
Q: Is the connector damaged?

YES : Repair or replace connector.
Refer to GROUP 00E, Harness Connector Inspection P.00E-2.
Then check that diagnostic trouble code 12 is not output.

NO : Go to Step 3.







STEP 3. Check the harness wire between auto-cruise control-ECU connector C-20 (terminal number 10) and joint connector (1) C-77 (terminal number 19).

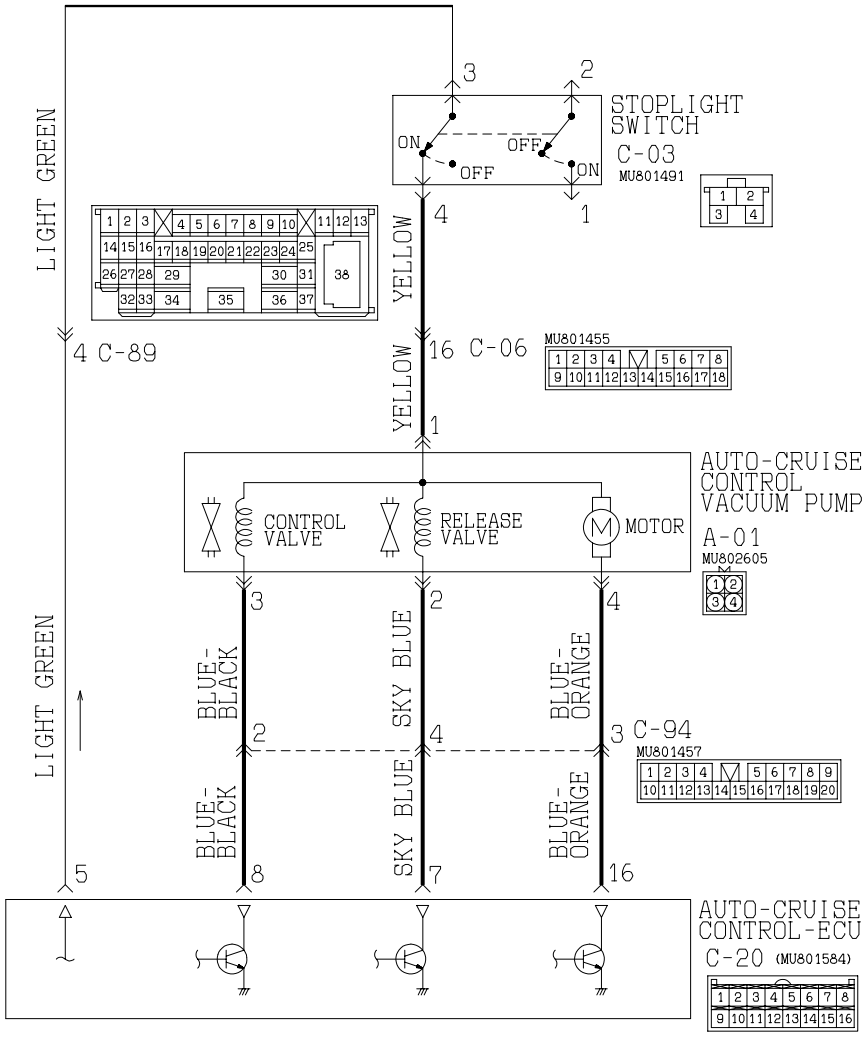
Q: Is any harness wire between auto-cruise control-ECU connector C-20 (terminal number 10) and joint connector (1) C-77 (terminal number 19) damaged?

YES : Repair the harness wire and then check that diagnostic trouble code 12 is not output.

NO : Check that diagnostic trouble code 12 is not output. If diagnostic trouble code 12 is output, replace the auto-cruise control-ECU. (Refer to P.17-86.) Then check that diagnostic trouble code 12 is not output.

DTC 14 : Stoplight Switch System

Stoplight Switch System Circuit



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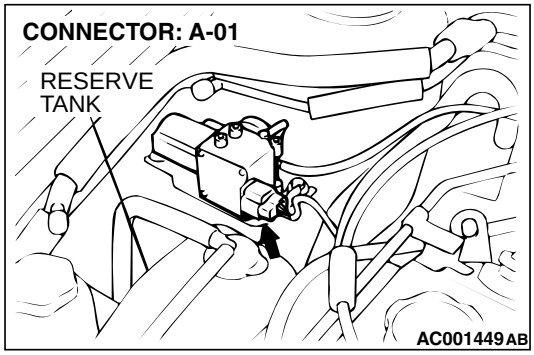

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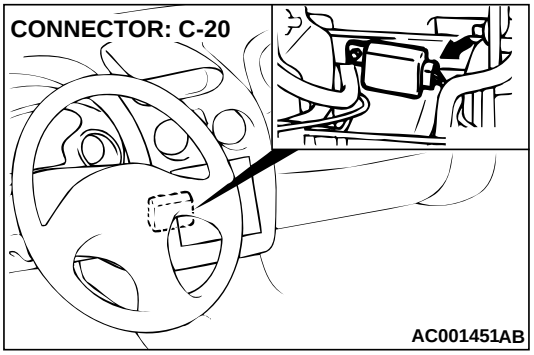

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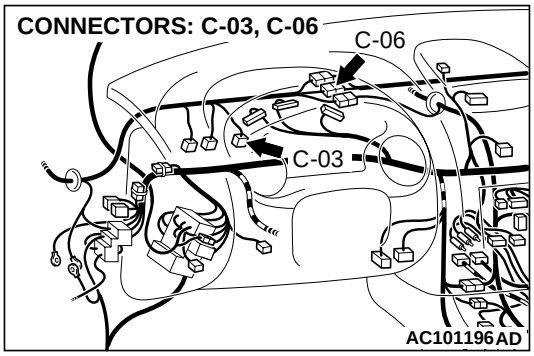
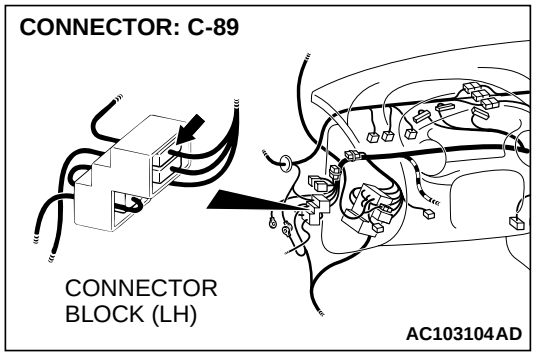
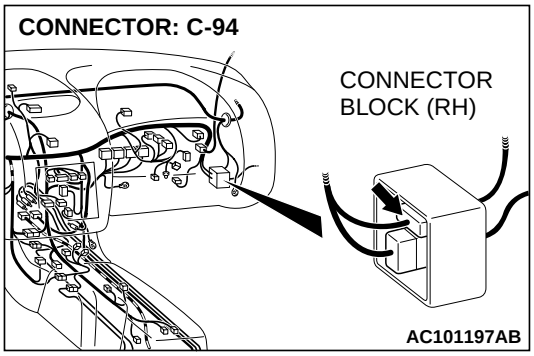






CIRCUIT OPERATION

This circuit supplies the power to the vacuum pump. The battery positive voltage is supplied to the auto-cruise control vacuum pump by turning on the transistor at terminal number 16 of the auto-cruise control-ECU.

The conditions for turning on the transistor at terminal number 16 of the auto-cruise control-ECU are as follows.

- Ignition switch "ON."
- Auto-cruise control main switch "ON."
- Stoplight switch ON.

DTC SET CONDITIONS

None of the drive signals from release valve, control valve and motor of the auto-cruise vacuum pump are input to the auto-cruise control-ECU.

TROUBLESHOOTING HINTS

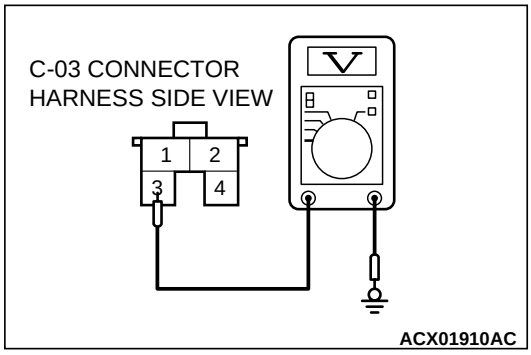
The most likely causes for this code to be set are:

- Malfunction of the stoplight switch.
- Malfunction of the auto-cruise vacuum pump.
- Damaged harness or connector.
- Malfunction of the auto-cruise control-ECU.

DIAGNOSIS

Required Special Tool:
- MB991223: Harness Set

STEP 1. Check the output circuit voltage at stoplight switch connector C-03 (terminal number 3) by backprobing.

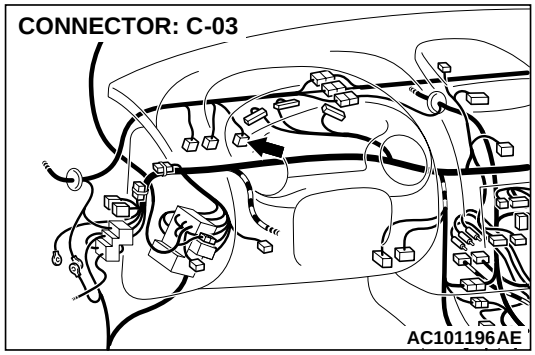


(1) Do not disconnect stoplight switch connector C-03.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 3 and ground by backprobing.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage approximately battery positive voltage?

YES : Go to Step 3.
NO : Go to Step 2.

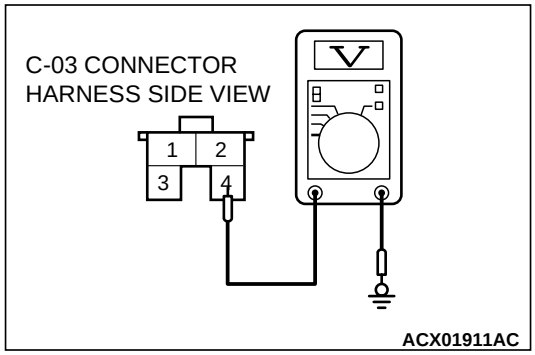
STEP 2. Check stoplight switch connector C-03.



Q: Is the connector damaged?

YES : Repair or replace connector.
Refer to GROUP 00E, Harness Connector Inspection P.00E-2.
Then check that diagnostic trouble code 14 is not output.
NO : Go to Step 13.

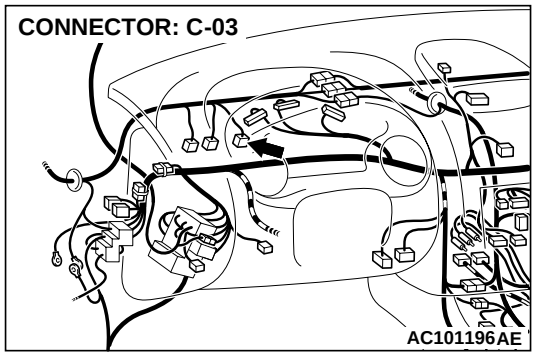
STEP 3. Check the output circuit voltage at stoplight switch connector C-03 (terminal number 4) by backprobing.



(1) Do not disconnect stoplight switch connector C-03.
(2) Turn the ignition switch to the "ON" position and the auto-cruise control main switch to the "ON" position.
(3) Measure the voltage between terminal 4 and ground by backprobing.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage approximately battery positive voltage?

YES : Go to Step 6.
NO : Go to Step 4.

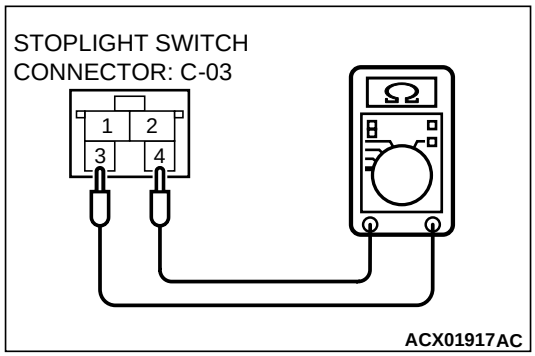


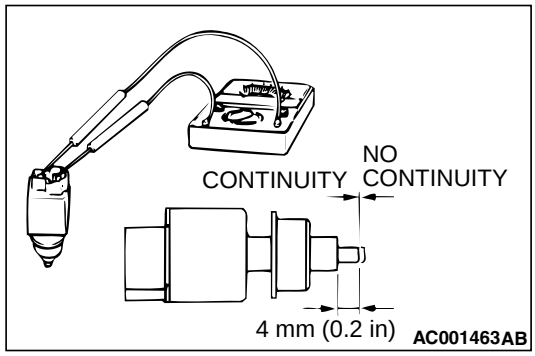
STEP 4. Check stoplight switch connector C-03.

Q: Is the connector damaged?

YES : Repair or replace connector.
Refer to GROUP 00E, Harness Connector Inspection P.00E-2.
Then check that diagnostic trouble code 14 is not output.

NO : Go to Step 5.





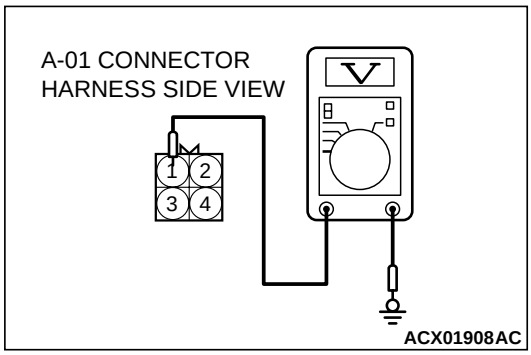
STEP 5. Check the stoplight switch.

(1) Disconnect stoplight switch connector C-03.
(2) Connect an ohmmeter to the stoplight switch between terminals 3 and 4, and check whether there is continuity when the plunger of the stoplight switch is pushed in and an open circuit when it is released.
(3) The stoplight switch is in good condition if the circuit is open when the plunger is pushed in to a depth of within 4 mm (0.2 inch) from the outer case edge surface, and if there is continuity when it is released.

Q: Is the circuit is open?

YES : Replace the stoplight switch.
Refer to GROUP 35A, Brake Pedal P.35A-31.
Then check that a diagnostic trouble code 14 is not output.

NO : Check that diagnostic trouble code 14 is not output.
If diagnostic trouble code 14 is output, replace the auto-cruise control-ECU. (Refer to P.17-86.)
Then check that diagnostic trouble code 14 is not output.

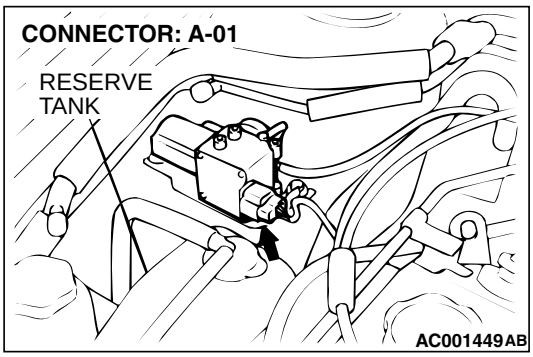


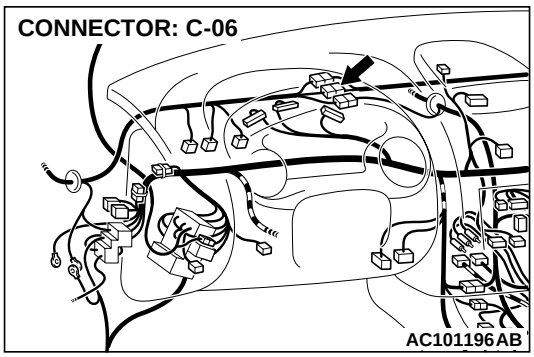
STEP 6. Check the output circuit voltage at auto-cruise control vacuum pump connector A-01 (terminal number 1) by backprobing.

(1) Do not disconnect auto-cruise control vacuum pump connector A-01.
(2) Turn the ignition switch to the "ON" position and the auto-cruise control main switch to the "ON" position.
(3) Measure the voltage between terminal 1 and ground by backprobing.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage approximately battery positive voltage?

YES : Go to Step 8.
NO : Go to Step 7.



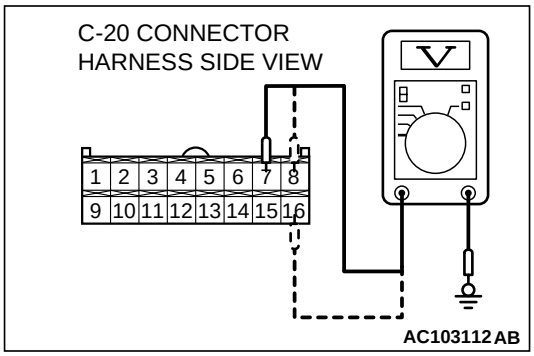


STEP 7. Check auto-cruise control vacuum pump connector A-01 and intermediate connector C-06.

Q: Is any connector damaged?

YES : Repair or replace connector.
Refer to GROUP 00E, Harness Connector Inspection P.00E-2.
Then check that diagnostic trouble code 14 is not output.

NO : Check the harness wire between stoplight switch connector C-03 and auto-cruise control vacuum pump connector A-01 for open circuit or damage.
Then repair if necessary.
Then check that diagnostic trouble code 14 is not output.



STEP 8. Check the output circuit voltage at auto-cruise control-ECU connector C-20 (terminal numbers 7,8 and 16) by backprobing.

(1) Do not disconnect auto-cruise control-ECU connector C-20.
(2) Turn the ignition switch to the "ON" position and the auto-cruise control main switch to the "ON" position.
(3) Measure the voltage between terminal 7 and ground by backprobing.
- Voltage should be battery positive voltage.
  [When decelerating with the "SET" switch while driving at constant speed (Release valve open).]

(4) Measure the voltage between terminal 8 and ground by backprobing.
- Voltage should be battery positive voltage.
  [When decelerating with the "SET" switch while driving at constant speed. (Control valve open).]

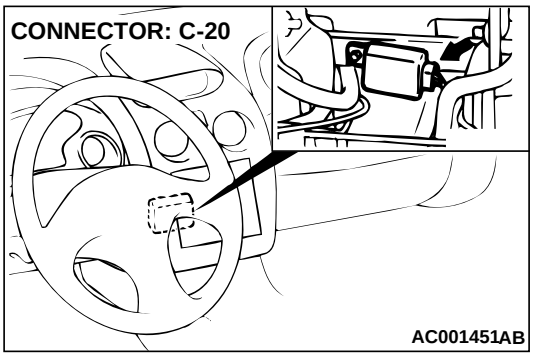
(5) Measure the voltage between terminal 16 and ground by backprobing.
- Voltage should be battery positive voltage.
  (When the motor is stopped during a constant road speed.)

(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are all of the above values satisfied?

YES : Check that diagnostic trouble code 14 is not output.
If diagnostic trouble code 14 is output, replace the auto-cruise control-ECU. (Refer to P.17-86.)
Then check that diagnostic trouble code 14 is not.

NO : Go to Step 9.

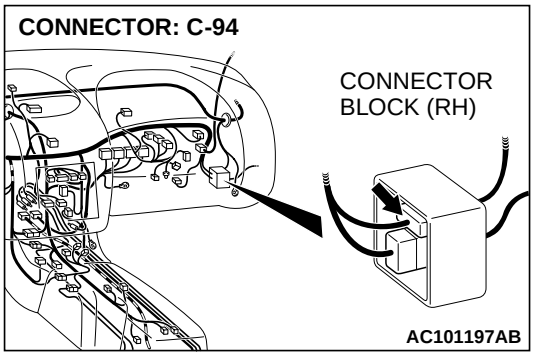


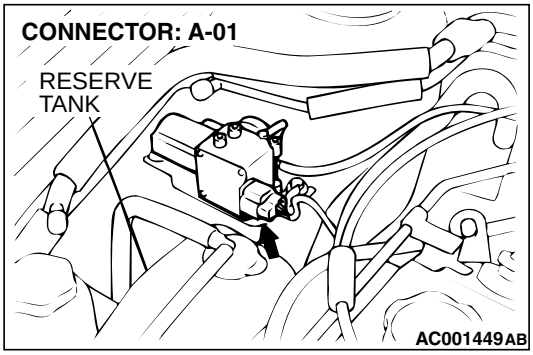
STEP 9. Check auto-cruise control-ECU connector C-20 and intermediate connector C-94.

Q: Is the connector damaged?

YES : Repair or replace connector.
Refer to GROUP 00E, Harness Connector Inspection P.00E-2.
Then check that diagnostic trouble code 14 is not output.

NO : Go to Step 10.



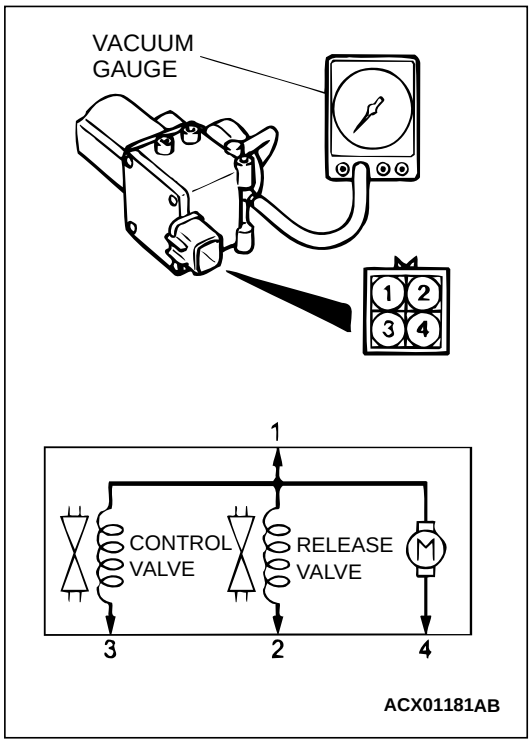


STEP 10. Check auto-cruise control vacuum pump connector A-01.

Q: Is the connector damaged?

YES : Repair or replace connector.
Refer to GROUP 00E, Harness Connector Inspection P.00E-2.
Then check that diagnostic trouble code 14 is not output.

NO : Go to Step 11.



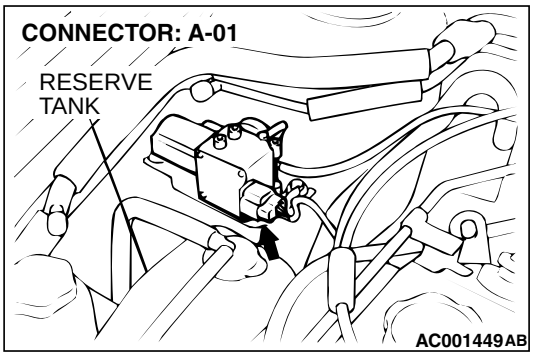
STEP 11. Check the auto-cruise vacuum pump.

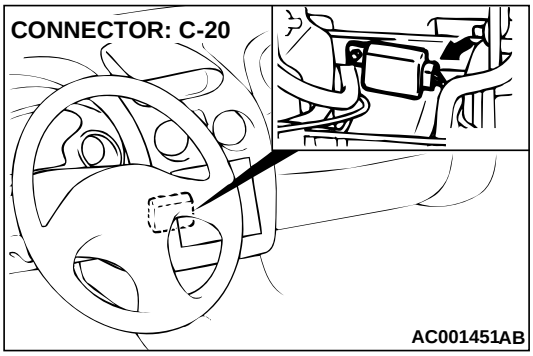
(1) Disconnect the vacuum hose from the auto-cruise vacuum pump and connect a vacuum gauge to the vacuum pump.
(2) Disconnect the vacuum pump connector.
(3) Check the auto-cruise vacuum pump and valves according to the following procedure:
- Connect the positive battery terminal to auto-cruise vacuum pump connector terminal 1, and the negative battery terminal to terminals 2, 3, and 4.
  The vacuum gauge should read 27 kPa (8.0 in Hg) or more.
- The vacuum should be maintained when terminal 4 is disconnected from the negative battery terminal while terminals 1, 2, and 3 remain connected.
  Then the vacuum gauge should read 0 kPa (0 in Hg) when terminal 2 is disconnected from the negative battery terminal while terminals 1, and 3 remain connected.
- The vacuum should be maintained when terminal 4 is disconnected from the negative battery terminal while terminals 1, 2, and 3 remain connected.
  Then the vacuum gauge should read 0 kPa (0 in Hg) when terminal 3 is disconnected from the negative battery terminal while terminals 1, and 2 remain connected.

Q: Are all of the above values satisfied?

YES : Go to Step 12.

NO : Replace the auto-cruise vacuum pump. (Refer to P.17-86.)
Then check that diagnostic trouble code 14 is not output.



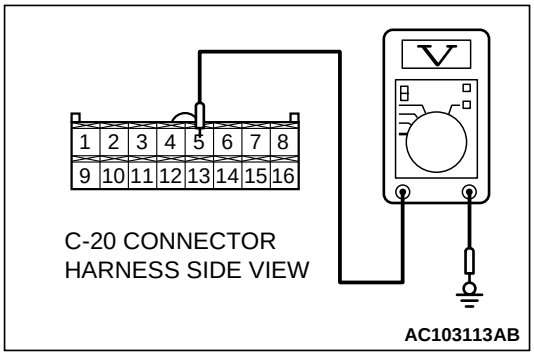


STEP 12. Check the harness wire between auto-cruise control vacuum pump connector A-01 (terminal numbers 2, 3 and 4) and auto-cruise control-ECU connector C-20 (terminal numbers 7, 8 and 16).

Q: Is any harness wire between auto-cruise control vacuum pump connector A-01 (terminal numbers 2,3 and 4) and auto-cruise control-ECU connector C-20 (terminal numbers 7,8 and 16) damaged?

YES : Repair harness wire and then check that diagnostic trouble code 14 is not output.

NO : Check that diagnostic trouble code 14 is not output. If diagnostic trouble code 14 is output, replace the auto-cruise control-ECU. (Refer to P.17-86.) Then check that diagnostic trouble code 14 is not output.



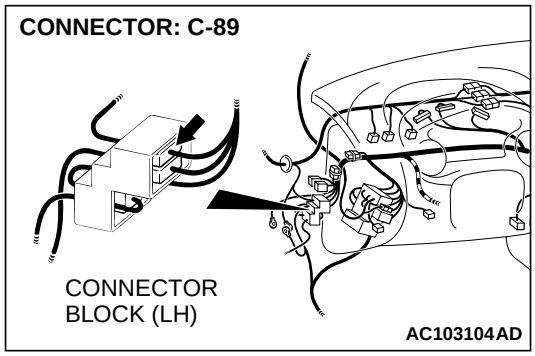
STEP 13. Check the output circuit voltage at auto-cruise control-ECU connector C-20 (terminal number 5) by backprobing.

(1) Do not disconnect auto-cruise control-ECU connector C-20.
(2) Turn the ignition switch to the "ON" position and the auto-cruise control main switch to the "ON" position.
(3) Measure the voltage between terminal 5 and ground by backprobing.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage approximately battery positive voltage?

YES : Go to Step 14.

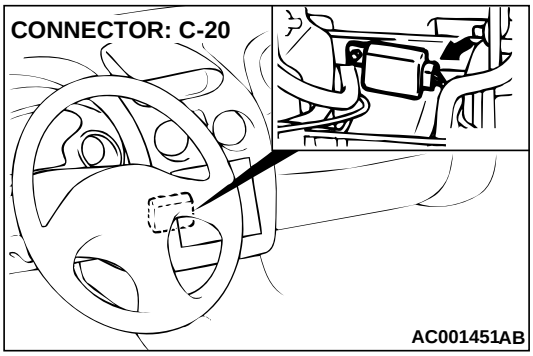
NO : Go to Step 15.



STEP 14. Check intermediate connector C-89.
Q: Is the connector damaged?

YES : Repair or replace connector.
Refer to GROUP 00E, Harness Connector Inspection P.00E-2.
Then check that diagnostic trouble code 14 is not output.

NO : Check the harness wire between auto-cruise control-ECU connector C-20 and stoplight switch connector C-03 for open circuit or damage.
Then repair if necessary.
Then check that diagnostic trouble code 14 is not output.



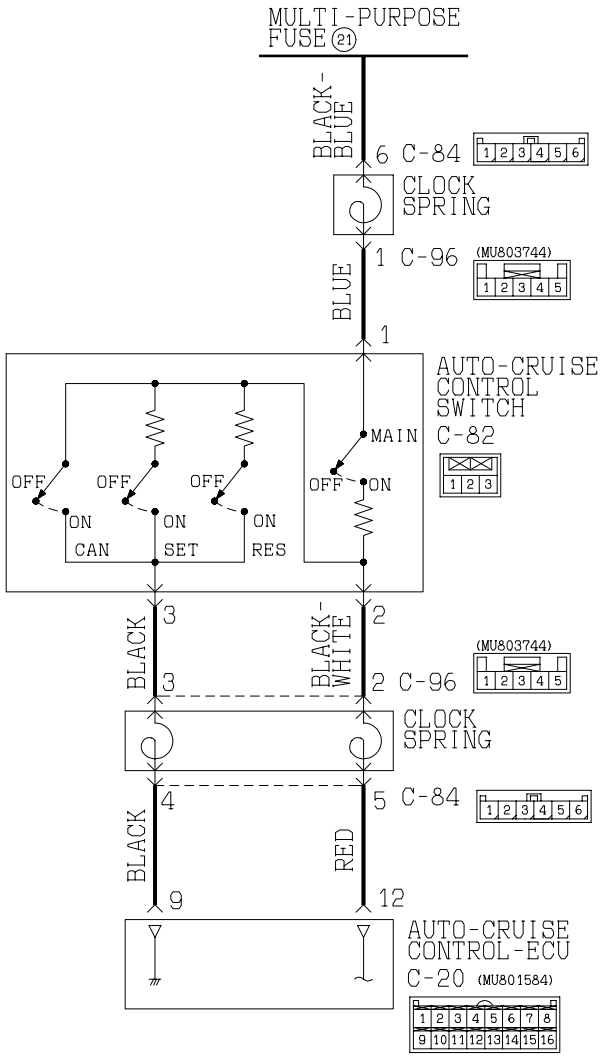
STEP 15. Check auto-cruise control-ECU connector C-20.
Q: Is the connector damaged?

YES : Repair or replace connector.
Refer to GROUP 00E, Harness Connector Inspection P.00E-2.
Then check that diagnostic trouble code 14 is not output.

NO : Check that diagnostic trouble code 14 is not output.
If diagnostic trouble code 14 is output, replace the auto-cruise control-ECU. (Refer to P.17-86.)
Then check that diagnostic trouble code 14 is not output.

DTC 15 : Auto-cruise Control Switch System

Auto-cruise Control Switch System Circuit



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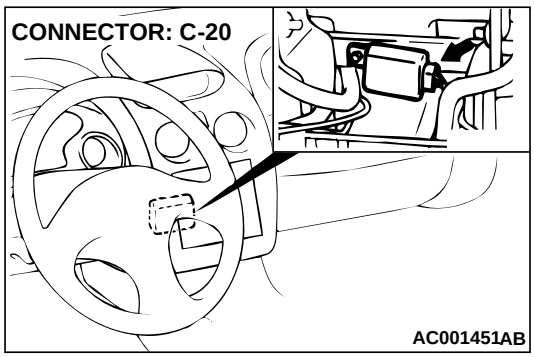

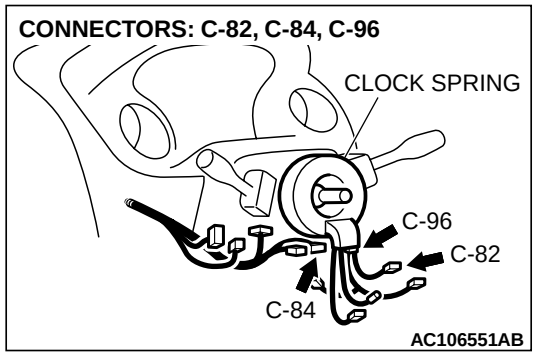

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CIRCUIT OPERATION

This circuit judges the signals of each switch ("OFF," "SET," "RESUME," "CANCEL" and "MAIN") of the auto-cruise control switch.
The auto-cruise control-ECU detects the state of the auto-cruise control switch by sensing the voltages shown below.

- When all switches are OFF, the ECU detects 3.5 – 5.0 volts.
- When the "SET" switch is ON, the ECU detects 0.4 – 2.3 volts.
- When the "RESUME" switch is ON, the ECU detects 2.3 – 3.5 volts.
- When the "CANCEL" switch is ON, the ECU detects 0.4 volts or less.
- When the main switch is ON, the ECU detects 7.0 volts.

DTC SET CONDITIONS

This code is output when the auto-cruise control switch "RESUME" switch, "SET" switch or "CANCEL" switch stays ON.

TROUBLESHOOTING HINTS

The most likely causes for this code to be set are:

- Malfunction of the auto-cruise control switch.
- Malfunction of the clock spring.
- Damaged harness or connector.
- Malfunction of the auto-cruise control-ECU.

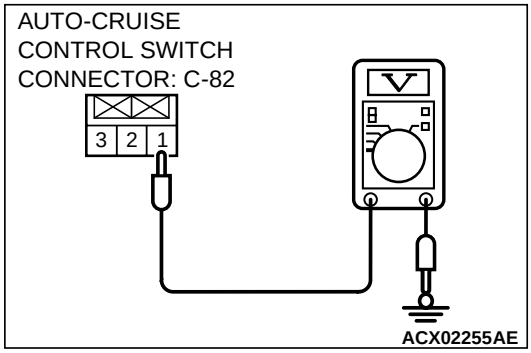
DIAGNOSIS

Required Special Tool:

- MB991223: Harness Set

STEP 1. Check the 12-Volt supply circuit voltage at auto-cruise control switch connector C-82 (terminal number 1).

(1) Disconnect auto-cruise control switch connector C-82 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 1 and ground.
(4) Turn the ignition switch to the "LOCK" (OFF) position.



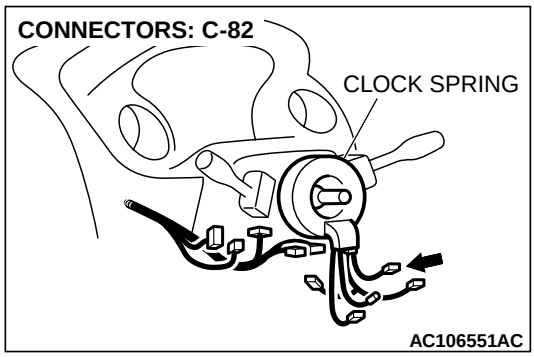
Q: Is the voltage approximately battery positive voltage?

YES : Go to Step 6.
NO : Go to Step 2.

STEP 2. Check auto-cruise control switch connector C-82.

Q: Is the connector damaged?

YES : Repair or replace connector.
Refer to GROUP 00E, Harness Connector Inspection P.00E-2.
Then check that diagnostic trouble code 15 is not output.
NO : Go to Step 3.



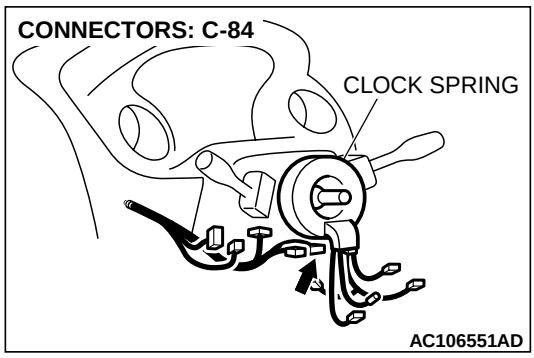
STEP 3. Check the clock spring.
Refer to GROUP 52B, Air Bag Modules and Clock Spring P.52B-144.

Q: Is the clock spring damaged?

YES : Replace the clock spring.
Refer to GROUP 52B, Air Bag Modules and Clock Spring P.52B-144.
Then check that diagnostic trouble code 15 is not output.

NO : Go to Step 4.

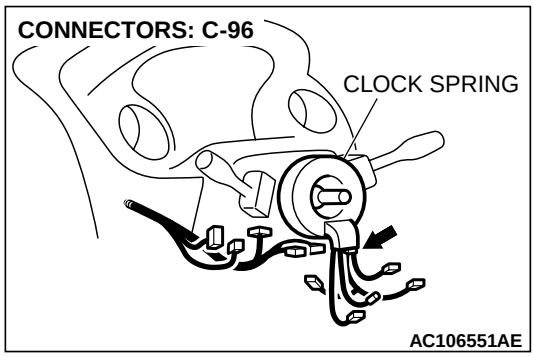
STEP 4. Check clock spring connector C-84.
Q: Is any connector damaged?



YES : Repair or replace connector.
Refer to GROUP 00E, Harness Connector Inspection P.00E-2.
Then check that diagnostic trouble code 15 is not output.

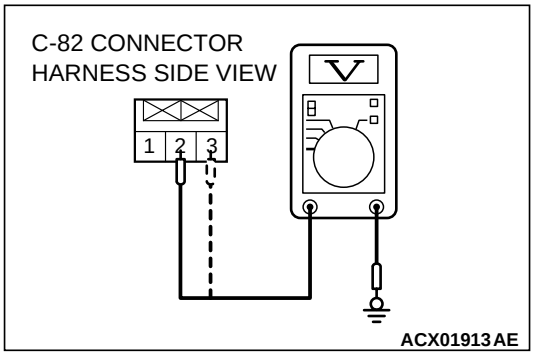
NO : Go to Step 5.

STEP 5. Check clock spring connector C-96.
Q: Is any connector damaged?



YES : Repair or replace connector.
Refer to GROUP 00E, Harness Connector Inspection P.00E-2.
Then check that diagnostic trouble code 15 is not output.

NO : Check the harness wire between multi-purpose fuse No.21 and auto-cruise control switch connector C-82 for open circuit or damage.
Then repair if necessary.
Then check that diagnostic trouble code 15 is not output.



STEP 6. Check the output circuit voltage at auto-cruise control switch connector C-82 (terminal numbers 2 and 3) by backprobing.

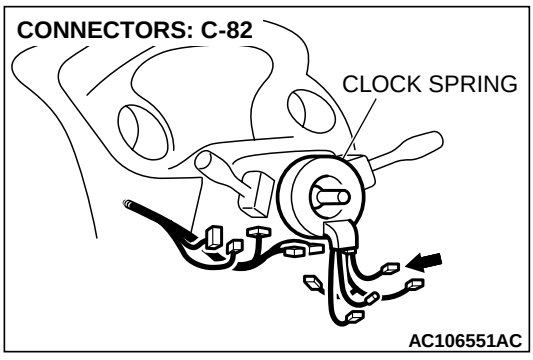
(1) Do not disconnect auto-cruise control switch connector C-207.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 2 and ground by backprobing.
- Voltage should be battery positive voltage. (MAIN switch is at the "ON" position.)

(4) Measure the voltage between terminal 3 and ground by backprobing.
- Voltage should be between 6.8 and 7.2 volts. (MAIN switch is at the "ON" position.)
- Voltage should be between 3.5 and 5.0 volts. (All switches are at the "OFF" position.)
- Voltage should be between 0.4 and 2.3 volts. ("SET" switch is at the "ON" position)
- Voltage should be between 2.3 and 3.5 volts. ("RESUME" switch is at the "ON" position.)
- Voltage should be between 1 volt or less. ("CANCEL" switch is at the "ON" position.)

(5) Turn the ignition switch to the "LOCK" (OFF) position.

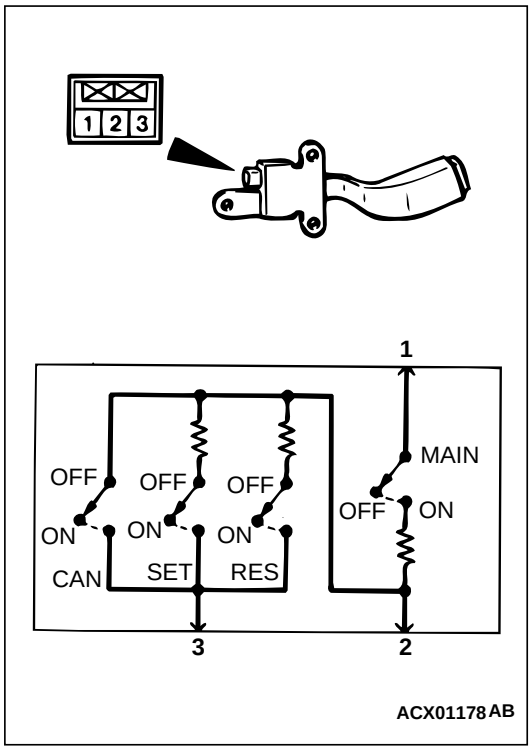
Q: Is the voltage within specifications?

YES : Go to Step 9.
NO : Go to Step 7.



STEP 7. Check auto-cruise control switch connector C-82.
Q: Is the connector damaged?

YES : Repair or replace connector.
Refer to GROUP 00E, Harness Connector Inspection P.00E-2.
Then check that diagnostic trouble code 15 is not output.
NO : Go to Step 8.



STEP 8. Check the auto-cruise control switch.

(1) Disconnect auto-cruise control switch. (Refer to P.17-86.)

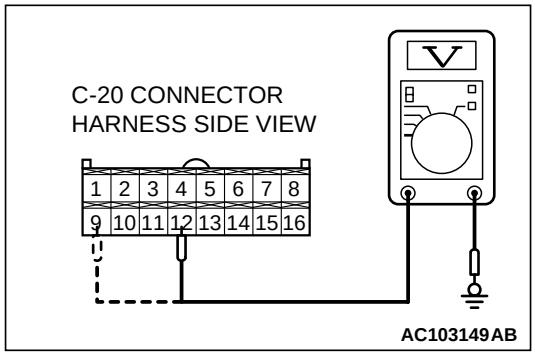
(2) Measure the resistance between the terminals when each of the "SET," "RESUME," "CANCEL" and MAIN switch is pressed.

SWITCH POSITION	TERMINAL CONNECTOR OF TESTER	SPECIFIED CONDITION
"MAIN" switch "OFF"	1 – 2	Open circuit
"MAIN" switch "ON"	1 – 2	Approximately 3.9 kΩ
"CANCEL" switch "ON"	2 – 3	Less than 2 Ω
"RESUME" switch "ON"	2 – 3	Approximately 910 Ω
"SET" switch "ON"	2 – 3	Approximately 220 Ω

Q: Is the values measured correspond to those in the table below?

YES : Check that diagnostic trouble code 15 is not output. If diagnostic trouble code 15 is output, replace the auto-cruise control-ECU. (Refer to P.17-86.)
Then check that diagnostic trouble code 15 is not output.

NO : Replace the auto-cruise control switch. (Refer to P.17-86.)
Then check that diagnostic trouble code 15 is not output.



STEP 9. Check the output circuit voltage at auto-cruise control-ECU connector C-20 (terminal numbers 9 and 12) by backprobing.

(1) Do not disconnect auto-cruise control-ECU connector C-20.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 12 and ground by backprobing.
- Voltage should be battery positive voltage. (The MAIN switch is at the "ON" position.)

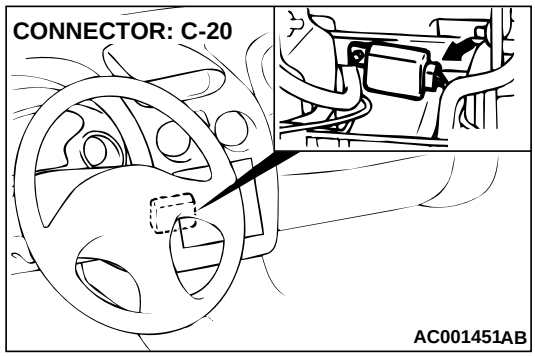
(4) Measure the voltage between terminal 9 and ground by backprobing.
- Voltage should be between 6.8 and 7.2 volts. (MAIN switch is at the "ON" position.)
- Voltage should be between 3.5 and 5.0 volts. (All switches are at the "OFF" position.)
- Voltage should be between 0.4 and 2.3 volts. ("SET" switch is at the "ON" position.)
- Voltage should be between 2.3 and 3.5 volts. ("RESUME" switch is at the "ON" position.)
- Voltage should be between 1 volt or less. ("CANCEL" switch is at the "ON" position.)

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage within specifications?

YES : Check that diagnostic trouble code 15 is not output. If diagnostic trouble code 15 is output, replace the auto-cruise control-ECU. (Refer to P.17-86.) Then check that diagnostic trouble code 15 is not output.

NO : Go to Step 10.



STEP 10. Check auto-cruise control-ECU connector C-20.

Q: Is the connector damaged?

YES : Repair or replace connector. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then check that diagnostic trouble code 15 is not output.

NO : Go to Step 11.

STEP 11. Check the clock spring.

Refer to GROUP 52B, Air Bag Modules and Clock Spring P.52B-144.

Q: Is the clock spring damaged?

YES : Replace the clock spring. Refer to GROUP 52B, Air Bag Modules and Clock Spring P.52B-144. Then check that diagnostic trouble code 15 is not output.

NO : Go to Step 12.

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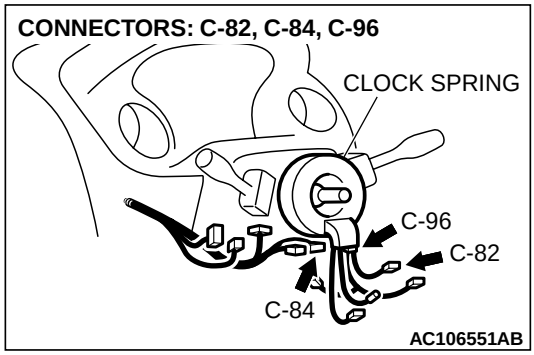
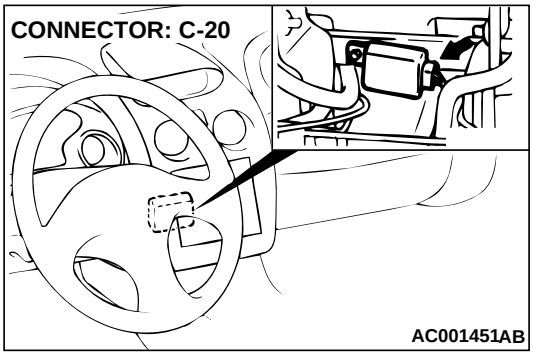


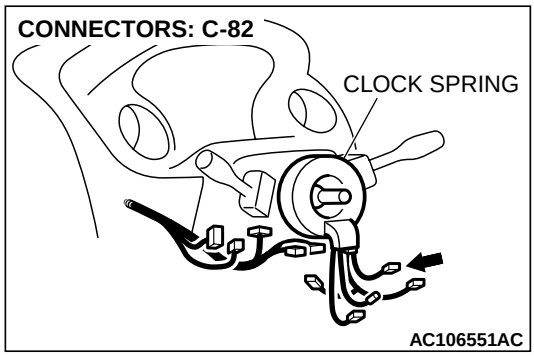
STEP 12. Check auto-cruise control switch connector C-82, clock spring connector C-84 and C-96.

Q: Is any connector damaged?

YES : Repair or replace connector.
Refer to GROUP 00E, Harness Connector Inspection P.00E-2.
Then check that diagnostic trouble code 15 is not output.

NO : Go to Step 13.





STEP 13. Check the harness wire between auto-cruise control switch connector C-82 (terminal numbers 2 and 3) and auto-cruise control-ECU connector C-20 (terminal numbers 9 and 12).

Q: Is any harness wire between auto-cruise control switch connector C-82 (terminal numbers 2 and 3) and auto-cruise control-ECU connector C-20 (terminal numbers 9 and 12) damaged?

YES : Repair harness wire and then check that diagnostic trouble code 15 is not output.

NO : Check that diagnostic trouble code 15 is not output. If diagnostic trouble code 15 is output, replace the auto-cruise control-ECU. (Refer to P.17-86.) Then check that diagnostic trouble code 15 is not output.

DTC 16: Auto-cruise Control-ECU

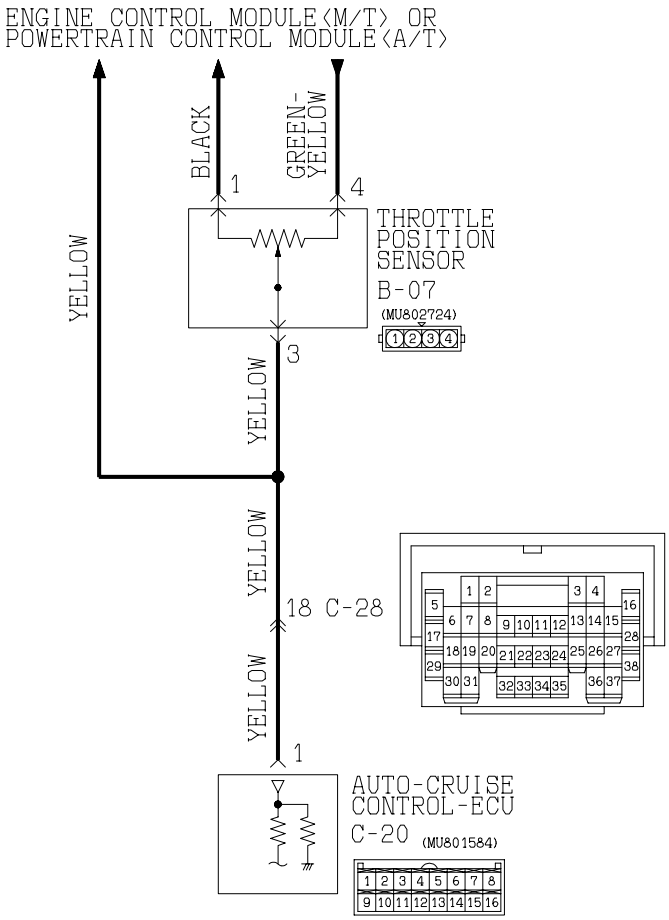
DTC SET CONDITIONS
This code is output when a problem is found on the cancel status hold circuit or microcomputer operation monitor circuit, which is incorporated in the auto-cruise control-ECU.

TROUBLESHOOTING HINTS
Malfunction of the auto-cruise control-ECU.

DIAGNOSIS
Replace the auto-cruise control-ECU. (Refer to P.17-86.)
Check that diagnostic trouble code 16 is not output.

DTC 17: Throttle Position Sensor System

Throttle Position Sensor System Circuit



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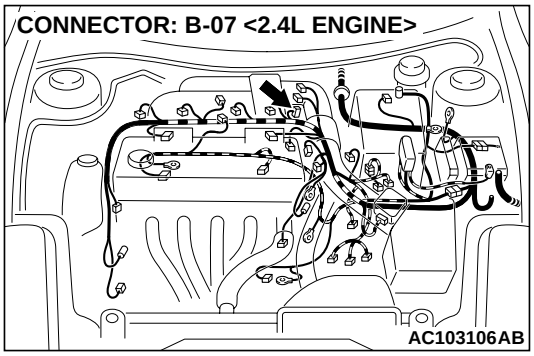
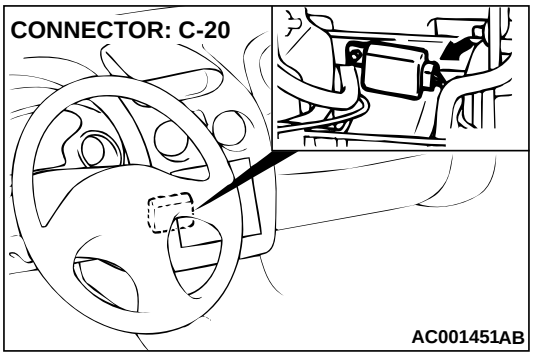
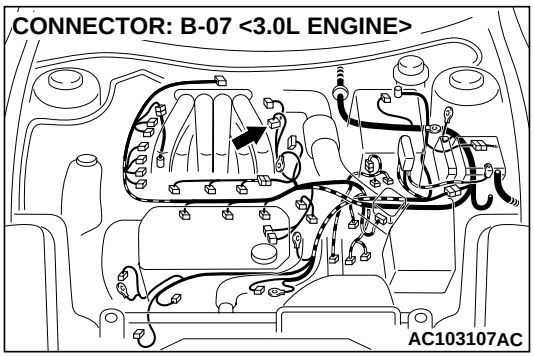
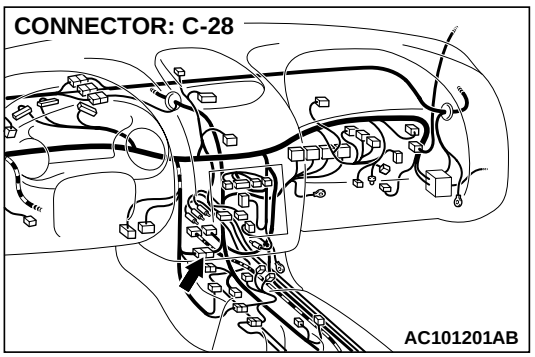








CIRCUIT OPERATION

The throttle position sensor signal is sent to the auto-cruise control-ECU through this circuit.
The auto-cruise control-ECU receives a signal from the throttle position sensor at terminal 3.
The signal is OFF when the accelerator pedal is depressed, and ON when the accelerator pedal is released.
The throttle position sensor sends a voltage signal to terminal 1 of the auto-cruise control-ECU.
The voltage depends on throttle opening angle.

DTC SET CONDITIONS

If 2.5 volts or more 0.2 volts or less is output for four seconds or more.

TROUBLESHOOTING HINTS

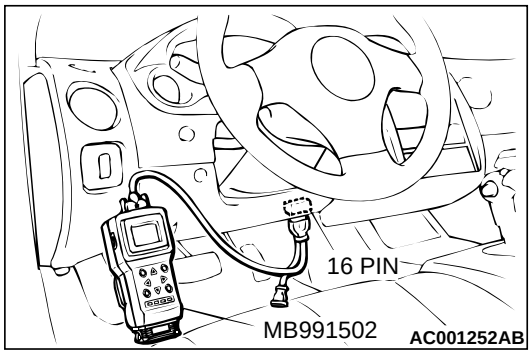
The most likely causes for this code to be set are:

- Malfunction of the throttle position sensor.
- Damaged harness or connector.
- Malfunction of the auto-cruise control-ECU.

DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991223: Harness Set



STEP 1. Check the throttle position sensor.

⚠ CAUTION

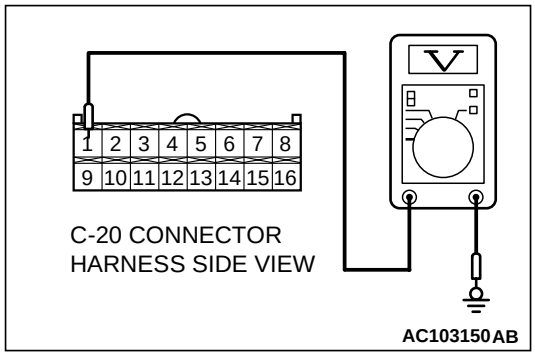
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Using scan tool MB991502.
(2) Connect scan tool MB991502 to the data link connector.
(3) Turn the ignition switch to the "ON" position.
(4) Read the MFI-DTC.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the MFI-DTC P0120 is output?

YES : For 2.4L engine, refer to GROUP 13A, Diagnosis – Diagnostic Trouble Code Chart P.13A-22.
For 3.0L engine, refer to GROUP 13B, Diagnosis – Diagnostic Trouble Code Chart P.13B-22.

NO : Go to Step 2.



STEP 2. Check the output circuit voltage at auto-cruise control-ECU connector C-20 (terminal number 1) by backprobing.

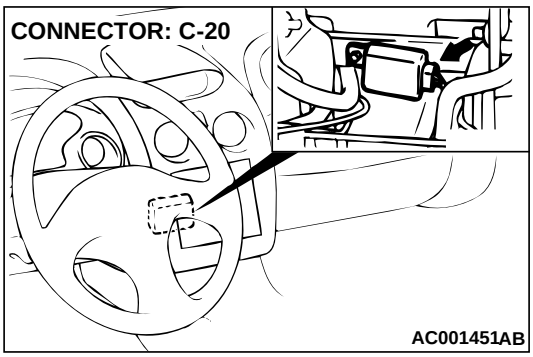
(1) Do not disconnect auto-cruise control-ECU connector C-20.
(2) Turn the ignition switch to the "ON" position and the auto-cruise control main switch to the "ON" position.
(3) Measure the voltage between terminal 1 and ground by backprobing.
- Voltage should be between 4.0 and 5.5 volts. (When accelerator pedal is fully depressed.)
- Voltage should be between 0.4 and 1.0 volts. (When accelerator pedal is released.)

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are the voltage within specifications?

YES : Check that diagnostic trouble code 17 is not output. If diagnostic trouble code 17 is output, replace the auto-cruise control-ECU. (Refer to P.17-86.) Then check that diagnostic trouble code 17 is not output.

NO : Go to Step 3.

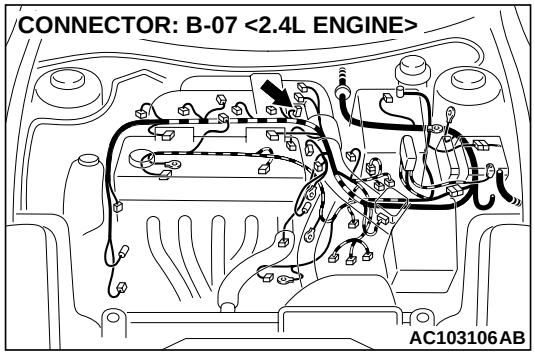


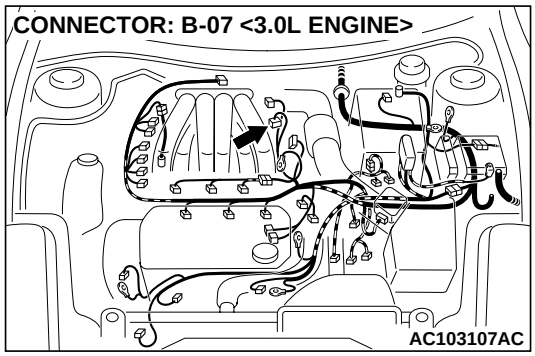
STEP 3. Check auto-cruise control-ECU connector C-20.

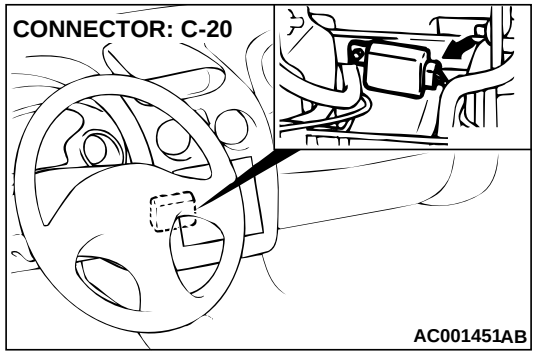
Q: Is the connector damaged?

YES : Repair or replace connector.
Refer to GROUP 00E, Harness Connector Inspection P.00E-2.
Then check that diagnostic trouble code 17 is not output.

NO : Go to Step 4.







STEP 4. Check the harness wire between throttle position sensor connector B-07 (terminal number 3) and auto-cruise control-ECU connector C-20 (terminal number 1).

Q: Is the harness wire between throttle position sensor connector B-07 (terminal number 3) and auto-cruise control-ECU connector C-20 (terminal number 1) damaged?

YES : Repair harness wire and then check that diagnostic trouble code 17 is not output.

NO : Check that diagnostic trouble code 17 is not output. If diagnostic trouble code 17 is output, replace the auto-cruise control-ECU. (Refer to P.17-86.) Then check that diagnostic trouble code 17 is not output.

SYMPTOM CHART

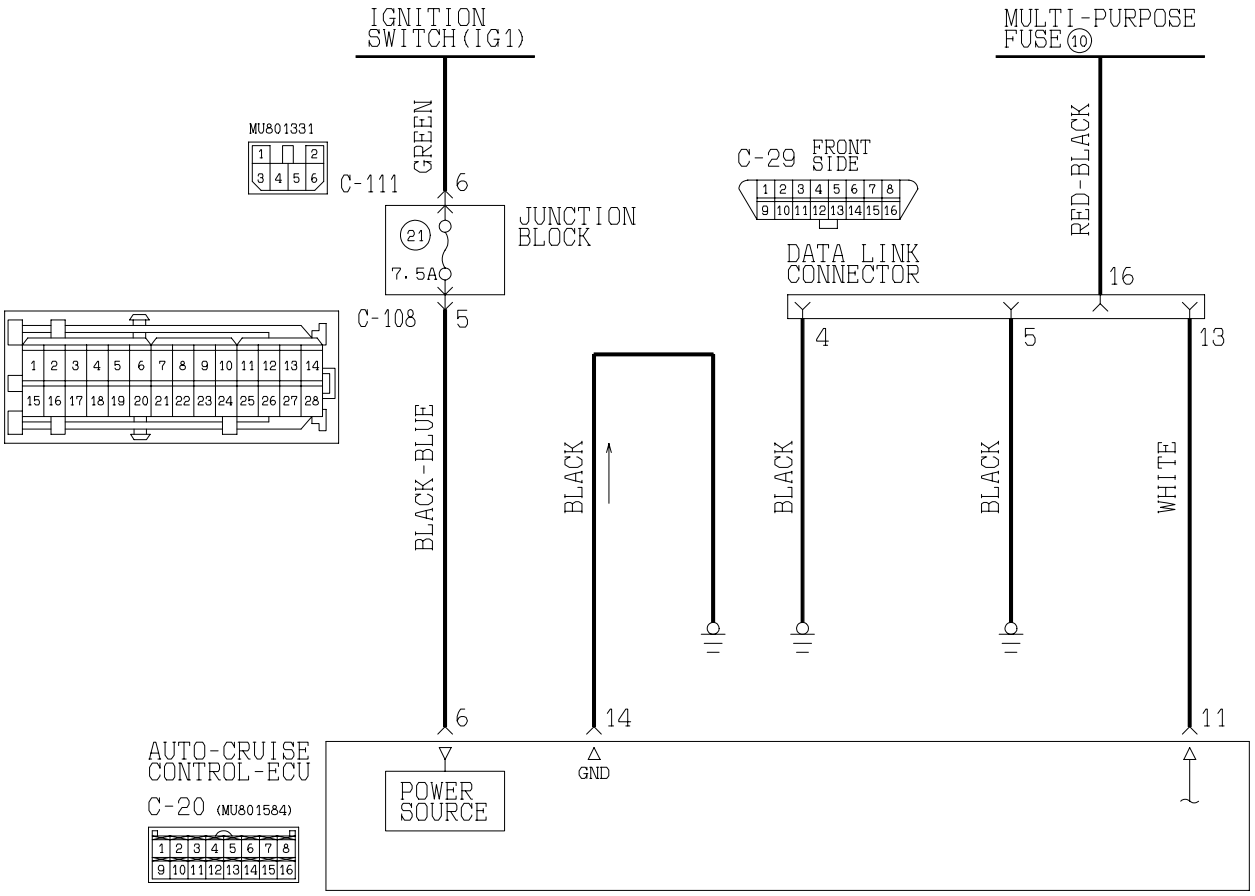
M1172002300195

SYMPTOMS			INSPECTION PROCEDURE NO.	REFERENCE PAGE
Communication with scan tool MB991502 is not possible.	Communication with all systems is not possible.	2.4L Engine	-	Group 13A, diagnosis P.13A-434
		3.0L Engine	-	Group 13B, diagnosis P.13B-530
	Communication with auto-cruise control-ECU only is not possible.		1	P.17-44
Auto-cruise control is not cancelled.	When brake pedal is depressed.		2	P.17-50
	When clutch pedal is depressed. <M/T>		3	P.17-56
	When selector lever is moved to "N" range. <A/T>		4	P.17-61
	When "CANCEL" switch is turned ON.		5	P.17-65
Auto-cruise control cannot be set.			6	P.17-66
Hunting (repeated acceleration and deceleration) occurs at the set vehicle speed. <M/T>			7	P.17-67
Hunting (repeated acceleration and deceleration) occurs at the set vehicle speed. <A/T>			8	P.17-69
Auto-cruise control indicator light inside combination meter does not illuminate. (However, auto-cruise control is normal.)			9	P.17-71

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Communication with Scan Tool MB991502 is not Possible (Communication with the Auto-cruise Control-ECU Only is not Possible.)

Auto-cruise Control-ECU Supply, Ground and Data Link Circuit



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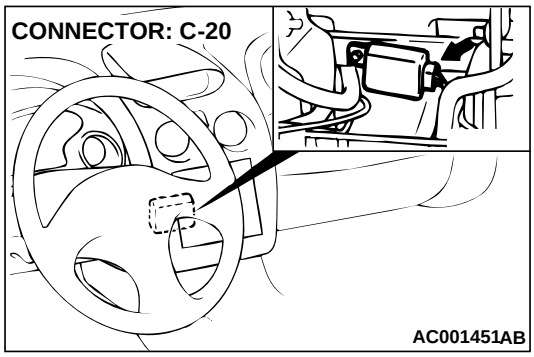
AC106774AB



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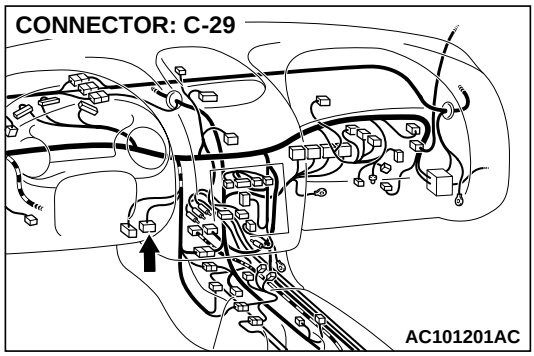
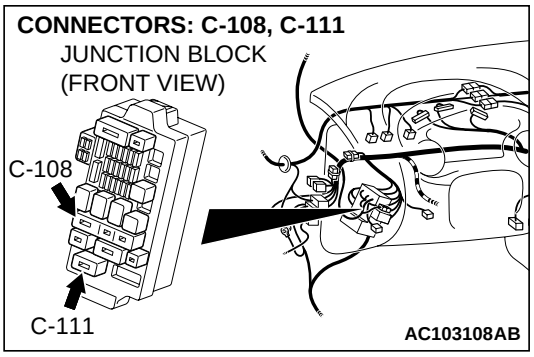


AC101201AC

TSB Revision



CIRCUIT OPERATION

Power of the auto-cruise control-ECU is transmitted from the ignition switch (IG1) to the auto-cruise control-ECU through multi-purpose fuse 4 in the junction block.

TECHNICAL DESCRIPTION (COMMENT)

The cause is probably a malfunction of the auto-cruise control-ECU power supply circuit or the auto-cruise control-ECU ground circuit.

TROUBLESHOOTING HINTS

- Damaged harness or connector.
- Malfunction of the auto-cruise control-ECU.

DIAGNOSIS

Required Special Tool:

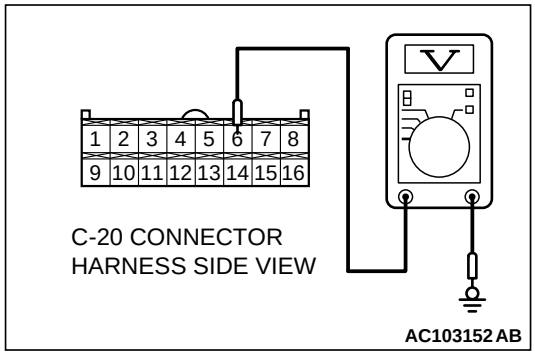
- MB991223: Harness Set

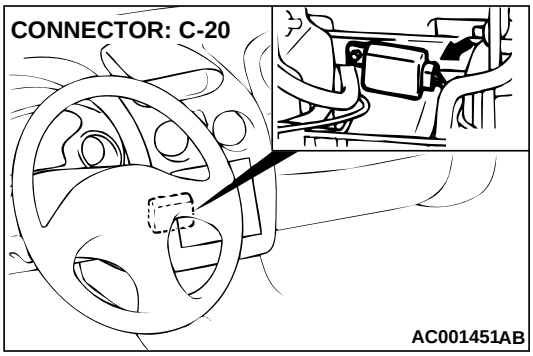
STEP 1. Check the output circuit voltage at auto-cruise control-ECU connector C-20 (terminal number 6) by backprobing.

(1) Do not disconnect auto-cruise control switch connector C-20.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 6 and ground by backprobing.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage approximately battery positive voltage?

YES : Go to Step 5.
NO : Go to Step 2.

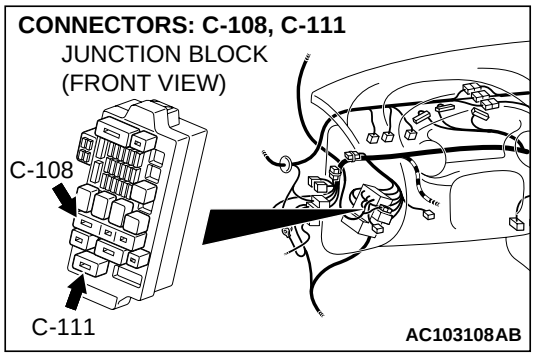




STEP 2. Check auto-cruise control-ECU connector C-20.
Q: Is the connector damaged?

YES : Repair or replace connector.
Refer to GROUP 00E, Harness Connector Inspection P.00E-2.
Then check that the malfunction is eliminated.

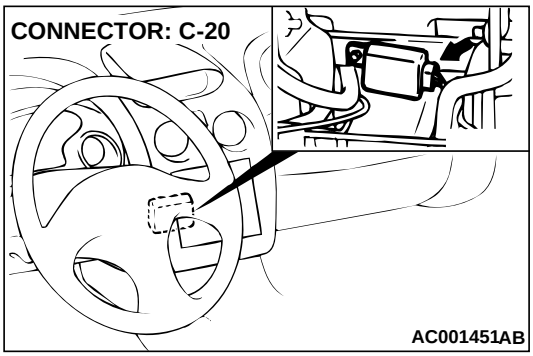
NO : Go to Step 3.



STEP 3. Check junction block connector C-108 and C-111.
Q: Is any connector damaged?

YES : Repair or replace connector.
Refer to GROUP 00E, Harness Connector Inspection P.00E-2.
Then check that the malfunction is eliminated.

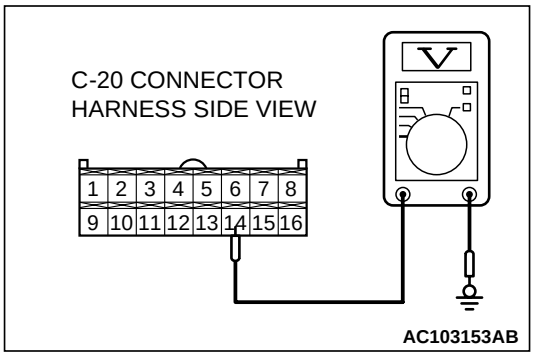
NO : Go to Step 4.



STEP 4. Check the harness wire between ignition switch and auto-cruise control-ECU connector C-20 (terminal number 6).
Q: Is any harness wire between ignition switch and auto-cruise control-ECU connector C-20 (terminal number 6) damaged?

YES : Repair the harness wire and then check that the malfunction is eliminated.

NO : Check that the malfunction is eliminated.
If the malfunction is not eliminated, replace the auto-cruise control-ECU. (Refer to P.17-86.)
Then check that the malfunction is eliminated.

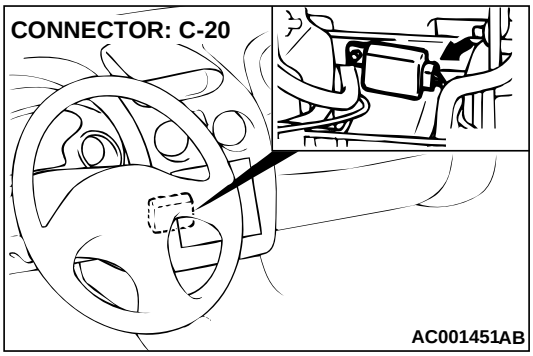


STEP 5. Check the ground circuit voltage at auto-cruise control-ECU connector C-20 (terminal number 14) by backprobing.

(1) Do not disconnect auto-cruise control switch connector C-20.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 14 and ground by backprobing.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage approximately 0.5 volts or less?

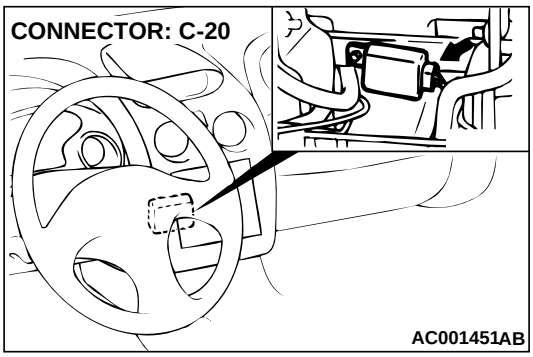
YES : Go to Step 8.
NO : Go to Step 6.



STEP 6. Check auto-cruise control-ECU connector C-20.

Q: Is the connector damaged?

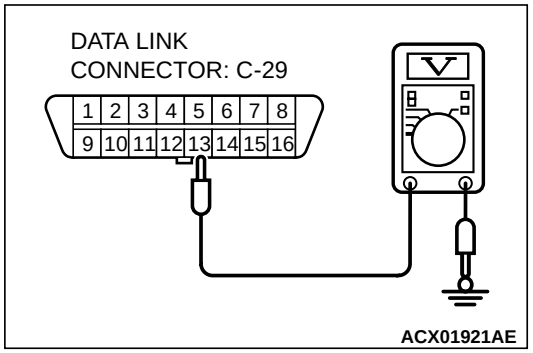
YES : Repair or replace connector.
Refer to GROUP 00E, Harness Connector Inspection P.00E-2.
Then check that the malfunction is eliminated.
NO : Go to Step 7.



STEP 7. Check the harness wire between auto-cruise control-ECU connector C-20 (terminal number 14) and ground.

Q: Is any harness wire between auto-cruise control-ECU connector C-20 (terminal number 14) and ground damaged?

YES : Repair the harness wire and then check that the malfunction is eliminated.
NO : Check that the malfunction is eliminated.
If the malfunction is not eliminated, replace the auto-cruise control-ECU. (Refer to P.17-86.)
Then check that the malfunction is eliminated.



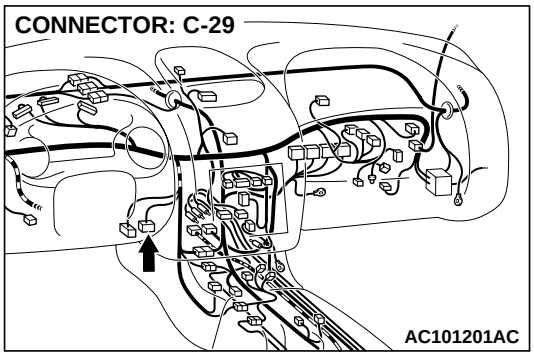
STEP 8. Check the output circuit voltage at data link connector C-29 (terminal number 13).

(1) Turn the ignition switch to the "ON" position.
(2) Measure the voltage between terminal 13 and ground.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage approximately 4 volts or more?

YES : Check that the malfunction is eliminated.
If the malfunction is not eliminated, replace the auto-cruise control-ECU. (Refer to P.17-86.)
Then check that the malfunction is eliminated.

NO : Go to Step 9.

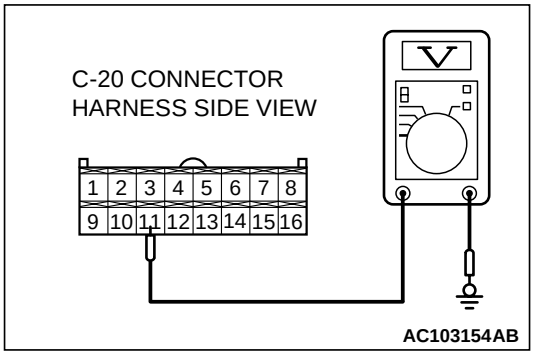


STEP 9. Check data link connector C-29.

Q: Is the connector damaged?

YES : Repair or replace connector.
Refer to GROUP 00E, Harness Connector Inspection P.00E-2.
Then check that the malfunction is eliminated.

NO : Go to Step 10.



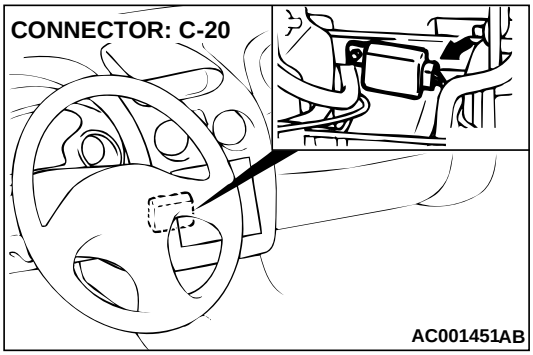
STEP 10. Check the output circuit voltage at auto-cruise control-ECU connector C-20 (terminal number 11) by backprobing.

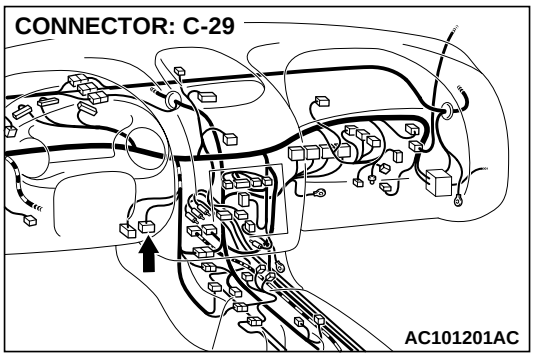
(1) Do not disconnect auto-cruise control switch connector C-20.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 11 and ground by backprobing.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage approximately 4 volts or more?

YES : Go to Step 11.

NO : Go to Step 12.



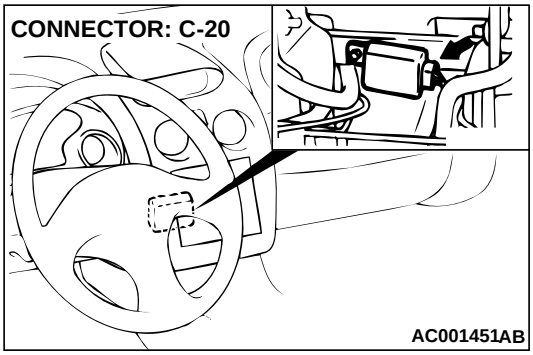


STEP 11. Check the harness wire between auto-cruise control-ECU connector C-20 (terminal number 11) and data link connector C-29 (terminal number 13).

Q: Is any harness wire between auto-cruise control-ECU connector C-20 (terminal number 11) and data link connector C-29 (terminal number 13) damaged?

YES : Repair the harness wire and then check that the malfunction is eliminated.

NO : Check that the malfunction is eliminated.
If the malfunction is not eliminated, replace the auto-cruise control-ECU. (Refer to P.17-86.)
Then check that the malfunction is eliminated.



STEP 12. Check auto-cruise control-ECU connector C-20.

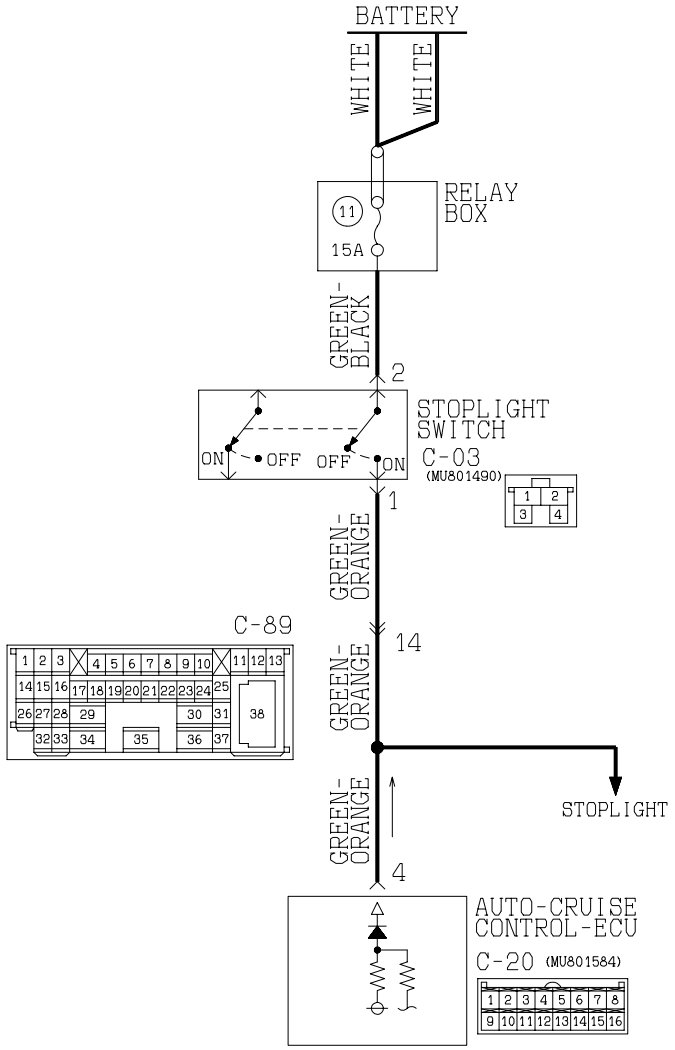
Q: Is the connector damaged?

YES : Repair or replace connector.
Refer to GROUP 00E, Harness Connector Inspection P.00E-2.
Then check that the malfunction is eliminated.

NO : Check that the malfunction is eliminated.
If the malfunction is not eliminated, replace the auto-cruise control-ECU. (Refer to P.17-86.)
Then check that the malfunction is eliminated.

INSPECTION PROCEDURE 2: When the Brake Pedal is Depressed, Auto-cruise Control is not Cancelled.

Stoplight Switch Circuit



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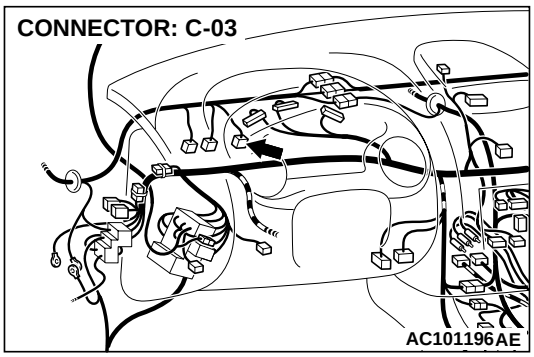

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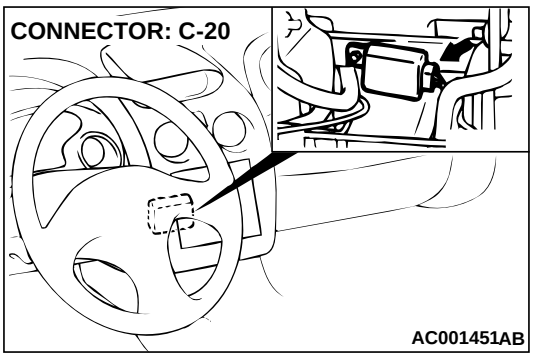

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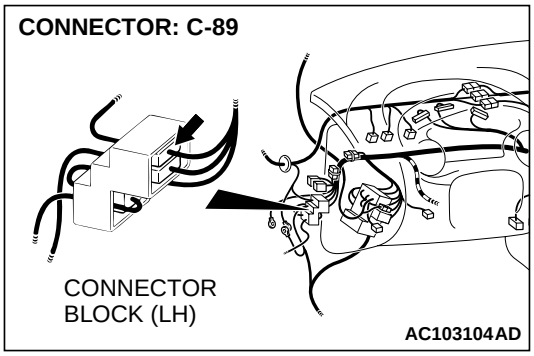


CIRCUIT OPERATION

This is the stoplight switch input signal circuit.
The signal is sent to the stoplight switch from dedicated fuse 5, and is then sent to the auto-cruise control-ECU.

TECHNICAL DESCRIPTION (COMMENT)

The cause is probably a malfunction of the stoplight switch circuit.

TROUBLESHOOTING HINTS

- Malfunction of the stoplight switch.
- Damaged harness or connector.
- Malfunction of the auto-cruise control-ECU.

DIAGNOSIS

Required Special Tool:

- MB991223: Harness Set

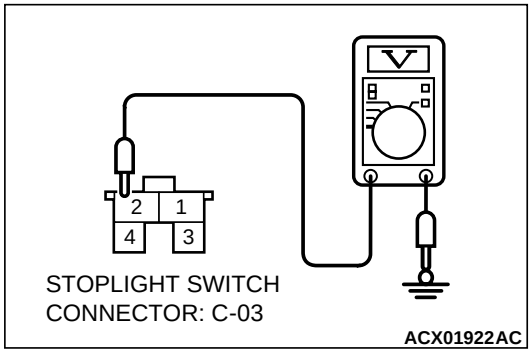
STEP 1. Check if the stoplight illuminates.

Q: Is the stoplight illuminated?

YES : Go to Step 8.
NO : Go to Step 2.

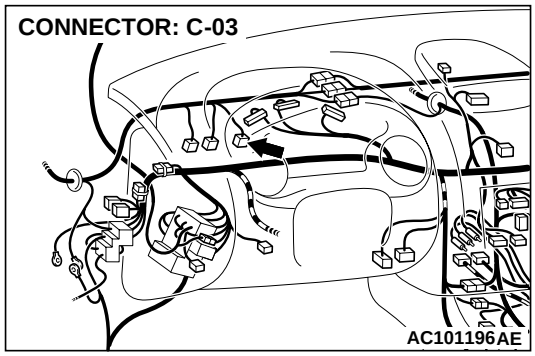
STEP 2. Check the 12-Volt supply circuit voltage at stoplight switch connector C-03 (terminal number 2).

(1) Disconnect stoplight switch connector C-03 and measure at the harness side.
(2) Measure the voltage between terminal 2 and ground.



Q: Is the voltage approximately battery positive voltage?

YES : Go to Step 5.
NO : Go to Step 3.

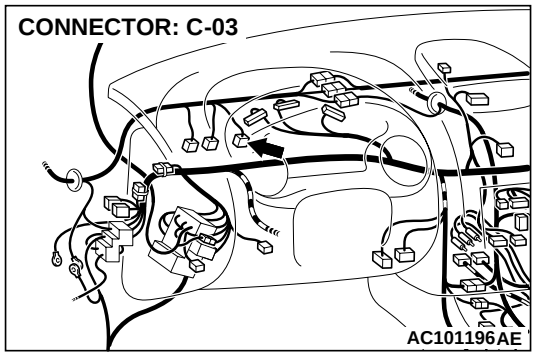


STEP 3. Check stoplight switch connector C-03.

Q: Is the connector damaged?

YES : Repair or replace connector.
Refer to GROUP 00E, Harness Connector Inspection P.00E-2.
Then check that the malfunction is eliminated.

NO : Go to Step 4.

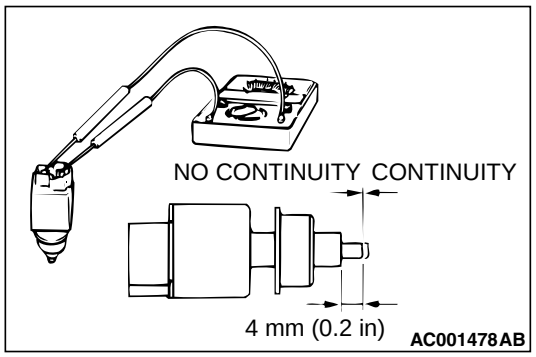


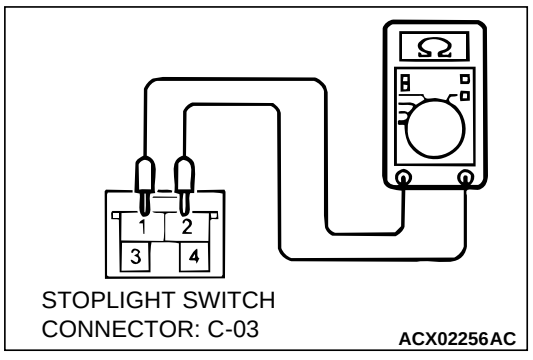
STEP 4. Check the harness wire between dedicated fuse No.5 and stoplight switch connector C-03 (terminal number 2).

Q: Is any harness wire between dedicated fuse No.5 and stoplight switch connector C-03 (terminal number 2) damaged?

YES : Repair the harness wire and then check that the malfunction is eliminated.

NO : Check that the malfunction is eliminated.
If the malfunction is not eliminated, replace the auto-cruise control-ECU. (Refer to P.17-86.)
Then check that the malfunction is eliminated.





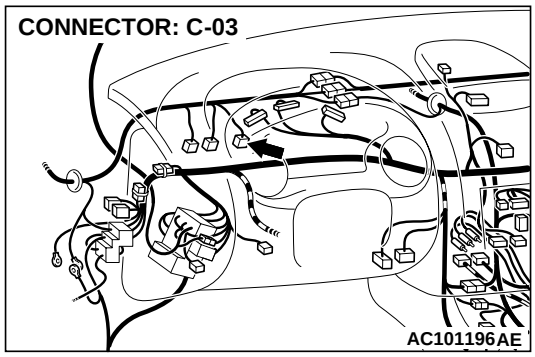
STEP 5. Check the stoplight switch.

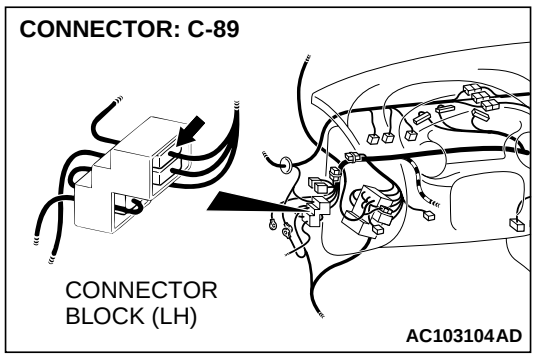
(1) Disconnect harness connector C-03 at the stoplight switch.
(2) Connect an ohmmeter to the stoplight switch, and check continuity when the plunger of the stoplight switch is pushed in and when it is released.
(3) The stoplight switch is in good condition if the circuit is open when the plunger is pushed in to a depth of within 4 mm (0.2 inch) from the outer case edge surface, and if the resistance value is less than 2 ohm when it is released.
(4) The check for continuity should be made at terminals 1 and 2 of the stoplight switch.

Q: Is the circuit open?

YES : Replace the stoplight switch.
Refer to GROUP 35A, Brake Pedal P.35A-31.
Then check that the malfunction is eliminated.

NO : Go to Step 6.



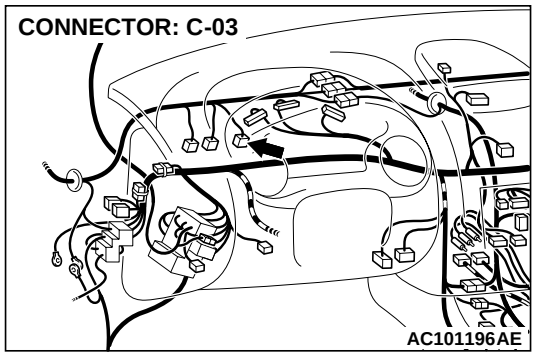


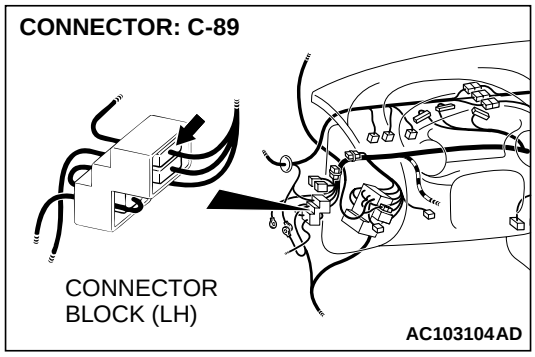
STEP 6. Check stoplight switch connector C-03 and intermediate connector C-89.

Q: Is any connector damaged?

YES : Repair or replace connector.
Refer to GROUP 00E, Harness Connector Inspection P.00E-2.
Then check that the malfunction is eliminated.

NO : Go to Step 7.



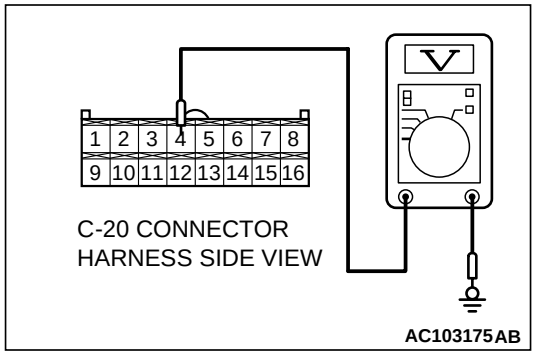


STEP 7. Check the harness wire between stoplight switch connector C-03 (terminal number 1) and intermediate connector C-89 (terminal number 14).

Q: Is any harness wire between stoplight switch connector C-03 (terminal number 1) and intermediate connector C-89 (terminal number 14) damaged?

YES : Repair the harness wire and then check that the malfunction is eliminated.

NO : Check that the malfunction is eliminated.
If the malfunction is not eliminated, replace the auto-cruise control-ECU. (Refer to P.17-86.)
Then check that the malfunction is eliminated.



STEP 8. Check the output circuit voltage at auto-cruise control-ECU connector C-20 (terminal number 4) by backprobing.

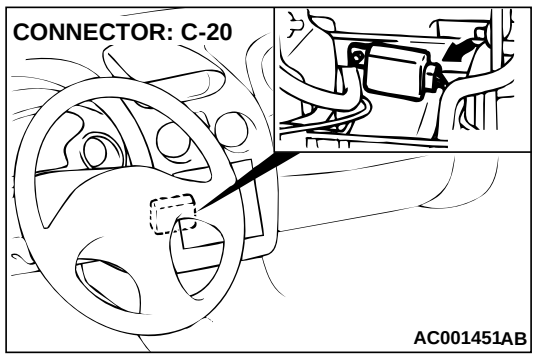
(1) Do not disconnect auto-cruise control switch connector C-20.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 4 and ground by backprobing.
- Voltage should be battery positive volts. (When brake pedal is depressed.)
- Voltage should be 0.5 volts or less. (When brake pedal is not depressed.)

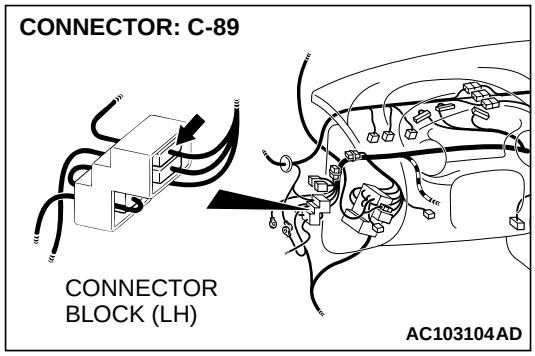
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage within specifications?

YES : Check that the malfunction is eliminated.
If the malfunction is not eliminated, replace the auto-cruise control-ECU. (Refer to P.17-86.)
Then check that the malfunction is eliminated.

NO : Go to Step 9.



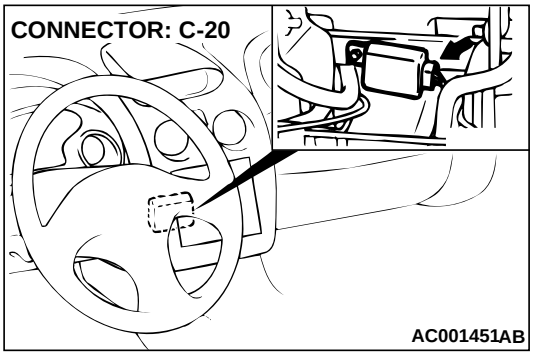


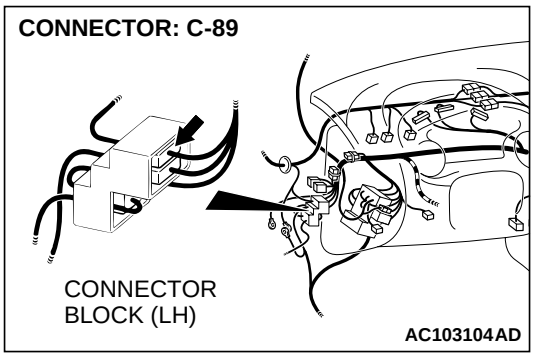
STEP 9. Check auto-cruise control-ECU connector C-20 and intermediate connector C-89.

Q: Is the connector damaged?

YES : Repair or replace connector.
Refer to GROUP 00E, Harness Connector Inspection P.00E-2.
Then check that the malfunction is eliminated.

NO : Go to Step 10.





STEP 10. Check the harness wire between intermediate connector C-89 (terminal number 14) and auto-cruise control-ECU connector C-20 (terminal number 4).

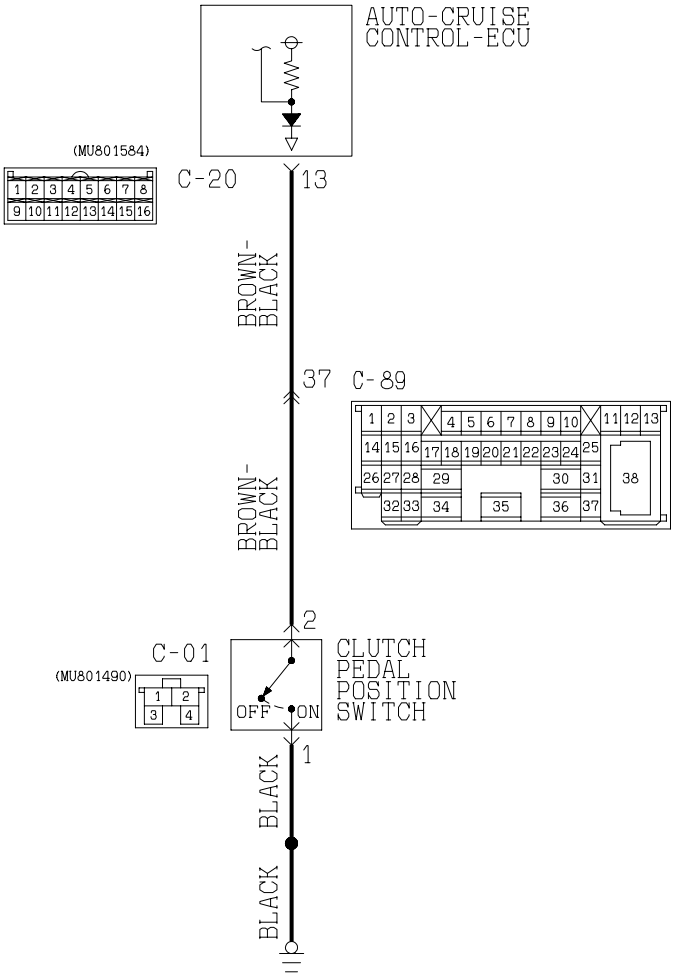
Q: Is any harness wire between intermediate connector C-89 (terminal number 14) and auto-cruise control-ECU connector C-20 (terminal number 4) damaged?

YES : Repair the harness wire and then check that the malfunction is eliminated.

NO : Check that the malfunction is eliminated.
If the malfunction is not eliminated, replace the auto-cruise control-ECU. (Refer to P.17-86.)
Then check that the malfunction is eliminated.

INSPECTION PROCEDURE 3: When the Clutch Pedal is Depressed, Auto-cruise Control is not Cancelled. <M/T>

Clutch Pedal Position Switch Circuit



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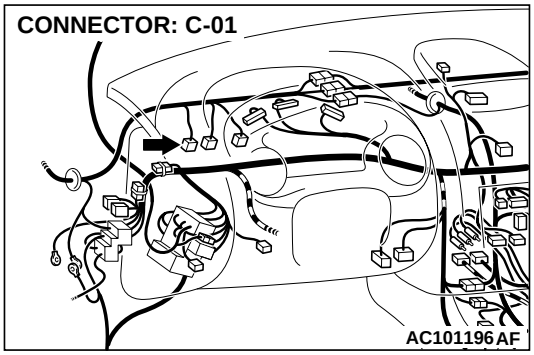
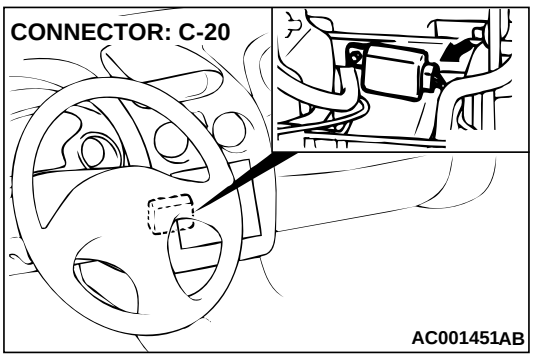
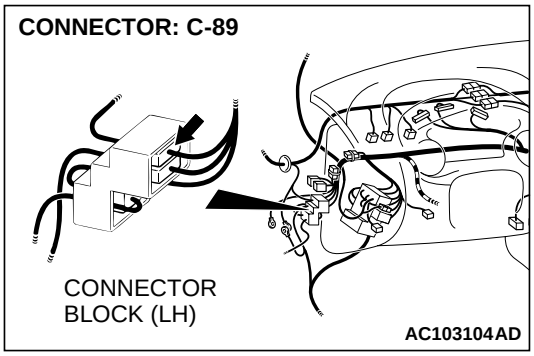




TSB Revision



CIRCUIT OPERATION

This circuit indicates the operation status of the clutch pedal position switch. When the clutch pedal position switch is ON (clutch pedal is depressed), the voltage of auto-cruise control-ECU terminal number 13 will indicate 0 volt.

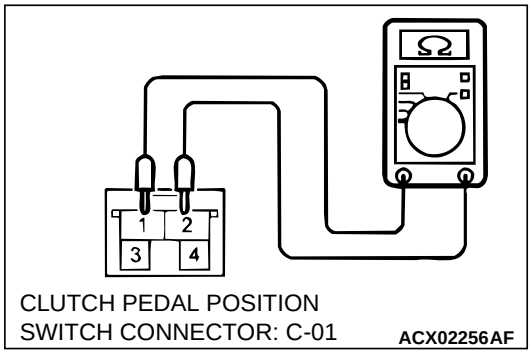
TECHNICAL DESCRIPTION (COMMENT)

The cause is probably a malfunction of the clutch pedal position switch circuit.

TROUBLESHOOTING HINTS

- Malfunction of the clutch pedal position switch.
- Damaged harness or connector.
- Malfunction of the auto-cruise control-ECU.

DIAGNOSIS



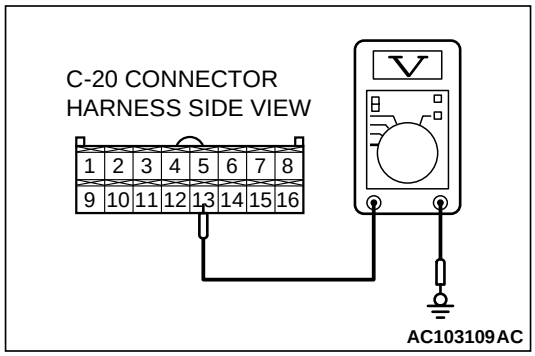
STEP 1. Check the clutch pedal position switch.

1.Disconnect clutch pedal position switch connector C-01.
2.Measure the continuity between the terminals.

MEASUREMENT CONDITIONS	TERMINAL CONNECTOR OF TESTER	SPECIFIED CONDITION
When clutch pedal is depressed.	1 – 2	Less than 2 ohm
When clutch pedal is not depressed.	1 – 2	Open circuit

Q: Is the continuity meet the table above?

YES : Go to Step 2.
NO : Replace the clutch pedal position switch.
Refer to GROUP 21A, Clutch P.21A-10.
Then check that the malfunction is eliminated.



STEP 2. Check the output circuit voltage at auto-cruise control-ECU connector C-20 (terminal number 13) by backprobing.

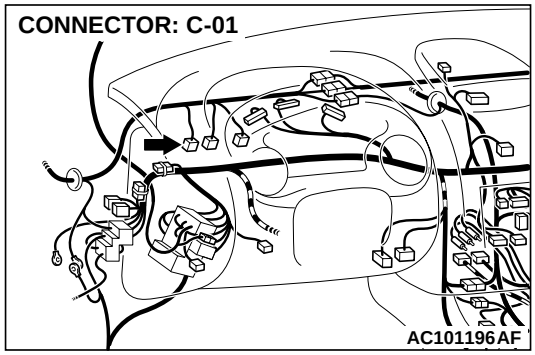
(1) Do not disconnect auto-cruise control switch connector C-20.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 13 and ground by backprobing.
- Voltage should be 0.5 volts or less. (When clutch pedal is depressed.)
- Voltage should be battery positive voltage. (When clutch pedal is not depressed.)

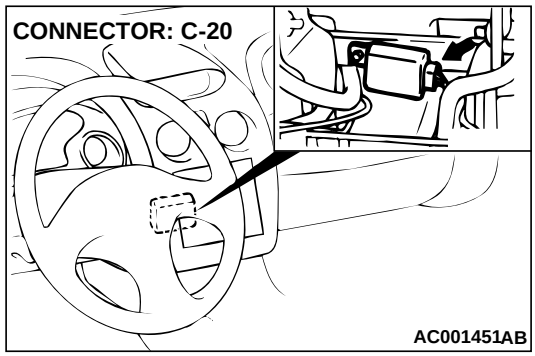
(4) Turn the ignition switch to the "LOCK" (OFF) position.

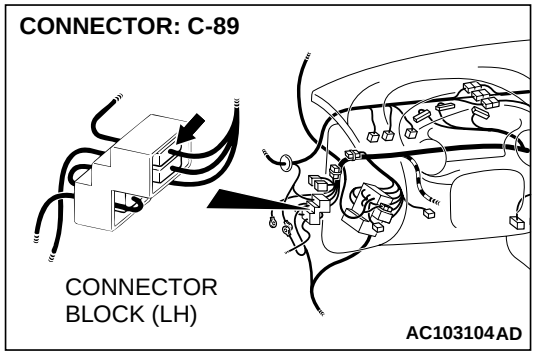
Q: Is the voltage within specifications?

YES : Check that the malfunction is eliminated.
If the malfunction is not eliminated, replace the auto-cruise control-ECU. (Refer to P.17-86.)
Then check that the malfunction is eliminated.

NO : Go to Step 3.





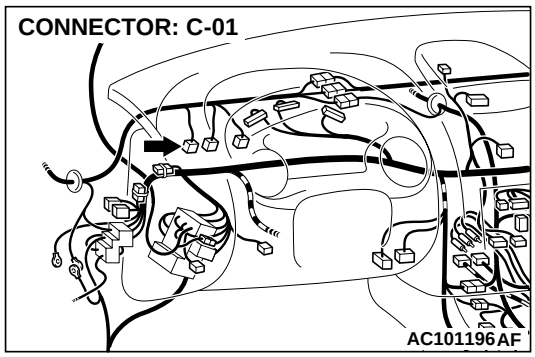


STEP 3. Check clutch pedal position switch connector C-01, auto-cruise control-ECU connector C-20 and intermediate connector C-89.

Q: Is any connector damaged?

YES : Repair or replace connector.
Refer to GROUP 00E, Harness Connector Inspection P.00E-2.
Then check that the malfunction is eliminated.

NO : Go to Step 4.

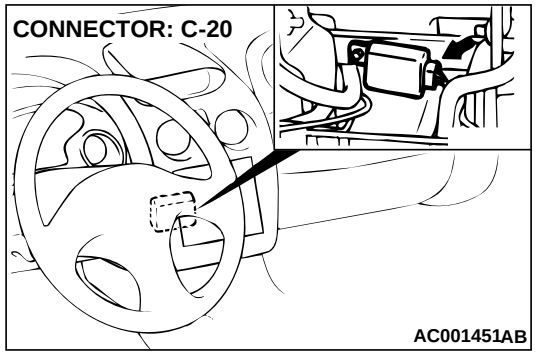


STEP 4. Check the harness wire between clutch pedal position switch connector C-01 (terminal number 2) and auto-cruise control-ECU connector C-20 (terminal number 13).

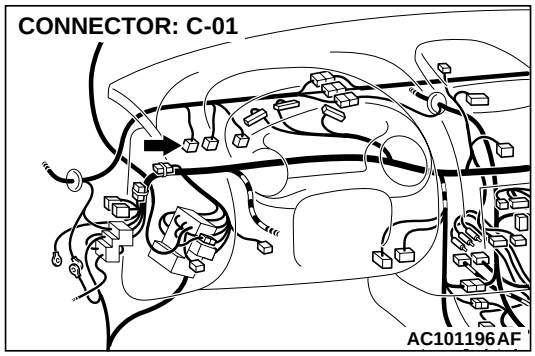
Q: Is any harness wire between clutch pedal position switch connector C-01 (terminal number 2) and auto-cruise control-ECU connector C-20 (terminal number 13) damaged?

YES : Repair the harness wire and then check that the malfunction is eliminated.

NO : Go to Step 5.



STEP 5. Check the harness wire between clutch pedal position switch connector C-01 (terminal number 1) and ground wire.



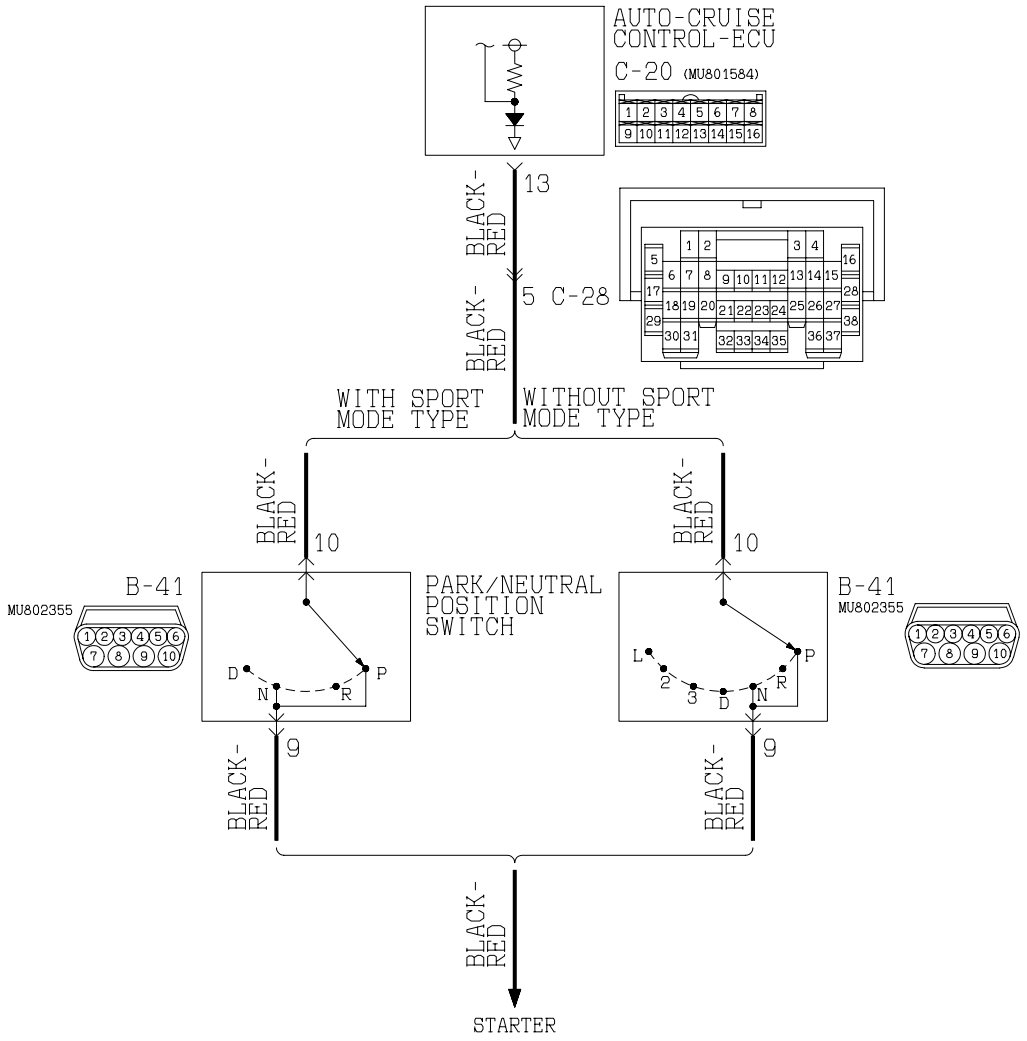
Q: Is any harness wire between clutch pedal position switch connector C-01 (terminal number 1) and ground wire damaged?

YES : Repair the harness wire and then check that the malfunction is eliminated.

NO : Check that the malfunction is eliminated.
If the malfunction is not eliminated, replace the auto-cruise control-ECU. (Refer to P.17-86.)
Then check that the malfunction is eliminated.

INSPECTION PROCEDURE 4: When the Selector Lever is Moved to "N" Range, Auto-cruise Control is not Cancelled. <A/T>

Park/neutral Position Switch Circuit



W3S13M04AA
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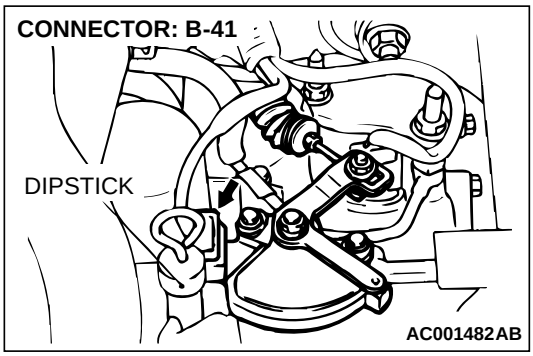
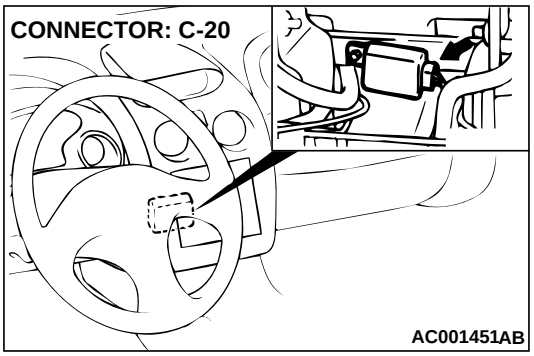
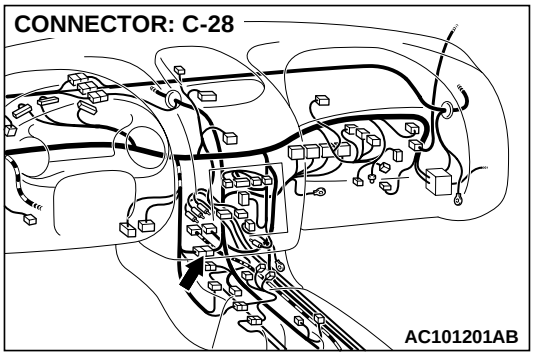




TSB Revision



CIRCUIT OPERATION

This circuit transmits the "N" or "P" position signal of the park/neutral position switch to the auto-cruise control-ECU.
When the park/neutral position switch is at the "N" or "P" position, auto-cruise control-ECU terminal number 13 will receives 0 volt.

TECHNICAL DESCRIPTION (COMMENT)

The cause is probably an open-circuit in the output signal circuit in "N" range.

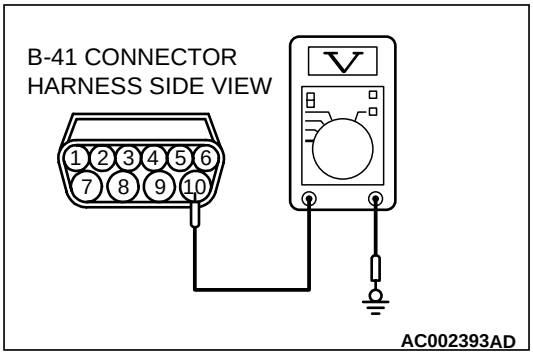
TROUBLESHOOTING HINTS

- Malfunction of the park/neutral position switch.
- Damaged harness or connector.
- Malfunction of the auto-cruise control-ECU.

DIAGNOSIS

Required Special Tool:

- MB991223: Harness Set



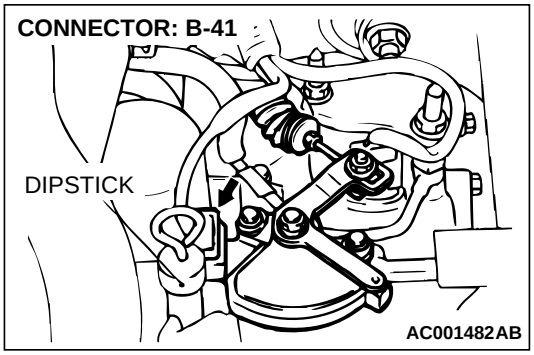
STEP 1. Check the output circuit voltage at park/neutral position switch connector B-41 (terminal number 10) by backprobing.

(1) Do not disconnect park/neutral position switch connector B-41.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 10 and ground by backprobing.
  - Voltage should be battery positive voltage. (When select lever is in a position other than "N" range.)
  - Voltage should be 0.5 volts or less. (When select lever is in "N" range.)
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage within specifications?

YES : Check that the malfunction is eliminated.
If the malfunction is not eliminated, replace the auto-cruise control-ECU. (Refer to P.17-86.)
Then check that the malfunction is eliminated.

NO : Go to Step 2.

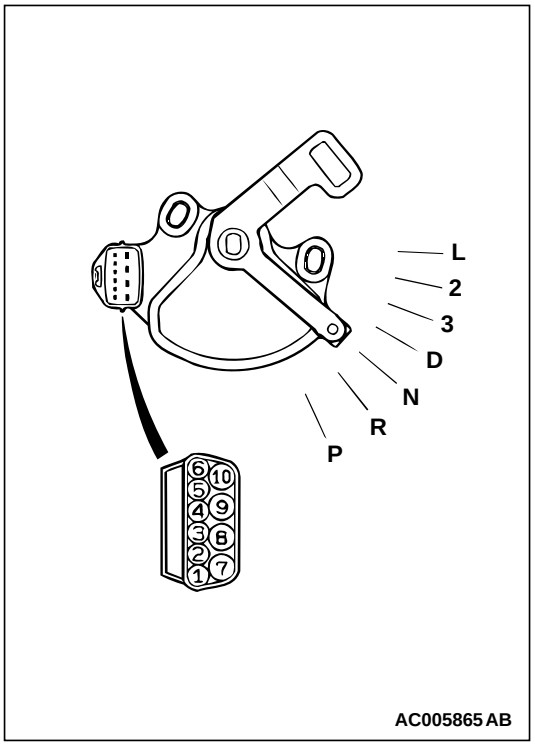


STEP 2. Check park/neutral position switch connector B-41.

Q: Is the connector damaged?

YES : Repair or replace connector.
Refer to GROUP 00E, Harness Connector Inspection P.00E-2.
Then check that the malfunction is eliminated.

NO : Go to Step 3.



STEP 3. Check the circuit at the park/neutral position switch.

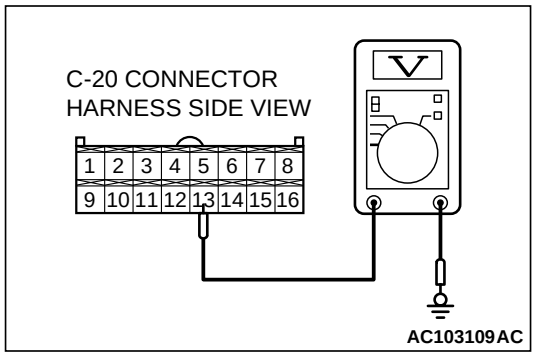
(1) Disconnect the park/neutral position switch connector B-41.
(2) Measure the continuity park/neutral position switch connector terminals.

ITEMS	TERMINAL CONNECTOR OF TESTER	SPECIFIED CONDITION
P	3 – 8, 9 – 10	Less than 2 ohm
N	4 – 8, 9 – 10	

Q: Does the continuity meet the table above?

YES : Go to Step 4.

NO : Replace the park/neutral position switch.
Refer to GROUP 23B, Transaxle P.23B-10.
Then check that the malfunction is eliminated.



STEP 4. Check the output circuit voltage at auto-cruise control-ECU connector C-20 (terminal number 13) by backprobing.

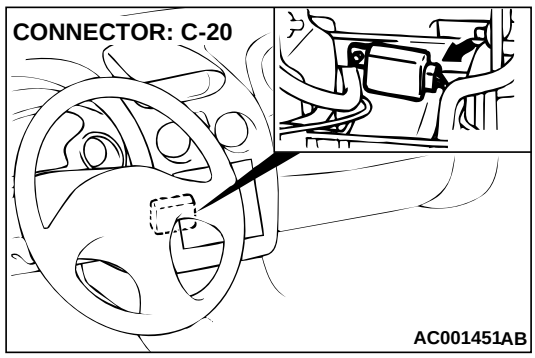
(1) Do not disconnect auto-cruise control switch connector C-20.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 13 and ground by backprobing.
- Voltage should be battery positive voltage. (When select lever is in a position other than "N" range.)
- Voltage should be 0.5 volts or less. (When select lever is in "N" range.)

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage within specifications?

YES : Check that the malfunction is eliminated.
If the malfunction is not eliminated, replace the auto-cruise control-ECU. (Refer to P.17-86.)
Then check that the malfunction is eliminated.

NO : Go to Step 5.

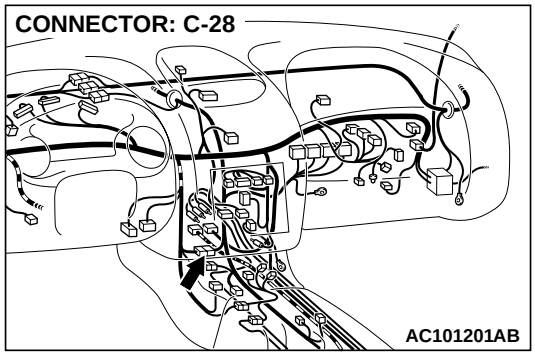


STEP 5. Check auto-cruise control-ECU connector C-20.

Q: Is the connector damaged?

YES : Repair or replace connector.
Refer to GROUP 00E, Harness Connector Inspection P.00E-2.
Then check that the malfunction is eliminated.

NO : Go to Step 6.

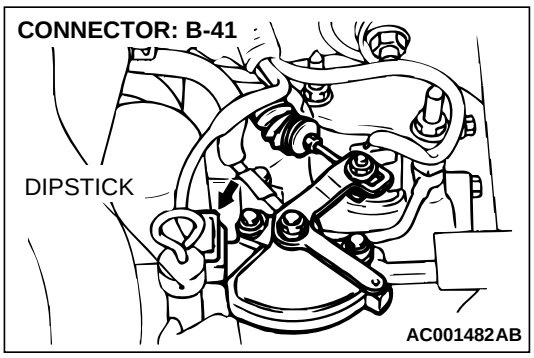


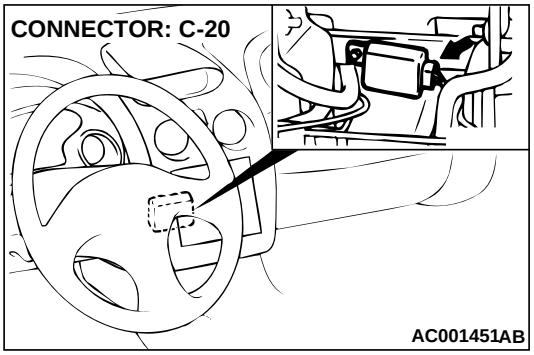
STEP 6. Check intermediate connector C-28.

Q: Is the connector damaged?

YES : Repair or replace connector.
Refer to GROUP 00E, Harness Connector Inspection P.00E-2.
Then check that the malfunction is eliminated.

NO : Go to Step 7.





STEP 7. Check the harness wire between park/neutral position switch connector B-41 (terminal number 10) and auto-cruise control-ECU connector C-20 (terminal number 13).

Q: Is any harness wire between park/neutral position switch connector B-41 (terminal number 10) and auto-cruise control-ECU connector C-20 (terminal number 13) damaged?

YES : Repair the harness wire and then check that the malfunction is eliminated.

NO : Check that the malfunction is eliminated.
If the malfunction is not eliminated, replace the auto-cruise control-ECU. (Refer to P.17-86.)
Then check that the malfunction is eliminated.

INSPECTION PROCEDURE 5: When the Auto-cruise Control "CANCEL" Switch is Set to ON, Auto-cruise Control is not Cancelled.

TECHNICAL DESCRIPTION (COMMENT)
The cause is probably an open-circuit in the output in the circuit inside the "CANCEL" switch.

TROUBLESHOOTING HINTS
- Malfunction of the auto-cruise control switch.

DIAGNOSIS
Replace the auto-cruise control switch. (Refer to P.17-86.)
Then check the malfunction is eliminated.

INSPECTION PROCEDURE 6: Auto-cruise Control cannot be Set.

TECHNICAL DESCRIPTION (COMMENT)

The fail-safe function is probably cancelling auto-cruise control.
In this case, scan tool MB991502 can be used to check the trouble symptoms in each system by checking the diagnostic trouble codes.
The scan tool can also be used to check if the circuits of each input switch are normal or not by checking the input switch codes.

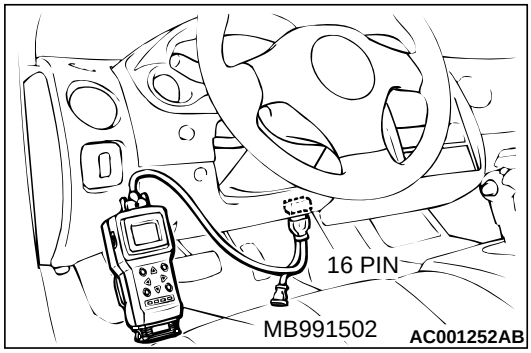
TROUBLESHOOTING HINTS

- Malfunction of the auto-cruise control switch.
- Malfunction of the auto-cruise control-ECU.

DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991223: Harness Set



STEP 1. Can the auto-cruise control-ECU communicate with scan tool MB991502?

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Using scan tool MB991502.
(2) Connect scan tool MB991502 to the data link connector.
(3) Turn the ignition switch to the "ON" position.

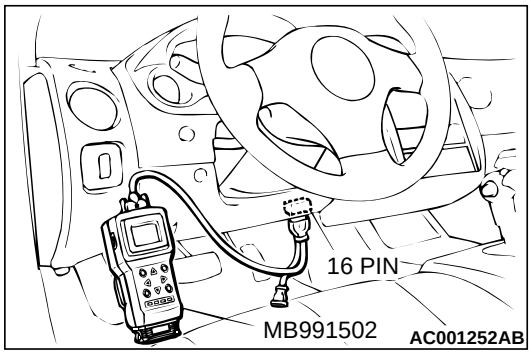
Q: Can the auto-cruise control-ECU communicate with the scan tool?

YES : Go to Step 2.
NO : Inspect each trouble symptom.
(Refer to Inspection Procedure number 1 P.17-44.)

STEP 2. Is any diagnostic trouble code output?

Q: Is any diagnostic trouble code output?

YES : Diagnostic trouble code number 11, 12, 14, 15, 16 or 17 is output, refer to the following.
(Code number 11 P.17-12.)
(Code number 12 P.17-17.) <M/T>
(Code number 12 P.17-20.) <A/T>
(Code number 14 P.17-23.)
(Code number 15 P.17-32.)
(Code number 16 P.17-39.)
(Code number 17 P.17-39.)
Then check that the malfunction is eliminated.
NO : Go to Step 3.



STEP 3.Using scan tool MB991502, check data list.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Using scan tool MB991502.
(2) Connect scan tool MB991502 to the data link connector.
(3) Check the following items in the data list.
Refer to P.17-77, Data List Reference Table.
- Item 04: Auto-cruise control "CANCEL" switch.
- Item 05: Stoplight switch.
- Item 14: Clutch pedal position switch. <M/T>.
- Item 14: Park/neutral position switch. <A/T>

(4) Turn the ignition switch to the "ON" position.

Q: Is the check above meet the specifications?

YES : Check that the malfunction is eliminated.
If the malfunction is not eliminated, replace the auto-cruise control-ECU. (Refer to P.17-86.)
Then that the malfunction is eliminated.

NO : Follow the diagnostic trouble code procedures and the symptom procedures below.
- Item 04: Refer to Diagnostic Trouble Code Procedures number 15 P.17-32.
- Item 05: Refer to Symptom Procedures number 2 P.17-50.
- Item 14: Refer to Symptom Procedures number 3 <M/T>P.17-56.
- Item 14: Refer to Symptom Procedures number 4 <A/T>P.17-61.

INSPECTION PROSEDURE 7:Hunting (Repeated Acceleration and Deceleration) Occurs at the Set Vehicle Speed. <M/T>

TECHNICAL DESCRIPTION (COMMENT)

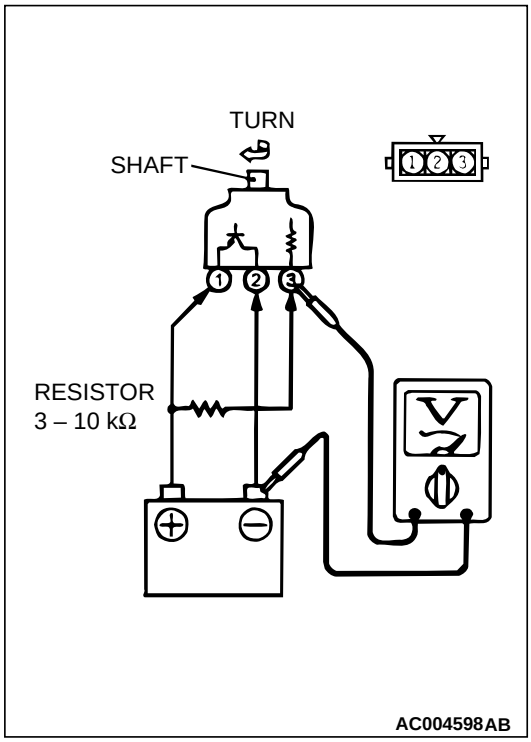
The cause is probably the malfunction of the vehicle speed sensor or incorrect vacuum in the auto-cruise control vacuum pump or actuator.

TROUBLESHOOTING HINTS

- Malfunction of the vehicle speed sensor.
- Malfunction of the auto-cruise control vacuum pump.
- Malfunction of the actuator.
- Malfunction of the auto-cruise control-ECU.

DIAGNOSIS

Required Special Tool:
- MB991223: Harness Set

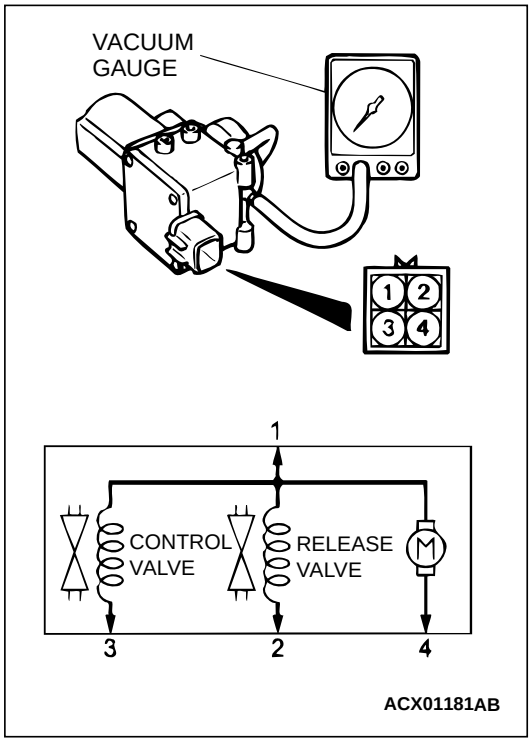


STEP 1. Check the vehicle speed sensor.

(1) Remove the vehicle speed sensor and connect a 3 – 10 kΩ resistor as shown in the illustration.
(2) Turn the shaft of the vehicle speed sensor and check that there is voltage between terminals 2 – 3. (one turn = four pulses.)

Q: Is the voltage within specifications?

YES : Go to Step 2.
NO : Replace the vehicle speed sensor.
Refer to GROUP 54A, Combination Meter Assembly and Vehicle Speed Sensor P.54A-105.
Then check that the malfunction is eliminated.



STEP 2. Check the auto-cruise vacuum pump.

(1) Disconnect the vacuum hose from the auto-cruise vacuum pump and connect a vacuum gauge to the vacuum pump.
(2) Disconnect the vacuum pump connector.
(3) Check the auto-cruise vacuum pump and valves according to the following procedure:
- Connect the positive battery terminal to auto-cruise vacuum pump connector terminal 1, and the negative battery terminal to terminals 2, 3, and 4.
  Then the vacuum gauge should read 27 kPa (8.0 in Hg) or more.
- The vacuum should be maintained when terminal 4 is disconnected from the negative battery terminal while terminals 1, 2, and 3 remain connected.
  Then the vacuum gauge should read 0 kPa (0 in Hg) when terminal 2 is disconnected from the negative battery terminal while terminals 1, and 3 remain connected.
- The vacuum should be maintained when terminal 4 is disconnected from the negative battery terminal while terminals 1, 2, and 3 remain connected.
  Then the vacuum gauge should read 0 kPa (0 in Hg) when terminal 3 is disconnected from the negative battery terminal while terminals 1, and 2 remain connected.

Q: Are all of the above values satisfied?

YES : Go to Step 3.
NO : Replace the auto-cruise vacuum pump. (Refer to P.17-86.)
Then that the malfunction is eliminated.

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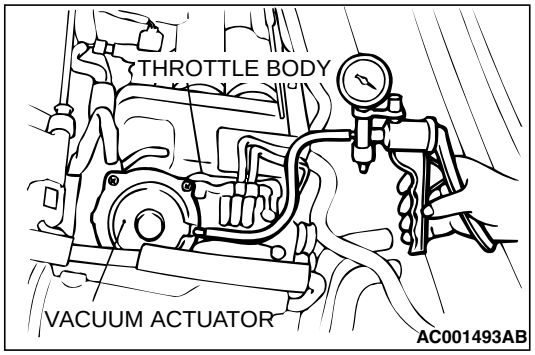


STEP 3. Check the vacuum actuator.

(1) Disconnect the vacuum hose from the vacuum actuator, and then connect a hand vacuum pump to the vacuum actuator.
(2) Apply a vacuum and check that the throttle lever moves and the vacuum is maintained.

Q: Is the vacuum actuator damaged?

YES : Replace the vacuum actuator.
For 2.4L engine, refer to GROUP 13A, Throttle Body Assembly P.13A-593.
For 3.0L engine, refer to GROUP 13B, Throttle Body Assembly P.13B-690.
Then check that the malfunction is eliminated.

NO : Check that the malfunction is eliminated.
If the malfunction is not eliminated, replace the auto-cruise control-ECU. (Refer to P.17-86.)
Then check that the malfunction is eliminated.

INSPECTION PROSEDURE 8: Hunting (Repeated Acceleration and Deceleration) Occurs at the Set Vehicle Speed. <A/T>

TECHNICAL DESCRIPTION (COMMENT)

The cause is probably the malfunction of the output shaft speed sensor or PCM or incorrect vacuum in the auto-cruise control vacuum pump or actuator.

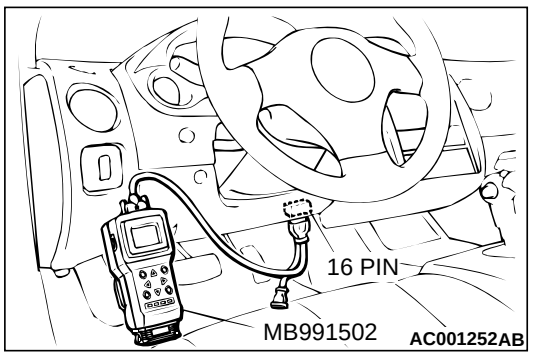
TROUBLESHOOTING HINTS

- Malfunction of the output shaft speed sensor.
- Malfunction of the PCM.
- Malfunction of the auto-cruise control vacuum pump.
- Malfunction of the actuator.
- Malfunction of the auto-cruise control-ECU.

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)
- MB991223: Harness Set



STEP 1. Check the vehicle speed signal.

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Using scan tool MB991502.
(2) Connect scan tool MB991502 to the data link connector.
(3) Turn the ignition switch to the "ON" position.
(4) Read the MFI-DTC.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the MFI-DTC P0720 is output?

YES : For 2.4L engine, refer to GROUP 13A, Diagnosis – Diagnostic Trouble Code Chart P.13A-22.
For 3.0L engine, refer to GROUP 13B, Diagnosis – Diagnostic Trouble Code Chart P.13B-22.

NO : Go to Step 2.

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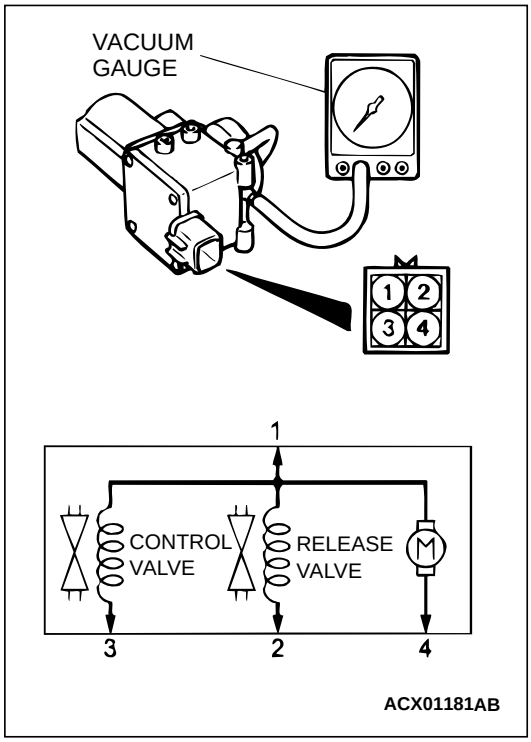
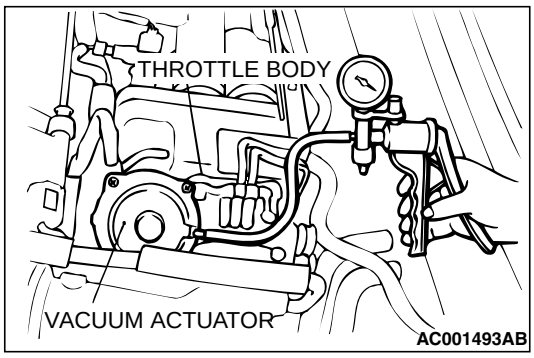


STEP 2. Check the auto-cruise vacuum pump.

(1) Disconnect the vacuum hose from the auto-cruise vacuum pump and connect a vacuum gauge to the vacuum pump.
(2) Disconnect the vacuum pump connector.
(3) Check the auto-cruise vacuum pump and valves according to the following procedure:
- Connect the positive battery terminal to auto-cruise vacuum pump connector terminal 1, and the negative battery terminal to terminals 2, 3, and 4.
  Then the vacuum gauge should read 27 kPa (8.0 in Hg) or more.
- The vacuum should be maintained when terminal 4 is disconnected from the negative battery terminal while terminals 1, 2, and 3 remain connected.
  Then the vacuum gauge should read 0 kPa (0 in Hg) when terminal 2 is disconnected from the negative battery terminal while terminals 1, and 3 remain connected.
- The vacuum should be maintained when terminal 4 is disconnected from the negative battery terminal while terminals 1, 2, and 3 remain connected.
  Then the vacuum gauge should read 0 kPa (0 in Hg) when terminal 3 is disconnected from the negative battery terminal while terminals 1, and 2 remain connected.

Q: Are all of the above values satisfied?

YES : Go to Step 3.
NO : Replace the auto-cruise vacuum pump. (Refer to P.17-86.)
Then that the malfunction is eliminated.



STEP 3. Check the vacuum actuator.

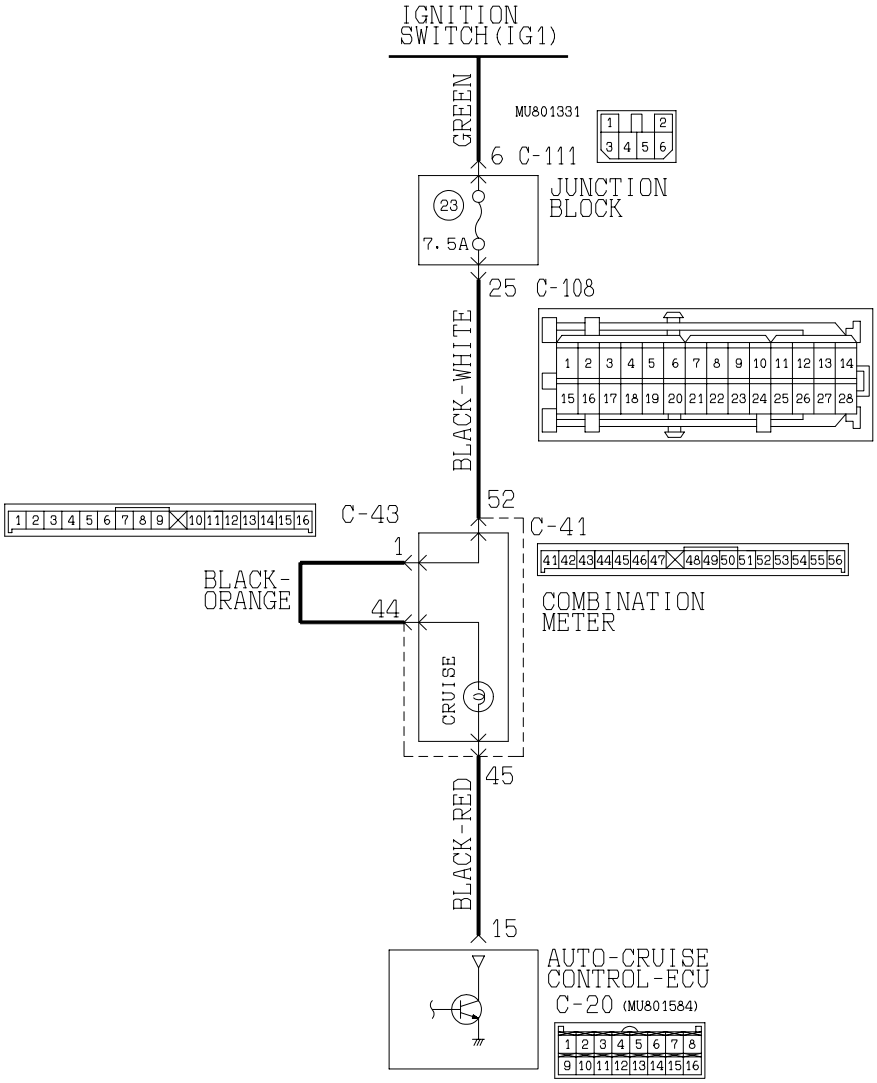
(1) Disconnect the vacuum hose from the vacuum actuator, and then connect a hand vacuum pump to the vacuum actuator.
(2) Apply a vacuum and check that the throttle lever moves and the vacuum is maintained.

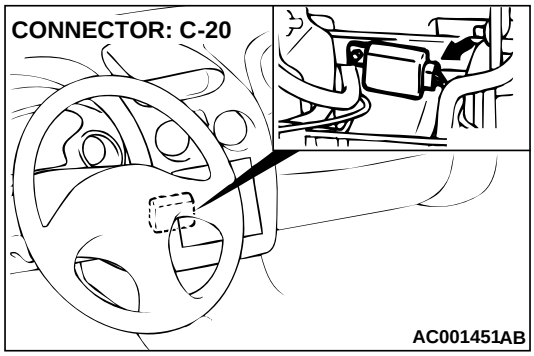
Q: Is the vacuum actuator damaged?

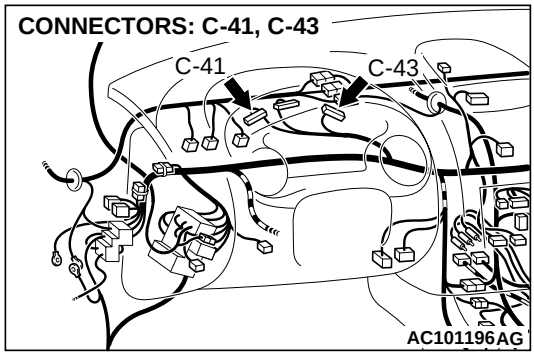
YES : Replace the vacuum actuator.
For 2.4L engine, refer to GROUP 13A, Throttle Body Assembly P.13A-593.
For 3.0L engine, refer to GROUP 13B, Throttle Body Assembly P.13B-690.
Then check that the malfunction is eliminated.
NO : Check that the malfunction is eliminated.
If the malfunction is not eliminated, replace the auto-cruise control-ECU. (Refer to P.17-86.)
Then check that the malfunction is eliminated.

INSPECTION PROCEDURE 9: Auto-cruise Control Indicator Light Inside Combination Meter does not Illuminate. (However, Auto-cruise Control is Normal.)

Auto-cruise Control Indicator Light Drive Circuit







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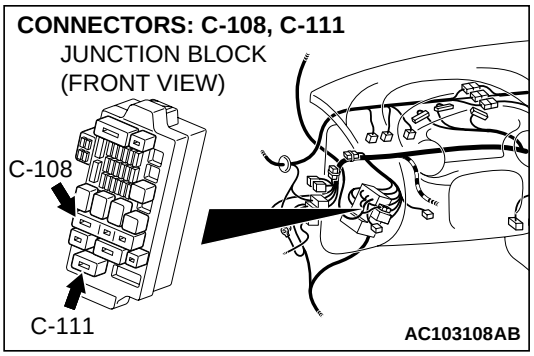


CIRCUIT OPERATION

The power for the auto-cruise indicator in the combination meter is supplied from the ignition switch (IG1).
When the auto-cruise control system is operating, the transistor inside the auto-cruise control-ECU illuminates the auto-cruise indicator through ECU terminal number 15.

TECHNICAL DESCRIPTION (COMMENT)

The cause is probably the malfunction of the indicator bulb or the malfunction of the connector or harness.

TROUBLESHOOTING HINTS

- Malfunction of the indicator bulb.
- Damaged harness or connector.
- Malfunction of the auto-cruise control-ECU.

DIAGNOSIS

Required Special Tool:
- MB991223: Harness Set

STEP 1. Check the auto-cruise control indicator bulb.

(1) Remove the combination meter.
Refer to GROUP 54A, Combination Meter Assembly and Vehicle Speed Sensor P.54A-105.
(2) Check the auto-cruise control indicator bulb.

Q: Is the bulb blown?

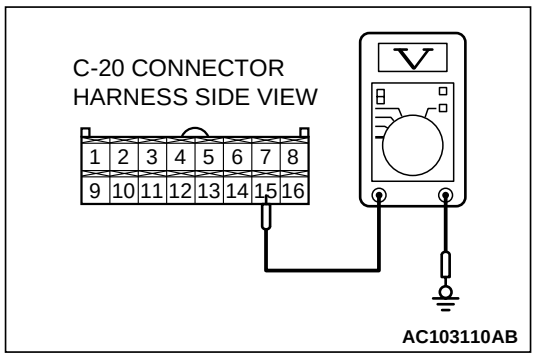
YES : Replace the bulb.
Then check that the malfunction is eliminated.
NO : Go to Step 2.

STEP 2. Check the output circuit voltage at auto-cruise control-ECU connector C-20 (terminal number 15) by backprobing.

(1) Do not disconnect auto-cruise control switch connector C-20.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 15 and ground by backprobing.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage approximately battery positive voltage?

YES : Check that the malfunction is eliminated.
If the malfunction is not eliminated, replace the auto-cruise control-ECU. (Refer to P.17-86.)
Then check that the malfunction is eliminated.
NO : Go to Step 3.



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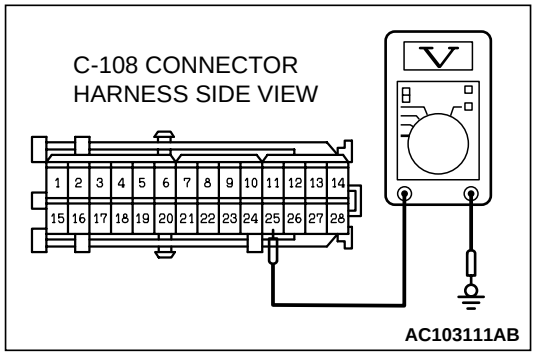
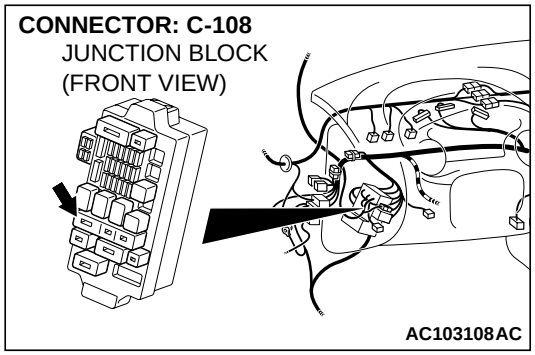


STEP 3. Check the output circuit voltage at junction block connector C-108 (terminal number 25) by backprobing.

(1) Do not disconnect auto-cruise control switch connector C-108.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 25 and ground by backprobing.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage approximately battery positive voltage?

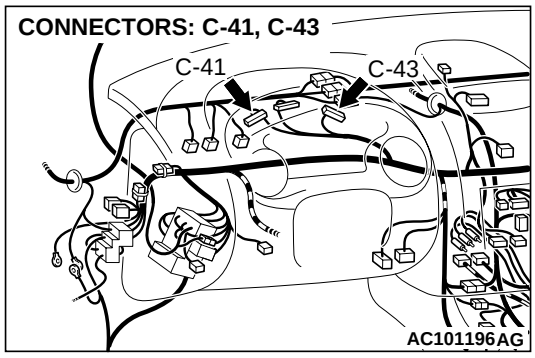
YES : Go to Step 5.
NO : Go to Step 4.



STEP 4. Check junction block connector C-108.

Q: Is the connector damaged?

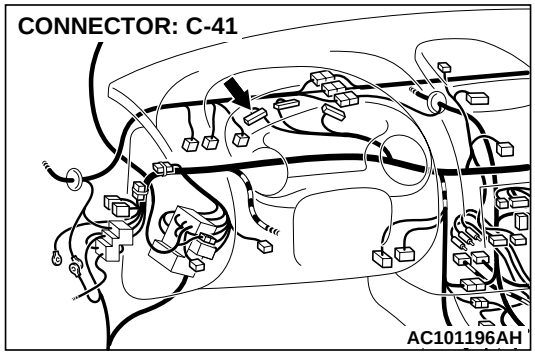
YES : Repair or replace connector.
Refer to GROUP 00E, Harness Connector Inspection P.00E-2.
Then check that the malfunction is eliminated.
NO : Replace the junction block.
Then check that the malfunction is eliminated.

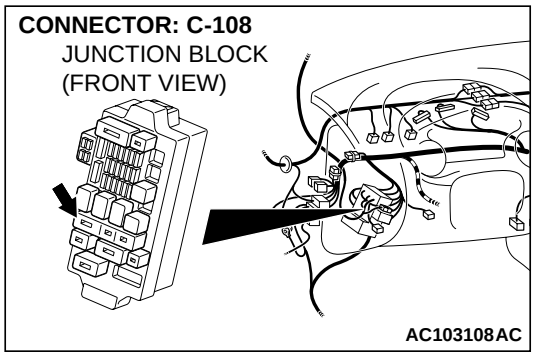


STEP 5. Check combination meter connector C-41 and C-43.

Q: Is any connector damaged?

YES : Repair or replace connector.
Refer to GROUP 00E, Harness Connector Inspection P.00E-2.
Then check that the malfunction is eliminated.
NO : Go to Step 6.



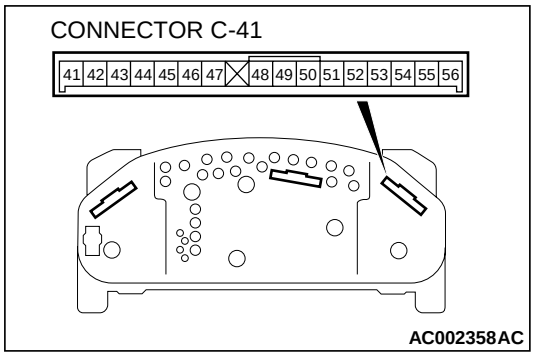


STEP 6. Check the harness wire between combination meter connector C-41 (terminal number 52) and junction block connector C-108 (terminal number 25).

Q: Is any harness wire between combination meter connector C-41 (terminal number 52) and junction block connector C-108 (terminal number 25) damaged?

YES : Repair the harness wire and then check that the malfunction is eliminated.

NO : Go to Step 7.



STEP 7. Check the combination meter.

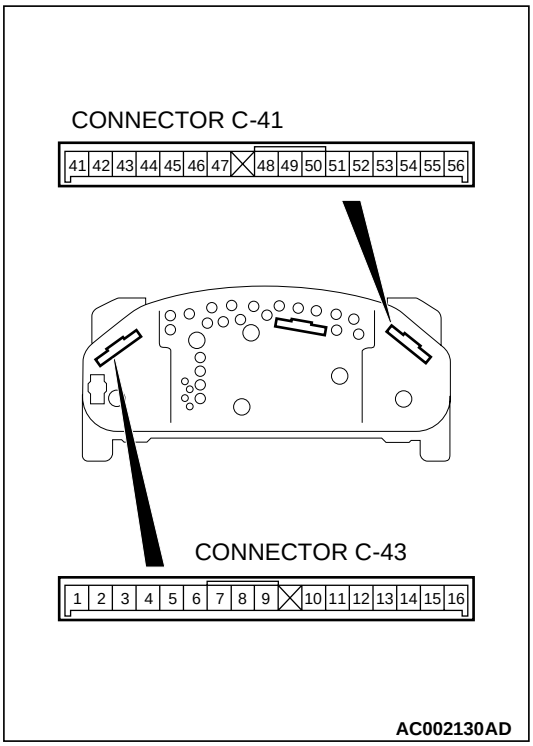
(1) Remove the combination meter and measure at the combination meter side. (Refer to GROUP 54A, Combination Meter Assembly and Vehicle Speed Sensor P.54A-105.)

(2) Measure the continuity between terminal 44 and 45 at conductor C-41.

Q: Is the continuity less than 2 ohm?

YES : Go to Step 8.

NO : Replace the combination meter.
Refer to GROUP 54A, Combination Meter Assembly and Vehicle Speed Sensor P.54A-105.
Then check that the malfunction is eliminated.



STEP 8. Check the combination meter.

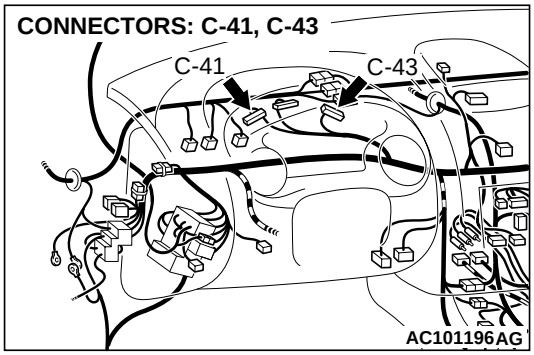
(1) Remove the combination meter and measure at the combination meter side. (Refer to GROUP 54A, Combination Meter Assembly and Vehicle Speed Sensor P.54A-105.)

(2) Measure the continuity between terminal 52 at conductor C-41 and terminal 1 at conductor C-43.

Q: Is the continuity less than 2 ohm?

YES : Go to Step 9.

NO : Replace the combination meter.
Refer to GROUP 54A, Combination Meter Assembly and Vehicle Speed Sensor P.54A-105.
Then check that the malfunction is eliminated.

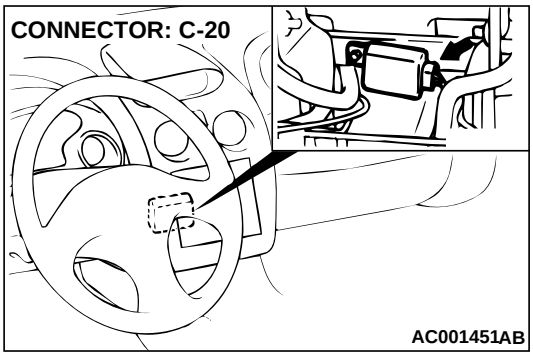


STEP 9. Check the harness wire between combination meter connector C-41 (terminal number 52) and C-43 (terminal number 1).

Q: Is any harness wire between combination meter connector C-41 (terminal number 52) and C-43 (terminal number 1) damaged?

YES : Repair the harness wire and then check that the malfunction is eliminated.

NO : Go to Step 10.

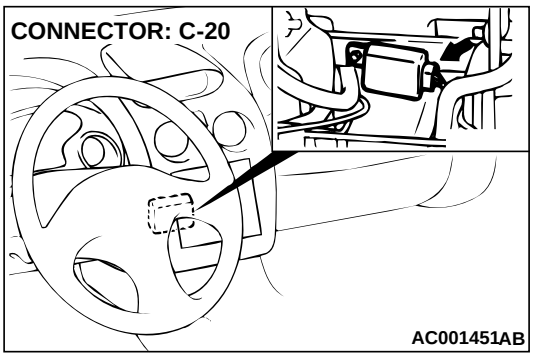


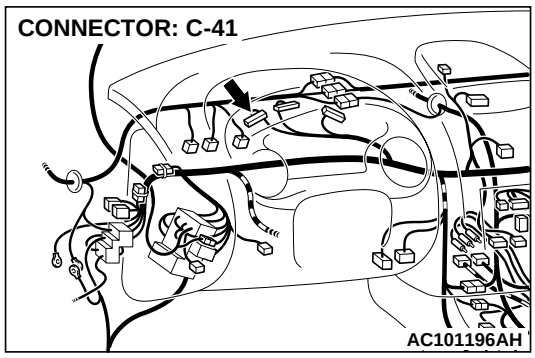
STEP 10. Check auto-cruise control-ECU connector C-20.

Q: Is the connector damaged?

YES : Repair or replace connector.
Refer to GROUP 00E, Harness Connector Inspection P.00E-2.
Then check that the malfunction is eliminated.

NO : Go to Step 11.





STEP 11. Check the harness wire between combination meter connector C-41 (terminal number 52) and auto-cruise control-ECU connector C-20 (terminal number 15).

Q: Is any harness wire between combination meter connector C-41 (terminal number 52) and auto-cruise control-ECU connector C-20 (terminal number 15) damaged?

YES : Repair the harness wire and then check that the malfunction is eliminated.

NO : Check that the malfunction is eliminated.
If the malfunction is not eliminated, replace the auto-cruise control-ECU. (Refer to P.17-86.)
Then check that the malfunction is eliminated.

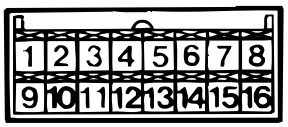
DATA LIST REFERENCE TABLE

M1172002400169

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM		INSPECTION REQUIREMENT		NORMAL CONDITION
CANCEL SWITCH	04	Auto-cruise control switch	CANCEL	CANCEL switch: "ON"		ON
				CANCEL switch: "OFF"		OFF
IDLE SW SIG	08	Closed throttle position switch		Accelerator pedal: Depressed		OFF
				Accelerator pedal: Released		ON
MAIN SW	01	Auto-cruise control switch	MAIN	MAIN switch: "ON"		ON
				MAIN switch: "OFF"		OFF
OD OFF	15	A/T control signal		No "OD-OFF" request		OFF
				"OD-OFF" request		ON
PNP SW/CLUTCH	14	Clutch pedal position switch <M/T>		Clutch switch: Depressed		ON
				Clutch switch: Released		OFF
		Park/neutral position switch <A/T>		Selector lever: "P" or "N" position		ON
				Selector lever: Other than "P" or "N" position		OFF
RESUME SWITCH	03	Auto-cruise control switch	RESUME	RESUME switch: "ON"		ON
				RESUME switch: "OFF"		OFF
SET SWITCH	02		SET	SET switch: "ON"		ON
				SET switch: "OFF"		OFF
STOPLIGHT SW	05	Stoplight switch		Brake pedal: Depressed		ON
				Brake pedal: Released		OFF
TP SENSOR	13	Throttle position sensor		Ignition switch: "ON"	Accelerator pedal: Fully depressed	400 – 1,000 mV
					Accelerator pedal: Depressed	Increases in proportion to throttle opening angle.
					Accelerator pedal: Released	4,000 – 5,500 mV
VSS	10	Vehicle speed sensor		Road test the vehicle		The speedometer and MUT-II display the same value.

CHECK AUTO-CRUISE CONTROL-ECU TERMINALS

M1172002700201



ACX02234

TERMINAL NO.	CHECK ITEM	CHECK CONDITIONS		NORMAL CONDITION
1	Throttle position sensor input	When accelerator pedal is fully depressed		4.0 – 5.5 V
		When accelerator pedal is released		0.4 – 1.0 V
2	Power train control module output (Idle switch)	When accelerator pedal is depressed		4.0 – 5.5 V
		When accelerator pedal is not depressed		2.5 V or less
3	A/T control output	No "OD-OFF" request		Battery positive voltage
		"OD-OFF" request		0 V
4	Stoplight switch input	When brake pedal is depressed	When stoplight switch is ON	Battery positive voltage
		When brake pedal is not depressed	When stoplight switch is OFF	0 V
5	Pump power supply	Ignition switch: "ON" position Stoplight switch: OFF		10 V or more
6	ECU power supply	Ignition switch: "ON" position		Battery positive voltage
7	Release valve	When decelerating with the "SET" switch while driving at constant speed		1 V or less
8	Control valve			10 V or more
7	Release valve	When cancelling constant speed driving with the "CANCEL" switch		10 V or more
8	Control valve			Battery positive voltage
9	Auto-cruise control switch input	When main switch is "ON"		Approximately 7.0 V
		When input switch has not been operated	When all switches are OFF	3.5 – 5.0 V
		When input switch is pushed down	When "SET" switch is ON	0.4 – 2.3 V
		When input switch is pushed up	When "RESUME" switch is ON	2.3 – 3.5 V
		When input switch is pulled forward	When "CANCEL" switch is ON	0.4 V or less
10	Vehicle speed sensor input	When vehicle is moved forwards and backwards, sensor turns ON and OFF repeatedly	When sensor is ON	0 V
			When sensor is OFF	8 – 12 V*
11	Diagnosis control input	When ignition switch is "ON" position		4 V or more

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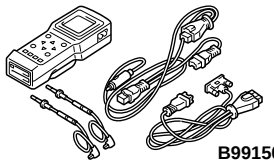
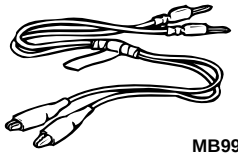
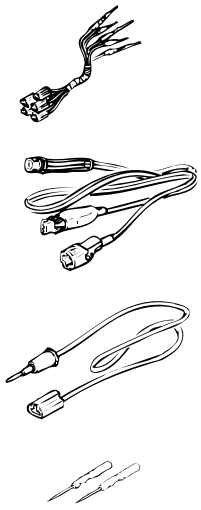
TERMINAL NO.	CHECK ITEM	CHECK CONDITIONS		NORMAL CONDITION
12	ECU power supply	When "MAIN" switch is ON		Battery positive voltage
13	Clutch pedal position switch input <M/T>	When pedal is not depressed	When clutch pedal position switch is OFF	Battery positive voltage
		When pedal is depressed	When clutch pedal position switch is ON	0 V
	Park/neutral position switch input <A/T>	When select lever is in a position other than N range	When park/neutral position switch is OFF	Battery positive voltage
		When select lever is in N range	When park/neutral position switch is ON	0 V
14	Ground	At any time		0 V
15	Indicator light input (inside combination meter)	When indicator light is illuminated		0 V
		When indicator light is switch off		Battery positive voltage
16	Auto-cruise vacuum pump motor input	When driving at constant speed using the "SET" switch	Motor stopped/ running	Battery positive voltage/0 V
		When accelerating with the "RESUME" switch while driving at constant speed	Motor stopped/ running	Battery positive voltage/0 V
		When decelerating with the "SET" switch while driving at constant speed	Motor stopped	Battery positive voltage
		When cancelling constant speed driving with the "CANCEL" switch	Motor stopped	Battery positive voltage

*NOTE: *: Auto-cruise control-ECU terminal No.10 is sending a voltage of 5 volts to the vehicle speed sensor system circuit. However, as higher voltage is mixed through the circuit a voltmeter will show 8 – 12 V.*

SPECIAL TOOLS

M1172000600156

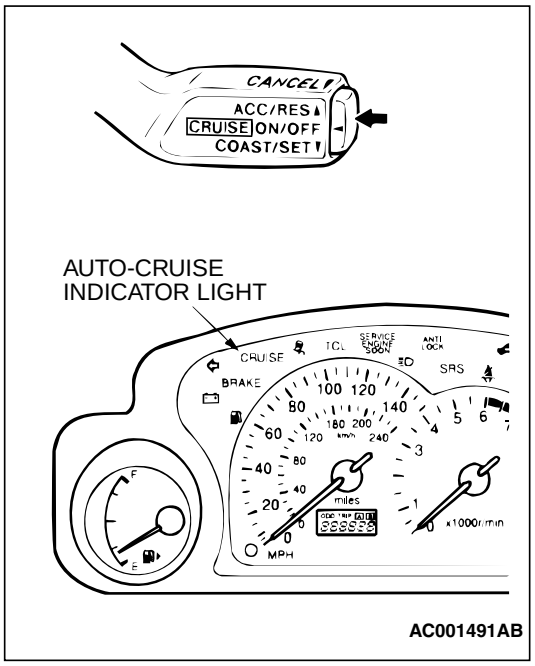
TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 B991502	MB991502 Scan tool (MUT-II)	MB991496-OD	Diagnostic trouble code check.
 MB991529	MB991529 Diagnostic trouble code check harness	Tool not necessary if scan tool (MUT-II) is available	
 MB991223	MB991223 Harness set MB991219 A: Connector pin contact pressure inspection	MB991223 MB991709-01	Checking the continuity and measuring the voltage at the harness connector

ON-VEHICLE SERVICE

AUTO-CRUISE CONTROL SWITCH CHECK

M1172001100154

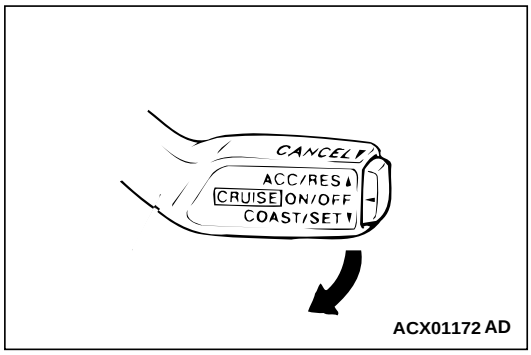
1. Turn the ignition switch to the "ON" position.
2. Check that the indicator light within the combination meter illuminates when the main switch is switched "ON."



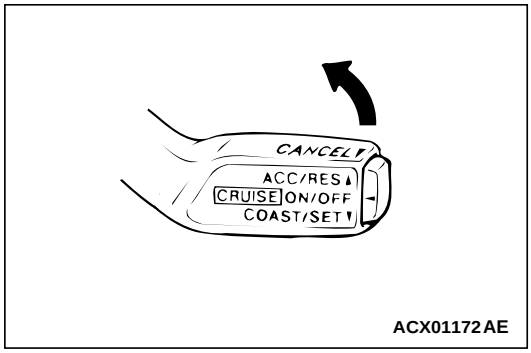
Auto-cruise Control Setting

1. Switch "ON" the main switch.
2. Drive at the desired speed, above approximately 40 km/h. (25 mph)
3. Push the auto-cruise control switch in the direction of arrow.
4. Check to be sure that when the switch is released the speed is the desired constant speed.

   NOTE: If the vehicles speed decreases to approximately 15 km/h (9 mph) below the set speed because of climbing a hill for example, the auto-cruise control will be cancelled.



Speed-increase Setting

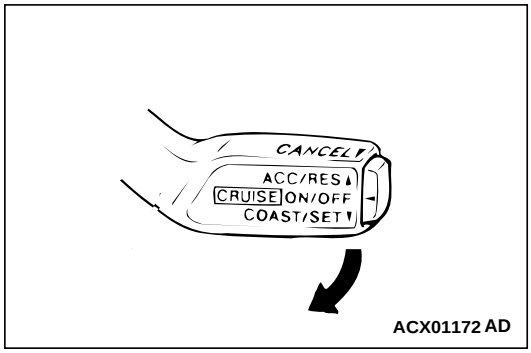


ACX01172AE

1. Set to the desired speed.
2. Push the auto-cruise control switch in the direction of arrow.
3. Check to be sure that acceleration continues while the switch is held, and that after it is released the constant speed at the time when it was released becomes the driving speed.

   NOTE: Acceleration can be continued even if the vehicle speed has passed the high-speed limit [approximately 200 km/h (124 mph)].
   But the speed when the auto-cruise control switch is released will be recorded as the high-speed limit.

Speed-reduction Setting

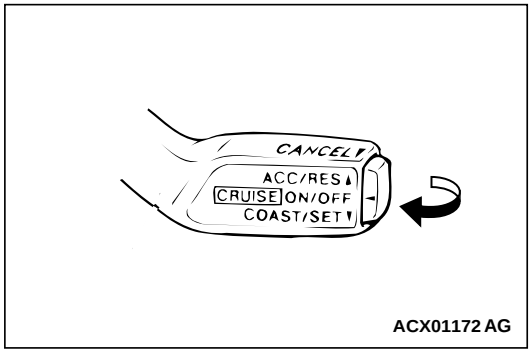


ACX01172AD

1. Set to the desired speed.
2. Push the auto-cruise control switch in the direction of arrow.
3. Check to be sure that deceleration continues while the switch is pressed, and that after it is released the constant speed at the time when it was released becomes the driving speed.

   NOTE: When the vehicle speed reaches the low limit [approximately 40 km/h (25 mph)] during deceleration, the auto-cruise control will be cancelled.

Return to the Set Speed Before Cancellation and Auto-cruise Control Cancellation



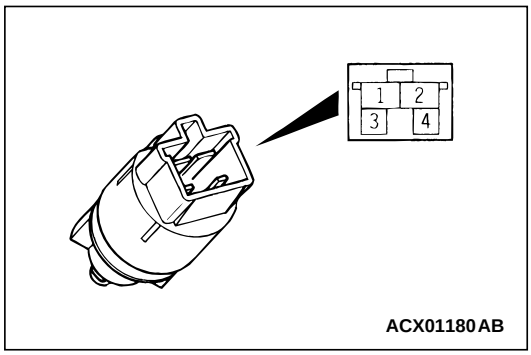
ACX01172AG

1. Set the auto-cruise speed control.
2. When any of the following operations are performed while at constant speed during auto-cruise control, check if normal driving is resumed and deceleration occurs.
   (1) The auto-cruise control switch is pushed in the direction of arrow.
   (2) The brake pedal is depressed.
   (3) The clutch pedal is depressed. (M/T)
   (4) The selector lever is moved to the "N" range. (A/T)
3. At a vehicle speed of 40 km/h (25 mph) or higher, check if when the "RESUME" switch is switched "ON," the vehicle speed returns to the speed before auto-cruise control driving was cancelled, and constant speed driving occurs.
4. When the main switch is turned to the "OFF" while driving at constant speed, check if normal driving is resumed and deceleration occurs.

AUTO-CRUISE CONTROL SYSTEM COMPONENT CHECK

M1172001700167

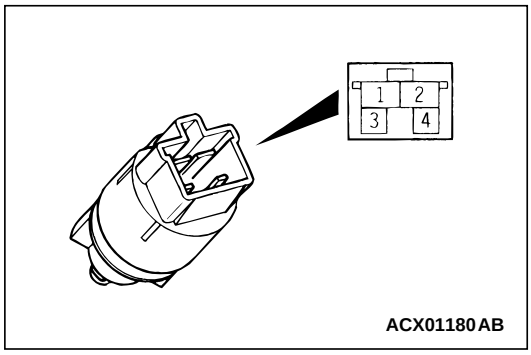
Stoplight Switch



1. Disconnect the connector.
2. Check for continuity between the terminals of the switch.

MEASUREMENT CONDITIONS	TERMINAL CONNECTOR OF TESTER	SPECIFIED CONDITION
When brake pedal is depressed. (for stoplight circuit)	1 – 2	Less than 2 ohm
	3 – 4	Open circuit
When brake pedal is not depressed. (for auto-cruise control circuit)	1 – 2	Open circuit
	3 – 4	Less than 2 ohm

Clutch Pedal Position Switch



1. Disconnect the connector.
2. Check for continuity between the terminals of the switch.

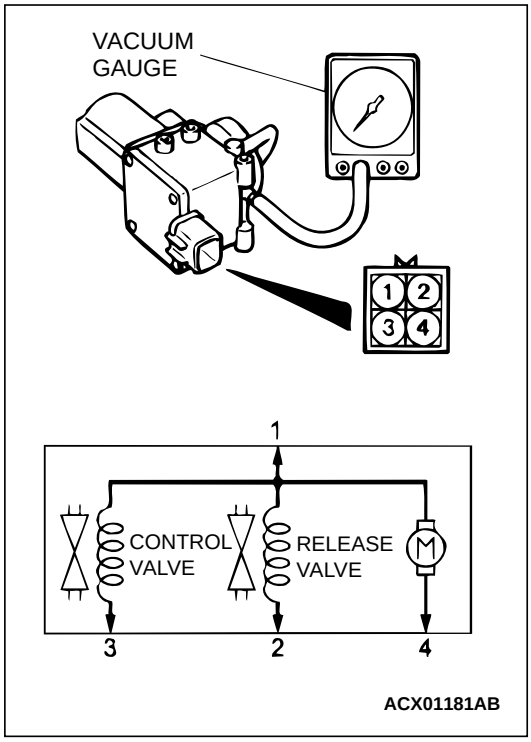
MEASUREMENT CONDITIONS	TERMINAL CONNECTOR OF TESTER	SPECIFIED CONDITION
When clutch pedal is depressed.	1 – 2	Less than 2 ohm
When clutch pedal is not depressed.	1 – 2	Open circuit

Park/Neutral Position Switch ("N" Position)

Refer to GROUP 23A, On-vehicle Service – Essential Service P.23A-351.

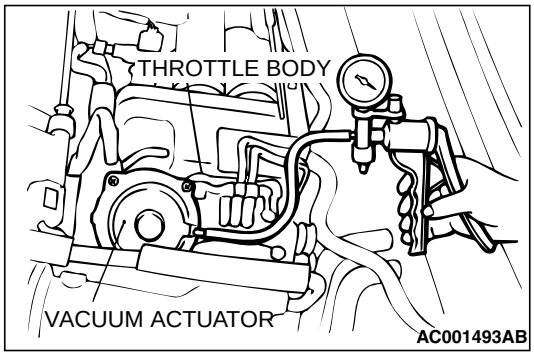
Throttle Position Sensor

For 2.4L engine, refer to GROUP 13A, On-vehicle Service – Throttle Position Sensor Check P.13A-584.
For 3.0L engine, refer to GROUP 13B, On-vehicle Service – Throttle Position Sensor Check P.13B-683.



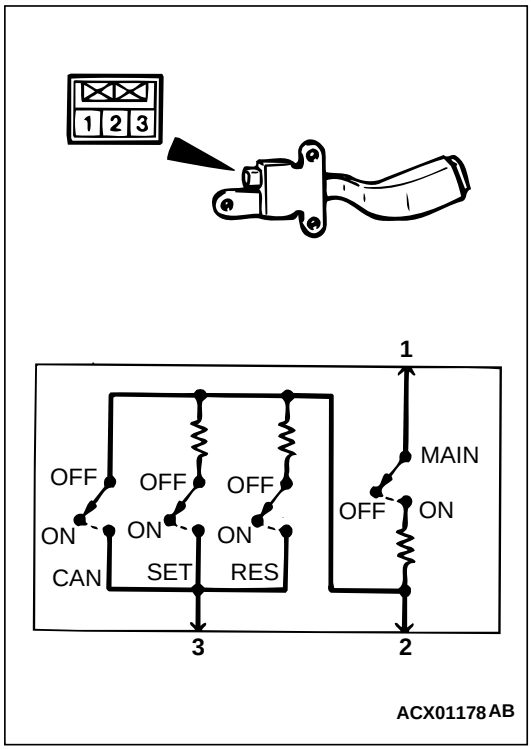
Auto-cruise Vacuum Pump

1. Disconnect the vacuum hose from the auto-cruise vacuum pump and connect a vacuum gauge to the vacuum pump.
2. Disconnect the vacuum pump connector.
3. Check the auto-cruise vacuum pump and valves according to the following procedure:
   (1) Connect the positive battery terminal to auto-cruise vacuum pump connector terminal 1, and the negative battery terminal to terminals 2, 3, and 4.
   Then the vacuum gauge should read 27 kPa (8.0 in Hg) or more.
   (2) The vacuum should be maintained when terminal 4 is disconnected from the negative battery terminal while terminals 1, 2, and 3 remain connected.
   Then the vacuum gauge should read 0 kPa (0 in Hg) when terminal 2 is disconnected from the negative battery terminal while terminals 1, and 3 remain connected.
   (3) The vacuum should be maintained when terminal 4 is disconnected from the negative battery terminal while terminals 1, 2, and 3 remain connected.
   Then the vacuum gauge should read 0 kPa (0 in Hg) when terminal 3 is disconnected from the negative battery terminal while terminals 1, and 2 remain connected.



Vacuum Actuator

1. Disconnect the vacuum hose from the vacuum actuator, and connect a hand vacuum pump to the actuator.
2. Check that the throttle lever operates when applying vacuum, and the vacuum is maintained.



Auto-cruise Control Check

Measure the resistance between the terminals when each of the "SET," "RESUME," "CANCEL" and "MAIN" switches is pressed. If the values measured at the time correspond to those in the table below, the resistance values are correct.

SWITCH POSITION	TERMINAL CONNECTOR OF TESTER	SPECIFIED CONDITION
"MAIN" switch "OFF"	1 – 2	Open circuit
"MAIN" switch "ON"	1 – 2	Approximately 3.9 kΩ
"CANCEL" switch "ON"	2 – 3	Less than 2 Ω
"RESUME" switch "ON"	2 – 3	Approximately 910 Ω
"SET" switch "ON"	2 – 3	Approximately 220 Ω

Vehicle Speed Sensor Check

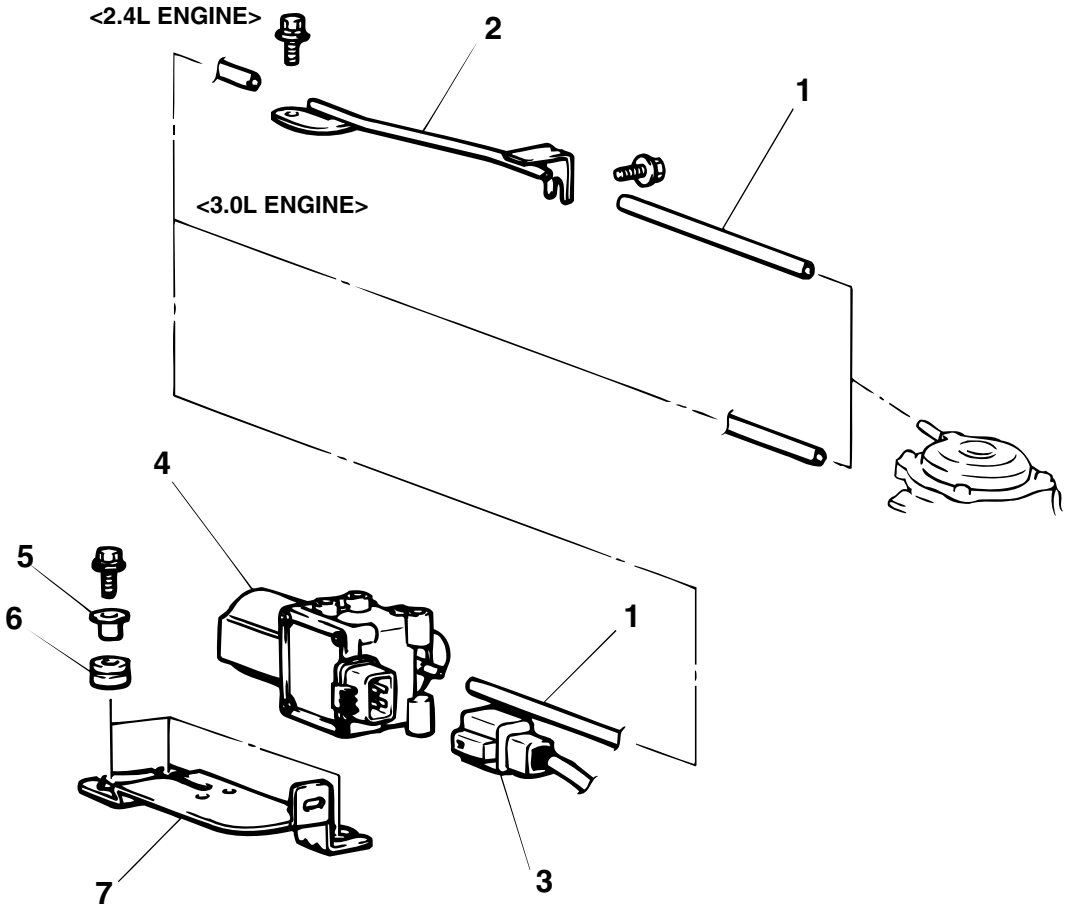
Refer to GROUP 54A, Combination Meters Assembly and Vehicle Speed Sensor P.54A-105.

AUTO-CRUISE CONTROL

REMOVAL AND INSTALLATION

M1172001400144

<ACTUATOR>



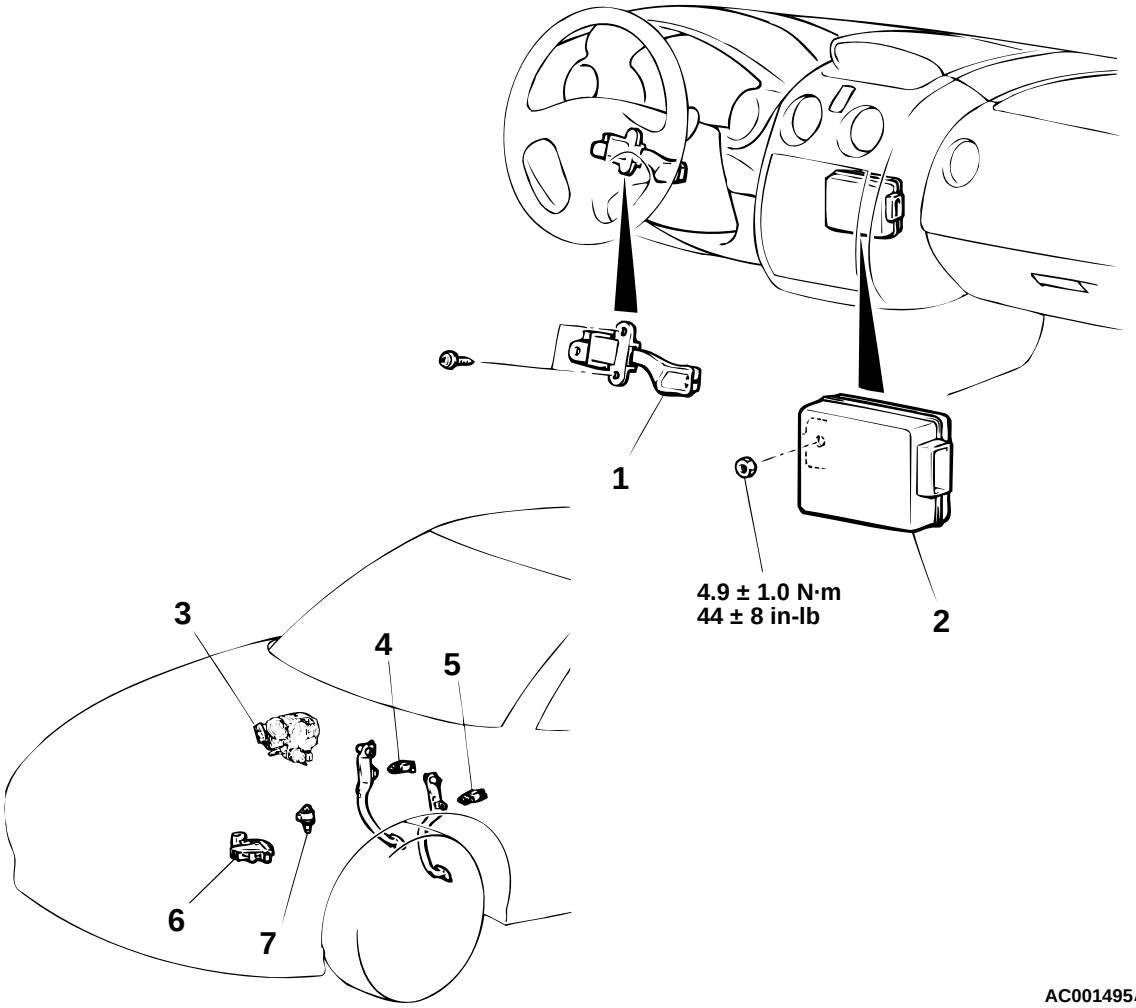
REMOVAL STEPS
1. VACUUM HOSE
2. VACUUM PIPE
3. WIRING CONNECTOR
4. VACUUM PUMP ASSEMBLY

REMOVAL STEPS (Continued)
5. SPACER
6. RUBBER MOUNT
7. PUMP BRACKET

<SWITCHES, CONTROL UNIT AND SENSORS>

⚠ ***WARNING***

Before removal of the air bag module, refer to GROUP 52B, SRS Service Precautions P.37A-21 and GROUP 52B, Air Bag Module and Clock Spring P.52B-144.



CONTROL SWITCH REMOVAL STEPS

- STEERING WHEEL (REFER TO GROUP 37A, STEERING WHEEL AND SHAFT P.37A-21.)

1. AUTO-CRUISE CONTROL SWITCH

CONTROL UNIT REMOVAL STEPS

- CENTER PANEL ASSEMBLY (REFER TO GROUP 52A, INSTRUMENT PANEL P.52A-3.)

2. AUTO-CRUISE CONTROL-ECU

SENSOR REMOVAL STEPS

3. THROTTLE POSITION SENSOR
4. STOPLIGHT SWITCH (REFER TO GROUP 35A, BRAKE PEDAL P.35A-31.)
5. CLUTCH PEDAL POSITION SWITCH (REFER TO GROUP 21A, CLUTCH PEDAL P.21A-10.)
6. PARK/NEUTRAL POSITION SWITCH <A/T>
7. VEHICLE SPEED SENSOR

TSB Revision

EMISSION CONTROL

GENERAL DESCRIPTION

M1173000100046

The emission control system consists of the following subsystems:

- Positive crankcase ventilation system
- Evaporative emission control system
- Exhaust emission control system

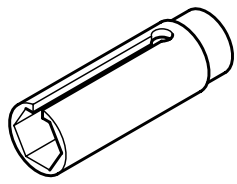
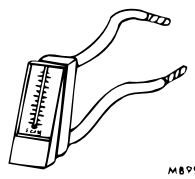
DIAGNOSIS

M1173000700026

SYMPTOM	PROBABLE CAUSE	REMEDY
Engine will not start or hard to start	Vacuum hose disconnected or damaged	Repair or replace
	The EGR valve is not closed.	Repair or replace
	Malfunction of the evaporative emission purge solenoid	Repair or replace
Rough idle or engine stalls	The EGR valve is not closed.	Repair or replace
	Vacuum hose disconnected or damaged.	Repair or replace
	Malfunction of the positive crankcase ventilation valve	Replace
	Malfunction of the purge control system	Check the system; If there is a problem, check its component parts.
Engine hesitates or poor acceleration	Malfunction of the exhaust gas recirculation system	Check the system; If there is a problem, check its component parts.
Excessive oil consumption	Positive crankcase ventilation line clogged	Check positive crankcase ventilation system
Poor fuel mileage	Malfunction of the exhaust gas recirculation system	Check the system; If there is a problem, check its component parts.

SPECIAL TOOLS

M1173000600063

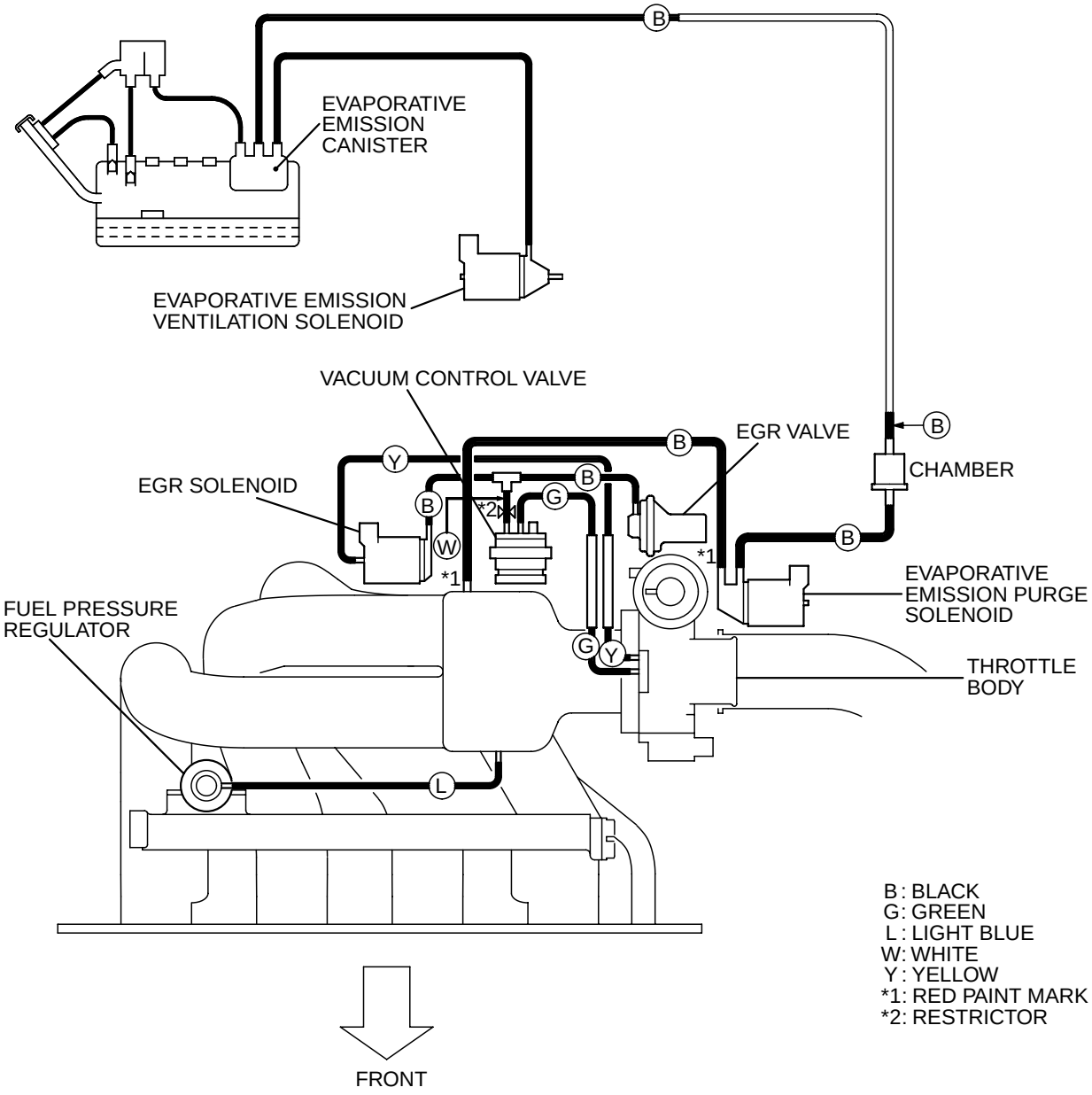
TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
	MD998770 Oxygen sensor wrench	MD998770-01 or General service tool	Removal/installation of heated oxygen sensor
	MB995061 Purge flow indicator	MLR6890A	Inspection of purge control system

VACUUM HOSES

VACUUM HOSE ROUTING

M1173000900183

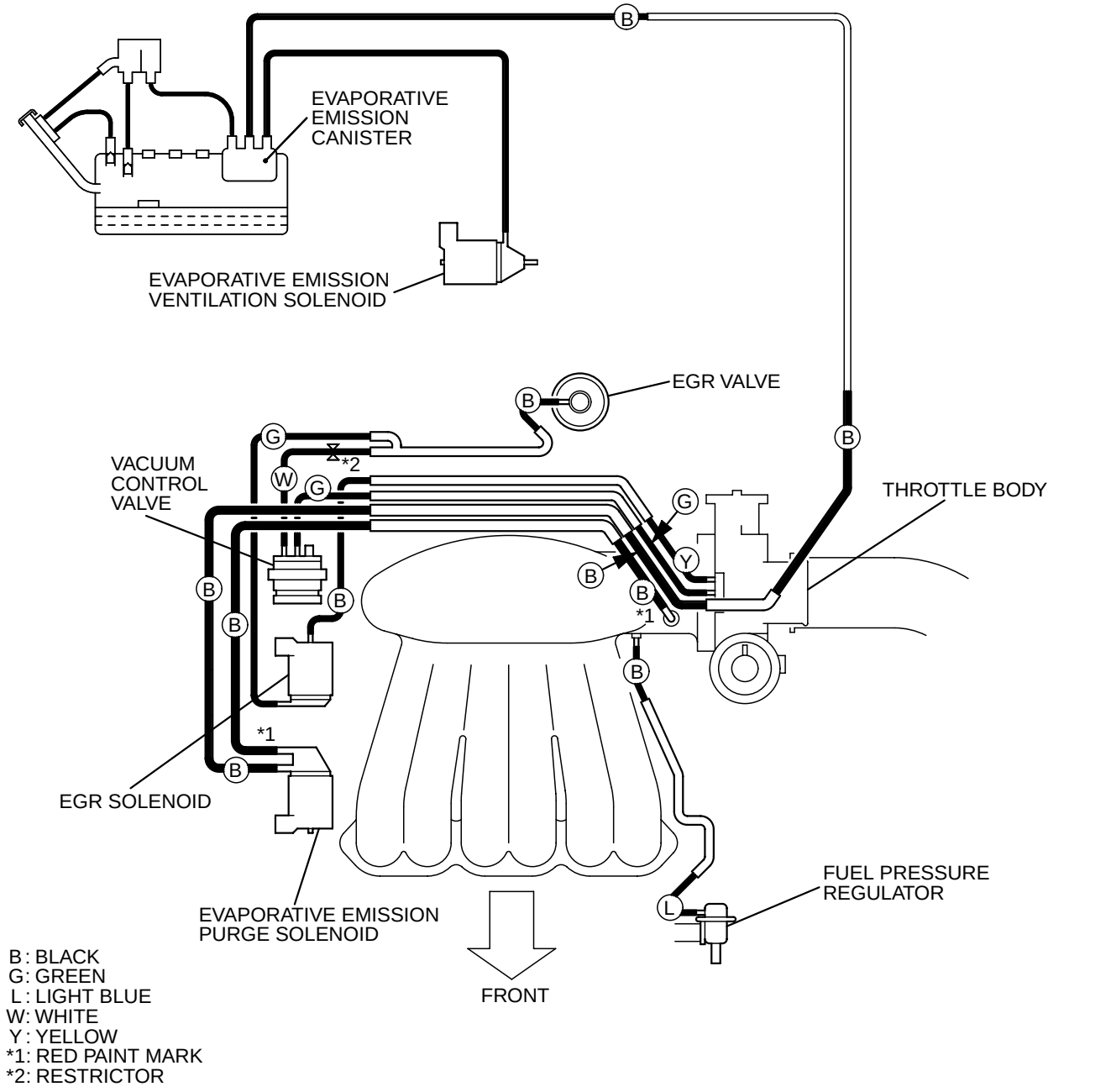
<2.4L ENGINE>



AK100995 AB

TSB Revision

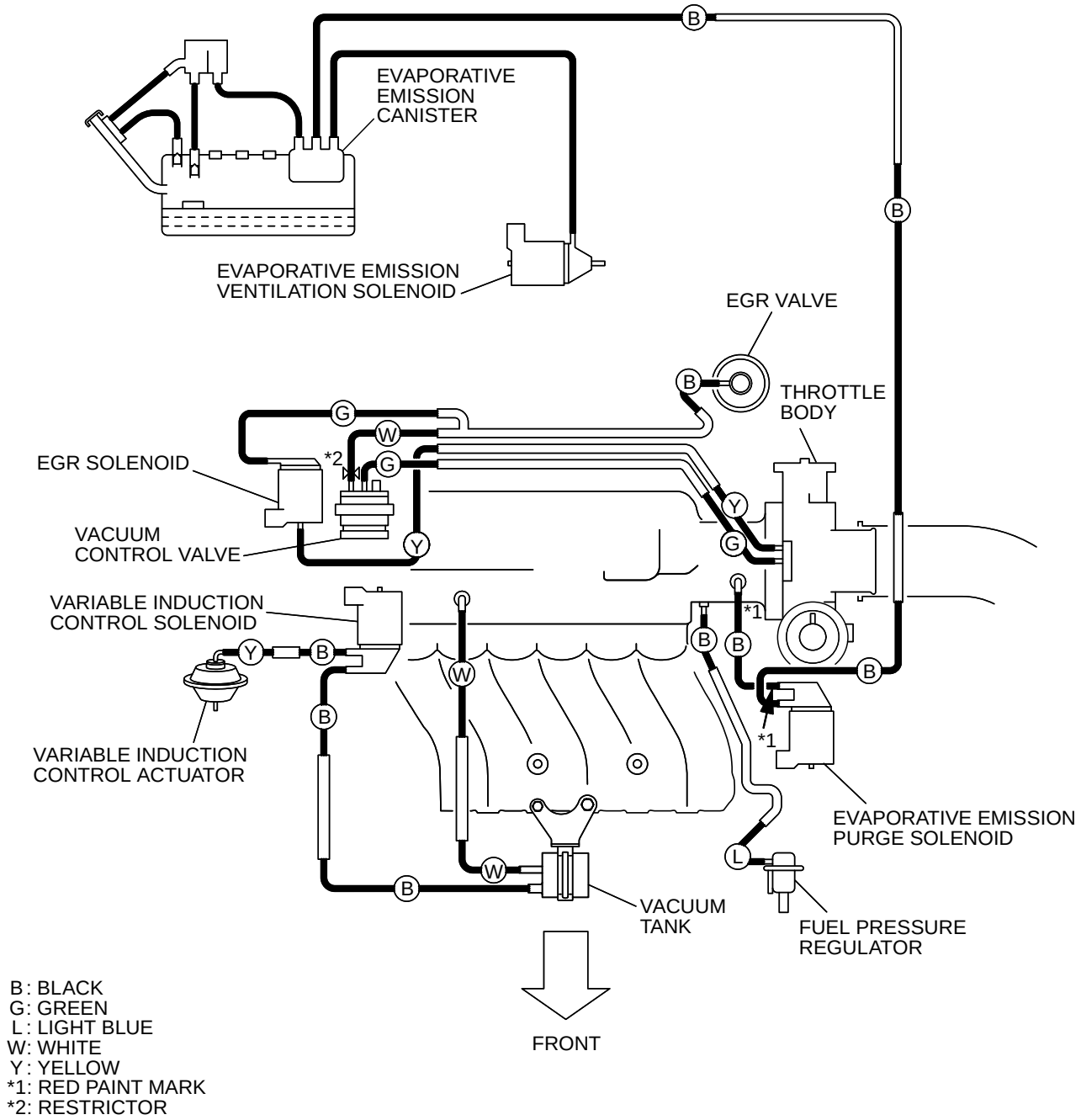
<3.0L ENGINE – without VARIABLE INDUCTION CONTROL (VIC) system>



B: BLACK
G: GREEN
L: LIGHT BLUE
W: WHITE
Y: YELLOW
*1: RED PAINT MARK
*2: RESTRICTOR

AK100996 AB

<3.0L ENGINE – with VARIABLE INDUCTION CONTROL (VIC) system>



B : BLACK
G : GREEN
L : LIGHT BLUE
W : WHITE
Y : YELLOW
*1: RED PAINT MARK
*2: RESTRICTOR

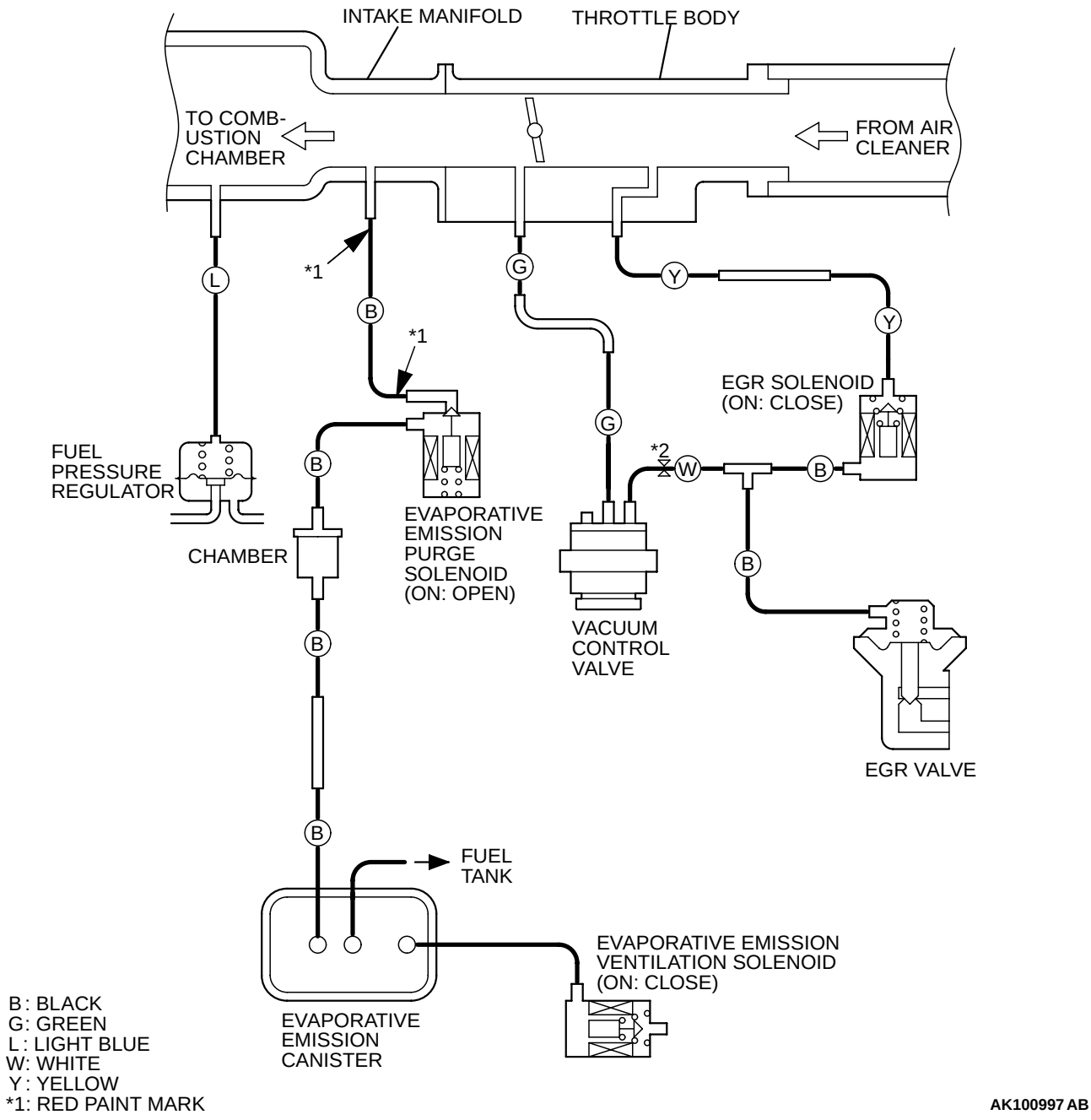
AK102959 AB

TSB Revision

VACUUM CIRCUIT DIAGRAM

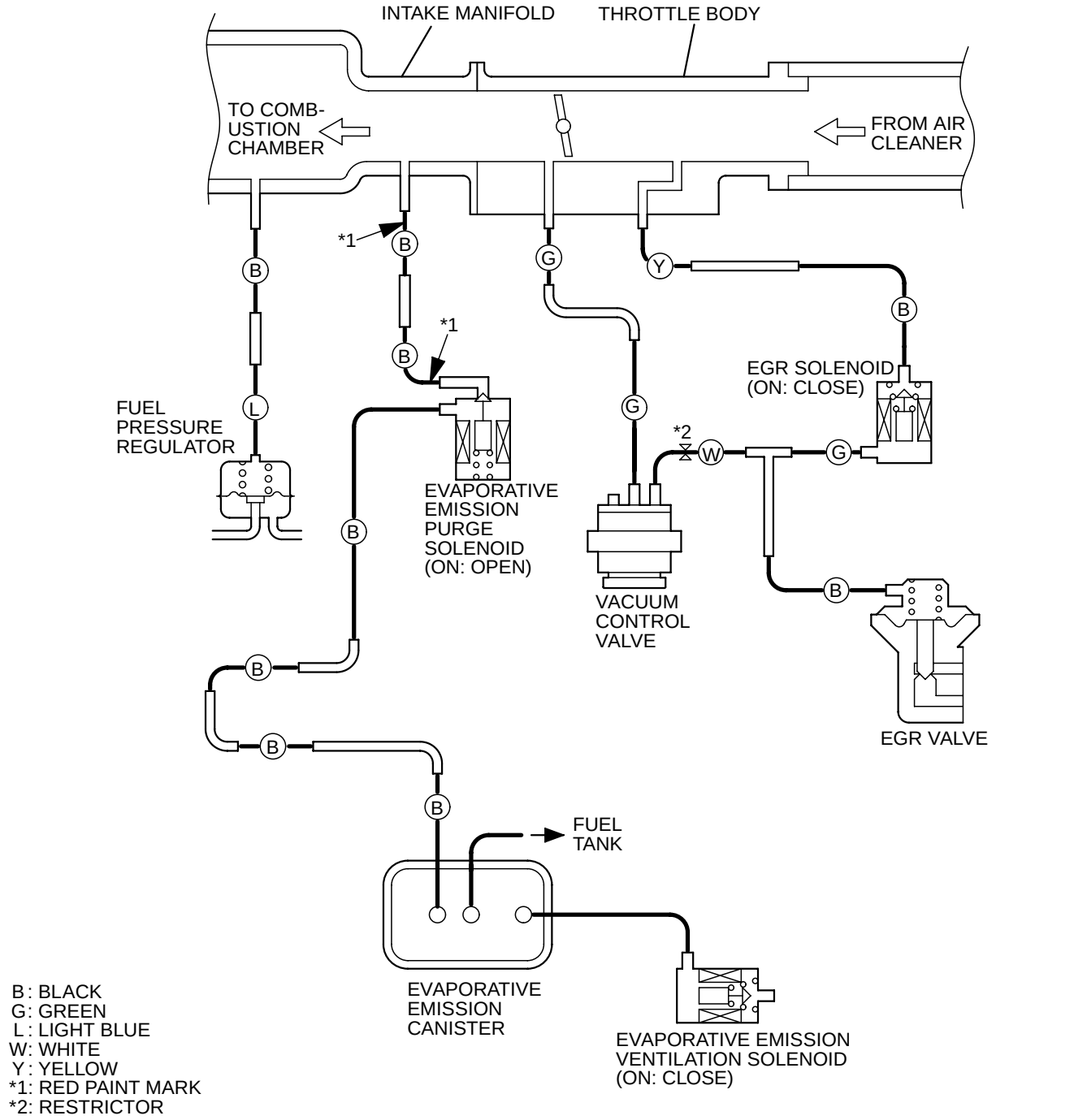
M1173007100133

<2.4L ENGINE>



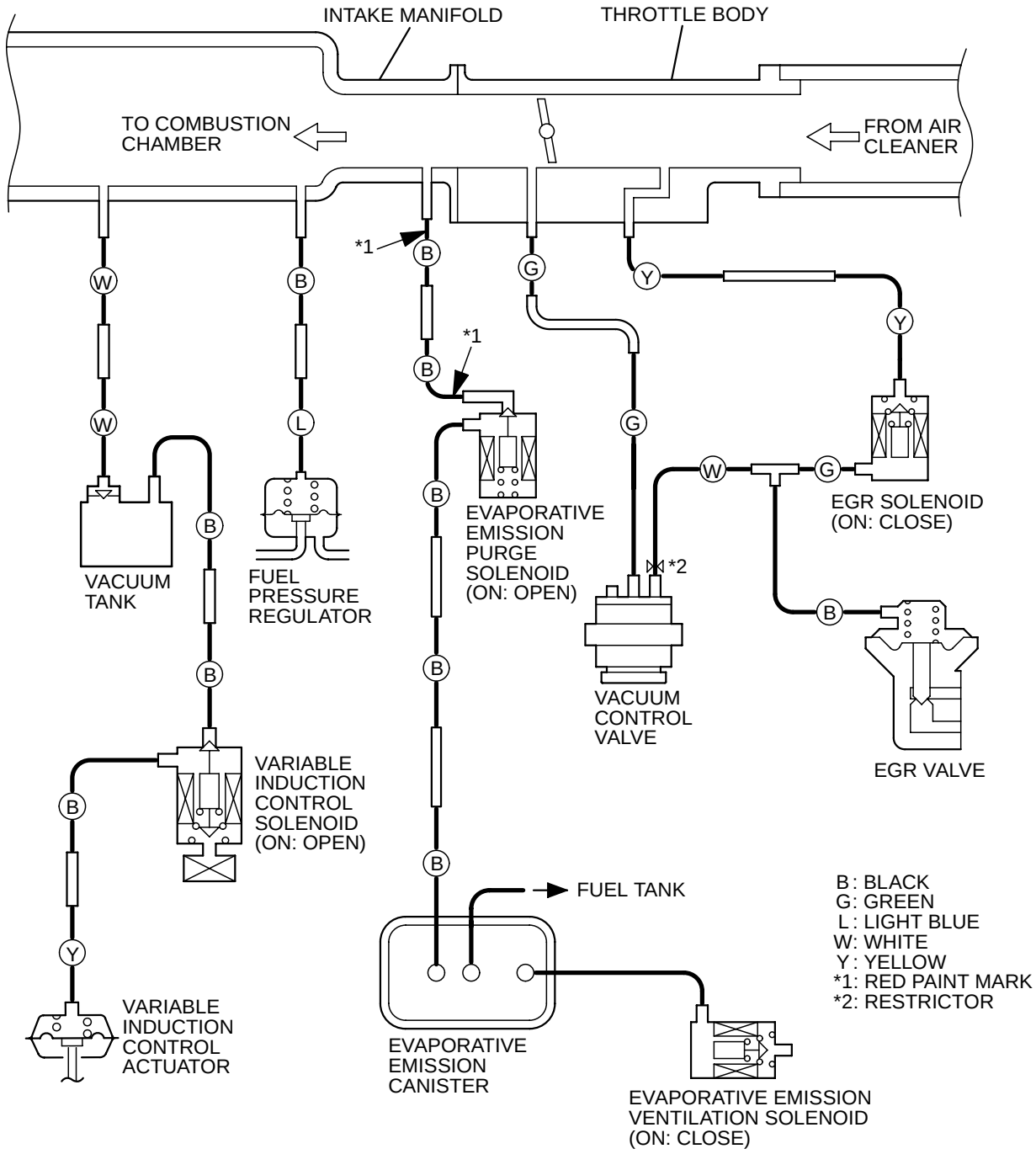
TSB Revision

<3.0L ENGINE – without VARIABLE INDUCTION CONTROL (VIC) system>



AK100998 AB

<3.0L ENGINE – with VARIABLE INDUCTION CONTROL (VIC) system>



AK102960 AB

VACUUM HOSE INSTALLATION

M1173007200022

1. When connecting the vacuum hoses, they should be securely inserted onto the nipples.
2. Connect the hoses correctly, using the VACUUM HOSE ROUTING as a guide.

TSB Revision

VACUUM HOSE CHECK

M1173007300029

1. Using the VACUUM HOSE ROUTING as a guide, check that the vacuum hoses are correctly connected.
2. Check the connection of the vacuum hoses, (removed, loose, etc.) and confirm that there are no sharp bends or damage.

POSITIVE CRANKCASE VENTILATION SYSTEM

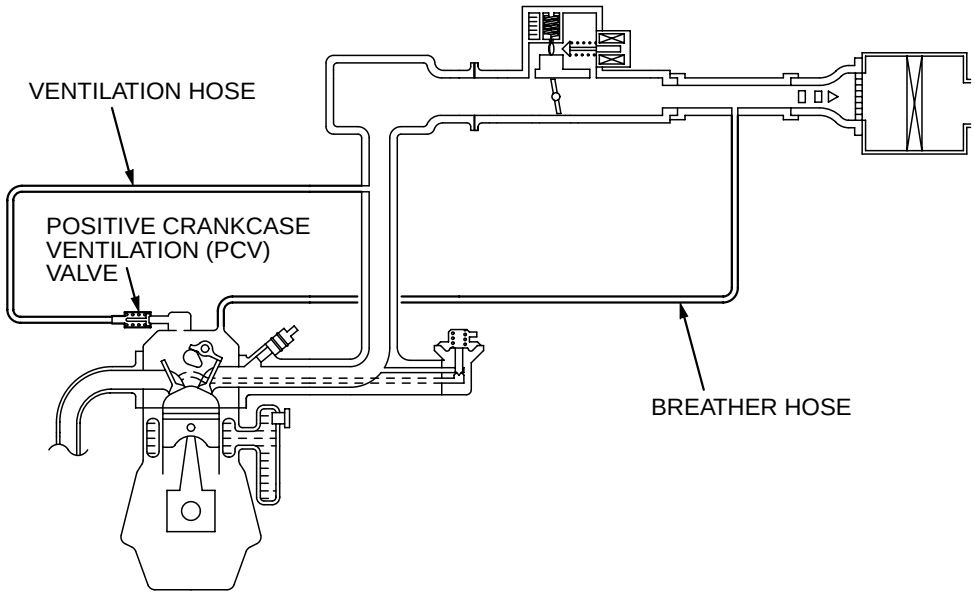
GENERAL INFORMATION (POSITIVE CRANKCASE VENTILATION SYSTEM)

M1173005000044

The positive crankcase ventilation system is a system for preventing the escape of blow-by gases from inside the crankcase into the atmosphere.
Fresh air is sent from the air cleaner into the crankcase through the breather hose to be mixed with the blow-by gas inside the crankcase.
The blow-by gas inside the crankcase is drawn into the intake manifold through the positive crankcase ventilation (PCV) valve.
The PCV valve is designed to lift the plunger according to the intake manifold vacuum so as to regulate the flow of blow-by gas properly.
In other words, the blow-by gas flow is regulated during low load engine operation to maintain engine stability, while the flow is increased during high load operation to improve the ventilation performance.

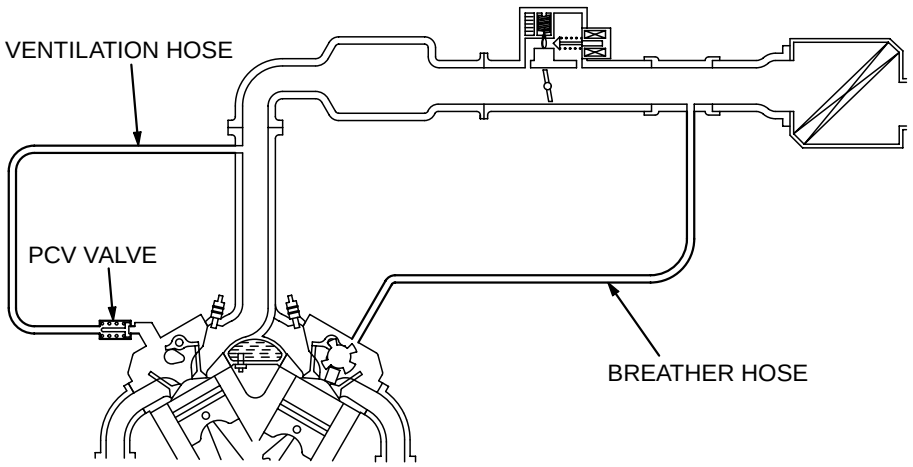
SYSTEM DIAGRAM

<2.4L ENGINE>



AKX01297AB

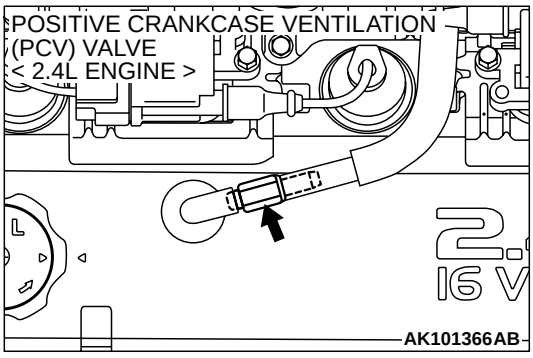
<3.0L ENGINE>



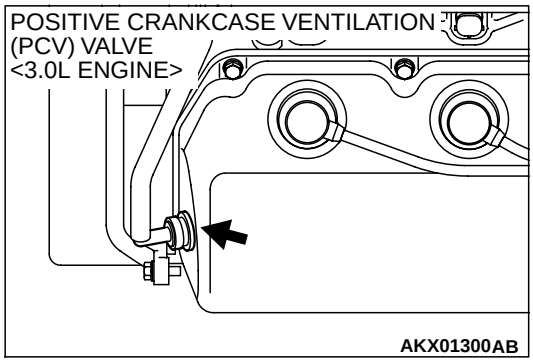
AKX00334AB

COMPONENT LOCATION

M1173007400059



AK101366AB



AKX01300AB

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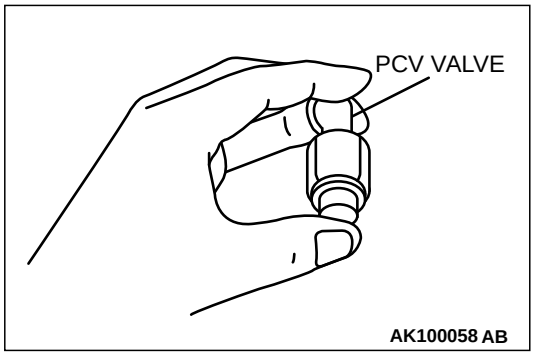
CRANKCASE VENTILATION SYSTEM CHECK

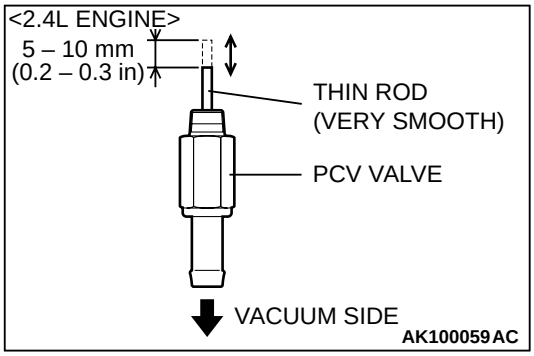
M1173001100094

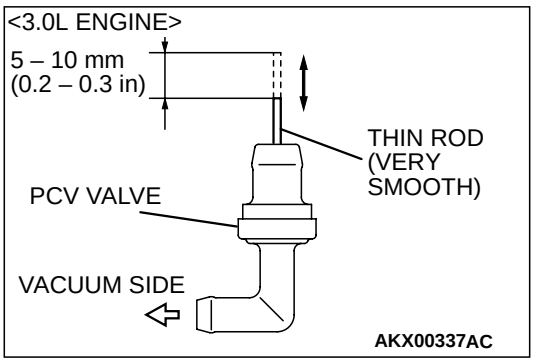


1. Remove the positive crankcase ventilation (PCV) valve from the rocker cover, then reconnect the PCV valve to the vacuum supply hose.
2. With the engine idling, put your finger on the open end of the PCV valve, and check for negative pressure (vacuum).
   NOTE: At this time, the plunger in the PCV valve should move back and forth as the open end is covered and uncovered.
3. If negative pressure is not felt, clean or replace the PCV valve. Inspect he vacuum supply hose and vacuum supply hose port for restriction or plugged condition.

POSITIVE CRANKCASE VENTILATION (PCV) VALVE CHECK

M1173001200080





1. Hold the PCV valve with the vacuum side down. Insert a thin rod, and using light pressure, depress the end of the PCV valve spring by 5 – 10 mm (0.2 – 0.3 inch). Release pressure on the rod to see if the PCV valve spring will lift the rod to its original position.
2. If the rod returns quickly to its original position, the PCV valve is OK. If the stick does not return quickly. clean or replace the PCV valve.

EVAPORATIVE EMISSION CONTROL SYSTEM

GENERAL INFORMATION

M1173005100104

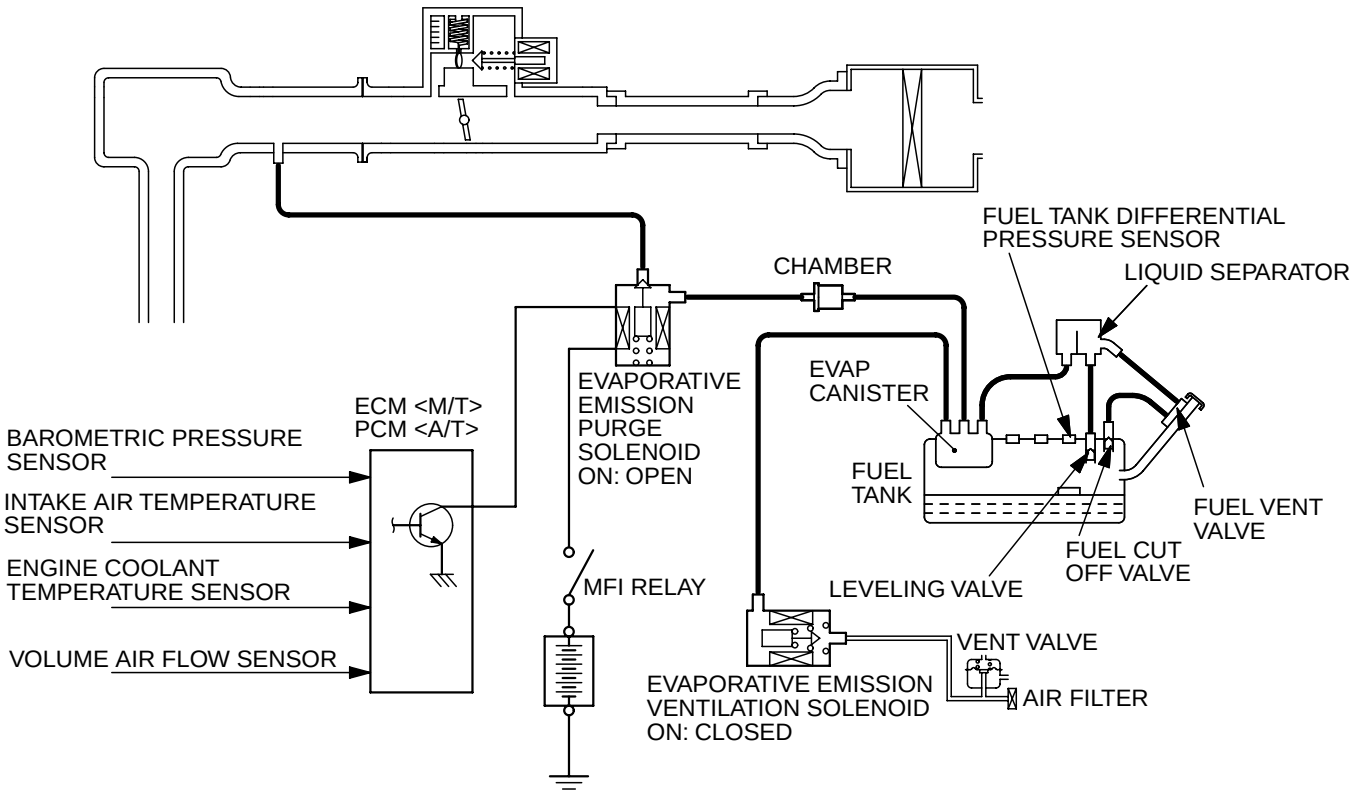
The evaporative emission control system prevents fuel vapors generated in the fuel tank from escaping into the atmosphere.
Fuel vapors from the fuel tank flow through the vapor pipe/hose to be stored temporarily in the evaporative emission (EVAP) canister.
When the vehicle is in operation, fuel vapors stored in the EVAP canister flow through the chamber, the EVAP purge solenoid, purge port and intake manifold plenum to the combustion chamber.
When the engine coolant temperature is low or when the intake air quantity is small (when the engine is at idle, for example), the engine control module brings the EVAP purge solenoid into the OFF state to shut off the fuel vapor flow to the intake manifold plenum. This ensures driveability when the engine is cold or running under low load and also stabilizes the emission level.

An EVAP ventilation solenoid is provided between the EVAP canister and atmosphere to monitor for OBD-II EVAP leaks. This solenoid is normally OFF. However, it turns ON when monitoring the OBD-II EVAP leaks and shuts off the atmosphere flow to the EVAP canister. Then the fuel tank differential pressure sensor monitors the fuel vapor pressure to detect OBD-II EVAP leaks. The fuel vent valve and the leveling valve prevent fuel from being overfilled. The fuel vent valve and the leveling valve prevents fuel leaks just if the vehicle is rolled over in an accident.

The vent valve releases the air from the fuel tank through the evaporative emission canister into the atmosphere when the fuel tank pressure increases due to refueling, etc. The vent valve and the air filter supply the atmospheric air to the evaporative emission canister when the fuel tank pressure decreases.

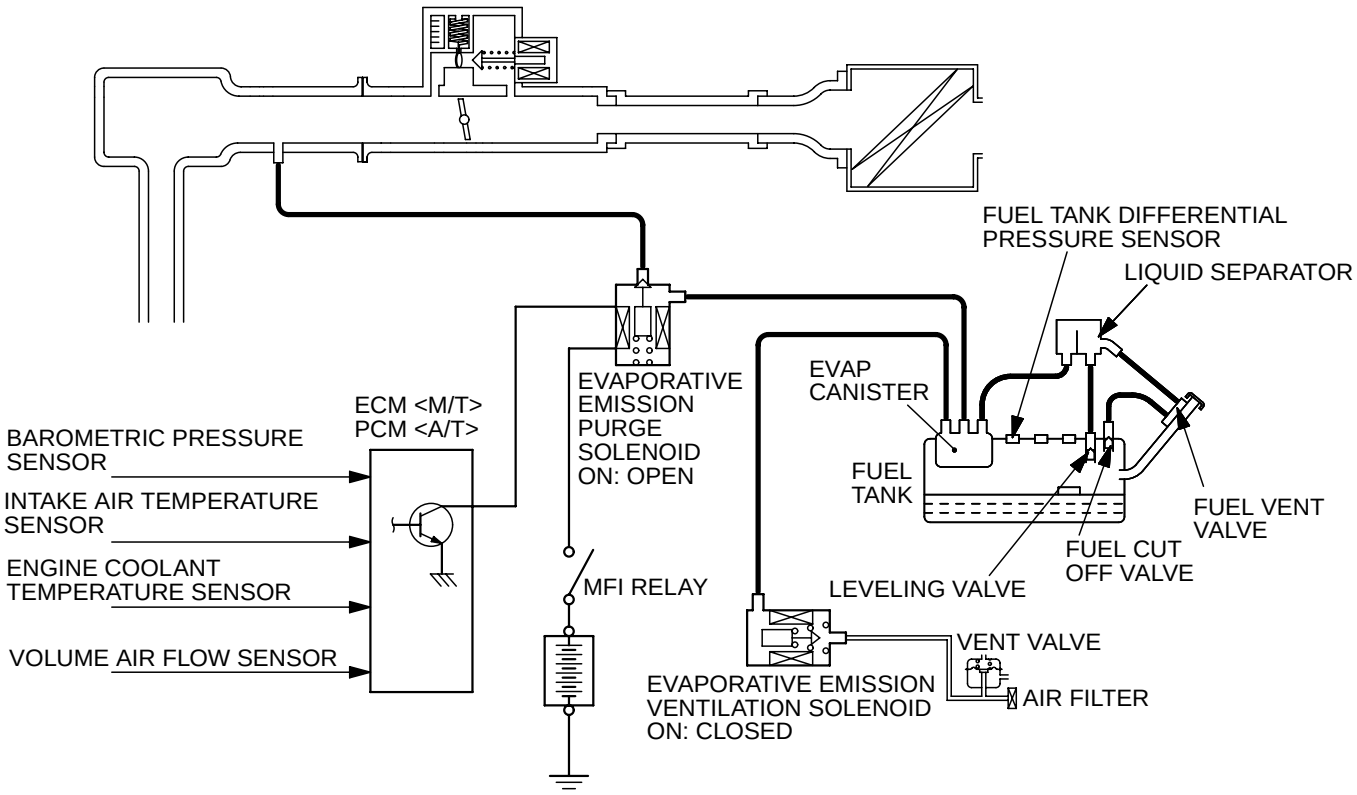
SYSTEM DIAGRAM

<2.4L ENGINE>



AK100999 AB

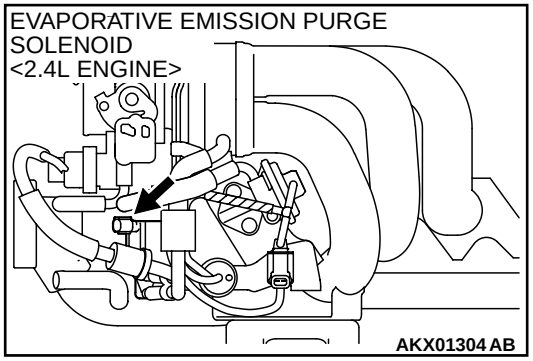
<3.0L ENGINE>



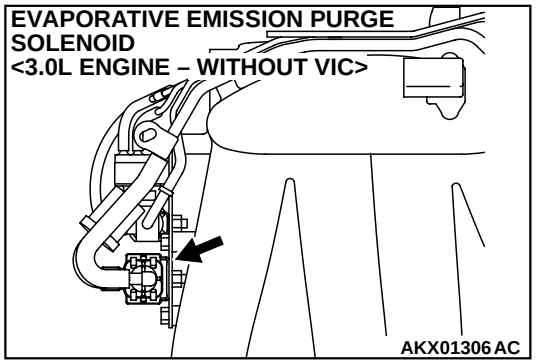
AK101000 AB

COMPONENT LOCATION

M1173007500067



AKX01304 AB



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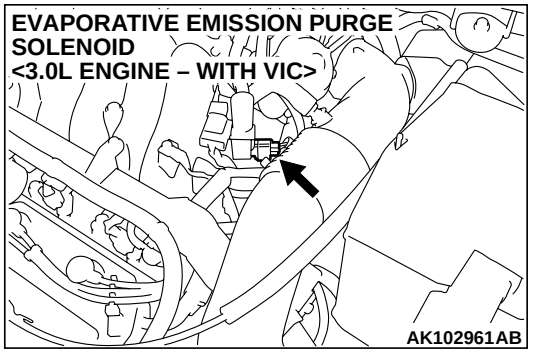
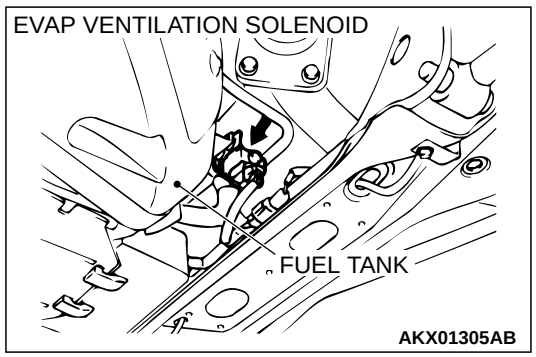


AK102961AB

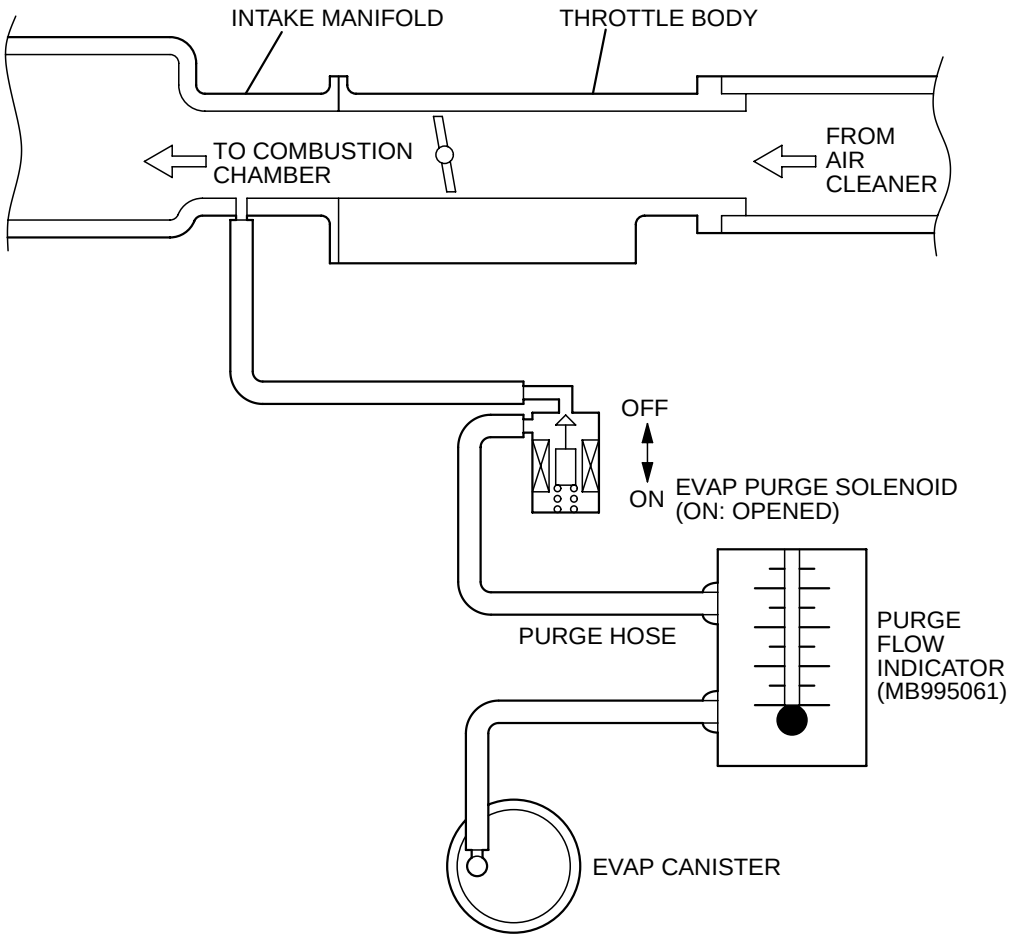


AKX01305AB

TSB Revision

PURGE CONTROL SYSTEM CHECK (PURGE FLOW CHECK)

M1173001400040



AKX00340AB

Required Special Tool:
MB995061: Purge Flow Indicator

1. Disconnect the purge hose from the evaporative emission (EVAP) purge solenoid, and connect special tool MB995061 between the EVAP purge solenoid and the purge hose.
2. Before inspection and adjustment, set the vehicle in the following conditions:
   - Engine coolant temperature: 80 – 95°C (176 – 203°F)
   - Lights, electric cooling fan and accessories: OFF
   - Transaxle: Neutral (A/T – P range)
3. Run the engine at idle for more than four minutes.
4. Check the purge flow volume when engine is revved suddenly several times.

   Standard value: Momentarily 20 cm^3/s (2.5 SCFH) or more.

TSB Revision

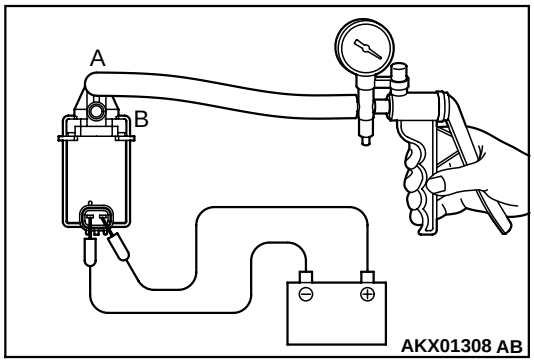
5. If the purge flow volume is less than the standard value, check it again with the vacuum hose disconnected from the EVAP canister. If the purge flow volume is less than the standard value, check the vacuum port and the vacuum hose for clogging. Also check the evaporative emission purge solenoid. If the purge flow volume is at the standard value, replace the EVAP canister.

EVAPORATIVE EMISSION PURGE SOLENOID CHECK

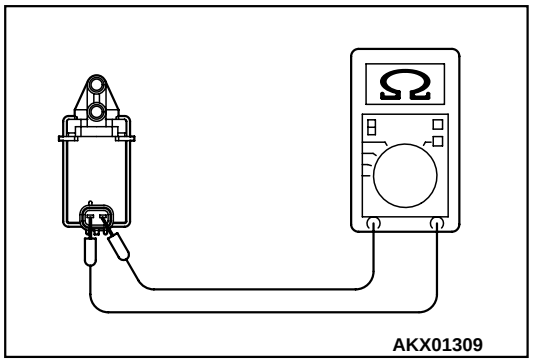
M1173001700096

1. Remove the air intake hose <2.4L ENGINE>.
2. Disconnect the vacuum hose (black, black with red paint mark) from the EVAP purge solenoid.

   NOTE: When disconnecting the vacuum hose, always place an identification mark so that it can be reconnected at its original position.
3. Disconnect the harness connector.
4. Connect a hand vacuum pump to nipple (A) of the EVAP purge solenoid (refer to the illustration at left).
5. As described in the chart below, check airtightness by applying a vacuum with voltage applied directly from the battery to the EVAP purge solenoid valve and without applying voltage.



BATTERY POSITIVE VOLTAGE	NORMAL CONDITION
Applied	Vacuum leaks
Not applied	Vacuum maintained



6. Measure the resistance between the terminals of the EVAP purge solenoid.

   Standard value: 30 – 34 Ω [at 20°C (68°F)]
7. Replace solenoid if resistance is out of specification.

CHAMBER CHECK

M1173008400041

<2.4L ENGINE>

Remove the vacuum hose and chamber assembly, and check that the assembly is not clogged by blowing it.

VOLUME AIR FLOW SENSOR CHECK

M1173007900236

<2.4L ENGINE>

To inspect the sensor, refer to GROUP 13A (2.4L), Multiport Fuel Injection (MFI) Diagnosis – Diagnostic Trouble Code Chart P.13A-22.

<3.0L ENGINE>

To inspect the sensor, refer to GROUP 13B (3.0L), Multiport Fuel Injection (MFI) Diagnosis – Diagnostic Trouble Code Chart P.13B-22.

BAROMETRIC PRESSURE SENSOR CHECK

M1173008000117

<2.4L ENGINE>

To inspect the sensor, refer to GROUP 13A (2.4L), Multiport Fuel Injection (MFI) Diagnosis – Diagnostic Trouble Code Chart P.13A-22.

<3.0L ENGINE>

To inspect the sensor, refer to GROUP 13B (3.0L), Multiport Fuel Injection (MFI) Diagnosis – Diagnostic Trouble Code Chart P.13B-22.

ENGINE COOLANT TEMPERATURE SENSOR CHECK

M1173008100211

<2.4L ENGINE>

To inspect the sensor, refer to GROUP 13A (2.4L), Multiport Fuel Injection (MFI) Diagnosis – Diagnostic Trouble Code Chart P.13A-22.

<3.0L ENGINE>

To inspect the sensor, refer to GROUP 13B (3.0L), Multiport Fuel Injection (MFI) Diagnosis – Diagnostic Trouble Code Chart P.13B-22.

INTAKE AIR TEMPERATURE SENSOR CHECK

M1173008200111

<2.4L ENGINE>

To inspect the sensor, refer to GROUP 13A (2.4L), Multiport Fuel Injection (MFI) Diagnosis – Diagnostic Trouble Code Chart P.13A-22.

<3.0L ENGINE>

To inspect the sensor, refer to GROUP 13B (3.0L), Multiport Fuel Injection (MFI) Diagnosis – Diagnostic Trouble Code Chart P.13B-22.

FUEL TANK DIFFERENTIAL PRESSURE SENSOR CHECK

M1173007700102

To inspect the sensor, refer to GROUP 13C, Fuel Supply Fuel Tank – Fuel Tank Differential Pressure Sensor Check P.13C-15.

EVAPORATIVE EMISSION VENTILATION SOLENOID CHECK

M1173007800057

Refer to Evaporative Emission Canister And Fuel Tank Pressure Relief Valve – Fuel Tank Pressure Relief Valve Inspection P.17-111.

EXHAUST GAS RECIRCULATION(EGR) SYSTEM

GENERAL INFORMATION

M1173005200048

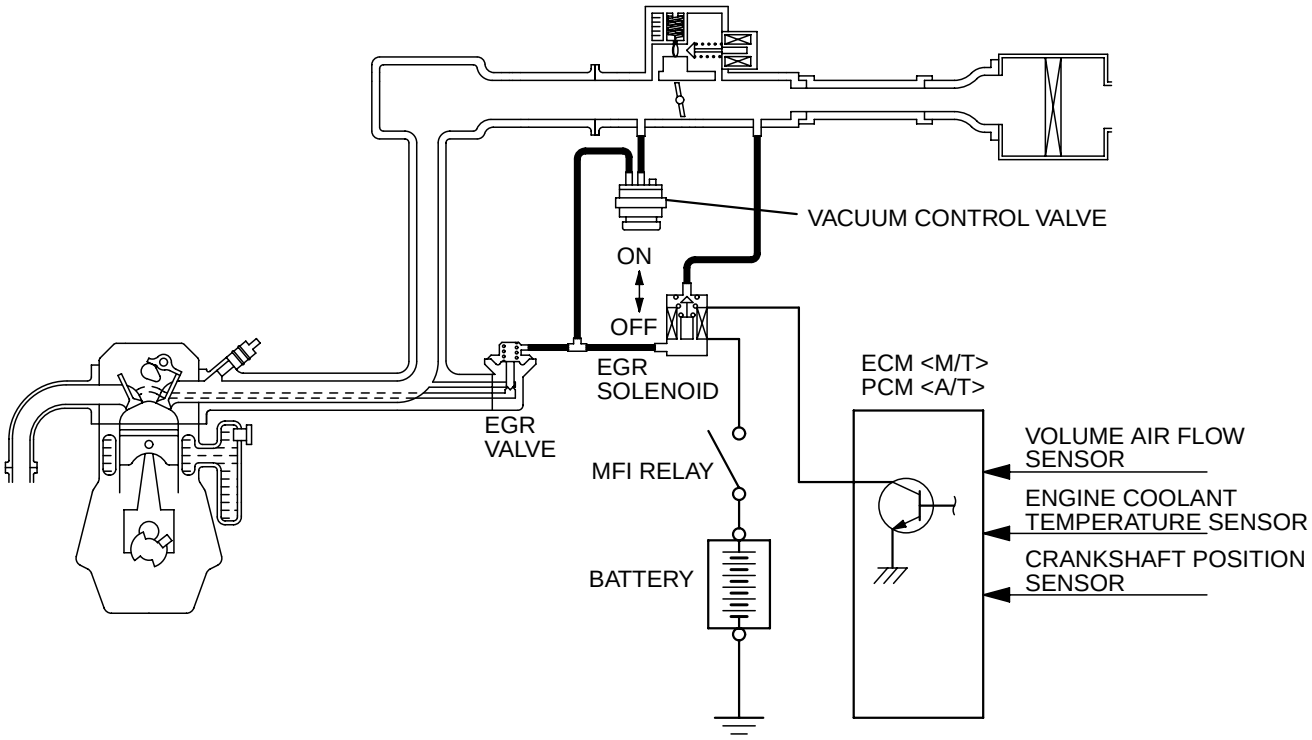
The exhaust gas recirculation (EGR) system lowers the oxides of nitrogen (NOx) emission level. When the air/fuel mixture combustion temperature is high, a large quantity of NOx is generated in the combustion chamber. Therefore, this system recirculates part of exhaust gas from the exhaust port of the cylinder head to the combustion chamber through the intake manifold to decrease the air/fuel mixture combustion temperature, resulting in reduction of NOx. The EGR flow rate is controlled by the EGR valve so as not to decrease the driveability.

OPERATION

When the engine coolant temperature is low, when the engine is at idle or when a wide open throttle operation is performed, the EGR valve is kept closed, achieving no EGR.
After warming up of the engine, the EGR valve can be opened by the engine control module.
The engine control module monitors the EGR system and illuminates the check engine/malfunction indicator lamp to indicate that there is a malfunction.

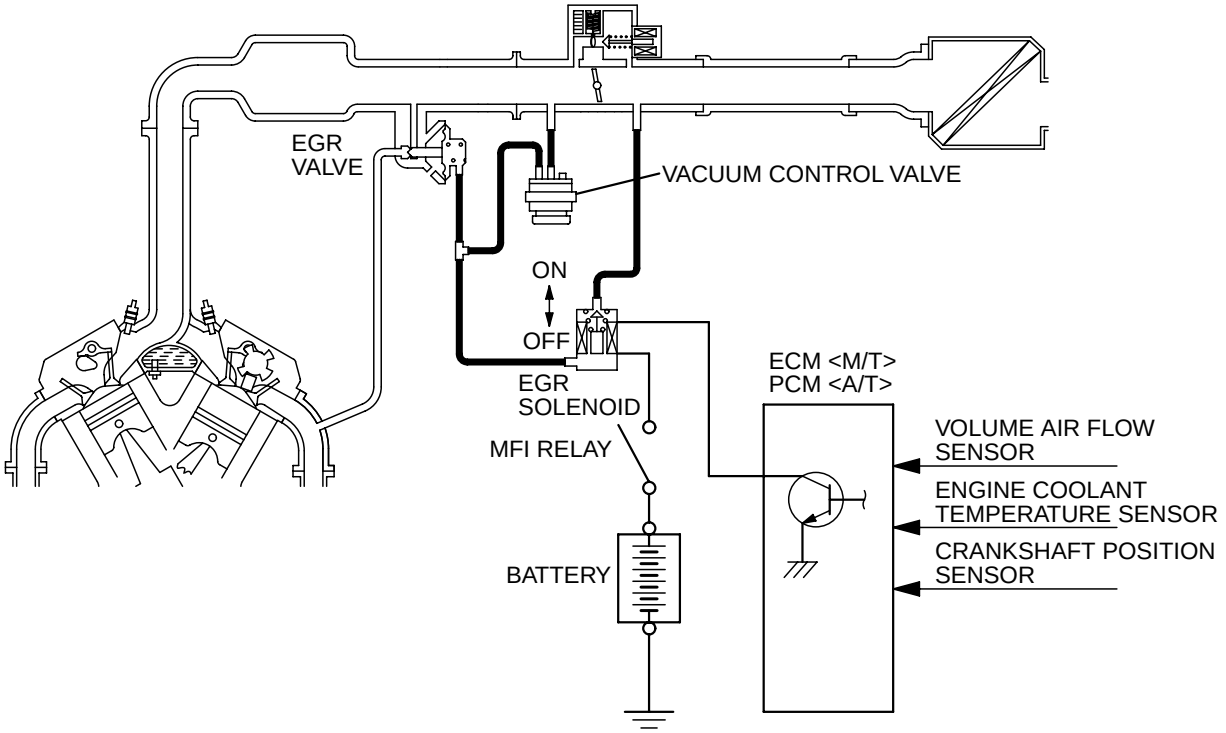
SYSTEM DIAGRAM

<2.4L ENGINE>



AKX01310 AB

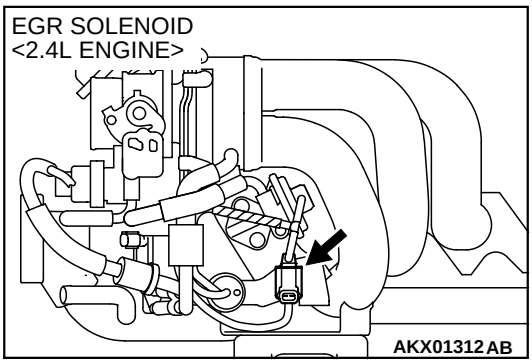
<3.0L ENGINE>



AKX00353AC

COMPONENT LOCATION

M1173007600116



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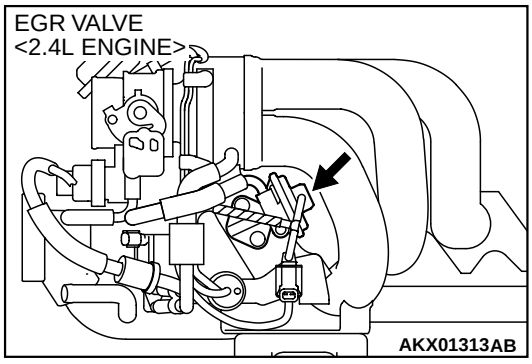

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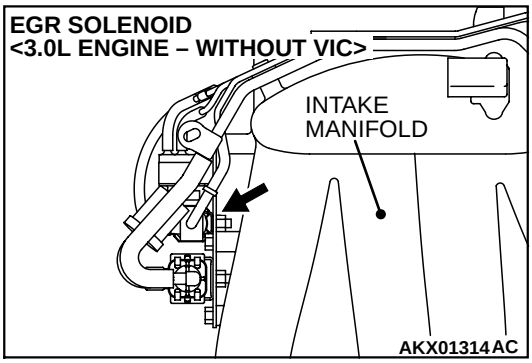
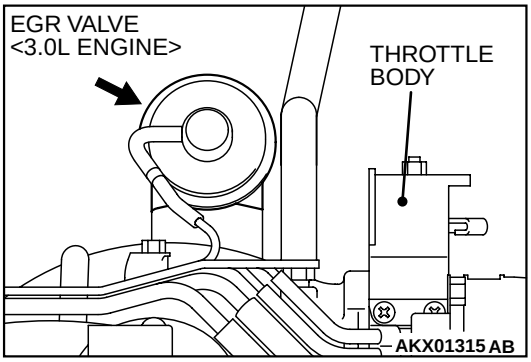
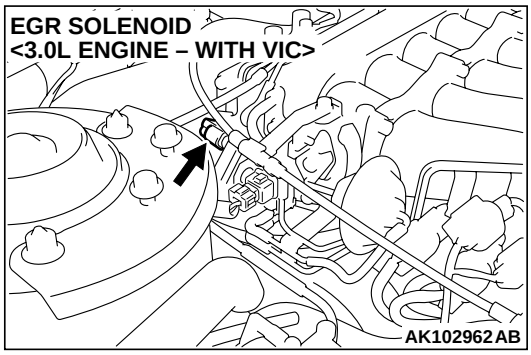
TSB Revision



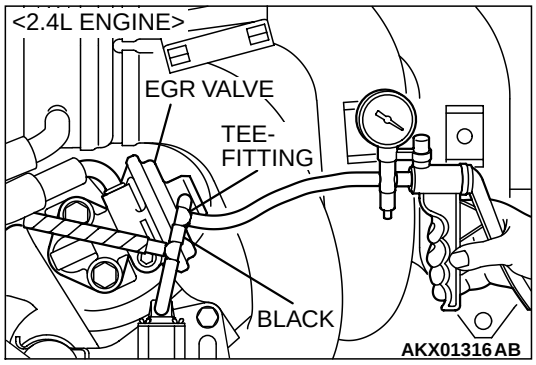


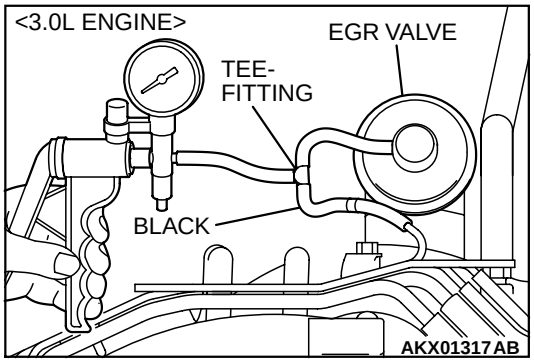


EGR SYSTEM CHECK

M1173002600188

1. Disconnect the vacuum hose (black) from the EGR valve, and then connect a hand vacuum pump via the Tee-fitting.
2. Start the engine. As described in the chart below, check the vacuum condition when the throttle valve is opened suddenly (revving) during cold and hot engine conditions.



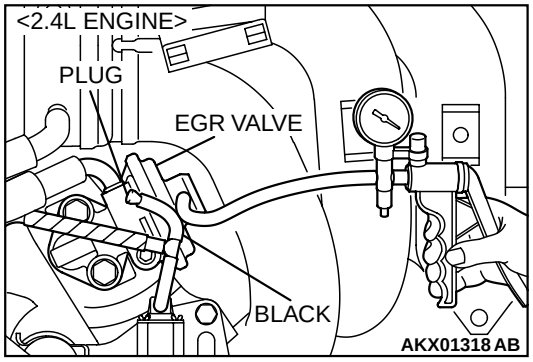


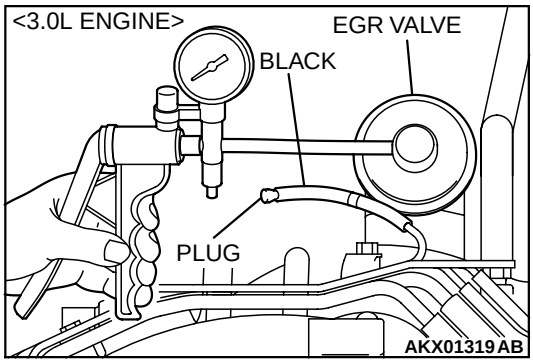
When engine is cold
[Engine coolant temperature: 20°C (68°F) or less]

THROTTLE VALVE	NORMAL VACUUM CONDITION
Open quickly	No vacuum (Remained as barometric pressure).

When engine is hot
[Engine coolant temperature: 80°C (176°F) or more]

THROTTLE VALVE	NORMAL VACUUM CONDITION
Open quickly	Momentarily rises over 13 kPa (3.9 in Hg)

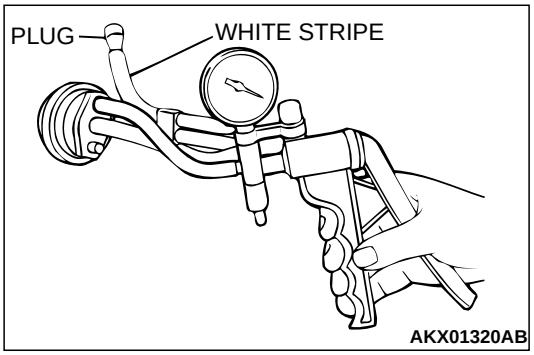




3. Stop the engine. Remove the Tee-fitting and the hand vacuum pump.
4. Connect the hand vacuum pump directly to the EGR valve.
5. Start the engine and run at idle until warm.
6. The engine idling speed should be rough when a vacuum of 29 kPa (8.7 in Hg) or more is applied to the EGR valve.
7. If engine idles rough, EGR passage is open and the system is OK. If engine idle is not rough, the EGR passage and the valve must be checked for restrictions. Perform the EGR valve check. Then repeat the EGR system check.

VACUUM CONTROL VALVE CHECK

M1173002700129

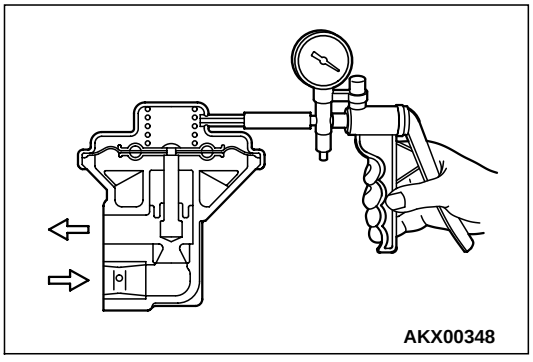


1. Disconnect the vacuum hose (white stripe) from the vacuum control valve and connect the hand vacuum pump to the vacuum control valve.
2. Plug the end of the removed vacuum hose.
3. Start the engine and run at idle.
4. As described in the chart below, check the vacuum condition.

ENGINE CONDITION	NORMAL VACUUM CONDITION
Idling	Approximately 21.3 – 24.0 kPa (6.3 – 7.1 in Hg)

EGR VALVE CHECK

M1173002800137



1. Remove the EGR valve and inspect for sticking, carbon deposits, etc. If found, clean with a suitable solvent so that the valve seats correctly.
2. Connect a hand vacuum pump to the EGR valve.
3. Apply 67 kPa (20 in Hg) of vacuum, and check to be sure that the vacuum is maintained.

4. As described in the chart below, apply a vacuum and check the passage of air by blowing through one side of the EGR passage.

VACUUM	PASSAGE OF AIR
5.3 kPa (1.6 in Hg) or less	Air is not blown out
29 kPa (8.7 in Hg) or more	Air is blown out

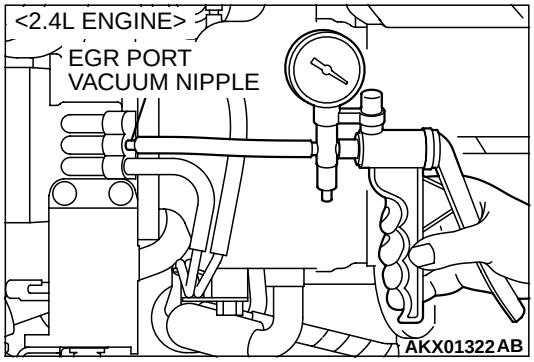
NOTE: Passage of air should be checked by blowing the valve port.

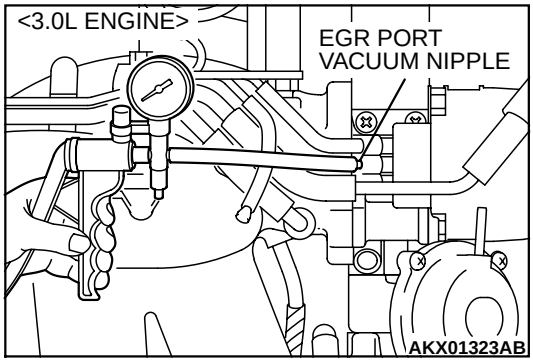
5. Reinstall the EGR valve, using a new gasket, and tighten to the specified torque.

Tightening torque:
<2.4L ENGINE> 19 ± 3 N·m (14 ± 2 ft-lb)
<3.0L ENGINE> 22 ± 4 N·m (16 ± 3 ft-lb)

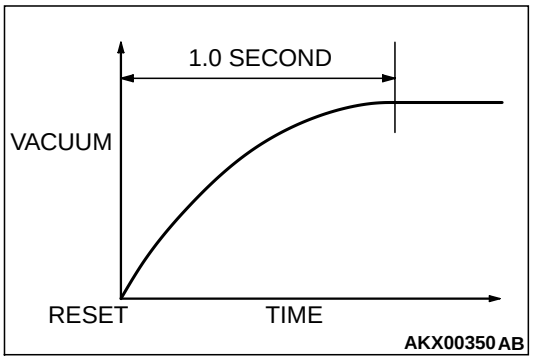
EGR PORT VACUUM CHECK

M1173002900048





1. Disconnect the vacuum hose (green stripe) from the throttle body EGR vacuum nipple and connect a hand vacuum pump to the nipple.



2. Start the engine.
3. Measure engine vacuum at idle.

Standard value: 51 kPa (15 in Hg) or more

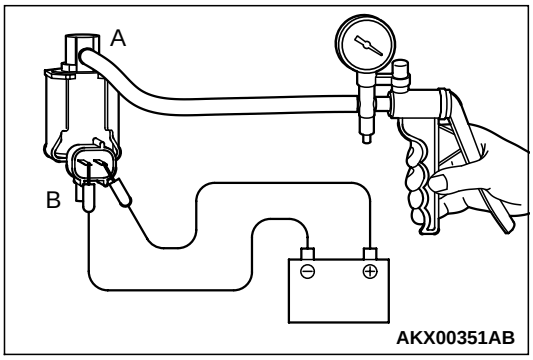
4. Reset the vacuum pump to "0" (Release vacuum).
5. Using a stop watch, measure how long it takes for the vacuum gauge to reach 51 kPa (15 in Hg).

Standard value: 1.0 second or less

6. If it takes more than 1.0 second for the gauge to reach 51 kPa (15 in Hg), the EGR may be restricted and should be cleaned.

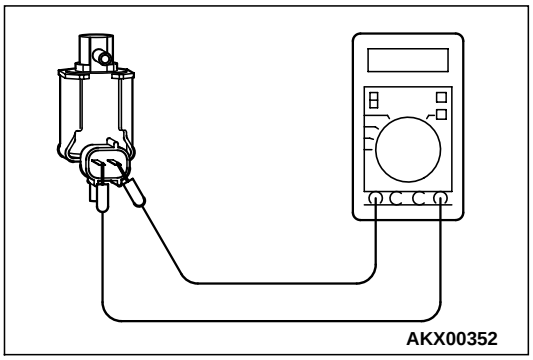
EGR SOLENOID CHECK

M1173003100120



1. Disconnect the vacuum hose from the EGR solenoid.
   NOTE: When disconnecting the vacuum hose, always make sure that it can be reconnected at its original position.
2. Disconnect the harness connector.
3. Connect a hand vacuum pump to nipple (A) of the EGR solenoid. (Refer to the illustration at left.)
4. As described in the chart below, check airtightness by applying a vacuum with voltage applied directly from the battery to the EGR solenoid and without applying voltage.

BATTERY POSITIVE VOLTAGE	NORMAL CONDITION
Not applied	Vacuum leaks
Applied	Vacuum maintained



5. Measure the resistance between the terminals of the EGR solenoid.
   Standard value: 29 – 35 Ω [at 20°C (68°F)]
6. Replace the solenoid if resistance is out of specification.

VOLUME AIR FLOW SENSOR CHECK

M1173007900247

<2.4L ENGINE>

To inspect the sensor, refer to GROUP 13A (2.4L), Multiport Fuel Injection (MFI) Diagnosis – Diagnostic Trouble Code Chart P.13A-22.

<3.0L ENGINE>

To inspect the sensor, refer to GROUP 13B (3.0L), Multiport Fuel Injection (MFI) Diagnosis – Diagnostic Trouble Code Chart P.13B-22.

ENGINE COOLANT TEMPERATURE SENSOR CHECK

M1173008100222

<2.4L ENGINE>

To inspect the sensor, refer to GROUP 13A (2.4L), Multiport Fuel Injection (MFI) Diagnosis – Diagnostic Trouble Code Chart P.13A-22.

<3.0L ENGINE>

To inspect the sensor, refer to GROUP 13B (3.0L), Multiport Fuel Injection (MFI) Diagnosis – Diagnostic Trouble Code Chart P.13B-22.

CRANKSHAFT POSITION SENSOR CHECK

M1173008300118

<2.4L ENGINE>

To inspect the sensor, refer to GROUP 13A (2.4L), Multiport Fuel Injection (MFI) Diagnosis – Diagnostic Trouble Code Chart P.13A-22.

<3.0L ENGINE>

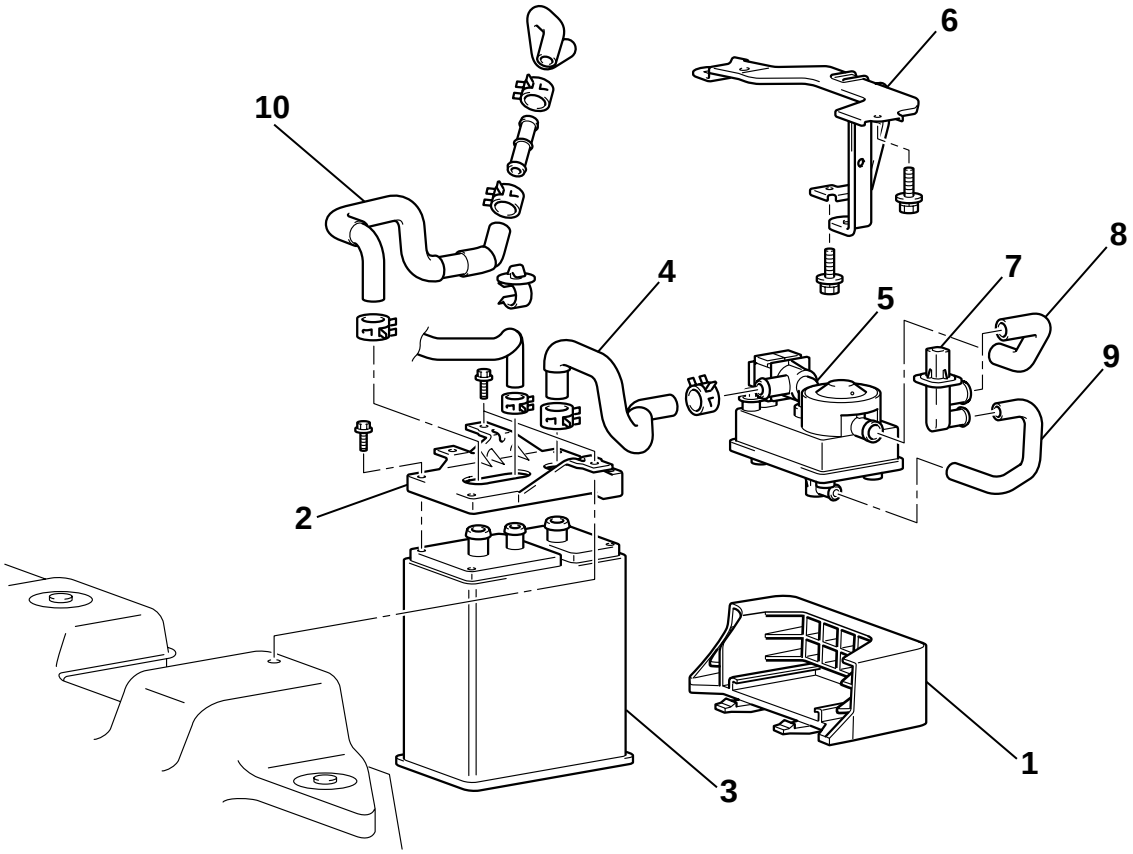
To inspect the sensor, refer to GROUP 13B (3.0L), Multiport Fuel Injection (MFI) Diagnosis – Diagnostic Trouble Code Chart P.13B-22.

EVAPORATIVE EMISSION CANISTER AND FUEL TANK PRESSURE RELIEF VALVE

REMOVAL AND INSTALLATION

M1173004800188

Pre-removal and Post-installation Operation
Fuel Tank Assembly Removal and Installation (Refer to GROUP 13C P.13C-11.)



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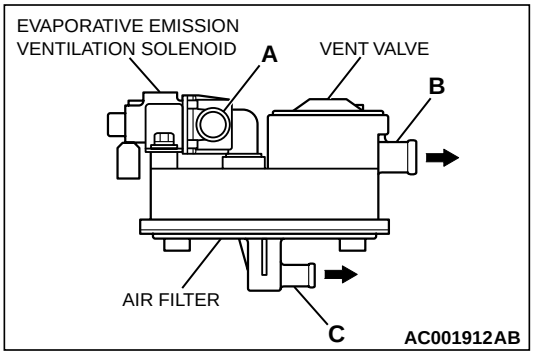
REMOVAL STEPS
1. PROTECTOR
2. CANISTER UPPER BRACKET
3. CANISTER ASSEMBLY
4. VENT HOSE
5. ONBOARD REFUELING VAPOR RECOVERY (ORVR) VENT VALVE MODULE

REMOVAL STEPS (Continued)
6. BRACKET
7. VENT PIPE
8. VENT HOSE
9. VENT HOSE
10. VAPOR HOSE

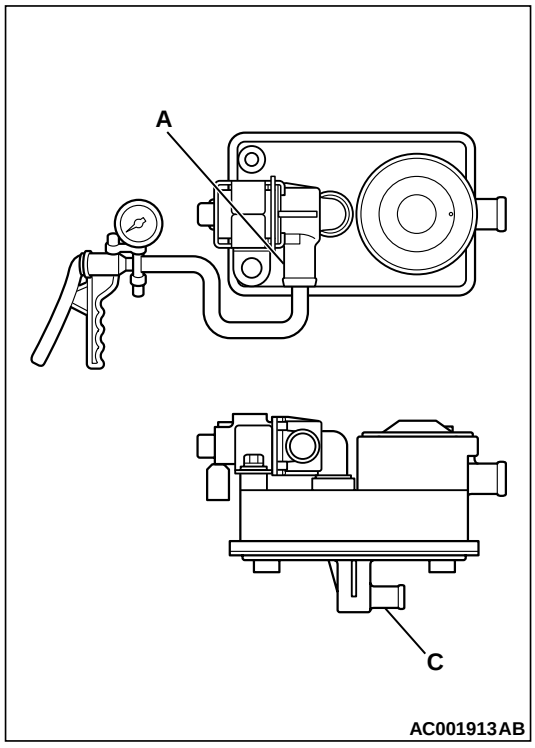
INSPECTION

M1173004600151

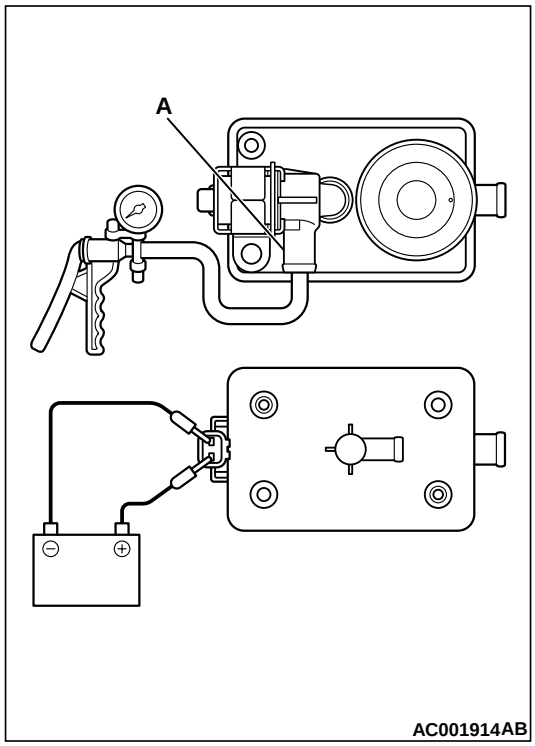
ORVR VENT VALVE MODULE CHECK



1. Blow air through orvr vent valve module nipple (A). Check that the air flows out of nipple (B) and nipple (C).



2. Connect a hand vacuum pump to nipple (A) of the orvr vent valve module.
3. With air flow through nipple (C) obstructed, apply a vacuum and check that the vacuum is maintained.



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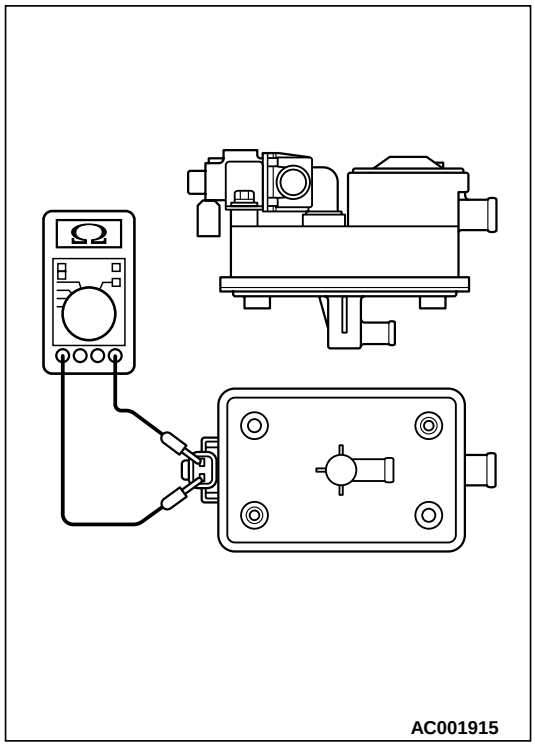
4. Check air tightness by applying a vacuum with voltage applied directly from the battery to the orvr vent valve module and without applying voltage.

BATTERY VOLTAGE	NORMAL CONDITION
Applied	Vacuum maintained
Not applied	Vacuum leaks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5. Measure the resistance between the terminals of the solenoid.

   Standard value: 17 – 21 Ω [at 20°C (68°F)]

6. Replace orvr vent valve module if resistance is out of specification.

CATALYTIC CONVERTER

GENERAL INFORMATION (CATALYTIC CONVERTER)

M1173005300108

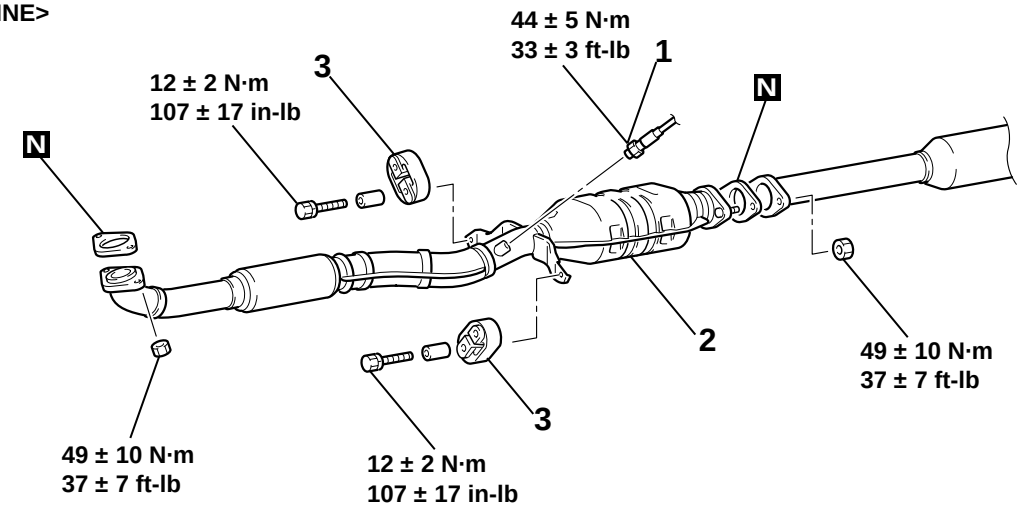
The three-way catalytic converter, together with the closed loop air-fuel ratio control based on the oxygen sensor signal, oxidizes carbon monoxides (CO) and hydrocarbons (HC) and reduces nitrogen oxides (NOx).

When the mixture is controlled at stoichiometric air-fuel ratio, the three-way catalytic converter provides the highest purification against the three constituents, namely, CO, HC and NOx.

REMOVAL AND INSTALLATION

M1173003900223

<2.4L ENGINE>



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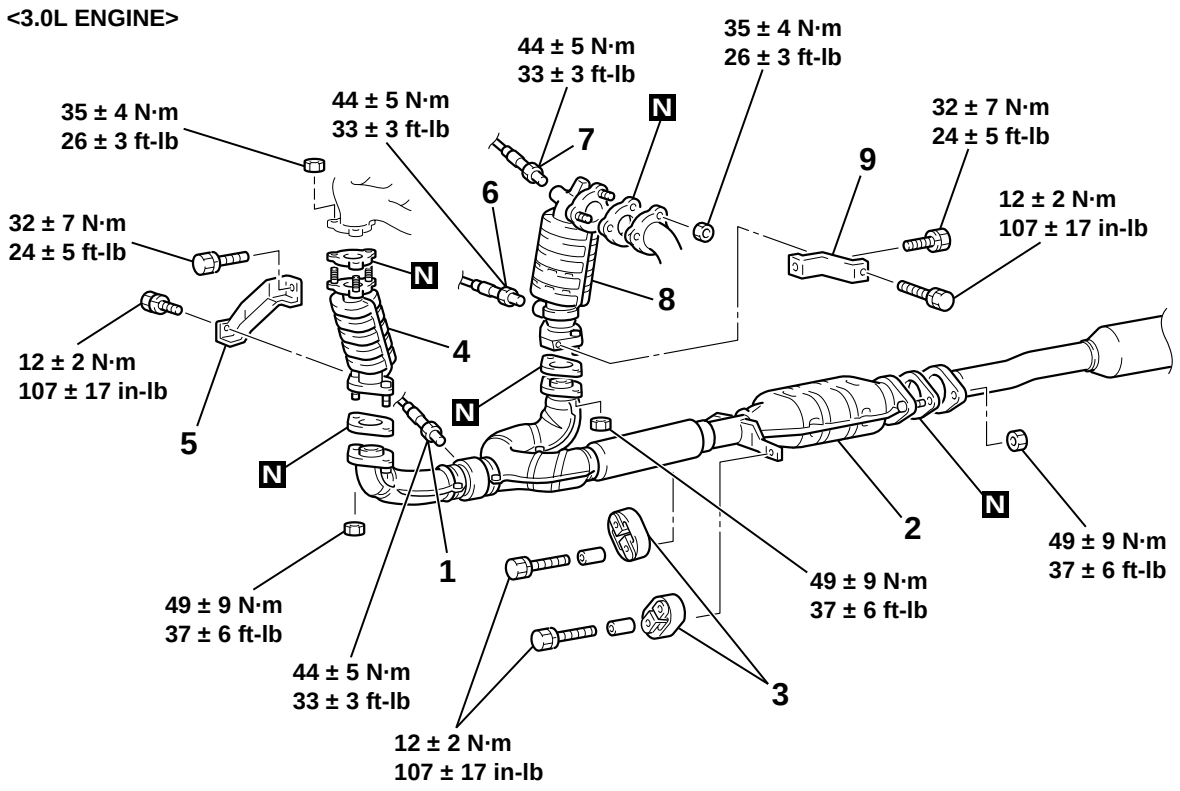
REMOVAL STEPS

<<A>> >>A<< 1. HEATED OXYGEN SENSOR (REAR)

REMOVAL STEPS (Continued)

2. FRONT EXHAUST PIPE (CATALYTIC CONVERTER INCORPORATED)
3. HANGER



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FRONT CATALYTIC CONVERTER (LH) REMOVAL STEPS

<<A>> >>A<<
1. LEFT BANK HEATED OXYGEN SENSOR (REAR)
2. FRONT EXHAUST PIPE (CATALYTIC CONVERTER INCORPORATED)
3. HANGER
4. FRONT CATALYTIC CONVERTER (LH)
5. EXHAUST FITTING STAY (LH)

FRONT CATALYTIC CONVERTER (RH) REMOVAL STEPS

<<A>> >>A<<
1. LEFT BANK HEATED OXYGEN SENSOR (REAR)
2. FRONT EXHAUST PIPE (CATALYTIC CONVERTER INCORPORATED)

FRONT CATALYTIC CONVERTER (RH) REMOVAL STEPS (Continued)

3. HANGER

<<A>> >>A<<
6. RIGHT BANK HEATED OXYGEN SENSOR (REAR)

- INTAKE MANIFOLD PLENUM <VEHICLE WITH VARIABLE INDUCTION CONTROL (VIC) SYSTEM> (REFER TO GROUP 15, INTAKE MANIFOLD PLENUM P.15-7.)

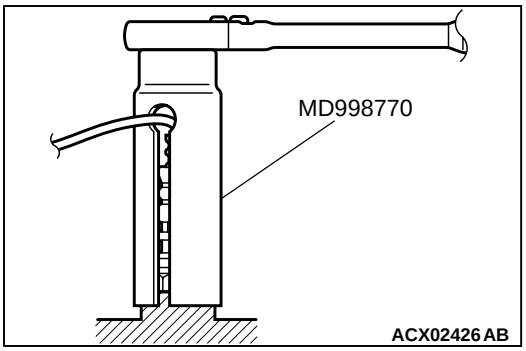
<<A>> >>A<<
7. RIGHT BANK HEATED OXYGEN SENSOR (FRONT)
8. FRONT CATALYTIC CONVERTER (RH)
9. EXHAUST FITTING STAY (RH)

Required Special Tool:
MD998770: Oxygen sensor wrench

REMOVAL SERVICE POINT

<<A>> HEATED OXYGEN SENSOR (REAR)/LEFT BANK HEATED OXYGEN SENSOR (REAR)/RIGHT BANK HEATED OXYGEN SENSOR (REAR)/RIGHT BANK HEATED OXYGEN SENSOR (FRONT) REMOVAL

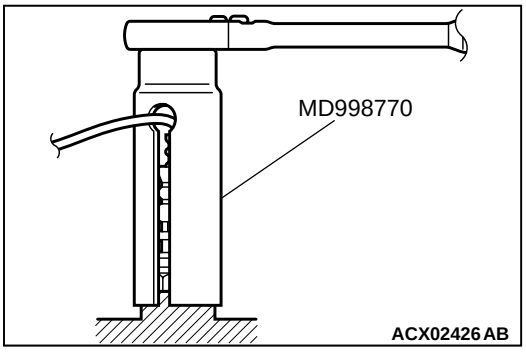
Use special tool MD998770 to remove the oxygen sensor.



INSTALLATION SERVICE POINT

>>A<< RIGHT BANK HEATED OXYGEN SENSOR (FRONT)/ RIGHT BANK HEATED OXYGEN SENSOR (REAR)/LEFT BANK HEATED OXYGEN SENSOR (REAR)/HEATED OXYGEN SENSOR (REAR) INSTALLATION

Use special tool MD998770 to installation the oxygen sensor.



SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1173006400186

ITEMS	SPECIFICATIONS
Engine control system	
Accelerator pedal bracket installation	12 ± 2 N·m (100 ± 22 in-lb)
Bracket nut	4.9 ± 1.0 N·m (44 ± 8 in-lb)
Auto-cruise control system	
Auto-cruise control-ECU installation nut	4.9 ± 1.0 N·m (44 ± 8 in-lb)
Emission control system	
EGR valve bolt <2.4L Engine>	19 ± 3 N·m (14 ± 2 ft-lb)
EGR valve bolt <3.0L Engine>	22 ± 4 N·m (16 ± 3 ft-lb)
Exhaust fitting stay (M8) <3.0L Engine>	12 ± 2 N·m (107 ± 17 in-lb)
Exhaust fitting stay (M12) <3.0L Engine>	32 ± 7 N·m (24 ± 5 ft-lb)
Front catalytic converter nut	35 ± 4 N·m (26 ± 3 ft-lb)
Front exhaust pipe nut	49 ± 10 N·m (37 ± 7 ft-lb)
Hanger bolt	12 ± 2 N·m (107 ± 17 in-lb)
Heated oxygen sensor	44 ± 5 N·m (33 ± 3 ft-lb)

SERVICE SPECIFICATIONS

M1173000300192

ITEMS	STANDARD VALUE
Engine control system	
Accelerator cable free play mm (in)	1 – 2 (0.04 – 0.08)
Curb idle speed r/min	700 ± 100
Emission control system	
EGR solenoid coil resistance [at 20°C (68°F)] Ω	29 – 35
Evaporative emission purge solenoid coil resistance [at 20°C (68°F)] Ω	30 – 34
Evaporative emission ventilation solenoid coil resistance [at 20°C (68°C)] Ω	17 – 21
Purge flow cm^3/s (SCFH) [at 80 – 95°C (176 – 205°F) with sudden revving]	20 (2.5)

GROUP 21A

CLUTCH

CONTENTS

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- TROUBLESHOOTING STRATEGY 21A-2
- SYMPTOM CHART 21A-3
- SYMPTOM PROCEDURES 21A-3

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- CLUTCH BLEEDING 21A-8
- CLUTCH PEDAL POSITION SWITCH CHECK 21A-8
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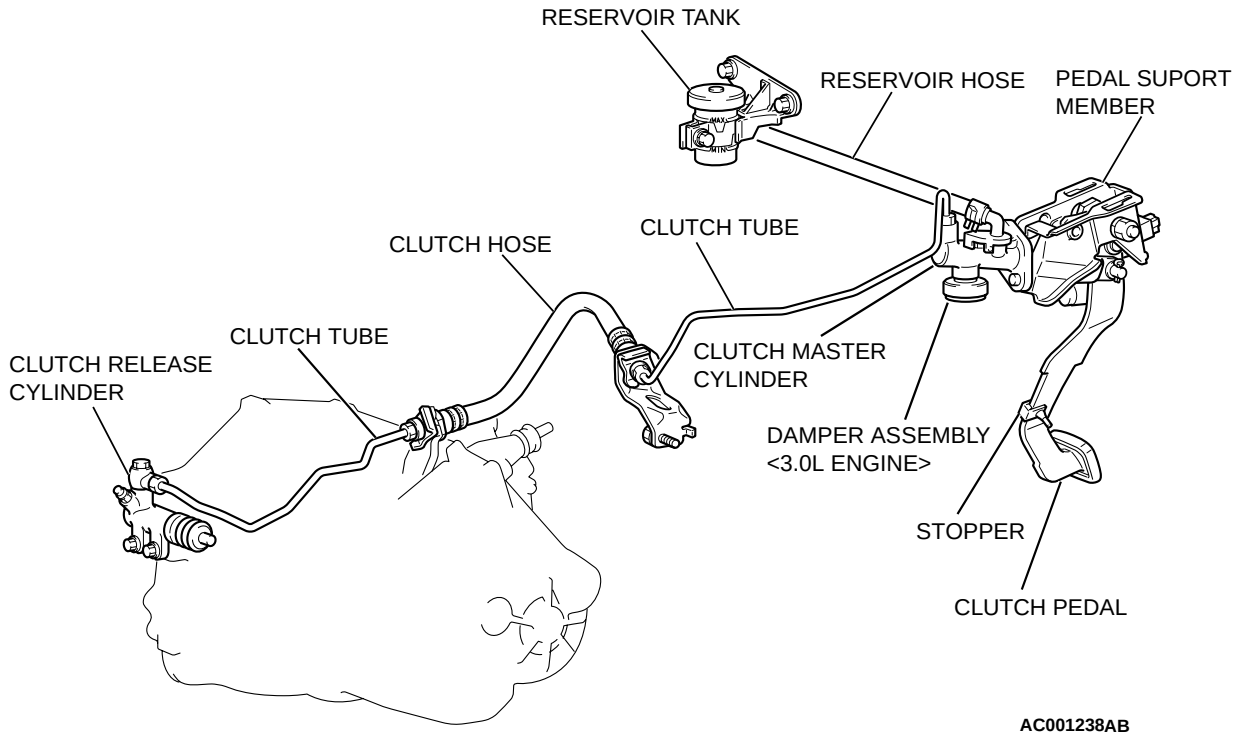
- LUBRICANTS 21A-14

GENERAL DESCRIPTION

M1211000100115

The clutch is a dry single-disc, diaphragm type; hydraulic pressure is used for the clutch control.

CONSTRUCTION DIAGRAM



CLUTCH DIAGNOSIS

INTRODUCTION TO CLUTCH DIAGNOSIS

M1211003400115

A defective clutch causes a clutch slippage, resulting in poor torque transmission. The causes for this problem may be a faulty clutch line or disc, or a mal-adjustment of the clutch pedal.

CLUTCH DIAGNOSIS TROUBLESHOOTING STRATEGY

M1211003500101

Use these Steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted most of the possible ways to find a clutch fault.

1. Gather information from the customer.
2. Verify that the condition described by the customer exists.
3. Find the malfunction by following the Symptom Chart.
4. Verify malfunction is eliminated.

SYMPTOM CHART

M1211003600090

SYMPTOMS	INSPECTION PROCEDURE	REFERENCE PAGE
Clutch slips	1	P.21A-3
Gear shift malfunction	2	P.21A-4
Clutch noise	3	P.21A-4
Clutch pedal feels "heavy"	4	P.21A-5
When the clutch is engaged, abnormal vibration occurs.	5	P.21A-6

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Clutch Slips

DIAGNOSIS

Step 1. Check insufficient clutch pedal play.
Refer to P.21A-7.

Q: Does the clutch pedal play meet the standard value?
YES : Go to Step 2.
NO : Adjust the clutch pedal play. Then go to Step 7.

Step 2. Check the hydraulic system for clogging.

Q: Is the hydraulic system clogged?
YES : Repair or replace the hydraulic system. Then go to Step 7.
NO : Go to Step 3.

Step 3. Check the clutch release fork for catching.

Q: Is the clutch release fork stuck?
YES : Repair or replace the clutch release fork. Then go to Step 7.
NO : Go to Step 4.

Step 4. Check the clutch disc facing for excessive wear.
Refer to GROUP 21B, Clutch P.21B-6.

Q: Is the clutch disc facing worn excessively?
YES : Replace the clutch disc. Then go to Step 7.
NO : Go to Step 5.

Step 5. Check the clutch disc facing for hardening and adhesion of oil.
Refer to GROUP 21B, Clutch P.21B-6.

Q: Is the clutch disc facing hardened or contaminated with oil?
YES : Replace the clutch disc. Then go to Step 7.
NO : Go to Step 6.

Step 6. Check the diaphragm spring for weakness and damage.
Refer to GROUP 21B, Clutch P.21B-6.

Q: Is the diaphragm spring weaken or damaged?
YES : Replace the clutch cover assembly. Then go to Step 7.
NO : Go to Step 7.

Step 7. Check the symptom.

Q: Is the symptom reproduced?
YES : Return to Step 1.
NO : This diagnosis is complete.

INSPECTION PROCEDURE 2: Gear Shift Malfunction

DIAGNOSIS

Step 1. Check the excessive clutch pedal play.
Refer to P.21A-7.

Q: Does the clutch pedal play meet the standard value?
YES : Go to Step 2.
NO : Adjust the clutch pedal play. Then go to Step 9.

Step 2. Check the hydraulic system for leakage, air mix and clogging.
Refer to P.21A-11.

Q: Is there a leakage, air mix or clogging on the hydraulic system?
YES : Repair or replace the hydraulic system. Then go to Step 9.
NO : Go to Step 3.

Step 3. Check the clutch disc for distortion and excessive oscillation.
Refer to GROUP 21B, Clutch P.21B-6.

Q: Is the clutch disc distorted or oscillated?
YES : Replace the clutch disc. Then go to Step 9.
NO : Go to Step 4.

Step 4. Check the clutch disc spline for wear and corrosion.
Refer to GROUP 21B, Clutch P.21B-6.

Q: Is the clutch disc spline worn or corroded?
YES : Replace the clutch disc. Then go to Step 9.
NO : Go to Step 5.

Step 5. Check the clutch disc facing for peeling.

Q: Is clutch disc facing peeled?
YES : Replace the clutch disc. Then go to Step 9.
NO : Go to Step 6.

Step 6. Check the clutch cover assembly for wear.
Refer to GROUP 21B, Clutch P.21B-6.

Q: Is the clutch cover assembly worn?
YES : Replace the clutch cover assembly. Then go to Step 9.
NO : Go to Step 7.

Step 7. Check the pressure plate and the flywheel for damage.

Q: Is the pressure plate or the flywheel damaged?
YES : Replace the clutch cover assembly or the flywheel. Then go to Step 9.
NO : Go to Step 8.

Step 8. Check the clutch release bearing for wear.
Refer to GROUP 21B, Clutch P.21B-6.

Q: Is the clutch release bearing worn?
YES : Replace the clutch release bearing. Then go to Step 9.
NO : Go to Step 9.

Step 9. Check the symptom.

Q: Is the symptom reproduced?
YES : Return to Step 1.
NO : This diagnosis is complete.

INSPECTION PROCEDURE 3: Clutch Noise

DIAGNOSIS

Step 1. Check insufficient clutch pedal play.
Refer to P.21A-7.

Q: Does the clutch pedal play meet the standard value?
YES : Go to Step 2.
NO : Adjust the clutch pedal play. Then go to Step 7.

Step 2. Check the clutch release bearing for wear.
Refer to GROUP 21B, Clutch P.21B-6.

Q: Is the clutch release bearing worn?
YES : Replace the clutch release bearing. Then go to Step 7.
NO : Go to Step 3.

Step 3. Check the bearing sleeve sliding surface for insufficient lubrication.

Q: Is the lubrication of the bearing sleeve sliding surface sufficient?
YES : Go to Step 4.
NO : Repair the bearing sleeve sliding surface. Then go to Step 7.

Step 4. Check the clutch cover assembly for improper installation.
Refer to GROUP 21B, Clutch P.21B-2.

Q: Is the clutch cover assembly installed properly?
YES : Go to Step 5.
NO : Install the clutch cover assembly properly. Then go to Step 7.

Step 5. Check the clutch disc facing for excessive wear.
Refer to GROUP 21B, Clutch P.21B-6.

Q: Is the clutch disc facing assembly worn excessively?
YES : Replace the clutch disc. Then go to Step 7.
NO : Go to Step 6.

Step 6. Check the pilot bushing for damage.

Q: Is the pilot bushing damaged?
YES : Replace the pilot bushing. Then go to Step 7.
NO : Go to Step 7.

Step 7. Check the symptom.

Q: Is the symptom reproduced?
YES : Return to Step 1.
NO : This diagnosis is complete.

INSPECTION PROCEDURE 4: Clutch Pedal Feels "Heavy"

DIAGNOSIS

Step 1. Check the clutch pedal clevis pin for insufficient lubrication.

Q: Is the lubrication of the clutch pedal clevis pin sufficient?
YES : Go to Step 2.
NO : Repair the clutch pedal. Then go to Step 4.

Step 2. Check the clutch disc spline for insufficient lubrication.
Refer to GROUP 21B, Clutch P.21B-6.

Q: Is the lubrication of the clutch disc spline sufficient?
YES : Go to Step 3.
NO : Replace the clutch disc. Then go to Step 4.

Step 3. Check the insufficient lubrication of bearing sleeve sliding surface.

Q: Is the lubrication of the bearing sleeve sliding surface sufficient?
YES : Go to Step 4.
NO : Repair the bearing sleeve sliding surface. Then go to Step 4.

Step 4. Check the symptom.

Q: Is the symptom reproduced?
YES : Return to Step 1.
NO : This diagnosis is complete.

INSPECTION PROCEDURE 5: When the Clutch is Engaged, Abnormal Vibration Occurs.

DIAGNOSIS

Step 1. Check the engine and transaxle mounting for loosening and damage.

Q: Is the engine and transaxle mounting loosened or damaged?
YES : Tighten or replace the engine and transaxle mounting. Then go to Step 6.
NO : Go to Step 2.

Step 2. Check the diaphragm spring for uneven height.

Q: Is the diaphragm spring even height?
YES : Go to Step 3.
NO : Replace the clutch cover assembly. Then go to Step 6.

Step 3. Check the pressure plate and flywheel for damage.

Q: Is the pressure plate or flywheel damaged?
YES : Repair the clutch cover assembly or flywheel. Then go to Step 6.
NO : Go to Step 4.

Step 4. Check the clutch disc facing for wear and damage.
Refer to GROUP 21B, Clutch P.21B-6.

Q: Is the clutch disc facing worn or damaged?
YES : Replace the clutch disc. Then go to Step 6.
NO : Go to Step 5.

Step 5. Check for grease or oil on the clutch disc facing.
Refer to GROUP 21B, Clutch P.21B-6.

Q: Is there grease or oil on the clutch disc facing?
YES : If the clutch disc facing is contaminated with grease or oil, check that greases is applied to the clutch disc spline. (Refer to GROUP 21B, Clutch P.21B-2.) Then check the clutch housing input shaft oil seal (Refer to GROUP 22B, Clutch Housing P.22B-56.) and the crank shaft rear oil seal (2.4L ENGINE: Refer to GROUP 11A, Crankshaft Rear Oil Seal P.11A-26, 3.0L ENGINE: Refer to GROUP 11C, Crankshaft Rear Oil Seal P.11C-32.) for leakage, and replace the oil seal(s). Replace the clutch disc. Then go to Step 6.
NO : Go to Step 6.

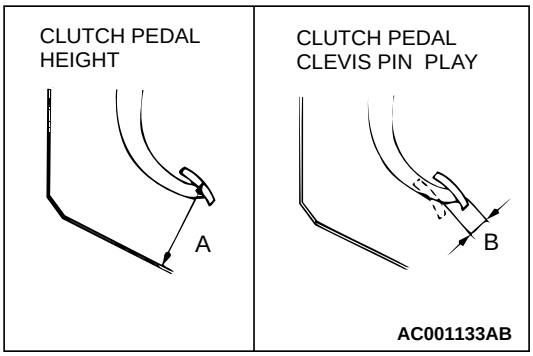
Step 6. Check the symptom.

Q: Is the symptom reproduced?
YES : Return to Step 1.
NO : This diagnosis is complete.

ON-VEHICLE SERVICE

CLUTCH PEDAL CHECK AND ADJUSTMENT

M1211000900111

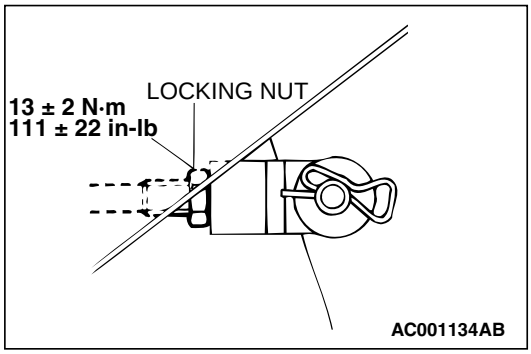


1. Turn back the carpet etc. under the clutch pedal.
2. Measure the clutch pedal height. If the height is outside the standard value, go to step 4.

   Standard value (A): 175.3 – 178.3 mm (6.90 – 7.02 inches) [From the surface of melting sheet (Floor board shield) to the face of pedal pad]

3. Measure the clutch pedal clevis pin play. If the play is outside the standard value, go to step 5.

   Standard value (B): 1 – 3 mm (0.04 – 0.12 inch)

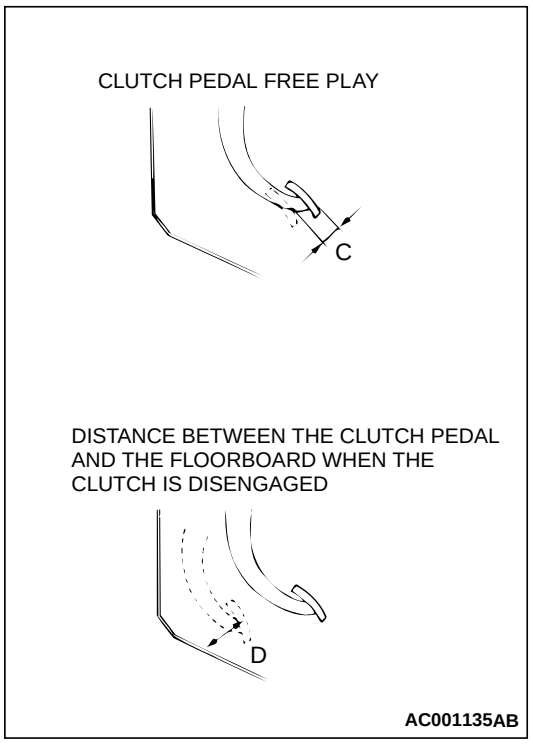


4. If the height of the clutch pedal is not within the standard value, loosen the locking nut and adjust the pedal height to the standard value using the adjusting bolt or push rod.

⚠ CAUTION

Do not push in the master cylinder push rod at this time.

5. If the clutch pedal play is not within the standard value, loosen the locking nut and move the push rod to adjust.



6. After the adjustments, confirm that the clutch pedal free play (measured at the face of the pedal pad) and the distance between the clutch pedal (the face of the pedal pad) and the floorboard when the clutch is disengaged are within the standard value ranges.

   Standard value (C): 6 – 13 mm (0.2 – 0.5 inch)
   Standard value (D): 76.4 mm (3.0 inches) or more

7. If the measured free play and distance do not agree with the standard value ranges, it is probably the result of either air in the hydraulic system or a faulty master cylinder or clutch. Bleed the air, or disassemble and inspect the master cylinder or clutch.
8. Reinstall the carpet, etc.

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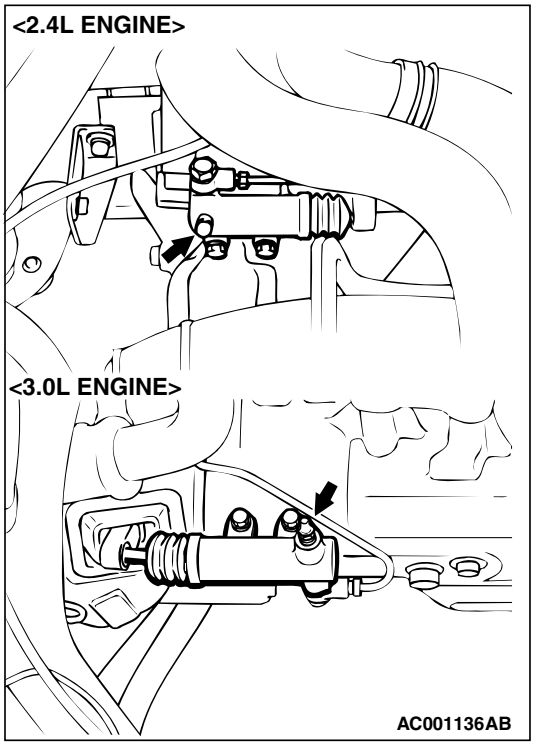
CLUTCH BLEEDING

M1211001400119



⚠ CAUTION

Use the specified brake fluid. Do not mix brake fluid.

Specified fluid: Brake Fluid DOT 3 or DOT 4

CLUTCH PEDAL POSITION SWITCH CHECK

M1211003100114

Refer to GROUP 17, Auto-cruise Control System – On-vehicle Service – Auto-cruise Control Component Check P.17-83.

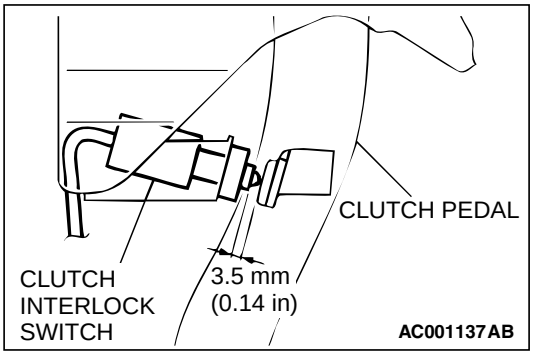
CLUTCH INTERLOCK SWITCH OPERATING CHECK

M1211001000111

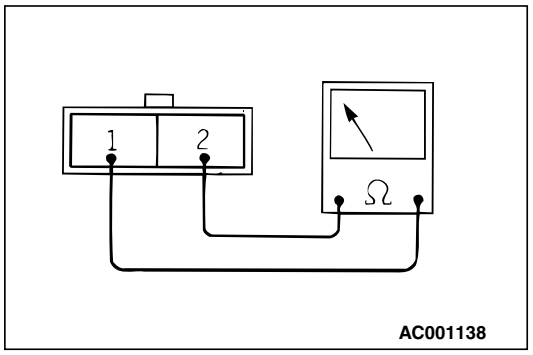
1. Lock the front wheels, apply the parking brake.
2. After normally adjusting the clutch pedal, check the interlock switch operation as follows:
   (1) The engine should not start even if the ignition switch is turned to the "START" position with the clutch pedal released. If the engine should start, check the interlock switch and the harness.
   (2) The engine should start after the clutch pedal is depressed and the ignition switch turned to the "START" position. If the engine should start before the clutch is disengaged or the engine does not start even if the clutch pedal is depressed, check and adjust the interlock switch.

CLUTCH INTERLOCK SWITCH CHECK AND ADJUSTMENT

M1211001100118



1. Check to be sure that the interlock switch is as shown in the illustration when the clutch pedal is depressed at its full stroke 130 mm (5.1 inches). If not at the specified dimension, loosen the clutch interlock switch 1/4 turn counterclockwise. Then slide the switch to the specified dimension, and turn the switch 1/4 turn clockwise to lock.



2. Connect an ohmmeter to the interlock switch connector, and then check for continuity when the clutch pedal is fully depressed and when it is released outward. If the interlock switch is not as it should be, replace it.

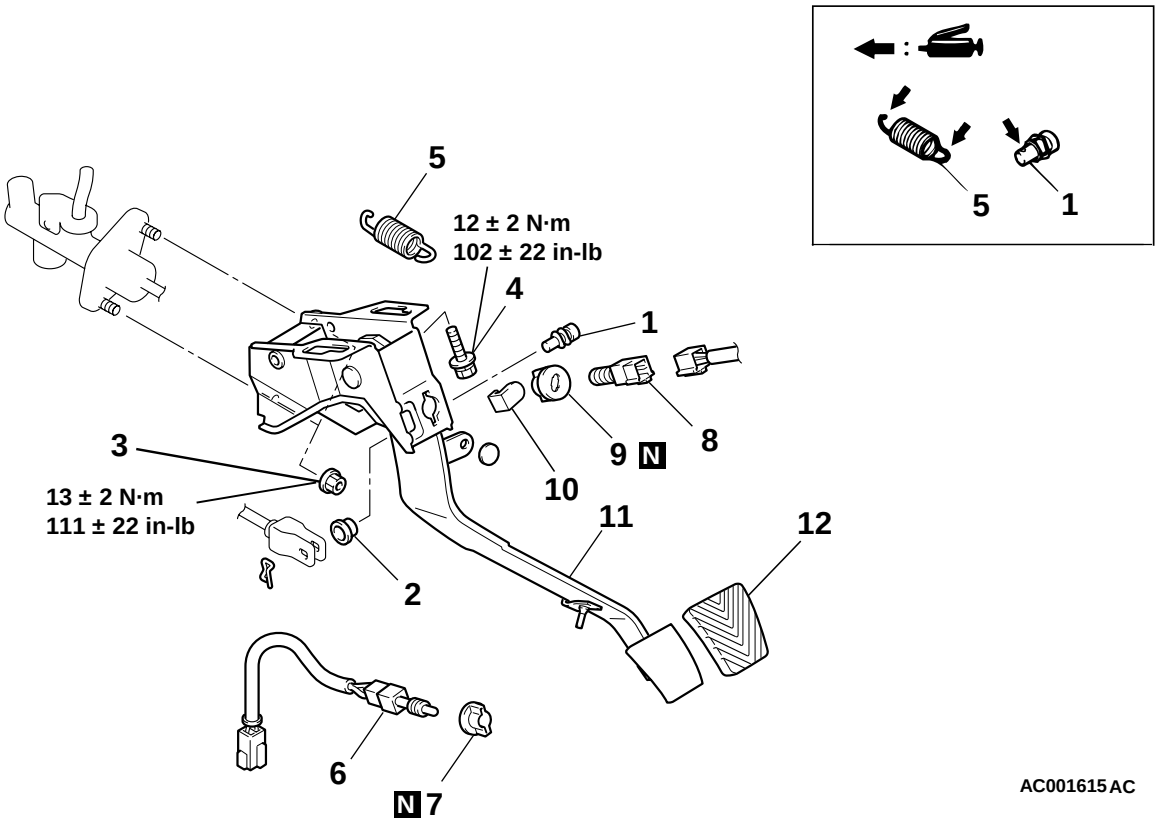
TESTER CONNECTION	PEDAL POSITION	SPECIFIED CONDITION
1 – 2	FULLY DEPRESSED	No Continuity
	RELEASED	Continuity

CLUTCH PEDAL

REMOVAL AND INSTALLATION

M1211001600113

Post-installation Operation
- Clutch Pedal Adjustment (Refer to P.21A-7.)
- Clutch Interlock Switch Adjustment (Refer to P.21A-9.)



REMOVAL STEPS
1. CLEVIS PIN
2. BUSHING
3. NUT
4. BOLT
5. RETURN SPRING
6. CLUTCH INTERLOCK SWITCH
7. CLIP

REMOVAL STEPS (Continued)
8. CLUTCH PEDAL POSITION SWITCH
9. CLIP
10. PEDAL STOPPER
11. CLUTCH PEDAL AND PEDAL SUPPORT MEMBER
12. PEDAL PAD

INSPECTION

M1211001700091

- Check the bushing for wear.
- Check the clutch pedal for bending or twisting.
- Check the return spring for damage or deterioration.
- Check the pedal pad for damage or wear.

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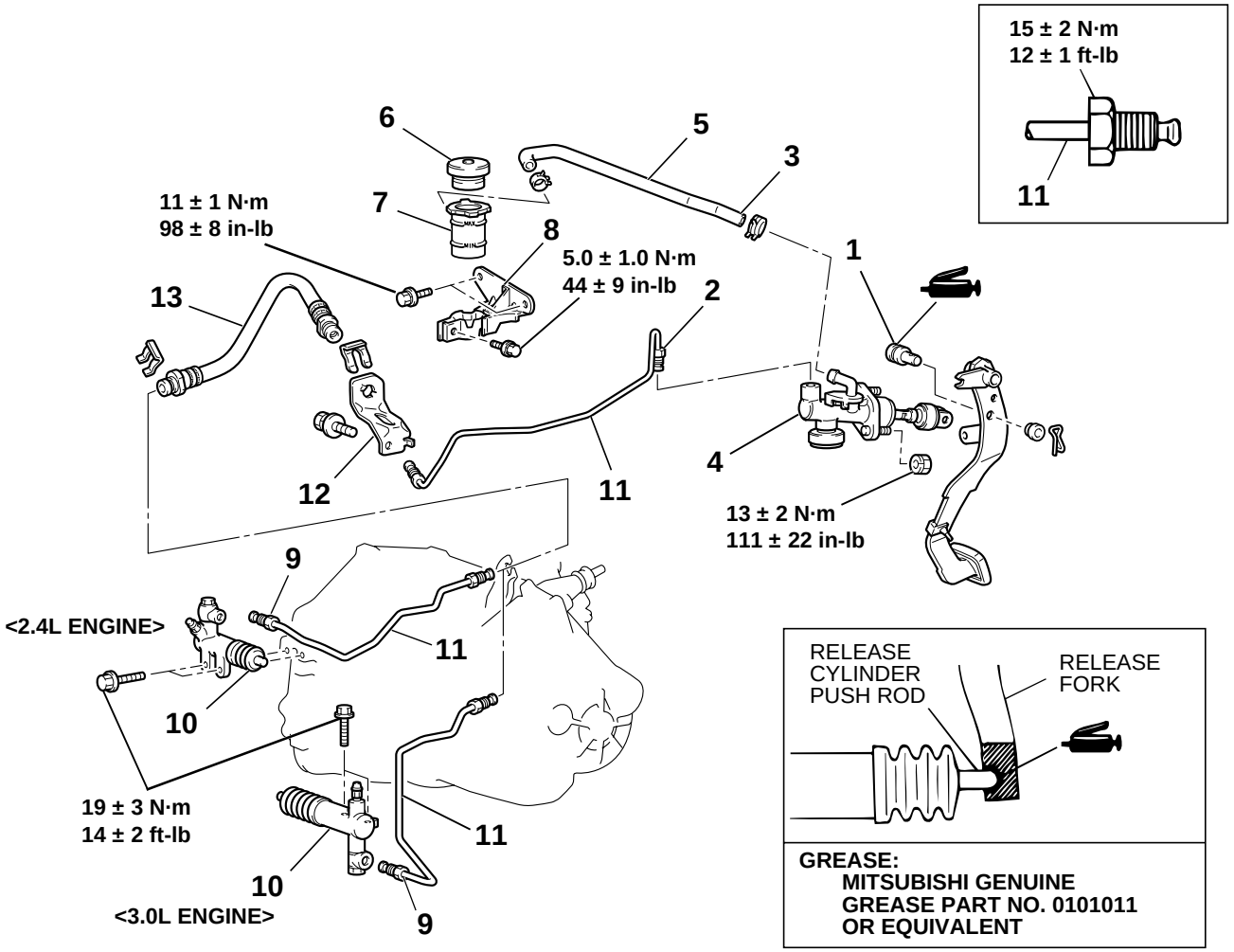
CLUTCH CONTROL

REMOVAL AND INSTALLATION

M1211001900125

Pre-removal Operation	Post-installation Operation
Clutch Fluid Draining	• Clutch Fluid Supplying • Clutch Line Bleeding (Refer to P.21A-8.) • Clutch Pedal Adjustment (Refer to P.21A-7.)



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CLUTCH MASTER CYLINDER REMOVAL STEPS
1. CLEVIS PIN
2. CLUTCH TUBE CONNECTION
3. RESERVOIR HOSE CONNECTION
4. CLUTCH MASTER CYLINDER

CLUTCH RESERVOIR TANK REMOVAL STEPS
5. RESERVOIR HOSE
6. RESERVOIR CAP
7. RESERVOIR TANK

CLUTCH RESERVOIR TANK REMOVAL STEPS (Continued)
8. RESERVOIR BRACKET

CLUTCH RELEASE CYLINDER REMOVAL STEPS
9. CLUTCH TUBE CONNECTION
10. CLUTCH RELEASE CYLINDER

CLUTCH LINE REMOVAL STEPS
>>A<< 11. CLUTCH TUBE
12. BRACKET
<<A>> >>A<< 13. CLUTCH HOSE

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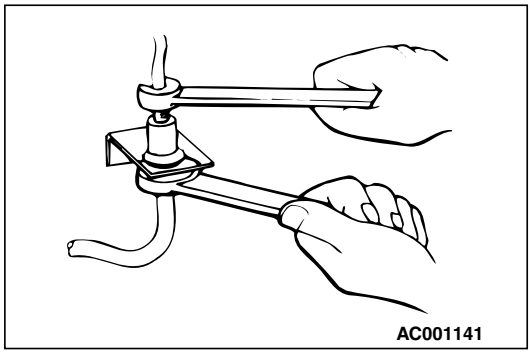
REMOVAL SERVICE POINT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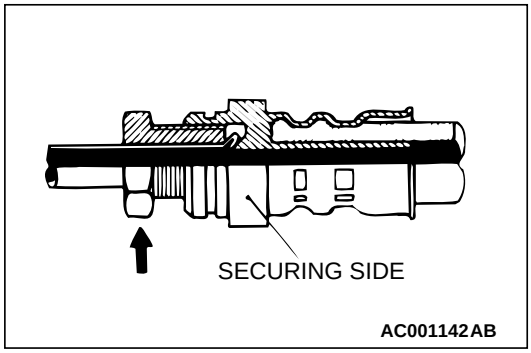
<<A>> CLUTCH HOSE REMOVAL
Holding the nut at the clutch hose side, loosen the flare nut on the clutch tube.

INSTALLATION SERVICE POINT



AC001142AB

>>A<< CLUTCH HOSE/CLUTCH TUBE INSTALLATION
1. Temporarily tighten the clutch tube flare nut by hand, and then tighten it to the specified torque, being careful that the clutch hose does not become twisted.
   Tightening torque: 15 ± 2 N·m (12 ± 1 ft-lb)
2. After tightening the clutch tube flare nut, check to be sure there is no leakage of the clutch fluid.

INSPECTION

M1211002000095

- Check the master cylinder or clutch hose for fluid leakage.
- Check the clutch hose or tube for cracks or clogging.

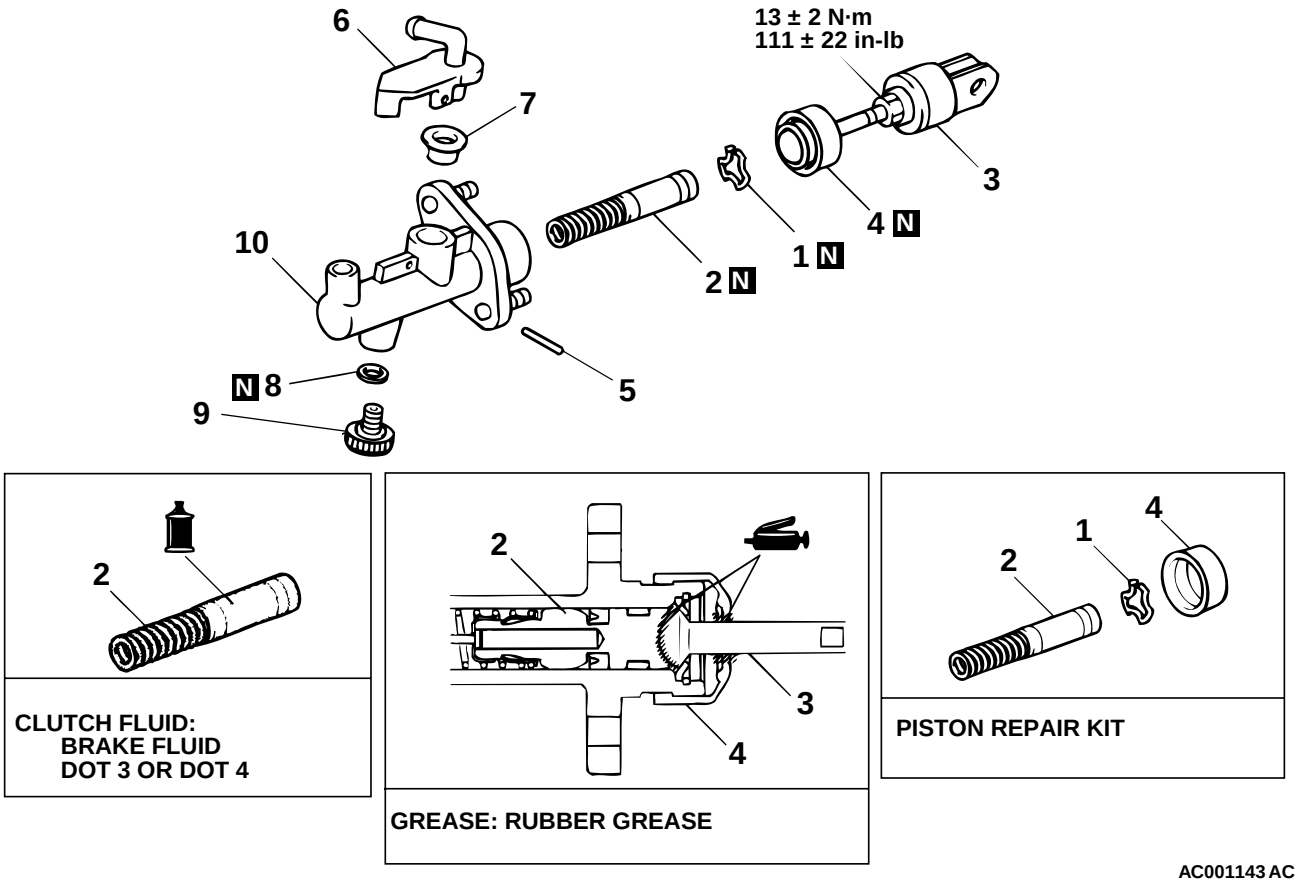
CLUTCH MASTER CYLINDER

M1211002100100

DISASSEMBLY AND ASSEMBLY

⚠ CAUTION

Do not disassemble the piston assembly.



AC001143 AC

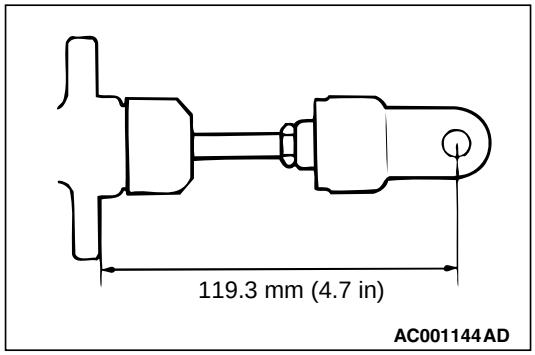
DISASSEMBLY STEPS

1. PISTON STOPPER RING
2. PISTON ASSEMBLY
>>A<< 3. DAMPER AND PUSHROD
4. BOOT
5. SPRING PIN
6. NIPPLE

DISASSEMBLY STEPS

7. RESERVOIR SEAL
8. GASKET <3.0L ENGINE>
9. DAMPER ASSEMBLY <3.0L ENGINE>
10. CLUTCH MASTER CYLINDER ASSEMBLY

ASSEMBLY SERVICE POINT



AC001144 AD

>>A<< DAMPER AND PUSHROD INSTALLATION

Set the length of the push rod assembly to the dimension shown to make the adjustment of the clutch pedal easier.

TSB Revision

INSPECTION

M1211002200099

- Check inside the cylinder body for rust and scars.
- Check the piston cup for wear and deformation.
- Check the piston for rust and scars.
- Check the pipe connection for clogging.

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1211003300118

ITEMS		SPECIFICATIONS
Clutch control	Clutch master cylinder mounting nut	13 ± 2 N·m (111 ± 22 in-lb)
	Clutch release cylinder mounting bolt	19 ± 3 N·m (14 ± 2 ft-lb)
	Clutch tube flare nut	15 ± 2 N·m (12 ± 1 ft-lb)
	Push rod jam nut	13 ± 2 N·m (111 ± 22 in-lb)
	Reservoir bracket bolt	5.0 ± 1.0 N·m (44 ± 9 in-lb)
	Reservoir bracket mounting bolt	11 ± 1 N·m (98 ± 8 in-lb)
Clutch pedal	Clutch master cylinder mounting nut	13 ± 2 N·m (111 ± 22 in-lb)
	Pedal support member mounting bolt	12 ± 2 N·m (102 ± 22 in-lb)

GENERAL SPECIFICATION

M1211000200101

ITEM	SPECIFICATION
Clutch master cylinder ID mm (in)	15.87 (5/8)

SERVICE SPECIFICATIONS

M1211000300108

ITEMS	STANDARD VALUE
Clutch pedal height mm (in)	175.3 – 178.3 (6.90 – 7.02)
Clutch pedal clevis pin play mm (in)	1 – 3 (0.04 – 0.12)
Clutch pedal free play mm (in)	6 – 13 (0.2 – 0.5)
Distance between the clutch pedal and the floorboard when the clutch pedal is released mm (in)	76.4 (3.0) or more

LUBRICANTS

M1211000400097

ITEMS	SPECIFIED LUBRICANTS	QUANTITY
Clutch fluid	Brake Fluid DOT 3 or DOT 4	As required
Push rod assembly	Rubber grease	As required
Boot	Rubber grease	As required
Release cylinder push rod	MITSUBISHI genuine grease Part No. 0101011 or equivalent	As required

GROUP 21B

CLUTCH OVERHAUL

CONTENTS

CLUTCH **21B-2**
- REMOVAL AND INSTALLATION 21B-2
- CLUTCH INSPECTION. 21B-6

CLUTCH RELEASE CYLINDER **21B-8**
- DISASSEMBLY AND REASSEMBLY. 21B-8
- CLUTCH RELEASE CYLINDER INSPECTION 21B-10

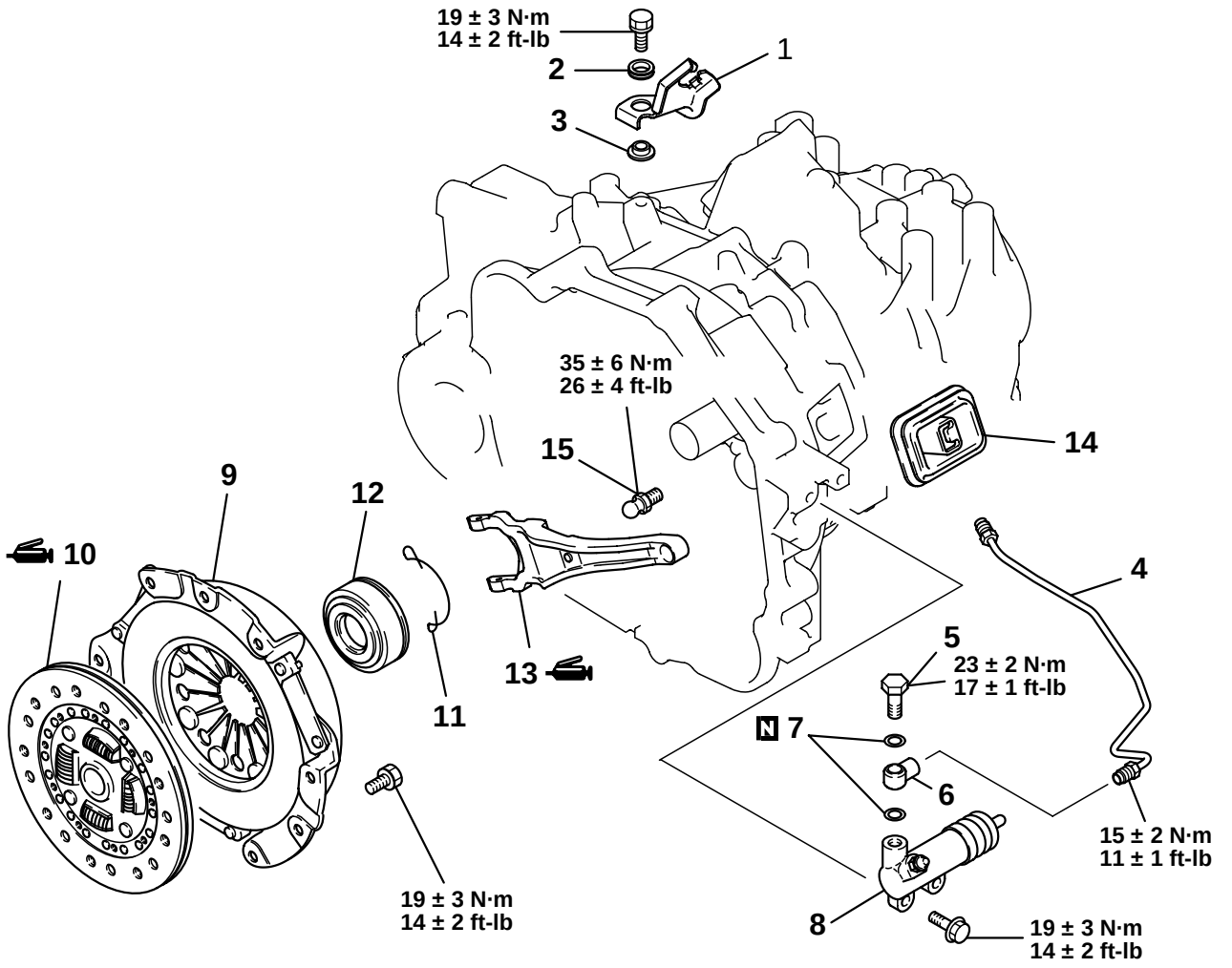
SPECIFICATIONS **21B-11**
- FASTENER TIGHTENING SPECIFICATIONS. 21B-11
- GENERAL SPECIFICATIONS 21B-11
- SERVICE SPECIFICATIONS 21B-11
- LUBRICANTS 21B-12

CLUTCH

REMOVAL AND INSTALLATION

M1212001000040

<2.4LENGINE>



AKX00758AB

REMOVAL STEPS

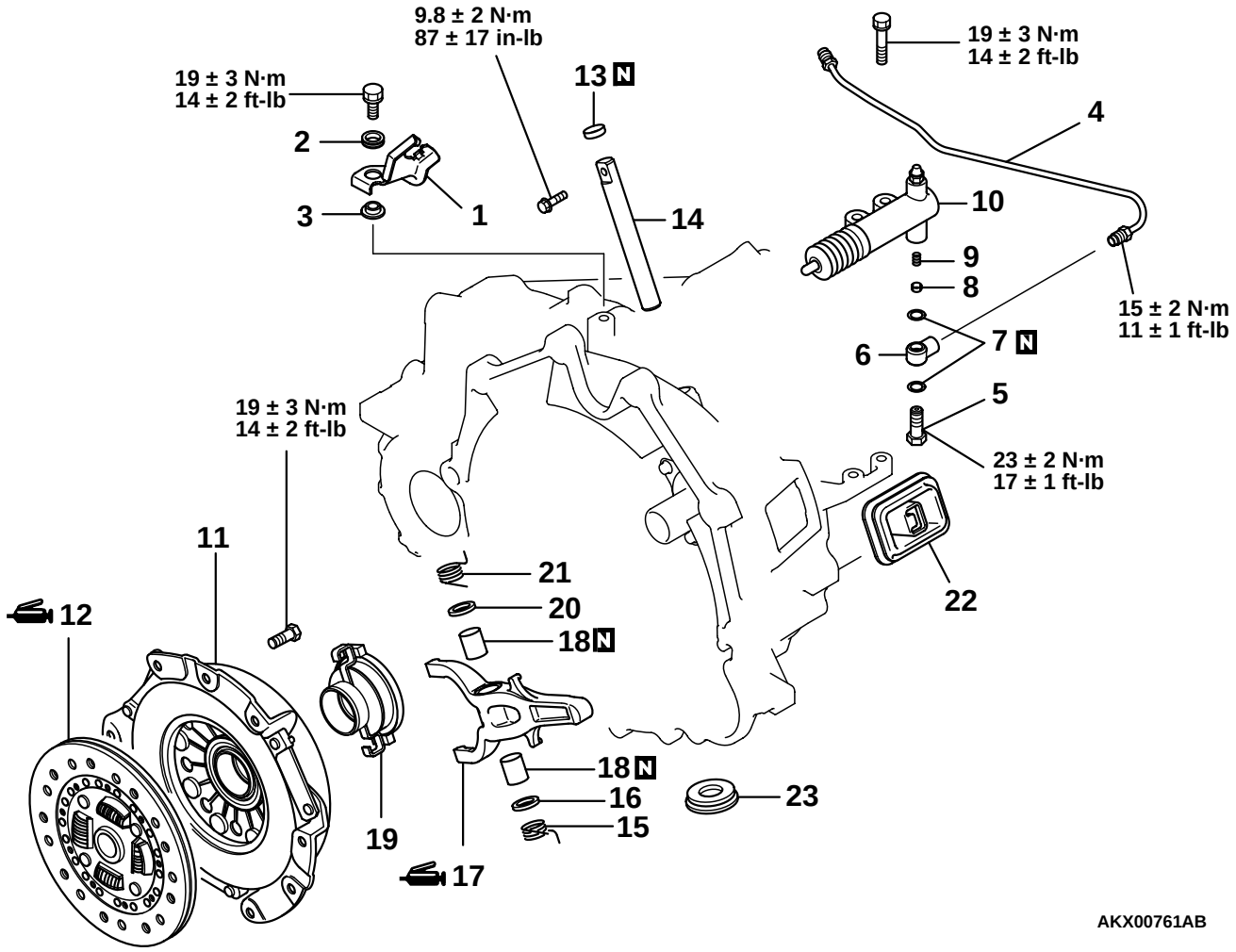
1. CLUTCH FLUID LINE BRACKET
2. INSULATOR
3. WASHER
4. CLUTCH TUBE
5. UNION BOLT
6. UNION
7. GASKET
8. CLUTCH RELEASE CYLINDER

REMOVAL STEPS (Continued)

>>B<< 9. CLUTCH COVER
>>B<< 10. CLUTCH DISC
11. RETURN CLIP
12. CLUTCH RELEASE BEARING
<<A>> >>A<< 13. RELEASE FORK
14. RELEASE FORK BOOT
15. FULCRUM

TSB Revision

<3.0L ENGINE>



REMOVAL STEPS

1. CLUTCH FLUID LINE BRACKET
2. INSULATOR
3. WASHER
4. CLUTCH TUBE
5. UNION BOLT
6. UNION
7. GASKET
8. VALVE
9. VALVE SPRING
10. CLUTCH RELEASE CYLINDER

>>B<< 11. CLUTCH COVER

>>B<< 12. CLUTCH DISC

REMOVAL STEPS (Continued)

>>E<< 13. SEALING CAP

14. RELEASE FORK SHAFT
15. SUPPORT SPRING (L)
16. PACKING

>>D<< 17. RELEASE FORK

>>C<< 18. BUSHING

19. CLUTCH RELEASE BEARING
20. PACKING
21. SUPPORT SPRING (R)
22. RELEASE FORK BOOT
23. MAINTENANCE HOLE COVER

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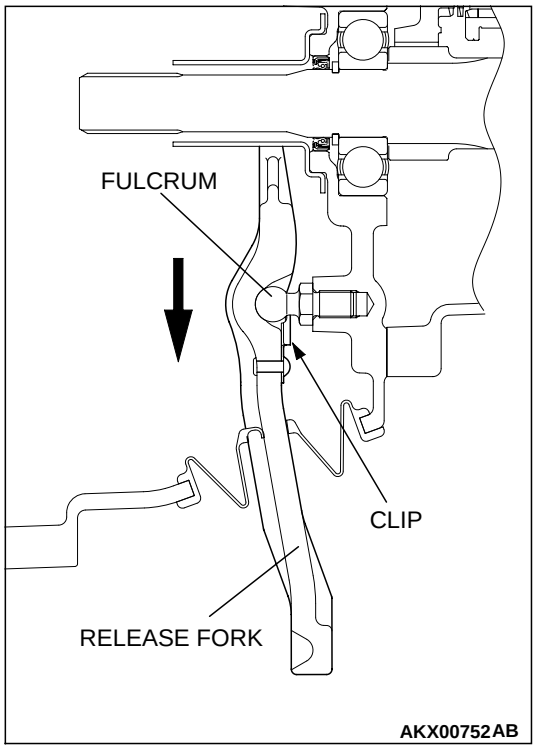
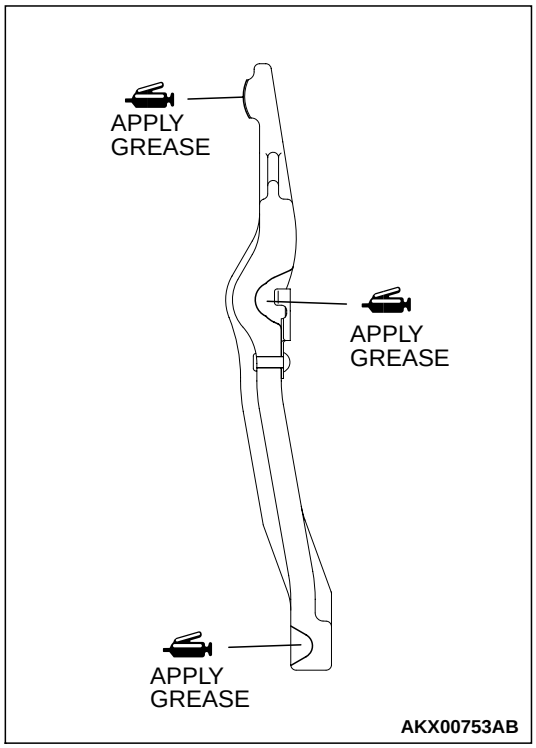
REMOVAL SERVICE POINT



<<A>> RELEASE FORK REMOVAL

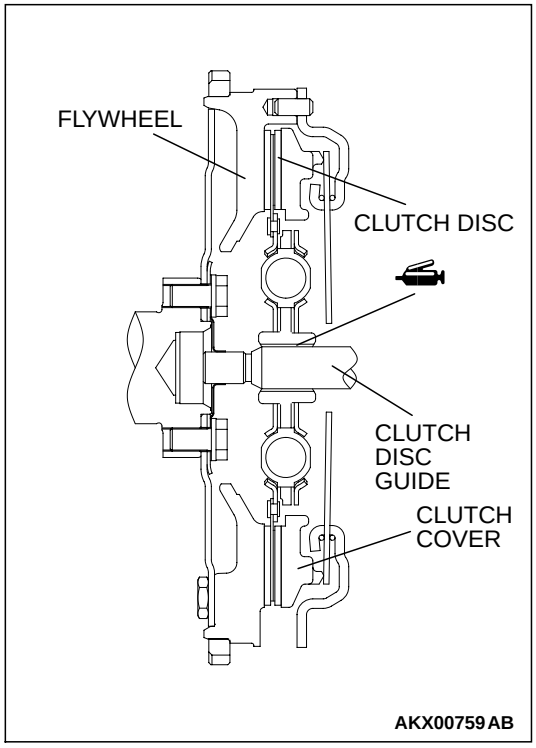
Move the release fork in the direction shown to remove the clip from the fulcrum.

INSTALLATION SERVICE POINTS



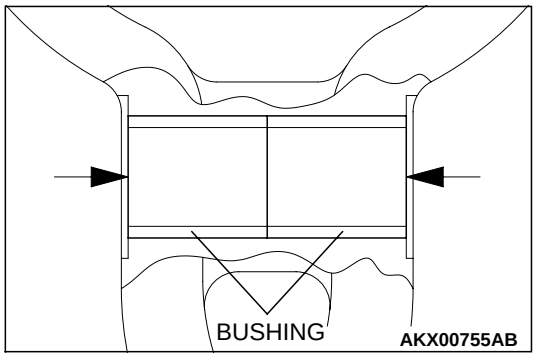
>>A<< RELEASE FORK INSTALLATION

1. Apply Mitsubishi genuine grease part number 0101011 or equivalent to the illustrated positions of the release fork.
2. Install the release fork to the fulcrum.



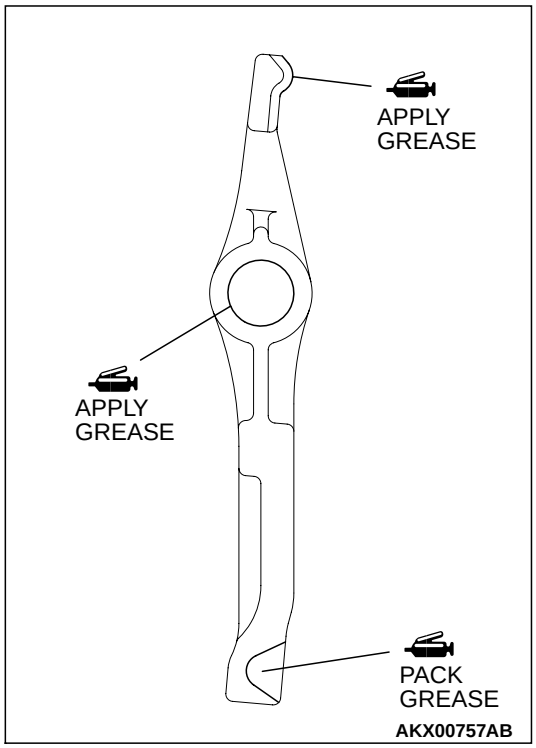
>>B<< CLUTCH DISC AND CLUTCH COVER INSTALLATION

1. Apply Mitsubishi genuine grease part number 0101011 or equivalent to the clutch disc splines and rub it in the splines with a brush.
2. Using the clutch disc guide to position the clutch disc on the flywheel.
3. Install the clutch cover onto the flywheel.



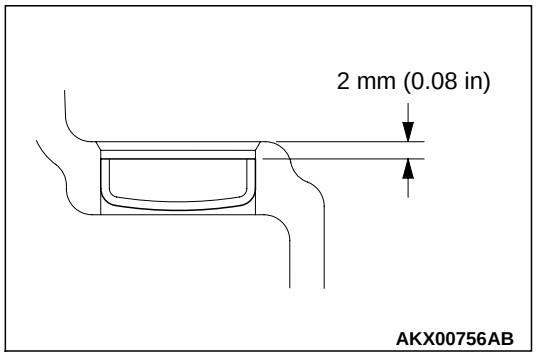
>>C<< OUTER RACE INSTALLATION

Press in the bushing into the release fork to the position shown in the illustration.



>>D<< RELEASE FORK INSTALLATION

Apply Mitsubishi genuine grease part number 0101011 or equivalent to the illustrated positions of the release fork.



>>E<< SEALING CAP INSTALLATION

Press in the sealing cap to the position shown in the illustration. Be sure that it is not installed in a slanted position.

CLUTCH INSPECTION

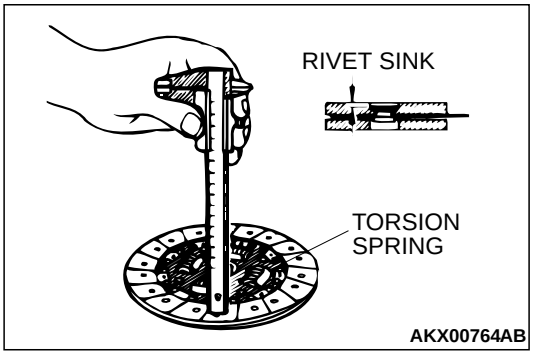
M1212001100036

CLUTCH COVER

1. Check the diaphragm spring end for wear and uneven height. Replace if wear is evident or height difference exceeds the limit.

   Limit: 0.5 mm (0.020 inch)

2. Check the pressure plate surface for wear, cracks and discoloration.
3. Check the rivets of the strap plate for looseness. If loose, replace the clutch cover.



CLUTCH DISC

⚠ CAUTION

Don't clean the clutch disc in a cleaning solvent.

1. Check the facing for loose rivets, uneven contact, evidence of seizure, or deposited oils and greases. If defective, replace the clutch disc.
2. Measure the rivet sink and replace the clutch disc if it is below the limit.

   Minimum limit: 0.3 mm (0.012 inch)
3. Check the torsion spring for play and damage. If defective, replace the clutch disc.
4. Combine the clutch disc with the input shaft and check for sliding condition and play in the rotating direction. If poor sliding condition is evident, clean, reassemble, and recheck.

   If excessive play is evident, replace the clutch disc and/or input shaft.

CLUTCH RELEASE BEARING

⚠ CAUTION

Release bearing is packed with grease. Therefore, do not wash it in a cleaning solvent.

1. Check for seizure, damage, noise or improper rotation.
2. Check for wear on the surface which contacts with the diaphragm spring.
3. Check for wear on the surface which contacts with the release fork. If abnormally worn, replace.

RELEASE FORK

If the surface which contacts with the bearing is abnormally worn, replace.

RELEASE FORK SHAFT <3.0L ENGINE>

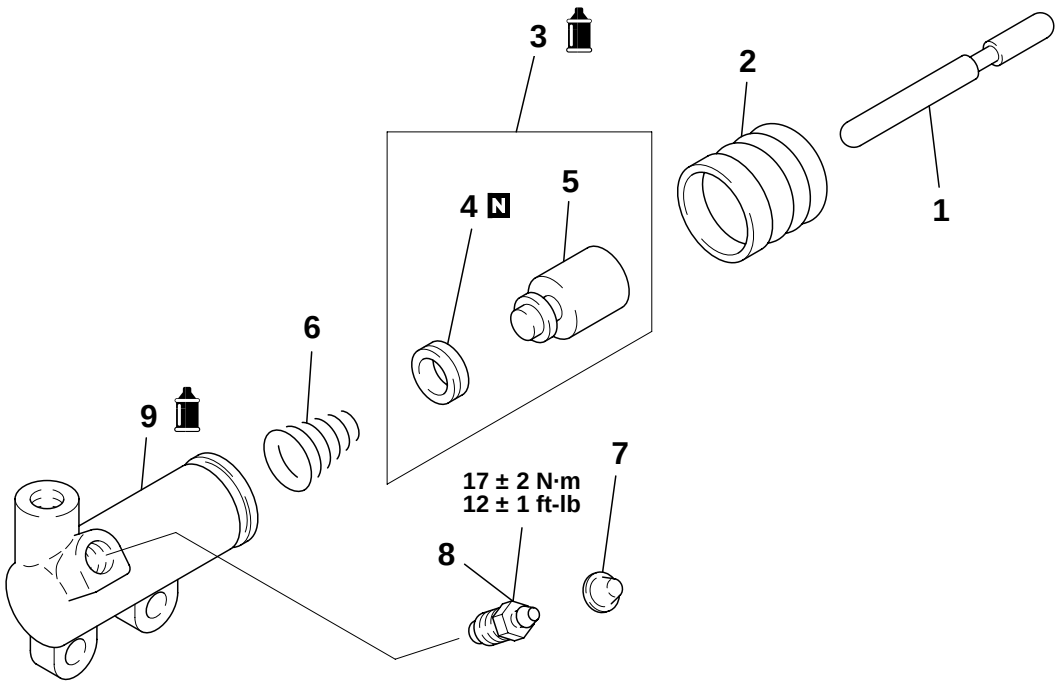
Check the release fork shaft for bend and wear, and replace if necessary.

CLUTCH RELEASE CYLINDER

DISASSEMBLY AND REASSEMBLY

M1212001500045

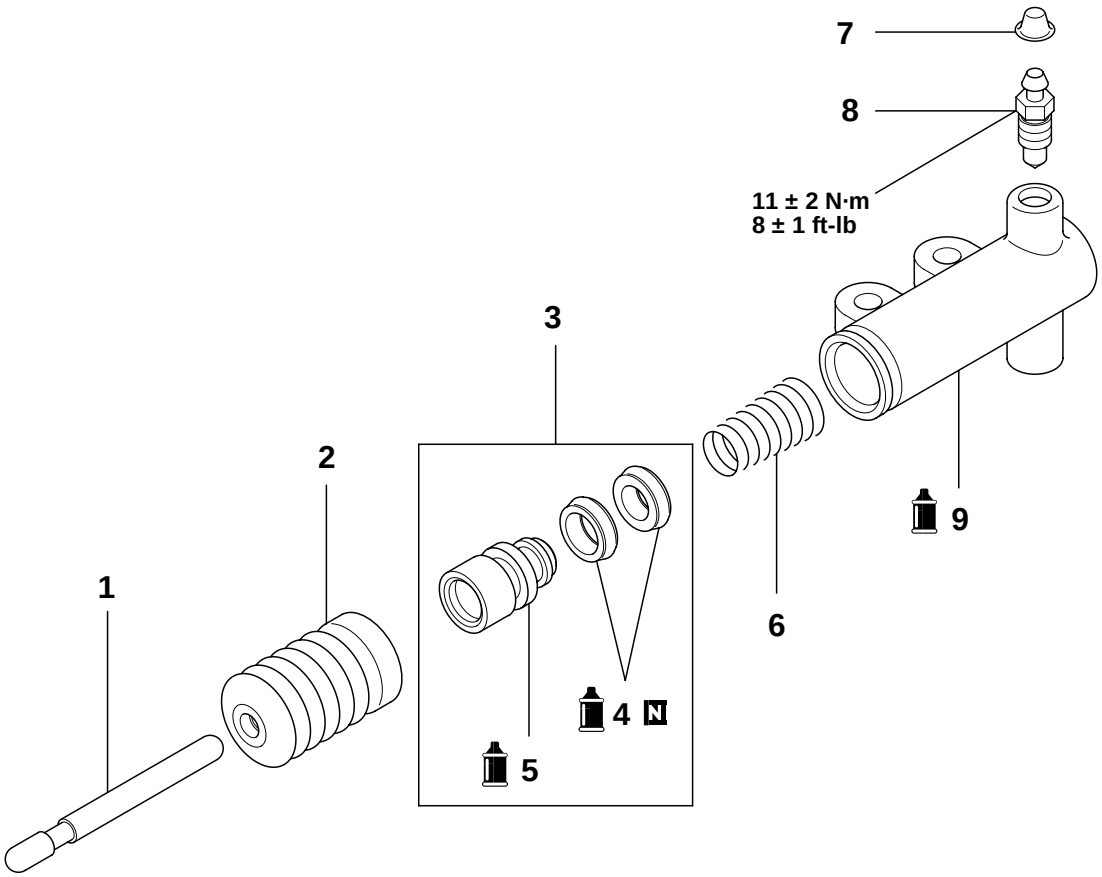
<2.4L ENGINE>



AKX00760AB

	DISASSEMBLY STEPS
	1. PUSH ROD
	2. BOOT
<<A>> >>A<<	3. PISTON ASSEMBLY
	4. PISTON CUP
	5. PISTON
	DISASSEMBLY STEPS
	6. CONICAL SPRING
	7. CAP
	8. AIR BLEEDER
	9. RELEASE CYLINDER

<3.0L ENGINE>



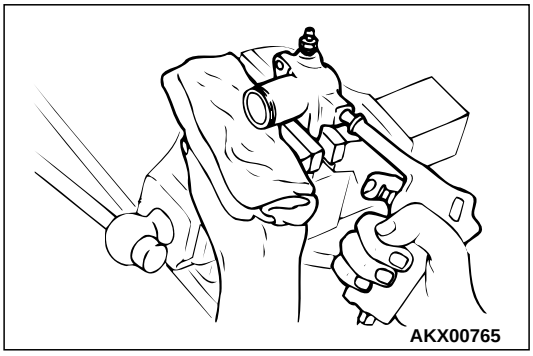
AKX00762AB

		DISASSEMBLY STEPS
		1. PUSH ROD
		2. BOOT
<<A>>	>>A<<	3. PISTON ASSEMBLY
		4. PISTON CUP
		5. PISTON

DISASSEMBLY STEPS	
6.	CONICAL SPRING
7.	CAP
8.	AIR BLEEDER
9.	RELEASE CYLINDER

TSB Revision

DISASSEMBLY SERVICE POINT


AKX00765

<<A>> PISTON ASSEMBLY REMOVAL

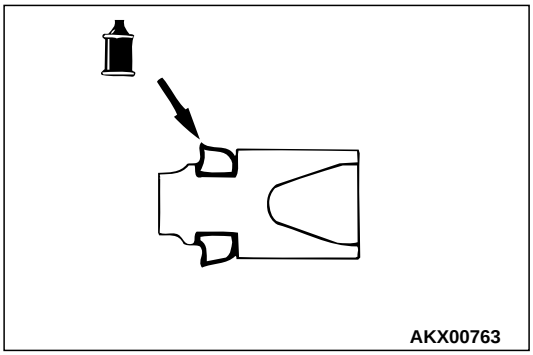
1. Cover with a shop towel to prevent the piston from popping out.

⚠ CAUTION

Apply compressed air slowly to prevent brake fluid from splashing.

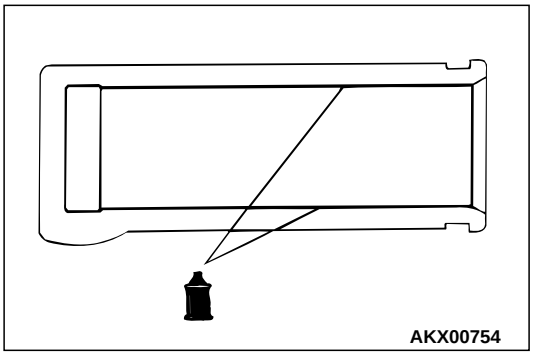
2. Apply the compressed air into the tube mounting hole to remove the piston assembly.

ASSEMBLY SERVICE POINT


AKX00763

>>A<< PISTON ASSEMBLY INSTALLATION

1. Apply brake fluid SAE J1703 (DOT3) to the piston cup and inner surface of the release cylinder.
2. Insert the piston assembly into the release cylinder.


AKX00754

CLUTCH RELEASE CYLINDER INSPECTION

M1212001600042

PISTON CUP

Check the lip of piston cup for scratch. If it is scratched, check the inner surface of the release cylinder for scratches.

RELEASE CYLINDER

Check the inner surface of the release cylinder for scratches or abnormal wear, replace if necessary.

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1212001800046

ITEMS	SPECIFICATIONS
Clutch cover mounting bolt	19 ± 3 N·m (14 ± 2 ft-lb)
Clutch fluid line bracket bolt	19 ± 3 N·m (14 ± 2 ft-lb)
Clutch release cylinder air bleeder <2.4L engine>	17 ± 2 N·m (12 ± 1 ft-lb)
Clutch release cylinder air bleeder <3.0L engine>	11 ± 2 N·m (8 ± 1 ft-lb)
Clutch release cylinder mounting bolt	19 ± 3 N·m (14 ± 2 ft-lb)
Clutch release cylinder union bolt	23 ± 2 N·m (17 ± 1 ft-lb)
Clutch tube flare nut	15 ± 2 N·m (11 ± 1 ft-lb)
Fulcrum <2.4L engine>	35 ± 6 N·m (26 ± 4 ft-lb)
Release fork shaft locking bolt <3.0L engine>	9.8 ± 2 N·m (87 ± 17 in-lb)

GENERAL SPECIFICATIONS

M1212000200104

ITEMS	SPECIFICATIONS
Clutch operating method	Hydraulic type
Clutch disc type	Single dry disc type
Clutch disc size OD x ID mm (in) <2.4L engine>	215 x 140 (8.46 x 5.51)
Clutch disc size OD x ID mm (in) <3.0L engine without induction control valve>	225 x 150 (8.87 x 5.91)
Clutch disc size OD x ID mm (in) <3.0L engine with induction control valve>	230 x 150 (9.06 x 5.91)
Clutch cover type	Diaphragm spring type
Clutch cover setting load N (lb) <2.4L engine>	4,539 (1,014)
Clutch cover setting load N (lb) <3.0L engine without induction control valve>	5,864 (1,318)
Clutch cover setting load N (lb) <3.0L engine with induction control valve>	5,860 (1317)
Clutch release cylinder ID mm (in) <2.4L engine>	19.05 (3/4)
Clutch release cylinder ID mm (in) <3.0L engine>	20.64 (13/16)

SERVICE SPECIFICATIONS

M1212000300048

ITEMS	LIMIT
Clutch disc facing rivet sink mm (in)	Minimum 0.3 (0.012)
Diaphragm spring end height difference mm (in)	0.5 (0.020)

LUBRICANTS

M1212000400056

ITEMS	SPECIFIED LUBRICANTS
Release fork and fulcrum contact surface <2.4L engine>	MITSUBISHI genuine grease Part Number 0101011 or equivalent
Release fork and release cylinder pushrod contact surface	
Release fork and release bearing contact surface	
Release fork bushing inner surface <3.0L engine>	
Piston and piston cup	Brake fluid SAE J1703 (DOT3)
Release cylinder inner surface	

GROUP 22A

MANUAL TRANSAXLE

CONTENTS

GENERAL DESCRIPTION 22A-2

MANUAL TRANSAXLE DIAGNOSIS 22A-5
- INTRODUCTOIN 22A-5
- TROUBLESHOOTING STRATEGY 22A-5
- SYMPTOM CHART 22A-5
- SYMPTOM PROCEDURES 22A-6

SPECIAL TOOLS 22A-10

ON-VEHICLE SERVICE 22A-11
- TRANSAXLE OIL LEVEL CHECK 22A-11
- TRANSAXLE OIL REPLACEMENT 22A-11

TRANSAXLE CONTROL* 22A-12
- REMOVAL AND INSTALLATION 22A-12

SHIFT LEVER ASSEMBLY 22A-15
- DISASSEMBLY AND REASSEMBLY 22A-15

TRANSAXLE ASSEMBLY 22A-16
- REMOVAL AND INSTALLATION 22A-16

SPECIFICATIONS 22A-26
- FASTENER TIGHTENING SPECIFICATIONS 22A-26
- LUBRICANT 22A-26

WARNINGS REGARDING SERVICING OF SUPPLEMENTAL RESTRAINT SYSTEM (SRS) EQUIPPED VEHICLES

⚠ ***WARNING***

- ***Improper service or maintenance of any component of the SRS, or any SRS-related component, can lead to personal injury or death to service personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).***
- ***Service or maintenance of any SRS component or SRS-related component must be performed only at an authorized MITSUBISHI dealer.***
- ***MITSUBISHI dealer personnel must thoroughly review this manual, and especially its GROUP 52B - Supplemental Restraint System (SRS) before beginning any service or maintenance of any component of the SRS or any SRS-related component.***

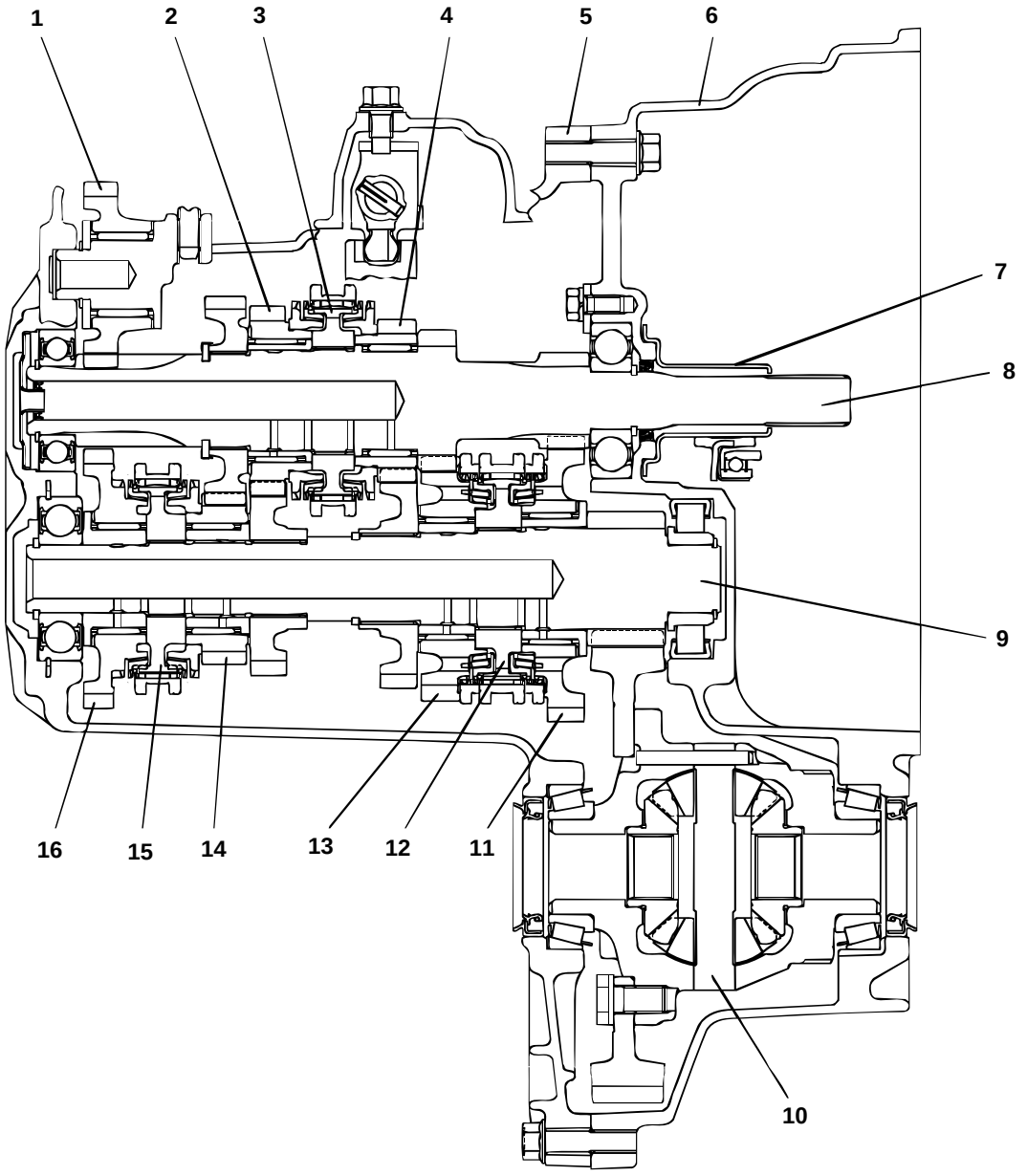
NOTE
The SRS includes the following components: SRS air bag control unit, SRS warning light, front impact sensors, air bag module, clock spring, and interconnecting wiring. Other SRS-related components (that may have to be removed/installed in connection with SRS service or maintenance) are indicated in the table of contents by an asterisk (*).

GENERAL INFORMATION

M1221000100558

ITEMS		SPECIFICATIONS		
Transaxle model		F5M42-2-F6ND	F5M51-F5N2	F5M51-S5N
Engine model		4G64 (2.4L Engine)	6G72 (3.0L Engine) <Vehicles without variable induction system>	6G72 (3.0L Engine) <Vehicles with variable induction system>
Transaxle type		5-speed forward, 1-speed reverse constant mesh		
Gear ratio	1st	3.583	3.333	2.928
	2nd	1.947	2.105	1.950
	3rd	1.379	1.407	1.407
	4th	1.030	1.031	1.031
	5th	0.767	0.761	0.720
	Reverse	3.363	3.416	3.416
Final gear ratio (Differential gear ratio)		3.722	3.736	4.111
Speedometer gear ratio		29/36	28/36	28/36

SECTIONAL VIEW <F5M42>

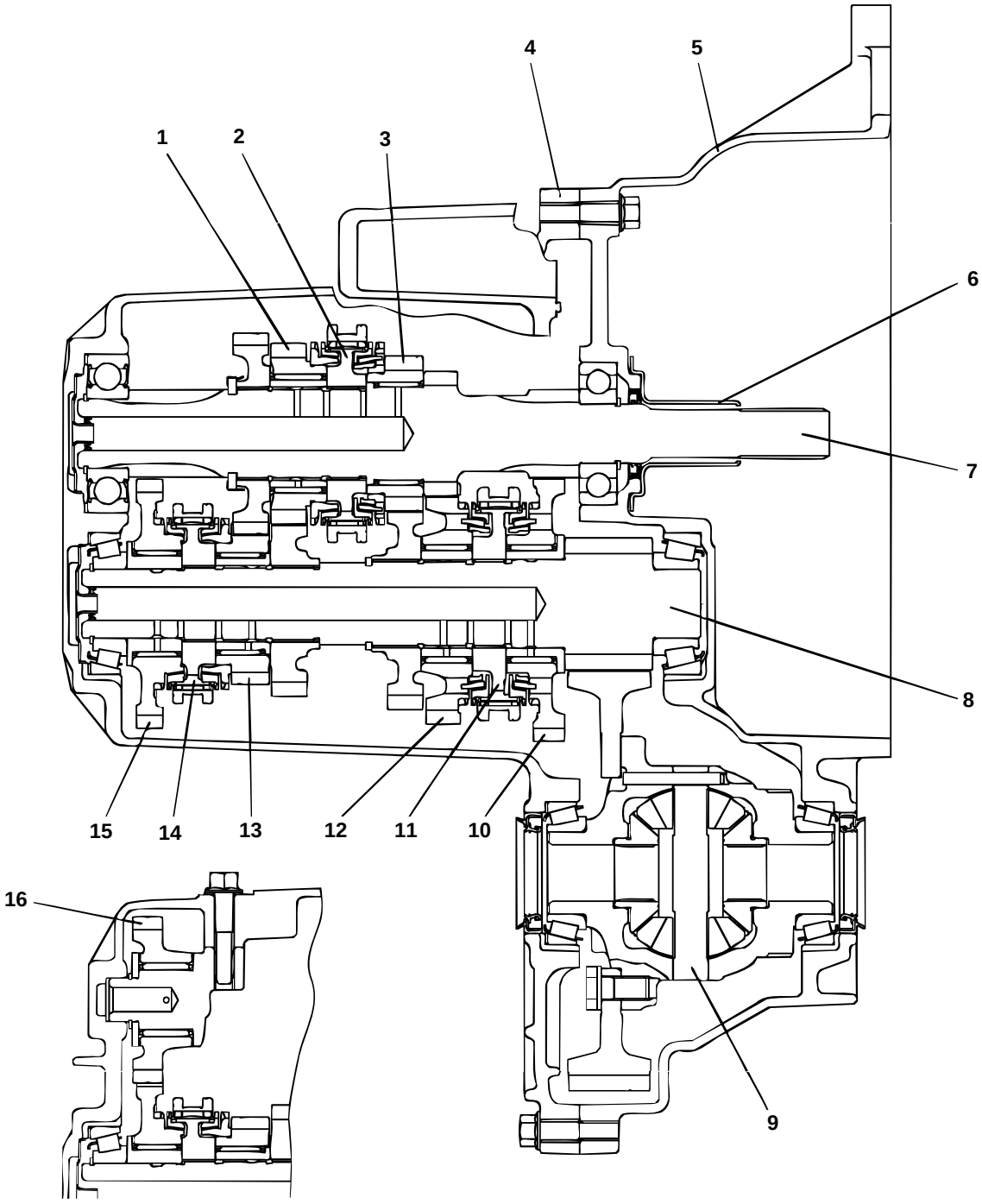


AC001599 AB

1. REVERSE IDLER GEAR
2. 4TH SPEED GEAR
3. 3RD-4TH SPEED SYNCHRONIZER HUB
4. 3RD SPEED GEAR
5. TRANSAXLE CASE
6. CLUTCH HOUSING
7. RELEASE BEARING RETAINER
8. INPUT SHAFT
9. OUTPUT SHAFT
10. DIFFERENTIAL
11. 1ST SPEED GEAR
12. 1ST-2ND SPEED SYNCHRONIZER HUB
13. 2ND SPEED GEAR
14. 5TH SPEED GEAR
15. 5TH-REVERSE SPEED SYNCHRONIZER HUB
16. REVERSE GEAR

TSB Revision

<F5M51>



AC001600AB

1. 4TH SPEED GEAR
2. 3RD-4TH SPEED SYNCHRONIZER HUB
3. 3RD SPEED GEAR
4. TRANSAXLE CASE
5. CLUTCH HOUSING
6. RELEASE BEARING RETAINER
7. INPUT SHAFT
8. OUTPUT SHAFT
9. DIFFERENTIAL
10. 1ST SPEED GEAR
11. 1ST-2ND SPEED SYNCHRONIZER HUB
12. 1ST-2ND SPEED SYNCHRONIZER HUB
13. 5TH SPEED GEAR
14. 5TH-REVERSE SPEED SYNCHRONIZER HUB
15. REVERSE GEAR
16. REVERSE IDLER GEAR

TSB Revision

MANUAL TRANSAXLE DIAGNOSIS

INTRODUCTION

M1221006900615

The manual transaxle can exhibit any of the following symptoms: noise or vibration is generated, oil leaks, shifting gears is hard or troublesome, or the transaxle jumps out of gear.

The causes of these symptoms could come from: incorrect mounting, the oil level may be low, or a component of the transaxle may be faulty.

TROUBLESHOOTING STRATEGY

M1221007000529

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted most of the possible ways to find a manual transaxle fault.

1. Gather information from the customer.
2. Verify that the condition described by the customer exists.
3. Find the malfunction by following the Symptom Chart.
4. Verify malfunction is eliminated.

SYMPTOM CHART

M1221007100504

SYMPTOMS	INSPECTION PROCEDURE	REFERENCE PAGE
Noise, vibration	1	P.22A-6
Oil leaks	2	P.22A-8
Hard shifting	3	P.22A-8
Jumps out of gear	4	P.22A-9

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Noise, Vibration

DIAGNOSIS

STEP 1. Check the idle speed.

Q: Does the idle speed meet the standard values?

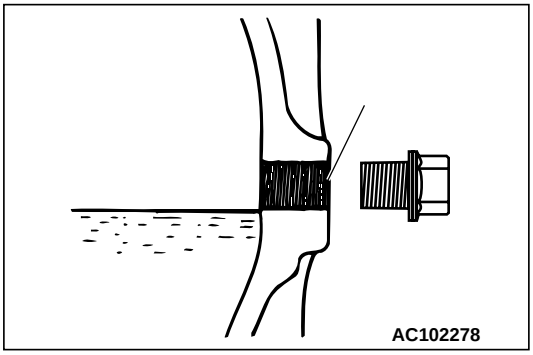
YES : Go to Step 2.
NO : Refer to GROUP 11A, On-vehicle Service – Curb Idle Speed Check <2.4L ENGINE>P.11A-7 or GROUP 11C, On-vehicle Service – Curb Idle Speed Check <3.0L ENGINE>P.11C-7.

STEP 2. Check whether the transaxle and engine mount is loose or damaged.

Q: Are the transaxle and engine mount loose or damaged?

YES : Tighten or replace the part. Then go to Step 7.
NO : Go to Step 3.

STEP 3. Check that the oil level is up to the lower edge of the filler plug hole.



Q: Is the oil level up to the lower edge of the filler plug hole?

YES : Go to Step 4.
NO : Refill gear oil SAE 75W – 90W or 75W – 85W conforming to API classification GL-4. Then go to Step 7.

STEP 4. Check for the specified oil.

Q: Is the specified oil gear oil SAE 75W – 90W or 75W – 85W conforming to API classification GL-4?

YES : Go to Step 5.
NO : If in doubt, replace the oil. Refer to P.22A-11. Then go to Step 7.

STEP 5. Remove the transaxle. Check the end play of the input and output shafts.

Q: Does the end play of the input and output shafts meet the standard value?

YES : Go to Step 6.
NO : Adjust the end play of the input and output shafts. Then go to Step 7.

STEP 6. Disassemble the transaxle. Check the gears for wear and damage.

Q: Are the gears worn or damaged?

YES : Replace the gears. Go to Step 7.
NO : Go to Step 7.

STEP 7. Check trouble symptoms.

Q: Is the noise or vibration still there?

YES : Return to Step 1.
NO : This diagnosis is complete.

INSPECTION PROCEDURE 2: Oil Leaks

DIAGNOSIS

STEP 1. Visual check.
Raise the vehicle, and check for oil leaks. If oil leak is difficult to locate, steam clean the transaxle and drive the vehicle for at 10 minutes. Then check the leak again.

Q: Is the oil leak(s) found?
YES : Go to Step 2.
NO : Check for the oil leak(s) around the engine. Then go to Step 4.

STEP 2. Visual check at the clutch housing.

Q: Do oil leaks appear around the joint between the engine and the clutch housing?
YES : Remove the transaxle. Check the input shaft oil seal, and replace if necessary. Then go to Step 4.
NO : Go to Step 3.

STEP 3. Check the oil seal or O-ring for damage.

Q: Is the oil seal or O-ring damaged?
YES : Replace the oil seal or the O-ring. Then go to Step 4.
NO : Go to Step 4.

STEP 4. Check trouble symptoms.

Q: Is the oil still leaking?
YES : Return to Step 1.
NO : This diagnosis is complete.

INSPECTION PROCEDURE 3: Hard Shifting

DIAGNOSIS

STEP 1. Check the transaxle control

Q: Are the shift cable and the select cable in good condition?
YES : Go to Step 2.
NO : Repair or replace the shift cable and the select cable. Refer to P.22A-12. Then go to Step 7.

STEP 2. Check the transaxle oil.

Q: Is the oil dirty?
YES : Replace the oil. Refer to P.22A-11. Then go to Step 7 .
NO : Go to Step 3.

STEP 3. Check the clutch system.

Q: Is the clutch system normal?
YES : Go to Step 4.
NO : Repair or replace the clutch system. Refer to P.21A-2. Then go to Step 7.

STEP 4. Remove and disassemble the transaxle. Check the control housing.

Q: Is the control housing in good condition?
YES : Go to Step 5.
NO : Repair or replace the control housing. Refer to GROUP 22B, Transaxle P.22B-8. Then go to Step 7.

STEP 5. Check for poor meshing of worn synchronizer ring and gear cone.

Q: Is poor meshing or worn synchronizer ring and gear cone found?
YES : Repair or replace the synchronizer ring and gear cone. Then go to Step 7.
NO : Go to Step 6.

STEP 6. Check the synchronizer spring for weakness.

Q: Is the synchronizer spring weak?
YES : Replace the synchronizer spring. Then go to Step 7.
NO : Go to Step 7.

STEP 7. Check trouble symptoms.

Q: Is the shifting of the gears still hard?
YES : Return to Step 1.
NO : This diagnosis is complete.

INSPECTION PROCEDURE 4: Jumps Out of Gear

DIAGNOSIS

STEP 1. Check the transaxle control

Q: Are the shift cable and the select cable in good condition?
YES : Go to Step 2.
NO : Repair or replace the shift cable and the select cable. Refer to P.22A-12. Then go to Step 6.

STEP 2. Remove and disassemble the transaxle. Check the poppet spring for breakage.

Q: Is the poppet spring broken?
YES : Replace the poppet spring. Refer to GROUP 22B, Transaxle P.22B-8. Then go to Step 6.
NO : Go to Step 3.

STEP 3. Check the control housing.

Q: Is the control housing in good condition?
YES : Go to Step 4.
NO : Repair or replace the control housing. Refer to GROUP 22B, Transaxle P.22B-8. Then go to Step 6.

STEP 4. Check the gear shift forks for wear.

Q: Is the gear shift forks worn?
YES : Replace the gear shift fork. Refer to GROUP 22B, Transaxle P.22B-8. Then go to Step 6.
NO : Go to Step 5.

STEP 5. Check the clearance.

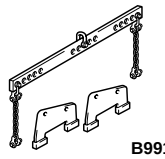
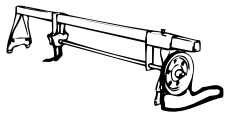
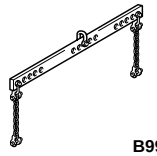
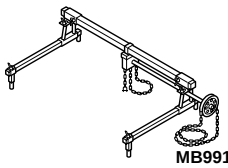
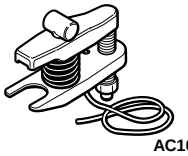
Q: Is the clearance between the synchronizer hub and sleeve excessive?
YES : Replace the synchronizer hub or sleeve. Refer to GROUP 22B, Input Shaft P.22B-23, Output Shaft P.22B-33. Then go to Step 6.
NO : Go to Step 6.

STEP 6. Check trouble symptoms.

Q: Does the transaxle still jumps out of gear?
YES : Return to Step 1.
NO : This diagnosis is complete.

SPECIAL TOOLS

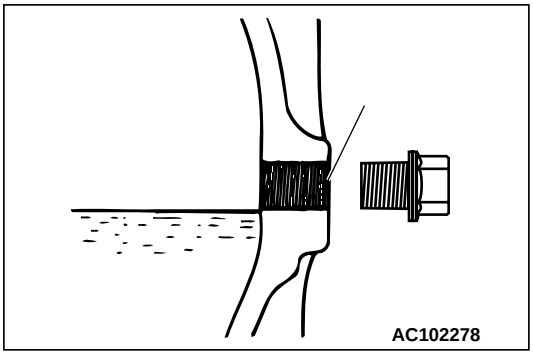
M1221000600564

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 B991453	MB991453 Engine hanger attachment set	MZ203827-01	When an engine lifer is used: Supporting the engine assembly during removal and installation of the transaxle
 MZ203827	GENERAL SERVICE TOOL MZ203827 Engine lifter	MZ203827-01	
 B991454	MB991454 Engine hanger balancer	MZ203827-01	When the engine hanger is used: Supporting the engine assembly during removal and installation of the transaxle *NOTE: Special tool MB991454 is a part of engine hanger attachment set MB991453.*
 MB991895	MB991895 Engine hanger	–	
 AC106827	MB991897 Ball joint remover	MB991113-01, MB990635-01 or general service tool	Knuckle and tie rod end ball joint breakaway torque check *NOTE: Steering linkage puller(MB990635 or MB991113)is also used to disconnect knuckle and tie rod end ball joint.*

ON-VEHICLE SERVICE

TRANSAXLE OIL LEVEL CHECK

M1221000900383

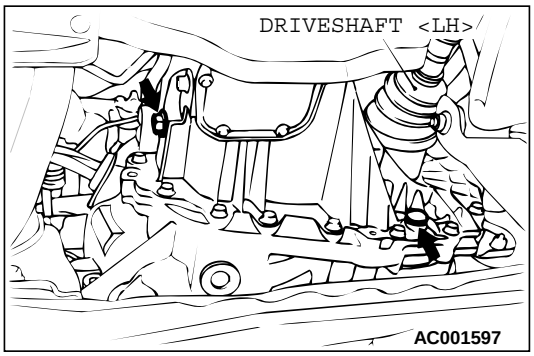


1. Remove the filler plug.
2. Check that the oil level is up to the lower edge of the filler plug hole.
3. Check that the oil is not noticeably dirty.
4. Tighten the filler plug to the specified torque.

   Tightening torque: 32 ± 2 N·m (24 ± 1 ft-lb)

TRANSAXLE OIL REPLACEMENT

M1221001000297



1. Remove the filler plug.
2. Remove the drain plug and drain the oil.
3. Tighten the drain plug to the specified torque.

   Tightening torque: 32 ± 2 N·m (24 ± 1 ft-lb)
4. Fill with gear oil SAE 75W – 90W or 75W – 85W conforming to API classification GL-4 until the level comes to the lower portion of filler plug hole.

   Quantity:

   <F5M42> 2.2 dm^3 (2.3 quarts)

   <F5M51> 2.8 dm^3 (3.0 quarts)
5. Tighten the filler plug to the specified torque.

   Tightening torque: 32 ± 2 N·m (24 ± 1 ft-lb)

TRANSAXLE CONTROL

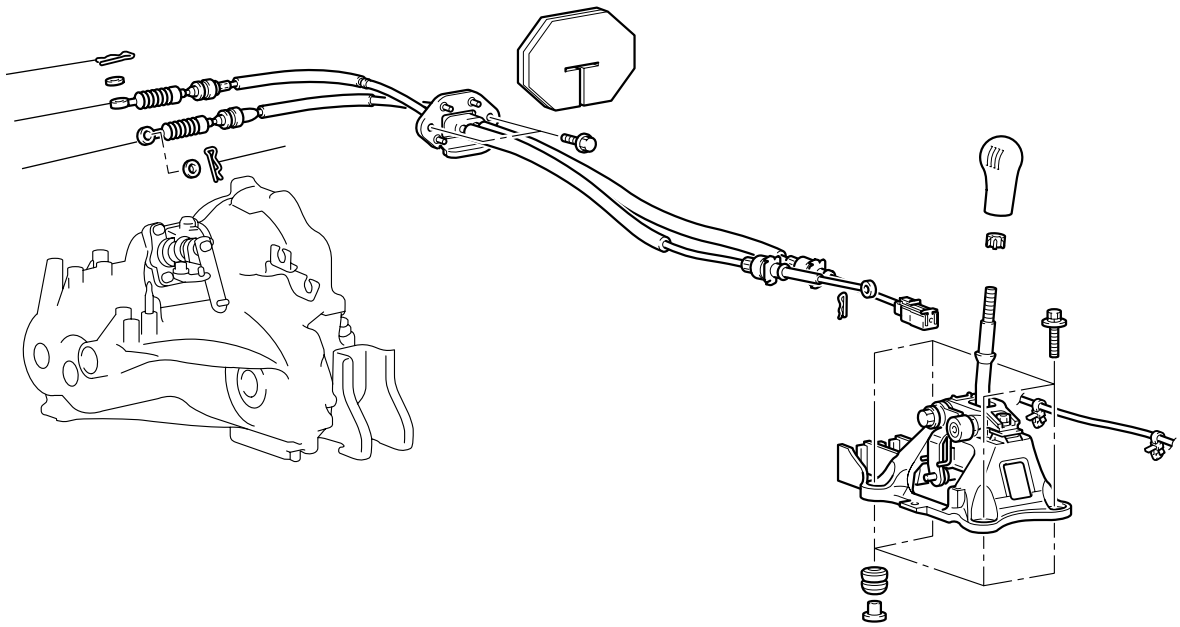
REMOVAL AND INSTALLATION

M1221003800460

⚠ ***WARNING***

Be careful not to subject the SRS-ECU to any shocks during removal and installation of the shift cable and select cable assembly.

Pre-removal and Post-installation Operation
- Air Cleaner Assembly Removal and Installation (Refer to GROUP 15, Air Cleaner P.15-6.)
- Battery and Battery Tray Removal and Installation. (Refer to GROUP 54A, Battery P.54A-8.)



AC001625

SHIFT CABLE AND SELECT CABLE ASSEMBLY REMOVAL STEPS

>>B<< 1. SHIFT KNOB
>>B<< 2. SLEEVE
- FLOOR CONSOLE BOX (REFER TO GROUP 52A, FLOOR CONSOLE P.52A-8.)

3. SNAP PIN
4. SELECT CABLE CONNECTION (SHIFT LEVER SIDE)

<<A>> >>A<< 5. SHIFT CABLE CONNECTION (SHIFT LEVER SIDE)

6. SNAP PIN
>>C<< 7. SELECT CABLE CONNECTION (TRANSAXLE SIDE)
>>C<< 8. SHIFT CABLE CONNECTION (TRANSAXLE SIDE)
- HEATER/COOLER UNIT (REFER TO GROUP 55, HEATER/ COOLER UNIT, HEATER CORE AND EVAPORATOR P.55-35.)

SHIFT CABLE AND SELECT CABLE ASSEMBLY REMOVAL STEPS (Continued)

>>C<< 9. SHIFT CABLE AND SELECT CABLE ASSEMBLY

SHIFT LEVER ASSEMBLY REMOVAL STEPS

>>B<< 1. SHIFT KNOB
>>B<< 2. SLEEVE
- FLOOR CONSOLE BOX (GROUP 52A, FLOOR CONSOLE P.52A-8.)

3. SNAP PIN
4. SELECT CABLE CONNECTION (SHIFT LEVER SIDE)

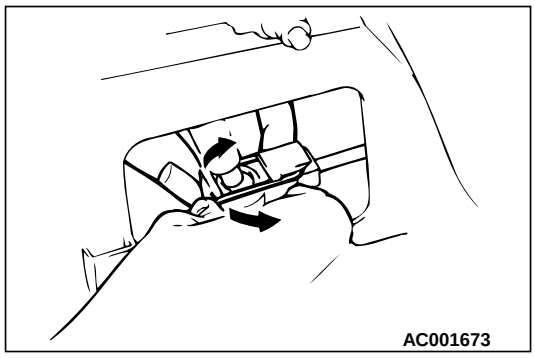
<<A>> >>A<< 5. SHIFT CABLE CONNECTION (SHIFT LEVER SIDE)

10. SHIFT LEVER ASSEMBLY

TSB Revision

REMOVAL SERVICE POINT

<<A>> SHIFT CABLE CONNECTION (SHIFT LEVER SIDE) REMOVAL

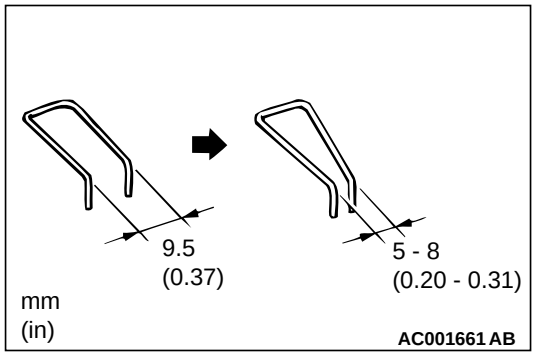


⚠ CAUTION
Be careful not to disengage the clip from the shift cable or deform it.

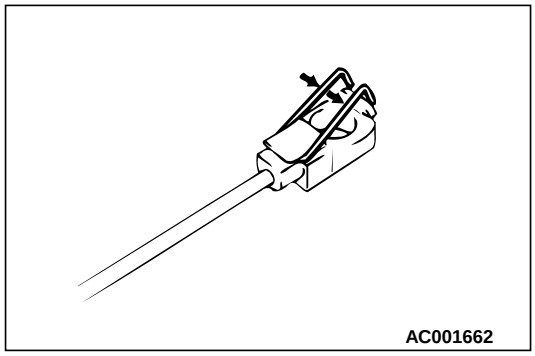
Expand the clip at the shift cable end toward the arrow direction, and remove the cable from the shift lever by pushing the shift cable down.

INSTALLATION SERVICE POINTS

>>A<< SHIFT CABLE CONNECTION (SHIFT LEVER SIDE) INSTALLATION



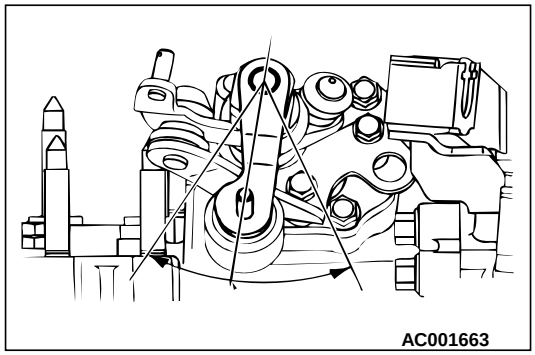
1. Make sure that there is no excessive play at the shift cable end clip. If there is excessive play or the clip is disengaged from the shift cable end, check the clip opening gap. If the gap is more than 9.5 mm (0.37 inch), squeeze the clip until the relaxed gap reaches 5 to 8 mm (0.20 to 0.31 inch).



2. Engage the clip with the shift cable hook securely, and push the clip with your thumbs until it clicks in place.
3. Install the shift cable to the shift lever.

>>B<< SLEEVE/SHIFT KNOB INSTALLATION

1. Place the sleeve over the shift lever end.
2. Place the shift knob over the sleeve.
3. Screw in the shift knob. When the shift knob is hard to turn (approximately seven turns), screw in the shift knob four additional turns until its shift pattern faces forward.


AC001663

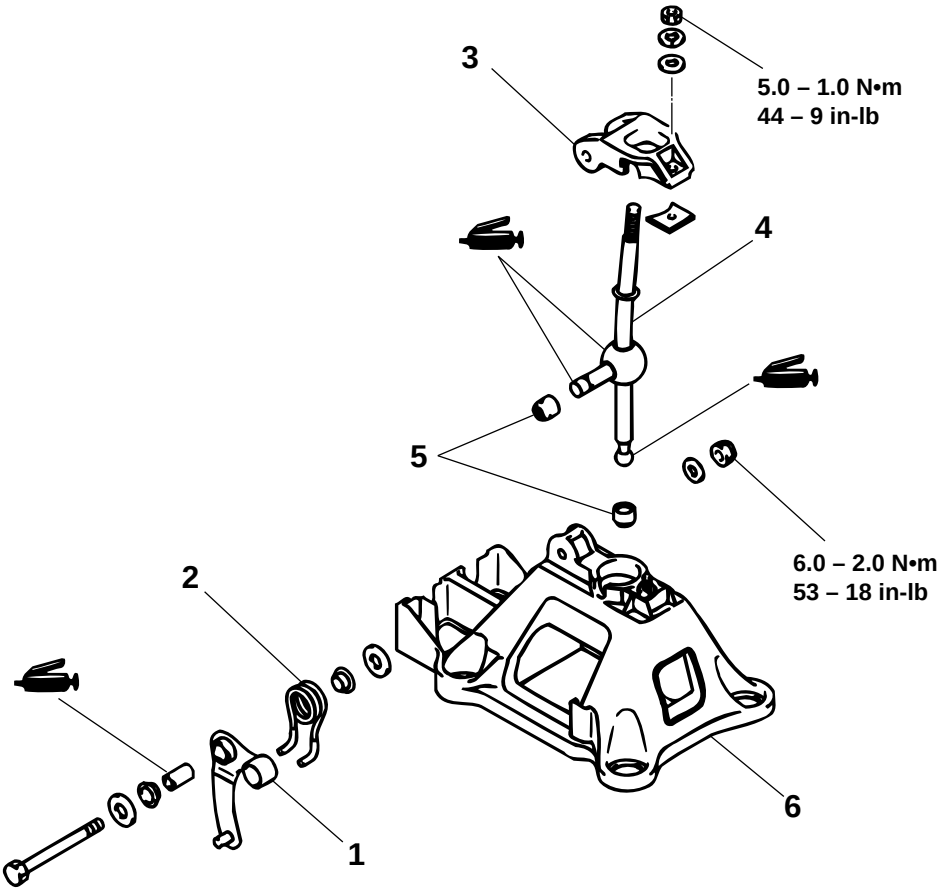
>>C<< SHIFT CABLE AND SELECT CABLE ASSEMBLY/ SHIFT CABLE CONNECTION/SELECT CABLE CONNECTION

1. Set the transaxle side shift lever and the passenger compartment side shift lever to the neutral position.
2. For the transaxle side, the white and yellow paint marks on the shift and select cable ends should face the snap pins.
3. Move the shift lever to all positions and check that the operation is smooth.

SHIFT LEVER ASSEMBLY

DISASSEMBLY AND ASSEMBLY

M1221004000100



AC001626AB

DISASSEMBLY STEPS

1. SELECT LEVER
2. RETURN SPRING
3. RETAINER

DISASSEMBLY STEPS

4. SHIFT LEVER
5. SHIFT LEVER BUSHING
6. LEVER BASE

TSB Revision

TRANSAXLE ASSEMBLY

REMOVAL AND INSTALLATION

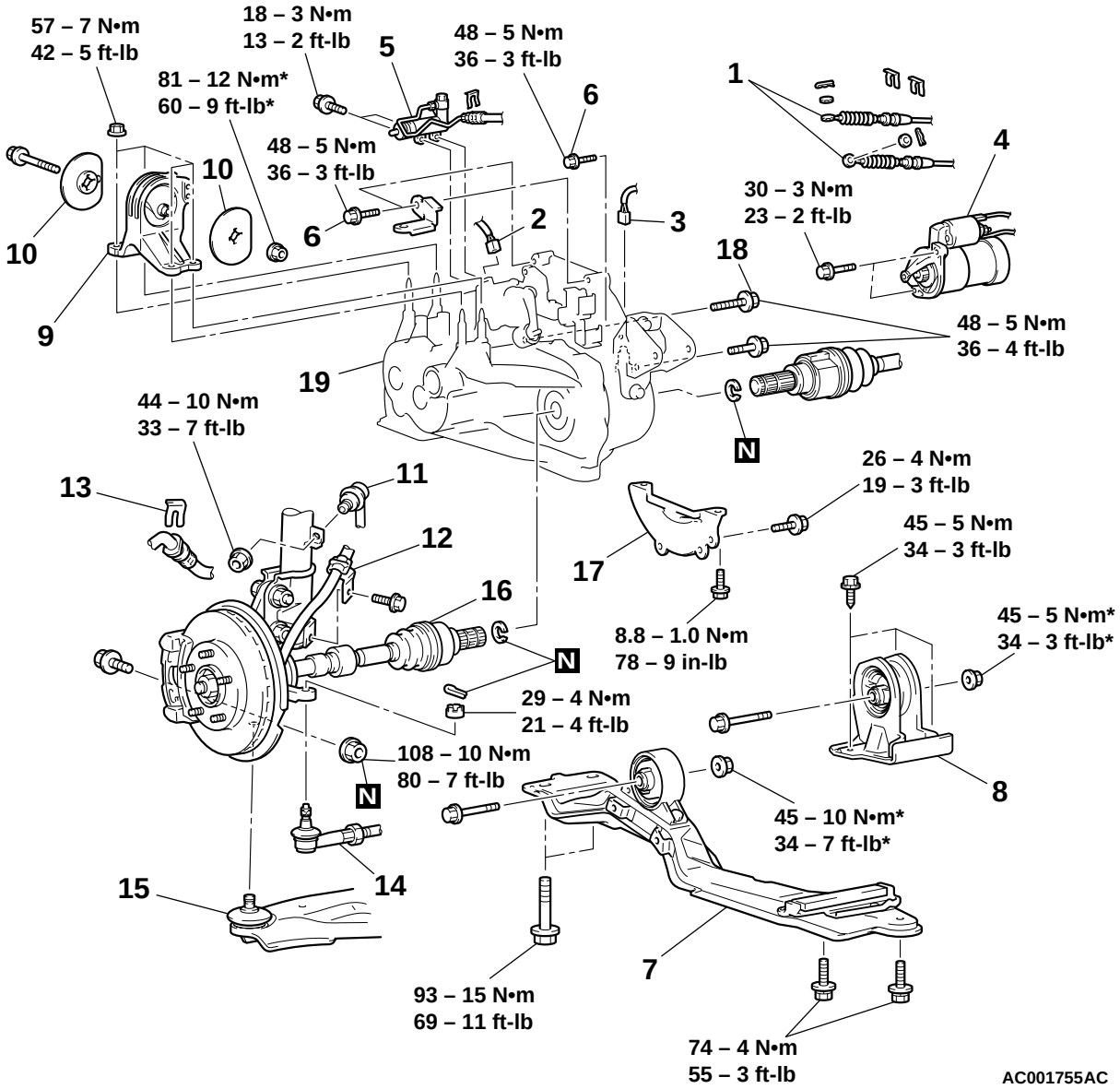
M1221002700158

<2.4L ENGINE>

⚠ CAUTION

***: Indicates parts which should be temporarily tightened, and then fully tightened after placing the vehicle horizontally and loading the full weight of the engine on the vehicle body.**

Pre-removal Operation	Post-installation Operation
• Transaxle Oil Draining (Refer to P.22A-11.) • Battery and Battery Tray Removal (Refer to GROUP 54A, Battery P.54A-8.) • Air Cleaner Assembly Removal (Refer to GROUP 15, Air Cleaner P.15-6.)	• Air Cleaner Assembly Installation (Refer to GROUP 15, Air Cleaner P.15-6.) • Battery and Battery Tray Installation (Refer to GROUP 54A, Battery P.54A-8.) • Transaxle Oil Refilling (Refer to P.22A-11.) • Check the Dust Cover for Cracks or Damage by Pushing it with Finger • Shift Lever Operation Check • Speedometer Operation Check • Wheel Alignment Adjustment (Refer to GROUP 33, On-vehicle Service – Wheel Alignment Check and Adjustment P.33A-6.)



TSB Revision

REMOVAL STEPS

1. SHIFT CABLE AND SELECT CABLE CONNECTION (REFER TO P.22A-12.)
2. BACKUP LIGHT SWITCH CONNECTOR
3. VEHICLE SPEED SENSOR CONNECTOR

<<A>> 4. STARTER MOTOR

<<B>> 5. CLUTCH RELEASE CYLINDER CONNECTION

6. TRANSAXLE ASSEMBLY UPPER PART COUPLING BOLTS

<<C>> 7. CENTERMEMBER ASSEMBLY

8. REAR ROLL STOPPER

<<D>> 9. TRANSAXLE MOUNT BRACKET

REMOVAL STEPS (Continued)

>>C<< 10. TRANSAXLE MOUNT STOPPER

11. STABILIZER LINK CONNECTION <STRUT SIDE>
12. WHEEL SPEED SENSOR CABLE CONNECTION <VEHICLES WITH ABS>
13. BRAKE HOSE CLAMP

<<E>> 14. TIE ROD END CONNECTION

<<E>> 15. LOWER ARM CONNECTION

<<G>> 16. DRIVESHAFT CONNECTION

17. BELL HOUSING COVER
18. TRANSAXLE ASSEMBLY LOWER PART COUPLING BOLTS

<<H>> 19. TRANSAXLE ASSEMBLY

Required Special Tools:

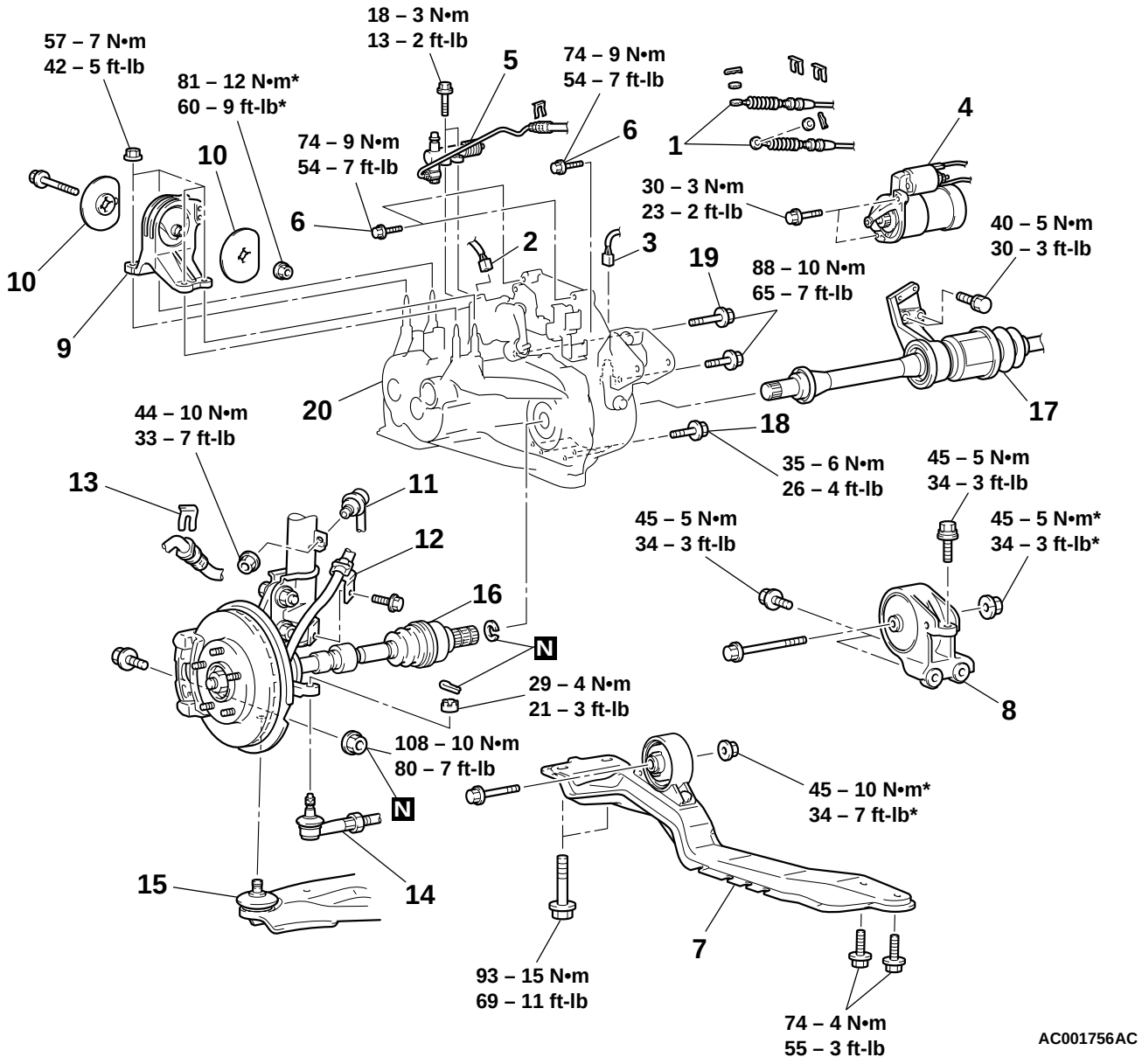
- MB991113: Steering Linkage Puller
- MB991453: Engine hanger attachment set
- MZ203827: Engine Lifter
- MB991454: Engine hanger balancer (MB991453, part of the engine hanger attachment set)
- MB991895: Engine Hanger

<3.0L ENGINE>

⚠ CAUTION

***: Indicates parts which should be temporarily tightened, and then fully tightened after placing the vehicle horizontally and loading the full weight of the engine on the vehicle body.**

Pre-removal Operation	Post-installation Operation
• Transaxle Oil Draining (Refer to P.22A-11.) • Battery and Battery Tray Removal (Refer to GROUP 54A, Battery P.54A-8.) • Air Cleaner Assembly Removal (Refer to GROUP 15, Air Cleaner P.15-6.) • Front Exhaust Pipe Removal (Refer to GROUP 15, Exhaust Pipe P.15-22.)	• Air Cleaner Assembly Installation (Refer to GROUP 15, Air Cleaner P.15-6.) • Battery and Battery Tray Installation (Refer to GROUP 54A, Battery P.54A-8.) • Transaxle Oil Refilling (Refer to P.22A-11.) • Check the Dust Cover for Cracks or Damage by Pushing it with Finger • Shift Lever Operation Check • Speedometer Operation Check • Wheel Alignment Adjustment (Refer to GROUP 33A, On-vehicle Service – Wheel Alignment Check and Adjustment P.33A-6.) • Front Exhaust Pipe Installation (Refer to GROUP 15, Exhaust Pipe P.15-22.)



TSB Revision

REMOVAL STEPS

1. SHIFT CABLE AND SELECT CABLE CONNECTION (REFER TO P.22A-12.)
2. BACKUP LIGHT SWITCH CONNECTOR
3. VEHICLE SPEED SENSOR CONNECTOR

<<A>> 4. STARTER MOTOR

<<B>> 5. CLUTCH RELEASE CYLINDER CONNECTION

6. TRANSAXLE ASSEMBLY UPPER PART COUPLING BOLTS

<<C>> 7. CENTERMEMBER ASSEMBLY

8. REAR ROLL STOPPER

<<D>> 9. TRANSAXLE MOUNT BRACKET

>>C<< 10. TRANSAXLE MOUNT STOPPER

11. STABILIZER LINK CONNECTION <STRUT SIDE>

REMOVAL STEPS (Continued)

12. WHEEL SPEED SENSOR CABLE CONNECTION <VEHICLES WITH ABS>
13. BRAKE HOSE CLAMP

<<E>> 14. TIE ROD END CONNECTION

<<E>> 15. LOWER ARM CONNECTION

<<F>> >>B<< • CLUTCH RELEASE BEARING ENGAGEMENT

<<G>> 16. DRIVESHAFT CONNECTION

<<G>> 17. DRIVESHAFT AND INNER SHAFT CONNECTION

18. UPPER OIL PAN CONNECTING BOLT

19. TRANSAXLE ASSEMBLY LOWER PART COUPLING BOLTS

<<H>> >>A<< 20. TRANSAXLE ASSEMBLY

Required Special Tools:

- MB991113: Steering Linkage Puller
- MB991453: Engine hanger attachment set
- MZ203827: Engine Lifter
- MB991454: Engine hanger balancer (MB991453, part of the engine hanger attachment set)
- MB991895: Engine Hanger

REMOVAL SERVICE POINTS

<<A>> STARTER MOTOR REMOVAL

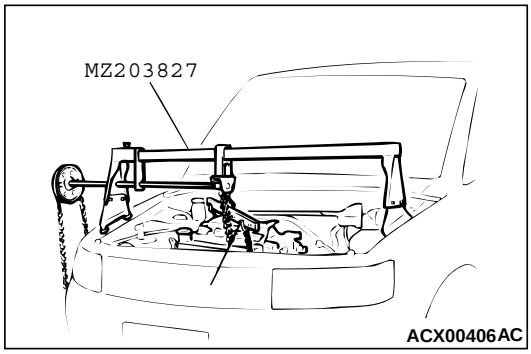
Remove the starter motor with the starter motor harness still connected and secure it inside the engine compartment.

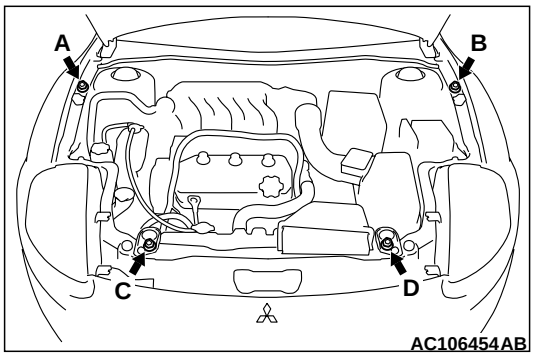
<<B>> CLUTCH RELEASE CYLINDER REMOVAL

Remove the clutch release cylinder without disconnecting the oil line connection, and fix it to the vehicle chassis.

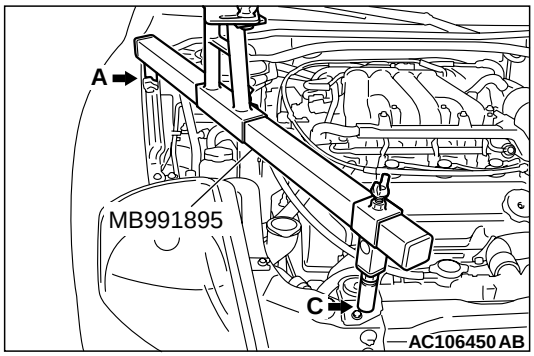
<<C>> CENTERMEMBER ASSEMBLY REMOVAL

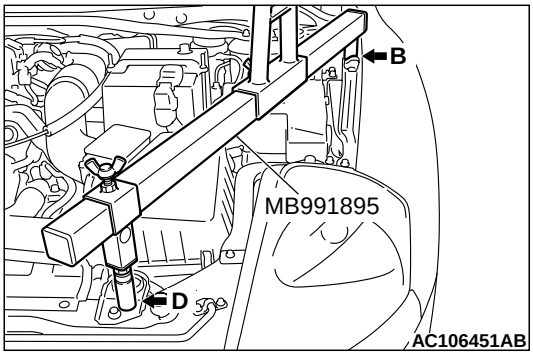
1. <Engine lifter MZ203827 is used>
   Set the special tools MB991453 and MZ203827 to the vehicle to support the engine assembly.





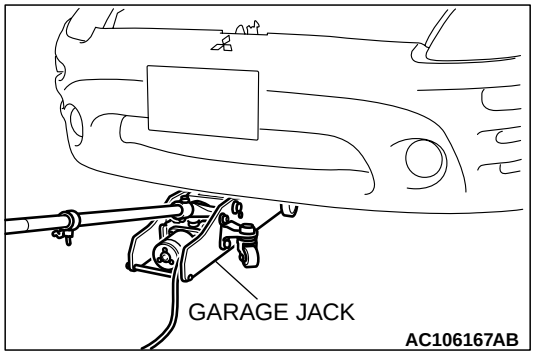
2. <Engine hanger MB991895 is used>
   (1) Set special tool MB991895 to the front fender mounting bolts (A and B) and the radiator support upper insulator mounting bolts (C and D), which are located in the engine compartment, as shown.





<<D>> TRANSAXLE MOUNT BRACKET REMOVAL

Jack up the transaxle assembly gently with a garage jack, and then remove the transaxle mount bracket.

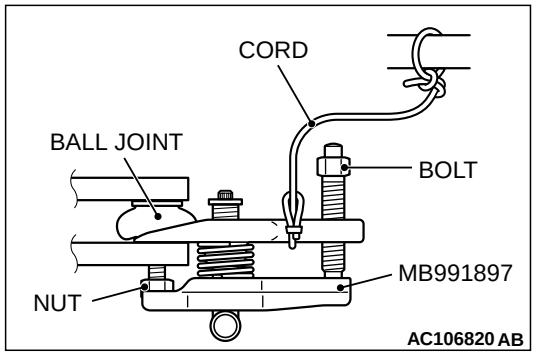


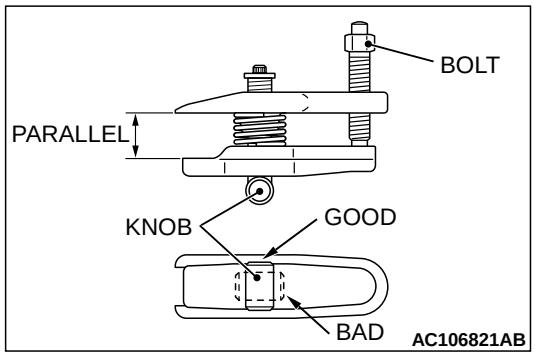
<<E>> TIE ROD END/LOWER ARM BALL JOINT DISCONNECTION

⚠ CAUTION

- **Do not remove the nut from ball joint. Loosen it and use special tool MB991897 to avoid possible damage to ball joint threads.**
- **Hang special tool MB991897 with rope or wire to prevent them from falling.**

1. Install the special tool MB991897 as shown in the figure.





2. After turning the bolt and knob to adjust the insert arms of the special tool MB991897 in parallel, tighten the bolt by hand and confirm that the insert arms are parallel.

   NOTE: When adjusting the insert arms in parallel, turn the knob in the direction shown in the figure.

<<F>> CLUTCH RELEASE BEARING DISENGAGEMENT

1. Remove the service hole plug at the clutch housing.
2. Insert a flat-tipped screwdriver into space between the release bearing and the wedge collar while pushing the release fork to the "A" direction by hand slightly.

⚠ CAUTION

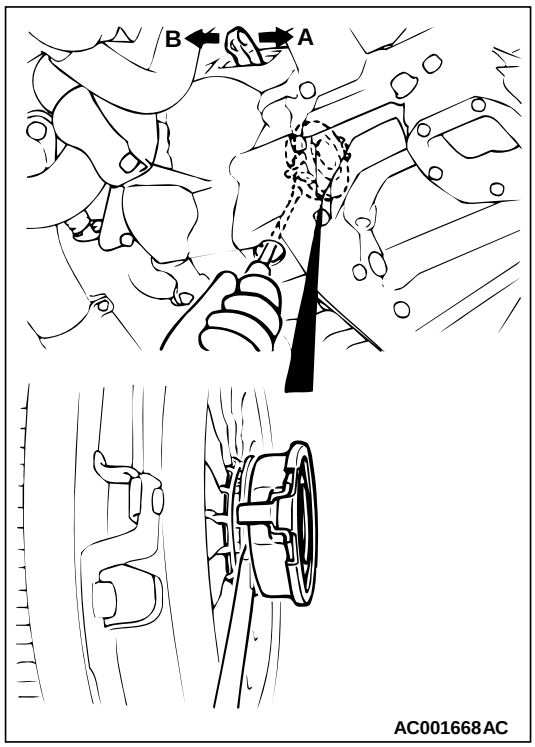
Do not insert the screwdriver before pushing the release fork to the "A" direction.

3. Disengage the wedge collar from the release bearing by using the flat-tipped screwdriver to pry gently (twisting the screwdriver handle 90 degree).

   NOTE: If the release bearing is disengaged, the release fork will move fully to the "B" direction via the return spring.

⚠ CAUTION

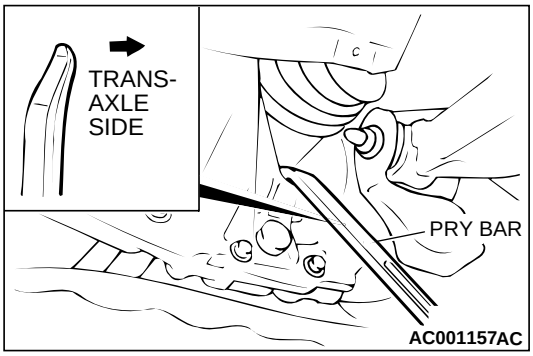
If the screwdriver cannot be twisted easily (the release bearing cannot be disengaged), remove the screwdriver, and push the release fork to the "A" direction two or three times to try again. If the clutch release bearing is pried forcibly, it will be damaged.



<<G>> DRIVESHAFT/DRIVESHAFT AND INNER SHAFT DISCONNECTION

⚠ CAUTION

- **Do not pull on the drive shaft; doing so will damage the TJ; be sure to use a pry bar.**
- **Do not insert a pry bar so deep as to damage the oil seal.**
- **Do not damage the transaxle oil seal with the spline of the drive shaft.**

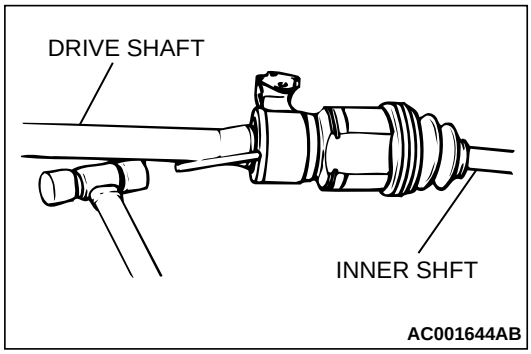


<2.4L ENGINE, 3.0L ENGINE – LH>

1. Insert a pry bar between the transaxle case and the drive shaft as shown to remove the drive shaft.

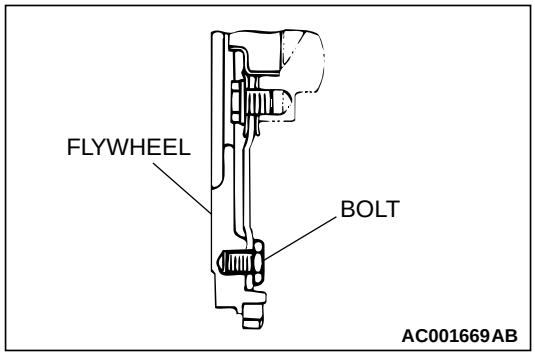
⚠ CAUTION

Do not damage the transaxle oil seal with the spline of the inner shaft.



<3.0L ENGINE – RH>

2. If the inner shaft and transaxle are tightly joined, tap the center bearing bracket lightly with a plastic hammer, etc. to remove the drive shaft and inner shaft from the transaxle.
3. Cover the transaxle case with a shop towel to prevent foreign material from entering it.



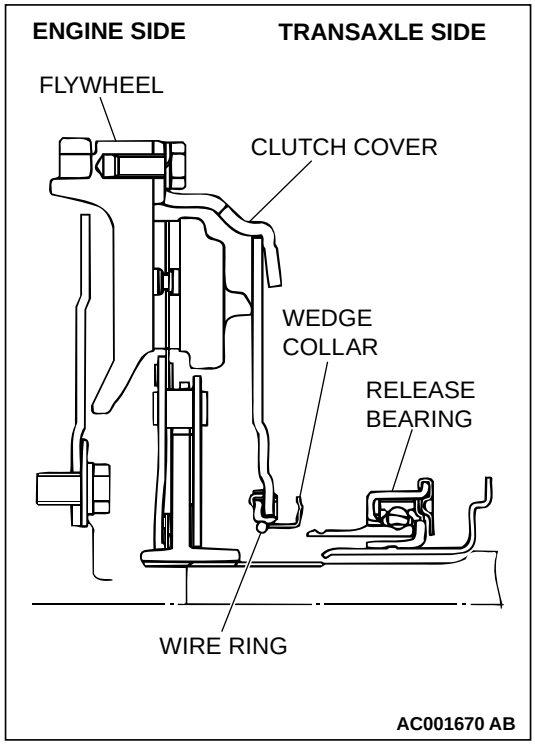
<<H>> TRANSAXLE ASSEMBLY REMOVAL

⚠ CAUTION

Do not remove the flywheel mounting bolt shown by the arrow. If this bolt is removed, the flywheel will become out of balance and damaged.

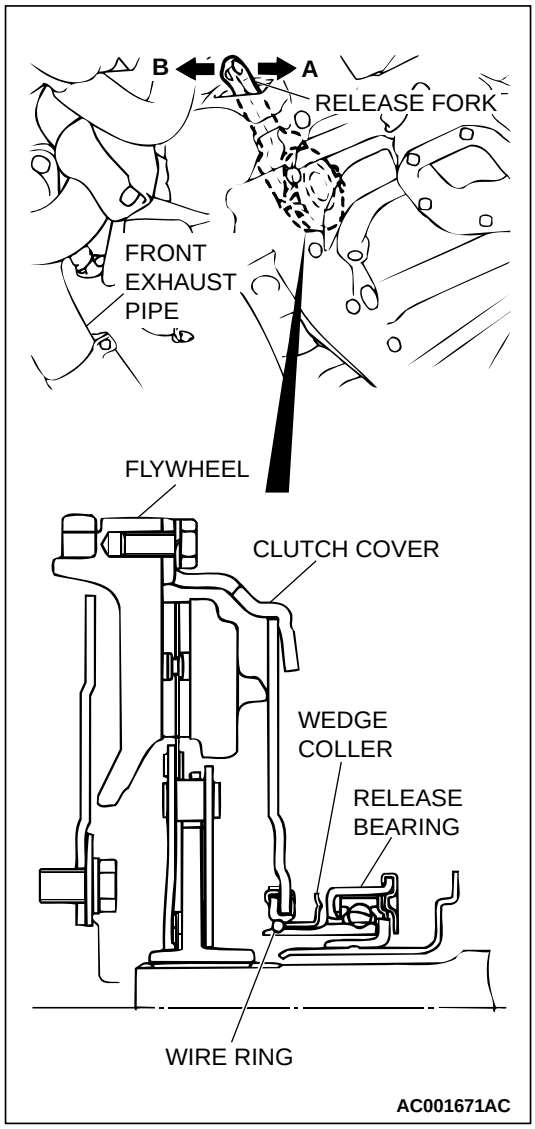
INSTALLATION SERVICE POINTS

>>A<< TRANSAXLE ASSEMBLY INSTALLATION



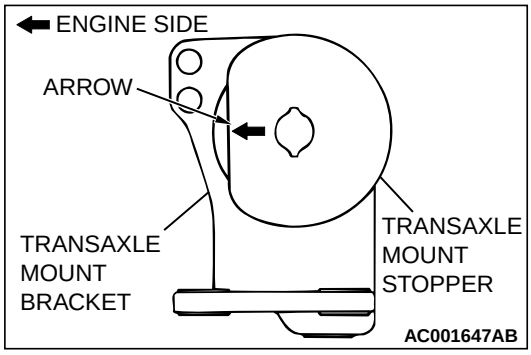
⚠ CAUTION

On the pull-type clutch, do not roll the transaxle assembly when installing it to the engine. If the transaxle assembly is rolled, the wedge collar and the wire ring will be deformed, causing a clutch malfunction due to improper engagement of the wedge collar and the wire ring.



>>B<< CLUTCH RELEASE BEARING CONNECTION

1. Move the release fork to the "A" direction, and engage the release bearing with the wedge collar.
2. When the release fork is moved to the "B" direction, the release fork should drag.



>>C<< TRANSAXLE MOUNT STOPPER INSTALLATION

Install the transaxle mount stopper so that the arrow points as shown in the illustration.

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1221006600089

ITEM		SPECIFICATION
Transaxle assembly		
Bell housing cover (to engine)		8.8 ± 1.0 N·m (78 ± 9 in-lb)
Bell housing cover (to transaxle)		26 ± 4 N·m (19 ± 3 ft-lb)
Center bearing bolt		40 ± 5 N·m (30 ± 3 ft-lb)
Centermember attaching bolt	front side	93 ± 15 N·m (69 ± 11 ft-lb)
	rear side	74 ± 4 N·m (55 ± 3 ft-lb)
Clutch release cylinder		18 ± 3 N·m (13 ± 2 ft-lb)
Front roll stopper bracket nut		45 ± 10 N·m (34 ± 7 ft-lb)
Lower arm nut		108 ± 10 N·m (80 ± 7 ft-lb)
Rear roll stopper bracket attaching bolt		45 ± 5 N·m (34 ± 3 ft-lb)
Rear roll stopper bracket nut		45 ± 5 N·m (34 ± 3 ft-lb)
Stabilizer link nut		44 ± 10 N·m (33 ± 7 ft-lb)
Starter motor		30 ± 3 N·m (23 ± 2 ft-lb)
Tie rod end nut		29 ± 4 N·m (21 ± 4 ft-lb)
Transaxle assembly lower part coupling bolt	2.4L ENGINE	48 ± 5 N·m (36 ± 4 ft-lb)
	3.0L ENGINE	88 ± 10 N·m (65 ± 7 ft-lb)
Transaxle assembly upper part coupling bolt	2.4L ENGINE	48 ± 5 N·m (36 ± 3 ft-lb)
Transaxle assembly upper part coupling bolt (bolt, flange)	3.0L ENGINE	74 ± 9 N·m (54 ± 7 ft-lb)
Transaxle assembly upper part coupling bolt (bolt, washer assembly)	3.0L ENGINE	88 ± 10 N·m (65 ± 7 ft-lb)
Transaxle mount bracket attaching nut		57 ± 7 N·m (42 ± 5 ft-lb)
Transaxle mount stopper attaching nut		81 ± 12 N·m (60 ± 9 ft-lb)
Transmission oil drain plug		32 ± 2 N·m (24 ± 1 ft-lb)
Transmission oil filler plug		32 ± 2 N·m (24 ± 1 ft-lb)
Transaxle control		
Lever base bracket attaching bolt		12 ± 2 N·m (102 ± 22 in-lb)
M/T cable attaching bolt		12 ± 2 N·m (102 ± 22 in-lb)
Retainer nut		5.0 ± 1.0 N·m (44 ± 9 in-lb)
Select lever attaching bolt		6.0 ± 2.0 N·m (53 ± 18 in-lb)

LUBRICANT

M1221000400087

ITEM		SPECIFIED LUBRICANTS	QUANTITY
Transaxle oil dm^3 (qt)	F5M42	Gear oil SAE 75W-90W or 75W-85W conforming to API classification GL-4	2.2 (2.3)
	F5M51		2.8 (3.0)

GROUP 22B

MANUAL TRANSAXLE OVERHAUL

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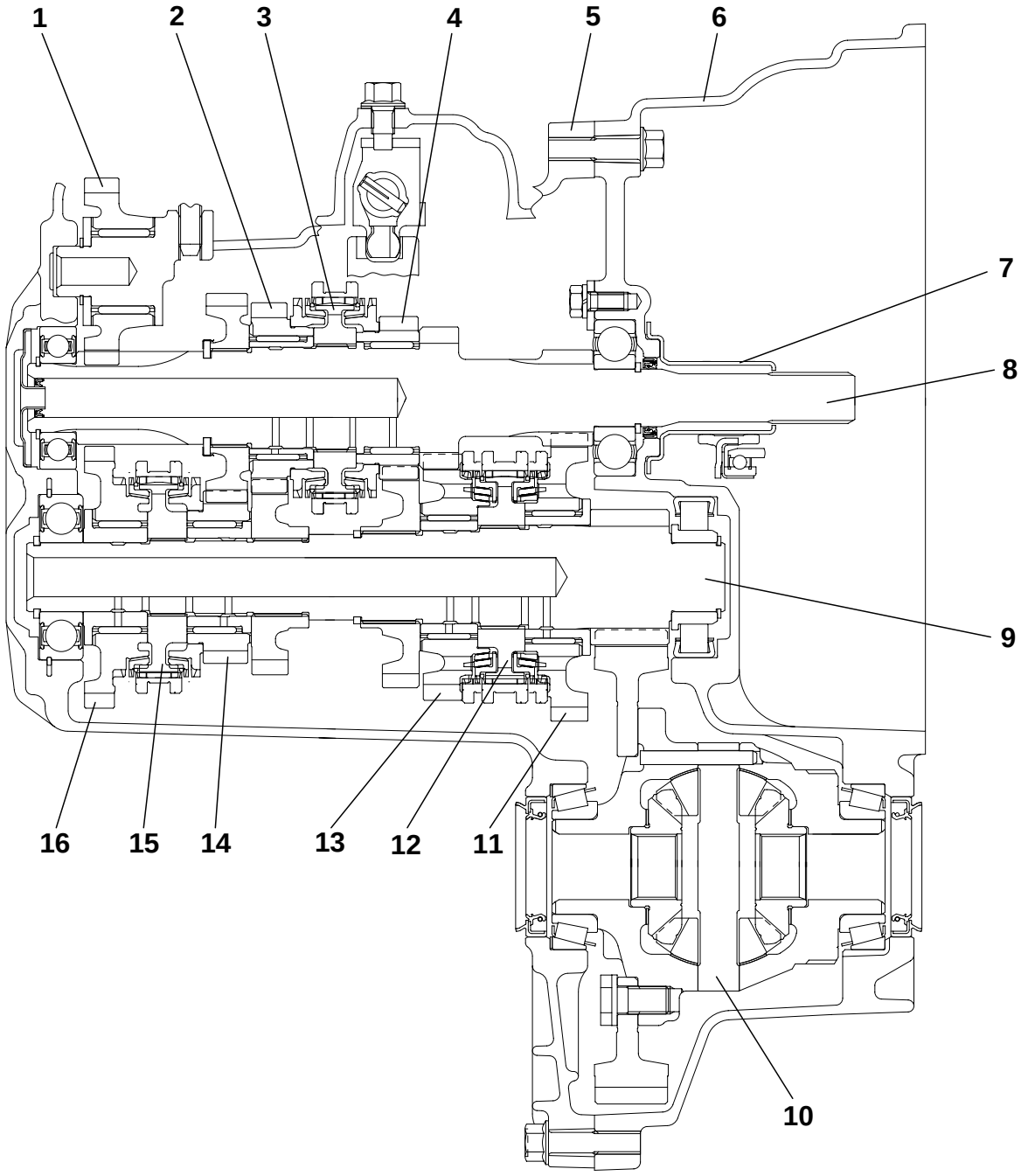
GENERAL INFORMATION

M1222000100023

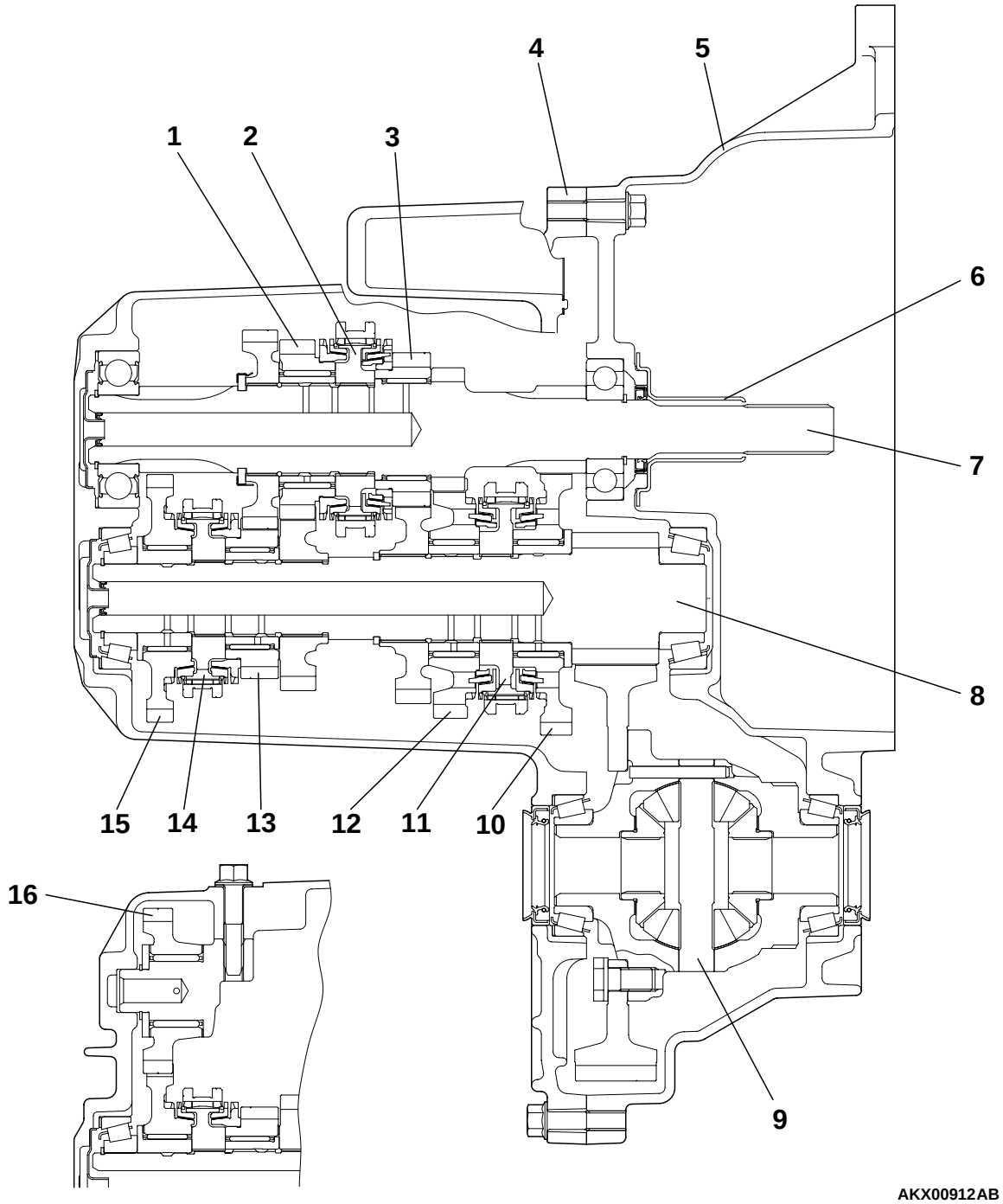
SECTIONAL VIEW<F5M42>



1. REVERSE IDLER GEAR
2. 4TH SPEED GEAR
3. 3RD-4TH SPEED SYNCHRONIZER HUB
4. 3RD SPEED GEAR
5. TRANSAXLE CASE
6. CLUTCH HOUSING
7. RELEASE BEARING RETAINER
8. INPUT SHAFT
9. OUTPUT SHAFT
10. DIFFERENTIAL
11. 1ST SPEED GEAR
12. 1ST-2ND SPEED SYNCHRONIZER HUB
13. 2ND SPEED GEAR
14. 5TH SPEED GEAR
15. 5TH-REVERSE SPEED SYNCHRONIZER HUB
16. REVERSE GEAR

TSB Revision

SECTIONAL VIEW<F5M51>

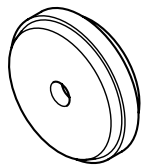
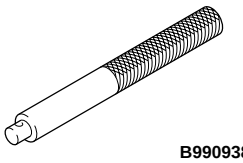
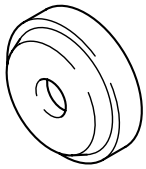
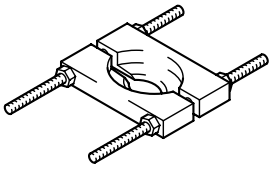
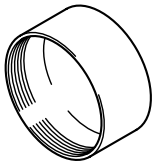
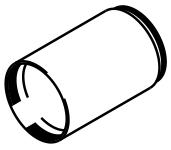
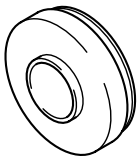


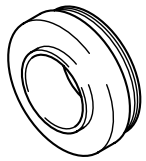
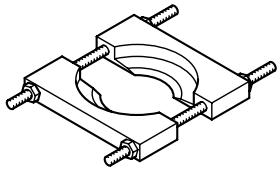
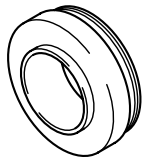
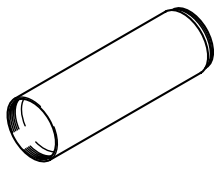
1. 4TH SPEED GEAR
2. 3RD-4TH SPEED SYNCHRONIZER HUB
3. 3RD SPEED GEAR
4. TRANSMISSION CASE
5. CLUTCH HOUSING
6. RELEASE BEARING RETAINER
7. INPUT SHAFT
8. OUTPUT SHAFT
9. DIFFERENTIAL
10. 1ST SPEED GEAR
11. 1ST-2ND SPEED SYNCHRONIZER HUB
12. 2ND SPEED GEAR
13. 5TH SPEED GEAR
14. 5TH-REVERSE SPEED SYNCHRONIZER HUB
15. REVERSE GEAR
16. REVERSE IDLER GEAR

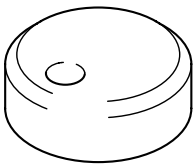
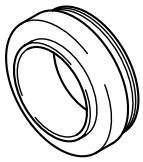
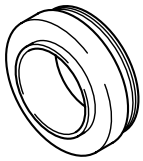
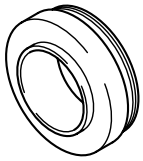
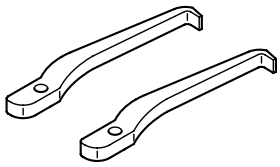
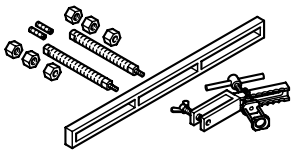
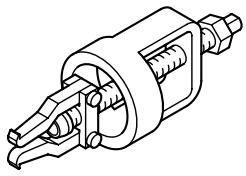
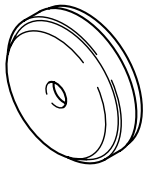
TSB Revision

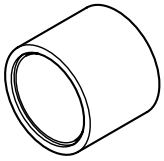
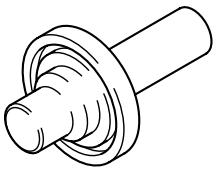
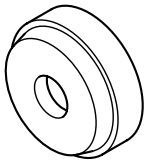
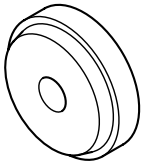
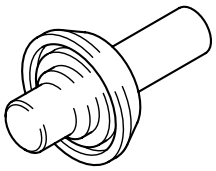
SPECIAL TOOLS

M1222000600028

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
	MB990935 Installer adapter	MB990935-01 OR GENERAL SERVICE TOOL	• Installation of differential case taper roller bearing outer race <F5M42> • Installation of output shaft front taper roller bearing outer race <F5M51>
	MB990938 Handle	MB990938-01	Use with Installer adapter
	MB990927 Installer adapter	MB990927-01 OR GENERAL SERVICE TOOL	Installation of sealing cap <F5M42>
	MD998801 Bearing remover	MD998348-01 OR GENERAL SERVICE TOOL	Installation and removal of gears, bearings and sleeves
	MD998812 Installer cap	GENERAL SERVICE TOOL	Use with Installer and Installer adapter
	MD998813 Installer-100	GENERAL SERVICE TOOL	Use with Installer cap and Installer adapter
	MD998816 Installer adapter (30)	GENERAL SERVICE TOOL	Installation of input shaft front bearing

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
	MD998825 Installer adapter (52)	GENERAL SERVICE TOOL	• Installation of 1st-2nd speed synchronizer hub, 3rd-4th speed synchronizer hub and 1st speed gear sleeve <F5M42> • Installation of 1st speed gear sleeve, 3rd-4th speed synchronizer hub, 4th speed gear sleeve, 5th speed gear and thrust plate stopper <F5M51>
	MD998824 Installer adapter (50)	GENERAL SERVICE TOOL	• Installation of 4th speed gear sleeve and 5th speed gear <F5M42> • Installation of 1st-2nd speed synchronizer hub, 2nd speed gear sleeve and 3rd speed gear <F5M51>
	MD998818 Installer adapter (38)	MD998818	• Installation of input shaft rear bearing, roller bearing inner race, reverse gear sleeve and output shaft rear ball bearing <F5M41> • Installation of input shaft front bearing <F5M51>
	MD998917 Bearing remover	GENERAL SERVICE TOOL	Installation and removal of gears, bearing and sleeves
	MD998819 Installer adapter (40)	GENERAL SERVICE TOOL	• Installation of 5th-reverse speed synchronizer hub, differential case bearing, 4th speed gear and 5th speed gear sleeve <F5M42> • Installation of input shaft rear bearing and output shaft taper roller bearing <F5M51>
	MD998814 Installer-200	MIT304180	Use with Installer cap and Installer adapter

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
	MD998364 Camshaft oil seal installer	MD998364-01	Installation of gear, bearing and sleeve <F5M51>
	MD998822 Installer adapter (46)	GENERAL SERVICE TOOL	Installation of 2nd speed gear sleeve and 3rd speed gear <F5M42>
	MD998821 Installer adapter (44)	MD998821	Installation of 4th speed gear, 5th speed gear sleeve and 5th-reverse speed synchronizer hub <F5M51>
	MD998820 Installer adapter (42)	MIT215013	Installation of reverse gear bearing sleeve <F5M51>
	MD999566 Claw	GENERAL SERVICE TOOL	Removal of taper roller bearing outer race
	MD998772 Valve spring compressor	GENERAL SERVICE TOOL	Removal of output shaft front roller bearing outer race <F5M42>
	MD998346 Bearing outer race remover	MD998346-01 OR GENERAL SERVICE TOOL	Removal of output shaft front roller bearing outer race <F5M42>
	MB990934 Installer adapter	MB990934-01 OR GENERAL SERVICE TOOL	Installation of output shaft front roller bearing outer race <F5M42>

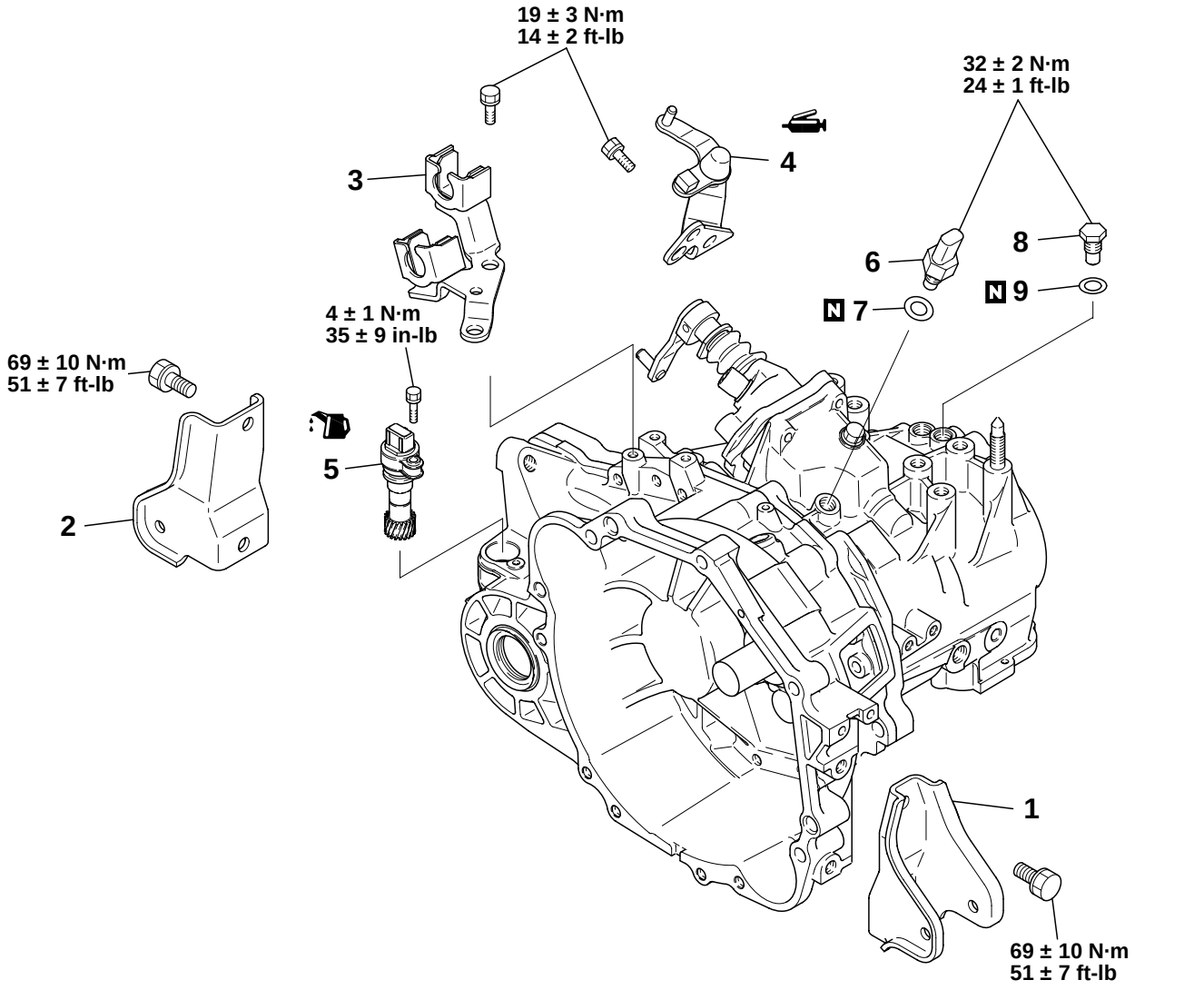
TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
	MB991445 Bushing remover and installer base	MB991445	Installation of differential case taper roller bearing outer race <F5M51>
	MD998800 Oil seal installer	GENERAL SERVICE TOOL	Installation of differential oil seal <F5M51>
	MB990926 Installer adapter	MB990926-01 OR GENERAL SERVICE TOOL	Installation of clutch housing input shaft oil seal <F5M42>
	MB990928 Installer adapter	MB990928-01	Installation of input shaft oil seal <F5M51>
	MD998325 Differential oil seal installer	MD998325-01	Installation of differential oil seal <F5M42>

TRANSAXLE(TRANSMISSION)

DISASSEMBLY AND ASSEMBLY

M1222001000029

<F5M42>



AKX00940AB

DISASSEMBLY STEPS

1. ROLL STOPPER BRACKET, FRONT
2. ROLL STOPPER BRACKET, REAR
3. SHIFT CABLE BRACKET

>>M<< 4. SELECT LEVER

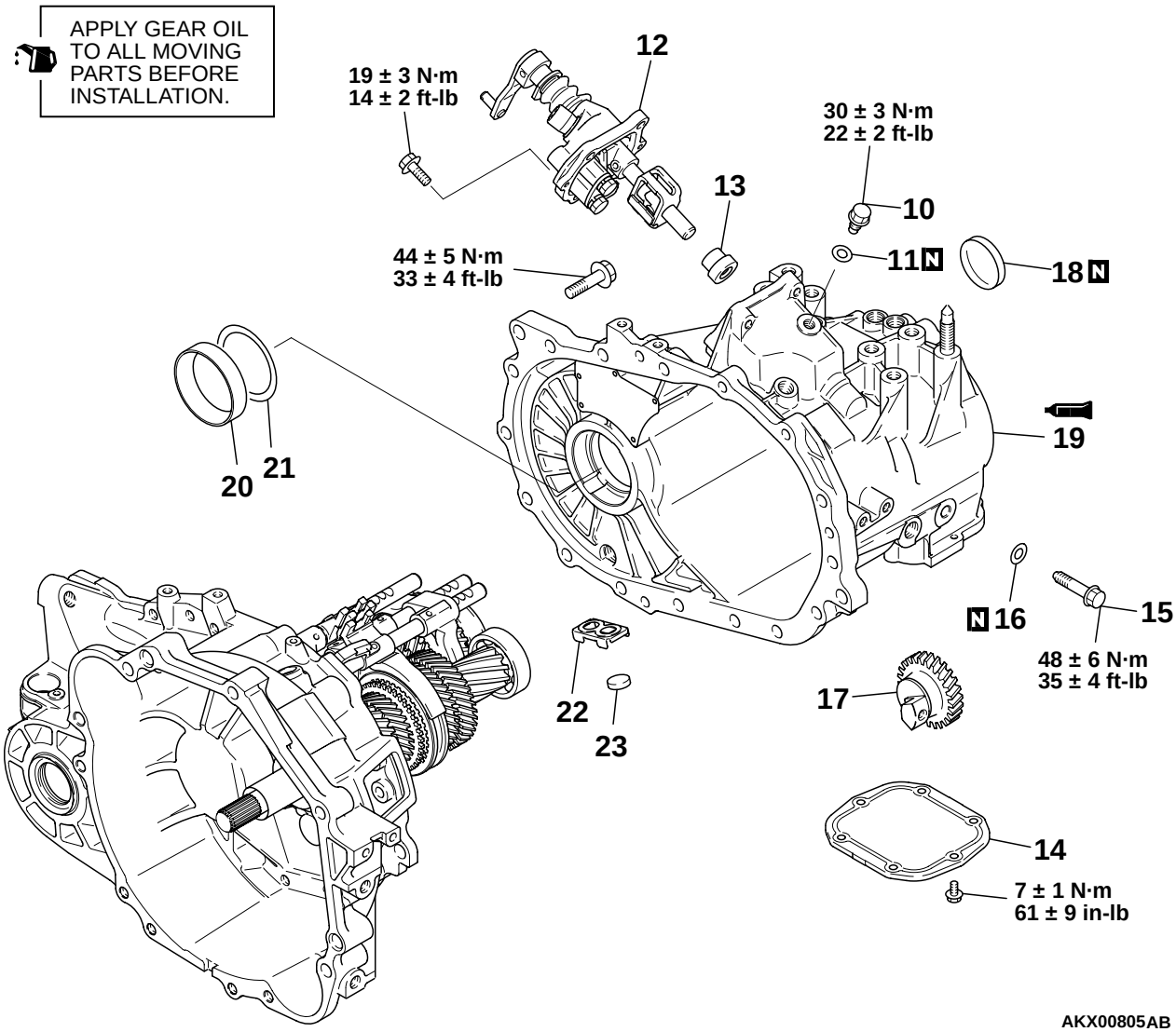
DISASSEMBLY STEPS

>>L<< 5. SPEEDOMETER GEAR
6. BACKUP LIGHT SWITCH
7. GASKET
8. POPPET SPRING
9. GASKET

Required Special Tools:

- MB990927: Installer Adapter <F5M42>
- MB990935: Installer Adapter
- MB990938: Handle

TSB Revision



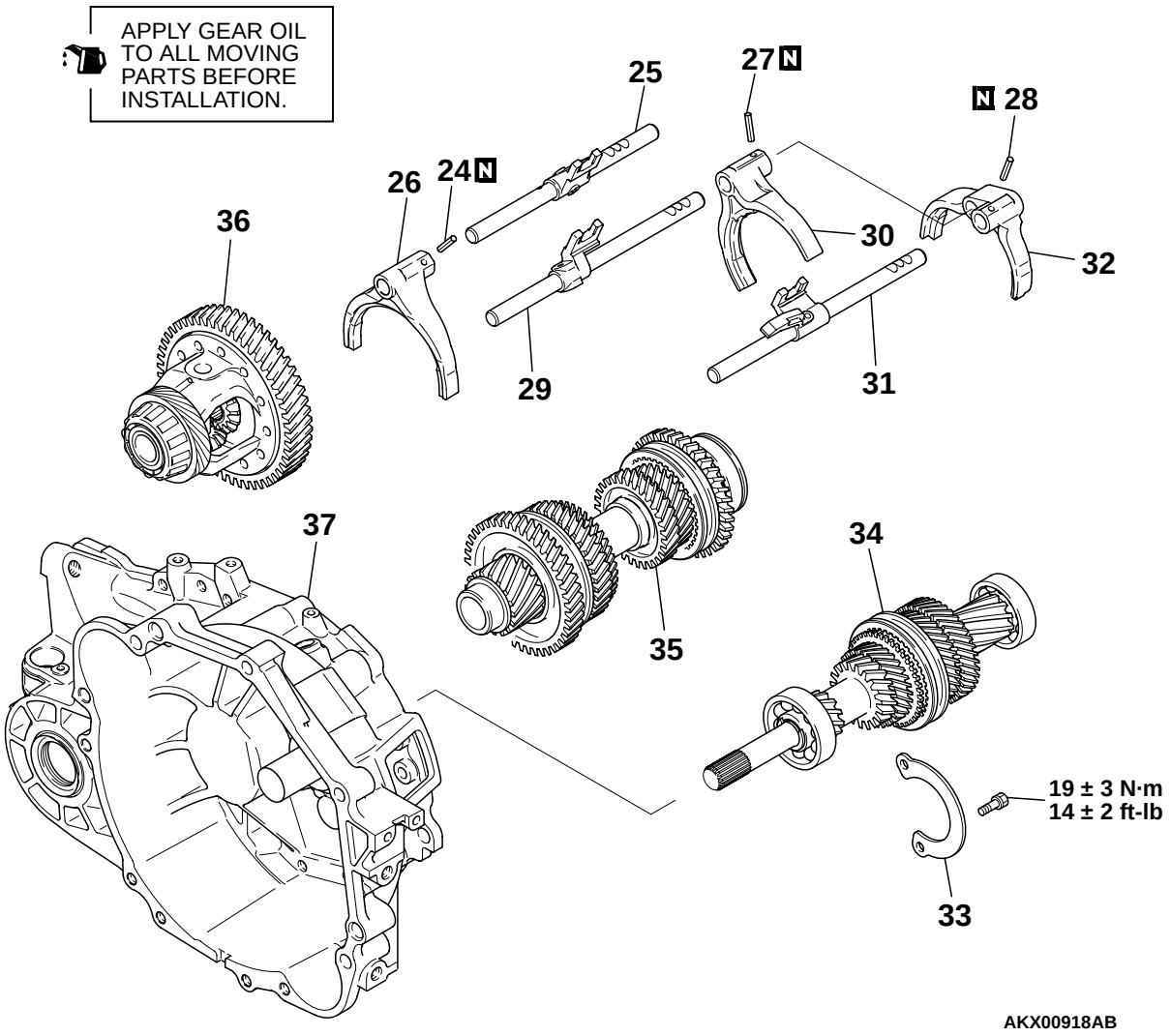
DISASSEMBLY STEPS

- 10. INTERLOCK PLATE BOLT
- 11. GASKET
- >>K<< 12. CONTROL HOUSING
- 13. NEUTRAL RETURN SPRING
- >>J<< 14. UNDER COVER
- 15. REVERSE IDLER GEAR SHAFT BOLT
- 16. GASKET
- <<A>> >>I<< 18. SEALING CAP
- <<B>> >>G<< 19. TRANSAXLE CASE
- >>F<< 20. OUTER RACE
- >>F<< 21. SPACER
- 22. MAGNET HOLDER
- 23. MAGNET

DISASSEMBLY STEPS

- 17. REVERSE IDLER GEAR ASSEMBLY

TSB Revision



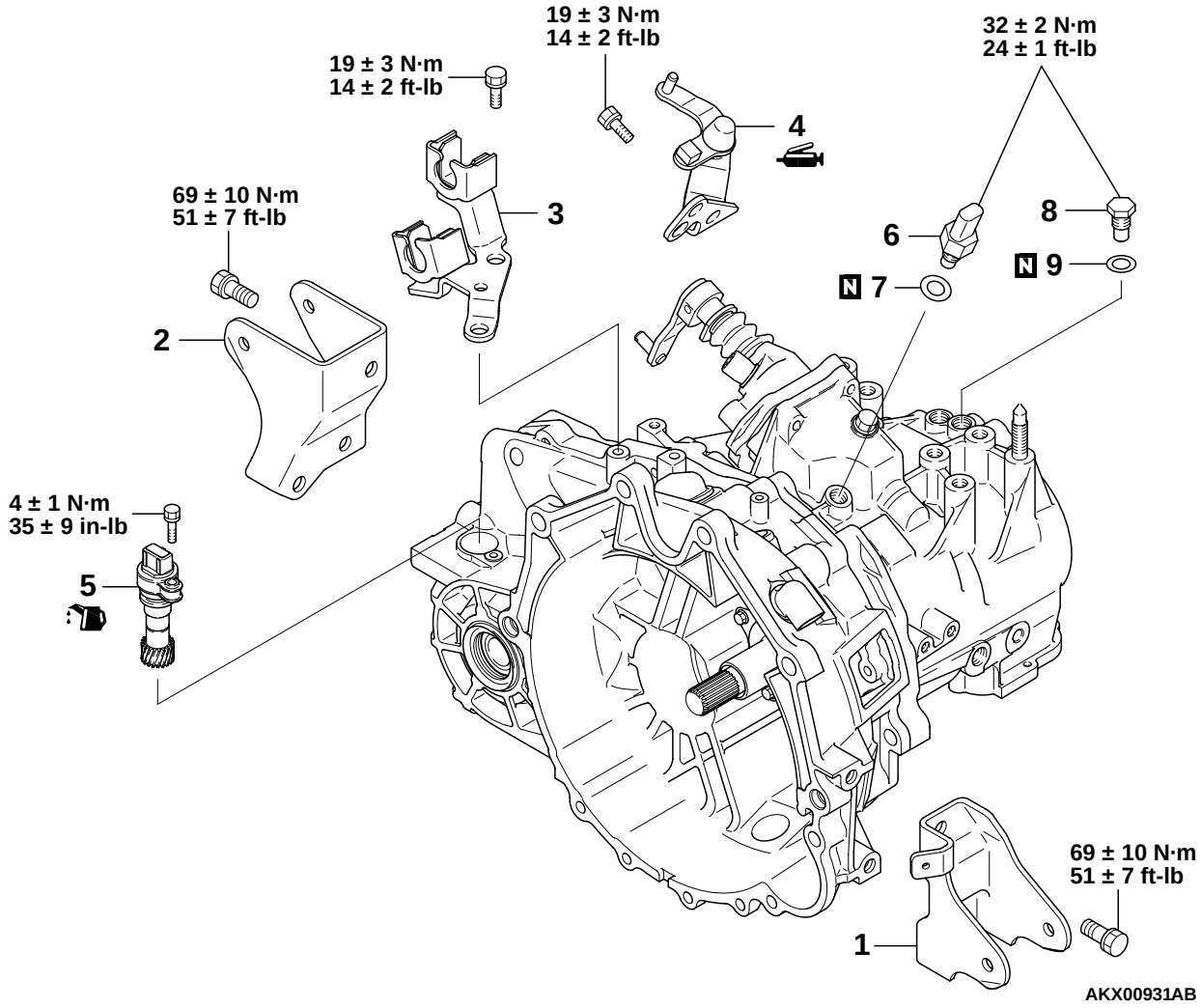
DISASSEMBLY STEPS

	>>E<<	24.	SPRING PIN
		25.	1ST-2ND SPEED SHIFT RAIL
		26.	1ST-2ND SPEED SHIFT FORK
	>>E<<	27.	SPRING PIN
	>>E<<	28.	SPRING PIN
<<D>>	>>C<<	29.	3RD-4TH SPEED SHIFT RAIL
<<D>>	>>C<<	30.	3RD-4TH SPEED SHIFT FORK
<<D>>	>>C<<	31.	5TH SPEED-REVERSE SHIFT RAIL

DISASSEMBLY STEPS

<<D>>	>>C<<	32.	5TH SPEED-REVERSE SHIFT FORK
		33.	FRONT BEARING RETAINER
<<F>>	>>A<<	34.	INPUT SHAFT
<<F>>	>>A<<	35.	OUTPUT SHAFT
		36.	DIFFERENTIAL
		37.	CLUTCH HOUSING

<F5M51>



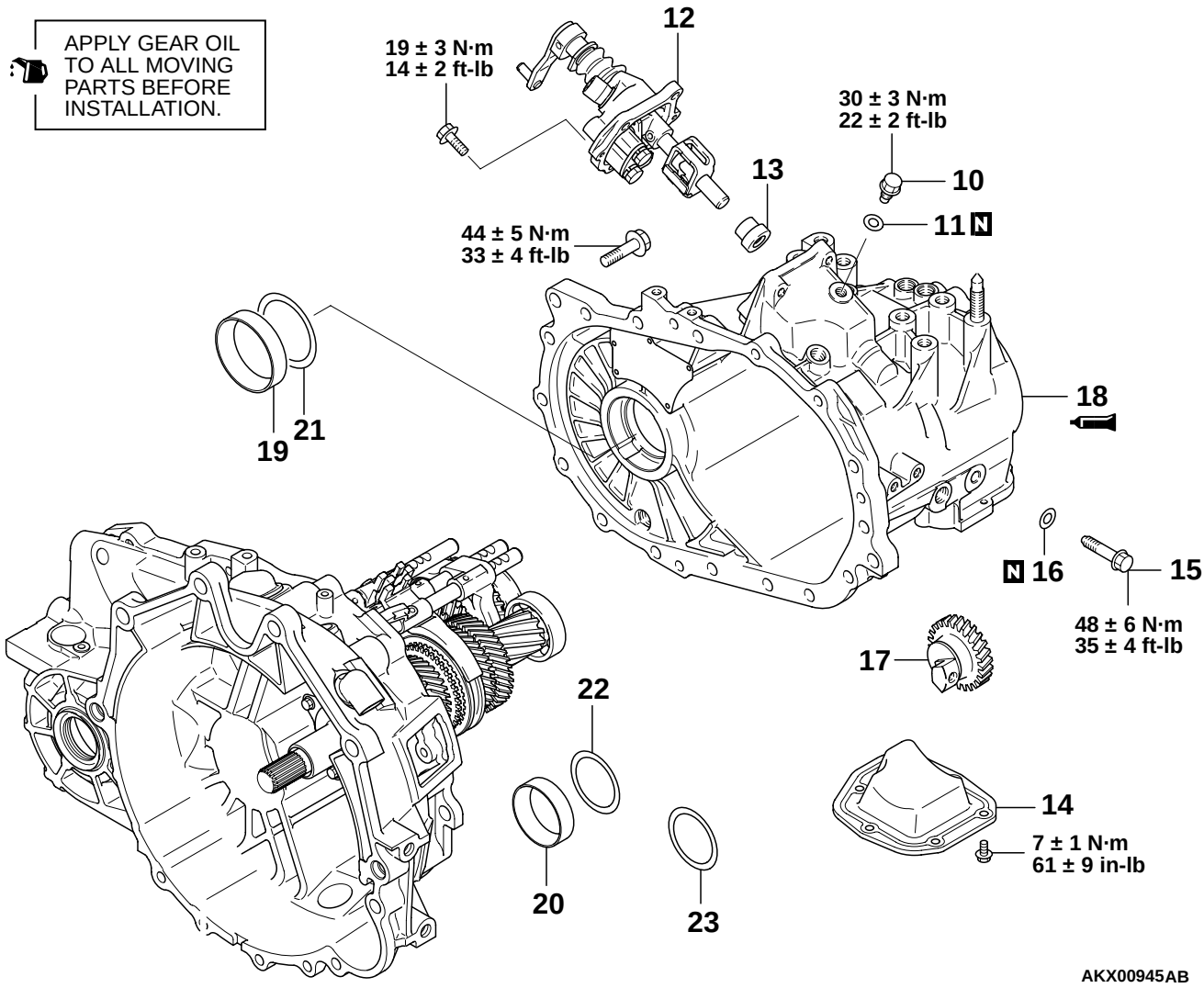
DISASSEMBLY STEPS

1. ROLL STOPPER BRACKET, FRONT
2. ROLL STOPPER BRACKET, REAR
3. SHIFT CABLE BRACKET

>>M<< 4. SELECT LEVER

DISASSEMBLY STEPS

>>L<< 5. SPEEDOMETER GEAR
6. BACKUP LIGHT SWITCH
7. GASKET
8. POPPET
9. GASKET



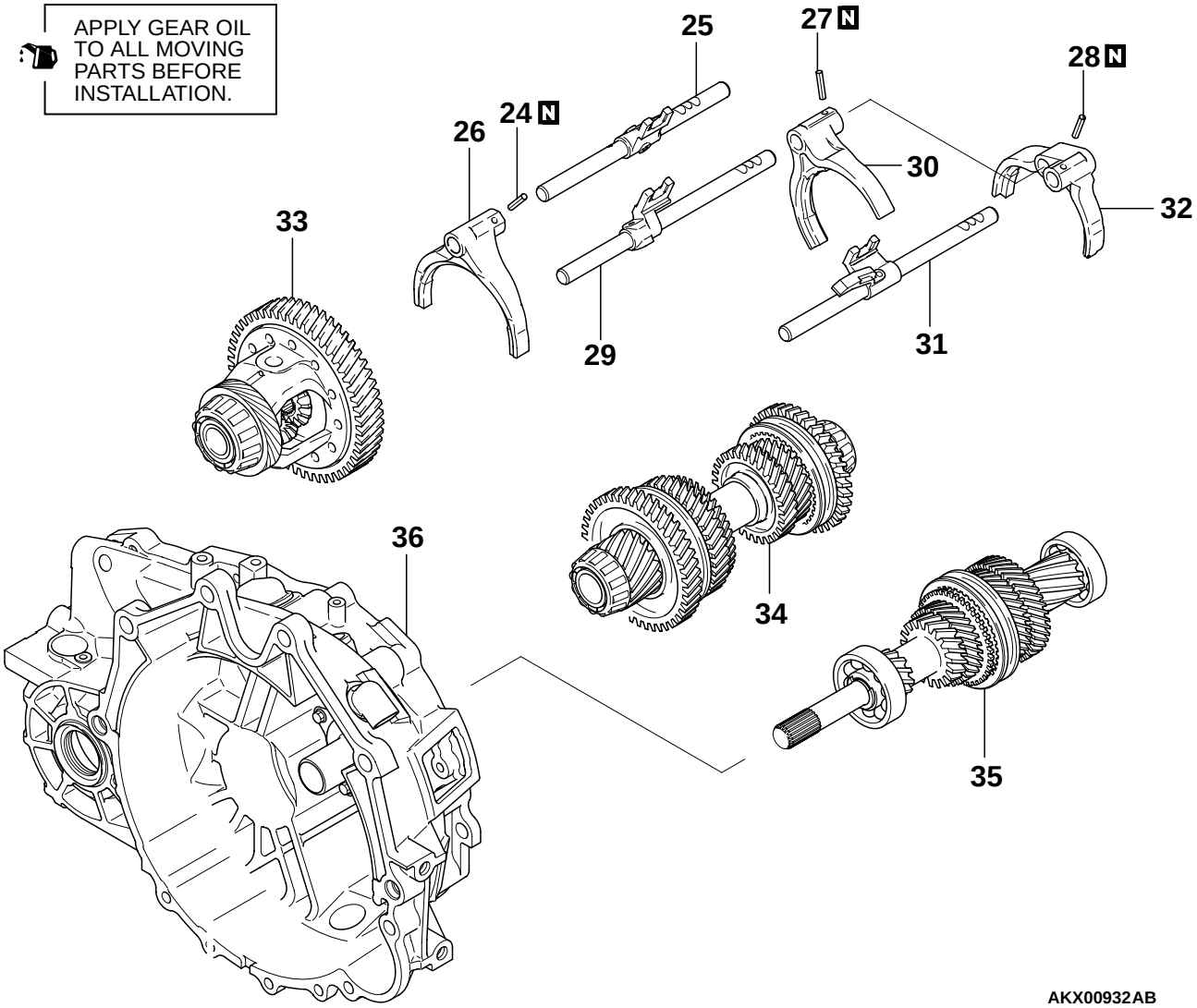
DISASSEMBLY STEPS

10. INTERLOCK PLATE BOLT
11. GASKET
>>K<< 12. CONTROL HOUSING
13. NEUTRAL RETURN SPRING
>>J<< 14. UNDER COVER
15. REVERSE IDLER GEAR SHAFT BOLT
16. GASKET

DISASSEMBLY STEPS

17. REVERSE IDLER GEAR
>>H<< 18. TRANSAXLE CASE
>>F<< 19. OUTER RACE
>>F<< 20. OUTER RACE
>>F<< 21. SPACER
>>F<< 22. SPACER
>>F<< 23. SPACER

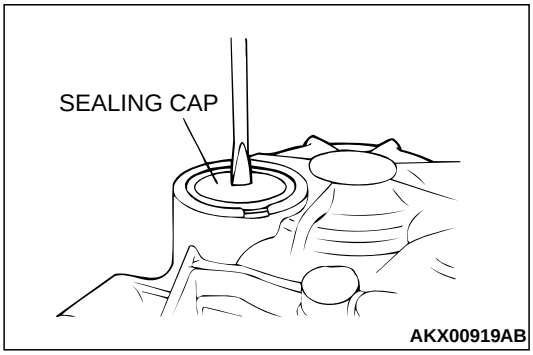
TSB Revision



			DISASSEMBLY STEPS
	>>E<<	24.	SPRING PIN
		25.	1ST-2ND SPEED SHIFT RAIL
		26.	1ST-2ND SPEED SHIFT FORK
	>>E<<	27.	SPRING PIN
<<C>>	>>E<<	28.	SPRING PIN
<<E>>	>>D<<	29.	3RD-4TH SPEED SHIFT RAIL
<<E>>	>>D<<	30.	3RD-4TH SPEED SHIFT FORK

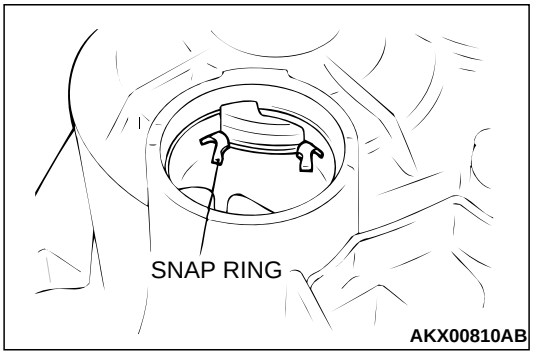
			DISASSEMBLY STEPS
<<E>>	>>D<<	31.	5TH-REVERSE SPEED SHIFT RAIL
<<E>>	>>D<<	32.	5TH-REVERSE SPEED SHIFT FORK
<<G>>	>>B<<	33.	DIFFERENTIAL
<<G>>	>>B<<	34.	OUTPUT SHAFT
<<G>>	>>B<<	35.	INPUT SHAFT
		36.	CLUTCH HOUSING

DISASSEMBLY SERVICE POINTS



<<A>> SEALING CAP REMOVAL

1. Drive a screwdriver into the center of the sealing cap.
2. Bend the screwdriver back to remove the sealing cap.



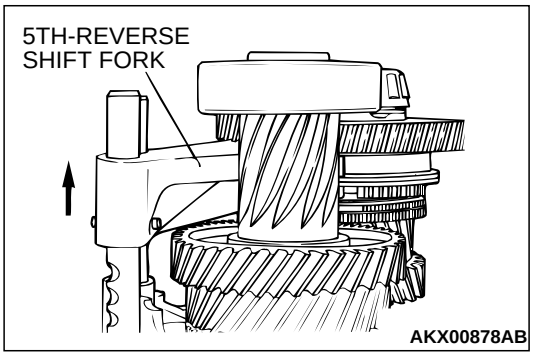
<<B>> TRANSAXLE CASE REMOVAL

1. Remove all sixteen bolts securing the transaxle case to the clutch housing.
2. Use snap ring pliers to expand the indicated snap ring. The snap ring will separate from the ball bearing groove, and the output shaft assembly will fall under its own weight.

⚠ CAUTION

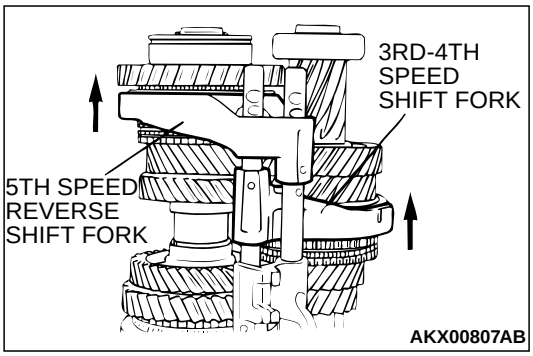
Do not use a scraper or chisel to remove the transaxle case.

3. Remove the transaxle case from the clutch housing.



<<C>> SPRING PIN REMOVAL

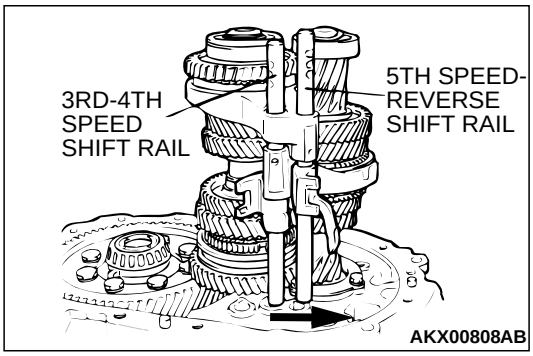
1. Shift the 5th-reverse shift fork in the direction shown in the illustration.
2. Using a pin punch, remove the spring pin from the shift fork and rail.



<<D>> 3RD-4TH SPEED SHIFT RAIL/3RD-4TH SPEED SHIFT FORK/5TH SPEED-REVERSE SHIFT RAIL/5TH SPEED-REVERSE SHIFT FORK REMOVAL

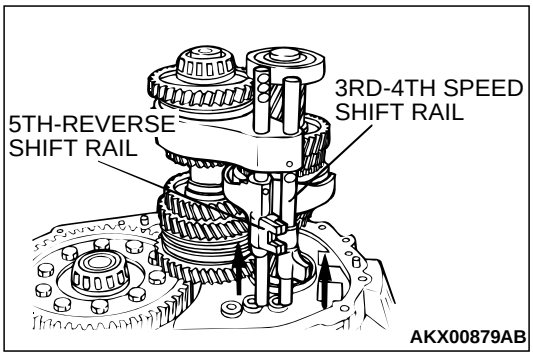
1. Shift the 3rd-4th speed shift fork and 5th speed-reverse shift fork in the direction shown.

TSB Revision



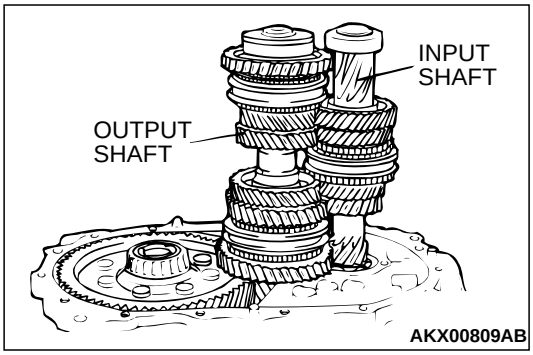
2. Pull up on the 3rd-4th speed shift rail and 5th speed-reverse shift rail and take them out of the hole in the clutch housing.
3. Slide the 3rd-4th speed shift rail and 5th speed-reverse shift rail in the direction shown and remove them together with the shift forks.

<<E>> 3RD-4TH SPEED SHIFT RAIL/3RD-4TH SPEED SHIFT FORK/5TH-REVERSE SPEED SHIFT RAIL/5TH-REVERSE SPEED SHIFT FORK REMOVAL



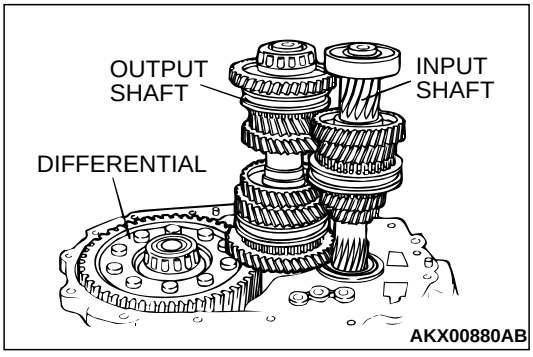
1. Pull out the shift rails from the shift rail holes in the clutch housing.
2. Remover the shift rails together with the shift forks.

<<F>> INPUT SHAFT AND OUTPUT SHAFT REMOVAL



Remove the input and output shafts together.

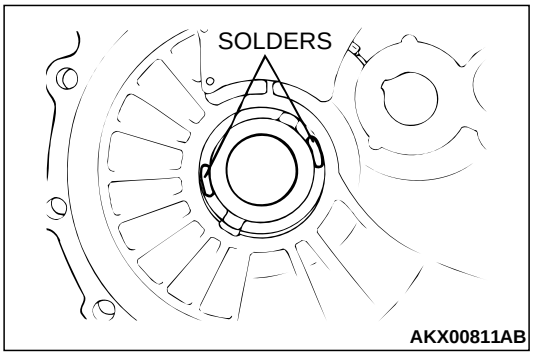
<<G>> DIFFERENTIAL/OUTPUT SHAFT/INPUT SHAFT REMOVAL



Remove the input and output shafts together.

ADJUSTMENT BEFORE ASSEMBLY

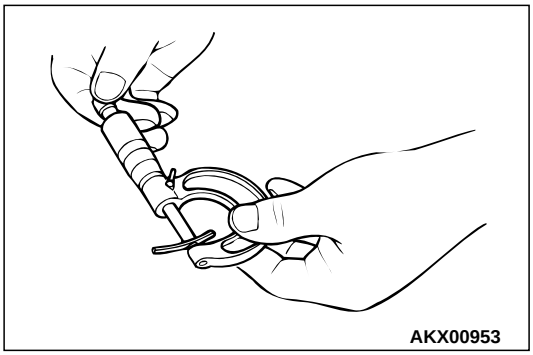
SPACER SELECTION FOR DIFFERENTIAL CASE PRE-LOAD ADJUSTMENT <F5M42>



1. Put solders [1.6 mm (0.063 inch) diameter, about 10 mm (0.39 inch) long] in the illustrated positions of the transaxle case.
2. Install the taper bearing outer race and differential assembly into the transaxle case.

   NOTE: If necessary, replace the differential case and taper bearing before carrying out these adjustments.
3. Install the clutch housing and tighten the bolts to the specified torque.

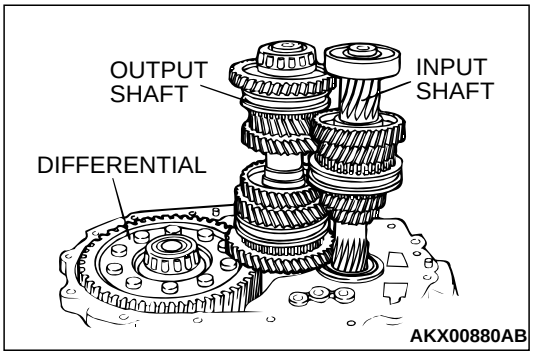
   Tightening torque: 44 ± 5 N·m (33 ± 4 ft-lb)



4. Remove the clutch housing, and then remove the differential assembly.
5. Remove the outer race and take out crushed solders.
6. Measure the thickness of the crushed solder with a micrometer and select a spacer that will provide the standard preload value.

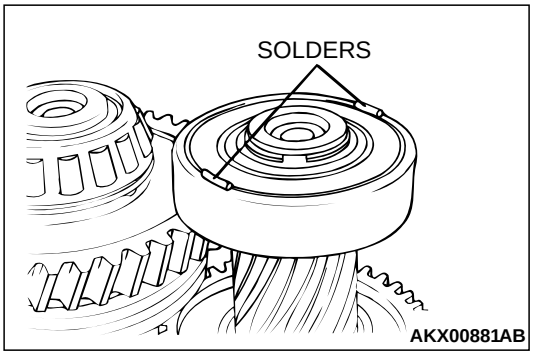
   Standard value:
   0.05 – 0.11 mm (0.0020 – 0.0043 inch) preload

SPACER SELECTION FOR ADJUSTING INPUT SHAFT END PLAY/OUTPUT SHAFT PRELOAD/DIFFERENTIAL PRELOAD <F5M51>

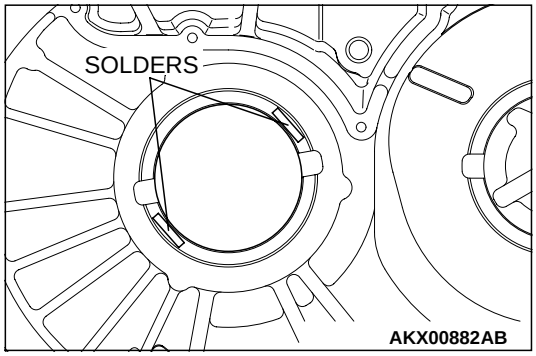


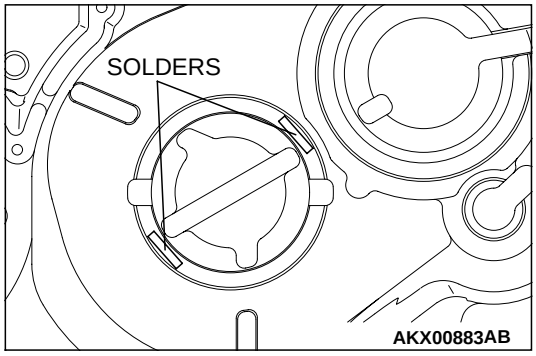
1. Install the input shaft, output shaft and differential as a set to the clutch housing.

   NOTE: If necessary, replace the input shaft, output shaft, differential case and/or bearings before carrying out these adjustments.



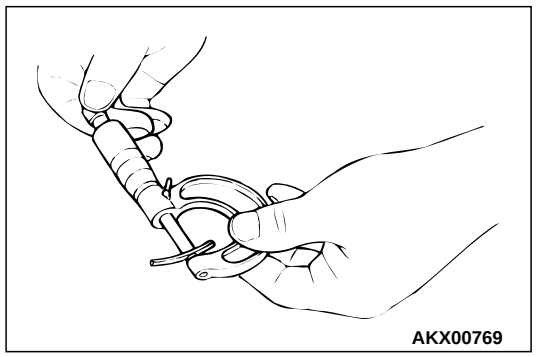
2. Put solders [1.6 mm (0.063 inch) diameter, about 10 mm (0.39 inch) long] on the input shaft rear bearing at the positions shown in the illustration.





3. Put solders [1.6 mm (0.063 inch) diameter, about 10 mm (0.39 inch) long] on the transaxle case at the positions shown in the illustration.
4. Install the bearing outer races of the differential and output shaft.
5. Install the transaxle case and tighten the bolts to the specified torque.

   Tightening torque: 44 ± 5 N·m (33 ± 4 ft-lb)

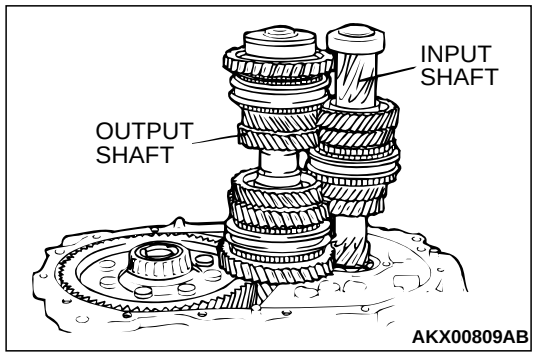


6. Remove the transaxle case.
7. Remove the outer races and take out the crushed solders.
8. Measure the thickness of the crushed solder with a micrometer and select spacers that will provide the standard end play/preload value.

   Standard value:
   Input shaft end play: 0.05 – 0.17 mm (0.0020 – 0.0067 inch)
   Output shaft preload: 0.13 – 0.18 mm (0.0051 – 0.0071 inch)
   Differential preload: 0.05 – 0.11 mm (0.0020 – 0.0043 inch)

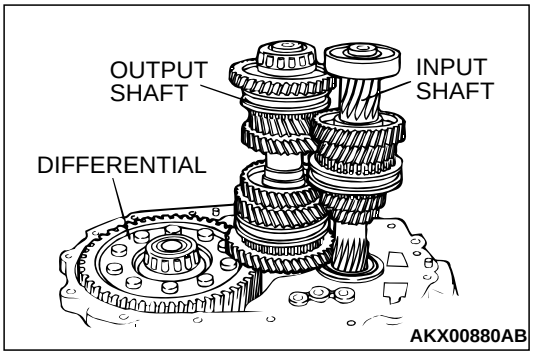
ASSEMBLY SERVICE POINTS

>>A<< OUTPUT SHAFT/INPUT SHAFT INSTALLATION
Install the input and output shafts together.



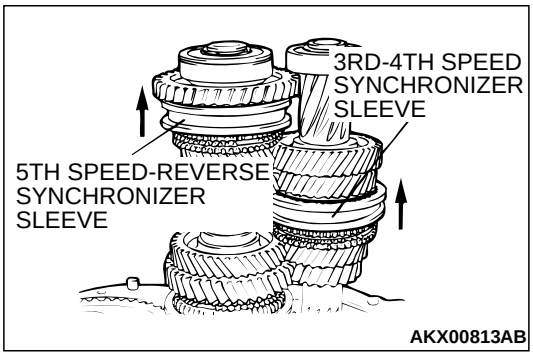
>>B<< INPUT SHAFT/OUTPUT SHAFT/DIFFERENTIAL INSTALLATION

Install the input shaft, output shaft and differential as a set.

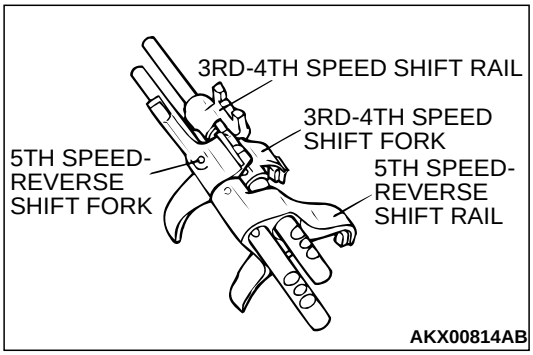


>>C<< 5TH SPEED-REVERSE SHIFT FORK/5TH SPEED-REVERSE SHIFT RAIL/3RD-4TH SPEED SHIFT FORK/3RD-4TH SPEED SHIFT RAIL INSTALLATION

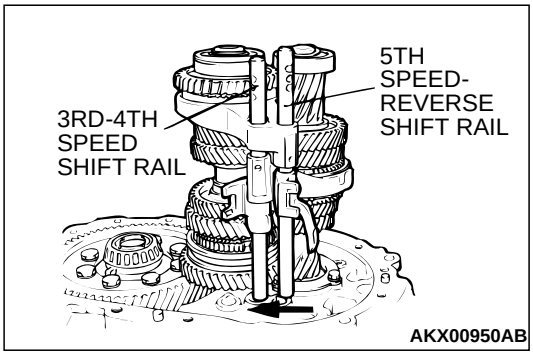
1. Shift the 3rd-4th speed synchronizer sleeve and 5th speed-reverse synchronizer sleeve in the direction shown.



2. Assemble the 3rd-4th speed shift rail and fork, and the 5th speed-reverse shift rail and fork.

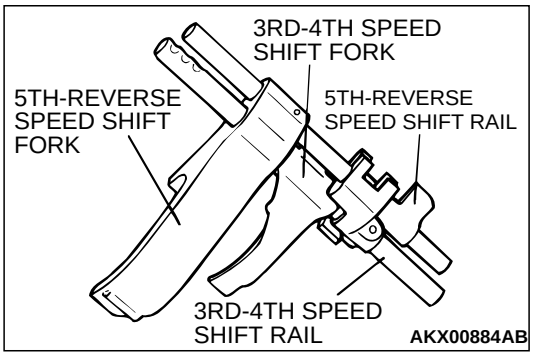


3. While fitting each shift fork in the groove of synchronizer sleeve, slide the shift rails in the direction shown and install.
4. Insert the 3rd-4th speed shift rail and 5th speed-reverse shift rail into the rail hole in the clutch housing.

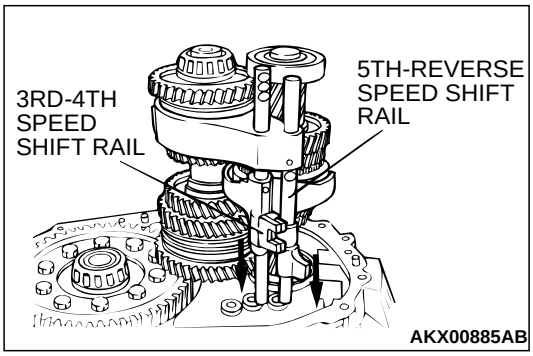


>>D<< 5TH-REVERSE SPEED SHIFT FORK/5TH-REVERSE SPEED SHIFT RAIL/3RD-4TH SPEED SHIFT FORK/3RD-4TH SPEED SHIFT RAIL INSTALLATION

1. Assemble the 3rd-4th speed shift rail and fork, and 5th-reverse speed shift rail and fork.

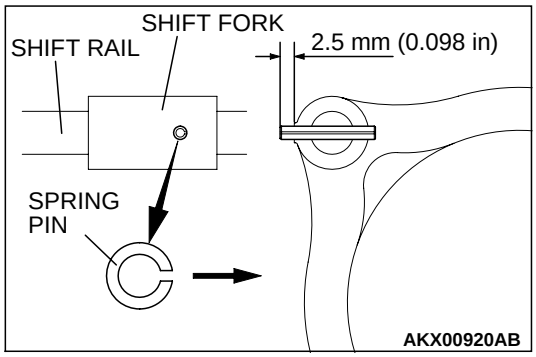


2. Fit each shift fork in the groove of synchronizer sleeve and install the shift fork and rail assembly.
3. Insert the 3rd-4th speed shift rail and 5th speed-reverse shift rail into the rail hole in the clutch housing.



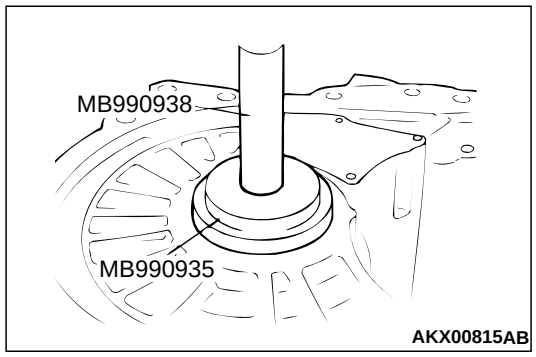
>>E<< SPRING PIN INSTALLATION

1. Align the pin holes in the shift rail and shift fork.
2. Insert the new spring pin. Push it in so that the slit and center axis of the rail are aligned.



>>F<< SPACER AND OUTER RACE INSTALLATION

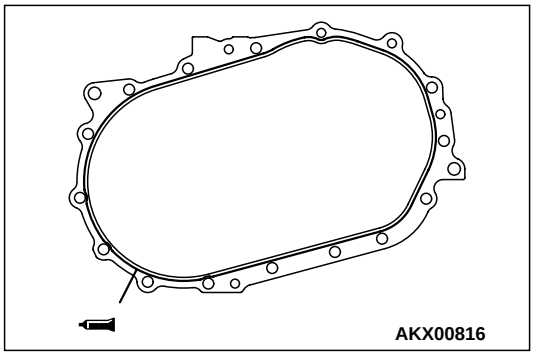
1. Install the spacer selected in the section "ADJUSTMENT BEFORE ASSEMBLY."
2. Using special tools MB990935 and MB990938, press install the outer race into the transaxle case.



>>G<< TRANSAXLE CASE INSTALLATION

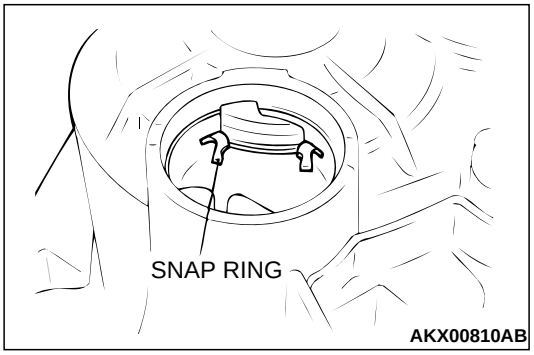
⚠ CAUTION

Squeeze out the sealant uniformly, while making sure that it is not broken or excessively applied.



1. Apply a 2 mm (0.08 inch) diameter bead of sealant (Mitsubishi Genuine Part number MD997740 or equivalent) to the illustrated position of the transaxle case.

   NOTE: Be sure to install the transaxle case while the sealant is wet (within 15 minutes).



2. Install the transaxle case and expand the snap ring.
3. Tighten the transaxle case mounting bolts to the specified torque.

   Tightening torque: 44 ± 5 N·m (33 ± 4 ft-lb)

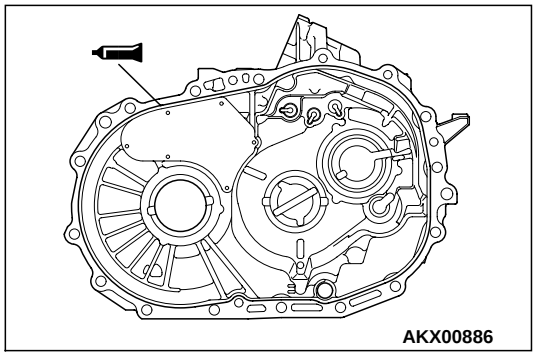
4. Place the transaxle upside down and let the snap ring fit in the groove by taking advantage of the output shaft's own weight.

   NOTE: After installation, keep the sealed area away from the oil for approximately one hour.

>>H<< TRANSAXLE CASE INSTALLATION

⚠ CAUTION

Squeeze out the sealant uniformly, while making sure that it is not broken or excessively applied.



1. Apply a 2 mm (0.08 inch) diameter bead of sealant (Mitsubishi Genuine Part number MD997740 or equivalent) to the illustrated position of the transaxle case.

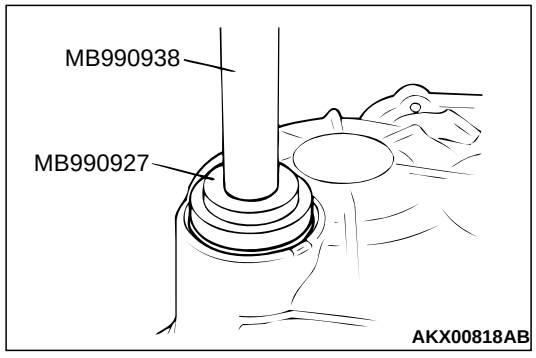
   NOTE: Be sure to install the transaxle case while the sealant is wet (within 15 minutes).

2. Install the transaxle case.
3. Tighten the transaxle case mounting bolts to the specified torque.

   Tightening torque: 44 ± 5 N·m (33 ± 4 ft-lb)

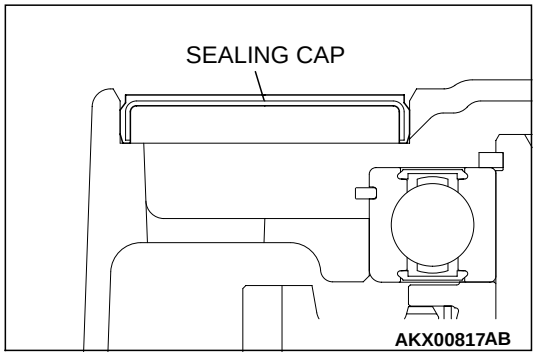
   NOTE: After installation, keep the sealed area away from the oil for approximately one hour.

>>I<< SEALING CAP INSTALLATION



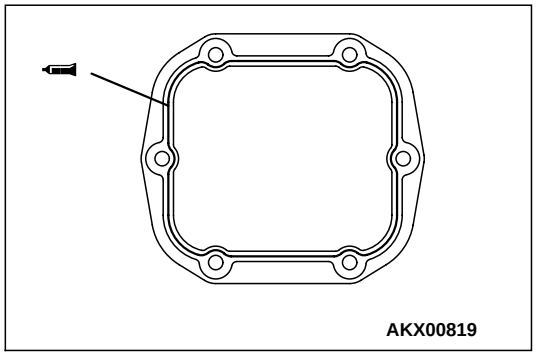
1. Using special tools MB990927 and MB990938, press install the sealing cap onto the case.

TSB Revision



2. Evenly press the sealing cap so it is not placed at an angle.

>>J<< UNDER COVER INSTALLATION



⚠ CAUTION

Squeeze out the sealant uniformly, while making sure that it is not broken or excessively applied.

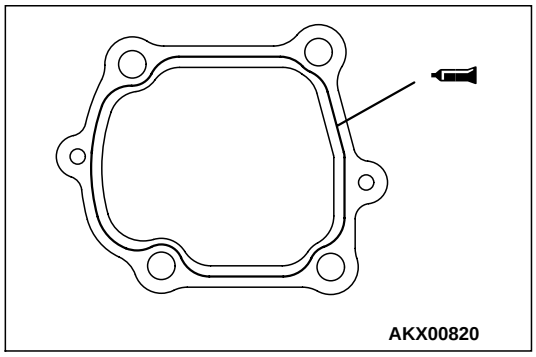
1. Apply a 2 mm (0.08 inch) diameter bead of sealant (Mitsubishi Genuine Part number MD997740 or equivalent) to the illustrated position of the transaxle case.

   NOTE: Be sure to install the case quickly while the sealant is wet (within 15 minutes).
2. Install the under cover to the transaxle case and tighten the bolts to specified torque.

   Tightening torque: 7 ± 1 N·m (61 ± 9 in-lb)

   NOTE: After installation, keep the sealed area away from the oil for approximately one hour.

>>K<< CONTROL HOUSING INSTALLATION



⚠ CAUTION

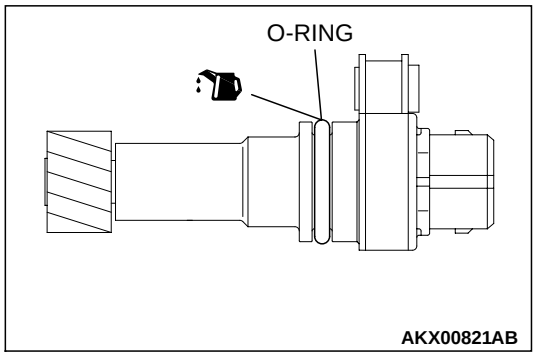
Squeeze out the sealant uniformly, while making sure that it is not broken or excessively applied.

1. Apply a 0.2 mm (0.08 inch) diameter bead of sealant (Mitsubishi Genuine Part number MD997740 or equivalent) to the illustrated position of the transaxle case.

   NOTE: Be sure to install the case quickly while the sealant is wet (within 15 minutes).
2. Install the control housing to the transaxle case and tighten the bolts to specified torque.

   Tightening torque: 19 ± 3 N·m (14 ± 2 ft-lb)

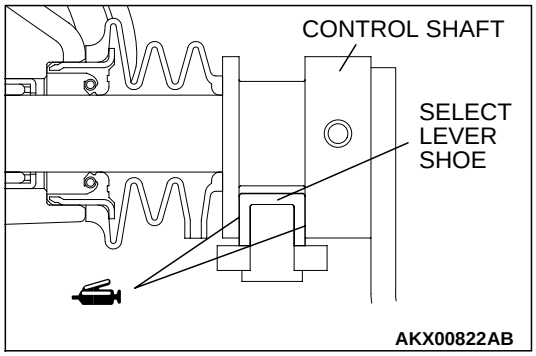
   NOTE: After installation, keep the sealed area away from the oil for approximately one hour.



>>L<< SPEEDOMETER GEAR INSTALLATION

1. Apply gear oil (Hypoid gear oil SAE 75W-90 or 75W-85W conforming to API classification GL-4) to the O-ring of the speedometer gear.
2. Tighten the bolt to specified torque.

   Tightening torque: 4 ± 1 N·m (35 ± 9 in-lb)



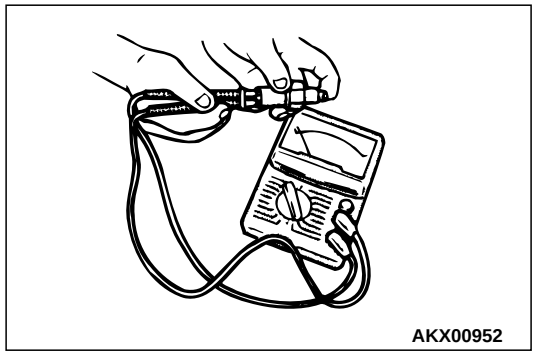
>>M<< SELECT LEVER INSTALLATION

1. Apply grease (Mitsubishi Genuine Part number 0101011 or equivalent) to the control shaft sliding portion of the select lever shoe.
2. Install the select lever and tighten the bolts to specified torque.

   Tightening torque: 19 ± 3 N·m (14 ± 2 ft-lb)

INSPECTION

M1222001100026



BACKUP LIGHT SWITCH

Check for continuity between terminals.

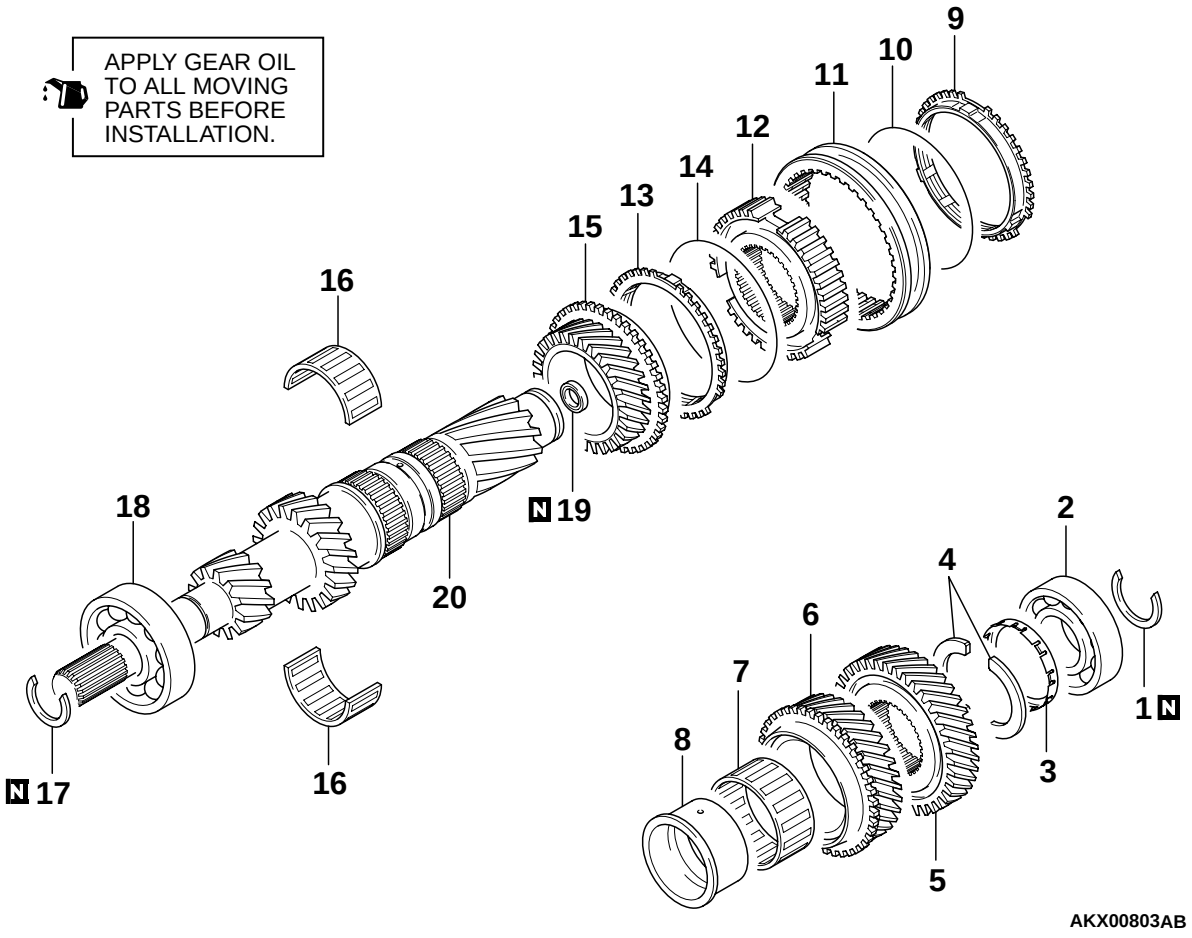
SWITCH CONDITION	CONTINUITY
Pressed	Open
Released	Conductive

INPUT SHAFT

DISASSEMBLY AND ASSEMBLY

M1222001600021

<F5M42>



			DISASSEMBLY STEPS
	>>M<<	1.	SNAP RING
<<A>>	>>L<<	2.	BALL BEARING
<<B>>	>>K<<	3.	THRUST PLATE STOPPER
	>>J<<	4.	THRUST PLATE
<<C>>	>>I<<	5.	5TH SPEED GEAR
		6.	4TH SPEED GEAR
		7.	NEEDLE ROLLER BEARING
<<D>>	>>H<<	8.	4TH SPEED GEAR SLEEVE
	>>E<<	9.	SYNCHRONIZER RING
	>>D<<	10.	SYNCHRONIZER SPRING
	>>G<<	11.	SYNCHRONIZER SLEEVE

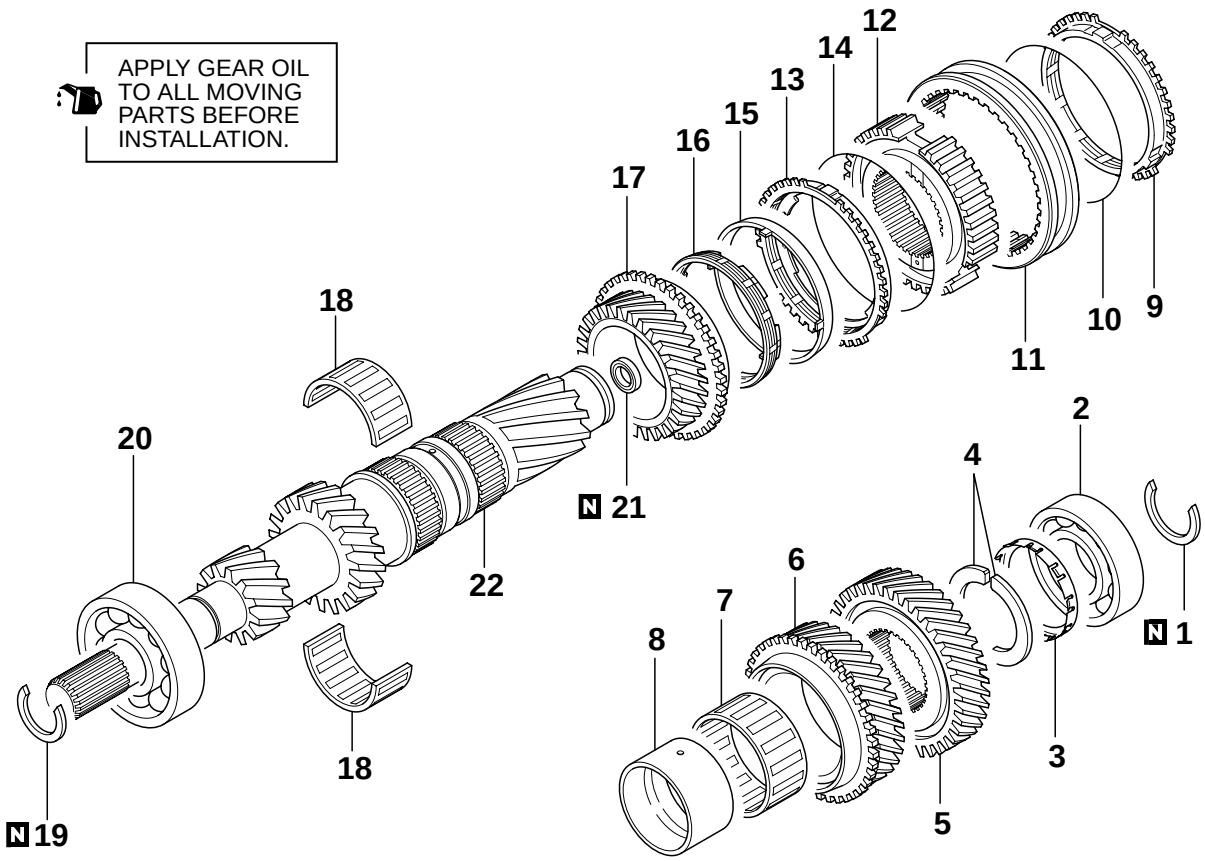
			DISASSEMBLY STEPS
	>>F<<	12.	3RD-4TH SPEED SYNCHRONIZER HUB
	>>E<<	13.	SYNCHRONIZER RING
	>>D<<	14.	SYNCHRONIZER SPRING
		15.	3RD SPEED GEAR
		16.	NEEDLE ROLLER BEARING
	>>C<<	17.	SNAP RING
<<E>>	>>B<<	18.	BALL BEAR
	>>A<<	19.	OIL SEAL
		20.	INPUT SHAFT

Required Special Tools:

- MD998801: Bearing Remover
- MD998812: Installer Cap
- MD998813: Installer-100
- MD998816: Installer Adapter (30)
- MD998818: Installer Adapter (38)
- MD998824: Installer Adapter (50) <F5M42>
- MD998825: Installer Adapter (52)

TSB Revision

<F5M51>



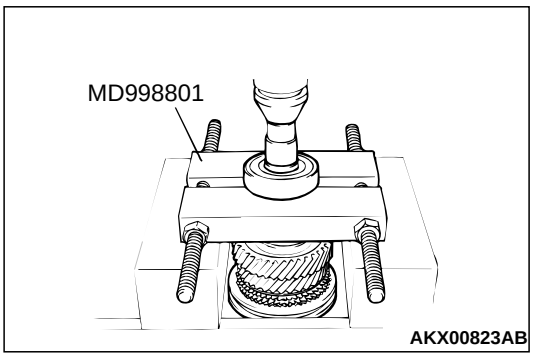
AKX00877AB

			DISASSEMBLY STEPS
	>>M<<	1.	SNAP RING
<<A>>	>>L<<	2.	BALL BEARING
<<B>>	>>K<<	3.	THRUST PLATE STOPPER
	>>J<<	4.	THRUST PLATE
<<C>>	>>I<<	5.	5TH SPEED GEAR
		6.	4TH SPEED GEAR
		7.	NEEDLE ROLLER BEARING
<<D>>	>>H<<	8.	4TH SPEED GEAR SLEEVE
		9.	SYNCHRONIZER RING
	>>D<<	10.	SYNCHRONIZER SPRING
	>>G<<	11.	SYNCHRONIZER SLEEVE

			DISASSEMBLY STEPS
	>>F<<	12.	3RD-4TH SPEED SYNCHRONIZER HUB
		13.	OUTER SYNCHRONIZER RING
	>>D<<	14.	SYNCHRONIZER SPRING
		15.	SYNCHRONIZER CONE
		16.	INNER SYNCHRONIZER RING
		17.	3RD SPEED GEAR
		18.	NEEDLE ROLLER BEARING
	>>C<<	19.	SNAP RING
<<E>>	>>B<<	20.	BALL BEAR
	>>A<<	21.	OIL SEAL
		22.	INPUT SHAFT

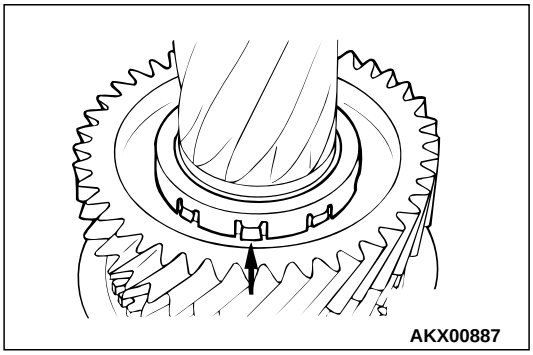
TSB Revision

DISASSEMBLY SERVICE POINTS



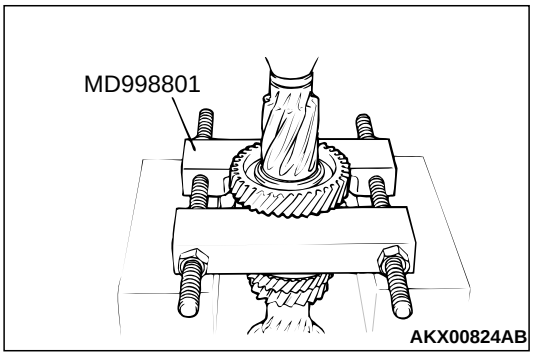
<<A>> BALL BEARING REMOVAL

1. Using special tool MD998801, support the ball bearing, and then set them on the press.
2. Push down on the input shaft with the press and extract the ball bearing.



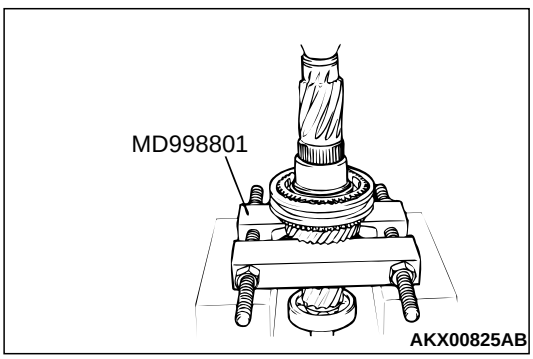
<<B>> THRUST PLATE STOPPER REMOVAL

Using a screwdriver, pry up the position shown in the illustration and remove the thrust plate stopper.



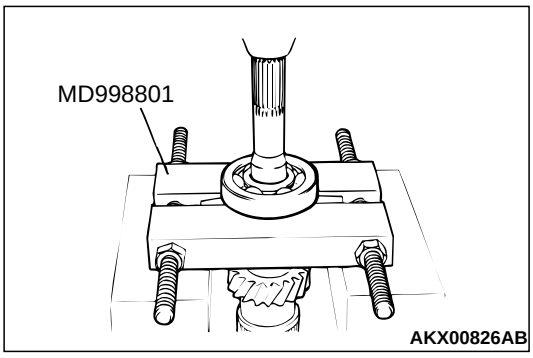
<<C>>5TH SPEED GEAR REMOVAL

1. Using special tool MD998801, support the 5th speed gear, and then set them on the press.
2. Push down on the input shaft with the press and take off the 5th speed gear.



<<D>>4TH SPEED GEAR SLEEVE REMOVAL

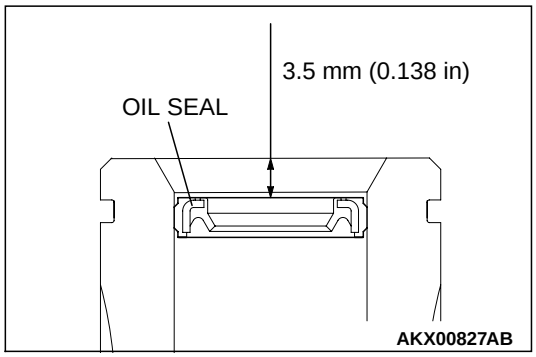
1. Using special tool MD998801, support the 3rd speed gear, and then set them on the press.
2. Push down on the input shaft with the press and remove the 4th speed gear sleeve.



<<E>> BALL BEARING REMOVAL

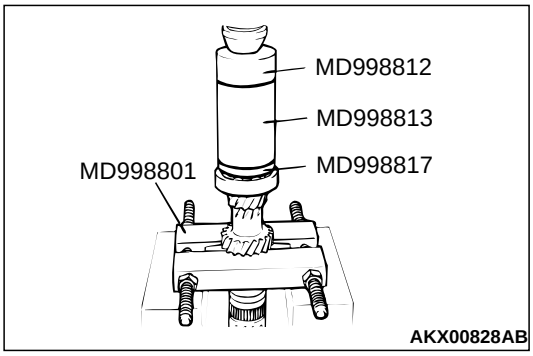
1. Using special tool MD998801, support the ball bearing, and then set them on the press.
2. Push down on the input shaft with the press and extract the ball bearing.

ASSEMBLY SERVICE POINTS



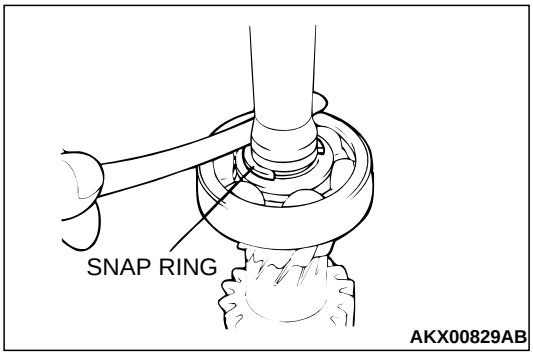
>>A<< OIL SEAL INSTALLATION

Install the oil seal into the illustrated position of the input shaft.



>>B<< BALL BEARING INSTALLATION

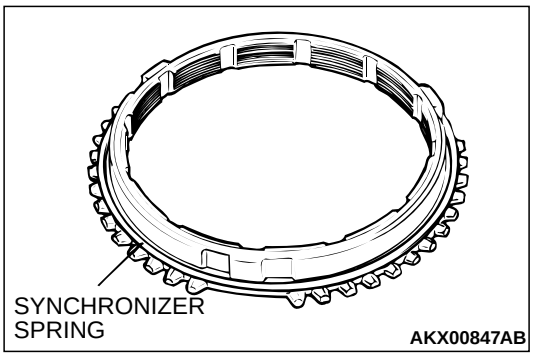
1. Using special tool MD998801, support the 2nd speed gear portion of the input shaft, and then set them on the press.
2. Using special tools MD998812, MD998813 and MD998816, press install the bearing with the press.



>>C<< SNAP RING INSTALLATION

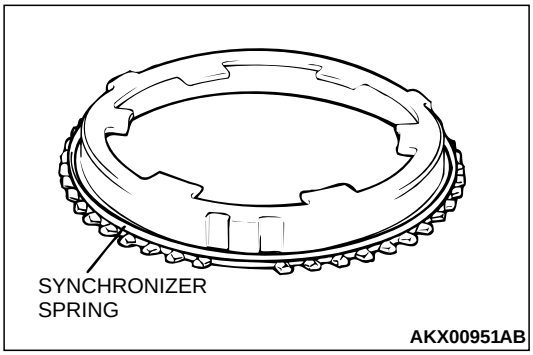
1. Install the thickest snap ring that can be fitted in the snap ring groove of input shaft.
2. Make sure that the ball bearing end play meets the standard value.

   Standard value: 0 – 0.12 mm (0 – 0.0047 inch)



>>D<< SYNCHRONIZER SPRING INSTALLATION

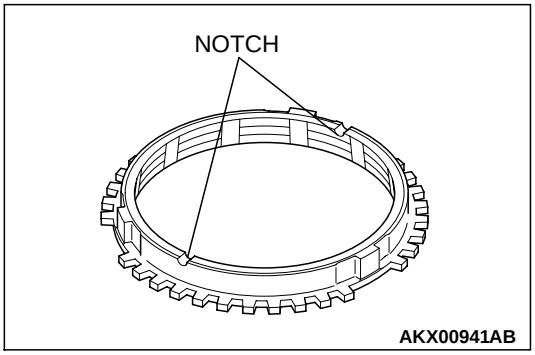
Install the synchronizer spring to the illustrated position of the synchronizer ring and outer synchronizer ring <F5M51>.



>>E<< SYNCHRONIZER RING INSTALLATION

⚠ CAUTION

There are 3rd speed and 4th speed synchronizer rings, if the wrong one is installed it will effect the shift feeling.

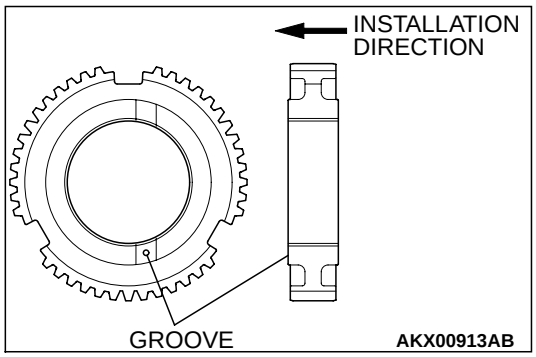


1. Ascertain whether or not there are identification notches on the synchronizer ring.

   Two notches: 3rd speed synchronizer ring

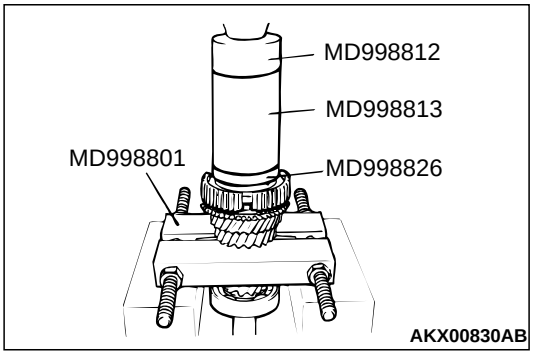
   No notches: 4th speed synchronizer ring

2. Install the synchronizer ring so that it does not angle to the cone of the gear.



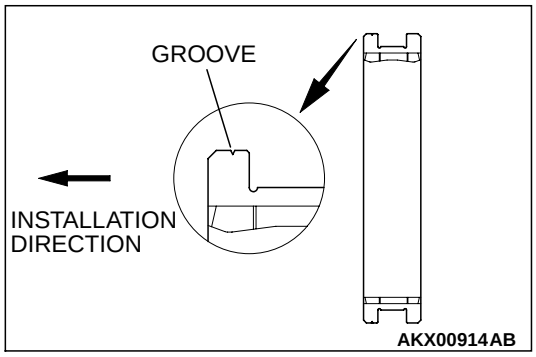
>>F<< 3RD-4TH SPEED SYNCHRONIZER HUB INSTALLATION

1. Using special tool MD998801, support the 2nd speed gear portion of the input shaft, and then set them on the press.
2. Make sure that the synchronizer ring <F5M42> or inner synchronizer ring <F5M51> has been perfectly matched to the 3rd speed gear cone.
3. Check the installation direction of the 3rd-4th speed synchronizer hub, and put it on the input shaft.
4. Using special tools MD998812, MD998813 and MD998825, press install the 3rd-4th speed synchronizer hub with the press.
5. Make sure that the synchronizer ring <F5M42> or outer synchronizer ring <F5M51> can rotate freely.

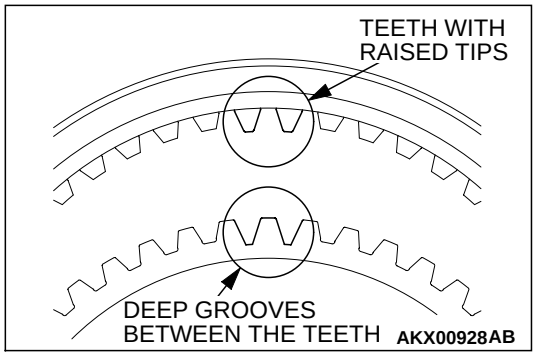


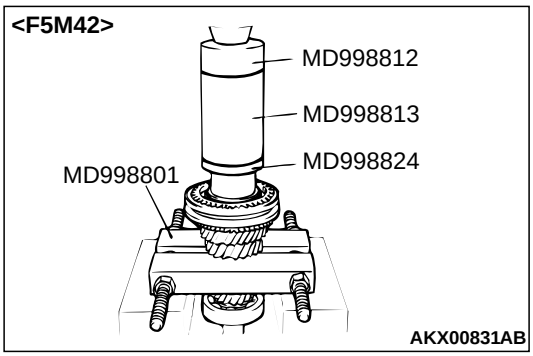
>>G<< SYNCHRONIZER SLEEVE INSTALLATION

1. Check the installation direction of the synchronizer sleeve, and install it onto the 3rd-4th speed synchronizer hub.



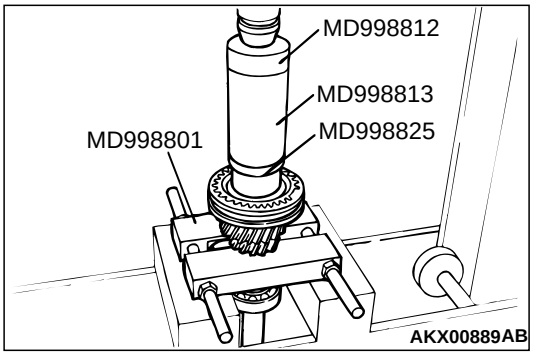
2. Install the synchronizer sleeve so that the areas with teeth that have raised tips (three areas total) are aligned with the areas on the synchronizer hub that have deep grooves between the teeth (three areas total).





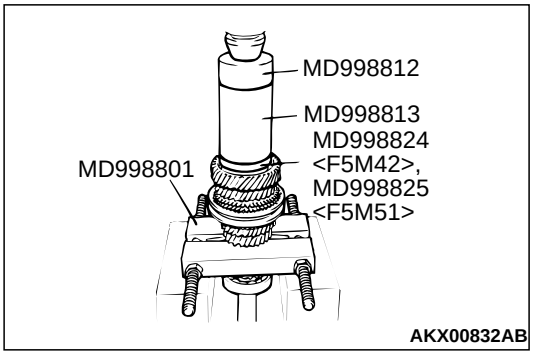
>>H<< 4TH SPEED GEAR SLEEVE INSTALLATION

1. Using special tool MD998801, support the 2nd speed gear portion of the input shaft, and then set them on the press.
2. Using special tools MD998812, MD998813, MD998824 <F5M42> and MD998825 <F5M51>, press install the 4th speed gear sleeve with the press.



>>I<< 5TH SPEED GEAR INSTALLATION

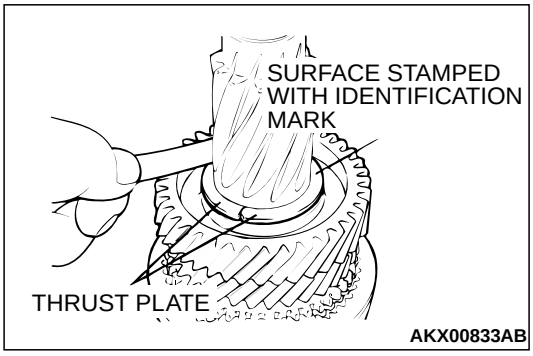
1. Using special tool MD998801, support the 2nd speed gear portion of the input shaft, and then set them on the press.
2. Using special tools MD998812, MD998813, MD998824 <F5M42> and MD998825 <F5M51>, press install the 5th speed gear in the input shaft.

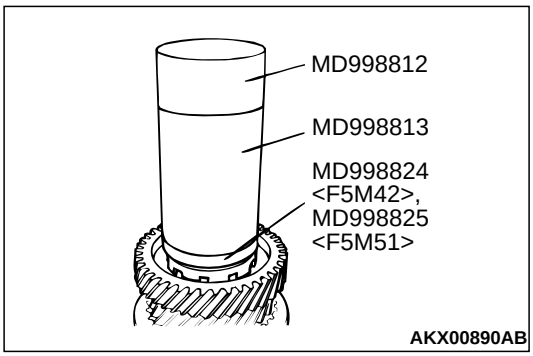


>>J<< THRUST PLATE INSTALLATION

1. Install the thickest thrust plates that can be fitted in the groove of input shaft. Install the thrust plate so the surface stamped with the identification mark is facing up.
2. Make sure that the 5th speed gear end play meets the standard value.

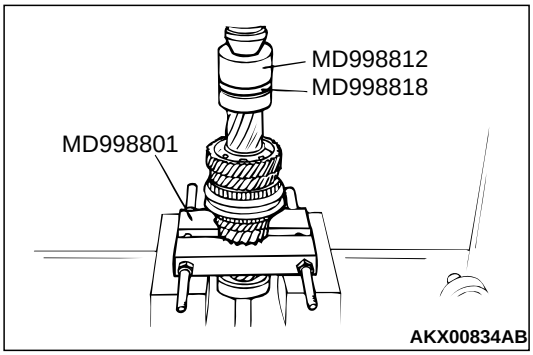
   Standard value: 0 – 0.09 mm (0 – 0.0035 inch)





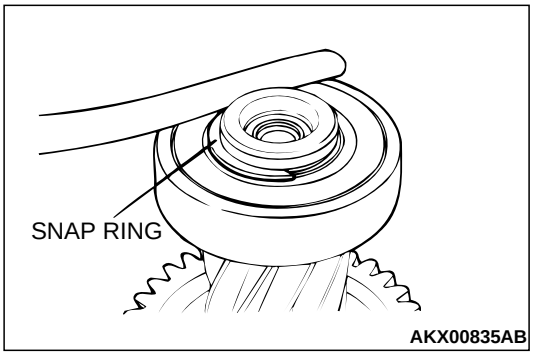
>>K<< THRUST PLATE STOPPER INSTALLATION

Install the thrust plate stopper by pressing special tools MD998812, MD998813, MD998824 <F5M42> and MD998825 <F5M51> by hand. Make sure that it is not tilted.



>>L<< BALL BEARING INSTALLATION

1. Using special tool MD998801, support the 2nd speed gear portion of the input shaft, and then set them on the press.
2. Using special tools MD998812 and MD998818, press install the ball bearing in the input shaft.



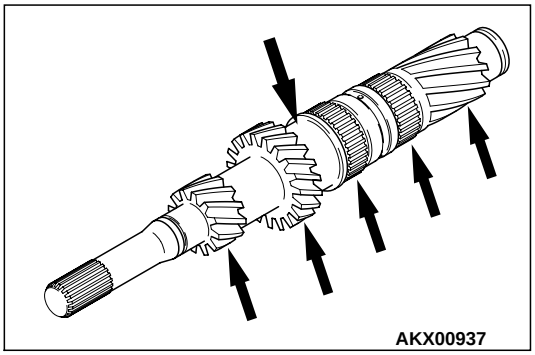
>>M<< SNAP RING INSTALLATION

1. Install the thickest snap ring that can be fitted in the groove of input shaft.
2. Make sure that the ball bearing end play meet the standard value.

   Standard value: 0 – 0.12 mm (0 – 0.0047 inch)

INSPECTION

M1222001700028



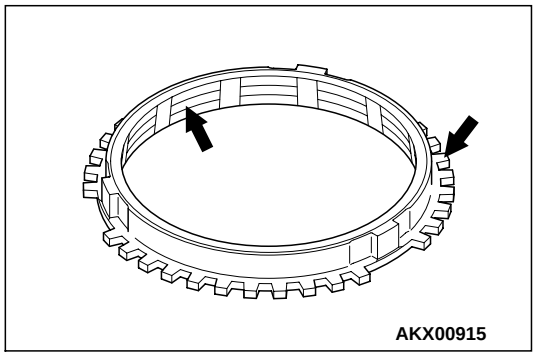
INPUT SHAFT

1. Check the outside diameter of the needle bearing mounting portion for damage, abnormal wear and seizure.
2. Check the splines for damage and wear.
3. Check that the helical gear teeth surfaces are not damaged or worn.

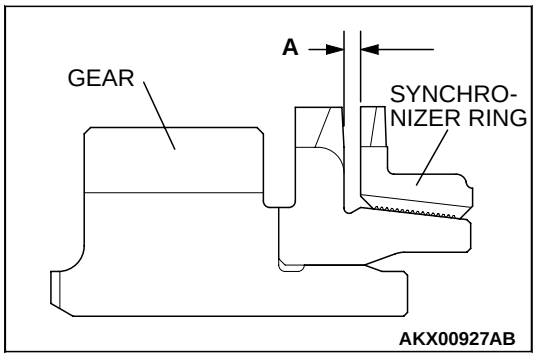
NEEDLE ROLLER BEARING

1. Combine the needle roller bearing with the input shaft or bearing sleeve and gear, and check that it rotates smoothly without noise or play.
2. Check the needle roller bearing cage for deformation.

SYNCHRONIZER RING



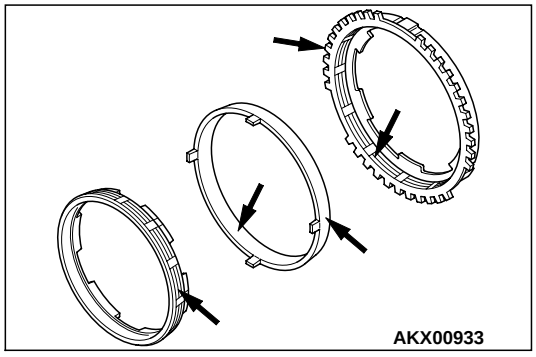
1. Check the clutch gear teeth for damage and broken.
2. Check internal surface for damage, wear and broken threads.



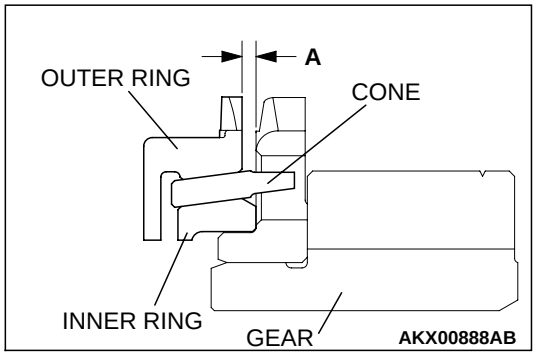
3. Force the synchronizer ring toward the clutch gear and check clearance "A". If "A" is less than the limit, replace.
   Minimum limit: 0.5 mm (0.020 inch)

OUTER SYNCHRONIZER RING/INNER SYNCHRONIZER RING/SYNCHRONIZER CONE

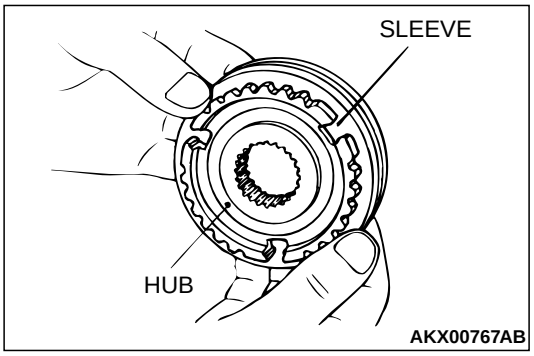
⚠ CAUTION
When any of the outer ring, inner ring or cone has to be replaced, replace them as a set.



1. Check to ensure that the clutch gear tooth surface and cone surface are not damaged and broken.



2. Install the outer ring, inner ring and cone, press them against the gear, and check clearance "A." If "A" is less than the limit, replace.
   Limit: 0.5 mm (0.020 inch)

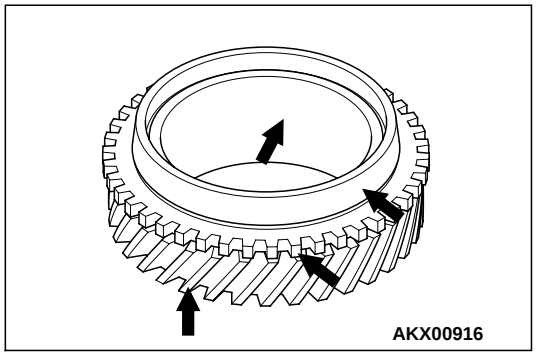


SYNCHRONIZER SLEEVE AND HUB

1. Combine the synchronizer sleeve and hub, and check that they slide smoothly.
2. Check that the sleeve is free from damage at its inside splines ends.

SYNCHRONIZER SPRING

Check that the spring is not sagging, deformed or broken.



SPEED GEARS

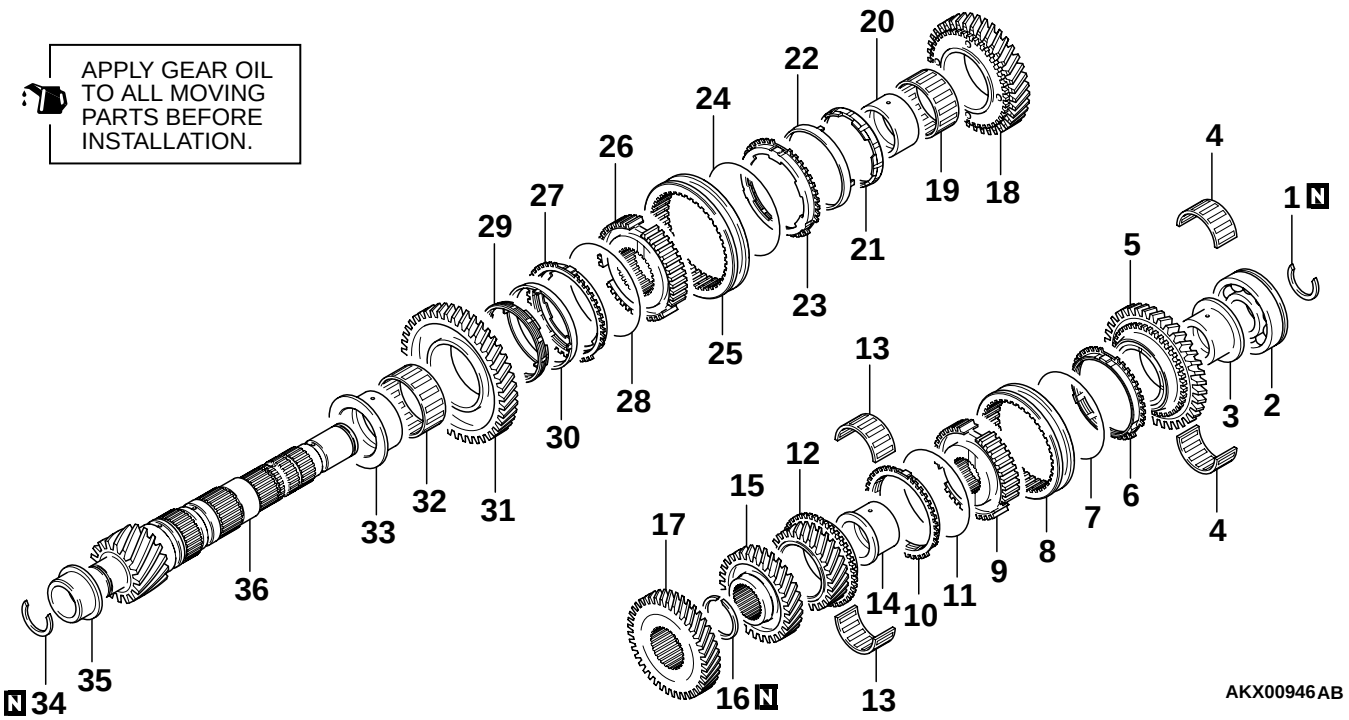
1. Check that the helical and clutch gear tooth surfaces are not damaged or worn.
2. Check that the synchronizer cone surfaces are not roughened, damaged or worn.
3. Check that the gear inside diameter and front and rear surfaces are not damaged and worn.

OUTPUT SHAFT

DISASSEMBLY AND ASSEMBLY

M1222002200026

<F5M42>



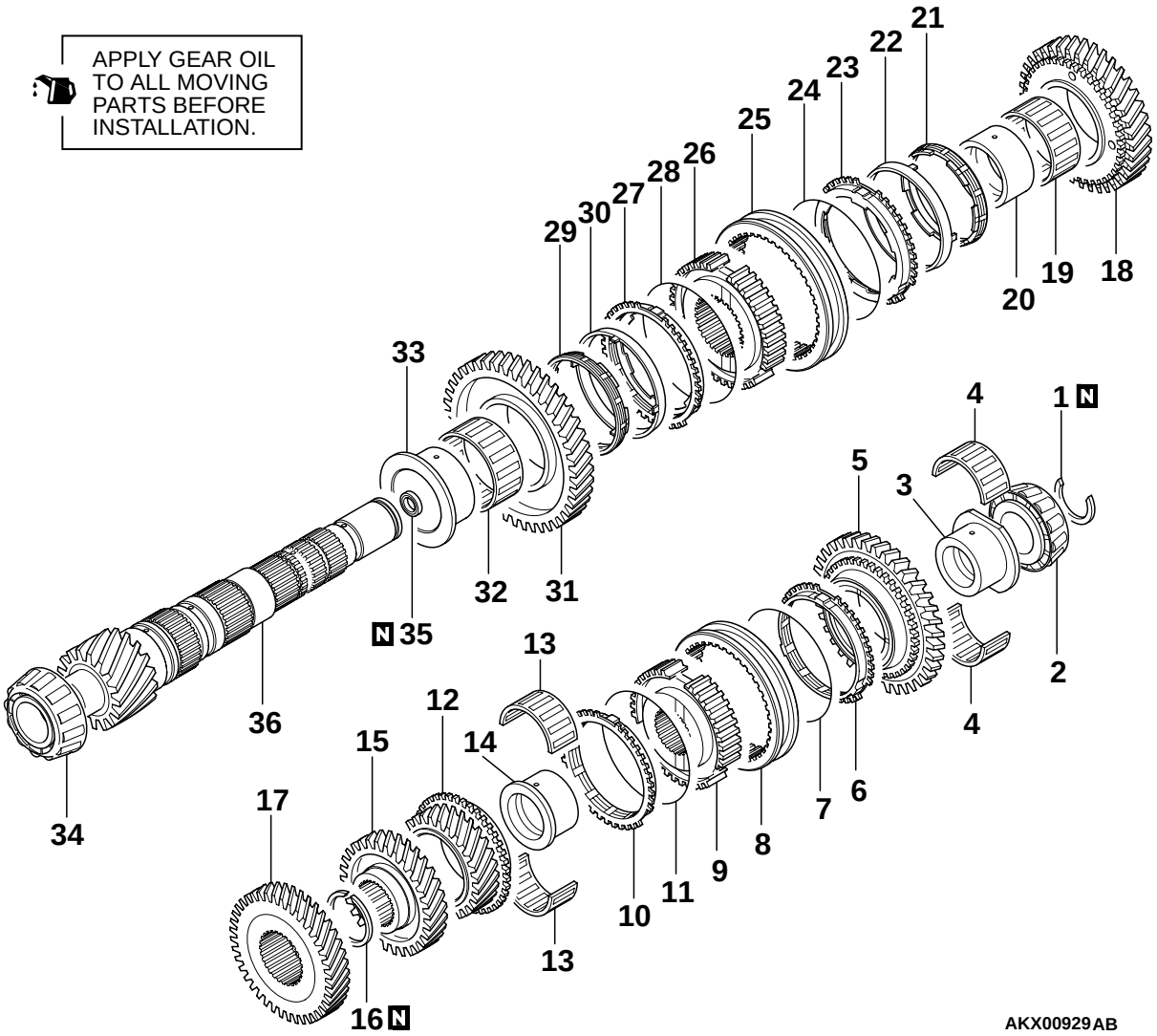
			DISASSEMBLY STEPS
	>>T<<	1.	SNAP RING
<<A>>	>>R<<	2.	BALL BEARING
<<C>>	>>Q<<	3.	REVERSE GEAR SLEEVE
		4.	NEEDLE ROLLER BEARING
		5.	REVERSE GEAR
	>>O<<	6.	SYNCHRONIZER RING
	>>N<<	7.	SYNCHRONIZER SPRING
	>>H<<	8.	SYNCHRONIZER SLEEVE
<<D>>	>>P<<	9.	5TH SPEED-REVERSE SYNCHRONIZER HUB
	>>O<<	10.	SYNCHRONIZER RING
	>>N<<	11.	SYNCHRONIZER SPRING
		12.	5TH SPEED GEAR
		13.	NEEDLE ROLLER BEARING
	>>M<<	14.	5TH SPEED GEAR SLEEVE
	>>L<<	15.	4TH SPEED GEAR
	>>K<<	16.	SNAP RING
<<E>>	>>J<<	17.	3RD SPEED GEAR
		18.	2ND SPEED GEAR
		19.	NEEDLE ROLLER BEARING
<<F>>	>>I<<	20.	2ND SPEED GEAR SLEEVE
		21.	INNER SYNCHRONIZER RING
		22.	SYNCHRONIZER CONE
		23.	OUTER SYNCHRONIZER RING
	>>F<<	24.	SYNCHRONIZER SPRING
	>>H<<	25.	SYNCHRONIZER SLEEVE
	>>G<<	26.	1ST-2ND SPEED SYNCHRONIZER HUB
		27.	OUTER SYNCHRONIZER RING
	>>F<<	28.	SYNCHRONIZER SPRING
		29.	INNER SYNCHRONIZER RING
		30.	SYNCHRONIZER CONE
		31.	1ST SPEED GEAR
		32.	NEEDLE ROLLER BEARING
<<G>>	>>E<<	33.	1ST SPEED GEAR SLEEVE
	>>D<<	34.	SNAP RING
<<H>>	>>B<<	35.	ROLLER BEARING INNER RACE
		36.	OUTPUT SHAFT

Required Special Tools:

- MD998364: Camshaft Oil Seal Installer <F5M51>
- MD998801: Bearing Remover
- MD998812: Installer Cap
- MD998813: Installer – 100 <F5M42>
- MD998814: Installer – 200
- MD998818: Installer Adapter (38) <F5M42>
- MD998819: Installer Adapter (40)
- MD998820: Installer Adapter (42) <F5M51>
- MD998821: Installer Adapter (44) <F5M51>
- MD998822: Installer Adapter (46) <F5M42>
- MD998824: Installer Adapter (50) <F5M51>
- MD998825: Installer Adapter (52) <F5M42>
- MD998917: Bearing Remover

TSB Revision

<F5M51>



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DISASSEMBLY STEPS

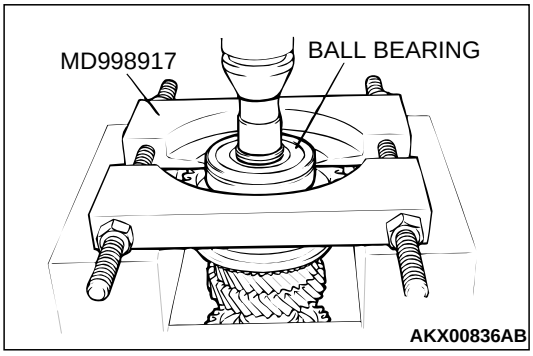
	>>T<<	1.	SNAP RING
<<B>>	>>S<<	2.	TAPER ROLLER BEARING
<<C>>	>>Q<<	3.	REVERSE GEAR BEARING SLEEVE
		4.	NEEDLE ROLLER BEARING
		5.	REVERSE GEAR
	>>O<<	6.	SYNCHRONIZER RING
	>>N<<	7.	SYNCHRONIZER SPRING
	>>H<<	8.	SYNCHRONIZER SLEEVE
<<D>>	>>P<<	9.	5TH SPEED-REVERSE SYNCHRONIZER HUB
	>>O<<	10.	SYNCHRONIZER RING
	>>N<<	11.	SYNCHRONIZER SPRING
		12.	5TH SPEED GEAR
		13.	NEEDLE ROLLER BEARING
	>>M<<	14.	5TH SPEED GEAR SLEEVE
	>>L<<	15.	4TH SPEED GEAR
	>>K<<	16.	SNAP RING
<<E>>	>>J<<	17.	3RD SPEED GEAR
		18.	2ND SPEED GEAR

DISASSEMBLY STEPS

		19.	NEEDLE ROLLER BEARING
<<F>>	>>I<<	20.	2ND SPEED GEAR SLEEVE
		21.	INNER SYNCHRONIZER RING
		22.	SYNCHRONIZER CONE
		23.	OUTER SYNCHRONIZER RING
	>>F<<	24.	SYNCHRONIZER SPRING
	>>H<<	25.	SYNCHRONIZER SLEEVE
	>>G<<	26.	1ST-2ND SPEED SYNCHRONIZER HUB
		27.	OUTER SYNCHRONIZER RING
	>>F<<	28.	SYNCHRONIZER SPRING
		29.	INNER SYNCHRONIZER RING
		30.	SYNCHRONIZER CONE
		31.	1ST SPEED GEAR
		32.	NEEDLE ROLLER BEARING
<<G>>	>>E<<	33.	1ST SPEED GEAR SLEEVE
<<I>>	>>C<<	34.	TAPER ROLLER BEARING
	>>A<<	35.	OIL SEAL
		36.	OUTPUT SHAFT

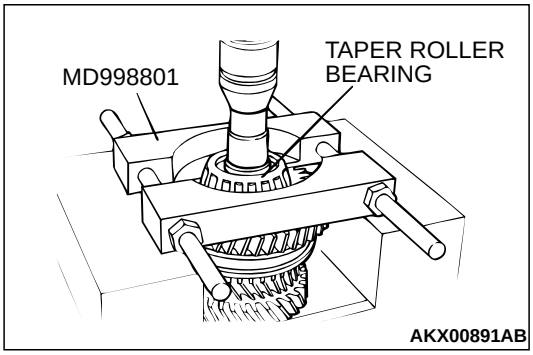
TSB Revision

DISASSEMBLY SERVICE POINTS



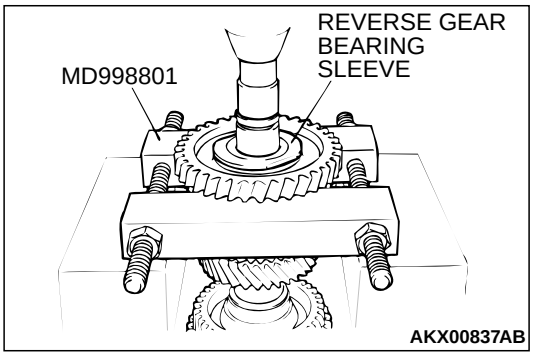
<<A>> BALL BEARING REMOVAL

1. Using special tool MD998917, support the ball bearing, and then set them on the press.
2. Push down on the output shaft with the press, and take out the ball bearing.



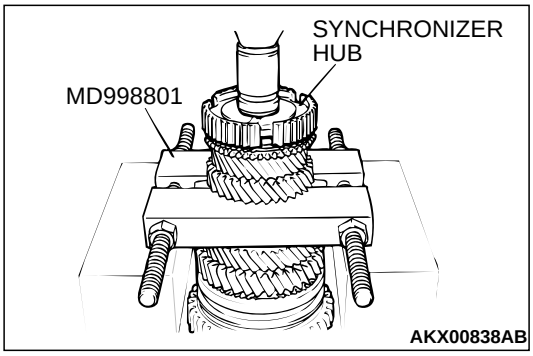
<<B>> TAPER ROLLER BEARING REMOVAL

1. Using special tool MD998801, support the taper roller bearing, and then set them on the press.
2. Push down on the output shaft with the press, and take out the taper roller bearing.



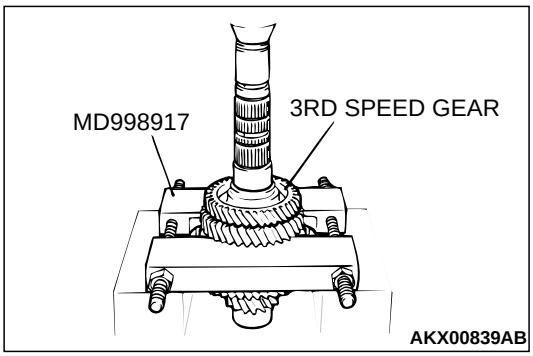
<<C>> REVERSE GEAR BEARING SLEEVE REMOVAL

1. Using special tool MD998801, support the reverse gear, and then set them on the press.
2. Push down on the output shaft with the press and remove the reverse gear bearing sleeve.



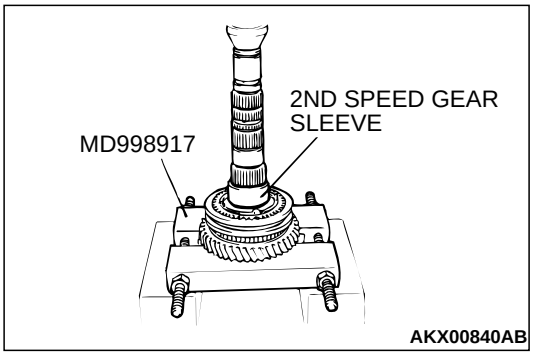
<<D>> 5TH SPEED-REVERSE SYNCHRONIZER HUB REMOVAL

1. Using special tool MD998801, support the 4th speed gear, and then set them on the press.
2. Push down on the output shaft with the press and remove the 5th speed-reverse synchronizer hub.



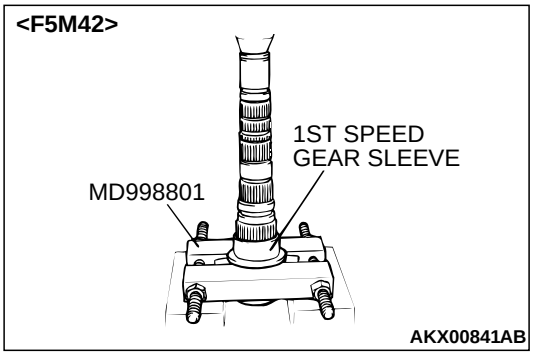
<<E>> 3RD SPEED GEAR REMOVAL

1. Using special tool MD998917, support the 2nd speed gear, and then set them on the press.
2. Push down on the output shaft with the press and remove the 3rd speed gear.



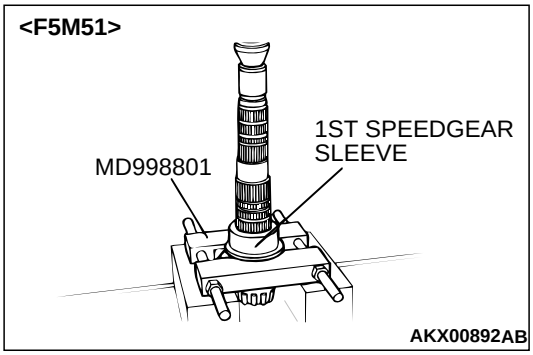
<<F>> 2ND SPEED GEAR SLEEVE REMOVAL

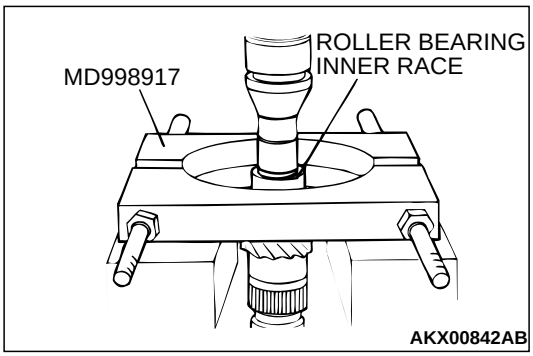
1. Using special tool MD998917, support the 1st speed gear, and then set them on the press.
2. Push down on the output shaft with the press and remove the 2nd speed gear sleeve.



<<G>> 1ST SPEED GEAR SLEEVE REMOVAL

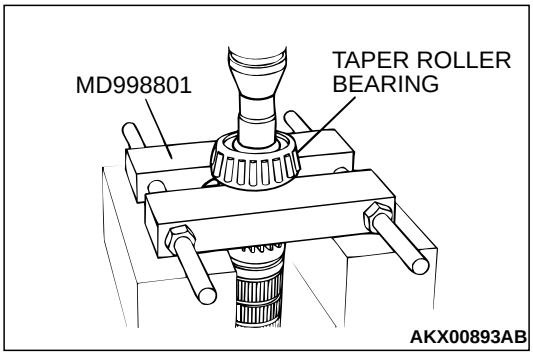
1. Using special tool MD998801, support the 1st speed gear sleeve, and then set them on the press.
2. Push down on the output shaft with the press and remove the 1st speed gear sleeve.





<<H>> ROLLER BEARING INNER RACE REMOVAL

1. Using special tool MD998917, support the roller bearing inner race, and then set them on the press.
2. Push down on the output shaft with the press and remove the roller bearing inner race.



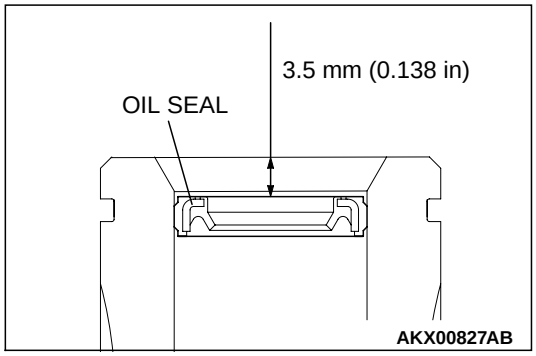
<<I>> TAPER ROLLER BEARING REMOVAL

1. Using special tool MD998801, support the taper roller bearing, and then set them on the press.
2. Push down on the output shaft with the press and remove the taper roller bearing.

ASSEMBLY SERVICE POINTS

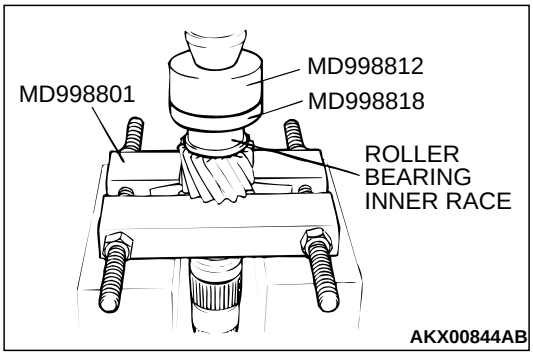
>>A<< OIL SEAL INSTALLATION

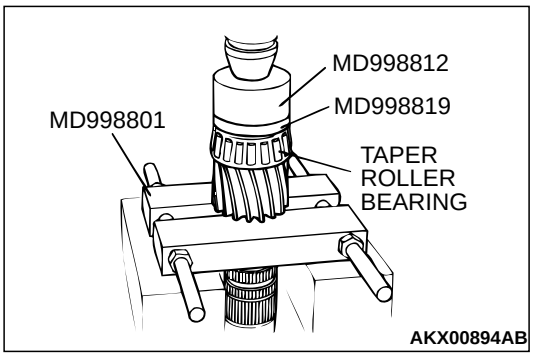
Make sure that the oil seal is pressed into the position shown in the illustration.



>>B<< ROLLER BEARING INNER RACE INSTALLATION

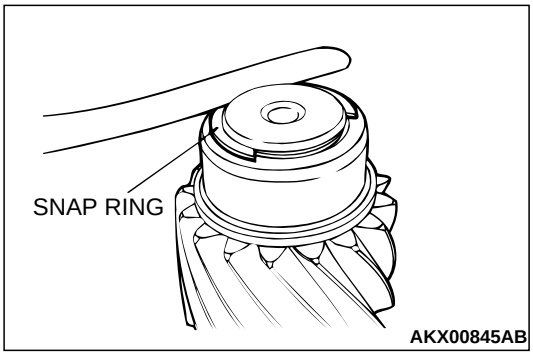
1. Using special tool MD998801, support the output shaft gear, and then set them on the press.
2. Using special tools MD998812 and MD998818, press install the roller bearing inner race with the press.





>>C<< TAPER ROLLER BEARING INSTALLATION

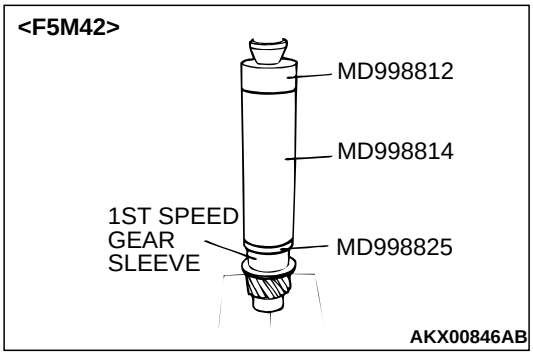
1. Using special tool MD998801, support the output shaft gear, and then set them on the press.
2. Using special tools MD998812 and MD998819, press install the taper roller bearing with the press.



>>D<< SNAP RING INSTALLATION

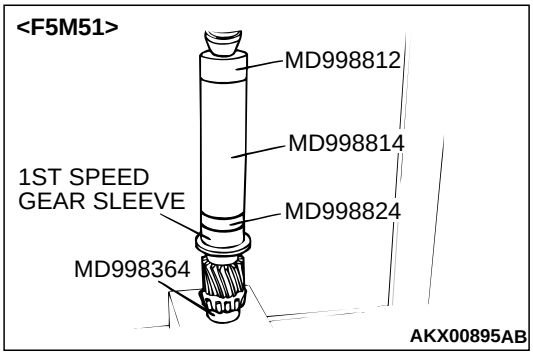
1. Install the thickest snap ring that can be fitted in the groove of output shaft.
2. Make sure that the roller bearing inner race end play meets the standard value.

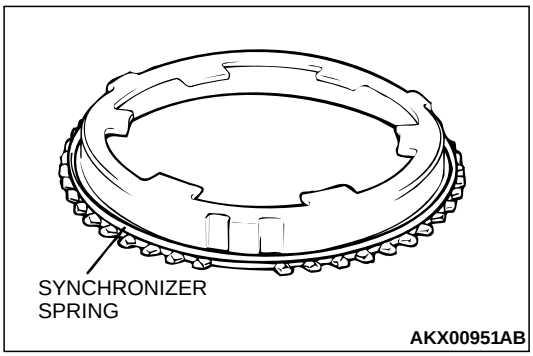
   Standard value: 0 – 0.12 mm (0 – 0.0047 inch)



>>E<<1ST SPEED GEAR SLEEVE INSTALLATION

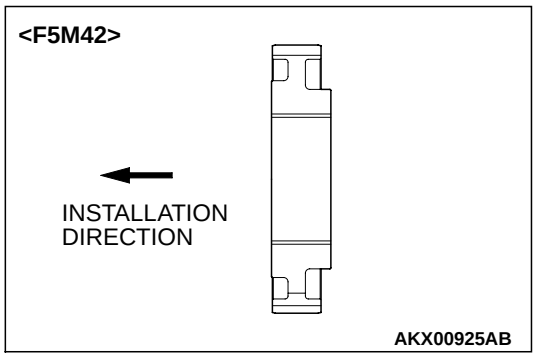
1. Set the output shaft on the press support stand.
2. Using special tools MD998812, MD998814, MD998825 <F5M42>, MD998824 <F5M51> and MD998364 <F5M51>, press install the 1st speed gear sleeve with the press.

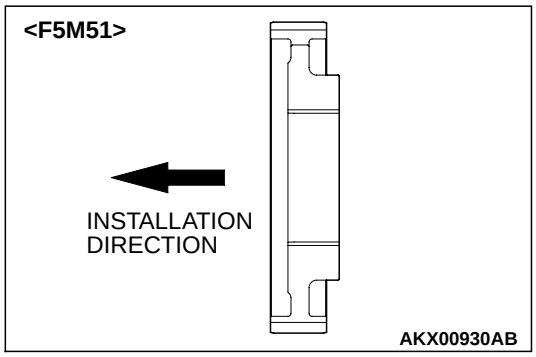


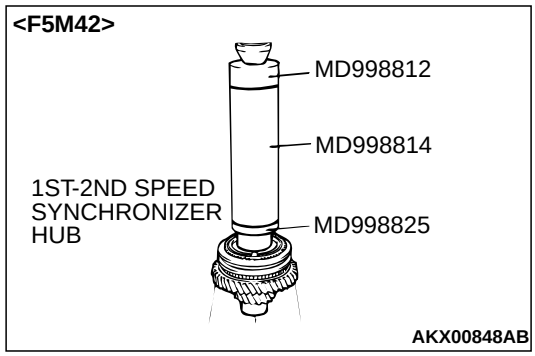


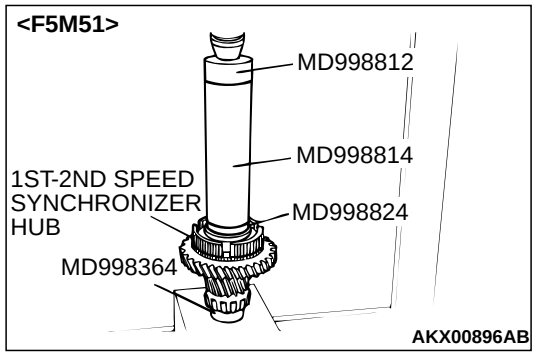
>>F<< SYNCHRONIZER SPRING INSTALLATION

Install the synchronizer spring to the illustrated position of the outer synchronizer ring.



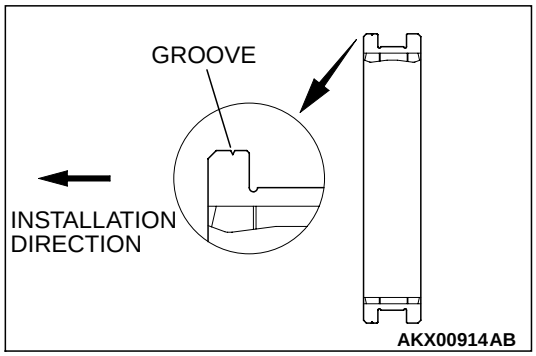






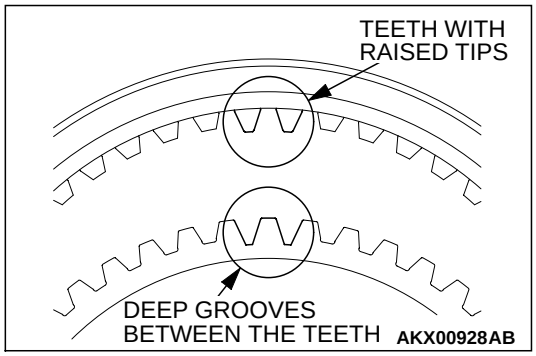
>>G<< 1ST-2ND SPEED SYNCHRONIZER HUB INSTALLATION

1. Set the output shaft on the press support stand.
2. Check that the 1st-2nd speed synchronizer hub is in the correct installation direction, and put it on the output shaft.
3. Using special tools MD998812, MD998814, MD998825 <F5M42>, MD998824 <F5M51> and MD998364 <F5M51>, press install the 1st-2nd speed synchronizer hub with the press.
4. Make sure that the outer synchronizer ring on the 1st speed gear side can rotate freely.



>>H<< SYNCHRONIZER SLEEVE INSTALLATION

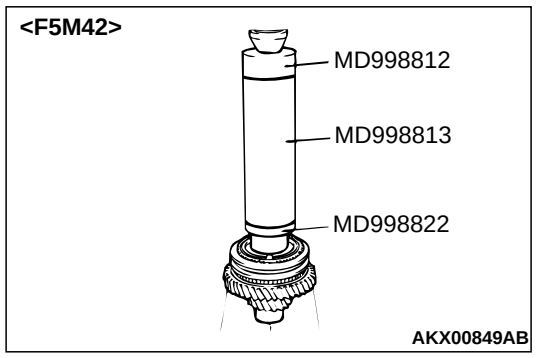
1. Check that the synchronizer sleeve is in the correct direction for installation, and install it on the 1st-2nd speed synchronizer hub.

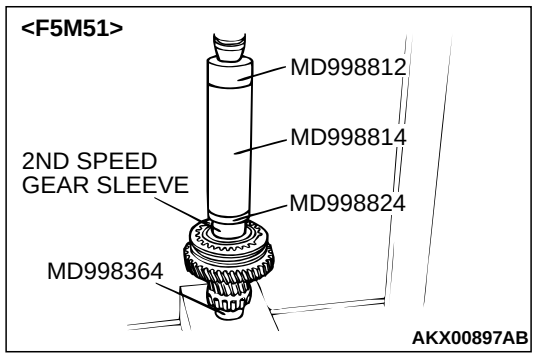


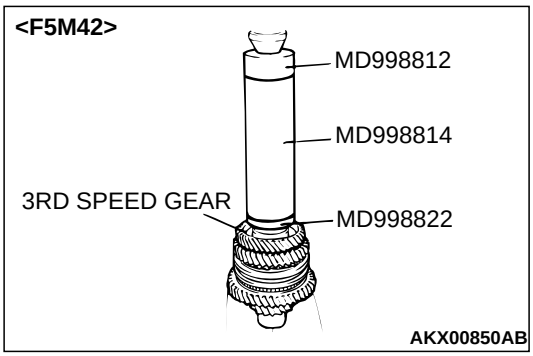
2. Install the synchronizer sleeve so that the areas with teeth that have raised tips (three areas total) are aligned with the areas on the synchronizer hub that have deep grooves between the teeth (three areas total).

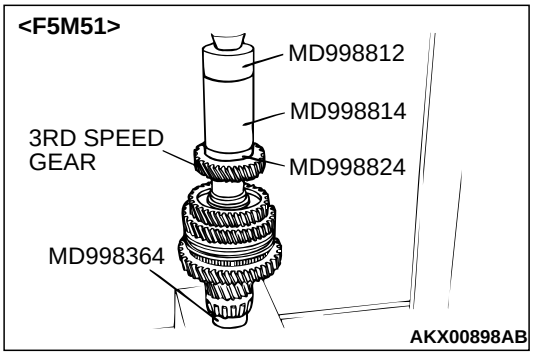
>>I<< 2ND SPEED GEAR SLEEVE INSTALLATION

1. Set the output shaft on the press support stand.
2. Using special tools MD998812, MD998813, MD998822 <F5M42>, MD998824 <F5M51> and MD998364 <F5M51>, press install the 2nd speed sleeve onto the output shaft.



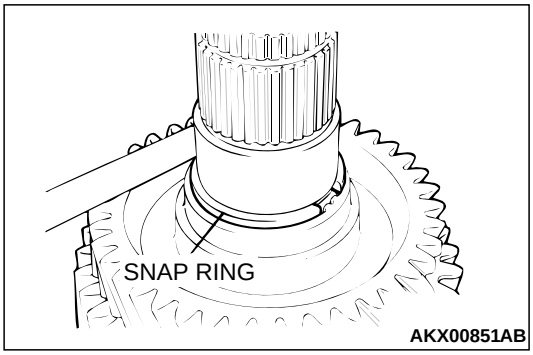






>>J<< 3RD SPEED GEAR INSTALLATION

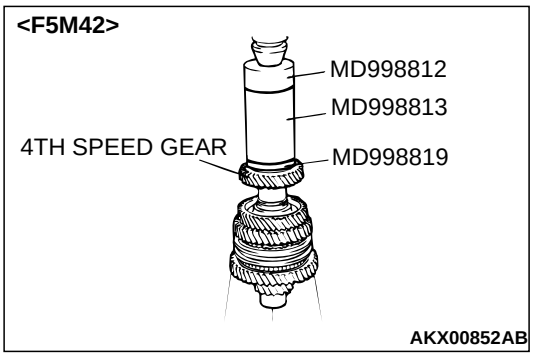
1. Check that the 2nd speed gear and the outer synchronizer ring have been properly installed. Also, make sure the claws on the synchronizer cone (four places) are correctly fitted into the holes in the 2nd speed gear (four places).
2. Using special tools MD998812, MD998814, MD998822 <F5M42>, MD998824 <F5M51> and MD998364 <F5M51>, press install the 3rd speed gear onto the output shaft.
3. Make sure that the 2nd speed gear and the outer synchronizer ring can rotate freely.



>>K<< SNAP RING INSTALLATION

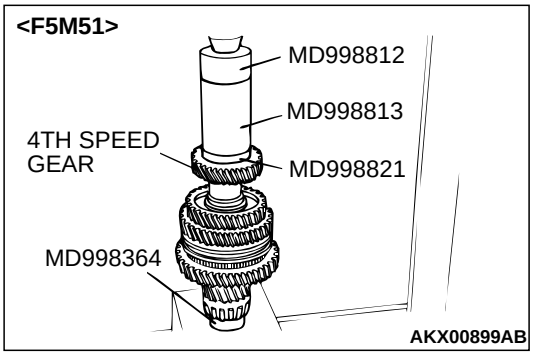
1. Install the thickest snap ring that can be fitted in the groove of output shaft.
2. Make sure that the 3rd speed gear end play meets the standard value.

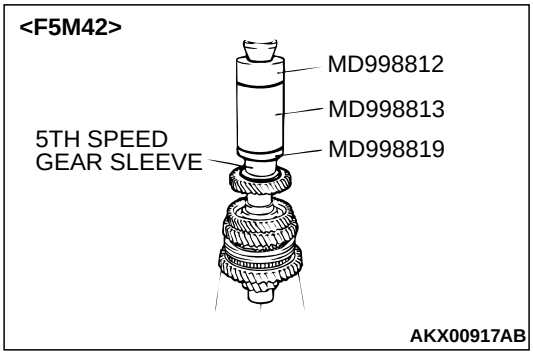
   Standard value: 0 – 0.09 mm (0 – 0.0035 inch)



>>L<< 4TH SPEED GEAR INSTALLATION

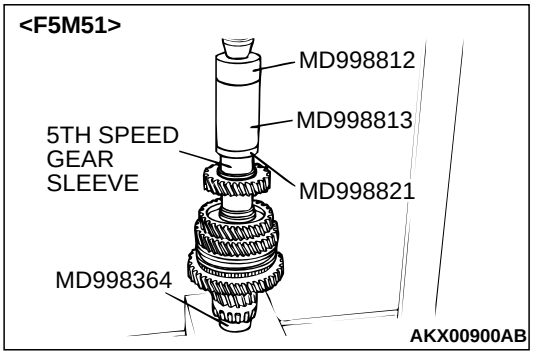
1. Set the output shaft on the press support stand.
2. Using special tools MD998812, MD998813, MD998819 <F5M42>, MD998821 <F5M51> and MD998364 <F5M51>, press install the 4th speed gear onto the output shaft.

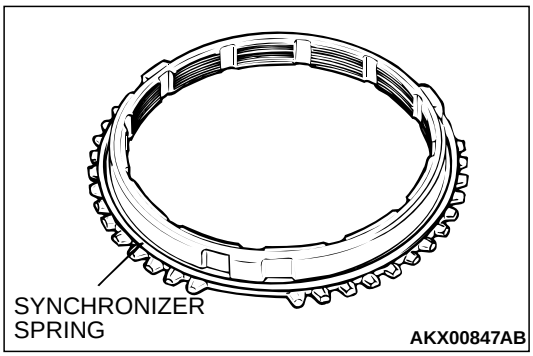




>>M<< 5TH SPEED GEAR SLEEVE INSTALLATION

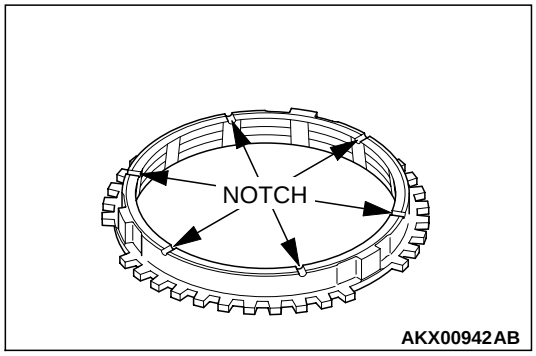
Using special tools MD998812, MD998813, MD998819 <F5M42>, MD998821 <F5M51> and MD998364 <F5M51>, press install the 5th speed gear sleeve onto the output shaft.





>>N<< SYNCHRONIZER SPRING INSTALLATION

Install the synchronizer spring to the illustrated position of the synchronizer ring.

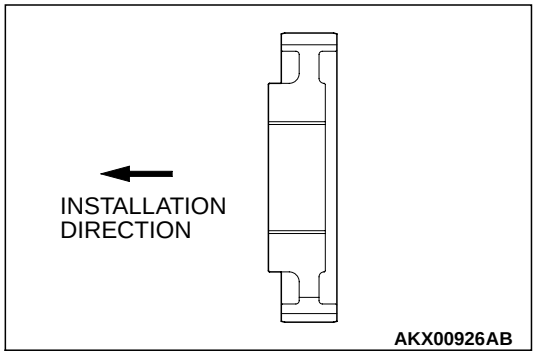


>>O<< SYNCHRONIZER RING INSTALLATION

⚠ CAUTION

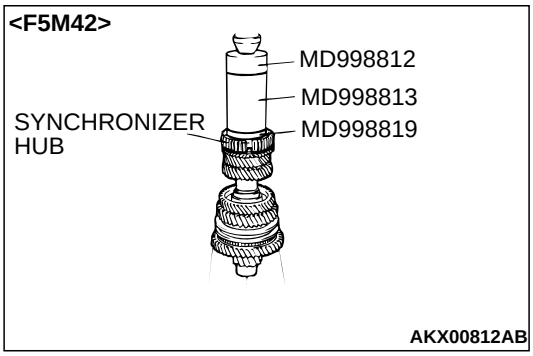
There is a 5th speed synchronizer ring and a reverse synchronizer ring. Be careful not to confuse the two when installing, as a mistake can effect the shift feeling.

1. Check for the presence of identification notches on the synchronizer ring.
   No notches: 5th speed synchronizer ring
   Six notches: Reverse synchronizer ring <F5M42>
   Three notches: Reverse synchronizer ring <F5M51>
2. Install the synchronizer ring so that it does not incline toward the cone of the gear.

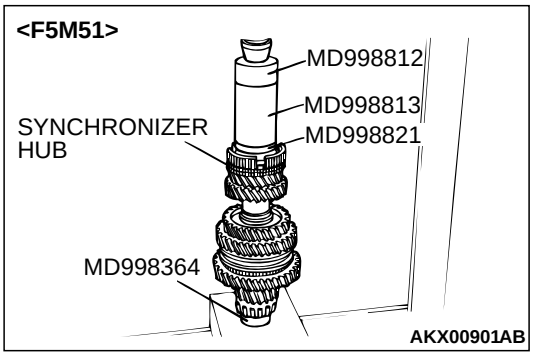


>>P<< 5TH SPEED-REVERSE SYNCHRONIZER HUB INSTALLATION

1. Set the output shaft on the press support stand.
2. Make sure that the synchronizer ring is fitted correctly on the cone of the 5th speed gear.
3. Check that the 5th speed-reverse synchronizer hub is oriented correctly for installation, and fit it on the output shaft.

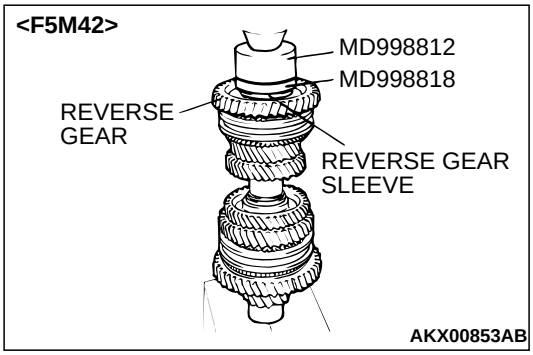


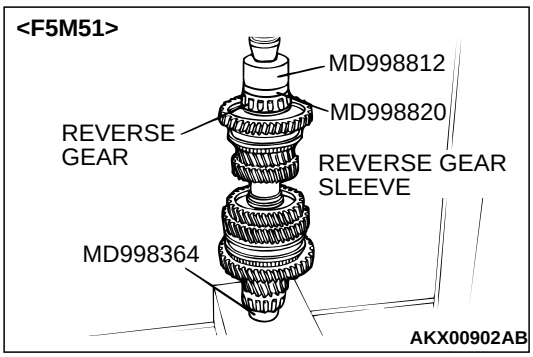
4. Using special tools MD98812, MD998813, MD998819 <F5M42>, MD998821 <F5M51> and MD998364 <F5M51>, press install the 5th speed-reverse synchronizer hub with the press.
5. Make sure that the synchronizer ring on the 5th speed gear side can rotate freely.

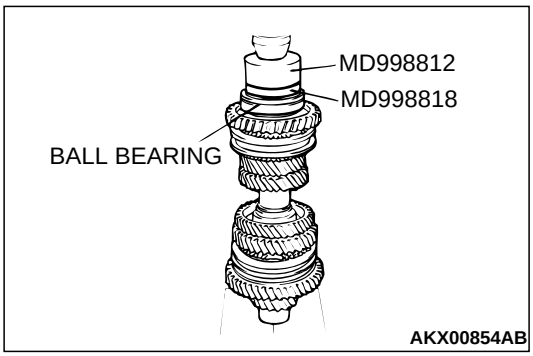


>>Q<< REVERSE GEAR SLEEVE INSTALLATION

1. Make sure the synchronizer ring, reverse gear and needle roller bearing have been correctly installed.
2. Using special tools MD998812, MD998818 <F5M42>, MD998820 <F5M51> and MD998364 <F5M51>, press fit the reverse gear sleeve. Make sure that the reverse gear and the synchronizer ring can rotate freely during the pressing process.

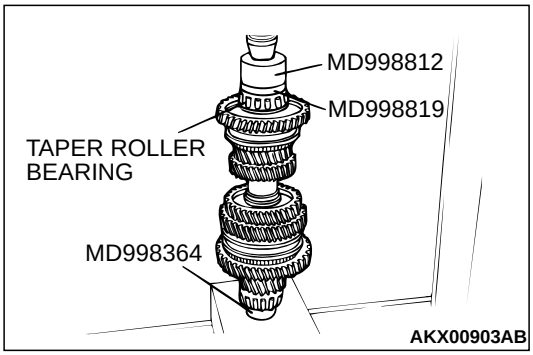






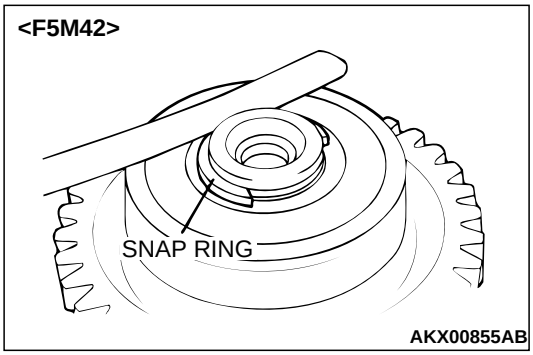
>>R<< BALL BEARING INSTALLATION

1. Check the installation direction of the ball bearing.
2. Using special tools MD998812 and MD998818, press install the ball bearing.



>>S<< TAPER ROLLER BEARING INSTALLATION

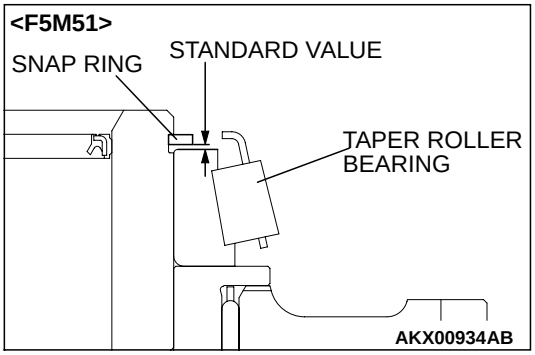
Using special tools MD998812, MD998819 and MD998364, press install the taper roller bearing.



>>T<< SNAP RING INSTALLATION

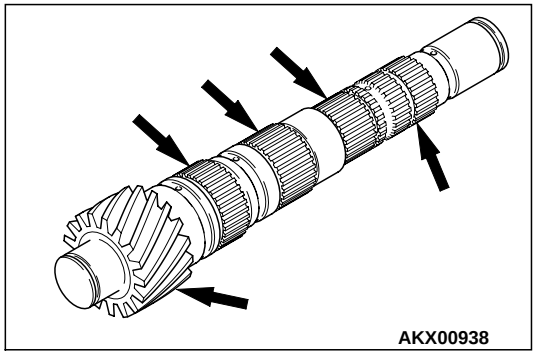
1. Install the thickest snap ring that can be fitted in the groove of output shaft.
2. Make sure that the ball bearing <F5M42> or taper roller bearing <F5M51> end play meets the standard value.

   Standard value: 0 – 0.09 mm (0 – 0.0035 inch)



INSPECTION

M1222002300023



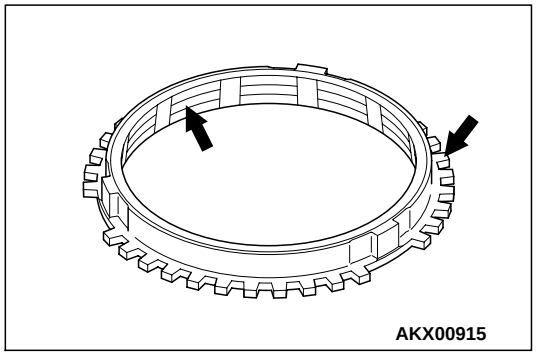
OUTPUT SHAFT

1. Check the splines for damage and wear.
2. Check that the helical gear teeth surfaces are not damaged or worn.

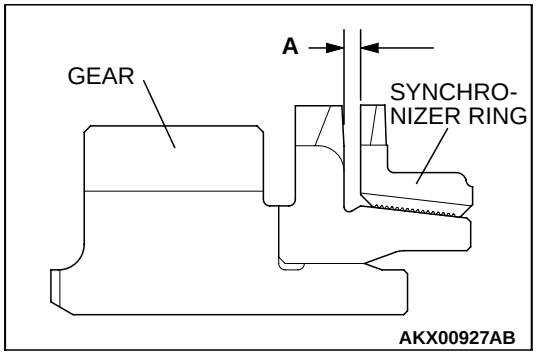
NEEDLE ROLLER BEARING

1. Combine the needle roller bearing with the bearing sleeve and gear, and check that it rotates smoothly without noise or play.
2. Check the needle roller bearing cage for deformation.

SYNCHRONIZER RING

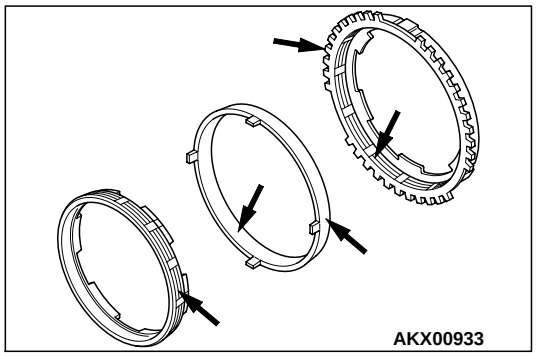


1. Check if the clutch gear teeth are damaged or broken.
2. Check internal surface for damage, wear and broken threads.



3. Force the synchronizer ring toward the clutch gear and check clearance "A". If "A" is less than the limit, replace the synchronizer ring.
   Minimum limit: 0.5 mm (0.020 inch)

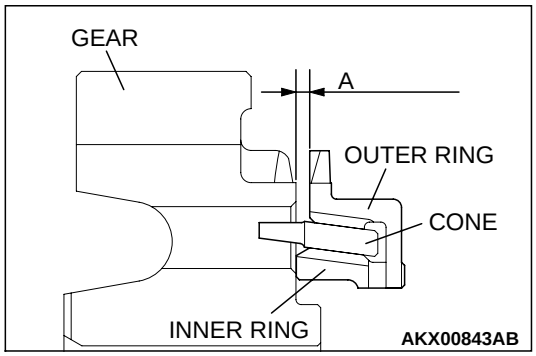
OUTER SYNCHRONIZER RING/INNER SYNCHRONIZER RING/SYNCHRONIZER CONE



⚠ CAUTION

When replacing, replace the outer ring, inner ring and cone as a set.

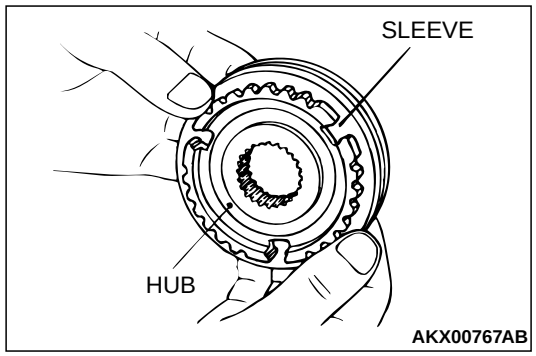
1. Check that the clutch gear tooth surfaces and cone surfaces are not damaged or broken.



2. Install the outer ring, inner ring and cone, force them toward the gear, and check clearance "A". If "A" is less than the limit, replace them as a set.

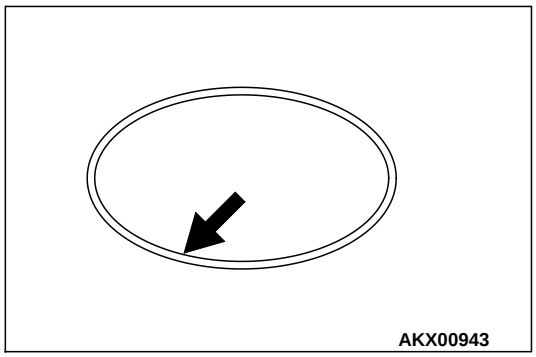
   Minimum limit: 0.5 mm (0.020 inch)

SYNCHRONIZER SLEEVE AND HUB

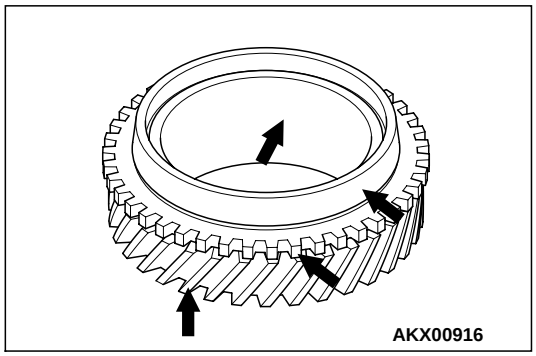


1. Combine the synchronizer sleeve and hub, and check that they slide smoothly.
2. Check that the sleeve is free from damage at its inside splines ends.

SYNCHRONIZER SPRING



Check that the spring is not sagging, deformed or broken.


AKX00916

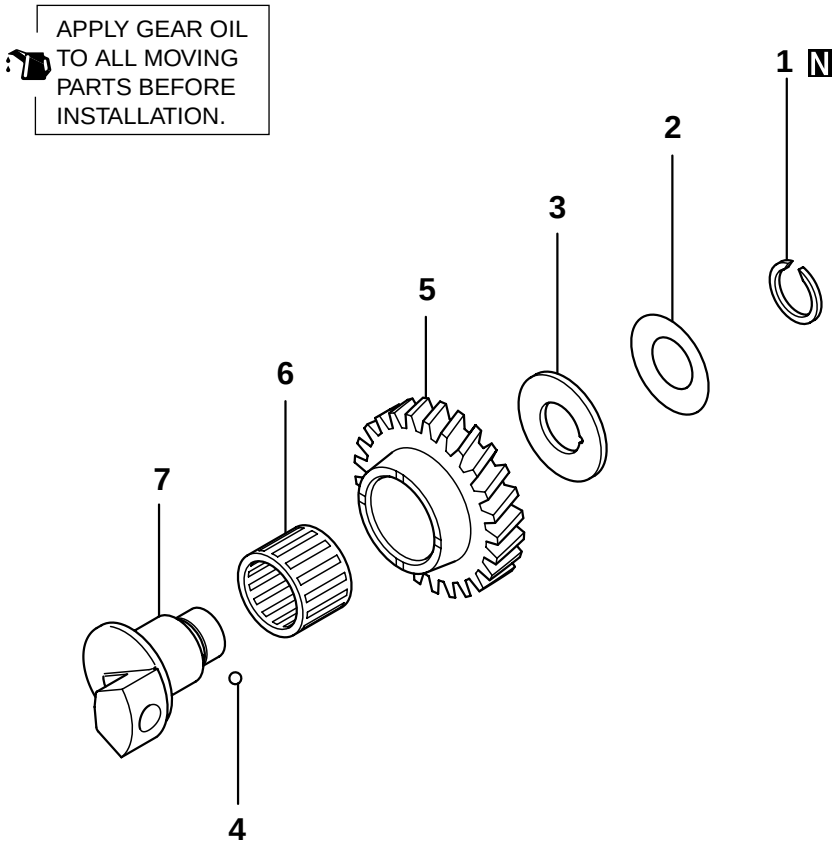
SPEED GEARS

1. Check that the helical and clutch gear tooth surfaces are not damaged or worn.
2. Check that the synchronizer cone surfaces are not roughened, damaged or worn.
3. Check that the gear inside diameter and front and rear surfaces are not damaged and worn.

REVERSE IDLER GEAR

DISASSEMBLY AND ASSEMBLY

M1222012500028



AK000202AB

DISASSEMBLY STEPS

1. SNAP RING
2. CONE SPRING
3. THRUST WASHER
4. STEEL BALL

DISASSEMBLY STEPS

5. REVERSE IDLER GEAR
6. NEEDLE ROLLER BEARING
7. REVERSE IDLER GEAR SHAFT

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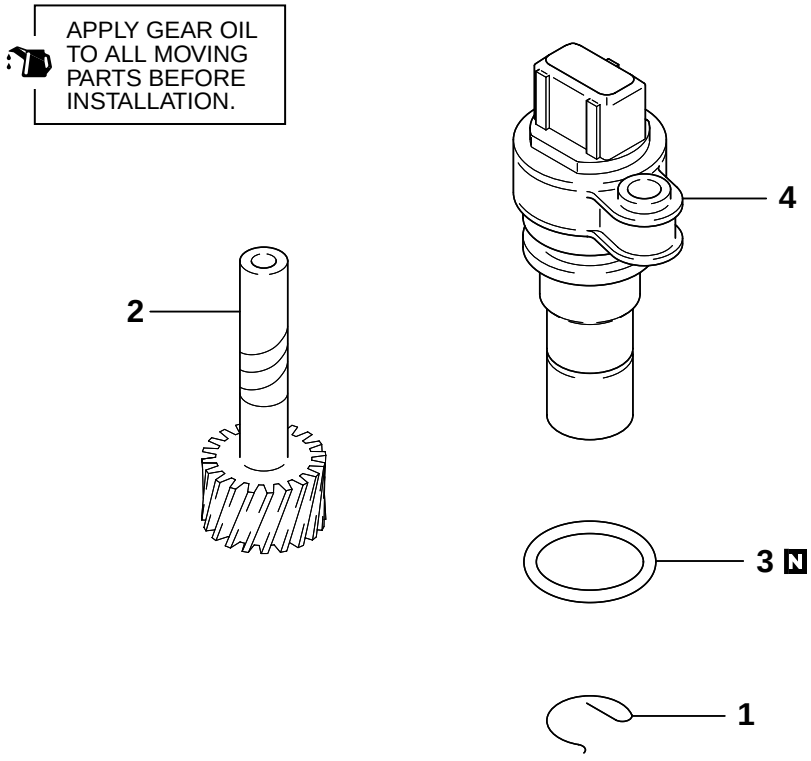
SPEEDOMETER GEAR

DISASSEMBLY AND ASSEMBLY

M1222003400023



DISASSEMBLY STEPS

1. E-CLIP
2. SPEEDOMETER DRIVEN GEAR

DISASSEMBLY STEPS

3. O-RING
4. SLEEVE

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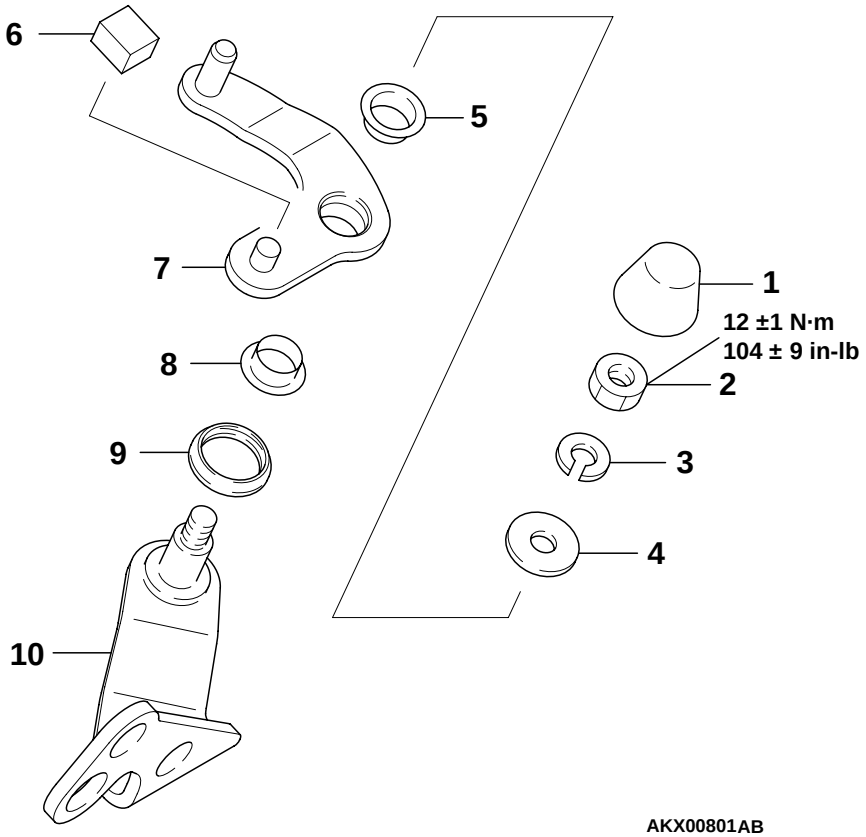
SELECT LEVER

DISASSEMBLY AND ASSEMBLY

M1222012800029



	DISASSEMBLY STEPS
	1. DUST COVER
	2. NUT
	3. SPRING WASHER
	4. WASHER
>>A<<	5. SELECT LEVER BUSHING

	DISASSEMBLY STEPS
	6. SELECT LEVER SHOE
	7. SELECT LEVER
>>A<<	8. SELECT LEVER BUSHING
>>A<<	9. DUST COVER
	10. SELECT LEVER SHAFT

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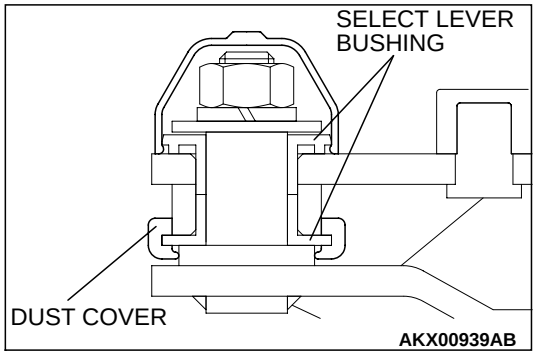
ASSEMBLY SERVICE POINT



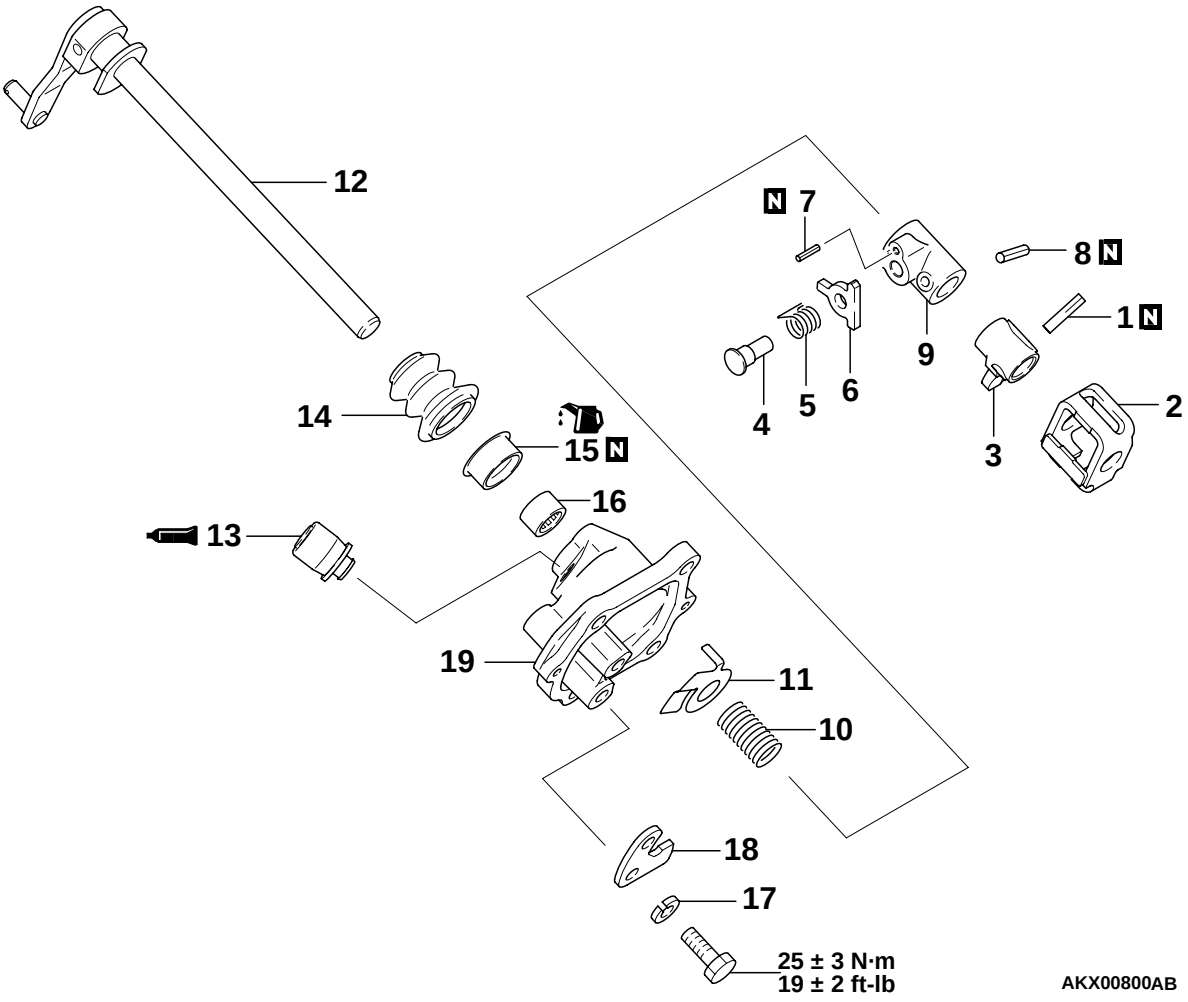
>>A<< DUST COVER AND SELECT LEVER BUSHING INSTALLATION

Use the figure to make sure the dust cover and select lever bushing installation direction is correct, and the distinguished parts are correctly assembled.

CONTROL HOUSING

DISASSEMBLY AND ASSEMBLY

M1222013100023



		DISASSEMBLY STEPS
<<A>>	>>F<<	1. LOCK PIN
		2. INTERLOCK PLATE
		3. CONTROL FINGER
		4. PIN
		5. RETURN SPRING
		6. STOPPER PLATE
	>>E<<	7. SPRING PIN
	>>D<<	8. SPRING PIN
		9. STOPPER BODY
		10. NEUTRAL RETURN SPRING

	DISASSEMBLY STEPS
	11. SPACER
	12. CONTROL SHAFT
>>C<<	13. AIR BREATHER
	14. CONTROL SHAFT BOOT
>>B<<	15. OIL SEAL
>>A<<	16. NEEDLE BEARING
	17. SPRING WASHER
	18. STOPPER BRACKET
	19. CONTROL HOUSING

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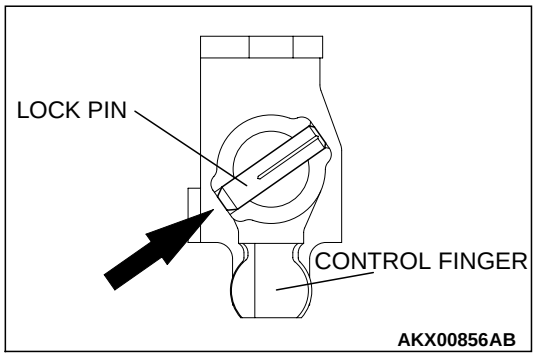
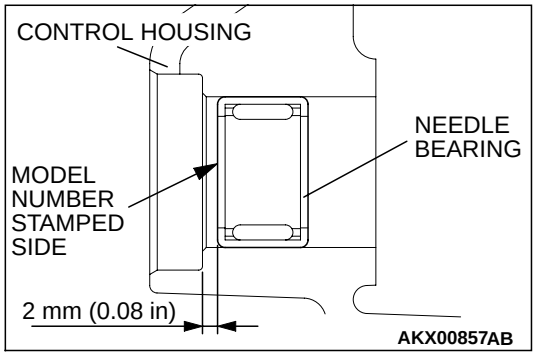
DISASSEMBLY SERVICE POINT

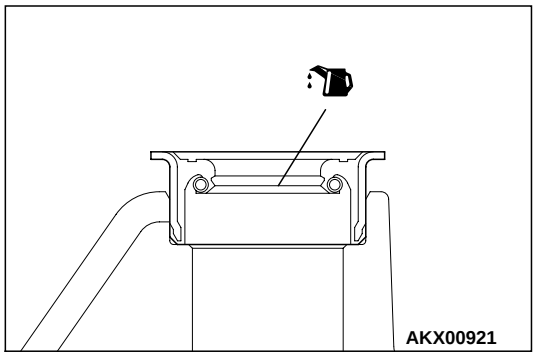


<<A>> LOCK PIN REMOVAL
Drive the lock pin out of position from the direction shown.

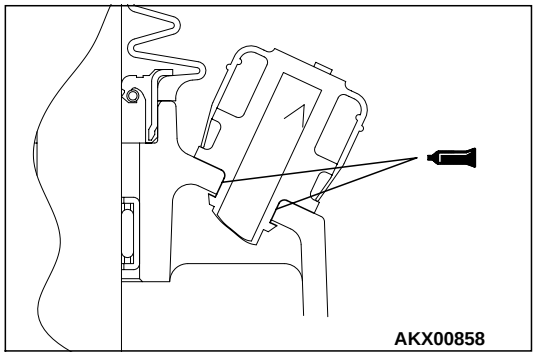
ASSEMBLY SERVICE POINTS



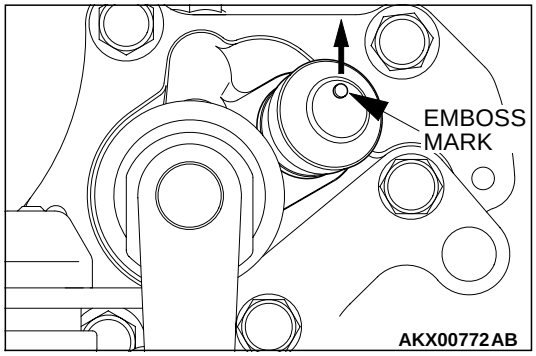
>>A<< NEEDLE BEARING INSTALLATION
Press fit the needle bearing up the illustrated dimension, while making sure that the model number stamped side is oriented toward the control housing side.



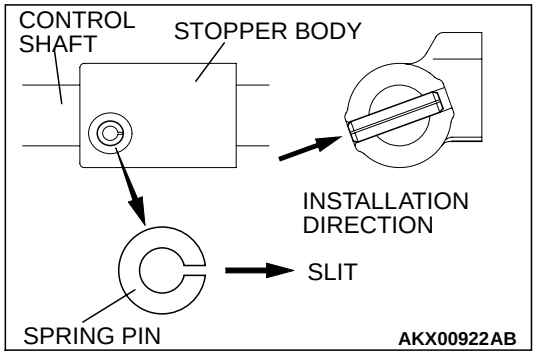
>>B<< OIL SEAL INSTALLATION
Apply gear oil (Hypoid gear oil SAE 75W-90 or 75W-85W conforming to API classification GL-4) to the oil seal lip area.



>>C<< AIR BREATHER INSTALLATION
1. Apply sealant (3M™ AAD Part Number 8001 or equivalent) to the inserting portion of air breather.

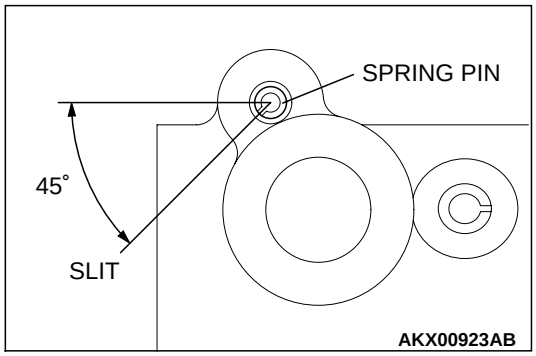


2. Install the air breather so that the embossed mark is in the direction shown in the figure.



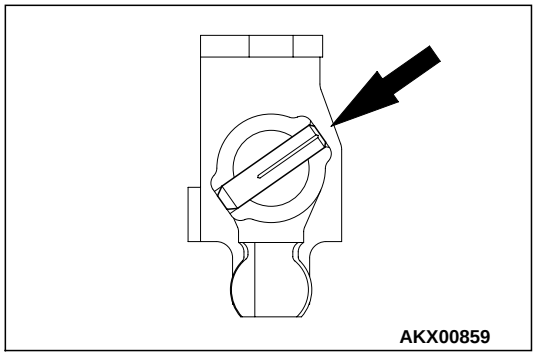
>>D<< SPRING PIN INSTALLATION

Drive in the spring pin so that the slit is in the direction shown in the figure.



>>E<< SPRING PIN INSTALLATION

Drive in the spring pin so that the slit is in the direction shown in the figure.



>>F<<LOCK PIN INSTALLATION

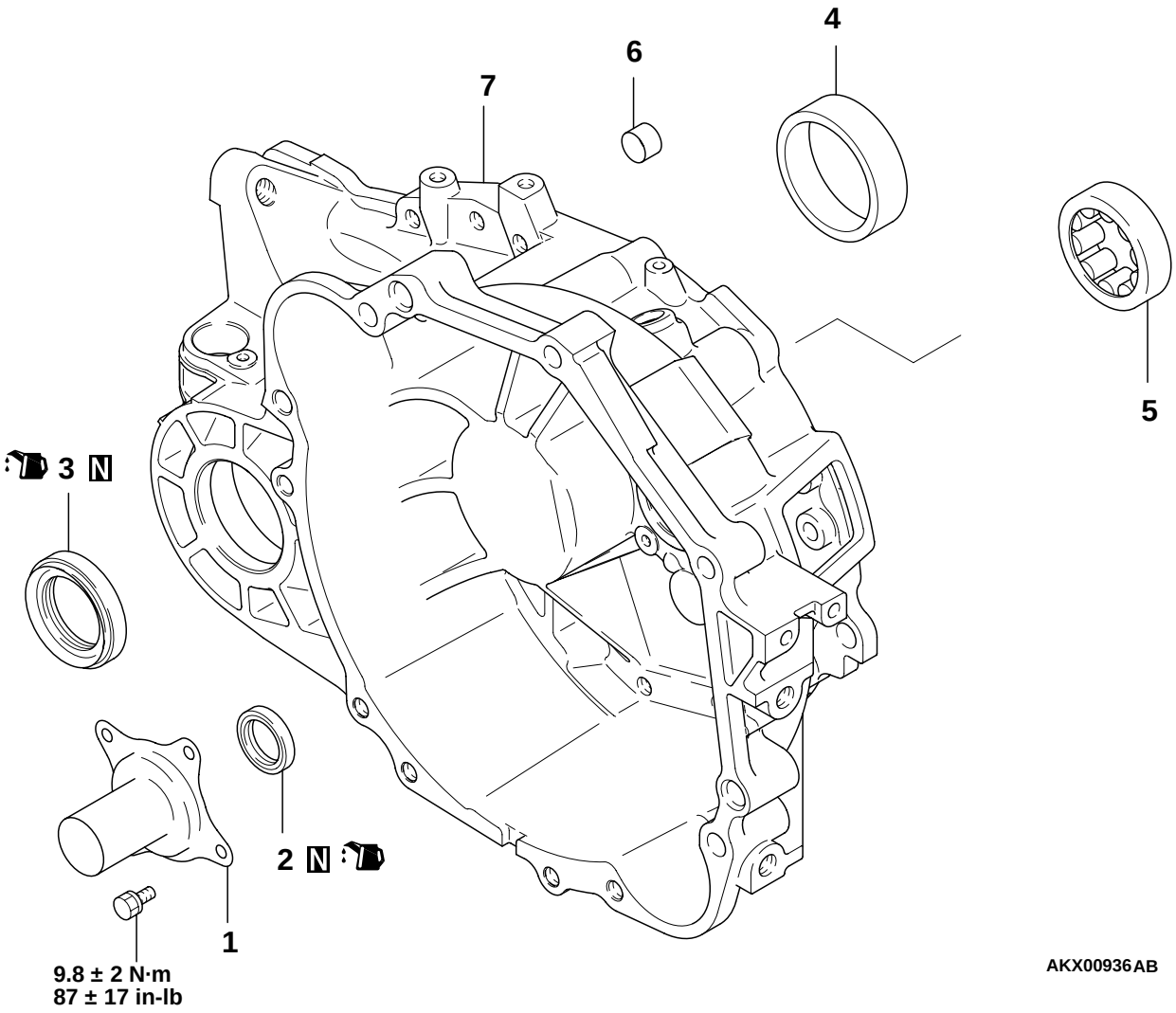
Drive the lock pin in from the direction shown in the figure.

CLUTCH HOUSING

DISASSEMBLY AND ASSEMBLY

M1222003700035

<F5M42>



		DISASSEMBLY STEPS
	1.	CLUTCH RELEASE BEARING RETAINER
>>G<<	2.	OIL SEAL
>>F<<	3.	OIL SEAL
<<A>> >>E<<	4.	OUTER RACE
<<B>> >>C<<	5.	OUTER RACE
>>B<<	6.	BUSHING*
	7.	CLUTCH HOUSING

Required Special Tools:

- MB990926: Installer Adapter <F5M42>
- MB990928: Installer Adapter <F5M51>
- MB990934: Installer Adapter <F5M42>
- MB990935: Installer Adapter
- MB990938: Handle
- MB991445: Bushing Remover and Installer Base <F5M51>
- MD998325: Differential Oil Seal Installer <F5M42>
- MD998346: Bearing Outer Race Remover <F5M42>
- MD998772: Valve Spring Compressor <F5M42>
- MD998800: Differential Oil Seal Installer <F5M51>
- MD999566: Claw

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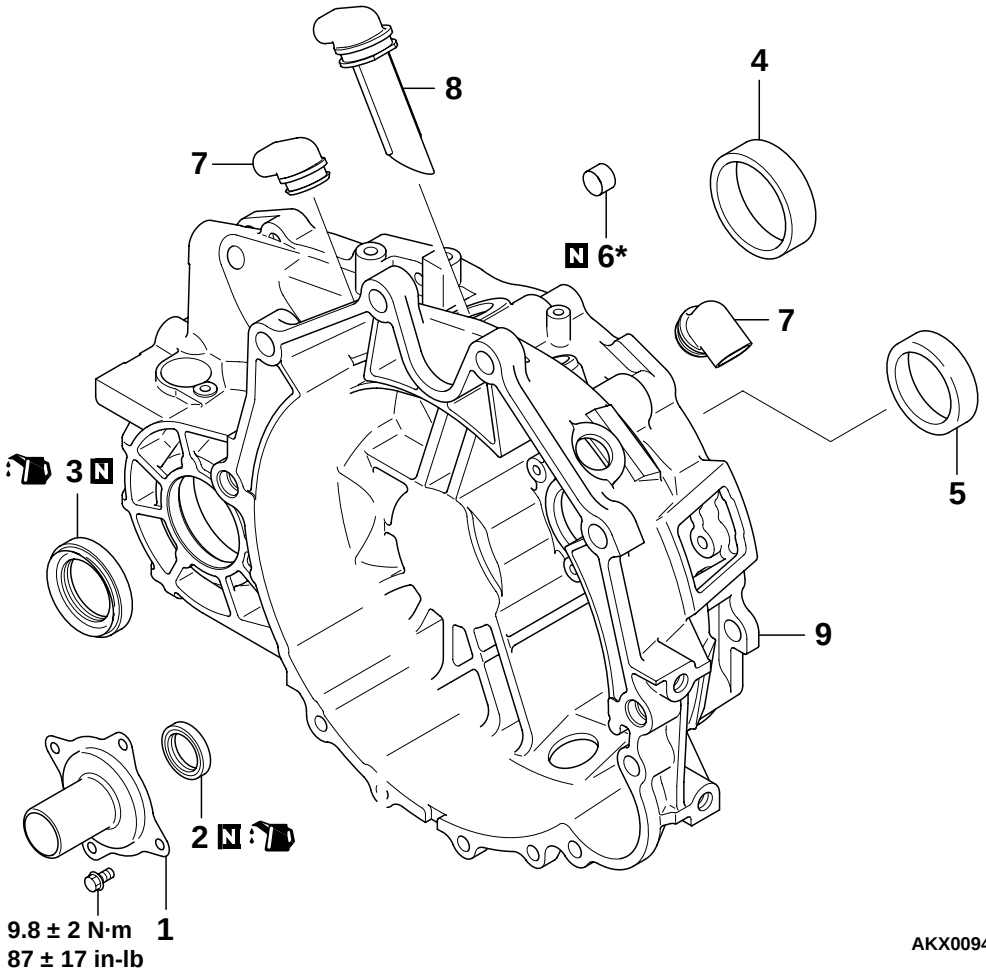
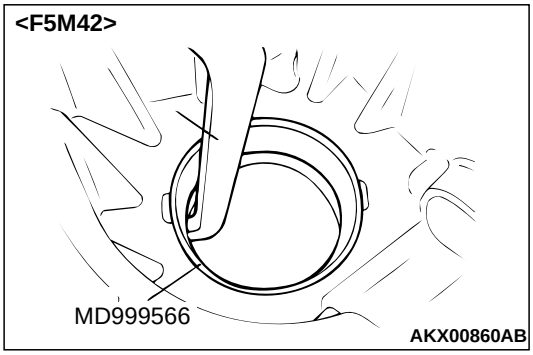
<F5M51>



			DISASSEMBLY STEPS
		1.	CLUTCH RELEASE BEARING RETAINER
	>>G<<	2.	OIL SEAL
	>>F<<	3.	OIL SEAL
<<A>>	>>E<<	4.	OUTER RACE

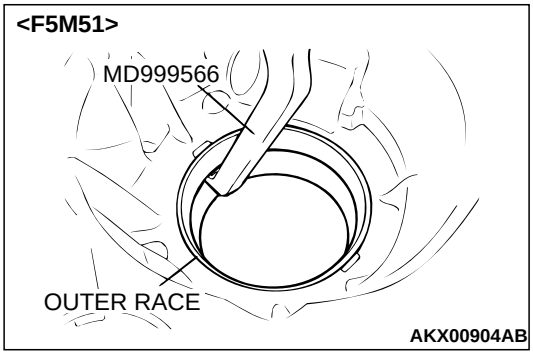
			DISASSEMBLY STEPS
<<B>>	>>C<<	5.	OUTER RACE
	>>B<<	6.	BUSHING*
	>>A<<	7.	COVER-A
	>>A<<	8.	COVER-B
		9.	CLUTCH HOUSING

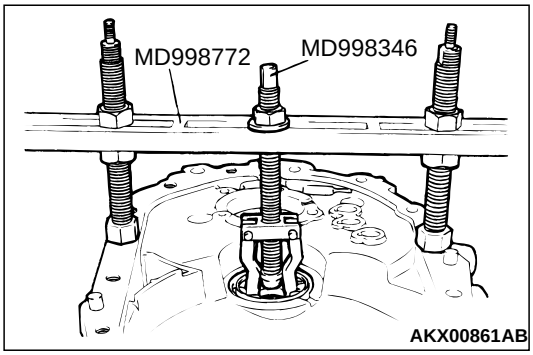
DISASSEMBLY SERVICE POINT



<<A>> OUTER RACE REMOVAL

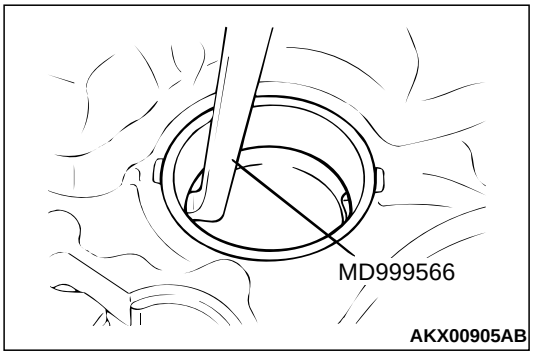
Using special tool MD999566, remove the outer race from the clutch housing.





<<B>> OUTER RACE REMOVAL

1. Set special tools MD998772 and MD998346 as indicated in the figure.
2. Turn the nut on special tool MD998346 to pull up on the tool and take out the outer race.



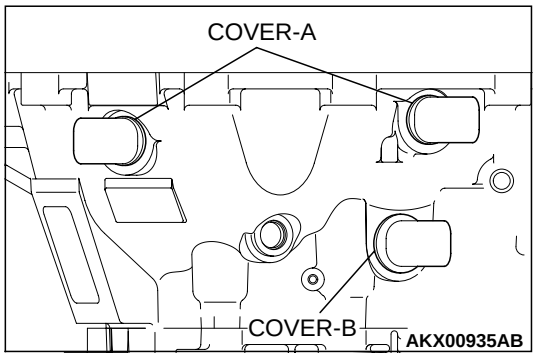
<<C>> OUTER RACE REMOVAL

Using special tool MD999566, remove the outer race from the clutch housing.

ASSEMBLY SERVICE POINTS

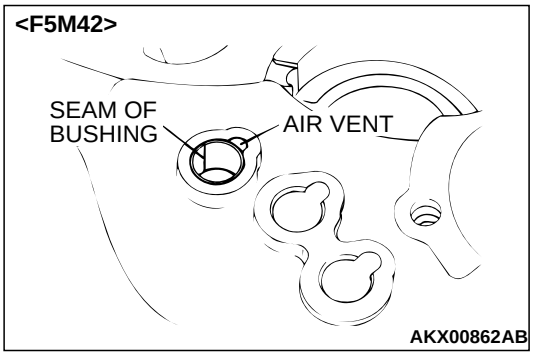
>>A<< COVER-B/COVER-A INSTALLATION

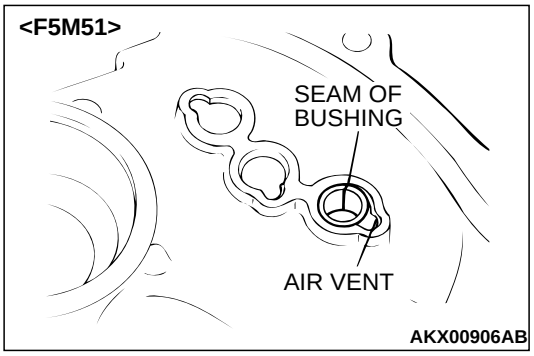
Install the covers directed as shown in the illustration.



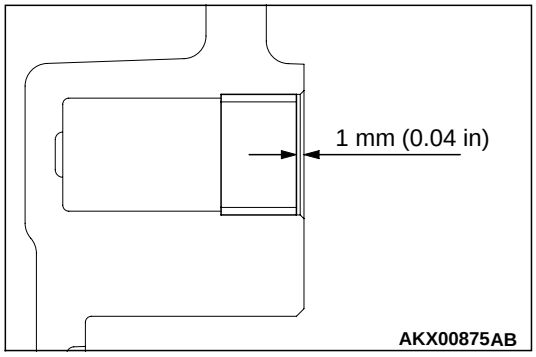
>>B<< BUSHING INSTALLATION

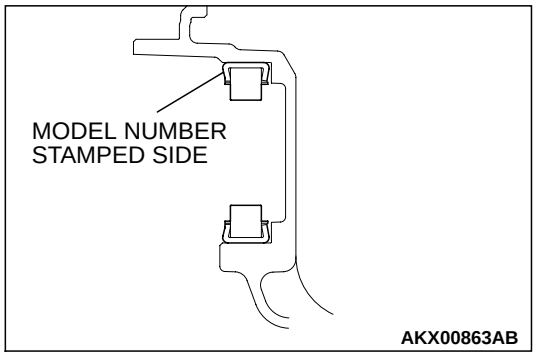
1. Press fit the bushing so the seam is away from the air vent.





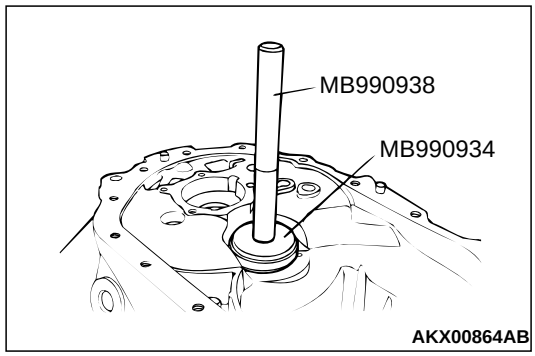
2. Be sure the bushing is fully seated as shown. It must be 1 mm (0.04 inch) below the housing surface.



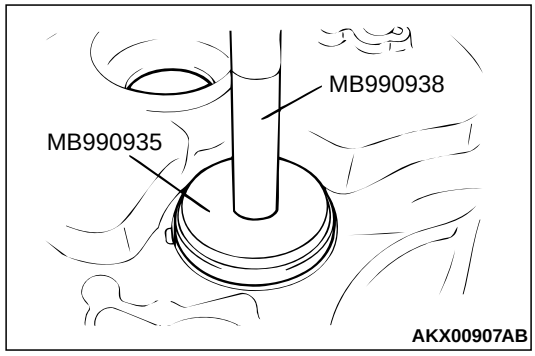


>>C<< OUTER RACE INSTALLATION

1. Check the installation direction of the outer race.

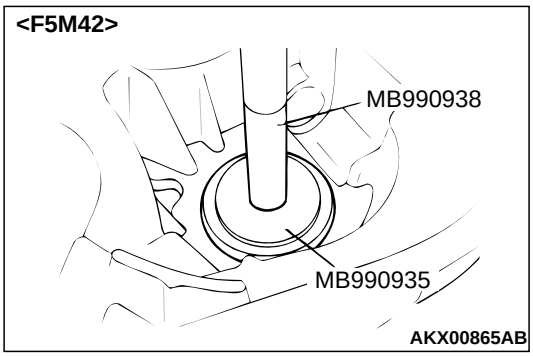


2. Using special tools MB990938 and MB990934, press fit the outer race into the clutch housing.



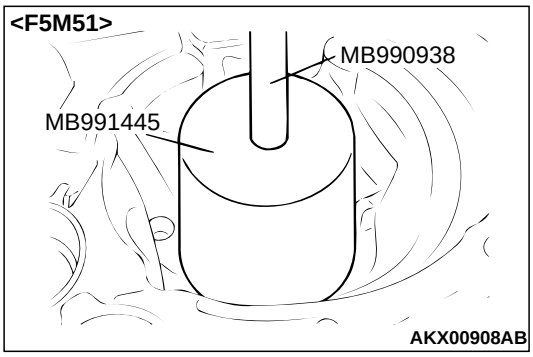
>>D<< OUTER RACE INSTALLATION

Using special tools MB990938 and MB990935, press fit the outer race into the clutch housing.



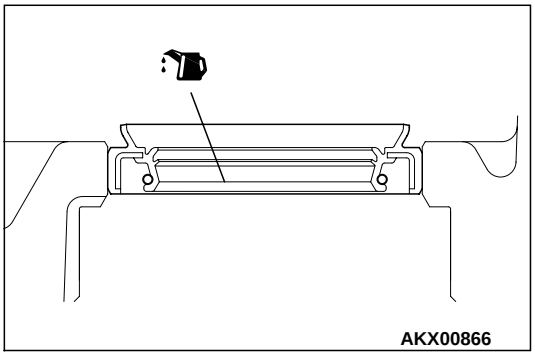
>>E<< OUTER RACE INSTALLATION

1. Check the installation direction of the outer race.
2. Using special tools MB990938, MB990935 <F5M42> and MB991445 <F5M51>, press fit the outer race into the clutch housing.

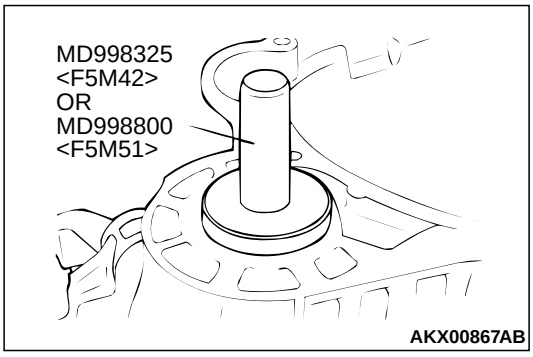


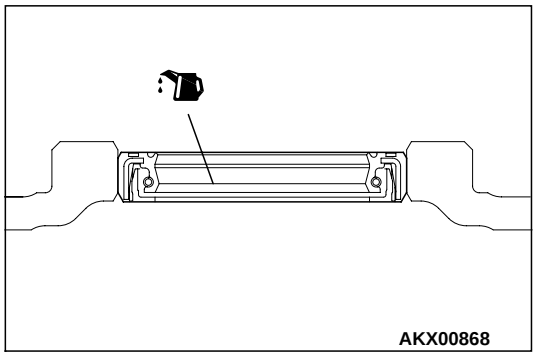
>>F<<OIL SEAL INSTALLATION

1. Apply gear oil (Hypoid gear oil SAE 75W-90 or 75W-85W conforming to API classification GL-4) to the oil seal lip.



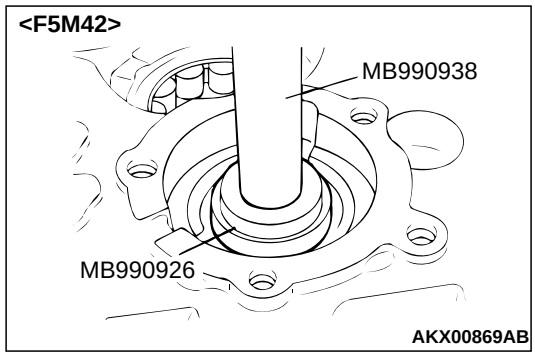
2. Using special tool MD998325 <F5M42> or MD998800 <F5M51>, press fit the oil seal into the clutch housing.



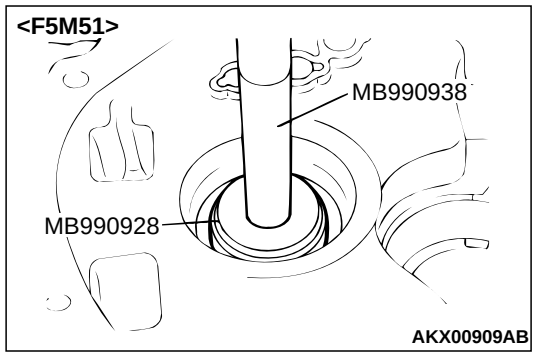


>>G<< OIL SEAL INSTALLATION

1. Apply transmission oil (Hypoid gear oil SAE 75W-90 or 75W-85W conforming to API classification GL-4) to the oil seal lip.



2. Using special tools MB990938, MB990926 <F5M42> and MB990928 <F5M51>, press fit the oil seal into the clutch housing.

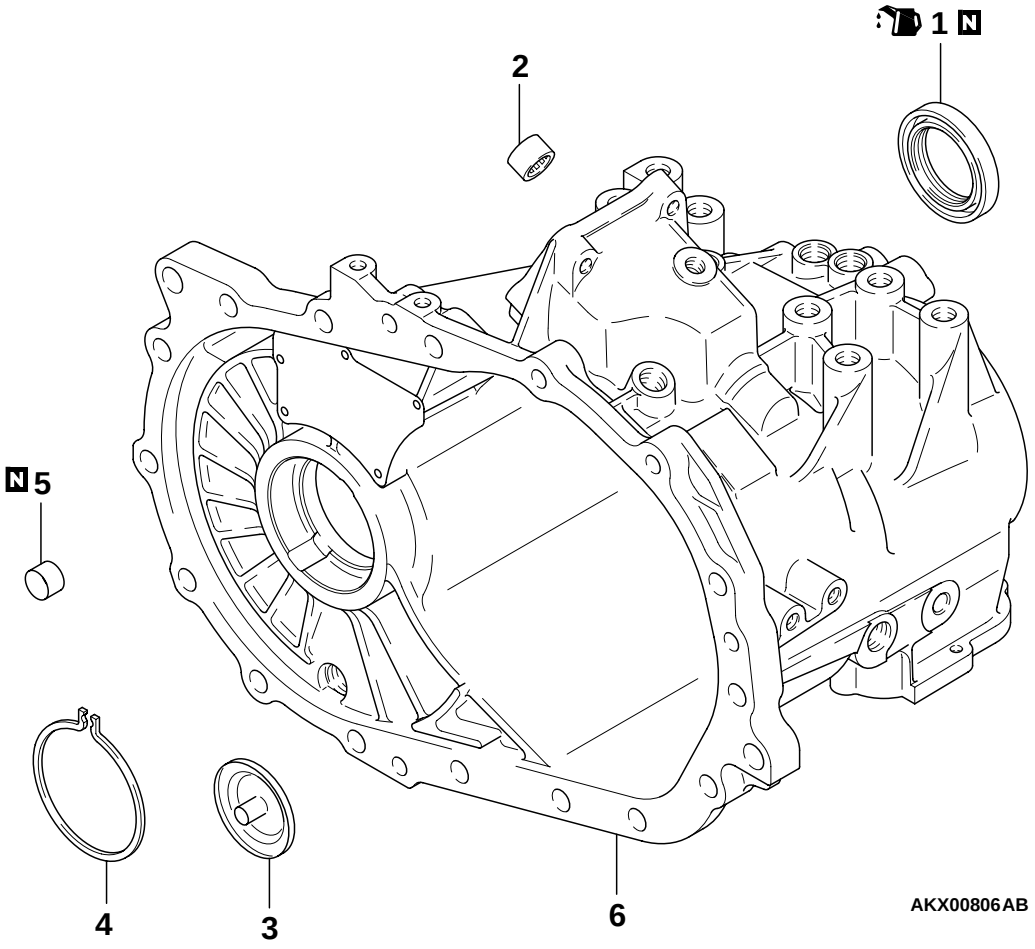


TRANSMISSION CASE

DISASSEMBLY AND ASSEMBLY

M1222013400024

<F5M42>



	DISASSEMBLY STEPS
>>C<<	1. OIL SEAL
>>B<<	2. NEEDLE BEARING*
	3. OIL GUIDE
	4. SNAP RING
>>A<<	5. BUSHING*
	6. TRANSAXLE

Required Special Tools:

- MD998325: Differential Oil Seal Installer <F5M42>
- MD998800: Differential Oil Seal Installer <F5M51>

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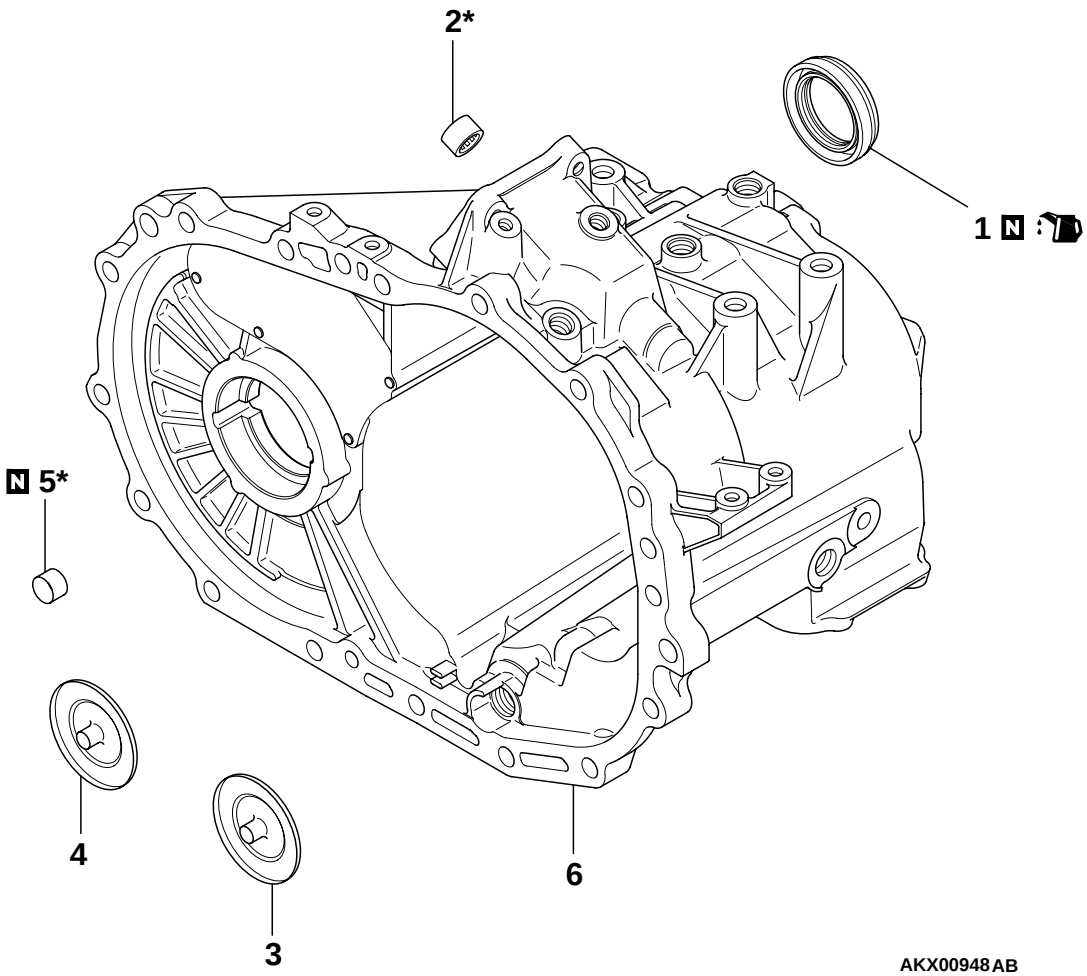
<F5M51>



DISASSEMBLY STEPS

>>C<< 1. OIL SEAL
>>B<< 2. NEEDLE BEARING*
3 OIL GUIDE
4. OIL GUIDE

DISASSEMBLY STEPS (Continued)

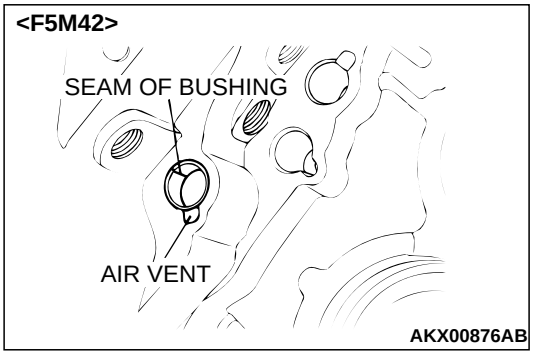
>>A<< 5. BUSHING*
6. TRANSAXLE

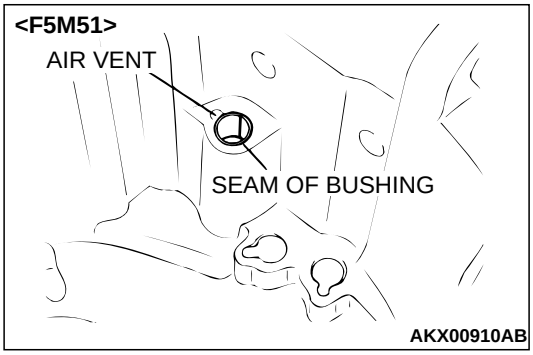
*NOTE: *:Refer to the needle bearing and bushing installation procedures only when replacing the transaxle case.*

ASSEMBLY SERVICE POINTS

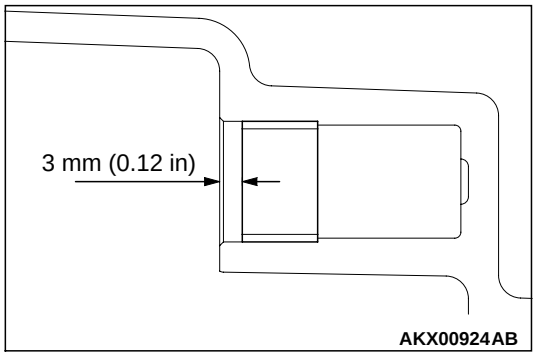
>>A<< BUSHING INSTALLATION

1. Press fit the bushing so the seam is away from the air vent.



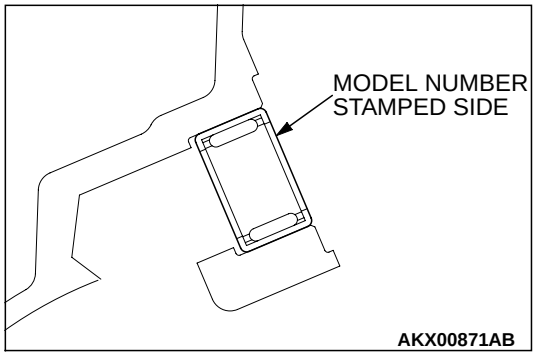


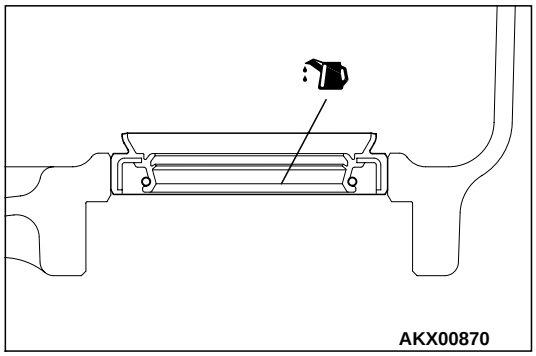
2. Be sure the bushing is fully seated as shown. It must be 3 mm (0.12 inch) below the housing surface.



>>B<< NEEDLE BEARING INSTALLATION

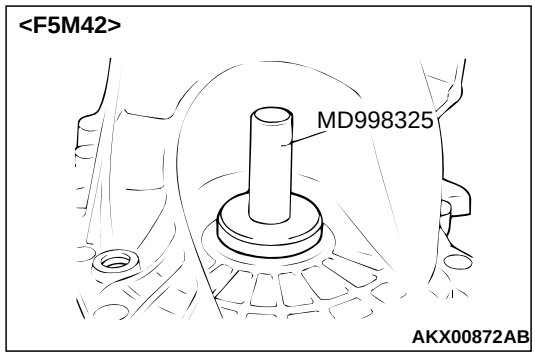
1. Check the installation direction of the needle bearing.
2. Press fit the needle bearing until it is flush with the case.



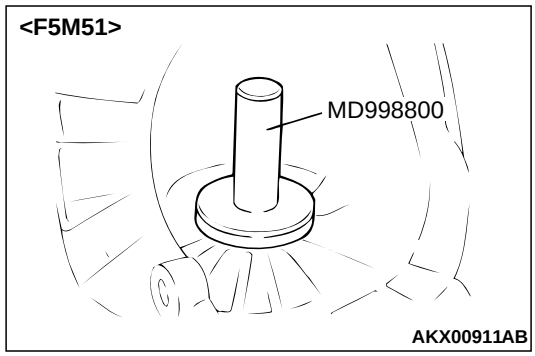

AKX00870

>>C<<OIL SEAL INSTALLATION

1. Apply gear oil (Hypoid gear oil SAE 75W-90 or 75W-85W conforming to API classification GL-4).



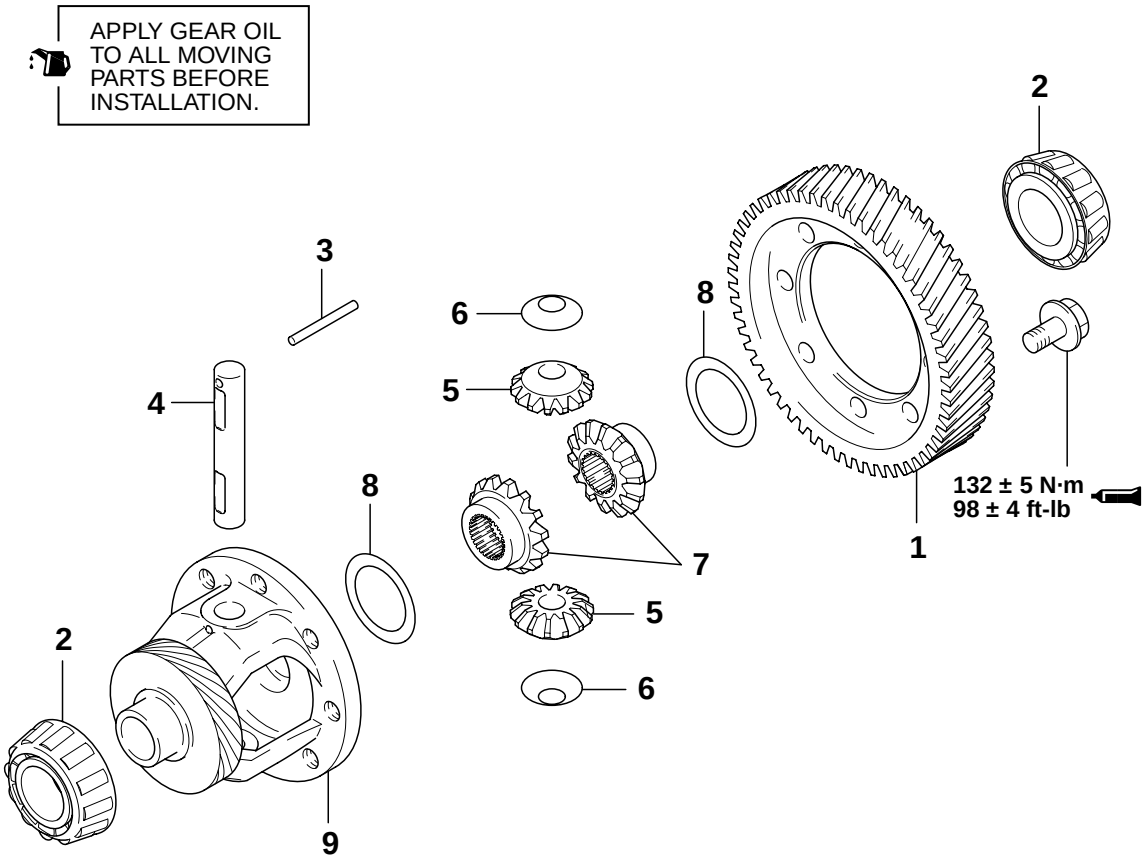
2. Using special tool MD998325 <F5M42> or MD998800 <F5M51>, press fit the oil seal into the transaxle case.



DIFFERENTIAL

DISASSEMBLY AND ASSEMBLY

M1222002500027



AKX00771AB

			DISASSEMBLY STEPS
	>>D<<	1.	DIFFERENTIAL DRIVE GEAR
<<A>>	>>C<<	2.	TAPER ROLLER BEARING
	>>B<<	3.	LOCK PIN
	>>A<<	4.	PINION SHAFT
	>>A<<	5.	PINION

		DISASSEMBLY STEPS
>>A<<	6.	WASHER
>>A<<	7.	SIDE GEAR
>>A<<	8.	SPACER
	9.	DIFFERENTIAL CASE

Required Special Tools:

- MD998801: Bearing Remover
- MD998812: Installer Cap
- MD998819: Installer Adapter (40)

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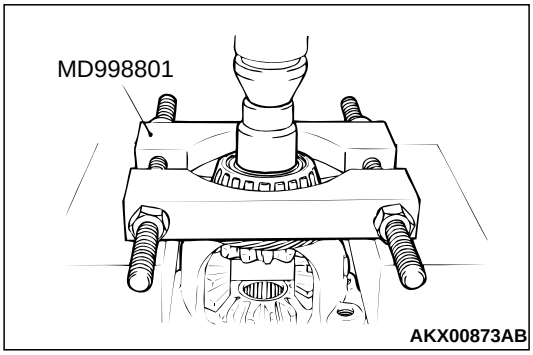
DISASSEMBLY SERVICE POINT

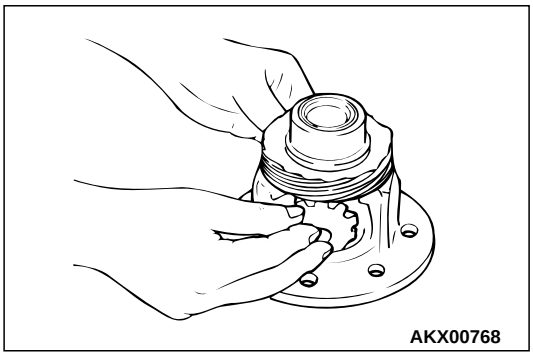


<<A>> TAPER ROLLER BEARING REMOVAL

1. Using special tool MD998801, support the taper roller bearing, and then set them on the press.
2. Push down on the differential case with the press and take out the bearing.

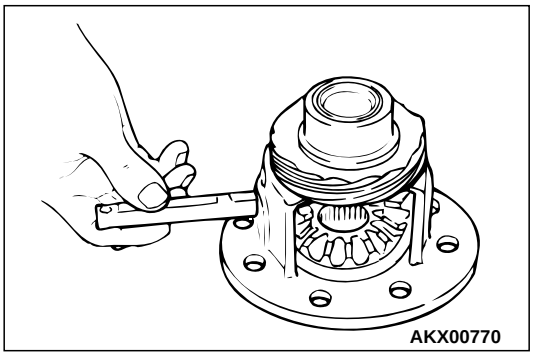
ASSEMBLY SERVICE POINTS

>>A<< SPACER/SIDE GEAR/WASHER/PINION/PINION SHAFT INSTALLATION

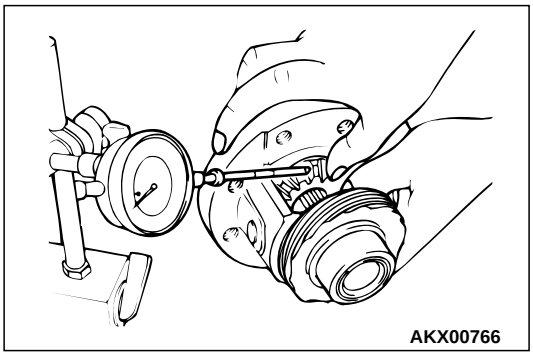


1. After a spacer has been mounted on the back surface of the side gear, install the side gear in the differential case.

   NOTE: When a new side gear is to be installed, mount a medium thickness spacer [0.93 – 1.00 mm (0.0366 – 0.0395 inch].
2. Set the washer on the back of each pinion, and put both pinions simultaneously in mesh with the side gears. While rotating them, install them in position.



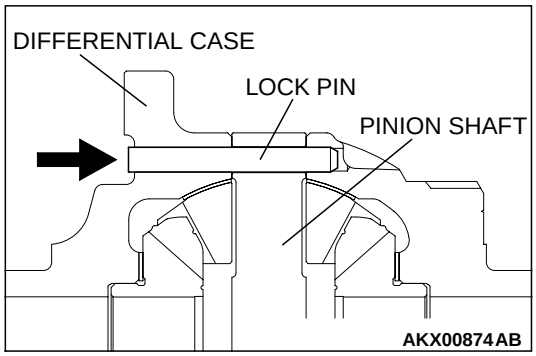
3. Insert the pinion shaft.



4. Measure the backlash between the side gear and pinion.

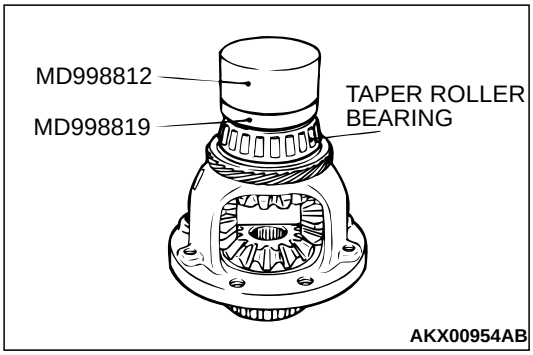
   Standard value:
   0.025 – 0.150 mm (0.0010 – 0.0059 inch)
5. If the backlash is out of specification, select a spacer and re-measure the backlash.

   NOTE: Adjust until the backlashes on both sides are equal.



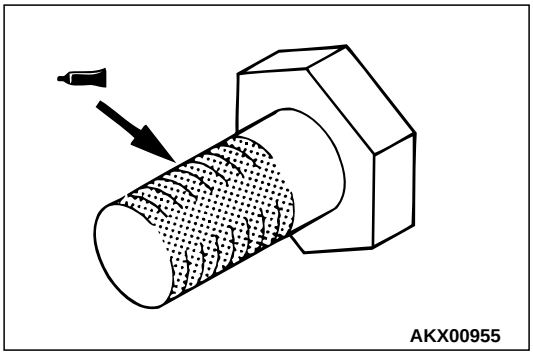
>>B<<LOCK PIN INSTALLATION

Install the lock pin so that it will be oriented in the direction shown.



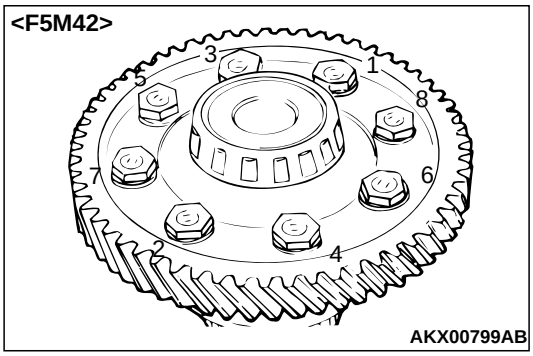
>>C<< TAPER ROLLER BEARING INSTALLATION

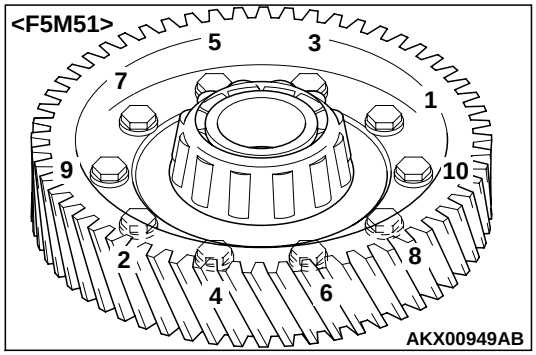
Using special tools MD998812 and MD998819, press install the taper roller bearing.



>>D<< DIFFERENTIAL DRIVE GEAR INSTALLATION

1. Apply a sealant (3M™AAD Part Number 8730 or 8731 or equivalent) to the entire threaded portion of the bolt.





2. Tighten to the specified torque in the illustrated sequence.
   Tightening torque: 132 ± 5 N·m (98 ± 4 ft-lb)

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1222012100020

ITEMS	SPECIFICATIONS
Roll stopper bracket mounting bolt	69 ± 10 N·m (51 ± 7 ft-lb)
Shift cable bracket mounting bolt	19 ± 3 N·m (14 ± 2 ft-lb)
Select lever mounting bolt	19 ± 3 N·m (14 ± 2 ft-lb)
Speedometer gear mounting bolt	4 ± 1 N·m (35 ± 9 in-lb)
Backup light switch	32 ± 2 N·m (24 ± 1 ft-lb)
Interlock plate bolt	30 ± 3 N·m (22 ± 2 ft-lb)
Poppet spring	32 ± 2 N·m (24 ± 1 ft-lb)
Control housing mounting bolt	19 ± 3 N·m (14 ± 2 ft-lb)
Under cover mounting bolt	7 ± 1 N·m (61 ± 9 in-lb)
Reverse idler gear shaft mounting bolt	48 ± 6 N·m (35 ± 4 ft-lb)
Clutch housing-transaxle case mounting bolt	44 ± 5 N·m (33 ± 4 ft-lb)
Front bearing retainer mounting bolt <F5M42>	19 ± 3 N·m (14 ± 2 ft-lb)
Select lever mounting nut	12 ± 1 N·m (104 ± 9 in-lb)
Stopper bracket mounting bolt	25 ± 3 N·m (19 ± 2 ft-lb)
Clutch release bearing retainer mounting bolt	9.8 ± 2 N·m (87 ± 17 in-lb)
Differential drive gear mounting bolt	132 ± 5 N·m (98 ± 4 ft-lb)

GENERAL SPECIFICATIONS

M1222000200075

ITEMS		SPECIFICATIONS		
Model		F5M42	F5M51-1-F5N2	F5M51-1-S5N
Applicable engine		4G64	6G72	
Type		5-speed transaxle floor shift		
Gear ratio	1st	3.583	3.333	2.928
	2nd	1.947	2.105	1.950
	3rd	1.379	1.407	
	4th	1.030	1.031	
	5th	0.767	0.761	0.720
	Reverse	3.363	3.416	
Final reduction ratio		3.722	3.736	4.111
Speedometer gear ratio (driven/drive)		29/36	28/36	

SERVICE SPECIFICATIONS

M1222000300027

ITEMS	STANDARD VALUE	MINIMUM LIMIT
Input shaft end play <F5M51> mm (in)	0.05 – 0.17 (0.020 – 0.0067)	–
Input shaft front bearing end play mm (in)	0 – 0.12 (0 – 0.0047)	–
Input shaft rear bearing end play mm (in)	0 – 0.12 (0 – 0.0047)	–
Input shaft 5th speed gear end play mm (in)	0 – 0.09 (0 – 0.0035)	–
Output shaft roller bearing inner race end play <F5M42> mm (in)	0 – 0.12 (0 – 0.0047)	–
Output shaft ball bearing end play <F5M42> mm (in)	0 – 0.09 (0 – 0.0035)	–
Output shaft preload <F5M51> mm (in)	0.13 – 0.18 (0.0051 – 0.0071)	–
Output shaft taper roller bearing end play <F5M51> mm (in)	0 – 0.09 (0 – 0.0035)	–
Output shaft 3rd speed gear end play mm (in)	0 – 0.09 (0 – 0.0035)	–
Differential pinion backlash mm (in)	0.025 – 0.150 (0.0010 – 0.0059)	–
Differential case preload mm (in)	0.05 – 0.11 (0.0020 – 0.0043)	–
Synchronizer ring back surface to gear clearance mm (in)	–	0.5 (0.020)

SEALANTS AND ADHESIVES

M1222000500021

ITEM	SPECIFIED SEALANT
Clutch housing-transaxle case mating surface	MITSUBISHI Genuine sealant part No. MD997740 or equivalent
Control housing-transaxle case mating surface	
Under cover-transaxle case mating surface	
Air breather	3M™AAD Part No.8001 or equivalent
Differential drive gear bolt	3M™AAD Part No.8730 or 8731 or equivalent

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LUBRICANTS

M1222000400024

ITEMS	SPECIFIED SEALANTS
Driveshaft oil seal lip gear oil	Hypoid gear oil SAE 75W-90 or 75W-85W conforming to API classification GL-4
Input shaft oil seal lip gear oil	
Control shaft oil seal lip gear oil	
Select lever shoe	MITSUBISHI genuine grease part No.0101011 or equivalent

SNAP RINGS, SPACERS AND THRUST PLATE FOR ADJUSTMENT

M1222012000023

Snap ring
(For adjustment of input shaft front bearing end play) <F5M42>

THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.	THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.
2.24 (0.0882) 2.31 (0.0909)	None Blue	MD706537 MD706538	2.38 (0.0937)	Brown	MD706539

Snap ring
(For adjustment of input shaft front bearing end play) <F5M51>
(For adjustment of input shaft rear bearing end play) <F5M42>
(For adjustment of output shaft front bearing end play) <F5M42>

THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.	THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.
1.43 (0.0563) 1.51 (0.0594)	Green (2) White (2)	MD746708 MD746709	1.59 (0.0626)	Yellow (2)	MD746710

Thrust plate <F5M42>
(For adjustment of input shaft 5th speed gear end play)

THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.	THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.
2.82 (0.1110)	0	MD748015	2.98 (0.1173)	6	MD748019
2.86 (0.1126)	2	MD748016	3.02 (0.1189)	7	MD748020
2.90 (0.1142)	3	MD748017	3.06 (0.1205)	8	MD748021
2.94 (0.1157)	5	MD748018	3.10 (0.1220)	9	MD748022

Thrust plate <F5M51>
(For adjustment of input shaft 5th speed gear end play)

THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.	THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.
3.82 (0.1504)	0	MD748465	3.98 (0.1567)	6	MD748469
3.86 (0.1520)	2	MD748466	4.02 (0.1583)	7	MD748470
3.90 (0.1535)	3	MD748467	4.06 (0.1598)	8	MD748471
3.94 (0.1551)	5	MD748468	4.10 (0.1614)	9	MD748472

Snap ring <F5M51>
(For adjustment of input shaft rear bearing end play)

THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.	THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.
1.44 (0.0567) 1.51 (0.0594)	None Blue	MD746602 MD746603	1.58 (0.0622)	Brown	MD746604

Snap ring <F5M42>
(For adjustment of output shaft 3rd speed gear end play)

THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.	THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.
2.81 (0.1106)	Green	MD745799	2.97 (0.1169)	Orange	MD745803
2.85 (0.1122)	White	MD745800	3.01 (0.1185)	Red	MD745804
2.89 (0.1138)	Yellow	MD745801	3.05 (0.1201)	Pink	MD745805
2.93 (0.1154)	Black	MD745802	3.09 (0.1217)	Blue	MD745806

Snap ring <F5M51>
(For adjustment of output shaft 3rd speed gear end play)

THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.	THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.
2.81 (0.1106)	None	MD746594	2.97 (0.1169)	Green	MD746598
2.85 (0.1122)	Blue	MD746595	2.97 (0.1169)	Black	MD746599
2.89 (0.1138)	Brown	MD746596	3.05 (0.1201)	White	MD746600
2.93 (0.1154)	Yellow	MD746597	3.09 (0.1217)	Orange	MD746601

Snap ring <F5M42>
(For adjustment of output shaft rear bearing end play)

THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.	THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.
2.31 (0.0909)	Black (2)	MD747149	2.55 (0.1004)	Yellow	MD746566
2.35 (0.0925)	None	MD746561	2.59 (0.1020)	Black	MD746567
2.39 (0.0941)	Blue	MD746562	2.63 (0.1035)	Orange	MD746568
2.43 (0.0957)	Brown	MD746563	2.67 (0.1051)	Blue	MD746569
2.47 (0.0972)	Green	MD746564	2.71 (0.1067)	Brown	MD746570
2.51 (0.0988)	White	MD746565			

Snap ring <F5M51>
(For adjustment of output shaft rear bearing end play)

THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.	THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.
1.36 (0.0535)	Yellow	MD748449	1.55 (0.0610)	White	MD748452
1.40 (0.0551)	Green	MD748450	1.58 (0.0622)	Brown	MD746604
1.44 (0.0567)	None	MD746602	1.63 (0.0642)	Orange	MD748453
1.44 (0.0567)	Black	MD748451	1.63 (0.0642)	Blue	MD748454
1.51 (0.0594)	Blue	MD746603	1.68 (0.0661)		

Spacer <F5M51>
(For adjustment of input shaft end play)

THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.	THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.
1.34 (0.0528)	34	MD723600	1.61 (0.0634)	61	MD723609
1.43 (0.0563)	43	MD723603	1.70 (0.0669)	70	MD756760
1.52 (0.0598)	52	MD723606	1.79 (0.0705)	79	MD756763

Spacer <F5M51>
(For adjustment of output shaft preload)

THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.	THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.
0.86 (0.0339)	86	MD720938	1.19 (0.0469)	L	MD710456
0.89 (0.0350)	89	MD720939	1.22 (0.0480)	G	MD700271
0.92 (0.0362)	92	MD720940	1.25 (0.0492)	M	MD710457
0.95 (0.0374)	95	MD720941	1.28 (0.0504)	N	MD710458
0.98 (0.0386)	98	MD720942	1.31 (0.0516)	E	MD706574
1.01 (0.0398)	01	MD720943	1.34 (0.0528)	O	MD710459
1.04 (0.0409)	04	MD720944	1.37 (0.0539)	P	MD710460
1.07 (0.0421)	07	MD720945	1.40 (0.0551)	None	MD706573
1.10 (0.0433)	J	MD710454	1.43 (0.0563)	Q	MD710461
1.13 (0.0445)	D	MD700270	1.46 (0.0575)	R	MD710462
1.16 (0.0457)	K	MD710455			

Spacer
(For adjustment of differential case preload)

THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.	THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.
0.71 (0.0279)	71	MD754475	1.01 (0.0398)	01	MD720943
0.74 (0.0292)	74	MD727660	1.04 (0.0409)	04	MD720944
0.77 (0.0303)	77	MD754476	1.07 (0.0421)	07	MD720945
0.80 (0.0315)	80	MD727661	1.10 (0.0433)	J	MD710454
0.83 (0.0327)	83	MD720937	1.13 (0.0445)	D	MD700270
0.86 (0.0339)	86	MD720938	1.16 (0.0457)	K	MD710455
0.89 (0.0350)	89	MD720939	1.19 (0.0469)	L	MD710456
0.92 (0.0362)	92	MD720940	1.22 (0.0480)	G	MD700271
0.95 (0.0374)	95	MD720941	1.25 (0.0492)	M	MD710457
0.98 (0.0386)	98	MD720942			

Spacer
(For adjustment of differential case backlash)

THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.	THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.
0.72 – 0.79 (0.0283 – 0.0311)	–	MA180862	1.06 – 1.10 (0.0417 – 0.0425)	–	MR581570
0.85 – 0.90 (0.0335 – 0.0354)	–	MA180861	1.12 – 1.16 (0.0441 – 0.0457)	–	MA180876
0.94 – 0.98 (0.0370 – 0.0386)	–	MA180860	1.16 – 1.20 (0.0457 – 0.0472)	–	MR581571
1.02 – 1.06 (0.0402 – 0.0417)	–	MA180875			

GROUP 23A

AUTOMATIC TRANSAXLE

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Continued on next page

WARNINGS REGARDING SERVICING OF SUPPLEMENTAL RESTRAINT SYSTEM (SRS) EQUIPPED VEHICLES

⚠ WARNING

- ***Improper service or maintenance of any component of the SRS, or any SRS-related component, can lead to personal injury or death to service personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).***
- ***Service or maintenance of any SRS component or SRS-related component must be performed only at an authorized MITSUBISHI dealer.***
- ***MITSUBISHI dealer personnel must thoroughly review this manual, and especially its GROUP 52B - Supplemental Restraint System (SRS) before beginning any service or maintenance of any component of the SRS or any SRS-related component.***

NOTE
The SRS includes the following components: SRS air bag control unit, SRS warning light, front impact sensors, air bag module, clock spring, and interconnecting wiring. Other SRS-related components (that may have to be removed/installed in connection with SRS service or maintenance) are indicated in the table of contents by an asterisk (*).

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GENERAL DESCRIPTION

M1231000100173

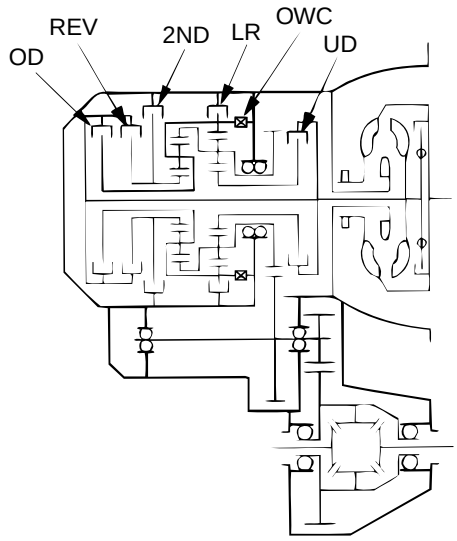
The A/T come in two models, namely, F4A42 and F4A51.

ITEMS		SPECIFICATIONS		
Transaxle model		F4A42-2-JZB7	F4A51-2-FZB2	F4A51-2-LZP
Engine model		4G64 (2.4L Engine)	6G72 (3.0L Engine) <Vehicles without variable induction system>	6G72 (3.0L Engine) <Vehicles with variable induction system>
Torque converter	Type	3-element, 1-stage, 2-phase		
	Torque converter clutch	Provided (3rd to 4th)		
	Stall torque ratio	1.85	2.04	2.04
Transaxle type		4-speed forward, 1-speed reverse fully automatic		
Gear ratio	1st	2.842	2.842	2.666
	2nd	1.529	1.495	1.448
	3rd	1.000	1.000	1.000
	4th	0.712	0.731	0.731
	Reverse	2.480	2.720	2.720
Final gear ratio (Differential gear ratio)		4.042	3.728	4.011
Number of underdrive clutch discs		4		
Number of overdrive clutch discs		4		
Number of reverse clutch discs		2		
Number of low-reverse brake discs		6		
Number of second brake discs		3	4	4
Manual control type		P-R-N-D-3-2-L (7 positions) or P-R-N-D (4 positions) + sport mode (up, down)	P-R-N-D (4 positions) + sport mode (up, down)	
Shift pattern control		Electronic control (INVECS-II)		
Oil pressure control during shifting		Electronic control (each oil pressure independently controlled)		
Torque converter clutch control		Electronic control		

TRANSAXLE

The transaxle is made up of the torque converter and gear train. A 3-element, 1-step, 2-phase torque converter with built-in torque converter clutch is used. The gear train is made up of three sets of multi-plate clutches, two sets of multi-plate brakes, one set of one-way clutches and two sets of planetary gears. The planetary gears are made up of sun gears, carriers, pinion gears and annulus gears.

TRANSAXLE CONFIGURATION DRAWING



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COMPONENTS AND FUNCTIONS

COMPONENT		FUNCTION
Underdrive clutch	UD	connects the input shaft to the underdrive sun gear.
Reverse clutch	REV	connects the input shaft to the reverse sun gear.
Overdrive clutch	OD	connects the input shaft to the overdrive planetary carrier.
Low-reverse brake	LR	holds the low-reverse annulus gear and the overdrive planetary carrier.
Second brake	2ND	holds the reverse sun gear.
One-way clutch	OWC	restricts the rotation direction of the low-reverse annulus gear.

FUNCTION ELEMENT TABLE

<Vehicles without sport mode>

OPERATING ELEMENT / SELECTOR LEVER POSITION		ENGINE START	PARKING MECHANISM	UNDERDRIVE CLUTCH (UD)	REVERSE CLUTCH (REV)	OVER-DRIVE CLUTCH (OD)	LOW-REVERSE BRAKE (LR)	SECOND BRAKE (2ND)
P	Parking	OK	×	–	–	–	×	–
R	Reverse	–	–	–	×	–	×	–
N	Neutral	OK	–	–	–	–	×	–
D	1st	–	–	×	–	–	×*	–
D	2nd	–	–	×	–	–	–	×
D	3rd	–	–	×	–	×	–	–
D	4th	–	–	–	–	×	–	×

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OPERATING ELEMENT / SELECTOR LEVER POSITION		ENGINE START	PARKING MECHANISM	UNDERDRIVE CLUTCH (UD)	REVERSE CLUTCH (REV)	OVER-DRIVE CLUTCH (OD)	LOW-REVERSE BRAKE (LR)	SECOND BRAKE (2ND)
3	1st	–	–	×	–	–	×*	–
3	2nd	–	–	×	–	–	–	×
3	3rd	–	–	×	–	×	–	–
2	1st	–	–	×	–	–	×*	–
2	2nd	–	–	×	–	–	–	×
L	1st	–	–	×	–	–	×	–

×: Function element

*NOTE: * operates only when the vehicle is stationary [at approximately 10 km/h (6.2 mph) or less].*

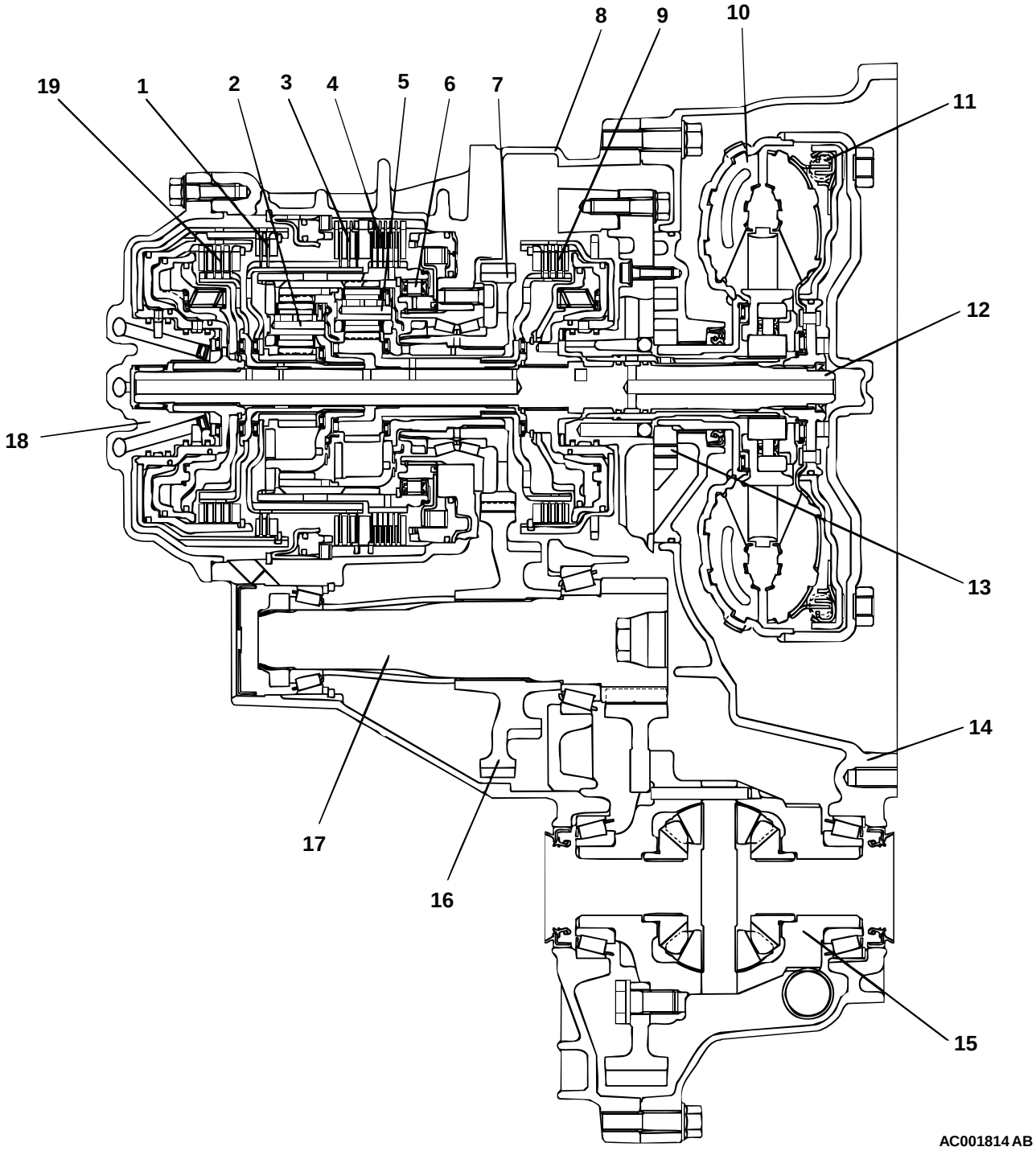
<Vehicles with sport mode>

OPERATING ELEMENT / SELECTOR LEVER POSITION		ENGINE START	PARKING MECHANISM	UNDERDRIVE CLUTCH (UD)	REVERSE CLUTCH (REV)	OVER-DRIVE CLUTCH (OD)	LOW-REVERSE BRAKE (LR)	SECOND BRAKE (2ND)
P	Parking	OK	×	–	–	–	×	–
R	Reverse	–	–	–	×	–	×	–
N	Neutral	OK	–	–	–	–	×	–
D	1st	–	–	×	–	–	×*	–
D	2nd	–	–	×	–	–	–	×
D	3rd	–	–	×	–	×	–	–
D	4th	–	–	–	–	×	–	×
Sport mode	1st	–	–	×	–	–	×	–
Sport mode	2nd	–	–	×	–	–	–	×
Sport mode	3rd	–	–	×	–	×	–	–
Sport mode	4th	–	–	–	–	×	–	×

×: Function element

*NOTE: *: operates only when the vehicle is stationary [at approximately 10 km/h (6.2 mph) or less].*

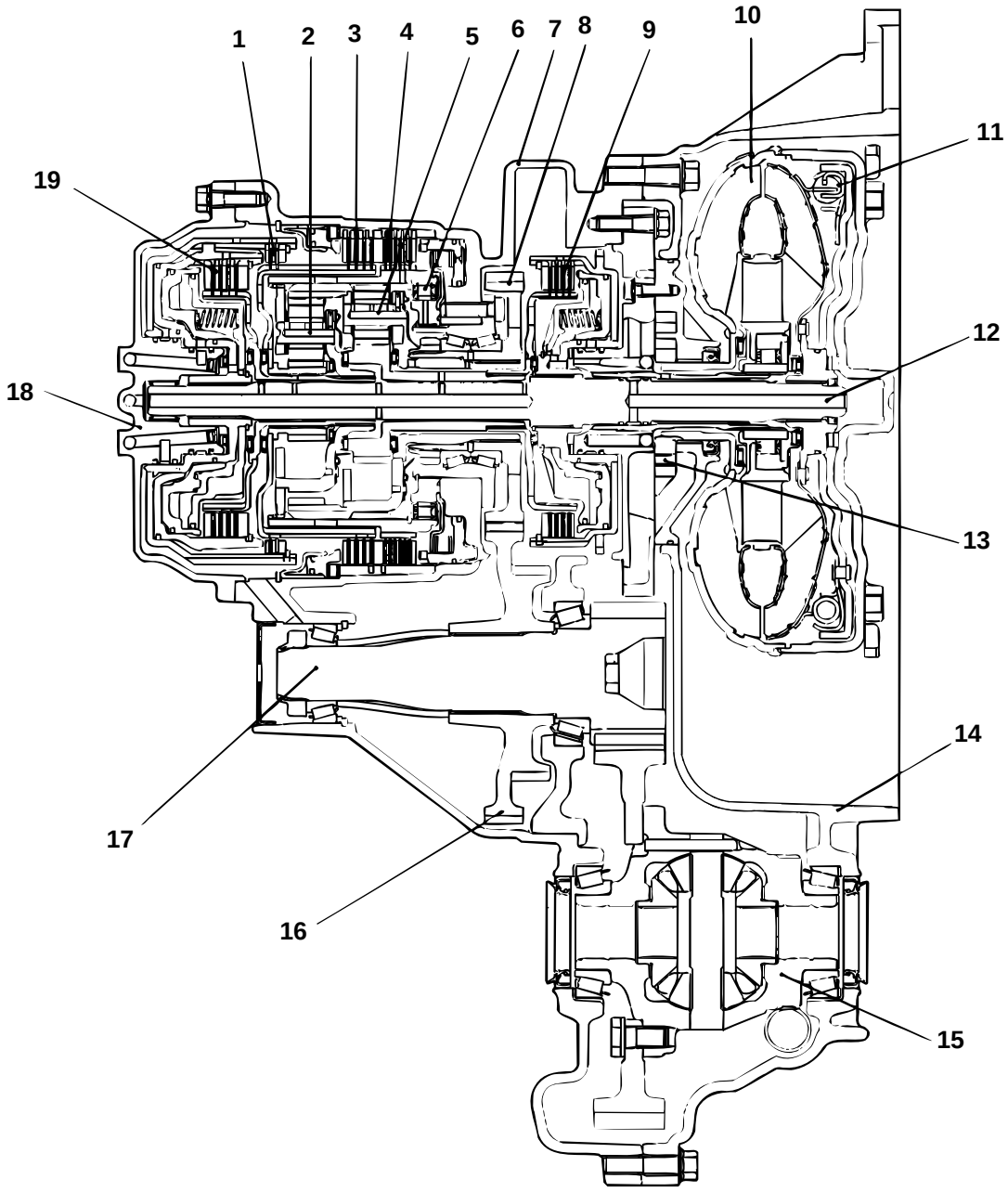
SECTIONAL VIEW <F4A42>



1. REVERSE CLUTCH
2. OVERDRIVE PLANETARY CARRIER
3. SECOND BRAKE
4. LOW-REVERSE BRAKE
5. OUTPUT PLANETARY CARRIER
6. ONE-WAY CLUTCH
7. TRANSFER DRIVE GEAR
8. TRANSAXLE CASE
9. UNDERDRIVE CLUTCH
10. TORQUE CONVERTER
11. TORQUE CONVERTER CLUTCH
12. INPUT SHAFT
13. OIL PUMP
14. TORQUE CONVERTER HOUSING
15. DIFFERENTIAL
16. TRANSFER DRIVEN GEAR
17. OUTPUT SHAFT
18. REAR COVER
19. OVERDRIVE CLUTCH

TSB Revision

<F4A51>



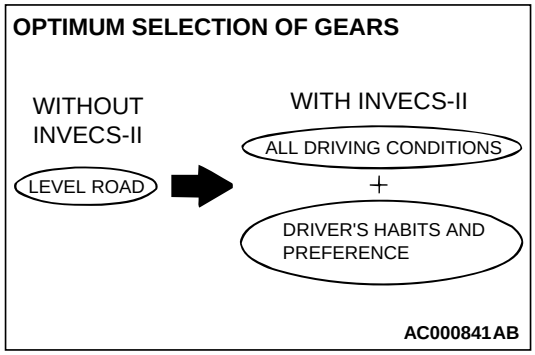
1. REVERSE CLUTCH
2. OVERDRIVE PLANETARY CARRIER
3. SECOND BRAKE
4. LOW-REVERSE BRAKE
5. OUTPUT PLANETARY CARRIER
6. ONE-WAY CLUTCH
7. TRANSFER DRIVE GEAR
8. TRANSAXLE CASE
9. UNDERDRIVE CLUTCH
10. TORQUE CONVERTER
11. TORQUE CONVERTER CLUTCH
12. INPUT SHAFT
13. OIL PUMP
14. TORQUE CONVERTER HOUSING
15. DIFFERENTIAL
16. TRANSFER DRIVEN GEAR
17. OUTPUT SHAFT
18. REAR COVER
19. OVERDRIVE CLUTCH

TSB Revision

ELECTRONICALLY-CONTROLLED SYSTEM

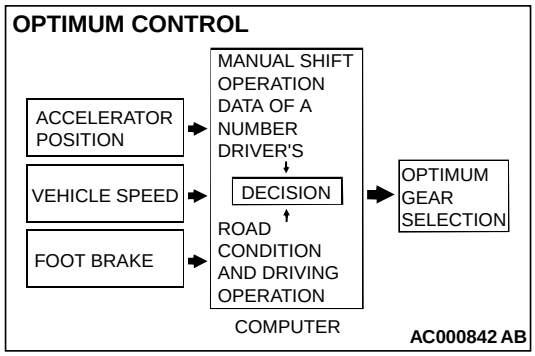
INVECS-II

- When in drive ("D" range), the new automatic transmission employs an innovative shift schedule to provide a high level of comfort and "easy driving style" that matches all driving conditions as well as the driver's driving style.
- INVECS-II features "Optimum Shift Control", which provides shift timing the average driver perceives to be the optimum timing under any road conditions. "Adaptive Shift Control" adjusts shift timing to match the driving habits and preferences of individual drivers.

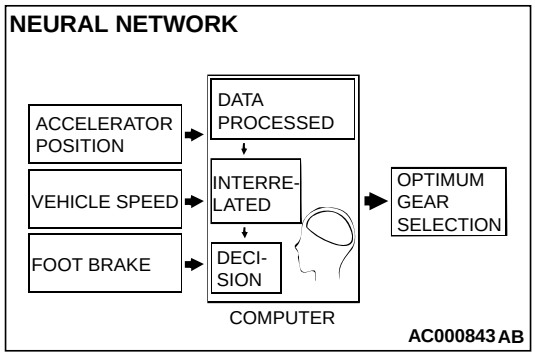


FEATURES

OPTIMUM SHIFT CONTROL



1. The shift patterns found satisfying by the typical driver for all ranges of driving are stored in the computer's memory. The computer uses this data to analyze road conditions and the driver's style of operation, and then outputs the optimal shift patterns stored in its memory to best match the conditions.

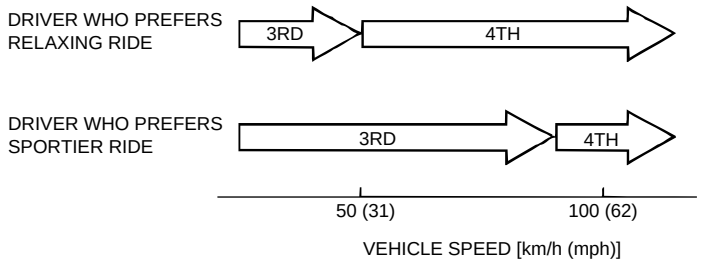


2. We introduce the latest in control technologies with an innovative new algorithm called the "neutral network" that works to imitate the decision-making processes of the human brain. The neural network links a wide variety of input data regarding road and operating conditions, and instantly makes accurate shift control decisions.

ADAPTIVE SHIFT CONTROL

1. The computer learns the driving habits and preferences of each individual driver by processing driving data on engine output, tire load, foot brake operation, etc. It then uses this data to adjust shift timing to best suit the driver's style.
2. If the computer determines from the driving patterns that the driver is one who enjoys a relaxed, unhurried style, it adjusts timing to execute upshifts at a lower engine speed to provide a smooth, quiet ride. On the other hand, if the computer determines the driver to prefer a sporty ride, it adjusts timing to shift up at a higher engine speed to provide more powerful response.

ADAPTIVE SHIFT CONTROL DURING ACCELERATION



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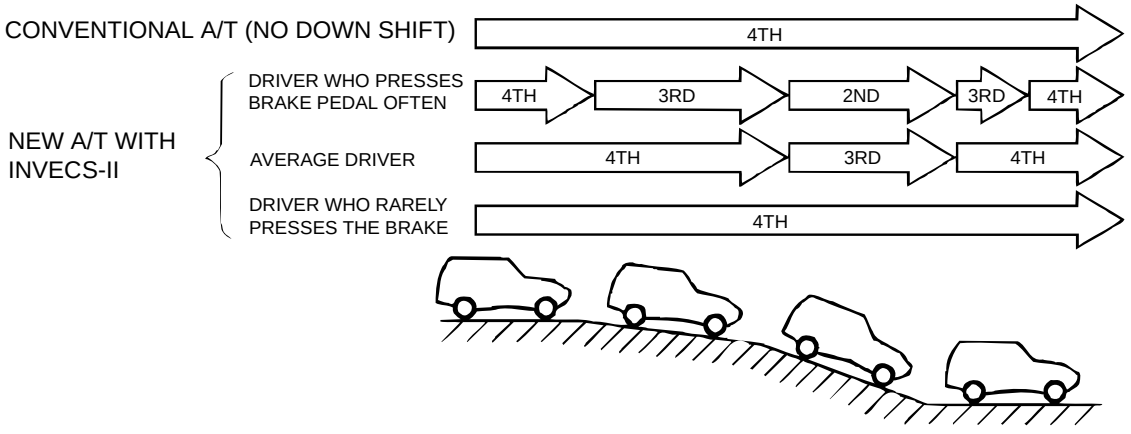
3. If the computer determines that the driver tends to apply the brakes often on a descending roadway, it adjusts timing to down shift sooner so that engine braking is more effectively applied. Conversely, if the computer determines that the driver does not brake much while driving downhill, it delays downshifting to minimize the effect of engine braking.

ADAPTIVE SHIFT CONTROL ON DOWNGRADES



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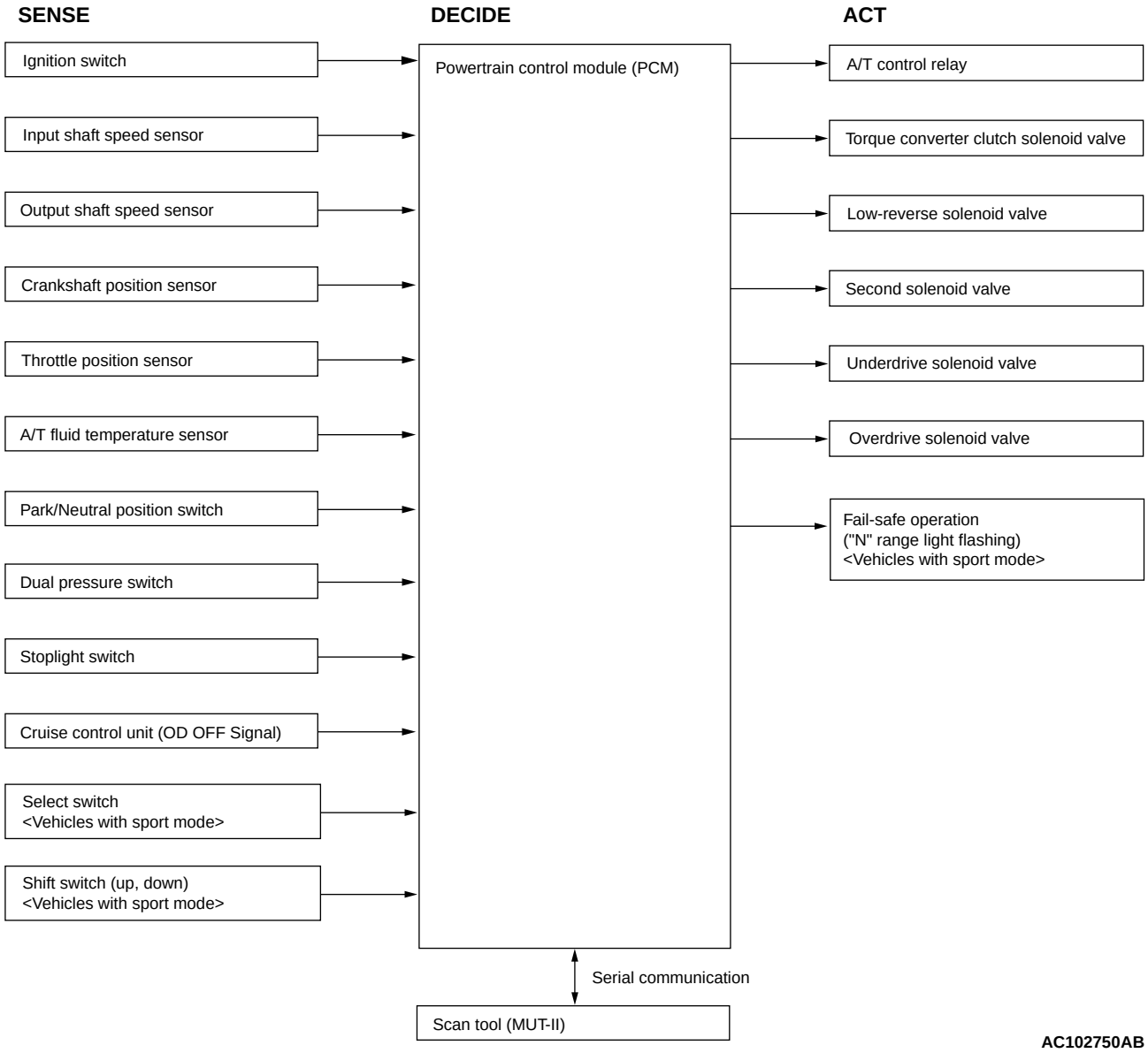
SYSTEM CONSTRUCTION DIAGRAM



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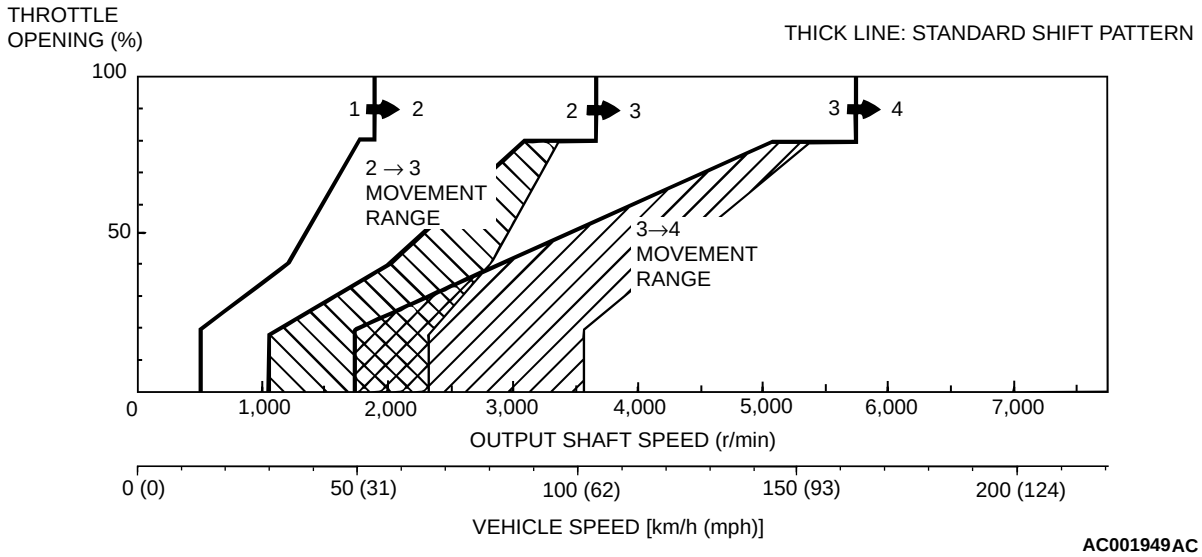
SHIFT PATTERN CONTROL

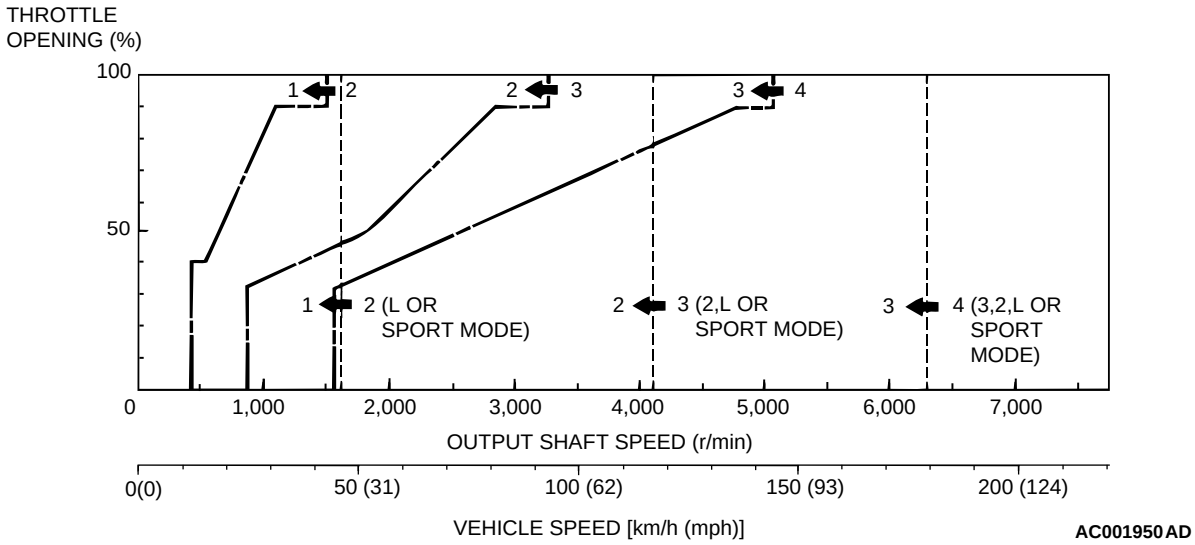
<2.4L ENGINE> UPSHIFT PATTERN



AC001949AC

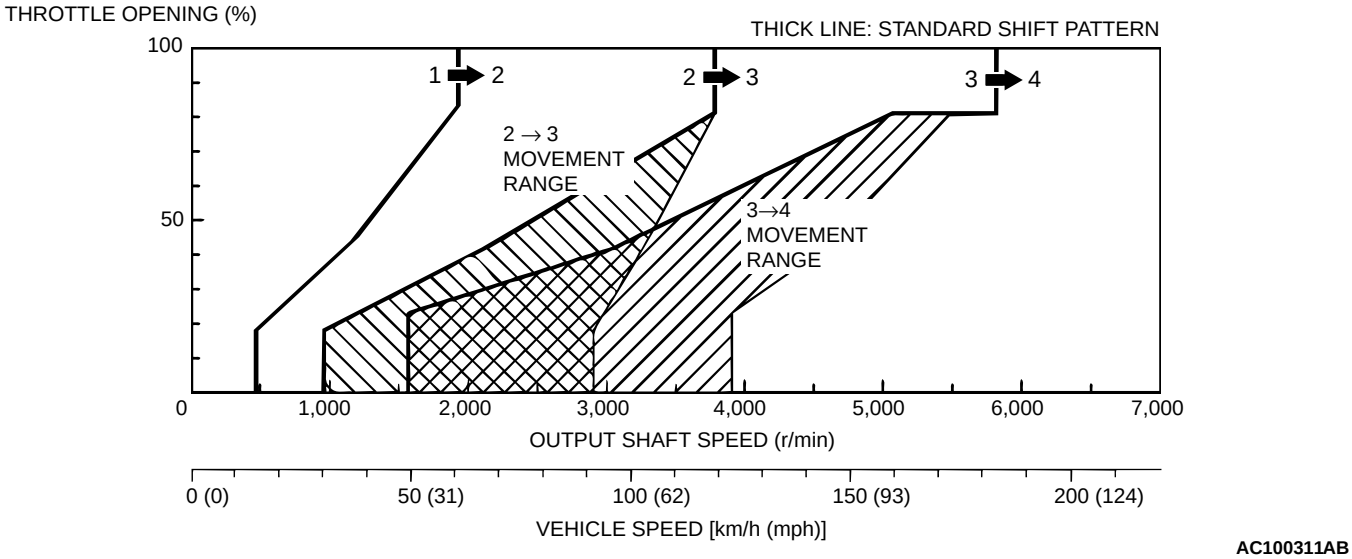
NOTE: Within 2 -to- 3 and 3 -to- 4 movement ranges, the PCM adjusts shift points according to the driving conditions by memorizing the accelerator pedal stroke and braking timing.

<2.4L ENGINE> DOWNSHIFT PATTERN



AC001950AD

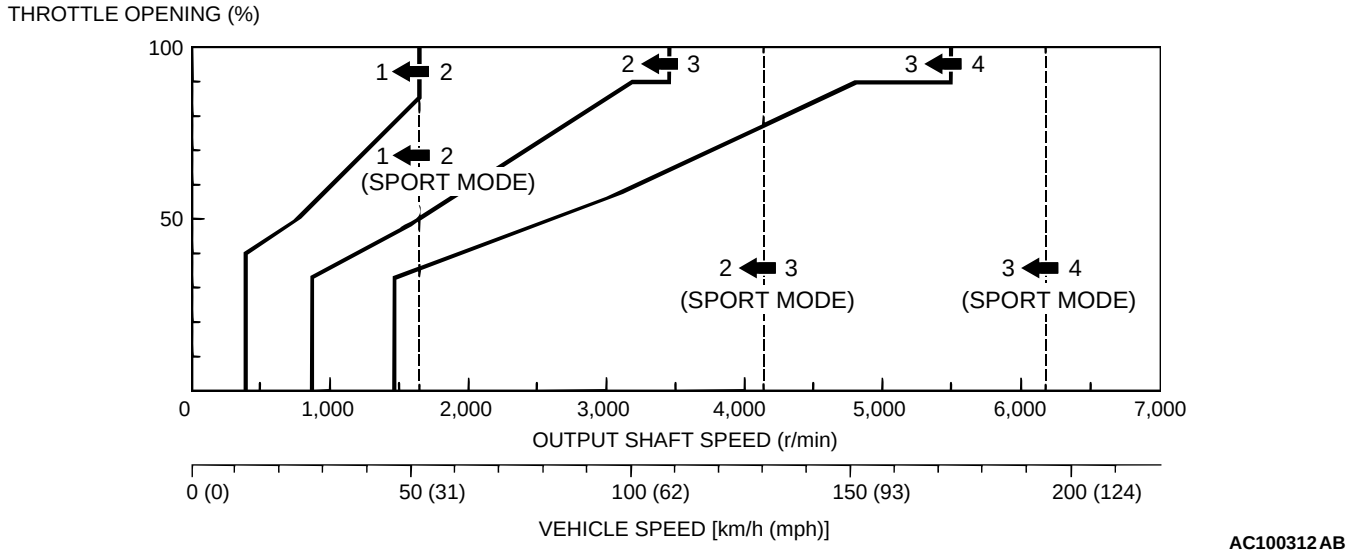
<3.0L ENGINE (VEHICLES WITHOUT VARIABLE INDUCTION SYSTEM) > UPSHIFT PATTERN



AC100311AB

NOTE: Within 2 -to- 3 and 3 -to- 4 movement ranges, the PCM adjusts shift points according to the driving conditions by memorizing the accelerator pedal stroke and braking timing.

<3.0L ENGINE (VEHICLES WITHOUT VARIABLE INDUCTION SYSTEM) > DOWNSHIFT PATTERN



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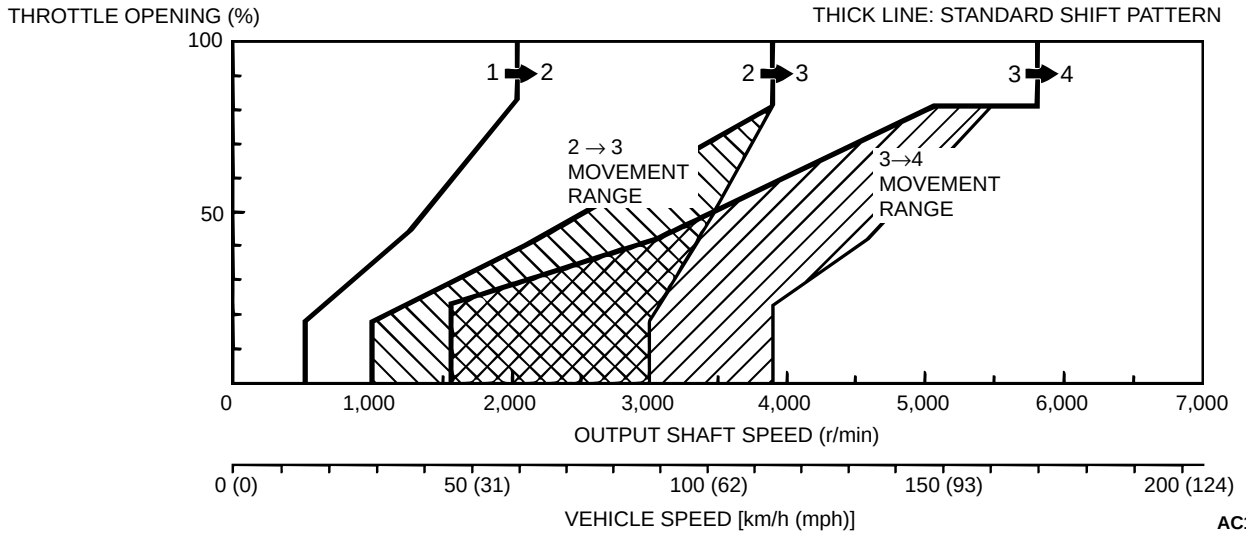
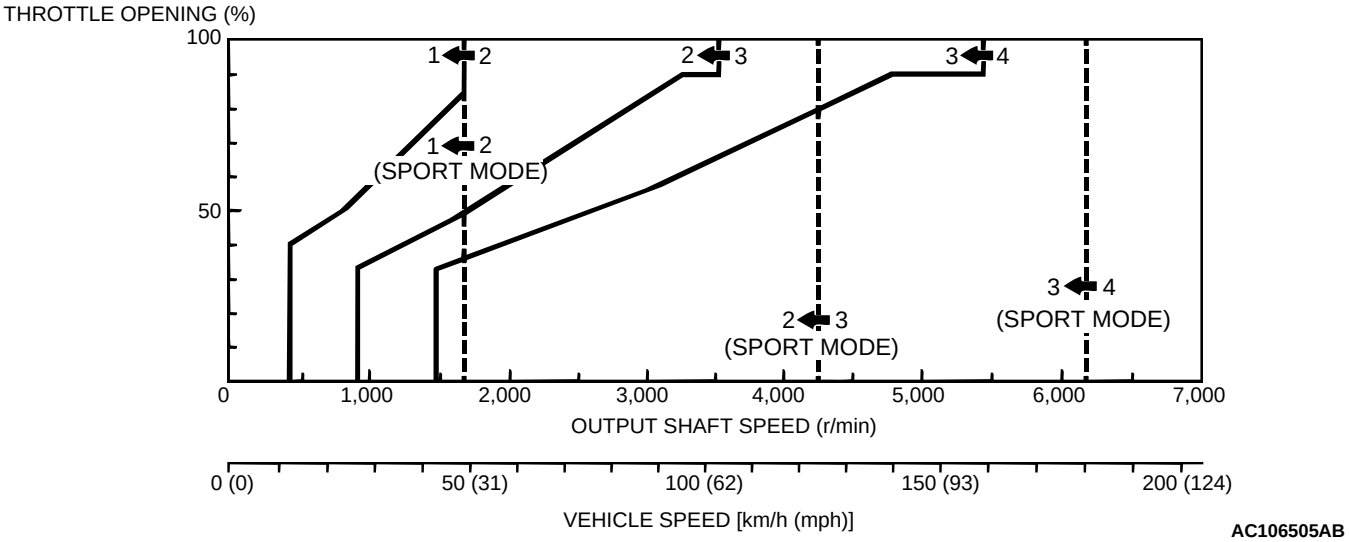


NOTE: Within 2 -to- 3 and 3 -to- 4 movement ranges, the PCM adjusts shift points according to the driving conditions by memorizing the accelerator pedal stroke and braking timing.

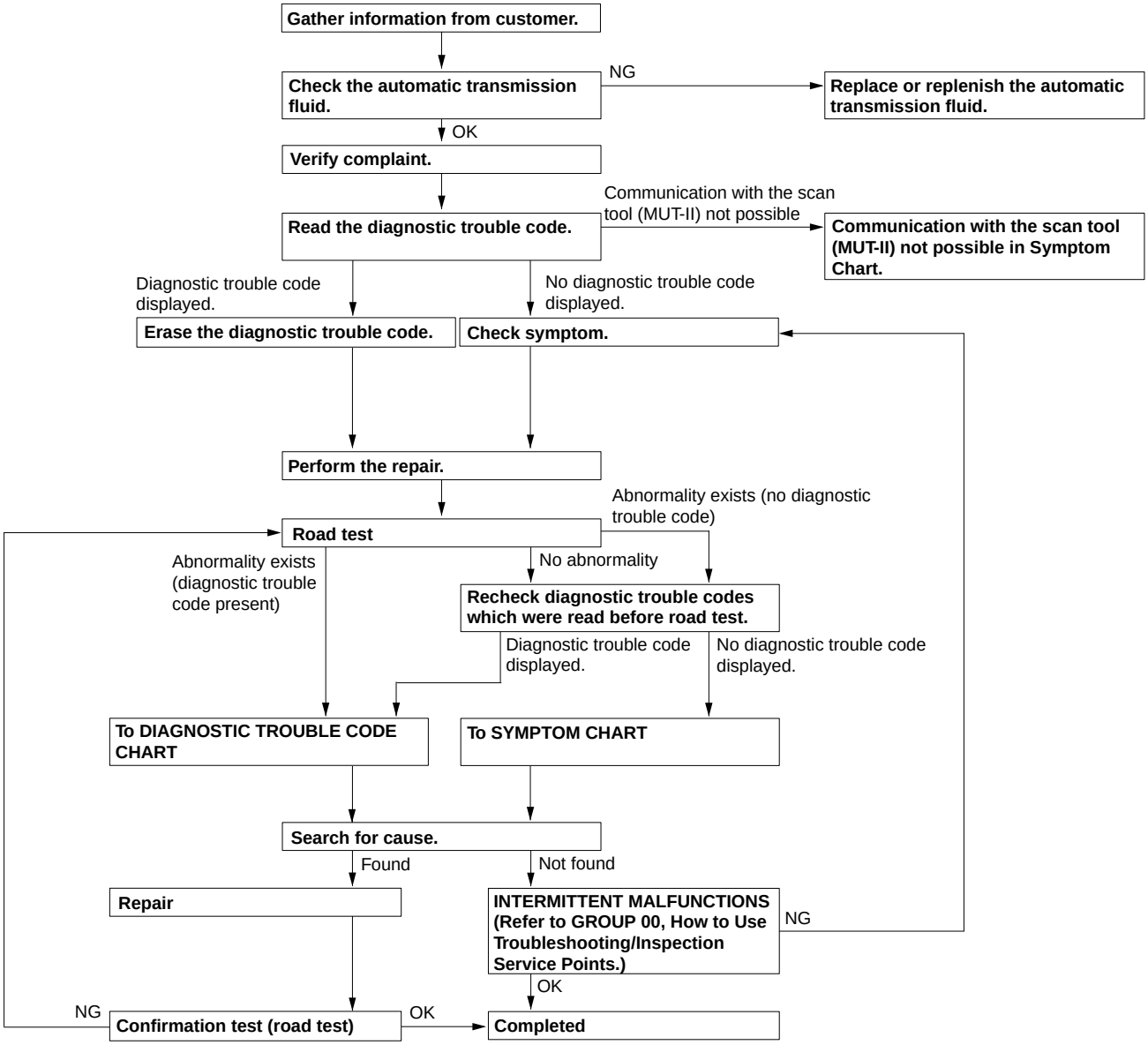
<3.0L ENGINE (VEHICLES WITH VARIABLE INDUCTION SYSTEM) > DOWNSHIFT PATTERN



AUTOMATIC TRANSAXLE DIAGNOSIS

DIAGNOSTIC TROUBLESHOOTING FLOW

M1231013500148



AC102288

INTRODUCTION TO A/T DIAGNOSIS

M1231012300130

The automatic transaxle can exhibit any of the following symptoms: noise or vibration is generated, A/T fluid leaks, the vehicle does not move forward or backward. The cases of these symptoms could come from: Incorrect mounting, the A/T fluid may be low, or a component of the transaxle may be faulty.

The following items are suspected as causes for the INVECS-II troubles: malfunctions of the PCM, the sensors, the switches, the harness or connectors.

A/T DIAGNOSTIC TROUBLESHOOTING STRATEGY

M1231007600168

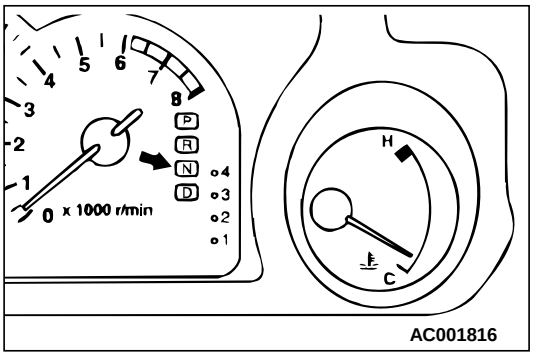
Use these steps to plan your diagnostic strategy. If you follow them carefully, you will find most A/T faults.

1. Gather as much information as possible about the complaint from the customer.
2. Verify that the condition described by the customer exists.
3. Check the vehicle for any A/T Diagnostic Trouble Code (DTC).
4. If you cannot verify the condition and there are no DTC, the malfunction is intermittent. For information on how to cope with intermittent malfunctions, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.
5. If you can verify the condition but there are no DTC, or the system cannot communicate with the scan tool, refer to Symptom Chart P.23A-41.
6. If there is a DTC, record the number of the code, then erase the code from memory using the scan tool.
7. Reconfirm the symptom using the Road Test.
8. If DTC is set again, go to Inspection Chart for Diagnostic Trouble Codes.
9. If DTC is not set again, the malfunction is intermittent. For information on how to cope with intermittent malfunctions, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.
10. After repairs are completed, conduct a Road Test duplicating the complaint set conditions to confirm the malfunction has been eliminated.

A/T DIAGNOSTIC TROUBLE CODE DIAGNOSIS

M1231007700154

CHECK "N" RANGE LIGHT <VEHICLES WITH SPORT MODE>



The "N" range light flashes once per second if there is an abnormality in any of the items in the table below which are related to the A/T system. Check for diagnostic trouble codes if the "N" range light is flashing once per second.

"N" range light flashing items

Input shaft speed sensor
Output shaft speed sensor
Each solenoid valve
Gear incorrect ratio
A/T control relay system

⚠ CAUTION

If the "N" range light is flashing twice per second, it means that the A/T fluid temperature is too high. Stop the vehicle in a safe place and wait until the "N" range light switches off.

ON-BOARD DIAGNOSTICS

The powertrain control module (PCM) monitors its input/output signals (some signals all the time and others under specified conditions). When an irregular signal is initially monitored, the PCM decides that a malfunction has occurred and records the occurrence as a diagnostic trouble code. There are 24 <Vehicles without sport mode> or 25 <Vehicles with sport mode> diagnostic items. The diagnostic results can be read with a scan tool. Diagnostic trouble codes are kept in memory by direct battery feed. The codes are retained in memory even if the ignition switch is in the "LOCK" (OFF) position. Diagnostic trouble codes will, however, be erased when a battery terminal or the PCM connector is disconnected. In addition, the diagnostic trouble code can also be erased by the scan tool MUT-II (MB991502).

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NOTE: If a sensor is disconnected when the ignition switch is in the "ON" position a diagnostic trouble code is memorized. In this case, erase the DTC using the scan tool.

The 24 <Vehicles without sport mode> or 25 <Vehicles with sport mode> diagnostic items are displayed in numeric order.

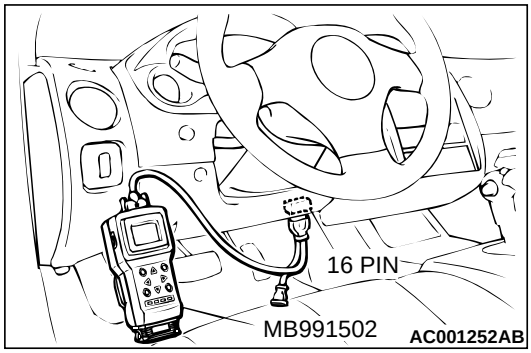
HOW TO READ AND ERASE DIAGNOSTIC TROUBLE CODES

Required Special Tools:
MB991502: Scan Tool (MUT-II)

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

NOTE: If the battery positive voltage is low, diagnostic trouble codes will not be output. Check the battery if the scan tool cannot display.

NOTE: If the battery is disconnected or if the powertrain control module connector is disconnected, the diagnostic trouble codes will be erased. Do not disconnect the battery or powertrain control module before the diagnostic trouble codes have been read.

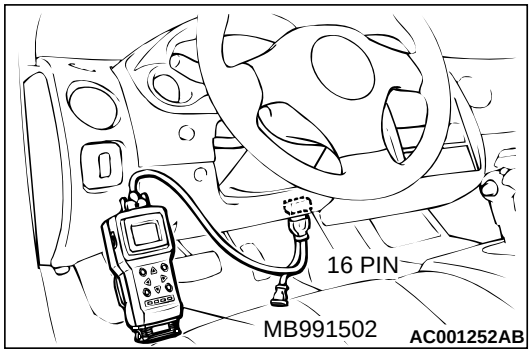


1. Connect the scan tool to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Record the diagnostic trouble codes for A/T.
4. Refer to the Diagnostic Trouble Code Chart.
5. Turn the ignition switch to the "LOCK" (OFF) and then back to "ON" again.
6. Erase the diagnostic trouble code by selecting DTC erase from SPECIAL MENU screen, using scan tool.
7. Check for diagnostic trouble codes. Confirm the scan tool displays "normal."
8. Turn the ignition switch to the "LOCK" (OFF) position.
9. Disconnect the scan tool.

INSPECTION USING SCAN TOOL, ROAD TEST AND DATA LIST

Required Special Tool:
MB991502: Scan Tool (MUT-II)

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool.



1. Connect the scan tool to data link connector.
2. Turn the ignition switch to the "ON" position.
3. Carry out inspection by means of the Road Test and Data List function. If there is an abnormality, check and repair the chassis harnesses and components. Refer to P.23A-19, Road Test. Refer to P.23A-323, Data List Reference Table.
4. Re-check using scan tool and confirm that the abnormal input and output have returned to normal because of the repairs.
5. Check for and inspect any diagnostic trouble code(s) that may have surfaced from testing. Erase the diagnostic trouble code(s) when finished checking.
6. Turn the ignition switch to the "LOCK" (OFF) position.
7. Disconnect the scan tool from the data link connector.
8. Start the engine again and do a test drive to confirm that the problem is eliminated.

FAIL-SAFE/BACKUP FUNCTION

M1231008300137

When malfunctions of the main sensors or actuators are detected by the PCM, the transaxle is controlled by pre-set control logic to maintain safe conditions for driving.

The following table shows how the fail-safe/backup function affects vehicle driveability and operation.

MALFUNCTIONING ITEM		JUDGEMENT CONDITION	CONTROL CONTENTS DURING MALFUNCTION
Input shaft speed sensor		No output pulse from the input shaft speed sensor is detected for one second or more when the vehicle speed is 30 km/h (19 mph) or more.	The diagnostic trouble code is recorded when the judgement condition occurs once. When the judgement condition is met four times, the transaxle holds 3rd gear or 2nd gear depending on speed and for vehicles with sport mode "N" range light flashes as a fail-safe.
Output shaft speed sensor		The output signal from the output shaft speed sensor has been lost for one second or more while the vehicle is being driven.	The diagnostic trouble code is recorded when the judgement condition occurs once. When the judgement condition is met four times, the transaxle holds 3rd gear or 2nd gear depending on speed and for vehicles with sport mode "N" range light flashes as a fail-safe.
Low-reverse solenoid valve		Solenoid valve resistance is below 2.7 W for 0.32 seconds.	When the judgement condition is met four times, the A/T control relay is turned off and for vehicles with sport mode "N" range light flashes. The transaxle will only operate in 3rd and reverse gears until the system is repaired.
Underdrive solenoid valve			
Second solenoid valve			
Overdrive solenoid valve			
Torque converter clutch solenoid valve			
Incomplete shifting	1st	Gear ratio value which is sent from the output shaft speed sensor is not identical to the output from the input shaft speed sensor for one second after shifting finished.	The diagnostic trouble code is displayed and the judgement condition occurs once. When the judgement condition is met four times, the A/T control relay is turned off and for vehicles with sport mode "N" range light flashes. The transaxle will only operate in 3rd and reverse gears until the system is repaired.
	2nd		
	3rd		
	4th		
	Reverse		
A/T control relay		A/T control relay voltage is less than seven volts for 0.1 second after the ignition switch is turned "ON."	Switch the A/T control relay off and for vehicles with sport mode "N" range light flashes. The transaxle will only operate in 3rd and reverse gears until the system is repaired.
Abnormality in the PCM		Abnormality has occurred in the PCM.	Switch the A/T control relay off. The transaxle will only operate in 3rd and reverse gears until the system is repaired.

ROAD TEST

M1231007800162

Check by the following procedures

STEP	CONDITION BEFORE TEST/OPERATION	TEST/OPERATION	STANDARD	INSPECTION ITEM	DTC	INSPECTION PROCEDURE PAGE
1	Ignition switch: (LOCK) OFF	Ignition switch (1) ON	Data list No. 54 (1) Control Relay Voltage [V]	A/T Control relay output voltage	54	A/T Control relay system (P.23A-233.)
2	Ignition switch: ON Engine: Stopped Selector lever position: P	Selector lever position <Vehicles without sport mode> (1) P, (2) R, (3) N, (4) D, (5) 3, (6) 2, (7) L	Data list No. 61 (1) P, (2) R, (3) N, (4) D, (5) 3, (6) 2, (7) L	Park/ Neutral position switch	27, 28	Park/Neutral position switch system (P.23A-136, P.23A-166.)
		Selector lever position <Vehicles with sport mode> (1) P, (2) R, (3) N, (4) D	Data list No. 61 (1) P, (2) R, (3) N, (4) D			
		Selector lever position <Vehicles with sport mode> (1) D (1st gear) (2) Select the sport mode (1st gear) (3) Upshift and hold the selector lever in that position (2nd gear) (4) Downshift and hold the selector lever in that position (1st gear)	Data list No. 67 (1) OFF, (2) ON, (3) ON, (4) ON Data list No. 68 (1) OFF, (2) OFF, (3) ON, (4) OFF Data list No. 69 (1) OFF, (2) OFF, (3) OFF, (4) ON	Select switch Shift switch	-	Shift switch assembly system (P.23A-302.)
			Shift indicator light (1) "D" or "1" illuminates (2) Only "1" illuminates (3) Only "2" illuminates (4) Only "1" illuminates			
		Accelerator pedal (1) Fully closed (2) Depressed (3) Fully open	Data list No. 11 (1) 535 – 735 mV (2) Gradually rises from (1) (3) 4,500 – 5,500 mV	TPS	11, 12, 14	TPS system (P.23A-42, P.23A-51, P.23A-59.)
		Brake pedal (1) Depressed (2) Released	Data list No. 26 (1) ON (2) OFF	Stoplight switch	26	Stoplight switch system (P.23A-129.)

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STEP	CONDITION BEFORE TEST/OPERATION	TEST/OPERATION	STANDARD	INSPECTION ITEM	DTC	INSPECTION PROCEDURE PAGE
3	Ignition switch: ST Engine: Stopped	Cranking test with lever in P or N range	Cranking should be possible	Cranking	-	Engine does not crank (P.23A-249.)
4	Warming up	Drive for 15 minutes or more so that the A/T fluid temperature becomes 70 – 80°C (158 – 176°F)	Data list No. 15 Gradually rises to 70 – 80°C (158 – 176°F)	A/T fluid temperature sensor	15, 16	A/T fluid temperature sensor system (P.23A-70, P.23A-77.)

STEP	CONDITION BEFORE TEST/OPERATION	TEST/OPERATION	STANDARD	INSPECTION ITEM	DTC	INSPECTION PROCEDURE PAGE
5	Engine: Idling Selector lever position: N	Brake pedal (Retest) (1) Depressed (2) Released	Data list No. 26 (1) ON (2) OFF	Stoplight switch	26	Stoplight switch system (P.23A-129.)
		A/C switch (1) ON (2) OFF	Data list No. 65 (1) ON (2) OFF	Dual pressure switch	-	Vehicle shifts differently with A/C engaged (P.23A-279.)
		Accelerator pedal (1) Fully closed (2) Depressed	Data list No. 21 (1) Engine tachometer and the MUT-II shows the same engine speed (2) Gradually rises from (1)	Crankshaft position sensor	21	Crankshaft position sensor system (P.23A-83.)
		Selector lever position (1) N → D (2) N → R	Should be no abnormal shift shocks Time delay when engaging should be within 2 seconds	Malfunction when starting	-	Engine stalls when moving selector lever from N to D or N to R (P.23A-256.)
					-	Shift shock when shifting from N to D and long delay (P.23A-258.)
					-	Shift shock when shifting from N to R and long delay (P.23A-260.)
					-	Shift shock when shifting from N to D, N to R and long delay (P.23A-263.)
				Does not move	-	Does not move forward (P.23A-251.)
					-	Does not move backward (P.23A-253.)
					-	Does not move (forward or backward) (P.23A-255.)

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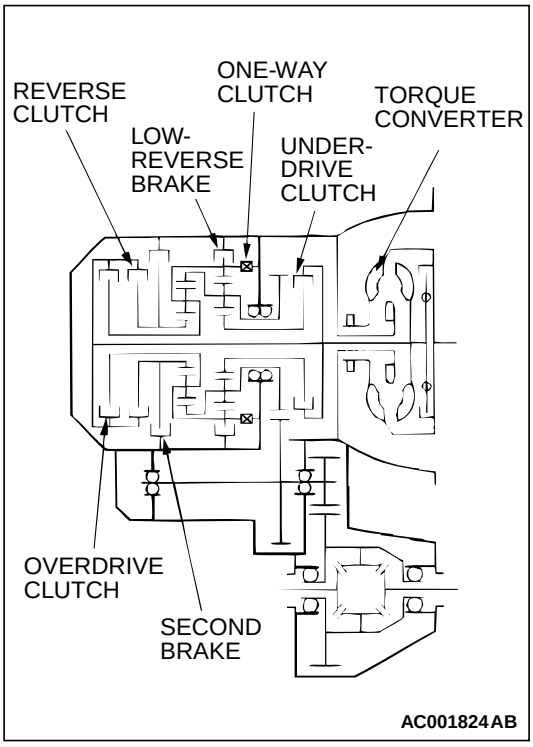
STEP	CONDITION BEFORE TEST/OPERATION	TEST/OPERATION	STANDARD	INSPECTION ITEM	DTC	INSPECTION PROCEDURE PAGE
6	Selector lever position: N <Vehicles without sport mode>, Sport mode <Vehicles with sport mode> (on a flat and straight road)	Selector lever position and vehicle speed (Each condition should be maintained for 10 seconds or more.) (1) Idling in 1st gear (Vehicle stopped) (2) Driving at constant speed of 10 km/h (6.2 mph) in 1st gear (3) Driving at constant speed of 30 km/h (19 mph) in 2nd gear (4) Driving at constant speed of 50 km/h (31 mph) in 3rd gear (5) Driving at constant speed of 50 km/h (31 mph) in 4th gear	Data list No. 63 (2) 1st, (3) 2nd, (4) 3rd, (5) 4th	Shift position	-	-
			Data list No. 31 (2) 0 %, (3) 100 %, (4) 100 %, (5) 100 %	Low-reverse solenoid valve duty %	31	Low-reverse solenoid valve system (P.23A-180.)
			Data list No. 32 (2) 0 %, (3) 0 %, (4) 0 %, (5) 100 %	Underdrive solenoid valve duty %	32	Underdrive solenoid valve system (P.23A-188.)
			Data list No. 33 (2)100 %, (3) 0 %, (4) 100 %, (5) 0 %	Second solenoid valve duty %	33	Second solenoid valve system (P.23A-195.)
			Data list No. 34 (2) 100 %, (3) 100 %, (4) 0 %, (5) 0 %	Overdrive solenoid valve duty %	34	Overdrive solenoid valve system (P.23A-202.)
			Data list No. 29 (1) 0 km/h (0 mph) (4) 50 km/h (31 mph)	Vehicle speed signal	-	Vehicle speed signal system (P.23A-295.)
			Data list No. 22 (4) 1,600 – 1,900 r/min <2.4L Engine> 1,300 – 1,600 r/min <3.0L Engine>	Input shaft speed sensor	22	Input shaft speed sensor system (P.23A-101.)
			Data list No. 23 (4) 1,600 – 1,900 r/min <2.4L Engine> 1,300 – 1,600 r/min <3.0L Engine>	Output shaft speed sensor	23	Output shaft speed sensor system (P.23A-115.)
7	Selector lever position: 3 <Vehicles without sport mode>, sport mode <Vehicles without sport mode> (on a flat and straight road)	Selector lever position and vehicle speed (1) Driving at speed of 50 km/h (31 mph) in 3rd gear (2) Driving at constant speed of 50 km/h (31 mph) (3) Release accelerator pedal (Speed under 50 km/h (31 mph)	Data list No. 36 (2) 70 – 90 % (3) 70 – 90 % → 0 %	Torque converter clutch solenoid valve duty %	36, 52, 53	Torque converter clutch solenoid system (P.23A-209, P.23A-226, P.23A-231.)

STEP	CONDITION BEFORE TEST/OPERATION	TEST/OPERATION	STANDARD	INSPECTION ITEM	DTC	INSPECTION PROCEDURE PAGE
			Data list No. 52 (2) –10 to 10 r/min (3) The value changes from (2)	Torque converter clutch amount of slippage		
8	Use the scan tool (MUT-II) to stop the INVECS-II function Selector lever position: D (on a flat and straight road) Use the scan tool (MUT-II) to stop the INVECS-II function Selector lever position: D (on a flat and straight road)	(1) Accelerate to 4th gear at a throttle position sensor output of 1.5V (accelerator opening angle of 30 %) (2) Slowly decelerate to a stop (3) Accelerate to 4th gear at a throttle position sensor output of 2.5 V (accelerator opening angle of 50%)	Data list No.11, 23 The shifting points correspond with the scan tool display and the APS voltage (opening angle) and output shaft speed, which are shown in the standard shift pattern	Malfunction when shifting	-	Shift shock and slipping (P.23A-265.)
				Does not shift according to instructions	-	Early or late shifting in all gears (P.23A-267.)
					-	Early or late shifting in some gears (P.23A-270.)
				Does not shift	-	No diagnostic trouble code (P.23A-272.)
					22	Input shaft speed sensor system (P.23A-101.)
					23	Output shaft speed sensor system (P.23A-115.)

STEP	CONDITION BEFORE TEST/OPERATION	TEST/OPERATION	STANDARD	INSPECTION ITEM	DTC	INSPECTION PROCEDURE PAGE
8	Use the scan tool (MUT-II) to stop the INVECS-II function Selector lever position: D (on a flat and straight road) Use the scan tool (MUT-II) to stop the INVECS-II function Selector lever position: D (on a flat and straight road)	(1) While driving at 60 km/h (37 mph) in 4th gear, downshift to 3rd gear (2) While driving at 40 km/h (25 mph) in 3rd gear, downshift to 2nd gear (3) While driving at 20 km/h (12 mph) in 2nd gear, downshift to 1st gear	Data list No.63 (1) 4th→3rd (2) 3rd→2nd (3) 2nd→1st	Does not shift from 2 to 1	31	Low-reverse solenoid valve system (P.23A-180.)
					33	Second solenoid valve system (P.23A-195.)
					41	1st gear incorrect ratio (P.23A-217.)
					42	2nd gear incorrect ratio (P.23A-217.)
				Does not shift from 3 to 2	33	Second solenoid valve system (P.23A-195.)
					34	Overdrive solenoid valve system (P.23A-202.)
					42	2nd gear incorrect ratio (P.23A-217.)
					43	3rd gear incorrect ratio (P.23A-217.)
				Does not shift from 4 to 3	32	Underdrive solenoid valve system (P.23A-188.)
					33	Second solenoid valve system (P.23A-195.)
					43	3rd gear incorrect ratio (P.23A-217.)
					44	4th gear incorrect ratio (P.23A-217.)

STEP	CONDITION BEFORE TEST/OPERATION	TEST/OPERATION	STANDARD	INSPECTION ITEM	DTC	INSPECTION PROCEDURE PAGE
9	Selector lever position: N (on a flat and straight road)	Monitor data list No. 22 and No. 23 with the scan tool (MUT-II) (1) Move selector lever to R range, drive at constant speed of 10 km/h (6.2 mph)	The ratio between data list No. 22 and No. 23 should be the same as the gear ratio when reversing.	Does not match	22	Input shaft speed sensor system (P.23A-101.)
					23	Output shaft speed sensor system (P.23A-115.)
					46	Reverse gear incorrect ratio (P.23A-217.)



TORQUE CONVERTER STALL TEST

M1231005400157

This test measures the maximum engine speed when the selector lever is at the "D" or "R" position and the torque converter stalls. This tests the operation of the torque converter, stator and one-way clutch operation and the holding performance of the clutches and brakes in the transaxle.

⚠ *WARNING*

Do not let anybody stand in front of or behind the vehicle while this test is being carried out.

1. Check the A/T fluid level and temperature. Check the engine coolant temperature.
   - A/T fluid level: At the "HOT" mark on the dipstick
   - A/T fluid temperature: 70 – 80 °C (158 – 176 °F)
   - Engine coolant temperature: 80 – 100 °C (176 – 212 °F)

NOTE: It measures A/T fluid temperature in scan tool (MUT-II).

2. Check both rear wheels.
3. Connect a tachometer.
4. Apply the parking and service brakes fully.
5. Start the engine.
6. Move the selector lever to the "D" position. Fully depress the accelerator pedal and read the maximum engine speed.

⚠ CAUTION

- **The throttle should not be left fully open for any more than five seconds.**
- **If you repeat the stall test when the fluid temperature is 80°C (176°F) or more, move the selector lever to the "N" range and let the engine run at approximately 1,000 r/min for at least one minute and then wait until the ATF temperature returns to 80°C (176°F) or lower.**

Standard value: Stall speed: 2,100 – 2,600 r/min

7. Move the selector lever to the "R" position and repeat step 6.

Standard value: Stall speed: 2,100 – 2,600 r/min

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TORQUE CONVERTER STALL TEST JUDGEMENT RESULTS

1. Stall speed is too high in "D" range only
   - Malfunction of torque converter (Slippage on the splines of the torque converter and the input shaft)
   - Low line pressure
   - Low-reverse brake slippage and malfunction of one-way clutch
2. Stall speed is too high in "D" range only
   - Underdrive clutch slippage
3. Stall speed is too high in "R" range only
   - Reverse clutch slippage
4. Stall speed too low in both "D" and "R" ranges
   - Malfunction of torque converter (Slippage of the one-way clutch)
   - Insufficient engine output

HYDRAULIC PRESSURE TESTS

M1231005500165

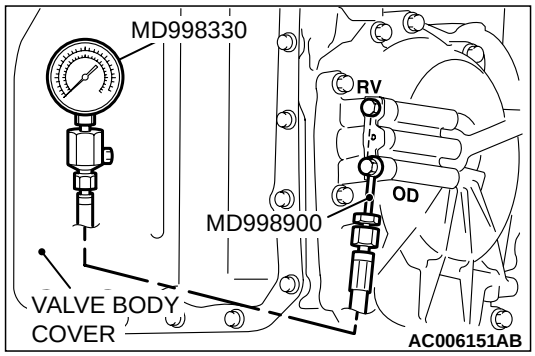
Check the A/T fluid level and temperature. Check engine coolant temperature.

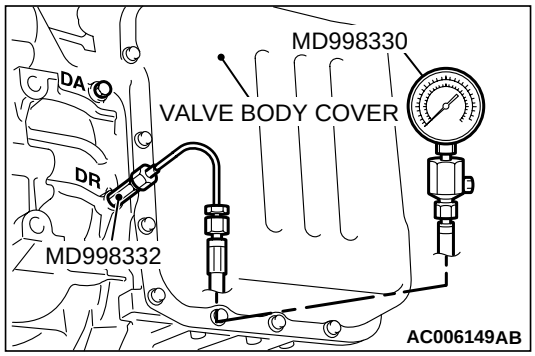
- A/T fluid level: "HOT" mark on the dipstick
- A/T fluid temperature: 70 – 80°C (158 – 176°F)
- Engine coolant temperature: 80 – 100°C (176 – 212°F)

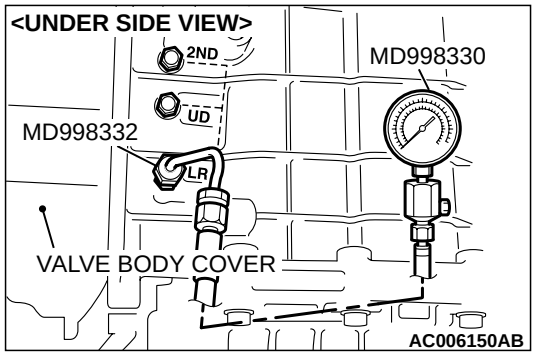
⚠ CAUTION

The fluid temperature should be within 70 – 80 °C (158 – 176°F) during the test.

1. Raise the vehicle so that the wheels are free to turn.







2. Connect the special tools (3.0 MPa (427 psi) oil pressure gauge [MD998330] and adapters [MD998332, MD998900]) to each pressure discharge port.

   NOTE:
   - *2ND: Second brake pressure port*
   - *UD: Underdrive clutch pressure port*
   - *LR: Low-reverse brake pressure port*
   - *DR: Torque converter release pressure port*
   - *DA: Torque converter apply pressure port ("DA" pressure is approximately the same as the "DR" pressure, so measurements are not needed)*
   - *RV: Reverse clutch pressure port*
   - *OD: Overdrive clutch pressure port*
3. Restart the engine.
4. Check that there are no leaks around the special tool port adapters.
5. Measure the hydraulic pressure at each port under the conditions given in the standard hydraulic pressure table, and check that the measured values are within the standard value ranges.
6. If not within the standard value, stop the engine and refer to the Hydraulic pressure test diagnosis table.
7. Recover the O-ring from the port plug and replace it.
8. Remove the special tool, and install the plugs to the hydraulic pressure ports.
9. On completion, start the engine and check that there are no leaks around the plugs.

STANDARD HYDRAULIC PRESSURE TEST

MEASUREMENT CONDITION			STANDARD HYDRAULIC PRESSURE MPa (psi)					
SELECTOR LEVER POSITION	SHIFT POSITION	ENGINE SPEED (r/min)	UNDERDRIVE CLUTCH PRESSURE [UD]	REVERSE CLUTCH PRESSURE [RV]	OVERDRIVE CLUTCH PRESSURE [OD]	LOW-REVERSE BRAKE PRESSURE [LR]	SECOND BRAKE PRESSURE [2ND]	TORQUE CONVERTER PRESSURE [DR]
P	–	2,500	–	–	–	0.31 – 0.39 (45 – 57)	–	0.25 – 0.39 (37 – 57)
R	Reverse	2,500	–	1.27 – 1.77 (185 – 256)	–	1.27 – 1.77 (185 – 256)	–	0.50 – 0.70 (73 – 101)
N	–	2,500	–	–	–	0.31 – 0.39 (45 – 57)	–	0.25 – 0.39 (37 – 57)

MEASUREMENT CONDITION			STANDARD HYDRAULIC PRESSURE MPa (psi)					
SELECTOR LEVER POSITION	SHIFT POSITION	ENGINE SPEED (r/min)	UNDERDRIVE CLUTCH PRESSURE [UD]	REVERSE CLUTCH PRESSURE [RV]	OVERDRIVE CLUTCH PRESSURE [OD]	LOW-REVERSE BRAKE PRESSURE [LR]	SECOND BRAKE PRESSURE [2ND]	TORQUE CONVERTER PRESSURE [DR]
L <Vehicles without sport mode> or Sport mode <Vehicles with sport mode>	1st gear	2,500	1.01 – 1.05 (147 – 152)	–	–	1.01 – 1.05 (147 – 152)	–	0.50 – 0.70 (73 – 101)
2 <Vehicles without sport mode> or Sport mode <Vehicles with sport mode>	2nd gear	2,500	1.01 – 1.05 (147 – 152)	–	–	–	1.01 – 1.05 (147 – 152)	0.50 – 0.70 (73 – 101)
3 <Vehicles without sport mode> or Sport mode <Vehicles with sport mode>	3rd gear	2,500	0.59 – 0.69 (86 – 100)	–	0.59 – 0.69 (86 – 100)	–	–	–
D <Vehicles without sport mode> or Sport mode <Vehicles with sport mode>	4th gear	2,500	–	–	0.59 – 0.69 (86 – 100)	–	0.59 – 0.69 (86 – 100)	–

NOTE: If the torque converter pressure is measured, the engine speed should be 1,500 r/min or less.

HYDRAULIC PRESSURE TEST DIAGNOSIS TABLE

SYMPTOMS	PROBABLE CAUSE
All hydraulic pressures are high.	Malfunction of the regulator valve
All hydraulic pressures are low.	Malfunction of the oil pump
	Clogged internal oil filter
	Clogged oil cooler
	Malfunction of the regulator valve
	Malfunction of the relief valve
	Incorrect valve body installation
	Improperly installed solenoid valves
	Damaged solenoid valve O-rings
Hydraulic pressure is abnormal in reverse gear only.	Malfunction of the regulator valve
	Clogged orifice
	Incorrect valve body installation
Hydraulic pressure is abnormal in 3rd or 4th gear only.	Malfunction of the overdrive solenoid valve
	Malfunction of the overdrive pressure control valve
	Malfunction of the regulator valve
	Malfunction of the switch valve
	Clogged orifice
	Incorrect valve body installation
Only underdrive clutch hydraulic pressure is abnormal.	Malfunction of the oil seal K
	Malfunction of the oil seal L
	Malfunction of the oil seal M
	Malfunction of the underdrive solenoid valve
	Malfunction of the underdrive pressure control valve
	Malfunction of check ball
	Clogged orifice
	Incorrect valve body installation
Only reverse clutch hydraulic pressure is abnormal.	Malfunction of the oil seal A
	Malfunction of the oil seal B
	Malfunction of the oil seal C
	Clogged orifice
	Incorrect valve body installation
Only overdrive clutch hydraulic pressure is abnormal.	Malfunction of the oil seal D
	Malfunction of the oil seal E
	Malfunction of the oil seal F
	Malfunction of the overdrive solenoid valve
	Malfunction of the overdrive pressure control valve
	Malfunction of check ball
	Clogged orifice
	Incorrect valve body installation

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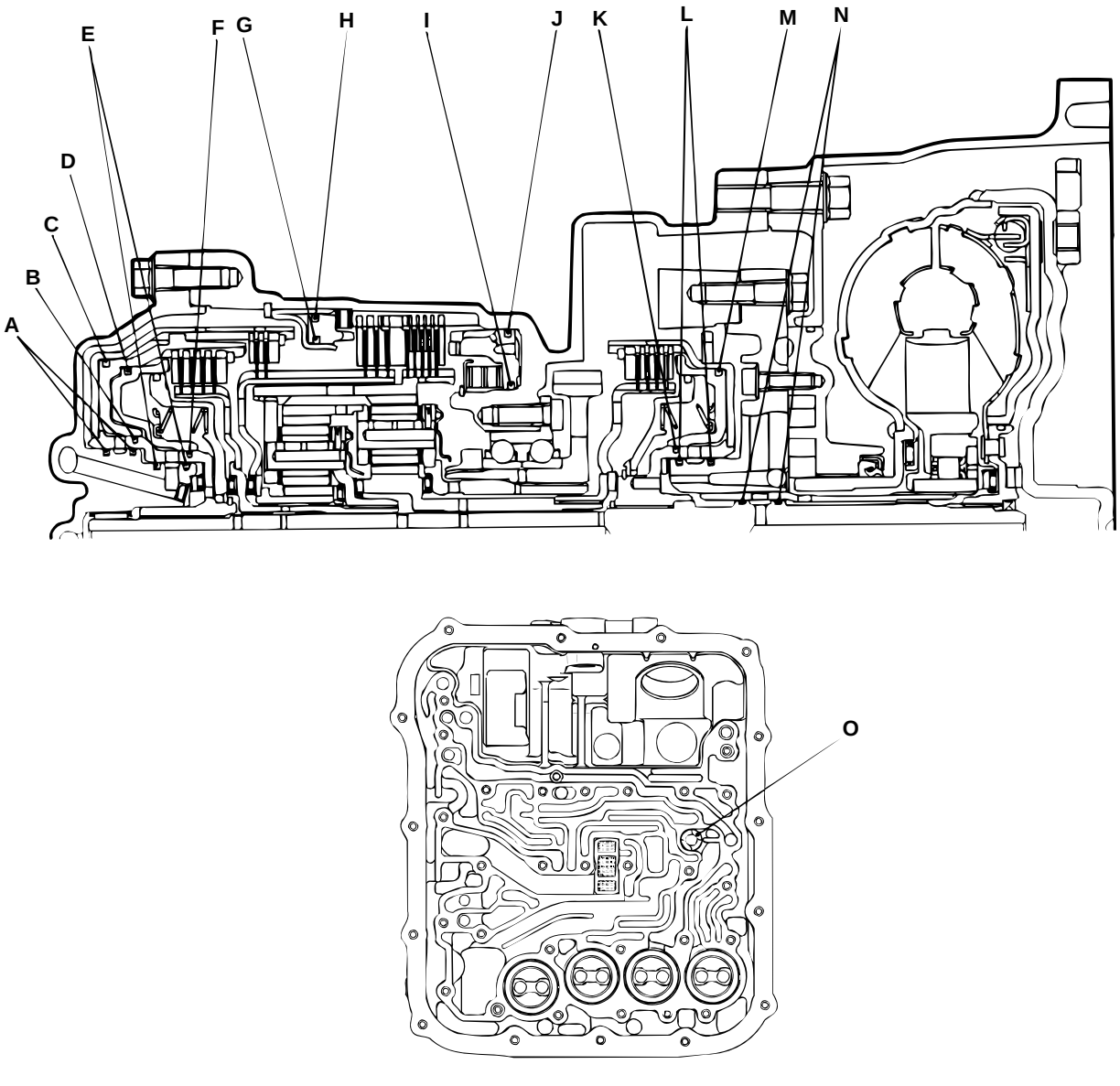
SYMPTOMS	PROBABLE CAUSE
Only low-reverse brake hydraulic pressure is abnormal.	Malfunction of the oil seal I
	Malfunction of the oil seal J
	Malfunction of the low-reverse solenoid valve
	Malfunction of the low-reverse pressure control valve
	Malfunction of the switch valve
	Malfunction of the fail safe valve A
	Malfunction of check ball
	Clogged orifice
	Incorrect valve body installation
Only second brake hydraulic pressure is abnormal.	Malfunction of the oil seal G
	Malfunction of the oil seal H
	Malfunction of the oil seal O
	Malfunction of the second solenoid valve
	Malfunction of the second pressure control valve
	Malfunction of the fail safe valve B
	Clogged orifice
	Incorrect valve body installation
Only torque converter pressure is abnormal.	Clogged oil cooler
	Malfunction of the oil seal N
	Malfunction of the torque converter clutch solenoid
	Malfunction of the torque converter pressure control valve
	Clogged orifice
	Incorrect valve body installation
Pressure applied to element which should not receive pressure.	Incorrect transaxle control cable adjustment
	Malfunction of the manual valve
	Malfunction of check ball
	Incorrect valve body installation

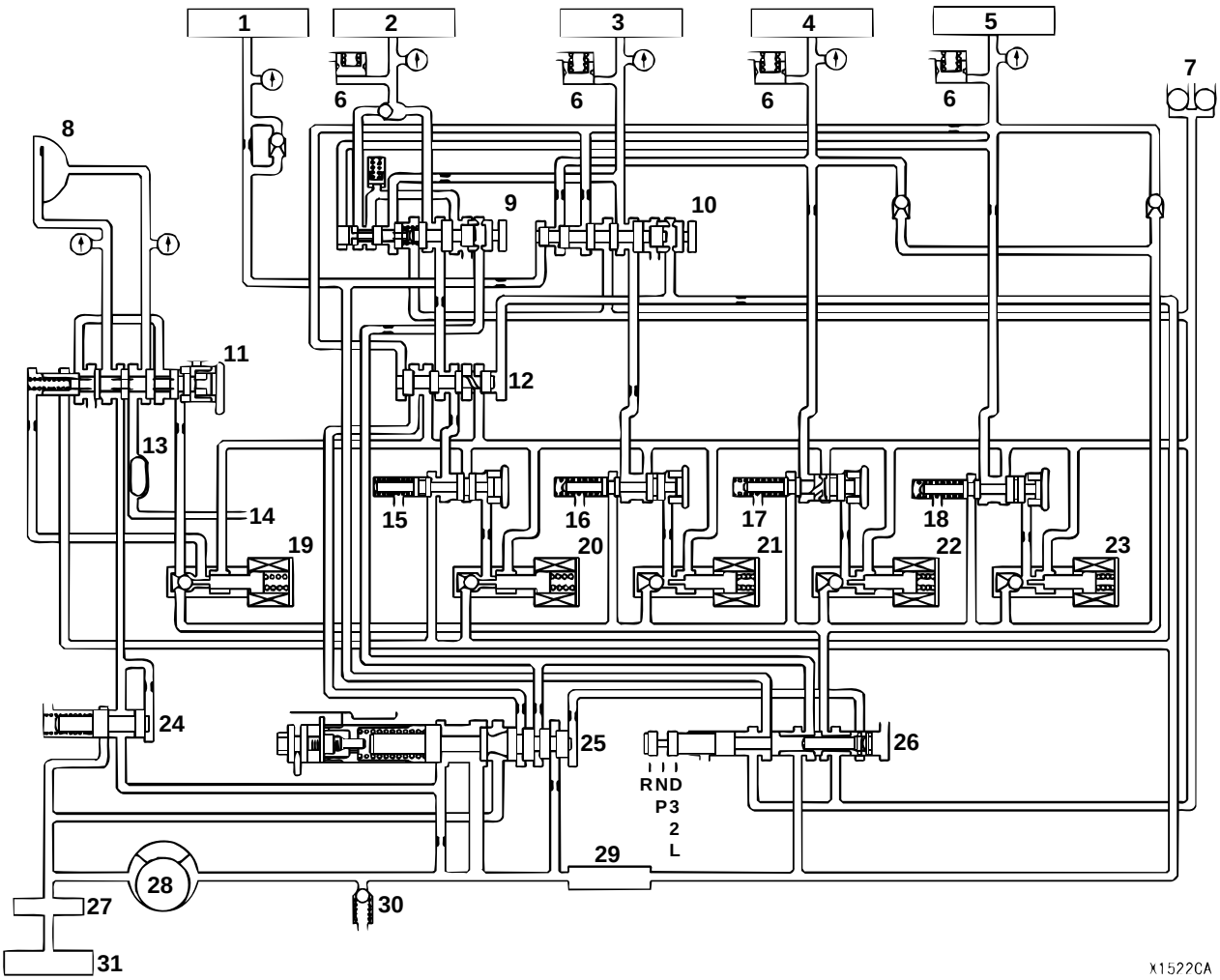
OIL SEAL LAYOUT



HYDRAULIC CIRCUIT

M1231008800046

<4A/T> PARKING AND NEUTRAL



: LINE PRESSURE

: OIL PUMP SUCTION PRESSURE

: TORQUE CONVERTER CLUTCH PRESSURE

: TORQUE CONVERTER AND LUBRICATION PRESSURE

: TORQUE CONVERTER CLUTCH SOLENOID VALVE PRESSURE

1. REVERSE CLUTCH
2. LOW-REVERSE BRAKE
3. SECOND BRAKE
4. UNDERDRIVE CLUTCH
5. OVERDRIVE CLUTCH
6. ACCUMULATOR
7. CHECK BALL
8. TORQUE CONVERTER CLUTCH
9. FAIL SAFE VALVE A
10. FAIL SAFE VALVE B
11. TORQUE CONVERTER CLUTCH CONTROL VALVE
12. SWITCH VALVE
13. A/T FLUID COOLER
14. LUBRICATION
15. LOW-REVERSE PRESSURE CONTROL VALVE
16. SECOND PRESSURE CONTROL VALVE
17. UNDERDRIVE PRESSURE CONTROL VALVE
18. OVERDRIVE PRESSURE CONTROL VALVE
19. TORQUE CONVERTER CLUTCH SOLENOID VALVE
20. LOW-REVERSE SOLENOID VALVE
21. SECOND SOLENOID VALVE
22. UNDERDRIVE SOLENOID VALVE
23. OVERDRIVE SOLENOID VALVE
24. TORQUE CONVERTER PRESSURE CONTROL VALVE
25. REGULATOR VALVE
26. MANUAL VALVE
27. OIL FILTER
28. OIL PUMP
29. OIL STRAINER
30. RELIEF VALVE
31. OIL PAN

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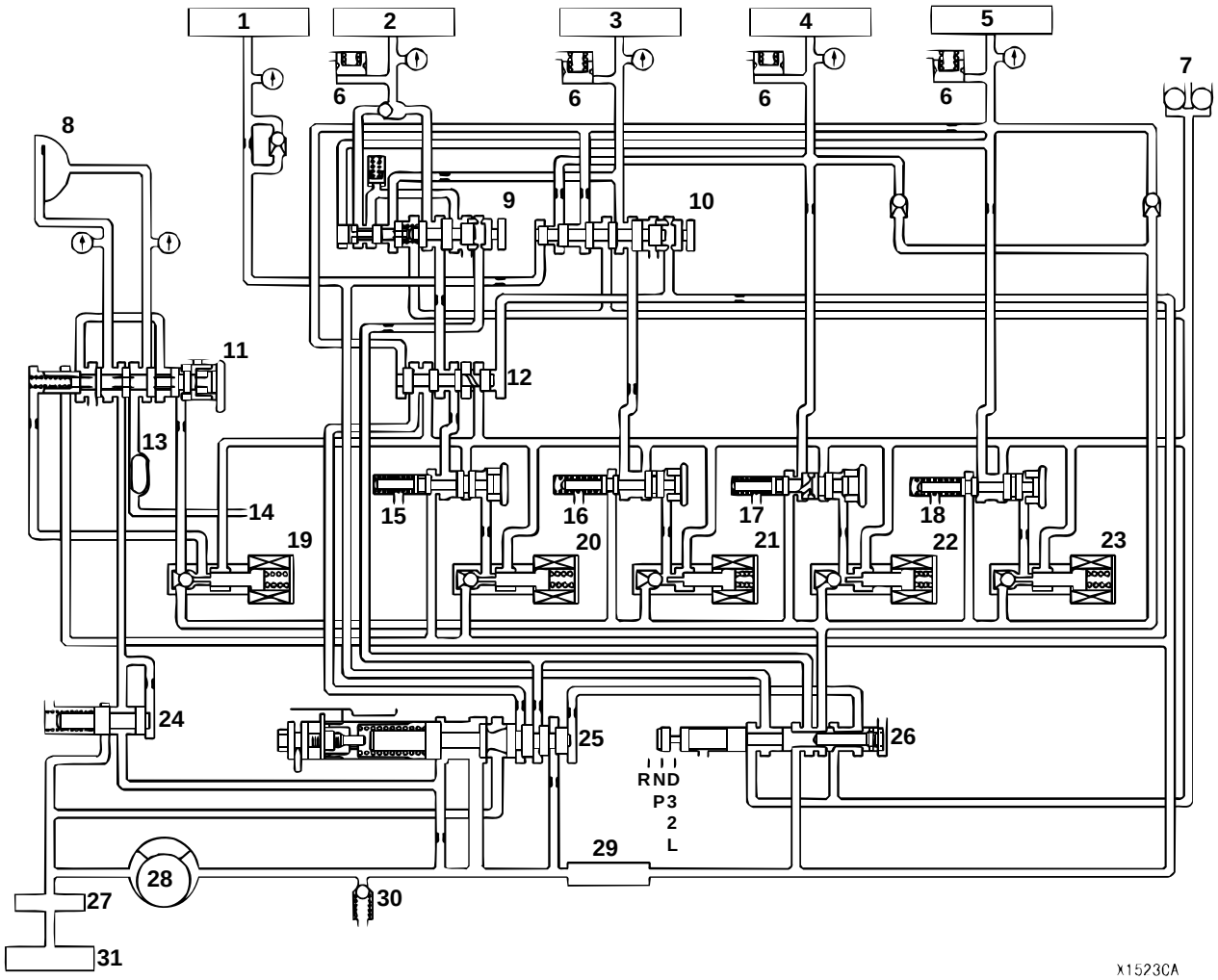
<4A/T> 1ST GEAR



1. REVERSE CLUTCH
2. LOW-REVERSE BRAKE
3. SECOND BRAKE
4. UNDERDRIVE CLUTCH
5. OVERDRIVE CLUTCH
6. ACCUMULATOR
7. CHECK BALL
8. TORQUE CONVERTER CLUTCH
9. FAIL SAFE VALVE A
10. FAIL SAFE VALVE B
11. TORQUE CONVERTER CLUTCH CONTROL VALVE
12. SWITCH VALVE
13. A/T FLUID COOLER
14. LUBRICATION
15. LOW-REVERSE PRESSURE CONTROL VALVE
16. SECOND PRESSURE CONTROL VALVE
17. UNDERDRIVE PRESSURE CONTROL VALVE
18. OVERDRIVE PRESSURE CONTROL VALVE
19. TORQUE CONVERTER CLUTCH SOLENOID VALVE
20. LOW-REVERSE SOLENOID VALVE
21. SECOND SOLENOID VALVE
22. UNDERDRIVE SOLENOID VALVE
23. OVERDRIVE SOLENOID VALVE
24. TORQUE CONVERTER PRESSURE CONTROL VALVE
25. REGULATOR VALVE
26. MANUAL VALVE
27. OIL FILTER
28. OIL PUMP
29. OIL STRAINER
30. RELIEF VALVE
31. OIL PAN

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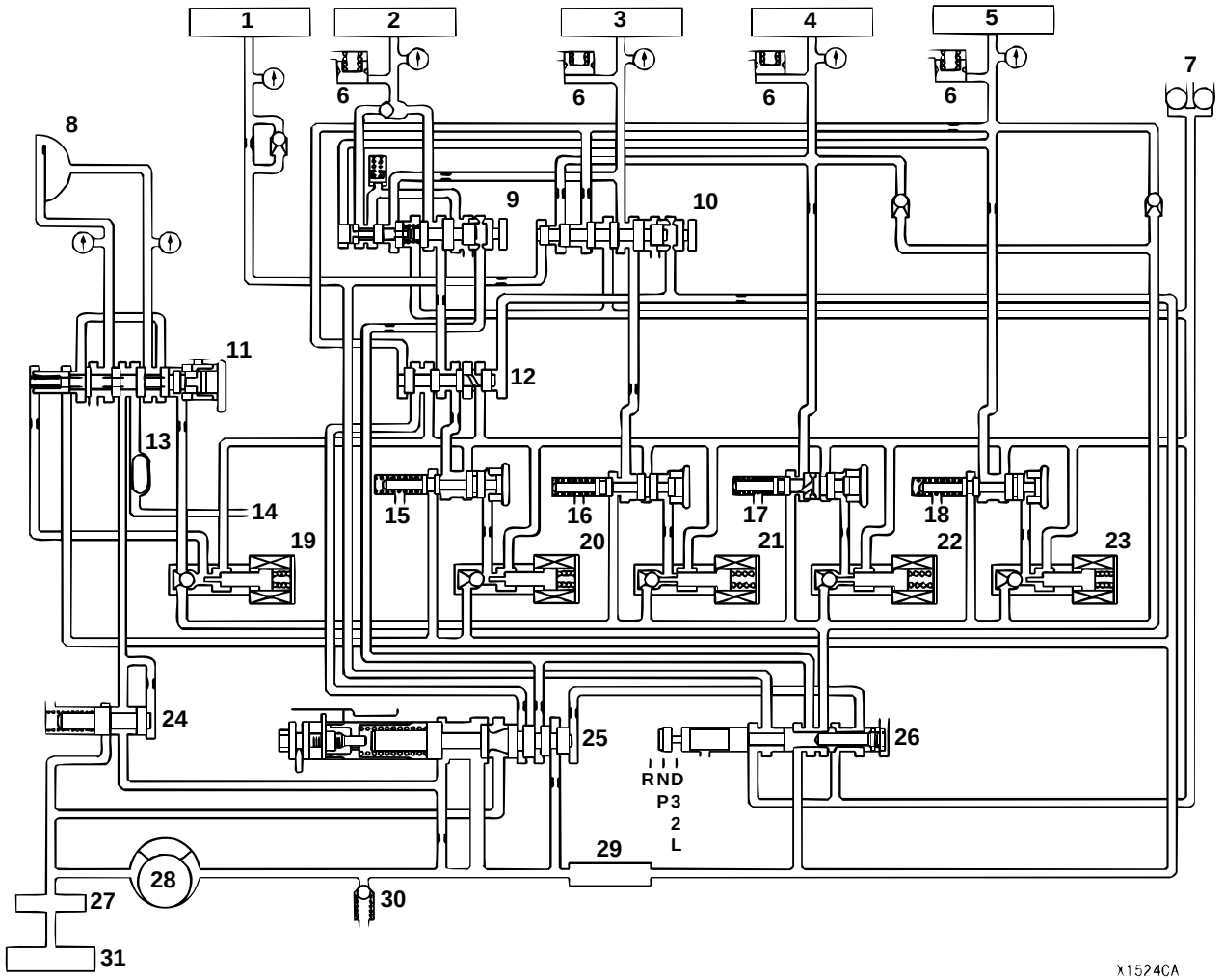
<4A/T> 2ND GEAR



1. REVERSE CLUTCH
2. LOW-REVERSE BRAKE
3. SECOND BRAKE
4. UNDERDRIVE CLUTCH
5. OVERDRIVE CLUTCH
6. ACCUMULATOR
7. CHECK BALL
8. TORQUE CONVERTER CLUTCH
9. FAIL SAFE VALVE A
10. FAIL SAFE VALVE B
11. TORQUE CONVERTER CLUTCH CONTROL VALVE
12. SWITCH VALVE
13. A/T FLUID COOLER
14. LUBRICATION
15. LOW-REVERSE PRESSURE CONTROL VALVE
16. SECOND PRESSURE CONTROL VALVE
17. UNDERDRIVE PRESSURE CONTROL VALVE
18. OVERDRIVE PRESSURE CONTROL VALVE
19. TORQUE CONVERTER CLUTCH SOLENOID VALVE
20. LOW-REVERSE SOLENOID VALVE
21. SECOND SOLENOID VALVE
22. UNDERDRIVE SOLENOID VALVE
23. OVERDRIVE SOLENOID VALVE
24. TORQUE CONVERTER PRESSURE CONTROL VALVE
25. REGULATOR VALVE
26. MANUAL VALVE
27. OIL FILTER
28. OIL PUMP
29. OIL STRAINER
30. RELIEF VALVE
31. OIL PAN

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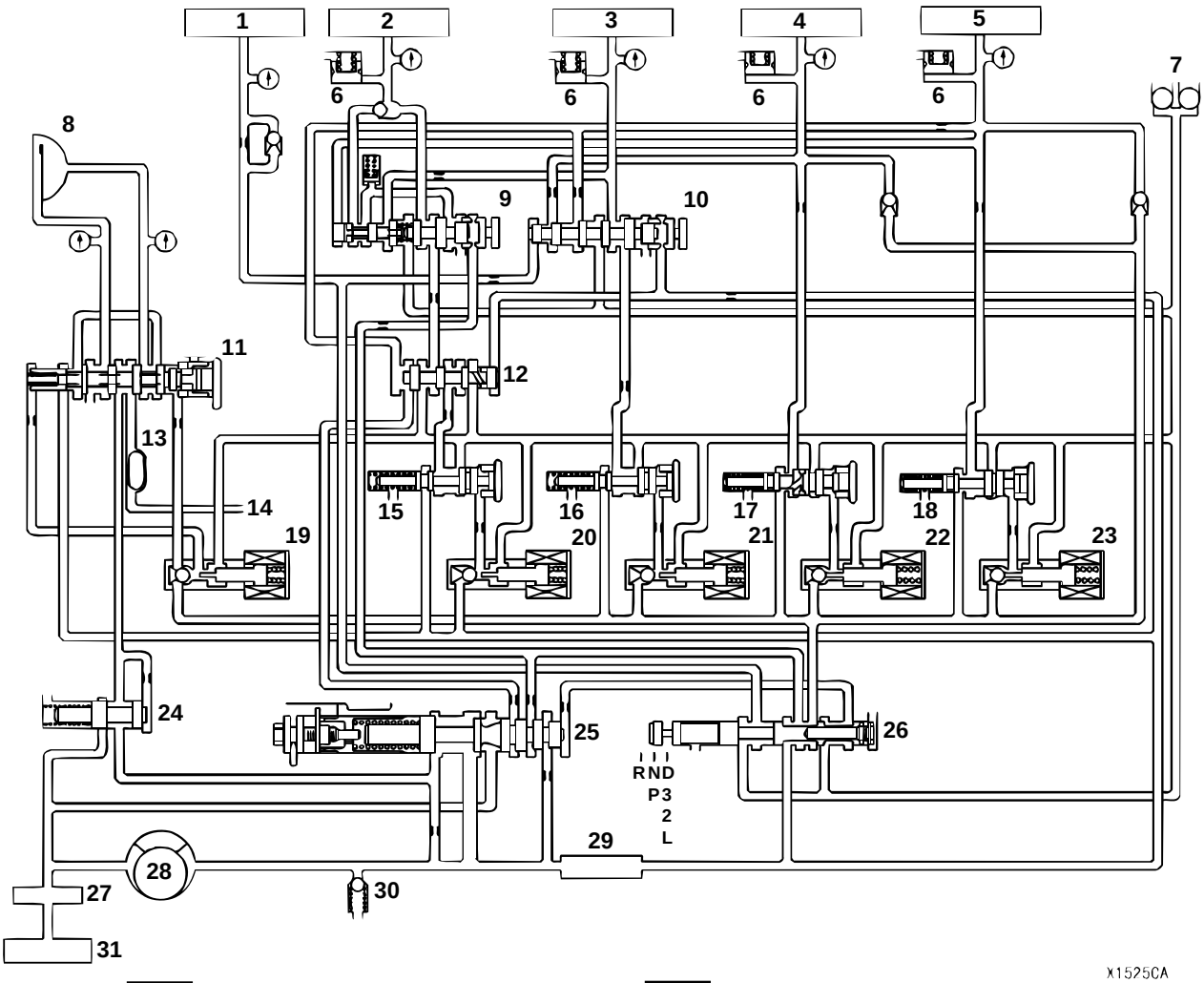
<4A/T> 3RD GEAR



1. REVERSE CLUTCH
2. LOW-REVERSE BRAKE
3. SECOND BRAKE
4. UNDERDRIVE CLUTCH
5. OVERDRIVE CLUTCH
6. ACCUMULATOR
7. CHECK BALL
8. TORQUE CONVERTER CLUTCH
9. FAIL SAFE VALVE A
10. FAIL SAFE VALVE B
11. TORQUE CONVERTER CLUTCH CONTROL VALVE
12. SWITCH VALVE
13. A/T FLUID COOLER
14. LUBRICATION
15. LOW-REVERSE PRESSURE CONTROL VALVE
16. SECOND PRESSURE CONTROL VALVE
17. UNDERDRIVE PRESSURE CONTROL VALVE
18. OVERDRIVE PRESSURE CONTROL VALVE
19. TORQUE CONVERTER CLUTCH SOLENOID VALVE
20. LOW-REVERSE SOLENOID VALVE
21. SECOND SOLENOID VALVE
22. UNDERDRIVE SOLENOID VALVE
23. OVERDRIVE SOLENOID VALVE
24. TORQUE CONVERTER PRESSURE CONTROL VALVE
25. REGULATOR VALVE
26. MANUAL VALVE
27. OIL FILTER
28. OIL PUMP
29. OIL STRAINER
30. RELIEF VALVE
31. OIL PAN

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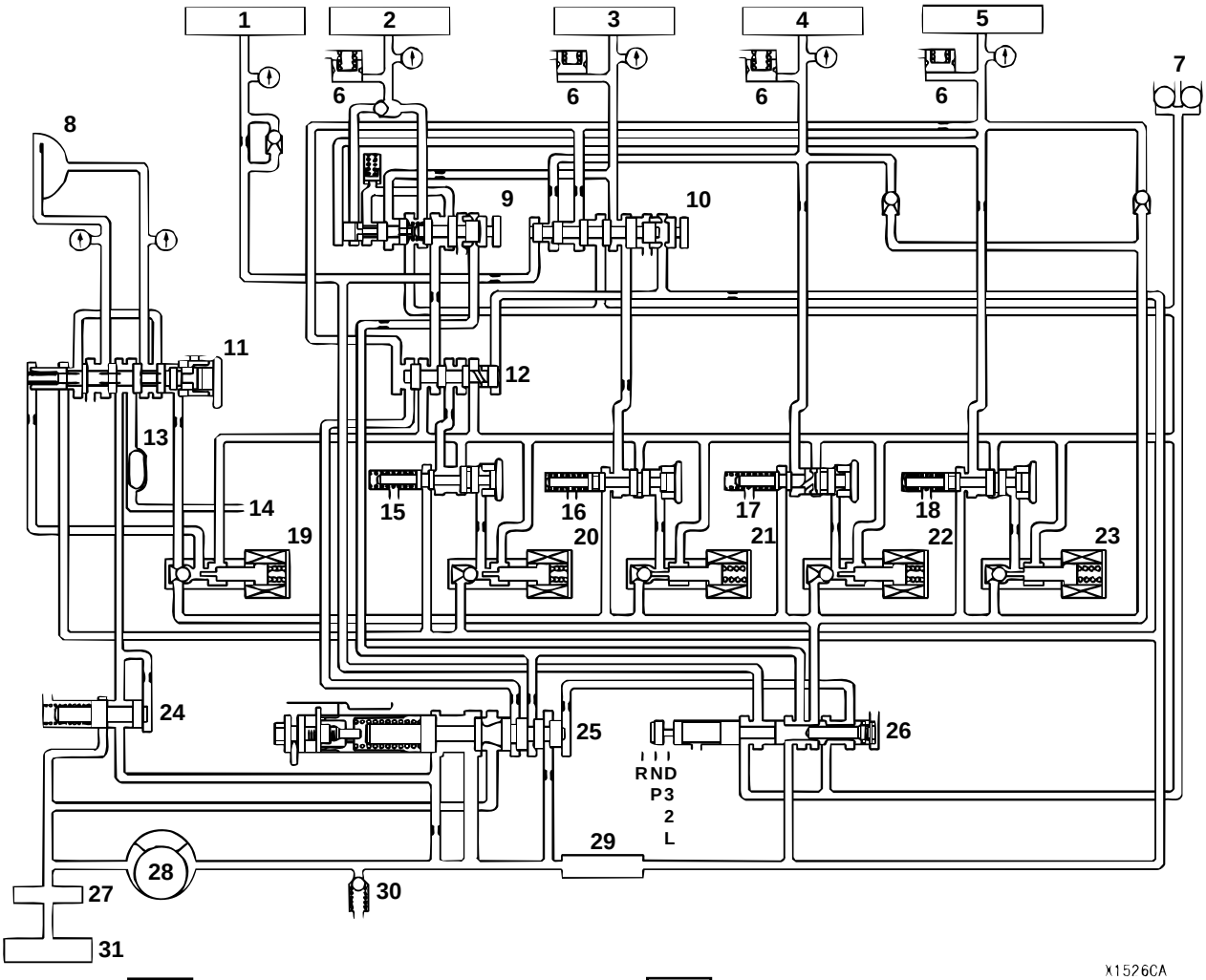
<4A/T> 4TH GEAR



1. REVERSE CLUTCH
2. LOW-REVERSE BRAKE
3. SECOND BRAKE
4. UNDERDRIVE CLUTCH
5. OVERDRIVE CLUTCH
6. ACCUMULATOR
7. CHECK BALL
8. TORQUE CONVERTER CLUTCH
9. FAIL SAFE VALVE A
10. FAIL SAFE VALVE B
11. TORQUE CONVERTER CLUTCH CONTROL VALVE
12. SWITCH VALVE
13. A/T FLUID COOLER
14. LUBRICATION
15. LOW-REVERSE PRESSURE CONTROL VALVE
16. SECOND PRESSURE CONTROL VALVE
17. UNDERDRIVE PRESSURE CONTROL VALVE
18. OVERDRIVE PRESSURE CONTROL VALVE
19. TORQUE CONVERTER CLUTCH SOLENOID VALVE
20. LOW-REVERSE SOLENOID VALVE
21. SECOND SOLENOID VALVE
22. UNDERDRIVE SOLENOID VALVE
23. OVERDRIVE SOLENOID VALVE
24. TORQUE CONVERTER PRESSURE CONTROL VALVE
25. REGULATOR VALVE
26. MANUAL VALVE
27. OIL FILTER
28. OIL PUMP
29. OIL STRAINER
30. RELIEF VALVE
31. OIL PAN

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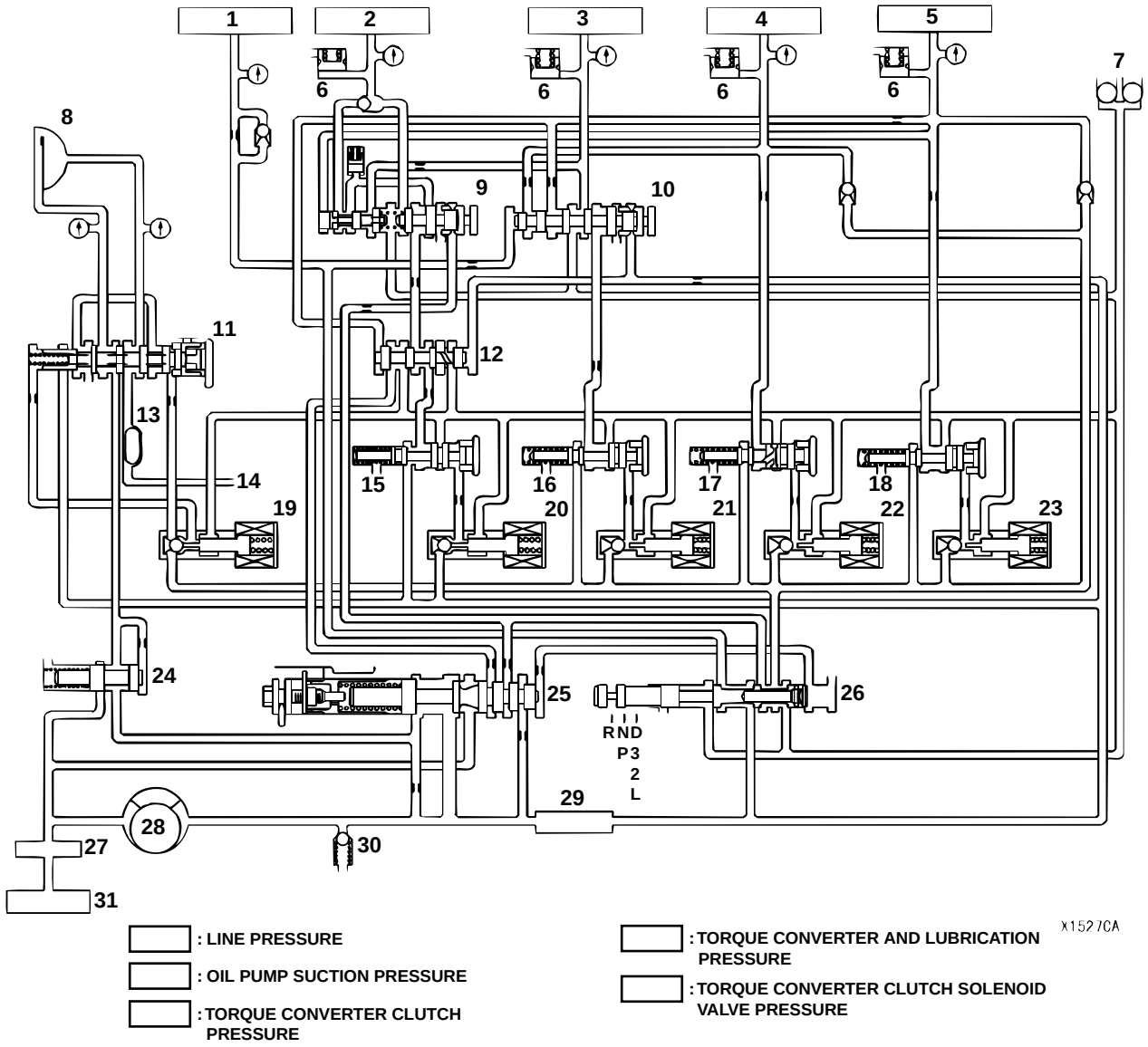
<4A/T> REVERSE



1. REVERSE CLUTCH
2. LOW-REVERSE BRAKE
3. SECOND BRAKE
4. UNDERDRIVE CLUTCH
5. OVERDRIVE CLUTCH
6. ACCUMULATOR
7. CHECK BALL
8. TORQUE CONVERTER CLUTCH
9. FAIL SAFE VALVE A
10. FAIL SAFE VALVE B
11. TORQUE CONVERTER CLUTCH CONTROL VALVE
12. SWITCH VALVE
13. A/T FLUID COOLER
14. LUBRICATION
15. LOW-REVERSE PRESSURE CONTROL VALVE
16. SECOND PRESSURE CONTROL VALVE
17. UNDERDRIVE PRESSURE CONTROL VALVE
18. OVERDRIVE PRESSURE CONTROL VALVE
19. TORQUE CONVERTER CLUTCH SOLENOID VALVE
20. LOW-REVERSE SOLENOID VALVE
21. SECOND SOLENOID VALVE
22. UNDERDRIVE SOLENOID VALVE
23. OVERDRIVE SOLENOID VALVE
24. TORQUE CONVERTER PRESSURE CONTROL VALVE
25. REGULATOR VALVE
26. MANUAL VALVE
27. OIL FILTER
28. OIL PUMP
29. OIL STRAINER
30. RELIEF VALVE
31. OIL PAN

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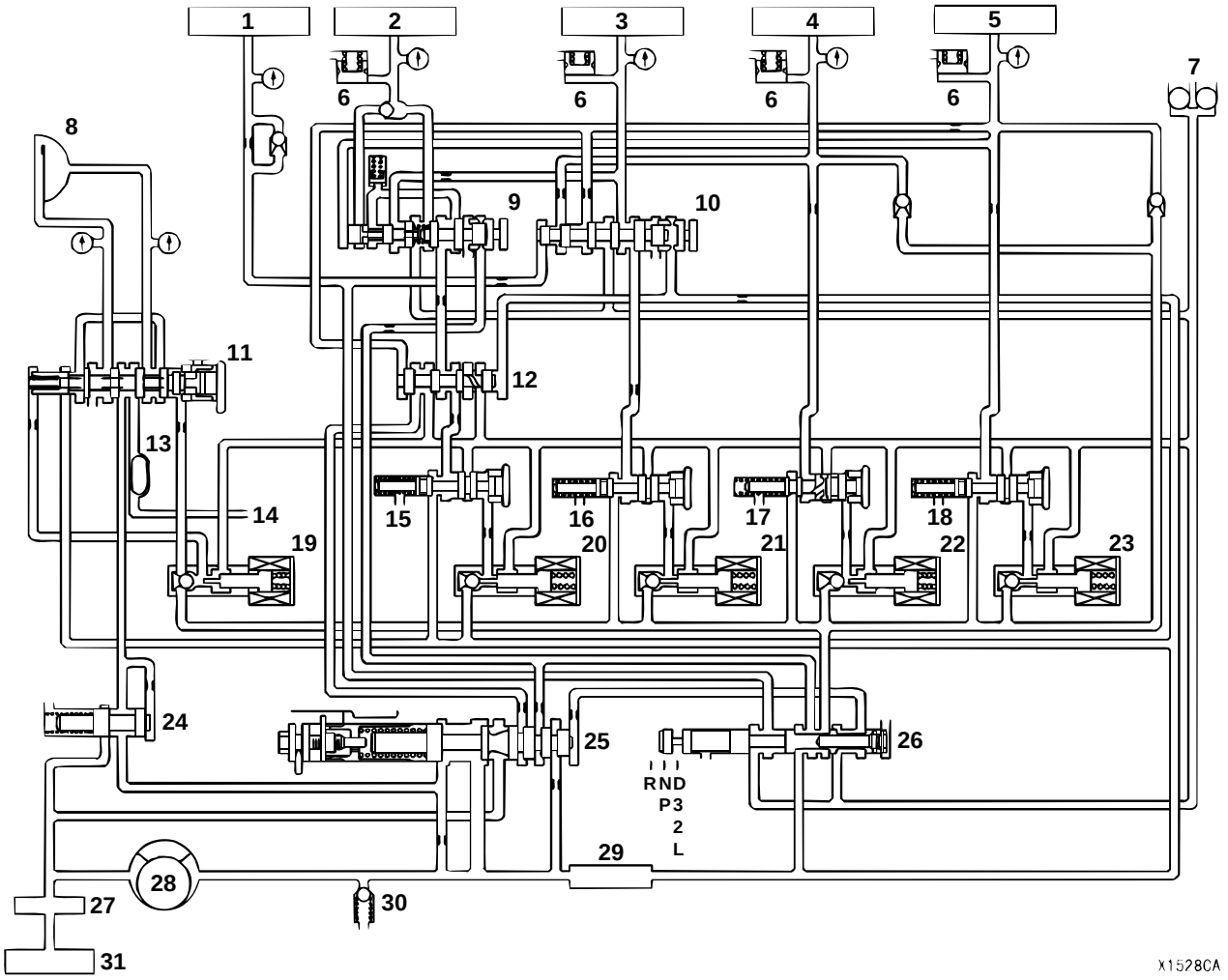
<4A/T> FAIL-SAFE (IN CASE OF FAIL-SAFE VALVE A OPERATION)



1. REVERSE CLUTCH
2. LOW-REVERSE BRAKE
3. SECOND BRAKE
4. UNDERDRIVE CLUTCH
5. OVERDRIVE CLUTCH
6. ACCUMULATOR
7. CHECK BALL
8. TORQUE CONVERTER CLUTCH
9. FAIL SAFE VALVE A
10. FAIL SAFE VALVE B
11. TORQUE CONVERTER CLUTCH CONTROL VALVE
12. SWITCH VALVE
13. A/T FLUID COOLER
14. LUBRICATION
15. LOW-REVERSE PRESSURE CONTROL VALVE
16. SECOND PRESSURE CONTROL VALVE
17. UNDERDRIVE PRESSURE CONTROL VALVE
18. OVERDRIVE PRESSURE CONTROL VALVE
19. TORQUE CONVERTER CLUTCH SOLENOID VALVE
20. LOW-REVERSE SOLENOID VALVE
21. SECOND SOLENOID VALVE
22. UNDERDRIVE SOLENOID VALVE
23. OVERDRIVE SOLENOID VALVE
24. TORQUE CONVERTER PRESSURE CONTROL VALVE
25. REGULATOR VALVE
26. MANUAL VALVE
27. OIL FILTER
28. OIL PUMP
29. OIL STRAINER
30. RELIEF VALVE
31. OIL PAN

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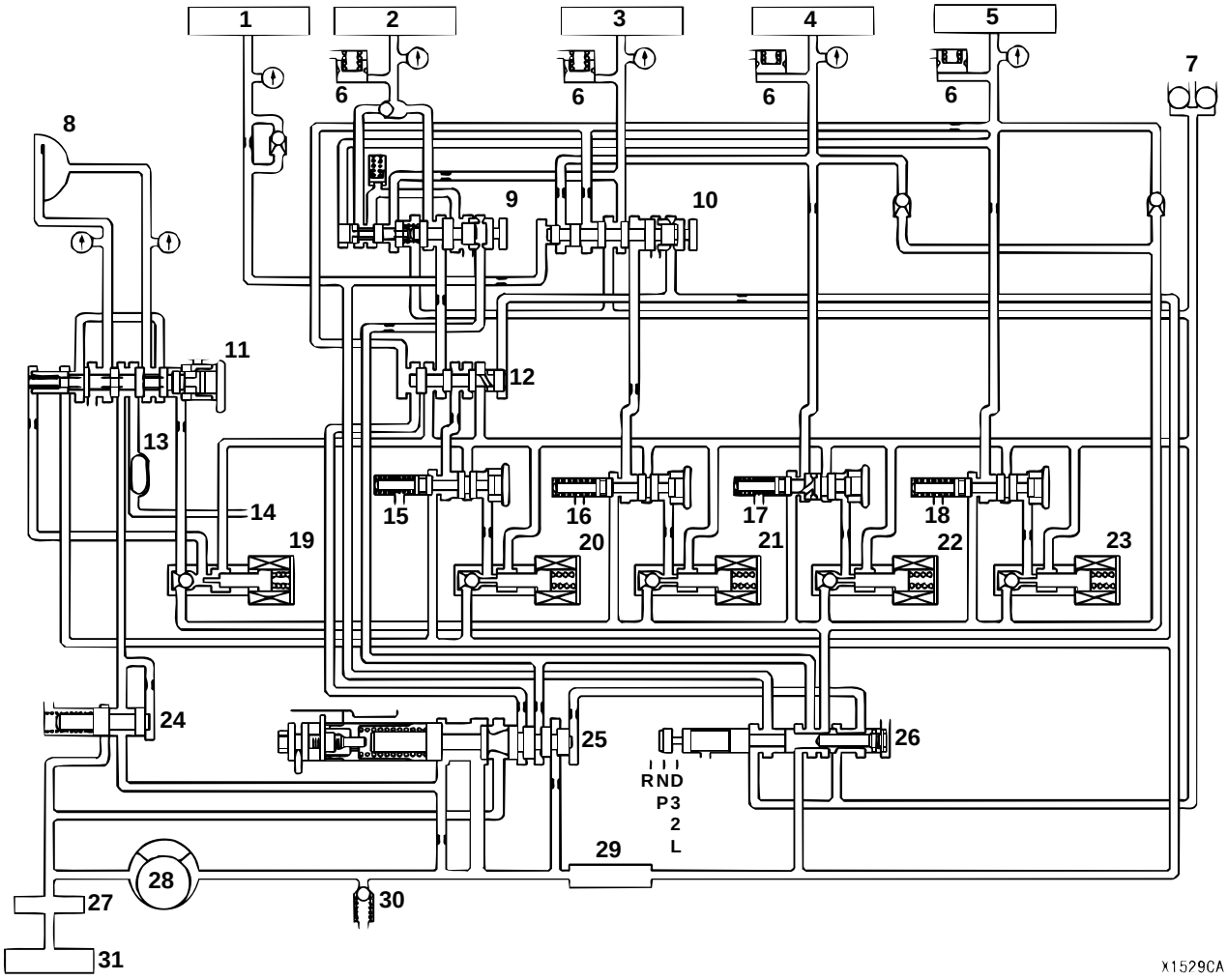
<4A/T> FAIL-SAFE (IN CASE OF FAIL-SAFE VALVE B OPERATION)



: LINE PRESSURE

: OIL PUMP SUCTION PRESSURE

: TORQUE CONVERTER CLUTCH PRESSURE

: TORQUE CONVERTER AND LUBRICATION PRESSURE

: TORQUE CONVERTER CLUTCH SOLENOID VALVE PRESSURE

1. REVERSE CLUTCH
2. LOW-REVERSE BRAKE
3. SECOND BRAKE
4. UNDERDRIVE CLUTCH
5. OVERDRIVE CLUTCH
6. ACCUMULATOR
7. CHECK BALL
8. TORQUE CONVERTER CLUTCH
9. FAIL SAFE VALVE A
10. FAIL SAFE VALVE B
11. TORQUE CONVERTER CLUTCH CONTROL VALVE
12. SWITCH VALVE
13. A/T FLUID COOLER
14. LUBRICATION
15. LOW-REVERSE PRESSURE CONTROL VALVE
16. SECOND PRESSURE CONTROL VALVE
17. UNDERDRIVE PRESSURE CONTROL VALVE
18. OVERDRIVE PRESSURE CONTROL VALVE
19. TORQUE CONVERTER CLUTCH SOLENOID VALVE
20. LOW-REVERSE SOLENOID VALVE
21. SECOND SOLENOID VALVE
22. UNDERDRIVE SOLENOID VALVE
23. OVERDRIVE SOLENOID VALVE
24. TORQUE CONVERTER PRESSURE CONTROL VALVE
25. REGULATOR VALVE
26. MANUAL VALVE
27. OIL FILTER
28. OIL PUMP
29. OIL STRAINER
30. RELIEF VALVE
31. OIL PAN

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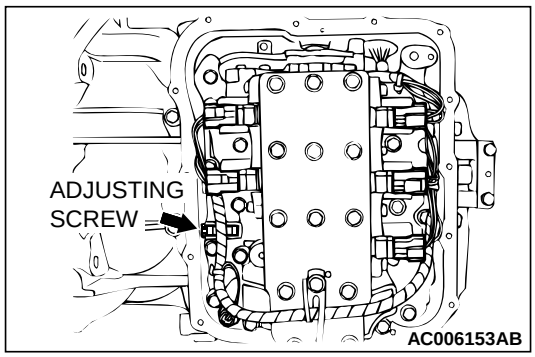
LINE PRESSURE ADJUSTMENT

M1231001700156



1. Drain the A/T fluid.
   NOTE: Be sure to perform the hydraulic pressure test before attempting any adjustments.
2. Remove the valve body cover.
3. Turn the adjusting screw shown in the illustration to adjust the line pressure to the standard value. The pressure increases when the screw is turned to the left.
   NOTE: When adjusting the line pressure, adjust to the middle of the standard value range.
   Standard value: 1.01 – 1.05 MPa (147 – 152 psi)
4. Install the valve body cover. Pour in one quart A/T fluid.
5. Repeat the hydraulic pressure test. (Refer to P.23A-26.) Readjust the line pressure if necessary.

DIAGNOSTIC TROUBLE CODE CHART

M1231007900136

CODE	DIAGNOSIS ITEM		REFERENCE PAGE
11	Throttle position sensor system	Short circuit	P.23A-42
12		Open circuit	P.23A-51
14		Sensor out of adjustment	P.23A-59
15	A/T fluid temperature sensor system	Open circuit	P.23A-70
16		Short circuit	P.23A-77
21	Crankshaft position sensor system	Open circuit	P.23A-83
22	Input shaft speed sensor system	Short circuit/open circuit	P.23A-101
23	Output shaft speed sensor system	Short circuit/open circuit	P.23A-115
26	Stoplight switch system	Short circuit	P.23A-129
27	Park/Neutral position switch system	Open circuit	P.23A-136
28		Short circuit	P.23A-166
31	Low-reverse solenoid valve system	Short circuit/open circuit	P.23A-180
32	Underdrive solenoid valve system	Short circuit/open circuit	P.23A-188
33	Second solenoid valve system	Short circuit/open circuit	P.23A-195
34	Overdrive solenoid valve system	Short circuit/open circuit	P.23A-202
36	Torque converter clutch solenoid system	Short circuit/open circuit	P.23A-209
41	1st gear incorrect ratio		P.23A-217
42	2nd gear incorrect ratio		P.23A-217
43	3rd gear incorrect ratio		P.23A-217
44	4th gear incorrect ratio		P.23A-217
46	Reverse gear incorrect ratio		P.23A-217

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CODE	DIAGNOSIS ITEM		REFERENCE PAGE
52	Torque converter clutch solenoid system	Defective system	P.23A-226
53		Clutch stuck on	P.23A-231
54	A/T control relay system	Short circuit to ground/open circuit	P.23A-233
56	"N" range light system <Vehicles with sport mode>	Open circuit	P.23A-242

SYMPTOM CHART

M1231008000158

SYMPTOMS			INSPECTION PROCEDURE NO.	REFERENCE PAGE
Communication with scan tool is not possible	Communication with all systems is impossible	2.4L Engine	-	Group 13A, diagnosis P.13A-434.
		3.0L Engine	-	Group 13B, diagnosis P.13B-530.
	Communication with the PCM only is impossible	2.4L Engine	-	Group 13A, diagnosis P.13A-436.
		3.0L Engine	-	Group 13B, diagnosis P.13B-532.
Driving impossible	Engine does not crank		1	P.23A-249
	Does not move forward		2	P.23A-251
	Does not move backward		3	P.23A-253
	Does not move (forward or backward)		4	P.23A-255
Malfunction when moving selector into gear	Engine stalls when moving selector lever from "N" to "D" or "N" to "R"		5	P.23A-256
	Shift shock when shifting from "N" to "D" and long delay		6	P.23A-258
	Shift shock when shifting from "N" to "R" and long delay		7	P.23A-260
	Shift shock when shifting from "N" to "D" or "N" to "R" and long delay		8	P.23A-263
Malfunction when shifting	Shift shock and slipping		9	P.23A-265
Does not shift properly	Early or late shifting in all gears		10	P.23A-267
	Early or late shifting in some gears		11	P.23A-270
Does not shift	No diagnostic trouble codes		12	P.23A-272
Malfunction while driving	Poor acceleration		13	P.23A-274
	Vibration		14	P.23A-276
Vehicle shifts differently with A/C engaged			15	P.23A-279
Transaxle won't downshift under load with auto-cruise engaged			16	P.23A-290
Vehicle speed signal system			17	P.23A-295
Shift switch assembly system <Vehicles with sport mode>			18	P.23A-302

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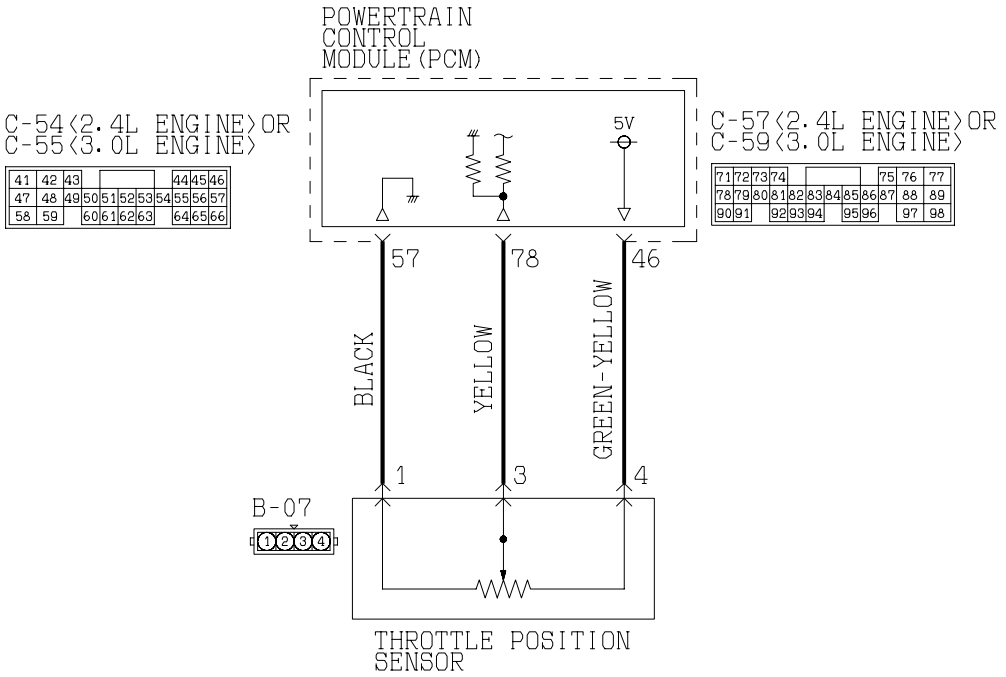
DIAGNOSTIC TROUBLE CODE PROCEDURES

DTC 11: Throttle Position Sensor System (Short Circuit)

Throttle Position Sensor System Circuit



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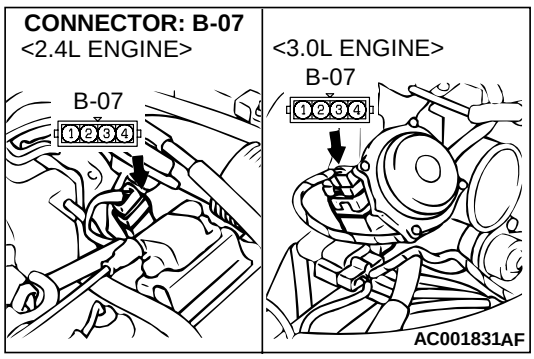
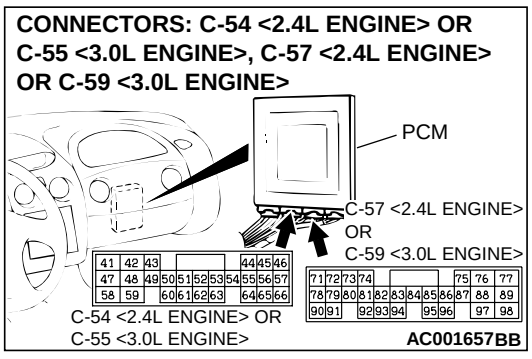




CIRCUIT OPERATION

- When the throttle valve shaft rotates from the idle position to the fully opened position, the resistance between the TPS output terminal (terminal 3) and ground terminal (terminal 1) will increase according to the rotation.
- With the ignition switch in the "ON" position, voltage at pin 78 increases from around 0.7 volts at closed throttle to about 5 volts at wide open throttle.

DTC SET CONDITIONS

If the PCM output voltage is 4.8 volts or higher when the engine is idling, the output is judged to be too high and diagnostic trouble code number "11" is output.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set:)

- Malfunction of the throttle position sensor circuit
- Damaged harness, connector
- Malfunction of the PCM

TSB Revision

DIAGNOSIS

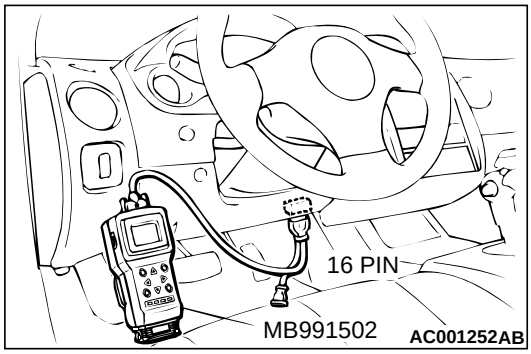
Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check data list item 11: Throttle Position Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.



(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to data reading mode for item 11: Throttle Position Sensor.
  - With the throttle valve in idle position, voltage should be between 535 and 735 mV.
  - With the throttle valve in full-open position, voltage should be between 4,500 and 5,500 mV.

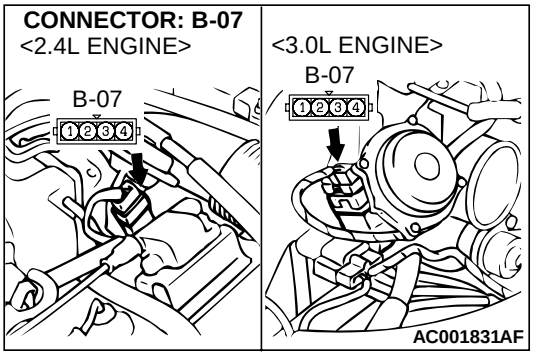
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

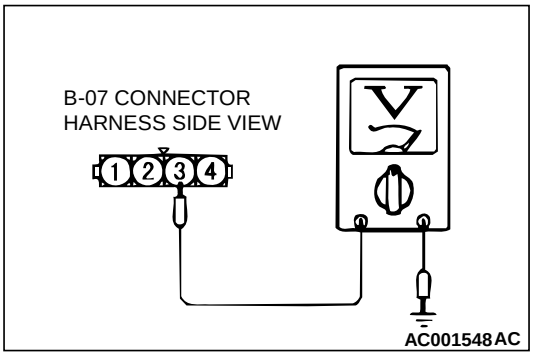
YES : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.

NO : Go to Step 2.

STEP 2. Check the sensor output voltage at throttle position sensor connector B-07 by backprobing.



(1) Do not disconnect connector B-07.
(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage between terminal 3 and ground by backprobing.
  - With the throttle valve in idle position, voltage should be between 0.535 and 0.735 volts.
  - With the throttle valve in full-open position, voltage should be between 4.5 and 5.5 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

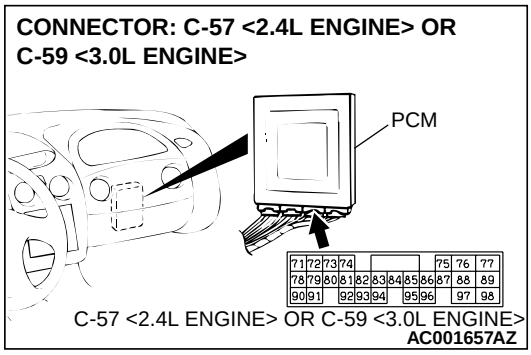
Q: Is the voltage normal?

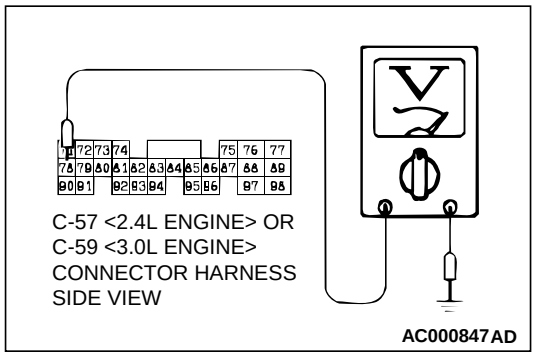
YES : Go to Step 3.

NO : Go to Step 7.

STEP 3. Check the sensor output voltage at PCM connector C-57 <2.4L Engine> or C-59 <3.0L Engine> by backprobing.

(1) Do not disconnect connector C-57 <2.4L Engine> or C-59 <3.0L Engine>.
(2) Turn the ignition switch to the "ON" position.





(3) Measure the voltage between terminal 78 and ground by backprobing.
- With the throttle valve in idle position, voltage should be between 0.535 and 0.735 volts.
- With the throttle valve in full-open position, voltage should be between 4.5 and 5.5 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

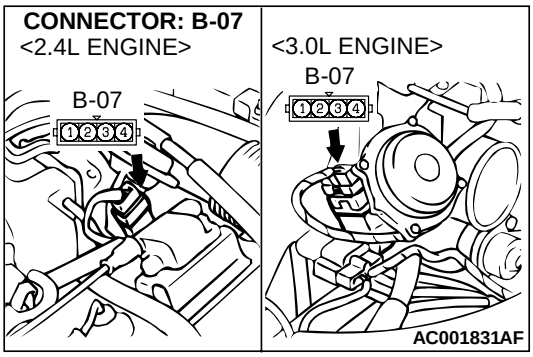
Q: Is the voltage normal?

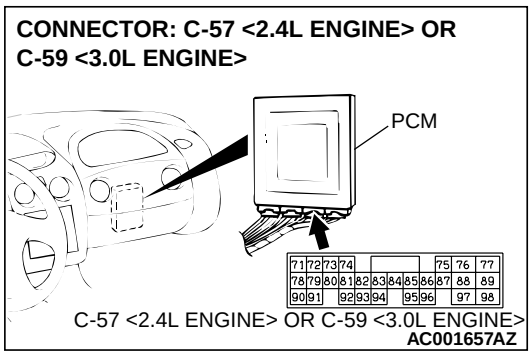
YES : Go to Step 4.
NO : Go to Step 6.

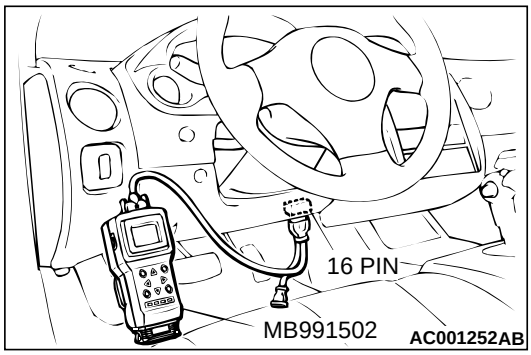
STEP 4. Check connectors B-07 at throttle position sensor and C-57 <2.4L Engine> or C-59 <3.0L Engine> at the PCM for damage.

Q: Are the connectors in good condition?

YES : Go to Step 5.
NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.







STEP 5. Using scan tool MB991502, check data list item 11: Throttle Position Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

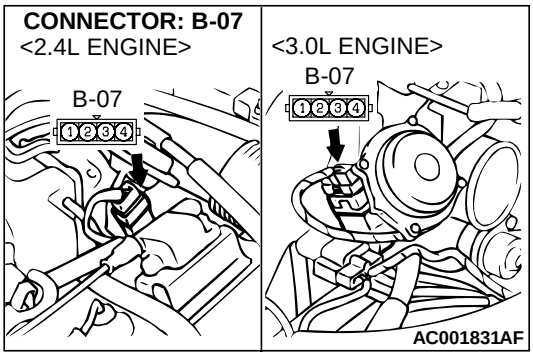
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the data reading mode for item 11: Throttle Position Sensor.
- With the throttle valve in the idle position, voltage should be between 535 and 735 mV.
- With the throttle valve in the full-open position, voltage should be between 4,500 and 5,500 mV.

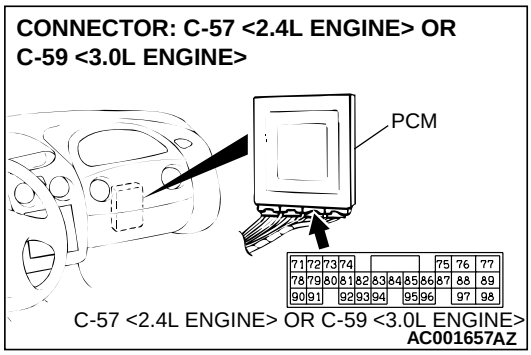
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.

NO : Replace the PCM.



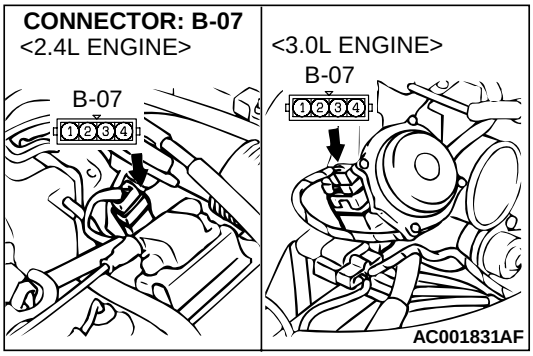


STEP 6. Check connectors B-07 at throttle position sensor and C-57 <2.4L Engine> or C-59 <3.0L Engine> at PCM for damage.

Q: Are the connectors in good condition?

YES : Repair harness damage between throttle position sensor connector B-07 terminal 3 and PCM connector C-57 <2.4L Engine> or C-59 <3.0L Engine> terminal 78.

NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

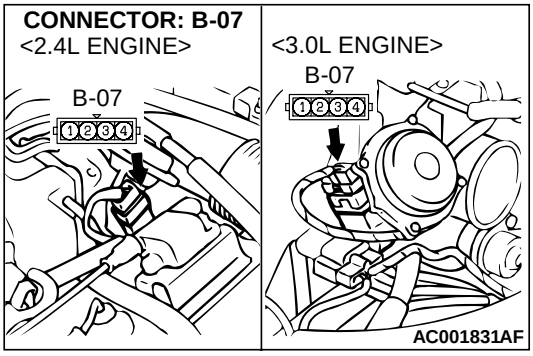


STEP 7. Check connector B-07 at throttle position sensor for damage.

Q: Is the connector in good condition?

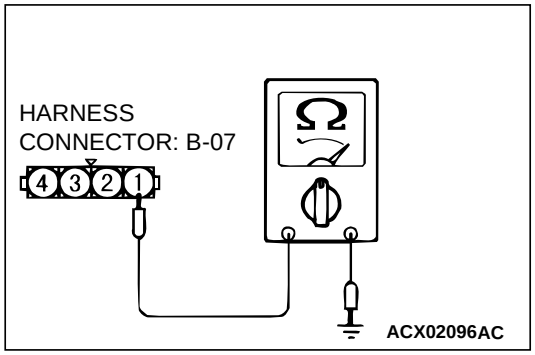
YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



STEP 8. Check the continuity at throttle position sensor connector B-07.

(1) Disconnect connector B-07 and measure at the harness side.

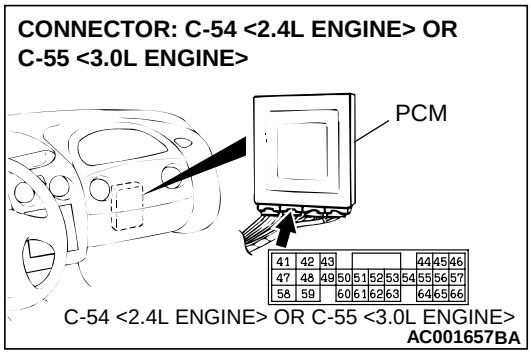


(2) Check for the continuity between terminal 1 and ground.
- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 11.

NO : Go to Step 9.



STEP 9. Check connector C-54 <2.4L Engine> or C-55 <3.0L Engine> at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

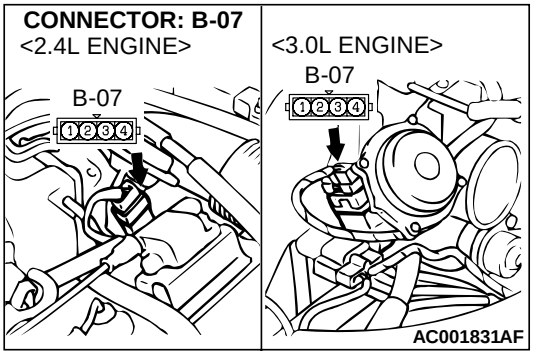
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

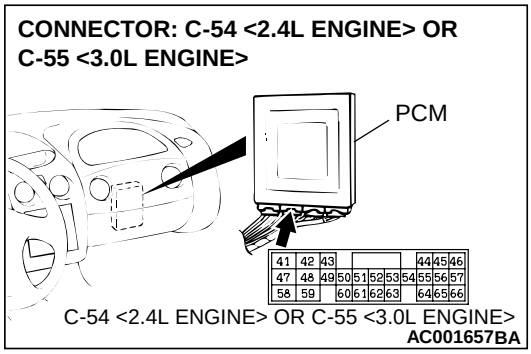
STEP 10. Check harness for open circuit or damage between throttle position sensor connector B-07 terminal 1 and PCM connector C-54 <2.4L Engine> or C-55 <3.0L Engine> terminal 57.

Q: Is the harness wire in good condition?

YES : Go to Step 5.

NO : Repair it.

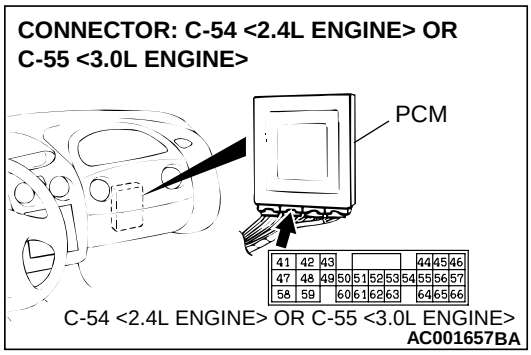




STEP 11. Check the power supply voltage at PCM connector C-54 <2.4L Engine> or C-55 <3.0L Engine> by backprobing.

(1) Do not disconnect connector C-54 <2.4L Engine> or C-55 <3.0L Engine>.

(2) Turn the ignition switch to the "ON" position.



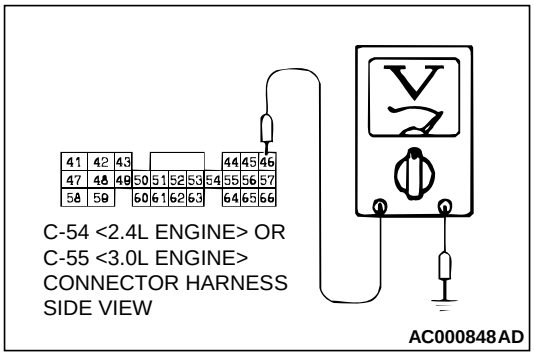
(3) Measure the voltage between terminal 46 and ground by backprobing.
- Voltage should be between 4.9 and 5.1 volts.

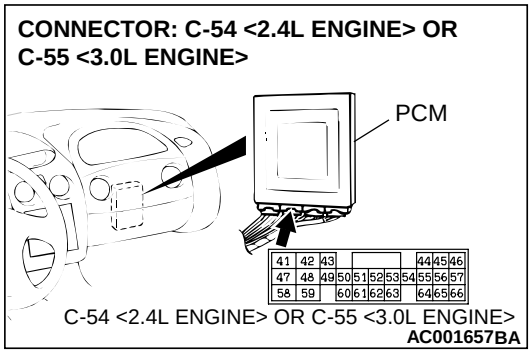
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 14.

NO : Go to Step 12.



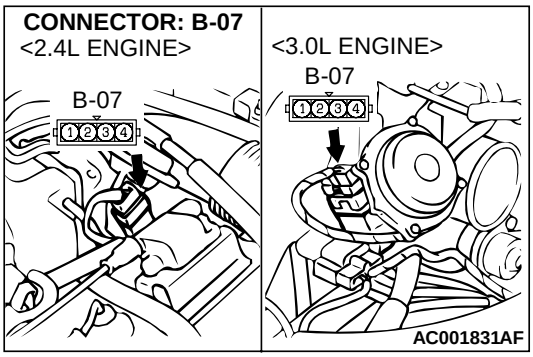


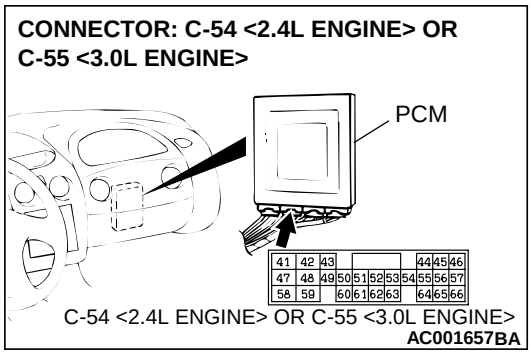
STEP 12. Check connector C-54 <2.4L Engine> or C-55 <3.0L Engine> at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 13.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



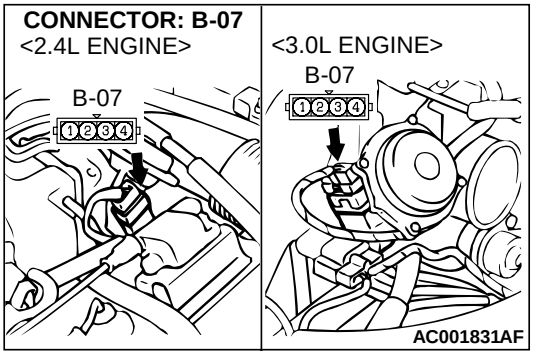


STEP 13. Check harness for damage between throttle position sensor connector B-07 terminal 4 and PCM connector C-54 <2.4L Engine> or C-55 <3.0L Engine> terminal 46.

Q: Is the harness wire in good condition?

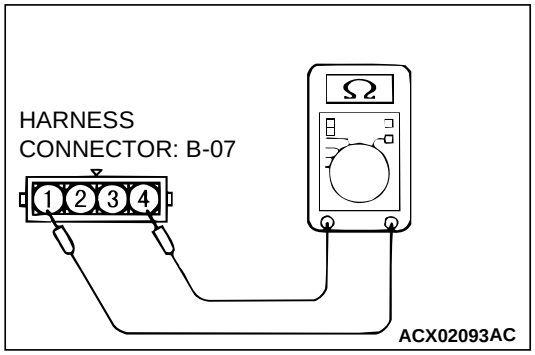
YES : Go to Step 5.

NO : Repair it.



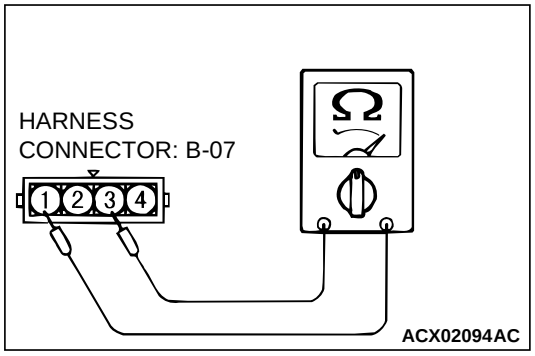
STEP 14. Check the throttle position sensor.

(1) Disconnect connector B-07 and measure at the sensor side.



(2) Measure the resistance between connector terminal 1 and 4.

Standard value: 3.5 – 6.5 kΩ



(3) Measure resistance between the throttle position sensor side connector terminal 1 and 3.

(4) Move the throttle valve from idle position to full-open position.

- Resistance should change smoothly in proportion to opening angle of the throttle valve.

Q: Is the resistance normal?

YES : Go to Step 15.

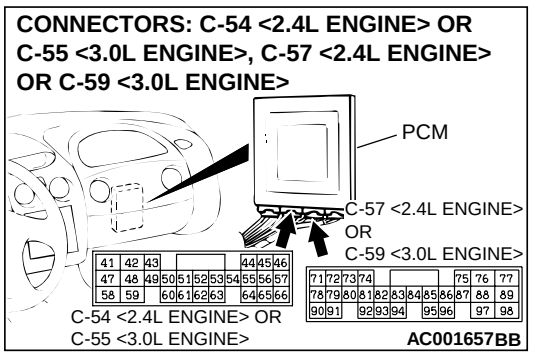
NO : Replace the throttle position sensor. Refer to GROUP 13A <2.4L Engine>, Throttle Body Assembly P.13A-592 or 13B <3.0L Engine>, Throttle Body Assembly P.13B-689.

STEP 15. Check connectors C-54 <2.4L Engine> or C-55 <3.0L Engine> and C-57 <2.4L Engine> or C-59 <3.0L Engine> at PCM for damage.

Q: Are the connectors in good condition?

YES : Go to Step 16.

NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

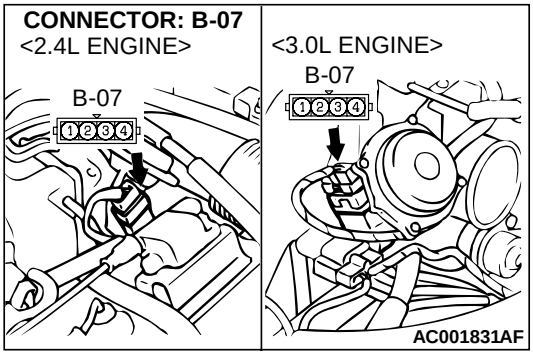


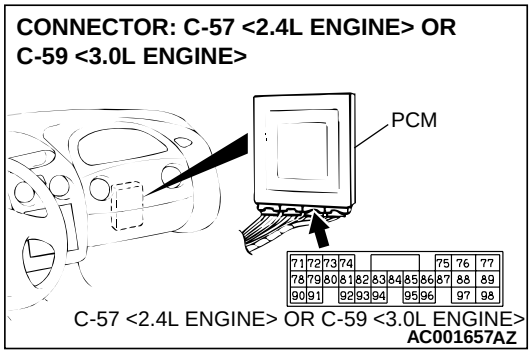
STEP 16. Check harness for damage between throttle position sensor connector B-07 terminal 3 and PCM connector C-57 <2.4L Engine> or C-59 <3.0L Engine> terminal 78.

Q: Is the harness wire in good condition?

YES : Go to Step 17.

NO : Repair it.



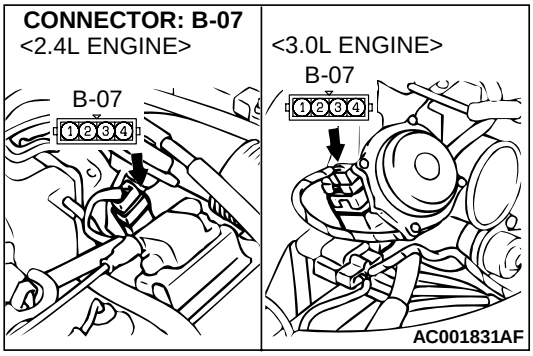


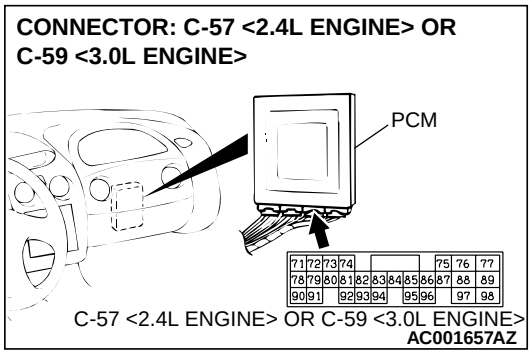
STEP 17. Check harness for damage between throttle position sensor connector B-07 terminal 1 and PCM connector C-57 <2.4L Engine> or C-59 <3.0L Engine> terminal 57.

Q: Is the harness wire in good condition?

YES : Throttle position sensor adjustment. Refer to GROUP 13A <2.4L Engine>, On-vehicle Service – Throttle Position Sensor Adjustment P.13A-576 or 13B <3.0L Engine>, On-vehicle Service – Throttle Position Sensor Adjustment P.13B-677.

NO : Repair it.





DTC 12: Throttle Position Sensor System (Open Circuit)

Throttle Position Sensor System Circuit
Refer to P.23A-42.

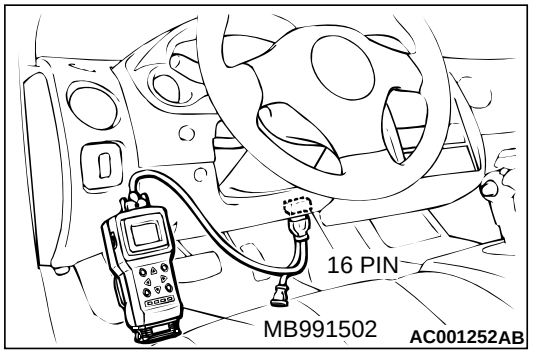
CIRCUIT OPERATION
Refer to P.23A-42.

DTC SET CONDITIONS
If TPS output voltage is 0.2 volts or lower at times other than when the engine is idling, the output is judged to be too low and diagnostic trouble code number "12" is output.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set:)
- Malfunction of the throttle position sensor circuit
- Damaged harness, connector
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 11: Throttle Position Sensor.

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to data reading mode for item 11: Throttle Position Sensor.
- With the throttle valve in idle position, voltage should be between 535 and 735 mV.
- With the throttle valve in full-open position, voltage should be between 4,500 and 5,500 mV.

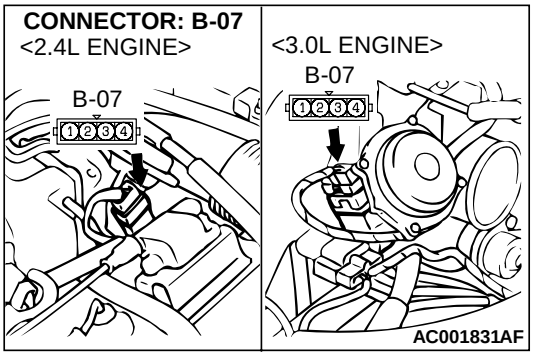
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

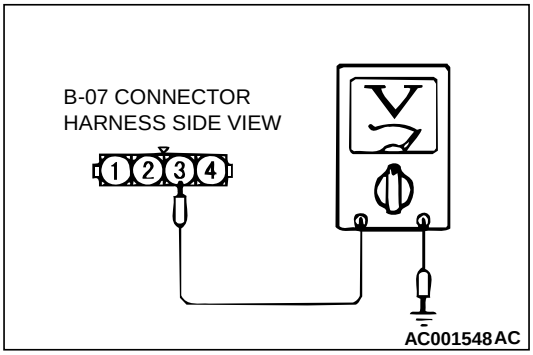
YES : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.

NO : Go to Step 2.

STEP 2. Check the sensor output voltage at throttle position sensor connector B-07 by backprobing.



(1) Do not disconnect connector B-07.
(2) Turn the ignition switch to the "ON" position.



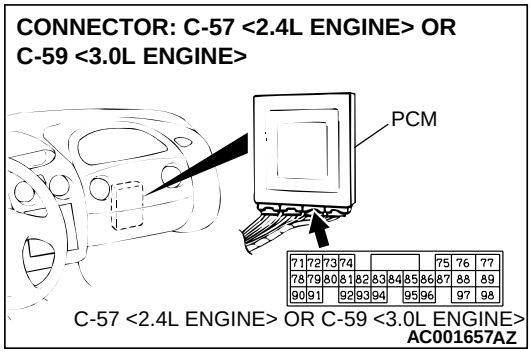
(3) Measure the voltage between terminal 3 and ground by backprobing.
- With the throttle valve in idle position, voltage should be between 0.535 and 0.735 volts.
- With the throttle valve in full-open position, voltage should be between 4.5 and 5.5 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

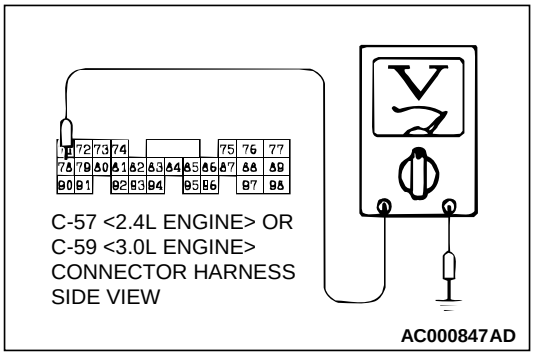
Q: Is the voltage normal?

YES : Go to Step 3.
NO : Go to Step 7.

STEP 3. Check the sensor output voltage at PCM connector C-57 <2.4L Engine> or C-59 <3.0L Engine> by backprobing.



(1) Do not disconnect connector C-57 <2.4L Engine> or C-59 <3.0L Engine>.
(2) Turn the ignition switch to the "ON" position.

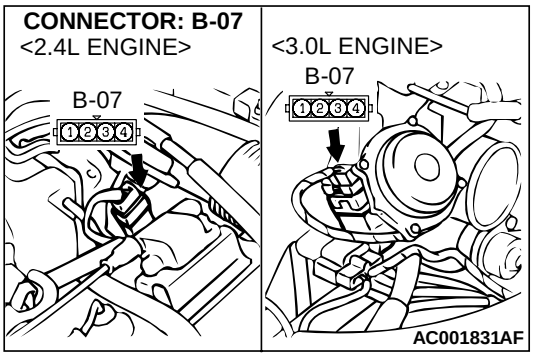


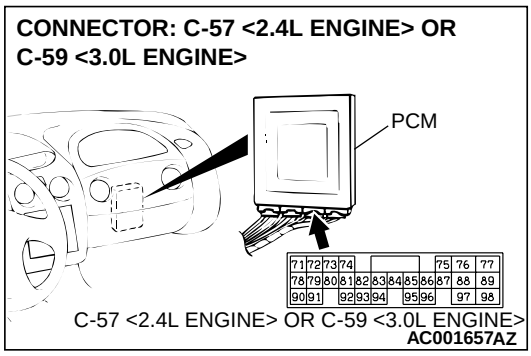
(3) Measure the voltage between terminal 78 and ground by backprobing.
- With the throttle valve in idle position, voltage should be between 0.535 and 0.735 volts.
- With the throttle valve in full-open position, voltage should be between 4.5 and 5.5 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 4.
NO : Go to Step 6.



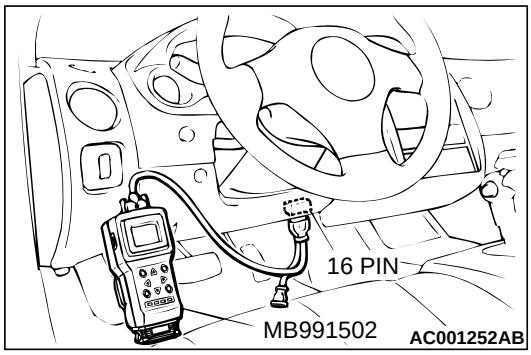


STEP 4. Check connectors B-07 at the throttle position sensor and C-57 <2.4L Engine> or C-59 <3.0L Engine> at PCM for damage.

Q: Are the connectors in good condition?

YES : Go to Step 5.

NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



STEP 5. Using scan tool MB991502, check data list item 11: Throttle Position Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to data reading mode for item 11: Throttle Position Sensor.
- With the throttle valve in idle position, voltage should be between 535 and 735 mV.
- With the throttle valve in full-open position, voltage should be between 4,500 and 5,500 mV.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.

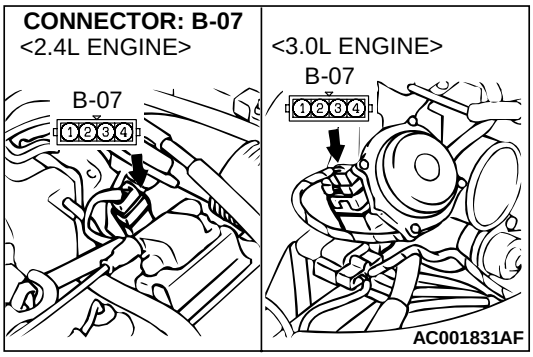
NO : Replace the PCM.

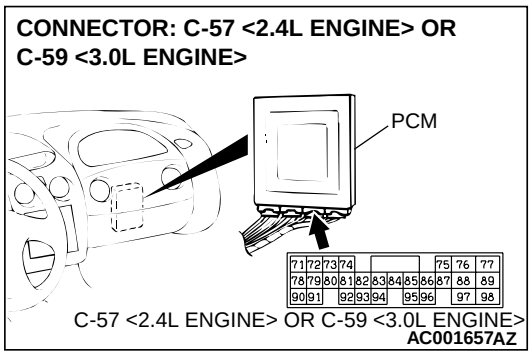
STEP 6. Check connectors B-07 at throttle position sensor and C-57 <2.4L Engine> or C-59 <3.0L Engine> at PCM for damage.

Q: Are the connectors in good condition?

YES : Repair harness open circuit or damage between throttle position sensor connector B-07 terminal 3 and PCM connector C-57 <2.4L Engine> or C-59 <3.0L Engine> terminal 78.

NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

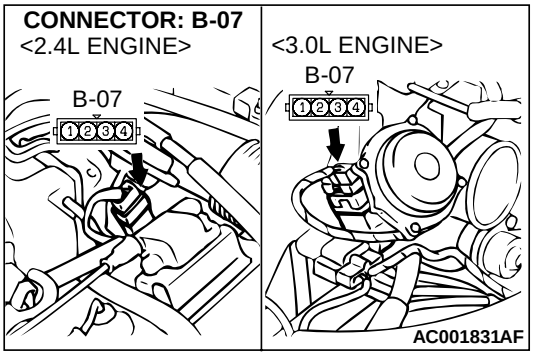


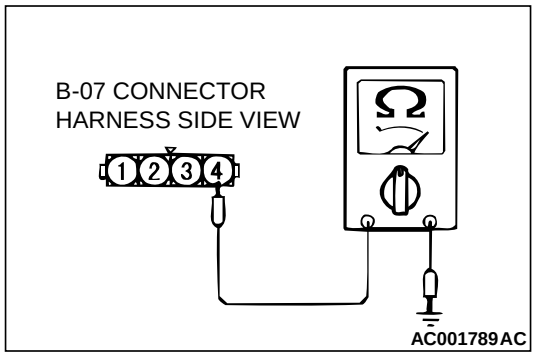


STEP 7. Check the power supply voltage at throttle position sensor connector B-07 by backprobing.

(1) Do not disconnect connector B-07.

(2) Turn the ignition switch to the "ON" position.





(3) Measure the voltage between terminal 4 and ground by backprobing.
- Voltage should be between 4.9 and 5.1 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

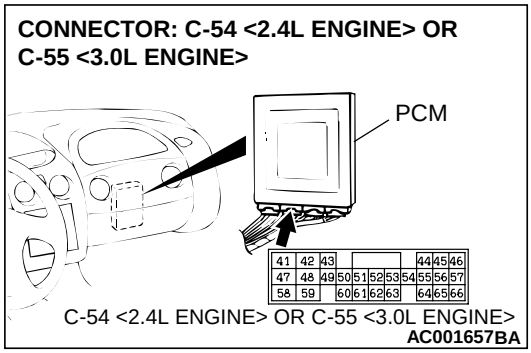
Q: Is the voltage normal?

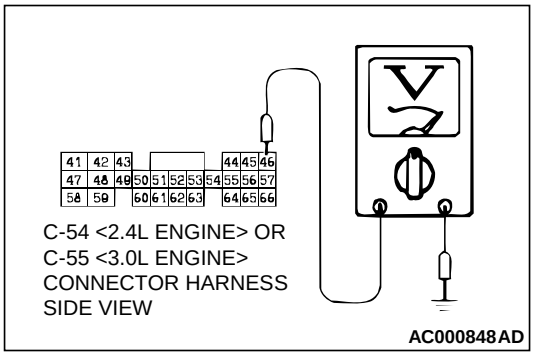
YES : Go to Step 12.

NO : Go to Step 8.

STEP 8. Check the power supply voltage at PCM connector C-54 <2.4L Engine> or C-55 <3.0L Engine> by backprobing.

(1) Do not disconnect connector C-54 <2.4L Engine> or C-55 <3.0L Engine>.
(2) Turn the ignition switch to the "ON" position.





(3) Measure the voltage between terminal 46 and ground by backprobing.
- Voltage should be between 4.9 and 5.1 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

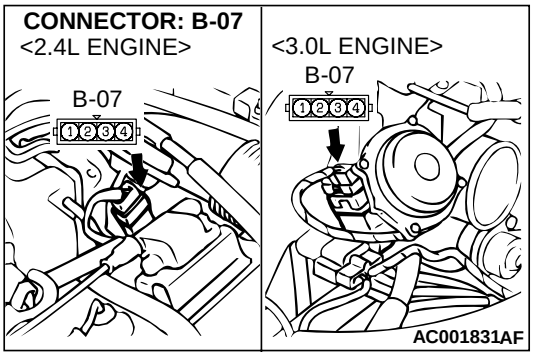
Q: Is the voltage normal?

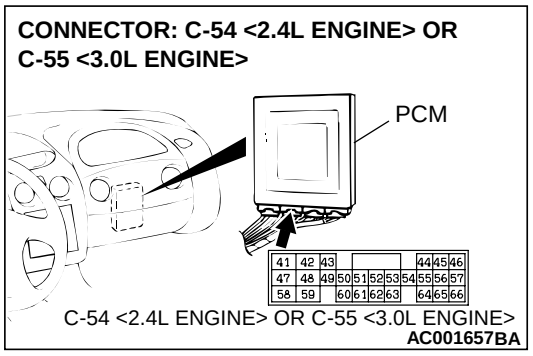
YES : Go to Step 9.
NO : Go to Step 10.

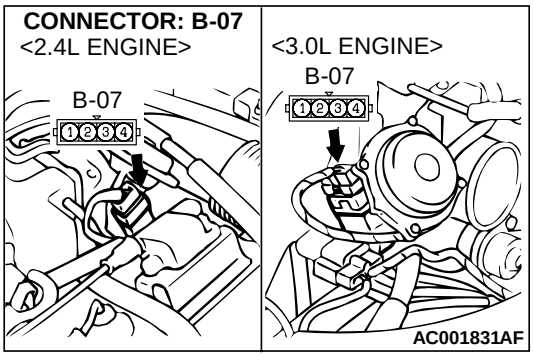
STEP 9. Check connectors B-07 at throttle position sensor and C-54 <2.4L Engine> or C-55 <3.0L Engine> at PCM for damage.

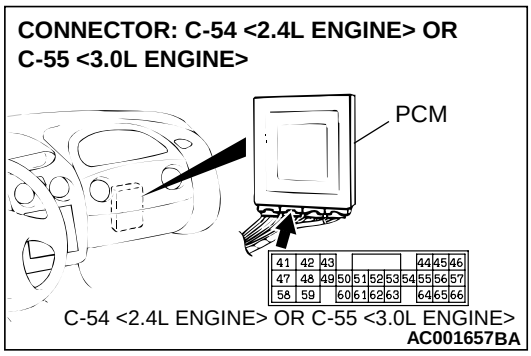
Q: Are the connectors in good condition?

YES : Repair harness open circuit or damage between throttle position sensor connector B-07 terminal 4 and PCM connector C-54 <2.4L Engine> or C-55 <3.0L Engine> terminal 46.
NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.







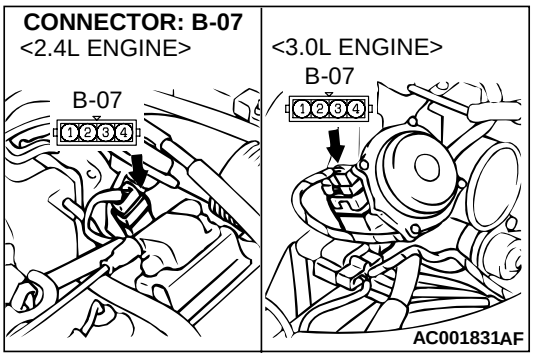


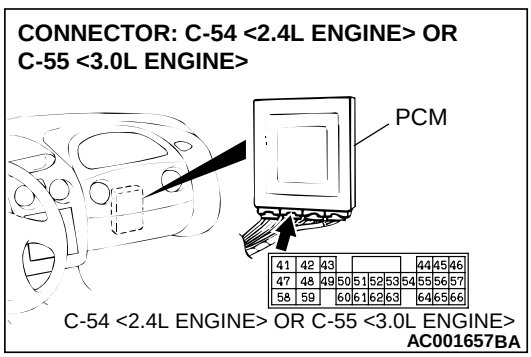
STEP 10. Check connectors B-07 at throttle position sensor and C-54 <2.4L Engine> or C-55 <3.0L Engine> at PCM for damage.

Q: Are the connectors in good condition?

YES : Go to Step 11.

NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



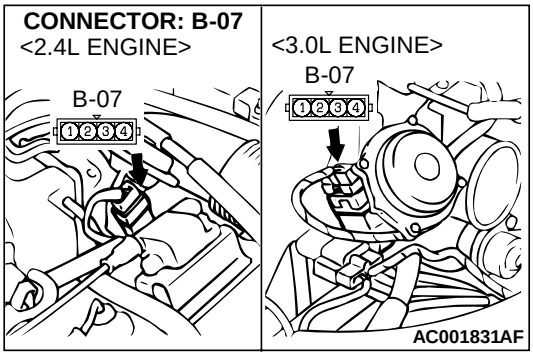


STEP 11. Check harness for short circuit to ground between throttle position sensor connector B-07 terminal 4 and PCM connector C-54 <2.4L Engine> or C-55 <3.0L Engine> terminal 46.

Q: Is the harness wire in good condition?

YES : Go to Step 5.

NO : Repair it.

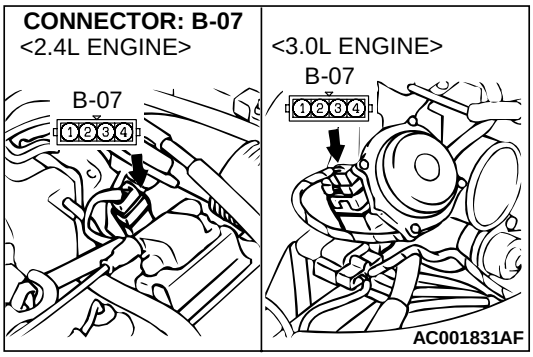


STEP 12. Check connector B-07 at throttle position sensor for damage.

Q: Is the connector in good condition?

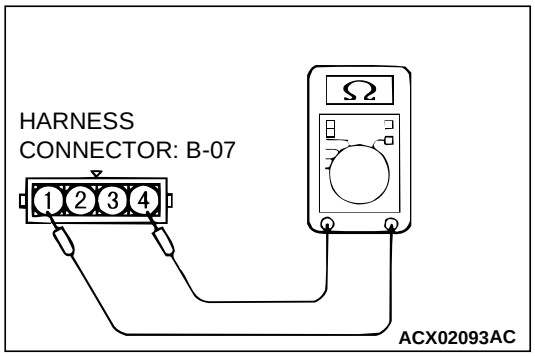
YES : Go to Step 13.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



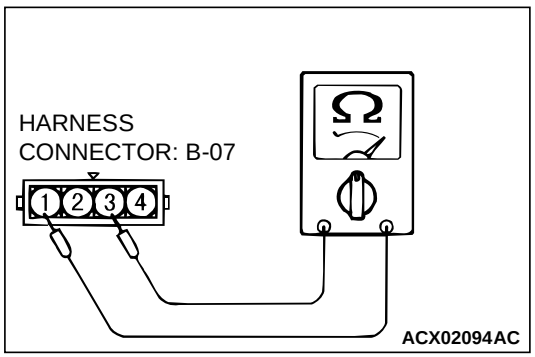
STEP 13. Check the throttle position sensor.

(1) Disconnect connector B-07 and measure at the sensor side.



(2) Measure the resistance between connector terminal 1 and 4.

Standard value: 3.5 – 6.5 kΩ



(3) Measure resistance between the throttle position sensor side connector terminal 1 and 3.

(4) Move the throttle valve from the idle position to full-open position.

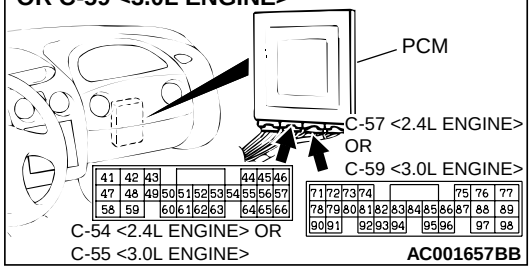
- Resistance should change smoothly in proportion to opening angle of the throttle valve.

Q: Is the resistance normal?

YES : Go to Step 14.

NO : Replace the throttle position sensor. Refer to GROUP 13A <2.4L Engine>, Throttle Body Assembly P.13A-592 or 13B <3.0L Engine>, Throttle Body Assembly P.13B-689.

CONNECTORS: C-54 <2.4L ENGINE> OR C-55 <3.0L ENGINE>, C-57 <2.4L ENGINE> OR C-59 <3.0L ENGINE>



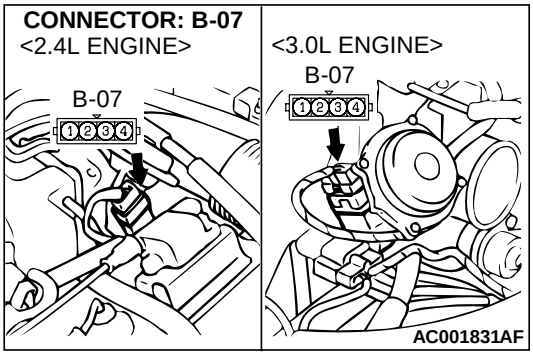
STEP 14. Check connectors C-54 <2.4L Engine> or C-55 <3.0L Engine> and C-57 <2.4L Engine> or C-59 <3.0L Engine> at PCM for damage.

Q: Are the connectors in good condition?

YES : Go to Step 15.

NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

CONNECTOR: B-07



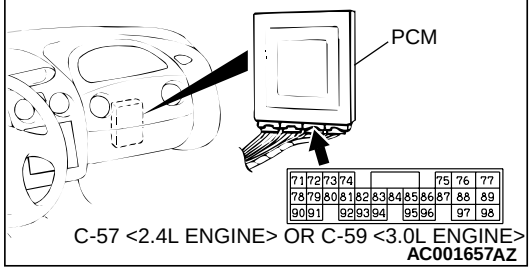
STEP 15. Check harness for short circuit to ground or damage between throttle position sensor connector B-07 terminal 3 and PCM connector C-57 <2.4L Engine> or C-59 <3.0L Engine> terminal 78.

Q: Is the harness wire in good condition?

YES : Go to Step 16.

NO : Repair it.

CONNECTOR: C-57 <2.4L ENGINE> OR C-59 <3.0L ENGINE>



STEP 16. Check the connector and the harness for short circuit to ground between the throttle position sensor connector and the auto-cruise control-ECU connector.

Q: Is the harness wire in good condition?

YES : Throttle position sensor adjustment. Refer to GROUP 13A <2.4L Engine>, On-vehicle Service – Throttle Position Sensor Adjustment P.13A-576 or 13B <3.0L Engine>, On-vehicle Service – Throttle Position Sensor Adjustment P.13B-677.

NO : Repair it.

TSB Revision

DTC 14: Throttle Position Sensor System (Maladjusted Sensor)

Throttle Position Sensor System Circuit
Refer to P.23A-42.

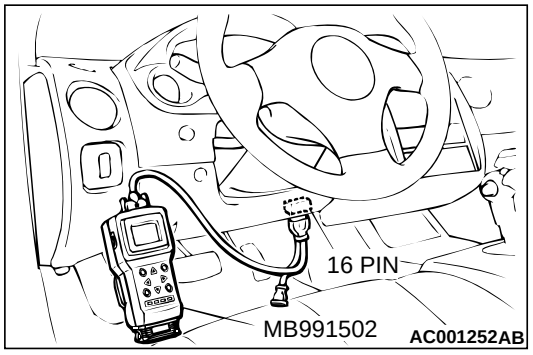
CIRCUIT OPERATION
Refer to P.23A-42.

DTC SET CONDITIONS
If TPS output voltage is 0.2 volts or lower or if it is 1.2 volts or higher when the engine is idling, the TPS adjustment is judged to be incorrect and diagnostic trouble code number "14" is output.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set:)
- Malfunction of the throttle position sensor circuit
- Damaged harness, connector
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check the A/T diagnostic trouble code.

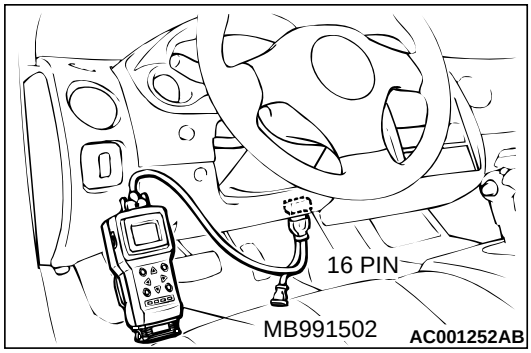
⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the A/T diagnostic trouble code.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the A/T diagnostic trouble code number "11" or "12" output?

YES : Refer to P.23A-42, code number 11: Throttle Position Sensor System (Short Circuit) or P.23A-51 code number 12: Throttle Position Sensor System (Open Circuit).

NO : Go to Step 2.



STEP 2. Using scan tool MB991502, check data list item 11: Throttle Position Sensor.

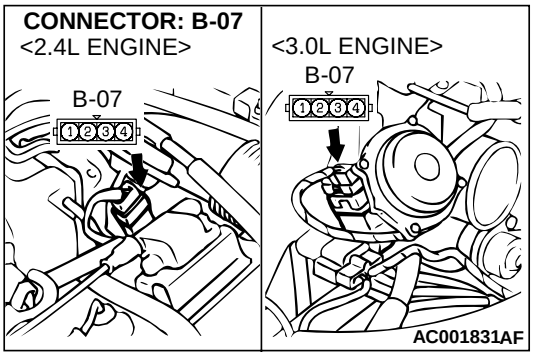
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to data reading mode for item 11: Throttle Position Sensor.
- With the throttle valve in idle position, voltage should be between 535 and 735 mV.
- With the throttle valve in full-open position, voltage should be between 4,500 and 5,500 mV.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

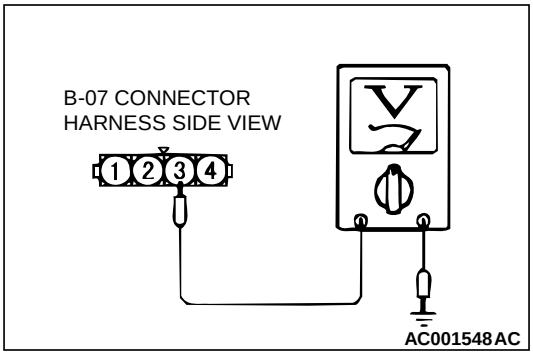
YES : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.

NO : Go to Step 3.



STEP 3. Check the sensor output voltage at throttle position sensor connector B-07 by backprobing.

(1) Do not disconnect connector B-07.
(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage between terminal 3 and ground by backprobing.
- With the throttle valve in idle position, voltage should be between 0.535 and 0.735 volts.
- With the throttle valve in full-open position, voltage should be between 4.5 and 5.5 volts.

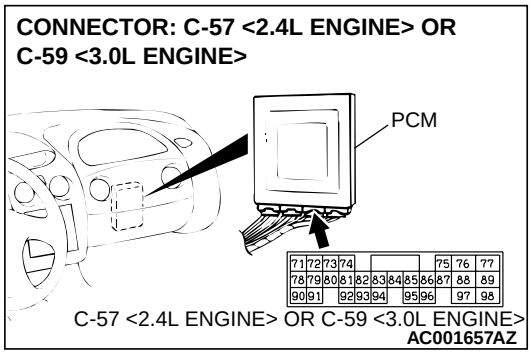
(4) Turn the ignition switch to the "LOCK" (OFF) position.

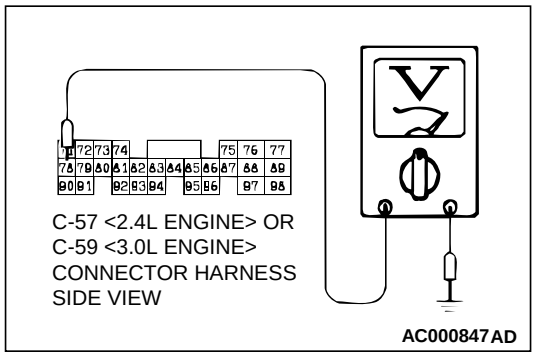
Q: Is the voltage normal?

YES : Go to Step 4.
NO : Go to Step 8.

STEP 4. Check the sensor output voltage at PCM connector C-57 <2.4L Engine> or C-59 <3.0L Engine> by backprobing.

(1) Do not disconnect connector C-57 <2.4L Engine> or C-59 <3.0L Engine>.
(2) Turn the ignition switch to the "ON" position.





(3) Measure the voltage between terminal 78 and ground by backprobing.
- With the throttle valve in idle position, voltage should be between 0.535 and 0.735 volts.
- With the throttle valve in full-open position, voltage should be between 4.5 and 5.5 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

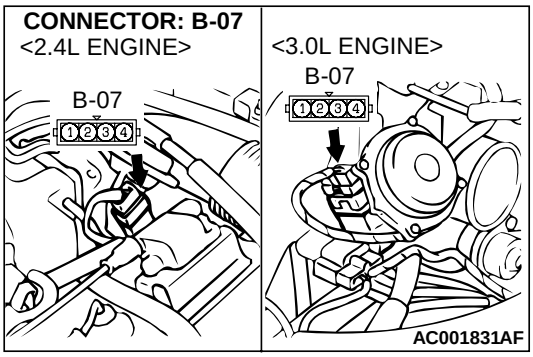
Q: Is the voltage normal?

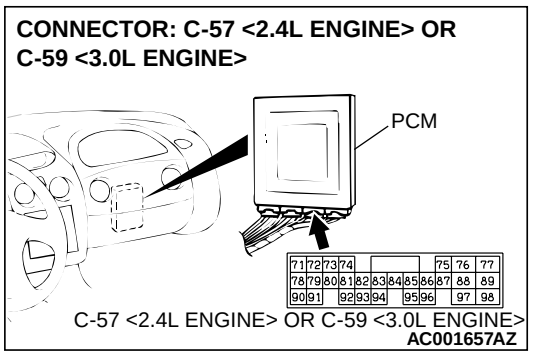
YES : Go to Step 5.
NO : Go to Step 7.

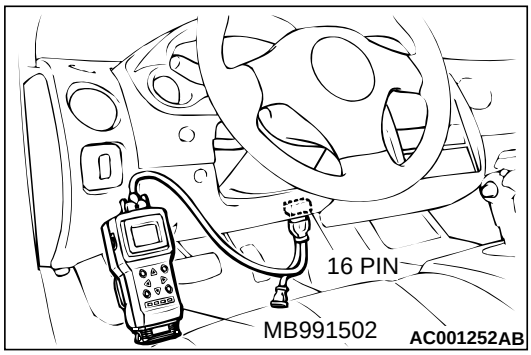
STEP 5. Check connectors B-07 at throttle position sensor and C-57 <2.4L Engine> or C-59 <3.0L Engine> at PCM for damage.

Q: Are the connectors in good condition?

YES : Go to Step 6.
NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.







STEP 6. Using scan tool MB991502, check data list item 11: Throttle Position Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

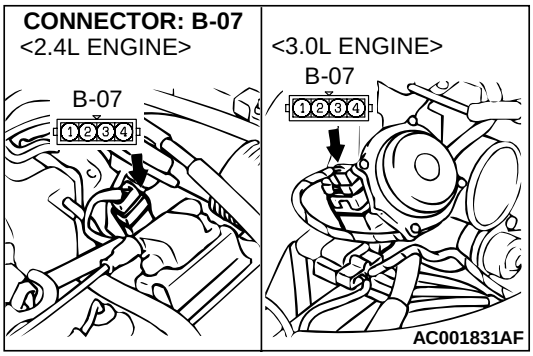
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to data reading mode for item 11: Throttle Position Sensor.
- With the throttle valve in idle position, voltage should be between 535 and 735 mV.
- With the throttle valve in the full-open position, voltage should be between 4,500 and 5,500 mV.

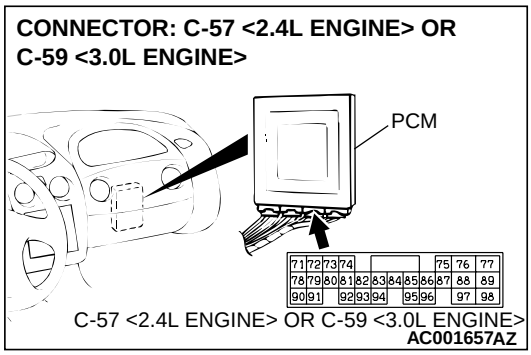
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.

NO : Replace the PCM.





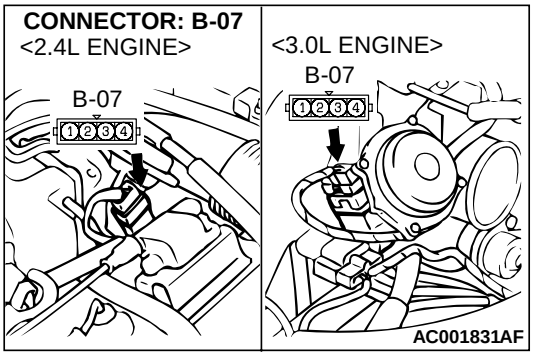
STEP 7. Check connectors B-07 at throttle position sensor and C-57 <2.4L Engine> or C-59 <3.0L Engine> at PCM for damage.

Q: Are the connectors in good condition?

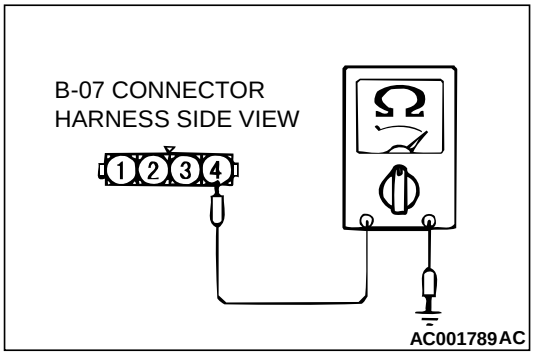
YES : Repair harness open circuit or damage between throttle position sensor connector B-07 terminal 3 and PCM connector C-57 <2.4L Engine> or C-59 <3.0L Engine> terminal 78.

NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

STEP 8. Check the power supply voltage at throttle position sensor connector B-07 by backprobing.



(1) Do not disconnect connector B-07.
(2) Turn the ignition switch to the "ON" position.



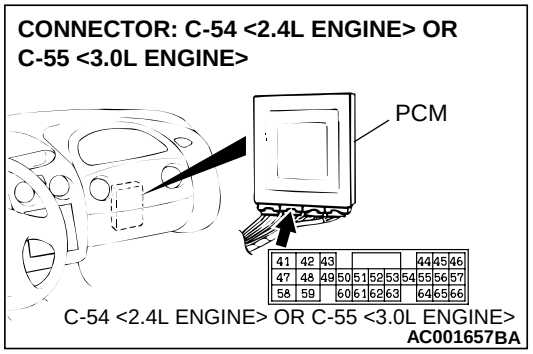
(3) Measure the voltage between terminal 4 and ground by backprobing.
- Voltage should be between 4.9 and 5.1 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

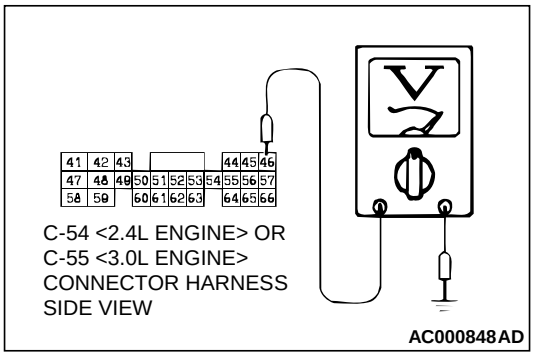
Q: Is the voltage normal?

YES : Go to Step 13.
NO : Go to Step 9.

STEP 9. Check the power supply voltage at PCM connector C-54 <2.4L Engine> or C-55 <3.0L Engine> by backprobing.



(1) Do not disconnect connector C-54 <2.4L Engine> or C-55 <3.0L Engine>.
(2) Turn the ignition switch to the "ON" position.

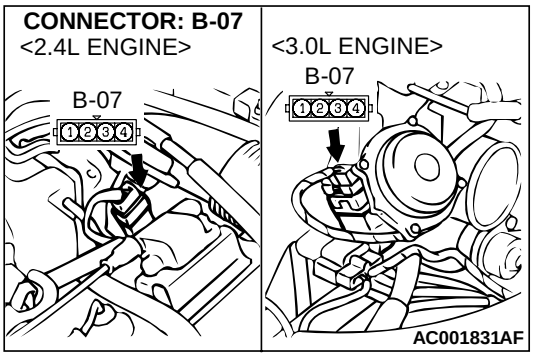


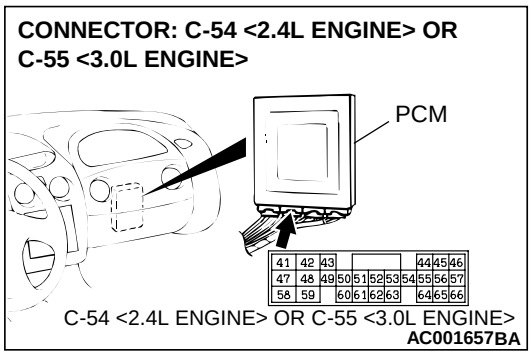
(3) Measure the voltage between terminal 46 and ground by backprobing.
- Voltage should be between 4.9 and 5.1 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 10.
NO : Go to Step 11.



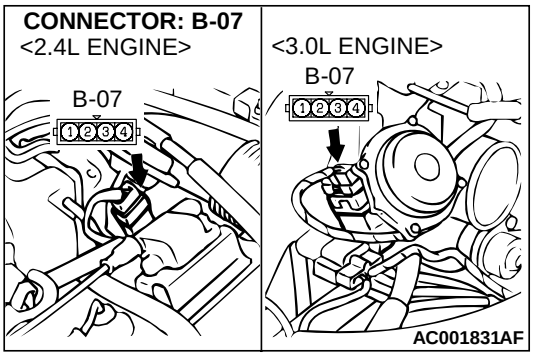


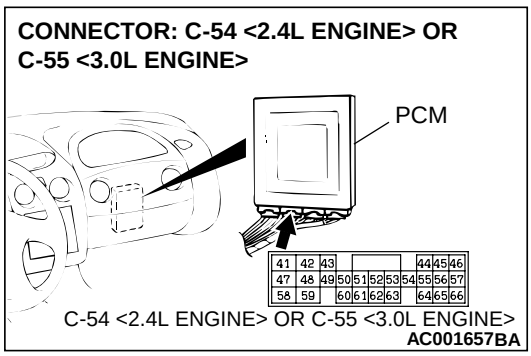
STEP 10. Check connectors B-07 at throttle position sensor and C-54 <2.4L Engine> or C-55 <3.0L Engine> at PCM for damage.

Q: Are the connectors in good condition?

YES : Repair harness open circuit or damage between throttle position sensor connector B-07 terminal 4 and PCM connector C-54 <2.4L Engine> or C-55 <3.0L Engine> terminal 46.

NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.





STEP 11. Check connectors B-07 at throttle position sensor and C-54 <2.4L Engine> or C-55 <3.0L Engine> at PCM for damage.

Q: Are the connectors in good condition?

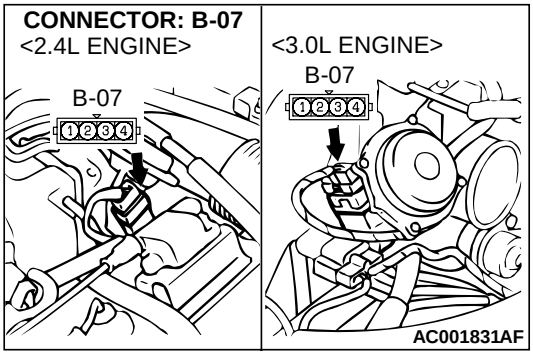
YES : Go to Step 12.

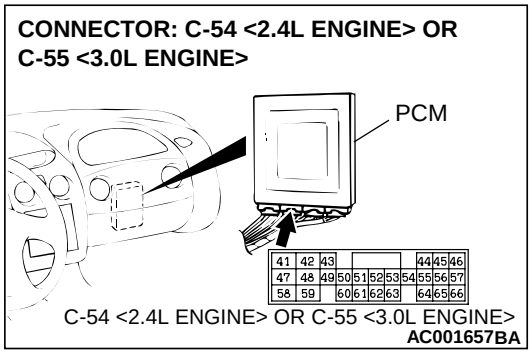
NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

STEP 12. Check harness for short circuit to ground between throttle position sensor connector B-07 terminal 4 and PCM connector C-54 <2.4L Engine> or C-55 <3.0L Engine> terminal 46.

Q: Is the harness wire in good condition?

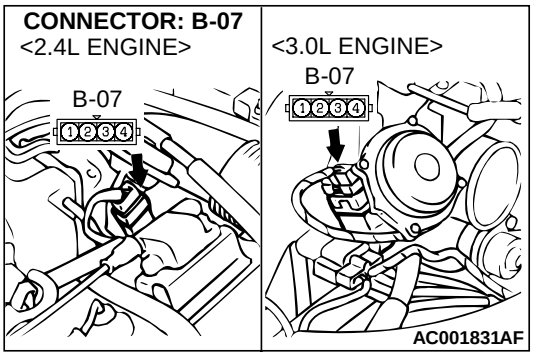
YES : Go to Step 6.
NO : Repair it.





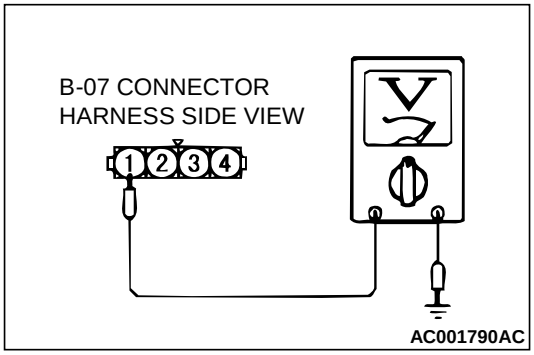
STEP 13. Check the ground voltage at throttle position sensor connector B-07 by backprobing.

(1) Do not disconnect connector B-07.
(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage between terminal 1 and ground by backprobing.
- Voltage should be 0.5 volt or less.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

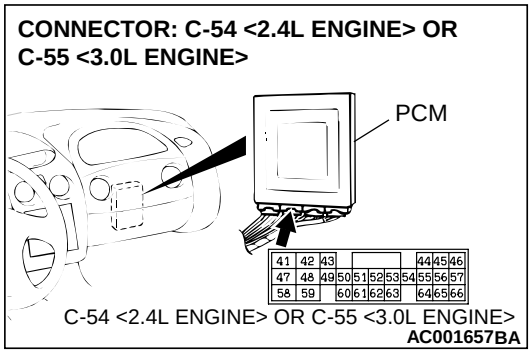


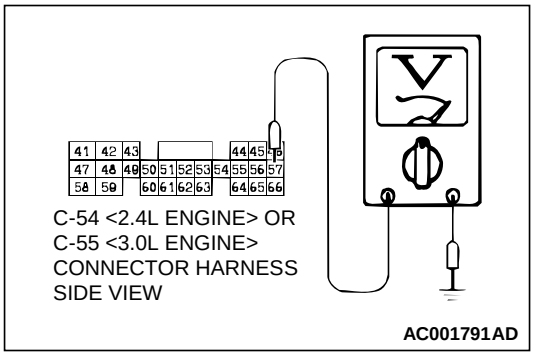
Q: Is the voltage normal?

YES : Go to Step 17.
NO : Go to Step 14.

STEP 14. Check the ground voltage at PCM connector C-54 <2.4L Engine> or C-55 <3.0L Engine> by backprobing.

(1) Do not disconnect connector C-54 <2.4L Engine> or C-55 <3.0L Engine>.
(2) Turn the ignition switch to the "ON" position.





(3) Measure the voltage between terminal 57 and ground by backprobing.
- Voltage should be 0.5 volt or less.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

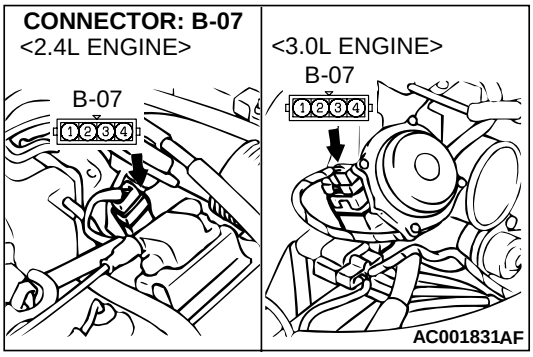
Q: Is the voltage normal?

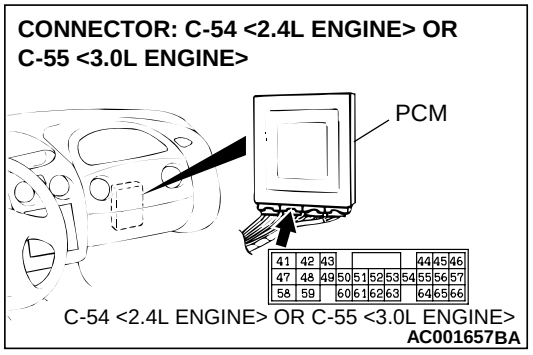
YES : Go to Step 15.
NO : Go to Step 16.

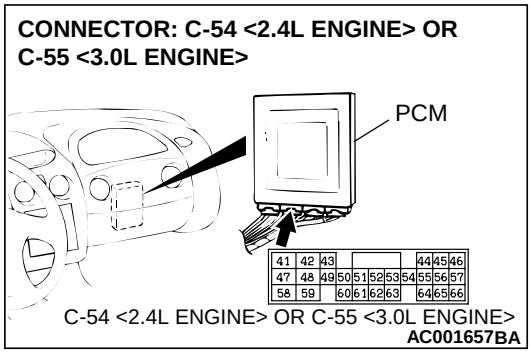
STEP 15. Check connectors B-07 at throttle position sensor and C-54 <2.4L Engine> or C-55 <3.0L Engine> at PCM for damage.

Q: Are the connectors in good condition?

YES : Repair harness open circuit or damage between throttle position sensor connector B-07 terminal 1 and PCM connector C-54 <2.4L Engine> or C-55 <3.0L Engine> terminal 57.
NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.





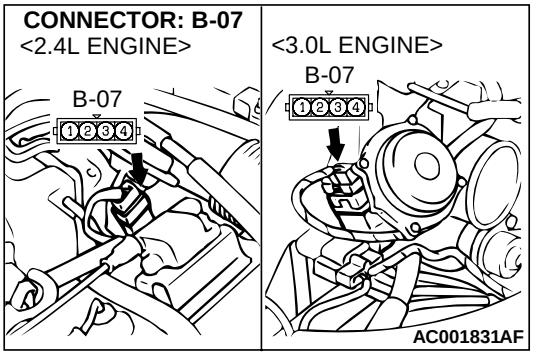


STEP 16. Check connector C-54 <2.4L Engine> or C-55 <3.0L Engine> at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

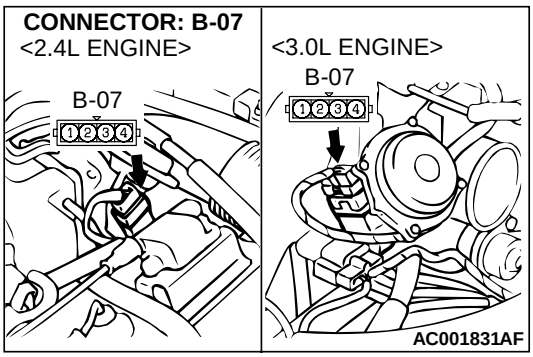


STEP 17. Check connector B-07 at throttle position sensor for damage.

Q: Is the connector in good condition?

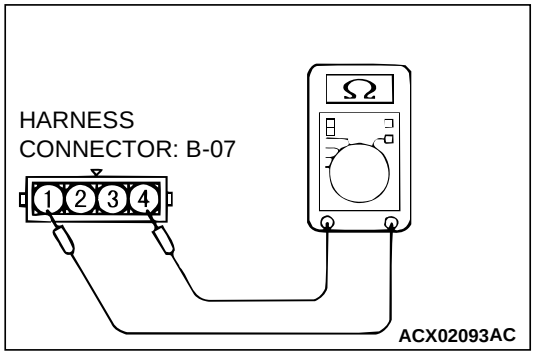
YES : Go to Step 18.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



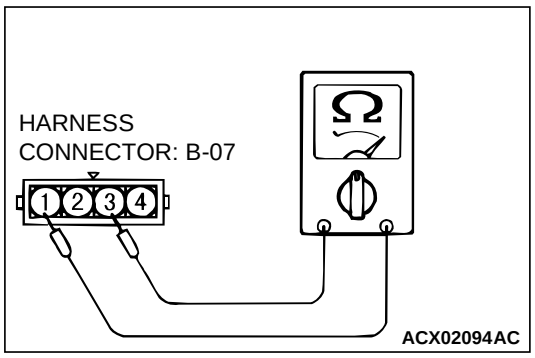
STEP 18. Check the throttle position sensor.

(1) Disconnect connector B-07 and measure at the sensor side.



(2) Measure the resistance between terminal 1 and 4.

Standard value: 3.5 – 6.5 kΩ



(3) Measure resistance between the throttle position sensor side connector terminal 1 and 3.

(4) Move the throttle valve from idle position to full-open position.

- Resistance should change smoothly in proportion to opening angle of the throttle valve.

Q: Is the resistance normal?

YES : Go to Step 19.

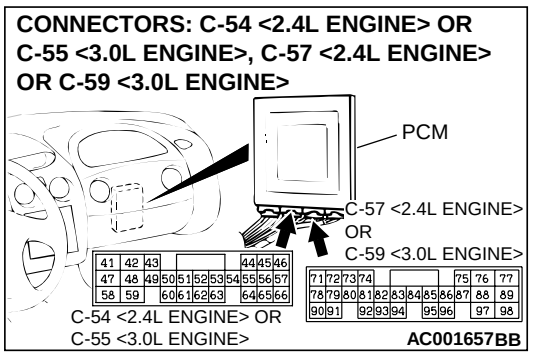
NO : Replace the throttle position sensor. Refer to GROUP 13A <2.4L Engine>, Throttle Body Assembly P.13A-592 or 13B <3.0L Engine>, Throttle Body Assembly P.13B-689.

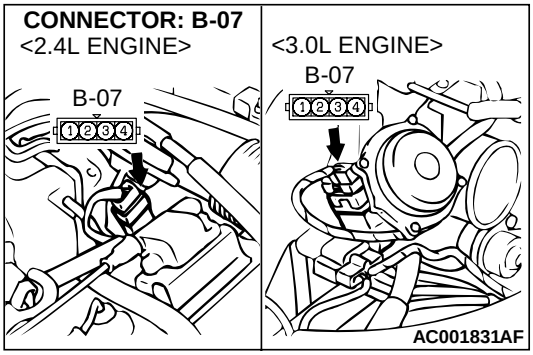
STEP 19. Check connectors C-54 <2.4L Engine> or C-55 <3.0L Engine> and C-57 <2.4L Engine> or C-59 <3.0L Engine> at PCM for damage.

Q: Are the connectors in good condition?

YES : Go to Step 20.

NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



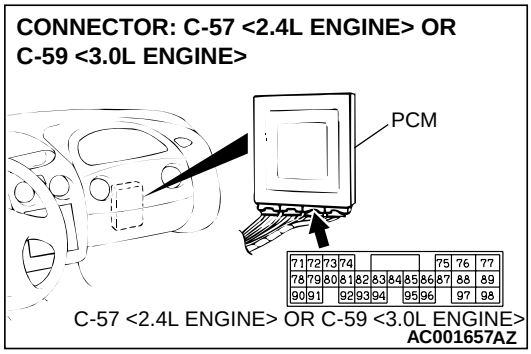


STEP 20. Check harness for short circuit to ground or damage between throttle position sensor connector B-07 terminal 3 and PCM connector C-57 <2.4L Engine> or C-59 <3.0L Engine> terminal 78.

Q: Is the harness wire in good condition?

YES : Go to Step 21.

NO : Repair it.



STEP 21. Check the connector and the harness for short circuit to ground between the throttle position sensor connector and the auto-cruise control-ECU connector.

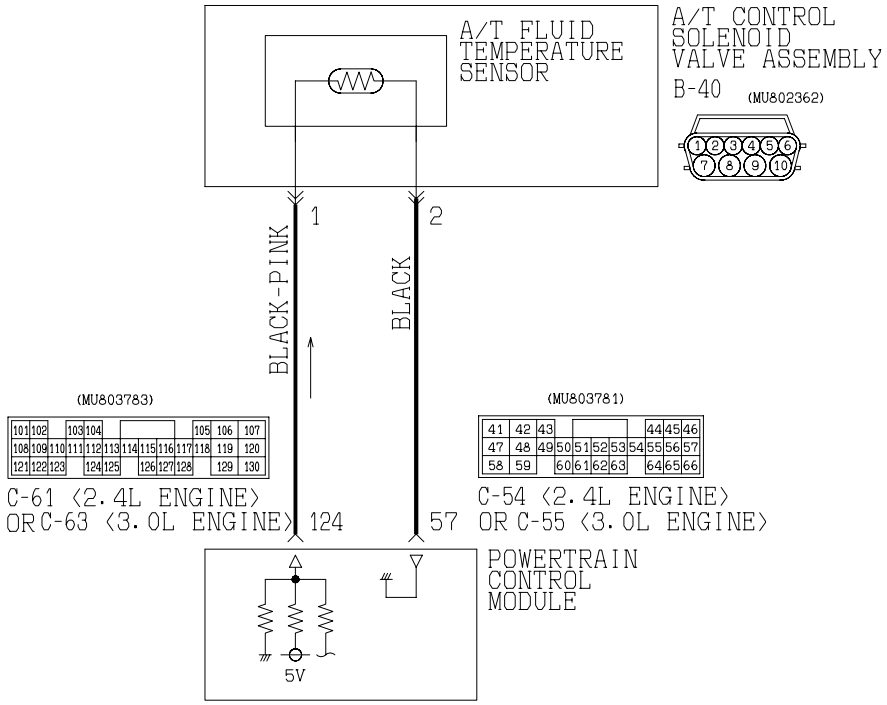
Q: Is the harness wire in good condition?

YES : Throttle position sensor adjustment. Refer to GROUP 13A <2.4L Engine>, On-vehicle Service – Throttle Position Sensor Adjustment P.13A-576 or 13B <3.0L Engine>, On-vehicle Service – Throttle Position Sensor Adjustment P.13B-677.

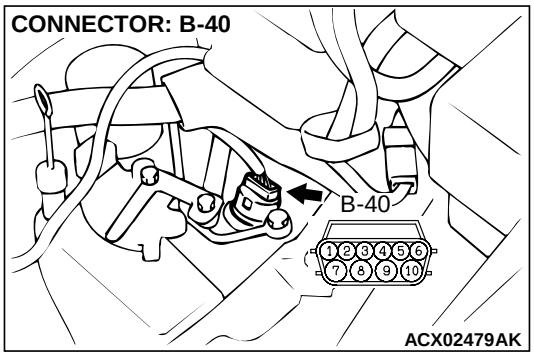
NO : Repair it.

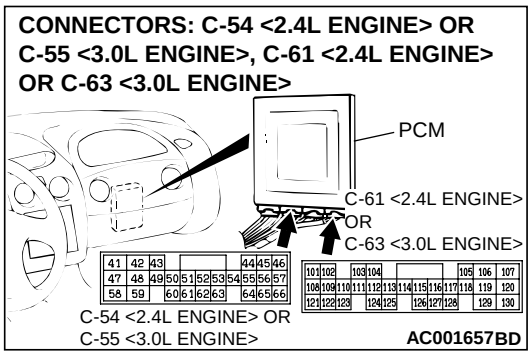
DTC 15: A/T Fruid Tempeature Sensor System (Open Circuit)

A/T Fluid Temperature Sensor System Circuit



AC102446AB





CIRCUIT OPERATION

- The PCM (terminal 124) applies 5 volts to the A/T fluid temperature sensor output terminal (terminal 1).
- Ground terminal (terminal 2) is grounded to the PCM (terminal 57).
- The A/T fluid temperature sensor is an NTC (negative temperature coefficient) type of resistor. When the A/T fluid temperature rises, the resistance decreases.
- The A/T fluid temperature sensor output voltage rises when the resistance increases (cools), and drops when the resistance decreases (heats up).

DTC SET CONDITIONS

If the A/T fluid temperature sensor output voltage is 4.5 volts or more after driving for 10 minutes or more (if the A/T fluid temperature does not increase), there is an open circuit in the A/T fluid temperature sensor and diagnostic trouble code number "15" is output.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set:)

- Malfunction of the A/T fluid temperature sensor circuit
- Damaged harness, connector
- Malfunction of the PCM

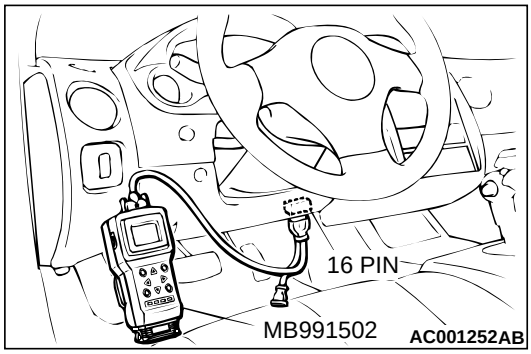
TSB Revision

DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check data list item 15: A/T Fluid Temperature Sensor.

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.



(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine.
(3) Set scan tool MB991502 to data reading mode for item 15: A/T Fluid Temperature Sensor.
- At cool condition: Almost equal to the ambient temperature (atmospheric temperature)
- At warm condition: 70 to 80°C (158 to 176°F)

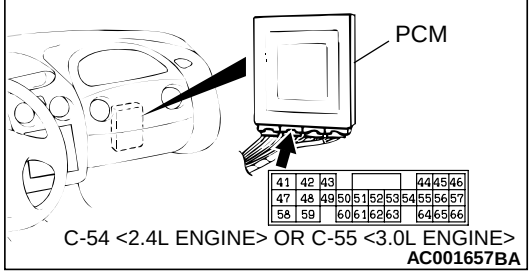
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

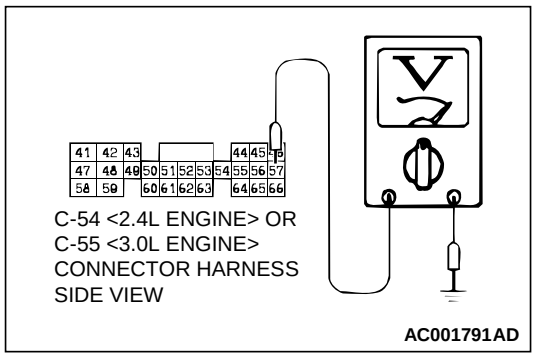
YES : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.
NO : Go to Step 2.

STEP 2. Check the ground voltage at PCM connector C-54 <2.4L Engine> or C-55 <3.0L Engine> by backprobing.

CONNECTOR: C-54 <2.4L ENGINE> OR C-55 <3.0L ENGINE>



(1) Do not disconnect connector C-54 <2.4L Engine> or C-55 <3.0L Engine>.
(2) Turn the ignition switch to the "ON" position.

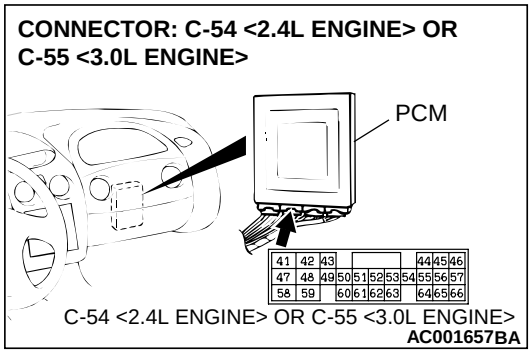


(3) Measure the voltage between terminal 57 and ground by backprobing.
- Voltage should be 0.5 volt or less.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 5.
NO : Go to Step 3.

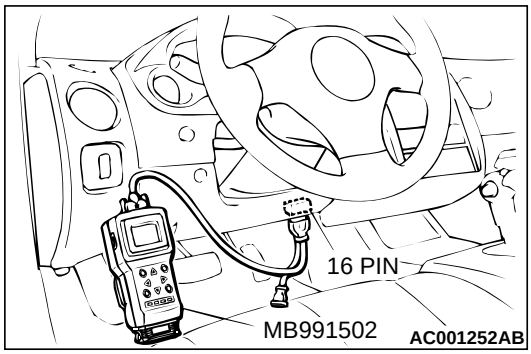


STEP 3. Check connector C-54 <2.4L Engine> or C-55 <3.0L Engine> at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



STEP 4. Using scan tool MB991502, check data list item 15: A/T Fluid Temperature Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to data link connector.
(2) Start the engine.
(3) Set scan tool MB991502 to the data reading mode for item 15: A/T Fluid Temperature Sensor.
- At cool condition: Almost equal to the ambient temperature (atmospheric temperature)
- At warm condition: 70 to 80°C (158 to 176°F)

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

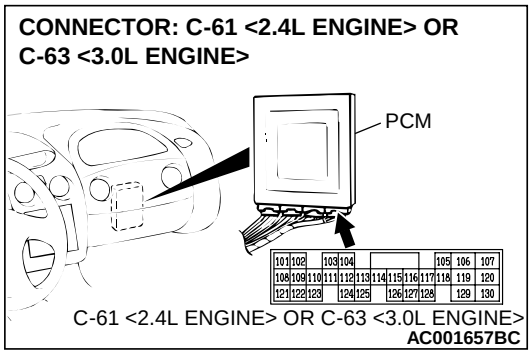
YES : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.

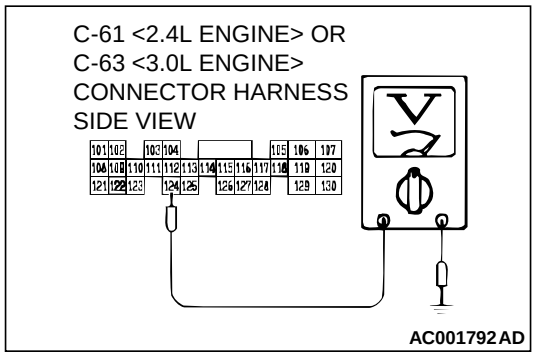
NO : Replace the PCM.

STEP 5. Check the sensor output voltage at PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> by backprobing.

(1) Do not disconnect connector C-61 <2.4L Engine> or C-63 <3.0L Engine>.

(2) Turn the ignition switch to the "ON" position.





(3) Measure the voltage between terminal 124 and ground by backprobing.
- When A/T fluid temperature is 20°C (68°F), voltage should be between 3.8 and 4.0 volts.
- When A/T fluid temperature is 40°C (104°F), voltage should be between 3.2 and 3.4 volts.
- When A/T fluid temperature is 80°C (176°F), voltage should be between 1.7 and 1.9 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

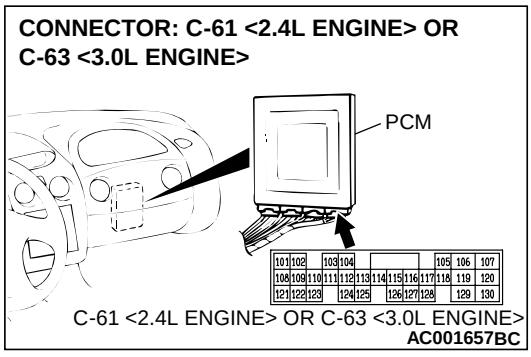
Q: Is the voltage normal?

YES : Go to Step 6.
NO : Go to Step 7.

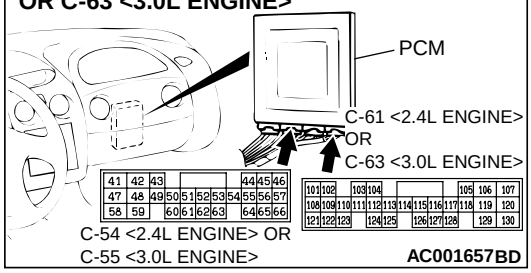
STEP 6. Check connector C-61 <2.4L Engine> or C-63 <3.0L Engine> at PCM for damage.

Q: Is the connector in good condition?

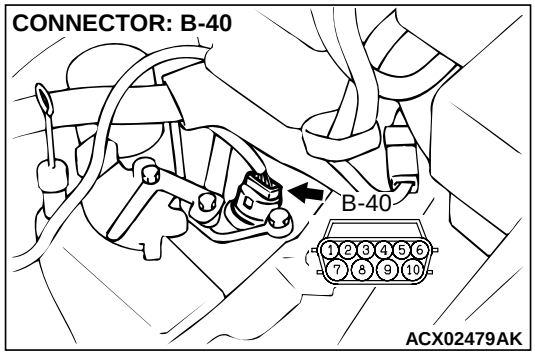
YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



CONNECTORS: C-54 <2.4L ENGINE> OR C-55 <3.0L ENGINE>, C-61 <2.4L ENGINE> OR C-63 <3.0L ENGINE>



CONNECTOR: B-40

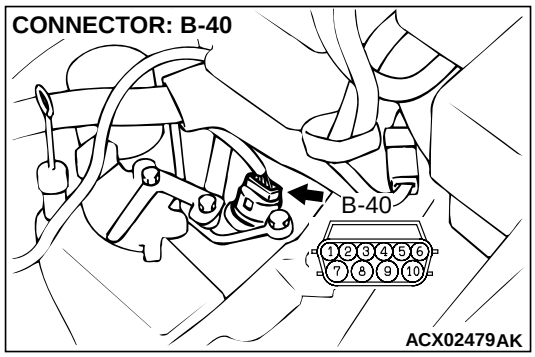


STEP 7. Check connectors C-54 <2.4L Engine> or C-55 <3.0L Engine> and C-61 <2.4L Engine> or C-63 <3.0L Engine> at PCM and B-40 at A/T control solenoid valve assembly for damage.

Q: Are the harness connectors in good condition?

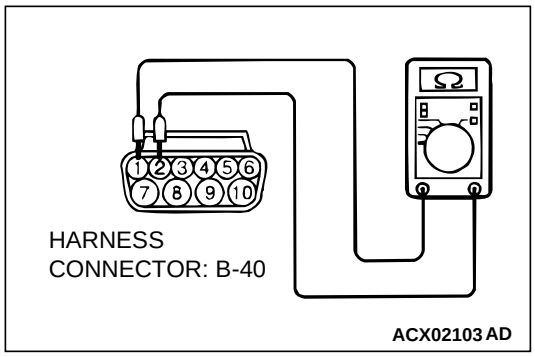
YES : Go to Step 8.

NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



STEP 8. Check the A/T fluid temperature sensor at A/T control solenoid valve assembly connector B-40.

(1) Disconnect connector B-40 and measure at the sensor side.



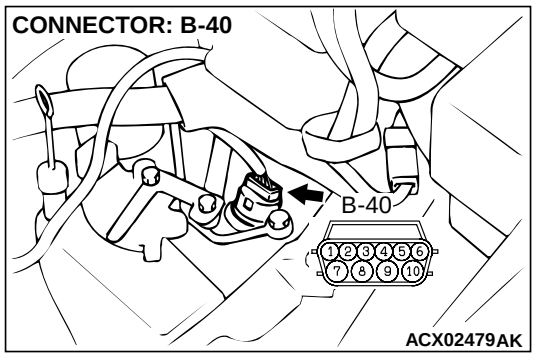
(2) Measure the resistance between terminal 1 and 2.
- When A/T fluid temperature is 0°C (32°F), resistance should be between 16.7 and 20.5 kiloohm.
- When A/T fluid temperature is 20°C (68°F), resistance should be between 7.3 and 8.9 kiloohm.
- When A/T fluid temperature is 40°C (104°F), resistance should be between 3.4 and 4.2 kiloohm.
- When A/T fluid temperature is 60°C (140°F), resistance should be between 1.9 and 2.2 kiloohm.
- When A/T fluid temperature is 80°C (176°F), resistance should be between 1.0 and 1.2 kiloohm.
- When A/T fluid temperature is 100°C (212°F), resistance should be between 0.57 and 0.69 kiloohm.

Q: Is the resistance normal?

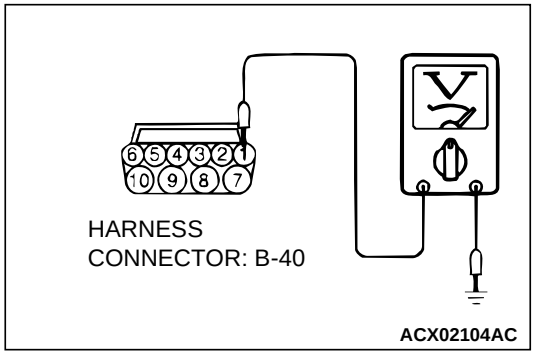
YES : Go to Step 9.

NO : Replace the A/T fluid temperature sensor. Refer to GROUP 23B, Transaxle P.23B-10.

STEP 9. Check the power supply voltage at A/T control solenoid valve assembly connector B-40.



(1) Disconnect connector B-40 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage between terminal 1 and ground.
- Voltage should be between 4.5 and 4.9 volts.

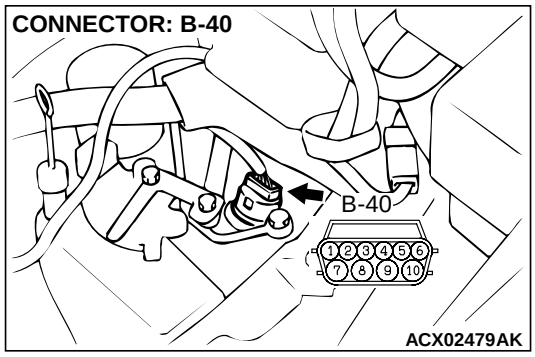
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

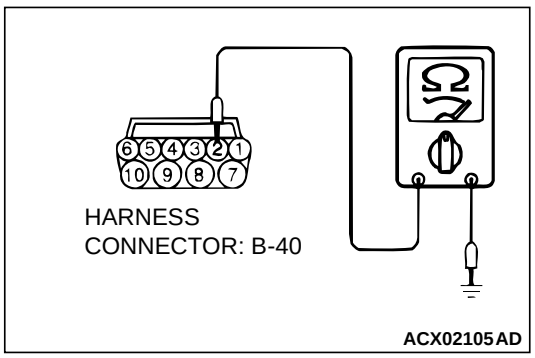
YES : Go to Step 10.

NO : Repair harness open circuit between A/T control solenoid valve assembly connector B-40 terminal 1 and PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> terminal 124.

STEP 10. Check the continuity at A/T control solenoid valve assembly connector B-40.



(1) Disconnect connector B-40 and measure at the harness side.



(2) Check for the continuity between terminal 2 and ground.
- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 11.

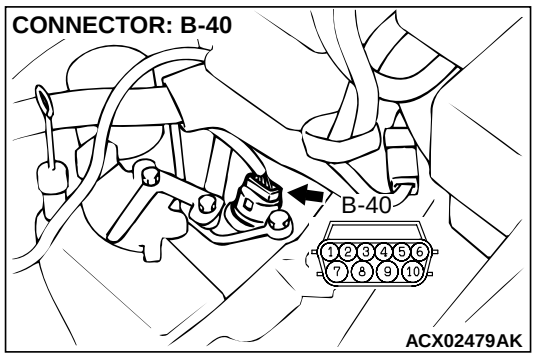
NO : Repair harness open circuit or damage between A/T control solenoid valve assembly connector B-40 terminal 2 and PCM connector C-54 <2.4L Engine> or C-55 <3.0L Engine> terminal 57.

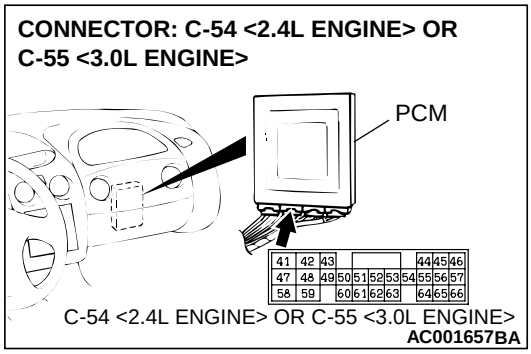
STEP 11. Check harness for damage between A/T control solenoid valve assembly connector B-40 terminal 1 and PCM connector C-54 <2.4L Engine> or C-55 <3.0L Engine> terminal 124.

Q: Is the harness wire in good condition?

YES : Repair harness damage between A/T control solenoid valve assembly connector B-40 terminal 2 and PCM connector C-64 <2.4L Engine> or C-65 <3.0L Engine> terminal 57.

NO : Repair it.





DTC 16: A/T Fluid Tenperature Sensor System (Short Circuit)

A/T Fluid Temperature Sensor System Circuit
Refer to P.23A-70.

CIRCUIT OPERATION
Refer to P.23A-70.

DTC SET CONDITIONS
If the A/T fluid temperature sensor output detects the voltage which corresponds to 0 volt for more than one second, there is a short in the A/T fluid temperature sensor circuit and diagnostic trouble code number "16" is output.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set:)
- Malfunction of the A/T fluid temperature sensor circuit
- Damaged harness, connector
- Malfunction of the PCM

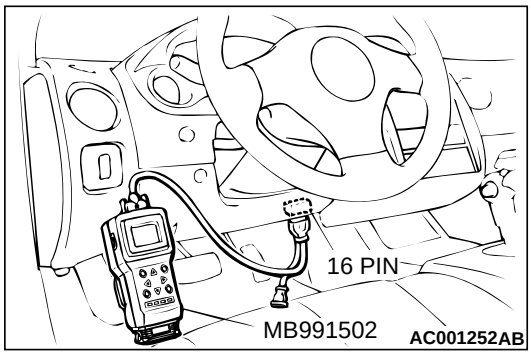
DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check data list item 15: A/T Fluid Temperature Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.



(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine.
(3) Set scan tool MB991502 to data reading mode for item 15: A/T Fluid Temperature Sensor.
- At cool condition: Almost equal to the ambient temperature (atmospheric temperature)
- At warm condition: 70 to 80°C (158°F to 176°F)

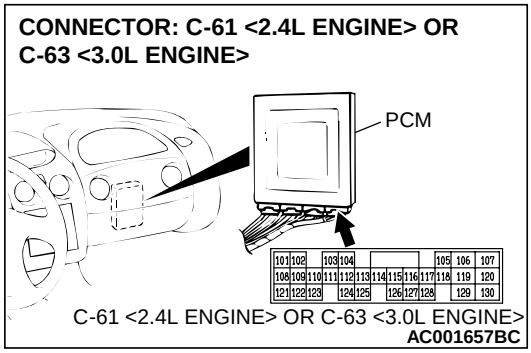
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

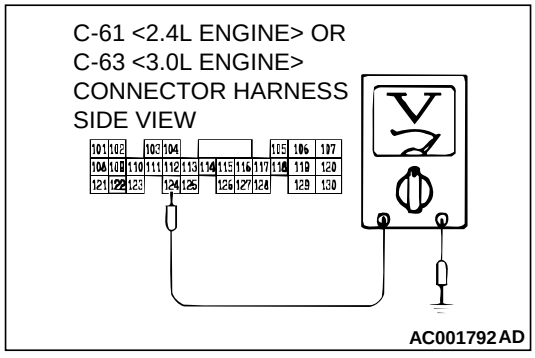
YES : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.

NO : Go to Step 2.

STEP 2. Check the sensor output voltage at PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> by backprobing.



(1) Do not disconnect connector C-61 <2.4L Engine> or C-63 <3.0L Engine>.
(2) Turn the ignition switch to the "ON" position.



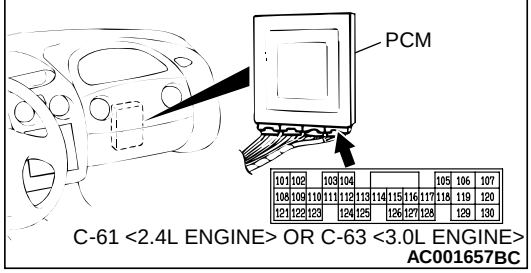
(3) Measure the voltage between terminal 124 and ground by backprobing.
- When A/T fluid temperature is 20°C (68°F), voltage should be between 3.8 and 4.0 volts.
- When A/T fluid temperature is 40°C (104°F), voltage should be between 3.2 and 3.4 volts.
- When A/T fluid temperature is 80°C (176°F), voltage should be between 1.7 and 1.9 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 3.
NO : Go to Step 5.

CONNECTOR: C-61 <2.4L ENGINE> OR C-63 <3.0L ENGINE>



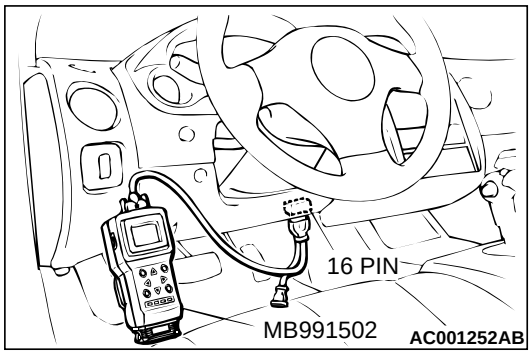
C-61 <2.4L ENGINE> OR C-63 <3.0L ENGINE>
AC001657BC

STEP 3. Check connector C-61 <2.4L Engine> or C-63 <3.0L Engine> at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



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STEP 4. Using scan tool MB991502, check data list item 15: A/T Fluid Temperature Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine.
(3) Set scan tool MB991502 to data reading mode for item 15: A/T Fluid Temperature Sensor.
- At cool condition: Almost equal to the ambient temperature (atmospheric temperature)
- At warm condition: 70 to 80°C (158 to 176°F)

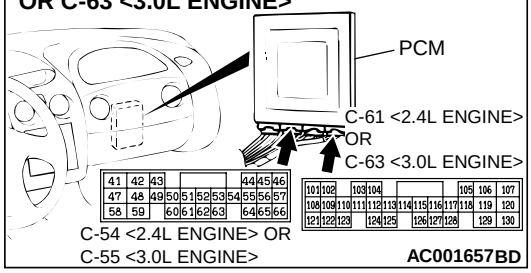
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

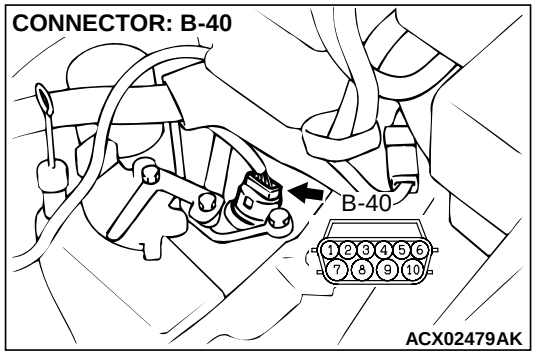
YES : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.

NO : Replace the PCM.

CONNECTORS: C-54 <2.4L ENGINE> OR C-55 <3.0L ENGINE>, C-61 <2.4L ENGINE> OR C-63 <3.0L ENGINE>



CONNECTOR: B-40

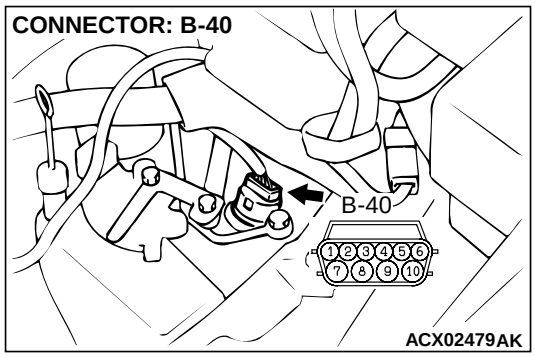


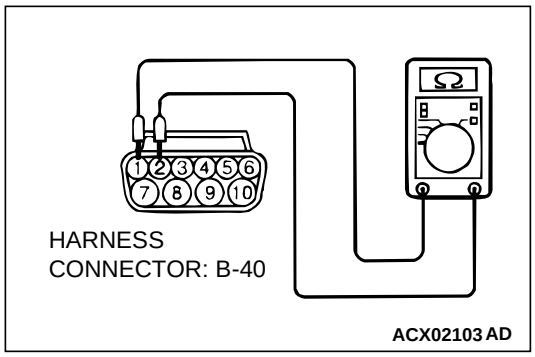
STEP 5. Check connectors C-54 <2.4L Engine> or C-55 <3.0L Engine> and C-61 <2.4L Engine> or C-63 <3.0L Engine> at PCM and B-40 at A/T control solenoid valve assembly for damage.

Q: Are the harness connectors in good condition?

YES : Go to Step 6.

NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.





STEP 6. Check the A/T fluid temperature sensor at A/T control solenoid valve assembly connector B-40.

(1) Disconnect connector B-40 and measure at the sensor side.

(2) Measure the resistance between terminal 1 and 2.

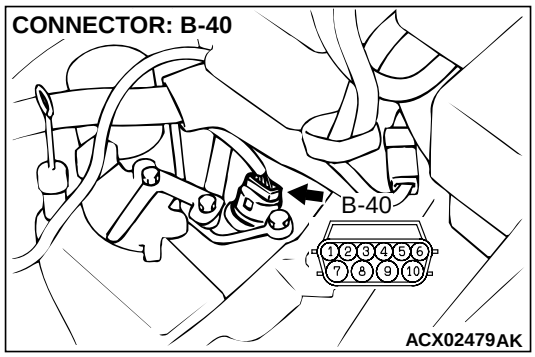
- When A/T fluid temperature is 0°C (32°F), resistance should be between 16.7 and 20.5 kiloohm.
- When A/T fluid temperature is 20°C (68°F), resistance should be between 7.3 and 8.9 kiloohm.
- When A/T fluid temperature is 40°C (104°F), resistance should be between 3.4 and 4.2 kiloohm.
- When A/T fluid temperature is 60°C (140°F), resistance should be between 1.9 and 2.2 kiloohm.
- When A/T fluid temperature is 80°C (176°F), resistance should be between 1.0 and 1.2 kiloohm.
- When A/T fluid temperature is 100°C (212°F), resistance should be between 0.57 and 0.69 kiloohm.

Q: Is the resistance normal?

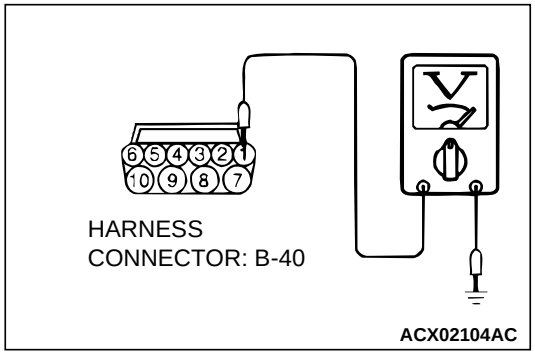
YES : Go to Step 7.

NO : Replace the A/T fluid temperature sensor. Refer to GROUP 23B, Transaxle P.23B-10.

STEP 7. Check the power supply voltage at A/T control solenoid valve assembly connector B-40.



(1) Disconnect connector B-40 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage between terminal 1 and ground.
- Voltage should be between 4.5 and 4.9 volts.

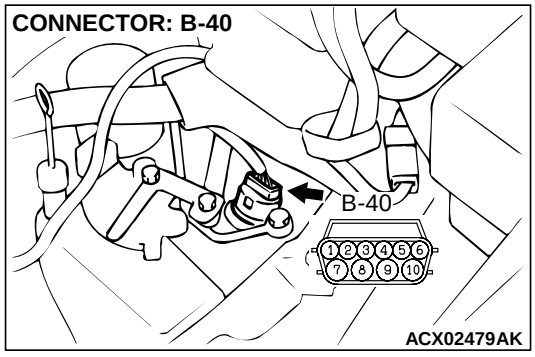
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 8.

NO : Repair harness short circuit to ground between A/T control solenoid valve assembly connector B-40 terminal 1 and PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> terminal 124.

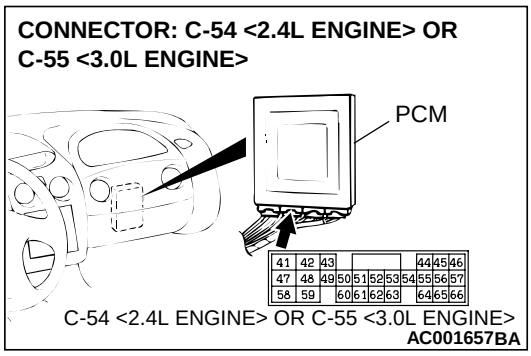
STEP 8. Check harness for damage between A/T control solenoid valve assembly connector B-40 terminal 1 and PCM connector C-54 <2.4L Engine> or C-55 <3.0L Engine> terminal 124.



Q: Is the harness wire in good condition?

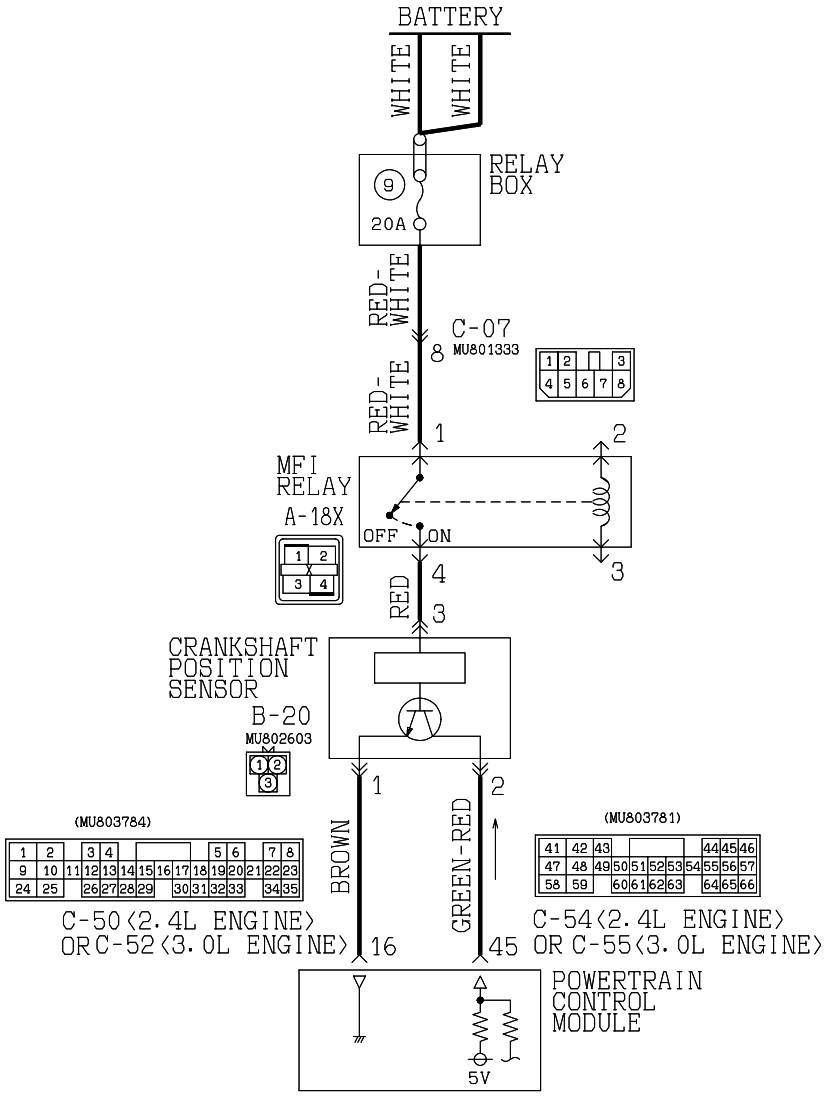
YES : Repair harness damage between solenoid valve assembly connector B-40 terminal 2 and PCM connector C-54 <2.4L Engine> or C-55 <3.0L Engine> terminal 57.

NO : Repair it.



DTC 21: Crankshaft Position Sensor System

Crankshaft Position Sensor System Circuit



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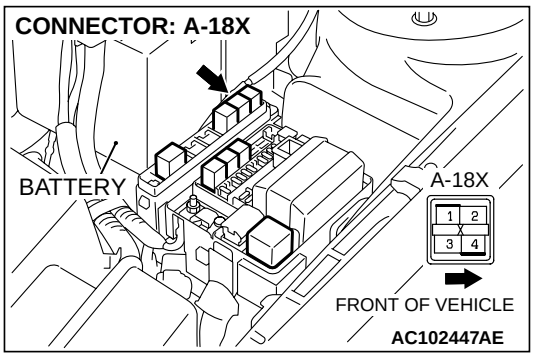
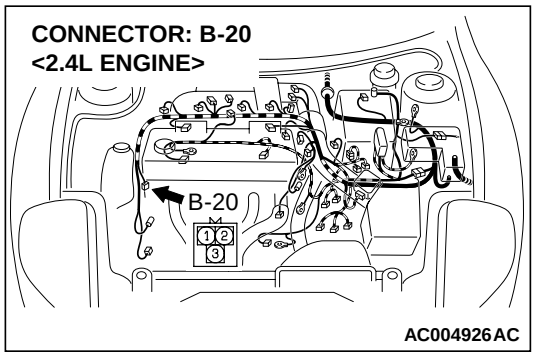
AC106629AB



AC102447AE



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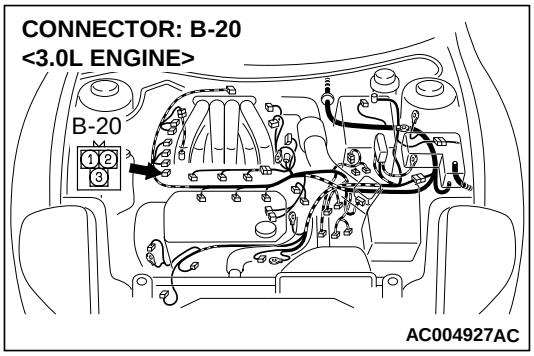
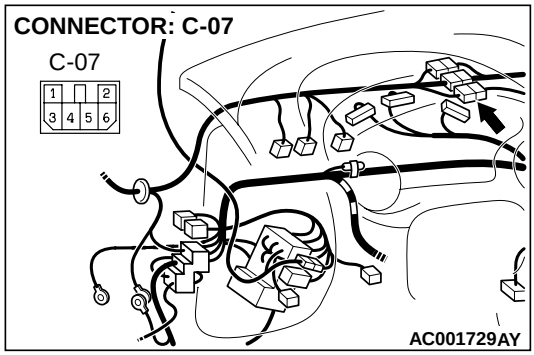
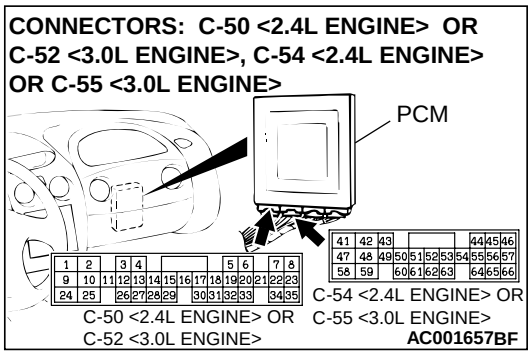
TSB Revision







CIRCUIT OPERATION

The crankshaft position sensor power is supplied from the MFI relay (terminal 3), and the ground (terminal 1) is provided on the PCM. The PCM supplies a five-volts voltage to crankshaft position sensor output terminal (terminal 2). The crankshaft position sensor generates a pulse signal when the output terminal is opened and grounded. The sensor is opened and closed as the flat on the crankshaft passes by.

DTC SET CONDITIONS

If no output pulse is detected from the crankshaft position sensor for five seconds or more while driving at 25 km/h (16 mph) or more, it is judged that there is an open circuit in the crankshaft position sensor and diagnostic trouble code number "21" is output.

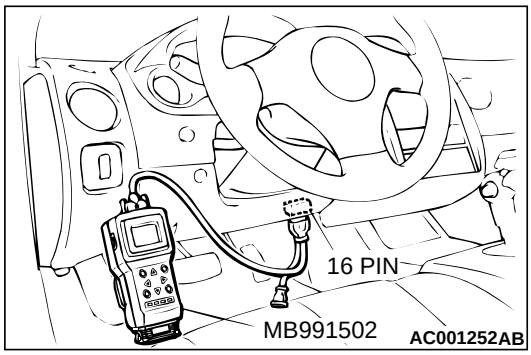
TROUBLESHOOTING HINTS (The most likely causes for this code to be set:)

- Malfunction of the crankshaft position sensor circuit
- Damaged harness, connector
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 21: Crankshaft Position Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) With the gear selector lever in the "P" position, start the engine and run at idle.
(3) Set scan tool MB991502 to data reading mode for item 21: Crankshaft Position Sensor.
- When the accelerator pedal is not depressed (throttle valve is fully closed) the display should be "600 to 900 r/min."
- With the accelerator pedal depressed, the engine speed display should increase according to engine speed.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

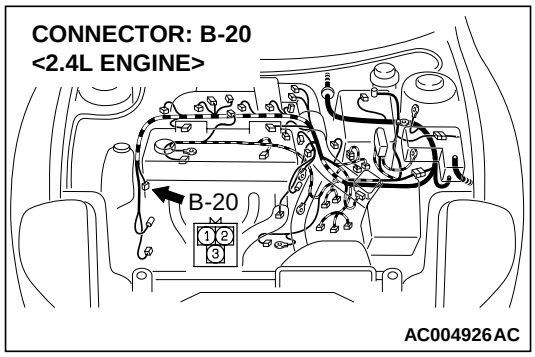
Q: Is the sensor operating properly?

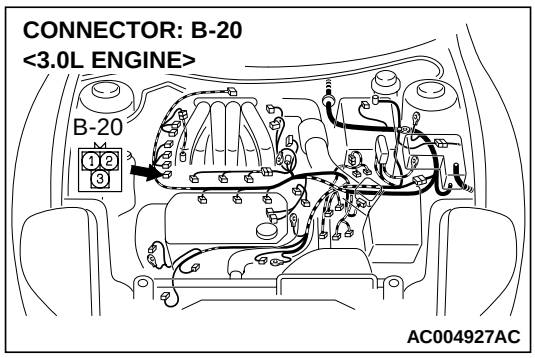
YES : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.

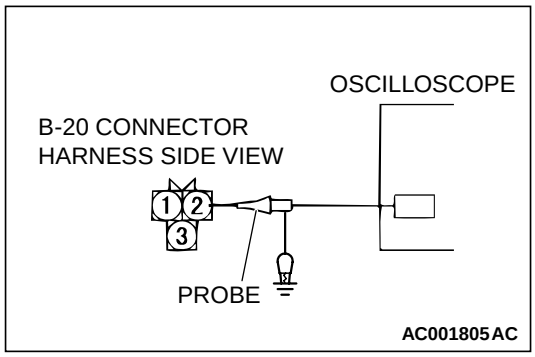
NO : Go to Step 2.

STEP 2. Using the oscilloscope, check the waveform at crankshaft position sensor connector B-20.

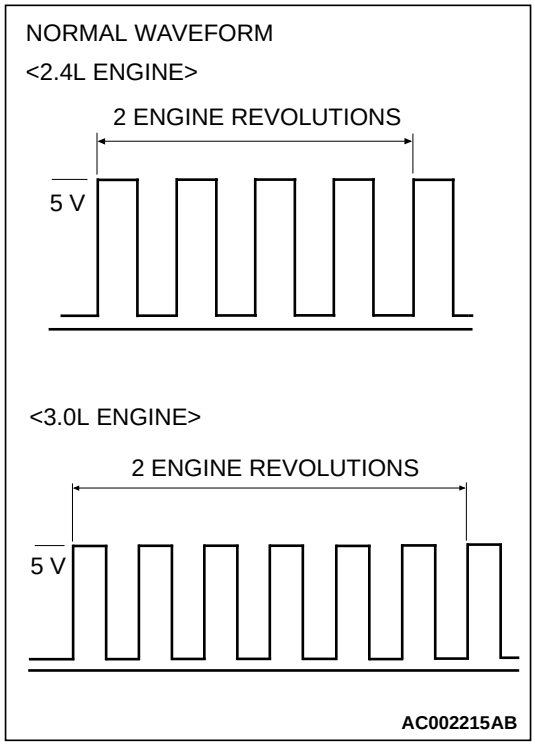
(1) Do not disconnect connector B-20.







(2) Connect an oscilloscope probe to crankshaft position sensor connector B-20 terminal 2 by backprobing.
(3) With the gear selector lever in the "P" position, start the engine and run at idle.



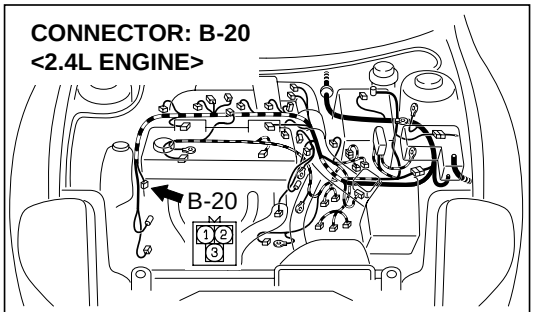
(4) Check the waveform.
- The waveform should show a pattern similar to the illustration. The maximum value should be 4.8 volts and more and the minimum value 0.6 volts and less.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the waveform normal?

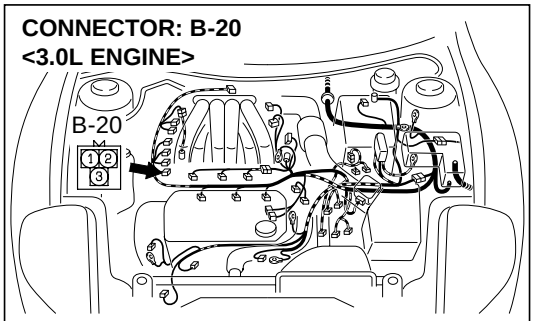
YES : Go to Step 3.
NO : Go to Step 5.

CONNECTOR: B-20 <2.4L ENGINE>



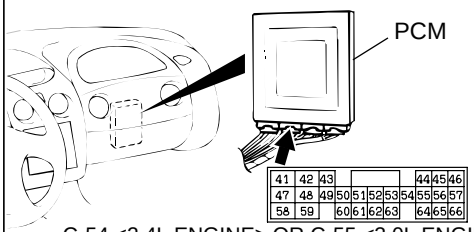
AC004926AC

CONNECTOR: B-20 <3.0L ENGINE>



AC004927AC

CONNECTOR: C-54 <2.4L ENGINE> OR C-55 <3.0L ENGINE>



C-54 <2.4L ENGINE> OR C-55 <3.0L ENGINE>

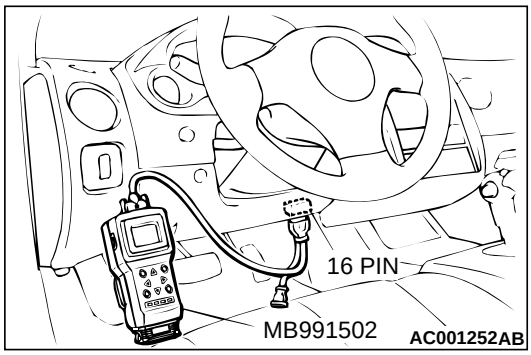
AC001657BA

STEP 3. Check connectors B-20 at crankshaft position sensor and C-54 <2.4L Engine> or C-55 <3.0L Engine> at PCM for damage.

Q: Are the connectors in good condition?

YES : Go to Step 4.

NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



STEP 4. Using scan tool MB991502, check data list item 21: Crankshaft Position Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) With the gear selector lever in the "P" position, start the engine and run at idle.
(3) Set scan tool MB991502 to data reading mode for item 21: Crankshaft Position Sensor.
- When the accelerator pedal is not depressed (throttle valve is fully closed) the display should be "600 to 900 r/min."
- With the accelerator pedal depressed, the engine speed display should increase according to engine speed.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.

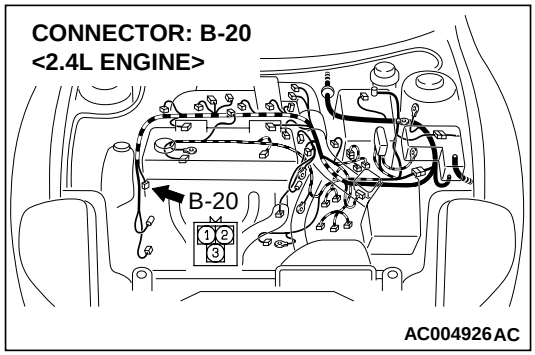
NO : Replace the PCM.

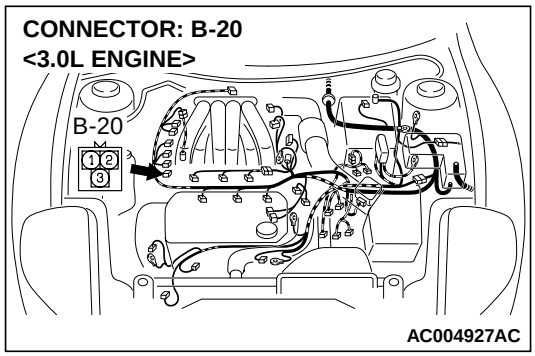
STEP 5. Check connector B-20 at crankshaft position sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

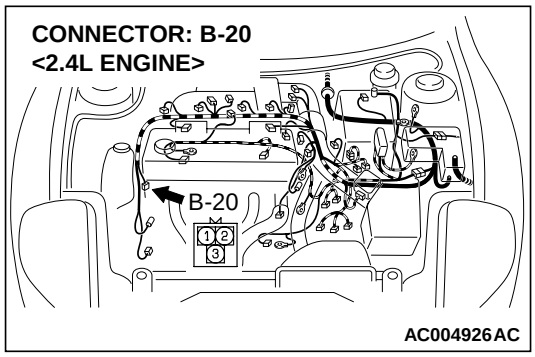


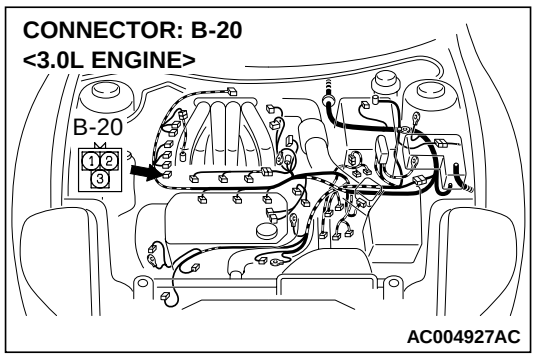


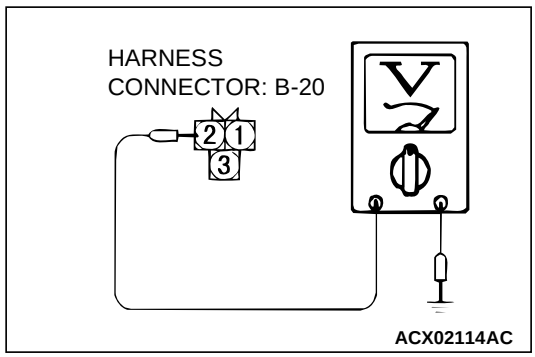
STEP 6. Check the sensor output voltage at crankshaft position sensor connector B-20.

(1) Disconnect connector B-20 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.







(3) Measure the voltage between terminal 2 and ground.
- Voltage should be between 4.9 and 5.1 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

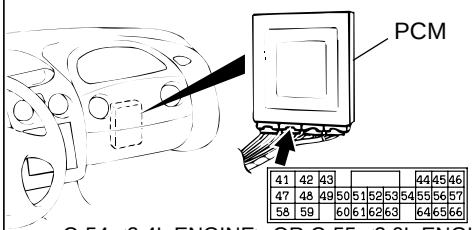
YES : Go to Step 11.

NO : Go to Step 7.

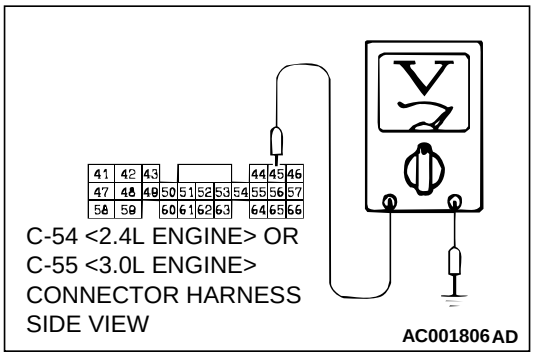
STEP 7. Check the sensor output voltage at PCM connector C-54 <2.4L Engine> or C-55 <3.0L Engine> by backprobing.

(1) Do not disconnect connector C-54 <2.4L Engine> or C-55 <3.0L Engine>.
(2) Disconnect connector B-20 at crankshaft position sensor.
(3) Turn the ignition switch to the "ON" position.

CONNECTOR: C-54 <2.4L ENGINE> OR C-55 <3.0L ENGINE>



C-54 <2.4L ENGINE> OR C-55 <3.0L ENGINE>
AC001657BA



C-54 <2.4L ENGINE> OR C-55 <3.0L ENGINE> CONNECTOR HARNESS SIDE VIEW
AC001806AD

(4) Measure the voltage between terminal 45 and ground by backprobing.
- Voltage should be between 4.9 and 5.1 volts.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

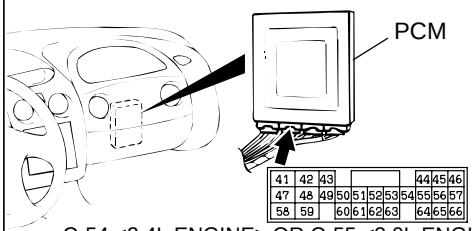
YES : Go to Step 8.
NO : Go to Step 9.

STEP 8. Check connector C-54 <2.4L Engine> or C-55 <3.0L Engine> at PCM for damage.

Q: Is the connector in good condition?

YES : Repair harness open circuit between crankshaft position sensor connector B-20 terminal 2 and PCM connector C-54 <2.4L Engine> or C-55 <3.0L Engine> terminal 45.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

CONNECTOR: C-54 <2.4L ENGINE> OR C-55 <3.0L ENGINE>



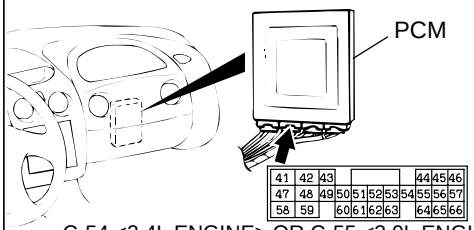
C-54 <2.4L ENGINE> OR C-55 <3.0L ENGINE>
AC001657BA

STEP 9. Check connector C-54 <2.4L Engine> or C-55 <3.0L Engine> at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

CONNECTOR: C-54 <2.4L ENGINE> OR C-55 <3.0L ENGINE>



C-54 <2.4L ENGINE> OR C-55 <3.0L ENGINE>
AC001657BA

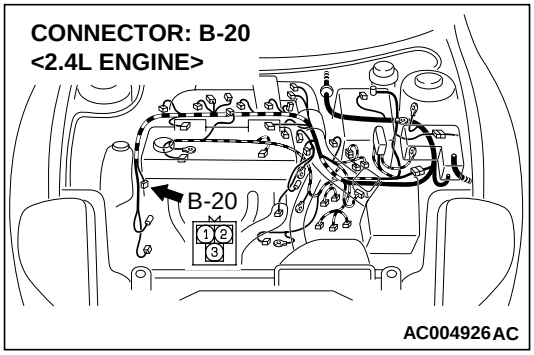
STEP 10. Check harness for short circuit to ground between crankshaft position sensor connector B-20 terminal 2 and PCM connector C-54 <2.4L Engine> or C-55 <3.0L Engine> terminal 45.

Q: Is the harness wire in good condition?

YES : Go to Step 4.

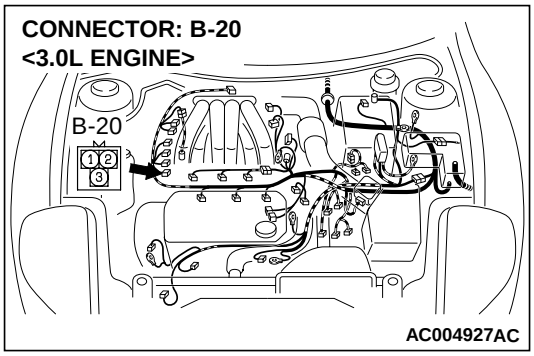
NO : Repair it.

CONNECTOR: B-20 <2.4L ENGINE>



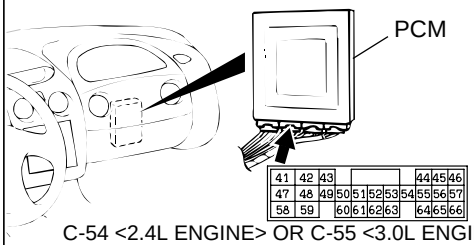
AC004926AC

CONNECTOR: B-20 <3.0L ENGINE>



AC004927AC

CONNECTOR: C-54 <2.4L ENGINE> OR C-55 <3.0L ENGINE>

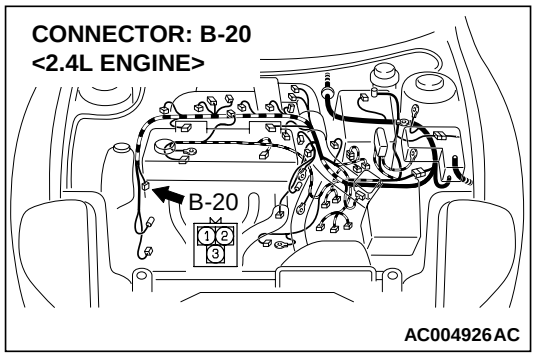


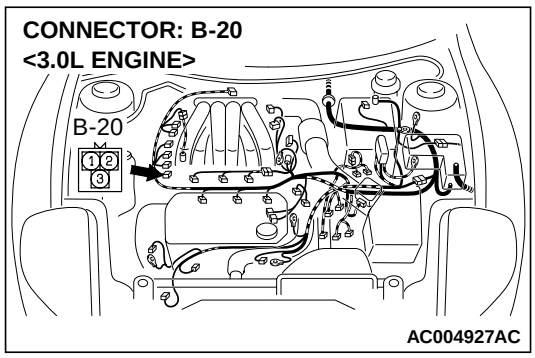
C-54 <2.4L ENGINE> OR C-55 <3.0L ENGINE>

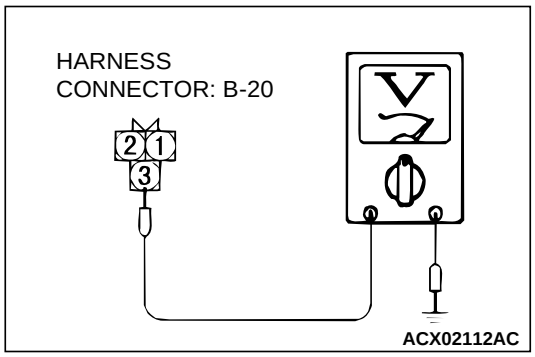
AC001657BA

STEP 11. Check the power supply voltage at crankshaft position sensor connector B-20.

(1) Disconnect connector B-20 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.







(3) Measure the voltage between terminal 3 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

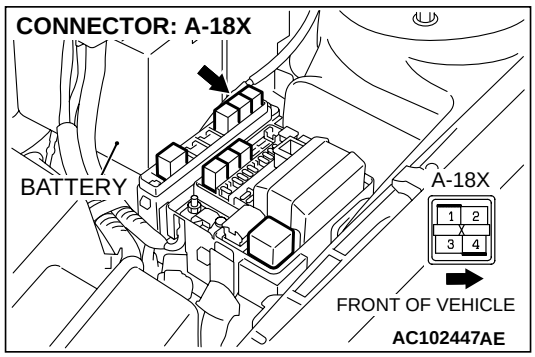
Q: Is the voltage normal?

YES : Go to Step 13.
NO : Go to Step 12.

STEP 12. Check connector A-18X at MFI relay for damage.

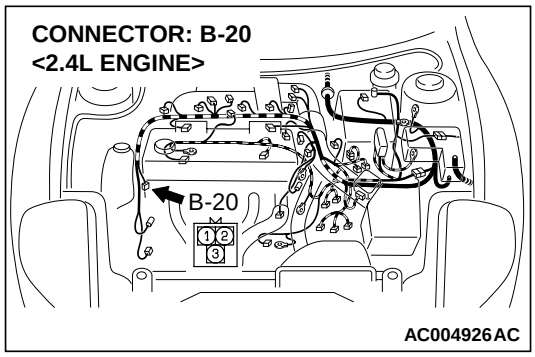
Q: Is the connector in good condition?

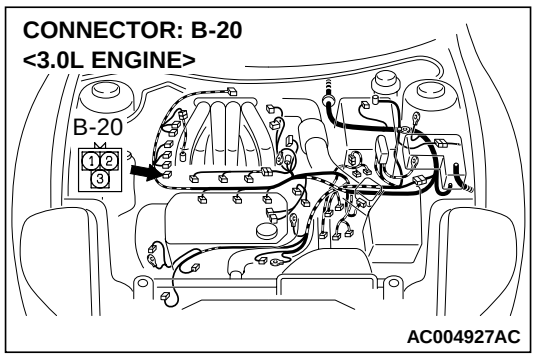
YES : Repair harness open circuit or short circuit to ground between MFI relay connector A-18X terminal 4 and crankshaft position sensor connector B-20 terminal 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

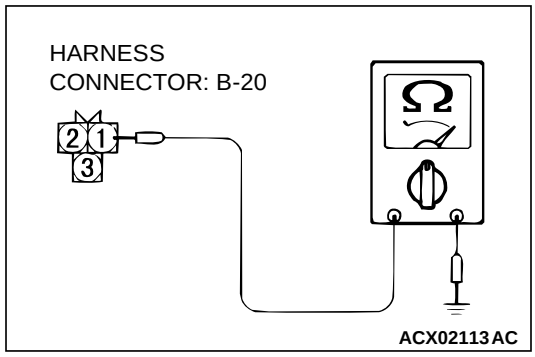


STEP 13. Check the continuity at crankshaft position sensor connector B-20.

(1) Disconnect connector B-20 and measure at the harness side.







(2) Check for the continuity between terminal 1 and ground.
- Should be less than 2 ohm.

Q: Is the continuity normal?

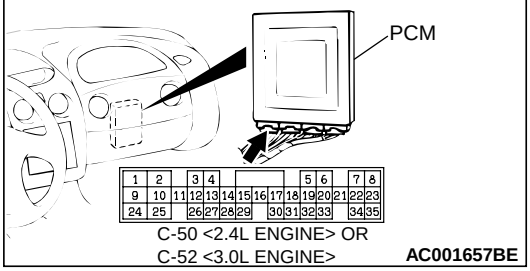
YES : Go to Step 18.
NO : Go to Step 14.

STEP 14. Check the ground voltage at PCM connector C-50 <2.4L Engine> or C-52 <3.0L Engine> by backprobing.

(1) Do not disconnect connector C-50 <2.4L Engine> or C-52 <3.0L Engine>.

(2) Turn the ignition switch to the "ON" position.

CONNECTOR: C-50 <2.4L ENGINE> OR C-52 <3.0L ENGINE>



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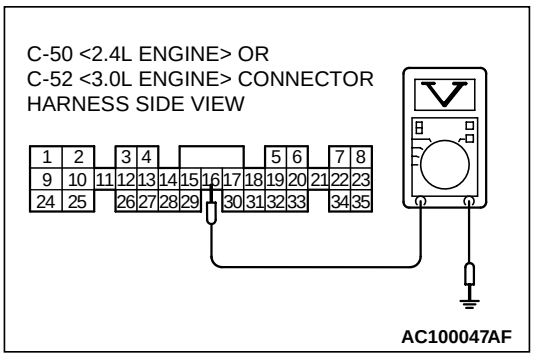


AC100047AF

(3) Measure the voltage between terminal 16 and ground by backprobing.
- Voltage should be 0.5 volt or less.

(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is the voltage normal?

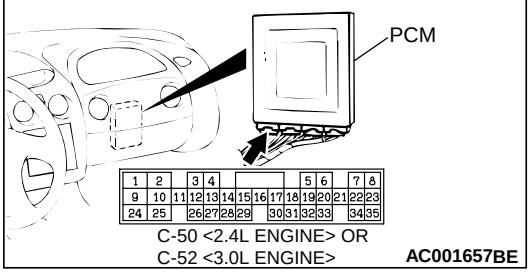
YES : Go to Step 15.
NO : Go to Step 16.

STEP 15. Check connector C-50 <2.4L Engine> or C-52 <3.0L Engine> at PCM for damage.

Q: Is the harness connector in good condition?

YES : Repair harness open circuit or damage between crankshaft position sensor connector B-20 terminal 1 and PCM connector C-50 <2.4L Engine> or C-52 <3.0L Engine> terminal 16.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

CONNECTOR: C-50 <2.4L ENGINE> OR C-52 <3.0L ENGINE>



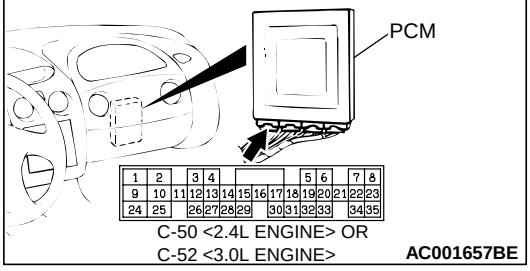
AC001657BE

STEP 16. Check connector C-50 <2.4L Engine> or C-52 <3.0L Engine> at PCM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 17.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

CONNECTOR: C-50 <2.4L ENGINE> OR C-52 <3.0L ENGINE>



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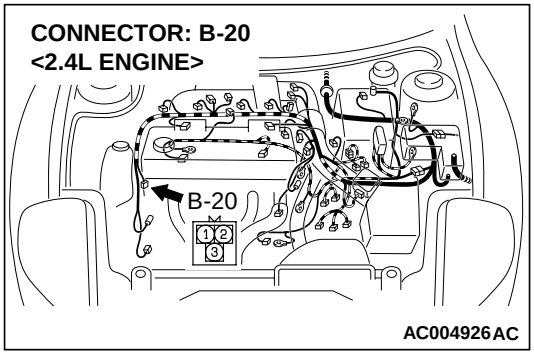
STEP 17. Check harness for short circuit to ground between crankshaft position sensor connector B-20 terminal 1 and PCM connector C-50 <2.4L Engine> or C-52 <3.0L Engine> terminal 16.

Q: Is the harness wire in good condition?

YES : Go to Step 4.

NO : Repair it.

CONNECTOR: B-20 <2.4L ENGINE>



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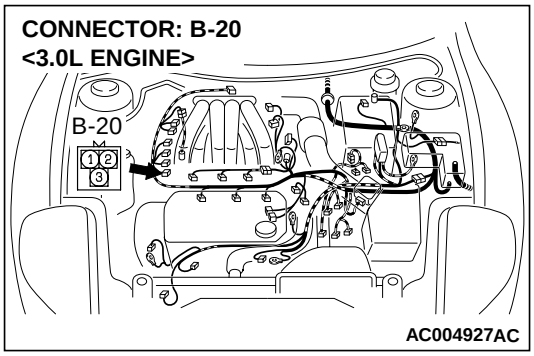
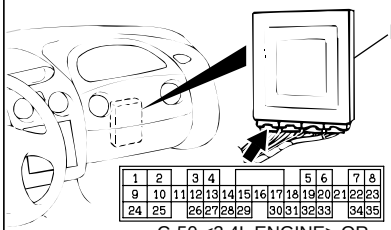
CONNECTOR: B-20 <3.0L ENGINE>



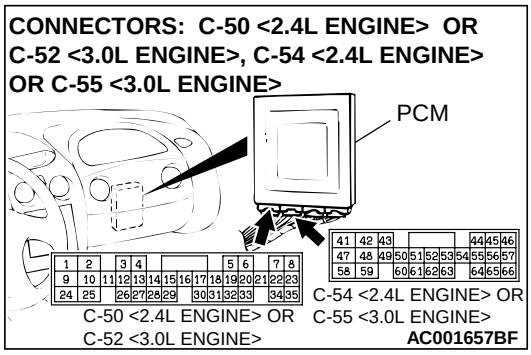
AC004927AC

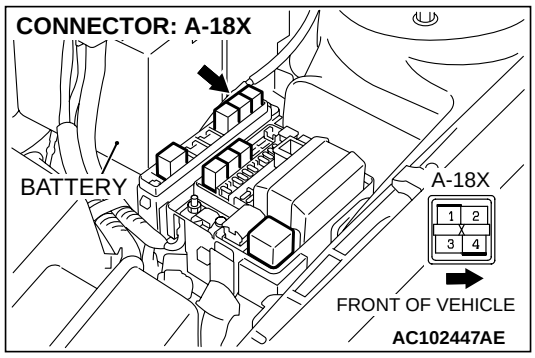
CONNECTOR: C-50 <2.4L ENGINE> OR C-52 <3.0L ENGINE>



C-50 <2.4L ENGINE> OR
C-52 <3.0L ENGINE>

AC001657BE





STEP 18. Check connectors C-50 <2.4L Engine> or C-52 <3.0L Engine> and C-54 <2.4L Engine> or C-55 <3.0L Engine> at PCM and A-18X at the MFI relay for damage.
Q: Are the harness connectors in good condition?

YES : Go to Step 19.

NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

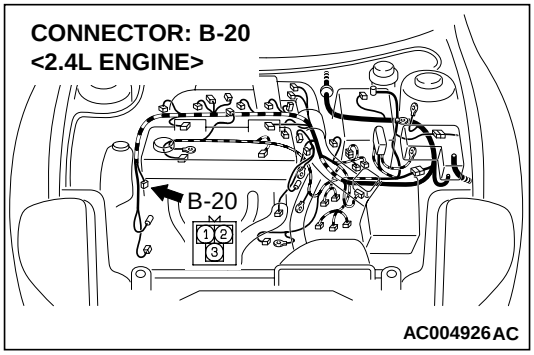
STEP 19. Check harness for damage between crankshaft position sensor connector B-20 terminal 1 and PCM connector C-50 <2.4L Engine> or C-52 <3.0L Engine> terminal 16.

Q: Is the harness wire in good condition?

YES : Go to Step 20.

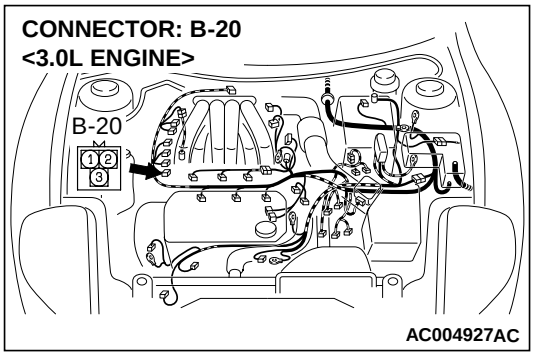
NO : Repair it.

CONNECTOR: B-20 <2.4L ENGINE>



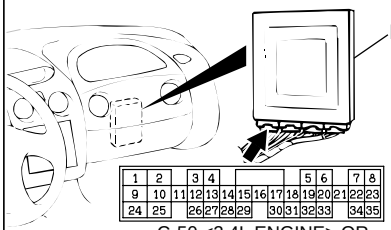
AC004926AC

CONNECTOR: B-20 <3.0L ENGINE>



AC004927AC

CONNECTOR: C-50 <2.4L ENGINE> OR C-52 <3.0L ENGINE>



C-50 <2.4L ENGINE> OR
C-52 <3.0L ENGINE>

AC001657BE

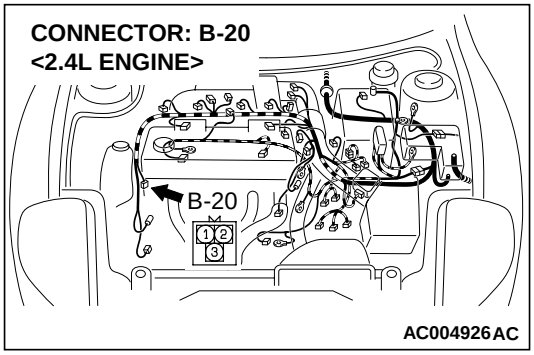
STEP 20. Check harness for damage between crankshaft position sensor connector B-20 terminal 2 and PCM connector C-54 <2.4L Engine> or C-55 <3.0L Engine> terminal 45.

Q: Is the harness wire in good condition?

YES : Go to Step 21.

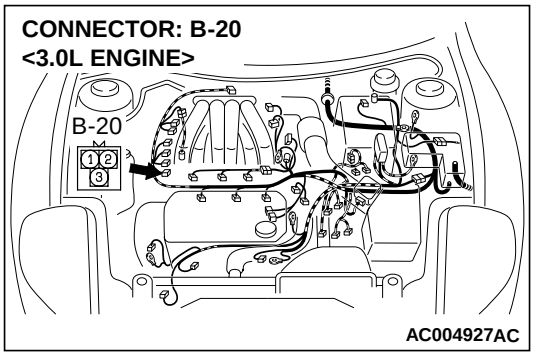
NO : Repair it.

CONNECTOR: B-20 <2.4L ENGINE>



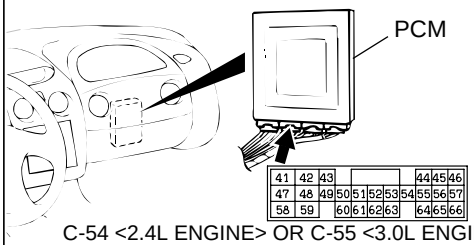
AC004926AC

CONNECTOR: B-20 <3.0L ENGINE>



AC004927AC

CONNECTOR: C-54 <2.4L ENGINE> OR C-55 <3.0L ENGINE>



C-54 <2.4L ENGINE> OR C-55 <3.0L ENGINE>

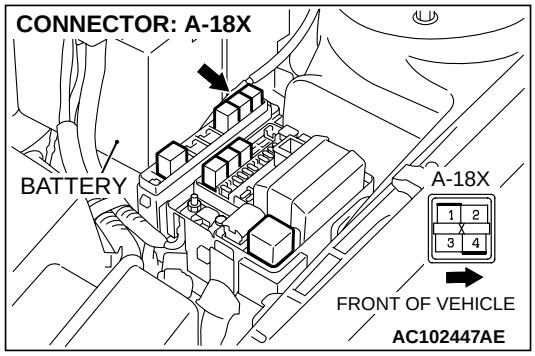
AC001657BA

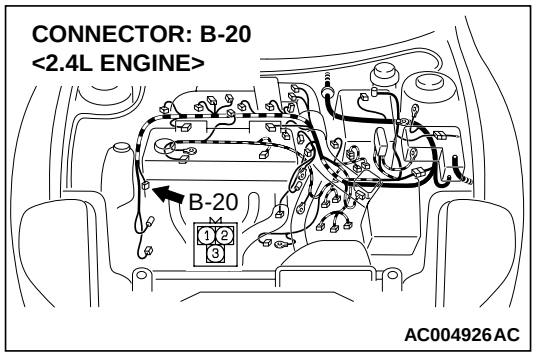
STEP 21. Check harness for damage between MFI relay connector A-18X terminal 4 and crankshaft position sensor connector B-20 terminal 3.

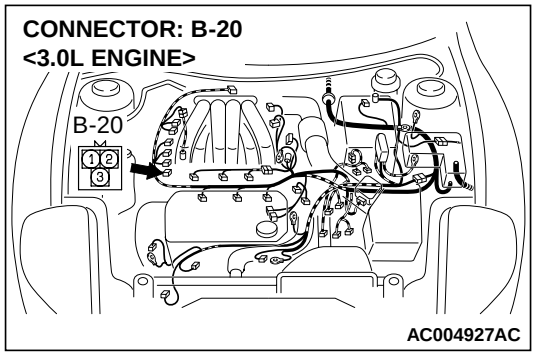
Q: Is the harness wire in good condition?

YES : Go to Step 22.

NO : Repair it.







STEP 22. Check the crankshaft position sensor vane.

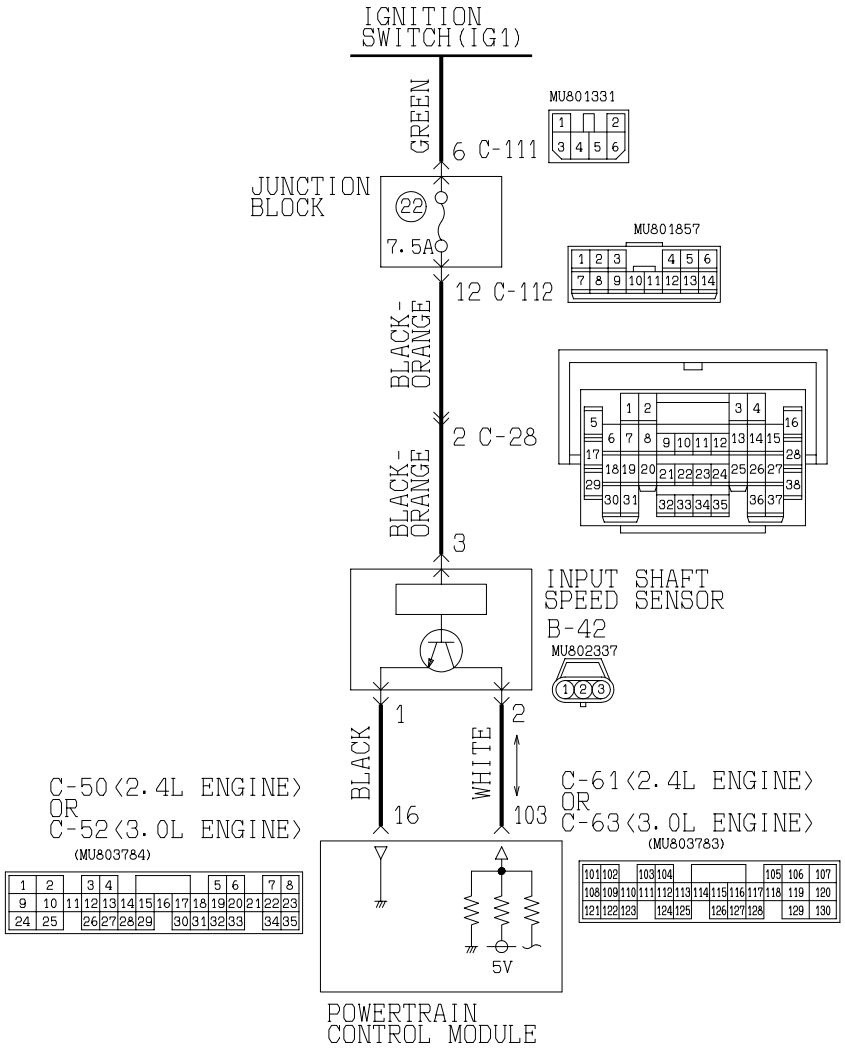
Q: Is the vane in good condition?

YES : Replace the crankshaft position sensor. Refer to GROUP 16, Ignition System – Crankshaft Position Sensor Removal and Installation <2.4L Engine>P.16-55 or <3.0L Engine>P.16-56 .

NO : Repair or replace it.

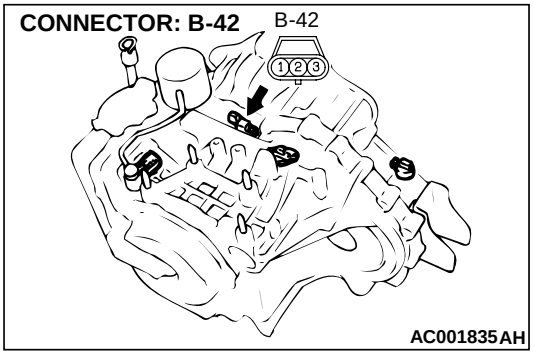
DTC 22: Input Shaft Speed Sensor System

Input Shaft Speed Sensor System Circuit



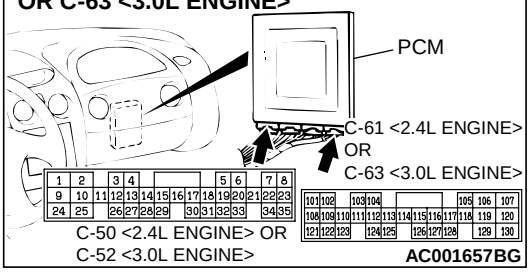
W3S11M02AA
AC106630AB

CONNECTOR: B-42



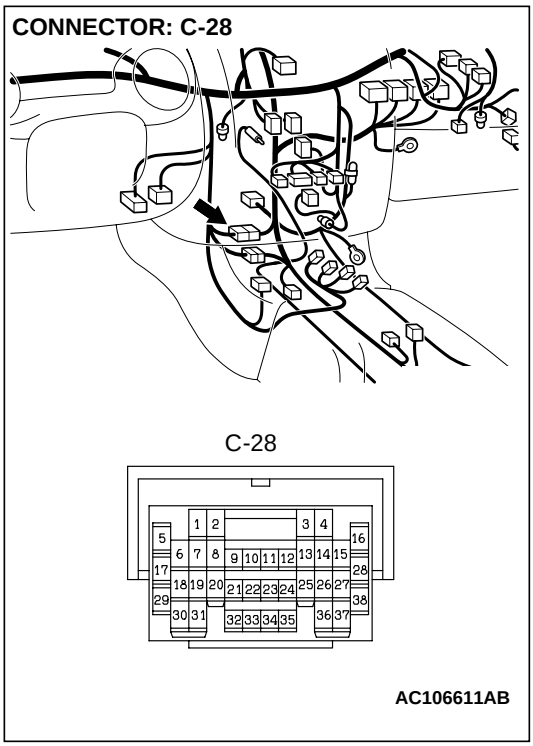
AC001835AH

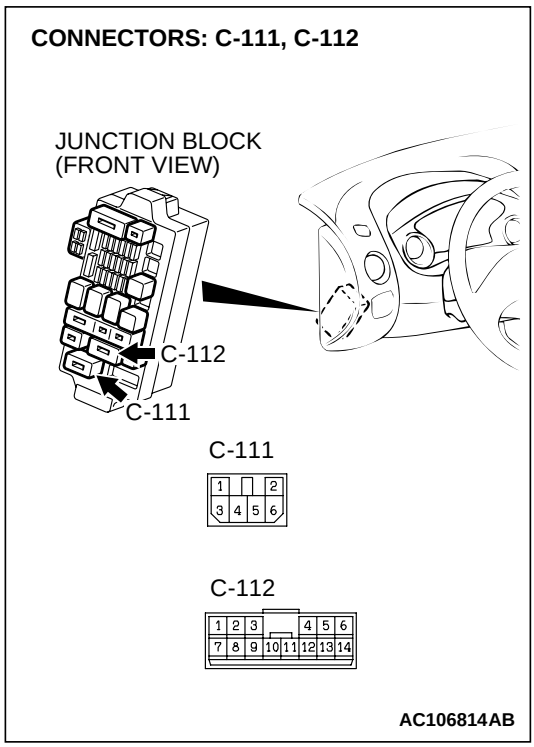
CONNECTORS: C-50 <2.4L ENGINE> OR C-52 <3.0L ENGINE>, C-61 <2.4L ENGINE> OR C-63 <3.0L ENGINE>



AC001657BG

TSB Revision





CIRCUIT OPERATION

- A coil built into the input shaft speed sensor generates a pulse signal at both ends of this coil when the input shaft rotates. The pulse signal frequency increases with a rise in input shaft speed.
- Both ends of the coil are connected to the PCM (terminals 16 and 103) via the input shaft speed sensor connector (terminals 1 and 2).
- The PCM detects the input shaft speed by the signal input to terminal 103.
- The input shaft speed sensor generates the pulse signal as the teeth of the underdrive clutch retainer pass the magnetic tip of the sensor.

DTC SET CONDITIONS

If no output pulse is detected from the input shaft speed sensor for one second or more while driving in 3rd or 4th gear at a speed of 30 km/h (19 mph) or more, it is judged to be an open circuit or short circuit in the input shaft speed sensor circuit. If diagnostic trouble code number "22" is output four times, the transaxle is locked into 3rd gear or 2nd gear as a fail-safe measure, and the "N" range light flashes once per second.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set:)

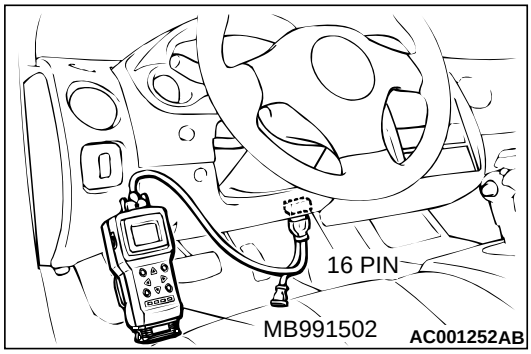
- Malfunction of the input shaft speed sensor circuit
- Malfunction of the underdrive clutch retainer
- Damaged harness, connector
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

TSB Revision



STEP 1. Using scan tool MB991502, check data list item 22: Input Shaft Speed Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine.
(3) Set scan tool MB991502 to data reading mode for item 22: Input Shaft Speed Sensor.
- When driving at constant speed of 50km/h (31mph), the display should be "1,600 – 1,900 r/min." <2.4L Engine>, "1,300 – 1,600 r/min." <3.0L Engine> (Gear range: 3rd gear)

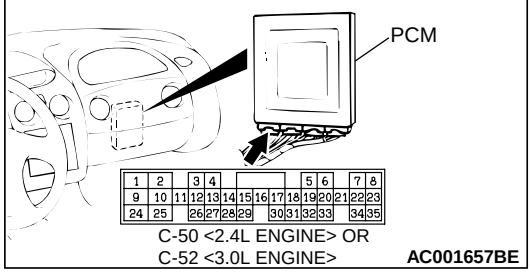
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.

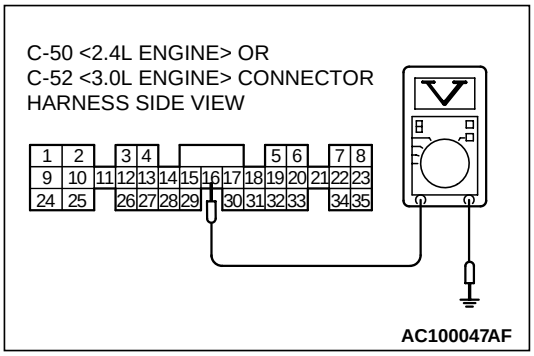
NO : Go to Step 2.

CONNECTOR: C-50 <2.4L ENGINE> OR C-52 <3.0L ENGINE>



STEP 2. Check the ground voltage at PCM connector C-50 <2.4L Engine> or C-52 <3.0L Engine> by backprobing.

(1) Do not disconnect connector C-50 <2.4L Engine> or C-52 <3.0L Engine>.
(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage between terminal 16 and ground by backprobing.
- Voltage should be 0.5 volt or less.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 5.

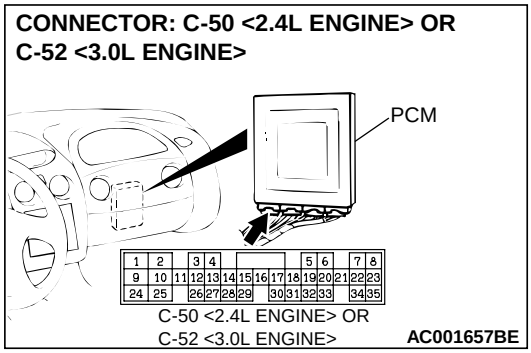
NO : Go to Step 3.

STEP 3. Check connector C-50 <2.4L Engine> or C-52 <3.0L Engine> at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



STEP 4. Using scan tool MB991502, check data list item 22: Input Shaft Speed Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

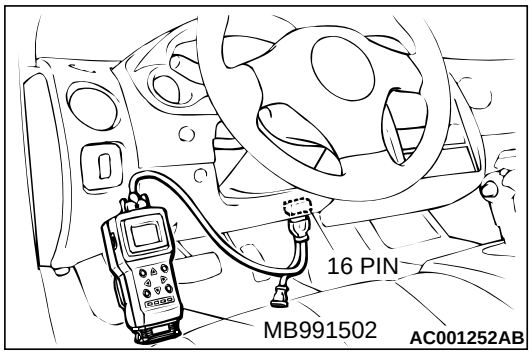
(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine.
(3) Set scan tool MB991502 to data reading mode for item 22: Input Shaft Speed Sensor.
- When driving at constant speed of 50km/h (31mph), the display should be "1,600 – 1,900 r/min." <2.4L Engine>, "1,300 – 1,600 r/min." <3.0L Engine> (Gear range: 3rd gear)

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

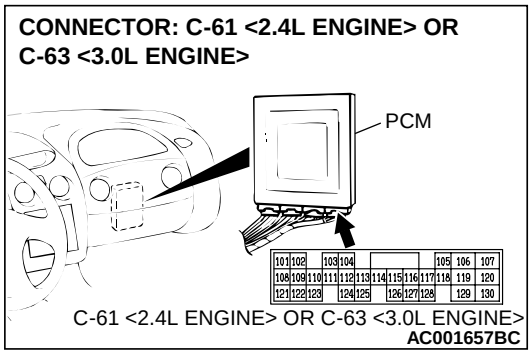
YES : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.

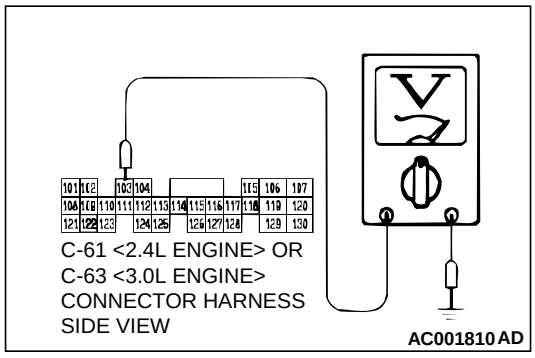
NO : Replace the PCM.



STEP 5. Check the sensor output voltage at PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> by backprobing.

(1) Do not disconnect connector C-61 <2.4L Engine> or C-63 <3.0L Engine>.
(2) Disconnect connector B-42 at the input shaft speed sensor.
(3) Turn the ignition switch to the "ON" position.





(4) Measure the voltage between terminal 103 and ground by backprobing.
- Voltage should be between 4.5 and 4.9 volts.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

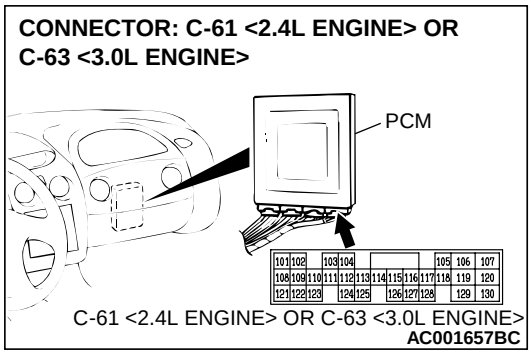
Q: Is the voltage normal?

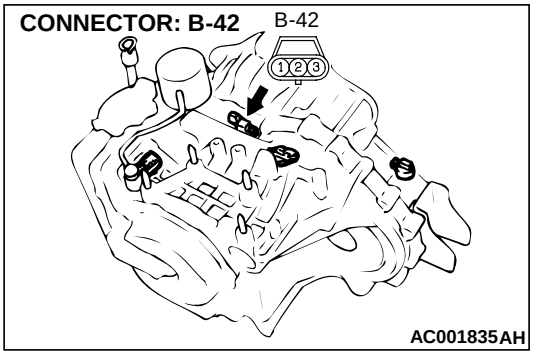
YES : Go to Step 8.
NO : Go to Step 6.

STEP 6. Check connectors C-61 <2.4L Engine> or C-63 <3.0L Engine> at PCM and B-42 at input shaft speed sensor for damage.

Q: Are the connectors in good condition?

YES : Go to Step 7.
NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.





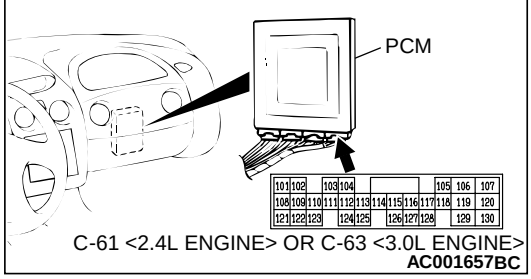
STEP 7. Check harness for short circuit to ground between PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> terminal 103 and input shaft speed sensor connector B-42 terminal 2.

Q: Is the harness wire in good condition?

YES : Go to Step 4.

NO : Repair it.

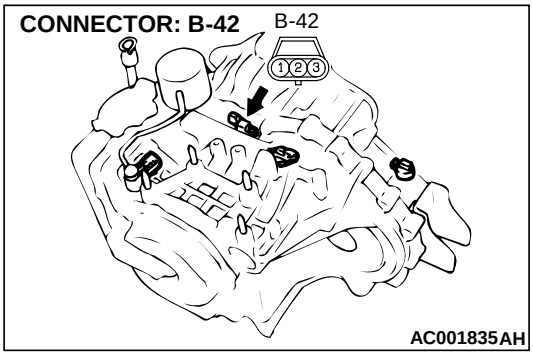
CONNECTOR: C-61 <2.4L ENGINE> OR C-63 <3.0L ENGINE>



C-61 <2.4L ENGINE> OR C-63 <3.0L ENGINE>

AC001657BC

CONNECTOR: B-42

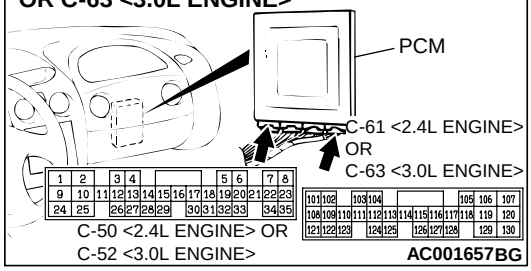


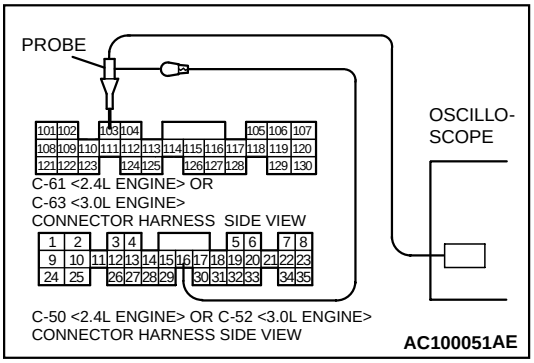
AC001835AH

STEP 8. Using the oscilloscope, check the waveform at PCM connectors C-50 <2.4L Engine> or C-52 <3.0L Engine> and C-61 <2.4L Engine> or C-63 <3.0L Engine> by backprobing.

(1) Do not disconnect connectors C-50 <2.4L Engine> or C-52 <3.0L Engine> and C-61 <2.4L Engine> or C-63 <3.0L Engine>.

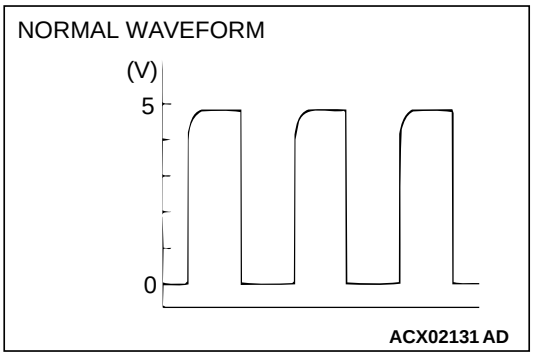
CONNECTORS: C-50 <2.4L ENGINE> OR C-52 <3.0L ENGINE>, C-61 <2.4L ENGINE> OR C-63 <3.0L ENGINE>





(2) Connect an oscilloscope probe to PCM connector C-50 <2.4L Engine> or C-52 <3.0L Engine> terminal 16 and to PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> terminal 103 by backprobing.

(3) Start the engine and run at constant speed of 50km/h (31mph). (Gear range: 3rd gear)



(4) Check the waveform.
- The waveform should show a pattern similar to the illustration. The maximum value should be 4.8 volts and more and the minimum value 0.8 volts and less. The output waveform should not contain electrical noise.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the waveform normal?

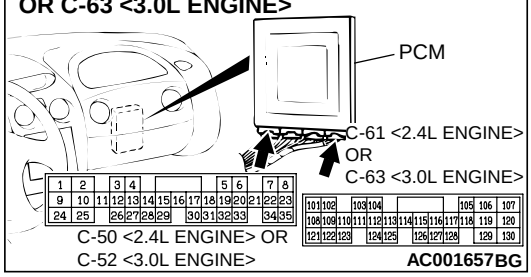
YES : Go to Step 9.
NO : Go to Step 10.

STEP 9. Check connectors C-50 <2.4L Engine> or C-52 <3.0L Engine> and C-61 <2.4L Engine> or C-63 <3.0L Engine> at PCM for damage.

Q: Are the connectors in good condition?

YES : Go to Step 4.
NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

CONNECTORS: C-50 <2.4L ENGINE> OR C-52 <3.0L ENGINE>, C-61 <2.4L ENGINE> OR C-63 <3.0L ENGINE>

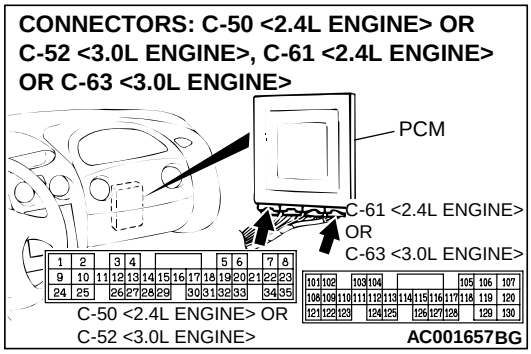


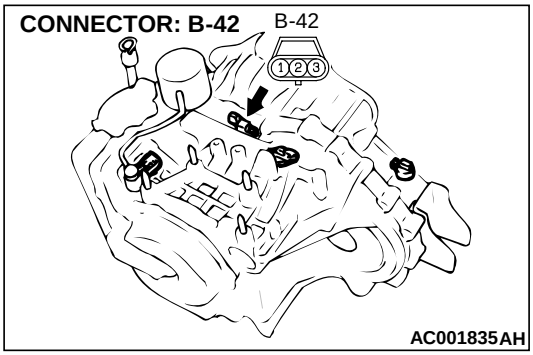
STEP 10. Check connectors C-50 <2.4L Engine> or C-52 <3.0L Engine> and C-61 <2.4L Engine> or C-63 <3.0L Engine> at PCM and B-42 at input shaft speed sensor for damage.

Q: Are the connectors in good condition?

YES : Go to Step 11.

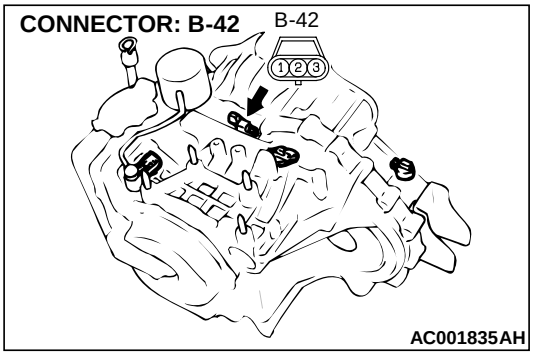
NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.





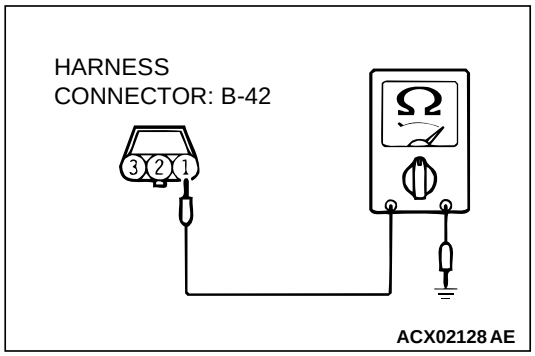
STEP 11. Check the continuity at input shaft speed sensor connector B-42.

(1) Disconnect connector B-42 and measure at the harness side.



(2) Check for the continuity between terminal 1 and ground.

- Should be less than 2 ohm.

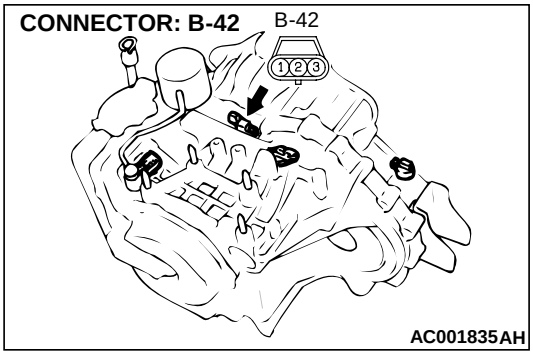


Q: Is the continuity normal?

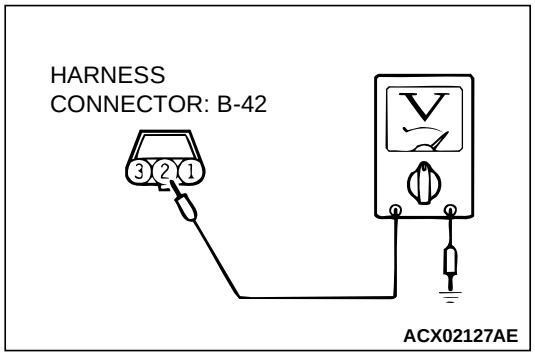
YES : Go to Step 12.

NO : Repair harness open circuit or damage between input shaft speed sensor connector B-42 terminal 1 and PCM connector C-50 <2.4L Engine> or C-52 <3.0L Engine> terminal 16.

STEP 12. Check the sensor output voltage at input shaft speed sensor connector B-42.



(1) Disconnect connector B-42 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.



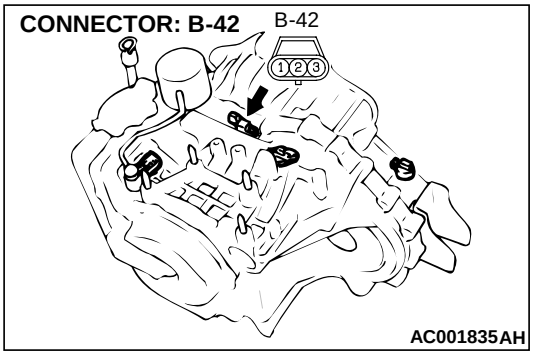
(3) Measure the voltage between terminal 2 and ground.
- Voltage should be between 4.5 and 4.9 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

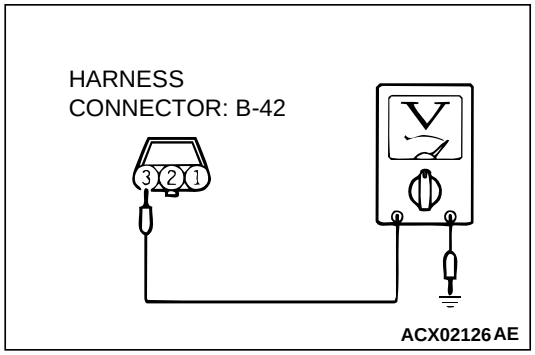
Q: Is the voltage normal?

YES : Go to Step 13.
NO : Repair harness open circuit or damage between input shaft speed sensor connector B-42 terminal 2 and PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> terminal 103.

STEP 13. Check the power supply voltage at input shaft speed sensor connector B-42.



(1) Disconnect connector B-42 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.



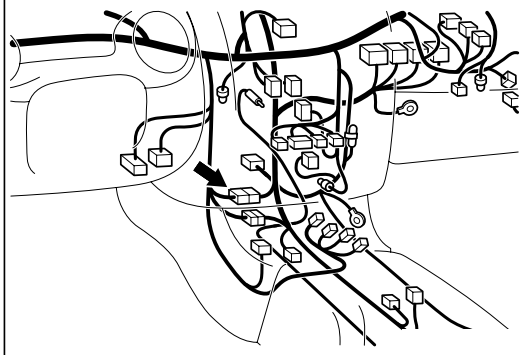
(3) Measure the voltage between terminal 3 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

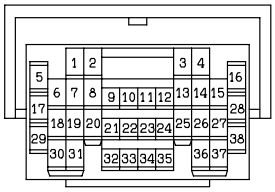
Q: Is the voltage normal?

YES : Go to Step 15.
NO : Go to Step 14.

CONNECTOR: C-28



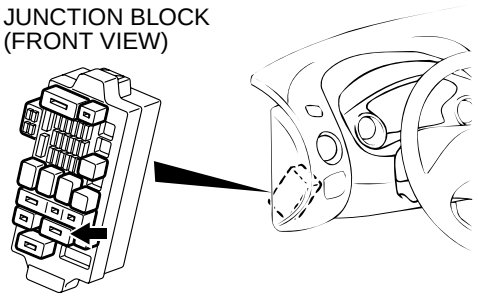
C-28



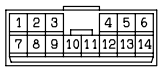
AC106611AB

CONNECTOR: C-112

JUNCTION BLOCK
(FRONT VIEW)



C-112

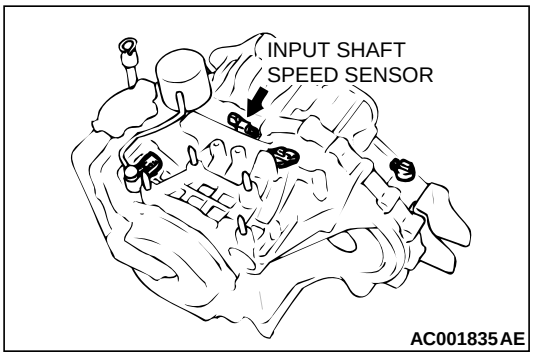


AC106612AB

STEP 14. Check connectors C-28 at intermediate connector and C-112 at junction block for damage.
Q: Are the connectors in good condition?

YES : Repair harness open circuit or short circuit to ground between input shaft speed sensor connector B-42 terminal 3 and junction block connector C-112 terminal 12.

NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



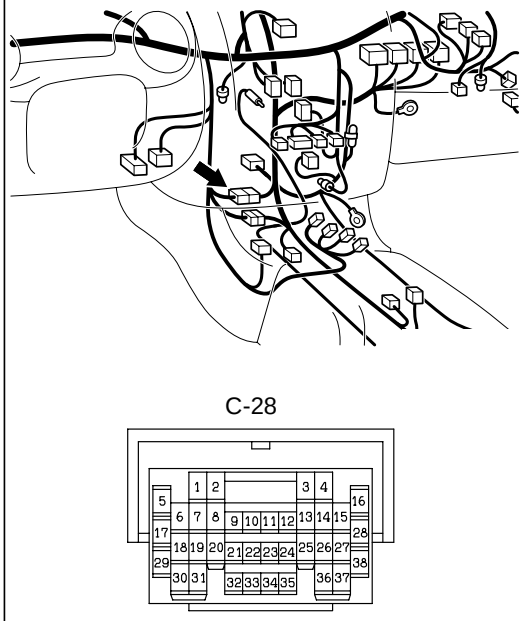
STEP 15. Replace the input shaft speed sensor.

(1) Replace the input shaft speed sensor. Refer to GROUP 23B, Transaxle P.23B-10.
(2) Test drive the vehicle.
(3) Check for diagnostic trouble code.

Q: Is the A/T diagnostic trouble code number "22" output?

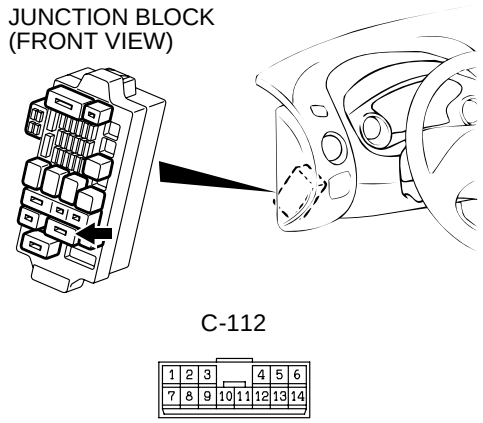
YES : Go to Step 16.
NO : The inspection is complete.

CONNECTOR: C-28



AC106611AB

CONNECTOR: C-112



AC106612AB

STEP 16. Check connectors C-28 at intermediate connector and C-112 at junction block for damage.
Q: Are the connectors in good condition?

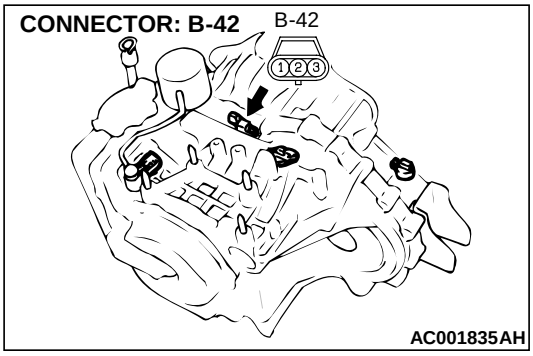
YES : Go to Step 17.
NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

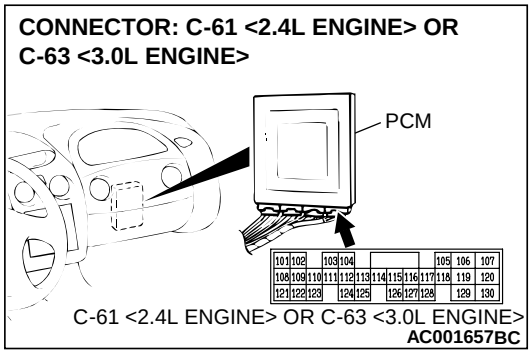
STEP 17. Check harness for damage between input shaft speed sensor harness side connector B-42 terminal 2 and PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> terminal 103.

Q: Is the harness wire in good condition?

YES : Go to Step 18.

NO : Repair it.



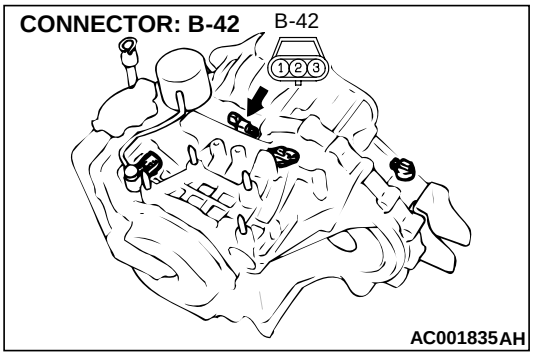


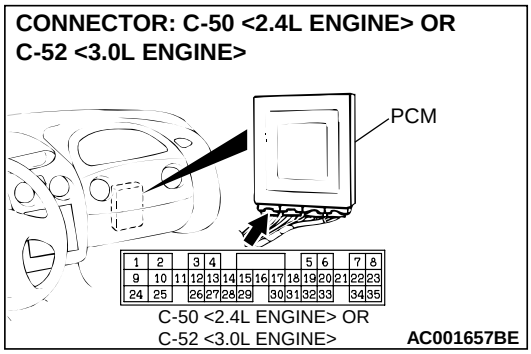
STEP 18. Check harness for damage between input shaft speed sensor harness side connector B-42 terminal 1 and PCM connector C-50 <2.4L Engine> or C-52 <3.0L Engine> terminal 16.

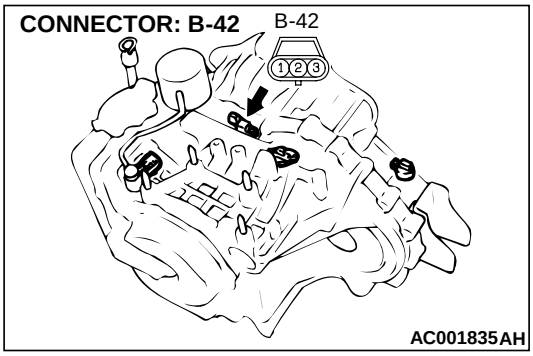
Q: Is the harness wire in good condition?

YES : Go to Step 19.

NO : Repair it.





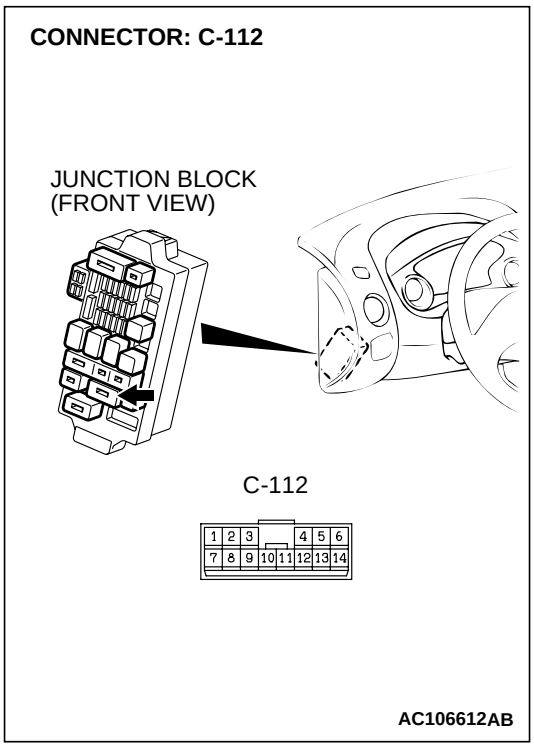


STEP 19. Check harness for damage between input shaft speed sensor harness side connector B-42 terminal 3 and junction block connector C-112 terminal 12.

Q: Is the harness wire in good condition?

YES : Go to Step 20.

NO : Repair it.



STEP 20. Replace the underdrive clutch retainer.

(1) Replace the underdrive clutch retainer. Refer to GROUP 23B, Underdrive Clutch and Input Shaft P.23B-59.

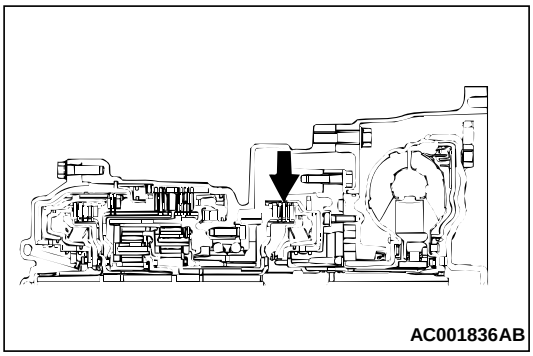
(2) Test drive the vehicle.

(3) Check for diagnostic trouble code.

Q: Is the A/T diagnostic trouble code number "22" output?

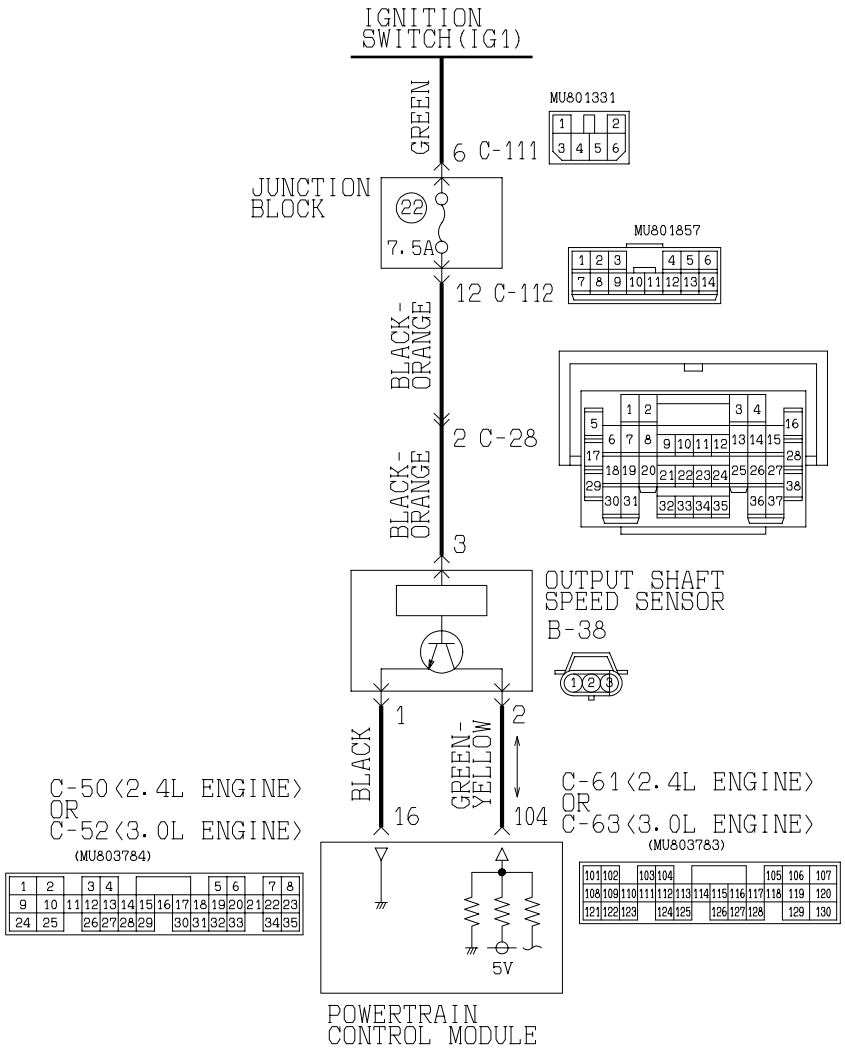
YES : The A/T diagnostic trouble code may have set due to external radio frequency (RFI), possibility caused by cellular phone activity, after market components installed on the vehicle, etc.

NO : The inspection is complete.



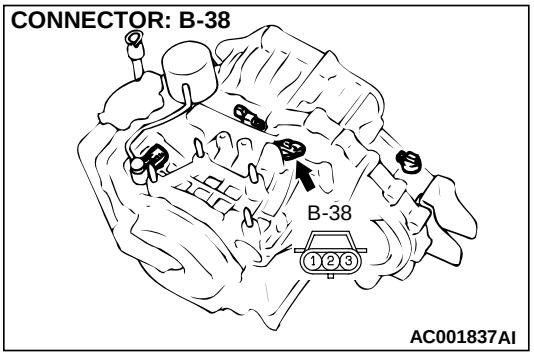
DTC 23: Output Shaft Speed Sensor System

Output Shaft Speed Sensor System Circuit



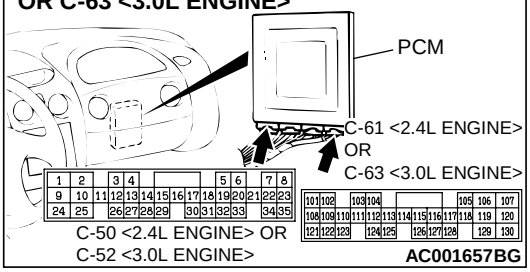
W3S11M03AA
AC106631AB

CONNECTOR: B-38



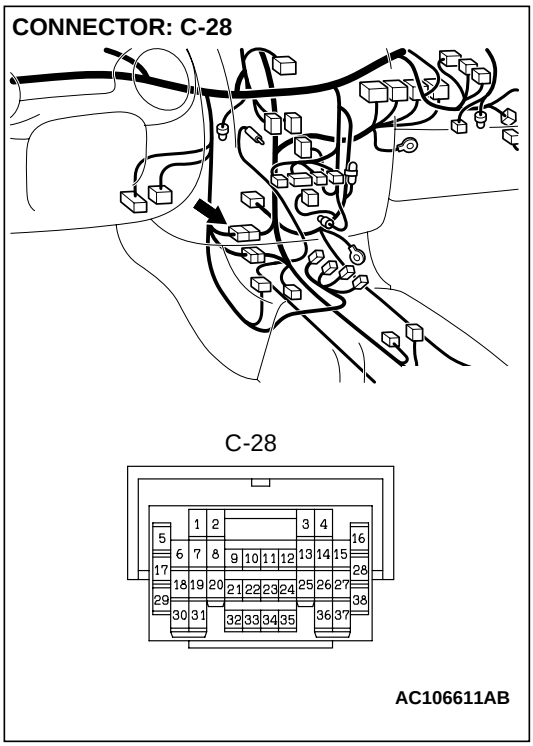
AC001837AI

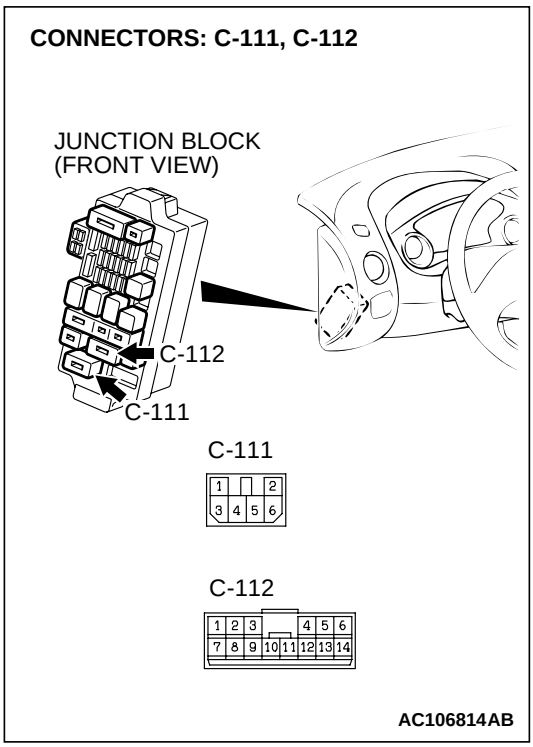
CONNECTORS: C-50 <2.4L ENGINE> OR C-52 <3.0L ENGINE>, C-61 <2.4L ENGINE> OR C-63 <3.0L ENGINE>



AC001657BG

TSB Revision





CIRCUIT OPERATION

- A coil built into the output shaft speed sensor generates a pulse signal at both ends of this coil when the output shaft rotates. The pulse signal frequency increases with a rise in output shaft speed.
- Both ends of the coil are connected to the PCM (terminals 16 and 104) via the output shaft speed sensor connector (terminals 1 and 2).
- The PCM detects the output shaft speed by the signal input to terminal 104.
- The output shaft speed sensor generates the pulse signal as the teeth of the transfer drive gear pass the magnetic tip of the sensor.

DTC SET CONDITIONS

If the output signal from the output shaft speed sensor has been lost for one second or more while the vehicle is being driven, it is judged to be an open circuit or short circuit in the output shaft speed sensor circuit and diagnostic trouble code number "23" is set. If diagnostic trouble code number "23" is output four times, the transaxle is locked into 3rd gear or 2nd gear as a fail-safe measure, and the "N" range light flashes once per second.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set:)

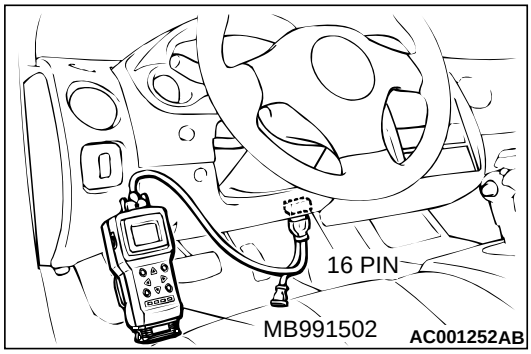
- Malfunction of the output shaft speed sensor
- Malfunction of the transfer drive gear or driven gear
- Damaged harness, connector
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

TSB Revision



STEP 1. Using scan tool MB991502, check data list item 23: Output Shaft Speed Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine.
(3) Set scan tool MB991502 to data reading mode for item 23: Output Shaft Speed Sensor.
- When driving at constant speed of 50km/h (31mph), the display should be "1,600 – 1,900 r/min." <2.4L Engine>, "1,300 – 1,600 r/min." <3.0L Engine> (Gear range: 3rd gear)

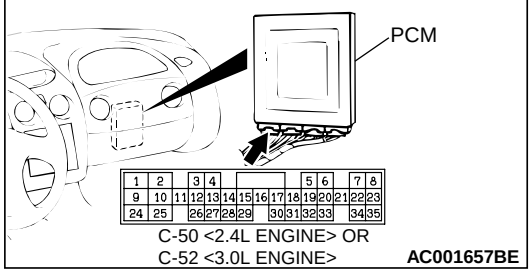
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.

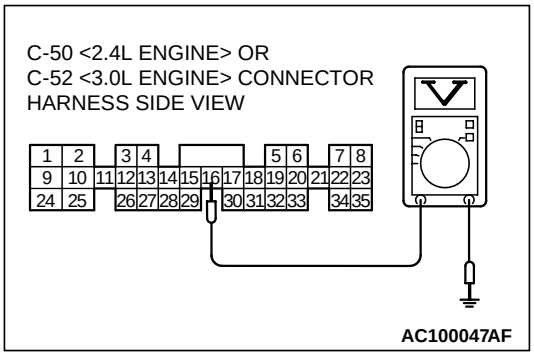
NO : Go to Step 2.

CONNECTOR: C-50 <2.4L ENGINE> OR C-52 <3.0L ENGINE>



STEP 2. Check the ground voltage at PCM connector C-50 <2.4L Engine> or C-52 <3.0L Engine> by backprobing.

(1) Do not disconnect connector C-50 <2.4L Engine> or C-52 <3.0L Engine>.
(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage between terminal 16 and ground by backprobing.
- Voltage should be 0.5 volt or less.

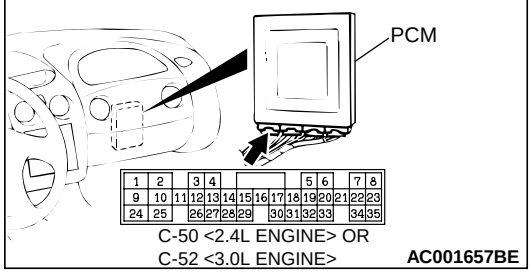
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 5.

NO : Go to Step 3.

CONNECTOR: C-50 <2.4L ENGINE> OR C-52 <3.0L ENGINE>



C-50 <2.4L ENGINE> OR C-52 <3.0L ENGINE>

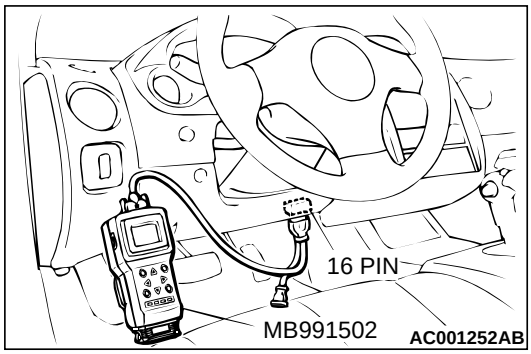
AC001657BE

STEP 3. Check connector C-50 <2.4L Engine> or C-52 <3.0L Engine> at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.

NO : Repair or replace it. Refer to GROUP 00, Harness Connector Inspection P.00E-2.



AC001252AB

STEP 4. Using scan tool MB991502, check data list item 23: Output Shaft Speed Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine.
(3) Set scan tool MB991502 to the data reading mode for item 23: Output Shaft Speed Sensor.
- When driving at constant speed of 50km/h (31mph), the display should be "1,600 – 1,900 r/min." <2.4L Engine>, "1,300 – 1,600 r/min." <3.0L Engine> (Gear range: 3rd gear)

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

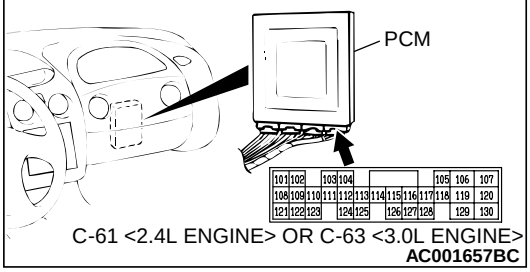
YES : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.

NO : Replace the PCM.

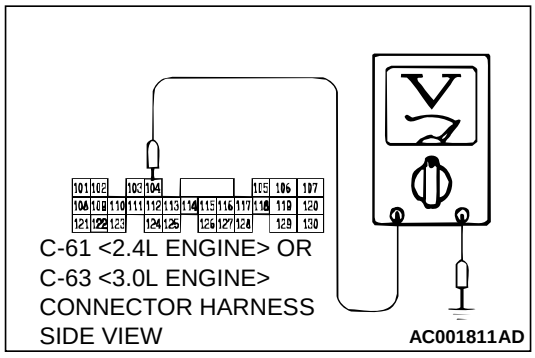
STEP 5. Check the sensor output voltage at PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> by backprobing.

(1) Do not disconnect connector C-61 <2.4L Engine> or C-63 <3.0L Engine>.
(2) Disconnect connector B-38 at the output shaft speed sensor.
(3) Turn the ignition switch to the "ON" position.

CONNECTOR: C-61 <2.4L ENGINE> OR C-63 <3.0L ENGINE>



AC001657BC



AC001811AD

(4) Measure the voltage between terminal 104 and ground by backprobing.
- Voltage should be between 4.5 and 4.9 volts.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

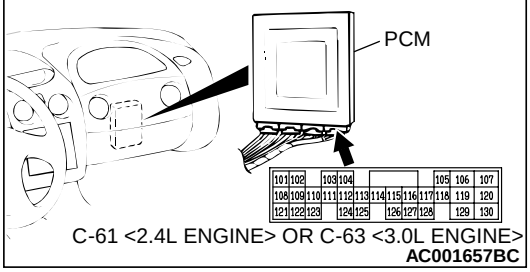
YES : Go to Step 8.
NO : Go to Step 6.

STEP 6. Check connectors C-61 <2.4L Engine> or C-63 <3.0L Engine> at PCM and B-38 at output shaft speed sensor for damage.

Q: Are the connectors in good condition?

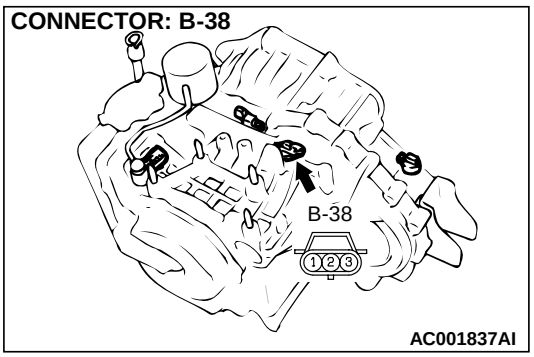
YES : Go to Step 7.
NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

CONNECTOR: C-61 <2.4L ENGINE> OR C-63 <3.0L ENGINE>



AC001657BC

CONNECTOR: B-38



AC001837AI

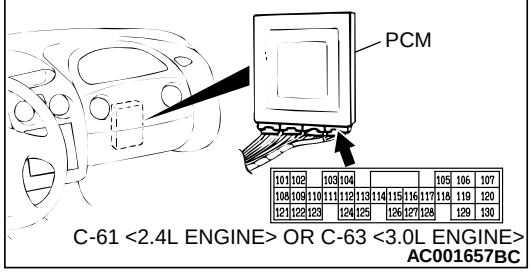
STEP 7. Check harness for short circuit to ground between PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> terminal 104 and output shaft speed sensor connector B-38 terminal 2.

Q: Is the harness wire in good condition?

YES : Go to Step 4.

NO : Repair it.

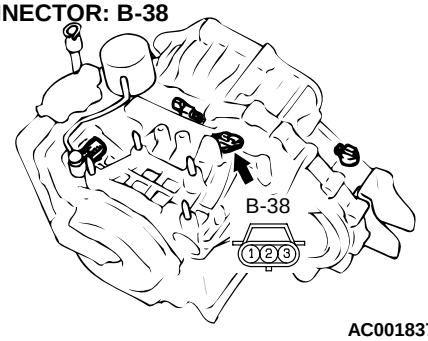
CONNECTOR: C-61 <2.4L ENGINE> OR C-63 <3.0L ENGINE>



C-61 <2.4L ENGINE> OR C-63 <3.0L ENGINE>

AC001657BC

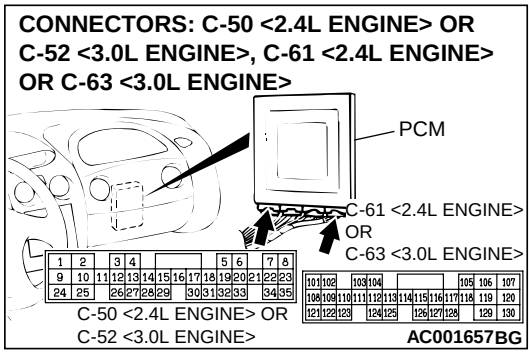
CONNECTOR: B-38



AC001837AI

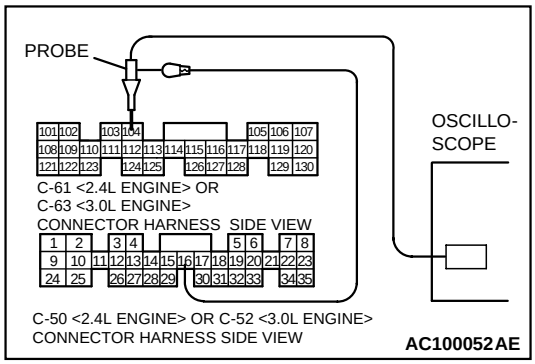
STEP 8. Using the oscilloscope, check the waveform at PCM connectors C-50 <2.4L Engine> or C-52 <3.0L Engine> and C-61 <2.4L Engine> or C-63 <3.0L Engine> by backprobing.

(1) Do not disconnect connectors C-50 <2.4L Engine> or C-52 <3.0L Engine> and C-61 <2.4L Engine> or C-63 <3.0L Engine>.



(2) Connect an oscilloscope probe to PCM connector C-50 <2.4L Engine> or C-52 <3.0L Engine> terminal 16 and to PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> terminal 104 by backprobing.

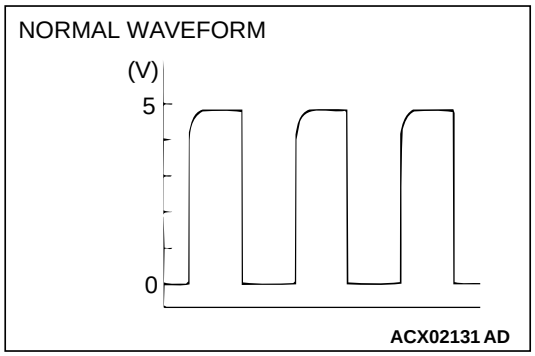
(3) Start the engine and run at constant speed of 50km/h (31mph). (Gear range: 3rd gear)



(4) Check the waveform.

- The waveform should show a pattern similar to the illustration. The maximum value should be 4.8 volts and more and the minimum value 0.8 volts and less. The output waveform should not contain electrical noise.

(5) Turn the ignition switch to the "LOCK" (OFF) position.



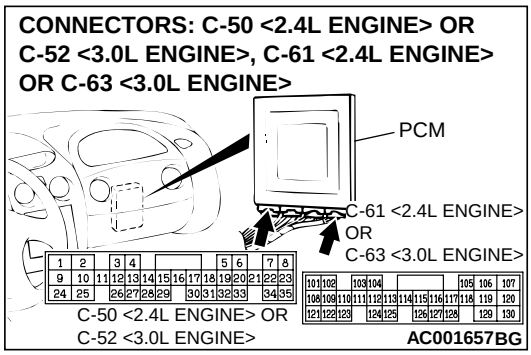
Q: Is the waveform normal?

YES : Go to Step 9.
NO : Go to Step 10.

STEP 9. Check connectors C-50 <2.4L Engine> or C-52 <3.0L Engine> and C-61 <2.4L Engine> or C-63 <3.0L Engine> at PCM for damage.

Q: Are the connectors in good condition?

YES : Go to Step 4.
NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

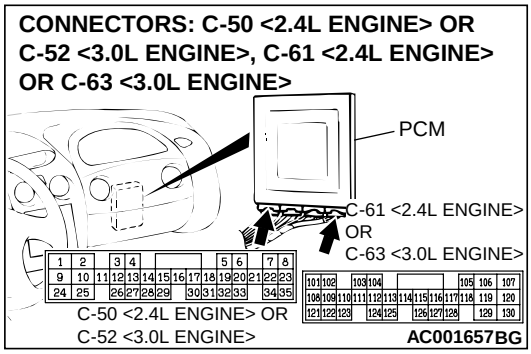


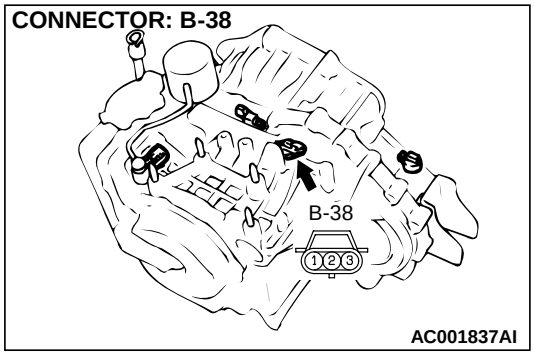
STEP 10. Check connectors C-50 <2.4L Engine> or C-52 <3.0L Engine> and C-61 <2.4L Engine> or C-63 <3.0L Engine> at PCM and B-38 at output shaft speed sensor for damage.

Q: Are the connectors in good condition?

YES : Go to Step 11.

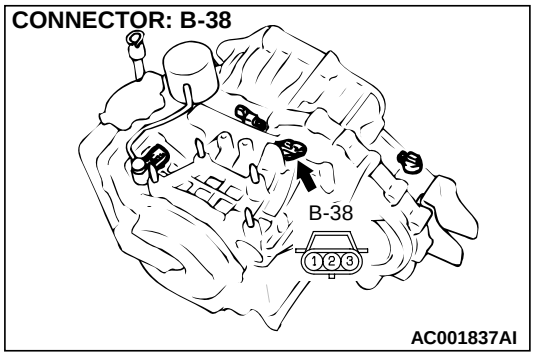
NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

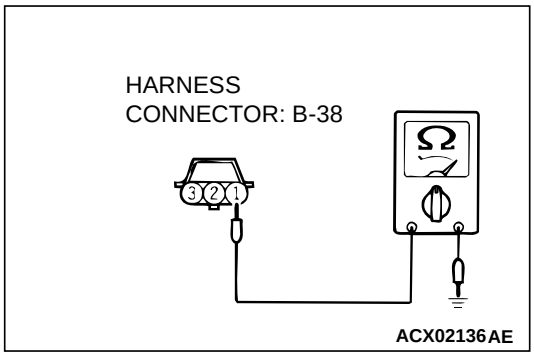




STEP 11. Check the continuity at output shaft speed sensor connector B-38.

(1) Disconnect connector B-38 and measure at the harness side.





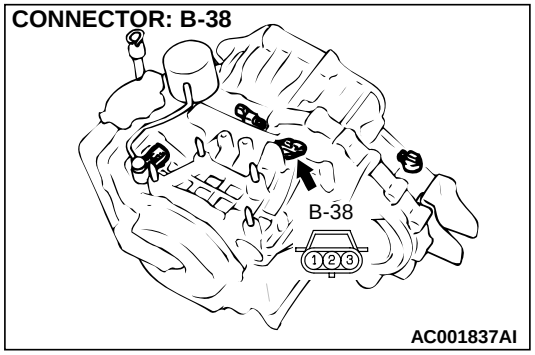
(2) Check for the continuity between terminal 1 and ground.
- Should be less than 2 ohm.

Q: Is the continuity normal?

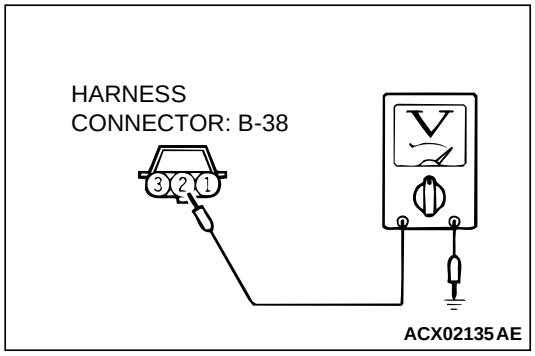
YES : Go to Step 12.

NO : Repair harness open circuit or damage between output shaft speed sensor connector B-38 terminal 1 and PCM connector C-50 <2.4L Engine> or C-52 <3.0L Engine> terminal 16.

STEP 12. Check the sensor output voltage at output shaft speed sensor connector B-38.



(1) Disconnect connector B-38 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.



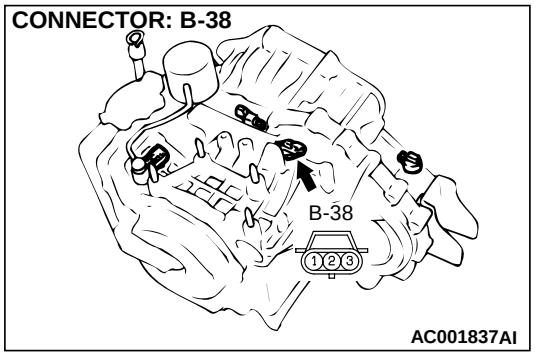
(3) Measure the voltage between terminal 2 and ground.
- Voltage should be between 4.5 and 4.9 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

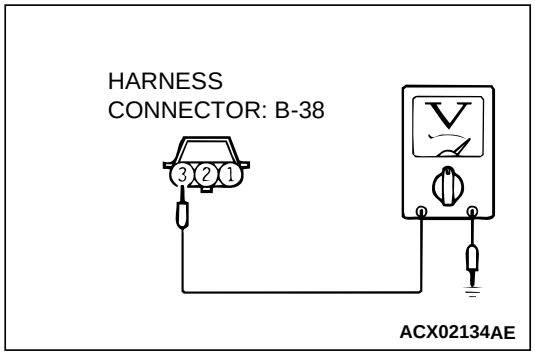
Q: Is the voltage normal?

YES : Go to Step 13.
NO : Repair harness open circuit between output shaft speed sensor connector B-38 terminal 2 and PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> terminal 104.

STEP 13. Check the power supply voltage at output shaft speed sensor connector B-38.



(1) Disconnect connector B-38 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.



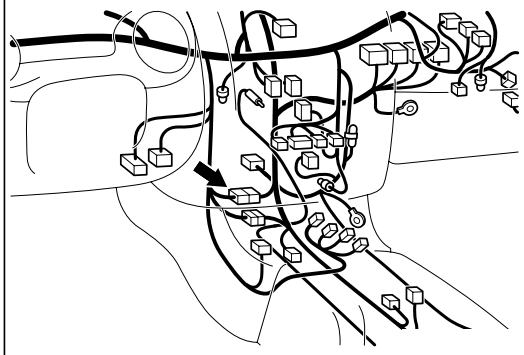
(3) Measure the voltage between terminal 3 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

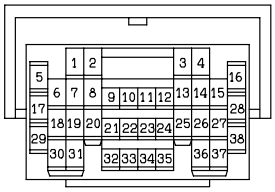
Q: Is the voltage normal?

YES : Go to Step 15.
NO : Go to Step 14.

CONNECTOR: C-28



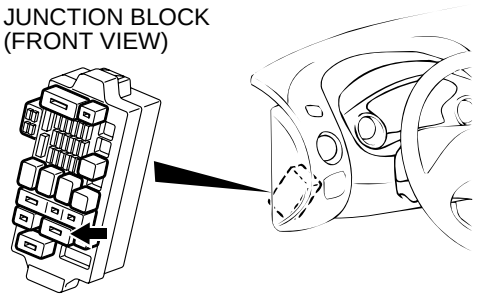
C-28



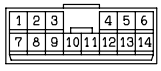
AC106611AB

CONNECTOR: C-112

JUNCTION BLOCK
(FRONT VIEW)



C-112

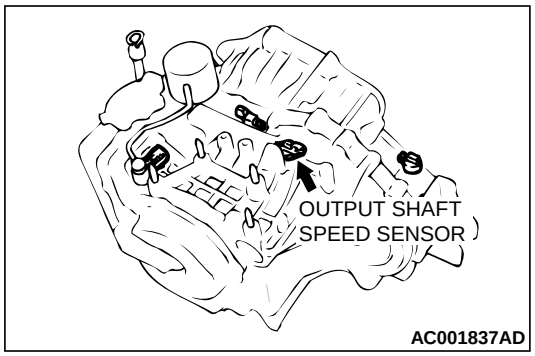


AC106612AB

STEP 14. Check connectors C-28 at intermediate connector and C-112 at junction block for damage.
Q: Are the connectors in good condition?

YES : Repair harness open circuit or short circuit to ground between output shaft speed sensor connector B-38 terminal 3 and junction block connector C-112 terminal 12.

NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



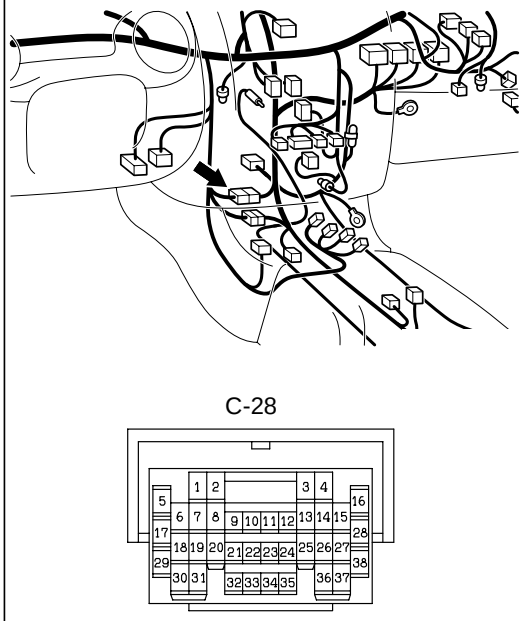
STEP 15. Replace the output shaft speed sensor.

(1) Replace the output shaft speed sensor. Refer to GROUP 23B, Transaxle P.23B-10.
(2) Test drive the vehicle.
(3) Check for A/T diagnostic trouble code.

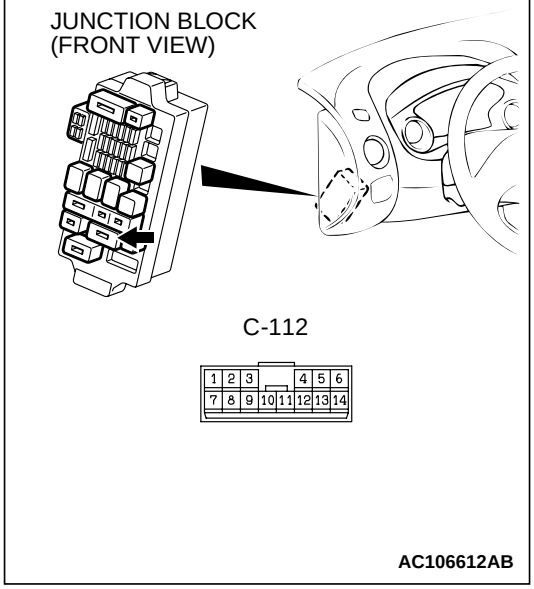
Q: Is the A/T diagnostic trouble code "23" output?

YES : Go to Step 18.
NO : The inspection is complete.

CONNECTOR: C-28



CONNECTOR: C-112



STEP 16. Check connectors C-28 at intermediate connector and C-112 at junction block for damage.
Q: Are the connectors in good condition?

YES : Go to Step 17.
NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

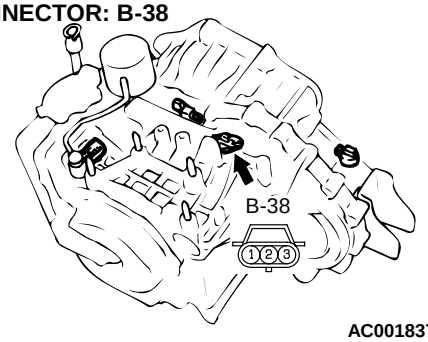
STEP 17. Check harness for damage between output shaft speed sensor harness side connector B-38 terminal 2 and PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> terminal 104.

Q: Is the harness wire in good condition?

YES : Go to Step 18.

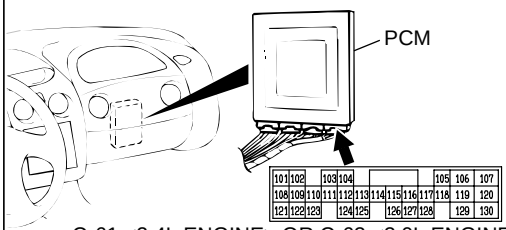
NO : Repair it.

CONNECTOR: B-38



AC001837AI

CONNECTOR: C-61 <2.4L ENGINE> OR C-63 <3.0L ENGINE>



C-61 <2.4L ENGINE> OR C-63 <3.0L ENGINE>

AC001657BC

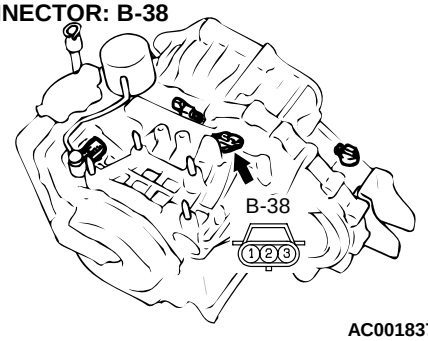
STEP 18. Check harness for damage between output shaft speed sensor harness side connector B-38 terminal 1 and PCM connector C-50 <2.4L Engine> or C-52 <3.0L Engine> terminal 16.

Q: Is the harness wire in good condition?

YES : Go to Step 19.

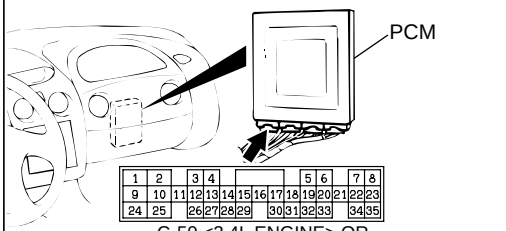
NO : Repair it.

CONNECTOR: B-38



AC001837AI

CONNECTOR: C-50 <2.4L ENGINE> OR C-52 <3.0L ENGINE>



C-50 <2.4L ENGINE> OR
C-52 <3.0L ENGINE>

AC001657BE

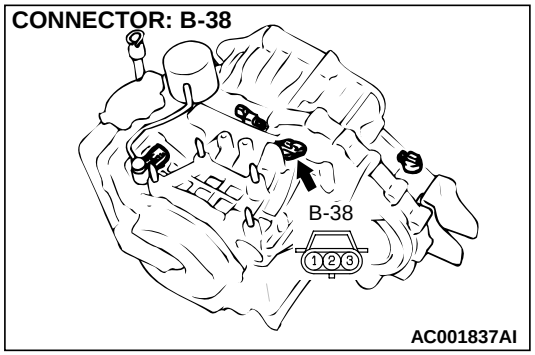
TSB Revision

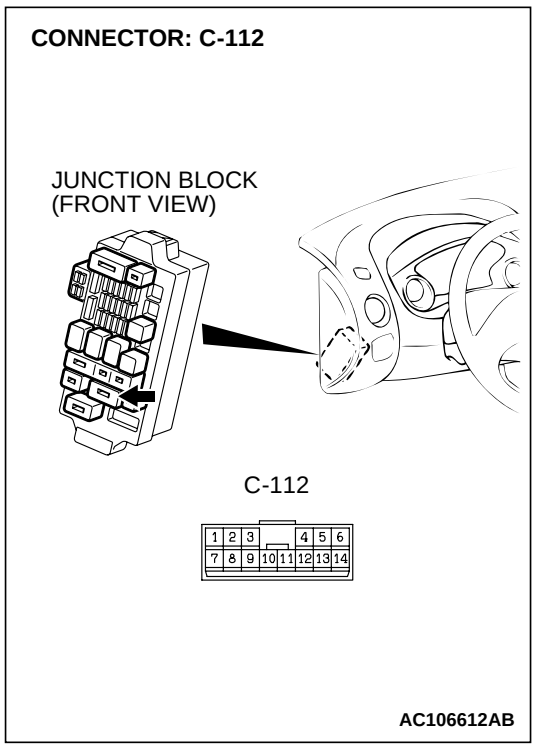
STEP 19. Check harness for damage between output shaft speed sensor harness side connector B-38 terminal 3 and junction block connector C-112 terminal 12.

Q: Is the harness wire in good condition?

YES : Go to Step 20.

NO : Repair it.





STEP 20. Replace the transfer drive gear or driven gear.

(1) Replace the transfer drive gear driven gear. Refer to GROUP 23B, Transaxle P.23B-10, Output Shaft P.23B-68.

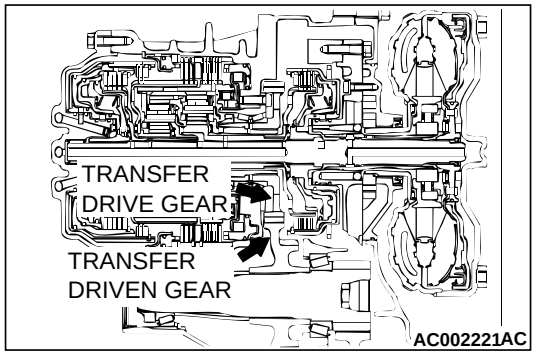
(2) Test drive the vehicle.

(3) Check for A/T diagnostic trouble code.

Q: Is the A/T diagnostic trouble code number "23" output?

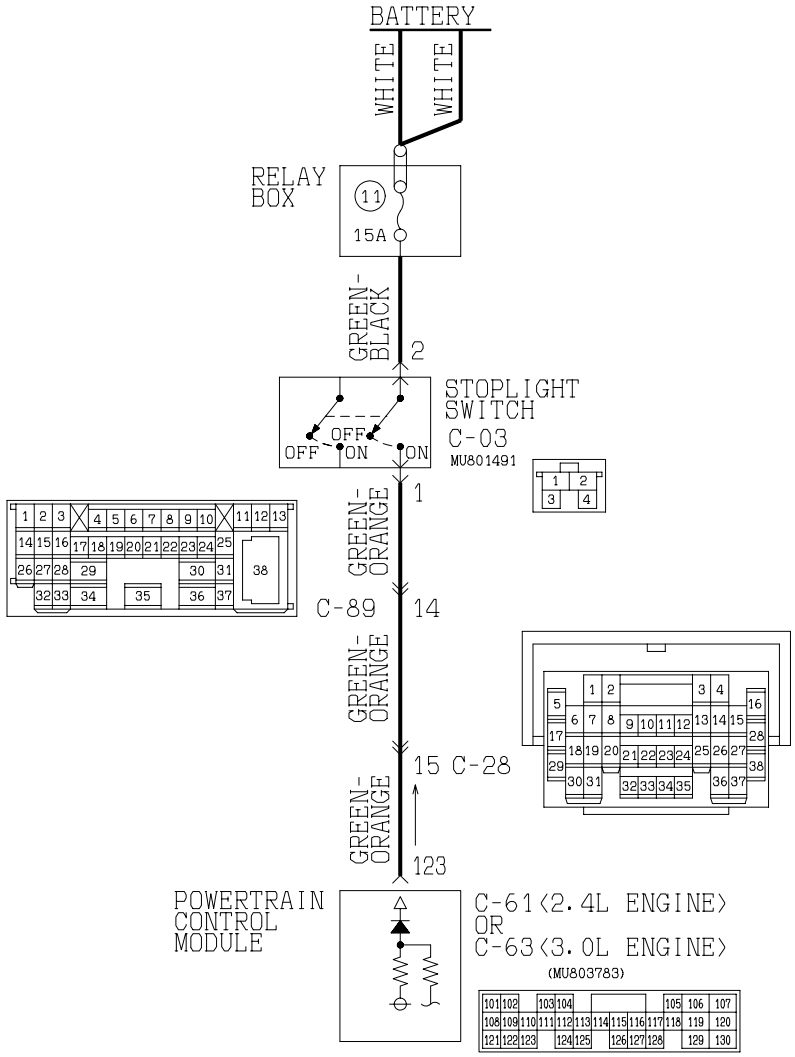
YES : The A/T diagnostic trouble code may have set due to external radio frequency (RFI), possibility caused by cellular phone activity, after market components installed on the vehicle, etc.

NO : The inspection is complete.



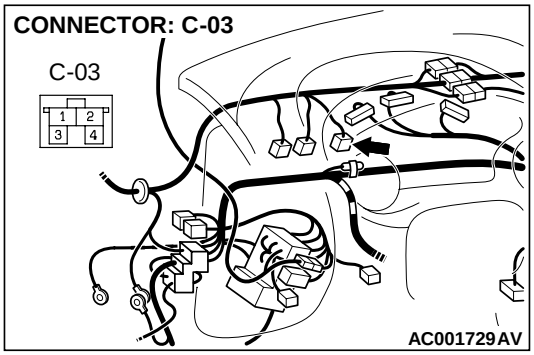
DTC 26: Stoplight Switch System

Stoplight Switch System Circuit



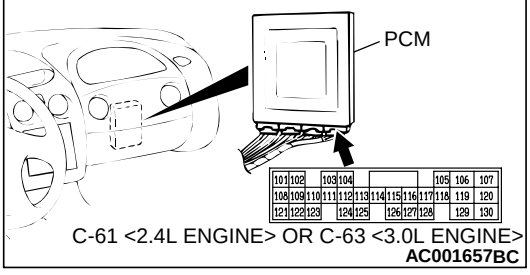
W3S11M04AA
AC106632AB

CONNECTOR: C-03



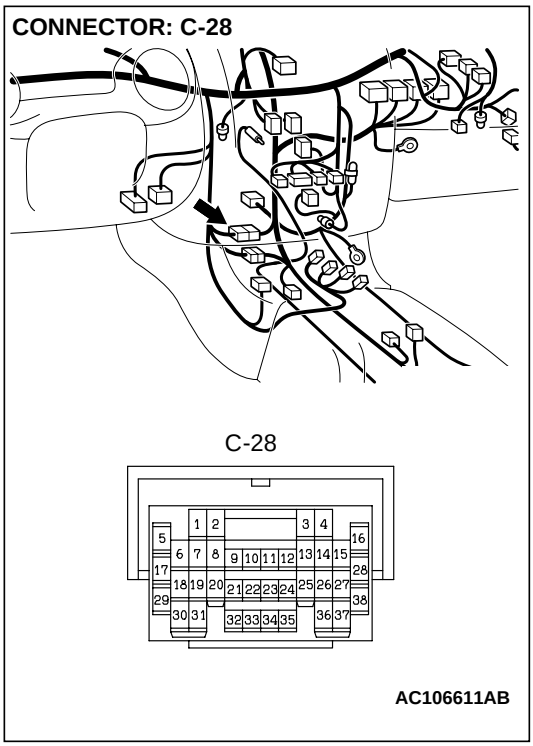
AC001729AV

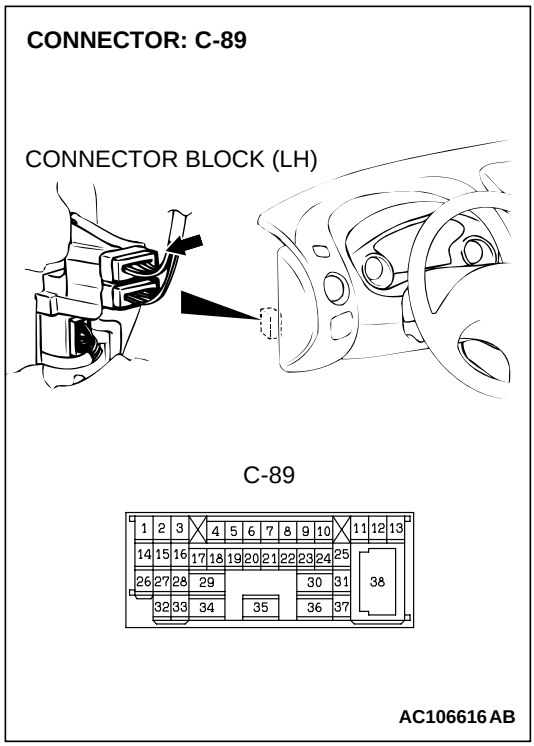
CONNECTOR: C-61 <2.4L ENGINE> OR C-63 <3.0L ENGINE>



C-61 <2.4L ENGINE> OR C-63 <3.0L ENGINE>
AC001657BC

TSB Revision





CIRCUIT OPERATION

- Battery positive voltage is supplied to the stoplight switch (terminal 2).
- When the brake pedal is depressed, battery positive voltage is applied to the PCM (terminal 123). The PCM judges that the brake pedal is depressed and the stoplight switch is on when battery positive voltage is sensed at the PCM (terminal 123).

DTC SET CONDITIONS

If the stoplight switch is on for five minutes or more while driving 50 km/h (31 mph), it is judged there is a short circuit in the stoplight switch and diagnostic trouble code number "26" is output.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set:)

- Malfunction of the stoplight switch circuit
- Damaged harness, connector
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:

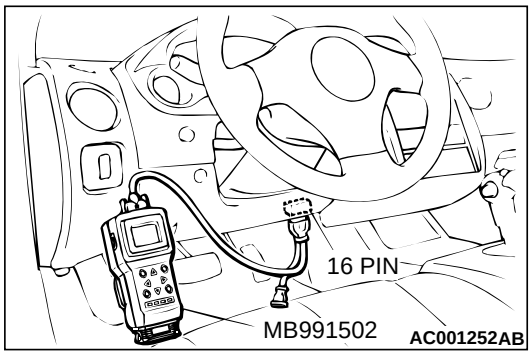
- MB991502: Scan Tool (MUT-II)

STEP 1. Check the brake pedal height.

Refer to GROUP 35A, On-vehicle Service – Brake Pedal Check and Adjustment P.35A-17.

Q: Is the height adjusted properly?

YES : Go to Step 2.
NO : Adjust it.



STEP 2. Using scan tool MB991502, check data list item 26: Stoplight Switch.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

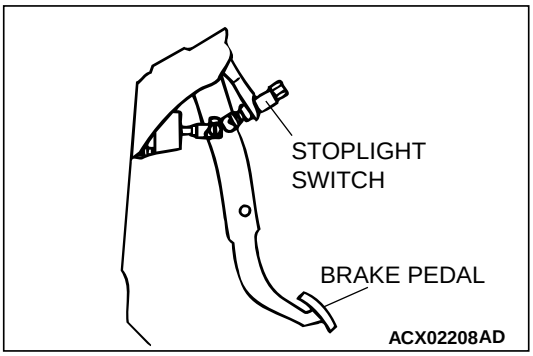
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to data reading mode for item 26, Stoplight Switch.
- When the brake pedal is depressed, the display should be "ON."
- When the brake pedal is not depressed, the display should be "OFF."

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the switch operating properly?

YES : This malfunction may be intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.

NO : Go to Step 3.



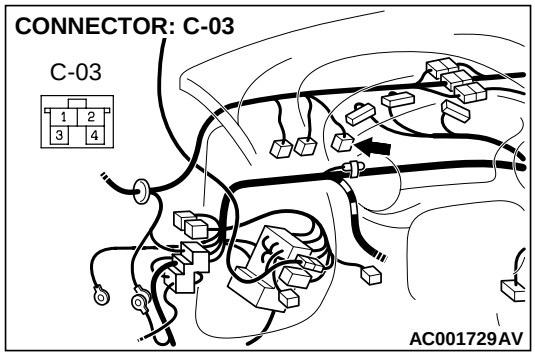
STEP 3. Check the stoplight switch as single part.

Refer to GROUP 35A, On-vehicle Service – Stoplight Switch Check P.35A-18.

Q: Is the switch normal?

YES : Go to Step 4.

NO : Replace the stoplight switch. Refer to GROUP 35A, Stoplight Switch Check P.35A-18.



STEP 4. Check connector C-03 at stoplight switch for damage.

Q: Is the connector in good condition?

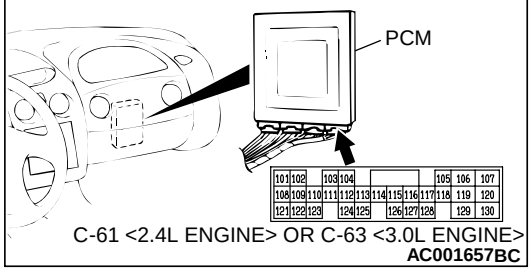
YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

STEP 5. Check the switch output voltage at PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> by backprobing.

(1) Do not disconnect connector C-61 <2.4L Engine> or C-63 <3.0L Engine>.

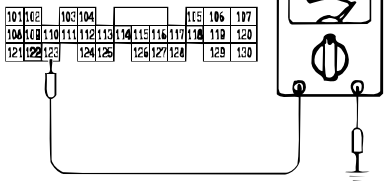
CONNECTOR: C-61 <2.4L ENGINE> OR C-63 <3.0L ENGINE>



C-61 <2.4L ENGINE> OR C-63 <3.0L ENGINE>

AC001657BC

C-61 <2.4L ENGINE> OR
C-63 <3.0L ENGINE>
CONNECTOR HARNESS
SIDE VIEW



AC001812 AD

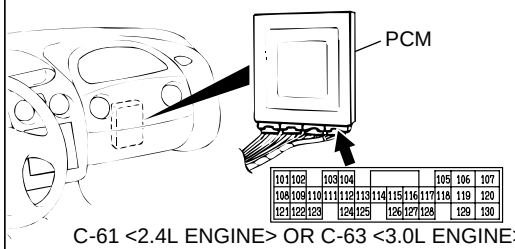
(2) Measure the voltage between terminal 123 and ground by backprobing.
- When the brake pedal is depressed, voltage should be battery positive voltage.
- When the brake pedal is not depressed, voltage should be less than 1.0 volt.

Q: Is the voltage normal?

YES : Go to Step 8.
NO : Go to Step 6.

STEP 6. Check connectors C-61 <2.4L Engine> or C-63 <3.0L Engine> at PCM and C-89, C-28 at intermediate connector for damage.

CONNECTOR: C-61 <2.4L ENGINE> OR C-63 <3.0L ENGINE>

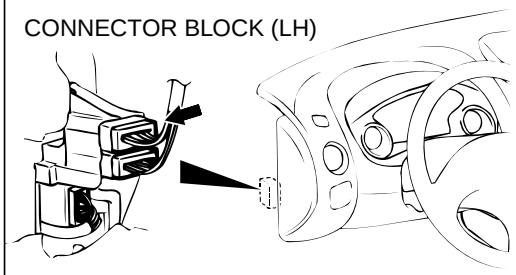


C-61 <2.4L ENGINE> OR C-63 <3.0L ENGINE>

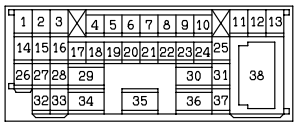
AC001657BC

CONNECTOR: C-89

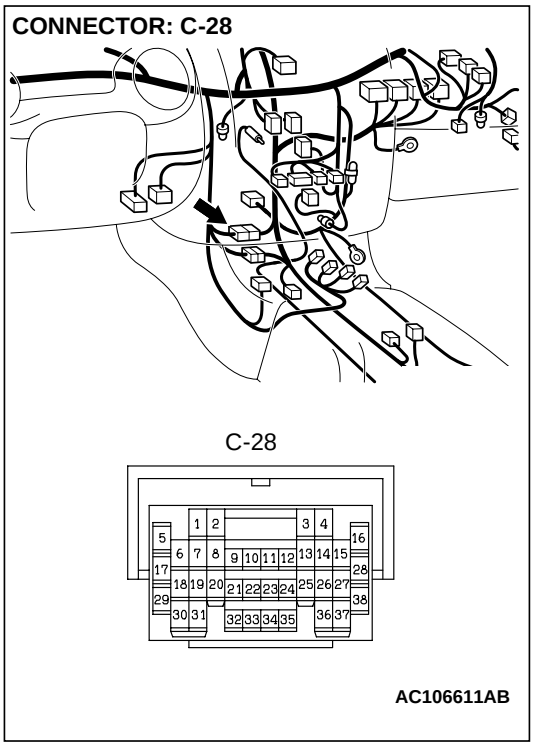
CONNECTOR BLOCK (LH)



C-89



AC106616 AB



Q: Are the connectors in good condition?

YES : Go to Step 7.

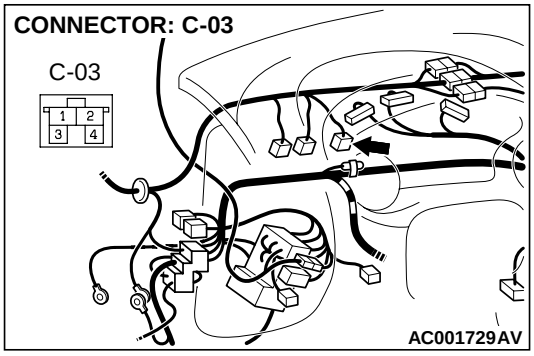
NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

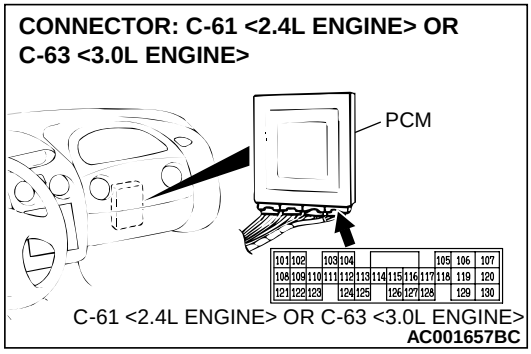
STEP 7. Check harness for damage between stoplight switch connector C-03 terminal 1 and PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> terminal 123.

Q: Is the harness wire in good condition?

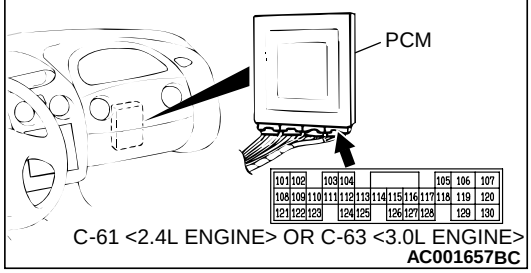
YES : Go to Step 9.

NO : Repair it.





CONNECTOR: C-61 <2.4L ENGINE> OR C-63 <3.0L ENGINE>



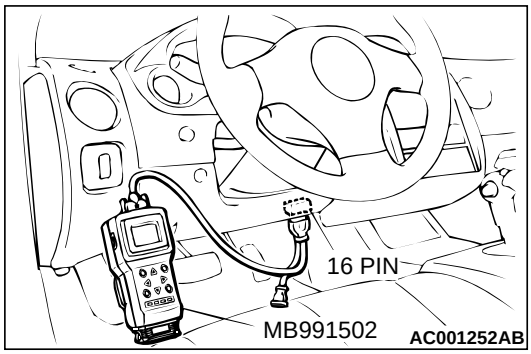
C-61 <2.4L ENGINE> OR C-63 <3.0L ENGINE>
AC001657BC

STEP 8. Check connector C-61 <2.4L Engine> or C-63 <3.0L Engine> at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



AC001252AB

STEP 9. Using scan tool MB991502, check data list item 26: Stoplight Switch.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to data reading mode for item 26: Stoplight Switch.
- When the brake pedal is depressed, the display should be "ON."
- When the brake pedal is not depressed, the display should be "OFF."

(4) Turn the ignition switch to the "LOCK" (OFF) position.

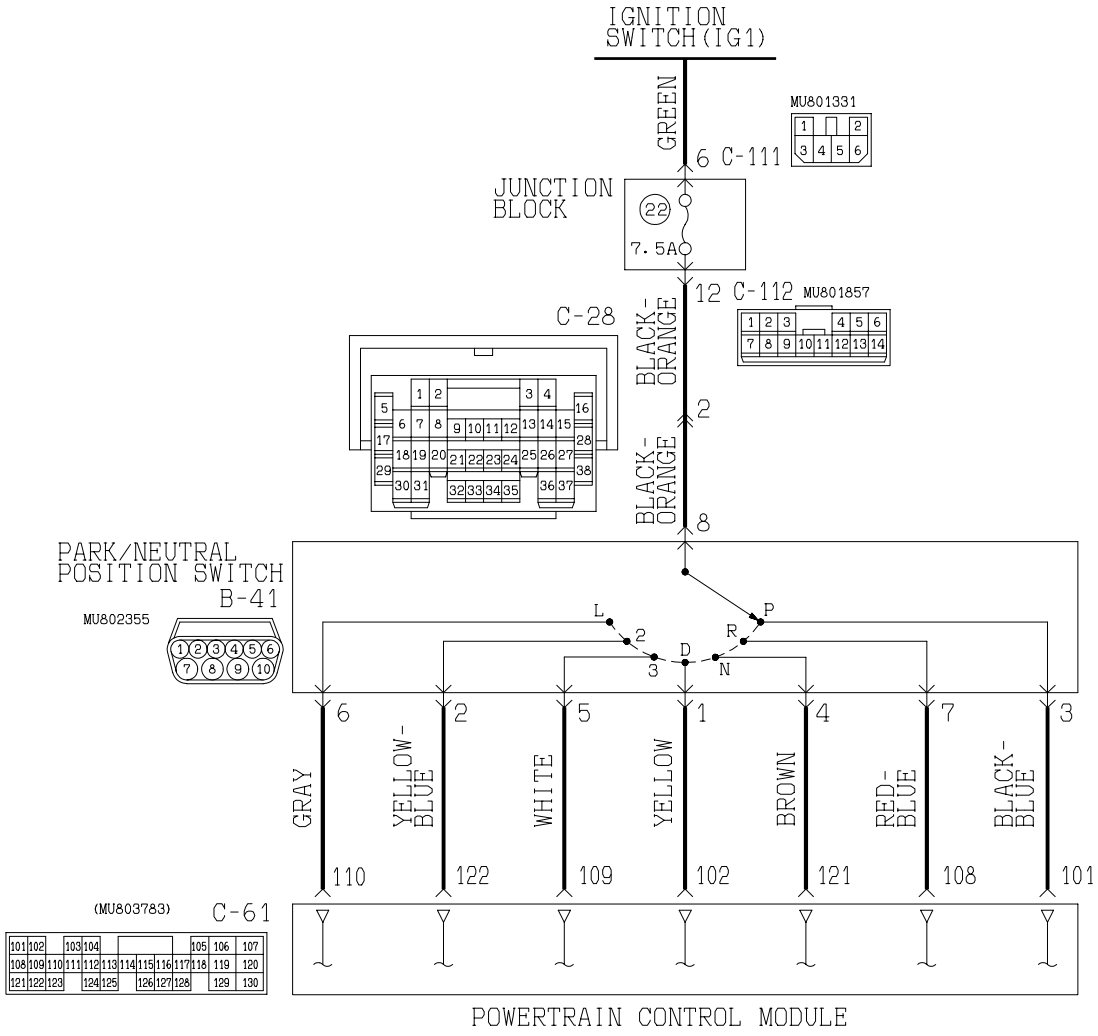
Q: Is the switch operating properly?

YES : This malfunction may be intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.

NO : Replace the PCM.

DTC 27: Park/Neutral Position Switch System (Open Circuit)

Park/Neutral Position Switch System Circuit <Vehicles without Sport Mode>



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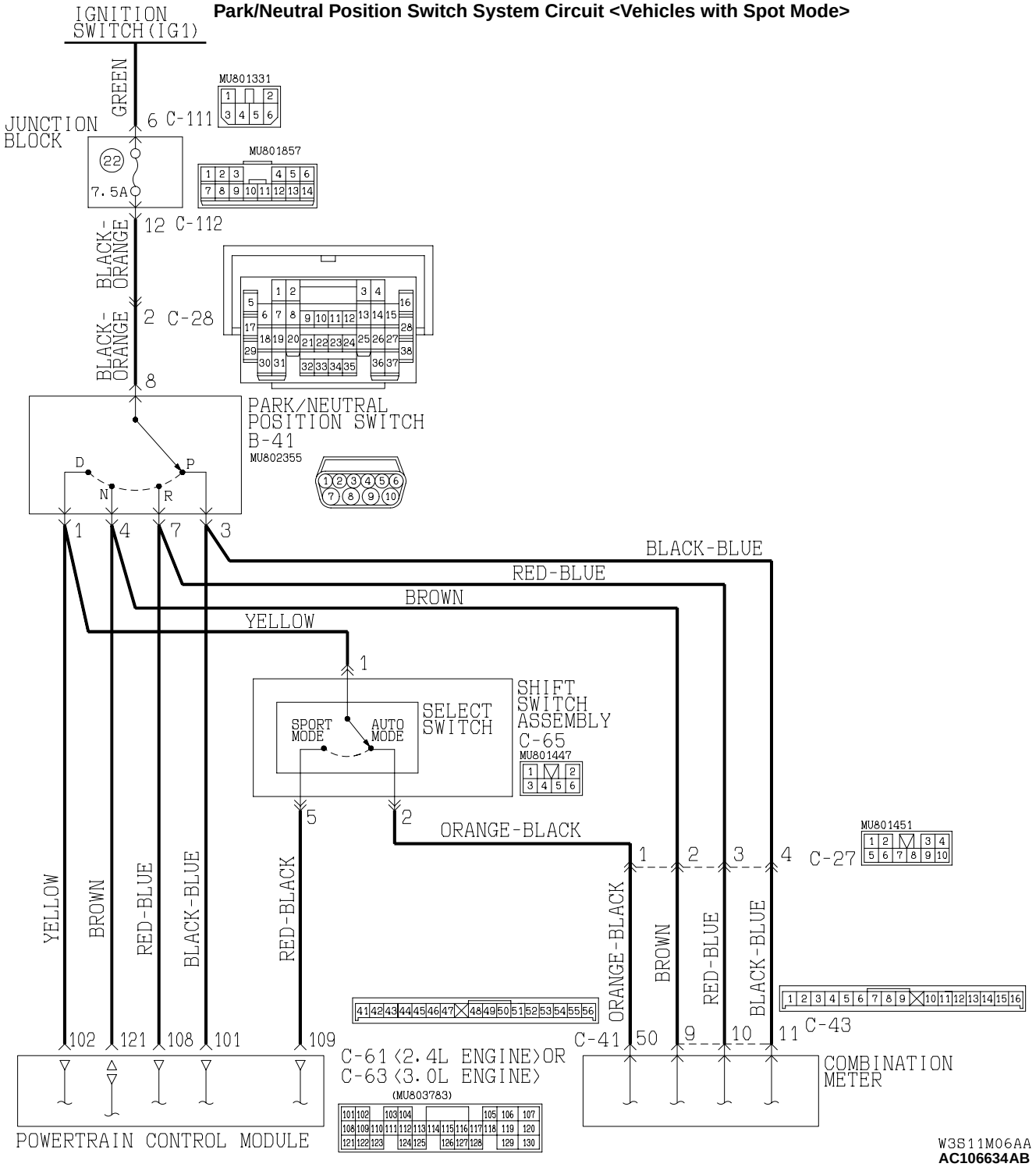
AC106633AB

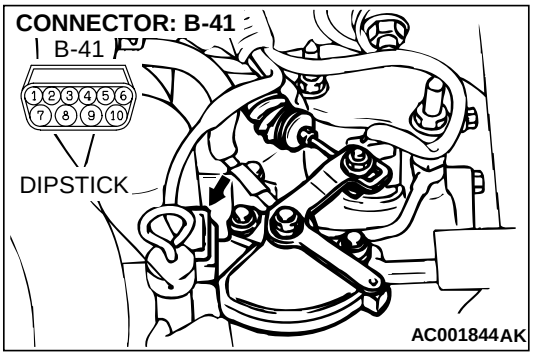
TSB Revision

Park/Neutral Position Switch System Circuit <Vehicles with Spot Mode>

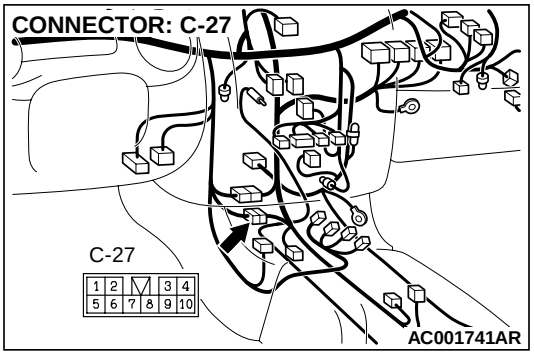


TSB Revision

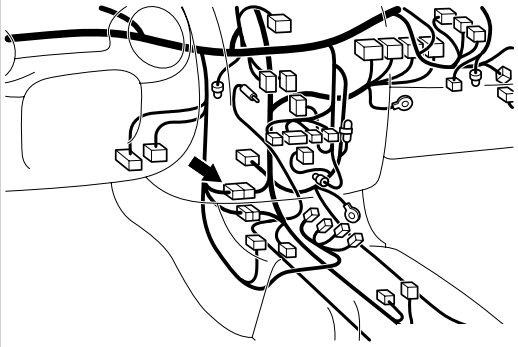
CONNECTOR: B-41



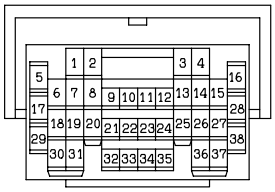
CONNECTOR: C-27



CONNECTOR: C-28



C-28



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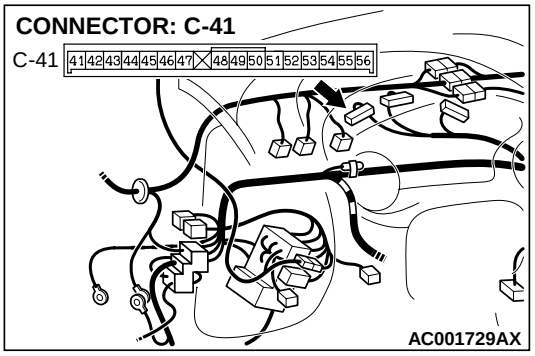
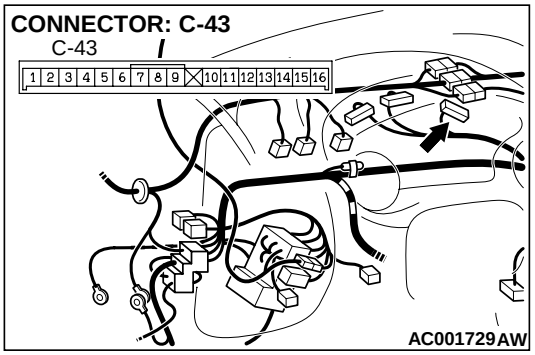
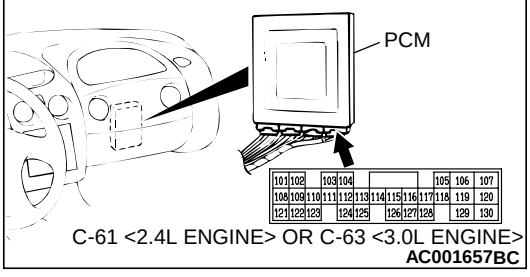
CONNECTOR: C-41



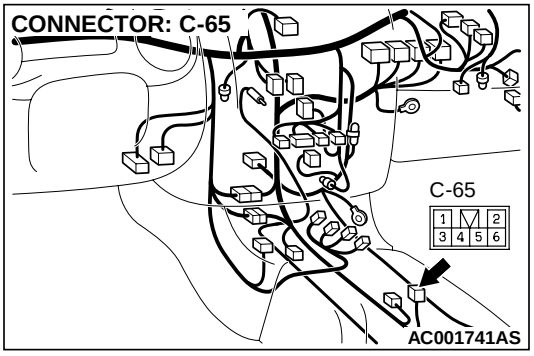
CONNECTOR: C-43

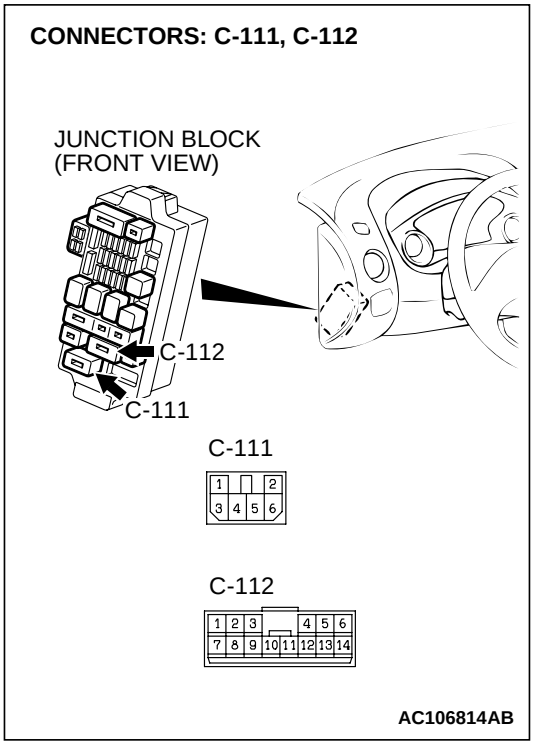


CONNECTOR: C-61 <2.4L ENGINE> OR C-63 <3.0L ENGINE>



CONNECTOR: C-65





CIRCUIT OPERATION

- Battery positive voltage is applied to the Park/ Neutral position switch (terminal 8) when the ignition switch is turned "ON."
- Battery positive voltage is applied to the PCM (terminal 101) when the selector lever is in the "P" range. The PCM judges that the selector lever is in the "P" range when the battery positive voltage is applied.
- Battery positive voltage is applied to the PCM terminal 108 (121, 102, 109, 122 or 110) when the selector lever is in the "R" range ("N," "D," "3," "2" or "L" range). The PCM judges that the selector lever is in the "R" range ("N," "D," "3," "2" or "L" range) when the battery positive voltage is applied.

DTC SET CONDITIONS

If the PCM detects no Park/Neutral position switch input signal from any selector position for continuous period of thirty seconds, it is judged that there is an open circuit in the Park/Neutral position switch and diagnostic trouble code number "27" is output.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set:)

- Malfunction of the Park/Neutral position switch
- Malfunction of the ignition switch
- Damaged harness, connector
- Malfunction of the PCM

DIAGNOSIS

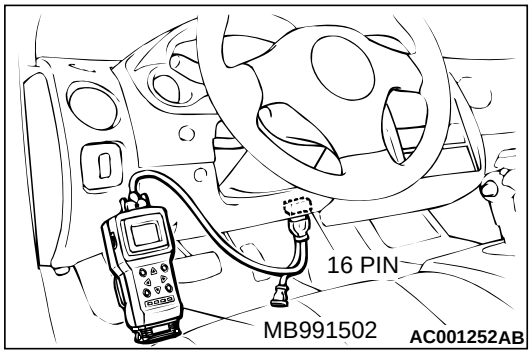
Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check data list item 61: Park/Neutral Position Switch.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.



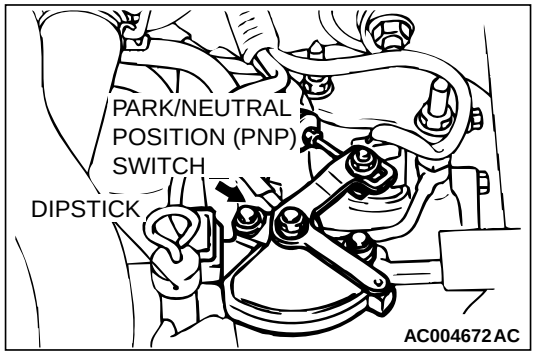
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to data reading mode for item 61: Park/Neutral Position Switch.
  - Move the selector lever to "P," "R," "N," "D," "3," "2," "L" and sport mode positions to confirm whether shown on the scan tool. (Vehicles with sport mode is indicated as "D" on the scan tool.)

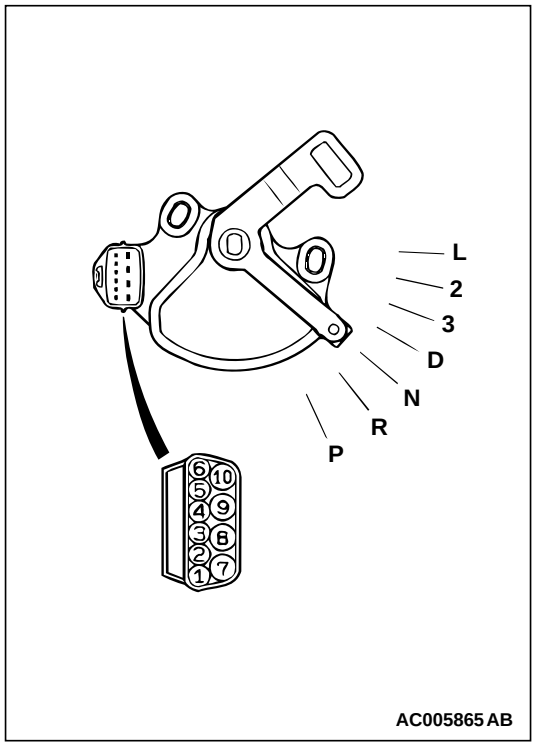
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the switch operating properly?

YES : This malfunction can be intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.

NO : When indication disagrees at all positions: Go to Step 2. When indication disagrees at "P" position: Go to Step 6. When indication disagrees at "R" position: Go to Step 13. When indication disagrees at "N" position: Go to Step 19. When indication disagrees at "D" position: Go to Step 25. When indication disagrees at "3" position: Go to Step 32 . When indication disagrees at "2" position: Go to Step 36. When indication disagrees at "L" position: Go to Step 40. When indication disagrees at sport mode position (agrees at "D" position): Go to Step 44.





STEP 2. Check the Park/Neutral position switch.

ITEMS	TERMINAL CONNECTION OF TESTER	SPECIFIED CONDITION
P	3 – 8, 9 – 10	Less than 2 ohm
R	7 – 8	
N	4 – 8, 9 – 10	
D	1 – 8	
3	5 – 8	
2	2 – 8	
L	6 – 8	

Check for continuity between terminals for each selector position.

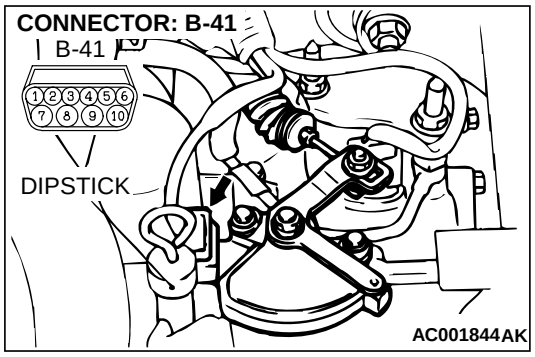
NOTE: For vehicles with sport mode, four positions (P, R, N, D) are used.

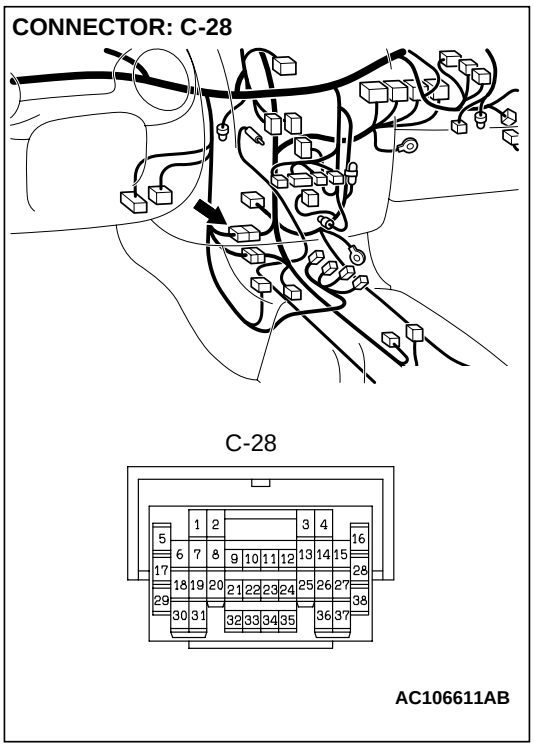
Q: Is the switch operating properly?

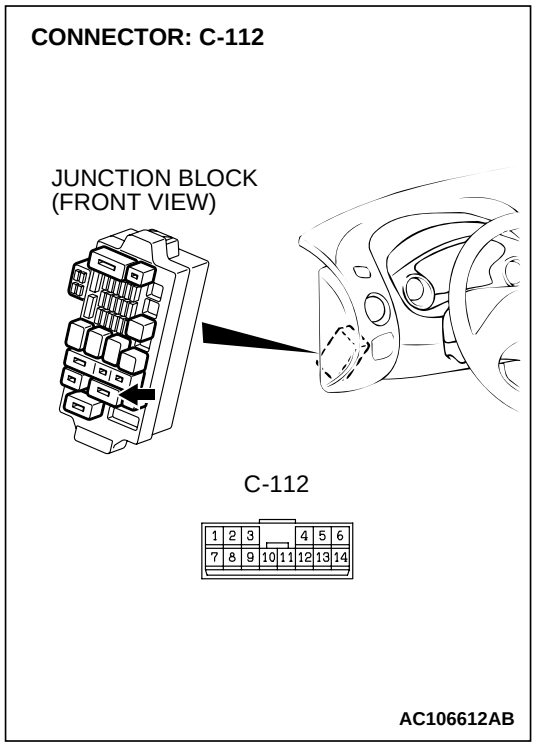
YES : Go to Step 3.

NO : Replace the Park/Neutral position switch. Refer to GROUP 23B, Transaxle P.23B-10.

STEP 3. Check connectors B-41 at Park/Neutral position switch, C-28 at intermediate connector and C-112 at junction block for damage.



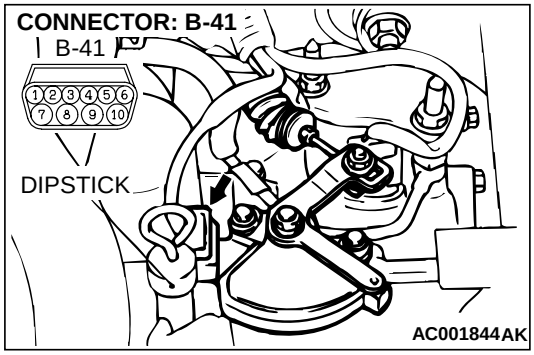


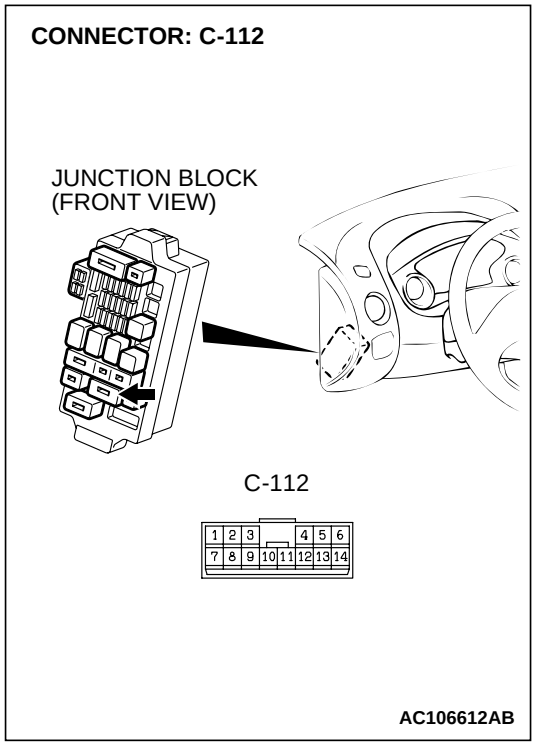


Q: Are the connectors in good condition?

YES : Go to Step 4.

NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



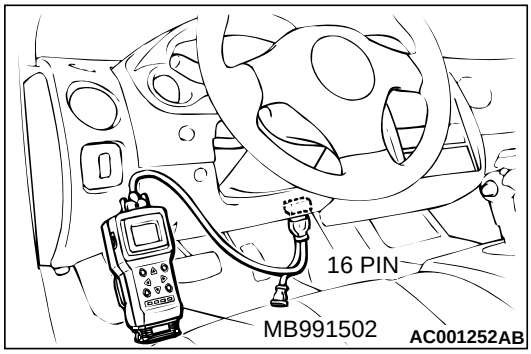


STEP 4. Check harness for open circuit or short circuit to ground between Park/Neutral position switch connector B-41 terminal 8 and junction block connector C-112 terminal 12.

Q: Is the harness wire in good condition?

YES : Go to Step 5.

NO : Repair it.



STEP 5. Using scan tool MB991502, check data list item 61: Park/Neutral Position Switch.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

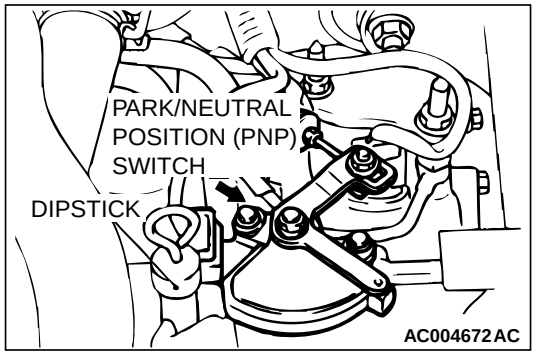
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to data reading mode for item 61: Park/Neutral Position Switch.
- Move the selector lever to "P," "R," "N," "D," "3," "2," "L" and sport mode positions to confirm whether shown on the scan tool. (Vehicles with sport mode is indicated as "D" on the scan tool.)

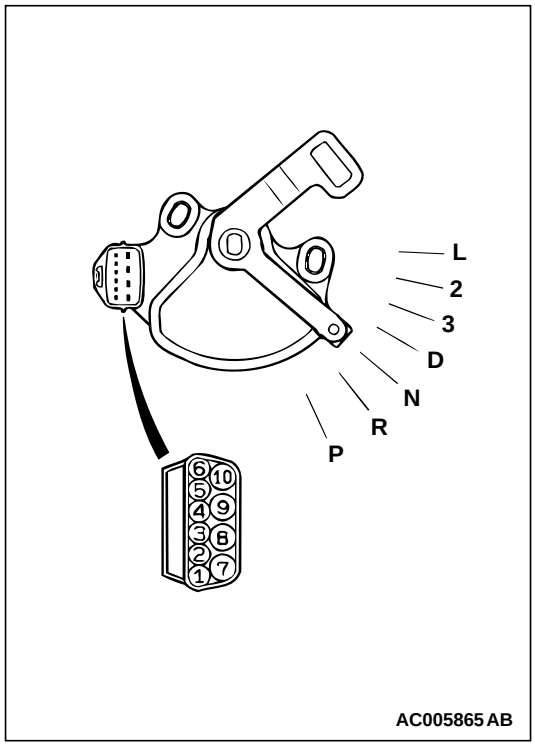
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the switch operating properly?

YES : This malfunction can be intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.

NO : Replace the PCM.





STEP 6. Check the Park/Neutral position switch.

ITEMS	TERMINAL CONNECTION OF TESTER	SPECIFIED CONDITION
P	3 – 8, 9 – 10	Less than 2 ohm
R	7 – 8	
N	4 – 8, 9 – 10	
D	1 – 8	
3	5 – 8	
2	2 – 8	
L	6 – 8	

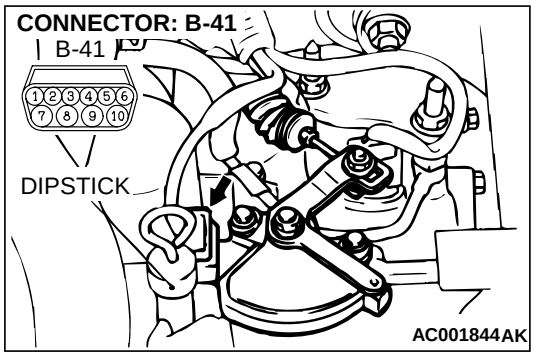
Check for continuity between terminals for each selector position.

NOTE: For vehicles with sport mode, four positions (P, R, N, D) are used.

Q: Is the switch operating properly?

YES : Go to Step 7.

NO : Replace the Park/Neutral position switch. Refer to GROUP 23B, Transaxle P.23B-10.



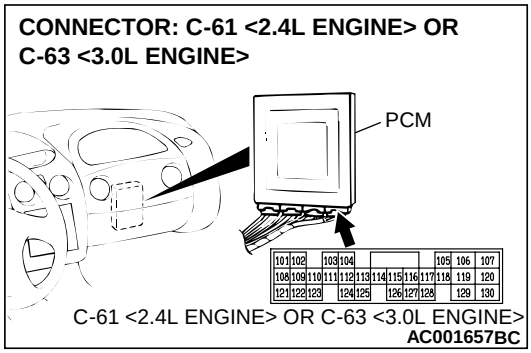
STEP 7. Check connector B-41 at the Park/Neutral position switch for damage.

Q: Is the connector in good condition?

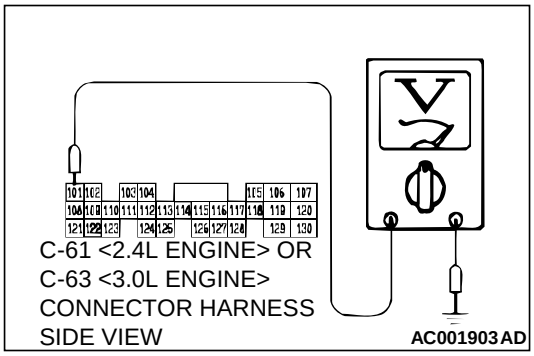
YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

STEP 8. Check the switch output voltage at PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> by backprobing.



(1) Do not disconnect connector C-61 <2.4L Engine> or C-63 <3.0L Engine>.
(2) Turn the ignition switch to the "ON" position.
(3) Move the selector lever to the "P" position.



(4) Measure the voltage between terminal 101 and ground by backprobing.
- Voltage should be battery positive voltage.

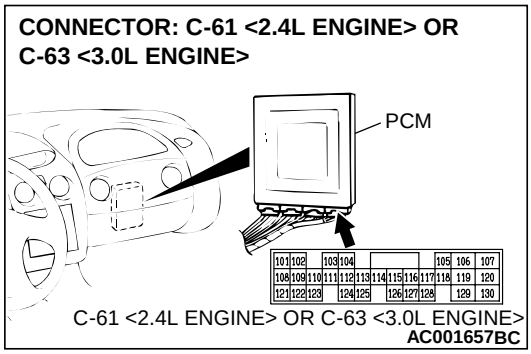
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 12.
NO : Go to Step 9.

STEP 9. Check connector C-61 <2.4L Engine> or C-63 <3.0L Engine> at PCM for damage.

Q: Is the connector in good condition?



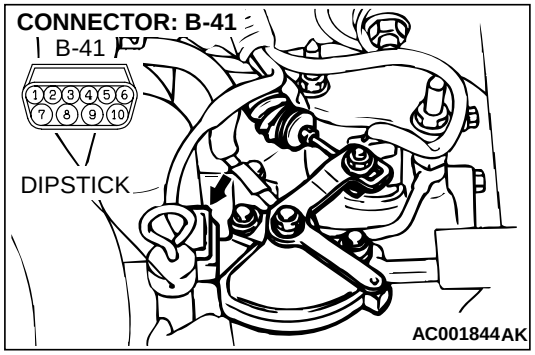
YES : Go to Step 10 <Vehicles with sports mode>. Repair harness open circuit or short circuit to ground between Park/Neutral position switch connector B-41 terminal 3 and PCM connector C-61 terminal 101 <Vehicles without sports mode>.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

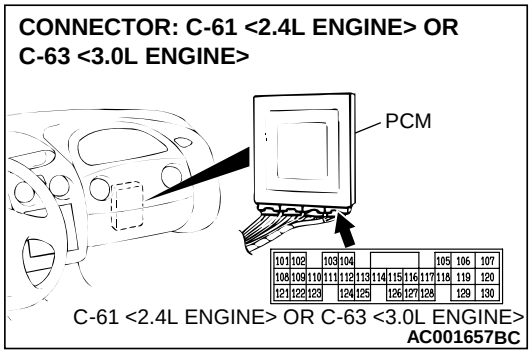
STEP 10. Check harness for open circuit or short circuit to ground between Park/Neutral position switch connector B-41 terminal 3 and PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> terminal 101 <Vehicles with sport mode>.

Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair it.



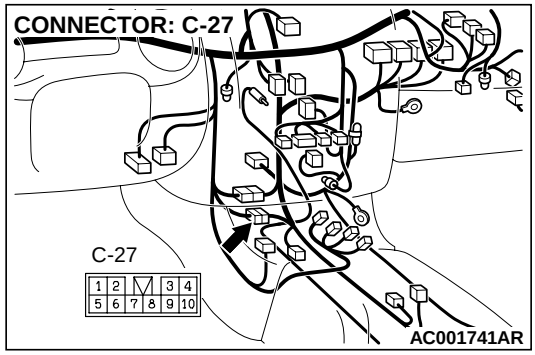


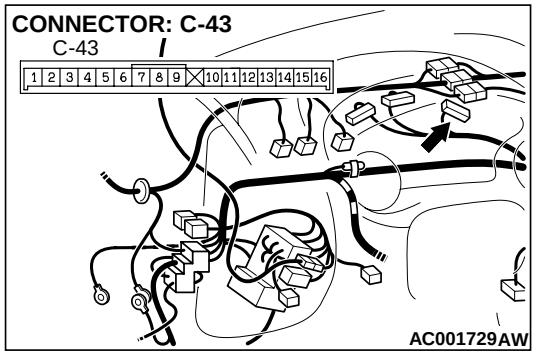
STEP 11. Check connectors C-27 at intermediate connector and C-43 at combination meter for damage <Vehicles with sport mode>.

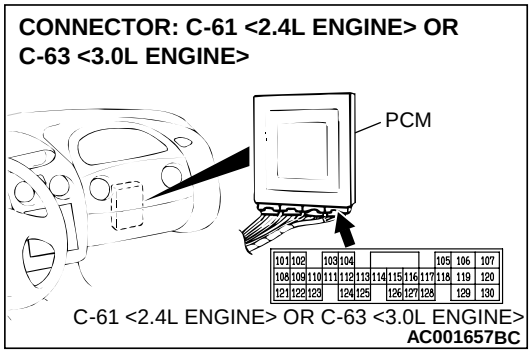
Q: Are the connectors in good condition?

YES : Repair harness short circuit to ground between Park/Neutral position switch connector B-41 terminal 3 and combination meter connector C-43 terminal 11.

NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.





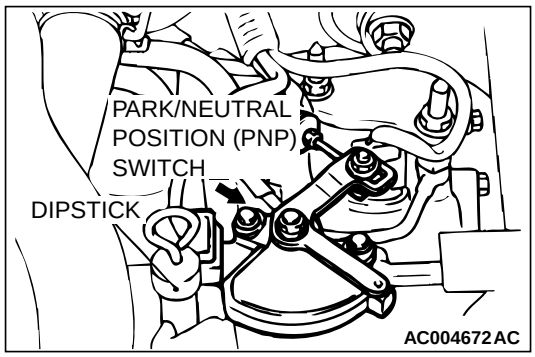


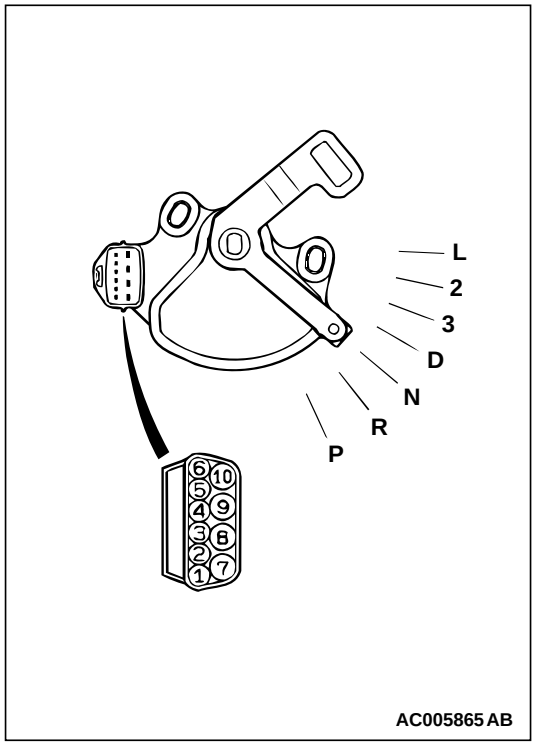
STEP 12. Check connector C-61 <2.4L Engine> or C-63 <3.0L Engine> at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.





STEP 13. Check the Park/Neutral position switch.

ITEMS	TERMINAL CONNECTION OF TESTER	SPECIFIED CONDITION
P	3 – 8, 9 – 10	Less than 2 ohm.
R	7 – 8	
N	4 – 8, 9 – 10	
D	1 – 8	
3	5 – 8	
2	2 – 8	
L	6 – 8	

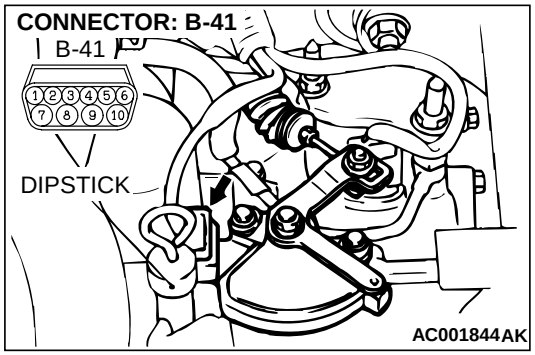
Check for continuity between terminals for each selector position.

NOTE: For vehicles with sport mode, four positions (P, R, N, D) are used.

Q: Is the switch operating properly?

YES : Go to Step 14.

NO : Replace the Park/Neutral position switch. Refer to GROUP 23B, Transaxle P.23B-10.

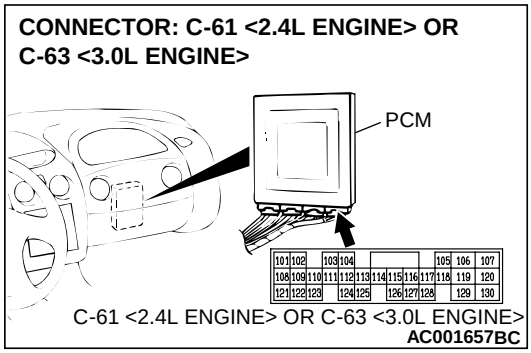


STEP 14. Check connector B-41 at the Park/Neutral position switch for damage.

Q: Is the connector in good condition?

YES : Go to Step 15.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

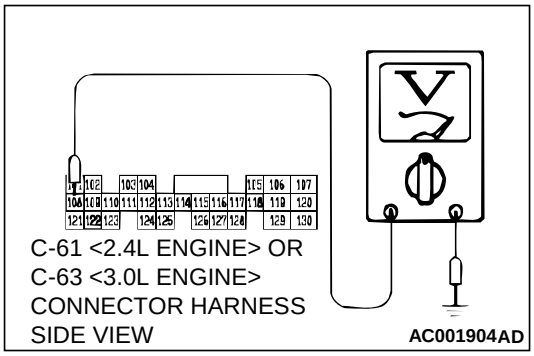


STEP 15. Check the switch output voltage at PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> by backprobing.

(1) Do not disconnect connector C-61 <2.4L Engine> or C-63 <3.0L Engine>.

(2) Turn the ignition switch to the "ON" position.

(3) Move the selector lever to the "R" position.



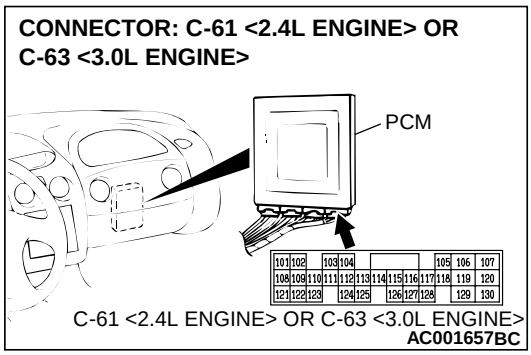
(4) Measure the voltage between terminal 108 and ground by backprobing.
- Voltage should be battery positive voltage.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 12.

NO : Go to Step 16.



STEP 16. Check connector C-61 <2.4L Engine> or C-63 <3.0L Engine> at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 17 <Vehicles with sports mode>. Repair harness open circuit or short circuit to ground between Park/Neutral position switch connector B-41 terminal 7 and PCM connector C-61 terminal 108 <Vehicles without sports mode>.

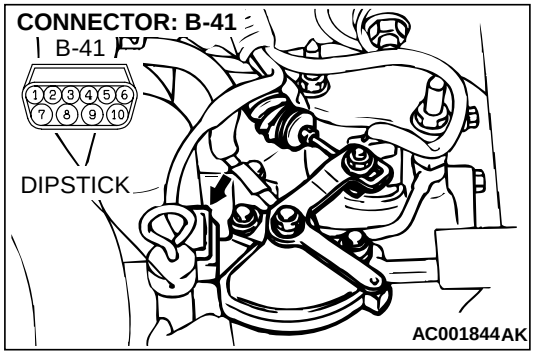
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

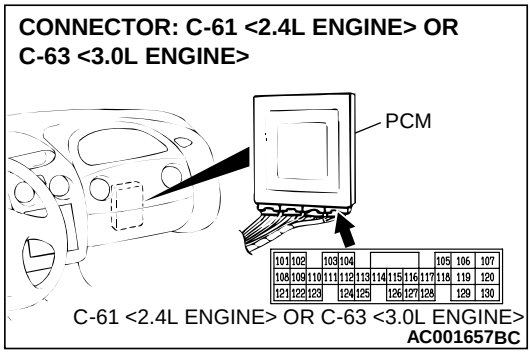
STEP 17. Check harness for open circuit or short circuit to ground between Park/Neutral position switch connector B-41 terminal 7 and PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> terminal 108 <Vehicles with sport mode>.

Q: Is the harness wire in good condition?

YES : Go to Step 18.

NO : Repair it.



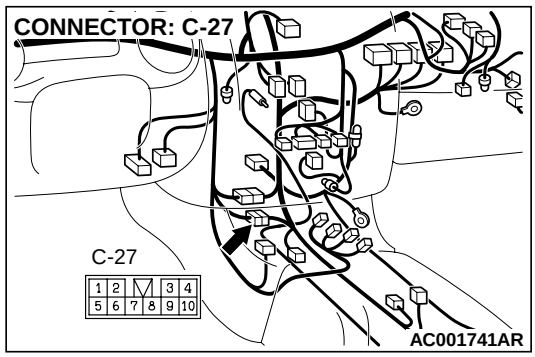


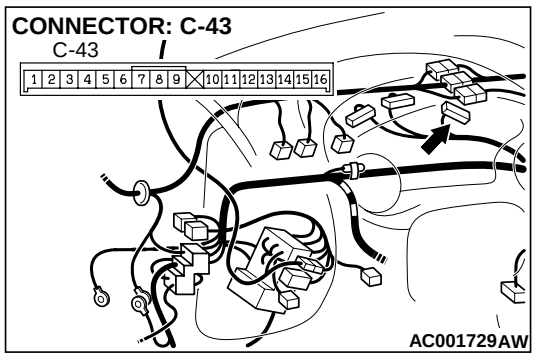
STEP 18. Check connectors C-27 at intermediate connector C-43 at combination meter for damage <Vehicles with sport mode>.

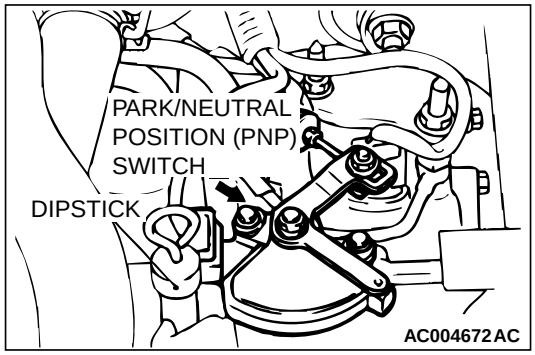
Q: Are the connectors in good condition?

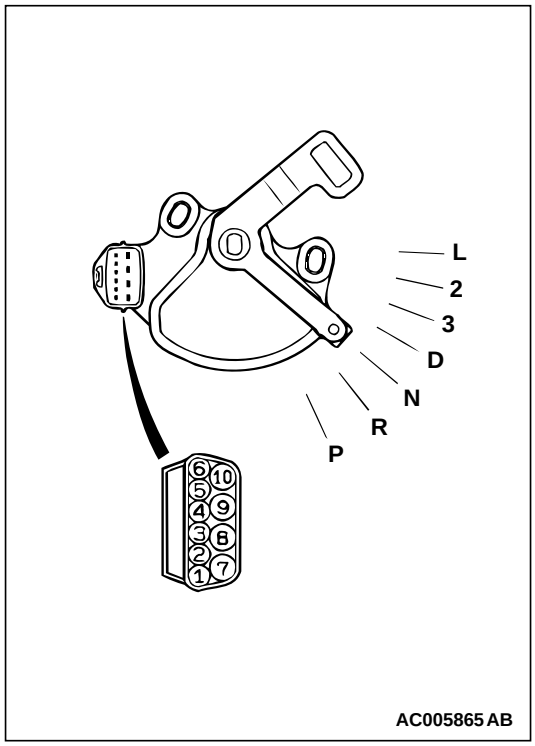
YES : Repair harness short circuit to ground between Park/Neutral position switch connector B-41 terminal 7 and combination meter connector C-43 terminal 10.

NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.









STEP 19. Check the Park/Neutral position switch.

ITEMS	TERMINAL CONNECTION OF TESTER	SPECIFIED CONDITION
P	3 – 8, 9 – 10	Less than 2 ohm
R	7 – 8	
N	4 – 8, 9 – 10	
D	1 – 8	
3	5 – 8	
2	2 – 8	
L	6 – 8	

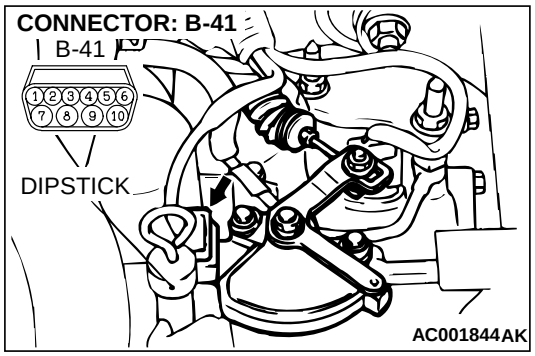
Check for continuity between terminals for each selector position.

NOTE: For vehicles with sport mode, four positions (P, R, N, D) are used.

Q: Is the switch operating properly?

YES : Go to Step 20.

NO : Replace the Park/Neutral position switch. Refer to GROUP 23B, Transaxle P.23B-10.



STEP 20. Check connector B-41 at the Park/Neutral position switch for damage.

Q: Is the connector in good condition?

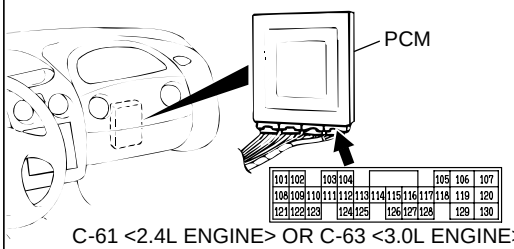
YES : Go to Step 21.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

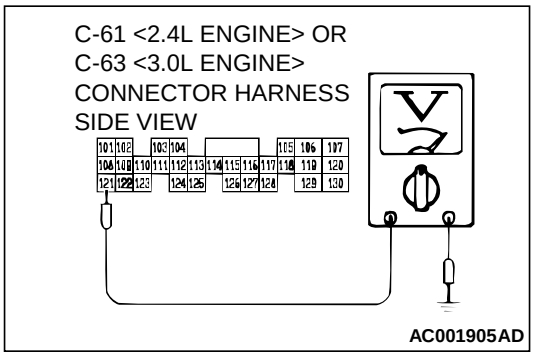
STEP 21. Check the switch output voltage at PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> by backprobing.

(1) Do not disconnect connector C-61 <2.4L Engine> or C-63 <3.0L Engine>.
(2) Turn the ignition switch to the "ON" position.
(3) Move the selector lever to the "N" position.

CONNECTOR: C-61 <2.4L ENGINE> OR C-63 <3.0L ENGINE>



C-61 <2.4L ENGINE> OR C-63 <3.0L ENGINE>
AC001657BC



AC001905AD

(4) Measure the voltage between terminal 121 and ground by backprobing.
- Voltage should be battery positive voltage.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

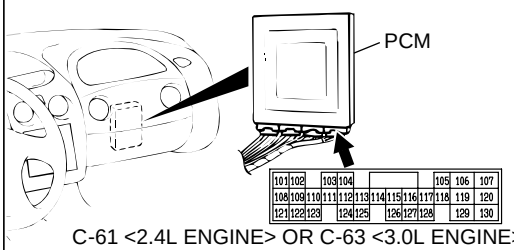
YES : Go to Step 12.
NO : Go to Step 22.

STEP 22. Check connector C-61 <2.4L Engine> or C-63 <3.0L Engine> at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 23 <Vehicles with sport mode>. Repair harness open circuit or short circuit to ground between Park/Neutral position switch connector B-41 terminal 4 and PCM connector C-61 terminal 121 <Vehicles without sport mode>.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

CONNECTOR: C-61 <2.4L ENGINE> OR C-63 <3.0L ENGINE>



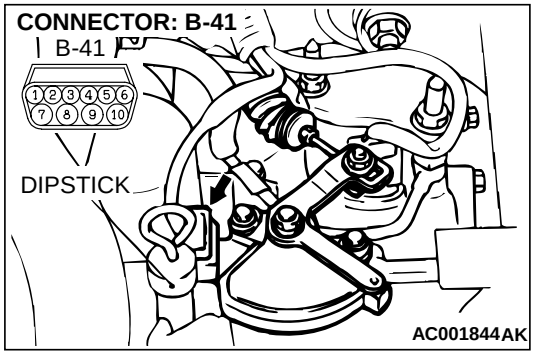
C-61 <2.4L ENGINE> OR C-63 <3.0L ENGINE>
AC001657BC

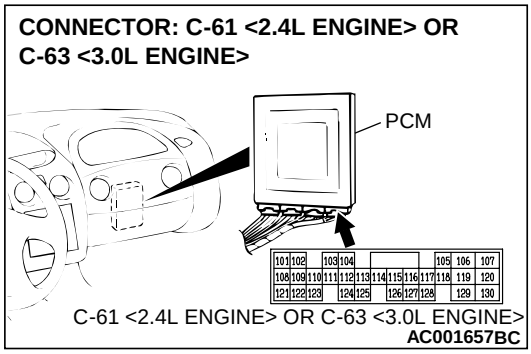
STEP 23. Check harness for open circuit or short circuit to ground between Park/Neutral position switch connector B-41 terminal 4 and PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> terminal 121 <Vehicles with sport mode>.

Q: Is the harness wire in good condition?

YES : Go to Step 24.

NO : Repair it.



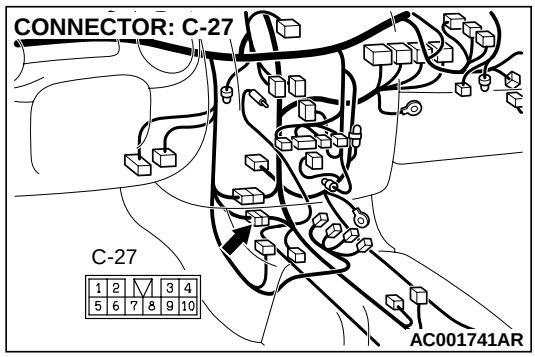


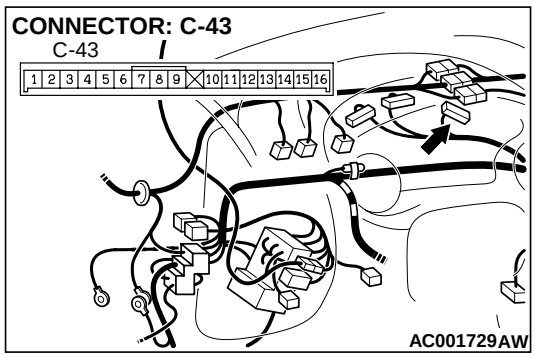
STEP 24. Check connectors C-27 at intermediate connector and C-43 at combination meter for damage <Vehicles with sport mode>.

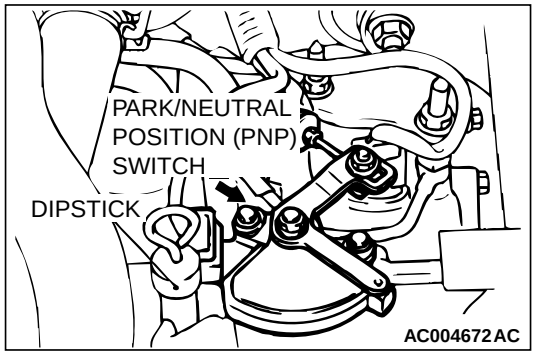
Q: Are the connectors in good condition?

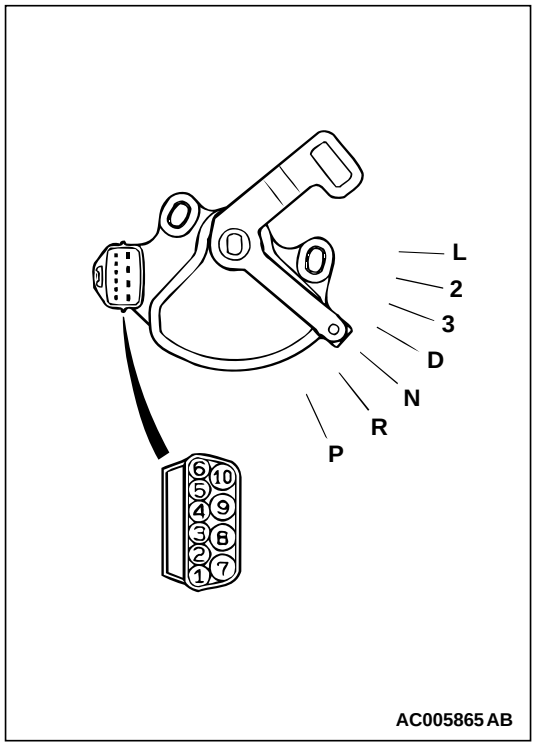
YES : Repair harness short circuit to ground between Park/Neutral position switch connector B-41 terminal 4 and Combination meter C-43 terminal 9.

NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.









STEP 25. Check the Park/Neutral position switch.

ITEMS	TERMINAL CONNECTION OF TESTER	SPECIFIED CONDITION
P	3 – 8, 9 – 10	Less than 2 ohm
R	7 – 8	
N	4 – 8, 9 – 10	
D	1 – 8	
3	5 – 8	
2	2 – 8	
L	6 – 8	

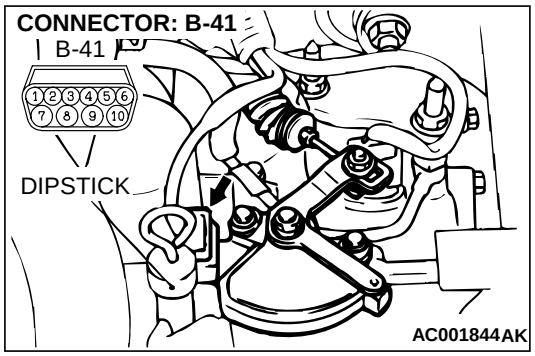
Check for continuity between terminals for each selector position.

NOTE: For vehicles with sport mode, four positions (P, R, N, D) are used.

Q: Is the switch operating properly?

YES : Go to Step 26.

NO : Replace the Park/Neutral position switch. Refer to GROUP 23B, Transaxle P.23B-10.



STEP 26. Check connector B-41 at the Park/Neutral position switch for damage.

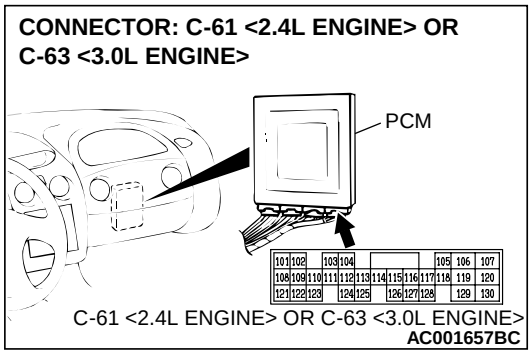
Q: Is the connector in good condition?

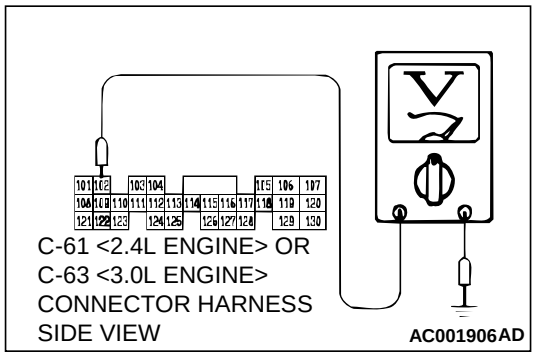
YES : Go to Step 27.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

STEP 27. Check the switch output voltage at PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> by backprobing.

(1) Do not disconnect connector C-61 <2.4L Engine> or C-63 <3.0L Engine>.
(2) Turn the ignition switch to the "ON" position.
(3) Move the selector lever to the "D" position.





(4) Measure the voltage between terminal 102 and ground by backprobing.
- Voltage should be battery positive voltage.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

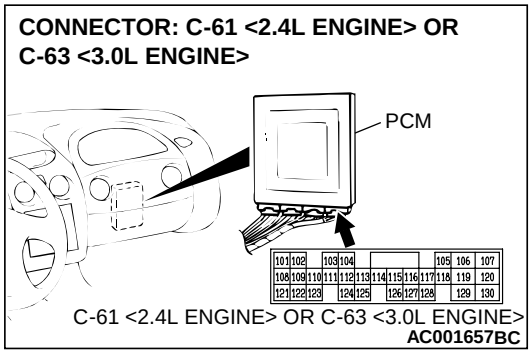
Q: Is the voltage normal?

YES : Go to Step 12.
NO : Go to Step 28.

STEP 28. Check connector C-61 <2.4L Engine> or C-63 <3.0L Engine> at PCM for damage.

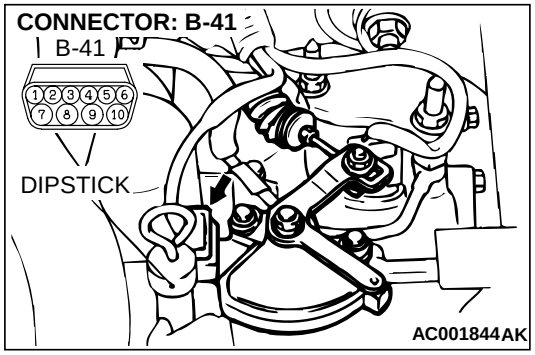
Q: Is the connector in good condition?

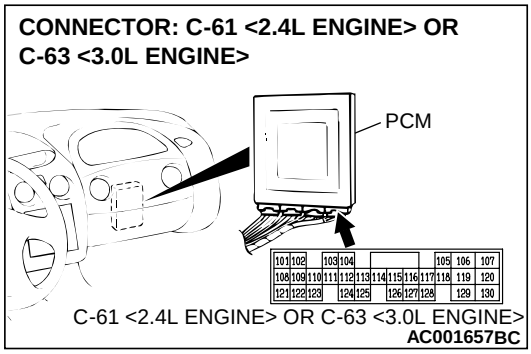
YES : Go to Step 29 <Vehicles with sport mode>. Repair harness open circuit or short circuit to ground between Park/Neutral position switch connector B-41 terminal 1 and PCM connector C-61 terminal 102 <Vehicles without sport mode>.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

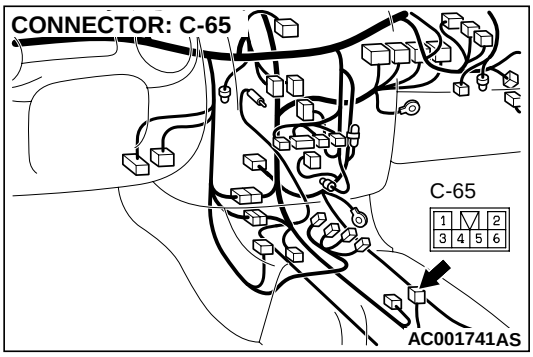


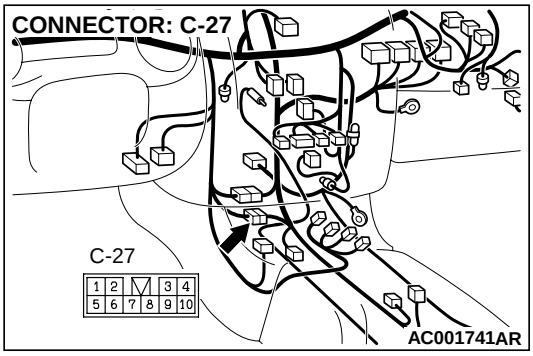
STEP 29. Check harness for open circuit or short circuit to ground between Park/Neutral position switch connector B-41 terminal 1 and PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> terminal 102 <Vehicles with sport mode>.
Q: Is the harness wire in good condition?

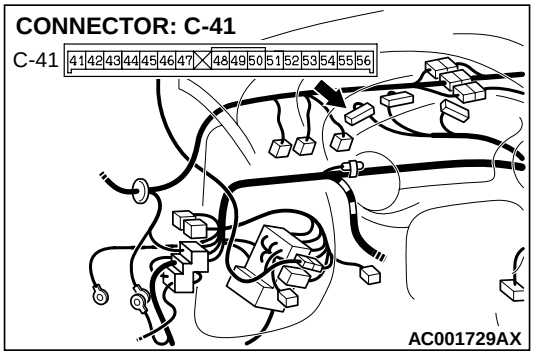
YES : Go to Step 30.
NO : Repair it.





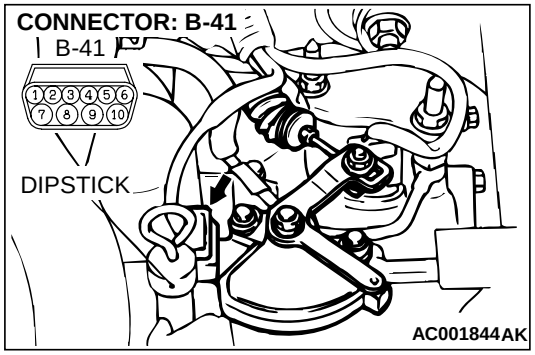


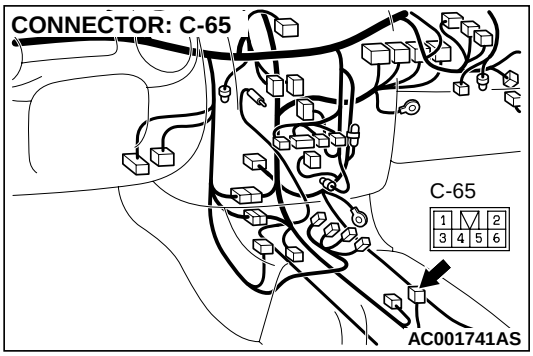




STEP 30. Check connectors C-65 at shift switch assembly, C-27 at intermediate connector and C-41 at combination meter for damage <Vehicles with sport mode>.
Q: Are the connectors in good condition?

YES : Go to Step 31.
NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



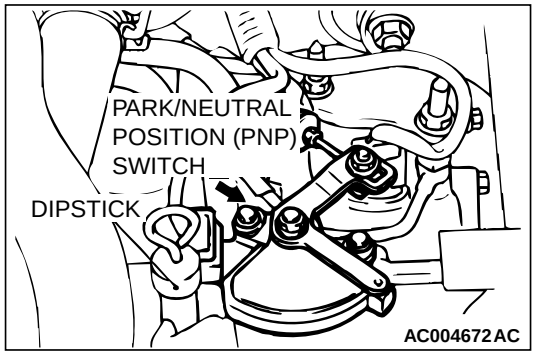


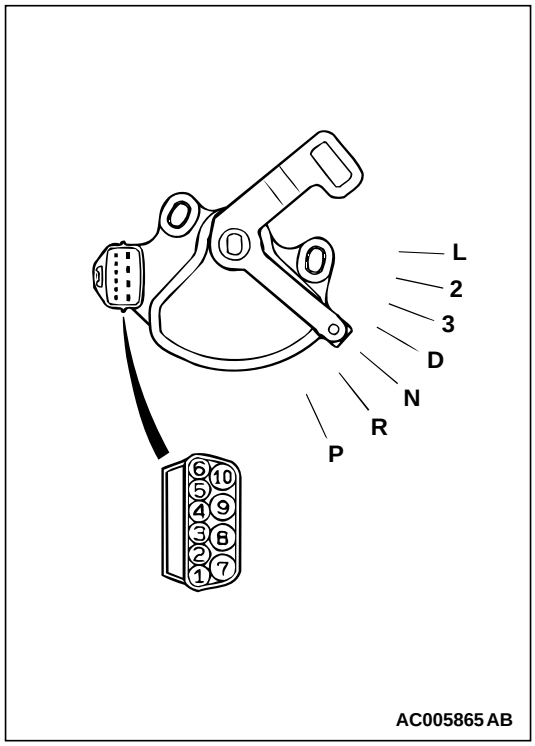
STEP 31. Check harness for short circuit to ground between Park/Neutral position switch connector B-41 terminal 1 and shift switch assembly connector C-65 terminal 1 <Vehicles with sport mode>.

Q: Is the harness wire in good condition?

YES : Repair harness short circuit to ground between shift switch assembly connector C-65 terminal 2 and combination meter connector C-41 terminal 50.

NO : Repair it.





STEP 32. Check the Park/Neutral position switch.

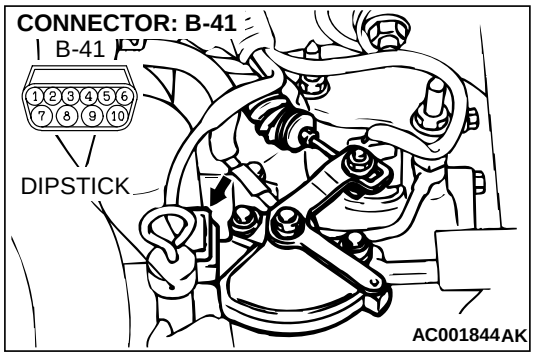
ITEMS	TERMINAL CONNECTION OF TESTER	SPECIFIED CONDITION
P	3 – 8, 9 – 10	Less than 2 ohm
R	7 – 8	
N	4 – 8, 9 – 10	
D	1 – 8	
3	5 – 8	
2	2 – 8	
L	6 – 8	

Check for continuity between terminals for each selector position.

Q: Is the switch operating properly?

YES : Go to Step 33.

NO : Replace the Park/Neutral position switch. Refer to GROUP 23B, Transaxle P.23B-10.

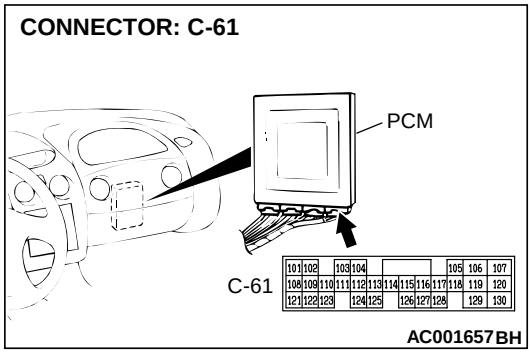


STEP 33. Check connector B-41 at the Park/Neutral position switch for damage.

Q: Is the connector in good condition?

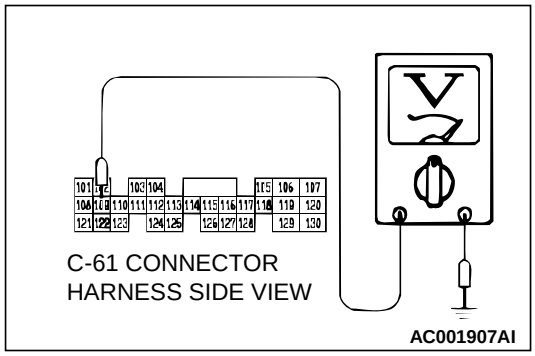
YES : Go to Step 34.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



STEP 34. Check the switch output voltage at PCM connector C-61 by backprobing.

(1) Do not disconnect connector C-61.
(2) Turn the ignition switch to the "ON" position.
(3) Move the selector lever to the "3" position.

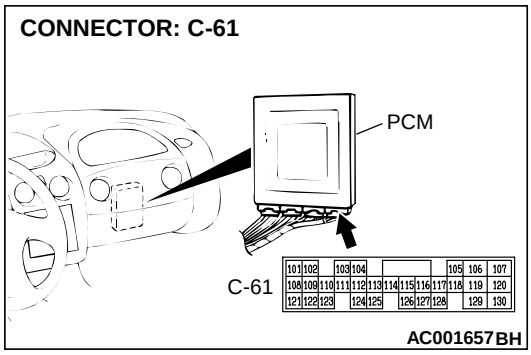


(4) Measure the voltage between terminal 109 and ground by backprobing.
- Voltage should be battery positive voltage.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

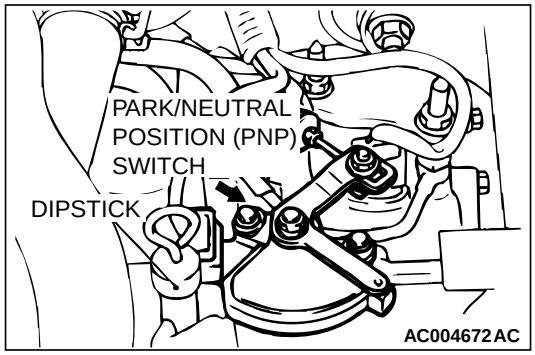
YES : Go to Step 12.
NO : Go to Step 35.

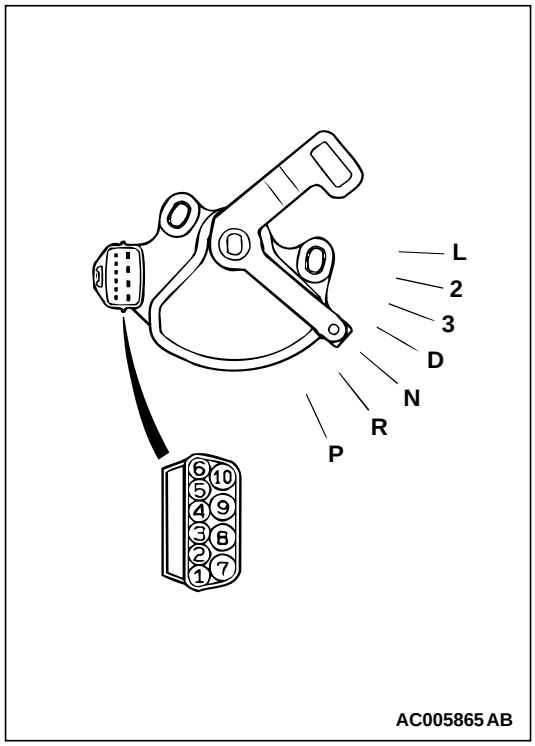


STEP 35. Check connector C-61 at PCM for damage.

Q: Is the connector in good condition?

YES : Repair harness open circuit or short circuit to ground between Park/Neutral position switch connector B-41 terminal 5 and PCM connector C-61 terminal 109.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.





STEP 36. Check the Park/Neutral position switch.

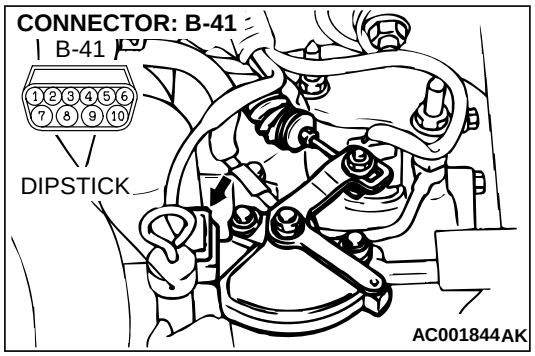
ITEMS	TERMINAL CONNECTION OF TESTER	SPECIFIED CONDITION
P	3 – 8, 9 – 10	Less than 2 ohm.
R	7 – 8	
N	4 – 8, 9 – 10	
D	1 – 8	
3	5 – 8	
2	2 – 8	
L	6 – 8	

Check for continuity between terminals for each selector position.

Q: Is the switch operating properly?

YES : Go to Step 37.

NO : Replace the Park/Neutral position switch. Refer to GROUP 23B, Transaxle P.23B-10.

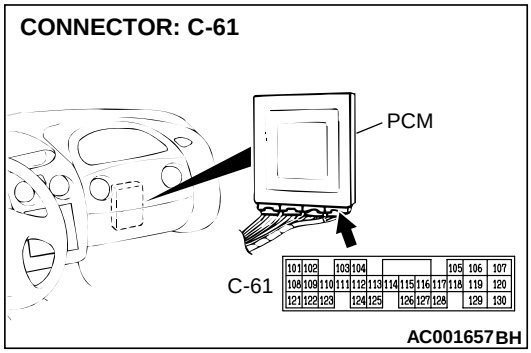


STEP 37. Check connector B-41 at the Park/Neutral position switch for damage.

Q: Is the connector in good condition?

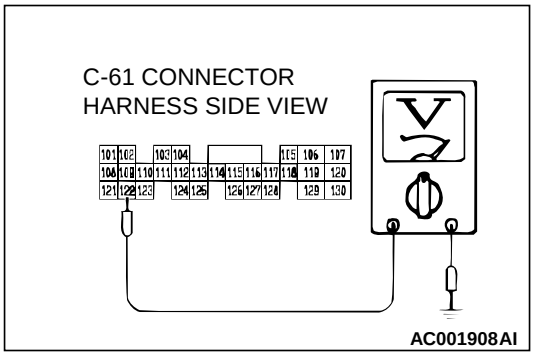
YES : Go to Step 38.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



STEP 38. Check the switch output voltage at PCM connector C-61 by backprobing.

(1) Do not disconnect connector C-61.
(2) Turn the ignition switch to the "ON" position.
(3) Move the selector lever to the "2" position.

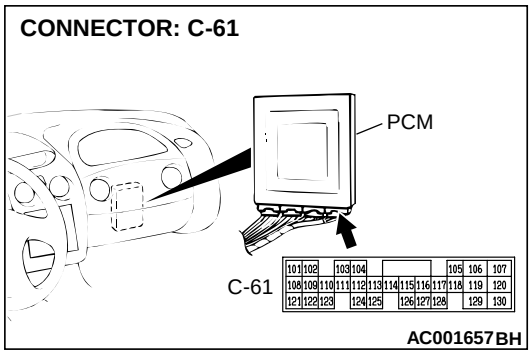


(4) Measure the voltage between terminal 122 and ground by backprobing.
- Voltage should be battery positive voltage.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

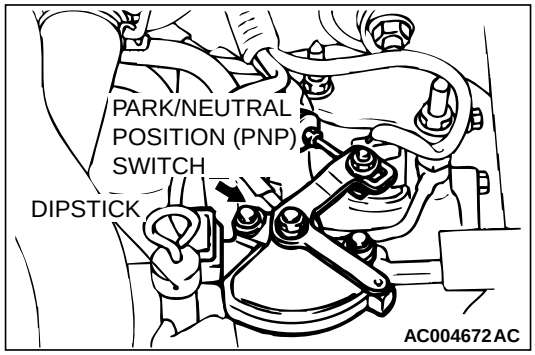
YES : Go to Step 12.
NO : Go to Step 39.

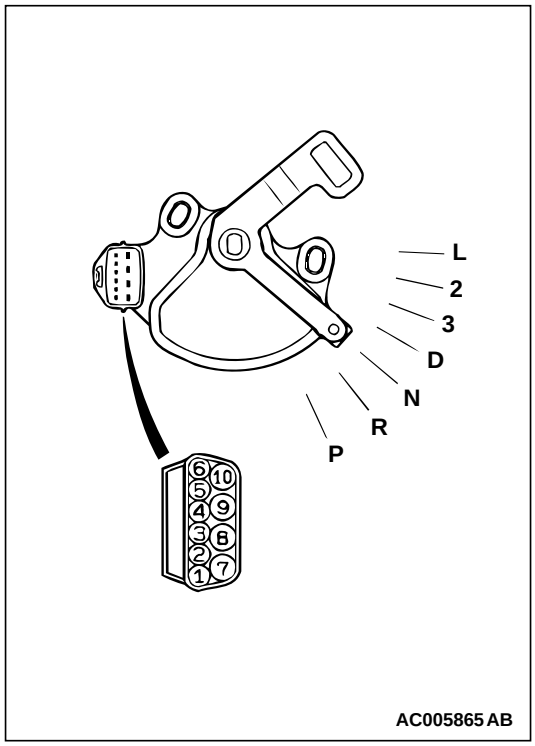


STEP 39. Check connector C-61 at PCM for damage.

Q: Is the connector in good condition?

YES : Repair harness open circuit or short circuit to ground between Park/Neutral position switch connector B-41 terminal 2 and PCM connector C-61 terminal 122.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.





STEP 40. Check the Park/Neutral position switch.

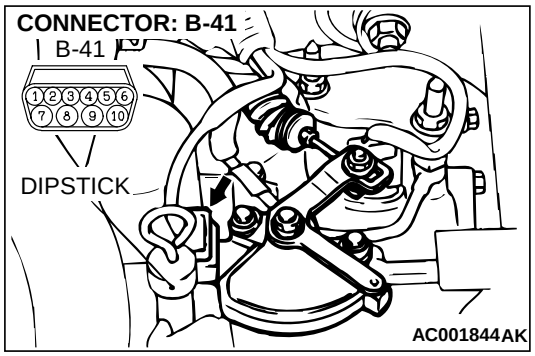
ITEMS	TERMINAL CONNECTION OF TESTER	SPECIFIED CONDITION
P	3 – 8, 9 – 10	Less than 2 ohm
R	7 – 8	
N	4 – 8, 9 – 10	
D	1 – 8	
3	5 – 8	
2	2 – 8	
L	6 – 8	

Check for continuity between terminals for each selector position.

Q: Is the switch operating properly?

YES : Go to Step 41.

NO : Replace the Park/Neutral position switch. Refer to GROUP 23B, Transaxle P.23B-10.

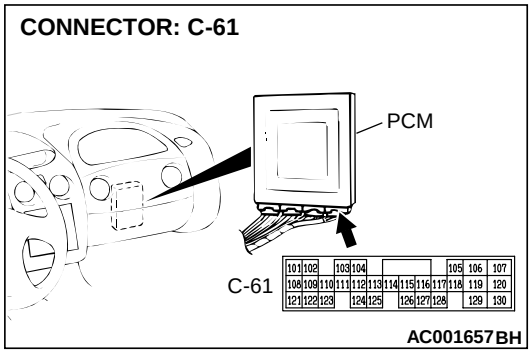


STEP 41. Check connector B-41 at the Park/Neutral position switch for damage.

Q: Is the connector in good condition?

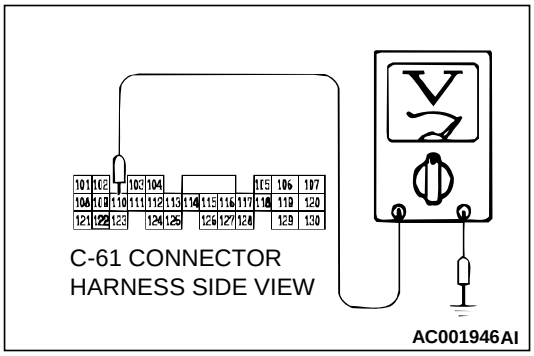
YES : Go to Step 42.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



STEP 42. Check the switch output voltage at PCM connector C-61 by backprobing.

(1) Do not disconnect connector C-61.
(2) Turn the ignition switch to the "ON" position.
(3) Move the selector lever to the "L" position.

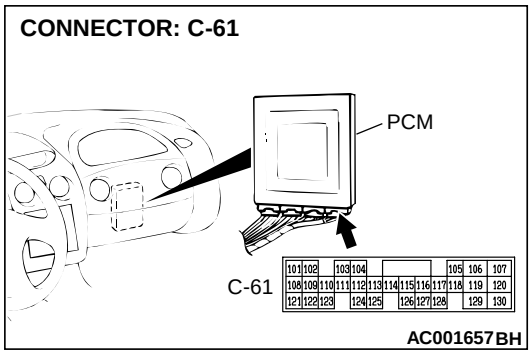


(4) Measure the voltage between terminal 110 and ground by backprobing.
- Voltage should be battery positive voltage.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

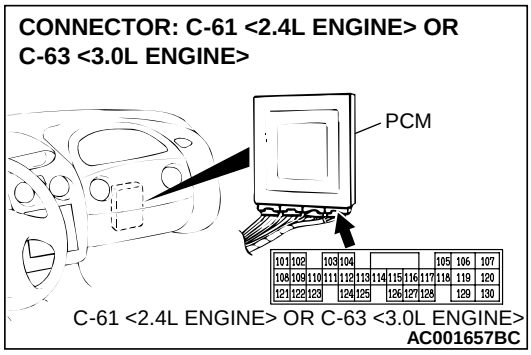
Q: Is the voltage normal?

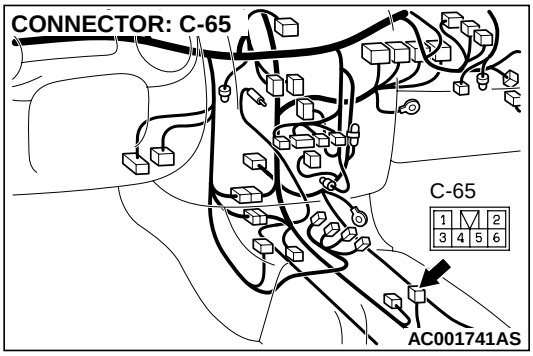
YES : Go to Step 12.
NO : Go to Step 43.



STEP 43. Check connector C-61 at PCM for damage.
Q: Is the connector in good condition?

YES : Repair harness open circuit or short circuit to ground between the Park/Neutral position switch connector B-41 terminal 6 and PCM connector C-61 terminal 110.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.





STEP 44. Check connectors C-61 <2.4L Engine> or C-63 <3.0L Engine> at PCM and C-65 at shift switch assembly for damage.

Q: Are the connectors in good condition?

YES : Repair harness short circuit to ground between shift switch assembly connector C-65 terminal 4 and PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> terminal 109.

NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

DTC 28: Park/Neutral Position Switch System (Short Circuit)

Park/Neutral Position Switch System Circuit
Refer to P.23A-136.

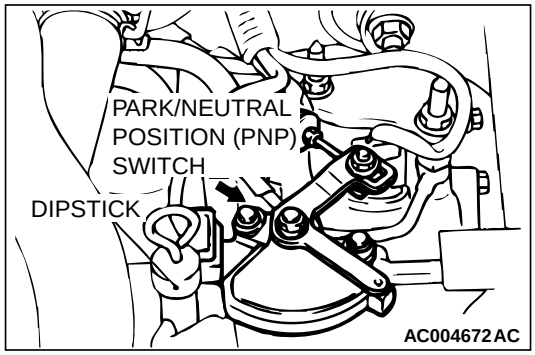
CIRCUIT OPERATION
Refer to P.23A-136.

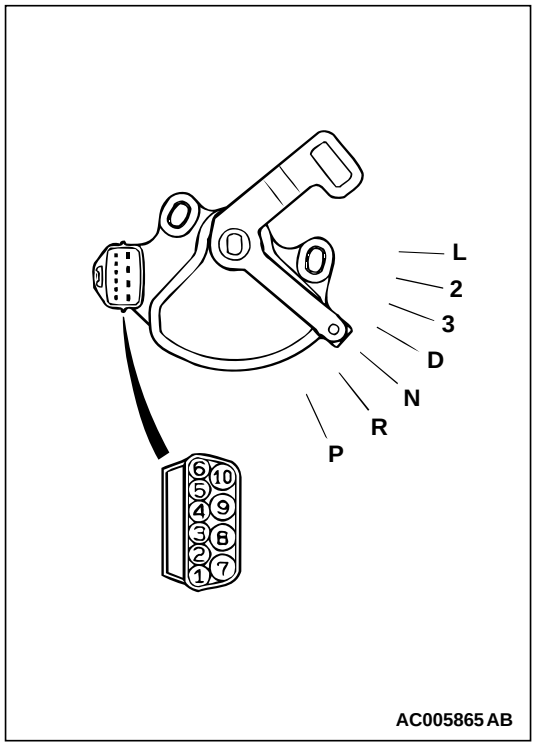
DTC SET CONDITIONS
If the PCM detects more than one kind of park/neutral position switch input signals for continuous period of thirty seconds, it is judged that there is a short circuit in the Park/Neutral position switch and diagnostic trouble code number "28" is output.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set:)
- Malfunction of the Park/Neutral position switch
- Malfunction of the ignition switch
- Damaged harness, connector
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)





STEP 1. Check the Park/Neutral position switch.

ITEMS	TERMINAL CONNECTION OF TESTER	SPECIFIED CONDITION
P	3 – 8, 9 – 10	Less than 2 ohm
R	7 – 8	
N	4 – 8, 9 – 10	
D	1 – 8	
3	5 – 8	
2	2 – 8	
L	6 – 8	

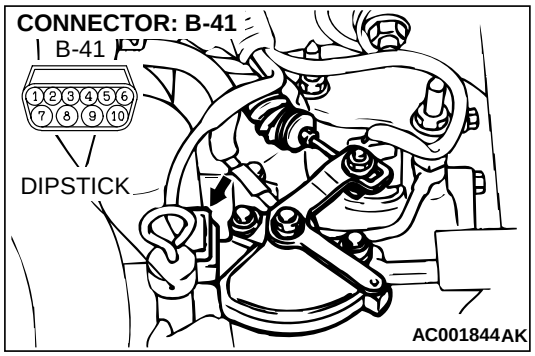
Check for continuity between terminals for each selector position.

NOTE: For vehicles with sport mode, four positions (P, R, N, D) are used.

Q: Is the switch operating properly?

YES : Go to Step 2.

NO : Replace the Park/Neutral position switch. Refer to GROUP 23B, Transaxle P.23B-10.



STEP 2. Check connector B-41 at the Park/Neutral position switch for damage.

Q: Is the connector in good condition?

YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

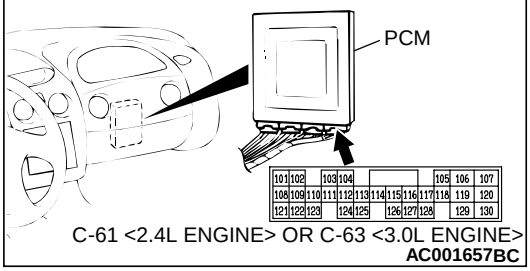
STEP 3. Check connector C-61 <2.4L Engine> or C-63 <3.0L Engine> at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

CONNECTOR: C-61 <2.4L ENGINE> OR C-63 <3.0L ENGINE>



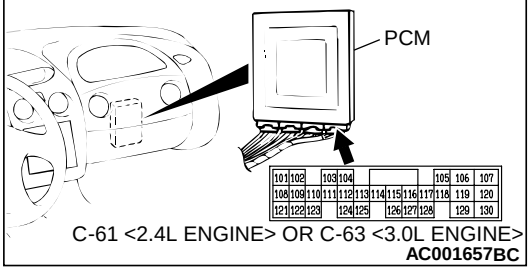
C-61 <2.4L ENGINE> OR C-63 <3.0L ENGINE>
AC001657BC

STEP 4. Check the switch output voltage at PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> by backprobing. ("P" position)

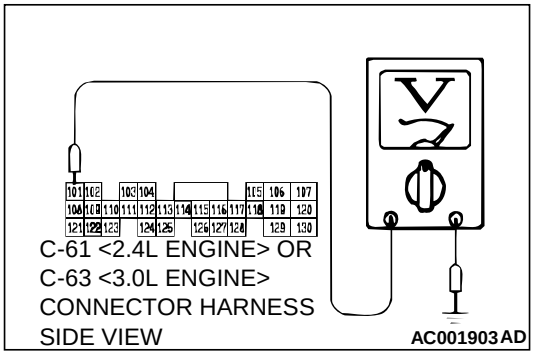
(1) Do not disconnect connector C-61 <2.4L Engine> or C-63 <3.0L Engine>.

(2) Turn the ignition switch to the "ON" position.

CONNECTOR: C-61 <2.4L ENGINE> OR C-63 <3.0L ENGINE>



C-61 <2.4L ENGINE> OR C-63 <3.0L ENGINE>
AC001657BC



C-61 <2.4L ENGINE> OR C-63 <3.0L ENGINE> CONNECTOR HARNESS SIDE VIEW
AC001903AD

(3) Measure the voltage between terminal 101 and ground by backprobing.

- When selector lever position is "P," voltage should be battery positive voltage.
- When selector lever position is "R," voltage should be 0.5 volt or less.
- When selector lever position is "N," voltage should be 0.5 volt or less.
- When selector lever position is "D," voltage should be 0.5 volt or less.
- When selector lever position is "3," voltage should be 0.5 volt or less. <Vehicles without sport mode>
- When selector lever position is "2," voltage should be 0.5 volt or less. <Vehicles without sport mode>
- When selector lever position is "L," voltage should be 0.5 volt or less. <Vehicles without sport mode>
- When selector lever position is sport mode, voltage should be 0.5 volt or less. <Vehicles with sport mode>

Q: Is the voltage normal?

YES : Go to Step 7.

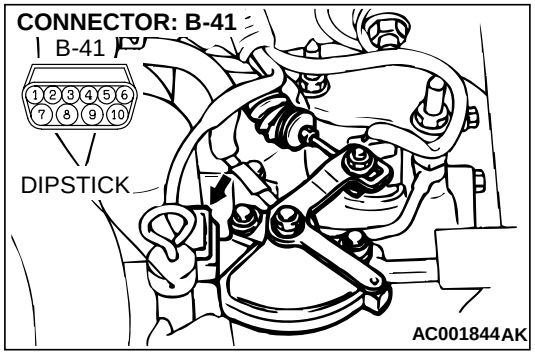
NO : Turn the ignition switch to the "LOCK" (OFF) position. Go to Step 5 <Vehicles with sport mode>. Repair harness damage between the Park/Neutral position switch connector B-41 terminal 3 and PCM connector C-61 terminal 101 <Vehicles without sport mode>.

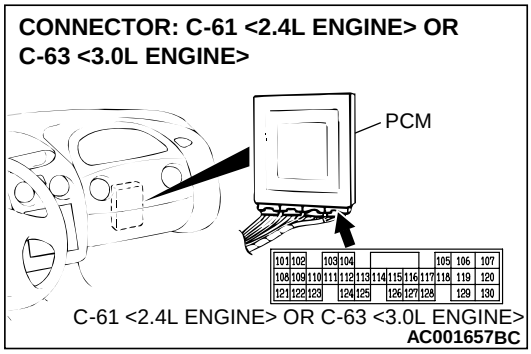
STEP 5. Check harness for damage between Park/Neutral position switch connector B-41 terminal 3 and PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> terminal 101. <Vehicles with sport mode>

Q: Is the harness wire in good condition?

YES : Go to Step 6.

NO : Repair it.



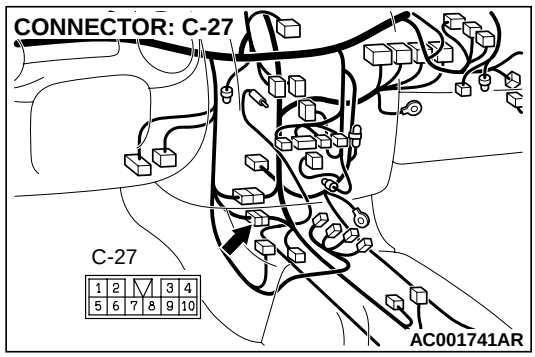


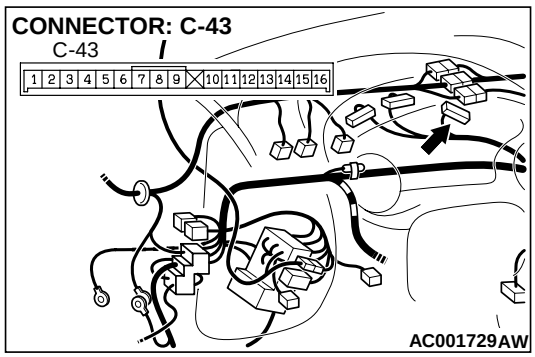
STEP 6. Check connectors C-27 at intermediate connector and C-43 at combination meter for damage. <Vehicles with sport mode>

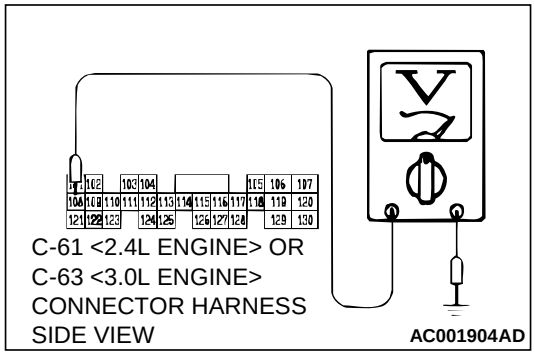
Q: Are the connectors in good condition?

YES : Repair harness damage between the Park/Neutral position switch connector B-41 terminal 3 and combination meter connector C-43 terminal 11.

NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.







STEP 7. Check the switch output voltage at PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> by backprobing. ("R" position)

Measure the voltage between terminal 108 and ground by backprobing.

- When selector lever position is "P," voltage should be 0.5 volt or less.
- When selector lever position is "R," voltage should be battery positive voltage.
- When selector lever position is "N," voltage should be 0.5 volt or less.
- When selector lever position is "D," voltage should be 0.5 volt or less.
- When selector lever position is "3," voltage should be 0.5 volt or less. <Vehicles without sport mode>
- When selector lever position is "2," voltage should be 0.5 volt or less. <Vehicles without sport mode>
- When selector lever position is "L," voltage should be 0.5 volt or less. <Vehicles without sport mode>
- When selector lever position is sport mode, voltage should be 0.5 volt or less. <Vehicles with sport mode>

Q: Is the voltage normal?

YES : Go to Step 10.

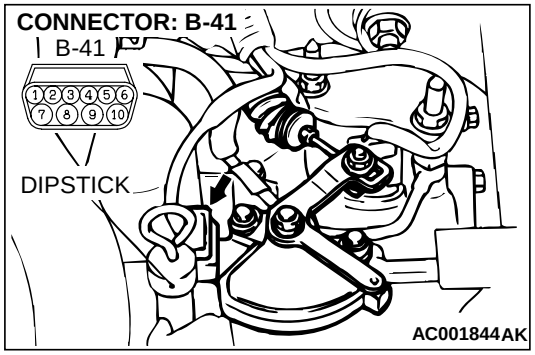
NO : Turn the ignition switch to the "LOCK" (OFF) position. Go to Step 8 <Vehicles with sport mode>. Repair harness damage between the Park/Neutral position switch connector B-41 terminal 7 and PCM connector C-61 terminal 108 <Vehicles without sport mode>.

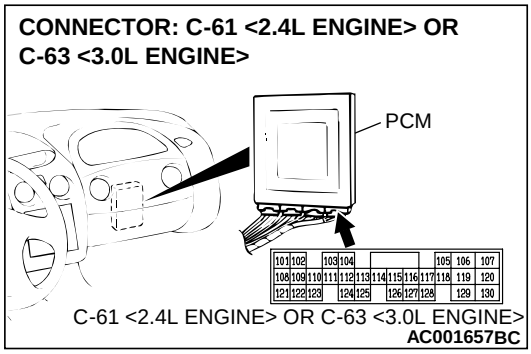
STEP 8. Check harness for damage between Park/Neutral position switch connector B-41 terminal 7 and PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> terminal 108. <Vehicles with sport mode>

Q: Is the harness wire in good condition?

YES : Go to Step 9.

NO : Repair it.



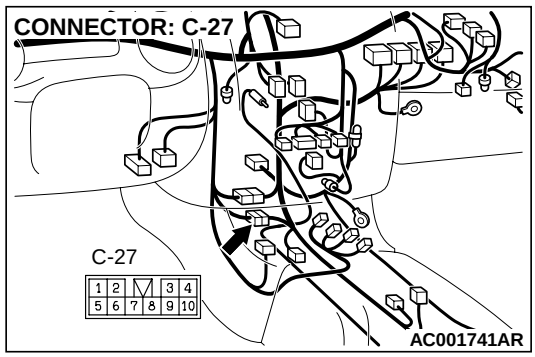


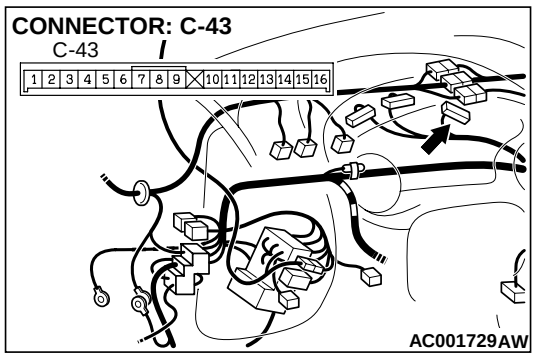
STEP 9. Check connectors C-27 at intermediate connector and C-43 at combination meter for damage. <Vehicles with sport mode>

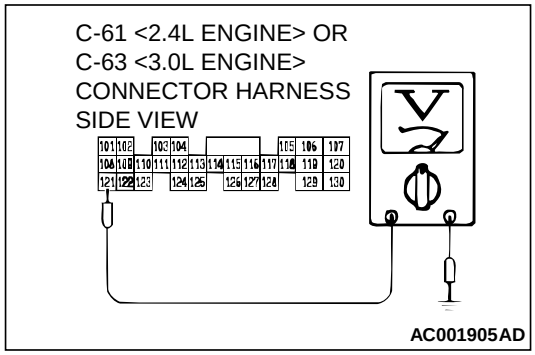
Q: Are the connectors in good condition?

YES : Repair harness damage between the Park/Neutral position switch connector B-41 terminal 7 and combination meter connector C-43 terminal 10.

NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.







STEP 10. Check the switch output voltage at PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> by backprobing. ("N" position)

Measure the voltage between terminal 121 and ground by backprobing.

- When selector lever position is "P," voltage should be 0.5 volt or less.
- When selector lever position is "R," voltage should be 0.5 volt or less.
- When selector lever position is "N," voltage should be battery positive voltage.
- When selector lever position is "D," voltage should be 0.5 volt or less.
- When selector lever position is "3," voltage should be 0.5 volt or less. <Vehicles without sport mode>
- When selector lever position is "2," voltage should be 0.5 volt or less. <Vehicles without sport mode>
- When selector lever position is "L," voltage should be 0.5 volt or less. <Vehicles without sport mode>
- When selector lever position is sport mode, voltage should be 0.5 volt or less. <Vehicles with sport mode>

Q: Is the voltage normal?

YES : Go to Step 13.

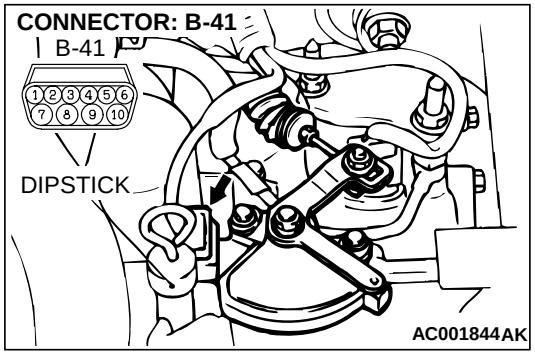
NO : Turn the ignition switch to the "LOCK" (OFF) position. Go to Step 11 <Vehicles with sport mode>. Repair harness damage between the Park/Neutral position switch connector B-41 terminal 4 and PCM connector C-61 terminal 121 <Vehicles without sport mode>.

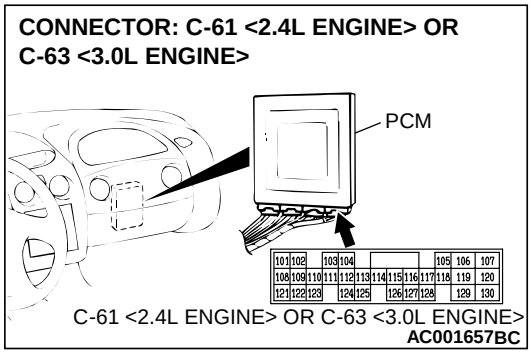
STEP 11. Check harness for damage between Park/Neutral position switch connector B-41 terminal 4 and PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> terminal 121. <Vehicles with sport mode>

Q: Is the harness wire in good condition?

YES : Go to Step 12.

NO : Repair it.



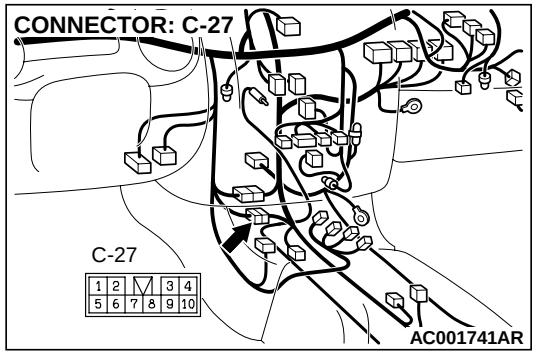


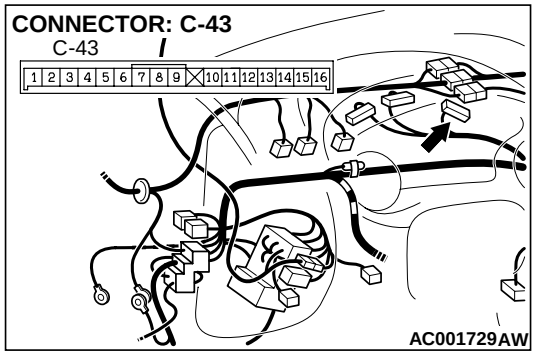
STEP 12. Check connectors C-27 at intermediate connector C-43 at combination meter for damage. <Vehicles with sport mode>

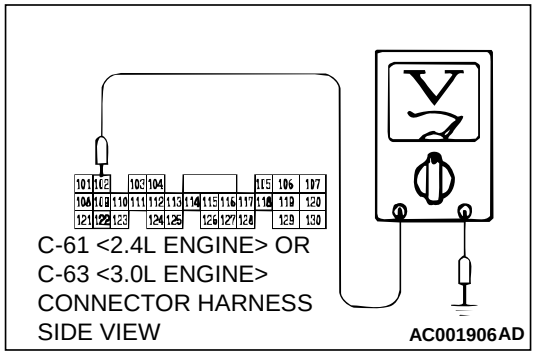
Q: Are the connectors in good condition?

YES : Repair harness damage between the Park/Neutral position switch connector B-41 terminal 4 and combination meter connector C-43 terminal 9.

NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.







STEP 13. Check the switch output voltage at PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> by backprobing. ("D" position)

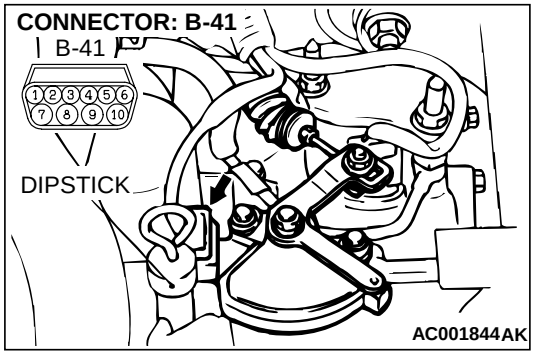
Measure the voltage between terminal 102 and ground by backprobing.

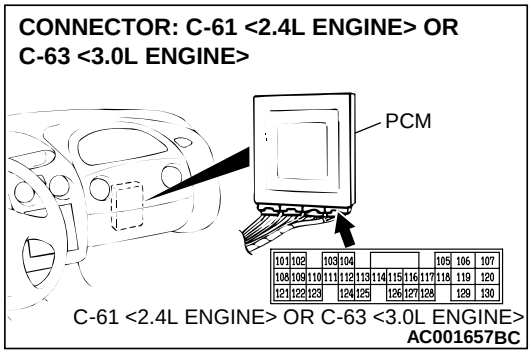
- When selector lever position is "P," voltage should be 0.5 volt or less.
- When selector lever position is "R," voltage should be 0.5 volt or less.
- When selector lever position is "N," voltage should be 0.5 volt or less.
- When selector lever position is "D," voltage should be battery positive voltage.
- When selector lever position is "3," voltage should be 0.5 volt or less. <Vehicles without sport mode>
- When selector lever position is "2," voltage should be 0.5 volt or less. <Vehicles without sport mode>
- When selector lever position is "L," voltage should be 0.5 volt or less. <Vehicles without sport mode>
- When selector lever position is sport mode, voltage should be 0.5 volt or less. <Vehicles with sport mode>

Q: Is the voltage normal?

YES : Go to Step 20 <Vehicles with sport mode>. Go to Step 17 <Vehicles without sport mode>.

NO : Tern the ignition switch to the "LOCK" (OFF) position. Go to Step 14 <Vehicles with sport mode>. Repair harness damage between the Park/Neutral position switch connector B-41 terminal 1 and PCM connector C-61 terminal 102 <Vehicles without sport mode>.



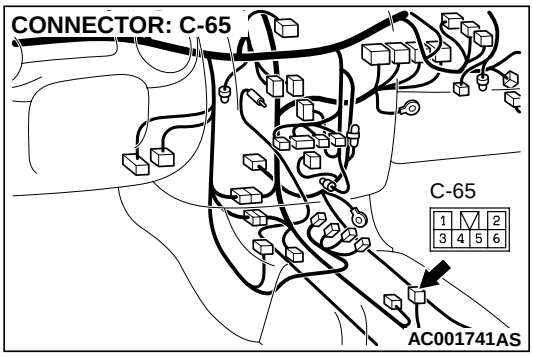


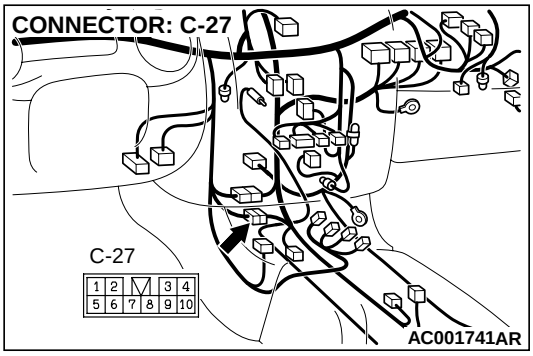
STEP 14. Check harness for damage between Park/Neutral position switch connector B-41 terminal 1 and PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> terminal 102. <Vehicles with sport mode>

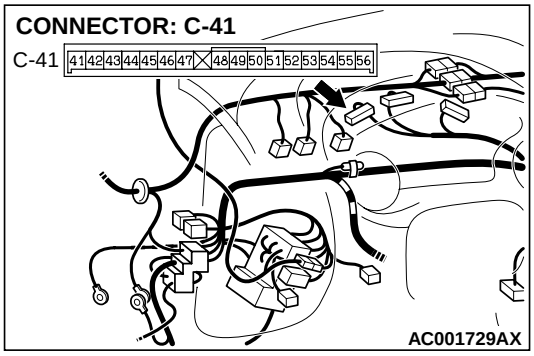
Q: Is the harness wire in good condition?

YES : Go to Step 15.

NO : Repair it.

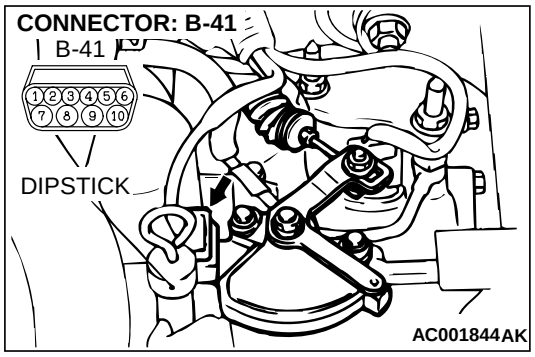


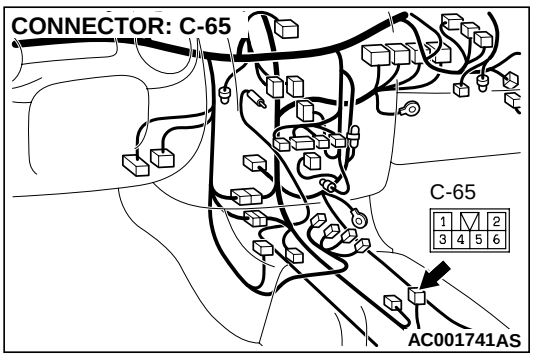




STEP 15. Check connectors C-65 at shift switch assembly, C-27 at intermediate connector and C-41 at combination meter for damage. <Vehicles with sport mode>
Q: Are the connectors in good condition?

YES : Go to Step 16.
NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



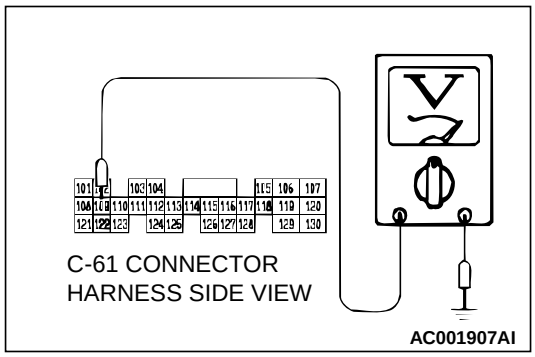


STEP 16. Check harness for damage between Park/Neutral position switch connector B-41 terminal 1 and shift switch assembly connector C-65 terminal 1.

Q: Is the harness wire in good condition?

YES : Repair harness damage between shift switch assembly connector C-65 terminal 2 and combination meter connector C-41 terminal 50.

NO : Repair it.



STEP 17. Check the switch output voltage at PCM connector C-61 by backprobing. ("3" position) <Vehicles without sport mode>

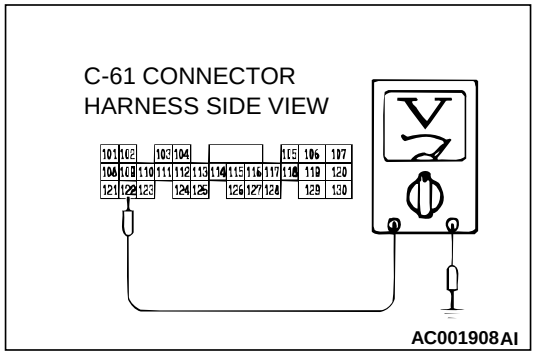
Measure the voltage between terminal 109 and ground by backprobing.

- When selector lever position is "P," voltage should be 0.5 volt or less.
- When selector lever position is "R," voltage should be 0.5 volt or less.
- When selector lever position is "N," voltage should be 0.5 volt or less.
- When selector lever position is "D," voltage should be 0.5 volt or less.
- When selector lever position is "3," voltage should be battery positive voltage.
- When selector lever position is "2," voltage should be 0.5 volt or less.
- When selector lever position is "L," voltage should be 0.5 volt or less.

Q: Is the voltage normal?

YES : Go to Step 18.

NO : Tern the ignition switch to the "LOCK" (OFF) position. Repair harness damage between the Park/Neutral position switch connector B-41 terminal 5 and PCM connector C-61 terminal 109.



STEP 18. Check the switch output voltage at PCM connector C-61 by backprobing. ("2" position) <Vehicles without sport mode>

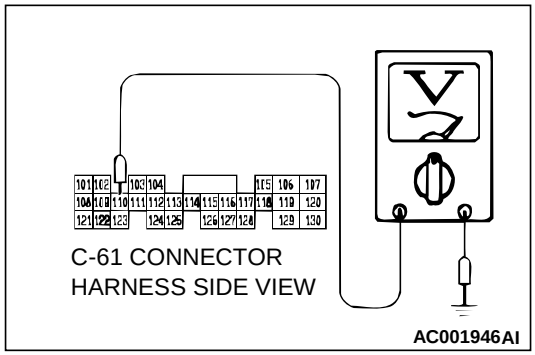
Measure the voltage between terminal 122 and ground by backprobing.

- When selector lever position is "P," voltage should be 0.5 volt or less.
- When selector lever position is "R," voltage should be 0.5 volt or less.
- When selector lever position is "N," voltage should be 0.5 volt or less.
- When selector lever position is "D," voltage should be 0.5 volt or less.
- When selector lever position is "3," voltage should be 0.5 volt or less.
- When selector lever position is "2," voltage should be battery positive voltage.
- When selector lever position is "L," voltage should be 0.5 volt or less.

Q: Is the voltage normal?

YES : Go to Step 19.

NO : Tern the ignition switch to the "LOCK" (OFF) position. Repair harness damage between the Park/Neutral position switch connector B-41 terminal 2 and PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> terminal 122.



STEP 19. Check the switch output voltage at PCM connector C-61 by backprobing. ("L" position) <Vehicles without sport mode>

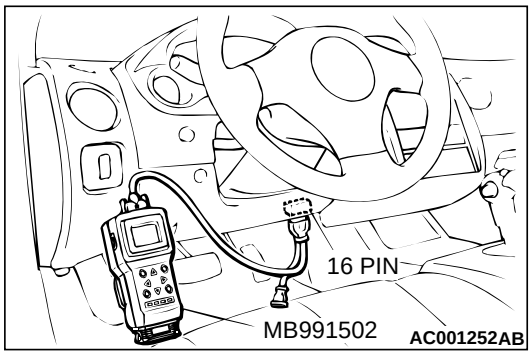
Measure the voltage between terminal 110 and ground by backprobing.

- When selector lever position is "P," voltage should be 0.5 volt or less.
- When selector lever position is "R," voltage should be 0.5 volt or less.
- When selector lever position is "N," voltage should be 0.5 volt or less.
- When selector lever position is "D," voltage should be 0.5 volt or less.
- When selector lever position is "3," voltage should be 0.5 volt or less.
- When selector lever position is "2," voltage should be 0.5 volt or less.
- When selector lever position is "L," voltage should be battery positive voltage.

Q: Is the voltage normal?

YES : Go to Step 20.

NO : Tern the ignition switch to the "LOCK" (OFF) position. Repair harness damage between the Park/Neutral position switch connector B-41 terminal 6 and PCM connector C-61 terminal 110.



STEP 20. Using scan tool MB991502, check data list item 61: Park/Neutral Position Switch.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to data reading mode for item 61: Park/Neutral Position Switch.
- Move the selector lever to "P," "R," "N," "D," "3," "2," "L" and sport mode positions and confirm the scan tool display. (Vehicles with sport mode is indicated as "D" on the scan tool.)

(4) Turn the ignition switch to the "LOCK" (OFF) position.

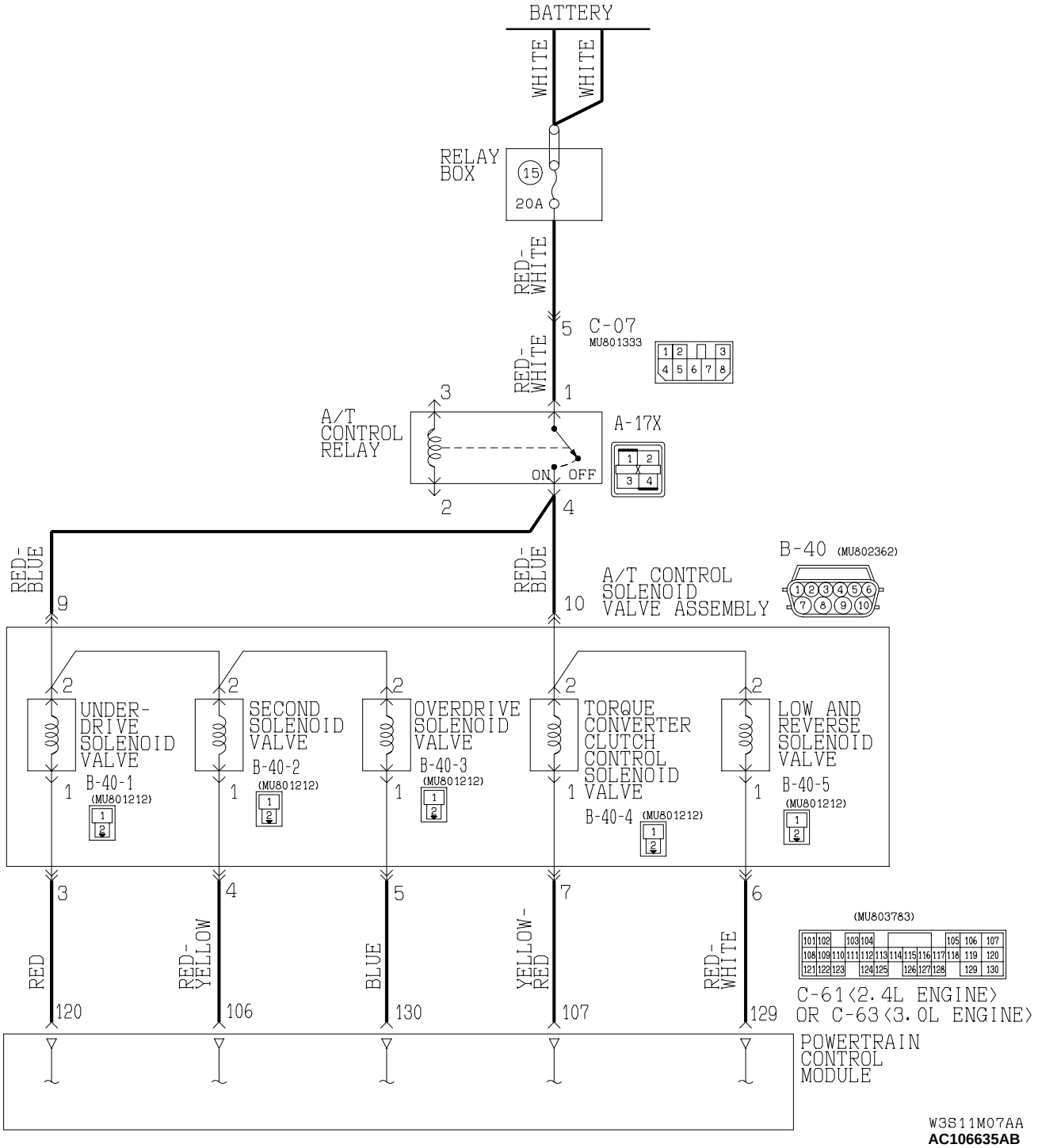
Q: Is the switch operating properly?

YES : This malfunction can be intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.

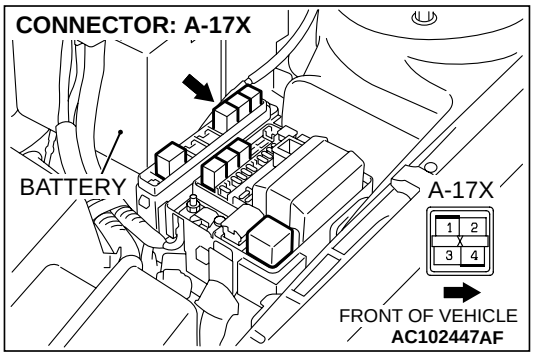
NO : Replace the PCM.

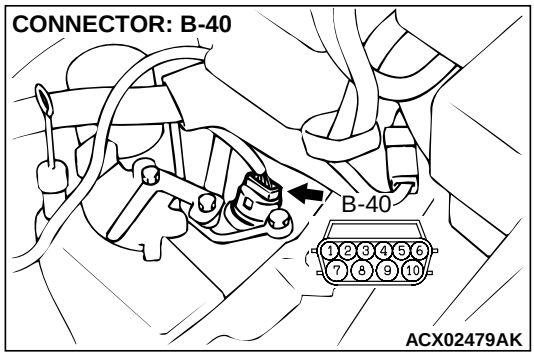
DTC 31: Low-Reverse Solenoid Valve System

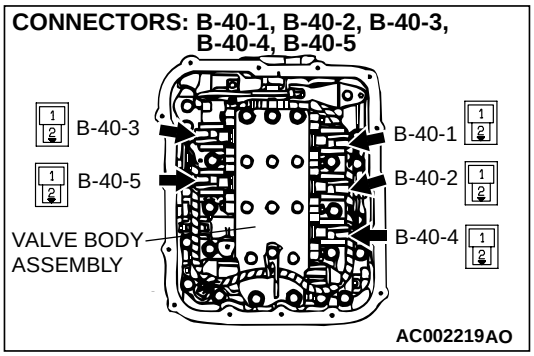
Solenoid Valve System Circuit

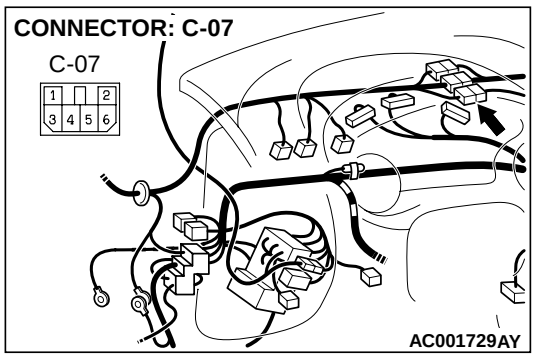


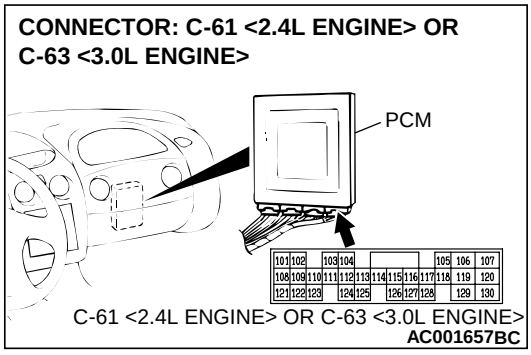
TSB Revision











CIRCUIT OPERATION

- A/T control relay supplies battery positive voltage to each solenoid valve (terminal 9 and 10).
- Solenoid valve closes when energized (on), and opens when deenergized (off). The PCM energizes or deenergizes solenoid valve, based on inputs from sensors such as Throttle Position Sensor, Park/Neutral Position Switch, Stoplight Switch, Vehicle Speed Sensor, Input Shaft Speed Sensor, Output Shaft Speed Sensor, A/T Fluid Temperature Sensor, etc.
- The PCM provides the ground to energize solenoid. The ground time is displayed in percent.
- As solenoid is energized or deenergized, it influences hydraulic pressure in the transmission applying and releasing elements.

DTC SET CONDITIONS

If the resistance value for a solenoid valve circuit is greater than 3.5 Ω for 4 seconds or less than 2.6 Ω for 4 seconds, it is judged that there is a short circuit or an open circuit in the solenoid valve and the diagnostic trouble code number "31" is displayed. The transmission is locked into 3rd gear as a fail-safe measure, and the "N" range light flashes once per second.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set:)

- Malfunction of low-reverse solenoid valve
- Damaged harness, connector
- Malfunction of the PCM

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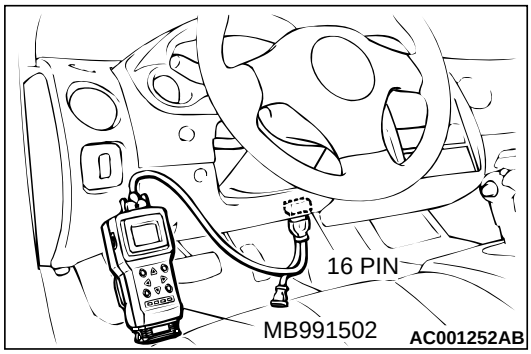
DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check the A/T diagnostic trouble code.

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

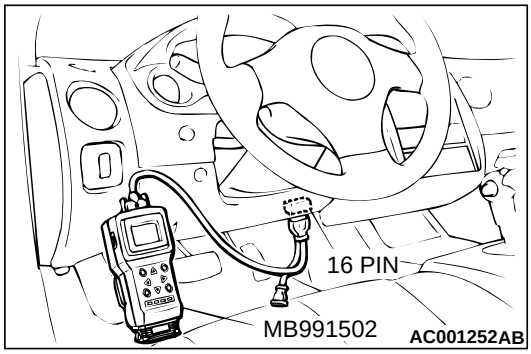


(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the A/T diagnostic trouble code.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the A/T diagnostic trouble code number "54" output?

YES : Refer to P.23A-233, code number 54: A/T control relay system.
NO : Go to Step 2.

STEP 2. Using scan tool MB991502, carry out the actuator test item 01: Low-Reverse Solenoid Valve.



(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to actuator test mode for item 01: Low-Reverse Solenoid Valve.
- An operation sound should be heard from solenoid valve when the low-reverse solenoid valve is operated.

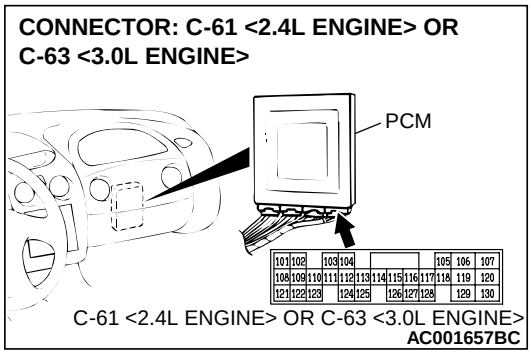
(4) Turn the ignition switch to the "LOCK" (OFF) position.

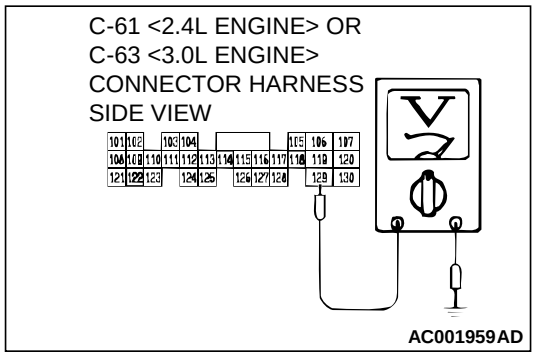
Q: Is the solenoid valve operating properly?

YES : This malfunction can be intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.
NO : Go to Step 3.

STEP 3. Check the solenoid valve output voltage at PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> by backprobing.

(1) Do not disconnect connector C-61 <2.4L Engine> or C-63 <3.0L Engine>.
(2) Turn the ignition switch to the "ON" position.





(3) Measure the voltage between terminal 129 and ground by backprobing.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

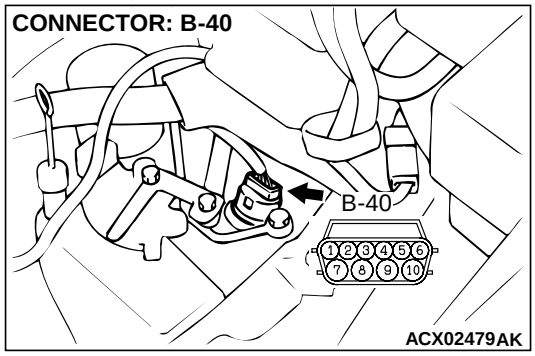
Q: Is the voltage normal?

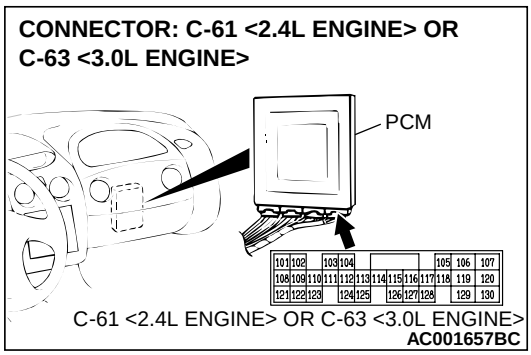
YES : Go to Step 4.
NO : Go to Step 9.

STEP 4. Check connectors B-40 at solenoid valve assembly and C-61 <2.4L Engine> or C-63 <3.0L Engine> at PCM for damage.

Q: Are the connectors in good condition?

YES : Go to Step 5.
NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



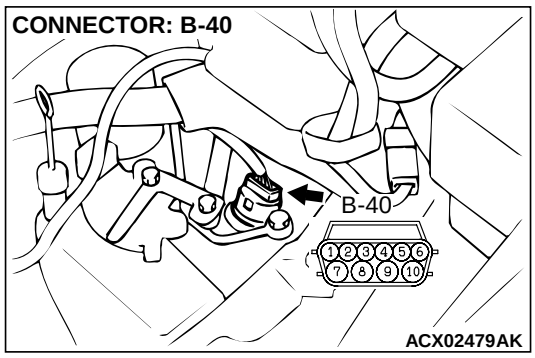


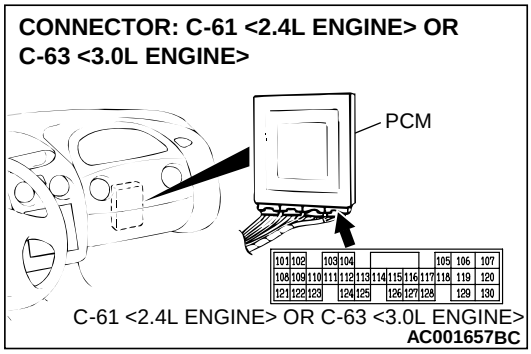
STEP 5. Check harness for damage between solenoid valve assembly connector B-40 terminal 6 and PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> terminal 129.

Q: Is the harness wire in good condition?

YES : Go to Step 6.

NO : Repair it.



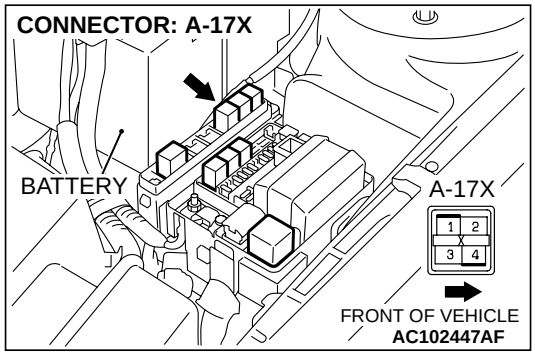


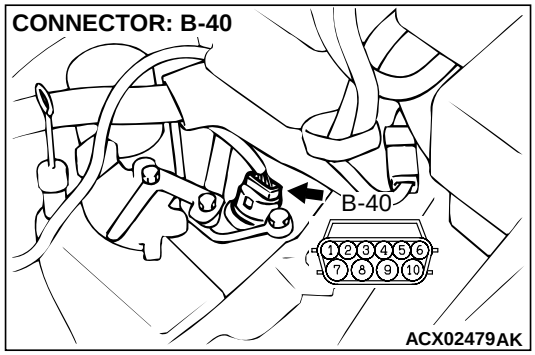
STEP 6. Check connector A-17X at A/T control relay for damage.

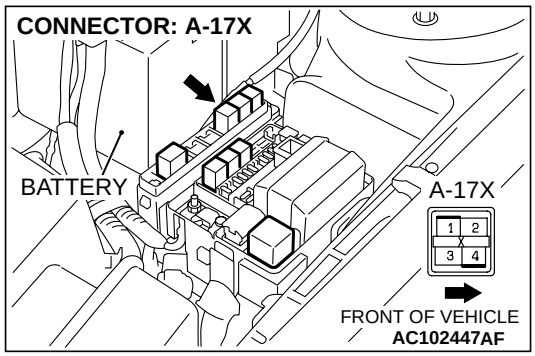
Q: Is the connector in good condition?

YES : Go to Step 7.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.





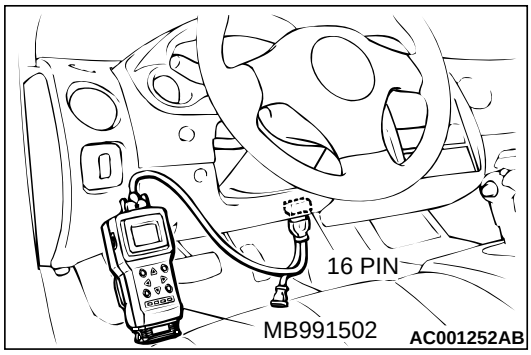


STEP 7. Check harness for damage between solenoid valve assembly connector B-40 terminal 10 and A/T control relay connector A-17X terminal 4.

Q: Is the harness wire in good condition?

YES : Go to Step 8.

NO : Repair it.



STEP 8. Using scan tool MB991502, carry out the actuator test item 01: Low-Reverse Solenoid Valve.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to data link connector.

(2) Turn the ignition switch to the "ON" position.

(3) Set scan tool MB991502 to the actuator test mode for item 01: Low-Reverse Solenoid Valve.

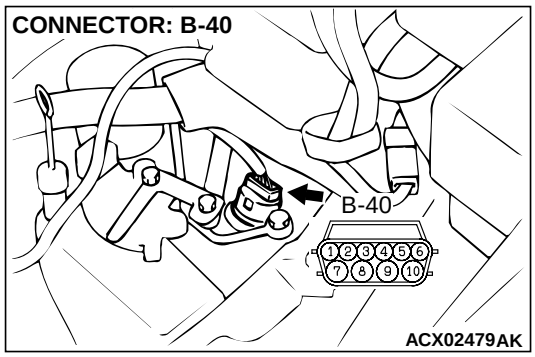
- An operation sound should be heard from solenoid valve when the low-reverse solenoid valve is operated.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the solenoid valve operating properly?

YES : This malfunction can be intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.

NO : Replace the PCM.

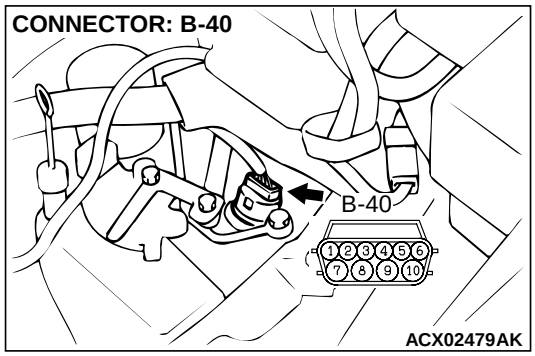


STEP 9. Check connector B-40 at solenoid valve assembly for damage.

Q: Is the connector in good condition?

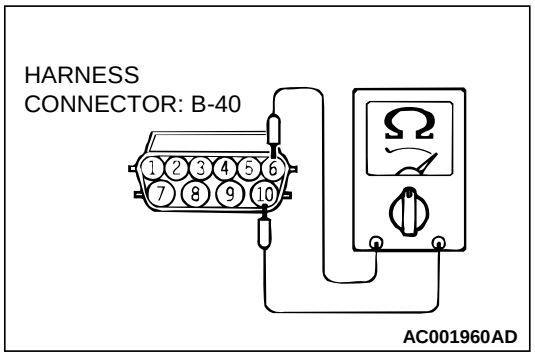
YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



STEP 10. Check the low-reverse solenoid valve at solenoid valve assembly connector B-40.

(1) Disconnect connector B-40 and measure at the solenoid valve side.



(2) Measure the resistance between terminal 6 and 10.

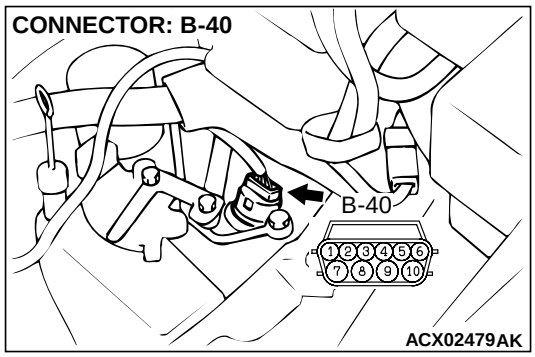
Standard value: 2.7 – 3.4 Ω [at 20°C (68°F)]

Q: Is the resistance at the standard value?

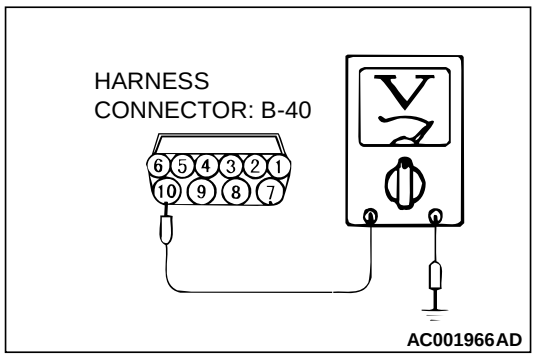
YES : Go to Step 11.

NO : Replace the low-reverse solenoid valve. Refer to GROUP 23B, Valve Body P.23B-74.

STEP 11. Check the power supply voltage at solenoid valve assembly connector B-40.



(1) Disconnect connector B-40 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.



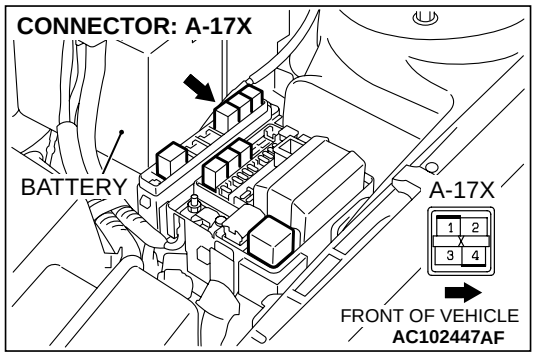
(3) Measure the voltage between terminal 10 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 13.
NO : Go to Step 12.

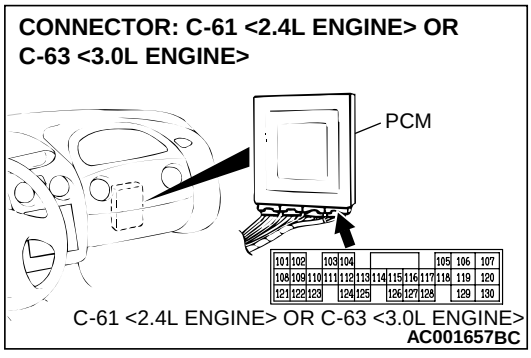
STEP 12. Check connector A-17X at A/T control relay for damage.



Q: Is the connector in good condition?

YES : Repair harness open circuit or short circuit to ground between solenoid valve assembly connector B-40 terminal 10 and A/T control relay connector A-17X terminal 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

STEP 13. Check connector C-61 <2.4L Engine> or C-63 <3.0L Engine> at PCM connector for damage.



Q: Is the connector in good condition?

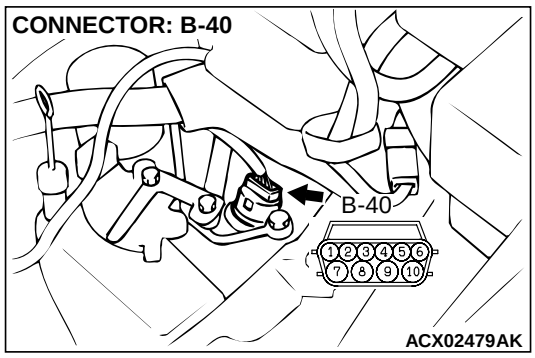
YES : Go to Step 14.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

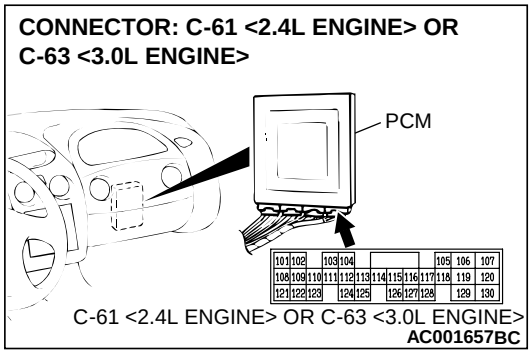
STEP 14. Check harness for open circuit, or short circuit to ground between solenoid valve assembly connector B-40 terminal 6 and PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> terminal 129.

Q: Is the harness wire in good condition?

YES : Replace the PCM.

NO : Repair it.





DTC 32: Underdrive Solenoid Valve System

Solenoid Valve System Circuit

Refer to P.23A-180.

CIRCUIT OPERATION

Refer to P.23A-180.

DTC SET CONDITIONS

If the resistance value for a solenoid valve circuit is greater than 3.5 Ω for 4 seconds or less than 2.6 Ω for 4 seconds, it is judged that there is a short circuit or an open circuit in the solenoid valve and the diagnostic trouble code number "32" is displayed. The transmission is locked into 3rd gear as a fail-safe measure, and the "N" range light flashes once per second.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set:)

- Malfunction of underdrive solenoid valve
- Damaged harness, connector
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check the A/T diagnostic trouble code.

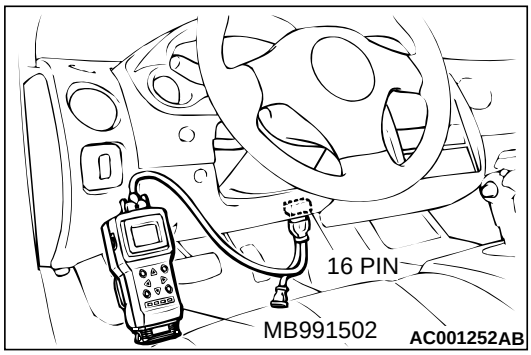
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the A/T diagnostic trouble code.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the A/T diagnostic trouble code number "54" output?

YES : Refer to P.23A-233, code number 54: A/T control relay system.
NO : Go to Step 2.



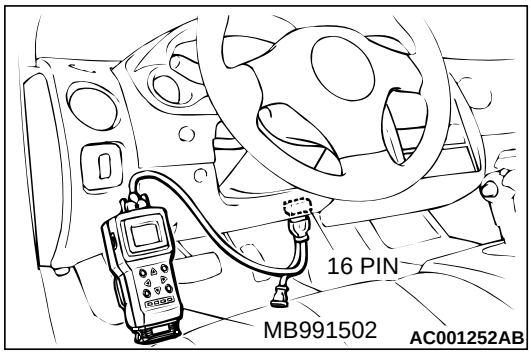
STEP 2. Using scan tool MB991502, carry out the actuator test item 02: Underdrive Solenoid Valve.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to actuator test mode for item 02: Underdrive Solenoid Valve.
- An operation sound should be heard from solenoid valve when the underdrive solenoid valve is operated.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

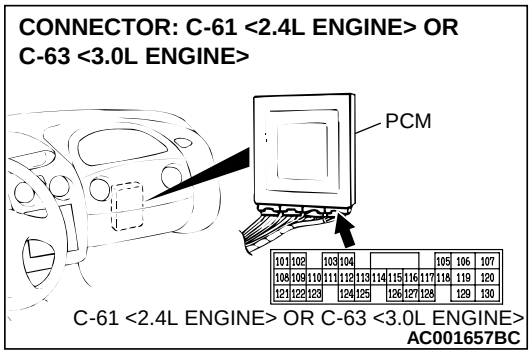
Q: Is the solenoid valve operating properly?

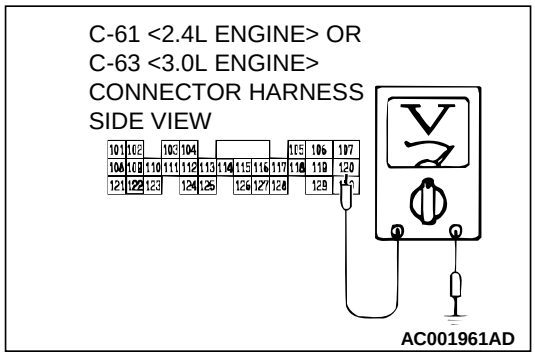
YES : This malfunction can be intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.
NO : Go to Step 3.



STEP 3. Check the solenoid valve output voltage at PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> by backprobing.

(1) Do not disconnect connector C-61 <2.4L Engine> or C-63 <3.0L Engine>.
(2) Turn the ignition switch to the "ON" position.





(3) Measure the voltage between terminal 120 and ground by backprobing.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

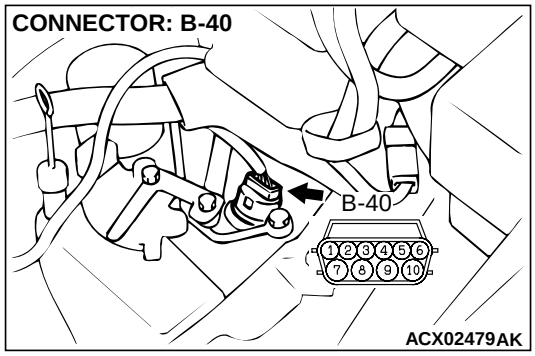
Q: Is the voltage normal?

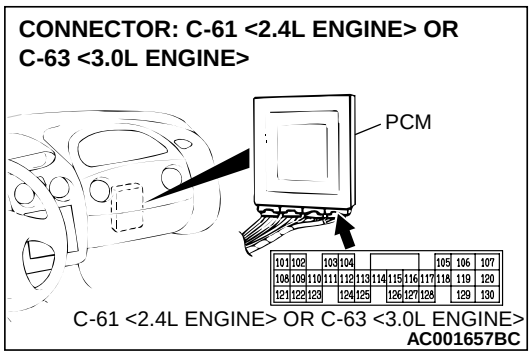
YES : Go to Step 4.
NO : Go to Step 9.

STEP 4. Check connectors B-40 at solenoid valve assembly and C-61 <2.4L Engine> or C-63 <3.0L Engine> at PCM for damage.

Q: Are the connectors in good condition?

YES : Go to Step 5.
NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



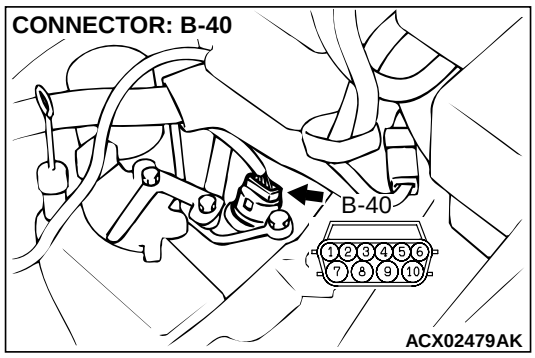


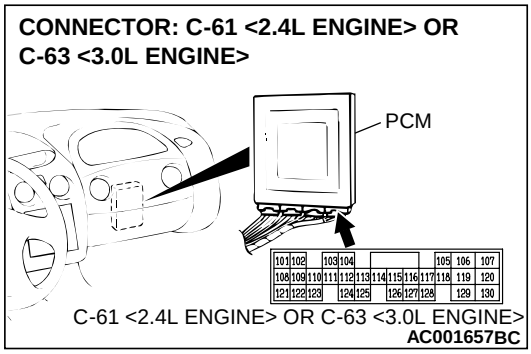
STEP 5. Check harness for damage between solenoid valve assembly connector B-40 terminal 3 and PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> terminal 120.

Q: Is the harness wire in good condition?

YES : Go to Step 6.

NO : Repair it.



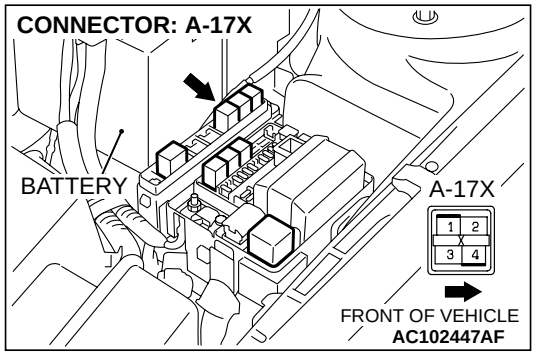


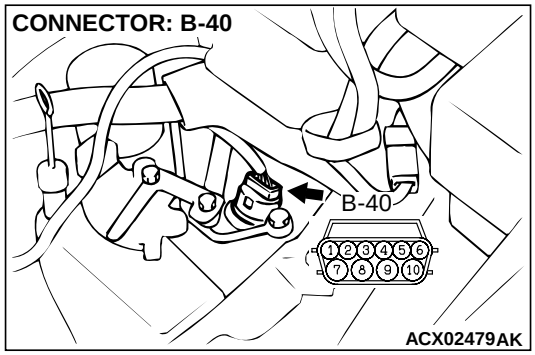
STEP 6. Check connector A-17X at A/T control relay for damage.

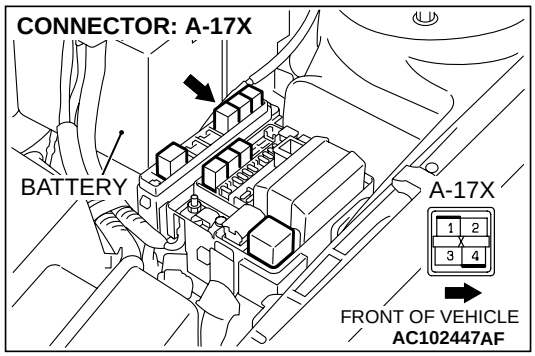
Q: Is the connector in good condition?

YES : Go to Step 7.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.





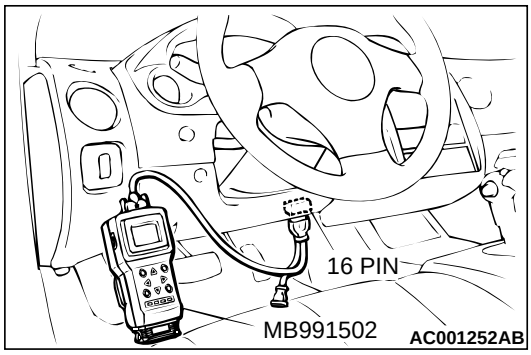


STEP 7. Check harness for damage between solenoid valve assembly connector B-40 terminal 9 and A/T control relay connector A-17X terminal 4.

Q: Is the harness wire in good condition?

YES : Go to Step 8.

NO : Repair it.



STEP 8. Using scan tool MB991502, carry out the actuator test item 02: Underdrive Solenoid Valve.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to data link connector.

(2) Turn the ignition switch to the "ON" position.

(3) Set scan tool MB991502 to the actuator test mode for item 02: Underdrive Solenoid Valve.

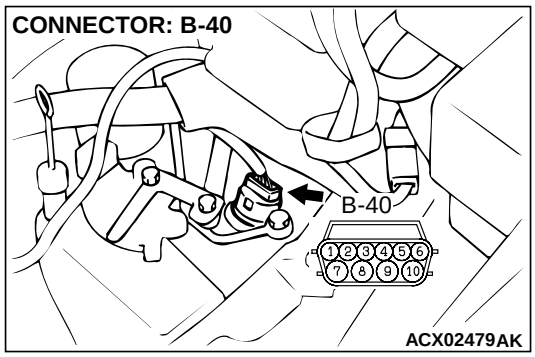
- An operation sound should be heard from solenoid valve when the underdrive solenoid valve is operated.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the solenoid valve operating properly?

YES : This malfunction can be intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.

NO : Replace the PCM.

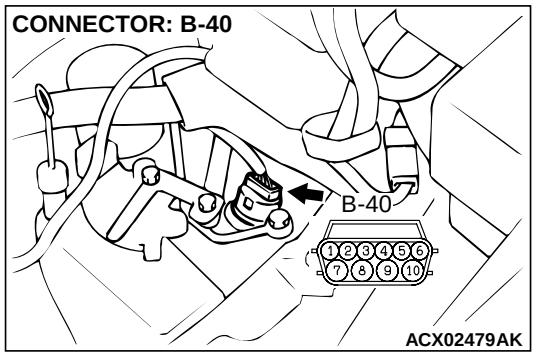


STEP 9. Check connector B-40 at solenoid valve assembly for damage.

Q: Is the connector in good condition?

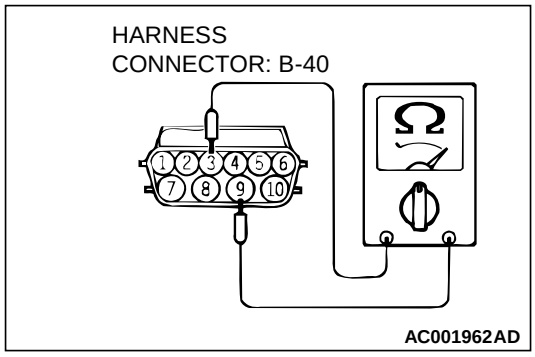
YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



STEP 10. Check the underdrive solenoid valve at solenoid valve assembly connector B-40.

(1) Disconnect connector B-40 and measure at the solenoid valve side.



(2) Measure the resistance between terminal 3 and 9.

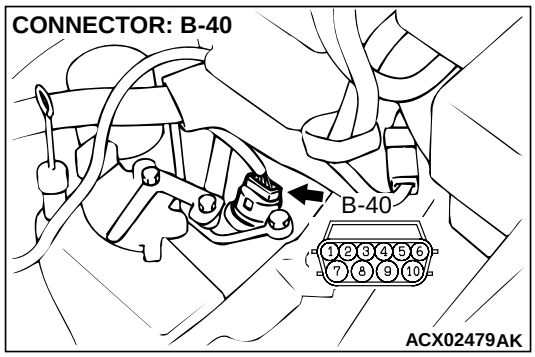
Standard value: 2.7 – 3.4 Ω [at 20°C (68°F)]

Q: Is the resistance at the standard value?

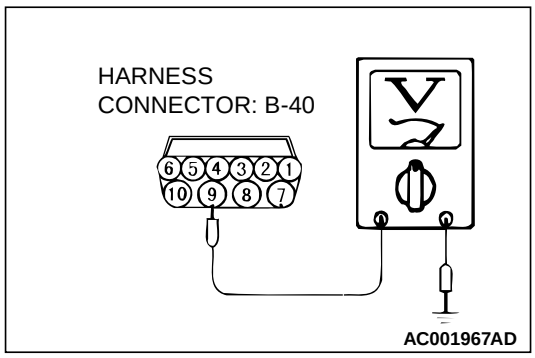
YES : Go to Step 11.

NO : Replace the underdrive solenoid valve. Refer to GROUP 23B, Valve Body P.23B-74.

STEP 11. Check the power supply voltage at solenoid valve assembly connector B-40.



(1) Disconnect connector B-40 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.



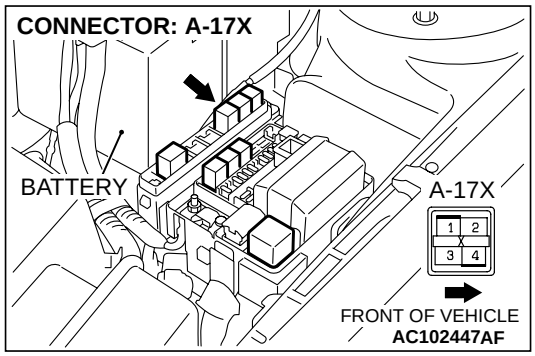
(3) Measure the voltage between terminal 9 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 13.
NO : Go to Step 12.

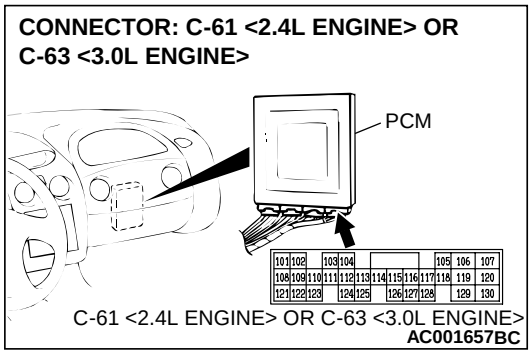
STEP 12. Check connector A-17X at A/T control relay for damage.



Q: Is the connector in good condition?

YES : Repair harness open circuit or short circuit to ground between solenoid valve assembly connector B-40 terminal 9 and A/T control relay connector A-17X terminal 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

STEP 13. Check connector C-61 <2.4L Engine> or C-63 <3.0L Engine> at PCM connector for damage.



Q: Is the connector in good condition?

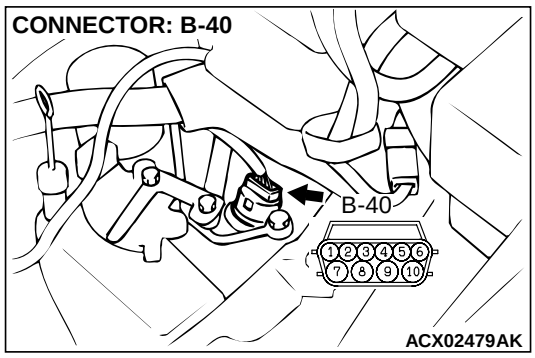
YES : Go to Step 14.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

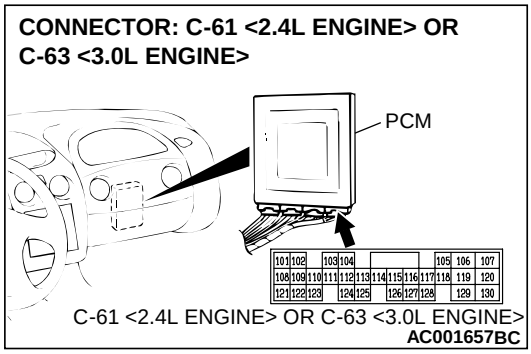
STEP 14. Check harness for open circuit, or short circuit to ground between solenoid valve assembly connector B-40 terminal 3 and PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> terminal 120.

Q: Is the harness wire in good condition?

YES : Replace the PCM.

NO : Repair it.





DTC 33: Second Solenoid Valve System

Solenoid Valve System Circuit

Refer to P.23A-180.

CIRCUIT OPERATION

Refer to P.23A-180.

DTC SET CONDITIONS

If the resistance value for a solenoid valve circuit is greater than 3.5 Ω for 4 seconds or less than 2.6 Ω for 4 seconds, it is judged that there is a short circuit or an open circuit in the solenoid valve and the diagnostic trouble code number "33" is displayed. The transmission is locked into 3rd gear as a fail-safe measure, and the "N" range light flashes once per second.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set:)

- Malfunction of second solenoid valve
- Damaged harness, connector
- Malfunction of the PCM

DIAGNOSIS

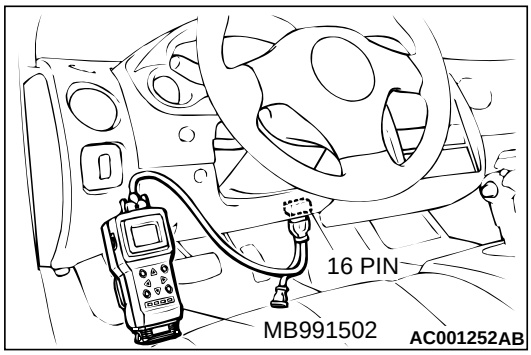
Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check the A/T diagnostic trouble code.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

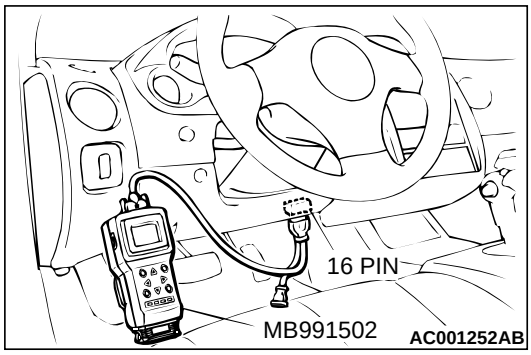


(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the A/T diagnostic trouble code.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the A/T diagnostic trouble code number "54" output?

YES : Refer to P.23A-233, code number 54: A/T control relay system.
NO : Go to Step 2.

STEP 2. Using scan tool MB991502, carry out the actuator test item 03: Second Solenoid Valve.



(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to actuator test mode for item 03, Second Solenoid Valve.
- An operation sound should be heard from solenoid valve when the second solenoid valve is operated.

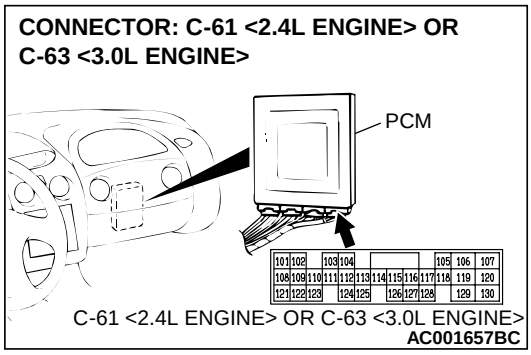
(4) Turn the ignition switch to the "LOCK" (OFF) position.

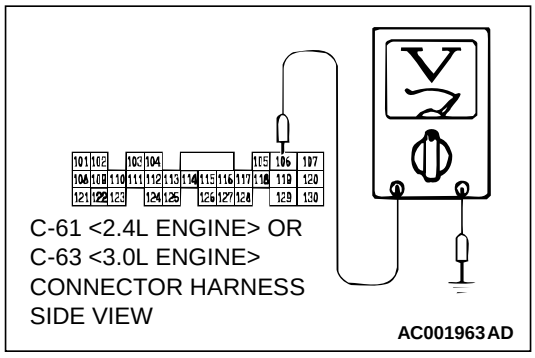
Q: Is the solenoid valve operating properly?

YES : This malfunction can be intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.
NO : Go to Step 3.

STEP 3. Check the solenoid valve output voltage at PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> by backprobing.

(1) Do not disconnect connector C-61 <2.4L Engine> or C-63 <3.0L Engine>.
(2) Turn the ignition switch to the "ON" position.





(3) Measure the voltage between terminal 106 and ground by backprobing.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

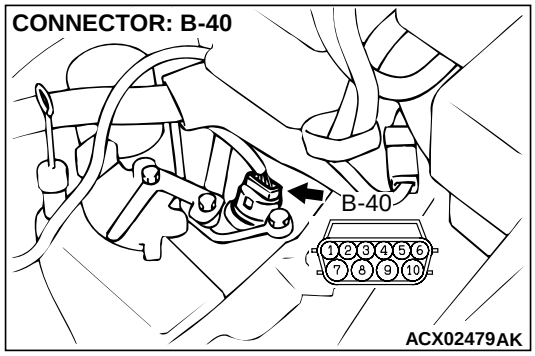
Q: Is the voltage normal?

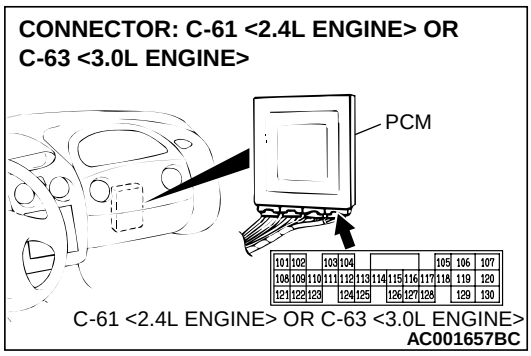
YES : Go to Step 4.
NO : Go to Step 9.

STEP 4. Check connectors B-40 at solenoid valve assembly and C-61 <2.4L Engine> or C-63 <3.0L Engine> at PCM for damage.

Q: Are the connectors in good condition?

YES : Go to Step 5.
NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



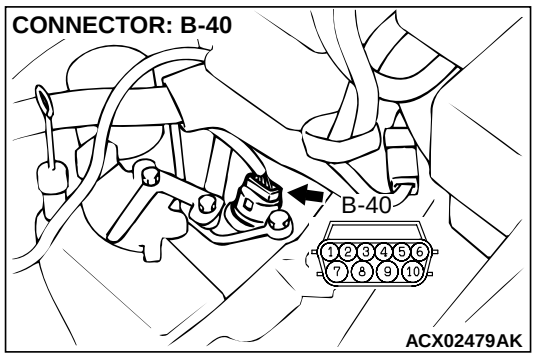


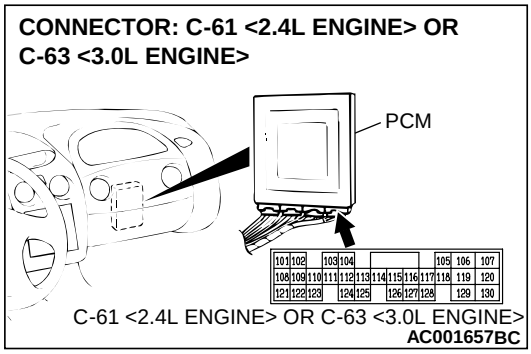
STEP 5. Check harness for damage between solenoid valve assembly connector B-40 terminal 4 and PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> terminal 106.

Q: Is the harness wire in good condition?

YES : Go to Step 6.

NO : Repair it.



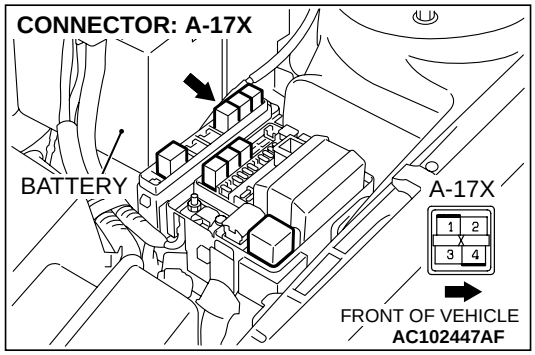


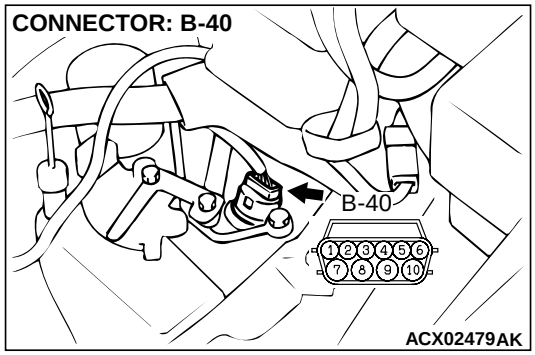
STEP 6. Check connector A-17X at A/T control relay for damage.

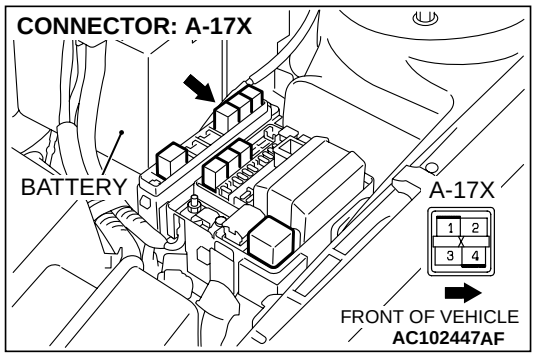
Q: Is the connector in good condition?

YES : Go to Step 7.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.





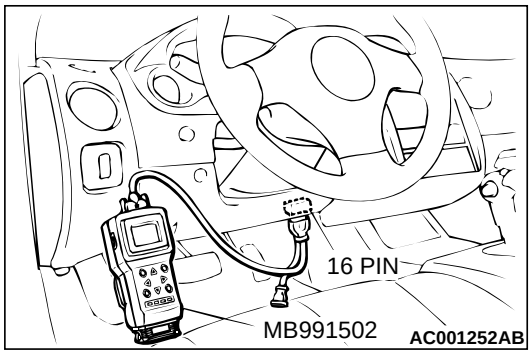


STEP 7. Check harness for damage between solenoid valve assembly connector B-40 terminal 9 and A/T control relay connector A-17X terminal 4.

Q: Is the harness wire in good condition?

YES : Go to Step 8.

NO : Repair it.



STEP 8. Using scan tool MB991502, carry out the actuator test item 03: Second Solenoid Valve.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to data link connector.

(2) Turn the ignition switch to the "ON" position.

(3) Set scan tool MB991502 to the actuator test mode for item 03: second Solenoid Valve.

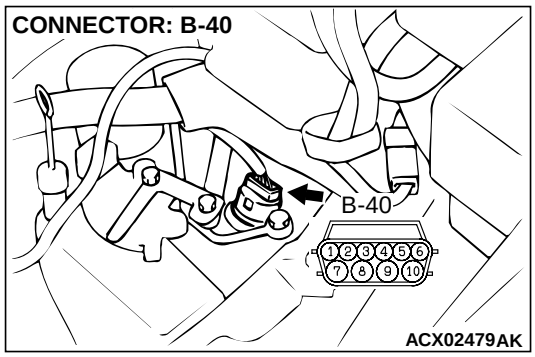
- An operation sound should be heard from solenoid valve when the second solenoid valve is operated.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the solenoid valve operating properly?

YES : This malfunction can be intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.

NO : Replace the PCM.

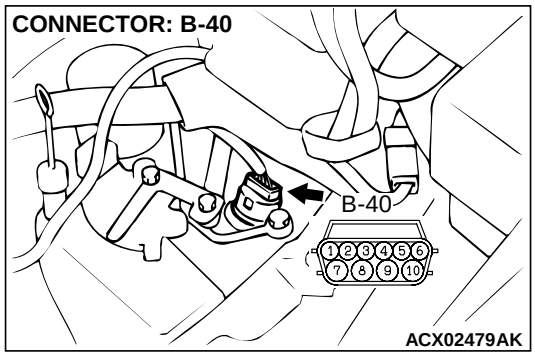


STEP 9. Check connector B-40 at solenoid valve assembly for damage.

Q: Is the connector in good condition?

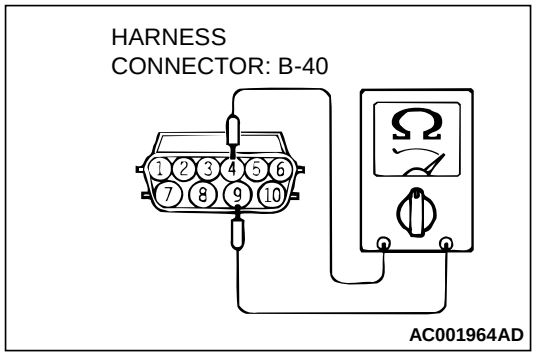
YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



STEP 10. Check the second solenoid valve at solenoid valve assembly connector B-40.

(1) Disconnect connector B-40 and measure at the solenoid valve side.



(2) Measure the resistance between terminal 4 and 9.

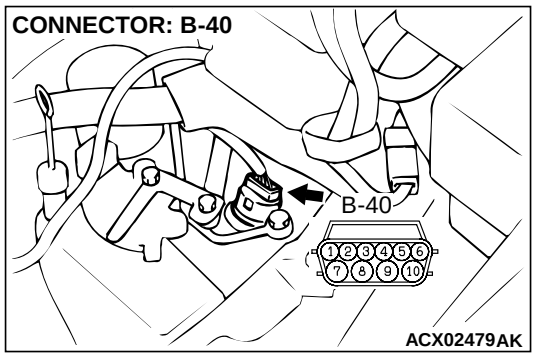
Standard value: 2.7 – 3.4 Ω [at 20°C (68°F)]

Q: Is the resistance at the standard value?

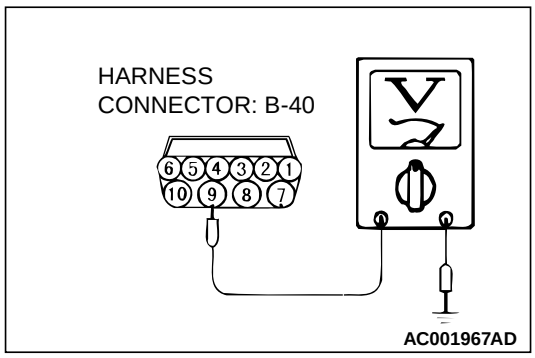
YES : Go to Step 11.

NO : Replace the second solenoid valve. Refer to GROUP 23B, Valve Body P.23B-74.

STEP 11. Check the power supply voltage at solenoid valve assembly connector B-40.



(1) Disconnect connector B-40 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.



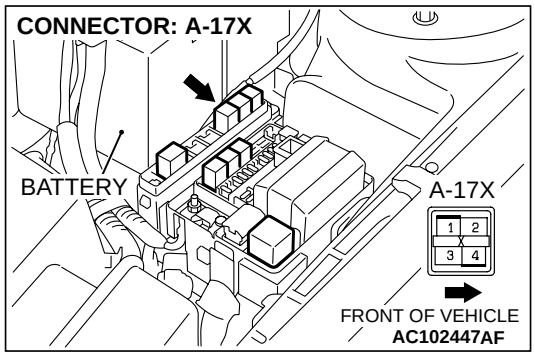
(3) Measure the voltage between terminal 9 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 13.
NO : Go to Step 12.

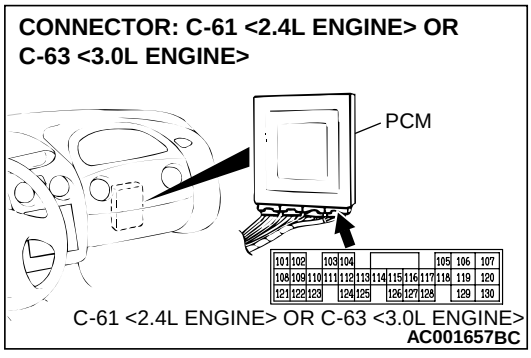
STEP 12. Check connector A-17X at A/T control relay for damage.



Q: Is the connector in good condition?

YES : Repair harness open circuit or short circuit to ground between solenoid valve assembly connector B-40 terminal 9 and A/T control relay connector A-17X terminal 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

STEP 13. Check connector C-61 <2.4L Engine> or C-63 <3.0L Engine> at PCM connector for damage.



Q: Is the connector in good condition?

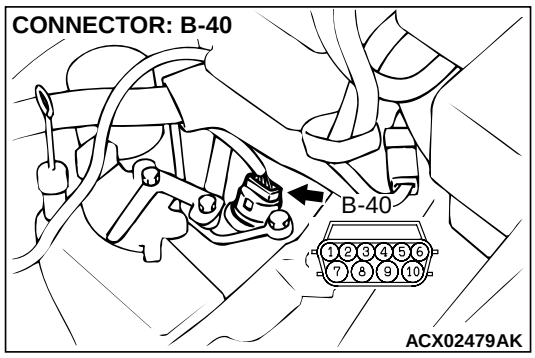
YES : Go to Step 14.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

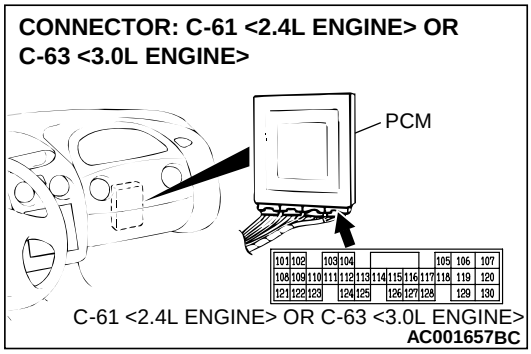
STEP 14. Check harness for open circuit, or short circuit to ground between solenoid valve assembly connector B-40 terminal 4 and PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> terminal 106.

Q: Is the harness wire in good condition?

YES : Replace the PCM.

NO : Repair it.





DTC 34: Overdrive Solenoid Valve System

Solenoid Valve System Circuit

Refer to P.23A-180.

CIRCUIT OPERATION

Refer to P.23A-180.

DTC SET CONDITIONS

If the resistance value for a solenoid valve circuit is greater than 3.5 Ω for 4 seconds or less than 2.6 Ω for 4 seconds, it is judged that there is a short circuit or an open circuit in the solenoid valve and the diagnostic trouble code number "34" is displayed. The transmission is locked into 3rd gear as a fail-safe measure, and the "N" range light flashes once per second.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set:)

- Malfunction of underdrive solenoid valve
- Damaged harness, connector
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check the A/T diagnostic trouble code.

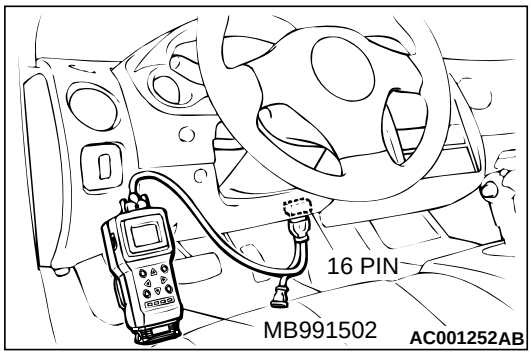
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the A/T diagnostic trouble code.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the A/T diagnostic trouble code number "54" output?

YES : Refer to P.23A-233, code number 54: A/T control relay system.
NO : Go to Step 2.



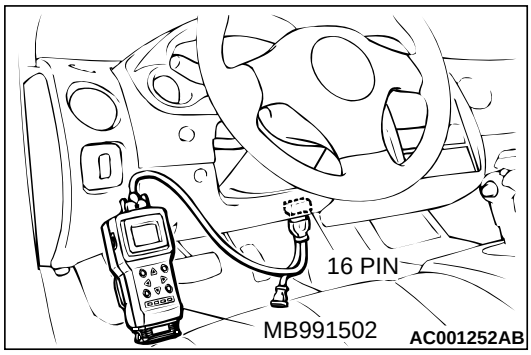
STEP 2. Using scan tool MB991502, carry out the actuator test item 04: Overdrive Solenoid Valve.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to actuator test mode for item 04, Overdrive Solenoid Valve.
- An operation sound should be heard from solenoid valve when the overdrive solenoid valve is operated.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

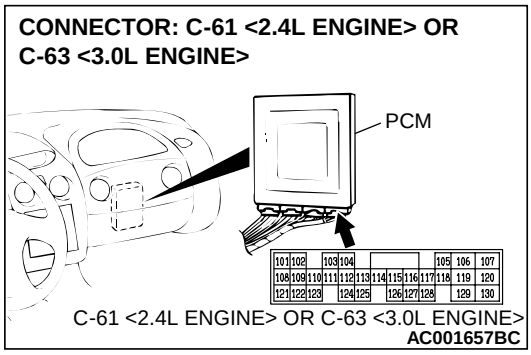
Q: Is the solenoid valve operating properly?

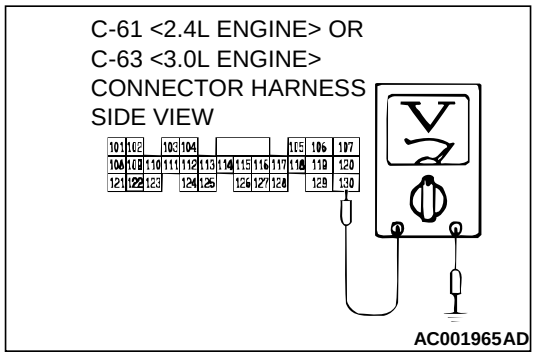
YES : This malfunction can be intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.
NO : Go to Step 3.



STEP 3. Check the solenoid valve output voltage at PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> by backprobing.

(1) Do not disconnect connector C-61 <2.4L Engine> or C-63 <3.0L Engine>.
(2) Turn the ignition switch to the "ON" position.





(3) Measure the voltage between terminal 130 and ground by backprobing.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

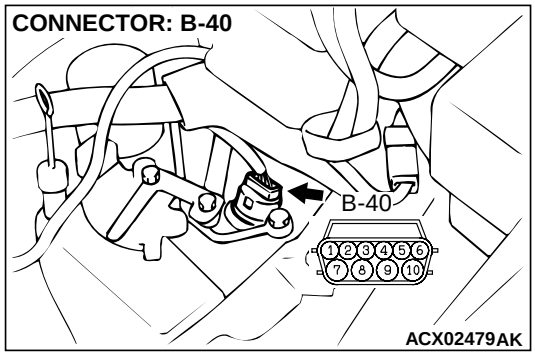
Q: Is the voltage normal?

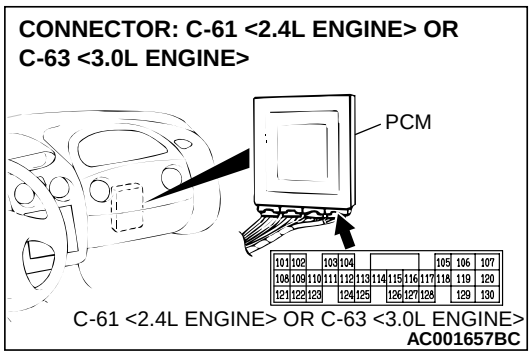
YES : Go to Step 4.
NO : Go to Step 9.

STEP 4. Check connectors B-40 at solenoid valve assembly and C-61 <2.4L Engine> or C-63 <3.0L Engine> at PCM for damage.

Q: Are the connectors in good condition?

YES : Go to Step 5.
NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



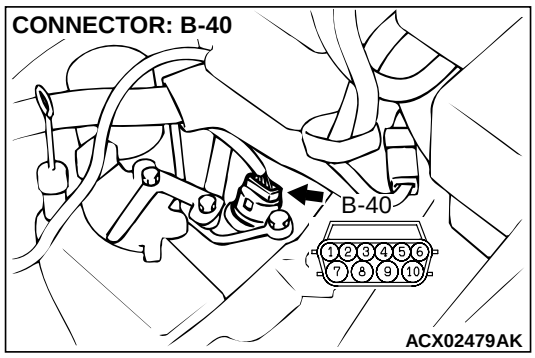


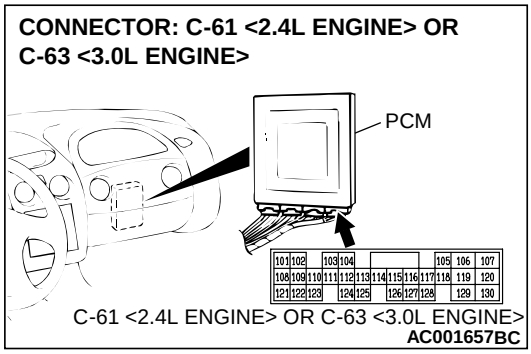
STEP 5. Check harness for damage between solenoid valve assembly connector B-40 terminal 5 and PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> terminal 130.

Q: Is the harness wire in good condition?

YES : Go to Step 6.

NO : Repair it.



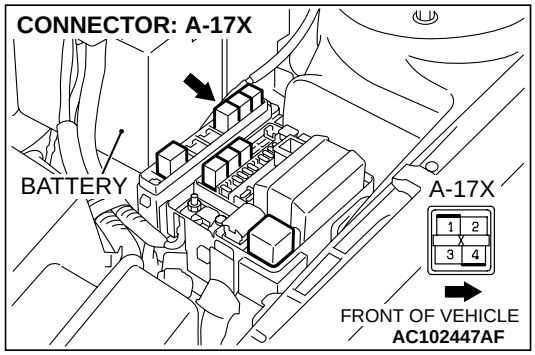


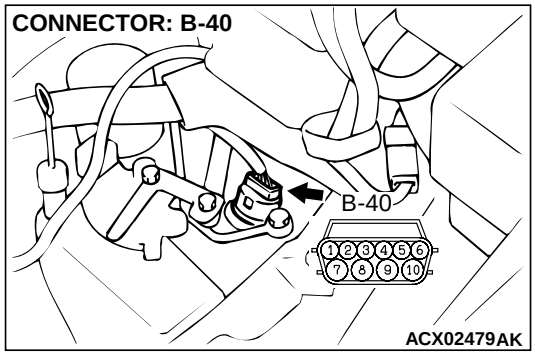
STEP 6. Check connector A-17X at A/T control relay for damage.

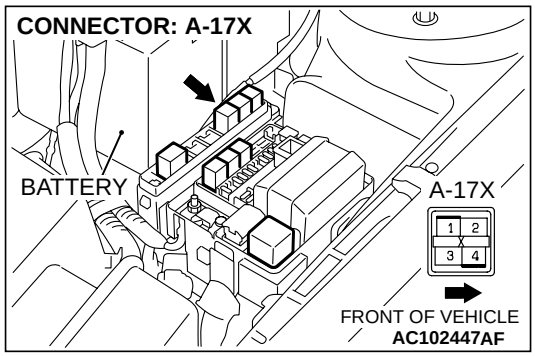
Q: Is the connector in good condition?

YES : Go to Step 7.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.





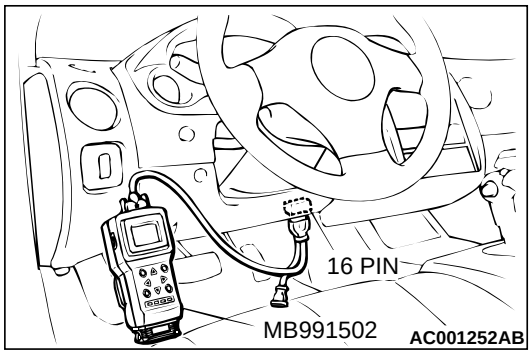


STEP 7. Check harness for damage between solenoid valve assembly connector B-40 terminal 9 and A/T control relay connector A-17X terminal 4.

Q: Is the harness wire in good condition?

YES : Go to Step 8.

NO : Repair it.



STEP 8. Using scan tool MB991502, carry out the actuator test item 04: Overdrive Solenoid Valve.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to data link connector.

(2) Turn the ignition switch to the "ON" position.

(3) Set scan tool MB991502 to the actuator test mode for item 04: Overdrive Solenoid Valve.

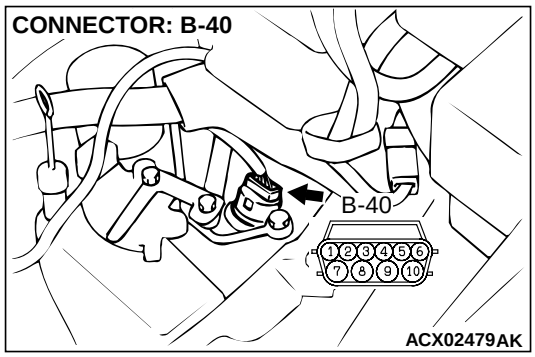
- An operation sound should be heard from solenoid valve when the overdrive solenoid valve is operated.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the solenoid valve operating properly?

YES : This malfunction can be intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.

NO : Replace the PCM.

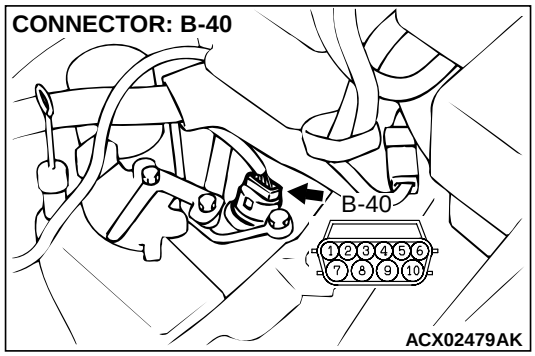


STEP 9. Check connector B-40 at solenoid valve assembly for damage.

Q: Is the connector in good condition?

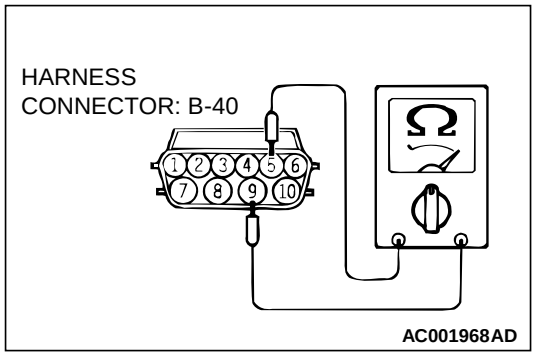
YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



STEP 10. Check the overdrive solenoid valve at solenoid valve assembly connector B-40.

(1) Disconnect connector B-40 and measure at the solenoid valve side.



(2) Measure the resistance between terminal 5 and 9.

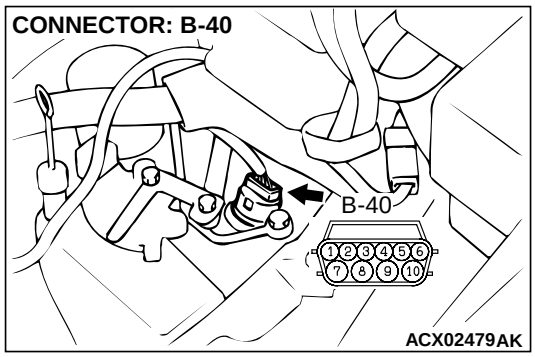
Standard value: 2.7 – 3.4 Ω [at 20°C (68°F)]

Q: Is the resistance at the standard value?

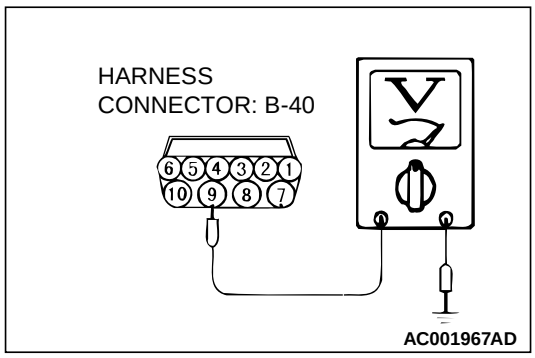
YES : Go to Step 11.

NO : Replace the overdrive solenoid valve. Refer to GROUP 23B, Valve Body P.23B-74.

STEP 11. Check the power supply voltage at solenoid valve assembly connector B-40.



(1) Disconnect connector B-40 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.



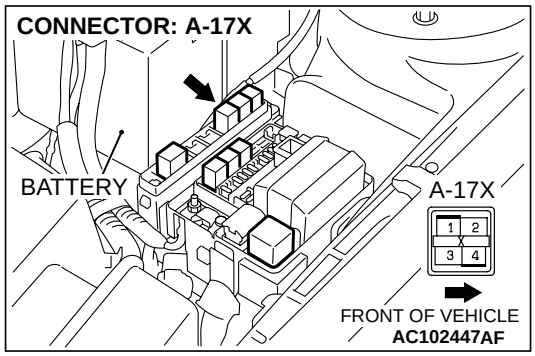
(3) Measure the voltage between terminal 9 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 13.
NO : Go to Step 12.

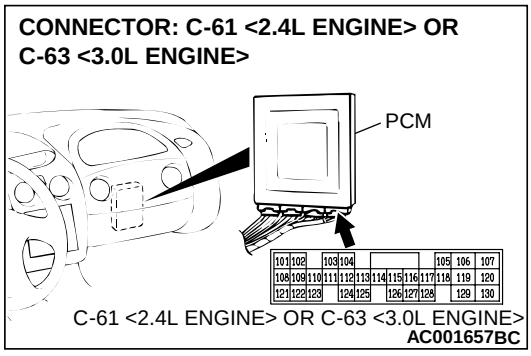
STEP 12. Check connector A-17X at A/T control relay for damage.



Q: Is the connector in good condition?

YES : Repair harness open circuit or short circuit to ground between solenoid valve assembly connector B-40 terminal 9 and A/T control relay connector A-17X terminal 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

STEP 13. Check connector C-61 <2.4L Engine> or C-63 <3.0L Engine> at PCM connector for damage.



Q: Is the connector in good condition?

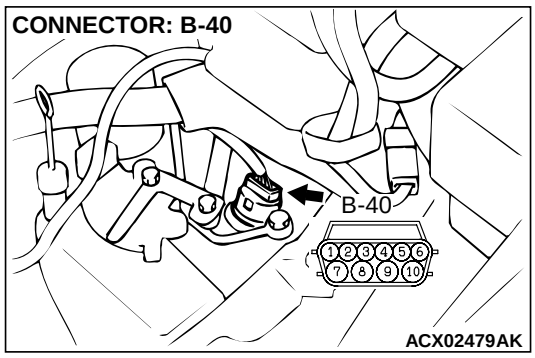
YES : Go to Step 14.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

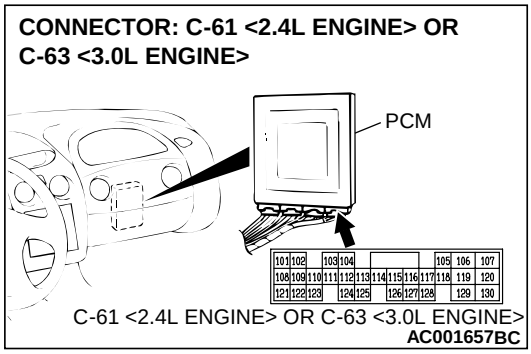
STEP 14. Check harness for open circuit, or short circuit to ground between solenoid valve assembly connector B-40 terminal 5 and PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> terminal 130.

Q: Is the harness wire in good condition?

YES : Replace the PCM.

NO : Repair it.





DTC 36: Torque Converter Clutch Solenoid Valve System

Solenoid Valve System Circuit

Refer to P.23A-180.

CIRCUIT OPERATION

Refer to P.23A-180.

DTC SET CONDITIONS

If the resistance value for a solenoid valve circuit is greater than 3.5 Ω for 4 seconds or less than 2.6 Ω for 4 seconds, it is judged that there is a short circuit or an open circuit in the solenoid valve and the diagnostic trouble code number "36" is displayed. The transmission is locked into 3rd gear as a fail-safe measure, and the "N" range light flashes once per second.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set:)

- Malfunction of torque converter clutch solenoid valve
- Damaged harness, connector
- Malfunction of the PCM

DIAGNOSIS

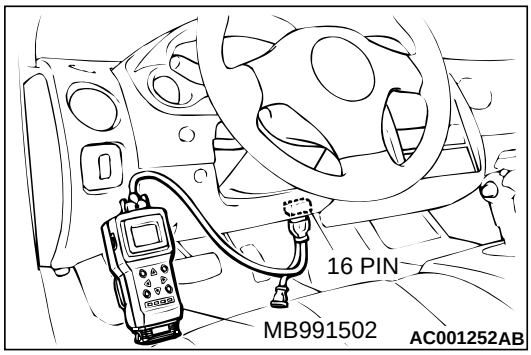
Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check the A/T diagnostic trouble code.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

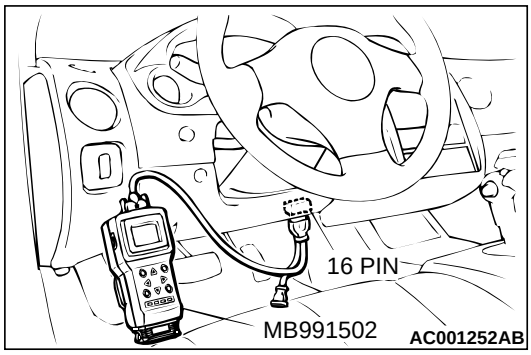


(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the A/T diagnostic trouble code.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the A/T diagnostic trouble code number "54" output?

YES : Refer to P.23A-233, code number 54: A/T control relay system.
NO : Go to Step 2.

STEP 2. Using scan tool MB991502, carry out the actuator test item 06: Torque Converter Clutch Solenoid Valve.



(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to actuator test mode for item 06: Torque Converter Clutch Solenoid Valve.
- An operation sound should be heard from solenoid valve when the torque converter clutch solenoid valve is operated.

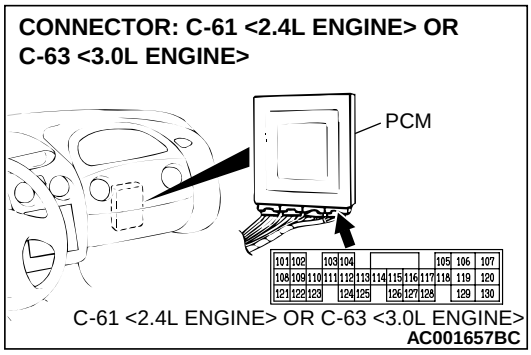
(4) Turn the ignition switch to the "LOCK" (OFF) position.

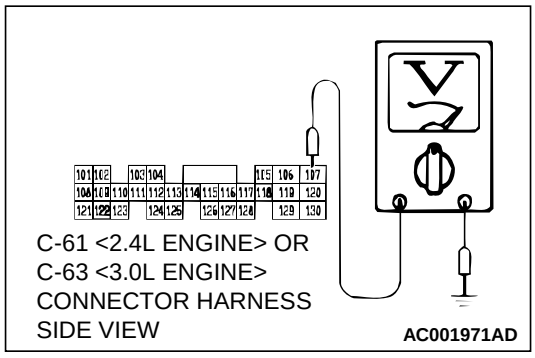
Q: Is the solenoid valve operating properly?

YES : This malfunction can be intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.
NO : Go to Step 3.

STEP 3. Check the solenoid valve output voltage at PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> by backprobing.

(1) Do not disconnect connector C-61 <2.4L Engine> or C-63 <3.0L Engine>.
(2) Turn the ignition switch to the "ON" position.





(3) Measure the voltage between terminal 107 and ground by backprobing.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

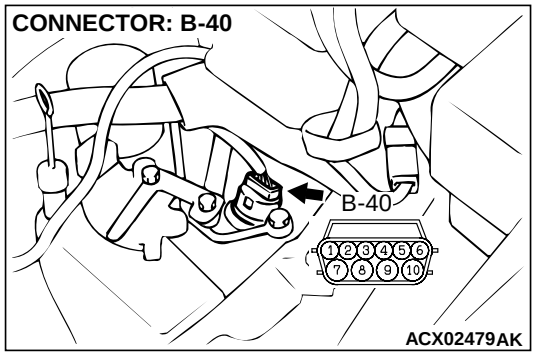
Q: Is the voltage normal?

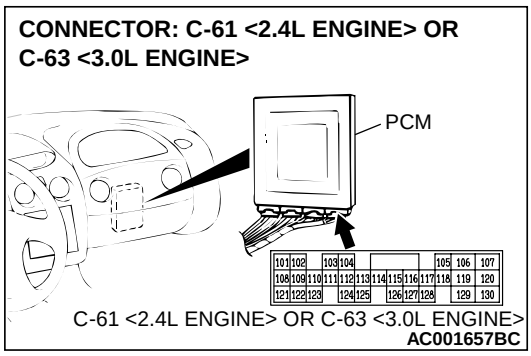
YES : Go to Step 4.
NO : Go to Step 9.

STEP 4. Check connectors B-40 at solenoid valve assembly and C-61 <2.4L Engine> or C-63 <3.0L Engine> at PCM for damage.

Q: Are the connectors in good condition?

YES : Go to Step 5.
NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



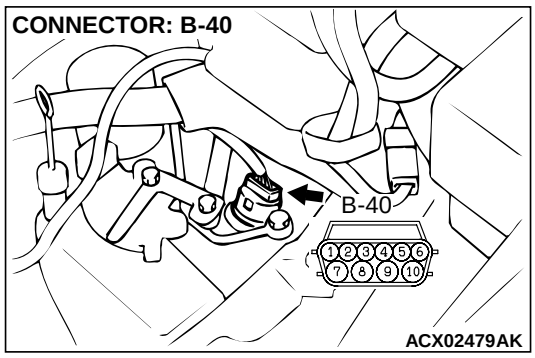


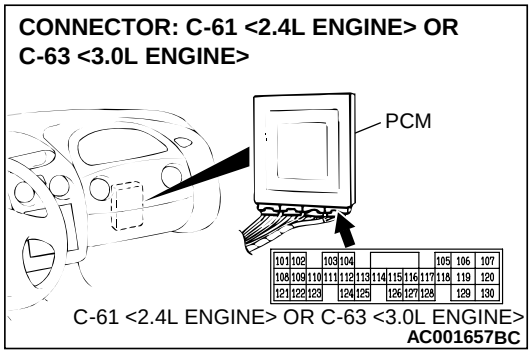
STEP 5. Check harness for damage between solenoid valve assembly connector B-40 terminal 7 and PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> terminal 107.

Q: Is the harness wire in good condition?

YES : Go to Step 6.

NO : Repair it.



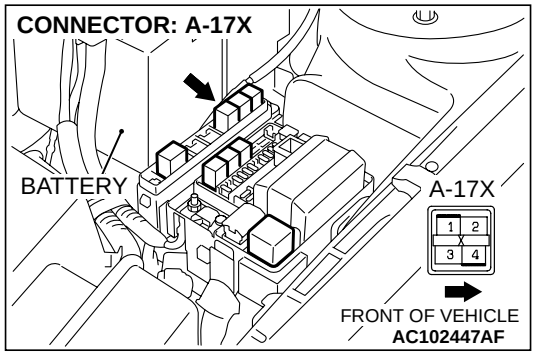


STEP 6. Check connector A-17X at A/T control relay for damage.

Q: Is the connector in good condition?

YES : Go to Step 7.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

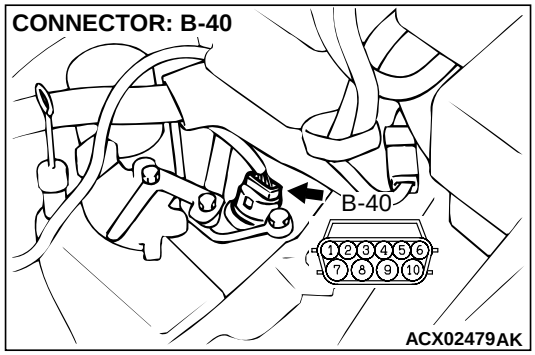


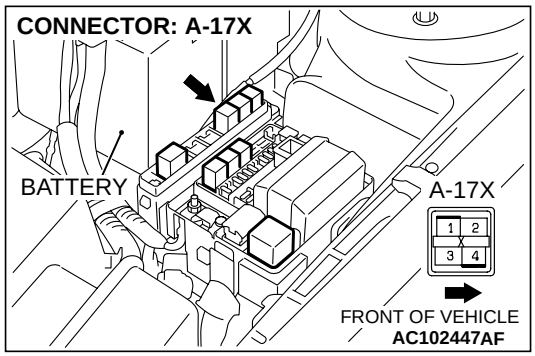
STEP 7. Check harness for damage between solenoid valve assembly connector B-40 terminal 10 and A/T control relay connector A-17X terminal 4.

Q: Is the harness wire in good condition?

YES : Go to Step 8.

NO : Repair it.





STEP 8. Using scan tool MB991502, carry out the actuator test item 06: Torque Converter Clutch Solenoid Valve.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

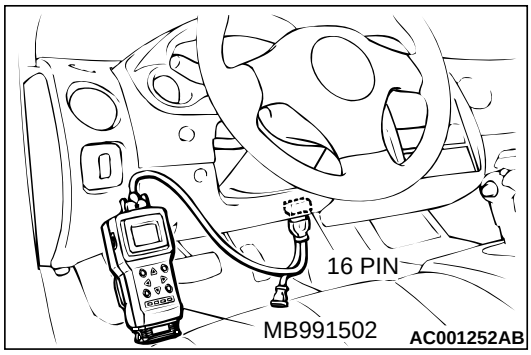
(1) Connect scan tool MB991502 to data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to the actuator test mode for item 06: Torque Converter Clutch Solenoid Valve.
- An operation sound should be heard from solenoid valve when the torque converter clutch solenoid valve is operated.

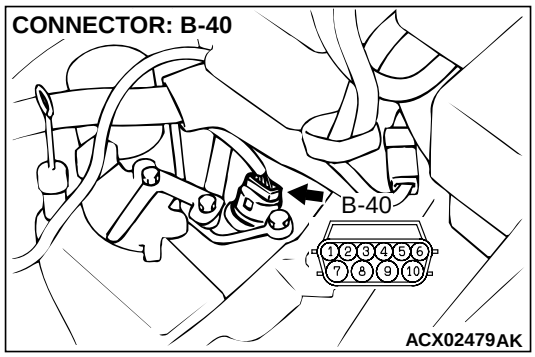
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the solenoid valve operating properly?

YES : This malfunction can be intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.

NO : Replace the PCM.



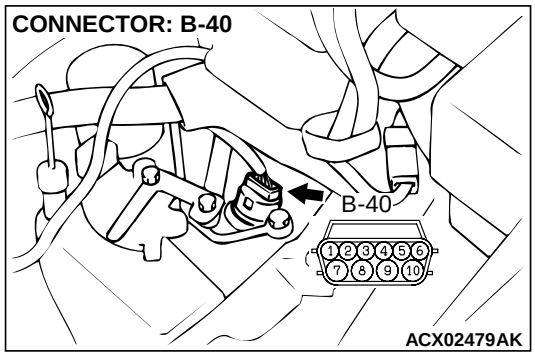


STEP 9. Check connector B-40 at solenoid valve assembly for damage.

Q: Is the connector in good condition?

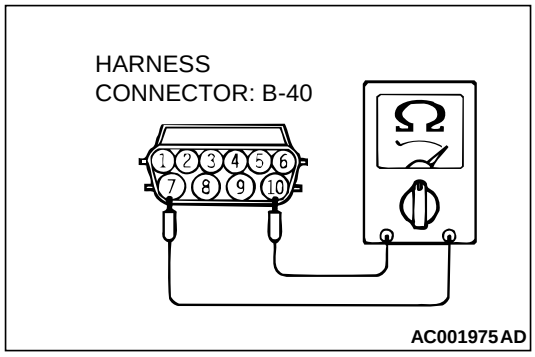
YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



STEP 10. Check the torque converter clutch solenoid valve at solenoid valve assembly connector B-40.

(1) Disconnect connector B-40 and measure at the solenoid valve side.



(2) Measure the resistance between terminal 7 and 10.

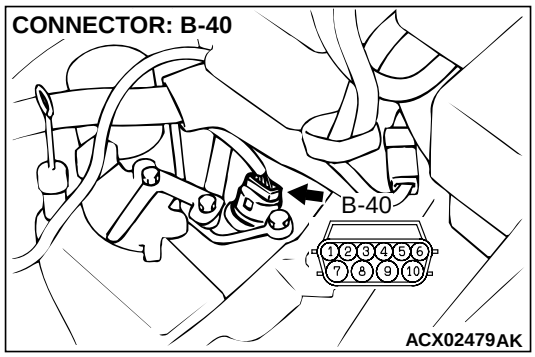
Standard value: 2.7 – 3.4 Ω [at 20°C (68°F)]

Q: Is the resistance at the standard value?

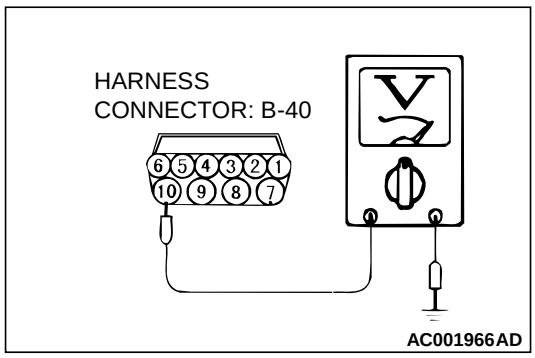
YES : Go to Step 11.

NO : Replace the torque converter clutch solenoid valve. Refer to GROUP 23B, Valve Body P.23B-74.

STEP 11. Check the power supply voltage at solenoid valve assembly connector B-40.



(1) Disconnect connector B-40 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.



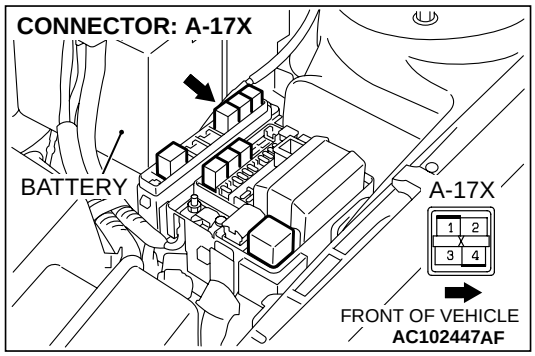
(3) Measure the voltage between terminal 10 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 13.
NO : Go to Step 12.

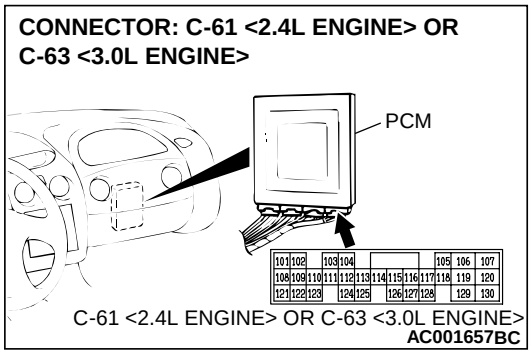
STEP 12. Check connector A-17X at A/T control relay for damage.



Q: Is the connector in good condition?

YES : Repair harness open circuit or short circuit to ground between solenoid valve assembly connector B-40 terminal 10 and A/T control relay connector A-17X terminal 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

STEP 13. Check connector C-61 <2.4L Engine> or C-63 <3.0L Engine> at PCM for damage.



Q: Is the connector in good condition?

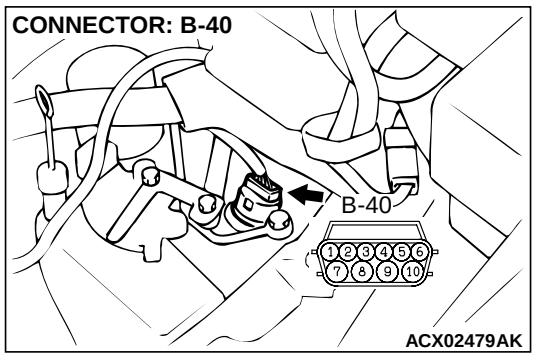
YES : Go to Step 14.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

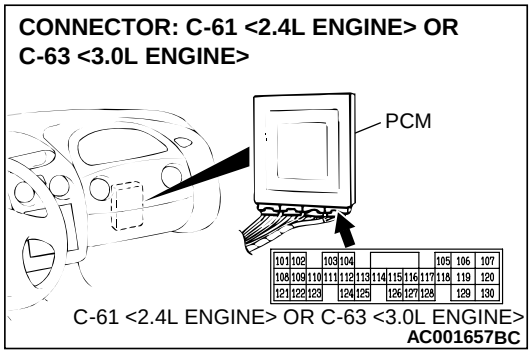
STEP 14. Check harness for open circuit, or short circuit to ground between solenoid valve assembly connector B-40 terminal 7 and PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> terminal 107.

Q: Is the harness wire in good condition?

YES : Replace the PCM.

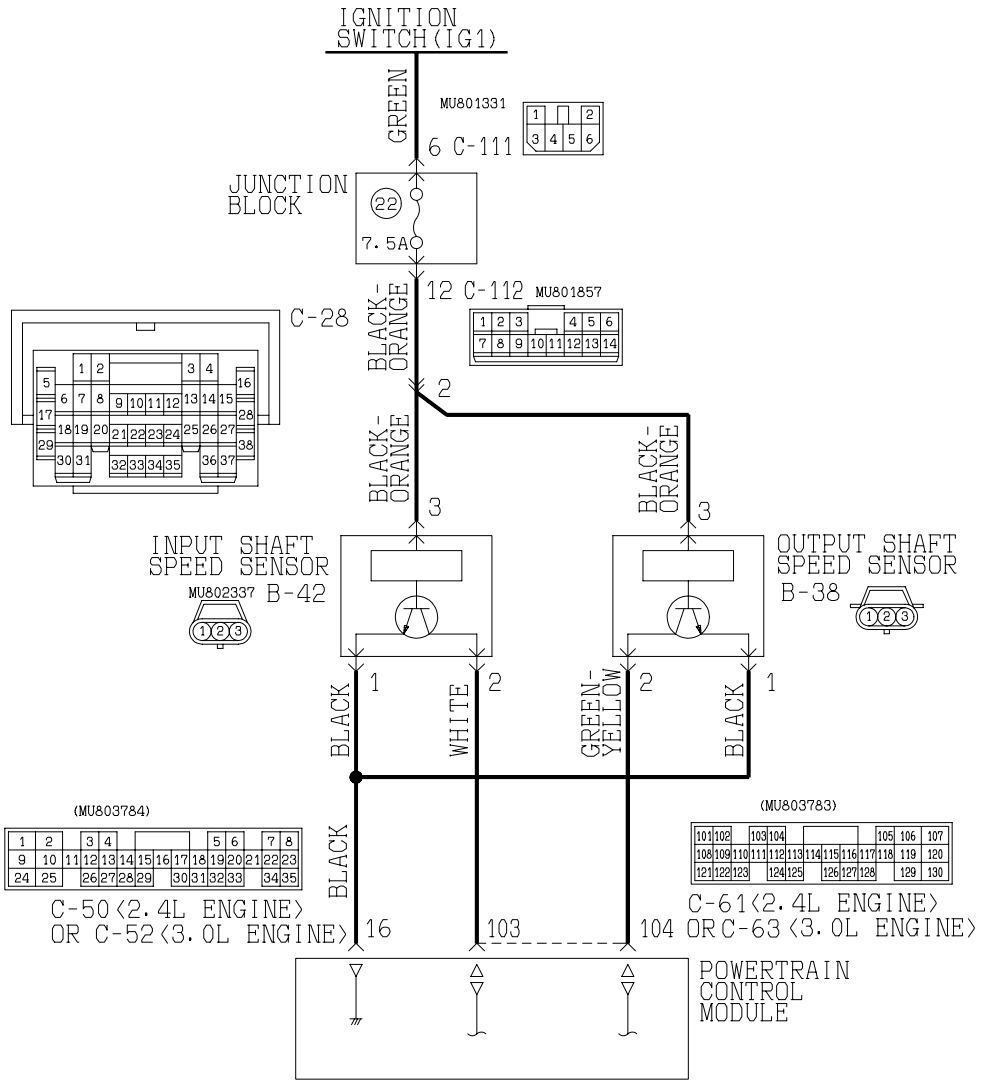
NO : Repair it.





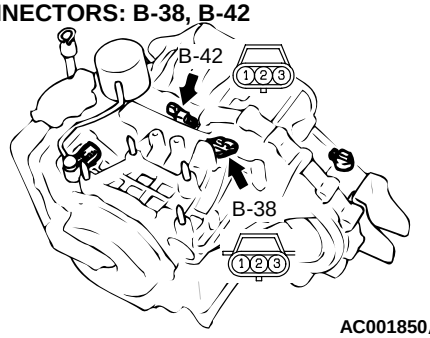
DTC 41: 1st Gear Incorrect Ratio
DTC 42: 2nd Gear Incorrect Ratio
DTC 43: 3rd Gear Incorrect Ratio
DTC 44: 4th Gear Incorrect Ratio
DTC 46: Reverse Gear Incorrect Ratio

Input Shaft Speed Sensor and Output Shaft Speed Sensor System Circuit



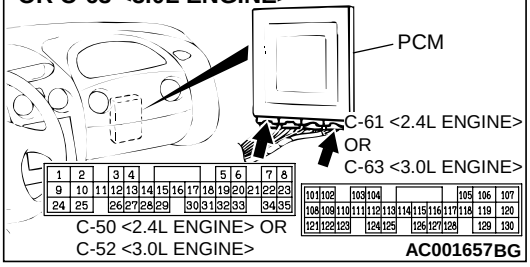
W3S11M08AA
AC106636AB

CONNECTORS: B-38, B-42



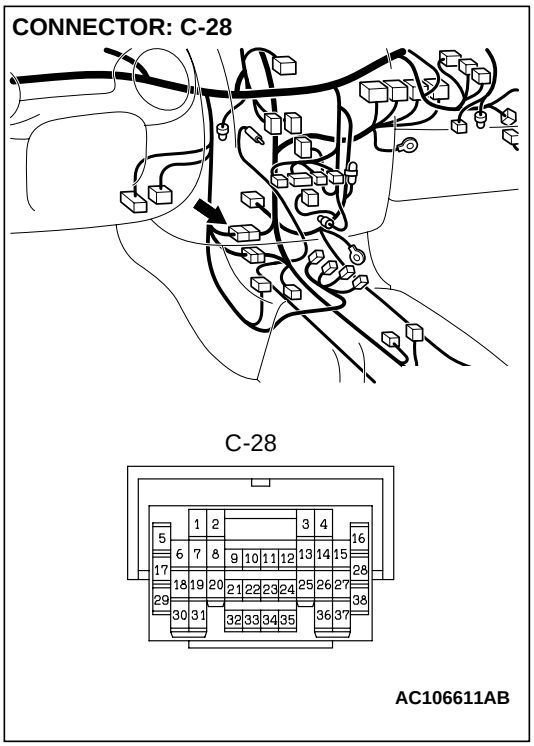
AC001850AG

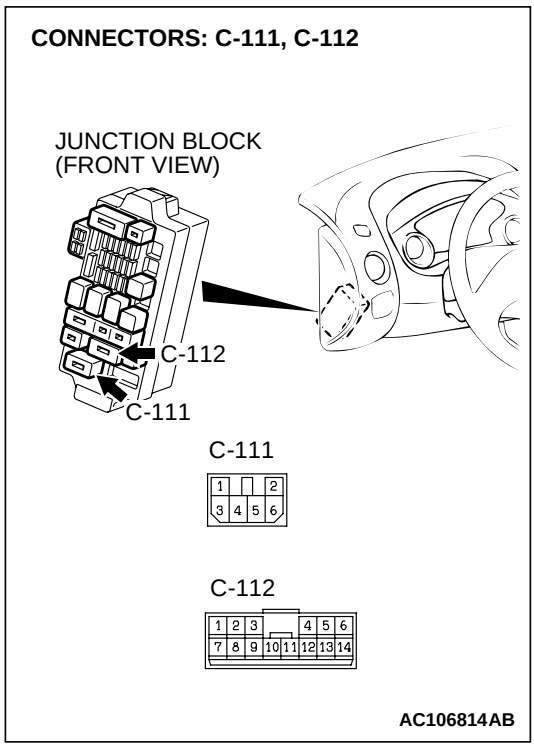
CONNECTORS: C-50 <2.4L ENGINE> OR C-52 <3.0L ENGINE>, C-61 <2.4L ENGINE> OR C-63 <3.0L ENGINE>



AC001657BG

TSB Revision





CIRCUIT OPERATION

- A coil built into the input shaft speed sensor generates pulse signal of 0 ⇔ 5 volts at both ends of this coil when the input shaft rotates. The pulse signal frequency increases with the rise in input shaft speed.
- Both ends of the coil are connected to the PCM (terminals 16 and 103) via the input shaft speed sensor connector (terminals 1 and 2).
- The PCM detects the input shaft speed with the signal input to terminal (terminal 103).
- A coil built into the output shaft speed sensor generates pulse signal of 0 ⇔ 5 volts at both ends of this coil when the output shaft rotates. The pulse signal frequency increases with the rise in output shaft speed.
- Both ends of the coil are connected to the PCM (terminals 16 and 104) via the output shaft speed sensor connector (terminals 1 and 2).
- The PCM detects the output shaft speed with the signal input to terminal (terminal 104).

DTC SET CONDITIONS

If the output from the output shaft speed sensor multiplied by the 1st gear ratio is not the same as the output from the input shaft speed sensor after shifting to 1st gear has been completed, diagnostic trouble code number "41" is output. If diagnostic trouble code number "41" is output four times, the transmission is locked into 3rd gear as a fail-safe measure, and the "N" range light flashes once per second.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set:)

- Malfunction of the input shaft speed sensor
- Malfunction of the output shaft speed sensor
- Malfunction of the PCM
- Malfunction of the underdrive clutch retainer
- Malfunction of the transfer drive gear or driven gear
- Malfunction of the low-reverse brake system (for code number "41," "46")
- Malfunction of the underdrive clutch system (for code number "41," "42," "43")
- Malfunction of the second brake system (for code number "42," "44")
- Malfunction of the overdrive clutch system (for code number "43," "44")
- Malfunction of the reverse clutch system (for code number "46")
- Noise generated

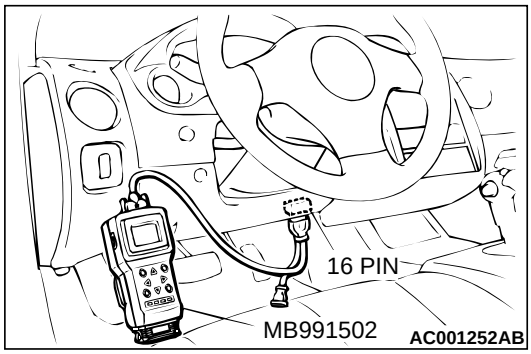
TSB Revision

DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check the A/T diagnostic trouble code.

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

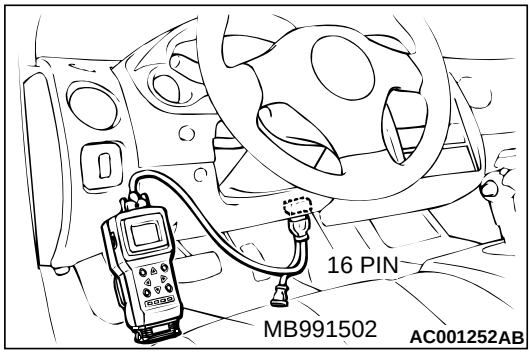


(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the A/T diagnostic trouble code.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is A/T diagnostic trouble code numbers "22" or "23" output?

YES : Refer to P.23A-101, code number 22: Input Shaft Speed Sensor System, or refer to P.23A-115, code number 23: Output Shaft Speed Sensor System.
NO : Go to Step 2.

STEP 2. Using scan tool MB991502, carry out the actuator test.



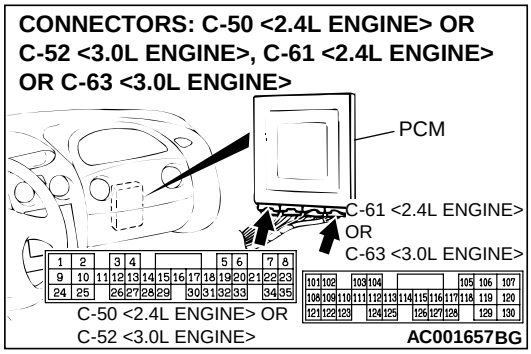
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to actuator test mode for following items.
   a. item 01: Low-reverse Solenoid Valve
   b. item 02: Underdrive Solenoid Valve
   c. item 03: Second Solenoid Valve
   d. item 04: Overdrive Solenoid Valve
      - An operation sound should be heard from solenoid valve when solenoid valve is operated.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the solenoid valve operating properly?

YES : Go to Step 3.
NO : Replace the corresponding solenoid valve. Refer to GROUP 23B, Valve Body P.23B-74.

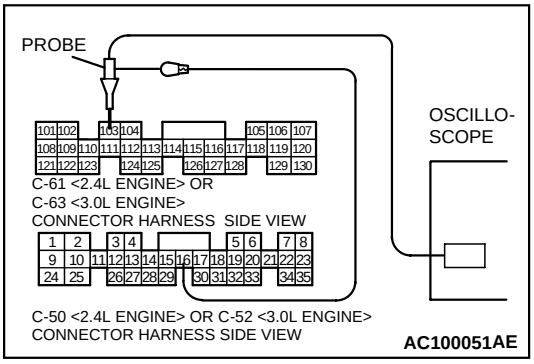
STEP 3. Using the oscilloscope, check the waveform at PCM connectors C-50 <2.4L Engine> or C-52 <3.0L Engine> and C-61 <2.4L Engine> or C-63 <3.0L Engine> by backprobing.

(1) Do not disconnect connectors C-50 <2.4L Engine> or C-52 <3.0L Engine> and C-61 <2.4L engine> or C-63 <3.0L Engine>.



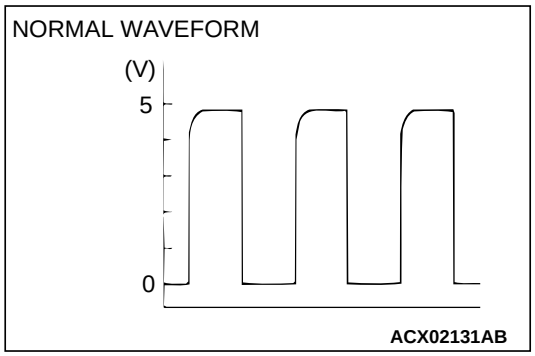
(2) Connect an oscilloscope probe to PCM connector C-50 <2.4L Engine> or C-52 <3.0L Engine> terminal 16 and to PCM connector C-61 <2.4L engine> or C-63 <3.0L Engine> terminal 103 by backprobing.

(3) Start the engine and run at constant speed of 50km/h (31mph). (Gear range: 3rd gear)



(4) Check the waveform.

- The waveform should show a pattern similar to the illustration. The maximum value should be 4.8 volts and more and the minimum value 0.8 volts and less. The output waveform should not contain electrical noise.



(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the waveform normal?

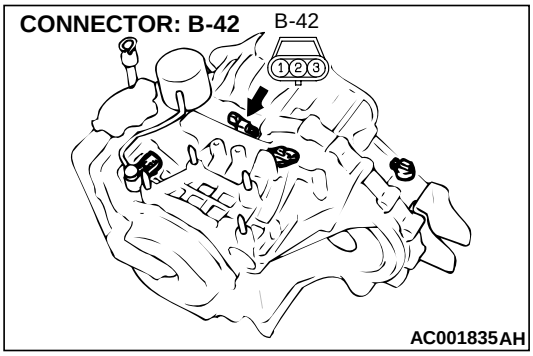
YES : Go to Step 8.
NO : Go to Step 4.

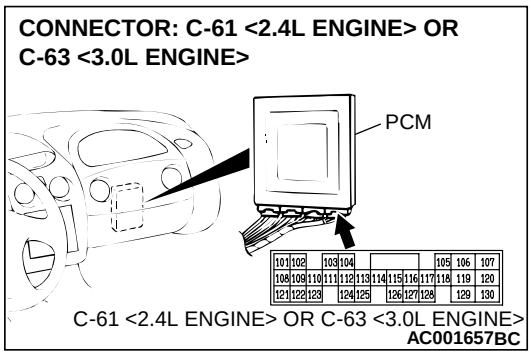
STEP 4. Check connectors B-42 at input shaft speed sensor and C-61 <2.4L Engine> or C-63 <3.0L Engine> at PCM for damage.

Q: Are the connectors in good condition?

YES : Go to Step 5.

NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



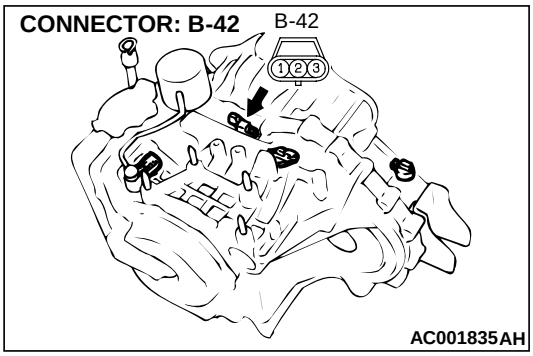


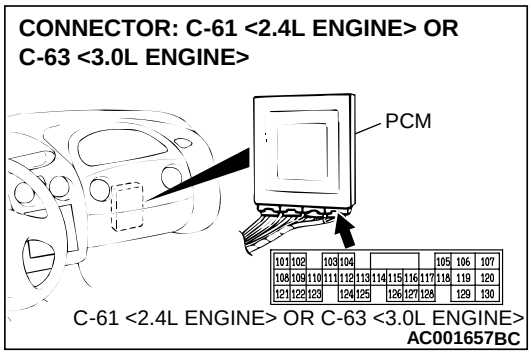
STEP 5. Check harness for damage between input shaft speed sensor connector B-42 terminal 2 and PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> terminal 103.

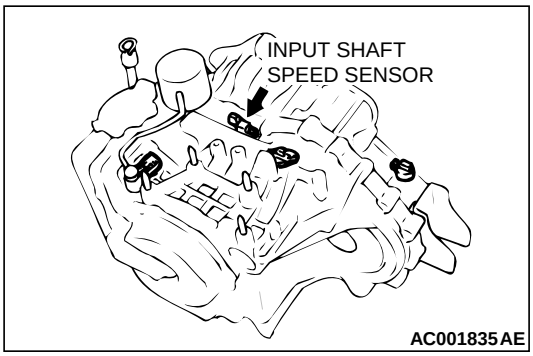
Q: Is the harness wire in good condition?

YES : Go to Step 6.

NO : Repair it.





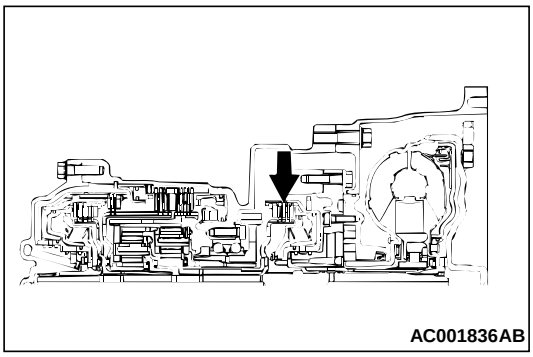


STEP 6. Replace the input shaft speed sensor.

(1) Replace the input shaft speed sensor. Refer to GROUP 23B, Transaxle P.23B-10.
(2) Test drive the vehicle.
(3) Check for A/T diagnostic trouble code.

Q: Is the A/T diagnostic trouble code output?

YES : Go to Step 7.
NO : The inspection is complete.



STEP 7. Replace the underdrive clutch retainer.

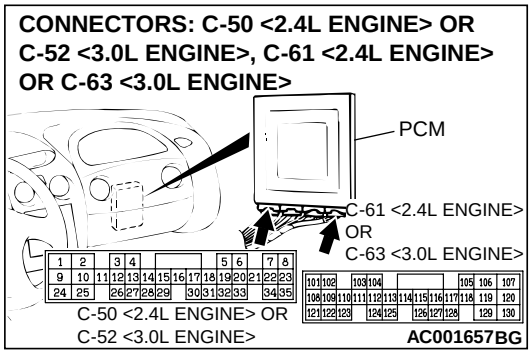
(1) Replace the underdrive clutch retainer. Refer to GROUP 23B, Underdrive Clutch and Input Shaft P.23B-57.
(2) Test drive the vehicle.
(3) Check for A/T diagnostic trouble code.

Q: Is the A/T diagnostic trouble code output?

YES : The A/T diagnostic trouble code may have set due to external radio frequency (RFI), possibly caused by cellular phone activity, after market components installed on the vehicle, etc.
NO : The inspection is complete.

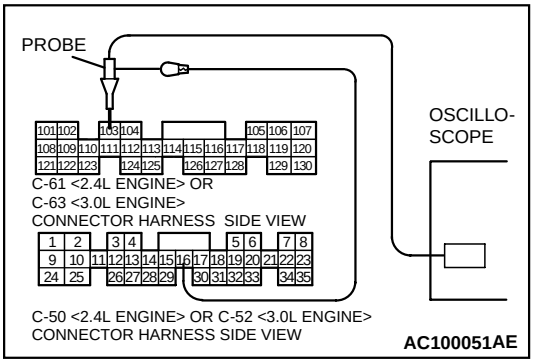
STEP 8. Using the oscilloscope, check the waveform at PCM connectors C-50 <2.4L Engine> or C-52 <3.0L Engine> and C-61 <2.4L Engine> or C-63 <3.0L Engine> by backprobing.

(1) Do not disconnect connectors C-50 <2.4L Engine> or C-52 <3.0L Engine> and C-61 <2.4L engine> or C-63 <3.0L Engine>.



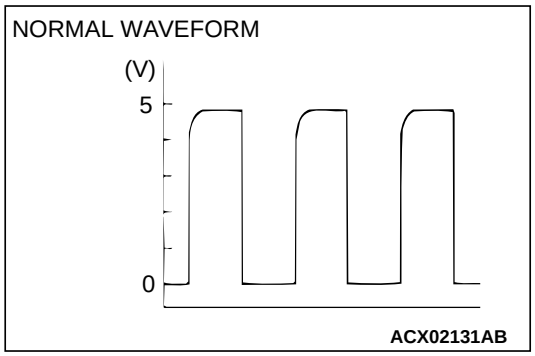
(2) Connect an oscilloscope probe to PCM connector C-50 <2.4L Engine> or C-52 <3.0L Engine> terminal 16 and to PCM connector C-61 <2.4L engine> or C-63 <3.0L Engine> terminal 104 by backprobing.

(3) Start the engine and run at constant speed of 50km/h (31mph). (Gear range: 3rd gear)



(4) Check the waveform.

- The waveform should show a pattern similar to the illustration. The maximum value should be 4.8 volts and more and the minimum value 0.8 volts and less. The output waveform should not contain electrical noise.



(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the waveform normal?

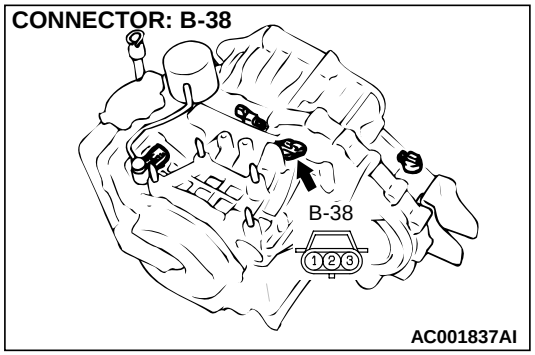
YES : Go to Step 13.
NO : Go to Step 9.

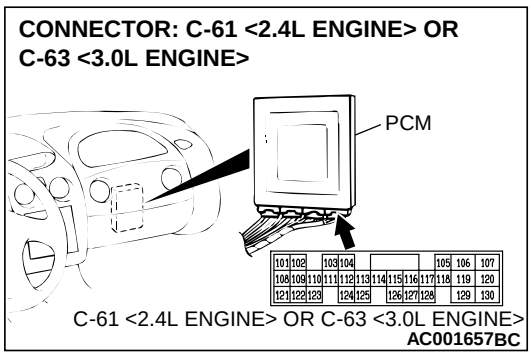
STEP 9. Check connectors B-38 at output shaft speed sensor and C-61 <2.4L Engine> or C-63 <3.0L Engine> at PCM for damage.

Q: Are the connectors in good condition?

YES : Go to Step 10.

NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



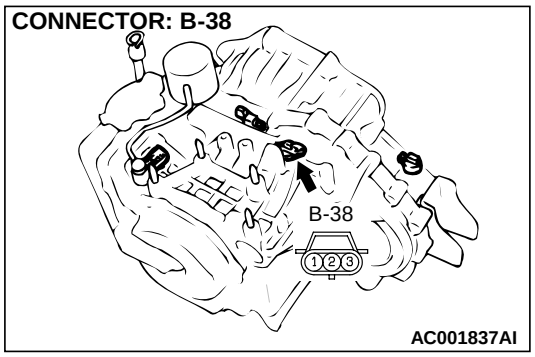


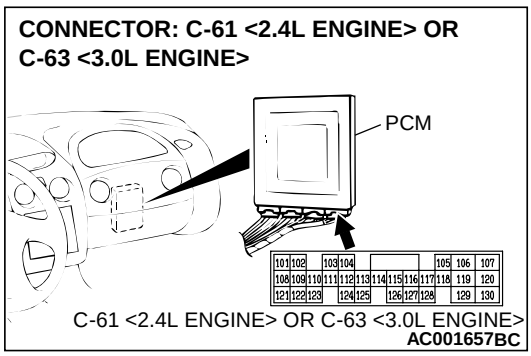
STEP 10. Check harness for damage between output shaft speed sensor connector B-38 terminal 2 and PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> terminal 104.

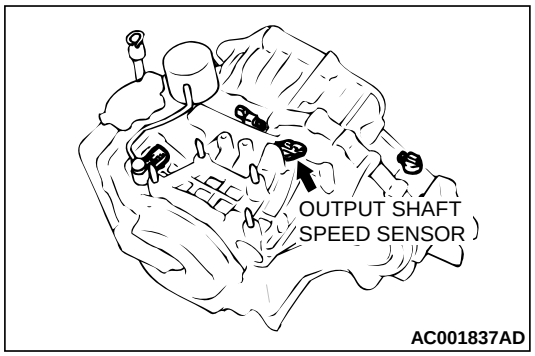
Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair it.





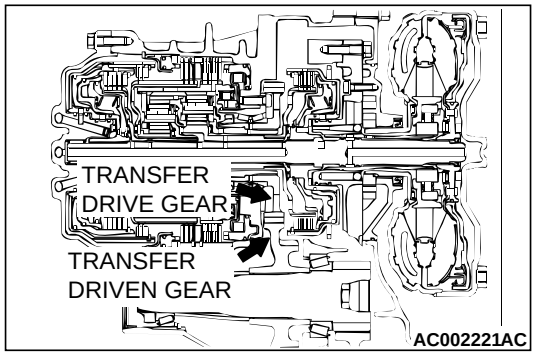


STEP 11. Replace the output shaft speed sensor.

(1) Replace the output shaft speed sensor. Refer to GROUP 23B, Transaxle P.23B-10.
(2) Test drive the vehicle.
(3) Check for A/T diagnostic trouble code (DTC).

Q: Is the A/T diagnostic trouble code output?

YES : Go to Step 12.
NO : The inspection is complete.



STEP 12. Replace the transfer drive gear or driven gear.

(1) Replace the transfer drive gear or driven gear. Refer to GROUP 23B, Transaxle P.23B-10, Output Shaft P.23B-68.
(2) Test drive the vehicle.
(3) Check for A/T diagnostic trouble code.

Q: Is the A/T diagnostic trouble code output?

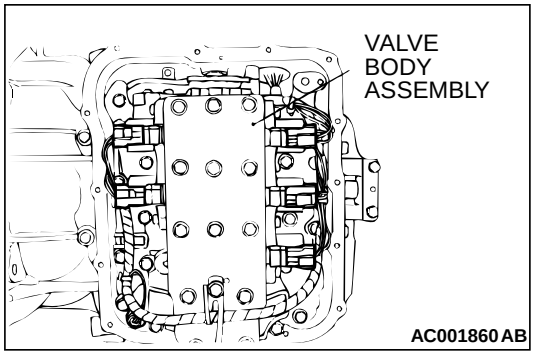
YES : The A/T diagnostic trouble code may have set due to external radio frequency (RFI), possibly caused by cellular phone activity, after market components installed on the vehicle, etc.
NO : The inspection is complete.

STEP 13. Replace the PCM.

(1) Replace the PCM.
(2) Test drive the vehicle.
(3) Check for A/T diagnostic trouble code.

Q: Is the A/T diagnostic trouble code output?

YES : Go to Step 14.
NO : The inspection is complete.

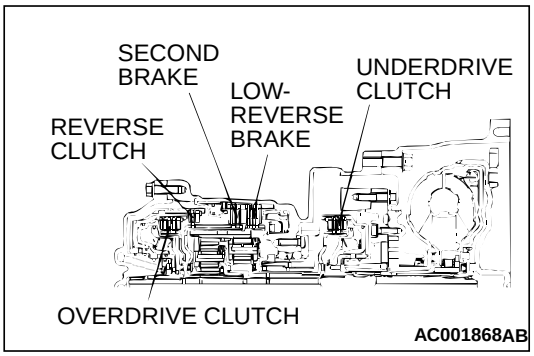


STEP 14. Replace the valve body.

(1) Replace the valve body. Refer to GROUP 23B, Transaxle P.23B-10.
(2) Test drive the vehicle.
(3) Check for A/T diagnostic trouble code.

Q: Is the A/T diagnostic trouble code output?

YES : Go to Step 15.
NO : The inspection is complete.



STEP 15. Overhaul the A/T.

(1) Replace the following parts.
- If DTC No.41, No.42, No.43 are output individually or in a group, replace the underdrive clutch. Refer to GROUP 23B, Underdrive Clutch and Input Shaft P.23B-57.
- If DTC No.43, No.44 are output individually or in a group, replace the overdrive clutch. Refer to GROUP 23B, Reverse and Overdrive Clutch P.23B-59.
- If DTC No.46 is output, replace the reverse clutch. Refer to GROUP 23B, Reverse and Overdrive Clutch P.23B-59.
- If DTC No.41, No.46 are output individually or in a group, replace the low-reverse brake. Refer to GROUP 23B, Transaxle P.23B-10.
- If DTC No.42, No.44 are output individually or in a group, replace the second brake. Refer to GROUP 23B, Transaxle P.23B-10.
- If DTC No.41 is output, replace the one-way clutch (OWC-L). Refer to GROUP 23B, Planetary Gear P.23B-64.

(2) Test drive the vehicle.
(3) Check for A/T diagnostic trouble code.

Q: Is the A/T diagnostic trouble code output again?

YES : The A/T diagnostic trouble code may have set due to external radio frequency (RFI), possibly caused by cellular phone activity, after market components installed on the vehicle, etc.

NO : The inspection is complete.

DTC 52: Torque Coverter Clutch System

DTC SET CONDITIONS

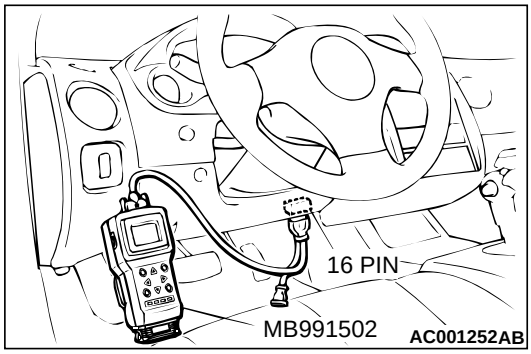
If input shaft speed sensor is abnormal and drive duty rate for the torque converter clutch solenoid valve is 100 percent for continuous period of 4 seconds or more, it is judged that there is an abnormality in the torque converter clutch system and diagnostic trouble code number "52" is output.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set:)

- Malfunction of the torque converter clutch solenoid valve
- Damaged harness, connector
- Malfunction of the PCM
- Malfunction of the underdrive clutch

DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check the A/T diagnostic trouble code.

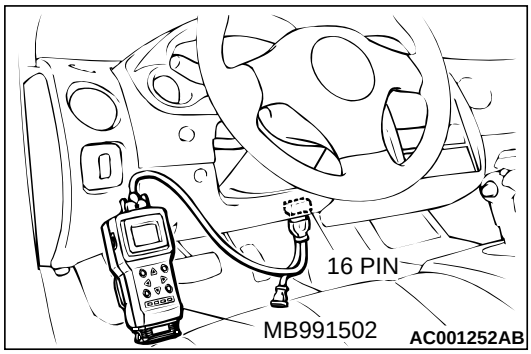
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the A/T diagnostic trouble code.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is A/T diagnostic trouble code number "22" output?

YES : Refer to P.23A-101, code number 22: Input Shaft Speed Sensor System.
NO : Go to Step 2.



STEP 2. Using scan tool MB991502, carry out the actuator test item 06: Torque Converter Clutch Solenoid Valve.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to actuator test mode for item 06: Torque Converter Clutch Solenoid Valve.
- An operation sound should be heard from solenoid valve when the torque converter clutch solenoid valve is operated.

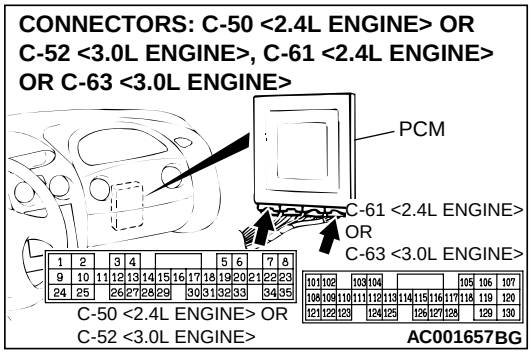
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the solenoid valve operating properly?

YES : Go to Step 3.
NO : Replace the torque converter clutch solenoid valve. Refer to GROUP 23B, Valve Body P.23B-74.

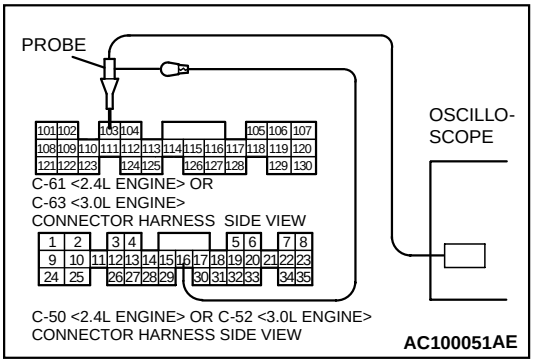
STEP 3. Using the oscilloscope, check the waveform at PCM connectors C-50 <2.4L Engine> or C-52 <3.0L Engine> and C-61 <2.4L Engine> or C-63 <3.0L Engine> by backprobing.

(1) Do not disconnect connectors C-50 <2.4L Engine> or C-52 <3.0L Engine> and C-61 <2.4L Engine> or C-63 <3.0L Engine>.



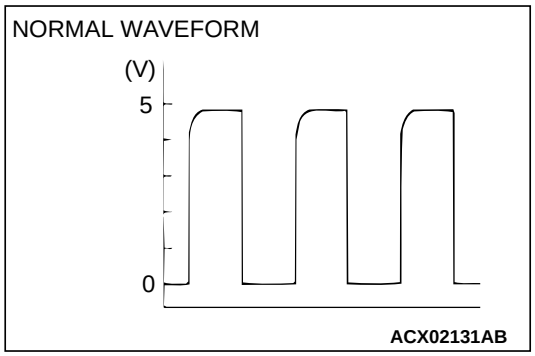
(2) Connect an oscilloscope probe to PCM connector C-50 <2.4L Engine> or C-52 <3.0L Engine> terminal 16 and to PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> terminal 103 by backprobing.

(3) Start the engine and run at constant speed of 50km/h (31mph). (Gear range: 3rd gear)



(4) Check the waveform.
- The waveform should show a pattern similar to the illustration. The maximum value should be 4.8 volts and more and the minimum value 0.8 volts and less. The output waveform should not contain electrical noise.

(5) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the waveform normal?

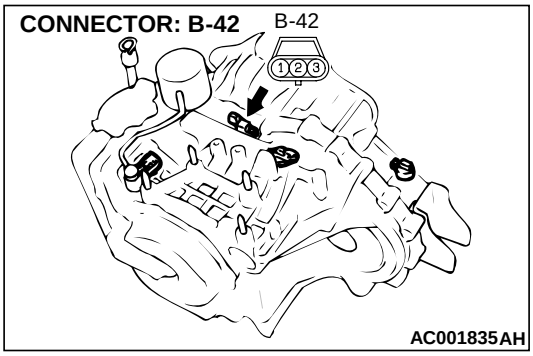
YES : Go to Step 8.
NO : Go to Step 4.

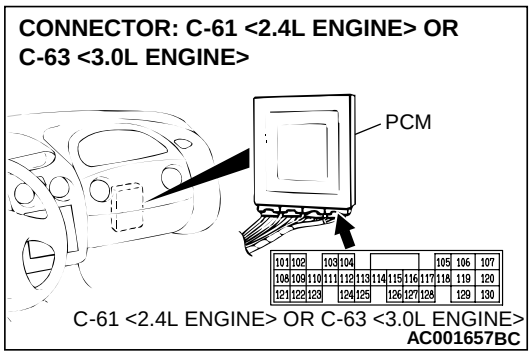
STEP 4. Check connectors B-42 at input shaft speed sensor and C-61 <2.4L Engine> or C-63 <3.0L Engine> at PCM for damage.

Q: Are the connectors in good condition?

YES : Go to Step 5.

NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



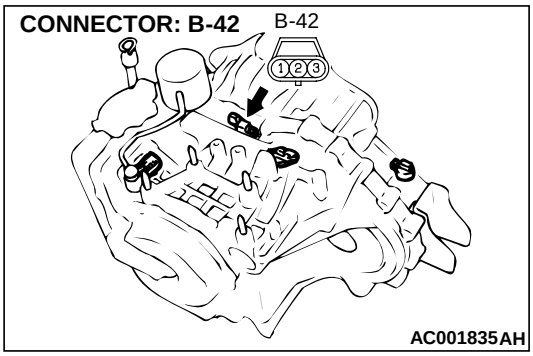


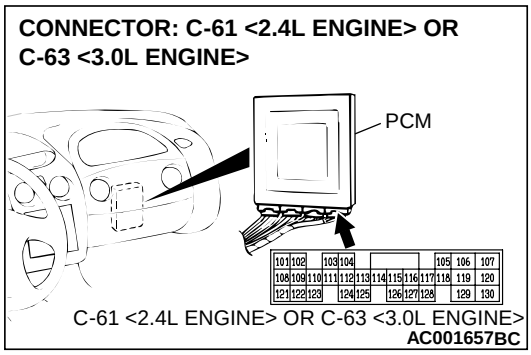
STEP 5. Check harness for damage between input shaft speed sensor connector B-42 terminal 2 and PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> terminal 103.

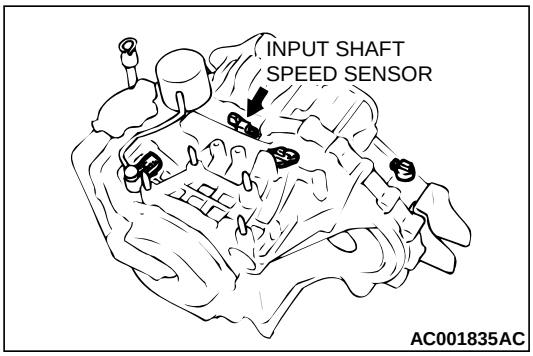
Q: Is the harness wire in good condition?

YES : Go to Step 6.

NO : Repair it.





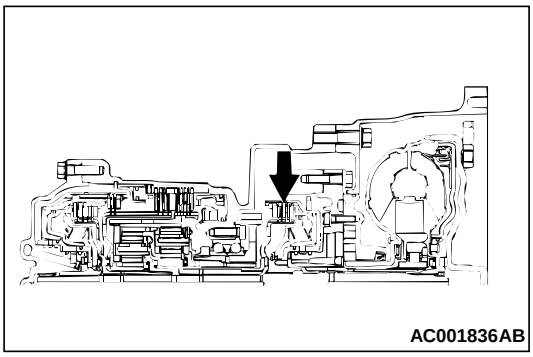


STEP 6. Replace the input shaft speed sensor.

(1) Replace the input shaft speed sensor. Refer to GROUP 23B, Transaxle P.23B-10.
(2) Test drive the vehicle.
(3) Check for A/T diagnostic trouble code.

Q: Is the A/T diagnostic trouble code "52" is output?

YES : Go to Step 7.
NO : The inspection is complete.



STEP 7. Replace the underdrive clutch retainer.

(1) Replace the underdrive clutch retainer. Refer to GROUP 23B, Underdrive Clutch and Input Shaft P.23B-57.
(2) Test drive the vehicle.
(3) Check for A/T diagnostic trouble code.

Q: Is the A/T diagnostic trouble code "52" is output?

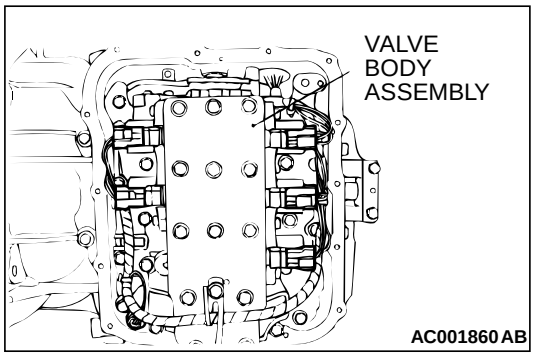
YES : The A/T diagnostic trouble code may have set due to external radio frequency (RFI), possibility caused by cellular phone activity, after market components installed on the vehicle, etc.
NO : The inspection is complete.

STEP 8. Replace the PCM.

(1) Replace the PCM.
(2) Test drive the vehicle.
(3) Check for A/T diagnostic trouble code.

Q: Is the A/T diagnostic trouble code "52" is output?

YES : Go to Step 9.
NO : The inspection is complete.



STEP 9. Replace the valve body.

(1) Replace the valve body. Refer to GROUP 23B, Transaxle P.23B-10.
(2) Test drive the vehicle.
(3) Check for A/T diagnostic trouble code.

Q: Is the A/T diagnostic trouble code "52" is output?

YES : Replace the torque converter. Refer to GROUP 23B, Transaxle P.23B-10.
NO : The inspection is complete.

DTC 53: Torque Converter Clutch is Stuck on

DTC SET CONDITIONS

If the torque converter clutch remains engaged for a continuous period of ten seconds when the PCM is attempting to disengage the torque converter clutch, it is judged that the torque converter clutch is stuck on and diagnostic trouble code number "53" is output.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set:)

- Malfunction of the torque converter clutch solenoid valve
- Damaged harness, connector
- Malfunction of the PCM

DIAGNOSIS

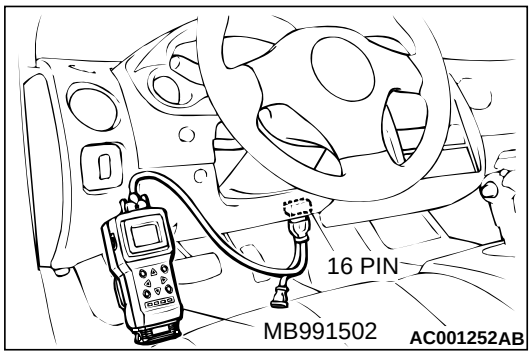
Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check data list item 52: Amount of Torque Converter Clutch Slippage.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.



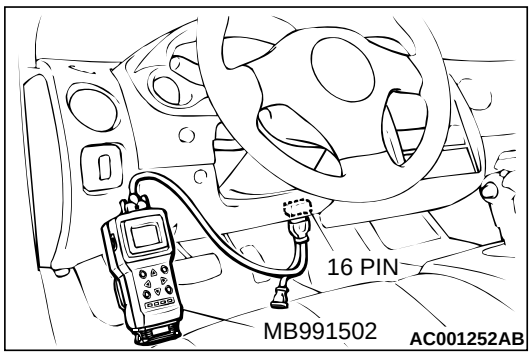
(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at constant speed of 50km/h (31mph). (Gear range: 3rd gear)
(3) Set scan tool MB991502 to data reading mode for item 52: Amount of Torque Converter Clutch Slippage.
  - Driving at constant speed of 50 km/h (31 mph), the display should be "–10 to 10 r/min."
  - If the accelerator pedal is released, the display on the scan tool changes.(50 km/h (31 mph) and less).
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : . This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.

NO : . Go to Step 2.

STEP 2. Using scan tool MB991502, carry out the actuator test item 06: Torque Converter Clutch Solenoid Valve.



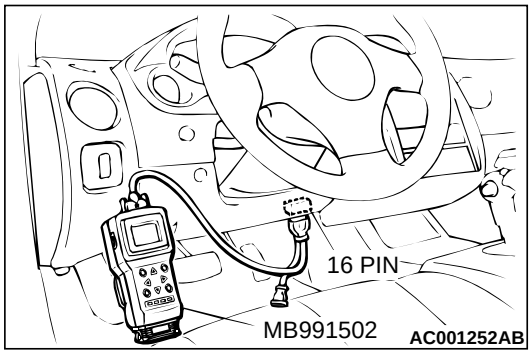
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to actuator test mode for item 06: Torque Converter Clutch Solenoid Valve.
  - An operation sound should be heard from solenoid valve when the torque converter clutch solenoid valve is operated.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the solenoid valve operating properly?

YES : Go to Step 3.

NO : Replace the torque converter clutch solenoid valve. Refer to GROUP 23B, Valve Body P.23B-74.

TSB Revision



STEP 3. Using scan tool MB991502, check data list item 52: Amount of Torque Converter Clutch Slippage. (Second check)

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at constant speed of 50km/h (31mph). (Gear range: 3rd gear)
(3) Set scan tool MB991502 to data reading mode for item 52: Amount of Torque Converter Clutch Slippage.
- Driving at constant speed of 50km/h (31mph), the display should be "–10 to 10 r/min."
- The display should be "–300 to –100 r/min" or "100 to 300 r/min" when the accelerator pedal is released (50 km/h (31 mph) and less).

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

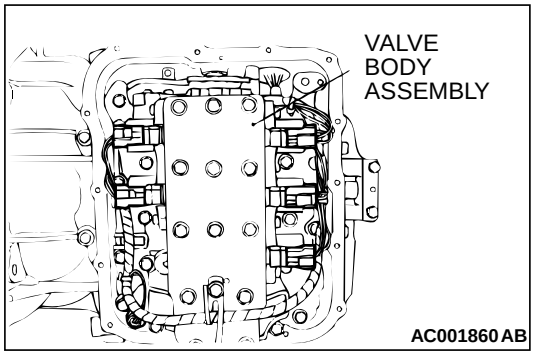
YES : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.
NO : Go to Step 4.

STEP 4. Replace the PCM.

(1) Replace the PCM.
(2) Test drive the vehicle.
(3) Check for A/T diagnostic trouble code (DTC).

Q: Is the A/T diagnostic trouble code "53" is output?

YES : Go to Step 5.
NO : The inspection is complete.



STEP 5. Replace the valve body.

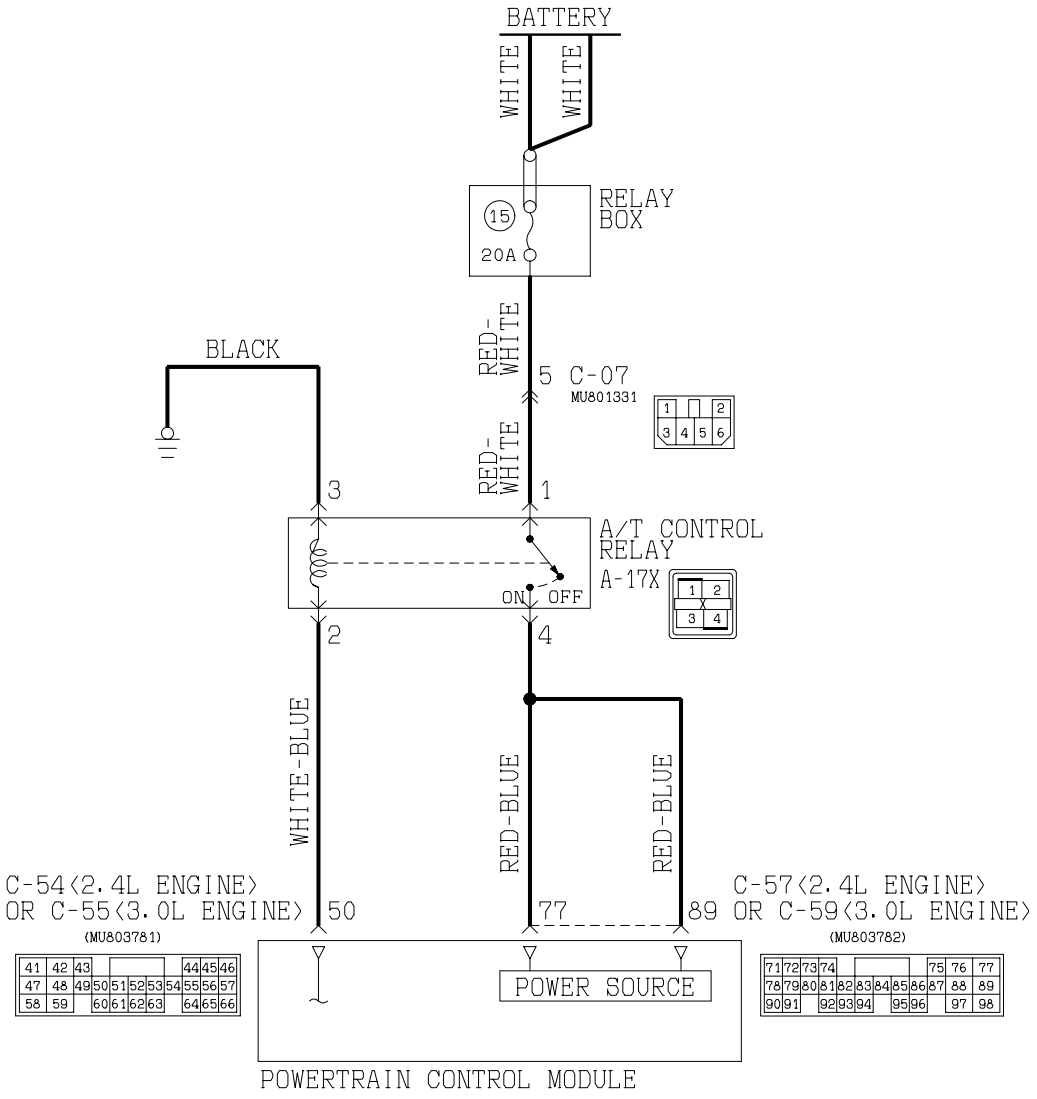
(1) Replace the valve body. Refer to GROUP 23B, Transaxle P.23B-10.
(2) Test drive the vehicle.
(3) Check for A/T diagnostic trouble code.

Q: Is the A/T diagnostic trouble code "53" is output?

YES : Replace the Torque Converter. Refer to GROUP 23B, Transaxle P.23B-10.
NO : The inspection is complete.

DTC 54: A/T Contorl Relay System

A/T Control Relay System Circuit



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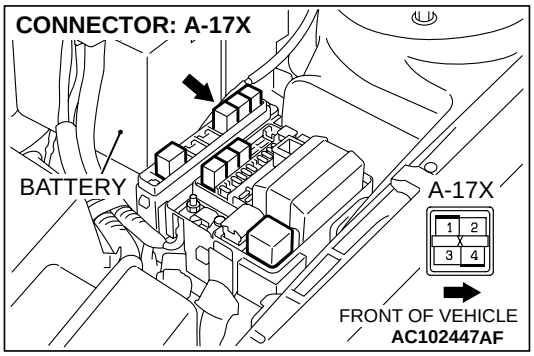
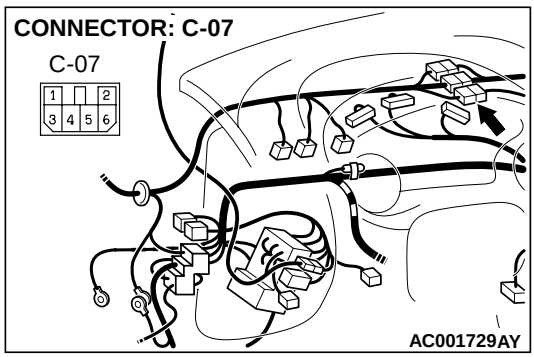


AC102447AF



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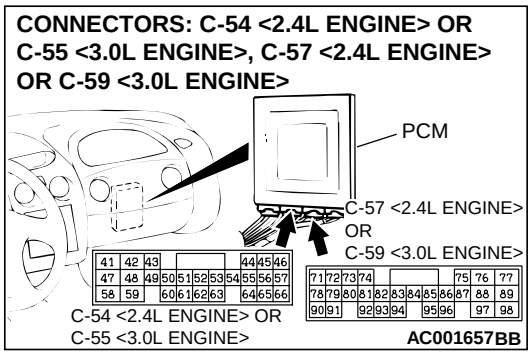
TSB Revision



CIRCUIT OPERATION

- A/T control relay (terminal number 1) receives the battery positive voltage from the battery.
- When turning the ignition switch to the "ON" position the PCM receives battery voltage from the ignition switch (terminal 98). Then the PCM (terminal number 50) applies a voltage to the A/T control relay (terminal number 4), and the A/T control relay switch is turned on. When the A/T control relay switch is turned on, the battery applies a power supply voltage to the PCM (terminal numbers 77 and 89).

DTC SET CONDITIONS

If the A/T control relay voltage is less than 7 volts at terminals 77 and 89 after the ignition switch has been turned to the "ON" position it is judged that there is an open circuit or a short-circuit in the A/T control relay ground and diagnostic trouble code number "54" is output. The transmission is locked into the 3rd gear as a fail-safe measure, and the "N" range light flashes once per second.

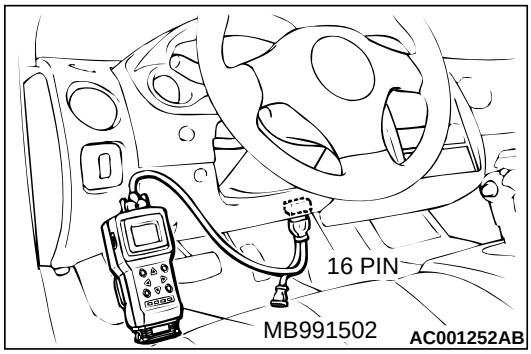
TROUBLESHOOTING HINTS (The most likely causes for this code to be set:)

- Malfunction of the A/T control relay
- Damaged harness, connector
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 54: A/T Control Relay Output Voltage.

⚠ CAUTION

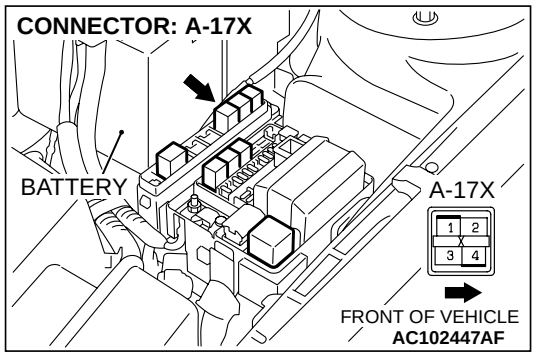
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to data reading mode for item 54: A/T Control Relay Output Voltage.
  - Voltage should be battery positive voltage.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the relay operating properly?

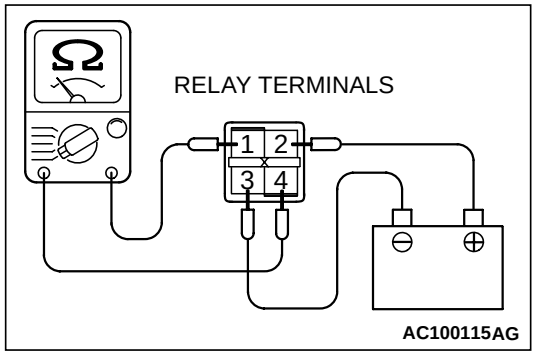
YES : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.

NO : Go to Step 2.



STEP 2. Check the A/T control relay.

(1) Remove the A/T control relay A-17X.



(2) Use jumper wires to terminal 2 of A/T control relay connector A-17X to the positive battery terminal, and terminal number 3 of A/T control relay connector A-17X to the negative battery terminal.

(3) Measure the resistance between terminal 1 and 4 of A/T control relay connector A-17X.

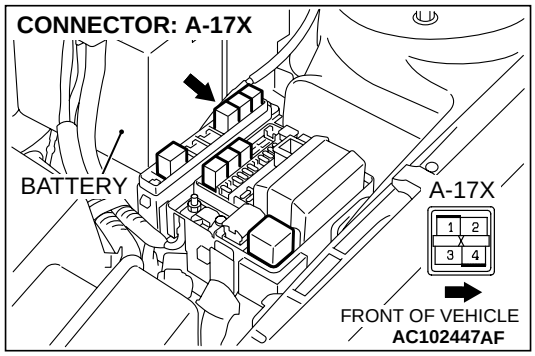
- Should be than 2 ohm when the jumper wire connected.
- Open circuit when the jumper wire disconnected.

Q: Is the resistance normal?

YES : Go to Step 3.

NO : Replace the A/T control relay.

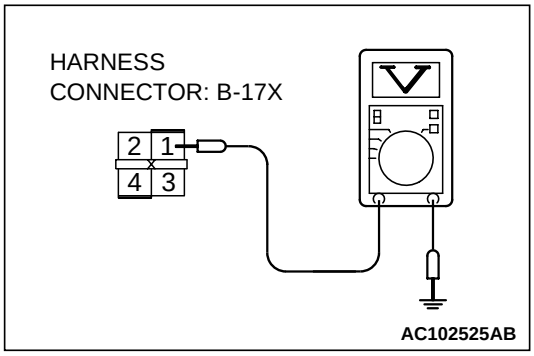
STEP 3. Check connector A-17X at A/T control relay for damage.



Q: Is the connector in good condition?

YES : Go to Step 4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



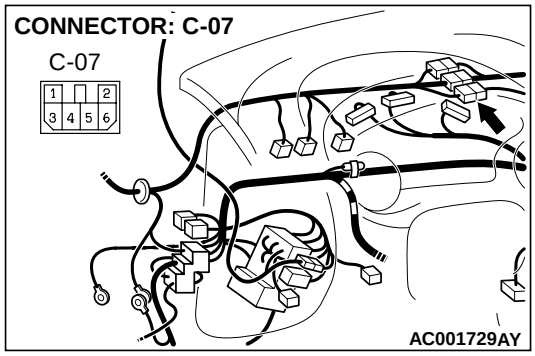
STEP 4. Check the power supply voltage at A/T control relay connector A-17X.

(1) Disconnect the A/T control relay and measure at the connector side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 1 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

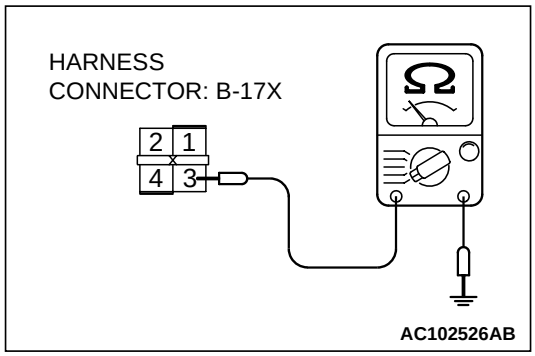
YES : Go to Step 6.
NO : Go to Step 5.



STEP 5. Check connector C-07 at intermediate connector for damage.

Q: Is the connector in good condition?

YES : Repair harness open circuit or short circuit to ground between A/T control relay connector A-17X terminal 1 and battery.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

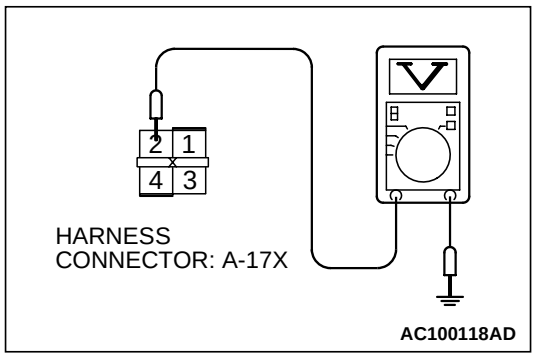


STEP 6. Check the continuity at A/T control relay connector A-17X.

(1) Disconnect the A/T control relay and measure at the connector side.
(2) Check for the continuity between terminal 3 and ground.
- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 7.
NO : Repair harness open circuit or damage between A/T control relay connector A-17X terminal 3 and the earth.



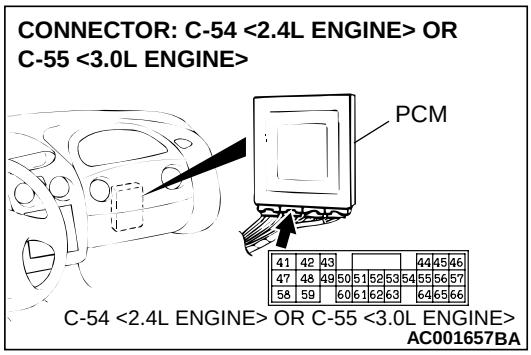
STEP 7. Check the power supply voltage at A/T control relay connector A-17X.

(1) Disconnect the A/T control relay and measure at the connector side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 2 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

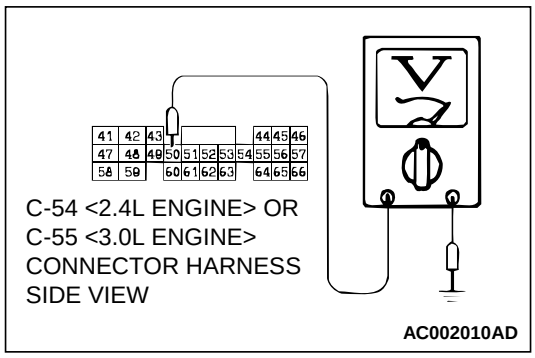
Q: Is the voltage normal?

YES : Go to Step 11.
NO : Go to Step 8.



STEP 8. Check the power supply voltage at PCM connector C-54 <2.4L Engine> or C-55 <3.0L Engine> by backprobing.

(1) Do not disconnect connector C-54 <2.4L Engine> or C-55 <3.0L Engine>.
(2) Turn the ignition switch to the "ON" position.

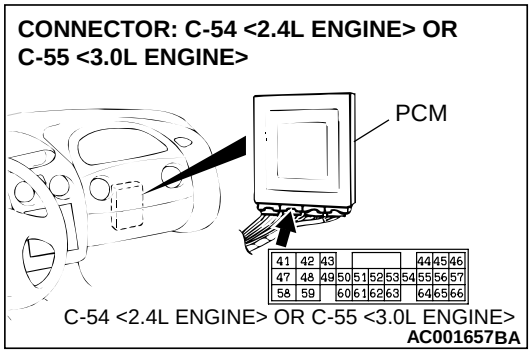


(3) Measure the voltage between terminal 50 and ground by backprobing.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 9.
NO : Go to Step 10.

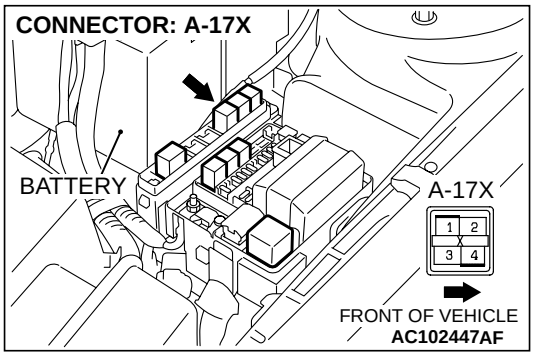


STEP 9. Check connector C-54 <2.4L Engine> or C-55 <3.0L Engine> at PCM for damage.

Q: Is the connector in good condition?

YES : Repair harness open circuit between A/T control relay connector A-19X terminal 4 and PCM connector C-54 <2.4L Engine> or C-55 <3.0L Engine> terminal 50.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

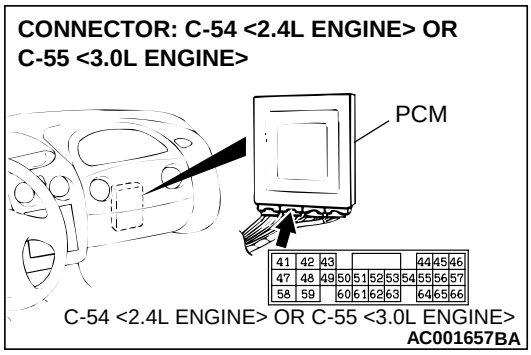


STEP 10. Check harness for short circuit to ground between A/T control relay connector A-17X terminal 2 and PCM connector C-54 <2.4L Engine> or C-55 <3.0L Engine> terminal 50.

Q: Is the harness wire in good condition?

YES : Go to Step 11.

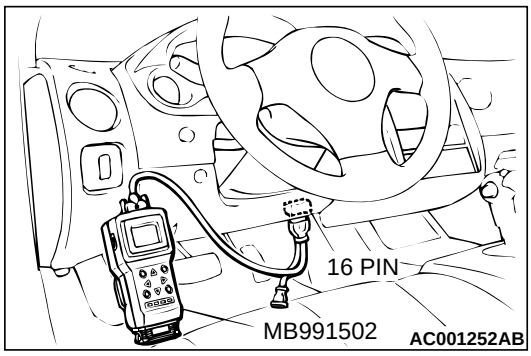
NO : Repair it.



STEP 11. Using scan tool MB991502, check data list item 54: A/T control relay output Voltage.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.



. (1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to data reading mode for item 54: A/T Control Relay Output Voltage.
- Voltage should be battery positive voltage.

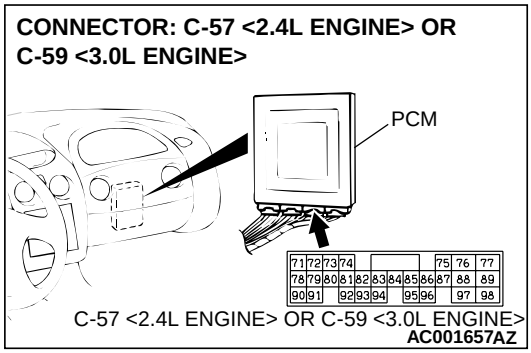
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the relay operating properly?

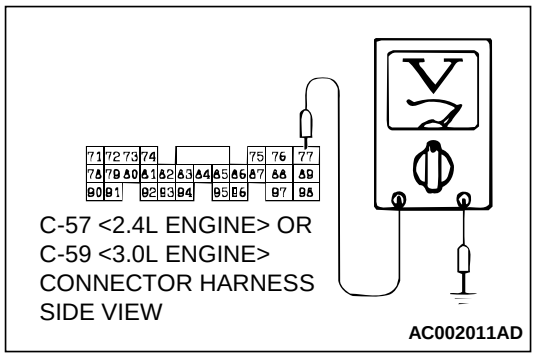
YES : . This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.

NO : . Replace the PCM.

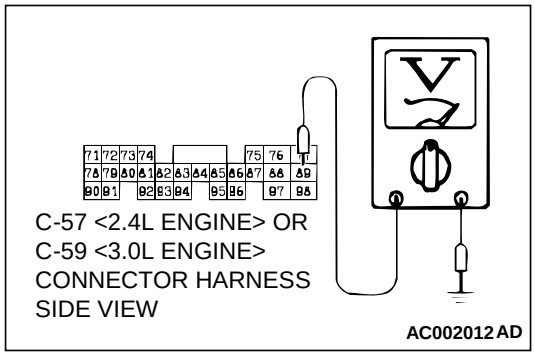
STEP 12. Check the relay output voltage at PCM connector C-57 <2.4L Engine> or C-59 <3.0L Engine> by backprobing.



(1) Do not disconnect connector C-57 <2.4L Engine> or C-59 <3.0L Engine>.
(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage between terminal 77 and ground by backprobing.
- Voltage should be battery positive voltage.



(4) Measure the voltage between terminal 89 and ground by backprobing.
- Voltage should be battery positive voltage.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

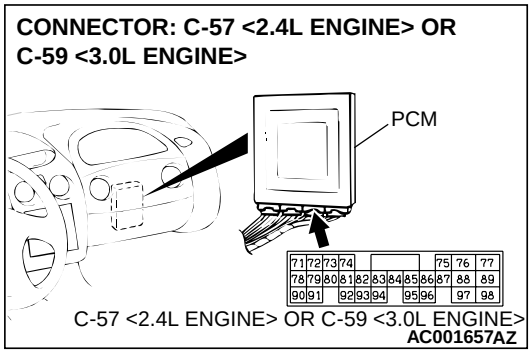
YES : Go to Step 11.
NO : Go to Step 13.

STEP 13. Check connector C-57 <2.4L Engine> or C-59 <3.0L Engine> at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

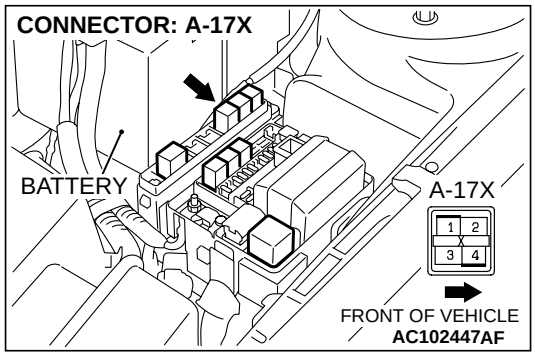


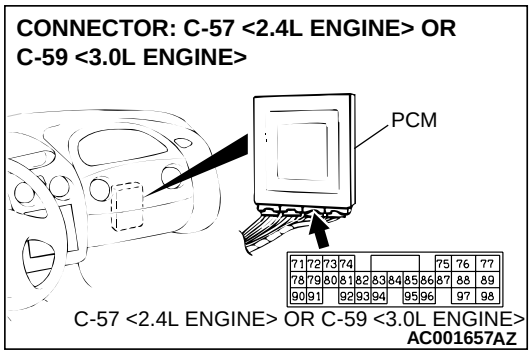
STEP 14. Check harness for short circuit to ground, open circuit or damage between A/T control relay connector A-17X terminal 4 and PCM connector C-57 <2.4L Engine> or C-59 <3.0L Engine> terminals 77 and 89.

Q: Is the harness wire in good condition?

YES : Go to Step 15.

NO : Repair it.



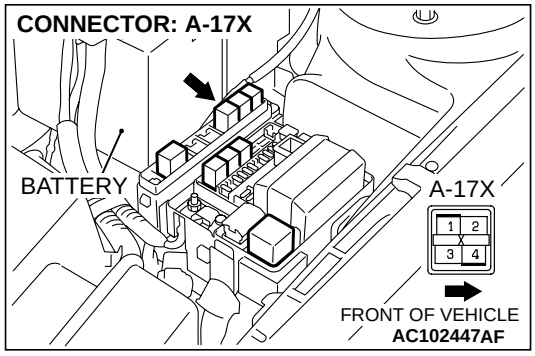


STEP 15. Check harness for damage between A/T control relay connector A-17X terminal 1 and battery.

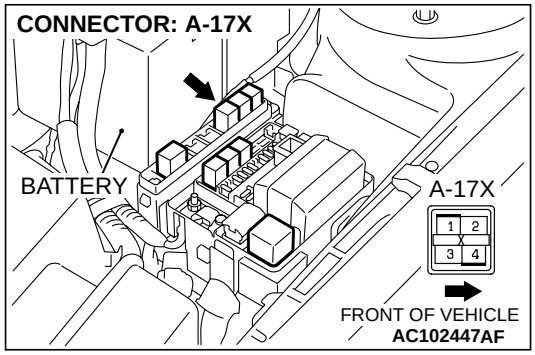
Q: Is the harness wire in good condition?

YES : Go to Step 16.

NO : Repair it.



TSB Revision

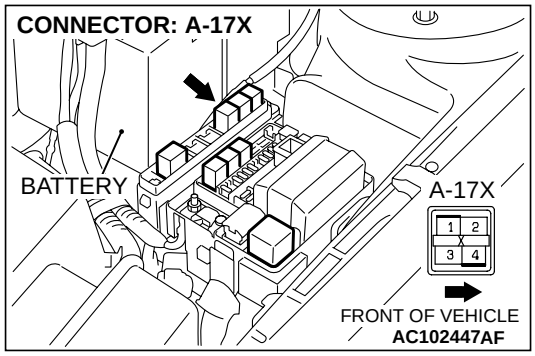


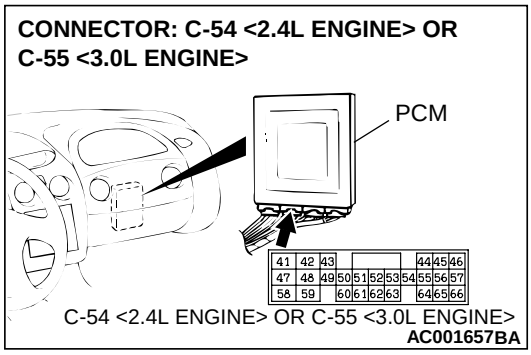
STEP 16. Check harness for damage between A/T control relay connector A-17X terminal 3 and the ground.

Q: Is the harness wire in good condition?

YES : Go to Step 17.

NO : Repair it.





STEP 17. Check harness for short circuit to ground between A/T control relay connector A-17X terminal 2 and PCM connector C-54 <2.4L Engine> or C-55 <3.0L Engine> terminal 50.

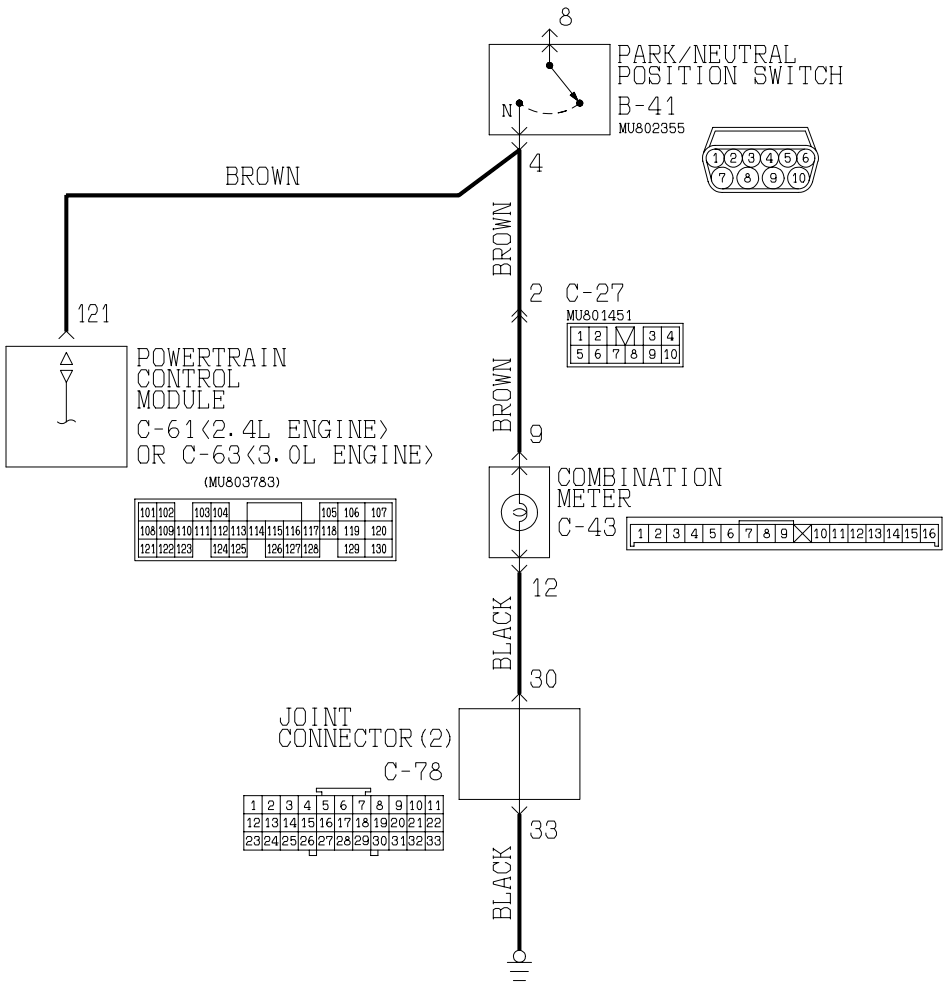
Q: Is the harness wire in good condition?

YES : Repair harness short circuit to ground between A/T control relay connector A-17X terminal 4 and solenoid valve assembly connector B-40 terminal 9 and 10.

NO : Repair it.

DTC 56: "N" Range Light System <Vehicles with sport mode>

"N" Range Light System Circuit



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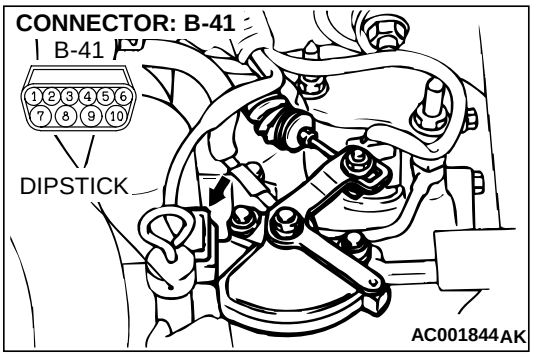

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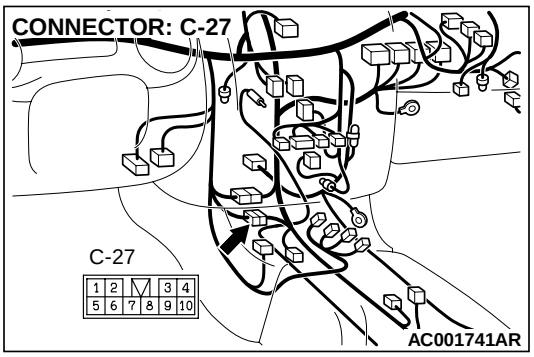

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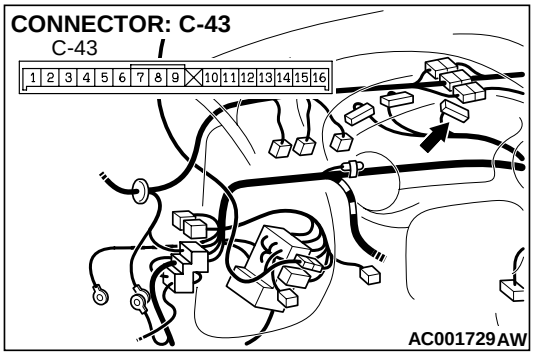
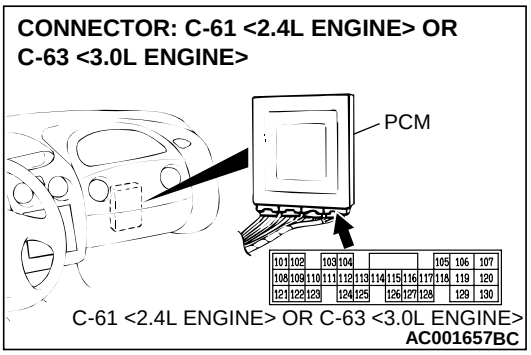
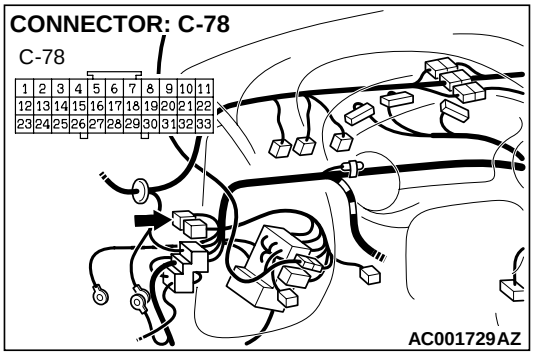
TSB Revision







CIRCUIT OPERATION

If a fail-safe is triggered while driving forward, the PCM flashes the "N" range light once per second (triggered fail-safe). The PCM does this by switching battery positive voltage to terminal 121.

DTC SET CONDITIONS

If the PCM detects a fail-safe condition, it will attempt to illuminate the "N" range light. The PCM sends a 12 volts pulse for 60 – 180 ms. If it does not detect a voltage drop during the pulse, it waits about 60 seconds and pulses 12 volts again for 60 – 180 ms. If the PCM does no detect the voltage drop before the ignition switch is turned "LOCK" (OFF), the PCM will consider it as an short circuit of the "N" range light circuit and output code number "56."

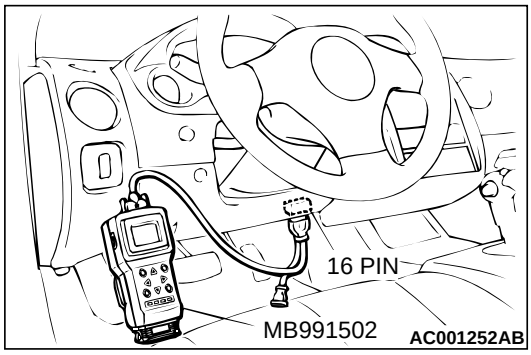
TROUBLESHOOTING HINTS (The most likely causes for this code to be set:)

- Defective "N" range light bulb
- Damaged harness, connector
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check the light bulb.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
- The "N" range light in the combination meter flushes.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Does the "N" range light flush?

YES : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.

NO : Go to Step 2.

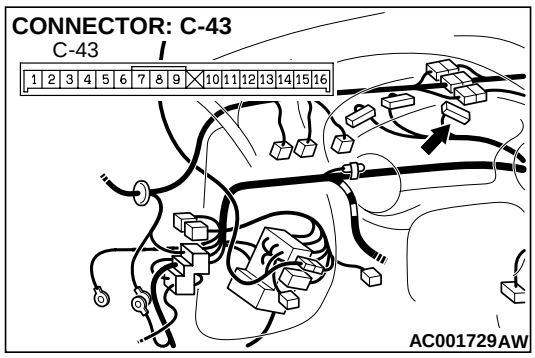
STEP 2. Check the "N" range light bulb.

(1) Remove the combination meter. Refer to GROUP 54A, Chassis Electrical – Combination Meters Assembly and Vehicle Speed Sensor P.54A-105.
(2) Check the "N" range light bulb.

Q: Is the bulb in good condition?

YES : Go to Step 3.

NO : Replace the "N" range light bulb. Refer to GROUP 54A, Chassis Electrical – Combination Meters Assembly and Vehicle Speed Sensor P.54A-105.



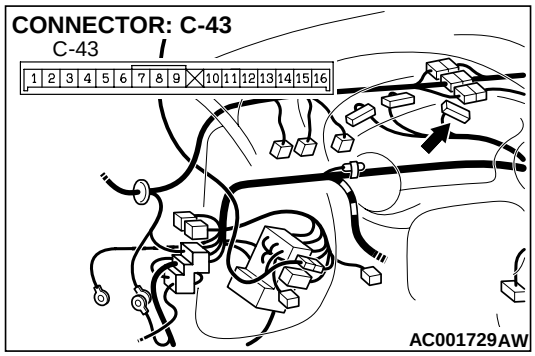
STEP 3. Check connector C-43 at combination meter for damage.

Q: Is the connector in good condition?

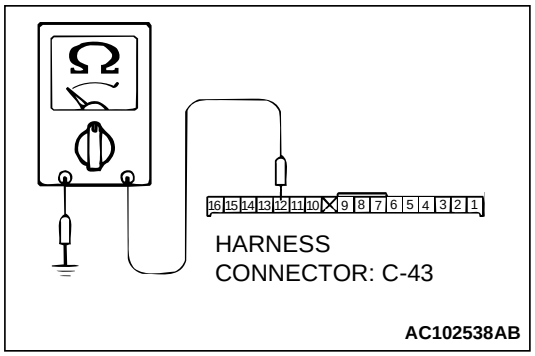
YES : Go to Step 4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

STEP 4. Check the continuity at combination meter connector C-43.



(1) Disconnect connector C-43 and measure at the harness side.

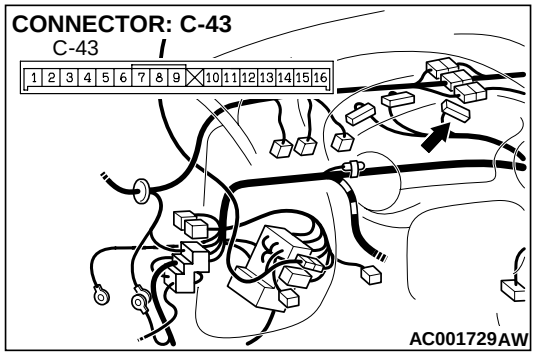


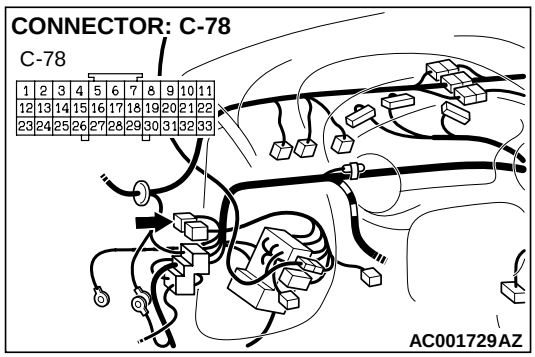
(2) Check for the continuity between terminal 12 and ground.
- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 6.
NO : Go to Step 5.

STEP 5. Check connectors C-43 at combination meter and C-78 at joint connector (2) for damage.





Q: Are the connectors in good condition?

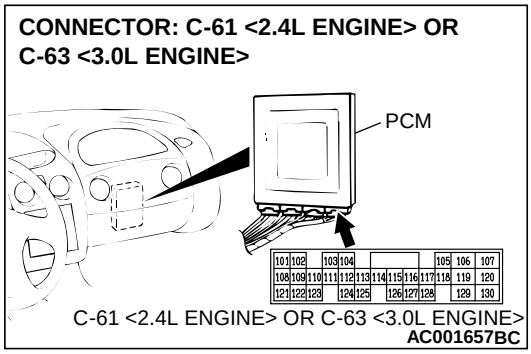
YES : Repair harness open circuit or harness damage between combination meter connector C-43 terminal 12 and the ground.
NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

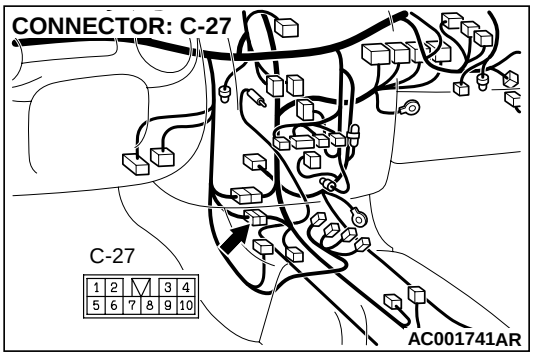
STEP 6. Check connectors C-61 <2.4L Engine> or C-63 <3.0L Engine> at PCM, C-27 at intermediate connector, B-41 Park/Neutral position switch connector and C-43 at combination meter for damage.

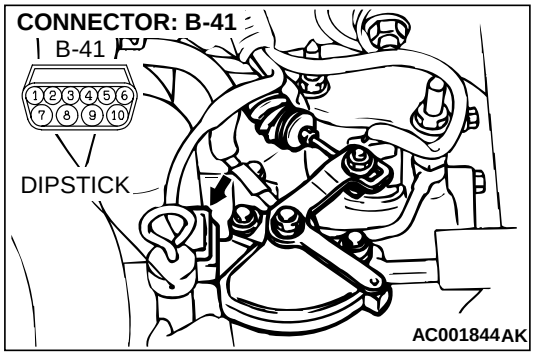
Q: Are the connectors in good condition?

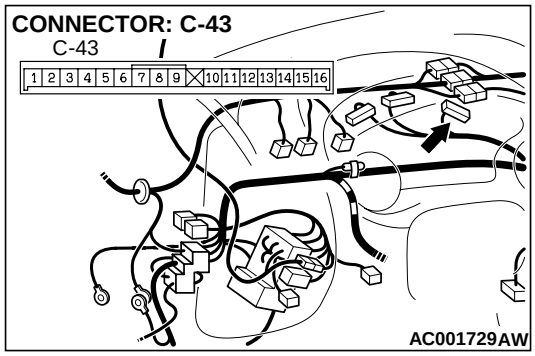
YES : Go to Step 7.

NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



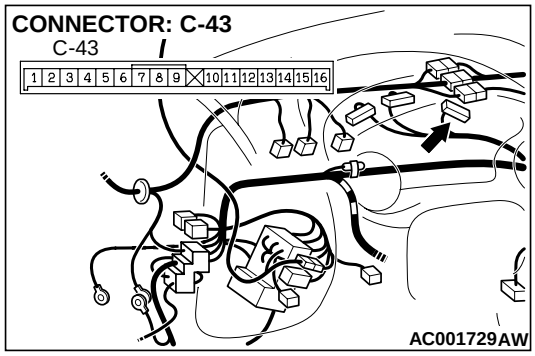


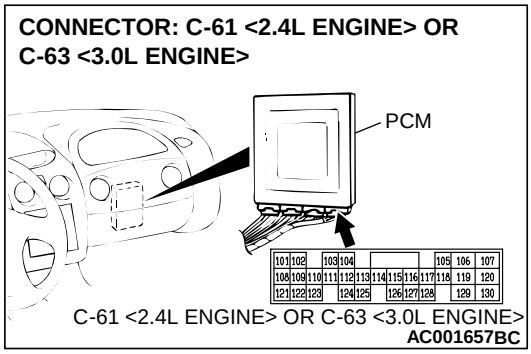




STEP 7. Check harness for open circuit, short circuit to ground and damage between combination meter connector C-43 terminal 9 and PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> terminal 121.
Q: Is the harness wire in good condition?

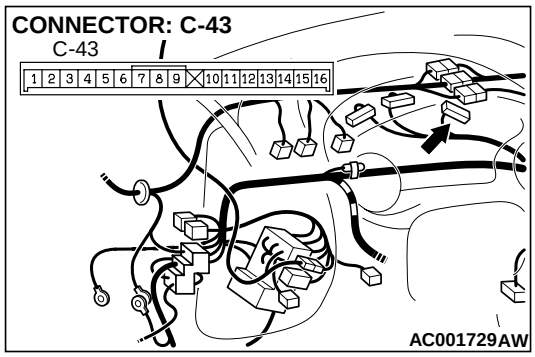
YES : Go to Step 8.
NO : Repair it.





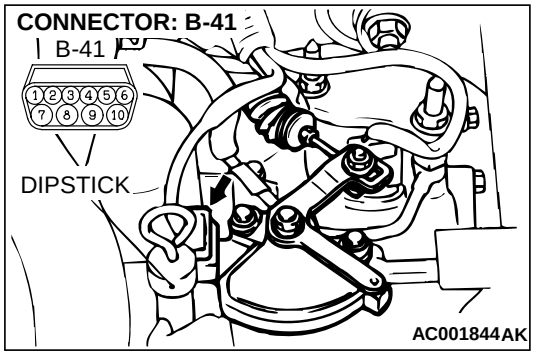
STEP 8. Check harness for damage between combination meter connector C-43 terminal 12 and the ground.
Q: Is the harness wire in good condition?

YES : Go to Step 9.
NO : Repair it.



STEP 9. Check connector B-41 at Park/Neutral position switch for damage.
Q: Is the connector in good condition?

YES : Go to Step 10.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

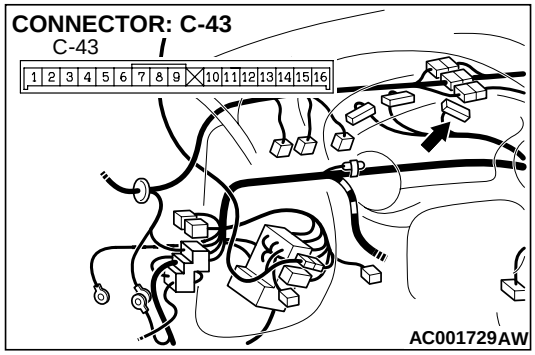


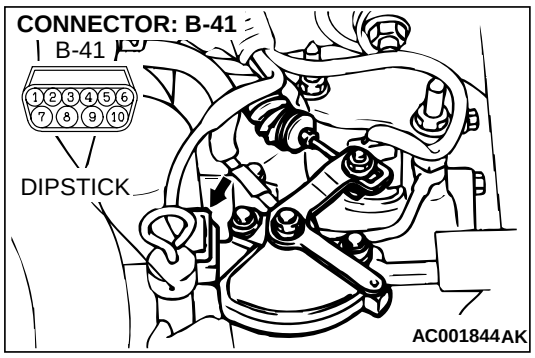
STEP 10. Check harness for short circuit to ground between combination meter connector C-43 terminal 9 and Park/Neutral position switch connector B-41 terminal 4.

Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair it.





STEP 11. Using scan tool MB991502, check the light bulb.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.

(2) Turn the ignition switch to the "ON" position.

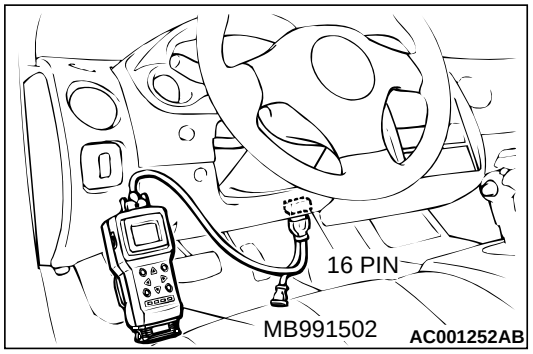
- The "N" range light in the combination meter flushes.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Does the "N" range light flush?

YES : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.

NO : Replace the PCM.



SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Engine does not Crank

COMMENT
If the engine does not crank when the selector lever is placed in the "P" or "N" position, the cause is probably a malfunction of the Park/Neutral position switch system, transaxle control cable assembly, engine system, torque converter or transaxle oil pump.

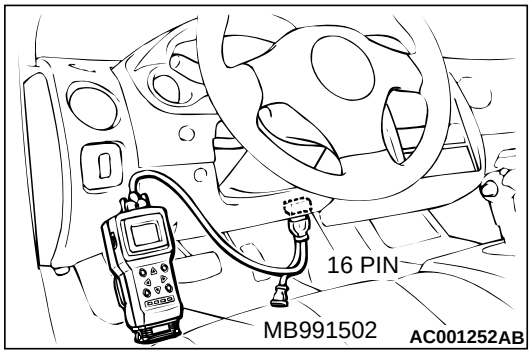
TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Malfunction of the Park/Neutral position switch
- Malfunction of the transaxle control cable assembly
- Malfunction of the engine system
- Malfunction of the torque converter
- Malfunction of the transaxle oil pump
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, check the A/T diagnostic trouble code.

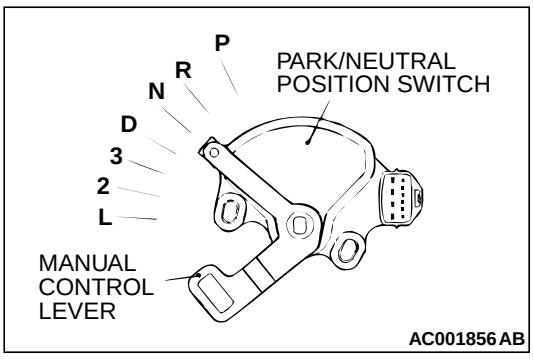
⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.



(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the A/T diagnostic trouble code.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is A/T diagnostic trouble code numbers "27" or "28" displayed?
YES : Refer to P.23A-136, P.23A-166, code number 27, 28: Park/Neutral Position Switch System.
NO : Go to Step 2.

STEP 2. Check the transaxle control cable assembly.
Move the selector lever to each position. The manual control lever position of the Park/Neutral position switch should match the selector lever position.



Q: Is the manual control lever position correct?
YES : Go to Step 3.
NO : Repair the transaxle control cable. Refer to P.23A-352, Park/Neutral Position Switch and Control Cable Adjustment. Retest the system to verify the repair.

STEP 3. Check the engine.

Refer to GROUP 13A <2.4L Engine>, Diagnosis – Trouble Symptom Chart – Starting P.13A-25 or GROUP 13B <3.0L Engine>, Diagnosis – Trouble Symptom Chart – Starting P.13B-26.

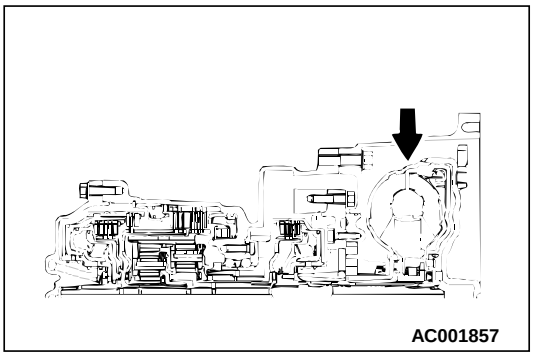
Q: Are the engine checks satisfactory?

YES : Go to Step 4.
NO : Repair or replace the defective engine components.

STEP 4. Check the torque converter.

(1) Remove the starter.
(2) Turn the torque converter and check for a binding or sticking condition. Check the ring gear for damaged or missing teeth.

NOTE: Since the torque converter drives the oil pump, turning the torque converter also checks for a binding oil pump. If either of these components are damaged the transaxle will need to be removed for inspection.

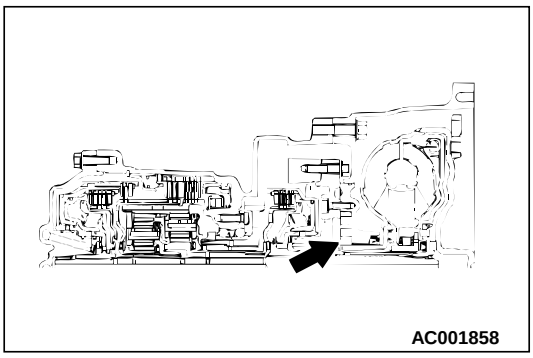

AC001857

Q: Dose the torque converter turn freely without any missing or damaged teeth?

YES : Replace the starter and go to Step 5.
NO : Replace the torque converter. Refer to GROUP 23B, Transaxle P.23B-10.

STEP 5. Replace the oil pump.

Replace the oil pump (Oil pump cannot be repaired). Refer to GROUP 23B, Transaxle P.23B-10. Confirm that the malfunction symptom is eliminated.


AC001858

Q: Is the symptom eliminated?

YES : Diagnosis is complete.
NO : Go to Step 6.

STEP 6. Replace the PCM.

Q: Dose the engine crank when the selector lever is placed in the "P" or "N" position?

YES : Diagnosis is complete.
NO : Start over at Step 1.

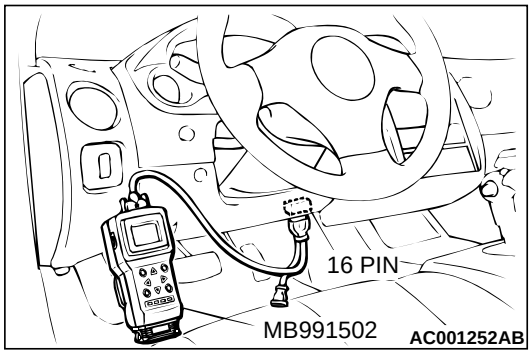
INSPECTION PROCEDURE 2: Does not Move Forward

COMMENT
If the vehicle does not move forward when the selector lever is shifted from "N" to "D," "2" or "L" range while the engine is idling, the cause is probably abnormal line pressure or a malfunction of the underdrive clutch or valve body.

TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Abnormal line pressure
- Malfunction of the underdrive solenoid valve
- Malfunction of the underdrive clutch
- Malfunction of the valve body
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, carry out the actuator test item 02: Underdrive Solenoid Valve.

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to actuator test mode for item 02: Underdrive Solenoid Valve.
- An operation sound should be heard from solenoid valve when solenoid valve is operated.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

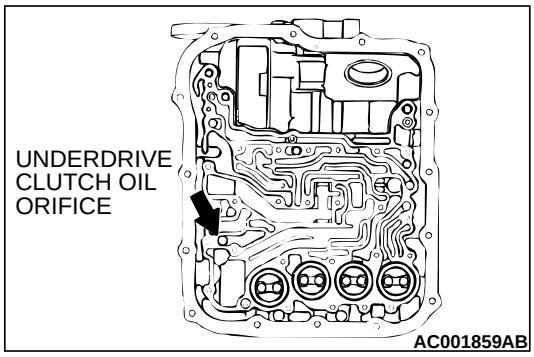
Q: Is the solenoid valve operating properly?

YES : Go to Step 2.
NO : Repair or replace the underdrive solenoid valve. Refer to GROUP 23B, Valve Body P.23B-74. Then confirm that the symptom is eliminated.

STEP 2. Check the hydraulic pressure.
Measure the hydraulic pressure of each element when the selector lever is at the "L" range, and check if each hydraulic pressure is within the standard value. Refer to P.23A-26, Hydraulic Pressure Test.

Q: Is the hydraulic pressure within the standard value?

YES : Go to Step 3.
NO : Go to Step 4.



STEP 3. Check the underdrive clutch system.

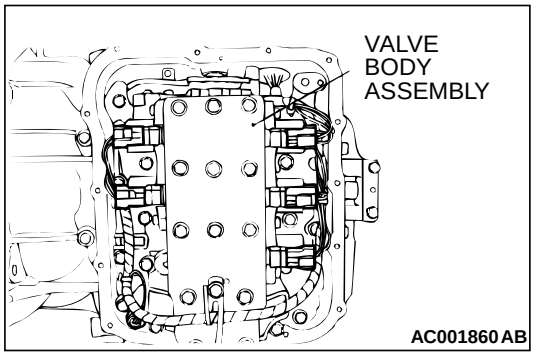
(1) Remove the valve body cover and valve body. Refer to P.23A-366, Transaxle Assembly and GROUP 23B, Transaxle P.23B-10.

(2) Blow 108 kPa (15 psi) compressed air into the underdrive clutch oil orifice of the transaxle case, and check if the underdrive clutch piston moves and air pressure is maintained in that condition.

Q: Is the air pressure maintained?

YES : Go to Step 6.

NO : Go to Step 5.



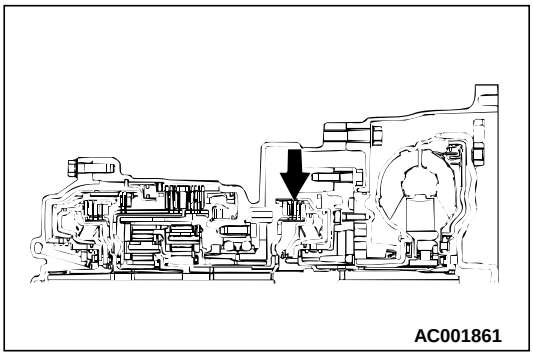
STEP 4. Disassemble and clean the valve body.

Check the O-ring installation bolts for looseness and valve body for damage. Repair or replace the faulty parts. Refer to GROUP 23B, Valve Body P.23B-74.

Q: Is the repair possible and the symptom eliminated?

YES : Diagnosis is complete.

NO : Replace the valve body assembly. Then check the symptom. If the symptom is not eliminated, go to Step 6.



STEP 5. Check the underdrive clutch.

(1) Remove the transaxle assembly.

(2) Check the facing for seizure and the piston seal ring for damage and interference with the retainer. Repair or replace the faulty parts. Refer to GROUP 23B, Underdrive Clutch and Input Shaft P.23B-57. Then check the symptom.

Q: Is the symptom eliminated?

YES : Diagnosis is complete.

NO : Go to Step 6.

STEP 6. Replace the PCM.

Q: Is the symptom eliminated?

YES : Diagnosis is complete.

NO : Start over at Step 1.

INSPECTION PROCEDURE 3: Does not Move Backward

COMMENT
If the vehicle does not backward when the selector lever is shifted from "N" to "R" range while the engine is idling, the cause is probably abnormal pressure or a malfunction of the reverse clutch, low-reverse brake, or valve body.

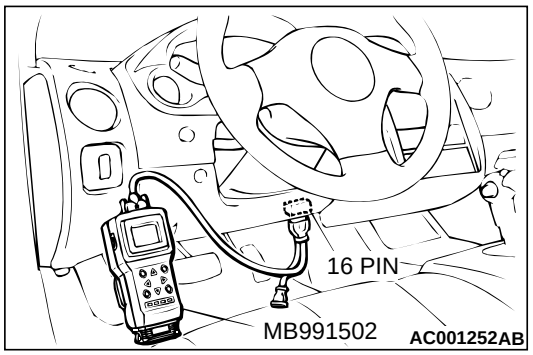
TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Abnormal reverse clutch pressure
- Abnormal low-reverse brake pressure
- Malfunction of the low-reverse solenoid valve
- Malfunction of the reverse clutch
- Malfunction of the low-reverse brake
- Malfunction of the valve body
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, carry out the actuator test item 01: Low-Reverse Solenoid Valve.

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.



(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to actuator test mode for item 01: Low-Reverse Solenoid Valve.
- An operation sound should be heard from solenoid valve when solenoid valve is operated.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the solenoid valve operating properly?
YES : . Go to Step 2.
NO : . Repair or replace the low-reverse solenoid valve. Refer to GROUP 23B, Valve Body P.23B-74. Then confirm that the symptom is eliminated.

STEP 2. Check the hydraulic pressure (for reverse clutch).
Measure the hydraulic pressure for reverse clutch when the selector lever is at the "R" range, and check if the hydraulic pressure is within the standard value. Refer to P.23A-26, Hydraulic Pressure Test.

Q: Is the hydraulic pressure within the standard value?
YES : . Go to Step 3.
NO : . Go to Step 5.

STEP 3. Check the hydraulic pressure (for low-reverse brake).
Measure the hydraulic pressure for low-reverse brake when the selector lever is at the "R" range, and check if the hydraulic pressure is within the standard value. Refer to P.23A-26, Hydraulic Pressure Test.

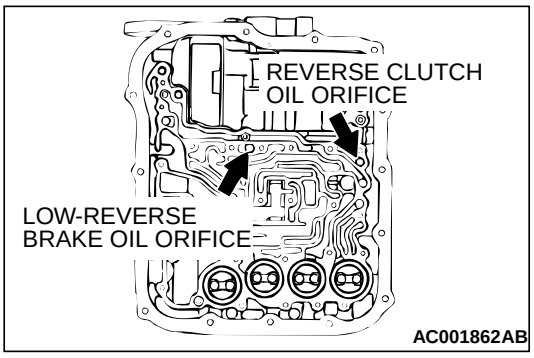
Q: Is the hydraulic pressure within the standard value?
YES : . Go to Step 4.
NO : . Go to Step 5.

TSB Revision

STEP 4. Check the reverse clutch system and low-reverse brake system.

(1) Remove the valve body cover and valve body. Refer to P.23A-366, Transaxle Assembly and GROUP 23B, Transaxle P.23B-10.

(2) Blow 108 kPa (15 psi) compressed air into the reverse clutch oil orifice of the transaxle case. Then check if the reverse clutch piston moves and air pressures are maintained in that condition. Repeat for the low-reverse brake.

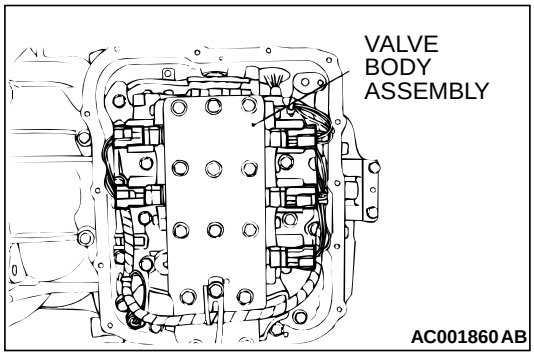


Q: Are the reverse clutch, low-reverse brake or both air pressures maintained?

YES : Go to Step 7.
NO : Go to Step 6.

STEP 5. Disassemble and clean the valve body.

Check the O-ring installation bolts for looseness and valve body for damage. Repair or replace the faulty parts. Refer to GROUP 23B, Valve Body P.23B-74.

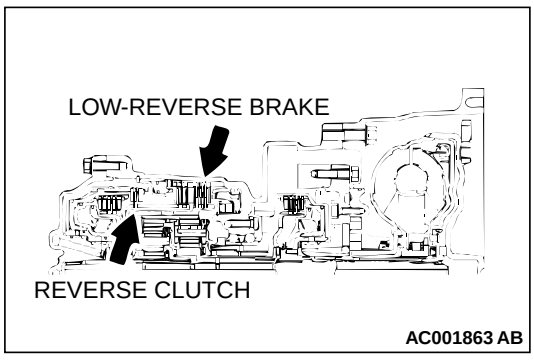


Q: Is the repair possible and the symptom eliminated?

YES : Diagnosis is complete.
NO : Go to Step 7.

STEP 6. Check the reverse clutch, low-reverse brake or both. Remove the transaxle.

Check the facing for seizure and the piston seal ring for damage and interference with the retainer. Repair or replace the faulty parts. Refer to GROUP 23B, Transaxle P.23B-10, Reverse and Overdrive Clutch P.23B-59. Then check the symptom.



Q: Is the symptom eliminated?

YES : Diagnosis is complete.
NO : Go to Step 7.

STEP 7. Replace the PCM.

Q: Is the symptom eliminated?

YES : Diagnosis is complete.
NO : Start over at Step 1.

INSPECTION PROCEDURE 4: Does not Move (forward or backward)

COMMENT
If the vehicle does not move forward or backward when the selector lever is shifted to any position while the engine is idling, the cause is probably abnormal line pressure, or a malfunction of the power train, oil pump or valve body.

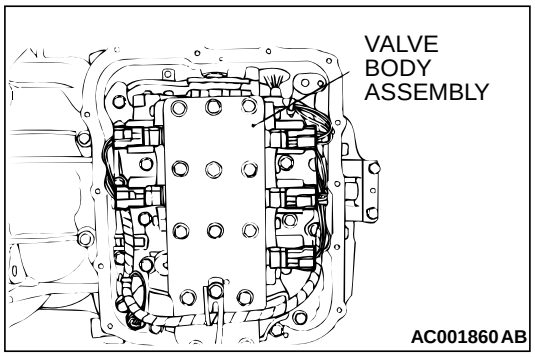
TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Abnormal line pressure
- Malfunction of the power train
- Malfunction of the oil pump
- Malfunction of the valve body
- Low A/T fluid level
- Malfunction of the PCM

DIAGNOSIS

STEP 1. Check the hydraulic pressure.
Measure the hydraulic pressure of each element when the transaxle is in 1st, 2nd or reverse. Check if each hydraulic pressure is within the standard value. Refer to P.23A-26, Hydraulic Pressure Test. If some elements are within the standard value and some are not, recheck the symptom.

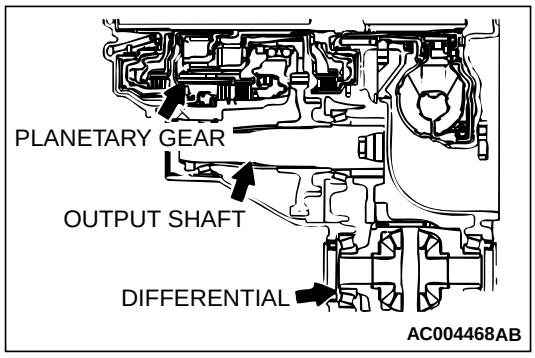
Q: Are all pressures within the standard value?
YES : Check A/T fluid level and condition. If not OK, repair or replace as necessary, then recheck symptom. If OK, go to Step 3.
NO : Go to Step 2.

STEP 2. Disassemble and clean the valve body.
Check the O-ring installation bolts for looseness and valve body for damage. Repair or replace the faulty parts. Refer to GROUP 23B, Valve Body P.23B-74.

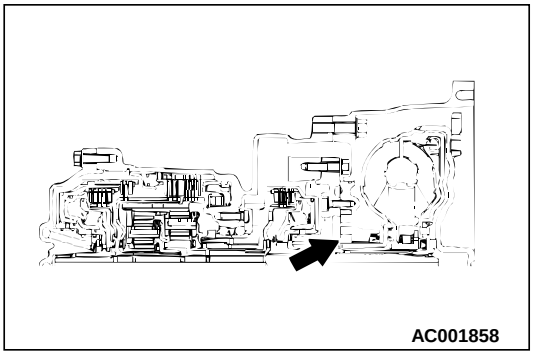


Q: Is the repair possible and the symptom eliminated?
YES : Diagnosis is complete.
NO : Replace the valve body assembly. Then check the symptom. If the symptom is not eliminated, go to Step 4.

STEP 3. Check the transaxle power train components.
Disassemble the transaxle and check the planetary carrier and output shaft, etc. Repair or replace the damaged parts. Refer to GROUP 23B, Transaxle P.23B-10, Planetary Gear P.23B-64, Output Shaft P.23B-68, Differential P.23B-70. Then check the symptom.



Q: Is the symptom eliminated?
YES : Diagnosis is complete.
NO : Go to Step 5.


AC001858

STEP 4. Replace the oil pump.
(1) Remove the transaxle.
(2) Replace the oil pump (Oil pump cannot be repaired). Refer to GROUP 23B, Transaxle P.23B-10. Then check the symptom.

Q: Is the symptom eliminated?
YES : Diagnosis is complete.
NO : Go to Step 5.

STEP 5. Replace the PCM.

Q: Is the symptom eliminated?
YES : Diagnosis is complete.
NO : Start over at Step 1.

INSPECTION PROCEDURE 5: Engine Stalls when Moving Selector Lever from "N" to "D" or "N" to "R"

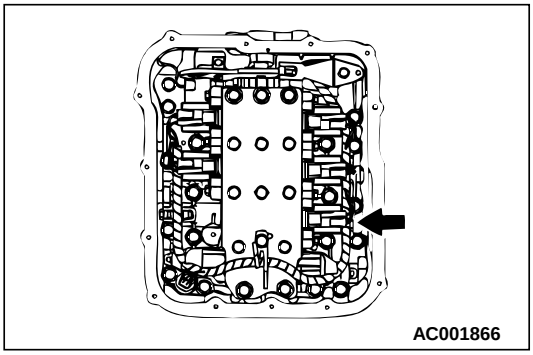
COMMENT
If the engine stalls when the selector lever is shifted from "N" to "D" or "R" range while the engine is idling, the cause is probably a malfunction of the engine system, torque converter clutch solenoid valve, valve body or torque converter (torque converter clutch malfunction).

TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Malfunction of the engine system
- Malfunction of the torque converter clutch solenoid
- Malfunction of the valve body
- Malfunction of the torque converter (Malfunction of the torque converter clutch)
- Malfunction of the PCM

DIAGNOSIS

STEP 1. Check the engine system.
Refer to GROUP 13A <2.4L Engine>, Diagnosis – Trouble Symptom Chart – When the engine is hot, it stalls at idle P.13A-25 or GROUP 13B <3.0L Engine>, Diagnosis – Trouble Symptom Chart – When the engine is hot, it stalls at idle P.13B-26.

Q: Is the inspection result good?
YES : Go to Step 2.
NO : Repair or replace the engine components.

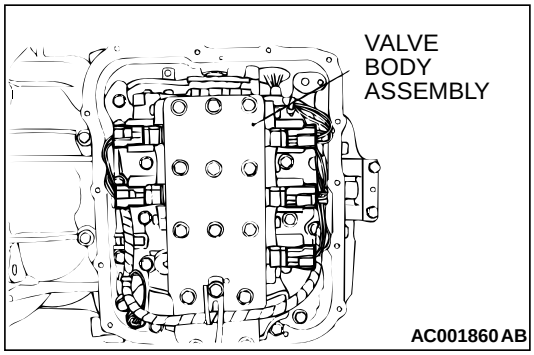

AC001866

STEP 2. Replace the torque converter clutch solenoid valve.

Replace the torque converter clutch solenoid valve. Refer to GROUP 23B, Valve Body P.23B-74. Then check the symptom.

Q: Is the symptom eliminated?

YES : Diagnosis is complete.
NO : Go to Step 3.



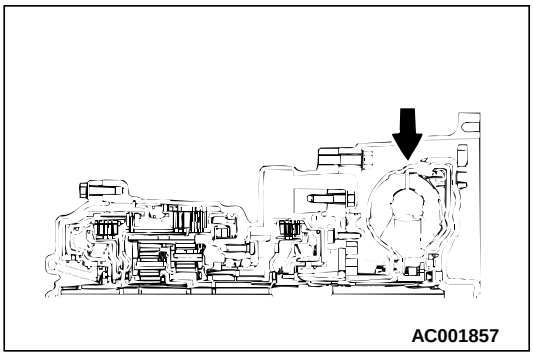
AC001860 AB

STEP 3. Disassemble and clean the valve body.

Check the O-ring installation bolts for looseness and valve body for damage. Repair or replace the faulty parts. Refer to GROUP 23B, Valve Body P.23B-74.

Q: Is the repair possible and the symptom eliminated?

YES : Diagnosis is complete.
NO : Replace the valve body assembly. Then check the symptom. If the symptom is not eliminated, go to Step 4.


AC001857

STEP 4. Replace the torque converter assembly.

(1) Remove the transaxle.
(2) Replace the torque converter assembly. Refer to GROUP 23B, Transaxle P.23B-10. Then check the symptom.

Q: Is the symptom eliminated?

YES : Diagnosis is complete.
NO : Go to Step 5.

STEP 5. Replace the PCM.

Q: Is the symptom eliminated?

YES : Diagnosis is complete.
NO : Start over at Step 1.

INSPECTION PROCEDURE 6: Shift Shock when Shifting from "N" to "D" and Long Delay

COMMENT
If abnormal shock or delay of two seconds or more occurs when the selector lever is shifted from "N" to "D" range while the engine is idling, the cause is probably abnormal underdrive clutch pressure or a malfunction of the underdrive clutch, valve body or throttle position sensor.

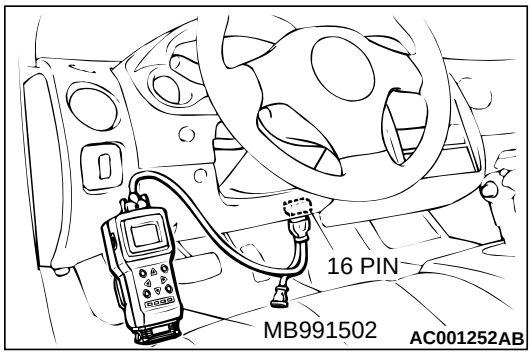
TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Abnormal underdrive clutch pressure
- Malfunction of the underdrive solenoid valve
- Malfunction of the underdrive clutch
- Malfunction of the valve body
- Malfunction of the throttle position sensor
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, carry out the actuator test item 02: Underdrive Solenoid Valve.

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.



(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to actuator test mode for item 02: Underdrive Solenoid Valve.
- An operation sound should be heard from solenoid valve when solenoid valve is operated.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

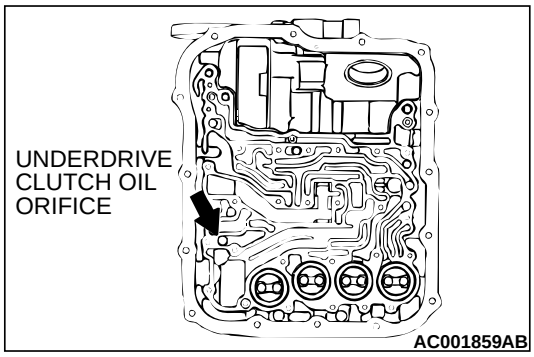
Q: Is the solenoid valve operating properly?
YES : Go to Step 2.
NO : Repair or replace the underdrive solenoid valve. Refer to GROUP 23B, Valve Body P.23B-74. Then confirm that the symptom is eliminated.

STEP 2. Check when shock occurs.

Q: When does the shock occur?
When engaging from N to D : Go to Step 3.
When the vehicle starts moving : Go to Step 6.

STEP 3. Check the hydraulic pressure (for underdrive clutch).
Measure the hydraulic pressure for underdrive clutch when the selector lever is shifted from "N" to "D" range. Check if the hydraulic pressure is within the standard value. Refer to P.23A-26, Hydraulic Pressure Test.

Q: Is the hydraulic pressure within the standard value?
YES : Go to Step 4.
NO : Go to Step 8.



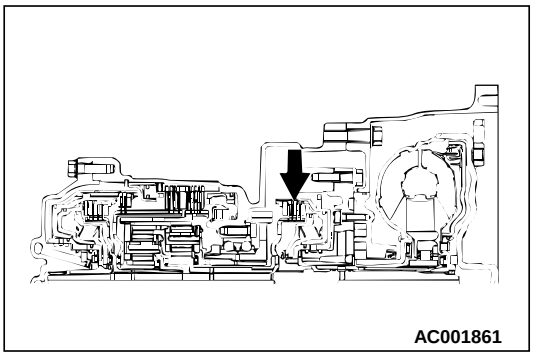
STEP 4. Check the underdrive clutch system.

(1) Remove the valve body cover and valve body. Refer to P.23A-366, Transaxle Assembly and GROUP 23B, Transaxle P.23B-10.

(2) Blow 108 kPa (15 psi) compressed air into the underdrive clutch oil orifice of the transaxle case, and check if the underdrive clutch piston moves and air pressure is maintained in that condition.

Q: Is the air pressure maintained?

YES : Go to Step 9.
NO : Go to Step 5.



STEP 5. Check the underdrive clutch.

(1) Remove the transaxle assembly.

(2) Check the facing for seizure and the piston seal ring for damage and interference with the retainer. Repair or replace the faulty parts. Refer to GROUP 23B P.23B-57, Underdrive Clutch and Input Shaft. Then check the symptom.

Q: Is the symptom eliminated?

YES : Diagnosis is complete.
NO : Go to Step 9.

STEP 6. Check shock.

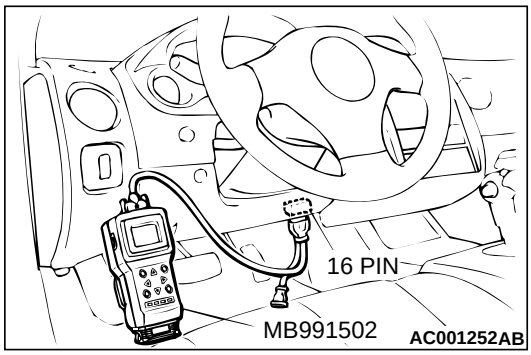
Q: Does shock occur sometimes?

YES : Go to Step 7.
NO : Go to Step 8.

STEP 7. Using scan tool MB991502, check data list item 11: Throttle position sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.



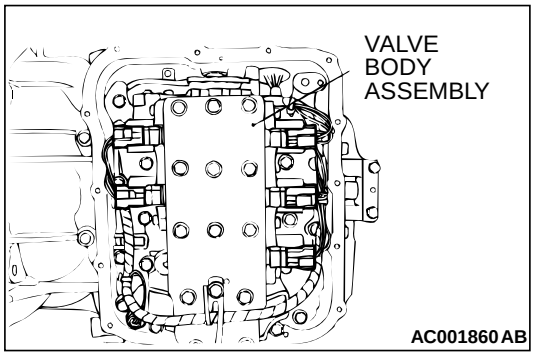
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to data reading mode for item 11: Throttle Position Sensor.
- With the throttle valve in idle position, voltage should be between 535 and 735 mV.
- With the throttle valve in full-open position, voltage should be between 4,500 and 5,500 mV.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : . Go to Step 8.
NO : . Check the throttle position sensor. Refer to P.23A-42, P.23A-51, P.23A-59, diagnostic trouble code number 11, 12, 14: Throttle Position Sensor System. Then check the symptom.

STEP 8. Disassemble and clean the valve body.



Check the O-ring installation bolts for looseness and the valve body for damage. Repair or replace the faulty parts. Refer to GROUP 23B, Valve Body P.23B-74.

Q: Is the repair possible and the symptom eliminated?

YES : Diagnosis is complete.
NO : Replace the valve body assembly. Then check the symptom. Go to Step 9.

STEP 9. Replace the PCM.

Q: Is the symptom eliminated?

YES : Diagnosis is complete.
NO : Start over at Step 1.

INSPECTION PROCEDURE 7: Shift Shock when Shifting from "N" to "R" and Long Delay

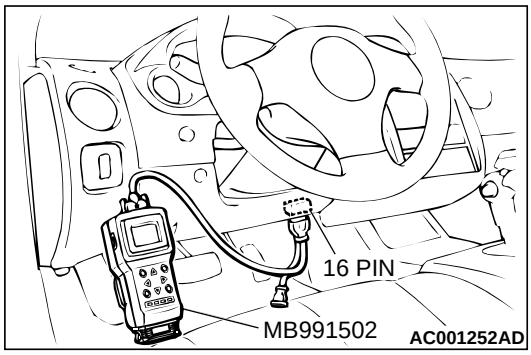
COMMENT

If abnormal shock or delay of two seconds or more occurs when the selector lever is shifted from "N" to "R" range while the engine is idling, the cause is probably abnormal reverse clutch pressure or low-reverse brake pressure, or a malfunction of the reverse clutch, low-reverse brake, valve body or throttle position sensor.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set:)

- Abnormal reverse clutch pressure
- Abnormal low-reverse brake pressure
- Malfunction of the low-reverse solenoid valve
- Malfunction of the reverse clutch
- Malfunction of the low-reverse brake
- Malfunction of the valve body
- Malfunction of the throttle position sensor
- Malfunction of the PCM

TSB Revision



DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, carry out the actuator test item 01: Low-Reverse Solenoid Valve.

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to actuator test mode for item 01: Low-Reverse Solenoid Valve.
- An operation sound should be heard from solenoid valve when solenoid valve is operated.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the solenoid valve operating properly?

YES : Go to Step 2.
NO : Repair or replace the low-reverse solenoid valve. Refer to GROUP 23B, Valve Body P.23B-74. Then confirm that the symptom is eliminated.

STEP 2. Check when shock occurs.

Q: When does the shock occur?

When engaging from N to R : Go to Step 3.
When the vehicle starts moving : Go to Step 7.

STEP 3. Check the hydraulic pressure (for reverse clutch).
Measure the hydraulic pressure for reverse clutch when the selector lever is at the "R" range. Check if the hydraulic pressure is within the standard value. Refer to P.23A-26, Hydraulic Pressure Test.

Q: Is the hydraulic pressure within the standard value?

YES : Go to Step 4.
NO : Go to Step 9.

STEP 4. Check the hydraulic pressure (for low-reverse brake).
Measure the hydraulic pressure for low-reverse brake when the selector lever is at the "R" range. Check if the hydraulic pressure is within the standard value. Refer to P.23A-26, Hydraulic Pressure Test.

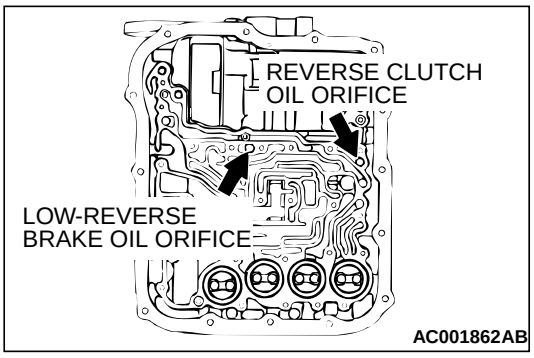
Q: Is the hydraulic pressure within the standard value?

YES : Go to Step 5.
NO : Go to Step 9.

STEP 5. Check the reverse clutch system and low-reverse brake system.

(1) Remove the valve body cover and valve body. Refer to P.23A-366, Transaxle Assembly and GROUP 23B, Transaxle P.23B-10.

(2) Blow 108 kPa (15 psi) compressed air into the reverse clutch oil orifice of the transaxle case, and check if the reverse clutch piston moves and air pressures are maintained in that condition. Repeat for the low-reverse brake.



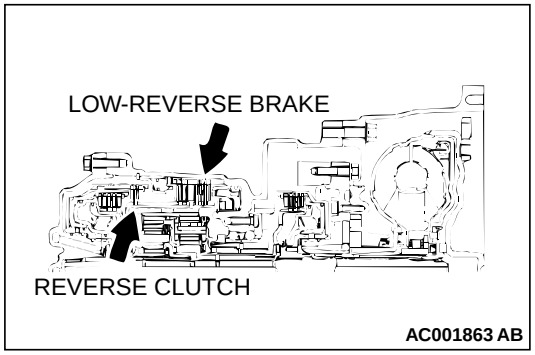
Q: Are both air pressures maintained?

YES : Go to Step 10.
NO : Go to Step 6.

STEP 6. Check the reverse clutch and low-reverse brake.

(1) Remove the transaxle assembly.

(2) Check the facing for seizure and the piston seal ring for damage and interference with the retainer. Repair or replace the faulty parts. Refer to GROUP 23B, Transaxle P.23B-10, Reverse and Overdrive Clutch P.23B-59. Then check for the symptom.



Q: Is the symptom eliminated?

YES : Diagnosis is complete.
NO : Go to Step 10.

STEP 7. Check shift shock.

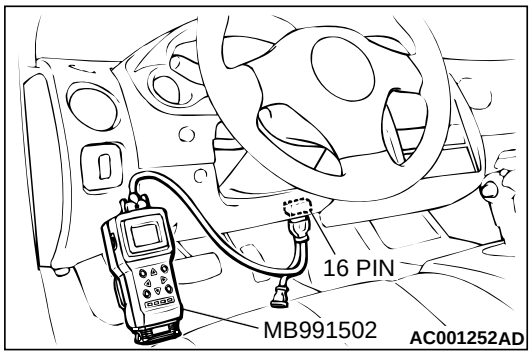
Q: Does shock occur sometimes?

YES : Go to Step 8.
NO : Go to Step 9.

STEP 8. Using scan tool MB991502, check data list item 11: Throttle position sensor.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.



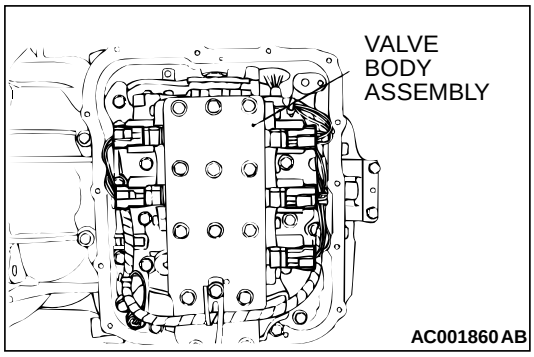
(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to data reading mode for item 11: Throttle Position Sensor.
- With the throttle valve in idle position, voltage should be between 535 and 735 mV.
- With the throttle valve in full-open position, voltage should be between 4,500 and 5,500 mV.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 9.
NO : Check the throttle position sensor. Refer to P.23A-42, P.23A-51, P.23A-59, diagnostic trouble code number 11, 12, 14: Throttle Position Sensor System. Then check the symptom.

STEP 9. Disassemble and clean the valve body.



Check the O-ring installation bolts for looseness and the valve body for damage. Repair or replace the faulty parts. Refer to GROUP 23B, Valve Body P.23B-74.

Q: Is the repair possible and the symptom eliminated?

YES : Diagnosis is complete.
NO : Replace the valve body assembly. Then check the symptom. Go to Step 10.

STEP 10. Replace the PCM.

Q: Is the symptom eliminated?

YES : Diagnosis is complete.
NO : Start over at Step 1.

INSPECTION PROCEDURE 8: Shift Shock when Shifting from "N" to "D," "N" to "R" and Long Delay

COMMENT

If abnormal shock or delay of two seconds or more occurs when the selector lever is moved from "N" to "D" range and from "N" to "R" range while the engine is idling, the cause is probably abnormal line pressure or a malfunction of the oil pump or valve body.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set:)

- Abnormal line pressure
- Malfunction of the oil pump
- Malfunction of the valve body
- Malfunction of the PCM

TSB Revision

DIAGNOSIS

STEP 1. Check the hydraulic pressure.

(1) Measure the hydraulic pressure of each element when the transaxle is in 1st, 2nd or reverse. Check if each hydraulic pressure is within the standard value. Refer to P.23A-26, Hydraulic Pressure Test.

(2) If some elements are within the standard value and some are not, recheck the symptom.

Q: Are all hydraulic pressures within the standard value?

YES : Go to Step 3.

NO : Go to Step 2.

STEP 2. Adjust line pressure.

Adjust line pressure. Refer to P.23A-40, Line Pressure Adjustment. Then check the symptom.

Q: Is the symptom eliminated?

YES : Diagnosis is complete.

NO : Go to Step 3.

STEP 3. Check when shock occurs.

Q: When does the shock occur?

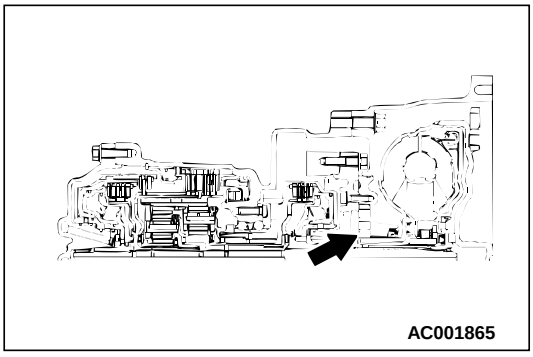
When engaging from N to D and N to R : Go to Step 4.

When the vehicle starts moving : Go to Step 5.

STEP 4. Replace the oil pump.

(1) Remove the transaxle.

(2) Replace the oil pump. (Oil pump cannot be repaired). Refer to GROUP 23B, Transaxle P.23B-10. Then check the symptom.


AC001865

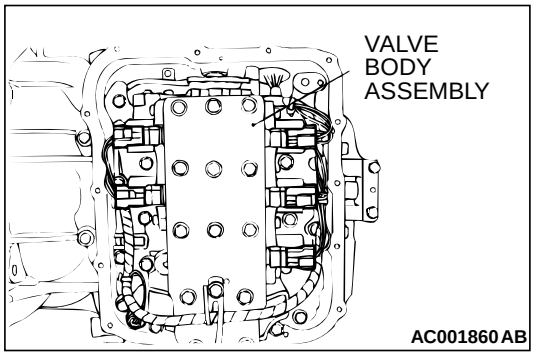
Q: Is the symptom eliminated?

YES : Diagnosis is complete.

NO : Go to Step 6.

STEP 5. Disassemble and clean the valve body.

Check the installation bolts for looseness and the O-ring, valves and valve body for damage. Repair or replace the faulty parts. Refer to GROUP 23B, Valve Body P.23B-74.



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Q: Is the repair possible and the symptom eliminated?

YES : Diagnosis is complete.

NO : Replace the valve body assembly. Then check the symptom. Go to Step 6.

TSB Revision

STEP 6. Replace the PCM.

Q: Is the symptom eliminated?

YES : Diagnosis is complete.
NO : Start over at Step 1.

INSPECTION PROCEDURE 9: Shift shock and slipping

COMMENT
If shift shock when driving are due to upshifting or downshifting and the transaxle speed become higher than the engine speed, the cause is probably abnormal line pressure or a malfunction of a solenoid valve, oil pump, valve body or of a brake or clutch.

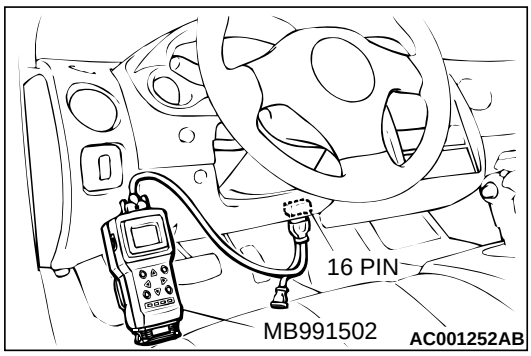
TROUBLESHOOTING HINTS (The most likely causes for this code to be set:)
- Abnormal line pressure
- Malfunction of each solenoid valve
- Malfunction of the oil pump
- Malfunction of the valve body
- Malfunction of each brake or each clutch
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)

STEP 1. Using scan tool MB991502, carry out the actuator test.

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.



(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to actuator test mode for following items.
   a. Item 01: Low-reverse solenoid valve
   b. Item 02: Underdrive solenoid valve
   c. Item 03: Second solenoid valve
   d. Item 04: Overdrive solenoid valve
      - An operation sound should be heard from solenoid valve when solenoid valve is operated.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are the solenoid valves operating properly?

YES : Go to Step 2.
NO : Repair or replace the solenoid valves. Refer to GROUP 23B, Valve Body P.23B-74. Then confirm that the symptom is eliminated.

STEP 2. Check the hydraulic pressure.

(1) Measure the hydraulic pressure of each element. Check if each hydraulic pressure is within the standard value. Refer to P.23A-26, Hydraulic Pressure Test.
(2) If some elements are within the standard value and some are not, recheck the symptom.

Q: Are all hydraulic pressures within the standard value?

YES : Go to Step 6.
NO : Go to Step 3.

STEP 3. Adjust the line pressure.

Adjust the line pressure. Refer to P.23A-40, Line Pressure Adjustment. Then check the symptom.

Q: Is the symptom eliminated?

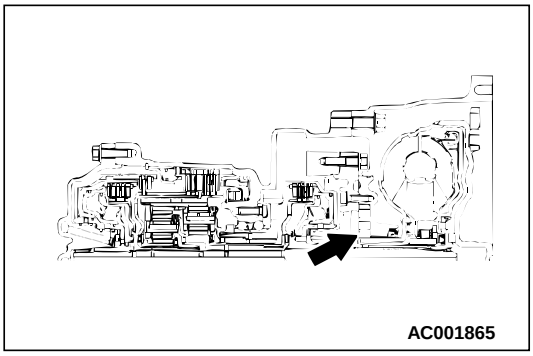
YES : Diagnosis is complete.
NO : Go to Step 4.

STEP 4. Replace the oil pump.

(1) Remove the transaxle.
(2) Replace the oil pump. (Oil pump can not be repaired). Refer to GROUP 23B, Transaxle P.23B-10. Then check the symptom.

Q: Is the symptom eliminated?

YES : Diagnosis is complete.
NO : Go to Step 5.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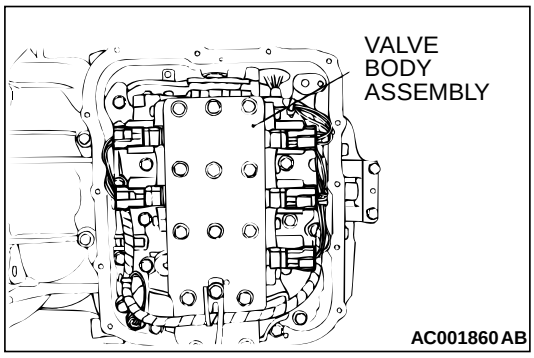
STEP 5. Disassemble and clean the valve body.

Check the O-ring installation bolts for looseness and the valve body for damage. Repair or replace the faulty parts. Refer to GROUP 23B, Valve Body P.23B-74.

Q: Is the repair possible and the symptom eliminated?

YES : Diagnosis is complete.
NO : Replace the valve body assembly. Then check the symptom. Go to Step 7.



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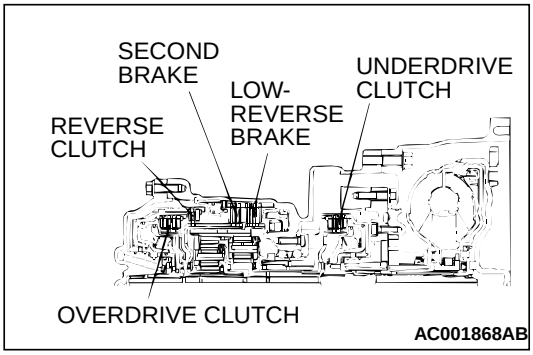


STEP 6. Check each brake and clutch.

(1) Remove the transaxle.
(2) Check the facing for seizure and piston seal ring for damage and interference with retainer. Repair or replace the faulty parts. Refer to GROUP 23B, Transaxle P.23B-10, Underdrive Clutch and Input Shaft P.23B-57, Reverse and Overdrive Clutch P.23B-59. Then check for the symptom.

Q: Is the symptom eliminated?

YES : Diagnosis is complete.
NO : Go to Step 7.

STEP 7. Replace the PCM.

Q: Is the symptom eliminated?

YES : Diagnosis is complete.
NO : Start over at Step 1.

INSPECTION PROCEDURE 10: Does not Shift Properly All Points (Early or Late Shift Points)

COMMENT

If all shift points are early or late while driving, the cause is probably a malfunction of the output shaft speed sensor, throttle position sensor or a solenoid valve.

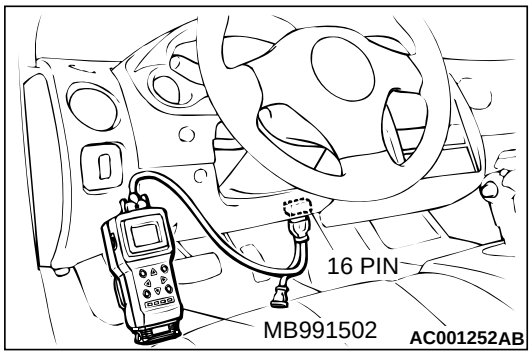
TROUBLESHOOTING HINTS (The most likely causes for this code to be set:)

- Malfunction of the output shaft speed sensor
- Malfunction of the throttle position sensor
- Malfunction of each solenoid valve
- Abnormal line pressure
- Malfunction of the valve body
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 23: Output Shaft Speed Sensor.

⚠ CAUTION

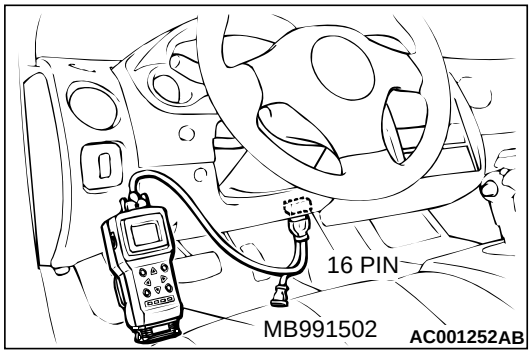
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine.
(3) Set scan tool MB991502 to data reading mode for item 23: Output Shaft Speed Sensor.
- When driving at constant speed of 50km/h (31mph), the display should be 1,600 – 1,900 r/min <2.4L Engine>, 1,300 – 1,600 r/min <3.0L Engine>. (Gear range: 3rd gear)

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 2.
NO : Refer to P.23A-115, diagnostic trouble code number 23: Output shaft speed sensor system.



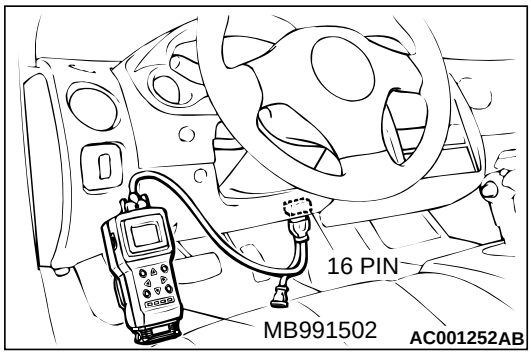
STEP 2. Using scan tool MB991502, check data list item 11: Throttle position sensor.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to data reading mode for item 11: Throttle Position Sensor.
- With the throttle valve in idle position, voltage should be between 535 and 735 mV.
- With the throttle valve in full-open position, voltage should be between 4,500 and 5,500 mV.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 3.
NO : Check the throttle position sensor. Refer to P.23A-42, P.23A-51, P.23A-59, diagnostic trouble code number 11, 12, 14: Throttle Position Sensor System. Then check the malfunction.



STEP 3. Using scan tool MB991502, check data list.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine.
(3) Set scan tool MB991502 to data reading mode for following items.
   a. Item 31: Low-Reverse Solenoid Valve Duty Percent
   b. Item 32: Underdrive Solenoid Valve Duty Percent
   c. Item 33: Second Solenoid Valve Duty Percent
   d. Item 34: Overdrive Solenoid Valve Duty Percent
      - Check that the values shown below are displayed when each data list item is entered.

DRIVING CONDITION	DATA LIST ITEM			
	31	32	33	34
Driving at constant speed of 10 km/h (6.2 mph) in 1st gear	0%	0%	100%	100%
Driving at constant speed of 30 km/h (19 mph) in 2nd gear	100%	0%	0%	100%
Driving at constant speed of 50 km/h (31 mph) in 3rd gear	100%	0%	100%	0%
Driving at constant speed of 50 km/h (31 mph) in 4th gear	100%	100%	0%	0%

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are the solenoid valves operating properly?

YES : Go to Step 4.
NO : Go to Step 6.

STEP 4. Adjust the line pressure.

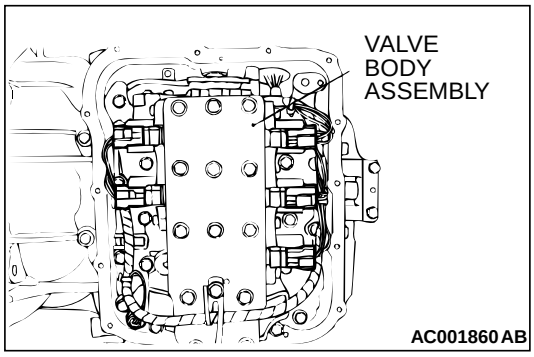
Adjust the line pressure. Refer to P.23A-40, Line Pressure Adjustment. Then check the symptom.

Q: Is the symptom eliminated?

YES : Diagnosis is complete.
NO : Go to Step 5.

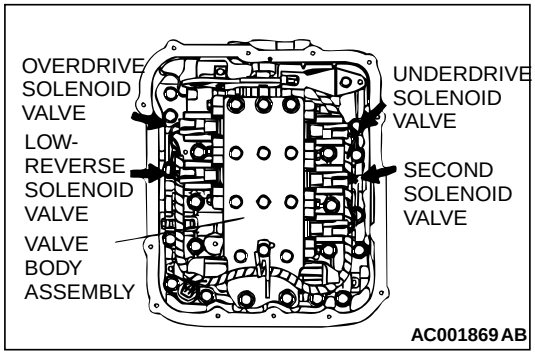
STEP 5. Disassemble and clean the valve body.

Check the O-ring installation bolts for looseness and the valve body for damage. Repair or replace the faulty parts. Refer to GROUP 23B, Valve Body P.23B-74.



Q: Is the repair possible and the symptom eliminated?

YES : Diagnosis is complete.
NO : Replace the valve body assembly. Then check the symptom. Go to Step 7.



STEP 6. Replace each solenoid valve.

Replace the faulty solenoid valve with a new one.

Q: Is the symptom eliminated?

YES : Diagnosis is complete.
NO : Go to Step 7.

STEP 7. Replace the PCM.

Q: Is the symptom eliminated?

YES : Diagnosis is complete.
NO : Start over at Step 1.

INSPECTION PROCEDURE 11: Does not Shift Properly Some Points (Early or Late Shift Points)

COMMENT

If some of the shift points are early or late when driving, the cause is probably a malfunction of the valve body, or it is due to the characteristics of the INVECS-II system but is not an abnormality.

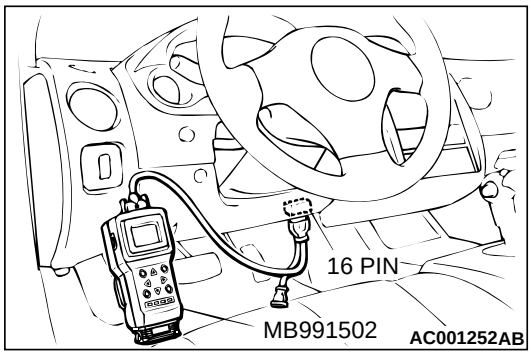
TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the valve body
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, carry out the actuator test item 14: INVECS-II Cancel Command.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine.
(3) Set scan tool MB991502 to actuator test mode for item14: INVECS-II Cancel Command.
- Drive the vehicle and confirm the gear shifting correspond to the standard shift line of the shift pattern diagram. Refer to P.23A-3.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

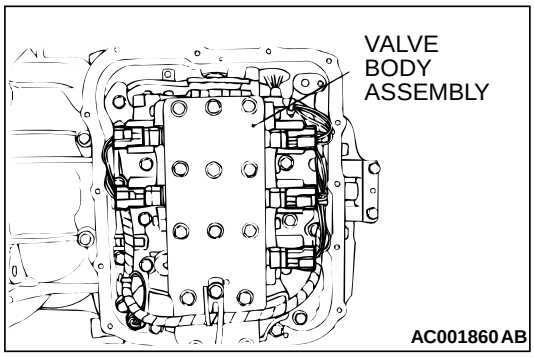
Q: Does the gear shifting correspond to the standard shift line of the shift pattern diagram?

YES : The symptom is due to characteristics of the INVECS-II system, but is not abnormal.
NO : Go to Step 2.

STEP 2. Check the shift points.

Q: Are the shift points early or late only when A/T fluid is -29°C (84°F) or less (early), or 125°C (257°F) or more (late)?

YES : The symptom is due to characteristics of the INVECS-II system, but is not abnormal.
NO : Go to Step 3.



STEP 3. Disassemble and clean the valve body.

Check the O-ring installation bolts for looseness and the valve body for damage. Repair or replace the faulty parts. Refer to GROUP 23B, Valve Body P.23B-74.

Q: Is the repair possible and the symptom eliminated?

YES : Diagnosis is complete.
NO : Replace the valve body assembly. Then check the symptom. Go to Step 4.

STEP 4. Replace the PCM.

Q: Is the symptom eliminated?

YES : Diagnosis is complete.
NO : Start over at Step 1.

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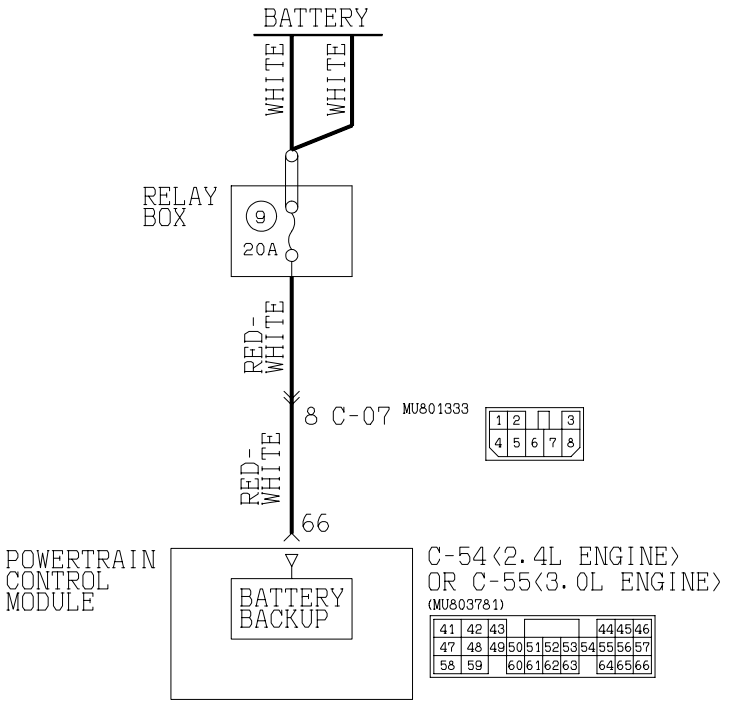
INSPECTION PROCEDURE 12: No Diagnostic Trouble Codes (Does not Shift)

Backup Power Supply System Circuit



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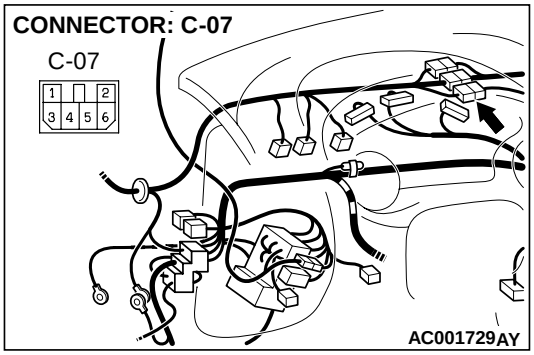
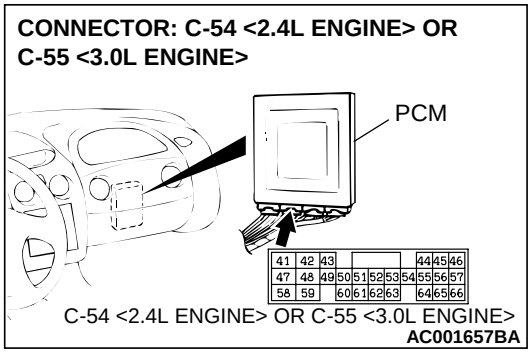




CIRCUIT OPERATION
PCM (terminal number 66) receives battery positive voltage from the battery.

COMMENT
If shifting does not occur while driving and no diagnostic trouble codes are output, a malfunction of the Park/Neutral position switch, or PCM may exist.

TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Malfunction of Park/Neutral position switch
- Damaged harness, connector
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)

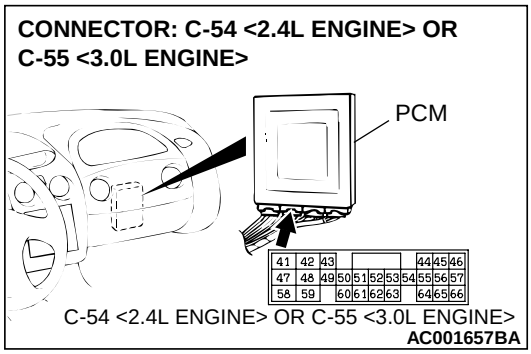
STEP 1. Check the vehicle acceleration.

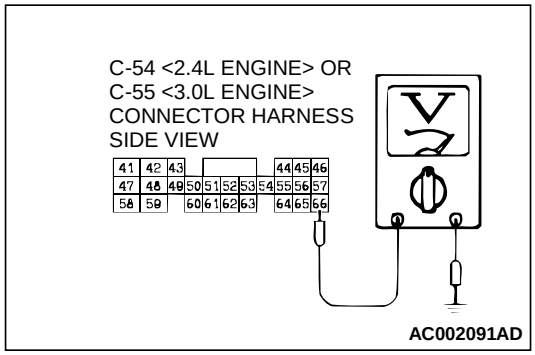
Q: Does the vehicle accelerate poorly (transaxle stays in 3rd gear) when starting from a stop with the selector lever in "D" range?

YES : Go to Step 2.
NO : Go to Step 5.

STEP 2. Check the backup power supply voltage at PCM connector C-54 <2.4L Engine> or C-55 <3.0L Engine> by backprobing.

(1) Do not disconnect connector C-54 <2.4L Engine> or C-55 <3.0L Engine>.





(2) Measure the voltage between terminal 66 and ground by backprobing.
- Voltage should be battery positive voltage.

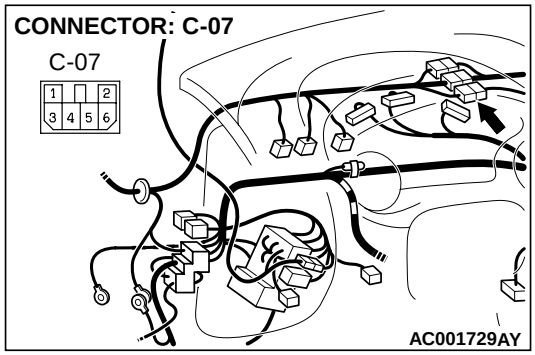
Q: Is the voltage normal?

YES : Go to Step 4.
NO : Go to Step 3.

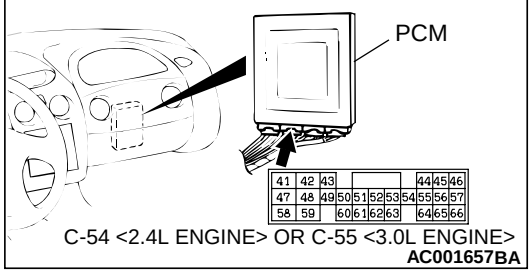
STEP 3. Check connector C-07 at intermediate connector for damage.

Q: Is the connector in good condition?

YES : Repair harness open circuit or short circuit to ground between PCM connector C-54 <2.4L Engine> or C-55 <3.0L Engine> terminal 66 and battery.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



CONNECTOR: C-54 <2.4L ENGINE> OR C-55 <3.0L ENGINE>



C-54 <2.4L ENGINE> OR C-55 <3.0L ENGINE>
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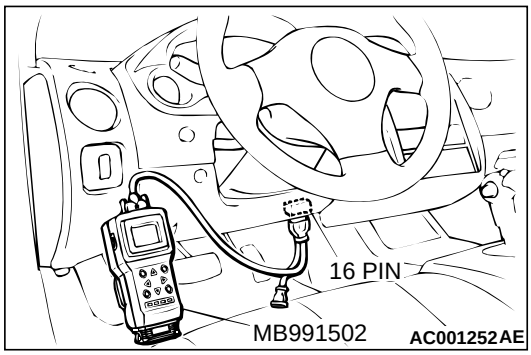
STEP 4. Check connector C-54 <2.4L Engine> or C-55 <3.0L Engine> at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then check for the symptom.



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STEP 5. Using scan tool MB991502, check data list item 61: Park/Neutral Position Switch.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to data reading mode for item 61: Park/Neutral Position Switch.
- Move the selector lever to "P," "R," "N," "D," "3," "2," "L" and sport mode positions to confirm whether the scan tool.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the switch operating properly?

YES : Go to Step 6.

NO : Refer to P.23A-136, P.23A-166, diagnostic trouble code number 27, 28: Park/Neutral position switch system.

STEP 6. Replace the PCM.

Q: Is the symptom eliminated?

YES : Diagnosis is complete.

NO : Start over at Step 1.

INSPECTION PROCEDURE 13: Poor Acceleration

COMMENT

If acceleration is poor when downshifting occurs while driving, a malfunction of the engine system or a brake or clutch may exist.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the engine system
- Malfunction of the clutch system and brake system
- Malfunction of the PCM

DIAGNOSIS

STEP 1. Check the engine system.

(1) Refer to GROUP 13A <2.4L Engine>, Diagnosis – Symptom Chart – Poor acceleration P.13A-25, or GROUP 13B <3.0L Engine>, Diagnosis – Symptom Chart – Poor acceleration P.13B-26.

Q: Is the inspection result good?

YES : Go to Step 2.
NO : Repair or replace the engine component(s).

STEP 2. Check each brake and clutch.

Perform the torque converter stall test. Refer to P.23A-25, Torque Converter Stall Test. Then check for the symptom.

Q: Is the symptom eliminated?

YES : Diagnosis is complete.
NO : Go to Step 3.

STEP 3. Perform the hydraulic pressure test.

Perform the hydraulic pressure test. Refer to P.23A-26, Hydraulic Pressure Test. Then check for the symptom.

Q: Is the symptom eliminated?

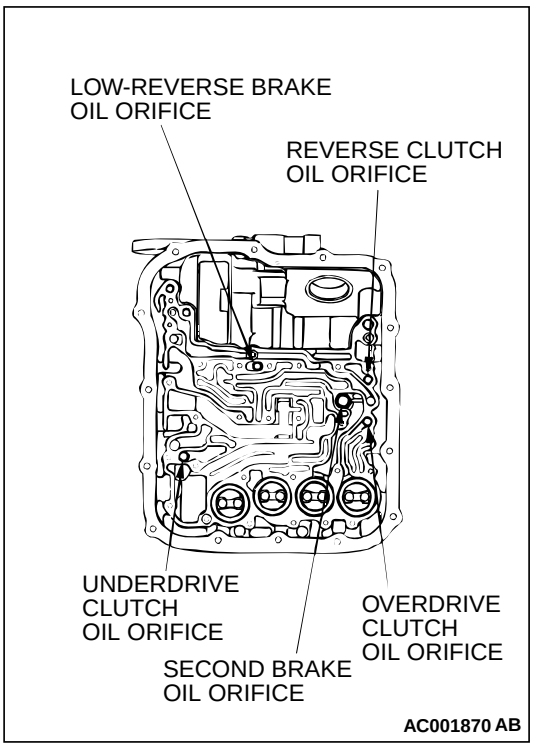
YES : Diagnosis is complete.
NO : Go to Step 4.

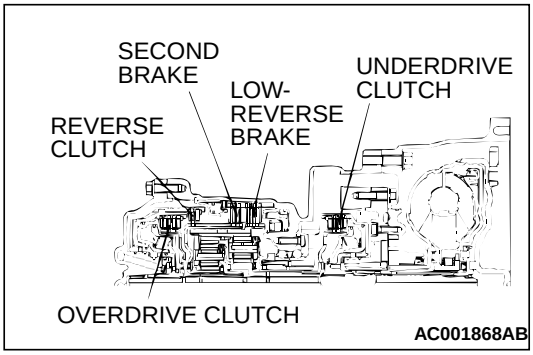
STEP 4. Check each brake system and clutch system.

(1) Remove the valve body cover and valve body. Refer to GROUP 23B, Transaxle P.23B-10.
(2) Blow 108 kPa (15 psi) compressed air into the each brake oil orifice and clutch oil orifice of the transaxle case, and check if each brake and clutch piston move and air pressure is maintained.

Q: Is the air pressure maintained?

YES : Diagnosis is complete.
NO : Go to Step 5.





STEP 5. Check each brake system and clutch system.

(1) Remove the transaxle.
(2) Check the facings for seizure and piston seal ring for damage and interference with retainer. Repair or replace the faulty parts. Refer to GROUP 23B, Transaxle P.23B-10, Underdrive Clutch and Input Shaft P.23B-57, Reverse and Overdrive Clutch P.23B-59. Then check for the symptom.

Q: Is the symptom eliminated?

YES : Diagnosis is complete.
NO : Go to Step 6.

STEP 6. Replace the PCM.

Q: Is the symptom eliminated?

YES : Diagnosis is complete.
NO : Start over at Step 1.

INSPECTION PROCEDURE 14: Vibration

COMMENT

If vibration occurs when driving at constant speed or when accelerating in 4th gear, abnormal torque converter clutch pressure or a malfunction of the engine system, torque converter clutch solenoid, torque converter or valve body may exist.

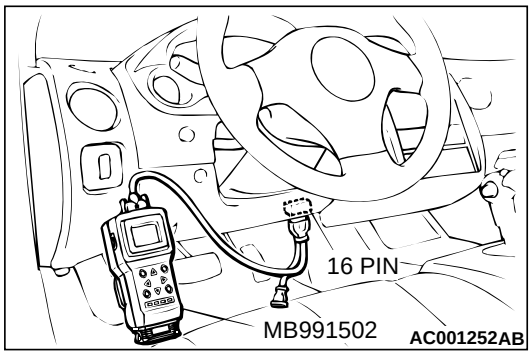
TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Abnormal torque converter clutch pressure
- Malfunction of the engine system
- Malfunction of the torque converter clutch solenoid
- Malfunction of the torque converter
- Malfunction of the valve body
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, carry out the actuator test item 06: Torque Converter Clutch Solenoid Valve.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to actuator test mode for item 06: Torque Converter Clutch Solenoid Valve.
- An operation sound should be heard from solenoid valve when the torque converter clutch solenoid valve is operated.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the solenoid valve operating properly?

YES : Go to Step 2.
NO : Repair or replace the torque converter clutch solenoid valve. Refer to GROUP 23B, Valve Body P.23B-74. Then confirm that the symptom is eliminated.

STEP 2. Check the vibration.

Q: Does the vibration occur when the transmission fluid temperature sensor connector has been disconnected?

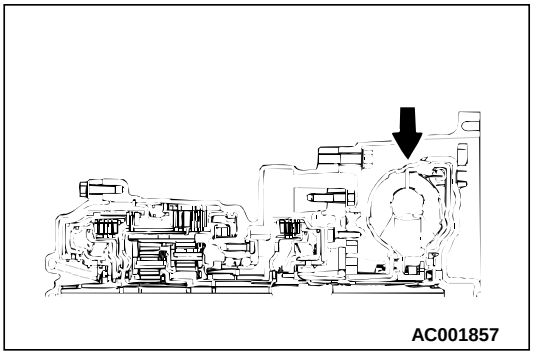
YES : Check the engine system. Refer to GROUP 13A <2.4L Engine>, Diagnosis – Symptom Chart – Driving P.13A-25, or GROUP 13B <3.0L Engine>, Diagnosis – Symptom Chart – Driving P.13B-26. If the inspection result is not good, diagnose, repair, and/or replace the engine component(s).
NO : Go to Step 3.

STEP 3. Check the torque converter hydraulic pressure.

Measure the torque converter hydraulic pressure. Then check if the torque converter hydraulic pressure is within the standard value. Refer to P.23A-26, Hydraulic Pressure Test.

Q: Is the torque converter hydraulic pressure within the standard value?

YES : Go to Step 4.
NO : Go to Step 5.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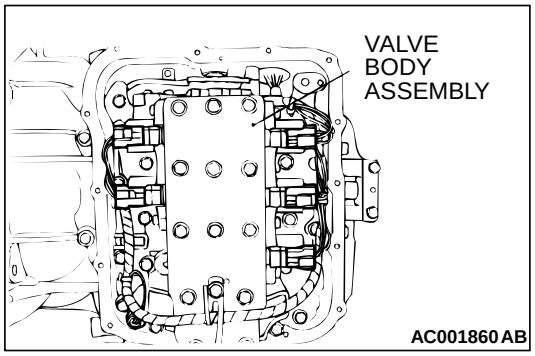
STEP 4. Replace the torque converter assembly.

(1) Remove the transaxle.
(2) Replace the torque converter assembly. Refer to GROUP 23B, Transaxle P.23B-10. Then check the symptom.

Q: Is the symptom eliminated?

YES : Diagnosis is complete.
NO : Go to Step 6.



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STEP 5. Disassemble and clean the valve body.

Check the O-ring installation bolts for looseness and the valve body for damage. Repair or replace the faulty parts. Refer to GROUP 23B, Valve Body P.23B-74.

Q: Is the repair possible and the symptom eliminated?

YES : Diagnosis is complete.
NO : Replace the valve body assembly. Then check the symptom. Go to Step 6.

STEP 6. Replace the PCM.

Q: Is the symptom eliminated?

YES : Diagnosis is complete.
NO : Start over at Step 1.

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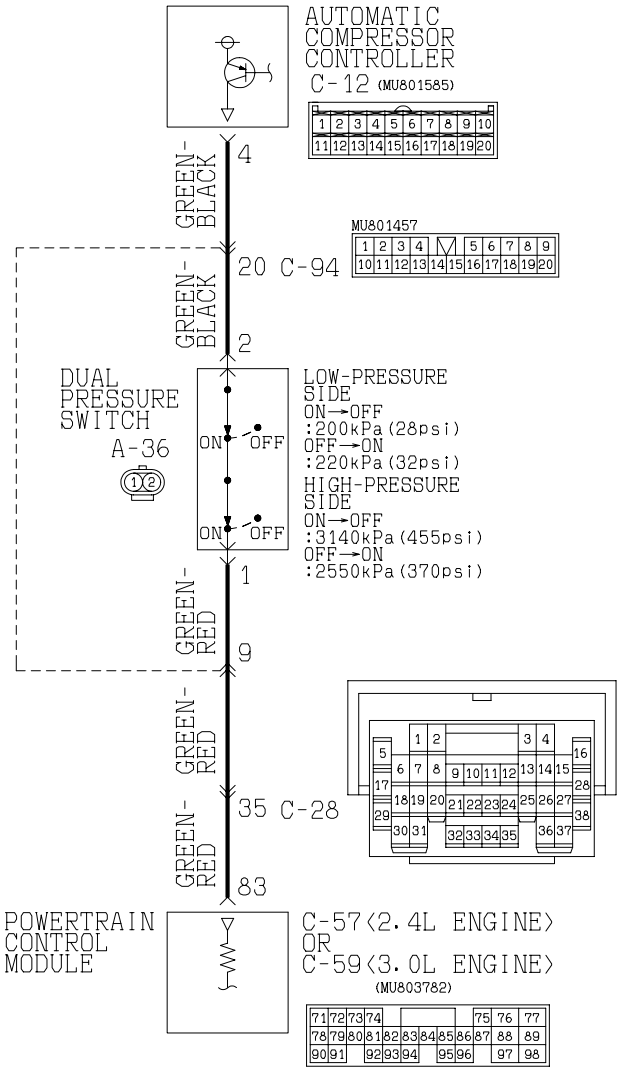
INSPECTION PROCEDURE 15: Vehicle Shifts Differently with A/C Engaged

Dual Pressure Switch System Circuit



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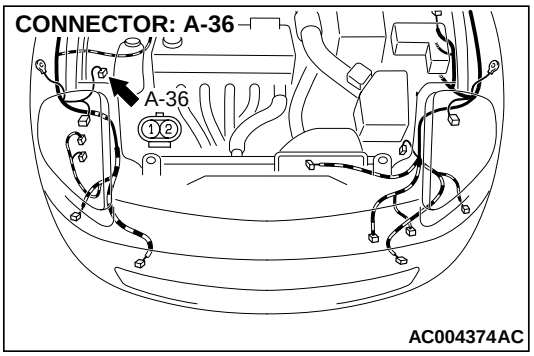

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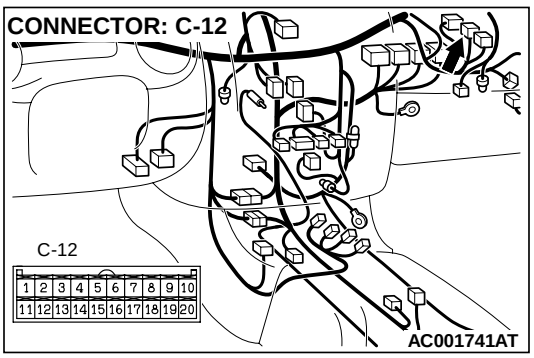

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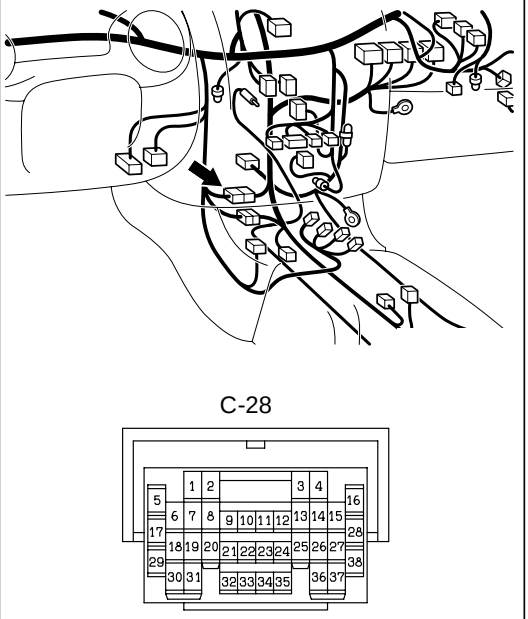
CONNECTOR: C-28



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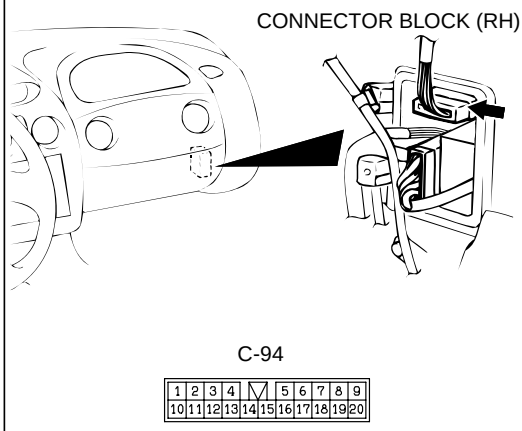
CONNECTOR: C-94



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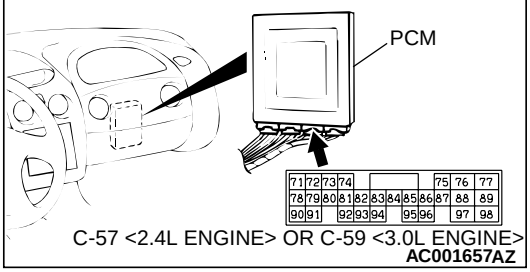
CONNECTOR: C-57 <2.4L ENGINE> OR C-59 <3.0L ENGINE>



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CIRCUIT OPERATION

- When the A/C is turned ON and the dual pressure switch is closed, PCM (terminal number 83) receives battery voltage and then determines the A/C compressor has been signaled to engage.
- When the A/C compressor is engaged, the PCM increases line pressure and briefly delays shift points to compensate for the additional engine load.

COMMENT

The cause is probably a faulty dual pressure switch circuit or a defective PCM.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set:)

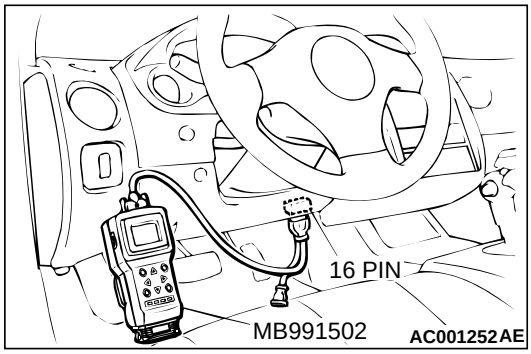
- Malfunction of the dual pressure switch
- Damaged harness, connector
- Malfunction of A/C system
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

TSB Revision



STEP 1. Using scan tool MB991502, check data list item 65: Dual Pressure Switch.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

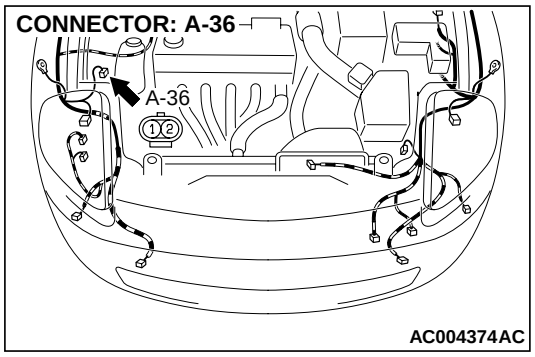
(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to data reading mode for item 65: Dual Pressure Switch.
- When the A/C is in operation, the scan tool display should be "ON."
- When the A/C is not in operation, the scan tool display should be "OFF."

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the switch operating properly?

YES : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.

NO : Go to Step 2.

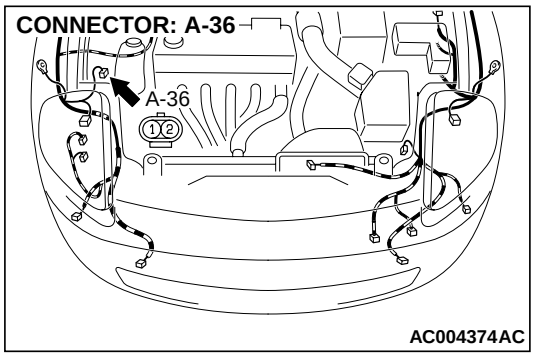


STEP 2. Check connector A-36 at dual pressure switch for damage.

Q: Is the connector in good condition?

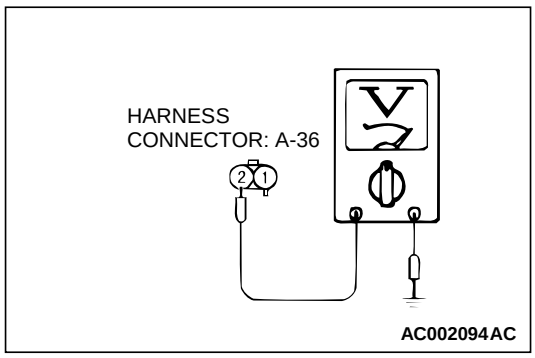
YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



STEP 3. Check the power supply voltage at dual pressure switch connector A-36.

(1) Disconnect the connector A-36 and measure at the harness side.
(2) Start the engine and run at idle.

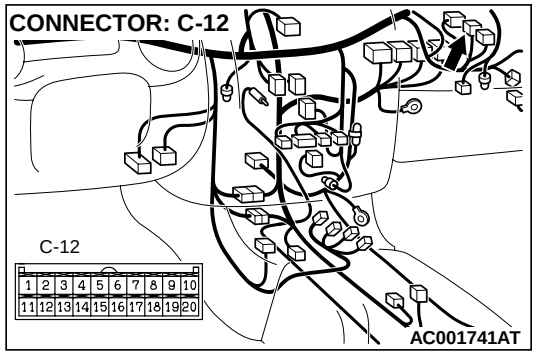


(3) Measure the voltage between terminal 2 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

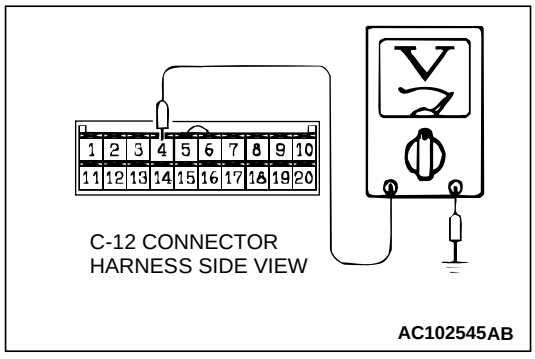
Q: Is the voltage normal?

YES : Go to Step 9.
NO : Go to Step 4.



STEP 4. Check the power supply voltage at automatic compressor controller connector C-12 by backprobing.

(1) Do not disconnect connector C-12.
(2) Start the engine and run at idle.
(3) Operate the A/C.

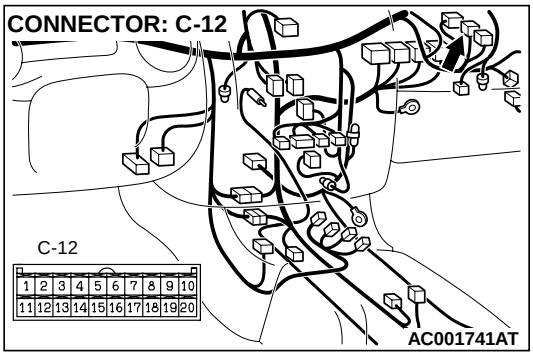


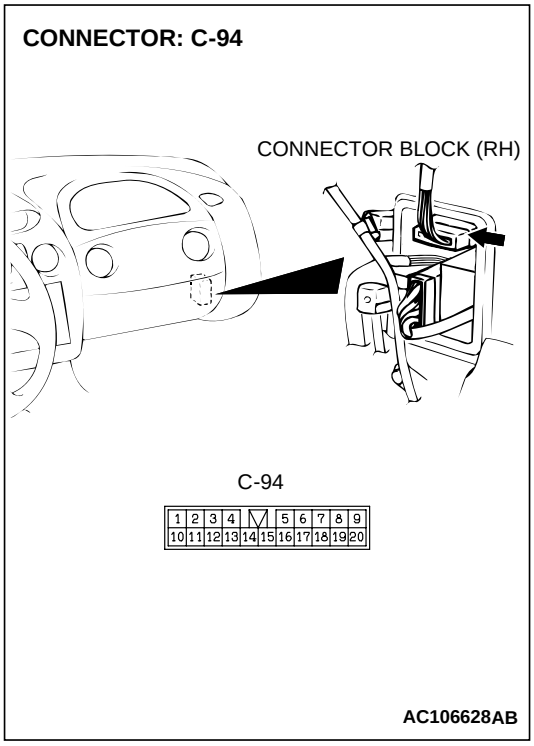
(4) Measure the voltage between terminal 4 and ground by backprobing.
- Voltage should be battery positive voltage.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 8.
NO : Go to Step 5.

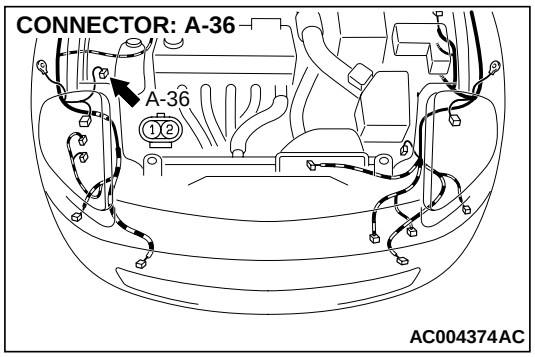


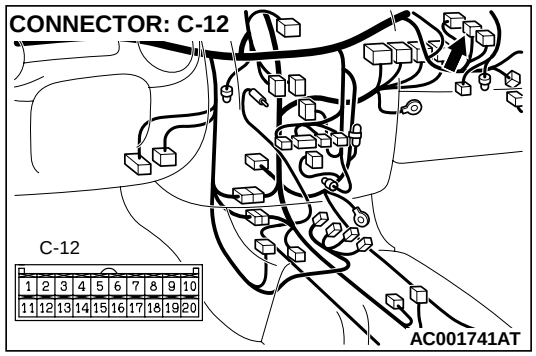


STEP 5. Check connectors C-12 at automatic compressor controller and C-94 at intermediate connector for damage.
Q: Are the connectors in good condition?

YES : Go to Step 6.
NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

STEP 6. Check harness for short circuit to ground between dual pressure switch connector A-36 terminal 1 and automatic compressor controller connector C-12 terminal 4.





Q: Is the harness wire in good condition?

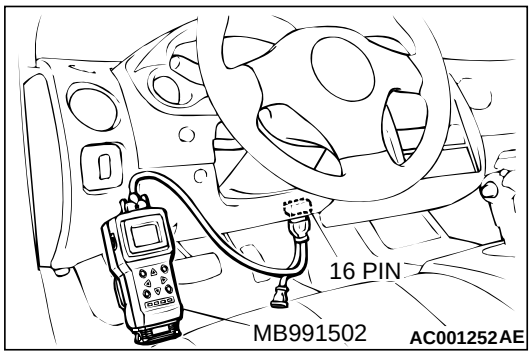
YES : Go to Step 7.

NO : Repair it.

STEP 7. Using scan tool MB991502, check data list item 65: Dual Pressure Switch.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.



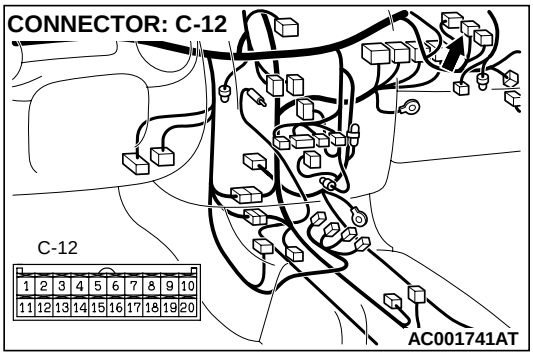
(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to data reading mode for item65: Dual Pressure Switch.
- When the A/C is in operation, the scan tool display should be "ON."
- When the A/C is not in operation, the scan tool display should be "OFF."

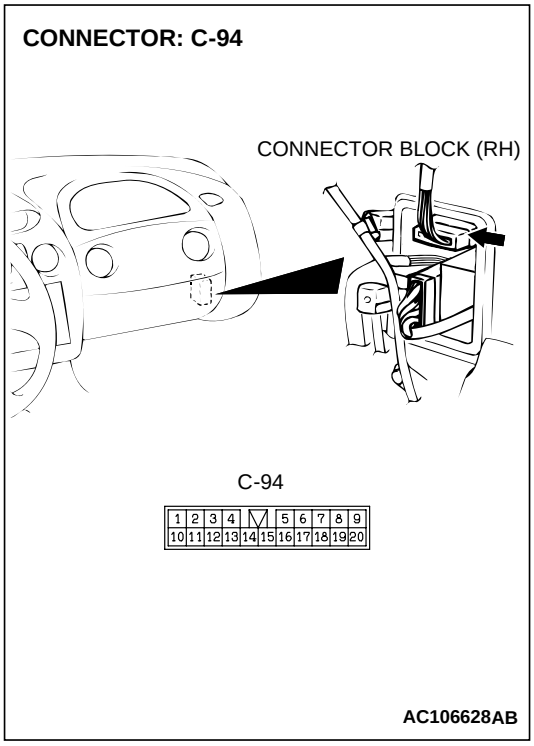
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the switch operating properly?

YES : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.

NO : Check the air conditioning system. Refer to GROUP 55A, Troubleshooting Strategy P.55-5.





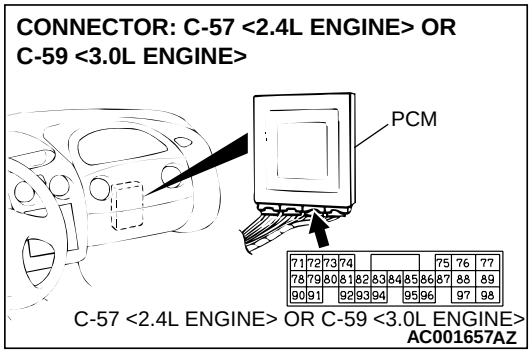
STEP 8. Check connectors C-12 at automatic compressor controller and C-94 at intermediate connector for damage.
Q: Are the connectors in good condition?

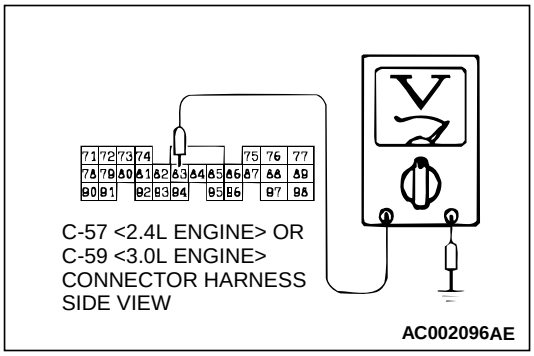
YES : Repair harness open circuit between automatic compressor controller connector C-12 terminal 4 and dual pressure switch connector A-36 terminal 1.

NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

STEP 9. Check the switch output voltage at PCM connector C-57 <2.4L Engine> or C-59 <3.0L Engine> by backprobing.

(1) Do not disconnect connector C-41.
(2) Start the engine and run at idle.
(3) Operate the A/C.





(4) Measure the voltage between terminal 83 and ground by backprobing.
- When the A/C is in operation, the voltage should be battery positive voltage.
- When the A/C is not in operation, the voltage should be 0.5 volt or less.

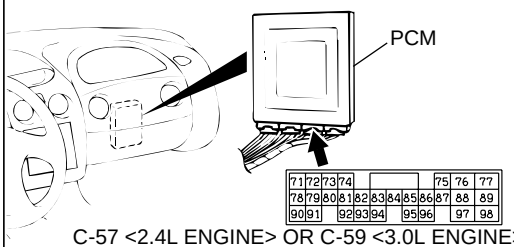
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 14.
NO : Go to Step 10.

STEP 10. Check connectors C-57 <2.4L Engine> or C-59 <3.0L Engine> at PCM, C-28 and C-94 at intermediate connector for damage.

CONNECTOR: C-57 <2.4L ENGINE> OR C-59 <3.0L ENGINE>



C-57 <2.4L ENGINE> OR C-59 <3.0L ENGINE>

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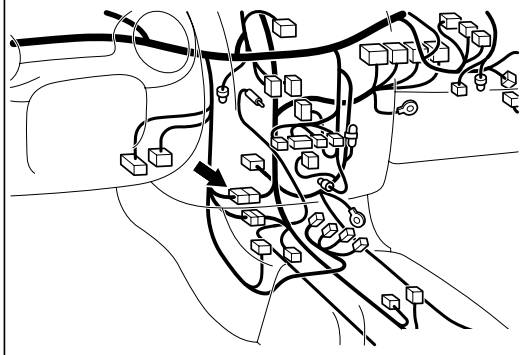
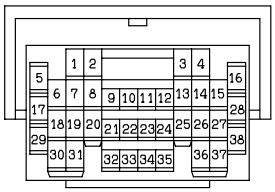
CONNECTOR: C-28



C-28



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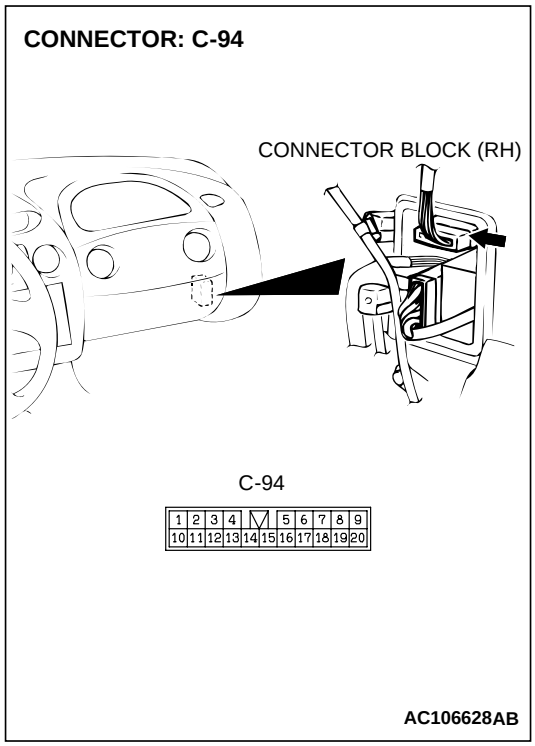


Q: Are the connectors in good condition?

YES : Go to Step 11.

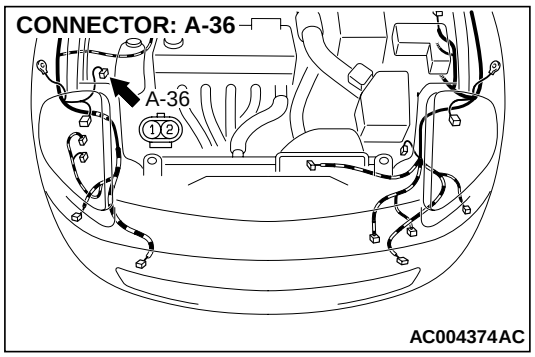
NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

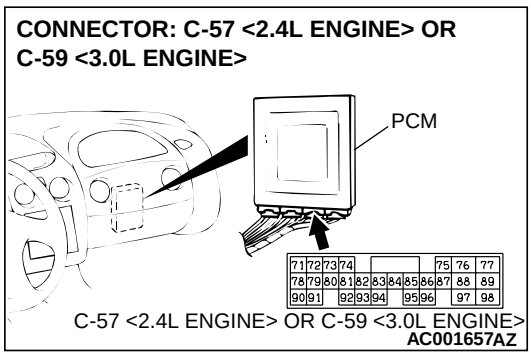
STEP 11. Check harness for short circuit to ground or open circuit between dual pressure switch connector A-36 terminal 2 and PCM connector C-57 <2.4L Engine> or C-59 <3.0L Engine> terminal 83.

Q: Is the harness wire in good condition?

YES : Go to Step 12.

NO : Repair it.





STEP 12. Check the dual pressure switch.
Refer to GROUP 55A, Dual Pressure Switch Check P.55-25.

Q: Is the switch operating properly?

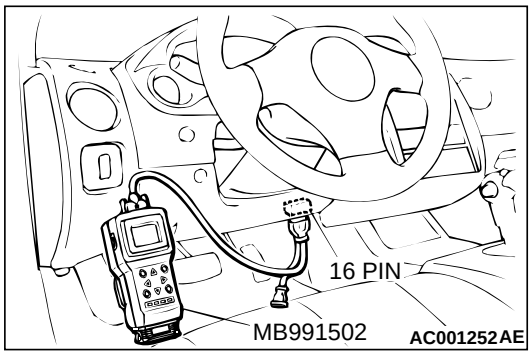
YES : Go to Step 13.
NO : Replace the dual pressure switch. Refer to GROUP 55A, Refrigerant Line P.55-52.

STEP 13. Using scan tool MB991502, check data list item 65: Dual Pressure Switch.

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991502 to data reading mode for item65: Dual Pressure Switch.
- When the A/C is in operation, the scan tool display should be "ON."
- When the A/C is not in operation, the scan tool display should be "OFF."

(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the switch operating properly?

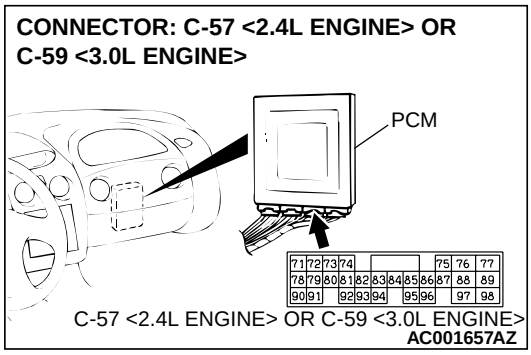
YES : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.
NO : Replace the PCM.

STEP 14. Check connector C-57 <2.4L Engine> or C-59 <3.0L Engine> at PCM for damage.

Q: Is the connector in good condition?

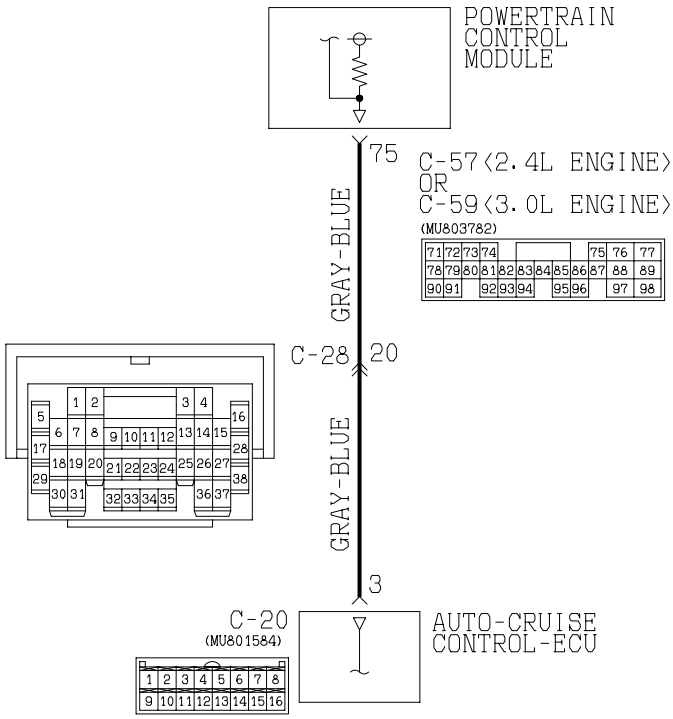
YES : Go to Step 13.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

CONNECTOR: C-57 <2.4L ENGINE> OR C-59 <3.0L ENGINE>



INSPECTION PROCEDURE 16: Transaxle won't Downshift under Load with Auto-cruise Engaged.

Auto-cruise Signal Line System Circuit



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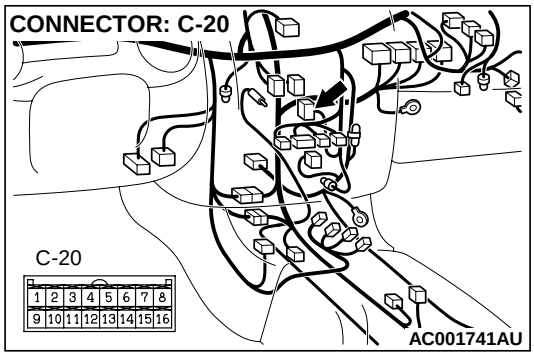
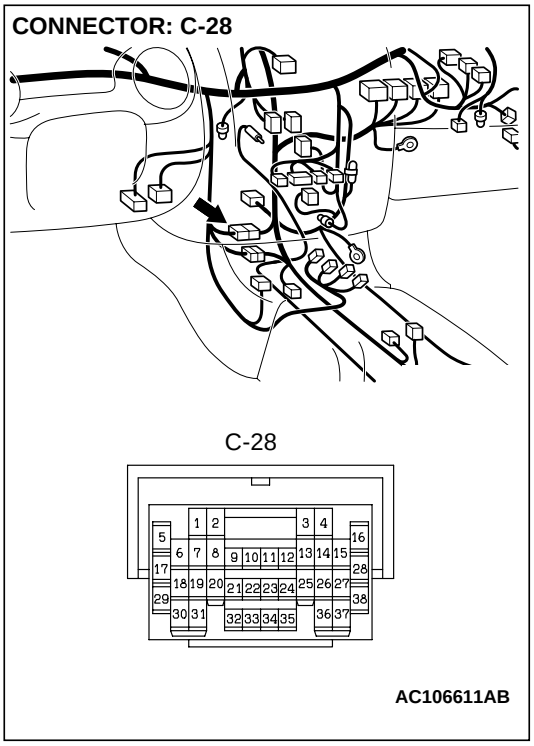
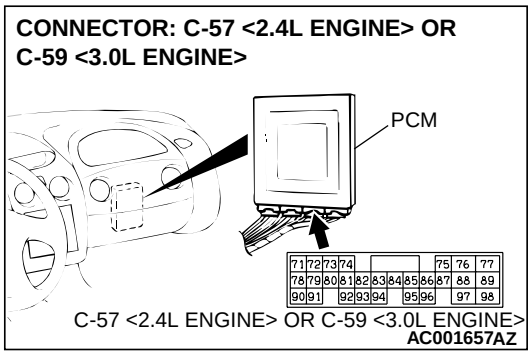
AC102734AB





TSB Revision



CIRCUIT OPERATION

When the battery positive voltage from PCM (terminal number 75) is grounded at auto-cruise control-ECU (terminal number 3), the auto-cruise control-ECU emits an overdrive cancel signal. When a malfunction of the auto-cruise control circuit occurs, the transaxle may downshift harshly with the auto-cruise control engaged.

COMMENT

A malfunction may be present on the auto-cruise signal line circuit, auto-cruise control ECU or the PCM.

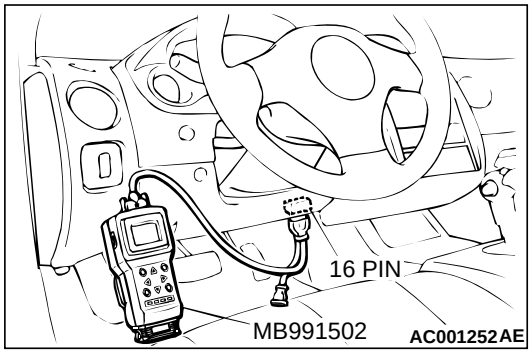
TROUBLESHOOTING HINTS (The most likely causes for this code to be set:)

- Damaged harness, connector
- Malfunction of the PCM
- Malfunction of the auto-cruise control ECU

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 66: Overdrive Off Signal (Auto-cruise ECM Signal).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine and prepare to test drive the vehicle. (Operate the auto-cruise)
(3) Set scan tool MB991502 to data reading mode for item 66: Overdrive Off Signal (Auto-cruise ECM Signal).
  - When driving at level road, the display should be "OFF."
  - When driving at uphill road, the display should be "ON."
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : This malfunction can be intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.

NO : Go to Step 2.

STEP 2. Check the auto-cruise system.

Check the auto-cruise system. Refer to GROUP 17, Auto-cruise Control System Diagnostic Troubleshooting Strategy P.17-8.

Q: Is the auto-cruise system operating properly?

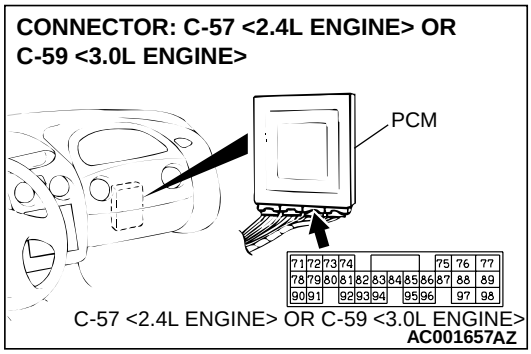
YES : Go to Step 3.

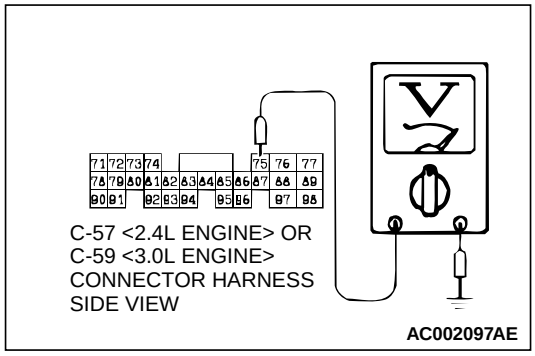
NO : Repair it, then check the symptom.

STEP 3. Check the signal voltage at PCM connector C-57 <2.4L Engine> or C-59 <3.0L Engine> by backprobing.

(1) Do not disconnect connector C-57 <2.4L Engine> or C-59 <3.0L Engine>.

(2) Turn the ignition switch to the "ON" position.





(3) Measure the voltage between terminal 75 and ground by backprobing.
- Voltage should be battery positive voltage.

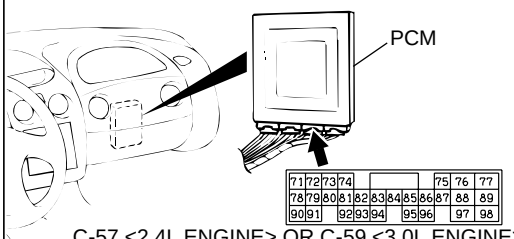
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 5.

NO : Go to Step 4.

CONNECTOR: C-57 <2.4L ENGINE> OR C-59 <3.0L ENGINE>



C-57 <2.4L ENGINE> OR C-59 <3.0L ENGINE>

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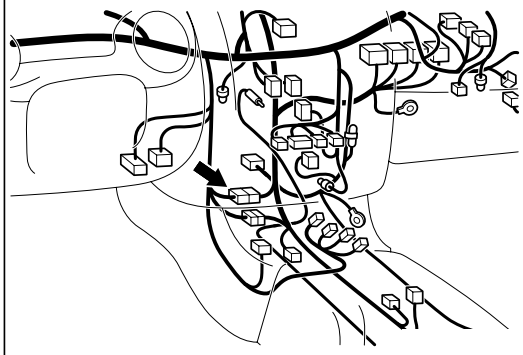
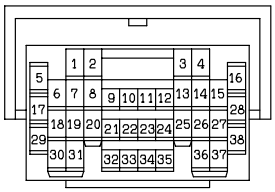
CONNECTOR: C-28



C-28



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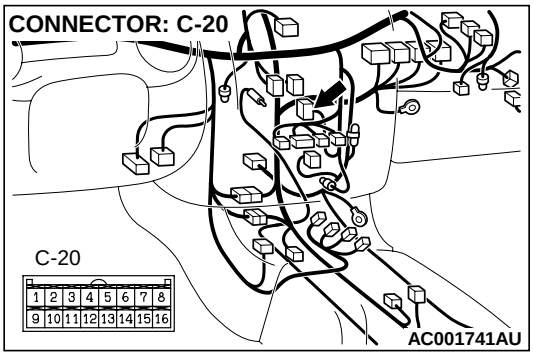
STEP 4. Check connectors C-57 <2.4L Engine> or C-59 <3.0L Engine> at PCM and C-28 at inter mediate connector for damage.

Q: Are the connectors in good condition?

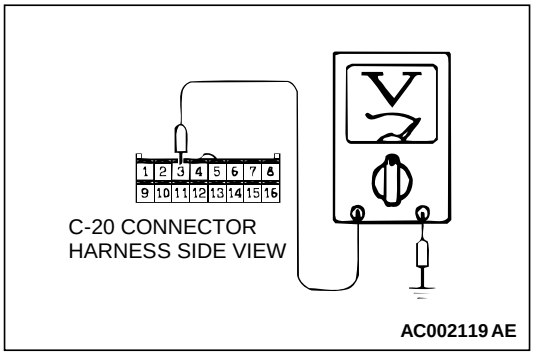
YES : Replace the PCM.

NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

STEP 5. Check the signal voltage at auto-cruise control-ECU connector C-20 by backprobing.



(1) Do not disconnect connector C-20.
(2) Turn the ignition switch to the "ON" position.



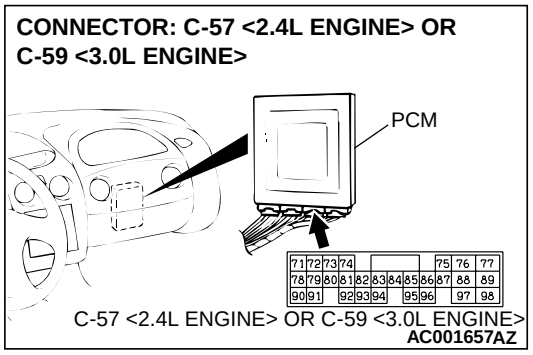
(3) Measure the voltage between terminal 3 and ground by backprobing.
- Voltage should be battery positive voltage.

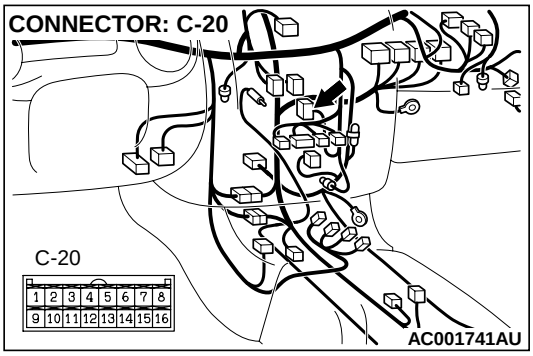
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 7.
NO : Go to Step 6.

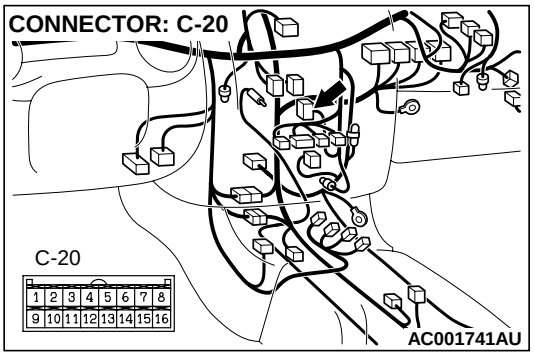
STEP 6. Check harness for short circuit to ground, open circuit or damage between PCM connector C-57 <2.4L Engine> or C-59 <3.0L Engine> terminal 75 and auto-cruise control-ECU connector C-20 terminal 3.





Q: Is the harness wire in good condition?

YES : Go to Step 7.
NO : Repair it.



STEP 7. Check connector C-20 at auto-cruise control-ECU connector for damage.

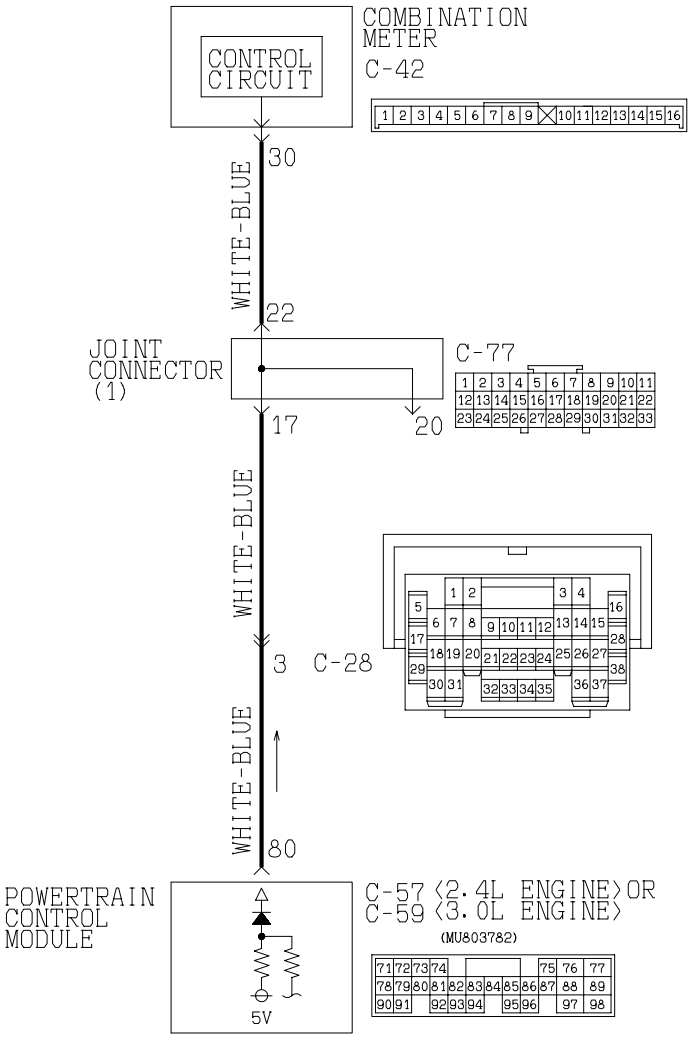
Q: Is the connector in good condition?

YES : Replace the auto-cruise control-ECU.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

INSPECTION PROCEDURE 17: Vehicle Speed Signal System

Vehicle Speed Signal System Circuit



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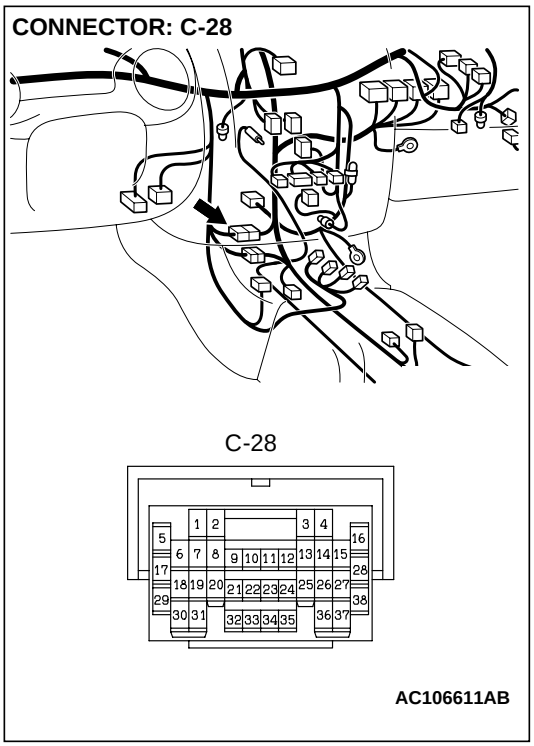
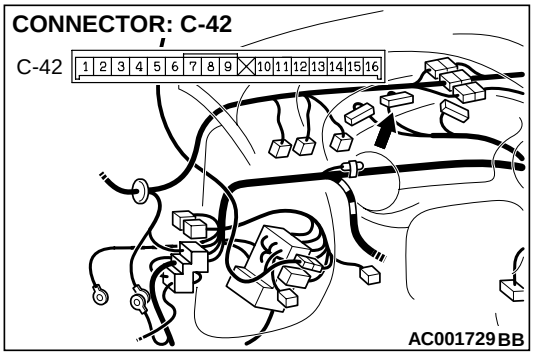
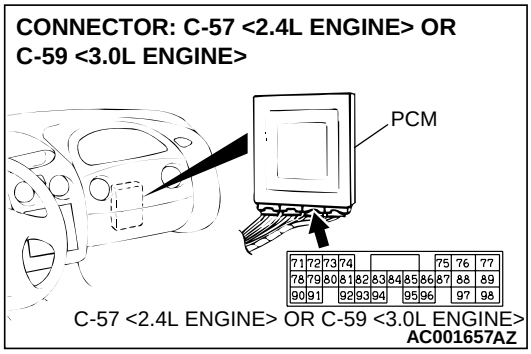
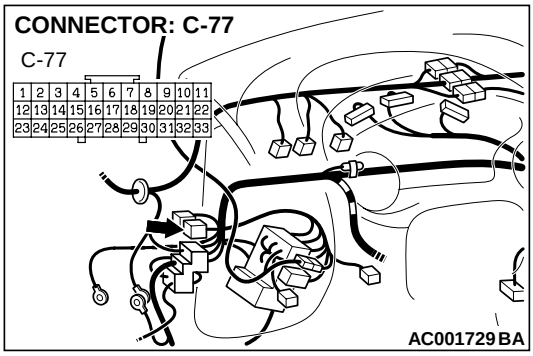
TSB Revision









CIRCUIT OPERATION

- While the vehicle is being driven, the PCM sends pulse signals (ranging from 0 to 12 volts) to the combination meter according to output signals from the output shaft speed sensor. The combination meter displays vehicle speed according to the pulse signals.
- If the vehicle speed signal becomes inoperative, the transaxle will not shift normally.

COMMENT

Failure may occur on vehicle speed signal circuit, speedometer and PCM.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set:)

- Malfunction of the output shaft speed sensor
- Malfunction of the speedometer
- Damaged harness, connector
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

TSB Revision

STEP 1. Using scan tool MB991502, check the A/T diagnostic trouble code.

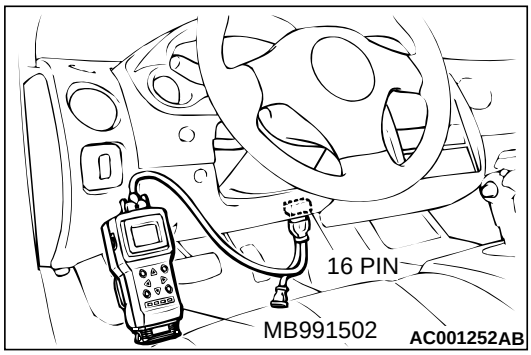
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the A/T diagnostic trouble code.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is A/T diagnostic trouble code number "23" set?

YES : Refer to P.23A-115, diagnostic trouble code number 23: Output Shaft Speed Sensor System.
NO : Go to Step 2.



STEP 2. Using scan tool MB991502, check data list item 29: Vehicle Speed Signal.

⚠ CAUTION

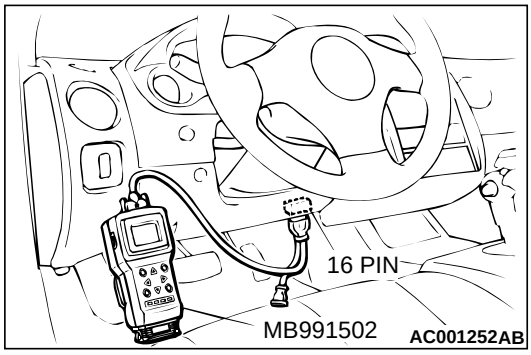
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine.
(3) Set scan tool MB991502 to data reading mode for item 29: Vehicle Speed Signal.
- Check that the speedometer and scan tool display speed match when driving at a vehicle speed of 40 km/h (25 mph).

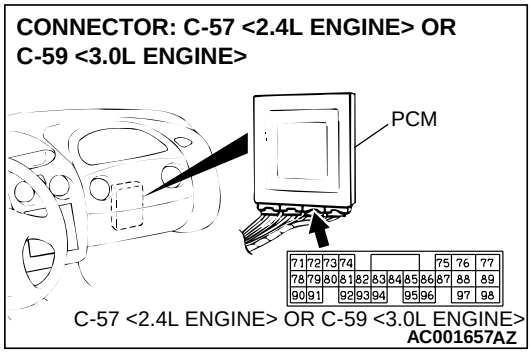
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

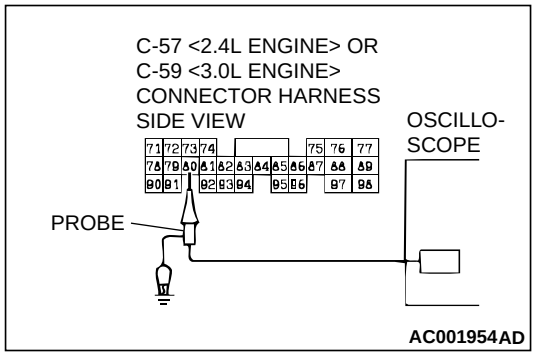
YES : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.
NO : Go to Step 3.



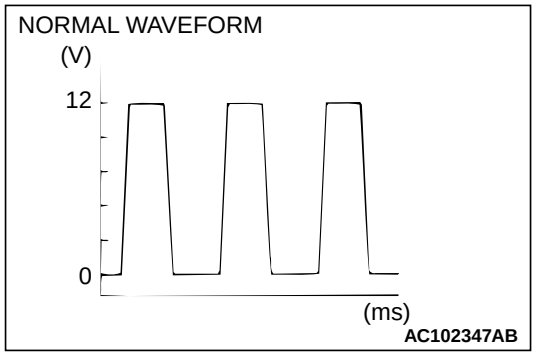
STEP 3. Using an oscilloscope, check the waveform at PCM connector C-57 <2.4L Engine> or C-59 <3.0L Engine>.



(1) Do not disconnect connector C-57 <2.4L Engine> or C-59 <3.0L Engine>.



(2) Connect an oscilloscope probe to PCM connector C-57 <2.4L Engine> or C-59 <3.0L Engine> terminal 80 by backprobing.
(3) Start the engine.



(4) Check the waveform.
- The waveform should show a pattern similar to the illustration when running the vehicle.

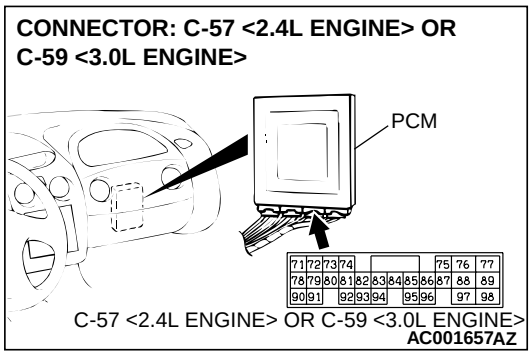
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the waveform normal?

YES : Go to Step 4.
NO : Go to Step 5.

STEP 4. Check connector C-57 <2.4L Engine> or C-59 <3.0L Engine> at PCM for damage.

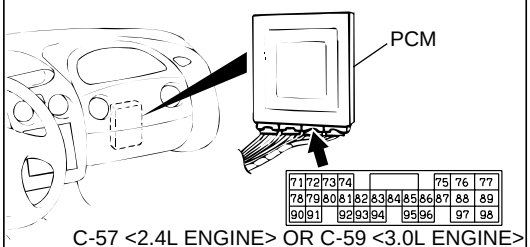
Q: Is the connector in good condition?



YES : Go to Step 8.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

STEP 5. Check connectors C-57 <2.4L Engine> or C-59 <3.0L Engine> at PCM, C-28 at intermediate connector, C-77 at joint connector and C-42 combination meter connector for damage.

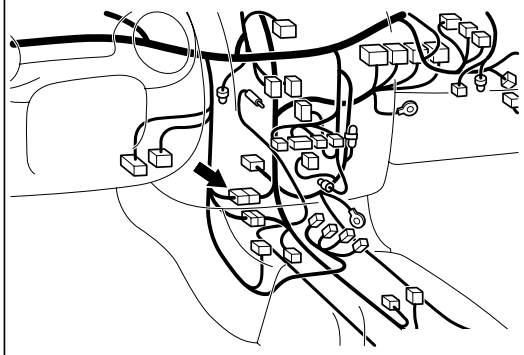
CONNECTOR: C-57 <2.4L ENGINE> OR C-59 <3.0L ENGINE>



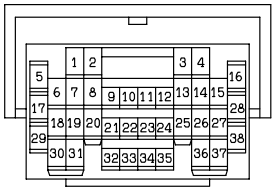
C-57 <2.4L ENGINE> OR C-59 <3.0L ENGINE>

AC001657AZ

CONNECTOR: C-28



C-28



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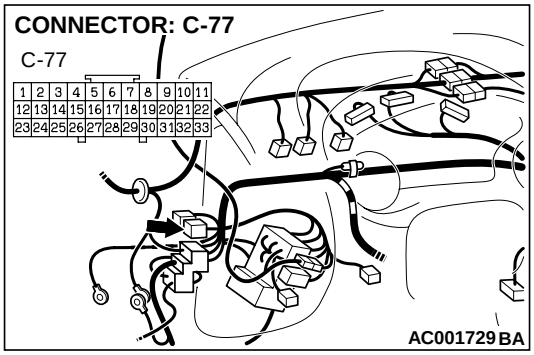
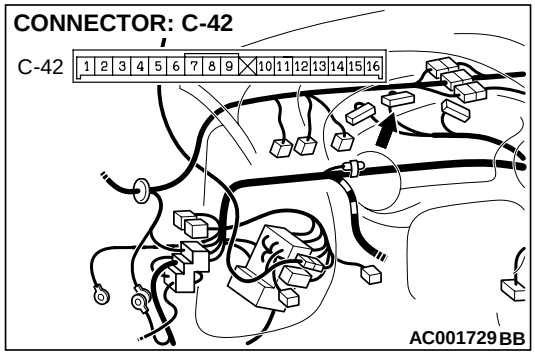
CONNECTOR: C-77

C-77



AC001729BA



Q: Are the connectors in good condition?

YES : Go to Step 6.

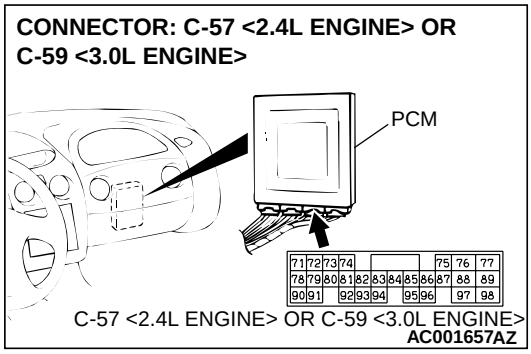
NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

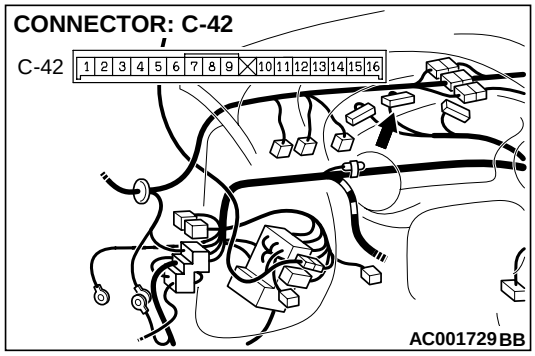
STEP 6. Check harness for open circuit or damage between PCM connector C-57 <2.4L Engine> or C-59 <3.0L Engine> terminal 80 and combination meter connector C-42 terminal 30.

Q: Is the harness wire in good condition?

YES : Go to Step 7.

NO : Repair it.



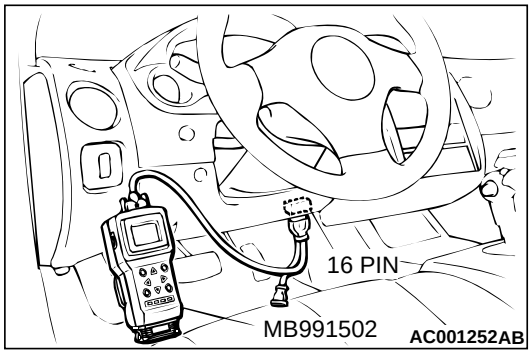


STEP 7. Check the speedometer.

Q: Is the speedometer operating properly?

YES : Go to Step 8.

NO : Repair harness damage or short circuit to ground between joint connector C-77 terminal 20 and data link connector C-29 terminal 14.



STEP 8. Using scan tool MB991502, check data list item 29: Vehicle Speed Signal.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Start the engine.
(3) Set scan tool MB991502 to data reading mode for item 29, Vehicle Speed Signal.
- Check that the speedometer and scan tool display speed match when driving at a vehicle speed of 40 km/h (25 mph).

(4) Turn the ignition switch to the "LOCK" (OFF) position.

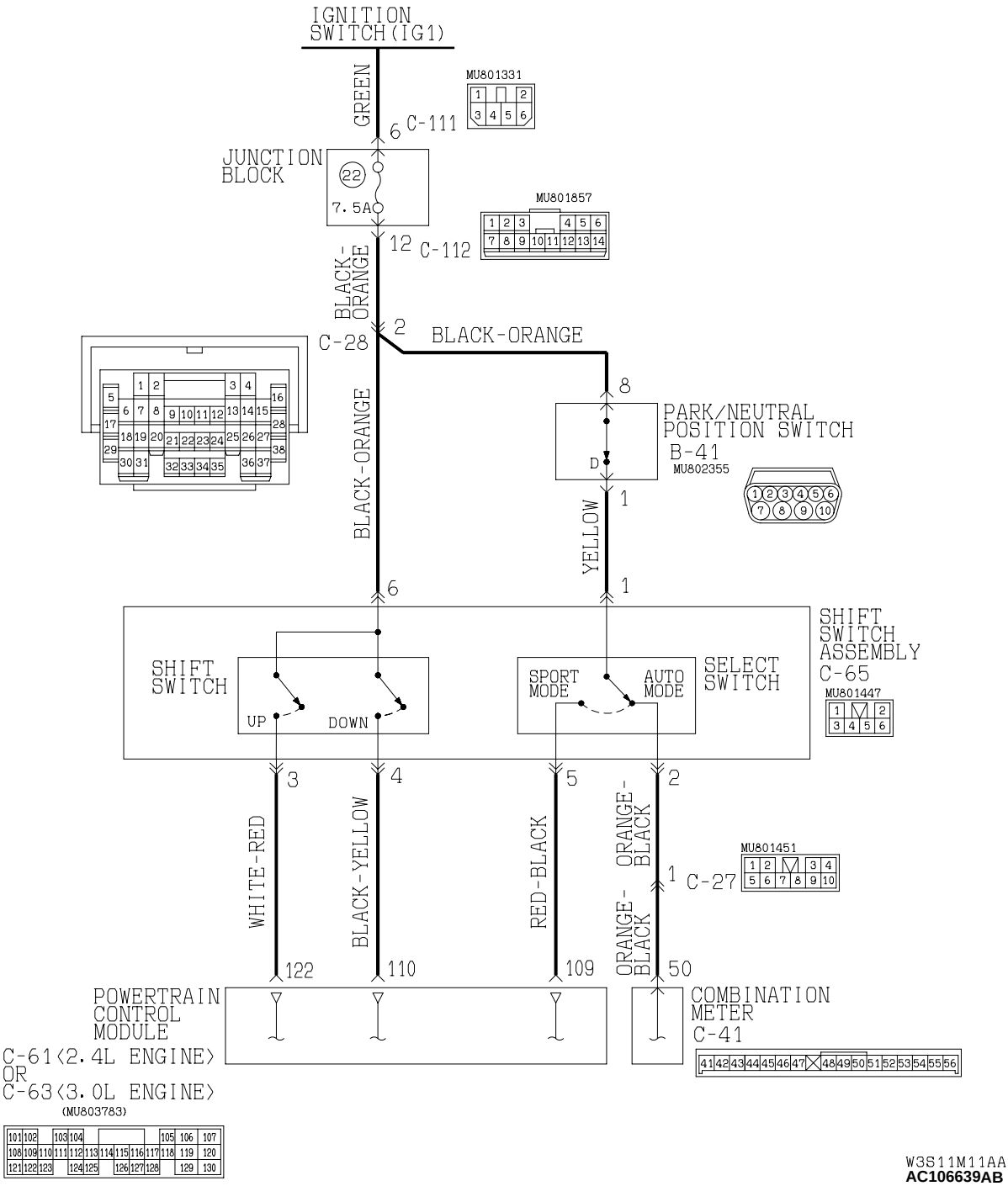
Q: Is the sensor operating properly?

YES : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.

NO : Replace the PCM.

INSPECTION PROCEDURE 18: Shift Switch Assembly System <Vehicles with Sport Mode>

Shift Switch Assembly System Circuit



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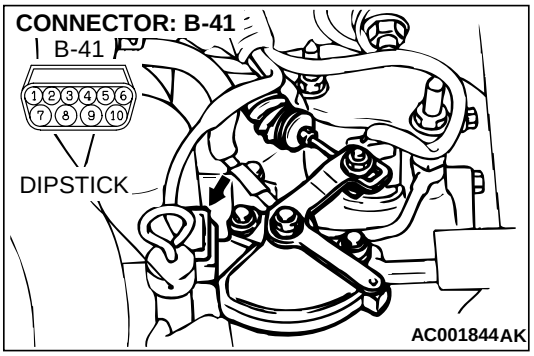
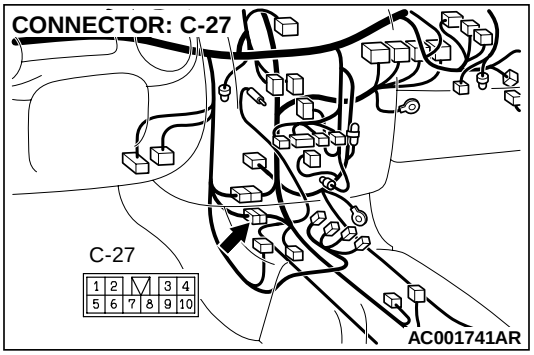
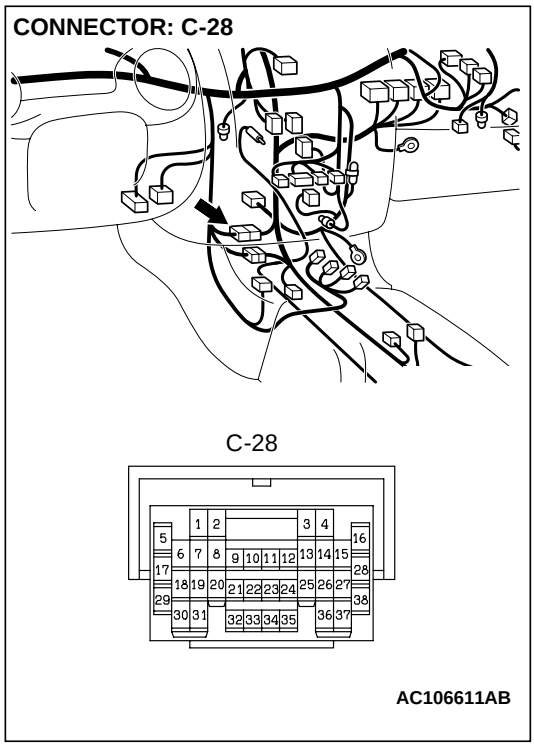
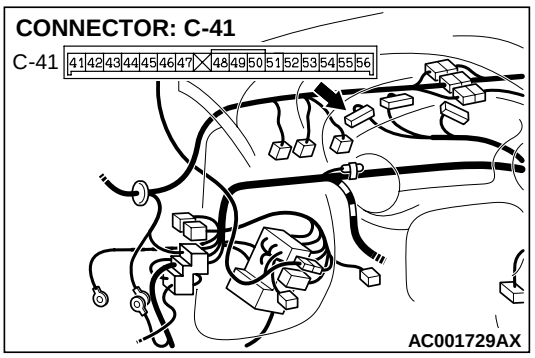
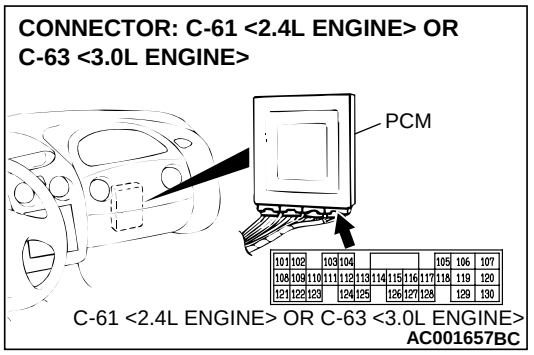
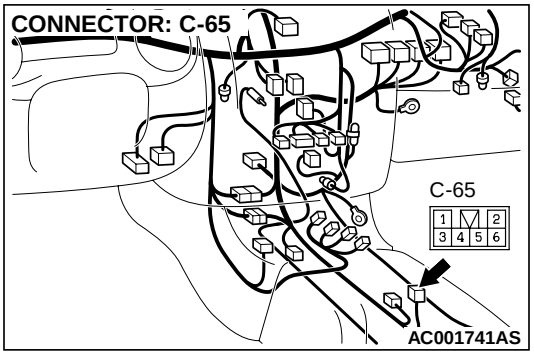




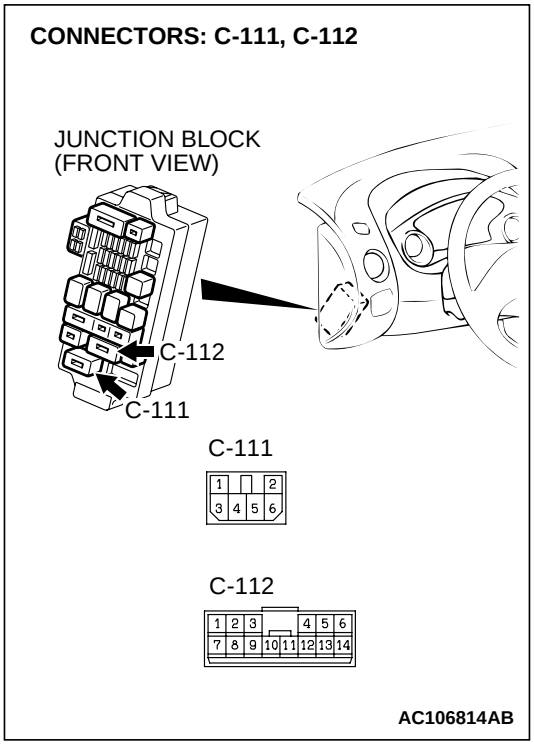








TSB Revision



CIRCUIT OPERATION

If the select switch of the shift switch assembly is set to the sport mode, battery positive voltage will be applied to the PCM (terminal number 109). If the shift switch of the shift switch assembly is set to "UP" or "DOWN" position, battery positive voltage will be applied to the PCM (terminal number 122, 110).

COMMENT

The cause is probably a malfunction of the Park/Neutral position switch circuit, shift switch assembly circuit or a defective PCM.

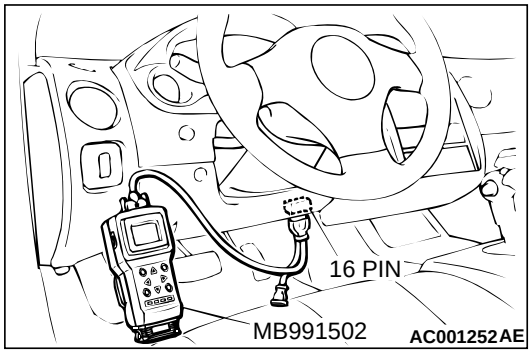
TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the Park/Neutral position switch
- Malfunction of the shift switch assembly select switch
- Malfunction of the shift switch assembly shift switch (Up)
- Malfunction of the shift switch assembly shift switch (Down)
- Damaged harness, connector
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



STEP 1. Using scan tool MB991502, check data list item 67: Select Switch, item 68: Shift Switch (Up), item 69: Shift Switch (Down).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to data reading mode for following items.
  a. item 67: Select Switch
  b. item 68: Shift Switch (Up)
  c. item 69: Shift Switch (Down)
    - The switches above are displayed, depending on the selector lever condition as shown in the table.

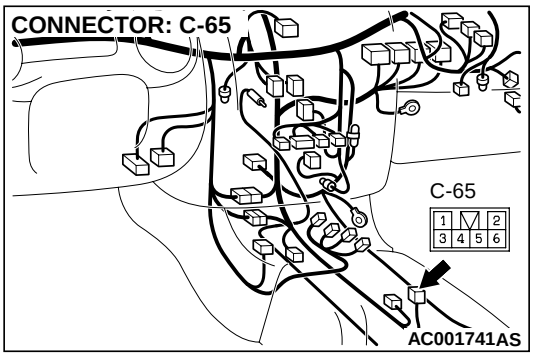
SELECTOR LEVER OPERATION	DATA LIST ITEM		
	67	68	69
D range	OFF	OFF	OFF
Sport mode	ON	OFF	OFF
Upshift and hold the selector lever	ON	ON	OFF
Downshift and hold the selector lever	ON	OFF	ON

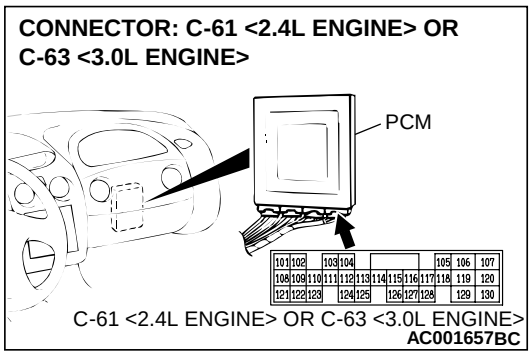
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the switch operating properly?

YES : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.

NO : If completely NG: Go to Step 2. If item 68 and item 69 both are NG: Go to Step 4. If only item 67 is NG: Go to Step 7. If only item 68 is NG: Go to Step 24. If only item 69 is NG: Go to Step 28 .



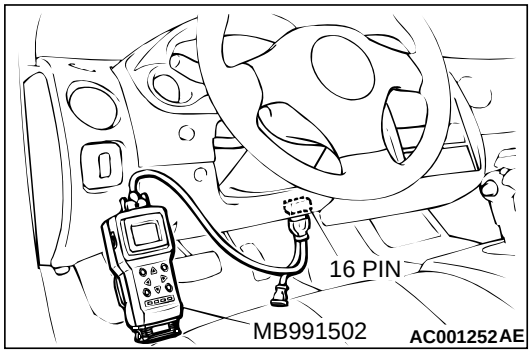


STEP 2. Check connectors C-65 at shift switch assembly and C-61 <2.4L Engine> or C-63 <3.0L Engine> at PCM for damage.

Q: Are the connectors in good condition?

YES : Go to Step 3.

NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



STEP 3. Using scan tool MB991502, check data list item 67: Select Switch, item 68: Shift Switch (Up), item 69: Shift Switch (Down).

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the following items in the data list.
  a. item 67: Select Switch
  b. item 68: Shift Switch (Up)
  c. item 69: Shift Switch (Down)
  The switches above are displayed, depending on the selector lever condition as shown in the table.

SELECTOR LEVER OPERATION	DATA LIST ITEM		
	67	68	69
D range	OFF	OFF	OFF
Sport mode	ON	OFF	OFF
Upshift and hold the selector lever	ON	ON	OFF
Downshift and hold the selector lever	ON	OFF	ON

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the switch operating properly?

YES : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.

NO : Replace the PCM.

STEP 4. Check the shift switch assembly.

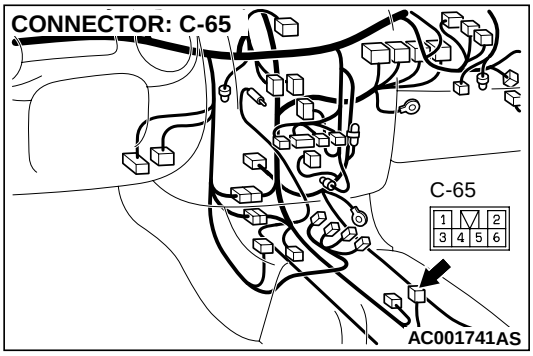
Refer to P.23A-363, Transaxle Control.

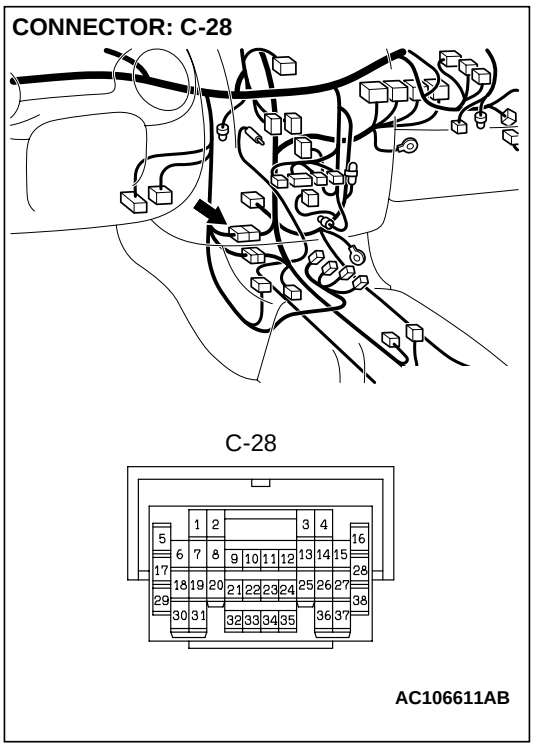
Q: Is the switch operating properly?

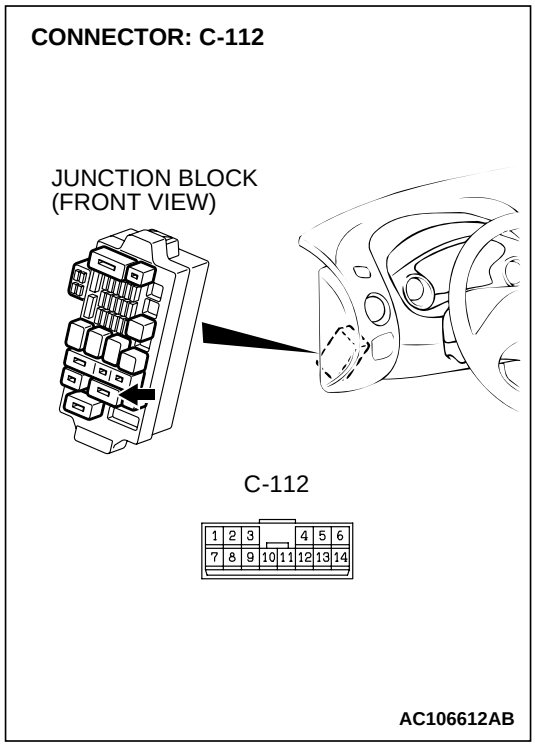
YES : Go to Step 5.

NO : Replace the shift switch assembly. Refer to P.23A-361, Transaxle Control.

STEP 5. Check connectors C-65 at shift switch assembly, C-28 at intermediate connector and C-112 at junction block for damage.



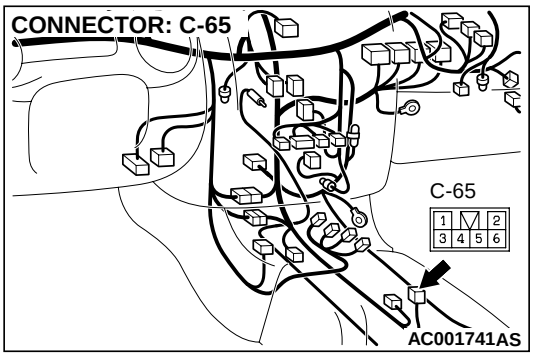


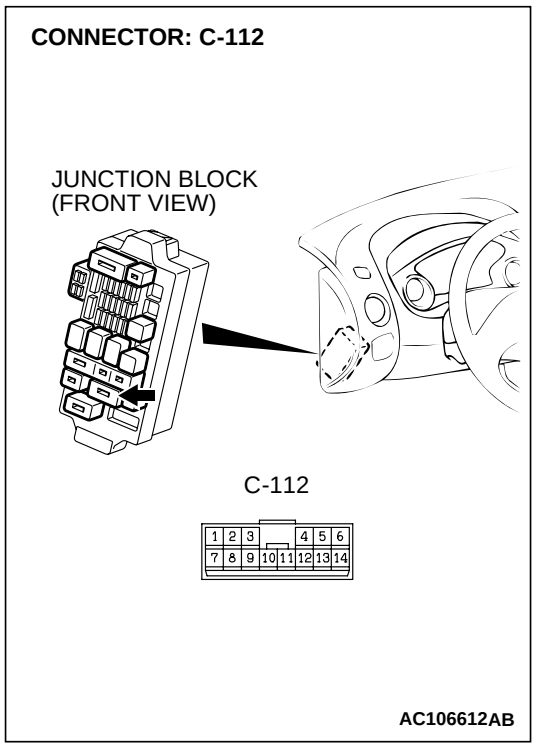


Q: Are the connectors in good condition?

YES : Go to Step 6.

NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.





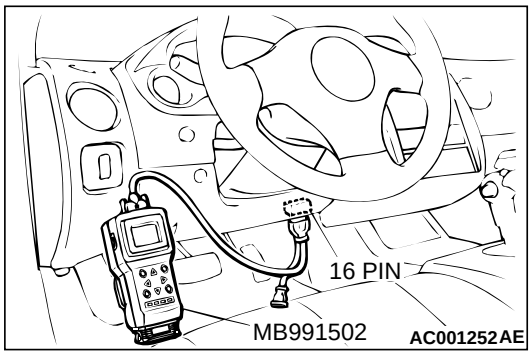
STEP 6. Check harness for open circuit or short circuit to ground between shift switch assembly connector C-65 terminal 6 and junction block connector C-112 terminal 12.
Q: Is the harness wire in good condition?

YES : Go to Step 3.
NO : Repair it.

STEP 7. Using scan tool MB991502, check data list item 61: Park/Neutral Position Switch.

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.



(1) Connect scan tool MB991502 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 to data reading mode for item 61: Park/Neutral Position Switch.
- The scan tool should display "D" when the selector lever is "D" range.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the switch operating properly?

YES : Go to Step 8.
NO : Go to Step 15.

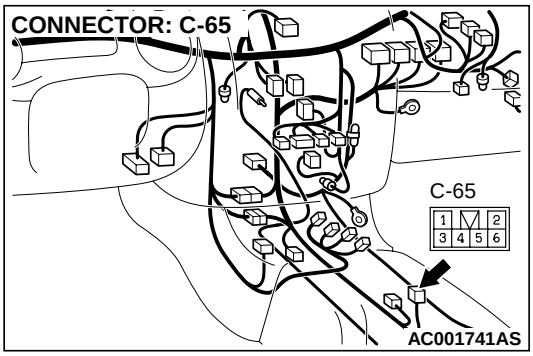
STEP 8. Check the shift switch assembly.

Refer to P.23A-363, Transaxle Control.

Q: Is the switch operating properly?

YES : Go to Step 9.
NO : Replace the shift switch assembly. Refer to P.23A-361, Transaxle Control.

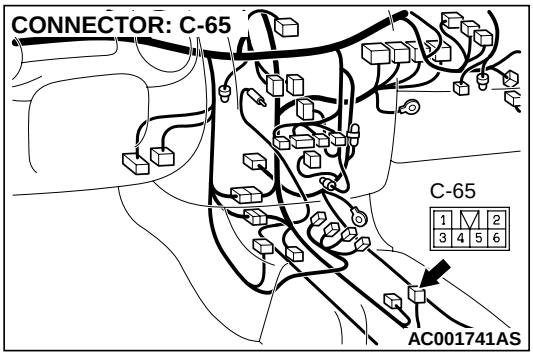
STEP 9. Check connector C-65 at shift switch assembly for damage.



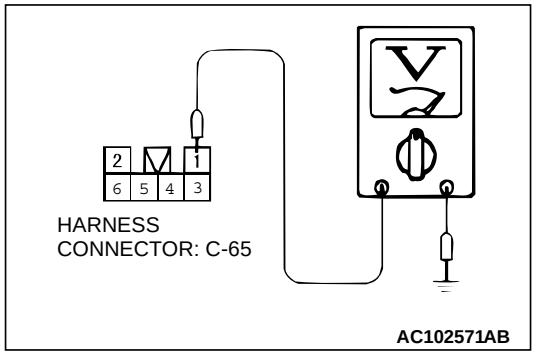
Q: Is the connector in good condition?

YES : Go to Step 10.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

STEP 10. Check the power supply voltage at shift switch assembly connector C-65.



(1) Disconnect connector C-65 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Selector lever position should be "D" range.



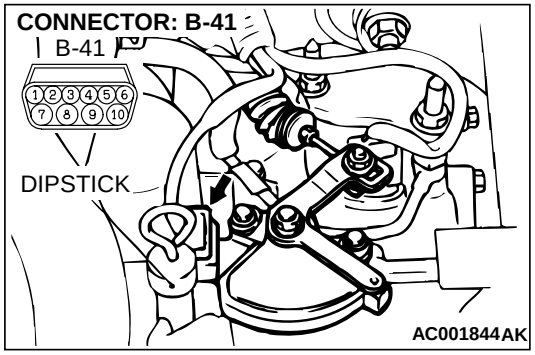
(4) Measure the voltage between terminal 1 and ground.
- Voltage should be battery positive voltage.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 12.
NO : Go to Step 11.

STEP 11. Check connector B-41 at Park/Neutral position switch for damage.



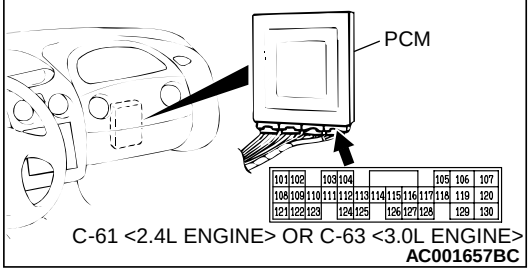
Q: Is the connector in good condition?

YES : Repair harness open circuit between shift switch assembly connector C-65 terminal 1 and Park/Neutral position switch connector B-41 terminal 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

STEP 12. Check the switch output voltage at PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> by backprobing.

(1) Do not disconnect connector C-61 <2.4L Engine> or C-63 <3.0L Engine>.
(2) Turn the ignition switch to the "ON" position.
(3) Selector lever position should be sport mode.

CONNECTOR: C-61 <2.4L ENGINE> OR C-63 <3.0L ENGINE>



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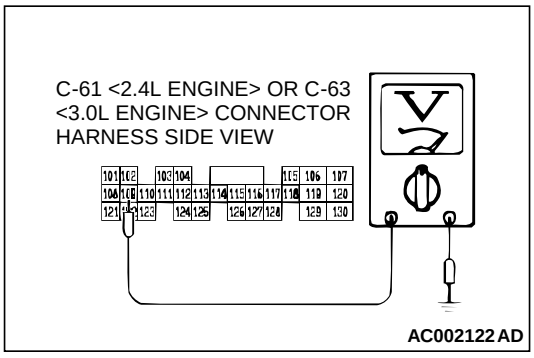


AC002122AD

(4) Measure the voltage between terminal 109 and ground by backprobing.
- Voltage should be battery positive voltage.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

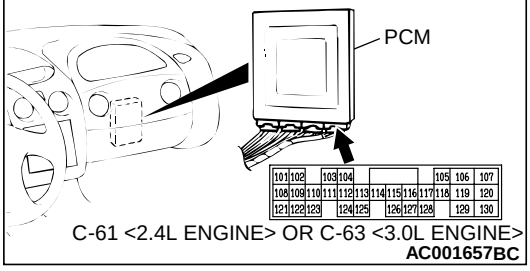
YES : Go to Step 14.
NO : Go to Step 13.

STEP 13. Check connector C-61 <2.4L Engine> or C-63 <3.0L Engine> at PCM connector for damage.

Q: Is the connector in good condition?

YES : Repair harness open circuit or short circuit to ground between shift switch assembly connector C-65 terminal 5 and PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> terminal 109.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

CONNECTOR: C-61 <2.4L ENGINE> OR C-63 <3.0L ENGINE>



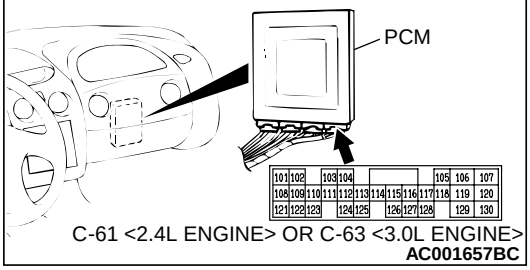
AC001657BC

STEP 14. Check connector C-61 <2.4L Engine> or C-63 <3.0L Engine> at PCM for damage.

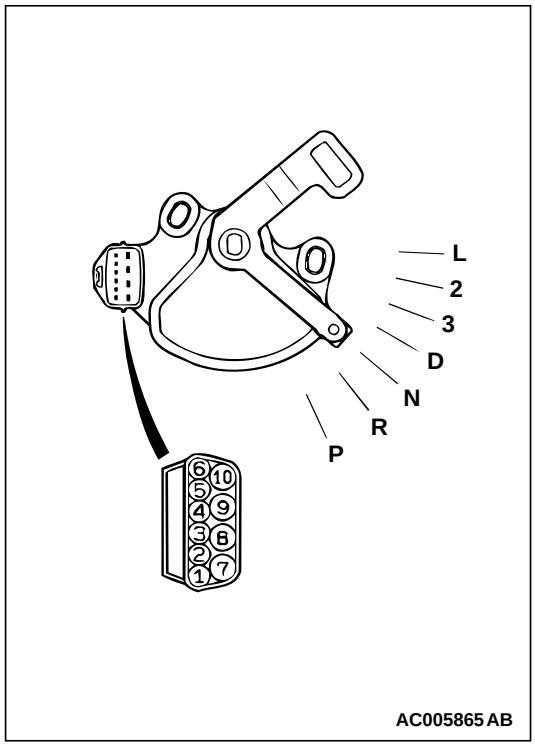
Q: Is the connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

CONNECTOR: C-61 <2.4L ENGINE> OR C-63 <3.0L ENGINE>



AC001657BC



STEP 15. Check the Park/Neutral position switch.

SWITCH POSITION	TERMINAL NUMBER	SPECIFIED CONDITION
P	3 – 8, 9 – 10	Less than 2 ohm
R	7 – 8	
N	4 – 8, 9 – 10	
D	1 – 8	

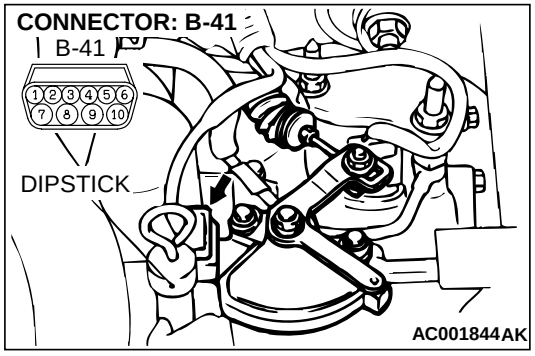
Check for continuity between terminals for each selector position.

NOTE: For vehicles with sport mode, four positions (P, R, N, D) are used.

Q: Is the switch operating properly?

YES : Go to Step 16.

NO : Replace the Park/Neutral position switch. Refer to GROUP 23B, Transaxle P.23B-10.

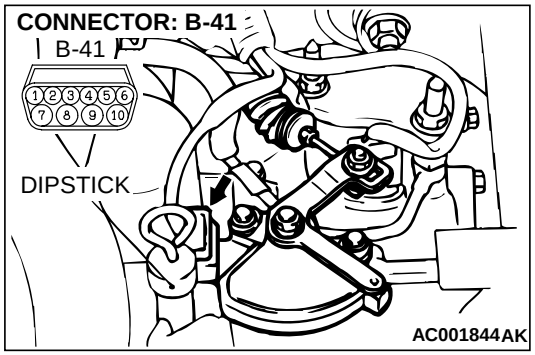


STEP 16. Check connector B-41 at Park/Neutral position switch for damage.

Q: Is the connector in good condition?

YES : Go to Step 17.

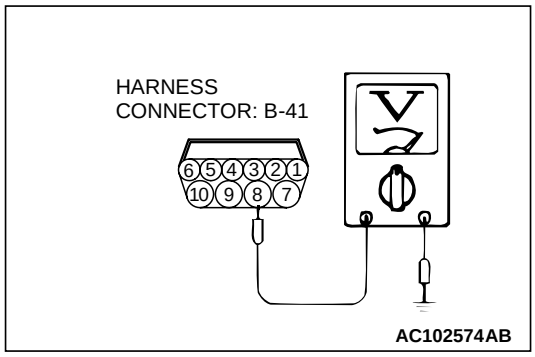
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



STEP 17. Check the power supply voltage at Park/Neutral position switch connector B-41.

(1) Disconnect connector B-41 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.



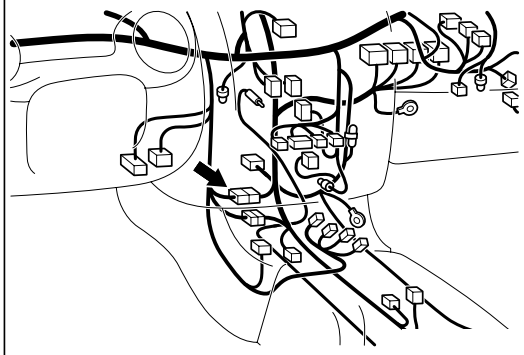
(3) Measure the voltage between terminal 8 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

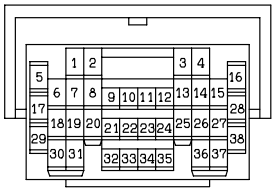
Q: Is the voltage normal?

YES : Go to Step 19.
NO : Go to Step 18.

CONNECTOR: C-28



C-28



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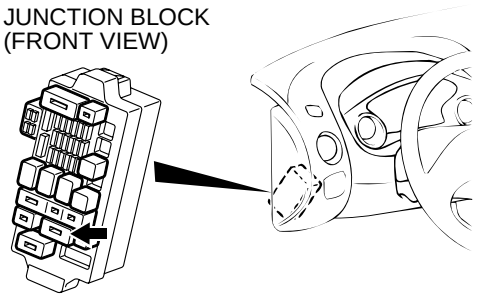
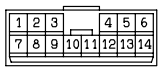
CONNECTOR: C-112

JUNCTION BLOCK
(FRONT VIEW)



C-112



AC106612AB

STEP 18. Check connectors C-28 at intermediate connector and C-112 at junction block for damage.
Q: Are the connectors in good condition?

YES : Repair harness open circuit or short circuit to ground between Park/Neutral position switch connector B-41 terminal 8 and junction block connector C-112 terminal 12.

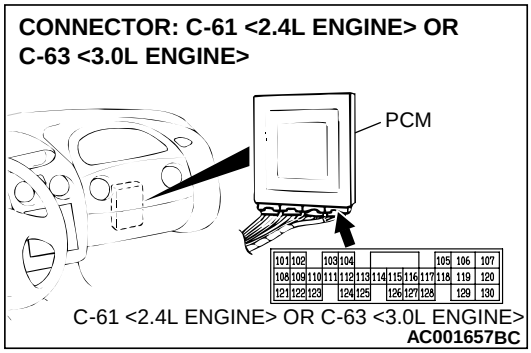
NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

STEP 19. Check connector C-61 <2.4L Engine> or C-63 <3.0L Engine> at PCM connector for damage.

Q: Is the connector in good condition?

YES : Go to Step 20.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

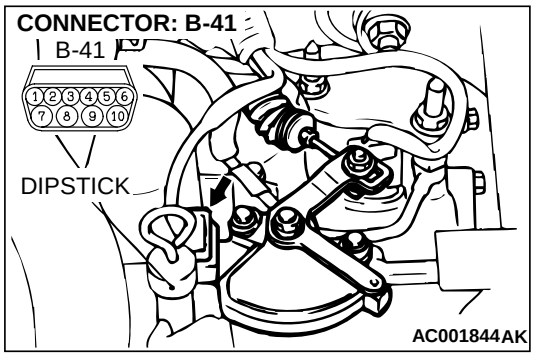


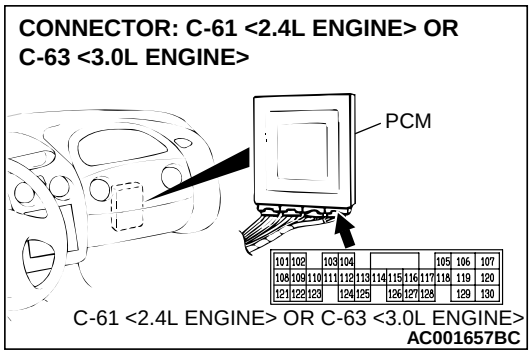
STEP 20. Check harness for short circuit to ground between Park/Neutral position switch connector B-41 terminal 1 and PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> terminal 102.

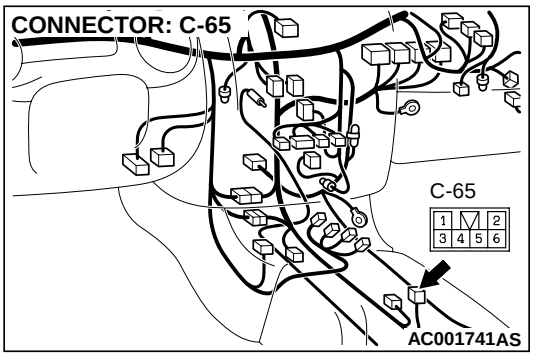
Q: Is the harness wire in good condition?

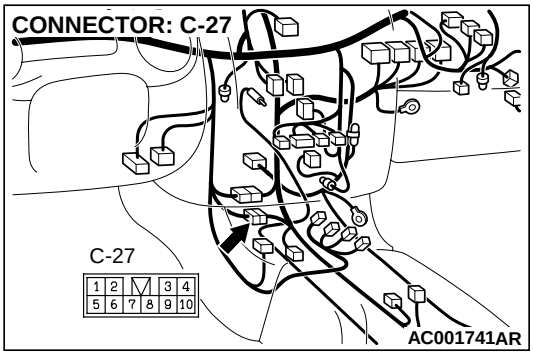
YES : Go to Step 21.

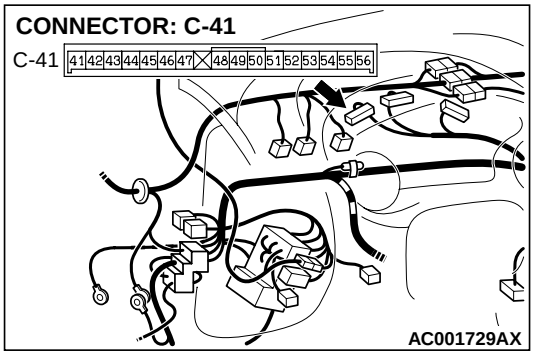
NO : Repair it.











STEP 21. Check connectors C-65 at shift switch assembly, C-27 at intermediate connector and C-41 at combination meter for damage.

Q: Are the connectors in good condition?

YES : Go to Step 22.

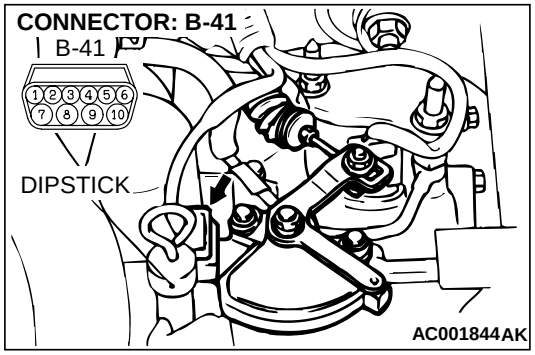
NO : Repair or replace the defective connector(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

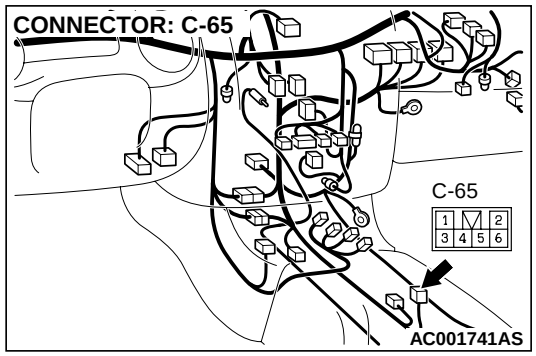
STEP 22. Check harness for short circuit to ground between Park/Neutral position switch connector B-41 terminal 1 and shift switch assembly connector C-65 terminal 1.

Q: Is the harness wire in good condition?

YES : Go to Step 23.

NO : Repair it.



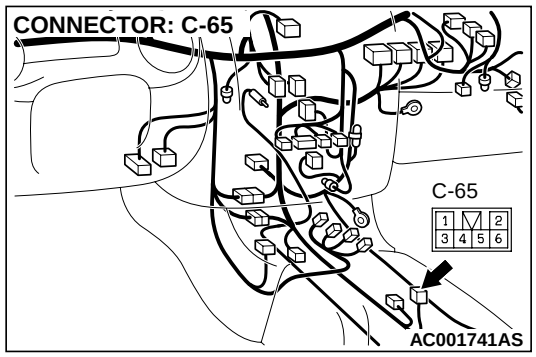


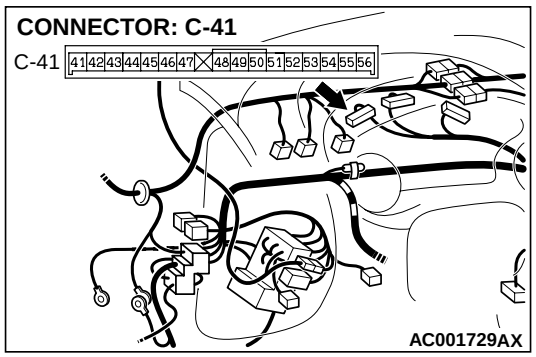
STEP 23. Check harness for short circuit to ground between shift switch assembly connector C-65 terminal 2 and combination meter connector C-41 terminal 50.

Q: Is the harness wire in good condition?

YES : Go to Step 3.

NO : Repair it.





STEP 24. Check the shift switch assembly.
Refer to P.23A-363, Transaxle Control.

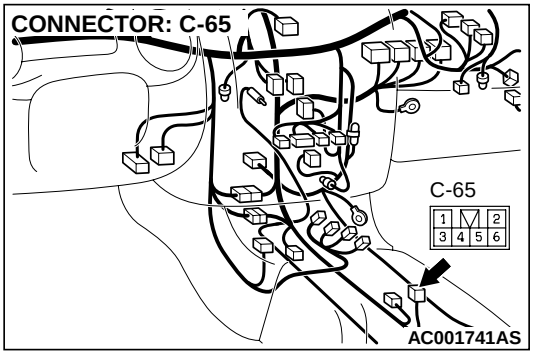
Q: Is the switch operating properly?

YES : Go to Step 25.
NO : Replace the shift switch assembly. Refer to P.23A-361, Transaxle Control.

STEP 25. Check connector C-65 at the shift switch assembly for damage.

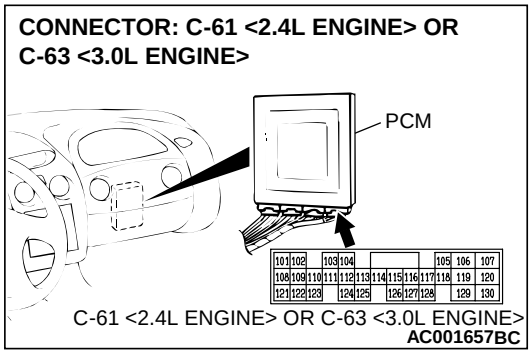
Q: Is the connector in good condition?

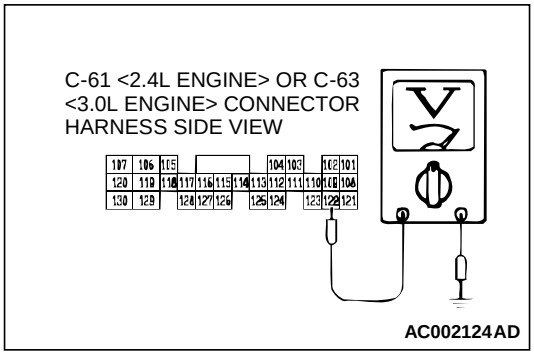
YES : Go to Step 26.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



STEP 26. Check the switch output voltage at PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine>.

(1) Disconnect connector C-61 <2.4L Engine> or C-63 <3.0L Engine> and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.



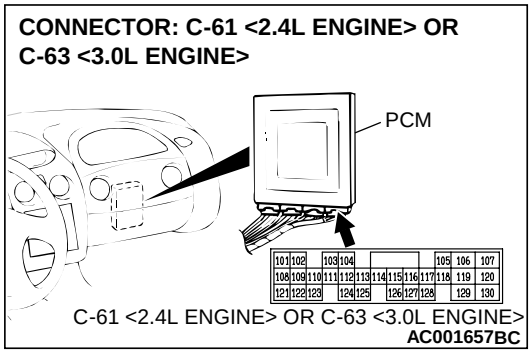


(3) Measure the voltage between terminal 122 and ground.
- Voltage should be battery positive voltage when the selector lever is upshift and hold.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 14.
NO : Go to Step 27.



STEP 27. Check connector C-61 <2.4L Engine> or C-63 <3.0L Engine> at PCM connector for damage.

Q: Is the connector in good condition?

YES : Repair harness open circuit or short circuit to ground between shift switch assembly connector C-65 terminal 3 and PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine> terminal 122.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

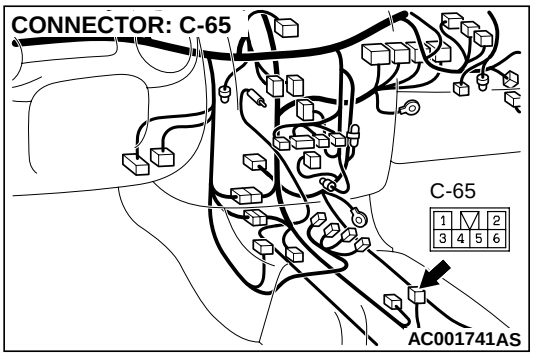
STEP 28. Check the shift switch assembly.

Refer to P.23A-363, Transaxle Control.

Q: Is the switch operating properly?

YES : Go to Step 29.

NO : Replace the shift switch assembly. Refer to P.23A-361, Transaxle Control.



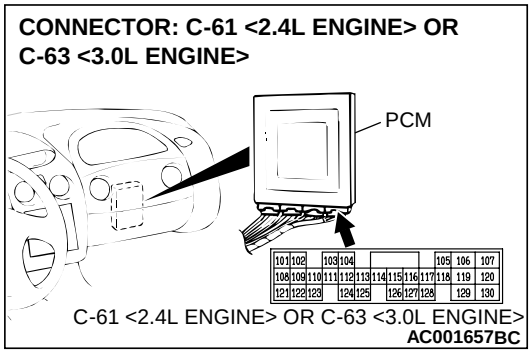
STEP 29. Check connector C-65 at shift switch assembly for damage.

Q: Is the connector in good condition?

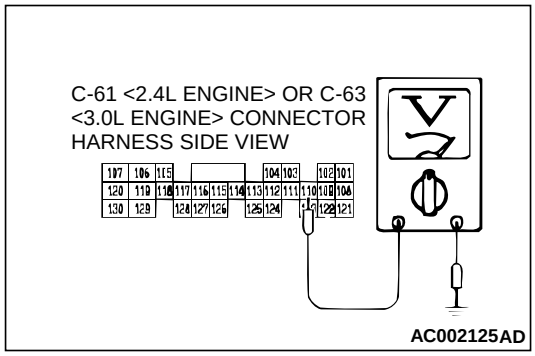
YES : Go to Step 30.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

STEP 30. Check the switch output voltage at PCM connector C-61 <2.4L Engine> or C-63 <3.0L Engine>.



(1) Disconnect connector C-61 <2.4L Engine> or C-63 <3.0L Engine> and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.



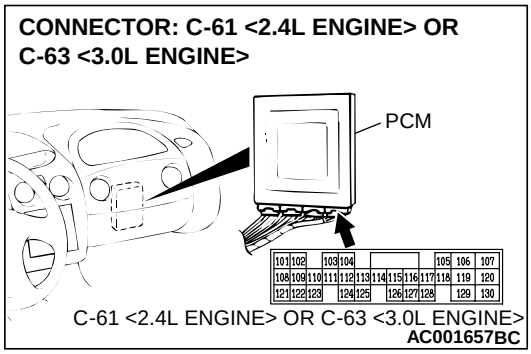
(3) Measure the voltage between terminal 110 and ground.
- Voltage should be battery positive voltage when the selector lever is downshift and hold.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 14.
NO : Go to Step 31.

STEP 31. Check connector C-61 <2.4L Engine> or C-63 <3.0L Engine> at PCM connector for damage.



Q: Is the connector in good condition?

YES : Repair harness open circuit or short circuit to ground between shift switch assembly connector C-65 terminal 4 and PCM connector C-61 <2.4L Engine> C-63 <3.0L Engine> terminal 110.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

DATA LIST REFERENCE TABLE

M1231008100144

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION
2ND SOL DUTY	33	Second solenoid valve duty %	Selector lever position: L, 2, 3, D <Vehicles without sport mode> or Sport mode <Vehicles with sport mode>	Driving at constant speed of 10 km/h (6.2 mph) in 1st gear	100%
				Driving at constant speed of 30 km/h (19 mph) in 2nd gear	0%
				Driving at constant speed of 50 km/h (31 mph) in 3rd gear	100%
				Driving at constant speed of 50 km/h (31 mph) in 4th gear	0%
A/T CONT RLY	54	A/T control relay output voltage	Ignition switch: ON		Battery positive voltage
A/T TMP SNSR	15	A/T fluid temperature sensor	Warming up	Drive for 15 minutes or more so that the A/T fluid temperature becomes 70 – 80 °C (158 – 176 °F)	Gradually rises to 70 – 80 °C (158 – 176 °F)
CRANK SENSOR	21	Crankshaft position sensor	Engine: Idling (after the worming up) Selector lever position: P	Accelerator pedal: Fully closed	600 – 900 r/min
				Accelerator pedal: Depressed	Gradually rises from the above value
DUAL PRESS SW	65	Dual pressure switch	Engine: Idling Selector lever position: P, N	A/C switch: ON (While the A/C compressor is in operation)	ON
				A/C switch: OFF	OFF
ENGINE LOAD	57	Engine load (volumetric efficiency)	Engine: Idling Selector lever position: P, N	Accelerator pedal: fully closed → depressed	Data changes
INP SHFT SNSR	22	Input shaft speed sensor	Gear range: 3rd gear	Driving at constant speed of 50 km/h (31 mph)	1,600 – 1,900 r/min <2.4L Engine> 1,300 – 1,600 r/min <3.0L Engine>

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION
L/R SOL DUTY	31	Low-reverse solenoid valve duty %	Selector lever position: L, 2, 3, D <Vehicles without sport mode> or Sport mode <Vehicles with sport mode>	Driving at constant speed of 10 km/h (6.2 mph) in 1st gear	0%
				Driving at constant speed of 30 km/h (19 mph) in 2nd gear	100%
				Driving at constant speed of 50 km/h (31 mph) in 3rd gear	100%
				Driving at constant speed of 50 km/h (31 mph) in 4th gear	100%
O/D SOL DUTY	34	Overdrive solenoid valve duty %	Selector lever position: L, 2, 3, D <Vehicles without sport mode> or Sport mode <Vehicles with sport mode>	Driving at constant speed of 10 km/h (6.2 mph) in 1st gear	100%
				Driving at constant speed of 30 km/h (19 mph) in 2nd gear	100%
				Driving at constant speed of 50 km/h (31 mph) in 3rd gear	0%
				Driving at constant speed of 50 km/h (31 mph) in 4th gear	0%
OD OFF SIGNAL	66	Overdrive off signal (Auto-cruise ECM signal)	While auto-cruise is engaged	Level road	OFF
				Uphill grade	ON
OUT SHFT SNSR	23	Output shaft speed sensor	Gear range: 3rd gear	Driving at constant speed of 50 km/h (31 mph)	1,600 – 1,900 r/min <2.4L Engine> 1,300 – 1,600 r/min <3.0L Engine>

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION
PNP SWITCH	61	Park/Neutral position switch	Ignition switch: ON	Selector lever position: P	P
				Selector lever position: R	R
				Selector lever position: N	N
				Selector lever position: D	D
				Selector lever position: 3 <Vehicles without sport mode>	3
				Selector lever position: 2 <Vehicles without sport mode>	2
				Selector lever position: L <Vehicles without sport mode>	L
SELECT SW	67	Select switch <Vehicles with sport mode>	Ignition switch: ON	Selector lever position: D	OFF
				Selector lever operation: Select sport mode	ON
				Selector lever operation: Upshift and hold the selector lever	ON
				Selector lever operation: Downshift and hold the selector lever	ON
SHIFT POS	63	Shift position	Selector lever position: L, 2, 3, D <Vehicles without sport mode> or Sport mode <Vehicles with sport mode>	Driving at constant speed of 10 km/h (6.2 mph) in 1st gear	1st
				Driving at constant speed of 30 km/h (19 mph) in 2nd gear	2nd
				Driving at constant speed of 50 km/h (31 mph) in 3rd gear	3rd
				Driving at constant speed of 50 km/h (31 mph) in 4th gear	4th
			Selector lever position: R	Driving at constant speed of 5 km/h (3.1 mph) in reverse gear	REV

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION
SHIFT SW DOWN	69	Shift switch (Down) <Vehicles with sport mode>	Ignition switch: ON	Selector lever position: D	OFF
				Selector lever operation: Select sport mode	OFF
				Selector lever operation: Upshift and hold the selector lever	OFF
				Selector lever operation: Downshift and hold the selector lever	ON
SHIFT SW UP	68	Shift switch (Up) <Vehicles with sport mode>	Ignition switch: ON	Selector lever position: D	OFF
				Selector lever operation: Select sport mode	OFF
				Selector lever operation: Upshift and hold the selector lever	ON
				Selector lever operation: Downshift and hold the selector lever	OFF
STOPLIGHT SW	26	Stoplight switch	Ignition switch: ON	Brake pedal: Depressed	ON
				Brake pedal: Released	OFF
TCC SLIPPAGE	52	Torque converter clutch amount of slippage	Warming up Selector lever position: 3 <Vehicles without sport mode> or Sport mode <Vehicles with sport mode> Driving at speed of 50 km/h (31 mph) in 3rd gear	Driving at constant speed of 50 km/h (31 mph)	−10 to 10 r/min
				Release accelerator pedal [at less than 50 km/h (31 mph)]	The value changes

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION
TCC SOL DUTY	36	Torque converter clutch solenoid valve duty %	Warming up Selector lever position: 3 <Vehicles without sport mode> or Sport mode <Vehicles with sport mode> Driving at speed of 50 km/h (31 mph) in 3rd gear	Driving at constant speed of 50 km/h (31 mph)	70 – 90%
				Release accelerator pedal [at less than 50 km/h (31 mph)]	70 – 90% → 0% Decreases gradually as the vehicle speed decreases
TP SENSOR	11	Throttle position sensor	Ignition switch: ON Engine: Stopped Selector lever position: P	Accelerator pedal: Fully closed	535 – 735 mV
				Accelerator pedal: Depressed	Gradually rises from the above value
				Accelerator pedal: Fully open	4,500 – 5,500 mV
U/D SOL DUTY	32	Underdrive solenoid valve duty %	Selector lever position: L, 2, 3, D <Vehicles without sport mode> or Sport mode <Vehicles with sport mode>	Driving at constant speed of 10 km/h (6.2 mph) in 1st gear	0%
				Driving at constant speed of 30 km/h (19 mph) in 2nd gear	0%
				Driving at constant speed of 50 km/h (31 mph) in 3rd gear	0%
				Driving at constant speed of 50 km/h (31 mph) in 4th gear	100%
VSS	29	Vehicle speed signal	Selector lever position: 3 <Vehicles without sport mode> or Sport mode <Vehicles with sport mode>	Idling with 1st gear (Vehicle stopped)	0 km/h (0 mph)
				Driving at constant speed of 50 km/h (31 mph)	50 km/h (31 mph)

ACTUATOR TEST REFERENCE TABLE

M1231008200130

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	TEST CONTENT	INSPECTION REQUIREMENT	NORMAL CONDITION
1st SHIFT LMP	07	1st indicator light <Vehicles with sport mode>	Illuminate each indicator light for three to the signal from the MUT-II.	• Ignition switch: ON • Selector lever position: P • Engine: stopped • Throttle opening voltage: Less than one volts	Shift indicator light illuminates.
2nd SHIFT LMP	08	2nd indicator light <Vehicles with sport mode>			
2ND SOL	03	Second solenoid valve	Drive the solenoid valve specified by the scan tool (MUT-II) at 50 % duty for five seconds. No other solenoid valve should be energized.		The solenoid should click when activated
3rd SHIFT LMP	09	3rd indicator light <Vehicles with sport mode>	Illuminate each indicator light for three to the signal from the MUT-II.		Shift indicator light illuminates.
4th SHIFT LMP	10	4th indicator light <Vehicles with sport mode>			
A/T RELAY	12	A/T control relay	Control relay is OFF for three seconds.		Data list No. 54 • (1) During test: 0 V • (2) Normal: Battery positive voltage [12 V]
L/R SOL	01	Low-reverse solenoid valve	Drive the solenoid valve specified by the scan tool (MUT-II) at 50 % duty for five seconds. No other solenoid valve should be energized.		The solenoid should click when activated
O/D SOL	04	Overdrive solenoid valve			
TCC SOL	06	Torque converter clutch solenoid valve			
U/D SOL	02	Underdrive solenoid valve			

TSB Revision

INVECS-II CANCEL COMMAND

M1231009500145

MUT-II SCAN TOOL DISPLAY	ITEM NO.	ITEM	CONTENT	REMARKS
Std. SIFT PATN	14	Standard shift pattern	Stops the INVECS-II control and shifts gears according to the standard shift pattern.	Use this function when performing procedure 8 in the road tests. (Refer to P.23A-19.) If the ignition switch is turned from "LOCK" (OFF) to "ON," this function restores the INVECS-II control.

PCM TERMINAL VOLTAGE REFERENCE CHART FOR TRANSAXLE OPERATION

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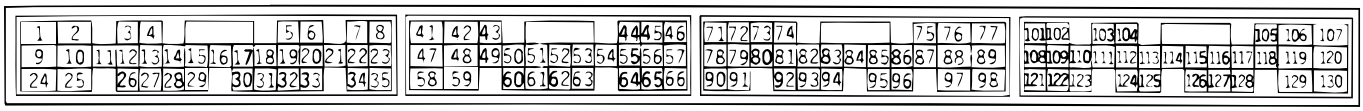

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TERMINAL NO.	INSPECTION ITEMS	INSPECTION REQUIREMENT		NORMAL CONDITION
45	Crankshaft position sensor	Engine: Cranking		0.4 – 4.0 V
		Engine: Idling		1.5 – 2.5 V
46	Throttle position sensor supplied voltage	Ignition switch: ON		4.8 – 5.2 V
50	A/T control relay	Ignition switch: LOCK (OFF)		0 V
		Ignition switch: ON		10 – 12 V
57	Throttle position sensor ground	Always		0.5 V or less
75	Auto-cruise signal	Ignition switch: ON		Battery positive voltage
76	Ground	Always		1 V or less
77	Solenoid valve power supply	Ignition switch: LOCK (OFF)		0 V
		Ignition switch: ON		Battery positive voltage
78	Throttle position sensor	Ignition switch: ON (check for smooth voltage increase as throttle is moved from idle position to wide open throttle	Idle	0.6 – 0.8 V
			Wide open throttle	4.5 – 5.5 V
80	Vehicle speed signal	• Measure between terminals 80 and ground with an oscilloscope. • Engine: 2,000 r/min • Selector lever position: 3 (3rd gear) <Vehicles without sport mode>, Sport mode (3rd gear) <Vehicles with sport mode>		Refer to P.23A-333, Inspection Procedure Using an Oscilloscope.
88	Ground	Always		0 V
89	Solenoid valve power supply	Ignition switch: LOCK (OFF)		0 V
		Ignition switch: ON		Battery positive voltage
97	Ground	Always		0 V

TSB Revision

TERMINAL NO.	INSPECTION ITEMS	INSPECTION REQUIREMENT	NORMAL CONDITION
101	Park/Neutral position switch: P	• Ignition switch: LOCK (OFF) • Selector lever position: P	0 V
		• Ignition switch: LOCK (OFF) • Selector lever position: Other than above	Battery positive voltage
102	Park/Neutral position switch: D	• Ignition switch: LOCK (OFF) • Selector lever position: D	0 V
		• Ignition switch: LOCK (OFF) • Selector lever position: Other than above	Battery positive voltage
103	Input shaft speed sensor	• Measure between terminals 57 and 103 with an oscilloscope. • Engine: 2,000 r/min • Selector lever position: 3 (3rd gear) <Vehicles without sport mode>, Sport mode (3rd gear) <Vehicle with sport mode>	Refer to P.23A-333, Inspection Procedure Using an Oscilloscope.
104	Output shaft speed sensor	• Measure between terminals 57 and 104 with an oscilloscope. • Engine: 2,000 r/min • Selector lever position: 3 (3rd gear) <Vehicles without sport mode>, Sport mode (3rd gear) <Vehicle with sport mode>	Refer to P.23A-333, Inspection Procedure Using an Oscilloscope.
105	Shift indicator light: 1st <Vehicles with sport mode>	• Engine: Idling • Gear range: 1st gear	Battery positive voltage
		• Engine: Idling • Gear range: other than 1st gear	0 – 0.9 V
106	Second solenoid valve	• Engine: Idling • Selector lever position: 2 (2nd gear) <Vehicles without sport mode>, Sport mode (2nd gear) <Vehicles with sport mode>	Battery positive voltage
		• Engine: Idling • Selector lever position: P	7 – 9 V
107	Torque converter clutch solenoid valve	• Engine: Idling • Selector lever position: L (1st gear) <Vehicles without sport mode>, Sport mode (1st gear) <Vehicles with sport mode>	Battery positive voltage
108	Park/Neutral position switch: R	• Ignition switch: ON • Selector lever position: R	0 V
		• Ignition switch: ON • Selector lever position: Other than above	Battery positive voltage

TERMINAL NO.	INSPECTION ITEMS	INSPECTION REQUIREMENT	NORMAL CONDITION
109	Park/Neutral position switch: 3 <Vehicles without sport mode>	• Ignition switch: ON • Selector lever position: 3	0 V
		• Ignition switch: ON • Selector lever position: Other than above	Battery positive voltage
	Select switch <Vehicles with sport mode>	• Ignition switch: ON • Selector lever position: Sport mode	0 V
		• Ignition switch: ON • Selector lever position: Other than above	Battery positive voltage
110	Park/Neutral position switch: L <Vehicles without sport mode>	• Ignition switch: ON • Selector lever operation: L	0 V
		• Ignition switch: ON • Selector lever operation: Other than above	Battery positive voltage
	Select switch (Down) <Vehicles with sport mode>	• Ignition switch: ON • Selector lever operation: Downshift and hold the selector lever	0 V
		• Ignition switch: ON • Selector lever operation: Other than above	Battery positive voltage
105	Shift indicator light: 3rd <Vehicles with sport mode>	• Engine: Idling • Gear range: 3rd gear	Battery positive voltage
		• Engine: Idling • Gear range: other than 3rd gear	0 – 0.9 V
117	Shift indicator light: 2 nd <Vehicles with sport mode>	• Engine: Idling • Gear range: 2nd gear	Battery positive voltage
		• Engine: Idling • Gear range: other than 2nd gear	0 – 0.9 V
120	Under drive solenoid valve	• Engine: Idling • Selector lever position: L (1st gear) <Vehicles without sport mode>, Sport mode (1st gear) <Vehicles with sport mode>	Battery positive voltage
		• Engine: Idling • Selector lever position: P	7 – 9 V
121	Park/Neutral position switch: N	• Ignition switch: ON • Selector lever position: N	Battery positive voltage
		• Ignition switch: ON • Selector lever position: Other than above	0 V

TERMINAL NO.	INSPECTION ITEMS	INSPECTION REQUIREMENT	NORMAL CONDITION
122	Park/Neutral position switch: 2 <Vehicles without sport mode>	• Ignition switch: ON • Selector lever operation: 2	Battery positive voltage
		• Ignition switch: ON • Selector lever operation: Other than above	0 V
	Select switch (Up) <Vehicles with sport mode>	• Ignition switch: ON • Selector lever operation: Upshift and hold the selector lever	Battery positive voltage
		• Ignition switch: ON • Selector lever operation: Other than above	0 V
123	Stoplight switch	• Ignition switch: ON • Brake pedal: Depressed	Battery positive voltage
		• Ignition switch: ON • Brake pedal: Released	0 V
124	A/T fluid temperature sensor	A/T fluid temperature: 20°C (68°F)	3.8 – 4.0 V
		A/T fluid temperature: 40°C (104°F)	3.2 – 3.4 V
		A/T fluid temperature: 80°C (176°F)	1.7 – 1.9 V
128	Shift indicator light: 4th <Vehicles with sport mode>	• Engine: Idling • Gear range: 4th gear	Battery positive voltage
		• Engine: Idling • Gear range: other than 4th gear	0 – 0.9 V
129	Low-reverse solenoid valve	• Engine: Idling • Selector lever position: P	Battery positive voltage
		• Engine: Idling • Selector lever position: 2 (2nd gear) <Vehicles without sport mode>, Sport mode (2nd gear) <Vehicles with sport mode>	7 – 9 V
130	Overdrive solenoid valve	• Engine: Idling • Selector lever position: 3 (3rd gear) <Vehicles without sport mode>, Sport mode (3rd gear) <Vehicles with sport mode>	Battery positive voltage
		• Engine: Idling • Selector lever position: P	7 – 9 V

PCM TERMINAL RESISTANCE AND CONTINUITY INSPECTION CHART

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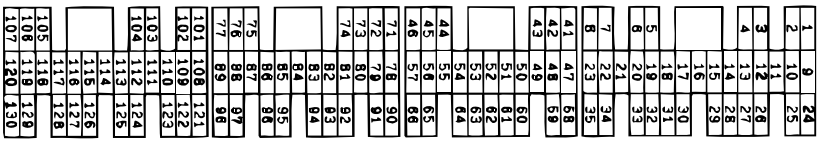

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TSB Revision

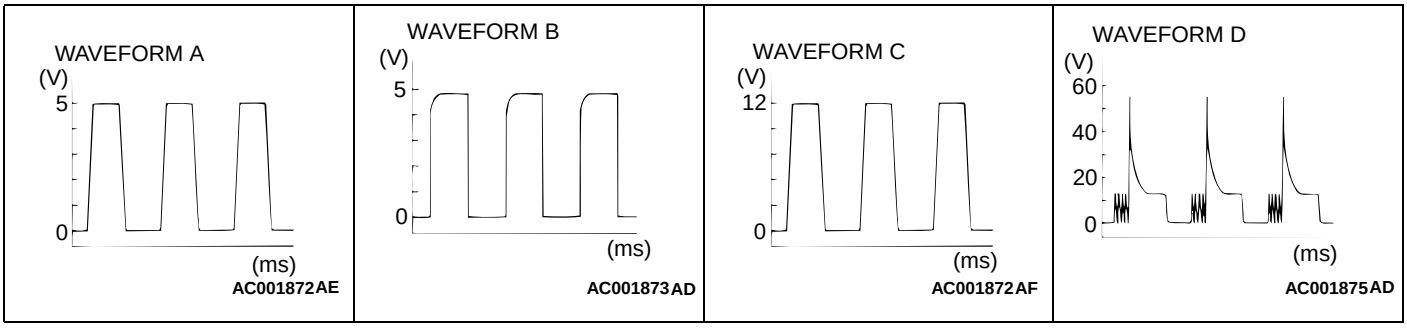
TERMINAL NO.	INSPECTION ITEM	NORMAL CONDITION (CHECK CONDITION)
57 – 124	A/T fluid temperature sensor	16.7 – 20.5 kΩ [at 0 °C (32 °F)]
		7.3 – 8.9 kΩ [at 20 °C (68 °F)]
		3.4 – 4.2 kΩ [at 40 °C (104 °F)]
		1.9 – 2.2 kΩ [at 60 °C (140 °F)]
		1.0 – 1.2 kΩ [at 80 °C (176 °F)]
		0.57 – 0.69 kΩ [at 100 °C (212 °F)]

INSPECTION PROCEDURE USING AN OSCILLOSCOPE

M1231008500131

TERMINAL NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION (WAVEFORM SAMPLE)
45	Crankshaft position sensor	Selector lever position: N	Idling (Vehicle stopped)	Waveform A
103	Input shaft speed sensor	Selector lever position: 3 <Vehicles without sport mode>, Sport mode <Vehicles with sport mode>	Driving at constant speed of 50 km/h (31 mph) in 3rd gear (2.4L Engine: 1,600 – 1,900 r/min, 3.0L Engine: 1,300 – 1,600 r/min)	Waveform B
104	Output shaft speed sensor			
80	Vehicle speed signal			Waveform C
129	Low-reverse solenoid valve	• Ignition switch: ON • Selector lever position: P • Engine: Stopped • Throttle (Accelerator) opening angle: Less than 1 Volt	Force drive each solenoid valve (Actuator test)	Waveform D
120	Underdrive solenoid valve			
106	Second solenoid valve			
130	Overdrive solenoid valve			
107	Torque converter clutch control solenoid			

Waveform sample



A/T FAULTY OPERATION PREVENTION MECHANISM DIAGNOSIS

INTRODUCTION TO A/T KEY INTERLOCK AND SHIFT LOCK MECHANISMS

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If the key interlock and shift lock mechanisms indicates a malfunction, the key interlock cable, the shift lock cable, or the selector lever assembly may be defective. In this case, follow troubleshooting below.

A/T KEY INTERLOCK AND SHIFT LOCK MECHANISMS DIAGNOSTIC TROUBLESHOOTING STRATEGY

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Use these steps to plan your diagnostic strategy. If your follow then carefully, you will be sure that you have exhausted most of the possible ways to find automatic transaxle key interlock and shift lock mechanisms fault.

1. Gather information from the customer.
2. Verify that the condition described by the customer exists.
3. Find the malfunction by following the Symptom Chart.
4. Verify malfunction is eliminated.

SYMPTOM CHART

M1232001800219

SYMPTOMS	INSPECTION PROCEDURE	REFERENCE PAGE
Selector lever can be moved from "P" to "R" position without depressing brake pedal when ignition key is at any position other than "LOCK" (OFF) position.	1	P.23A-334
Selector lever cannot be moved from "P" to "R" position with brake pedal depressed when ignition key is at any position other than "LOCK" (OFF) position.	2	P.23A-335
Selector lever can be moved from "P" to "R" position with brake pedal depressed when ignition key is at "LOCK" (OFF) position.	3	P.23A-336
Selector lever cannot be moved from "P" to "R" position smoothly.	4	P.23A-337
Selector lever cannot be moved from "P" to "R" position.	5	P.23A-338
Ignition key cannot be turned to "LOCK" (OFF) position when selector lever is at "P" position.	6	P.23A-339
Ignition key can be turned to "LOCK" (OFF) position when selector lever is at any position other than "P" position.	7	P.23A-340

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Selector Lever can be Moved from "P" to "R" Position without Depressing Brake Pedal when Ignition Key is at any Position Other than "LOCK" (OFF) Position.

TECHNICAL DESCRIPTION (COMMENT)

- Lock cam or shift lock cable may be defective.

TROUBLESHOOTING HINTS

- Malfunction of lock cam
- Malfunction of shift lock cable

DIAGNOSIS

STEP 1. Check the fit of the lock cam.

Q: Is the lock cam installed correctly?
YES : Go to Step 2.
NO : Install the lock cam correctly. Refer to P.23A-361. When the brake pedal is released with the ignition key at other positions than "LOCK" (OFF) position, check that the selector lever can not be moved from "P" position to "R" position.

STEP 2. Check the lock cam.

Q: Is the lock cam in good condition?
YES : Go to Step 3.
NO : Replace the lock cam. Refer to P.23A-361. When the brake pedal is released with the ignition key at other positions than "LOCK" (OFF) position, check that the selector lever can not be moved from "P" position to "R" position.

STEP 3. Check the fit of the shift lock cable.

Q: Is the shift lock cable installed correctly?
YES : Go to Step 4.
NO : Install the shift lock cable correctly. Refer to P.23A-363. When the brake pedal is released with the ignition key at other positions than "LOCK" (OFF) position, check that the selector lever can not be moved from "P" position to "R" position.

STEP 4. Check the shift lock cable.

Q: Is the shift lock cable in good condition?
YES : No action to be taken.
NO : Replace the shift lock cable. Refer to P.23A-363. When the brake pedal is released with the ignition key at other positions than "LOCK" (OFF) position, check that the selector lever can not be moved from "P" position to "R" position.

INSPECTION PROCEDURE 2: Selector Lever cannot be Moved from "P" to "R" Position with Brake Pedal Depressed when Ignition Key is at any Position Other than "LOCK" (OFF) Position.

TECHNICAL DESCRIPTION (COMMENT)
Selector lever assembly, shift lock cable, key interlock cable, transmission control cable, or lock cam may be defective.

TROUBLESHOOTING HINTS
- Malfunction of selector lever assembly
- Malfunction of shift lock cable
- Malfunction of key interlock cable
- Malfunction of transmission control cable
- Malfunction of lock cam

DIAGNOSIS

STEP 1. Check the connection of lock cam and key interlock cable.

Q: Is the connection of lock cam and key interlock cable in good condition?
YES : Go to Step 2.
NO : Repair the connection of lock cam and shift lock cable. When the brake pedal is depressed with the ignition key at other positions than "LOCK" (OFF) position, check that the selector lever can be moved from "P" position to "R" position.

STEP 2. Check the connection of selector lever assembly and shift transaxle control cable.

Q: Is the connection of selector lever assembly and shift transaxle control cable in good condition?
YES : Go to Step 3.
NO : Repair the connection of selector lever assembly and shift transaxle control cable. When the brake pedal is depressed with the ignition key at other positions than "LOCK" (OFF) position, check that the selector lever can be moved from "P" position to "R" position.

STEP 3. Check the fit of the shift lock cable.

Q: Is the shift lock cable installed correctly?
YES : Go to Step 4.
NO : Install the shift lock cable correctly. Refer to P.23A-363. When the brake pedal is depressed with the ignition key at other positions than "LOCK" (OFF) position, check that the selector lever can be moved from "P" position to "R" position.

STEP 4. Check the shift lock cable.

Q: Is the shift lock cable in good condition?
YES : Go to Step 5.
NO : Replace the shift lock cable. Refer to P.23A-363. When the brake pedal is depressed with the ignition key at other positions than "LOCK" (OFF) position, check that the selector lever can be moved from "P" position to "R" position.

STEP 5. Check the fit of the key interlock cable.

Q: Is the key interlock cable installed correctly?
YES : Go to Step 6.
NO : Install the key interlock cable correctly. Refer to P.23A-363. When the brake pedal is depressed with the ignition key at other positions than "LOCK" (OFF) position, check that the selector lever can be moved from "P" position to "R" position.

STEP 6. Check the key interlock cable.

Q: Is the key interlock cable in good condition?
YES : Go to Step 7.
NO : Replace the key interlock cable. Refer to P.23A-363. When the brake pedal is depressed with the ignition key at other positions than "LOCK" (OFF) position, check that the selector lever can be moved from "P" position to "R" position.

STEP 7. Check the fit of the transaxle control cable.

Q: Is the transaxle control cable installed correctly?
YES : Go to Step 8.
NO : Install the transaxle control cable correctly. Refer to P.23A-358. When the brake pedal is depressed with the ignition key at other positions than "LOCK" (OFF) position, check that the selector lever can be moved from "P" position to "R" position.

STEP 8. Check the transaxle control cable.

Q: Is the transaxle control cable in good condition?
YES : Repair or replace the selector lever assembly. Refer to P.23A-358 and P.23A-361. When the brake pedal is depressed with the ignition key at other positions than "LOCK" (OFF) position, check that the selector lever can be moved from "P" position to "R" position.
NO : Replace the transaxle control cable. Refer to P.23A-358. When the brake pedal is depressed with the ignition key at other positions than "LOCK" (OFF) position, check that the selector lever can be moved from "P" position to "R" position.

INSPECTION PROCEDURE 3: Selector Lever can be Moved from "P" to "R" Position with Brake Pedal Depressed when Ignition Key is at "LOCK" (OFF) Position.

TECHNICAL DESCRIPTION (COMMENT)
Key interlock cable or lock cam may be defective.

TROUBLESHOOTING HINTS
- Malfunction of lock cam
- Malfunction of key interlock cable

DIAGNOSIS

STEP 1. Check the connection of lock cam and key interlock cable.

Q: Is the connection of lock cam and key interlock cable in good condition?
YES : Go to Step 2.
NO : Repair the connection of lock cam and shift lock cable. When the brake pedal is depressed with the ignition key at the "LOCK" (OFF) position, check that the selector lever can not be moved from "P" position to "R" position.

STEP 2. Check the fit of the lock cam.

Q: Is the lock cam installed correctly?
YES : Go to Step 3.
NO : Install the lock cam correctly. Refer to P.23A-361. When the brake pedal is depressed with the ignition key at the "LOCK" (OFF) position, check that the selector lever can not be moved from "P" position to "R" position.

STEP 3. Check the lock cam.

Q: Is the lock cam in good condition?
YES : Go to Step 4.
NO : Replace the lock cam. Refer to P.23A-361. When the brake pedal is depressed with the ignition key at the "LOCK" (OFF) position, check that the selector lever can not be moved from "P" position to "R" position.

STEP 4. Check the fit of the key interlock cable.

Q: Is the key interlock cable installed correctly?
YES : Go to Step 5.
NO : Install the key interlock cable correctly. Refer to P.23A-363. When the brake pedal is depressed with the ignition key at the "LOCK" (OFF) position, check that the selector lever can not be moved from "P" position to "R" position.

STEP 5. Check the key interlock cable.

Q: Is the key interlock cable in good condition?
YES : No action to be taken.
NO : Replace the key interlock cable. Refer to P.23A-363. When the brake pedal is depressed with the ignition key at the "LOCK" (OFF) position, check that the selector lever can not be moved from "P" position to "R" position.

INSPECTION PROCEDURE 4: Selector Lever cannot be Moved from "P" to "R" Position Smoothly.

TECHNICAL DESCRIPTION (COMMENT)
Key interlock cable, shift lock cable, transaxle control cable, lock cam, or selector lever assembly may be defective.

TROUBLESHOOTING HINTS
- Malfunction of key interlock cable
- Malfunction of shift lock cable
- Malfunction of transaxle control cable
- Malfunction of lock cam
- Malfunction of selector lever assembly

DIAGNOSIS

STEP 1. Check the connection of lock cam and key interlock cable.

Q: Is the connection of lock cam and key interlock cable in good condition?
YES : Go to Step 2.
NO : Repair the connection of lock cam and shift lock cable. Check that the selector lever can be moved from "P" position to "R" position smoothly.

STEP 2. Check the connection of selector lever assembly and transaxle control cable.

Q: Is the connection of selector lever assembly and transaxle control cable in good condition?
YES : Go to Step 3.
NO : Repair the connection of selector lever assembly and transaxle control cable. Check that the selector lever can be moved from "P" position to "R" position smoothly.

STEP 3. Check the fit of the lock cam.

Q: Is the lock cam installed correctly?
YES : Go to Step 4.
NO : Install the lock cam correctly. Refer to P.23A-361. Check that the selector lever can be moved from "P" position to "R" position smoothly.

STEP 4. Check the lock cam.

Q: Is the lock cam in good condition?
YES : Go to Step 5.
NO : Replace the lock cam. Refer to P.23A-361. Check that the selector lever can be moved from "P" position to "R" position smoothly.

STEP 5. Check the fit of the shift lock cable.

Q: Is the shift lock cable installed correctly?
YES : Go to Step 6.
NO : Install the shift lock cable correctly. Refer to P.23A-363. Check that the selector lever can be moved from "P" position to "R" position smoothly.

STEP 6. Check the shift lock cable.

Q: Is the shift lock cable in good condition?
YES : Go to Step 7.
NO : Replace the shift lock cable. Refer to P.23A-363. Check that the selector lever can be moved from "P" position to "R" position smoothly.

STEP 7. Check the fit of the key interlock cable.

Q: Is the key interlock cable installed correctly?
YES : Go to Step 8.
NO : Install the key interlock cable correctly. Refer to P.23A-363. Check that the selector lever can be moved from "P" position to "R" position smoothly.

STEP 8. Check the key interlock cable.

Q: Is the key interlock cable in good condition?
YES : Go to Step 9.
NO : Replace the key interlock cable. Refer to P.23A-363. Check that the selector lever can be moved from "P" position to "R" position smoothly.

STEP 9. Check the fit of the transaxle control cable.

Q: Is the transaxle control cable installed correctly?
YES : Go to Step 10.
NO : Install the transaxle control cable correctly. Refer to P.23A-358. Check that the selector lever can be moved from "P" position to "R" position smoothly.

STEP 10. Check the transaxle control cable.

Q: Is the transaxle control cable in good condition?
YES : Repair or replace the selector lever assembly. Refer to P.23A-358 and P.23A-361. Check that the selector lever can be moved from "P" position to "R" position smoothly.
NO : Replace the transaxle control cable. Refer to P.23A-358. Check that the selector lever can be moved from "P" position to "R" position smoothly.

INSPECTION PROCEDURE 5: Selector Lever cannot be Moved from "R" to "P" Position.

TECHNICAL DESCRIPTION (COMMENT)
Selector lever assembly, transaxle control cable, or lock cam may be defective.

TROUBLESHOOTING HINTS
- Malfunction of selector lever assembly
- Malfunction of transaxle control cable
- Malfunction of lock cam

STEP 2. Check the fit of the lock cam.

Q: Is the lock cam installed correctly?
YES : Go to Step 3.
NO : Install the lock cam correctly. Refer to P.23A-361. Check that the selector lever can be moved from "R" position to "P"

DIAGNOSIS

STEP 1. Check the connection of selector lever assembly and transaxle control cable.

Q: Is the connection of selector lever assembly and transaxle control cable in good condition?
YES : Go to Step 2.
NO : Repair the connection of selector lever assembly and transaxle control cable. Check that the selector lever can be moved from "R" position to "P" position.

position.

STEP 3. Check the lock cam.

Q: Is the lock cam in good condition?
YES : Go to Step 4.
NO : Replace the lock cam. Refer to P.23A-361. Check that the selector lever can be moved from "R" position to "P" position.

STEP 4. Check the fit of the transaxle control cable.

Q: Is the transaxle control cable installed correctly?
YES : Go to Step 5.
NO : Install the transaxle control cable correctly. Refer to P.23A-358. Check that the selector lever can be moved from "R" position to "P" position.

STEP 5. Check the transaxle control cable.

Q: Is the transaxle control cable in good condition?
YES : Repair or replace the selector lever assembly. Refer to P.23A-358 and P.23A-361. Check that the selector lever can be moved from "P" position to "R" position smoothly.
NO : Replace the transaxle control cable. Refer to P.23A-358. Check that the selector lever can be moved from "R" position to "P" position.

INSPECTION PROCEDURE 6: Ignition Key cannot be Turned to the "LOCK" (OFF) Position when Selector Lever is at "P" Position.

TECHNICAL DESCRIPTION (COMMENT)
Lock cam, steering lock cylinder assembly, transaxle control cable, or key interlock cable may be defective.

TROUBLESHOOTING HINTS
- Malfunction of lock cam
- Malfunction of key interlock cable
- Malfunction of transaxle control cable
- Malfunction of steering lock cylinder assembly

DIAGNOSIS

STEP 1. Check the connection of lock cam and key interlock cable.

Q: Is the connection of lock cam and key interlock cable in good condition?
YES : Go to Step 2.
NO : Repair the connection of lock cam and shift lock cable. Check that the ignition key can not be turned to the "LOCK" (OFF) position with the selector lever at "P" position.

STEP 2. Check the fit of the lock cam.

Q: Is the lock cam installed correctly?
YES : Go to Step 3.
NO : Install the lock cam correctly. Refer to P.23A-361. Check that the selector lever can be moved from "R" position to "P" position.

STEP 3. Check the lock cam.

Q: Is the lock cam in good condition?
YES : Go to Step 4.
NO : Replace the lock cam. Refer to P.23A-361. Check that the selector lever can be moved from "R" position to "P" position.

STEP 4. Check the fit of the key interlock cable.

Q: Is the key interlock cable installed correctly?
YES : Go to Step 5.
NO : Install the key interlock cable correctly. Refer to P.23A-363. Check that the ignition key can not be turned to the "LOCK" (OFF) position with the selector lever at "P" position.

STEP 5. Check the key interlock cable.

Q: Is the key interlock cable in good condition?
YES : Go to Step 6.
NO : Replace the key interlock cable. Refer to P.23A-363. Check that the ignition key can not be turned to the "LOCK" (OFF) position with the selector lever at "P" position.

STEP 6. Check the fit of the transaxle control cable.

Q: Is the transaxle control cable installed correctly?
YES : Replace the steering lock cylinder assembly. Refer to P.37A-21 and P.37A-23. Check that the ignition key can not be turned to the "LOCK" (OFF) position with the selector lever at "P" position.
NO : Install the transaxle control cable correctly. Refer to P.23A-358. Check that the ignition key can not be turned to the "LOCK" (OFF) position with the selector lever at "P" position.

INSPECTION PROCEDURE 7: Ignition Key can be Turned to the "LOCK" (OFF) Position when Selector Lever is at any Position Other than "P" Position.

TECHNICAL DESCRIPTION (COMMENT)
Lock cam, steering lock cylinder assembly, transaxle control cable, or key interlock cable may be defective.

TROUBLESHOOTING HINTS
- Malfunction of lock cam
- Malfunction of steering lock cylinder assembly
- Malfunction of transmission control cable
- Malfunction of key interlock cable

DIAGNOSIS

STEP 1. Check the connection of lock cam and key interlock cable.

Q: Is the connection of lock cam and key interlock cable in good condition?
YES : Go to Step 2.
NO : Repair the connection of lock cam and shift lock cable. Check that the ignition key can not be turned to the "LOCK" (OFF) position with the selector lever at any position other than "P" position.

STEP 2. Check the fit of the lock cam.

Q: Is the lock cam installed correctly?
YES : Go to Step 3.
NO : Install the lock cam correctly. Refer to P.23A-361. Check that the ignition key can not be turned to the "LOCK" (OFF) position with the selector lever at any position other than "P" position.

STEP 3. Check the lock cam.

Q: Is the lock cam in good condition?
YES : Go to Step 4.
NO : Replace the lock cam. Refer to P.23A-361. Check that the ignition key can not be turned to the "LOCK" (OFF) position with the selector lever at any position other than "P" position.

STEP 4. Check the fit of the key interlock cable.

Q: Is the key interlock cable installed correctly?
YES : Go to Step 5.
NO : Install the key interlock cable correctly. Refer to P.23A-363. Check that the ignition key can not be turned to the "LOCK" (OFF) position with the selector lever at any position other than "P" position.

STEP 5. Check the key interlock cable.

Q: Is the key interlock cable in good condition?
YES : Go to Step 6.
NO : Replace the key interlock cable. Refer to P.23A-363. Check that the ignition key can not be turned to the "LOCK" (OFF) position with the selector lever at any position other than "P" position.

STEP 6. Check the fit of the transaxle control cable.

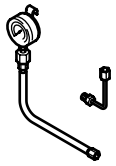
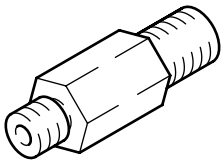
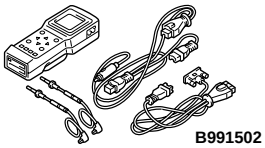
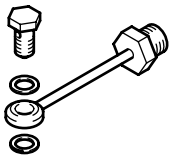
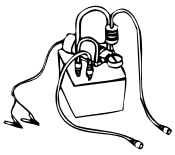
Q: Is the transaxle control cable installed correctly?

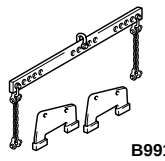
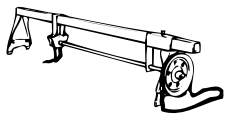
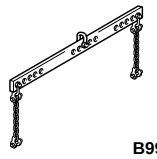
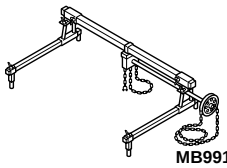
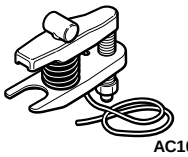
YES : Replace the steering lock cylinder assembly. Refer to P.37A-21 and P.37A-23. Check that the ignition key can not be turned to the "LOCK" (OFF) position with the selector lever at any position other than "P" position.

NO : Install the transaxle control cable correctly. Refer to P.23A-358. Check that the ignition key can not be turned to the "LOCK" (OFF) position with the selector lever at any position other than "P" position.

SPECIAL TOOLS

M1231000600167

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
	MD998330 (Includes MD998331) Oil pressure gauge (3.0 MPa, 427 psi)	MD998330-01	Measurement of hydraulic pressure
	MD998332 Adapter	MD998332-01	Connection for oil pressure gauge
	MD998478 Test harness (3 pin, triangle)	MD998478-01	Inspection using an oscilloscope
 B991502	MB991502 Scan tool (MUT-II)	MB991496-OD	Checking diagnostic trouble codes
	MB991709 Test harness set	Tool not available	Inspection using an oscilloscope
	MD998900 Adapter	MD998900-01	Connection for oil pressure gauge
	MB995062 Flushing tool	–	Flushing cooler and tube

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 B991453	MB991453 Engine hanger attachment set	MZ203827-01	When an engine lifer is used: Supporting the engine assembly during removal and installation of the transaxle
 MZ203827	GENERAL SERVICE TOOL MZ203827 Engine lifter	MZ203827-01	
 B991454	MB991454 Engine hanger balancer	MZ203827-01	When the engine hanger is used: Supporting the engine assembly during removal and installation of the transaxle *NOTE: Special tool MB991454 is a part of engine hanger attachment set MB991453.*
 MB991895	MB991895 Engine hanger	–	
 AC106827	MB991897 Ball joint remover	MB991113-01, MB990635-01 or general service tool	Knuckle and tie rod end ball joint breakaway torque check *NOTE: Steering linkage puller(MB990635 or MB991113)is also used to disconnect knuckle and tie rod end ball joint.*

ON-VEHICLE SERVICE

A/T CONTROL COMPONENT LAYOUT

M1231008600149

NAME	SYMBOL	NAME	SYMBOL
A/T control relay	D	Park/Neutral position (PNP) switch	F
A/T fluid temperature sensor	G	Power train control module (PCM)	H
Crankshaft position sensor <2.4L Engine>	E	Shift switch assembly <Vehicles with sport mode>	K
Crankshaft position sensor <3.0L Engine>	E	Solenoid valves	G
Data link connector	J	Stoplight switch	I
Dual pressure switch	A	Throttle position sensor <2.4L Engine>	B
Input shaft speed sensor	C	Throttle position sensor <3.0L Engine>	B
Output shaft speed sensor	C		

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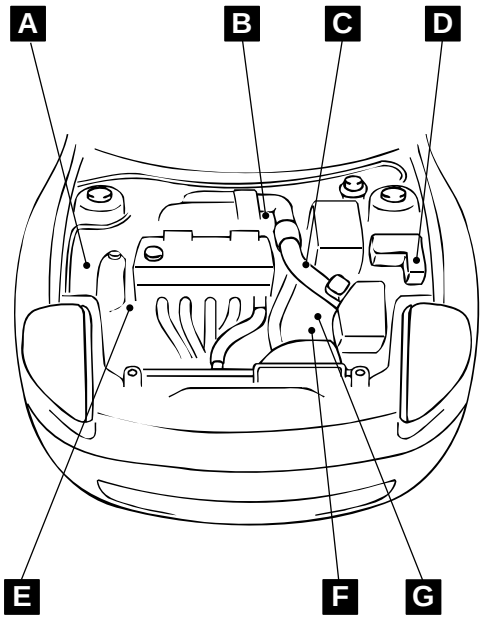

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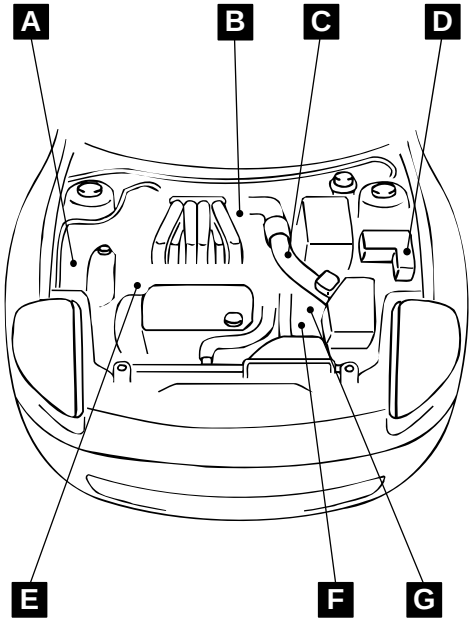

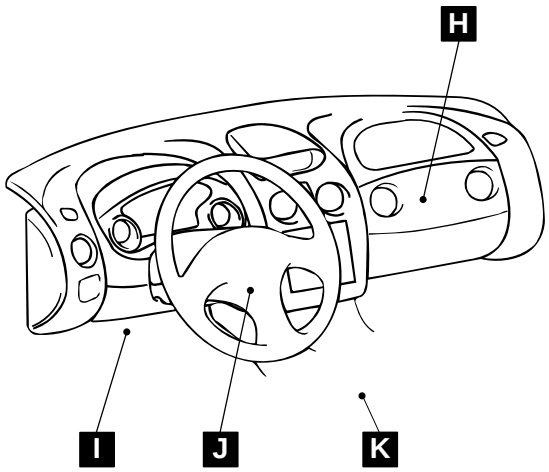

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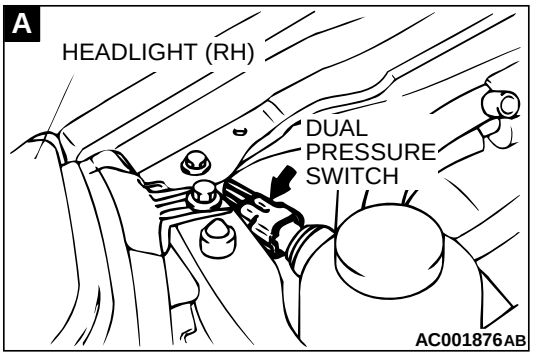

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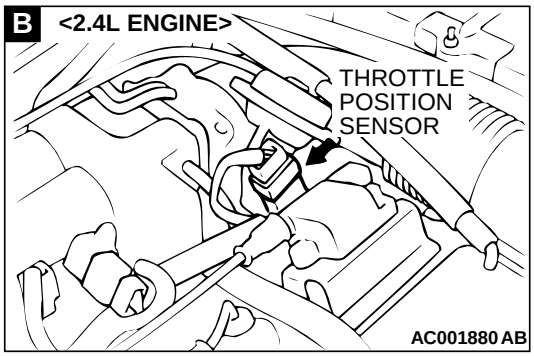

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TSB Revision

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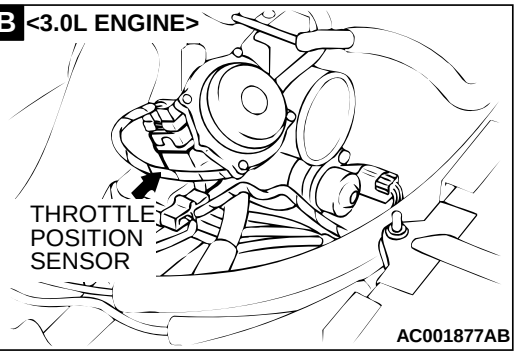

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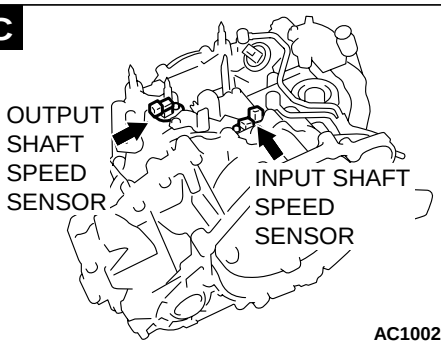

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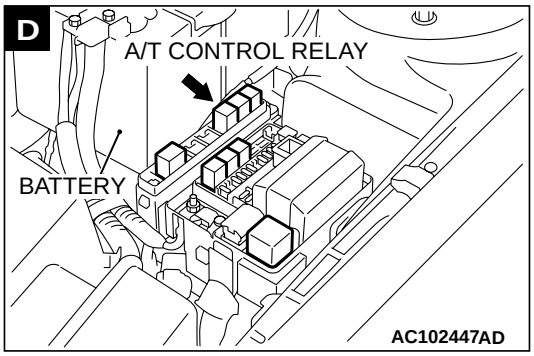

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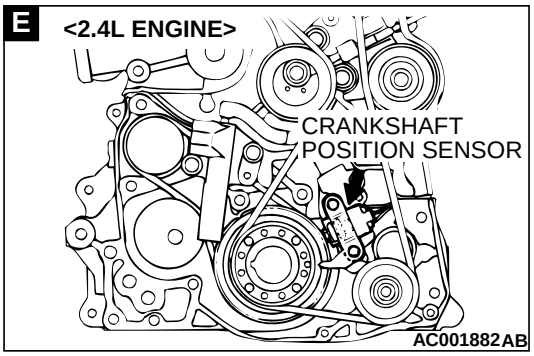

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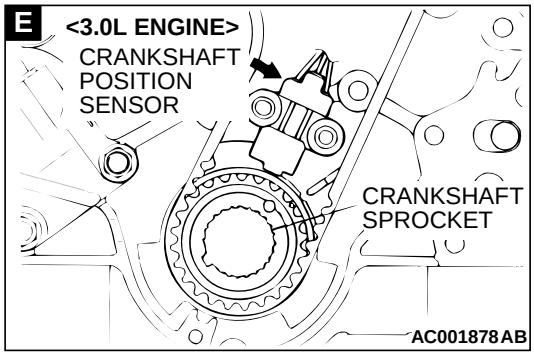

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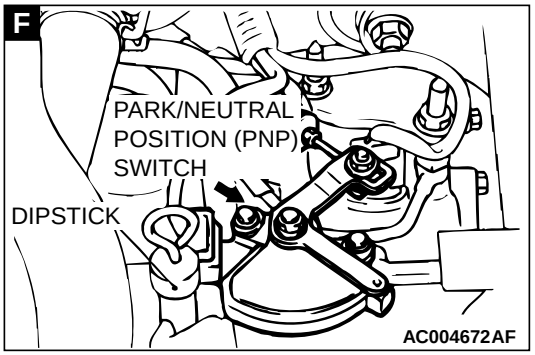

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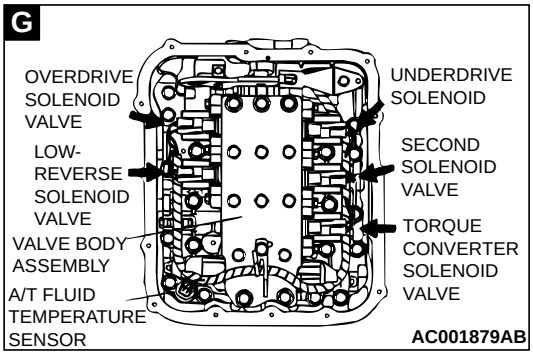

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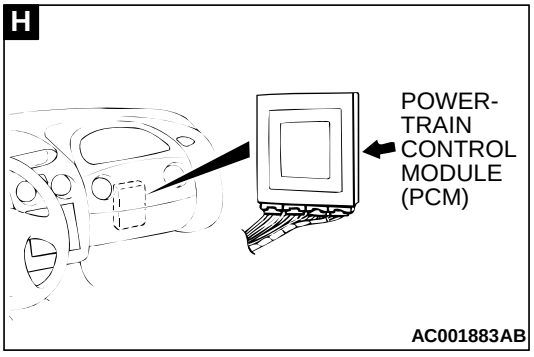
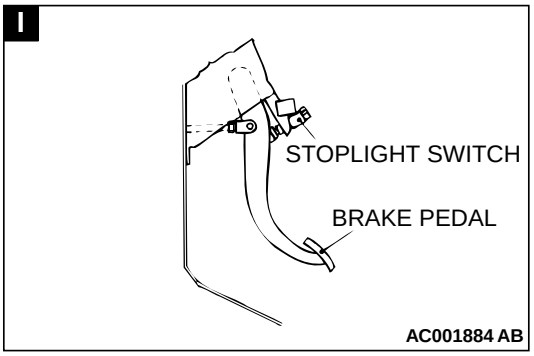
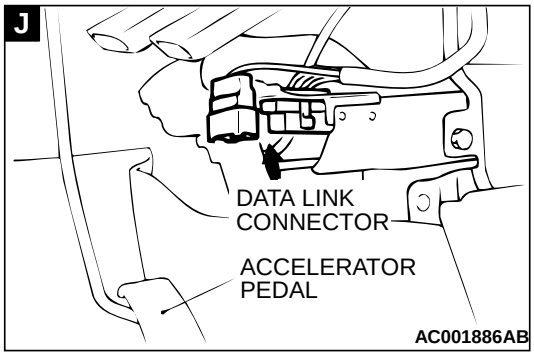
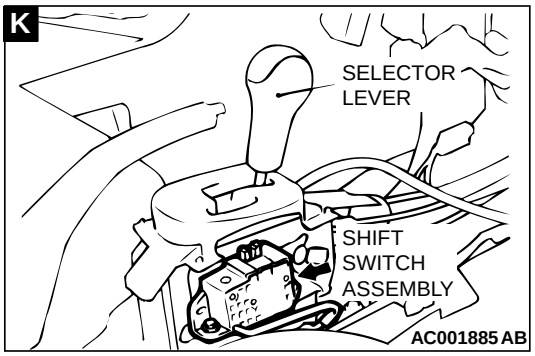








ESSENTIAL SERVICE

A/T FLUID CHECK

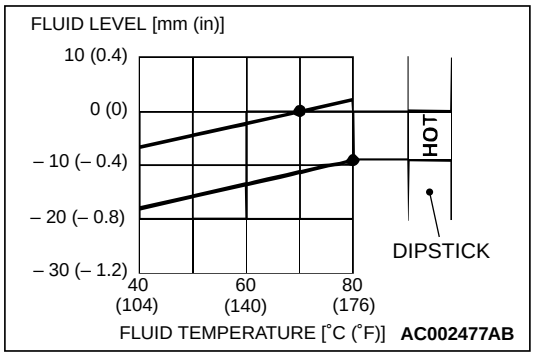
M1231000900157

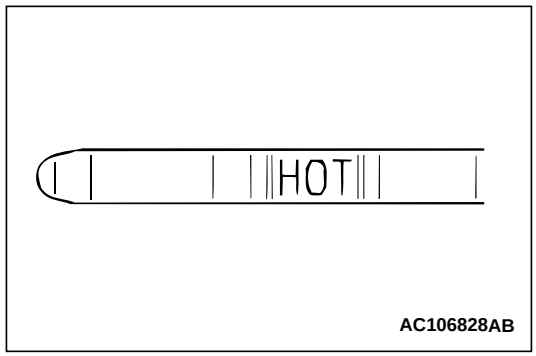
1. Drive the vehicle until the A/T fluid temperature rises to the normal temperature [70 – 80°C (158 – 176°F)].

   NOTE: The A/T fluid temperature is measured with scan tool (MUT-II).

   NOTE: If it takes some amount of time until the A/T fluid reaches its normal operating temperature [70 – 80°C (158 – 176°F)], check the A/T fluid level by referring to the left diagram.
2. Park the vehicle on a level surface.
3. Move the selector lever through all positions to fill the torque converter and the hydraulic circuits with fluid, and then move the selector lever to the "N" position.
4. After wiping off any dirt around the dipstick, remove the dipstick and check the condition of the A/T fluid.

   NOTE: If the A/T fluid smells as if it is burnt, it means that the A/T fluid has been contaminated by fine particles from the bushings and friction materials. A transaxle overhaul and cooler line flushing may be necessary.
5. Check that the A/T fluid level is at the "HOT" mark on the dipstick. If the A/T fluid level is lower than this, pour in more DIAMOND ATF SP III or equivalent until the level reaches the "HOT" mark.





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NOTE: If the A/T fluid level is too low, the oil pump will draw in air along with the A/T fluid, which will cause bubbles to form. If the A/T fluid level is too high, rotating components inside the transaxle will churn the fluid and air into a foamy liquid. Both conditions (level too low or too high) will cause the hydraulic pressure to drop, which will result in late shifting and slipping of the clutches and brakes.

NOTE: In either case, air bubbles can interfere with normal valve, clutch, and brake operation. Also, foaming can cause A/T fluid to escape from the transaxle vents where case it may be mistaken for a leak.

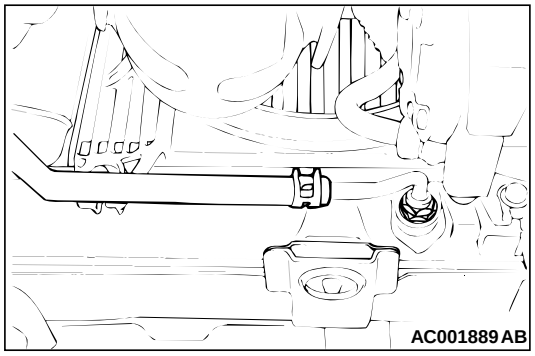
6. Securely insert the dipstick.

NOTE: The A/T fluid should always be replaced in the following conditions:

- *When troubleshooting the transaxle*
- *When overhauling the transaxle*
- *When the A/T fluid is noticeably dirty or burnt (driving under severe conditions)*

A/T FLUID REPLACEMENT

M1231001000146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If you have an A/T fluid changer, use this changer to replace the A/T fluid. If you do not have an A/T fluid changer, replace the A/T fluid by the following procedure.

1. Disconnect the hose shown in the illustration which connects the transaxle and the oil cooler (inside the radiator). Place a container under the hose to collect the discharge.

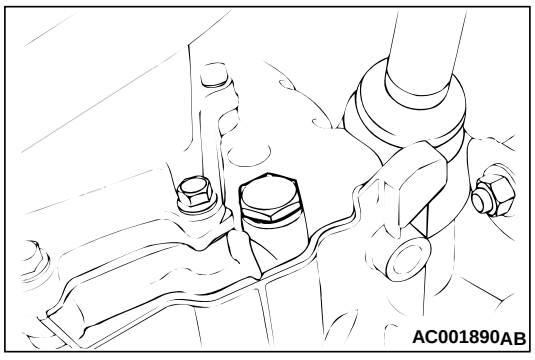
⚠ CAUTION

The engine should be stopped within one minute after it is started. If the A/T fluid has all drained out before then, the engine should be stopped at that point.

Discharge volume: Approximately 3.5 dm^3 (3.7 quarts)

2. Start the engine and let the A/T fluid drain out.

Running conditions: "N" range with engine idling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3. Remove the drain plug from the bottom of the transaxle case to drain the A/T fluid.

Discharge volume: Approximately 2.0 dm^3 (2.1 quarts)

4. Install the drain plug with a new gasket, and tighten it to the specified torque.

Tightening torque: 32 ± 2 N·m (24 ± 1 ft-lb)

⚠ CAUTION

Stop pouring if the full volume of A/T fluid cannot be poured in.

5. Pour new A/T fluid (DIAMOND ATF SP III or equivalent) in through the oil filter tube.

Adding volume: Approximately 5.5 dm^3 (5.8 quarts)

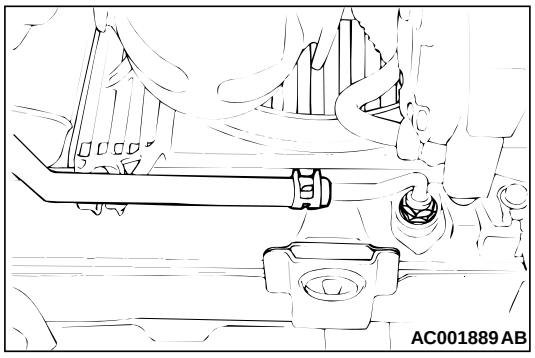
6. Repeat the procedure in Step 2. (to pump out the rest of the contaminated A/T fluid)

7. Pour the new A/T fluid in through the oil filler tube.

   Adding volume: Approximately 3.5 dm^3 (3.7 quarts)

   NOTE: Check for contamination or burnt smell. If fluid is still contaminated or burnt, repeat Steps 6 and 7 before proceeding to Step 8.

8. Reconnect the hose which was disconnected in step 1 above, and firmly replace the dipstick.
9. Start the engine and run it at idle for one to two minutes.
10. Move the selector lever through all positions, and then move it to the "N" position.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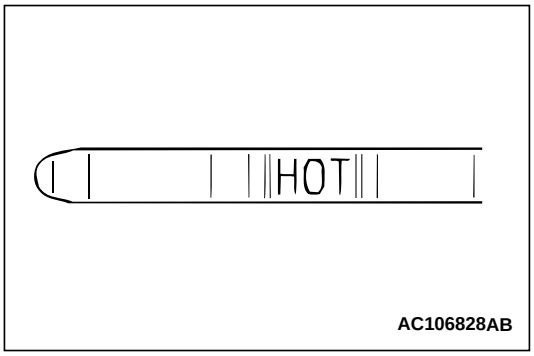


AC106828AB

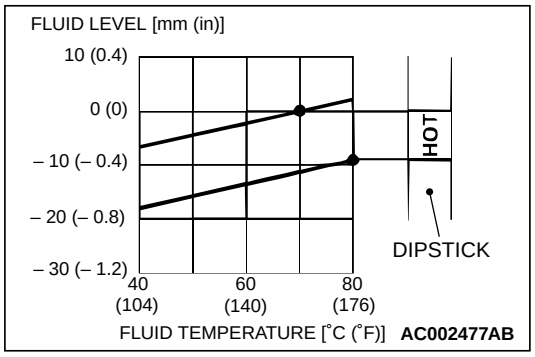
11. Check that the A/T fluid level is at the "COLD" mark on the dipstick. If the level is lower than this, pour in more A/T fluid.
12. Drive the vehicle until the A/T fluid temperature rises to the normal temperature [70 – 80°C (158 – 176°F)], and then check the A/T fluid level again. The A/T fluid level must be at the "HOT" mark.

    NOTE: The A/T fluid temperature is measured with scan tool (MUT-II).

    NOTE: The "COLD" level is for reference only; the "HOT" level should be regarded as the standard level.

    NOTE: If it takes some amount of time until the A/T fluid reaches its normal operating temperature [70 – 80°C (158 – 176°F)], check the A/T fluid level by referring to the left diagram.

13. When A/T fluid is under the specified level, pour in more A/T fluid. When A/T fluid is under the specified level, drain the excessive A/T fluid from the drain plug to adjust A/T fluid level to the specified level.
14. Firmly insert the dipstick into the oil filler tube.



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FLUSHING COOLERS AND TUBES

M1231013000143

Required Special Tool:
MB995062: Flushing Tool

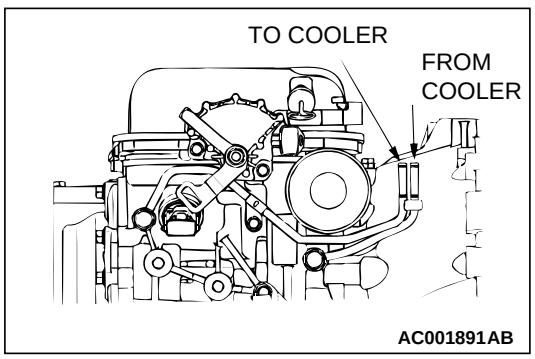
⚠ WARNING

- ***Wear protective eye wear that meets the requirements of OSHA and ANSI Z87.1 – 1968. Wear standard industrial rubber gloves.***
- ***Keep lighted cigarettes, sparks, flames, and other ignition sources away from the area to prevent the ignition of combustible liquids and gases. Keep a class (B) fire extinguisher in the area where the flushing tool will be used. Keep the area well ventilated. Do not let flushing solvent come in contact with eyes or skin. In case it does, flush with water for 15 to 20 seconds. Remove contaminated clothing and wash affected skin with soap and water. Seek medical attention.***

When a transaxle failure has contaminated the A/T fluid, the oil cooler(s) must be flushed. The cooler by-pass valve in the transaxle must also be replaced. The torque converter must also be replaced with an exchange unit. This will ensure that metal particles or sludged A/T fluid are not later transferred back into the reconditioned (or replaced) transaxle. There are two different procedures for flushing coolers and lines. The recommended procedure is to use Tool MB995062 Cooler Flusher. The other procedure is to use a hand suction gun and mineral spirits.

1. Remove the cover plate filler plug on special tool MB995062. Fill the reservoir 1/2 to 3/4 full of fresh flushing solution. Flushing solvents are petroleum based solutions generally used to clean transaxle components. Do not use solvents containing acids, water, gasoline, or any other corrosive liquids.
2. Reinstall filler plug on special tool MB995062.
3. Verify the pump power switch is turned "OFF." Connect the red alligator clip to the positive battery terminal. Connect the black alligator clip to a good ground.
4. Disconnect the cooler lines at the transaxle.

   NOTE: When flushing the transaxle cooler and lines, always reverse flush.
5. Connect the BLUE pressure line to the OUTLET (From) cooler line.
6. Connect the CLEAR return line to the INLET (To) cooler line.
7. Turn the pump "ON" for two to three minutes to flush the cooler(s) and lines. Monitor the pressure readings. Clear the return lines. Pressure readings should stabilize below 138 kPa (20 psi) for vehicles equipped with a single cooler and 208 kPa (30 psi) for vehicles equipped with dual coolers. If flow is intermittent or exceeds these pressures, replace the cooler.



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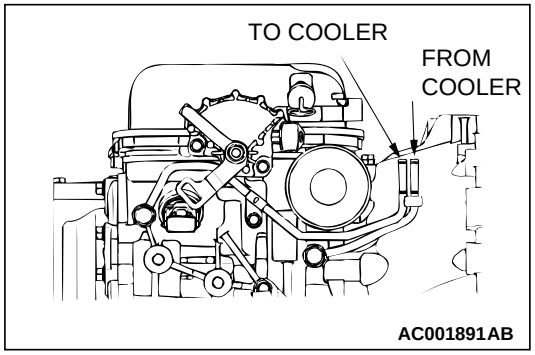
8. Turn the pump "OFF."
9. Disconnect the CLEAR suction line from the reservoir at cover plate. Disconnect the CLEAR return line at the cover plate, and place it in a drain pan.
10. Turn the pump "ON" for 30 seconds to purge flushing solution from the cooler and lines. Turn the pump "OFF."
11. Place the CLEAR suction line into a one quart container of DIAMOND ATF SP III or equivalent A/T fluid.
12. Turn the pump "ON" until all A/T fluid is removed from the one quart container and lines. This purges any residual cleaning solvent from the transaxle cooler and lines. Turn the pump "OFF."
13. Disconnect the alligator clips from the battery. Reconnect the flusher lines to the cover plate, and remove the flushing adapters from the cooler lines. Reconnect the cooler lines.

OIL COOLER FLOW CHECK

M1231013100139



After the new or repaired transaxle has been installed, fill to the proper level with DIAMOND ATF SP III or equivalent A/T fluid. The flow should be checked using the following procedure:

⚠ CAUTION

With the fluid set at the proper level, A/T fluid collection should not exceed one quart or internal damage to the transaxle may occur.

1. Disconnect the OUTLET (From cooler) line at the transaxle and place a collecting container under the disconnected line.
2. Run the engine at curb idle speed with the shift selector in neutral.
3. If A/T fluid flow is intermittent or it takes more than 20 seconds to collect one quart of A/T fluid, replace the cooler.
4. If flow is found to be within acceptable limits, reconnect the cooler line. Then fill the transaxle to the proper level, using DIAMOND ATF SP III or equivalent fluid.

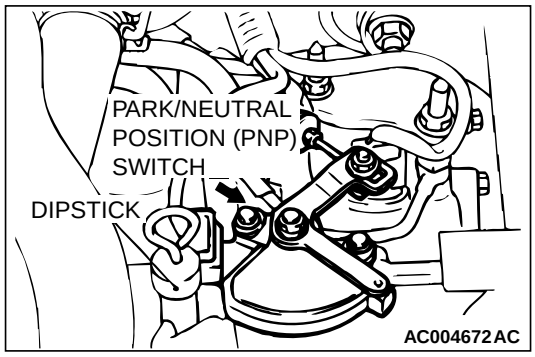
THROTTLE POSITION SENSOR ADJUSTMENT

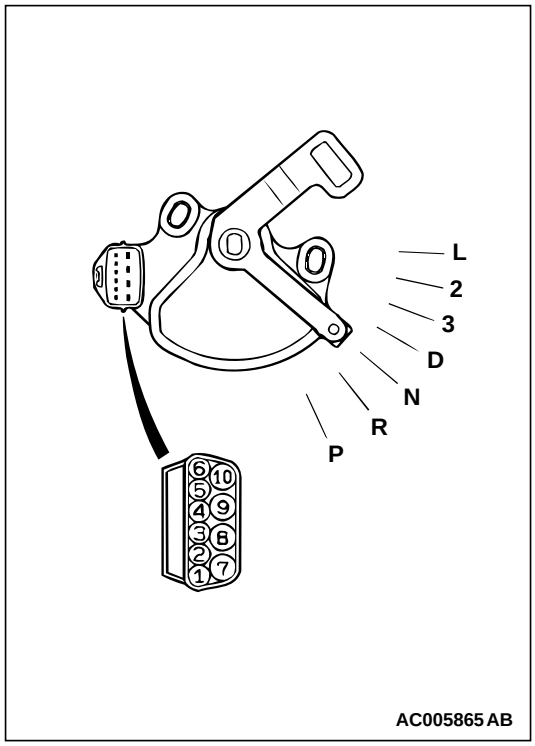
M1231001900127

Refer to GROUP 13A <2.4L Engine>, On-vehicle Service – Throttle Position Sensor Adjustment P.13A-576.
Refer to GROUP 13B <3.0L Engine>, On-vehicle Service – Throttle Position Sensor Adjustment P.13B-677.

PARK/NEUTRAL POSITION SWITCH CONTINUITY CHECK

M1231001400252



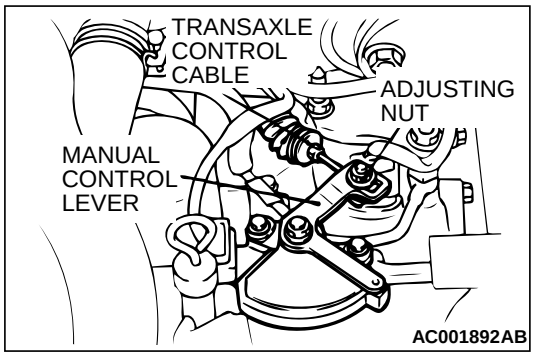


ITEMS	TERMINAL CONNECTION OF TESTER	SPECIFIED CONDITION
P	3 – 8, 9 – 10	Less than 2 ohm
R	7 – 8	
N	4 – 8, 9 – 10	
D	1 – 8	
3	5 – 8	
2	2 – 8	
L	6 – 8	

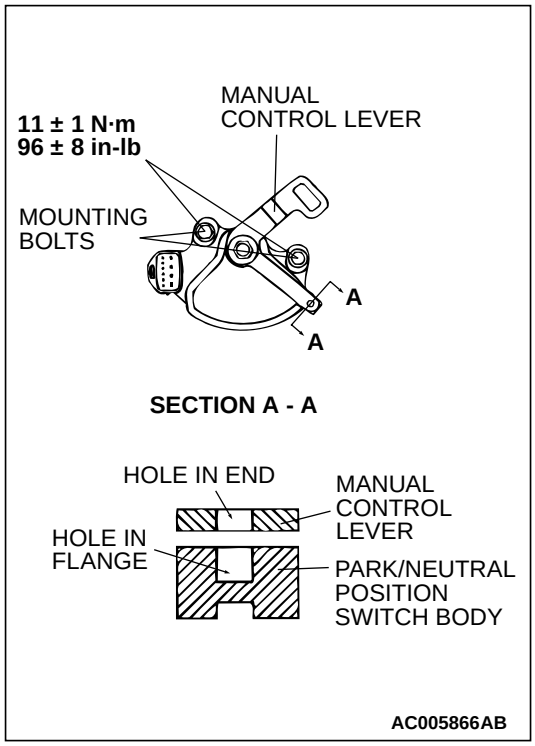
NOTE: For vehicles with sport mode, four positions (P, R, N, D) are used.

PARK/NEUTRAL POSITION SWITCH AND CONTROL CABLE ADJUSTMENT

M1231010300134



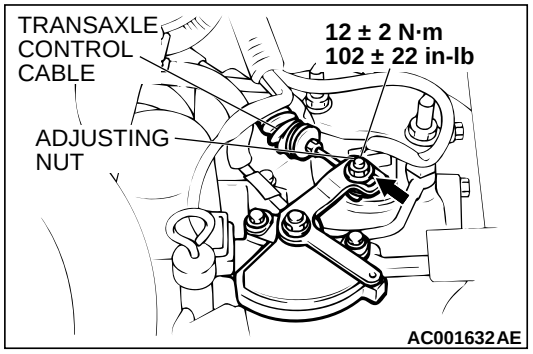
1. Set the selector lever to the "N" position.
2. Loosen the control cable to the manual control lever coupling nut to free the cable and lever.
3. Set the manual control lever to the neutral position.



4. Loosen the park/neutral position switch body mounting bolts and turn the park/neutral position switch body so the hole in the end of the manual control lever and the hole (section A – A in the figure on the left) in the flange of the park/neutral position switch body flange are aligned.

   NOTE: The park/neutral position switch body can be aligned by inserting a 5-mm diameter steel bar into the end hole of the manual control lever and the flange hole of the park/neutral position switch body.
5. Tighten the park/neutral position switch body mounting bolts to the specified torque. Be careful at this time that the switch body does not move.

   Tightening torque: 11 ± 1 N·m (96 ± 8 in-lb)



6. Gently push the transaxle control cable in the direction of the arrow, until the cable is taut. Tighten the adjusting nut.

   Tightening torque: 12 ± 2 N·m (102 ± 22 in-lb)
7. Check that the selector lever is in the "N" position.
8. Check that each position of the manual control lever matches each position of the selector lever and using scan tool.

AUTOMATIC TRANSAXLE CONTROL COMPONENT CHECK

CRANKSHAFT POSITION SENSOR CHECK

M1231009000151

Refer to GROUP 13A <2.4L Engine>, Diagnosis – Inspection Procedure Using an Oscilloscope P.13A-560.
Refer to GROUP 13B <3.0L Engine>, Diagnosis – Inspection Procedure Using an Oscilloscope P.13B-661.

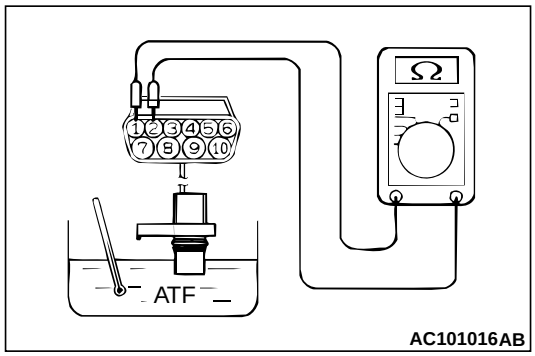
THROTTLE POSITION SENSOR CHECK

M1231003900123

Refer to GROUP 13A <2.4L Engine>, On-vehicle Service – Throttle Position Sensor Check P.13A-584.
Refer to GROUP 13B <3.0L Engine>, On-vehicle Service – Throttle Position Sensor Check P.13B-683.

A/T FLUID TEMPERATURE SENSOR CONTINUITY CHECK

M1231004500139



1. Remove the A/T fluid temperature sensor.
2. Measure the resistance between terminals 1 and 2 of the A/T fluid temperature sensor connector.

   Standard value:

A/T FLUID TEMPERATURE	RESISTANCE
0°C (32°F)	16.7 – 20.5 kΩ
20°C (68°F)	7.3 – 8.9 kΩ
40°C (104°F)	3.4 – 4.2 kΩ
60°C (140°F)	1.9 – 2.2 kΩ
80°C (176°F)	1.0 – 1.2 kΩ
100°C (212°F)	0.57 – 0.69 kΩ

3. If the A/T fluid temperature sensor resistance is not consistent with the fluid temperature, replace A/T fluid temperature sensor.

   NOTE: The N range indicator light on the combination meter flashes when the temperature reaches approximately 125°C (257°F) or higher, and then stops flashing when the temperature drops below approximately 115°C (239°F).

PARK/NEUTRAL POSITION SWITCH CHECK

M1231001400263

Refer to P.23A-351.

STOPLIGHT SWITCH CHECK

M1231009100114

Refer to GROUP 35A, On-vehicle Service – Stoplight Switch Check P.35A-18.

PRESSURE SWITCH CHECK

M1231004700122

Refer to GROUP 55A, On-vehicle Service – Pressure Switch Check P.55-25.

SELECT SWITCH CHECK

M1231012700064

Refer to P.23A-363.

SHIFT SWITCH (UP) CHECK

M1231012800050

Refer to P.23A-363.

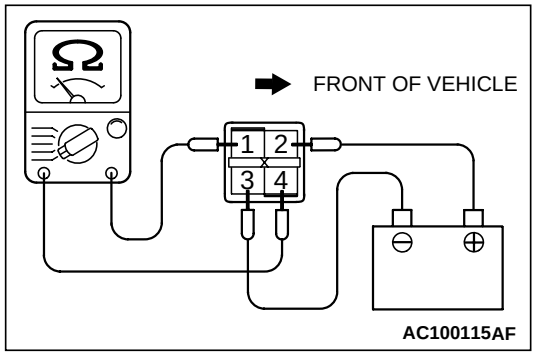
SHIFT SWITCH (DOWN) CHECK

M1231012900057

Refer to P.23A-363.

A/T CONTROL RELAY CHECK

M1231009300118



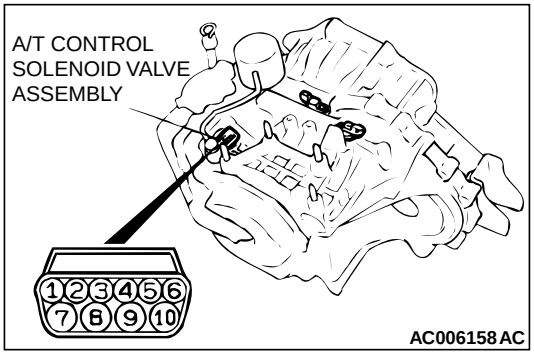
1. Remove the A/T control relay.
2. Use jumper wires to connect the A/T control relay terminal 2 to the positive battery terminal and terminal 3 to the negative battery terminal.
3. Check the continuity between terminal 1 and terminal 4 of the A/T control relay when the jumper wires are connected to and disconnected from the battery.

JUMPER WIRE	CONTINUITY BETWEEN TERMINALS NO.1 AND NO.4
Connected	Less than 2 ohm
Disconnected	Open circuit

4. If there is any problem with the A/T control relay, replace it.

SOLENOID VALVE CHECK

M1231009400115

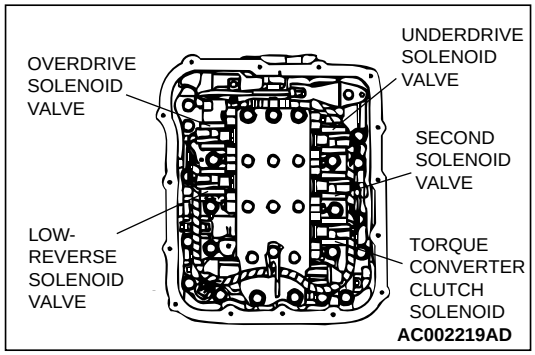


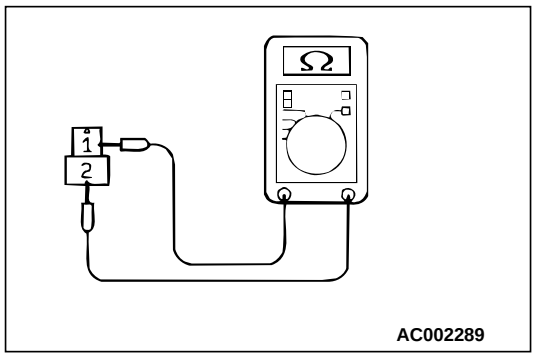
1. Use the scan tool to measure the ATF temperature and set the ATF temperature to 20°C (68°F).
2. Remove the A/T control solenoid valve assembly connector.
3. Measure the resistance between the solenoid valve terminals.
4. Check that the measured values are within the standard values at Steps 1 and 2.

Standard value:

TERMINAL CONNECTION OF TESTER	ITEMS	RESISTANCE
7 - 10	Torque converter clutch solenoid valve	2.7 – 3.4 Ω [at 20°C (68°F)]
6 - 10	Low-reverse solenoid valve	
4 - 9	Second solenoid valve	
3 - 9	Underdrive solenoid valve	
5 - 9	Overdrive solenoid valve	

5. If within the standard value, check the power supply and the ground circuits.
6. If not within the standard value, drain the ATF and remove the valve body cover.
7. Disconnect the connectors of each solenoid valve.

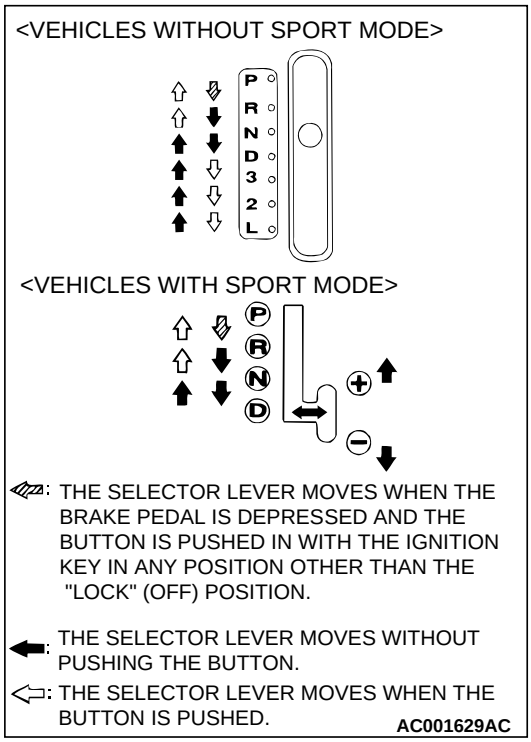




8. Measure the resistance between terminals 1 and 2 of each solenoid valve.

   Standard value: 2.7 – 3.4 Ω [at 20°C (68°F)]

9. If the resistance is not within the standard value, replace the solenoid valve.
10. If within the standard value, check each wiring harness between A/T control solenoid valve assembly and each solenoid valve. If a problem is not found at the steps above, check the solenoid valve O-rings and replace if necessary.



SELECTOR LEVER OPERATION CHECK

M1231001300211

1. Apply the parking brake, and check that the selector lever moves smoothly and accurately to each position.
2. Check that the engine starts when the selector lever is at the "N" or "P" position, and that it does not start when the selector lever is in any other position.
3. Start the engine, release the parking brake, and check that the vehicle moves forward when the selector lever is moved from "N" position to "D," "3," "2" or "L" position or to 1st or 2nd gear in Sports mode, and that the vehicle reverses when the selector lever is moved to "R" position.
4. Stop the engine.
5. Turn the ignition switch to the "ON" position, and check that the backup lamp illuminates when the selector lever is shifted from "P" position to "R" position.

   NOTE: The A/T mis-operation prevention mechanism is provided so that the selector lever cannot be moved from the "P" position if the ignition switch is at a position other than the "LOCK" (OFF) position and the brake pedal is not depressed.

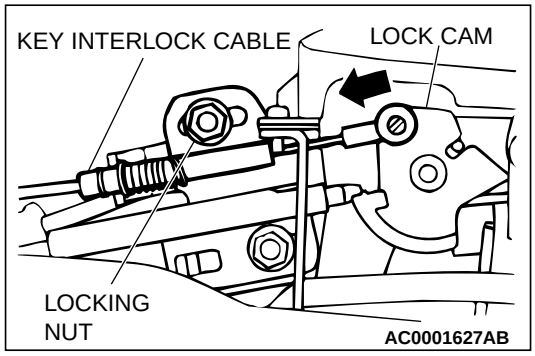
KEY INTERLOCK MECHANISM CHECK

M1232000900202

1. Carry out the following inspection.

INSPECTION PROCEDURE	INSPECTION REQUIREMENTS	INSPECTION ITEM (NORMAL CONDITION)	
1	Brake pedal: Depressed	Ignition key position: "LOCK" (OFF) or removed	Push in the selector lever push button. Shifting from "P" position to other positions is not possible.
2		Ignition key position: "ACC"	Push in the selector lever push button. Shifting from "P" position to other positions is possible.
3	Brake pedal: Not depressed	Selector lever: Other than "P" position	Turning the ignition key to "LOCK" (OFF) position is not possible.
4		Selector lever: "P" position	Turning the ignition key to "LOCK" (OFF) position smoothly is possible.

2. When any of the above checks are not normal, adjust the key interlock cable in following procedure.
   (1) Remove the floor console. (Refer to GROUP 52A – Floor Console P.52A-8.)
   (2) Shift selector lever to "P" position.
   (3) Turn the ignition key to "LOCK" (OFF) position.



(4) Loosen the locking nut of the key interlock cable.
(5) Push the cable joint on the lock cam gently toward the arrow until the cable stops. Tighten the locking nut.
(6) Install the floor console.

3. After adjusting, check the operation once more. If the operation is still incorrect, replace the key interlock cable. (Refer to P.23A-363.)

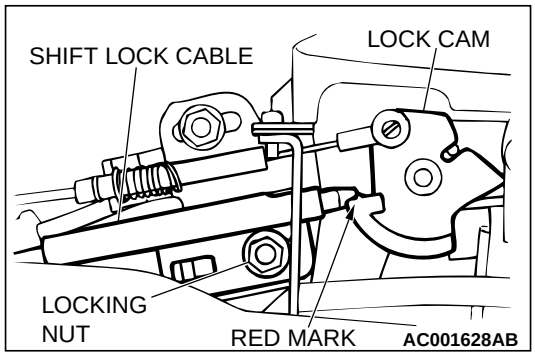
SHIFT LOCK MECHANISM CHECK

M1232001000194

1. Carry out the following inspections.

INSPECTION PROCEDURE	INSPECTION CONTENTS		CHECK DETAILS (NORMAL CONDITION)
1	Brake pedal: Not depressed	Ignition key position: "ACC"	Push in the selector lever push button. Shifting from "P" position to other positions is not possible.
2	Brake pedal: Depressed		Push in the selector lever push button. Shifting from "P" position to other positions smoothly is possible.
3	Brake pedal: Not depressed		Push in the selector lever push button. Shifting from "R" position to "P" position smoothly is possible.

2. When the above operations are defective, adjust the shift lock cable as follows:
(1) Remove the floor console. (Refer to GROUP 52A – Floor Console P.52A-8.)
(2) Shift selector lever to "P" position.
(3) Loosen the locking nut of shift lock cable.
(4) Tighten the locking nut so that the end of the shift lock cable comes above the red marking of the lock cam.
(5) Install the floor console.
3. After adjusting, check the operation once more. If the operation is still incorrect, replace the shift lock cable. (Refer to P.23A-363.)



TRANSAXLE CONTROL

REMOVAL AND INSTALLATION

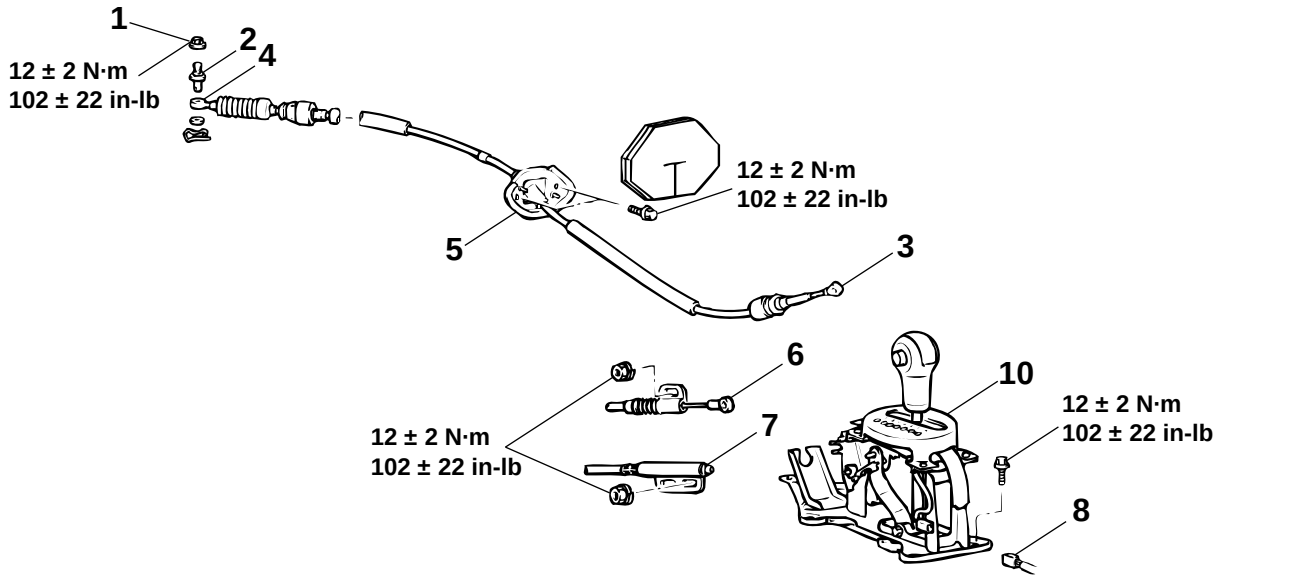
M1231006600165

⚠ CAUTION

When removing and installing the transmission control cable and shift lock cable unit, be careful not to hit the SRS-ECU.

Pre-removal and Post-installation Operation
- Air Cleaner Assembly Removal and Installation (Refer to GROUP 15 P.15-6.)
- Battery and Battery Tray Removal and Installation (Refer to GROUP 54A P.54A-8.)
- Front Driver's Side Under Cover Removal and Installation (Refer to GROUP 52A, Instrument Panel P.52A-3.)
- Floor Console Box Removal and Installation (Refer to GROUP 52A, Floor Console P.52A-8.)

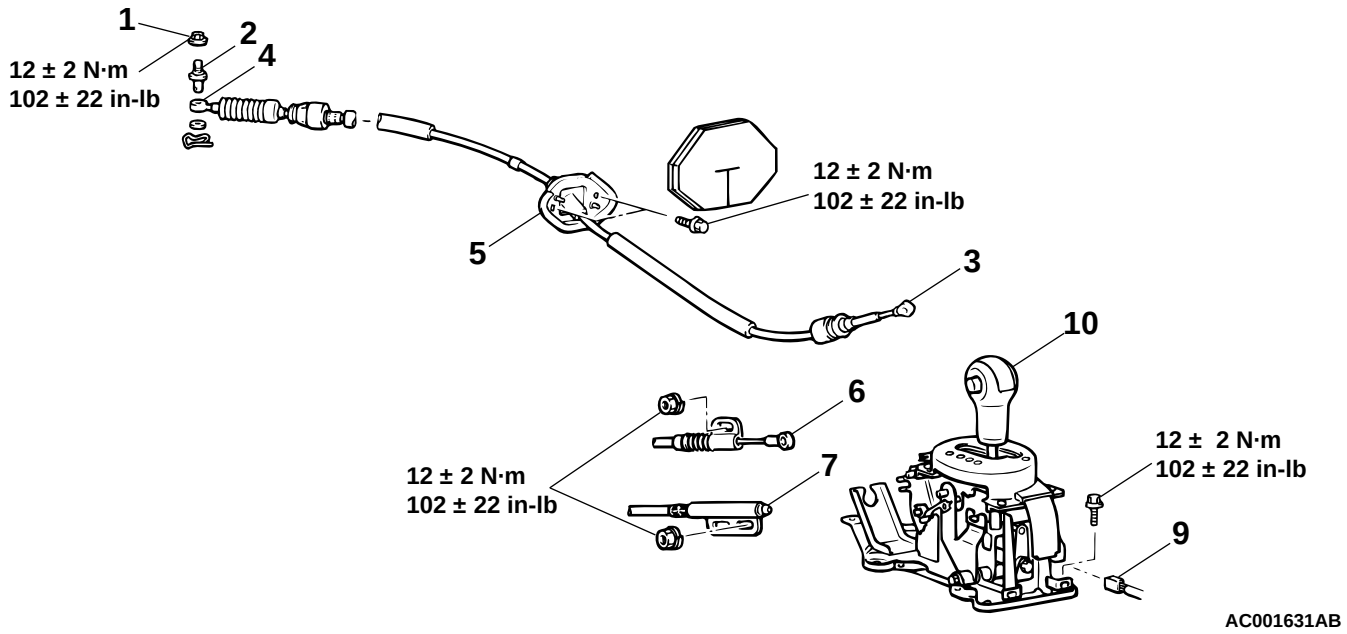
<VEHICLES WITHOUT SPORT MODE>



AC001630AB

TSB Revision

<VEHICLES WITH SPORT MODE>



TRANSAXLE CONTROL CABLE ASSEMBLY REMOVAL STEPS

>>C<< 1. NUT
2. ADJUSTER
3. TRANSAXLE CONTROL CABLE ASSEMBLY CONNECTION (SELECTOR LEVER ASSEMBLY SIDE)
4. TRANSAXLE CONTROL CABLE ASSEMBLY (TRANSAXLE SIDE)
- HEATER/COOLER UNIT (REFER TO GROUP 55, HEATER/COOLER UNIT, HEATER CORE AND EVAPORATOR P.55-35.)
5. TRANSAXLE CONTROL CABLE ASSEMBLY

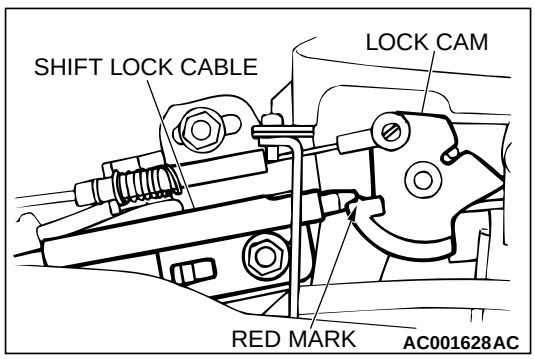
SELECTOR LEVER ASSEMBLY REMOVAL STEPS

3. TRANSAXLE CONTROL CABLE ASSEMBLY CONNECTION (SELECTOR LEVER ASSEMBLY SIDE)
>>B<< 6. KEY INTERLOCK CABLE CONNECTION (SELECTOR LEVER SIDE)
>>A<< 7. SHIFT LACK CABLE CONNECTION (SELECTOR LEVER SIDE)
8. A/T SELECTOR LEVER POSITION ILLUMINATION LIGHT CONNECTOR
9. HARNESS CONNECTOR
10. SELECTOR LEVER ASSEMBLY

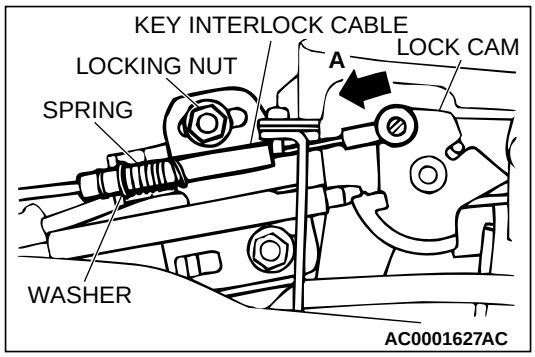
INSTALLATION SERVICE POINTS

>>A<< SHIFT LOCK CABLE (SELECTOR LEVER SIDE) INSTALLATION

1. Place the selector lever to "P" position.
2. Fasten the shift lock cable at the position where the end of the shift lock cable is positioned above the red marking.



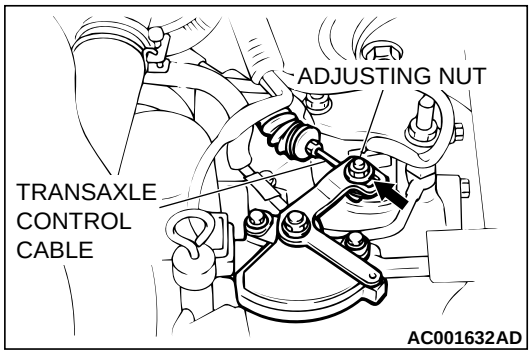
TSB Revision



>>B<< KEY INTERLOCK CABLE (SELECTOR LEVER SIDE) INSTALLATION

1. Install the key interlock cable on the lock cam.
2. Install the spring and washer of the key interlock cable as shown.
3. While lightly pushing the cable coupling portion of the lock cam in the direction A, tighten the nut to the specified torque.

   Tightening torque: 12 ± 2 N·m (102 ± 22 in-lb)



>>C<< NUT INSTALLATION

1. Put the selector lever in the "N" position.
2. Loosen the nut. Gently push the transaxle control cable in the direction of the arrow until the cable is taut. Tighten the nut at the specified torque.

   Tightening torque: 12 ± 2 N·m (102 ± 22 in-lb)

INSPECTION

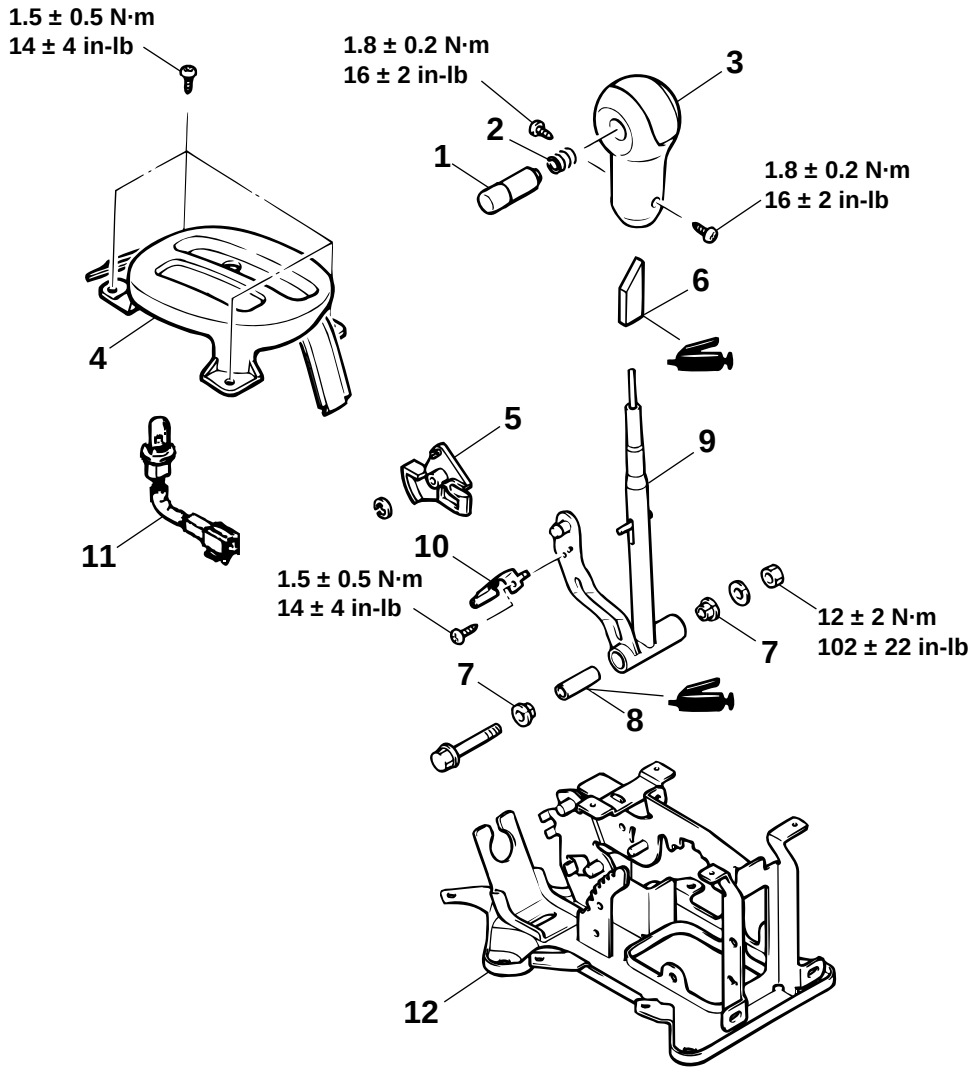
M1231006700117

Check the cable assembly for function and for damage.

DISASSEMBLY AND ASSEMBLY

M1231006800181

<VEHICLES WITHOUT SPORT MODE>



AC001633AB

REMOVAL STEPS

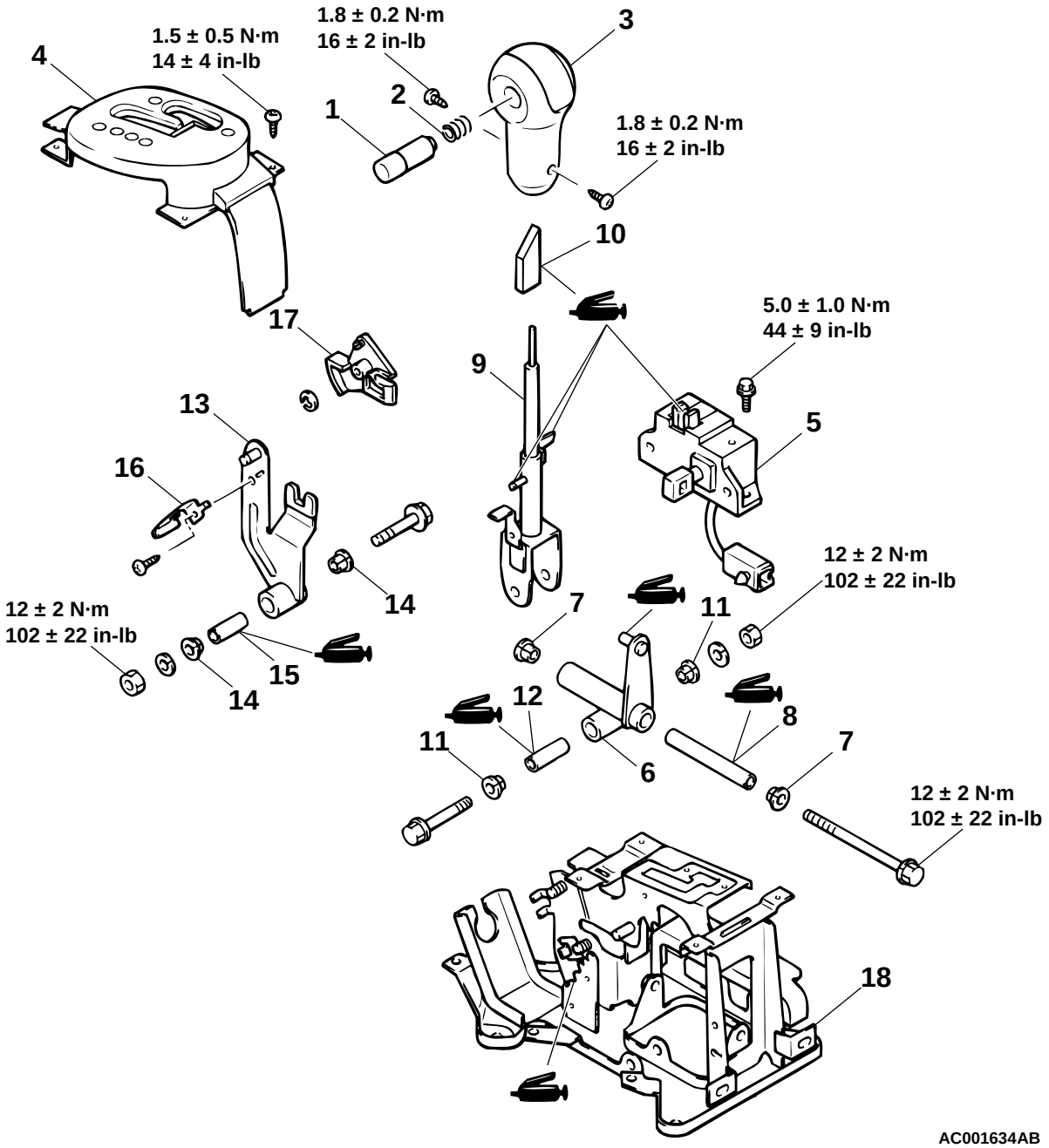
1. PUSH BUTTON
2. SPRING
3. SHIFT KNOB
4. INDICATOR PANEL ASSEMBLY
5. LOCK CAM
6. SLEEVE
7. BUSHING

REMOVAL STEPS (Continued)

8. PIPE
9. LEVER ASSEMBLY
10. DETENTE SPRING
11. POSITION INDICATOR LAMP ASSEMBLY
12. BASE BRACKET

TSB Revision

<VEHICLES WITH SPORT MODE>



REMOVAL STEPS

1. PUSH BUTTON
2. SPRING
3. SHIFT KNOB
4. INDICATOR PANEL ASSEMBLY
5. SHIFT SWITCH
6. SELECT LEVER
7. BUSHING
8. PIPE
9. LEVER ASSEMBLY

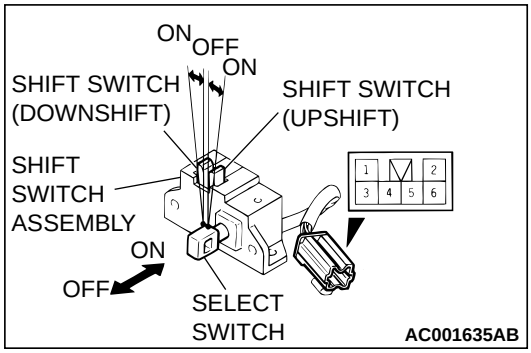
REMOVAL STEPS (Continued)

10. SLEEVE
11. BUSHING
12. PIPE
13. CABLE ARM
14. BUSHING
15. PIPE
16. DETENTE SPRING
17. LOCK CAM
18. BASE BRACKET

TSB Revision

INSPECTION

M1231006900111



SHIFT SWITCH ASSEMBLY CONTINUITY CHECK

SWITCH POSITION		TERMINAL NO.
Select switch	ON	1 – 5
	OFF	1 – 2
Shift switch (up shift)	ON	3 – 6
	OFF	–
Shift switch (down shift)	ON	4 – 6
	OFF	–

A/T KEY INTERLOCK AND SHIFT LOCK MECHANISMS

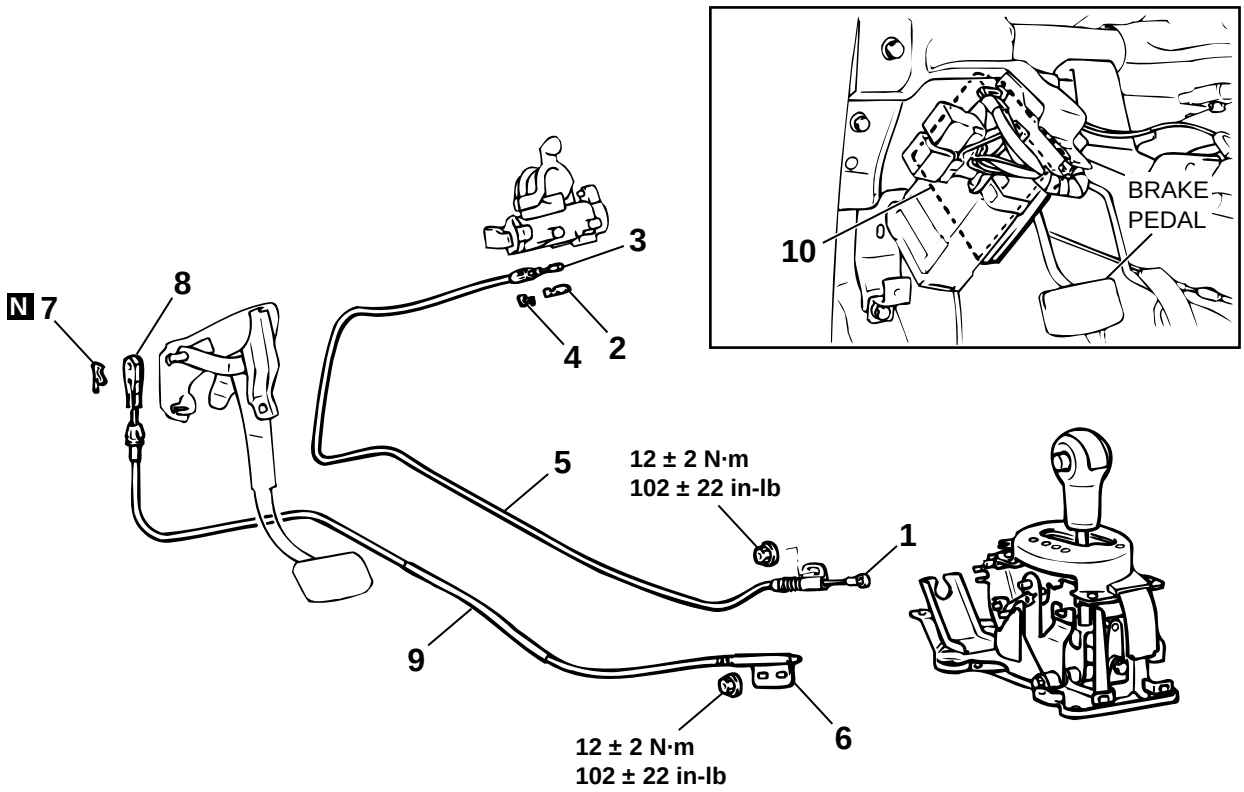
REMOVAL AND INSTALLATION

M1232001200217

⚠ CAUTION

When removing and installing the transmission control cable and shift lock cable unit, be careful not to hit the SRS-ECU.

Pre-removal and Post-installation Operation
Floor Console Removal and Installation (Refer to GROUP 52A, Floor Console P.52A-8.)



TSB Revision

KEY INTERLOCK CABLE REMOVAL STEPS

>>C<< 1. KEY INTERLOCK CABLE CONNECTION (SELECTOR LEVER SIDE)
- LOWER COLUMN COVER (REFER TO GROUP 37A, STEERING WHEEL AND SHAFT P.37A-21.)

2. COVER
>>B<< 3. KEY INTERLOCK CABLE CONNECTION (STEERING LOCK CYLINDER SIDE)
4. SLIDER
5. KEY INTERLOCK CABLE

SHIFT LOCK CABLE REMOVAL STEPS

>>A<< 6. SHIFT LOCK CABLE CONNECTION (SELECTOR LEVER SIDE)
7. COTTER PIN
8. SHIFT LOCK CABLE CONNECTION (BRAKE PEDAL SIDE)
9. SHIFT LOCK CABLE

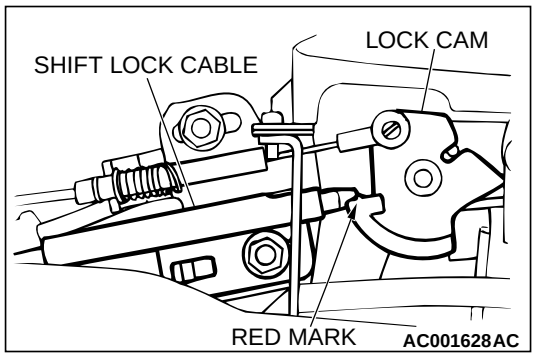
ETACS-ECU REMOVAL

10. ETACS-ECU

INSTALLATION SERVICE POINTS

>>A<< SHIFT LOCK CABLE (SELECTOR LEVER SIDE) INSTALLATION

1. Place the selector lever to "P" position.
2. Fasten the shift lock cable at the position where the end of the shift lock cable is positioned above the red marking.



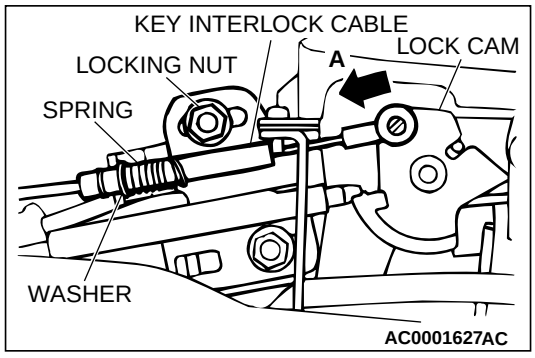
>>B<< KEY INTERLOCK CABLE (STEERING LOCK CYLINDER SIDE) INSTALLATION

Turn the ignition key to the "LOCK" (OFF) position and install the key interlock cable.

>>C<< KEY INTERLOCK CABLE (SELECTOR LEVER SIDE) INSTALLATION

1. Install the key interlock cable on the lock cam.
2. Install the spring and washer of the key interlock cable as shown.
3. While lightly pushing the cable coupling portion of the lock cam in the direction A, tighten the locking nut to the specified torque.

   Tightening torque: 12 ± 2 N·m (102 ± 22 in-lb)



INSPECTION

M1232001300117

Check the cable assembly for function and for damage.

TRANSAXLE ASSEMBLY

REMOVAL AND INSTALLATION

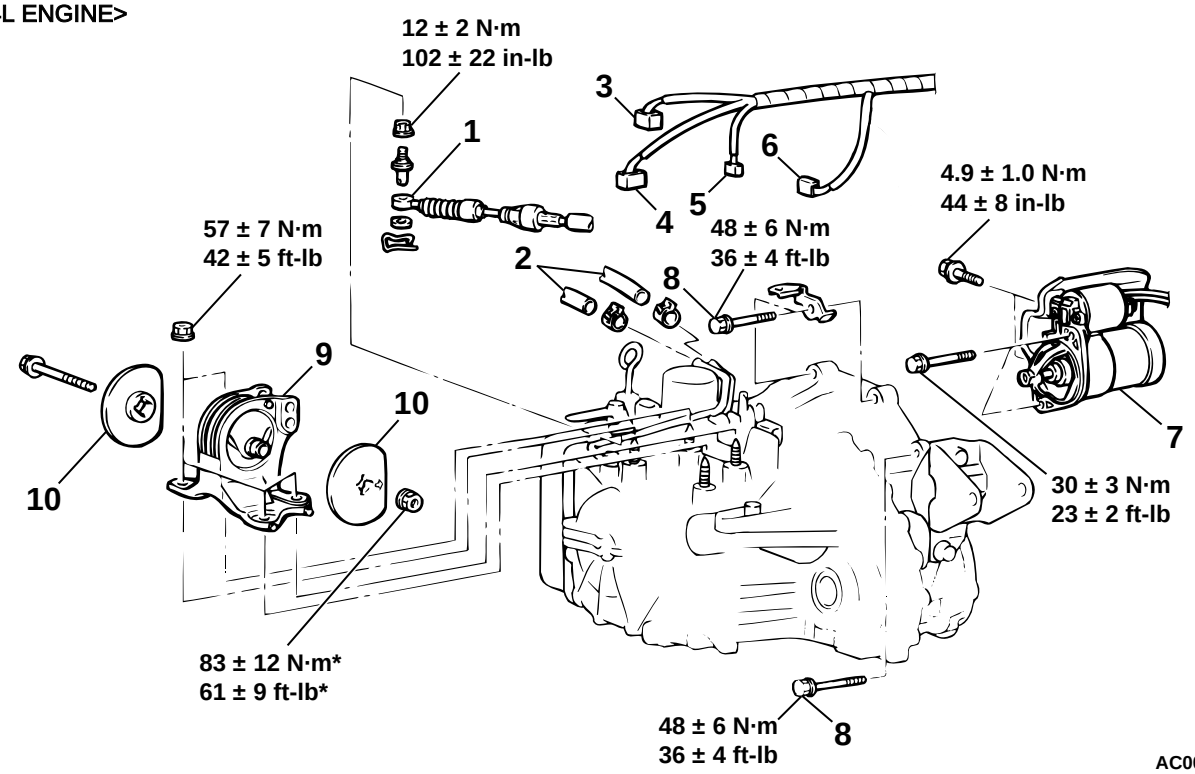
M1231005700181

⚠ CAUTION

***: Indicates parts which should be temporarily tightened, and then fully tightened after placing the vehicle on the ground and loading the full weight of the engine on the vehicle body.**

Pre-removal Operation	Post-installation Operation
• Transmission Fluid Draining (Refer to GROUP 00, Maintenance Service – Automatic Transmission Fluid P.00-53.) • Under Cover Removal • Battery and Battery Tray Removal (Refer to GROUP 54A, Battery P.54A-8.) • Air Cleaner Assembly Removal (Refer to GROUP 15, Air Cleaner P.15-6.)	• Air Cleaner Assembly Installation (Refer to GROUP 15, Air Cleaner P.15-6.) • Battery and Battery Tray Installation (Refer to GROUP 54A, Battery P.54A-8.) • Under Cover Installation • Transmission Fluid Supplying (Refer to GROUP 00, Maintenance Service – Automatic Transmission Fluid P.00-53.) • Selector Lever Operation Check (Refer to P.23A-356.) • Speedometer Operation Check (Refer to GROUP 54A, Combination Meter – On-vehicle Service – Speedometer Check P.54A-8.)

<2.4L ENGINE>



AC001637AE

REMOVAL STEPS

1. TRANSAXLE CONTROL CABLE
2. TRANSAXLE OIL COOLER HOSE
3. PARK/NEUTRAL SOLENOID VALVE ASSEMBLY CONNECTOR
4. A/T CONTROL SOLENOID VALVE ASSEMBLY CONNECTOR
5. INPUT SHAFT SPEED SENSOR CONNECTOR

<<A>>

<<B>>

>>B<<

<<C>>

REMOVAL STEPS (Continued)

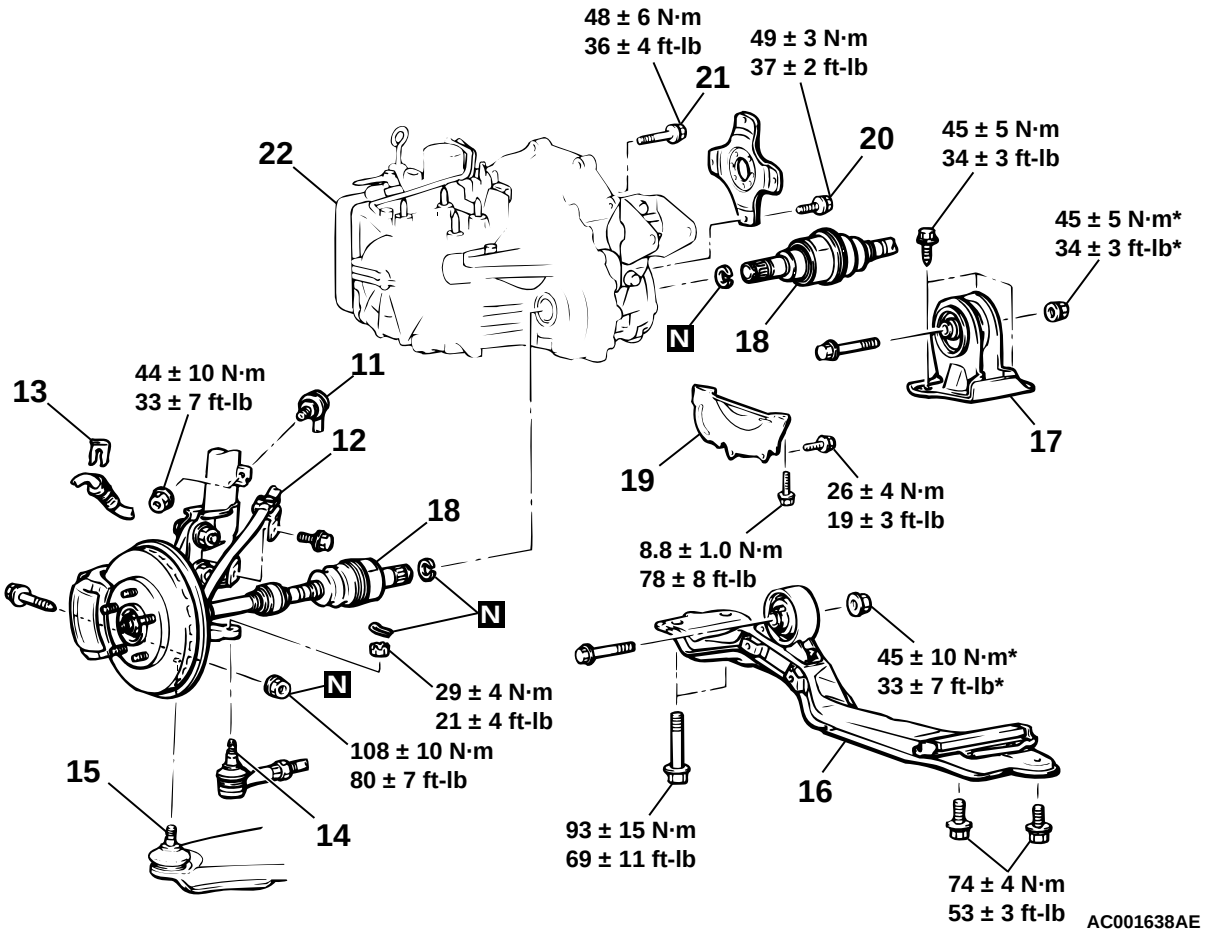
6. OUTPUT SHAFT SPEED SENSOR CONNECTOR
7. STARTER MOTOR
8. TRANSAXLE ASSEMBLY UPPER PART COUPLING BOLTS
9. TRANSAXLE MOUNT BRACKET
10. TRANSAXLE MOUNT STOPPER

• ENGINE ASSEMBLY SUPPORTING

TSB Revision

⚠ CAUTION

***: Indicates parts which should be temporarily tightened, and then fully tightened after placing the vehicle on the ground and loading the full weight of the engine on the vehicle body.**



REMOVAL STEPS

- LIFTING UP OF THE VEHICLE

11. STABILIZER LINK <STRUT SIDE>
12. SPEED SENSOR CABLE <VEHICLES WITH ABS>
13. BRAKE HOSE CLAMP

<<D>> 14. TIE ROD END

<<D>> 15. LOWER ARM

REMOVAL STEPS (Continued)

16. CENTERMEMBER ASSEMBLY
17. REAR ROLL STOPPER

<<E>> 18. DRIVE SHAFT

19. BELL HOUSING COVER

<<F>> 20. DRIVE PLATE BOLTS

<<F>> 21. TRANSAXLE ASSEMBLY LOWER PART COUPLING BOLTS

<<F>> >>A<< 22. TRANSAXLE ASSEMBLY

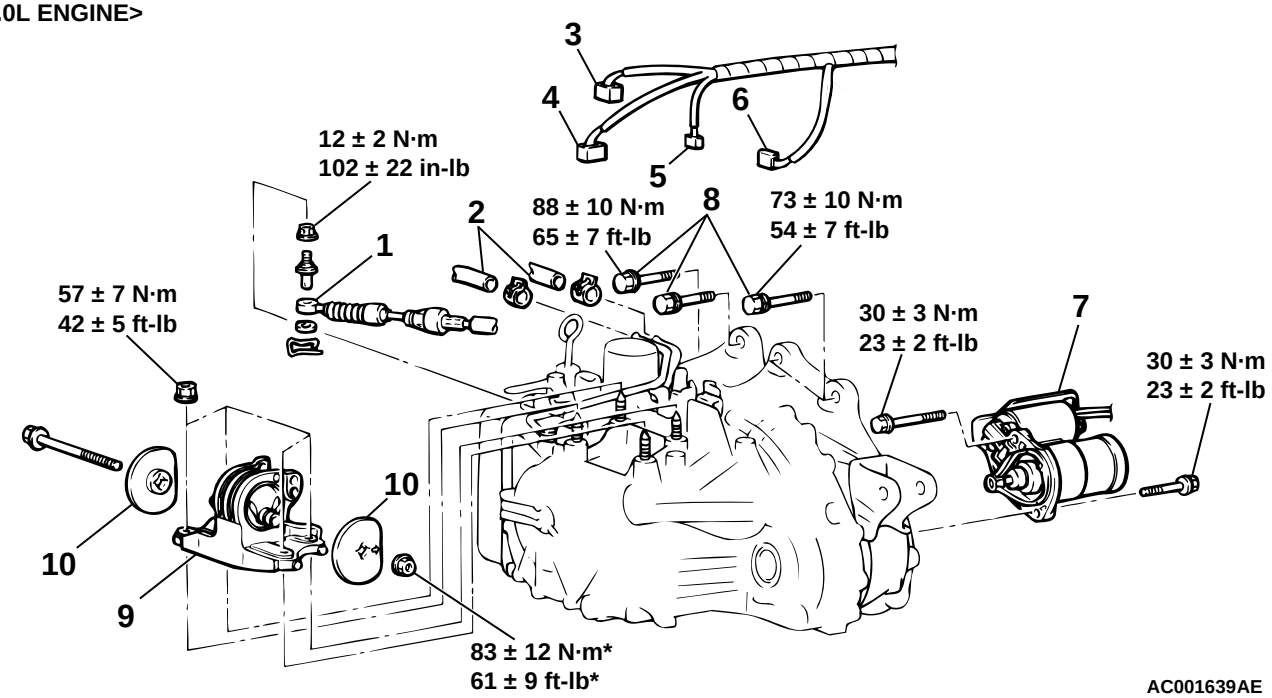
Required Special Tools:

- MB991113: Steering Linkage Puller
- MB991453: Engine Hanger Attachment Set
- MZ203827: Engine Lifter
- MB991454: Engine Hanger Balancer (a part of MB991453 Engine Hanger Attachment Set)
- MB991895: Engine Hanger

⚠ CAUTION

***: Indicates parts which should be temporarily tightened, and then fully tightened after placing the vehicle on the ground and loading the full weight of the engine on the vehicle body.**

<3.0L ENGINE>



AC001639AE

REMOVAL STEPS

1. TRANSAXLE CONTROL CABLE
2. TRANSAXLE OIL COOLER HOSES
3. PARK/NEUTRAL POSITION SWITCH CONNECTOR
4. A/T CONTROL SOLENOID VALVE ASSEMBLY CONNECTOR
5. INPUT SHAFT SPEED SENSOR CONNECTOR

<<A>>

<<B>>

<<C>>

>>B<<

REMOVAL STEPS (Continued)

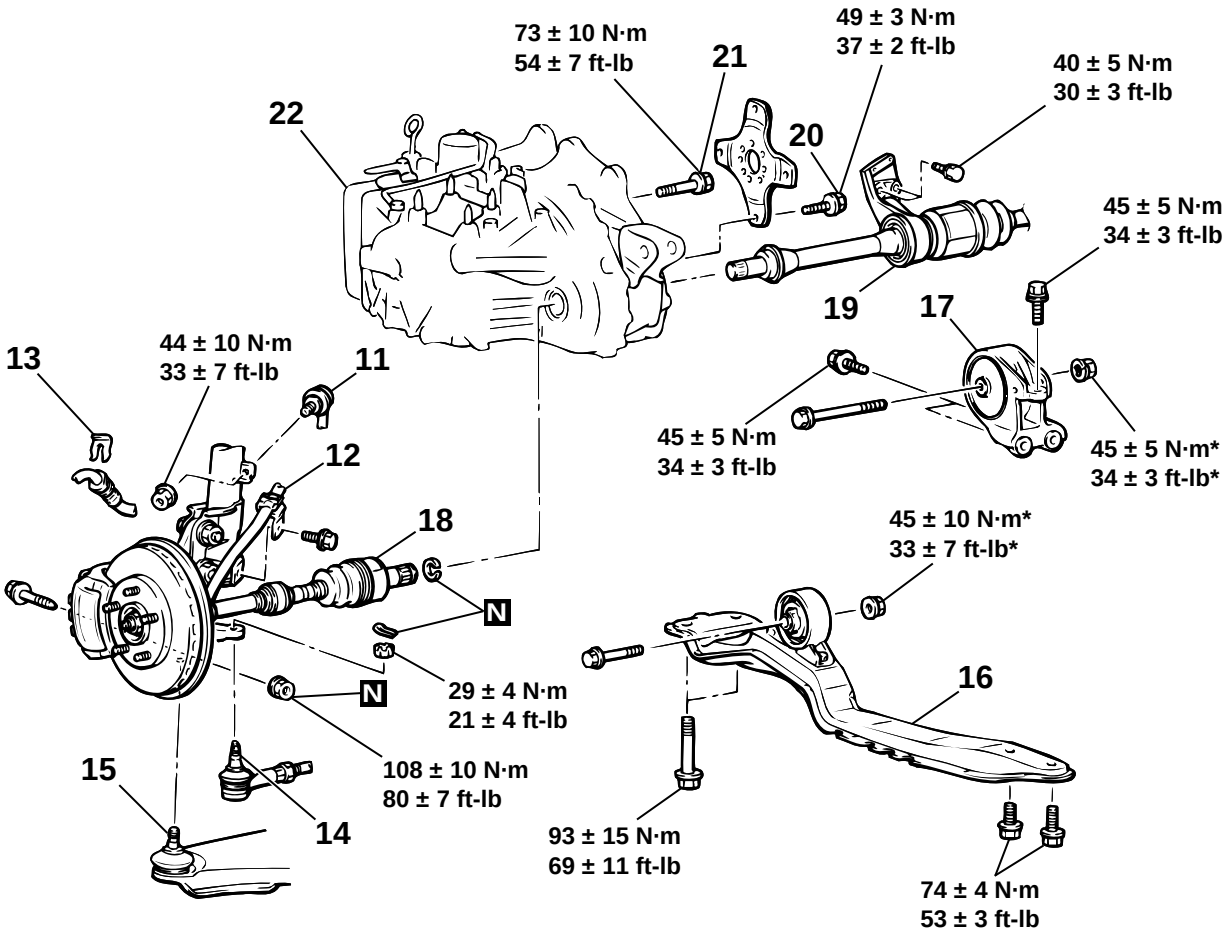
6. OUTPUT SHAFT SPEED SENSOR CONNECTOR
7. STARTER MOTOR
8. TRANSAXLE ASSEMBLY UPPER PART COUPLING BOLTS
9. TRANSAXLE MOUNT BRACKET
10. TRANSAXLE MOUNT STOPPER

- ENGINE ASSEMBLY SUPPORTING

TSB Revision

⚠ CAUTION

***: Indicates parts which should be temporarily tightened, and then fully tightened after placing the vehicle on the ground and loading the full weight of the engine on the vehicle body.**



AC001640AE

REMOVAL STEPS

- LIFTING UP THE VEHICLE

11. STABILIZER LINK <STRUT SIDE>
12. SPEED SENSOR CABLE <VEHICLES WITH ABS>
13. BRAKE HOSE CLAMP

<<D>> 14. TIE ROD END

<<D>> 15. LOWER ARM

16. CENTERMEMBER ASSEMBLY

REMOVAL STEPS (Continued)

17. REAR ROLL STOPPER

<<E>> 18. DRIVE SHAFT

<<E>> 19. DRIVE SHAFT AND INNER SHAFT

<<F>> 20. DRIVE PLATE BOLTS

<<F>> 21. TRANSAXLE ASSEMBLY LOWER PART COUPLING BOLTS

<<F>> >>A<< 22. TRANSAXLE ASSEMBLY

Required Special Tools:

- MB991113: Steering Linkage Puller
- MB991453: Engine Hanger Attachment Set
- MZ203827: Engine Lifter
- MB991454: Engine Hanger Balancer (a part of MB991453 Engine Hanger Attachment Set)
- MB991895: Engine Hanger

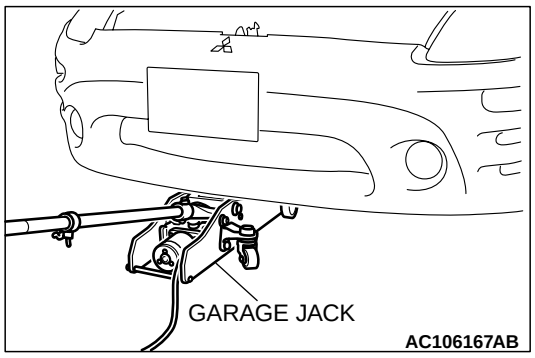
REMOVAL SERVICE POINTS

<<A>> STARTER MOTOR REMOVAL

Remove the starter motor with the starter motor harness still connected, and secure it inside the engine compartment.

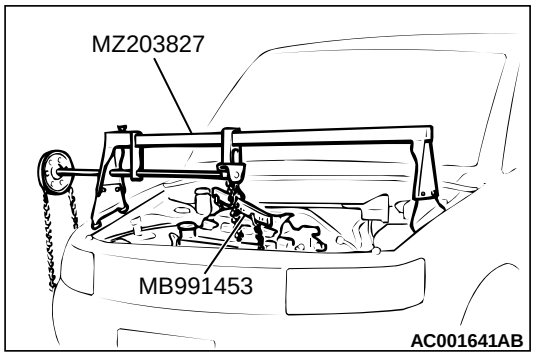
<<B>> TRANSAXLE MOUNT BRACKET REMOVAL

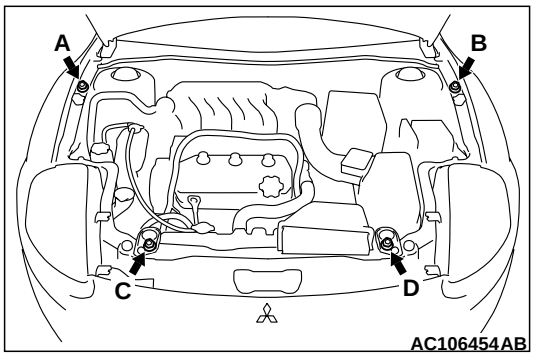
Jack up the transaxle assembly gently and then remove the transaxle mounting.



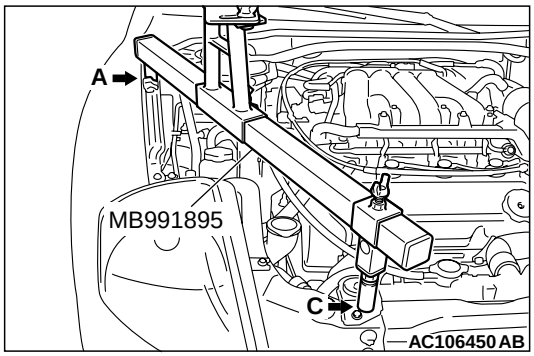
<<C>> ENGINE ASSEMBLY SUPPORTING

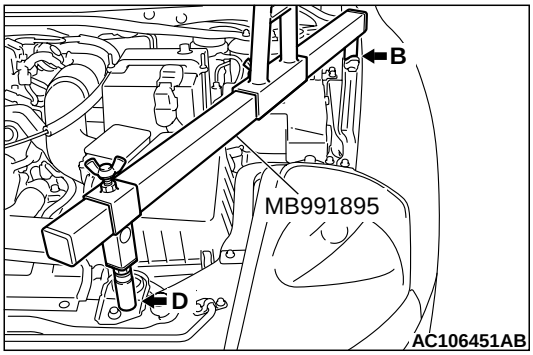
1. <Engine lifter MZ2073827 is used>
   Set special tools MB991453 and MZ203827 to the vehicle to support the engine assembly.

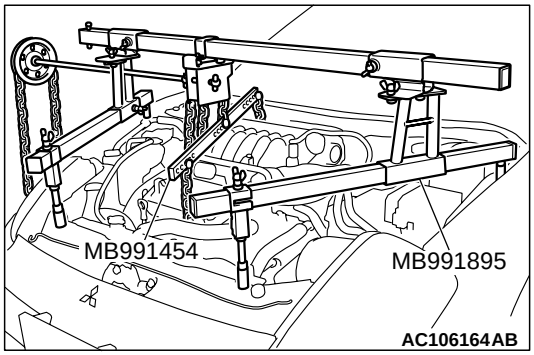




2. <Engine hanger MB991895 is used>
   (1) Set special tool MB991895 to the front fender mounting bolts (A and B) and the radiator support upper insulator mounting bolts (C and D), which are located in the engine compartment, as shown.







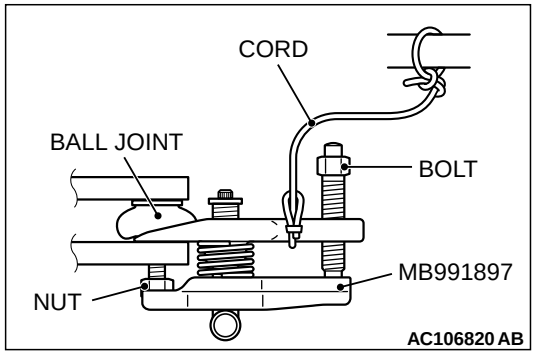
   (2) Set special tools MB991454 and MB991527 to hold the engine/transaxle assembly.

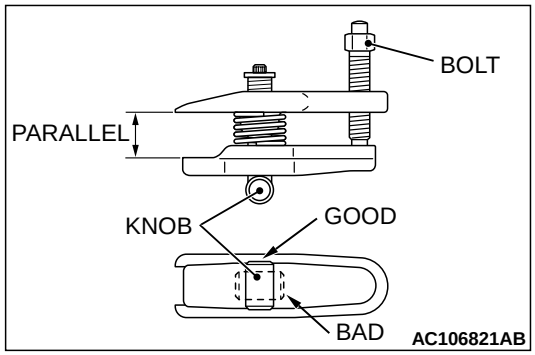
<<D>> TIE ROD END/LOWER ARM DISCONNECTION

⚠ CAUTION

- **Do not remove the nut from ball joint. Loosen it and use special tool MB991897 to avoid possible damage to ball joint threads.**
- **Hang special tool MB991897 with rope or wire to prevent them from falling.**

1. Install the special tool MB991897 as shown in the figure.





2. After turning the bolt and knob to adjust the insert arms of the special tool MB991897 in parallel, tighten the bolt by hand and confirm that the insert arms are parallel.

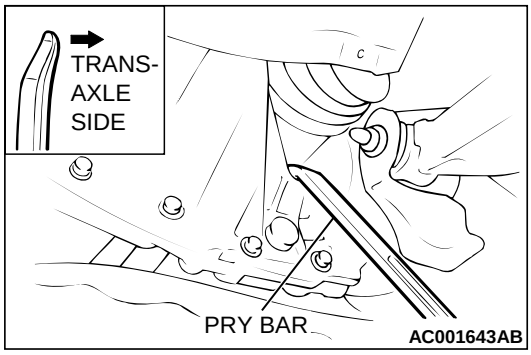
   NOTE: When adjusting the insert arms in parallel, turn the knob in the direction shown in the figure.

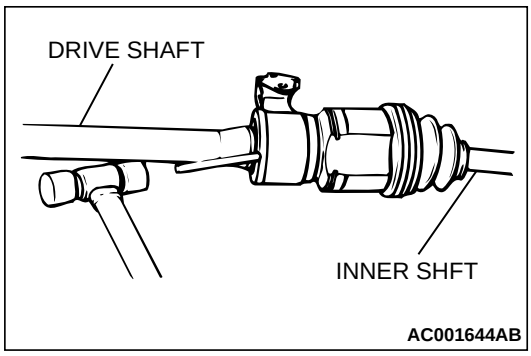
<<E>> DRIVE SHAFT/DRIVE SHAFT AND INNER SHAFT DISCONNECTION

⚠ CAUTION

- **Do not pull on the drive shaft; doing so will damage the TJ; be sure to use a pry bar.**
- **Do not insert the pry bar so deep as to damage the oil seal.**
- **Do not damage the transaxle oil seal with the spline of the drive shaft.**

1. Insert the pry bar between the transaxle case and the driveshaft as shown to remove the drive shaft. <2.4L ENGINE, 3.0L ENGINE-LH>

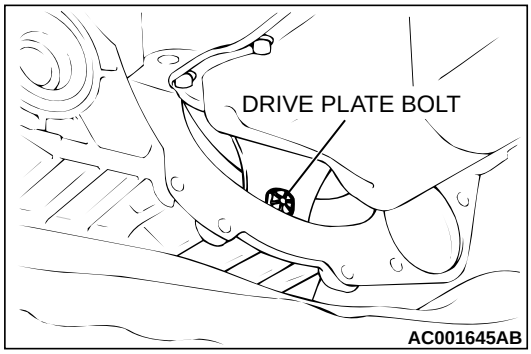




⚠ CAUTION
Do not damage the transaxle oil seal with the spline of the inner shaft.

2. If the inner shaft and transaxle are tightly joined, tap the center bearing bracket lightly with a plastic hammer, etc. to remove the drive shaft and inner shaft from the transaxle. <3.0L ENGINE-RH>
3. Cover the transaxle case with a shop towel to prevent foreign material from entering it.

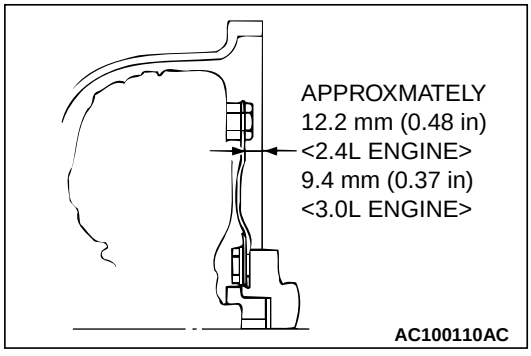
<<F>> DRIVE PLATE BOLTS/TRANSAXLE ASSEMBLY LOWER PART COUPLING BOLTS/TRANSAXLE ASSEMBLY REMOVAL



1. Support the transaxle assembly by using a transaxle jack.
2. Remove the drive plate bolts while turning the crank shaft.
3. Press in the torque converter to the transaxle side so that the torque converter does not stay engaged to the drive plate.
4. Remove the transaxle assembly lower bolts and lower the transaxle assembly.

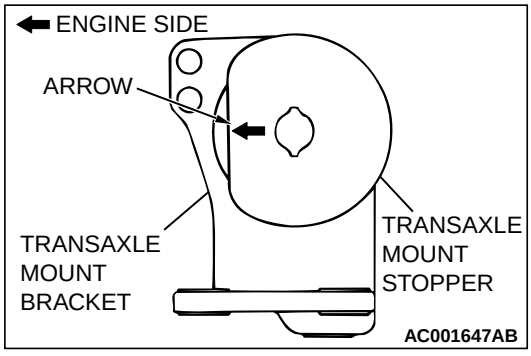
INSTALLATION SERVICE POINTS

>>A<< TRANSAXLE ASSEMBLY INSTALLATION



Inserting the torque converter into the transaxle oil pump so that the shown dimension is approximately. 12.2 mm (0.48 inch) <2.4L ENGINE>, approximately 9.4 mm (0.37 inch) <3.0L ENGINE>. Install the transaxle assembly to the engine.

>>B<< TRANSAXLE MOUNT STOPPER INSTALLATION



Install the transaxle mount stopper so that the arrow mark points as shown in the illustration.

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1231012400137

ITEMS			SPECIFICATIONS
Key interlock and shift lock mechanisms			
Key interlock cable			12 ± 2 N·m (102 ± 22 in-lb)
Shift lock cable			12 ± 2 N·m (102 ± 22 in-lb)
Transaxle assembly			
Bell housing cover <2.4L engine>		To engine	8.8 ± 1.0 N·m (78 ± 8 in-lb)
		To transaxle	26 ± 4 N·m (19 ± 3 ft-lb)
Centermember assembly		Front	93 ± 15 N·m (69 ± 11 ft-lb)
		Front roll stopper	45 ± 10 N·m (33 ± 7 ft-lb)
		Rear	74 ± 4 N·m (53 ± 3 ft-lb)
Drive plate bolt			49 ± 3 N·m (37 ± 2 ft-lb)
Drive shaft and inner shaft <3.0L engine>			40 ± 5 N·m (30 ± 3 ft-lb)
Lower arm connection			108 ± 10 N·m (80 ± 7 ft-lb)
Park/neutral position switch mounting bolt			11 ± 1 N·m (96 ± 8 in-lb)
Rear roll stopper bracket			45 ± 5 N·m (34 ± 3 ft-lb)
Starter motor			30 ± 3 N·m (23 ± 2 ft-lb)
Starter cover mounting bolt <2.4L engine>			4.9 ± 1.0 N·m (44 ± 8 in-lb)
Stabilizer link connection			44 ± 10 N·m (33 ± 7 ft-lb)
Tie rod end connection			29 ± 4 N·m (21 ± 4 ft-lb)
Transaxle assembly lower part coupling bolt	2.4L engine		48 ± 6 N·m (36 ± 4 ft-lb)
	3.0L engine		73 ± 10 N·m (54 ± 7 ft-lb)
Transaxle assembly upper part coupling bolt	2.4L engine		48 ± 6 N·m (36 ± 4 ft-lb)
	3.0L engine	Bolt, flange	73 ± 10 N·m (54 ± 7 ft-lb)
		Bolt, washer assembled	88 ± 10 N·m (65 ± 7 ft-lb)
Transaxle control cable connection			12 ± 2 N·m (102 ± 22 in-lb)
Transaxle mount bracket			57 ± 7 N·m (42 ± 5 ft-lb)
Transaxle mount stopper			83 ± 12 N·m (61 ± 9 ft-lb)
Transaxle control			
Cable arm <vehicles with sport mode>			12 ± 2 N·m (102 ± 22 in-lb)
Detente spring <vehicles without sport mode>			1.5 ± 0.5 N·m (14 ± 4 in-lb)
Indicator panel assembly			1.5 ± 0.5 N·m (14 ± 4 in-lb)
Key interlock cable connection			12 ± 2 N·m (102 ± 22 in-lb)
Lever assembly <vehicles without sport mode>			12 ± 2 N·m (102 ± 22 in-lb)
Nut			12 ± 2 N·m (102 ± 22 in-lb)
Shift lock cable connection			12 ± 2 N·m (102 ± 22 in-lb)
Shift knob			1.8 ± 0.2 N·m (16 ± 2 in-lb)
Shift switch <vehicles with sport mode>			5.0 ± 1.0 N·m (44 ± 9 in-lb)

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ITEMS	SPECIFICATIONS
Select lever <vehicles with sport mode>	12 ± 2 N·m (102 ± 22 in-lb)
Selector lever assembly	12 ± 2 N·m (102 ± 22 in-lb)
Transaxle control cable assembly	12 ± 2 N·m (102 ± 22 in-lb)

SERVICE SPECIFICATIONS

M1231000300122

ITEMS		STANDARD VALUE
Line pressure kPa (psi)		1,010 – 1,050 (147 – 152)
A/T fluid temperature sensor kΩ	at 0°C (32°F)	16.7 – 20.5
	at 20°C (68°F)	7.3 – 8.9
	at 40°C (104°F)	3.4 – 4.2
	at 60°C (140°F)	1.9 – 2.2
	at 80°C (176°F)	1.0 – 1.2
	at 100°C (212°F)	0.57 – 0.69
Resistance of torque converter clutch control solenoid valve coil [at 20°C (68°F)] Ω		2.7 – 3.4
Resistance of low-reverse solenoid valve coil [at 20°C (68°F)] Ω		2.7 – 3.4
Resistance of second solenoid valve coil [at 20°C (68°F)] Ω		2.7 – 3.4
Resistance of underdrive solenoid valve coil [at 20°C (68°F)] Ω		2.7 – 3.4
Resistance of overdrive solenoid valve coil [at 20°C (68°F)] Ω		2.7 – 3.4
Stall speed r/min		2,100 – 2,600

LUBRICANTS

M1231000400174

ITEMS		SPECIFIED LUBRICANTS	QUANTITY
A/T fluid dm^3 (qt)	F4A42	DIAMOND ATF SP III or equivalent	7.7 (8.1)
	F4A51		8.4 (8.9)

NOTES

GROUP 23B

AUTOMATIC TRANSAXLE OVERHAUL

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GENERAL INFORMATION

M1233000100038

This automatic transaxle is made up of the following main parts.

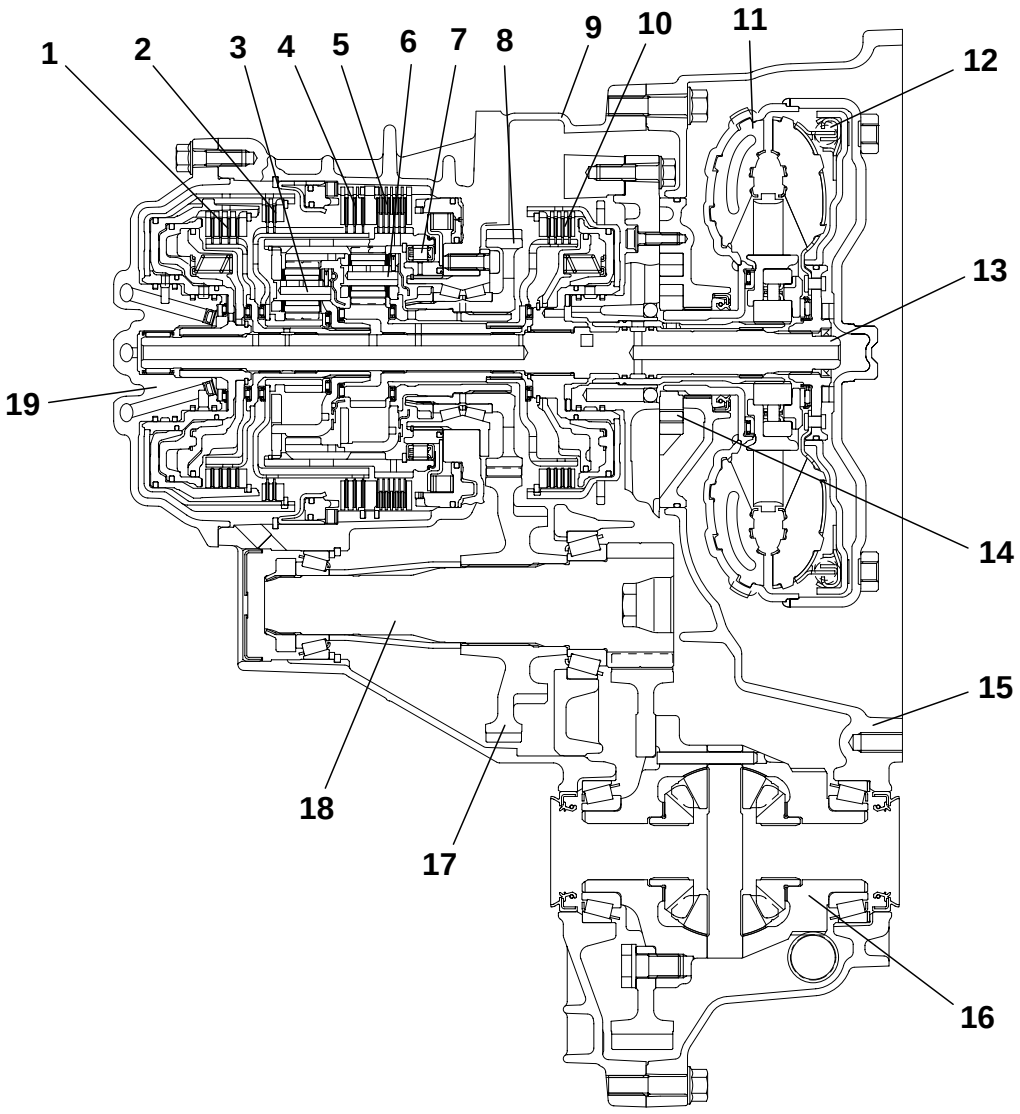
The torque converter employs a 3 element, 1 step, 2 phase lock-up clutch.

The gear train is made up of 3 multi-plate clutches, 2 multi-plate brakes and 2 planetary gears made up of a sun gear, carrier, pinion gear and annulus gear.

The cases consist of a converter housing, transaxle case, rear cover and a valve body cover.

Parts related to oil pressure regulation are the oil pump, which pressurizes the oil; the regulator, which controls the pressure setting; the solenoid valves, which changes the oil pressure with electrical signals; the pressure control valve, which controls the oil pressure coming from the solenoid valve that effects each clutch and brake; each kind of valve, which carry out the retention of the oil pressure through the lines; and finally the valve body, which houses all the valves.

SECTIONAL VIEW <F4A42>



AKX01131AB

1. OVERDRIVE CLUTCH
2. REVERSE CLUTCH
3. OVERDRIVE PLANETARY CARRIER
4. SECOND BRAKE
5. LOW-REVERSE BRAKE
6. OUTPUT PLANETARY CARRIER
7. ONE-WAY CLUTCH
8. TRANSFER DRIVE GEAR
9. TRANSAXLE CASE
10. UNDERDRIVE CLUTCH

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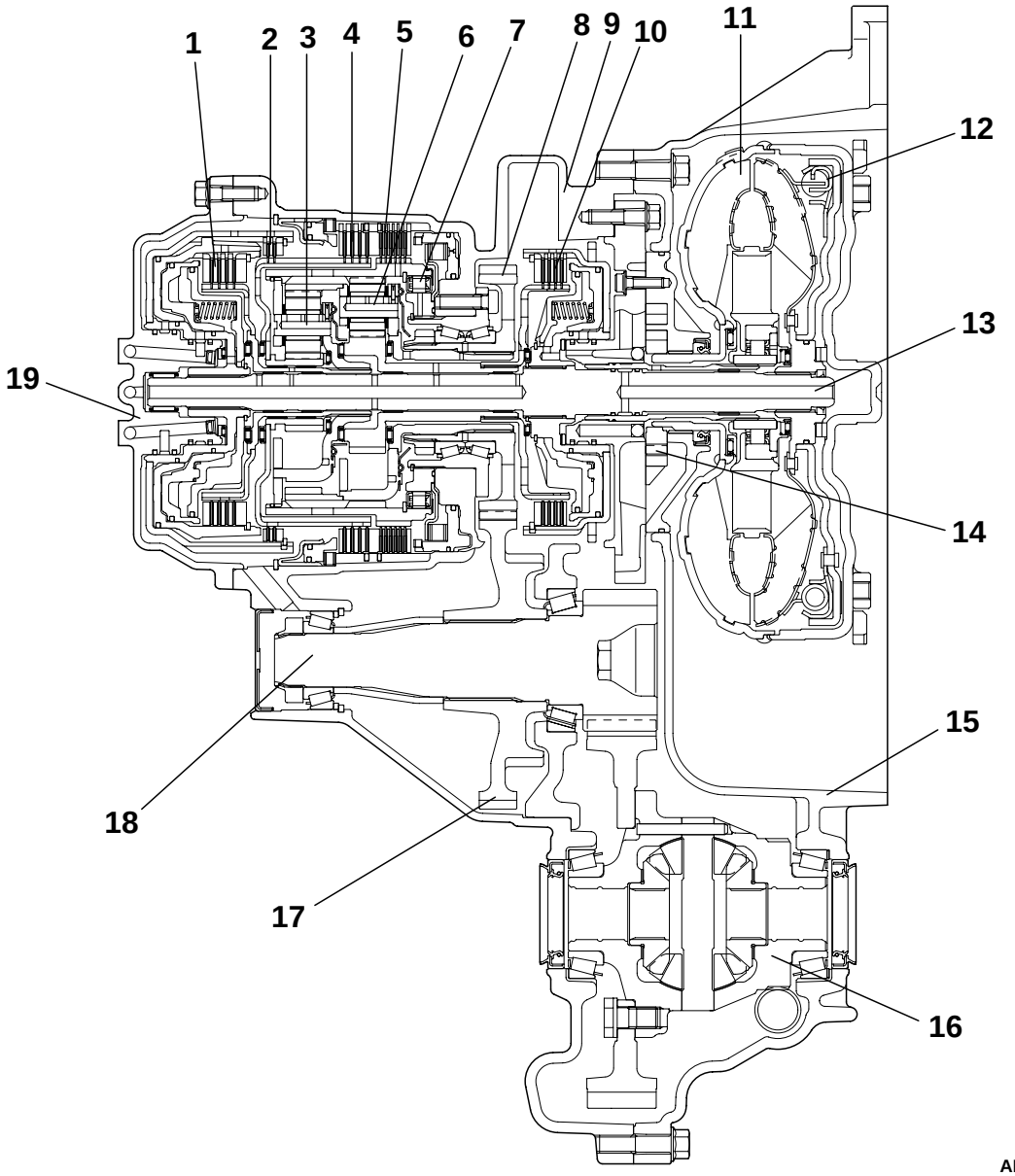
11. TORQUE CONVERTER
12. TORQUE CONVERTER CLUTCH
13. INPUT SHAFT
14. OIL PUMP
15. CONVERTER HOUSING
16. DIFFERENTIAL
17. TRANSFER DRIVEN GEAR
18. OUTPUT SHAFT
19. REAR COVER

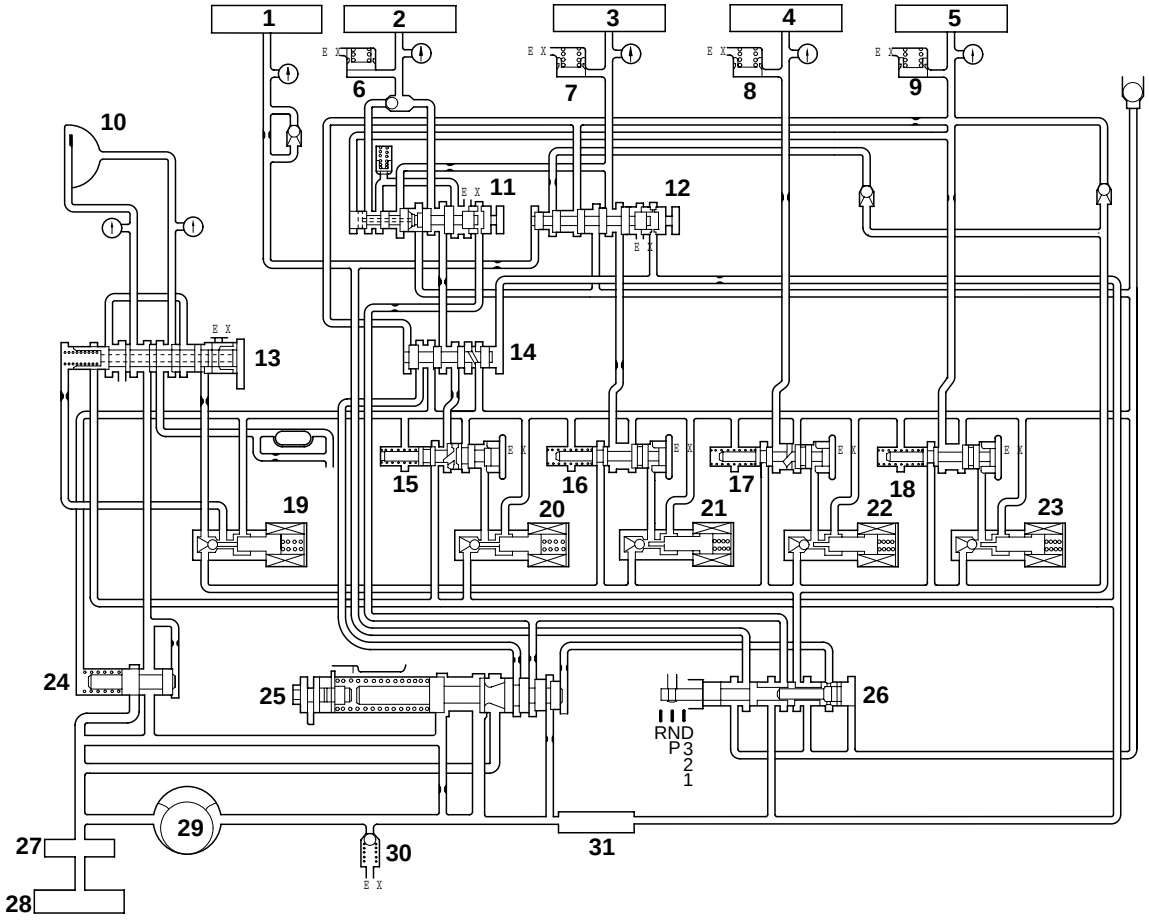
SECTIONAL VIEW <F4A51>



AKX01109 AB

1. OVERDRIVE CLUTCH
2. REVERSE CLUTCH
3. OVERDRIVE PLANETARY CARRIER
4. SECOND BRAKE
5. LOW-REVERSE BRAKE
6. OUTPUT PLANETARY CARRIER
7. ONE-WAY CLUTCH
8. TRANSFER DRIVE GEAR
9. TRANSAXLE CASE
10. UNDERDRIVE CLUTCH
11. TORQUE CONVERTER
12. TORQUE CONVERTER CLUTCH
13. INPUT SHAFT
14. OIL PUMP
15. CONVERTER HOUSING
16. DIFFERENTIAL
17. TRANSFER DRIVEN GEAR
18. OUTPUT SHAFT
19. REAR COVER

HYDRAULIC CIRCUIT

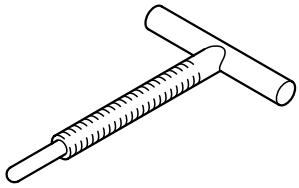
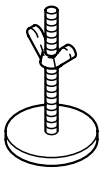
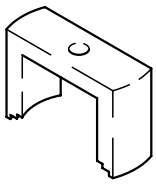
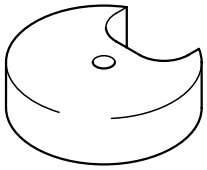
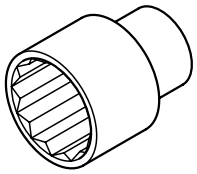
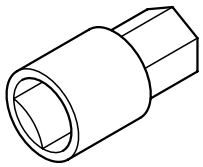
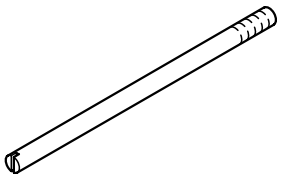


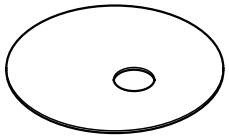
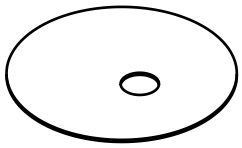
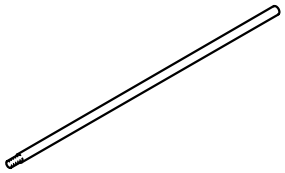
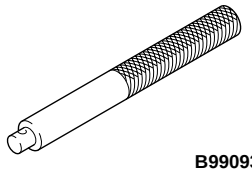
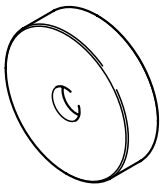
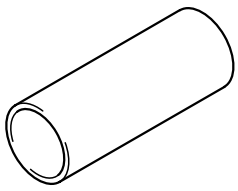
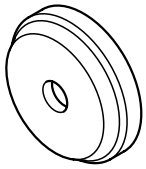
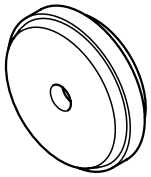
AKX00963AB

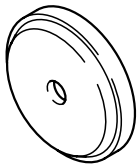
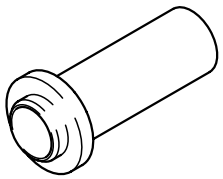
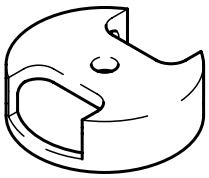
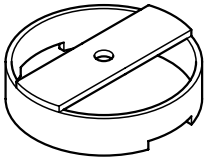
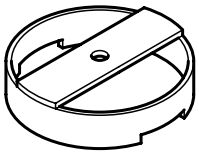
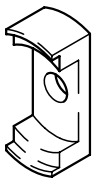
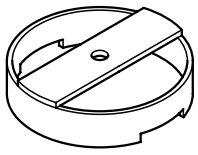
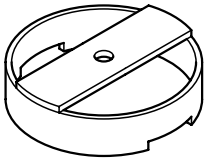
1. REVERSE CLUTCH
2. LOW-REVERSE BRAKE
3. SECOND BRAKE
4. UNDERDRIVE CLUTCH
5. OVERDRIVE CLUTCH
6. LOW-REVERSE ACCUMULATOR
7. SECOND ACCUMULATOR
8. UNDERDRIVE ACCUMULATOR
9. OVERDRIVE ACCUMULATOR
10. TORQUE CONVERTER CLUTCH
11. FAIL-SAFE VALVE A
12. FAIL-SAFE VALVE B
13. TORQUE CONVERTER CLUTCH CONTROL VALVE
14. SWITCHING VALVE
15. LOW-REVERSE PRESSURE CONTROL VALVE
16. SECOND PRESSURE CONTROL VALVE
17. UNDERDRIVE PRESSURE CONTROL VALVE
18. OVERDRIVE PRESSURE CONTROL VALVE
19. TORQUE CONVERTER CLUTCH CONTROL SOLENOID VALVE
20. LOW-REVERSE SOLENOID VALVE
21. SECOND SOLENOID VALVE
22. UNDERDRIVE SOLENOID VALVE
23. OVERDRIVE SOLENOID VALVE
24. TORQUE CONVERTER PRESSURE CONTROL VALVE
25. REGULATOR VALVE
26. MANUAL VALVE
27. OIL FILTER
28. OIL PAN
29. OIL PUMP
30. RELIEF VALVE
31. OIL STRAINER

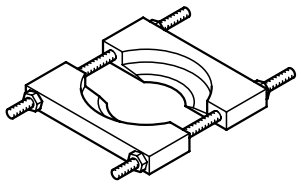
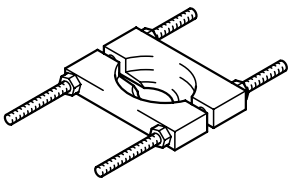
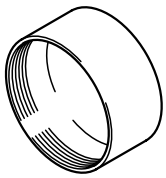
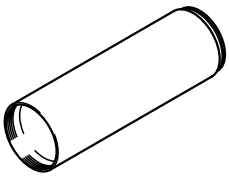
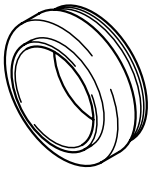
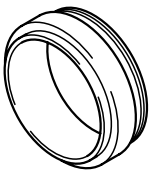
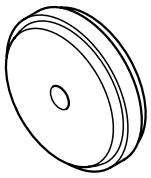
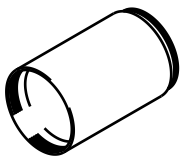
SPECIAL TOOLS

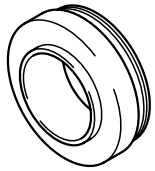
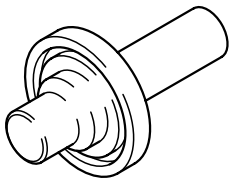
M1233000600033

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
	MD998333 Oil pump remover	MD998333-01	Removal of oil pump
	MD998924 Spring compressor retainer	MD998924-01	Use with spring compressor
	MD998903 Spring compressor	MD998903	Removal and installation of one-way clutch inner race snap ring <F4A42>
	MD998338 Spring compressor	MD998338	Removal and installation of one-way clutch inner race snap ring <F4A51>
	MB991625 Socket (41)	MB991625-01 or General service tool	Removal and installation of transfer drive gear jam nut <F4A42>
	MB990607 Torque wrench socket	MB990607-01	Removal and installation of output shaft nut
	MD998412 Guide	MD998412	Installation of oil pump and transfer drive gear

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
	MB991631 Clearance dummy plate	MB991631-01	Measurement of reaction plate low-reverse brake and second brake end play <F4A42>
	MB991632 Clearance dummy plate	MB991632-01	Measurement of reaction plate low-reverse brake and second brake end play <F4A51>
	MD998913 Dial gauge extension	MD998913-01	Measurement of low-reverse brake end play
 B990938	MB990938 Handle	MB990938-01	• Installation of input shaft rear bearing • Use with installer adapter
	MB990930 Installer adapter	MB990930-01 or General service tool	Installation of output shaft taper roller bearing outer race
	MD998350 Bearing installer	MD998350-01	Installation of output shaft collar and taper roller bearing
	MB990931 Installer adapter	MB990931-01 or General service tool	Installation of cap
	MB990935 Installer adapter	MB990935-01 or General service tool	Installation of differential taper roller bearing outer race <F4A42>

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
	MB990936 Installer adapter	MB990936-01 or General service tool	Installation of output shaft taper roller bearing outer race <F4A42> and differential taper roller bearing outer race <F4A51>
	MD998334 Oil seal installer	MD998334-01	Installation of oil pump oil seal
	MD998907 Spring compressor	MD998907-01	Removal and installation of underdrive clutch snap ring
	MB991628 Spring compressor	MB991628-01	Measurement of underdrive clutch and overdrive clutch end play <F4A42>
	MB991629 Spring compressor	–	Measurement of underdrive clutch and overdrive clutch end play <F4A51>
	MD999590 Spring compressor	MIT305039	Removal and installation of overdrive clutch snap ring
	MB991790 Spring compressor	–	Measurement of reverse clutch end play <F4A42>
	MB991789 Spring compressor	–	Measurement of reverse clutch end play <F4A51>

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
	MD998917 Bearing remover	General service tool or MD998348-01	Removal of output shaft taper roller bearing and transfer driven gear<F4A42>
	MD998801 Bearing remover	MD998348-01	Removal of each bearing output shaft taper roller bearing (differential ball bearing)
	MD998812 Installer cap	General service tool	Use with installer and installer adapter
	MD998814 Installer – 200	MIT304180	Use with installer cap and installer adapter
	MD998823 Installer adapter (48)	General service tool	Installation of output shaft taper roller bearing <F4A42> and transfer driven gear <F4A42>
	MD998827 Installer adapter (56)	General service tool	Installation of output shaft taper roller bearing <F4A51>
	MB990937 Installer adapter	MB990937 or General service tool	Installation of output shaft taper roller bearing <F4A51>
	MD998813 Installer – 100	General service tool	Use with installer cap and installer adapter

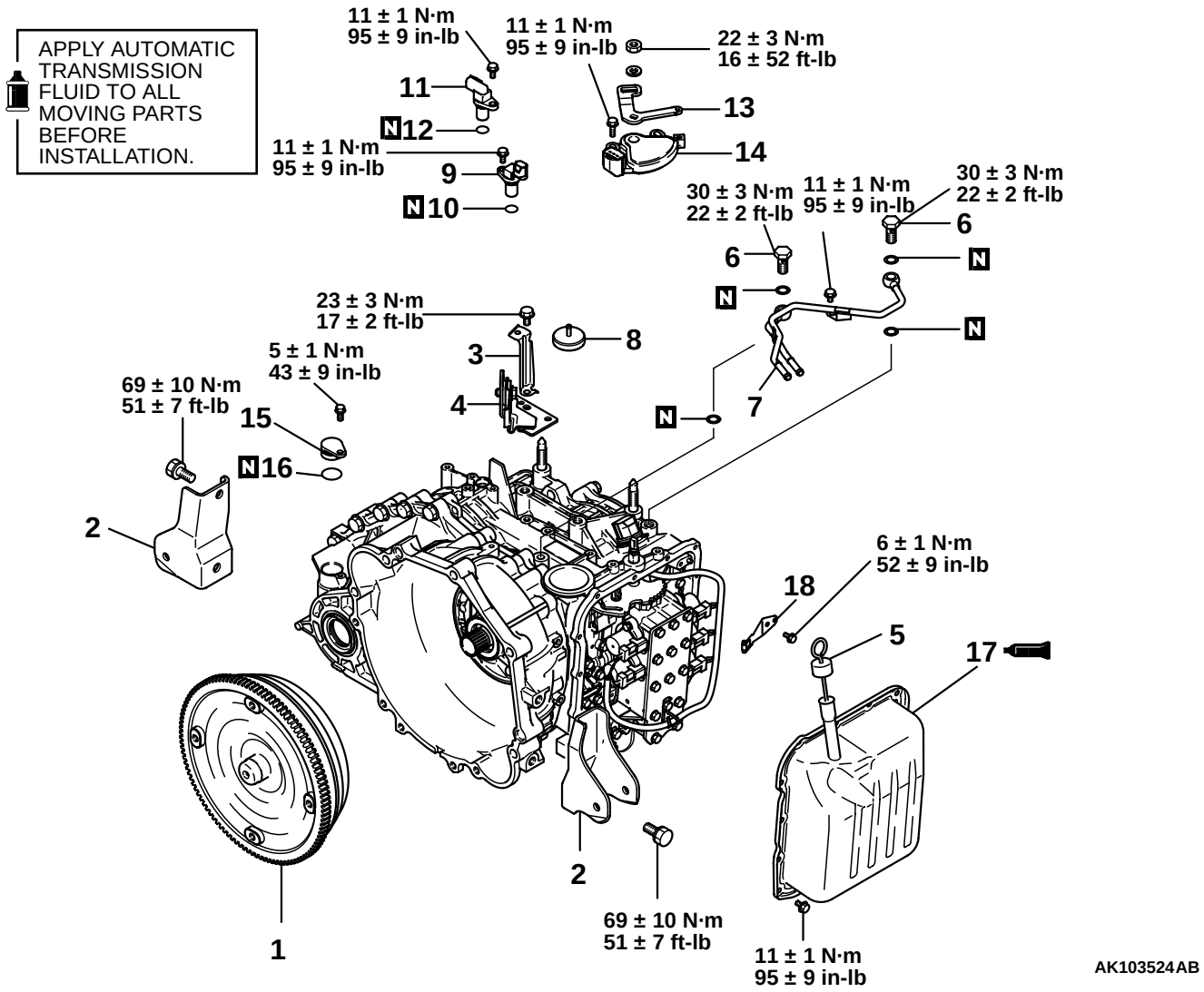
TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
	MD998824 Installer adapter (50)	General service tool	Installation of transfer driven gear <F4A51>, differential taper roller bearing <F4A51>
	MD998820 Installer adapter (42)	MIT215013	Installation of differential taper roller bearing
	MD998800 Oil seal installer	General service tool	Installation of driveshaft oil seal

TRANSAXLE

DISASSEMBLY AND ASSEMBLY

M1233001000175

<F4A42>



1. TORQUE CONVERTER
2. ROLL STOPPER BRACKET
3. HARNESS BRACKET
4. CONTROL CABLE SUPPORT BRACKET
5. OIL DIPSTICK
6. EYE BOLT
7. OIL COOLER FEED TUBE
8. AIR BREATHER
9. INPUT SHAFT SPEED SENSOR
10. O-RING
11. OUTPUT SHAFT SPEED SENSOR
12. O-RING
13. MANUAL CONTROL LEVER
14. PARK/NEUTRAL POSITION SWITCH
15. SEALING CAP
16. O-RING
17. VALVE BODY COVER
18. MANUAL CONTROL SHAFT DETENT

Required Special Tools:

- MB990607: Torque Wrench Socket
- MB990930: Installer Adapter
- MB990931: Installer Adapter
- MB990935: Installer Adapter <F4A42>
- MB990936: Installer Adapter <F4A42>
- MB990938: Handle
- MB991625: Special Socket (41)
- MB991631: Clearance Dummy Plate <F4A42>
- MB991632: Clearance Dummy Plate <F4A51>
- MD998333: Oil Pump Remover
- MD998338: Spring Compressor <F4A51>
- MD998350: Bearing Installer

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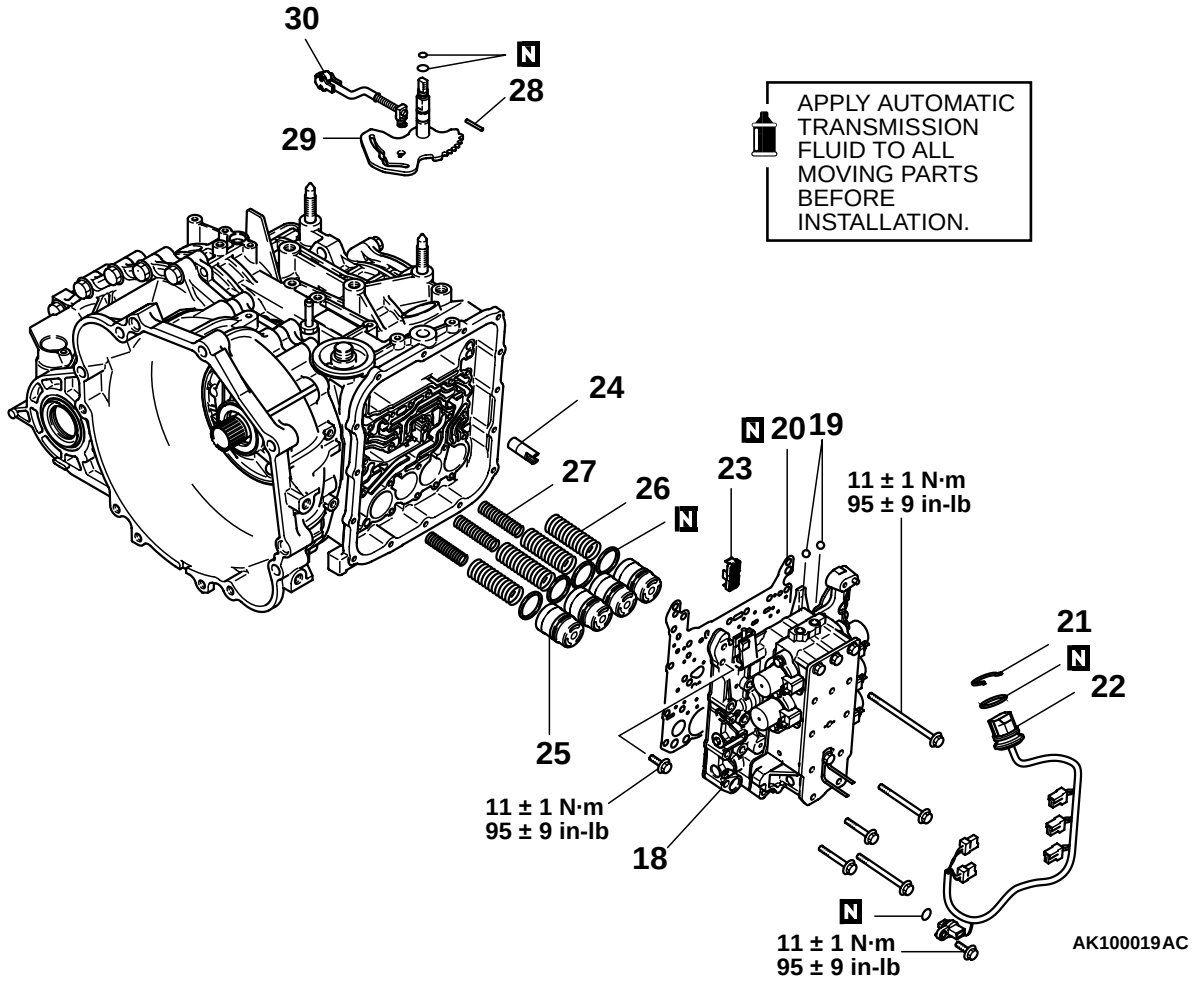
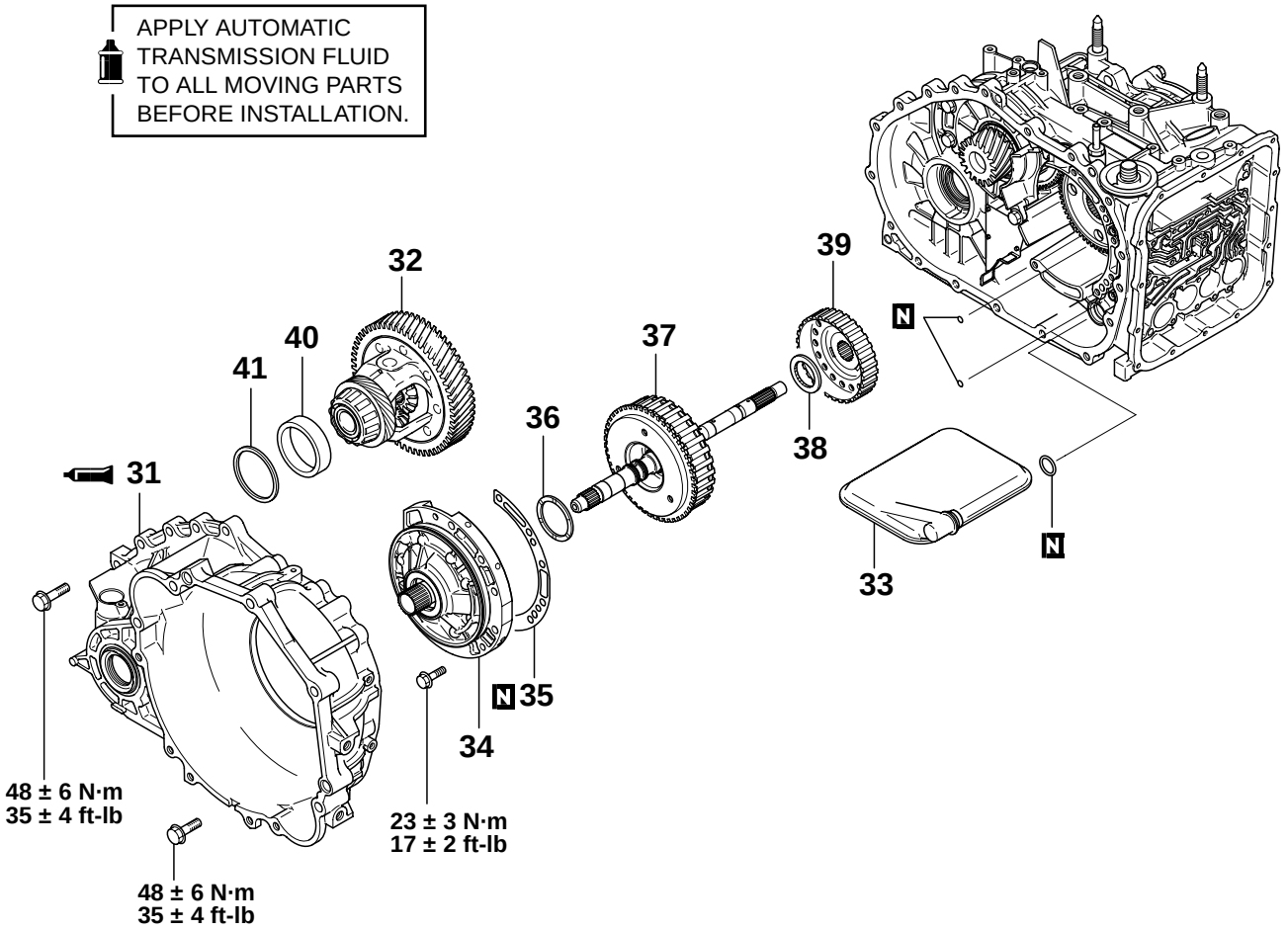
- MD998412: Guide
- MD998903: Spring Compressor <F4A42>
- MD998913: Dial Gauge Extension
- MD998924: Spring Compressor Retainer



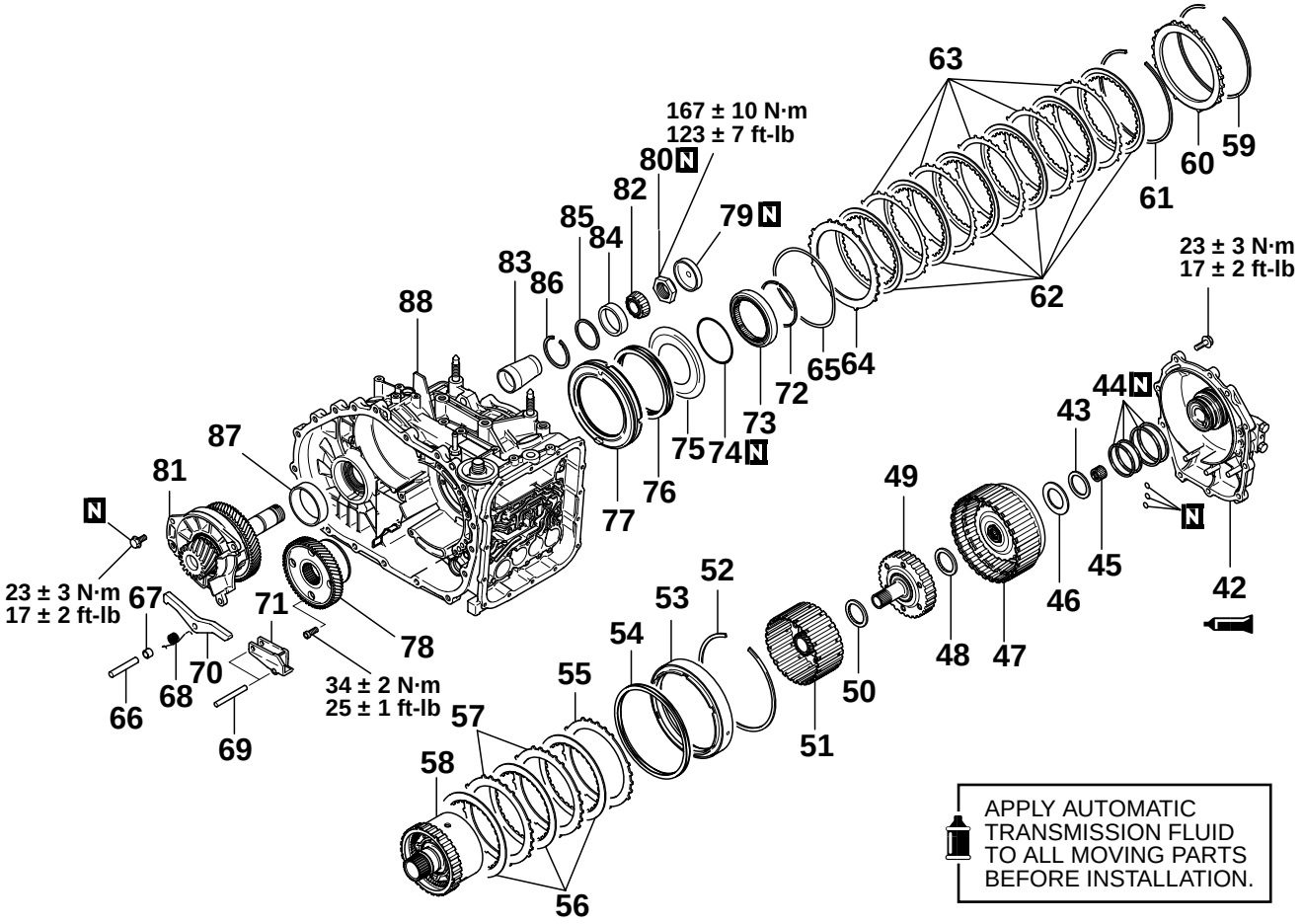
18. VALVE BODY
19. STEEL BALL
20. GASKET
21. SNAP RING
22. SOLENOID VALVE HARNESS
23. STRAINER
24. SECOND BRAKE RETAINER OIL SEAL
25. ACCUMULATOR PISTON
26. ACCUMULATOR SPRING
27. ACCUMULATOR SPRING
28. MANUAL CONTROL LEVER SHAFT ROLLER
29. MANUAL CONTROL LEVER SHAFT
30. PARKING PAWL ROD

TSB Revision



AKX01114 AB

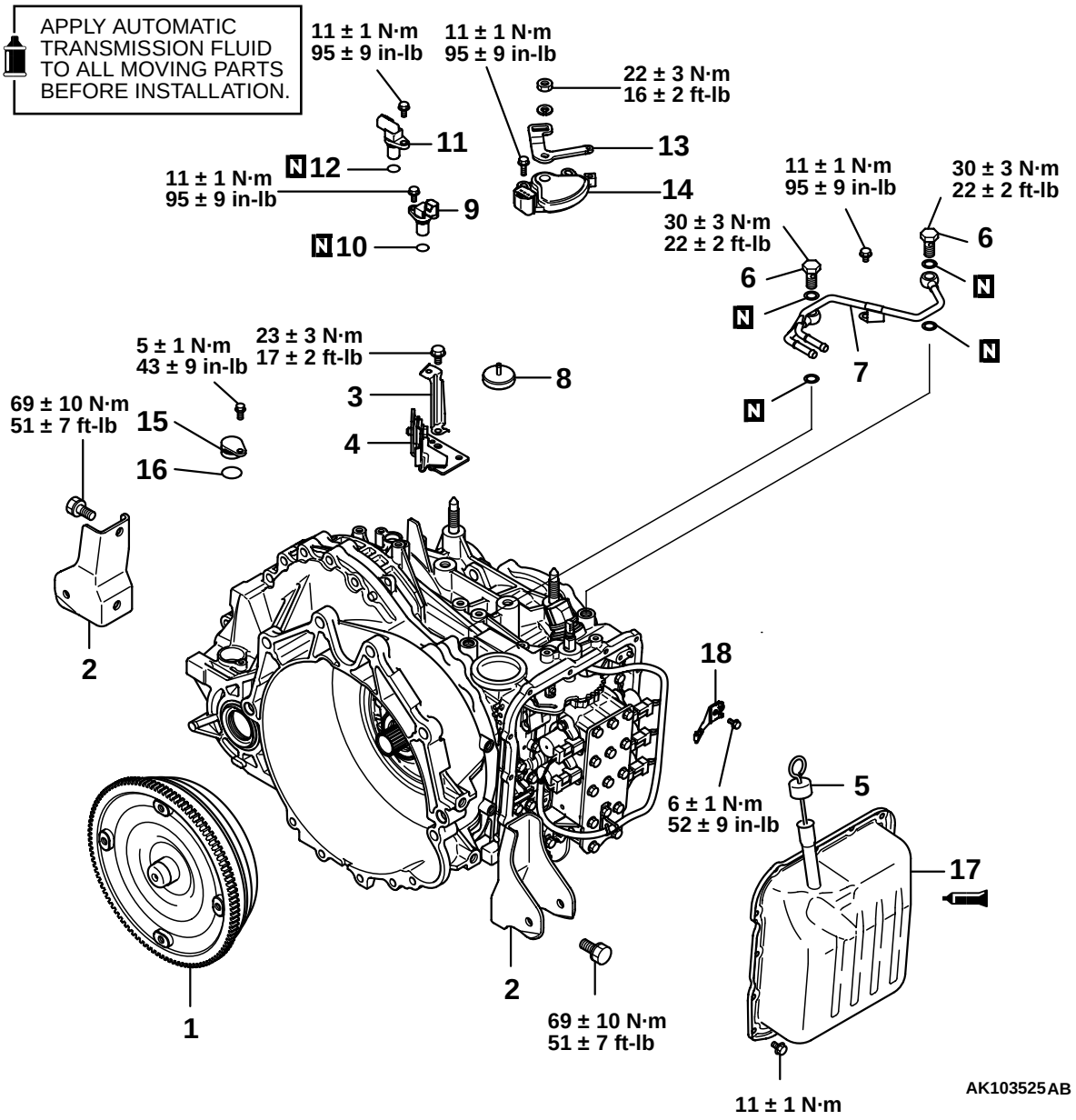
31. TORQUE CONVERTER HOUSING
32. DIFFERENTIAL
33. OIL FILTER
34. OIL PUMP
35. GASKET
36. THRUST WASHER NO.1
37. UNDERDRIVE CLUTCH AND INPUT SHAFT
38. THRUST BEARING NO.2
39. UNDERDRIVE CLUTCH HUB
40. OUTER RACE
41. SPACER



42. REAR COVER
43. THRUST RACE NO.8
44. SEAL RING
45. INPUT SHAFT REAR BEARING
46. THRUST BEARING NO.7
47. REVERSE AND OVERDRIVE CLUTCH
48. THRUST BEARING NO.6
49. OVERDRIVE CLUTCH HUB
50. THRUST BEARING NO.5
51. PLANETARY REVERSE SUN GEAR
52. SNAP RING
53. SECOND BRAKE PISTON
54. RETURN SPRING
55. PRESSURE PLATE
56. SECOND BRAKE DISCS
57. SECOND BRAKE PLATES
58. PLANETARY CARRIER ASSEMBLY
59. SNAP RING
60. REACTION PLATE
61. SNAP RING
62. LOW-REVERSE BRAKE DISCS
63. LOW-REVERSE BRAKE PLATES
64. PRESSURE PLATE
65. WAVE SPRING
66. PARKING PAWL SHAFT
67. SPACER
68. PARKING PAWL SPRING
69. PARKING ROLLER SUPPORT SHAFT
70. PARKING PAWL
71. PARKING ROLLER SUPPORT
72. SNAP RING
73. ONE-WAY CLUTCH INNER RACE
74. O-RING
75. SPRING RETAINER
76. RETURN SPRING
77. LOW-REVERSE BRAKE PISTON
78. TRANSFER DRIVE GEAR
79. CAP
80. JAM NUT
81. OUTPUT SHAFT
82. TAPER ROLLER BEARING
83. COLLAR
84. OUTER RACE
85. SPACER
86. SNAP RING
87. OUTER RACE
88. TRANSAXLE CASE

TSB Revision

<F4A51>



1. TORQUE CONVERTER
2. ROLL STOPPER BRACKET
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4. CONTROL CABLE SUPPORT BRACKET
5. OIL DIPSTICK
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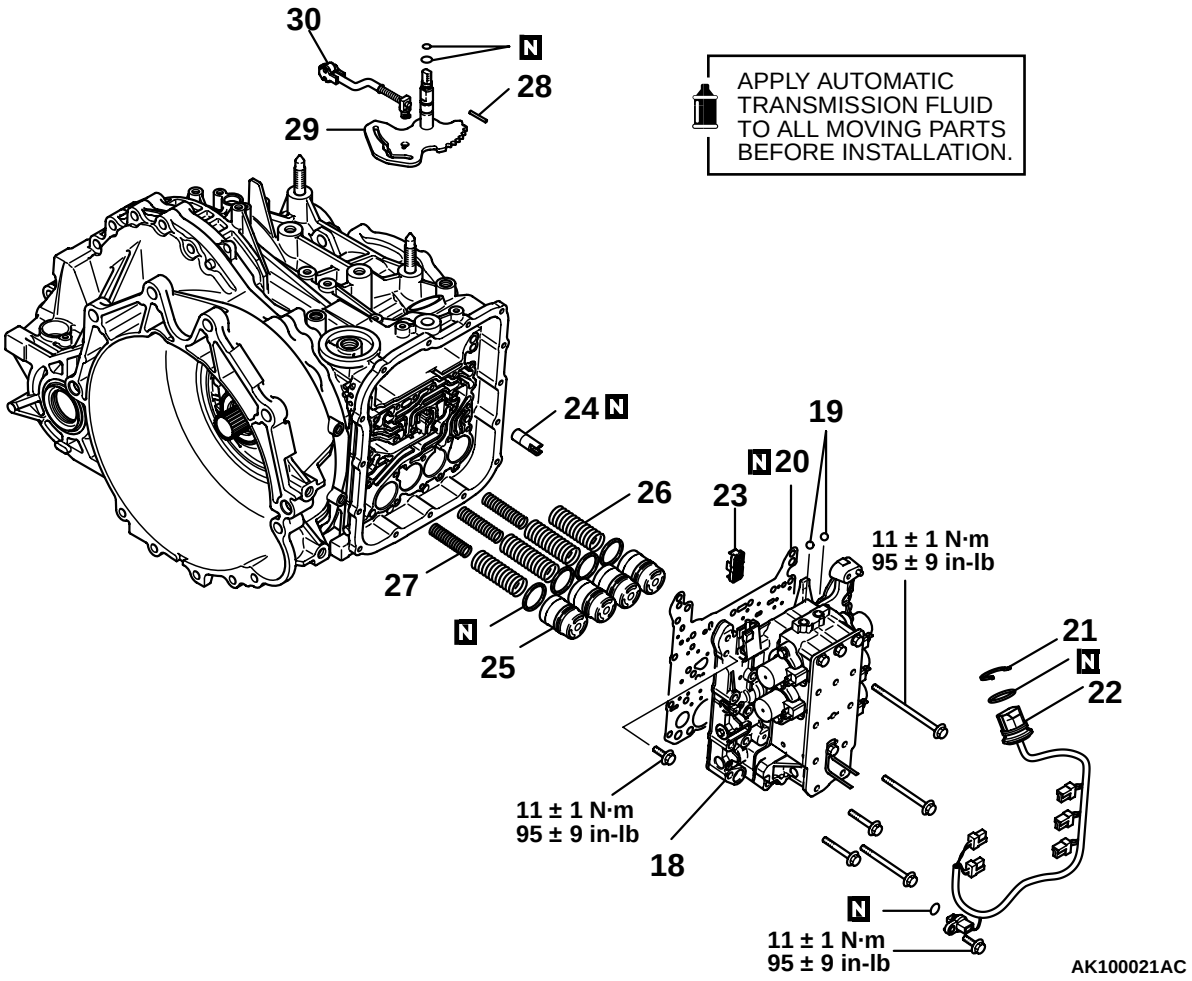
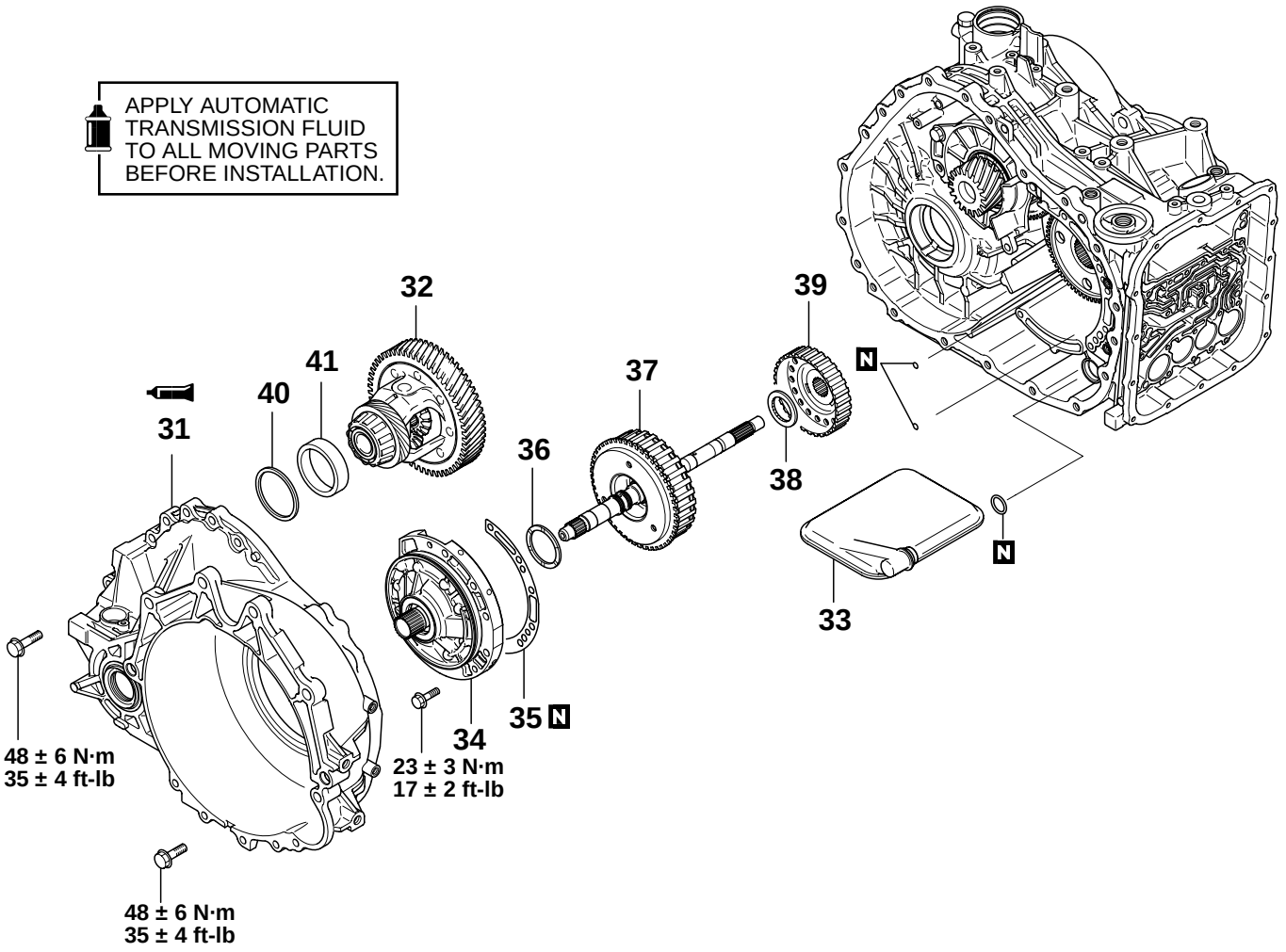
10. O-RING
11. OUTPUT SHAFT SPEED SENSOR
12. O-RING
13. MANUAL CONTROL LEVER
14. PARK/NEUTRAL POSITION SWITCH
15. SEALING CAP
16. O-RING
17. VALVE BODY COVER
18. MANUAL CONTROL SHAFT DETENT

TSB Revision



18. VALVE BODY
19. STEEL BALL
20. GASKET
21. SNAP RING
22. SOLENOID VALVE HARNESS
23. STRAINER
24. SECOND BRAKE RETAINER OIL SEAL
25. ACCUMULATOR PISTON
26. ACCUMULATOR SPRING
27. ACCUMULATOR SPRING
28. MANUAL CONTROL LEVER SHAFT ROLLER
29. MANUAL CONTROL LEVER SHAFT
30. PARKING PAWL ROD

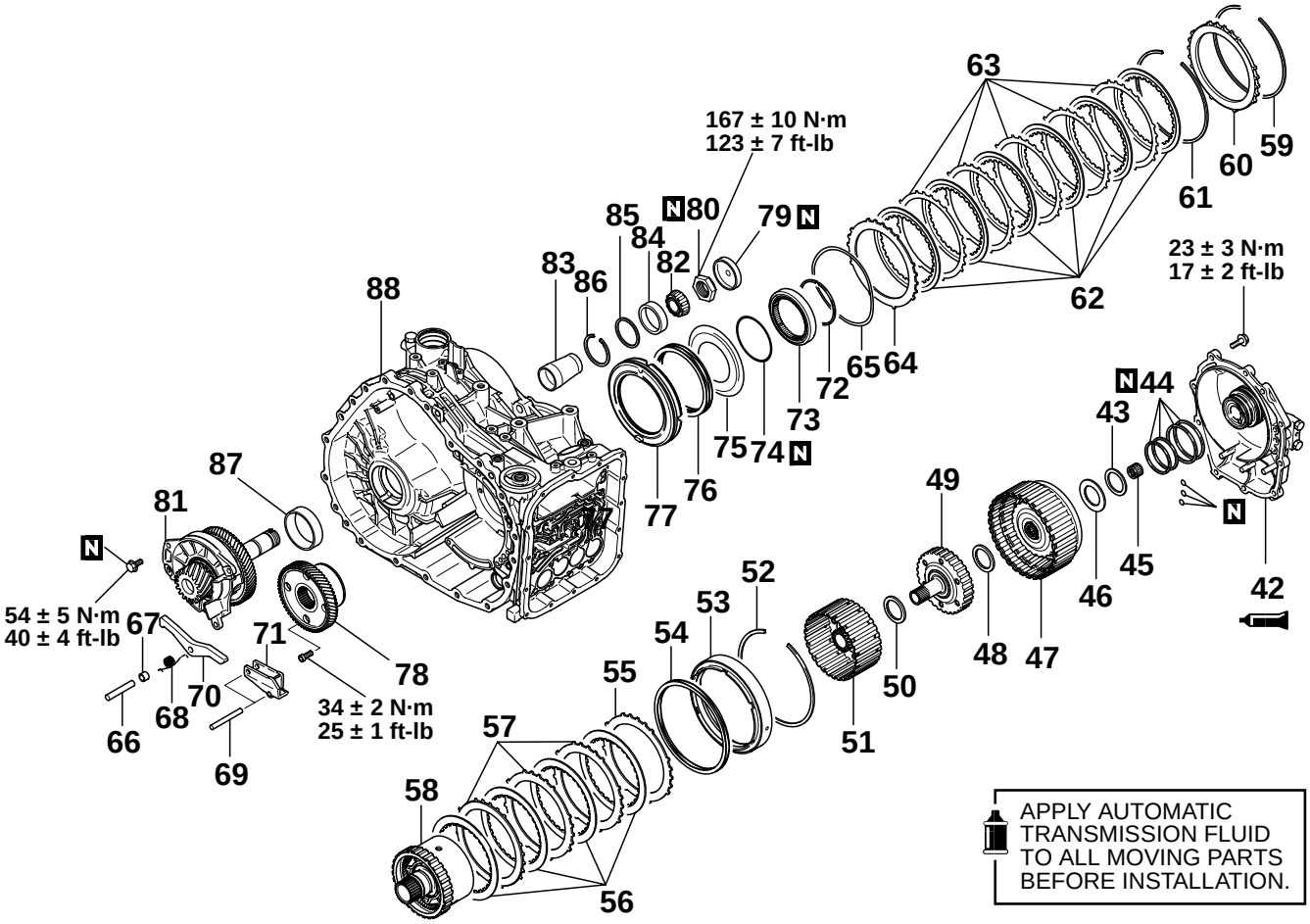
TSB Revision



AKX01134AB

31. TORQUE CONVERTER HOUSING
32. DIFFERENTIAL
33. OIL FILTER
34. OIL PUMP
35. GASKET
36. THRUST WASHER NO.1
37. UNDERDRIVE CLUTCH AND INPUT SHAFT
38. THRUST BEARING NO.2
39. UNDERDRIVE CLUTCH HUB
40. OUTER RACE
41. SPACER

TSB Revision



42. REAR COVER
43. THRUST RACE NO.8
44. SEAL RING
45. INPUT SHAFT REAR BEARING
46. THRUST BEARING NO.7
47. REVERSE AND OVERDRIVE CLUTCH
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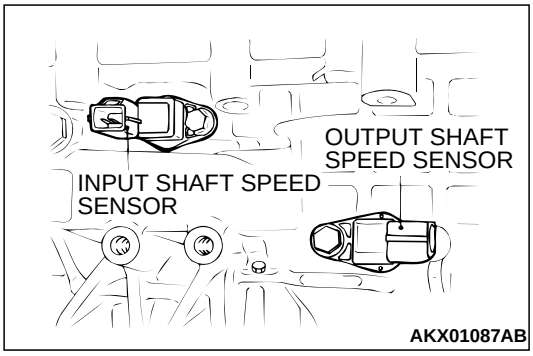
66. PARKING PAWL SHAFT
67. SPACER
68. PARKING PAWL SPRING
69. PARKING ROLLER SUPPORT SHAFT
70. PARKING PAWL
71. PARKING ROLLER SUPPORT
72. SNAP RING
73. ONE-WAY CLUTCH INNER RACE
74. O-RING
75. SPRING RETAINER
76. RETURN SPRING
77. LOW-REVERSE BRAKE PISTON
78. TRANSFER DRIVE GEAR
79. CAP
80. JAM NUT
81. OUTPUT SHAFT
82. TAPER ROLLER BEARING
83. COLLAR
84. OUTER RACE
85. SPACER
86. SNAP RING
87. OUTER RACE
88. TRANSAXLE CASE

TSB Revision

DISASSEMBLY

⚠ CAUTION

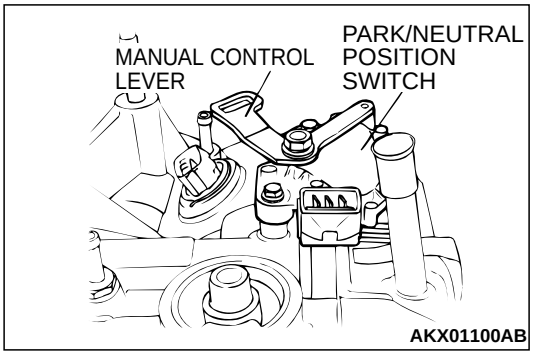
- **Because the automatic transaxle is manufactured from high-precision parts, care must be taken not to scratch or damage these parts during disassembly and assembly.**
- **Work or rubber mat and keep it clean at all times.**
- **Do not wear any cloth gloves and do not use any shop towels during disassembly. Use only nylon cloth, paper towels or any other lint-free material.**
- **Parts which have been disassembled should all be cleaned. Metal parts can be cleaned with normal detergent, but they should be dried completely using compressed air.**
- **Clutch discs, plastic thrust plates and rubber parts should be cleaned with automatic transmission fluid (ATF).**
- **If the transaxle body has been damaged, disassemble and clean the cooler system.**



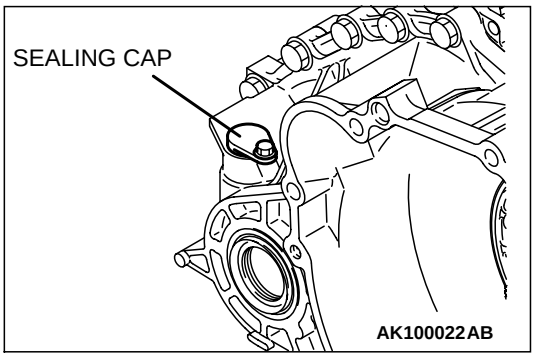
1. Remove the torque converter.
2. Remove each bracket.
3. Remove the dipstick.
4. Remove the eye bolt gauge, gaskets and the oil cooler feed tube.
5. Remove the air breather
6. Remove the input shaft speed sensor and output shaft speed sensor.

⚠ CAUTION

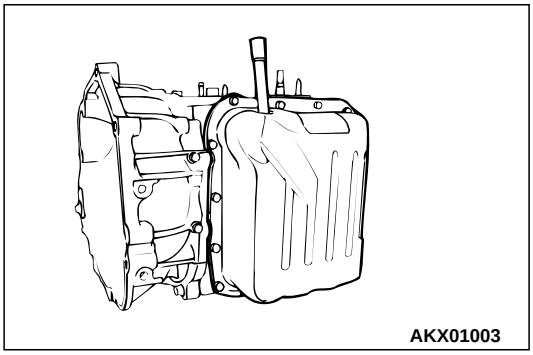
The manual control lever tightening nut must be removed before removing the valve body. If the valve body is removed before the nut, the park/neutral position switch will be damaged.



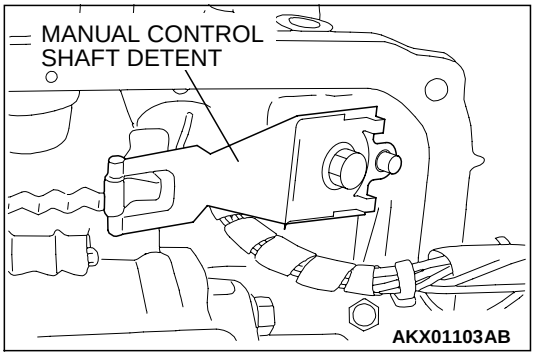
7. Loosen the manual control lever tightening nut, and then remove the manual control lever, and the park/neutral position switch.



8. Remove the Sealing cap and o-rig.

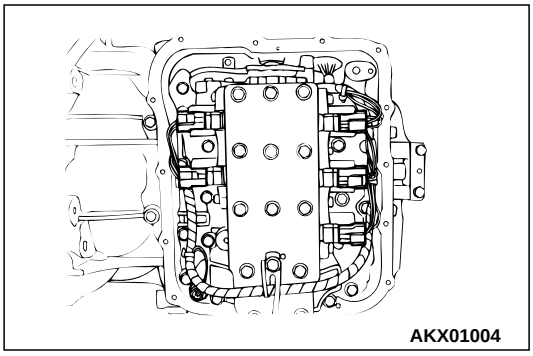

AKX01003

9. Remove the valve body cover.

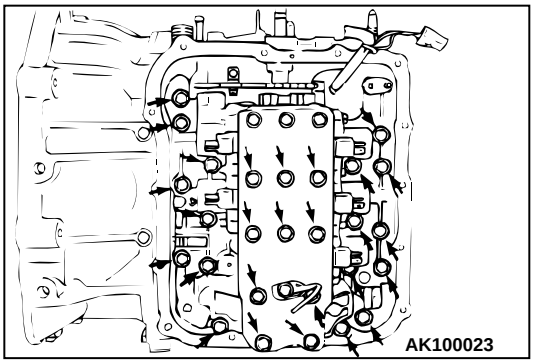


AKX01103AB

10. Remove the manual control shaft detent.

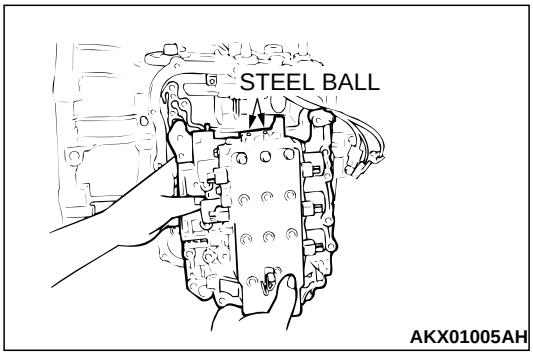

AKX01004

11. Disconnect the solenoid valve harness from the valve body by undoing the fluid temperature sensor and all the connectors.


AK100023

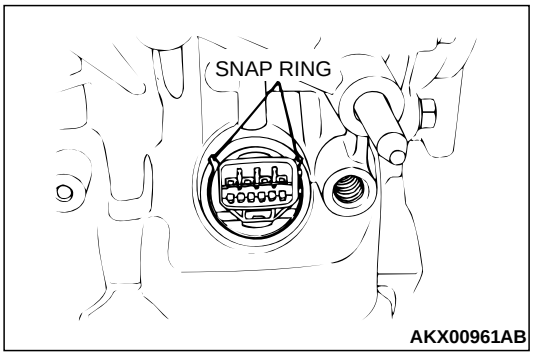
⚠ CAUTION
Make sure that the manual control lever and the park/neutral position switch are removed. See step 8.

12. Remove the valve body mounting bolts (27 pieces).

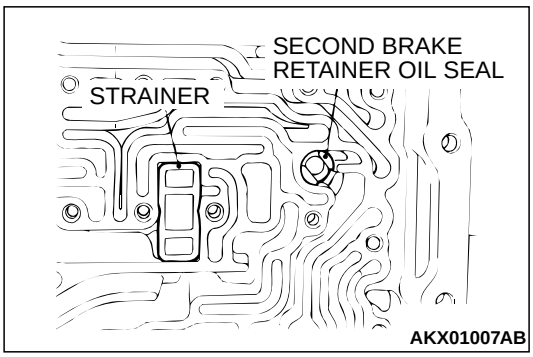


⚠ CAUTION
Do not lose the two steel balls.

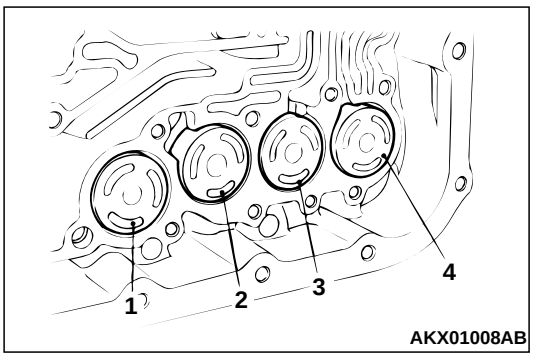
13.Remove the valve body, gasket, and the two steel balls.



14.Remove the snap ring from the connector. Push the connector into the transaxle case and remove the solenoid valve harness.

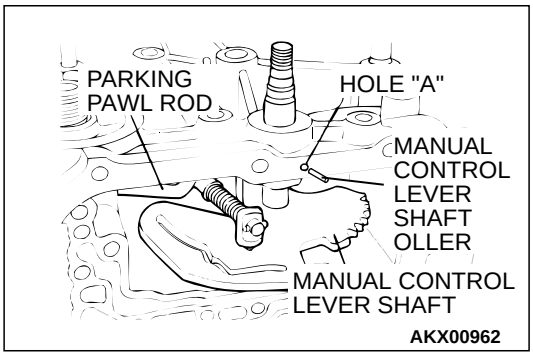


15.Remove the strainer and the second brake retainer oil seal.

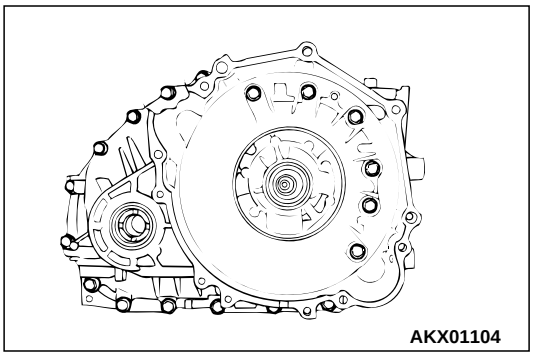


16.Remove each accumulator piston and spring.

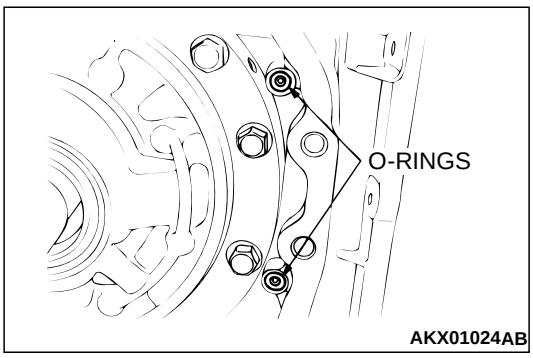
NUMBER	NAME
1	For low-reverse brake
2	For underdrive clutch
3	For second brake
4	For overdrive clutch



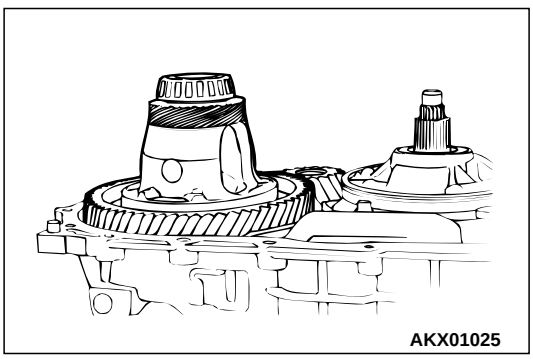
17.Remove the manual control lever shaft roller.
18.Remove the manual control lever shaft and the parking pawl rod.



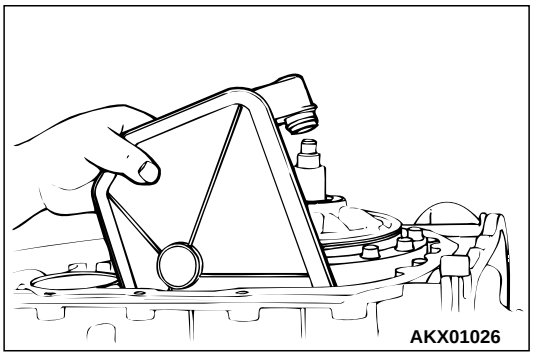
19.Remove the torque converter housing mounting bolts (18 bolts), and then remove the torque converter housing.
20.Remove the differential bearing outer race and spacer from the torque converter housing.



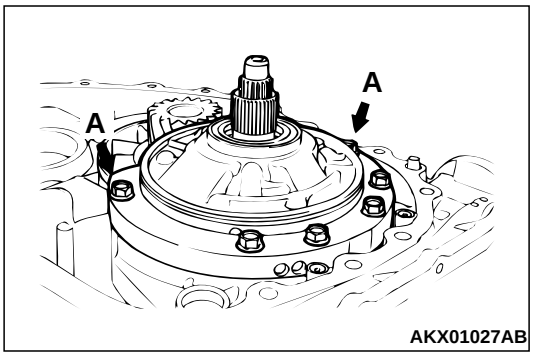
21.Remove the O-rings (two pieces).



22.Remove the differential.
23.Remove the differential bearing outer race from the transaxle case.

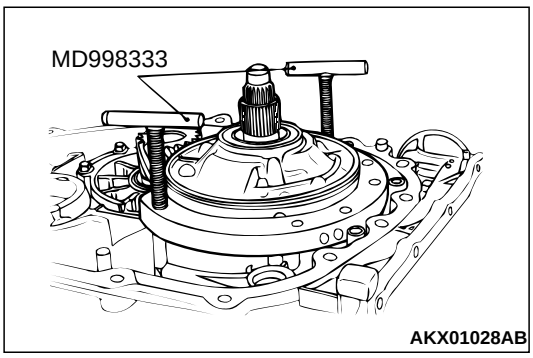

AKX01026

24.Remove the oil filter.



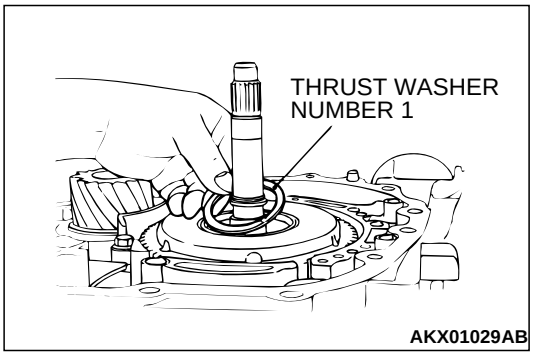
AKX01027AB

25.Remove the oil pump mounting bolts (six bolts).
26.Install special tool MD998333 in hole "A."



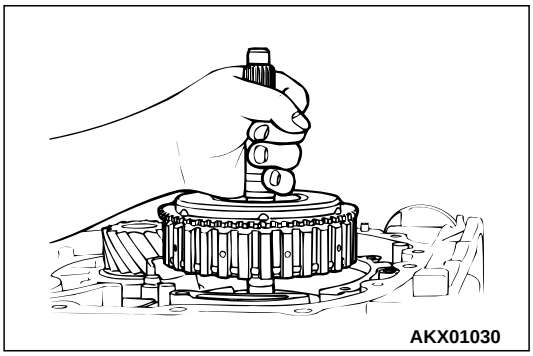
AKX01028AB

27.Turn special tools MD998333 to remove the oil pump.
28.Remove the oil pump gasket.

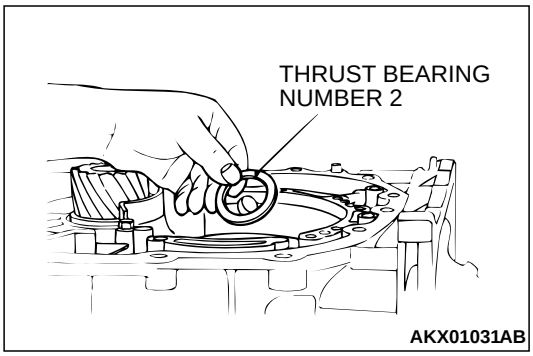


AKX01029AB

29.Remove thrust washer number 1.

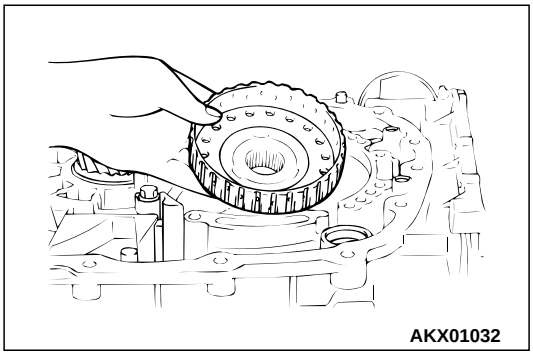

AKX01030

30.Holding the input shaft, remove the underdrive clutch and input shaft.

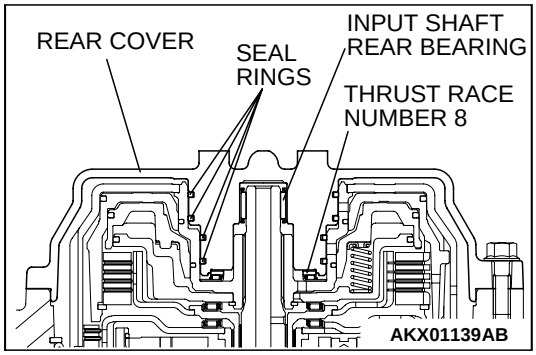


AKX01031AB

31.Remove thrust bearing number 2.

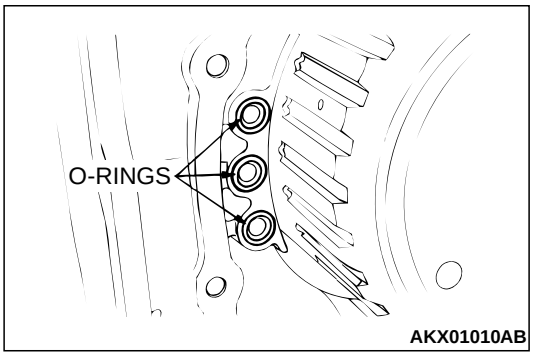

AKX01032

32.Remove the underdrive clutch hub.

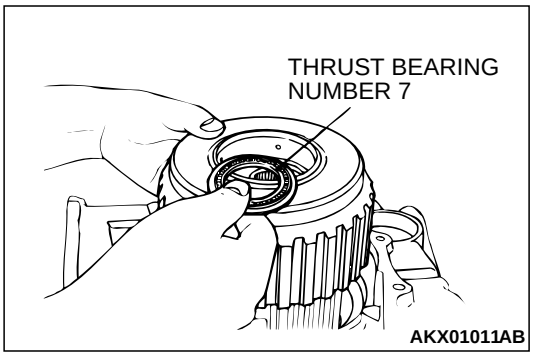


AKX01139AB

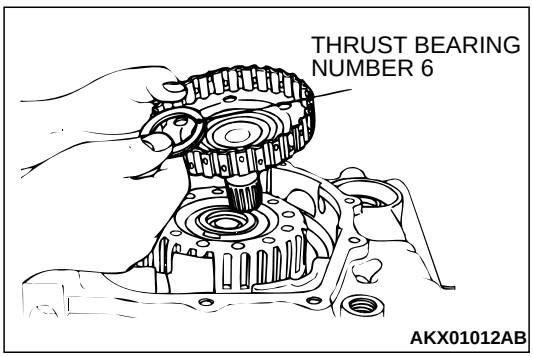
33.Remove the rear cover and input shaft rear bearing.
34.Remove thrust race number 8.
35.Remove the seal rings (four pieces).



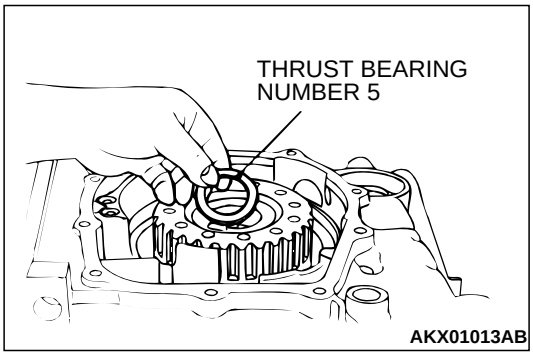
36.Remove the O-rings (three pieces).



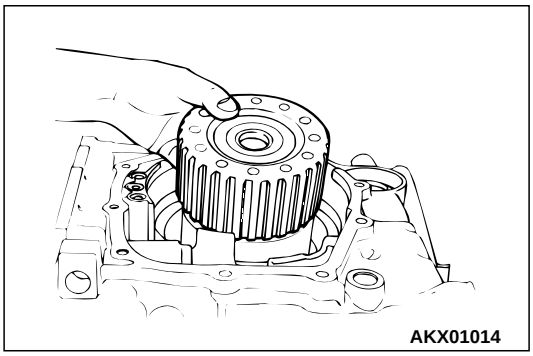
37.Remove the reverse and overdrive clutch and thrust bearing number 7.



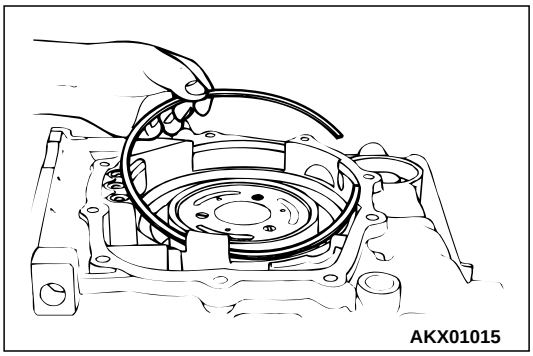
38.Remove overdrive clutch hub and thrust bearing number 6.



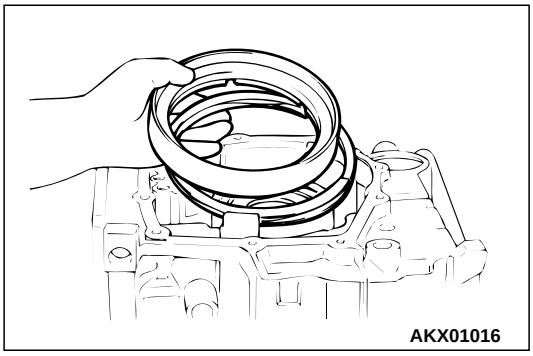
39.Remove thrust bearing number 5.


AKX01014

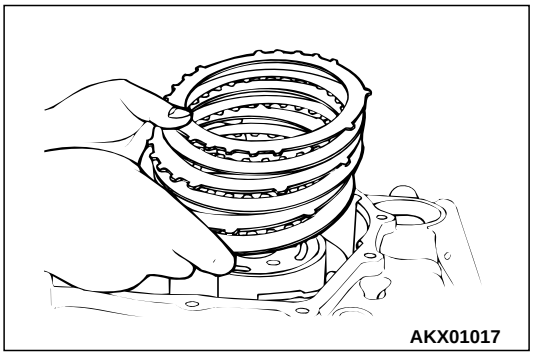
40.Remove the planetary reverse sun gear.


AKX01015

41.Remove the snap ring.


AKX01016

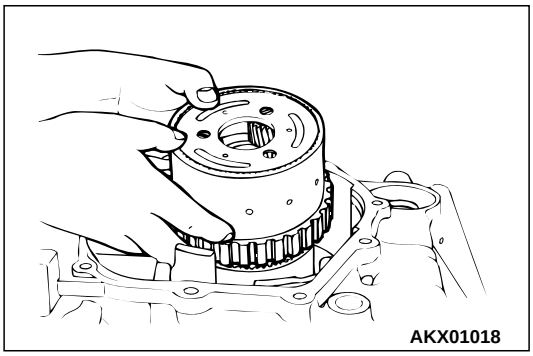
42.Remove the second brake piston and the return spring.


AKX01017

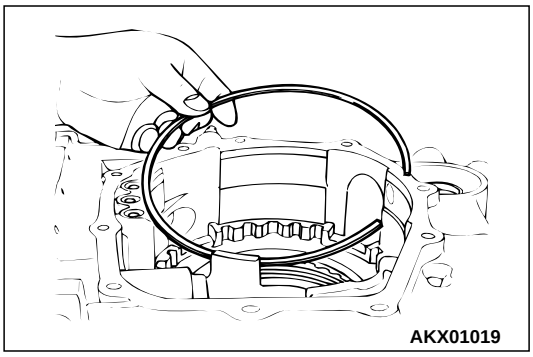
43.Remove the pressure plate, brake discs and brake plate.

Number of brake discs and plates:

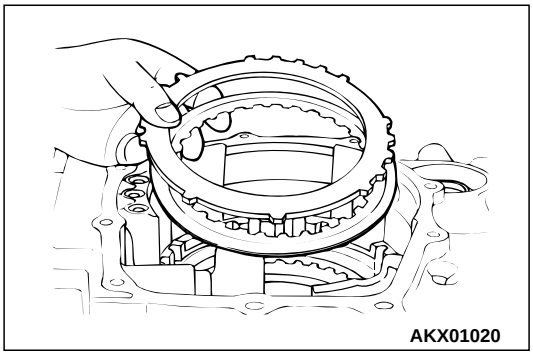
A/T MODEL	BRAKE DISC	BRAKE PLATE	PRESSURE PLATE
F4A42	3	2	1
F4A51	4	3	1


AKX01018

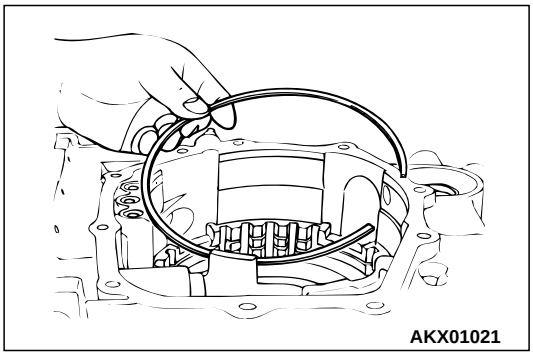
44.Remove the planetary carrier assembly.


AKX01019

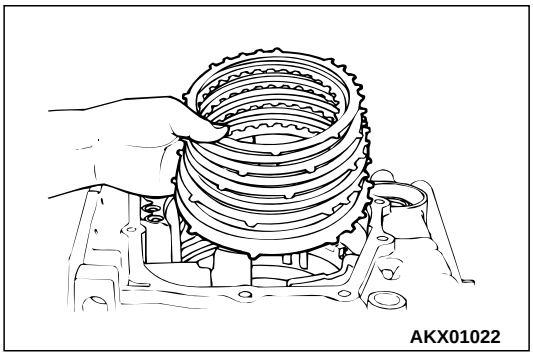
45.Remove the snap ring.


AKX01020

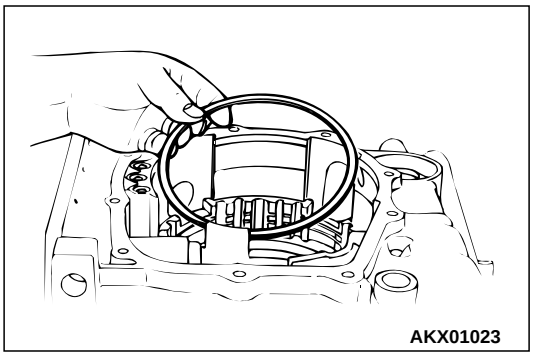
46.Remove the reaction plate and the brake disc.


AKX01021

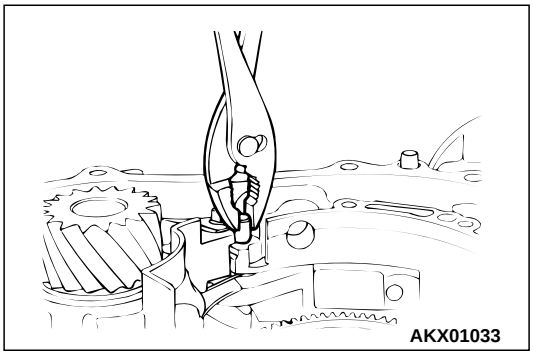
47.Remove the snap ring.


AKX01022

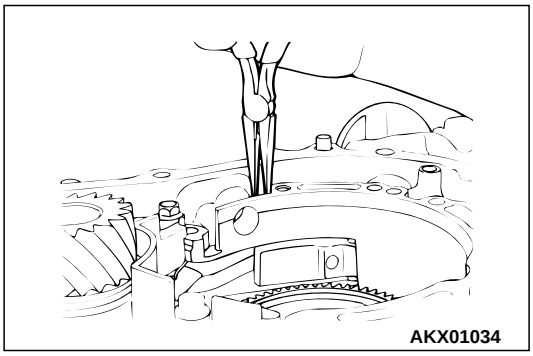
48.Remove the brake plates (five pieces), brake discs (six pieces) and pressure plate.


AKX01023

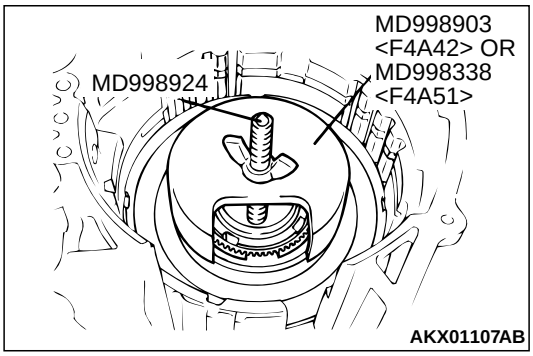
49.Remove the wave spring.


AKX01033

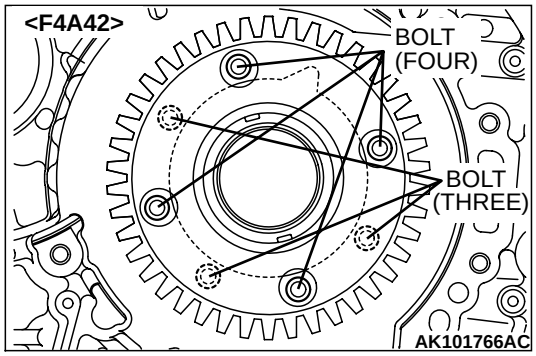
50.Remove the parking pawl shaft, and then remove the spacer and spring.


AKX01034

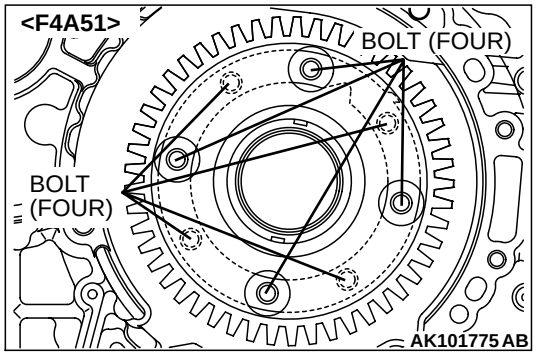
51.Remove the two parking roller support shafts, and then remove the parking roller support.

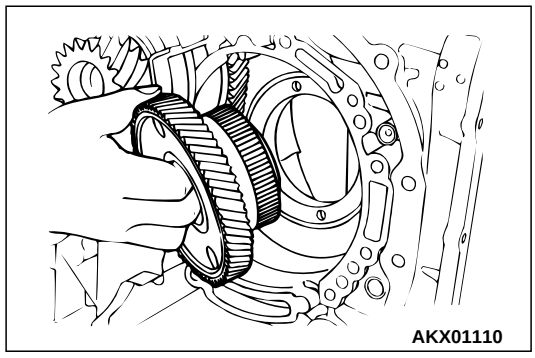


52.Remove the one-way clutch inner race and low-reverse brake piston as follows:
(1) Using special tools MD998903 <F4A42> or MD998338 <F4A51> and MD998924, compress the one-way clutch inner race.
NOTE: This illustration shows F4A51.
(2) Remove the snap ring.
(3) Remove the special tools.
(4) Remove the one-way clutch inner race, O-ring, spring retainer, return spring and low-reverse brake piston.

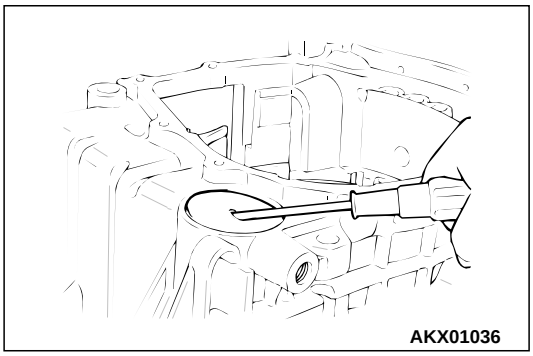


53.Remove the four <F4A51> or three <F4A42> transfer drive gear bearing mounting bolts.
Then, turn the gear 1/8 turn (45 degree angle) and remove the remaining bolts.
F4A42 = seven mounting bolts
F4A51 = eight mounting bolts

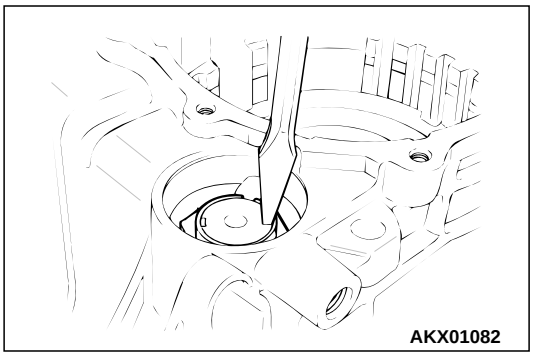




54.Remove the transfer drive gear.

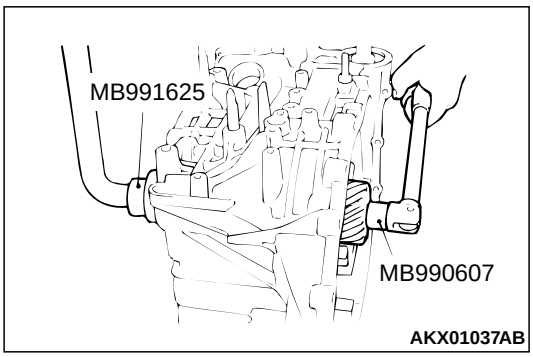

AKX01036

55.Remove the cap by jabbing a screw driver into the center of the cap and prying it up.


AKX01082

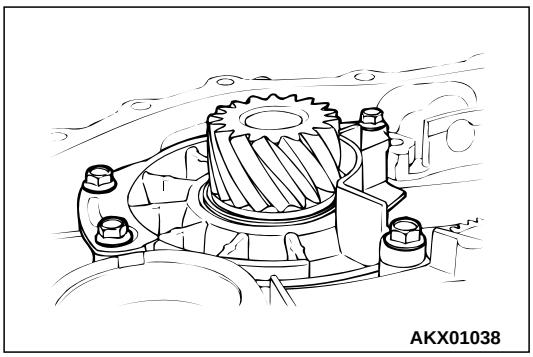
56.Using a chisel, straighten the staked portions from the output shaft unt.

⚠ CAUTION
The jam nut is reverse threaded.

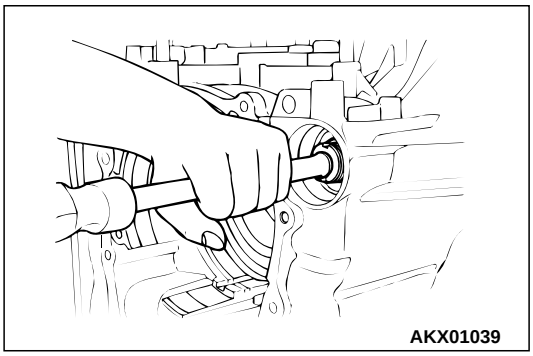


AKX01037AB

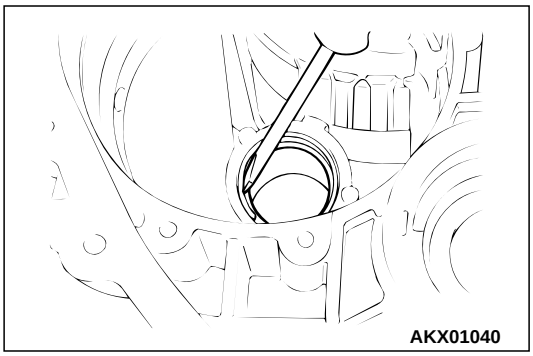
57.Use special tools MB991625 and MB990607 to remove the output shaft jam nut.


AKX01038

58.Remove the bearing retainer mounting bolt.


AKX01039

59. Tap on the rear end of the output shaft to remove the output shaft, taper roller bearing and collar.

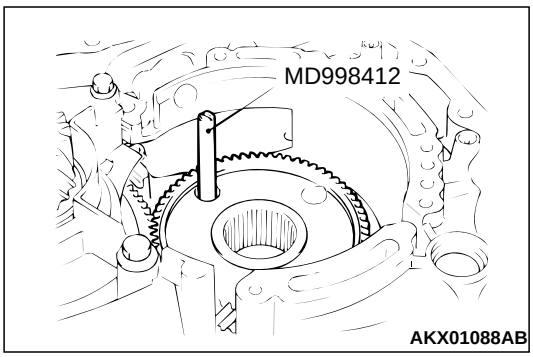

AKX01040

60. Tap out the outer race and the spacer.
61. Remove the snap ring.

ASSEMBLY

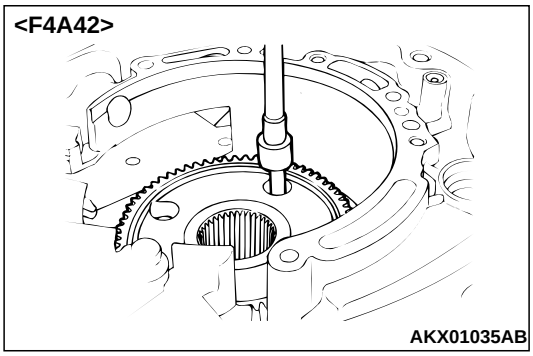
⚠ CAUTION

- **Do not reuse the gasket, O-ring, oil seal. Always replace with a new one when assembling.**
- **Do not use grease, use petroleum jelly (i.e. Vaseline).**
- **Apply ATF to friction components, rotating parts, and sliding parts before installation. Immerse a new clutch discs or brake discs in ATF for at least two hours before assembling them.**
- **When replacing a bushing, replace the assembly which it belongs to.**
- **Do not use cloth gloves or shop towels during assembly. Use nylon cloth or other lint-free material.**



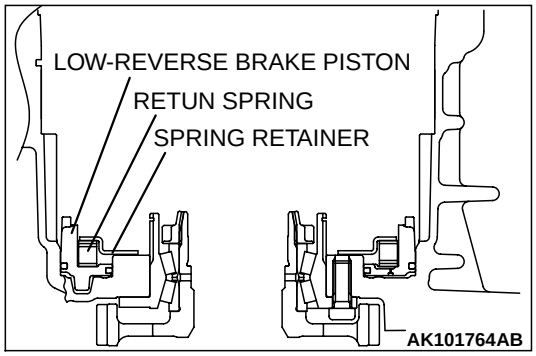
AKX01088AB

1. Install special tool MD998412 in the installation screw hole of the transfer drive gear bearing located in the transaxle case. Using this as a guide, install the transfer drive gear bearing and gear in the transaxle case.

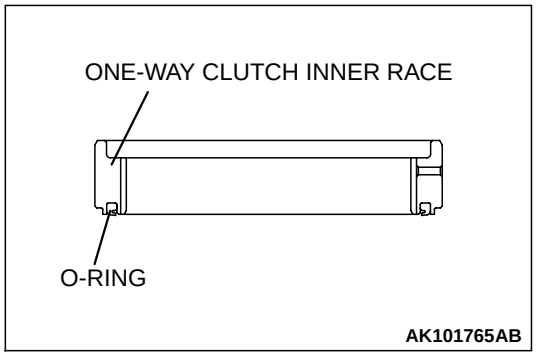


2. Tighten the seven mounting bolts <F4A42> and eight mounting bolts <F4A51> of the transfer drive gear bearing to the specified torque.

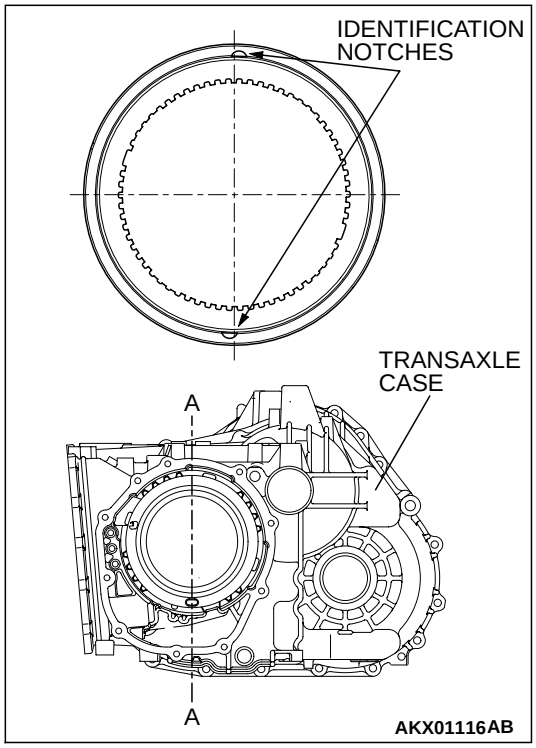
   Tightening torque: 34 ± 2 N·m (25 ± 1 ft-lb)



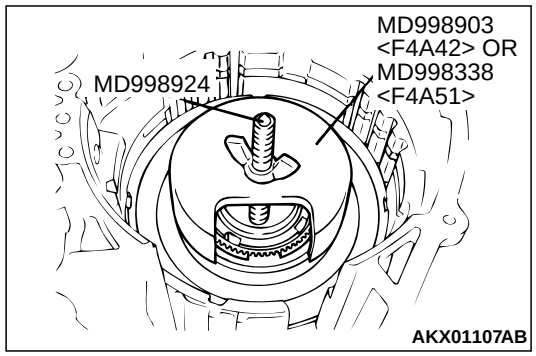
3. Install the low-reverse brake piston, return spring, and spring retainer into the transaxle case.



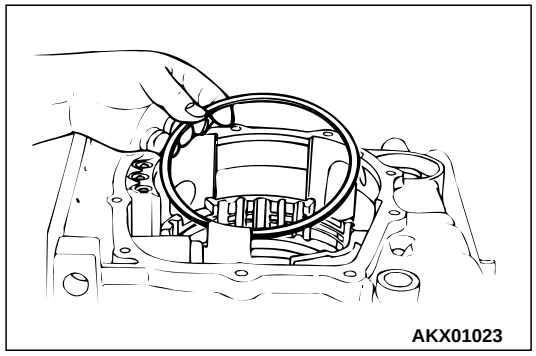
4. Fit a new O-ring into the groove of one-way clutch inner race.



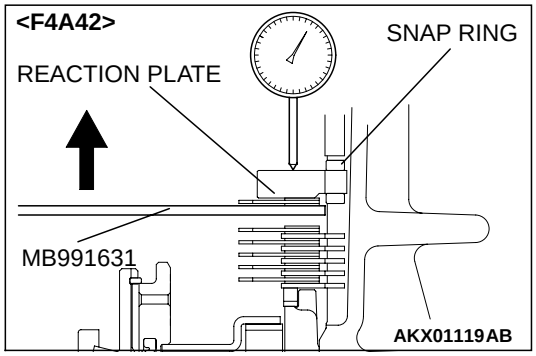
5. Check the placement of the identification notches in the one-way clutch inner race. Install the one-way clutch inner race to the transfer drive gear bearing so that the notches fall along the A – A line.

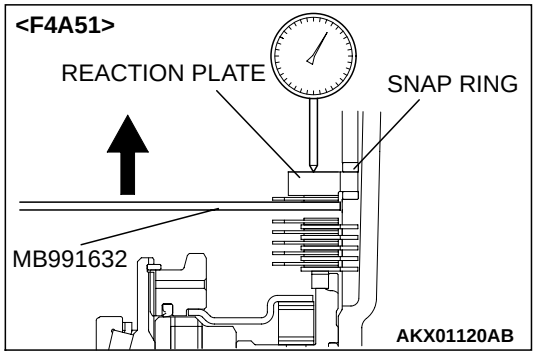


6. Put the snap ring on the inner race.
7. Set special tools MD998703 <F4A42> or MD998338 <F4A51> and MD998924 as shown, and then compress the one-way clutch inner race and install the snap ring.
   NOTE: This illustration shows F4A51.



8. Install the wave spring onto the low-reverse brake piston.



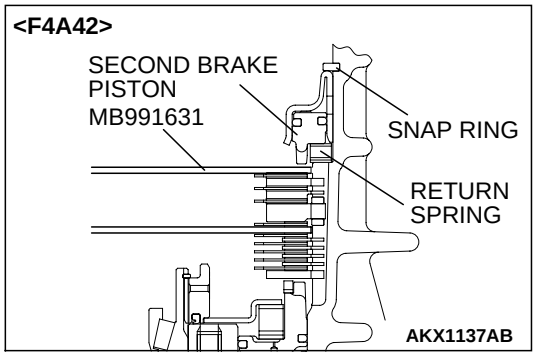


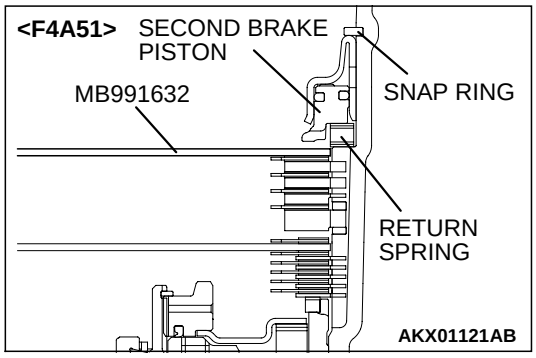
9. Install the six brake discs, five brake plates and snap ring as shown in the figure.

   NOTE: Do not install the pressure plate at this time.

10. Install special tool MB991631 <F4A42> or MB991632 <F4A51> on the brake disc.
11. Install the reaction plate and the used snap ring.
12. Move special tool MB991631 <F4A42> or MB991632 <F4A51> to measure the end play of reaction plate. Then replace the snap ring installed in step 11 to adjust the end play to standard value.

    Standard value: 0 – 0.16 mm (0 – 0.0063 inch)



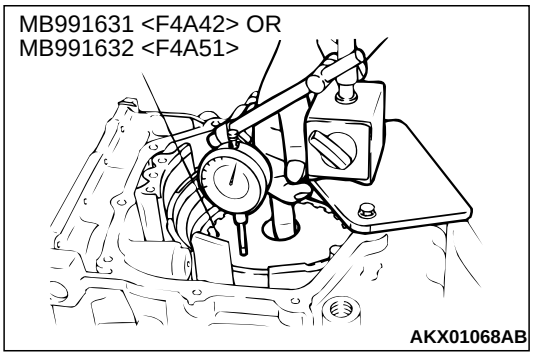


13. Install the brake discs and brake plates as shown in the figure.

Number of brake discs and plates

A/T MODEL	BRAKE DISC	BRAKE PLATE
F4A42	3	2
F4A51	4	3

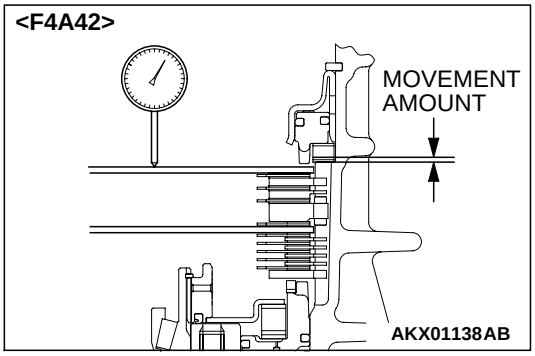
14. Place special tool MB991631 <F4A42> or MB991632 <F4A51> on top of the brake disc in place of the pressure plate.
15. Install the return spring, second brake piston and snap ring.

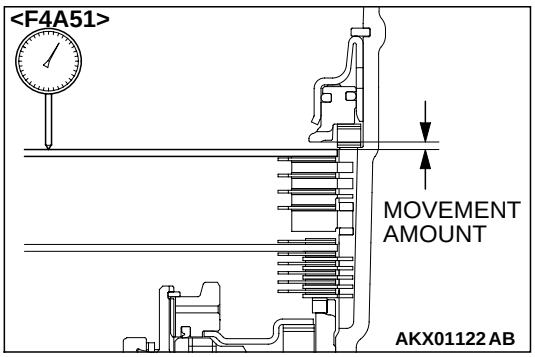


16. Move special tool MB991631 <F4A42> or MB991632 <F4A51> and measure its movement.

Standard value of end play (Reference):
0.79 – 1.25 mm (0.0311 – 0.0492 inch) <F4A42>
1.09 – 1.55 mm (0.0429 – 0.0610 inch) <F4A51>

17. Select a pressure plate whose thickness corresponds to the measured amount of movement from the following table.



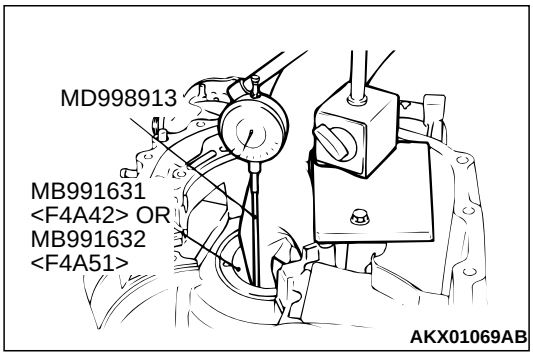


PRESSURE PLATE FOR SECOND BRAKE <F4A42>

MOVEMENT AMOUNT mm (in)	THICKNESS mm (in)	ID SYMBOL	PRESSURE PLATE PART NO.
0.6 – 0.8 (0.024 – 0.031)	1.6 (0.063)	L	MD759567
0.8 – 1.0 (0.031 – 0.039)	1.8 (0.071)	1	MD759414
1.0 – 1.2 (0.039 – 0.047)	2.0 (0.079)	0	MD759415
1.2 – 1.4 (0.047 – 0.055)	2.2 (0.087)	2	MD759416
1.4 – 1.6 (0.055 – 0.063)	2.4 (0.094)	4	MD759417
1.6 – 1.8 (0.063 – 0.071)	2.6 (0.102)	6	MD759418

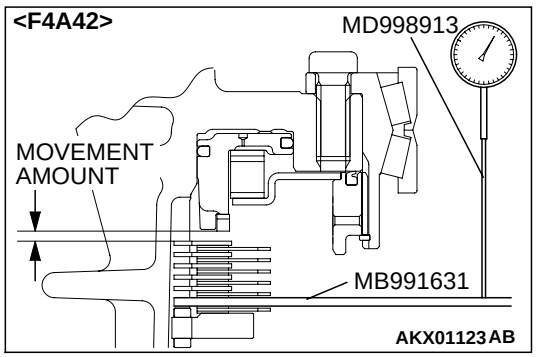
PRESSURE PLATE FOR SECOND BRAKE < F4A51>

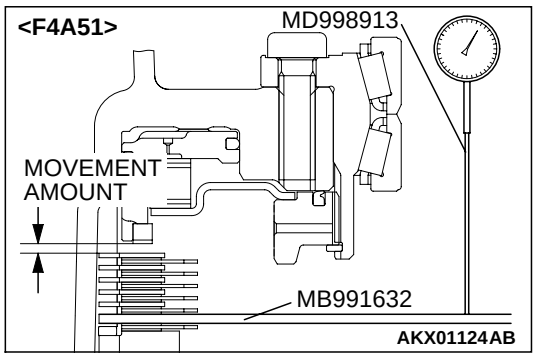
MOVEMENT AMOUNT mm (in)	THICKNESS mm (in)	ID SYMBOL	PRESSURE PLATE PART NO.
1.1 – 1.3 (0.043 – 0.051)	1.8 (0.071)	E	MD759425
1.3 – 1.5 (0.051 – 0.059)	2.0 (0.079)	D	MD759426
1.5 – 1.7 (0.059 – 0.067)	2.2 (0.087)	C	MD759427
1.7 – 1.9 (0.067 – 0.075)	2.4 (0.094)	B	MD759428
1.9 – 2.1 (0.075 – 0.083)	2.6 (0.102)	A	MD759429
2.1 – 2.3 (0.083 – 0.091)	2.8 (0.110)	0	MD759430



18. Turn the transaxle over so that the installation surface of the torque converter housing is facing up.
    Install special tool MD998913 in a dial gauge, and then move special tool MB991631 <F4A42> or MB991632 <F4A51> and measure its movement.

    Standard value of end play (Reference):
    1.65 – 2.11 mm (0.050 – 0.0831 inch)





19. Select a pressure plate whose thickness corresponds to the measured amount of movement from the table below.
    NOTE: This illustration shows F4A51.

PRESSURE PLATE FOR LOW-REVERSE BRAKE < F4A42>

MOVEMENT AMOUNT mm (in)	THICKNESS mm (in)	ID SYMBOL	PRESSURE PLATE PART NO.
1.3 – 1.5 (0.051 – 0.059)	1.6 (0.063)	L	MD759567
1.5 – 1.7 (0.059 – 0.067)	1.8 (0.071)	1	MD759414
1.7 – 1.9 (0.067 – 0.075)	2.0 (0.079)	0	MD759415
1.9 – 2.1 (0.075 – 0.083)	2.2 (0.087)	2	MD759416
2.1 – 2.3 (0.083 – 0.091)	2.4 (0.094)	4	MD759417
2.3 – 2.5 (0.091 – 0.098)	2.6 (0.102)	6	MD759418
2.5 – 2.7 (0.098 – 0.106)	2.8 (0.110)	8	MD759419
2.7 – 2.9 (0.106 – 0.114)	3.0 (0.118)	D	MD759420

PRESSURE PLATE FOR OW-REVERSE BRAKE <F4A51>

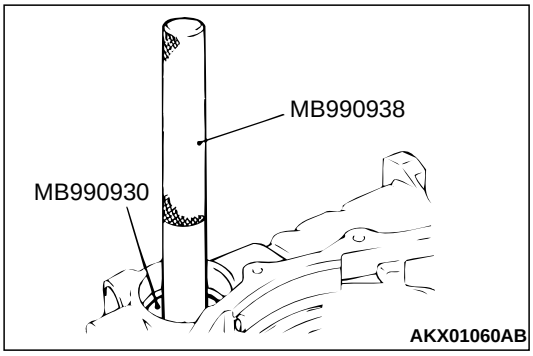
MOVEMENT AMOUNT mm (in)	THICKNESS mm (in)	ID SYMBOL	PRESSURE PLATE PART NO.
1.0 – 1.2 (0.039 – 0.047)	1.6 (0.063)	F	MD759568
1.2 – 1.4 (0.047 – 0.055)	1.8 (0.071)	E	MD759425
1.4 – 1.6 (0.055 – 0.063)	2.0 (0.079)	D	MD759426
1.6 – 1.8 (0.063 – 0.071)	2.2 (0.087)	C	MD759427

MOVEMENT AMOUNT mm (in)	THICKNESS mm (in)	ID SYMBOL	PRESSURE PLATE PART NO.
1.8 – 2.0 (0.071 – 0.079)	2.4 (0.094)	B	MD759428
2.0 – 2.2 (0.079 – 0.087)	2.6 (0.102)	A	MD759429
2.2 – 2.4 (0.087 – 0.094)	2.8 (0.110)	0	MD759430
2.4 – 2.6 (0.094 – 0.102)	3.0 (0.118)	1	MD759431

⚠ CAUTION

If necessary, take the measurements in steps 9 to 18 after replacing the pressure plate, brake plate and brake disc.

20. Remove all parts and special tools that were installed to take the measurements in steps 9 to 18. Remove and separate the pressure plate and snap ring chosen in steps 12, 16 and 18.
21. Install the snap ring into the groove of transaxle case output shaft bore.
22. Use special tools MB990930 and MB990938 to tap the output shaft bearing outer race in the transaxle case.

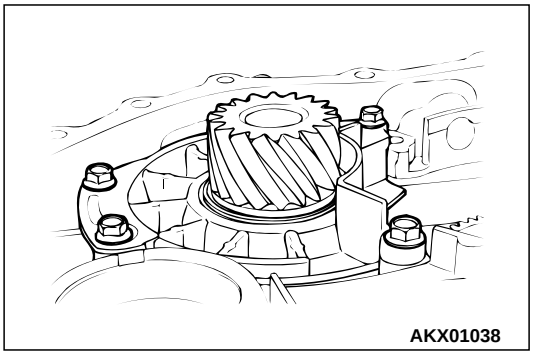


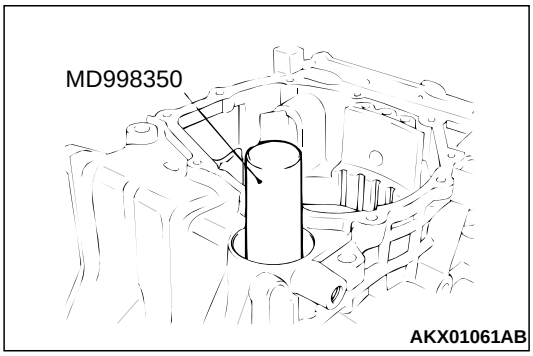
⚠ CAUTION

Do not reuse the bolt, as it has had sealant applied.

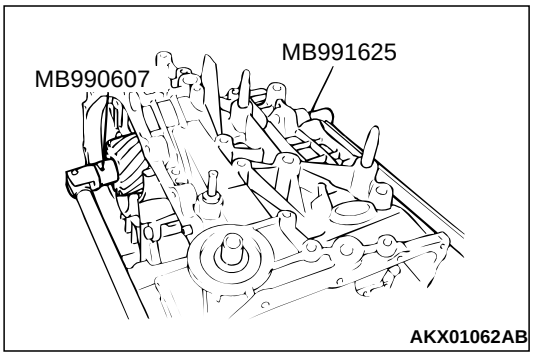
23. Tighten the mounting bolts of the output shaft bearing retainer to the specified torque.

Tightening torque:
23 ± 3 N·m (17 ± 2 ft-lb) <F4A42>
54 ± 5 N·m (40 ± 4 ft-lb) <F4A51>





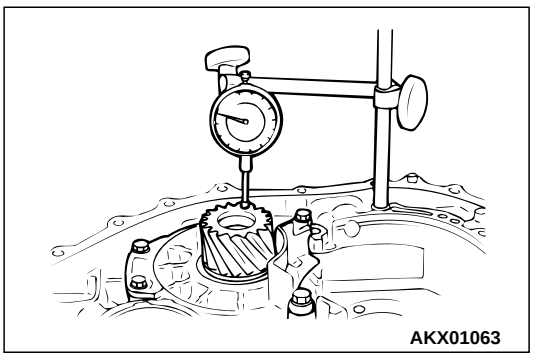
24.Use special tool MD998350 to install the collar and taper roller bearing on the output shaft.



25.Apply ATF to a new jam nut, and use special tools MB990607 and MB991625 to tighten the jam nut to the specified torque. Then turn back one turn, and tighten to the specified torque again.

Tightening torque: 167 ± 10 N·m (123 ± 7 ft-lb)

NOTE: The jam nut is reverse threaded.



26.Move the output shaft to measure the end play and record the measurement value.

27.Remove the parts that were installed in steps 21 to 24.

28.Add 0.01 to 0.09 mm (0.0004 to 0.0035 inch)** to the measured value in step 25 and select a spacer of the same thickness. Adjustment spacer sizes are all listed on P.23B-82. Select the most suitable one from among those listed.

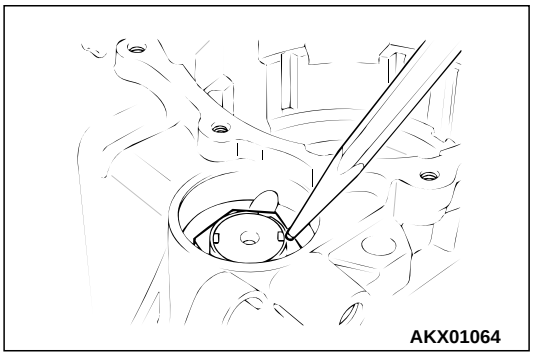
*NOTE: * is the thickness of the spacer installed in step 21. ** is the preload of the output shaft.*

SPACER FOR OUTPUT SHAFT

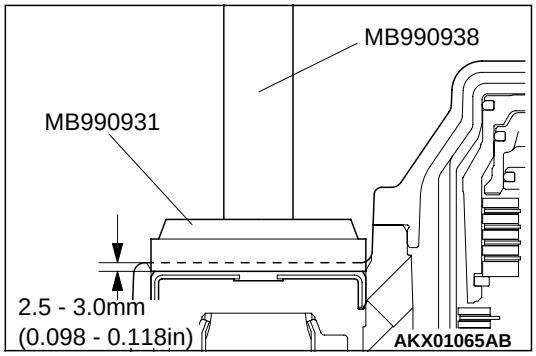
MOVEMENT AMOUNT mm (in)	THICKNESS mm (in)	ID SYMBOL	PRESSURE PLATE PART NO.
1.81 – 1.85 (0.0713 – 0.0728)	1.88 (0.0740)	88	MD756579
1.85 – 1.89 (0.0728 – 0.0744)	1.92 (0.0756)	92	MD756580
1.89 – 1.93 (0.0744 – 0.0760)	1.96 (0.0772)	96	MD756581
1.93 – 1.97 (0.0760 – 0.0776)	2.00 (0.0787)	00	MD756582
1.97 – 2.01 (0.0776 – 0.0791)	2.04 (0.0803)	04	MD756583
2.01 – 2.05 (0.0791 – 0.0807)	2.08 (0.0819)	08	MD756584
2.05 – 2.09 (0.0807 – 0.0823)	2.12 (0.0835)	12	MD756585

MOVEMENT AMOUNT mm (in)	THICKNESS mm (in)	ID SYMBOL	PRESSURE PLATE PART NO.
2.09 – 2.13 (0.0823 – 0.0839)	2.16 (0.0850)	16	MD756586
2.13 – 2.17 (0.0839 – 0.0854)	2.20 (0.0866)	20	MD756587
2.17 – 2.21 (0.0854 – 0.0870)	2.24 (0.0882)	24	MD756588
2.21 – 2.25 (0.0870 – 0.0886)	2.28 (0.0898)	28	MD756589
2.25 – 2.29 (0.0886 – 0.0902)	2.32 (0.0913)	32	MD756590
2.29 – 2.33 (0.0902 – 0.0917)	2.36 (0.0929)	36	MD756591
2.33 – 2.37 (0.0917 – 0.0933)	2.40 (0.0945)	40	MD756592
2.37 – 2.41 (0.0933 – 0.0949)	2.44 (0.0961)	44	MD756593
2.41 – 2.45 (0.0949 – 0.0965)	2.48 (0.0976)	48	MD756594
2.45 – 2.49 (0.0965 – 0.0980)	2.52 (0.0992)	52	MD756595
2.49 – 2.53 (0.0980 – 0.0996)	2.56 (0.1008)	56	MD756596
2.53 – 2.57 (0.0996 – 0.1012)	2.60 (0.1024)	60	MD756597
2.57 – 2.61 (0.1012 – 0.1028)	2.64 (0.1039)	64	MD756598
2.61 – 2.65 (0.1028 – 0.1043)	2.68 (0.1055)	68	MD756599
2.65 – 2.69 (0.1043 – 0.1059)	2.72 (0.1071)	72	MD760685
2.69 – 2.73 (0.1059 – 0.1075)	2.76 (0.1087)	76	MD760686

29.Repeat steps 22 to 25 again, installing each part and using the appropriate adjustment spacer determined in step 27.

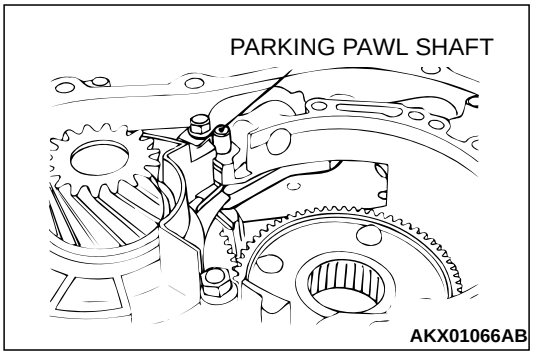

AKX01064

30.Stake the jam nut with a punch (two places).



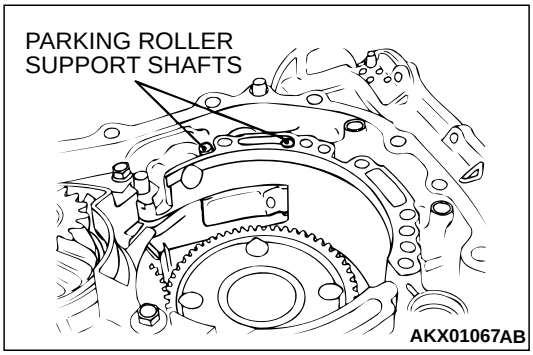
AKX01065AB

31.Use special tools MB990931 and MB990938 to install the cap as shown in the illustration.



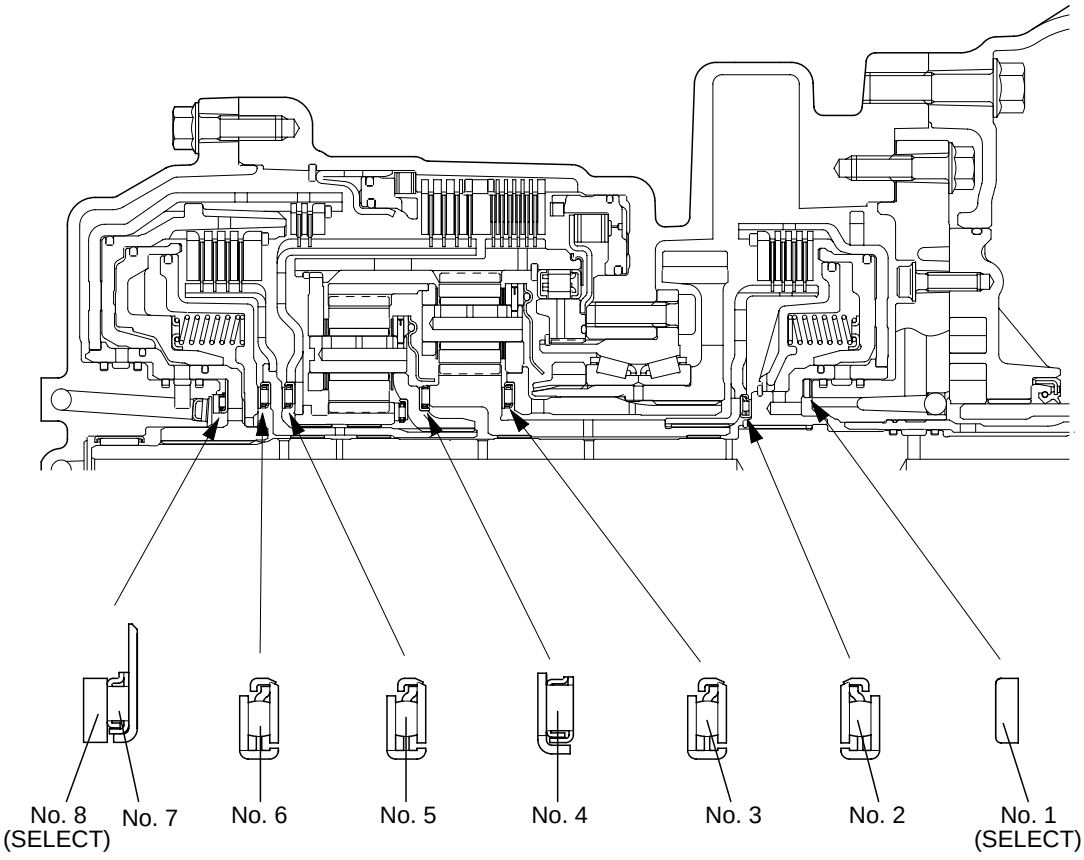
AKX01066AB

32.Install the parking pawl, spacer, and spring. Then insert the parking pawl shaft.



AKX01067AB

33.Install the parking roller support, and then insert the two parking roller support shafts.



IDENTIFICATION OF THRUST BEARING, THRUST RACES, AND THRUST WASHERS

mm (in)

SYMBOL	OD	ID	THICKNESS	PART NO.	APPLICATION
No.1	59 (2.32)	47 (1.85)	1.8 (0.071)	MD754509	
	59 (2.32)	47 (1.85)	2.0 (0.079)	MD754508	
	59 (2.32)	47 (1.85)	2.2 (0.087)	MD754507	
	59 (2.32)	47 (1.85)	2.4 (0.094)	MD753793	
	59 (2.32)	47 (1.85)	2.6 (0.102)	MD753794	
	59 (2.32)	47 (1.85)	2.8 (0.110)	MD753795	
No.2	49 (1.93)	34 (1.34)	3.6 (0.142)	MD756846	
No.3	49 (1.93)	34 (1.34)	3.6 (0.142)	MD756846	F4A42
	57 (2.24)	38.5 (1.516)	4.12 (0.1622)	MD758556	F4A51
No.4	45.3 (1.783)	31 (1.22)	3.3 (0.130)	MD757647	F4A42
	55.4 (2.181)	38.5 (1.516)	3.3 (0.130)	MD761683	F4A51
No.5	49 (1.93)	34 (1.34)	3.6 (0.142)	MD756846	F4A42
	57 (2.244)	38.5 (1.516)	4.1 (0.161)	MD758556	F4A51
No.6	49 (1.93)	34 (1.34)	3.6 (0.142)	MD756846	F4A42
	57 (2.244)	38.5 (1.516)	4.1 (0.161)	MD758556	F4A51

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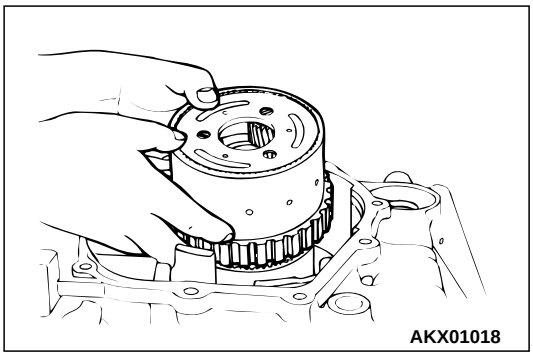
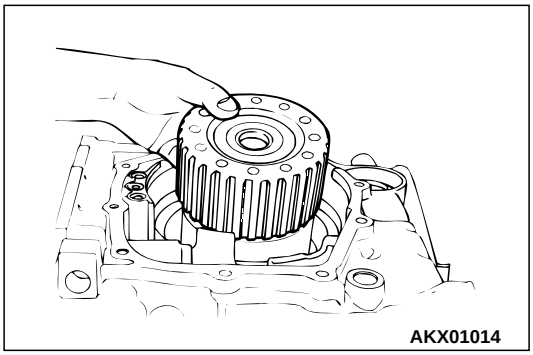
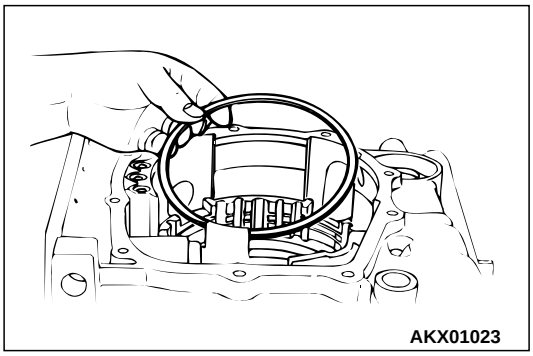
SYMBOL	OD	ID	THICKNESS	PART NO.	APPLICATION
No.7	59 (2.32)	37 (1.46)	2.8 (0.110)	MD754595	
No.8	48.9 (1.925)	37 (1.46)	1.6 (0.063)	MD707267	
	48.9 (1.925)	37 (1.46)	1.7 (0.067)	MD759681	
	48.9 (1.925)	37 (1.46)	1.8 (0.071)	MD723064	
	48.9 (1.925)	37 (1.46)	1.9 (0.075)	MD754794	
	48.9 (1.925)	37 (1.46)	2.0 (0.079)	MD707268	
	48.9 (1.925)	37 (1.46)	2.1 (0.083)	MD754795	
	48.9 (1.925)	37 (1.46)	2.2 (0.087)	MD723065	
	48.9 (1.925)	37 (1.46)	2.3 (0.091)	MD754796	
	48.9 (1.925)	37 (1.46)	2.4 (0.094)	MD724358	
	48.9 (1.925)	37 (1.46)	2.5 (0.098)	MD754797	
	48.9 (1.925)	37 (1.46)	2.6 (0.102)	MD754798	


AKX01018

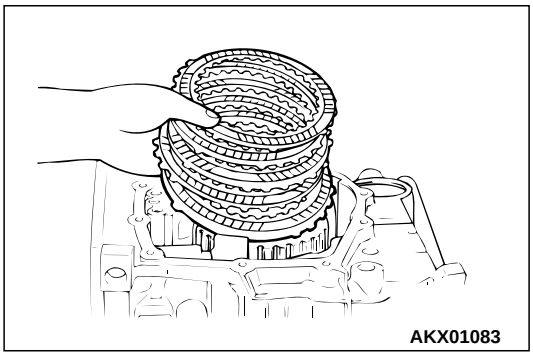
34.Install the planetary carrier assembly.


AKX01014

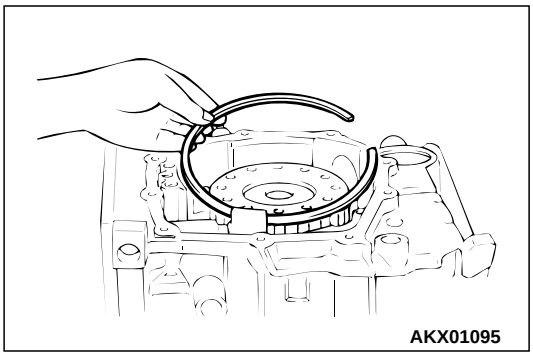
35.Install the planetary reverse sun gear.


AKX01023

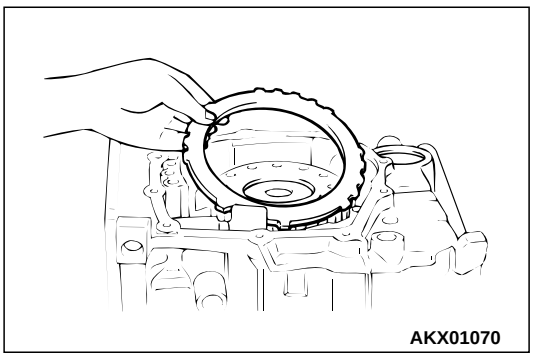
36.Install the wave spring on the low-reverse brake piston.


AKX01083

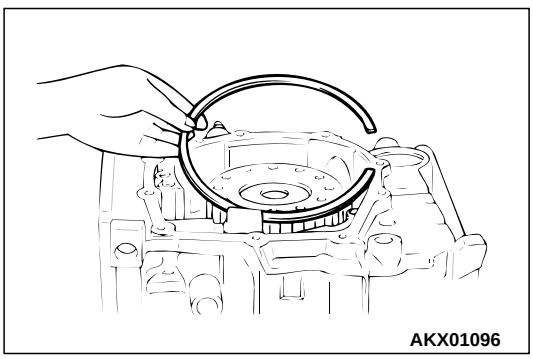
37.Install the pressure plate that was selected in step 19. Next, install six brake discs and five brake plates, one on top of the other.


AKX01095

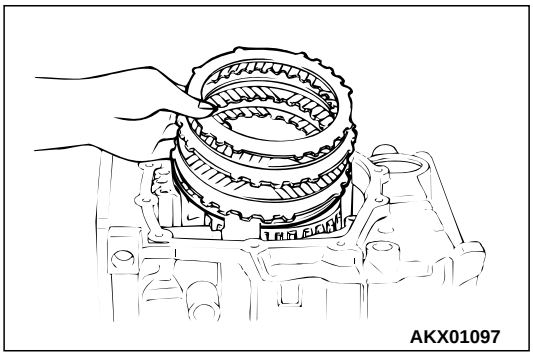
38.Install the snap ring.


AKX01070

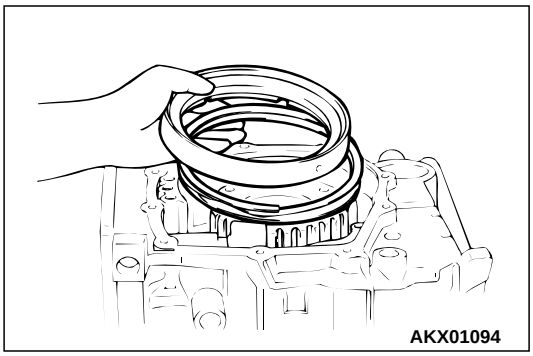
39.Install the reaction plate.


AKX01096

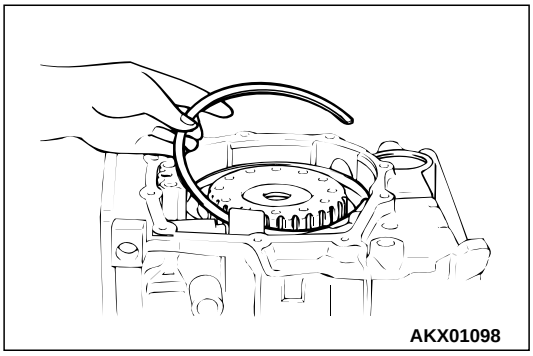
40.Install the snap ring that was selected in step 12.


AKX01097

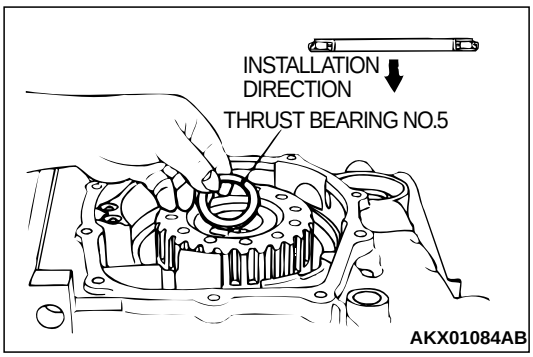
41.Install three brake discs <F4A42> or four brake discs <F4A51> and two brake plates <F4A42> or three brake plates <F4A51>, one on top of the other. Next, install the pressure plate that was selected in step 17.


AKX01094

42.Install the return spring and second brake piston.


AKX01098

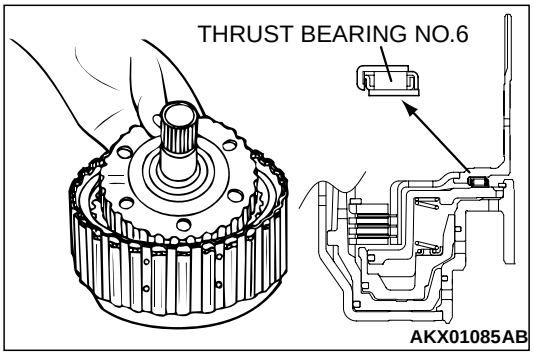
43.Install the snap ring.



AKX01084AB

⚠ CAUTION
Be sure to install the thrust bearing in the correct direction as shown.

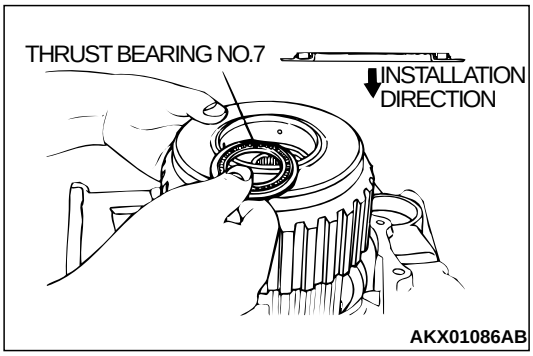
44.Check the installation direction of the thrust bearing number 5, and install it on the hub of the planetary reverse sun gear.



⚠ CAUTION

Use care to install the thrust bearing in the proper direction.

45.Attach thrust bearing number 6 to the inside of the overdrive clutch hub using petroleum jelly (Vaseline). Then install the assembly in the reverse and overdrive clutch.

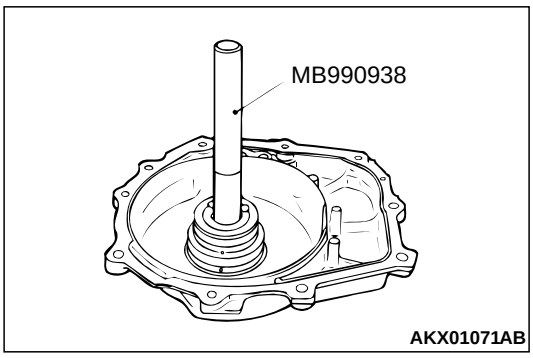


46.Install the reverse and overdrive clutch.

⚠ CAUTION

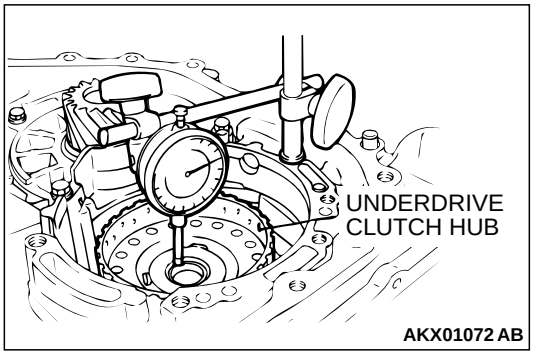
Be sure to install the thrust bearing in the correct direction as shown.

47.Check the installation direction of thrust bearing number 7, and install it on the reverse clutch retainer.



48.Use special tool MB990938 to tap the input shaft rear bearing in the rear cover.

49.Install the four seal rings in the grooves of the rear cover.



50.Measure the end play of the under drive sun gear by the following procedures:

(1) Install the thinnest thrust race number 8 [thickness 1.6 mm (0.063 inch); part number MD707267] on thrust bearing number 7.

(2) Install the rear cover on the transaxle case and tighten the bolts to the specified torque.

Tightening torque: 23 ± 3 N·m (17 ± 2 ft-lb)

(3) Turn over the transaxle case so that the installation surface of the torque converter housing is facing up.

(4) Install the under drive clutch hub on the under drive sun gear.

(5) Measure end play of the underdrive sun gear and record the measurement value.

Standard value (Reference):
0.25 – 0.45 mm (0.0098 – 0.0177 inch)

(6) After taking the measurement in steps (5), take out the installed parts in steps (1) through (4).

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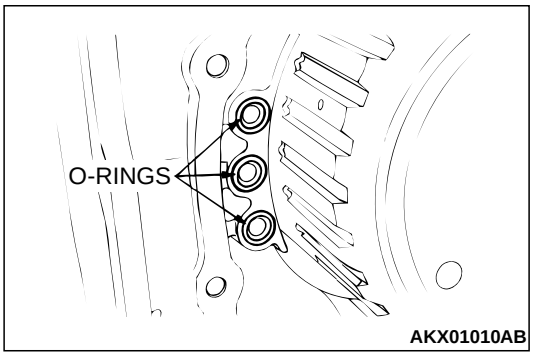
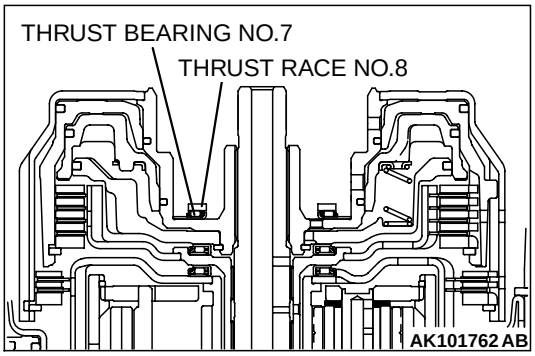
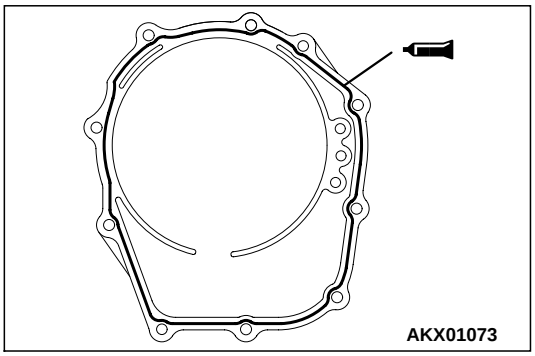


51.Install the three O-rings.



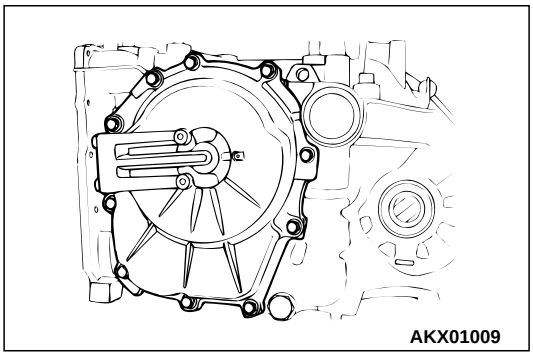
52.Select a thrust race number 8 whose thickness corresponds to the measured values taken in step 50 from the table below. Install it on thrust bearing number 7.

MEASUREMENT VALUE mm (in)	THICKNESS mm (in)	PART NO.
0.3 – 0.4 (0.012 – 0.016)	1.6 (0.063)	MD707267
0.4 – 0.5 (0.016 – 0.020)	1.7 (0.067)	MD759681
0.5 – 0.6 (0.020 – 0.024)	1.8 (0.071)	MD723064
0.6 – 0.7 (0.024 – 0.028)	1.9 (0.075)	MD754794
0.7 – 0.8 (0.028 – 0.031)	2.0 (0.079)	MD707268
0.8 – 0.9 (0.031 – 0.035)	2.1 (0.083)	MD754795
0.9 – 1.0 (0.035 – 0.039)	2.2 (0.087)	MD723065
1.0 – 1.1 (0.039 – 0.043)	2.3 (0.091)	MD754796
1.1 – 1.2 (0.043 – 0.047)	2.4 (0.094)	MD724358
1.2 – 1.3 (0.047 – 0.051)	2.5 (0.098)	MD754797
1.3 – 1.4 (0.051 – 0.055)	2.6 (0.102)	MD754798



53.Apply a 2 mm (0.08 inch) diameter bead of sealant (MITSUBISHI Genuine Part number MD974421 or equivalent) to the illustrated position of the rear cover.

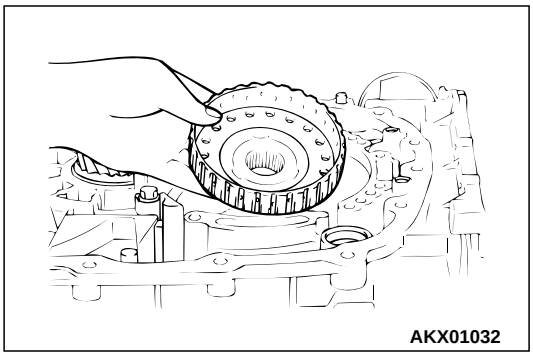
NOTE: Be sure to install the case quickly while the sealant is wet (within 15 minutes) or leaks will occur if the rear cover is installed after the sealant dries.


AKX01009

54.Install the rear cover, and tighten its mounting bolts to the specified torque.

Tightening torque: 23 ± 3 N·m (17 ± 2 ft-lb)

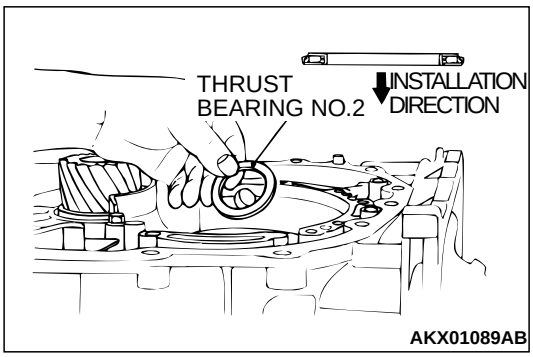
NOTE: After installation, keep the sealed area away from the ATF for approximately one hour.


AKX01032

55.Install the underdrive clutch hub to the underdrive sun gear.

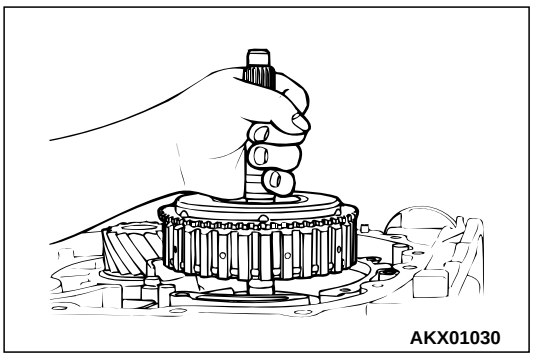
⚠ CAUTION

Be sure to install the thrust bearing in the correct direction as shown.

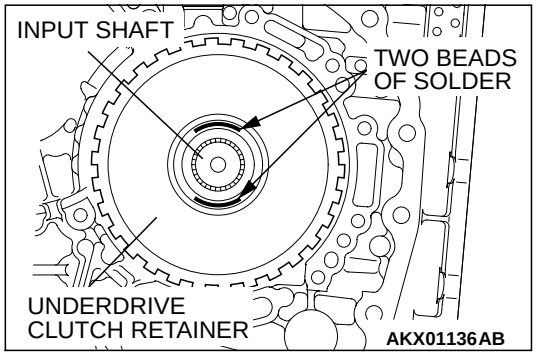


AKX01089AB

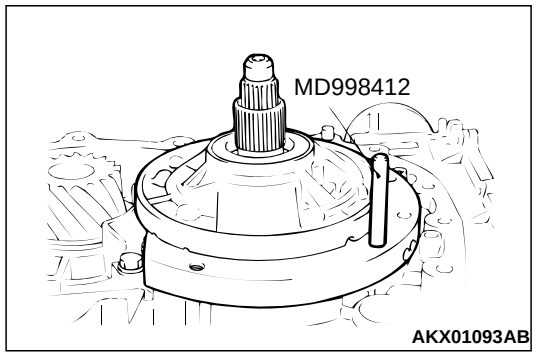
56.Check the installation direction of thrust bearing number 2, and install it on the underdrive clutch hub.


AKX01030

57.Hold the input shaft, and install the underdrive clutch.



58.Place two beads of solder [each 10 mm (0.39 inch) in length, 3.5 mm (0.14 inch) in diameter] on the underdrive clutch retainer as shown in the illustration.



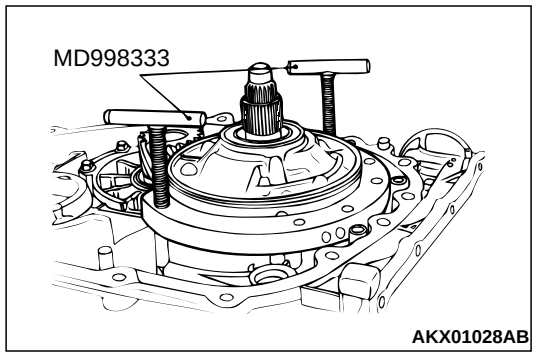
59.Install special tool MD998412 in the illustrated place.

60.Install the oil pump to the transaxle case.

NOTE: Do not install the oil pump gasket at this time.

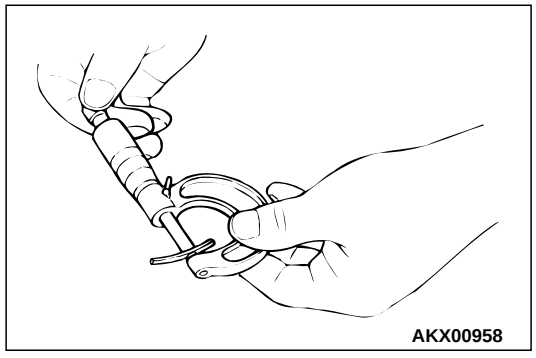
61.Tighten the oil pump mounting bolts (six pieces) to the specified torque.

Tightening torque: 23 ± 3 N·m (17 ± 2 ft-lb)



62.Remove the oil pump mounting bolts.

63.Using special tools MD998333, remove the oil pump and the crushed solders.

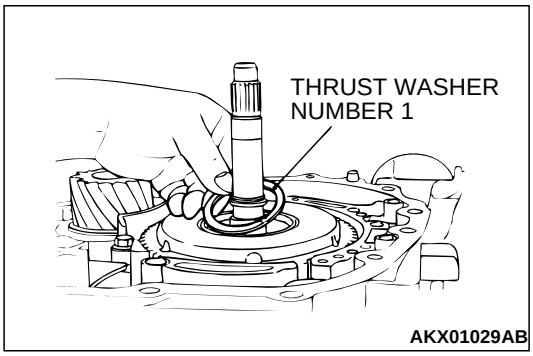


64.Use a micrometer to measure the thickness of the crushed solder beads and record the measured value.

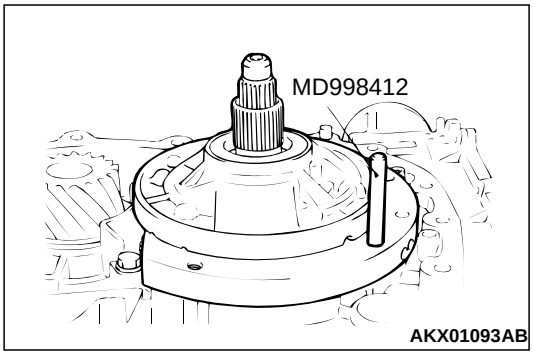
65.Select a thrust washer number 1 whose thickness corresponds to the measured value from table below.

MEASUREMENT VALUE mm (in)	THICKNESS mm (in)	ID SYMBOL	PART NO.
2.25 – 2.45 (0.089 – 0.096)	1.8 (0.071)	18	MD754509
2.45 – 2.65 (0.096 – 0.104)	2.0 (0.079)	20	MD754508
2.65 – 2.85 (0.104 – 0.112)	2.2 (0.087)	22	MD754507

MEASUREMENT VALUE mm (in)	THICKNESS mm (in)	ID SYMBOL	PART NO.
2.85 – 3.05 (0.112 – 0.120)	2.4 (0.094)	24	MD753793
3.05 – 3.25 (0.120 – 0.128)	2.6 (0.102)	26	MD753794
3.25 – 3.45 (0.128 – 0.136)	2.8 (0.110)	28	MD753795



66.Install thrust washer number 1 that was selected in step 66 on the underdrive clutch retainer.

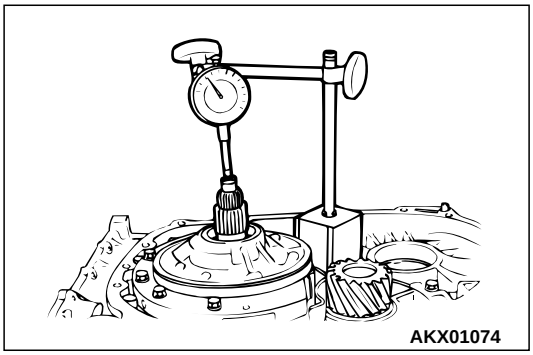


67.Install special tool MD998412 in the illustrated place.

68.Install the new oil pump gasket on the transaxle case.

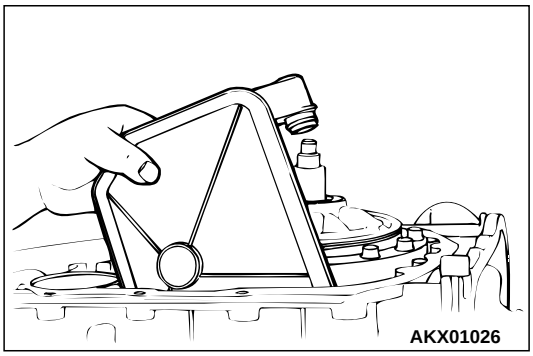
69.Install the oil pump and tighten the mounting bolts (six pieces) to the specified torque.

Tightening torque: 23 ± 3 N·m (17 ± 2 ft-lb)

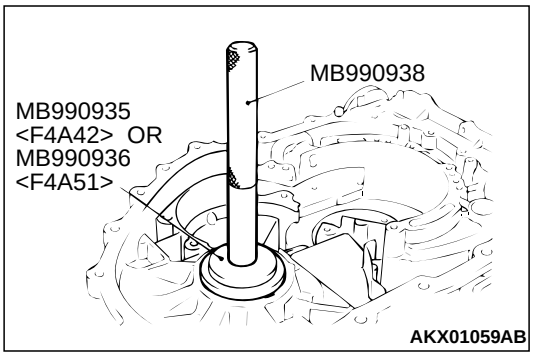


70.Make sure that the input shaft end play meets the standard value.

Standard value: 0.70 – 1.45 mm (0.028 – 0.057 inch)

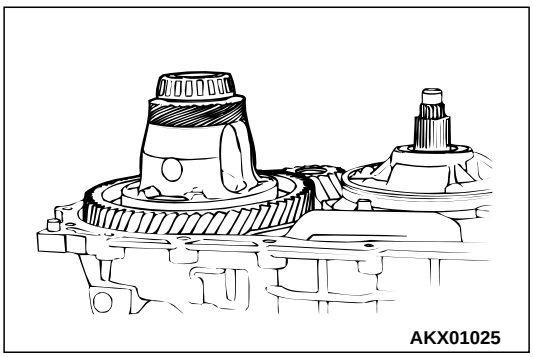

AKX01026

71.Install the oil filter.

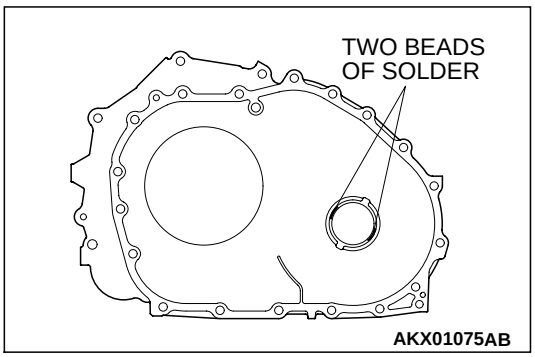


AKX01059AB

72.Use special tools MB990935 <F4A42> or MB990936 <F4A51> and MB990938 to tap the differential bearing outer race in the transaxle case.

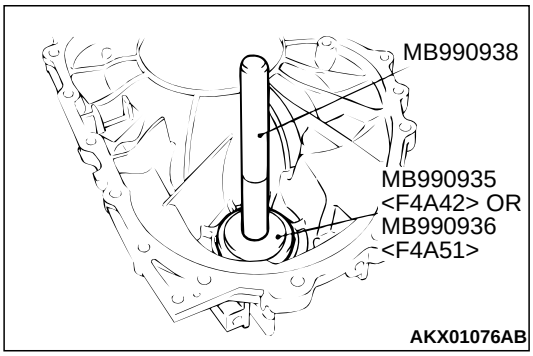

AKX01025

73.Install the differential.

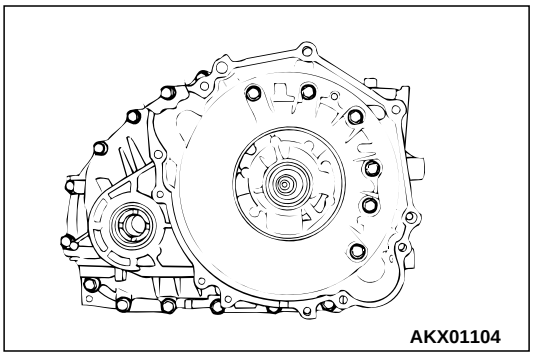


AKX01075AB

74.Place two beads of solder [each 10 mm (0.39 inch) in length, 3 mm (0.12 inch) in diameter] on the torque converter housing as shown in the illustration.



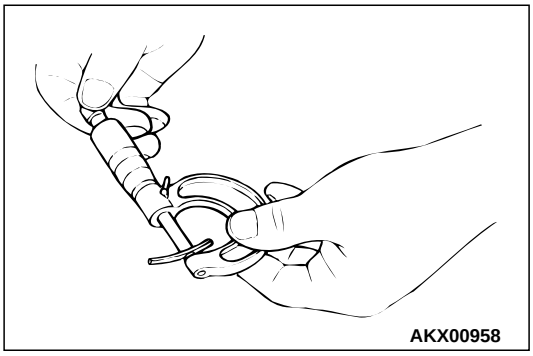
75.Use special tools MB990935 <F4A42> or MB990936 <F4A51> and MB990938 to press in the differential bearing outer race into the torque converter housing.



76.Install the torque converter housing to the transaxle case without applying sealant. Tighten its mounting bolts to the specified torque.

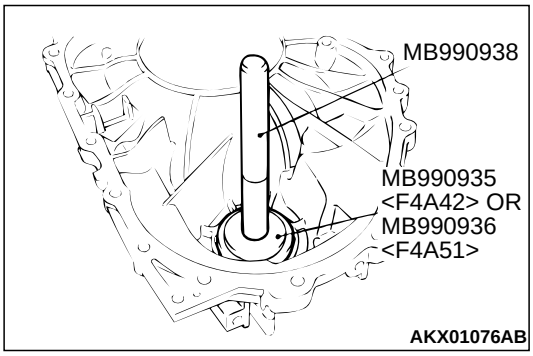
Tightening torque: 48 ± 6 N·m (35 ± 4 ft-lb)

77.Loosen all the bolts, and remove the torque converter housing. Then remove the outer race and the crushed solders.



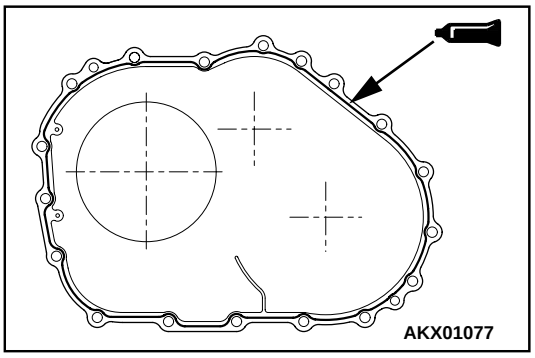
78.Use a micrometer to measure the thickness of the crushed solder beads and record the measured value. Add 0.045 to 0.105 mm (0.0018 to 0.0041 inch)* to the measured value and select a spacer with the corresponding thickness. Adjustment spacer sizes are all listed on P.23B-82. Select the most suitable one from among those listed.

*NOTE: * is the thickness for the differential case preload.*



79.Install the spacer selected in step 79 to the torque converter housing.

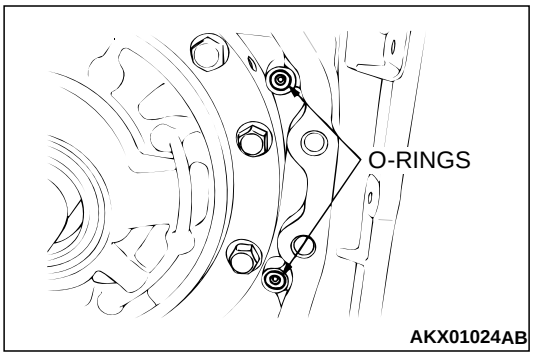
80.Use special tools MB990935 <F4A42> or MB990936 <F4A51> and MB990938 to press the outer race into housing.


AKX01077

81.Apply a 2 mm (0.08 inch) diameter bead of sealant (MITSUBISHI Genuine Part number MD974421 or equivalent) to the torque converter housing in the area shown.

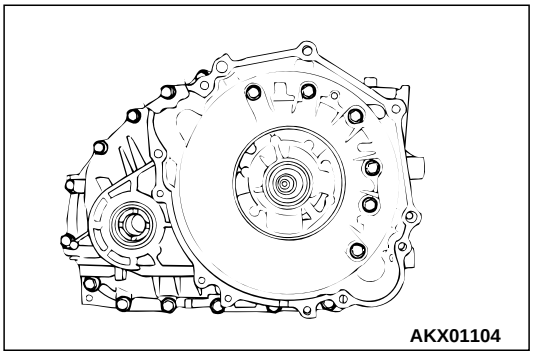
NOTE: Be sure to install the case quickly while the sealant is wet (with 15 minutes) or leaks will occur if the rear cover is installed after the sealant dries.

NOTE: After installation, keep the sealed area away from the ATF for approximately one hour.



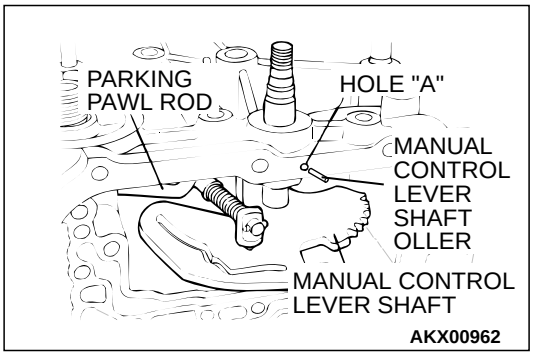
AKX01024AB

82.Install the two O-rings.


AKX01104

83.Install the torque converter housing and then tighten its 18 mounting bolts to the specified torque.

Tightening torque: 48 ± 6 N·m (35 ± 4 ft-lb)

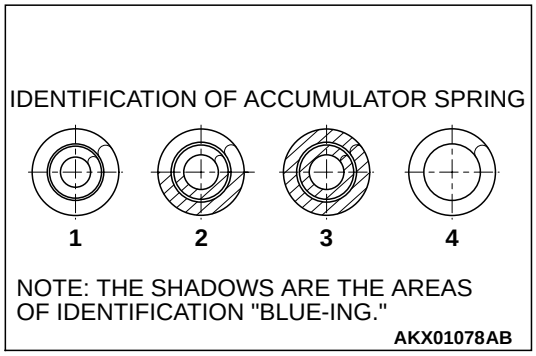


AKX00962

84.Insert the two O-rings into the grooves of the manual control lever shaft.

85.Install the manual control lever shaft and parking pawl rod.

86.Align hole "A" with the groove in the manual control lever shaft. Insert the manual control lever shaft roller into hole "A".



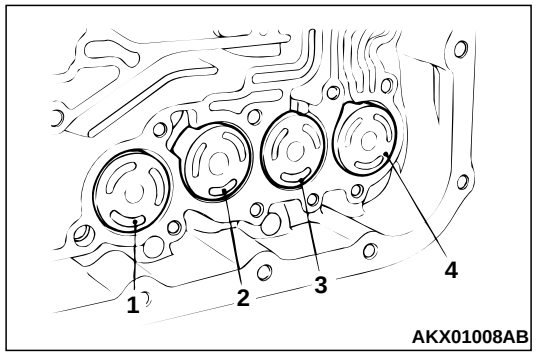
87.Insert the new seal rings in the grooves of the accumulator pistons.

NOTE: The piston and seal ring are common parts.

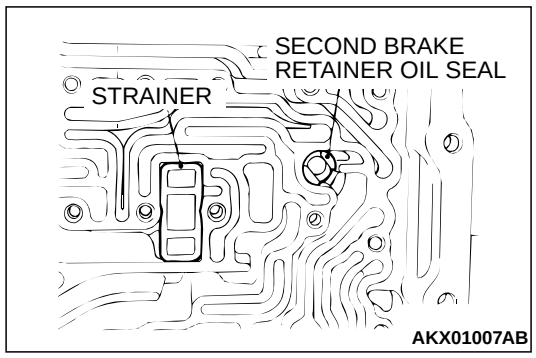
88.Identify the accumulator spring and insert it and the accumulator piston into each hole of the transaxle case.

NOTE: Accumulator springs are identified as shown in the illustration.

NO.	NAME	IDENTIFICATION "BLUEING"
1	For low-reverse brake	None
2	For underdrive clutch	Half
3	For second brake	Whole surface
4	For overdrive clutch	None

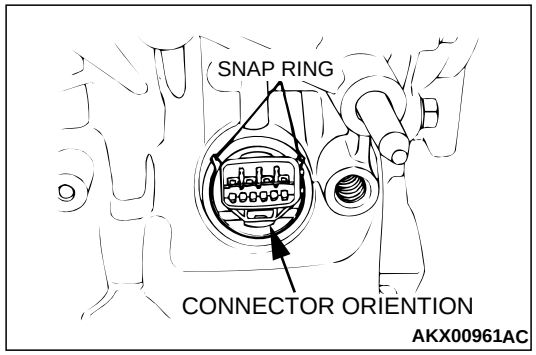


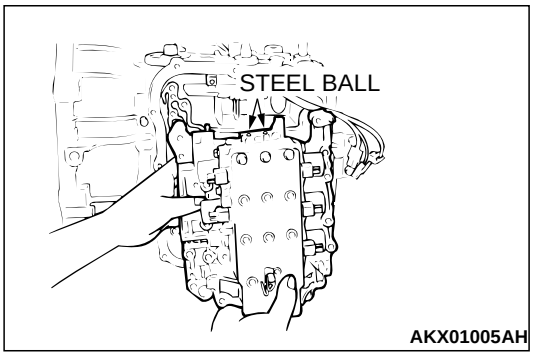
89.Install the strainer and second brake retainer oil seal.



90.Insert a new O-ring to the groove of the solenoid valve harness connector.

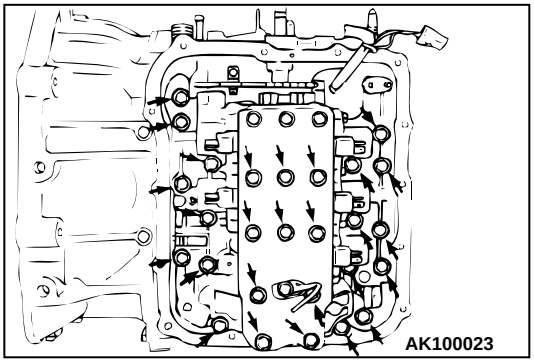
91.Insert the solenoid valve harness connector into the hole from the inside of the transaxle case so it is oriented as shown in the illustration. Then secure the snap ring to the connector groove.





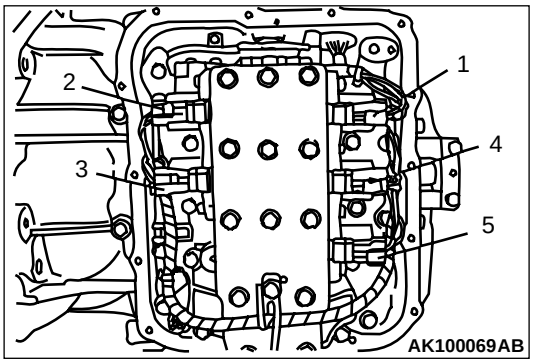
92.Install a steel ball into each of the two holes in the top face of the valve body (outside valve body).

93.Install the valve body and gasket to the transaxle case. Make sure that the manual valve's pin is in the groove in the detent plate of the manual control lever.



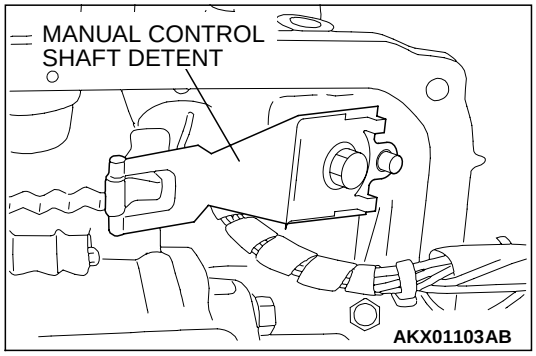
94.Install the 27 valve body mounting bolts, and tighten to the specified torque.

Tightening torque: 11 ± 1 N·m (95 ± 9 in-lb)



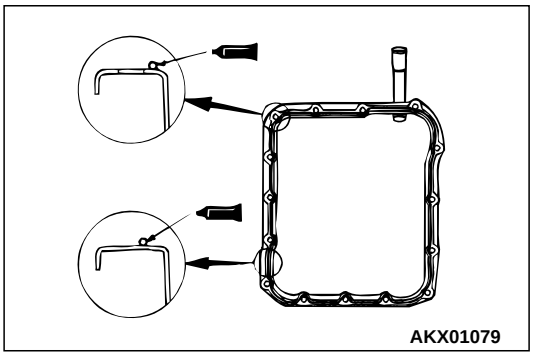
95.Attach the solenoid valve harness to the valve body by connecting the fluid temperature sensor and all the connectors.

NO.	PARTS TO BE CONNECTED	SOLENOID VALVE HARNESS	
		CABLE COLOR	CONNECTOR HOUSING COLOR
1	Underdrive solenoid valve	White, red, red	Black
2	Overdrive solenoid valve	Orange, red	Black
3	Low-reverse solenoid valve	Brown, yellow	Milky white
4	Second solenoid valve	Green, red, red	Milky white
5	Torque converter clutch control solenoid valve	Blue, yellow, yellow	Black



96.Install the manual control shaft detent and tighten the bolt to the specified torque.

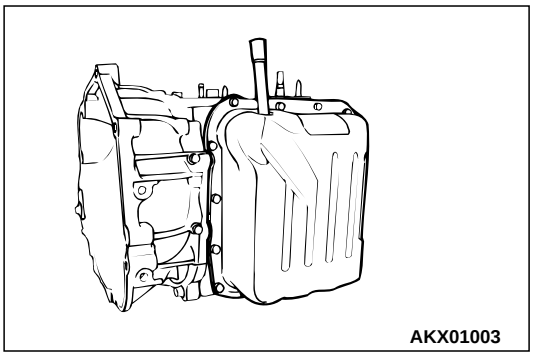
Tightening torque: 6 ± 1 N·m (52 ± 9 in-lb)



97.Apply a 2 mm (0.08 inch) diameter bead of sealant (MITSUBISHI Genuine Part number MD974421 or equivalent) to the valve body cover in the area shown.

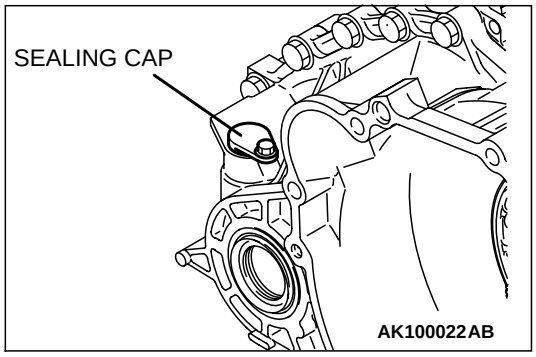
NOTE: Be sure to install the case quickly while the sealant is wet (with 15 minutes) or leaks will occur if the rear cover is installed after the sealant dries.

NOTE: After installation, keep the sealed area away from the ATF for approximately one hour.



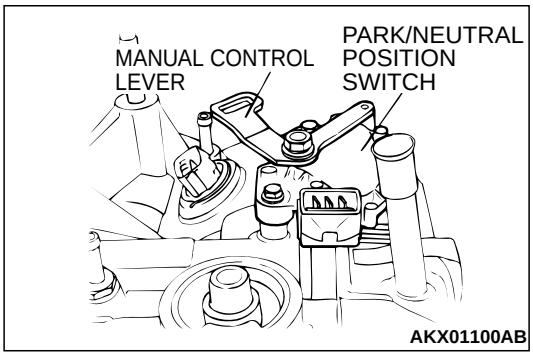
98.Install the valve body cover, and then tighten its mounting bolts to the specified torque.

Tightening torque: 11 ± 1 N·m (95 ± 9 in-lb)



99.Install the Sealing cap and tighten the bolt to the specified torque.

Tightening torque: 5 ± 1 N·m (43 ± 9 in-lb)

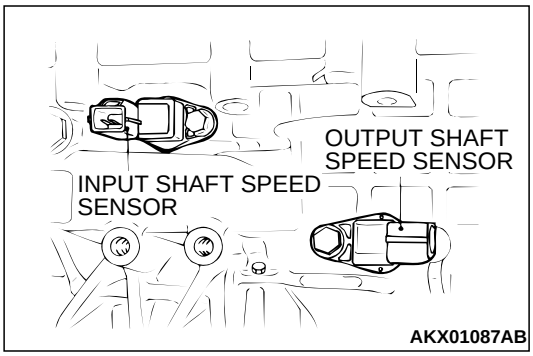


100.Install the park/neutral position switch and tighten the bolt to specified torque.

Tightening torque: 11 ± 1 N·m (95 ± 9 in-lb)

101.Install the manual control lever and tighten the nut to specified torque.

Tightening torque: 22 ± 3 N·m (16 ± 2 ft-lb)



102.Install the input shaft speed sensor and output shaft speed sensor and tighten the bolt to the specified torque.

Tightening torque: 11 ± 1 N·m (95 ± 9 in-lb)

103.Install the air breather

104.Install the oil cooler feed tube together with new gaskets and tighten the eye bolts to the specified torque.

Tightening torque: 30 ± 3 N·m (22 ± 2 ft-lb)

105.Tighten the oil cooler feed pipe clamp bolt.

Tightening torque: 11 ± 1 N·m (95 ± 9 in-lb)

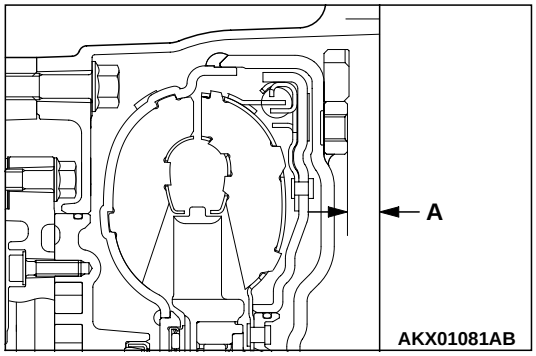
106.Install the oil dipstick.

107.Install the cable support bracket.

Tightening torque: 23 ± 3 N·m (17 ± 2 ft-lb)

108.Install the roll stopper brackets.

Tightening torque: 69 ± 10 N·m (51 ± 7 ft-lb)



⚠ CAUTION

Apply ATF to the oil pump drive hub before installing the torque converter. Be careful not to damage the oil seal lip when installing the torque converter.

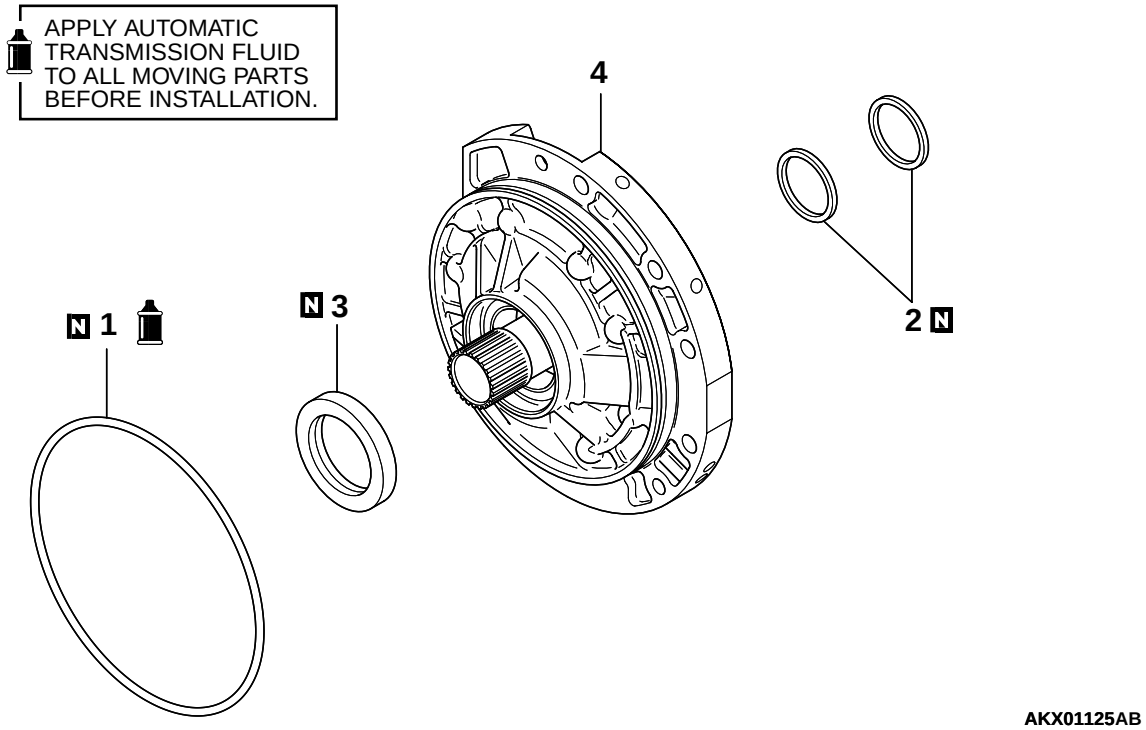
109.Install the torque converter, and align it with the oil pump so that the shown dimension "A" meets the reference value.

Reference value:
Approximately 12.2 mm (0.48 inch) <F4A42>
Approximately 9.4 mm (0.37 inch) <F4A51>

OIL PUMP

DISASSEMBLY AND ASSEMBLY

M1233001300024



AKX01125AB

DISASSEMBLY STEPS

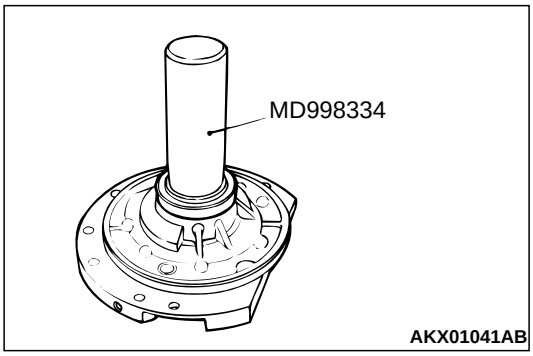
>>B<< 1. O-RING
2. SEAL RING

DISASSEMBLY STEPS

>>A<< 3. OIL SEAL
4. OIL PUMP ASSEMBLY

Required Special Tool:

- MD998334: Oil Seal Installer



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ASSEMBLY SERVICE POINTS

>>A<< OIL SEAL INSTALLATION

1. Apply a small amount of ATF to the oil seal lip.
2. Use special tool MD998334 to tap the oil seal in the oil pump body.

>>B<< O-RING INSTALLATION

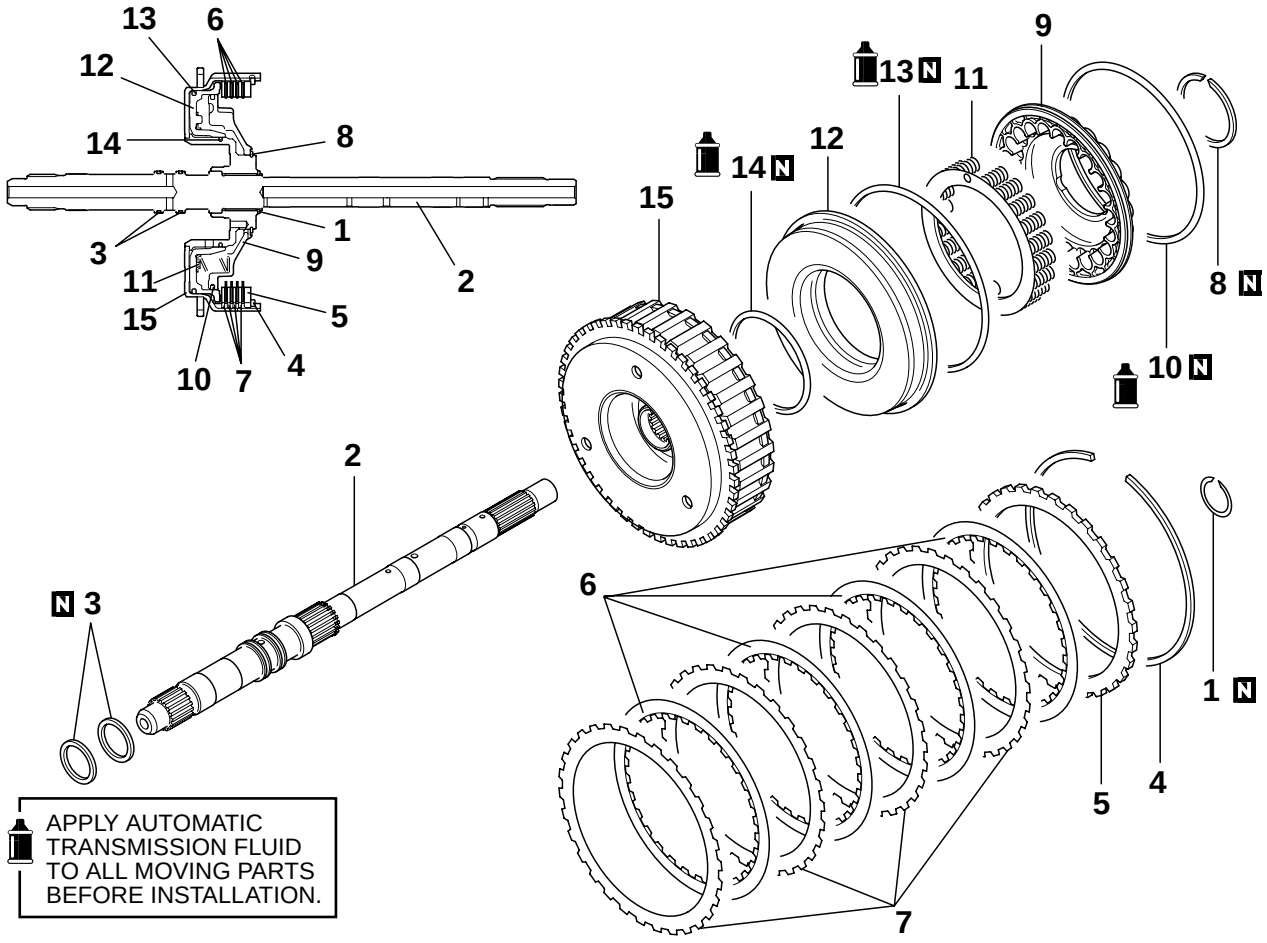
Install a new O-ring to the outer groove of the oil pump, and apply ATF or petroleum jelly (Vaseline) to the O-ring.

TSB Revision

UNDERDRIVE CLUTCH AND INPUT SHAFT

DISASSEMBLY AND ASSEMBLY

M1233024500029



AKX01126AB

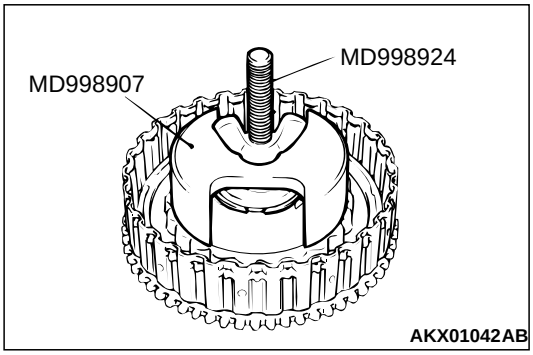
		DISASSEMBLY STEPS
	1.	SNAP RING
	2.	INPUT SHAFT
	3.	SEAL RING
>>D<<	4.	SNAP RING
>>C<<	5.	CLUTCH REACTION PLATE
>>C<<	6.	CLUTCH DISC
<<A>> >>C<<	7.	CLUTCH PLATE
>>B<<	8.	SNAP RING
	9.	SPRING RETAINER
>>A<<	10.	D-RING
	11.	RETURN SPRING
	12.	UNDERDRIVE CLUTCH PISTON
>>A<<	13.	D-RING
>>A<<	14.	D-RING
	15.	UNDERDRIVE CLUTCH RETAINER

Required Special Tools:

- MB991628: Spring Compressor <F4A42>
- MB991629: Spring Compressor <F4A51>
- MD998907: Spring Compressor
- MD998924: Spring Compressor Retainer

TSB Revision

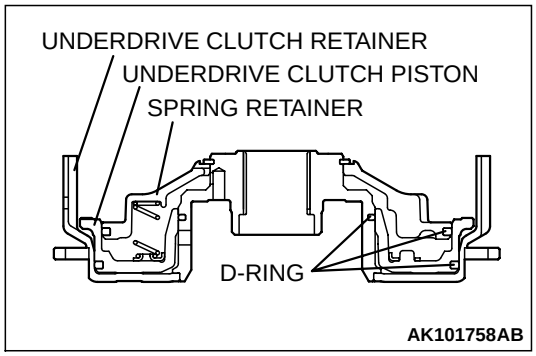
DISASSEMBLY SERVICE POINT



<<A>> SNAP RING REMOVAL

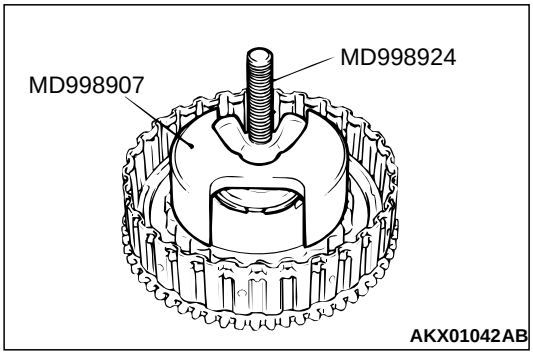
1. Set special tools MD998907 and MD998924 as shown in the illustration.
2. Compress the return spring and remove the snap ring.

ASSEMBLY SERVICE POINTS



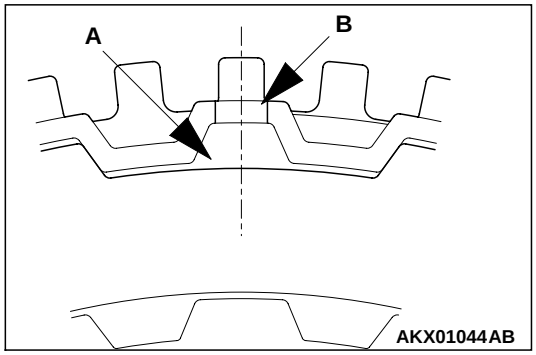
>>A<< D-RING INSTALLATION

1. Install a D-ring in the groove in the underdrive clutch retainer and piston, and in the groove in the outside of the spring retainer. Be careful not to twist or damage the D-rings.
2. Apply ATF or petroleum jelly (Vaseline) to the D-rings.



>>B<< SNAP RING INSTALLATION

1. Place the snap ring on top of the spring retainer, and then set special tool MD998907 as shown in the illustration.
2. Compress the return spring and install the snap ring.

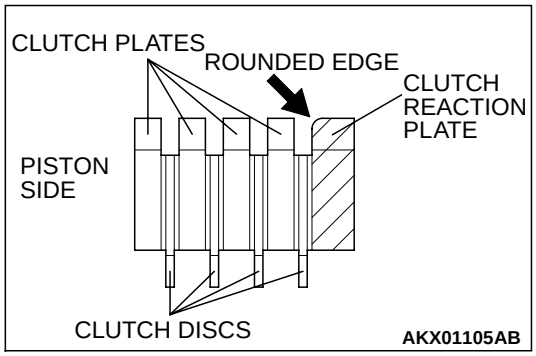


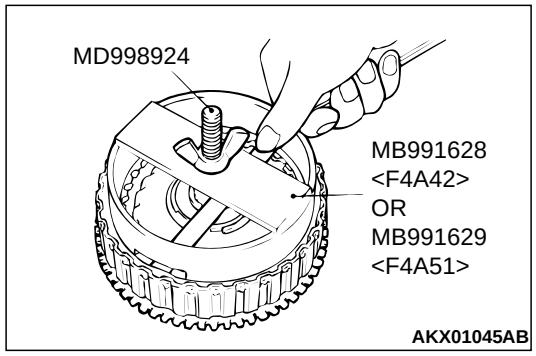
>>C<< CLUTCH PLATE/CLUTCH DISC/CLUTCH REACTION PLATE INSTALLATION

⚠ CAUTION

Immerse the clutch disc in ATF before assembling it. IF the clutch disc is new, soak it in ATF for at least two hours.

1. Assemble the four clutch plates and four clutch discs one on top of the other inside the underdrive clutch retainer. All four clutch plates should be assembled so that the places with no teeth (marked "A") are aligned with the holes in the retainer (marked "B").
2. Install the clutch reaction plate in the direction shown.
   in stall it the same as the clutch plates, so that the areas with no teeth (marked "A") are aligned with the retainer (marked "B").





>>D<< SNAP RING INSTALLATION

1. Install the snap ring into the groove of clutch retainer.
2. Set special tools MB991628 <F4A42>, MB991629 <F4A51> and MD998924 as shown in the illustration, and then compress the clutch element.
3. Check that the clearance between the snap ring and the clutch reaction plate is within the standard value. If not within the standard value, select a snap ring so that it is.

   Standard value: 1.6 – 1.8 mm (0.0630 – 0.0709 inch)

REVERSE AND OVERDRIVE CLUTCH

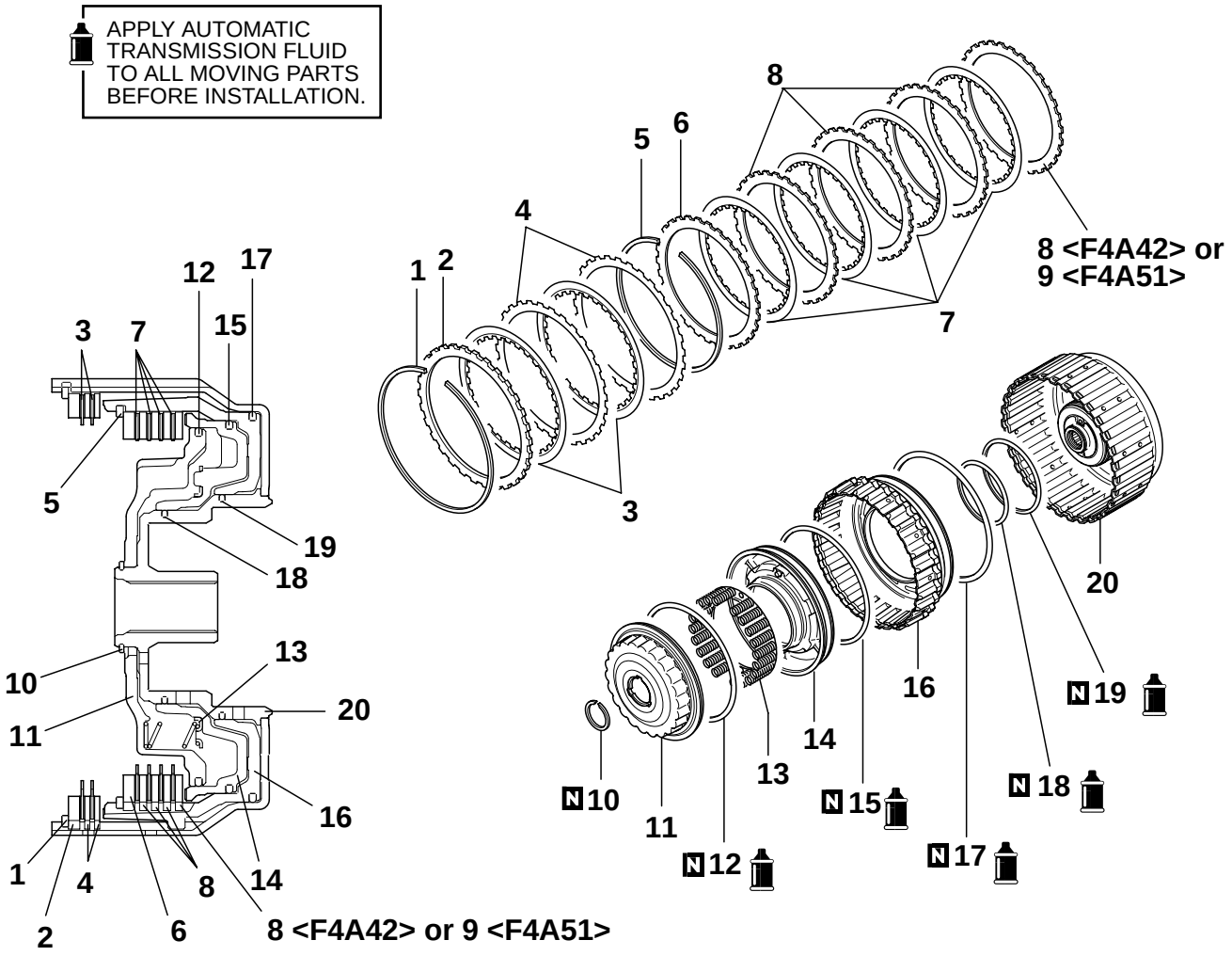
DISASSEMBLY AND ASSEMBLY

M1233024800020

NUMBER OF CLUTCH DISCS AND PLATES

	MODEL	PRESSURE PLATE	CLUTCH DISC	CLUTCH PLATE	CLUTCH REACTION PLATE
Over drive clutch	F4A42	–	4	4	1
	F4A51	1	4	3	1
Reverse clutch		–	2	2	1

TSB Revision



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		DISASSEMBLY STEPS
>>G<<	1.	SNAP RING
>>F<<	2.	CLUTCH REACTION PLATE
>>F<<	3.	CLUTCH DISC
>>F<<	4.	CLUTCH PLATE
>>E<<	5.	SNAP RING
>>D<<	6.	CLUTCH REACTION PLATE
>>D<<	7.	CLUTCH DISC
>>D<<	8.	CLUTCH PLATE
	9.	PRESSURE PLATE <F4A51>
<<A>> >>C<<	10.	SNAP RING

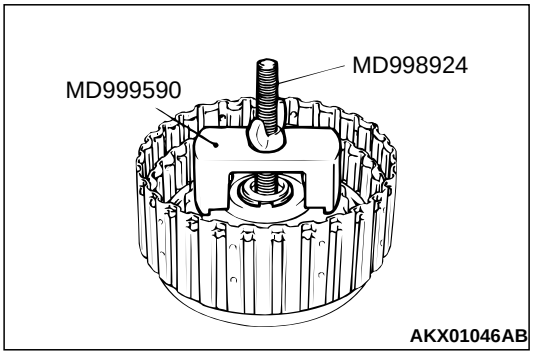
		DISASSEMBLY STEPS
	11.	SPRING RETAINER
>>A<<	12.	D-RING
	13.	RETURN SPRING
	14.	OVERDRIVE CLUTCH PISTON
>>A<<	15.	D-RING
>>B<<	16.	REVERSE CLUTCH PISTON
>>A<<	17.	D-RING
>>A<<	18.	D-RING
>>A<<	19.	D-RING
	20.	REVERSE CLUTCH RETAINER

Required Special Tools:

- MB991628: Spring Compressor <F4A42>
- MB991629: Spring Compressor <F4A51>
- MB991789: Spring Compressor <F4A51>
- MB991790: Spring Compressor <F4A42>
- MD998924: Spring Compressor Retainer
- MD999590: Spring Compressor

TSB Revision

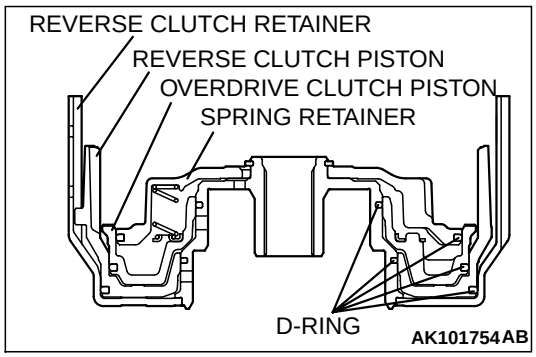
DISASSEMBLY SERVICE POINT



<<A>> SNAP RING REMOVAL

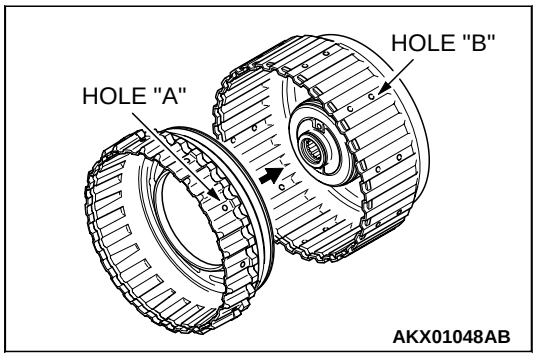
1. Set special tools MD999590 and MD998924 as shown in the illustration.
2. Compress the return spring and remove the snap ring.

ASSEMBLY SERVICE POINTS



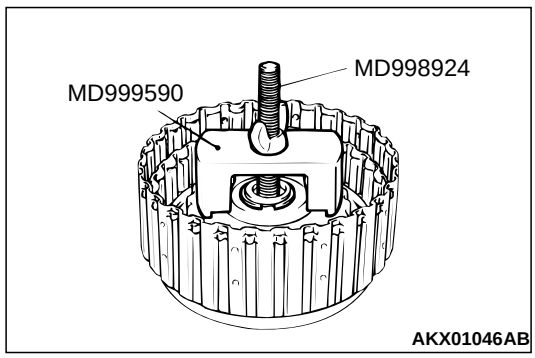
>>A<< D-RING INSTALLATION

1. Install D-rings in the grooves on the reverse clutch retainer, piston, overdrive clutch piston and spring retainer. Be careful not to twist or damage the D-rings.
2. Apply ATF or petroleum jelly (Vaseline) to D-rings.



>>B<< REVERSE CLUTCH PISTON INSTALLATION

Align the outer circumference holes ("A" and "B") of the reverse clutch piston and the reverse clutch retainer to assemble them.

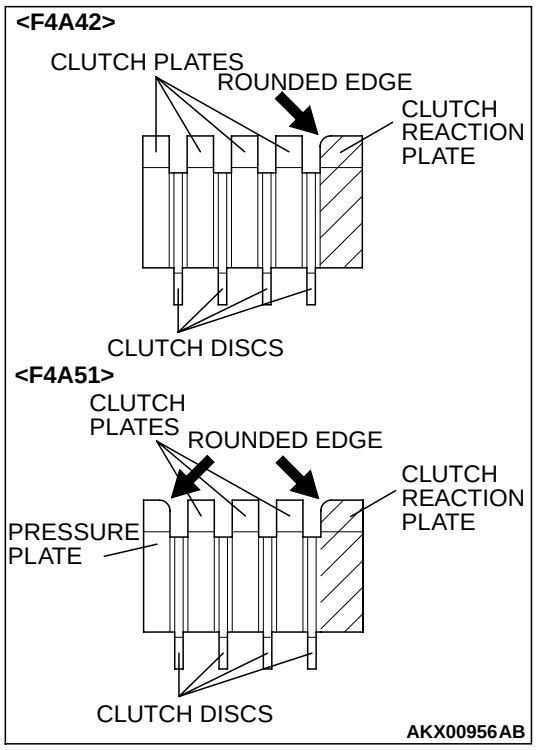


>>C<< SNAP RING INSTALLATION

1. Set special tools MD999590 and MD998924 as shown in the illustration.
2. Tighten the nut on the special tool to press down on the spring retainer and reverse clutch retainer, and then install the snap ring.
3. Check that the clearance between the snap ring and the return spring retainer is within the standard value. If not within the standard value, select a snap ring so that it is.

   Standard value: 0 – 0.09 mm (0 – 0.0035 inch)

TSB Revision



>>D<< PRESSURE PLATE/CLUTCH PLATE/CLUTCH DISC/ CLUTCH REACTION PLATE INSTALLATION

1. Install the pressure plate in the direction shown <F4A51>.

⚠ CAUTION

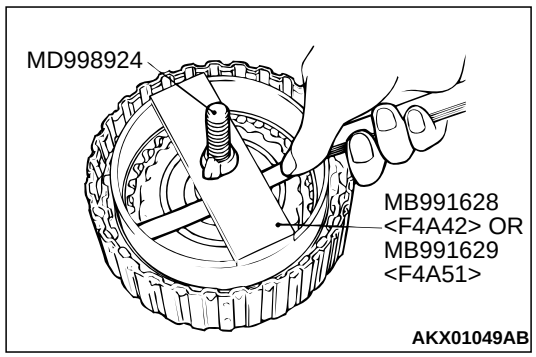
Immerse the clutch disc in ATF before assembling it. IF the clutch disc is new, soak it in ATF for more than two hours.

2. Assemble the clutch discs and clutch plates, one on top of the other, inside the reverse clutch piston.

NUMBER OF CLUTCH DISCS AND PLATES

MODEL	PRESSURE PLATE	CLUTCH DISC	CLUTCH PLATE	CLUTCH REACTION PLATE
F4A42	–	4	4	1
F4A51	1	4	3	1

3. Install the clutch reaction plate in the direction shown.

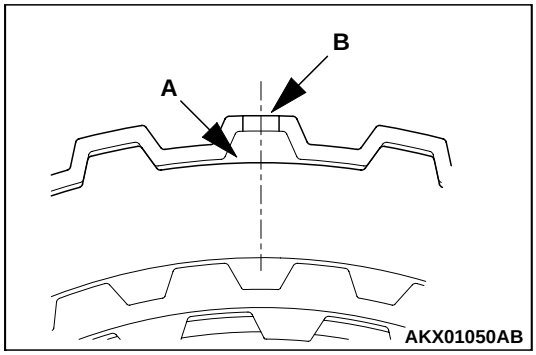


>>E<< SNAP RING INSTALLATION

1. Install the snap ring into the groove in the reverse clutch piston.
2. Set special tools MB991628 <F4A42>, MB991629 <F4A51> and MD998924 as shown in the illustration, and compress the clutch element.
3. Check that the clearance between the snap ring and the clutch reaction plate is within the standard value. If not within the standard value, select a snap ring so that it is.

Standard value: 1.6 – 18 mm (0.0630 – 0.0709 inch)

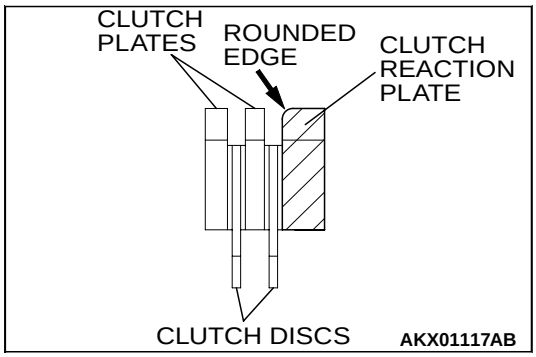
>>F<< CLUTCH PLATE/CLUTCH DISC/CLUTCH REACTION PLATE INSTALLATION



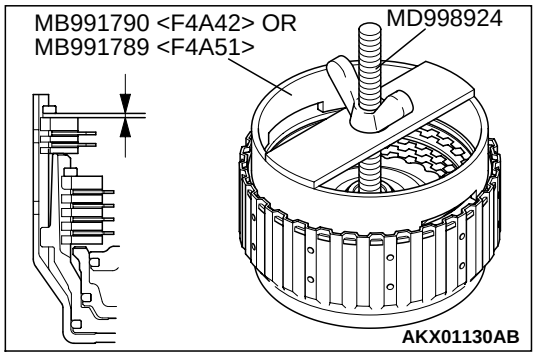
⚠ CAUTION

Immerse the clutch disc in ATF before assembling it. IF the clutch disc is new, soak it in ATF for at least two hours.

1. Assemble two clutch discs and two clutch plates, one on top of the other, inside the reverse clutch retainer. Assemble both clutch plates so that the places with no teeth (marked "A") are aligned with the holes in the retainer (marked "B").
2. Install the clutch reaction plate in the direction shown. Install it the same as the clutch plate, so that the places with no teeth (marked "A") are aligned with the holes in the retainer (marked "B").



>>G<< SNAP RING INSTALLATION



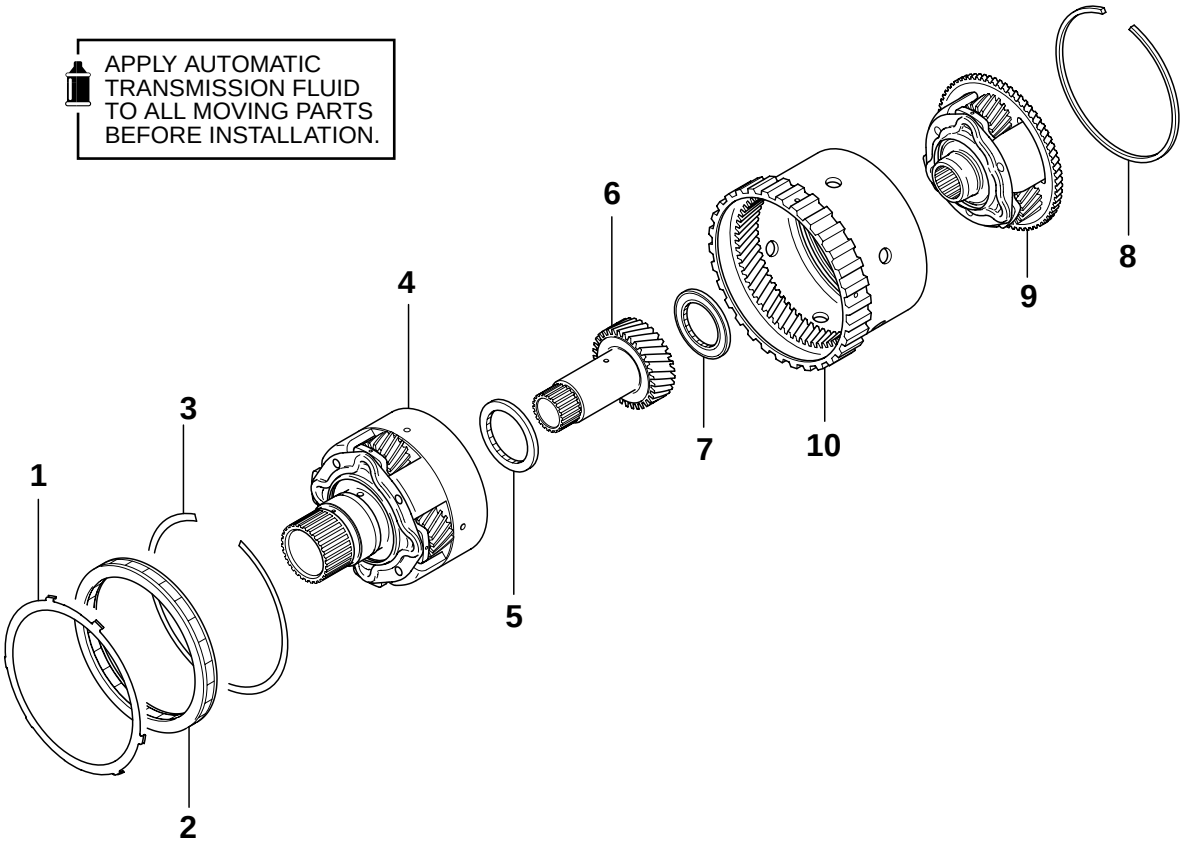
1. Install the snap ring into the groove of reverse clutch retainer.
2. Set special tools MB991790 <F4A42> or MB991789 <F4A51> and MD998924 as shown in the illustration, and compress the clutch element.
3. Check that the clearance between the snap ring and the clutch reaction plate is within the standard value. If not within the standard value, select a snap ring so that it is.

Standard value: 1.5 – 1.7 mm (0.0591 – 0.0669 inch)

PLANETARY GEAR

DISASSEMBLY AND ASSEMBLY

M1233002500021



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DISASSEMBLY STEPS

1. STOPPER PLATE
>>B<< 2. ONE-WAY CLUTCH
3. SNAP RING
4. OUTPUT PLANETARY CARRIER
>>A<< 5. THRUST BEARING NUMBER 3
6. UNDERDRIVE SUN GEAR

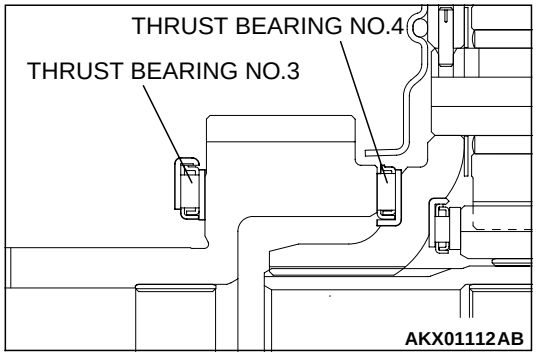
DISASSEMBLY STEPS

>>A<< 7. THRUST BEARING NUMBER 4
8. SNAP RING
9. OVERDRIVE PLANETARY CARRIER
10. OVERDRIVE ANNULUS GEAR

TSB Revision

ASSEMBLY SERVICE POINTS

>>A<< THRUST BEARING NUMBER 4 AND THRUST BEARING NUMBER 3 INSTALLATION

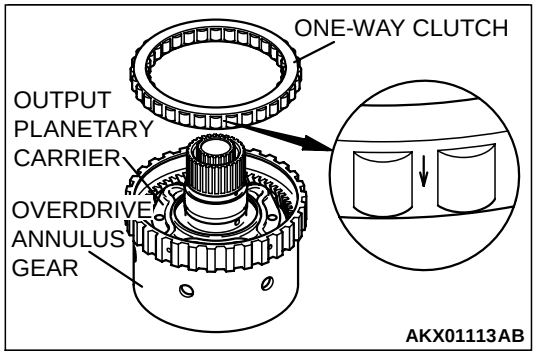


⚠ CAUTION

Use care to install the thrust bearings in the correct direction.

Check the installation direction of thrust bearings number 3 and 4, and install them as shown.

>>B<< ONE-WAY CLUTCH INSTALLATION

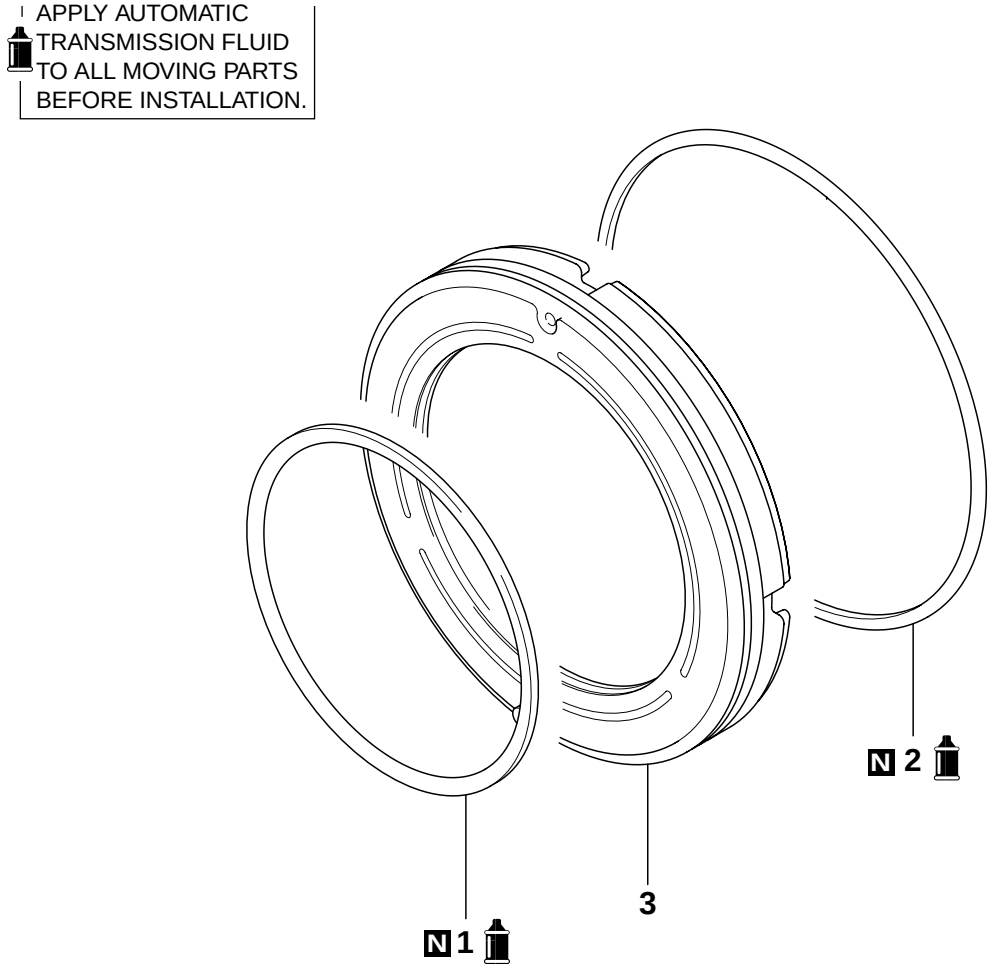


Insert the one-way clutch into the overdrive annulus gear so that the arrow points towards the output planetary carrier.

LOW-REVERSE BRAKE

DISASSEMBLY AND ASSEMBLY

M1233003700028



AKX01128 AB

DISASSEMBLY STEPS

>>A<< 1. D-RING

DISASSEMBLY STEPS

>>A<< 2. D-RING
3. LOW-REVERSE BRAKE PISTON

ASSEMBLY SERVICE POINT

>>A<< D-RING INSTALLATION

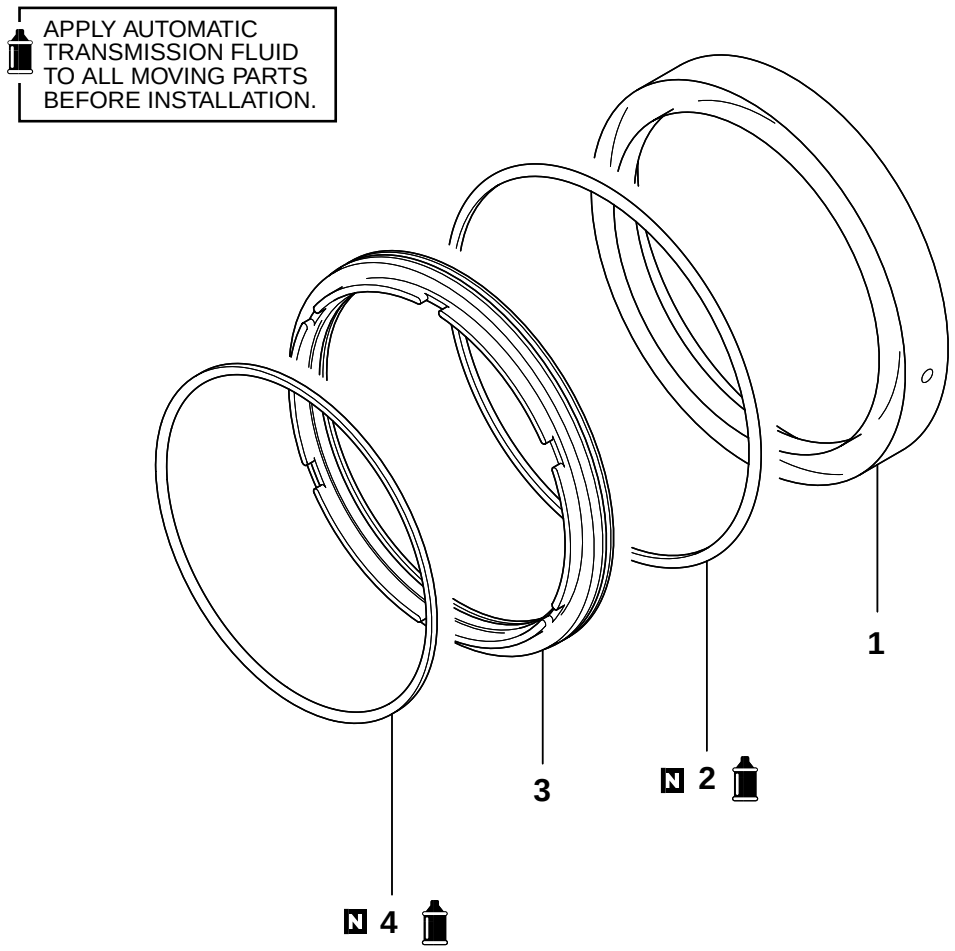
Apply ATF or petroleum jelly (Vaseline) to the D-ring, and install carefully.

TSB Revision

SECOND BRAKE

DISASSEMBLY AND ASSEMBLY

M1233025400025



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DISASSEMBLY STEPS

>>A<< 1. SECOND BRAKE RETAINER
2. D-RING
3. SECOND BRAKE PISTON
>>A<< 4. D-RING

ASSEMBLY SERVICE POINT

>>A<< D-RING INSTALLATION

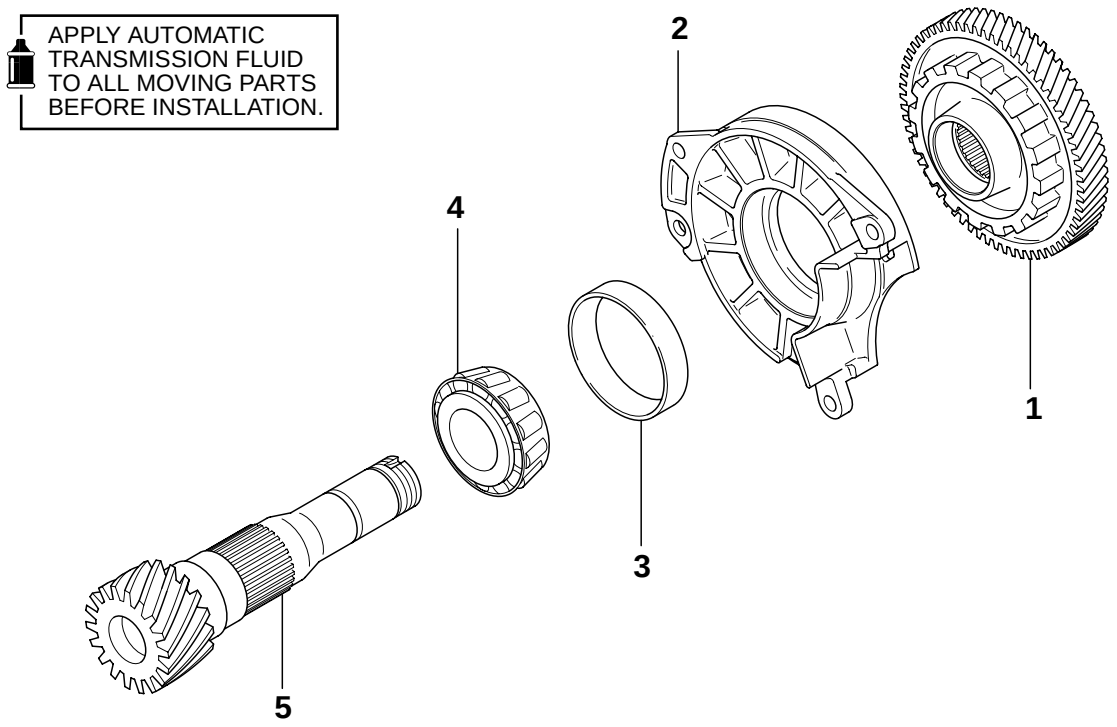
Apply ATF or petroleum jelly (Vaseline) to the D-ring, and install carefully.

TSB Revision

OUTPUT SHAFT

DISASSEMBLY AND ASSEMBLY

M1233025700026



AKX01000AB

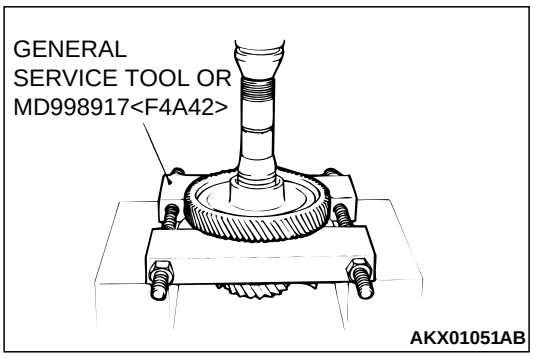
			DISASSEMBLY STEPS
<<A>>	>>C<<	1.	TRANSFER DRIVEN GEAR
		2.	BEARING RETAINER
	>>B<<	3.	OUTER RACE
<<B>>	>>A<<	4.	TAPER ROLLER BEARING
		5.	OUTPUT SHAFT

Required Special Tools:

- MB990936: Installer Adapter <F4A42>
- MB990937: Installer Adapter <F4A51>
- MB990938: Handle
- MD998801: Bearing Remover
- MD998812: Installer Cap
- MD998813: Installer-100
- MD998814: Installer-200
- MD998823: Installer Adapter (48) <F4A42>
- MD998824: Installer Adapter (50) <F4A51>
- MD998827: Installer Adapter (56) <F4A51>
- MD998917: Bearing Remover <F4A42>

TSB Revision

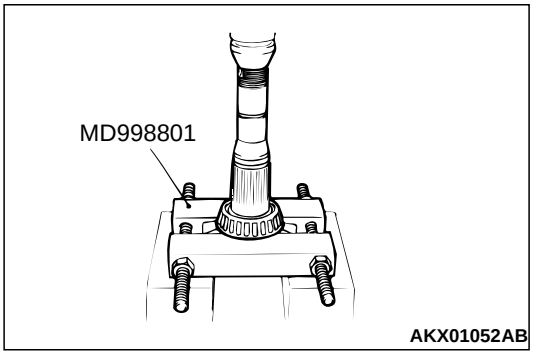
DISASSEMBLY SERVICE POINTS



AKX01051AB

<<A>> TRANSFER DRIVEN GEAR REMOVAL

1. Support the transfer driven gear with general service tool or special tool MD998917 <F4A42>, and then set them on the press.
2. Push down on the output shaft with the press to remove the transfer driven gear.

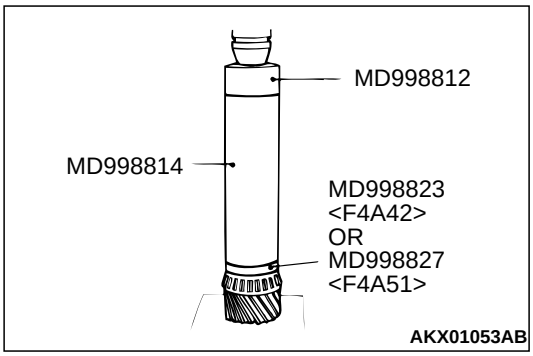


AKX01052AB

<<B>> TAPER ROLLER BEARING REMOVAL

1. Support the taper roller bearing with the special tool MD998801, and then set them on the press.
2. Push down on the output shaft with the press to remove the tapper roller bearing.

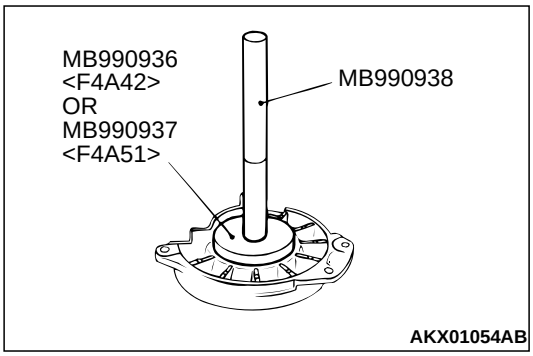
ASSEMBLY SERVICE POINTS



AKX01053AB

>>A<< TAPER ROLLER BEARING INSTALLATION

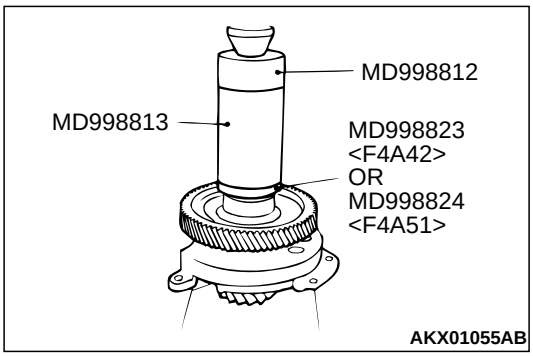
1. Set the output shaft on the press support stand.
2. Using special tools MD998823 <F4A42>, MD998827 <F4A51>, MD998812 and MD998814, press install the taper roller bearing.



AKX01054AB

>>B<< OUTER RACE INSTALLATION

Use the special tools MB990936 <F4A42>, MB990937 <F4A51> and MB990938 to tap the outer race in the bearing retainer.



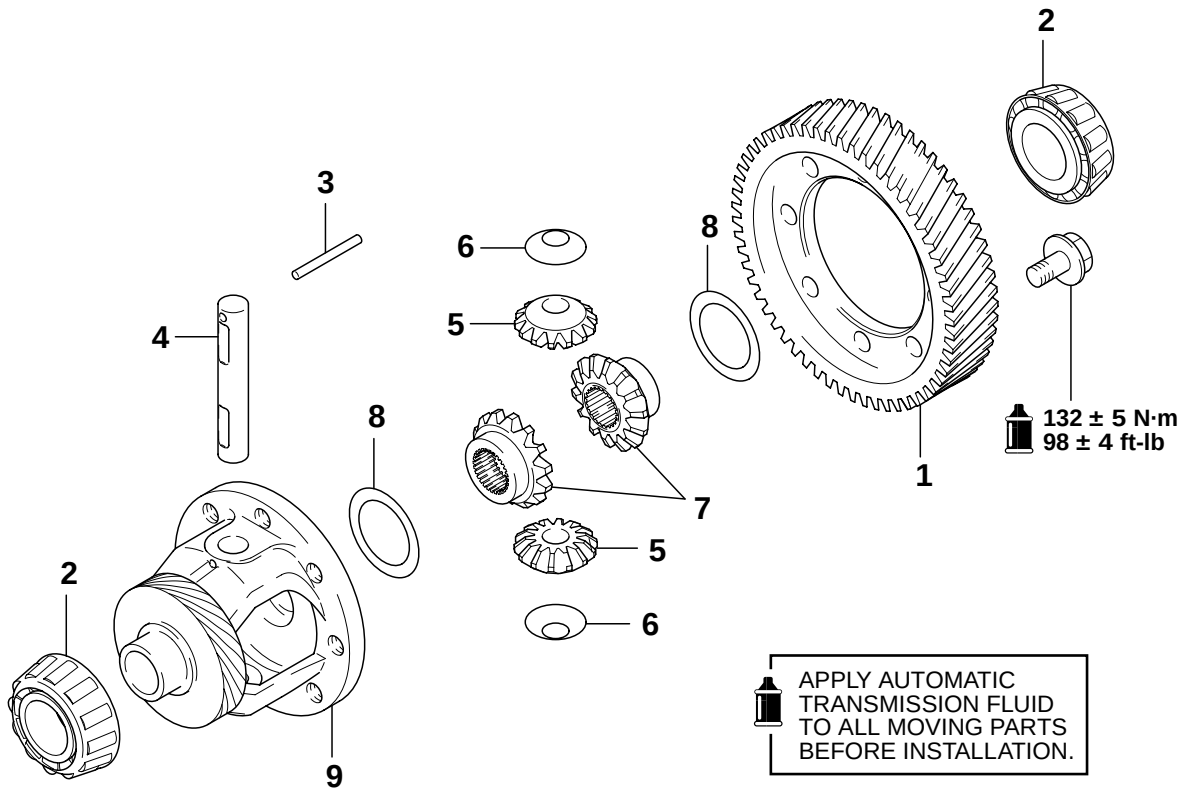
>>C<< TRANSFER DRIVEN GEAR INSTALLATION

1. Set the output shaft on the press support stand.
2. Using special tools MD998823 <F4A42>, MD998824 <F4A51>, MD998812 and MD998813, press install the transfer driven gear.

DIFFERENTIAL

DISASSEMBLY AND ASSEMBLY

M1233003100026



			DISASSEMBLY STEPS
	>>D<<	1.	DIFFERENTIAL DRIVE GEAR
<<A>>	>>C<<	2.	TAPER ROLLER BEARINGS
	>>B<<	3.	LOCK PIN
	>>A<<	4.	PINION SHAFT
	>>A<<	5.	PINIONS
	>>A<<	6.	WASHERS
	>>A<<	7.	SIDE GEARS
	>>A<<	8.	SPACERS
		9.	DIFFERENTIAL CASE

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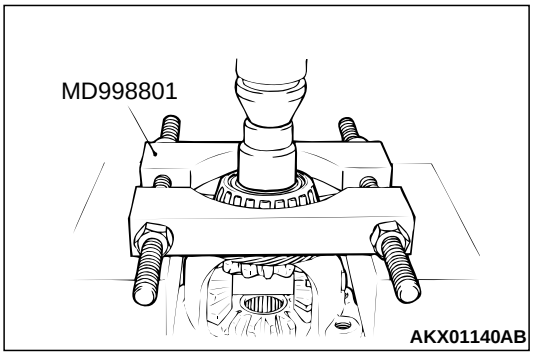
Required Special Tools:

- MD998801: Bearing Remover
- MD998812: Installer Cap
- MD998820: Installer Adapter (42)

DISASSEMBLY SERVICE POINT

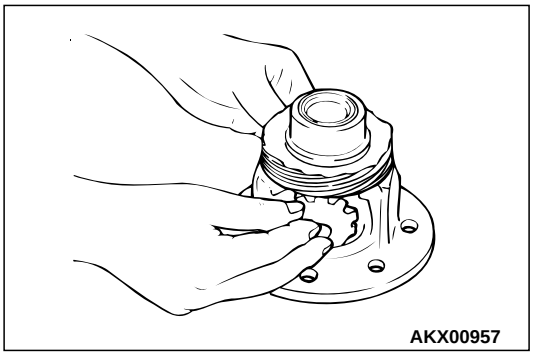
<<A>> TAPER ROLLER BEARING REMOVAL



1. Support the taper roller bearing with special tool MD998801, and then set them on the press.
2. Push down on the differential case with the press to remove the bearing.

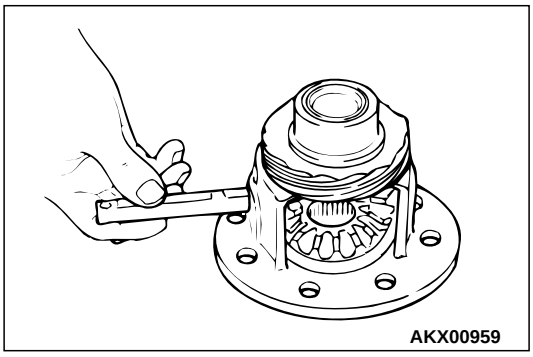
ASSEMBLY SERVICE POINTS

>>A<< SPACER, SIDE GEAR, WASHER, PINION AND PINION SHAFT INSTALLATION

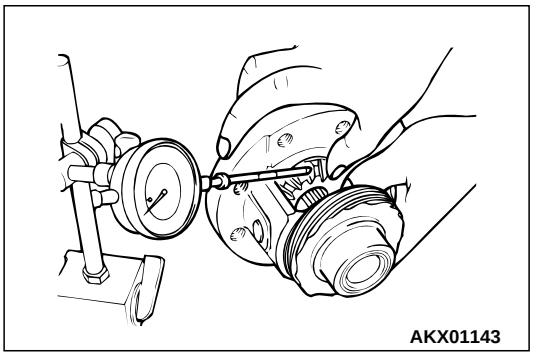


1. Mount a spacer on the back surface of the side gear, and then install the side gear in the differential case.

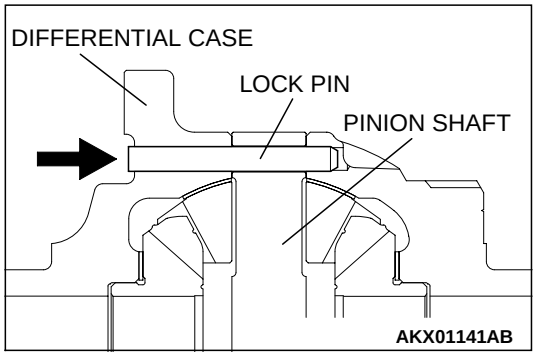
   NOTE: When a new side gear is to be installed, use a medium thickness spacer [0.93 to 1.00 mm (0.0366 to 0.0395 inch)].
2. Set the washer on the back of each pinion, and put both pinions simultaneously in mesh with the side gears. While rotating them, install them into position.



3. Insert the pinion shaft.


AKX01143

4. Measure the backlash between the side gear and pinion.
   Standard value:
   0.025 – 0.150 mm (0.0010 - 0.0059 inch)
5. If the backlash is out of the standard value, select a spacer and re-measure the backlash.
   NOTE: Adjust until the backlash on both sides are equal.



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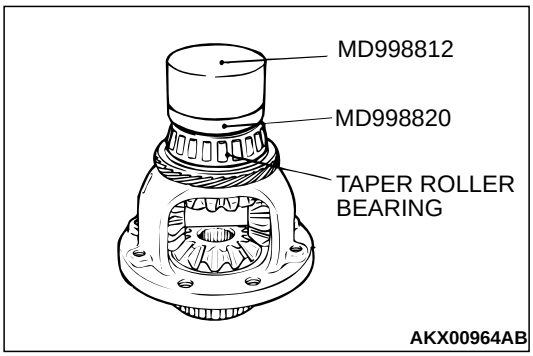
>>B<<LOCK PIN INSTALLATION
Install the lock pin so that it will be oriented in the direction shown.



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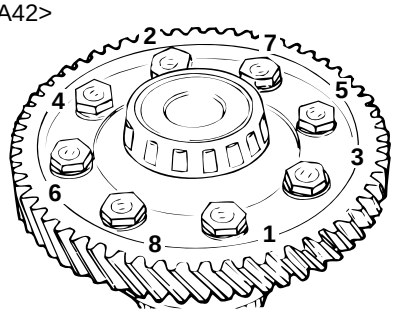
>>C<< TAPER ROLLER BEARING INSTALLATION
Using special tools MD998812 and MD998820, press install the taper roller bearing with the press.

<F4A42>



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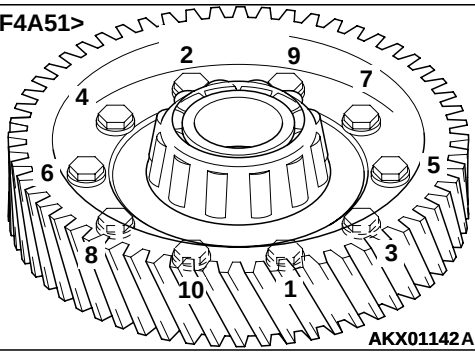
<F4A51>



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>>D<< DIFFERENTIAL DRIVE GEAR INSTALLATION

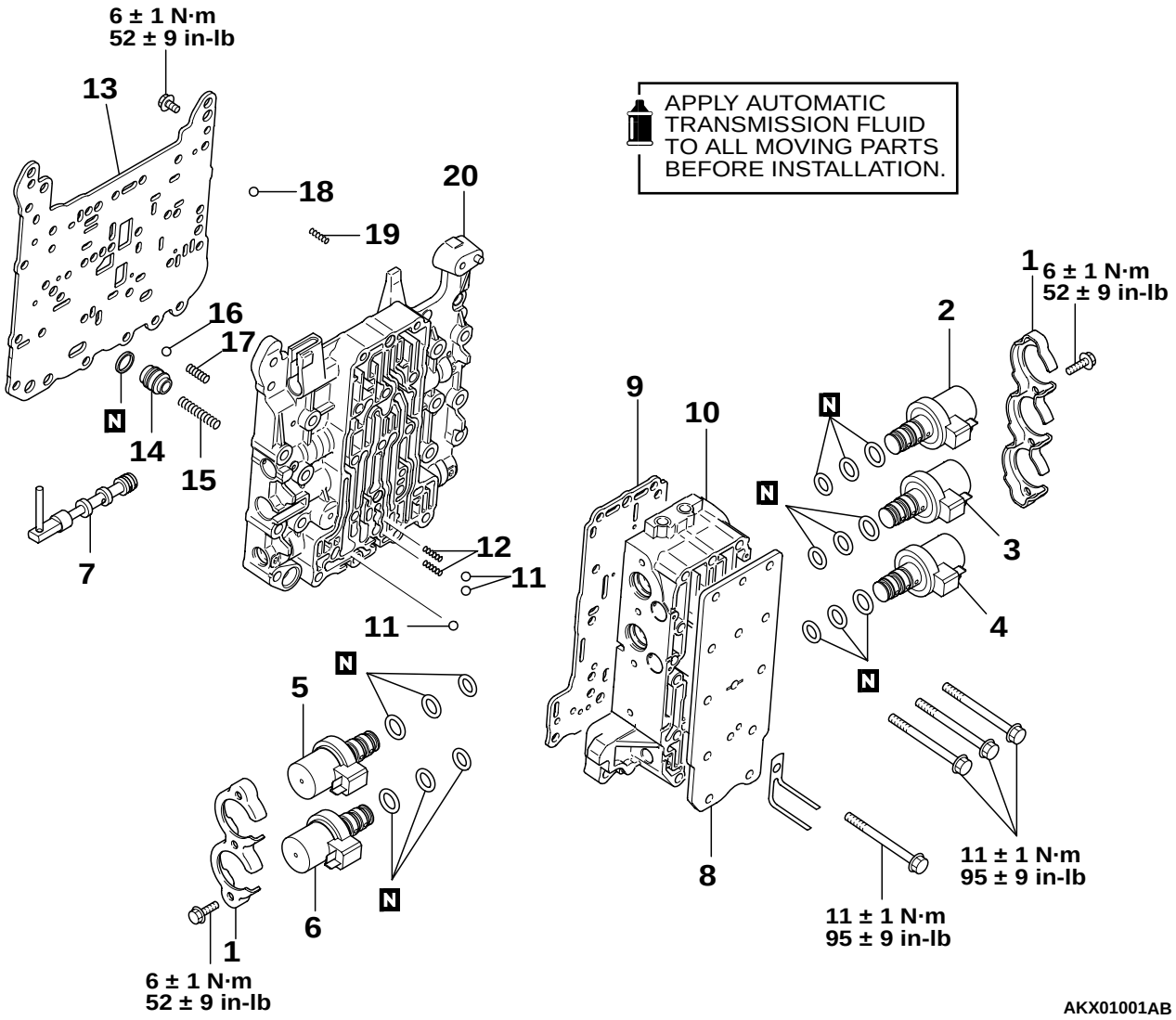
Apply ATF to the bolt, and then tighten the bolts to the specified torque in the sequence shown.

Tightening torque: 132 ± 5 N·m (98 ± 4 ft-lb)

VALVE BODY

DISASSEMBLY AND ASSEMBLY

M1233005500020



DISASSEMBLY STEPS

		1.	SOLENOID VALVE SUPPORT
<<A>>	**>>C<<**	2.	UNDERDRIVE SOLENOID VALVE
<<A>>	**>>C<<**	3.	SECOND SOLENOID VALVE
<<A>>	**>>C<<**	4.	TORQUE CONVERTER CLUTCH CONTROL SOLENOID VALVE
<<A>>	**>>C<<**	5.	OVERDRIVE SOLENOID VALVE
<<A>>	**>>C<<**	6.	LOW-REVERSE SOLENOID VALVE
		7.	MANUAL VALVE
		8.	COVER
		9.	PLATE
		10.	OUTSIDE VALVE BODY ASSEMBLY

DISASSEMBLY STEPS

>>B<<	11.	STEEL BALL (ORIFICE CHECK BALL)
>>B<<	12.	SPRING
	13.	PLATE
>>A<<	14.	DAMPING VALVE
>>A<<	15.	DAMPING VALVE SPRING
>>A<<	16.	STEEL BALL (LINE RELIEF)
>>A<<	17.	SPRING
>>A<<	18.	STEEL BALL (ORIFICE CHECK BALL)
>>A<<	19.	SPRING
	20.	INSIDE VALVE BODY ASSEMBLY

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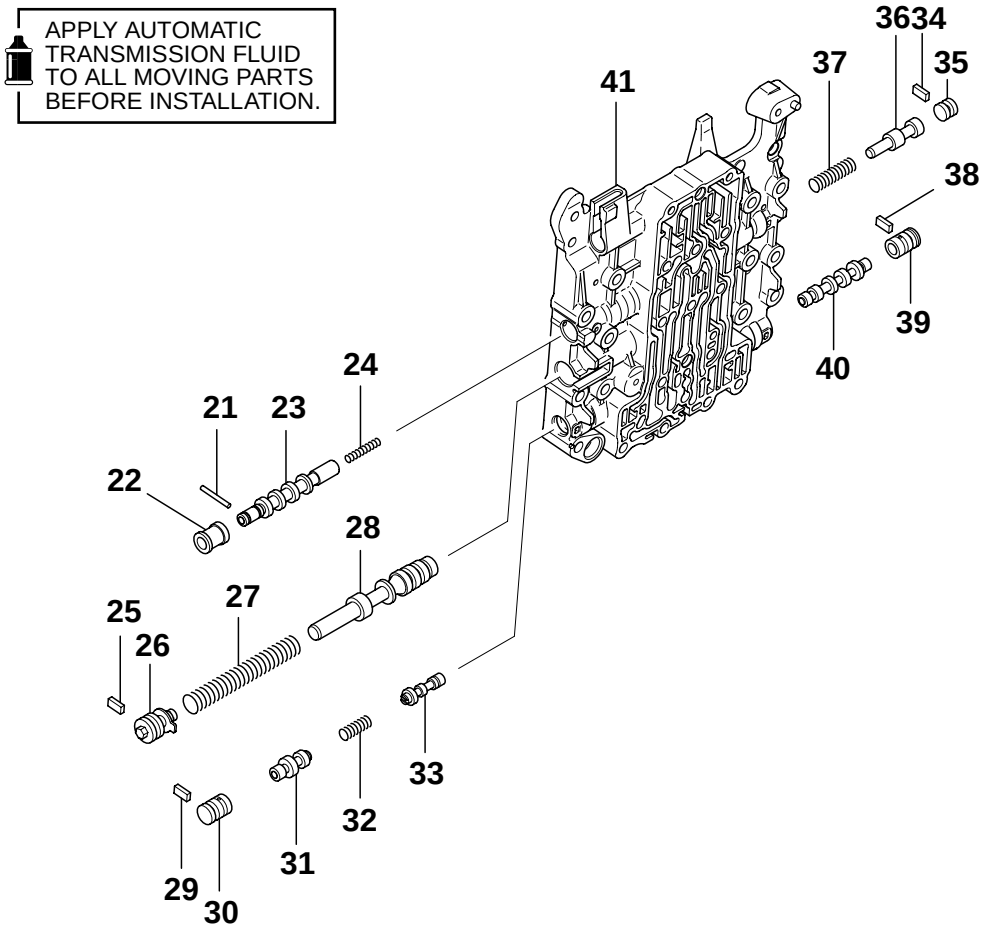

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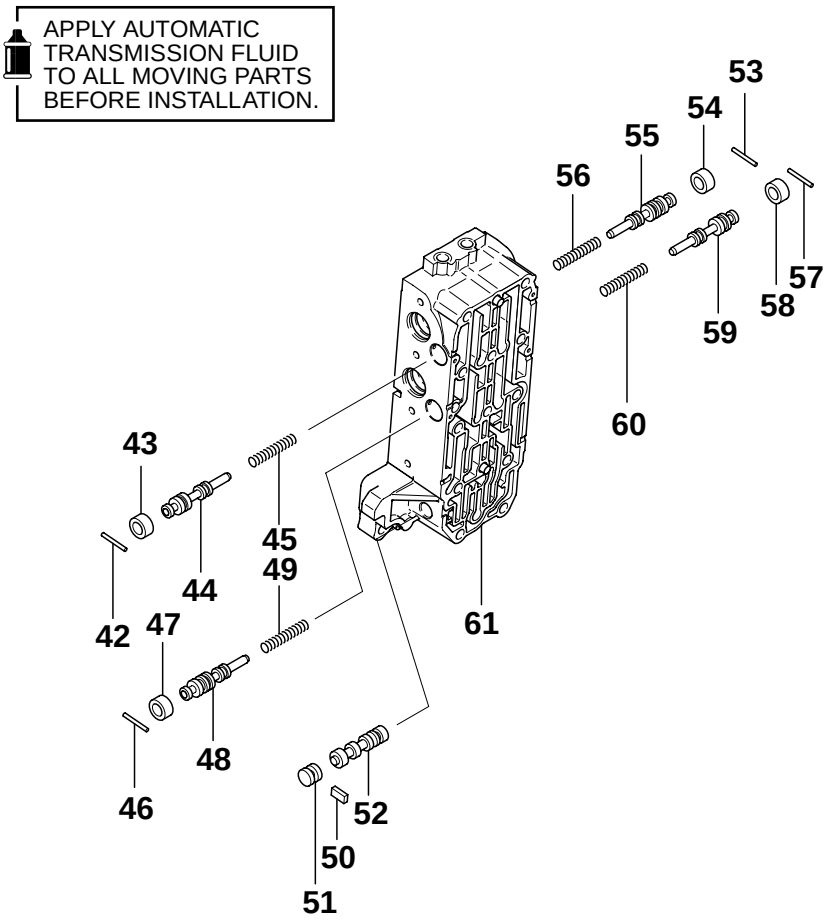
DISASSEMBLY STEPS

21. ROLLER
22. TORQUE CONVERTER CLUTCH CONTROL VALVE SLEEVE
23. TORQUE CONVERTER CLUTCH CONTROL VALVE
24. TORQUE CONVERTER CLUTCH CONTROL VALVE SPRING
25. PLATE
26. SCREW
27. REGULATOR VALVE SPRING
28. REGULATOR VALVE
29. PLATE
30. FAIL-SAFE VALVE A SLEEVE

DISASSEMBLY STEPS

31. FAIL-SAFE VALVE A2
32. FAIL-SAFE VALVE A SPRING
33. FAIL-SAFE VALVE A1
34. PLATE
35. PLUG
36. TORQUE CONVERTER VALVE
37. TORQUE CONVERTER VALVE SPRING
38. PLATE
39. FAIL-SAFE VALVE B SLEEVE
40. FAIL-SAFE VALVE B
41. INSIDE VALVE BODY

TSB Revision



AKX01092AB

DISASSEMBLY STEPS

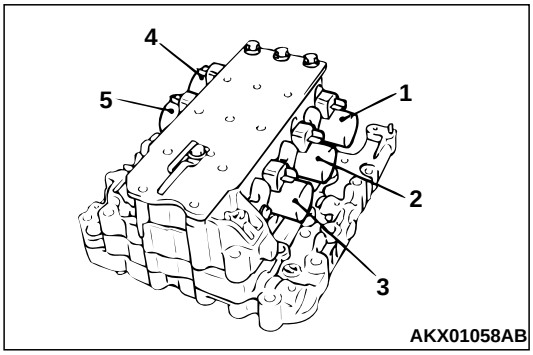
42. ROLLER
43. OVERDRIVE PRESSURE CONTROL VALVE SLEEVE
44. OVERDRIVE PRESSURE CONTROL VALVE
45. OVERDRIVE PRESSURE CONTROL VALVE SPRING
46. ROLLER
47. LOW-REVERSE PRESSURE CONTROL VALVE SLEEVE
48. LOW-REVERSE PRESSURE CONTROL VALVE
49. LOW-REVERSE PRESSURE CONTROL VALVE SPRING
50. PLATE
51. PLUG

DISASSEMBLY STEPS

52. SWITCHING VALVE
53. ROLLER
54. UNDERDRIVE PRESSURE CONTROL VALVE SLEEVE
55. UNDERDRIVE PRESSURE CONTROL VALVE
56. UNDERDRIVE PRESSURE CONTROL VALVE SPRING
57. ROLLER
58. SECOND PRESSURE CONTROL VALVE SLEEVE
59. SECOND PRESSURE CONTROL VALVE
60. SECOND PRESSURE CONTROL VALVE SPRING
61. OUTSIDE VALVE BODY

TSB Revision

DISASSEMBLY SERVICE POINT



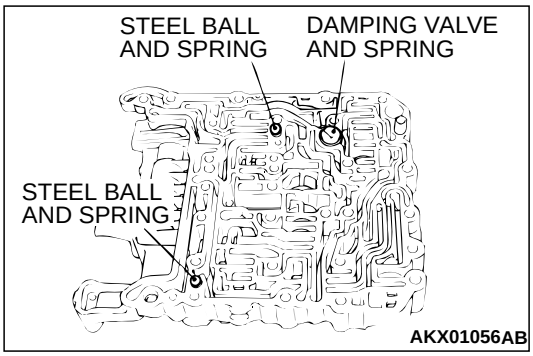
<<A>> SOLENOID VALVES REMOVAL

Mark the solenoid valves with white paint to make assembly easier.

ASSEMBLY SERVICE POINTS

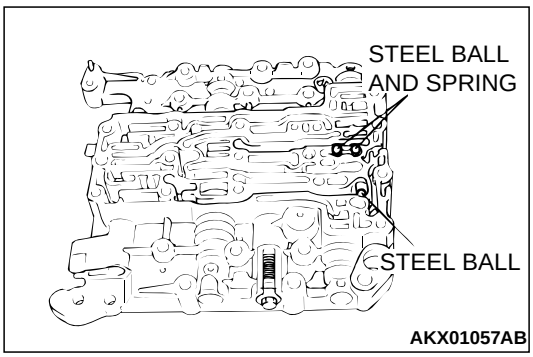
>>A<< SPRING, STEEL BALL, DAMPING VALVE AND DAMPING VALVE SPRING INSTALLATION

1. Install the two steel balls and two springs to the inside valve body as shown.
2. Install the damping valve and spring to the inside valve body as shown.



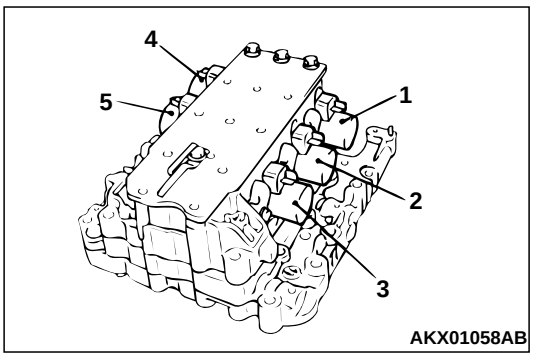
>>B<< SPRING AND STEEL BALL INSTALLATION

Install the three steel balls and two springs to the inside valve body as shown.



>>C<< SOLENOID VALVES INSTALLATION

1. Apply ATF or petroleum jelly (Vaseline) to the O-ring and install carefully.
2. Install the solenoid valves by referring to the marks applied during disassembly.



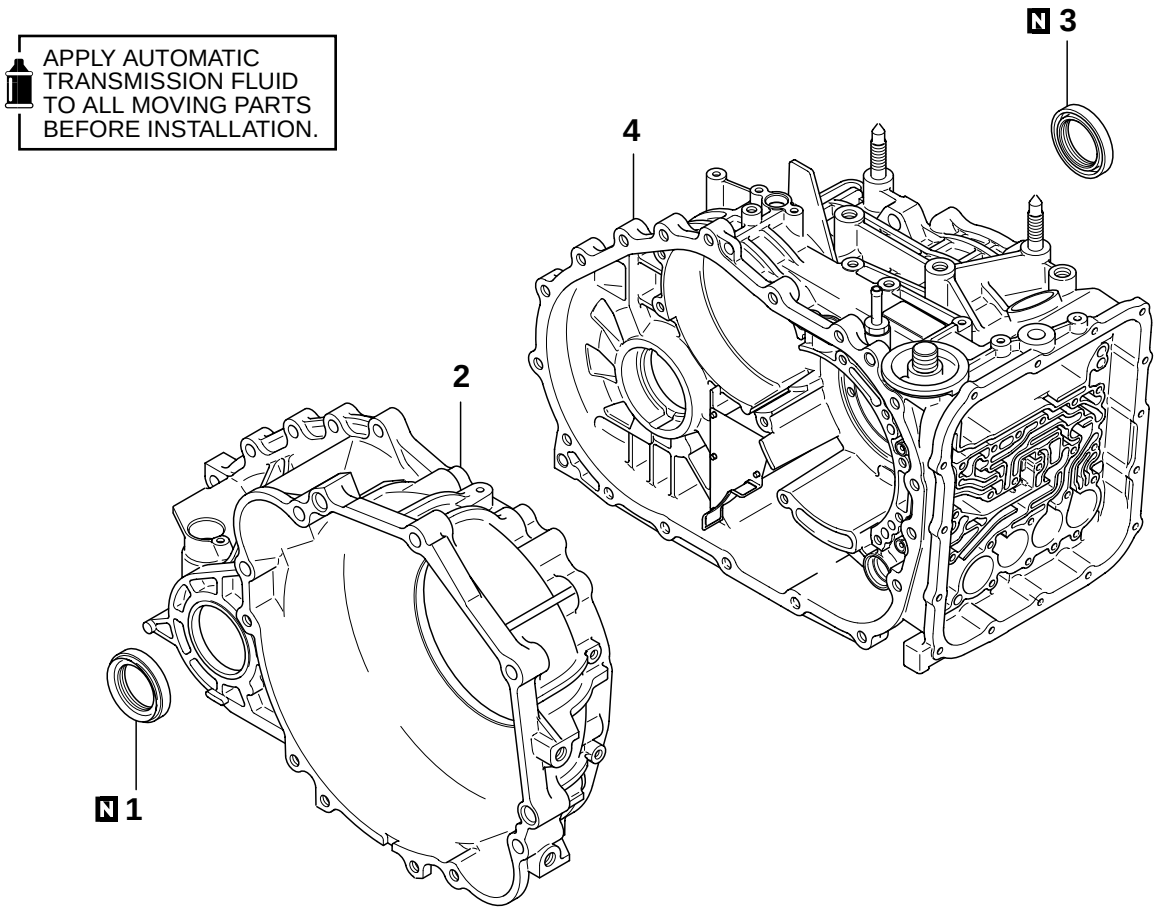
NO.	NAME
1	Underdrive solenoid valve
2	Second solenoid valve

NO.	NAME
3	Torque converter clutch control solenoid valve
4	Overdrive solenoid valve
5	Low-reverse solenoid valve

DRIVE SHAFT OIL SEAL

DISASSEMBLY AND ASSEMBLY

M1233004300023



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DISASSEMBLY STEPS

>>A<< 1. OIL SEAL
2. TORQUE CONVERTER HOUSING

DISASSEMBLY STEPS

>>B<< 3. OIL SEAL
4. TRANSAXLE CASE

Required Special Tool:

- MD998800: Oil Seal Installer

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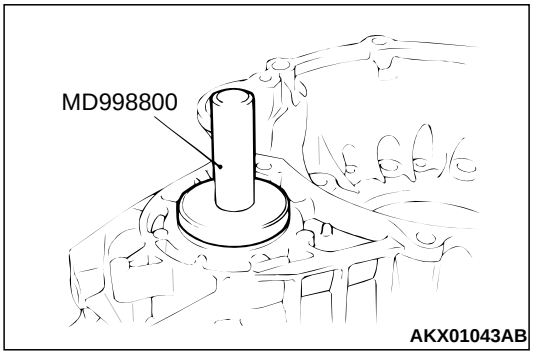
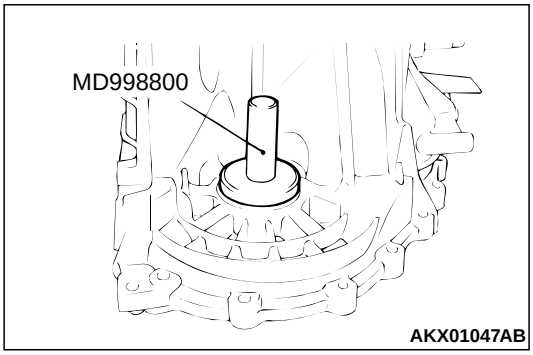
ASSEMBLY SERVICE POINTS



>>A<< OIL SEAL INSTALLATION

Use special tool MD998800 to tap the oil seal into the torque converter housing.



>>B<< OIL SEAL INSTALLATION

Use special tool MD998800 to tap the oil seal in the transaxle case.

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1233023100103

ITEMS		SPECIFICATIONS
Transaxle	Control cable bracket	23 ± 3 N·m (17 ± 2 ft-lb)
	Eye bolt	30 ± 3 N·m (22 ± 2 ft-lb)
	Fluid temperature sensor	11 ± 1 N·m (95 ± 9 in-lb)
	Input shaft speed sensor	11 ± 1 N·m (95 ± 9 in-lb)
	Manual control lever	22 ± 3 N·m (16 ± 2 ft-lb)
	Manual control shaft detent	6 ± 1 N·m (52 ± 9 in-lb)
	Oil filter	12 ± 1 N·m (104 ± 9 in-lb)
	Oil pump	23 ± 3 N·m (17 ± 2 ft-lb)
	Output shaft bearing retainer <F4A42>	23 ± 3 N·m (17 ± 2 ft-lb)
	Output shaft bearing retainer<F4A51>	54 ± 5 N·m (40 ± 4 ft-lb)
	Output shaft jam nut	167 ± 10 N·m (123 ± 7 ft-lb)
	Output shaft speed sensor	11 ± 1 N·m (95 ± 9 in-lb)
	Park/neutral position switch (PNP switch)	11 ± 1 N·m (95 ± 9 in-lb)
	Rear cover	23 ± 3 N·m (17 ± 2 ft-lb)
	Roll stopper bracket	69 ± 10 N·m (51 ± 7 ft-lb)
	Sealing cap	5 ± 1 N·m (43 ± 9 in-lb)
	Torque converter housing	48 ± 6 N·m (35 ± 4 ft-lb)
	Transfer drive gear	34 ± 2 N·m (25 ± 1 ft-lb)
	Valve body cover	11 ± 1 N·m (95 ± 9 in-lb)
	Valve body mounting bolt	11 ± 1 N·m (95 ± 9 in-lb)
	Wiring harness bracket	23 ± 3 N·m (17 ± 2 ft-lb)
Components	Differential drive gear	132 ± 5 N·m (98 ± 4 ft-lb)
	Plate	6 ± 1 N·m (52 ± 9 in-lb)
	Solenoid valve support	6 ± 1 N·m (52 ± 9 in-lb)
	Valve body	11 ± 1 N·m (95 ± 9 in-lb)

GENERAL SPECIFICATIONS

M1233000200110

ITEMS		SPECIFICATIONS	
Model		F4A42	F4A51
Type		Electronically controlled 4-speed full-automatic	
Torque converter	Type	3-element with torque converter clutch	
	Engine stall speed	2100 – 2600 r/min	2100 – 2600 r/min
	Stall torque ratio	2.0	2.0

ITEMS		SPECIFICATIONS	
Gear ratio	1st	2.842	2.842
	2nd	1.529	1.495
	3rd	1.000	1.000
	4th	0.712	0.731
	Reverse	2.480	2.720
Final gear ratio		4.041	3.728

SERVICE SPECIFICATIONS

M1233000300032

ITEMS		STANDARD VALUE
Output shaft preload mm (in)		0.01 – 0.09 (0.0004 – 0.0035)
Brake reaction plate end play mm (in)		0 – 0.16 (0 – 0.0063)
Low-reverse brake end play mm (in)		1.65 – 2.11 (0.050 – 0.0831)
Second brake end play mm (in)	F4A42	0.79 – 1.25 (0.0311 – 0.0492)
	F4A51	1.09 – 1.55 (0.0429 – 0.0610)
Underdrive sun gear end play mm (in)		0.25 – 0.45 (0.0098 – 0.0177)
Input shaft end play mm (in)		0.70 – 1.45 (0.028 – 0.057)
Differential case preload mm (in)		0.045 – 0.105 (0.0018 – 0.0041)
Underdrive clutch end play mm (in)		1.6 – 1.8 (0.0630 – 0.0709)
Reverse and overdrive clutch return spring retainer end play mm (in)		0 – 0.09 (0 – 0.0035)
Overdrive clutch end play mm (in)		1.6 – 1.8 (0.0630 – 0.0709)
Reverse clutch end play mm (in)		1.5 – 1.7 (0.0591 – 0.0669)
Backlash between differential side gear and pinion mm (in)		0.025 – 0.150 (0.0010 – 0.0059)

VALVE BODY SPRING IDENTIFICATION TABLE

M1233022900032

SPRING	WIRE DIAMETER mm (in)	OUTSIDE DIAMETER mm (in)	FREE LENGTH mm (in)	NUMBER OF LOOPS
Regulator valve spring	1.8 (0.071)	15.7 (0.618)	86.7 (3.413)	24
Underdrive pressure control valve spring	0.7 (0.028)	7.6 (0.299)	37.7 (1.484)	25
Overdrive pressure control valve spring	0.7 (0.028)	7.6 (0.299)	37.7 (1.484)	25
Low-reverse pressure control valve spring	0.7 (0.028)	7.6 (0.299)	37.7 (1.484)	25
Second pressure control valve spring	0.7 (0.028)	7.6 (0.299)	37.7 (1.484)	25
Torque converter spring	1.6 (0.063)	11.2 (0.441)	34.4 (1.354)	12.5
Torque converter clutch control valve spring	0.7 (0.028)	5.9 (0.232)	28.1 (1.106)	19
Fail-safe valve spring	0.7 (0.028)	8.9 (0.350)	21.9 (0.862)	9.5

SPRING	WIRE DIAMETER mm (in)	OUTSIDE DIAMETER mm (in)	FREE LENGTH mm (in)	NUMBER OF LOOPS
Damping valve spring	1.0 (0.039)	7.7 (0.303)	35.8 (1.409)	17
Line relief valve spring	1.0 (0.039)	7.0 (0.276)	17.3 (0.681)	10
Orifice check ball spring	0.5 (0.020)	4.5 (0.177)	17.2 (0.677)	15

ADJUSTING PLATE, SNAP RING AND SPACERS

M1233023000032

Thrust washer (For adjustment of input shaft end play)

THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.	THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.
1.8 (0.071)	18	MD754509	2.4 (0.094)	24	MD753793
2.0 (0.079)	20	MD754508	2.6 (0.102)	26	MD753794
2.2 (0.087)	22	MD754507	2.8 (0.110)	28	MD753795

Snap ring <F4A42> (For adjustment of underdrive clutch and overdrive clutch end play)

THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.	THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.
1.6 (0.063)	None	MD759666	2.4 (0.094)	Brown	MD752129
1.7 (0.067)	Blue	MD759667	2.5 (0.098)	None	MD752130
1.8 (0.071)	Brown	MD759668	2.6 (0.102)	Blue	MD752131
1.9 (0.075)	None	MD752124	2.7 (0.106)	Brown	MD752132
2.0 (0.079)	Blue	MD752125	2.8 (0.110)	None	MD752133
2.1 (0.083)	Brown	MD752126	2.9 (0.114)	Blue	MD752134
2.2 (0.087)	None	MD752127	3.0 (0.118)	Brown	MD754680
2.3 (0.091)	Blue	MD752128			

Snap ring <F4A51> (For adjustment of underdrive clutch and overdrive clutch end play)

THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.	THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.
1.6 (0.063)	Brown	MD759960	2.4 (0.094)	Blue	MD750845
1.7 (0.067)	None	MD759961	2.5 (0.098)	Brown	MD750846
1.8 (0.071)	Blue	MD759962	2.6 (0.102)	None	MD750847
1.9 (0.075)	Brown	MD759963	2.7 (0.106)	Blue	MD750848
2.0 (0.079)	None	MD750841	2.8 (0.110)	Brown	MD750849
2.1 (0.083)	Blue	MD750842	2.9 (0.114)	None	MD750850
2.2 (0.087)	Brow	MD750843	3.0 (0.118)	Blue	MD750851
2.3 (0.091)	None	MD750844			

Snap ring <F4A42> (For adjustment of low-reverse brake and second brake reaction plates end play)

THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.	THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.
2.2 (0.087)	Blue	MD754786	2.4 (0.094)	None	MD758240
2.3 (0.091)	Brown	MD754787	2.5 (0.098)	Blue	MD758241

Snap ring <F4A51> (For adjustment of low-reverse brake and second brake reaction plates end play)

THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.	THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.
2.2 (0.087)	None	MD756784	2.4 (0.094)	Brown	MD758552
2.3 (0.091)	Blue	MD756785	2.5 (0.098)	None	MD758553

Pressure plate <F4A42> (For adjustment of low-reverse brake and second brake end play)

THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.	THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.
1.6 (0.063)	L	MD759567	2.4 (0.094)	4	MD759417
1.8 (0.071)	1	MD759414	2.6 (0.102)	6	MD759418
2.0 (0.079)	0	MD759415	2.8 (0.110)	8	MD759419
2.2 (0.087)	2	MD759416	3.0 (0.118)	D	MD759420

Pressure plate <F4A51> (For adjustment of low-reverse brake and second brake end plays)

THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.	THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.
1.6 (0.063)	F	MD759568	2.4 (0.094)	B	MD759428
1.8 (0.071)	E	MD759425	2.6 (0.102)	A	MD759429
2.0 (0.079)	D	MD759426	2.8 (0.110)	0	MD759430
2.2 (0.087)	C	MD759427	3.0 (0.118)	1	MD759431

Snap ring <F4A42> (For adjustment of reverse clutch end play)

THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.	THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.
1.6 (0.063)	None	MD761085	2.3 (0.091)	Blue	MD752141
1.7 (0.067)	Blue	MD761086	2.4 (0.094)	Brown	MD752142
1.8 (0.071)	Brown	MD761087	2.5 (0.098)	None	MD752143
1.9 (0.075)	None	MD752137	2.6 (0.102)	Blue	MD752144
2.0 (0.079)	Blue	MD752138	2.7 (0.106)	Brown	MD752145
2.1 (0.083)	Brown	MD752139	2.8 (0.110)	None	MD752146
2.2 (0.087)	None	MD752140			

Snap ring <F4A51> (For adjustment of reverse clutch end play)

THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.	THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.
1.6 (0.063)	None	MD761008	2.3 (0.091)	Blue	MD756693
1.7 (0.067)	Blue	MD761089	2.4 (0.094)	Brown	MD756694
1.8 (0.071)	Brown	MD761090	2.5 (0.098)	None	MD756695
1.9 (0.075)	None	MD758947	2.6 (0.102)	Blue	MD756696
2.0 (0.079)	Blue	MD756690	2.7 (0.106)	Brown	MD756697
2.1 (0.083)	Brown	MD756691	2.8 (0.110)	None	MD756698
2.2 (0.087)	None	MD756692			

Snap ring (For adjustment of reverse clutch and overdrive clutch spring retainer end plays)

THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.	THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.
1.48 (0.0583)	Brown	MD755600	1.58 (0.0622)	Blue	MD755602
1.53 (0.0602)	None	MD755601	1.63 (0.0642)	Brown	MD755603

Thrust race (For adjustment of underdrive sun gear end play)

THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.	THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.
1.6 (0.063)	_	MD707267	2.2 (0.087)	_	MD723065
1.7 (0.067)	_	MD759681	2.3 (0.091)	_	MD754796
1.8 (0.071)	_	MD723064	2.4 (0.094)	_	MD724358
1.9 (0.075)	_	MD754794	2.5 (0.098)	_	MD754797
2.0 (0.079)	_	MD707268	2.6 (0.102)	_	MD754798
2.1 (0.083)	_	MD754795			

Spacer (For adjustment of output shaft preload)

THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.	THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.
1.88 (0.0740)	88	MD756579	2.36 (0.0929)	36	MD756591
1.92 (0.0756)	92	MD756580	2.40 (0.0945)	40	MD756592
1.96 (0.0772)	96	MD756581	2.44 (0.0961)	44	MD756593
2.00 (0.0787)	00	MD756582	2.48 (0.0976)	48	MD756594
2.04 (0.0803)	04	MD756583	2.52 (0.0992)	52	MD756595
2.08 (0.0819)	08	MD756584	2.56 (0.1008)	56	MD756596
2.12 (0.0835)	12	MD756585	2.60 (0.1024)	60	MD756597
2.16 (0.0850)	16	MD756586	2.64 (0.1039)	64	MD756598
2.20 (0.0866)	20	MD756587	2.68 (0.1055)	68	MD756599
2.24 (0.0882)	24	MD756588	2.72 (0.1071)	72	MD760685
2.28 (0.0898)	28	MD756589	2.76 (0.1087)	76	MD760686
2.32 (0.0913)	32	MD756590			

Spacer (For adjustment of differential case preload)

THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.	THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.
0.71 (0.0280)	71	MD754475	1.07 (0.0421)	07	MD720945
0.74 (0.0291)	74	MD727660	1.10 (0.0433)	J	MD710454
0.77 (0.0303)	77	MD754476	1.13 (0.0445)	D	MD700270
0.80 (0.0315)	80	MD727661	1.16 (0.0457)	K	MD710455
0.83 (0.0327)	83	MD720937	1.19 (0.0469)	L	MD710456
0.86 (0.0339)	86	MD720938	1.22 (0.0480)	G	MD700271
0.89 (0.0350)	89	MD720939	1.25 (0.0492)	M	MD710457
0.92 (0.0362)	92	MD720940	1.28 (0.0504)	N	MD710458
0.95 (0.0374)	95	MD720941	1.31 (0.0516)	E	MD706574
0.98 (0.0386)	98	MD720942	1.34 (0.0528)	O	MD710459
1.01 (0.0398)	01	MD720943	1.37 (0.0539)	P	MD710460
1.04 (0.0409)	04	MD720944			

Spacer (For adjustment of backlash between differential side gear and pinion)

THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.	THICKNESS mm (in)	IDENTIFICATION SYMBOL	PART NO.
0.75 – 0.82 (0.0295 – 0.0323)	_	MD722986	1.01 – 1.08 (0.0398 –0.0425)	_	MD722982
0.83 – 0.92 (0.0327 – 0.0362)	_	MD722985	1.09 – 1.16 (0.0429 – 0.0457)	_	MD722983
0.93 – 1.00 (0.0366 – 0.0394)	_	MD722984			

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SEALANTS

M1233000500036

ITEMS	SPECIFIED SEALANT
Rear cover	MITSUBISHI genuine sealant Part No. MD974421 or equivalent
Torque converter housing	MITSUBISHI genuine sealant Part No. MD974421 or equivalent
Valve body cover	MITSUBISHI genuine sealant Part No. MD974421 or equivalent

NOTES

GROUP 26

FRONT AXLE

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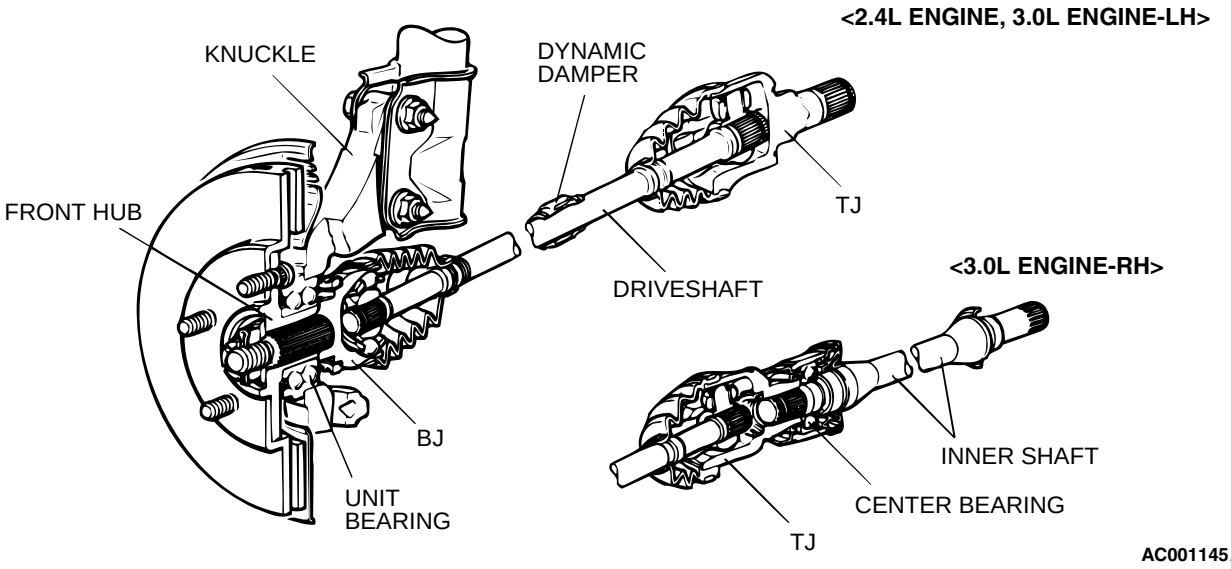
GENERAL DESCRIPTION

M1261000100206

FRONT AXLE

The front axle consists of a knuckle, front hub, unit bearing and drive shaft. The unit bearing is press-fitted to the front hub and bolted to the knuckle. Also, the unit bearing utilizes a double row angular contact ball bearing. The drive shaft has a Tripod joint (TJ) on the transaxle side and a Birfield joint (BJ) on the wheel side. A center bearing and an inner shaft have been adopted in 3.0L engine.

CONSTRUCTION DIAGRAM



FRONT AXLE DIAGNOSIS

INTRODUCTION

M1261005500157

Noise from driveshaft or inner shaft can be caused by a component defect.

TROUBLESHOOTING STRATEGY

M1261005600176

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted most of the possible ways to find a front axle fault.

1. Gather information from the customer.
2. Verify that the condition described by the customer exists.
3. Find the malfunction by following the Symptom Chart.
4. Verify malfunction is eliminated.

SYMPTOM CHART

M1261005700195

SYMPTOMS		INSPECTION PROCEDURE	REFERENCE PAGE
Driveshaft, inner shaft	Noise during wheel rotation	1	P.26-3
	Noise due to excessive play of wheel in turning direction	2	P.26-3

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Noise during Wheel Rotation

DIAGNOSIS

STEP 1. Check the driveshaft and inner shaft for bending.

Q: Is the driveshaft and inner shaft bent?
YES : Replace the part. Then go to Step 4.
NO : Go to step 2.

STEP 2. Check the inner shaft bearing for wear.

Q: Is the inner shaft bearing worn?
YES : Replace the bearings. Then go to Step 4.
NO : Go to Step 3.

STEP 3. Check the driveshaft assembly for wear, damage or bending.

Q: Is the driveshaft assembly worn, damaged or bent?
YES : Replace the driveshaft assembly. Then go to Step 4.
NO : There is no action to be taken.

STEP 4. Check symptoms.

Q: Is the abnormal noise eliminated?
YES : This diagnosis is complete.
NO : Repeat to Step 1.

INSPECTION PROCEDURE 2: Noise due to Excessive Play of Wheel in Turning Direction

DIAGNOSIS

STEP 1. Check for play in the inner shaft and side gear serration, the driveshaft and side gear, or the driveshaft and drive flange.

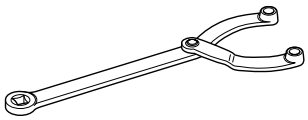
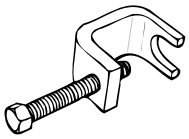
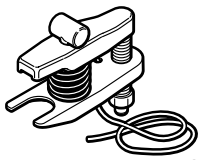
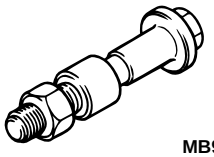
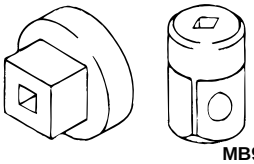
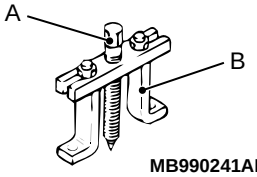
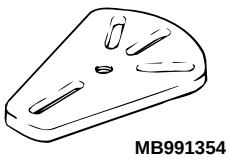
Q: Is the play found?
YES : Adjust or replace the part. Then go to Step 2.
NO : This diagnosis is complete.

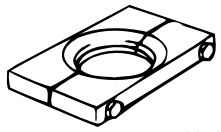
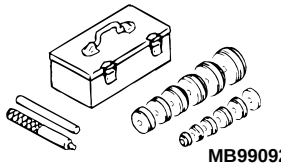
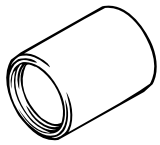
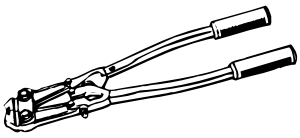
STEP 2. Check symptoms.

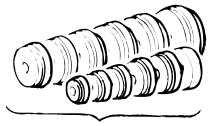
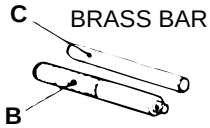
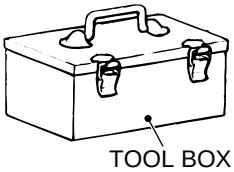
Q: Is the abnormal noise eliminated?
YES : This diagnosis is complete.
NO : Repeat to Step 1.

SPECIAL TOOLS

M1261000600223

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 B990767	MB990767 End yoke holder	MB990767-01	Hub fixing
 MB991618	MB991618 Hub bolt remover	General service tool	Driving out of hub bolt
 AC106827	MB991897 Ball joint remover	MB991113-01, MB990635-01 or General service tool	Knuckle and tie rod end ball joint disconnection *NOTE: Steering linkage puller (MB990635 or MB991113) is also used to disconnect knuckle and tie rod end ball joint.*
 MB990998	MB990998 Front hub remover and installer	MB990998-01 or General service tool	• Removal of or pressing-in the hub • Provisional holding of the wheel bearing
 MB990326	MB990326 Preload socket	General service tool	Wheel bearing breakaway torque measurement
 MB990241AB	MB990241 Axle shaft puller A: MB990244 Puller shaft B: MB990242 Puller bar	MB990241-01 or General service tool	Drive shaft removal
 MB991354	MB991354 Puller body	MB990241-01 or General service tool	Drive shaft removal

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 MB991248	MB991248 or MB998801 Inner shaft remover	MD998348-01	Inner shaft removal
 MB990925	MB990925 Bearing and oil seal installer set	MB990925-01 or General service tool	Bearing removal and dust seal installation
 MB990890	MB990890 Rear suspension bush base	MB990890-01	Oil seal installation
 MB991561	MB991561 Boot band crimping tool	MB991561	Resin boot band installation

TOOL	TYPE	TOOL NUMBER	O D mm (in)
MB990925  A INSTALL ADAPTER	A	MB990926	39.0 (1.54)
		MB990927	45.0 (1.77)
		MB990928	49.5 (1.95)
		MB990929	51.0 (2.00)
		MB990930	54.0 (2.13)
		MB990931	57.0 (2.24)
		MB990932	61.0 (2.40)
 C BRASS BAR B BAR (SNAP-IN TYPE)		MB990933	63.5 (2.50)
		MB990934	67.5 (2.66)
		MB990935	71.5 (2.81)
		MB990936	75.5 (2.97)
		MB990937	79.0 (3.11)
	B	MB990938	–
 TOOL BOX ACX02372 AB	C	MB990939	–

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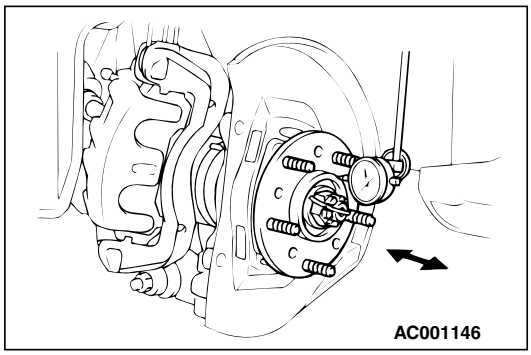
ON-VEHICLE SERVICE

HUB END PLAY CHECK

M1261000900149



1. Remove the disc brake caliper and suspend it with a wire.
2. Remove the brake disc from the front hub.
3. Attach a dial gauge as shown in the illustration, and then measure the end play while moving the hub in the axial direction.

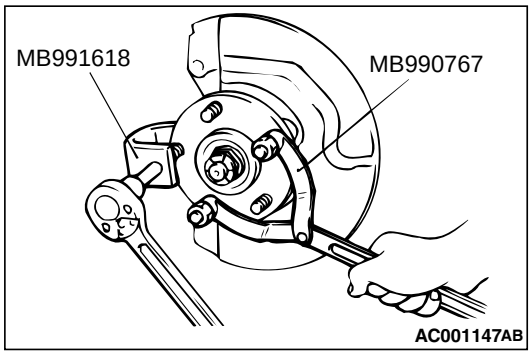
   Limit: 0.05 mm (0.002 inch)
4. If end play exceeds the limit, replace the front hub assembly.

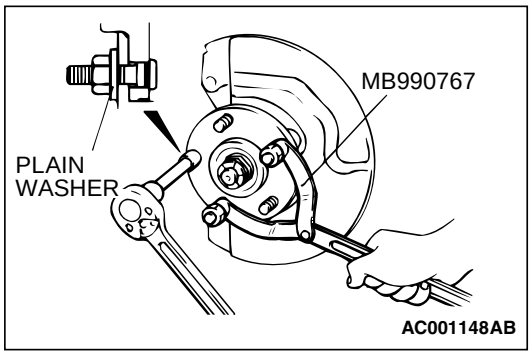
HUB BOLT REPLACEMENT

M1261001000183

Required Special Tools:
- MB990767: End Yoke Holder
- MB991618: Hub Bolt Remover

1. Remove the caliper assembly and suspend it with wire so that it does not fall.
2. Remove the brake disc.
3. Use the special tools MB990767 and MB991618 to remove the hub bolts.





4. Install the plain washer to the new hub bolt, and install the bolt with a nut.

FRONT AXLE HUB ASSEMBLY

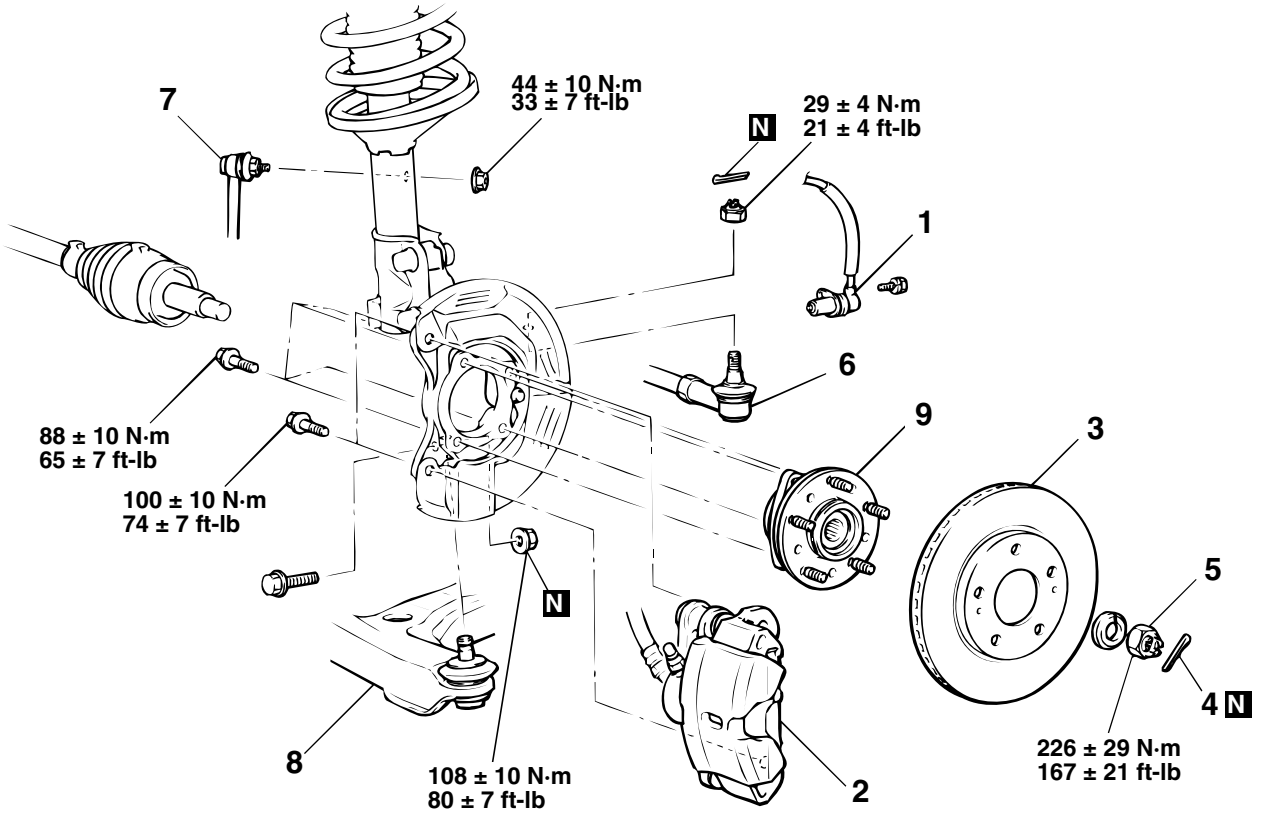
REMOVAL AND INSTALLATION

M1261001700193

⚠ CAUTION

- **For vehicles with ABS, be careful when handling the projection at the tip of the speed sensor so as not to damage it by striking against other parts.**
- **The front hub assembly should not be disassembled. When removing the front hub assembly, the wheel bearing inner race may be left at the spindle side. In this case, always replace the front hub assembly, otherwise the hub will damage the oil seal, causing oil leaks or excessive play.**

Post-installation Operation
- Press Dust Cover with a Finger to Check for Crack or Damage in Ball Joint Dust Cover.



AC001149AB

REMOVAL STEPS
1. FRONT SPEED SENSOR <VEHICLES WITH ABS>

<<A>> 2. CALIPER ASSEMBLY
3. BRAKE DISC
4. COTTER PIN

<<B>> >>A<< 5. DRIVESHAFT NUT

REMOVAL STEPS (Continued)

<<C>> 6. TIE ROD END CONNECTION
7. STABILIZER LINK CONNECTION

<<C>> 8. LOWER ARM ASSEMBLY CONNECTION
9. FRONT HUB ASSEMBLY

Required Special Tools:
- MB990326: Preload Socket
- MB990767: End Yoke Holder
- MB990998: Front Hub Remover and Installer
- MB991113 or MB990635: Steering Linkage Puller

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REMOVAL SERVICE POINTS

<<A>> CALIPER ASSEMBLY REMOVAL

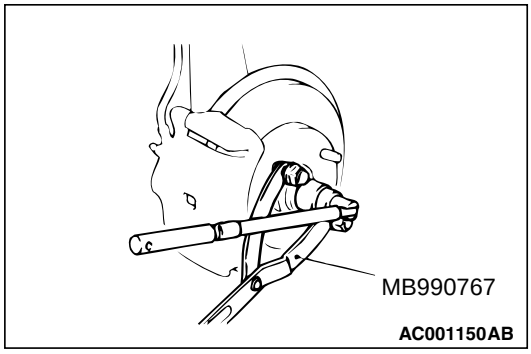
Secure the removed caliper assembly with wire, etc.

<<B>> DRIVESHAFT NUT REMOVAL

⚠ CAUTION

Do not apply pressure to wheel bearing by the vehicle weight to avoid possible damage when driveshaft nut is loosened.

Use special tool MB990787 to fix the hub and remove the driveshaft nut.

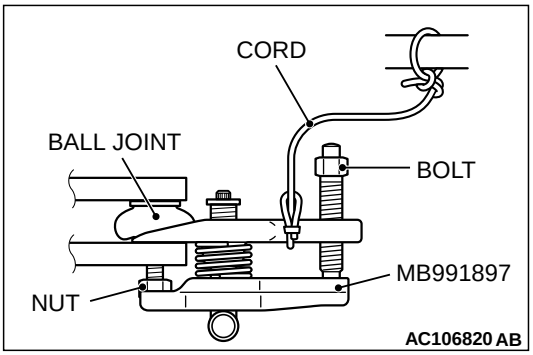


<<C>> TIE ROD END/LOWER ARM ASSEMBLY DISCONNECTION

⚠ CAUTION

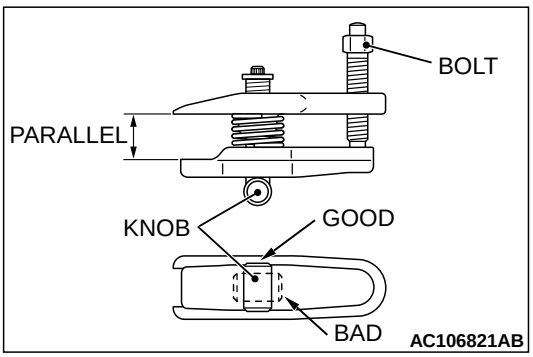
- **Do not remove the nut from ball joint. Loosen it and use special tool MB991897 to avoid possible damage to ball joint threads.**
- **Hang special tool MB991897 with rope or wire to prevent them from falling.**

1. Install the special tool MB991897 as shown in the figure.



2. After turning the bolt and knob to adjust the insert arms of the special tool MB991897 in parallel, tighten the bolt by hand and confirm that the insert arms are parallel.

   NOTE: When adjusting the insert arms in parallel, turn the knob in the direction shown in the figure.



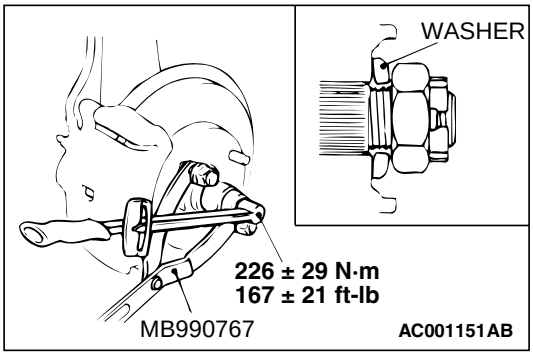
INSTALLATION SERVICE POINT

>>A<< DRIVE SHAFT NUT INSTALLATION

⚠ CAUTION

Do not apply pressure to wheel bearing by the vehicle weight to avoid possible damage before securely tightening the driveshaft nut.

1. Face the flat side of a washer to a driveshaft nut to install
2. Use special tool MB990767 to fix the hub and tighten the driveshaft nut.
3. If the position of the cotter pin holes does not match, tighten the nut up to 255 N·m (188 ft-lb) maximum.
4. Install the cotter pin in the first matching holes and bend it securely.



INSPECTION

M1261001800167

WHEEL BEARING BREAKAWAY TORQUE CHECK

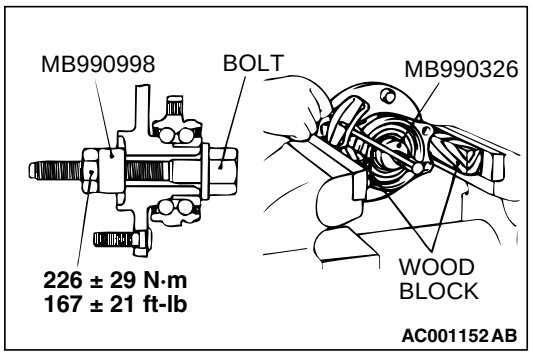
1. Install the special tools MB990998 and MB990326 to the front hub assembly and tighten the nut to the specified torque.

   Tightening torque: 226 ± 29 N·m (167 ± 21 ft-lb)

2. Measure the wheel bearing breakaway torque with special tool MB990326.

   Limit: 1.0 N·m (9 in-lb) or less

3. Wheel bearing breakaway torque must be under the limit value and there should be no roughness when rotating the hub.



WHEEL BEARING END PLAY CHECK

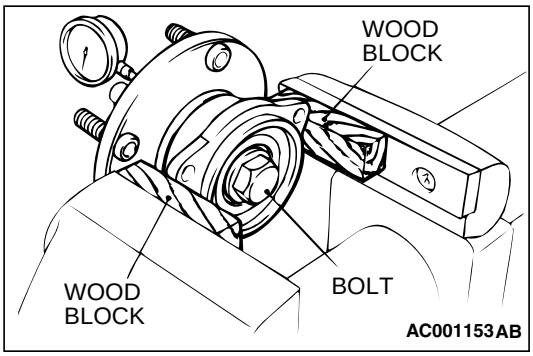
1. Install the special tool MB990998 to the front hub assembly and tighten the nut to the specified torque.

   Tightening torque: 226 ± 29 N·m (167 ± 21 ft-lb)

2. Measure the play in the hub axial direction.

   Limit: 0.05 mm (0.002 inch)

3. If the play exceeds the limit, replace the front hub assembly.

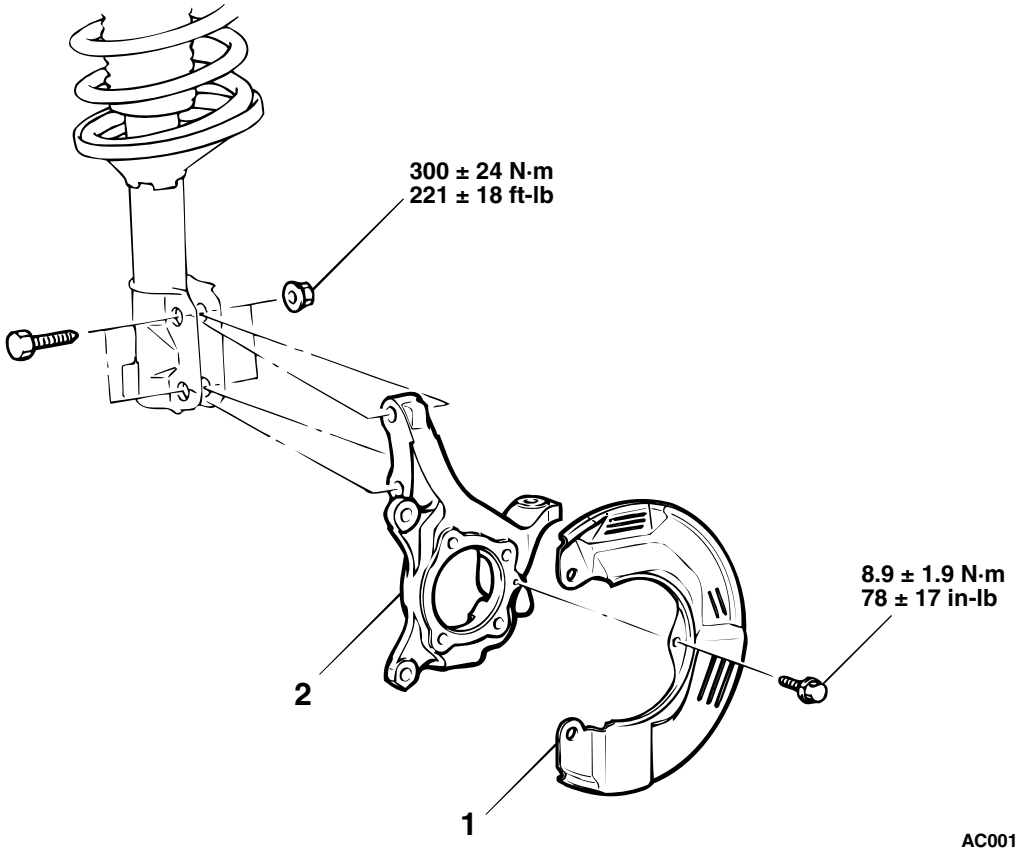


KNUCKLE

REMOVAL AND INSTALLATION

M1261002400162

Pre-removal Operation	Post-installation Operation
• Front Hub Assembly Removal (Refer to P.26-7.)	• Front Hub Assembly Installation (Refer to P.26-7.) • Wheel Alignment Check and Adjustment (Refer to GROUP 33A, On-vehicle Service – Front Wheel Alignment Check and Adjustment P.33A-6.)



REMOVAL STEPS

1. DUST SHIELD
2. KNUCKLE

INSPECTION

M1261002500158

Check the knuckle surface for galling and cracks.

DRIVE SHAFT ASSEMBLY

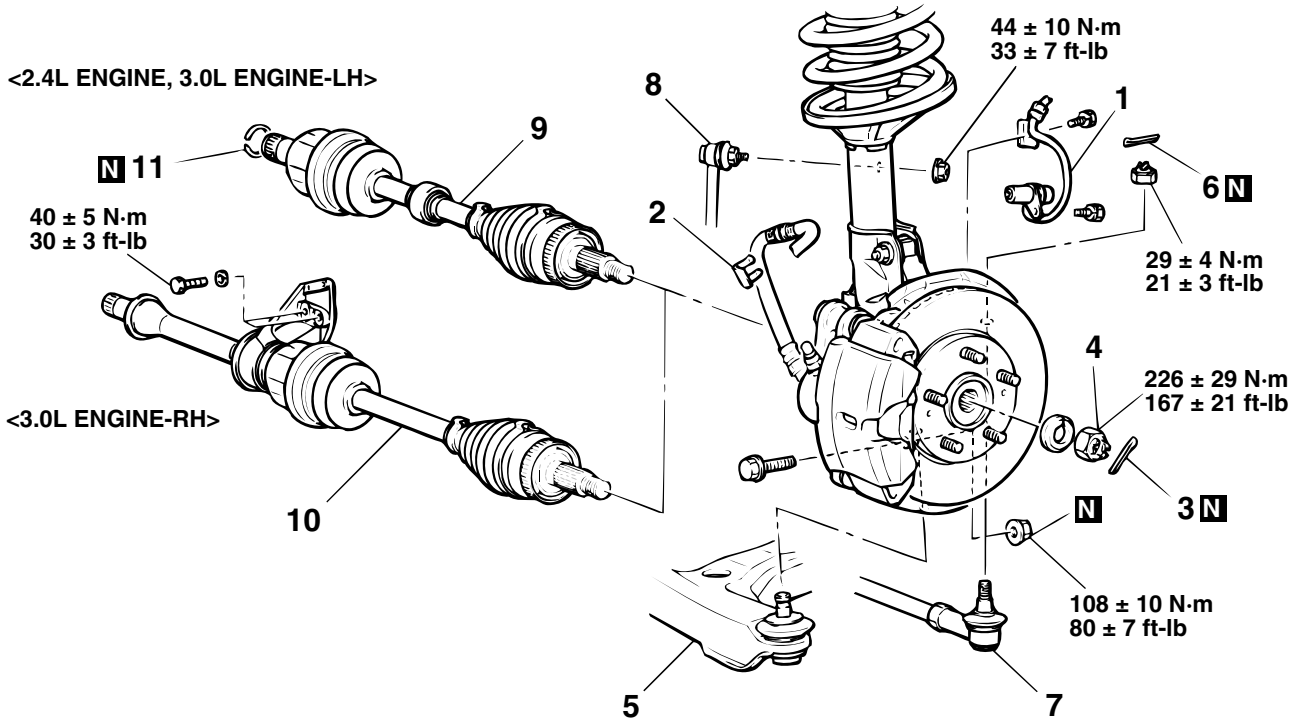
REMOVAL AND INSTALLATION

M1261003500203

⚠ CAUTION

For vehicles with ABS, be careful when handling the projection at the tip of the speed sensor so as not to damage it by striking against other parts.

Post-installation Operation
- Press Dust Cover with a Finger to Check for Crack or Damage in Ball Joint Dust Cover.



AC001155AB

REMOVAL STEPS

1. SPEED SENSOR CABLE CONNECTION <VEHICLES WITH ABS>
2. BRAKE HOSE CLIP
3. COTTER PIN

<<A>> >>B<< 4. DRIVESHAFT NUT

<<B>> 5. LOWER ARM BALL JOINT CONNECTION

6. COTTER PIN

<<B>> 7. TIE ROD END CONNECTION

8. STABILIZER LINK CONNECTION

<<C>> >>A<< 9. DRIVESHAFT

REMOVAL STEPS (Continued)

<<C>> >>A<< 10. DRIVESHAFT AND INNER SHAFT

11. CIRCLIP

Required Special Tools:
- MB990242: Puller Bar
- MB990767: End Yoke Holder
- MB990998: Front Hub Remover and Installer
- MB991113 or MB990635: Steering Linkage Puller
- MB991354: Puller Body

TSB Revision

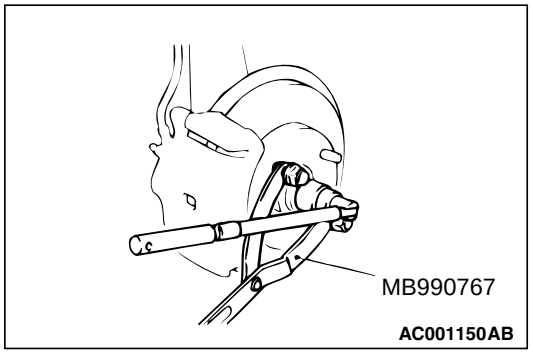
REMOVAL SERVICE POINTS

<<A>> DRIVESHAFT NUT REMOVAL

⚠ CAUTION

Do not apply pressure to the wheel bearing by the vehicle weight to avoid possible damage when the driveshaft nut is loosened.

Use special tool MB990787 to fix the hub and remove the driveshaft nut.

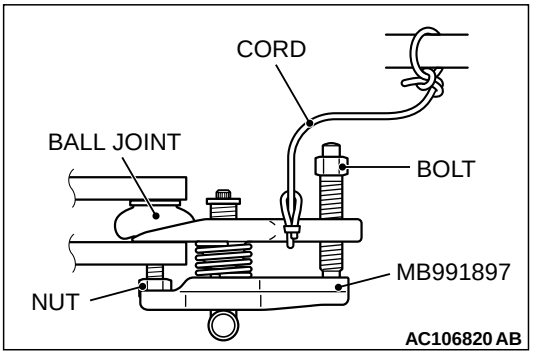


<<B>> LOWER ARM BALL JOINT/TIE ROD END DISCONNECTION

⚠ CAUTION

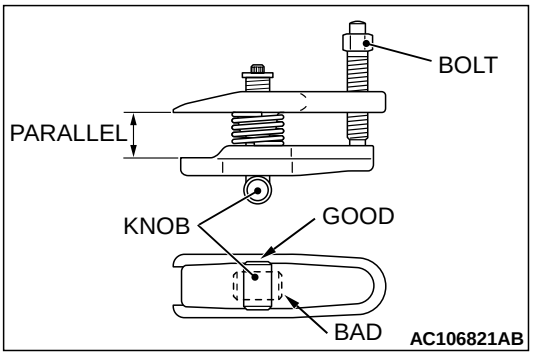
- **Do not remove the nut from the ball joint. Loosen it and use special tool MB991897 to avoid possible damage to the ball joint threads.**
- **Hang special tool MB991897 with rope or wire to prevent them from falling.**

1. Install the special tool MB991897 as shown in the figure.



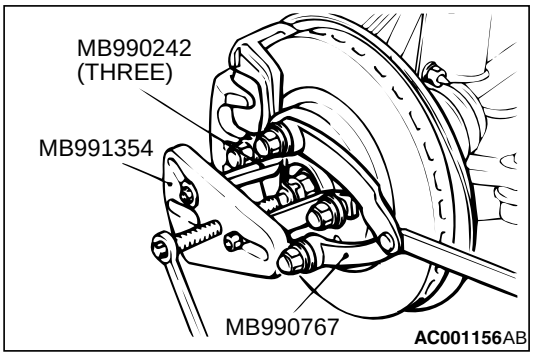
2. After turning the bolt and knob to adjust the insert arms of the special tool MB991897 in parallel, tighten the bolt by hand and confirm that the insert arms are parallel.

   NOTE: When adjusting the insert arms in parallel, turn the knob in the direction shown in the figure.



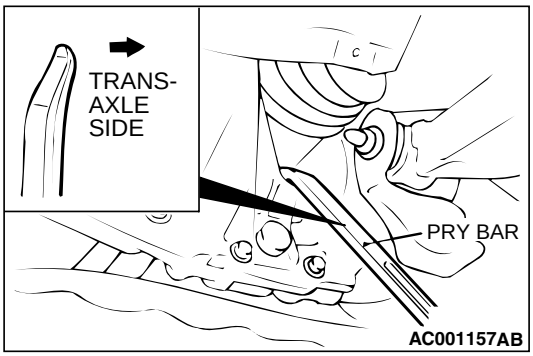
<<C>> DRIVESHAFT/DRIVESHAFT AND INNER SHAFT REMOVAL

⚠ CAUTION
Do not damage the ABS rotor attached to the BJ outer race. <Vehicles with ABS>



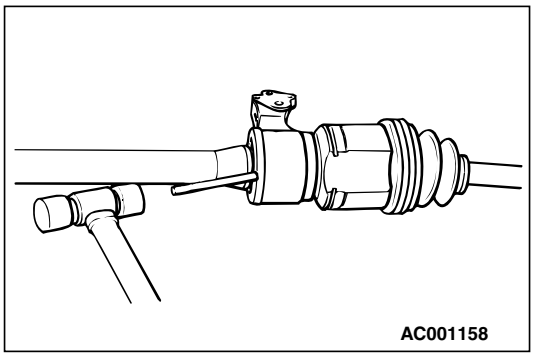
1. Use special tools MB991354, MB990242 and MB990767 to push the driveshaft out from the hub.

⚠ CAUTION
- **Do not pull on the driveshaft; doing so will damage the TJ; be sure to use the pry bar.**
- **Do not insert the pry bar so deep as to damage the oil seal.**
- **Do not damage the transaxle oil seal with the spline of the driveshaft.**



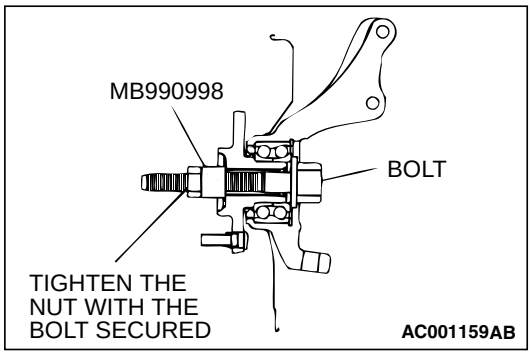
2. Insert a pry bar between the transaxle case and the driveshaft as shown to remove the driveshaft. <2.4L ENGINE, 3.0L ENGINE-LH>

⚠ CAUTION
Do not damage the transaxle oil seal with the spline of the inner shaft.



3. If the inner shaft and transaxle are tightly joined, tap the center bearing bracket lightly with a plastic hammer, etc. to remove the drive shaft and inner shaft from the transaxle. <3.0L ENGINE-RH>
4. Cover the transaxle case with a shop towel to prevent foreign material from entering it.

⚠ CAUTION
Do not apply the vehicle weight to the wheel bearing while loosening the driveshaft nut. If, however, the vehicle weight must be applied to the bearing (in order to move the vehicle), temporarily secure the wheel bearing by using special tool MB990998.



INSTALLATION SERVICE POINTS

>>A<< DRIVESHAFT AND INNER SHAFT/DRIVESHAFT INSTALLATION

⚠ CAUTION

- **Do not damage the transaxle oil seal with the spline of the shaft.**
- **Do not damage the ABS rotor attached to the BJ outer race. <Vehicles with ABS>**

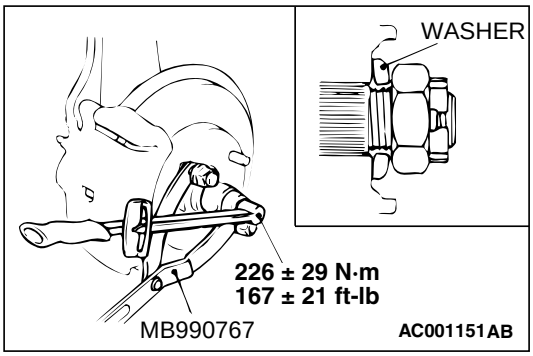
>>B<< DRIVESHAFT NUT INSTALLATION

1. Face the flat side of a washer to a driveshaft nut to install

⚠ CAUTION

Do not apply pressure to wheel bearing by the vehicle weight to avoid possible damage when driveshaft nut is loosened.

2. Use special tool MB990767 to fix the hub and tighten the driveshaft nut.
3. If the position of the cotter pin holes does not match, tighten the nut up to 255 N·m (188 ft-lb) maximum.
4. Install the cotter pin in the first matching holes and bend it securely.



INSPECTION

M1261003600170

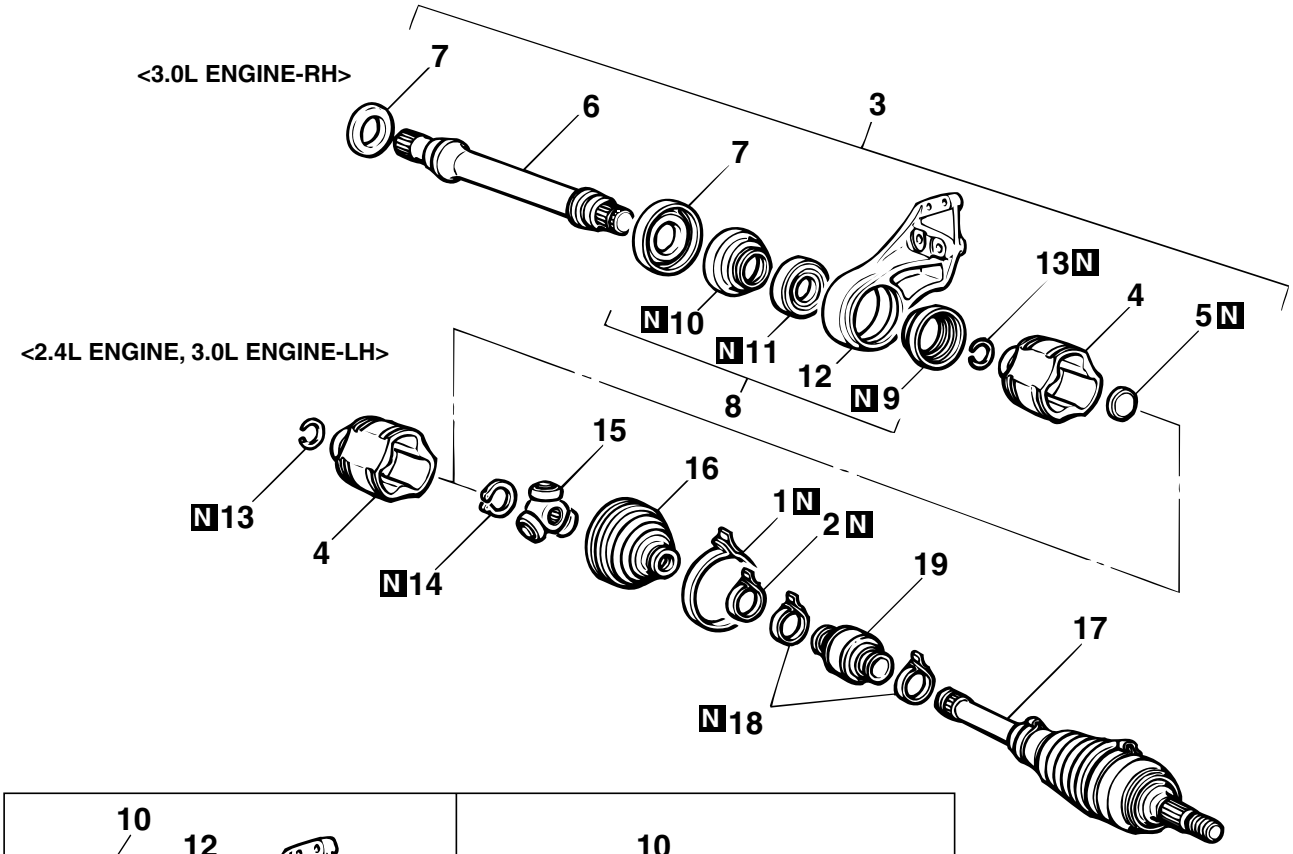
- Check the driveshaft boot for damage or deterioration.
- Check the ball joints for excessive play or poor operating condition.
- Check the spline part for wear or damage.

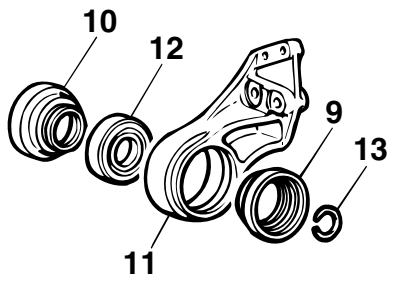
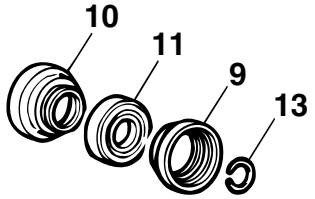
DISASSEMBLY AND ASSEMBLY

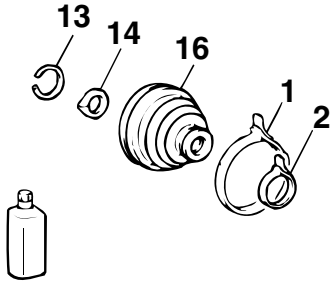
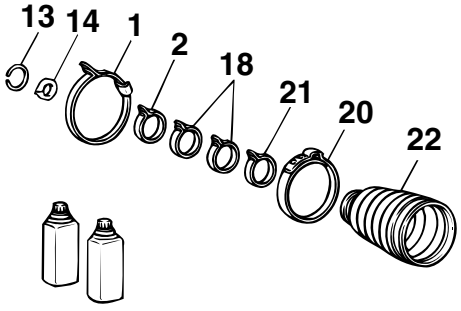
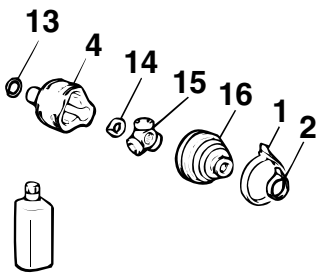
M1261003700207

⚠ CAUTION

Never disassemble the BJ assembly except when replacing the BJ boot.



	
BRACKET ASSEMBLY REPAIR KIT	BEARING DUST SEAL REPAIR KIT

		
TJ BOOT REPAIR KIT	BJ BOOT REPAIR KIT	TJ REPAIR KIT

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TSB Revision

DISASSEMBLY STEPS

- **>>G<<** 1. TJ BOOT BAND (LARGE)
- **>>G<<** 2. TJ BOOT BAND (SMALL)
- **>>F<<** 3. TJ CASE AND INNER SHAFT ASSEMBLY
- 4. TJ CASE
- 5. SEAL PLATE
- **<<A>> >>E<<** 6. INNER SHAFT
- 7. DUST COVER
- 8. BRACKET ASSEMBLY
- **>>D<<** 9. DUST SEAL OUTER
- **>>D<<** 10. DUST SEAL INNER
- **<<B>> >>C<<** 11. CENTER BEARING
- 12. CENTER BEARING BRACKET
- 13. CIRCLIP
- 14. SNAP RING
- **>>B<<** 15. SPIDER ASSEMBLY
- **<<C>> >>A<<** 16. TJ BOOT
- 17. BJ ASSEMBLY

DISASSEMBLY STEPS

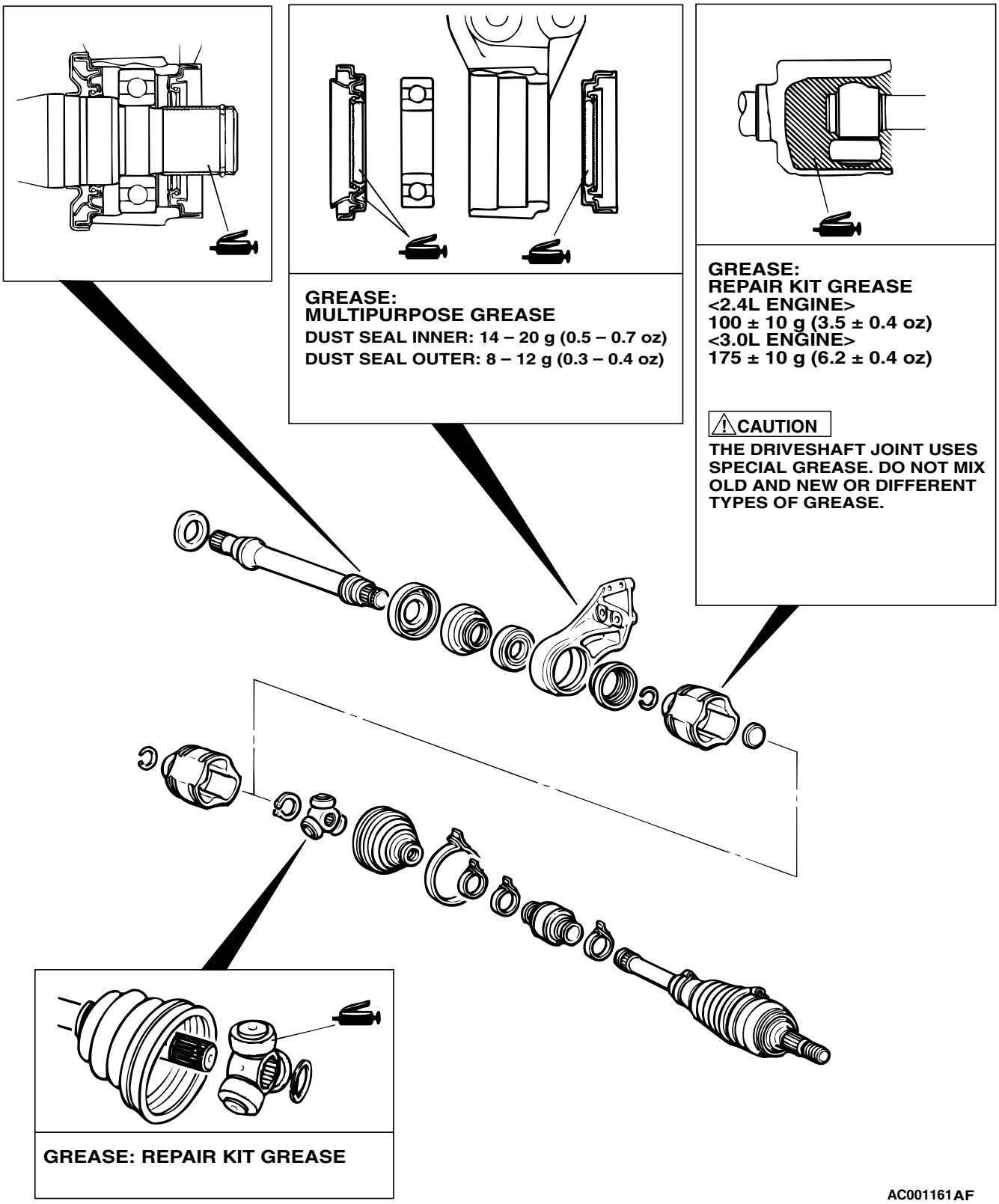
- **>>A<<** 18. DAMPER BAND <2.4L ENGINE, 3.0L ENGINE-LH>
- **>>A<<** 19. DYNAMIC DAMPER <2.4L ENGINE, 3.0L ENGINE-LH>
- 20. BJ BOOT BAND (LARGE)
- 21. BJ BOOT BAND (SMALL)
- 22. BJ BOOT

NOTE: BJ: Birfield Joint, TJ: Tripod Joint

Required Special Tools:

- MB990890: Rear Suspension Bush Base
- MB990930: Installation Adapter
- MB990932: Installation Adapter
- MB990934: Installation Adapter
- MB990938: Installation Adapter
- MB991172: Adapter
- MB991248 or MD998801: Inner Shaft Remover
- MB991561: Boot Band Crimping Tool

LUBRICATION POINTS

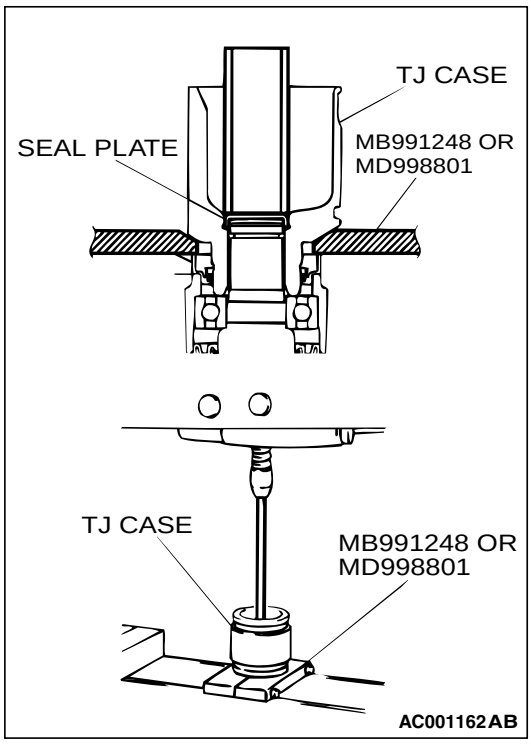


DISASSEMBLY SERVICE POINTS

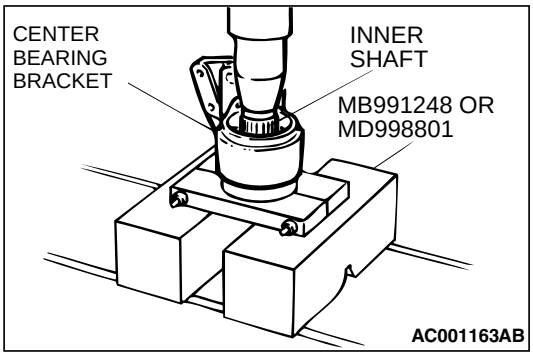
<<A>> INNER SHAFT REMOVAL

1. Use special tool MB991248 or MD998801 to remove the inner shaft assembly and the seal plate from the TJ case.

   NOTE: Press the seal plate to deform it, and then press out the inner shaft.

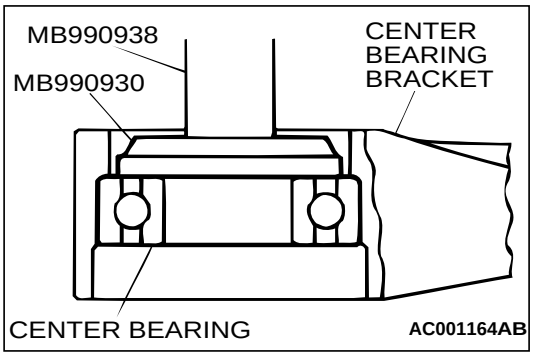


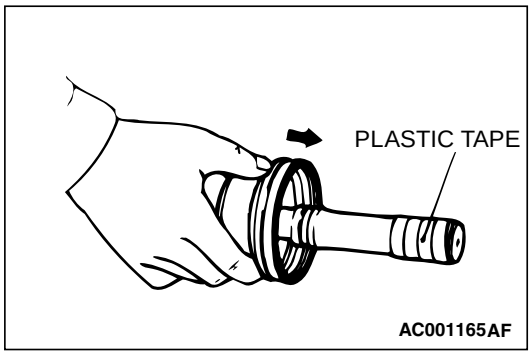
2. Use special tool MB991248 or MD998801 to remove the inner shaft from the center bearing bracket.



<<B>> CENTER BEARING REMOVAL

Use special tools MB990930 and MB990938 to press the center bearing out from the center bearing bracket.



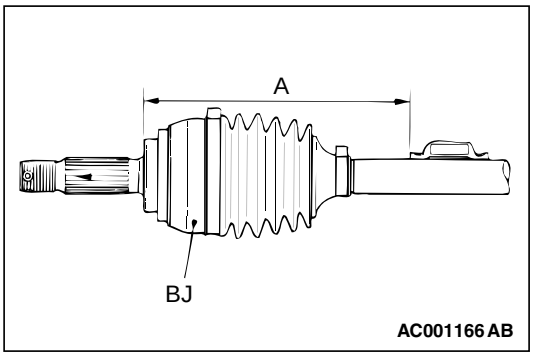


<<C>> TJ BOOT REMOVAL

Wrap plastic tape around the spline part on the BJ assembly so that the TJ boot is not damaged when they are removed.

ASSEMBLY SERVICE POINTS

>>A<< DYNAMIC DAMPER/DAMPER BAND/TJ BOOT INSTALLATION



1. Install the dynamic damper in the position shown in the illustration.

ITEMS	LH	RH
A mm (in)	242 ± 3 (9.5 ± 0.12)	254 ± 3 (10.0 ± 0.12)

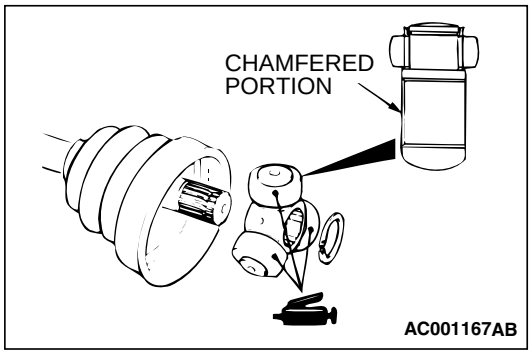
⚠ CAUTION

- **There should be no grease adhered to the rubber part of the dynamic damper.**
- **The damper band and the TJ boot band (small) are different in shape. Be careful not to assemble a wrong band by identifying a color of the band.**

2. Secure the damper bands.

ITEMS		BAND COLOR
Damper band		Blue
TJ boot band	2.4L ENGINE	–
	3.0L ENGINE– without ABS	Pink
	3.0L ENGINE– with ABS	Brown

3. Wrap plastic tape around the shaft spline, and then install the TJ boot band (small) and TJ boot.

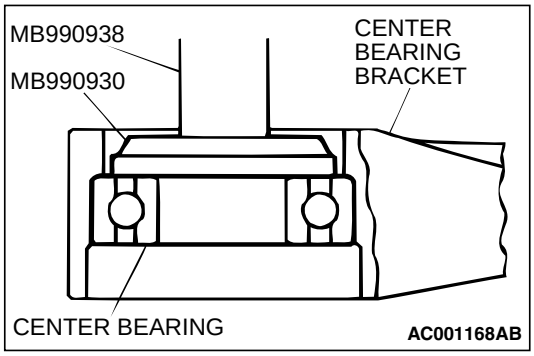


>>B<< SPIDER ASSEMBLY INSTALLATION

⚠ CAUTION

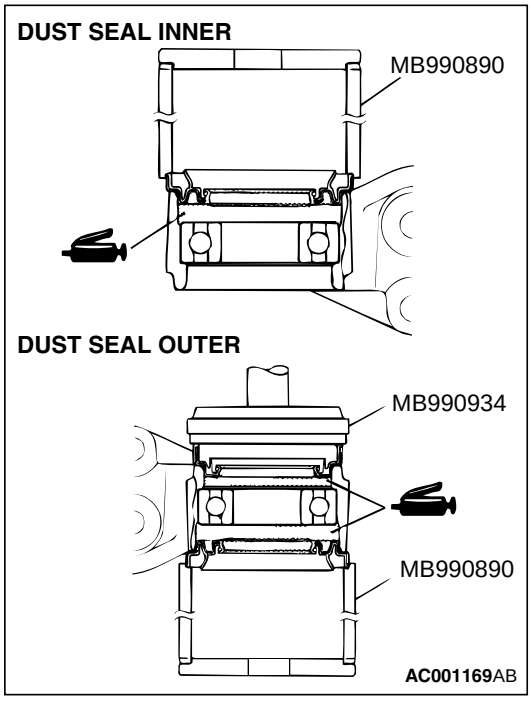
The driveshaft joint uses special grease. Do not mix old and new or different types of grease.

1. Apply the repair kit grease to the spider axles and rollers of the spider assembly.
2. Face the chamfered portion of the spider assembly's spline toward the driveshaft, and then install the spider assembly to the driveshaft.



>>C<< CENTER BEARING INSTALLATION

Use special tools MB990930 and MB990938 to press the center bearing into the center bearing bracket.



>>D<< DUST SEAL INNER/DUST SEAL OUTER INSTALLATION

1. Pack multipurpose grease in the places shown in the figure.

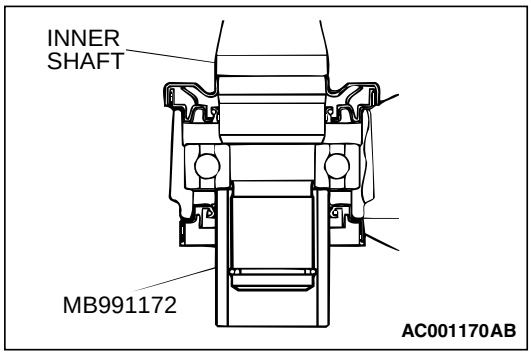
   Quantity:
   14 – 20 g (0.5 – 0.7 oz) <Dust seal inner>
   8 – 12 g (0.3 – 0.4 oz) <Dust seal outer>

⚠ CAUTION

Do not damage the rubber portion of the dust seal outer surface when packing the multipurpose grease, otherwise grease will leak.

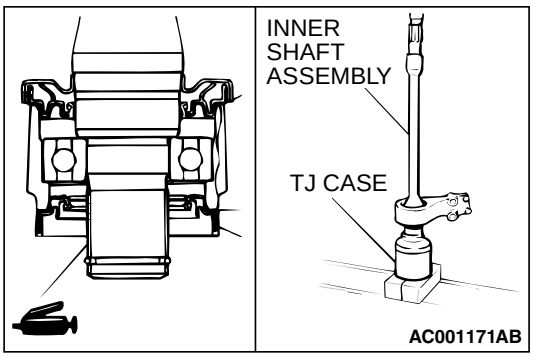
2. Use special tools MB990890 and MB990934 to press the oil seal into the center bearing bracket.
3. Apply multipurpose grease to the lip of the dust seal.

   NOTE: Do not apply the specified grease to the outside of the lip.



>>E<< INNER SHAFT INSTALLATION

Use special tool MB991172 to hold the center bearing inner race, and then press-in the inner shaft.



>>F<< TJ CASE AND INNER SHAFT ASSEMBLY INSTALLATION

1. Apply multipurpose grease to the inner shaft serration, and then press the inner shaft assembly into the TJ case.

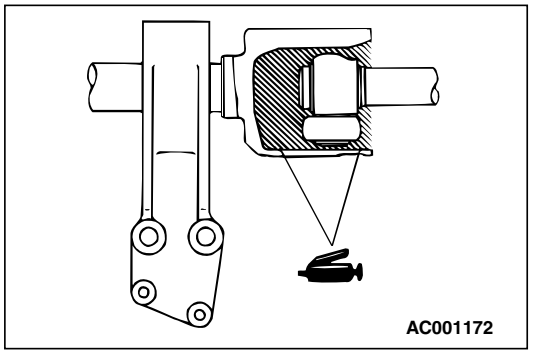
⚠ CAUTION

The driveshaft joint uses special grease. Do not mix old and new or different types of grease.

2. Fill the TJ case with repair kit grease and insert the driveshaft, and then refill the TJ case with repair kit grease.

   Grease quantity:
   100 ± 10 g (3.5 ± 0.4 oz) <2.4L ENGINE>
   175 ± 10 g (6.2 ± 0.4 oz) <3.0L ENGINE>

   NOTE: The grease in the repair kit should be divided in half for use, respectively, at the joint and inside the boot.

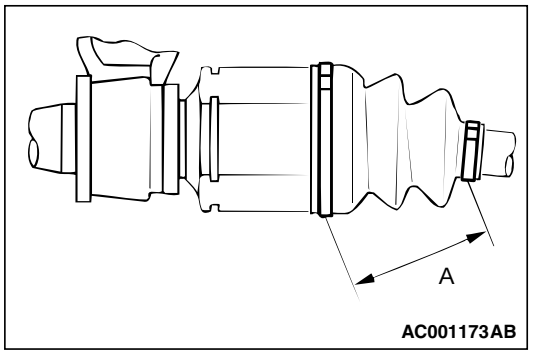


>>G<< TJ BOOT BAND (SMALL)/TJ BOOT BAND (LARGE) INSTALLATION

1. Position the TJ outer race so that the distance between the boot bands is at the standard value.

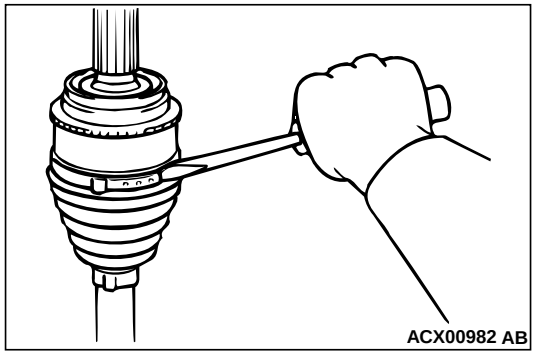
   Standard value (A):
   85 ± 3 mm (3.3 ± 0.12 inch) <2.4L ENGINE>
   90 ± 3 mm (3.5 ± 0.12 inch) <3.0L ENGINE>

2. Remove part of the TJ outer race to release the air pressure inside the boot.

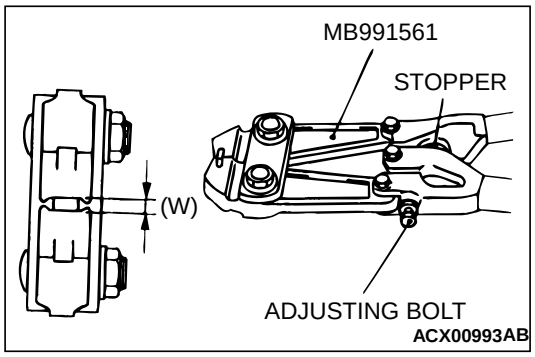


BJ BOOT REPLACEMENT

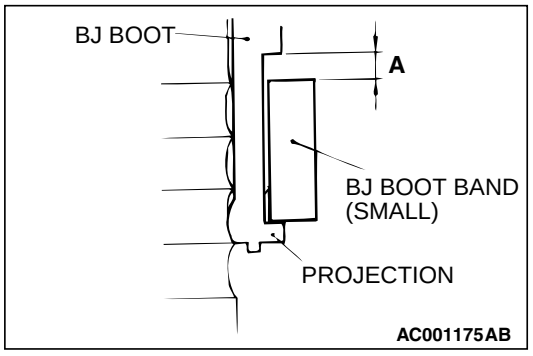
M1261005200219



1. Remove the boot bands (large and small).
   NOTE: The BJ boot bands cannot be re-used.
2. Remove the BJ boot.



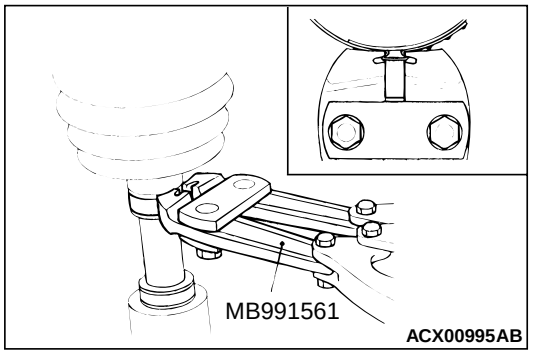
3. Turn the adjusting bolt on the special tool MB991561 so that the size of the opening (W) is at the standard value.
   Standard value (W): 2.9 mm (0.12 inch)
   <If it is larger than 2.9 mm (0.12 inch)>
   Tighten the adjusting bolt.
   <If it is smaller than 2.9 mm (0.12 inch)>
   Loosen the adjusting bolt.
   NOTE: The value of W will change by approximately 0.7 mm (0.03 inch) for each turn of the adjusting bolt.
   NOTE: The adjusting bolt should not be turned more than once.



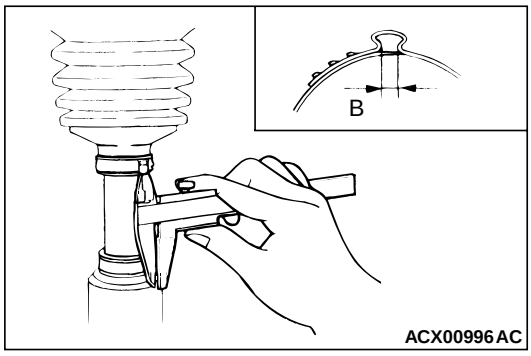
4. Place the BJ boot band (small) against the projection at the edge of the boot, and then secure it so that there is a clearance left as shown by (A) in the illustration.

⚠ CAUTION

- **Secure the driveshaft in an upright position and clamp the part of the BJ boot band to be crimped securely in the jaws of the special tool MB991561.**
- **Crimp the BJ boot band until the special tool MB991561 touches the stopper.**

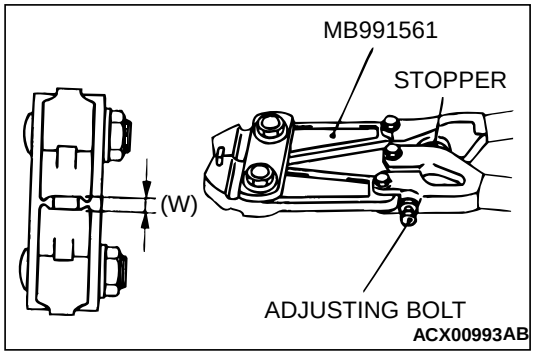


5. Use special tool MB991561 to crimp the BJ boot band (small).



6. Check that crimping amount (B) of the BJ boot band is at the standard value.

   Standard value (B): 2.4 – 2.8 mm (0.10 – 0.11 inch)



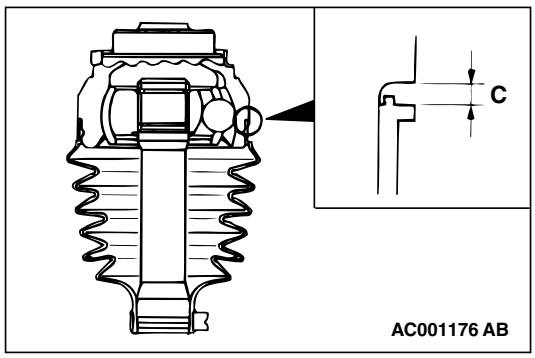
   <If the crimping amount is larger than 2.8 mm (0.11 inch)>
   Readjust the value of (W) in step 4 according to the following formula, and then repeat the operation in step 6.
   [W = 5.5 mm (0.22 inch) – B]
   Example: If B = 2.9 mm (0.11 inch), then W = 2.6 mm (0.10 inch).
   <If the crimping amount is smaller than 2.4 mm (0.09 inch)>
   Remove the BJ boot band, readjust the value of (W) in step 4 according to the following formula, and then repeat the operations in steps 5 and 6 using a new BJ boot band.
   [W = 5.5 mm (0.22 inch) – B]
   Example: If B = 2.3 mm (0.10 inch), then W = 3.2 mm (0.13 inch).

7. Check that the BJ boot band is not sticking out past the place where it has been installed. If the BJ boot band is sticking out, remove it and then repeat the operations in steps 4 to 6 using a new BJ boot band.

⚠ CAUTION
The driveshaft joint uses special grease. Do not mix old and new grease or different types of grease.

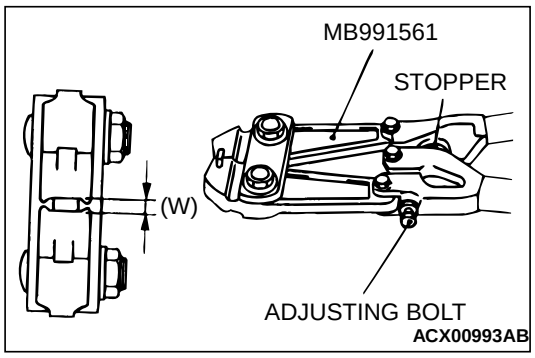
8. Fill the inside of the BJ boot with the specified amount of the repair kit grease.

   Grease quantity:
   <2.4L ENGINE> 110 ± 10 g (3.9 ± 0.4 oz)
   <3.0L ENGINE> 120 ± 10 g (4.2 ± 0.4 oz)



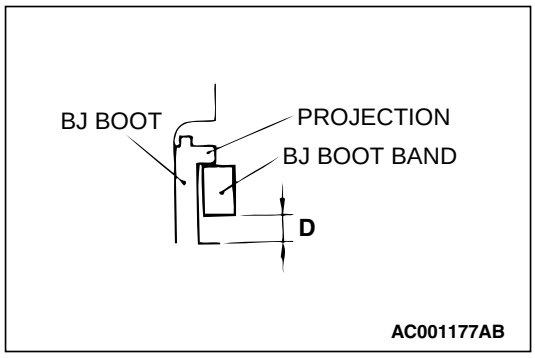
9. Install the BJ boot band (large) so that clearance (C) between it and the BJ housing is at the standard value.

   Standard value (C): 0.1 – 1.55 mm (0.004 – 0.061 inch)



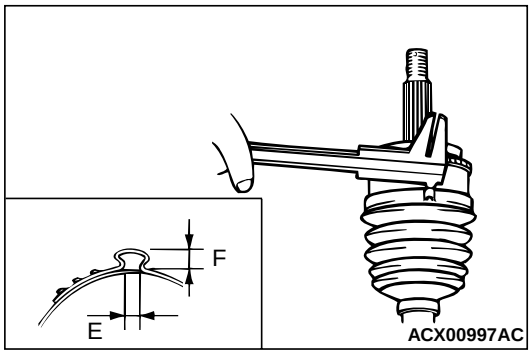
10.Follow the same procedure as in step 3 to adjust the size of the opening (W) on special tool MB991561 so that it is at the standard value.

Standard value (W): 3.2 mm (0.13 inch)



11.Place the BJ boot band (large) against the projection at the edge of the boot, and then secure it so that there is a clearance left as shown by (D) in the illustration.

12.Use special tool MB991561 to crimp the BJ boot band (large) in the same way as in step 5.



13.Check that the crimping amount (E) of the BJ boot band is at the standard value and that the crimping amount (F) of the BJ boot band is at the limited value.

Standard value (E): 2.4 – 2.8 mm (0.10 – 0.11 inch)
Limited value (F): 9.5 mm (0.40 inch)
<If the crimping amount is larger than 2.8 mm (0.11 inch)>
Readjust the value of (W) in step 10 according to the following formula, and then repeat the operation in step 12.
[W = 5.8 mm (0.23 inch) – E]
Example: If E = 2.9 mm (0.11 inch), then W = 2.9 mm (0.11 inch).
<If the crimping amount is smaller than 2.4 mm (0.09 inch)>
Remove the BJ boot band, readjust the value of (W) in step 10 according to the following formula, and then repeat the operations in steps 11 and 12 using a new BJ boot band.
[W = 5.8 mm (0.23 inch) – E]
Example: If E = 2.3 mm (0.10 inch) then W = 3.5 mm (0.15 inch).

14.Check that the BJ boot band is not sticking out past the place where it has been installed. If the BJ boot band is sticking out, remove it and then repeat the operations in steps 11 to 13 using a new BJ boot band.

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1261005400202

ITEMS	SPECIFICATIONS
Caliper assembly bolt	100 ± 10 N·m (74 ± 7 ft-lb)
Center bearing bolt	40 ± 5 N·m (30 ± 3 ft-lb)
Driveshaft nut	226 ± 29 N·m (167 ± 21 ft-lb)
Dust shield bolt	8.9 ± 1.9 N·m (78 ± 17 in-lb)
Front strut nut	300 ± 24 N·m (221 ± 18 ft-lb)
Knuckle and wheel bearing bolt	88 ± 10 N·m (65 ± 7 ft-lb)
Lower arm ball joint nut	108 ± 10 N·m (80 ± 7 ft-lb)
Stabilizer link nut	44 ± 10 N·m (33 ± 7 ft-lb)
Tie rod end nut	29 ± 4 N·m (21 ± 3 ft-lb)

GENERAL SPECIFICATIONS

M1261000200195

ITEMS			SPECIFICATIONS
Front axle hub bearing		Type	Double row angular contact bearing
Driveshaft	Joint type	Outer	Birfield joint
		Inner	Tripod joint

SERVICE SPECIFICATIONS

M1261000300222

ITEMS		STANDARD VALUE	LIMIT
Front hub axial play mm (in)		–	0.05 (0.002)
Setting of TJ boot length mm (in)	2.4L ENGINE	85 ± 3 (3.3 ± 0.12)	–
	3.0L ENGINE	90 ± 3 (3.5 ± 0.12)	–
Wheel bearing breakaway torque N·m (in-lb)		–	1.0 (9) or less
Opening dimension of the special tool (MB991561) mm (in)	When the BJ boot band (small) is crimped	2.9 (0.12)	–
	When the BJ boot band (large) is crimped	3.2 (0.13)	–
Crimped width of the BJ boot band mm (in)		2.4 – 2.8 (0.10 – 0.11)	–
Clearance between the BJ boot (larger diameter side) and the stepped phase of the BJ housing mm (in)		0.1 – 1.55 (0.004 – 0.061)	–

LUBRICANTS

M1261000400218

ITEMS		SPECIFIED LUBRICANTS	QUANTITY
Dust seal inner		Repair kit grease	14 – 20 g (0.5 – 0.7 oz)
Dust seal outer		Repair kit grease	8 – 12 g (0.3 – 0.4 oz)
TJ boot grease	2.4L ENGINE	Repair kit grease	100 ± 10 g (3.5 ± 0.4 oz)
	3.0L ENGINE	Repair kit grease	175 ± 10 g (6.2 ± 0.4 oz)
BJ boot grease	2.4L ENGINE	Repair kit grease	110 ± 10 g (3.9 ± 0.4 oz)
	3.0L ENGINE	Repair kit grease	120 ± 10 g (4.2 ± 0.4 oz)

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NOTES

GROUP 27

REAR AXLE

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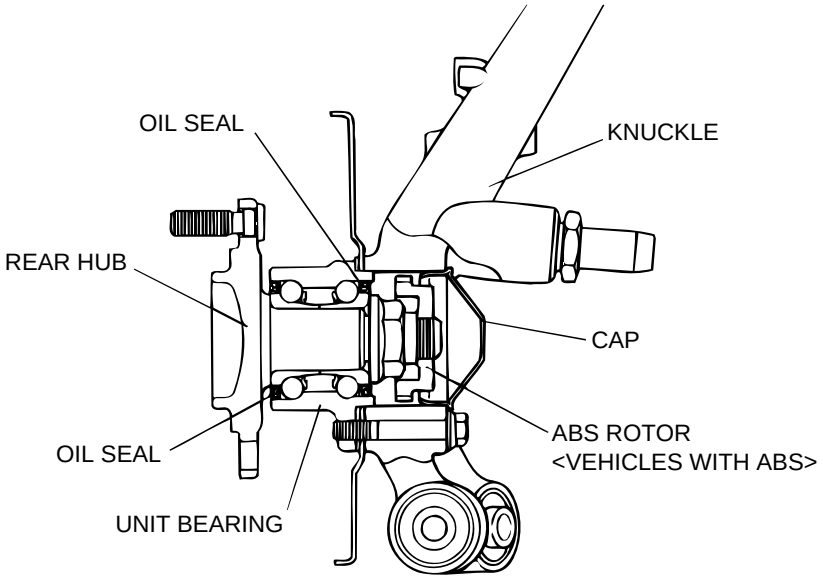
GENERAL DESCRIPTION

M1271000100155

The rear axle consists of a knuckle, rear hub, unit bearing. The unit bearing is press-fitted to the rear hub and bolted to the knuckle. Also, the unit bearing utilizes the same type of double row angular contact ball bearing as does the front axle.

ABS rotor for detecting the vehicle speed is located on the hub assembly, and a speed sensor is located on the knuckle.



AC001179 AB

REAR AXLE DIAGNOSIS

INTRODUCTION TO REAR AXLE DIAGNOSIS

M1271004100168

Noise from the rear axle may be caused by defects in the components.

REAR AXLE DIAGNOSTIC TROUBLESHOOTING STRATEGY

M1271004200165

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted most of the possible ways to find a rear axle fault.

1. Gather information from the customer.
2. Verify that the condition described by the customer exists.
3. Find the malfunction by following the Inspection Chart for Trouble Symptoms.
4. Verify malfunction is eliminated.

SYMPTOM CHART

M1271004300162

SYMPTOM	INSPECTION PROCEDURE	REFERENCE PAGE
Abnormal noise	1	P.27-3

SYMPTOM PROCEDURE

M1271004400158

INSPECTION PROCEDURE 1: Abnormal Noise

DIAGNOSIS

STEP 1. Check the wheel nut for looseness.

Q: Are the wheel nuts loosened?
YES : Tighten the nuts, then go to Step3.
NO : Go to Step 2.

STEP 2. Check the wheel bearing for wear or damage.

Q: Is the wheel bearing in good condition?
YES : Go to step 3.
NO : Replace the part, then go to Step 4.

STEP 3. Check the brake disc for bent or distortion.

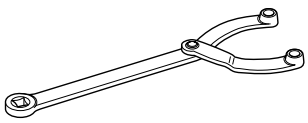
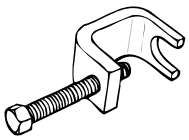
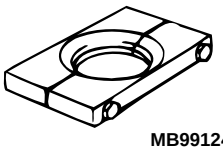
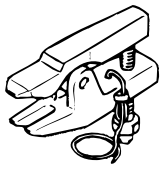
Q: Is the brake disc in good condition?
YES : Go to Step 4.
NO : Replace the part, then go to Step 4.

STEP 4. Check trouble symptoms.

Q: Are any noises generated?
YES : Return to Step 1.
NO : This diagnosis is complete.

SPECIAL TOOLS

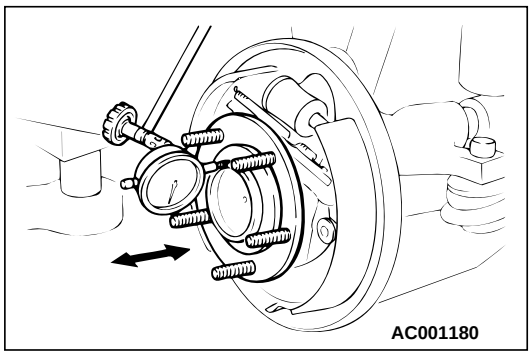
M1271000600235

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 B990767	MB990767 End yoke holder	MB990767-1	Hub fixing
 MB991618	MB991618 Hub bolt remover	General service tool	Hub bolt removal
 MB991248	MB991248 Inner shaft remover	Tool not available	ABS rotor removal
 MB990635	MB990635 or MB991113 Steering linkage puller	MB991113-1, MB990635-01 or General service tool	Ball joint disconnection

ON-VEHICLE SERVICE

WHEEL BEARING END PLAY CHECK

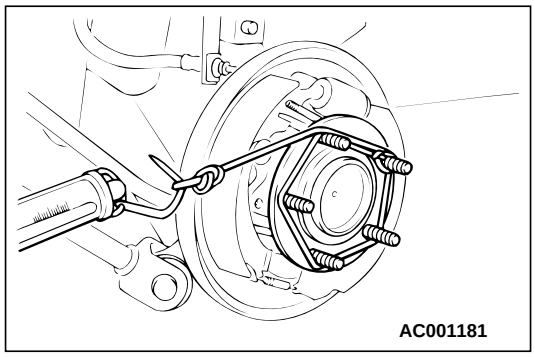
M1271000900195


AC001180

1. For vehicles with rear disc brakes, remove the caliper assembly, suspend the caliper assembly with a wire and remove the brake disc.
2. For vehicles with rear drum brakes, remove the brake drum.
3. Check the bearing's end play.
   Place a dial gauge against the hub surface; then move the hub in the axial direction and check whether or not there is end play.
   Limit: 0.05 mm (0.002 inch)
4. If the play exceeds the limit value, replace the rear hub assembly.

REAR HUB ROTARY-SLIDING RESISTANCE CHECK

M1271001100136


AC001181

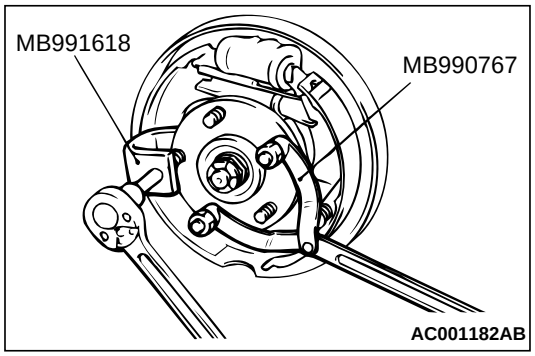
1. For vehicles with rear disc brakes, remove the caliper assembly, suspend the caliper assembly with a wire and remove the brake disc.
2. For vehicles with rear drum brakes, remove the brake drum.
3. After turning the hub a few times to seat the bearing, wind a rope around the hub bolt and turn the hub by pulling at a 90 degree angle with a spring scale. Measure to determine whether or not the rotary-sliding resistance of the rear hub is at the limit value.
   Limit: 18 N·m (13 ft-lb)
4. If the rotary-sliding resistance exceeds the limit value, replace the rear hub assembly.

HUB BOLT REPLACEMENT

M1271001000128

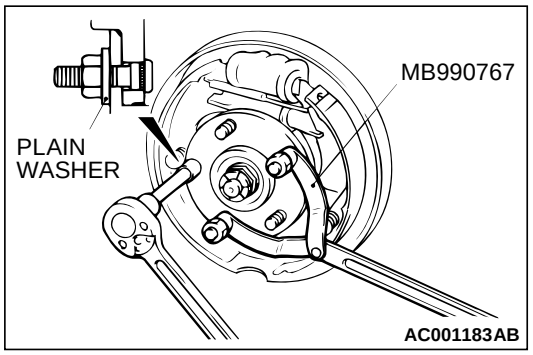
Required Special Tools:
- MB990767: End Yoke Holder
- MB991618: Hub Bolt Remover

1. For vehicles with rear disc brakes, remove the caliper assembly, suspend the caliper assembly with a wire and remove the brake disc.
2. For vehicles with rear drum brake, remove the brake drum.



3. Pull the hub bolt out using special tools MB990767 and MB991618.

   NOTE: For vehicles with drum brakes, the hub bolts should be removed near the retainer spring installation position in order to maintain enough clearance for removal.



4. Install the plain washer to the new hub bolt, and install the bolt with a nut.

REAR AXLE HUB ASSEMBLY

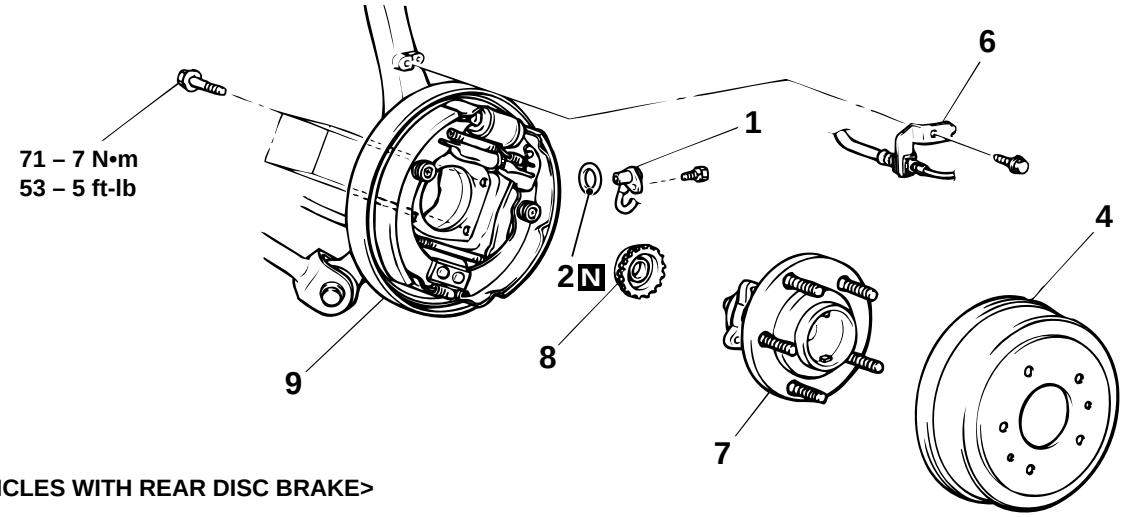
REMOVAL AND INSTALLATION

M1271002000154

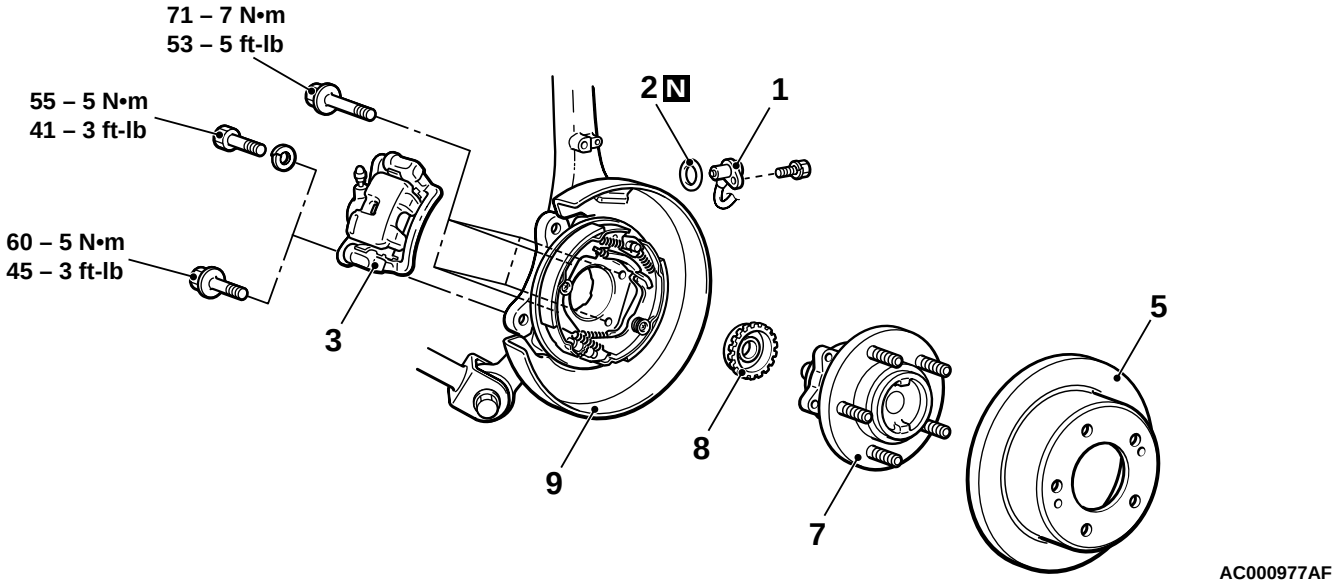
⚠ CAUTION

The rear hub unit bearing should not be dismantled.

<VEHICLES WITH REAR DRUM BRAKE>



<VEHICLES WITH REAR DISC BRAKE>



AC000977AF

REMOVAL STEPS

1. REAR WHEEL SPEED SENSOR <VEHICLES WITH ABS> (REFER TO GROUP 35B, WHEEL SPEED SENSOR P.35B-55.)
2. O-RING

<<A>>

3. CALIPER ASSEMBLY
4. BRAKE DRUM
5. BRAKE DISC

REMOVAL STEPS (Continued)

6. BRAKE HOSE INSTALLATION BRACKET
7. REAR HUB ASSEMBLY

<<B>> >>A<<

8. ABS ROTOR <VEHICLES WITH ABS>

<<C>>

9. BACKING PLATE

Required Special Tool:

- MB991248: Inner Shaft Remover

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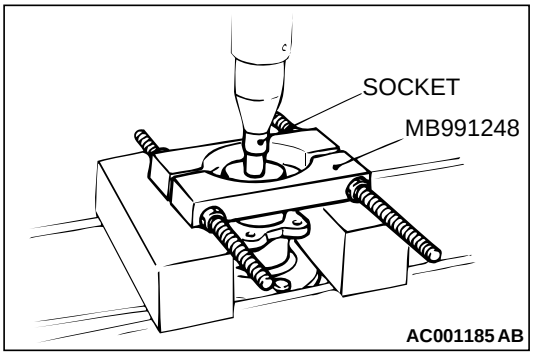
REMOVAL SERVICE POINTS

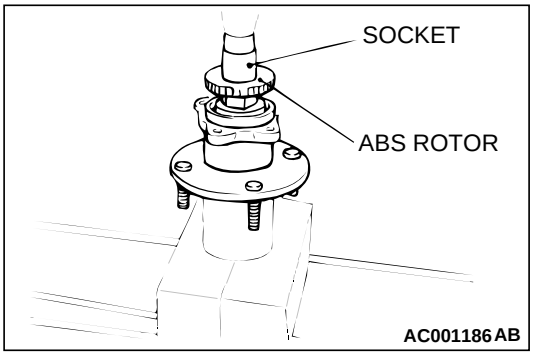
<<A>> CALIPER ASSEMBLY REMOVAL
Remove the caliper assembly and suspend it with a wire.

<<B>> ABS ROTOR REMOVAL
Use special tool MB991248 to remove the ABS rotor.



<<C>> BACKING PLATE REMOVAL
Remove the backing plate and suspend it.

INSTALLATION SERVICE POINT



>>A<< ABS ROTOR INSTALLATION
Install the ABS rotor as shown in the illustration.

INSPECTION

M1271002100139

- Check the oil seal for crack or damage.
- Check the ABS rotor for chipped teeth.

KNUCKLE

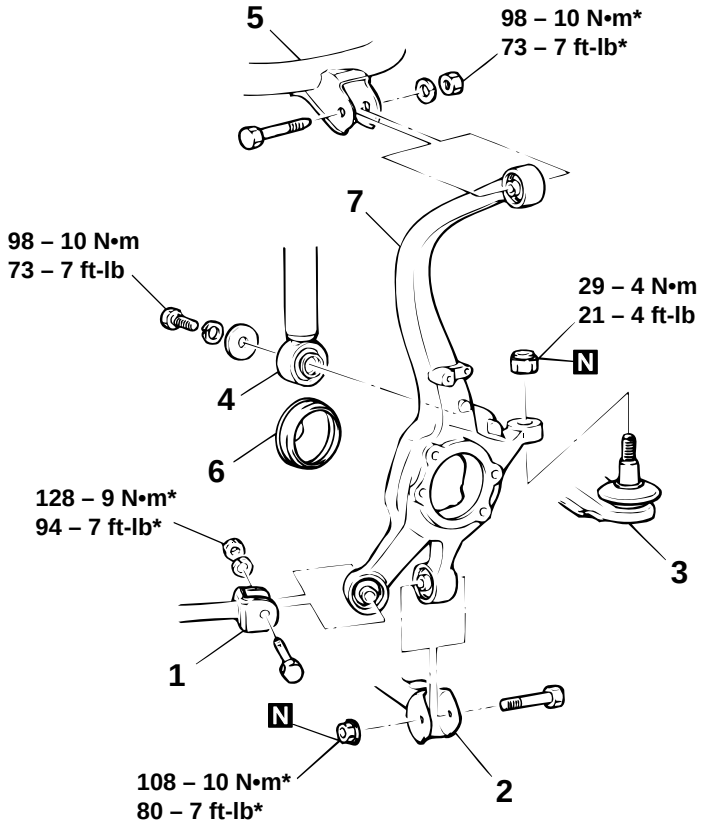
REMOVAL AND INSTALLATION

M1271003000124

⚠ CAUTION

***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.**

Pre-removal Operation	Post-installation Operation
Rear Axle Hub Assembly Removal (Refer to P.27-6.)	• Check the Dust Cover for Cracks or Damage by Pushing It with Finger. • Rear Axle Hub Assembly Installation (Refer to P.27-6.)



AC001187AB

REMOVAL STEPS

1. TRAILING ARM CONNECTION
2. LOWER ARM CONNECTION
3. <<A>> TOE CONTROL ARM CONNECTION
4. SHOCK ABSORBER CONNECTION

REMOVAL STEPS (Continued)

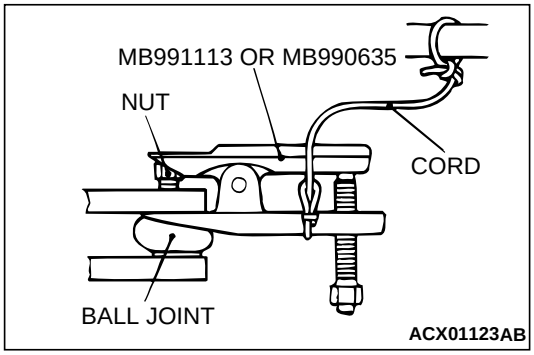
5. UPPER ARM CONNECTION
6. HUB CAP
7. KNUCKLE

Required Special Tool:

- MB991113 or MB990635: Steering Linkage Puller

TSB Revision

REMOVAL SERVICE POINT



<<A>> TOE CONTROL ARM DISCONNECTION

⚠ CAUTION

- **Loosen the nut from the ball joint instead of removing it.**
- **Hang special tool MB991113 or MB990635 with a cord, etc. to prevent it from falling.**

INSPECTION

M1271003100091

Check the knuckle for wear or cracks.

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1271004000150

ITEMS	SPECIFICATIONS
Brake caliper assembly bolt <flange bolt>	60 ± 5 N·m (45 ± 3 ft-lb)
Brake caliper assembly bolt <bolt and washer>	55 ± 5 N·m (41 ± 3 ft-lb)
Lower arm assembly to knuckle jam nut	108 ± 10 N·m (80 ± 7 ft-lb)
Rear hub assembly bolt	71 ± 7 N·m (53 ± 5 ft-lb)
Shock absorber assembly to knuckle bolt	98 ± 10 N·m (73 ± 7 ft-lb)
Toe control arm assembly to knuckle jam nut	29 ± 4 N·m (21 ± 4 ft-lb)
Trailing arm assembly to knuckle nut	128 ± 9 N·m (94 ± 7 ft-lb)
Upper arm assembly to knuckle nut	98 ± 10 N·m (73 ± 7 ft-lb)

SERVICE SPECIFICATIONS

M1271000300212

ITEMS	LIMIT
Wheel bearing end play mm (in)	0.05 (0.002)
Rear hub rotary-sliding resistance N·m (ft-lb)	18 (13)

NOTES

GROUP 31

WHEEL AND TIRE

CONTENTS

WHEEL AND TIRE DIAGNOSIS 31-2
- DIAGNOSIS 31-2
- WHEEL BALANCE ACCURACY 31-3

ON-VEHICLE SERVICE. 31-7
- TIRE INFLATION PRESSURE CHECK . . . 31-7
- TIRE WEAR CHECK. 31-7
- WHEEL RUNOUT CHECK 31-7

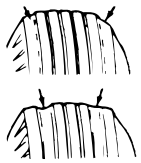
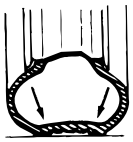
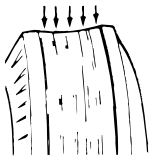
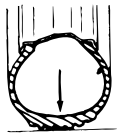
WHEEL AND TIRE 31-7
- INSTALLATION SERVICE POINT 31-7

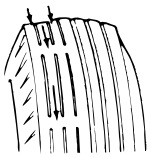
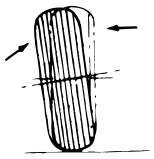
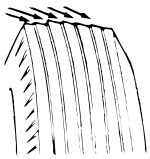
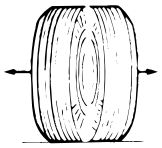
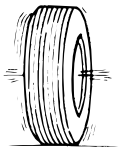
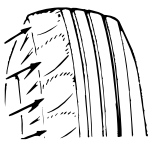
SPECIFICATIONS 31-8
- FASTENER TIGHTENING SPECIFICATION 31-8
- GENERAL SPECIFICATIONS 31-8
- SERVICE SPECIFICATIONS 31-8

WHEEL AND TIRE DIAGNOSIS

DIAGNOSIS

M1311000700244

SYMPTOM		PROBABLE CAUSE		REMEDY	REFERENCE PAGE
Rapid wear at shoulders	 ACX00923AB	Under-inflation or lack of rotation	 ACX00924AB	Adjust the tire pressure.	P.31-7
Rapid wear at center	 ACX00925AB	Over-inflation or lack of rotation	 ACX00926AB		
Cracked treads	ACX00927AB	Under-inflation		Adjust the tire pressure.	P.31-7

SYMPTOM		PROBABLE CAUSE		REMEDY	REFERENCE PAGE
Wear on one side	 ACX00928AB	Excessive camber	 ACX00929AB	Check the camber.	Refer to GROUP 33A, On-vehicle service – Front wheel alignment check and adjustment P.33A-6.
Feathered edge	 ACX00930AB	Incorrect toe-in	 ACX00931AB	Adjust the toe-in.	
Bald spots	ACX00932AB	Unbalanced wheel	 ACX00933AB	Balance the wheels.	–
Scalloped wear	 ACX00934	Lack of rotation of tires or worn or out-of-alignment suspension		Rotate the tires, check the front suspension alignment.	Refer to GROUP 33A, On-vehicle service – Front wheel alignment check and adjustment P.33A-6.

WHEEL BALANCE ACCURACY

M1311001700162

PURPOSE

This section contains tips and procedures for achieving accurate wheel balance. Steering wheel vibration and/or body shake can result if any of these procedures are not carefully observed.

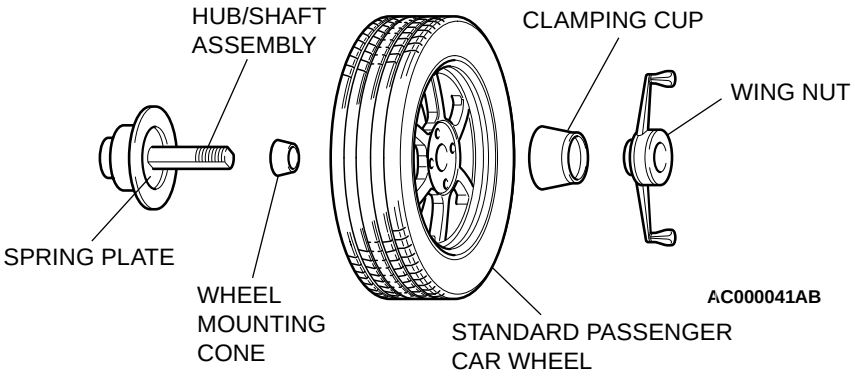
1. Wheels and tires must be properly mounted on a balancer in order to achieve correct balance. Centering the wheel on the shaft of the balancer is essential for proper mounting.
2. Off-the-car wheel balancers must be calibrated periodically to ensure good balancing results. An inaccurately calibrated balancer could cause unnecessary replacement of tires, shocks, suspension components, or steering components.

Check your balancer's calibration approximately every 100 balances. Your wheel balancer's instruction manual should include calibration procedures. If the calibration procedures specifically for your balancer are missing, use the generic steps in this section for zero calibration, static balance, and dynamic balance checks. The wheel balancer calibration checks are also described in the flowchart.

PROCEDURE <Balancing Tips>

1. Confirm that the balancer's cone and the wheel mounting cone are undamaged and free of dirt and rust.
2. On this vehicle, the wheel's center hole on the hub side has a chamfered edge. Use a back-mounting cone on your wheel balancer to center the wheel on the balancer shaft.

3. Install a wheel mounting cone. The appropriate size cone for this vehicle is 67.0 mm (2.64 inches).
4. Before balancing the wheel, remove any wheel weights from both sides. Also check both sides for any damage.
5. When installing wheel weights, hammer them at a straight (not diagonal) angle.



<Confirming Proper Balance>

1. After balancing the wheel, loosen the wing nut and turn the wheel 180 degree angle against the balancer's hub. Then re-tighten the wing nut and check the balance again. Repeat wheel balance if necessary.
2. Turn the wheel again 180 degree angle against the balancer's hub. If the wheel becomes out-of-balance each time it is turned against the balancer's hub, the wheel balancer may require calibration.

<Wheel Balancer Calibration Checks>

1. Mount an undamaged original-equipment alloy rim and tire assembly (wheel) onto your off-the-car wheel balancer. Balance the wheel.
2. <<Zero Calibration Check>>

   Loosen the balancer wing nut, rotate the wheel a half-turn (180 degree angle), and retighten the nut. Recheck the balance.
   - If the imbalance is 5 g (0.18 ounce) or less, the zero calibration is OK. Rebalance the wheel, then go to Step 4 to check static balance.
   - If the imbalance is more than 5 g (0.18 ounce), go to Step 3.
3. Loosen the balancer wing nut, rotate the wheel 1/4 turn (90 degree angle), and retighten the nut. Recheck the wheel balance.
   - If the imbalance is 5 g (0.18 ounce) or less, the wheel may not be centered on the balancer, or the balancing cones, the cup, and/or wing nut are damaged, dirty, or inappropriate for the wheel. You may need to refer to the balancer manufacturer's instructions to verify the correct attachments. After making the necessary corrections, recheck the wheel balance. If OK, then go to Step 4.
   - If the imbalance is more than 5 g (0.18 ounce), the balancer requires calibration. Contact the balancer manufacturer for calibration by their repair representative.
4. <<Static Balance Check>>

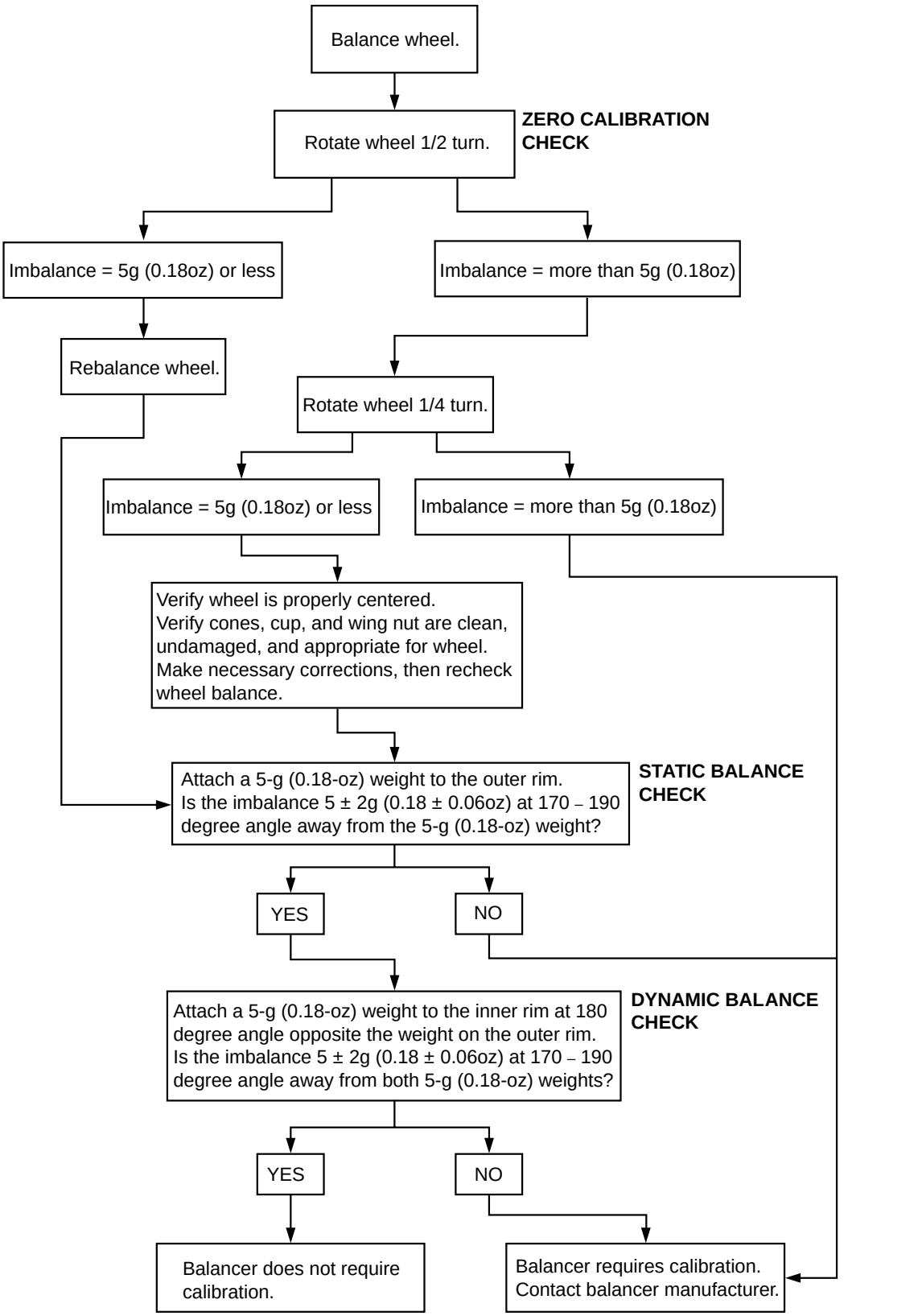
   Attach a 5-g (0.18-ounce) weight to the outer rim. Recheck the balancer. The balancer should detect 5 ± 2 g (0.18 ± 0.06 ounce) of imbalance 170 to 190 degree angle away from the 5-g (0.18-ounce) weight.
   - If the imbalance is within specification, the static balance calibration is correct. Go to Step 5 to check the dynamic balance.
   - If the imbalance is out of specification, the balancer requires calibration. Contact the balancer manufacturer for calibration by their repair representative.

5. <<Dynamic Balance Check>>

   Attach a 5-g (0.18-ounce) weight to the inner rim at 180 degree angle opposite the 5-g (0.18-ounce) weight that was added in Step 4. Recheck the balance. The balancer should detect 5 ± 2 g (0.18 ± 0.06 ounce) of imbalance 170 to 190 degree angle away from both the inner and outer 5-g (0.18-ounce) weights.

   - If the imbalance is within specification, the dynamic balance calibration is correct. The balancer calibration checks are complete.
   - If the imbalance is out of specification, the balancer requires calibration. Contact the balancer manufacturer for calibration by their repair representative.

WHEEL BALANCER CALIBRATION CHECKING FLOW CHART



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ON-VEHICLE SERVICE

TIRE INFLATION PRESSURE CHECK

M1311000900215

NOTE: For information on tire inflation pressure, refer to the label attached to the center pillar on the driver's side.

TIRE WEAR CHECK

M1311001000215

Measure the tread depth of the tires.

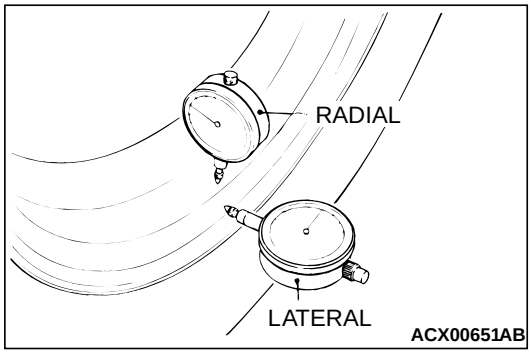
Minimum limit: 1.6 mm (0.06 inch)

If the remaining tread depth is less than the minimum limit, replace the tire.

NOTE: When the tread depth of the tires is reduced to 1.6 mm (0.06 inch) or less, wear indicators will appear.

WHEEL RUNOUT CHECK

M1311001100212



Jack up the vehicle so that the wheels are clear of the floor. While slowly turning the wheel, measure wheel runout with a dial indicator.

Limit:
Radial runout; 1.0 mm (0.04 inch) or less
Lateral runout; 1.0 mm (0.04 inch) or less

If wheel runout exceeds the limit, replace the wheel.

WHEEL AND TIRE

INSTALLATION SERVICE POINT

M1311001300175

Tighten the wheel nuts to the specified torque.

Tightening torque: 98 ± 10 N·m (73 ± 7 ft-lb)

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATION

M1311001600206

ITEM	SPECIFICATION
Wheel nut	98 ± 10 N·m (73 ± 7 ft-lb)

GENERAL SPECIFICATIONS

M1311000200197

ITEMS		SPECIFICATIONS		
Wheel	Type	Aluminum type	Aluminum type	Aluminum type
	Size	15 × 6JJ	16 × 6JJ	17 × 6.5JJ
	Amount of wheel offset mm (in)	46 (1.8)	46 (1.8)	46 (1.8)
	Pitch circle diameter (PCD) mm (in)	114.3 (4.50)	114.3 (4.50)	114.3 (4.50)
Tire	Size	P195/65 R15 89H	P205/55 R16 89H	P215/50 R17 90V
Spare wheel	Type	Steel type	Steel type	Steel type
	Size	16 × 4T	16 × 4T	16 × 4T
	Amount of wheel offset mm (in)	40 (1.57)	40 (1.57)	40 (1.57)
	Pitch circle diameter (PCD) mm (in)	114.3 (4.50)	114.3 (4.50)	114.3 (4.50)
Spare tire	Size	T125/70 D16	T125/70 D16	T125/70 D16

NOTE: PCD (Pitch Circle Diameter) indicates the pitch circle diameter of the wheel installation holes.

SERVICE SPECIFICATIONS

M1311000300235

ITEMS	LIMIT
Tread depth of tire mm (in)	Minimum 1.6 (0.06)
Wheel runout (Radial runout) mm (in)	1.0 (0.04) or less
Wheel runout (Lateral runout) mm (in)	1.0 (0.04) or less

GROUP 32

POWER PLANT MOUNT

CONTENTS

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- INSPECTION 32-5

TRANSAXLE MOUNTING 32-6
- REMOVAL AND INSTALLATION 32-6

ENGINE ROLL STOPPER AND CENTERMEMBER 32-8
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CROSSMEMBER* 32-10
- REMOVAL AND INSTALLATION 32-10
- CROSSMEMBER BUSHING REPLACEMENT 32-11

SPECIFICATIONS 32-12
- FASTENER TIGHTENING SPECIFICATIONS 32-12
- SERVICE SPECIFICATION 32-13

WARNINGS REGARDING SERVICING OF SUPPLEMENTAL RESTRAINT SYSTEM (SRS) EQUIPPED VEHICLES

⚠ WARNING

- ***Improper service or maintenance of any component of the SRS, or any SRS-related component, can lead to personal injury or death to service personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).***
- ***Service or maintenance of any SRS component or SRS-related component must be performed only at an authorized MITSUBISHI dealer.***
- ***MITSUBISHI dealer personnel must thoroughly review this manual, and especially its GROUP 52B - Supplemental Restraint System (SRS) before beginning any service or maintenance of any component of the SRS or any SRS-related component.***

NOTE
The SRS includes the following components: SRS air bag control unit, SRS warning light, front impact sensors, air bag module, clock spring, and interconnecting wiring. Other SRS-related components (that may have to be removed/installed in connection with SRS service or maintenance) are indicated in the table of contents by an asterisk (*).

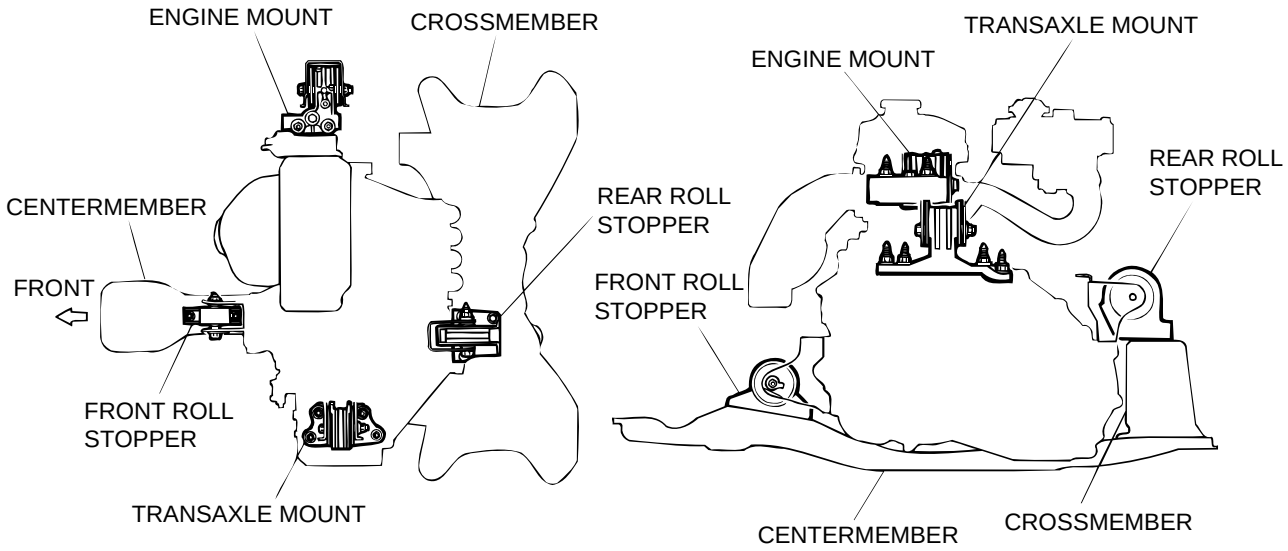
GENERAL DESCRIPTION

M1321000100180

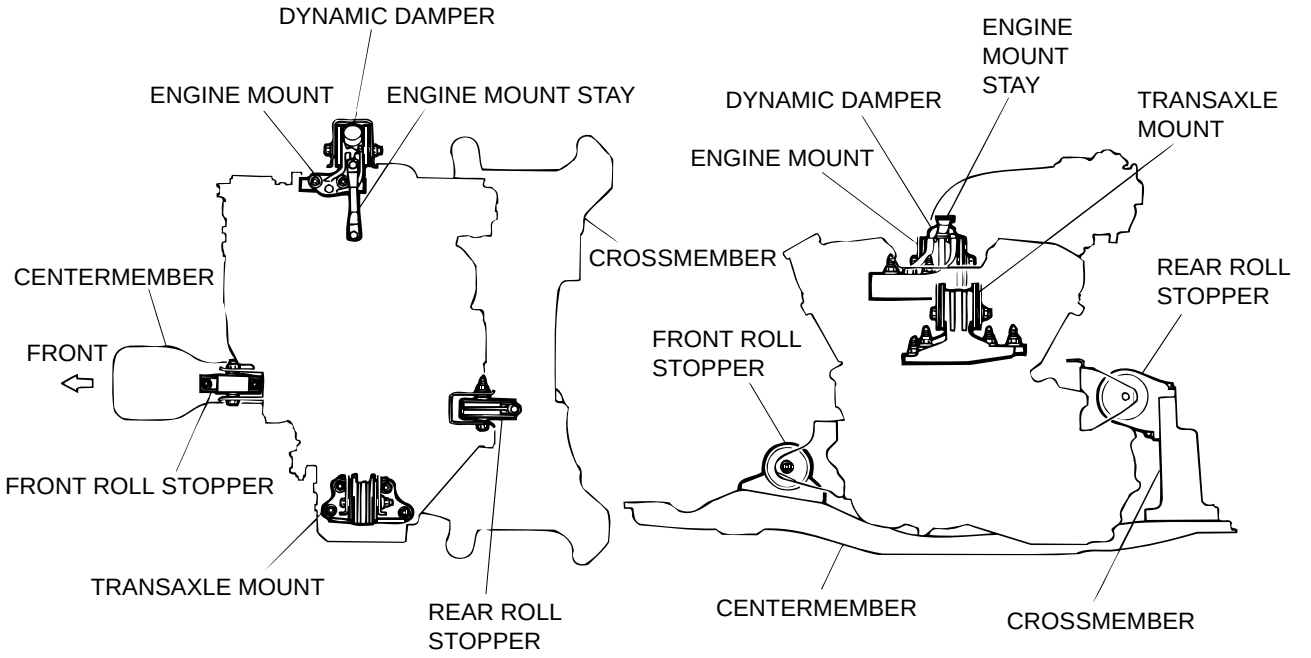
The engine-transaxle mount is of an inertial axis supporting type whose excellent features have already been proven in many Mitsubishi vehicles. The inertial axis supporting type mount supports the front upper part of the engine at the front and the rear upper part of the transaxle at the rear. This arrangement effectively suppresses the engine vibration.

CONSTRUCTION DIAGRAM

2.4L ENGINE>



<3.0L ENGINE>



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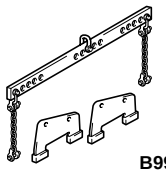
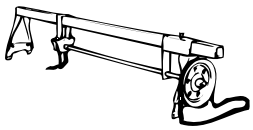
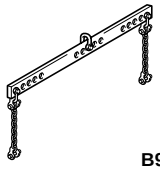
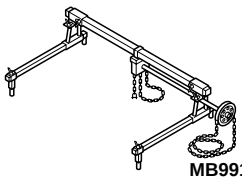
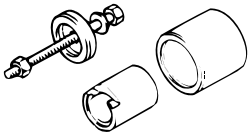
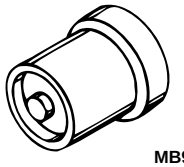
SPECIAL TOOLS

M1321000600163

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 B991453	MB991453 Engine hanger assembly	MZ203827-01	When an engine lifer is used: Supporting the engine assembly during remove and installation of the transaxle mounting
 MZ203827	GENERAL SERVICE TOOL MZ203827 Engine lifter	General service tool	
 B991454	MB991454 Engine hanger	MZ203827-01	When the engine hanger is used: Supporting the engine assembly during remove and installation of the transaxle mounting *NOTE: Special tool MB991454 is a part of engine hanger attachment set MB991453.*
 MB991895	MB991895 Engine hanger	–	
 MB991045	MB991045 Bushing remover and installer	Tool not available	Driving out and press-fitting of crossmember bushings A and B
 MB990828	MB990828 Bushing remover and installer	Tool not available	Driving out and press-fitting of crossmember bushing C

ENGINE MOUNTING

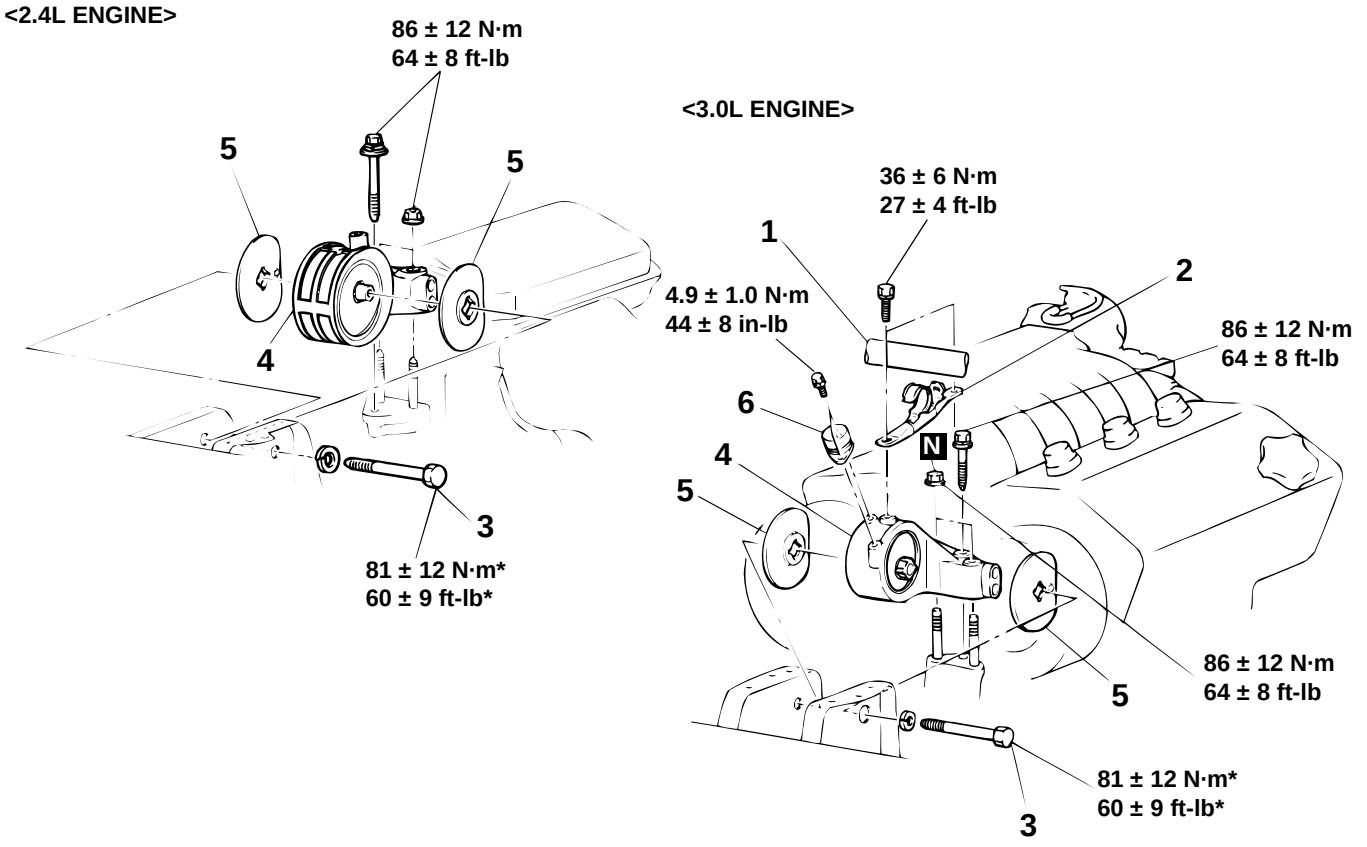
REMOVAL AND INSTALLATION

M1321001100213

⚠ CAUTION

Mounting locations marked by * should be provisionally tightened, and then fully tightened after placing the vehicle horizontally and loading the full weight of the engine on the vehicle body.

Pre-removal and Post-installation Operation
- Jack Up the Engine and Transmission Assembly Until There is no Weight on the Engine Mount Bracket Insulator.
- Reserve Tank Removal and Installation (Refer to GROUP 14, Radiator P.14-21 .)



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REMOVAL STEPS
1. SUCTION HOSE <3.0L ENGINE>
2. ENGINE MOUNT STAY <3.0L ENGINE>
3. ENGINE MOUNT INSULATOR MOUNTING BOLT

REMOVAL STEPS (Continued)

>>A<<
4. ENGINE MOUNT BRACKET
5. ENGINE MOUNT STOPPER
6. DYNAMIC DAMPER <3.0L ENGINE>

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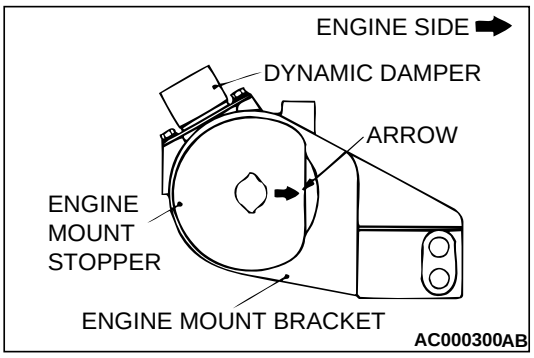
INSTALLATION SERVICE POINT



>>A<< ENGINE MOUNT STOPPER INSTALLATION

Clamp the engine mount stopper so that the arrow points in the direction as shown in the diagram.

INSPECTION

M1321001200124

- Check the insulators for cracks, separation or deformation.
- Check the front insulator stoppers for deformation.

TRANSAXLE MOUNTING

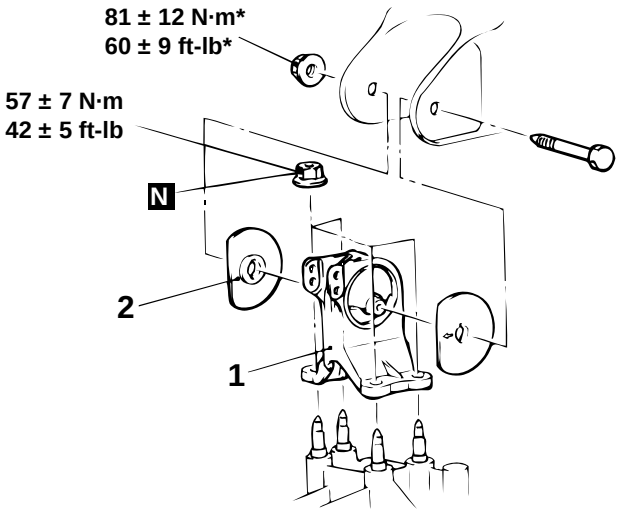
REMOVAL AND INSTALLATION

M1321001400214

⚠ CAUTION

Mounting locations marked by * should be provisionally tightened, and then fully tightened after placing the vehicle horizontally and loading the full weight of the engine on the vehicle body.

Pre-removal and Post-installation Operation
- Air Cleaner Assembly Removal and Installation (Refer to GROUP 15, Air Cleaner P.15-6 .)
- Battery and Battery Tray Removal and Installation (Refer to GROUP 54A, Battery P.54A-8 .)
- Centermember Removal and Installation (Refer to P.32-8.)
- Transaxle and Rear Roll Stopper Connecting Bolt Removal and Installation (Refer to P.32-8.)
- Rear Roll Stopper Bracket Removal and Installation <2.4L Engine-M/T> (Refer to GROUP 22B, Transaxle P.22B-8 .), <2.4L Engine-A/T> (Refer to GROUP 23B, Transaxle P.23B-10 .)



AC000301 AB

REMOVAL STEPS

<<A>> 1. TRANSAXLE MOUNT BRACKET

REMOVAL STEPS (Continued)

>>A<< 2. TRANSAXLE MOUNT STOPPER

Required Special Tools:

- MB991453: Engine Hanger Assembly
- MZ203827: Engine Lifter
- MB991454: Engine Hanger
- MB991895: Engine Lifter

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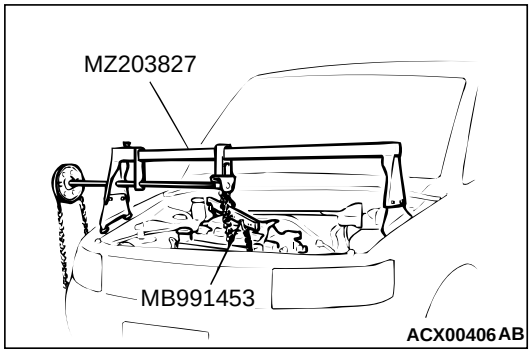
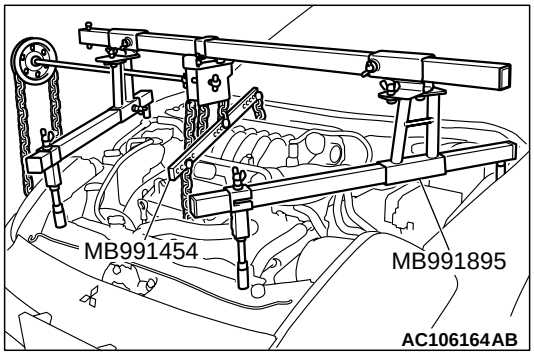
REMOVAL SERVICE POINT

<<A>> TRANSAXLE MOUNT BRACKET REMOVAL



1. When the engine lifter is used
   Install special tools MB991453 and MZ203827 to the vehicle body to support the engine and transaxle assembly.

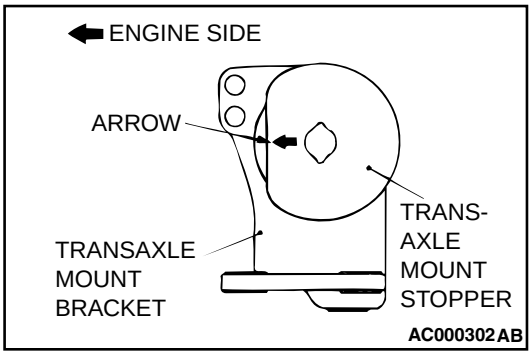


2. When the engine hanger is used
   Install special tools MB991895 and MB991454 to the vehicle body to support the engine and transaxle assembly.
3. Remove the centermember and rear roll stopper bracket.
4. Remove the bolt and nut of the transaxle mount bracket.
5. After lowering the engine and transaxle assembly, remove the transaxle mount bracket.

INSTALLATION SERVICE POINT

>>A<< TRANSAXLE MOUNT STOPPER INSTALLATION

Clamp the transaxle mount stopper so that the arrow points in the direction as shown in the diagram.



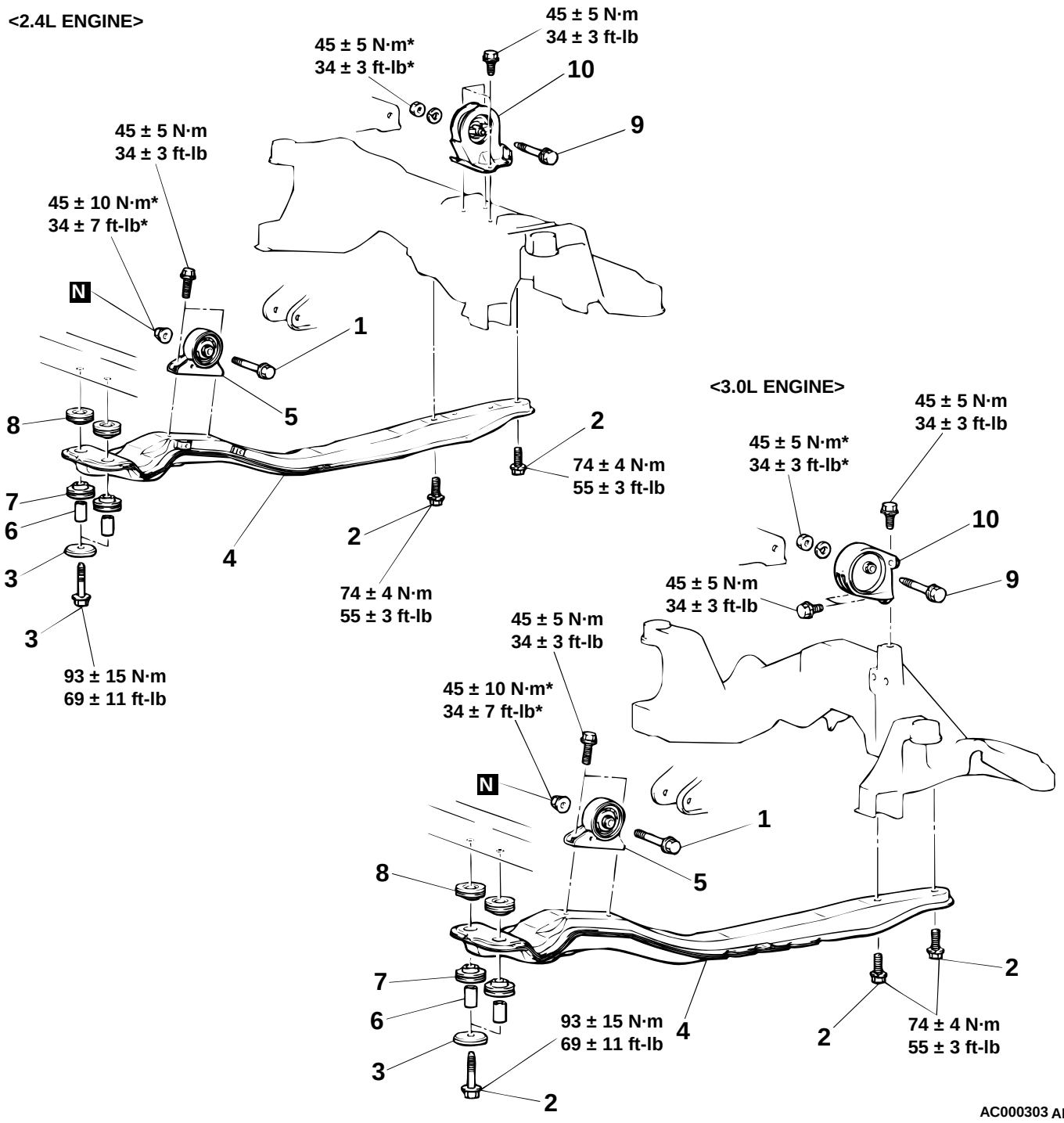
ENGINE ROLL STOPPER AND CENTERMEMBER

REMOVAL AND INSTALLATION

M1321002300135

⚠ CAUTION

Mounting locations marked by * should be provisionally tightened, and then fully tightened after placing the vehicle horizontally and loading the full weight of the engine on the vehicle body.



FRONT ROLL STOPPER, CENTERMEMBER REMOVAL STEPS

1. TRANSAXLE AND FRONT ROLL STOPPER CONNECTING BOLT
2. CENTERMEMBER MOUNTING BOLTS
3. STOPPER
4. CENTERMEMBER

>>A<< 5. FRONT ROLL STOPPER

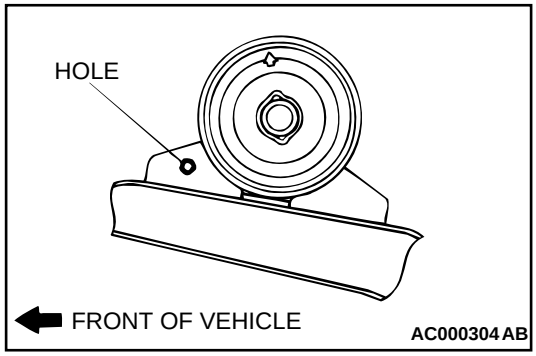
6. COLLAR

FRONT ROLL STOPPER, CENTERMEMBER REMOVAL STEPS (Continued)

7. BUSHING (LOWER)
8. BUSHING (UPPER)

REAR ROLL STOPPER REMOVAL STEPS

9. TRANSAXLE AND REAR ROLL STOPPER CONNECTING BOLT
10. REAR ROLL STOPPER



INSTALLATION SERVICE POINT

>>A<< FRONT ROLL STOPPER INSTALLATION

Install so that the hole in the front roll stopper is facing towards the front of the vehicle.

CROSSMEMBER

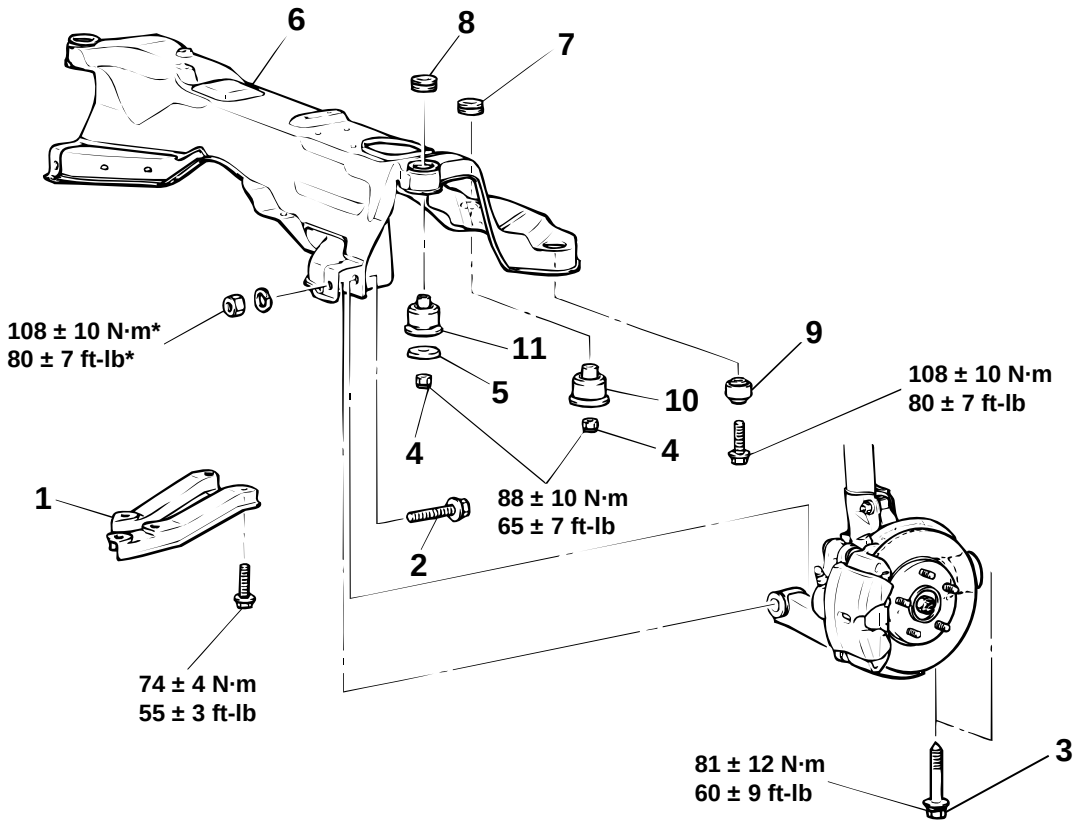
REMOVAL AND INSTALLATION

M1321003200186

⚠ CAUTION

- ***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.**
- **For vehicles with SRS, before removal of steering gear box, refer to GROUP 52B, center the front wheels and remove the ignition key. Failure to do so may damage the SRS clock spring and render the SRS system inoperative, risking serious injury.**

Pre-removal Operation	Post-installation Operation
• Power Steering Fluid Draining (Refer to GROUP 37A, On-vehicle Service – Fluid Replacement P.37A-17 .) • Centermember Removal (Refer to P.32-8.) • Front Exhaust Pipe Removal (Refer to GROUP 15, Exhaust pipe and Main Muffler P.15-21 <2.4L Engine>, P.15-22 <3.0L Engine>.) • Stabilizer Bar Removal (Refer to GROUP 33A, Stabilizer Bar P.33A-16 .) • Rear Roll Stopper Removal (Refer to P.32-8.)	• Rear Roll Stopper Installation (Refer to P.32-8.) • Stabilizer Bar Installation (Refer to GROUP 33A, Stabilizer Bar P.33A-16 .) • Front Exhaust Pipe Installation (Refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-21 <2.4L Engine>, P.15-22 <3.0L Engine>.) • Centermember Installation (Refer to P.32-8.) • Power Steering Fluid Supplying and Bleeding (Refer to GROUP 37A, On-vehicle Service – Fluid Replacement P.37A-17.) • Steering Wheel Straight Ahead Position Checking.) • Wheel Alignment Check and Adjustment (Refer to GROUP 33A, On-vehicle Service – Front Wheel Alignment Check and Adjustment P.33A-6.)



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REMOVAL STEPS

1. STAY <2.4L ENGINE>
2. LOWER ARM AND CROSSMEMBER CONNECTION
3. LOWER ARM MOUNT BOLT

REMOVAL STEPS (Continued)

- POWER STEERING GEAR BOX (REFER TO GROUP 37A, POWER STEERING GEAR BOX P.37A-25 .)

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REMOVAL STEPS (Continued)

4. CROSSMEMBER MOUNTING NUT
5. LOWER PLATE
6. CROSSMEMBER
7. STOPPER A

REMOVAL STEPS (Continued)

8. STOPPER B
9. BUSHING C
10. BUSHING A
11. BUSHING B

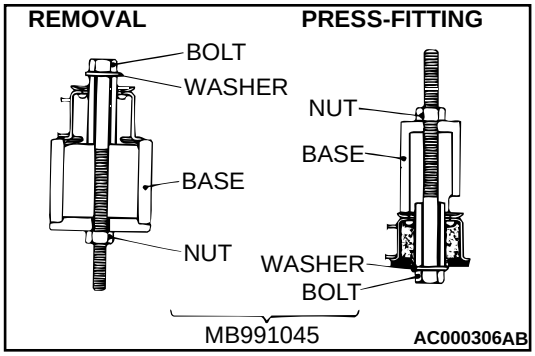
CROSSMEMBER BUSHING REPLACEMENT

M1321000900119

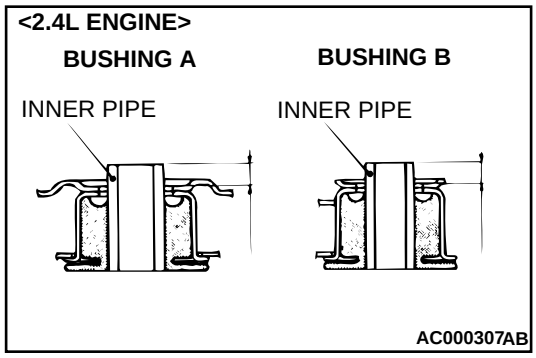
Required Special Tools:

- MB990828: Bushing Remover and Installer
- MB991045: Bushing Remover and Installer

Crossmember Bushings A and B



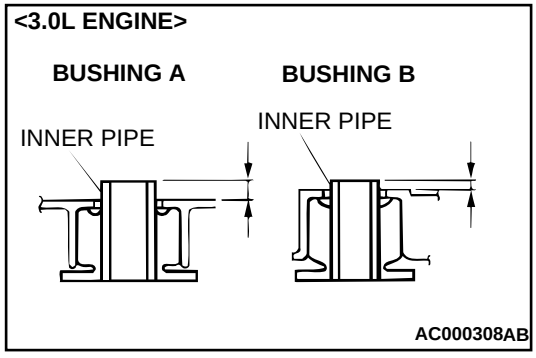
1. Apply soapy water to the contact surface of the bushing when press-fitted the bushing.



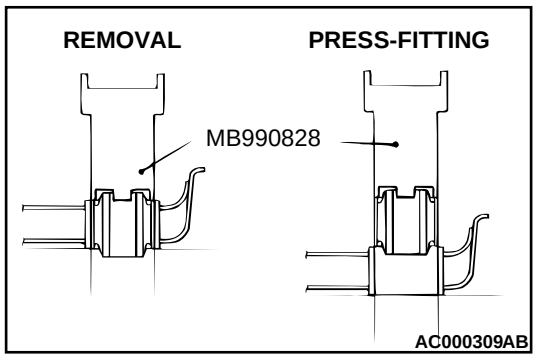
2. The bushing should be press-fitted so that the inner pipe projection is at the standard length.

   Standard values

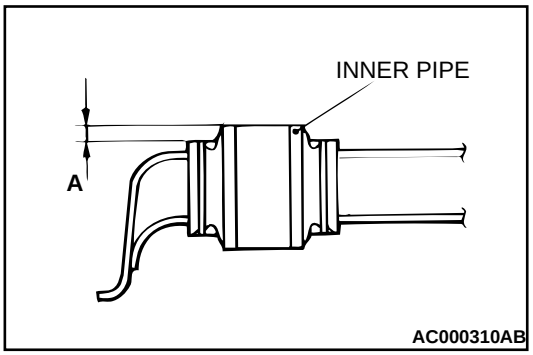
   - **<2.4L ENGINE>**
     - **Bushing A: 9.0 ± 1.0 mm (0.35 ± 0.04 inch)**
     - **Bushing B: 4.0 ± 1.0 mm (0.16 ± 0.04 inch)**
   - **<3.0L ENGINE>**
     - **Bushing A, B: 9.0 ± 1.0 mm (0.35 ± 0.04 inch)**



Crossmember Bushing C



1. Use special tool MB990828 to drive out and press-fit the crossmember bushing C.



2. The bushing should be press-fitted so that the inner pipe projection is at the standard length.

   Standard value (A): 4.0 ± 0.5 mm (0.16 ± 0.02 inch)

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1321004100182

ITEMS	SPECIFICATIONS
Centermember front mounting bolt	93 ± 15 N·m (69 ± 11 ft-lb)
Centermember rear mounting bolt	74 ± 4 N·m (55 ± 3 ft-lb)
Crossmember and stay connecting bolt <2.4L ENGINE>	74 ± 4 N·m (55 ± 3 ft-lb)
Crossmember mounting bolt	108 ± 10 N·m (80 ± 7 ft-lb)
Crossmember mounting nut	88 ± 10 N·m (65 ± 7 ft-lb)
Dynamic damper bolt <3.0L ENGINE>	4.9 ± 1.0 N·m (44 ± 8 in-lb)
Engine mount bracket bolt	86 ± 12 N·m (64 ± 8 ft-lb)
Engine mount bracket nut	86 ± 12 N·m (64 ± 8 ft-lb)
Engine mount insulator mounting bolt	81 ± 12 N·m (60 ± 9 ft-lb)
Engine mount stay bolt <3.0L ENGINE>	35 ± 5 N·m (26 ± 4 ft-lb)
Lower arm and crossmember connecting nut	108 ± 10 N·m (80 ± 7 ft-lb)
Lower arm mount bolt	81 ± 12 N·m (60 ± 9 ft-lb)
Transaxle and front roll stopper connecting bolt	45 ± 5 N·m (34 ± 3 ft-lb)
Transaxle and front roll stopper connecting nut	45 ± 10 N·m (34 ± 7 ft-lb)
Transaxle and rear roll stopper connecting bolt	45 ± 5 N·m (34 ± 3 ft-lb)
Transaxle and rear roll stopper connecting nut	45 ± 5 N·m (34 ± 3 ft-lb)
Transaxle mount bracket nut	57 ± 7 N·m (42 ± 5 ft-lb)
Transaxle mount insulator mounting nut	81 ± 12 N·m (60 ± 9 ft-lb)

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SERVICE SPECIFICATION

M1321000300173

ITEMS			STANDARD VALUE
Inner pipe projection mm (in)	Bushing A		9.0 ± 1.0 (0.35 ± 0.04)
	Bushing B	2.4L ENGINE	4.0 ± 1.0 (0.16 ± 0.04)
		3.0L ENGINE	9.0 ± 1.0 (0.35 ± 0.04)
	Bushing C		4.0 ± 0.5 (0.16 ± 0.02)

NOTES

GROUP 33A

FRONT SUSPENSION

CONTENTS

GENERAL DESCRIPTION. 33A-2

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- SYMPTOM CHART. 33A-3
- SYMPTOM PROCEDURES 33A-3

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STABILIZER BAR. 33A-16
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- GENERAL SPECIFICATIONS 33A-18
- SERVICE SPECIFICATIONS 33A-18
- COMPONENT IDENTIFICATION 33A-18

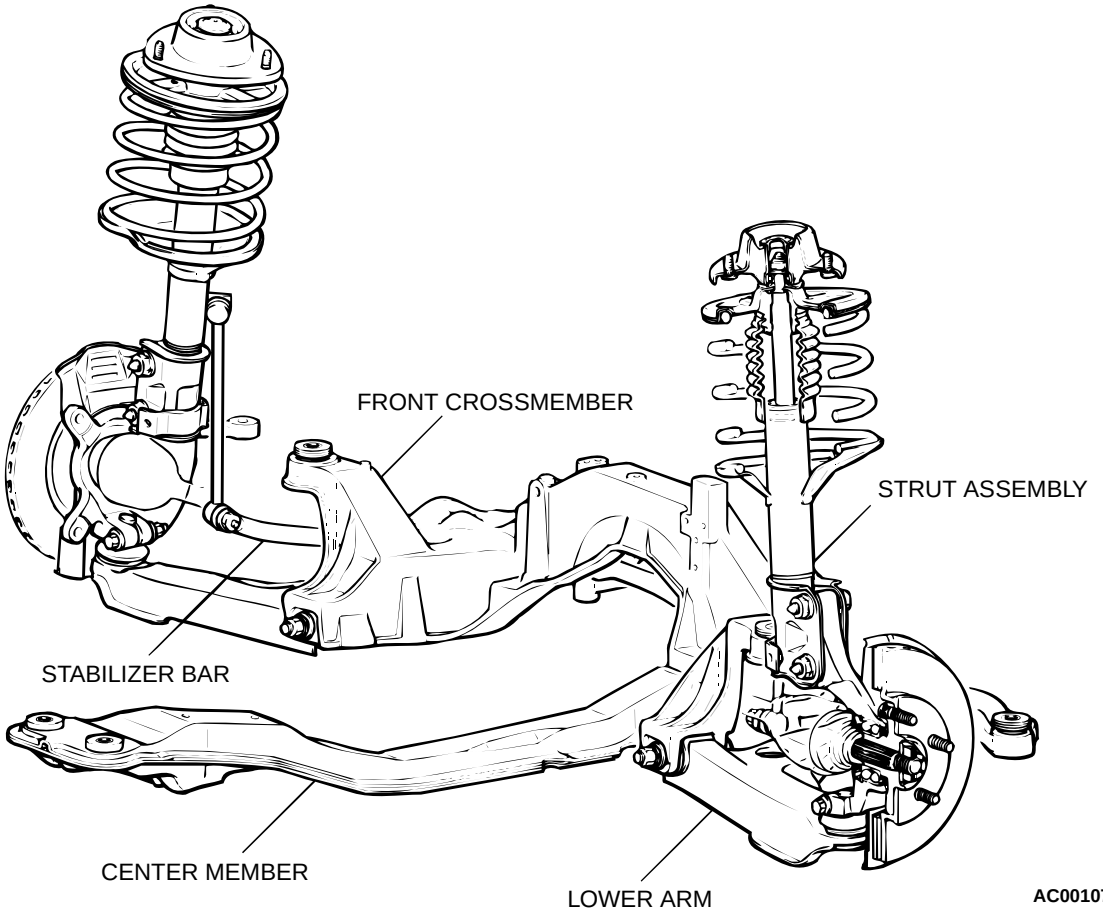
GENERAL DESCRIPTION

M1332000100117

FRONT SUSPENSION

The front suspension is MacPherson strut type with coil springs and compression rod. Anti-dive geometry ensures excellent driving stability while negative off-set geometry provides good braking stability. The off-set coil spring ensures optimum riding comfort.

CONSTRUCTION DIAGRAM



FRONT SUSPENSION DIAGNOSIS

INTRODUCTION TO FRONT SUSPENSION DIAGNOSIS

M1332009000151

If the front suspension is faulty, the vehicle will not run straightforward or noise will occur. Incorrect wheel alignment, malfunction of strut assembly, stabilizer bar, coil spring, or worn or out-of-balance tires can cause these problems.

FRONT SUSPENSION DIAGNOSIS TROUBLESHOOTING STRATEGY

M1332009100147

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted most of the possible ways to find a front suspension fault.

1. Gather information from the customer.
2. Verify that the condition described by the customer exists.
3. Find and repair the malfunction by following the Symptom Chart and Symptom Procedures.
4. Verify malfunction is eliminated.

SYMPTOM CHART

M1332009400159

SYMPTOMS	INSPECTION PROCEDURE	REFERENCE PAGE
Steering wheel is heavy, vibrates or pulls to one side	1	P.33A-3
Excessive body rolling	2	P.33A-4
Poor riding	3	P.33A-4
Unequal ride height	4	P.33A-4
Noise	5	P.33A-5

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Steering Wheel is Heavy, Vibrates or Pulls to One Side

DIAGNOSIS

STEP 1. Check the tires.

Refer to GROUP 31, Diagnosis P.31-2.

Q: Are the tires at normal condition?

YES : Replace as necessary, then go to Step 2.

NO : If out of balance, balance as necessary. If excessively worn, replace as necessary and go to Step5.

STEP2. Check the wheel alignment.

Q: Is the wheel alignment correct?

YES : Go to Step 3.

NO : Adjust it, then go to Step 5.

STEP 3. Check the ball joint.

Q: Is the ball joint in good condition?

YES : Go to Step 4.

NO : Replace it, then go to Step 5.

STEP4. Check the coil spring.

Q: Is the coil spring in good condition?

YES : Go to Step 5.

NO : Replace it, then go to Step 5.

STEP 5. Check symptoms.

Q: Is the malfunction eliminated?

YES : This diagnosis is complete.

NO : Return to Step 1.

INSPECTION PROCEDURE 2: Excessive Body Rolling

DIAGNOSIS

STEP 1. Check for broken or deteriorated stabilizer bar.

Q: Is the stabilizer bar in good condition?
YES : Go to Step 2.
NO : Replace it, then go to Step 3.

STEP 2. Check for strut assembly damage.

Q: Is the strut assembly in good condition?
YES : Go to Step 3.
NO : Replace it, then go to Step 3.

STEP 3. Check symptoms.

Q: Is the malfunction eliminated?
YES : This diagnosis is complete.
NO : Return to Step 1.

INSPECTION PROCEDURE 3: Poor Riding

DIAGNOSIS

STEP 1. Check for improper tire inflation pressure.
Refer to GROUP 31, On-vehicle Service – Tire Inflation Pressure Check P.31-7.

Q: Is the tire inflation correct?
YES : Go to Step 2.
NO : Adjust it, then go to Step 4.

STEP 2. Check for broken or deteriorated coil spring(s).

Q: Is the coil spring(s) broken or deteriorated?
YES : Replace it, then go to Step 4.
NO : Go to Step 3.

STEP 3. Check for strut assembly damage.

Q: Is the strut assembly damaged?
YES : Replace it, then go to Step 4.

STEP 4. Check symptoms.

Q: Is the malfunction eliminated?
YES : This diagnosis is complete.
NO : Return to Step 1.

INSPECTION PROCEDURE 4: Unequal Ride Height

DIAGNOSIS

STEP 1. Check for broken or deteriorated coil spring(s).

Q: Is the coil spring(s) broken or deteriorated?
YES : Replace it, then go to Step 2.
NO : Go to Step 2.

STEP 2. Check symptoms.

Q: Is the malfunction eliminated?
YES : This diagnosis is complete.
NO : Return to Step 1.

INSPECTION PROCEDURE 5: Noise

DIAGNOSIS

STEP 1. Check for lack of lubrication.

Q: Is lubrication inadequate?
YES : Lubricate it, then go to Step 5.
NO : Go to Step 2.

STEP 2. Check the tightened parts for looseness as well as the bushings for wear.

Q: Are the tightened parts and bushings in good condition?
YES : Go to Step 3.
NO : Replace it, then go to Step 5.

STEP 3. Check for broken coil spring.

Q: Is the coil spring broken?
YES : Replace it, then go to Step 5.
NO : Go to Step 4.

STEP 4. Check for strut assembly damage.

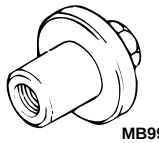
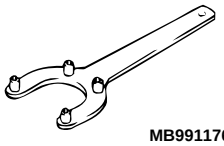
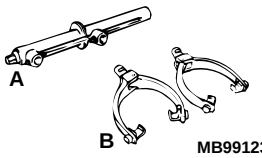
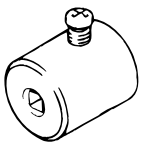
Q: Is the strut assembly damaged?
YES : Replace it, then go to Step 5.
NO : Go to Step 5.

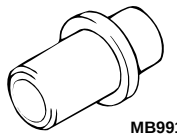
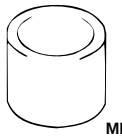
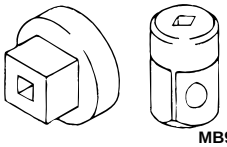
STEP 5. Check symptoms.

Q: Is the malfunction eliminated?
YES : This diagnosis is complete.
NO : Return to Step 1.

SPECIAL TOOLS

M1332000600145

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 MB991004	MB991004 Wheel alignment gauge attachment	MB991004-01 or General service tool	Wheel alignment measurement
 MB991176	MB991176 Spring seat holder	General service tool	Strut disassembly and assembly
 A B MB991237	• A: MB991237 Spring compressor body • B: MB991238 Arm set	MIT221369	Front coil spring compression
 MB991006	MB991006 Preload socket	MB990228-01	Lower arm ball joint breakaway torque check
MB990799	MB990799 Ball joint dust cover installer	MB990799-01	Lower arm ball joint dust cover installation

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 MB991007	MB991007 Bearing installer	Tool not available	Press-fitting of lower arm ball joint dust cover
 MB991446	MB991446 Bushing remover and installer spacer	Tool not available	Press-fitting of lower arm bushing
 MB990326	MB990326 Preload socket	General service tool	Stabilizer link ball joint breakaway torque measurement

ON-VEHICLE SERVICE

FRONT WHEEL ALIGNMENT CHECK AND ADJUSTMENT

M1331000900228

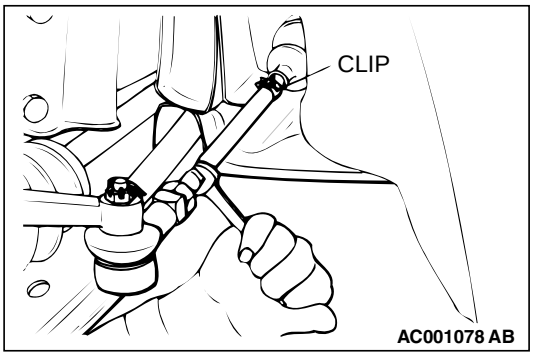
Required Special Tool:

- MB991004: Wheel Alignment Gauge Attachment.

Measure wheel alignment with alignment equipment on a level surface. The front suspension, steering system, and wheels should be serviced to normal condition before measuring wheel alignment.

TOE-IN

Standard value: 0 ± 3 mm (0 ± 0.12 inch)



NOTE: If the toe-in is not within the standard value, adjust the toe-in by undoing the clips and turning the left and right tie rod turnbuckles by the same amount (in opposite directions).

NOTE: The toe will move out as the left turnbuckle is turned toward the front of the vehicle and the right turnbuckle is turned toward the rear of the vehicle.

For each one turn of the left and right tie rods, the toe-in will be adjusted by approximately 1°05' (per wheel).

STEERING ANGLE

Use a turning radius gauge to check that the steering angle is at the standard value.

Standard value:

ITEM	2.4L ENGINE	3.0L ENGINE
Inner wheel	36°12' ± 2°00'	31°00' ± 2°00'
Outer wheel (reference)	30°24'	27°00'

CAMBER AND CASTER

Standard value:

Camber 0° 00' ± 30' (Left/right deviation within 30')

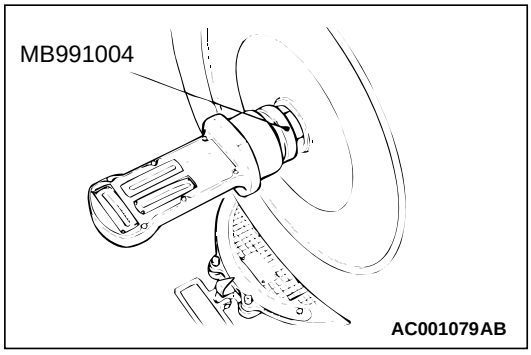
Caster 3° 00' ± 30' (Left/right deviation within 30')

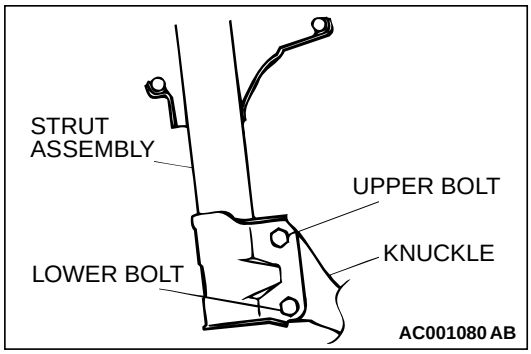
NOTE: Caster is preset at the factory and cannot be adjusted.

⚠ CAUTION

Never subject the wheel bearings to the vehicle load when the drive shaft nuts are loosened.

NOTE: For vehicles with aluminum type wheels, attach the camber/caster/kingpin gauge to the driveshaft by using special tool MB991004. Tighten special tool MB991004 to the same torque 226 ± 29 N·m (167 ± 21 ft-lb) as the driveshaft nut.





If the camber is outside of the standard value, perform the following adjustment procedures.

1. Estimate how much additional camber adjustment is required. Using the table below, select the camber adjusting bolt, and then replace the knuckle and strut assembly connection bolts (upper bolt, lower bolt) with the selected bolts.

BOLT DIAMETER mm (in)		CAMBER ADJUSTING VALUE					
		0°15'	0°30'	0°45'	1°00'	1°15'	1°30'
Upper bolt	16.0 (0.63)	•	•				
	14.9 (0.59)			•	•		
	14.1 (0.56)					•	
	13.6 (0.54)						•
Lower bolt	16.0 (0.63)	•					
	14.9 (0.59)		•	•			
	14.1 (0.56)				•	•	
	13.6 (0.54)						•

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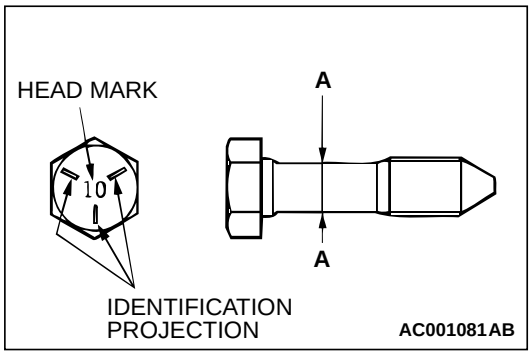
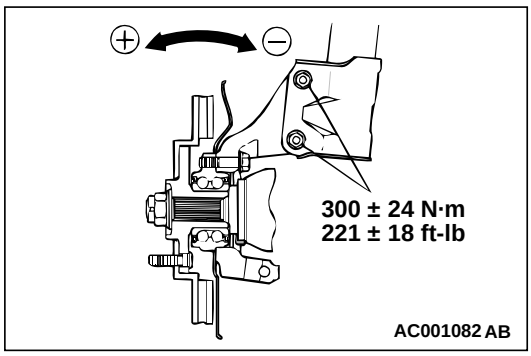
NOTE: If the camber adjusting value that is required is greater than 1° 30', check for bent or damaged parts and replace as necessary.



BOLT IDENTIFICATION		
DIAMETER A mm (in)		NUMBER OF IDENTIFICATION PROJECTION
Set bolt	16.0 (0.63)	0
Adjusting bolt	14.9 (0.59)	1
	14.1 (0.59)	2
	13.6 (0.54)	3

NOTE: Set bolt is the bolt installed at factory. "10" embossed on bolt head is head mark.



2. Tighten the nuts temporarily, and then pull or push the front axle to adjust the camber.

   NOTE: Pulling the upper side of the front axle to the outside of the vehicle will increase the camber. Pushing it to the inside of the vehicle will decrease the camber.
3. Tighten the nuts to 300 ± 24 N·m (221 ± 18 ft-lb).
4. Recheck the camber.

BALL JOINT DUST COVER CHECK

M1332008600172

1. Press the dust cover with your finger to check that there are no cracks or damage in the dust cover.
2. If the dust cover is cracked or damaged, replace the lower arm assembly or stabilizer link.

   NOTE: If the dust cover is cracked or damaged, it is possible that there may also be damage to the ball joint.

STRUT ASSEMBLY

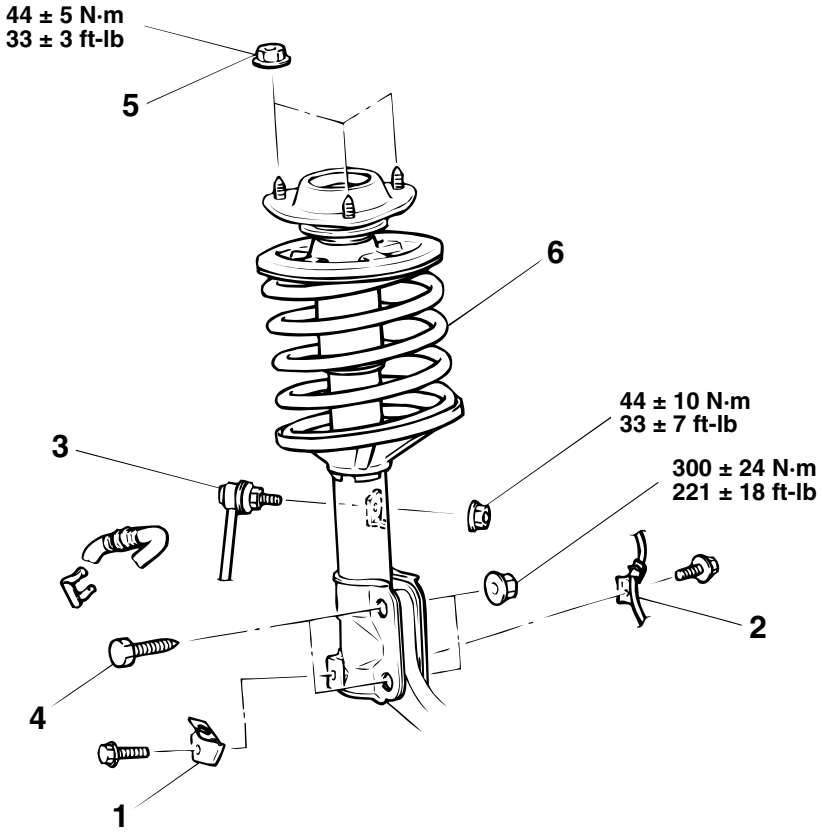
REMOVAL AND INSTALLATION

M1332001100132

⚠ CAUTION

For vehicles with ABS, be careful when handling the pole piece at the tip of the speed sensor so as not to damage it by striking against other parts.

Post-installation Operation
- Check the Dust Cover for Cracks or Damage by Pushing it with Your Finger.
- Front Wheel Alignment Adjustment (Refer to P.33A-6.)



AC001083AB

REMOVAL STEPS
- STRUT TOWER BAR <ECLIPSE SPYDER> (REFER TO GROUP 42, STRUT TOWER BAR P.42-11.) <<A>>
1. BRAKE HOSE CLAMP
2. FRONT SPEED SENSOR HARNESS CLAMP <VEHICLES WITH ABS>

REMOVAL STEPS (Continued)
3. STABILIZER LINK
4. BOLTS
5. NUT
6. STRUT ASSEMBLY

REMOVAL SERVICE POINT

<<A>> BOLTS REMOVAL

1. Suspend the lower arm from the vehicle with wire.
2. Remove the strut and knuckle connection.

INSPECTION

M1332001200139

- Check for oil leaks from the strut assembly.
- Check the strut assembly for damage or deformation.

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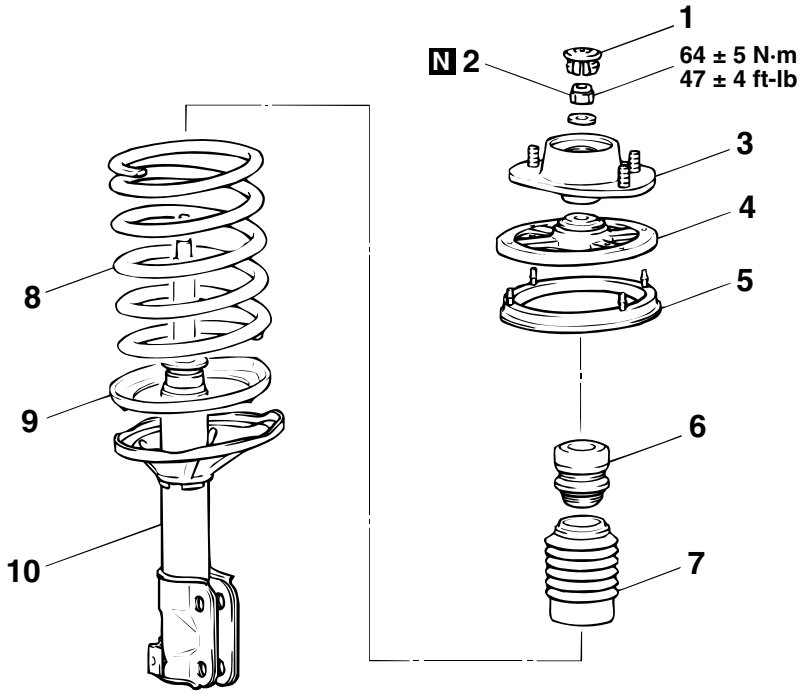
DISASSEMBLY AND ASSEMBLY

M1332001300136



DISASSEMBLY STEPS

1. DUST COVER
<<A>> >>A<< 2. JAM NUT
3. STRUT INSULATOR
4. SPRING SEAT, UPPER
5. SPRING PAD, UPPER
6. BUMP RUBBER
7. DUST COVER
8. COIL SPRING

DISASSEMBLY STEPS (Continued)

9. SPRING PAD, LOWER
<<B>> 10. STRUT ASSEMBLY

Required Special Tools:

- MB991176: Special Spanner
- MB991237: Spring Compressor
- MB991238: Arm Set

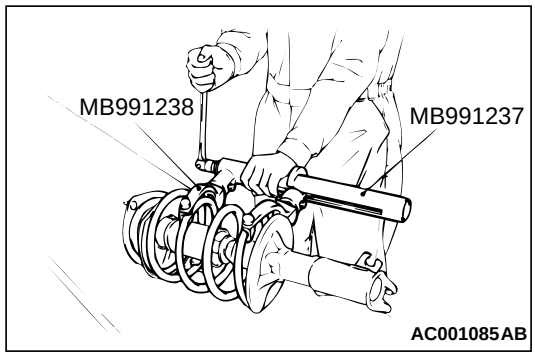
DISASSEMBLY SERVICE POINTS

<<A>> JAM NUT REMOVAL

⚠ CAUTION

- **To hold the coil spring securely, install special tools MB991237 and MB991238 evenly as shown (parallel with each other).**
- **Do not use an impact wrench to tighten the bolt of special tool MB991237, otherwise the special tool will break.**

1. Use special tools MB991237 and MB991238 to compress the coil spring.

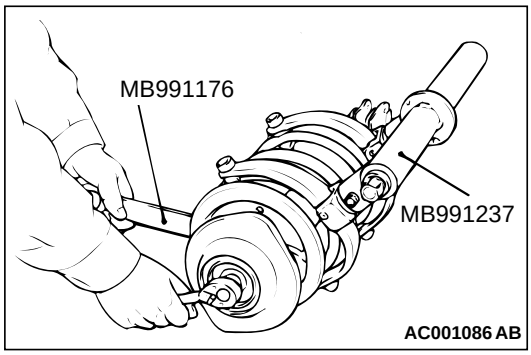


TSB Revision

⚠ ***WARNING***

Do not use an impact wrench to remove the jam nut. Vibration of the impact wrench will cause special tools MB991237 and MB991238 to slip and cause bodily harm.

2. Use special tool MB991176 to secure the strut, and then remove the jam nut.

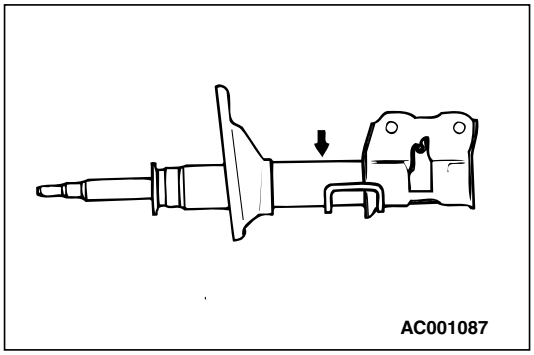


<<B>> STRUT ASSEMBLY REMOVAL

⚠ ***WARNING***

Wear goggles when drilling to protect your eyes from flying metal debris.

The gas must be discharged from the strut assembly before discarding it. Place the assembly horizontally with its piston rod extended. Then drill a hole of approximately 3 mm (0.1 inch) in diameter at the location shown in the illustration and discharge the gas.



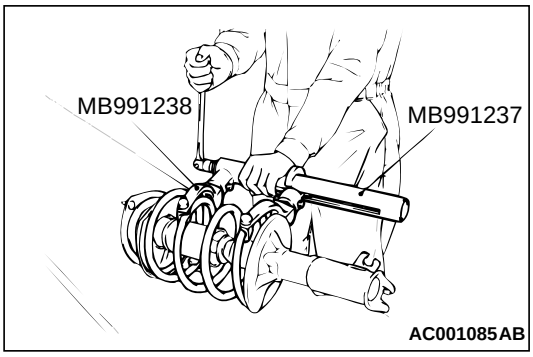
ASSEMBLY SERVICE POINT

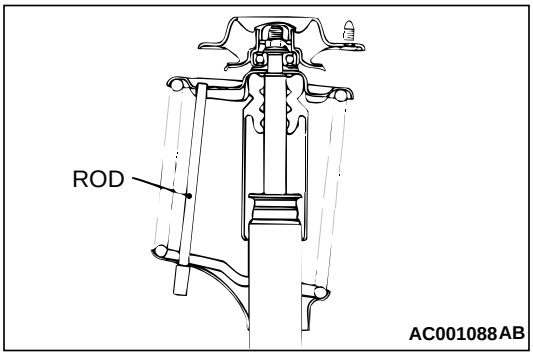
>>A<< JAM NUT INSTALLATION

⚠ **CAUTION**

Do not use an impact wrench to tighten the bolt of special tool MB991237, otherwise the special tool will break.

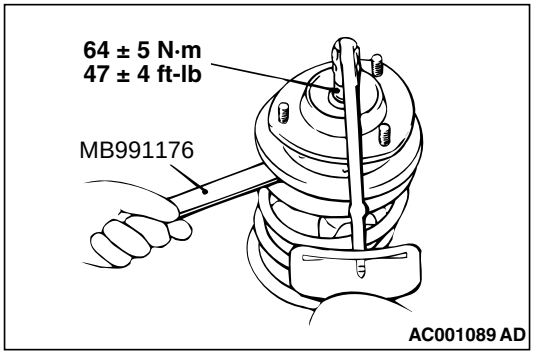
1. With the coil spring held compressed by special tools MB991237 and MB991238, temporarily tighten the jam nut.





2. Using a rod as shown, line up the holes in the strut assembly spring lower seat with the hole in the spring upper seat.
3. Align both ends of the coil spring with the grooves in spring seat, and then loosen special tools MB991237 and MB991238.

⚠ CAUTION
Do not use an impact wrench to tighten the jam nut, otherwise the jam nut will not be tightened securely.



4. Using special tool MB991176, tighten the jam nut to 64 ± 5 N·m (47 ± 4 ft-lb).

INSPECTION

M1332001400092

- Check the bearing for wear or rust.
- Check the rubber parts for damage or deterioration.
- Check the spring for deformation, deterioration or damage.
- Check the shock absorber for deformation.

LOWER ARM

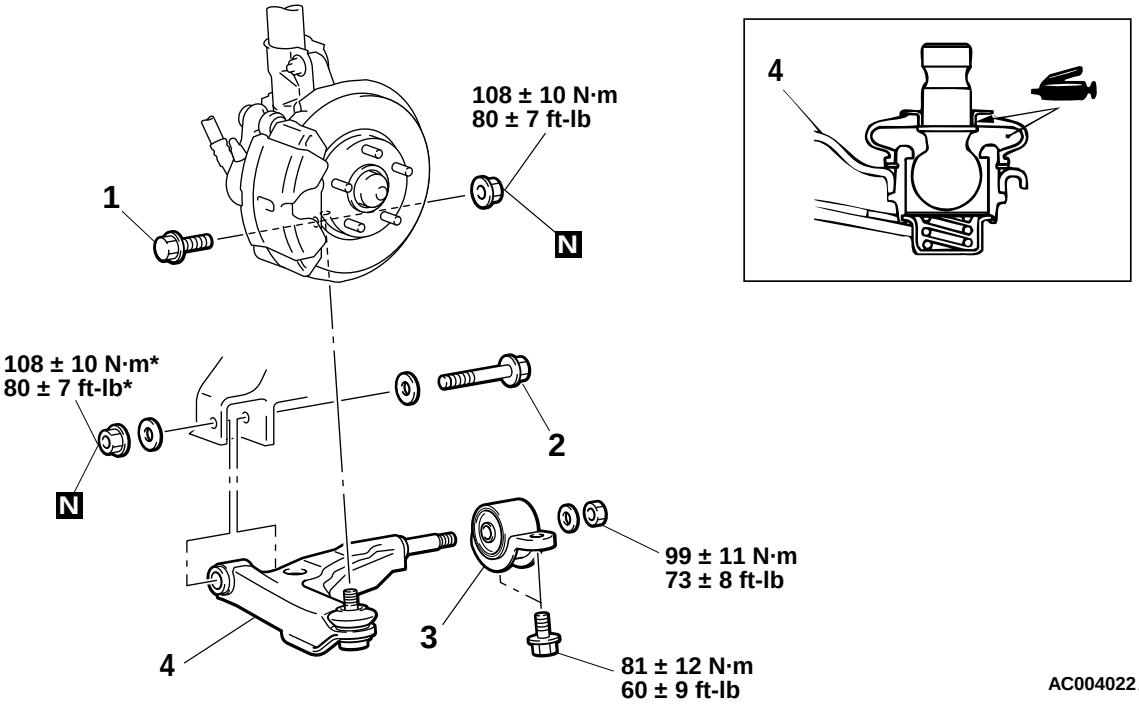
REMOVAL AND INSTALLATION

M1332001600148

⚠ CAUTION

***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in an unladen condition.**

Post-installation Operation
- Check the Dust Cover for Cracks or Damage by Pushing it with Your Finger.
- Wheel Alignment Check and Adjustment (Refer to P.33A-6.)



AC004022AB

REMOVAL STEPS

1. LOWER ARM AND KNUCKLE CONNECTION
2. LOWER ARM MOUNTING BOLT
>>A<< 3. LOWER ARM CLAMP
4. LOWER ARM

Required Special Tools:
- MB990799: Ball Joint Remover and Installer
- MB991006: Preload Socket
- MB991007: Bearing Installer
- MB991446: Bushing Remover and Installer Spacer

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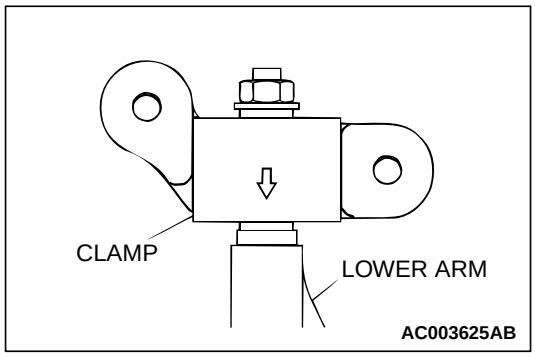
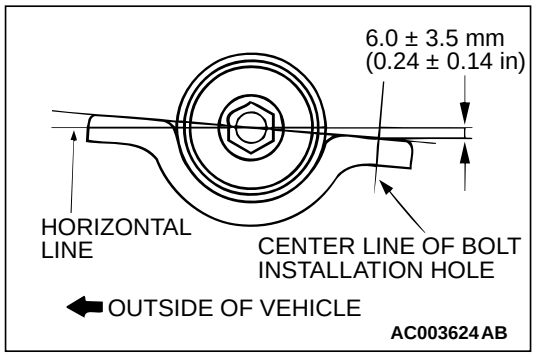
INSTALLATION SERVICE POINT

>>A<< LOWER ARM CLAMP INSTALLATION

1. The arrow mark on the clamp should point as shown.



2. Install the clamp into the shaft at the angle shown in the illustration.



INSPECTION

M1332001700145

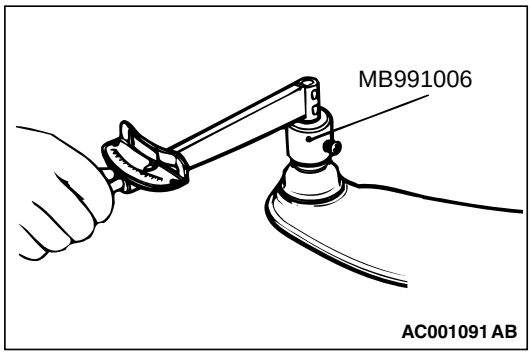
- Check the bushing for wear and deterioration.
- Check the lower arm for bend or breakage.
- Check the lower arm clamp for deterioration or damage.
- Check all bolts for condition and straightness.

BALL JOINT BREAKAWAY TORQUE CHECK

1. After shaking the ball joint stud several times, use special tool MB991006 to measure the breakaway torque of the ball joint.

   Standard value: 2.5 – 6.1 N·m (22 – 54 in-lb)

2. If the measured value exceeds the standard value, replace the lower arm.
3. If the measured value is lower than the standard value, verify that the ball joint turns smoothly without excessive play. If so, the ball joint is reusable.



LOWER ARM BALL JOINT DUST COVER CHECK

1. Check the dust cover for cracks or damage by pushing it with your finger.
2. If the dust cover is cracked or damaged, replace the lower arm.

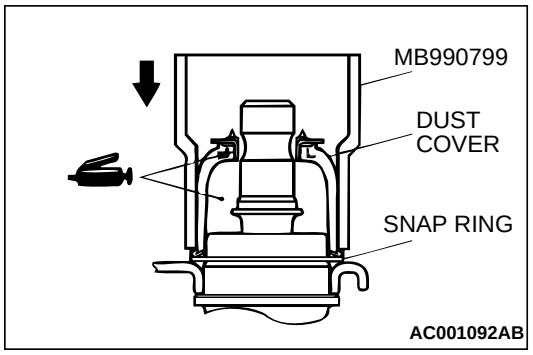
NOTE: Cracks or damage to the dust cover may cause damage to the ball joint. When it is damaged during service work, replace the dust cover.

BALL JOINT DUST COVER REPLACEMENT

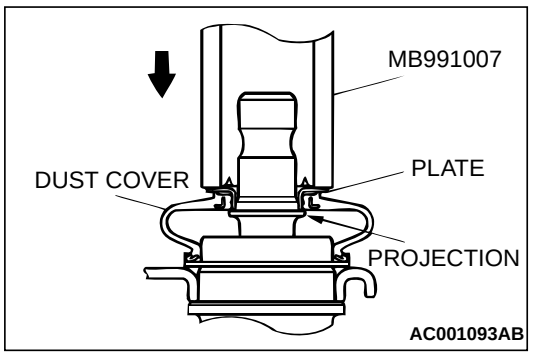
M1332008200174

If the dust cover is damaged accidentally during service work, replace the dust cover as follows:

1. Remove the dust cover.
2. Apply multipurpose grease to the lip and inside of the dust cover.
3. Using special tool MB990799, drive in the dust cover until it is fully seated.



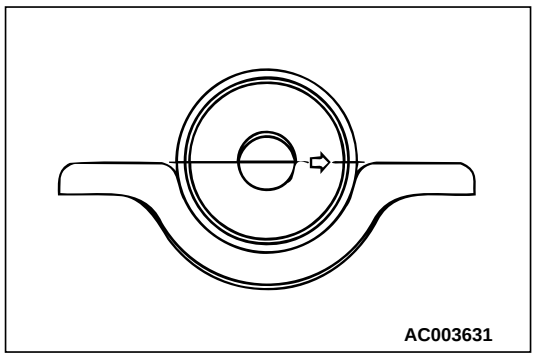
4. Using special tool MB991007, drive in the dust cover plate until it contacts the projection of the ball joint.
5. Check the dust cover for cracks or damage by pushing it with your finger.



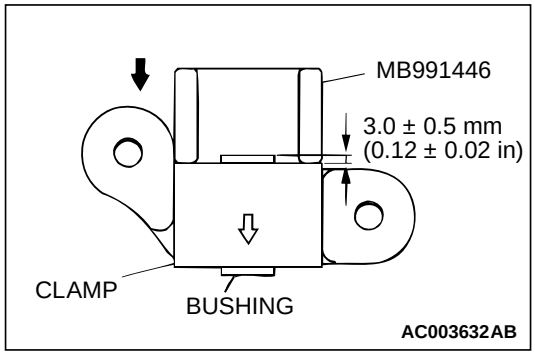
LOWER ARM REAR BUSHING REPLACEMENT

M1332008100218

1. Position the lower arm bushing so that its arrow mark points the shown direction.



2. Use the special tool MB991446 to press in the bushing to the shown dimension.

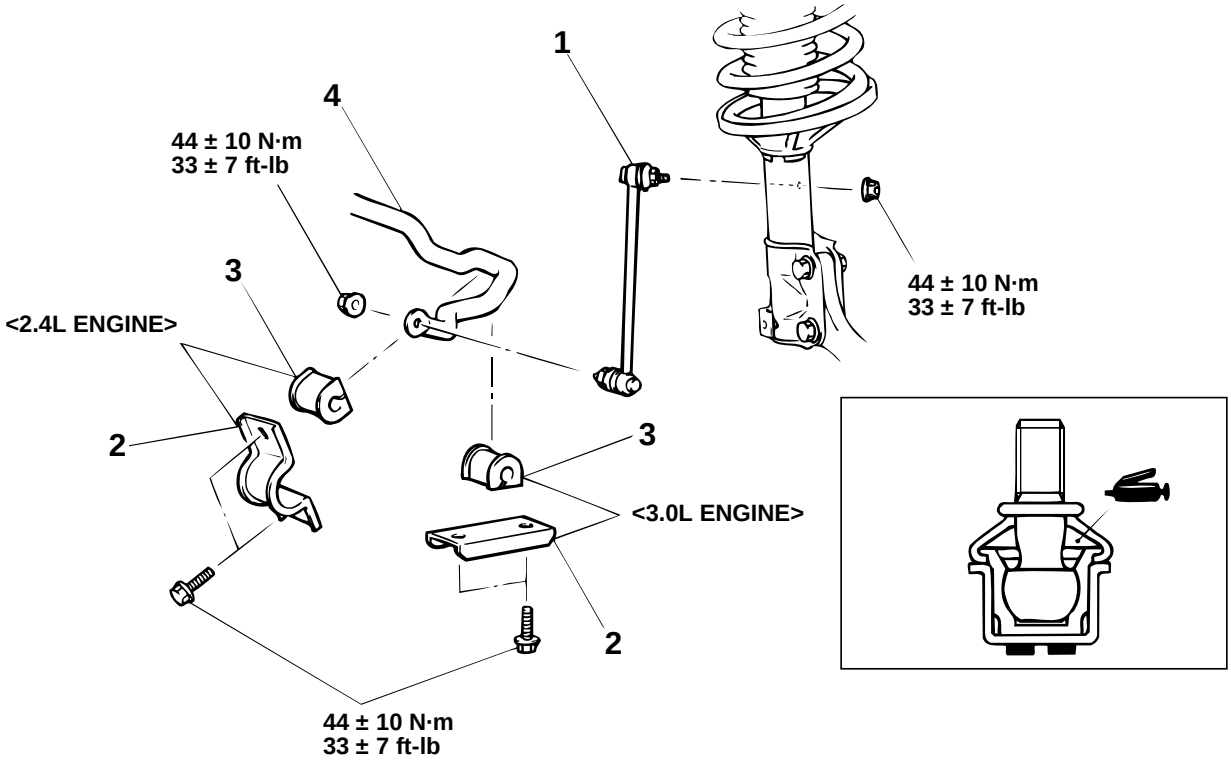


STABILIZER BAR

REMOVAL AND INSTALLATION

M1332004000134

Pre-removal Operation	Post-installation Operation
• Front Exhaust Pipe Removal <2.4L ENGINE> (Refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-21.) • Centermember Removal <2.4L ENGINE> (Refer to GROUP 32, Engine Roll Stopper, Centermember P.32-8.) • Stay Removal <2.4L ENGINE> (Refer to GROUP 32, Crossmember P.32-10.) • Lower Arm Removal (Refer to P.33A-13.)	• Check the Dust Cover for Cracks or Damage by Pushing it with Your Finger. • Lower Arm Installation (Refer to P.33A-13.) • Stay Installation <2.4L ENGINE> (Refer to GROUP 32, Crossmember P.32-10.) • Centermember Installation <2.4L ENGINE> (Refer to GROUP 32, Engine Roll Stopper, Centermember P.32-8.) • Front Exhaust Pipe Installation <2.4L ENGINE> (Refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-22.)



AC003543AC

			REMOVAL STEPS
		1.	STABILIZER LINK
	>>A<<	2.	STABILIZER BRACKET
	>>A<<	3.	BUSHING
<<A>>	>>A<<	4.	STABILIZER BAR

Required Special Tool:
- MB990326: Preload Wrench

REMOVAL SERVICE POINT

<<A>> STABILIZER BAR REMOVAL <3.0L ENGINE>
Turn the steering wheel to the right to remove the left end of the stabilizer bar.

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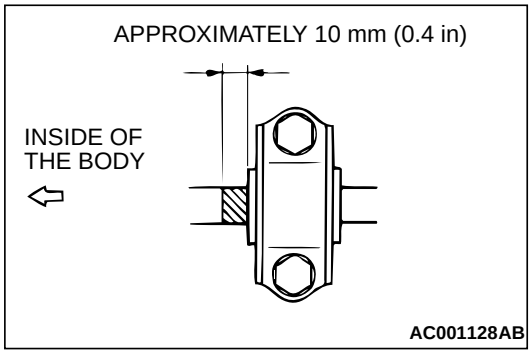
INSTALLATION SERVICE POINT

>>A<< STABILIZER BAR/BUSHING/STABILIZER BAR BRACKET INSTALLATION



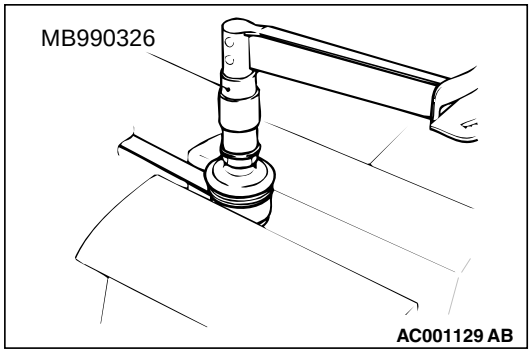
Position the stabilizer bar so that the left side identification mark is at the shown position, and tighten the stabilizer bar bracket mounting bolt.

INSPECTION

M1332002000138

- Check the bushing for wear and deterioration.
- Check the stabilizer bar for deterioration or damage.
- Check all bolts for condition and straightness.

STABILIZER LINK BALL JOINT BREAKAWAY TORQUE CHECK



1. After shaking the ball joint stud several times, install the nut to the stud and use special tool MB990326 to measure the breakaway torque of the ball joint.

   Standard value: 3.4 – 9.0 N·m (30 – 80 in-lb)

2. If the measured value exceeds the standard value, replace the stabilizer link.
3. If the measured value is lower than the standard value, verify that the ball joint turns smoothly without excessive play. If so, the ball joint is reusable.

STABILIZER LINK BALL JOINT DUST COVER CHECK

1. Check the dust cover for cracks or damage by pushing it with your finger.
2. If the dust cover is cracked or damaged, replace the stabilizer link.

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1332008500108

ITEMS	SPECIFICATIONS
Lower arm assembly	
Lower arm clamp bolt	81 ± 12 N·m (60 ± 9 ft-lb)
Lower arm to clamp connection nut	99 ± 11 N·m (73 ± 8 ft-lb)
Lower arm to crossmember connection nut	108 ± 10 N·m (80 ± 7 ft-lb)
Lower arm to knuckle connection nut	108 ± 10 N·m (80 ± 7 ft-lb)

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ITEMS	SPECIFICATIONS
Stabilizer bar	
Stabilizer bracket bolt	44 ± 10 N·m (33 ± 7 ft-lb)
Stabilizer link nut	44 ± 10 N·m (33 ± 7 ft-lb)
Strut assembly	
Stabilizer link nut	44 ± 10 N·m (33 ± 7 ft-lb)
Strut assembly jam nut	64 ± 5 N·m (47 ± 4 ft-lb)
Strut assembly to body connection nut	44 ± 5 N·m (33 ± 3 ft-lb)
Strut assembly to knuckle connection nut	300 ± 24 N·m (221 ± 18 ft-lb)

GENERAL SPECIFICATIONS

M1332000200103

COIL SPRING <ECLIPSE>

ITEMS	RS, GS – M/T	GS – A/T, GT – M/T	GT – A/T
Wire diameter mm (in)	14.3 (0.56)	14.5 (0.57)	14.7 (0.58)
Average diameter mm (in)	169.0 (6.65)	169.0 (6.65)	169.0 (6.65)
Free length mm (in)	311.5 (12.26)	320.0 (12.60)	328.5 (12.93)

COIL SPRING <ECLIPSE SPYDER>

ITEMS	GS	GT – M/T	GT – A/T
Wire diameter mm (in)	14.7 (0.58)	15.0 (0.59)	15.2 (0.60)
Average diameter mm (in)	169.0 (6.65)	169.0 (6.65)	169.0 (6.65)
Free length mm (in)	328.5 (12.93)	336.5 (13.25)	345.0 (13.59)

SERVICE SPECIFICATIONS

M1332000300155

ITEMS			SPECIFICATIONS
Toe-in mm (in)			0 ± 3 (0 ± 0.12)
Steering angle	Inner wheel	2.4L ENGINE	36°12' ± 2°00'
		3.0L ENGINE	31°00' ± 2°00'
	Outer wheel (reference)	2.4L ENGINE	30°24'
		3.0L ENGINE	27°00'
Camber			0°00' ± 30' (Left/right deviation within 30')
Caster			3°00' ± 30' (Left/right deviation within 30')
Lower arm ball joint breakaway torque N·m (in-lb)			2.5 – 6.1 (22 – 54)
Stabilizer link ball joint breakaway torque N·m (in-lb)			3.4 – 9.0 (30 – 80)

COMPONENT IDENTIFICATION

M1331001300100

CAMBER ADJUSTING BOLT

BOLT DIAMETER mm (in)		NUMBER OF IDENTIFICATION PROJECTION
Set bolt	16.0 (0.63)	0
Adjusting bolt	14.9 (0.59)	1
	14.1 (0.56)	2
	13.6 (0.54)	3

GROUP 34

REAR SUSPENSION

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GENERAL DESCRIPTION

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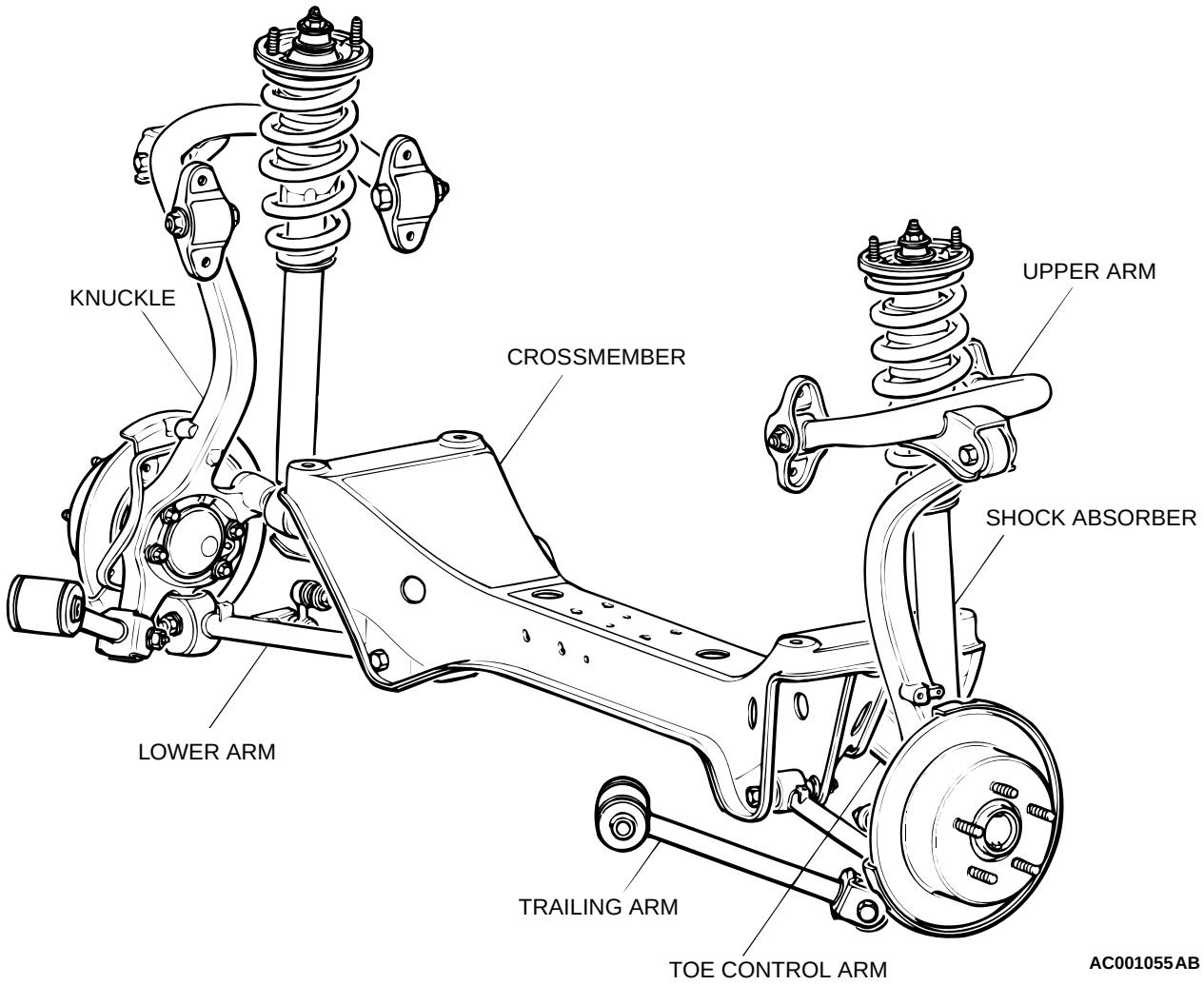
The rear suspension is a multi-link suspension, which has been used for the previous models. The layout of each arm and the rigidity balance of each bushing have been rationalized to provide both excellent steering stability and riding comfort.



REAR SUSPENSION DIAGNOSIS

INTRODUCTION TO REAR SUSPENSION DIAGNOSIS

M1341013100159

If the rear suspension is faulty, the vehicle will not run straightforward or noise will occur. Incorrect wheel alignment, malfunction of shock absorber, stabilizer bar, coil spring, control arms or worn or out-of-balance will cause these problems.

REAR SUSPENSION DIAGNOSIS TROUBLESHOOTING STRATEGY

M1341013200156

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted most of the possible ways to find a rear suspension fault.

1. Gather information from the customer.
2. Verify that the condition described by the customer exists.
3. Find the malfunction by following the Symptom Chart.
4. Verify malfunction is eliminated.

SYMPTOM CHART

M1341013500168

SYMPTOMS	INSPECTION PROCEDURE	REFERENCE PAGE
Squeaks or other abnormal noise	1	P.34-3
Poor riding	2	P.34-4
Body tilting	3	P.34-4

SYMPTOM PROCEDURES

IINSPECTION PROCEDURE 1: Squeaks or other Abnormal Noise

DIAGNOSIS

STEP 1. Check for loose rear suspension installation bolts and nuts.

Q: Are the rear suspension installation bolts and nuts loose?
YES : Retighten them, then go to Step 6.
NO : Go to Step 2.

STEP 2. Check the malfunction of shock absorbers (worn bushings).

Q: Are the shock absorbers (bushings) in good condition?
YES : Go to Step 3.
NO : Replace the faulty part, then go to Step 6.

STEP 3. Check the upper arms and/or lower arms and/or toe control arms for deformity or damage.

Q: Are the upper arms and/or lower arms and/or toe control arms in good condition?
YES : Go to Step 4.
NO : Replace the faulty part, then go to Step 6.

STEP 4. Check the trailing arms for deformity or damage.

Q: Are the trailing arms in good condition?
YES : Go to Step 5.
NO : Replace the faulty part, then go to Step 6.

STEP 5. Check the crossmember deformed or damaged.

Q: Is the crossmember deformed or damaged?
YES : Adjust or replace it, then go to Step 6.
NO : Go to Step 6.

STEP 6. Check symptoms.

Q: Is the malfunction eliminated?
YES : This diagnosis is complete.
NO : Return to Step 1.

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INSPECTION PROCEDURE 2: Poor Riding

DIAGNOSIS

STEP 1. Check the excessive tire inflation pressure.

Q: Is the tire inflation pressure in good condition?
YES : Go to Step 2.
NO : Adjust the pressure, then go to Step 4.

STEP 2. Check for malfunction of shock absorbers (weak or broken springs).

Q: Are the shock absorbers in good condition?
YES : Go to Step 3.
NO : Replace the faulty part, then go to Step 4.

STEP 3. Check the stabilizer bar and/or stabilizer links for deformity or damage.

Q: Are the stabilizer bar and/or stabilizer link deformed or damaged?
YES : Replace the faulty part, then go to Step 4.
NO : Go to Step 4.

STEP 4. Check symptoms.

Q: Is the malfunction eliminated?
YES : This diagnosis is complete.
NO : Return to Step 1.

INSPECTION PROCEDURE 3: Body Tilting

DIAGNOSIS

STEP 1. Check for weak or deteriorated bushings.

Q: Are the bushings in good condition?
YES : Go to Step 2.
NO : Replace the faulty part, then go to Step 6.

STEP 2. Check for weak or broken springs.

Q: Are the springs in good condition?
YES : Go to Step 3.
NO : Replace the faulty part, then go to Step 6.

STEP 3. Check the upper arms and/or lower arms and/or toe control arms for deformity or damage.

Q: Are the upper arms and/or lower arms and/or toe control arms deformed or damaged?
YES : Replace the faulty part, then go to Step 6.
NO : Go to Step 4.

STEP 4. Check the trailing arms for deformity or damage.

Q: Are the trailing arms deformed or damaged?
YES : Replace the faulty part, then go to Step 6.
NO : Go to Step 5.

STEP 5. Check the crossmember for deformity or damage.

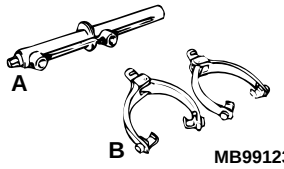
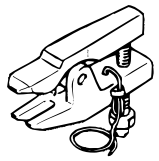
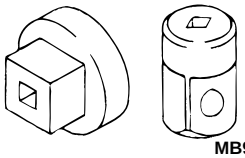
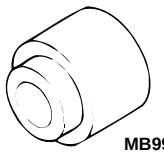
Q: Is the crossmember deformed or damaged?
YES : Replace it, then go to Step 6.
NO : Go to Step 6.

STEP 6. Check symptoms.

Q: Is the malfunction eliminated?
YES : This diagnosis is complete.
NO : Return to Step 1.

SPECIAL TOOLS

M1341000600206

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
	• A: MB991237 Spring compressor body • B: MB991239 Arm set	MIT221369	Coil spring removal and installation
	MB990635 or MB991113 Steering linkage puller	MB991113-01, MB990635-01 or General service tool	Ball joint disconnection
	MB990326 Preload socket	General service tool	Ball joint rotating torque check
	MB990800 Ball joint remover and installer	MB990800-01 or General service tool	Dust cover installation

ON-VEHICLE SERVICE

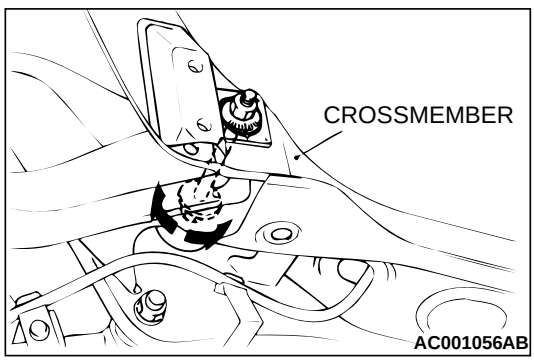
REAR WHEEL ALIGNMENT CHECK AND ADJUSTMENT

M1341011000190

Measure wheel alignment with an alignment equipment on level ground.
The rear suspension and wheels should be serviced to the normal condition prior to wheel alignment.

TOE-IN

Standard value: 3 ± 3 mm (0.12 ± 0.12 inch)



Loosen nut, then turn the toe control arm mounting bolt to adjust toe.

NOTE:
- *LH: Clockwise viewed from the rear → Toe-out*
- *RH: Clockwise viewed from the rear → Toe-in*
- *Toe adjustment can be made at graduations of approximately 2.5 mm (0.10 inch).*

TSB Revision

CAMBER

Standard value:
<ECLIPSE> −1° 20' ± 30' (Difference between right and left within 30')
<ECLIPSE SPYDER> −1° 10' ± 30' (Difference between right and left within 30')

NOTE: Camber is preset at the factory and cannot be adjusted.

NOTE: If camber is not within the standard value, check and replace bent or damaged parts.

BALL JOINT DUST COVER INSPECTION

M1341012800166

1. Check dust covers for cracks or damage by pushing it with your finger.
2. If a dust cover is cracked or damaged, replace the toe control arm assembly or stabilizer link.

   NOTE: Cracks or damage to the dust cover may cause damage to the ball joint.

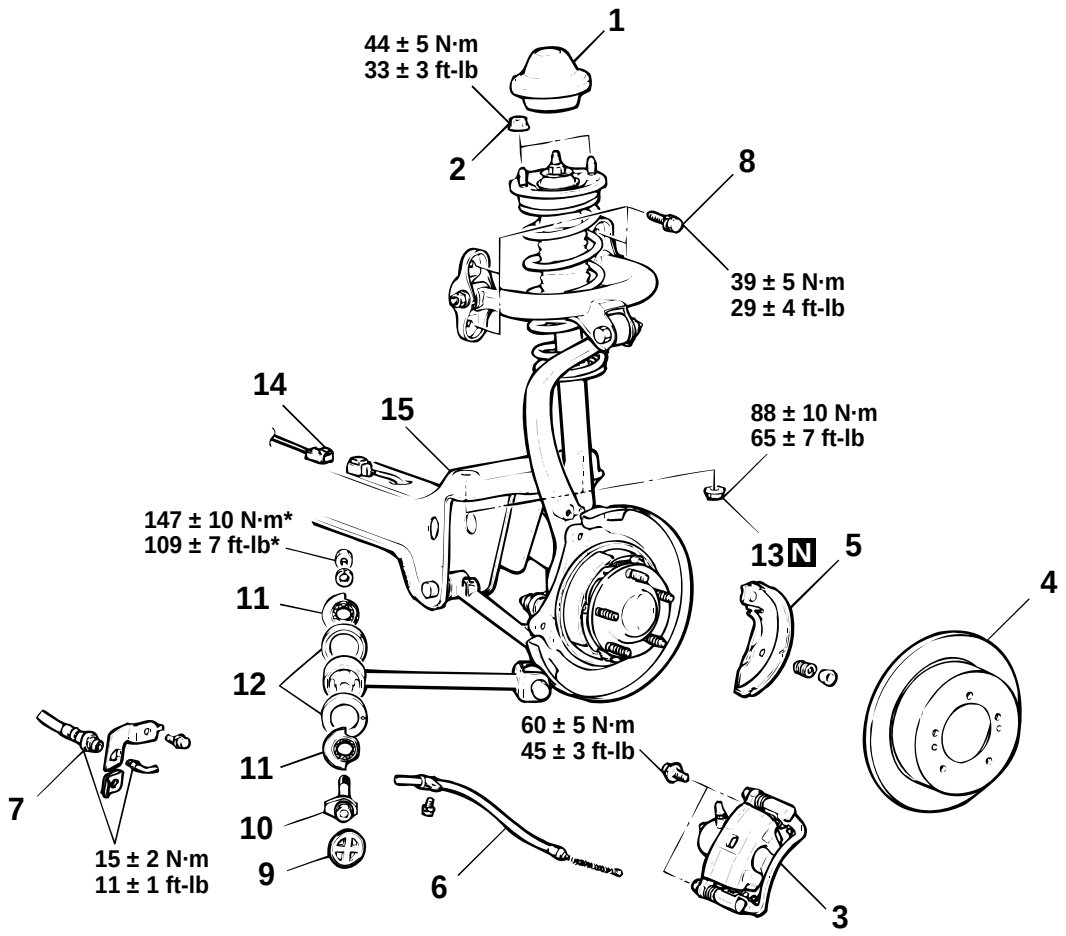
REAR SUSPENSION ASSEMBLY

REMOVAL AND INSTALLATION

M1341001000100

⚠ CAUTION
***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.**

Pre-removal Operation	Post-installation Operation
• Fully Close Convertible Top Assembly. <ECLIPSE SPYDER> • Brake Fluid Draining <Vehicles with drum brake> • Service Lid Removal <ECLIPSE> (Refer to GROUP 52A, Trims P.52A-9.) • Center Exhaust Pipe Removal (Refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-21 and P.15-22.)	• Center Exhaust Pipe Installation (Refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-21 and P.15-22.) • Service Lid Installation <ECLIPSE> (Refer to GROUP 52A, Trims P.52A-9.) • Parking Brake Lever Stroke Check (Refer to GROUP 36, On-vehicle Service – Parking Brake Lever Stroke Check and Adjustment P.36-4.) • Brake Line Bleeding <Vehicles with drum brake> (Refer to GROUP 35A, On-vehicle Service – Bleeding P.35A-21.) • Wheel Alignment Check and Adjustment (Refer to P.34-5.)



AC003096AC

REMOVAL STEPS

<<A>> .• DRAIN TURF MOUNTING HOOK <ECLIPSE SPYDER>
1. CAP
2. SHOCK ABSORBER MOUNTING NUTS

<<B>>
3. BRAKE CALIPER ASSEMBLY
4. BRAKE DISC OR BRAKE DRUM
5. SHOE AND LINING ASSEMBLY (DRUM BRAKE: REFER TO GROUP 36, PARKING BRAKE CABLE P.36-7. /DRUM-IN-DISC BRAKE: REFER TO GROUP 36, PARKING BRAKE CABLE P.36-8.)
6. PARKING BRAKE CABLE CONNECTION (DRUM BRAKE: REFER TO GROUP 36, PARKING BRAKE CABLE P.36-7. /DRUM-IN-DISC BRAKE: REFER TO GROUP 36, PARKING BRAKE CABLE P.36-8.)

REMOVAL STEPS (Continued)

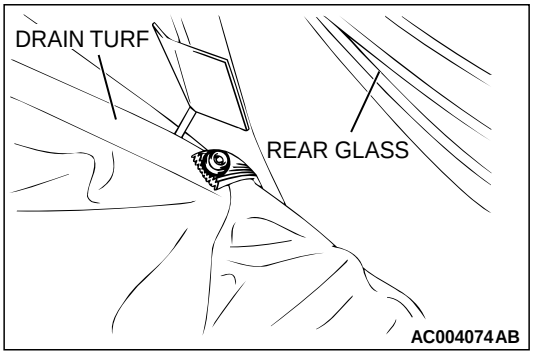
7. BRAKE HOSE CONNECTION <VEHICLES WITH DRUM BRAKE>
8. UPPER ARM MOUNTING BOLTS
9. GROMMET
10. TRAILING ARM MOUNTING BOLT

>>A<< 11. STOPPER A
>>A<< 12. STOPPER B

<<C>>
13. CROSSMEMBER MOUNTING NUT
14. REAR WHEEL SPEED SENSOR CONNECTOR CONNECTION <VEHICLES WITH ABS>
15. REAR SUSPENSION ASSEMBLY

TSB Revision

REMOVAL SERVICE POINTS

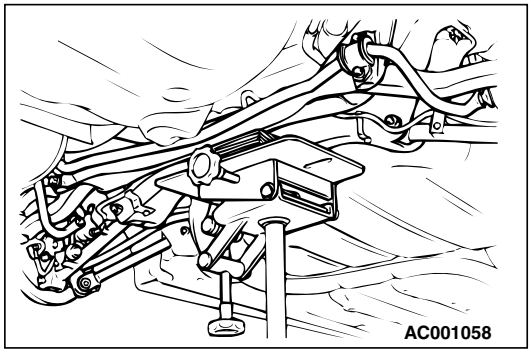


<<A>> DRAIN TURF MOUNTING HOOK REMOVAL <ECLIPSE SPYDER>

Remove the drain turf mounting hook so that the cap can be seen from the passenger compartment.

<<B>> BRAKE CALIPER ASSEMBLY REMOVAL

Secure the removed caliper assembly with a wire, so that it does not fall.



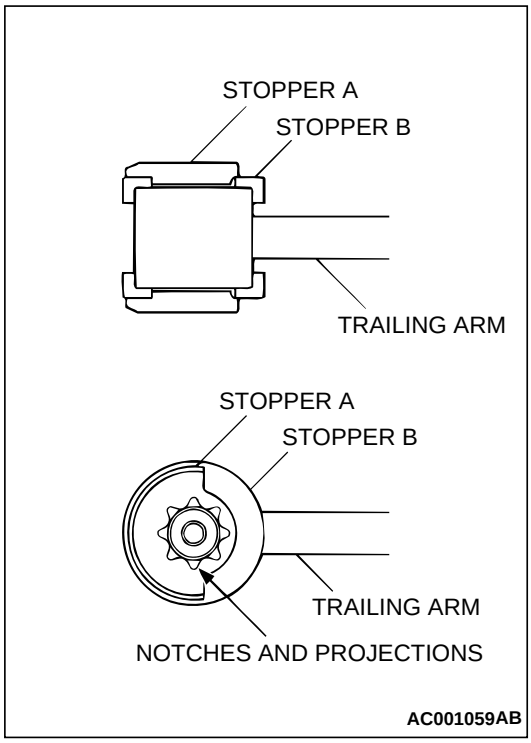
<<C>> CROSSMEMBER MOUNTING NUT REMOVAL

Support the crossmember with a garage jack or transmission jack to remove the crossmember mounting nut.

INSTALLATION SERVICE POINT

>>A<< STOPPER B/STOPPER A INSTALLATION

1. Install stopper B in the shown direction.
2. Install stopper A in the shown direction while checking that the notches on stopper A are engaged with the projections on the trailing arm bushing.



INSPECTION

M1341001100088

Check crossmember for cracks or other damage.

UPPER ARM ASSEMBLY

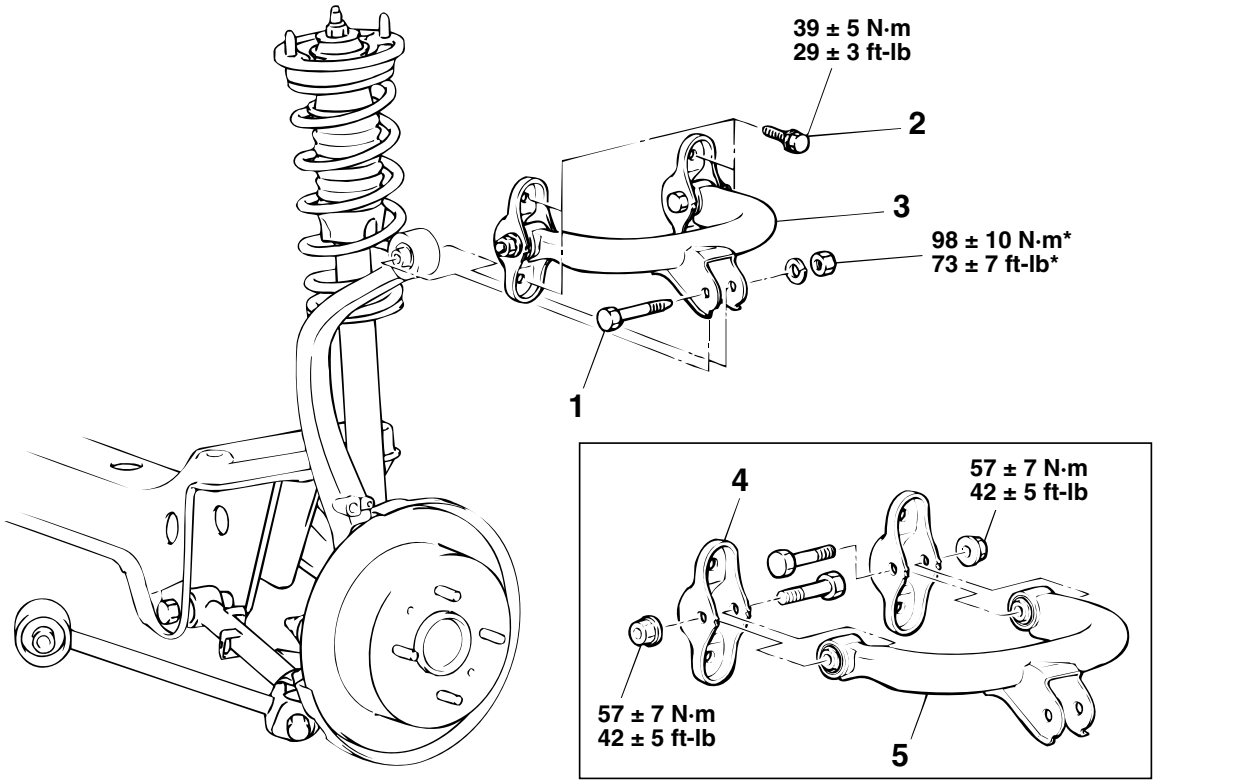
REMOVAL AND INSTALLATION

M1341003600142

⚠ CAUTION

***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.**

Post-installation Operation
- Wheel Alignment Check and Adjustment (Refer to P.34-5.)



AC001060AB

REMOVAL STEPS
1. UPPER ARM AND KNUCKLE CONNECTING BOLT
2. UPPER ARM ASSEMBLY MOUNTING BOLTS

REMOVAL STEPS (Continued)
3. UPPER ARM ASSEMBLY
>>A<< 4. UPPER ARM BRACKET
5. UPPER ARM

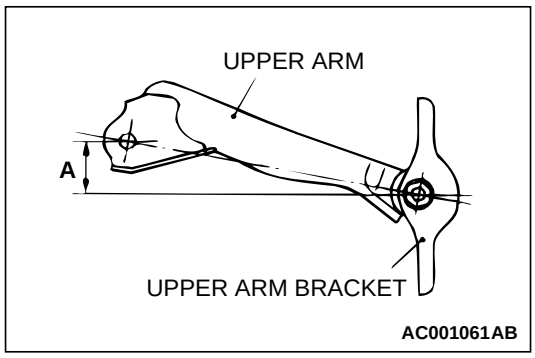
TSB Revision

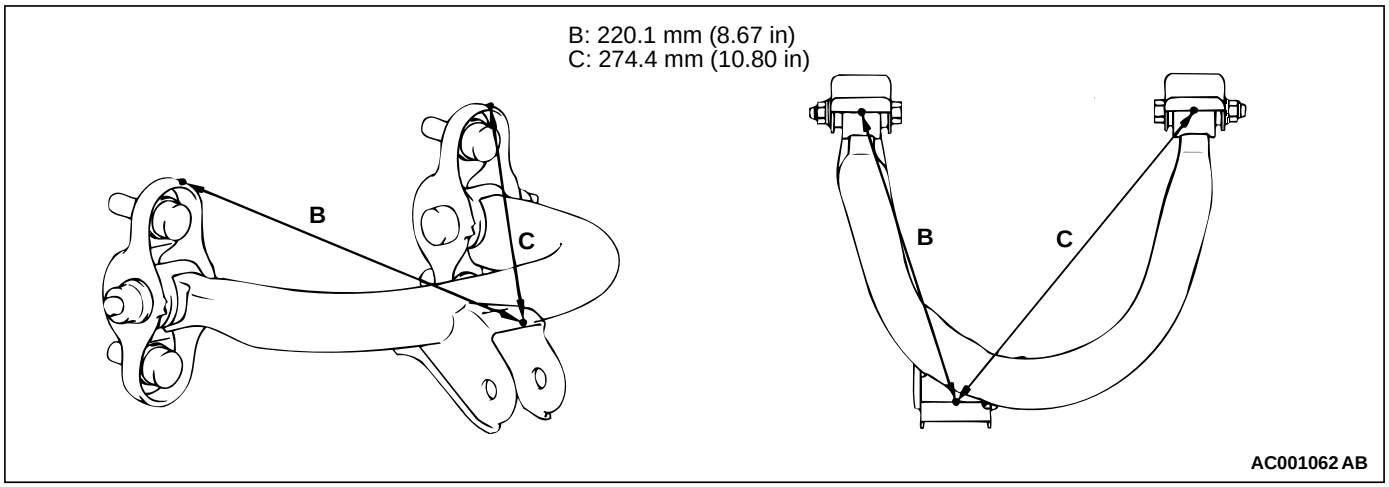
INSTALLATION SERVICE POINT

>>A<< UPPER ARM BRACKET INSTALLATION

Install the upper arm bracket so that the dimension shown in the illustration is at the standard value.

Standard value (A): 37.2 ± 2 mm (1.46 ± 0.08 inches)





NOTE: Refer to distances B and C shown in the illustration to check the installation angle of the upper arm bracket.

INSPECTION

M1341003700149

- Check the bushings for wear and deterioration.
- Check the upper arm for bends or damage.
- Check all bolts for condition and straightness.

TRAILING ARM ASSEMBLY

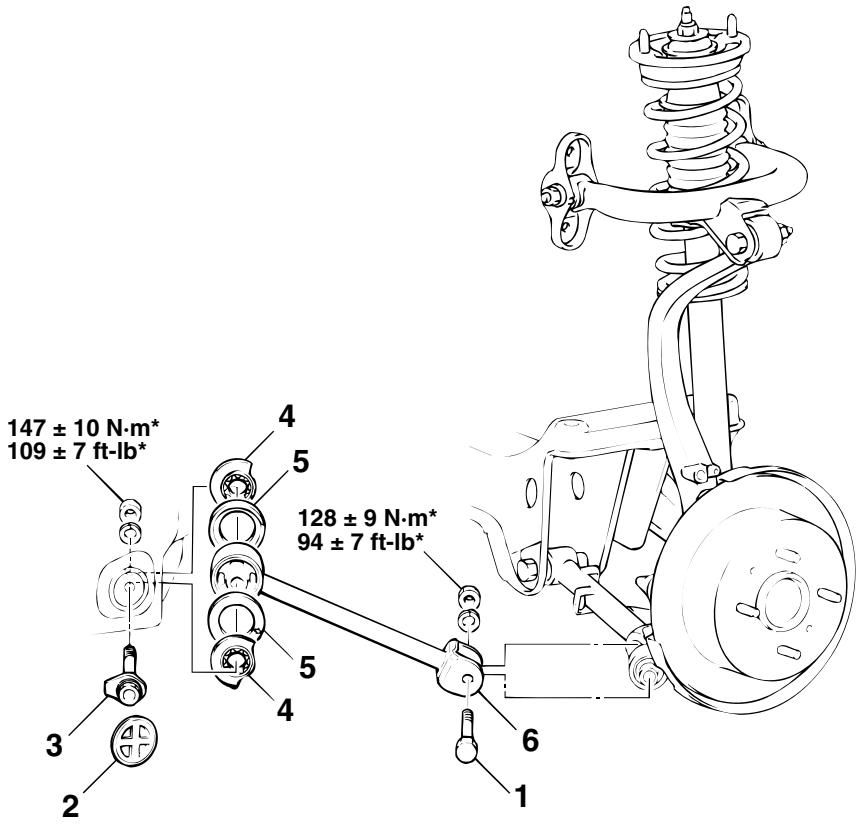
REMOVAL AND INSTALLATION

M1341002200107

⚠ CAUTION

***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.**

Post-installation Operation
- Wheel Alignment Check and Adjustment (Refer to P.34-5.)



AC001063 AB

REMOVAL STEPS
1. KNUCKLE AND TRAILING ARM ASSEMBLY CONNECTING BOLT
2. GROMMET
3. TRAILING ARM ASSEMBLY MOUNTING BOLT

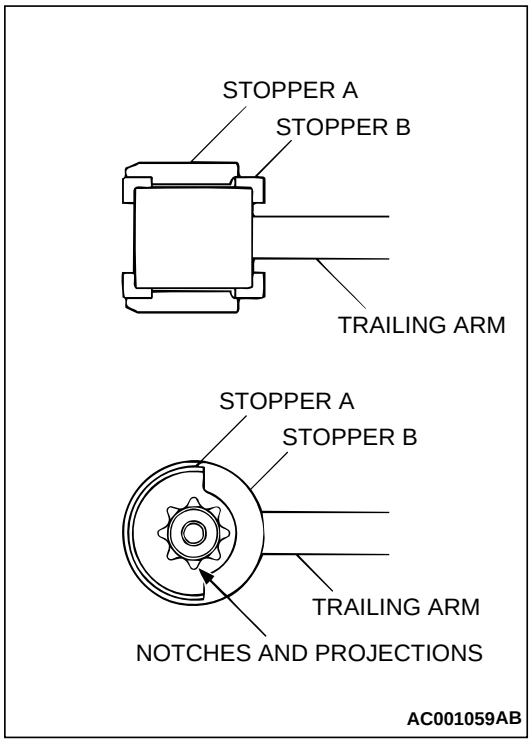
REMOVAL STEPS (Continued)
>>A<< 4. STOPPER A
>>A<< 5. STOPPER B
6. TRAILING ARM ASSEMBLY

TSB Revision

INSTALLATION SERVICE POINT

>>A<< STOPPER B/STOPPER A INSTALLATION

1. Install stopper B in the shown direction.
2. Install stopper A in the shown direction while checking that the notches on stopper A are engaged with the projections on the trailing arm bushing.



INSPECTION

M1341002300085

- Check the bushings for wear and deterioration.
- Check the trailing arm for bends or damage.

LOWER ARM AND TOE CONTROL ARM ASSEMBLY

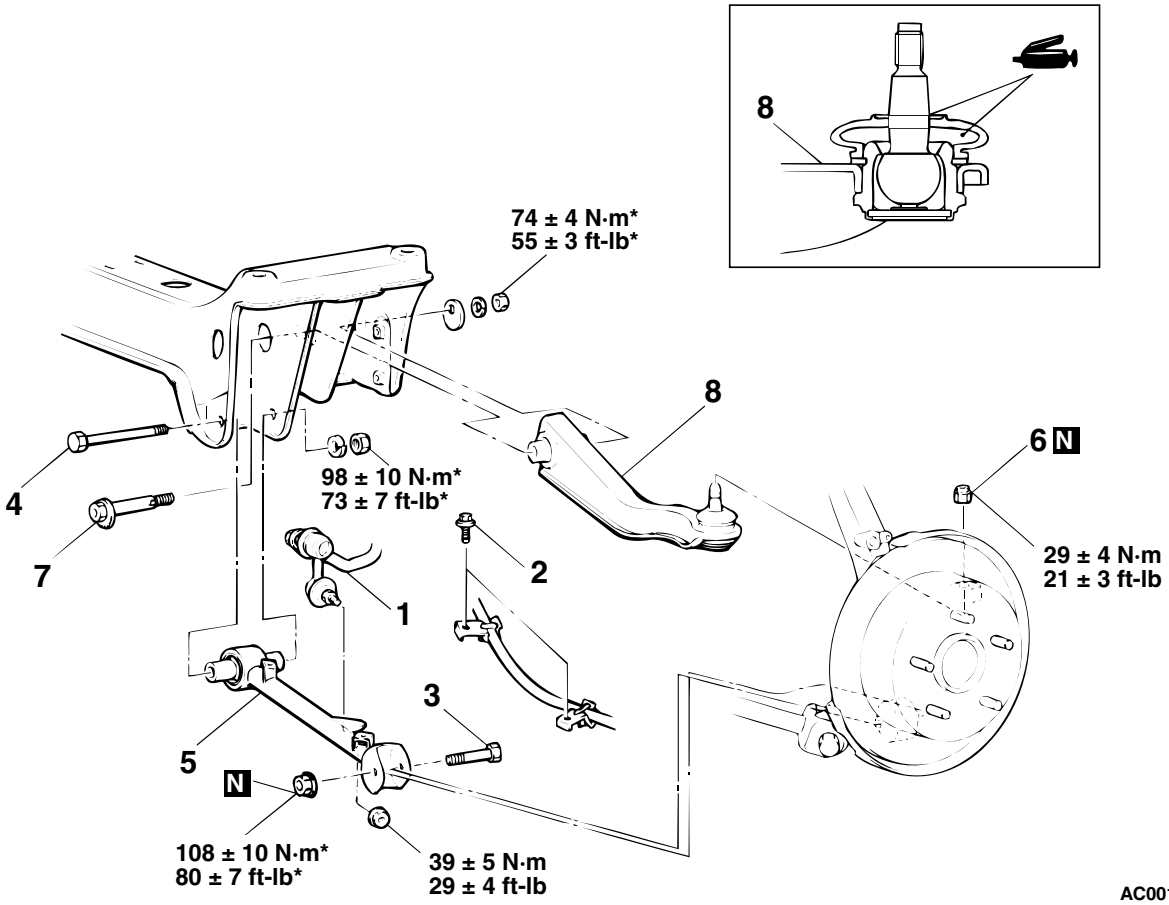
REMOVAL AND INSTALLATION

M1341004500115

⚠ CAUTION

***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.**

Post-installation Operation
- Check the Dust Cover for Cracks or Damage by Pushing it with Your Finger.
- Wheel Alignment Check and Adjustment (Refer to P.34-5.)



AC001064 AD

LOWER ARM ASSEMBLY REMOVAL STEPS
1. STABILIZER LINK CONNECTION
2. WHEEL SPEED SENSOR MOUNTING BOLTS
3. LOWER ARM ASSEMBLY AND KNUCKLE CONNECTING BOLT
4. LOWER ARM ASSEMBLY MOUNTING BOLT
5. LOWER ARM ASSEMBLY

TOE CONTROL ARM ASSEMBLY REMOVAL STEPS

<<A>>
6. TOE CONTROL ARM AND KNUCKLE CONNECTION

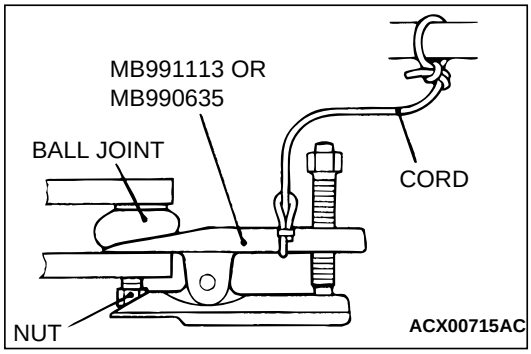
<<B>>
7. TOE CONTROL ARM ASSEMBLY MOUNTING BOLT
8. TOE CONTROL ARM ASSEMBLY

Required Special Tools:
- MB990326: Preload Socket
- MB990635 or MB991113: Steering Linkage Puller
- MB990800: Ball Joint Remover and Installer

TSB Revision

REMOVAL SERVICE POINTS

<<A>> TOE CONTROL ARM AND KNUCKLE DISCONNECTION

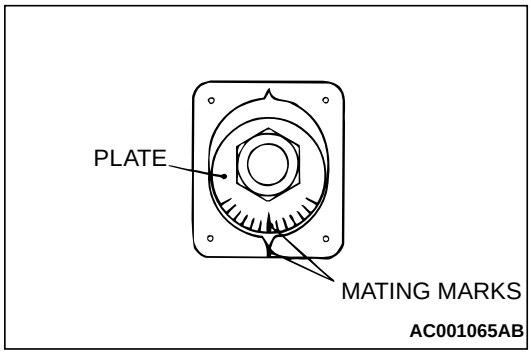


⚠ CAUTION

- **Use special tool MB990635 or MB991113 to loosen the nut only; do not remove it from the ball joint.**
- **Tie special tool MB990635 or MB991113 with a cord to prevent it from falling off.**

Use special tool MB990635 or MB991113 to disconnect the toe control arm and knuckle.

<<B>> TOE CONTROL ARM ASSEMBLY MOUNTING BOLT REMOVAL



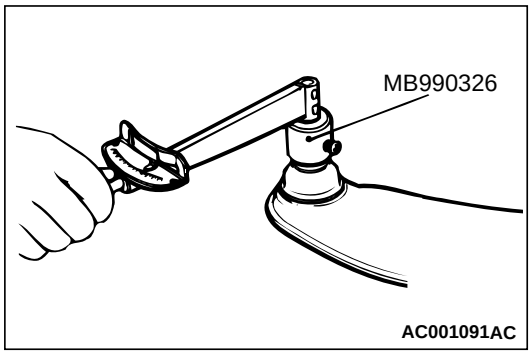
Place mating marks on the crossmember and the plate before removing the bolt.

INSPECTION

M1341004600112

- Check the bushings for wear and deterioration.
- Check the lower arm or toe control arm for bends or damage.
- Check all bolts for condition and straightness.

TOE CONTROL ARM BALL JOINT BREAKAWAY TORQUE CHECK



1. After shaking the ball joint stud several times, in order to make the ball joint turn smoothly, install the nut to the stud and use the special tool MB990326 to measure the breakaway torque of the ball joint.

   Standard value: 1.0 – 3.1 N·m (8.9 – 27 in-lb)

2. When the measured value exceeds the standard value, replace the toe control arm assembly.
3. When the measured value is lower than the standard value, check that the ball joint turns smoothly without excessive play. If so, it is possible to re-use that ball joint.

TOE CONTROL ARM BALL JOINT DUST COVER CHECK

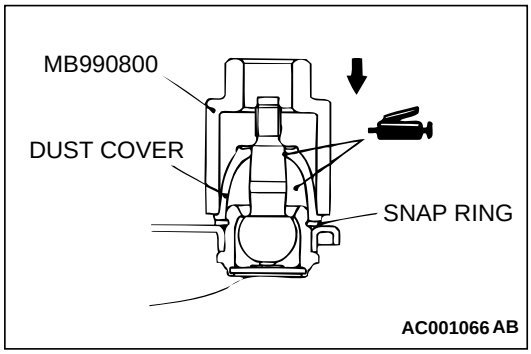
1. Check the dust cover for cracks or damage by pushing it with your finger.
2. If the dust cover is cracked or damaged, replace the toe control arm assembly.

   NOTE: Cracks or damage of the dust cover may cause damage to the ball joint. When it is damaged during service work, replace the dust cover.

TOE CONTROL ARM BALL JOINT DUST COVER REPLACEMENT

M1341014800117

If the dust cover is damaged accidentally during service work, replace the dust cover as follows:



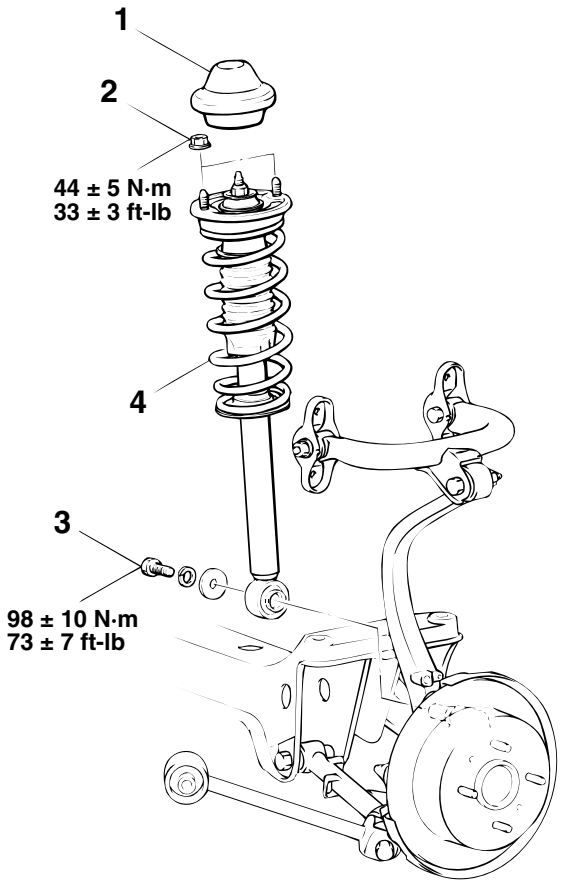
1. Remove the dust cover.
2. Apply multipurpose grease to inside and lip of the dust cover.
3. Using special tool MB990800 press the dust cover until it contacts the snap ring.
4. Check the dust cover for cracks or damage by pushing it with your finger.

SHOCK ABSORBER ASSEMBLY

REMOVAL AND INSTALLATION

M1341002500108

Pre-removal and Post-installation Operation
- Service Lid Removal and Installation <ECLIPSE> (Refer to GROUP 52A, Trims P.52A-9.)
- Fully Close Convertible Top Assembly <ECLIPSE SPYDER>



AC001067AB

REMOVAL STEPS

<<A>> • DRAIN TURF MOUNTING HOOK <ECLIPSE SPYDER>
1. CAP

REMOVAL STEPS (Continued)

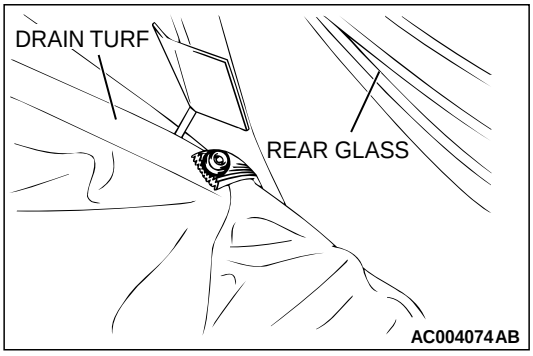
2. SHOCK ABSORBER MOUNTING NUTS
3. BOLT
>>A<< 4. SHOCK ABSORBER ASSEMBLY

TSB Revision

REMOVAL SERVICE POINT

<<A>> DRAIN TURF MOUNTING HOOK REMOVAL <ECLIPSE SPYDER>

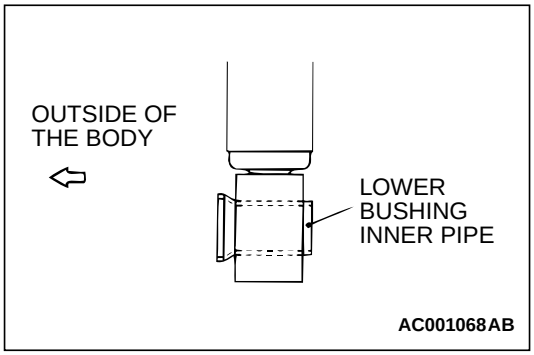
Remove the drain turf mounting hook so that the cap can be seen from the passenger compartment.



INSTALLATION SERVICE POINT

>>A<< SHOCK ABSORBER ASSEMBLY INSTALLATION

Install the shock absorber so that the larger diameter side of the lower bushing inner pipe faces toward the outside of the vehicle.



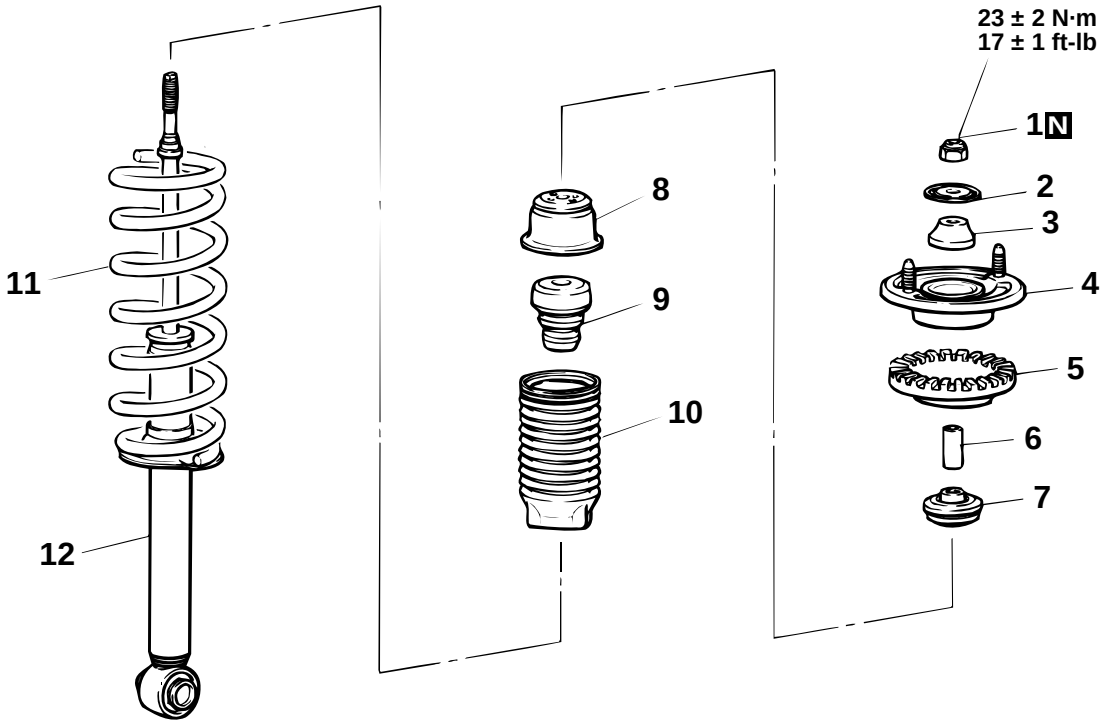
INSPECTION

M1341002600086

- Check the rubber parts for cracks and wear.
- Check the shock absorber for malfunctions, oil leakage, or abnormal noise.

DISASSEMBLY AND ASSEMBLY

M1341005300125



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DISASSEMBLY STEPS

<<A>> >>C<< 1. JAM NUT
2. WASHER
3. UPPER BUSHING A
>>B<< 4. UPPER BRACKET ASSEMBLY
5. UPPER SPRING PAD
6. COLLAR
7. UPPER BUSHING B
8. CUP ASSEMBLY
9. BUMP RUBBER

DISASSEMBLY STEPS (Continued)

10. DUST COVER
>>A<< 11. COIL SPRING
12. SHOCK ABSORBER ASSEMBLY

Required Special Tools:

- MB991237: Spring Compressor Body
- MB991239: Arm Set

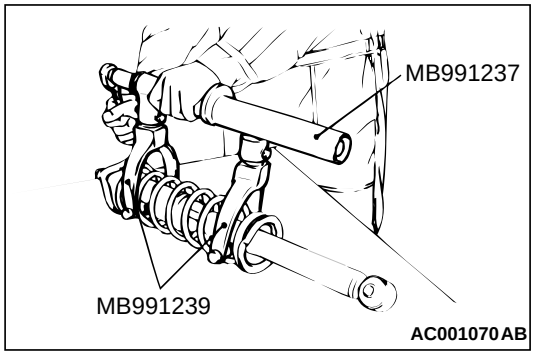
DISASSEMBLY SERVICE POINT

<<A>> JAM NUT REMOVAL

⚠ CAUTION

- **To hold the coil spring securely, install special tools MB991237 and MB991239 evenly, and so that the space between both arms of the special tool will be maximum within the installation range.**
- **Do not use an impact wrench to tighten the bolt of special tool MB991237. It will break the special tool.**

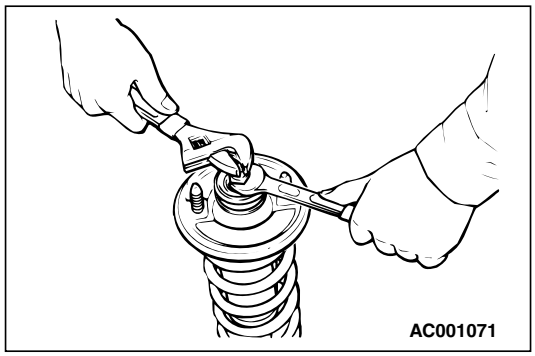
1. Use special tools MB991237 and MB991239 to compress the coil spring.



⚠ WARNING

Do not use an impact wrench to remove the jam nut. Vibration of the impact wrench will cause special tools MB991237 and MB991239 to slip. This is dangerous.

2. While holding the piston rod, remove the jam nut.



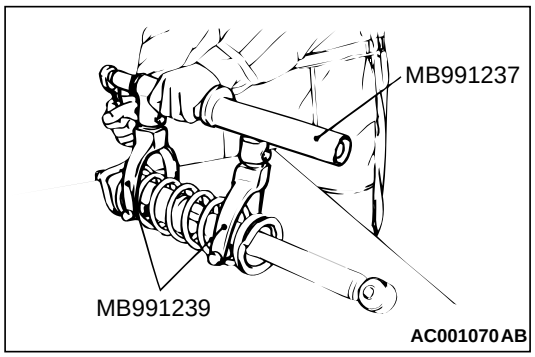
ASSEMBLY SERVICE POINTS

>>A<< COIL SPRING INSTALLATION

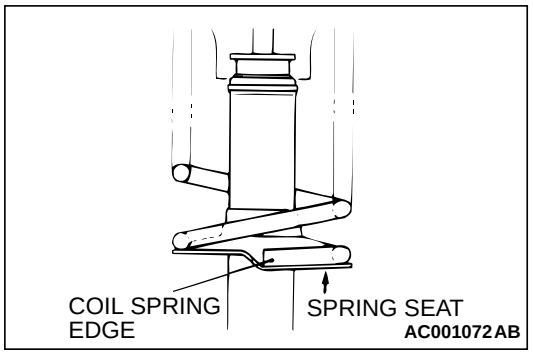
⚠ CAUTION

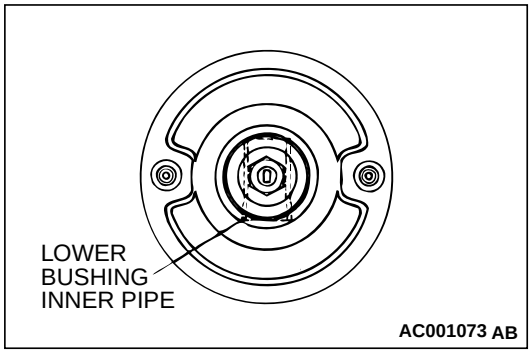
Do not use an impact wrench to tighten the bolt of special tool MB991237. It will break the special tool.

1. Install special tools MB991237 and MB991239 in the same manner as for removal, and compress the coil spring to install it to the shock absorber



2. Align the edge of the coil spring to the stepped part of the shock absorber spring seat.





>>B<< UPPER BRACKET ASSEMBLY INSTALLATION

Install the upper bracket assembly so that the lower bushing inner pipe of the shock absorber is at the position shown.

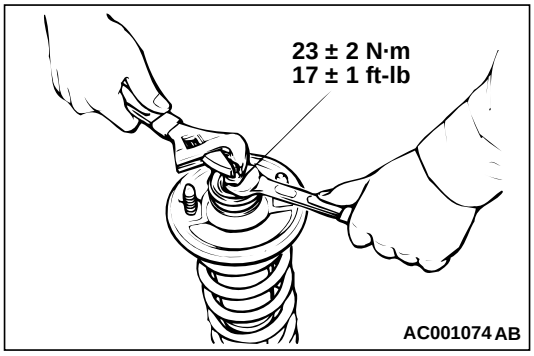
>>C<< JAM NUT INSTALLATION

1. Temporarily tighten the jam nut.

⚠ CAUTION

Do not use an impact wrench to tighten the jam nut, otherwise the jam nut will be damaged.

2. Remove special tools MB991237 and MB991239, and then tighten the jam nut to 23 ± 2 N·m (17 ± 1 ft-lb).

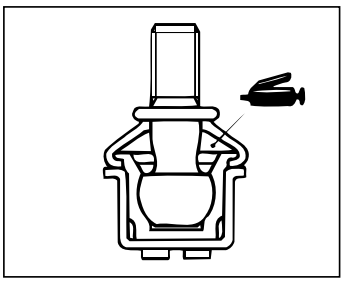


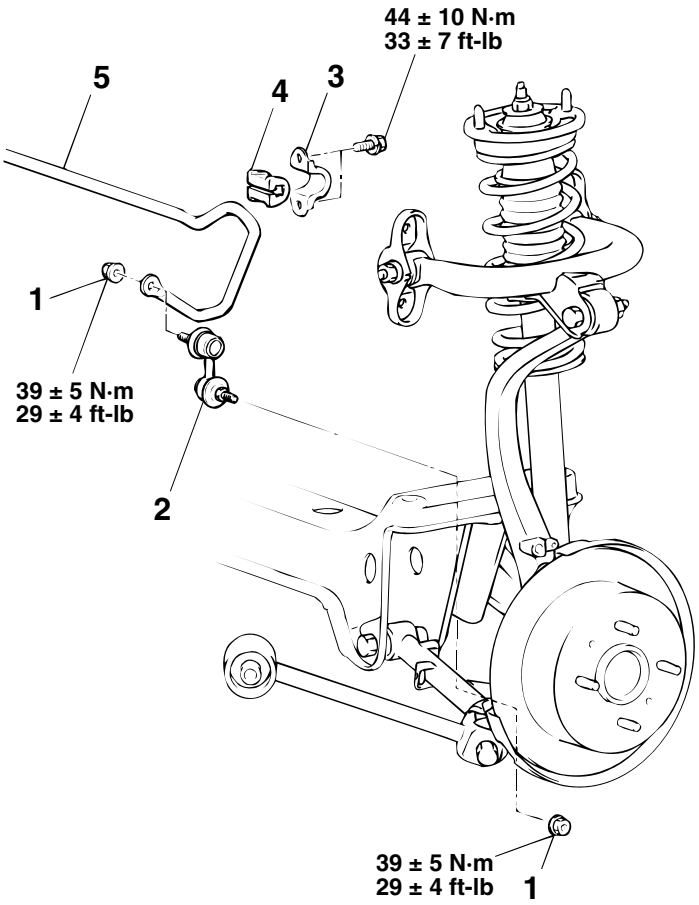
STABILIZER BAR

REMOVAL AND INSTALLATION

M1341003000106

Post-installation Operation
- Check the Dust Cover for Cracks or Damage by Pushing it with your Finger.





REMOVAL STEPS
1. STABILIZER LINK MOUNTING NUTS
2. STABILIZER LINK
>>A<< 3. STABILIZER BAR BRACKET

REMOVAL STEPS (Continued)
>>A<< 4. BUSHING
>>A<< 5. STABILIZER BAR

Required Special Tool:
- MB990326: Preload Socket

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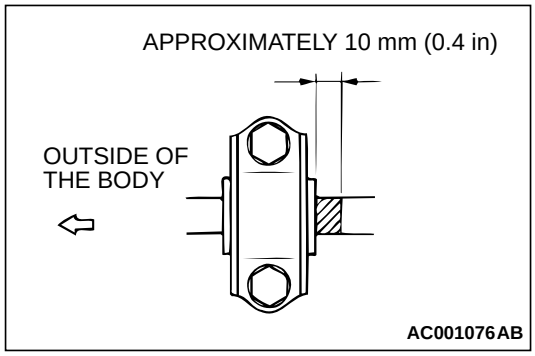
INSTALLATION SERVICE POINT

>>A<< STABILIZER BAR/BUSHING/STABILIZER BAR BRACKET INSTALLATION

Position the stabilizer bar identification mark to the left side. Adjust the identification mark position as shown in the figure, and tighten the stabilizer bar bracket mounting bolt.



INSPECTION

M1341001400142

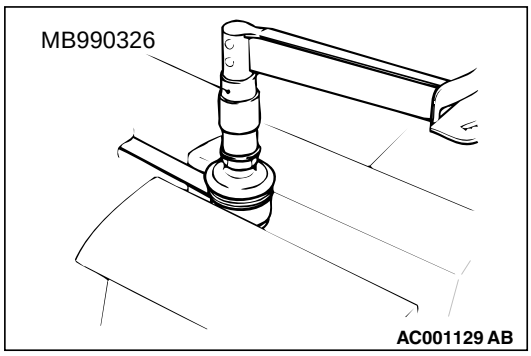
- Check the bushings for wear and deterioration.
- Check the stabilizer bar for deterioration or damage.
- Check all bolts for condition and straightness.

STABILIZER LINK BALL JOINT BREAKAWAY TORQUE CHECK

1. After shaking the ball joint stud several times, install the nut to the stud and use special tool MB990326 to measure the breakaway torque of the ball joint.

   Standard value: 3.4 – 9.0 N·m (30 – 80 in-lb)

2. When the measured value exceeds the standard value, replace the stabilizer link.
3. When the measured value is lower than the standard value, check that the ball joint turns smoothly without excessive play. If so, it is possible to re-use that ball joint.



STABILIZER LINK BALL JOINT DUST COVER CHECK

1. Check the dust cover for cracks or damage by pushing it with your finger.
2. If the dust cover is cracked or damaged, replace the stabilizer link.

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1341012700170

ITEMS	SPECIFICATIONS
Lower arm and toe control arm assembly	
Lower arm assembly to crossmember nut	98 ± 10 N·m (73 ± 7 ft-lb)
Lower arm assembly to knuckle jam nut	108 ± 10 N·m (80 ± 7 ft-lb)
Stabilizer link nut	39 ± 5 N·m (29 ± 4 ft-lb)
Toe control arm assembly to crossmember nut	74 ± 4 N·m (55 ± 3 ft-lb)
Toe control arm assembly to knuckle jam nut	29 ± 4 N·m (21 ± 3 ft-lb)

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ITEMS	SPECIFICATIONS
Rear suspension assembly	
Brake caliper assembly bolt	60 ± 5 N·m (45 ± 3 ft-lb)
Brake hose	15 ± 2 N·m (11 ± 1 ft-lb)
Crossmember to body nut	88 ± 10 N·m (65 ± 7 ft-lb)
Shock absorber assembly to body nut	44 ± 5 N·m (33 ± 3 ft-lb)
Trailing arm assembly to body nut	147 ± 10 N·m (109 ± 7 ft-lb)
Upper arm assembly to body bolt	39 ± 5 N·m (29 ± 4 ft-lb)
Shock absorber assembly	
Shock absorber assembly to body nut	44 ± 5 N·m (33 ± 3 ft-lb)
Shock absorber assembly to knuckle bolt	98 ± 10 N·m (73 ± 7 ft-lb)
Shock absorber jam nut	23 ± 2 N·m (17 ± 1 ft-lb)
Stabilizer bar	
Stabilizer bar bracket bolt	44 ± 10 N·m (33 ± 7 ft-lb)
Stabilizer link nut	39 ± 5 N·m (29 ± 3 ft-lb)
Trailing arm assembly	
Trailing arm assembly to body nut	147 ± 10 N·m (109 ± 7 ft-lb)
Trailing arm assembly to knuckle nut	128 ± 9 N·m (94 ± 7 ft-lb)
Upper arm assembly	
Upper arm assembly to body bolt	39 ± 5 N·m (29 ± 4 ft-lb)
Upper arm assembly to knuckle nut	98 ± 10 N·m (73 ± 7 ft-lb)
Upper arm to upper arm bracket nut	57 ± 7 N·m (42 ± 5 ft-lb)

GENERAL SPECIFICATIONS

M1341000200178

COIL SPRING

ITEMS	SPECIFICATIONS
Wire diameter mm (in)	13.0 (0.51)
Average diameter mm (in)	53 ± 1.5 – 93 ± 1.5 (2.1 ± 0.06 – 3.7 ± 0.06)
Free length mm (in)	278 (10.9)

SERVICE SPECIFICATIONS

M1341000300197

ITEMS		STANDARD VALUE
Toe-in mm (in)		3 ± 3 (0.12 ± 0.12)
Camber	ECLIPSE	–1°20' ± 30' (Difference between right and left within 30')
	ECLIPSE SPYDER	–1°10' ± 30' (Difference between right and left within 30')
Dimension for positioning upper arm bracket mm (in)		37.2 ± 2 (1.46 ± 0.08)
Toe control arm ball joint breakaway torque N·m (in-lb)		1.0 – 3.1 (8.9 – 27)
Stabilizer link ball joint breakaway torque N·m (in-lb)		3.4 – 9.0 (30 – 80)

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GROUP 35A

BASIC BRAKE SYSTEM

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GENERAL DESCRIPTION

M1351000100183

The basic brake system uses a X-type hydraulic feed arrangement. The left front and right rear brakes operate together from the same circuit, right front and left rear operate likewise. If a leak develops in the left front line or piston, the right rear brake would be affected. For safety and control, the right front and left rear circuit operates normally, providing stable braking. In this case, the left front leak must be repaired immediately as the right front left rear circuit is only provided half the braking power required for this vehicle. The main features are as follows:

- A tandem type master cylinder is equipped in all models.
- Tandem type 8 + 9-inch brake booster is used.
- The following type of brakes are used.
  Front:
  Floating caliper, 1-piston, ventilated disc brakes.
  Rear:
  Leading-trailing type drum brake. <2.4L Engine>
  Floating caliper, 1-piston, solid disc brakes. <3.0L Engine>

CONFIGURATION DIAGRAM

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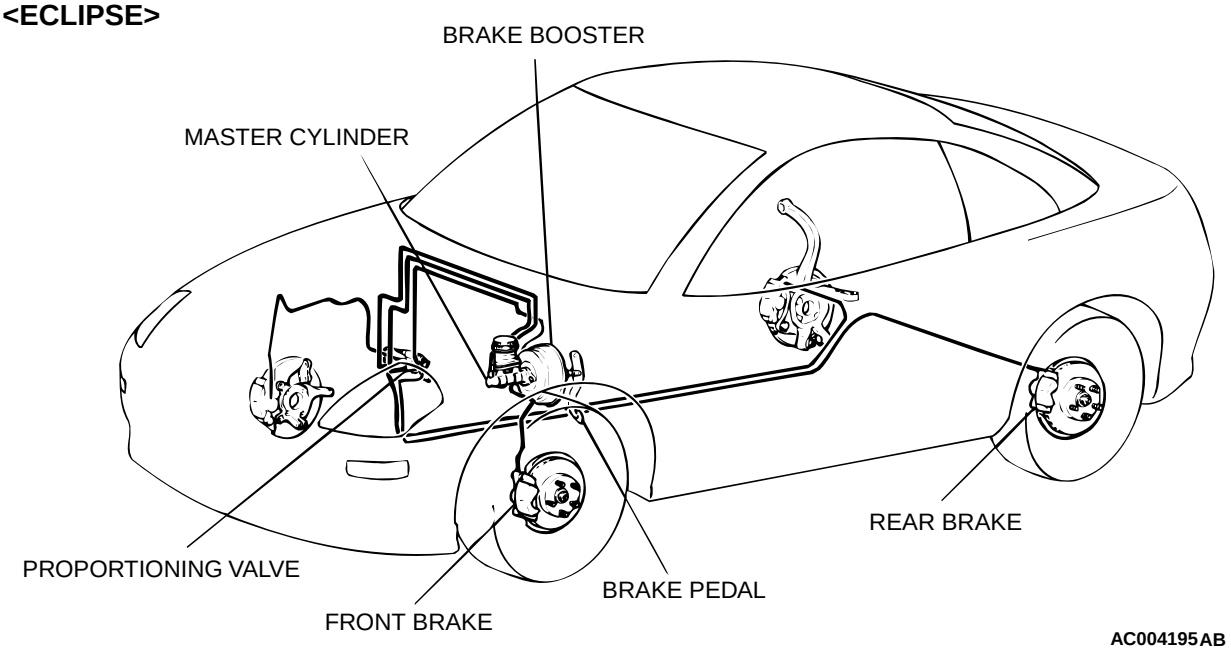

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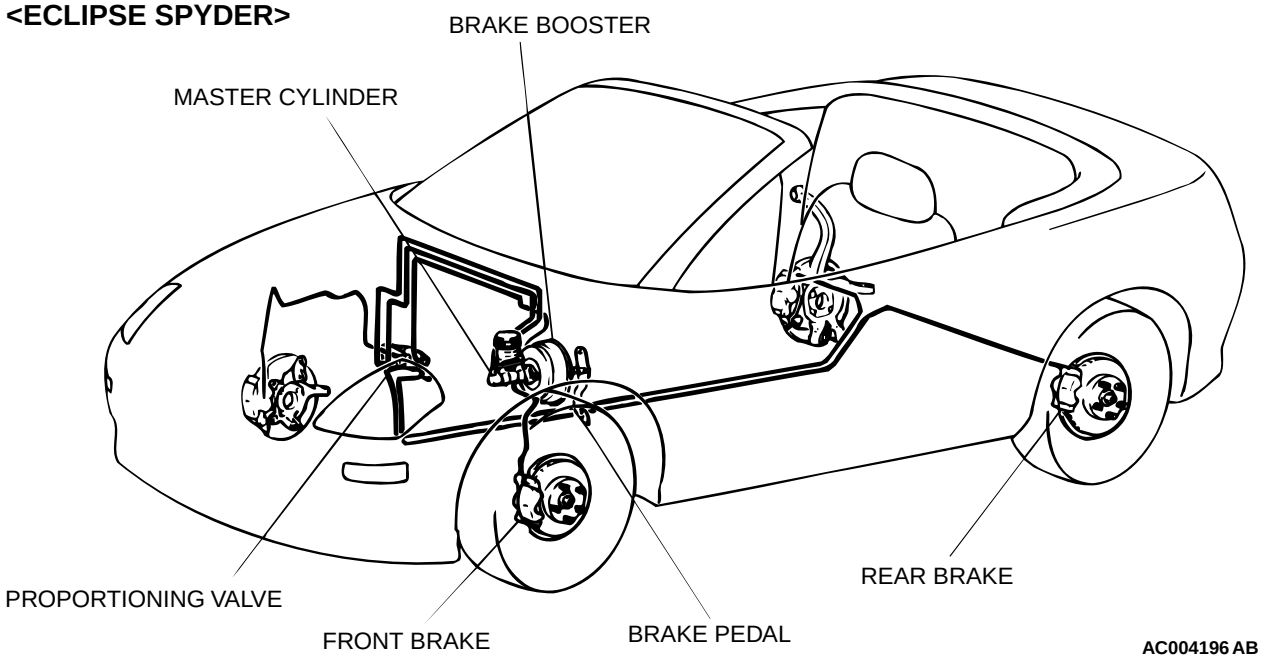

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BASIC BRAKE SYSTEM DIAGNOSIS

INTRODUCTION TO BASIC BRAKE SYSTEM DIAGNOSIS

M1351009700171

Hydraulic brakes configured of the brake pedal, master cylinder, brake booster and drum or disc brakes, are incorporated. Malfunctions such as insufficient braking power or the generation of noise may occur due to wear, damage or incorrect adjustment of these parts.

BASIC BRAKE SYSTEM DIAGNOSTIC TROUBLESHOOTING STRATEGY

M1351009800178

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted most of the possible ways to find a basic brake system fault.

1. Gather information from the customer.
2. Verify that the condition described by the customer exists.
3. Find the malfunction by following the symptom chart.
4. Verify malfunction is eliminated.

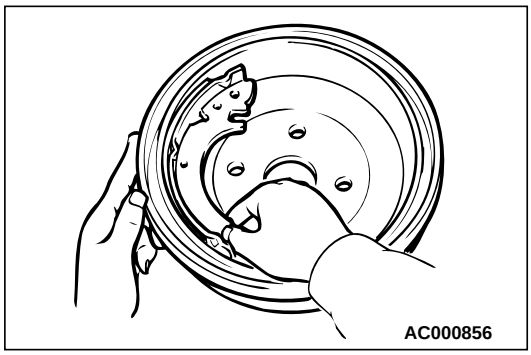
SYMPTOM CHART

M1351009900186

SYMPTOMS	INSPECTION PROCEDURE	REFERENCE PAGE
Vehicle pulls to one side when brakes are applied	1	P.35A-5
Insufficient braking power	2	P.35A-6
Increased pedal stroke (Reduced pedal-to-floor board clearance)	3	P.35A-8
Brake drag	4	P.35A-9
Scraping or grinding noise when brake are applied	5	P.35A-11
Squealing, groaning or chattering noise when brake are applied	6	P.35A-13
Squealing noise when brakes are not applied	7	P.35A-13
Groaning, clicking or rattling noise when brakes are not applied	8	P.35A-15

SYMPTOM PROCEDURES

INSPECTIONPROCEDURE 1: Vehicle Pulls to One Side when Brakes are Applied



DIAGNOSIS

STEP 1. Check for oil, water, etc., on the pad or lining contact surface of all brakes.

Q: Is oil, water, etc., on the pad or lining contact surface?

YES : Replace the part and determine and repair source/ cause of foreign material. Then go to Step 8.

NO : Go to Step 2.

STEP 2. Check the lining and brake drum contact.
<Vehicles equipped with rear drum brake>

(1) If equipped with rear disc brake, go to Step 5.

(2) Put chalk on the inner surface of the brake drum. Rub the lining against the drum inner surface.

NOTE: Clean off chalk after check.

Q: Does the lining wipe off or smudge the chalk across the full width of the lining?

YES : Go to Step 3.

NO : Replace the shoe and lining assemblies on both sides. Then go to Step 4.

STEP 3. Check the auto adjuster function (Refer to P.35A-30.).

Q: Is there fault?

YES : Repair it. Then go to step 8.

NO : Go to Step 4.

STEP 4. Check the brake drum inside diameter (Refer to P.35A-29.).

Q: Is the brake drum inside diameter outside of specifications?

YES : Replace the part. Then go to Step 8.

NO : Go to Step 5.

STEP 5. Check disc brake pistons for smooth operation.

(1) With engine not running, depress the brake pedal rapidly several times to deplete booster vacuum reserves.
(2) Test each disc brake assembly one at a time.
   a. Remove the lower caliper bolt, then remove caliper from mount.
   b. Have an assistant slowly depress the brake pedal. Confirm piston(s) extend slowly and smoothly with no jumpiness. Repeat for each disc brake assembly.

Q: Does (do) the piston(s) move correctly?

YES : Go to Step 6.
NO : Disassemble and inspect brake assembly. (Refer to P.35A-37 and/or P.35A-45.) Then go to Step 8.

STEP 6. Check brake disc(s) for run out (Refer to P.35A-25 or P.35A-26.).

Q: Is runout outside of specifications?

YES : Repair and replace as necessary. Then go to Step 8.
NO : Go to Step 7.

STEP 7. Check brake discs for correct thickness (Refer to P.35A-27.).

Q: Is the thickness outside of specifications?

YES : Repair or replace as necessary. Then go to Step 8.
NO : Go to Step 8.

STEP 8. Check symptoms.

Q: Is the symptom eliminated?

YES : Repair complete.
NO : Start over at Step 1. If a new symptom appears, refer to the symptom chart.

INSPECTION PROCEDURE 2: Insufficient Braking Power

DIAGNOSIS

STEP 1. Check whether the brake fluid is low, is the correct fluid (A/T fluid, engine oil, etc.) or is contaminated (debris, sand, etc.).

Q: Is there fault?

YES : Refill or replace with the specified brake fluid DOT 3 or DOT 4. Bleed the brakes if necessary (Refer to P.35A-21). Then go to Step 9.
NO : Go to Step 2.

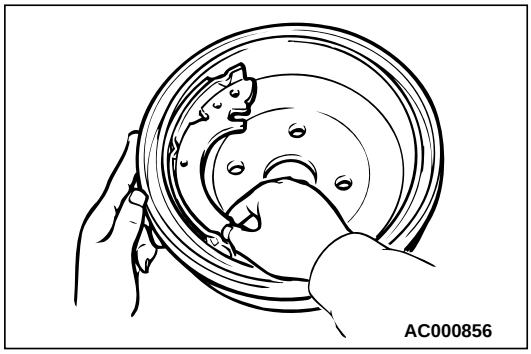
STEP 2. Check for spongy (not firm brakes).

(1) With engine not running, depress the brake pedal rapidly several times to deplete booster vacuum reserve.
(2) With the brake pedal fully released, depress the brake pedal slowly until it stops.
(3) With a measuring stick (ruler, etc.) next to the brake pedal, depress the pedal firmly and measure the distance the pedal traveled.

Q: Is the distance greater than 20 mm (0.8 inch)?

YES : Bleed the brakes to remove air in the fluid (Refer to P.35A-21.). Then go to Step 9.
NO : Go to Step 3.

STEP 3. Check the lining and brake drum contact. <Vehicles equipped with rear drum brake>



(1) If equipped with rear disc brake, go to Step 5.
(2) Put chalk on the inner surface of the brake drum. Rub the lining against the drum inner surface.

NOTE: Clean off chalk after check.

Q: Does the lining wipe off or smudge the chalk across the full width of the lining?

YES : Go to Step 5.
NO : Replace the shoe and lining assemblies on both sides. Go to Step 9.

STEP 4. Check the auto adjuster function. <Vehicles equipped with rear drum brake>

Refer to P.35A-30.

Q: Is there fault?

YES : Repair it. Then go to Step 9.
NO : Go to Step 5.

STEP 5. Check the brake booster function.

Refer to P.35A-19.

Q: Is there fault?

YES : Replace the part. Then go to Step 9.
NO : Go to Step 6.

STEP 6. Check for pinched or restricted brake tube or hose.

Q: Is there pinched or restricted brake tube or hose?

YES : Replace that complete section of brake tube or brake hose. Then go to Step 9.
NO : Go to Step 7.

STEP 7. Check for oil, water, etc., on the pad or lining contact surfaces of all brakes.

Q: Is oil, water, etc., on the pad or lining contact surface?

YES : Replace the part and determine and repair source/ cause of foreign material. Recheck symptom. Then go to Step 9.

NO : Diagnosis is complete. If condition persists, go to Step 8.

STEP 8. Check the proportioning valve operation.

Refer to P.35A-20.

Q: Is there fault?

YES : Replace the part. Then go to Step 9.

NO : Go to Step 9.

STEP 9. Recheck symptom.

Q: Is the symptom eliminated?

YES : Diagnosis is complete.

NO : Start over at step 1. If a new symptom surfaces, refer to the symptom chart.

INSPECTION PROCEDURE 3: Increased Pedal Stroke (Reduced Pedal-to-Floor Board Clearance)

DIAGNOSIS

STEP 1. Check for spongy (not firm brakes).

(1) With engine not running, depress the brake pedal rapidly several times to deplete booster vacuum reserve.
(2) With the brake pedal fully released, depress the brake pedal slowly until it stops.
(3) With a measuring stick (ruler, etc.) next to the brake pedal, depress the pedal firmly and measure the distance the pedal traveled.

Q: Is the distance greater than 20 mm (0.8 inch)?

YES : Bleed the brakes to remove air in the fluid (Refer to P.35A-21.). Then go to Step 8.

NO : Go to Step 2.

STEP 2. Check the pad or lining for wear.

Refer to P.35A-22 or P.35A-28.

Q: Is the pad or lining thickness outside of specifications?

YES : Replace the part. Then go to Step 8.

NO : Go to Step 3.

STEP 3. Check the vacuum hose and check valve for damage.

Refer to P.35A-20.

Q: Is there damage?

YES : Replace the part. Then go to Step 8.

NO : Go to Step 4.

STEP 4. Check the master cylinder function.

Refer to P.35A-31.

Q: Is there fault?

YES : Repair it. Then go to Step 8.

NO : Go to Step 5.

STEP 5. Check for brake fluid leaks.

Q: Is there leaks?

YES : Check the connection for looseness, corrosion, etc. Clean and repair as necessary. If leaking in any tube or hose section, replace the complete tube or hose. Then go to Step 8 .

NO <Vehicles with rear disc brake> : Go to Step 7.

NO <Vehicles with rear drum brake> : Go to Step 6.

STEP 6. Check the auto adjuster function. <Vehicles with rear drum brake>
Refer to P.35A-30.

Q: Is there fault?
YES : Repair the part. Then go to Step 8.
NO : Go to Step 7.

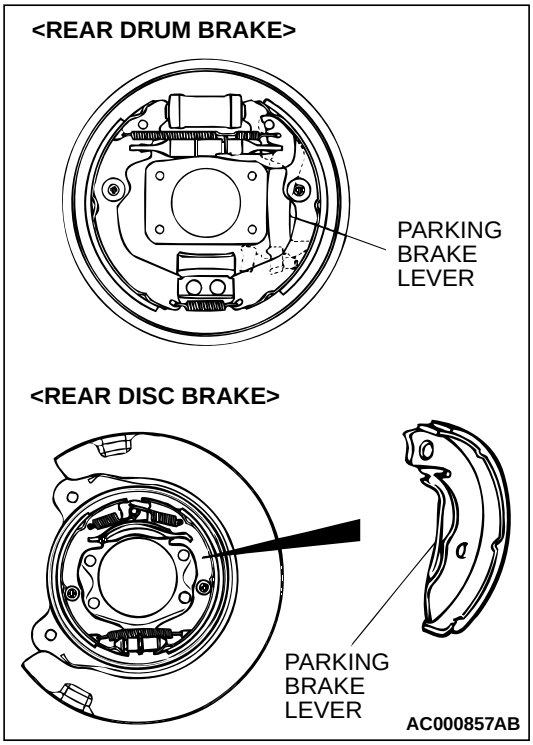
STEP 7. Check the clearance (too much) between the push rod and primary piston.
Refer to P.35A-32.

Q: Is the clearance outside of specifications?
YES : Adjust the clearance. Then go to Step 8.
NO : Go to Step 8.

STEP 8. Recheck symptom.

Q: Is the symptom eliminated?
YES : Diagnosis is complete.
NO : Start over at step 1. If a new symptom surfaces, refer to the symptom chart.

INSPECTION PROCEDURE 4: Brake Drag

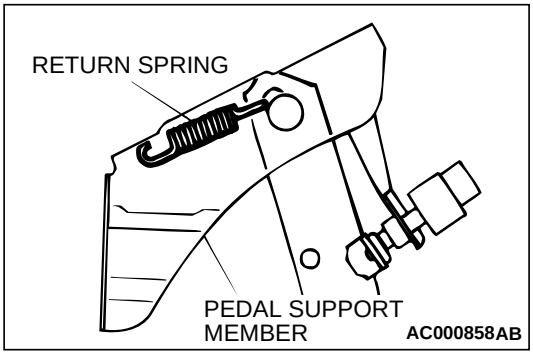


DIAGNOSIS

STEP 1. Check the parking brake lever return.
Q: Is there fault?
YES : Repair it. Then go to Step 10.
NO : Go to Step 2.

STEP 2. Check the parking brake pull amount.
Refer to GROUP 36, On-vehicle Service – Parking Brake Lever Stroke Check and Adjustment P.36-4.

Q: Is there fault?
YES : Adjust it. Then go to Step 10.
NO : Go to Step 3.

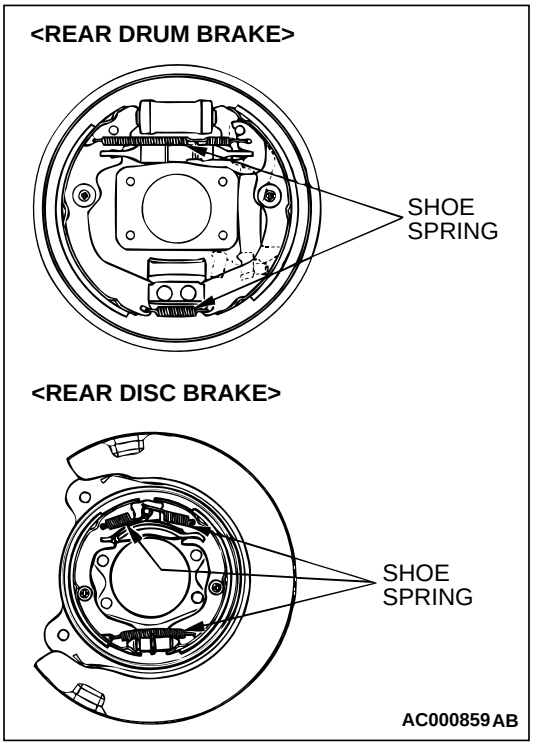


STEP 3. Check the brake pedal return spring for deterioration.

Q: Is there deterioration?

YES : Replace the spring. Then go to Step 10.

NO : Go to Step 4.



STEP 4. Check the brake shoe springs for breakage.

Q: Are the brake shoe springs broken?

YES : Replace the spring. Then go to Step 10.

NO : Go to Step 5.

STEP 5. Check the amount of grease at each sliding section.

Refer to P.35A-45 or refer to GROUP 36, Parking Brake Drum P.36-11.

Q: Is the grease amount low?

YES : Apply grease. Then go to Step 10.

NO : Go to Step 6.

STEP 6. Check the clearance (too low) between the push rod and primary piston.

Refer to P.35A-32.

Q: Is there fault?

YES : Adjust the clearance. Then go to Step 10.

NO : Go to Step 7.

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STEP 7. Check the master cylinder piston return spring for damage and return port for clogging.
Refer to P.35A-34.

Q: Is there damage?

YES : Replace the part. Then go to Step 10.
NO : Go to Step 8.

STEP 8. Check port for clogging.

Q: Is the port clogged?

YES : Repair it. Then go to Step 10.
NO : Go to Step 9.

STEP 9. Check disc brake pistons for sticking.
Depress the brake pedal, then release. Confirm each wheel spins freely.

Q: Are all wheels stuck?

YES : Inspect that brake assembly. Then go to Step 10.
NO : Go to Step 10.

STEP 10. Recheck symptom.

Q: Is the symptom eliminated?

YES : Diagnosis is complete.
NO : Start over at step 1. If a new symptom surfaces, refer to the symptom chart.

INSPECTION PROCEDURE 5: Scraping or Grinding Noise when Brakes are Applied

DIAGNOSIS

STEP 1. Check the front brakes, then rear brakes, for metal-to-metal condition.

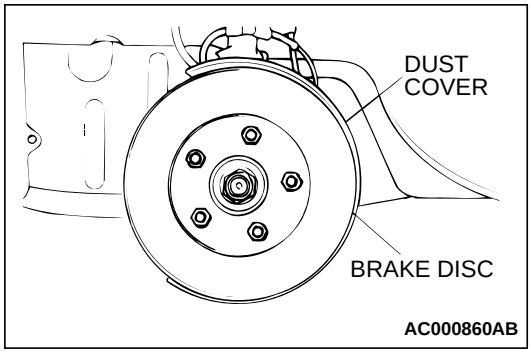
Q: Is the metal-to-metal contact evident?

YES : Repair or replace components. Then go to Step 6.
NO : Go to Step 2.

STEP 2. Check for interference between the caliper and wheel.

Q: Is there interference?

YES : Repair or replace the part. Then go to Step 6.
NO : Go to Step 3.



STEP 3. Check for interference between the dust cover and brake disc.

Q: Is there interference?

YES : Repair or replace the part. Then go to Step 6.
NO : Go to Step 4.

STEP 4. Check the brake drums or discs for cracks.

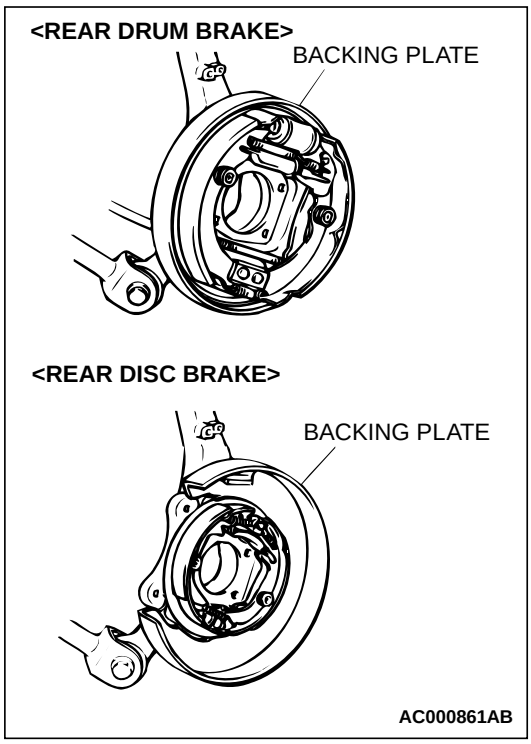
Q: Are there cracks?

YES : Repair or replace the part. Then go to Step 6.
NO : Go to Step 5.

STEP 5. Check for bent backing plate(s).

Q: Is (Are) the backing plate(s) bent?

YES : Repair or replace the part. Then go to Step 6.
NO : Go to Step 6.



STEP 6. Recheck symptom.

Q: Is the symptom eliminated?

YES : Diagnosis is complete.
NO : Start over at step 1. If a new symptom surfaces, refer to the symptom chart.

INSPECTION PROCEDURE6: Squealing, Groaning or Chattering Noise when Brakes are Applied

DIAGNOSIS

STEP 1. Check the brake drums and lining or brake disc and pads for wear or cutting.

Q: Is there wear or cutting?
YES : Repair or replace the part. Then go to Step 7.
NO : Go to Step 2.

STEP 2. Check the calipers for rust.

Q: Is there rust?
YES : Remove the rust. Then go to Step 7.
NO : Go to Step 3.

STEP 3. Check the lining parts for damage.
If equipped with rear disc brakes, go to Step 6.

Q: Is there damage?
YES : Repair or replace the part. Then go to Step 7.
NO : Go to Step 4.

STEP 4. Check whether the lining is dirty or greasy.

Q: Is the lining dirty or greasy?
YES : Clean or replace the part. Then go to Step 7.
NO : Go to Step 5.

STEP 5. Check whether the shoe hold-down springs are weak or the shoe-hold-down pins and springs are loose or damaged.

Q: Is there fault?
YES : Repair or replace the part. Then go to Step 7.
NO : Go to Step 6.

STEP 6. Adjust the brake pedal or brake booster pushrod.
Refer to P.35A-17 or P.35A-32.

Q: Is the adjustment value come?
YES : Adjust. Then go to Step 7.
NO : Go to Step 7.

STEP 7. Recheck symptom.

Q: Is the symptom eliminated?
YES : Diagnosis is complete.
NO : Start over at step 1. If a new symptom surfaces, refer to the symptom chart.

INSPECTION PROCEDURE 7: Squealing Noise when Brakes are not Applied

DIAGNOSIS

STEP 1. Check whether the backing plate is bent or loose and interfering with the drum. <Vehicles equipped with rear drum brakes>
If equipped with rear disc brakes, go to Step 4.

Q: Is there fault?
YES : Replace the part. Then go to Step 10.
NO : Go to Step 2.

STEP 2. Check whether the drum is damaged due to interference with the backing plate or shoe.

Q: Is there damage?
YES : Replace the part. Then go to Step 10.
NO : Go to Step 3.

STEP 3. Check the brake drum for wear and the shoe-to-shoe spring for damage.

Q: Is there wear or damage?

YES : Replace the part. Then go to Step 10.
NO : Go to Step 4.

STEP 4. Check the brake discs for rust.

Q: Are the brake discs rusted?

YES : Remove the rust by using sand paper. If still rusted, turn the rotors with an on-the-car brake lathe. Then go to Step 10.
NO : Go to Step 5.

STEP 5. Check the brake pads for correct installation.

Q: Are the pads installed incorrectly?

YES : Repair it. Then go to Step 10.
NO : Go to Step 6.

STEP 6. Check the calipers for correct installation.

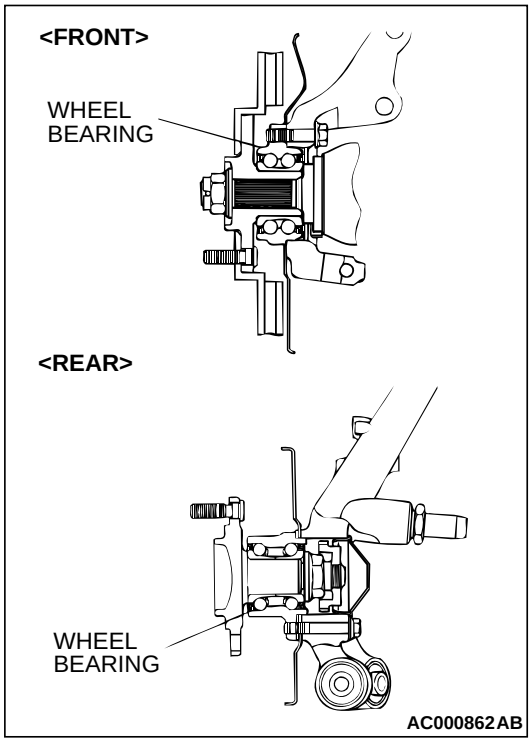
Q: Are the calipers installed incorrectly?

YES : Repair it. Then go to Step 10.
NO : Go to Step 7.

STEP 7. Check the wheel bearings for deterioration or damage, and the grease quality and quantity.

Q: Are the wheel bearings damaged or out of grease?

YES : Apply grease or replace the part. Then go to Step 10.
NO : Go to Step 8.



STEP 8. Check whether the brake booster, master cylinder or wheel cylinder return is insufficient.

Q: Is the brake booster, master cylinder or wheel cylinder return insufficient?

YES : Replace the part. Then go to Step 10.
NO : Go to Step 9.

STEP 9. Adjust the brake pedal or brake booster pushrod.
Refer to P.35A-17 or P.35A-32.

Q: Is the adjustment value come?

YES : Adjust. Then go to Step 10.
NO : Go to Step 10.

STEP 10. Recheck symptom.

Q: Is the symptom eliminated?

YES : Diagnosis is complete.
NO : Start over at step 1. If a new symptom surfaces, refer to the symptom chart.

INSPECTION PROCEDURE 8: Groaning, Clicking or Rattling Noise when Brakes are not Applied.

DIAGNOSIS

STEP 1. Check whether foreign material has entered the wheel covers.

Q: Is there foreign material?

YES : Remove it. Then go to Step 5.
NO : Go to Step 2.

STEP 2. Check for looseness of the wheel nuts.

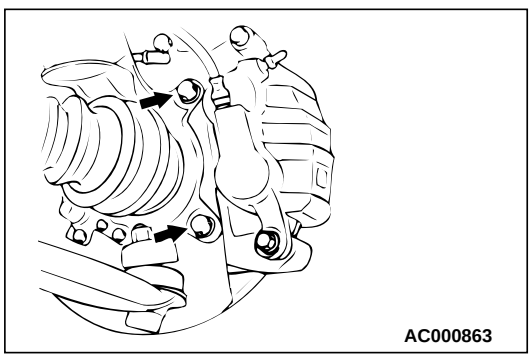
Q: Are the wheel nuts loose?

YES : Tighten to 98 ± 10 N·m (73 ± 7 ft-lb). Then go to Step 5 .
NO : Go to Step 3.

STEP 3. Check for looseness of the caliper installation bolt.

Q: Is the caliper installation bolt loose?

YES : Tighten to 100 ± 110 N·m (74 ± 7 ft-lb) for the front caliper, or 60 ± 5 N·m (45 ± 3 ft-lb) for the rear caliper. Then go to Step 5.
NO : Go to Step 4.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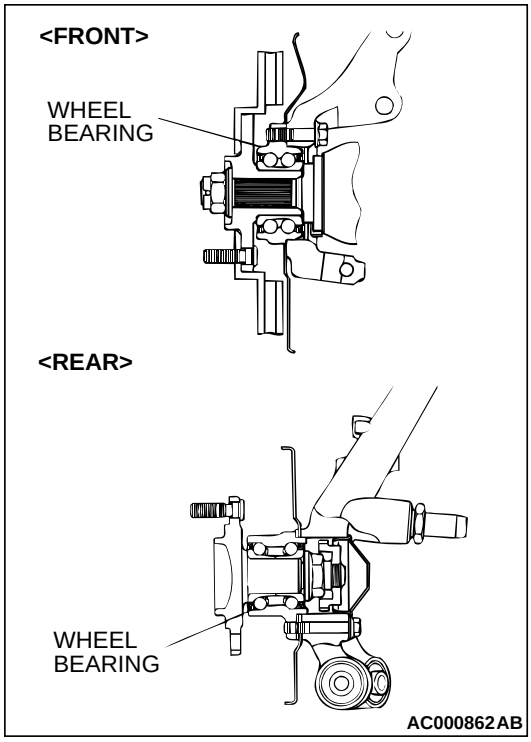


STEP 4. Check the wheel bearings for wear, damage or dryness.

Q: Is there fault?

YES : Apply grease or replace the part. Then go to Step 5.

NO : Go to Step 5.

STEP 5. Recheck symptom.

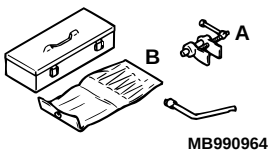
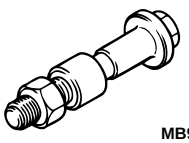
Q: Is the symptom eliminated?

YES : Diagnosis is complete.

NO : Start over at step 1. If a new symptom surfaces, refer to the symptom chart.

SPECIAL TOOLS

M1351000600188

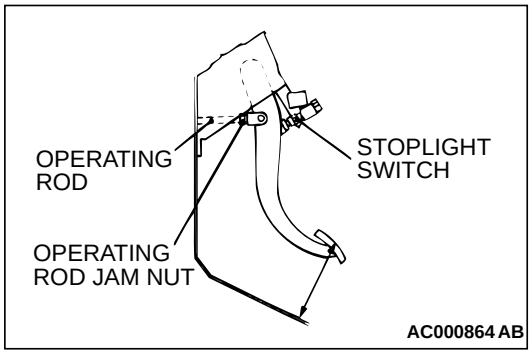
TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
	MB990964 A: MB990520 B: MB990619 Brake tool set A: Disc brake piston expander B: Installer	General service tool	• Pushing-in of the disc brake piston • Installation of the drum brake wheel cylinder piston cup
	MB990998 Front hub remover and installer	MB990998-01	Provisional holding of the wheel bearing

ON-VEHICLE SERVICE

BRAKE PEDAL CHECK AND ADJUSTMENT

M1351000900220

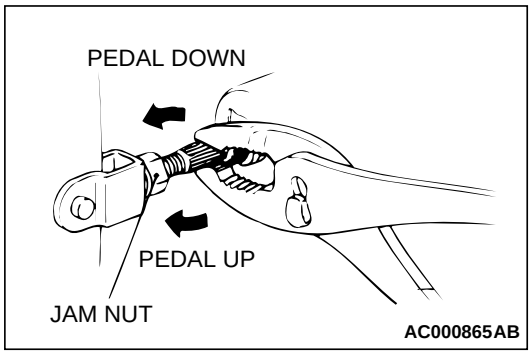
BRAKE PEDAL HEIGHT



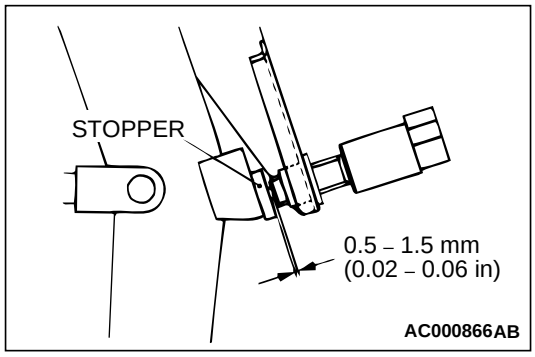
1. Turn up the carpet etc. under the brake pedal.
2. Measure the brake pedal height as illustrated. If it is not within the standard value, adjust as follows.

   Standard value: 175 – 178 mm (6.9 – 7.0 inches) [From the surface of melting sheet (floorboard) to the face of pedal pad]

   (1) Disconnect the stoplight switch connector.
   (2) Rotate the stoplight switch 1/4 turn counter clockwise to loosen.

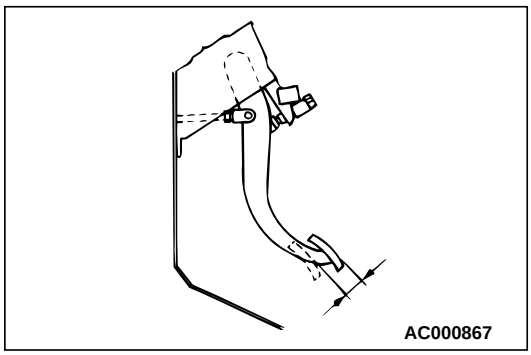


   (3) Loosen the operating rod jam nut. Turn the serrations of the operating rod with pliers to adjust the brake pedal height to the standard value.



   (4) Push the stoplight switch until its thread part contacts the stopper. During this step, secure the pedal by moving it forward by hand.
   (5) Turn the stoplight switch 1/4 turn clockwise to secure. Confirm that the clearance between the switch plunger and the stopper is as shown.
   (6) Connect the connector of the stoplight switch.
   (7) Check to be sure that the stoplight does not illuminated with the brake pedal released
3. Return the carpet, etc. to its original position.

BRAKE PEDAL FREE PLAY

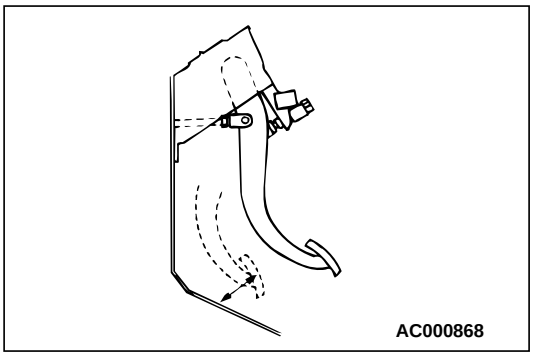


1. Turn the ignition switch to the "LOCK" (OFF) position, depress the brake pedal two or three times. After eliminating the vacuum in the brake booster, press the pedal down by hand, and confirm that the amount of movement before resistance is met (free play) is within the standard value range.

   Standard value: 3 – 8 mm (0.12 – 0.31 inch)

2. If the brake pedal play is not within the standard value, check the following, and adjust or replace if necessary:
   - Excessive play between the brake pedal and the clevis pin, or between the clevis pin and the brake booster operating rod
   - Brake pedal height
   - Installation position of the stoplight switch, etc.

CLEARANCE BETWEEN BRAKE PEDAL AND FLOORBOARD

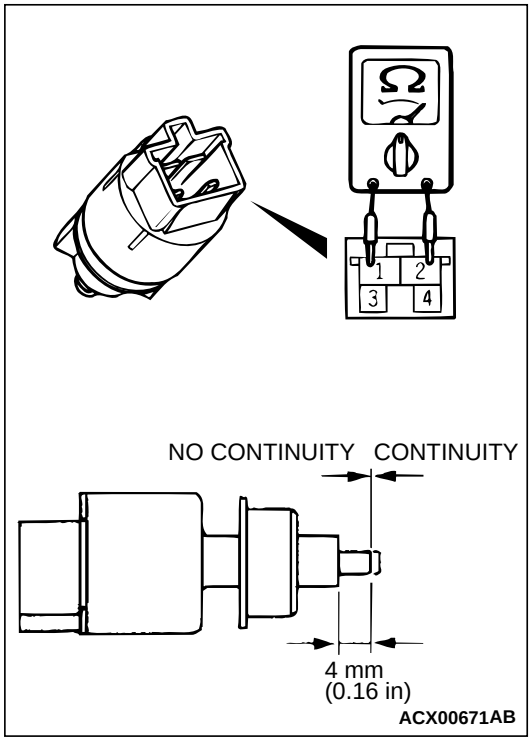


1. Turn up the carpet etc. under the brake pedal.
2. Start the engine, depress the brake pedal with approximately 490 N (110 pound) of force, and measure the clearance between the brake pedal and the floorboard.

   Standard value: 90 mm (3.5 inches) or more [From the surface of melting sheet (floorboard) to the face of pedal pad]
3. If the clearance is outside the standard value, check for air trapped in the brake line, thickness of the disc brake pad, clearance between the lining and the drum and dragging in the parking brake. And then adjust and replace defective parts as required.
4. Return the carpet etc. to its original position.

STOPLIGHT SWITCH CHECK

M1351008900183



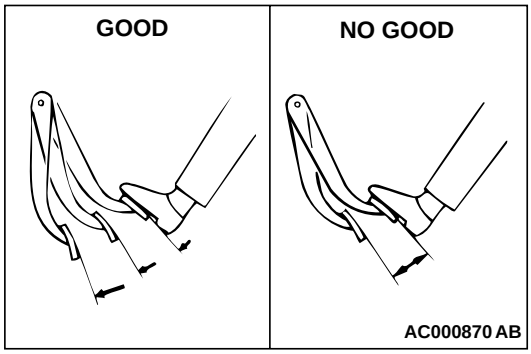
1. Connect an ohmmeter between the stoplight switch connector terminals.
2. There should be no continuity between the terminals when the plunger is pushed in as shown. There should be continuity when it is released.

TESTER CONNECTION	PLUNGER	SPECIFIED CONDITION
1 – 2	If the plunger is pushed in.	Open circuit
	If the plunger is released.	Less than 2Ω

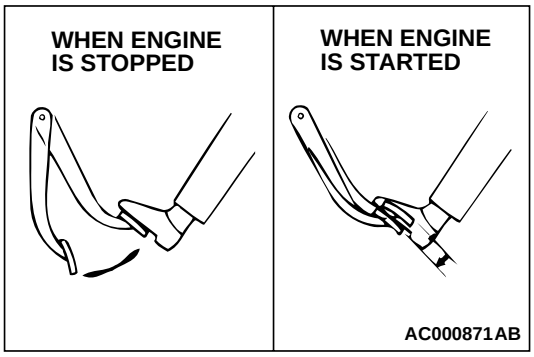
BRAKE BOOSTER OPERATING TEST

M1351001000190

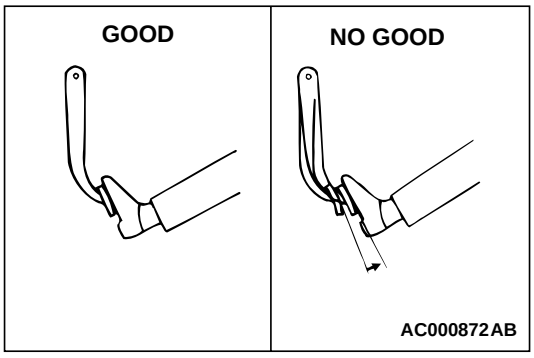
1. For simple checking of the brake booster operation, carry out the following tests:



(1) Run the engine for one or two minutes, and then stop it. If the pedal depresses fully the first time but gradually becomes higher when depressed succeeding times, the booster is operating properly. If the pedal height remains unchanged, the booster is defective. Go to step 2.



(2) With the engine stopped, step on the brake pedal several times. Then step on the brake pedal and start the engine. If the pedal moves downward slightly, the booster is in good condition. If there is no change, the booster is defective. Go to step 3.



(3) With the engine running, step on the brake pedal and then stop the engine. Hold the pedal depressed for 30 seconds. If the pedal height does not change, the booster is in good condition, if the pedal rises, the booster is defective.

2. If the above three tests are okay, the booster is OK. If one of the above three tests is not okay, the check valve, vacuum hose, or booster is defective. Check the check valve (Refer to P.35A-20.), vacuum hose for leaks, high volume engine vacuum applied to booster. Repair or replace as necessary. If these are OK, replace booster and repeat this test starting at Step 1.

CHECK VALVE OPERATION CHECK

M1351009000194

⚠ CAUTION

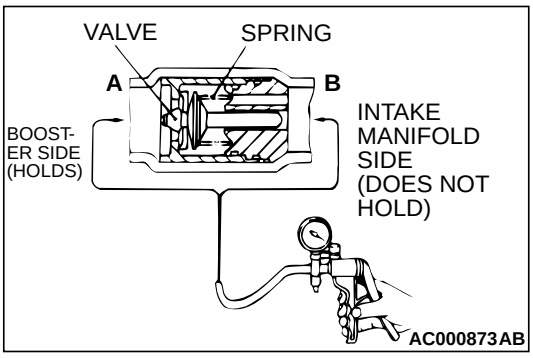
The check valve should not be removed from the vacuum hose.

1. Remove the vacuum hose. (Refer to P.35A-32.)

⚠ CAUTION

If the check valve is defective, replace it as an assembly unit together with the vacuum hose.

2. Check the operation of the check valve by using a vacuum pump.

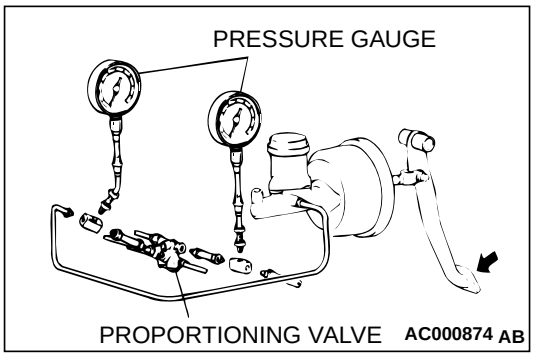


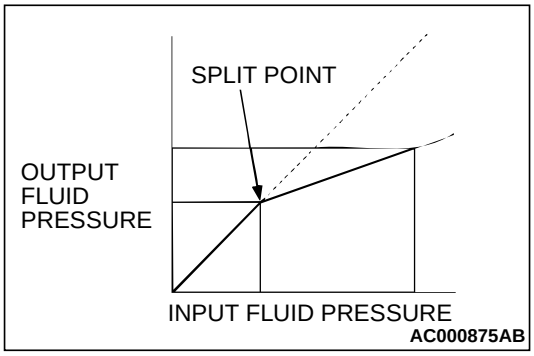
VACUUM PUMP CONNECTION	CRITERIA
Connection at the brake booster side (A)	A negative pressure (vacuum) is created and held.
Connection at the intake manifold side (B)	A negative pressure (vacuum) is not created.

PROPORTIONING VALVE FUNCTION TEST

M1351001100197

1. Connect two pressure gauges, one each to the input side and output side of the proportioning valve, as shown.
2. Air bleed the brake line and the pressure gauge.
3. While gradually depressing the brake pedal, make the following measurements and check to be sure that the measured values are within the allowable range.





(1) Output fluid pressure begins to drop relative to input fluid pressure (split point).

Standard value:
<2.4L engine> 3.7 – 4.2 MPa (537 – 609 psi)
<3.0L engine> 3.2 – 3.7 MPa (464 – 537 psi)

(2) Check that the output fluid pressure is at standard value when the input fluid pressure indicates 9.8 MPa (1,422 psi).

Standard value:
<2.4L engine> 5.0 – 5.8 MPa (725 – 841 psi)
<3.0L engine> 4.6 – 5.4 MPa (667 – 783 psi)

(3) Output fluid pressure difference between left and right brake lines.

Limit: 0.8 MPa (116 psi)

4. If the measured fluid pressures are not within allowable ranges, replace the proportioning valve.

TSB Revision

BLEEDING

M1351001400217

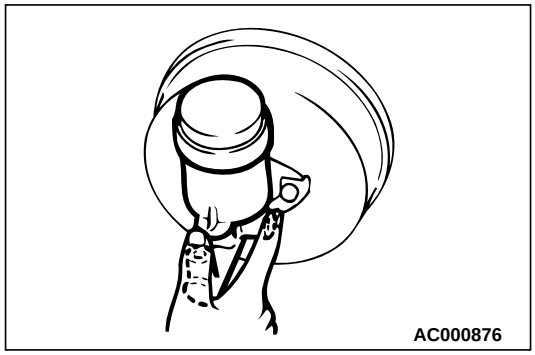
⚠ CAUTION

Use only brake fluid DOT 3 or DOT 4. Never mix the specified brake fluid with other fluid as it will influence the braking performance significantly.

MASTER CYLINDER BLEEDING

The master cylinder used has no check valve, so if bleeding is carried out by the following procedure, bleeding of air from the brake pipeline will become easier. (When brake fluid is not contained in the master cylinder.)

1. Fill the reserve tank with brake fluid.
2. Keep the brake pedal depressed.
3. Have another person cover the master cylinder outlet with a finger.
4. With the outlet still closed, release the brake pedal.
5. Repeat steps 2 – 4 three or four times to fill the inside of the master cylinder with brake fluid.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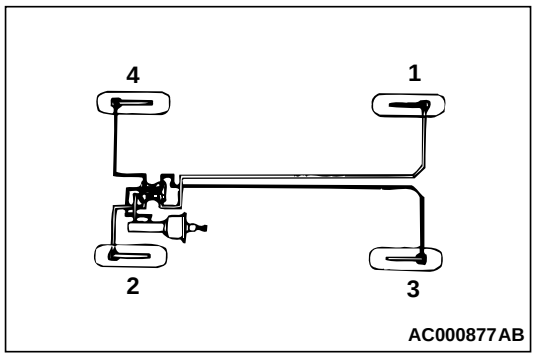
BRAKE LINE BLEEDING

⚠ CAUTION

For vehicles equipped with ABS, be sure to filter/strain the brake fluid being added to the master cylinder reservoir tank. Debris may damage the hydraulic unit.

Start the engine and bleed the air in the sequence shown in the figure.



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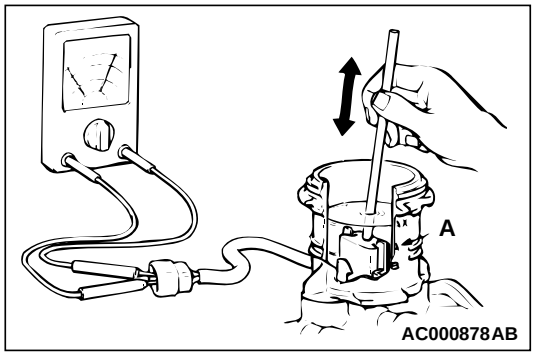
BRAKE FLUID LEVEL SENSOR CHECK

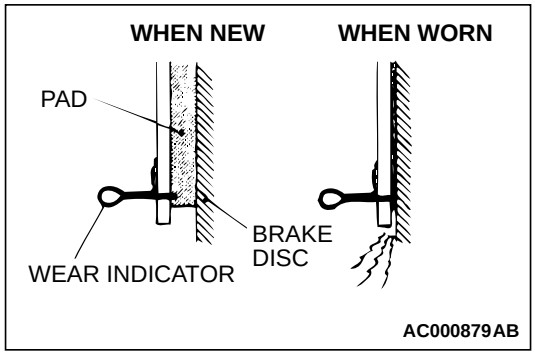
M1351009100191



The brake fluid level sensor is in good condition if there is no continuity when the float surface is above "A" and if there is continuity when the float surface is below "A."

DISC BRAKE PAD CHECK AND REPLACEMENT

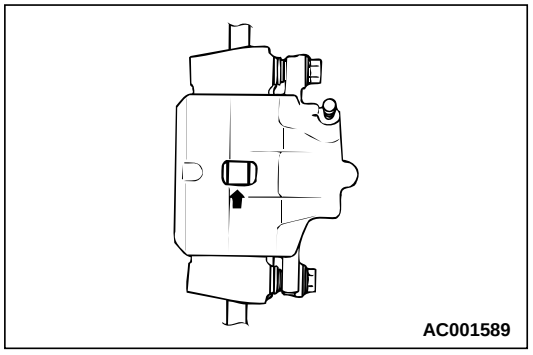
M1351002300161



NOTE: The brake pads have indicators that contact the brake disc when the brake pad thickness becomes 2 mm (0.08 inch), and emit a squealing sound to warn the driver.

⚠ CAUTION

- **Whenever a pad must be replaced, replace both LH and RH wheel pads as a set to prevent the vehicle from pulling to one side when braking.**
- **If there is a significant difference in the thicknesses of the pads on the left and right sides, check the sliding condition of the piston, lock pin, and guide pin.**

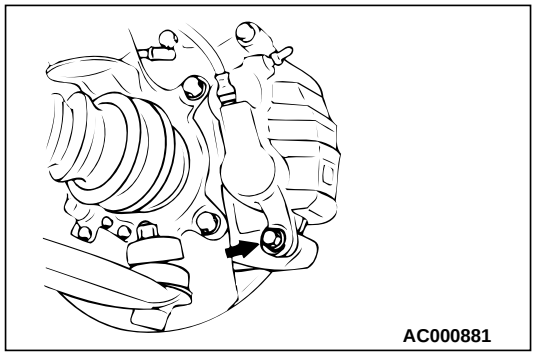


1. Check the brake pad thickness through the caliper body check port.

   Standard value: 10.0 mm (0.39 inch)
   Minimum limit: 2.0 mm (0.08 inch)

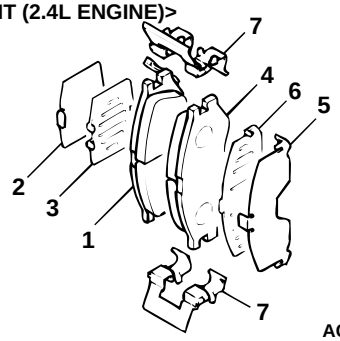
⚠ CAUTION

Do not wipe the special grease from the guide pin. Do not contaminate the guide pin.



2. Remove the guide pin. Lift the caliper assembly and secure it with a wire.

<FRONT (2.4L ENGINE)>



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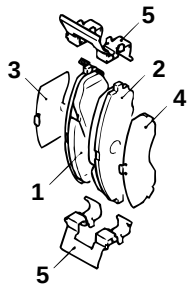
3. Remove the following parts from caliper support. <FRONT (2.4L ENGINE)>

1.	Pad and wear indicator assembly
2.	Inner shim B
3.	Inner shim A
4.	Pad assembly
5.	Outer shim B
6.	Outer shim A
7.	Clip

<FRONT (3.0L ENGINE)>



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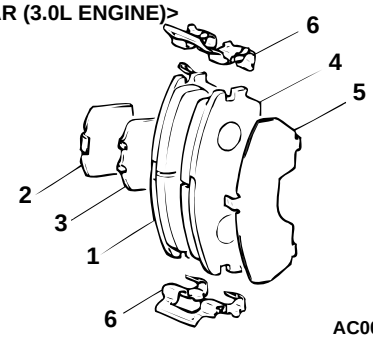
4. Remove the following parts from caliper support. <FRONT (3.0L ENGINE)>

1.	Pad and wear indicator assembly
2.	Pad assembly
3.	Inner shim
4.	Outer shim
5.	Pad clip

<REAR (3.0L ENGINE)>



AC000884AC

5. Remove the following parts from caliper support. <REAR (3.0L ENGINE)>

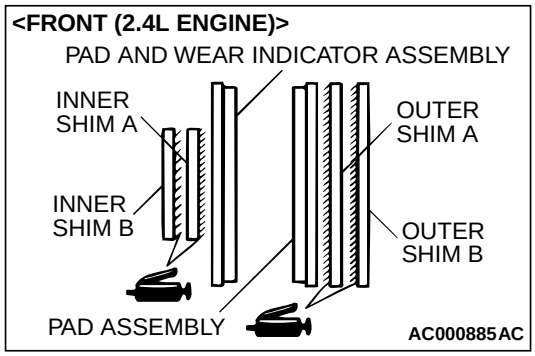
1.	Pad and wear indicator assembly
2.	Inner shim B
3.	Inner shim A
4.	Pad assembly
5.	Outer shim
6.	Clip

6. Measure the hub torque before and after pad installation.
   Follow the procedure:
   Front: Refer to P.35A-35.
   Rear: Refer to P.35A-43.

⚠ CAUTION

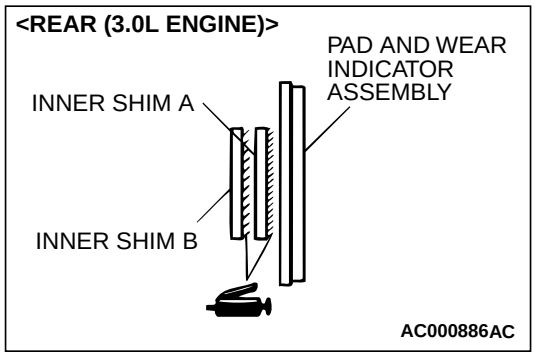
Do not apply excessive grease. Excessive grease may cause brake performance to become poor.

7. For front disc brake <2.4L ENGINE> and rear disc bake <3.0L ENGINE>, apply brake grease SAE J310, NLGI number 1 to the following positions before installing the pad.



<FRONT (2.4L ENGINE)>

- Pad and wear indicator assembly and inner shim A contact surface
- Inner shim A and inner shim B contact surface
- Pad assembly and outer shim A contact surface
- Outer shim A and inner shim B contact surface



<REAR (3.0L ENGINE)>

- Pad and wear indicator assembly and inner shim A contact surface
- Inner shim A and inner shim B contact surface

8. Install the pad and caliper assembly, and check the brake drag force.
   Front: Refer to P.35A-35.
   Rear: Refer to P.35A-43.

DISC BRAKE ROTOR CHECK

M1351002900174

⚠ CAUTION

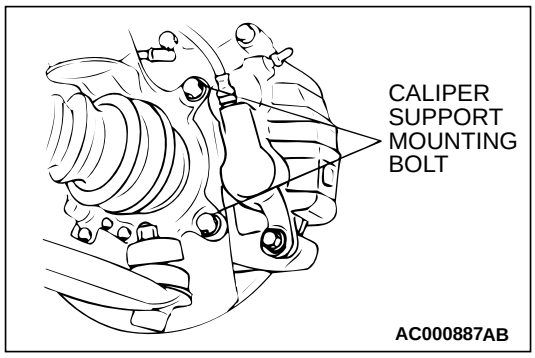
Disc brakes must be kept within the allowable service values in order to maintain normal brake operation.

Before turning the brake disc, the following conditions should be checked.

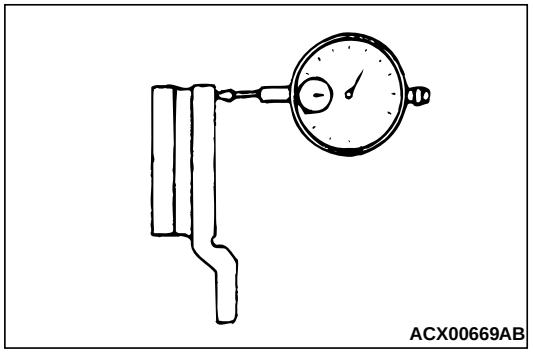
INSPECTION ITEMS	REMARKS
Scratches, rust, saturated lining materials and wear	• If the vehicle is not driven for a long period of time, sections of the discs that are not in contact with the pads will become rusty, causing noise and shuddering. • If grooves and scratches resulting from excessive disc wear are not removed prior to installing a new pad assembly, there will be inadequate contact between the disc and the lining (pad) until the pads conform to the disc.
Run-out	Excessive run-out of the discs will increase the pedal depression resistance due to piston kick-back.
Change in thickness (parallelism)	If the thickness of the disc changes, this will cause pedal pulsation, shuddering and surging.
Warping (flatness) or distortion	Overheating and improper handling while servicing will cause warping or distortion.

FRONT BRAKE DISC RUN-OUT CHECK AND CORRECTION

M1351009400307

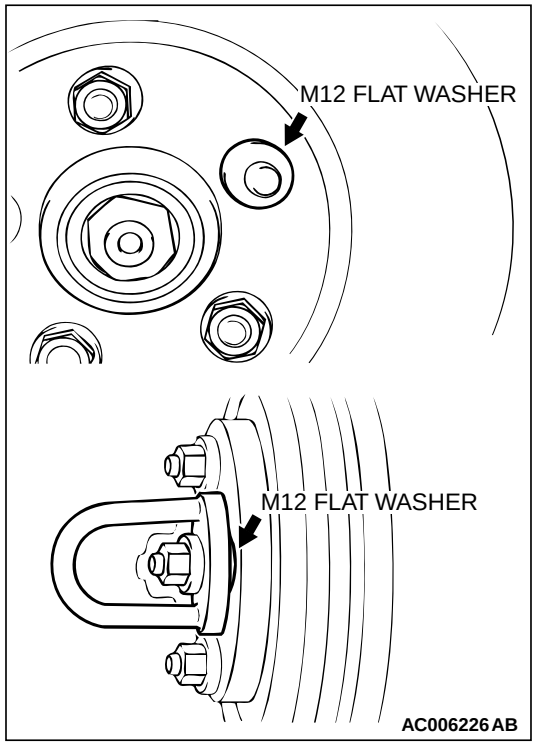


1. Remove the caliper support; then raise the caliper assembly upward and secure it with a wire.
2. Inspect the disc surface for grooves, cracks and rust. Clean the disc thoroughly and remove all rust.



3. Place a dial gauge approximately 5 mm (0.2 inch) from the outer circumference of the brake disc, and measure the run-out of the disc.

   Limit: 0.06 mm (0.002 inch)



⚠ CAUTION

- **When the on-the-car type lathe is used, first install M12 flat washer on the stud bolt in the brake disc side according to the figure, and then install the adapter. If the adapter is installed with M12 flat washer not seated, the brake disc rotor may be deformed, resulting in inaccurate grinding.**
- **Grind the brake disc with all wheel nuts diagonally and equally tightened to the specified torque 100 N·m (74 ft-lb). When all numbers of wheel nuts are not used, or the tightening torque is excessive or not equal, the brake disc rotor or drum may be deformed, resulting in judder.**

4. If the run-out of the brake disc is limit value or more, turn rotor with an on-car type brake lathe ("Accuturn-8750" or equivalent). If it still exceeds the limit, inspect hub end play.

   Limit: 0.05 mm (0.002 inch)

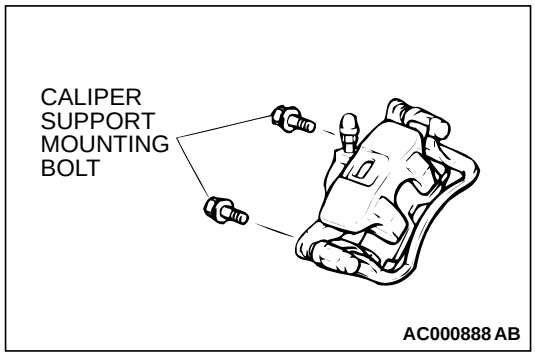
⚠ CAUTION

After a new brake disc is installed, always grind the brake disc with on-the-car type brake lathe. If this step is not carried out, the brake disc run-out exceeds the specified value, resulting in judder.

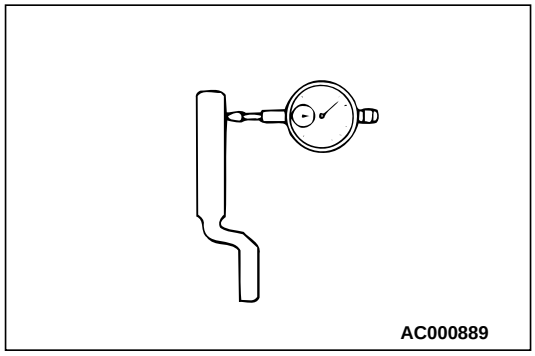
5. If the play exceeds the limit, check the hub. If the play does not exceed the limit, replace the brake disc.

REAR BRAKE DISC RUN-OUT CHECK AND CORRECTION

M1351009400318



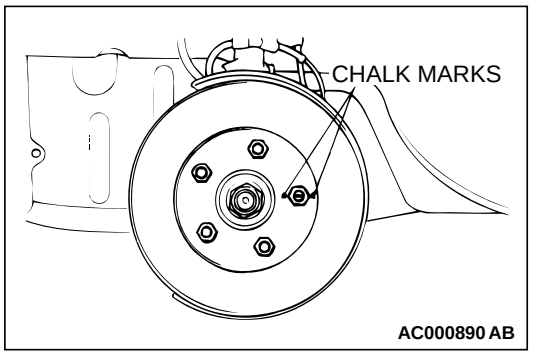
1. Remove the caliper support; then raise the caliper assembly upward and secure it with a wire.
2. Check the disc surface for grooves, cracks and rust. Clean the disc thoroughly and remove all rust.



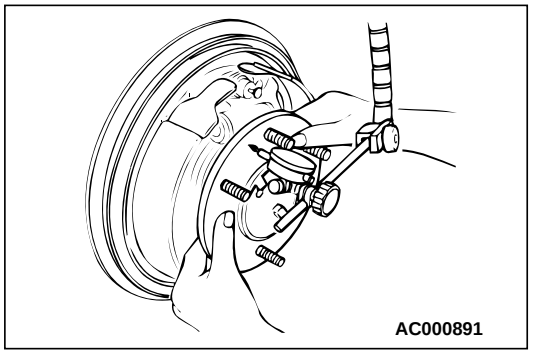
3. Place a dial gauge approximately 5 mm (0.2 inch) from the outer circumference of the brake disc, and measure the run-out of the disc.

   Limit: 0.08 mm (0.003 inch)

4. If the run-out of the brake disc is the limit value or more, change the phase of the disc and hub, and then measure the run-out again.

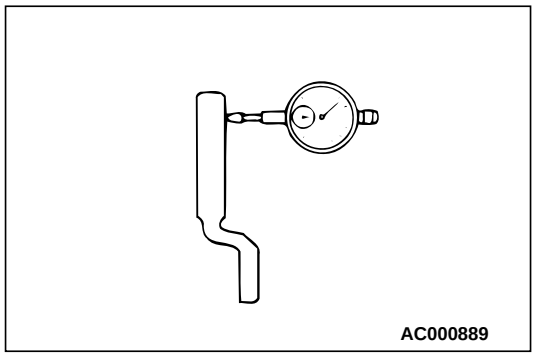


(1) Before removing the brake disc, place a mating mark on both the wheel stud and disc with chalk where the run-out is greatest.



(2) Place a dial gauge as shown in the illustration, and then move the hub in the axial direction and measure the play.

Limit: 0.05 mm (0.002 inch)


AC000889

(3) If the play does not exceed the limit install the brake disc at a different phase, and then check the run-out of the brake disc again.

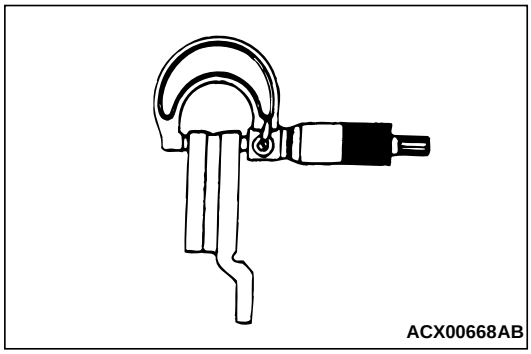
5. If the run-out cannot be corrected by changing the phase of the brake disc, replace the disc.

BRAKE DISC THICKNESS CHECK

M1351002400179

<Front>

1. Remove dirt and rust from the brake disc surface.
2. Using a micrometer, measure disc thickness at eight positions, approximately 45 degrees apart and 10 mm (0.4 inch) in from the outer edge of the disc.

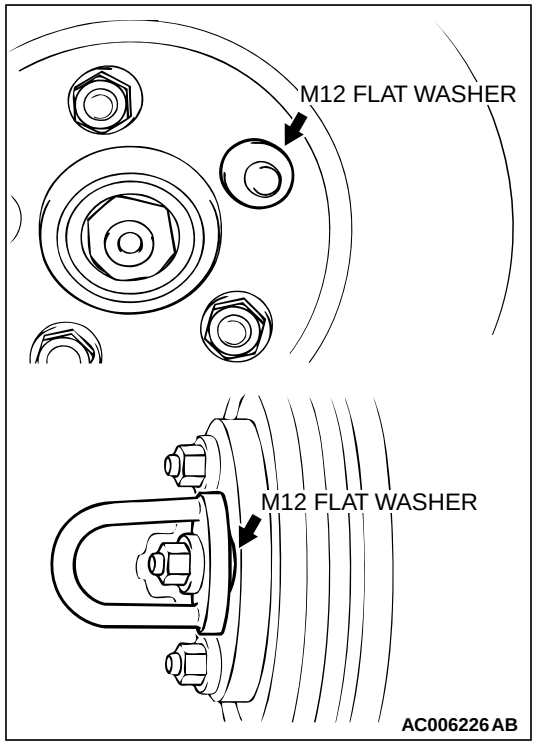

ACX00668AB

<2.4L ENGINE>
Standard value: 24.0 mm (0.9 inch)
Minimum limit: 22.4 mm (0.88 inch)
<3.0L ENGINE>
Standard value: 26.0 mm (1.02 inch)
Minimum limit: 24.4 mm (0.96 inch)

NOTE: Thickness variation (at least 8 positions) should not be more than 0.015 mm (0.0006 inch).

⚠ CAUTION

- **When the on-the-car type lathe is used, first install M12 flat washer on the stud bolt in the brake disc side according to the figure, and then install the adapter. If the adapter is installed with M12 flat washer not seated, the brake disc rotor may be deformed, resulting in inaccurate grinding.**
- **Grind the brake disc with all wheel nuts diagonally and equally tightened to the specified torque 100 N·m (74 ft-lb). When all numbers of wheel nuts are not used, or the tightening torque is excessive or not equal, the brake disc rotor or drum may be deformed, resulting in judder.**



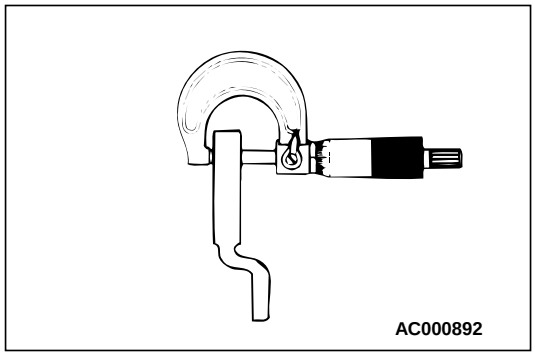
AC006226AB

3. If the disc thickness is less than the limits, replace it with a new one. If thickness variation exceeds the specification, turn rotor with an on-the-car type brake lathe ("Accuturn-8750" or equivalent).

⚠ CAUTION

After a new brake disc is installed, always grind the brake disc with on-the-car type brake lathe. If this step is not carried out, the brake disc run-out exceeds the specified value, resulting in judder.

4. If the calculated final thickness after turning the rotor is less than the standard value, replace the disc.

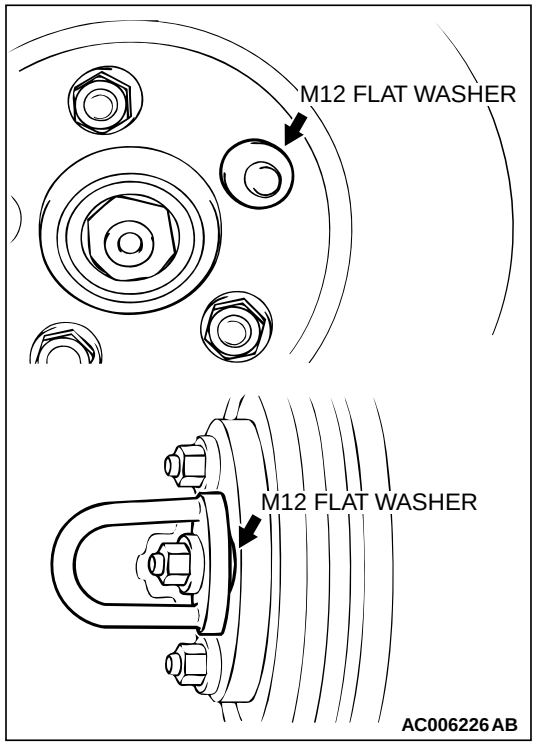


<Rear>

1. Remove dirt and rust from the brake disc surface.
2. Measure the disc thickness at four positions or more.

   Standard value: 10.0 mm (0.4 inch)
   Minimum limit: 8.4 mm (0.33 inch)

   NOTE: Thickness variation (at least 8 positions) should not be more than 0.015 mm (0.0006 inch).



⚠ CAUTION

- **When the on-the-car type lathe is used, first install M12 flat washer on the stud bolt in the brake disc side according to the figure, and then install the adapter. If the adapter is installed with M12 flat washer not seated, the brake disc rotor may be deformed, resulting in inaccurate grinding.**
- **Grind the brake disc with all wheel nuts diagonally and equally tightened to the specified torque 100 N·m (74 ft-lb). When all numbers of wheel nuts are not used, or the tightening torque is excessive or not equal, the brake disc rotor or drum may be deformed, resulting in judder.**

3. If the disc is less than 8.4 mm (0.33 inch) thick, replace it with a new one. If thickness variation exceeds the specification, turn rotor with an on-the-car brake lathe ("Accuturn-8750" or equivalent).

⚠ CAUTION

After a new brake disc is installed, always grind the brake disc with on-the-car type brake lathe. If this step is not carried out, the brake disc run-out exceeds the specified value, resulting in judder.

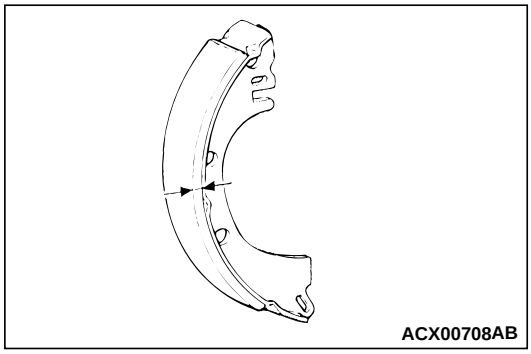
4. If the calculated final thickness is less than the standard value, replace the disc.

BRAKE LINING THICKNESS CHECK

M1351003000174

NOTE: For brake lining thickness for drum-in-disc brake, refer to GROUP 36, Parking Brake Drum – Inspection P.36-12.

1. Remove the brake drum.


ACX00708AB

2. Measure the thickness of the brake lining at the area with the worst wear.

   Standard value: 4.9 mm (0.19 inch)
   Minimum limit: 1.0 mm (0.04 inch)

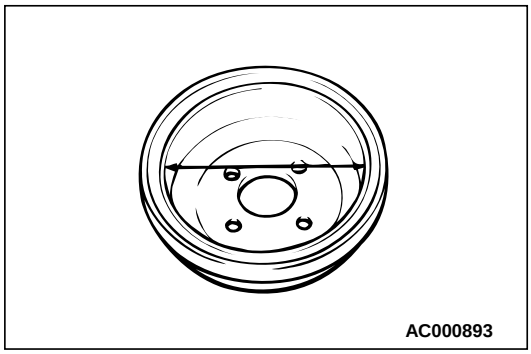
⚠ CAUTION

- **Whenever the shoe and lining assembly is replaced, replace both RH and LH assemblies as a set to prevent the car from pulling to one side when braking.**
- **If there is a significant difference in the thickness of the shoe and lining assemblies on the left and right sides, check the sliding condition of the piston.**

3. Replace the shoe and lining assembly if the brake lining thickness is less than the limit or if it is not worn evenly. For installation procedures for the shoe and lining assembly, refer to P.35A-49.

BRAKE DRUM INSIDE DIAMETER CHECK

M1351003200297


AC000893

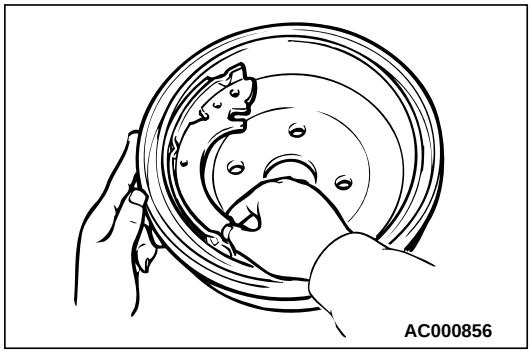
1. Remove the brake drum.
2. Measure the inside diameter of the brake drum at two or more locations.

   Standard value: 228.6 mm (9.00 inches)
   Limit: 230.6 mm (9.08 inches)

3. Replace the brake drums, shoe and lining assembly when wear exceeds the limit value or is badly imbalanced.

BRAKE LINING AND BRAKE DRUM CONTACT CHECK

M1351003100171

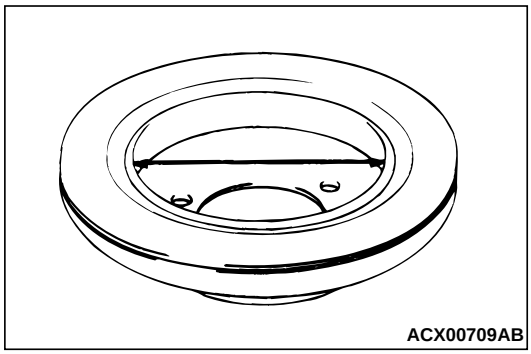

AC000856

1. Remove the brake drum.
2. Remove the shoe and lining assembly. (Refer to P.35A-49.)
3. Chalk the inner surface of the brake drum and rub with the shoe and lining assembly.
4. Replace the shoe and lining assembly or brake drums if there are any irregular contact areas.

   NOTE: Clean off chalk after check.

BRAKE DISC INSIDE DIAMETER CHECK

M1351003200305

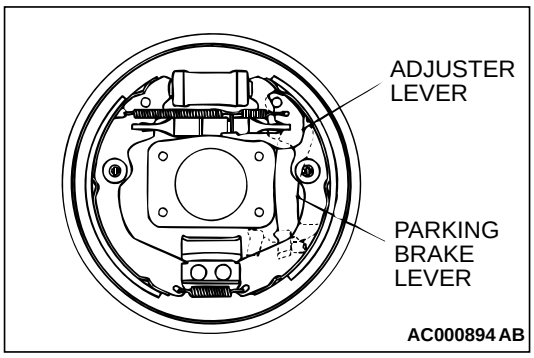

ACX00709AB

1. Remove the rear brake assembly, raise the rear brake assembly and secure it with a wire, etc.
2. Remove the brake disc.
3. Measure the inside diameter of the hub and disc at two or more locations.

   Standard value: 168.0 mm (6.61 inches)
   Limit: 169.0 mm (6.65 inches)
4. Replace the brake discs and shoe and lining assembly when the wear exceeds the limit value or if the measured areas are not equal to each other. (concentric).

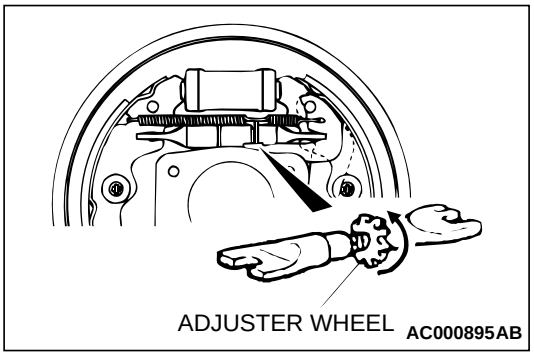
AUTO ADJUSTER FUNCTION CHECK

M1351010100151



AC000894 AB

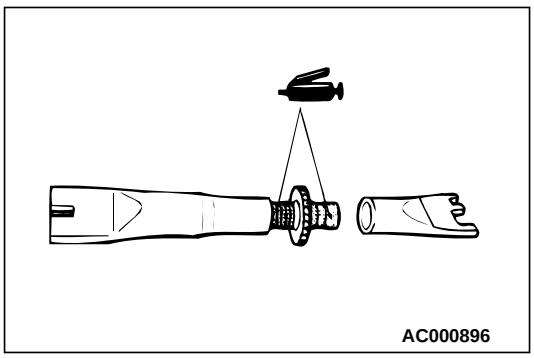
1. Remove the brake drum.
2. Operate the parking brake lever. Observe adjuster lever movement for ratcheting action of the auto adjuster. Repair or replace the lever(s) as required.
3. Remove the shoe-to-lever spring.
4. Remove the adjuster.



AC000895AB

NOTE: It may be necessary to rotate the adjuster wheel bottom to top to release tension.

5. Inspect the adjuster wheel for wear, i.e., flat spots, worn teeth, etc. Replace if faulty.
6. Check both ends of the adjuster for smooth rotation. Replace if faulty.


AC000896

7. Apply brake grease SAE J310, NLGI number 1 as shown.
8. To install adjuster, assemble the adjuster so it is at its minimum length and insert between shoe and lining assemblies.
9. Install adjuster lever and shoe-to-lever spring.
10. Rotate the adjuster wheel top to bottom until the drum has a slight drag when the drum is installed.

MASTER CYLINDER FUNCTION CHECK

M1351010200158

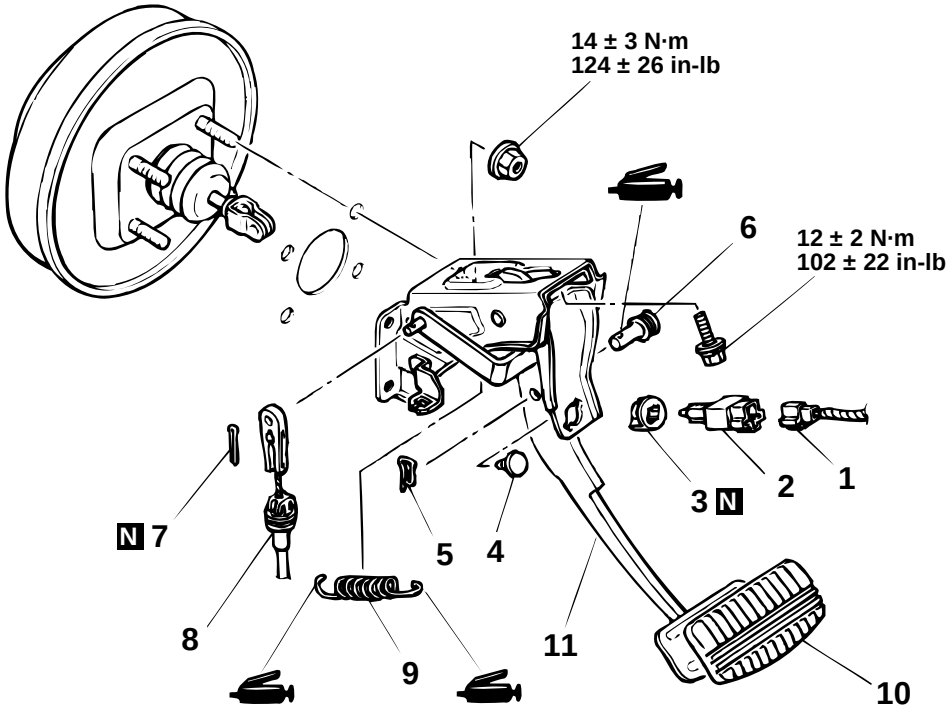
1. Remove the reservoir cap and diaphragm.
2. While watching the open reservoir from a distance of 50 cm (20 inches), have an assistant depress the brake pedal.
   If there was a stream of brake fluid rising from the reservoir, proceed to Step 3.
   If there was no stream of brake fluid rising from the reservoir, repair or replace the master cylinder.
3. While watching the open reservoir from a distance of 50 cm (20 inches), have the assistant release the brake pedal.
   If there was a small amount of air bubbles rising through the brake fluid, master cylinder function is normal.
   If there were no bubbles rising through the brake fluid, repair or replace the master cylinder.

BRAKE PEDAL

REMOVAL AND INSTALLATION

M1351003400183

Post-installation Operation
- Brake Pedal Adjustment (Refer to P.35A-17.)



AC000897 AB

REMOVAL STEPS
1. HARNESS CONNECTOR
2. STOPLIGHT SWITCH
3. ADJUSTER
4. PEDAL STOPPER
5. SNAP PIN
6. CLEVIS PIN
7. COTTER PIN <A/T>

REMOVAL STEPS (Continued)
8. SHIFT LOCK CABLE CONNECTION <A/T>
9. RETURN SPRING
10. PEDAL PAD
11. BRAKE PEDAL AND PEDAL SUPPORT MEMBER ASSEMBLY

TSB Revision

MASTER CYLINDER ASSEMBLY AND BRAKE BOOSTER

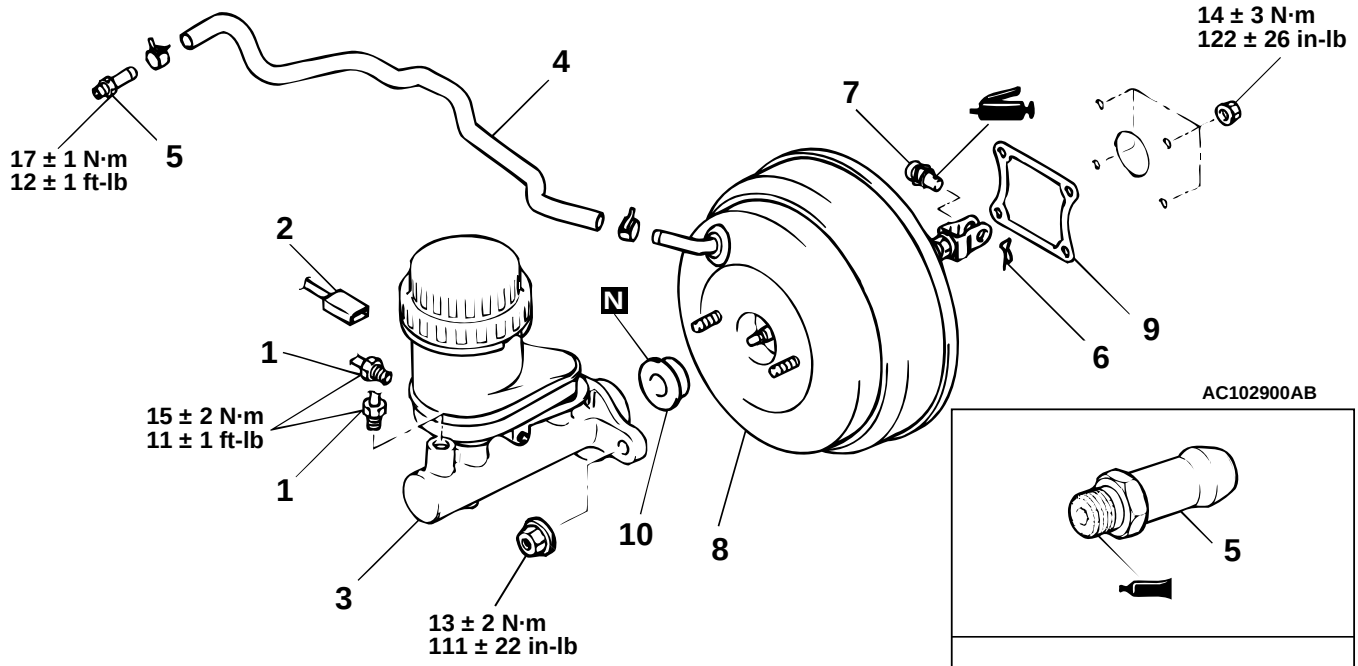
REMOVAL AND INSTALLATION

M1351003700173

⚠ CAUTION

Do not remove the check valve from the vacuum hose. If the check valve is defective, replace it together with the vacuum hose.

Pre-removal Operation	Post-installation Operation
• Brake Fluid Draining	• Brake Fluid Supplying • Brake Line Bleeding (Refer to P.35A-21.) • Brake Pedal Adjustment (Refer to P.35A-17.)



REMOVAL STEPS

1. BRAKE TUBE CONNECTION
2. BRAKE FLUID LEVEL SENSOR CONNECTOR
3. MASTER CYLINDER ASSEMBLY

>>B<< • ADJUSTMENT OF CLEARANCE BETWEEN BRAKE BOOSTER PUSHROD AND PRIMARY PISTON

>>A<< 4. VACUUM HOSE (WITH BUILT-IN CHECK VALVE)

5. FITTING

REMOVAL STEPS (Continued)

6. SNAP PIN
7. CLEVIS PIN

• STRUT TOWER BAR ASSEMBLY <VEHICLES WITH STRUT TOWER BAR> (REFER TO GROUP 42, STRUT TOWER BAR P.42-11.)

8. BRAKE BOOSTER
9. SEALER
10. PLATE AND SEAL ASSEMBLY <VEHICLES WITH TCL>

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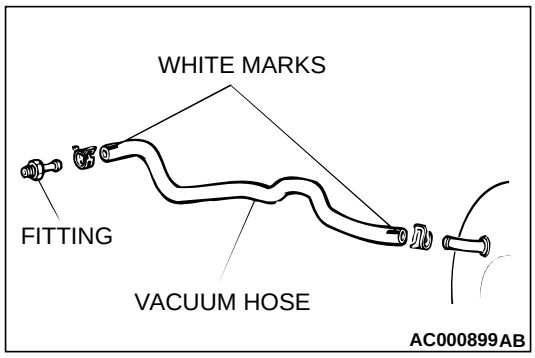
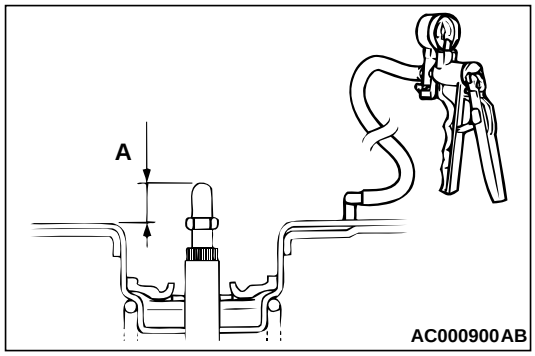
INSTALLATION SERVICE POINTS



>>A<< VACUUM HOSE CONNECTION

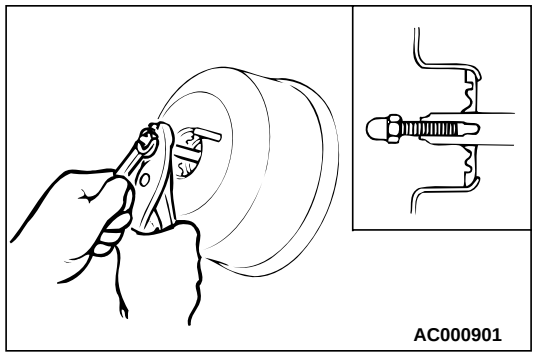
1. Install the vacuum hose with the white-marked sections facing up.
2. Insert securely and completely until the vacuum hose at the engine side contacts the edge of the hexagonal part of the fitting, and then secure with the hose clamp.



>>B<< CLEARANCE ADJUSTMENT BETWEEN BRAKE BOOSTER PUSHROD AND PRIMARY PISTON

1. Using a hand vacuum pump, apply a negative pressure of – 66.7 kPa (19.6 inHg) to the brake booster.
2. Measure protruding length A at the pushrod.

   Standard value (A): 10.28 – 10.53 mm (0.404 – 0.415 inch)



3. If the protruding length is not within the standard value range, adjust by changing the pushrod length by turning the end of the pushrod.

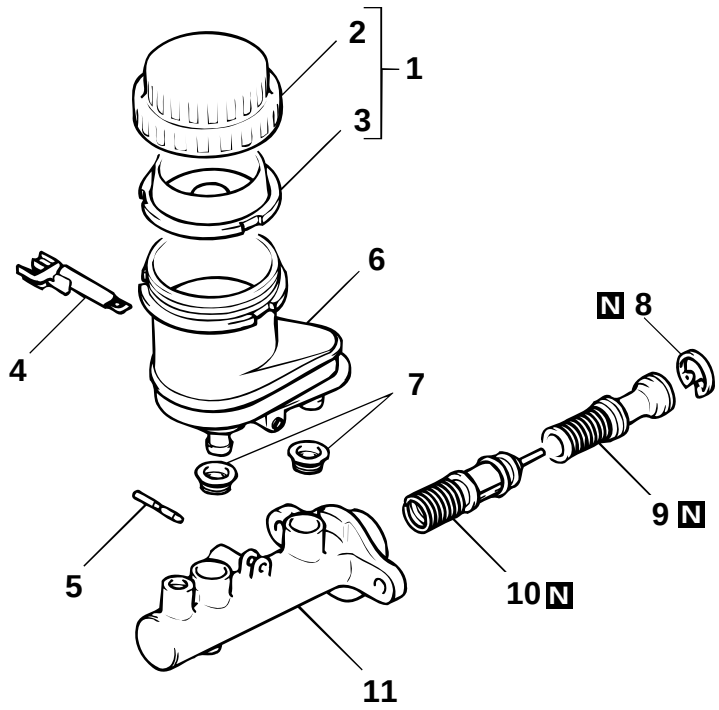
MASTER CYLINDER

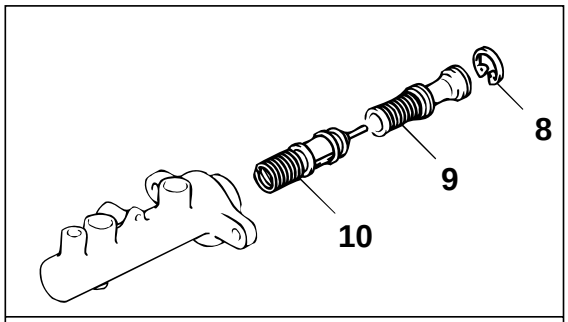
M1351004200171

DISASSEMBLY AND ASSEMBLY

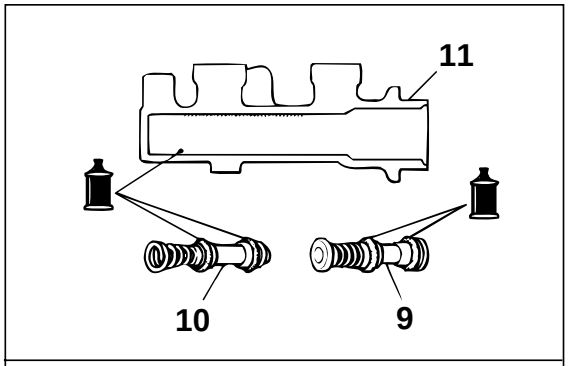
⚠ CAUTION

Do not disassemble the primary piston and secondary piston assembly.





MASTER CYLINDER KIT



BRAKE FLUID: DOT 3 OR DOT 4

AC000902 AD

DISASSEMBLY STEPS

1. RESERVOIR CAP ASSEMBLY
2. RESERVOIR CAP
3. DIAPHRAGM
4. BRAKE FLUID LEVEL INDICATOR ASSEMBLY
5. SPRING PIN

<<A>>

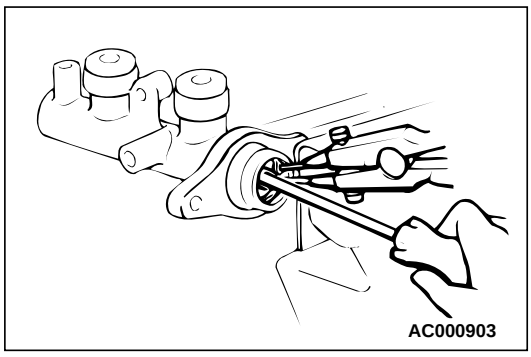
DISASSEMBLY STEPS (Continued)

6. RESERVOIR TANK
7. RESERVOIR SEAL
8. PISTON STOPPER RING
9. PRIMARY PISTON ASSEMBLY
10. SECONDARY PISTON ASSEMBLY
11. MASTER CYLINDER BODY

DISASSEMBLY SERVICE POINT

<<A>> PISTON STOPPER RING DISASSEMBLY

Remove the piston stopper ring while depressing the piston.



AC000903

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INSPECTION

M1351004300156

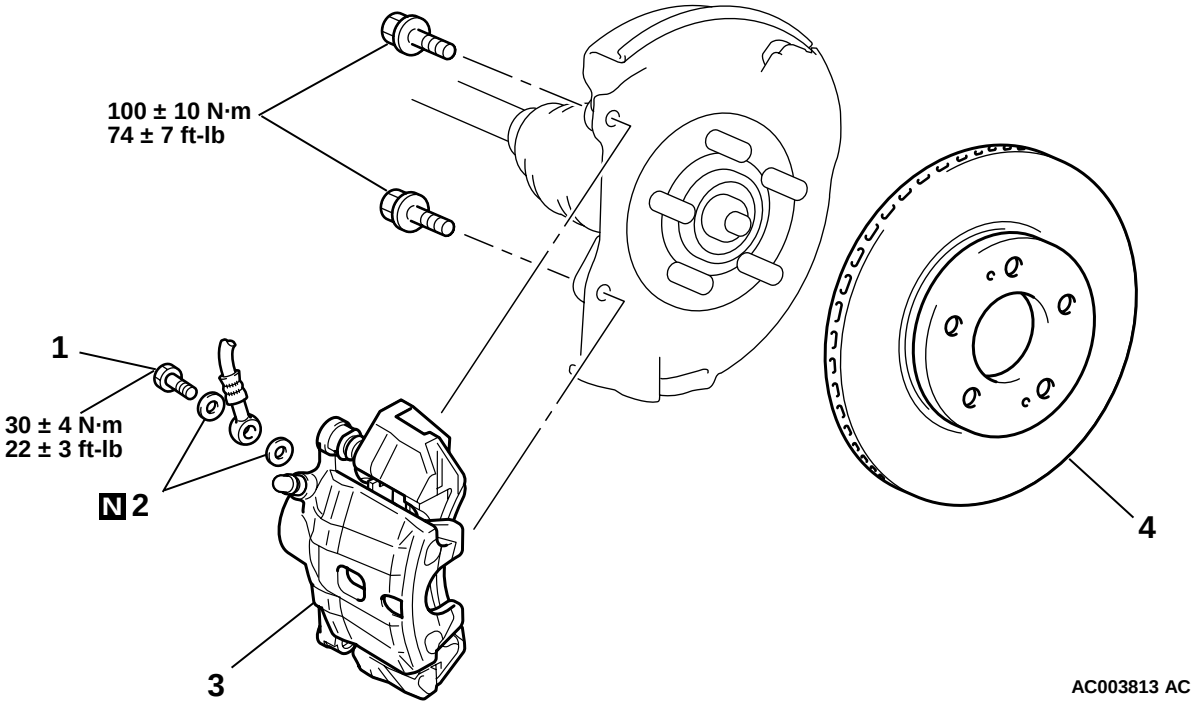
- Check the inner surface of master cylinder body for rust or pitting.
- Check the primary and secondary pistons for rust, scoring, wear or damage.
- Check the diaphragm for cracks and wear.

FRONT DISC BRAKE ASSEMBLY

REMOVAL AND INSTALLATION

M1351006000184

Pre-removal Operation	Post-installation Operation
• Brake Fluid Draining	• Brake Line Bleeding (Refer to P.35A-21.)



REMOVAL STEPS

1. BRAKE HOSE CONNECTOR BOLT
2. GASKET
>>A<< 3. FRONT BRAKE ASSEMBLY
4. BRAKE DISC

Required Special Tools:

- MB990520: Disc Brake Piston Expander
- MB990998: Front Hub Remover and Installer

INSTALLATION SERVICE POINT

>>A<< FRONT BRAKE ASSEMBLY INSTALLATION

1. In order to measure the brake drag torque, measure the hub torque with the pads removed by the following procedure.
   (1) Remove the driveshaft. (Refer to GROUP 26, Driveshaft P.26-11.)

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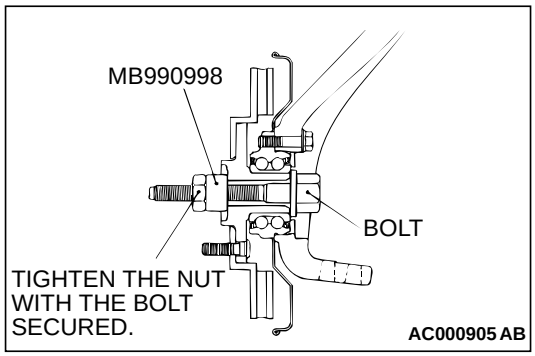
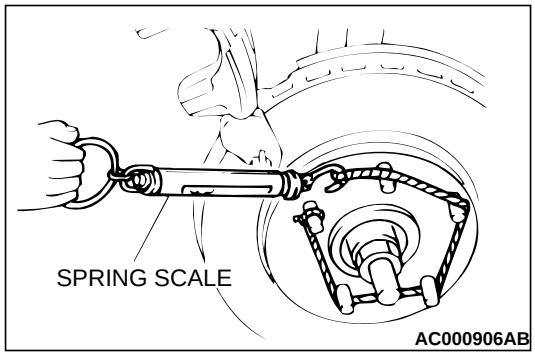


(2) Attach special tool MB990998 to the front hub assembly as shown in the illustration, and tighten it to the specified torque.

Tightening torque: 226 ± 29 N·m (167 ± 21 ft-lb)



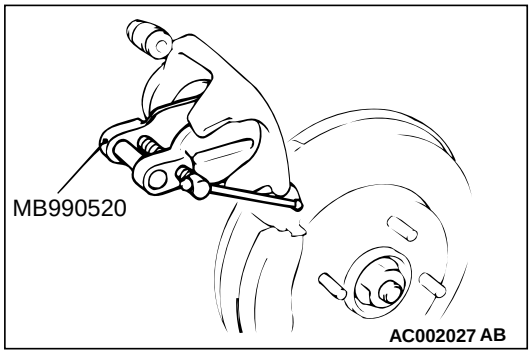
(3) Use a spring scale to measure the hub torque in the forward direction. Record hub torque with pads removed.

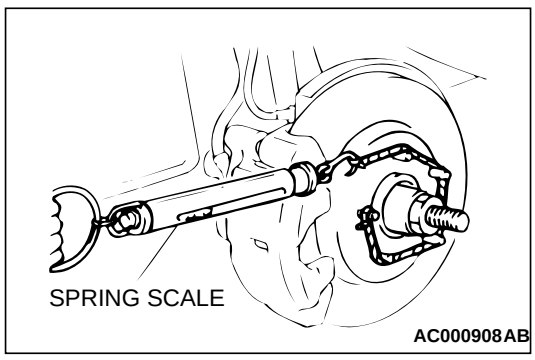
⚠ CAUTION

Do not let any oil, grease or other contamination get onto the friction surfaces of the pads and brake discs.

2. After re-installing the caliper support to the knuckle, install the pad clips and the pads to the caliper support.
3. Clean the piston and insert into cylinder with special tool MB990520.
4. Be careful that the piston boot does not become caught, when lowering the caliper assembly and installing the guide pin.
5. Check the brake drag force as follows.
   (1) Start the engine and hold the brake pedal down for 5 seconds. [Pedal depression force: approximately 196 N (44 pound)]
   (2) Stop the engine.
   (3) Turn the brake disc forward 10 times.
   (4) Use a spring scale to measure the hub torque with pads installed in the same direction as earlier.
   (5) Calculate the drag force of the disc brake [difference between hub torque with pads installed and hub torque with pads removed].

   Standard value: 69 N (16 pounds) or less
6. If the brake drag force exceeds the standard value, disassemble and clean the piston. Check for corrosion or worn piston seal, and check the sliding condition of the lock pin and guide pin.





INSPECTION

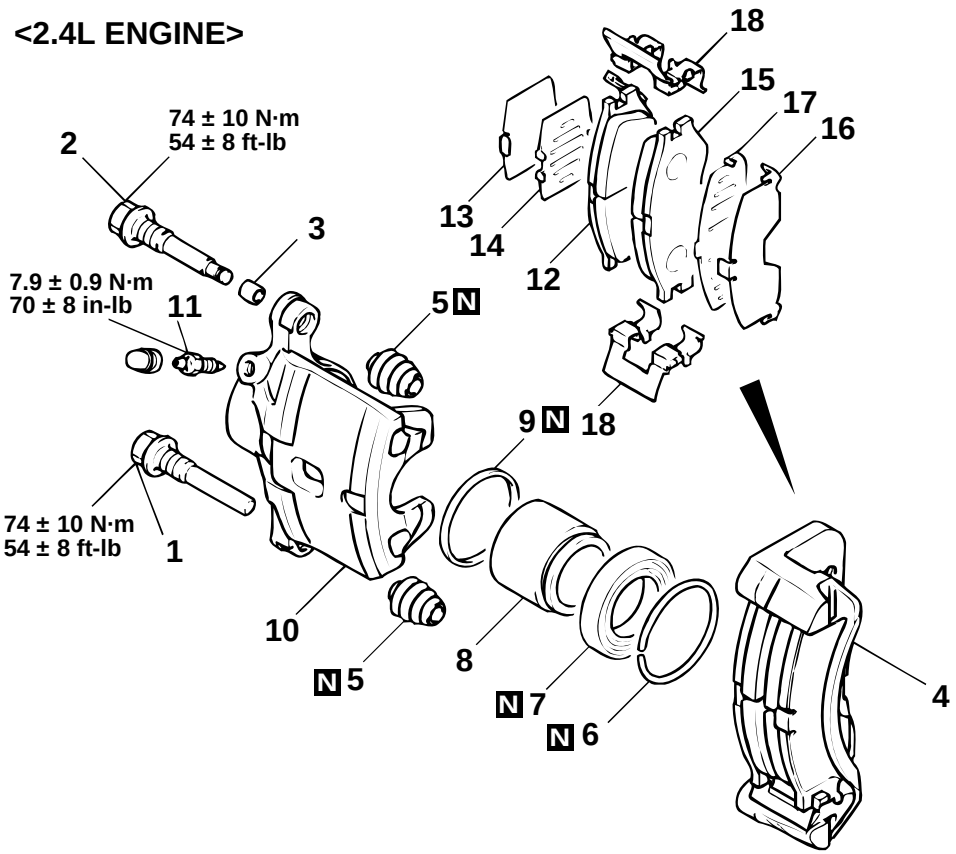
M1351006100158

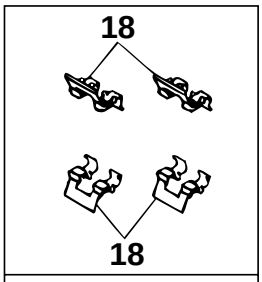
BRAKE DISC CHECK

Disc wear (Refer to P.35A-24.)
Disc run-out (Refer to P.35A-25.)

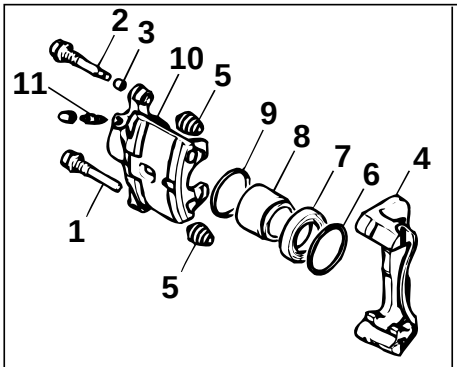
DISASSEMBLY AND ASSEMBLY

M1351006200207

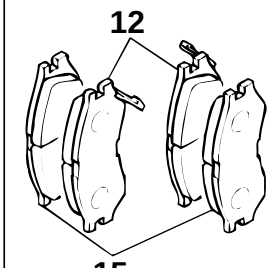




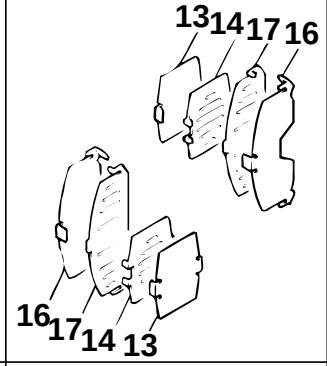
CLIP KIT



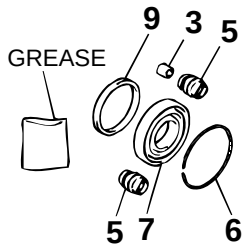
BRAKE CALIPER KIT



PAD SET



SHIM KIT



SEAL AND BOOT REPAIR KIT

AC000910 AD

CALIPER ASSEMBLY DISASSEMBLY STEPS

>>A<< 1. GUIDE PIN
>>A<< 2. LOCK PIN
3. BUSHING
4. CALIPER SUPPORT, PAD, CLIP AND SHIM ASSEMBLY
<<A>> 5. PIN BOOT
<<A>> 6. BOOT RING
<<B>> 7. PISTON BOOT
8. PISTON
9. PISTON SEAL

CALIPER ASSEMBLY DISASSEMBLY STEPS (Continued)

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CALIPER ASSEMBLY DISASSEMBLY STEPS (Continued)

10. CALIPER BODY
11. BLEEDER SCREW

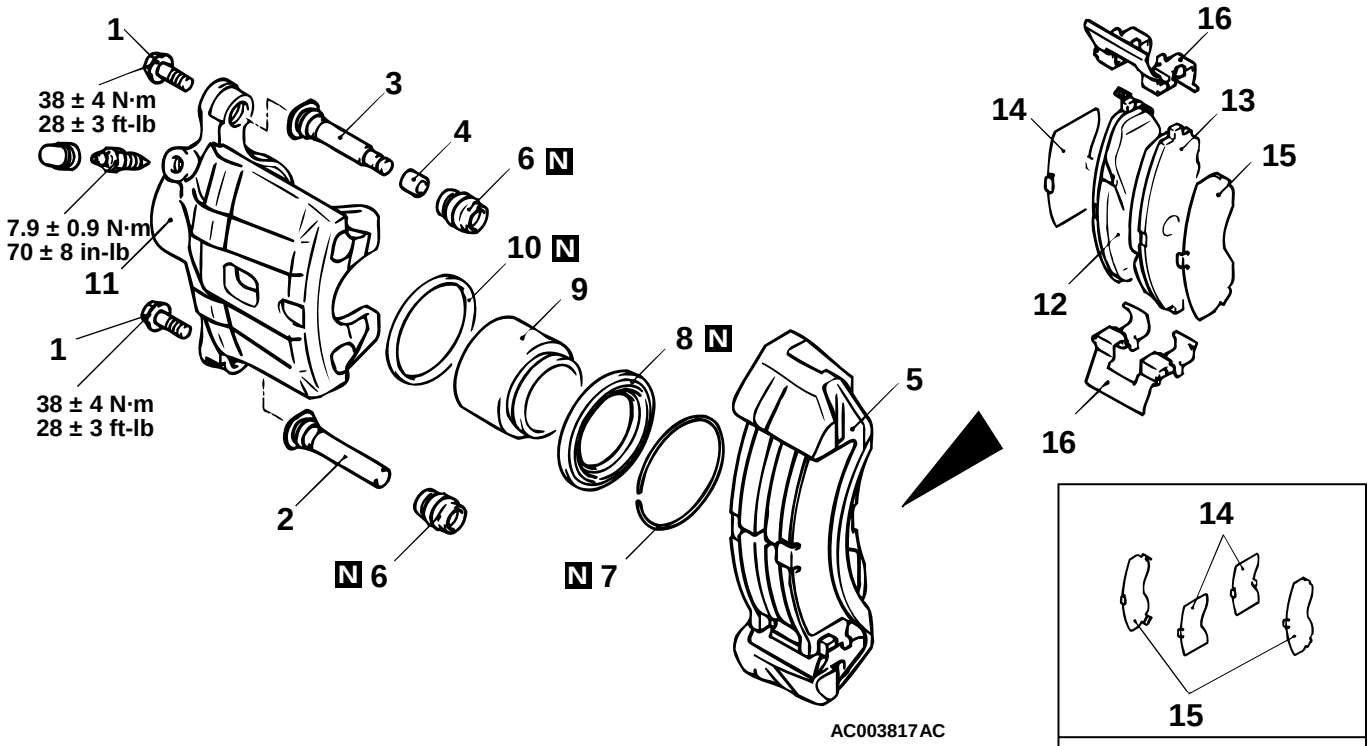
PAD ASSEMBLY DISASSEMBLY STEPS

>>A<< 1. GUIDE PIN
>>A<< 2. LOCK PIN
3. BUSHING
4. CALIPER SUPPORT, PAD, CLIP AND SHIM ASSEMBLY

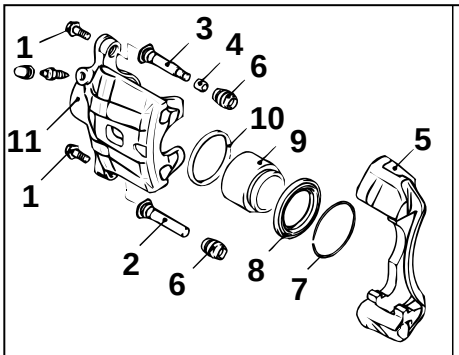
PAD ASSEMBLY DISASSEMBLY STEPS (Continued)

12. PAD AND WEAR INDICATOR ASSEMBLY
13. INNER SHIM B
14. INNER SHIM A
15. PAD ASSEMBLY
16. OUTER SHIM B
17. OUTER SHIM A
18. CLIP

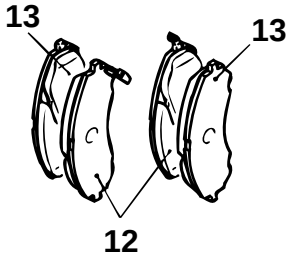
<3.0L ENGINE>



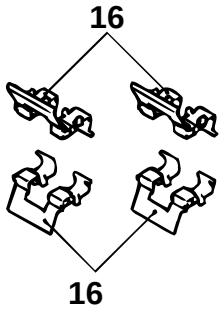
SHIM SET



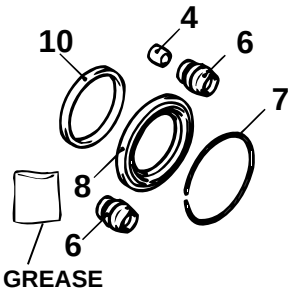
BRAKE CALIPER KIT



PAD SET



CLIP SET



SEAL AND BOOT REPAIR KIT

CALIPER ASSEMBLY DISASSEMBLY STEPS

1. PIN BOLT
>>B<< 2. GUIDE PIN

CALIPER ASSEMBLY DISASSEMBLY STEPS (Continued)

>>B<< 3. LOCK PIN
>>B<< 4. BUSHING

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CALIPER ASSEMBLY DISASSEMBLY STEPS (Continued)

5. CALIPER SUPPORT, PAD, CLIP AND SHIM ASSEMBLY
6. PIN BOOT
7. BOOT RING

<<A>> 8. PISTON BOOT
<<A>> 9. PISTON
<<B>> 10. PISTON SEAL
11. CALIPER BODY

PAD ASSEMBLY DISASSEMBLY STEPS

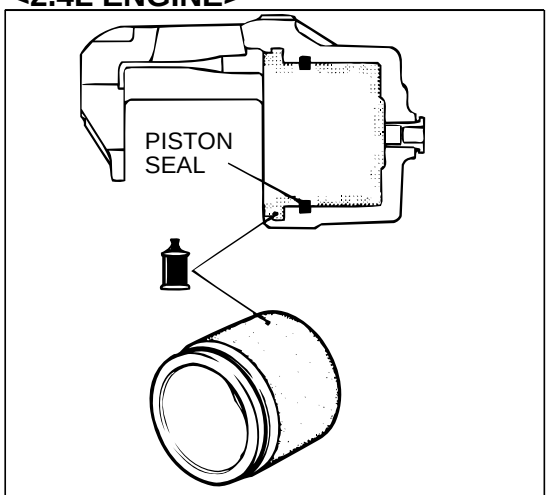
1. PIN BOLT

PAD ASSEMBLY DISASSEMBLY STEPS (Continued)

>>B<< 2. GUIDE PIN
>>B<< 3. LOCK PIN
>>B<< 4. BUSHING
5. CALIPER SUPPORT, PAD, CLIP AND SHIM ASSEMBLY
12. PAD AND WEAR INDICATOR ASSEMBLY
13. PAD ASSEMBLY
14. INNER SHIM
15. OUTER SHIM
16. PAD CLIP

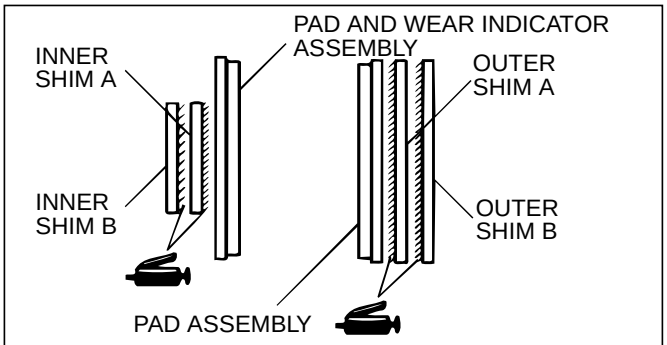
LUBRICATION POINTS

<2.4L ENGINE>

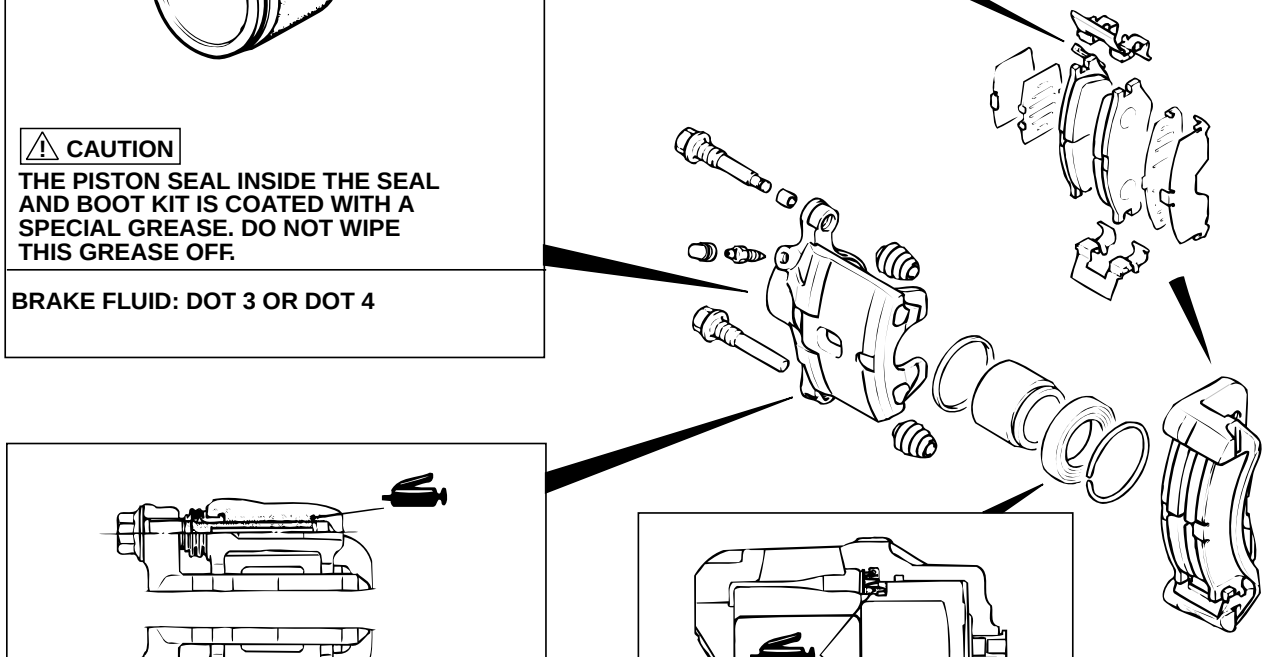


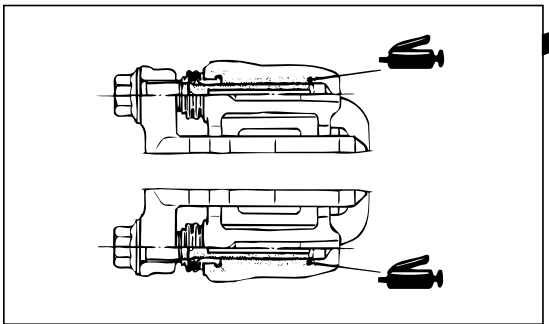
⚠ CAUTION
THE PISTON SEAL INSIDE THE SEAL AND BOOT KIT IS COATED WITH A SPECIAL GREASE. DO NOT WIPE THIS GREASE OFF.

BRAKE FLUID: DOT 3 OR DOT 4

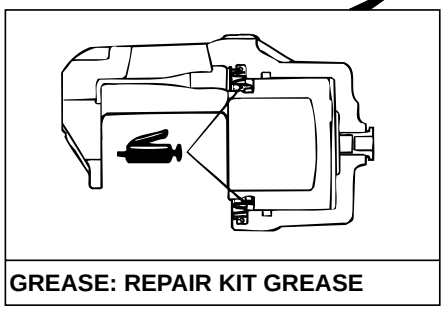


GREASE: BRAKE GREASE SAE J310, NLGI NO.1





GREASE: REPAIR KIT GREASE

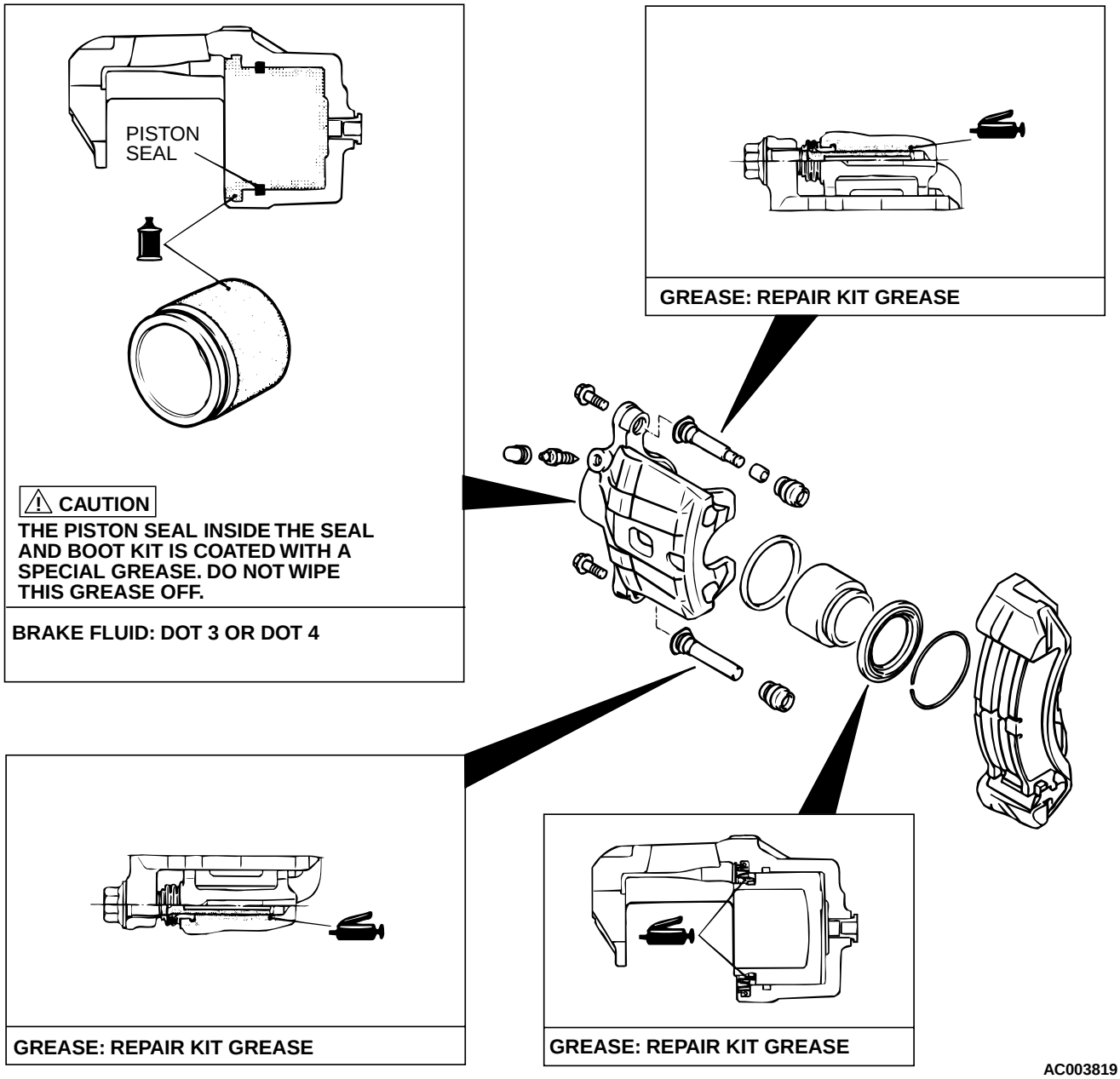


GREASE: REPAIR KIT GREASE

AC000911AC

TSB Revision

<3.0L ENGINE>


PISTON SEAL
GREASE: REPAIR KIT GREASE
CAUTION
THE PISTON SEAL INSIDE THE SEAL AND BOOT KIT IS COATED WITH A SPECIAL GREASE. DO NOT WIPE THIS GREASE OFF.
BRAKE FLUID: DOT 3 OR DOT 4
GREASE: REPAIR KIT GREASE
GREASE: REPAIR KIT GREASE
AC003819 AB

DISASSEMBLY SERVICE POINTS

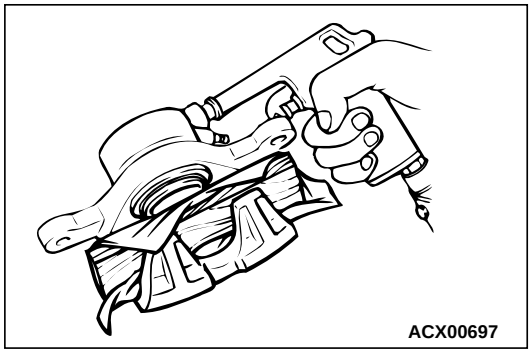
When disassembling the disc brakes, disassemble both sides (left and right) as a set.

<<A>> PISTON BOOT/PISTON REMOVAL

⚠ CAUTION

Blow air little by little to remove the piston. The piston will rush out if a force of air is applied suddenly.

Place a piece of wood, etc. against the caliper body as shown. Blow compressed air through the brake hose to remove the piston boot and piston.

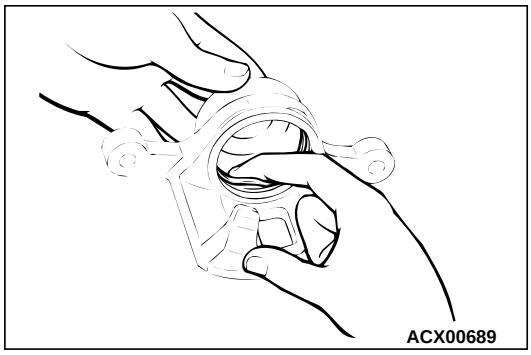


<<B>> PISTON SEAL REMOVAL

⚠ CAUTION

Do not use a flat-tipped screwdriver or similar tool to remove piston seal. These may damage the inner side of the cylinder.

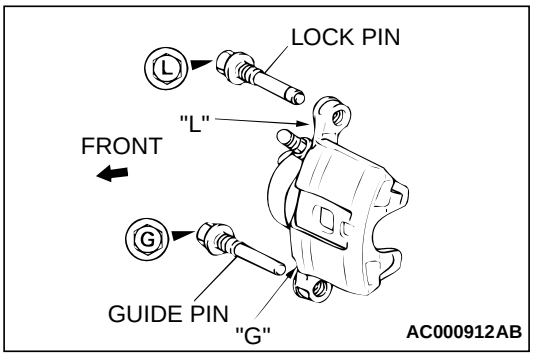
1. Remove the piston seal with your finger tip.
2. Clean the piston surface and inner cylinder with alcohol or brake fluid DOT 3 or DOT 4.

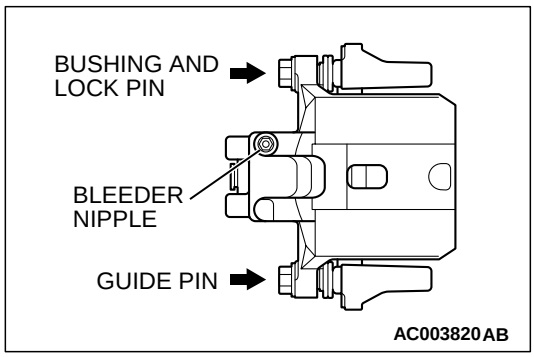


ASSEMBLY SERVICE POINTS

>>A<< LOCK PIN/GUIDE PIN INSTALLATION <2.4L ENGINE>

Install the guide pin as illustrated that each head mark of the guide pin and the lock pin matches the indication mark ("G" or "L") located on the caliper body.





>>B<< BUSHING/LOCK PIN/GUIDE PIN INSTALLATION <3.0L ENGINE>

Install the bushing and lock pin to the bleeder nipple side at the caliper body, the guide pin to its opposite side, respectively.

INSPECTION

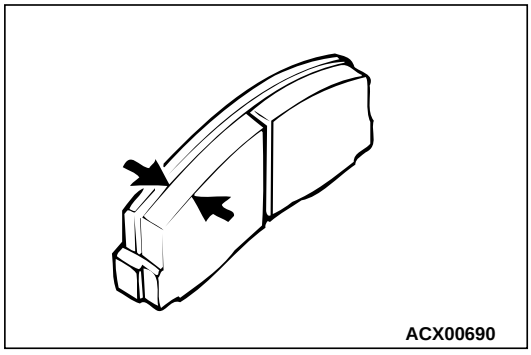
M1351006300196

- Check the cylinder for wear, damage or rust.
- Check the piston surface for wear, damage or rust.
- Check the caliper body or sleeve for wear.
- Check the pad for damage or adhesion of grease, check the backing metal for damage.

PAD WEAR CHECK

⚠ WARNING

- ***Always replace both brake pads on each wheel as a set (both front wheels or both rear wheels). Failure to do so will result in uneven braking, which may cause unreliable brake operation.***
- ***If there is significant difference in the thickness of the pads on the left and right sides, check the sliding condition of the piston, lock pin and guide pin.***



Measure thickness at the thinnest and most worn area of the pad.

Replace the pad assembly if pad thickness is less than the limit value.

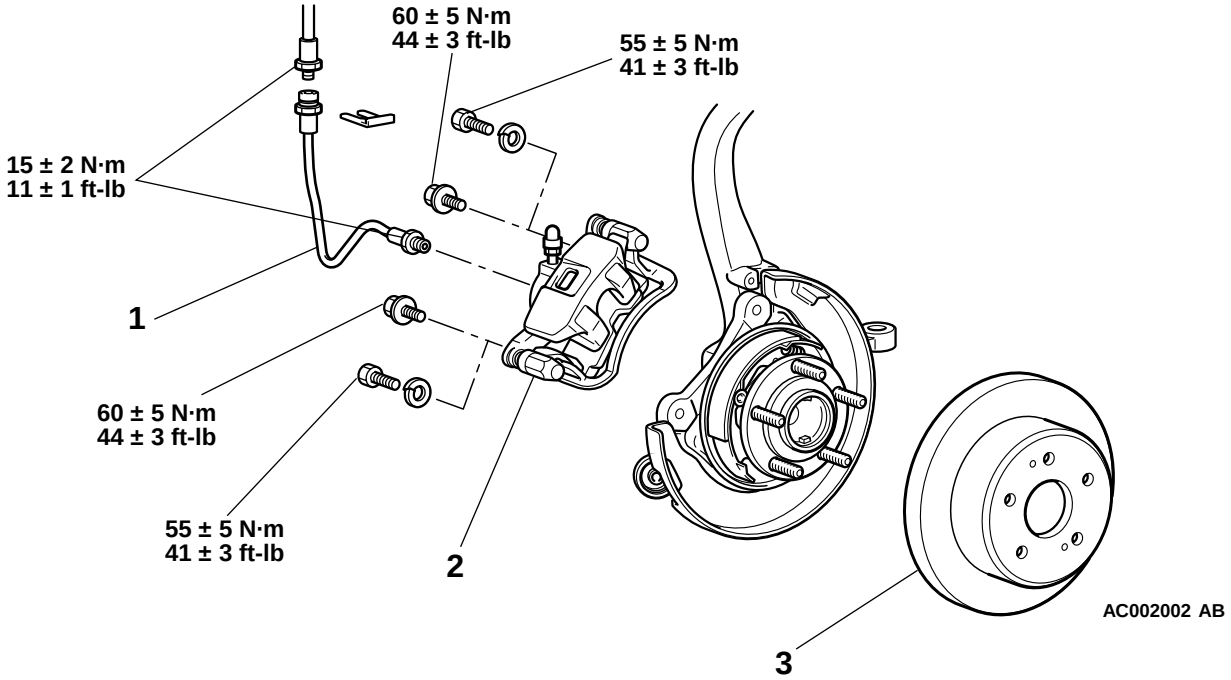
Standard value: 10 mm (0.39 inch)
Minimum limit: 2.0 mm (0.08 inch)

REAR DISC BRAKE ASSEMBLY

REMOVAL AND INSTALLATION

M1351007000143

Pre-removal Operation	Post-installation Operation
• Brake Fluid Draining	• Brake Fluid Supplying • Brake Line Bleeding (Refer to P.35A-21.)



REMOVAL STEPS

1. BRAKE HOSE
>>A<< 2. REAR BRAKE ASSEMBLY
3. BRAKE DISC

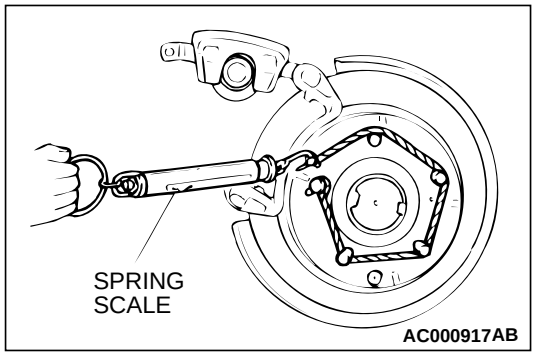
Required Special Tool:

- MB990520: Disc Brake Piston Expander

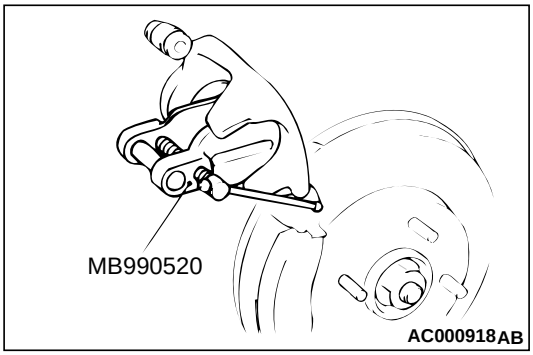
INSTALLATION SERVICE POINT

>>A<< REAR BRAKE ASSEMBLY INSTALLATION

1. In order to measure brake drag torque after pad installation, measure hub torque with the pads removed.
2. Use a spring scale to measure hub torque in the direction shown. Record the value.



TSB Revision



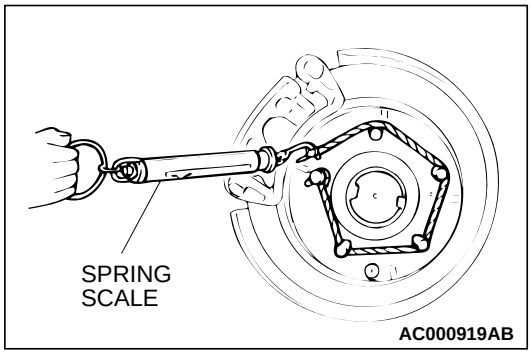
⚠ CAUTION

Do not let any oil, grease or other contamination get onto the friction surfaces of the pads and brake discs.

3. After re-installing the caliper support, install the pad clips and pads to the caliper support.
4. Clean the piston and insert it into the cylinder with special tool MB990520.

5. Be careful that the piston boot does not become caught, when lowering the caliper assembly and installing the guide pin.
6. Check brake drag force as follows:
   (1) Start the engine and hold the brake pedal down for five seconds. [Pedal depression force: approximately 196 N (44 pounds)]
   (2) Stop the engine.
   (3) Turn the brake disc forward ten times.
   (4) Use a spring scale to measure the hub torque with pads installed in the same direction as earlier.
   (5) Calculate the drag force of the disc brake [difference between hub torque with pads installed and hub torque with pads removed].

   Standard value: 69 N (16 pounds) or less
7. If the drag torque exceeds the standard value, disassemble and clean the piston. Check for corrosion or worn piston seal, and check the sliding condition of the lock pin and guide pin.



INSPECTION

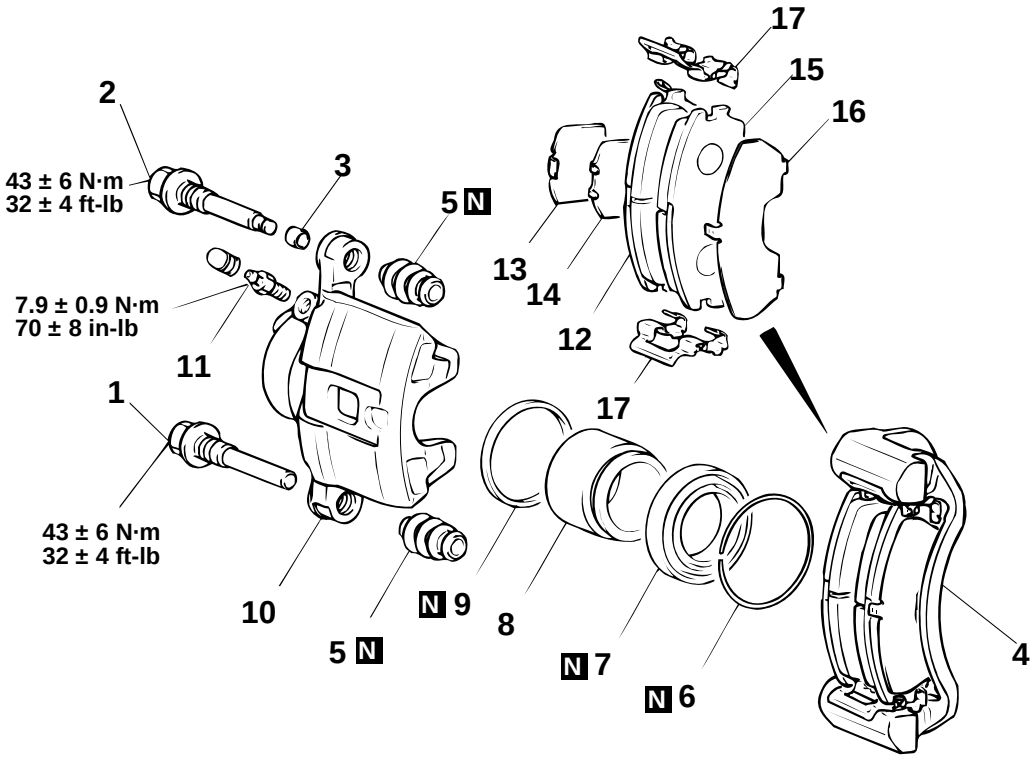
M1351007100151

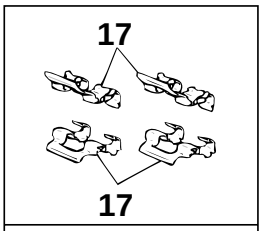
BRAKE DISC CHECK

Disc wear (Refer to P.35A-24.)
Disc run-out (Refer to P.35A-26.)
Disc inside diameter (Refer to P.35A-30.)

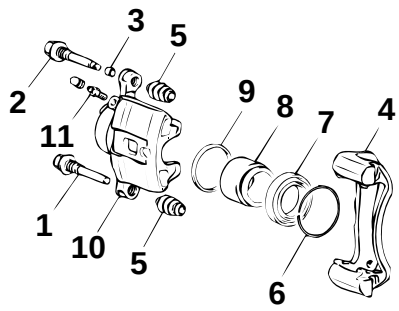
DISASSEMBLY AND ASSEMBLY

M1351007200147

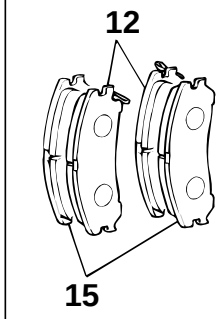




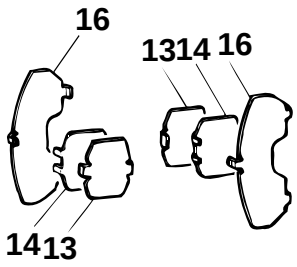
CLIP KIT



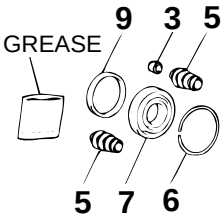
BRAKE CALIPER KIT



PAD SET



SHIM SET



SEAL AND BOOT REPAIR KIT

AC000920AB

CALIPER ASSEMBLY DISASSEMBLY STEPS

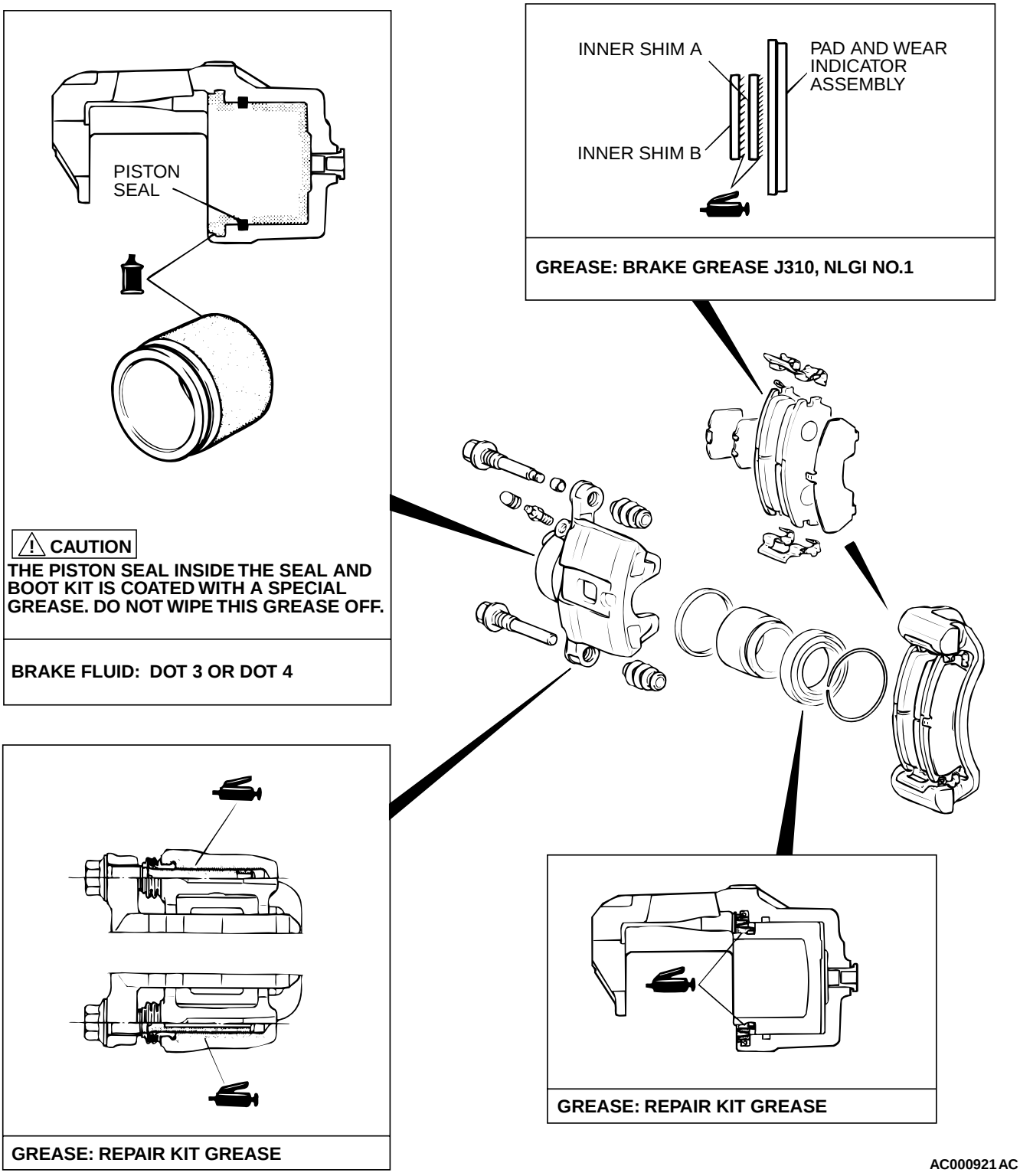
- >>A<< 1. GUIDE PIN
- >>A<< 2. LOCK PIN
- 3. BUSHING
- 4. CALIPER SUPPORT, PAD, CLIP AND SHIM ASSEMBLY
- 5. BOOT
- 6. BOOT RING
- <<A>> 7. PISTON BOOT
- <<A>> 8. PISTON
- <<B>> 9. PISTON SEAL
- 10. CALIPER BODY
- 11. BLEEDER SCREW

PAD ASSEMBLY DISASSEMBLY STEPS

- >>A<< 1. GUIDE PIN
- >>A<< 2. LOCK PIN
- 3. BUSHING
- 4. CALIPER SUPPORT, PAD, CLIP AND SHIM ASSEMBLY
- 12. PAD AND WEAR INDICATOR ASSEMBLY
- 13. INNER SHIM B
- 14. INNER SHIM A
- 15. PAD ASSEMBLY
- 16. OUTER SHIM
- 17. CLIP

TSB Revision

LUBRICATION POINTS



DISASSEMBLY SERVICE POINTS

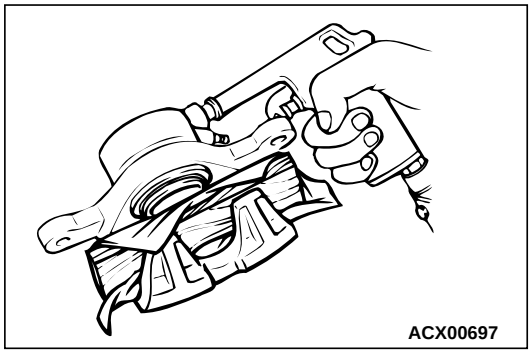
When disassembling the disc brakes, disassemble both sides (left and right) as a set.

<<A>> PISTON BOOT/PISTON REMOVAL

⚠ CAUTION

Blow air little by little to remove the piston. The piston will rush out if a force of air is applied suddenly.

Place a piece of wood, etc. against the caliper body as shown. Blow compressed air through the brake hose connection hole to remove the piston boot and piston.

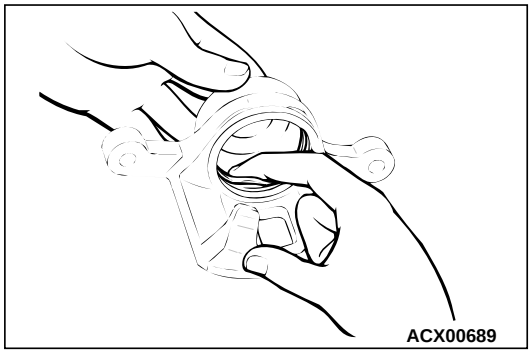


<<B>> PISTON SEAL REMOVAL

⚠ CAUTION

Do not use a flat-tipped screwdriver or similar tool to remove piston seal. These may damage the inner side of the cylinder.

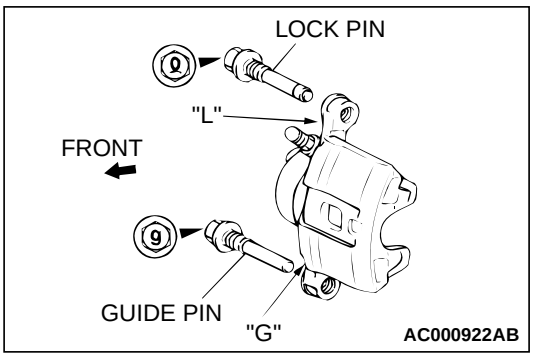
1. Remove the piston seal with your finger tip.
2. Clean piston surface and inner cylinder with alcohol, or brake fluid DOT 3 or DOT 4.



ASSEMBLY SERVICE POINT

>>A<< LOCK PIN/GUIDE PIN INSTALLATION

Install the guide pin as illustrated that each head mark of the guide pin and the lock pin matches the indication mark ("G" or "L") located on the caliper body.



INSPECTION

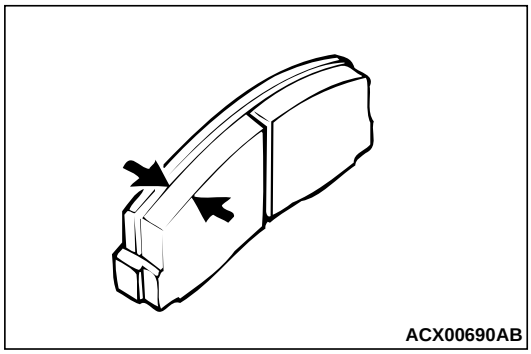
M1351007300144

- Check the cylinder for wear, damage or rust.
- Check the piston surface for wear, damage or rust.
- Check the caliper body or sleeve for wear.
- Check the pad for damage or adhesion of grease, check the backing metal for damage.

PAD WEAR CHECK

⚠ ***WARNING***

- ***Always replace both brake pads on each wheel as a set (both front wheels or both rear wheels). Failure to do so will result in uneven braking, which may cause unreliable brake operation.***
- ***If there is significant difference in the thickness of the pads on the left and right sides, check the sliding condition of the piston, lock pin and guide pin.***


ACX00690AB

Measure thickness at the thinnest and most worn area of the pad. Replace the pad assembly if pad thickness is less than the limit value.

Standard value: 10 mm (0.39 inch)
Minimum limit: 2.0 mm (0.08 inch)

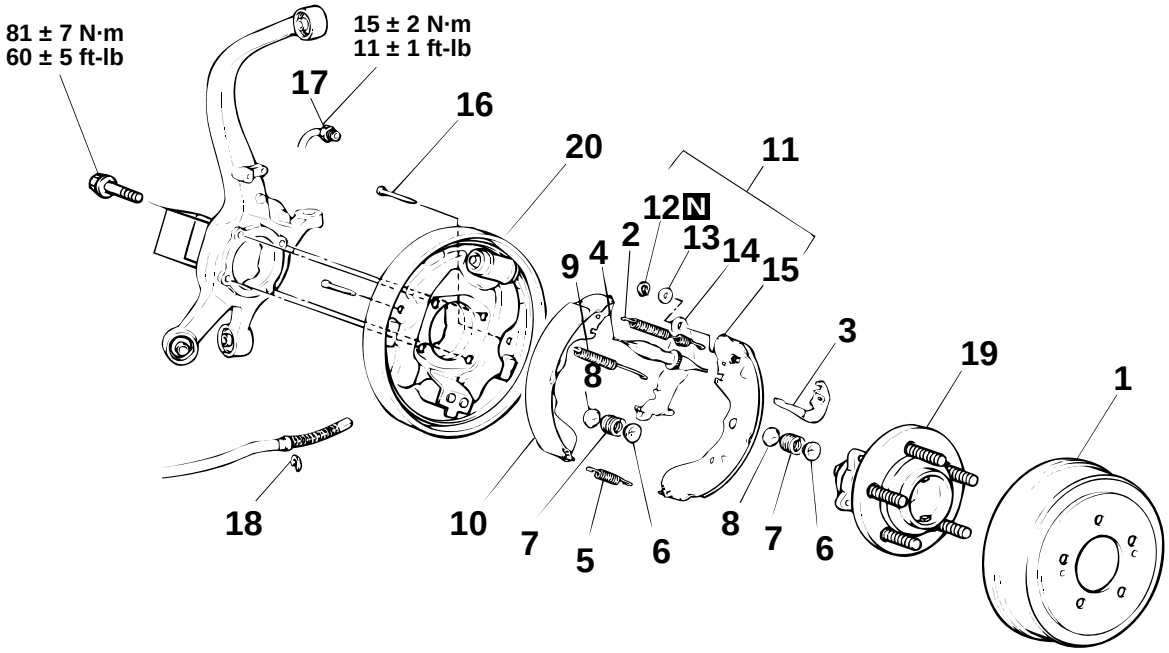
REAR DRUM BRAKE

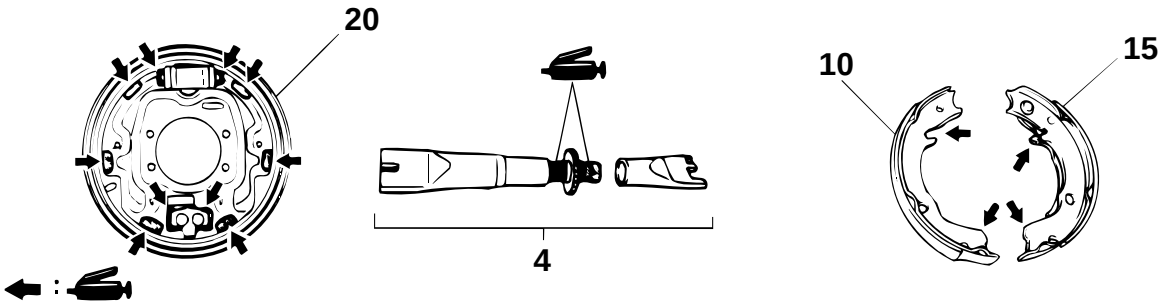
REAR DRUM BRAKE SHOE

M1351007500171

REMOVAL AND INSTALLATION

Pre-removal Operation	Post-installation Operation
• Loosening the Parking Brake Cable Adjusting Nut • Brake Fluid Draining	• Brake Fluid Filling and Air Bleeding (Refer to P.35A-21.) • Parking Brake Lever Stroke Adjustment (Refer to GROUP 36, On-vehicle Service – Parking Brake Lever Stroke Check and Adjustment P.36-4.)





SPECIFIED GREASE: BRAKE GREASE SAE J310, NLGI NO.1

AC000923 AD

REAR DRUM BRAKE REMOVAL STEPS

1. BRAKE DRUM
2. SHOE-TO-LEVER SPRING
3. ADJUSTER LEVER
4. AUTO ADJUSTER ASSEMBLY
5. RETAINER SPRING
6. SHOE HOLD-DOWN CUP
7. SHOE HOLD-DOWN SPRING
8. SHOE HOLD-DOWN CUP
9. SHOE-TO-SHOE SPRING
10. SHOE AND LINING ASSEMBLY

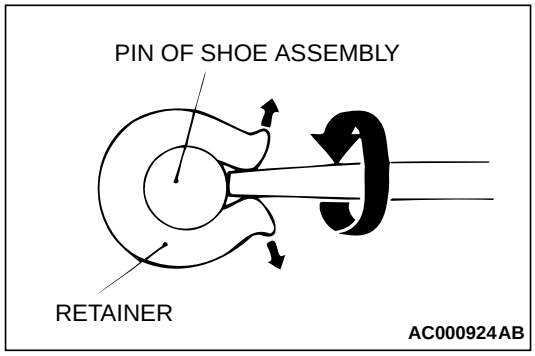
REAR DRUM BRAKE REMOVAL STEPS (Continued)

<<A>> >>B<< >>A<<

11. SHOE AND LEVER ASSEMBLY
12. RETAINER
13. WAVE WASHER
14. PARKING LEVER
15. SHOE AND LINING ASSEMBLY
16. SHOE HOLD-DOWN PIN
17. BRAKE TUBE CONNECTION
18. SNAP RING
19. REAR HUB ASSEMBLY
20. BACKING PLATE

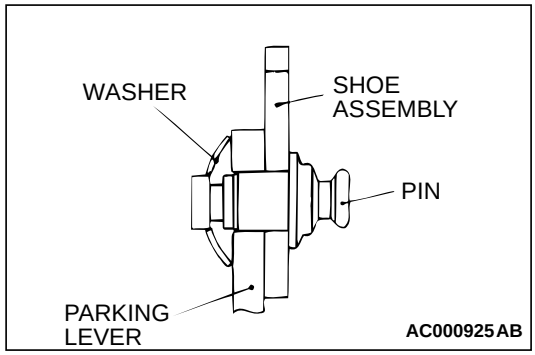
TSB Revision

REMOVAL SERVICE POINT

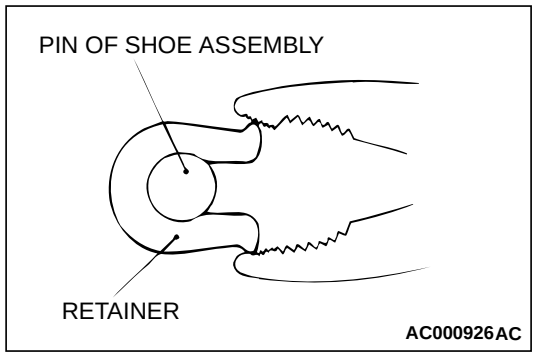


<<A>> RETAINER REMOVAL
Use a flat-tipped screwdriver or a similar tool to open up the retainer joint. Then remove the retainer.

INSTALLATION SERVICE POINTS



>>A<< WAVE WASHER INSTALLATION
Install the washer in the direction shown in the illustration.



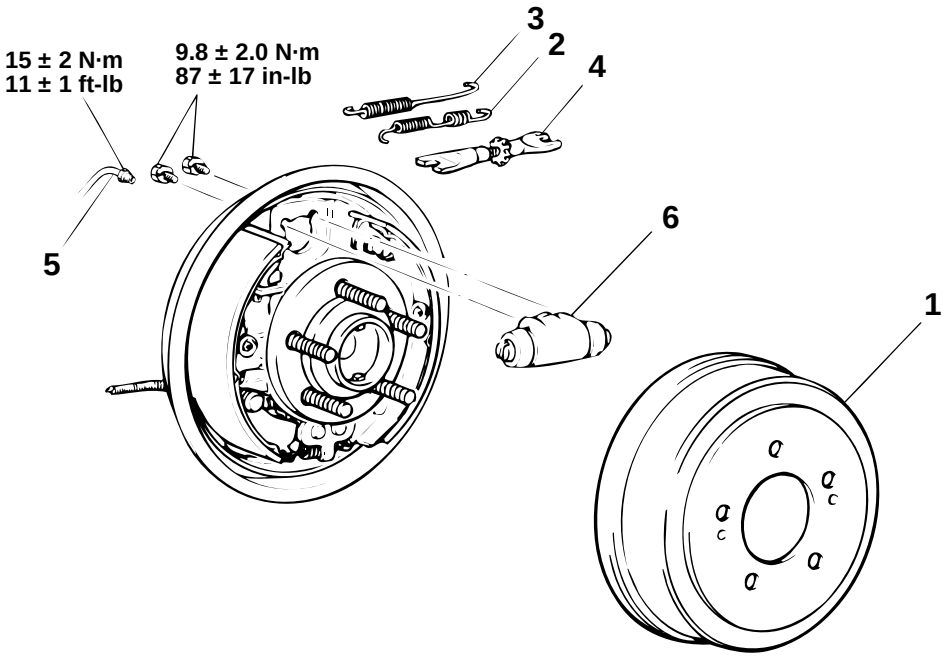
>>B<< RETAINER INSTALLATION
Use pliers or a similar tool to close the retainer end onto the pin.

REAR DRUM BRAKE WHEEL CYLINDER

M1351009300106

REMOVAL AND INSTALLATION

Pre-removal Operation	Post-installation Operation
• Brake Fluid Draining	• Brake Fluid Filling • Brake Line Bleeding (Refer to P.35A-21.)



AC000927AB

REMOVAL STEPS

1. BRAKE DRUM
2. SHOE-TO-LEVER SPRING
3. SHOE-TO-SHOE SPRING
4. AUTO ADJUSTER ASSEMBLY

REMOVAL STEPS (Continued)

5. CONNECTION FOR THE BRAKE PIPE
6. WHEEL CYLINDER

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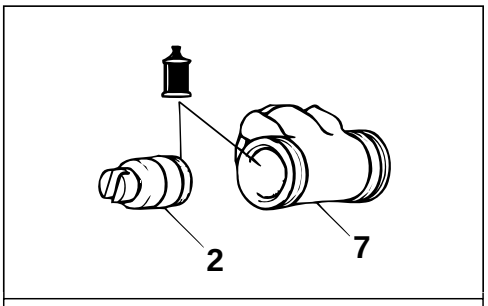
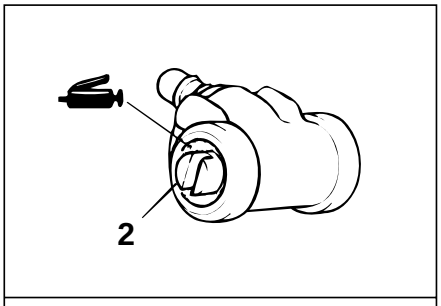
WHEEL CYLINDER

M1351007700175

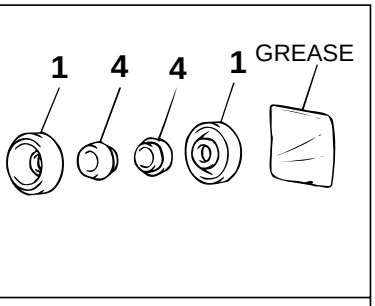
DISASSEMBLY AND ASSEMBLY



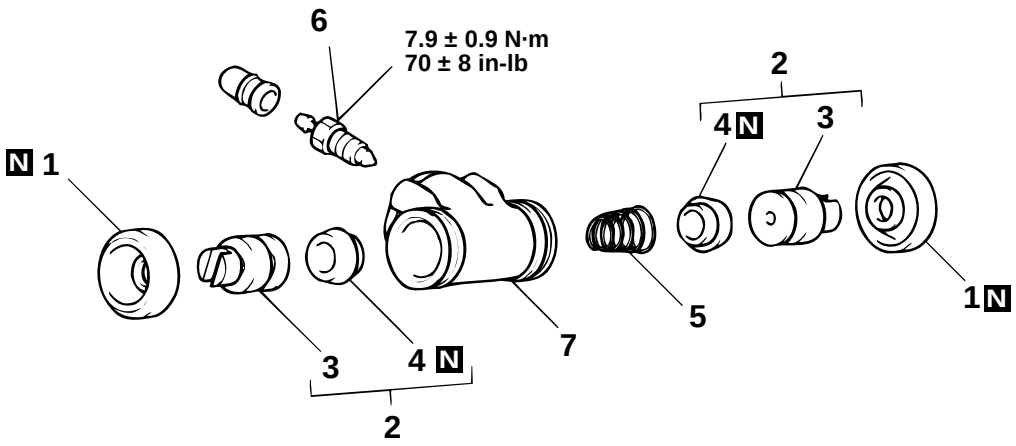
BRAKE FLUID: DOT 3 OR DOT 4



GREASE: REPAIR KIT GREASE



WHEEL CYLINDER REPAIR KIT



AC000928AC

DISASSEMBLY STEPS

1. BOOTS
2. PISTON ASSEMBLY
- **>>A<<** 3. PISTON
- **>>A<<** 4. PISTON CUP
5. SPRING

DISASSEMBLY STEPS (Continued)

6. BLEEDER SCREW
7. WHEEL CYLINDER BODY

Required Special Tool:

- MB990619: Installer

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ASSEMBLY SERVICE POINT

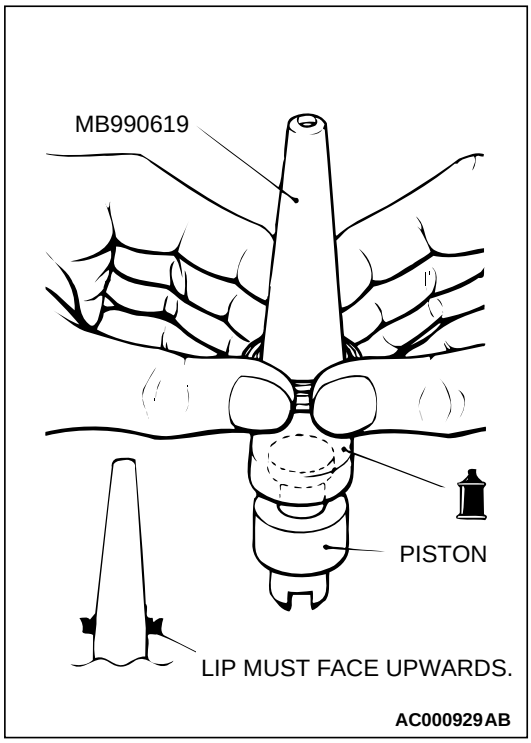
>>A<< PISTON CUP/PISTON ASSEMBLY

1. Use alcohol or brake fluid DOT 3 or DOT 4 to clean the wheel cylinder and the piston.
2. Apply brake fluid DOT 3 or DOT 4 to the piston cups and special tool MB990619.

⚠ CAUTION

In order to keep the piston cup from becoming twisted or slanted, slide the piston cup down special tool MB990619 slowly and carefully, without stopping.

3. Set the piston cup on special tool MB990619 with the lip of the cup facing up. Fit the cup onto special tool MB990619, and then slide it down the outside of special tool MB990619 into the piston groove.



INSPECTION

M1351007800150

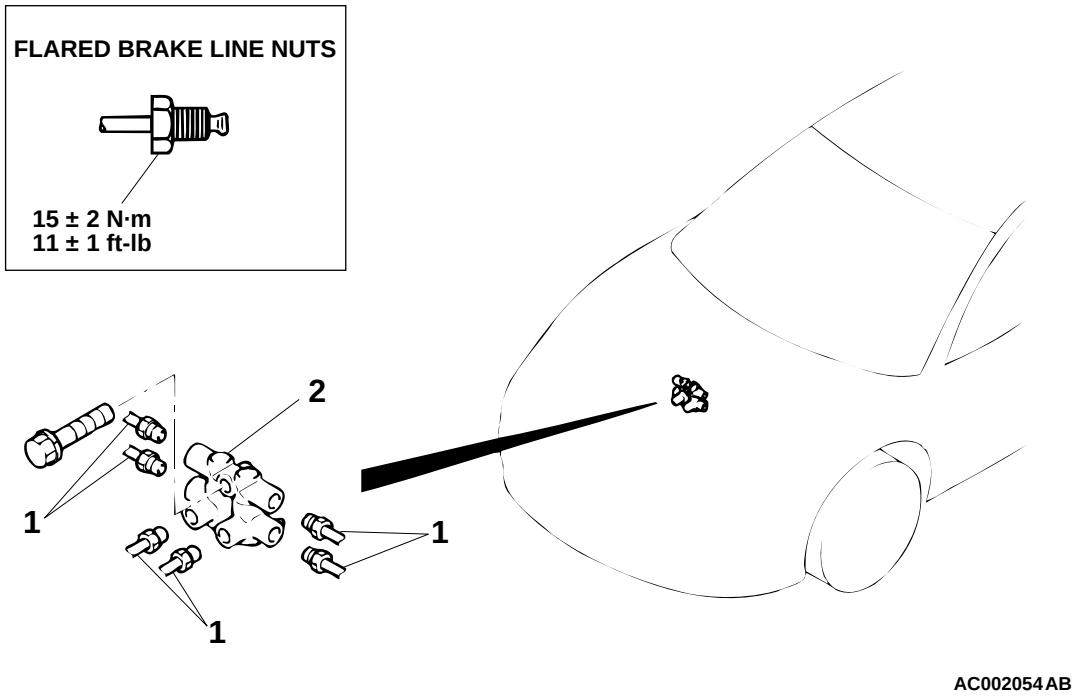
Check the piston and wheel cylinder walls for rust, pitting, or damage. If there is any abnormality, replace the entire wheel cylinder assembly.

PROPORTIONING VALVE

REMOVAL AND INSTALLATION

M1351005700146

Pre-removal Operation	Post-installation Operation
• Brake Fluid Draining	• Brake Fluid Supplying • Brake Line Bleeding (Refer to P.35A-21.)



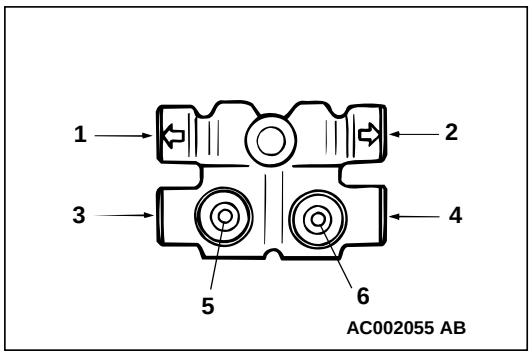
REMOVAL STEPS

>>A<< 1. BRAKE PIPE
2. PROPORTIONING VALVE

INSTALLATION SERVICE POINT

>>A<< BRAKE PIPE CONNECTION

Connect the pipes to the hydraulic unit as shown in the illustration.



1.	Proportioning valve – Rear brake (LH)
2.	Proportioning valve – Rear brake (RH)
3.	Proportioning valve – Front brake (RH)
4.	Proportioning valve – Front brake (LH)
5.	Proportioning valve – Master cylinder (secondary)
6.	Proportioning valve – Master cylinder (primary)

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SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1351009600174

ITEMS		SPECIFICATIONS
Brake line		
Brake tube flare nut		15 ± 2 N·m (11 ± 1 ft-lb)
Brake pedal		
Pedal support member mounting bolt		12 ± 2 N·m (100 ± 22 in-lb)
Pedal support member mounting nut		14 ± 3 N·m (122 ± 26 in-lb)
Front disc brake		
Bleeder screw		7.9 ± 0.9 N·m (70 ± 8 in-lb)
Brake hose connector bolt		30 ± 4 N·m (22 ± 3 ft-lb)
Front brake assembly mounting bolt		100 ± 10 N·m (74 ± 7 ft-lb)
Guide pin <2.4L ENGINE>		74 ± 10 N·m (54 ± 8 ft-lb)
Lock pin <2.4L ENGINE>		74 ± 10 N·m (54 ± 8 ft-lb)
Pin bolt <3.0L ENGINE>		38 ± 4 N·m (28 ± 3 ft-lb)
Master cylinder and brake booster		
Brake booster mounting nut		14 ± 3 N·m (124 ± 26 in-lb)
Fitting		17 ± 1 N·m (12 ± 1 ft-lb)
Master cylinder mounting nut		13 ± 2 N·m (111 ± 22 in-lb)
Rear disc brake		
Bleeder screw		7.9 ± 0.9 N·m (70 ± 8 in-lb)
Rear disc brake assembly mounting bolt	Bolt and washer	55 ± 5 N·m (41 ± 3 ft-lb)
	Flange bolt	60 ± 5 N·m (44 ± 3 ft-lb)
Guide pin		43 ± 6 N·m (32 ± 4 ft-lb)
Lock pin		43 ± 6 N·m (32 ± 4 ft-lb)
Rear drum brake		
Bleeder screw		7.9 ± 0.9 N·m (70 ± 8 in-lb)
Rear hub mounting bolt		81 ± 7 N·m (60 ± 5 ft-lb)
Wheel cylinder mounting bolt		9.8 ± 2.0 N·m (87 ± 17 in-lb)

GENERAL SPECIFICATIONS

M1351000200168

ITEMS	2.4L ENGINE	3.0L ENGINE
Master cylinder ID mm (in)	27.0 (1.06)	27.0 (1.06)
Brake booster effective diameter of power cylinder mm (in)	205 + 230 (8 + 9)	205 + 230 (8 + 9)
Brake booster boosting ratio	7.0	7.0
Front disc brake disc effective diameter mm (in)	204 (8.0)	222 (8.7)
Front disc brake wheel cylinder ID mm (in)	60.3 (2.37)	60.3 (2.37)
Rear disc brake disc effective diameter mm (in)	–	222 (8.7)
Rear disc brake wheel cylinder ID mm (in)	–	34.9 (1.4)

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ITEMS	2.4L ENGINE	3.0L ENGINE
Rear drum brake drum ID mm (in)	228.6 (9.0)	–
Rear drum brake wheel cylinder ID mm (in)	19.05 (0.75)	–
Rear drum brake lining thickness mm (in)	4.9 (0.20)	–

SERVICE SPECIFICATIONS

M1351000300217

ITEMS		STANDARD VALUE	LIMIT
Brake booster push rod protruding length mm (in)		10.28 – 10.53 (0.404 – 0.415)	–
Brake pedal height mm (in)		175 – 178 (6.9 – 7.0)	–
Brake pedal free play mm (in)		3 – 8 (0.12 – 0.31)	–
Brake pedal to floor board clearance mm (in)		90 (3.5) or more	–
Proportioning valve output fluid pressure MPa (psi)	Split point <2.4L ENGINE>	3.7 – 4.2 (537 – 609)	–
	Split point <3.0L ENGINE>	3.2 – 3.7 (464 – 537)	–
	When input fluid pressure is 9.8 MPa (1,422 psi). <2.4L ENGINE>	5.0 – 5.8 (725 – 841)	–
	When input fluid pressure is 9.8 MPa (1,422 psi). <3.0L ENGINE>	4.6 – 5.4 (667 – 783)	–
Proportioning valve output fluid pressure difference between left and right MPa (psi)		–	0.8 (116)
Disc brake pad thickness mm (in)		10.0 (0.39)	Minimum 2.0 (0.08)
Disc brake disc thickness mm (in)	Front <2.4L ENGINE>	24.0 (0.9)	Minimum 22.4 (0.88)
	Front <3.0L ENGINE>	26.0 (1.02)	Minimum 24.4 (0.96)
	Rear	10.0 (0.4)	Minimum 8.4 (0.33)
Disc brake disc run-out mm (in)	Front	–	0.06 (0.002)
	Rear	–	0.08 (0.003)
Front disc brake drags force N (lb)		69 (16) or less	–
Rear disc brake drag force N (lb)		69 (16) or less	–
Rear drum brake lining thickness mm (in)		4.9 (0.19)	Minimum 1.0 (0.04)
Rear drum inside diameter mm (in)		228.6 (9.00)	230.6 (9.08)
Rear disc inside diameter mm (in)		168.0 (6.61)	169.0 (6.65)
Front hub end play mm (in)		–	0.05 (0.002)
Rear axle shaft end play mm (in)		–	0.05 (0.002)

LUBRICANTS

M1351000400195

ITEMS	SPECIFIED LUBRICANT
Brake fluid	DOT3 or DOT4
Brake piston seal	Repair kit grease
Guide pin boot inner surface	
Lock pin boot inner surface	
Piston boot mounting grooves	
Brake piston boot inner surface	
Lock pin bush inner surface	
Piston cup surface	
Front brake pad and inner shim A contact surface <2.4L ENGINE>	Repair kit grease Brake grease SAE J310, NLGI NO.1
Front disc brake inner shim A and inner shim B contact surface <2.4L ENGINE>	
Front brake pad and outer shim A contact surface <2.4L ENGINE>	
Front disc brake outer shim A and outer shim B contact surface <2.4L ENGINE>	
Rear brake pad and inner shim A contact surface	
Rear disc brake inner shim A and inner shim B contact surface	
Rear brake shoe and backing plate contact surface	
Auto adjuster assembly	

SEALANT

M1351000500200

ITEM	SPECIFIED SEALANT	REMARKS
Thread part fitting	3M™ AAD Part No. 8661, 8663, 8672, 8678, 8679 or equivalent	Semi-drying sealant

NOTES

GROUP 35B

ANTI-LOCK BRAKING SYSTEM (ABS)

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- ABS DIAGNOSTIC TROUBLESHOOTING STRATEGY 35B-3
- ABS TROUBLE CODE DIAGNOSIS 35B-4
- DIAGNOSTIC TROUBLE CODE CHART . . 35B-7
- DIAGNOSTIC TROUBLE CODE PROCEDURES 35B-8
- SYMPTOM CHART 35B-26
- SYMPTOM PROCEDURES 35B-27
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- ACTUATOR TEST REFERENCE TABLE . . 35B-43
- CHECK AT ABS-ECU 35B-44

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- REMOVAL AND INSTALLATION 35B-52

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- SERVICE SPECIFICATIONS 35B-57

GENERAL DESCRIPTION

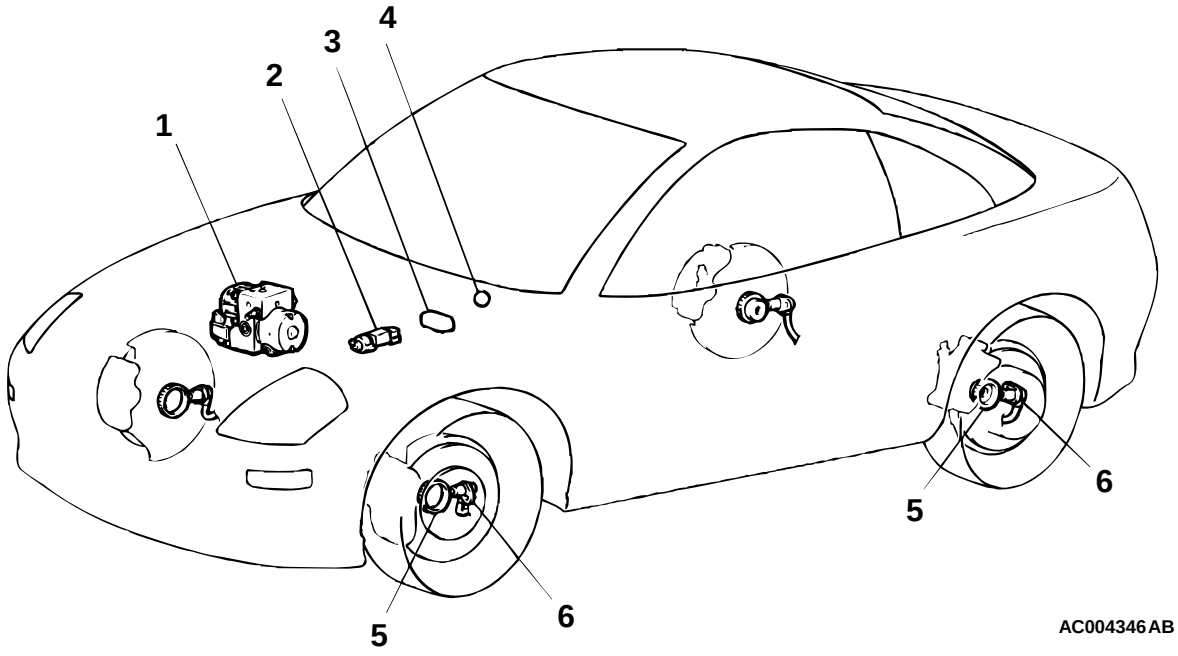
M1352000100238

The ABS consists of components such as the wheel speed sensors, stoplight switch, hydraulic unit assembly (integrated with ABS-ECU), ABS rotor, and the ABS warning light. If a problem occurs in the system, the malfunctioning components can be identified and the trouble symptoms will be memorized by the diagnostic function.
In addition, reading of diagnostic trouble codes and data list and actuator testing are possible by using the Scan Tool.

If the ABS hydraulic unit is faulty, the ABS-ECU must be replaced.
The ABS-ECU runs a self-check for 3 seconds upon start-up (also ignition switch ON, engine stopped). The ABS warning light, TCL warning light, and TCL indicator light should be illuminated during the self-check and turn off when the self-check completes.

ITEMS	SPECIFICATIONS
ABS type	4-sensor, 3-channel type
Speed sensor	Magnet coil type on 4-wheels
Front ABS rotor teeth	43
Rear ABS rotor teeth	43

CONSTRUCTION DIAGRAM



1. HYDRAULIC UNIT (INTEGRATED WITH ABS-ECU)
2. STOPLIGHT SWITCH
3. DATA LINK CONNECTOR
4. ABS WARNING LIGHT
5. ABS ROTOR
6. WHEEL SPEED SENSOR

System Check Sound
When starting the engine, a thudding sound can sometimes be heard coming from the engine compartment. This is a normal sound during the ABS self-check.

ABS Operation Sounds and Sensations
During normal operation, the ABS makes several sounds that may seem unusual at first:
- A whining sound is caused by the ABS hydraulic unit motor.
- When pressure is applied to the brake pedal, the pulsation of the pedal causes a scraping sound.
- When the brakes are applied firmly, the ABS operates, rapidly applying and releasing the brakes many times per second. This repeated application and release of braking forces can cause the suspension to make a thumping sound and the tires to squeak.

Long Stopping Distances on Loose Road Surfaces
When braking on loose surfaces like snow-covered or gravel roads, the stopping distance can be longer for an ABS-equipped vehicle than the stopping distance for a vehicle with a conventional brake system.

Shock at starting check
Shock may be felt when the brake pedal is lightly pressed while driving at a low speed. This is a normal characteristic because the ABS system operation check is carried out when vehicle speed is 8 km/h (5 mph) or less.

ANTI-LOCK BRAKING SYSTEM (ABS) DIAGNOSIS

INTRODUCTION TO ANTI-LOCK BRAKE SYSTEM DIAGNOSIS

M1352012500233

The anti-lock brake system (ABS) operates differently from conventional brake systems. These differences include sounds, sensations, and vehicle performance that owners and service technicians who are not familiar with ABS may not be used to. Some operational characteristics may seem to be malfunctions, but they are simply signs of normal ABS operation. When diagnosing the ABS system, keep these operational characteristics in mind. Inform the owner of the kind of performance characteristics to expect from an ABS-equipped vehicle.

ABS Diagnostic Trouble Code Detection Conditions

ABS diagnostic trouble codes (ABS DTCs) are set under different conditions, depending on the malfunction detected. Most ABS DTCs will only be set during vehicle operation. Some ABS DTCs will also be set during the ABS self-check immediately after the engine is started.
When you check if an ABS DTC will be displayed again after the DTC has been erased, you should duplicate the ABS DTC set conditions. Depending on the detection timing and set conditions for the specific ABS DTC, you must either drive the vehicle or turn the engine off and restart it. To set the proper conditions for that DTC again, refer to "ABS DTC SET CONDITIONS" for each ABS DTC that you are trying to reset.

ABS DIAGNOSTIC TROUBLESHOOTING STRATEGY

M1352011100265

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted most of the possible ways to find an ABS fault.

1. Gather information about the problem from the customer.
2. Verify that the condition described by the customer exists.
3. Check the vehicle for any ABS DTC.
4. If you cannot verify the condition and there are no ABS DTCs, the malfunction is intermittent. Refer to GROUP 00, How to use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-6.

5. If you can verify the condition but there are no ABS DTCs, or the system cannot communicate with the scan tool, check that the basic brake system is operating properly.
   - If the basic brake system is not operating properly, refer to the GROUP 35A, Basic Brake System Diagnosis P.35A-4.
   - If the basic brake system is operating properly, refer to P.35B-26.
6. If there is an ABS DTC, record the number of the DTC, then erase the DTC from the memory using the scan tool.
7. Recreate the ABS DTC set conditions to see if the same ABS DTC will set again.
   - If the same ABS DTC sets again, perform the diagnostic procedures for the DTC. Refer to P.35B-7.
   - If you cannot get the same ABS DTC to set again, the malfunction is intermittent. Refer to GROUP 00, How to use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-6.

ABS TROUBLE CODE DIAGNOSIS

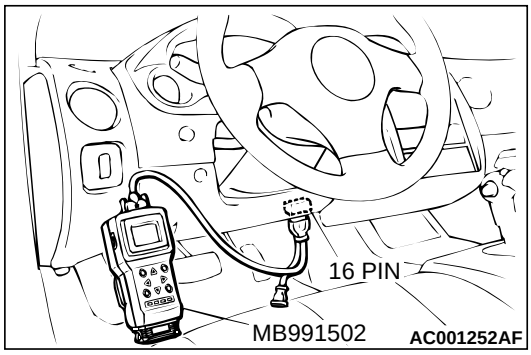
M1352011200273

Retrieving ABS Diagnostic Trouble Codes

Using Scan Tool MB991502

Required Special Tool:
- MB991502: Scan Tool (MUT-II)

⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOOK" (OFF) position before connecting or disconnecting the scan tool MB991502.



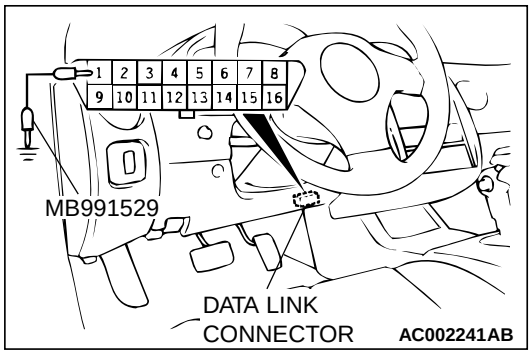
1. Connect scan tool MB991502 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Use scan tool MB991502 to check for ABS diagnostic trouble codes.
4. Turn the ignition switch to the "LOOK" (OFF) position.
5. Disconnect scan tool MB991502.

Using the ABS Warning Light and Special Tool MB991529

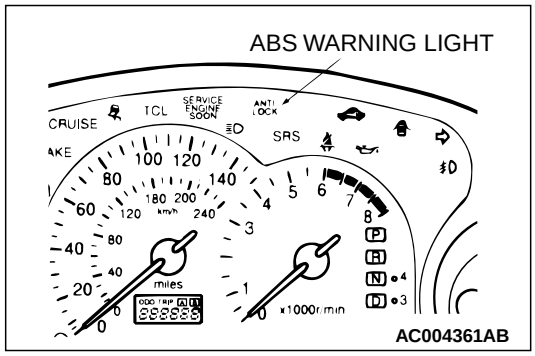
Required Special Tool:
- MB991529: Diagnostic Trouble Code Check Harness

1. Use special tool MB991529 to ground number 1 terminal of the data link connector.

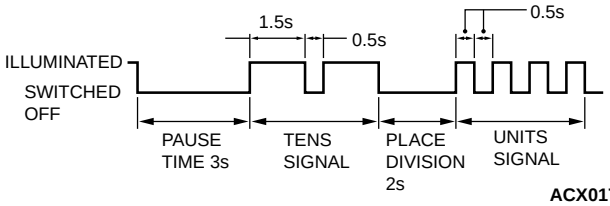
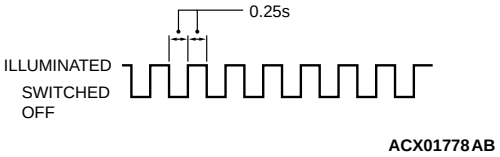
⚠ CAUTION
Do not depress the brake pedal after the ignition switch is turned to the "ON" position. If the brake pedal is depressed while the ABS is inoperative and the ignition switch is "ON," the ABS warning light will remain on. Because of this, diagnostic trouble codes will not be read out.



2. Turn the ignition switch to the "ON" position.



3. Read out a diagnostic trouble code by observing how the warning light flashes.

WHEN THE DIAGNOSTIC TROUBLE CODE NO. 24 IS OUTPUT	WHEN NO DIAGNOSTIC TROUBLE CODE IS OUTPUT
	

4. Disconnect special tool MB991529.

Erasing ABS Diagnostic Trouble Codes

NOTE: If the ABS-ECU functions have stopped due to the fail-safe function, the diagnostic trouble code cannot be erased.

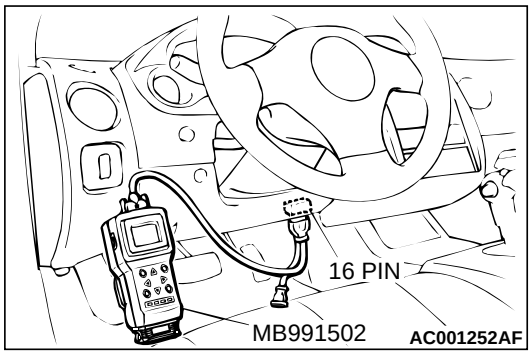
Using Scan Tool MB991502

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOOK" (OFF) position before connecting or disconnecting the scan tool.



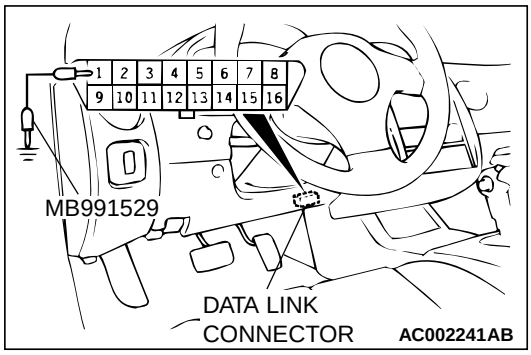
1. Connect scan tool MB991502 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Use scan tool MB991502 to erase ABS diagnostic trouble codes.
4. Turn the ignition switch to the "LOOK" (OFF) position.
5. Disconnect scan tool MB991502.

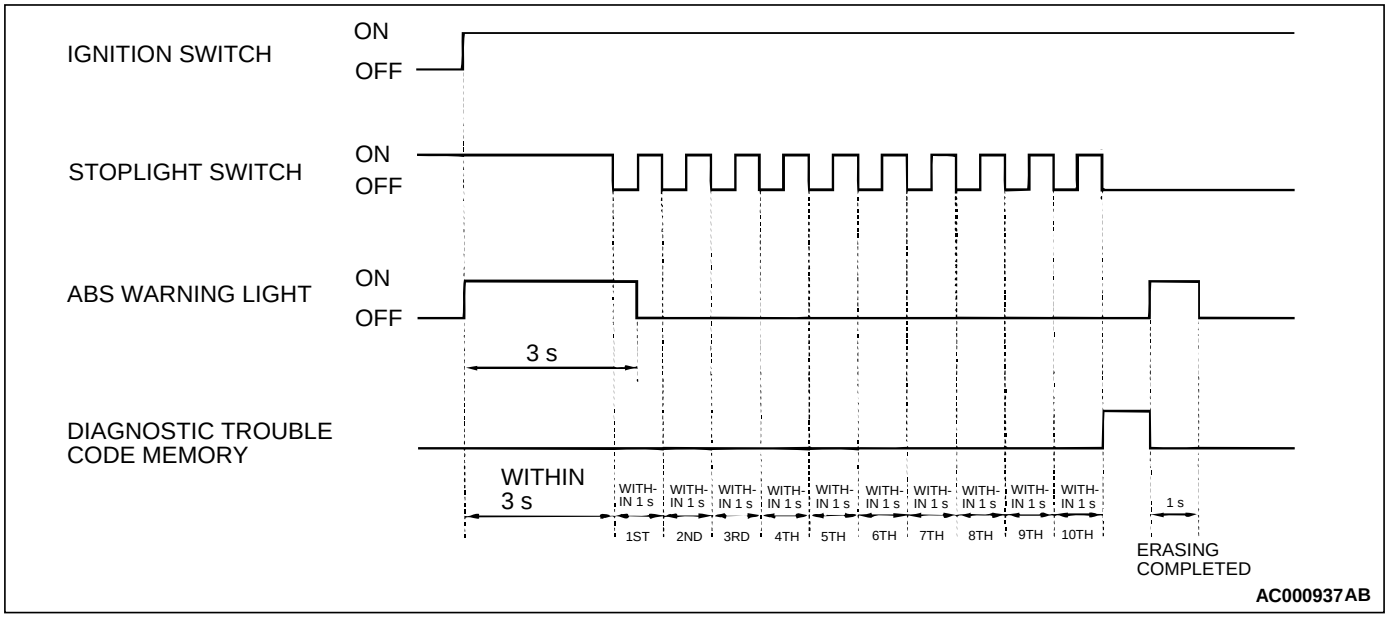
By Special Operation for Brake Pedal

Required Special Tool:

- MB991529: Diagnostic Trouble Code Check Harness

1. Use special tool MB991529 to ground number 1 terminal of the data link connector.





2. Depress the brake pedal and hold it.
3. Turn the ignition switch to the "ON" position.
4. After turning the ignition switch to the "ON" position, release the brake pedal within three seconds. Repeat this process of pressing and releasing the brake pedal 10 continuous times.
5. Turn the ignition switch to the "LOOK" (OFF) position.
6. Disconnect special tool MB991529.

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DIAGNOSTIC TROUBLE CODE CHART

M1352011300281

Follow the inspection chart that is appropriate for the diagnostic trouble code.

DIAGNOSTIC TROUBLE CODE NO.	INSPECTION ITEM	DIAGNOSTIC CONTENT	REFERENCE PAGE
11	Front right wheel speed sensor	Open circuit or short circuit	P.35B-8
12	Front left wheel speed sensor		
13	Rear right wheel speed sensor		
14	Rear left wheel speed sensor		
15	Wheel speed sensor	Abnormal output signal	P.35B-14
16	Power supply system	ABS-ECU power supply voltage below or above the standard value. Not displayed if the voltage recovers.	Check the battery. (Refer to GROUP 54A, Battery – On-vehicle Service – Battery Check P.54A-5.)
21	Front right wheel speed sensor		P.35B-8
22	Front left wheel speed sensor		
23	Rear right wheel speed sensor		
24	Rear left wheel speed sensor		
31*	TCL front left solenoid valve (IN)		Refer to GROUP 35C, Diagnostic Trouble Code Chart P.35C-7.)
32*	TCL front left solenoid valve (OUT)		
33*	TCL front right solenoid valve (IN)		
34*	TCL front right solenoid valve (OUT)		
38	Stoplight switch system		P.35B-19
41	ABS front right solenoid valve (IN)		P.35B-24
42	ABS front left solenoid valve (IN)		
43	ABS rear right solenoid valve (IN)		
44	ABS rear left solenoid valve (IN)		
45	ABS front right solenoid valve (OUT)		
46	ABS front left solenoid valve (OUT)		
47	ABS rear right solenoid valve (OUT)		
48	ABS rear left solenoid valve (OUT)		
51	Valve power supply		
53	Pump motor		
63	ABS-ECU		Replace the hydraulic unit (Integrated with ABS-ECU).

NOTE:

**: Vehicles with TCL*

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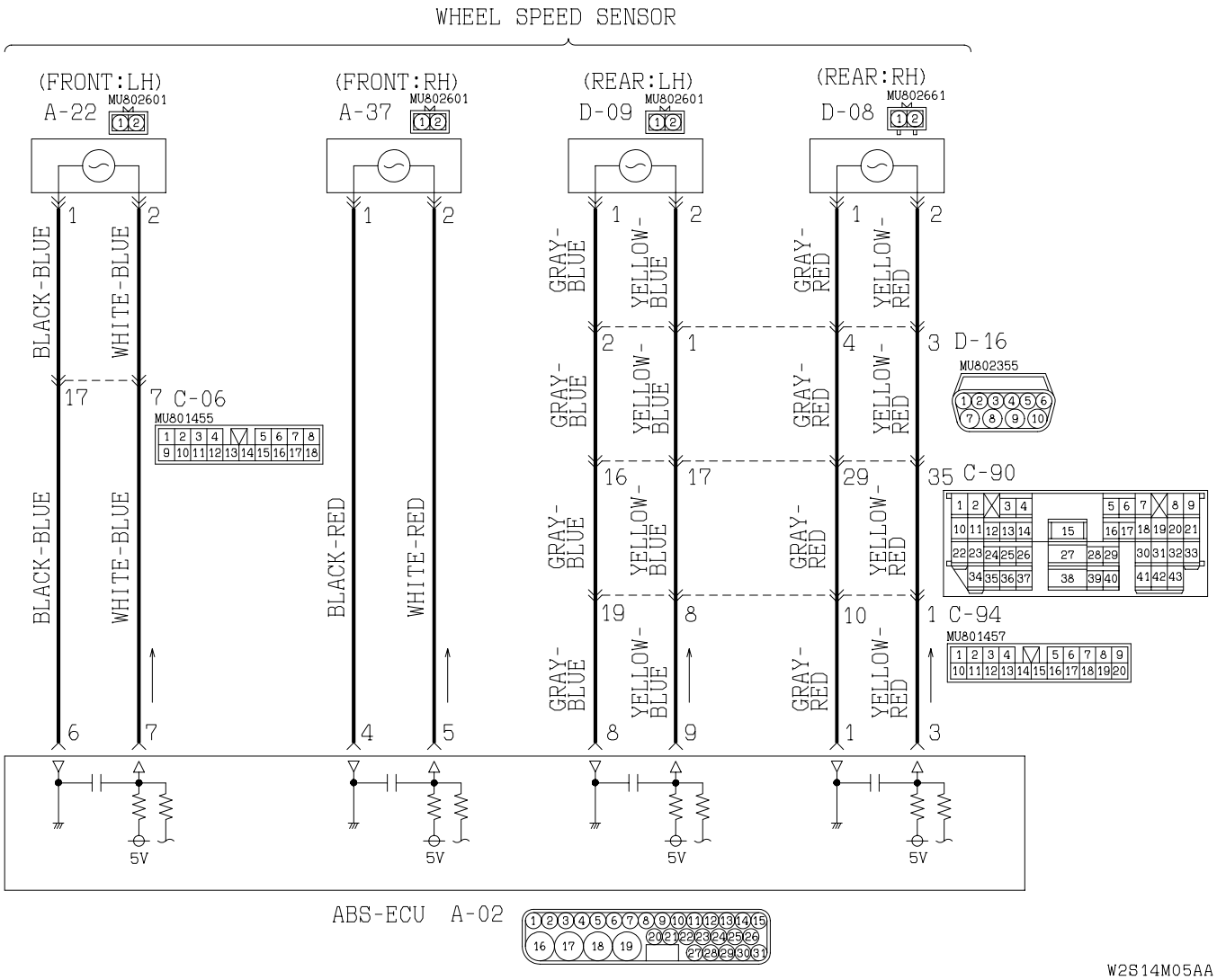
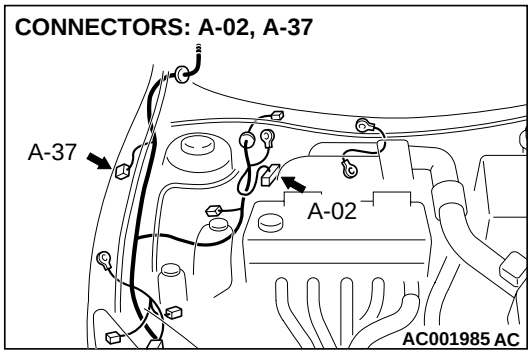
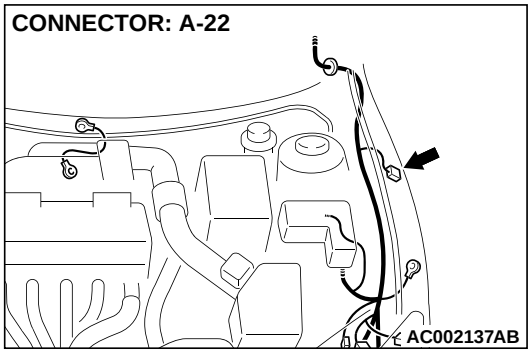
DIAGNOSTIC TROUBLE CODE PROCEDURES

DTC 11, 12, 13, 14, 21, 22, 23, 24: Wheel Speed Sensor

Wheel Speed Sensor Circuit







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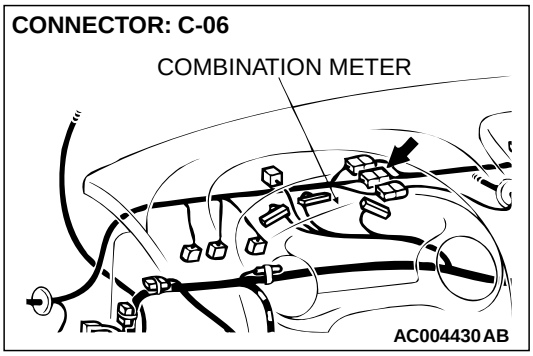
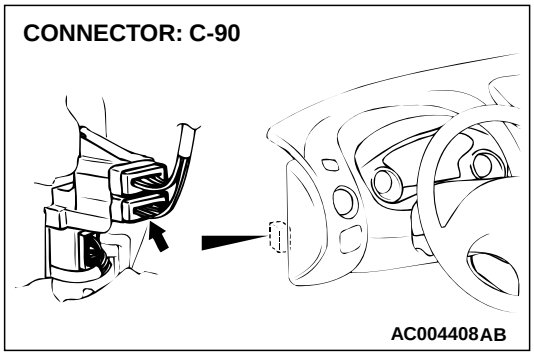
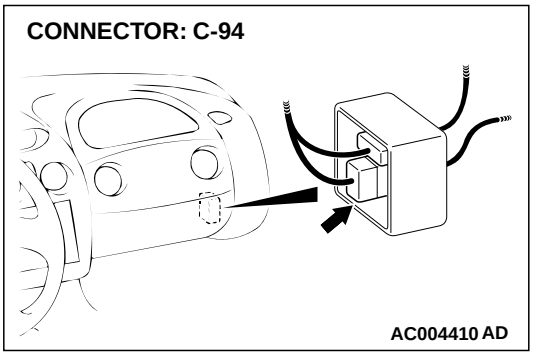
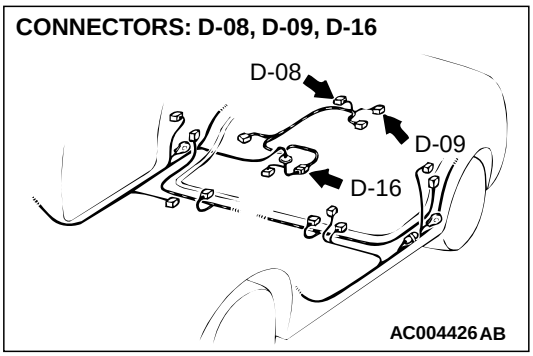








CIRCUIT OPERATION

- A toothed ABS rotor generates a voltage pulse as it moves across the pickup field of each wheel speed sensor.
- The amount of voltage generated at each wheel is determined by the clearance between the ABS rotor teeth and the wheel speed sensor, and by the speed of rotation.
- The wheel speed sensors transmit the frequency of the voltage pulses and the amount of voltage generated by each pulse to the ABS-ECU.
- The ABS hydraulic unit modulates the amount of braking force individually applied to each wheel cylinder.

ABS DTC SET CONDITIONS

- DTCs 11, 12, 13, 14 are output when signal is not input due to breakage of the wires of one or more of the four wheel-speed sensors. DTCs 21, 22, 23, 24 are output in the following cases:
- Open circuit is not found but no input is received by one or more of the four wheel speed sensors at 10 km/h (6 mph) or more.
- Sensor output drops due to a malfunctioning sensor or warped ABS rotor.

TROUBLESHOOTING HINTS (The most likely causes for these DTCs are to set are:)

DTC11, 12, 13, 14

- Malfunction of the wheel speed sensor
- Damaged wiring harness or connector
- Malfunction of the hydraulic unit (integrated with ABS-ECU)

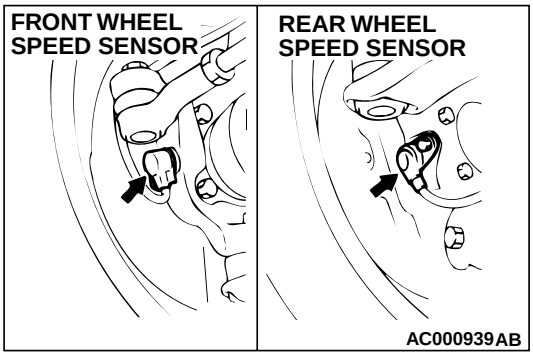
DTC21, 22, 23, 24

- Malfunction of the wheel speed sensor
- Damaged wiring harness or connector
- Malfunction of the hydraulic unit (integrated with ABS-ECU)
- Malfunction of the ABS rotor
- Malfunction of the wheel bearing
- Excessive clearance between the sensor and ABS rotor

DIAGNOSIS

Required Special Tools:

- MB991223: Harness Set
- MB991502: Scan Tool (MUT-II)
- MB991529: Diagnostic Trouble Code Check Harness

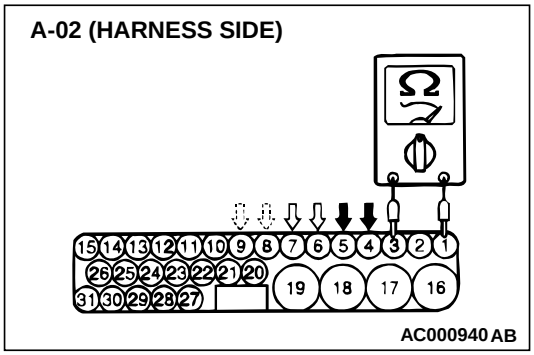


STEP 1. Check the wheel speed sensor installation.

Q: Is the wheel speed sensor bolted securely in place at the front knuckle or the rear knuckle?

YES : Go to Step 2.

NO : Install it properly (Refer to P.35B-55.) and go to Step 9 .



STEP 2. Check wheel speed sensor circuit at the ABS-ECU connector A-02.

(1) Disconnect the connector A-02 and measure at the harness side.

(2) Measure the resistance between the ABS-ECU connector terminals 1 and 3, 4 and 5, 6 and 7, or 8 and 9.

Standard Value: 1.28 – 1.92 kΩ

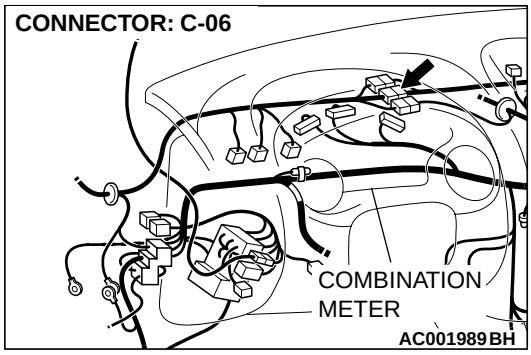
Q: Is the resistance between terminals 1 and 3, 4 and 5, 6 and 7, or 8 and 9 within the standard value?

YES : Go to Step 6.

NO <terminals 6 and 7> : Go to Step 3.

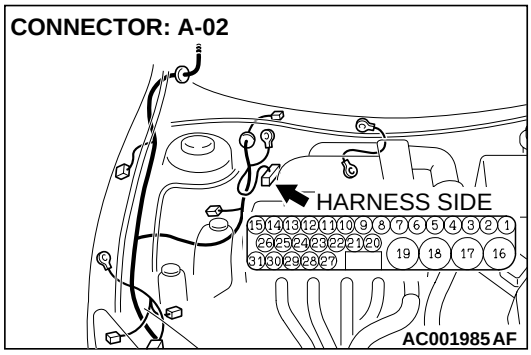
NO <terminals 4 and 5> : Go to Step 4.

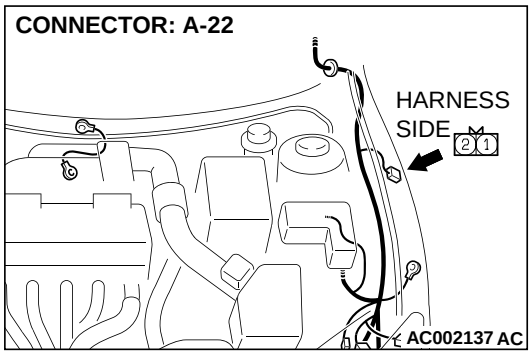
NO <terminals 1 and 3, 8 and 9> : Go to Step 5.



STEP 3. Check the harness wires between the ABS-ECU connector A-02 (terminals 6 and 7) and the wheel speed sensor <front: LH> connector A-22 (terminals 1 and 2).

NOTE: After inspecting the intermediate connector C-06, inspect the wires. If the intermediate connector C-06 is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If the connector has been repaired or replaced, go to Step 9.

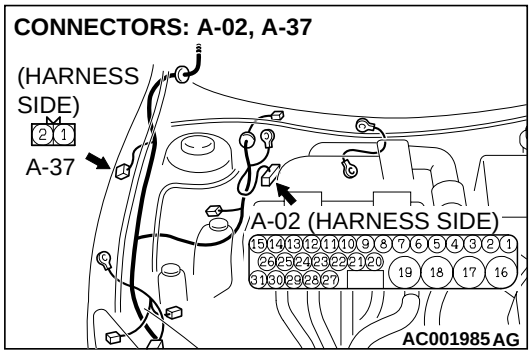




Q: Is any of the harness wires between the ABS-ECU connector A-02 (terminals 6 and 7) and the wheel speed sensor <front: LH> connector A-22 (terminals 1 and 2) damaged?

YES : Repair it and go to Step 9.
NO : Go to Step 7.

STEP 4. Check the harness wires between the ABS-ECU connector A-02 (terminals 4 and 5) and the wheel speed sensor <front: RH> connector A-37 (terminals 1 and 2).

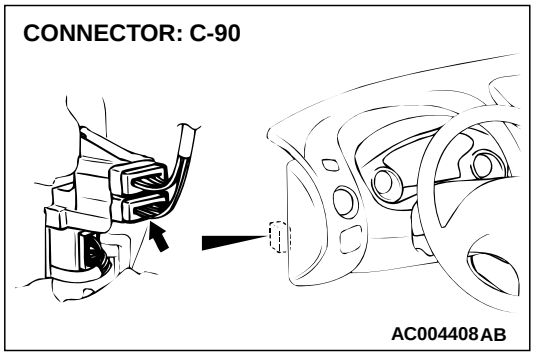


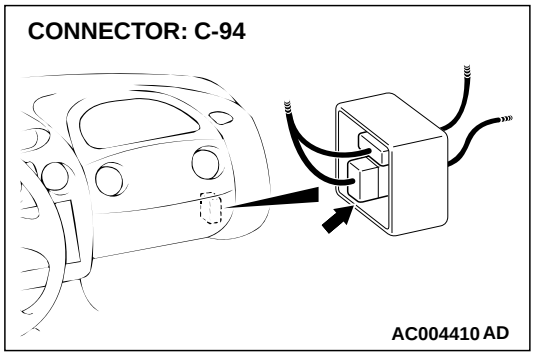
Q: Is any of the harness wires between the ABS-ECU connector A-02 (terminals 4 and 5) and the wheel speed sensor <front: RH> connector A-37 (terminals 1 and 2) damaged?

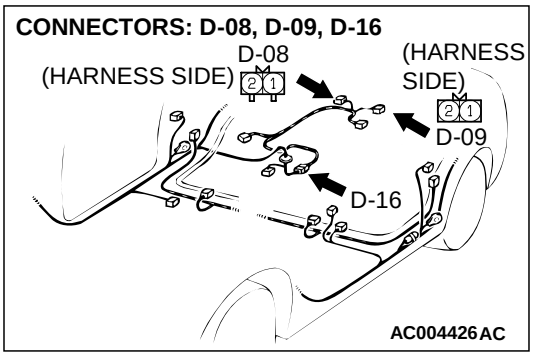
YES : Repair it and then go to Step 9.
NO : Go to Step 7.

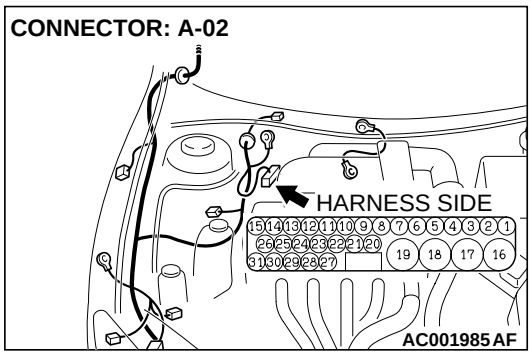
STEP 5. Check the harness wires between the ABS-ECU connector A-02 (terminals 1, 3, 8, and 9) and the wheel speed sensor connectors D-08 <rear: RH> (terminals 1 and 2) or D-09 <rear: LH> (terminals 1 and 2).

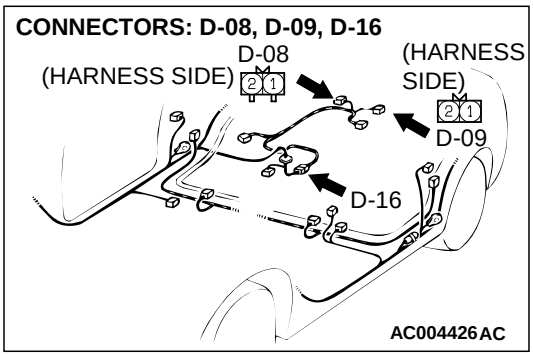
NOTE: After inspecting the intermediate connector C-90, C-94 or D-16, inspect the wires. If the intermediate connector C-90, C-94 or D-16 is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If the connector has been repaired or replaced, go to Step 9.











Q: Is any of the harness wires between the ABS-ECU connector A-02 (terminals 1, 3, 8, and 9) and the wheel speed sensor connectors D-08 <rear: RH> (terminals 1 and 2) or D-09 <rear: LH> (terminals 1 and 2) damaged?

YES : Repair it and then go to Step 9.
NO : Go to Step 7.

STEP 6. Check the wheel speed sensor output voltage.
Refer to P.35B-46.

Output Voltage:
- When measured with a voltmeter: 42 mV or more
- When measured with oscilloscope (maximum voltage): 200 mV or more

Q: Does the voltage meet the specification?

YES : Replace the hydraulic unit (integrated with ABS-ECU) and then go to Step 9.
NO : Go to Step 7.

STEP 7. Check the wheel speed sensor or ABS rotor.
Refer to P.35B-55. If there is a damage in any of the following check items, replace the wheel speed sensor or the ABS rotor.

Check items:
- Wheel speed sensor internal resistance

  Standard value: 1.28 – 1.92 kΩ
- Insulation between the wheel speed sensor body and connector terminals
- Toothed ABS rotor

Q: Is the wheel speed sensor or ABS rotor damaged?

YES : Replace the faulty part and then go to Step 9.
NO : Go to Step 8.

STEP 8. Check the wheel bearing.
Refer to GROUP 26, Front Hub Assembly P.26-7, or GROUP 27, Rear Axle Hub P.27-6.

Q: Is the wheel bearing damaged?
YES : Replace it and then go to Step 9.
NO : Go to Step 9.

STEP 9. Check the diagnostic trouble codes.

Q: Do the diagnostic trouble codes 11, 12, 13, 14, 21, 22, 23 or 24 reset?
YES : Go to Step 1.
NO : This diagnosis is complete.

DTC 15: Wheel Speed Sensor (Abnormal Output Signal)

WHEEL SPEED SENSOR CIRCUIT
Refer to P.35B-8.

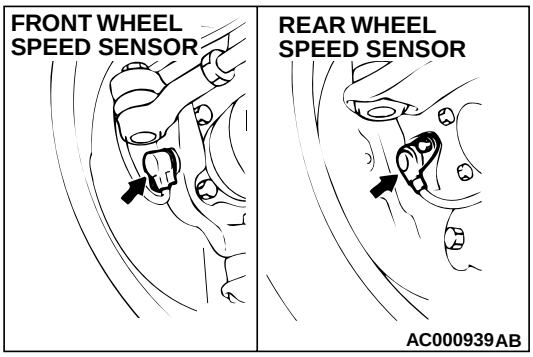
CIRCUIT OPERATION
Refer to P.35B-8.

ABS DTC SET CONDITIONS
- DTC 15 is output when output signal produced by any of wheel speed sensor is abnormal (excluding short and open-circuits).

TROUBLESHOOTING HINTS (The most likely causes for this DTC is to set are:)
- Improper installation of the wheel speed sensor
- Malfunction of the wheel speed sensor
- Damaged wiring harness or connector
- Malfunction of the ABS rotor
- Malfunction of the wheel bearing

DIAGNOSIS

Required Special Tools:
- MB991223: Harness Set
- MB991502: Scan Tool (MUT-II)
- MB991529: Diagnostic Trouble Code Check Harness

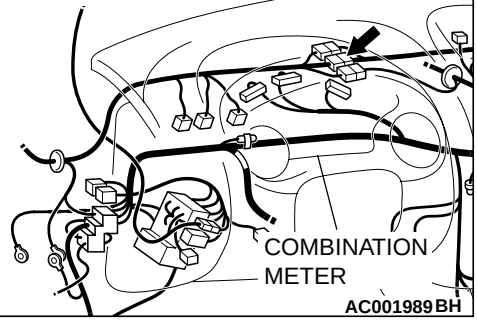


STEP 1. Check the wheel speed sensor installation.
Q: Are the wheel speed sensors bolted securely in place at the front knuckle or the rear knuckle?
YES : Go to Step 2.
NO : Install it properly. (Refer to P.35B-55.) Then go to Step 8 .

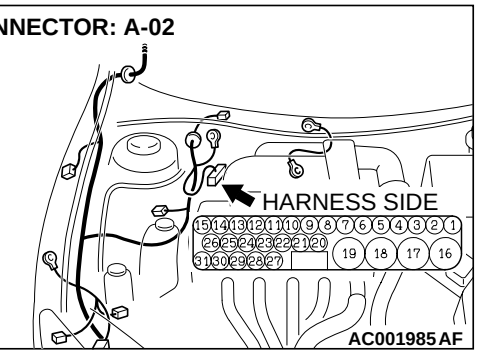
STEP 2. Check the harness wires between the ABS-ECU connector A-02 (terminals 6 and 7) and the wheel speed sensor <front: LH> connector A-22 (terminals 1 and 2).

NOTE: After inspecting the intermediate connector C-06, inspect the wires. If the intermediate connector C-06 is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If the connector has been repaired or replaced, go to Step 8.

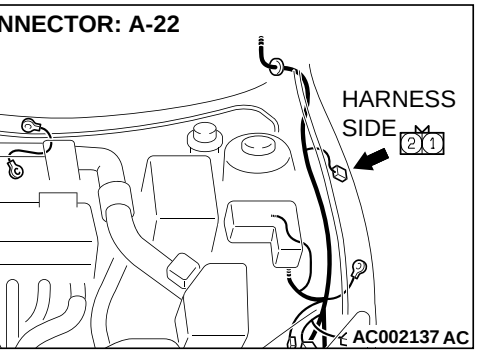
CONNECTOR: C-06



CONNECTOR: A-02



CONNECTOR: A-22



Q: Is any of the harness wires between the ABS-ECU connector A-02 (terminals 6 and 7) and the wheel speed sensor <front: LH> connector A-22 (terminals 1 and 2) damaged?

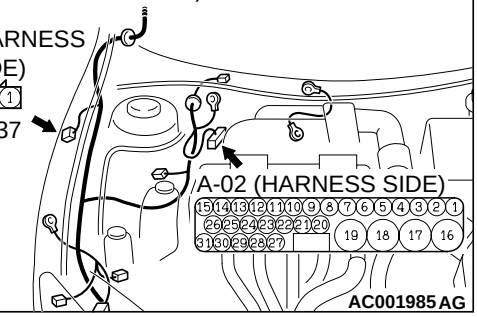
YES : Repair it and go to Step 8.
NO : Go to Step 3.

STEP 3. Check the harness wires between the ABS-ECU connector A-02 (terminals 4 and 5) and the wheel speed sensor <front: RH> connector A-37 (terminals 1 and 2).

Q: Is any of the harness wires between the ABS-ECU connector A-02 (terminals 4 and 5) and the wheel speed sensor <front: RH> connector A-37 (terminals 1 and 2) damaged?

YES : Repair it and then go to Step 8.
NO : Go to Step 4.

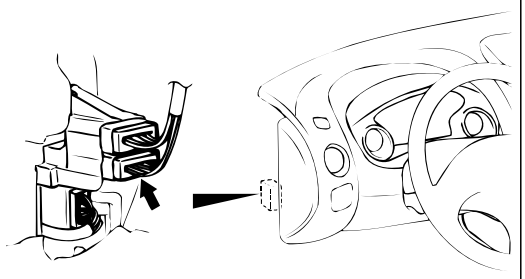
CONNECTORS: A-02, A-37



STEP 4. Check the harness wires between the ABS-ECU connector A-02 (terminals 1, 3, 8, and 9) and the wheel speed sensor connector D-08 <rear: RH> (terminals 1 and 2) or D-09 <rear: LH> (terminals 1 and 2).

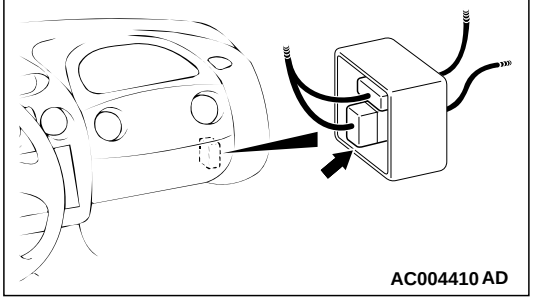
NOTE: After inspecting the intermediate connectors C-90, C-94 and D-16, inspect the wires. If the intermediate connector C-90, C-94 or D-16 is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If the connector has been repaired or replaced, go to Step 8.

CONNECTOR: C-90



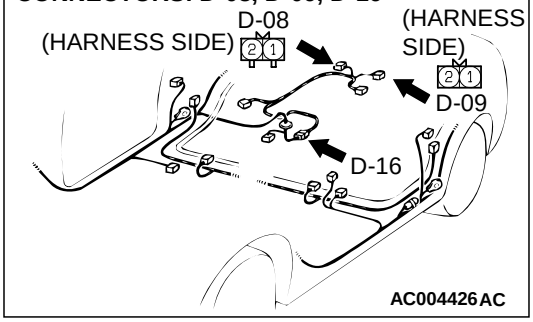
AC004408AB

CONNECTOR: C-94

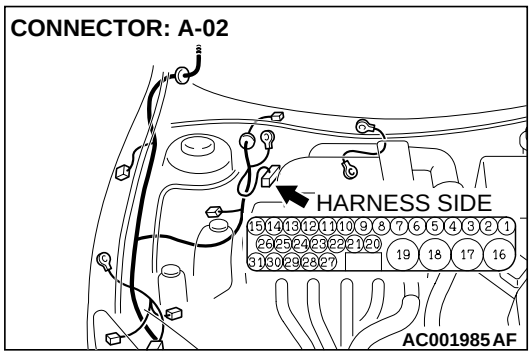


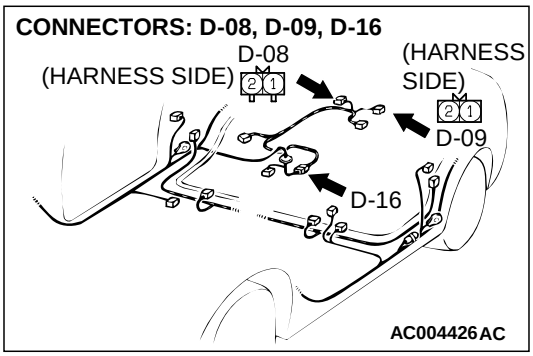
AC004410AD

CONNECTORS: D-08, D-09, D-16



AC004426AC





Q: Is any of the harness wires between the ABS-ECU connector A-02 (terminals 1, 3, 8, and 9) and the wheel speed sensor connector D-08 <rear: RH> (terminals 1 and 2) or D-09 <rear: LH> (terminals 1 and 2) damaged?

YES : Repair it and then go to Step 8.
NO : Go to Step 5.

STEP 5. Check each wheel speed sensor output voltage.
Refer to P.35B-46.

Output Voltage:
- When measured with a voltmeter: 42 mV or more
- When measured with oscilloscope (maximum voltage): 200 mV or more

Q: Does the voltage meet the specification?

YES : Replace the hydraulic unit (integrated with ABS-ECU) and then go to Step 8.
NO : Go to Step 6.

STEP 6. Check the wheel speed sensors or ABS rotors.
Refer to P.35B-55. If there is a damage in any of the following check items, replace the wheel speed sensor or the ABS rotor.

Check items:
- Wheel speed sensor internal resistance

  Standard value: 1.28 – 1.92 kΩ
- Insulation between the wheel speed sensor body and the connector terminals
- Toothed ABS rotor

Q: Is any of the wheel speed sensors or ABS rotors damaged?

YES : Replace the faulty part and then go to Step 8.
NO : Go to Step 7.

STEP 7. Check the wheel bearings.

Refer to GROUP 26, Front Hub Assembly P.26-7, or GROUP 27, Rear Axle Hub P.27-6.

Q: Is any of the wheel bearings damaged?

YES : Replace it and then go to Step 8.
NO : Go to Step 8.

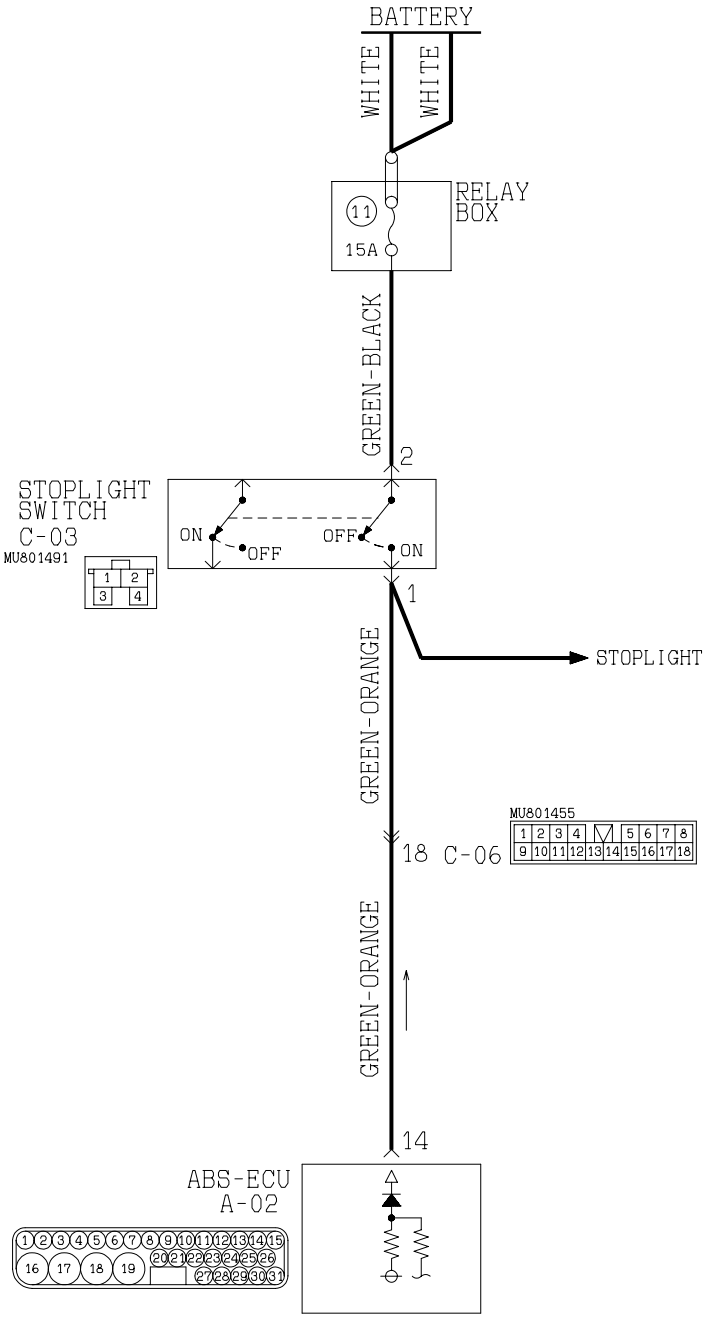
STEP 8. Check the diagnostic trouble codes.

Q: Do the diagnostic trouble code 15 reset?

YES : Go to Step 1.
NO : This diagnosis is complete.

DTC 38: Stoplight Switch System

Stoplight Switch Circuit



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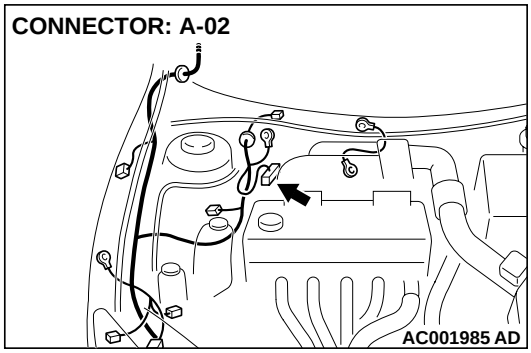

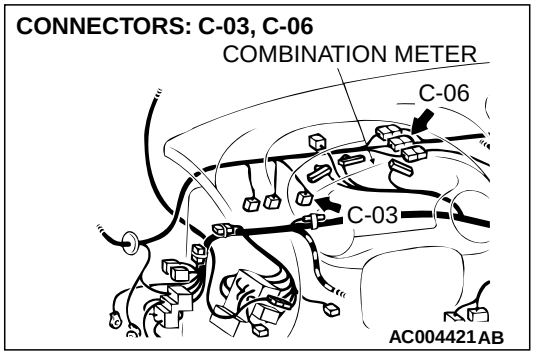

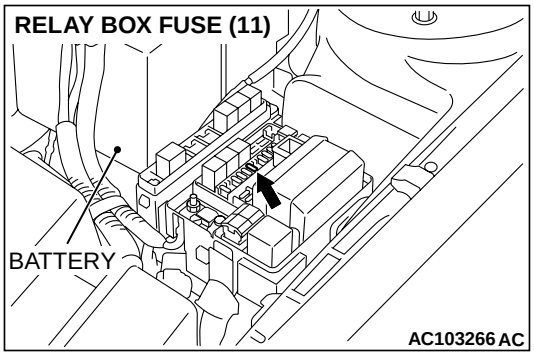

CIRCUIT OPERATION

- The ON signal when the brake pedal is pressed or the OFF signal when the brake pedal is released is input to the ABS-ECU (terminal 14).

ABS DTC SET CONDITION

Output is provided in the following cases:

- Stoplight switch is not operating properly and remains in ON state for more than 15 minutes.
- Stoplight switch system harness is damaged and no signal is input to ABS-ECU.

TROUBLESHOOTING HINTS (The most likely causes for this DTC is to set are:)

- Malfunction of the stoplight switch
- Damaged wiring harness or connector
- Malfunction of the hydraulic unit (integrated with ABS-ECU)

DIAGNOSIS

Required Special Tools:

- MB991223: Harness Set
- MB991502: Scan Tool (MUT-II)
- MB991529: Diagnostic Trouble Code Check Harness

STEP 1. Check the stoplight operation.

Q: Does the stoplight light or go out correctly?

YES : Go to Step 3.
NO : Go to Step 2.

STEP 2. Check the stoplight switch installation condition.

Q: Is the stoplight switch installed properly?

YES : Go to Step 4.
NO : Install it correctly and then go to Step 7.

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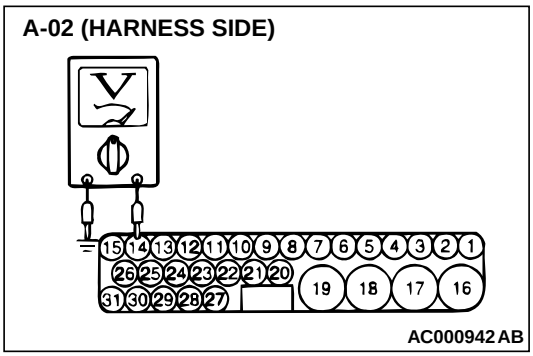
STEP 3. Check the stoplight switch circuit at the ABS-ECU connector A-02.

(1) Disconnect the ABS-ECU connector A-02 and measure at the harness side.
(2) Press the brake pedal. (The stoplight switch is turned to ON.)
(3) Measure the voltage between terminal 14 and ground.

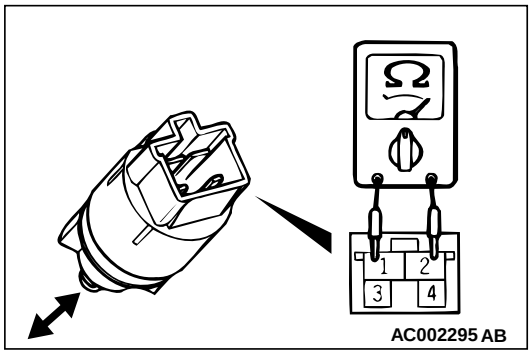


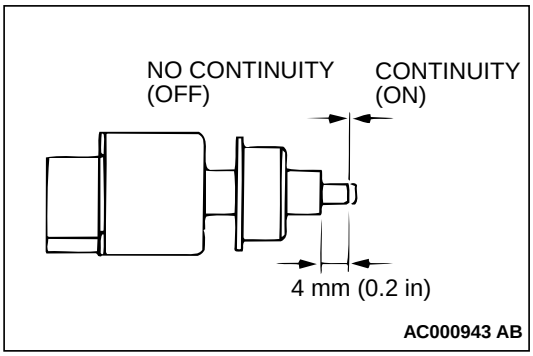
Q: Is the voltage approximately 12 volts (battery positive voltage)?

YES : Replace the hydraulic unit (integrated with ABS-ECU) and then go to Step 7.
NO : Go to Step 5.

STEP 4. Check the stoplight switch continuity.

(1) Remove the stoplight switch. (Refer to GROUP 35A, Brake Pedal P.35A-31.)
(2) Connect an ohmmeter to the stoplight switch terminals 1 and 2, and check whether there is continuity when the plunger of the stoplight switch is pushed in and when it is released.





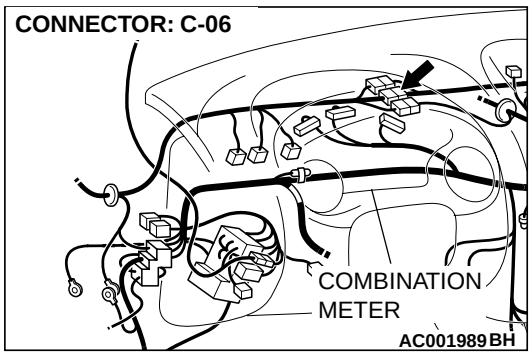
(3) The stoplight switch is in good condition if there is no continuity when the plunger is pushed in to a depth of within 4 mm (0.2 inch) from the outer case edge surface, and if there is continuity when it is released.

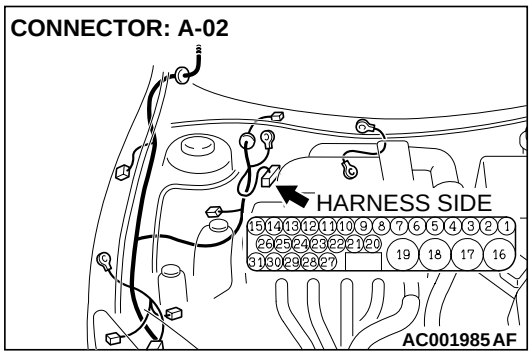
Q: Is the stoplight switch damaged?

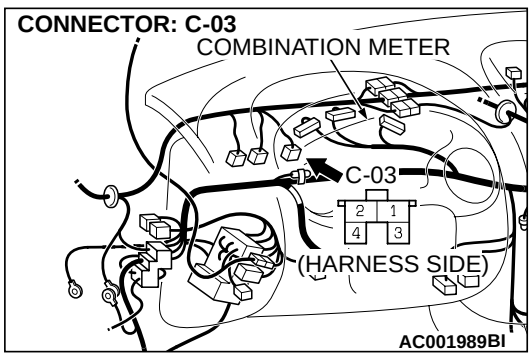
YES : Replace it and then go to Step 7.
NO : Go to Step 6.

STEP 5. Check the harness wire between the ABS-ECU connector A-02 (terminal 14) and the stoplight switch connector C-03 (terminal 1).

NOTE: After inspecting the intermediate connector C-06, inspect the wire. If the intermediate connector C-06 is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If the connector has been repaired or replaced, go to Step 7.

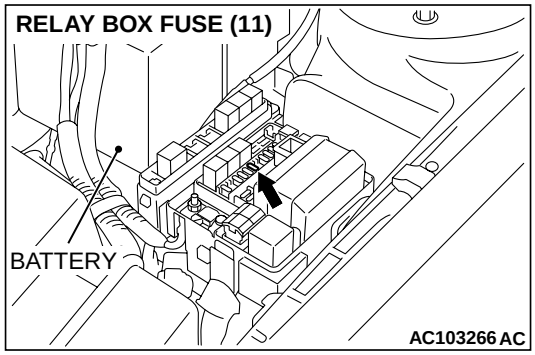


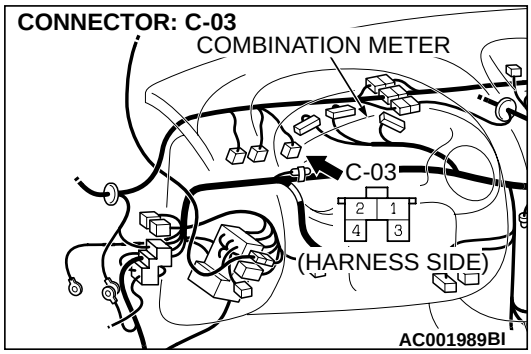




Q: Is the harness wire between the ABS-ECU connector A-02 (terminal 14) and the stoplight switch connector C-03 (terminal 1) damaged?

YES : Repair it and then go to Step 7.
NO : No action is to be taken.





STEP 6. Check the harness wire between relay box fuse number 11 and stoplight switch connector C-03 (terminal 2).

Q: Is the harness wire between the relay box fuse number 11 and the stoplight switch connector C-03 (terminal 2) damaged?

YES : Repair it and then go to Step 7.

NO : Check and repair the harness wire between stoplight switch and stoplight. Then go to Step 7.

STEP 7. Check the diagnostic trouble code.

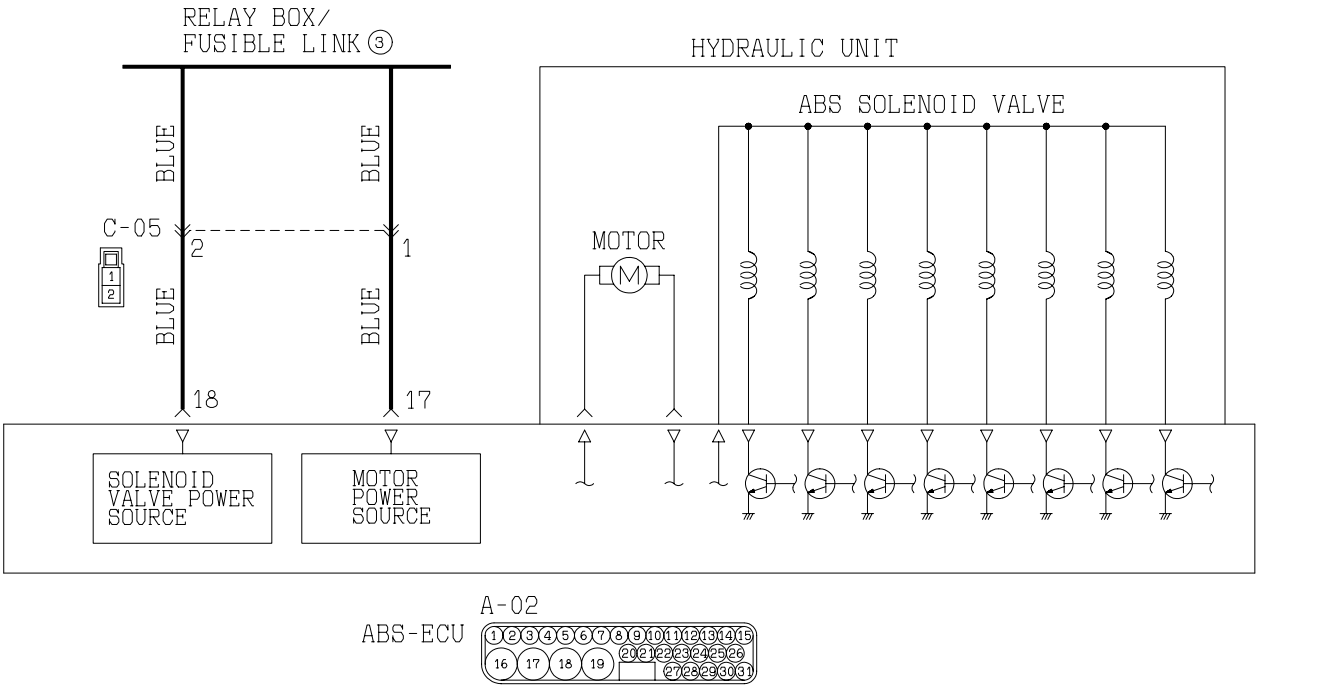
Q: Does the diagnostic trouble code 38 reset?

YES : Return to Step 1.

NO : This diagnosis is complete.

DTC 41, 42, 43, 44, 45, 46, 47, 48: ABS Solenoid Valve inside Hydraulic Unit (Open Circuit or Short circuit) /DTC 51: Valve Power Supply /DTC 53: Pump Motor

Solenoid Valve and Motor Power Supply Circuit



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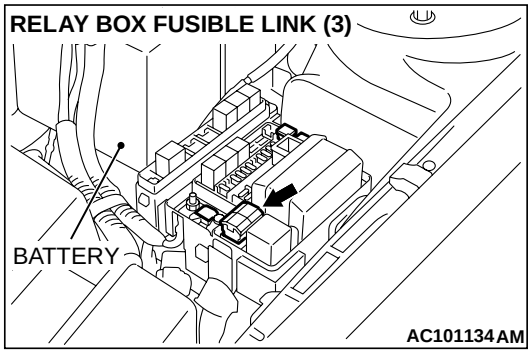

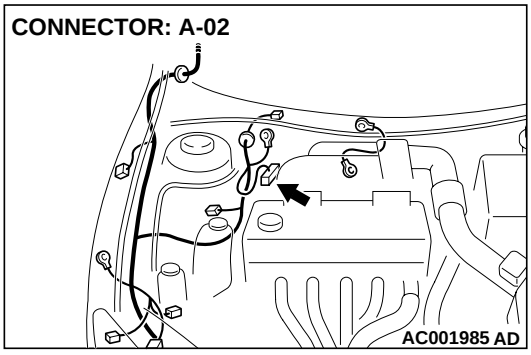

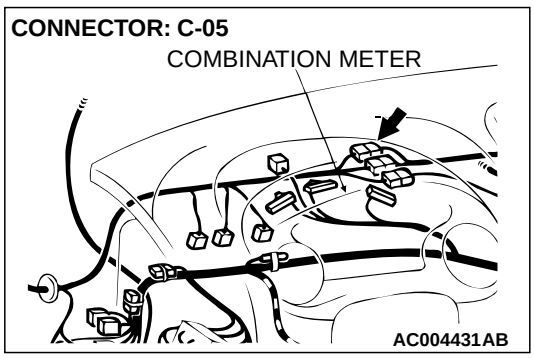

CIRCUIT OPERATION

Power is continuously supplied to the ABS-ECU through the relay box fusible link number 3 to operate the solenoid valve and motor.

ABS DTC SET CONDITIONS

These codes are displayed if the power supply circuit of solenoid valve or motor is open or shorted.

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TROUBLESHOOTING HINTS (The most likely causes for these DTCs are to set are:)

- Damaged wiring harness or connector
- Malfunction of the hydraulic unit (integrated with ABS-ECU)

DIAGNOSIS

Required Special Tools:

- MB991223: Harness Set
- MB991502: Scan Tool (MUT-II)
- MB991529: Diagnostic Trouble Code Check Harness

STEP 1. Check the solenoid valve or motor power supply circuit at ABS-ECU connector A-02.

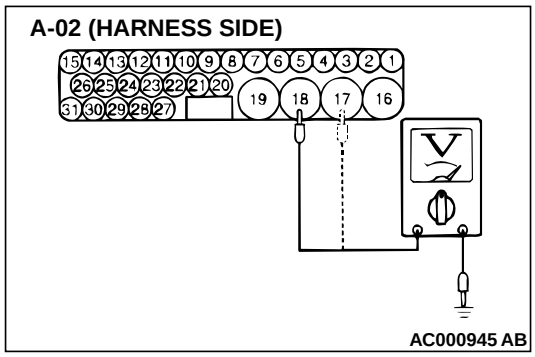
(1) Disconnect the ABS-ECU connector A-02 and measure at the harness side.

(2) Measure the voltage between terminal 18 and ground, and 17 and ground.

Q: Is the voltage approximately 12 volts (battery positive voltage)?

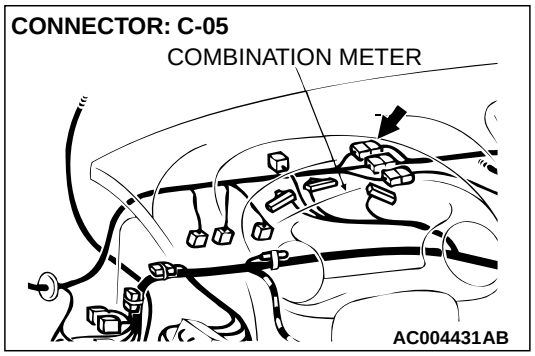
YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-52.) and then go to Step 3.

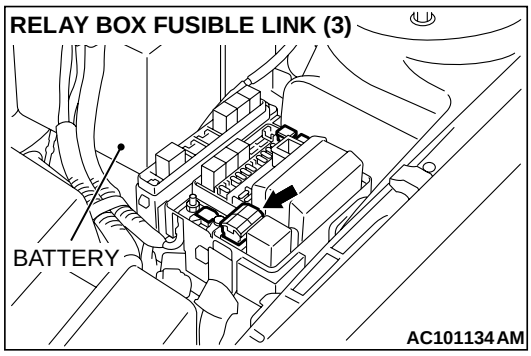
NO : Go to Step 2.

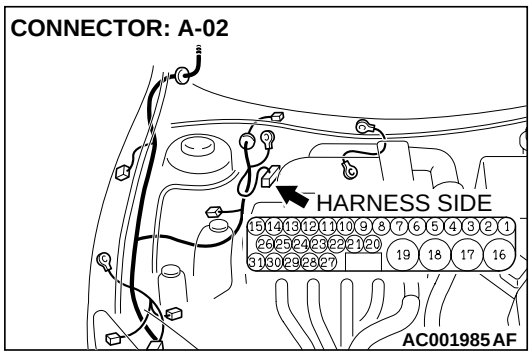


STEP 2. Check the harness wires between the relay box fusible link number 3 and the ABS-ECU connector A-02 (terminals 17 and 18).

NOTE: After inspecting the intermediate connector C-05, inspect the wires. If the intermediate connector C-05 is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If the connector has been repaired or replaced, go to Step 3.







Q: Is any of the harness wires between the relay box fusible link number 3 and the ABS-ECU connector A-02 (terminals 17 and 18) damaged?

YES : Repair it and then go to Step 3.
NO : Go to Step 3.

STEP 3. Check the diagnostic trouble codes.

Q: Do the diagnostic trouble codes 41, 42, 43, 44, 45, 46, 47, 48, 51 or 53 reset?

YES : Go to Step 1.
NO : This diagnosis is complete.

SYMPTOM CHART

M1352011400318

NOTE: If steering movements are made when driving at high speed, or when driving on road surfaces with low frictional resistance, or when passing over bumps, the ABS may operate although sudden braking is not being applied. Because of this, when getting information from the customer, check if the problem occurred while driving under such conditions as these.

NOTE: During ABS operation, the brake pedal may vibrate a little or may not be able to be pressed. Such conditions are due to intermittent changes in hydraulic pressure inside the brake line to prevent the wheels from locking. This is normal.

SYMPTOMS	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Communication between the scan tool and the whole system is not possible.	–	GROUP 13A, Diagnosis P.13A-434 or GROUP 13B, Diagnosis P.13B-530.
Communication between the scan tool and the ABS-ECU is not possible.	1	P.35B-27
When the ignition key is turned to the "ON" position (Engine stopped), the ABS warning light does not illuminate.	2	P.35B-32
The ABS warning light remains illuminated after the engine is started.	3	P.35B-38
Faulty ABS operation	4	P.35B-42

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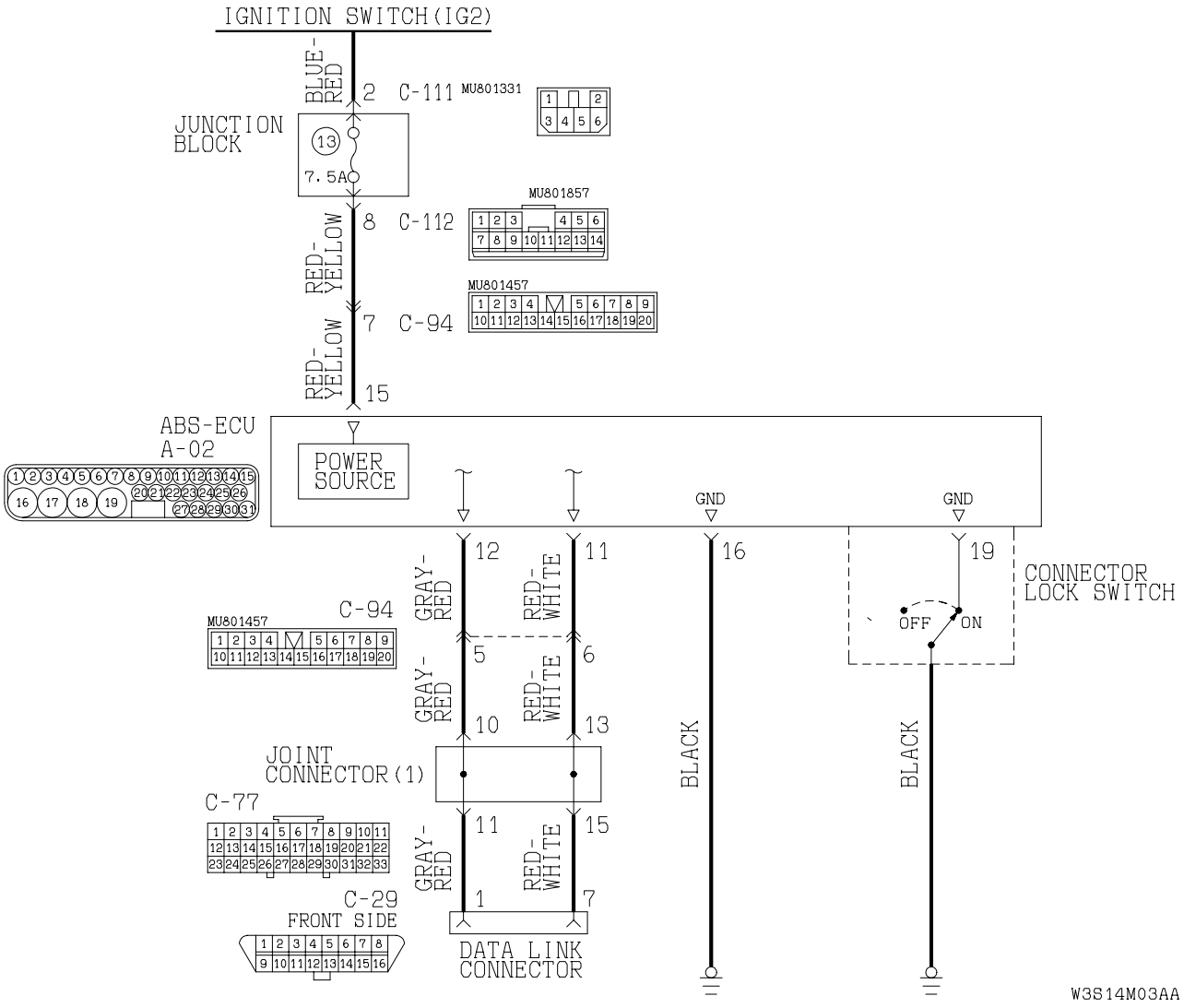
SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Communication between the Scan Tool and the ABS-ECU is not Possible.

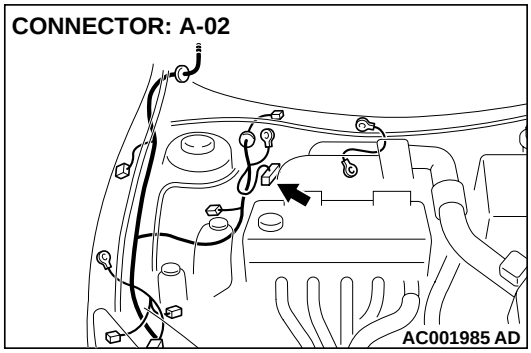
Data Link Connector Circuit

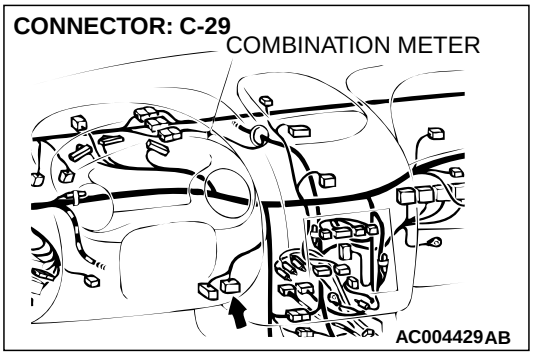


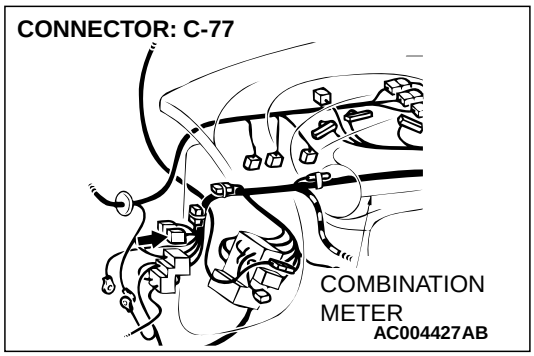
NOTE: CONNECTOR LOCK SWITCH

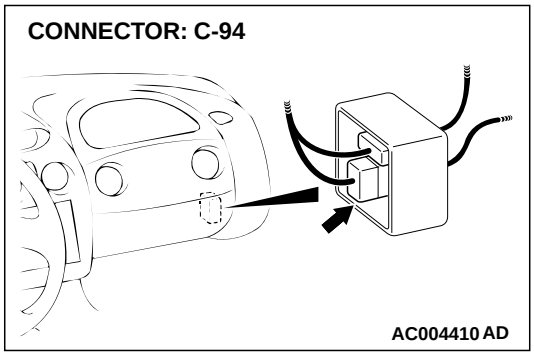
ON: The ABS-ECU connector A-02 is connected.

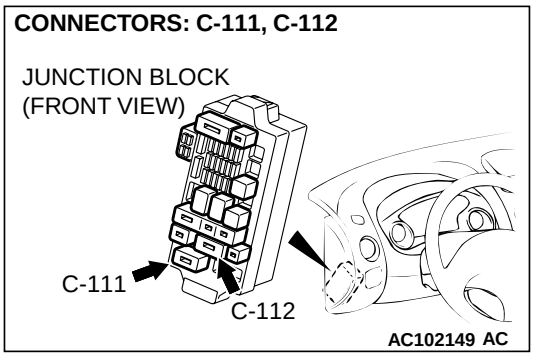
OFF: The ABS-ECU connector A-02 is disconnected.











CIRCUIT OPERATION

- The diagnostic output is made from the ABS-ECU (terminal 11) to the diagnostic output terminal (terminal 7) of the data link connector.
- When the data link connector's diagnostic test mode control terminal (terminal 1) is grounded, the ABS-ECU (terminal 12) will go into diagnostic mode.

TECHNICAL DESCRIPTION (COMMENT)

When communication with the scan tool is not possible, the cause is probably an open circuit in the ABS-ECU power circuit or an open circuit in the diagnostic output circuit.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Blown fuse
- Damaged wiring harness and connector
- Malfunction of the hydraulic unit (Integrated with ABS-ECU)

DIAGNOSIS

Required Special Tool:
- MB991223: Harness Set

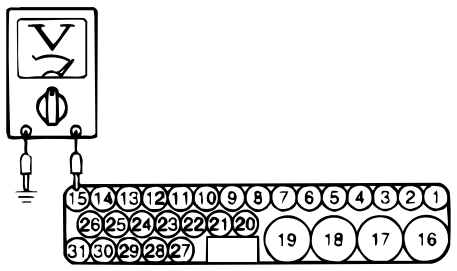
STEP 1. Check the power supply circuit at ABS-ECU connector A-02.

(1) Disconnect connector A-02 and measure at the harness side.
(2) Start the engine.
(3) Measure the voltage between terminal 15 and ground. It should be approximately 12 volts (battery positive voltage).

Q: Is voltage approximately 12 volts (battery positive voltage)?

YES : Go to Step 3.
NO : Go to Step 2.

A-02 (HARNESS SIDE)



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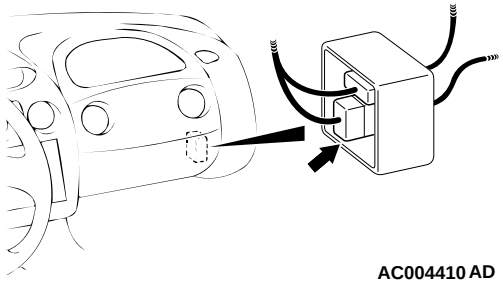
STEP 2. Check the harness wire between the ignition switch (IG2) and the ABS-ECU connector A-02 (terminal 15).

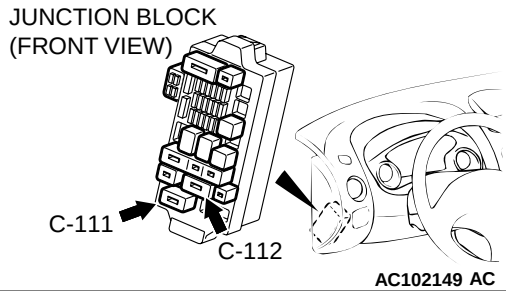
NOTE: After inspecting the intermediate connectors C-94, C-111, and C-112, inspect the wire. If the intermediate connector C-94, C-111, or C-112 is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If the connector has been repaired or replaced, go to Step 5.

CONNECTOR: C-94



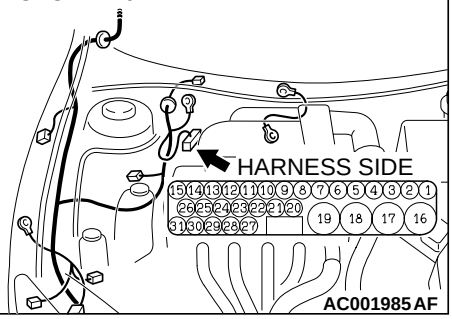
AC004410 AD

CONNECTORS: C-111, C-112



AC102149 AC

CONNECTOR: A-02



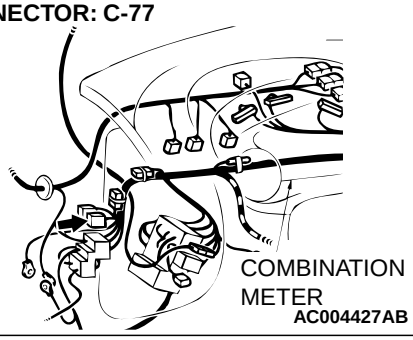
Q: Is the harness wire between the ignition switch (IG2) and the ABS-ECU connector A-02 (terminal 15) damaged?

YES : Repair it and go to Step 5.
NO : Go to Step 3.

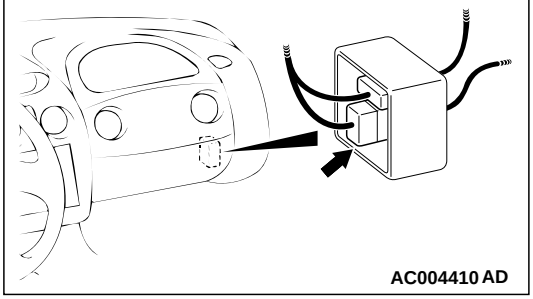
STEP 3. Check the harness wires between the ABS-ECU connector A-02 (terminals 11 and 12) and the data link connector C-29 (terminals 1 and 7).

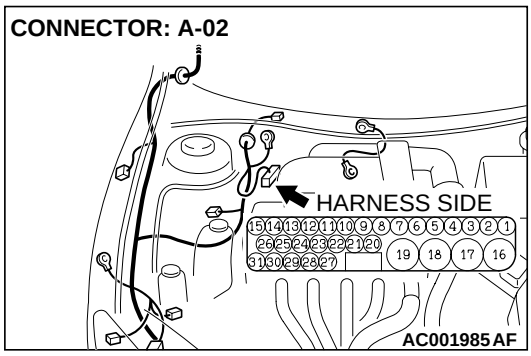
NOTE: After inspecting the intermediate connectors C-77 and C-94, inspect the wires. If the intermediate connector C-77 or C-94 is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If the connector has been repaired or replaced, go to Step 5.

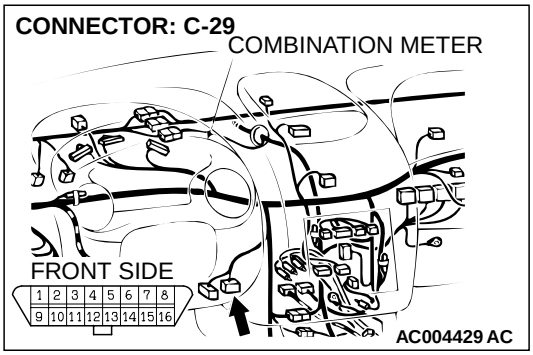
CONNECTOR: C-77



CONNECTOR: C-94



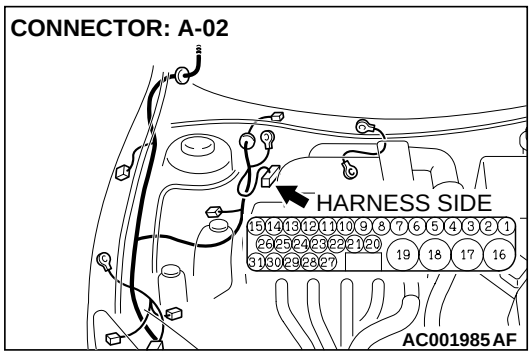




Q: Is any of the harness wires between the ABS-ECU connector A-02 (terminals 11 and 12) and the data link connector C-29 (terminals 1 and 7) damaged?

YES : Repair it and go to Step 5.
NO : Go to Step 4.

STEP 4. Check the harness wires between ABS-ECU connector A-02 (terminals 16 and 19) and ground.



Q: Are any harness wires between ABS-ECU connector A-02 (terminals 16 and 19) and ground damaged?

YES : Repair them and then go to Step 5.
NO : Go to Step 5.

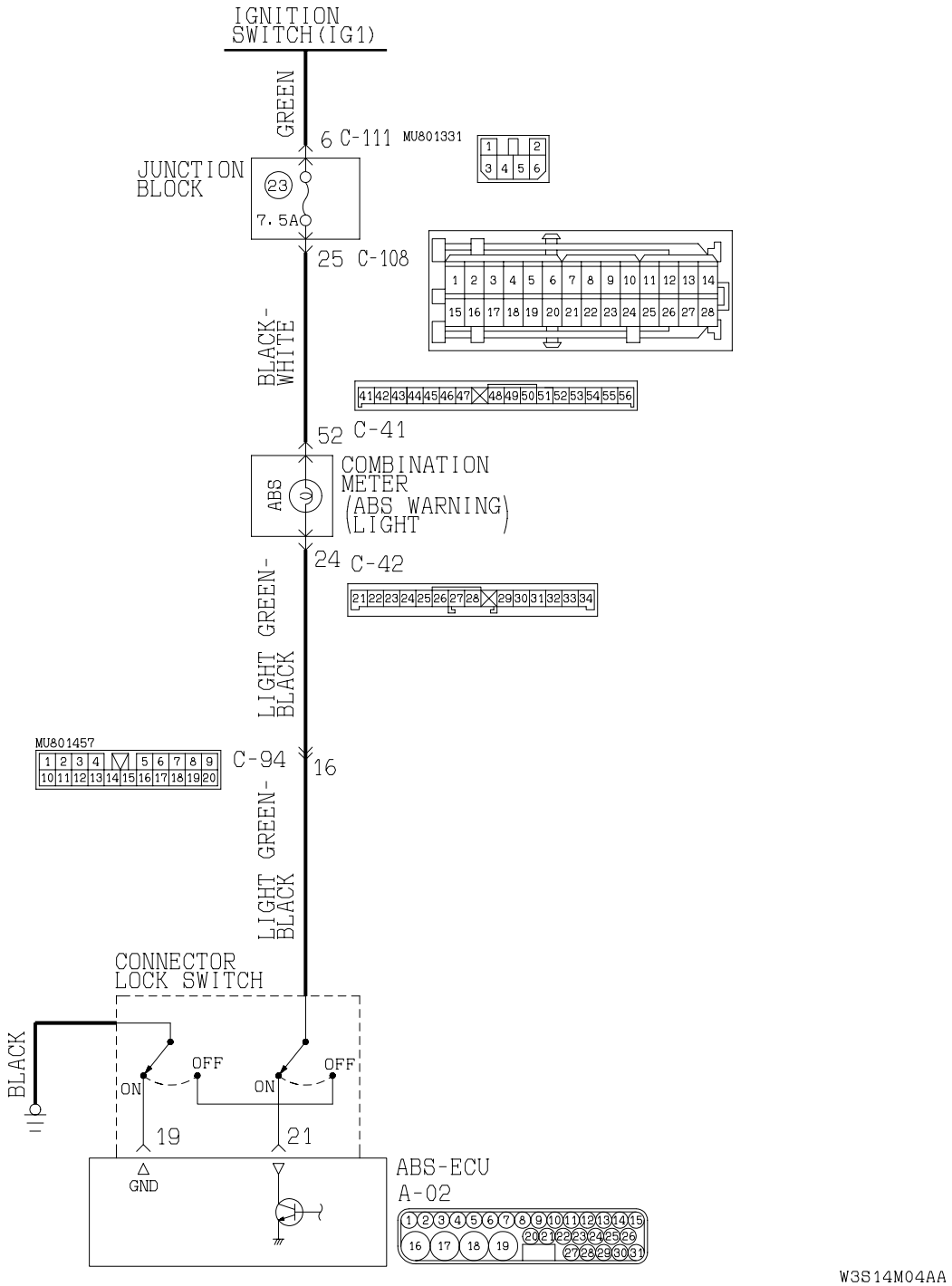
STEP 5. Check symptom.

Q: Does the scan tool communicate with the ABS system?

YES : This diagnosis is complete.
NO : Return to Step 1.

INSPECTION PROCEDURE 2: When the Ignition Key is Turned to the "ON" Position (Engine Stopped), the ABS Warning Light does not Illuminate.

ABS Warning Light Circuit

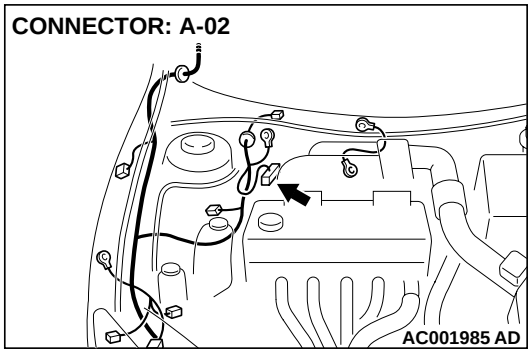


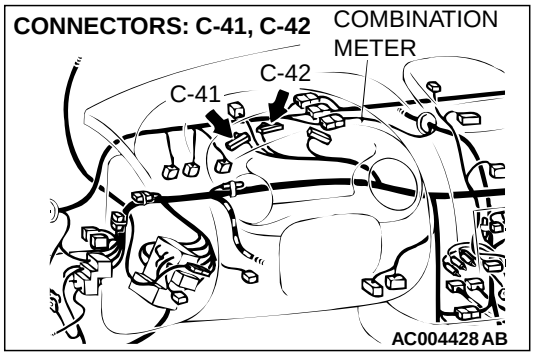
NOTE: CONNECTOR LOCK SWITCH

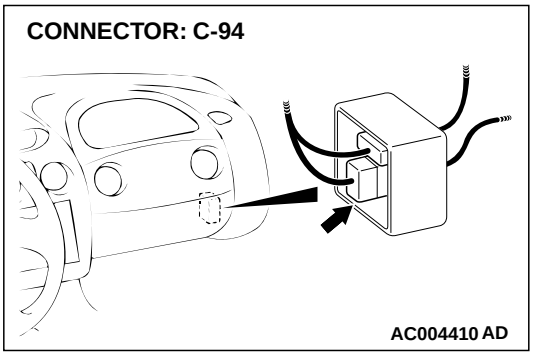
ON: The ABS-ECU connector A-02 is connected.

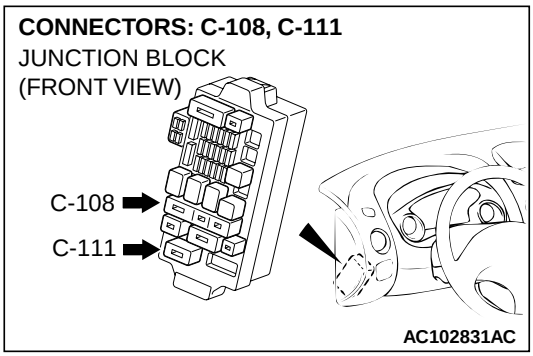
OFF: The ABS-ECU connector A-02 is disconnected.

TSB Revision









CIRCUIT OPERATION

- The ABS warning light power is supplied from the ignition switch. The ABS-ECU grounds the circuit to illuminate the light.
- The ABS-ECU illuminates the ABS warning light for 3 seconds while running self-check. This light can be illuminated for 3 seconds upon start-up or when the ignition switch is turned to the "ON" position with engine stopped.
- When the ABS-ECU connector is disconnected, the circuit is grounded to illuminate the light by the connector lock switch OFF operation.

TECHNICAL DESCRIPTION (COMMENT)

The cause may be: an open circuit in the ABS warning light power supply circuit, a blown ABS warning light bulb, or malfunction of the ABS-ECU.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Blown fuse
- Damaged wiring harness or connector
- Burnt out ABS warning light bulb
- Malfunction of the hydraulic unit (integrated with ABS-ECU)

DIAGNOSIS

Required Special Tool:

- MB991223: Harness Set

STEP 1. Check the ABS warning light circuit at the ABS-ECU connector A-02.

(1) Disconnect the ABS-ECU connector A-02.
(2) Turn the ignition switch to the "ON" position.

Q: Does the ABS warning light illuminate?

YES : Replace the hydraulic unit (integrated with ABS-ECU) and then go to Step 9.
NO : Go to Step 2.

STEP 2 Check the ABS warning light bulb.

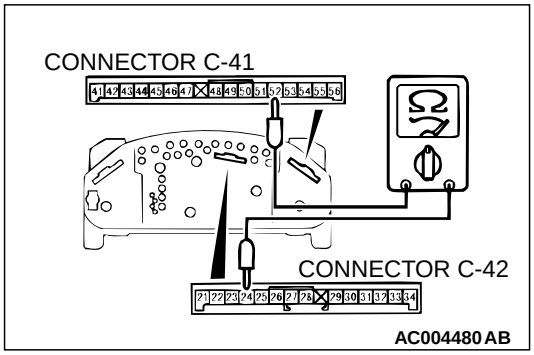
(1) Remove the combination meter (Refer to GROUP 54A, Combination Meter P.54A-105 and P.54A-107.)
(2) Check the ABS warning light bulb.

Q: Is the bulb burned out?

YES : Replace the bulb and then go to Step 9.
NO : Go to Step 3.

STEP 3. Check the combination meter for continuity.

(1) Remove the combination meter.
(2) Remove the ABS warning light bulb. Then measure the resistance between the bulb terminals.
(3) Install the ABS warning light bulb to the combination meter, and then measure the resistance between connector C-41 terminal 52 and connector C-42 terminal 24. The resistance reading at this time should be much the same as the resistance measured at step (2).

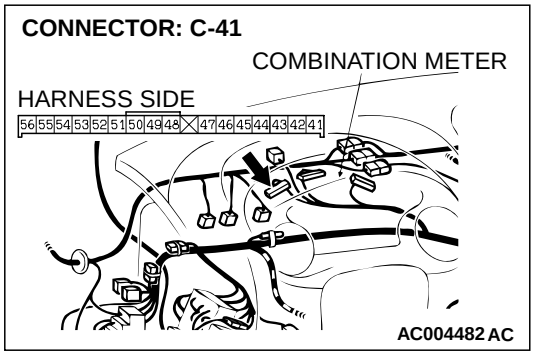


Q: Are the two resistance values extremely different each other?

YES : Replace the combination meter (printed circuit board) and then go to Step 9.
NO : Go to Step 4.

STEP 4. Check the combination meter power supply circuit.

(1) Disconnect connector C-41, and check at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 52 and ground. It should be approximately 12 volts (battery positive voltage).



Q: Is the voltage approximately 12 volts (battery positive voltage)?

YES : Go to Step 5.
NO : Go to Step 7.

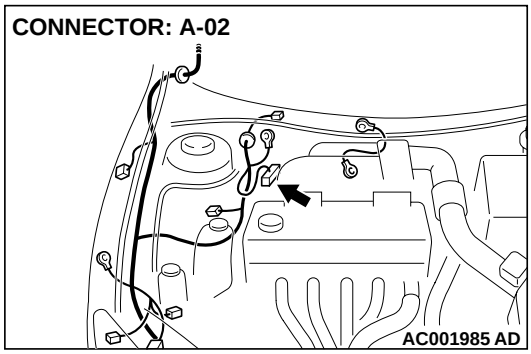
STEP 5. Check the connectors A-02, C-42, and C-94.

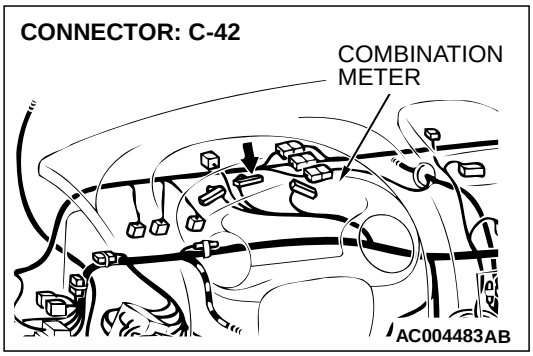
Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

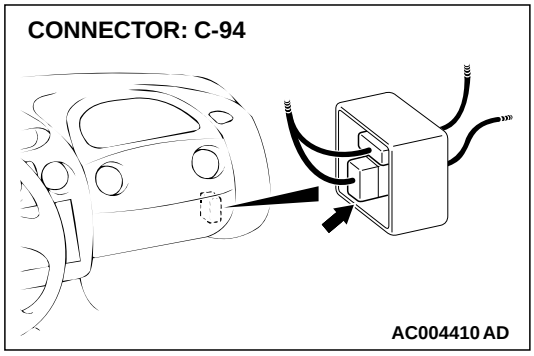
Q: Is any of the connectors damaged?

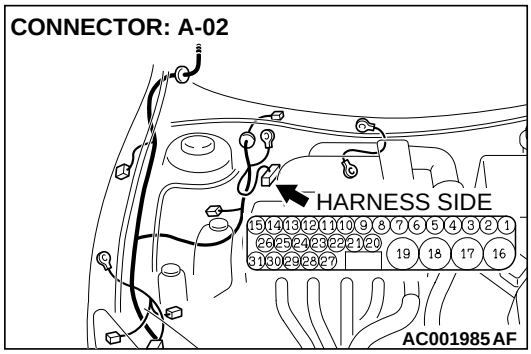
YES : Repair it and then go to Step 9.

NO : Go to Step 6.









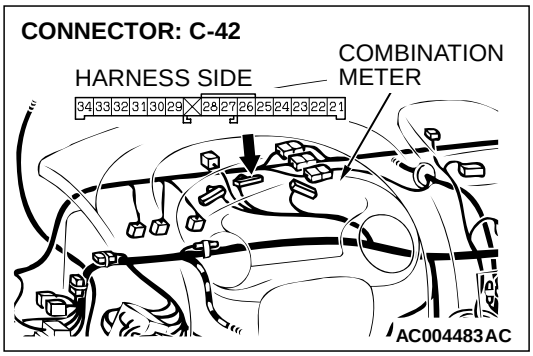
STEP 6. Check the continuity between the combination meter and the ABS-ECU.

Check the continuity between the combination meter connector C-42 (terminal 24) and the ABS-ECU connector A-02 (terminal 21).

NOTE: This check must be done with the ABS-ECU connector A-02 is connected to the ABS-ECU. Disconnection of the ABS-ECU connector A-02 makes the connector lock switch OFF, so this continuity check could not be done.

Q: Is there the continuity between the combination meter connector C-42 (terminal 24) and the ABS-ECU connector A-02 (terminal 21)?

YES : Go to Step 9.
NO : Repair the harness wire and then go to Step 9.

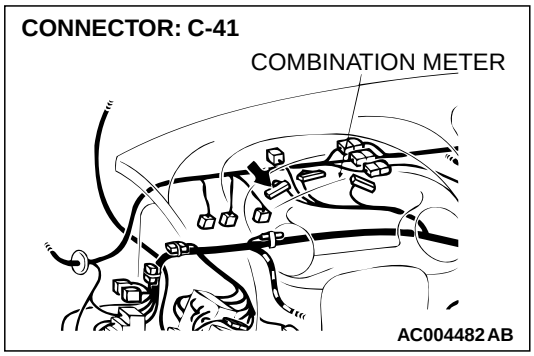


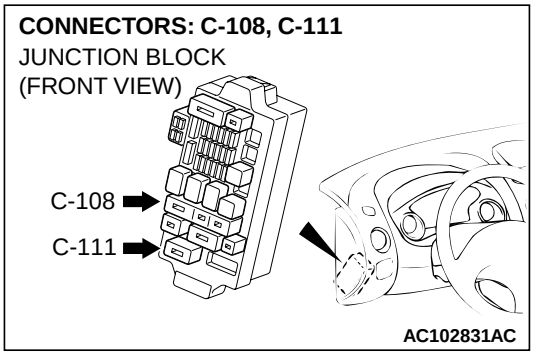
STEP 7. Check the connectors C-41, C-108, and C-111.

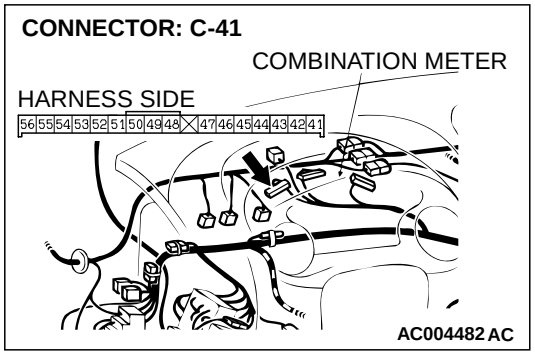
Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

Q: Is any of the connectors damaged?

YES : Repair it and then go to Step 9.
NO : Go to Step 8.







STEP 8. Check the continuity between the ignition switch (IG1) and the combination meter.

Q: Is there any continuity (less than 2 ohm) between the ignition switch (IG1) and the combination meter connector C-41 (terminal 52)?

YES : Go to Step 9.

NO : Repair the harness wire and then go to Step 9.

STEP 9. Check symptom.

Q: Does the ABS warning light illuminate for 3 seconds when the ignition switch is turned to the "ON" position with engine stopped or upon start-up?

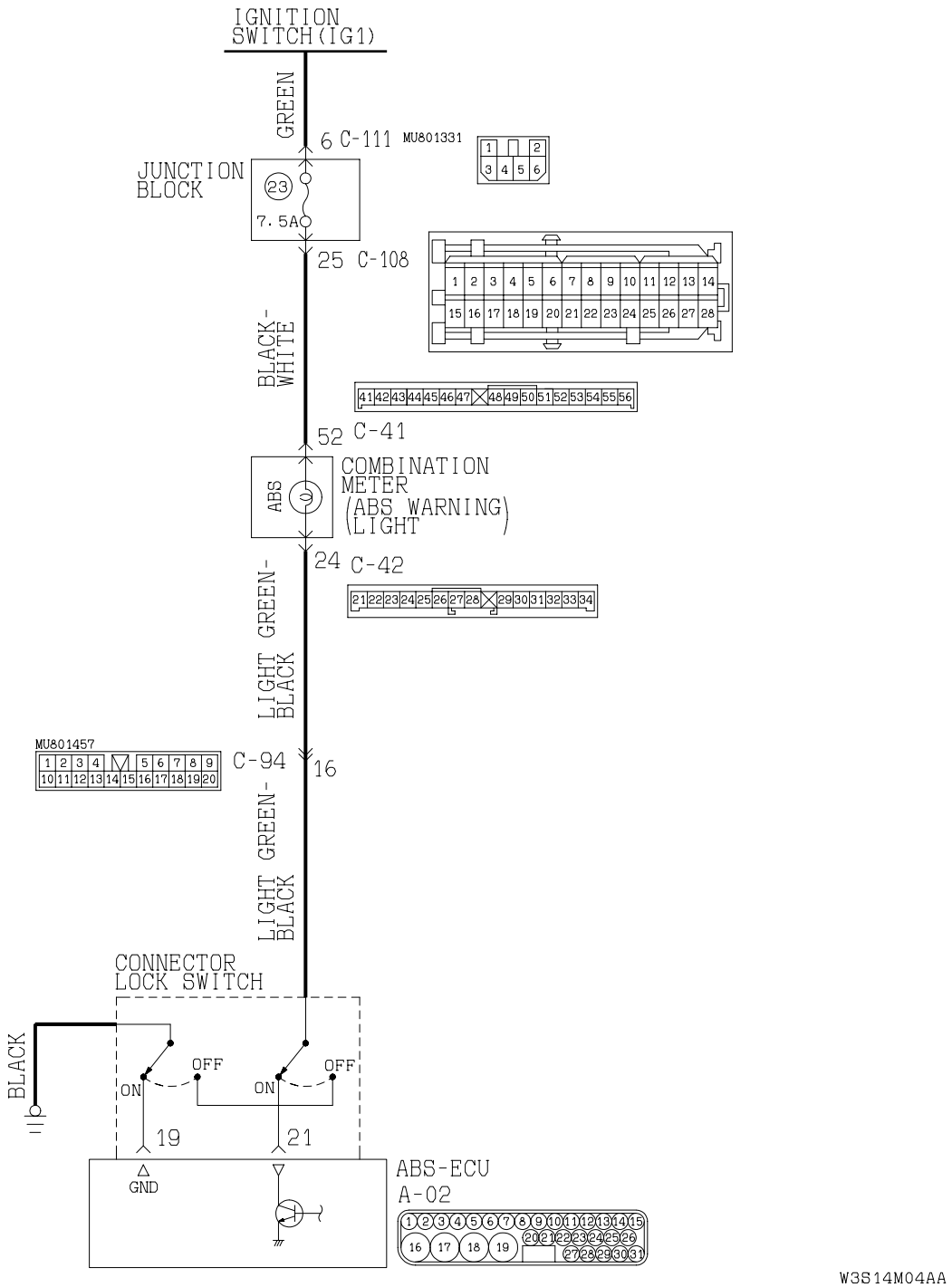
YES : This diagnosis is complete.

NO : Return to Step 1.

INSPECTION PROCEDURE 3: The ABS Warning Light Remains Illuminated after the Engine is Started.

NOTE: This diagnosis procedure is limited to cases where communication with the scan tool is possible (ABS-ECU power supply is normal) and no diagnostic trouble code outputs.

ABS Warning Light Circuit

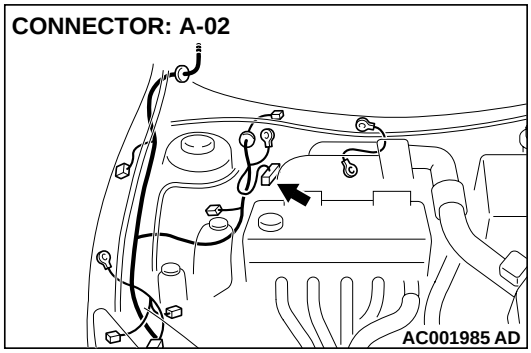


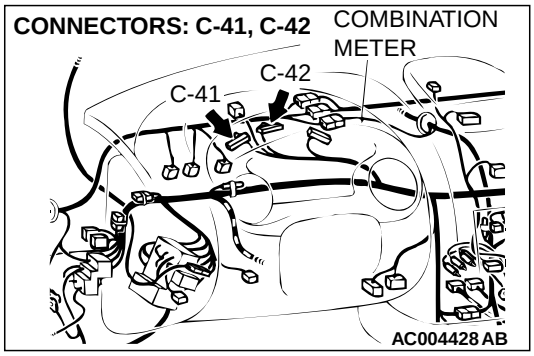
NOTE: CONNECTOR LOCK SWITCH

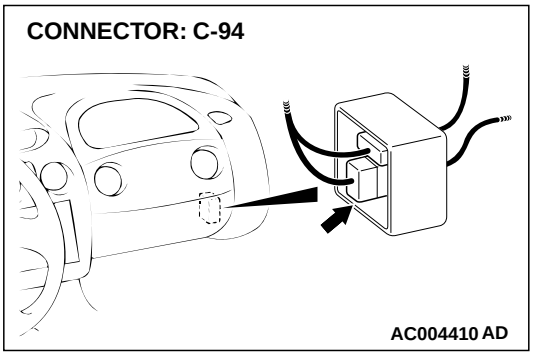
ON: The ABS-ECU connector A-02 is connected.

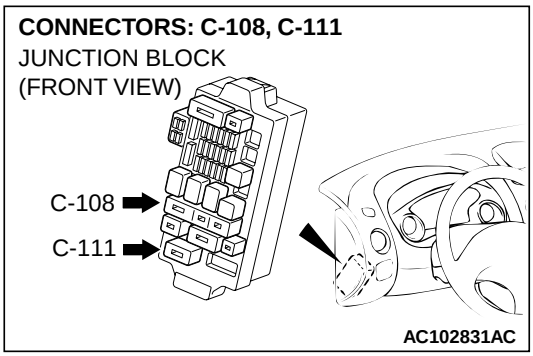
OFF: The ABS-ECU connector A-02 is disconnected.

TSB Revision









CIRCUIT OPERATION

- The ABS-ECU controls the illumination of the ABS warning light by turning the power transistor in the ABS-ECU ON and OFF.
- The ABS-ECU illuminates the ABS warning light on start-up. It turns the light off after 3 seconds when the ABS-ECU completes the self-check.
- When the ABS-ECU connector is disconnected, the circuit is grounded to illuminate the light by the connector lock switch OFF operation.

TECHNICAL DESCRIPTION (COMMENT)

The cause is probably the ABS-ECU malfunction.

TROUBLESHOOTING HINTS (The most likely causes for this condition:)

- Malfunction of the ABS-ECU connector lock
- Disconnection of the ABS-ECU connector
- Damaged wiring harness or connector
- Malfunction of the hydraulic unit (integrated with ABS-ECU)

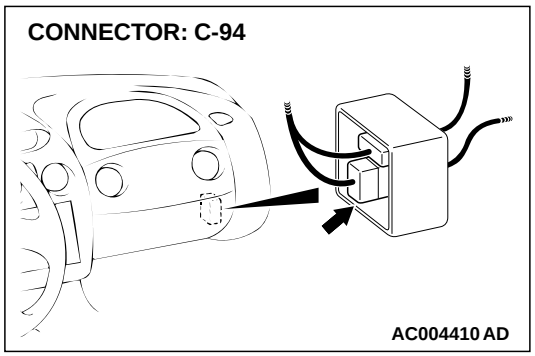
DIAGNOSIS

Confirm the ABS-ECU connector connection and locking. If the connector is connected and locked to the ABS-ECU correctly, perform the following diagnosis.

Required Special Tool:

- MB991223: Harness Set

STEP 1. Check the ABS warning light circuit at the intermediate connector C-94.

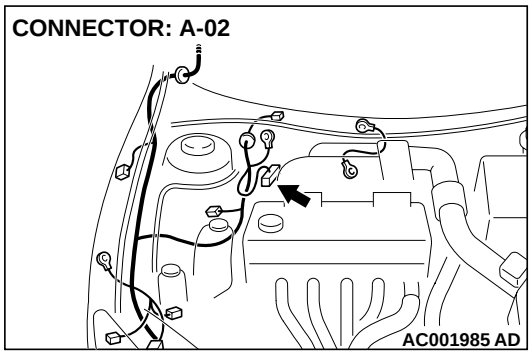


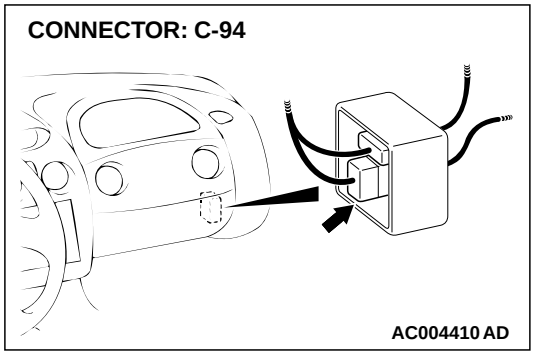
(1) Disconnect the intermediate connector C-94.
(2) Turn the ignition switch to the "ON" position.

Q: Does the ABS warning light illuminate?

YES : Go to Step 4.
NO : Go to Step 2.

STEP 2. Check the following connectors: the ABS-ECU connector A-02 and the intermediate connector C-94.





Q: Is any of the connectors damaged?

YES : Repair it and then go to Step 6.
NO : Go to Step 3.

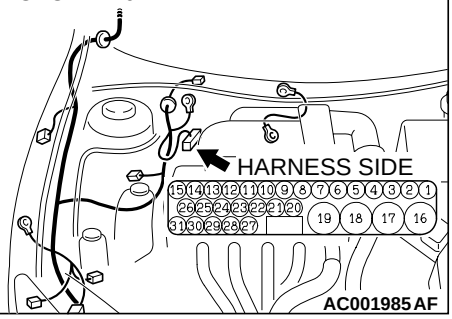
STEP 3. Check the harness wire between the ABS-ECU connector A-02 (terminal 21) and the intermediate connector C-94 (terminal 16).

Q: Is the harness wire between the ABS-ECU connector A-02 (terminal 21) and the intermediate connector C-94 (terminal 16) damaged?

YES : Repair it and then go to Step 6.

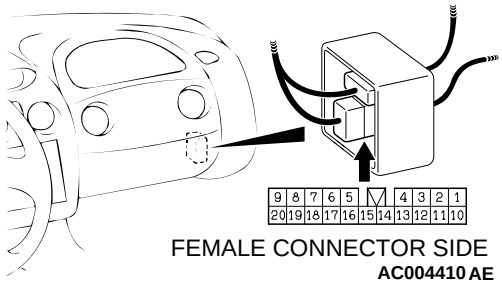
NO : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-52.) and then go to Step 6.

CONNECTOR: A-02



AC001985 AF

CONNECTOR: C-94



AC004410 AE

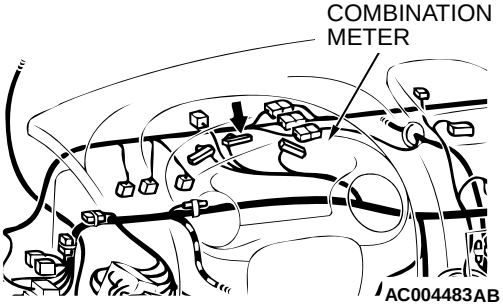
STEP 4. Check the following connectors: the combination meter connector C-42 and the intermediate connector C-94.

Q: Is any of the connectors damaged?

YES : Repair it and then go to Step 6.

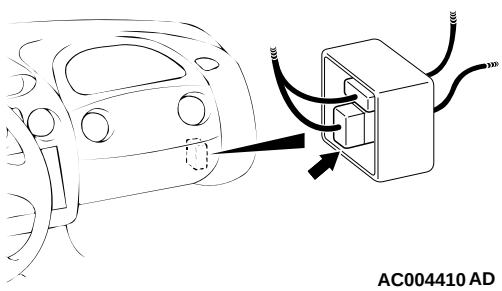
NO : Go to Step 5.

CONNECTOR: C-42

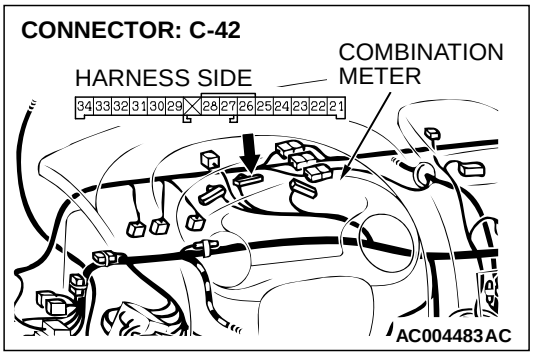


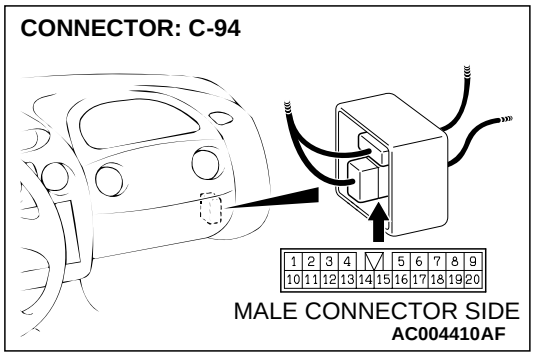
AC004483 AB

CONNECTOR: C-94



AC004410 AD





STEP 5. Check the harness wire between the combination meter connector C-42 (terminal 24) and the intermediate connector C-94 (terminal 16).

Q: Is the harness wire between the combination meter connector C-42 (terminal 24) and the intermediate connector C-94 (terminal 16) damaged?

YES : Repair it and then go to Step 6.

NO : Replace the combination meter (printed circuit board) (Refer to GROUP 54A, Combination Meter P.54A-105 and P.54A-107.) and then go to Step 6.

STEP 6. Check symptom.

Q: Does the ABS warning light turn off 3 seconds after start-up?

YES : This diagnosis is complete.

NO : Return to Step 1.

INSPECTION PROCEDURE 4: Faulty ABS Operation

TECHNICAL DESCRIPTION (COMMENT)

The cause depends on driving and road surface conditions, so diagnosis may be difficult. However, if no diagnostic trouble code is displayed, carry out the following inspection.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the hydraulic unit

DIAGNOSIS

Check the hydraulic unit. (Refer to P.35B-47.) If the hydraulic unit (integrated with ABS-ECU) is malfunctioning, replace it. Then check that the malfunction symptom is eliminated.

DATA LIST REFERENCE TABLE

M1352011500285

The following items can be read by the scan tool from the ABS-ECU input data.

MUT-II SCAN TOOL DISPLAY	ITEM NO.	CHECK ITEM	CHECKING REQUIREMENTS	NORMAL VALUE
FR SNSR	11	Front-right wheel speed sensor	Drive the vehicle	Vehicle speeds displayed on the speedometer and scan tool are identical.
FL SNSR	12	Front-left wheel speed sensor		
RR SNSR	13	Rear-right wheel speed sensor		
RL SNSR	14	Rear-left wheel speed sensor		
BATT. VOLTAGE	16	ABS-ECU power supply voltage	Ignition switch power supply voltage and valve monitor voltage	9 – 16 V
STOPLIGHT SW	36	Stoplight switch	Depress the brake pedal.	ON
			Release the brake pedal.	OFF

ACTUATOR TEST REFERENCE TABLE

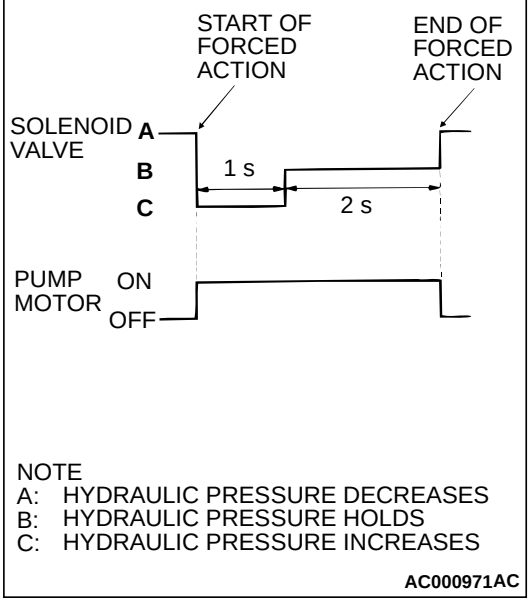
M1352011600260

The scan tool activates the following actuators for testing.

NOTE: If the ABS-ECU is inoperative, actuator testing cannot be carried out.

NOTE: Actuator testing is only possible when the vehicle is stationary. If the vehicle speed during actuator testing exceeds 10 km/h (6 mph), forced actuation will be canceled.

ACTIVATION PATTERN



NOTE
A: HYDRAULIC PRESSURE DECREASES
B: HYDRAULIC PRESSURE HOLDS
C: HYDRAULIC PRESSURE INCREASES

AC000971AC

ACTUATOR TEST SPECIFICATIONS

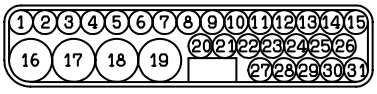
NO.	ITEM	PARTS TO BE ACTIVATED
01	Solenoid valve for front-left wheel	Solenoid valves and pump motors in the hydraulic unit (simple inspection mode)
02	Solenoid valve for front-right wheel	
03	Solenoid valve for rear-left wheel	
04	Solenoid valve for rear-right wheel	

CHECK AT ABS-ECU

M1352011800286

TERMINAL VOLTAGE CHECK CHART

1. Measure the voltages between terminals (16) and (19) (ground terminals) and each respective terminal.
2. The terminal layouts are shown in the illustrations below.



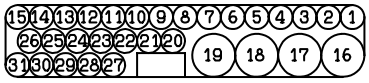
AC002089 AB

NOTE: Do not measure terminal voltage for approximately three seconds after the ignition switch is turned to the "ON" position. The ABS-ECU performs the initial check during that period.

CONNECTOR TERMINAL NO	SIGNAL	CHECKING REQUIREMENT	NORMAL CONDITION
14	Input from stoplight switch	Stoplight switch: ON	Battery positive voltage
		Stoplight switch: OFF	Approximately 0 V
15	ABS-ECU power supply	Ignition switch: "ON"	Battery positive voltage
17	Motor power supply	Always	Battery positive voltage
18	Solenoid valve power supply	Always	Battery positive voltage

RESISTANCE AND CONTINUITY BETWEEN HARNESS-SIDE CONNECTOR TERMINALS

1. Turn the ignition switch to the "LOCK" (OFF) position and disconnect the ABS-ECU connector before checking resistance and continuity.
2. Check between the terminals indicated in the table below.
3. The terminal layouts are shown in the illustration below.

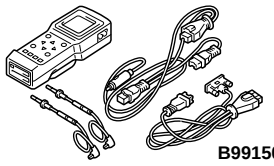
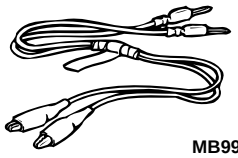
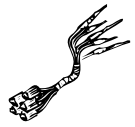
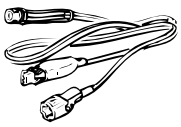
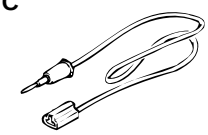


AC002090 AB

CONNECTOR TERMINAL NO.	SIGNAL	NORMAL CONDITION
6 – 7	Front-left wheel speed sensor	1.28 – 1.92 kΩ
1 – 3	Rear-right wheel speed sensor	1.28 – 1.92 kΩ
4 – 5	Front-right wheel speed sensor	1.28 – 1.92 kΩ
8 – 9	Rear-left wheel speed sensor	1.28 – 1.92 kΩ
16 – body ground	Solenoid valve ground	Less than 2 ohms

SPECIAL TOOLS

M1352000600288

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 B991502	MB991502 Scan tool (MUT-II)	MB991496-OD	For checking of ABS (Diagnostic trouble code display when using the scan tool)
 MB991529	MB991529 Diagnostic trouble code check harness	Tool not necessary if scan tool (MUT-II) is available.	For checking of ABS (Diagnostic trouble code display when using the ABS warning light)
A  B  C  D MB991223AB	MB991223 Harness set A: MB991219 Inspection harness B: MB991220 LED harness C: MB991221 LED harness adaptor D: MB991222 Probe	MB991223 MB991709-01	Making voltage and resistance measurement during troubleshooting A: Connector pin contact B: Power circuit inspection C: Power circuit inspection D: Commercial tester connection

ON-VEHICLE SERVICE

BLEEDING

M1352001500165

⚠ CAUTION

Use the specified brake fluid. Avoid using a mixture of the specified brake fluid and other fluid.

Specified brake fluid: Conforming to DOT 3 or DOT 4

MASTER CYLINDER BLEEDING

Refer to GROUP 35A – On-vehicle Service – Bleeding P.35A-21.

BRAKE LINE BLEEDING

⚠ CAUTION

Be sure to filter/strain the brake fluid being added to the master cylinder reservoir tank. Debris may damage the hydraulic unit.

Refer to GROUP 35A – On-vehicle Service – Bleeding P.35A-21.

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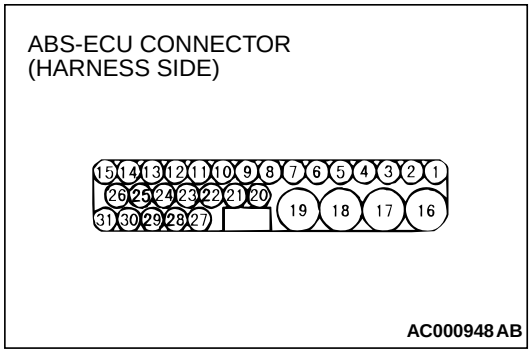
WHEEL SPEED SENSOR OUTPUT VOLTAGE MEASUREMENT

M1352001600225

Required Special Tool:
MB991219: Inspection Harness

1. Lift up the vehicle and release the parking brake.
2. Disconnect the ABS-ECU connector, and then use special tool MB991219 to measure the output voltage at the harness side connector.



TERMINAL NO.			
Front left	Rear right	Front right	Rear left
6	1	4	8
7	3	5	9

3. Manually turn the wheel to be measured 1/2 to 1 turn/second. Measure the output voltage with a voltmeter or oscilloscope.

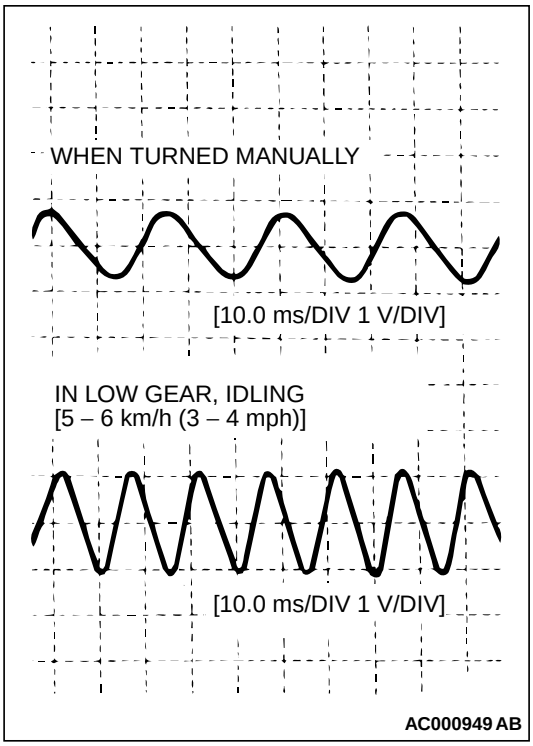
   NOTE: Check the connection of the sensor harness and connector before using the oscilloscope.

Output voltage:
- Minimal voltmeter reading: 42 mV
- Maximum voltmeter reading: 300 mV
- Minimal oscilloscope reading: 120 mV
- Maximum oscilloscope reading: 600 mV

Probable causes of low output voltage
- Wheel speed sensor pole piece-to-ABS rotor clearance too large
- Faulty wheel speed sensor

4. To observe the waveform with an oscilloscope:
   - Front Wheels: Shift into low gear and drive the wheels.
   - Rear Wheels: Turn the wheels manually at a constant speed

   NOTE: The output waveform is low when the wheel speed is low. Similarly, it will be higher as the wheel speed increases. Waveform may also be observed by driving the vehicle.



POINTS IN WAVEFORM MEASUREMENT

SYMPTOM	PROBABLE CAUSES	REMEDY
Too small or zero waveform amplitude	Faulty wheel speed sensor	Replace sensor
	Incorrect pole piece-to-ABS rotor clearance	Adjust clearance
Waveform amplitude fluctuates excessively (This is no problem if the minimum amplitude is 100 mV or more)	Axle hub eccentric or with large runout	Replace hub
Noisy or disturbed waveform	Open circuit in wheel speed sensor	Replace sensor
	Open circuit in harness	Repair harness
	Incorrectly mounted wheel speed sensor	Mount correctly
	ABS rotor with missing or damaged teeth	Replace ABS rotor

NOTE: The wheel speed sensor cable moves in relation to motion of the front or rear suspension. Therefore, it is likely that it has an open circuit only when driving on rough roads but it functions normally when driving on smooth roads. It is recommended to observe sensor output voltage waveform also under special conditions, such as driving on a rough road.

HYDRAULIC UNIT CHECK

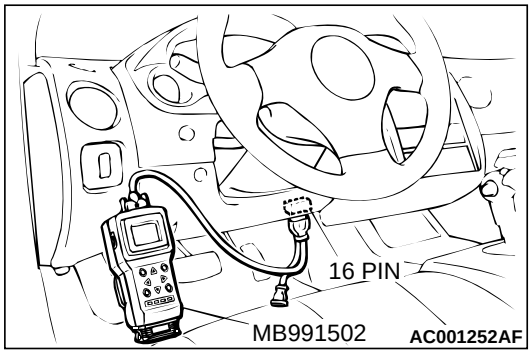
M1352001700233

Required Special Tool:
MB991502: Scan Tool (MUT-II)

⚠ CAUTION

- **The roller of the braking force tester and the tire should be dry during testing.**
- **When testing the front brakes, apply the parking brake. When testing the rear brakes, stop the front wheels with chocks.**

1. Jack up the vehicle. Then support the vehicle with rigid racks at the specified jack-up points or place the front or rear wheels on the rollers of the braking force tester.
2. Release the parking brake, and feel the drag force (drag torque) on each road wheel. When using the braking force tester, take a reading of the brake drag force.



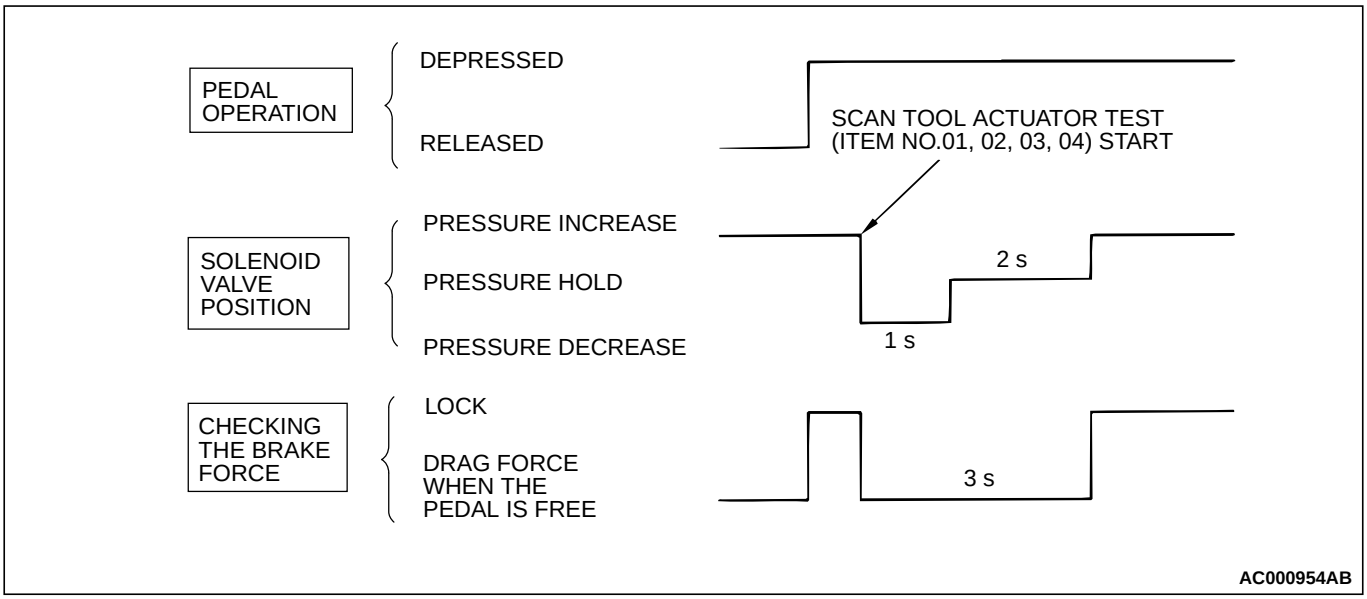
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOOK" (OFF) position before connecting or disconnecting scan tool MB991502.

3. Turn the ignition switch to the "LOCK" (OFF) position and set scan tool MB991502 as shown in the illustration.
4. After checking that the shift lever <M/T> or the selector lever <A/T> is in neutral, start the engine.
5. Use scan tool MB991502 to force-drive the actuator.

   NOTE: The ABS system will switch to the scan tool mode and the ABS warning light will illuminate.

   NOTE: When the ABS has been interrupted by the fail-safe function, scan tool MB991502 actuator testing cannot be used.



6. Turn the wheel by hand and check the change in braking force when the brake pedal is depressed. When using the braking force tester, depress the brake pedal until the braking force is at the following values, and check that the braking force changes to the brake drag force inspected in step 2 when the actuator is force-driven. The result should be as shown in the diagram above.

Front wheel	785 – 981 N (176 – 220 lb.)
Rear wheel	588 – 784 N (132 – 176 lb.)

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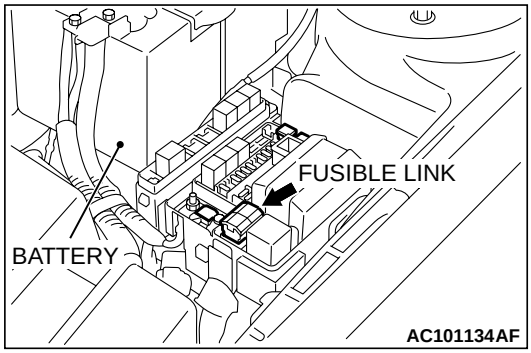
7. If the result of inspection is abnormal, repair according to the Diagnosis Table below.

DIAGNOSIS TABLE					
NO.	**OPERATION**	**TEST RESULTS**	**JUDGMENT**	**PROBABLE CAUSE**	**REMEDY**
01 02 03 04	1. Depress brake pedal to lock wheel. 2. Using scan tool MB991502, select the wheel to be checked and force the actuator to operate. 3. Turn the selected wheel manually to check the change of brake force.	Brake force released for three locking.	Normal	–	–
		Wheel does not lock when brake pedal is depressed.	Abnormal	Clogged brake line other than hydraulic unit	Check and clean brake line
				Clogged hydraulic circuit in hydraulic unit	Replace hydraulic unit
		Brake force is not released		Incorrect hydraulic unit brake tube connection	Connect correctly
				Hydraulic unit solenoid valve not functioning correctly	Replace hydraulic unit

8. After inspection, disconnect the scan tool immediately after turning the ignition switch to the "LOCK" (OFF) position.

DISCHARGED BATTERY

M1352003500257



The ABS system consumes a large amount of battery current for its self-check function. If the battery is completely discharged and booster cables are used to start the engine, the engine must be allowed to idle for a few minutes to recharge. If the battery does not recharge, the engine may misfire or stall. To prevent this condition, allow the engine to idle for a few minutes before driving the vehicle, or temporarily disable the ABS system by removing the fusible link for the ABS circuit. The ABS warning light will illuminate when the ABS fusible link is removed. After the battery is recharged, reinstall the ABS fusible link and check that the ABS warning light is not illuminated.

MASTER CYLINDER AND BRAKE BOOSTER

REMOVAL AND INSTALLATION

M1352004000158

Refer to GROUP 35A, Master Cylinder and Brake Booster P.35A-32.

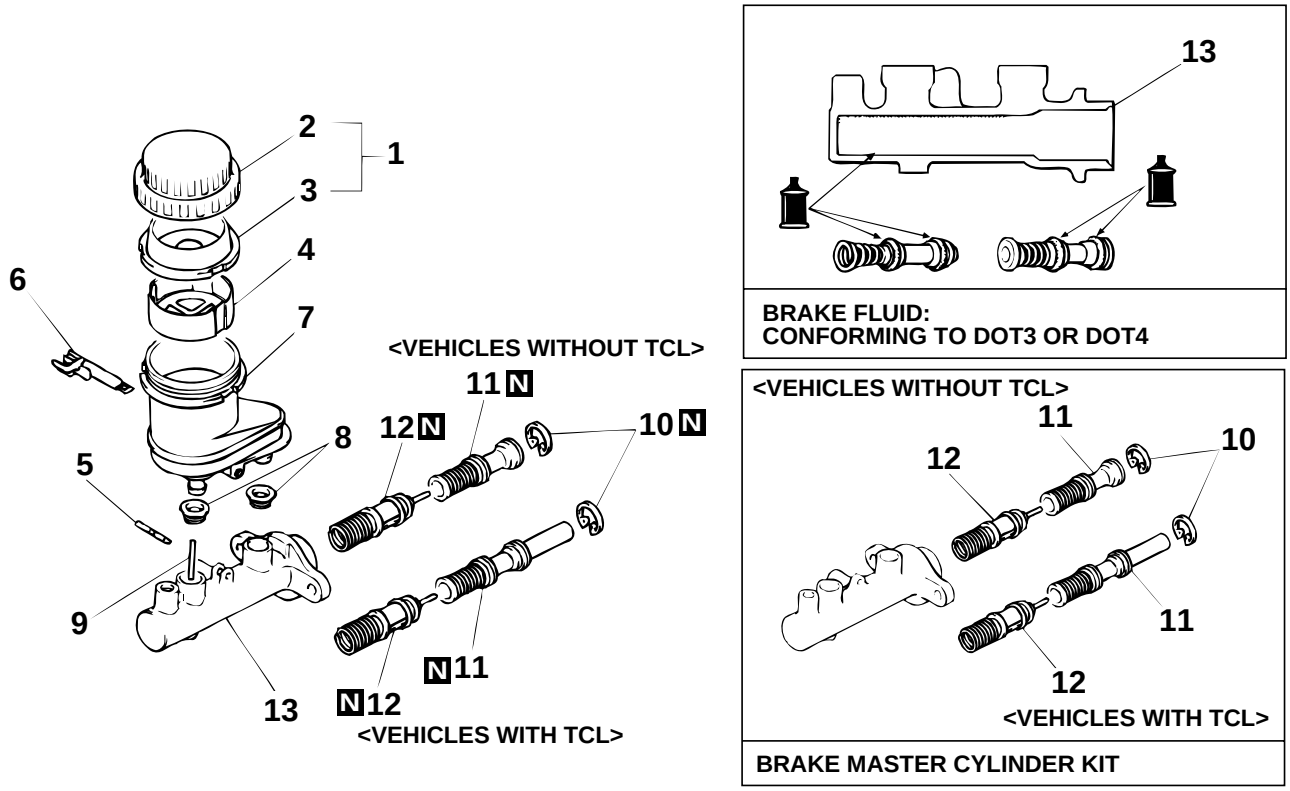
MASTER CYLINDER

M1352004500153

DISASSEMBLY AND ASSEMBLY

⚠ CAUTION

Do not disassemble the primary and secondary piston assemblies.



AC000955AC

DISASSEMBLY STEPS

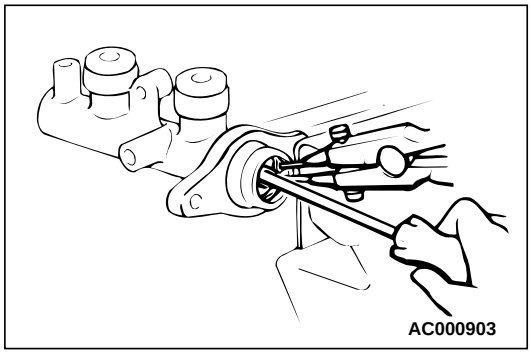
1. RESERVOIR CAP ASSEMBLY
2. RESERVOIR CAP
3. DIAPHRAGM
4. FILTER
5. SPRING PIN
6. BRAKE FLUID LEVEL SENSOR
7. RESERVOIR

<<A>>

DISASSEMBLY STEPS (Continued)

8. RESERVOIR SEAL
9. PIN
10. PISTON STOPPER RING
11. PRIMARY PISTON ASSEMBLY
12. SECONDARY PISTON ASSEMBLY
13. MASTER CYLINDER BODY

DISASSEMBLY SERVICE POINT



<<A>> PISTON STOPPER RING DISASSEMBLY
While depressing the piston, remove the piston stopper ring.

INSPECTION

M1352004600127

- Check the inner surface of the master cylinder body for corrosion or pitting.
- Check the primary and secondary pistons for corrosion, scoring, wear or damage.
- Check the diaphragm for cracks and wear.

HYDRAULIC UNIT

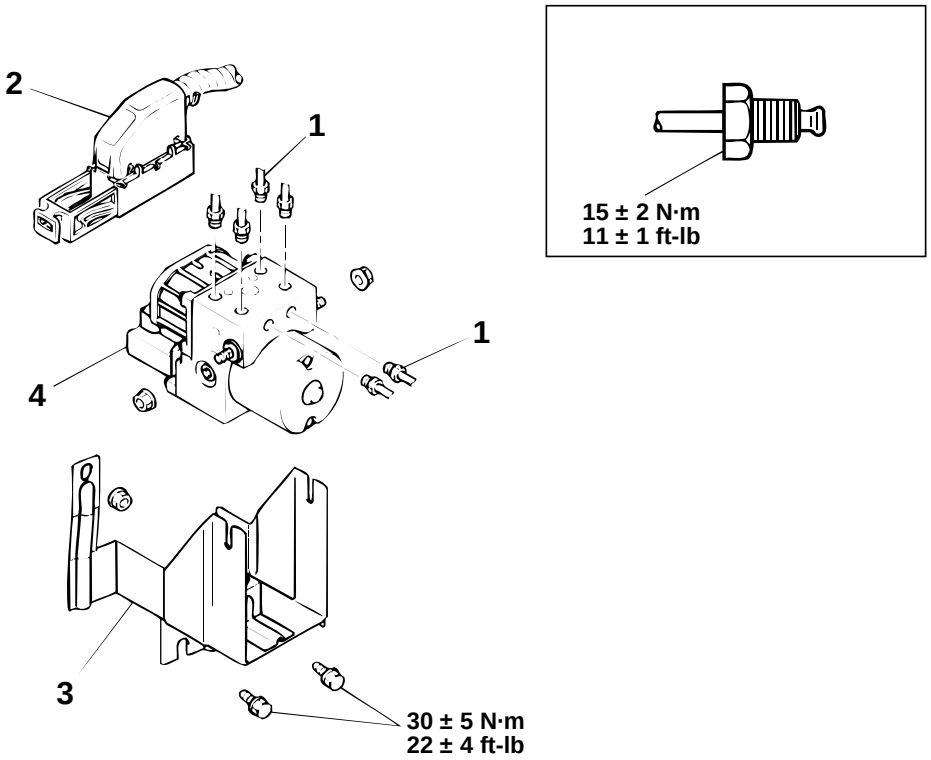
REMOVAL AND INSTALLATION

M1352008600215

<2.4L ENGINE>

NOTE: The ABS-ECU is integrated in the hydraulic unit.

Pre-removal Operation	Post-installation Operation
• Strut Tower Bar Removal <Vehicles with Strut Tower Bar> (Refer to GROUP 42, Strut Tower Bar P.42-11.) • Brake Fluid Draining	• Brake Fluid Filling • Bake Line Bleeding (Refer to P.35B-45.) • Strut Tower Bar Installation <Vehicles with Strut Tower Bar> (Refer to GROUP 42, Strut Tower Bar P.42-11.)



AC000956 AB

REMOVAL STEPS

>>A<< 1. BRAKE TUBE
<<A>> 2. HARNESS CONNECTOR

REMOVAL STEPS (Continued)

<<C>> 3. BRACKET ASSEMBLY
4. HYDRAULIC UNIT

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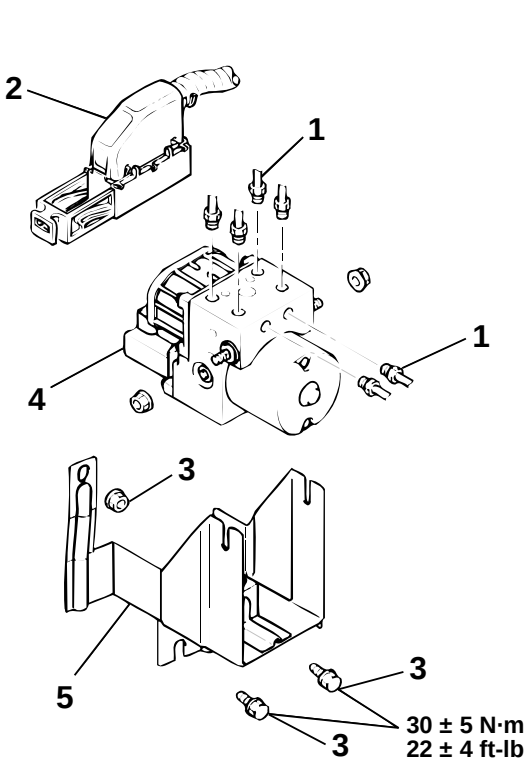
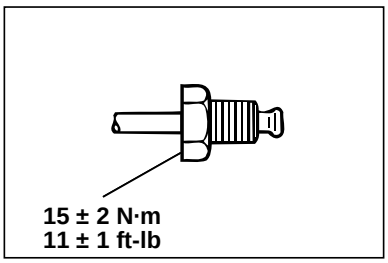
<3.0L ENGINE>

NOTE: The ABS-ECU is integrated in the hydraulic unit.

Pre-removal Operation	Post-installation Operation
• Strut Tower Bar Removal <Vehicles with Strut Tower Bar> (Refer to GROUP 42, Strut Tower Bar P.42-11.) • Intake Manifold Plenum Removal (Refer to GROUP 15, Intake Manifold Plenum P.15-7.) • Brake Fluid Draining	• Brake Fluid Filling • Bake Line Bleeding (Refer to P.35B-45.) • Intake Manifold Plenum Installation (Refer to GROUP 15, Intake Manifold Plenum P.15-7.) • Strut Tower Bar Installation <Vehicles with Strut Tower Bar> (Refer to GROUP 42, Strut Tower Bar P.42-11.)





AC000956 AC

REMOVAL STEPS

>>A<< 1. BRAKE TUBE
<<A>> 2. HARNESS CONNECTOR
<<B>> • BRAKE TUBE (FRONT RH) CLAMP

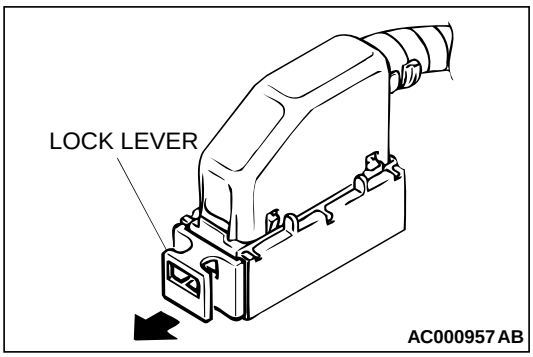
REMOVAL STEPS (Continued)

<<C>> 3. BRACKET BOLT AND NUT
4. HYDRAULIC UNIT
5. BRACKET ASSEMBLY

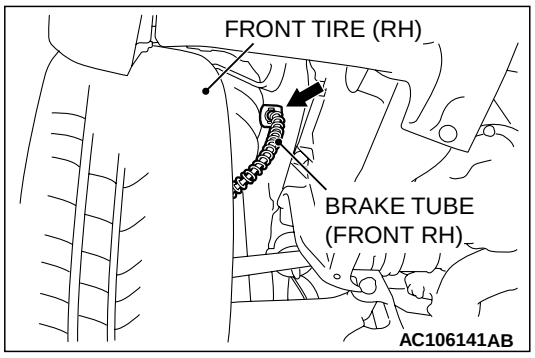
REMOVAL SERVICE POINTS

<<A>> HARNESS CONNECTOR REMOVAL

Pull the lock lever in the direction shown in the illustration, and remove the harness.



AC000957 AB



<<B>> BRAKE TUBE (FRONT RH) CLAMP REMOVAL

Release the clamp (arrow) from the vehicle body, and move the brake tube aside to the wheel house in order to make room for the hydraulic unit removal.

<<C>> HYDRAULIC UNIT REMOVAL

⚠ ***WARNING***

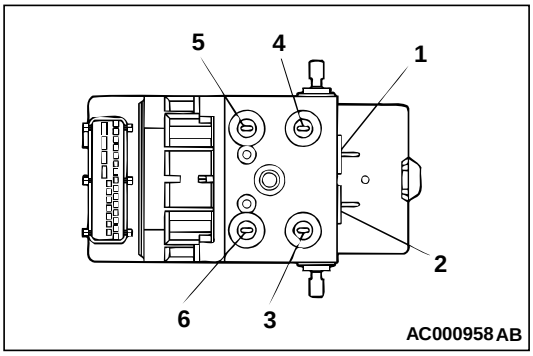
The hydraulic unit is heavy. Use care when removing it.

⚠ **CAUTION**

- **The hydraulic unit cannot be disassembled. Never loosen its nuts or bolts.**
- **Do not drop or shock the hydraulic unit.**
- **Do not turn the hydraulic unit upside down or lay it on its side.**

INSTALLATION SERVICE POINT

>>A<< BRAKE TUBE INSTALLATION



Connect the tubes to the hydraulic unit as shown in the illustration.

1. To the proportioning valve (rear brake: LH)
2. To the proportioning valve (rear brake: RH)
3. From the master cylinder (primary)
4. From the master cylinder (secondary)
5. To the front brake (RH)
6. To the front brake (LH)

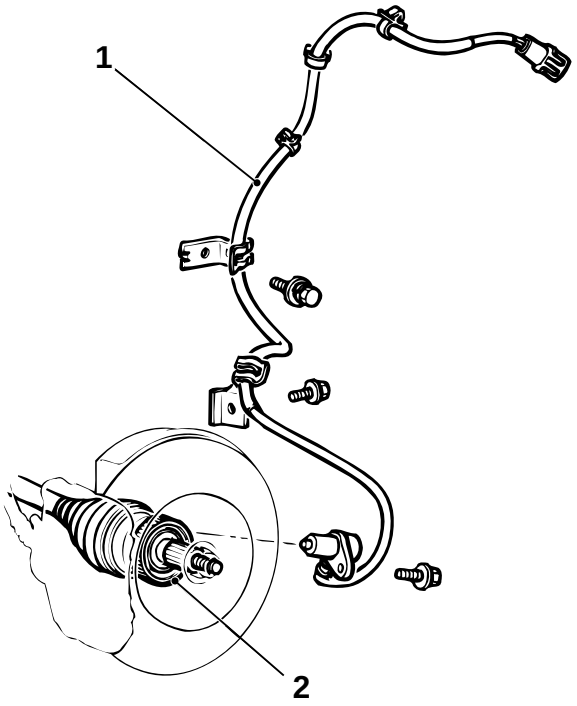
WHEEL SPEED SENSOR

REMOVAL AND INSTALLATION

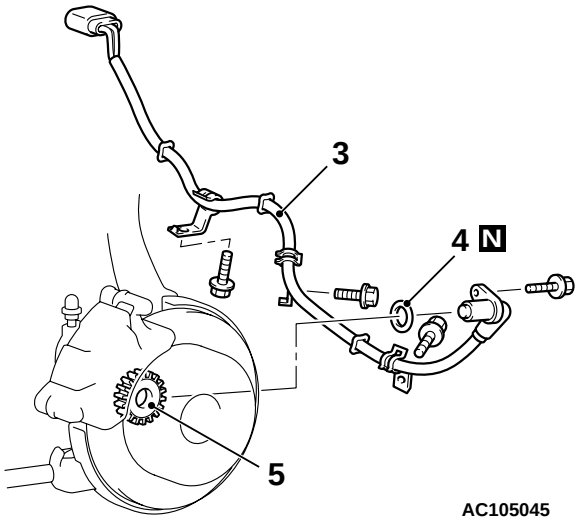
M1352008300247

Post-installation Operation
- Wheel Speed Sensor Output Voltage Measurement (Refer to P.35B-46.)

<FRONT>



<REAR>



AC105045

AC106419 AB

REMOVAL STEPS

<<A>> >>A<< 1. FRONT SPEED SENSOR
2. FRONT ABS ROTOR WITH DRIVESHAFT (REFER TO GROUP 26, DRIVESHAFT P.26-11.)

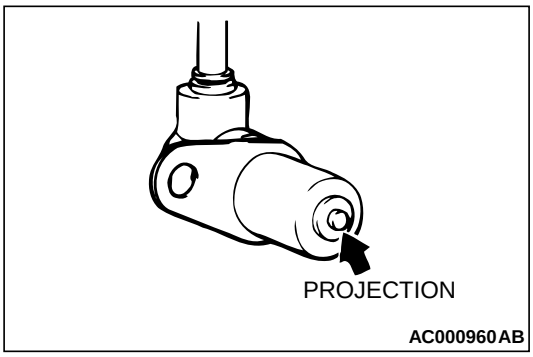
REMOVAL STEPS (Continued)

<<A>> >>A<< 3. REAR SPEED SENSOR
4. O-RING
5. REAR ABS ROTOR (REFER TO GROUP 27, REAR AXLE HUB P.27-6.)

REMOVAL SERVICE POINT

<<A>> FRONT SPEED SENSOR/REAR SPEED SENSOR REMOVAL

⚠ CAUTION
Be careful when handling the projection at the tip of the speed sensor and the toothed edge of the ABS rotor so as not to damage them by contacting other parts.

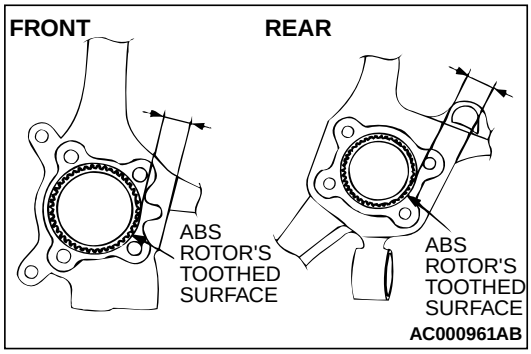


AC000960 AB

TSB Revision

INSTALLATION SERVICE POINT

>>A<< FRONT SPEED SENSOR/REAR SPEED SENSOR INSTALLATION



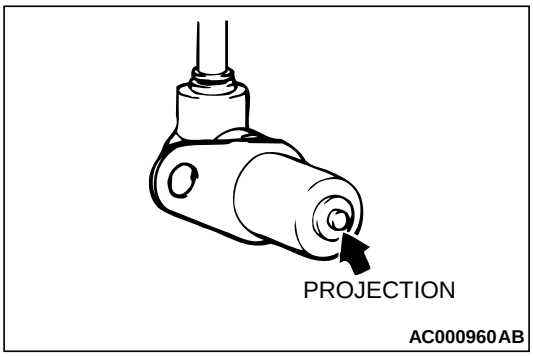
The clearance between the wheel speed sensor and the ABS rotor's toothed surface is not adjustable, but measure the distance between the sensor installation surface and the ABS rotor's toothed surface.

Standard value: 28.2 – 28.5 mm (1.11 – 1.12 inches)

INSPECTION

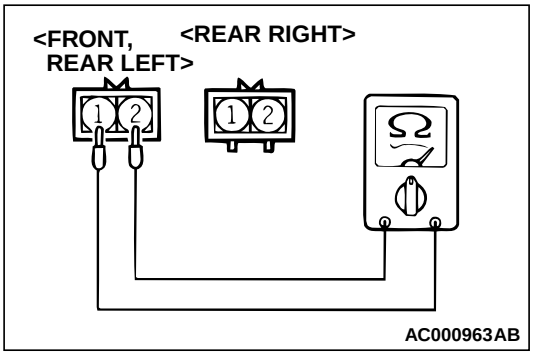
M1352008400222

SPEED SENSOR CHECK



1. Check whether any metallic foreign material has adhered to the projection at the speed sensor tip. Remove any foreign material. Also check whether the pole piece is damaged. Replace it with a new one if it is damaged.

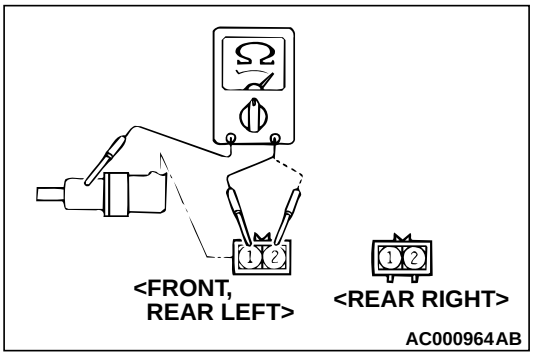
   NOTE: The projection can become magnetized due to the magnet inside the speed sensor, causing foreign material to easily adhere to it. The projection may not be able to correctly sense the wheel rotation speed if foreign matter is on it or if it is damaged.



2. Measure the resistance between the speed sensor terminals.

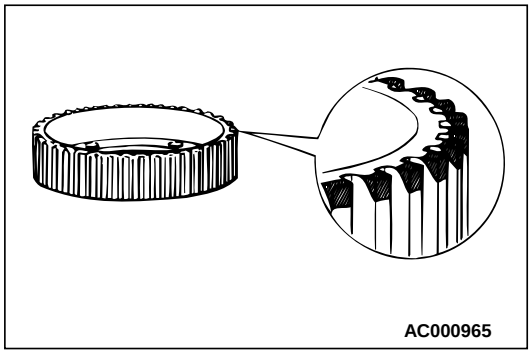
   Standard value: 1.28 – 1.92 kΩ

3. If the internal resistance of the speed sensor is not within the standard value, replace it with a new speed sensor.



4. Remove all connections from the speed sensor. The circuit should be open between terminals (1) and (2) and the body of the speed sensor. If the circuit is not open, replace with a new speed sensor.
5. Check the speed sensor cable for breakage, damage or disconnection. Replace with a new one if a problem is found.

   NOTE: When checking for cable damage, remove the cable clamp part from the body and then gently bend and pull the cable near the clamp.



TOOTHED ABS ROTOR CHECK

Check whether the ABS rotor teeth are broken or deformed. Replace the driveshaft assembly for the front side, or the ABS rotor for the rear side, respectively, if the teeth are damaged or deformed.

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1352012400203

ITEMS	SPECIFICATIONS
Brake tube flare nut	15 ± 2 N·m (11 ± 1 ft-lb)
Hydraulic unit bracket bolt	30 ± 5 N·m (22 ± 4 ft-lb)

SERVICE SPECIFICATIONS

M1352000300287

ITEMS	STANDARD VALUE
Wheel speed sensor internal resistance kΩ	1.28 – 1.92
Distance between wheel speed sensor installation surface and ABS rotor tooth top mm (in)	28.2 – 28.5 (1.11 – 1.12)

NOTES

GROUP 35C

TRACTION CONTROL SYSTEM (TCL)

CONTENTS

GENERAL DESCRIPTION 35C-2

TRACTION CONTROL SYSTEM (TCL) DIAGNOSIS 35C-4

- TCL DIAGNOSTIC TROUBLE CODE DETECTION CONDITIONS 35C-4
- TCL DIAGNOSTIC TROUBLESHOOTING STRATEGY 35C-4
- TCL TROUBLE CODE DIAGNOSIS 35C-4
- DIAGNOSTIC TROUBLE CODE CHART . . 35C-7
- DIAGNOSTIC TROUBLE CODE PROCEDURES 35C-8
- SYMPTOM CHART 35C-10
- SYMPTOM PROCEDURES 35C-11
- DATA LIST REFERENCE TABLE 35C-34
- ACTUATOR TEST REFERENCE TABLE . . 35C-35
- CHECK AT ABS-ECU 35C-35

SPECIAL TOOLS 35C-37

ON-VEHICLE SERVICE 35C-38

- BLEEDING 35C-38
- WHEEL SPEED SENSOR OUTPUT VOLTAGE MEASUREMENT 35C-38
- HYDRAULIC UNIT CHECK 35C-38

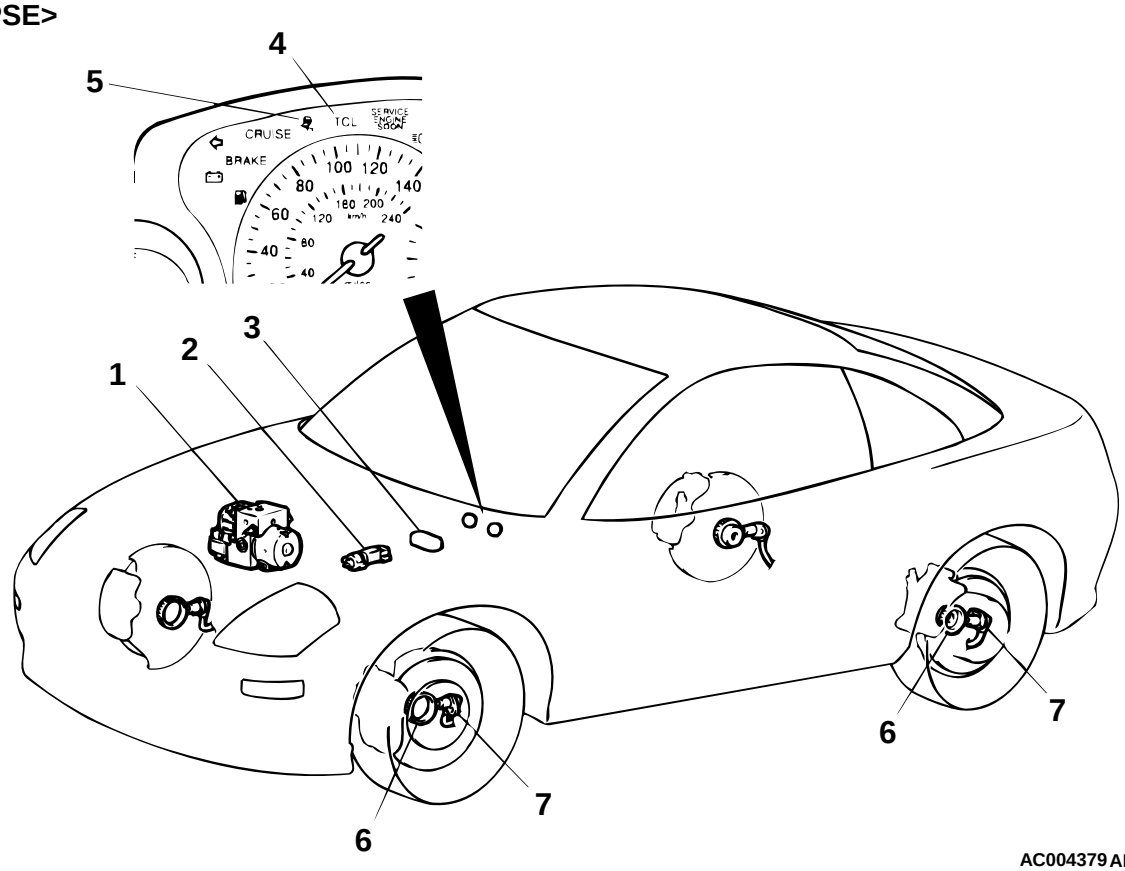
GENERAL DESCRIPTION

M1354000100085

If the throttle is opened excessively when a vehicle is started or accelerated, the driving wheels may slip due to excessive drive torque. This adversely affects startability, accelerating ability or controllability. To ensure startability, accelerating ability and controllability, this TCL system will prevent wheel slip by controlling (applying) brake fluid pressure to the drive wheels to adjust the driving torque according to road conditions. Each wheel-speed sensor detects wheel speed and converts it to an electric signal. The ABS-ECU determines which wheel begins to slip according to that signal. If the ABS-ECU determines wheel slip, it activates the solenoid valves and the pump inside the hydraulic unit to prevent the wheel slip by applying brake ensuring controllability. This TCL system is controlled by the ABS-ECU, and the TCL components are shared by the ABS system. If the ABS hydraulic unit is faulty, the ABS-ECU must be replaced.

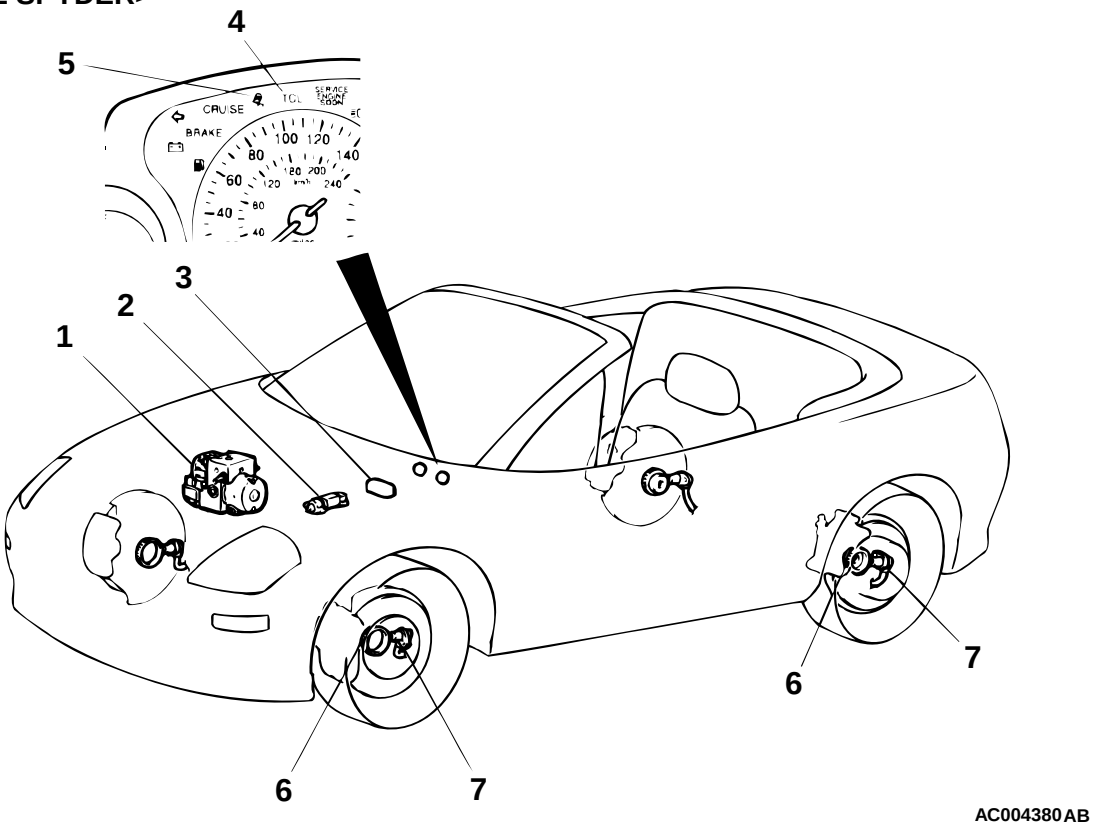
CONSTRUCTION DIAGRAM

<ECLIPSE>



1. HYDRAULIC UNIT (INTEGRATED WITH ABS-ECU)
2. STOPLIGHT SWITCH
3. DATA LINK CONNECTOR
4. TCL INDICATOR LIGHT
5. TCL WARNING LIGHT
6. ABS ROTOR
7. WHEEL SPEED SENSOR

<ECLIPSE SPYDER>



1. HYDRAULIC UNIT (INTEGRATED WITH ABS-ECU)
2. STOPLIGHT SWITCH
3. DATA LINK CONNECTOR
4. TCL INDICATOR LIGHT
5. TCL WARNING LIGHT
6. ABS ROTOR
7. WHEEL SPEED SENSOR

System Check Sound

When starting the engine and moving the vehicle for the first time after startup, a thudding sound can sometimes be heard coming from the engine compartment. This is a normal sound during the ABS and TCL unit self-check.

ABS Operation Sounds and Sensations

During normal operation, the ABS makes several sounds that may seem unusual at first:
A whining sound is caused by the ABS hydraulic unit motor.

TRACTION CONTROL SYSTEM (TCL) DIAGNOSIS

TCL DIAGNOSTIC TROUBLE CODE DETECTION CONDITIONS

M1354003500082

TCL diagnostic trouble codes (TCL DTCs) are set under different conditions, depending on the malfunction detected. Most TCL DTCs will only be set during vehicle operation. Some TCL DTCs will also be set during the TCL self-check immediately after the engine is started. When you check if an TCL DTC will be displayed again after the DTC has been erased, you should recreate the TCL DTC set conditions. Depending on the detection timing and set conditions for the specific TCL DTC, you must either drive the vehicle or turn the engine off and restart it. To set the proper conditions for that DTC again, refer to "TCL DTC SET CONDITIONS" for each TCL DTC that you are trying to reset.

TCL DIAGNOSTIC TROUBLESHOOTING STRATEGY

M1354000400086

Refer to GROUP 35B, Diagnosis – ABS Diagnostic Troubleshooting Strategy P.35B-3.

TCL TROUBLE CODE DIAGNOSIS

M1354000500094

Retrieving TCL Diagnostic Trouble Codes

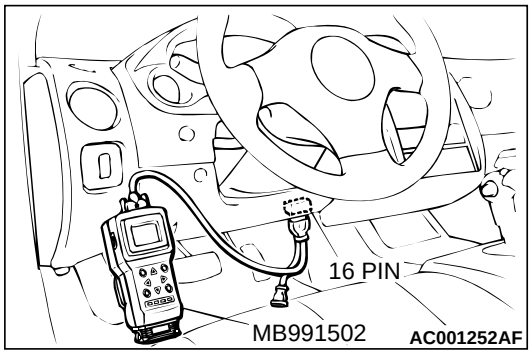
USING SCAN TOOL MB991502

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOOK" (OFF) position before connecting or disconnecting the scan tool MB991502.



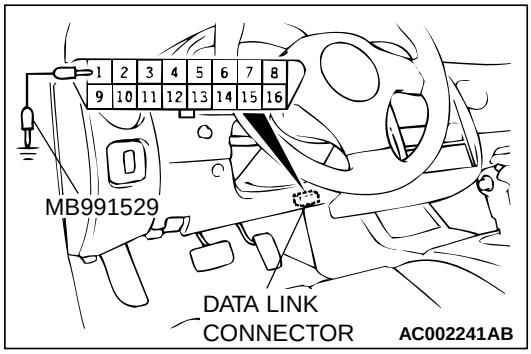
1. Connect scan tool MB991502 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Use scan tool MB991502 to check for TCL diagnostic trouble codes.
4. Turn the ignition switch to the "LOCK" (OFF) position.
5. Disconnect scan tool MB991502.

USING THE ABS WARNING LIGHT AND SPECIAL TOOL MB991529

NOTE: The TCL system is controlled by the ABS-ECU. TCL diagnostic trouble codes are also indicated by flashing of the ABS warning light.

Required Special Tool:

- MB991529: Diagnostic Trouble Code Check Harness

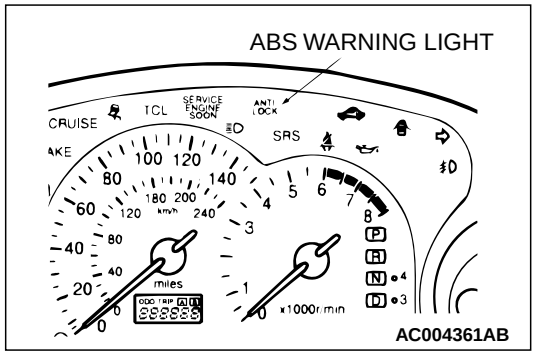


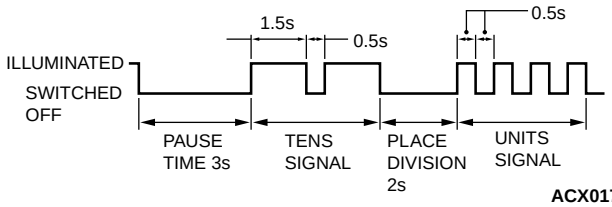
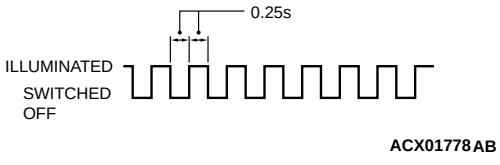
1. Use special tool MB991529 to ground number 1 terminal of the data link connector.

⚠ CAUTION

Do not depress the brake pedal after the ignition switch is turned "ON." If the brake pedal is depressed while the ABS is inoperative and the ignition switch is "ON," the ABS warning light will remain on. Because of this, diagnostic trouble codes will not be read out.

2. Turn the ignition switch to the "ON" position.
3. Read out a diagnostic trouble code by observing how the warning light flashes.



WHEN THE DIAGNOSTIC TROUBLE CODE NO. 24 IS OUTPUT	WHEN NO DIAGNOSTIC TROUBLE CODE IS OUTPUT
	

4. Disconnect special tool MB991529.

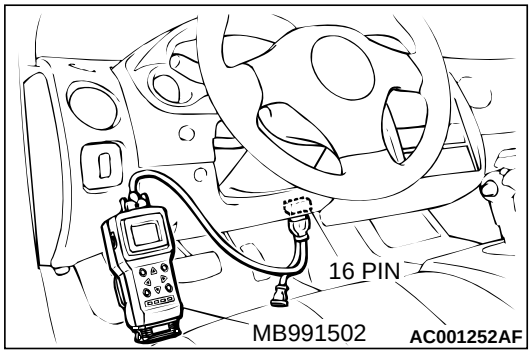
Erasing TCL Diagnostic Trouble Codes

NOTE: If the ABS-ECU functions have stopped due to the fail-safe function, the diagnostic code cannot be erased.

USING SCAN TOOL MB991502

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



⚠ CAUTION

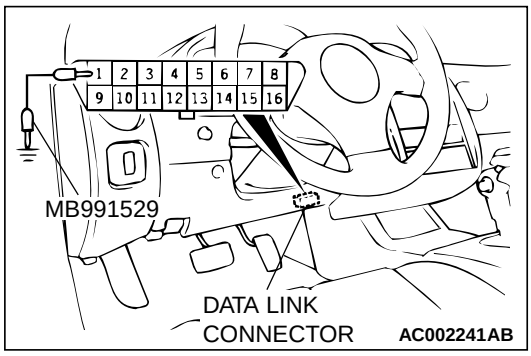
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOOK" (OFF) position before connecting or disconnecting the scan tool MB991502.

1. Connect scan tool MB991502 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Use scan tool MB991502 to erase ABS diagnostic trouble codes.
4. Turn the ignition switch to the "LOCK" (OFF) position.
5. Disconnect scan tool MB991502.

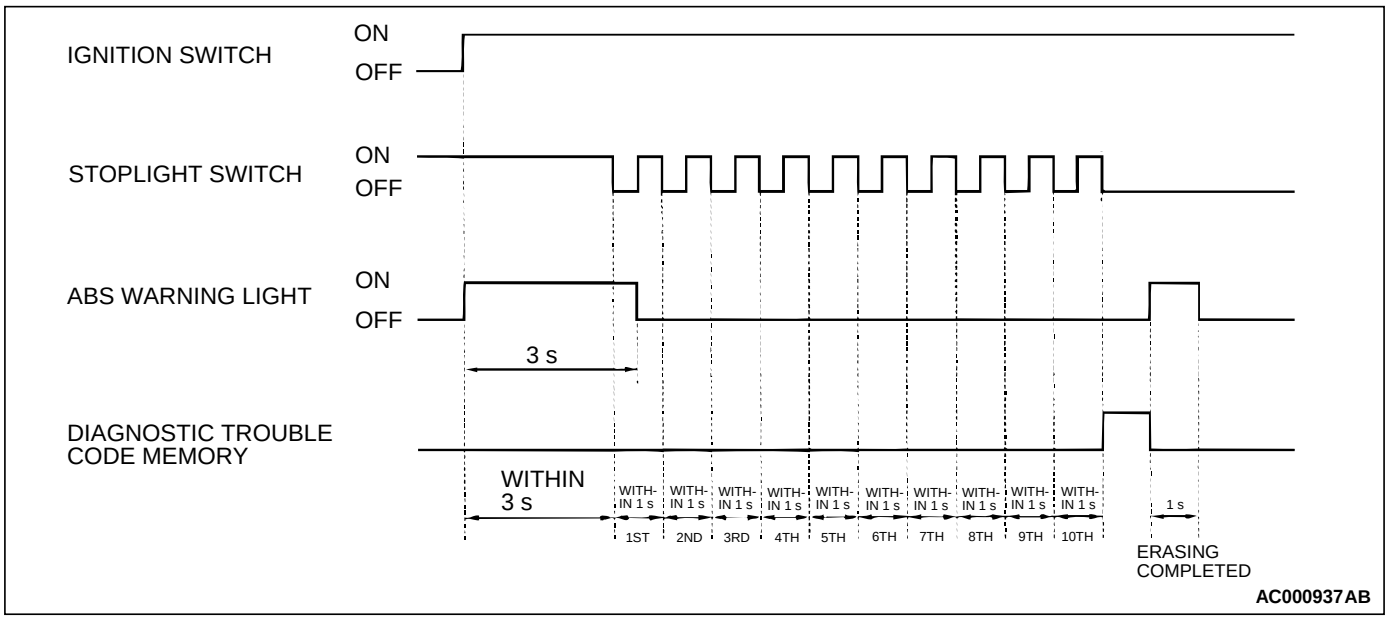
BY SPECIAL OPERATION FOR BRAKE PEDAL

Required Special Tool:

- MB991529: Diagnostic Trouble Code Check Harness



1. Use special tool MB991529 to ground number 1 terminal of the data link connector.



2. Depress the brake pedal and hold it.
3. Turn the ignition switch to the "ON" position.
4. After turning the ignition switch to the "ON," release the pedal within three seconds. Repeat this process of pressing and releasing the brake pedal 10 continuous times.

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5. Turn the ignition switch to the "LOCK" (OFF) position.
6. Disconnect special tool MB991529.

DIAGNOSTIC TROUBLE CODE CHART

M1354000600080

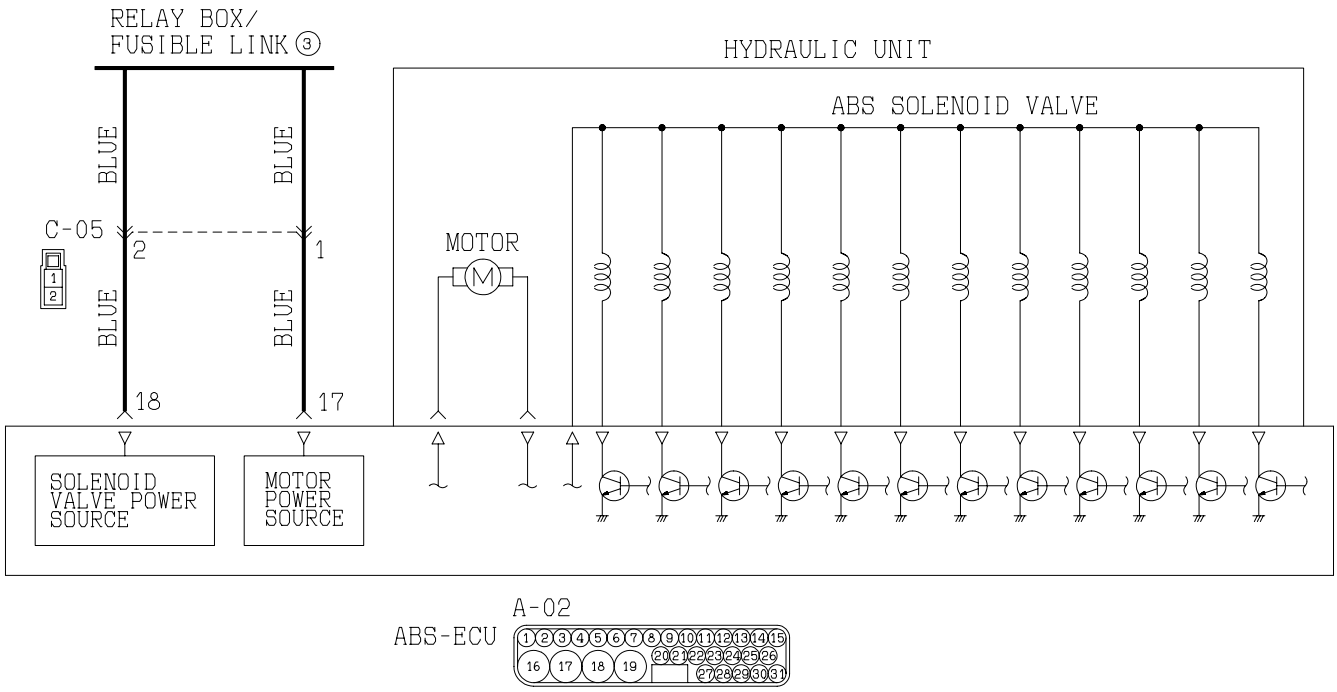
Follow the inspection chart that is appropriate for the diagnostic trouble code.

DIAGNOSTIC TROUBLE CODE NO.	INSPECTION ITEM	DIAGNOSTIC CONTENT	REFERENCE PAGE
11	Front right wheel speed sensor	Open circuit or short circuit	GROUP 35B, Diagnostic Trouble Code Procedures P.35B-8
12	Front left wheel speed sensor		
13	Rear right wheel speed sensor		
14	Rear left wheel speed sensor		
15	Wheel speed sensor	Abnormal output signal	
16	Power supply system	ABS-ECU power supply voltage below or above the standard value. Not displayed if the voltage recovers.	Check the battery. (Refer to GROUP 54A, Battery – On-vehicle Service – Battery Check P.54A-5.)
21	Front right wheel speed sensor		GROUP 35B, Diagnostic Trouble Code Procedures P.35B-8
22	Front left wheel speed sensor		
23	Rear right wheel speed sensor		
24	Rear left wheel speed sensor		
31	TCL front left solenoid valve (IN)		P.35C-8
32	TCL front left solenoid valve (OUT)		
33	TCL front right solenoid valve (IN)		
34	TCL front right solenoid valve (OUT)		
38	Stoplight switch system		GROUP 35B, Diagnostic Trouble Code Procedures P.35B-19
41	ABS front right solenoid valve (IN)		P.35C-8
42	ABS front left solenoid valve (IN)		
43	ABS rear right solenoid valve (IN)		
44	ABS rear left solenoid valve (IN)		
45	ABS front right solenoid valve (OUT)		
46	ABS front left solenoid valve (OUT)		
47	ABS rear right solenoid valve (OUT)		
48	ABS rear left solenoid valve (OUT)		
51	Valve power supply		
53	Pump motor		
63	ABS-ECU		Replace the hydraulic unit (Integrated with ABS-ECU). (Refer to GROUP 35B, Hydraulic Unit P.35B-52.)

DIAGNOSTIC TROUBLE CODE PROCEDURES

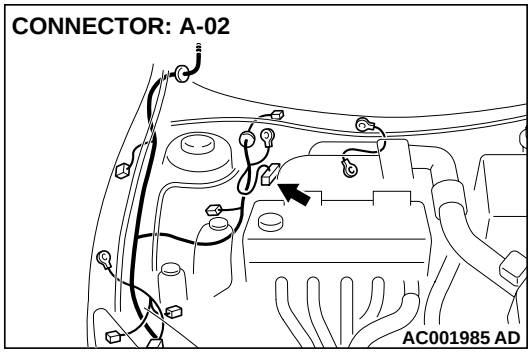
DTC 31, 32, 33, 34: TCL Solenoid Valve inside Hydraulic Unit (Open Circuit or Short Circuit) /DTC 41, 42, 43, 44, 45, 46, 47, 48: ABS Solenoid Valve inside Hydraulic Unit (Open Circuit or Short Circuit) / DTC 51: Valve Power Supply /DTC 53: Pump Motor

Solenoid Valve and Motor Power Supply Circuit



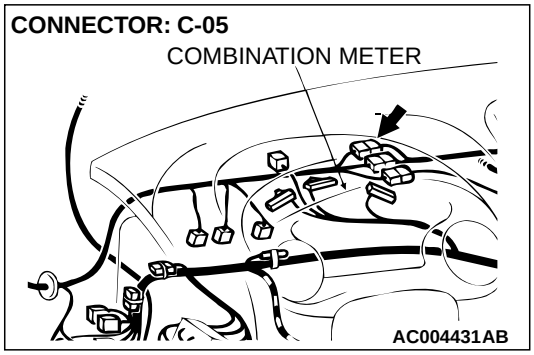
W3S14M05AA

CONNECTOR: A-02



AC001985 AD

CONNECTOR: C-05



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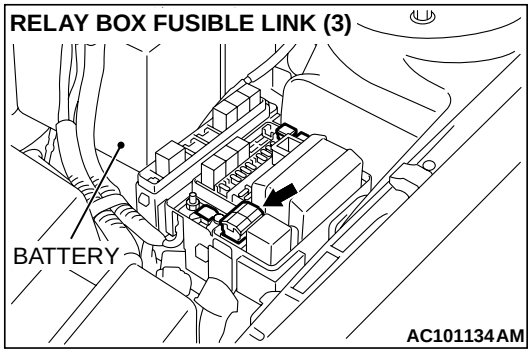
RELAY BOX FUSIBLE LINK (3)



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CIRCUIT OPERATION

Power is continuously supplied to the ABS-ECU through the relay box fusible link number 3 to operate the solenoid valves and motor. The ABS-ECU supplies power to the solenoids. If controls each solenoid by switching the ground circuit ON or OFF, depending on driving conditions.

TCL DTC SET CONDITIONS

These codes are displayed if the power supply circuit of solenoid valve or motor is open or short.

TROUBLESHOOTING HINTS (The most likely causes for these DTCs are to set are:)

- Damaged wiring harness or connector
- Malfunction of the hydraulic unit (integrated with ABS-ECU)

DIAGNOSIS

Required Special Tools:

- MB991223: Harness Set
- MB991502: Scan Tool (MUT-II)
- MB991529: Diagnostic Trouble Code Check Harness

STEP 1. Check the solenoid valve and motor power supply circuit at the ABS-ECU connector A-02.

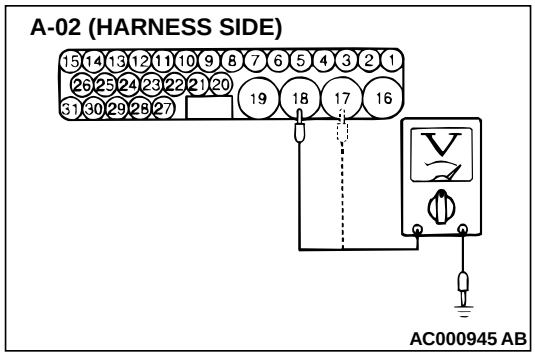
(1) Disconnect the ABS-ECU connector A-02 and measure at the harness side.

(2) Measure the voltages between terminal 18 and ground, and 17 and ground.

Q: Are the voltages approximately 12 volts (battery positive voltage)?

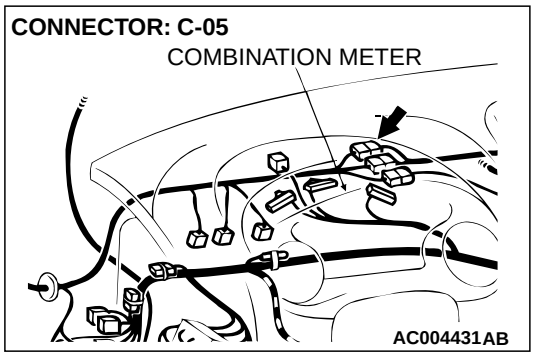
YES : Replace the hydraulic unit (integrated with ABS-ECU). (Refer to GROUP 35B, Hydraulic Unit P.35B-52.) Then go to Step 3.

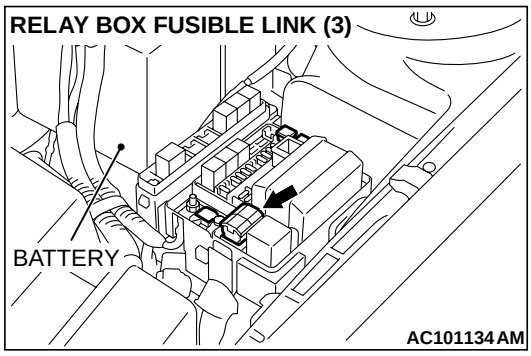
NO : Go to Step 2.

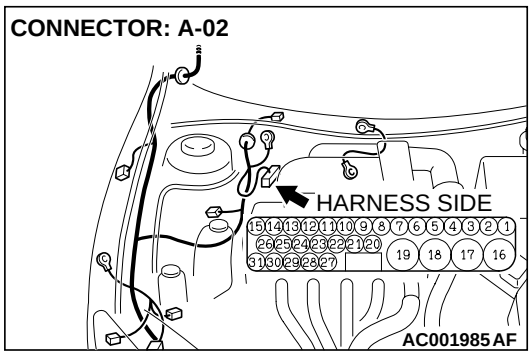


STEP 2. Check the harness wire between the relay box fusible link number 3 and the ABS-ECU connector A-02 (terminals 17 and 18).

NOTE: After inspecting the intermediate connector C-05, inspect the wires. If the intermediate connector C-05 is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If the connector has been repaired or replaced, go to Step 3.







Q: Is any of the harness wires between the relay box fusible link number 3 and the ABS-ECU connector A-02 (terminals 17 and 18) damaged?

YES : Repair it and then go to Step 3.
NO : Go to Step 3.

STEP 3. Check the diagnostic trouble codes.

Q: Does any of the diagnostic trouble codes 31, 32, 33, 34, 41, 42, 43, 44, 45, 46, 47, 48, 51, or 53 reset?

YES : Return to Step 1.
NO : This diagnosis is complete.

SYMPTOM CHART

M1354000700087

SYMPTOMS	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Communication between the scan tool and all systems is not possible.	–	GROUP 13A, Diagnosis P.13A-434 or GROUP 13B, Diagnosis P.13B-530.
Communication between the scan tool and the ABS-ECU is not possible.	1	P.35C-11
When the ignition key is turned to the "ON" position (engine stopped), the TCL indicator light does not illuminate.	2	P.35C-16
When the ignition key is turned to the "ON" position (engine stopped), the TCL warning light does not illuminate.	3	P.35C-22
The TCL indicator light remains illuminated after the engine is started.	4	P.35C-28
The TCL warning light remains illuminated after the engine is started.	5	P.35C-31
The TCL system does not operate.	6	P.35C-34

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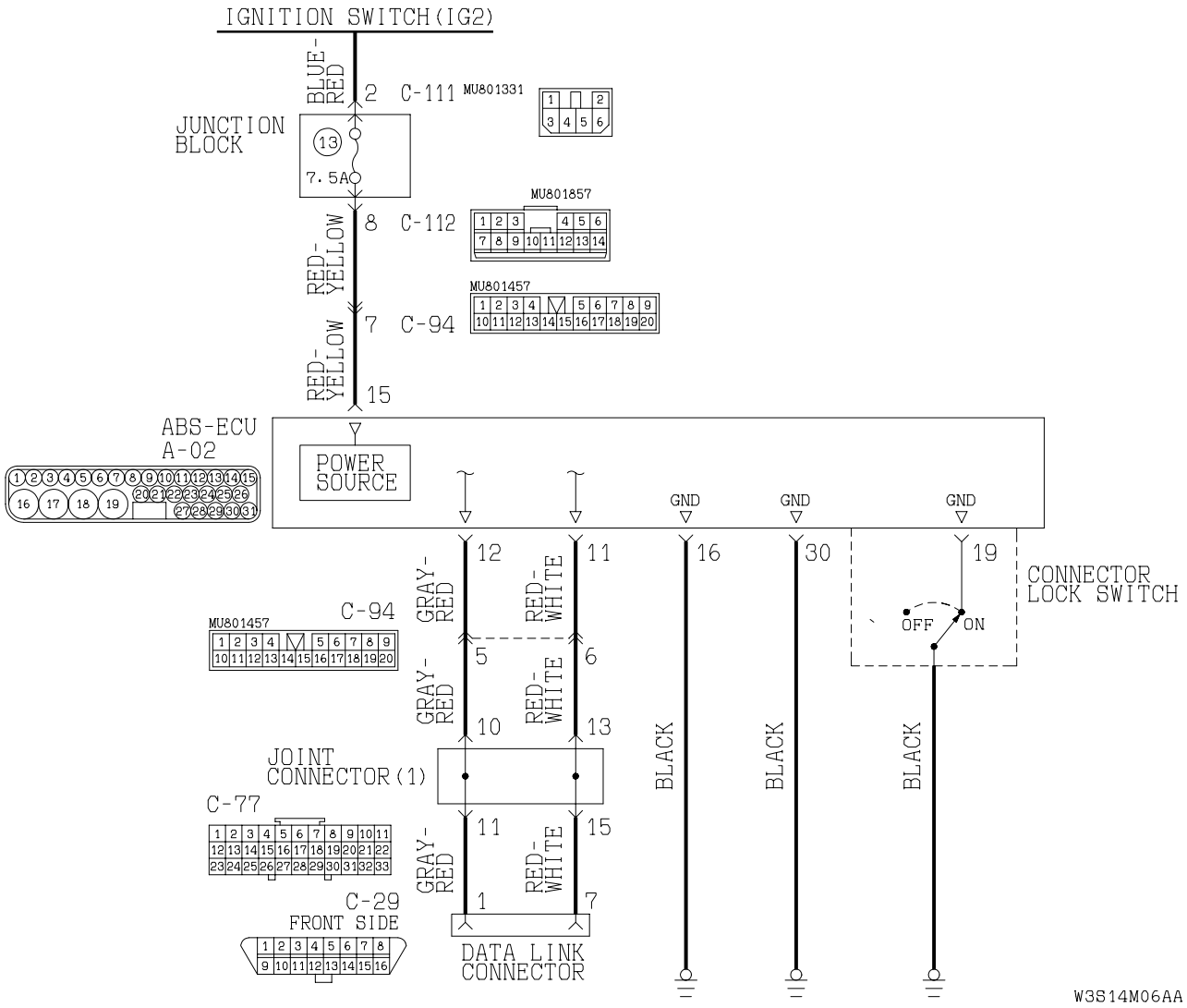
SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Communication between the Scan Tool and the ABS-ECU is not Possible.

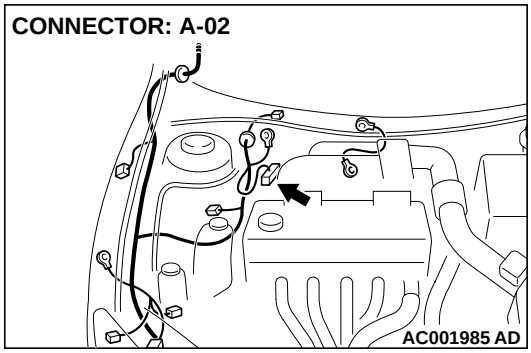
Data Link Connector Circuit

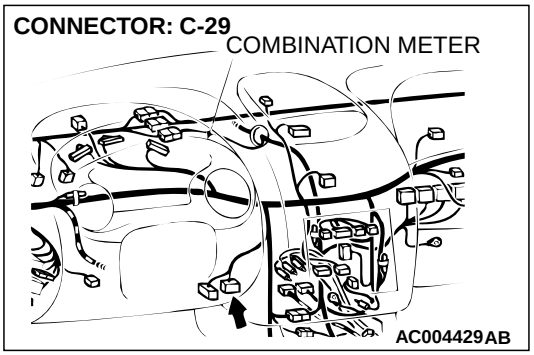


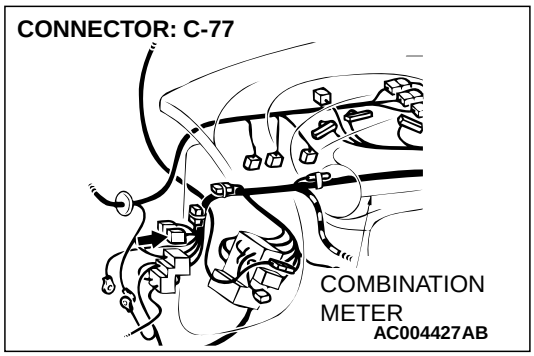
NOTE: CONNECTOR LOCK SWITCH

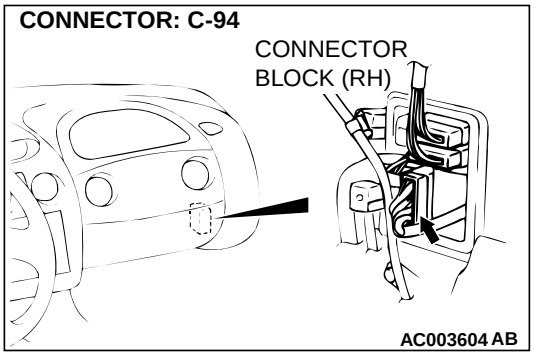
ON: The ABS-ECU connector A-02 is connected.

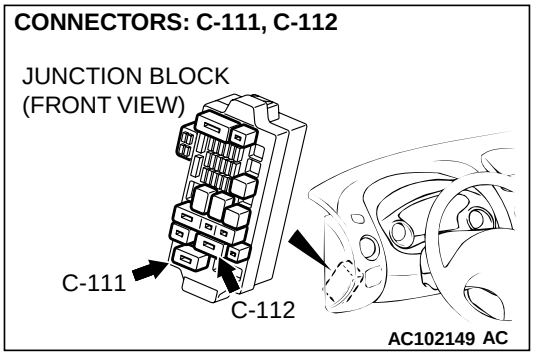
OFF: The ABS-ECU connector A-02 is disconnected.











CIRCUIT OPERATION

- The diagnostic output is made from the ABS-ECU (terminal 11) to the diagnostic output terminal (terminal 7) of the data link connector.
- When the data link connector's diagnostic test mode control terminal (terminal 1) is grounded, the ABS-ECU (terminal 12) will switch to the diagnostic mode.

TECHNICAL DESCRIPTION (COMMENT)

When communication with the scan tool is not possible, the cause is probably an open circuit in the ABS-ECU power circuit or an open circuit in the diagnostic output circuit.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Blown fuse
- Damaged wiring harness or connector
- Malfunction of the hydraulic unit (Integrated with ABS-ECU)

DIAGNOSIS

Required Special Tool:

- MB991223: Harness Set

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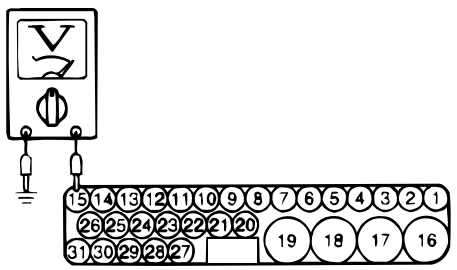
STEP 1. Check the power supply circuit at the ABS-ECU connector A-02.

(1) Disconnect the ABS-ECU connector A-02 and measure at the harness side.
(2) Start the engine.
(3) Measure the voltage between terminal 15 and ground.

Q: Is the voltage approximately 12 volts (battery positive voltage)?

YES : Go to Step 3.
NO : Go to Step 2.

A-02 (HARNESS SIDE)



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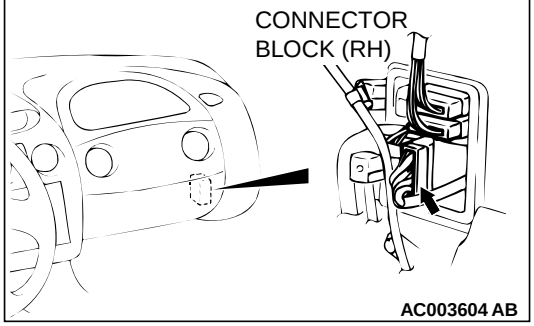
STEP 2. Check the harness wire between the ignition switch (IG2) and the ABS-ECU connector A-02 (terminal 15).

NOTE: After inspecting the intermediate connectors C-94, C-111 and C-112, inspect the wire. If the intermediate connector C-94, C-111, or C-112 is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If the connector has been repaired or replaced, go to Step 5.

CONNECTOR: C-94



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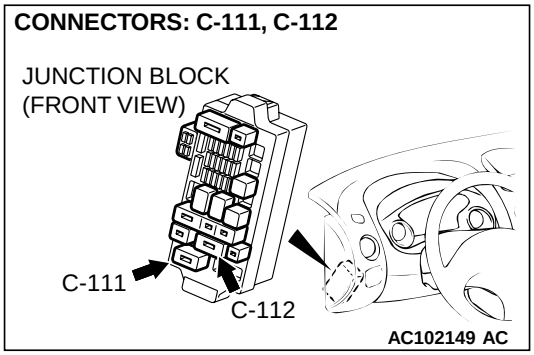
CONNECTORS: C-111, C-112



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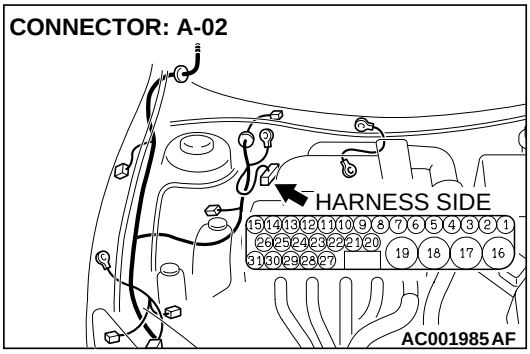
Q: Is the harness wire between the ignition switch (IG2) and the ABS-ECU connector A-02 (terminal 15) damaged?

YES : Repair it and go to Step 5.
NO : Go to Step 3.

CONNECTOR: A-02



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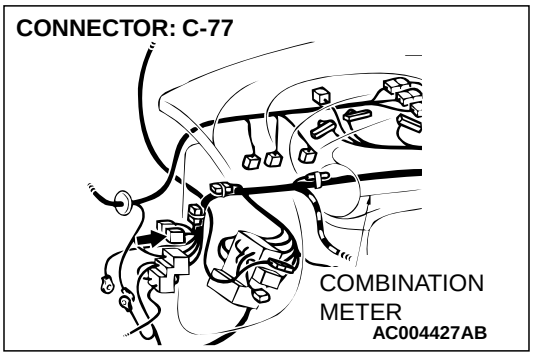
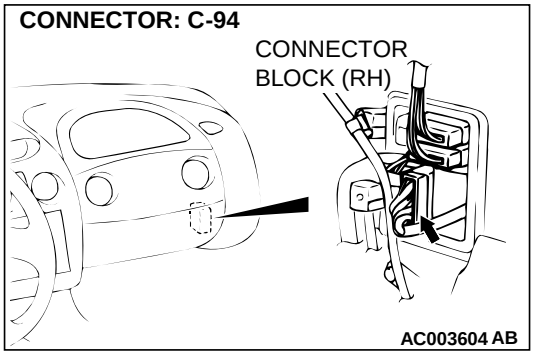
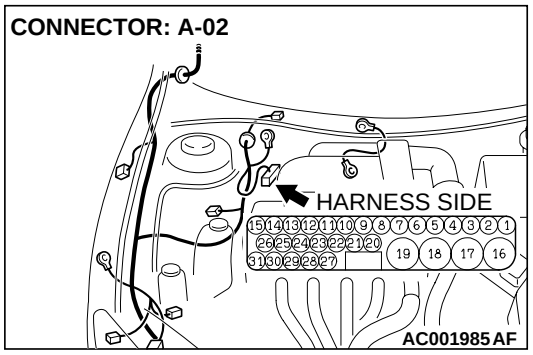
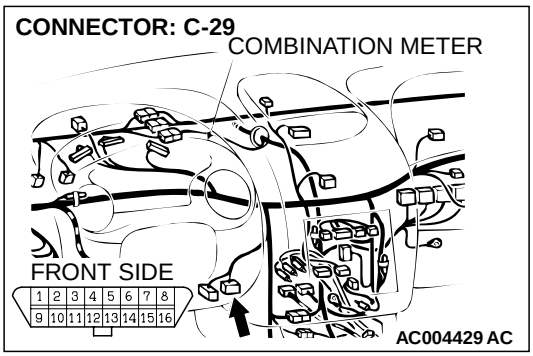
STEP 3. Check the harness wires between the ABS-ECU connector A-02 (terminals 11 and 12) and the data link connector C-29 (terminals 1 and 7).

NOTE: After inspecting the intermediate connectors C-77 and C-94, inspect the wires. If the intermediate connector C-77 or C-94 is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If the connector has been repaired or replaced, go to Step 5.



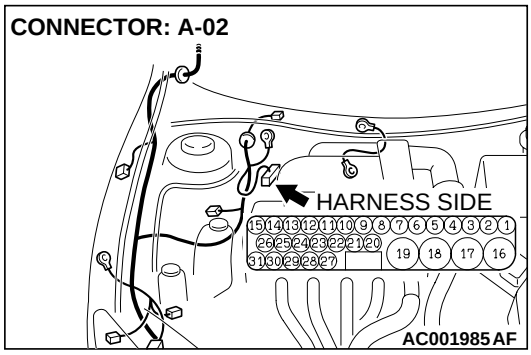






Q: Is any of the harness wires between the ABS-ECU connector A-02 (terminals 11 and 12) and the data link connector C-29 (terminals 1 and 7) damaged?

YES : Repair it and go to Step 5.
NO : Go to Step 4.



STEP 4. Check the harness wires between the ABS-ECU connector A-02 (terminals 16, 19, and 30) and ground.

Q: Is any of the harness wires between the ABS-ECU connector A-02 (terminals 16, 19, and 30) and ground damaged?

YES : Repair it and then go to Step 5.

NO : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to GROUP 35B, Hydraulic Unit P.35B-52.) and then go to Step 5.

STEP 5. Check symptom.

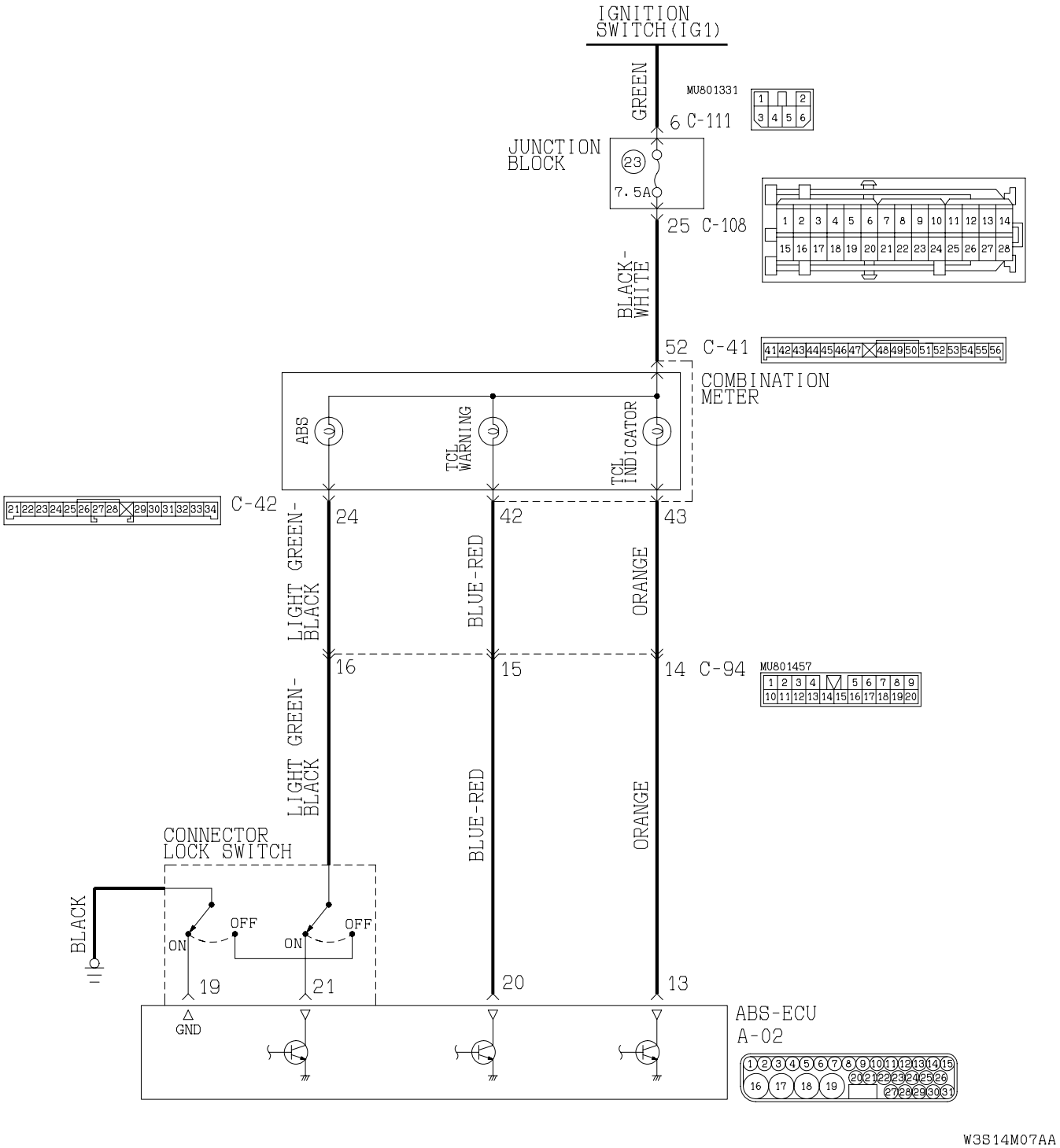
Q: Does the scan tool communicate with the TCL system?

YES : This diagnosis is complete.

NO : Return to Step 1.

INSPECTION PROCEDURE 2: When the Ignition Key is Turned to the "ON" Position (Engine Stopped), the TCL Indicator Light does not Illuminate.

TCL Warning Light and TCL Indicator Light Circuit

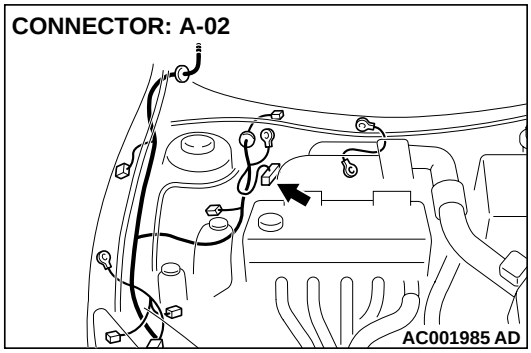


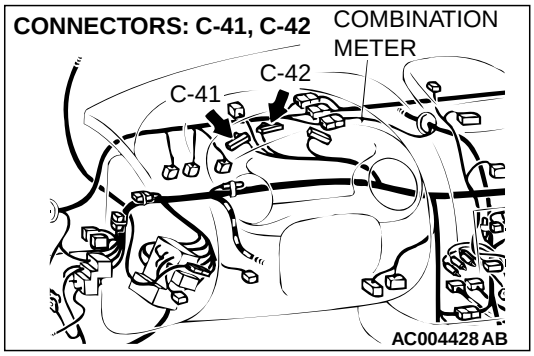
NOTE: CONNECTOR LOCK SWITCH

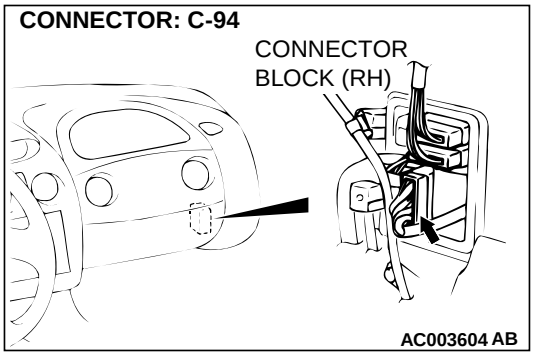
ON: The ABS-ECU connector A-02 is connected.

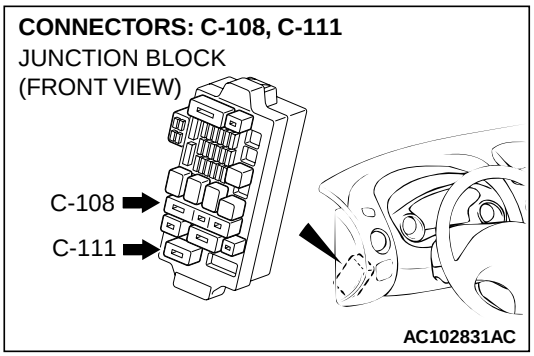
OFF: The ABS-ECU connector A-02 is disconnected.

TSB Revision









CIRCUIT OPERATION

- Power to the TCL indicator light is supplied from the ignition switch. The ABS-ECU grounds the circuit to turn the light ON.
- The ABS-ECU illuminates the TCL indicator light for three seconds on start-up <ignition key: "ON" (with engine stopped)>. When the ABS-ECU completes the self-check, it turns off the light.

TECHNICAL DESCRIPTION (COMMENT)

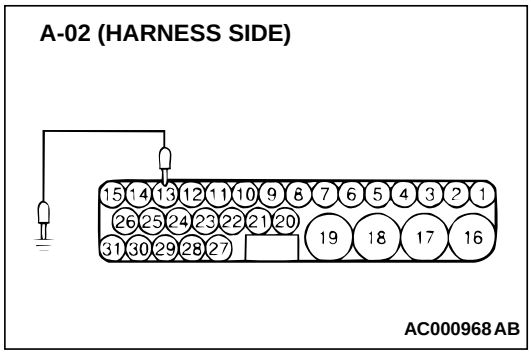
The cause may be: an open circuit in the TCL indicator light power supply circuit, a blown TCL indicator light bulb or ABS-ECU malfunction.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Blown fuse
- Damaged wiring harness or connector
- Burnt out TCL indicator light bulb
- Malfunction of the ABS-ECU

DIAGNOSIS

Required Special Tool:
- MB991223: Harness Set



STEP 1. Check the TCL indicator light circuit at the ABS-ECU connector A-02.

(1) Disconnect the ABS-ECU connector A-02 and measure at the harness side.
(2) Ground the terminal 13.
(3) Turn the ignition switch to the "ON" position.

Q: Does the TCL indicator light illuminate?

YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to GROUP 35B, Hydraulic Unit P.35B-52.) and then go to Step 9.
NO : Go to Step 2.

STEP 2. Check the TCL indicator light bulb.

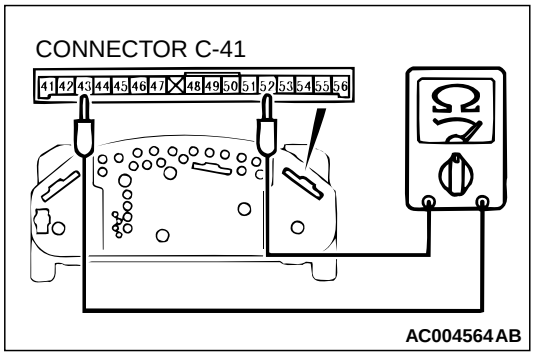
(1) Remove the combination meter. (Refer to GROUP 54A, Combination Meter P.54A-105 and P.54A-107.)
(2) Check the TCL indicator light bulb.

Q: Is the TCL indicator light bulb burned out?

YES : Replace the bulb and then go to Step 9.
NO : Go to Step 3.

STEP 3. Check the combination meter for the continuity.

(1) Remove the combination meter. (Refer to GROUP 54A, Combination Meter P.54A-105.)
(2) Remove the TCL indicator light bulb. (Refer to GROUP 54A, Combination Meter P.54A-107.) Then measure the resistance between the bulb terminals.
(3) Install the TCL indicator light bulb to the combination meter, and then measure the resistance between the connector C-41 terminals 43 and 52. The resistance reading at this time should be much the same as the resistance measured at step (2).



Q: Are the two resistance values extremely different each other?

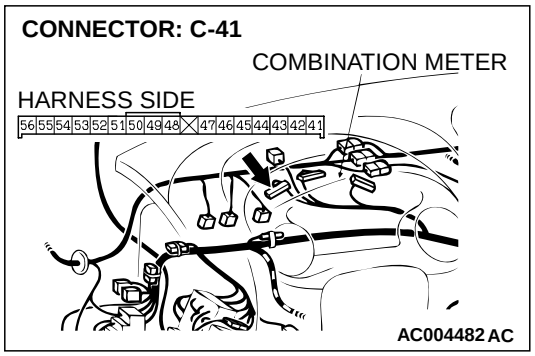
YES : Replace the combination meter (printed circuit board) and then go to Step 9.
NO (much the same) : Go to Step 4.

STEP 4. Check the combination meter power supply circuit.

(1) Disconnect the combination meter connector C-41, and check at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between the terminal 52 and ground. It should be approximately 12 volts (battery positive voltage).

Q: Is the voltage approximately 12 volts (battery positive voltage)?

YES : Go to Step 5.
NO : Go to Step 7.

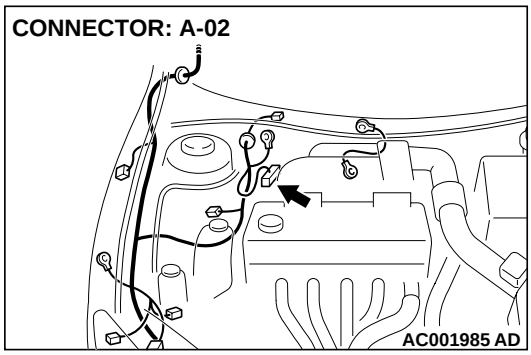


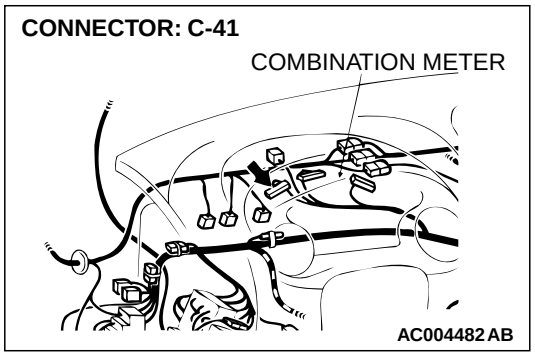
STEP 5. Check the connectors A-02, C-41, and C-94.

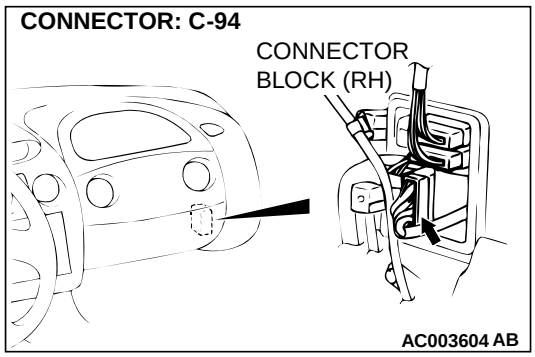
Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

Q: Is any of the connectors damaged?

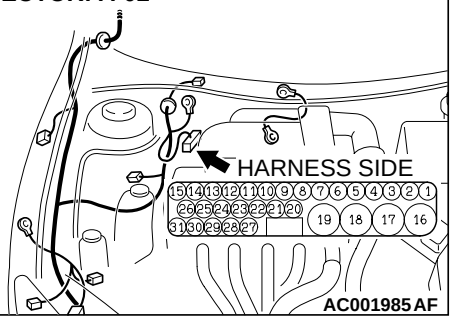
YES : Repair it and then go to Step 9.
NO : Go to Step 6.







CONNECTOR: A-02



AC001985 AF

STEP 6. Check the continuity between the combination meter and the ABS-ECU.

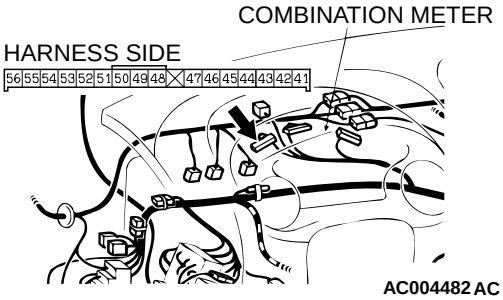
Check the continuity between the combination meter connector C-41 (terminal 43) and ABS-ECU connector A-02 (terminal 13).

Q: Is there the continuity between the combination meter connector C-41 (terminal 43) and the ABS-ECU connector A-02 (terminal 13)?

YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to GROUP 35B, Hydraulic Unit P.35B-52.) and then go to Step 9.

NO : Repair the harness wire and then go to Step 9.

CONNECTOR: C-41



AC004482 AC

STEP 7. Check the connectors C-41, C-108, and C-111.

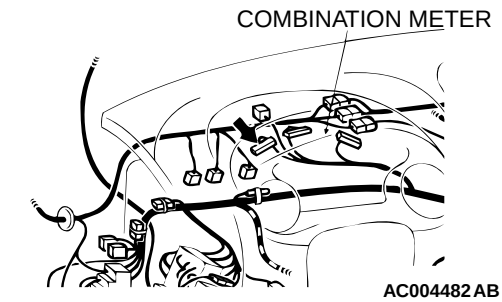
Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

Q: Is any of the connectors damaged?

YES : Repair it and then go to Step 9.

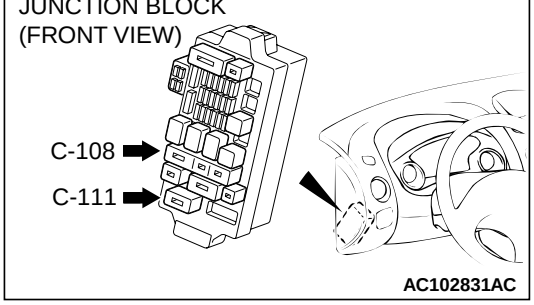
NO : Go to Step 8.

CONNECTOR: C-41

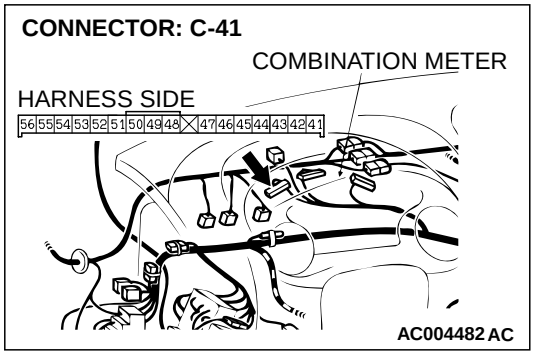


AC004482 AB

CONNECTORS: C-108, C-111



AC102831AC



STEP 8. Check the continuity between the ignition switch (IG1) and the combination meter.

Check the continuity between the ignition switch (IG1) and the combination meter connector C-41 (terminal 52).

Q: Is there any continuity (less than 2 ohms) between the ignition switch (IG1) and combination meter connector C-41 (terminal 52)?

YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to GROUP 35B, Hydraulic Unit P.35B-52.) and then go to Step 9.

NO : Repair the harness wire and then go to Step 9.

STEP 9. Check symptom.

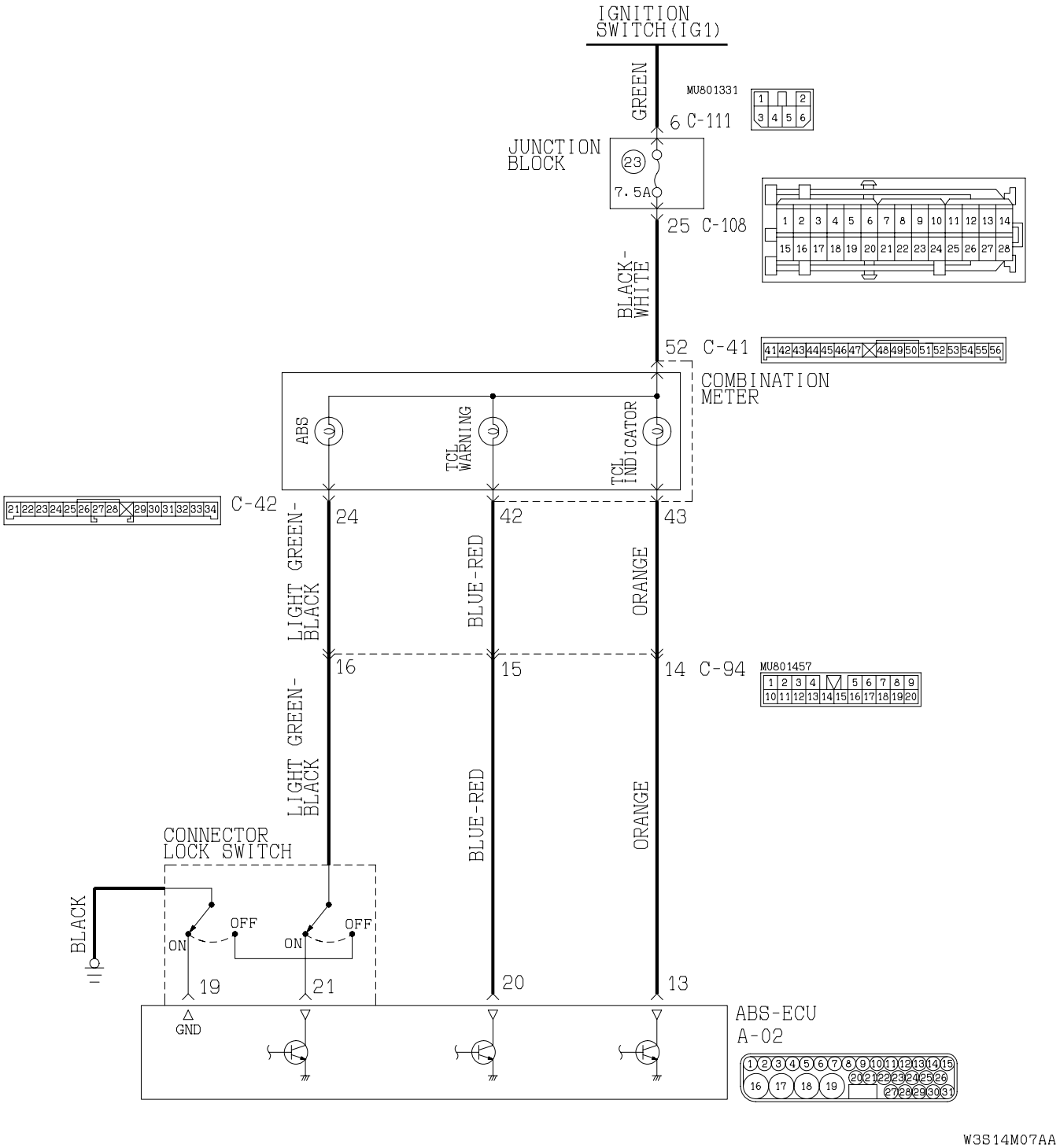
Q: Does the TCL indicator light illuminate 3 seconds when the ignition switch is turned to the "ON" position with engine stopped or upon start-up?

YES : This diagnosis is complete.

NO : Return to Step 1.

INSPECTION PROCEDURE 3: When the Ignition Key is Turned to the "ON" Position (Engine Stopped), the TCL Warning Light does not Illuminate.

TCL Warning Light and TCL Indicator Light Circuit

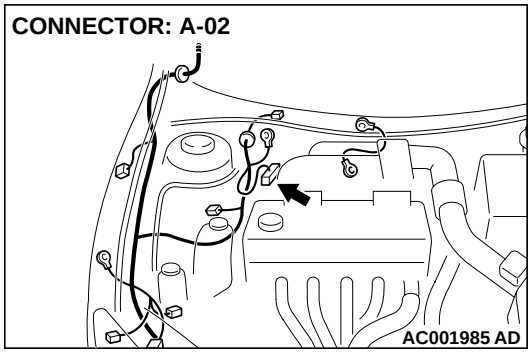


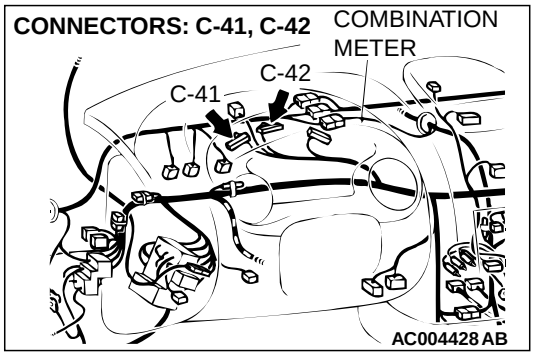
NOTE: CONNECTOR LOCK SWITCH

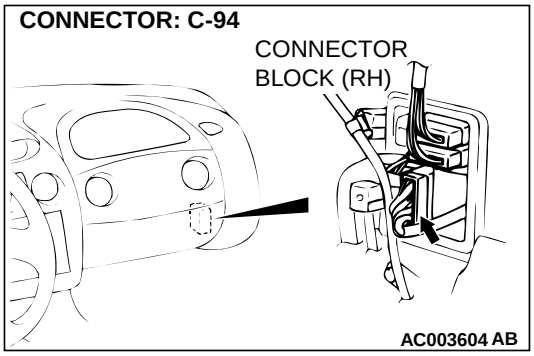
ON: The ABS-ECU connector A-02 is connected.

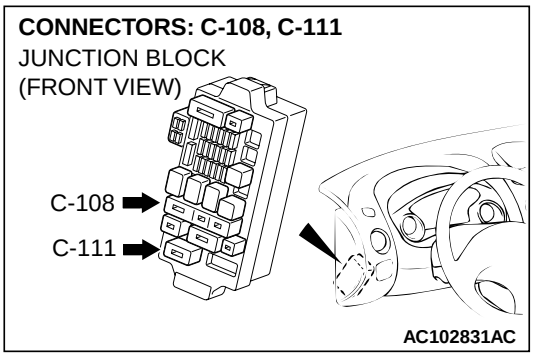
OFF: The ABS-ECU connector A-02 is disconnected.

TSB Revision









CIRCUIT OPERATION

- Power to the TCL warning light is supplied from the ignition switch. The ABS-ECU grounds the circuit to illuminate the light.
- The ABS-ECU illuminates the TCL warning light for three seconds on start-up <ignition key: "ON" (with engine stopped)>. When the ABS-ECU completes the self-check, it turns off the light.

TECHNICAL DESCRIPTION (COMMENT)

The cause may be: an open circuit in the TCL warning light power supply circuit, a blown TCL warning light bulb or ABS-ECU malfunction.

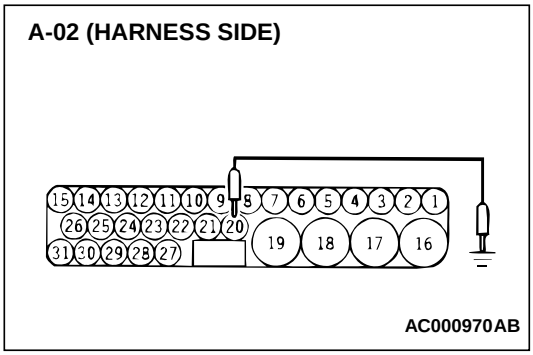
TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Blown fuse
- Damaged wiring harness or connector
- Burnt out TCL warning light bulb
- Malfunction of the ABS-ECU

DIAGNOSIS

Required Special Tool:
- MB991223: Harness Set

STEP 1. Check the TCL warning light circuit at the ABS-ECU connector A-02.



(1) Disconnect the ABS-ECU connector A-02 and measure at the harness side.
(2) Ground the terminal 20.
(3) Turn the ignition switch to the "ON" position.

Q: Does the TCL warning light illuminate?

YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to GROUP 35B, Hydraulic Unit P.35B-52.) and then go to Step 9.
NO : Go to Step 2.

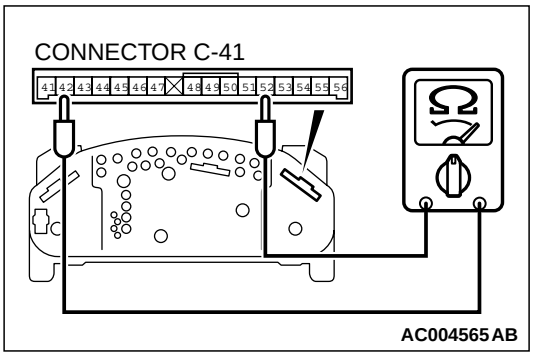
STEP 2. Check the TCL warning light bulb.

(1) Remove the combination meter. (Refer to GROUP 54A, Combination Meter P.54A-105 and P.54A-107.)
(2) Check the TCL warning light bulb.

Q: Is the TCL warning light bulb burned out?

YES : Replace the bulb and then go to Step 9.
NO : Go to Step 3.

STEP 3. Check the combination meter for the continuity.



(1) Remove the combination meter.
(2) Remove the TCL warning light bulb. Then measure the resistance between the bulb terminals.
(3) Install the TCL warning light bulb to the combination meter, and then measure the resistance between the connector C-41 terminals 52 and 42. The resistance reading at this time should be much the same as the resistance measured at step (2).

Q: Are the two resistance values extremely different each other?

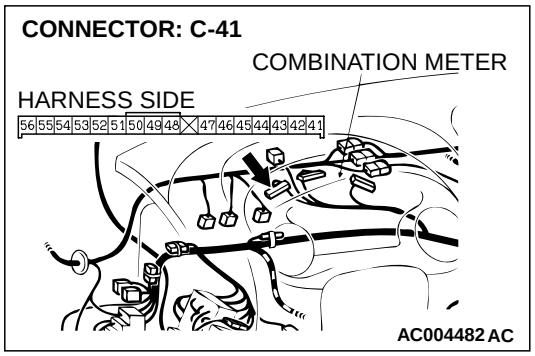
YES : Replace the combination meter (printed circuit board) and then go to Step 9.
NO (much the same) : Go to Step 4.

STEP 4. Check the combination meter power supply circuit.

(1) Disconnect the combination meter connector C-41, and check at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between the terminal 52 and ground. It should be approximately 12 volts (battery positive voltage).

Q: Is the voltage approximately 12 volts (battery positive voltage)?

YES : Go to Step 5.
NO : Go to Step 7.

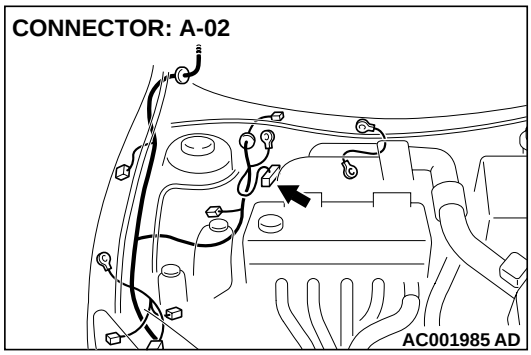


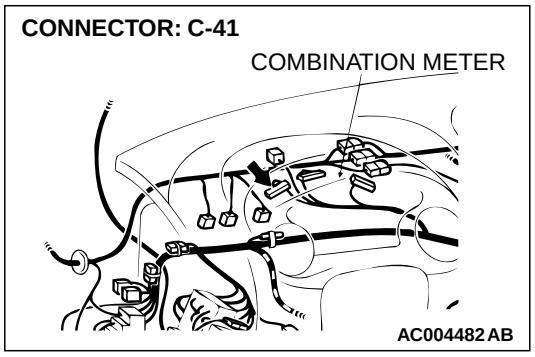
STEP 5. Check the connectors A-02, C-41, and C-94.

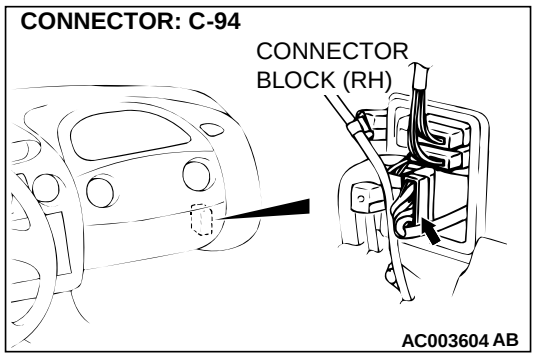
Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

Q: Is any of the connectors damaged?

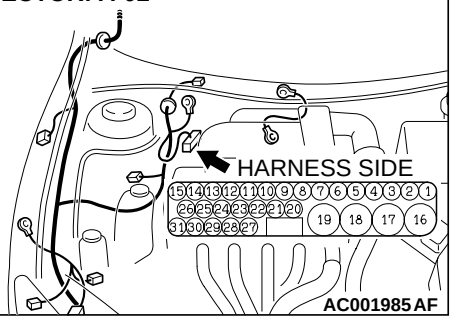
YES : Repair it and then go to Step 9.
NO : Go to Step 6.







CONNECTOR: A-02



AC001985 AF

STEP 6. Check the continuity between the combination meter and the ABS-ECU.

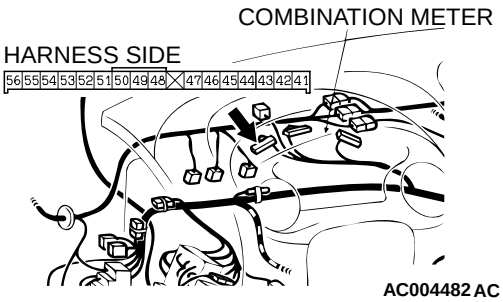
Check the continuity between the combination meter connector C-41 (terminal 42) and ABS-ECU connector A-02 (terminal 20).

Q: Is there the continuity between the combination meter connector C-41 (terminal 42) and the ABS-ECU connector A-02 (terminal 20)?

YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to GROUP 35B, Hydraulic Unit P.35B-52.) and then go to Step 9.

NO : Repair the harness wire and then go to Step 9.

CONNECTOR: C-41



AC004482 AC

STEP 7. Check connectors C-41, C-108, and C-111.

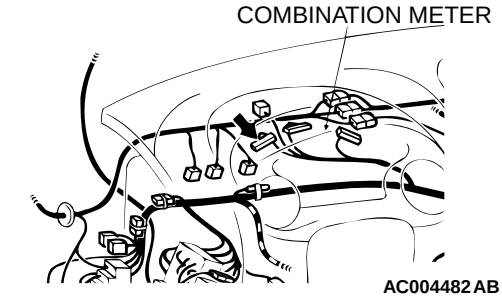
Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

Q: Is any of the connectors damaged?

YES : Repair it and then go to Step 9.

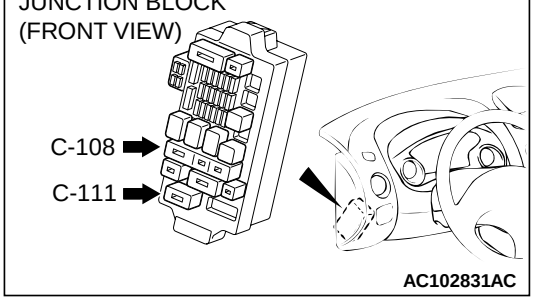
NO : Go to Step 8.

CONNECTOR: C-41

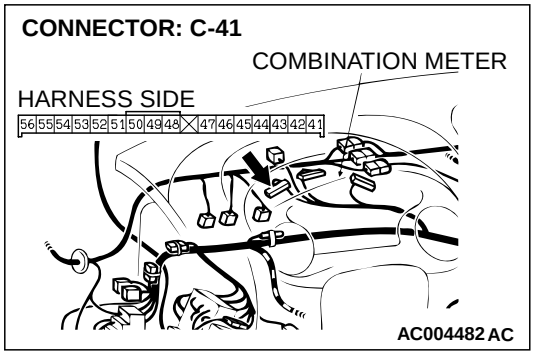


AC004482 AB

CONNECTORS: C-108, C-111



AC102831AC



STEP 8. Check the continuity between the ignition switch (IG1) and the combination meter.

Check the continuity between the ignition switch (IG1) and the combination meter connector C-41 (terminal 52).

Q: Is there any continuity (less than 2 ohm) between the ignition switch (IG1) and the combination meter connector C-41 (terminal 52)?

YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to GROUP 35B, Hydraulic Unit P.35B-52.) and then go to Step 9.

NO : Repair the harness wire and then go to Step 9.

STEP 9. Check symptom.

Q: Does the TCL warning light illuminate for 3 seconds when the ignition switch is turned to the "ON" position with engine stopped or upon startup?

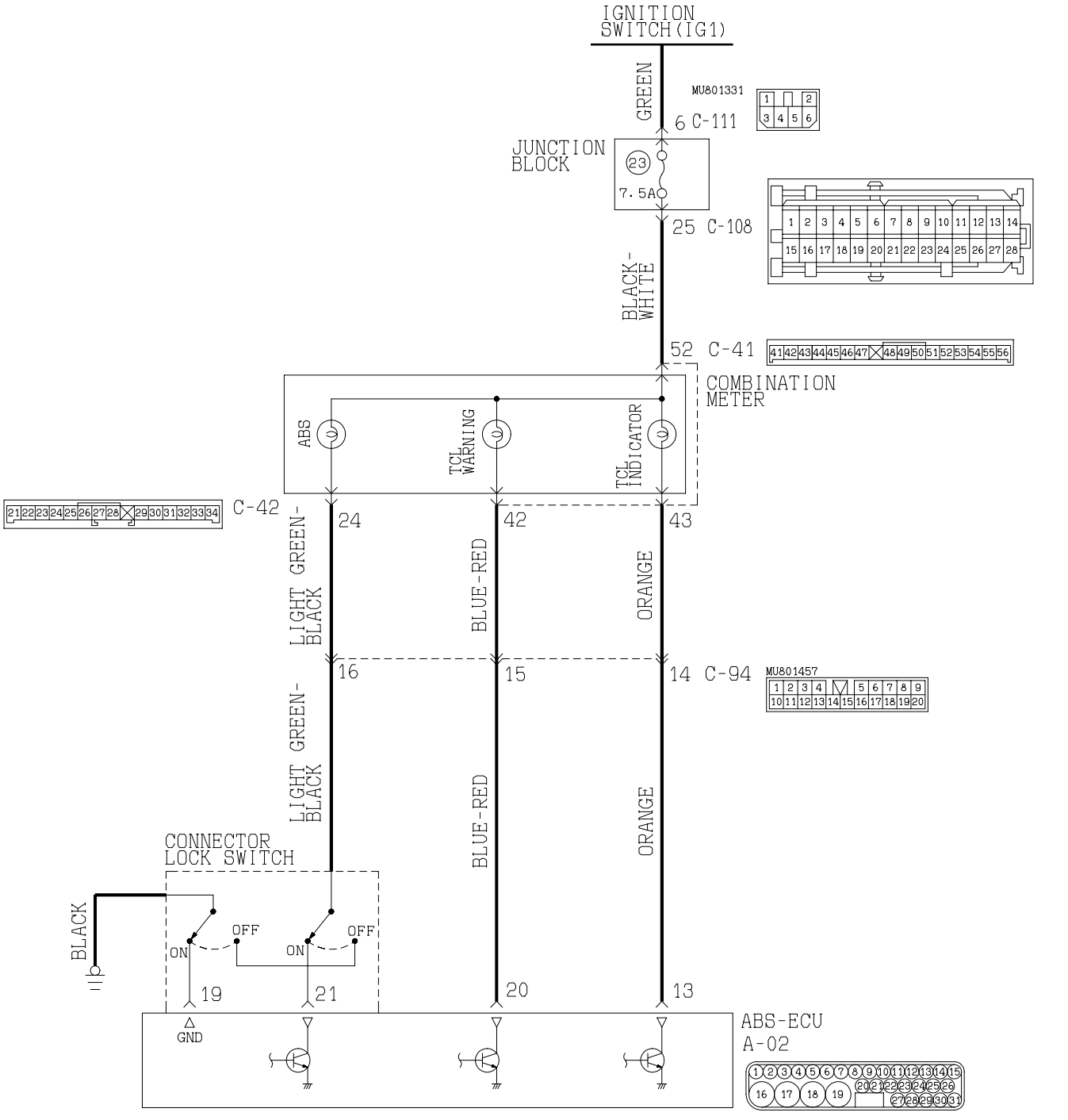
YES : This diagnosis is complete.

NO : Return to Step 1.

INSPECTION PROCEDURE 4: The TCL Indicator Light Remains Illuminated after the Engine is Started.

NOTE: This diagnosis procedure is limited to cases where communication with the scan tool is possible (ABS-ECU power supply is normal) and no diagnostic trouble code outputs.

TCL Warning Light and TCL Indicator Light Circuit

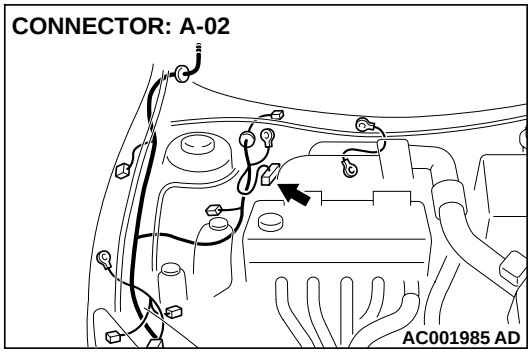


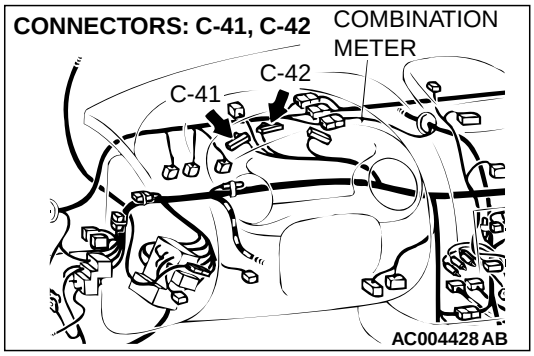
NOTE: CONNECTOR LOCK SWITCH

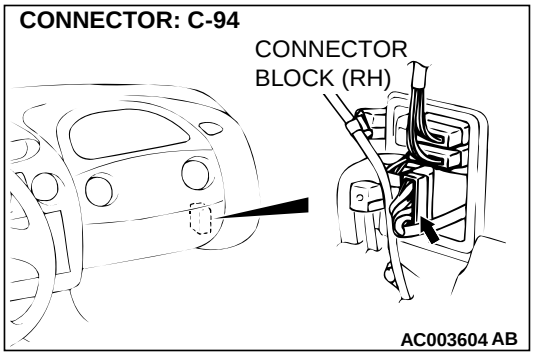
ON: The ABS-ECU connector A-02 is connected.

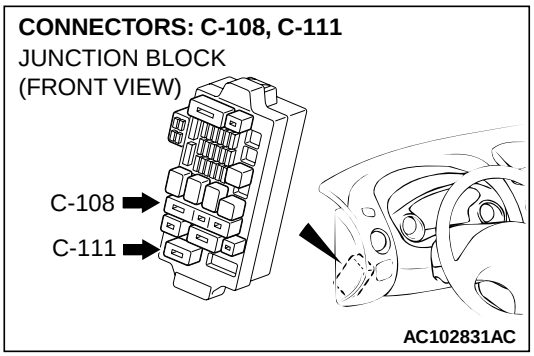
OFF: The ABS-ECU connector A-02 is disconnected.

TSB Revision









CIRCUIT OPERATION

- The ABS-ECU controls the illumination of the TCL indicator light by turning the transistor in the ECU "ON" and "OFF."
- The ABS-ECU illuminates the TCL indicator light for three seconds on start-up <ignition key: "ON" (with engine stopped)>. When the ABS-ECU completes the self-check, it turns off the light.

TECHNICAL DESCRIPTION (COMMENT)

The cause is probably the hydraulic unit (integrated with ABS-ECU) malfunction.

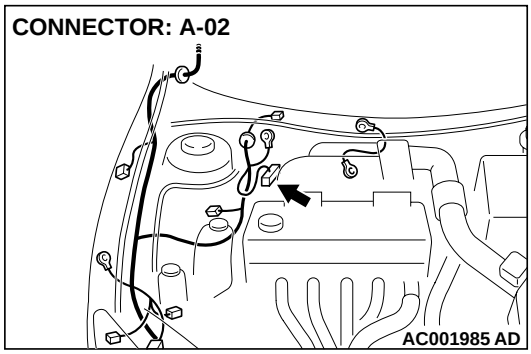
TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Damaged wiring harness or connector
- Malfunction of the hydraulic unit (integrated with ABS-ECU)

DIAGNOSIS

Required Special Tool:

- MB991223: Harness Set



STEP 1. Check the TCL indicator light circuit at the ABS-ECU connector A-02.

(1) Disconnect the ABS-ECU connector A-02.
(2) Turn the ignition switch to the "ON" position.

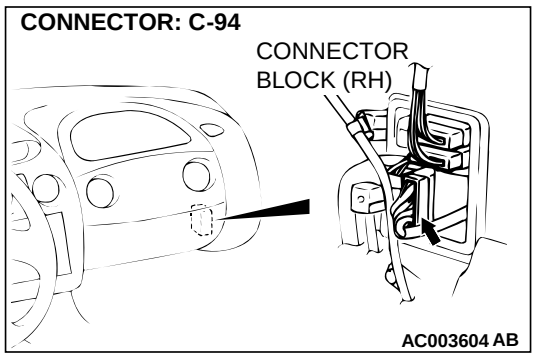
Q: Does the TCL indicator light illuminate?

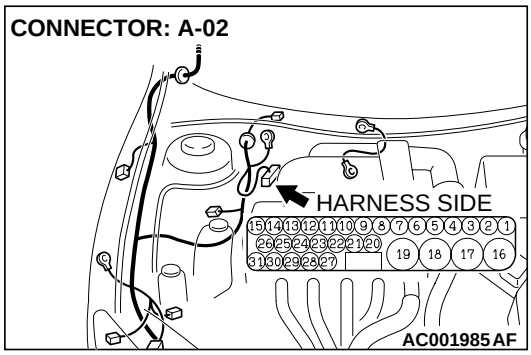
YES : Go to Step 2.

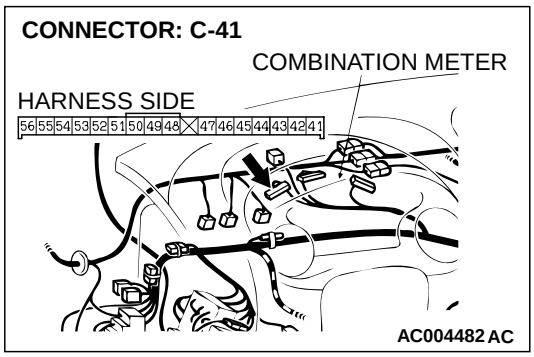
NO : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to GROUP 35B, Hydraulic Unit P.35B-52.) and then go to Step 3.

STEP 2. Check the harness wire between the ABS-ECU connector A-02 (terminal 13) and the combination meter connector C-41 (terminal 43).

NOTE: After inspecting the intermediate connector C-94, inspect the wire. If the intermediate connector C-94 is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If the connector has been repaired or replaced, go to Step 3.







Q: Is the harness wire between the ABS-ECU connector A-02 (terminal 13) and the combination meter connector C-41 (terminal 43) damaged?

YES : Repair it and then go to Step 3.
NO : Go to Step 3.

STEP 3. Check symptom.

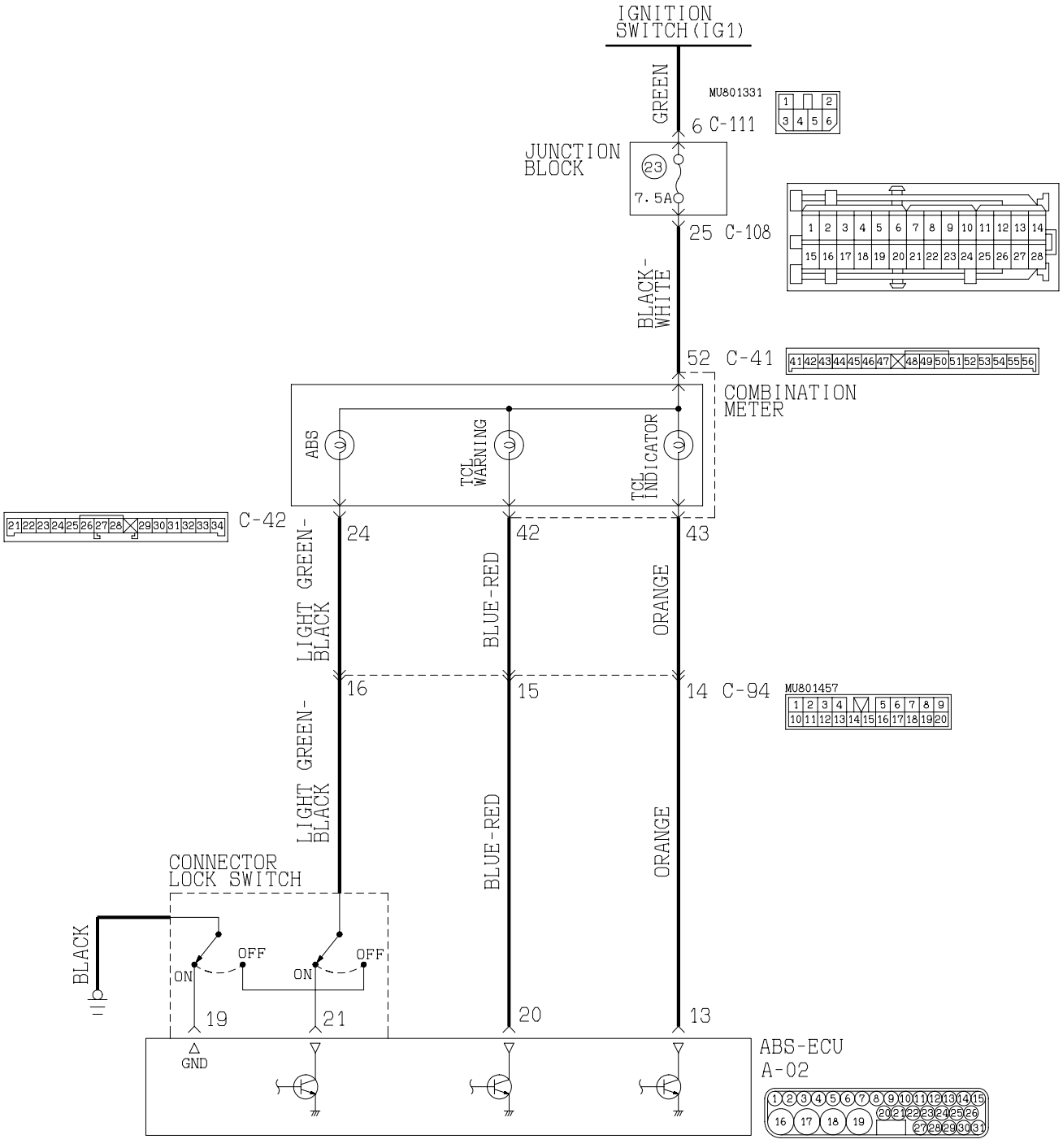
Q: Does the TCL indicator light turn off 3 seconds after start-up?

YES : This diagnosis is complete.
NO : Return to Step 1.

INSPECTION PROCEDURE 5: The TCL Warning Light Remains Illuminated after the Engine is Started.

NOTE: This diagnosis procedure is limited to cases where communication with the scan tool is possible (ABS-ECU power supply is normal) and no diagnostic trouble code outputs.

TCL Warning Light and TCL Indicator Light Circuit

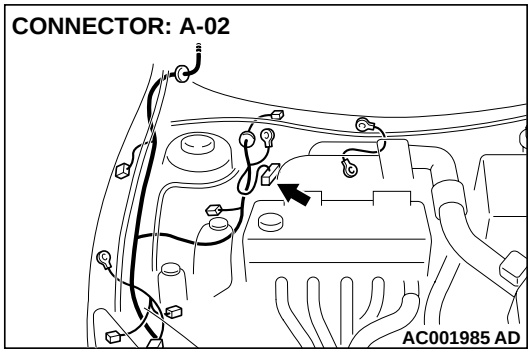


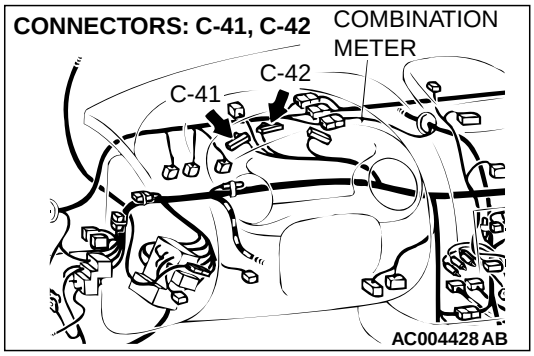
NOTE: CONNECTOR LOCK SWITCH

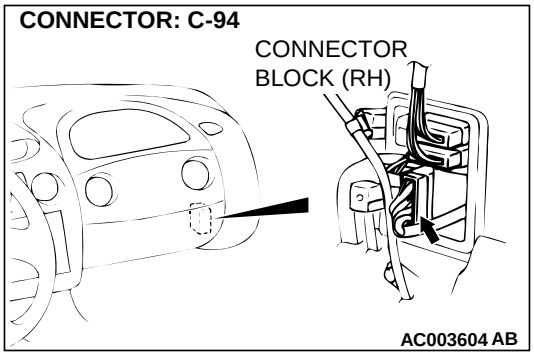
ON: The ABS-ECU connector A-02 is connected.

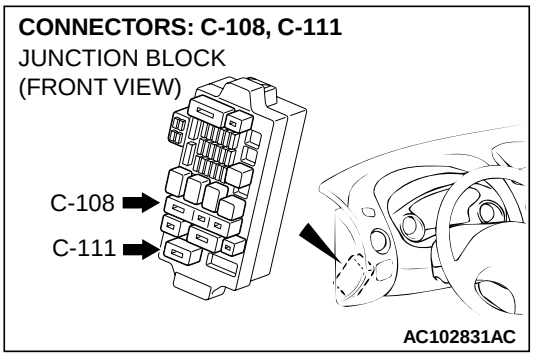
OFF: The ABS-ECU connector A-02 is disconnected.

TSB Revision









CIRCUIT OPERATION

- The ABS-ECU controls the illumination of the TCL warning light by turning the transistor in the ECU "ON" and "OFF."
- The ABS-ECU illuminates the TCL warning light for three seconds on start-up <ignition key: "ON" (with engine stopped)>. When the ABS-ECU completes the self-check, it turns off the light.

TECHNICAL DESCRIPTION (COMMENT)

The cause is probably hydraulic unit (integrated with ABS-ECU) malfunction.

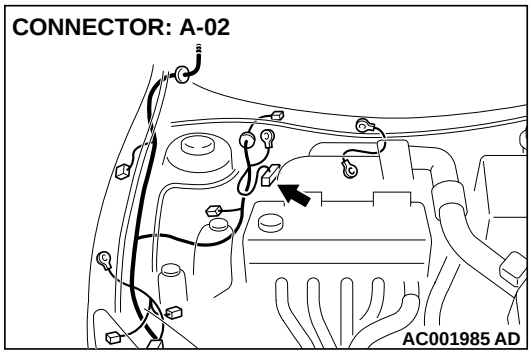
TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Damaged wiring harness or connector
- Malfunction of the hydraulic unit (integrated with ABS-ECU)

DIAGNOSIS

Required Special Tool:

- MB991223: Harness Set



STEP 1. Check the TCL warning light circuit at the ABS-ECU connector A-02.

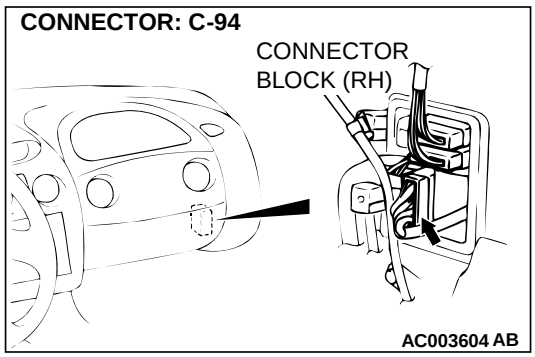
(1) Disconnect the ABS-ECU connector A-02.
(2) Turn the ignition switch to the "ON" position.

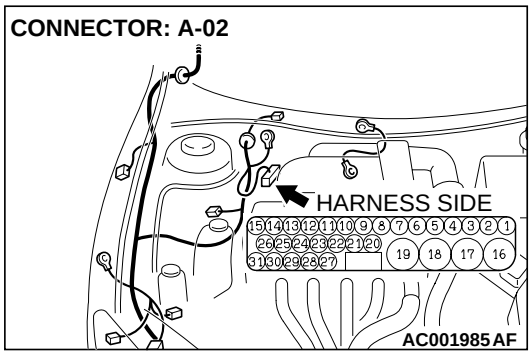
Q: Does the TCL warning light illuminate?

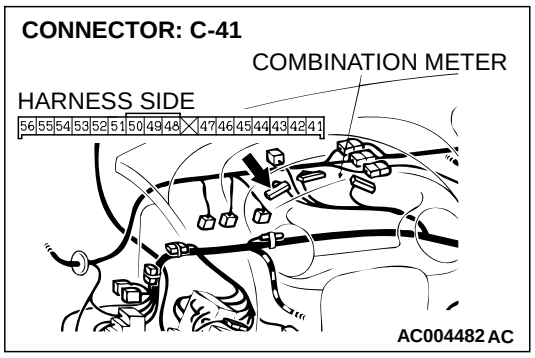
YES : Go to Step 2.
NO : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to GROUP 35B, Hydraulic Unit P.35B-52.) and then go to Step 3.

STEP 2. Check the harness wire between the ABS-ECU connector A-02 (terminal 20) and the combination meter connector C-41 (terminal 42).

NOTE: After inspecting the intermediate connector C-94, inspect the wire. If the intermediate connector C-94 is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If the connector has been repaired or replaced, go to Step 3.







Q: Is the harness wire between the ABS-ECU connector A-02 (terminal 20) and the combination meter connector C-41 (terminal 42) damaged?

YES : Repair it and then go to Step 3.
NO : Go to Step 3.

STEP 3. Check symptom.

Q: Does the TCL warning light turn off 3 seconds after start-up?

YES : This diagnosis is complete.
NO : Return to Step 1.

INSPECTION PROCEDURE 6: The TCL System does not Operate.

TECHNICAL DESCRIPTION (COMMENT)
The cause depends on driving and road surface conditions, so diagnosis may be difficult. However, if no diagnostic trouble code is displayed, carry out the following inspection.

TROUBLESHOOTING HINTS (The most likely cause for this case:)
Malfunction of the hydraulic unit

DIAGNOSIS
Check the hydraulic unit (Refer to P.35C-38.). If the hydraulic unit (integrated with ABS-ECU) is malfunctioning, replace it. Then check that the malfunction symptom is eliminated.

DATA LIST REFERENCE TABLE

M1354003000087

The following items can be read by the scan tool from the ABS-ECU input data.

MUT-II SCAN TOOL DISPLAY	ITEM NO.	CHECK ITEM	CHECKING REQUIREMENTS	NORMAL VALUE
BATT. VOLTAGE	16	ABS-ECU power supply voltage	Ignition switch power supply voltage and valve monitor voltage	9 – 16 V
FL SNSR	12	Front-left wheel speed sensor	Drive the vehicle	Vehicle speeds displayed on the speedometer and scan tool are identical.
FR SNSR	11	Front-right wheel speed sensor		
RL SNSR	14	Rear-left wheel speed sensor		
RR SNSR	13	Rear-right wheel speed sensor		
STOPLIGHT SW	36	Stoplight switch	Depress the brake pedal.	ON
			Release the brake pedal.	OFF

ACTUATOR TEST REFERENCE TABLE

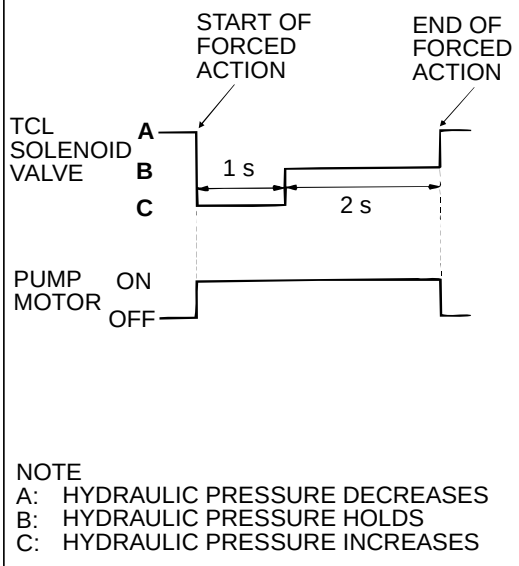
M1354003100084

The scan tool activates the following actuators for testing.

NOTE: If the ABS-ECU is inoperative, actuator testing cannot be carried out.

NOTE: Actuator testing is only possible when the vehicle is stationary. If the vehicle speed during actuator testing exceeds 10 km/h (6 mph), forced actuation will be canceled.

ACTIVATION PATTERN (NO.06,07)



NOTE
A: HYDRAULIC PRESSURE DECREASES
B: HYDRAULIC PRESSURE HOLDS
C: HYDRAULIC PRESSURE INCREASES

AC000971AB

ACTUATOR TEST SPECIFICATIONS

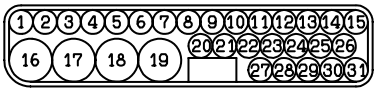
NO.	ITEM	PARTS TO BE ACTIVATED
01	ABS solenoid valve for front-left wheel	Solenoid valves and pump motor in the hydraulic unit (simple inspection mode)
02	ABS solenoid valve for front-right wheel	
03	ABS solenoid valve for rear-left wheel	
04	ABS solenoid valve for rear-right wheel	
06	TCL solenoid valve for front-right wheel	TCL valves and pump motor in the hydraulic unit (simple inspection mode)
07	TCL solenoid valve for front-left wheel	
12	Pump motor	Activate the pump motor for two seconds.

CHECK AT ABS-ECU

M1354003200081

TERMINAL VOLTAGE CHECK CHART

1. Measure the voltages between terminals (16), (19) and (30) (ground terminals) and each respective terminal.
2. The terminal layouts are shown in the illustration below.



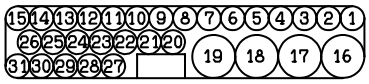
AC002089 AB

NOTE: Do not measure terminal voltage for approximately three seconds after the ignition switch is turned to "ON." The ABS-ECU performs the initial check during that period.

CONNECTOR TERMINAL NO.	SIGNAL	CHECKING REQUIREMENT	NORMAL CONDITION
14	Input from stoplight switch	Stoplight switch: ON	System voltage
		Stoplight switch: OFF	Approximately 0 V
15	ABS-ECU power supply	Ignition switch: "ON"	System voltage
17	Motor power supply	Always	System voltage
18	Solenoid valve power supply	Always	System voltage

RESISTANCE AND CONTINUITY BETWEEN HARNESS-SIDE CONNECTOR TERMINALS

1. Turn the ignition switch to the "LOCK" (OFF) position and disconnect the ABS-ECU connector before checking resistance and continuity.
2. Check between the terminals indicated in the table below.
3. The terminal layouts are shown in the illustration below.

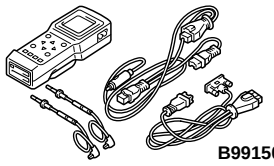
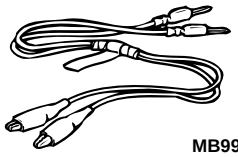
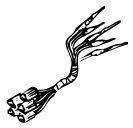
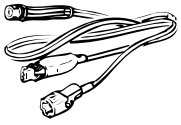
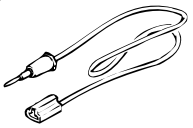


AC002090 AB

CONNECTOR TERMINAL NO.	SIGNAL	NORMAL CONDITION
6 – 7	Front-left wheel speed sensor	1.28 – 1.92 kΩ
1 – 3	Rear-right wheel speed sensor	1.28 – 1.92 kΩ
4 – 5	Front-right wheel speed sensor	1.28 – 1.92 kΩ
8 – 9	Rear-left wheel speed sensor	1.28 – 1.92 kΩ
16 – body ground	Solenoid valve ground	Less than 2 Ω
19 – body ground	Motor ground	Less than 2 Ω
30 – body ground	TCL solenoid valve ground	Less than 2 Ω

SPECIAL TOOLS

M1354000200082

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 B991502	MB991502 Scan tool (MUT-II)	MB991496-OD	For checking of TCL (Diagnostic trouble code display when using the scan tool)
 MB991529	MB991529 Diagnostic trouble code check harness	Tool not necessary if scan tool (MUT-II) is available.	For checking of TCL (Diagnostic trouble code display when using the TCL warning light)
A  B  C  D MB991223AB	MB991223 Harness set A: MB991219 Inspection harness B: MB991220 LED harness C: MB991221 LED harness adaptor D: MB991222 Probe	MB991223 MB991709-01	Making voltage and resistance measurement during troubleshooting A: Connector pin contact B: Power circuit inspection C: Power circuit inspection D: Commercial tester connection

ON-VEHICLE SERVICE

BLEEDING

M1354003600089

⚠ CAUTION

Use the specified brake fluid. Don't use a mixture of the specified brake fluid and another non-specified fluid.

Specified brake fluid: Conforming to DOT 3 or DOT 4

MASTER CYLINDER BLEEDING

Refer to GROUP 35A, On-vehicle Service – Bleeding P.35A-21.

BRAKE LINE BLEEDING

⚠ CAUTION

Be sure to filter/strain the brake fluid being added to the master cylinder reservoir tank. Debris may damage the hydraulic unit.

Refer to GROUP 35A, On-vehicle Service – Bleeding P.35A-21.

WHEEL SPEED SENSOR OUTPUT VOLTAGE MEASUREMENT

M1354003700086

Refer to GROUP 35B, On-vehicle Service – Wheel Speed Sensor Output Voltage Measurement P.35B-46.

HYDRAULIC UNIT CHECK

M1354003400085

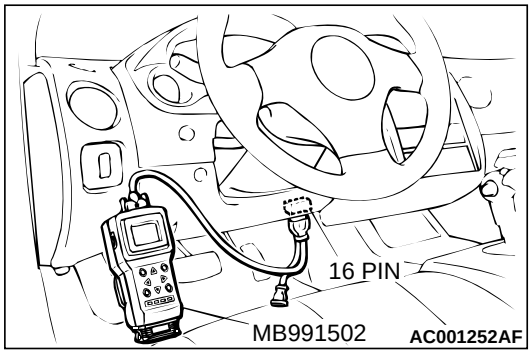
Required Special Tool:

- MB991502: Scan Tool (MUT-II)

⚠ CAUTION

- **The roller of the braking force tester and the tire should be dry during testing.**
- **When testing the front brakes, apply the parking brake. When testing the rear brakes, stop the front wheels with chocks.**

1. Jack up the vehicle. Then support the vehicle with rigid racks at the specified jack-up points or place the front or rear wheels on the rollers of the braking force tester.
2. Release the parking brake, and feel the drag force (drag torque) on each road wheel.
   When using the braking force tester, take a reading of the brake drag force.

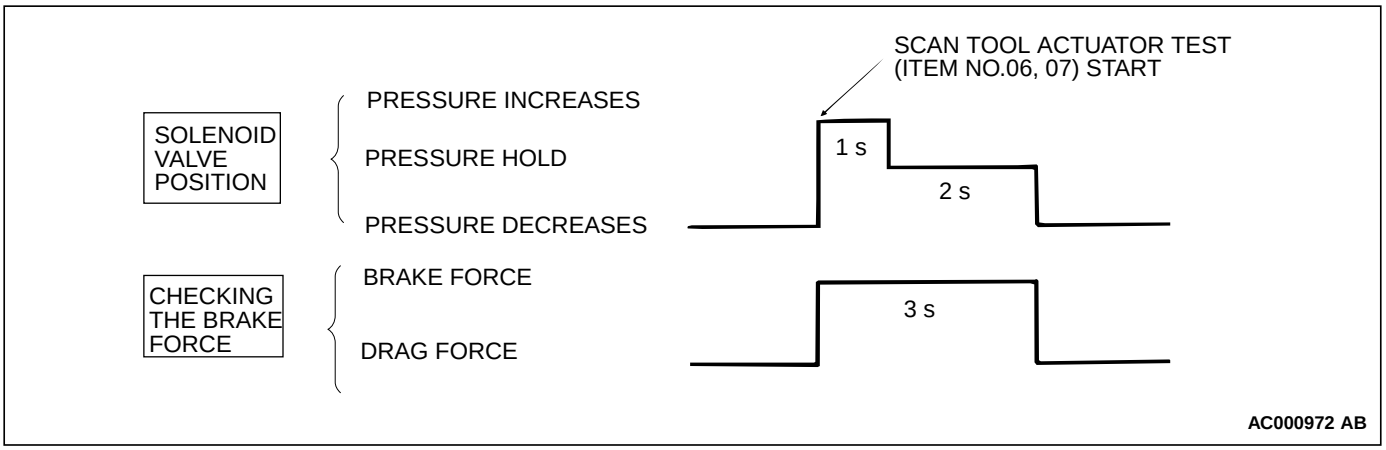


⚠ CAUTION
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool.

3. Turn the ignition switch to the "LOCK" (OFF) position and set scan tool MB991502 as shown in the illustration.
4. After checking that the selector lever <A/T> or the shift lever <M/T> is in neutral, start the engine.
5. Use scan tool MB991502 to force-drive the actuator.

   NOTE: The TCL system will switch to the scan tool mode and the ABS warning light will illuminate.

   NOTE: When the TCL has been interrupted by the fail-safe function, scan tool MB991502 actuator testing cannot be used.



6. Turn the wheel by hand and check the change in braking force. Use a braking force tester. The braking force reading value should change when the actuator test is carried out. The result should be as shown in the diagram above.
7. If the result of inspection is abnormal, replace the hydraulic unit. (Refer to GROUP 35B, Hydraulic Unit P.35B-52.)

NOTES

GROUP 37A

POWER STEERING

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SYMPTOM PROCEDURES 37A-4

SPECIAL TOOLS. 37A-12

ON-VEHICLE SERVICE. 37A-14

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STEERING ANGLE CHECK. 37A-15
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DISASSEMBLY AND ASSEMBLY 37A-23

POWER STEERING GEAR BOX ASSEMBLY* 37A-25

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INSPECTION 37A-39
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Continued on next page

WARNINGS REGARDING SERVICING OF SUPPLEMENTAL RESTRAINT SYSTEM (SRS) EQUIPPED VEHICLES

⚠ WARNING

- ***Improper service or maintenance of any component of the SRS, or any SRS-related component, can lead to personal injury or death to service personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).***
- ***Service or maintenance of any SRS component or SRS-related component must be performed only at an authorized MITSUBISHI dealer.***
- ***MITSUBISHI dealer personnel must thoroughly review this manual, and especially its GROUP 52B - Supplemental Restraint System (SRS) before beginning any service or maintenance of any component of the SRS or any SRS-related component.***

NOTE
The SRS includes the following components: SRS air bag control unit, SRS warning light, front impact sensors, air bag module, clock spring, and interconnecting wiring. Other SRS-related components (that may have to be removed/installed in connection with SRS service or maintenance) are indicated in the table of contents by an asterisk (*).

POWER STEERING OIL PUMP ASSEMBLY 37A-40
REMOVAL AND INSTALLATION 37A-40
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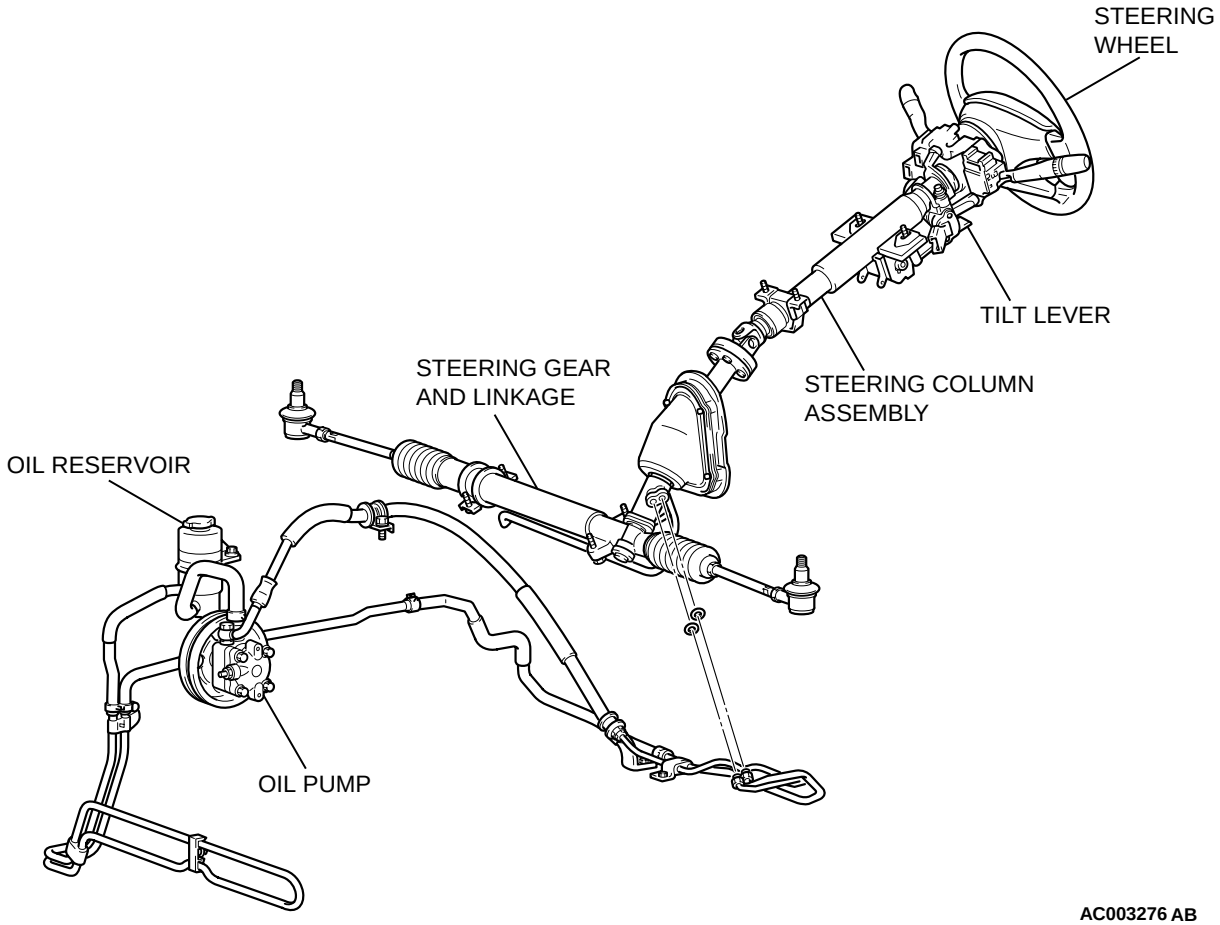
SEALANTS 37A-48

GENERAL DESCRIPTION

M1372000100122

The vehicle uses engine speed-responsive hydraulic power steering.
The steering wheel has three spokes. In addition, all vehicles are equipped with SRS (Supplemental Restraint System).
The steering column in all vehicles has a shock absorber mechanism and a tilt steering mechanism. A vane-type oil pump with a fluid flow control system has been included. The steering gear and linkage is rack and pinion type.



AC003276 AB

POWER STEERING DIAGNOSIS

INTRODUCTION TO POWER STEERING DIAGNOSIS

M1372008500113

Hydraulic power steering is used for all vehicles. Faults in the power steering can include excessive play of the steering wheel, difficult steering wheel operation, noise, vibration, and oil leaks, etc. Possible causes of these faults can include defects in the gear box, oil pump or steering linkage.

POWER STEERING DIAGNOSIS TROUBLESHOOTING STRATEGY

M1372007300116

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted most of the possible ways to find a power steering fault.

1. Gather information from the customer.
2. Verify that the condition described by the customer exists.
3. Find the malfunction by following the Symptom Chart.
4. Verify malfunction is eliminated.

SYMPTOM CHART

M1372007600117

SYMPTOMS	INSPECTION PROCEDURE	REFERENCE PAGE
Excessive play of steering wheel	1	P.37A-4
Difficult steering wheel operation (insufficient power assist)	2	P.37A-5
Rattling noise	3	P.37A-7
Shrill noise	4	P.37A-7
Squealing noise	5	P.37A-8
Hissing noise	6	P.37A-8
Droning noise	7	P.37A-8
Squeaking noise	8	P.37A-9
Vibration	9	P.37A-10
Oil leakage from hose connection	10	P.37A-10
Oil leakage from hose assembly	11	P.37A-10
Oil leakage from oil reservoir	12	P.37A-11
Oil leakage from oil pump	13	P.37A-11
Oil leakage from gear box	14	P.37A-11

SYMPTOM PROCEDURES

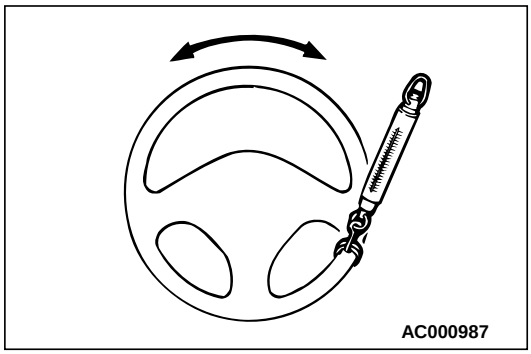
INSPECTION PROCEDURE 1: Excessive Play of Steering Wheel

DIAGNOSIS

STEP 1. Check for looseness at the steering shaft coupling section and at the steering wheel linkage.

Q: Is there any looseness?

YES : Repair or replace the part. Then go to Step 3.
NO : Go to Step 2.



STEP 2. Check the steering wheel free play.

(1) With engine running (hydraulic operation), set front wheels straight ahead.

(2) Measure the play on steering wheel circumference before wheels start to move when slightly moving the steering wheel in both directions.

Limit: 30 mm (1.2 inch)

(3) If the free play exceeds the limit value, set steering wheel straight ahead with engine stopped. Load approximately 5 N (1.1 pound) toward steering circumference and check play.

Standard value (steering wheel play with engine stopped): 10 mm (0.4 inch) or less

Q: Does the play exceed the standard value?

YES : Remove steering gear box (Refer to P.37A-25.) and check total pinion torque (Refer to P.37A-27.). Then go to Step 3.

NO : Go to Step 3.

STEP 3. Check steering wheel play.

Verify that the steering wheel play is not excessive.

Q: Is the steering wheel play excessive?

YES : Repeat to Step 1.

NO : Diagnosis is complete.

INSPECTION PROCEDURE 2: Difficult Steering Wheel Operation (Insufficient Power Assist)

DIAGNOSIS

STEP 1. Check the power steering belt tension.

Refer to GROUP 00, Maintenance Service – Drive Belts P.00-44.

Q: Is the power steering belt tension within the standard value?

YES : Go to Step 2.

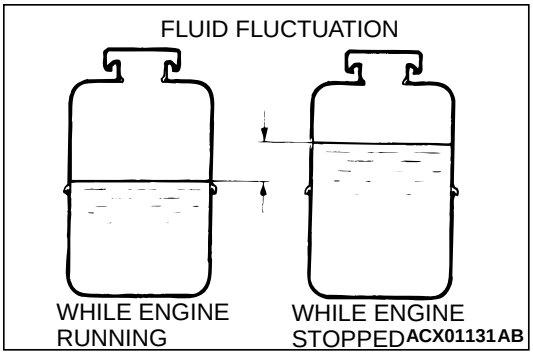
NO : Adjust the tension. (Refer to GROUP 00, Maintenance Service – Drive Belts P.00-44.) Then go to Step 10.

STEP 2. Check the belt for damage.

Q: Is the belt damaged?

YES : Replace the belt. Then go to Step 10.

NO : Go to Step 3.



STEP 3. Check the fluid level.

(1) Park the vehicle on a flat, level surface, start the engine, and then turn the steering wheel several times to raise the temperature of the fluid to approximately 50 – 60°C (122 – 140°F).
(2) With the engine running, turn the wheel all the way to the left and right several times.
(3) Check the fluid in the oil reservoir for foaming or milkiness. Check the difference of the fluid level when the engine is stopped, and while it is running. If the change of the fluid level is 5 mm (0.2 inch) or more, bleed air from the system. (Refer to P.37A-18.)

Q: Is fluid foamy?

YES : Go to Step 10.
NO : Go to Step 4.

STEP 4. Check for entry of air.

Q: Has air entered?

YES : Bleed the air. (Refer to P.37A-18.) Then go to Step 10.
NO : Go to Step 5.

STEP 5. Check each hose for crushing or twisting.

Q: Is there fault?

YES : Repair or replace the hose. Then go to Step 10.
NO : Go to Step 6.

STEP 6. Check for oil leaks.

Q: Are there oil leaks?

YES : Repair it. Then go to Step 10.
NO : Go to Step 7.

STEP 7. Check the wheel alignment (camber and caster).

Refer to GROUP 33A, On-vehicle Service – Front Wheel Alignment Check and Adjustment P.33A-6.

Q: Is there fault?

YES : Repair it. Then go to Step 10.
NO : Go to Step 8.

STEP 8. Check the gear box rack piston seal for damage.

Q: Is there damage?

YES : Replace it. Then go to Step 10.
NO : Go to Step 9.

STEP 9. Check for excessive tie rod end ball joint breakaway torque.
Refer to P.37A-15.

Q: Is there fault?
YES : Replace the part. Then go to Step 10.
NO : Go to Step 10.

STEP 10. Check steering wheel operation.
Verify that steering wheel operation is not difficult.

Q: Is the steering wheel operation difficult?
YES : Repeat from Step 1.
NO : Diagnosis is complete.

INSPECTION PROCEDURE 3: Rattling Noise

DIAGNOSIS

STEP 1. Check for proper oil pump and gear box installation.

Q: Is the oil pump and gear box installation correct?
YES : Go to Step 2.
NO : Repair it. Then go to Step 4.

STEP 2. Check for interference of other parts with the steering column and power steering hoses.

Q: Is there interference?
YES : Correct the interference. Then go to Step 4.
NO : Go to Step 3.

STEP 3. Check for noise from inside the oil pump or gear box.

Q: Is there noise?
YES : Replace the part. Then go to Step 4.
NO : Go to Step 4.

STEP 4. Check for rattling noise.
Confirm that no noise is generated.

Q: Is there noise?
YES : Repeat from Step 1.
NO : Diagnosis is complete.

INSPECTION PROCEDURE 4: Shrill Noise

DIAGNOSIS

STEP 1. Check for entry of air.

Q: Has air entered?
YES : Bleed the air. (Refer to P.37A-18.) Then go to Step 3 .
NO : Go to Step 2.

STEP 2. Check for seizure in the oil pump.

Q: Is there seizure?
YES : Replace the part. Then go to Step 3.
NO : Go to Step 3.

STEP 3. Check symptoms.
Confirm that no noise is generated.

Q: Is there noise?
YES : Repeat from Step 1.
NO : Diagnosis is complete.

INSPECTION PROCEDURE 5: Squealing Noise

DIAGNOSIS

STEP 1. Check the belt tension.
Refer to GROUP 00, Maintenance Service – Drive Belts P.00-44.

Q: Is the belt tension incorrect?
YES : Adjust the belt tension. (Refer to GROUP 00, Maintenance Service – Drive Belts P.00-44.) Then go to Step 3.
NO : Go to Step 2.

STEP 2. Check for seizure in the oil pump.

Q: Is there seizure?
YES : Replace the part. Then go to Step 3.
NO : Go to Step 3.

STEP 3. Check symptoms.
Confirm that no noise is generated.

Q: Is there noise?
YES : Repeat from Step 1.
NO : Diagnosis is complete.

INSPECTION PROCEDURE 6: Hissing Noise

DIAGNOSIS

STEP 1. Check for entry of air.

Q: Has air entered?
YES : Bleed the air. (Refer to P.37A-18.) Then go to Step 4 .
NO : Go to Step 2.

STEP 2. Check each hose for crushing or twisting.

Q: Is there fault?
YES : Repair or replace the hose. Then go to Step 4.
NO : Go to Step 3.

STEP 3. Check the steering gear box for damage.

Q: Is there damage?
YES : Repair or replace the part. Then go to Step 4.
NO : Go to Step 4.

STEP 4. Check symptoms.
Confirm that no noise is generated.

Q: Is there noise?
YES : Repeat from Step 1.
NO : Diagnosis is complete.

INSPECTION PROCEDURE 7: Droning Noise

DIAGNOSIS

STEP 1. Check the oil pump or oil pump bracket installation.

Q: Is the oil pump or oil pump bracket installation correct?
YES : Go to Step 2.
NO : Repair it. Then go to Step 3.

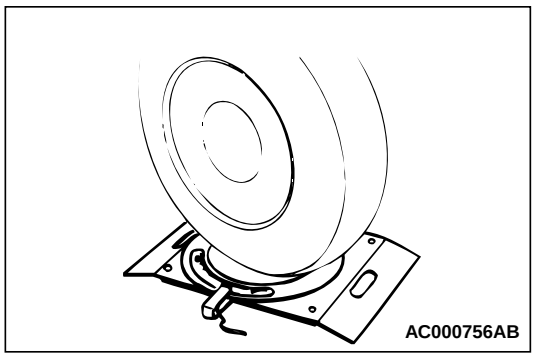
STEP 2. Check the oil pump for damage.
If a slight "beat noise" is produced by the oil pump when the steering wheel is turned fully and held in that position, this is not a malfunction.

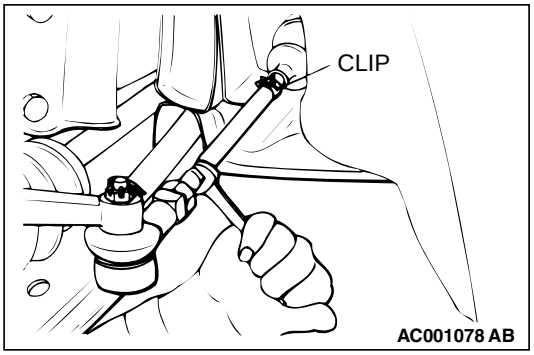
Q: Is there damage?
YES : Replace the oil pump. Then go to Step 3.
NO : Go to Step 3.

STEP 3. Check symptoms.
Confirm that no noise is generated.

Q: Is there noise?
YES : Repeat from Step 1.
NO : Diagnosis is complete.

INSPECTION PROCEDURE 8: Squeaking Noise





DIAGNOSIS

STEP 1. Check for interference of the wheel and vehicle body.

If interfering, adjust the steering angle.

(1) Place the front wheel on a turning radius gauge and measure the steering angle.

Standard value:

ITEMS	2.4L ENGINE	3.0L ENGINE
Inside wheel	36°12' ± 2°00'	31°00' ± 2°00'
Outside wheel (reference)	30°24'	27°00'

(2) If the steering angle is not within the standard value, adjust the toe-in.

Standard value: 0 ± 3 mm (0 ± 0.12 inch)

(3) Adjust the toe-in by undoing the clip and turning the left and right tie rod turnbuckles by the same amount (in opposite directions).

NOTE: The toe will move out as the left turnbuckle is turned toward the front of the vehicle and the right turnbuckle is turned toward the rear of the vehicle.

Q: Is the steering angle normal?

YES : Go to Step 2.
NO : Adjust the steering angle. Then go to Step 3.

STEP 2. Check the steering gear box for damage.

Q: Is there damage?

YES : Repair or replace the part. Then go to Step 3.
NO : Go to Step 3.

STEP 3. Check symptoms.

Confirm that no noise is generated.

Q: Is there noise?

YES : Repeat from Step 1.
NO : Diagnosis is complete.

INSPECTION PROCEDURE 9: Vibration

NOTE: A slight vibration may be felt when the stationary steering effort is made due to the condition of the road surface. To check whether the vibration actually exists or not, test-drive the vehicle on a dry concrete or asphalt surface. Moreover, a very slight amount of vibration is not a malfunction.

DIAGNOSIS

STEP 1. Check for entry of air.

Q: Has air entered?
YES : Bleed the air. (Refer to P.37A-18.) Then go to Step 3 .
NO : Go to Step 2.

STEP 2. Check the steering gear box for damage.

Q: Is there damage?
YES : Repair or replace the part. Then go to Step 3.
NO : Go to Step 3.

STEP 3. Check symptoms.
Confirm that no noise is generated.

Q: Is there noise?
YES : Repeat from Step 1.
NO : Diagnosis is complete.

INSPECTION PROCEDURE 10: Oil Leakage from Hose Connection

DIAGNOSIS

STEP 1. Check for loosening of the flare nut.

Q: Is the flare nut loose?
YES : Tighten it to 15 ± 3 N·m (11 ± 2 ft-lb). Then go to Step 3.
NO : Go to Step 2.

STEP 2. Check the insertion of the hose and the clamp installation state.

Q: Are they correct?
YES : Go to Step 3.
NO : Repair or replace the part. Then go to Step 3.

STEP 3. Check symptoms.
Check that no oil is leaking.

Q: Is there oil leakage?
YES : Repeat from Step 1.
NO : Diagnosis is complete.

INSPECTION PROCEDURE 11: Oil Leakage from Hose Assembly

DIAGNOSIS

STEP 1. Check the hose for damage or clogging.

Q: Is the hose damaged or clogged?
YES : Repair or replace it. Then go to Step 2.
NO : Go to Step 2.

STEP 2. Check symptoms.
Check that no oil is leaking.

Q: Is there oil leakage?
YES : Repeat from Step 1.
NO : Diagnosis is complete.

INSPECTION PROCEDURE 12: Oil Leakage from Oil Reservoir

DIAGNOSIS

STEP 1. Check the oil reservoir for damage.

Q: Is there damage?
YES : Repair or replace it. Then go to Step 3.
NO : Go to Step 2.

STEP 2. Check for overflowing.

Q: Is there overflowing?
YES : Adjust fluid level. Then go to Step 3.
NO : Go to Step 3.

STEP 3. Check symptoms.

Q: Is there oil leakage?
YES : Repeat from to Step 1.
NO : Diagnosis is complete.

INSPECTION PROCEDURE 13: Oil Leakage from Oil Pump

DIAGNOSIS

STEP 1. Check the oil pump body for damage.

Q: Is there damage?
YES : Replace the part. Then go to Step 3.
NO : Go to Step 2.

STEP 2. Check the O-ring or oil seal for damage.

Q: Is there damage?
YES : Replace the part. Then go to Step 3.
NO : Go to Step 3.

STEP 3. Check symptoms.
Check that no oil is leaking.

Q: Is there oil leakage?
YES : Repeat from Step 1.
NO : Diagnosis is complete.

INSPECTION PROCEDURE 14: Oil Leakage from Gear Box

DIAGNOSIS

STEP 1. Check the gear box housing for damage.

Q: Is there damage?
YES : Replace the part. Then go to Step 3.
NO : Go to Step 2.

STEP 2. Check the oil-ring or oil seal for damage.

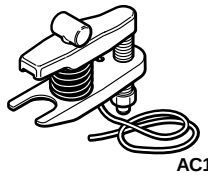
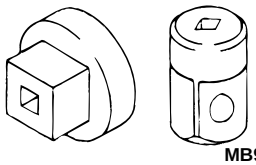
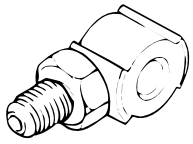
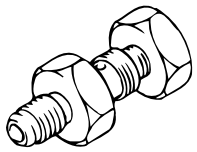
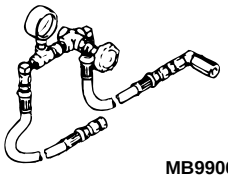
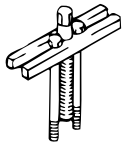
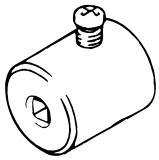
Q: Is there damage?
YES : Replace the part. Then go to Step 3.
NO : Go to Step 3.

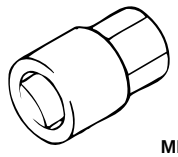
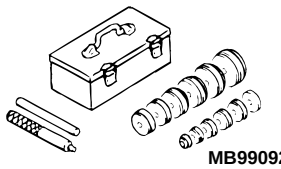
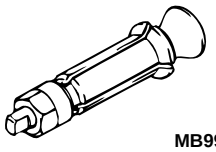
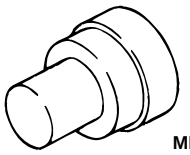
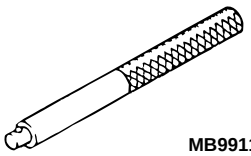
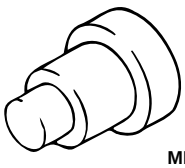
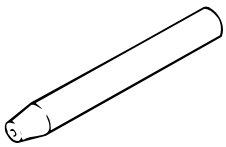
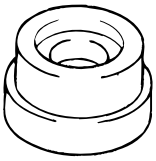
STEP 3. Check symptoms.
Check that no oil is leaking.

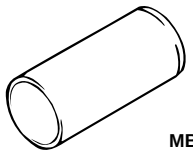
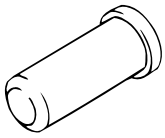
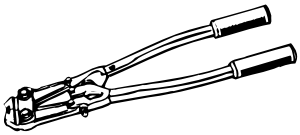
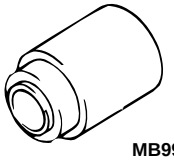
Q: Is there oil leakage?
YES : Repeat from Step 1.
NO : Diagnosis is complete.

SPECIAL TOOLS

M1372000600183

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 AC106827	MB991897 Ball joint remover	MB991113-01, MB990635-01 or general service tool	Knuckle and tie rod end ball joint breakaway torque check *NOTE: Steering linkage puller(MB990635 or MB991113)is also used to disconnect knuckle and tie rod end ball joint.*
 MB990326	MB990326 Preload socket	General service tool	Knuckle and tie rod end ball joint breakaway torque check
 MB991548	MB991548 Power steering oil pressure gauge adapter (Pump side)	MB991548-01	Oil pump pressure test
 MB991549	MB991549 Power steering oil pressure gauge adapter (Hose side)	MB991549-01	
 MB990662	MB990662 Oil pressure gauge assembly	MB990662-01	
 MB990803	MB990803 Steering wheel puller	General service tool	Steering wheel removal
 MB991006	MB990228 or MB991006 Preload socket	MB990228-01	Gear box total pinion torque check

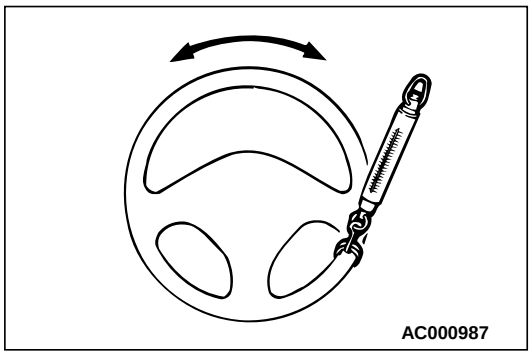
TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 MB991204	MB991204 Torque wrench socket	General service tool	• Rack support adjustment • Rack support cover removal
 MB990925	MB990925 Bearing and oil seal installer set	MB990925-01 or general service tool	• Oil seal and bearing installation • MB990926, MB990927, MB990938, MB990939 (For details, refer to GROUP 26, Special Tools P.26-4.)
 MB991120	MB991120 Needle bearing puller	Tool not available	Needle roller bearing removal
 MB991199	MB991199 Oil seal installer	General service tool	Oil seal installation
 MB991197	MB991197 Bar (long type)	General service tool	
 MB991202	MB991202 Oil seal and bearing installer	General service tool	Needle roller bearing installation
 MB991212	MB991213 Rack installer	General service tool	Rack installation
 MB991203	MB991203 Oil seal and bearing installer	Tool not available	Oil seal and bearing installation

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 MB991317	MB991317 Seal ring installer	Tool not available	Seal ring installation
 MB991152	MB991152 Dust cover installer	General service tool	Oil seal installation
 MB991561	MB991561 Boot band crimping tool	–	Bellows band installation
 MB990776	MB990776 Front axle base	MB990776-01	Dust cover installation

ON-VEHICLE SERVICE

STEERING WHEEL FREE PLAY CHECK

M1372001000128


AC000987

1. With the engine running (hydraulic operation), set the front wheels straight ahead.
2. Measure the play on the steering wheel circumference before the wheels start to move when slightly moving the steering wheel in both directions.

   Limit: 30 mm (1.2 inch)
3. When the play exceeds the limit, check for the play on the steering shaft and steering linkage connection. Correct or replace.
4. If the free play still exceeds the limit value, set the steering wheel straight ahead with the engine stopped. Load 5 N (1.1 pound) towards the steering wheel circumference and check the play.

   Standard value (steering wheel play with the engine stopped): 10 mm (0.4 inch) or less
5. If the play exceeds the standard value, remove the steering gear box (Refer to P.37A-25.) and check total pinion torque (Refer to P.37A-27.).

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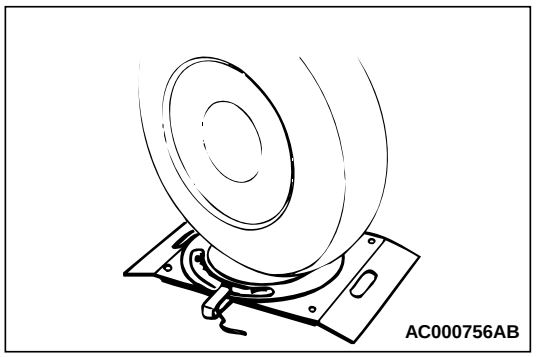
STEERING ANGLE CHECK

M1372001100147



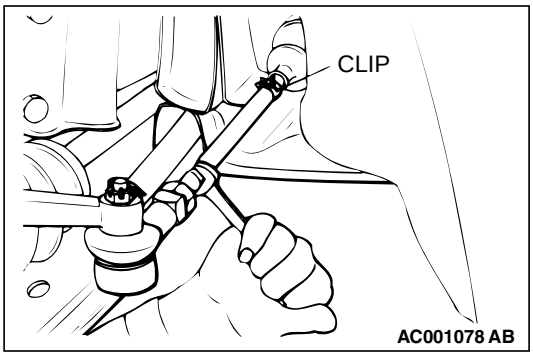
1. Place the front wheel on a turning radius gauge and measure the steering angle.

   Standard value:

ITEMS	2.4L ENGINE	3.0L ENGINE
Inside wheel	36°12' ± 2°00'	31°00' ± 2°00'
Outside wheel (reference)	30°24'	27°00'

2. If the steering angle is not within the standard value, adjust the toe-in.

   Standard value: 0 ± 3 mm (0 ± 0.12 inch)



3. Adjust the toe-in by undoing the clip and turning the left and right tie rod turnbuckles by the same amount (in opposite directions).

   NOTE: The toe will move out as the left turnbuckle is turned toward the front of the vehicle and the right turnbuckle is turned toward the rear of the vehicle.

TIE ROD END BALL JOINT BREAKAWAY TORQUE CHECK

M1372001500178

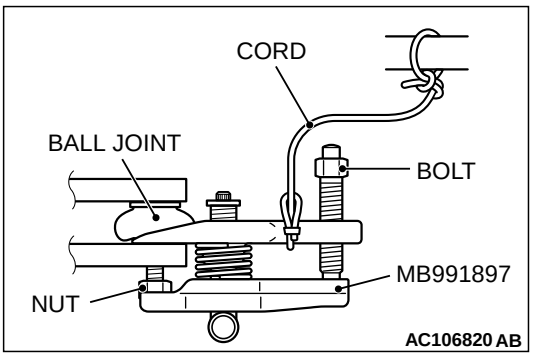
Required Special Tools:

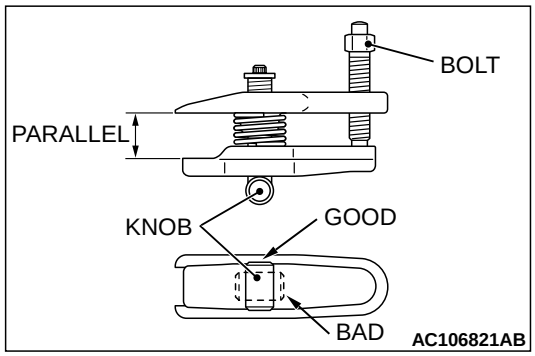
- MB990326: Preload Socket
- MB991897: Ball Joint Remover

⚠ CAUTION

- **Do not remove the nut from ball joint. Loosen it and use special tool MB991897 to avoid possible damage to ball joint threads.**
- **Hang special tool MB991897 with rope or wire to prevent them from falling.**

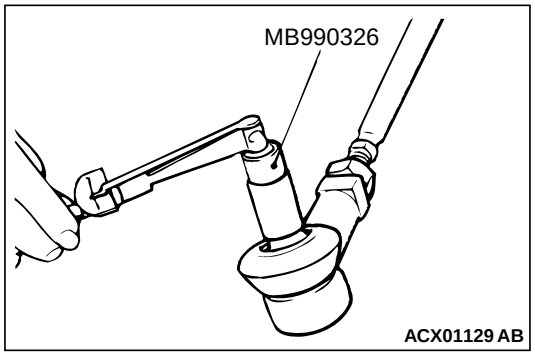
1. Install the special tool MB991897 as shown in the figure.





2. After turning the bolt and knob to adjust the insert arms of the special tool MB991897 in parallel, tighten the bolt by hand and confirm that the insert arms are parallel.

   NOTE: When adjusting the insert arms in parallel, turn the knob in the direction shown in the figure.



3. Move the ball joint stud several times and install the nut on the stud. Measure the ball joint breakaway torque with special tool MB990326.

   Standard value: 0.5 – 2.5 N·m (4.4 – 22.1 in-lb)

4. If the breakaway torque exceeds the standard value, replace the tie rod end.
5. If the breakaway torque is under the standard value, check the ball joint for end play or ratcheting. If no end play or ratcheting, the ball joint can be re-used.
6. Tighten the nut to the specified torque and install a new cotter pin.

   Tightening torque: 29 ± 4 N·m (21 ± 4 ft-lb)

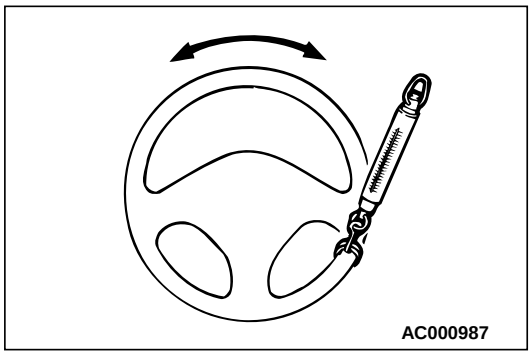
STATIONARY STEERING EFFORT CHECK

M1372001700127

1. With the vehicle stopped on a flat and paved surface, turn the steering wheel to the straight ahead position.
2. Start the engine and check the engine idle speed.

   Standard value:

ENGINE	ENGINE IDLE SPEED r/min
2.4L Engine	750 ± 100
3.0L Engine	700 ± 100

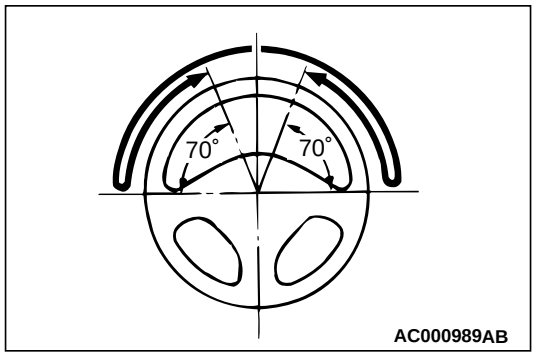


3. Attach a spring scale to the outer circumference of the steering wheel and measure the steering force required to turn the steering wheel from the straight ahead position to the left and right (within a range of 1.5 turns). Also check to be sure that there is no significant fluctuation of the required steering effort.

   Standard value:
   Steering effort: 30 N (6.7 lb) or less
   Fluctuation allowance: 5.9 N (1.33 lb) or less

STEERING WHEEL RETURN TO CENTER CHECK

M1372001800124



Conduct a road test:

1. Make both gradual and sudden turns and check the steering wheel return.
2. At a speed of approximately 35 km/h (22 mph), turn the steering wheel 90 degrees, hold a few seconds, then release. If the steering wheel then returns 70 degrees or more, the return can be judged satisfactory.

   NOTE: There will be a momentary feeling or "heaviness" when the wheel is turned quickly, but this is not abnormal. (Oil pump discharge amount is especially apt to be insufficient during idling.)

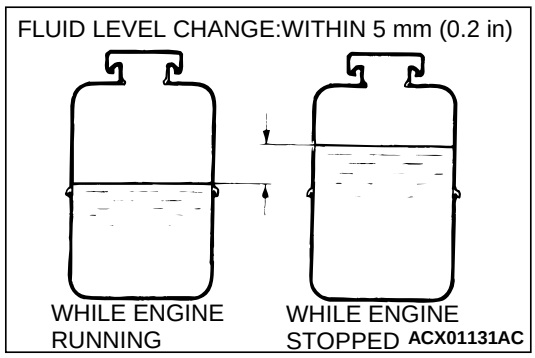
DRIVE BELT TENSION CHECK

M1372001900121

Refer to GROUP 00, Maintenance Service – Drive Belts P.00-44.

FLUID LEVEL CHECK

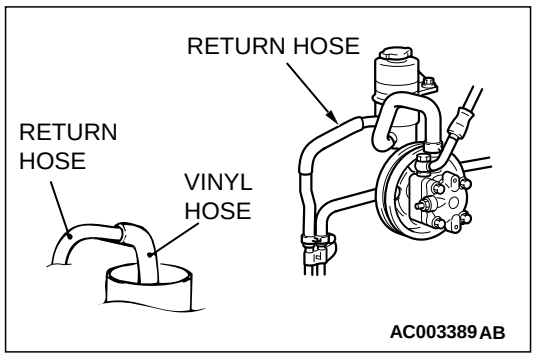
M1372002000121



1. Park the vehicle on a flat, level surface, start the engine, and then turn the steering wheel several times to raise the temperature of the fluid to approximately 50 – 60°C (122 – 140°F).
2. With the engine running, turn the wheel all the way to the left and right several times.
3. Check the fluid in the oil reservoir for foaming or milkiness. Check the difference of the fluid level when the engine is stopped, and while it is running. If the change of the fluid level is 5 mm (0.2 inch) or more, air bleeding should be done.

FLUID REPLACEMENT

M1372002100139



1. Raise and support the front wheels.
2. Disconnect the return hose connection.
3. Connect a vinyl hose to the return hose, and drain the fluid into a container.

⚠ CAUTION

Be careful not to position the high-tension cable near the fuel rail.

4. Disconnect the high-tension cable.
5. While operating the starter motor intermittently, turn the steering wheel all the way to the left and right several times to drain all of the fluid.
6. Connect the return hose securely, and then secure with the clip.
7. Fill the oil reservoir with DIAMOND ATF up to the lower position of the filler, and then bleed the air.

POWER STEERING SYSTEM BLEEDING

M1372002200136

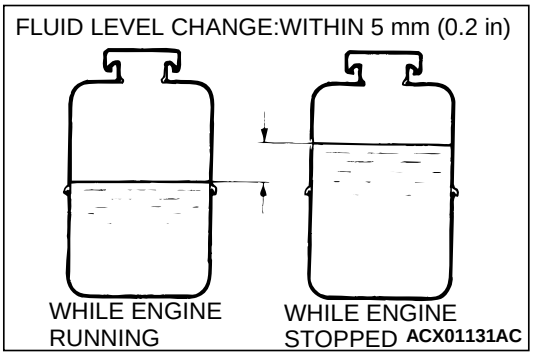
Perform air bleeding procedure as necessary after replacing the steering gear box or the steering fluid lines.

1. Raise and support the front wheels.
2. Disconnect the high-tension cable. Turn the steering wheel all the way to the left and right five or six times while using the starter motor to crank the engine intermittently several times (for 15 to 20 seconds).

⚠ CAUTION

- **Be careful not to place the high-tension cable near the fuel rail.**
- **Perform air bleeding only while cranking the engine. If air bleeding is performed while the engine is running, air could enter the fluid. During air bleeding, refill the steering fluid supply so that the level never falls below the lower mark on the dipstick.**

3. Connect the high-tension cable. Start the engine (idling).
4. Turn the steering wheel to the left and right until there are no air bubbles in the oil reservoir.
5. Confirm that the fluid is not milky, and that the level is between the high and low dipstick marks.
6. Confirm that there is very little change in the fluid level when the steering wheel is turned left and right.
7. Confirm that the change in the fluid level is no more than 5 mm (0.2 inch) when the engine is stopped and when it is running.



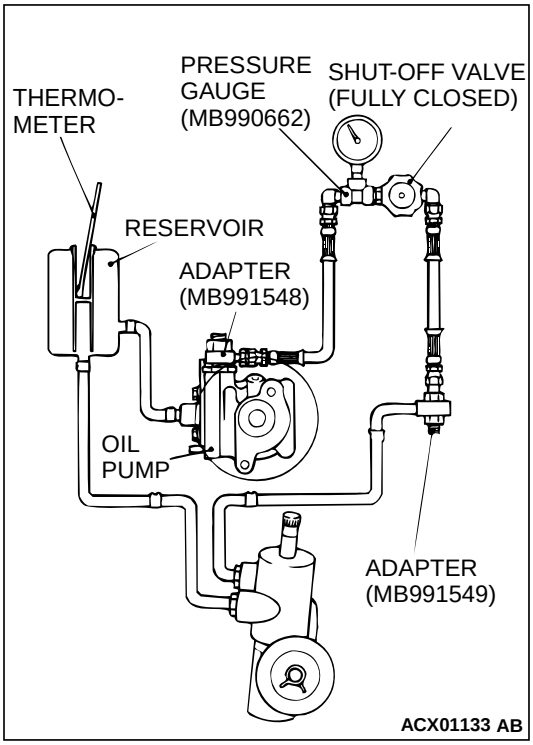
⚠ CAUTION

If the fluid level rises suddenly after the engine is stopped, the air has not been completely bled. If air bleeding is not complete, there will be abnormal noises from the pump and the flow-control valve, and this condition could cause reduce the life of the power steering components.

8. If the change of the fluid level is 5 mm (0.2 inch) or more, the air has not been completely bled from the system. Air bleeding procedure must be repeated.

OIL PUMP PRESSURE TEST

M1372002300122



Required Special Tools:

- MB990662: Pressure Gauge
- MB991548: Power Steering Oil Pressure Gauge Adapter (Pump Side)
- MB991549: Power Steering Oil Pressure Gauge Adapter (Hose Side)

1. Disconnect the pressure hose from the oil pump, and then connect special tools MB991548, MB990662 and MB991549.
2. Bleed air, then turn the steering wheel several times while the vehicle is not moving so that the temperature of the fluid rises to approximately 50 – 60°C (122 – 140°F).
3. Start the engine and idle it at 1,000 ± 100 r/min.

⚠ CAUTION

The pressure gauge shut-off valve must not remain closed for more than 10 seconds.

4. Fully close the shut-off valve of the pressure gauge and measure the oil pump relief pressure to confirm that it is within the standard value range. Open it again immediately after checking the pressure.

   Standard value: 8.3 – 9.5 MPa (1,209 – 1,280 psi)

5. If it is not within the standard value, replace the oil pump.
6. Check whether or not the hydraulic pressure is the standard value when no-load conditions are created by fully opening the shut-off valve of the pressure gauge.

   Standard value: 0.8 – 1.0 MPa (116 – 145 psi)

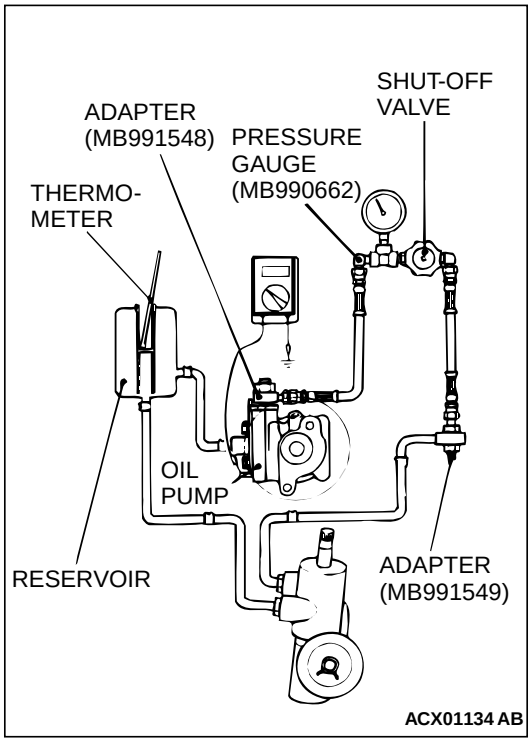
7. If it is not within the standard value, the probable cause is a malfunction of the oil line or steering gear box, so check these parts and repair as necessary.
8. Turn the steering wheel all the way to the left or right; then check whether or not the retention hydraulic pressure is the standard value.

   Standard value: 8.3 – 9.5 MPa (1,209 – 1,280 psi)

9. If not the standard value, overhaul the steering gear box. Remeasure fluid pressure.
10. Remove special tools MB991548, MB990662 and MB991549, and then tighten the pressure hose to the specified torque.

    Tightening torque: 57 ± 7 N·m (42 ± 5 ft-lb)

11. Bleed the system.



POWER STEERING PRESSURE SWITCH CHECK

M1372007200120

Required Special Tools:

- MB990662: Pressure Gauge
- MB991548: Power Steering Oil Pressure Gauge Adapter (Pump Side)
- MB991549: Power Steering Oil Pressure Gauge Adapter (Hose Side)

1. Disconnect the pressure hose from the oil pump, and then connect special tools MB991548, MB990662 and MB991549.
2. Bleed air, and then turn the steering wheel several times while the vehicle is not moving so that the temperature of the fluid rises to approximately 50 – 60°C (122 – 140°F).
3. The engine should be idling.
4. Disconnect the connector for the oil pressure switch, and place an ohmmeter.
5. Gradually close the shut-off valve of the pressure gauge and increase the hydraulic pressure, then check whether or not the hydraulic pressure that activates the switch is the standard value.

   Standard value: 1.8 – 2.4 MPa (261 – 348 psi)
6. Gradually open the shut-off valve and reduce the hydraulic pressure; then check whether or not the hydraulic pressure that deactivates the switch is the standard value.

   Standard value: 0.8 – 2.4 MPa (116 – 348 psi)
7. Remove special tools MB991548, MB990662 and MB991549, and then tighten the pressure hose to the specified torque.

   Tightening torque: 57 ± 7 N·m (42 ± 5 ft-lb)
8. Bleed the system.

BALL JOINT DUST COVER CHECK

M1372008600121

1. Press the dust cover with your finger to check whether the dust cover is cracked or damaged.
2. If the dust cover is cracked or damaged, replace the tie rod end.

   NOTE: If the dust cover is cracked or damaged, the ball joint could be damaged.

STEERING WHEEL AND SHAFT ASSEMBLY

REMOVAL AND INSTALLATION

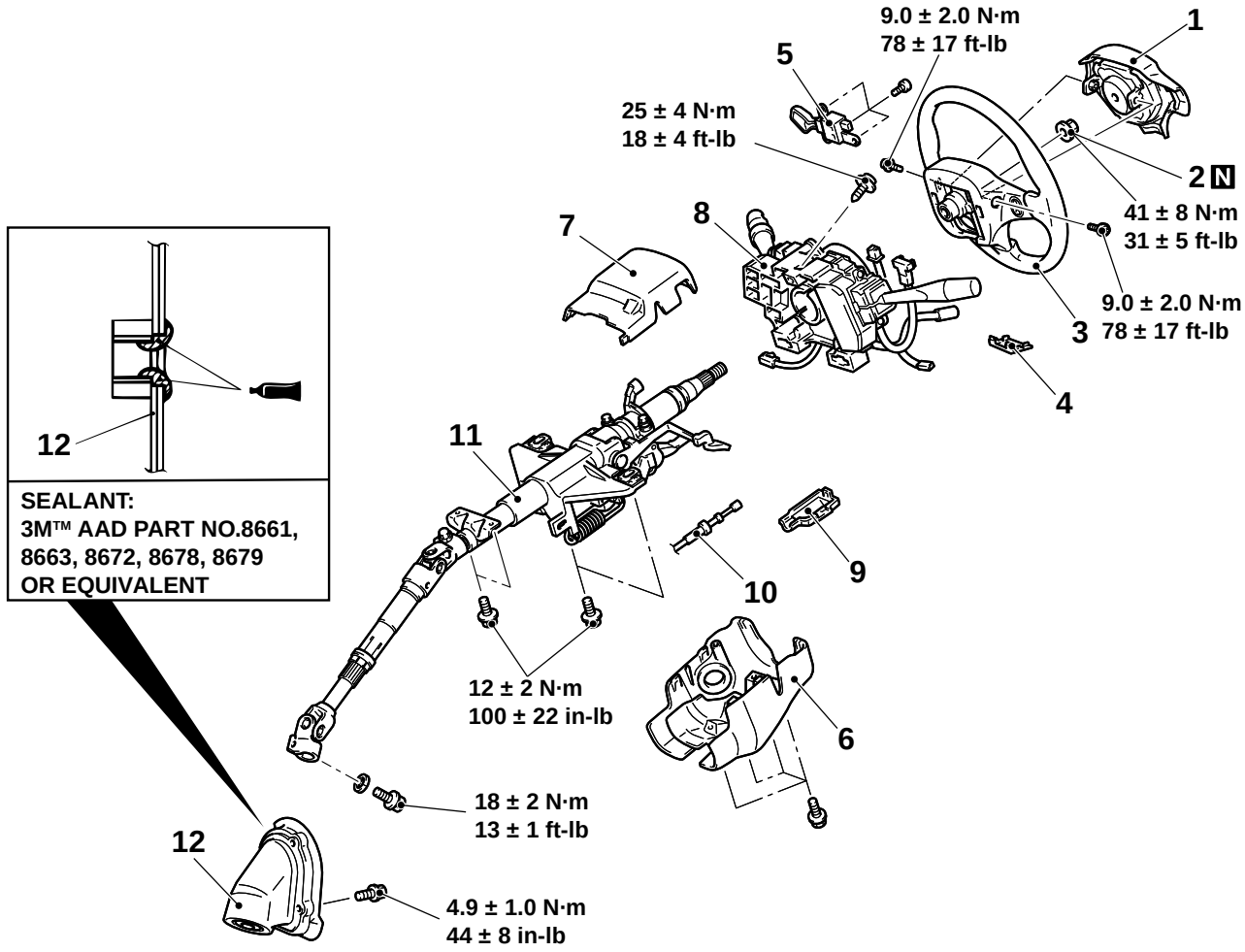
M1372002600178

⚠ WARNING

- ***Before removing the air bag module, refer to GROUP 52B, Service Precautions and Air Bag Module and Clock Spring P.52B-17.***
- ***When removing and installing the steering wheel, do not let it bump against the air bag module.***

NOTE: For removal and installation of the remote controlled radio switch, refer to GROUP 54A, Remote Controlled Radio Switch P.54A-235.

Post-installation Operation
- Checking Steering Wheel Position with Wheels Straight Ahead



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REMOVAL STEPS
1. AIR BAG MODULE (REFER TO GROUP 52B, AIR BAG MODULE AND CLOCK SPRING P.52B-144.)
2. STEERING WHEEL NUT

<<A>> >>B<< 3. STEERING WHEEL
4. COVER

REMOVAL STEPS (Continued)
5. AUTO-CRUISE CONTROLSWITCH (REFER TO GROUP 17, AUTO-CRUISE CONTROL P.17-86.)
- INSTRUMENT PANEL UNDER COVER (REFER TO GROUP 52A, INSTRUMENT PANEL P.52A-3.)

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REMOVAL STEPS (Continued)

6. LOWER COLUMN COVER
7. UPPER COLUMN COVER

>>A<< 8. CLOCK SPRING AND COLUMN SWITCH ASSEMBLY (REFER TO GROUP 52B, AIR BAG MODULE AND CLOCK SPRING P.52B-144.)

REMOVAL STEPS (Continued)

9. COVER <A/T>
10. KEY INTERLOCK CABLE <A/T>
11. STEERING SHAFT ASSEMBLY
12. STEERING COVER ASSEMBLY

Required Special Tool:

- MB990803:Steering Wheel Puller

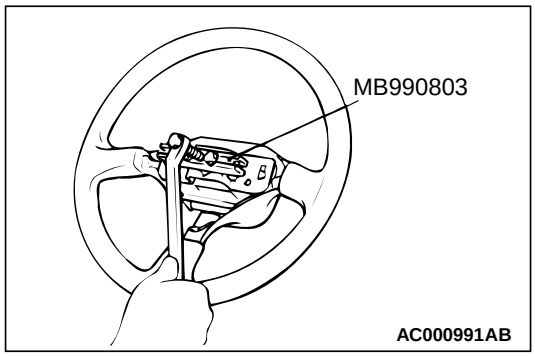
REMOVAL SERVICE POINT

<<A>> STEERING WHEEL REMOVAL

⚠ CAUTION

Do not hammer on the steering wheel to remove it; doing so will damage the collapsible mechanism.

Use special tool MB990803 to remove the steering wheel.



INSTALLATION SERVICE POINTS

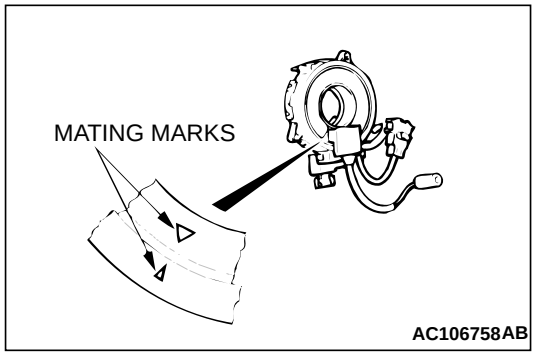
>>A<< CLOCK SPRING AND COLUMN SWICH ASSEMBLY INSTALLATION

⚠ CAUTION

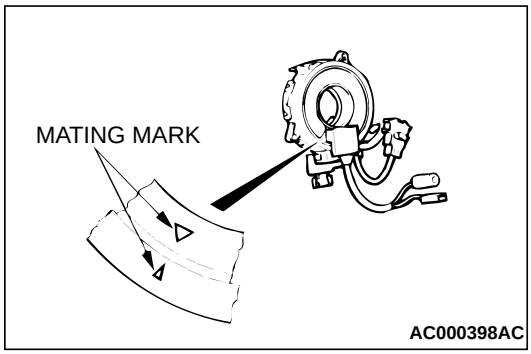
If the clock spring is correctly aligned, the steering wheel may not be turned or the cable inside the clock spring may be broken, causing the SRS to be inoperative.

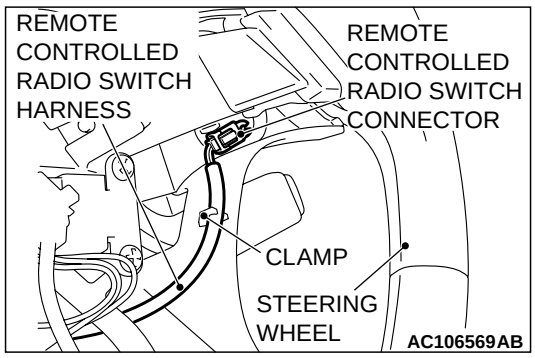
Align the clock spring mating marks according to the procedure below, and install the clock spring and column switch assembly.

1. Turn the clock spring clockwise fully.



2. Turn the spring off approximately three turns counterclockwise to align the mating marks.



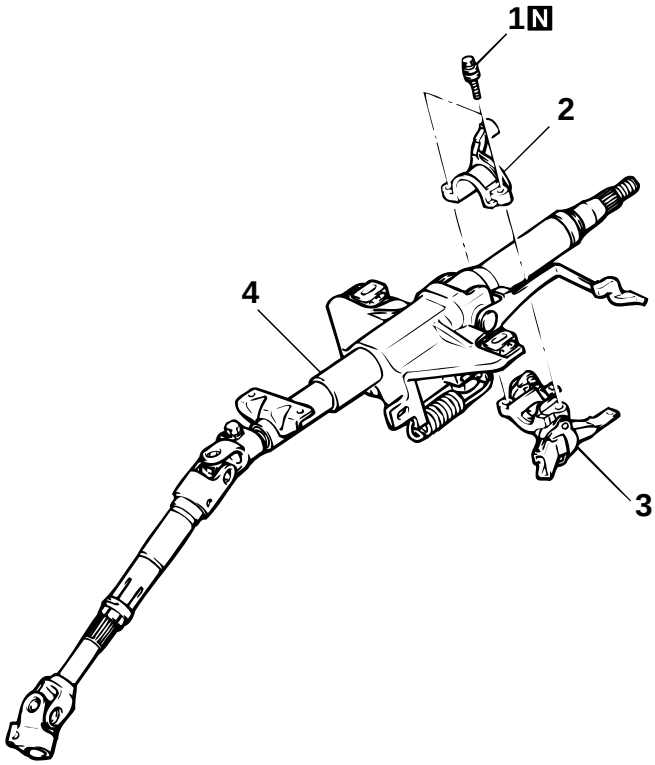


>>B<< STEERING WHEEL INSTALLATION

After the steering wheel has been installed, connect the remote controlled radio switch harness to the remote controlled radio switch connector. The remote controlled radio switch harness should be clamped at right and left sides as shown.

DISASSEMBLY AND ASSEMBLY

M1372002800127



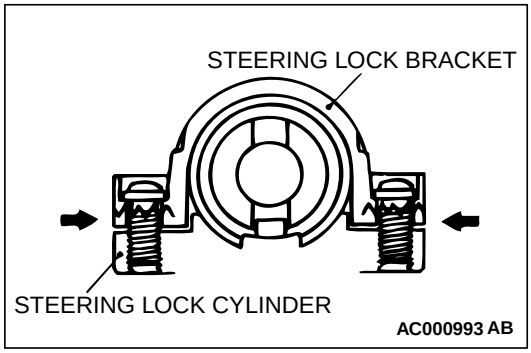
DISASSEMBLY STEPS

>>A<< 1. SPECIAL BOLT
<<A>> >>A<< 2. STEERING LOCK BRACKET

DISASSEMBLY STEPS (Continued)

<<A>> >>A<< 3. STEERING LOCK CYLINDER
4. STEERING COLUMN ASSEMBLY

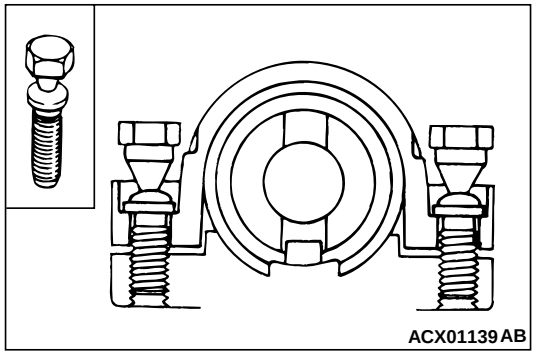
DISASSEMBLY SERVICE POINT



<<A>> STEERING LOCK BRACKET/STEERING LOCK CYLINDER REMOVAL

If it is necessary to remove the steering lock cylinder, use a hacksaw to cut the special bolts at the steering lock bracket side.

ASSEMBLY SERVICE POINT



>>A<< STEERING LOCK CYLINDER/STEERING LOCK BRACKET/SPECIAL BOLT INSTALLATION

⚠ CAUTION

The steering lock bracket and bolts must be replaced with new ones when the steering lock is installed.

1. When installing the steering lock cylinder and steering lock bracket to the column tube, temporarily install the steering lock in alignment with the column boss.
2. After checking that the lock works properly, tighten the special bolts until the head twists off.

POWER STEERING GEAR BOX ASSEMBLY

REMOVAL AND INSTALLATION

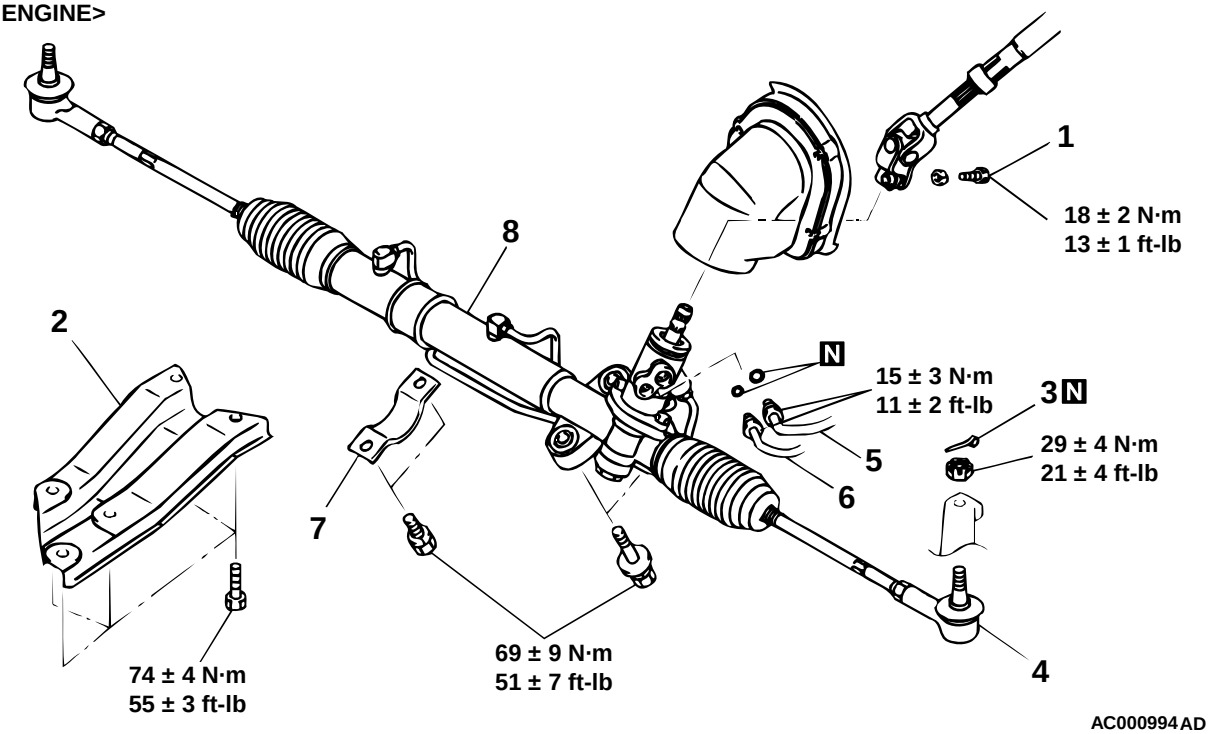
M1372003900194

⚠ ***WARNING***

Before removing the steering gear box, refer to GROUP 52B, Service Precautions P.52B-17, and Air Bag Module and Clock Spring P.52B-144. Center the front wheels. Failure to do so may damage the SRS clock spring and render the SRS system inoperative, risking serious injury.

Pre-removal Operation	Post-installation Operation
• Clock Spring Removal (Refer to GROUP 52B, Air Bag Module and Clock Spring P.52B-144.) • Power Steering Fluid Draining (Refer to P.37A-17.) • Center Member Removal (Refer to GROUP 32, Engine Roll Stopper, Centermember P.32-8.) • Front Exhaust Pipe Removal (2.4L Engine: Refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-21, 3.0L Engine: Refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-22.) • Stabilizer Bar Removal <2.4L Engine> (Refer to GROUP 33A, Stabilizer Bar P.33A-16.) • Rear Roll Stopper Removal <3.0L Engine> (Refer to GROUP 32, Engine Roll Stopper, Centermember P.32-8.) • Roll Stopper Bracket Removal <3.0L Engine> (Refer to GROUP 23B, Transaxle P.23B-10.) • Steering Cover Assembly Removal <3.0L Engine> (Refer to P.37A-21.)	• Clock Spring Installation (Refer to GROUP 52B, Air Bag Module and Clock Spring P.52B-144.) • Check the Dust Cover for Cracks or Damage by Pushing it with Finger. • Stabilizer Bar Installation <2.4L Engine> (Refer to GROUP 33A, Stabilizer Bar P.33A-16.) • Front Exhaust Pipe Installation (2.4L Engine: Refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-21, 3.0L Engine: Refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-22.) • Center Member Installation (Refer to GROUP 32, Engine Roll Stopper, Centermember P.32-8.) • Power Steering Fluid Supplying (Refer to P.37A-17.) • Power Steering Fluid Line Bleeding (Refer to P.37A-18.) • Checking Steering Wheel Position with Wheels Straight Ahead. • Front Wheel Alignment Adjustment (Refer to GROUP 33A, On-vehicle Service – Front Wheel Alignment Check and Adjustment P.33A-6.) • Steering Cover Assembly Installation <3.0L Engine> (Refer to P.37A-21.) • Roll Stopper Bracket Installation <3.0L Engine> (Refer to GROUP 23B, Transaxle P.23B-10.) • Rear Roll Stopper Installation <3.0L Engine> (Refer to GROUP 32, Engine Roll Stopper, Centermember P.32-8.)

<2.4L ENGINE>



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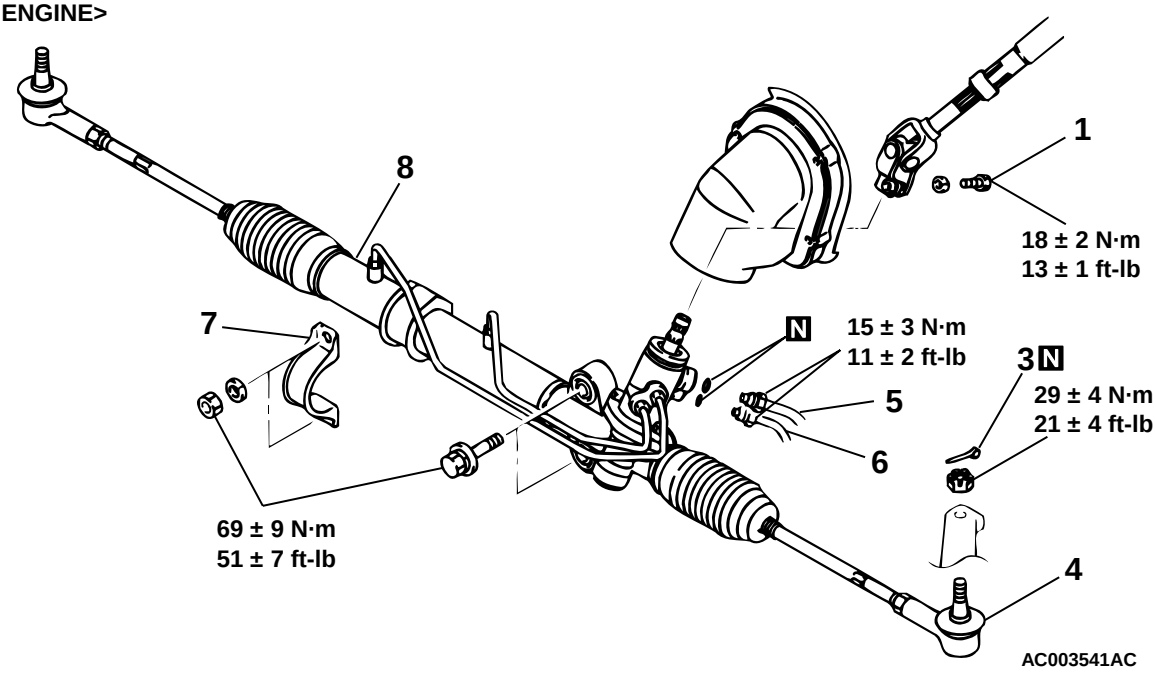
<3.0L ENGINE>



REMOVAL STEPS

1. STEERING SHAFT ASSEMBLY AND GEAR BOX CONNECTING BOLT
2. STAY <2.4L ENGINE>
3. COTTER PIN

<<A>> 4. TIE ROD END AND KNUCKLE CONNECTION

5. RETURN HOSE CONNECTION

REMOVAL STEPS (Continued)

6. PRESSURE TUBE CONNECTION
7. CYLINDER CLAMP

<<B>> 8. GEAR BOX ASSEMBLY

Required Special Tools:

- MB990228 or MB991006: Preload Socket
- MB991897: Ball Joint Remover Puller

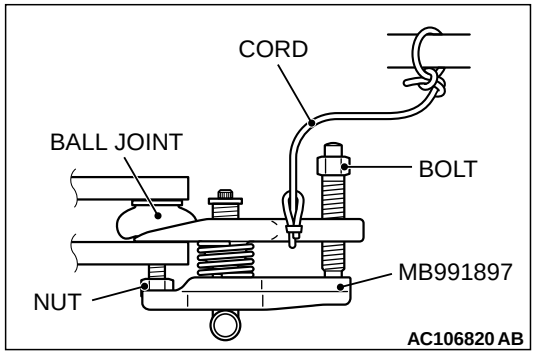
REMOVAL SERVICE POINTS

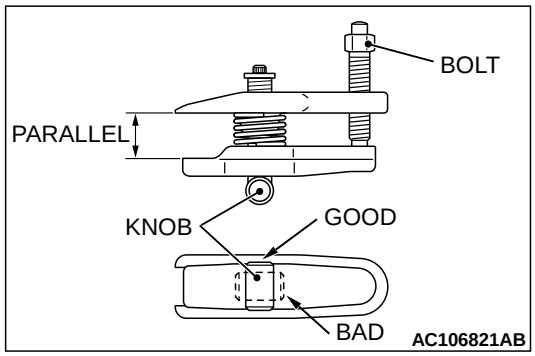
<<A>> TIE ROD END DISCONNECTION

⚠ CAUTION

- **Do not remove the nut from ball joint. Loosen it and use special tool MB991897 to avoid possible damage to ball joint threads.**
- **Hang special tool MB991897 with rope or wire to prevent them from falling.**

1. Install the special tool MB991897 as shown in the figure.





2. After turning the bolt and knob to adjust the insert arms of the special tool MB991897 in parallel, tighten the bolt by hand and confirm that the insert arms are parallel.

   NOTE: When adjusting the insert arms in parallel, turn the knob in the direction shown in the figure.

<<B>> GEAR BOX ASSEMBLY REMOVAL

⚠ CAUTION

Be sure not to damage the bellows and the tie rod end dust cover when removing the gear box assembly.

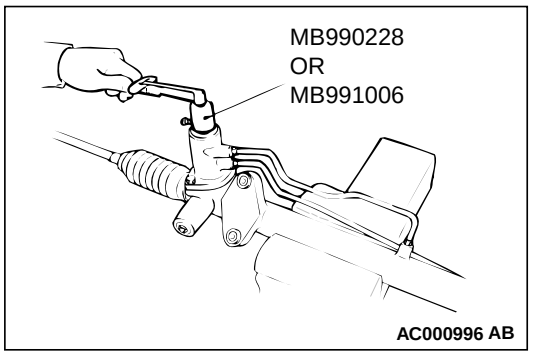
INSPECTION

M1372003200054

GEAR BOX TOTAL PINION TORQUE CHECK

⚠ CAUTION

When holding the steering gear box assembly in a vice, secure its mounting positions. If it is secured in any other places, the gear housing may become deformed or damaged.



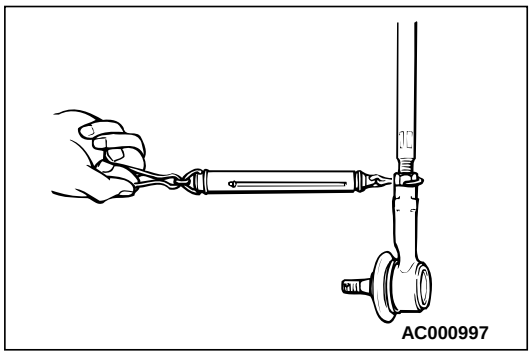
Using special tool MB990228 or MB991006, rotate the pinion gear at the rate of one rotation in approximately 4 to 6 seconds to check the total pinion torque.

Standard value: 0.8 – 1.9 N·m (6.9 – 16.5 in-lb)
[Change in torque: 0.7 N·m (6.1 in-lb) or less]

NOTE: When measuring, remove the bellows from the rack housing. Measure the pinion torque through the whole stroke of the rack.

If the measured value is not within the standard range, first adjust the rack support cover, and then check the total pinion torque again.

If the total pinion torque cannot be adjusted to within the standard range by adjusting the rack support cover, check the rack support cover, rack support spring, rack support and replace any parts if necessary.



TIE ROD SWING RESISTANCE CHECK

1. Give 10 hard swings to the tie rod.
2. Measure the tie rod swing resistance with a spring scale.

   Standard value: 4.0 – 18.6 N (17.8 – 82.7 lb) [1.0 – 4.9 N·m (8.7 – 43.4 in-lb)]
3. If the measured value exceeds the standard value, replace tie rod.
4. If the measured value is below the standard value, the tie rod can be re-used if it swings smoothly without excessive play.

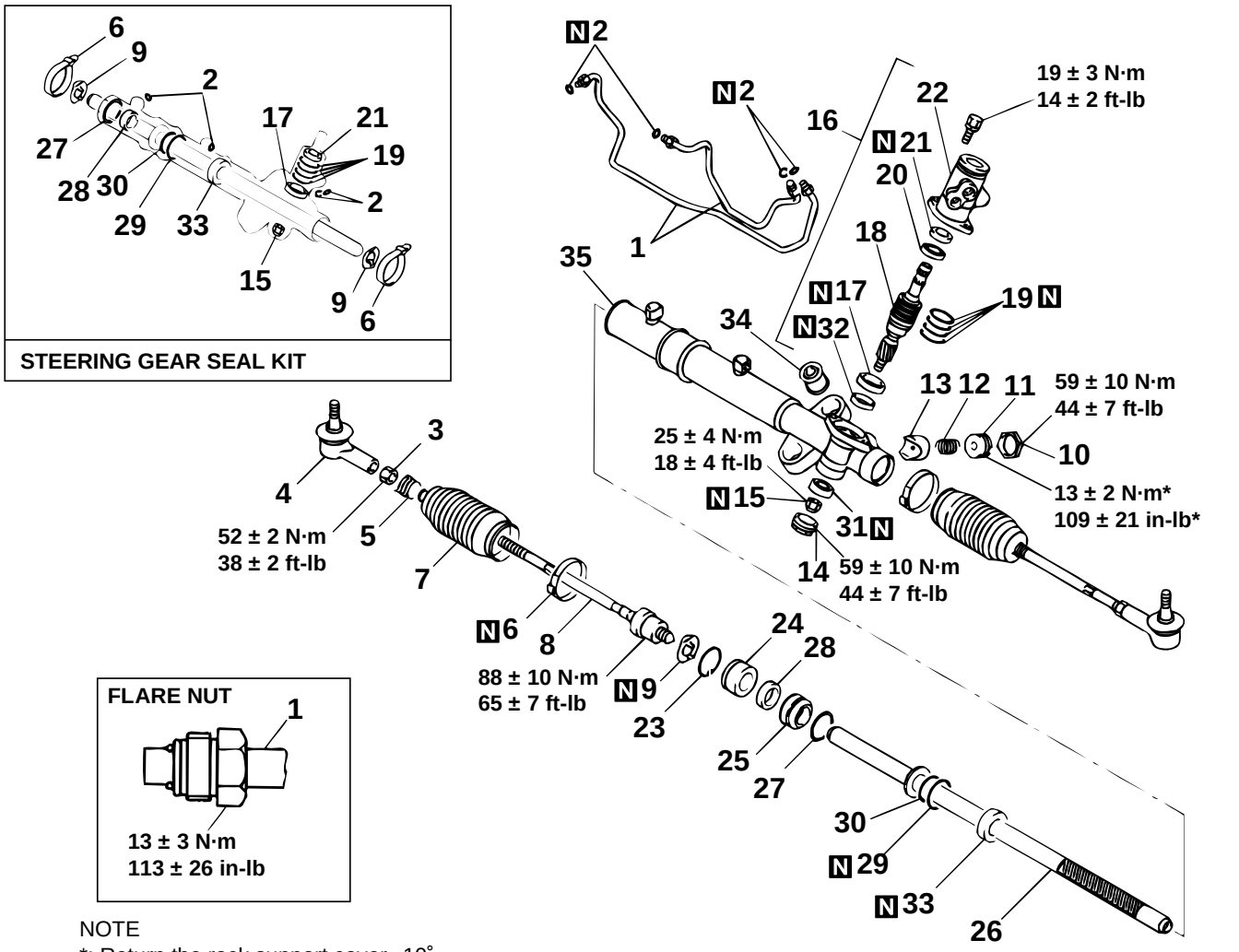
TIE ROD END BALL JOINT DUST COVER CHECK

1. Check the dust cover for cracks or damage by pushing it with your finger.
2. If the dust cover is cracked or damaged, replace the tie rod end. (Refer to P.37A-29.)

   NOTE: Cracks or damage of the dust cover may damage the ball joint. If it is damaged during service work, replace the dust cover. (Refer to P.37A-39.)

DISASSEMBLY AND ASSEMBLY

M1372004100135



NOTE
*: Return the rack support cover –10˚.

AC000999AB

		DISASSEMBLY STEPS
	1.	FEED TUBE
	2.	O-RING
>>O<<	3.	TIE ROD END JAM NUT
>>O<<	4.	TIE ROD END
	5.	BELLOWS CLIP
>>N<<	6.	BELLOWS BAND
	7.	BELLOWS
<<A>> >>M<<	8.	TIE ROD
<<A>> >>M<<	9.	TAB WASHER
>>L<<	•	TOTAL PINION TORQUE ADJUSTMENT
>>K<<	10.	JAM NUT
<<B>> >>K<<	11.	RACK SUPPORT COVER
	12.	RACK SUPPORT SPRING
	13.	RACK SUPPORT
>>J<<	14.	END PLUG
	15.	JAM NUT
	16.	VALVE HOUSING ASSEMBLY
<<C>> >>I<<	17.	OIL SEAL

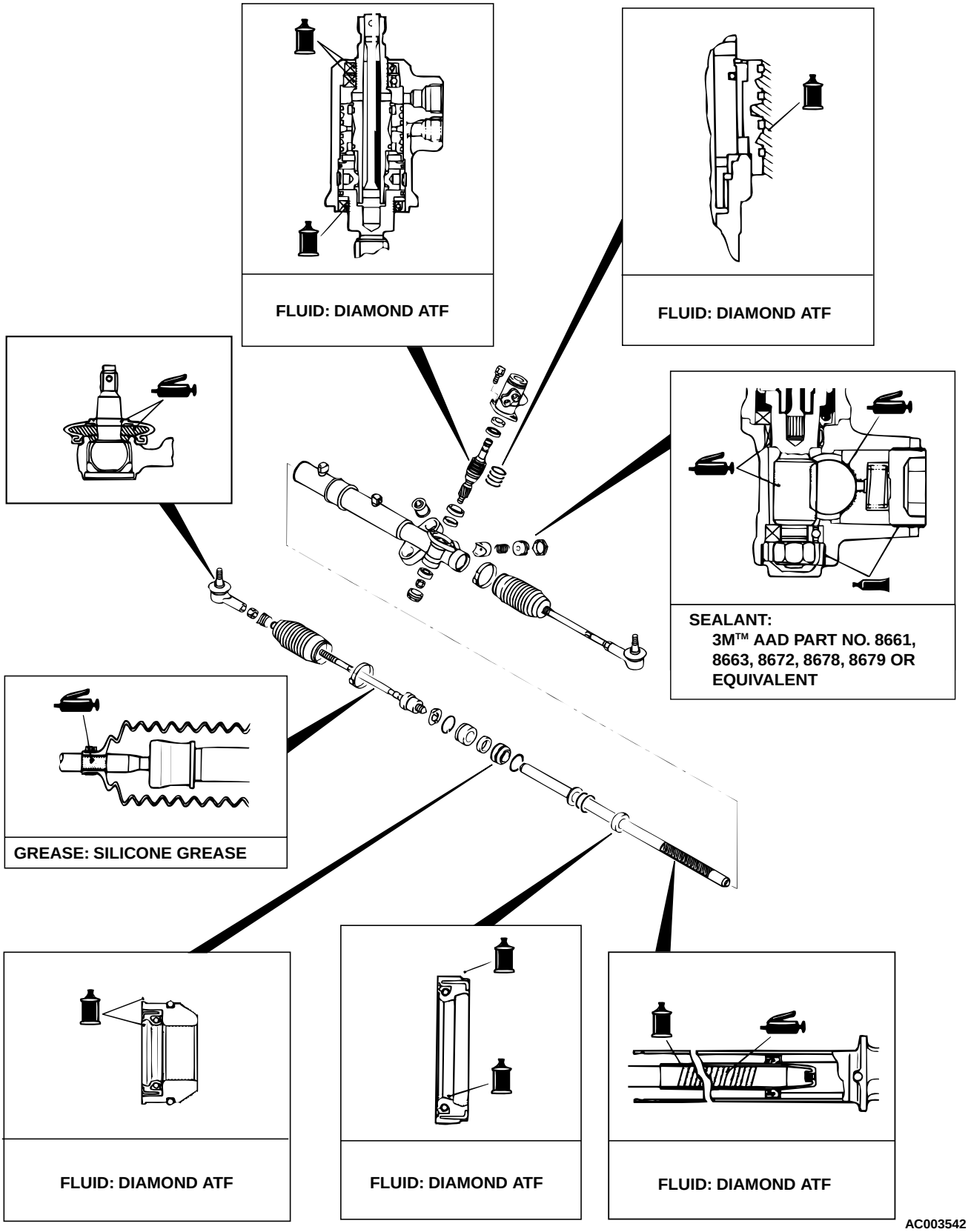
		DISASSEMBLY STEPS
<<C>>	18.	PINION AND VALVE ASSEMBLY
<<D>> >>H<<	19.	SEAL RING
<<E>> >>G<<	20.	BALL BEARING
<<E>> >>G<<	21.	OIL SEAL
	22.	VALVE HOUSING
<<F>> >>F<<	23.	CIRCLIP
	24.	RACK STOPPER
>>E<<	25.	RACK BUSHING
<<G>> >>D<<	26.	RACK
>>C<<	27.	O-RING
<<H>> >>C<<	28.	OIL SEAL
	29.	SEAL RING
	30.	O-RING
<<I>> >>B<<	31.	BALL BEARING
<<J>> >>B<<	32.	NEEDLE ROLLER BEARING
<<K>> >>A<<	33.	OIL SEAL
	34.	BUSHING
	35.	RACK HOUSING

TSB Revision

Required Special Tools:

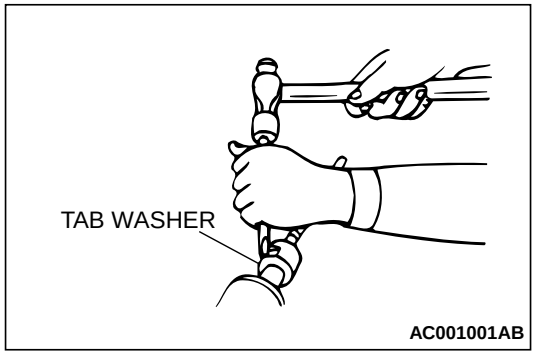
- MB990228 or MB991006: Preload Socket
- MB990776: Front Axle Base
- MB990927: Installer Adapter
- MB990938: Bar (Snap-in type)
- MB990939: Brass Bar
- MB991120: Needle Bearing Puller
- MB991152: Dust Cover Installer
- MB991197: Bar (Long type)
- MB991199: Oil Seal Installer
- MB991202: Oil Seal and Bearing Installer
- MB991203: Oil Seal and Bearing Installer
- MB991204: Torque Wrench Socket
- MB991213: Rack Installer
- MB991317: Seal Ring Installer

LUBRICATION AND SEALING POINTS

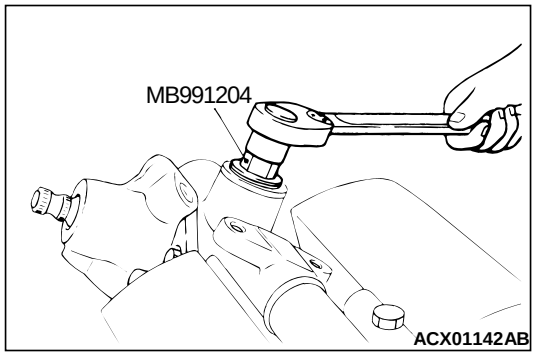


TSB Revision

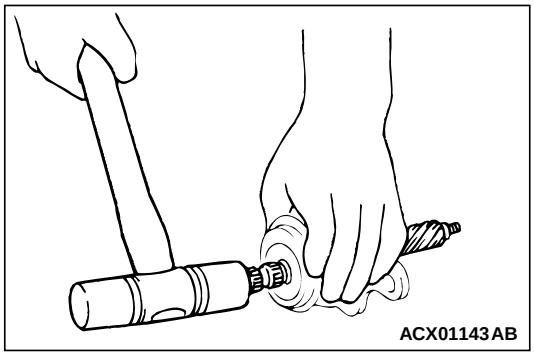
DISASSEMBLY SERVICE POINTS



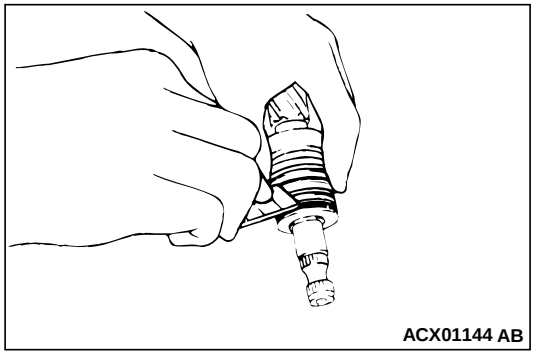
<<A>> TIE ROD/TAB WASHER REMOVAL
Unstake the tab washer which secures the tie rod and rack with a chisel.



<<B>> RACK SUPPORT COVER REMOVAL
Using special tool MB991204, remove the rack support cover from the gear box.

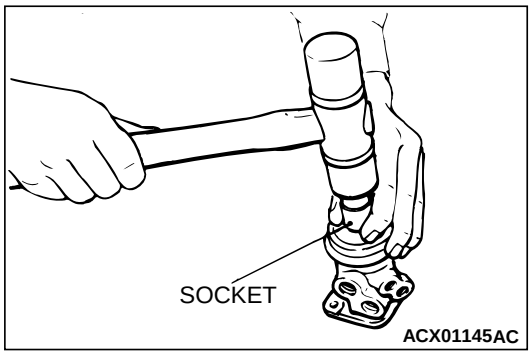


<<C>> OIL SEAL/PINION AND VALVE ASSEMBLY REMOVAL
Using a plastic hammer, gently tap the pinion to remove it.



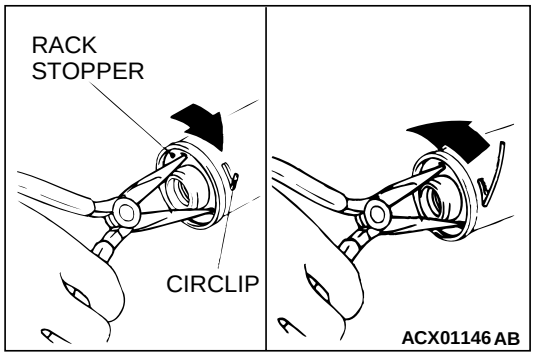
<<D>> SEAL RING REMOVAL

⚠ CAUTION
When cutting the seal ring, be careful not to damage the pinion and valve assembly or the rack.
Cut the seal ring and remove it from the pinion and valve assembly and the rack.



<<E>> BALL BEARING/OIL SEAL REMOVAL

Using a socket, remove the oil seal and the ball bearing from the valve housing simultaneously.

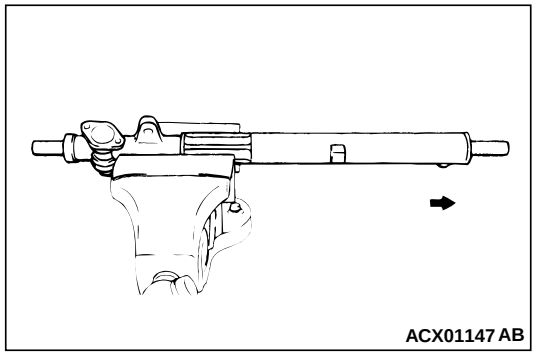


<<F>> CIRCLIP REMOVAL

⚠ CAUTION

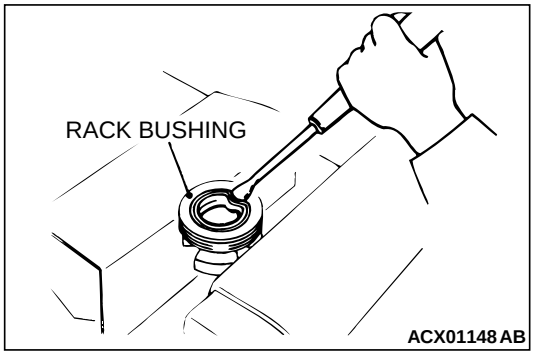
If the rack stopper is first turned counterclockwise, the circlip will get caught in the slot in the housing and the rack stopper will not turn.

1. Turn the rack stopper clockwise until the end of the circlip comes out of the slot in the rack housing.
2. Turn the rack stopper counterclockwise to remove the circlip.



<<G>> RACK REMOVAL

Pull out the rack slowly. At this time also take out the rack stopper and the rack bushing simultaneously.

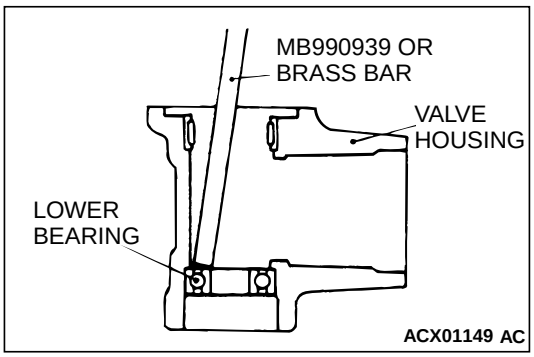


<<H>> OIL SEAL REMOVAL

⚠ CAUTION

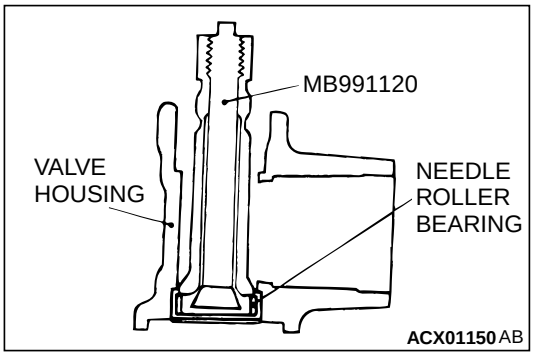
Do not damage oil seal press fitting surface.

Partially bend oil seal and remove from rack bushing.



<<I>> BALL BEARING REMOVAL

Use a brass bar or special tool MB990939 to remove the ball bearing from the gear housing.

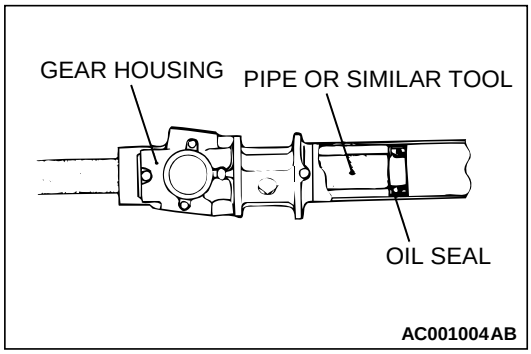


<<J>> NEEDLE ROLLER BEARING REMOVAL

⚠ CAUTION

Do not open special tool MB991120 excessively to prevent damaging housing interior.

Use special tool MB991120 to remove the needle roller bearing from the rack housing.



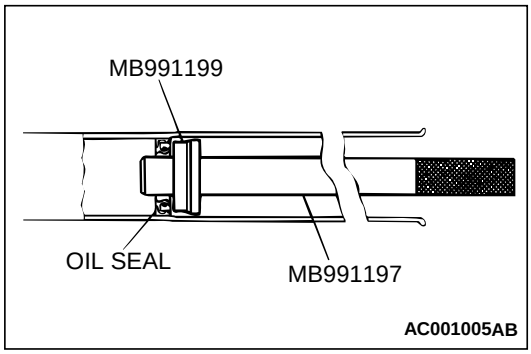
<<K>> OIL SEAL REMOVAL

⚠ CAUTION

Be careful not to damage the inner surface of the rack cylinder of the gear housing.

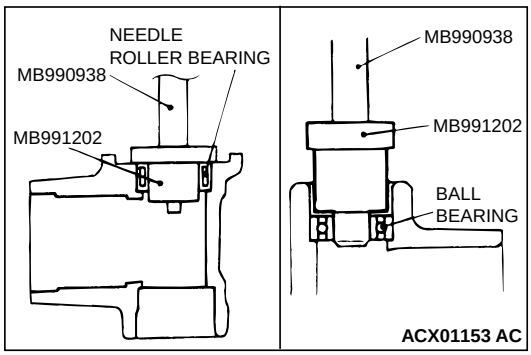
Use a piece of pipe or similar tool to remove the oil seal from the gear housing.

ASSEMBLY SERVICE POINTS



>>A<< OIL SEAL INSTALLATION

1. Apply a coating of the DIAMOND ATF to the both sides of the oil seal.
2. Using special tools MB991199 and MB991197, press the oil seal into the rack housing.

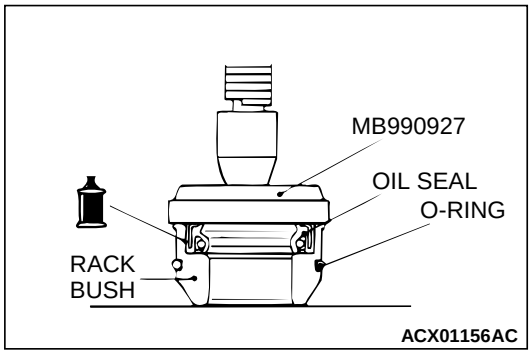


>>B<< NEEDLE ROLLER BEARING/BALL BEARING INSTALLATION

⚠ CAUTION

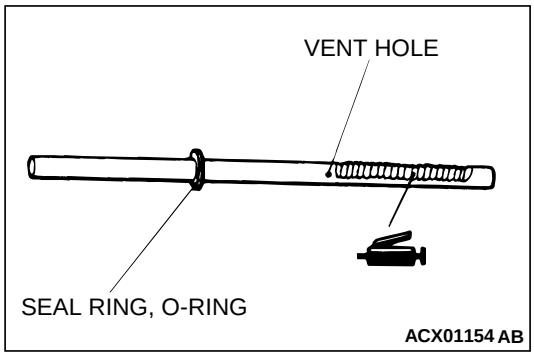
Press-fit straight. Valve housing is aluminum, and may become deformed if Press-fit on an angle.

1. Apply DIAMOND ATF to housing, bearing and oil seal press fitting surface.
2. Press fit needle roller bearing with special tools MB990938 and MB991202.



>>C<< OIL SEAL/O-RING INSTALLATION

1. Apply a coating of the DIAMOND ATF to the outside of the oil seal and O-ring.
2. Use special tool MB990927 to press fit oil seal until it touches rack bush end.

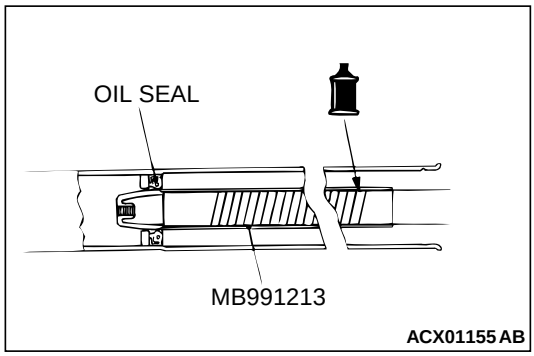


>>D<< RACK INSTALLATION

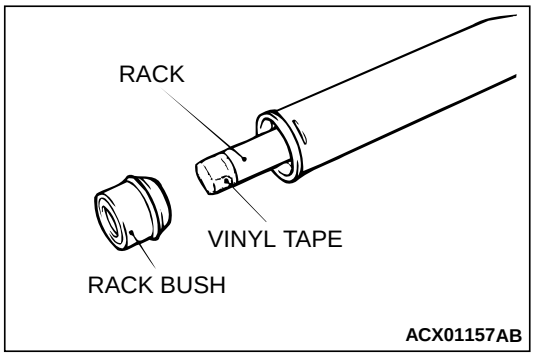
⚠ CAUTION

Do not close the vent hole in the rack with grease.

1. Apply a coating of multipurpose grease to the rack teeth face.



2. Cover rack serrations with special tool MB991213.
3. Apply DIAMOND ATF to special tool MB991213.
4. Align center of oil seal with rack to prevent retainer spring from slipping. Slowly insert rack from power cylinder side.

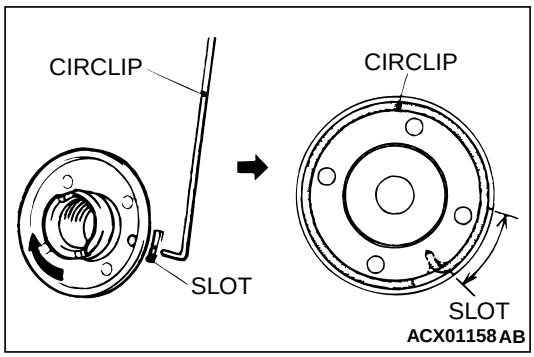


>>E<< RACK BUSHING INSTALLATION

⚠ CAUTION

Do not allow oil seal retainer spring to slip out.

Wrap the rack end with vinyl tape, apply a coating of the DIAMOND ATF, and then install the rack bushing and rack stopper.

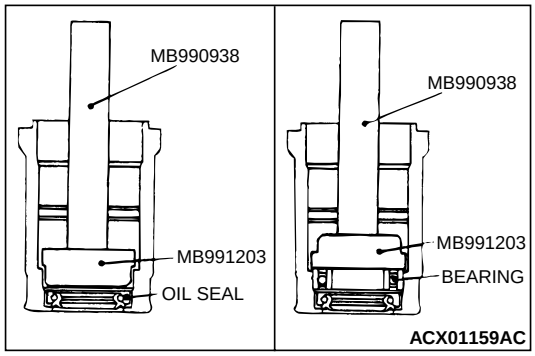


>>F<< CIRCLIP INSTALLATION

⚠ CAUTION

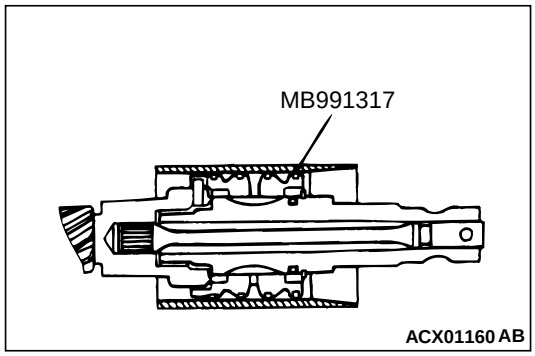
Insert circlip to rack stopper hole whilst turning rack stopper clockwise.

Insert circlip to rack stopper hole through cylinder hole. Turn rack stopper clockwise and insert circlip firmly.



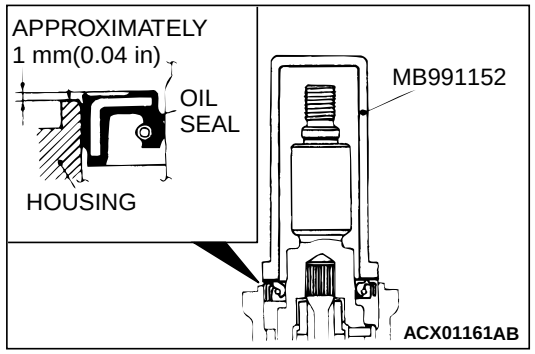
>>G<< OIL SEAL/BALL BEARING INSTALLATION

Apply a coating of the DIAMOND ATF to the outside of the oil seal/ball bearing. Using special tools MB990938 and MB991203, press the oil seal/ball bearing into the valve housing.



>>H<< SEAL RING INSTALLATION

Because the seal rings expand after installation, tighten after installing by using special tool MB991317 to compress the rings, or press down by hand.

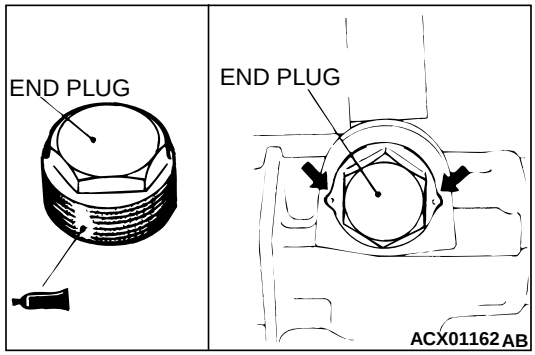


>>I<< OIL SEAL INSTALLATION

⚠ CAUTION

To eliminate a seal malfunction at the valve housing alignment surface, the upper surface of the oil seal should project outward approximately 1 mm (0.04 inch) from the housing edge surface.

Using special tool MB991152, press the oil seal into the valve housing.

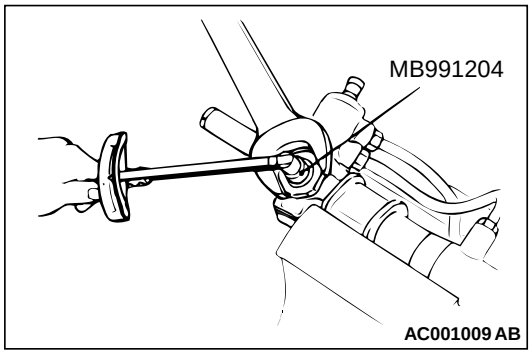


>>J<< END PLUG INSTALLATION

1. Apply the 3M™ AAD Part number 8672, 8679, 8678, 8661, 8663 or equivalent to the threaded part of the end plug.
2. Secure the threaded portion of the end plug at two places by using a punch.

>>K<< RACK SUPPORT COVER/JAM NUT INSTALLATION

1. Position rack at its center.
2. Apply the 3M™ AAD Part number 8672, 8679, 8678, 8661, 8663 or equivalent to the threaded part of the rack support cover.



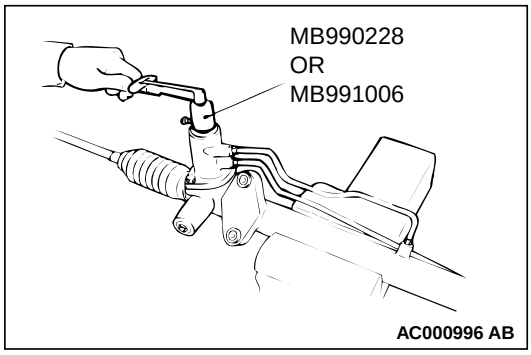
3. Use special tool MB991204 to tighten rack support cover to 13 ± 2 N·m (109 ± 21 in-lb).
4. Turn the rack support cover by 10 degree counterclockwise.
5. Use special tool MB991204 to hold the rack support cover, and then tighten the jam nut to 59 ± 10 N·m (44 ± 7 ft-lb).

>>L<< TOTAL PINION TORQUE ADJUSTMENT

⚠ CAUTION

- **When adjusting, set at the highest value of the standard value range.**
- **Be sure there is no ratcheting or catching when operating the rack towards the shaft.**
- **Measure the total pinion torque through the whole stroke of the rack.**

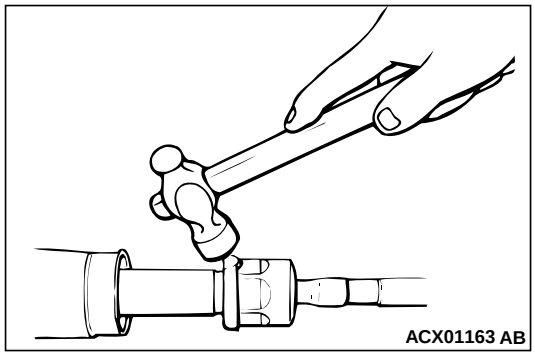
NOTE: If the total pinion toque cannot be adjusted to the standard value within the specified return angle, check the rack support cover components and replace any parts if necessary.



1. Using special tool MB990228 or MB991006, rotate the pinion shaft at the rate of one rotation in four to six seconds to check the total pinion torque and the change in torque.

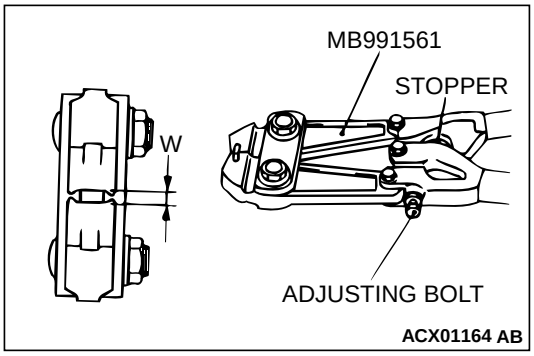
   Standard value:
   Total pinion torque: 0.8 – 1.9 mm (6.9 – 16.5 in-lb)
   [Change in torque: 0.7 N·m (6.1 in-lb) or less]

2. If the total pinion torque or the change in torque is outside the standard value, return the rack support cover within 0 degree angle to 30 degree angle, and adjust again.



>>M<< TAB WASHER/TIE ROD INSTALLATION

After installing tie rod to rack, fold tab washer end (two locations) to tie rod notch.



>>N<< BELLOWS BAND INSTALLATION

1. Turn the adjusting bolt of special tool MB991561 to adjust the opening dimension (W) to the standard value.

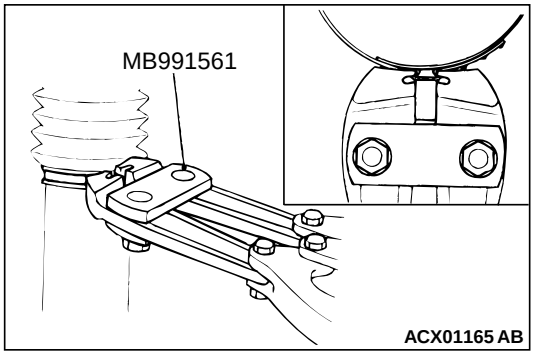
   NOTE: The dimension (W) is adjusted by approximately 0.7 mm (0.03 inch) per one turn.

   NOTE: Do not turn the adjusting bolt more than one turn.

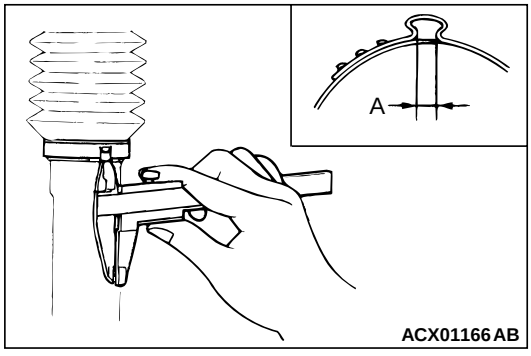
   Standard value (W): 1.9 mm (0.07 inch)
   <When more than 1.9 mm (0.07 inch)>: Screw in the adjusting bolt.
   <When less than 1.9 mm (0.07 inch)>: Loosen the adjusting bolt.

⚠ CAUTION

- **Hold the rack housing, and use special tool MB991561 to crimp the bellows band securely.**
- **Crimp the bellows band until special tool MB991561 touches the stopper.**

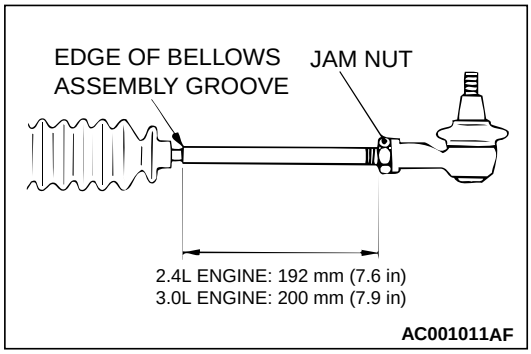


2. Use special tool MB991561 to crimp the bellows band.



3. Check that crimped width (A) is within the standard value.

   Standard value (A): 1.4 – 1.8 mm (0.06 – 0.07 inch)
   <When more than 1.8 mm (0.07 inch)>: Readjust the dimension (W) of step (1) to the value calculated by the following equation, and repeat step (2).
   W = 5.5 mm (0.22 inch) – A [Example: if (A) is 1.9 mm (0.07 inch), (W) is 3.6 mm (0.14 inch).]
   <When less than 1.4 mm (0.06 inch)>: Remove the bellows band, readjust the dimension (W) of step (1) to the value calculated by the following equation, and use a new bellows band to repeat steps (2) to (3).
   W = 5.5 mm (0.22 inch) – A [Example: if (A) is 1.3 mm (0.05 inch), (W) is 4.2 mm (0.17 inch).]



>>O<< TIE ROD END/TIE ROD END JAM NUT INSTALLATION

Screw in the tie rod end to achieve the right and left length as illustrated. Lock with the jam nut.

INSPECTION

M1372004400095

RACK

- Check the rack tooth surfaces for damage or wear.
- Check the oil seal contact surfaces for uneven wear.
- Check the rack for bends.

PINION AND VALVE ASSEMBLY

- Check the pinion gear tooth surfaces for damage or wear.
- Check for worn or defective seal ring.

BEARING

- Check for roughness or abnormal noise during bearing operation.
- Check the bearing for play.
- Check the needle roller bearings for roller slip-off.

OTHERS

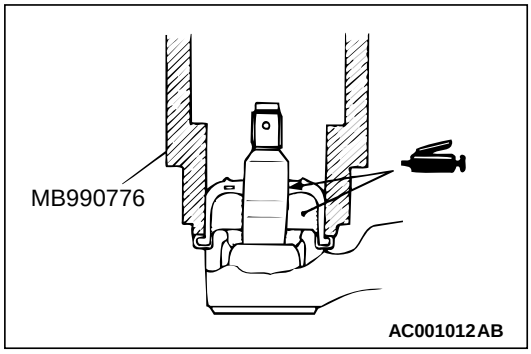
- Check the cylinder inner surface of the rack housing for damage.
- Check the boots for damage, cracking or deterioration.
- Check the rack support for uneven wear or dents.
- Check the rack bushing for uneven wear or damage.

TIE ROD END BALL JOINT DUST COVER REPLACEMENT

M1372008200156

If the dust cover is damaged accidentally during service work, replace the dust cover as follows:

1. Apply grease to the lip and inside of the dust cover.
2. Drive in the dust cover with special tool MB990776 until it is fully seated.
3. Check the dust cover for cracks or damage by pushing it with your finger.



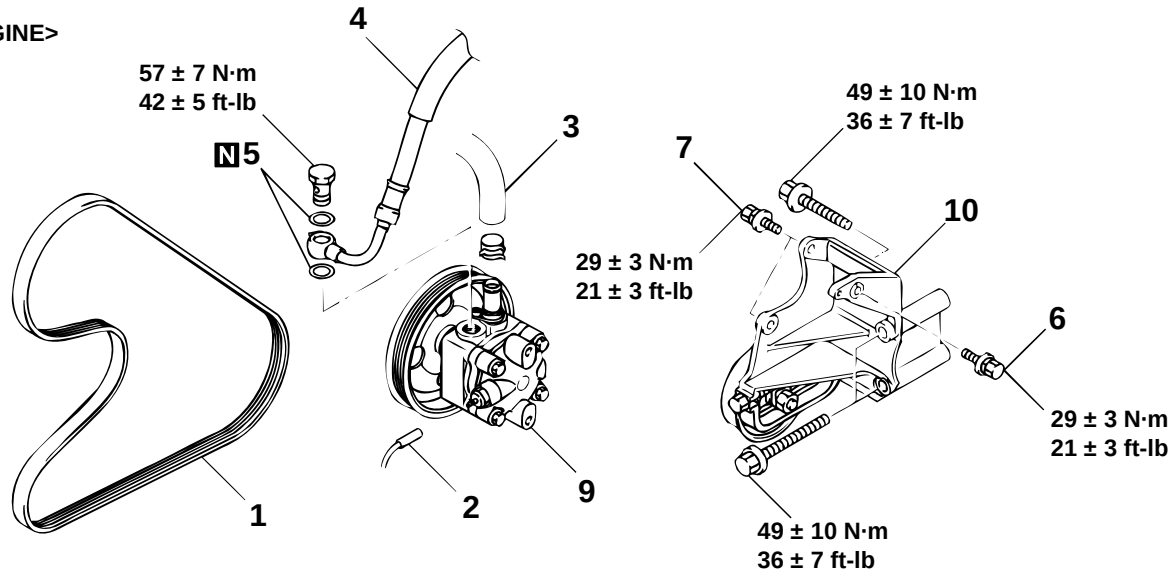
POWER STEERING OIL PUMP ASSEMBLY

REMOVAL AND INSTALLATION

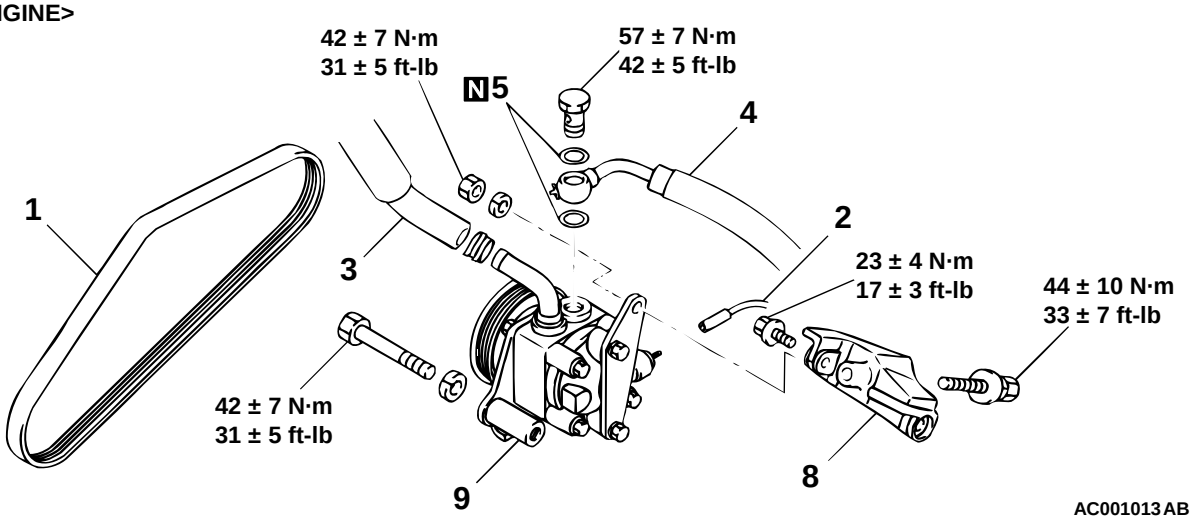
M1372005200124

Pre-removal Operation	Post-installation Operation
• Power Steering Fluid Draining (Refer to P.37A-17.)	• Power Steering Fluid Level Check (Refer to P.37A-17.) • Drive Belt Tension Check (Refer to P.37A-17.) • Power Steering Fluid Line Bleeding (Refer to P.37A-18.) • Oil Pump Pressure Test (Refer to P.37A-19.)

<2.4L ENGINE>



<3.0L ENGINE>



AC001013AB

REMOVAL STEPS
1. DRIVE BELT
2. PRESSURE SWITCH CONNECTOR
3. SUCTION HOSE
4. PRESSURE HOSE
5. GASKET

REMOVAL STEPS (Continued)
6. BOLT
7. BOLT
8. POWER STEERING PUMP BRACKET
9. OIL PUMP
10. OIL PUMP BRACKET

INSPECTION

M1372005300109

Check the drive belt for cracks.
Check the driveshaft assembly for uneven rotation.

TSB Revision

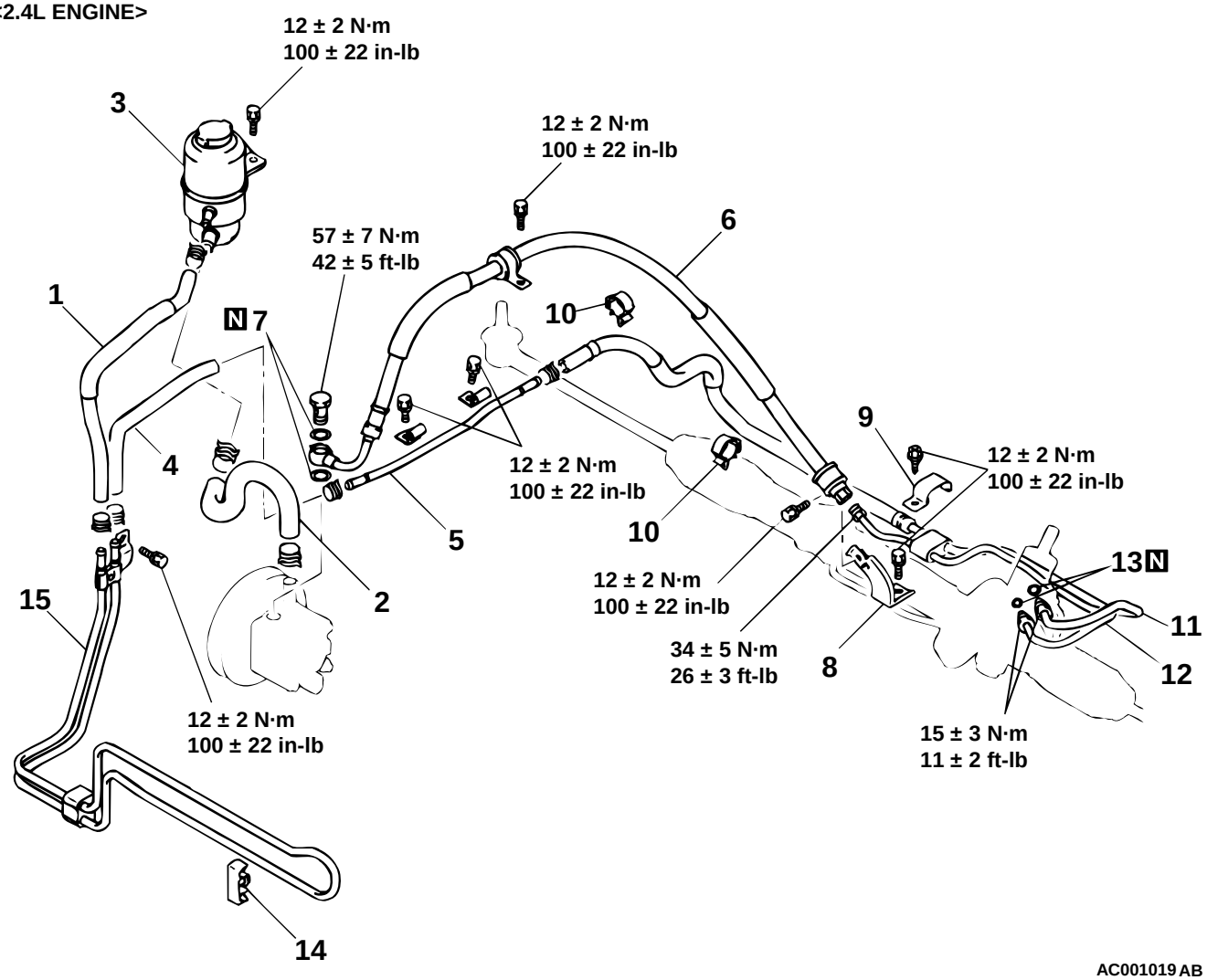
POWER STEERING HOSES

REMOVAL AND INSTALLATION

M1372005700185

Pre-removal Operation	Post-installation Operation
• Power Steering Fluid Draining (Refer to P.37A-17.)	• Power Steering Fluid Level Check (Refer to P.37A-17.) • Power Steering Fluid Line Bleeding (Refer to P.37A-18.)

<2.4L ENGINE>



AC001019 AB

REMOVAL STEPS

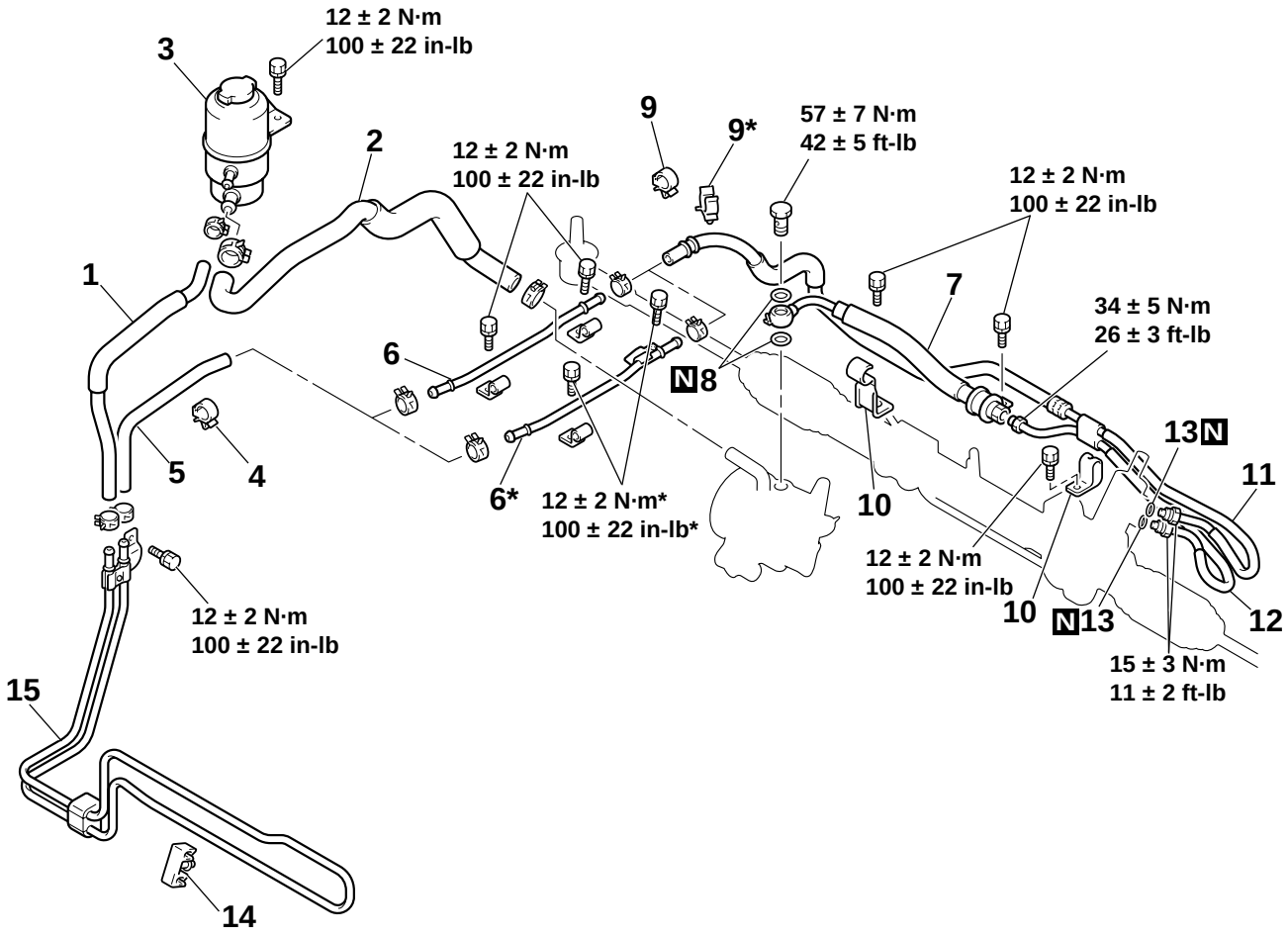
- >>F<< 1. RETURN HOSE
- >>E<< 2. SUCTION HOSE
- 3. OIL RESERVOIR
- >>D<< 4. RETURN HOSE
- 5. RETURN TUBE
- >>C<< 6. PRESSURE HOSE
- 7. O-RING
- 8. BRACKET
- 9. CLAMP

REMOVAL STEPS (Continued)

- 10. CLIP
- >>B<< 11. RETURN HOSE ASSEMBLY
- >>A<< 12. PRESSURE TUBE ASSEMBLY
- 13. O-RING
  - • FRONT BUMPER (REFER TO GROUP 51, FRONT BUMPER P.51-4.)
- 14. CLIP
- 15. COOLER TUBE ASSEMBLY

TSB Revision

<3.0L ENGINE>



NOTE
***: VEHICLE WITH VARIABLE INDUCTION CONTROL (VIC) SYSTEM**

AC106105 AB

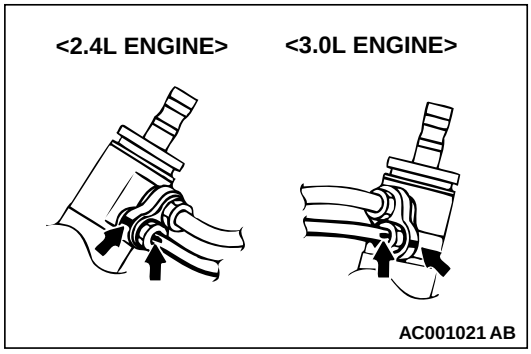
REMOVAL STEPS

>>F<< 1. RETURN HOSE
>>E<< 2. SUCTION HOSE
3. OIL RESERVOIR
4. CLIP
>>D<< 5. RETURN HOSE
6. RETURN TUBE
>>C<< 7. PRESSURE HOSE
8. O-RING
9. CLIP

REMOVAL STEPS (Continued)

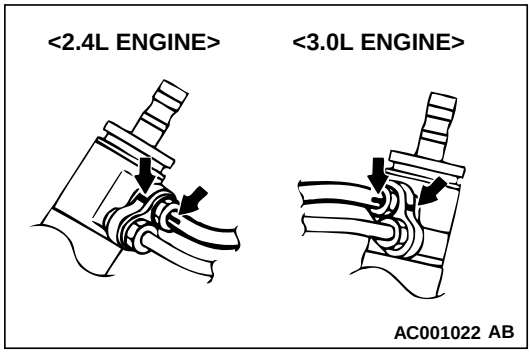
10. CLIP
>>B<< 11. RETURN HOSE ASSEMBLY
>>A<< 12. PRESSURE TUBE ASSEMBLY
13. O-RING
• FRONT BUMPER ASSEMBLY (REFER TO GROUP 51, FRONT BUMPER P.51-4.)
14. CLIP
15. COOLER TUBE ASSEMBLY

INSTALLATION SERVICE POINTS



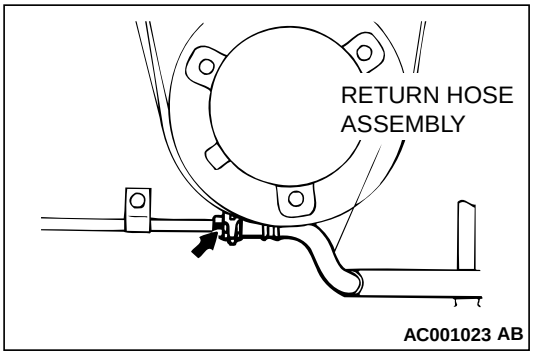
>>A<< PRESSURE TUBE ASSEMBLY INSTALLATION

Align the marks on the pressure tube assembly and steering gear box, and install the pressure tube assembly.

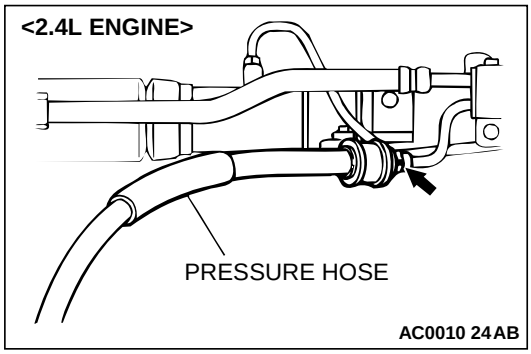


>>B<< RETURN HOSE ASSEMBLY INSTALLATION

1. Align the marks on the return hose assembly and steering gear box, and install the return hose assembly.

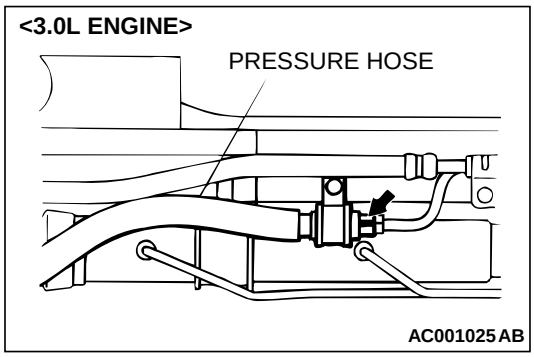


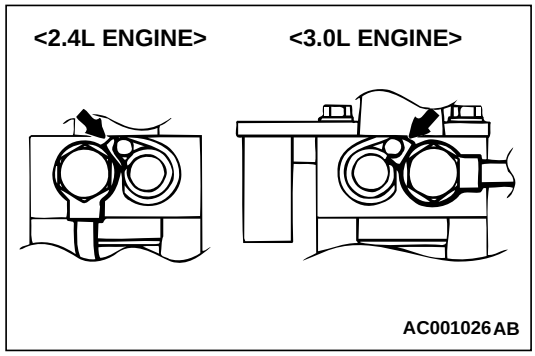
2. Install the return hose assembly so that the marking is positioned as shown in the illustration.



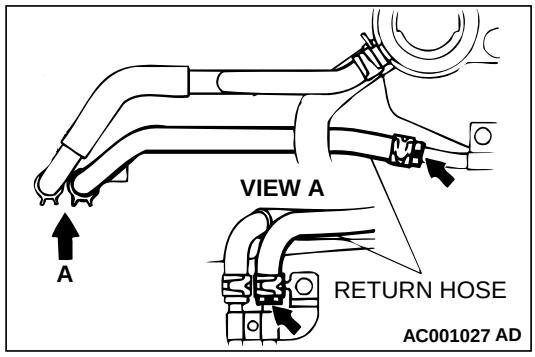
>>C<< PRESSURE HOSE INSTALLATION

1. Install the pressure hose at the gear box side so that the marking is positioned as shown in the illustration.



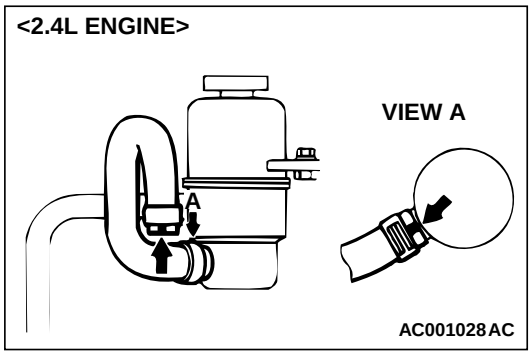


2. Install the pressure hose at the power steering oil pump side as shown in the illustration.

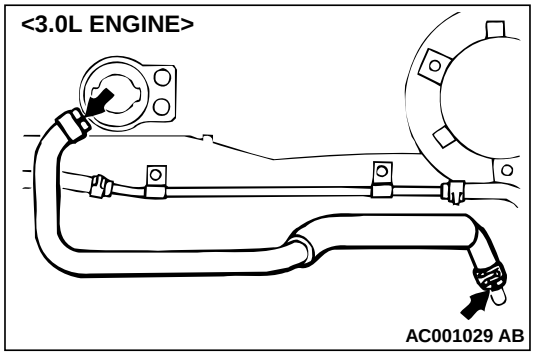


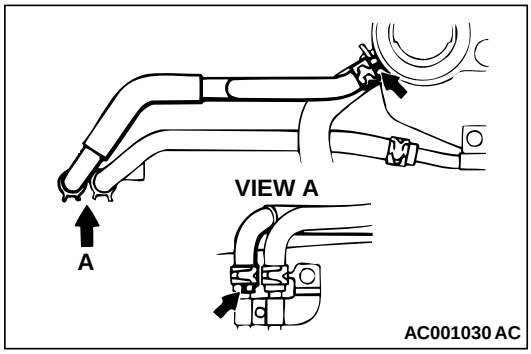
>>D<< RETURN HOSE INSTALLATION

Install the return hose so that the markings are positioned as shown in the illustration.



>>E<< SUCTION HOSE INSTALLATION
Install the suction hose so that the markings are positioned as shown in the illustration.





>>F<< RETURN HOSE INSTALLATION
Install the return hose so that the markings are positioned as shown in the illustration.

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1372008400194

ITEMS		SPECIFICATIONS
Power steering gear box		
Cylinder clamp assembly nut, gear box assembly bolt <3.0L ENGINE>		69 ± 9 N·m (51 ± 7 ft-lb)
Cylinder clamp assembly bolt, gear box assembly bolt <2.4L ENGINE>		69 ± 9 N·m (51 ± 7 ft-lb)
End plug		59 ± 10 N·m (44 ± 7 ft-lb)
Feed tube flare nut		13 ± 3 N·m (113 ± 26 in-lb)
Pinion and valve assembly jam nut		25 ± 4 N·m (18 ± 4 ft-lb)
Rack support cover		13 ± 2 N·m (109 ± 21 in-lb)
Rack support cover jam nut		59 ± 10 N·m (44 ± 7 ft-lb)
Return hose flare nut, pressure tube flare nut		15 ± 3 N·m (11 ± 2 ft-lb)
Stay bolt <2.4L ENGINE>		74 ± 4 N·m (55 ± 3 ft-lb)
Steering shaft and gear box connecting bolt		18 ± 2 N·m (13 ± 1 ft-lb)
Tie rod		88 ± 10 N·m (65 ± 7 ft-lb)
Tie rod end nut		52 ± 2 N·m (38 ± 2 ft-lb)
Tie rod end to knuckle fixing nut		29 ± 4 N·m (21 ± 4 ft-lb)
Valve housing bolt		19 ± 3 N·m (14 ± 2 ft-lb)
Power steering hose		
OIl pump eye bolt		57 ± 7 N·m (42 ± 5 ft-lb)
Oil reservoir, pressure hose, pressure tube, return tube, cooler tube bolt		12 ± 2 N·m (100 ± 22 in-lb)
Pressure tube flare nut (Gear box side)		15 ± 3 N·m (11 ± 2 ft-lb)
Pressure tube flare nut (Pressure hose side)		34 ± 5 N·m (26 ± 3 ft-lb)
Power steering oil pump		
Oil pump bolt/nut <3.0L ENGINE>		42 ± 7 N·m (31 ± 5 ft-lb)
Oil pump bracket bolt	M8 <2.4L ENGINE>	29 ± 3 N·m (21 ± 3 ft-lb)
	M10 <2.4L ENGINE>	49 ± 10 N·m (36 ± 7 ft-lb)
	M8 <3.0L ENGINE>	23 ± 4 N·m (17 ± 3 ft-lb)
	M10 <3.0L ENGINE>	44 ± 10 N·m (33 ± 7 ft-lb)
Oil pump eye bolt		57 ± 7 N·m (42 ± 5 ft-lb)
Power steering wheel and shaft		
Air bag module (driver's side) mounting screw		9.0 ± 2.0 N·m (78 ± 17 in-lb)
Clock spring and column switch assembly bolt		25 ± 4 N·m (18 ± 4 ft-lb)
Steering shaft and gear box connecting bolt		18 ± 2 N·m (13 ± 1 ft-lb)
Steering column assembly bolt		12 ± 2 N·m (100 ± 22 in-lb)
Steering cover assembly bolt		4.9 ± 1.0 N·m (44 ± 8 in-lb)
Steering wheel nut		41 ± 8 N·m (31 ± 5 ft-lb)

GENERAL SPECIFICATIONS

M1372000200129

ITEMS		SPECIFICATIONS
Power steering gear box	Type	Rack and pinion
	Gear ratio	45.74
Oil pump	Type	Vane type
	Displacement cm^3/rev (cu in/rev)	9.6 (0.59)
	Relief set pressure MPa (psi)	8.8 (1,276)

SERVICE SPECIFICATIONS

M1372000300137

ITEMS			STANDARD VALUE	LIMIT
Steering wheel free play mm (in)	With engine running		–	30 (1.2)
	With engine stopped		10 (0.4) or less	–
Steering angle	Inside wheel	2.4L ENGINE	36°12' ± 2°00'	–
		3.0L ENGINE	31°00' ± 2°00'	–
	Outside wheel (reference)	2.4L ENGINE	30°24'	–
		3.0L ENGINE	27°00'	–
Toe-in mm (in)			0 ± 3 (0 ± 0.12)	–
Tie rod end ball joint breakaway torque N·m (in-lb)			0.5 – 2.5 (4.4 – 22.1)	–
Tie rod swing resistance N (lb) [N·m (in-lb)]			4.0 – 18.6 (17.8 – 82.7) [1.0 – 4.9 (8.7 – 43.4)]	–
Engine idle speed r/min		2.4L ENGINE	750 ± 100	–
		3.0L ENGINE	700 ± 100	–
Stationary steering effort N (lb) [Fluctuation allowance N (lb)]			30 (6.7) or less [5.9 (1.33)]	–
Oil pump pressure MPa (psi)	Oil pump relief pressure		8.3 – 9.5 (1,209 – 1,280)	–
	Pressure under no-load conditions		0.8 – 1.0 (116 – 145)	–
	Steering gear retention hydraulic pressure		8.3 – 9.5 (1,209 – 1,280)	–
Oil pressure switch operating pressure MPa (psi)		OFF → ON	1.8 – 2.4 (261 – 348)	–
		ON → OFF	0.8 – 2.4 (116 – 348)	–
Gear box total pinion torque N·m (in-lb) [Change in torque: 0.7 N·m (6.1 in-lb) or less]			0.8 – 1.9 (6.9 – 16.5)	–
Opening dimension of special tool MB991561 mm (in)			1.9 (0.07)	–
Band crimped width mm (in)			1.4 – 1.8 (0.06 – 0.07)	–

LUBRICANTS

M1372000400134

ITEMS		SPECIFIED LUBRICANTS	QUANTITY dm^3 (qt)
Gear box	Bearing	DIAMOND ATF	As required
	O-ring		
	Oil seal		
	Special tool (MB991213)		
	Pinion and valve assembly seal ring part		
	Bellows	Silicon grease	As required
Oil pump	Power steering fluid	DIAMOND ATF	0.8 (0.85)

SEALANTS

M1372000500120

ITEMS		SPECIFIED SEALANTS
Steering column and shaft	Steering cover	3M™ AAD Part No.8672, 8679, 8678, 8661, 8663 or equivalent
Power steering gear box	End plug	
	Rack support cover	

GROUP 42

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HOOD

BODY DIAGNOSIS

INTRODUCTION TO HOOD DIAGNOSIS

M1421005800114

Wind noise at the hood may be caused by improper hood adjustment.

HOOD DIAGNOSTIC TROUBLESHOOTING STRATEGY

M1421005900092

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted most of the possible ways to find a hood fault.

1. Gather information from the customer.
2. Verify that the condition described by the customer exists.
3. Find the malfunction by following the Symptom Chart.
4. Verify malfunction is eliminated.

SYMPTOM CHART

M1421006000070

SYMPTOMS	INSPECTION PROCEDURE	REFERENCE PAGE
Difficult locking and unlocking	1	P.42-5
Uneven body clearance	2	P.42-6
Uneven height	3	P.42-6

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Difficult Locking and Unlocking

DIAGNOSIS

STEP 1. Check the release cable routing condition.

Q: Is the release cable routing condition good?
YES : Go to Step 2.
NO : Repair it, then go to Step 4.

STEP 2. Check the engagement of the hood latch and hood striker.

Q: Are the hood latch and hood striker engaged correctly?
YES : Go to Step 3.
NO : Adjust it. Refer to P.42-7. Then go to Step 4.

STEP 3. Check for proper lubrication of release cable.

Q: Is the release cable properly lubricated?
YES : Go to Step 4.
NO : Lubricate, then go to Step 4.

STEP 4. Check symptoms.

Q: Does the hood lock operate easily?
YES : This diagnosis is complete.
NO : Return to Step 1.

INSPECTION PROCEDURE 2: Uneven Body Clearance

DIAGNOSIS

STEP 1. Check the hood installation condition.

Q: Is the hood installation in good condition?
YES : Go to Step 2.
NO : Adjust it. Refer to P.42-7. Then go to Step 2.

STEP 2. Check symptoms.

Q: Is the clearance with the body even?
YES : This diagnosis is complete.
NO : Return to Step 1.

INSPECTION PROCEDURE 3: Uneven Height

DIAGNOSIS

STEP 1. Check the hood bumper height.

Q: Is the hood bumper height proper?
YES : Go to Step 2.
NO : Adjust it. Refer to P.42-7. Then go to Step2.

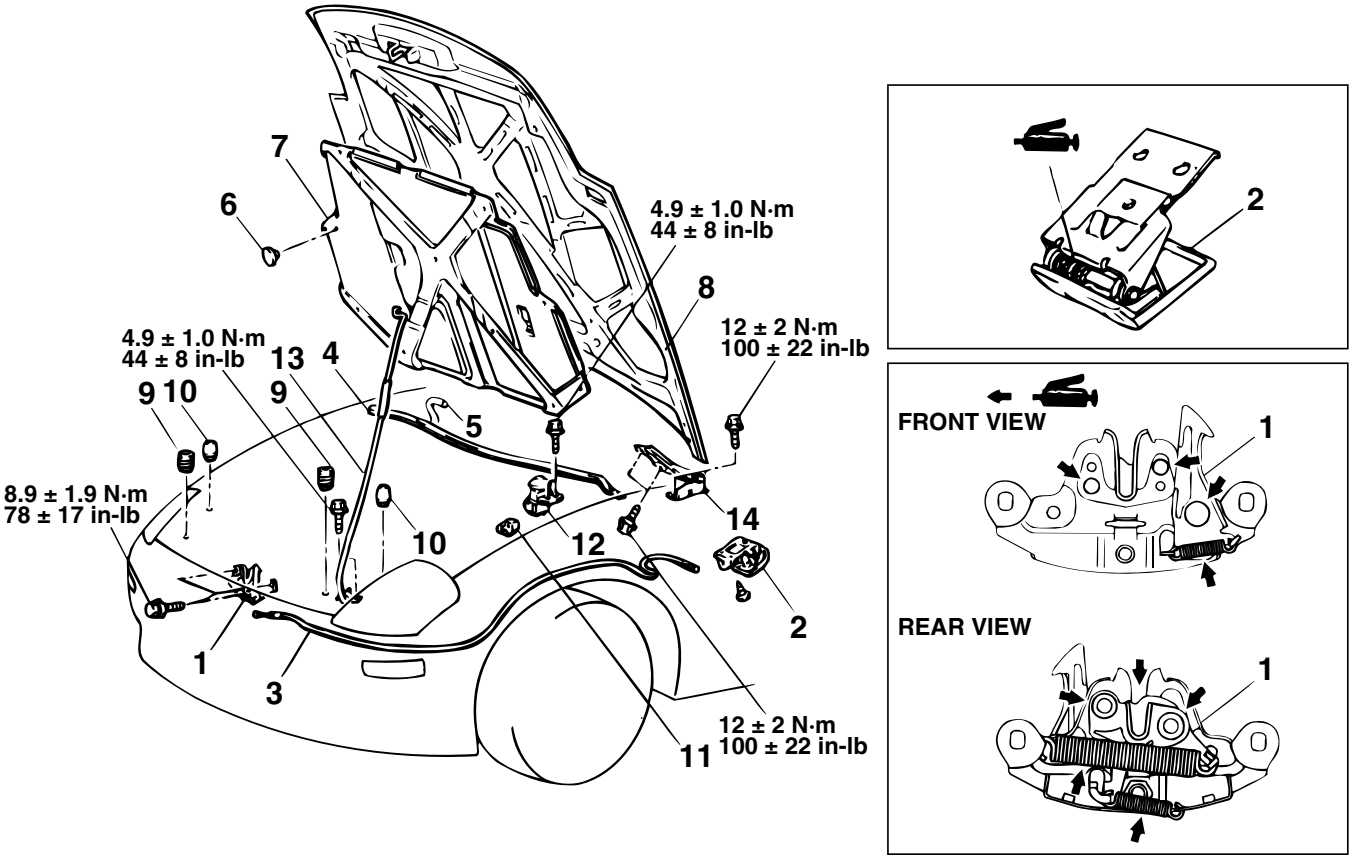
STEP 2. Check symptoms.

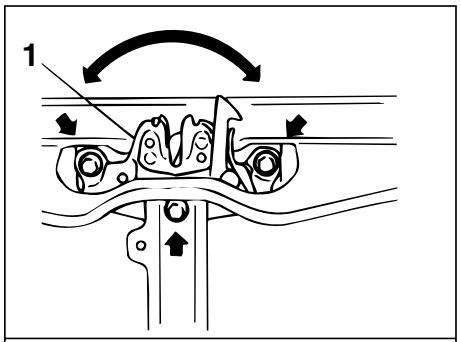
Q: Are the hood and body height even?
YES : This diagnosis is complete.
NO : Return to Step 1.

HOOD

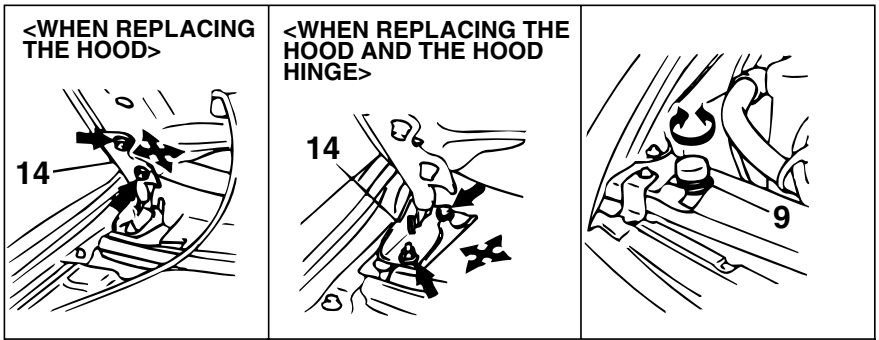
REMOVAL AND INSTALLATION

M1421001600066





ADJUSTMENT OF FOOD LATCH AND HOOD STRIKER ENGAGEMENT



ADJUSTMENT OF HOOD INSTALLATION AND BUMPER

AC000448 AC

HOOD LATCH REMOVAL STEPS

- FRONT BUMPER (REFER TO GROUP 51 P.51-4.)

1. HOOD LATCH

HOOD LOCK RELEASE CABLE REMOVAL STEPS

2. HOOD LOCK RELEASE HANDLE
3. HOOD LOCK RELEASE CABLE

HOOD AND HOOD HINGE REMOVAL STEPS

4. HOOD WEATHERSTRIP
5. WASHER HOSE CONNECTION
6. CLIP
7. HOOD INSULATOR
8. HOOD

>>A<< 9. BUMPER A

>>A<< 10. BUMPER B

11. HOOD DAMPER

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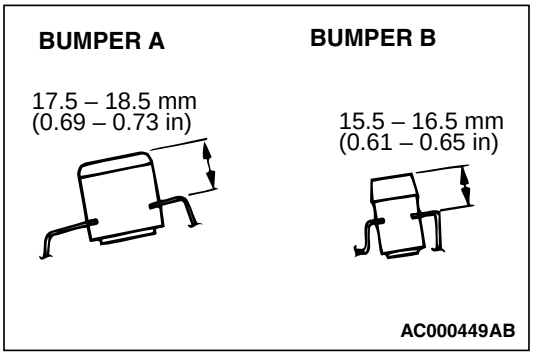
HOOD AND HOOD HINGE
REMOVAL STEPS (Continued)
12. HOOD SWITCH <VEHICLES WITH THEFT-ALARM SYSTEM>
13. HOOD SUPPORT ROD

HOOD AND HOOD HINGE
REMOVAL STEPS (Continued)
- FRONT DECK GARNISH (REFER TO GROUP 51 P.51-17.)

14. HOOD HINGE

INSTALLATION SERVICE POINT

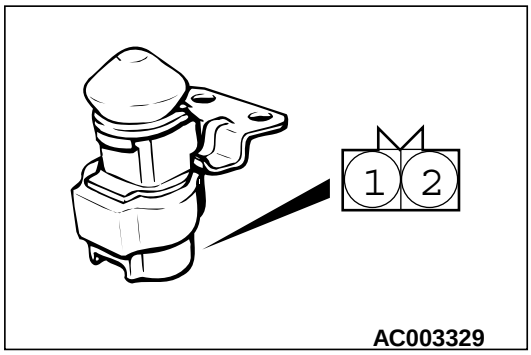


>>A<< BUMPER B/BUMPER A INSTALLATION
Install bumpers A and B as shown in the illustration.
Be sure they are adjusted so the hood is even with the body on all sides.

INSPECTION

M1421007600246

HOOD SWITCH CHECK <VEHICLES WITH THEFT-ALARM SYSTEM>



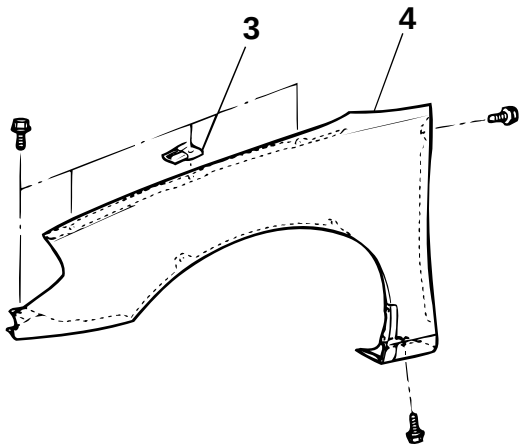
SWITCH POSITION	TESTER CONNECTION	SPECIFIED CONDITION
Hood switch unpressed	1 – 2	Less than 2 ohm
Hood switch depressed	1 – 2	Open circuit

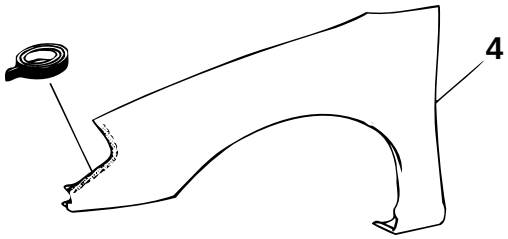
FENDER

REMOVAL AND INSTALLATION

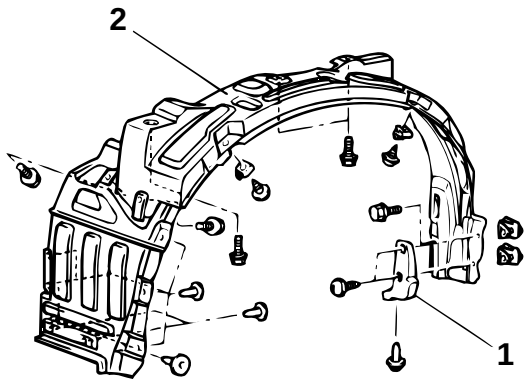
M1421001900067

Pre-removal and Post-installation Operation
- Front Bumper Removal and Installation (Refer to GROUP 51, Front Bumper P.51-4.)
- Headlight Removal and Installation (Refer to GROUP 54A, Headlight P.54A-111.)





SEALANT:
3M™ AAD PART NO.8625 OR EQUIVALENT



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REMOVAL STEPS
1. FRONT STONE GUARD OR FRONT SIDE AIR DAM
2. SPLASH SHIELD

REMOVAL STEPS (Continued)
3. HOOD DAMPER BRACKET
4. FENDER

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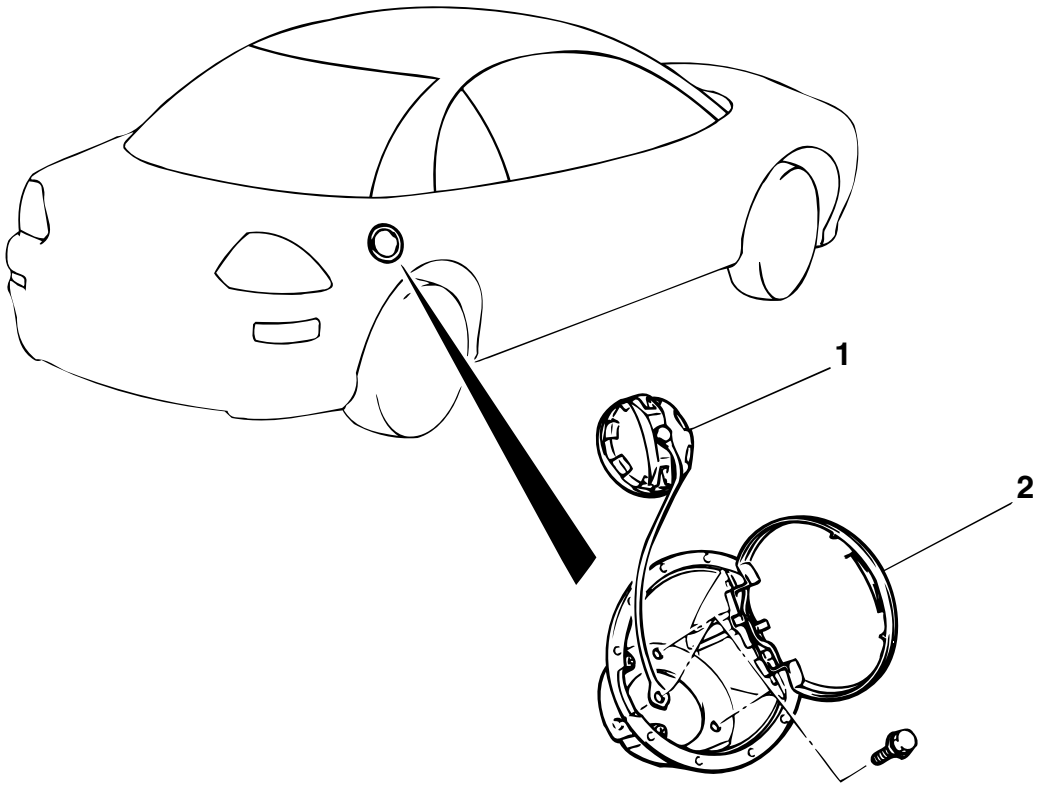
FUEL FILLER LID

REMOVAL AND INSTALLATION

M1421002500073



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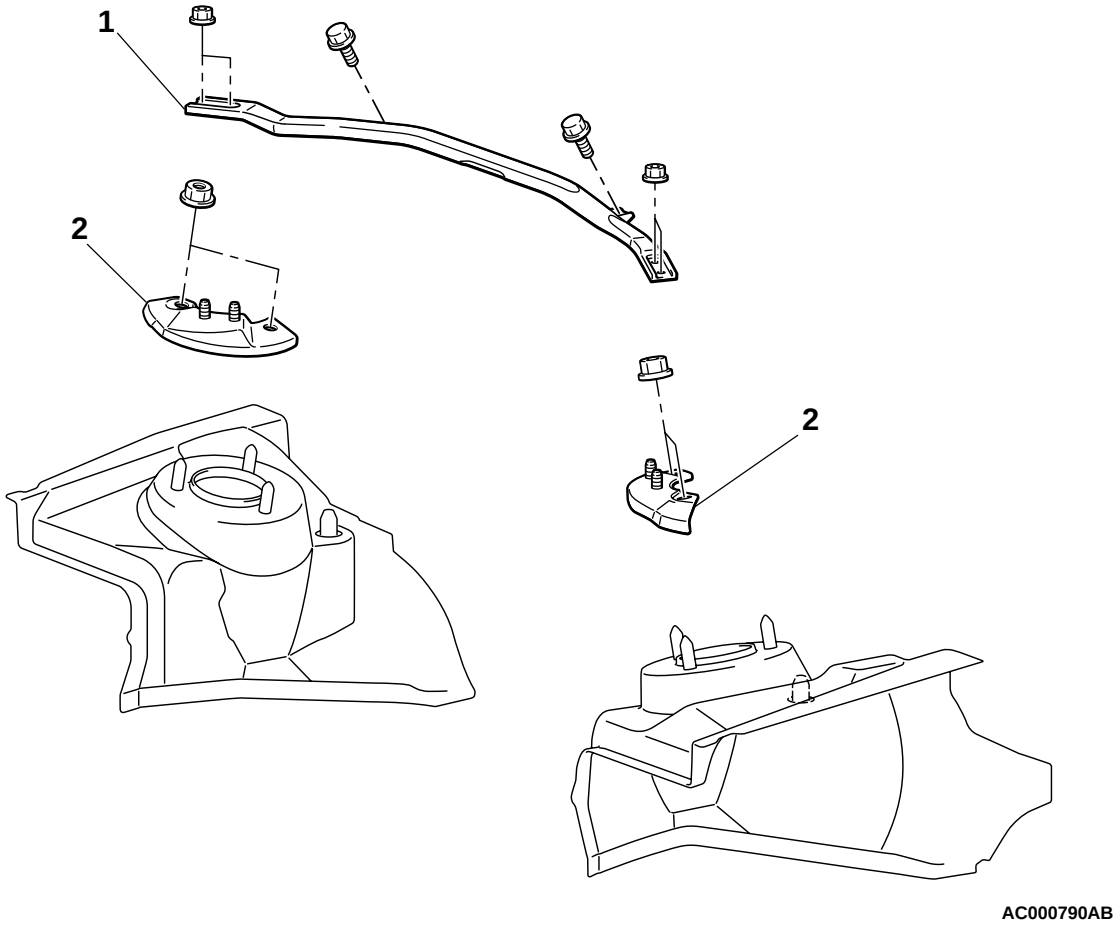
REMOVAL STEPS
1. FUEL CAP
2. FUEL FILLER DOOR

STRUT TOWER BAR

REMOVAL AND INSTALLATION

M1421005600046



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REMOVAL STEPS

1. STRUT TOWER BAR ASSEMBLY
2. STRUT TOWER BAR BRACKET

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WINDOW GLASS

WINDOW GLASS DIAGNOSIS

INTRODUCTION TO WINDOW GLASS DIAGNOSIS

M1422006700072

If water leaks from the windshield, the quarter window glass <ECLIPSE>, the liftgate glass <ECLIPSE>, or the seal or body flange may be faulty.

WINDOW GLASS DIAGNOSTIC TROUBLESHOOTING STRATEGY

M1422006800079

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted most of the possible ways to find a window glass fault.

1. Gather information from the customer.
2. Verify that the condition described by the customer exists.
3. Find the malfunction by following the Symptom Chart.
4. Verify malfunction is eliminated.

SYMPTOM CHART

M1422006900087

SYMPTOMS	INSPECTION PROCEDURE	REFERENCE PAGE
Water leak through windshield	1	P.42-12
Water leak through quarter window glass		
Water leak through liftgate glass		

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Water Leak through Windshield/Water Leak through Quarter Window Glass/Water Leak through Liftgate Glass

DIAGNOSIS

STEP 1. Check if the seal is faulty.

Q: Is the seal faulty?
YES : Repair it, then go to Step 3.
NO : Go to Step 2.

STEP 2. Check if the body flange is deformed.

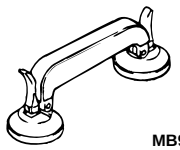
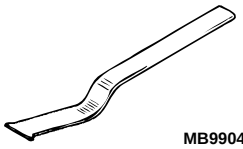
Q: Is the body flange deformed?
YES : Repair or replace it, then go to Step 3.
NO : Go to Step 3.

STEP 3. Check symptoms.

Q: Is any water leaking?
YES : Return to Step 1.
NO : This diagnosis complete.

SPECIAL TOOLS

M1422000600066

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 MB990480	MB990480 Glass holder	General service tool	Removal and installation of window glass
 MB990449	MB990449 Window molding remover	General service tool	Removal of drip molding

WINDOW GLASS

GENERAL INFORMATION

M1422000100072

The windshield, quarter window <ECLIPSE> and lift-gate glass <ECLIPSE> are attached by an urethane-base adhesive to the window frame. This adhesive provides improved glass holding and sealing, and also permits use of body openings having a greater structural strength.

ITEM	APPLICATION	QUANTITY
Wire (dia × length)	For cutting adhesive	Five pieces of wire 0.6 mm × 1 m (0.02 in × 3.3 ft)
Glass adhesive knife	For cutting adhesive	One
Sealant gun	For adhesive application	One
Wiping shop towels	-	As required
Sealer	For prevention of water leaks and gathering after adhesive application	As required
3M™ AAD Part No. 8880 or equivalent	For cleaning	As required
Glass holder MB990480	For holding window glass	Two
Window molding remover MB990449	For roof drip molding removal	One

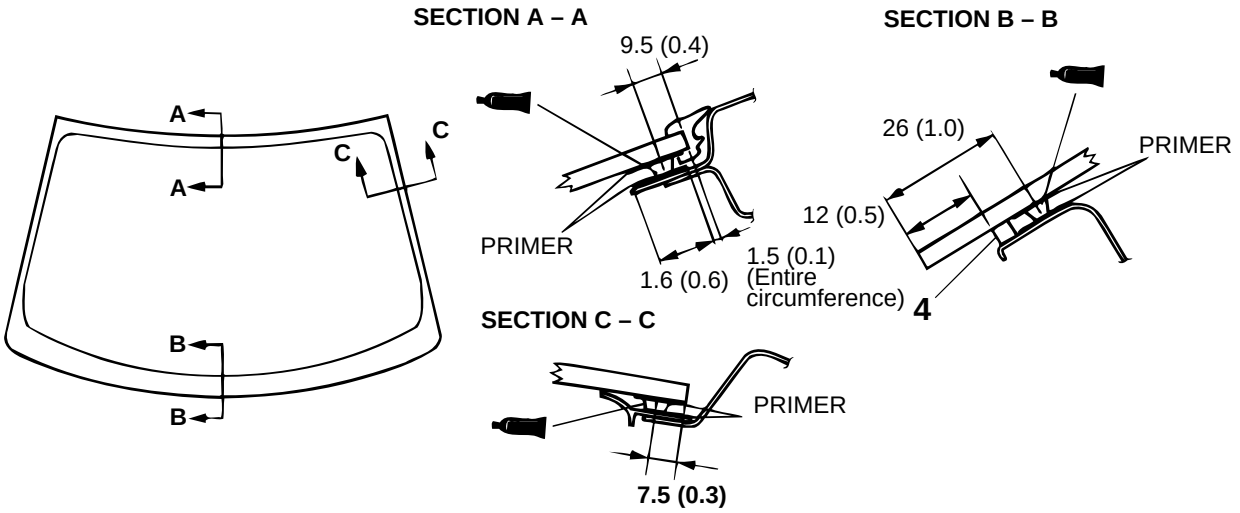
WINDSHIELD

REMOVAL AND INSTALLATION

M1422001000078

Pre-removal and Post-installation Operation
- Front Deck Garnish Removal and Installation (Refer to GROUP 51 P.51-17.)
- Drip Garnish Removal and Installation (Refer to GROUP 51 P.51-11.) <ECLIPSE SPYDER>
- Front Pillar Trim Removal and Installation (Refer to GROUP 52AP.52A-9 .)
- Headlining Removal and Installation (Refer to GROUP 52AP.52A-13 .)
- Inside Rear View Mirror Removal and Installation (Refer to GROUP 52A P.52A-14.)

mm (in)



ADHESIVE: 3M™ AAD PART NO.8609 SUPER FAST URETHANE AND 3M™AAD PART NO.8608 SUPER FAST URETHANE PRIMER OR EQUIVALENT

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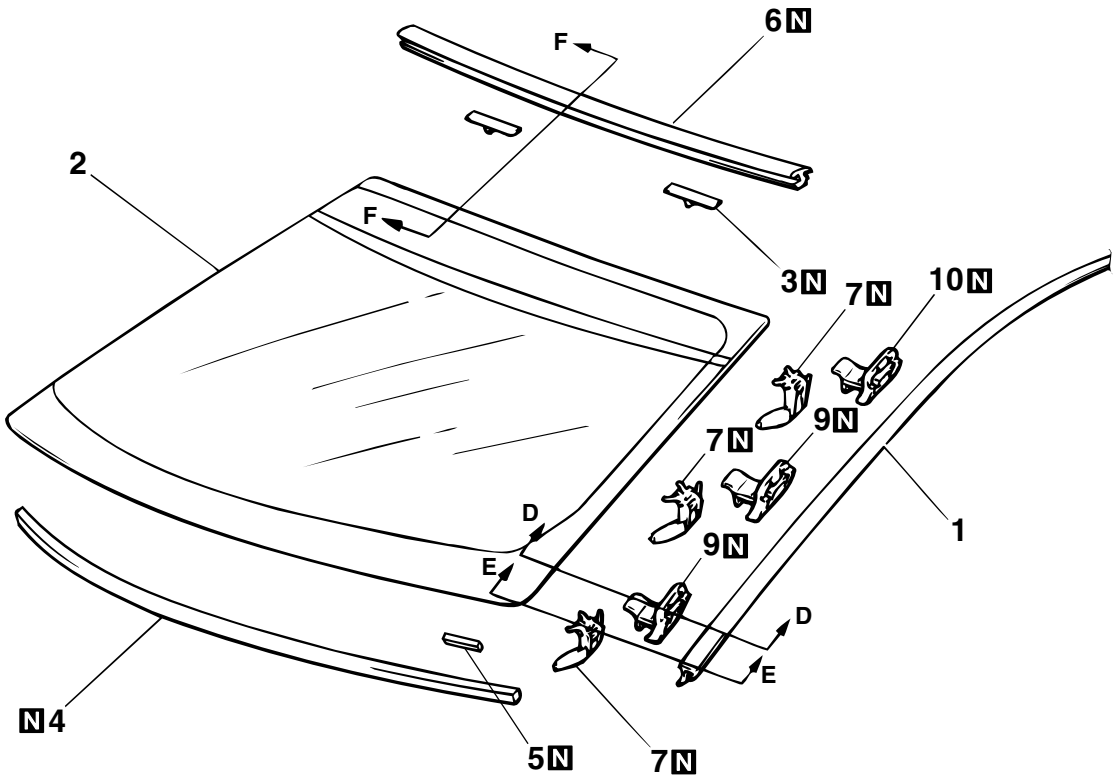

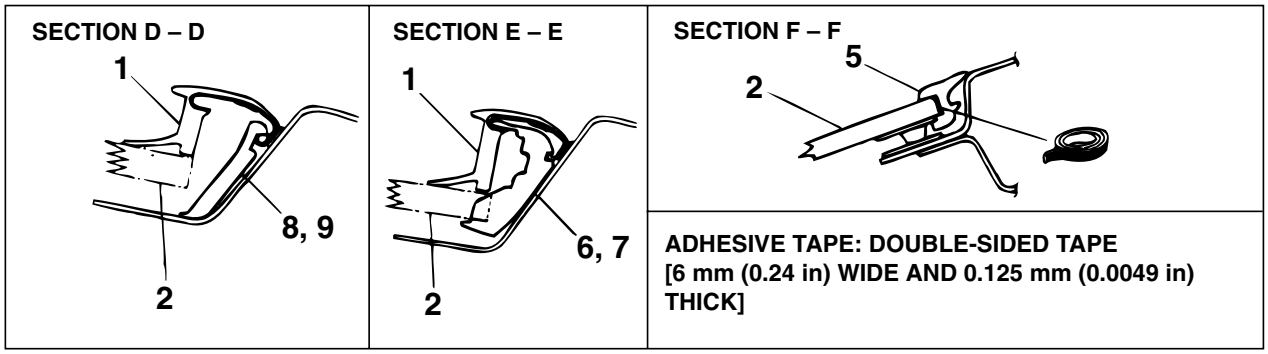

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REMOVAL STEPS

<<A>> >>D<< 1. ROOF DRIP MOLDING <ECLIPSE>
<<B>> >>C<< 2. WINDSHIELD
>>C<< 3. GLASS STOPPER
>>C<< 4. WINDOW SPACER
>>C<< 5. SPACER
>>C<< 6. WINDSHIELD UPPER MOLDING
>>B<< 7. FRONT DRIP MOLDING CLIP A <ECLIPSE>

REMOVAL STEPS (Continued)

>>B<< 8. FRONT DRIP MOLDING CLIP B <ECLIPSE>
>>A<< 9. DRIP MOLDING CLIP A <ECLIPSE>
>>A<< 10. DRIP MOLDING CLIP B <ECLIPSE>

Required Special Tool:

- MB990480: Glass Holder
- MB990449: Window molding remover

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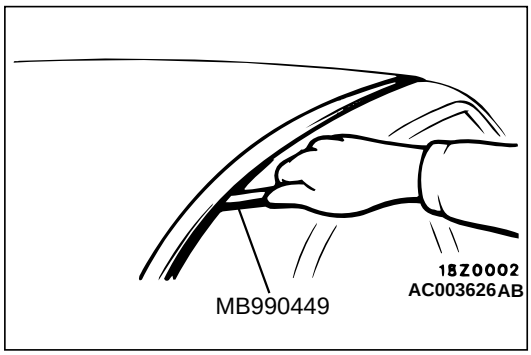
REMOVAL SERVICE POINTS

<<A>> ROOF DRIP MOLDING REMOVAL



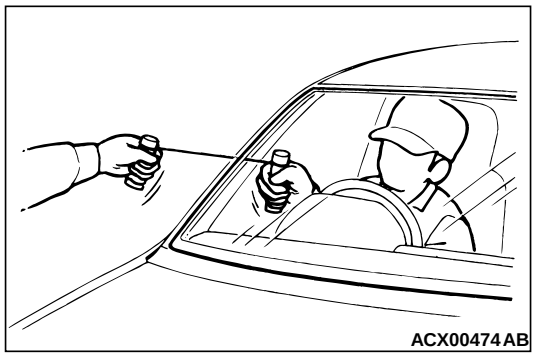
⚠ CAUTION

If the roof drip molding has become warped, should be replaced (do not re-use).

Use special tool MB990449 to lever out the roof drip molding.

<<B>> WINDSHIELD REMOVAL

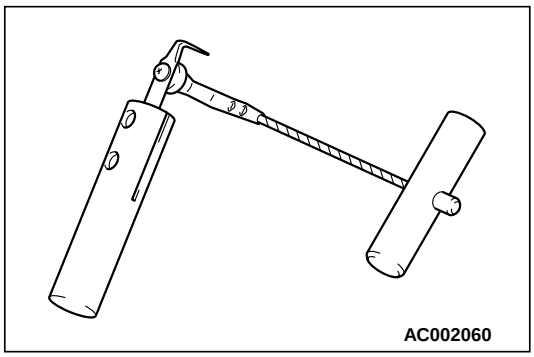
1. To protect the body (paint surface), apply cloth tape to all body areas around the installed
2. Using piano wire
   (1) Using a sharp-point drill, make a hole in the windshield adhesive.
   (2) Pass the piano wire from the inside of the vehicle through the hole.
   (3) Using a sharp-point drill, make a hole in the windshield adhesive.
   (4) Pass the piano wire from the inside of the vehicle through the hole.



⚠ CAUTION

Do not let the piano wire touch the edge of the windshield.

   (5) Pull the piano wire alternately from the inside and outside along the windshield to cut the adhesive.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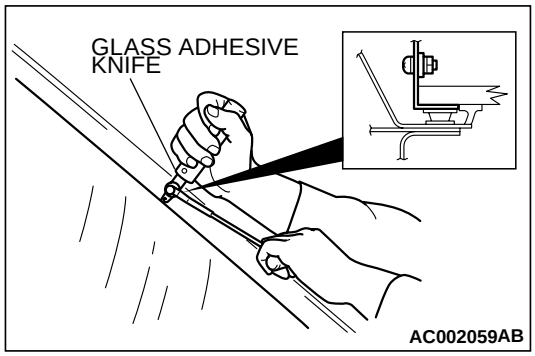

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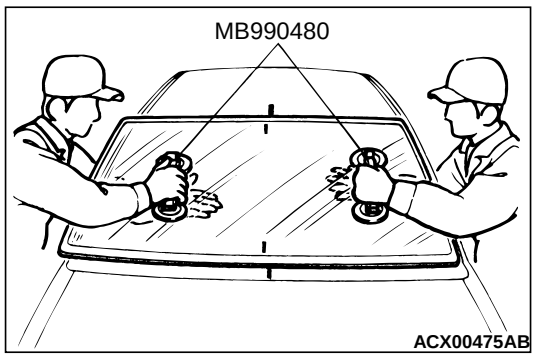
⚠ CAUTION

Putting glass adhesive knife too deeply into windshield adhesive may damage windshield.

3. Using glass adhesive knife
   Keep glass adhesive knife at right angles with the windshield edge, and put the blade at windshield edge and surface. Then cut away adhesive along the windshield edge.



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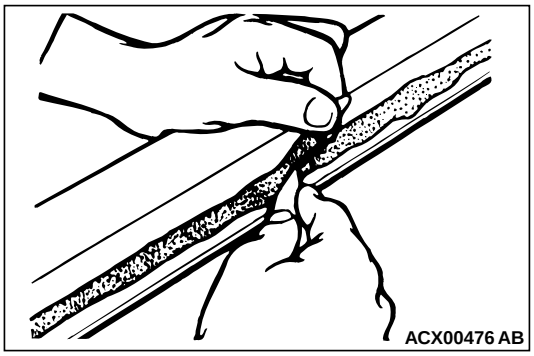
4. Make mating marks on the windshield and body.
5. Use special tool MB990480 to remove the windshield.


ACX00476 AB

⚠ CAUTION

- **Be careful not to remove more adhesive than is necessary.**
- **Be careful also not to damage the paintwork on the body surface with the knife. If the paintwork is damaged, repair the damaged area with repair paint or anti-rust agent.**

6. Use a knife to cut away the remaining adhesive so that the thickness is within 2 mm (0.08 inch) around the entire circumference of the body flange.
7. Finish the flange surfaces so that they are smooth.

⚠ CAUTION

Allow the cleaned area to dry for at least three minutes. Do not touch any surface that has been cleaned.

8. When reusing the windshield, remove the adhesive still adhering to the windshield, and clean with 3M™ AAD Part number 8906 or equivalent.
9. Clean the body side in the same way.

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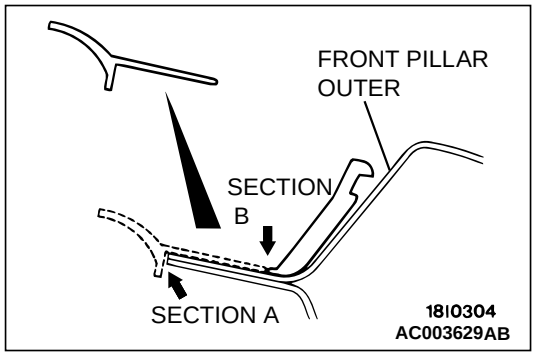
INSTALLATION SERVICE POINTS

>>A<< DRIP MOLDING CLIP A/DRIP MOLDING CLIP B INSTALLATION

1. The drip molding clips A and B differ according to where they are used, so check the identification color before installation.

APPLICABLE LOCATION	IDENTIFICATION COLOR
Drip molding clips A	Gray
Drip molding clips B	Green

2. After installing the clip to outer front pillar in alignment with its section A, cut from section B.



>>B<< FRONT DRIP MOLDING CLIP A/FRONT DRIP MOLDING CLIP B INSTALLATION

Clips A and B differ according to where they are used, so check the identification color before installation.

APPLICABLE LOCATION	IDENTIFICATION COLOR
Front drip molding clips A <LH>	Gray
Front drip molding clips A <RH>	Yellow
Front drip molding clips B	Violet

>>C<< WINDSHIELD UPPER MOLDING/SPACER/WINDOW SPACER/GLASS STOPPER/WINDSHIELD INSTALLATION

1. When replacing the windshield, temporarily set the windshield against the body, and place a mating mark on the windshield and body.
2. Use 3M™ AAD Part number 8906 or equivalent to de grease the inside and outside of the windshield and the body flanges.

⚠ CAUTION

- **The primer strengthens the adhesive, so be sure to apply it evenly around the entire circumference. However, a too thick application will weaken the adhesive.**
- **Do not touch the coated surface.**

3. Soak a sponge in the primer, and apply evenly to the windshield and the body in the specified places.
4. Apply the primer, and then let it dry for 3 to 30 minutes, depending on ambient temperature and humidity.

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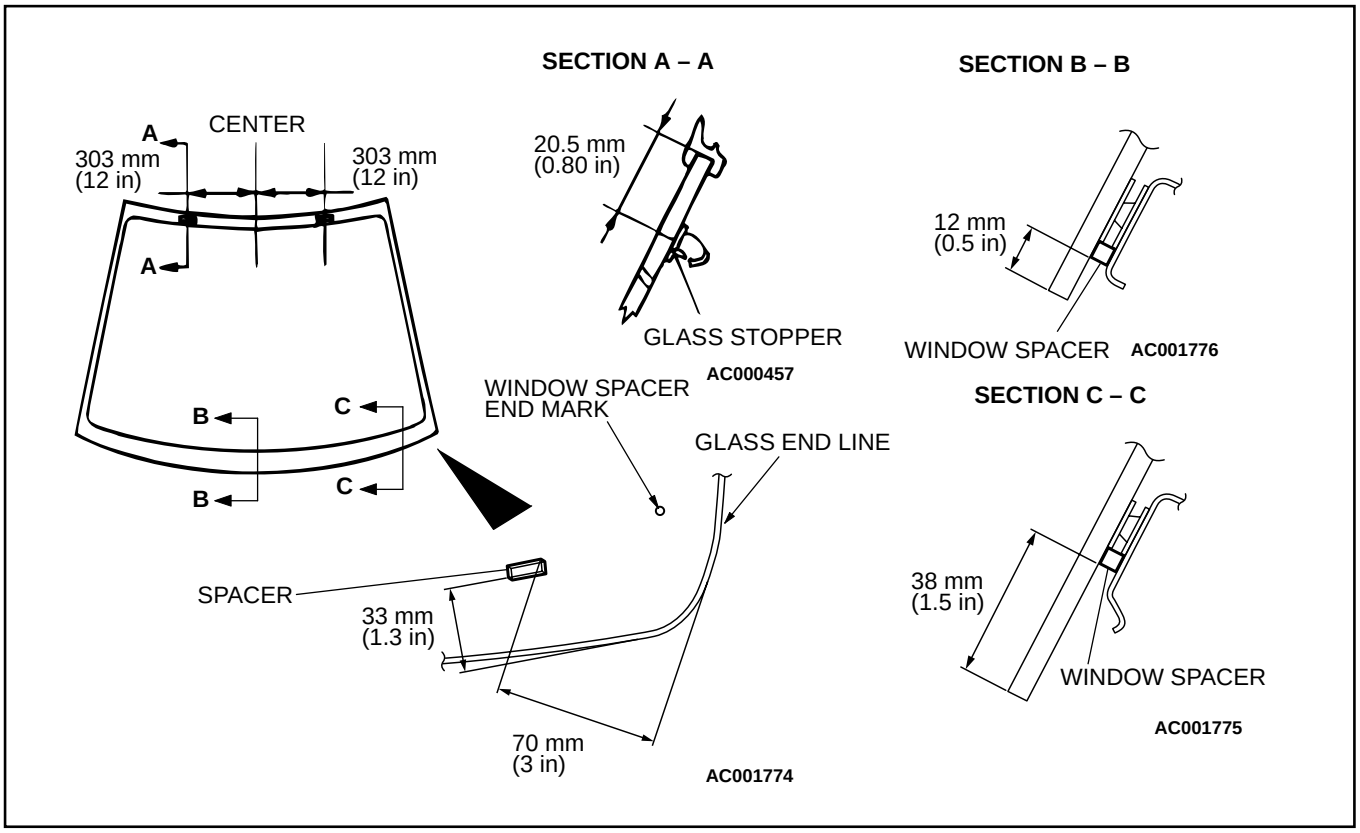
5. Install the windshield upper molding to the windshield.
6. Install the glass stopper to the windshield.
7. Place the window spacer to the windshield so that it inclines toward the windshield and its right and left clearances are equal. Then install the spacer firmly so that it is firmly anchored.



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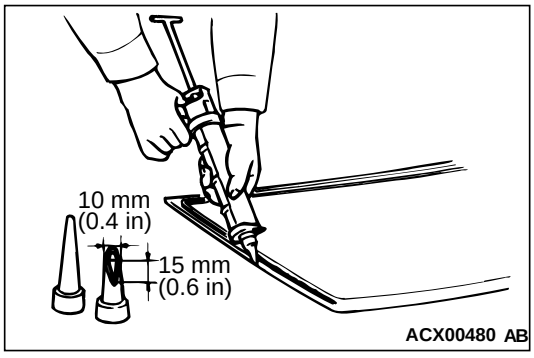

8. Fill a sealant gun with adhesive. Then apply the adhesive evenly around the windshield within 30 minutes after applying the primer.

   NOTE: Cut the tip of the sealant gun nozzle into a V shape to simplify adhesive application.
9. Align the mating marks on the windshield and the body, and lightly press the windshield evenly so that it adheres completely.
10. Use a spatula or similar tool to remove any excessive adhesive. Clean the surface with 3M™ AAD Part number 8906 or equivalent. Avoid moving the vehicle until the adhesive sets.

⚠ CAUTION

- **Do not move the vehicle unless absolutely necessary.**
- **When testing for water leakage, do not pinch the end of the hose to spray the water.**

11. Wait 30 minutes or more, and then test for water leakage.

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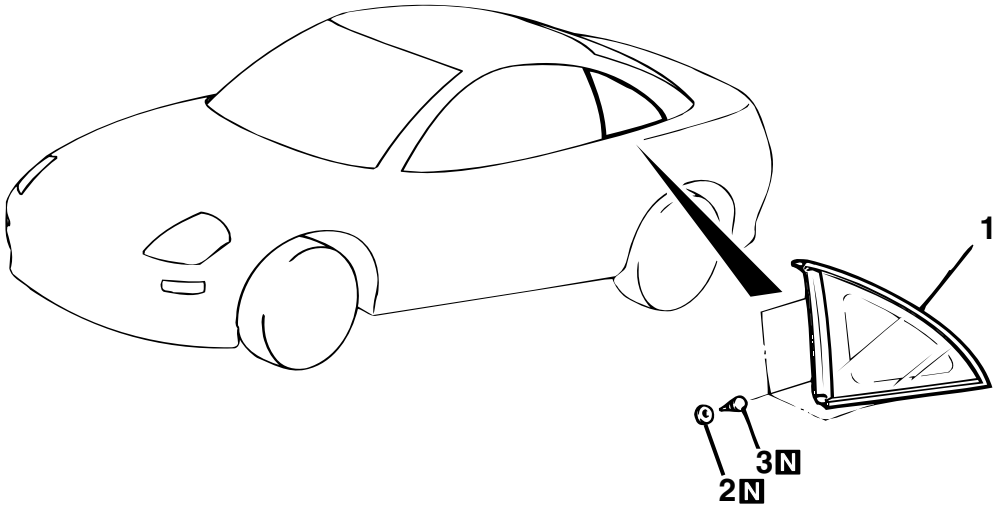
>>D<< ROOF DRIP MOLDING INSTALLATION
Install the clip to the roof drip molding before installing the molding to the vehicle body.

QUARTER WINDOW GLASS

REMOVAL AND INSTALLATION

M1422002500065

Pre-removal and Post-installation Operation
- Quarter Trim Upper Removal and Installation (Refer to GROUP 52AP.52A-9 .)



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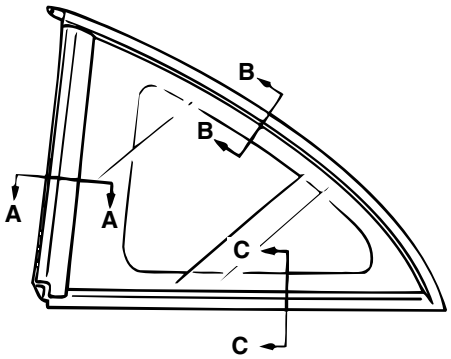
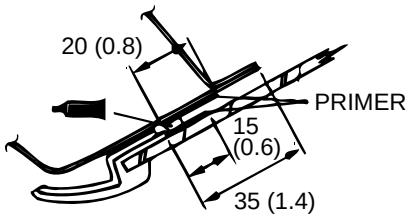
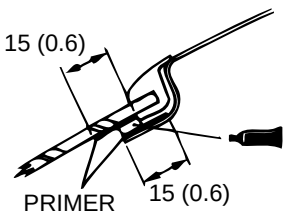


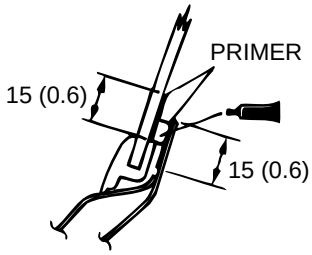
SECTION A – A



SECTION B – B



SECTION C – C



ADHESIVE: 3M™ AAD PART NO.8609 SUPER FAST URETHANE AND 3M™ AAD PART NO.8608 SUPER FAST URETHANE PRIMER OR EQUIVALENT

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REMOVAL STEPS

<<A>> >>A<< 1. QUARTER WINDOW GLASS ASSEMBLY

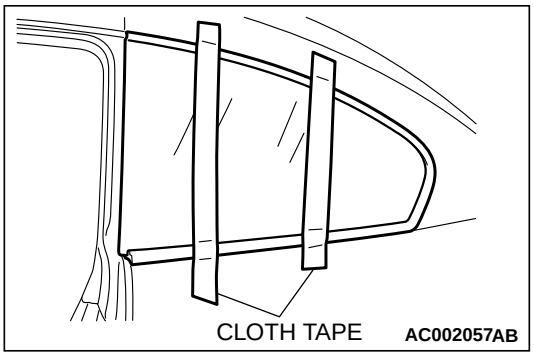
REMOVAL STEPS (Continued)

2. PACKING
3. CLIP

REMOVAL SERVICE POINT

<<A>> QUARTER WINDOW GLASS REMOVAL

1. Apply cloth tape to protect quarter window glass.



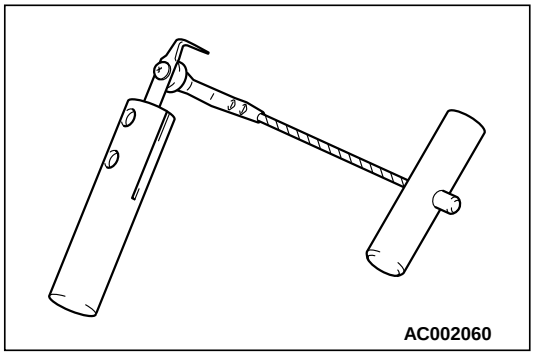
⚠ CAUTION

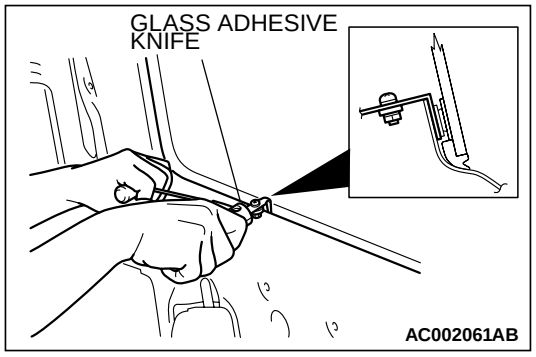
Putting glass adhesive knife too deeply into windshield adhesive may damage quarter window glass.

2. Use glass adhesive knife to cut away adhesive.

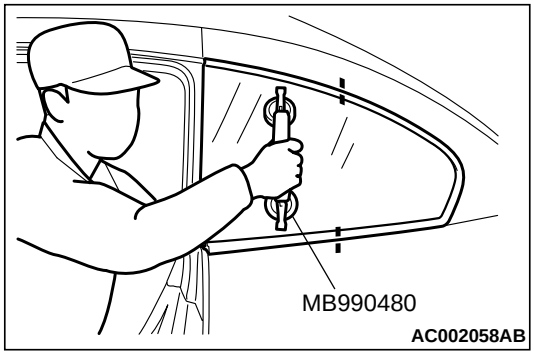
   Keep glass adhesive knife at right angles with body flange (from inside the vehicle), and put the blade at body flange. Then cut away adhesive along the body flange.

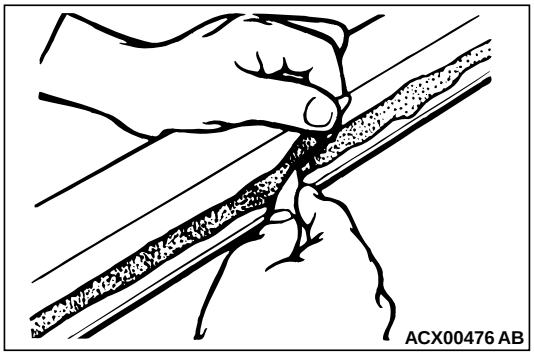
   NOTE: If glass adhesive knife does not reach the body flange, refer to WINDSHIELD P.42-14.





3. Make mating marks on the quarter window glass and body.
4. Use special tool MB990480 to remove the quarter window glass.

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⚠ CAUTION

- **Be careful not to remove more adhesive than is necessary.**
- **Be careful also not to damage the paintwork on the body surface with the knife. If the paintwork is damaged, repair the damaged area with repair paint or anti-rust agent.**

5. Use a knife to cut away the remaining adhesive so that the thickness is within 2 mm (0.08 inch) around the entire circumference of the body flange.
6. Finish the flange surfaces so that they are smooth.

⚠ CAUTION

Allow the cleaned area to dry for at least three minutes. Do not touch any surface that has been cleaned.

7. When reusing the quarter window glass, remove the adhesive still adhering to the quarter window glass, and clean with 3M™ AAD Part number 8906 or equivalent.
8. Clean the body side in the same way.

INSTALLATION SERVICE POINT

>>A<< QUARTER WINDOW GLASS INSTALLATION

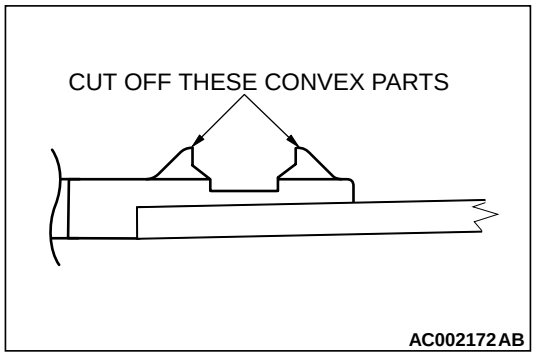
1. Carry out the following procedure to re-install quarter window glass.

⚠ CAUTION

Do not forget packing.

(1) Fit clips into body.
(2) Cut away clip fitting convex on quarter window glass.

NOTE: Convex gets broken when quarter window glass is removed.



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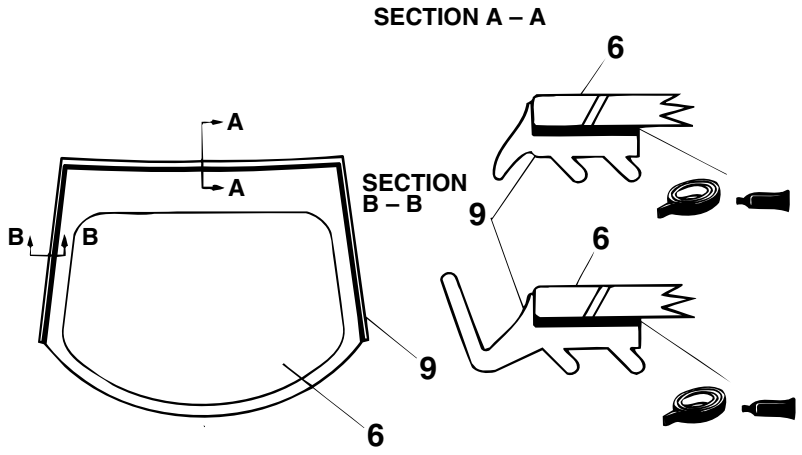
2. Remove the quarter window glass using the same procedure as for the windshield remove. (Refer to P.42-14.)

LIFTGATE WINDOW GLASS

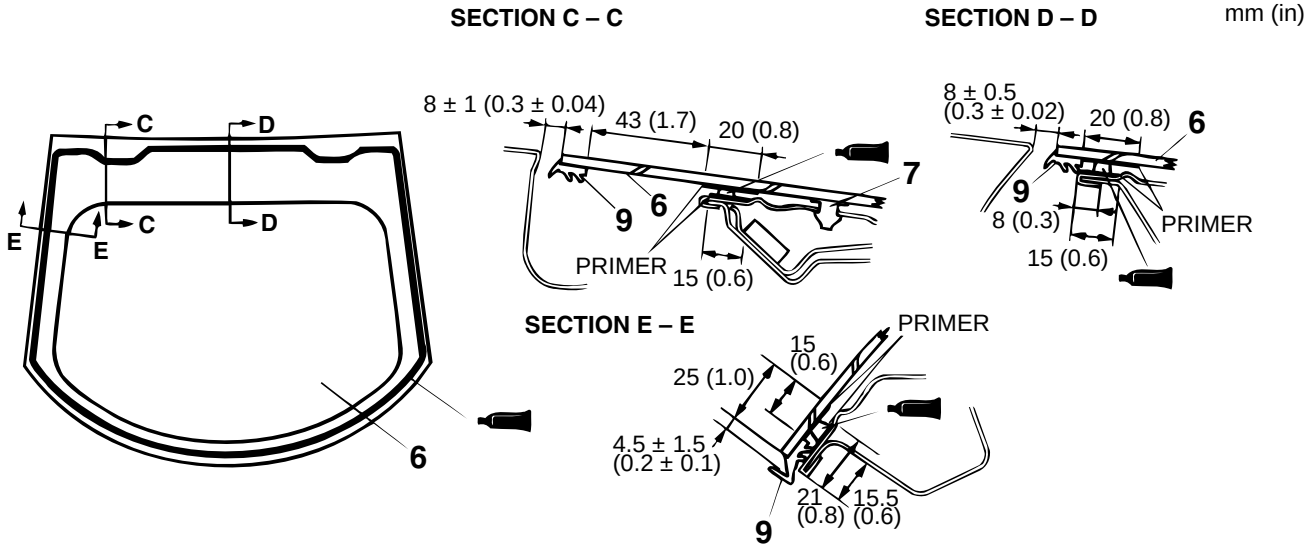
REMOVAL AND INSTALLATION

M1422003700040

Pre-removal and Post-installation Operation
- Liftgate Trim Removal and Installation (Refer to P.42-72.)
- Rear Wiper Arm, Wiper Motor and Washer Nozzle Removal and Installation (Refer to GROUP 51P.51-22 .)



ADHESIVE TAPE: DOUBLE-SIDED TAPE [6 mm (0.2 in) WIDE AND 0.125 mm (0.0049) THICK] AND 3M™ AAD PART NO.8608 SUPER FAST URETHANE PRIMER OR EQUIVALENT



ADHESIVE: 3M™ AAD PART NO. 8609 SUPER FAST URETHANE AND 3M™ AAD PART NO.8608 SUPER FAST URETHANE PRIMER OR EQUIVALENT

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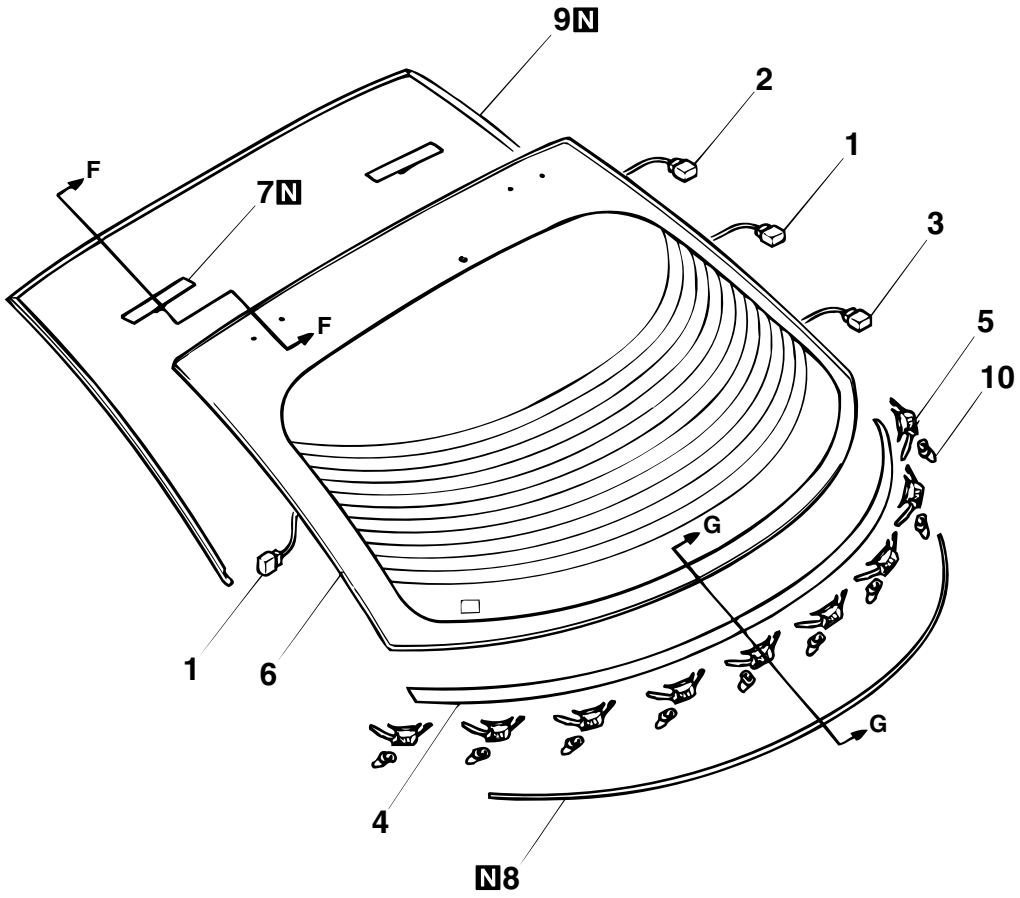

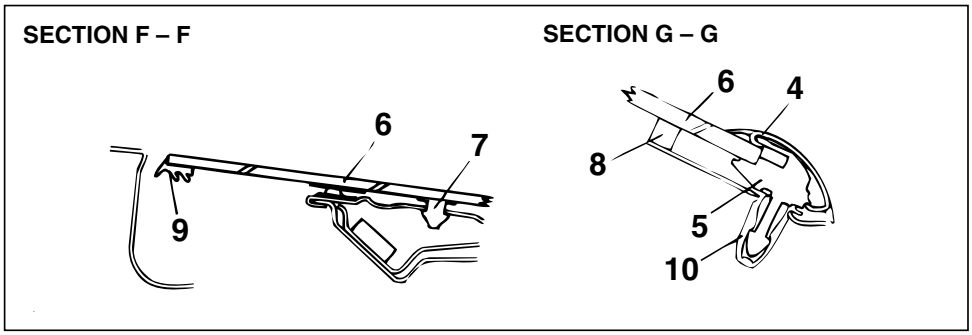

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REMOVAL STEPS

1. HARNESS CONNECTOR (FOR LIFTGATE WINDOW DEFOGGER)
2. HARNESS CONNECTOR (FOR MAIN GLASS ANTENNA)
3. HARNESS CONNECTOR (FOR SUB GLASS ANTENNA)

<<A>> 4. LIFTGATE LOWER MOLDING

5. LIFTGATE MOLDING CLIP

<<B>> >>A<< 6. LIFTGATE WINDOW GLASS

REMOVAL STEPS (Continued)

>>A<< 7. GLASS STOPPER

>>A<< 8. WINDOW SPACER

9. LIFTGATE UPPER MOLDING

10. CLIP GROMMET A

Required Special Tool:

- MB990480: Glass Holder
- MB990449: Window molding remover

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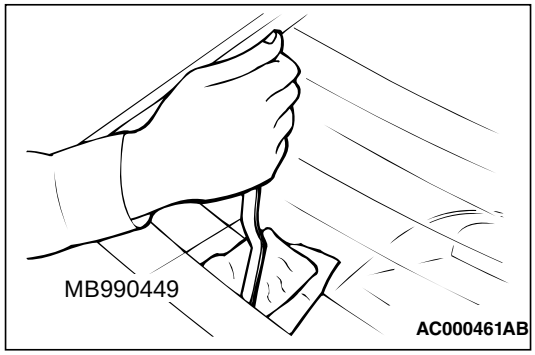
REMOVAL SERVICE POINTS

<<A>> LIFTGATE LOWER MOLDING REMOVAL

⚠ CAUTION

If liftgate lower molding has become warped, it should not be reused.

Use special tool MB990449 to lever out the molding.



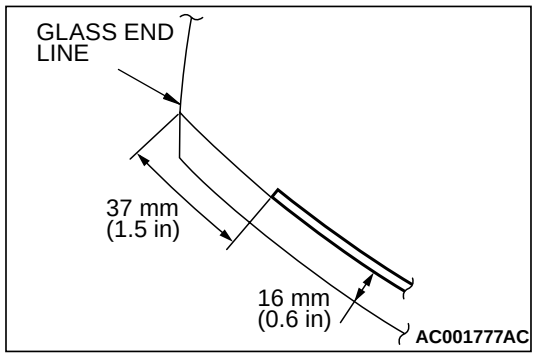
<<B>> LIFTGATE WINDOW GLASS REMOVAL

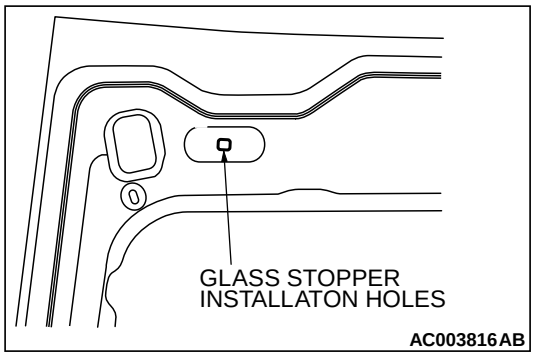
Remove the liftgate window glass using the same procedure as for the windshield. (Refer to P.42-14.)

INSTALLATION SERVICE POINT

>>A<< WINDOW SPACER/GLASS STOPPER/LIFTGATE WINDOW GLASS INSTALLATION

1. Use 3M™ AAD Part number 8906 or equivalent. to degrease the inside and outside edges of the liftgate window glass and the surface of the body flange.
2. Install glass stopper so that it is bent toward inside the liftgate window glass and is firmly affixed.





3. Install glass stopper on liftgate window glass at the same place as glass stopper is installed on body flange
4. Apply primer and adhesive.
5. Install the glass in the same way as for the windshield. (Refer to P.42-14.)

QUARTER WINDOW GLASS AND REGULATOR ASSEMBLY

GENERAL DESCRIPTION

M1422000100094

POWER WINDOWS

Power windows are used in all vehicles. When the power window main switch is operated, the quarter windows will open or close. This system has the following operations and features.

- A timer function has been provided so that when all doors are closed and ignition is turned off, the power window can be operated for 30 seconds from the time the ignition is turned off.
- The power window main switch contains a one-touch down switch that will automatically open the quarter windows.

WINDOW GLASS DIAGNOSIS

INTRODUCTION TO WINDOW GLASS DIAGNOSIS

M1422006700102

If water leaks from the quarter window glass, causes for these faults can include faults in the glass, weatherstrip or drain hole.

WINDOW GLASS DIAGNOSTIC TROUBLESHOOTING STRATEGY

M1422006800109

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted most of the possible ways to find a window glass fault.

1. Gather information from the customer.
2. Verify that the condition described by the customer exists.
3. Find the malfunction by following the Symptom Chart.
4. Verify malfunction is eliminated.

SYMPTOM CHART

M1422006900117

SYMPTOMS	INSPECTION PROCEDURE	REFERENCE PAGE
Quarter window glass water leak	1	P.42-26
Quarter window malfunction	2	P.42-27
Water leak around quarter window glass edge	3	P.42-27
Water leak from quarter trim	4	P.42-27
Wind noise around quarter window	5	P.42-27

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Quarter Window Glass Water Leak

DIAGNOSIS

STEP 1. Check if the seal is faulty.

Q: Is the seal faulty?
YES : Repair it, then go to Step 3.
NO : Go to Step 2.

STEP 2. Check if the body flange is deformed.

Q: Is the body flange deformed?
YES : Repair or replace it, then go to Step 3.
NO : Go to Step 3.

STEP 3. Check symptoms.

Q: Is any water leaking?
YES : Return to Step 1.
NO : This diagnosis complete.

INSPECTION PROCEDURE 2: Quarter Window Malfunction

DIAGNOSIS

STEP 1. Check the quarter window installation condition.

Q: Is the quarter window installation condition good?
YES : Go to Step 2.
NO : Adjust it. (Refer to P.42-39.) Then go to Step 3.

STEP 2. Inspect the window regulator assembly.

Q: Is the window regulator assembly in good condition?
YES : Go to Step 3.
NO : Repair or replace it, then go to Step 3.

STEP 3. Check symptoms.

Q: Does the quarter window operate correctly?
YES : This diagnosis is complete.
NO : Return to Step 1.

INSPECTION PROCEDURE 3: Water Leak around Quarter Window Glass Edge

DIAGNOSIS

STEP 1. Check the weatherstrip.

Q: Is the weatherstrip in good condition?
YES : Go to Step 2.
NO : Replace it, then go to Step 3.

STEP 2. Check quarter window glass fit (alignment).

Q: Is the quarter window glass fit (alignment) correct?
YES : Go to Step 3.
NO : Adjust it. Refer to P.42-39. Then go to Step 3.

STEP 3. Check symptoms.

Q: Is any water leaking?
YES : Return to Step 1.
NO : This diagnosis is complete.

INSPECTION PROCEDURE 4: Water Leak from Quarter Trim

DIAGNOSIS

STEP 1. Check the drain hole.

Q: Is the drain hole clogged?
YES : Replace it, then go to Step 3.
NO : Go to Step 2.

STEP 2. Check the waterproof cover.

Q: Is the waterproof cover in good condition?
YES : Go to Step 3.
NO : Repair or replace it, then go to Step 3.

STEP 3. Check symptoms.

Q: Is any water leaking?
YES : Return to Step 1.
NO : This diagnosis is complete.

INSPECTION PROCEDURE 5: Wind Noise around Quarter Window

DIAGNOSIS

STEP 1. Check the weatherstrip for holding condition.

Q: Is the weatherstrip holding firmly?
YES : Go to Step 2.
NO : Adjust fit of quarter window glass. Refer to P.42-39. Then go to Step 4.

STEP 2. Check the clearance.

Q: Is the clearance between the quarter window glass and the rear rail weatherstrip holder proper?
YES : Go to Step 3.
NO : Adjust it. Refer to P.42-39. Then go to Step 4.

STEP 3. Check the quarter window regulator assembly.

Q: Is the quarter window regulator deformed?
YES : Repair or replace it. then go to Step 4.
NO : Go to Step 4.

STEP 4. Check symptoms.

Q: Has the wind noise been improved?
YES : Return to Step 1.
NO : This diagnosis complete.

POWER WINDOW DIAGNOSIS

INTRODUCTION TO POWER WINDOWS DIAGNOSIS

M1429002600074

The quarter window is controlled by the convertible top control module. For troubleshooting, refer to Electric Convertible Top Diagnosis P.42-95. When the power window main switch is operated, the quarter window regulator motor operates and opens or closes the quarter window.
A timer function has been provided to allow the quarter windows to be opened or closed in 30 seconds after the ignition switch is turned from "ON" to "LOCK" (OFF) position when a door <LH> and <RH> is closed (door switch is OFF).

If the following types of symptom occur, there may be a fault.

- None of the quarter windows open or close.
- There are quarter windows that do not open or close using the power window main switch.
- When parking there are quarter windows that do not open using the convertible top switch.
- The windows cannot be opened or closed using the power window main switch within 30 seconds after the ignition switch is turned from "ON" to "LOCK" (OFF) position.

POWER WINDOWS DIAGNOSTIC TROUBLESHOOTING STRATEGY

M1429002700071

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted most of the possible ways to find a power windows fault.

1. Gather information from customer.
2. Verify that the condition described by the customer exists.
3. Find the malfunction by following the Symptom Chart.
4. Verify malfunction is eliminated.

SYMPTOM CHART

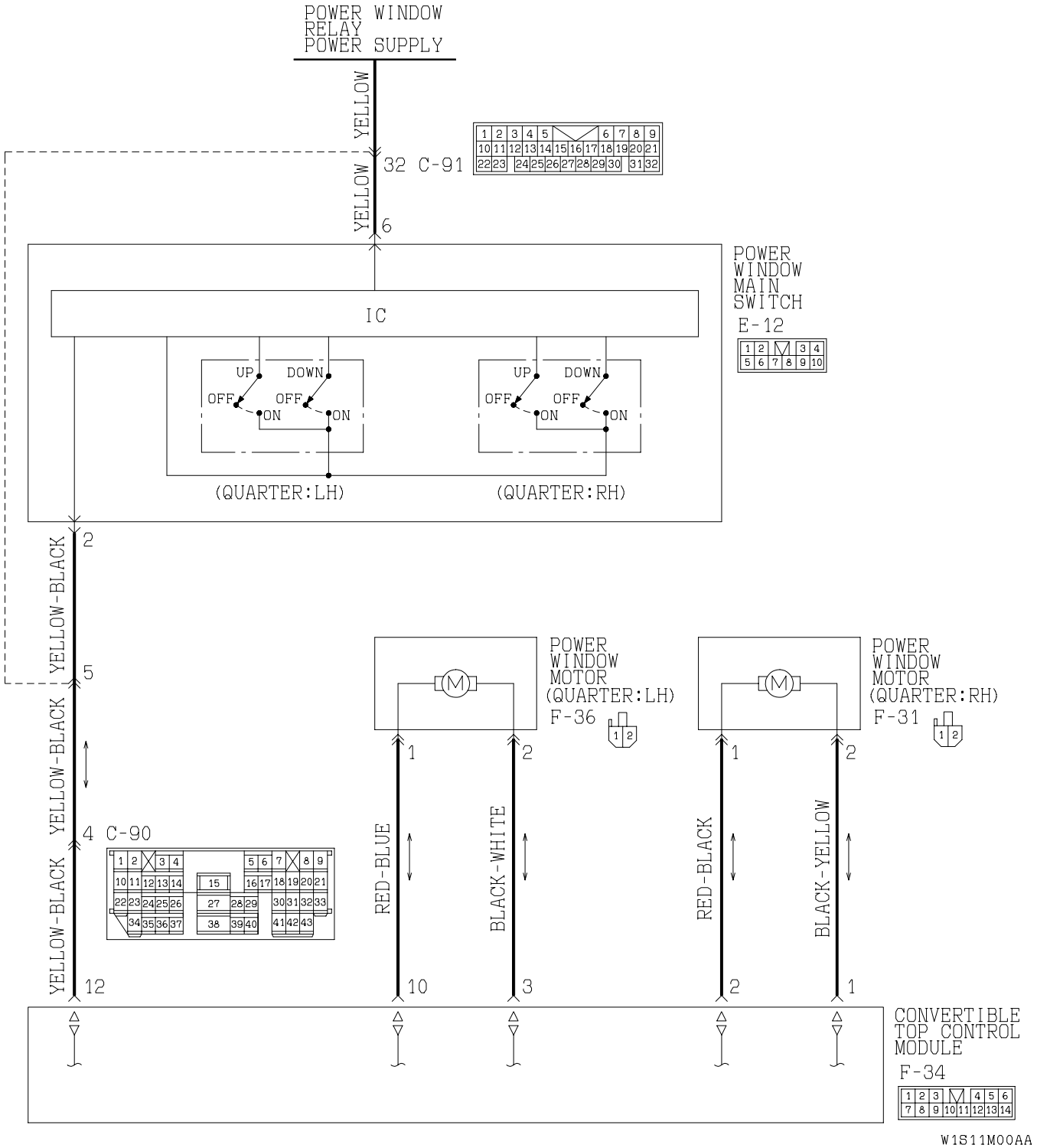
M1429002800089

SYMPTOMS	INSPECTION PROCEDURE	REFERENCE PAGE
None of the quarter windows open or close.	1	P.42-29
Only the quarter window <LH> does not open and close.	2	P.42-32
Only the quarter window <RH> does not open and close.	3	P.42-35
The quarter windows cannot be opened or closed by the power window main switch within 30 seconds after the ignition switch is turned from "ON" to "LOCK" (OFF) position. (However, this is before the front doors <LH> and <RH> are opened.)	-	Refer to GROUP 54B, Diagnosis P.54B-17.

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: None of the Quarter Windows are Open or Close.

Quarter Window Regulator Motor Drive Circuit



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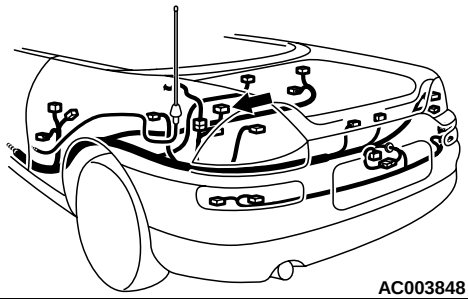
TSB Revision

CONNECTOR: F-34



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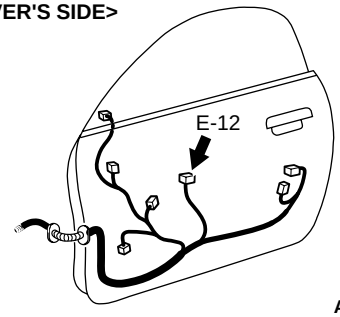
CONNECTOR: E-12
<DRIVER'S SIDE>



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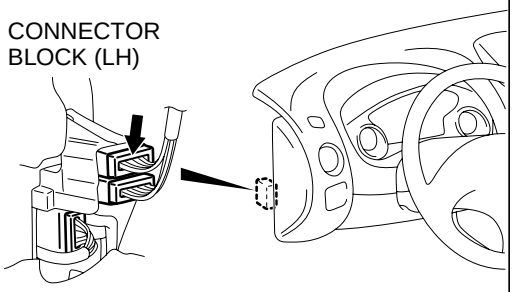
CONNECTOR: C-89



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CIRCUIT OPERATION

- When the power main switch is operated, signal is sent to the convertible top control module in order to operate the quarter window regulator motor to open/close the quarter window.

TECHNICAL DESCRIPTION (COMMENT)

- The cause may be a malfunction of the quarter window regulator motor drive circuit.

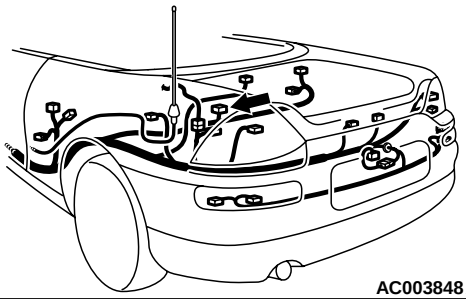
TROUBLESHOOTING HINTS

- Malfunction of the convertible top control module
- Malfunction of the power main switch
- Damaged harness wires or connectors

DIAGNOSIS

STEP 1. Check harness wires between convertible top control module connector F-34 (terminal 12) and power window main switch connector E-12 (terminal 2).

CONNECTOR: F-34



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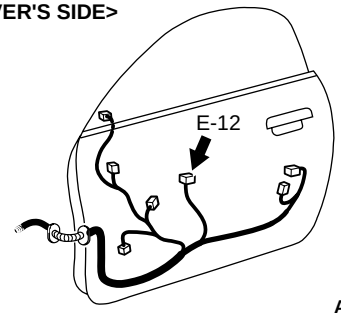
CONNECTOR: E-12
<DRIVER'S SIDE>



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Q: Are there any damaged wires between convertible top control module connector F-34(terminal 12) and power main switch connector E-12 (terminal 2)?

YES : Repair then, go to Step 3.
NO : Go to Step 2.

STEP 2. Check the power window main switch.

(1) Exchange the power window main switch with one in good condition to check that the quarter window glass operates properly. (Refer to P.42-54.)
(2) If normal operates can not be seen, replace the convertible top control module. (Refer to P.42-138.)

Q: Is the power window main switch damaged?

YES : Replace it, then go to Step 3.
NO : Go to Step 3.

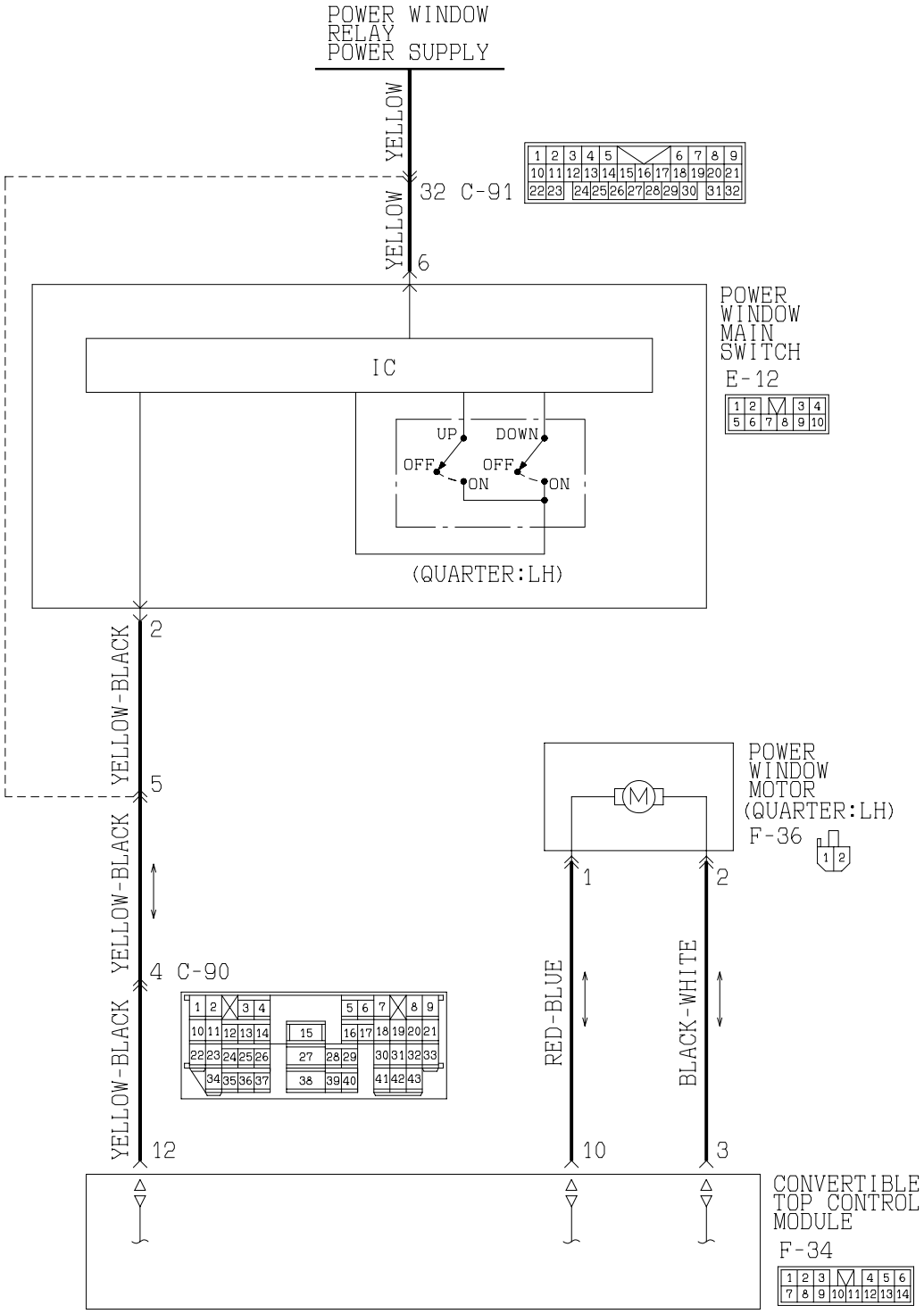
STEP 3. Check symptoms.

Q: Does the quarter windows open and close normally?

YES : This diagnosis is complete.
NO : Return to Step 1.

INSPECTION PROCEDURE 2: Only the Quarter Window <LH> does not Open and Close.

Quarter Window Regulator Motor <LH> Drive Circuit



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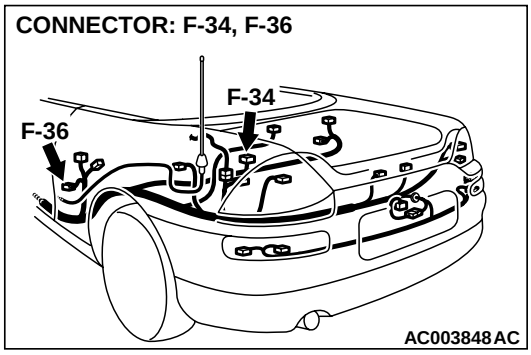


CIRCUIT OPERATION

- When the power window switch is operated, signal is sent to the convertible top control module in order to operate the quarter window regulator motor to open/close the quarter window.

TECHNICAL DESCRIPTION (COMMENT)

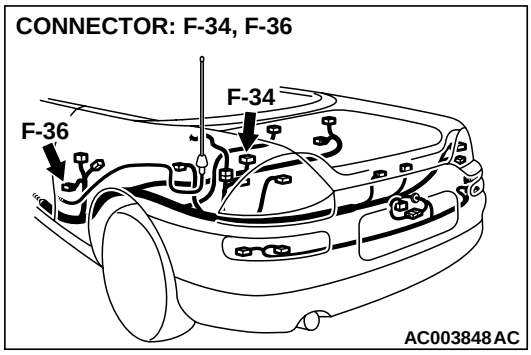
- The cause may be a malfunction of the quarter window regulator motor <LH> drive circuit.

TROUBLESHOOTING HINTS

- Malfunction of the convertible top control module.
- Malfunction of the quarter window regulator motor assembly <LH>.
- Damaged harness wires or connectors.

DIAGNOSIS

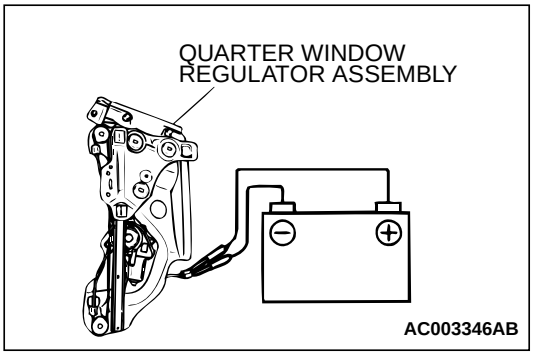
STEP 1. Check harness wires between convertible top control module connector F-34 (terminals 10, 3) and quarter window regulator motor <LH> connector F-36 (terminals 1, 2).



Q: Are there any damaged wires between convertible top control module connector F-34 (terminals 10, 3) and quarter window regulator motor <LH> connector F-36 (terminals 1, 2)?

YES : Replace it, then go to Step 4.
NO : Go to Step 2.

STEP 2. Check the quarter window regulator motor <LH> operation.



(1) Check that the motor runs smoothly when the battery is connected directly to the motor terminals.
(2) Furthermore, check that the motor operates in reverse when the terminal connections are reversed. (Refer to P.42-39.)

Q: Is the quarter window regulator motor <LH> damaged?

YES : Replace it, then go to Step 4.
NO : Go to Step 3.

STEP 3. Check the power window main switch continuity.

(1) Exchange the power window main switch with one in good condition to check that the quarter window glass operates properly. (Refer to P.42-54.)

(2) If normal operates can not be seen, replace the convertible top control module. (Refer to P.42-138.)

Q: Is the power window main switch damaged?

YES : Replace it, then go to Step 4.

NO : Go to Step 4.

STEP 4. Check symptoms.

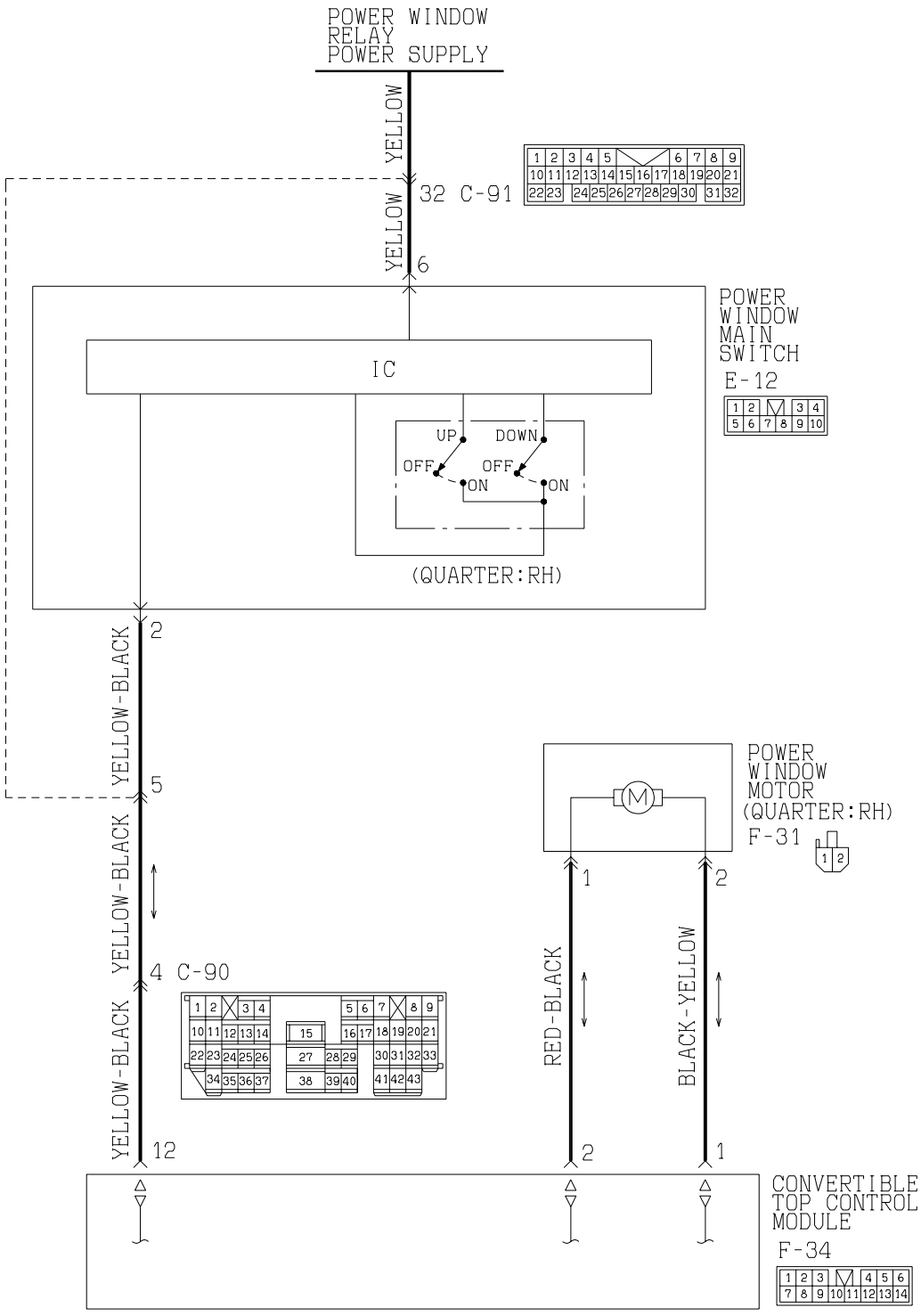
Q: Does the quarter windows open and close normally?

YES : This diagnosis is complete.

NO : Return to Step 1.

INSPECTION PROCEDURE 3: Only the Quarter Window <RH> does not Open and Close.

Quarter Window Regulater Motor <RH> Drive Circuit



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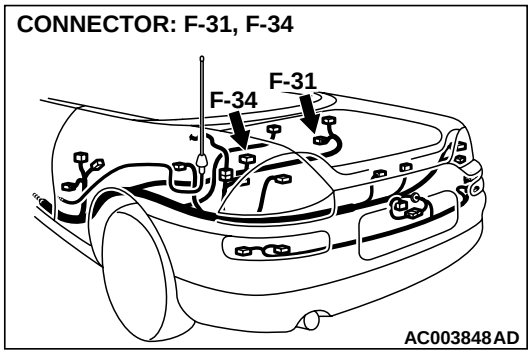
TSB Revision



CIRCUIT OPERATION

- When the power window main switch is operated, signal is sent to the convertible top control module in order to operate the quarter window regulator motor to open/close the quarter window.

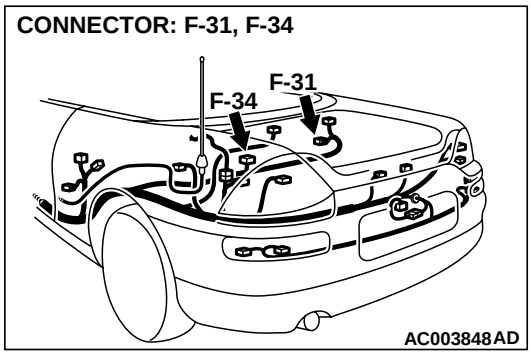
TECHNICAL DESCRIPTION (COMMENT)

- The cause may be a malfunction of the quarter window regulator motor <RH> drive circuit.

TROUBLESHOOTING HINTS

- Malfunction of the power window main switch
- Malfunction of the quarter window regulator motor assembly <RH>
- Damaged harness wires or connectors

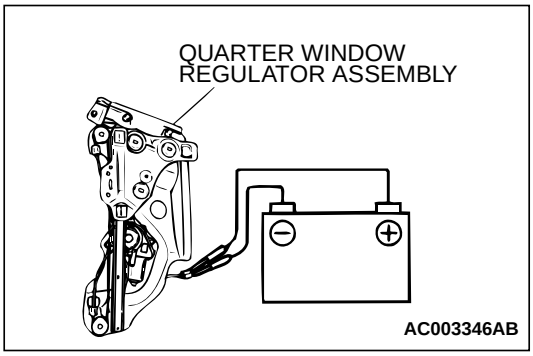
DIAGNOSIS



STEP 1. Check harness wires between convertible top control module connector F-34 (terminals 2, 1) and quarter window regulator motor connector F-31 (terminals 1, 2).

Q: Are there any damaged wires between convertible top control module connector F-34 (terminal 2, 1) and quarter window regulator motor connector F-31 (terminals 1, 2)?

YES : Replace it, then go to Step 4.
NO : Go to Step 2.



STEP 2. Check the quarter window regulator motor <RH> operation.

(1) Check that the motor runs smoothly when the battery is connected directly to the motor terminals.
(2) Furthermore, check that the motor operates in reverse when the terminal connections are reversed. (Refer to P.42-39.)

Q: Is the quarter window regulator motor <RH> damaged?

YES : Replace it, then go to Step 4.
NO : Go to Step 3.

STEP 3. Check the power window main switch continuity.

(1) Exchange the power window main switch with one in good condition to check that the quarter window glass operates properly. (Refer to P.42-54.)

(2) If normal operates can not be seen, replace the convertible top control module. (Refer to P.42-138.)

Q: Is the power window main switch damaged?

YES : Replace it, then go to Step 4.

NO : Go to Step 4.

STEP 4. Check symptoms.

Q: Does the quarter windows open and close normally?

YES : This diagnosis is complete.

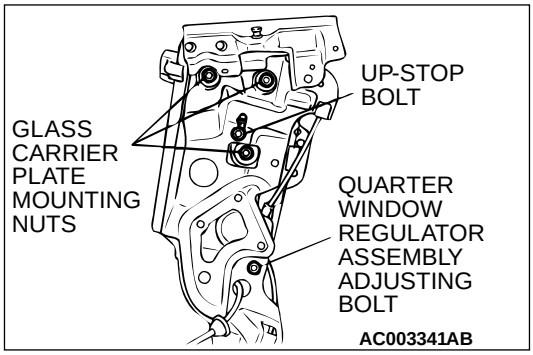
NO : Return to Step 1.

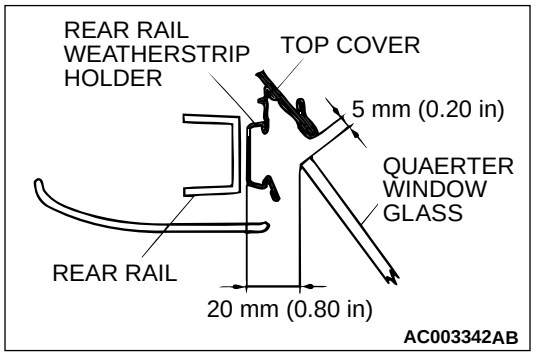
ON-VEHICLE SERVICE

QUARTER WINDOW GLASS ADJUSTMENT

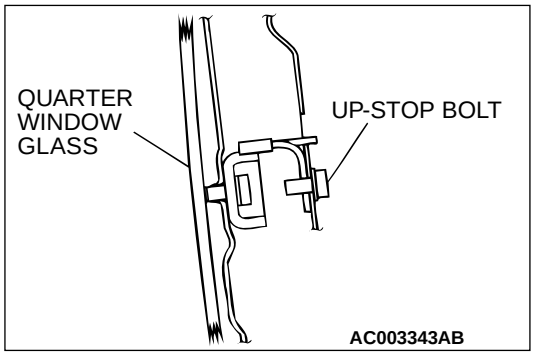
M1422005800043

1. Remove the quarter lower trim. (Refer to GROUP 52A P.52A-9.)
2. Remove the topstack rear rail weatherstrip. (Refer to P.42-136.)
3. Loosen the bolts and nuts of the following parts.
   - Quarter window regulator assembly
   - Glass carrier plate
   - Up-stop





4. Tighten the glass carrier plate mounting nuts so that the gap between the quarter window glass and topstack rear rail weatherstrip holder meets the value shown.
5. Using the quarter window regulator assembly adjusting bolt, adjust so that the gap between the quarter window glass and topstack rear rail weatherstrip holder meets the value shown.



6. Press the up-stop against the quarter window glass stop, and then tighten the up-stop bolt.

7. Lock the adjusting bolt with a nut.

⚠ CAUTION

Ensure that the weatherstrip is not wrinkled or out of position.

8. Install the topstack rear rail weatherstrip. (Refer to P.42-136.)
9. Install the quarter lower trim. (Refer to GROUP 52AP.52A-9 .)
10. Check the quarter window glass alignment according to the following procedure.
    (1) The upper end of the front door glass and the quarter window glass should be positioned so that standard value (a) is met.

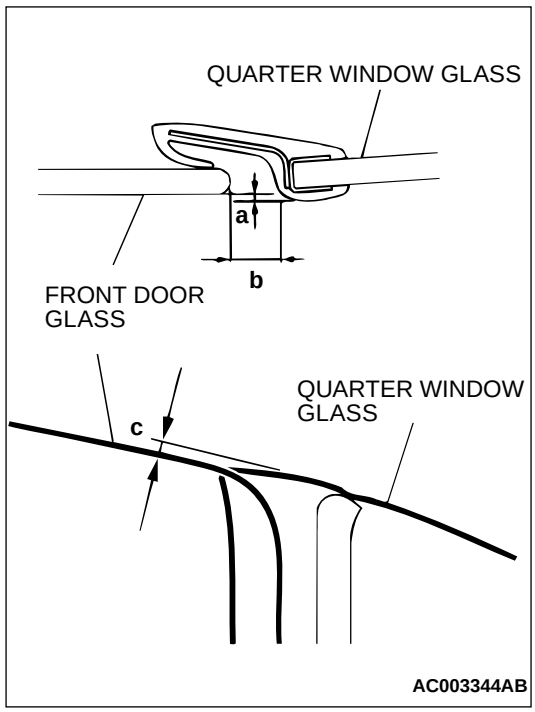
    Standard value (a): 1.0 ± 1.0 mm (0.04 ± 0.04 inches)

    (2) The front door glass and the quarter window glass should be positioned to meet standard value (c) so that gap in their upper end lines is smooth.

    Standard value (c): 3.0 ± 1.0 mm (0.12 ± 0.04 inches)

    (3) The end line of the front door glass and the front line of the quarter window glass should be parallel in the interval of standard value (b).

    Standard value (b): 8.7 mm (0.34 inches)

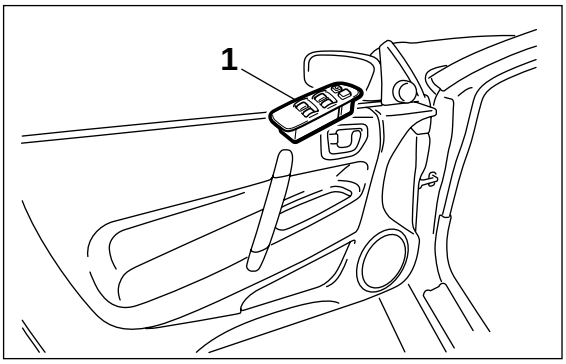


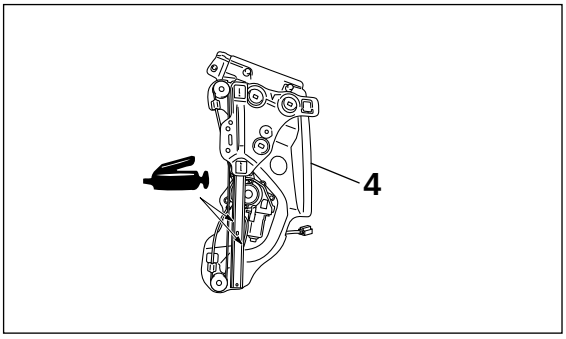
QUARTER WINDOW GLASS AND REGULATOR ASSEMBLY

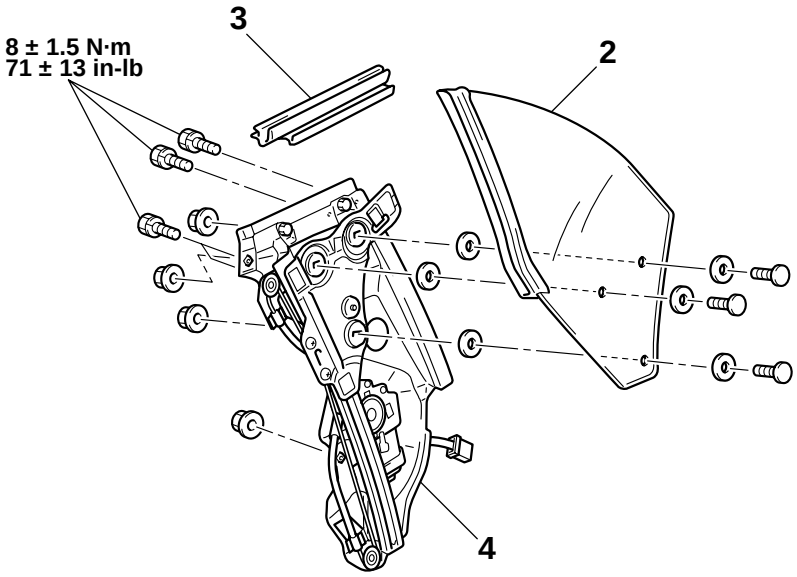
REMOVAL AND INSTALLATION

M1422006000028

Post-installation Operation
- Quarter Window Glass Adjustment (Refer to P.42-37.)







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POWER WINDOW MAIN SWITCH
SWITCH REMOVAL STEPS
1. POWER WINDOW MAIN SWITCH (REFER TO P.42-53.)

QUARTER WINDOW GLASS
REMOVAL STEPS
- REAR SPEAKER GARNISH (REFER TO GROUP 52A P.52A-9.)
- QUARTER BELT MOLDING (REFER TO GROUP 51 P.51-11.)

<<A>> 2. QUARTER WINDOW GLASS

QUARTER WINDOW REGULATOR ASSEMBLY REMOVAL STEPS

<<A>> 2. QUARTER WINDOW GLASS
- QUARTER TRIM (REFER TO GROUP 52A P.52A-9.)
- REAR SPEAKER (REFER TO GROUP 54AP.54A-218 .)

3. QUARTER WINDOW INNER BELTLINE MOLDING

<<B>> 4. QUARTER WINDOW REGULATOR ASSEMBLY

REMOVAL SERVICE POINTS

<<A>> QUARTER WINDOW GLASS REMOVAL

1. Completely raise the quarter window.
2. Remove the quarter window

<<B>> QUARTER WINDOW REGULATOR ASSEMBLY REMOVAL

Disconnect regulator motor connector, remove the quarter window regulator assembly.

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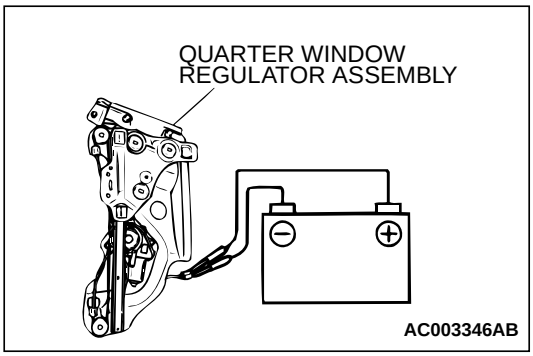
INSPECTION

M1421007600020



QUARTER WINDOW REGULATOR MOTOR CHECK
Check that motor runs smoothly when the battery is connected directly to the motor terminals.
Furthermore, check that the motor operates in reverse when the terminal connections are switched.

DOOR

GENERAL DESCRIPTION

M1423000100138

OPERATION

CENTRAL DOOR LOCKING SYSTEM

The central door locking system operates the door lock actuator to lock or unlock the doors using the operation of the door lock switch or key built into the driver's side inside door lock knob and power window (main or sub) switch.The system has the following operations and features:

- All doors can be locked or unlocked using the door (LH or RH <vehicles without keyless entry system>) key cylinder key operation.
- All doors can be locked using the driver's inside door lock knob.
- All doors can be locked using the door lock switch built into the power window (main or sub) switch.
- You cannot lock an open door if the key is in the ignition switch. The key reminder function automatically unlocks all doors when the door is locked.

Power windows

Power windows are used in all vehicles. When the power window (main or sub) switch is operated, the door windows will open or close. This system has the following operations and features:

- When the power window main switch lock/unlock switch is locked, the door windows can only be opened or closed by the power window main switch on the driver's door.
- When all doors are closed and the ignition is turned off, the power windows can be operated for 30 seconds from the time the ignition is turned off.
- The power window main switch contains a one-touch down switch that will automatically fully open driver's side door window only.

CENTRAL DOOR LOCKING SYSTEM DIAGNOSIS

M1427000700057

The central door locking system is controlled by the Smart Wiring System (SWS). For troubleshooting, refer to GROUP 54B, Diagnosis P.54B-17.

POWER WINDOW DIAGNOSIS

M1429000700150

The power window is controlled by the Smart Wiring System (SWS). For troubleshooting, refer to GROUP 54B, Diagnosis P.54B-17.

DOOR DIAGNOSIS

DOOR DIAGNOSIS

M1423000700118

The central door locking system is controlled by the Simplified by the Simplified Wiring System (SWS). Refer to GROUP 54B, Diagnosis for troubleshootingP.54B-17 .

INTRODUCTION TO GLASS AND DOOR DIAGNOSIS

M1423007300081

Glass and door faults include water leaks and improper opening and closing. Causes for these faults can include faults in the glass, weatherstrip, drain hole, waterproof film or door installation.

GLASS AND DOOR DIAGNOSTIC TROUBLESHOOTING STRATEGY

M1423006700086

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted most of the possible ways to find a glass and door fault.

1. Gather information from the customer.
2. Verify that the condition described by the customer exists.
3. Find the malfunction by following the Symptom Chart.
4. Verify malfunction is eliminated.

SYMPTOM CHART

M1423007000109

SYMPTOMS	INSPECTION PROCEDURE	REFERENCE PAGE
Water leak through door window glass	1	P.42-41
Door window malfunction	2	P.42-42
Water leak through door edge	3	P.42-42
Water leak from door center	4	P.42-42
Door hard to open	5	P.42-43
Door does not open or close completely	6	P.42-43
Uneven gap between body	7	P.42-43
Wind noise around door	8	P.42-43

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Water Leak through Door Window Glass

DIAGNOSIS

STEP 1. Check the door window glass installation.

Q: Is the door window glass installed correctly?
YES : Go to Step 2.
NO : Adjust it. (Refer to P.42-47.) Then go to Step 3.

STEP 2. Check the clearance at the top of the window glass.

Q: Is the clearance at the top of the window glass correct?
YES : Go to Step 3.
NO : Adjust it. (Refer to P.42-47.) Then go to Step 3.

STEP 3. Check symptoms.

Q: Is any water leaking?
YES : Return to Step 1.
NO : This diagnosis is complete.

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INSPECTION PROCEDURE 2: Door Window Malfunction

DIAGNOSIS

STEP 1. Check the door window installation condition.

Q: Is the door window installation condition good?
YES : Go to Step 2.
NO : Adjust it. (Refer to P.42-47.) Then go to Step 4.

STEP 2. Check the door sash.

Q: Is the door sash in good condition?
YES : Go to Step 3.
NO : Repair or replace it, then go to Step 4.

STEP 3. Inspect the window regulator assembly.

Q: Is the window regulator assembly in good condition?
YES : Go to Step 4.
NO : Repair or replace it, then go to Step 4.

STEP 4. Check symptoms.

Q: Does the door window operate correctly?
YES : This diagnosis is complete.
NO : Return to Step 1.

INSPECTION PROCEDURE 3: Water Leak through Door Edge

DIAGNOSIS

STEP 1. Check the weatherstrip.

Q: Is the weatherstrip in good condition?
YES : Go to Step 2.
NO : Replace it, then go to Step 3.

STEP 2. Check door fit (alignment).

Q: Is the door fit (alignment) correct?
YES : Go to Step 3.
NO : Adjust it. (Refer to P.42-46.) Then go to Step 3.

STEP 3. Check symptoms.

Q: Is any water leaking?
YES : Return to Step 1.
NO : This diagnosis is complete.

INSPECTION PROCEDURE 4: Water Leak through Door Center

DIAGNOSIS

STEP 1. Check the drain hole.

Q: Is the drain hole clogged?
YES : Replace it, then go to Step 3.
NO : Go to Step 2.

STEP 2. Check the waterproof film.

Q: Is the waterproof film in good condition?
YES : Go to Step 3.
NO : Repair or replace it, then go to Step 3.

STEP 3. Check symptoms.

Q: Is any water leaking?
YES : Return to Step 1.
NO : This diagnosis is complete.

INSPECTION PROCEDURE 5: Door Hard to Open

DIAGNOSIS

STEP 1. Adjust the latch and striker engagement.
(Refer to P.42-46.)

Q: Is the latch and striker engagement adjusted?
YES : Go to Step 2.
NO : Adjust it. (Refer to P.42-46.) Then go to Step 4.

STEP 2. Check for possible lock rod damage.

Q: Is the possible lock rod damaged?
YES : Repair or replace it, then go to Step 4.
NO : Go to Step 3.

STEP 3. Check door handle flexibility (amount of movement of handle required to open door).

Q: Is the door handle flexibility good?
YES : Go to Step 4.
NO : Adjust it. (Refer to P.42-52 and P.42-52.) Then go to Step 4.

STEP 4. Check symptoms.

Q: Does the door open easily?
YES : This diagnosis is complete.
NO : Return to Step 1.

INSPECTION PROCEDURE 6: Door does Open or Close Completely

DIAGNOSIS

STEP 1. Check the door hinge position.

Q: Is the door hinge position correct?
YES : Go to Step 2.
NO : Adjust it. (Refer to P.42-46.) Then go to Step 4.

STEP 2. Check the door.

Q: Is the door in good condition?
YES : Go to Step 3.
NO : Repair or replace it, then go to Step 4.

STEP 3. Check the grease.

Q: Is the door check or door hinge grease sufficient?
YES : Go to Step 4.
NO : Apply the grease, then go to Step 4.

STEP 4. Check symptoms.

Q: Does the door open and close correctly?
YES : This diagnosis is complete.
NO : Return to Step 1.

INSPECTION PROCEDURE 7: Uneven Gap between Body

DIAGNOSIS
Adjust the door fit. (Refer to P.42-47.) Then check that the gap has been improved.

INSPECTION PROCEDURE 8: Wind Noise around Door

DIAGNOSIS

STEP 1. Check the weatherstrip for holding condition.

Q: Is the weatherstrip installed properly?
YES : Go to Step 2.
NO : Repair or replace it. Then go to Step 5.

STEP 2. Check the weatherstrip for installation condition.

Q: Is the weatherstrip installed properly?
YES : Go to Step 3.
NO : Repair or replace it. Then go to Step 5.

STEP 3. Check the clearance.

Q: Is the clearance between the door glass and the door weatherstrip holder proper?
YES : Go to Step 4.
NO : Adjust it. (Refer to P.42-47.) Then go to Step 5.

STEP 4. Check the door.

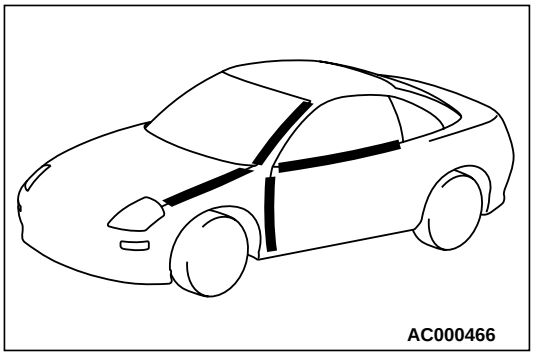
Q: Is the door deformed?
YES : Repair or replace it. Then go to Step 5.
NO : Go to Step 5.

STEP 5. Check symptoms.

Q: Has the wind noise been improved?
YES : Return to Step 1.
NO : This diagnosis complete.

HOW TO LOCATE WIND NOISES

M1421004200067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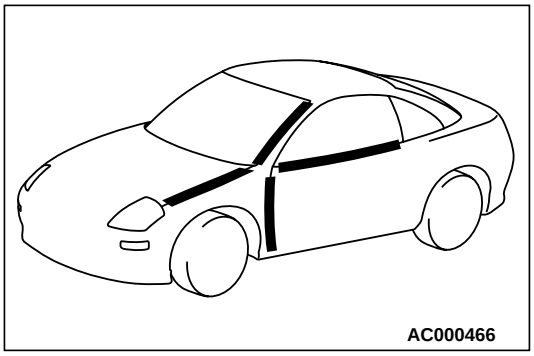
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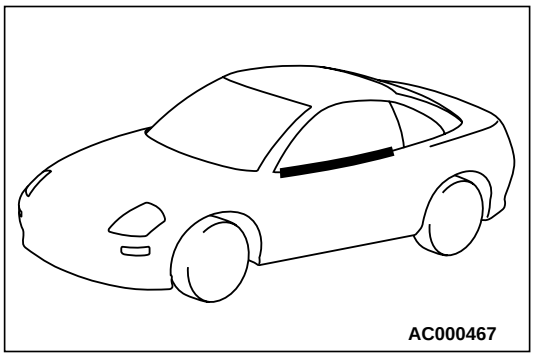
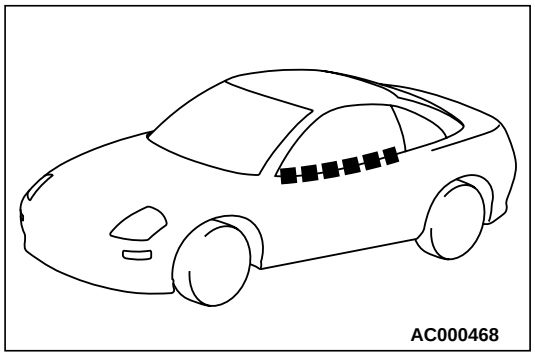
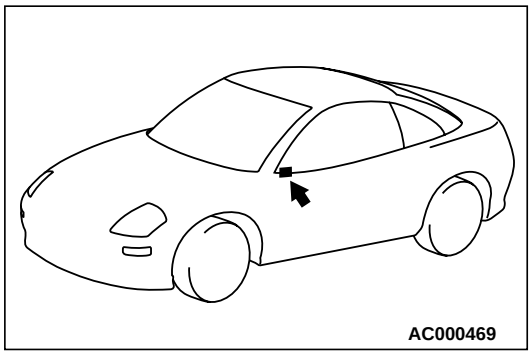

AC000467

1. Attach cloth tape to every place, such as panel seams, projections, molding seams, glass and body seams, etc. which might conceivably be the source of wind noise.
2. Then make a road test to check that the places not covered by tape are not sources of wind noise.
3. Remove the strips of tape one by one, making a road test after each is removed, until a wind noise source is discovered.
4. When such a place is found, cover it again and repeat the procedure to check if there are any other noise source.
5. If no others are found, the last remaining tape is the only source.



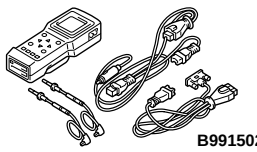
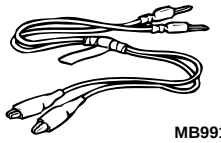
6. Cut the remaining piece of tape into smaller pieces, attach it again as it was before, and then remove the pieces one by one to narrow down the source.

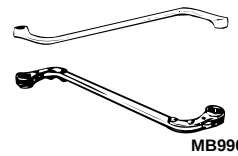
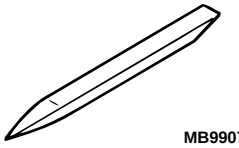
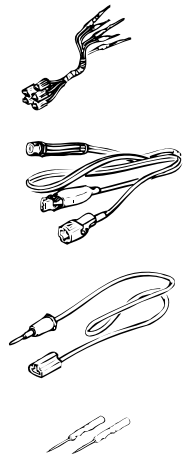


7. Check that wind noise occurs when the last remaining tape is removed, and that noise does not occur when it is re-attached.
8. When the source(s) of the wind noise is finally located, attach butyl tape, body sealer or similar material to obstruct this source as much as possible.

SPECIAL TOOLS

M1423000600070

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 B991502	MB991502 Scan tool (MUT-II)	DRB-III scan tool	ETACS-ECU input signal or diagnostic trouble code checking
 MB991529	MB991529 Diagnostic trouble code check harness	MB991529	ETACS-ECU input signal or checking (when using a voltmeter)

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 MB990900	MB990900 or MB991164 Door adjusting wrench	MB990900-01	Adjustment of door fit
 MB990784	MB990784 Ornament remover	General service tool	Removal of trim, etc.
 MB991223	MB991223 Harness set • A: MB991219 Test harness • B: MB991220 LED harness • C: MB991221 LED harness adapter • D: MB991222 Probe	MB991223	Measurement of terminal voltage • A: Connector pin contact pressure inspection • B: Power circuit inspection • C: Power circuit inspection • D: Commercial tester connection

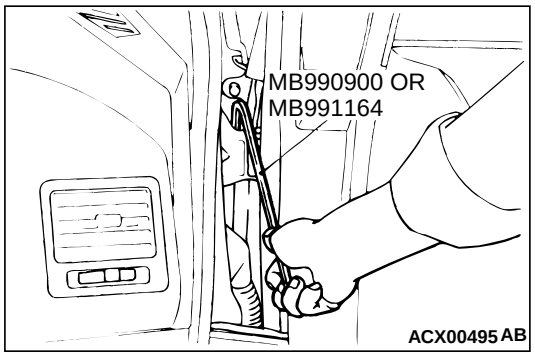
ON-VEHICLE SERVICE

DOOR FIT ADJUSTMENT

M1423000900059

⚠ CAUTION

- **Attach protection tape to the fender and door edges where the hinge is installed.**
- **Do not rotate special tool MB991164 with a torque of over 98 N·m (72 ft-lb)**



1. Use special tool MB990900 or MB991164 to loosen the hinge mounting bolts on the body side, and then adjust the clearance around the door so that it is uniform on all sides.
2. When there is a stepped section in the door and body, use special tool MB990900 or MB991164 to loosen the hinge mounting bolts on the door side, and ten adjust the door fit.

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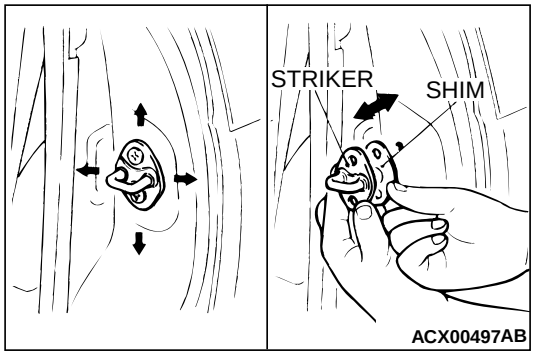
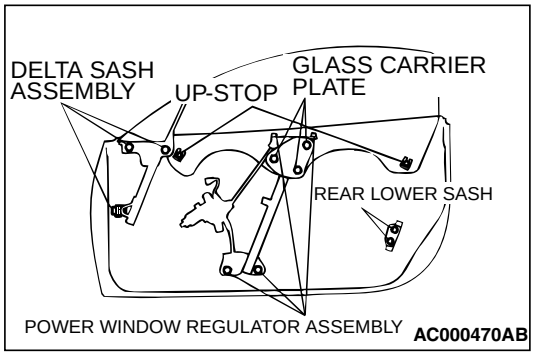


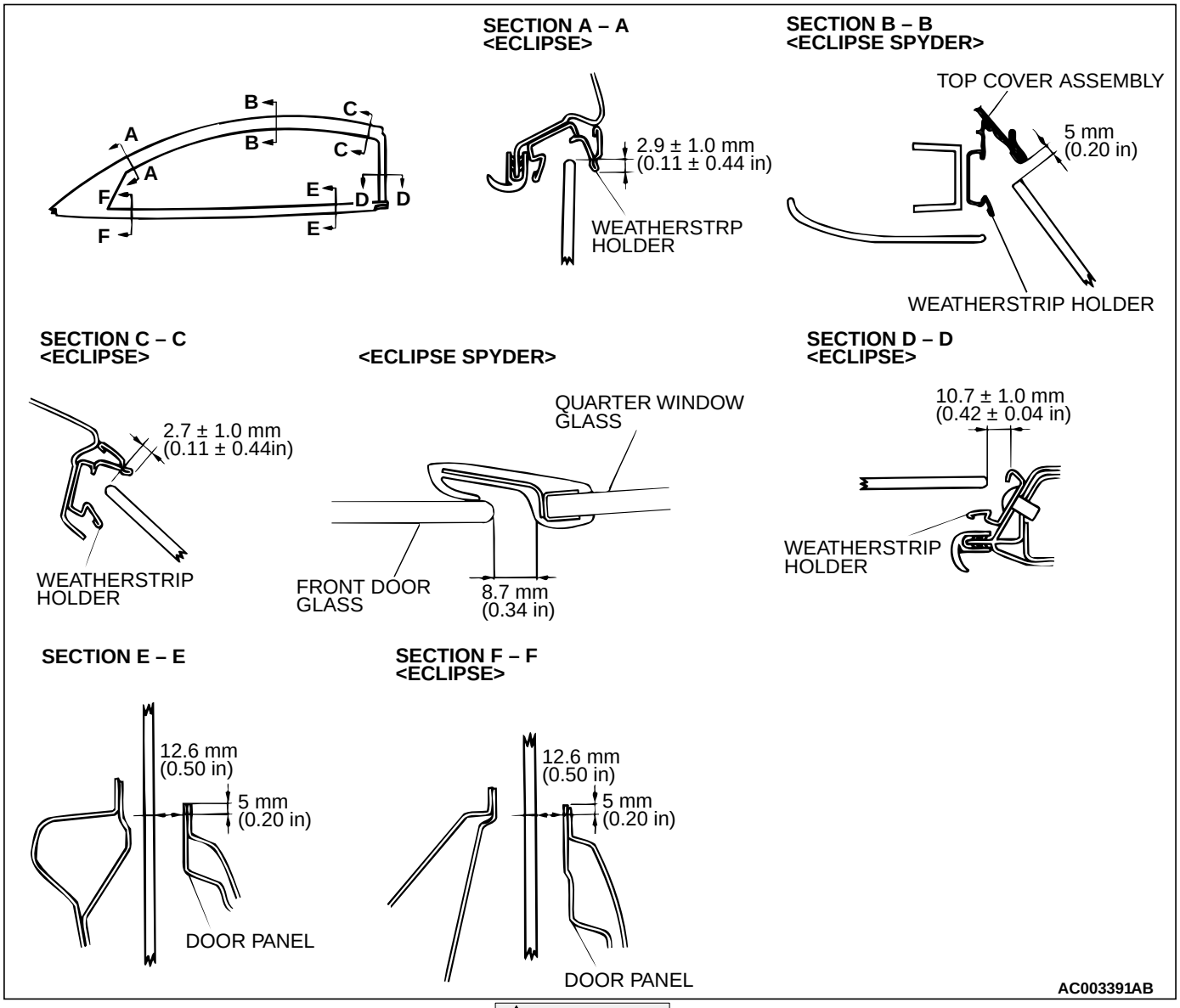
3. If the door opening and closing are stiff, adjust the linking of the striker and the door latch using the shim, while moving the striker up and down, or left and right.

DOOR WINDOW GLASS ADJUSTMENT

M1423001000145



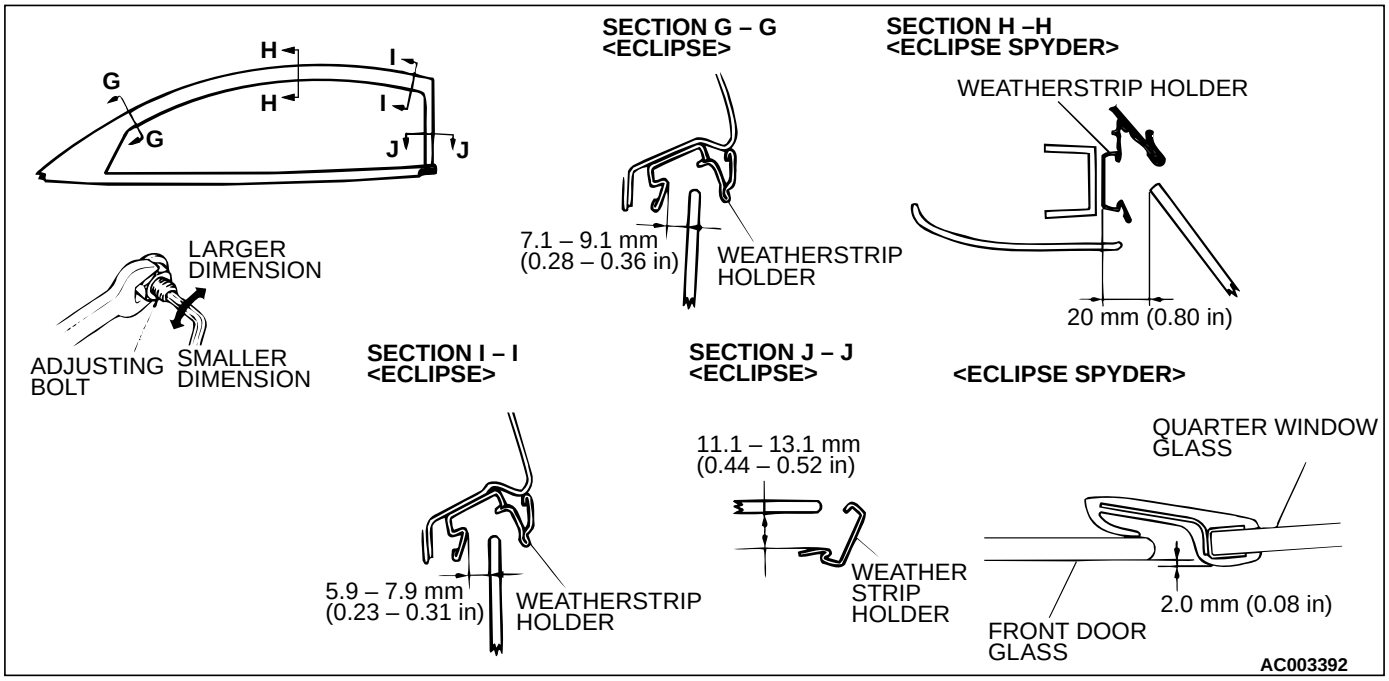
1. Remove the door trim and waterproof film. (Refer to P.42-54.)
2. Remove the drip line weatherstrip. <ECLIPSE> (Refer to P.42-65.)
3. Remove the topstack rail weatherstrip. <ECLIPSE SPYDER> (Refer to P.42-136.)
4. Loosen the bolts and nuts of the following parts.
   - Delta sash assembly
   - Power window regulator assembly
   - Glass carrier plate
   - Up-stop
   - Rear lower sash
5. Tighten the power window regulator assembly upper bolts and the glass carrier plate mounting bolts so that the clearances between the weatherstrip holder and the window glass as well as between the door panel and the window glass meet the respective standard values. (Sections A – A, B – B, C – C, D – D, E – E, F – F.)

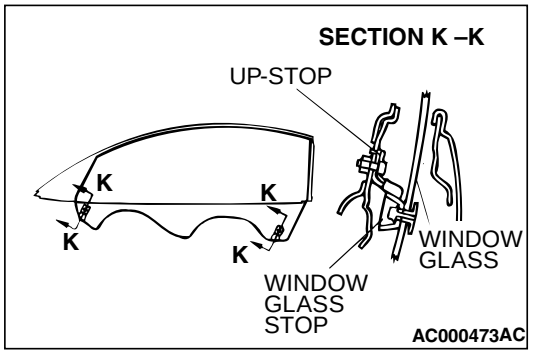


⚠ CAUTION

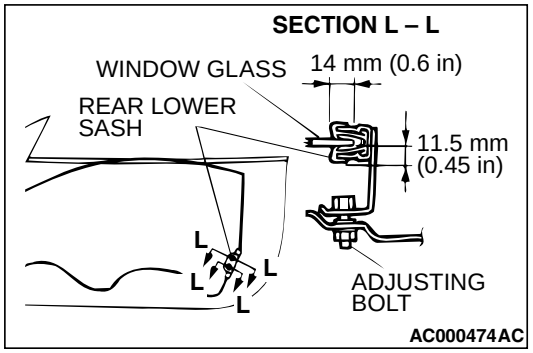
The right and left adjusting bolts should turned by the same number of threads.

6. Turn the lower adjusting bolts (right and left) of the power window regulator assembly until the clearances between the weatherstrip and the window glass meet the respective standard values. (Sections G – G, H – H, I – I, J – J.)





7. Press the up-stop against the window glass stop, and then tighten the up-stop nut.

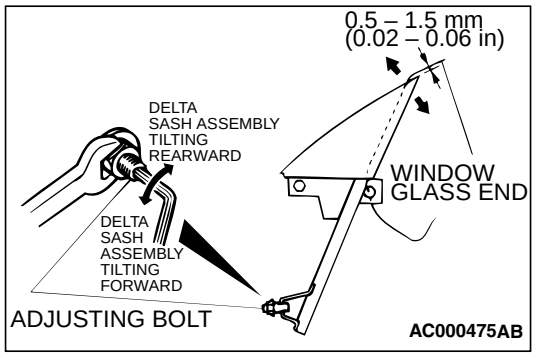


8. Lower the window glass to the extreme position.

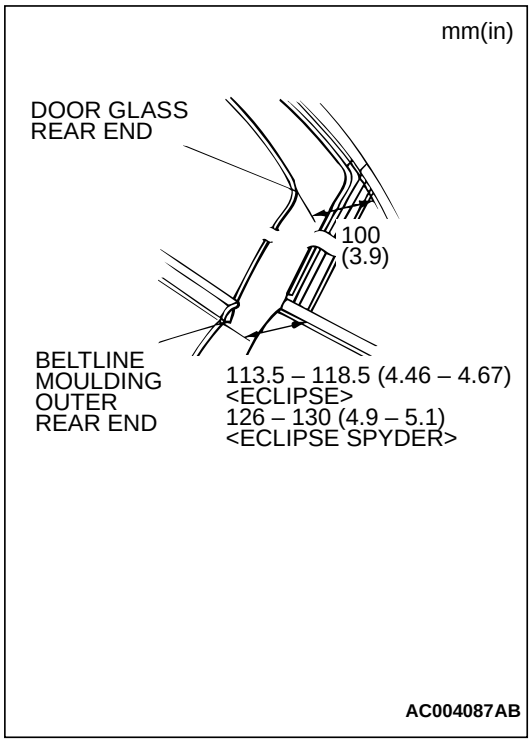
⚠ CAUTION

The adjusting bolts should be turned by the same number of threads.

9. Tighten the adjusting bolts (upper and lower) until the rear lower sash is positioned as shown in the illustration, and then lock the nuts place.

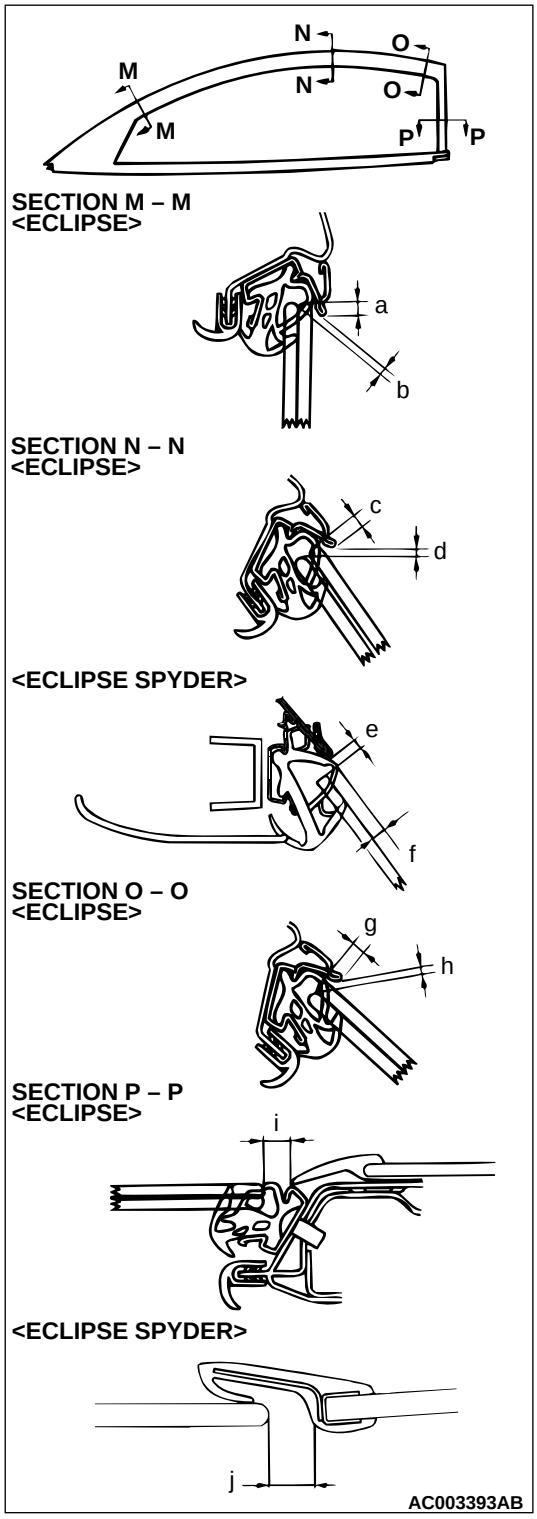


10. Raise the window glass to the extreme position.
11. Turn the adjusting bolt until the gap between the delta sash assembly and the window glass end meets the shown dimension.
12. Lower the window glass.
13. Lock the adjusting bolt of the delta sash assembly with a nut
14. Tighten the two upper bolts at the delta sash assembly.



⚠ CAUTION
Ensure that the weatherstrip is not wrinkled or out of position.

15. Install the drip line weatherstrip to the weatherstrip holder. <ECLIPSE> (Refer to P.42-65.)
16. Install the topstack rail weatherstrip to the weatherstrip holder. <ECLIPSE SPYDER> (Refer to P.42-136.)
17. Install the door trim and the waterproof film (Refer to P.42-54.)
18. Check the door window glass alignment according to following procedure.
    (1) Close the door window glass fully, and close the door until the clearance between the door window glass rear end and the weatherstrip reaches 100 mm (3.9 inches). At this time, the distance between the rear end of the belt line molding outer and the quarter panel should be 113.5 – 118.5 mm (4.46 – 4.67 inches) <ECLIPSE> and 126 – 130 mm (4.9 – 5.1 inches) <ECLIPSE SPYDER>.



(2) The clearance between the glass and the glass catch should be within the range of standard values (a, c, e, g) when the window is fully closed and the door is closed gently.

Standard value

(a): 2.9 ± 1.0 mm (0.11 ± 0.04 inches)
(c): 4.5 ± 1.0 mm (0.18 ± 0.04 inches)
(e): 5.0 mm (0.20 inches)
(g): 3.4 mm (0.13 inches)
(i): 10.7 ± 1.0 mm (0.42 ± 0.04 inches)
(j): 8.7 mm (0.32 inches)

NOTE: IF the clearance is too small, the glass catch will move above the glass when the door is closed. If the clearance is too large, wind noise may be generated at high vehicle speeds because the glass catch is not hooked onto the glass.

(3) The amount of catch of the door catch on the door glass and the weatherstrip should be at the standard values b, d, f:

when the window is closed fully and then the door is closed.

Standard value

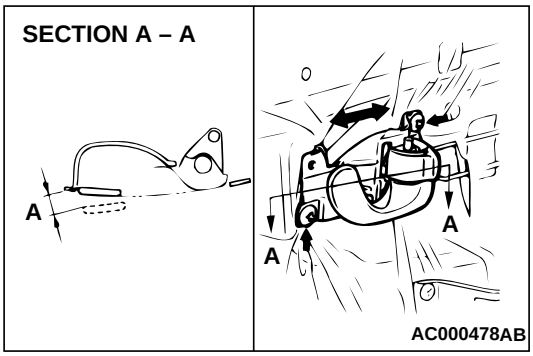
(b): 2.7 ± 1.0 mm (0.11 ± 0.04 inches)
(d): 2.7 ± 1.0 mm (0.11 ± 0.04 inches)
(f): 8.0 mm (0.32 inches)
(h): 2.4 ± 1.0 mm (0.09 ± 0.04 inches)

(4) The door glass should slide smoothly over its full range of movement when the door is closed.

(5) The glass catch and the weatherstrip should be parallel with the door glass and the two up-stops should touch simultaneously when the glass is fully closed.

DOOR INSIDE HANDLE PLAY CHECK AND ADJUSTMENT

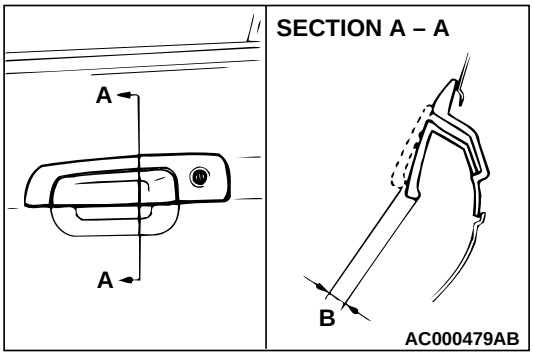
M1423001500054



1. Check that the door inside handle play is within the standard value range.
   Standard value (A): 3.2 mm (0.13 inch)
2. If the door inside handle play is outside the standard value range, remove the door trim. (Refer to P.42-54.)
3. Loosen the inside handle mounting screws, and then move the inside handle back and forth to adjust the play.

DOOR OUTSIDE HANDLE PLAY CHECK

M1423001600051



1. Check that the door outside handle play is within the standard value range.
   Standard value (B): 2.4 mm (0.09 inch)
2. If the door outside handle play is not within the standard value range, check the door outside handle or the door latch assembly. Replace if necessary.

CIRCUIT BREAKER (INCORPORATED IN THE POWER WINDOW MOTOR) INSPECTION

M1429001000046

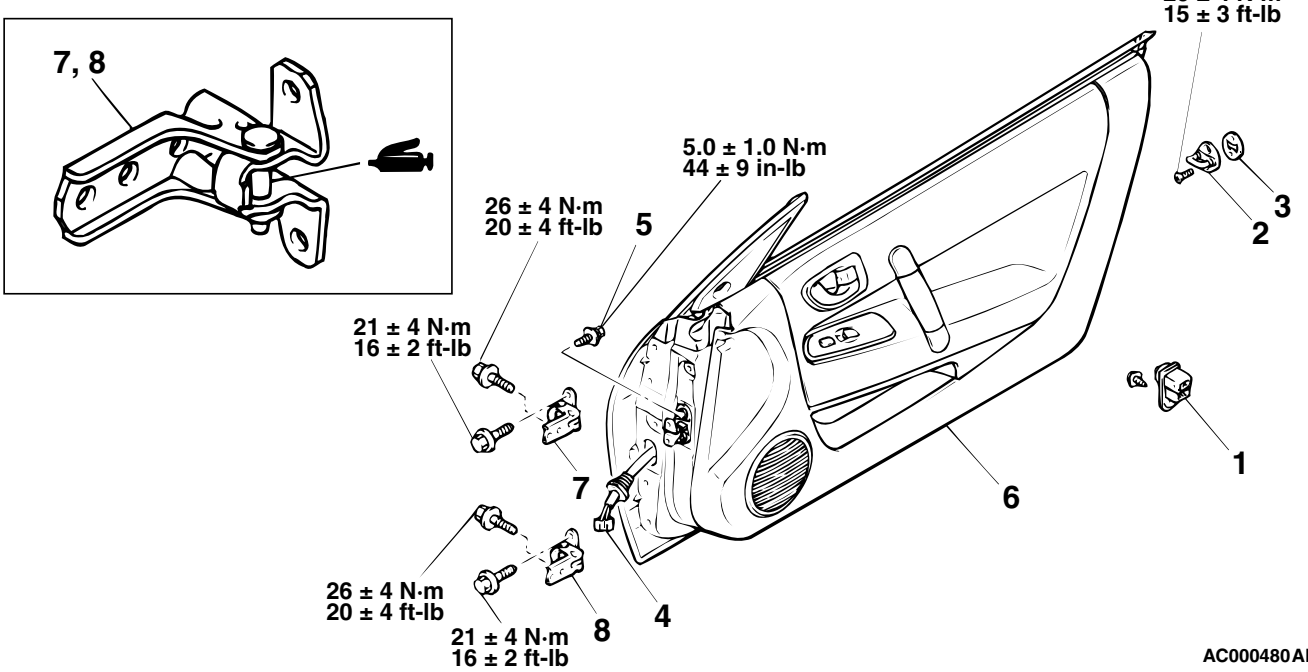
1. Pull the power window switch to the UP position to fully close the door window glass, and keep pulling the switch for a further 10 seconds.
2. Release the power window switch from the UP position and immediately press it to the DOWN position. The condition of the circuit breaker is good if the door window glass starts to move downwards within 60 seconds.

DOOR ASSEMBLY

REMOVAL AND INSTALLATION

M1423002200067

Post-installation Operation
- Door Fit Adjustment (Refer to P.42-46.)



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DOOR SWITCH REMOVAL STEPS
1. DOOR SWITCH

STRIKER REMOVAL STEPS
2. STRIKER
3. STRIKER SHIM

DOOR ASSEMBLY REMOVAL STEPS
- SCUFF PLATE AND COWL SIDE TRIM (REFER TO GROUP 52A P.52A-9.)

4. HARNESS CONNECTOR

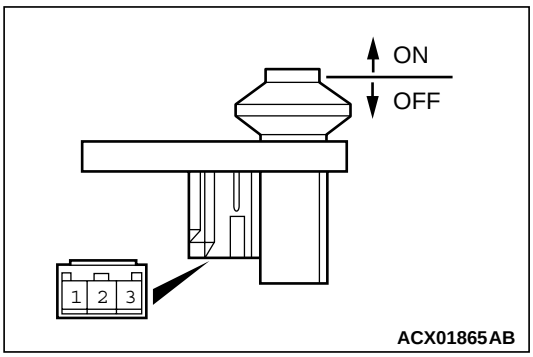
DOOR ASSEMBLY REMOVAL STEPS
5. DOOR CHECK CONNECTING BOLT
6. DOOR ASSEMBLY
7. DOOR UPPER HINGE
8. DOOR LOWER HINGE

Required Special Tool
- MB990900 or MB991164: Door Adjusting Wrench

INSPECTION

M1421007600257

DOOR SWITCH CHECK



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SWITCH POSITION	TESTER CONNECTION	SPECIFIED CONDITION
Released (ON)	1 – 2	Less than 2 ohm
Depressed (OFF)	1 – 2	Open circuit

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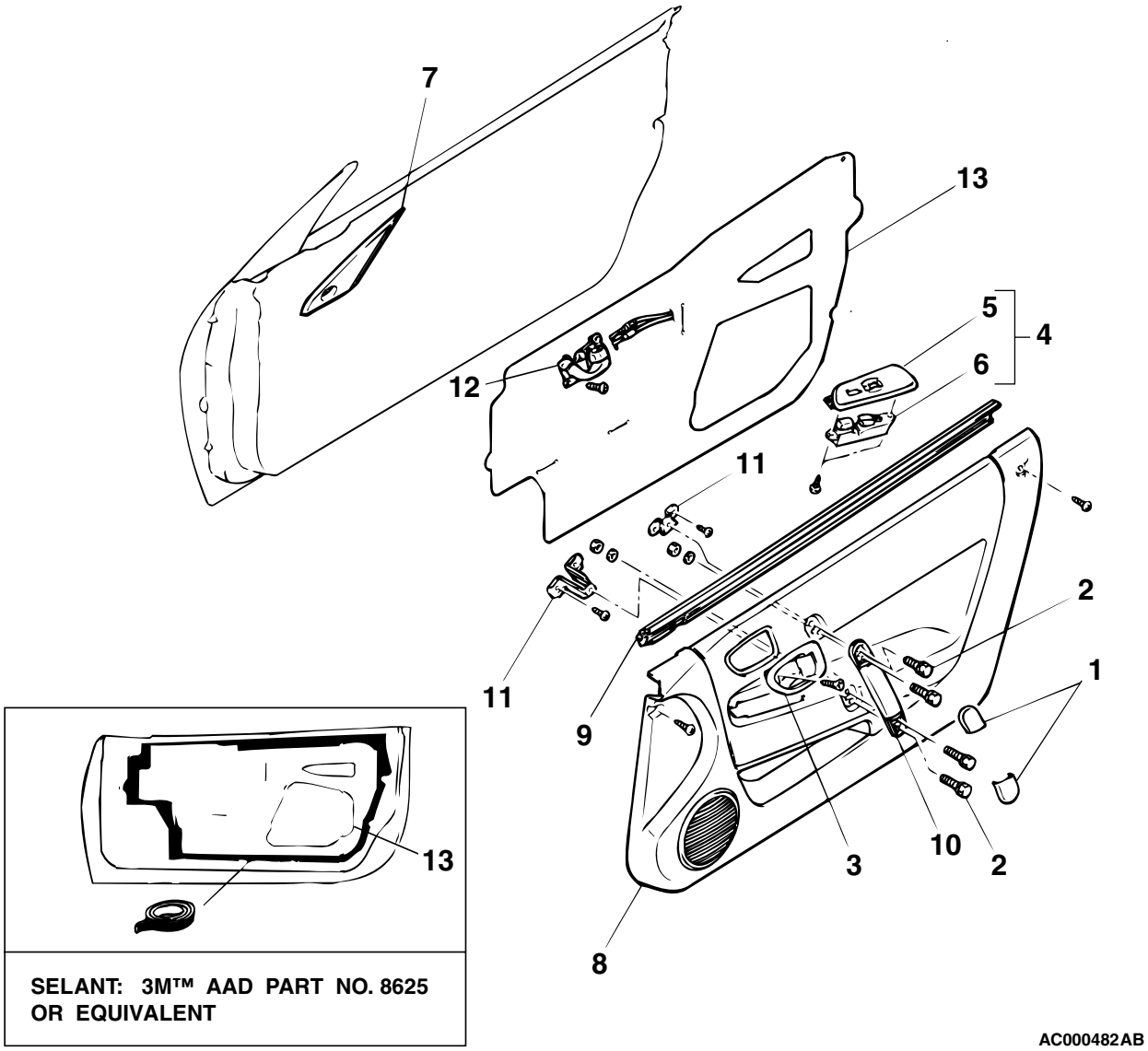
DOOR TRIM AND WATERPROOF FILM

REMOVAL AND INSTALLATION

M1423004300060



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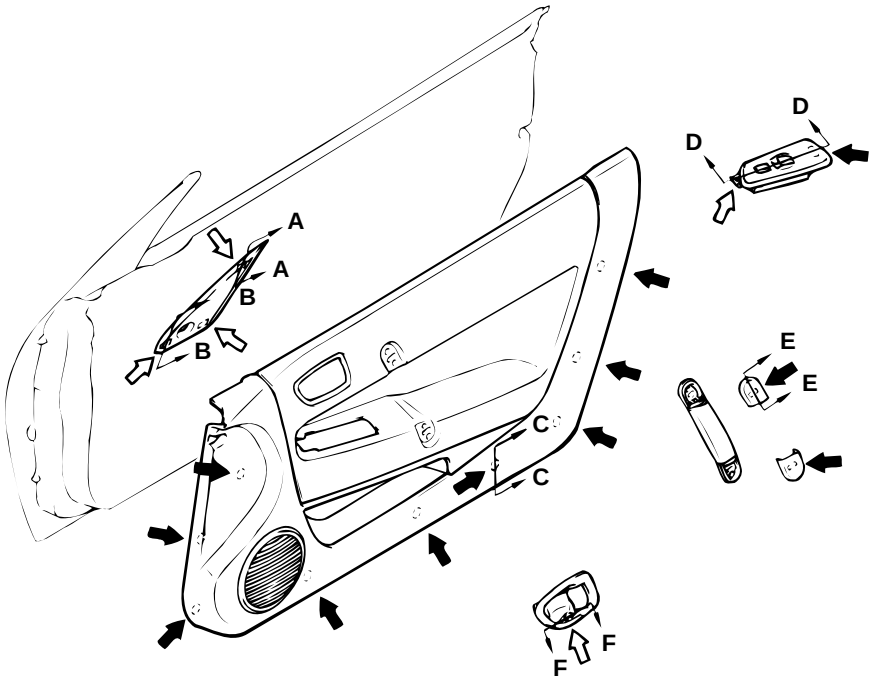
REMOVAL STEPS

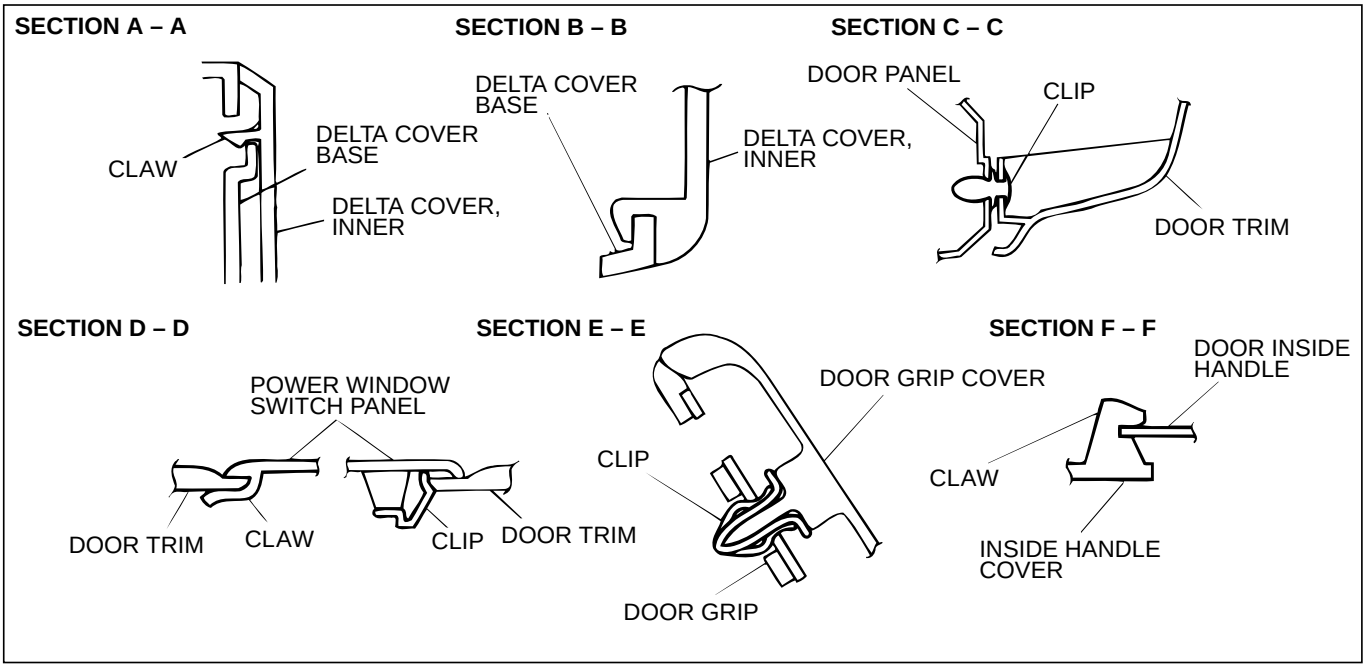
1. DOOR GRIP COVER
2. BOLT
3. DOOR INSIDE HANDLE COVER
4. POWER WINDOW SWITCH AND POWER WINDOW SWITCH PANEL ASSEMBLY
5. POWER WINDOW SWITCH PANEL
6. POWER WINDOW SWITCH

REMOVAL STEPS (Continued)

7. INNER DELTA COVER OR TWEETER COVER
8. DOOR TRIM
9. DOOR BELT LINE MOLDING ASSEMBLY
10. DOOR GRIP
11. DOOR GRIP BRACKET
12. DOOR INSIDE HANDLE
13. WATERPROOF FILM

CLIP AND CLAW POSITIONS





NOTE

: CLIP POSITIONS

: CLAW POSITIONS

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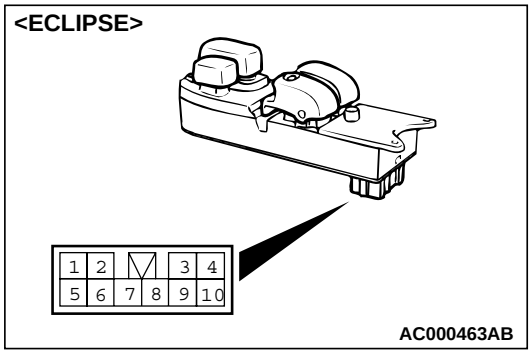
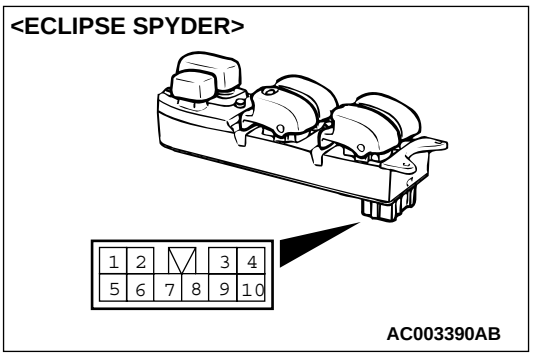
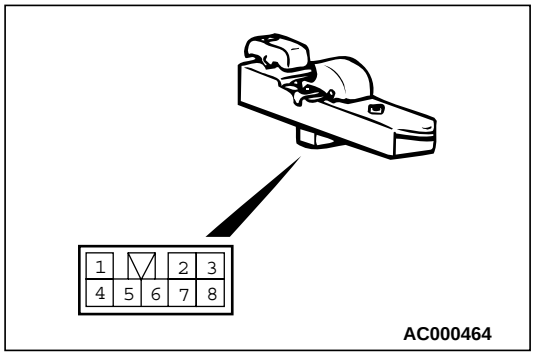
INSPECTION

M1421007600042

POWER WINDOW SWITCH CHECK







POWER WINDOW MAIN SWITCH CHECK

SWITCH POSITION		TESTER CONNECTION	SPECIFIED CONDITION
LH	UP	1 – 6, 5 – 9	Less than 2 ohm
	OFF	1 – 5 – 9	Less than 2 ohm
	DOWN	5 – 6, 1 – 9	Less than 2 ohm
RH	UP	6 – 7, 8 – 9*	Less than 2 ohm
	OFF	7 – 8 – 9*	Less than 2 ohm
	DOWN	6 – 8, 7 – 9*	Less than 2 ohm

*NOTE: *:Lock switch to UNLOCK position.*

POWER WINDOW SUB SWITCH CHECK

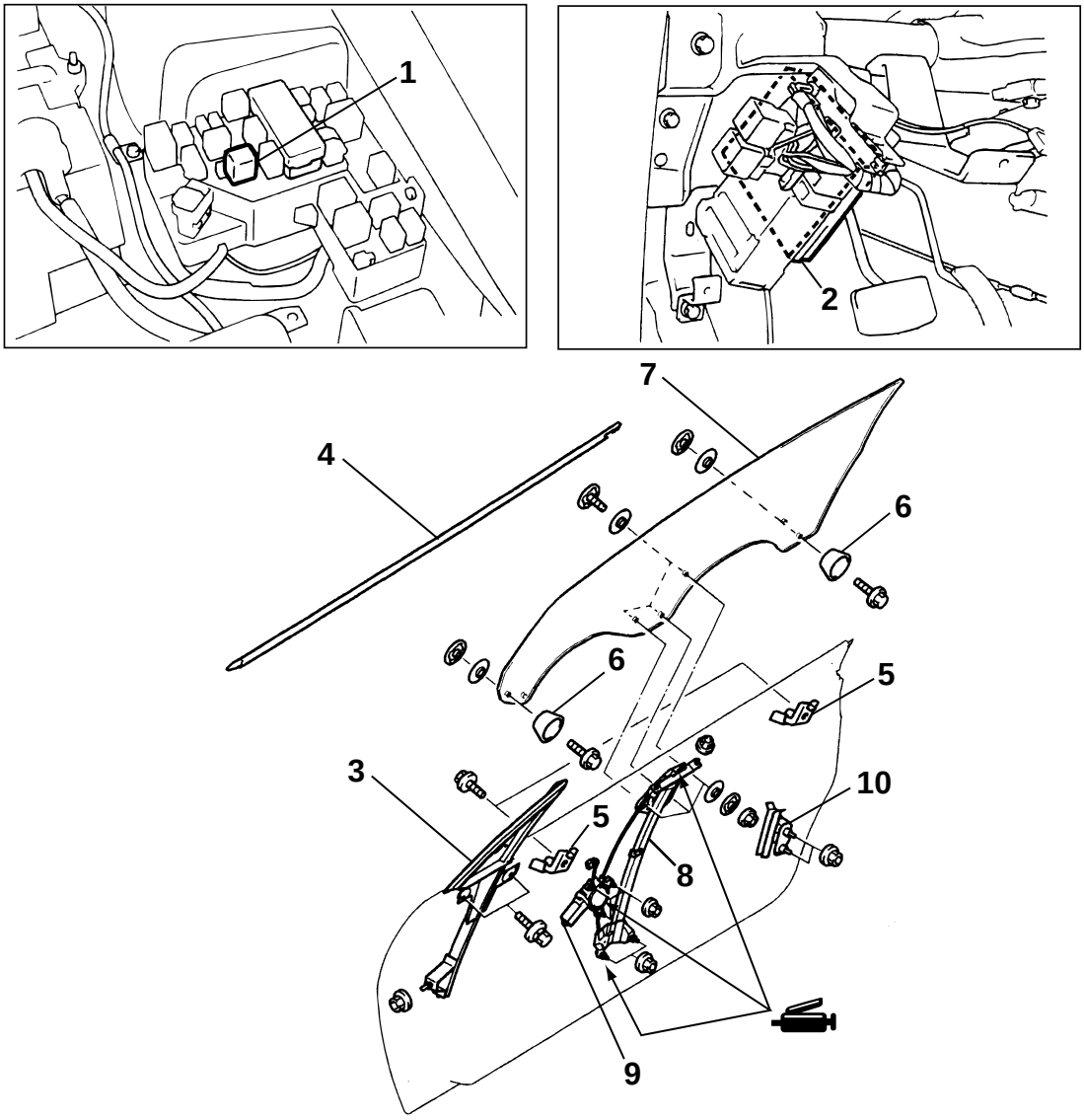
SWITCH POSITION		TESTER CONNECTION	SPECIFIED CONDITION
Sub switch	UP	6 – 7, 4 – 5	Less than 2 ohm
	OFF	4 – 5, 6 – 8	Less than 2 ohm
	DOWN	4 – 7, 6 – 8	Less than 2 ohm

DOOR GLASS AND REGULATOR

REMOVAL AND INSTALLATION

M1429001300144

Pre-removal Operation	Post-installation Operation
• Door Trim and Waterproof Film Removal (Refer to P.42-54.)	• Door Trim and Waterproof Film Removal (Refer to P.42-54.) • Door Window Glass Adjustment (Refer to P.42-47.)



AC101944 AB

REMOVAL STEPS
1. POWER WINDOW RELAY
2. ETACS-ECU

DOOR WINDOW GLASS AND DOOR WINDOW REGULATOR ASSEMBLY REMOVAL STEPS
3. DOOR DELTASASH
4. DOOR BELTLINE MOLDING (REFER TO P.42-65.)
5. DOOR WINDOW GLASS UP STOP

DOOR WINDOW GLASS AND DOOR WINDOW REGULATOR ASSEMBLY REMOVAL STEPS (Continued)
6. DOOR WINDOW STOP

>>B<< 7. DOOR WINDOW GLASS

>>A<< 8. POWER WINDOW REGULATOR ASSEMBLY

>>A<< 9. POWER WINDOW MOTOR

10. DOOR WINDOW REAR LOWER SASH

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INSTALLATION SERVICE POINT

>>A<< POWER WINDOW MOTOR/WINDOW REGULATOR ASSEMBLY INSTALLATION

1. Power window motor and window regulator assembly installation procedure

⚠ CAUTION

Do not operate the power window motor until the glass installation is finished.

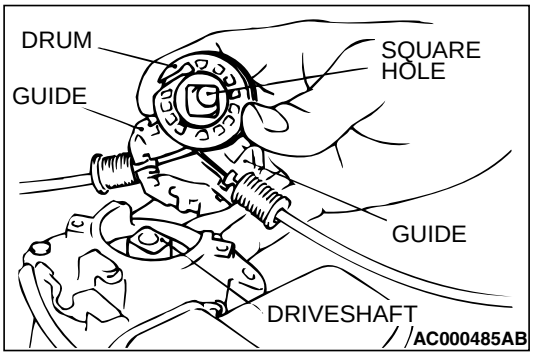
(1) Connect the power window motor to the body-side harness connector, and then turn on the ignition switch.

(2) Continue to pull the power window switch until the power window motor stops.

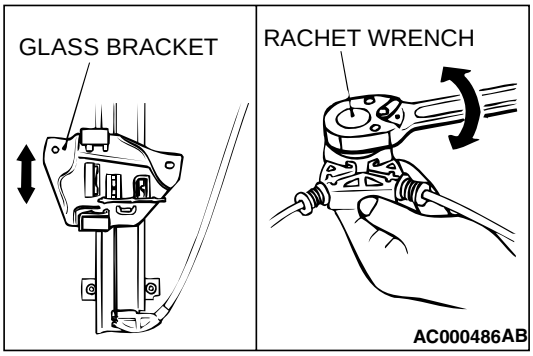
NOTE: Power window motor stops automatically and the limit switch incorporated in the power motor will be reset.

(3) Turn off the ignition switch, and then remove window motor from the body-side harness connector.

(4) Align the power window motor drive shaft and the square hole in the drum by the following procedure, while using the guide and the opening in the motor housing as a reference for the installation position.

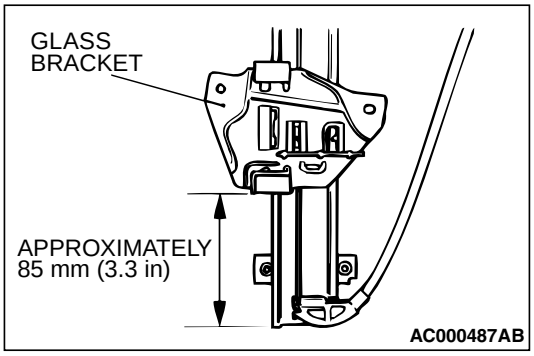


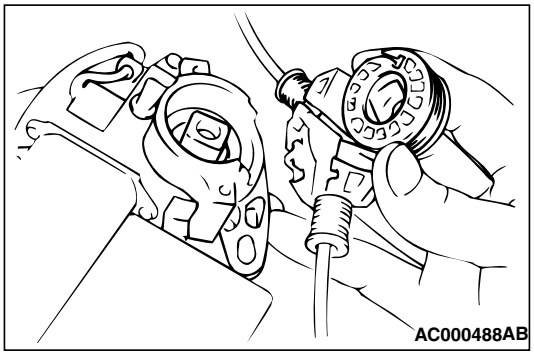
a. Align the square hole with the drive shaft by sliding the glass bracket (glass mounting section) or by turning the drum using a ratchet wrench [with a socket diameter of 12.7 mm (0.50 inches)].



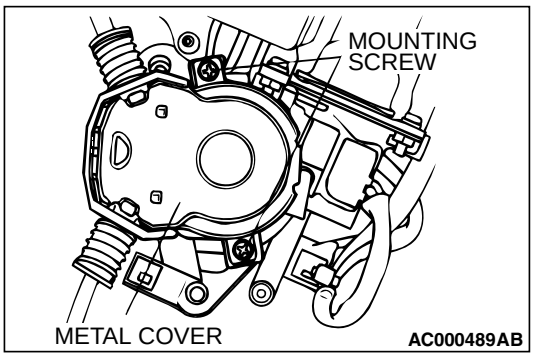
b. Turn the drum to position the glass bracket as shown in the illustration. Support the drum and the guide with your hand while turning the drum, otherwise the wires may pull out of the drum.

c. If the wires pull out of the drum, re-insert them by following the drum and regulator wire installation procedure.





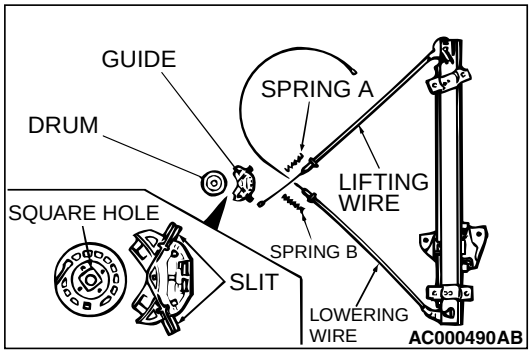
(5) Align the guide and the opening of the motor housing, and slide the guide into the motor housing while holding the guide and drum.



⚠ CAUTION

Make sure that the metal cover is installed securely and does not move, in order to stop the drum from vibrating. If the drum vibrates, the glass may not slide up and down smoothly, or it may fall down.

(6) install the metal cover securely to housing.



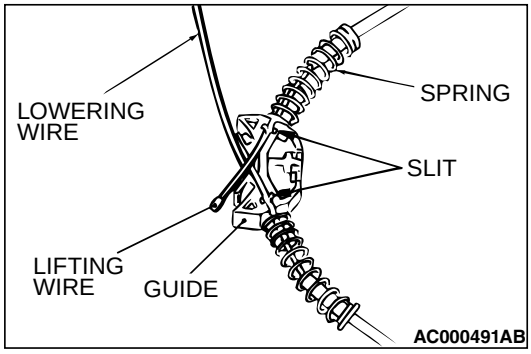
2. Drum and regulator wire installation procedure

(1) Place the drum, guide and regulator on a work bench as shown in the illustration.

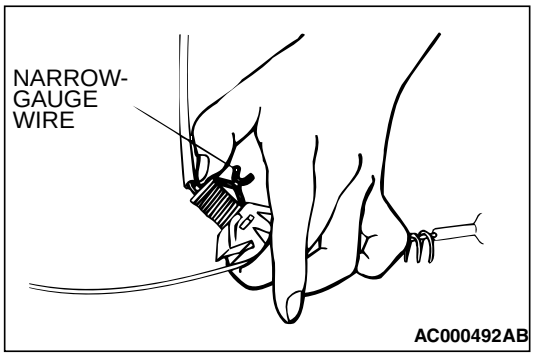
a. Place the drum so that the square hole is facing upward.

b. Place the guide so that the slits are facing upward.

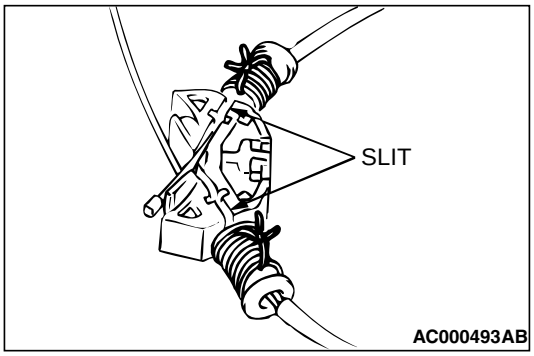
c. Place the regulator so that the glass bracket is facing downward. Position the glass bracket so that glass is in the fully-open position.

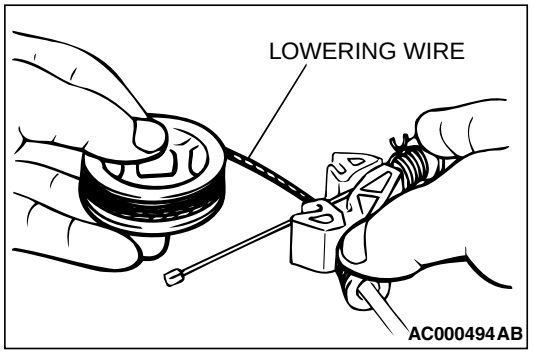


(2) Pass the springs over the wires, and then install the lowering wire to the guide first, followed by the lifting wire. (The lifting wire should be on top of the lowering wire.)

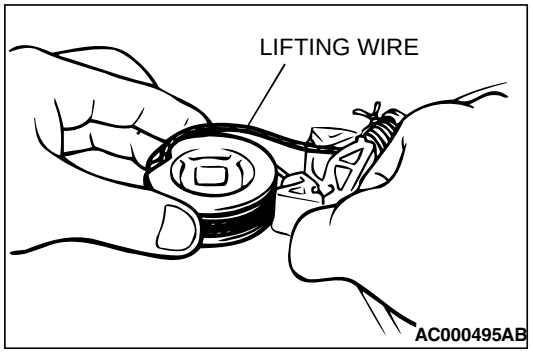


(3) Use some narrow-gauge wire [approximately 0.5 mm (0.02 inches) diameter] to compress the springs, and then tie the narrow-gauge wire a to the slits in the guide.



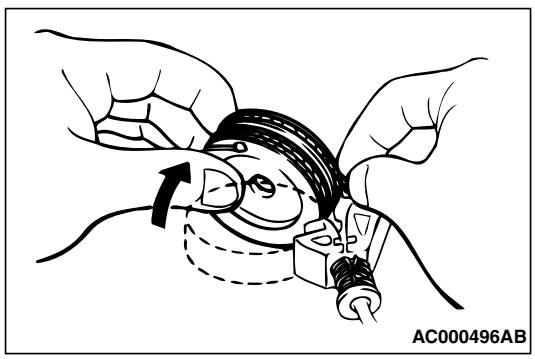


(4) Insert the end of the lowering wire into the wire hole at the bottom of the drum, and then wrap the bottom so that there is no slackness in the wire.

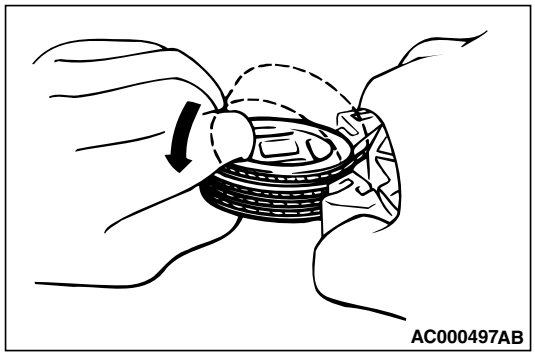


(5) Install the lifting wire to the drum as following:

a. Insert the end of the lifting wire into the wire hole at the top of the drum.



b. Raise the front of the drum until the drum is vertical, and then position the lifting wire in the groove of the drum.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c. Return the drum to its original position while holding the wires to make sure that they do not pull out.

(6) After installing the power window motor assembly to the window regulator assembly, cut and remove the wires witch are compressing the springs.

3. Operation check

⚠ CAUTION

- **Do not operate the window regulator assembly before installing the window glass, otherwise the limit switch will be set.**
- **Window glass safety mechanism does not operate when the window glass is closed fully at first time.**

(1) Install the window glass to the window regulator assembly.

(2) Close the window glass completely.

NOTE: Closing the window glass completely will finish the adjustment of the limit switch.

(3) Check that the limit switch operates correctly.

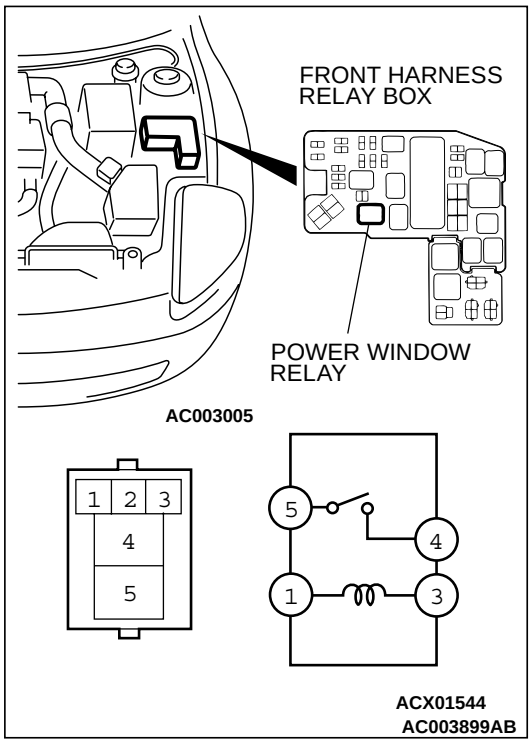
>>B<< DOOR WINDOW GLASS INSTALLATION

1. Temporarily secure the door window glass to the door window regulator.
2. After raising the door window glass as far as it will go, fully secure the door window glass to the door window regulator assembly.

INSPECTION

M1421007600268

POWER WINDOW RELAY CHECK



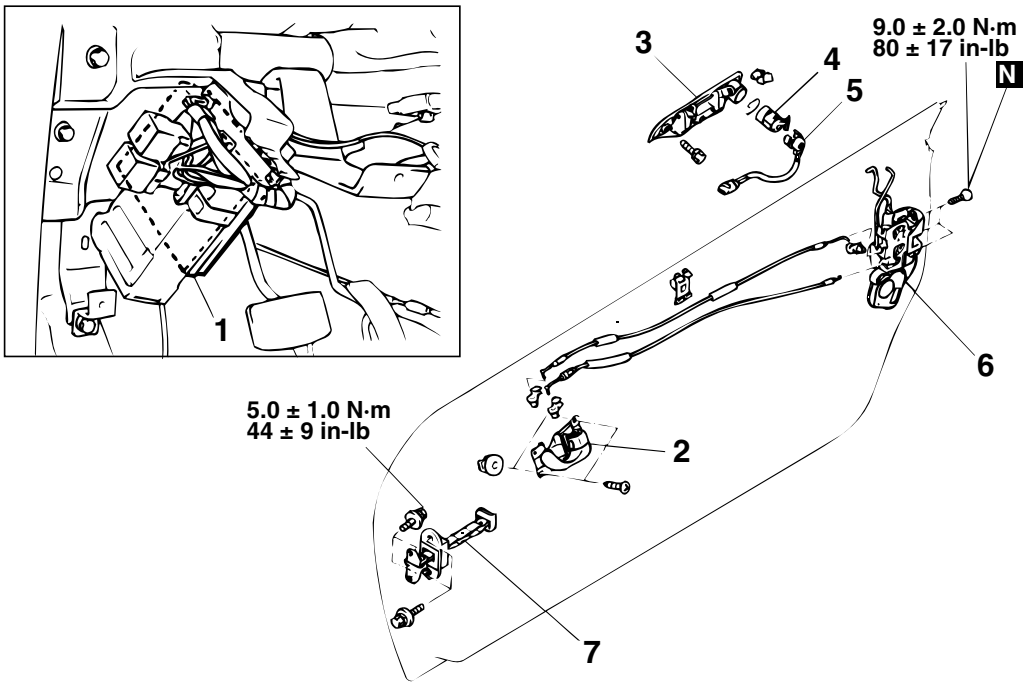
BATTERY CONNECTION	TESTER CONNECTION	SPECIFIED CONDITION
Not applied	1 – 3	Less than 2 ohm
• Connect terminal 1 to the negative battery terminal • Connect terminal 3 to the positive battery terminal	4 – 5	Less than 2 ohm

DOOR HANDLE AND LATCH

REMOVAL AND INSTALLATION

M1423004600168

Pre-removal Operation	Post-installation Operation
• Door Trim Removal (Refer to P.42-54.)	• Door Inside Handle Play Check (Refer to P.42-52.) • Door Outside Handle Play Check (Refer to P.42-52.) • Door Trim Installation (Refer to P.42-54.) • Door Fit Adjustment (Refer to P.42-46.)



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DOOR HANDLE AND DOOR LATCH ASSEMBLY REMOVAL STEPS

1. ETACS-ECU
2. DOOR INSIDE HANDLE
- WATERPROOF FILM (REFER TO P.42-54.)
3. DOOR OUTSIDE HANDLE
4. DOOR LOCK KEY CYLINDER

DOOR HANDLE AND DOOR LATCH ASSEMBLY REMOVAL STEPS

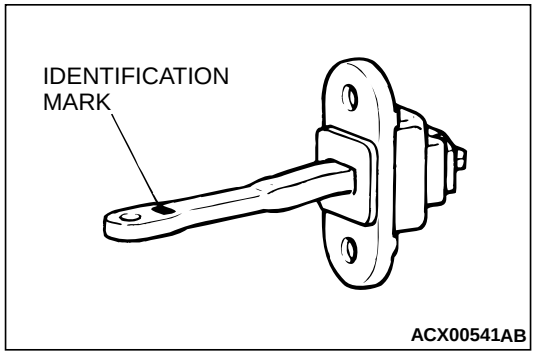
5. DOOR LOCK KEY CYLINDER SWITCH
6. DOOR LATCH ASSEMBLY

DOOR CHECK REMOVAL STEPS

- WATERPROOF FILM (REFER TO P.42-54.)

>>A<< 7. DOOR CHECK

INSTALLATION SERVICE POINT



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>>A<< DOOR CHECK INSTALLATION

Install the door check so that the identification mark faces upwards.

ITEM	IDENTIFICATION MARK
Left door	1L
Right door	1R

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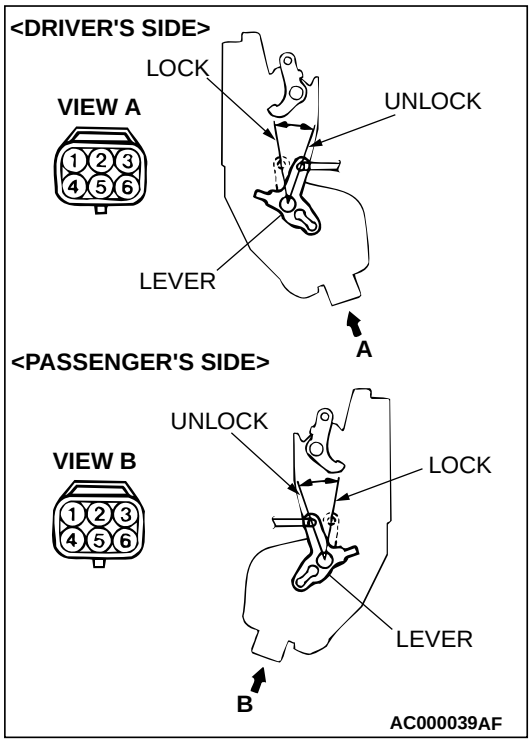
INSPECTION

M1421007600279

DOOR LOCK ACTUATOR CHECK



ACTUATOR OPERATION CHECK <DRIVER'S SIDE>

LEVER POSITION	BATTERY CONNECTION	LEVER OPERATION
At the "LOCK" position	• Connect terminal 6 to the negative battery terminal • Connect terminal 4 to the positive battery terminal	The lever moves from the "LOCK" position to the "UNLOCK" position.
At the "UNLOCK" position	• Connect terminal 4 to the negative battery terminal • Connect terminal 6 to the positive battery terminal	The lever moves from the "UNLOCK" position to the "LOCK" position.

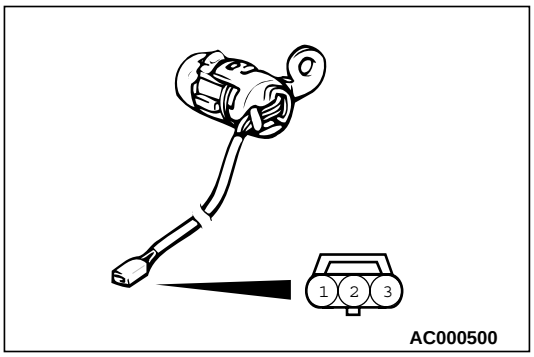
ACTUATOR OPERATION CHECK <PASSENGER'S SIDE>

LEVER POSITION	BATTERY CONNECTION	LEVER OPERATION
At the "LOCK" position	• Connect terminal 4 to the negative battery terminal • Connect terminal 6 to the positive battery terminal	The lever moves from the "LOCK" position to the "UNLOCK" position.
At the "UNLOCK" position	• Connect terminal 6 to the negative battery terminal • Connect terminal 4 to the positive battery terminal	The lever moves from the "UNLOCK" position to the "LOCK" position.

ACTUATOR SWITCH CHECK <DRIVER'S SIDE>

LEVER POSITION	TESTER CONNECTION	SPECIFIED CONDITION
At the "LOCK" position	1 – 3	Less than 2 ohm
At the "UNLOCK" position	1 – 2	Less than 2 ohm

DOOR LOCK KEY CYLINDER SWITCH CHECK



<DRIVER'S SIDE>

SWITCH POSITION	TESTER CONNECTION	SPECIFIED CONDITION
LOCK	2 – 3	Less than 2 ohm
NEUTRAL (OFF)	1 – 2 – 3	Open circuit
UNLOCK	1 – 2	Less than 2 ohm

<PASSENGER'S SIDE>

SWITCH POSITION	TESTER CONNECTION	SPECIFIED CONDITION
LOCK	1 – 2	Less than 2 ohm
NEUTRAL (OFF)	1 – 2 – 3	Open circuit
UNLOCK	2 – 3	Less than 2 ohm

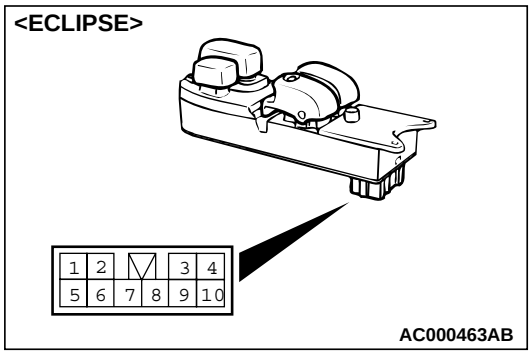
CENTRAL DOOR LOCK SWITCH CONTINUITY CHECK

Remove the power window switch. (Refer to P.42-54.)

<DRIVER'S SIDE>

SWITCH POSITION	TESTER CONNECTION	SPECIFIED CONDITION
LOCK	3 – 9	Less than 2 ohm
OFF	3 – 9 – 10	Open circuit
UNLOCK	9 – 10	Less than 2 ohm

<ECLIPSE>



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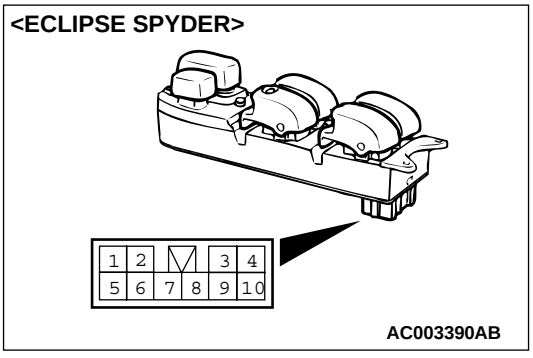

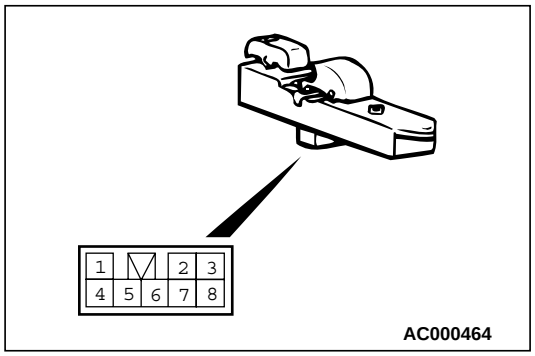

<PASSENGER'S SIDE>

SWITCH POSITION	TESTER CONNECTION	SPECIFIED CONDITION
LOCK	1 – 2	Less than 2 ohm
OFF	1 – 2 – 3	Open circuit
UNLOCK	2 – 3	Less than 2 ohm

WINDOW GLASS RUNCHANNEL AND DOOR OPENING WEATHER-STRIP

REMOVAL AND INSTALLATION

M1423003100063

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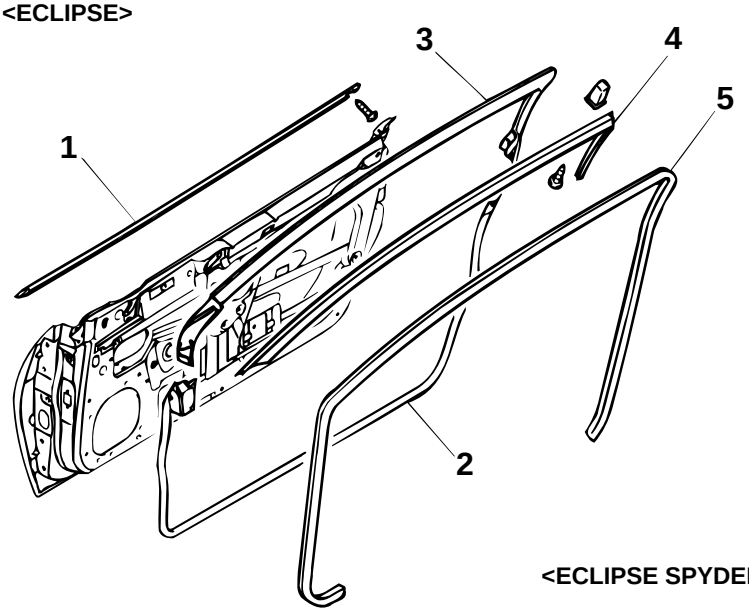

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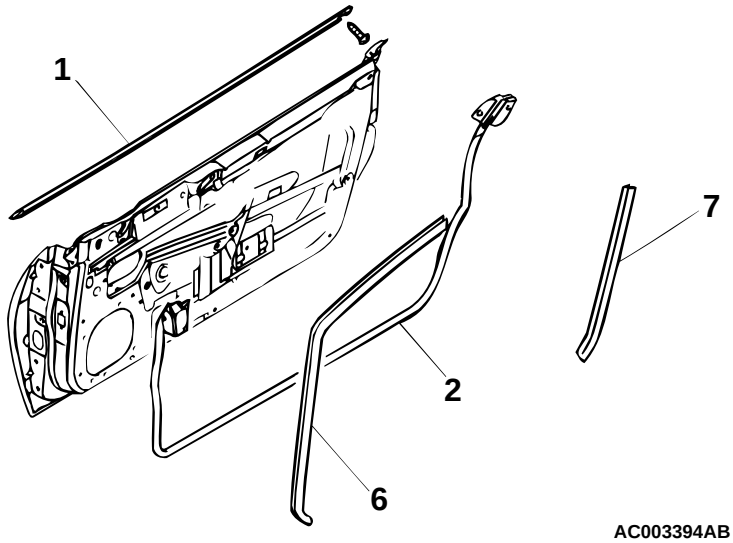


DOOR OUTER OPENING WEATHERSTRIP REMOVAL STEPS

- DOOR TRIM (REFER TO P.42-54.)
- DOOR DELTA SASH (REFER TO P.42-57.)

1. BELT LINE MOLDING

<<A>> >>A<< 2. DOOR OUTER OPENING WEATHERSTRIP

DRIP LINE WEATHERSTRIP REMOVAL STEPS

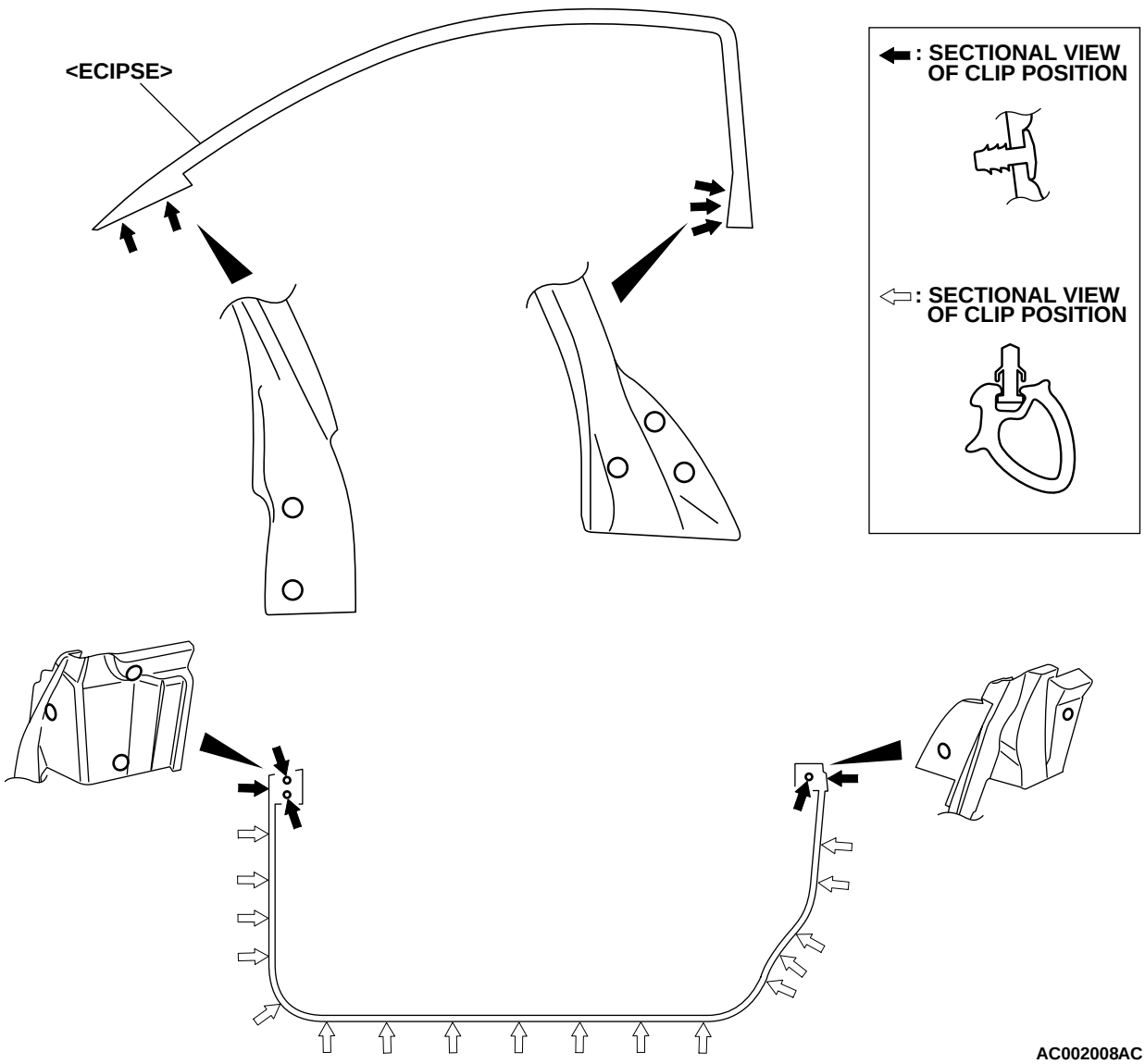
3. DRIP LINE WEATHERSTRIP
4. DRIP LINE WEATHERSTRIP HOLDER

DOOR INNER OPENING WEATHERSTRIP REMOVAL STEPS

- SCUFF PLATE (REFER TO GROUP 52A P.52A-9.)

5. DOOR INNER OPENING WEATHERSTRIP
6. DOOR INNER FRONT OPENING WEATHERSTRIP
7. DOOR INNER REAR OPENING WEATHERSTRIP

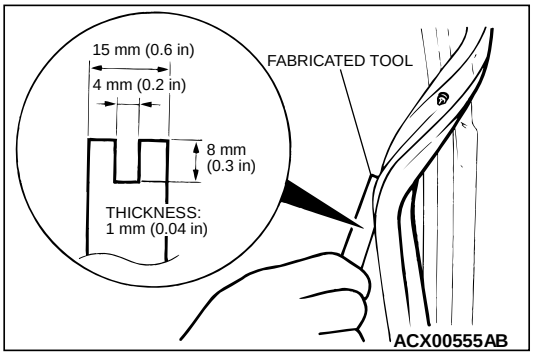
CLIP AND CLAW POSITIONS



REMOVAL SERVICE POINT

<<A>> DOOR OUTER OPENING WEATHERSTRIP REMOVAL

Make a tool as shown and remove the door opening weatherstrip.



INSTALLATION SERVICE POINT

>>A<< DOOR OUTER OPENING WEATHERSTRIP INSTALLATION

The clip color identifies the left and right weatherstrips.

APPLICABLE SIDE	IDENTIFICATION COLOR
Left door	Natural (White)
Right door	Orange

LIFTGATE

LIFTGATE DIAGNOSIS

INTRODUCTION TO LIFTGATE DIAGNOSIS

M1424002500050

Difficult locking and unlocking and uneven clearance, and generation of wind noise from the liftgate may be improper adjustment of the liftgate.

LIFTGATE DIAGNOSTIC TROUBLESHOOTING STRATEGY

M1424002600057

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted most of the possible ways to find a liftgate fault.

1. Gather information from the customer.
2. Verify that the condition described by the customer exists.
3. Find the malfunction by following the Symptom Chart.
4. Verify malfunction is eliminated.

SYMPTOM CHART

M1424002700054

SYMPTOMS	INSPECTION PROCEDURE	REFERENCE PAGE
Difficult locking and unlocking	1	P.42-68
Uneven body clearance	2	P.42-68

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Difficult Locking and Unlocking

DIAGNOSIS

STEP 1. Check the release cable routing condition.

Q: Is the release cable routing condition good?
YES : Go to Step 3.
NO : Repair it, then go to Step 2.

STEP 2. Check the engagement of the liftgate latch and liftgate striker.

Q: Are the liftgate latch and liftgate striker engaged correctly?
YES : Adjust it. Refer to P.42-69.
NO : Then go to Step 3.

STEP 3. Check symptoms.

Q: Does the liftgate lock operate easily?
YES : This diagnosis is complete.
NO : Return to Step 1.

INSPECTION PROCEDURE 2: Uneven Body Clearance

DIAGNOSIS

STEP 1. Check the liftgate installation condition.

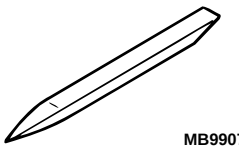
Q: Is the liftgate installation in good condition?
YES : Adjust it. Refer to P.42-69.
NO : Then go to Step 2.

STEP 2. Check symptoms.

Q: Is the clearance with the body even?
YES : This diagnosis is complete.
NO : Return to Step 1.

SPECIAL TOOL

M1424000600040

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 MB990784	MB990784 Ornament remover	General service tool	Removal of liftgate trim.

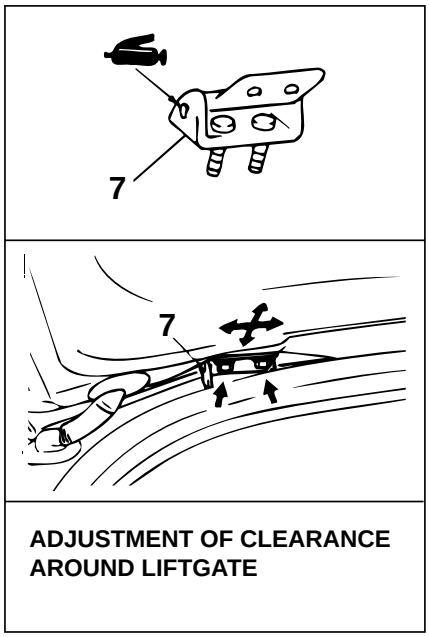
LIFTGATE

REMOVAL AND INSTALLATION

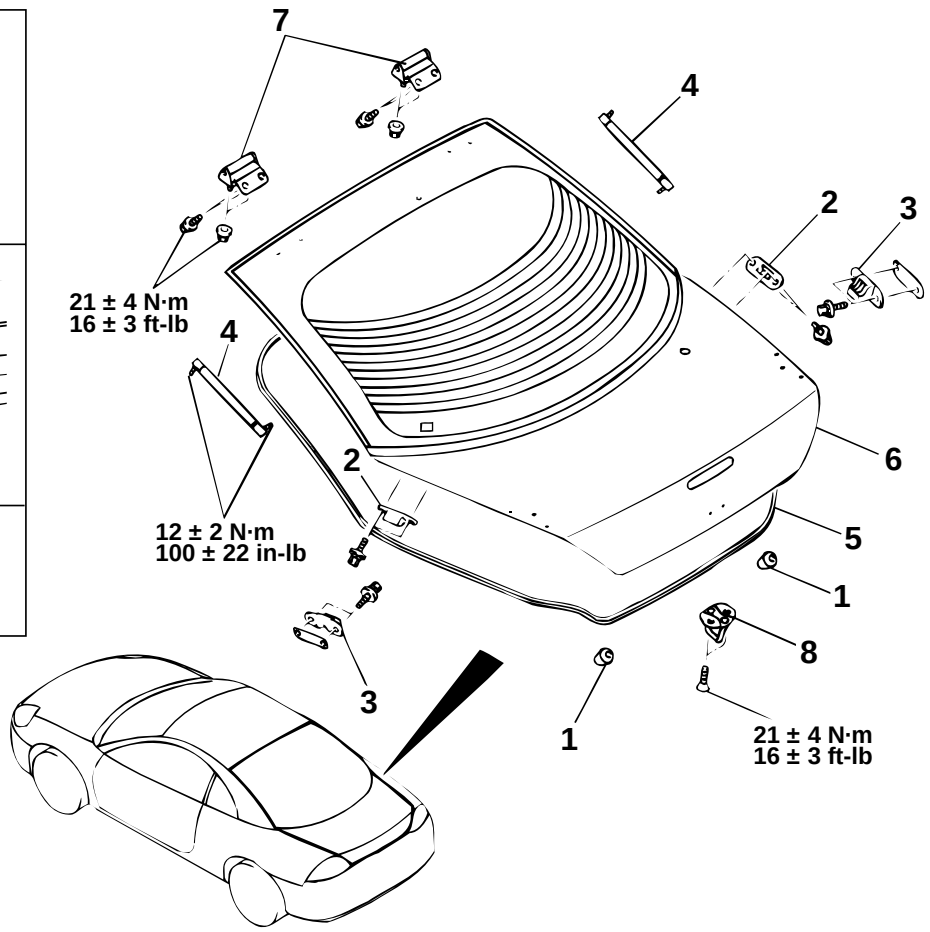
M1424001100048

⚠ CAUTION

1. **Never try to disassemble liftgate gas spring.**
2. **Always bore a hole in the gas spring to release the interior gas before the spring is discarded.**
3. **Keep the liftgate gas spring away from fire or flame.**



ADJUSTMENT OF CLEARANCE AROUND LIFTGATE



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REMOVAL STEPS

1. BUMPER
2. LIFTGATE DAMPER (UPPER)
3. LIFTGATE DAMPER (LOWER)
4. LIFTGATE GAS SPRING

LIFTGATE OPENING WEATHERSTRIP REMOVAL STEPS

- REAR END TRIM (REFER TO GROUP 52A P.52A-9.)

5. LIFTGATE OPENING WEATHERSTRIP

LIFTGATE AND LIFTGATE HINGE REMOVAL STEPS

- REAR WIPER MOTOR (REFER TO GROUP 51 P.51-22.)
- REAR SPOILER (REFER TO GROUP 51 P.51-15.)
- HIGH MOUNTED STOPLIGHT (REFER TO GROUP 54A P.54A-119.)
- REAR END TRIM (REFER TO GROUP 52A P.52A-9.)
- CONNECTION FOR LIFTGATE WIRING HARNESS

4. LIFTGATE GAS SPRING
6. LIFTGATE

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LIFTGATE AND LIFTGATE HINGE REMOVAL STEPS (Continued)
- HEADLINING

7. LIFTGATE HINGE

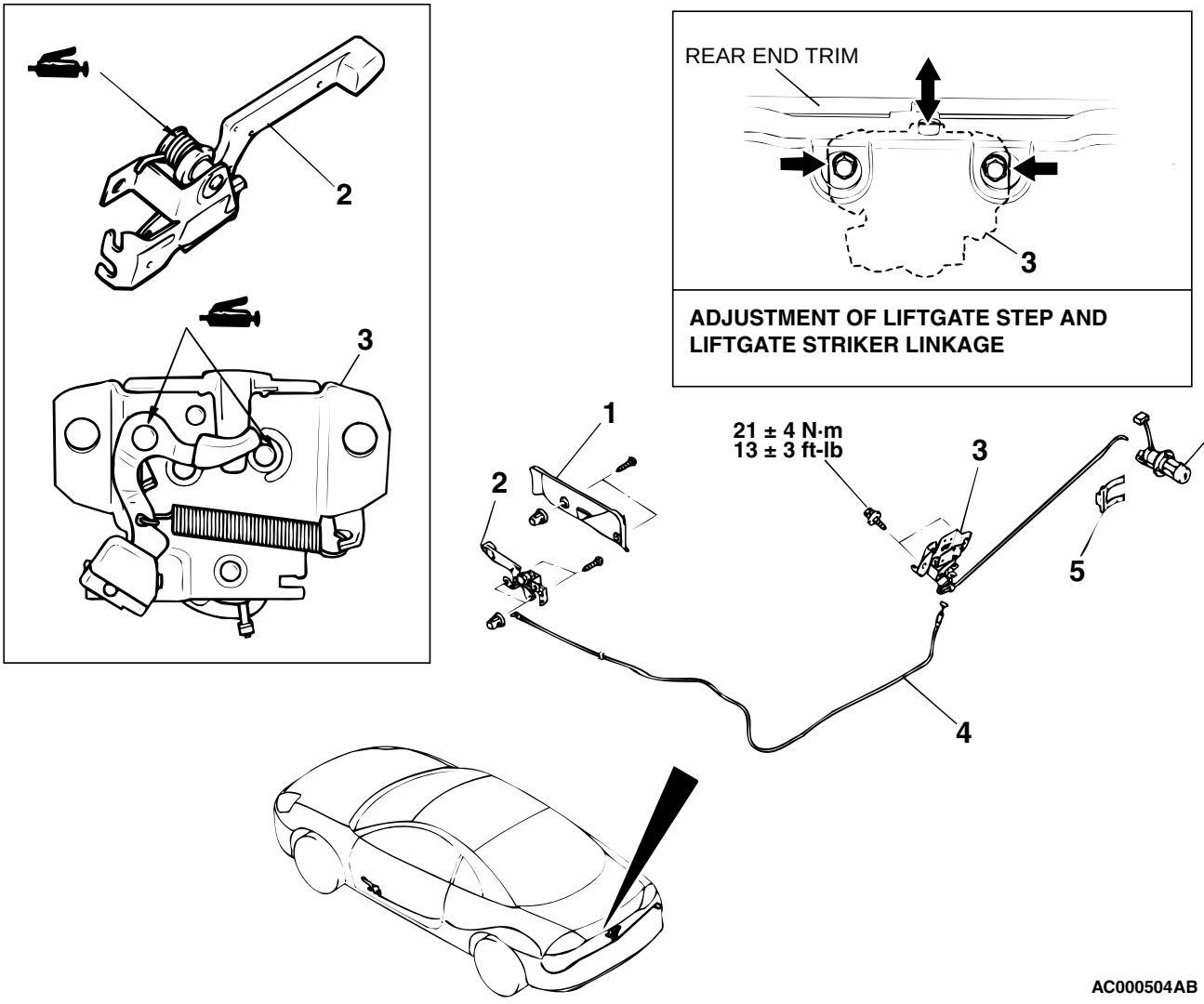
LIFTGATE STRIKER REMOVAL STEPS
- LIFTGATE LOWER TRIM (REFER TO P.42-72.)

8. LIFTGATE STRIKER

LIFTGATE HANDLE AND LATCH

REMOVAL AND INSTALLATION

M1424001700039



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LIFTGATE LOCK RELEASE CABLE AND HANDLE REMOVAL STEPS
- SCUFF PLATE (DRIVER'S SIDE) (REFER TO GROUP 52A P.52A-9.)

1. RELEASE HANDLE COVER
2. LIFTGATE LOCK RELEASE HANDLE
- REAR END TRIM (REFER TO GROUP 52A P.52A-9.)

LIFTGATE LOCK RELEASE CABLE AND HANDLE REMOVAL STEPS (Continued)

3. LIFTGATE LATCH
4. LIFTGATE LOCK RELEASE CABLE

LIFTGATE LATCH REMOVAL STEPS
- REAR END TRIM (REFER TO GROUP 52A P.52A-9.)

3. LIFTGATE LATCH

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LIFTGATE LOCK CYLINDER REMOVAL STEPS

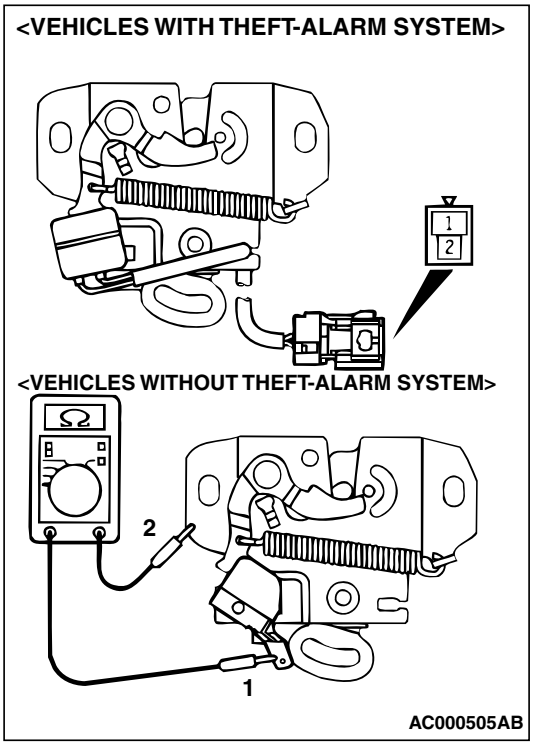
- REAR END TRIM (REFER TO GROUP 52A P.52A-9.)
- REAR COMBINATION LIGHT (PASSENGER'S SIDE) (REFER TO GROUP 54A P.54A-117.)

5. RETAINER
6. LIFTGATE LOCK CYLINDER

INSPECTION

M1421007600280

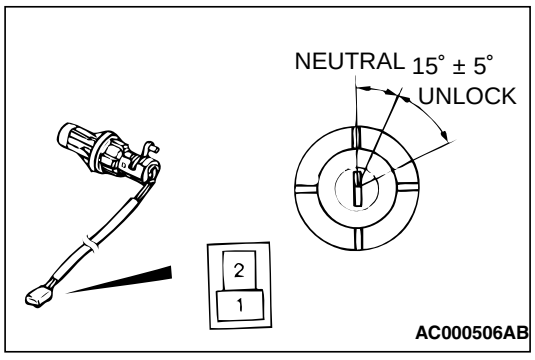
LIFTGATE LATCH SWITCH CHECK



SWITCH POSITION	TESTER CONNECTION	SPECIFIED CONDITION
ON	1 – 2	Less than 2 ohm
OFF	1 – 2	Open circuit

LIFTGATE LOCK KEY CYLINDER SWITCH CHECK

<VEHICLES WITH THEFT-ALARM SYSTEM>

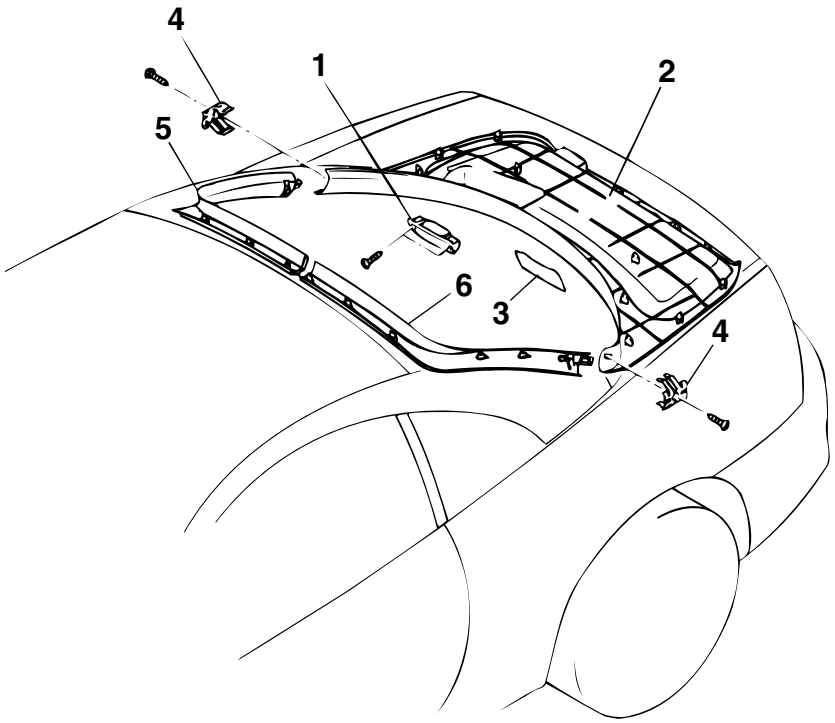


SWITCH POSITION	TESTER CONNECTION	SPECIFIED CONDITION
UNLOCK	1 – 2	Less than 2 ohm
NEUTRAL (OFF)	1 – 2	Open circuit

LIFTGATE TRIM AND WATERPROOF FILM

REMOVAL AND INSTALLATION

M1424001400049



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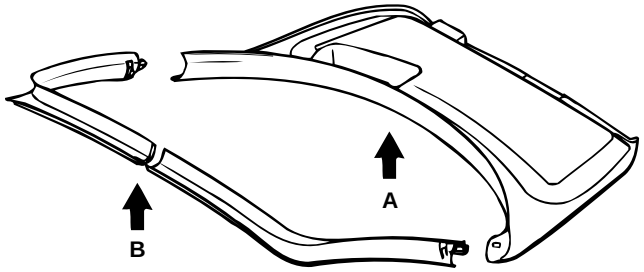
REMOVAL STEPS
1. LIFTGATE GRIP
2. LIFTGATE LOWER TRIM
3. HIGH MOUNTED STOPLIGHT LID
4. CLIP
5. LIFTGATE UPPER TRIM (LH)

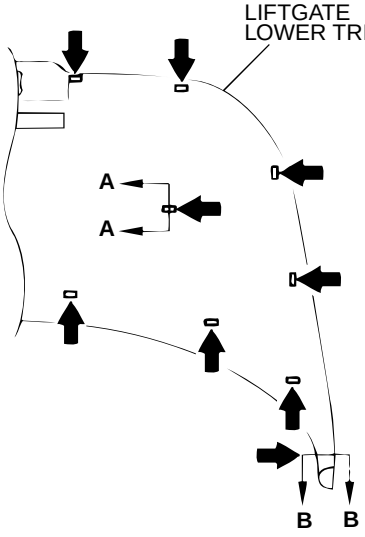
REMOVAL STEPS (Continued)
6. LIFTGATE UPPER TRIM (RH)
7. LIFTGATE SIDE TRIM

Required Special Tool:
- MB990784: Remover

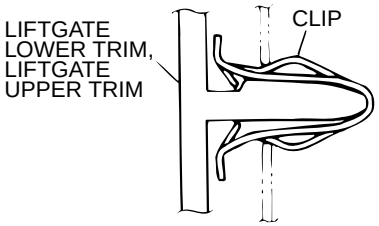
CLIP POSITIONS



VIEW A



SECTION A – A



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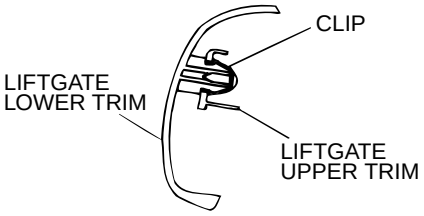
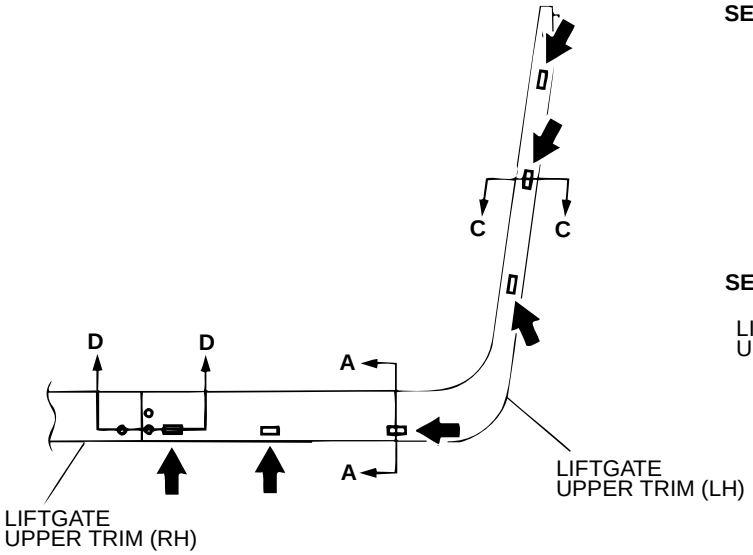


VIEW B



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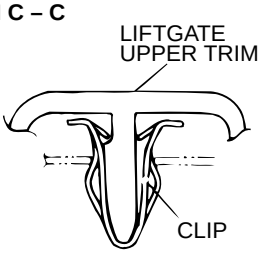

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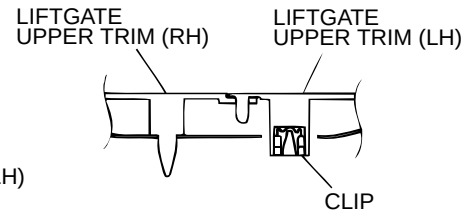

NOTE

: CLIP POSITIONS

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TSB Revision

TRUNK LID

TRUNK LID DIAGNOSIS

INTRODUCTION TO TRUNK LID DIAGNOSIS

M1421005800125

Difficult locking and unlocking and uneven clearance, and generation of wind noise from the trunk lid may be caused by improper adjustment of the trunk lid.

TRUNK LID DIAGNOSTIC TROUBLESHOOTING STRATEGY

M1421005900100

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted most of the possible ways to find a trunk lid fault.

1. Gather information from the customer.
2. Verify that the condition described by the customer exists.
3. Find the malfunction by following the Symptom Chart.
4. Verify malfunction is eliminated.

SYMPTOM CHART

M1421006000081

SYMPTOMS	INSPECTION PROCEDURE	REFERENCE PAGE
Difficult locking and unlocking	1	P.42-74
Uneven body clearance	2	P.42-75
Uneven height	3	P.42-75

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Difficult Locking and Unlocking

DIAGNOSIS

STEP 1. Check the release cable routing condition.

Q: Is the release cable routing condition good?
YES : Go to Step 2.
NO : Repair it, then go to Step 3.

STEP 2. Check the engagement of the trunk lid latch and trunk lid striker.

Q: Are the trunk lid latch and trunk lid striker engaged correctly?
YES : Adjust it. Refer to P.42-76.
NO : Then go to Step 3.

STEP 3. Check symptoms.

Q: Does the trunk lid lock operate easily?
YES : This diagnosis is complete.
NO : Return to Step 1.

INSPECTION PROCEDURE 2: Uneven Body Clearance

DIAGNOSIS

STEP 1. Check the trunk lid installation condition.

Q: Is the trunk lid installation in good condition?
YES : Adjust it. Refer to P.42-76.
NO : Then go to Step 2.

STEP 2. Check symptoms.

Q: Is the clearance with the body even?
YES : This diagnosis is complete.
NO : Return to Step 1.

INSPECTION PROCEDURE 3: Uneven Height

DIAGNOSIS

STEP 1. Check the trunk lid bumper height.

Q: Is the trunk lid bumper height proper?
YES : Adjust it. Refer to P.42-76.
NO : Then go to Step2.

STEP 2. Check symptoms.

Q: Are the trunk lid and body height even?
YES : This diagnosis is complete.
NO : Return to Step 1.

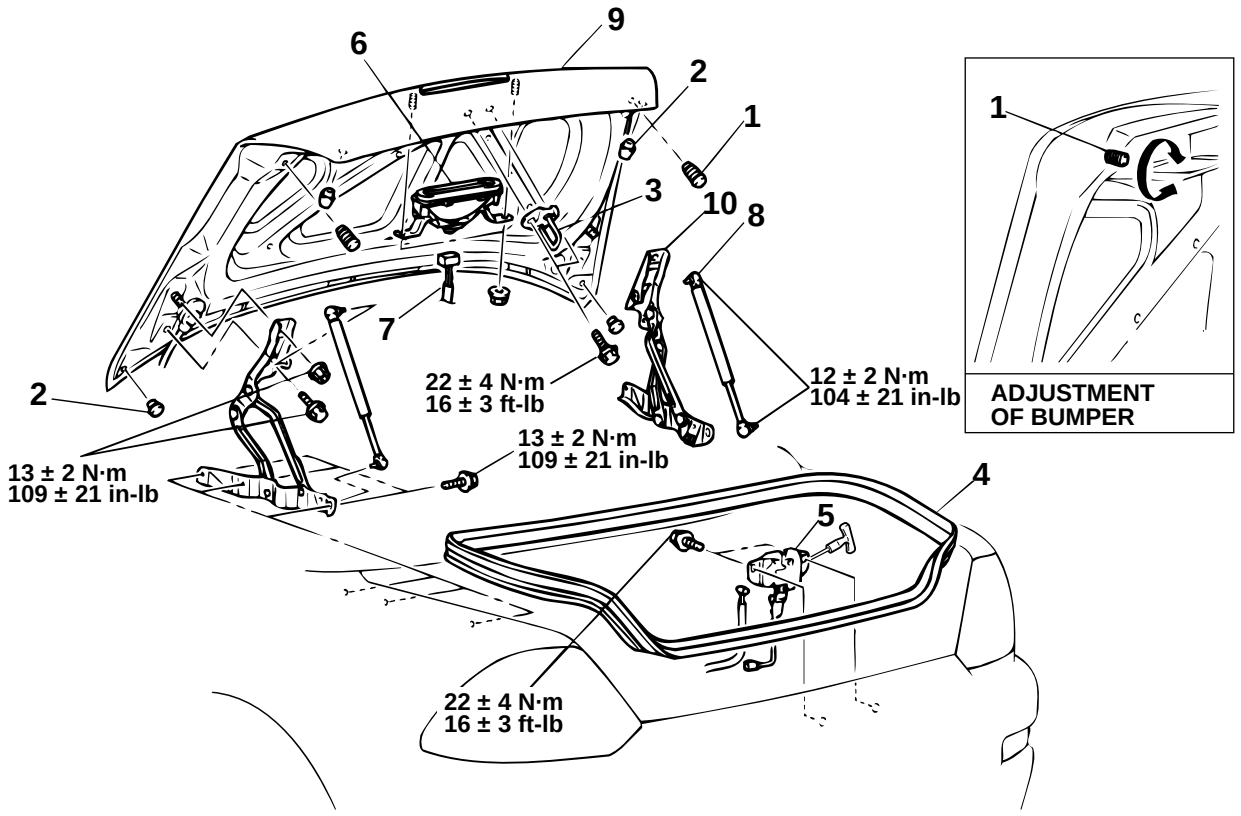
TRUNK LID

REMOVAL AND INSTALLATION

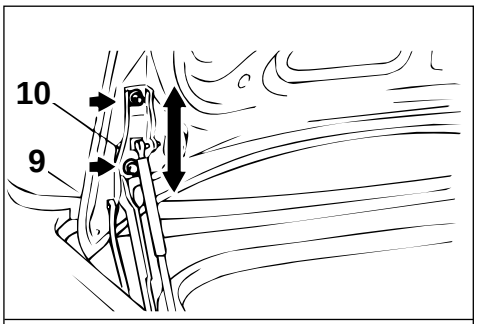
M1421002200094

⚠ CAUTION

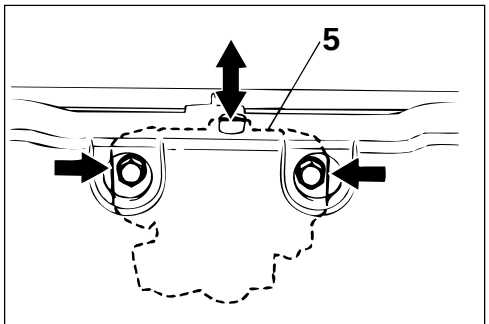
1. **Never try to disassemble trunk lid gas spring.**
2. **Always bore a hole in the gas spring to release the interior gas before the spring is discarded.**
3. **Keep the trunk lid gas spring away from fire or flame.**



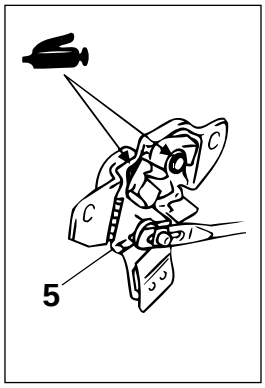
ADJUSTMENT OF BUMPER



ADJUSTMENT OF CLEARANCE AROUND TRUNK LID



ADJUSTMENT OF CLEARANCE AROUND TRUNK LID



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REMOVAL STEPS

>>C<< 1. BUMPER
2. BUMPER

REMOVAL STEPS (Continued)

3. TRUNK LID STRIKER
>>B<< 4. TRUNK LID OPENING WEATHERSTRIP

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TRUNK LID LATCH REMOVAL STEPS
- REAR END TRIM (REFER TO GROUP 52A – TRIMS P.52A-9.)

5. TRUNK LID LATCH

TRUNK LID GAS SPRING REMOVAL STEPS

>>B<< 4. TRUNK LID OPENING WEATHERSTRIP

TRUNK LID GAS SPRING REMOVAL STEPS (Continued)

8. TRUNK LID GAS SPRING

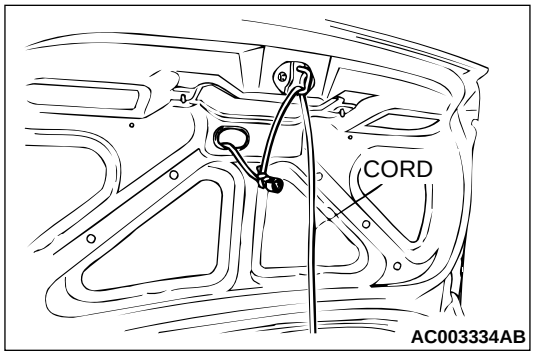
TRUNK LID REMOVAL STEPS

6. HIGH MOUNTED STOPLIGHT
<<A>> >>A<< 7. HARNESS CONNECTOR
8. TRUNK LID HINGE
9. TRUNK LID
10. TRUNK LID HINGE

REMOVAL SERVICE POINT

<<A>> HARNESS CONNECTOR REMOVAL

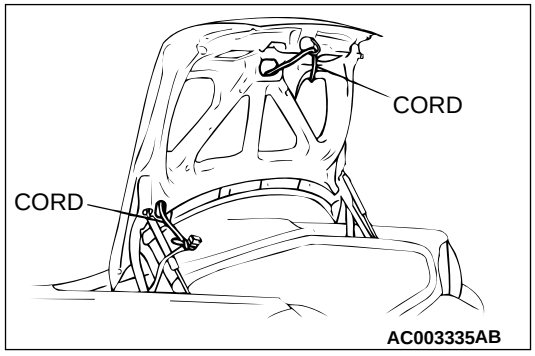
Removal the grommet Tie a cord to the end of the harness connector, wind plastic tape around it so that there is no other side.



INSTALLATION SERVICE POINTS

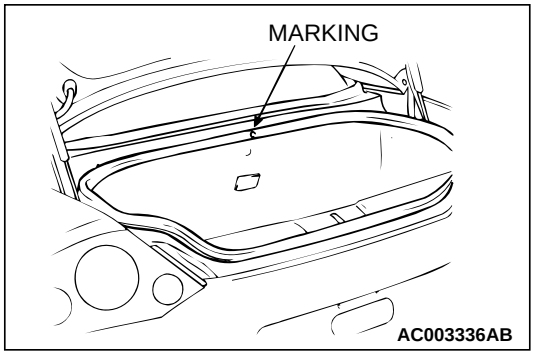
>>A<< HARNESS CONNECTOR INSTALLATION

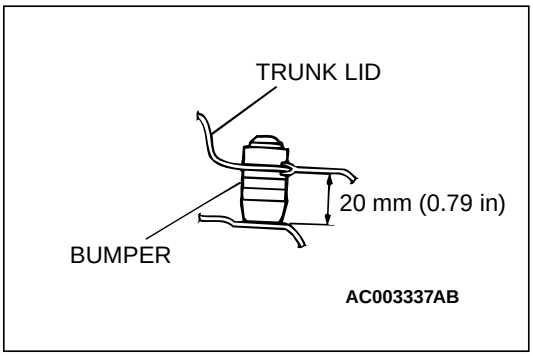
1. Tie the cord that was used during removal to the end of the harness connector, wind plastic tape around it so that there is no unevenness.
2. Pull the cord to pull through the harness connector.
3. Install the grommet.



>>B<< TRUNK LID OPENING WEATHERSTRIP INSTALLATION

Install the trunk lid opening weatherstrip so that its marking is positioned at the center of the vehicle.



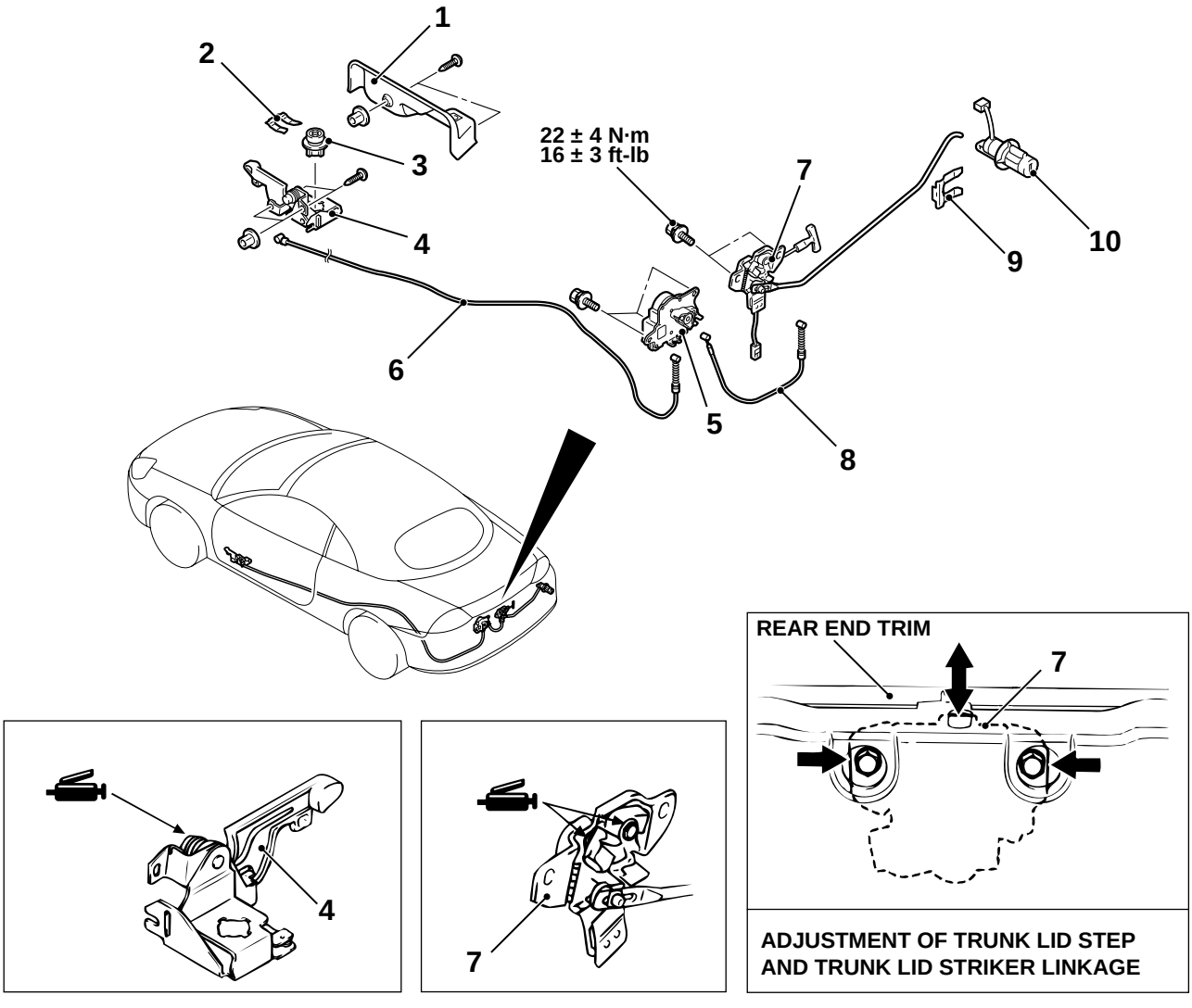


>>C<< BUMPER INSTALLATION
Install the bumper as shown in figure.
Be sure they are adjusted so the trunk lid is even with the rear fenders and body on all sides.

TRUNK LID LOCK RELEASE HANDLE AND CABLE

REMOVAL AND INSTALLATION

M1421004500057



TRUNK LID LOCK RELEASE HANDLE REMOVAL STEPS
1. RELEASE HANDLE COVER
2. RETAINER

TRUNK LID LOCK RELEASE HANDLE REMOVAL STEPS
3. RELEASE HANDLE LOCK CYLINDER

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TRUNK LID LOCK RELEASE HANDLE REMOVAL STEPS

- SCUFF PLATE (DRIVER'S SIDE) (REFER TO GROUP 52A P.52A-9.)
- FRONT SEAT (DRIVER'S SIDE) (REFER TO GROUP 52A P.52A-15.)

4. TRUNK LID RELEASE HANDLE

TRUNK LID OPENER ACTUATOR ASSEMBLY REMOVAL STEPS

- QUARTER TRIM, REAR END TRIM AND LUGGAGE COMPARTMENT TRIM (REFER TO GROUP 52A P.52A-9.)

5. TRUNK LID OPENER ACTUATOR ASSEMBLY

TRUNK LID LOCK RELEASE CABLE REMOVAL STEPS

1. RELEASE HANDLE COVER

TRUNK LID LOCK RELEASE CABLE REMOVAL STEPS

- SCUFF PLATE (DRIVER'S SIDE) (REFER TO GROUP 52A P.52A-9.)
- FRONT SEAT (DRIVER'S SIDE) (REFER TO GROUP 52A P.52A-15.)

4. TRUNK LID RELEASE HANDLE

- QUARTER TRIM, REAR END TRIM AND LUGGAGE COMPARTMENT TRIM (REFER TO GROUP 52A P.52A-9.)

5. TRUNK LID OPENER ACTUATOR ASSEMBLY
6. TRUNK LID LOCK RELEASE CABLE
7. TRUNK LID LATCH
8. CABLE
9. RETAINER
10. TRUNK LID LOCK CYLINDER

INSPECTION

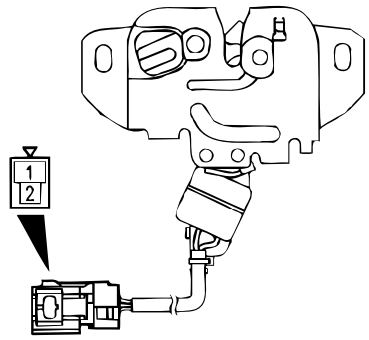
M1421007600235

TRUNK LID LATCH SWITCH CHECK

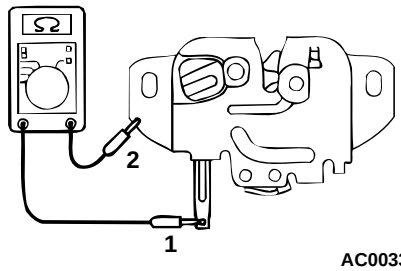
Follow the table below to check continuity at the trunk lid latch switch.

SWITCH POSITION	TESTER CONNECTION	SPECIFIED CONDITION
ON	1 – 2	Less than 2 ohm
OFF	1 – 2	Open circuit

<VEHICLES WITH THEFT-ALARM SYSTEM>



<VEHICLES WITHOUT THEFT-ALARM SYSTEM>



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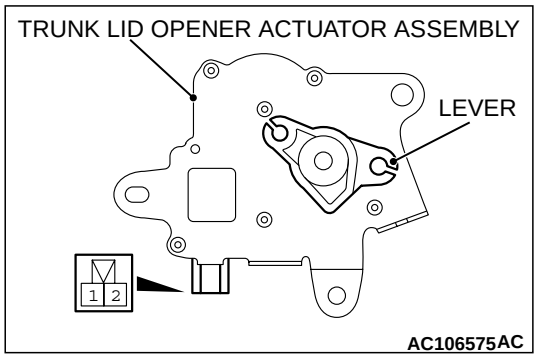


TRUNK LID OPENER ACTUATOR CHECK <VEHICLES WITH KEYLESS ENTRY SYSTEM>

1. Connect a battery (–) terminal to the trunk lid opener actuator assembly connector terminal No.2.
2. Connect a battery (+) terminal to the trunk lid opener actuator assembly connector terminal No.1 and check that the trunk lid opener actuator assembly lever move.

KEYLESS ENTRY SYSTEM

GENERAL DESCRIPTION

M1428000100058

Some models are equipped with a radio-controlled keyless entry system. The main features are:

- Antenna and receiver are incorporated in the ETACS-ECU.
- ID code can be registered by using the scan tool (MUT-II).
- Transmitter is a key holder type, which incorporates lock switch, unlock switch, and panic switch.
- The signal causes the room light to flash twice when the door is locked, or light for 15 seconds when the door is unlocked.
- The signal causes the turn signal light to flash twice when the door is locked, or flash four times when the door is unlocked.

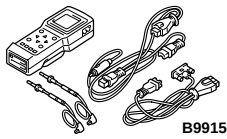
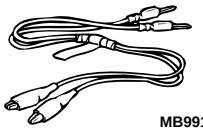
KEYLESS ENTRY SYSTEM DIAGNOSIS

M1428000700050

The keyless entry system is controlled by the Smart Wiring System (SWS). For troubleshooting, refer to GROUP 54B, Diagnosis P.54B-17.

SPECIAL TOOLS

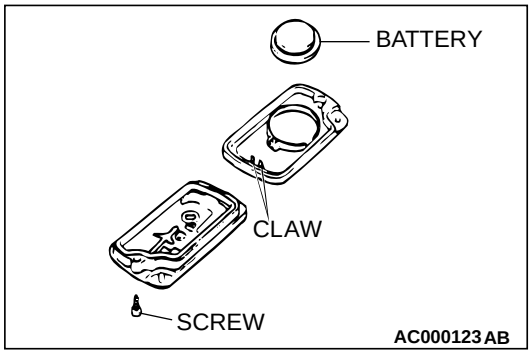
M1428000600053

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 B991502	MB991502 Scan tool (MUT-II)	MB991496-OD	For checking of keyless entry system [Input signal check]
 MB991529	MB991529 Diagnostic trouble code check harness	Tool not necessary if scan tool (MUT-II) is available	For checking of keyless entry system [Input signal check]

ON-VEHICLE SERVICE

HOW TO REPLACE THE TRANSMITTER BATTERY

M1428000900054



⚠ CAUTION

- **Do not allow water or dust to enter the inside of the transmitter when it is open. Also, do not touch the precision electronic device.**

1. Remove the set screw to remove the battery from the transmitter.
2. Install a battery with its (+) side face-down.

   Battery required for replacement: Coin type battery CR2032

3. Insert the claw first, and assemble the transmitter.
4. Verify that the keyless entry system operates.

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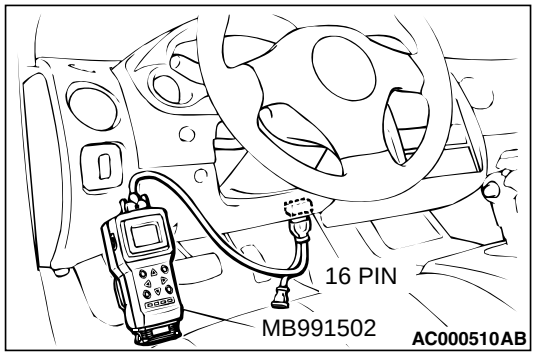
ENABLING/DISABLING THE ANSWERBACK FUNCTION

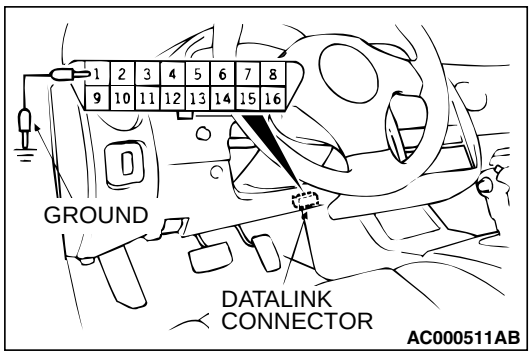
M1428003200043

If the keyless entry system locks or unlocks the doors, the dome light flashes or illuminates, the hazard warning light flashes (hazard answerback function) and the horn sounds (horn answerback function). The hazard and horn answerback functions can be enabled or disabled according to the following procedure:

ENABLING/DISABLING THE HAZARD ANSWERBACK FUNCTION

The hazard answerback function can be enabled or disabled by one of the two following procedures.





<When the transmitter is used after connecting scan tool MB991502 to the data link connector or grounding data link connector terminal (1)>

1. Enter the hazard answerback customize mode by observing one of the following steps. If the ETACS-ECU enters the customize mode, its tone alarm will sound once.
   (1) Connect scan tool MB991502 to the data link connector terminal (1).
   (2) Turn the ignition switch to "LOCK" (OFF) position.
   (3) Close the driver's side door.
   (4) Leave the windshield washer switch on for at least ten seconds. Then the ETACS-ECU tone alarm will sound once.
2. If the transmitter "LOCK" switch is pushed consecutively twice (within two seconds), the ETACS-ECU tone alarm will sound, indicating that the hazard answerback function can be enabled or disabled when the doors are locked.
   - **Enable the hazard answerback function when the doors are locked: The ETACS-ECU tone alarm will sound once.**
   - **Disable the hazard answerback function when the doors are locked: The ETACS-ECU tone alarm will sound twice.**
3. If the transmitter "UNLOCK" switch is pushed consecutively twice (within two seconds), the ETACS-ECU tone alarm will sound, indicating that the hazard answerback function can be enabled or disabled when the doors are unlocked.
   - **Enable the hazard answerback function when the doors are unlocked: The ETACS-ECU tone alarm will sound once.**
   - **Disable the hazard answerback function when the doors are unlocked: The ETACS-ECU tone alarm will sound twice.**

4. Exit the hazard answerback customize mode by observing one of the following steps.
   (1) Disconnect scan tool MB991502 from the data link connector, or disconnect data link connector terminal (1) form the ground.
   (2) Turn the ignition switch to position other then "LOCK" (OFF), or remove the ignition key.
   (3) Open the driver's side door,

NOTE: If any operation is not done for at least three minutes after the ETACS-ECU has entered the customize mode, the hazard answerback customize mode will be canceled automatically.

<When only the transmitter is used>

1. Remove the ignition key.
2. Push the "LOCK" switch while holding the "UNLOCK" switch pushed for four to ten seconds.
3. If the "LOCK" switch and "UNLOCK" switch are released in that order, the ETACS-ECU tone alarm will sound, indicating that the hazard answerback function can be enabled or disabled when the doors are locked.
   - **Enable the hazard answerback function when the doors are locked: The ETACS-ECU tone alarm will sound once.**
   - **Disable the hazard answerback function when the doors are locked: The ETACS-ECU tone alarm will sound twice.**
4. If the "UNLOCK" switch and "LOCK" switch are released in that order, the ETACS-ECU tone alarm will sound, indicating that the hazard answerback function can be enabled or disabled when the door are unlocked.
   - **Enable the hazard answerback function when the doors are unlocked: The ETACS-ECU tone alarm will sound once.**
   - **Disable the hazard answerback function when the doors are unlocked: The ETACS-ECU tone alarm will sound twice.**

ENABLING/DISABLING THE HORN ANSWERBACK FUNCTION

1. Remove the ignition key.
2. Push the "UNLOCK" switch while holding the "LOCK" switch pushed for four to ten seconds.
3. If the "LOCK" switch and "UNLOCK" switch are released at the same time, the ETACS-ECU tone alarm will sound, indicating that the horn answerback function can be enabled or disabled.
   - **Enable the horn answerback function: The ETACS-ECU tone alarm will sound once.**
   - **Disable the horn answerback function: The ETACS-ECU tone alarm will sound twice.**

SECRET CODE REGISTRATION METHOD

M1428001000054

Each individual secret code is registered inside the transmitter, and so it is necessary to resister these codes with the EEPROM inside the receiver in the following cases.

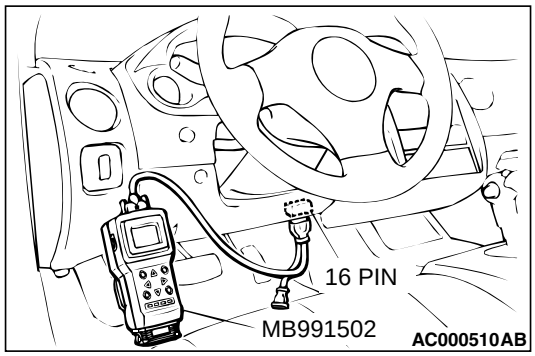
- When the transmitter or ETACS-ECU is replaced
- If more transmitters are to be used
- If it appears that a problem is occurring because of faulty registration of a code.

A maximum of four different codes can be stored in the EEPROM memory (four different transmitters can be used). When the code for the first transmitter is registered, the previously registered codes for all transmitters are cleared. Therefore, if you are using four transmitters or are adding more transmitters, the codes for all transmitters must be registered at the same time.

1. Check that the doors lock normally when the key is used.
2. Insert the ignition key.

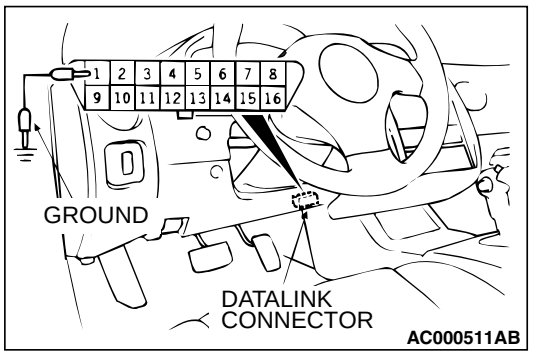
⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.



3. Connect the scan tool to the data link connector. If the scan tool is not used, ground terminal (1) of the data link connector.

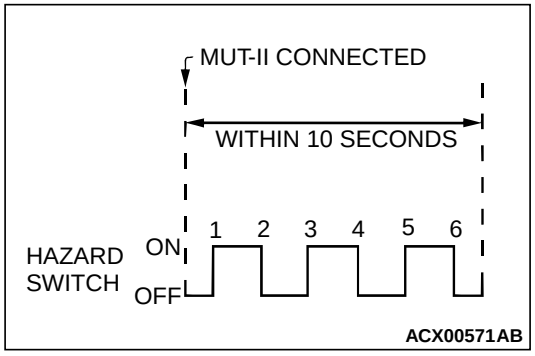
   NOTE: This will connect terminal (1) of the data link connector to ground, and the system will be in secret code registration standby mode.



4. Press the hazard switch six times within 10 seconds.

   NOTE: At this time the code registration monitor request is output (all doors locked and unlocked) and becomes registration mode.

   NOTE: The hazard warning light switch is turned on and off alternately whenever it is pushed.



5. Press the transmitter switch, and then press it two times within 10 seconds of the first press. This will register the code.
6. When registration is completed, the code registration monitor request is output (all doors locked and unlocked).

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7. If you are using two or more transmitters or have added a second transmitter, the same registration procedure should be carried out within one minute after registering the code for the first transmitter. After the second registration is completed, the code registration monitor request is output (all doors locked and unlocked).
8. Registration mode will be canceled under the following conditions:
   - When the secret code for four transmitters has been registered;
   - When one minute has been passed after registration mode started;
   - When scan tool MB991502 is disconnected (the ground connection is broken);
   - When the key is removed from the key cylinder;
9. After the registration is completed, carry out the following work, and then check that the keyless entry system operates normally.
   - Remove the ignition key.
   - Close all of the doors.

SUNROOF ASSEMBLY

GENERAL DESCRIPTION

M1426000100063

A motor-driven outer slide-type glass sunroof with a tilt-up mechanism is adopted in some models as optional equipment.Even when the sunroof is fully closed, a sufficient amount of light and a feeling of openness can still be obtained by opening the sunroof sunshade.

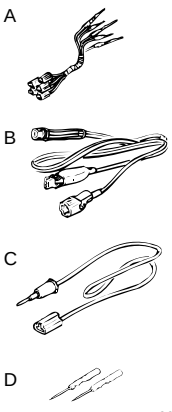
SUNROOF DIAGNOSIS

M1426000700043

The sunroof system is controlled by the Simplified Wiring System (SWS). For troubleshooting, refer to GROUP 54B, Diagnosis P.54B-17.

SPECIAL TOOLS

M1426000600057

TOOL	TOOL NUMBER AND NAME	SUPER SESSION	APPLICATION
	MB991223 Harness set • A: MB991219 Test harness • B: MB991220 LED harness • C: MB991221 LED harness adapter • D: MB991222 Probe	MB991223	Measurement of terminal voltage • A: Connector pin contact pressure inspection • B: Power circuit inspection • C: Power circuit inspection • D: Commercial tester connection

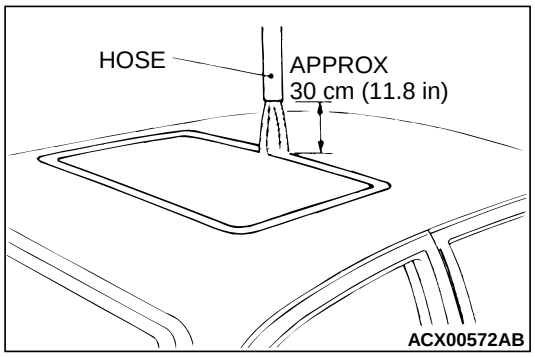
ON-VEHICLE SERVICE

WATER TEST

M1426000900069

Check if there are any leaks in the sunroof by the following procedure.

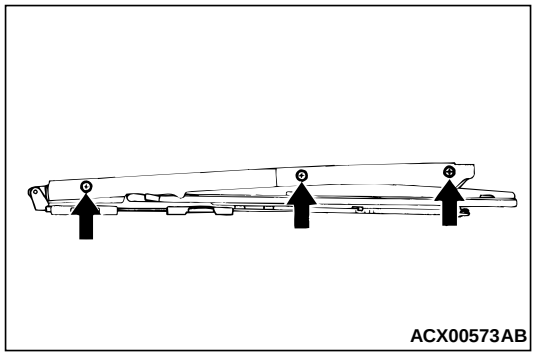
1. Fully close the roof lid glass.
2. Adjust the water pressure so that water comes out of the hose to a height of approximately 50 cm (19.7 inches) when the hose is held vertically facing upwards.
3. Hold the end of the hose approximately 30 cm (11.8 inches) above the roof and let the water run onto the weatherstrip for 5 minutes or more.
4. Check if any water leaks can be found in the room while watering. Even though there are any water leaks around the roof lid glass, it can be acceptable as long as water is caught in the drip area.



SUNROOF FIT ADJUSTMENT

M1426001000069

1. Fully close the roof lid glass.
2. Fully open the sunshade.
3. Loosen the roof lid glass assembly mounting screws (four), and then slide the roof lid glass assembly along the slot in the roof lid glass assembly to adjust the height of the roof lid glass. Ensure that uniform space between the roof lid glass and the body is secured in circumference.
4. After adjustment, check to be sure that the sunroof operates smoothly.



OPERATION CHECK

M1426002600075

Check that the following items. If faulty, replace the sunroof-ECU (sunroof motor assembly).

⚠ CAUTION

Check that the following items are normal before carrying out this operation check.

1. **Installation condition of the sunroof assembly**
2. **Installation condition, deforms and foreign material of the sunroof drive cable**
3. **Unfitted sunroof lid glass**
4. **Sunroof switch and sunroof motor assembly**

NO.	SUNROOF INITIAL POSITION	SWITCH OPERATION	JUDGMENT (NORMAL)
01	Fully closed	Ignition switch: ON • Sunroof switch: OPEN	The sunroof automatically opens.
02	Fully open	Ignition switch: ON • Sunroof switch: CLOSE	The sunroof closes while the sunroof switch is pushed to the CLOSE position.
03	Fully closed (tilt down)	Ignition switch: ON • Sunroof switch: TILT UP	The sunroof will automatically tilt up.
04	Tilt up	Ignition switch: ON • Sunroof switch: CLOSE	The sunroof closes while the sunroof switch is pushed to the CLOSE position.
05	Fully closed, tilt up or fully tilted	Ignition switch: ON 1. Sunroof switch: OPEN 2. Sunroof switch: CLOSE (The sunroof switch is pushed to the CLOSE position while the sunroof is automatically opening. The time of pushing: Within 2 seconds)	The sunroof stops the automatic open operation.
06	Fully tilted	Ignition switch: ON • Sunroof switch: TILT UP	The sunroof dose not move.
07	Fully closed, tilt up or fully tilted	Ignition switch: ON 1. Sunroof switch: OPEN 2. Sunroof switch: CLOSE (The sunroof switch is pushed to the CLOSE position while the sunroof is automatically opening. The time of pushing: More than 2 seconds)	The sunroof stops the automatic open operation, and the sunroof closes while the sunroof switch is pushed to the CLOSE position.
08	Fully closed (tilt down)	Ignition switch: ON 1. Sunroof switch: TILT UP 2. Sunroof switch: OPEN, CLOSE (Each direction switch of the sunroof switch is pushed while the sunroof is conducting the automatic tilt up operation.)	The sunroof will continue automatic operation until tilted up.
09	Fully closed or while opening	Ignition switch: ON • Sunroof switch: OPEN Block the sunroof before the sunroof is fully open.	The sunroof stop.

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NO.	SUNROOF INITIAL POSITION	SWITCH OPERATION	JUDGMENT (NORMAL)
10	Fully opened or while closing	Ignition switch: ON • Sunroof switch: CLOSE Block the sunroof before the sunroof is fully closed.	The sunroof moves back toward open and stops.
11	Fully opened or while opening	Ignition switch: ON 1. Sunroof switch: CLOSE Block the sunroof before the sunroof is fully closed. 2. Sunroof switch: TILT UP, OPEN or CLOSE	The sunroof moves back toward open and stops when any switch is pushed.
12	Fully closed	Ignition switch: ON 1. Ignition switch: LOCK (OFF) 2. Sunroof switch: OPEN [Within 30 seconds after the ignition switch is turned LOCK (OFF).]	The sunroof automatic opens 30 seconds after the ignition switch is turned LOCK (OFF).
13	Fully opened or while closing	Ignition switch: ON 1. Sunroof switch: CLOSE 2. Ignition switch: LOCK (OFF) 3. Sunroof switch: TILT UP, OPEN or CLOSE [Within 30 seconds after the ignition switch is turned LOCK (OFF).]	The sunroof closes while the sunroof switch is pushed to the CLOSE position. Then, the sunroof does not move when any switch is pushed.
14	Fully closed (tilt down)	Ignition switch: ON 1. Sunroof switch: TILT UP 2. Ignition switch: LOCK (OFF) [The ignition switch is turned LOCK (OFF) while the sunroof switch is automatically opening.]	The sunroof automatic opens only 30 seconds after the ignition switch is turned LOCK (OFF).
15	Fully opened or while closing	Ignition switch: ON 1. Sunroof switch: CLOSE 2. Ignition switch: LOCK (OFF) [The ignition switch is turned LOCK (OFF) while the sunroof switch is pushed to the CLOSE position.]	The sunroof closes while the sunroof switch is pushed to the CLOSE position.

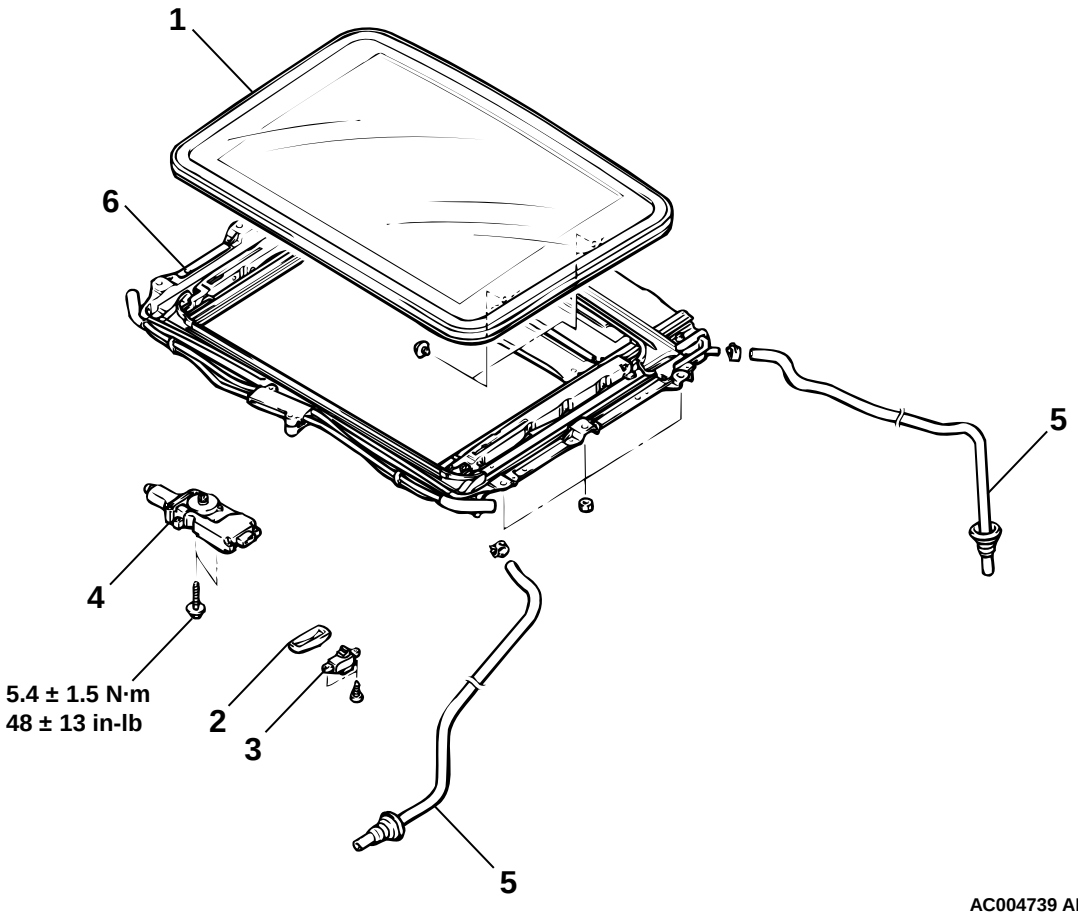
NO.	SUNROOF INITIAL POSITION	SWITCH OPERATION	JUDGMENT (NORMAL)
16	Fully closed	Ignition switch: ON 1. Ignition switch: LOCK (OFF) 2. Sunroof switch: OPEN [Within 30 seconds after the ignition switch is turned LOCK (OFF).] 3. Door switch: ON [Within 30 seconds after the ignition switch is turned LOCK (OFF).]	The sunroof automatic opens and stops when the door switch is LOCK (OFF).
17	Fully closed	Ignition switch: ON 1. Ignition switch: LOCK (OFF) 2. Sunroof switch: OPEN [Within 30 seconds after the ignition switch is turned LOCK (OFF).] 3. Door switch: ON [Within 30 seconds after the ignition switch is turned LOCK (OFF).]	The sunroof closes while the sunroof switch is pushed to the CLOSE position. Then, the sunroof does not move when the door switch is ON.
18	Fully closed (tilt down)	Ignition switch: ON 1. Ignition switch: LOCK (OFF) 2. Sunroof switch: TILT UP [Within 30 seconds after the ignition switch is turned LOCK (OFF).] 3. Door switch: ON [Within 30 seconds after the ignition switch is turned LOCK (OFF).]	The sunroof automatic opens and stops when the door switch is ON.

SUNROOF ASSEMBLY

REMOVAL AND INSTALLATION

M1426001200063

Post-installation Operation <Roof lid glass assembly, Sunroof assembly>
- Sunroof Fit Adjustment (Refer to P.42-86.)
- Sunroof Water Test (Refer to P.42-86.)



AC004739 AB

1. ROOF LID GLASS ASSEMBLY

SUNROOF SWITCH REMOVAL STEPS

2. SUNROOF SWITCH COVER
- HEADLINING (REFER TO GROUP 52A P.52A-13.)

3. SUNROOF SWITCH

SUNROOF MOTOR REMOVAL STEPS
- HEADLINING (REFER TO GROUP 52A P.52A-13.)

<<A>> >>B<< 4. SUNROOF MOTOR ASSEMBLY

DRAIN HOSE REMOVAL STEPS
- FRONT SIDE AIR DAM (FRONT DRAIN HOSE) (REFER TO P.42-9.)
- HEADLINING (REFER TO GROUP 52AP.52A-13 .)
- SPLASH SHIELD (FRONT DRAIN HOSE) (REFER TO P.42-9.)

<<B>> >>A<< 5. DRAIN HOSE

SUNROOF ASSEMBLY REMOVAL STEPS

2. SUNROOF SWITCH COVER
- HEADLINING (REFER TO GROUP 52A P.52A-13.)

<<A>> >>B<< 4. SUNROOF MOTOR ASSEMBLY
5. DRAIN HOSE CONNECTION
6. SUNROOF ASSEMBLY

TSB Revision

REMOVAL SERVICE POINTS

<<A>> SUNROOF MOTOR REMOVAL

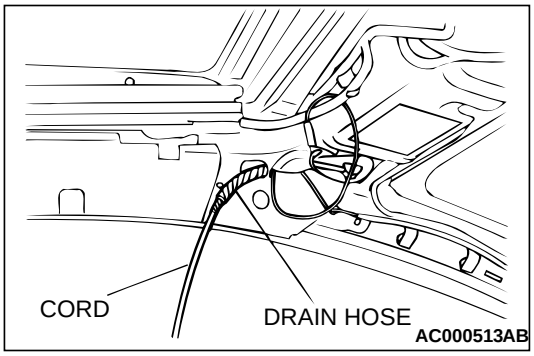
⚠ CAUTION

Always close the roof lid glass fully before removing the sunroof motor. If the fully-closed positions of the roof lid glass and the sunroof motor are not the same, the sunroof will not operate properly.

NOTE: If there is a problem with the sunroof motor so that the roof lid glass cannot close fully, use an Allen wrench to turn the gear section of the sunroof motor to fully close the roof lid glass.

<<B>> DRAIN HOSE REMOVAL

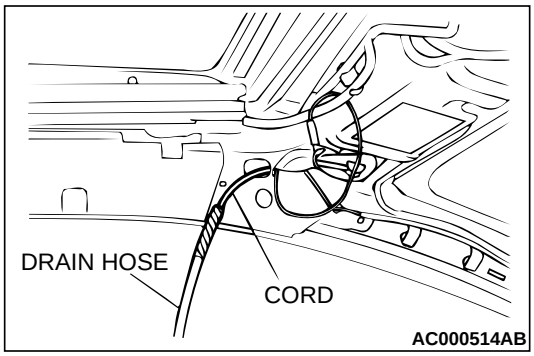
Tie a cord to the end of the drain hose, and wind tape around the tie until it is smooth. Then pull the drain hose out into the wheel housing.



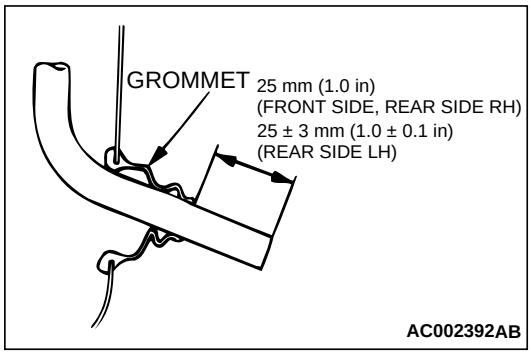
INSTALLATION SERVICE POINTS

>>A<< DRAIN HOSE INSTALLATION

1. Tie the cord that was used during removal to the end of the drain hose, and wind tape around it until it is smooth.
2. Pull the cord to pull through the drain hose.



3. Install the grommet, and then position the drain hose so that it protrudes from the grommet as shown in the illustration.



>>B<< SUNROOF MOTOR ASSEMBLY INSTALLATION

If the sunroof motor assembly is out of its fully closed position, adjust the motor position by the following steps before installment.

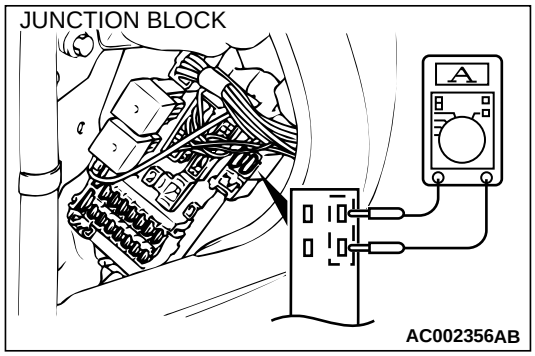
1. Remove the sunroof motor assembly without disconnecting the sunroof motor assembly connector.
2. Close the sunroof lid glass fully.
3. Push the sunroof close switch until the sunroof motor assembly stops turning. Repeat this operation until the motor does not turn at all. Then install the motor assembly to the roof.

   NOTE: When the sunroof motor assembly does not turn at all, the sunroof-ECU will return to its default condition.

INSPECTION

M1421007600097

ROOF LID GLASS OPERATION CURRENT CHECK



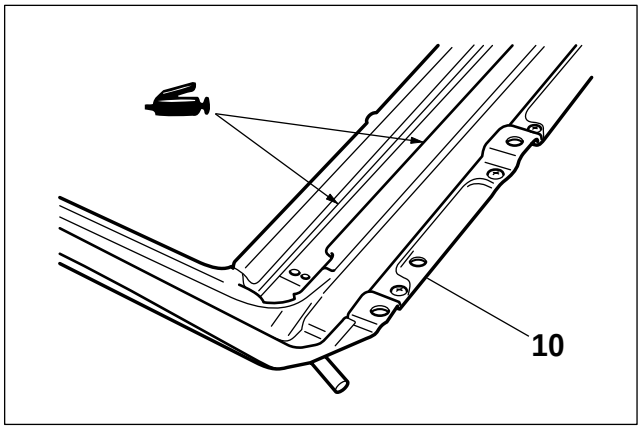
1. Remove the sunroof fuse and connect an ammeter as shown in the illustration.
2. Press the sunroof switch to operate the sunroof, and then measure the operation current while the roof lid glass is moving (except when the sunroof starts to operate, when it is fully open, when it is fully closed and when it is fully tilted up).

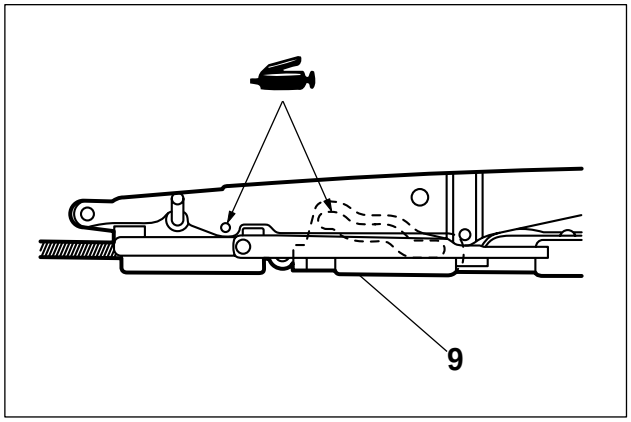
   Standard value: 10 A or less [at 20°C (68°F)]

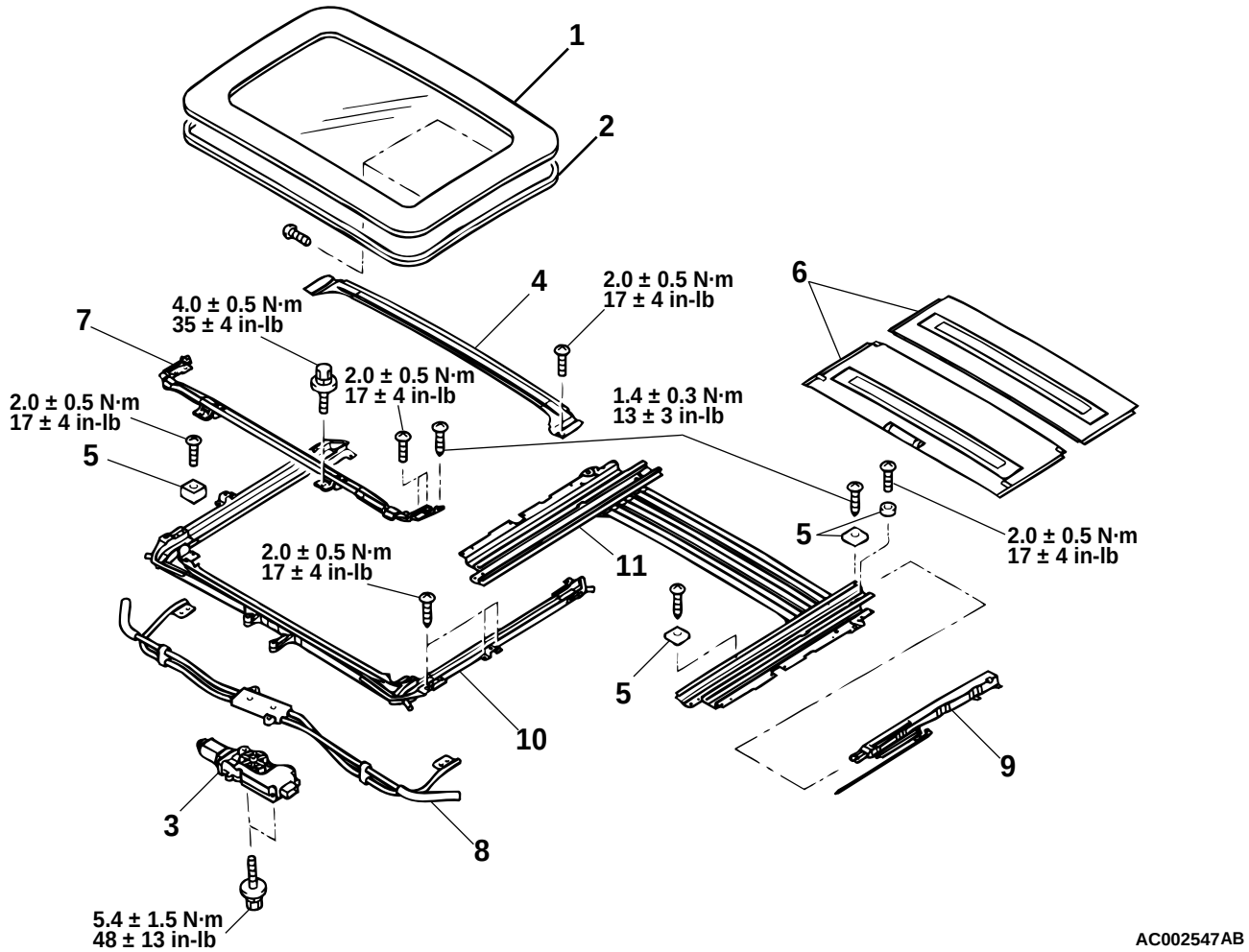
3. If the operation current is outside the standard value, check the following points.
   - Installation condition, warping or jamming of sunroof assembly
   - Sticking of drive cable
   - Tilt of roof lid glass

DISASSEMBLY AND ASSEMBLY

M1426001400120







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DISASSEMBLY STEPS

1. ROOF LID GLASS ASSEMBLY
2. WEATHERSTRIP

>>B<< • CHECK OPERATION

3. SUNROOF MOTOR ASSEMBLY
4. SUNROOF DRIP RAIL
5. STOPPER

DISASSEMBLY STEPS

6. SUN SHADE ASSEMBLY

>>A<< 7. ROOF LID SLIDER

8. SUNROOF DEFLECTOR
9. SLIDING ROOF OPERATING UNIT
10. SUNROOF HOUSING, UPPER
11. SUNROOF HOUSING, LOWER

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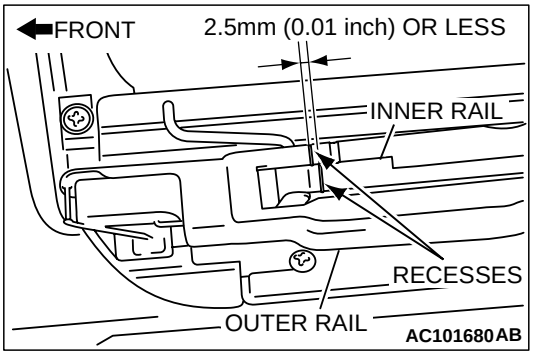


INSTALLATION SERVICE POINT

>>A<< ROOF LID SLIDER INSTALLATION

To set the roof lid slider to fully closed position, position the recesses on the inner and outer rails of the roof lid slider as shown.

NOTE: Ideally, the inner and outer rails of the roof lid slider should be aligned.

>>B<< CHECK OPERATION

⚠ CAUTION

Roof lid slider recesses position error must be kept within 2.5 mm (0.01 inch) or less.

When roof lid slider is set to its fully closed position, it must be at the recesses position.

If roof lid slider is positioned at the rear of recesses, carry out the following procedure.

1. Remove sunroof motor assembly.
2. Fit sunroof motor firmly.
3. Install sunroof motor assembly
4. Check recesses position again.

CONVERTIBLE TOP

GENERAL DESCRIPTION

M1421000100024

The electric convertible top can be opened/closed by means of electric power. For safety, the convertible top control module disables opening and closing of the convertible top in response to signals from the vehicle speed sensor when the vehicle speed exceeds 3km/h (1.9 mph).

CONVERTIBLE TOP DIAGNOSIS

INTRODUCTION TO ELECTRIC CONVERTIBLE TOP DIAGNOSIS

M1426203900028

The electric convertible top is controlled by the convertible top control module. When the convertible top switch is operated at the vehicle speed of less than 3 km/h (1.9 mph), all the door windows automatically lower and then all the quarter windows. After all the door windows and the quarter windows are fully lowered, the top stack drive motor operates to open or close the electric convertible top.

Incidentally, the door windows will automatically lower during the operation of the convertible top switch even when the lock switch of the power window main switch is locked.

If the following types of symptom occur, there may be a fault.

- The electric convertible top does not open or close.

ELECTRIC CONVERTIBLE TOP DIAGNOSTIC TROUBLESHOOTING STRATEGY

M1426204000028

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted most of the possible ways to find the electric convertIble top fault.

1. Gather information from customer.
2. Verify that the condition described by the customer exists.
3. Find the malfunction by following the Symptom Chart.
4. Verify malfunction is eliminated.

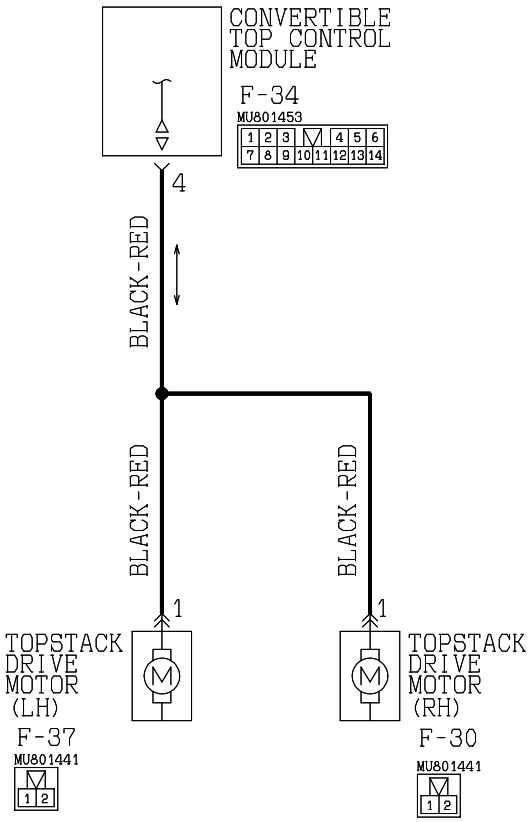
SYMPTOM CHART

M1426204100025

SYMPTOMS	INSPECTION PROCEDURE	REFERENCE PAGE
The electric convertible top does not open or close at the vehicle speed of less than 3 km/h (1.9 mph). (The door windows and the quarter windows automatically lower when the convertible top switch is operated.)	1	P.42-96
The electric convertible top does not open or close at the vehicle speed of less than 3 km/h (1.9 mph). (The door windows and the quarter windows do not automatically lower when the convertible top switch is operated. However, the door windows and the quarter windows lower and raise when the power window main switch is operated.)	2	P.42-98
The electric convertible top does not open or close at the vehicle speed of less than 3 km/h (1.9 mph). (The door windows and the quarter windows do not automatically lower when the convertible top switch is operated. Also, the quarter windows do not operate when the power window main switch is operated.)	3	P.42-102
The electric convertible top opens or closes even at the vehicle speed of 3 km/h (1.9 mph) or more.	4	P.42-105

INSPECTION PROCEDURE 1: The Electric Convertible Top does not Open or Close at the Vehicle Speed of Less than 3 km/h (1.9 mph). (The Door Windows and the Quarter Windows Automatically Lower when the Convertible Top Switch is Operated.)

Electric Convertible Top Drive Motor Circuit



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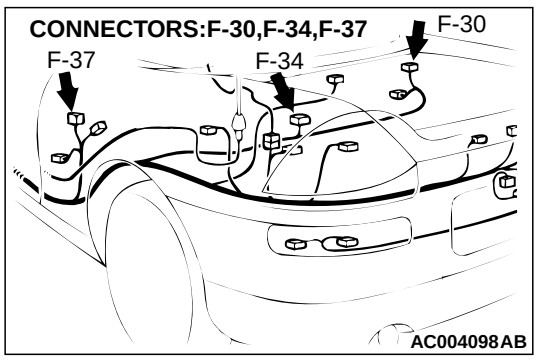

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CIRCUIT OPERATION

When the convertible top switch is operated, a signal is sent to the convertible top control module. The convertible top control module sends convertible top switch "ON" signal to the power window main switch to lower the door windows automatically. The power window main switch lowers the door windows and simultaneously sends the "AUTO DOWN" signal to the convertible top control module. When the "AUTO DOWN" signal is received, the convertible top control module drives the quarter window regulator motor to lower the quarter windows and simultaneously drives the topstack drive motor assembly to operate the electric convertible top.

TECHNICAL DESCRIPTION (COMMENT)

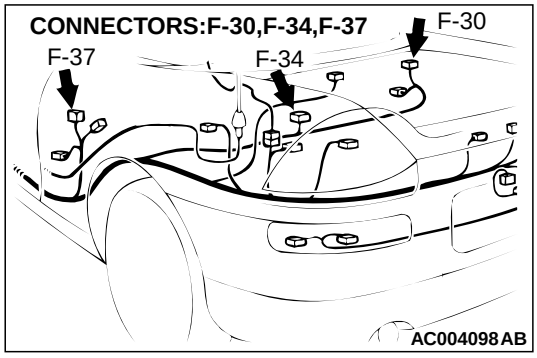
The cause may be a malfunction of the topstack drive motor circuit.

TROUBLESHOOTING HINTS

- Malfunction of the topstack drive motor assembly
- Damaged harness wires or connectors

DIAGNOSIS

STEP 1. Check the harness wires between convertible top control module connector F-34 (4) and topstack drive motor connector F-37 <LH> (terminal 1), F-30 <RH> (terminal 1).

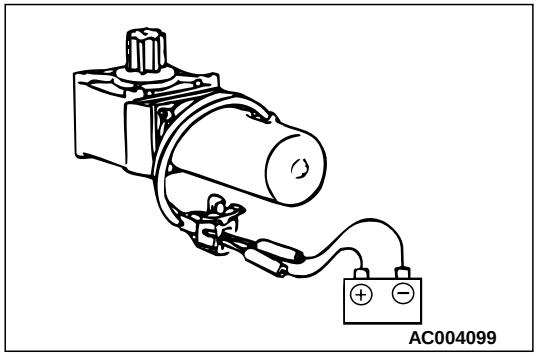


Q: Are the harness wires between convertible top control module connector F-34 (terminal 4) and topstack drive motor connector F-37 <LH> (terminal 1) , F-30 <RH> (terminal 1) in good condition?

YES : Go to Step 2.

NO : Repair or replace them. Refer to GROUP 00E, Harness Connector InspectionP.00E-2 . Then go to Step 3.

STEP 2. Check the topstack drive motor assembly.



Q: Are topstack drive motor assembly in good condition?

YES : Go to Step 3.

NO : Replace the topstack drive motor assembly P.42-114.

STEP 3. Check symptoms.

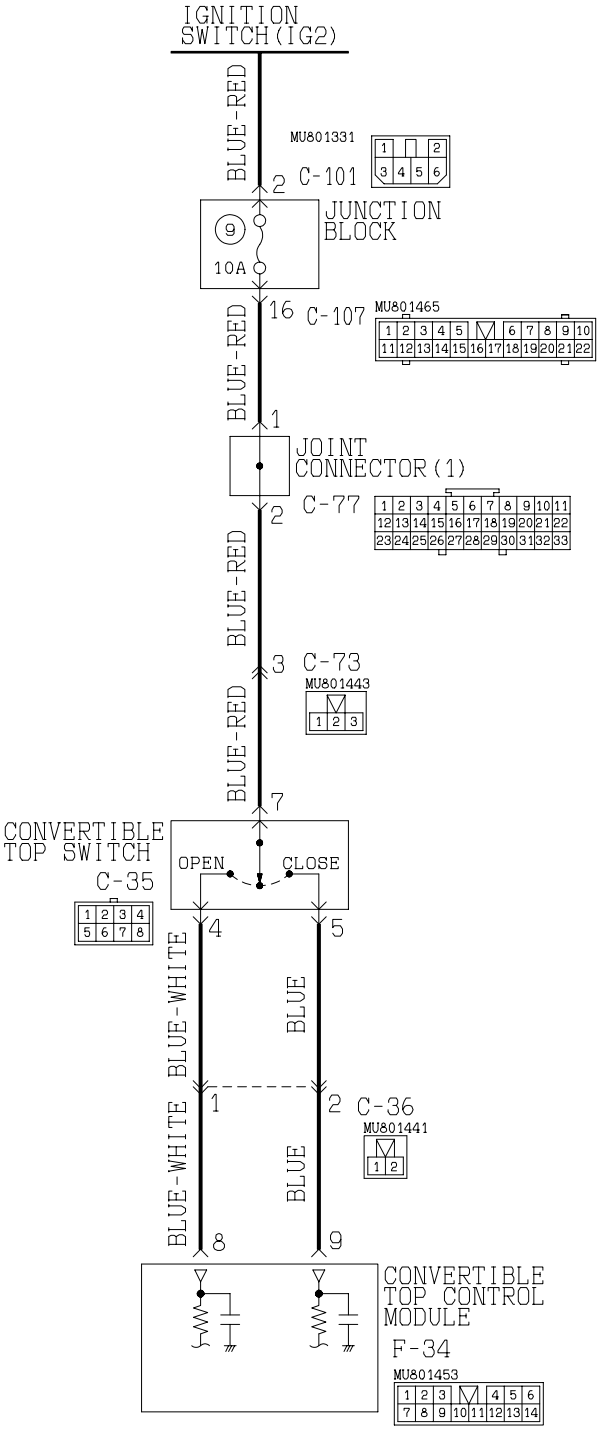
Q: Does the electric convertible top open and close normally?

YES : This diagnosis is complete.

NO : Return to Step 1.

INSPECTION PROCEDURE 2: The Electric Convertible Top does not Open or Close at the Vehicle Speed of Less than 3 km/h (1.9 mph). (The Door Windows and the Quarter Windows do not Automatically Lower when the Convertible Top Switch is Operated. However, the Door Windows and the Quarter Windows Lower and Raise when the Power Window Main Switch is Operated.)

Convertible Top Switch Circuit



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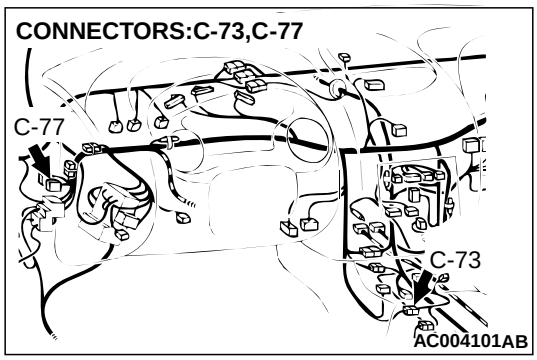
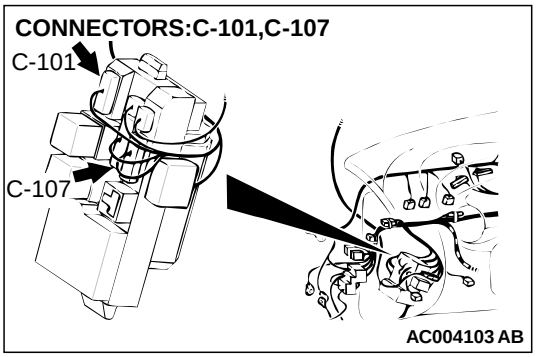
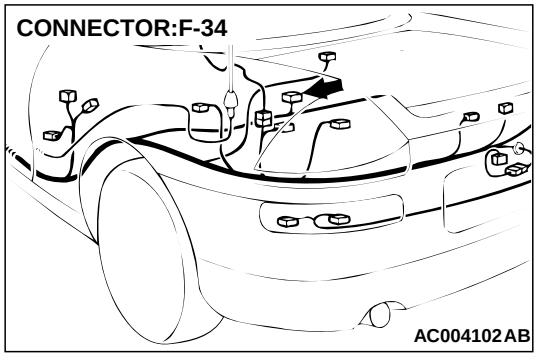
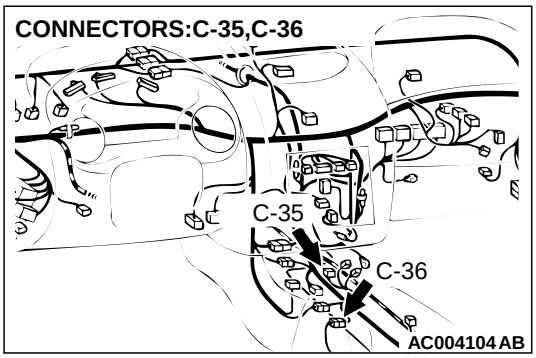








CIRCUIT OPERATION

When the convertible top switch is operated, signal is sent to the convertible top control module. The convertible top control module sends convertible top switch "ON" signal to the power window main switch to lower the door windows automatically. The power window main switch lowers the door windows and simultaneously sends the "AUTO DOWN" signal to the convertible top control module. When the "AUTO DOWN" signal is received, the convertible top control module drives the quarter window regulator motor to lower the quarter windows and simultaneously drives the topstack drive motor assembly to operate the electric convertible top.

TECHNICAL DESCRIPTION (COMMENT)

The cause may be a malfunction of the topstack control module circuit.

TROUBLESHOOTING HINTS

- Malfunction of the topstack drive motor assembly
- Malfunction of the power window main switch
- Damaged harness wires or connectors

DIAGNOSIS

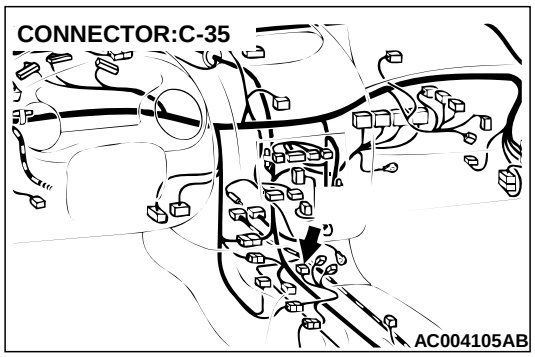
STEP 1. Check the harness wires between ignition switch (IG2) and convertible top switch connector C-35 (terminal 7).

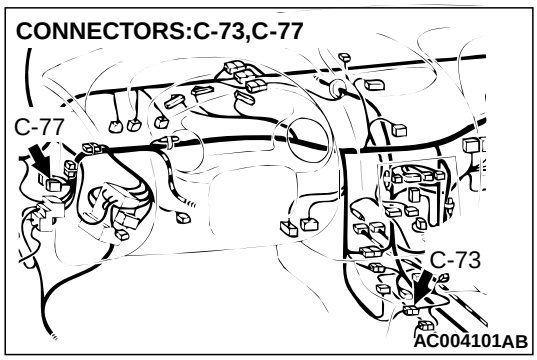
NOTE: After inspecting intermediate connector C-73, C-77, C-101, C-107 inspect the wire. If intermediate connector C-73, C-77, C-101, C-107 are damaged, repair or replace it. Refer to GROUP 00E P.00E-2, Harness Connector Inspection. Then go to Step 5.

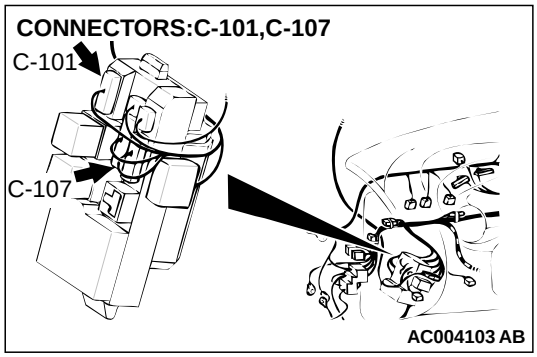
Q: Are the harness wires between ignition switch (IG2) and convertible top switch connector C-35 (terminal 7) in good condition?

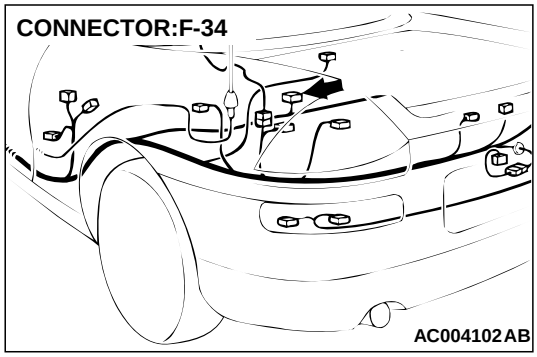
YES : Go to Step 2.

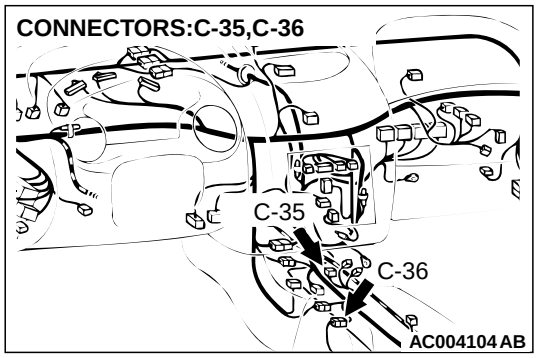
NO : Repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.











STEP 2. Check the harness wires between convertible top control module connector F-34 (terminals 8, 9) and convertible top switch connector C-35 (terminals 4, 5).

NOTE: After inspecting intermediate connector C-36 inspect the wire. If intermediate connector C-36 is damaged, repair or replace it. Refer to GROUP 00E P.00E-2, Harness Connector Inspection. Then go to Step 5.

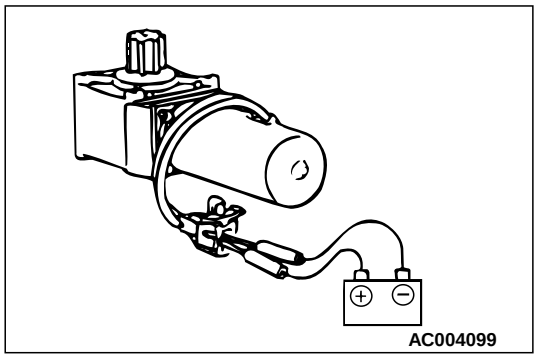
Q: Are the harness wires between convertible top control module connector F-34 (terminals 8, 9) and convertible top switch connector C-35 (terminals 4, 5) in good condition?

YES : Go to Step 3.
NO : Repair or replace them. Refer to GROUP 00E, Harness Connector InspectionP.00E-2 . Then go to Step 5.

STEP 3. Check the convertible top switch

Q: Are convertible top switch in good condition?

YES : Go to Step 4.
NO : Replace the convertible top switch P.42-137.



STEP 4. Check the topstack drive motor assembly.

Q: Are topstack drive motor assembly in good condition?

YES : Go to Step 5.
NO : Replace the topstack drive motor assemblyP.42-114 .

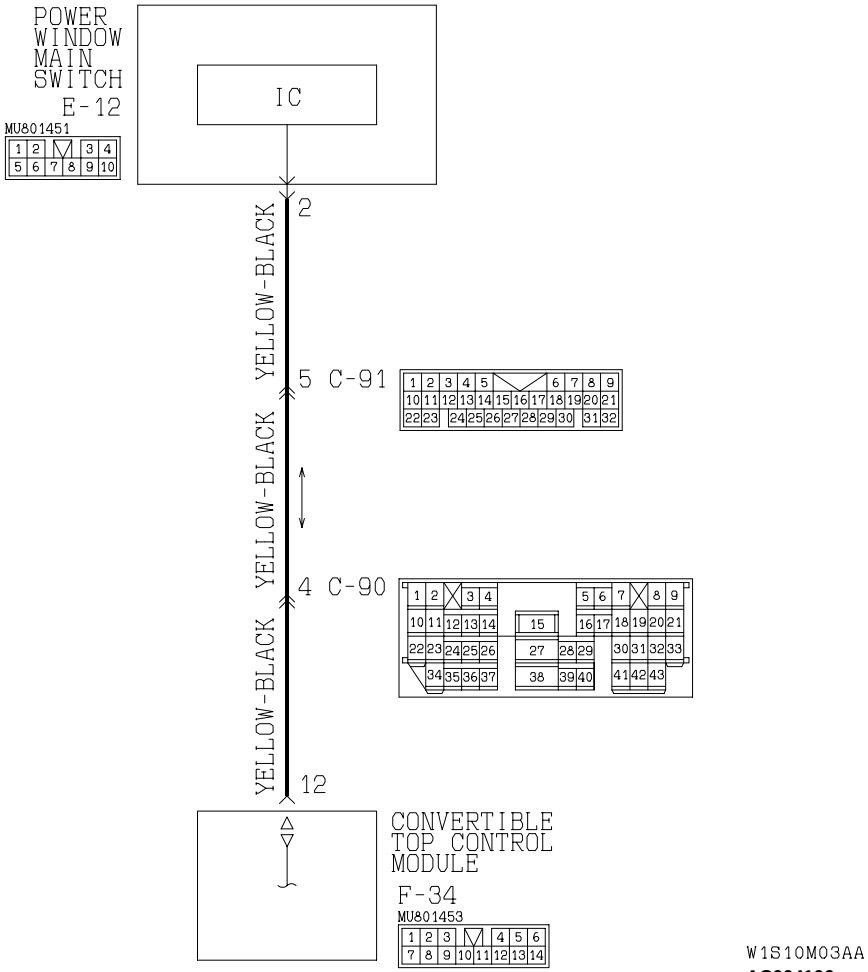
STEP 5. Check symptoms.

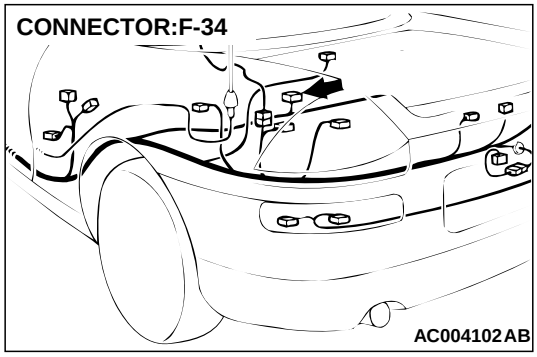
Q: Does the electric convertible top open and close normally?

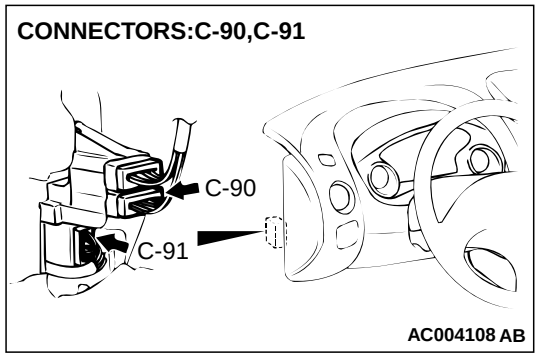
YES : This diagnosis is complete.
NO : Return to Step 1.

INSPECTION PROCEDURE 3: The Electric Convertible Top does not Open or Close at the Vehicle Speed of Less than 3 km/h (1.9 mph). (The Door Windows and the Quarter Windows do not Automatically Lower when the Convertible Top Switch is Operated. Also, the Quarter Windows do not Operate when the Power Window Main Switch is Operated.)

Convertible Top Control Module Circuit







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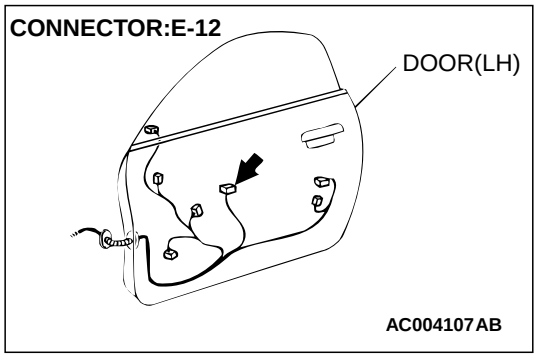


CIRCUIT OPERATION

When the convertible top switch is operated, a signal is sent to the convertible top control module. The convertible top control module sends convertible top switch "ON" signal to the power window main switch to lower the door windows automatically. The power window main switch lowers the door windows and simultaneously sends the "AUTO DOWN" signal to the convertible top control module. When the "AUTO DOWN" signal is received, the convertible top control module drives the quarter window regulator motor to lower the quarter windows and simultaneously drives the topstack drive motor assembly to operate the electric convertible top.

TECHNICAL DESCRIPTION (COMMENT)

The cause may be a malfunction of the topstack control module circuit.

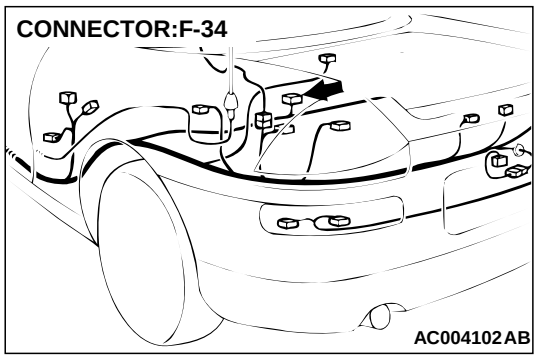
TROUBLESHOOTING HINTS

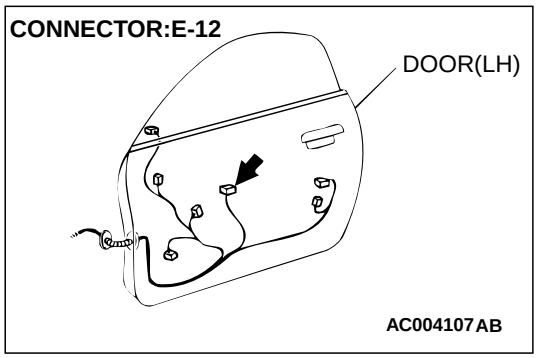
- Malfunction of the power window main switch
- Damaged harness wires or connectors

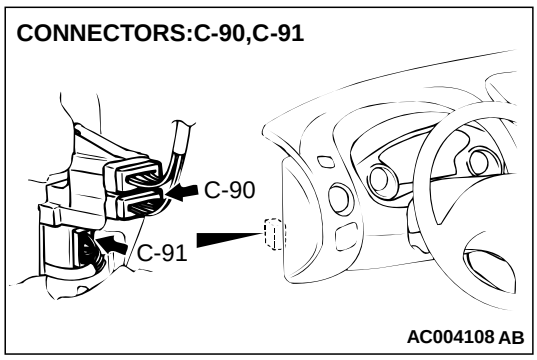
DIAGNOSIS

STEP 1. Check harness wires between convertible top control module connector F-34 (terminal 12) and power window main switch connector E-12 (terminal 2).

NOTE: After inspecting intermediate connector C-90, C-91 inspect the wire. If connector block connector C-90, C-91 are damaged, repair or replace it. Refer to GROUP 00E P.00E-2, Harness Connector Inspection. Then go to Step 3.







Q: Are there any damaged wires between convertible top control module connector F-34 (terminal 12) and power window main switch connector E-12 (terminal 2)?

YES : Replace it, then go to Step 3.
NO : Go to Step 2.

STEP 2. Check the power window main switch

Furthermore, check that the power window main switch with the one in good condition to check that the quarter window glass operates properly. (Refer to P.42-137.)

Q: Is the power window main switch damaged?

YES : Replace it, then go to Step 3.
NO : Go to Step 3.

STEP 3. Check the Check symptoms.

Q: Does the electric convertible top open and close normally?

YES : This diagnosis is complete.
NO : Return to Step 1.

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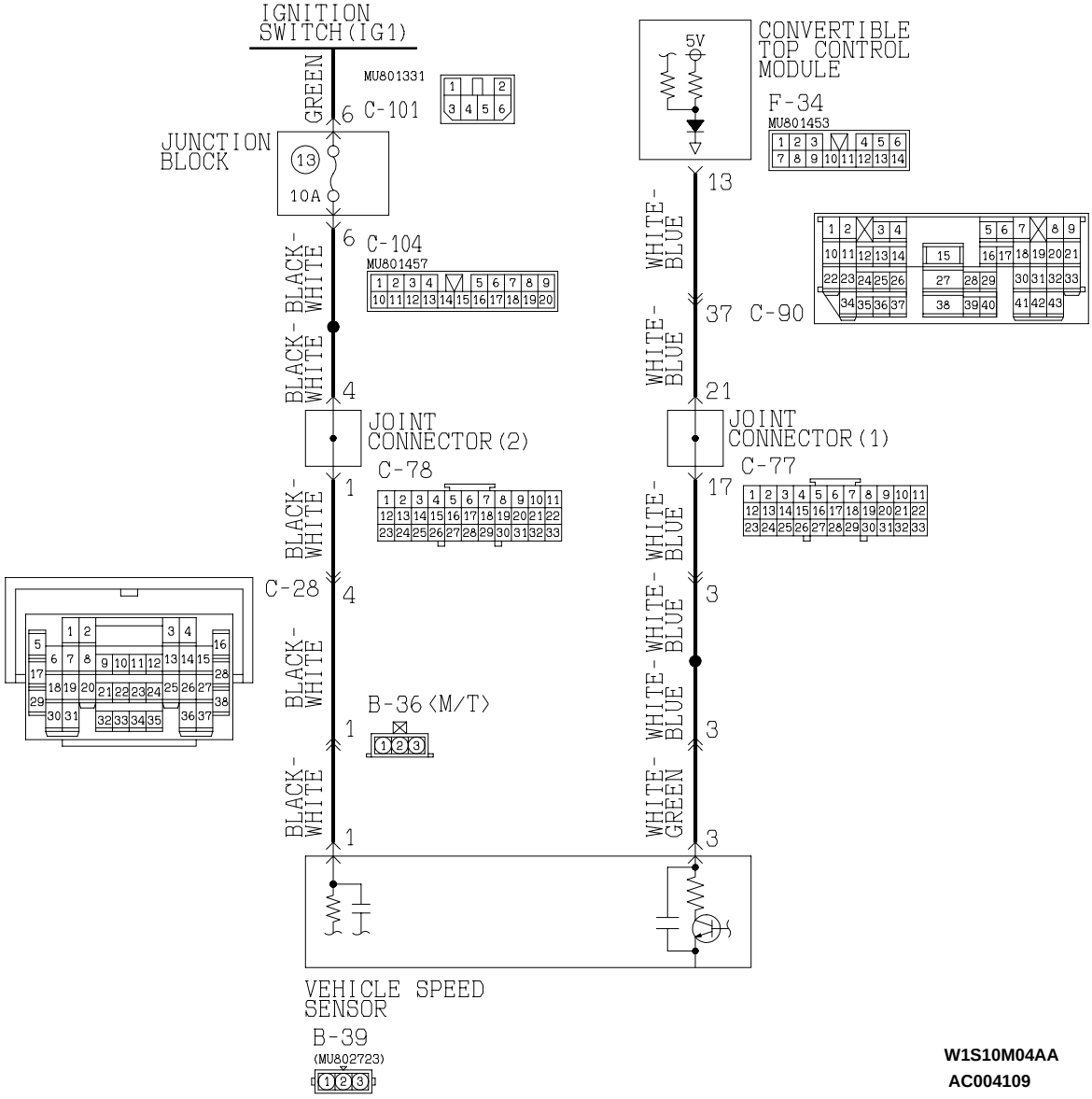
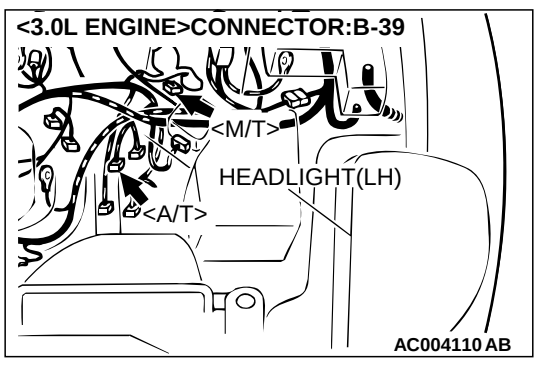
INSPECTION PROCEDURE 4: The Electric Convertible Top Opens or Closes Even at the Vehicle Speed of 3 km/h (1.9 mph) or more.

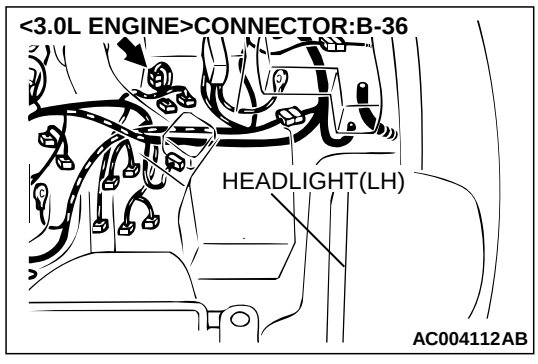
Vehicle Speed Sensor Circuit



W1S10M04AA
AC004109



AC004110 AB



AC004112AB

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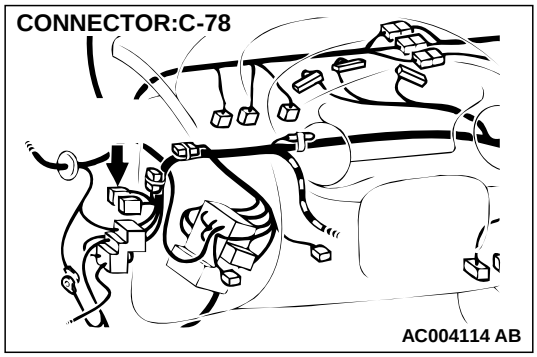

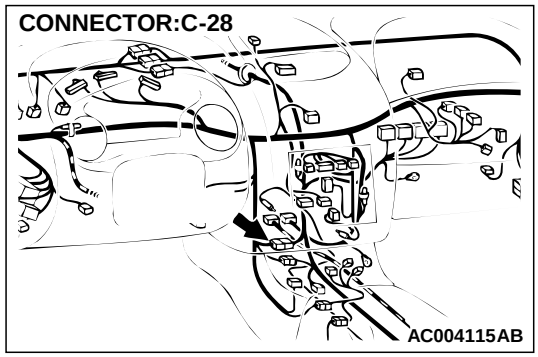

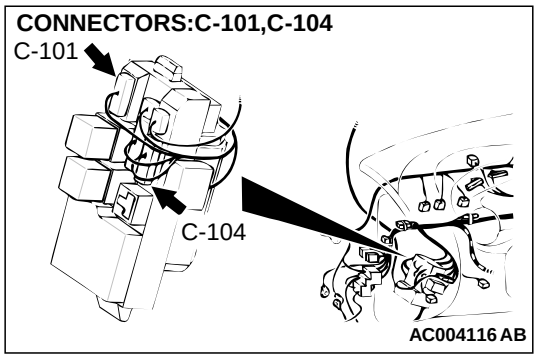

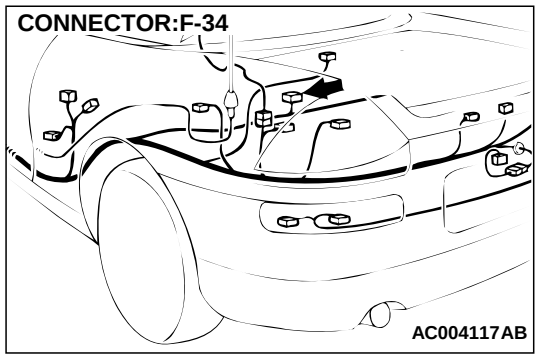

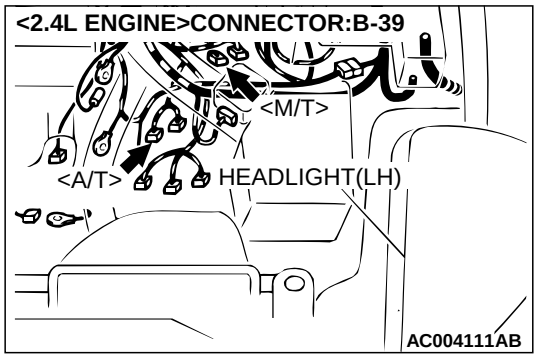

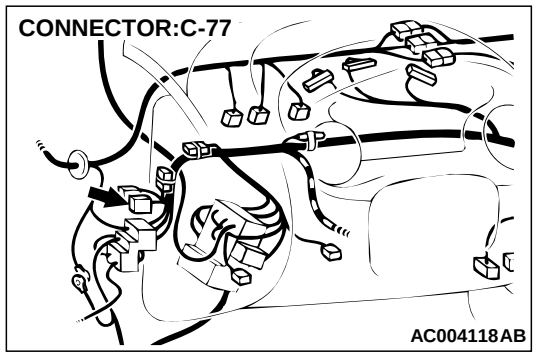

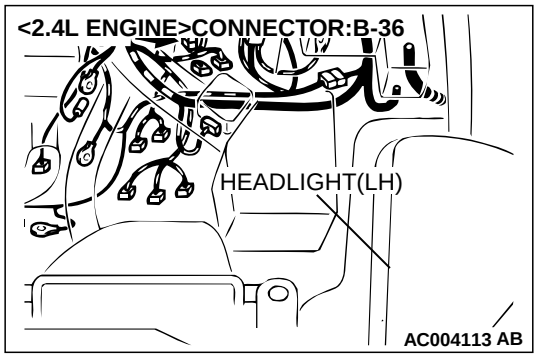

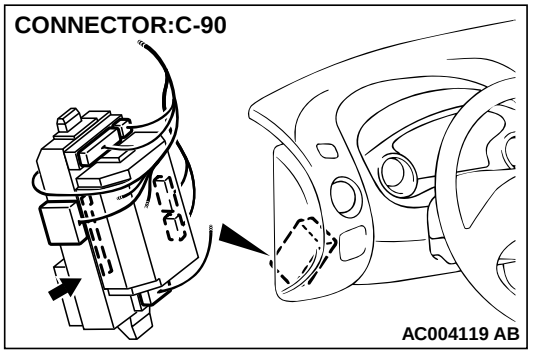

CIRCUIT OPERATION

When the convertible top switch is operated, a signal is sent to the convertible top control module. The convertible top control module sends convertible top switch "ON" signal to the power window main switch to lower the door windows automatically. The power window main switch lowers the door windows and simultaneously sends the "AUTO DOWN" signal to the convertible top control module. When the "AUTO DOWN" signal is received, the convertible top control module drives the quarter window regulator motor to lower the quarter windows and simultaneously drives the topstack drive motor assembly to operate the electric convertible top.

TECHNICAL DESCRIPTION (COMMENT)

The cause may be a malfunction of the vehicle speed sensor.

TROUBLESHOOTING HINTS

- Malfunction of the vehicle speed sensor
- Damaged harness wires or connectors

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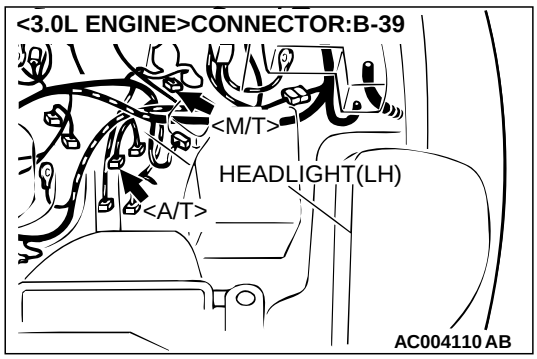
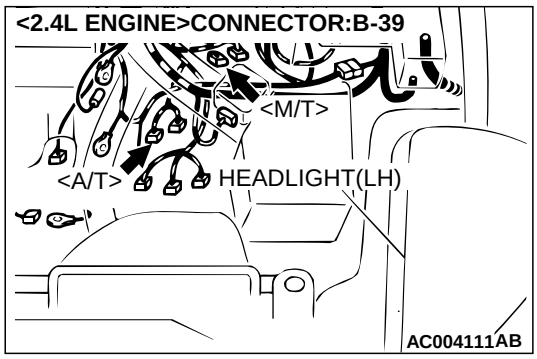
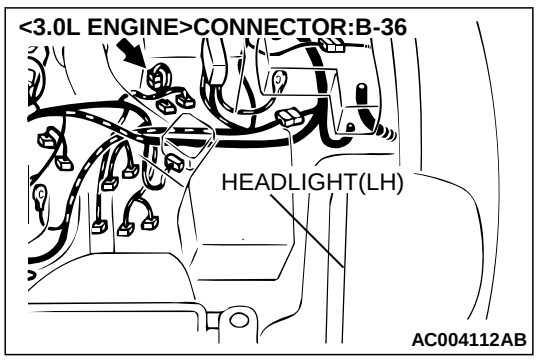
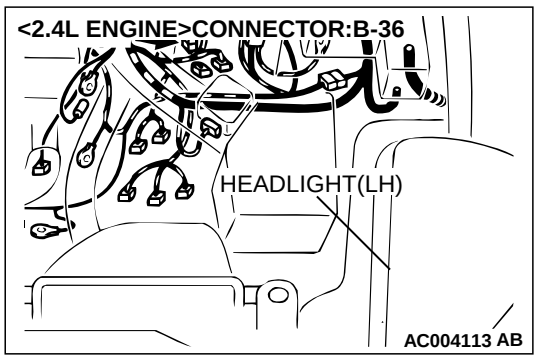
DIAGNOSIS

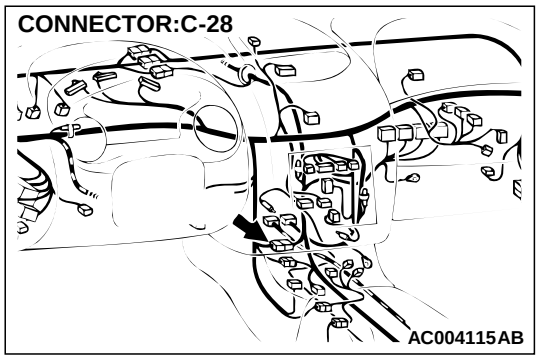
STEP 1. Check harness wires between ignition switch (IG1) and vehicle speed sensor connector B-39 (terminal 1).

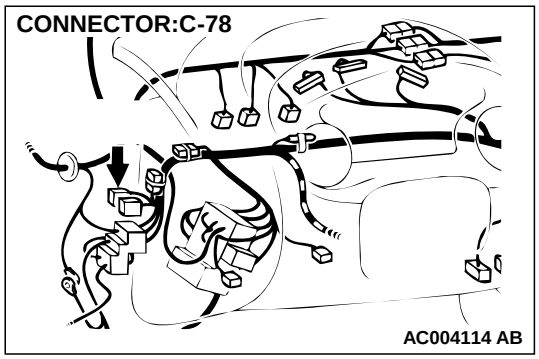


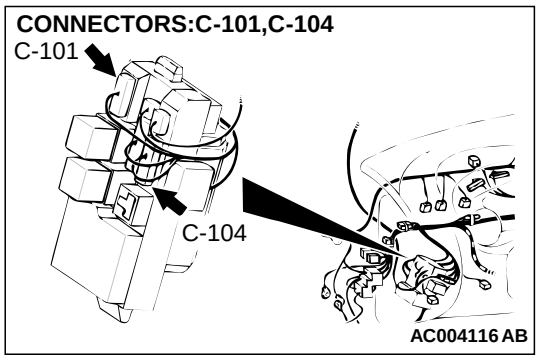










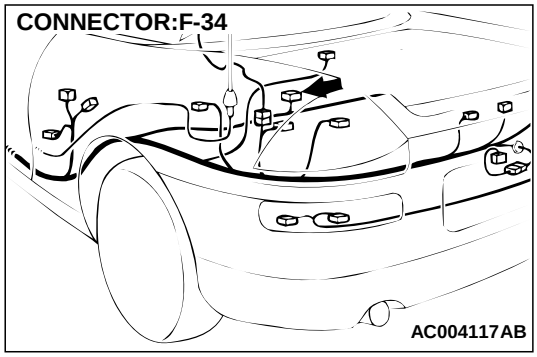


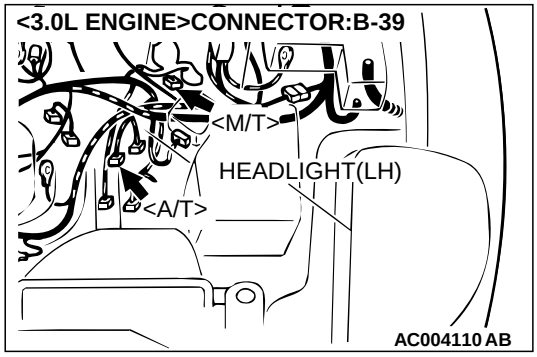
NOTE: After inspecting intermediate connector B-36 <M/T>, C-28, C-78, C-101, C-104 inspect the wire. If intermediate connector B-36 <M/T>, C-28, C-78, C-101, C-104 are damaged, repair or replace it. Refer to GROUP 00E P.00E-2, Harness Connector Inspection. Then go to Step 4.

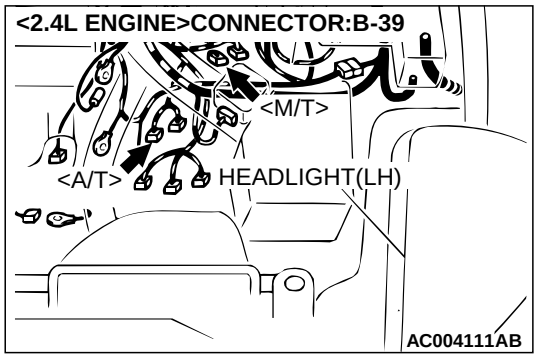
Q: Are there any damaged wires between ignition switch (IG1) and vehicle speed sensor connector B-39 (terminal 1)?

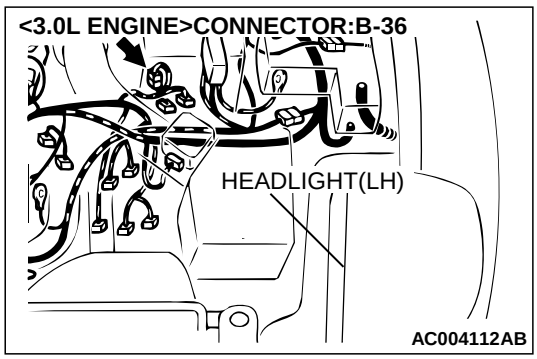
YES : Replace it, then go to Step 4.
NO : Go to Step 2.

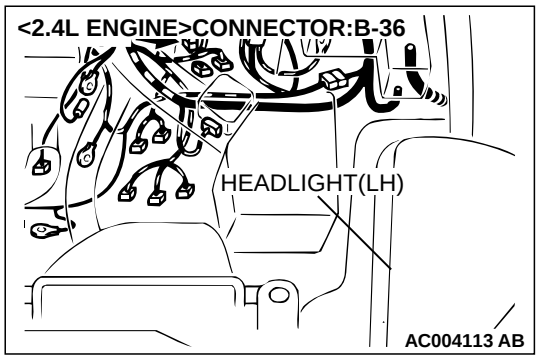
STEP 2. Check harness wires between convertible top control module connector F-34 (terminal 13) and vehicle speed sensor connector B-39 (terminal 3).

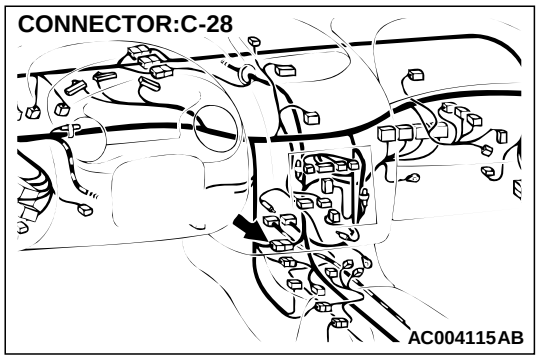


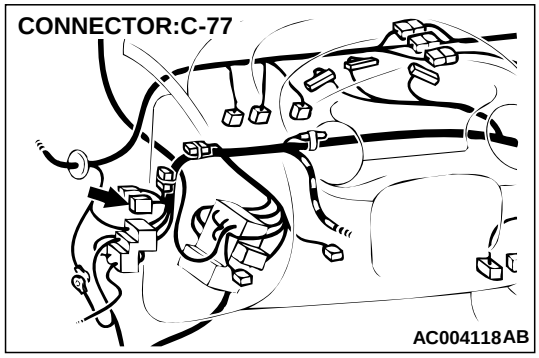


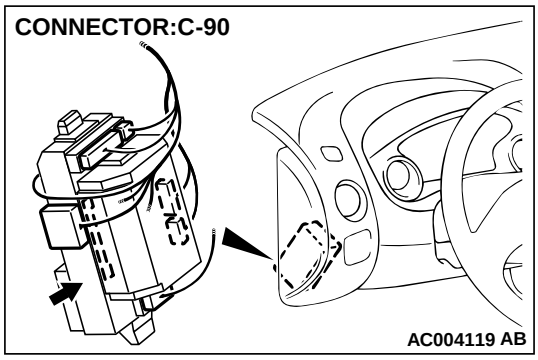












NOTE: After inspecting intermediate connector B-36 <M/T>, C-28, C-77, C-90 inspect the wire. If intermediate connector B-36 <M/T>, C-28, C-77, C-90 are damaged, repair or replace it. Refer to GROUP 00E P.00E-2, Harness Connector Inspection. Then go to Step 4.

Q: Are there any damaged wires between convertible top control module connector F-34 (terminal 13) and vehicle speed sensor connector B-39 (terminal 3)?

YES : Replace it, then go to Step 4.
NO : Go to Step 3.

STEP 3. Check the vehicle speed sensor

Furthermore, check that the vehicle speed sensor operates properly. (Refer to P.42-39.)

Q: Is the vehicle speed sensor damaged?

YES : Replace it, then go to Step 4.
NO : Go to Step 4.

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STEP 4. Check the Check symptoms.

Q: Does the electric convertible top open and close normally?

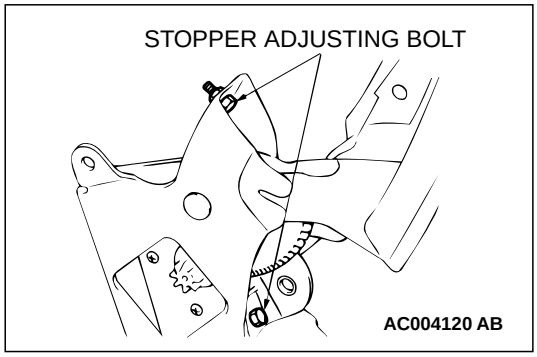
YES : This diagnosis is complete.
NO : Return to Step 1.

ON VEHICLE SERVICE

CONVERTIBLE TOP FIT ADJUSTMENT

M1426200900029

1. Remove the quarter trim, lower (Refer to GROUP 52A - Trims P.52A-9.)
2. Fully open or close the top, then adjust the stopper adjusting bolt so it contacts the flange as shown in the illustration.



WATER LEAK TEST

M1426208400028

DEFINITION OF TERMS

Leakage: Defined as water that spills over weather-stripping and causes the interior to become wet in a short period of time.
Seepage: Defined as water that runs down the inside of the door and or quarter glass but does not build up or drip onto any interior trim components. By nature of their design, convertible tops normally display some water seepage under certain ambient conditions. Water leakage/seepage characteristics for the convertible are:

- Normal-Under normal conditions, the convertible top should never display seepage of more than a total of three moisture weeps of more than 5 mm (0.2 inch) wide at any or all of the convertible top roof joints. As with any convertible top, leakage may occur under abnormal conditions such as the flooding of the weatherstrip roof joints with large quantities of water as might happen in an automatic car wash.
- Service Required-Vehicle service is required if leakage occurs under normal conditions. (Some adjustments may help reduce leakage which occurs under abnormal conditions).

TEST PROCEDURES

1. Interview the customer to get a detailed description of the leak and the conditions under which the leak occurred.
2. Open the part of the vehicle to be tested for the water leak, door, windows, convertible top, etc.
3. Use a clean cloth and wipe clean and dry the sealing surfaces for the suspected area.
4. Close the doors, windows, etc. of the vehicle to prevent water from accidentally getting into the vehicle.
5. Turn off A/C, heater and ventilation blower. Otherwise, if the blower is on this will pressurize the cabin, preventing water from entering back through a bad seal condition.
6. Evaluate the customer's description of the leak in question then use the method of water testing (angle, distance, pressure, etc.) which closely simulates or duplicates the leak condition the customer's vehicle experienced.

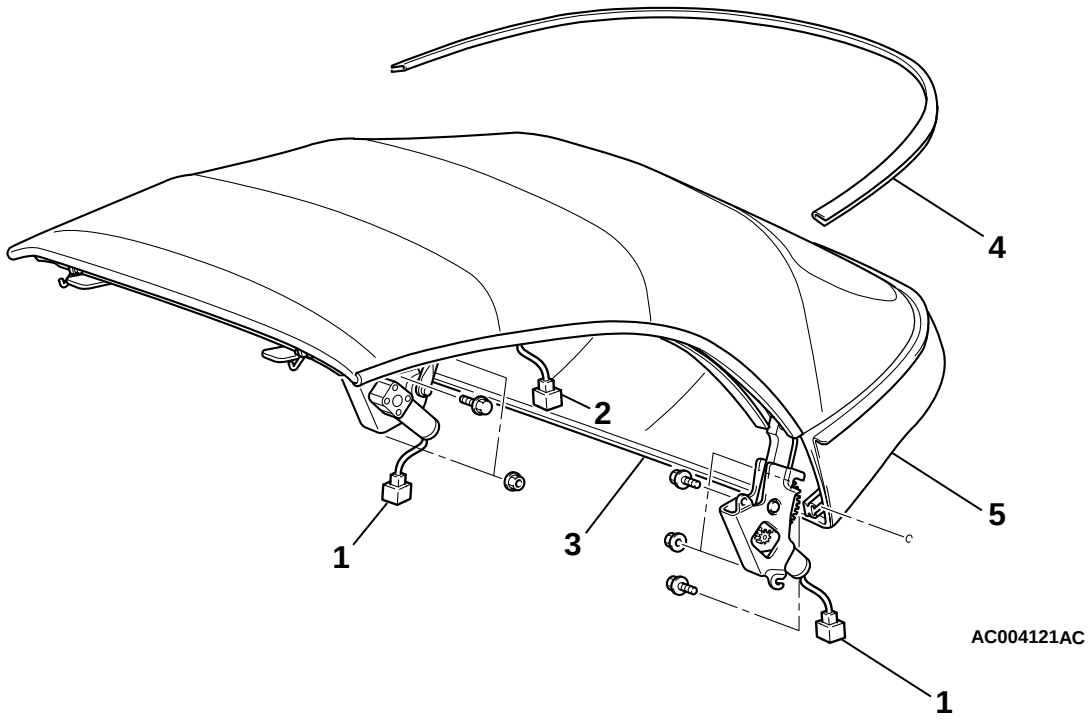
7. Most leaks can be corrected by glass and/or weatherstrip adjustments so the glass achieves proper insertion into the weatherstrip. Proper insertion of the glass into the weatherstrip is necessary for proper leak prevention. Weatherstrip replacement may be necessary if proper insertion cannot be attained by adjustments.

CONVERTIBLE TOP ASSEMBLY

REMOVAL AND INSTALLATION

M1426201100026

Pre-removal Operation	Post-installation Operation
• Completely Open the Convertible Top.	• Convertible Top Fit Adjustment (Refer to P.42-111.)



REMOVAL STEPS
- QUARTER BELT SIDE MOLDING / BACK BELT MOLDING (REFER TO GROUP 51 - MOLDINGS P.51-11.)
- QUARTER TRIM (REFER TO GROUP 52A – TRIMS P.52A-9.)
- REAR SPEAKER BRACKET (REFER TO GROUP 54 – SPEAKER P.54A-218.)

REMOVAL STEPS (Continued)
1. TOPSTACK DRIVE MOTOR HARNESS CONNECTOR
2. DEFOGGER HARNESS CONNECTOR (LH ONLY)
3. TOPSTACK WELL AND BODY PANEL CONNECTION

>>A<< 4. DRAIN TROUGH RETAINER

5. CONVERTIBLE TOP ASSEMBLY

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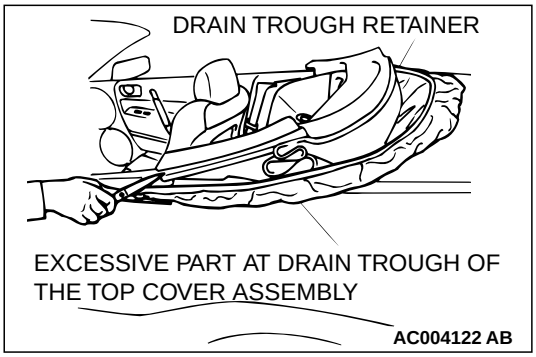
INSTALLATION SERVICE POINT

>>A<< DRAIN TROUGH RETAINER INSTALLATION

When the top cover assembly is replaced, cut out the rear end of the top cover assembly.

1. Install the drain trough retainer so that the drain trough around the rear end of the top cover assembly covers a suitable dimension.
2. Cut out an excessive part at the rear end of the top cover assembly as shown.

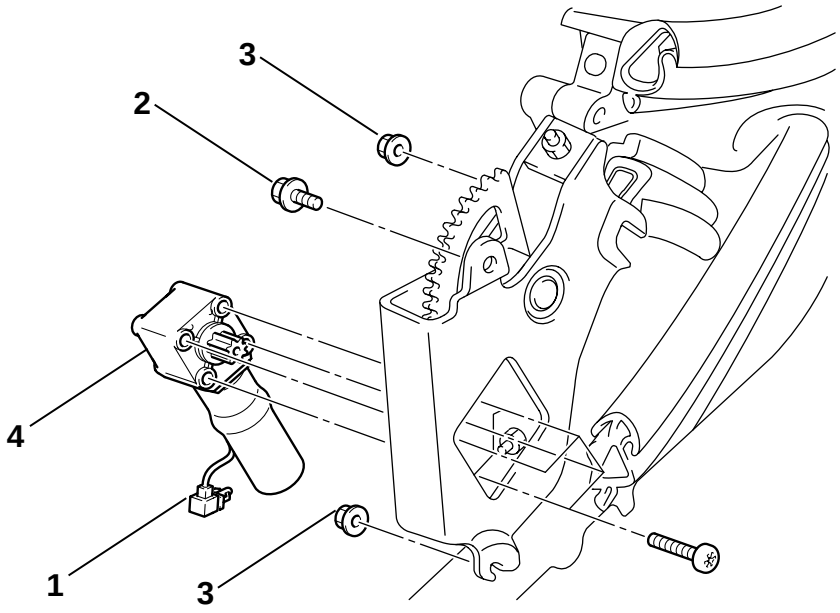


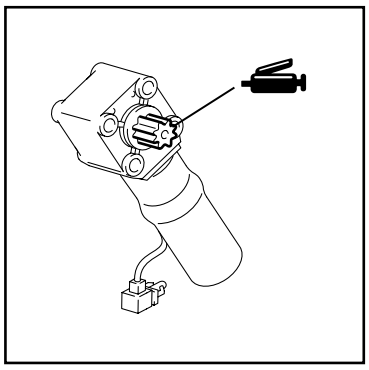
TOPSTACK DRIVE MOTOR

REMOVAL AND INSTALLATION

M1426201700028

Pre-removal Operation
- Completely Down the Quarter Window Glass





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REMOVAL STEPS
- QUARTER BELT MOLDING (REFER TO GROUP 51 – MOLDING P.51-11.)
- QUARTER TRIM (REFER TO GROUP 52A -TRIMS P.52A-9.)
- REAR SPEAKER BRACKET (REFER TO GROUP 54 – SPEAKER P.54A-218.)

1. TOPSTACK DRIVE MOTOR HARNESS CONNECTOR

<<A>> >>A<<

2. MAIN PIVOT BASE ASSEMBLY MOUNTING BOLT
3. MAIN PIVOT BASE ASSEMBLY MOUNTING NUT
4. TOPSTACK DRIVE MOTOR ASSEMBLY

REMOVAL SERVICE POINT

<<A>> TOPSTACK DRIVE MOTOR ASSEMBLY REMOVAL

1. Lift the main pivot base assemblies at the same time as a set.
2. Remove the topstack drive motor.

INSTALLATION SERVICE POINT

>>A<< TOPSTACK DRIVE MOTOR ASSEMBLY INSTALLATION

1. Lift the main pivot base assemblies at the same time as a set.

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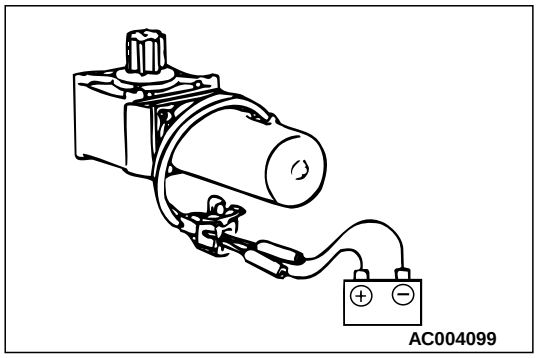
2. Open the convertible top fully, and install the topstack drive motor.

INSPECTION

M1421007600105

TOPSTACK DRIVE MOTOR ASSEMBLY CHECK



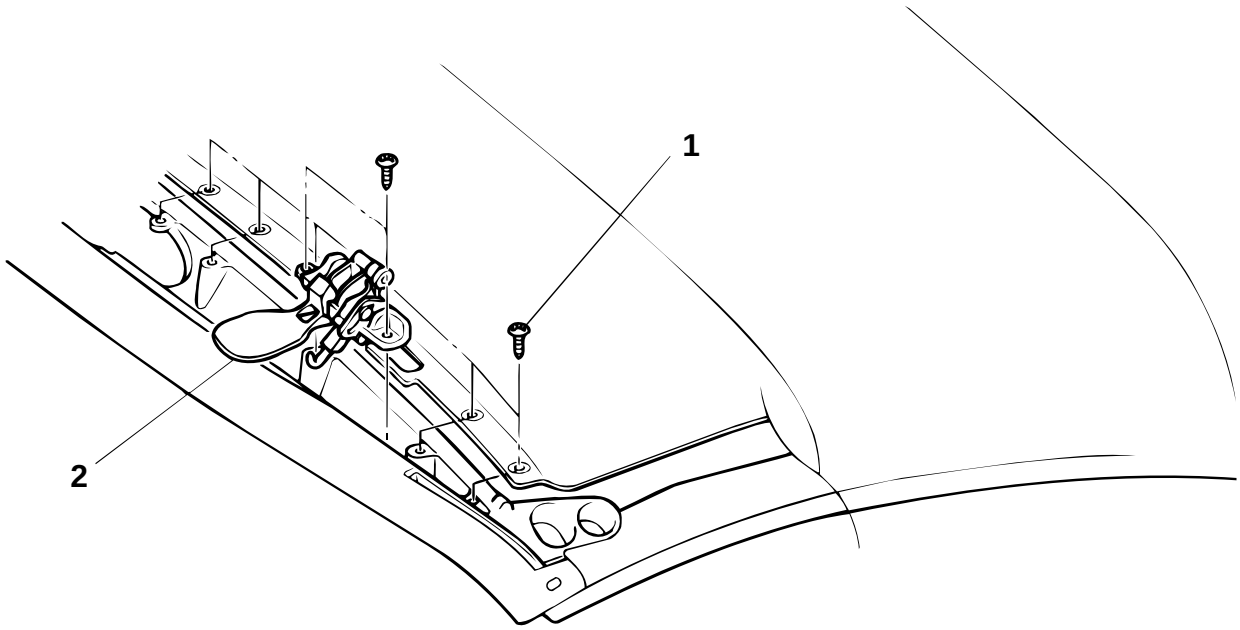
1. Check that the topstack drive motor assembly runs smoothly when the battery is connected directly to the motor terminals.
2. Furthermore, check that the topstack drive motor assembly operates in reverse when the terminal connections are switched.

TOPSTAK LATCH ASSEMBLY

REMOVAL AND INSTALLATION

M1426208800015

Pre-removal Operation	Post-installation Operation
• Completely Open the Convertible Top.	• Convertible Top Fit Adjustment (Refer to P.42-111.)



REMOVAL STEPS

- NO.1 BOW GARNISH (REFER TO P.42-116.)

REMOVAL STEPS (Continued)

1. HEADLINER SCREW (REFER TO P.42-131.)
2. TOPSTACK LATCH ASSEMBLY

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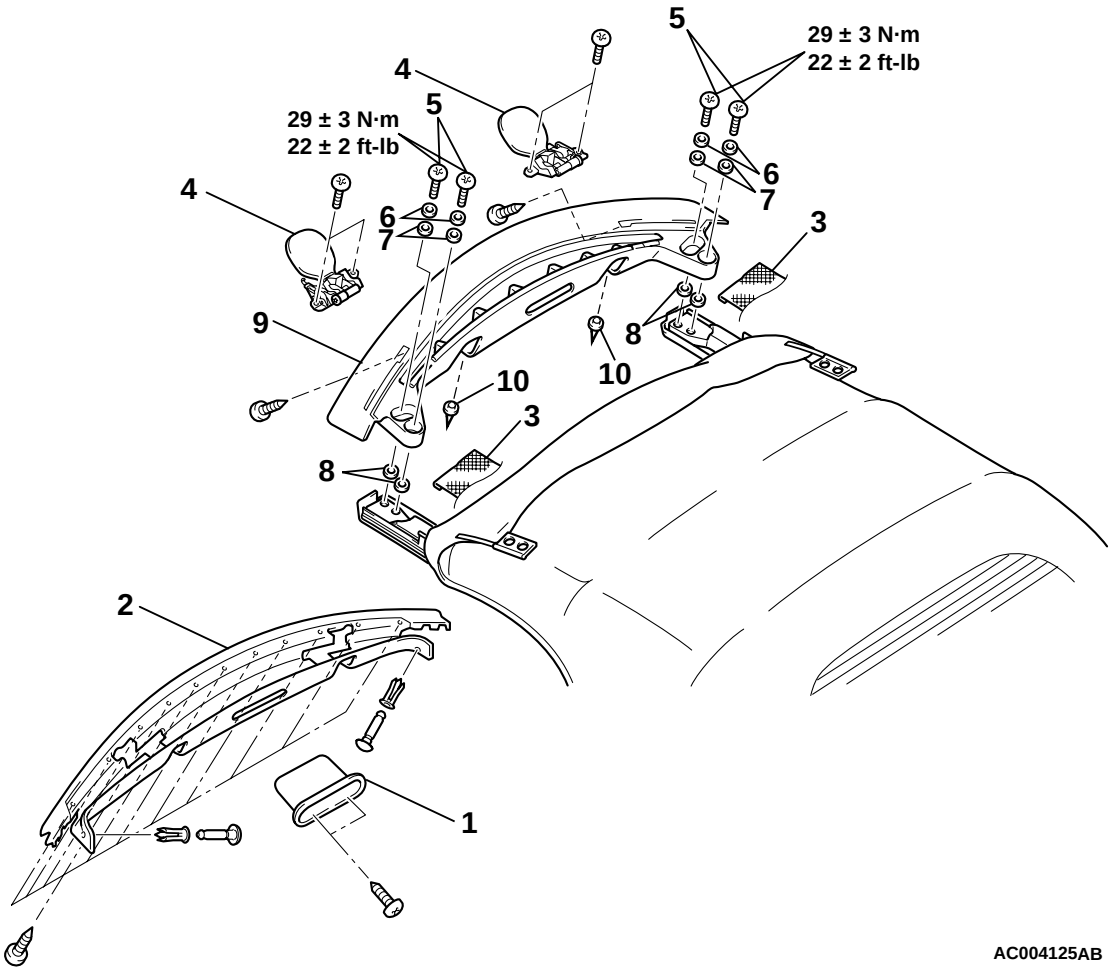
TOPSTACK No.1 BOW

REMOVAL AND INSTALLATION

M1426206000024

Post-installation Operation
- Convertible Top Fit Adjustment (Refer to P.42-111.)



REMOVAL STEPS
1. TOPSTACK PULL HANDLE BOX BEZEL
2. NO.1 BOW GARNISH
- TOP COVER ASSEMBLY (REFER TO P.42-128.)
3. TOPSTACK SIDE STAY PAD ASSEMBLY FROM NO.1 BOW (REFER TO P.42-126.)
- HEADLINER FROM NO.1 BOW (REFER TO P.42-131.)

REMOVAL STEPS (Continued)
4. TOPSTACK LATCH ASSEMBLY (REFER TO P.42-115.)
5. BOLT
6. WASHER
7. WASHER
8. WASHER
9. NO.1 BOW
10. DOWEL PIN

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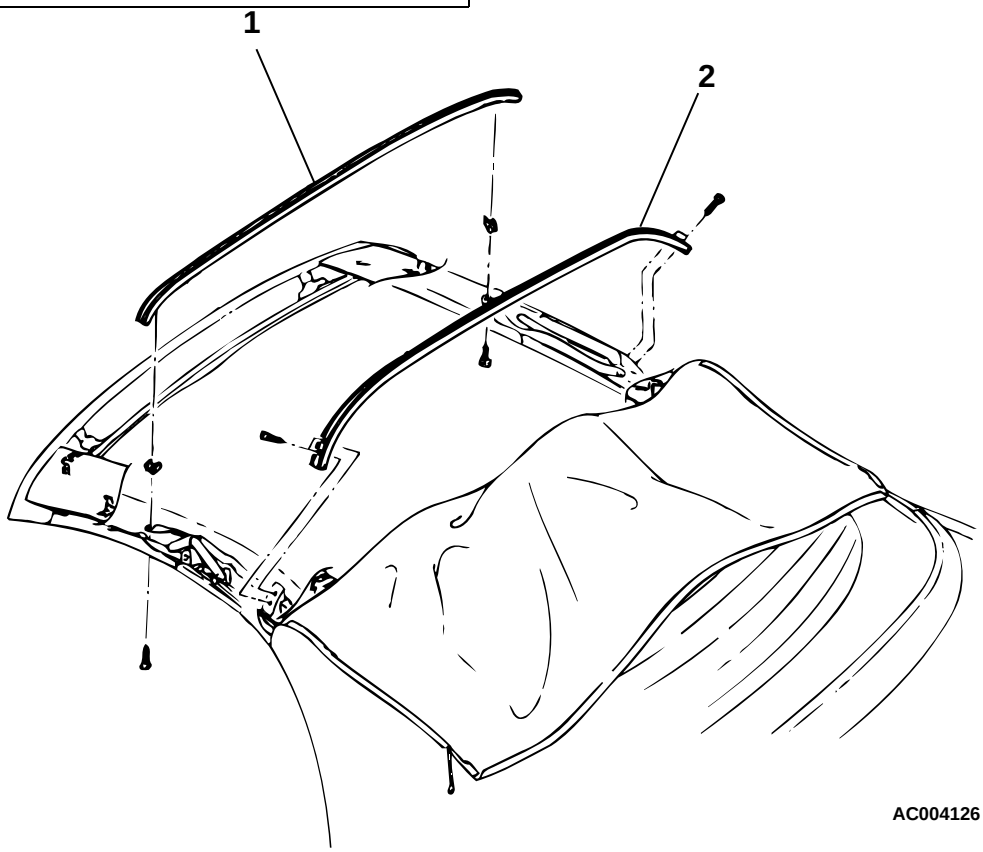
TOPSTACK No.2 AND No.3 BOWS

REMOVAL AND INSTALLATION

M1426206300025

Post-installation Operation
- Convertible Top Fit Adjustment (Refer to P.42-111.)



AC004126 AB

REMOVAL STEPS
- HEADLINER (REFER TO P.42-131. NOTE: ONLY REMOVE THE HEADLINER FROM THE NO.1, 2 AND/OR 3 BOWS AS REQUIRED)
- TOP COVER ASSEMBLY (REFER TO P.42-128. NOTE: ONLY REMOVE THE TOP COVER FROM THE NO.1, 2 AND/OR 3 BOWS AS REQUIRED)

REMOVAL STEPS (Continued)
- TOPSTACK SIDE STAY PAD ASSEMBLY (REFER TO P.42-126. NOTE: ONLY REMOVE THE TOP COVER FROM THE NO.1, 2 AND/OR 3 BOWS AS REQUIRED)

1. TOPSTACK NO.2 BOW
2. TOPSTACK NO.3 BOW

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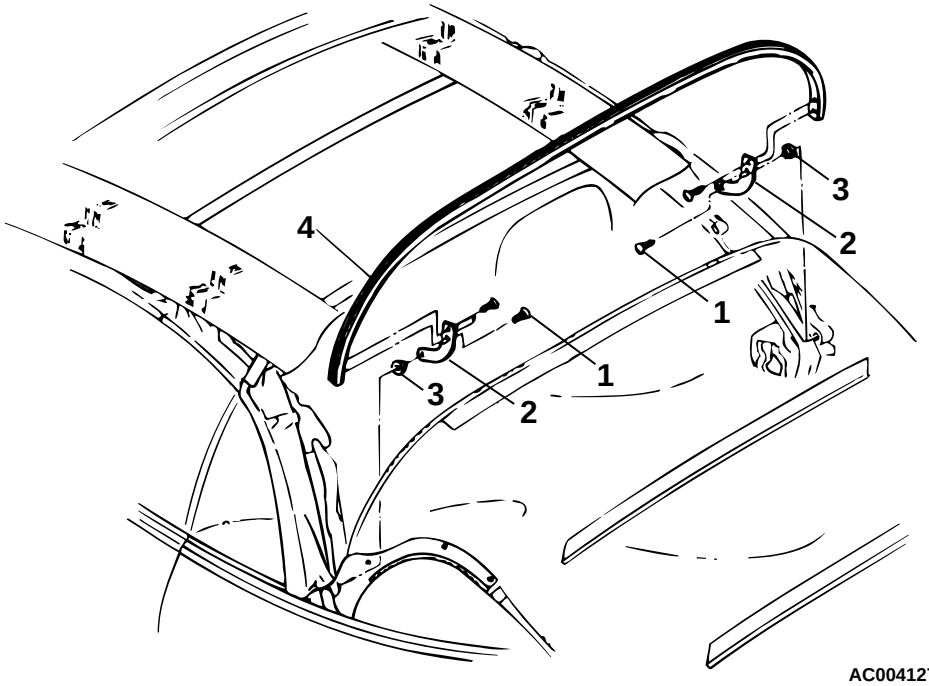
TOPSTACK No.4 BOW

REMOVAL AND INSTALLATION

M1426206600026

Post-installation Operation
- Convertible Top Fit Adjustment (Refer to P.42-111.)



AC004127AB

REMOVAL STEPS
- HEADLINER (REFER TO P.42-131. NOTE: ONLY REMOVE THE HEADLINER FROM THE NO.1, 2 AND/OR 3 BOWS AS REQUIRED)
- TOP COVER ASSEMBLY (REFER TO P.42-128. NOTE: ONLY REMOVE THE TOP COVER FROM THE NO.1, 2 AND/OR 3 BOWS AS REQUIRED)

REMOVAL STEPS (Continued)
- TOPSTACK SIDE STAY PAD ASSEMBLY (REFER TO P.42-126. NOTE: ONLY REMOVE THE TOP COVER FROM THE NO.1, 2 AND/OR 3 BOWS AS REQUIRED)

1. BOLT
2. SLAT
3. BUSHING
4. NO.4 BOW

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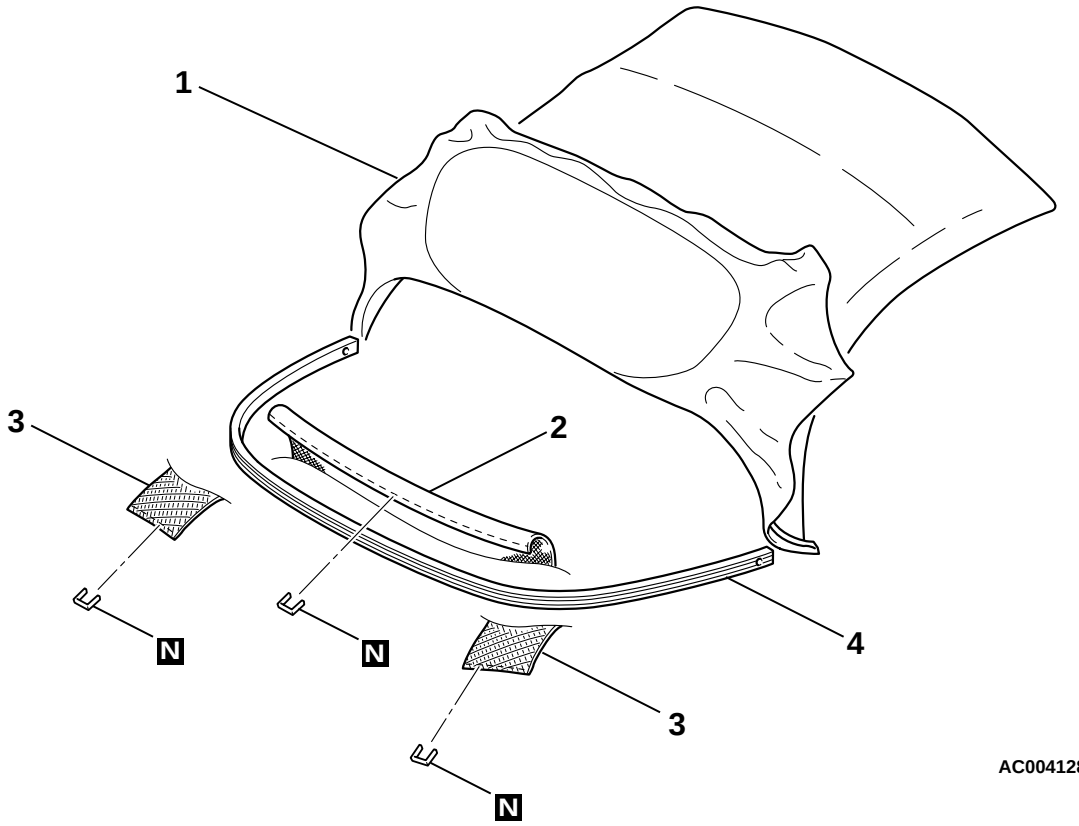
TOPSTACK No.5 BOW

REMOVAL AND INSTALLATION

M1426205700020

Post-installation Operation
- Convertible Top Fit Adjustment (Refer to P.42-111.)



REMOVAL STEPS
- CONVERTIBLE TOP ASSEMBLY (REFER TO P.42-112.)

1. TOP COVER ASSEMBLY AT NO.5 BOW CONNECTION

REMOVAL STEPS (Continued)

2. TOPSTACK WELL AT NO.5 BOW CONNECTION
3. SIDE STAY PAD AT NO.5 BOW CONNECTION
4. NO.5 BOW

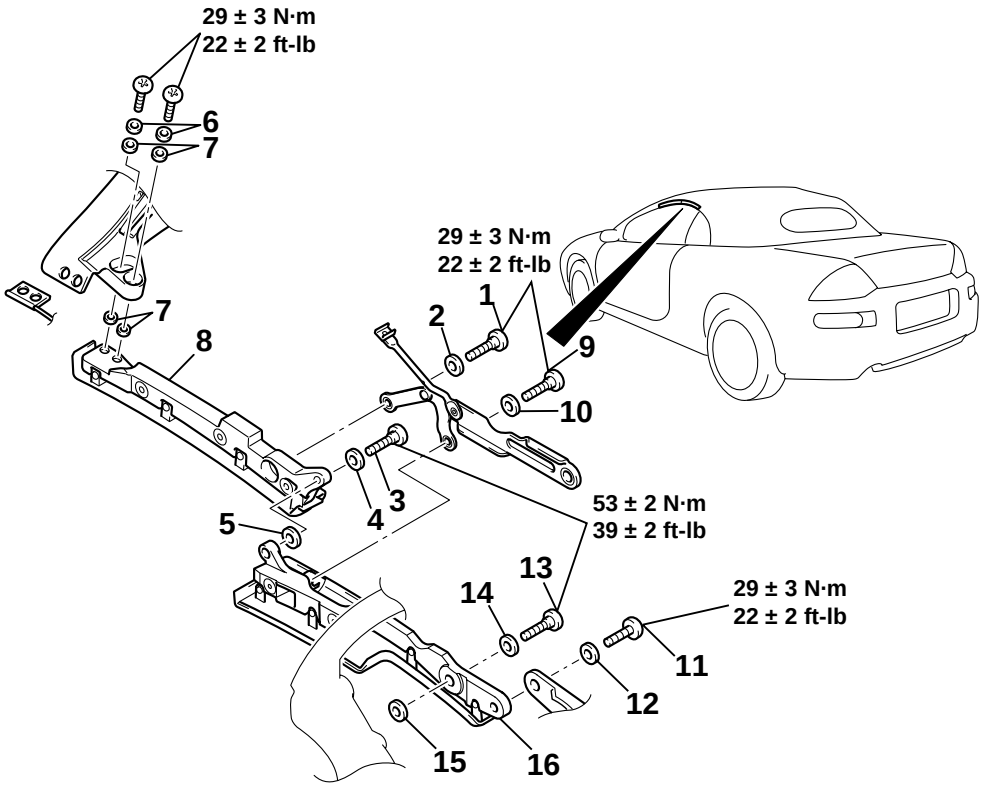
TSB Revision

TOPSTACK FRONT RAIL AND CENTER RAIL

REMOVAL AND INSTALLATION

M1426207500022

Pre-removal Operation
- Topstack Open 1/2 Way.



AC004129 AB

TOPSTACK FRONT RAIL ASSEMBLY REMOVAL STEPS
- TOPSTACK FRONT RAIL WEATHERSTRIP HOLDER (REFER TO P.42-136.)
- CONVERTIBLE TOP ASSEMBLY (REFER TO P.42-112.)

1. BOLT
2. WASHER
3. BOLT
4. BUSHING
5. BUSHING
- TOPSTACK SIDE STAY PAD ASSEMBLY (REFER TO P.42-126.)

6. BOLT
7. WASHER
8. TOPSTACK FRONT RAIL ASSEMBLY

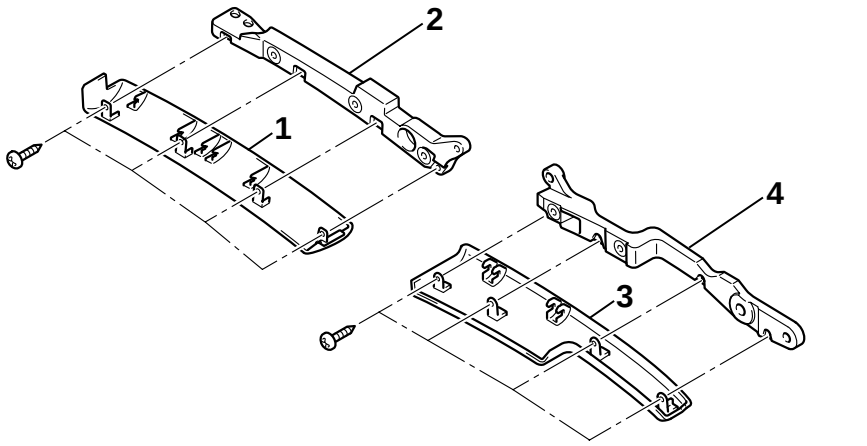
TOPSTACK CENTER RAIL ASSEMBLY REMOVAL STEPS
- TOPSTACK CENTER RAIL WEATHERSTRIP HOLDER (REFER TO P.42-136.)
- CONVERTIBLE TOP ASSEMBLY (REFER TO P.42-112.)

9. BOLT
10. WASHER
11. BOLT
12. BUSHING
13. BOLT
14. BUSHING
15. BUSHING
16. TOPSTACK CENTER RAIL ASSEMBLY

TSB Revision

DISASSEMBLY AND ASSEMBLY

M1426209300013



AC004130AB

TOPSTACK FRONT RAIL
DISASSEMBLY STEPS
1. TOPSTACK FRONT RAIL GARNISH
2. TOPSTACK FRONT RAIL

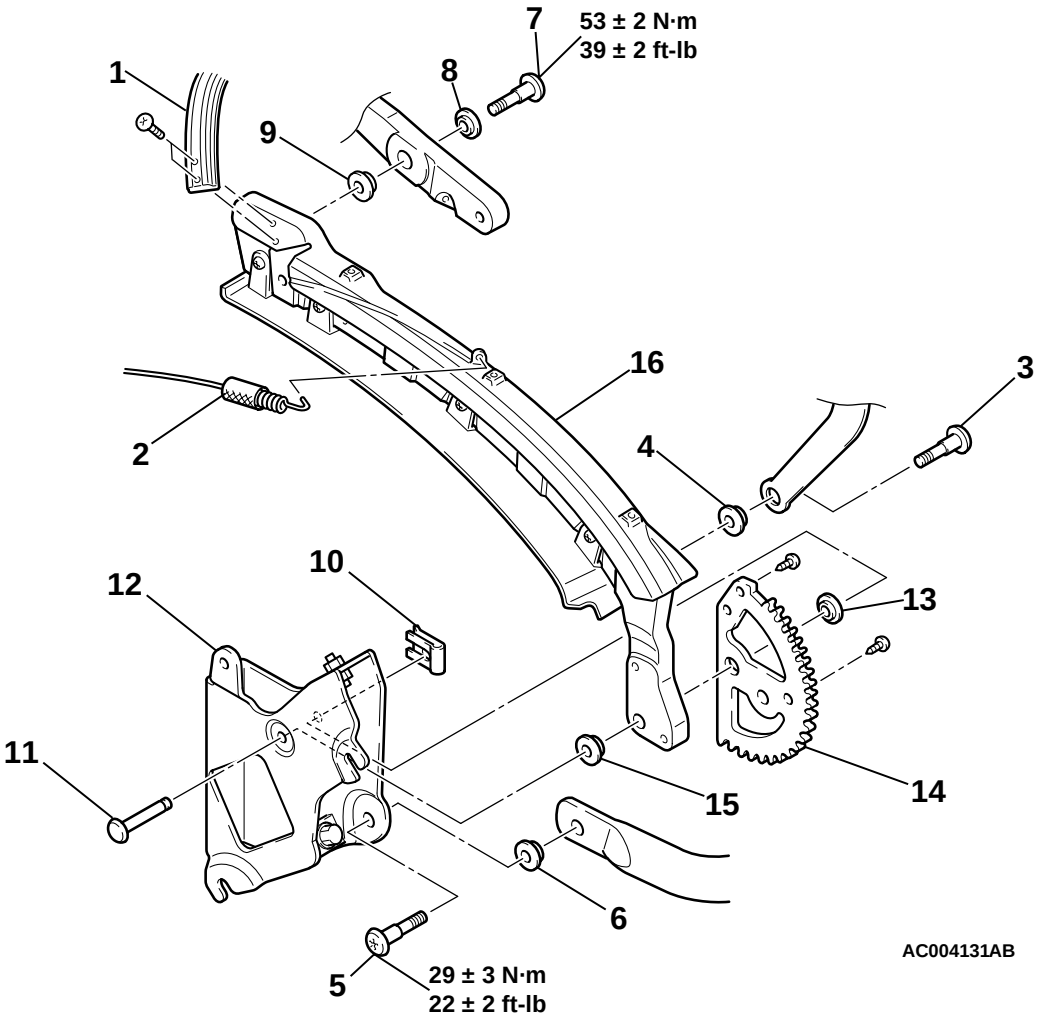
TOPSTACK CENTER RAIL
DISASSEMBLY STEPS
3. TOPSTACK CENTER RAIL GARNISH
4. TOPSTACK CENTER RAIL

TOPSTACK REAR RAIL

REMOVAL AND INSTALLATION

M1426208100027

Pre-removal Operation	Post-installation Operation
• Completely Open the Convertible Top. • Completely Down the Quarter window Glass.	• Convertible Top Fit Adjustment (Refer to P.42-111.)



REMOVAL STEPS
- TOPSTACK REAR RAIL WEATHERSTRIP HOLDER (REFER TO P.42-136.)
- CONVERTIBLE TOP ASSEMBLY (REFER TO P.42-112.)
- TOP COVER ASSEMBLY (REFER TO P.42-128.)

1. NO.3 BOW (REFER TO P.42-117.)
2. SIDE CABLE ASSEMBLY
3. BOLT
4. BUSHING
5. BOLT
6. WASHER

REMOVAL STEPS (Continued)

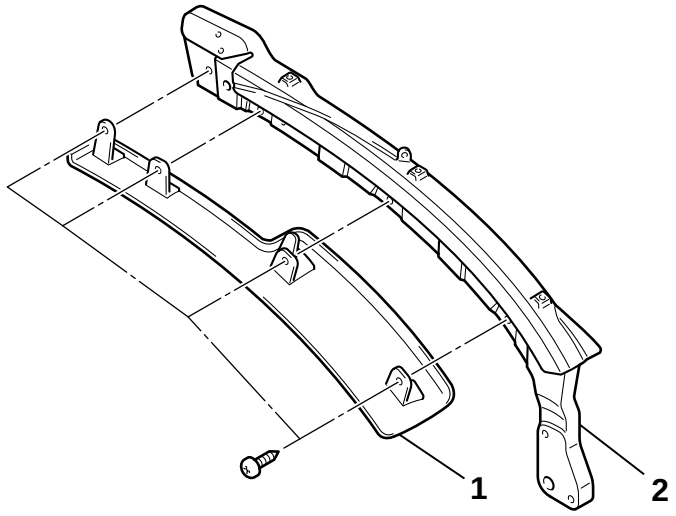
7. BOLT
8. BUSHING
9. BUSHING
- TOPSTACK DRIVE MOTOR ASSEMBLY (REFER TO P.42-114.)

10. RETAINER CLIP
11. PIN
12. MAIN PIVOT BASE ASSEMBLY
13. BUSHING
14. TOPSTACK DRIVE GEAR
15. BUSHING
16. TOPSTACK REAR RAIL ASSEMBLY

TSB Revision

DISASSEMBLY AND ASSEMBLY

M1426209400010



AC004132 AB

DISASSEMBLY STEPS

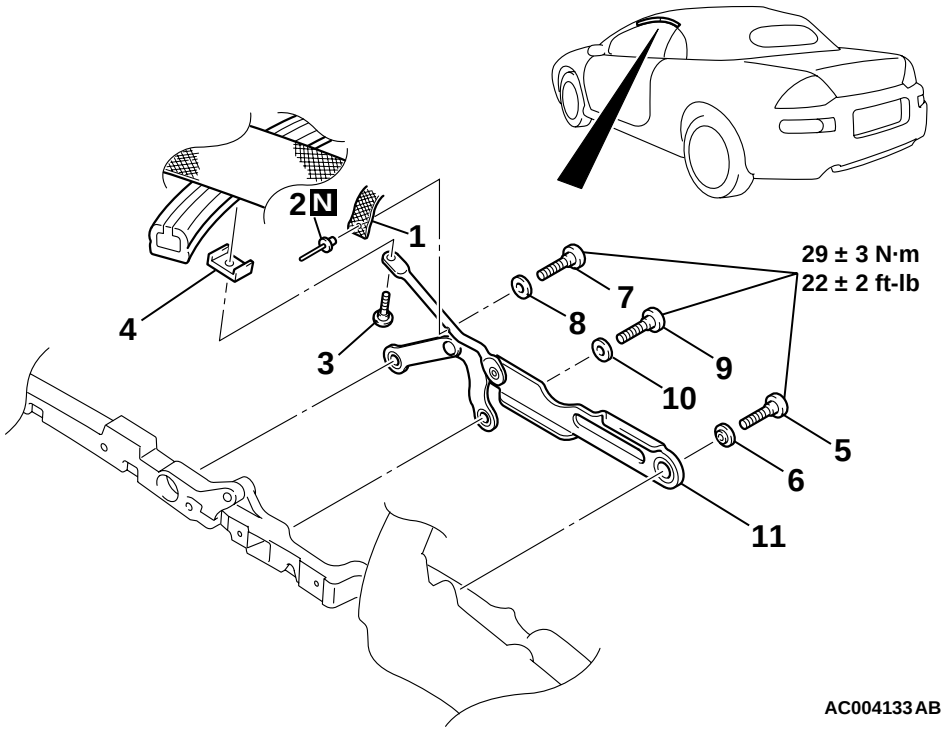
1. TOPSTACK REAR RAIL GARNISH
2. TOPSTACK REAR RAIL

TOPSTACK CONTROL LINK ASSEMBLY

REMOVAL AND INSTALLATION

M1426207800023

Pre-removal Operation	Post-installation Operation
• Completely Open the Convertible Top. • Completely Down the Quarter Window Glass.	• Convertible Top Fit Adjustment (Refer to P.42-111.)



REMOVAL STEPS
- TOPSTACK CENTER RAIL WEATHERSTRIP HOLDER (REFER TO P.42-136.)

1. TOP COVER SIDE STRAP

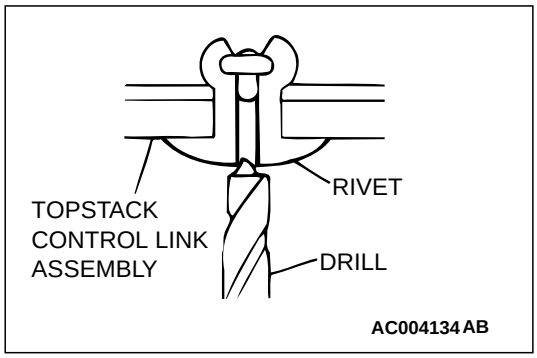
<<A>> >>A<< 2. RIVET
3. SCREW
4. NO.2 BOW BUSHING

REMOVAL STEPS (Continued)
5. BOLT
6. WASHER
7. BOLT
8. WASHER
9. BOLT
10. WASHER
11. TOPSTACK CONTROL LINK

REMOVAL SERVICE POINT

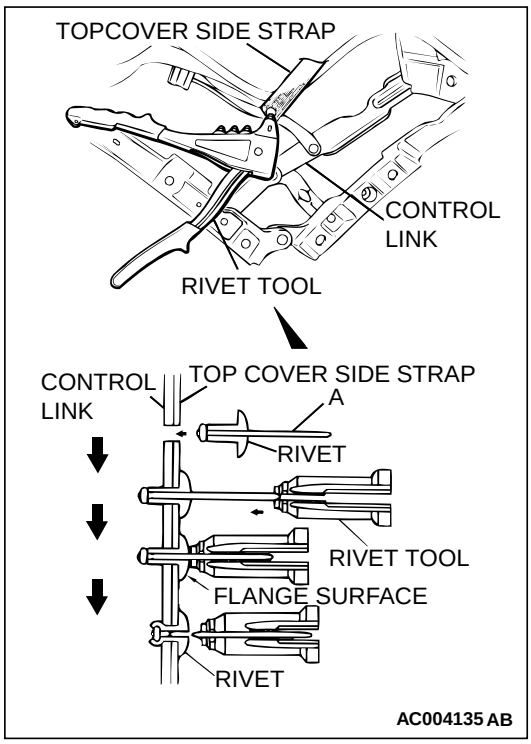
<<A>> RIVET REMOVAL

Use a drill [ϕ4.0 – 4.5 mm (ϕ0.16 – 0.18 inch)] to break the rivet by drilling a hole, and remove the rivet.



TSB Revision

INSTALLATION SERVICE POINT



>>A<< RIVET INSTALLATION

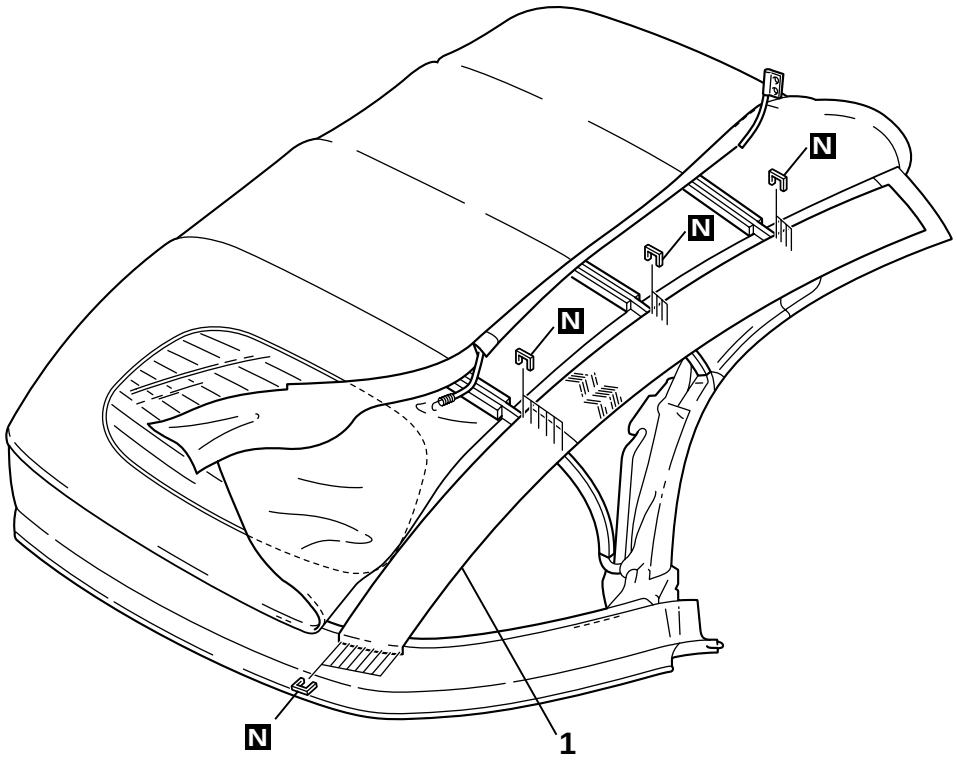
1. Insert the rivet [ϕ4.8 mm (ϕ0.19 inch)] into the top cover side strap and control link.
2. Insert "A" of the rivet into the rivet tool.
3. Pressing the flange surface of the rivet, move the handle of the rivet tool.
4. The thinnest point of "A" is cut and the rivet is held in the position.

TOPSTACK SIDE STAY PADS

REMOVAL AND INSTALLATION

M1426205400029

Post-installation Operation
- Convertible Top Fit Adjustment (Refer to P.42-111.)



AC004136AB

REMOVAL STEPS
- DEFOGGER HARNESS CONNECTOR (REFER TO P.42-112.)

<<A>> >>A<<

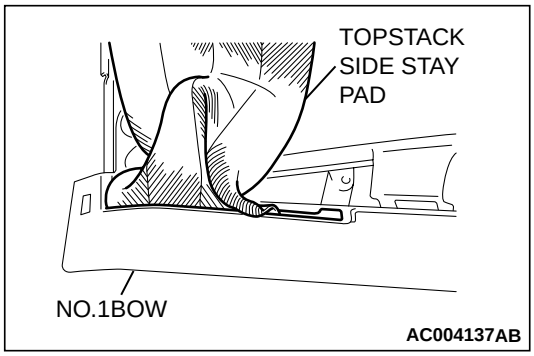
REMOVAL STEPS (Continued)
- TOP COVER ASSEMBLY (REFER TO P.42-128.)

1. TOPSTACK SIDE STAY PAD ASSEMBLY

REMOVAL SERVAICE POINT

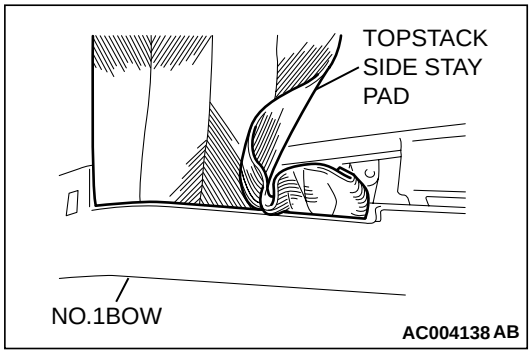
<<A>> TOPSTACK SIDE STAY PAD ASSEMBLY REMOVAL

1. Move the No.1 bow side topstack side stay pad to the outer side of the vehicle.

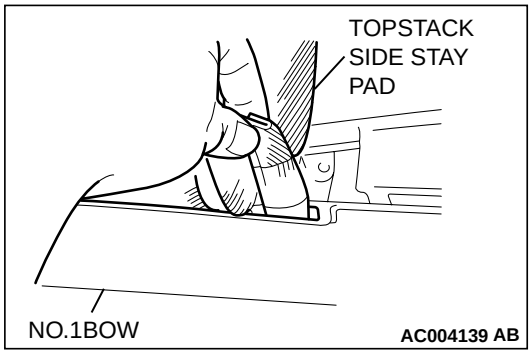


AC004137AB

TSB Revision



2. Guide the (folded) end of the topstack side stay pad out of the wider slit of the No.1 bow.

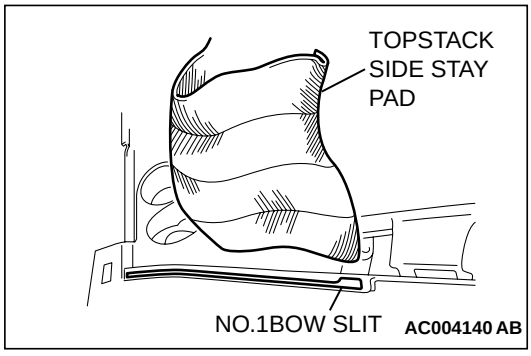


3. Pull out the folded end of the topstack side stay, and disconnect the topstack side stay pad from the No.1 bow.
4. Disconnect the topstack side stay pad from the No.2, No.3, No.4, and No.5 bows.

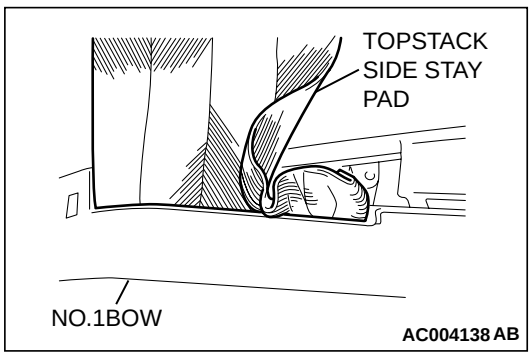
INSTALLATION SERVICE POINT

>>A<< TOPSTACK SIDE STAY PAD ASSEMBLY INSTALLATION

1. Face the folded end of the topstack side stay pad downward, and then position it to the No.1 bow side.
2. Connect the topstack side stay pad to the No.5, No.4, No.3, and No.2 bows.
3. Insert the folded end of the topstack side stay pad through the wider part of the No.1 bow slit as shown.



4. Working from inside the vehicle, pull out the folded end of the topstack side stay pad, and then install the topstack side stay pad to the No.1 bow.

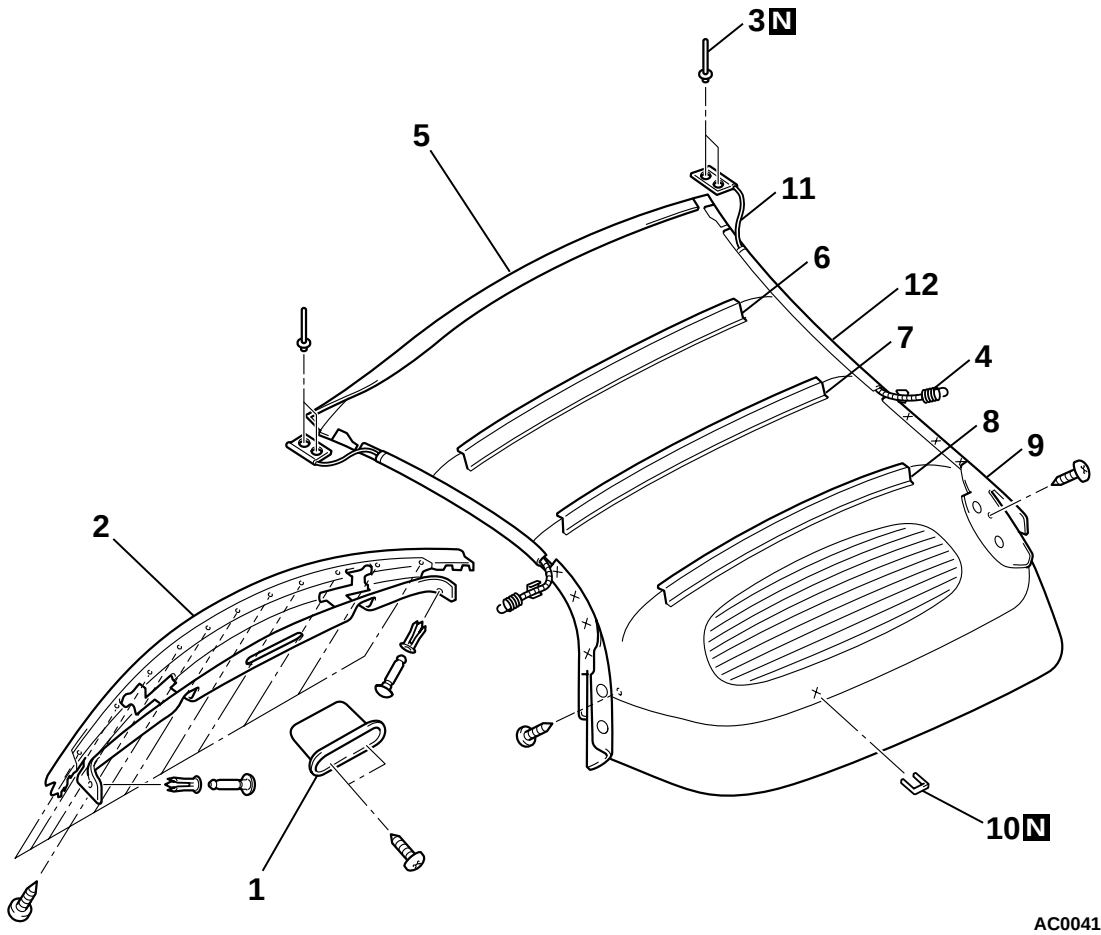


TOP COVER ASSEMBLY

REMOVAL AND INSTALLATION

M1426205100028

Post-installation Operation
- Convertible Top Fit Adjustment (Refer to P.42-111.)



AC004142 AB

REMOVAL STEPS
- CONVERTIBLE TOP ASSEMBLY (REFER TO P.42-112.)
- HEADLINER (REFER TO P.42-131.)

1. TOP STACK PULL HANDLE BOX BEZEL
2. NO.1 BOW GARNISH

<<A>> >>B<< 3. RIVET

4. TOP STACK REAR RAIL AND SIDE CABLE ASSEMBLY CONNECTION

REMOVAL STEPS (Continued)

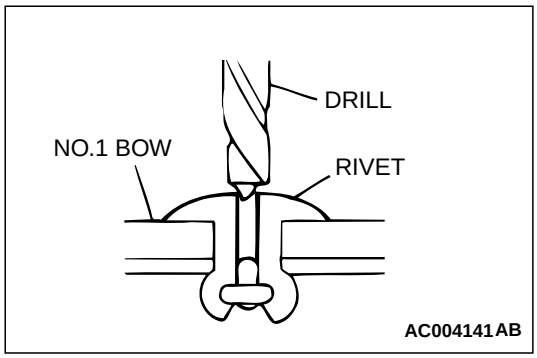
5. TOP COVER FROM NO.1 BOW
6. NO.2 BOW LISTING STRAP
7. NO.3 BOW LISTING STRAP
8. NO.4 BOW LISTING STRAP
9. REAR RAIL SAIL PANEL FLAP
10. TOP COVER FROM NO.5 BOW

>>A<< 11. SIDE CABLE ASSEMBLY

12. TOP COVER ASSEMBLY

TSB Revision

REMOVAL SERVICE POINT



<<A>> RIVET REMOVAL

Use a drill [ϕ4.0 – 4.5 mm (ϕ0.16 – 0.18 inch)] to break the rivet by drilling a hole, and remove the rivet.

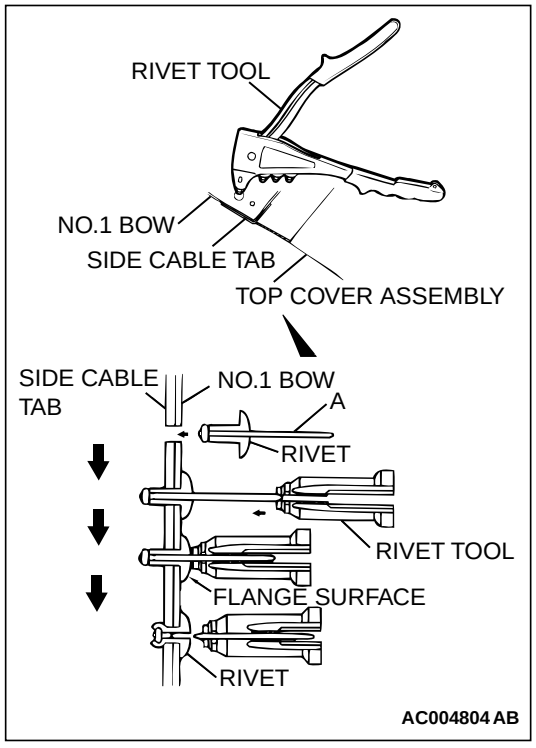
INSTALLATION SERVICE POINT

>>A<< SIDE CABLE ASSEMBLY INSTALLATION

1. Feed a wire through the hollow part at the side of the top cover assembly.
2. Tie the rear end of the wire to the front end of the side cable assembly, pull out the front end of the wire, and then feed the side cable assembly through the hollow part.
3. Remove the wire.

>>B<< RIVET INSTALLATION

1. Insert the rivet [ϕ4.8 mm (ϕ0.19 inch)] into the No.1 bow and side cable tab.
2. Insert "A" of the rivet into the rivet tool.
3. Pressing the flange surface of the rivet, move the handle of the rivet tool.
4. The thinnest point of "A" is cut and the rivet is held in the position.

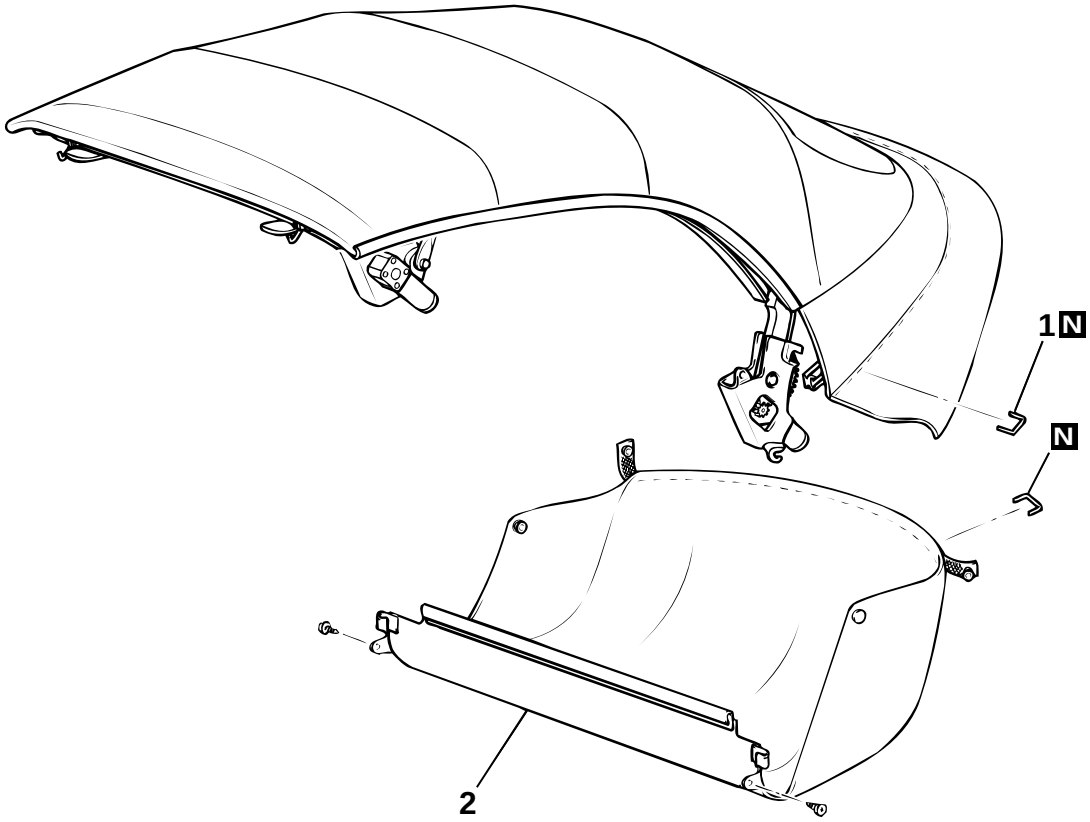


TOPSTACK WELL

REMOVAL AND INSTALLATION

M1426204500023

Post-installation Operation
- Convertible Top Fit Adjustment (Refer to P.42-111.)



AC004143AB

REMOVAL STEPS
- CONVERTIBLE TOP ASSEMBLY (REFER TO P.42-112.)

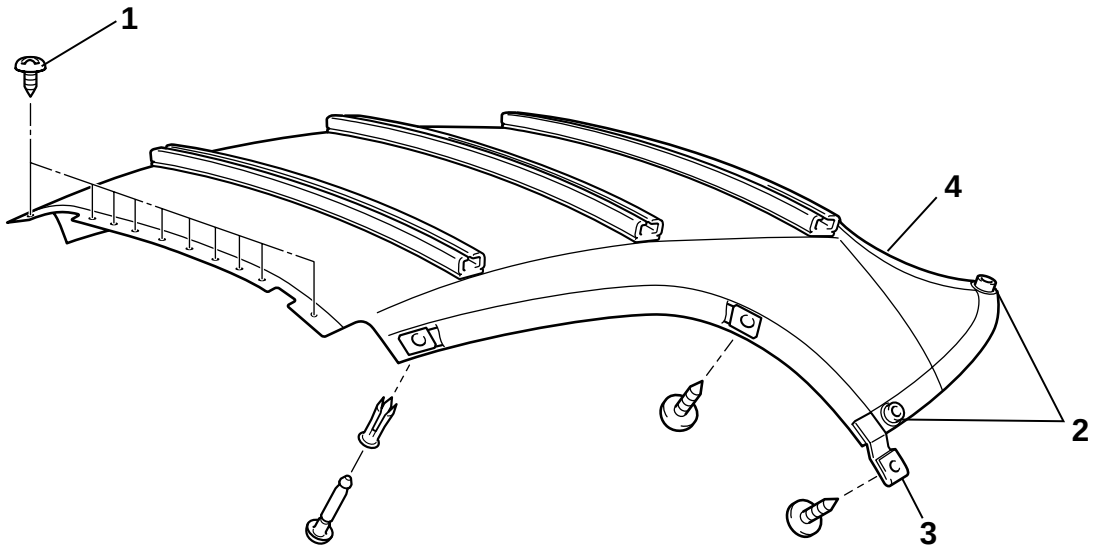
REMOVAL STEPS (Continued)
1. TOPSTACK WELL TO NO.5 BOW CONNECTION
2. TOPSTACK WELL

TSB Revision

HEADLINER

REMOVAL AND INSTALLATION

M1426201500024



AC004144AB

REMOVAL STEPS

- NO.1 BOW GARNISH (REFER TO P.42-116.)

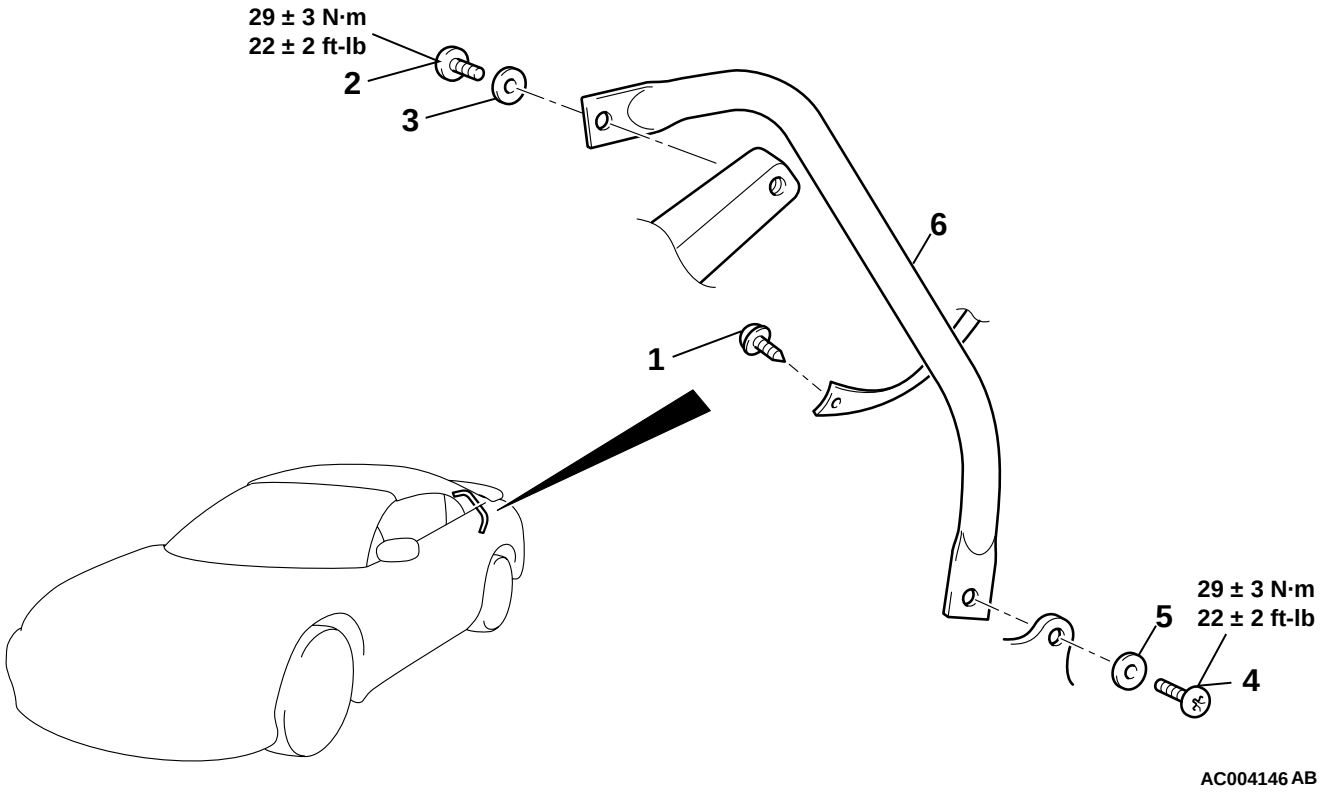
1. SCREW
2. SNAPS
3. HEADLINER ATTACHING STRAP
4. HEADLINER

BALANCE LINK

REMOVAL AND INSTALLATION

M1426202200026

Post-installation Operation
- Convertible Top Fit Adjustment (Refer to P.42-111.)



REMOVAL STEPS
- QUARTER TRIM (REFER TO GROUP 52A – TRIMS P.52A-9.)

1. SCREW
2. BOLT

REMOVAL STEPS (Continued)
3. WASHER
4. BOLT
5. WASHER
6. BALANCE LINK

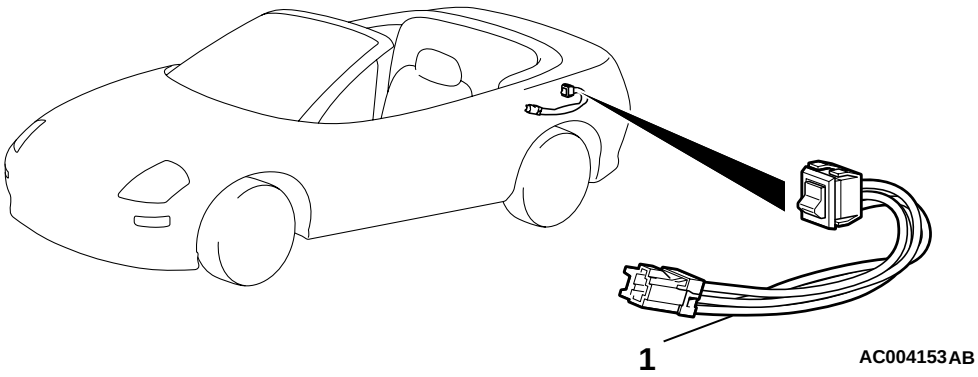
TSB Revision

CONVERTIBLE TOP BYPASS SWITCH

REMOVAL AND INSTALLATION

M1426202700021

Post-installation Operation
- Convertible Top Fit Adjustment (Refer to P.42-111.)



REMOVAL STEPS
- TRUNK ROOM TRIM (REFER TO GROUP 52A – TRIMS P.52A-9.)

<<A>> 1. CONVERTIBLE TOP BYPASS SWITCH

REMOVAL SERVICE POINT

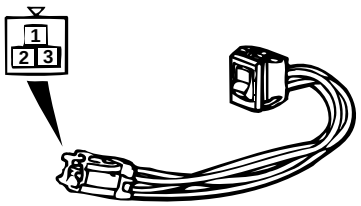
<<A>> CONVERTIBLE TOP BYPASS SWITCH REMOVAL

1. Depress lower clips.
2. While holding lower clip, push the lower front of the switch past the lower clip [approximately 5 mm (0.2 inch)].
3. Depress upper clip.
4. While holding upper clip, jiggle and slide switch out.

INSPECTION

M1421007600291

CONVERTIBLE TOP BYPASS SWITCH CHECK



SWITCH POSITION	TESTER CONNECTION	SPECIFIED CONDITION
OFF	1 – 2 – 3	Less than 2 ohm
MANUAL	1 – 2 – 3	Open circuit

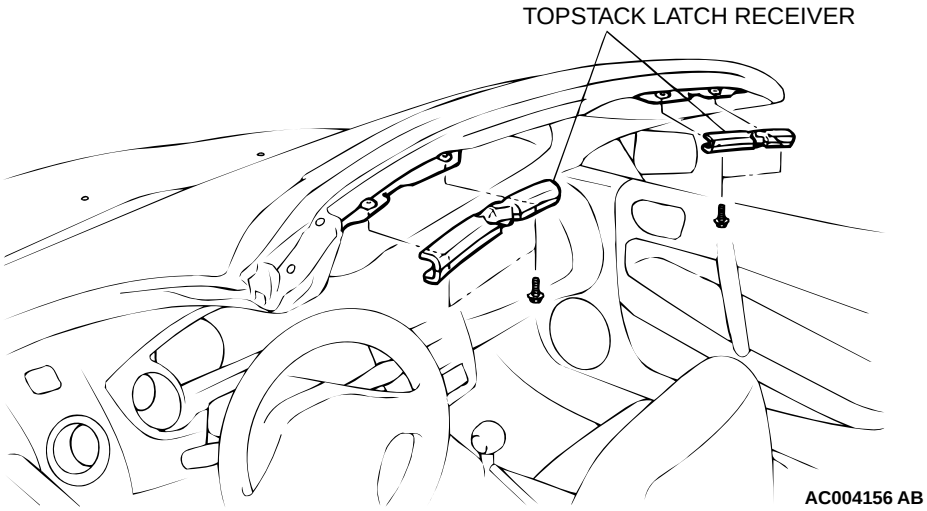
TSB Revision

TOPSTACK FRONT HEADER LATCH RECEIVER

REMOVAL AND INSTALLATION

M1426207200021

Pre-removal Operation
- Completely Open the Convertible Top.



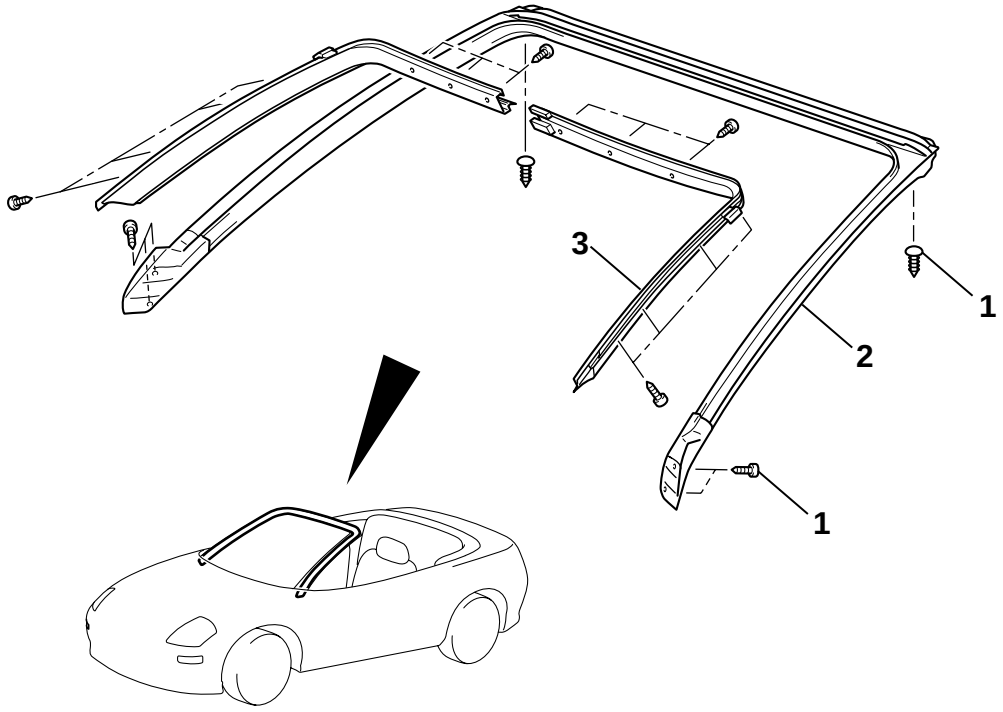
TSB Revision

FRONT ROOF WEATHER-STRIP

REMOVAL AND INSTALLATION

M1426202000022

Pre-removal Operation	Post-installation Operation
• Completely Open the Convertible Top.	• Convertible Top Fit Adjustment (Refer to P.42-111.)



AC004157 AB

REMOVAL STEPS
- TOPSTACK LATCH RECEIVER (REFER TO P.42-115.)

1. CLIP

REMOVAL STEPS (Continued)

2. FRONT ROOF WEATHERSTRIP
3. FRONT ROOF WEATHERSTRIP HOLDER

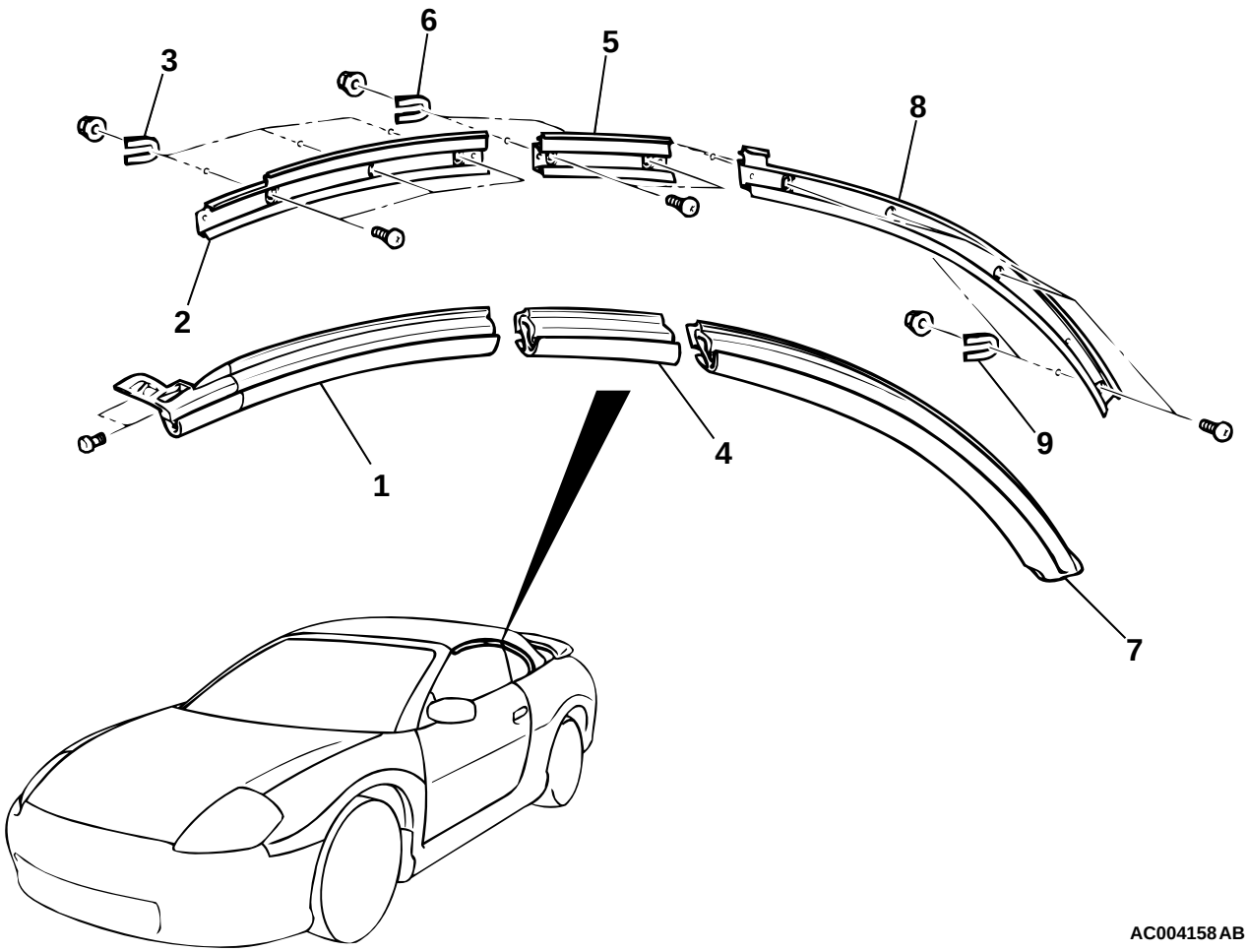
TSB Revision

TOPSTAK RAIL WEATHERSTRIP

REMOVAL AND INSTALLATION

M1426208600011

Pre-removal Operation	Post-installation Operation
• Completely Open the Convertible Top. • Completely Down the Quarter Window Glass.	• Convertible Top Fit Adjustment (Refer to P.42-111.)



AC004158 AB

REMOVAL STEPS
1. TOPSTACK FRONT RAIL WEATHERSTRIP
2. TOPSTACK FRONT RAIL WEATHERSTRIP HOLDER
3. SHIM
4. TOPSTACK CENTER RAIL WEATHERSTRIP

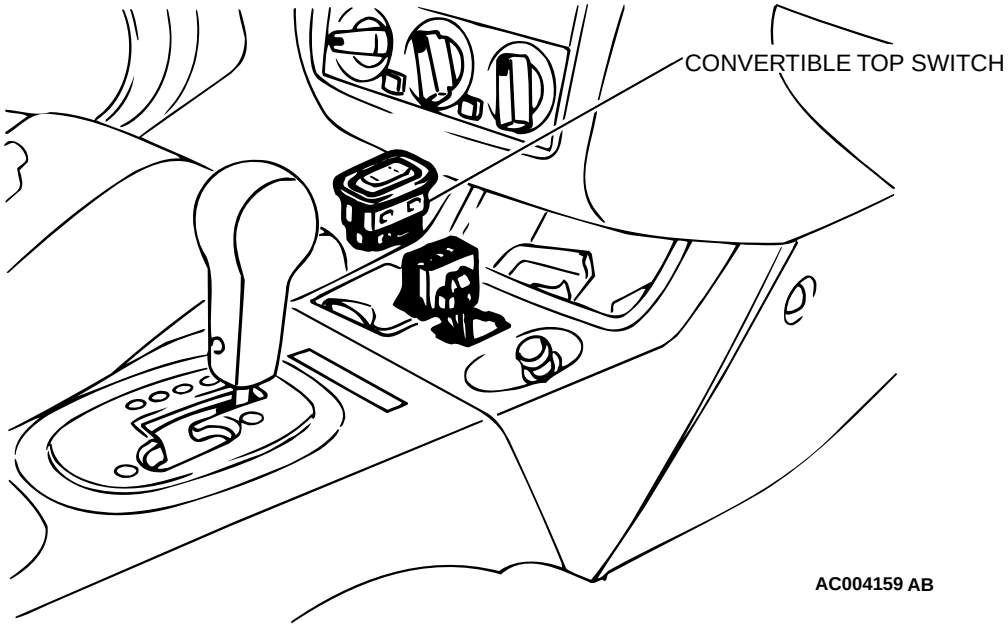
REMOVAL STEPS (Continued)
5. TOPSTACK CENTER RAIL WEATHERSTRIP
6. SHIM
7. TOPSTACK REAR RAIL WEATHERSTRIP
8. TOPSTACK REAR RAIL WEATHERSTRIP HOLDER
9. SHIM

TSB Revision

CONVERTIBLE TOP SWITCH

REMOVAL AND INSTALLATION

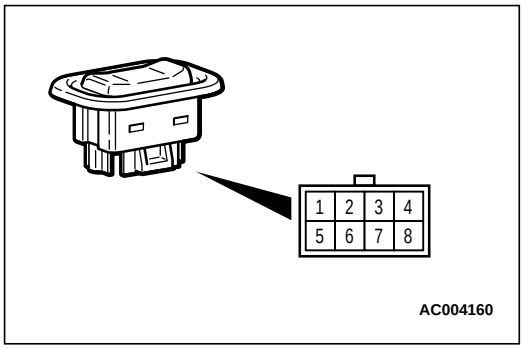
M1426202400020



INSPECTION

M1421007600127

CONVERTIBLE TOP SWITCH CHECK

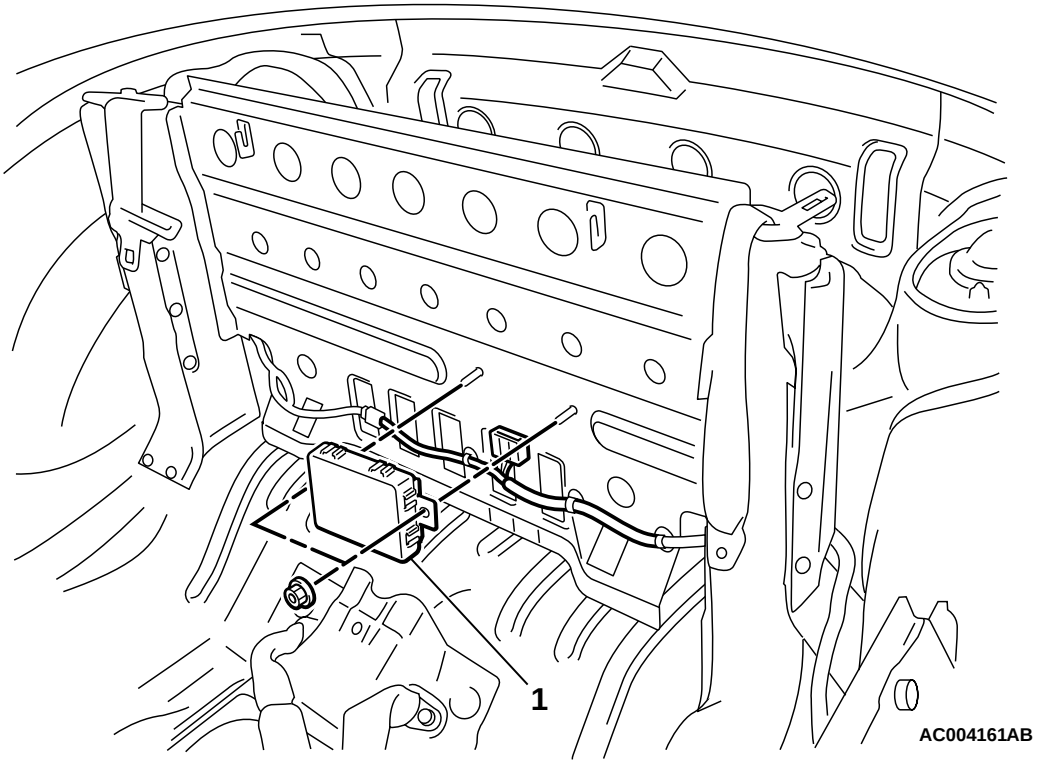


SWITCH POSITION	TESTER CONNECTION	SPECIFIED CONDITION
CLOSE	4 – 7	Less than 2 ohm
OPEN	5 – 7	Less than 2 ohm

CONVERTIBLE TOP CONTROL MODULE

REMOVAL AND INSTALLATION

M1426203000025



REMOVAL STEPS

- REAR SEAT BACK (REFER TO GROUP 52A – REAR SEAT P.52A-20.)

1. CONVERTIBLE TOP CONTROL MODULE

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1426003000032

ITEMS		SPECIFICATIONS
Hood	Hood hinge bolt (hood side)	12 ± 2 N·m (100 ± 22 in-lb)
	Hood hinge bolt (body side)	12 ± 2 N·m (100 ± 22 in-lb)
	Hood latch bolt	8.9 ± 1.9 N·m (78 ± 17 in-lb)
	Hood support rod bolt	4.9 ± 1.0 N·m (44 ± 8 in-lb)
	Hood switch bolt	4.9 ± 1.0 N·m (44 ± 8 in-lb)
Quarter window regulator	Quarter window regulator bolt	8 ± 1.5 N·m (71 ± 13 in-lb)
Door	Door check bolt	5.0 ± 1.0 N·m (44 ± 9 in-lb)
	Door hinge bolt (door side)	21 ± 4 N·m (16 ± 3 ft-lb)
	Door hinge bolt (body side)	26 ± 5 N·m (19 ± 3 ft-lb)
	Door latch assembly screw	9.0 ± 2.0 N·m (80 ± 17 in-lb)
	Striker screw	20 ± 4 N·m (15 ± 2 in-lb)
Liftgate	Liftgate gas spring bolt	12 ± 2 N·m (100 ± 2 in-lb)
	Liftgate hinge bolt	21 ± 4 N·m (16 ± 3 in-lb)
	Liftgate latch assembly screw	21 ± 4 N·m (16 ± 3 in-lb)
	Striker bolt	21 ± 4 N·m (16 ± 3 in-lb)
Trunk lid	Striker bolt	22 ± 4 N·m (16 ± 3 ft-lb)
	Trunk lid gas spring bolt	12 ± 2 N·m (104 ± 21 in-lb)
	Trunk lid hinge bolt (trunk lid side)	13 ± 2 N·m (109 ± 21 in-lb)
	Trunk lid hinge bolt (body side)	13 ± 2 N·m (109 ± 21 in-lb)
	Trunk lid hinge nut	13 ± 2 N·m (109 ± 21 in-lb)
	Trunk lid latch assembly bolt	22 ± 4 N·m (16 ± 3 ft-lb)
Sunroof	Guide block screw	2.0 ± 0.5 N·m (18 ± 4 in-lb)
	Guide rail stopper screw	2.0 ± 0.5 N·m (18 ± 4 in-lb)
	Sunroof motor assembly bolt	5.4 ± 1.5 N·m (48 ± 13 in-lb)
	Sunroof drip rail screw	2.0 ± 0.5 N·m (18 ± 4 in-lb)
	Sunshade stopper screw	1.4 ± 0.3 N·m (13 ± 3 in-lb)
		2.0 ± 0.5 N·m (18 ± 4 in-lb)
Electric convertible top	Balance link bolt	29 ± 3 N·m (22 ± 2 ft-lb)
	Main pivot base assembly bolt	29 ± 3 N·m (22 ± 2 ft-lb)
	No.1 bow bolt	29 ± 3 N·m (22 ± 2 ft-lb)
	Topstack center rail assembly bolt	29 ± 3 N·m (22 ± 2 ft-lb)
		53 ± 2 N·m (39 ± 2 ft-lb)
	Topstack control link bolt	29 ± 3 N·m (22 ± 2 ft-lb)
	Topstack front rail assembly bolt	29 ± 3 N·m (22 ± 2 ft-lb)
	Topstack rear rail assembly bolt	53 ± 2 N·m (39 ± 2 ft-lb)

SERVICE SPECIFICATIONS

M1426000300034

<DOOR>

ITEMS	STANDARD VALUE
Door inside handle play mm (in)	3.2 (0.13) or more
Door outside handle play mm (in)	2.4 (0.09) or more

<SUNROOF>

ITEMS	STANDARD VALUE
Roof lid glass operation current A	10 or more [20°C (68°F)]

SEALANTS

M1426000500038

<DOOR>

ITEMS	SPECIFIED SEALANT	REMARK
Waterproof film	3 M™AAD Part No. 8625 or equivalent	Ribbon sealer

<FENDER>

ITEMS	SPECIFIED SEALANT	REMARK
Fender	3 M™AAD Part No. 8625 or equivalent	Ribbon sealer

<WINDOW GLASS>

ITEMS	SPECIFIED SEALANT
Liftgate door <ECLIPSE>	3 M™AAD Part No. 8609 Super Fast Urethane and 3 M™AAD Part No. 8608 Super Fast Urethane Primer or equivalent
Quarter window glass <ECLIPSE>	
Windshield	

COMPONENT IDENTIFICATIONS

M1421005400075

<DOOR CHECK>

APPLICABLE LOCATION	IDENTIFICATION MARK
Left door	1L
Right door	1R

<DOOR OUTER OPENING WEATHERSTRIP>

APPLICABLE SIDE	IDENTIFICATION COLOR
Left door	Natural (White)
Right door	Orange

<ROOF DRIP MOULDING CLIP>

APPLICABLE LOCATION	IDENTIFICATION COLOR
Drip molding clip A	Gray
Drip molding clip B	Green
Front drip molding clip A <LH>	Gray
Front drip molding clip A <RH>	Yellow
Front drip molding clip B	Violet

GROUP 51

EXTERIOR

CONTENTS

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WARNINGS REGARDING SERVICING OF SUPPLEMENTAL RESTRAINT SYSTEM (SRS) EQUIPPED VEHICLES

⚠ WARNING

- ***Improper service or maintenance of any component of the SRS, or any SRS-related component, can lead to personal injury or death to service personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).***
- ***Service or maintenance of any SRS component or SRS-related component must be performed only at an authorized MITSUBISHI dealer.***
- ***MITSUBISHI dealer personnel must thoroughly review this manual, and especially its GROUP 52B - Supplemental Restraint System (SRS) before beginning any service or maintenance of any component of the SRS or any SRS-related component.***

NOTE
The SRS includes the following components: SRS air bag control unit, SRS warning light, front impact sensors, air bag module, clock spring, and interconnecting wiring. Other SRS-related components (that may have to be removed/installed in connection with SRS service or maintenance) are indicated in the table of contents by an asterisk (*).

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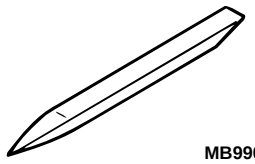
FRONT BUMPER ASSEMBLY

SPECIAL TOOL

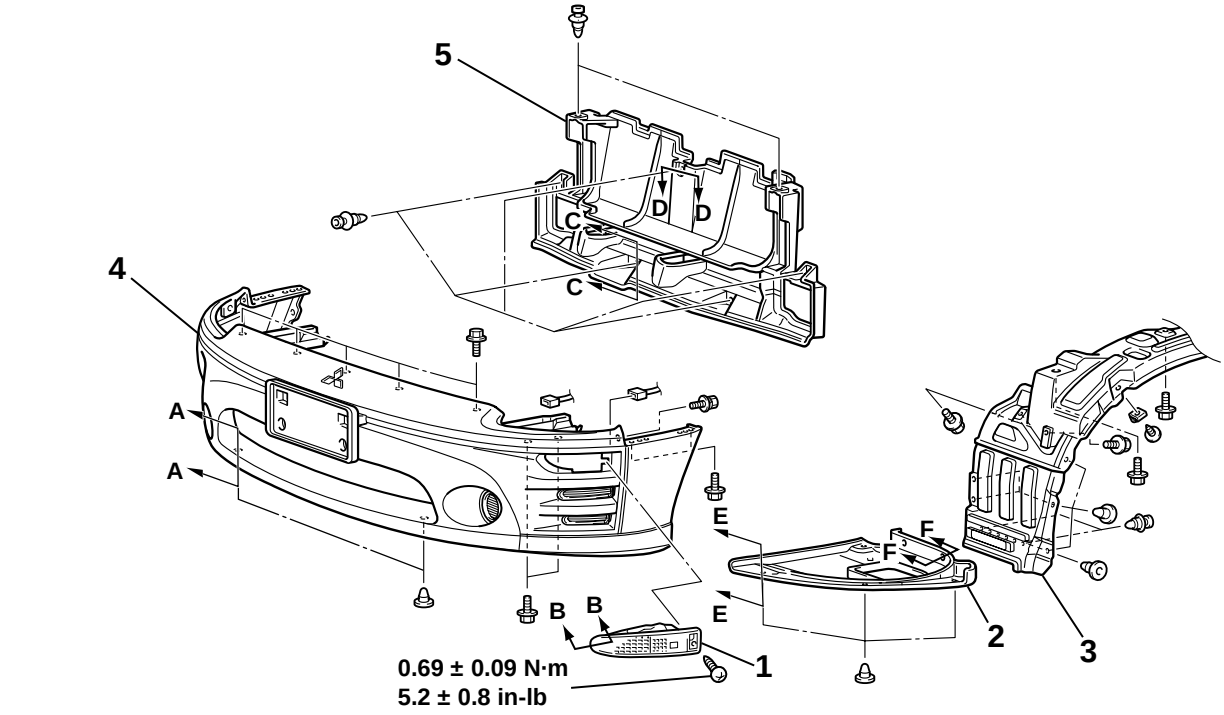
M1511000600542

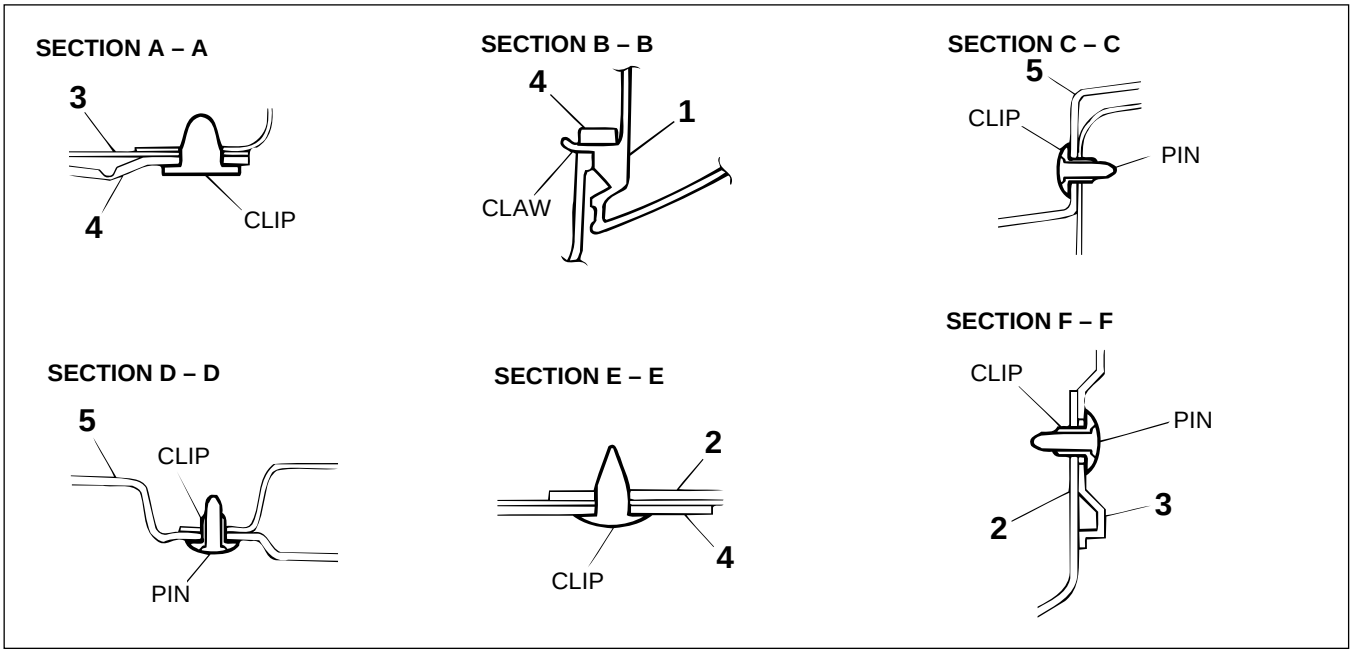
TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 MB990784	MB990784 Ornament remover	General service tool	Removal of clip

FRONT BUMPER ASSEMBLY

REMOVAL AND INSTALLATION

M1511001400187





AC106710 AB

REMOVAL STEPS
1. FRONT TURN SIGNAL LIGHT
2. UNDER COVER
3. SPLASH SHIELD

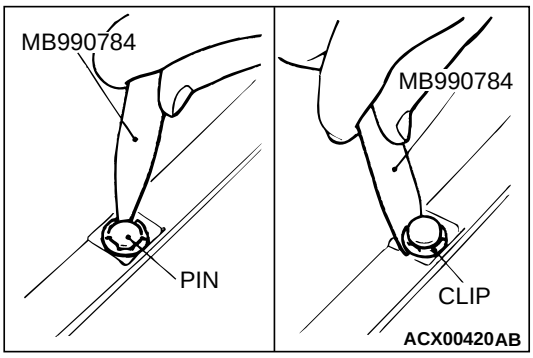
<<A>>

REMOVAL STEPS (Continued)
4. FRONT BUMPER ASSEMBLY
5. AIR GUIDE DUCT

Required Special Tool:
- MB990784: Ornament Remover

TSB Revision

REMOVAL SERVICE POINT

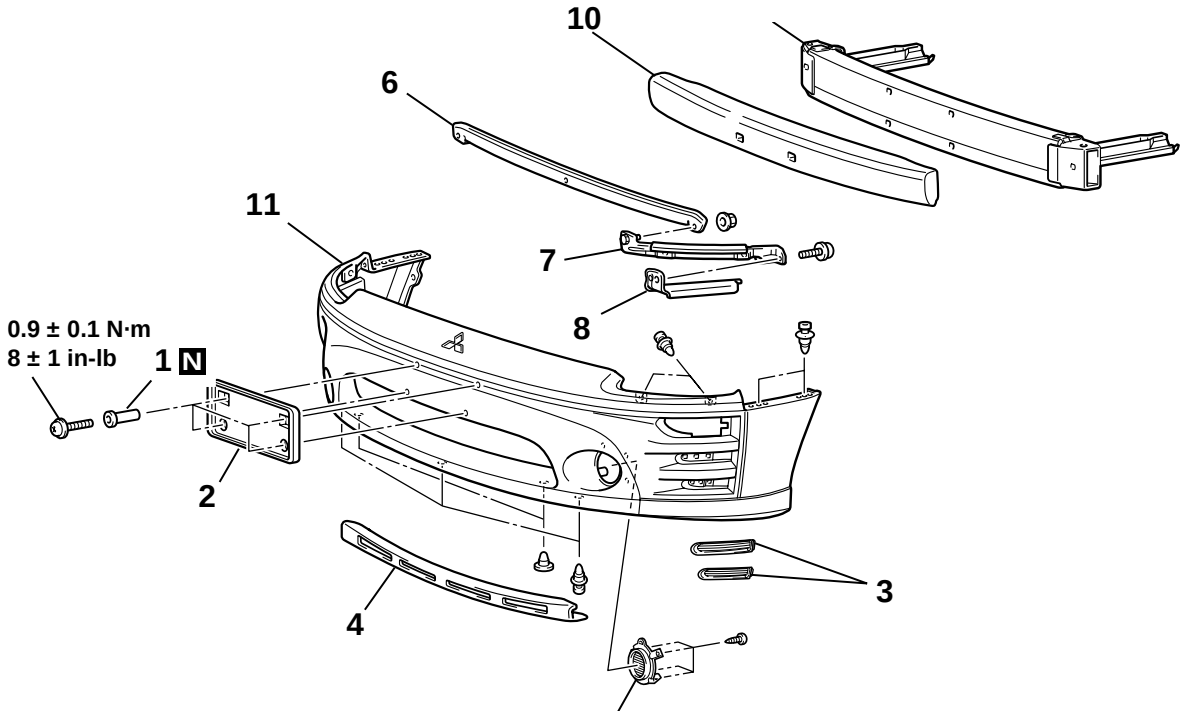


<<A>> FRONT BUMPER ASSEMBLY REMOVAL

1. Use special tool MB990784 to pull up the center pin in the clip.
2. Remove the clip.

DISASSEMBLY AND ASSEMBLY

M1511001600181



DISASSEMBLY STEPS

1. RUBBER NUT
2. LICENCE PLATE GARNISH
3. FRONT BUMPER FACE COVER
4. FRONT BUMPER LOWER PLATE
5. FOG LIGHT HOLE COVER
6. FRONT BUMPER CENTER PLATE
7. FRONT BUMPER SIDE PLATE
8. FRONT BUMPER CORNER PLATE

DISASSEMBLY STEPS (Continued)

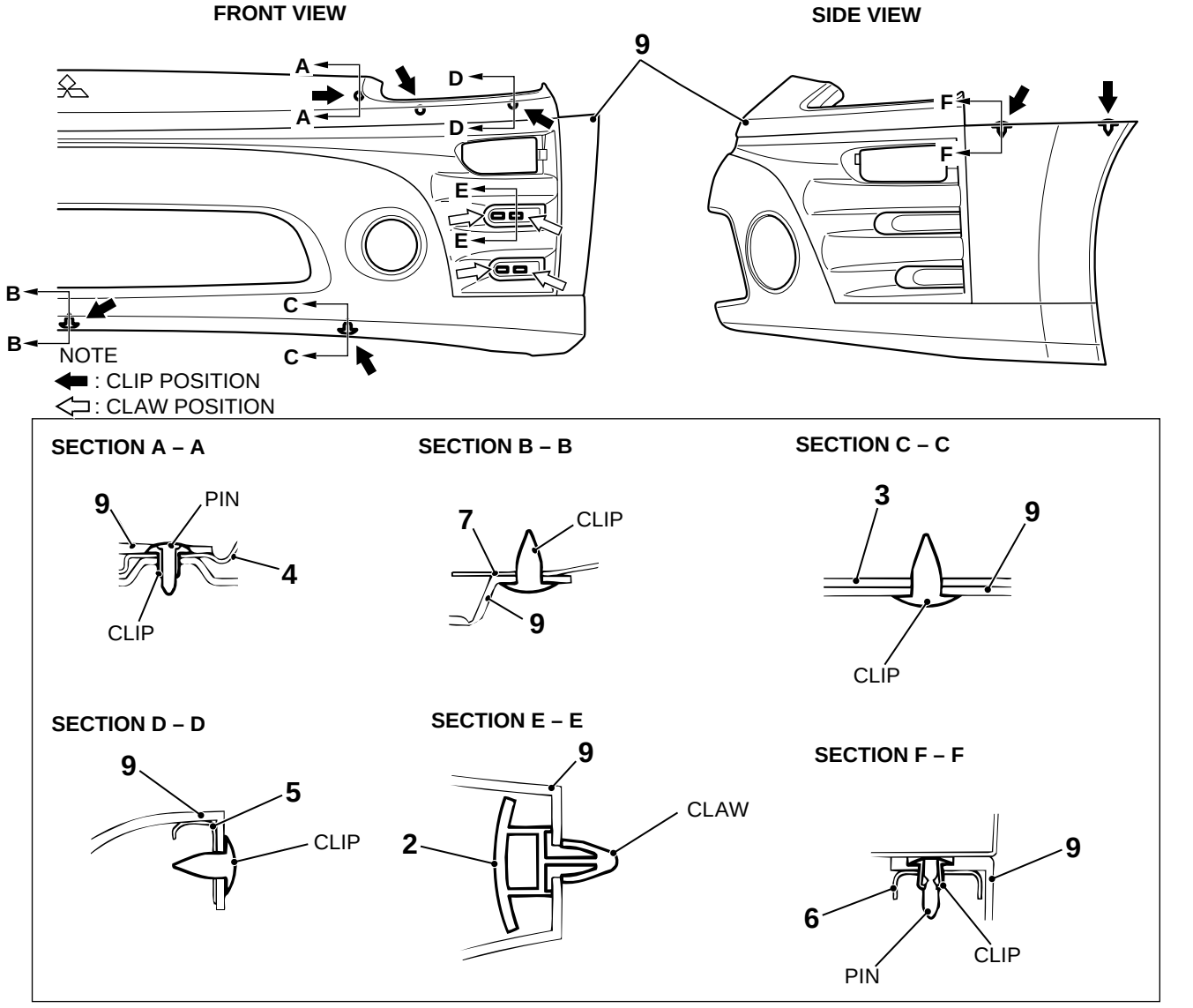
9. FRONT BUMPER REINFORCEMENT
10. FRONT BUMPER CORE

<<A>> 11. FRONT BUMPER FACE

Required Special Tool:

- MB990784: Ornament Remover

CLIP AND CLAW POSITION

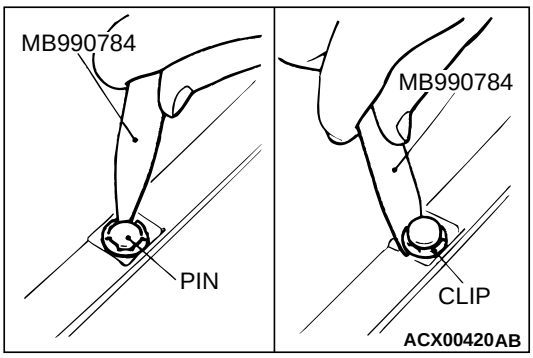


AC106680 AB

DISASSEMBLY SERVICE POINT

<<A>> FRONT BUMPER FACE REMOVAL

1. Use special tool MB990784 to pull up the center pin in the clip.
2. Remove the clip.



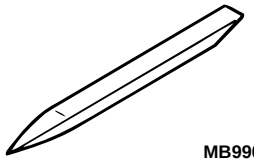
ACX00420AB

TSB Revision

REAR BUMPER ASSEMBLY

SPECIAL TOOL

M1511000600553

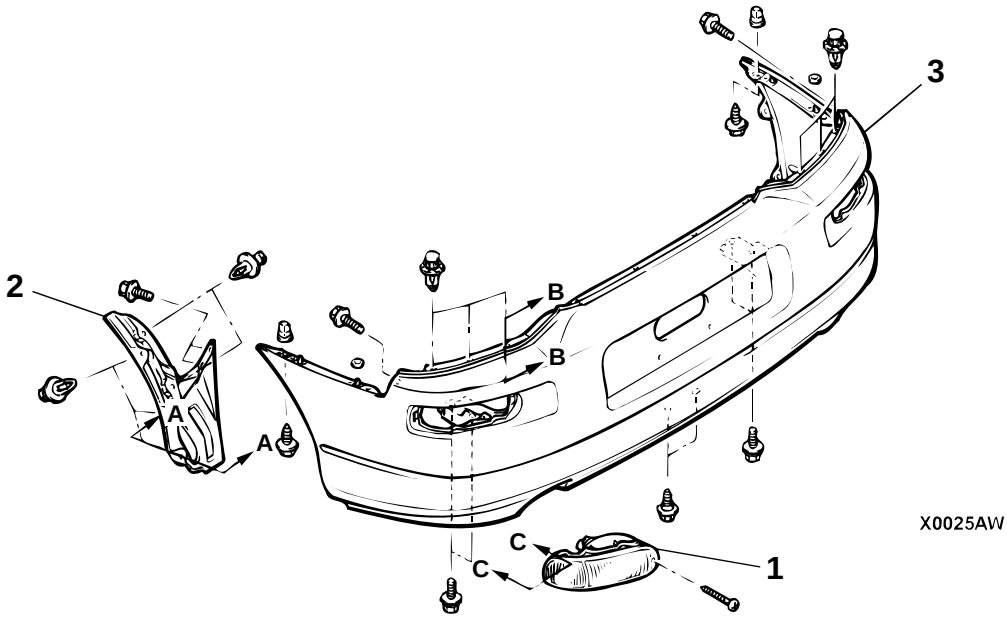
TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 MB990784	MB990784 Ornament remover	General service tool	Removal of clip

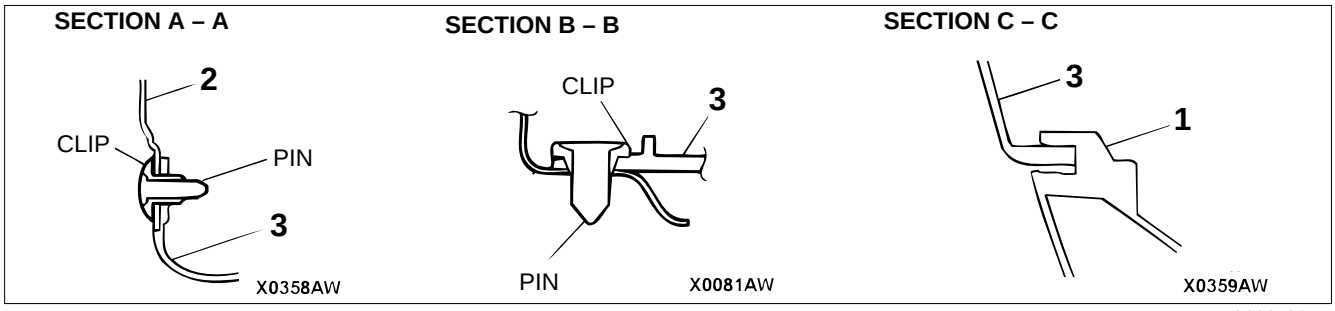
REAR BUMPER ASSEMBLY

REMOVAL AND INSTALLATION

M1511001900085

Pre-removal and Post-installation Operation
- Rear End Trim and Trunk Compartment Trim <ECLIPSE SPYDER> Removal and Installation (Refer to GROUP 52A, Trims P.52A-9.)
- Main Muffler Removal and Installation (Refer to GROUP 15, Exhaust Pipe and Main Muffler <2.4L> P.15-21.)
- Main Muffler Removal and Installation (Refer to GROUP 15, Exhaust Pipe and Main Muffler <3.0L> P.15-22.)





AC003186 AB

TSB Revision

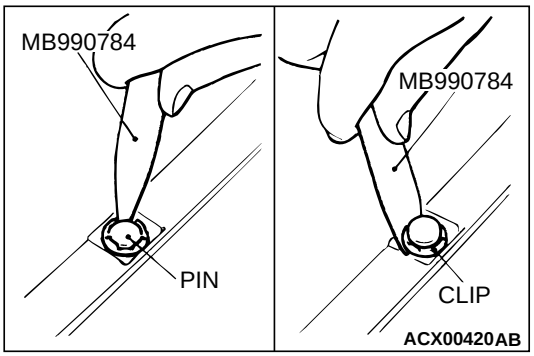
REMOVAL STEPS

1. BACKUP LIGHT ASSEMBLY
2. SPLASH SHIELD

<<A>> 3. REAR BUMPER ASSEMBLY

Required Special Tool:

- MB990784: Ornament Remover



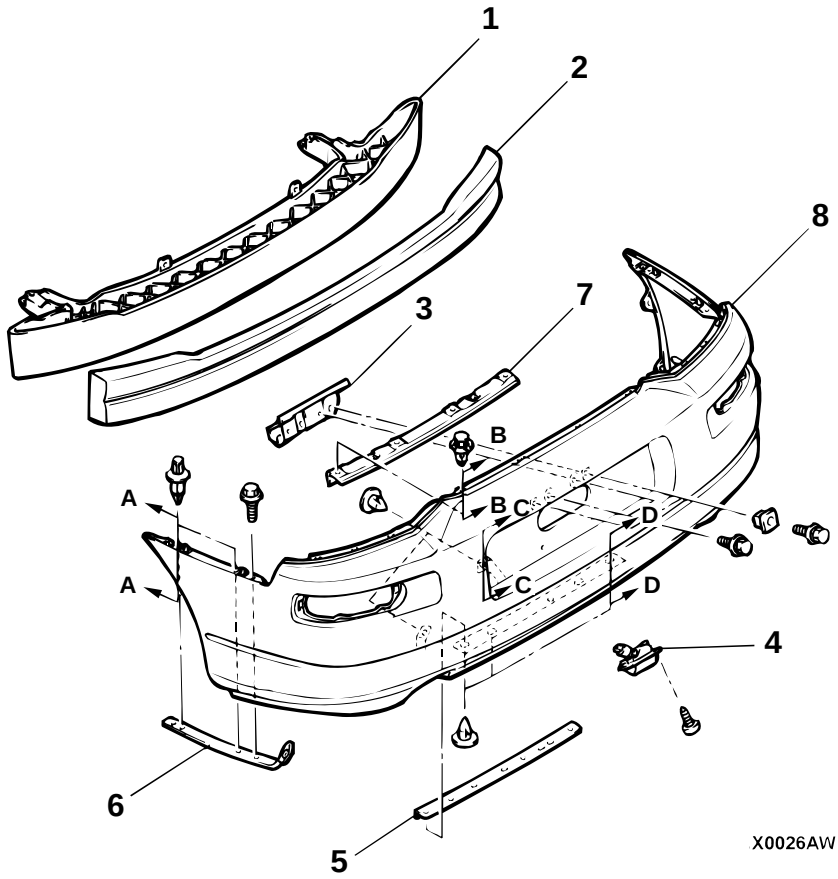
REMOVAL SERVICE POINT

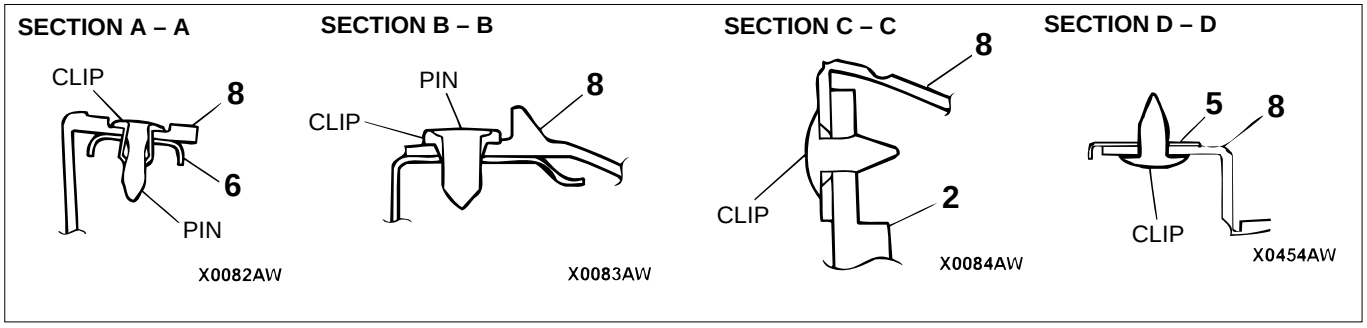
<<A>> REAR BUMPER ASSEMBLY REMOVAL

1. Use special tool MB990784 to pull up the center pin in the clip.
2. Remove the clip.

DISASSEMBLY AND REASSEMBLY

M1511002100082





AC003187AB

DISASSEMBLY STEPS

1. REAR BUMPER REINFORCEMENT
2. REAR BUMPER CORE
3. LICENSE PLATE LIGHT BRACKET
4. LICENSE PLATE LIGHT ASSEMBLY
5. REAR BUMPER LOWER PLATE
6. REAR BUMPER SIDE PLATE
7. REAR BUMPER UPPER PLATE

<<A>>

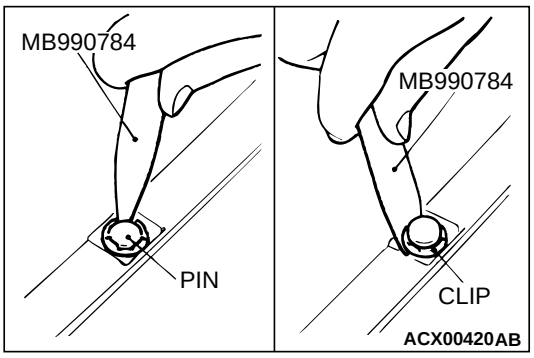
8. REAR BUMPER FACE

Required Special Tool:

- MB990784: Ornament Remover

TSB Revision

DISASSEMBLY SERVICE POINT



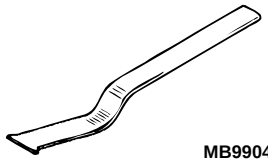
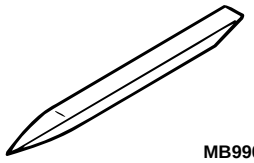
<<A>> REAR BUMPER FACE REMOVAL

1. Use special tool MB990784 to pull up the center pin in the clip.
2. Remove the clip.

GARNISHES AND MOLDINGS

SPECIAL TOOLS

M1511000600564

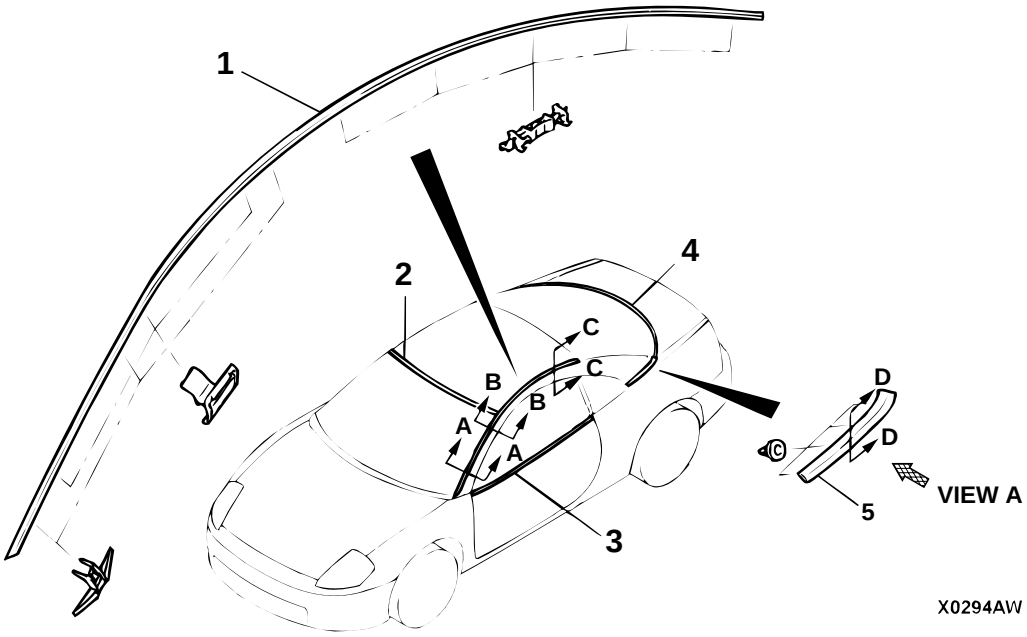
TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 MB990449	MB990449 Window molding remover	General service tool	Removal of roof drip molding
 MB990784	MB990784 Ornament remover	General service tool	Removal of clip

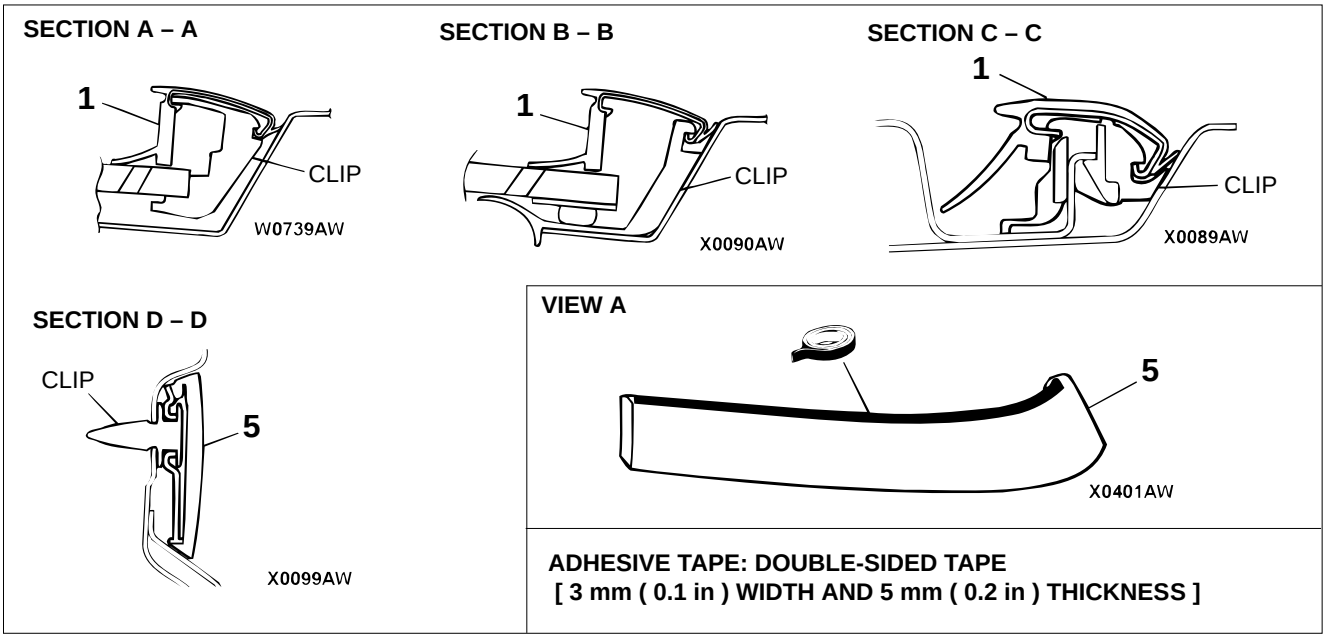
GARNISHES AND MOLDINGS

REMOVAL AND INSTALLATION

M1511004400056

<ECLIPSE>





<<A>> >>B<<
1. ROOF DRIP MOLDING
2. WINDSHIELD UPPER MOLDING (REFER TO GROUP 42, WINDSHIELD P.42-14.)
3. BELT LINE MOLDING (REFER TO GROUP 42P.42-65 .)
4. REAR WINDOW LOWER MOLDING (REFER TO GROUP 42, LIFTGATE GLASS P.42-23.)

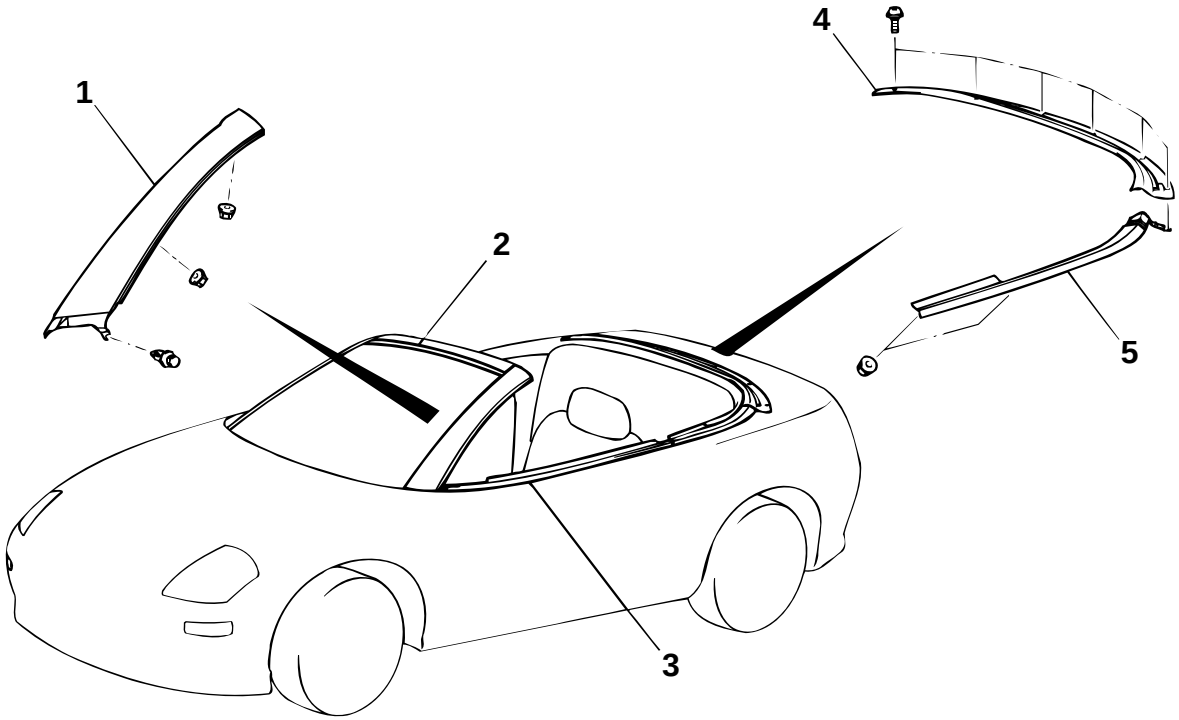
<<B>> **>>A<<**
5. REAR PILLAR GARNISH

TSB Revision

Required Special Tools:

- MB990449: Window Molding Remover
- MB990784: Ornament Remover

<ECLIPSE SPYDER>



AX0890AW
AC003620 AB

1. DRIP GARNISH
2. WINDSHIELD UPPER MOLDING (REFER TO GROUP 42, WINDSHIELD P.42-14.)
3. BELT LINE MOLDING (REFER TO GROUP 42, DOOR WINDOW GLASS RUNCHANNEL AND DOOR OPENING WEATHERSTRIP P.42-65.)
4. BACK BELT MOLDING
5. QUARTER BELT SIDE GARNISH

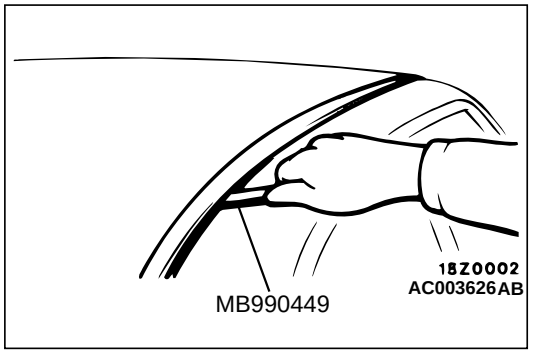
REMOVAL SERVICE POINTS

<<A>> ROOF DRIP MOLDING REMOVAL

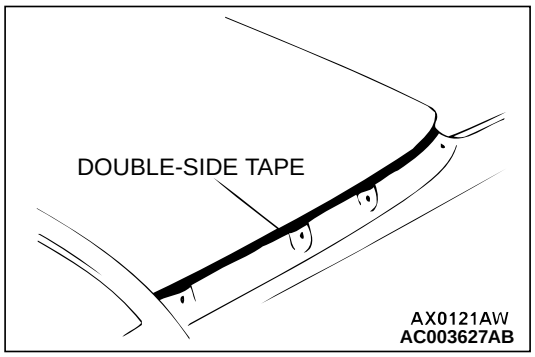
⚠ CAUTION

If the molding has become warped, it should not be reused.

Use special tool MB990449 to lever out the molding.



<<B>> REAR PILLAR GARNISH REMOVAL

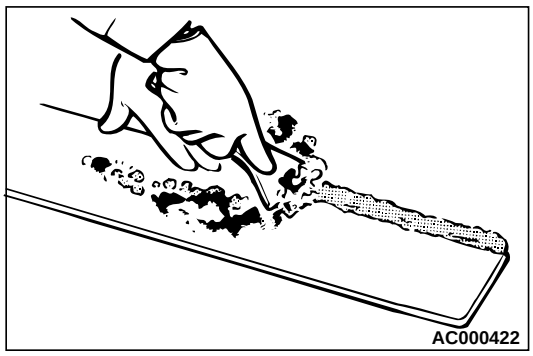


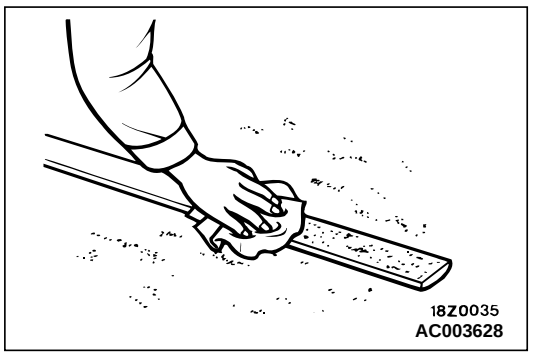
1. Use a resin spatula to scrape off the double-sided tape.
2. Wipe the body surface and clean it with a shop moistened with isopropyl alcohol.

INSTALLATION SERVICE POINTS

>>A<< REAR PILLAR GARNISH INSTALLATION.

1. Scrape off the double-sided tape with a resin spatula or gasket scraper.





2. Use a shop towel moistened with 3M™ AAD Part number 8906 or equivalent to wipe the protect molding surface.

⚠ CAUTION

Do not remove all of the residual adhesive.

3. Remove only a small portion of the residual adhesive.

⚠ CAUTION

- **Always apply it evenly on the entire surface, because a lot or little will reduce its strength.**
- **Do not touch the painted surface.**

4. Affix the specified double-sided tape [3 mm (0.1 inch) wide and 5 mm (0.2 inch) thick].

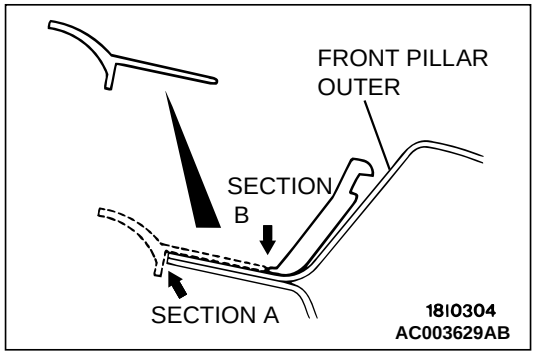
TSB Revision

REAR PILLAR GARNISH INSTALLATION

1. Tear off the double-sided tape backing paper.

   NOTE: If you attach the adhesive tape to the edge of the backing paper, if will be easy to tear off.
2. Install the rear pillar garnish.

   NOTE: If the double-sided tape is difficult to affix in cold temperature, etc., warm the bonding surfaces of the body and rear pillar garnish to about 40 – 60°C (104 – 140°F) before affixing the tape.
3. Firmly press in the rear pillar garnish.



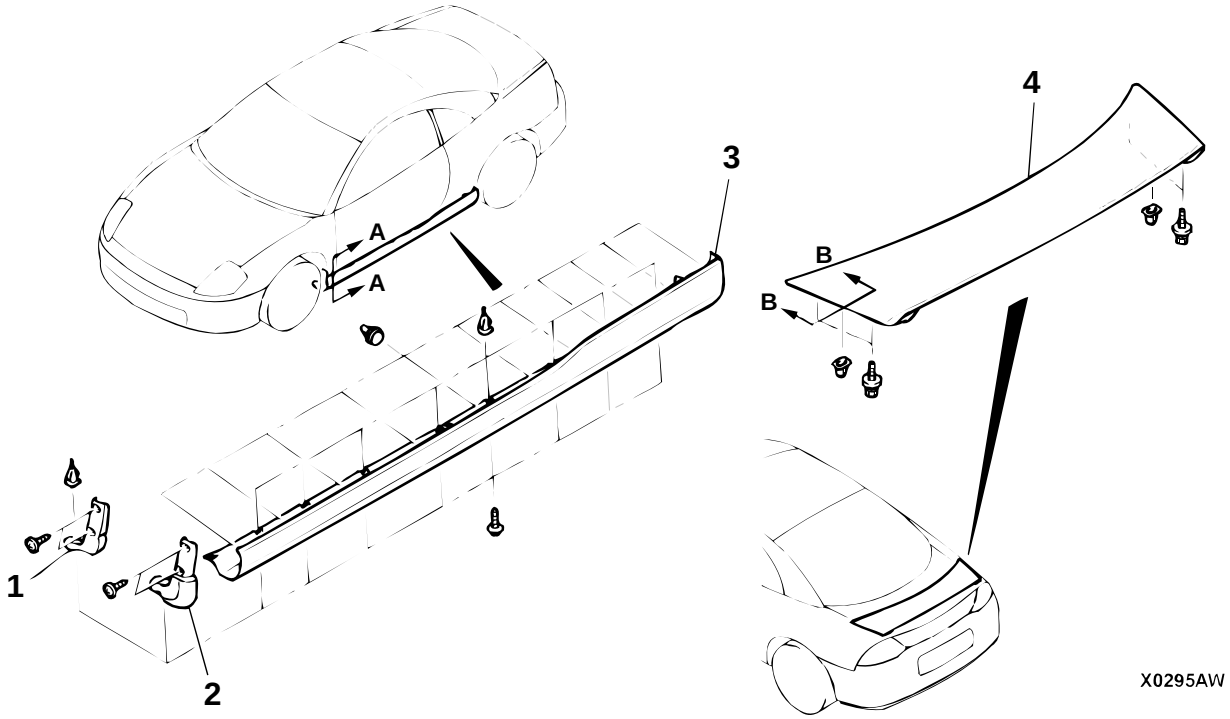
>>B<< ROOF DRIP MOLDING INSTALLATION

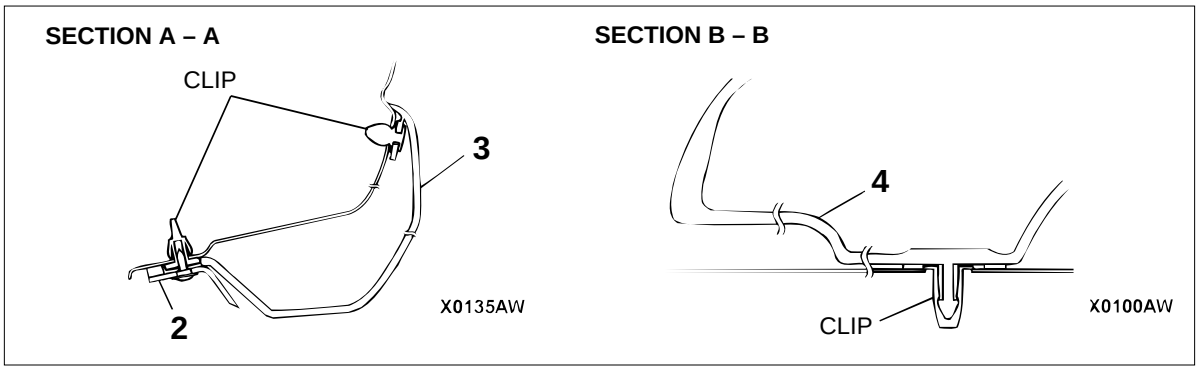
After installing the clip to the outer front pillar in alignment with its section A, cut from section B.

AERO PARTS

REMOVAL AND INSTALLATION

M1511005000039





AC003621AB

REMOVAL STEPS

1. STONE GUARD <VEHICLES WITHOUT SIDE AIR DAM>
2. FRONT SIDE AIR DAM
3. REAR SIDE AIR DAM
4. REAR SPOILER

WINDSHIELD WIPER AND WASHER

GENERAL INFORMATION

M1511000100116

OPERATION

Windshield Low-speed (and High-speed) Wiper Operation

- If the wiper switch is turned to the "LO" position with the ignition switch at the "ACC" or "ON" position, the column switch sends a low-speed wiper ON and high-speed wiper OFF signals to the front-ECU. This turns the wiper signal on and the wiper speed switching relay off (low-speed), causing the wipers to operate at low-speed.
- If the wiper switch is turned to the "HI" position, the column switch sends a low-speed wiper OFF and high-speed wiper ON signals to the front-ECU. This turns both the wiper signal and the wiper speed switching relay on (high-speed), causing the wipers to operate at high-speed.

Windshield Intermittent Wiper Operation

- The ETACS-ECU calculates the wiper operation interval according to the voltage signal sent from the column switch. Then the ETACS-ECU sends a signal to the front-ECU. The front-ECU determines the wiper operation interval and turns on the wiper relay signal. This causes the wiper auto stop relay to turn on. Then the wiper auto stop relay will turn off after the wipers reach the park position. This causes the wiper signal relay and then the wipers to turn off. If the wiper signal relay remains off for the wiper operation interval, the relay turns on again, causing the wipers to operate in intermittent mode.

Windshield Mist Wiper Operation

- If the wiper switch is turned to the "MIST" position with the ignition switch at "ACC" or "ON" position, the mist wiper high-speed operation signal is sent to the front-ECU. This signal turns on the wiper speed switching relay, causing the wipers to work at high-speed while the mist switch is on.
- While the mist wiper switch remains turned on when the intermittent mode is still working, the wipers work as the mist wiper. However, the wipers return to the intermittent mode again when the wiper auto stop signal turns on after the mist wiper switch is turned off.

Windshield Washer Operation

- If the wiper switch is turned to the "WASHER" position with the ignition switch at "ACC" or "ON" position, the washer ON signal is sent to the front-ECU, causing the wiper signal to turn on after 0.6 seconds. After the washer switch signal turns off, the wiper signal turns off in three seconds. If the wiper switch is turned the "WASHER" position while the wiper is at intermittent mode, the washer works for that period when the washer switch remains on. Then the wipers return to the intermittent mode.

WINDSHIELD WIPER AND WASHER DIAGNOSIS

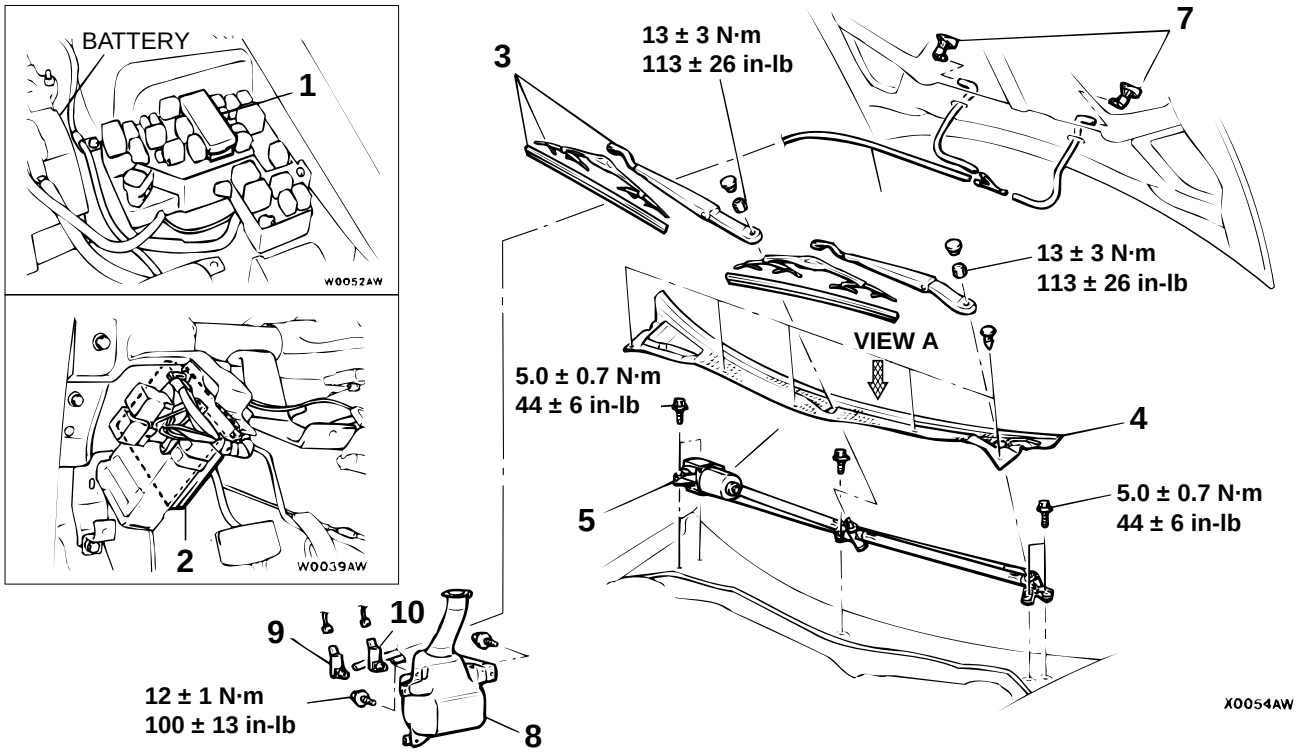
M1511000700099

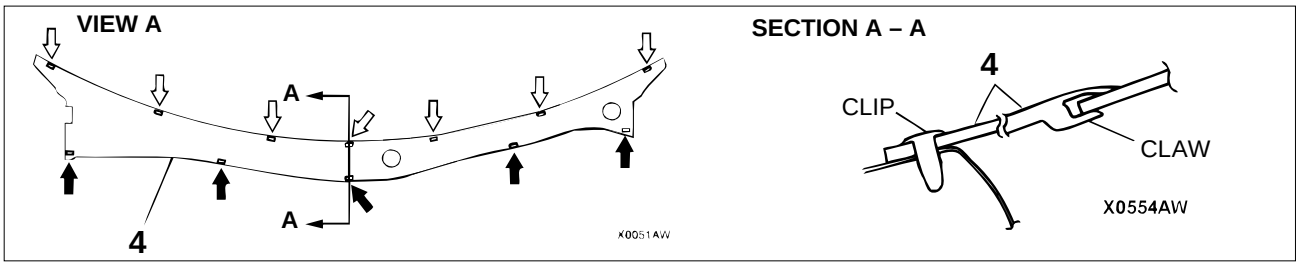
The windshield wiper and washer are controlled by ETACS-ECU. For troubleshooting, refer to GROUP 54B, SWS Diagnosis P.54B-17.

WINDSHIELD WIPER AND WASHER

REMOVAL AND INSTALLATION

M1511007600134





AC003326 AB

NOTE
⬅: CLIP POSITION
⇦: CLAW POSITION

1. FRONT-ECU
2. ETACS-ECU

WIPER MOTOR AND LINK ASSEMBLY REMOVAL STEPS

>>B<< 3. WIPER ARM AND BLADE ASSEMBLY
4. FRONT DECK GARNISH
<<A>> >>A<< 5. WIPER MOTOR AND LINK ASSEMBLY

WASHER NOZZLE REMOVAL STEPS

- FRONT SPLASH SHIELD

6. WASHER HOSE
7. WASHER NOZZLE

WASHER TANK REMOVAL STEPS

- FRONT SPLASH SHIELD (REFER TO GROUP 42, FENDER P.42-9.)
- FRONT BUMPER ASSEMBLY (REFER TO GROUP 51P.51-4 .)

WASHER TANK REMOVAL STEPS

- PASSENGER'S SIDE HEADLIGHT (REFER TO GROUP 54A P.54A-111.)
- WASHER FLUID DRAINING AND REFILLING

6. WASHER HOSE
8. WASHER TANK ASSEMBLY
9. FRONT WINDSHIELD WASHER MOTOR
10. REAR WINDSHIELD WASHER MOTOR

NOTE: For removal and installation of the wiper and washer switch, refer to GROUP 54A P.54A-122, Column Switch.

TSB Revision

REMOVAL SERVICE POINT

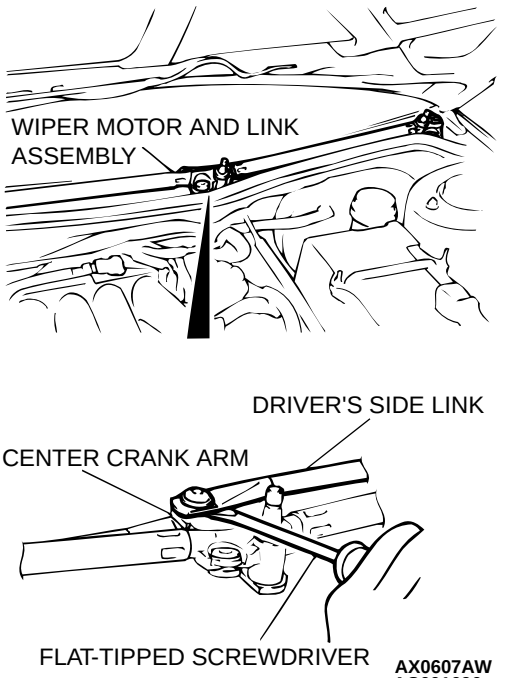
<<A>> WIPER MOTOR AND LINK ASSEMBLY REMOVAL

1. Remove the five mounting bolts of the wiper motor and link assembly and disconnect the connector.
2. To protect the windshield, apply duct tape to the entire circumference of the glass near the wiper motor and link assembly installation position.

⚠ CAUTION

Be careful not to damage the windshield glass when removing the wiper motor and link assembly.

3. Use a flat-tipped screwdriver to disengage the driver's side link from the center crank arm.
4. Remove the wiper motor and link assembly from the vehicle body (the cowl) while being careful not to scratch the windshield glass.



INSTALLATION SERVICE POINTS

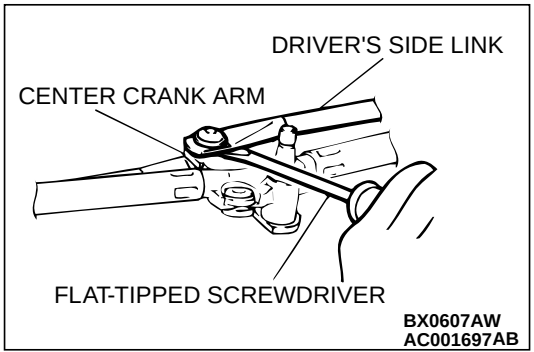
>>A<< WIPER MOTOR AND LINK ASSEMBLY INSTALLATION

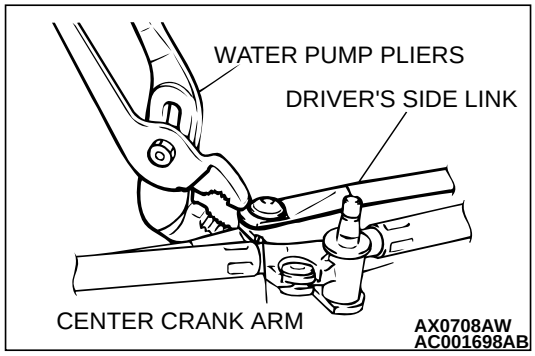
1. Disengage the driver's side link from the center crank arm when replacing with new one.

⚠ CAUTION

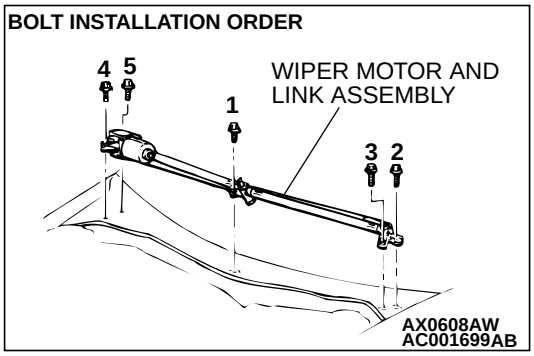
Be careful not to scratch the windshield glass when installing the wiper motor and link assembly.

2. Install the wiper motor and link assembly to the vehicle body (the cowl) while being careful not to scratch the windshield glass.

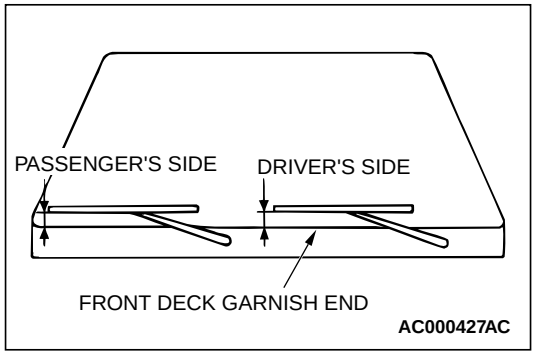




3. Use water pump pliers to engage securely the driver's side link with the center crank arm.



4. Install the five mounting bolts in the shown order to install the wiper motor and link assembly.
5. Secure the wiper motor and link assembly in the wiper park position. (Refer to, Wiper Motor Check P.51-20.)



>>B<< WIPER ARM AND BLADE ASSEMBLY INSTALLATION

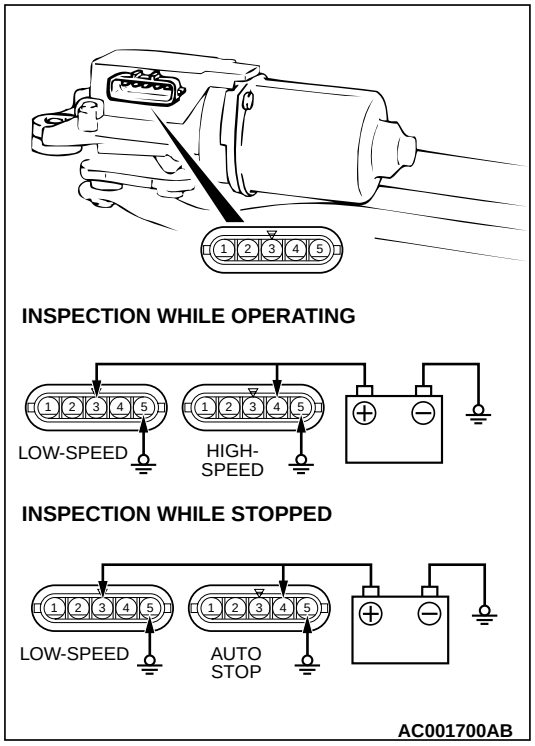
Install the wiper blade at the specified position (standard value).

Standard value:
Driver's side: 33 – 43 mm (1.3 – 1.7 inches)
Passenger's side: 38 – 48 mm (1.5 – 1.9 inches)

INSPECTION

M1511019100192

FRONT WIPER MOTOR CHECK



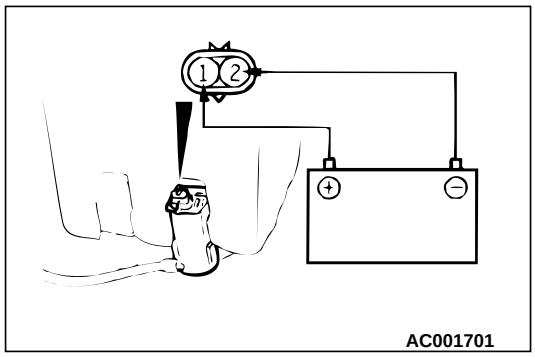
Check the wiper motor after disconnecting the wiring harness connector, and with the wiper motor remaining installed to the body.

Wiper Motor at Low-Speed and High-Speed Operation
Connect the battery to the wiper motor as shown in the illustration, and then check the operation of the wiper motor at low speed and at high speed.

Wiper Motor at Stop Position Operation

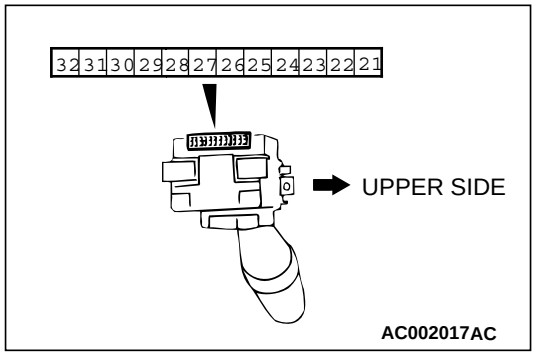
1. Run the wiper motor at low-speed, disconnect the battery, and stop the motor.
2. Reconnect the battery as shown in the illustration, and confirm that the motor starts turning at low-speed, and then stops at the automatic stop position.

FRONT WASHER MOTOR CHECK



1. With the washer motor installed to the washer tank, fill the washer tank with water.
2. Check that water is sprayed out strongly when battery voltage is applied to terminal (1) and terminal (2) is grounded.

WINDSHIELD WIPER AND WINDSHIELD WASHER SWITCH CHECK



1. Windshield wiper and washer switch

SWITCH POSITION	TESTER CONNECTION	SPECIFIED CONDITION
OFF	21 – 23 , 22 – 23 , 23 – 30 , 23 – 31 , 23 – 32	Open circuit
Windshield mist wiper switch	23 – 32	Less than 2 ohm
Windshield intermittent wiper switch	23 – 31	Less than 2 ohm

SWITCH POSITION	TESTER CONNECTION	SPECIFIED CONDITION
Windshield low-speed wiper switch	23 – 30	Less than 2 ohm
Windshield high-speed wiper switch	21 – 23	Less than 2 ohm
Windshield washer switch	22 – 23	Less than 2 ohm

2. Windshield intermittent wiper interval adjusting knob
Measure the resistance value at terminal numbers 27 and 28. The resistance value should rise smoothly from approximately 0 Ω ("FAST" position) to approximately 1 kΩ ("SLOW" position).

REAR WIPER AND WASHER

GENERAL INFORMATION

M1511000100138

OPERATION

Rear Wiper Operation

- If the rear wiper and washer switch is turned to the "INT" position with the ignition switch at "ACC" or "ON" position, the ETACS-ECU causes the rear wiper to operate continuously two times, then intermittently at eight-second intervals.
- If the selector lever is moved to the "R" position when the rear wiper and washer switch is turned the "INT" position and the ignition switch at "ACC" or "ON" position, park/neutral position switch "R" turns ON. One second later, the ETACS-ECU causes the rear wiper to operate two times continuously to ensure good rearward visibility. The ETACS-ECU then causes the rear wiper to again operate intermittently at eight-second intervals.

Rear Washer Operation

- If the rear wiper and washer switch is turned the "WASHER" position with the ignition switch at "ACC" or "ON" position, the rear washer ON signal is sent to the ETACS-ECU, causing the rear wiper signal to turn on after 0.9 seconds. After the rear washer switch signal turns off, the rear wiper signal turns off in three seconds.
- If the rear wiper and washer switch is turned to the "WASHER" position while the rear wiper is at intermittent mode, the rear washer works for that period when the washer switch remains on. Then the rear wipers return to the intermittent mode.

EXTERIOR DIAGNOSIS

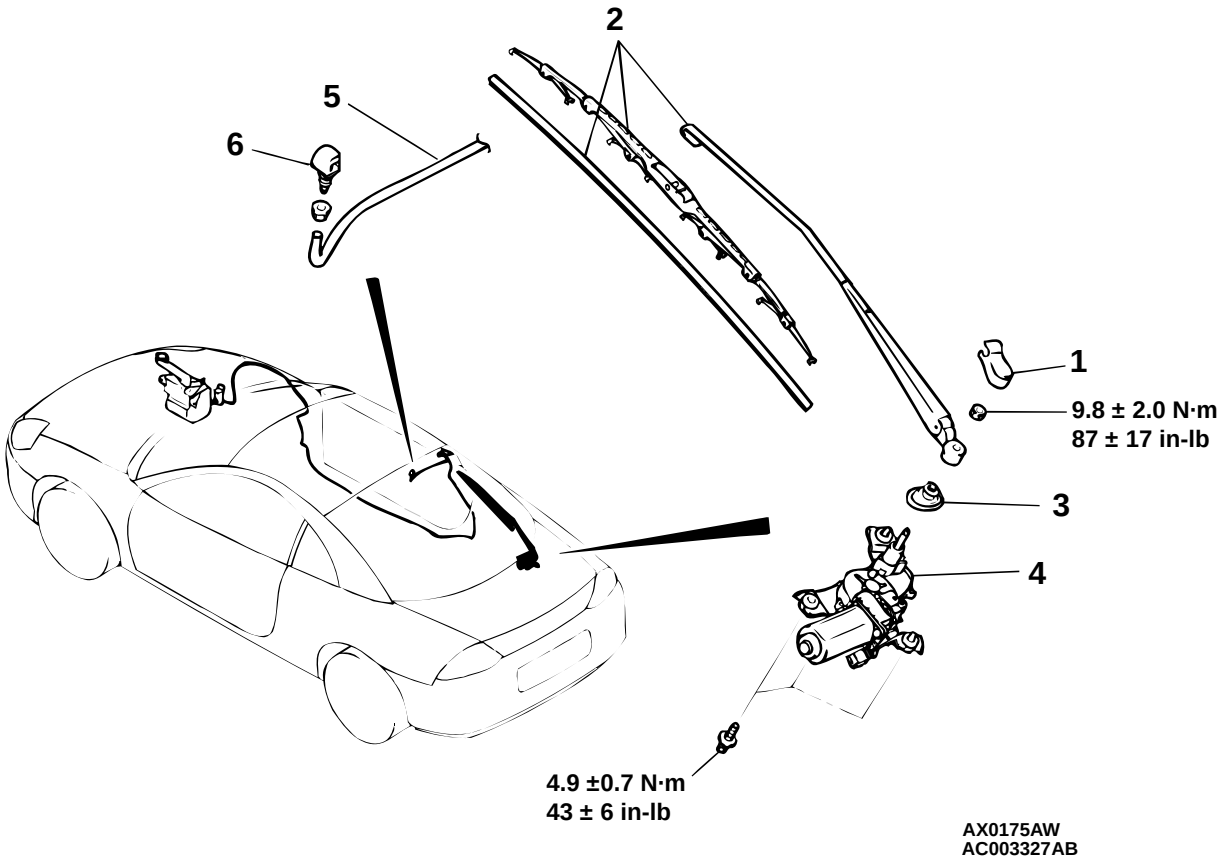
M1511000700118

The rear wiper and washer are controlled by ETACS-ECU. For troubleshooting, refer to GROUP 54B, SWS Diagnosis P.54B-17.

REAR WIPER

REMOVAL AND INSTALLATION

M1511008800045



- WASHER TANK ASSEMBLY AND REAR WASHER MOTOR (REFER TO GROUP 51, WINDSHIELD WIPER AND WASHER P.51-17.)

REAR WIPER MOTOR ASSEMBLY REMOVAL STEPS

1. COVER
- >>A<< 2. REAR WIPER ARM AND BLADE ASSEMBLY
  - LIFTGATE LOWER TRIM (REFER TO GROUP 42, LIFTGATE TRIM P.42-72.)
- >>B<< 3. GROMMET
4. REAR WIPER MOTOR ASSEMBLY

REAR WASHER HOSE REMOVAL STEPS

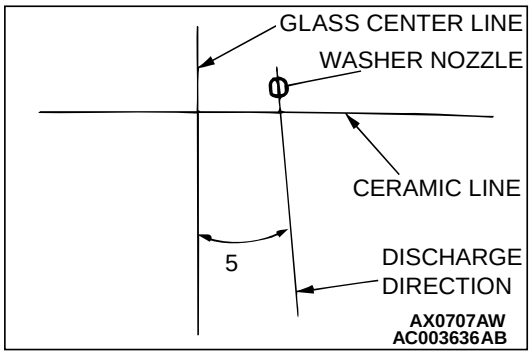
- QUARTER TRIM, LOWER <RH> (REFER TO GROUP 52A, TRIMS P.52A-9.)

5. REAR WASHER HOSE
- >>A<< 6. WASHER NOZZLE

NOTE: For removal and installation of the wiper and washer switch, refer to GROUP 54A, Column SwitchP.54A-122 .

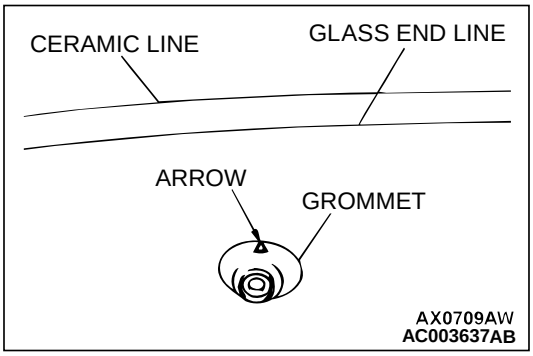
TSB Revision

INSTALLATION SERVICE POINTS



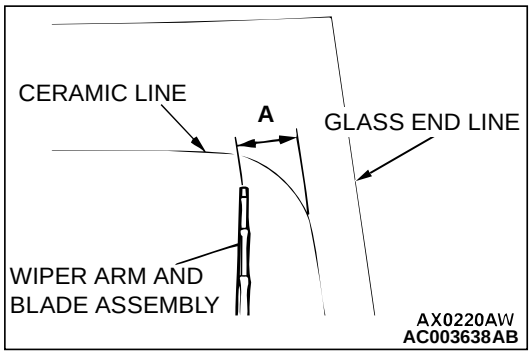
>>A<< WASHER NOZZLE INSTALLATION

Install the washer nozzle in the specified direction.



>>B<< GROMMET INSTALLATION

Install the grommet so that the arrow points upwards.



>>C<< REAR WIPER ARM AND BLADE ASSEMBLY INSTALLATION

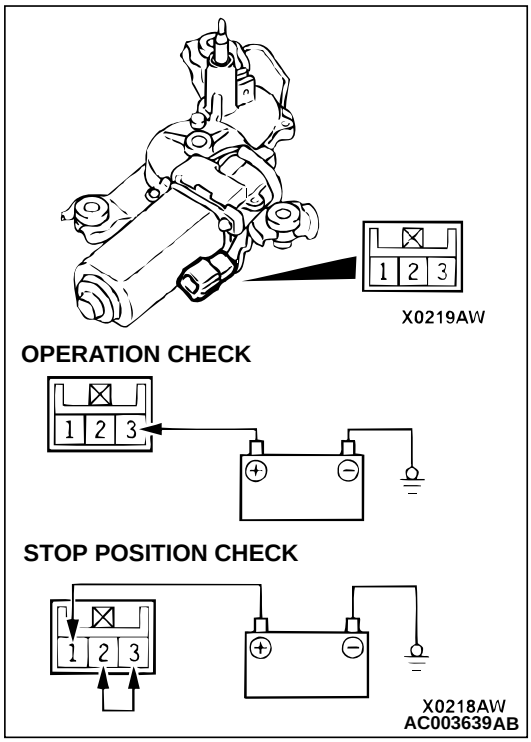
Install the wiper blade so that the tip stops at the standard position (standard value), and also so that the lower section of the wiper blade enters the middle of the defogger pattern.

Standard value (A): 89 – 99 mm (3.5 ± 3.9 inches)

INSPECTION

M1511019100200

REAR WIPER MOTOR CHECK



Check the wiper motor after first disconnecting the wiring harness connector, and with the wiper motor remaining installed to the body.

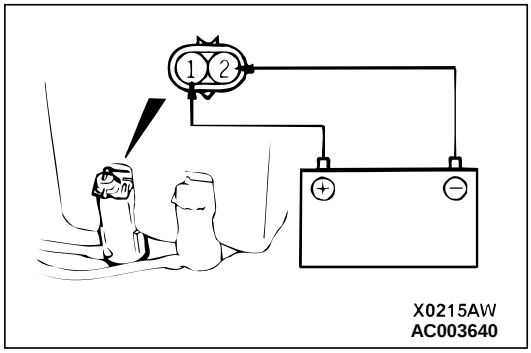
Wiper Motor Operation

Connect a battery to the wiper motor as shown in the illustration and inspect the motor operation.

Wiper Motor at Stop Position Operation

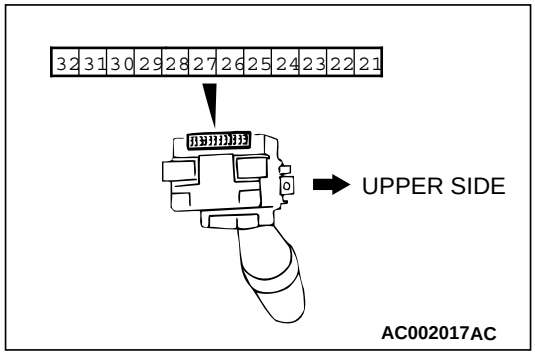
1. Run the wiper motor, disconnect the battery, and stop the motor.
2. Reconnect the battery as shown in the illustration, and confirm that after the motor starts turning it stops at the automatic stop position.

REAR WASHER MOTOR CHECK



1. With the washer motor installed to the washer tank, fill the washer tank with water.
2. When the battery is connected as shown in the figure, check that the washer squirts out strongly.

REAR WIPER AND WASHER SWITCH INSPECTION



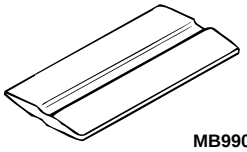
SWITCH POSITION	TERMINAL CONNECTION	SPECIFIED CONDITION
OFF	25 – 26 , 25 – 29	Open circuit
Rear wiper switch ON	25 – 26	Less than 2 ohm
Rear washer switch ON	25 – 29	Less than 2 ohm

TSB Revision

MARK

SPECIAL TOOL

M1511000600575

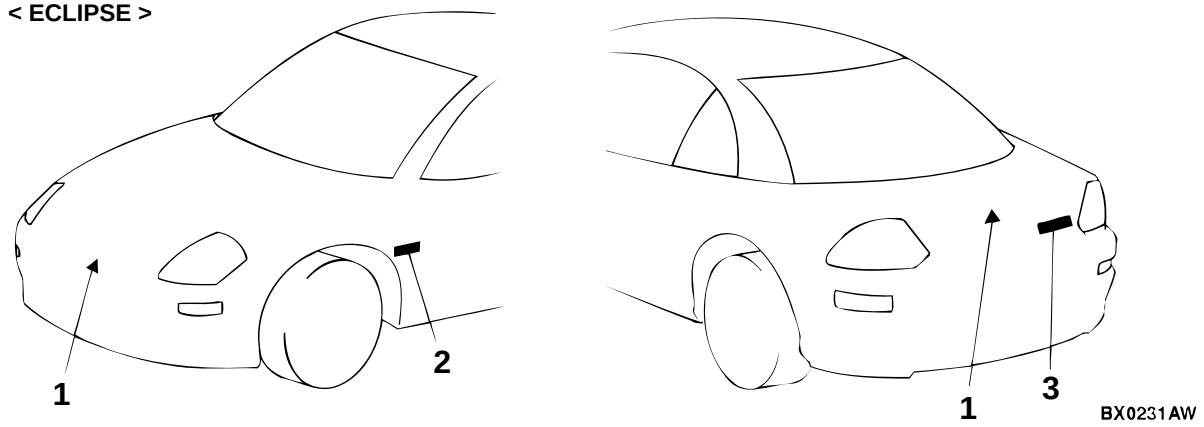
TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 MB990528	MB990528 Stripe tape spatula	-	Bonding of the mark

MARK

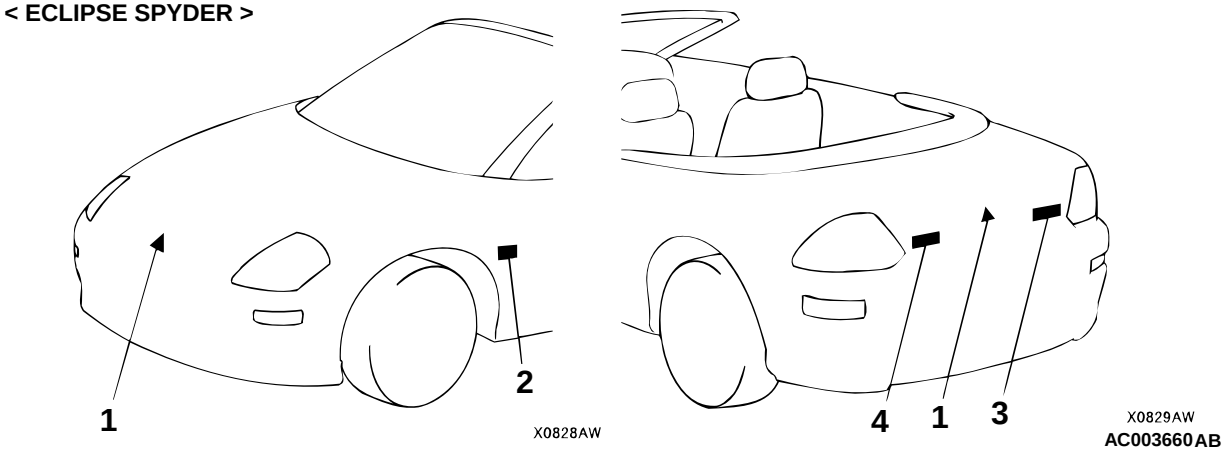
REMOVAL AND INSTALLATION

M1511011800067

< ECLIPSE >



< ECLIPSE SPYDER >



1. TOP MARK
>>A<< 2. ENGINE SPECIFICATION MARK
>>A<< 3. GRADE MARK (GT, RS, GS)
>>A<< 4. SPYDER MARK

Required Special Tool:
- MB990528: Stripe Tape Spatula

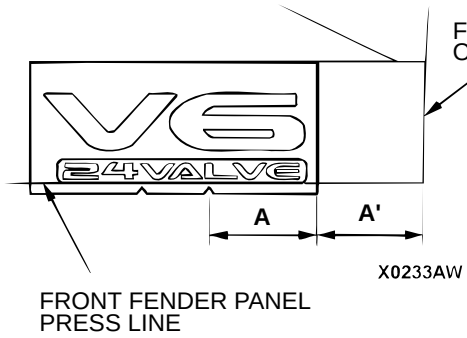
INSTALLATION SERVICE POINT

>>A<< MARK INSTALLATION

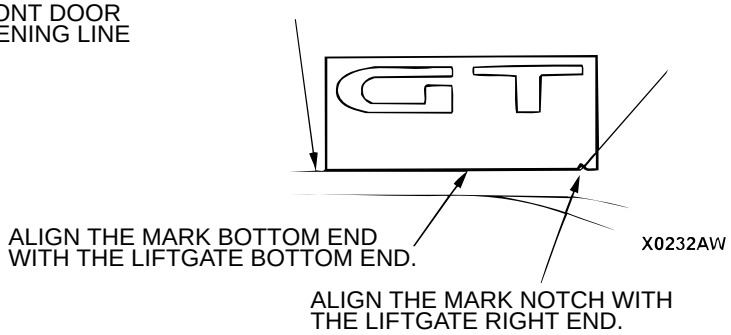
1. APPLICATION LOCATION
   The distance A (from the mark right end to the notch) should be identical to the distance A' (from the front door opening line to the mark right end).

TSB Revision

ENGINE SPECIFICATION MARK
LH SIDE

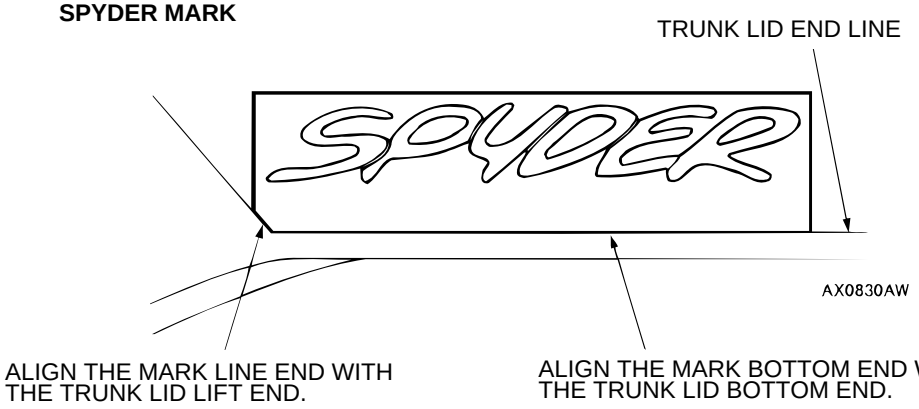


GRADE MARK
GT (ALSO APPLICABLE FOR GS)



NOTE
RH SIDE IS SYMMETRICAL ON LH SIDE.

SPYDER MARK



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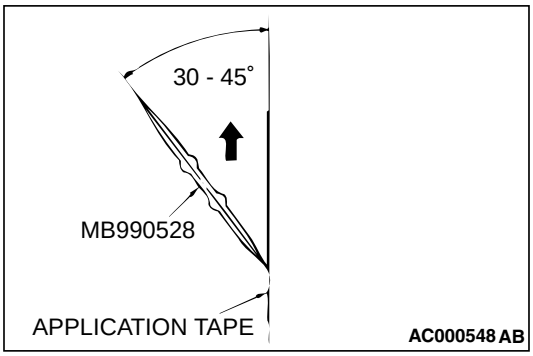
⚠ CAUTION

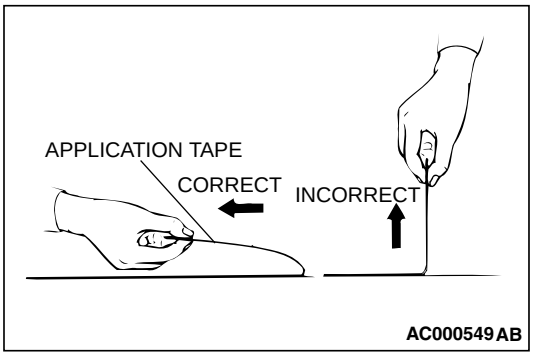
- **Work in a dust-free workplace with temperature of 20 – 38°C (60 - 100°F).**
- **If workplace temperature is under 20°C (60°F), warm tape and vehicle body (adhesion area) to 20 – 38°C (60 – 100°F).**

2. Install the tape by the following procedure.
   (1) Use 3M™ AAD Part number 8906 or equivalent to wipe off oil from stripe tape adhesion area.
   (2) Remove protective paper from back of stripe tape and adhere entirely to indicated area.

⚠ CAUTION
- **Pressing the mark horizontally may lead to a slack, clinching or improper position.**
- **If the mark is pressed improperly, the mark may be easily peeled off.**

(3) Make sure that air bubbles are not trapped in the application surface. When applying the mark, use special tool MB990528 to press the mark from its center to top and bottom gradually.



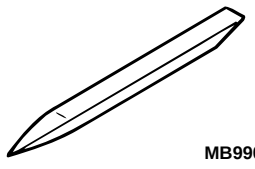


(4) Peel off an application tape (top protection paper) horizontally and carefully from one end. If an air bubble is left in the mark, open a hole by using a needle, and then use special tool MB990528 to expel the air bubble.

DOOR MIRROR

SPECIAL TOOL

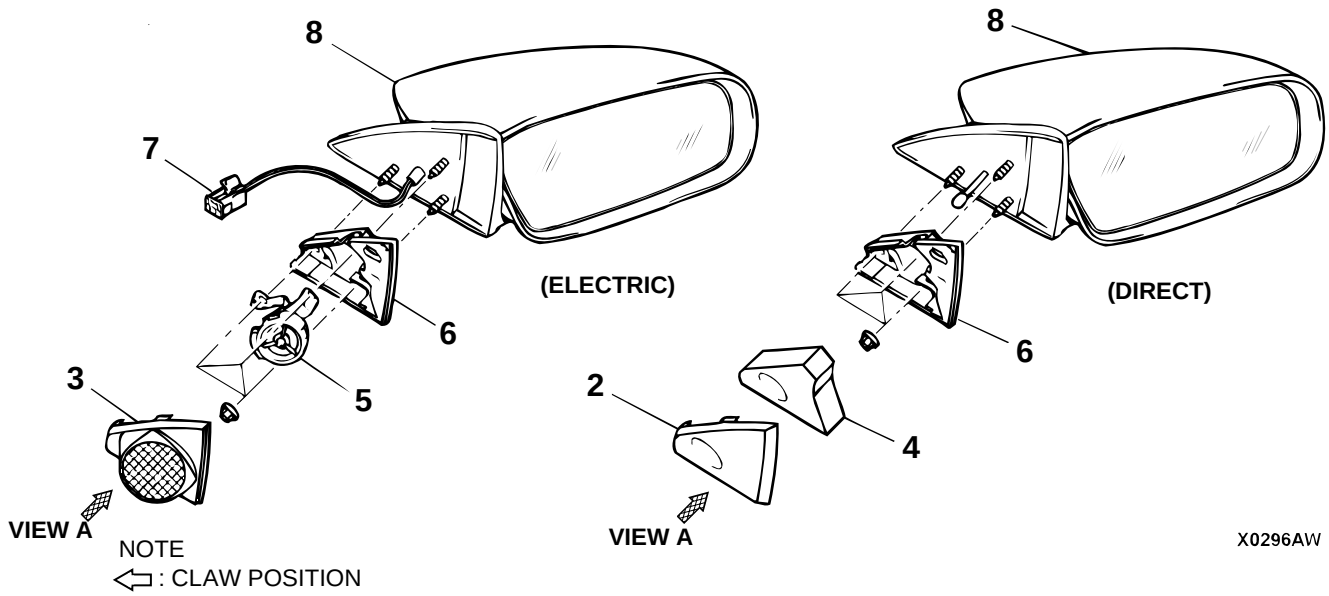
M1511000600586

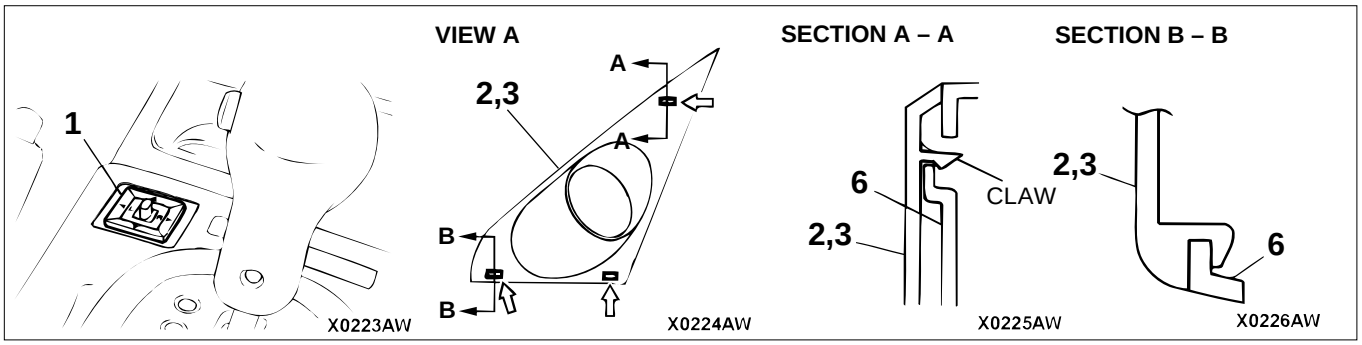
TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 MB990784	MB990784 Ornament remover	General service tool	Removal of remote controlled mirror switch

DOOR MIRROR

REMOVAL AND INSTALLATION

M1511006400063





AC003328 AB

1. REMOTE CONTROLLED MIRROR SWITCH

DOOR MIRROR REMOVAL STEPS

- DOOR TRIM (REFER TO GROUP 42 P.42-54.)

2. DELTA COVER, INNER
3. TWEETER COVER
4. PAD

DOOR MIRROR REMOVAL STEPS

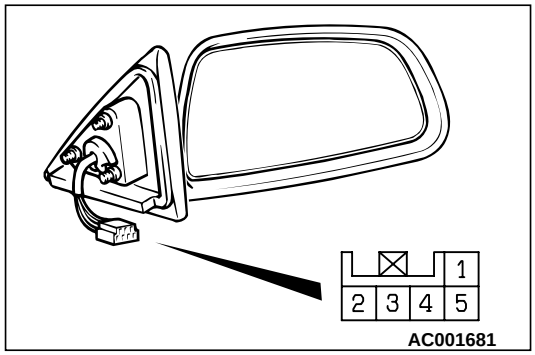
5. TWEETER
6. DELTA COVER BASE
7. HARNESS CONNECTOR <VEHICLES WITH REMOTE CONTROLLED MIRROR>
8. DOOR MIRROR ASSEMBLY

INSPECTION

M1511019100211

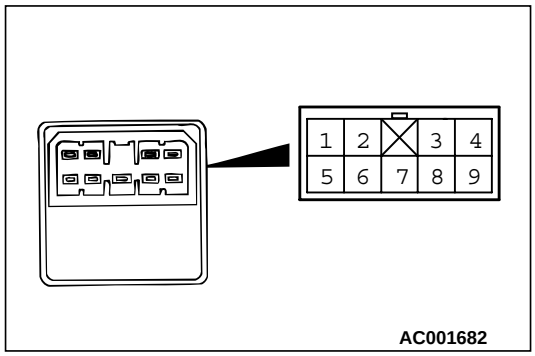
ELECTRIC REMOTE CONTROL MIRROR OPERATION CHECK

Check that the mirror moves as described in the table when each terminal is connected to the battery.



DIRECTION OPERATION	TESTER CONNECTION	SPECIFIED CONDITION
Up	• Connect terminal 3 to the negative battery terminal • Connect terminal 1 to the positive battery terminal	Less than 2 ohm
Down	• Connect terminal 1 to the negative battery terminal • Connect terminal 3 to the positive battery terminal	Less than 2 ohm
Right	• Connect terminal 3 to the negative battery terminal • Connect terminal 2 to the positive battery terminal	Less than 2 ohm
Left	• Connect terminal 2 to the negative battery terminal • Connect terminal 3 to the positive battery terminal	Less than 2 ohm

DOOR MIRROR CONTROL SWITCH CHECK



SWITCH POSITION		TESTER CONNECTION	SPECIFIED CONDITION
Left side	Up	4 – 8, 6 – 7	Less than 2 ohm
	Down	4 – 7, 6 – 8	Less than 2 ohm
	Right	3 – 6, 4 – 7	Less than 2 ohm
	Left	3 – 4, 6 – 7	Less than 2 ohm
Right side	Up	2 – 4, 6 – 7	Less than 2 ohm
	Down	2 – 6, 4 – 7	Less than 2 ohm
	Right	4 – 7, 6 – 9	Less than 2 ohm
	Left	4 – 9, 6 – 7	Less than 2 ohm

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1511015300149

ITEMS		SPECIFICATIONS
Front bumper	Front turn signal light screw	0.69 ± 0.09 N·m (5.2 ± 0.8 in-lb)
	Front fog light assembly screw	4.9 ± 0.7 N·m (43 ± 6 in-lb)
	Front fog light bracket bolt	4.9 ± 0.7 N·m (43 ± 6 in-lb)
	License plate garish screw	0.9 ± 0.1 N·m (8 ± 1 in-lb)
Windshield wiper and washer	Wiper arm and blade assembly nut	13 ± 3 N·m (113 ± 26 in-lb)
	Wiper motor and wiper link assembly bolt	5.0 ± 0.7 N·m (44 ± 6 in-lb)
	Washer tank motor assembly bolt	12 ± 1 N·m (100 ± 13 in-lb)

SERVICE SPECIFICATIONS

M1511000300121

ITEMS		STANDARD VALUE
Windshield wiper blade position installation mm (in)	Driver's side	33 – 43 (1.3 – 1.7)
	Passenger's side	38 – 48 (1.5 – 1.9)
Rear wiper blade position installation mm (in)		89 – 99 (3.5 – 3.9)

SEALANT AND ADHESIVE

M1511000500136

ITEM	SPECIFICATIONS
Rear pillar garnish	Adhesive tape: Double-sided tape [3 mm (0.1 in) width and 5 mm (0.2 in) thick]

GROUP 52A

INTERIOR

CONTENTS

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WARNINGS REGARDING SERVICING OF SUPPLEMENTAL RESTRAINT SYSTEM (SRS) EQUIPPED VEHICLES

⚠ ***WARNING***

- ***Improper service or maintenance of any component of the SRS, or any SRS-related component, can lead to personal injury or death to service personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).***
- ***Service or maintenance of any SRS component or SRS-related component must be performed only at an authorized MITSUBISHI dealer.***
- ***MITSUBISHI dealer personnel must thoroughly review this manual, and especially its GROUP 52B - Supplemental Restraint System (SRS) before beginning any service or maintenance of any component of the SRS or any SRS-related component.***

NOTE
The SRS includes the following components: SRS air bag control unit, SRS warning light, front impact sensors, air bag module, clock spring, and interconnecting wiring. Other SRS-related components (that may have to be removed/installed in connection with SRS service or maintenance) are indicated in the table of contents by an asterisk (*).

SEAT BELT DIAGNOSIS

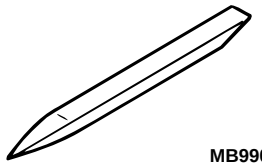
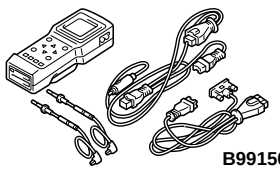
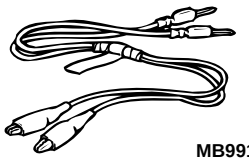
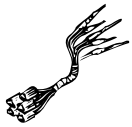
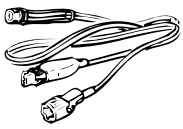
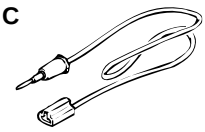
SEAT BELT WARNING SYSTEM DIAGNOSIS

M1521000700067

The seat belt warning system is controlled by the Simplified Wiring System (SWS). For troubleshooting, refer to GROUP 54B P.54B-252.

SPECIAL TOOLS

M1521000600060

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 MB990784	MB990784 Ornament remover	General service tool	Removal of switch, trim, etc.
 B991502	MB991502 Scan tool (MUT-II)	MB991496-OD	Checking the ETACS-ECU input signal
 MB991529	MB991529 Diagnostic trouble code check harness	Tool not necessary if scan tool (MUT-II) is available	Checking the ETACS-ECU input signal (When using the voltmeter)
A  B  C  D MB991223AE	MB991223 A: MB991219 B: MB991220 C: MB991221 D: MB991222 Harness set A: Test harness B: LED harness C: LED harness D: Probe	MB991223	Measurement of terminal voltage

INSTRUMENT PANEL ASSEMBLY

REMOVAL AND INSTALLATION

M1521001700134

⚠ ***WARNING***

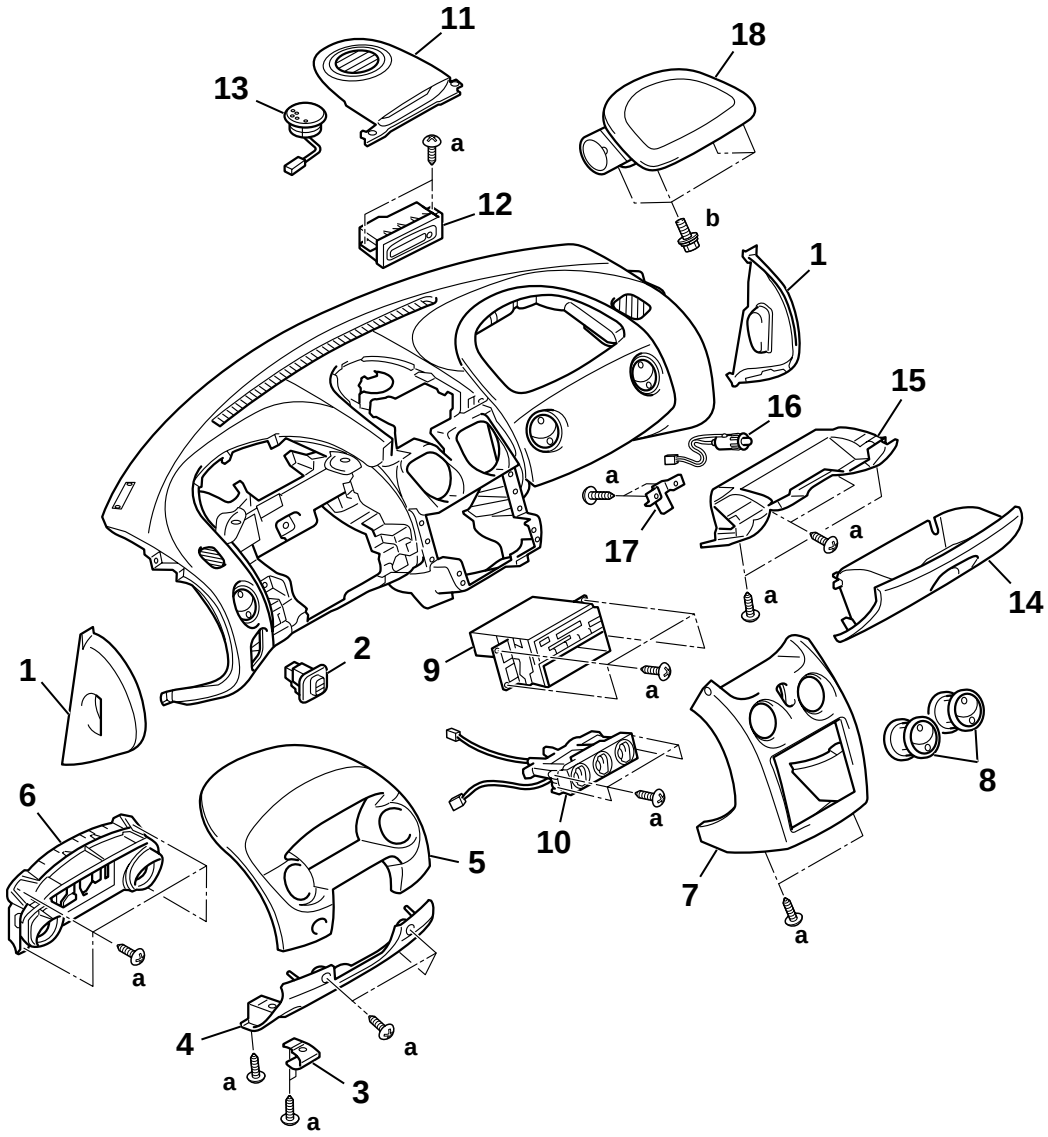
For removal and installation of the passenger's side air bag module, always observe the service procedures described in GROUP 52B, Air Bag Module and Clock Spring P.52B-144.

The bolts and screws described below are used for installation of the instrument panel. They are indicated by symbols in the illustration.

NAME	SYMBOL	SIZE (D × L) mm (in)	COLOR	SHAPE
Tapping screw	a	5 × 16 (0.20 × 0.63)	-	ACX01282
Washer assembled bolt	b	6 × 16 (0.24 × 0.63)	-	ACX02229
	c	6 × 20 (0.24 × 0.79)		
	d	6 × 16 (0.24 × 0.63)	-	ACX00614
Washer assembled bolt (ground)	e	6 × 16 (0.24 × 0.63)	-	ACX00614
	f	6 × 20 (0.24 × 0.79)		

D: Thread diameter L: Effective thread length

Pre-removal and Post-installation Operation
- Floor Console Assembly Removal and Installation (Refer to P.52A-8.)
- Steering Wheel and Shaft Removal and Installation (Refer to GROUP 37A, Steering Wheel and Shaft P.37A-21.)
- Front Pillar Trim Removal Installation (Refer to P.52A-9.)



AC006055 AB

REMOVAL STEPS
1. INSTRUMENT PANEL SIDE COVER
2. FOG LAMP SWITCH ASSEMBLY
3. HOOD LOCK RELEASE HANDLE
4. INSTRUMENT PANEL UNDER COVER
5. METER BEZEL ASSEMBLY
6. COMBINATION METER
7. CENTER PANEL ASSEMBLY
8. AIR OUTLET (CENTER SIDE)
9. RADIO AND TAPE PLAYER ASSEMBLY

REMOVAL STEPS (Continued)
10. HEATER CONTROL ASSEMBLY (REFER TO GROUP 55, HEATER CONTROL ASSEMBLY AND A/C SWITCH P.55-31.)
11. CENTER HOOD
12. MULTI CENTER DISPLAY
13. CENTER SPEAKER
14. GLOVE BOX, OUTER
15. GLOVE BOX, INNER
16. GLOVE BOX LAMP SWITCH ASSEMBLY

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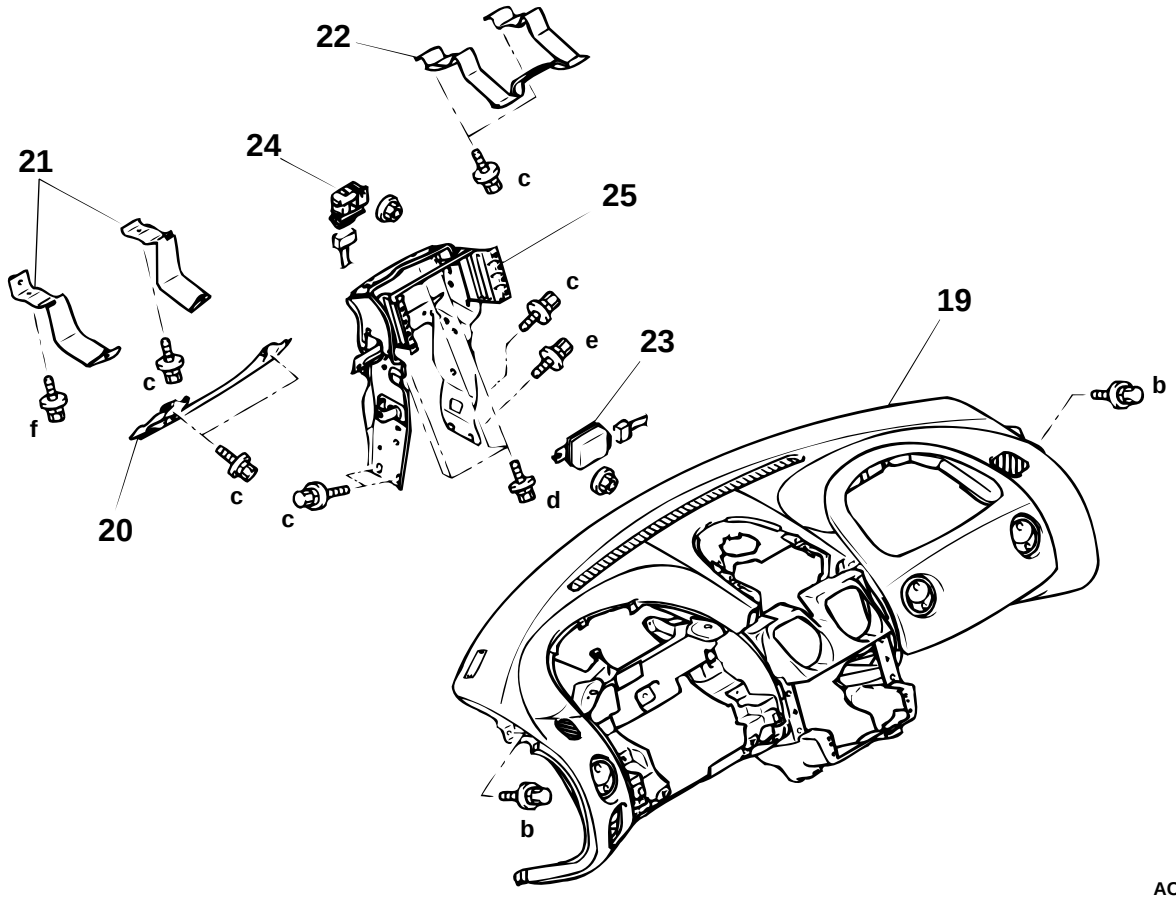
REMOVAL STEPS (Continued)

17. GLOVE BOX STRIKER
18. AIR BAG MODULE (PASSENGER'S SIDE) (REFER TO GROUP 52B, AIR BAG MODULES AND CLOCK SPRING P.52B-144.)



AC003331AC

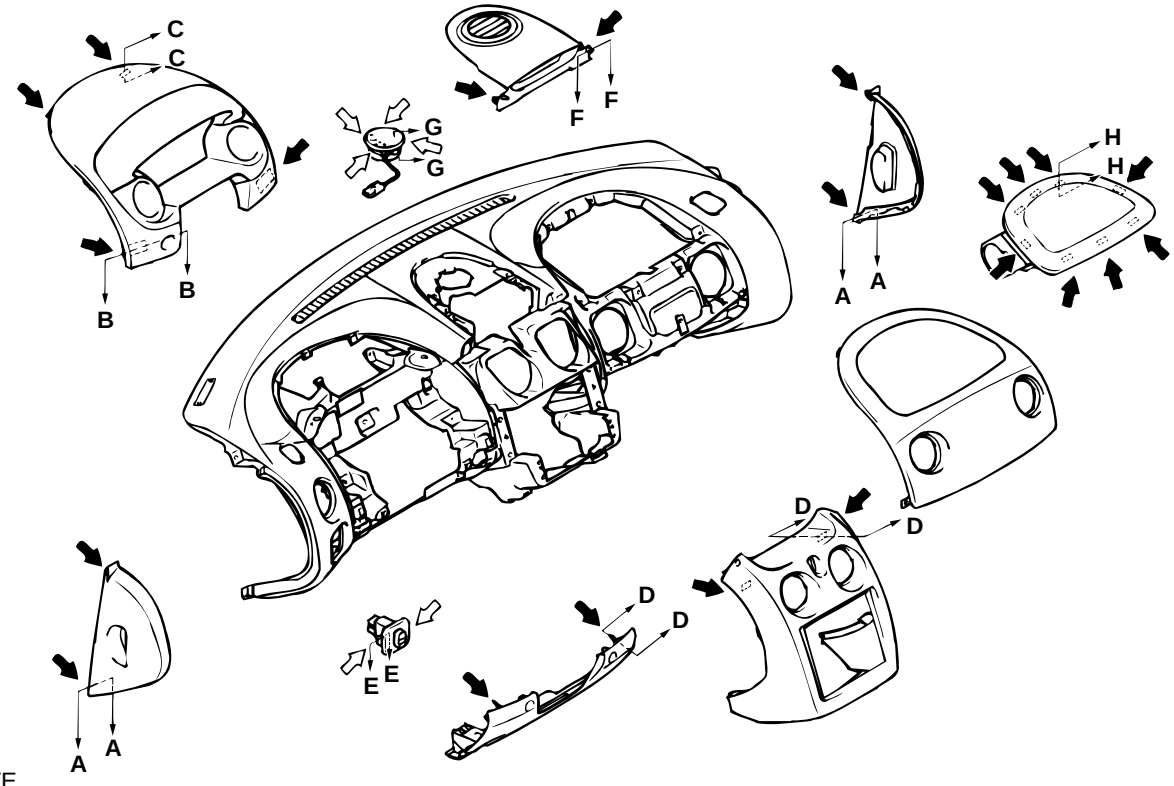
REMOVAL STEPS

19. INSTRUMENT PANEL ASSEMBLY
20. INSTRUMENT PANEL REINFORCEMENT
21. KNEE ABSORBER (DRIVER'S SIDE)

REMOVAL STEPS (Continued)

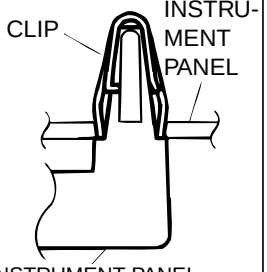
22. KNEE ABSORBER (PASSENGER'S SIDE)
23. AUTO-CRUISE CONTROL-ECU
24. IMMOBILIZER-ECU
25. INSTRUMENT PANEL CENTER REINFORCEMENT

CLIP AND CLAW POSITIONS



NOTE
◀: Clip position
⇦: Claw position

SECTION A – A



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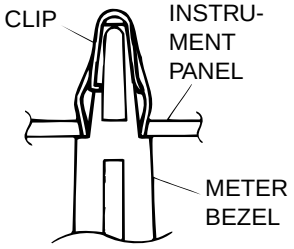

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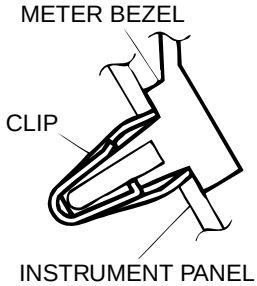

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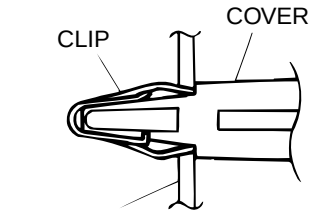

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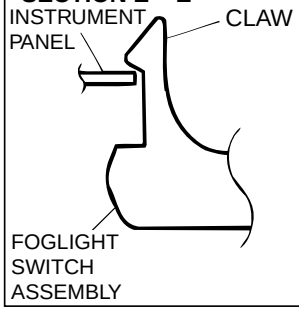

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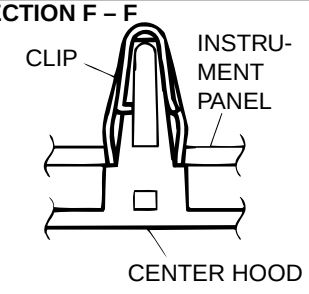
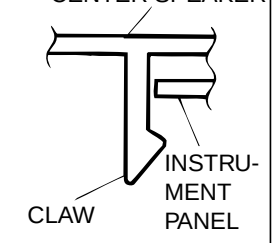


SECTION G – G



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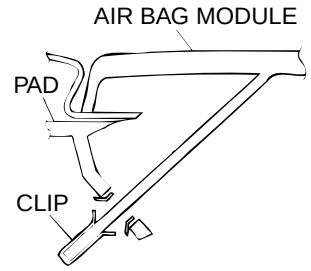

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DISASSEMBLY AND ASSEMBLY

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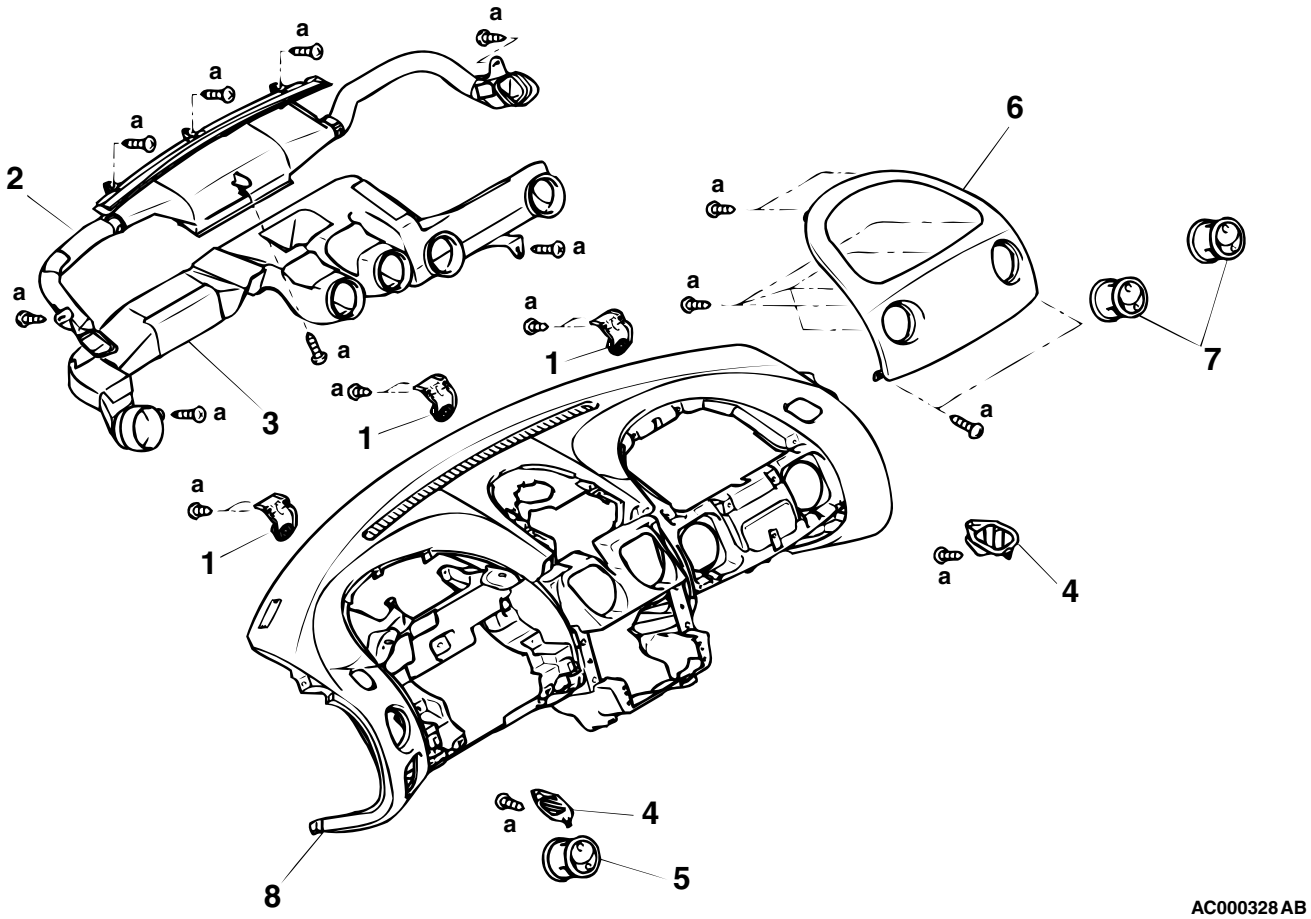


DISASSEMBLY STEPS

1. INSTRUMENT PANEL UPPER BRACKET
2. DEFROSTER NOZZLE ASSEMBLY
3. DISTRIBUTION DUCT
4. SIDE DEFROSTER GRILLE

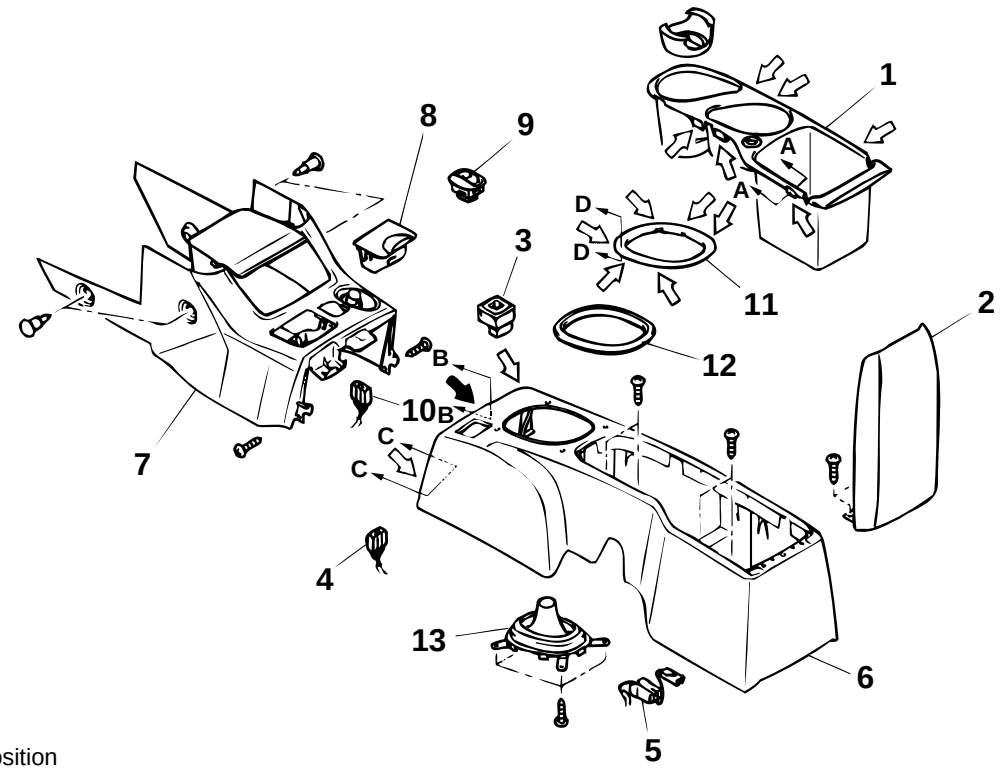
DISASSEMBLY STEPS

5. AIR OUTLET (DRIVER'S SIDE)
6. PAD (PASSENGER'S SIDE)
7. AIR OUTLET (PASSENGER'S SIDE)
8. INSTRUMENT PANEL

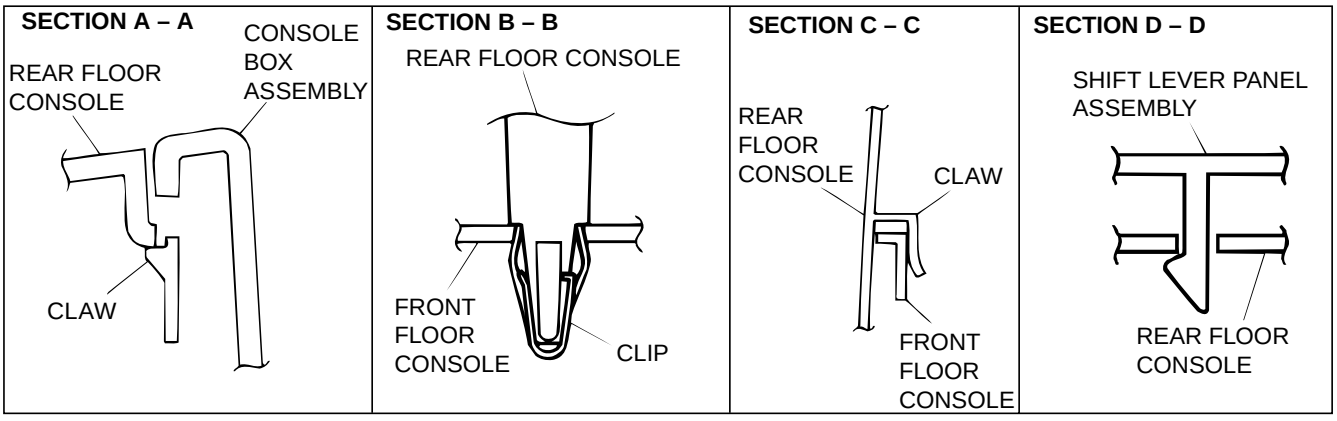
FLOOR CONSOLE ASSEMBLY

REMOVAL AND INSTALLATION

M1521002200068



NOTE
⬅ : Clip position
⇦ : Claw position



AC003043AB

REMOVAL STEPS
1. CONSOLE BOX ASSEMBLY
2. CONSOLE LID ASSEMBLY <EXCEPT ECLIPSE "RS">
3. DOOR MIRROR CONTROL SWITCH
4. DOOR MIRROR CONTROL SWITCH HARNESS
5. ACCESSORY SOCKET HARNESS
6. REAR FLOOR CONSOLE
7. FRONT FLOOR CONSOLE

REMOVAL STEPS (Continued)
8. ASHTRAY
9. FOLDING TOP SWITCH <ECLIPSE SPYDER>
10. FOLDING TOP SWITCH HARNESS <ECLIPSE SPYDER>
11. SHIFT LEVER PANEL ASSEMBLY <M/T>
12. GARNISH <A/T>
13. SHIFT LEVER BOOT <M/T>

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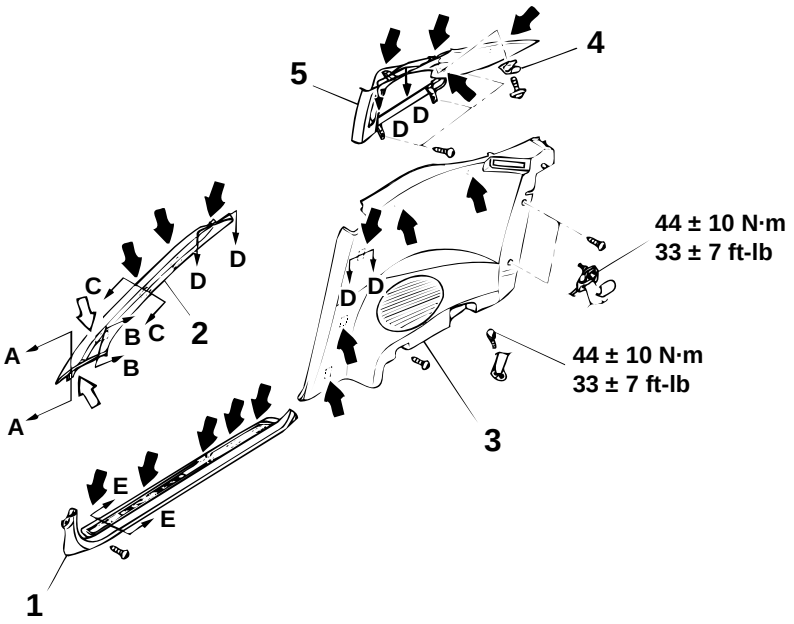
TRIMS

REMOVAL AND INSTALLATION

M1521001100068

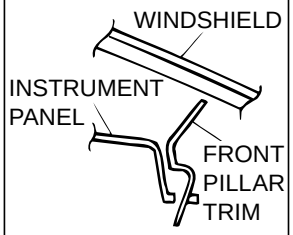
<ECLIPSE>

Pre-removal and Post-installation Operation
- Rear Seat Cushion and Installation (Refer to P.52A-20.)



NOTE
◀: Clip position
⇦: Claw position

SECTION A – A



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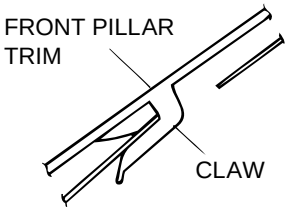

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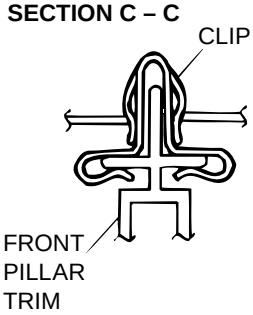

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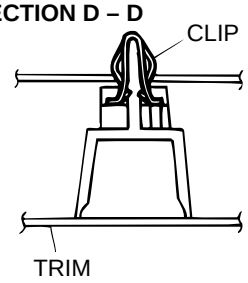

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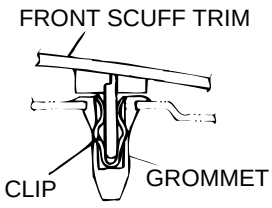

AC003034AB

TRIMS REMOVAL STEPS
1. FRONT SCUFF PLATE
2. FRONT PILLAR TRIM
3. QUARTER TRIM, LOWER

TRIMS REMOVAL STEPS
4. COAT HANGER (LH ONLY)
5. QUARTER TRIM, UPPER

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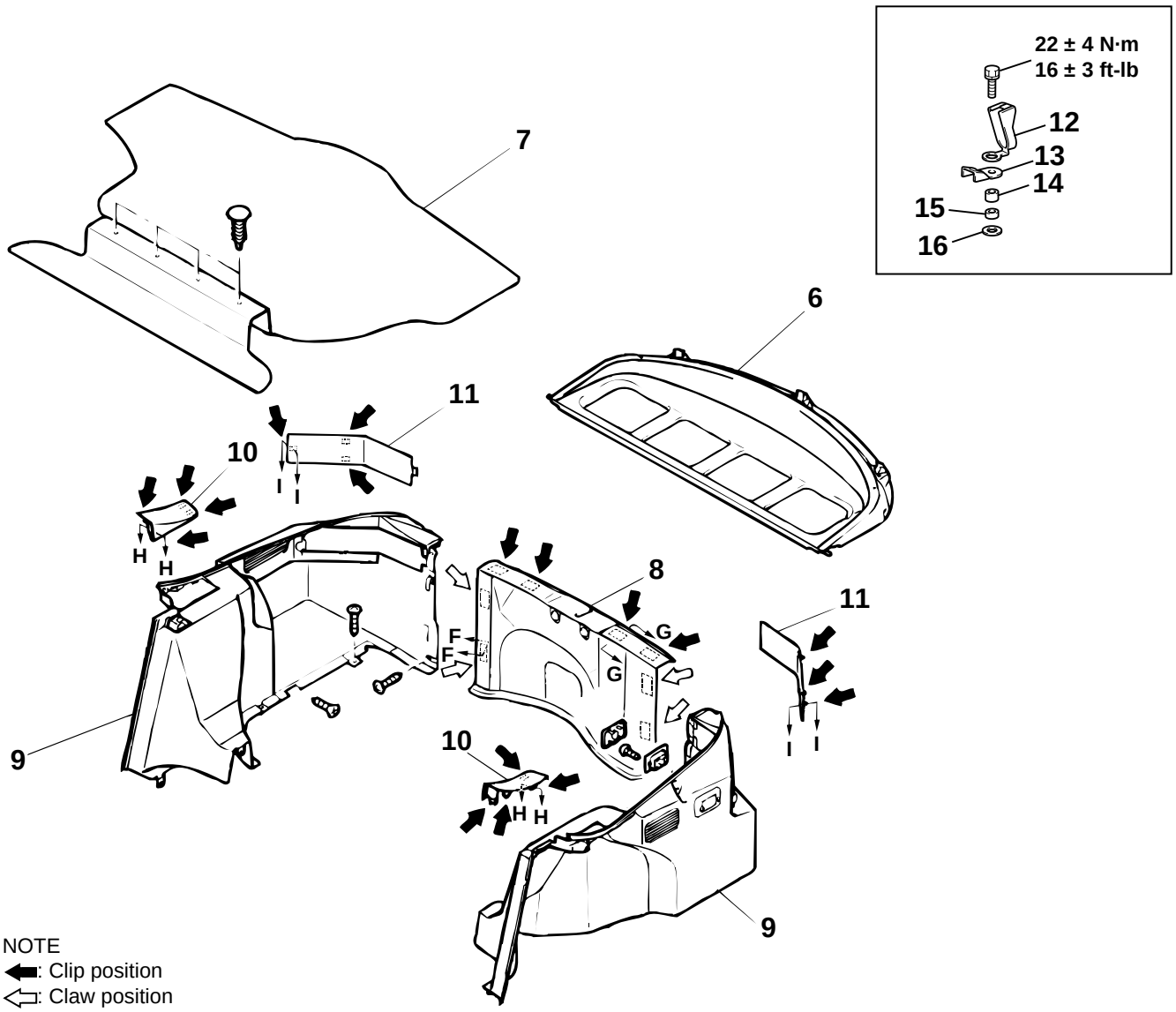

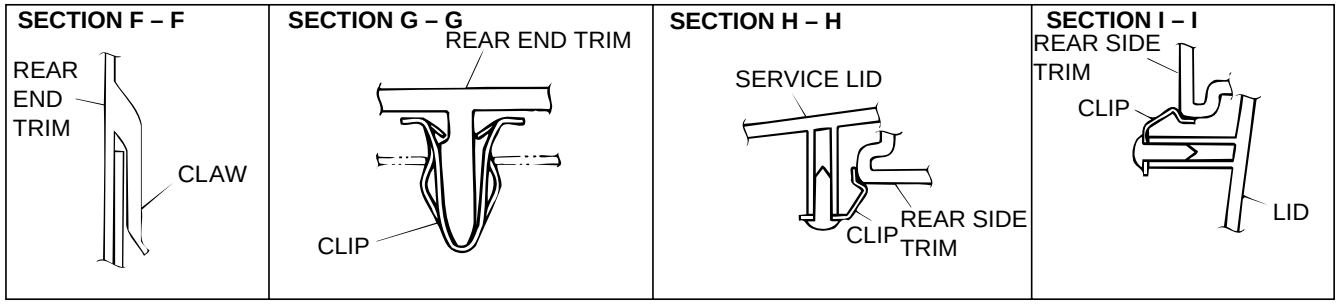

AC003035AB

TRIMS REMOVAL STEPS

6. SHELF TRIM
7. LUGGAGE COMPARTMENT FLOOR CARPET ASSEMBLY
8. REAR END TRIM
9. REAR SIDE TRIM
10. SERVICE LID
11. LID

TETHER ANCHOR REMOVAL STEPS

12. COVER
13. TETHER ANCHOR BRACKET
14. SPACER 10mm (0.4 inch)
15. SPACER 7mm (0.3 inch)
16. FIBER WASHER

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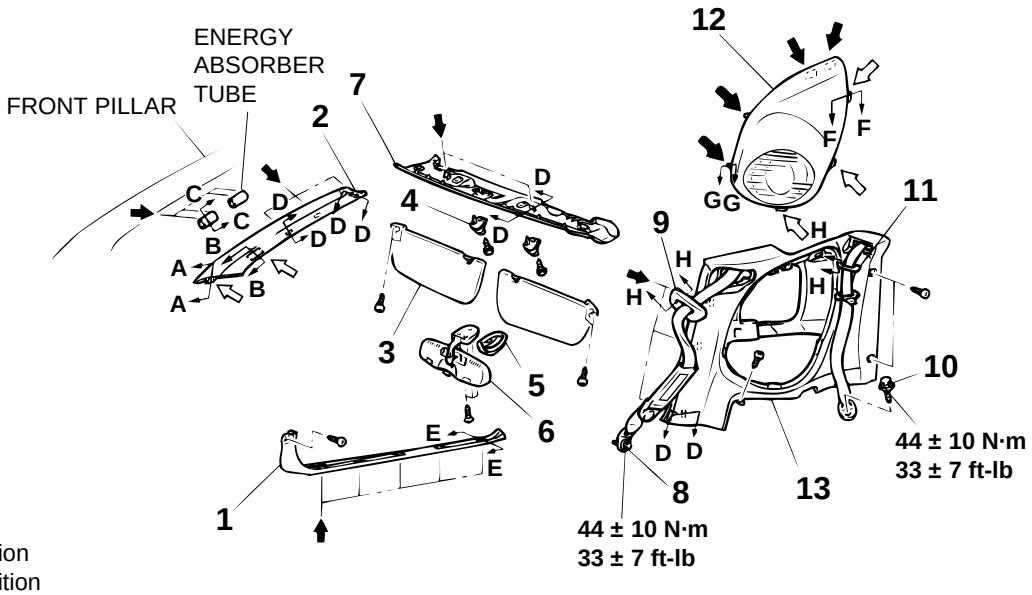
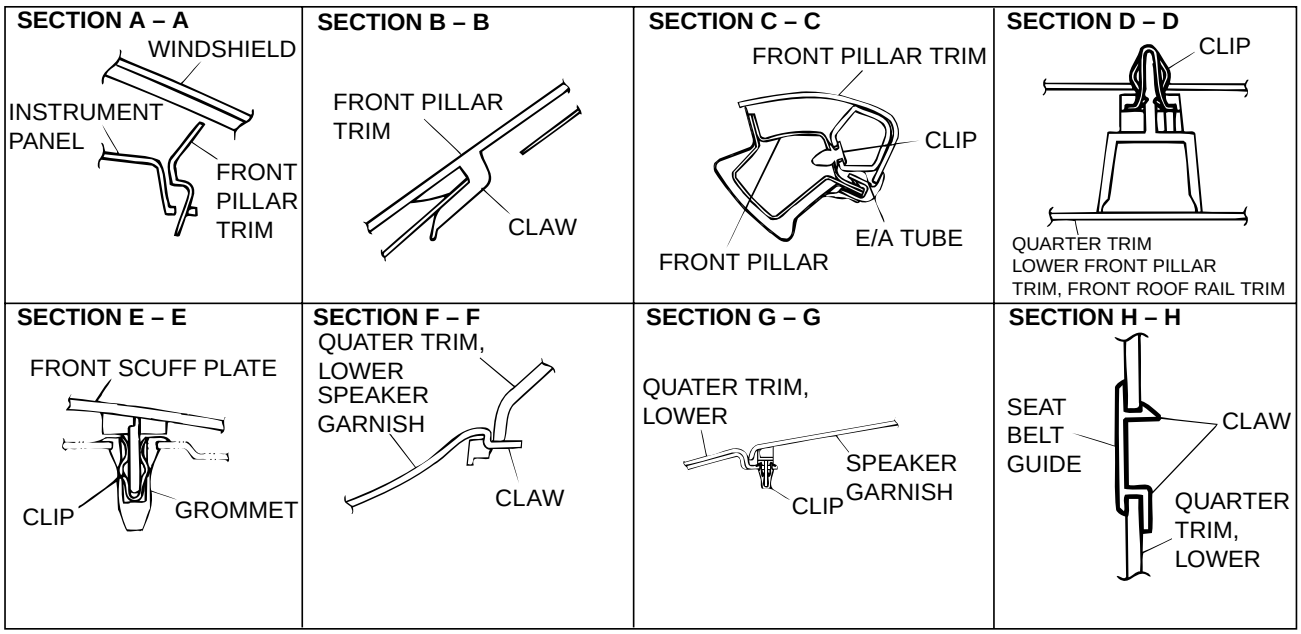
<ECLIPSE SPYDER>

Pre-removal and Post-installation Operation
- Rear Seat Cushion and Installation (Refer to P.52A-20.)



NOTE
◀: Clip position
⇦: Claw position



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FRONT PILLAR TRIM AND FRONT ROOF RAIL TRIM REMOVAL STEPS
1. FRONT SCUFF PLATE
2. FRONT PILLAR TRIM
3. SUN VISOR
4. SUN VISOR HOLDER
5. INSIDE REAR VIEW MIRROR STAY COVER
6. INSIDE REAR VIEW MIRROR
7. FRONT ROOF RAIL TRIM

QUARTER TRIM REMOVAL STEPS
- DOOR INNER REAR OPENING WEATHERSTRIP (REFER TO GROUP 42 – DOOR INNER OPENING WEATHERSTRIP P.42-65.)
- REAR SEAT (REFER TO P.52A-20.)

8. FRONT OUTER SEAT BELT ANCHOR PLATE
9. SEAT BELT GUIDE <FRONT>
10. REAR OUTER SEAT BELT ANCHOR PLATE

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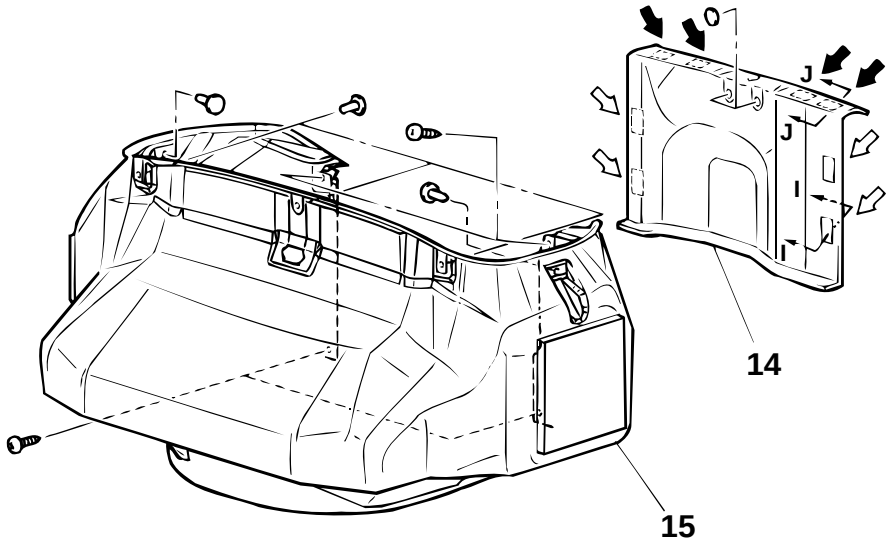
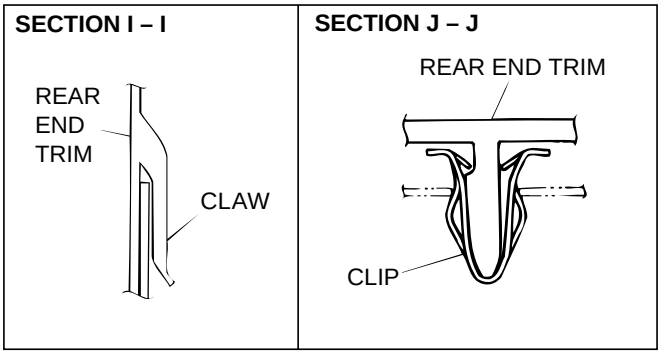
QUARTER TRIM REMOVAL STEPS (Continued)

11. SEAT BELT GUIDE <REAR>
12. REAR SPEAKER GARNISH
13. QUARTER TRIM, LOWER



NOTE
⬅: Clip position
⇦: Claw position



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14. REAR END TRIM
15. TRUNK COMPARTMENT TRIM

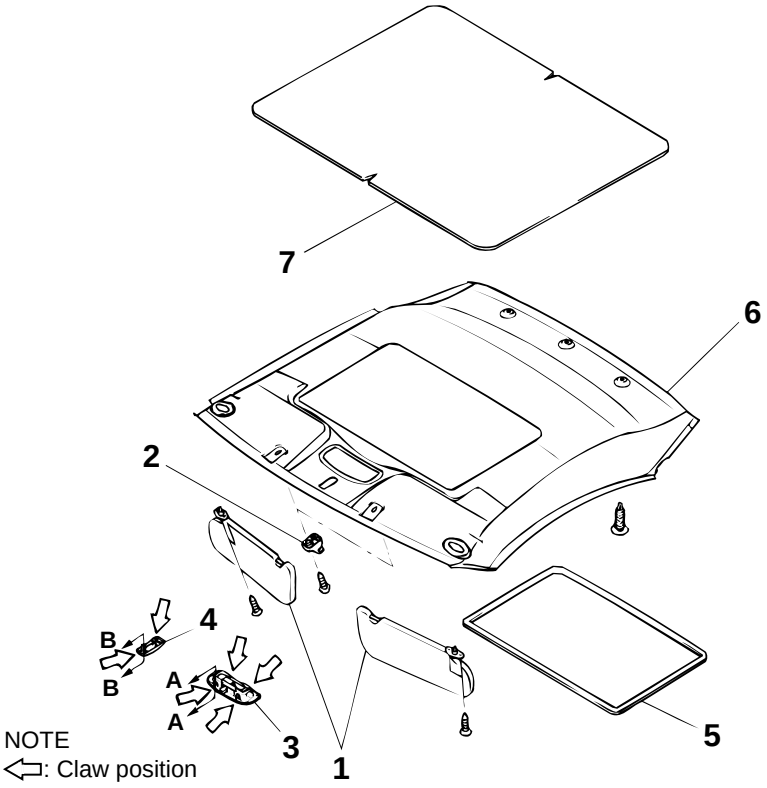
HEADLINING

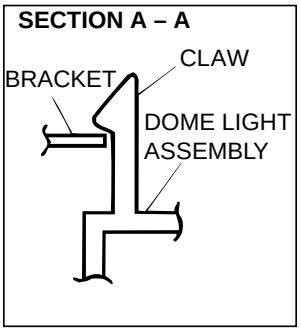
REMOVAL AND INSTALLATION

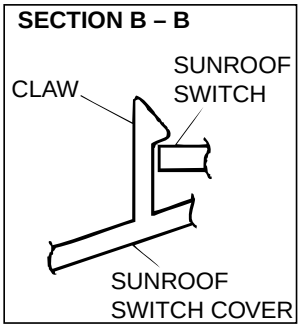
M1521001400069

<ECLIPSE>

Pre-removal and Post-installation Operation
- ² Front Pillar Trim and Quarter Trim, Upper Removal and Installation (Refer to P.52A-9.)







AC003036AB

REMOVAL STEPS
1. SUN VISOR ASSEMBLY
2. SUN VISOR HOLDER
3. DOOM LIGHT ASSEMBLY <VEHICLES WITHOUT SUNROOF>
4. SUNROOF SWITCH COVER <VEHICLES WITH SUNROOF>

REMOVAL STEPS (Continued)
5. HEADLINING TRIM <VEHICLES WITH SUNROOF>
6. HEADLINING
7. ROOF PAD <VEHICLES WITHOUT SUNROOF>

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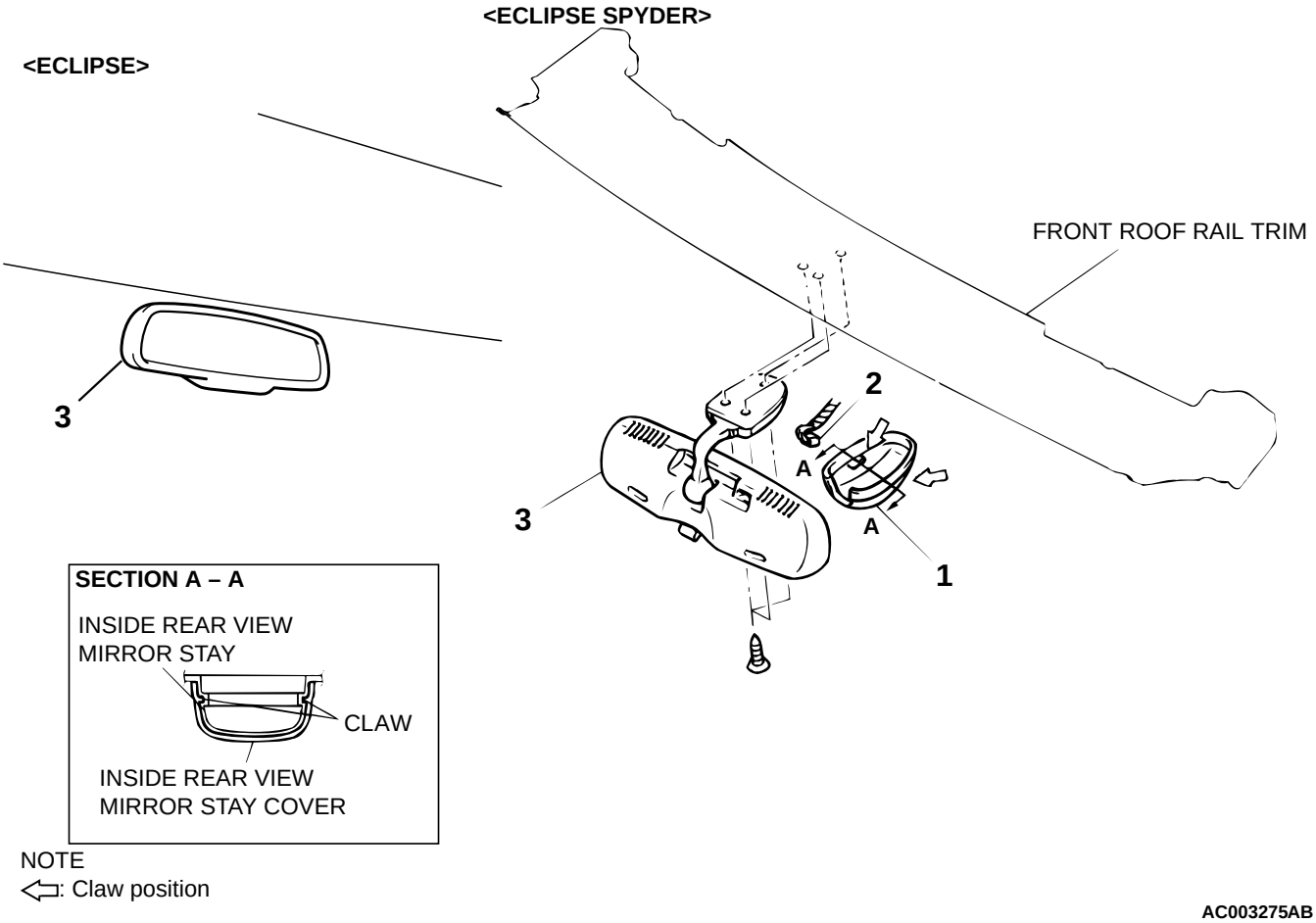
INSIDE REAR VIEW MIRROR

REMOVAL AND INSTALLATION

M1521002700063



NOTE
⇦: Claw position

AC003275AB

REMOVAL STEPS <ECLIPSE>
- COMPASS SENSOR

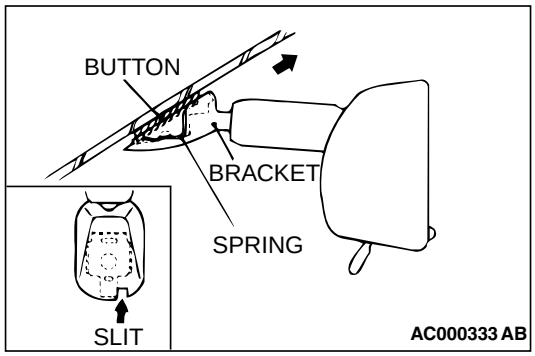
<<A>> 3. INSIDE REAR VIEW MIRROR

REMOVAL STEPS <ECLIPSE SPYDER>
1. INSIDE REAR VIEW MIRROR STAY COVER
2. HARNESS CONNECTOR
3. INSIDE REAR VIEW MIRROR

REMOVAL SERVICE POINT

<<A>> INSIDE REAR VIEW MIRROR REMOVAL
Insert a narrow flat-tip screwdriver into the slit in the inside rear view mirror in the direction of the arrow in the illustration.

NOTE: While the spring is pushed in, connection between the spring and the pawl of the button is released.



TSB Revision

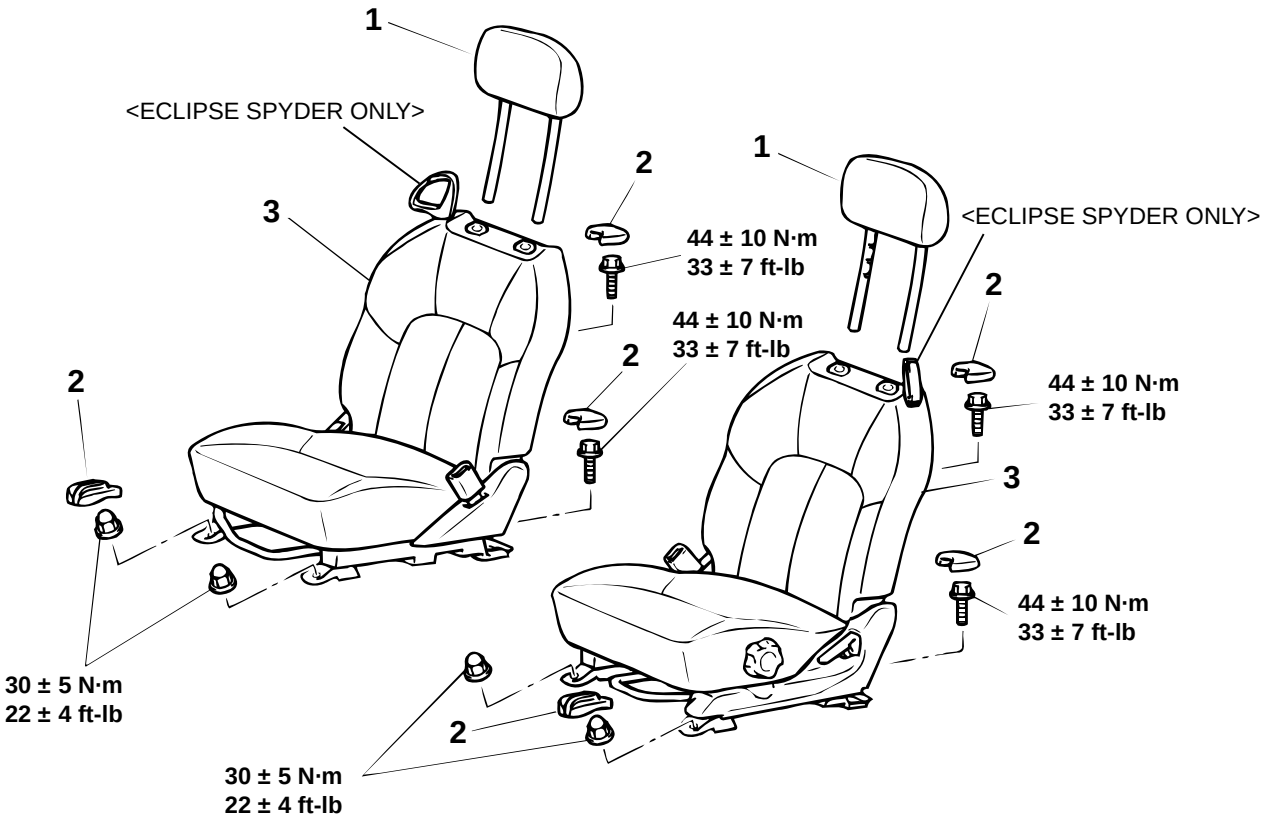
FRONT SEAT ASSEMBLY

REMOVAL AND INSTALLATION

M1522001300065

⚠ WARNING

Before removing a seat equipped with a side air bag module, refer to GROUP 52B, SRS Service Precautions P.52B-17.



AC003047AB

1. HEAD RESTRAINT

FRONT SEAT ASSEMBLY REMOVAL STEPS

- HARNESS CONNECTOR
2. SEAT ANCHOR COVER

>>A<< 3. FRONT SEAT ASSEMBLY

INSTALLATION SERVICE POINT

>>A<< FRONT SEAT ASSEMBLY INSTALLATION

First install all of the front seat assembly mounting nuts and bolts, and then tighten them to the specified torque.

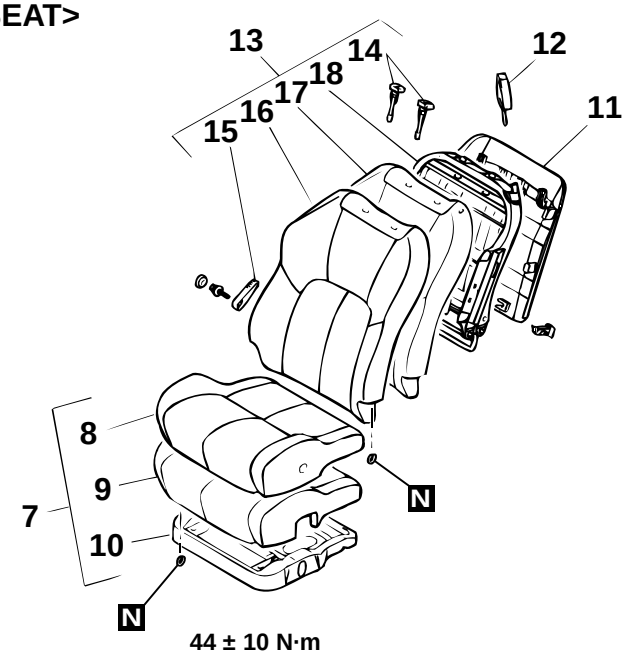
DISASSEMBLY AND ASSEMBLY

M1522001500081

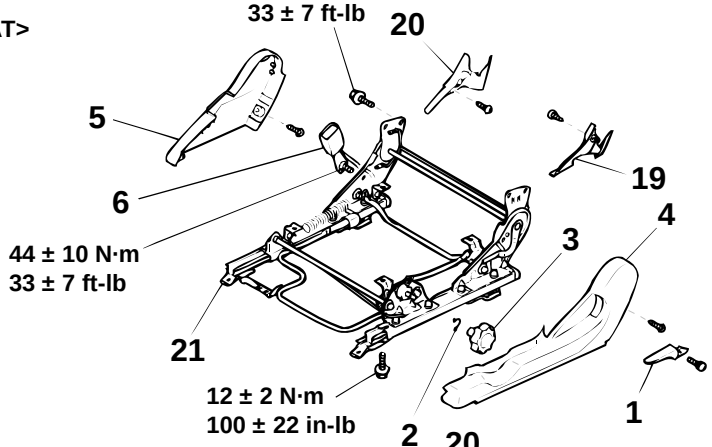
⚠ ***WARNING***

Do not disassemble a front seatback assembly with built-in side air bag module.

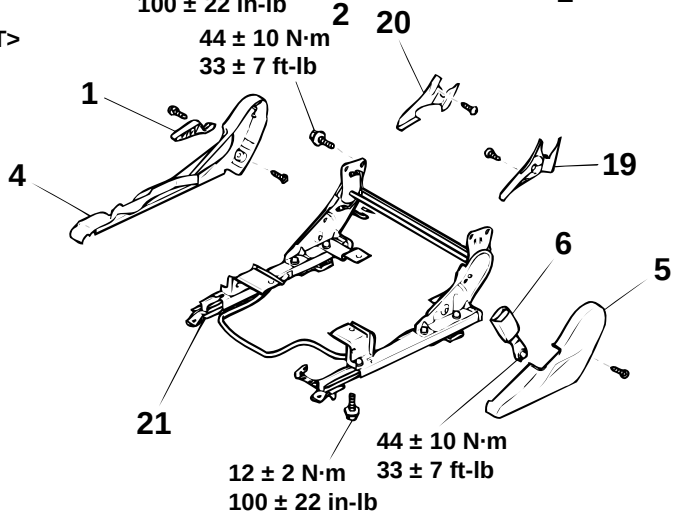
<WITHOUT POWER SEAT>



<DRIVER'S SEAT>



<PASSENGER'S SEAT>



AC003048AB

DISASSEMBLY STEPS

1. RECLINING ADJUSTER KNOB
2. CLIP <DRIVER'S SEAT>

DISASSEMBLY STEPS (Continued)

3. HEIGHT ADJUSTER KNOB <DRIVER'S SEAT>

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DISASSEMBLY STEPS (Continued)

4. FRONT SEAT SHIELD COVER
5. FRONT SEAT SHIELD COVER
6. INNER SEAT BELT
7. FRONT SEAT CUSHION ASSEMBLY
8. FRONT SEAT CUSHION COVER
9. FRONT SEAT CUSHION PAD
10. FRONT SEAT CUSHION FRAME

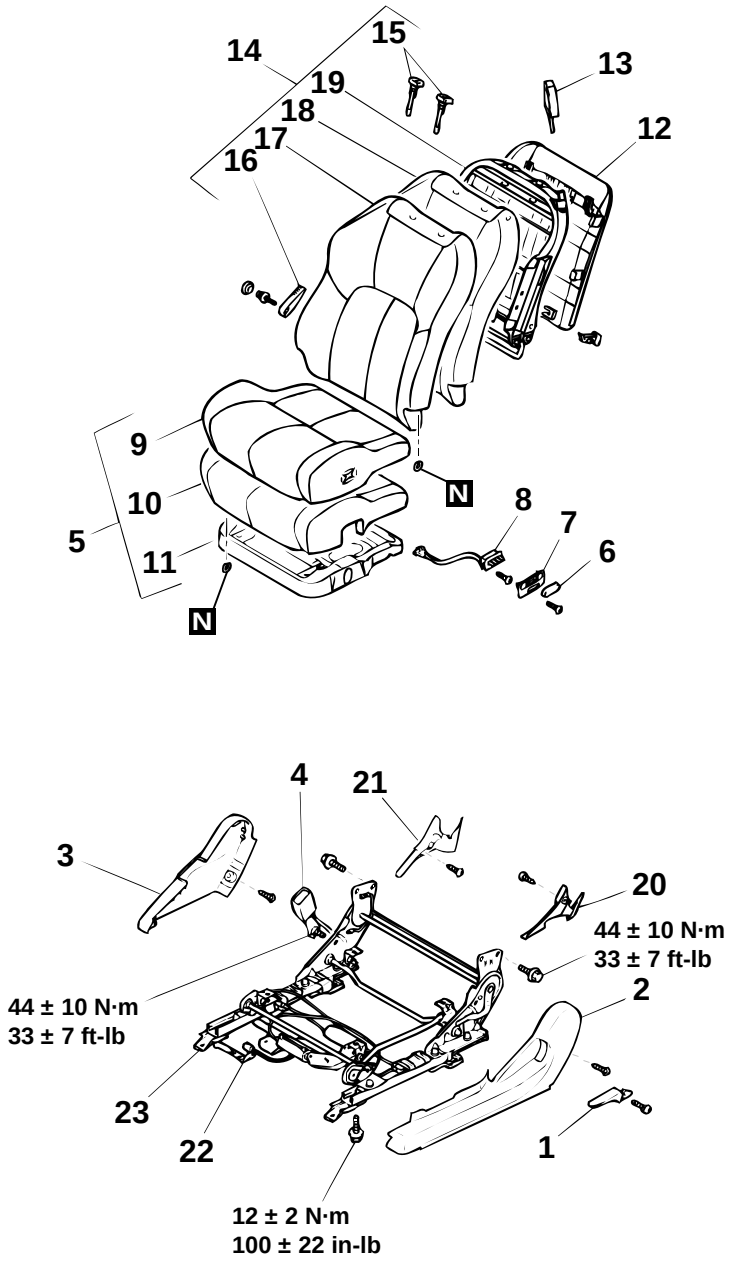
<<A>>

11. FRONT SEATBACK PANEL
12. SEAT BELT GUIDE <ECLIPSE SPYDER ONLY>
13. FRONT SEATBACK ASSEMBLY
14. HEADRESTRAINT GUIDE

DISASSEMBLY STEPS (Continued)

15. LUMBAR SUPPORT KNOB <DRIVER'S SEAT>
16. FRONT SEATBACK COVER
17. FRONT SEATBACK PAD
18. FRONT SEATBACK FRAME <VEHICLES WITHOUT SRS SIDE AIR BAG>
19. FRONT SEAT INNER COVER
20. FRONT SEAT INNER COVER
21. FRONT SEAT ADJUSTER ASSEMBLY

<POWER SEAT>



AC003049AB

DISASSEMBLY STEPS

1. RECLINING ADJUSTER KNOB
2. FRONT SEAT SHIELD COVER
3. FRONT SEAT SHIELD COVER
4. INNER SEAT BELT
5. FRONT SEAT CUSHION ASSEMBLY
6. FRONT SEAT SLIDE ADJUSTER LEVER
7. GARNISH
8. POWER SEAT SWITCH
9. FRONT SEAT CUSHION COVER
10. FRONT SEAT CUSHION PAD
11. FRONT SEAT CUSHION FRAME

<<A>>

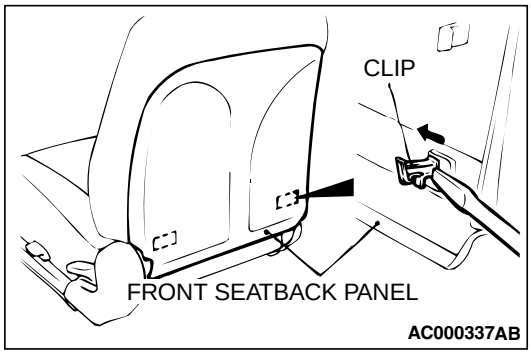
12. FRONT SEATBACK PANEL
13. SEAT BELT GUIDE <ECLIPSE SPYDER ONLY>

DISASSEMBLY STEPS (Continued)

14. FRONT SEATBACK ASSEMBLY
15. HEADRESTRAINT GUIDE
16. LUMBAR SUPPORT KNOB
17. FRONT SEATBACK COVER
18. FRONT SEATBACK PAD
19. FRONT SEATBACK FRAME <VEHICLES WITHOUT SRS SIDE AIR BAG>
20. FRONT SEAT INNER COVER
21. FRONT SEAT INNER COVER
22. POWER SEAT HARNESS
23. POWER SEAT ADJUSTER ASSEMBLY

TSB Revision

DISASSEMBLY SERVICE POINT



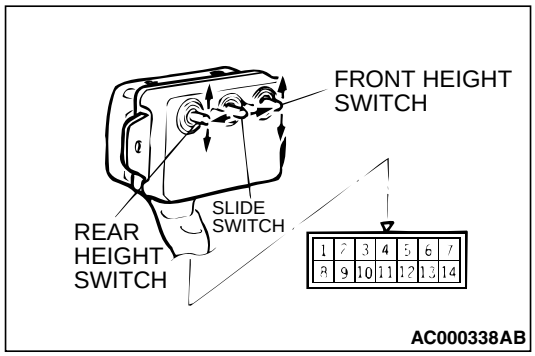
<<A>> FRONT SEATBACK PANEL REMOVAL

1. Using a screwdriver or similar tool, push in the clip of the front seatback panel lower portion to remove it.
2. Pull down the front seatback panel to remove it.

INSPECTION

M1522001600077

POWER SEAT SWITCH CONTINUITY CHECK

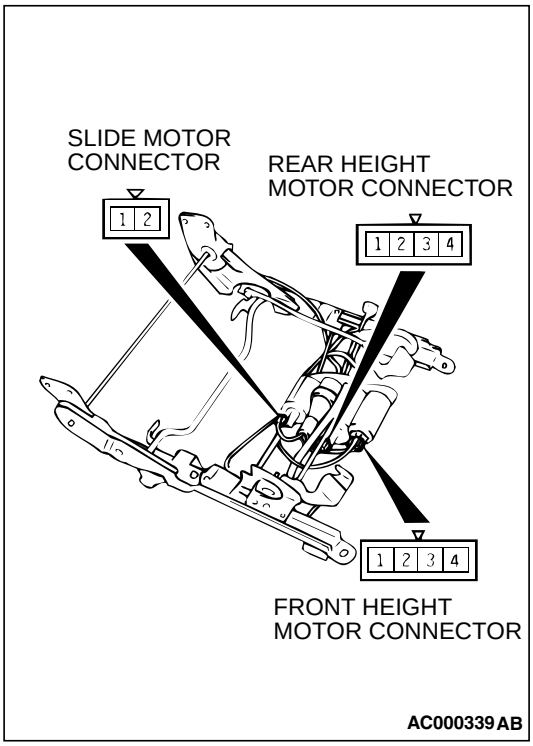


SWITCH POSITION		TESTER CONNECTION	SPECIFIED CONDITION
Slide switch	Forward	2 – 3, 4 – 14	Less than 2 ohm
	Backward	1 – 4, 3 – 14	Less than 2 ohm
Front height switch	Up	9 – 10, 11 – 14	Less than 2 ohm
	Down	8 – 11, 10 – 14	Less than 2 ohm
Rear height switch	Up	6 – 12, 7 – 14	Less than 2 ohm
	Down	5 – 7, 12 – 14	Less than 2 ohm
All switches	OFF	1 – 2 – 3 – 4 – 5 – 6 – 7 – 8 – 9 – 10 – 11 – 12 – 13 – 14	Open circuit

POWER SEAT MOTOR OPERATION CHECK

Inspect the operation of each motor according to the following procedures.

1. Disconnect the connector for each motor.



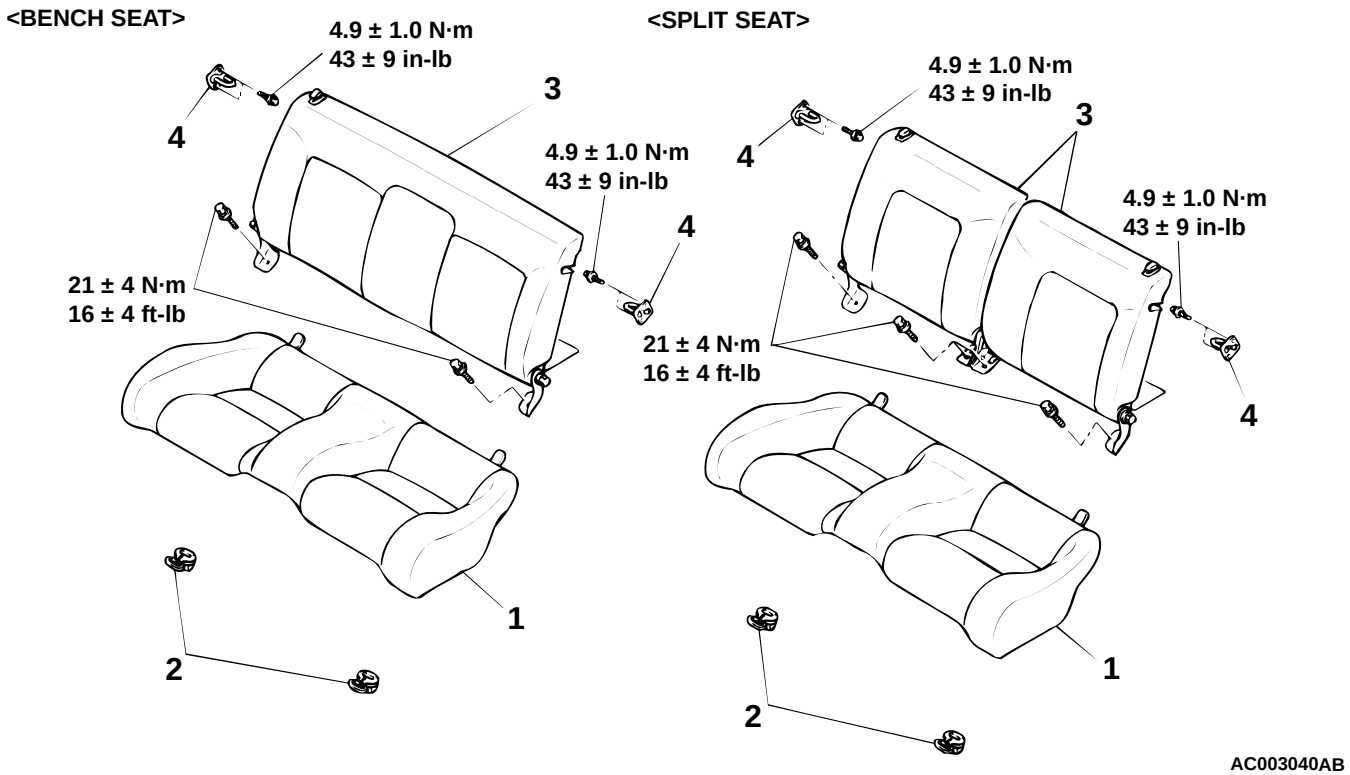
2. When the battery is connected directly to the motor terminals, check if the motors run smoothly, and check if each setting mechanism runs in the direction shown in the table below for each motor.
   (1) Connect the battery power source to the terminal 3 and ground the terminal 4 for the front/rear height down side and connect the battery power source to the terminal 4 and ground the terminal 3 for the front/rear height up side.
   (2) Connect the battery power source to the terminal 1 and ground the terminal 2 for the slide backward side and connect the battery power source to the terminal 2 and ground the terminal 1 for the slide forward side.
3. If there is an abnormality, replace the power seat adjuster assembly.

REAR SEAT ASSEMBLY

REMOVAL AND INSTALLATION

M1522001800060

<ECLIPSE>



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REMOVAL STEPS

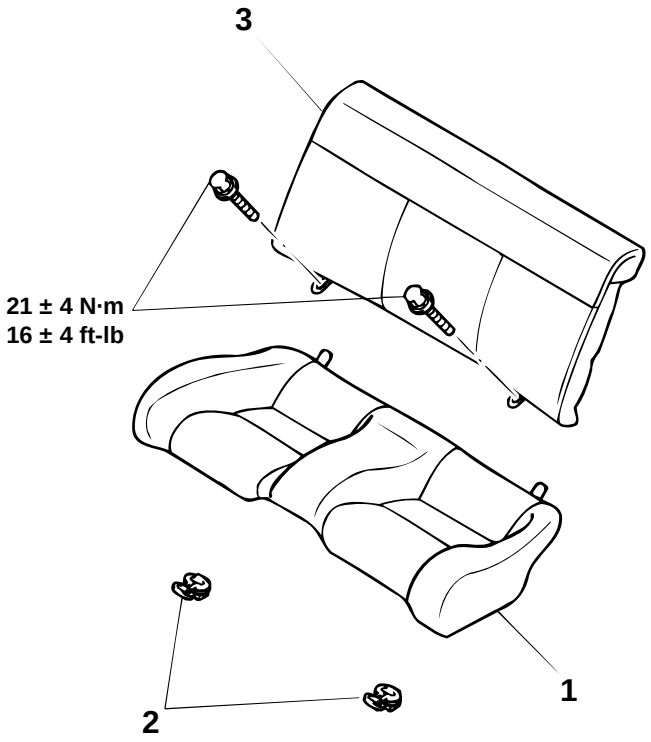
<<A>> 1. REAR SEAT CUSHION
2. REAR SEAT STOPPER
3. REAR SEATBACK

STRIKER REMOVAL STEPS

- QUARTER TRIM, LOWER (REFER TO P.52A-9.)

4. STRIKER

<ECLIPSE SPYDER>



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REMOVAL STEPS

<<A>> 1. REAR SEAT CUSHION

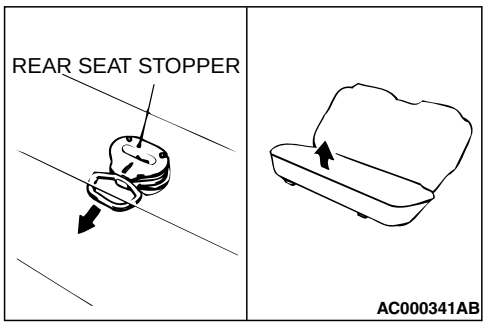
REMOVAL STEPS (Continued)

2. REAR SEAT STOPPER
>>A<< 3. REAR SEATBACK

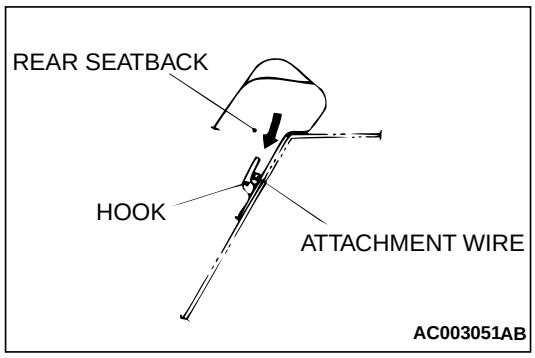
REMOVAL SERVICE POINT

<<A>> REAR SEAT CUSHION REMOVAL

While pulling the rear seat stopper pulled, lift up the seat cushion to remove it.



INSTALLATION SERVICE POINT



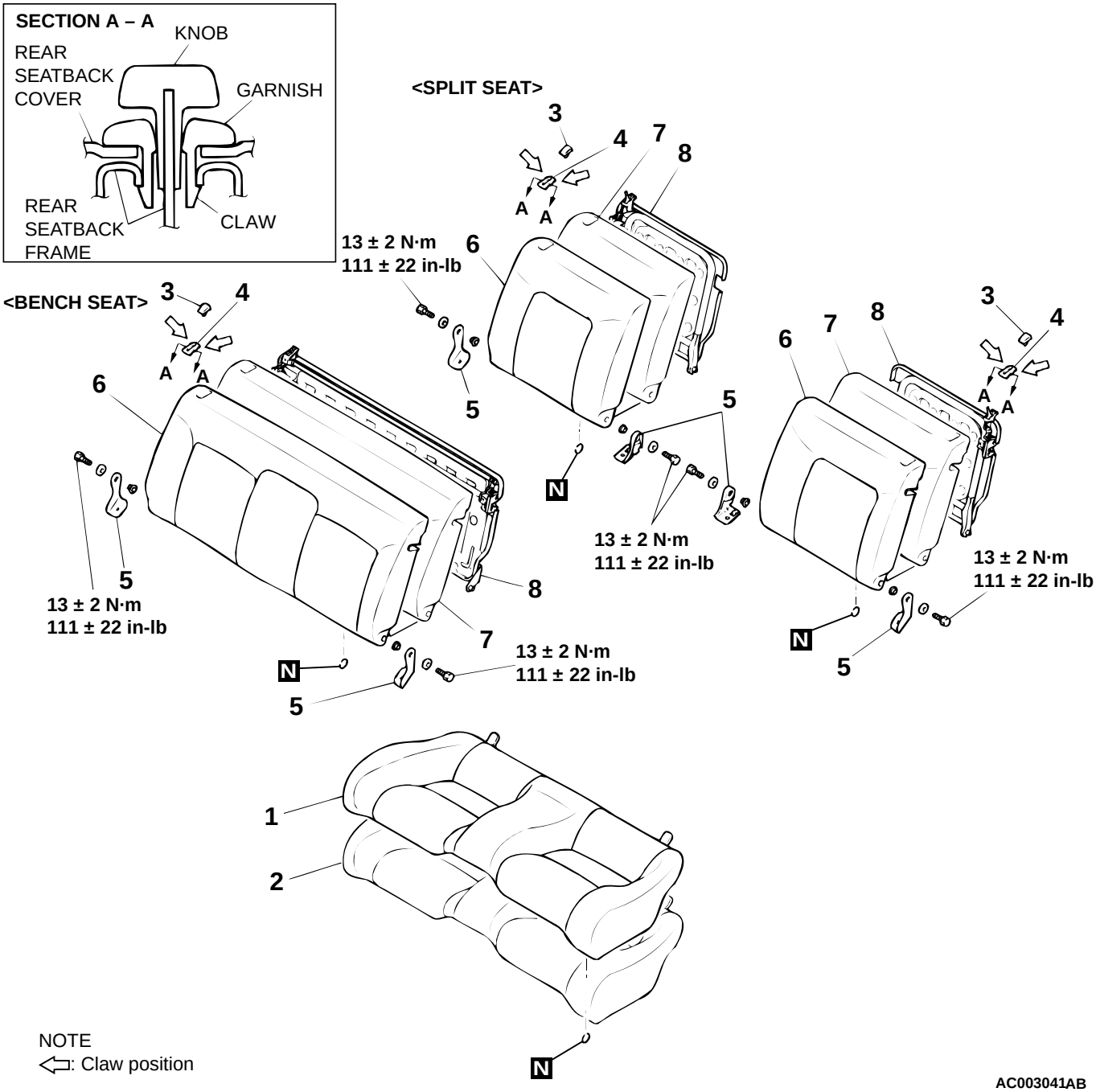
>>A<< REAR SEATBACK INSTALLATION

Push the rear seatback in the direction indicated in the illustration; then securely attach the attachment wire to the body side hook and install the rear seatback.

DISASSEMBLY AND ASSEMBLY

M1522002000090

<ECLIPSE>



DISASSEMBLY STEPS

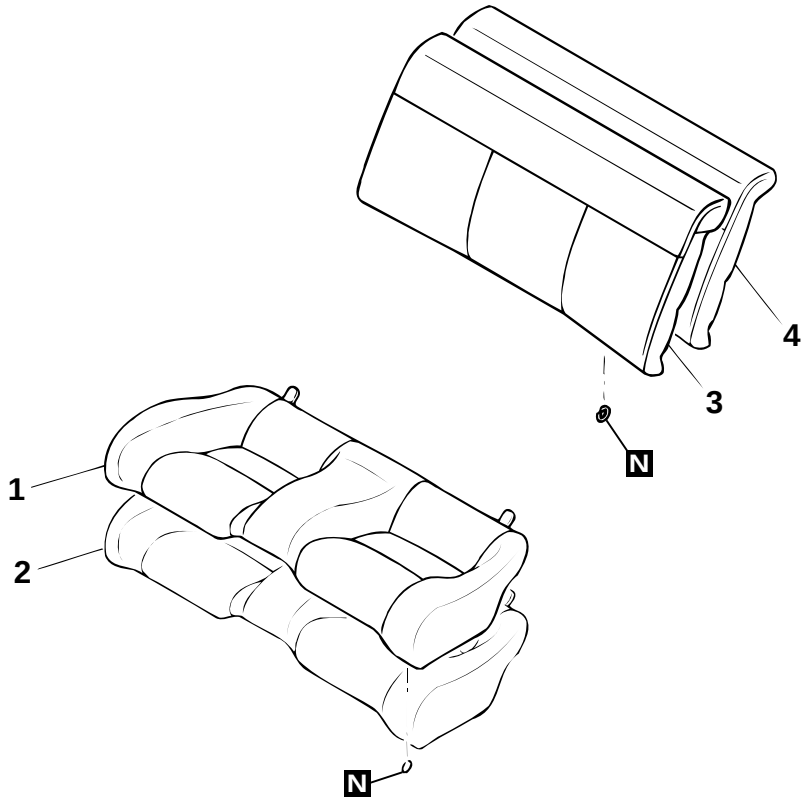
1. REAR SEAT CUSHION COVER
2. REAR SEAT CUSHION PAD
3. KNOB
4. GARNISH

DISASSEMBLY STEPS

5. REAR SEATBACK HINGE
6. REAR SEATBACK COVER
7. REAR SEATBACK PAD
8. REAR SEATBACK FRAME

TSB Revision

<ECLIPSE SPYDER>



AC003052AB

DISASSEMBLY STEPS

1. REAR SEAT CUSHION COVER
2. REAR SEAT CUSHION PAD

DISASSEMBLY STEPS

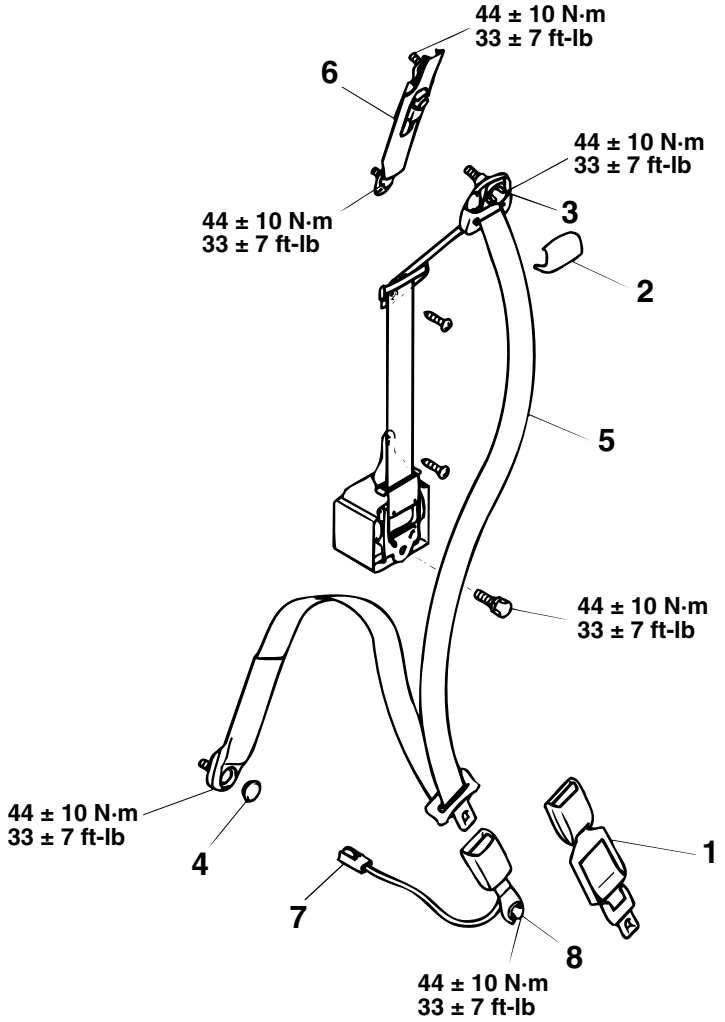
3. REAR SEATBACK COVER
4. REAR SEATBACK PAD

FRONT SEAT BELT

REMOVAL AND INSTALLATION

M1523001300068

<ECLIPSE>



AC000343AB

1. EXTENDER SEAT BELT ASSEMBLY*

OUTER SEAT BELT REMOVAL STEPS

2. SEAT BELT SASH GUIDE COVER
3. SEAT BELT ANCHOR PLATE
4. ANCHOR PLATE COVER CAP
- QUARTER TRIM, LOWER (REFER TO P.52A-9.)
5. OUTER SEAT BELT
- QUARTER TRIM, UPPER (REFER TO P.52A-9.)

>>A<< 6. ADJUSTABLE SEAT BELT ANCHOR

INNER SEAT BELT REMOVAL STEPS

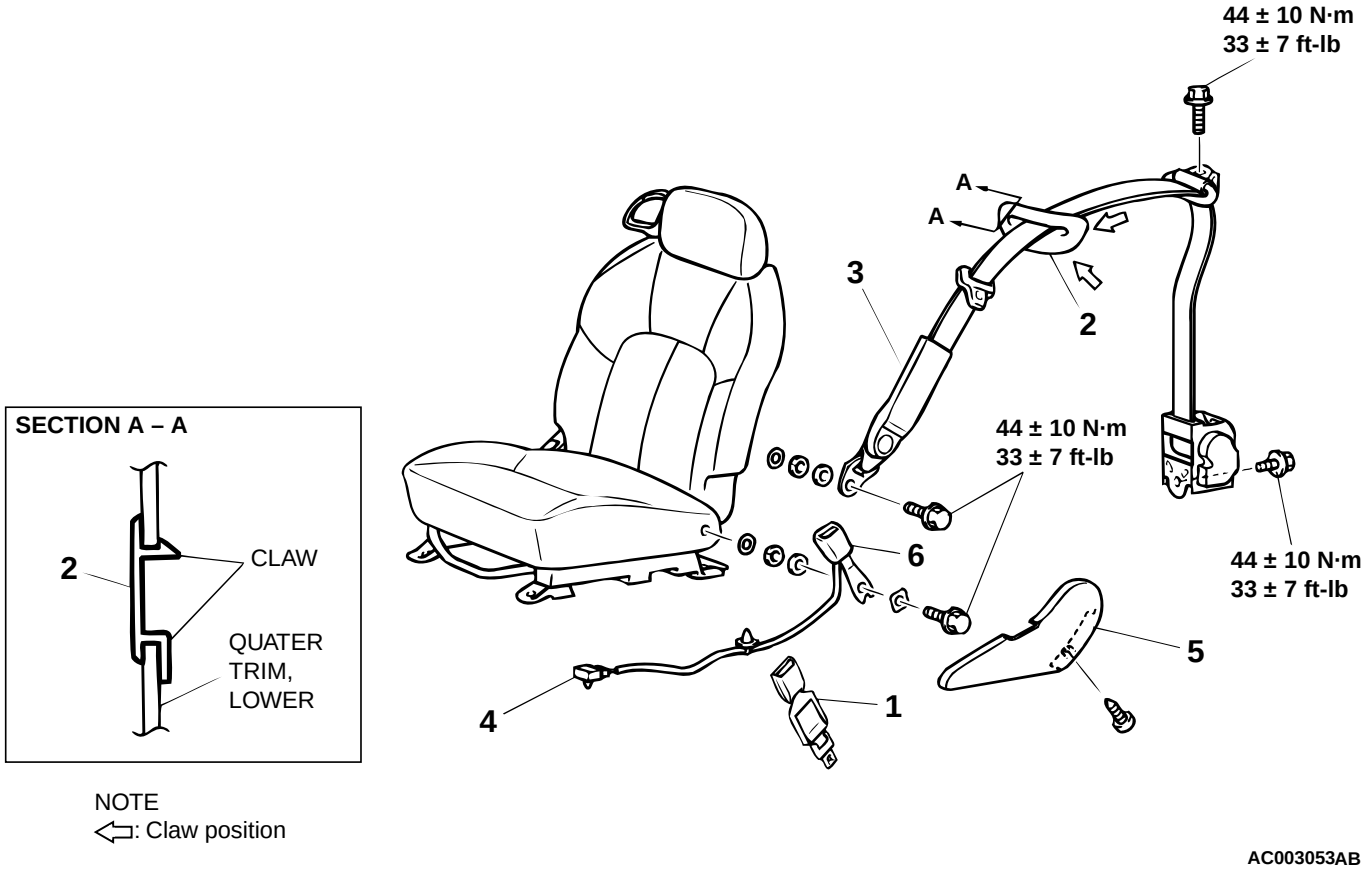
- FRONT SEAT ASSEMBLY (REFER TO P.52A-15.)

7. HARNESS CONNECTOR (DRIVER'S SIDE)
- FRONT SEAT SHIELD COVER (REFER TO P.52A-16.)

8. INNER SEAT BELT

*NOTE: *Equipped if necessary (for particular vehicle usage)*

<ECLIPSE SPYDER>



NOTE
⇦: Claw position

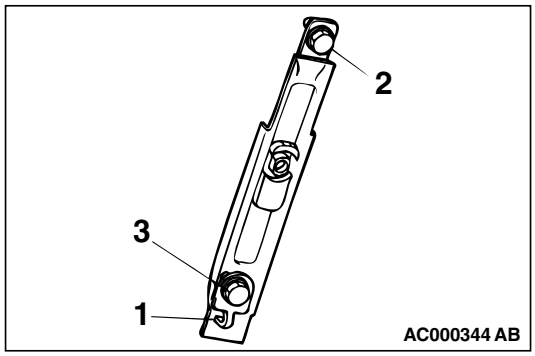
AC003053AB

1. EXTENDER SEAT BELT ASSEMBLY*
   OUTER SEAT BELT REMOVAL STEPS
2. SEAT BELT GUIDE
   - QUARTER TRIM, LOWER (REFER TO P.52A-9.)
3. OUTER SEAT BELT
   INNER SEAT BELT REMOVAL STEPS
   - FRONT SEAT ASSEMBLY (REFER TO P.52A-15.)
4. HARNESS CONNECTOR (DRIVER'S SIDE)
5. FRONT SEAT SHIELD COVER (REFER TO P.52A-16.)
6. INNER SEAT BELT

*NOTE: *Equipped if necessary (for particular vehicle usage)*

INSTALLATION SERVICE POINT

>>A< ADJUSTABLE SEAT BELT ANCHOR INSTALLATION
Observe the order shown.



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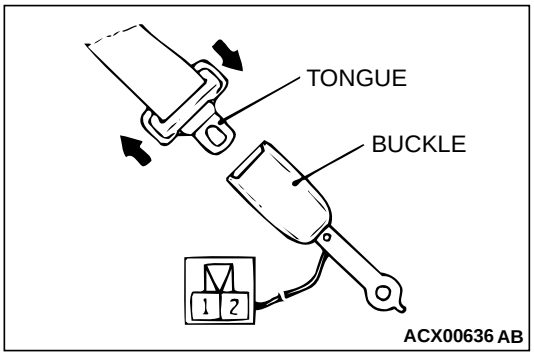
INSPECTION

M1523001400173

SEAT BELT BUCKLE SWITCH CONTINUITY CHECK



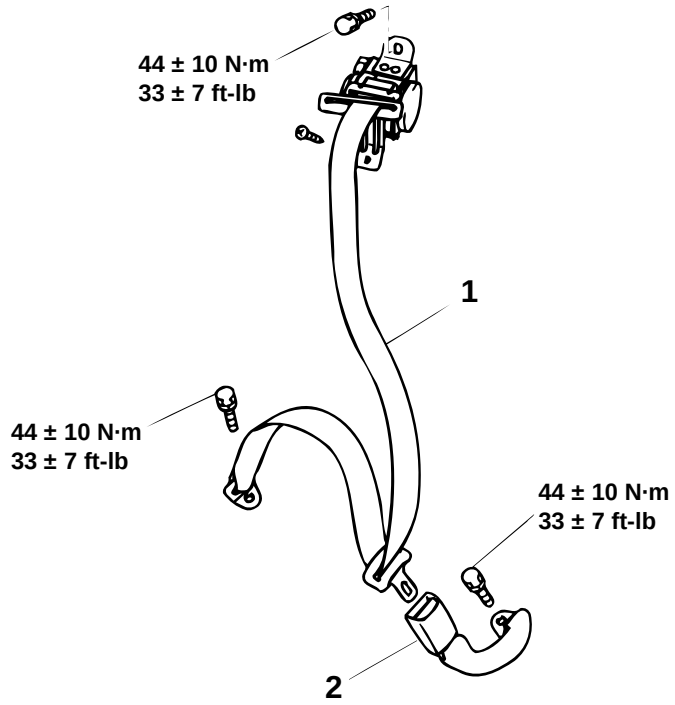
ITEMS	TESTER CONNECTION	SPECIFIED CONDITION
Fastened seat belt	1 – 2	Open circuit
Unfastened seat belt	1 – 2	Less than 2 ohm

REAR SEAT BELT

REMOVAL AND INSTALLATION

M1523001600069

<ECLIPSE>



OUTER SEAT BELT REMOVAL STEPS

- REAR SEAT CUSHION (REFER TO P.52A-20.)
- REAR SEATBACK (REFER TO P.52A-20.)
- QUARTER TRIM, LOWER (REFER TO P.52A-9.)

1. OUTER SEAT BELT

INNER SEAT BELT REMOVAL STEPS

- REAR SEAT CUSHION (REFER TO P.52A-20.)

2. INNER SEAT BELT

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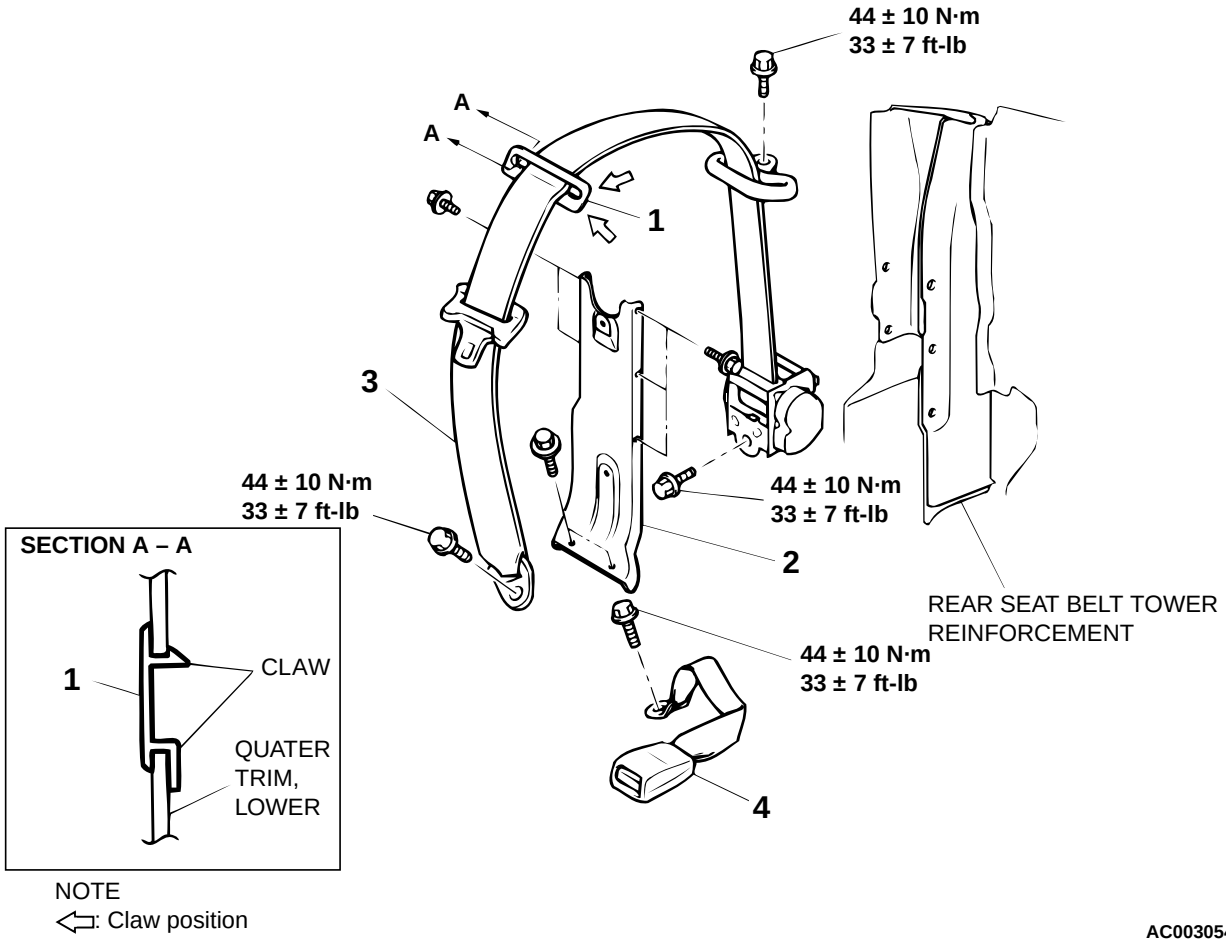
<ECLIPSE SPYDER>



OUTER SEAT BELT REMOVAL STEPS

- REAR SEAT CUSHION (REFER TO P.52A-20.)
- REAR SEATBACK (REFER TO P.52A-20.)

1. SEAT BELT GUIDE
   - QUARTER TRIM, LOWER (REFER TO P.52A-9.)

OUTER SEAT BELT REMOVAL STEPS (Continued)

2. OUTER SEAT BELT
3. REAR SEAT BELT TOWER, FRONT

INNER SEAT BELT REMOVAL STEPS

- REAR SEAT CUSHION (REFER TO P.52A-20.)

4. INNER SEAT BELT

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1521004100067

ITEM	SPECIFICATION
Adjustable seat belt anchor bolt	44 ± 10 N·m (33 ± 7 ft-lb)
Catch bolt	12 ± 2 N·m (100 ± 22 in-lb)
Front inner seat belt bolt	44 ± 10 N·m (33 ± 7 ft-lb)
Front outer seat belt anchor plate bolt	44 ± 10 N·m (33 ± 7 ft-lb)
Front outer seat belt bolt	44 ± 10 N·m (33 ± 7 ft-lb)

TSB Revision

ITEM	SPECIFICATION
Front seat bolt	44 ± 10 N·m (33 ± 7 ft-lb)
Front seat nut	30 ± 5 N·m (22 ± 4 ft-lb)
Front seat reclining adjuster bolt	44 ± 10 N·m (33 ± 7 ft-lb)
Rear inner seat belt bolt	44 ± 10 N·m (33 ± 7 ft-lb)
Rear outer seat belt anchor plate bolt	44 ± 10 N·m (33 ± 7 ft-lb)
Rear outer seat belt bolt	44 ± 10 N·m (33 ± 7 ft-lb)
Rear seatback bolt	21 ± 4 N·m (16 ± 4 ft-lb)
Rear seatback hinge bolt	13 ± 2 N·m (111 ± 22 in-lb)
Striker bolt	4.9 ± 1.0 N·m (44 ± 8 in-lb)
Tether anchor bolt	22 ± 4 N·m (16 ± 3 ft-lb)

NOTES

GROUP 52B

SUPPLEMENTAL RESTRAINT SYSTEM (SRS)

CONTENTS

GENERAL DESCRIPTION 52B-3

SERVICE PRECAUTIONS 52B-17

SRS AIR BAG DIAGNOSIS 52B-20
- INTRODUCTION 52B-20
- TROUBLESHOOTING STRATEGY 52B-20
- TROUBLE CODE DIAGNOSIS 52B-20
- DIAGNOSTIC TROUBLE CODE CHART . . 52B-21
- TROUBLE SYMPTOM CHART 52B-23
- DIAGNOSTIC TROUBLE CODE PROCEDURES 52B-23

SPECIAL TOOLS 52B-136

TEST EQUIPMENT 52B-137

SRS MAINTENANCE 52B-137

POST-COLLISION DIAGNOSIS 52B-138

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SRS CONTROL UNIT (SRS-ECU) . . . 52B-142
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- INSPECTION 52B-144

AIR BAG MODULE(S) AND CLOCK SPRING 52B-144
- REMOVAL AND INSTALLATION 52B-144
- INSPECTION 52B-151

Continued on next page

> ⚠ ***WARNING***
> ***Battery posts, terminals and related accessories contain lead and lead compounds. WASH HANDS AFTER HANDLING.***

> ⚠ ***WARNING***
> - ***Carefully read and observe the information in the SRS SERVICE PRECAUTIONS prior to any service.***
> - ***For information concerning diagnosis or maintenance, always observe the procedures in the SRS Diagnosis or the SRS Maintenance sections, respectively.***
> - ***If any SRS components are removed or replaced in connection with any service procedures, be sure to follow the procedures in the INDIVIDUAL COMPONENT SERVICE section for the comportments involved.***
> - ***If you have any questions about the SRS, please contact the MMSA Tech Line.***

SIDE IMPACT SENSOR 52B-153
REMOVAL AND INSTALLATION 52B-153
INSPECTION 52B-156

AIR BAG MODULE AND DISPOSAL PROCEDURES 52B-157

SPECIFICATIONS 52B-168
FASTENER TIGHTENING SPECIFICATIONS. 52B-168
SERVICE SPECIFICATIONS 52B-168

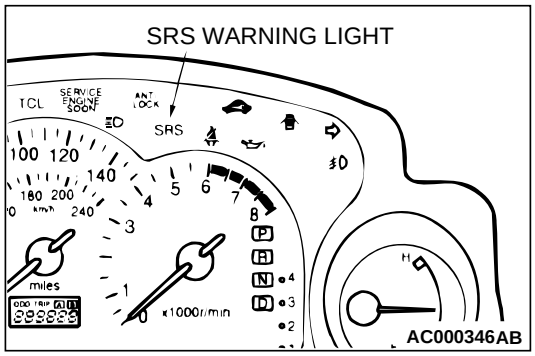
GENERAL DESCRIPTION

M1524000100213

⚠ ***WARNING***

Extreme care must be used when servicing the SRS to avoid injury to the service personnel (by inadvertent deployment of the air bags) or the driver (by rendering the SRS inoperative).

The Supplemental Restraint System (SRS) is designed to supplement the driver's and front passenger's seat belts to help reduce the risk or severity of injury to the driver and front passenger by activating and deploying both front air bags in certain frontal collisions.



The SRS consist of four air bag modules, SRS air bag control unit (SRS-ECU), SRS warning light, and clock spring. Air bags are located in the center of the steering wheel, above the glove box, and in the front seat back assemblies. Each air bag is made up of a folded air bag and an inflator unit. The control unit under the floor console monitors the system and has a safing G-sensor and an analog G-sensor. The warning light on the instrument panel indicates the operational status of the SRS. The clock spring is installed in the steering column. Only authorized service personnel should do work on or around the SRS components. Those service personnel should read this manual carefully before starting any such work.

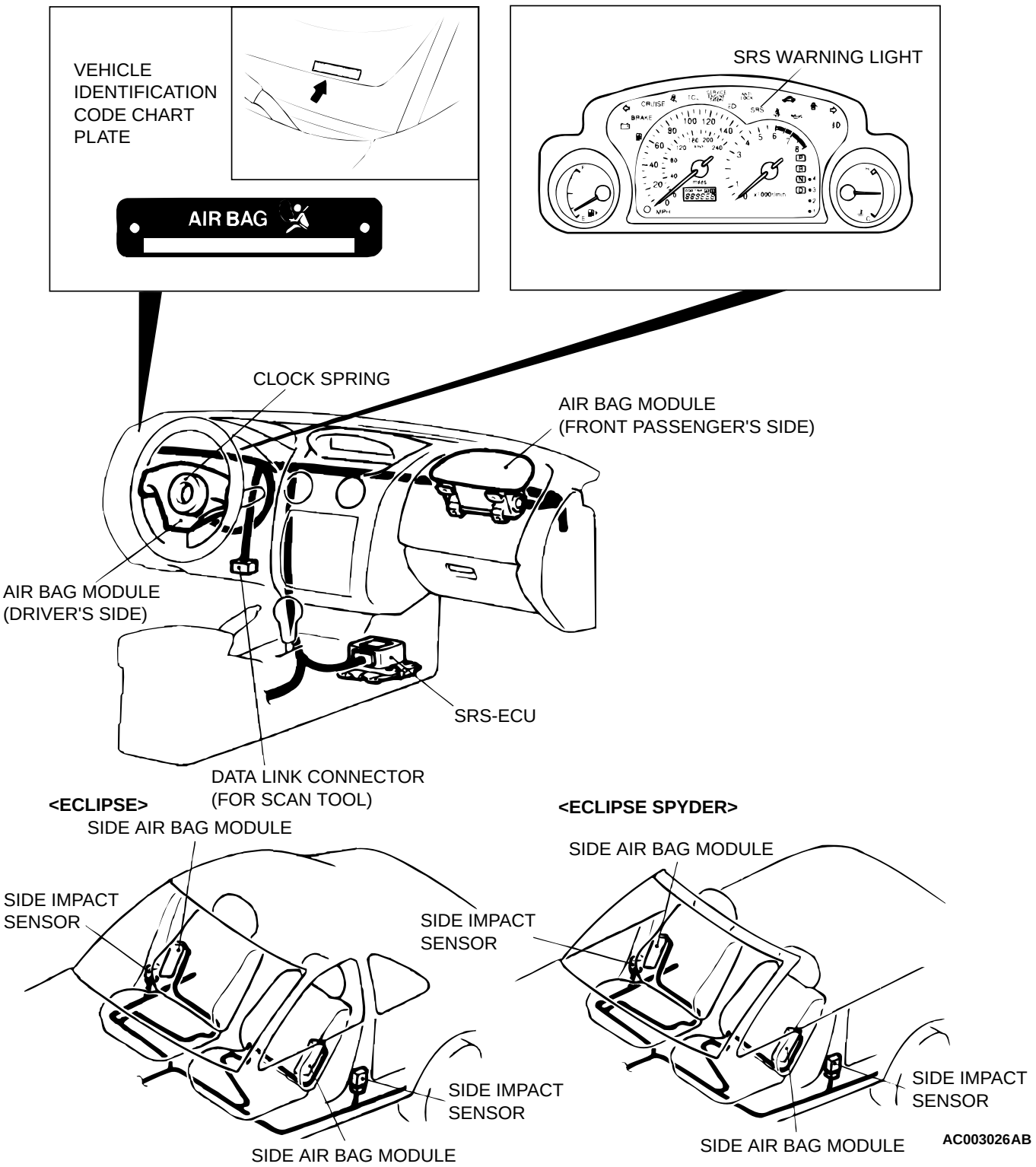
ON-BOARD DIAGNOSTIC/SRS WARNING LIGHT FUNCTION

The SRS-ECU monitors the SRS system and stores data concerning any detected faults in the system. When the ignition switch is in the "ON" or "START" position, the SRS warning light should illuminate for about 7 seconds and then turn "OFF." That indicates that the SRS system is in operational order. If the SRS warning light does any of the following, immediate inspection by an authorized dealer is needed.

1. The SRS warning light does not illuminate as described above.
2. The SRS warning light stays on for more than 7 seconds.
3. The SRS warning light illuminates while driving.

If a vehicle’s SRS warning light is in any of these three conditions when brought in for inspection, the SRS system must be inspected, diagnosed and serviced in accordance with this manual.

CONSTRUCTION DIAGRAM

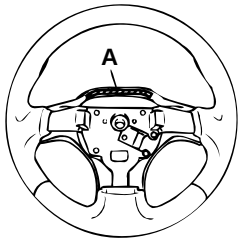


NOTE: This construction diagram shows the general view of the SRS components. For details, refer to "Schematic (P.52B-8)," "Configuration Diagrams (P.52B-12)" and "Circuit Diagram (P.52B-13)."

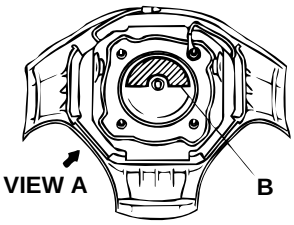
WARNING/CAUTION LABELS

A number of caution labels related to the SRS are found in the vehicle, as shown in the following illustration. Follow label instructions when servicing SRS. If labels are dirty or damaged, replace them.

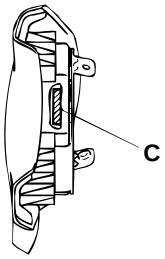
STEERING WHEEL



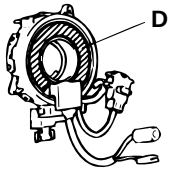
AIR BAG MODULE (DRIVER'S SIDE)



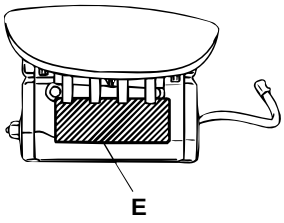
VIEW A



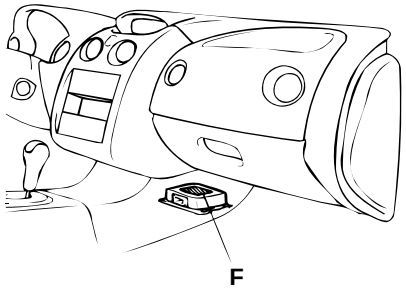
CLOCK SPRING



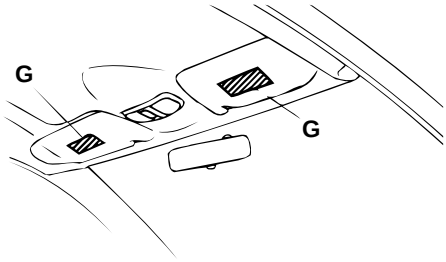
AIR BAG MODULE (FRONT PASSENGER'S SIDE)



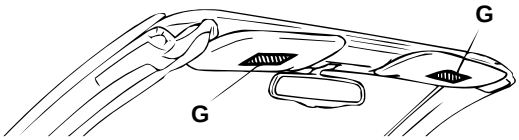
SRS-ECU



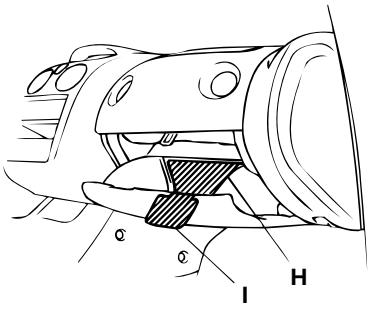
SUN VISOR <ECLIPSE>



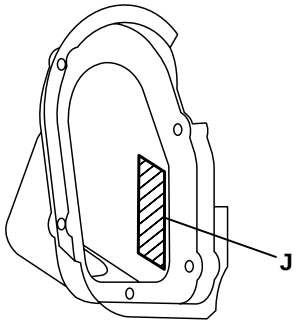
SUN VISOR <ECLIPSE SPYDER>



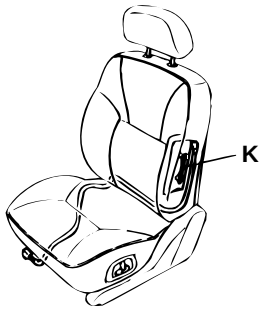
GLOVE BOX



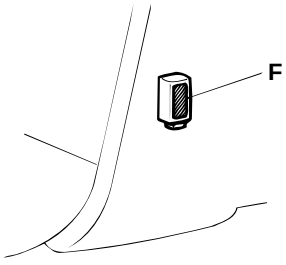
STEERING JOINT COVER



SIDE AIR BAG MODULE (DRIVER'S AND FRONT PASSENGER'S SEAT)



SIDE IMPACT SENSOR



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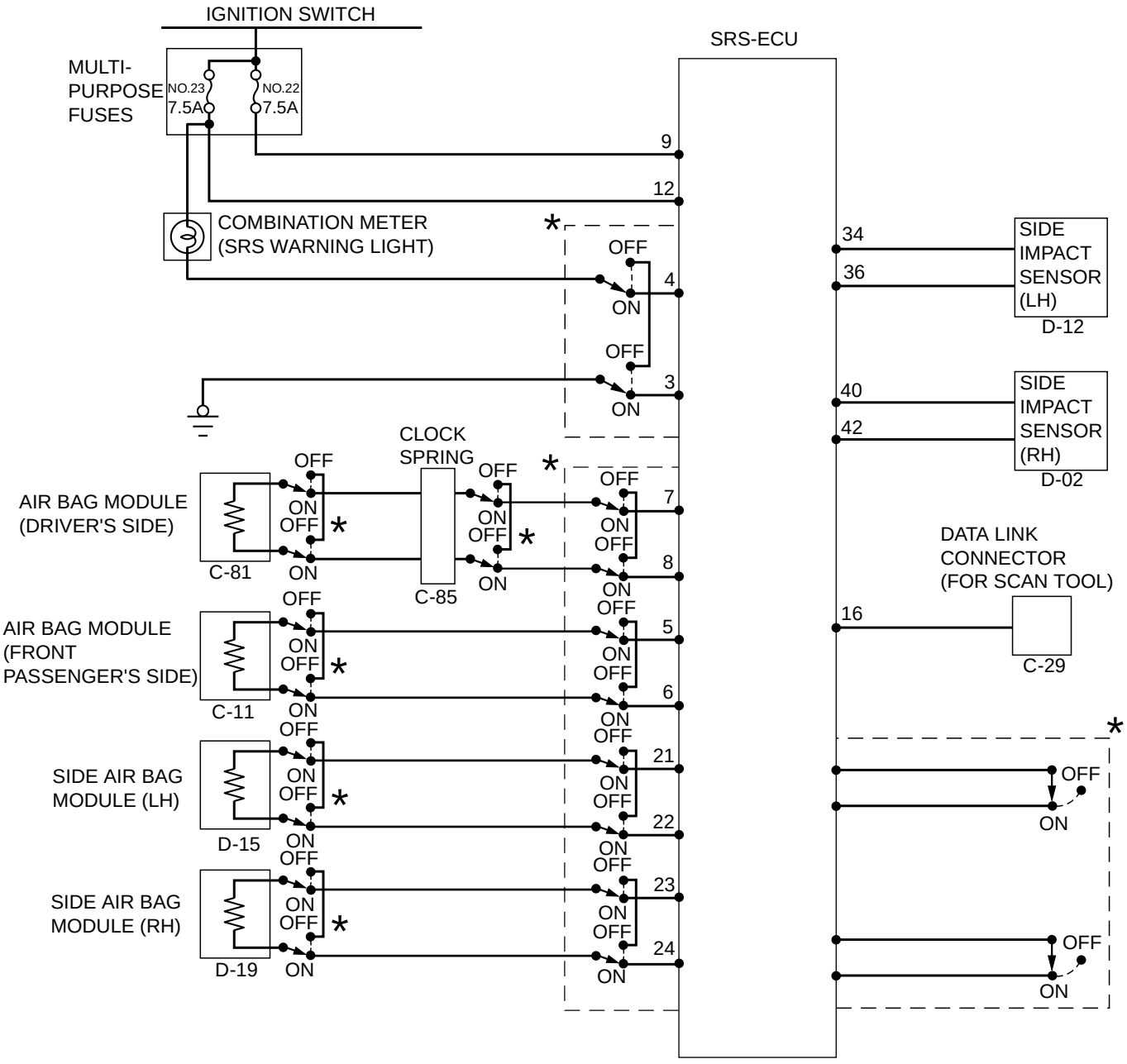
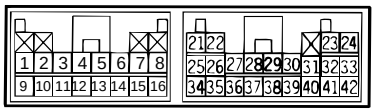
LABEL CONTENTS	
A	CAUTION: SRS BEFORE REPLACING STEERING WHEEL, READ SERVICE MANUAL, CENTER FRONT WHEELS AND ALIGN SRS CLOCK SPRING NEUTRAL MARKS. FAILURE TO DO SO MAY RENDER SRS SYSTEM INOPERATIVE, RISKING SERIOUS DRIVER INJURY.
B	DANGER FLAMMABLE MATERIAL TO PREVENT PERSONAL INJURY, DO NOT DISMANTLE, INCINERATE, OR BRING INTO CONTACT WITH ELECTRICITY STORE BELOW 200 °F (93 °C).
C	WARNING: SRS THIS AIR BAG MODULE CANNOT BE REPAIRED. DO NOT DISASSEMBLE OR TAMPER. DO NOT PERFORM DIAGNOSIS. DO NOT TOUCH WITH ELECTRICAL TEST EQUIPMENT OR PROBES. REFER TO SERVICE MANUAL FOR FURTHER INSTRUCTIONS, AND FOR SPECIAL HANDLING, STORAGE AND DISPOSAL PROCEDURES, TAMPERING OR MISHANDLING CAN RESULT IN INJURY.
D	CAUTION: SRS CLOCK SPRING THIS IS NOT A REPAIRABLE PART. IF DEFECTIVE REPLACE ENTIRE UNIT ACCORDING TO THE SERVICE MANUAL INSTRUCTIONS. TO RE-CENTER: ROTATE CLOCKWISE UNTIL TIGHT. THEN ROTATE IN OPPOSITE DIRECTION ROUGHLY 3 TURNS AND ALIGN ARROWS >><<.
E	WARNING: SRS THIS AIR BAG MODULE CANNOT BE REPAIRED, DO NOT DISASSEMBLE OR TAMPER. DO NOT PERFORM DIAGNOSIS. DO NOT TOUCH WITH ELECTRICAL TEST EQUIPMENT OR PROSES. REFER TO SERVICE MANUAL FOR FURTHER INSTRUCTIONS, AND FOR SPECIAL HANDING, STORAGE AND DISPOSAL PROCEDURES. TAMPERING OR MISHANDLING CAN RESULT IN INJURY. DANGER POISON KEEP OUT OF THE REACH OF CHILDREN. CONTAINS SODIUM AZIDE AND POTASSIUM NITRATE CONTENTS ARE POISONOUS AND EXTREMELY FLAMMABLE. CONTACT WITH ACID, WATER, OR HEAVY METALS MAY PRODUCE HARMFUL AND IRRITATING GASES OR EXPLOSIVE COMPOUNDS. DO NOT DISMANTLE, INCINERATE, BRING INTO CONTACT WITH ELECTRICITY OR STORE AT TEMPERATURES EXCEEDING 200 °F (93°C). FIRST AID: IF CONTENTS ARE SWALLOWED INDUCE VOMITING. FOR EYE CONTACT FLUSH EYE WITH WATER FOR 15 MINUTES. IF GASES FORM ACID OR WATER CONTACT ARE INHALED, FRESH AIR. IN EVERY CASE, GET PROMPT MEDICAL ATTENTION.
F	CAUTION: DO NOT DISASSEMBLE OR DROP. IF DEFECT REFER TO SERVICE MANUAL.
G V0037AA	WARNING DEATH or SERIOUS INJURY can occur • Children 12 and under can be killed by the air bag. • The BACK SEAT is the SAFEST place for children. • NEVER put a rear-facing child seat in the front. • Sit as far back as possible from the air bag. • ALWAYS use SEAT BELTS and CHILD RESTRAINS.

LABEL CONTENTS	
H	AIR BAG SYSTEM INFORMATION THIS VEHICLE HAS AN AIR BAG SYSTEM WHICH WILL SUPPLEMENT THE SEAT BELT IN CERTAIN FRONTAL COLLISIONS. THE AIR BAG IS NOT A SUBSTITUTE FOR THE SEAT BELT IN ANY TYPE OF COLLISION. THE DRIVER AND ALL OTHER OCCUPANTS SHOULD WEAR SEAT BELTS AT ALL TIME. WARNING! IF THE "SRS" WARNING LIGHT DOES NOT ILLUMINATE FOR SEVERAL SECONDS WHEN IGNITION KEY IS TURNED TO "ON" OR THE ENGINE IS STARTED, OR IF THE WARNING LIGHT STAYS ON WHILE DRIVING, TAKE THE VEHICLE TO YOUR NEAREST AUTHORIZED DEALER IMMEDIATELY. ALSO, IF VEHICLE'S FRONT END IS DAMAGED OR IF THE AIR BAG HAS DEPLOYED, TAKE THE VEHICLE FOR SERVICE IMMEDIATELY. THE AIR BAG SYSTEM MUST BE INSPECTED BY AN AUTHORIZED DEALER TEN YEARS AFTER THE VEHICLE MANUFACTURE DATE SHOWN ON THE CERTIFICATION LABEL LOCATED ON THE LEFT FRONT DOOR-LATCH POST OR DOOR FRAME. READ THE "SRS" SECTION OF YOUR OWNER'S MANUAL BEFORE DRIVING FOR IMPORTANT INFORMATION ABOUT OPERATION AND SERVICE OF THE AIR BAG SYSTEM. WHEN YOU ARE GOING TO DISCARD YOUR GAS GENERATOR OR VEHICLE, PLEASE SEE YOUR DEALER.
I	WARNING Children Can Be KILLED or INJURED by Passenger Air Bag. The back seat is the safest place for children 12 and under. Make sure all children use seat belts or child seat. Not to be removed except by owner.
J	CAUTION: SRS BEFORE REMOVAL OF STEERING GEARBOX, READ SERVICE MANUAL, CENTER FRONT WHEELS AND REMOVE IGNITION KEY. FAILURE TO DO SO MAY DAMAGE SRS CLOCK SPRING AND RENDER SRS SYSTEM INOPERATIVE, RISKING SERIOUS DRIVER INJURY.
K	WARNING FLAMMABLE/EXPLOSIVE SRS AIR BAG MODULE TO AVOID SERIOUS INJURY: • DO NOT REPAIR, DISASSEMBLE OR TAMPER WITH. • AVOID CONTACT WITH FLAME OR ELECTRICITY. • DO NOT USE TEST EQPT OR PROBES. • STORE BELOW 200°F (93°C). • BEFORE DOING ANY WORK INVOLVING MODULE, READ SERVICE MANUAL FOR IMPORTANT FURTHER DATA.

SCHEMATIC



NOTE
*: CONNECTOR LOCK SWITCH
CONNECTOR ENGAGED: ON
CONNECTOR DISENGAGED: OFF



SRS-ECU CONNECTOR

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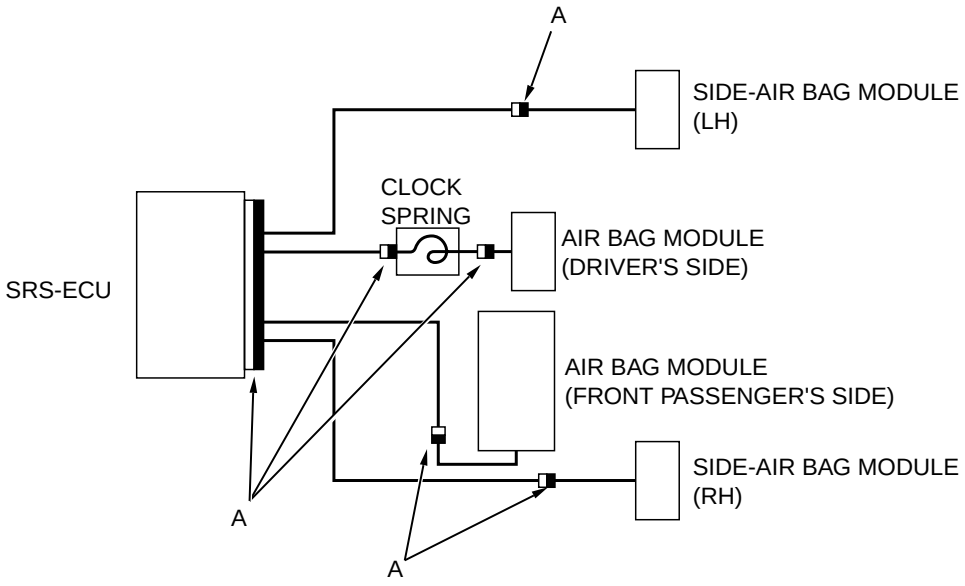
SRS air bag special connector

To enhance the system reliability, a connector lock switch is integrated in the SRS-ECU connector, the air bag module connectors and the clock spring connector (black connector "A" shown in the illustration below).

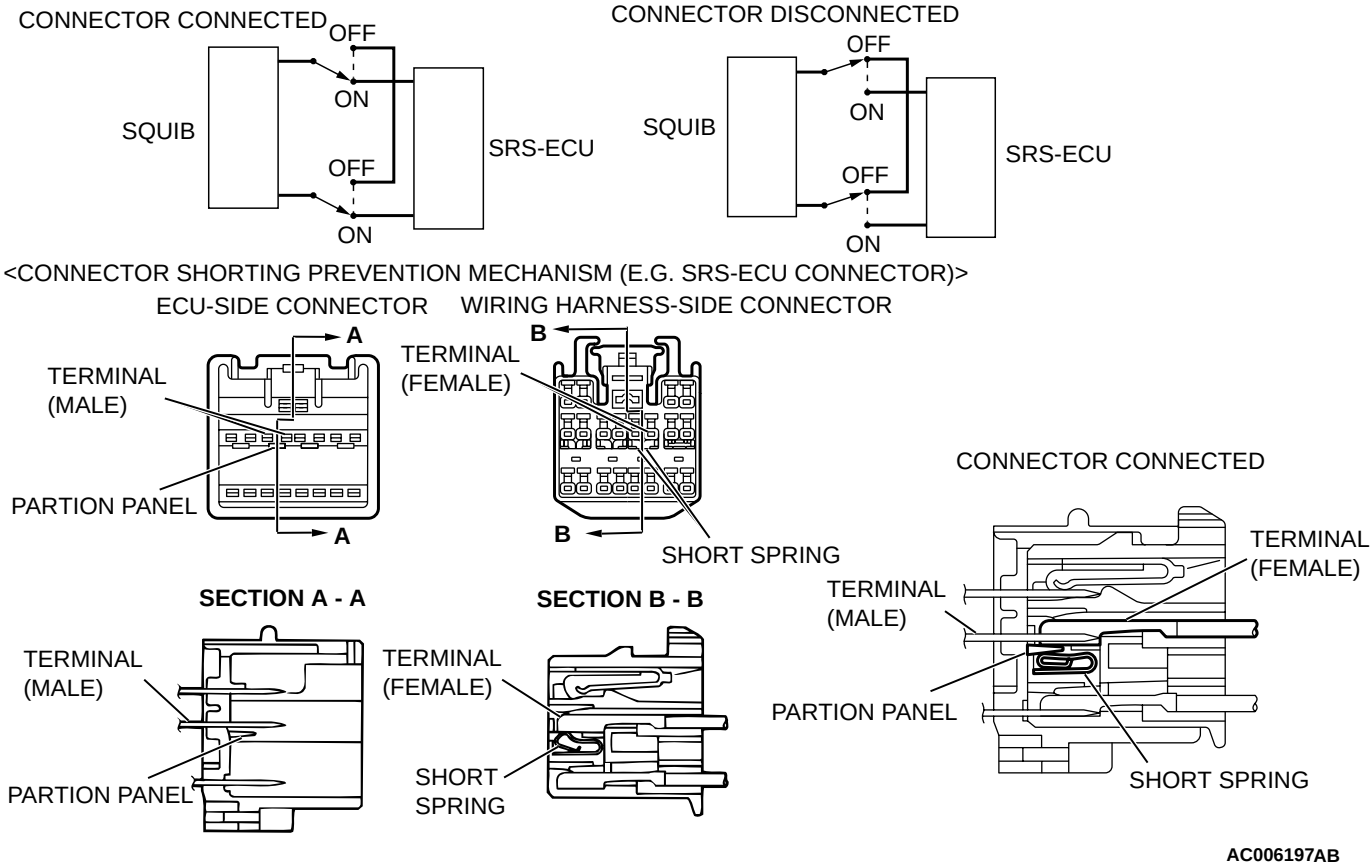


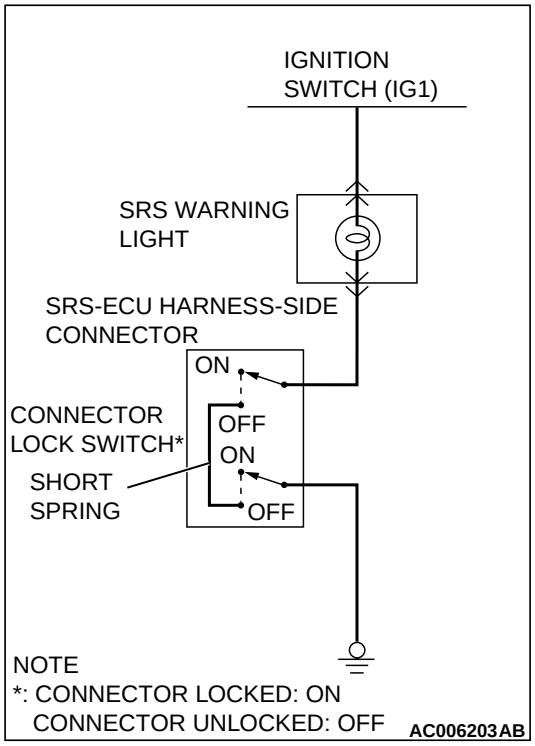
SQUIB CIRCUIT CONNECTOR LOCK SWITCH

The switch is a mechanism that shorts the power supply terminal to the ground terminal automatically in the air bag squib circuit when the connector is disconnected. A "short" spring is integrated inside the connector. This spring prevents static electricity from flowing to the squib by shorting the power supply terminal to the ground terminal (i.e. there is no potential difference between the two terminals).

⚠ CAUTION

When the connector is disconnected, there will be short circuit between the terminals. This is not a fault.



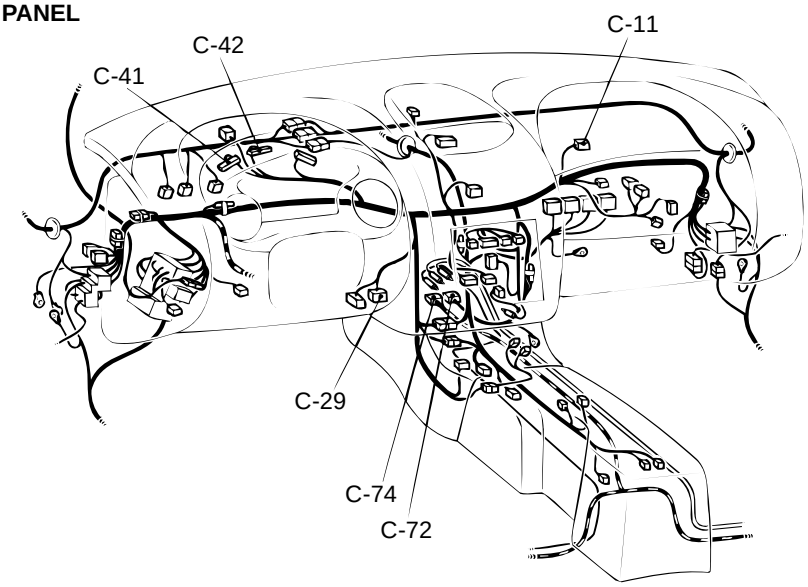


WARNING LIGHT CIRCUIT CONNECTOR LOCK SWITCH

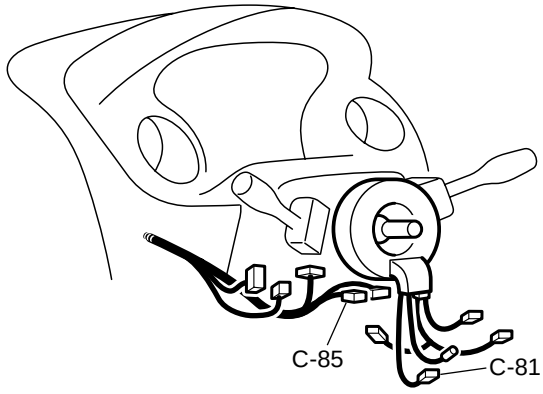
The switch is a mechanism that shorts the power supply terminal to the ground terminal automatically in the warning light circuit when the connector is disconnected. Its structure is similar to the squib circuit connector shorting mechanism.

CONFIGURATION DIAGRAMS

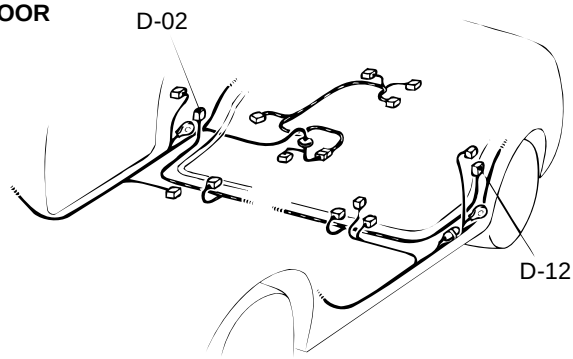
DASH PANEL



STEERING COLUMN



FLOOR



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C-11	AIR BAG MODULE (FRONT PASSENGER'S SIDE)
C-29	DATA LINK CONNECTOR (FOR SCAN TOOL)
C-41	COMBINATION METER (FOR SRS WARNING LIGHT)
C-42	COMBINATION METER (FOR SRS WARNING LIGHT)
C-72	SRS-ECU
C-74	SRS-ECU <VEHICLES WITH SRS SIDE AIR BAG>

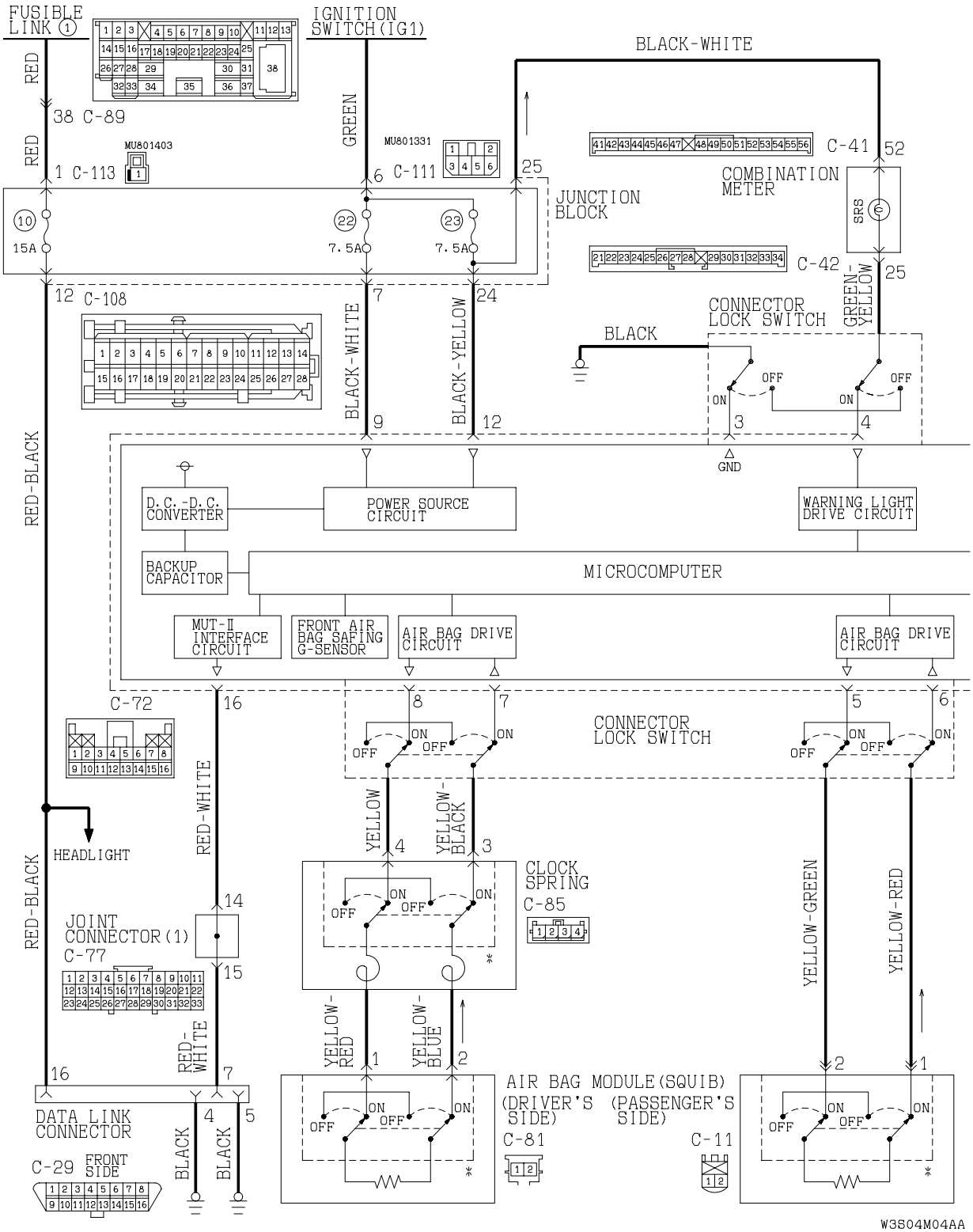
(Continued)

C-81	AIR BAG MODULE (DRIVER'S SIDE)
C-85	CLOCK SPRING
D-02	SIDE IMPACT SENSOR (RH) <VEHICLES WITH SRS SIDE AIR BAG>
D-12	SIDE IMPACT SENSOR (LH) <VEHICLES WITH SRS SIDE AIR BAG>

CIRCUIT DIAGRAM

⚠ WARNING

- ***Do not repair, splice, or modify the SRS wiring (except for specific repairs to the front wiring harness, the instrument panel wiring harness, floor wiring harness and the side air bag wiring harness shown on P.52B-17): replace the wiring if necessary, after reading and following all precautions and procedures in this manual.***
- ***Do not use an analog ohmmeter to check the SRS wiring or components; use only the special tools (refer to P.52B-136.) and a digital multi-meter (refer to P.52B-137.).***



NOTE
* : CONNECTOR LOCK SWITCH

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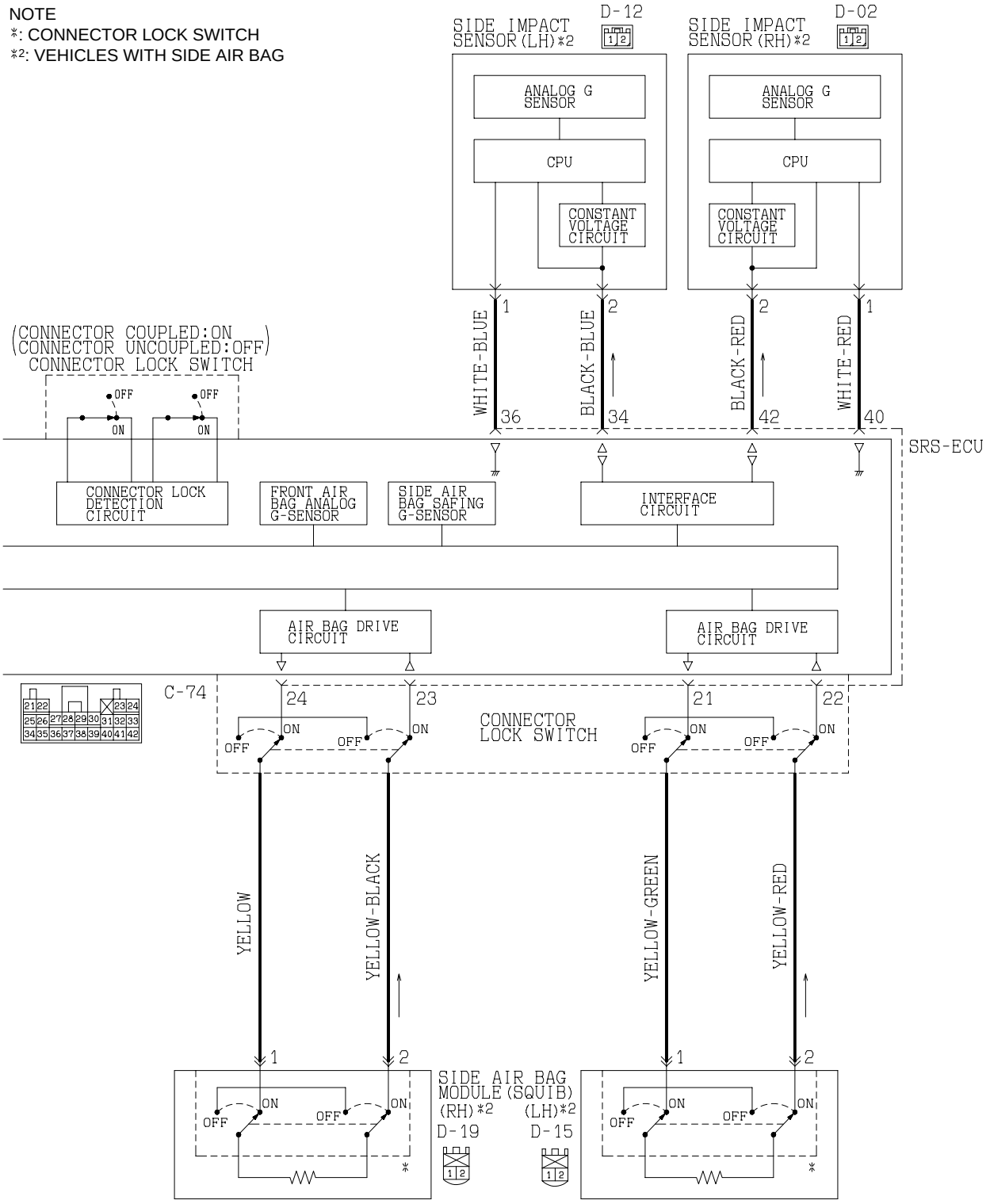

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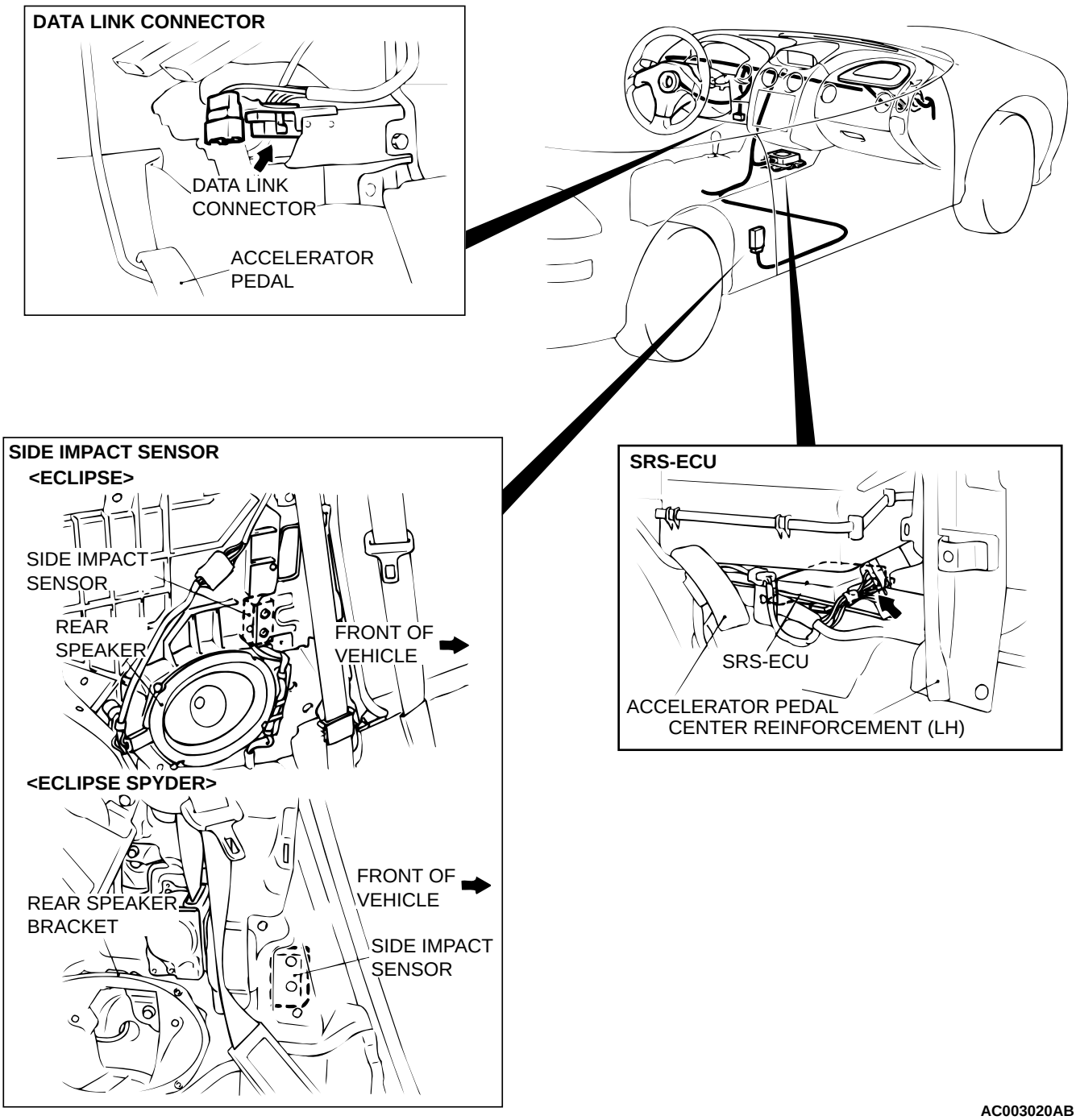
COMPONENT LOCATION



NOTE: The illustration above shows the side impact sensor (LH). The position of the side impact sensor (RH) is symmetrical to this.

SRS SERVICE PRECAUTIONS

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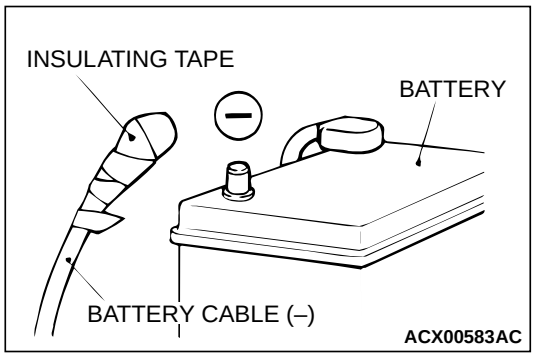


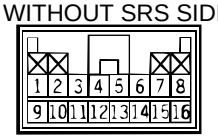
⚠ DANGER

- ***In order to avoid injury to yourself or others from accidental deployment of the air bag during servicing, read and carefully follow all the precautions and procedures described in this manual.***
- ***After disconnecting the battery cable, wait 60 seconds or more before proceeding with the following work. The SRS system is designed to retain enough voltage to deploy the air bag for a short time even after the battery has been disconnected, so serious injury may result from unintended air bag deployment if work is done on the SRS system immediately after the battery cables are disconnected.***

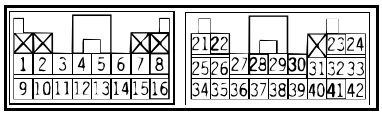
⚠ WARNING

- ***Battery posts, terminals and related accessories contain lead and lead compounds. WASH HANDS AFTER HANDLING.***
- ***Do not use any electrical test equipment on or near the SRS components, except those specified on P.52B-137.***
- ***Never Attempt to Repair the Following Components: SRS-ECU, Clock Spring, Air Bag Module, Side Impact Sensor. If any of these components are diagnosed as faulty, they should only be replaced, in accordance with the INDIVIDUAL COMPONENT SERVICE procedures in this manual, starting on page P.52B-141.***

SRS-ECU CONNECTOR
<VEHICLES WITHOUT SRS SIDE AIR BAG>



<VEHICLES WITH SRS SIDE AIR BAG>



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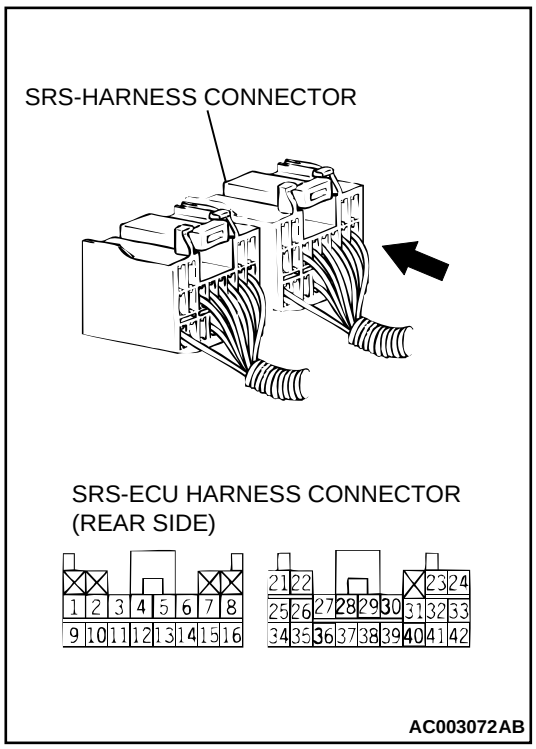
- ***Do not attempt to repair the wiring harness connectors of the SRS. If any of the connectors are diagnosed as faulty, replace the wiring harness. If the wires are diagnosed as faulty, replace or repair the wiring harness according to the following table.***

SRS-ECU TERMINAL NO.	DESTINATION OF HARNESS	CORRECTIVE ACTION
3	Instrument panel wiring harness→ Ground	Correct or replace the instrument panel wiring harness.
4	Instrument panel wiring harness → SRS warning light	Correct or replace the instrument panel wiring harness.
5, 6	Instrument panel wiring harness → Air bag module (Front passenger's side)	Correct or replace the instrument panel wiring harness.
7, 8	Instrument panel wiring harness → Clock spring → Air bag module (Driver's side)	Correct or replace the instrument panel wiring harness. Replace the clock spring.
9	Instrument panel wiring harness → Junction block (fuse No.22)	Correct or replace the instrument panel wiring harness.
12	Instrument panel wiring harness →Junction block (fuse No.23)	Correct or replace the instrument panel wiring harness.
16	Instrument panel wiring harness → Data link connector	Correct or replace the instrument panel wiring harness.
21*, 22*	Floor wiring harness → Side air bag module (LH)	Correct or replace the floor wiring harness.
23*, 24*	Floor wiring harness → Side air bag module (RH)	Correct or replace the floor wiring harness.
34*, 36*	Floor wiring harness → Side impact sensor (LH)	Correct or replace the floor wiring harness.
40*, 42*	Floor wiring harness → Side impact sensor (RH)	Correct or replace the floor wiring harness.

*NOTE: *Vehicles with side air bags*



⚠ ***WARNING***

- ***Inspection of the SRS-ECU connector harness should be carried out by the following procedure. Insert the backprobing tool into connector from harness side, and connect the tester to backprobing tool. If any tool other than backprobing tool is used, it may cause damage to the harness and other components. Furthermore, measurement should not be carried out by touching the backprobing tool directly against the terminals from the front of the connector. The terminals are plated to increase their conductivity, so if they are touched directly by the backprobing tool, the plating may break, which will decrease reliability.***
- ***The SRS components should not be subjected to heat over 93°C (200°F), so remove the SRS-ECU, air bag modules, and clock spring before drying or baking the vehicle after painting.***
- ***After servicing the SRS system, check the SRS warning light operation to make sure that the system functions properly. (Refer to P.52B-3.)***
- ***Make certain that the ignition switch is in the "LOCK" (OFF) position when the scan tool is connected or disconnected.***
- ***If you have any questions about the SRS system, please contact the MMSA Tech Line.***

SRS AIR BAG DIAGNOSIS

INTRODUCTION TO DIAGNOSIS

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The SRS system is controlled by the SRS-ECU. The SRS-ECU judges how severe a collision is by detecting signals from the analog G-sensor. If the impact is over a predetermined level, the SRS-ECU outputs an ignition signal. At this time, if the safing G-sensor is on, the SRS air bag will inflate. The SRS warning light in the combination meter alerts a malfunction of the SRS system. If the following symptoms occur even when the vehicle has not been in a collided, there may be a malfunction in the SRS system.

- The SRS warning light does not go off within approximately 7 seconds after the ignition switch has been turned "ON."
- The SRS warning light does not illuminate when the ignition switch is turned "ON."

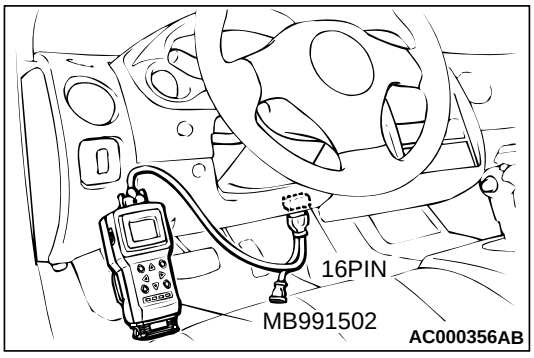
Refer to the Post-collision Diagnosis when inspecting and servicing the vehicle that has been in a collision. (Refer to P.52B-138.)

TROUBLESHOOTING STRATEGY

M1524003100159

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted all of the possible ways to find a SRS fault.

1. Gather information about the problem from the customer.
2. Verify that the condition described by the customer exists.
3. Check the vehicle for any SRS DTC.
4. If you cannot verify the condition but there are no SRS DTCs, the malfunction is intermittent. Refer to GROUP 00, How to use Troubleshooting – Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-6.
5. If there is a SRS DTC, record the code number, then erase the code from vehicle memory using scan tool MB991502.
6. Recreate the SRS DTC set conditions to see if the same SRS DTC will set again.
   - If the same SRS DTC sets again, follow the Inspection Chart for DTC and find the fault.
   - If you cannot get the same SRS DTC to set again, the malfunction is intermittent. Refer to GROUP 00, How to use Troubleshooting – Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-6.



SRS DTC DIAGNOSIS

M1524003200134

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

RETRIEVING SRS DTC

Connect scan tool MB991502 to the data link connector, and then check DTC.

ERASING SRS DTC

Connect scan tool MB991502 to the data link connector, and then erase the DTC.

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DTC CHART

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Inspect according to the inspection chart that is appropriate for the DTC.

CODE NO.	ON-BOARD DIAGNOSTIC ITEM		REFERENCE PAGE
14	Analog G-sensor system in the SRS-ECU		P.52B-23
15	Safing G-sensor short circuit		P.52B-23
16	Safing G-sensor open circuit		P.52B-23
17	Safing G-sensor for side-airbag faults		P.52B-23
21*2	Driver's air bag module (squib) system fault 1 (Short circuit between terminals of the squib circuit)		P.52B-25
22*2	Driver's air bag module (squib) system fault 2 (Open in the squib circuit)		P.52B-31
24*2	Passenger's (front) air bag module (squib) system fault 1 (Short circuit between terminals of the squib circuit)		P.52B-35
25*2	Passenger's (front) air bag module (squib) system fault 2 (Open in the squib circuit)		P.52B-40
31	SRS-ECU capacitor circuit voltage too high		P.52B-23
32	SRS-ECU capacitor circuit voltage too low		P.52B-23
34*1	Connector lock system detects connector unlocked		P.52B-43
35	SRS-ECU air bag condition monitor detects deployed air bag		P.52B-44
41*1	IG1 power circuit system (fuse No.23 circuit)		P.52B-45
42*1	IG1 power circuit system (fuse No.22 circuit)		P.52B-52
43	SRS warning light drive circuit system fault 1	Light does not illuminate*1	P.52B-57
		Light does not switch off	P.52B-61
44*1	SRS warning light drive circuit system fault 2		P.52B-57
45	SRS-ECU non-volatile memory (EEPROM) and A/D converter system		P.52B-23
51	Driver's air bag module (squib ignition drive circuit) system detected short circuit		P.52B-23
52	Driver's air bag module (squib ignition drive circuit) system detected open circuit		P.52B-23
54	Passenger's (front) air bag module (squib ignition drive circuit) system detected short circuit		P.52B-23
55	Passenger's (front) air bag module (squib ignition drive circuit) system detected open circuit		P.52B-23
61	Driver's air bag module (squib) system fault for power supply circuit (Short-circuited to power supply)		P.52B-66
62	Driver's s air bag module (squib) system fault for ground circuit (Short-circuited to ground)		P.52B-70
64	Passenger's (front) air bag module (squib) system fault for power supply circuit (Short-circuited to power supply)		P.52B-74
65	Passenger's (front) air bag module (squib) system fault for ground circuit (Short-circuited to ground)		P.52B-78
71*2	Right hand side-airbag module (squib) system fault 1 (Short circuit between terminals of the squib circuit)		P.52B-82

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CODE NO.	ON-BOARD DIAGNOSTIC ITEM	REFERENCE PAGE
72*2	Right hand side-airbag module (squib) system fault 2 (Open in the squib circuit)	P.52B-87
73	Right hand side-airbag module (squib) system detected short circuit	P.52B-23
74	Right hand side-airbag module (squib) system detected open circuit	P.52B-23
75	Right hand side-airbag module (squib) system fault power supply circuit (Short-circuited to power supply)	P.52B-90
76	Right hand side-airbag module (squib) system fault ground circuit (Short-circuited to ground)	P.52B-94
79	Left hand side-airbag module (squib) system fault 5 for power supply circuit	P.52B-98
81*2	Left hand side-airbag module (squib) system fault 1 (Short circuit between terminals of the squib circuit)	P.52B-101
82*2	Left hand side-airbag module (squib) system fault 2 (Open in the squib circuit)	P.52B-106
83	Left hand side-airbag module (squib) system fault 3 for ignition drive circuit	P.52B-23
84	Left hand side-airbag module (squib) system fault 4 for ignition drive circuit	P.52B-23
85	Left hand side-airbag module (squib) system fault power supply circuit (Short-circuited to power supply)	P.52B-109
86	Left hand side-airbag module (squib) system fault ground circuit (Short-circuited to ground)	P.52B-113
89	Right hand side-airbag module (squib) system fault 5 for power supply circuit	P.52B-98
91*1	Left hand side-impact sensor power supply circuit system	P.52B-120
92	Left hand side-impact sensor system for fault 1	P.52B-124
93	Left hand side-airbag module (squib) system fault 6 for communication system	P.52B-98
94*1	Right hand side-impact sensor power supply circuit system	P.52B-125
95	Right hand side-impact sensor system for fault 1	P.52B-124
96	Right hand side-airbag module (squib) system fault 6 for communication system	P.52B-98

NOTE:

1. **1: If the vehicle condition returns to normal, the DTC will be automatically erased, and the SRS warning light will return to normal.*
2. **2: However, if no DTC resets, the SRS warning light will be switched off (The DTC will be retained). <Vehicles without SRS side-airbag>*
3. *If the vehicle has a discharged battery, it will store the DTC 41 or 42. When these DTC are read, check the battery condition.*

SYMPTOM CHART

M1524003400194

SYMPTOMS	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Communication with scan tool MB991502 is not possible. (Communication with all systems is not possible)	–	GROUP 13A, DIAGNOSIS P.13A-434 GROUP 13B, DIAGNOSIS P.13B-530
Communication with scan tool MB991502 is not possible. (Communication is not possible with SRS system only.)	1	P.52B-130
When the ignition switch is turned to the "ON" position (engine stopped), the SRS warning light does not illuminate.	Refer to DTC No. 43.	P.52B-57
After the ignition switch is turned to "ON" position, the SRS warning light does not go off within approximately 7 seconds.	Refer to DTC No. 43.	P.52B-57

DIAGNOSTIC TROUBLE CODE PROCEDURES

DTC 14: Analog G-sensor System in the SRS-ECU
DTC 15: Safing G-sensor Short Circuit
DTC 16: Safing G-sensor Open Circuit
DTC 17: Safing G-sensor for Side-airbag Faults
DTC 31: SRS-ECU Capacitor Circuit Voltage too High
DTC 32: SRS-ECU Capacitor Circuit Voltage too Low
DTC 45: SRS-ECU Non-volatile Memory (EEPROM) and A/D Converter System
DTC 51: Driver's Air Bag Module (Squib Ignition Drive Circuit) System Detected Short Circuit
DTC 52: Driver's Air Bag Module (Squib Ignition Drive Circuit) System Detected Open Circuit
DTC 54: Passenger's (Front) Air Bag Module (Squib Ignition Drive Circuit) System Detected Short Circuit
DTC 55: Passenger's (Front) Air Bag Module (Squib Ignition Drive Circuit) System Detected Open Circuit
DTC 73: Right Hand Side-airbag Module (Squib) Sytem Detected Short Circuit
DTC 74: Right Hand Side-airbag Module (Squib) Sytem Detected Open Circuit
DTC 83: Left Hand Side-airbag Module (Squib) System Fault 3 for Ignition Drive Circuit
DTC 84: Left Hand Side-airbag Module (Squib) System Fault 4 for Ignition Drive Circuit

DTC SET CONDITIONS

- These DTC are output when a fault is detected in the SRS-ECU. The most likely causes for this code to be set are shown in the table below:

TROUBLESHOOTING HINTS

- Malfunction of the SRS-ECU

CODE NO.	DEFECTIVE PART	SYMPTOMS
14	Analog G-sensor	• When the analog G-sensor is not operating • When the characteristics of the analog G-sensor are abnormal • When the output from the analog G-sensor is abnormal
15	Safing G-sensor (front air bag)	• Short circuit in the safing G-sensor
16		• Open circuit in the safing G-sensor
17	Safing G-sensor (side-airbag)	• When the safing G-sensor is not operating • When the characteristics of the safing G-sensor are abnormal • When the output from the safing G-sensor is abnormal
31	Capacitor	• Voltage at the capacitor terminal is higher than the specified value for five seconds or more
32		• Voltage at the capacitor terminal is lower than the specified value for five seconds or more (This is not detected if diagnostic trouble code No. 41 or 42 indicating battery positive voltage drop has been output.)
45	Non-volatile memory (EEPROM) and A/D converter	• When the non-volatile memory (EEPROM) and A/D converter system are abnormal
51	Driver's air bag module (squib ignition drive circuit)	• Short circuit in the squib ignition drive circuit
52		• Open circuit in the squib ignition drive circuit
54	Passenger's (front) air bag module (squib ignition drive circuit)	• Short circuit in the squib ignition drive circuit
55		• Open circuit in the squib ignition drive circuit
73	Right hand side-airbag module (squib ignition drive circuit)	• Short circuit in the squib ignition drive circuit
74		• Open circuit in the squib ignition drive circuit
83	Left hand side-airbag module (squib ignition drive circuit)	• Short circuit in the squib ignition drive circuit
84		• Open circuit in the squib ignition drive circuit

DIAGNOSIS

Replace the SRS-ECU. (Refer to P.52B-142.)

Q: Is any of DTC output?

YES : There is no action to be taken.
NO : This diagnosis is complete.

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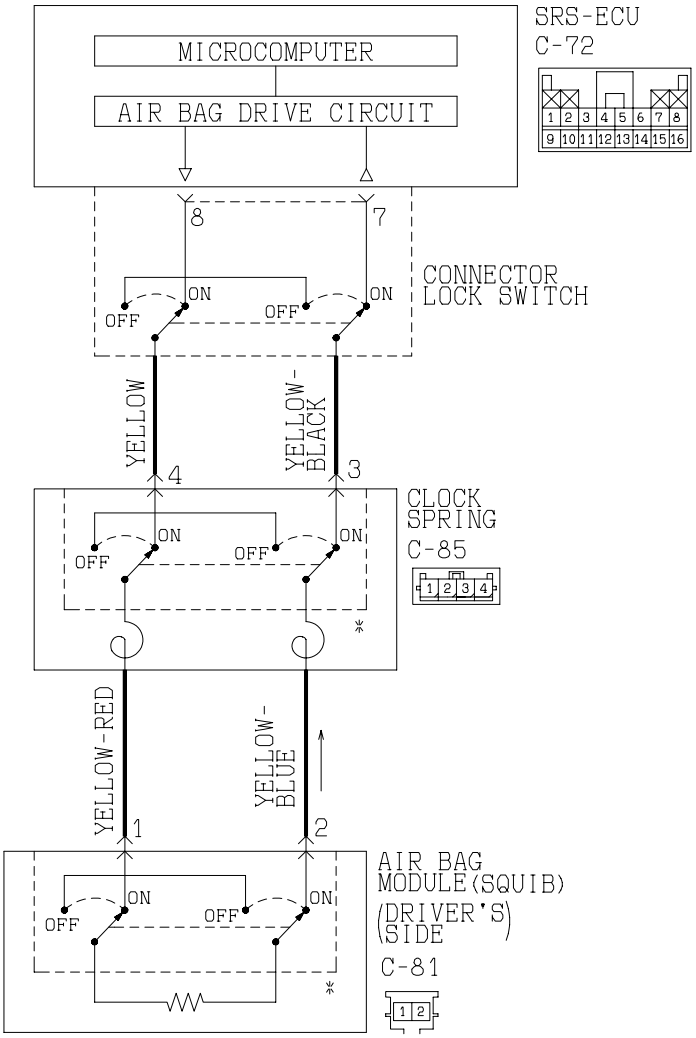
DTC 21: Driver's Air Bag Module (Squib) System Fault 1 (Short Circut between Terminal of the Squib Circuit)

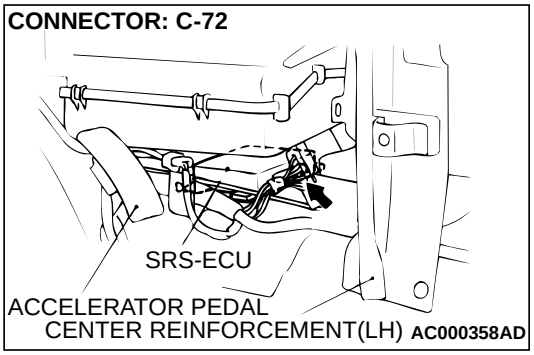
Driver's Air Bag Module (Squib) Circuit



NOTE
*: CONNECTOR LOCK SWITCH

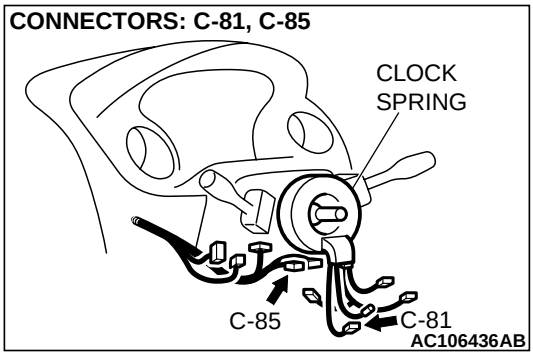
W3S15M01AA
AC106622 AB

CONNECTOR: C-72



AC000358AD

CONNECTORS: C-81, C-85



AC106436AB

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CIRCUIT OPERATION

- The SRS-ECU judges how severe a collision is by detecting signals from the front air bag analog G-sensor. If the impact is over a predetermined level, the SRS-ECU outputs an ignition signal. At this time, if the front air bag safing G-sensor is on, the SRS air bag will inflate.
- The ignition signal is input to the air bag module via the clock spring to inflate the air bag.

DTC SET CONDITIONS

- This DTC is set if there is abnormal resistance between the input terminals of the driver's side air bag module (squib). The most likely causes for this code to be set are shown in the table below: However, if no DTC resets, the SRS warning light will be switched off (DTC will be retained).

TROUBLESHOOTING HINTS

- Improper engaged connector or defective short bar*
- Short circuit in the clock spring
- Short circuit between the driver's air bag module (squib) circuit terminals
- Damaged connector(s)
- Malfunction of the SRS-ECU

*NOTE: *: The squib circuit connectors integrate a "short" bar (which prevents the air bag from deploying unintentionally due to static electricity by shorting the positive wire to the ground wire in the squib circuit when the connectors are disconnected) (Refer to P.52B-20.) Therefore, if the connector C-72, C-85 or C-81 is damaged or improperly engaged, the short bar may not be released when the connector is connected.*

DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991613: SRS Check Harness
- MB991865: Dummy resister
- MB991866: Resister harness

STEP 1. Check the DTC.

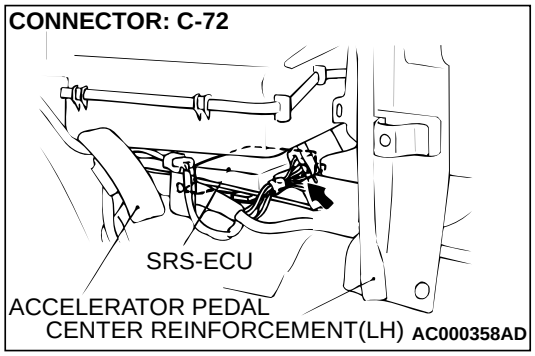
Q: Is DTC 34 output?

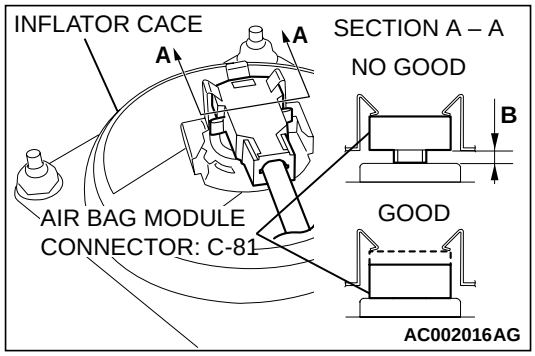
YES : Go to Step 2.
NO : Go to Step 3.

STEP 2. Check the SRS-ECU connector C-72.

Q: Is the connector correctly engaged?

YES : Go to Step 3.
NO : Engage the connector correctly. Then go to Step 9.





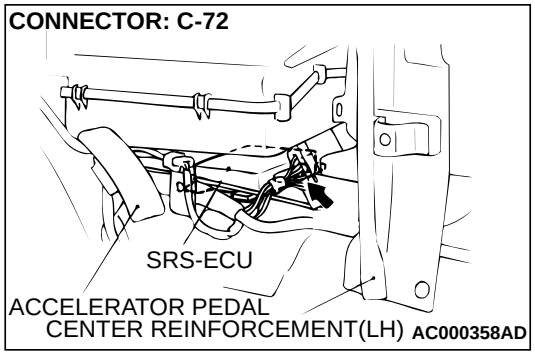
STEP 3. Check the air bag module connector C-81.

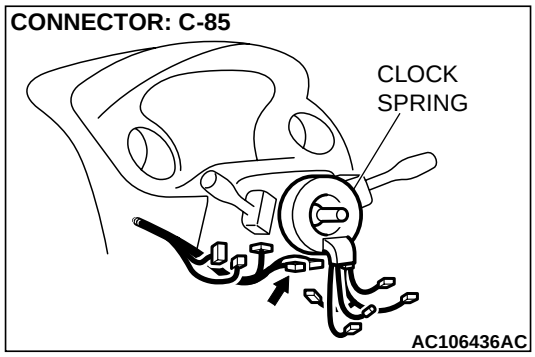
Remove the air bag module mounting equipment and check air bag module connector C-81.At this time, check that there is no gap at place B shown in the illustration. (Refer to P.52B-144 .)

Q: Is the connector correctly connected?

YES : Go to Step 4.

NO : Insert the connector to the place, where there remains no gap at place B shown in the illustration. Then go to Step 9.





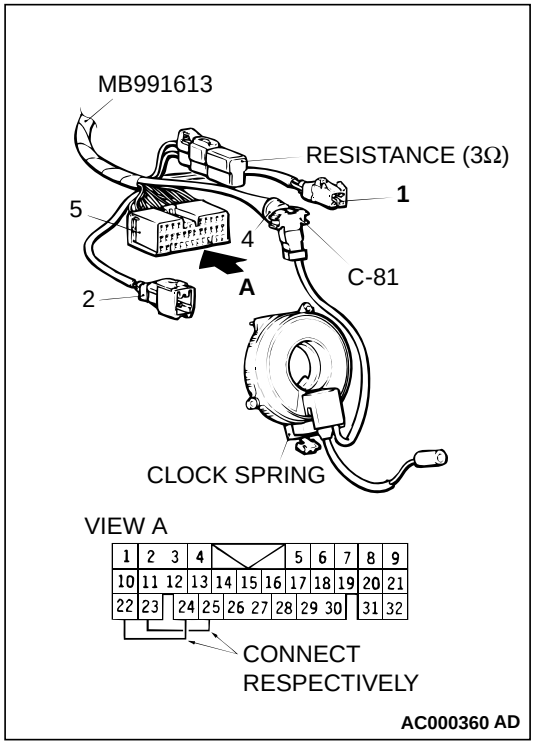
STEP 4. Check the SRS-ECU connector C-72 and clock spring connector C-85.

(1) Disconnect the negative battery terminal.
(2) Disconnection connectors C-72 and C-85 then reconnect them.
(3) Connect the negative battery terminal.
(4) Erase the DTC memory, and then check the DTC.

Q: Is DTC 21 output?

YES : Go to Step 5.

NO : The inspection is complete. (It is assumed that DTC 21 set as connector C-72 or C-85 was engaged improperly.)

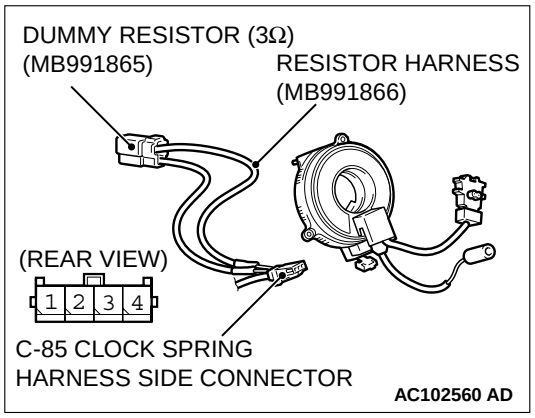


STEP 5. Check the driver's air bag module line.

(1) Disconnect the negative battery terminal.
(2) Remove the driver's air bag module. (Refer to P.52B-144.)
(3) Connect connector (4) of special tool MB991613 to clock spring connector C-81.special tool MB991613 to special tool MB991866.
(4) Connect connector (1) of special tool MB991613 to connector (2).
(5) Connect terminals 22 to 24, and terminals 23 to 25 of special tool MB991613 to connector (5).
(6) Connect the clock spring to the body wiring harness.
(7) Connect the negative battery terminal.
(8) Erase the DTC memory, and then recheck the DTC.

Q: Is DTC 21 output?

YES : Go to Step 6.
NO : Replace the driver's air bag module. Refer to P.52B-144. Then go to Step 9.



STEP 6. Check the clock spring.

(1) Disconnect the negative battery terminal.
(2) Disconnect the clock spring connector C-85.
(3) Connect special tool MB991865 to special tool MB991866.

⚠ CAUTION
Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

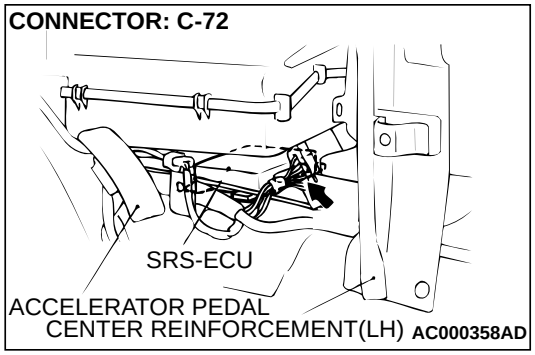
(4) Insert special tool MB991866 into clock spring harness side connector C-85 (terminal No.3 and 4) by backprobing.
(5) Connect the negative battery terminal.
(6) Erase the DTC memory, and then recheck the DTC.

Q: Is DTC 21 output?

YES : Go to Step 7.
NO : Replace the clock spring. Refer to P.52B-144. Then go to Step 9.

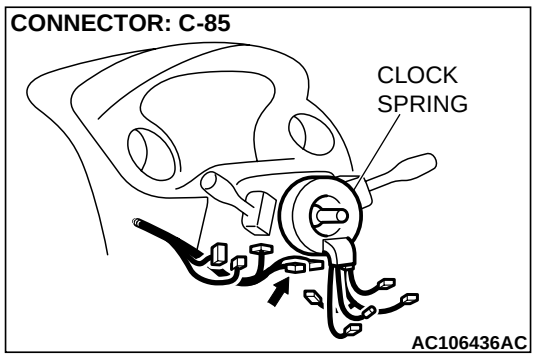
STEP 7. Check harness between the SRS-ECU and the clock spring for short circuit.

(1) Disconnect SRS-ECU connector C-72.



⚠ CAUTION
To release the short bar in the SRS-ECU connector, disconnect connector C-85 to short the squib circuit.

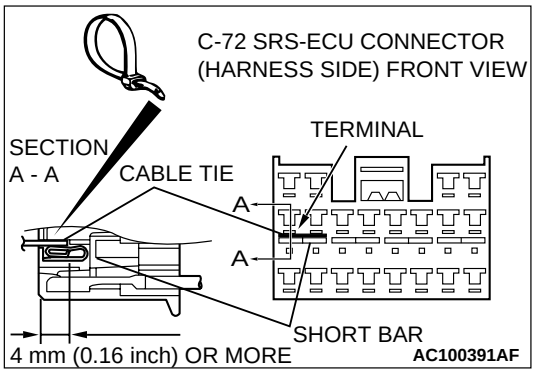
(2) Disconnect the clock spring connector C-85.



⚠ CAUTION
Insert an insulator such as a cable tie to a depth of 4mm (0.16 inch) or more, otherwise the short bar will not cable tie release.

(3) Insert a cable tie [3 mm (0.12 inch) wide, 0.5 mm (0.02 inch) thick] between terminals 7, 8 and the short bar to release the short bar.

(4) Measure at the wiring harness side.



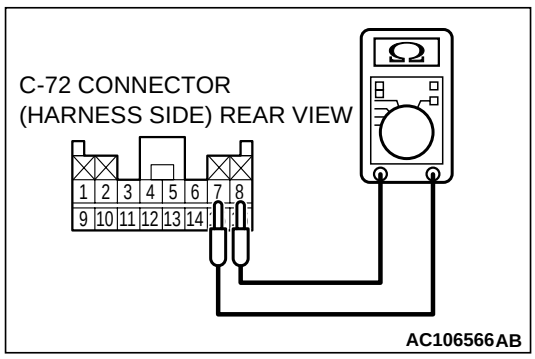
⚠ CAUTION
Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

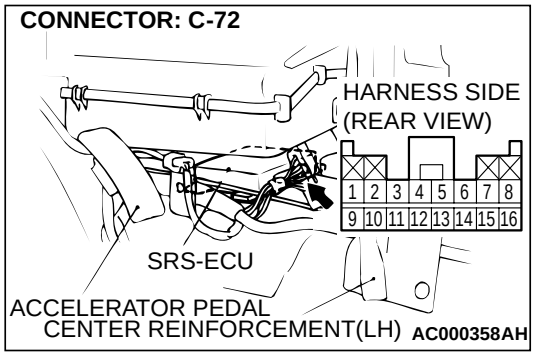
(5) Check the continuity between terminals 7 and 8.
- There should be open circuit.

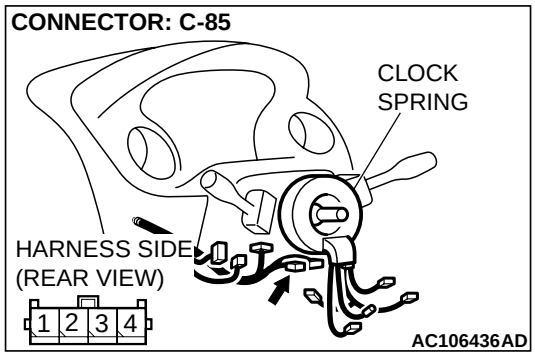
Q: Is the continuity normal?

YES : Erase the DTC memory, and recheck if any DTC sets. If DTC 21 sets, replace the SRS-ECU. Refer to P.52B-142. Then go to Step 9.

NO : Go to Step 8.







STEP 8. Check the harness for short circuit between SRS-ECU connector C-72 (terminal No.7 and 8) and clock spring connector C-85 (terminal No.3 and 4) .

Q: Are harness wires between SRS-ECU connector C-72 (terminal No.7 and 8) and clock spring connector C-85 (terminal No.3 and 4) in good condition?

YES : Go to Step 9.

NO : Repair the harness wires between SRS-ECU connector C-72 and clock spring connector C-85. Then go to Step 9.

STEP 9. Check the DTC.

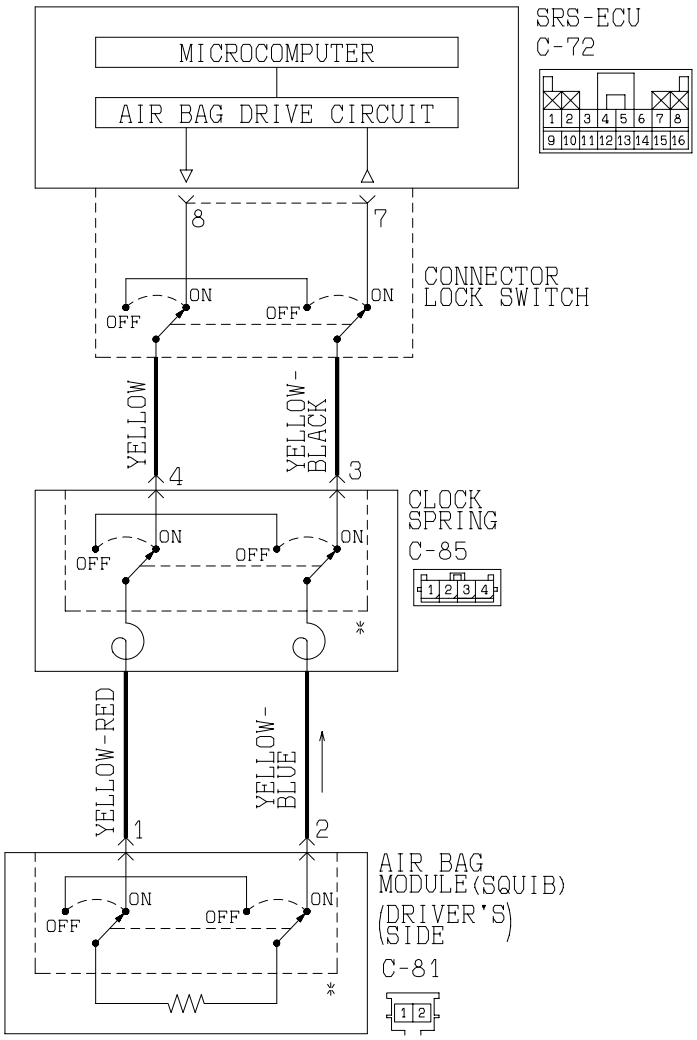
Q: Is DTC 21 output?

YES : Return to Step 1.

NO : This diagnosis is complete. (If no malfunctions are not found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.)

DTC 22 : Driver's Air Bag Module (Squib) System Fault 2 (Open in the Squib Circuit)

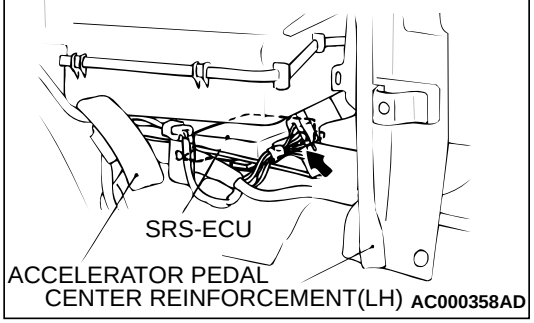
Driver's Air Bag Module (Squib) Circuit



NOTE
*: CONNECTOR LOCK SWITCH

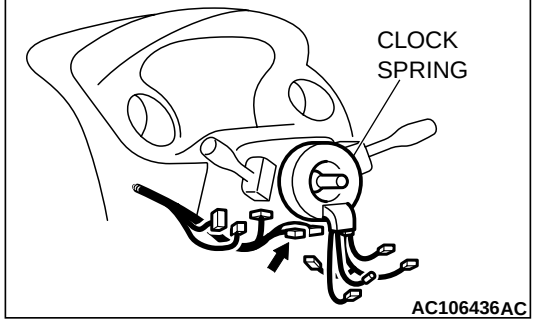
W3S15M01AA
AC106622 AB

CONNECTOR: C-72



AC000358AD

CONNECTOR: C-85



AC106436AC

TSB Revision

CIRCUIT OPERATION

- The SRS-ECU judges how severe a collision is by detecting signals from the front air bag analog G-sensor. If the impact is over a predetermined level, the SRS-ECU outputs an ignition signal. At this time, if the front air bag safing G-sensor is on, the SRS air bag will inflate.
- The ignition signal is input to the air bag module via the clock spring to inflate the air bag.

DTC SET CONDITIONS

- These DTC are output if there is abnormal resistance between the input terminals of the driver's side air bag module (squib). The most likely causes for this code to be set are shown in the table below: However, if no DTC resets, the SRS warning light will be switched off (DTC will be retained).

TROUBLESHOOTING HINTS

- Open circuit in the clock spring
- Open circuit due to improper neutral position of the clock spring
- Open circuit in the driver's air bag module (squib) circuit
- Disengaged driver's air bag module (squib) connector
- Improper connector contact
- Malfunction of the SRS-ECU

DIAGNOSIS

Required Special Tools:

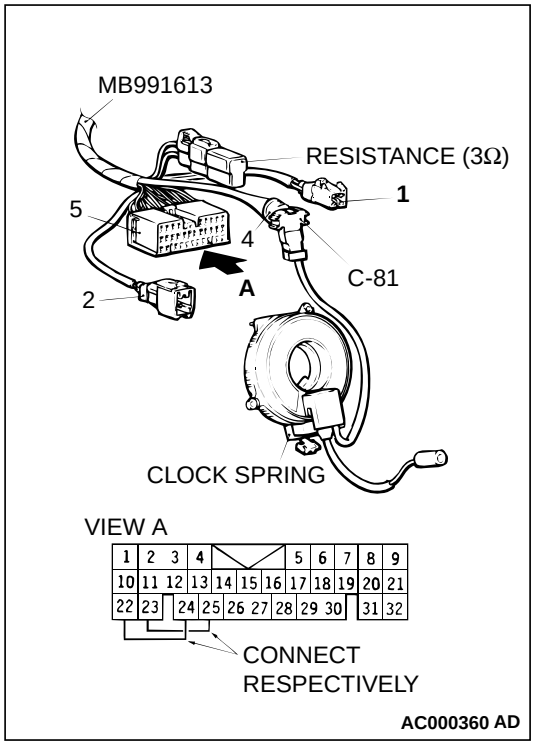
- MB991502: Scan Tool (MUT-II)
- MB991613: SRS Check Harness
- MB991865: Dummy resister
- MB991866 Resister harness

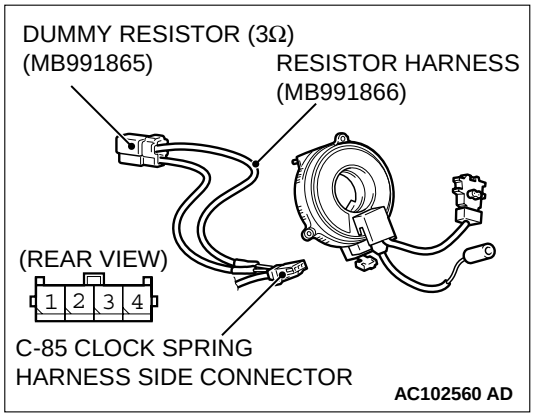
STEP 1. Check the driver's air bag module.

(1) Disconnect the negative battery terminal.
(2) Remove the driver’s air bag module. (Refer to P.52B-144.)
(3) Connect connector (4) of special tool MB991613 to clock spring connector C-81.special tool MB991613 to special tool MB991866.
(4) Connect connector (1) of special tool MB991613 to connector (2).
(5) Connect terminals 22 to 24, and terminals 23 to 25 of special tool MB991613 to connector (5).
(6) Connect the clock spring to the body wiring harness.
(7) Connect the negative battery terminal.
(8) Erase the DTC memory, and then recheck the DTC.

Q: Is DTC 22 out put?

YES : Go to Step 2.
NO : Replace the driver’s air bag module. Then go to Step 4.





STEP 2. Check the clock spring.

(1) Disconnect the negative battery terminal.
(2) Disconnect the clock spring connector C-85.
(3) Connect special tool MB991865 to special tool MB991866.

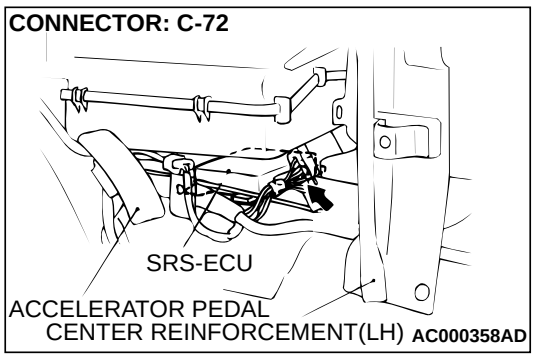
⚠ CAUTION

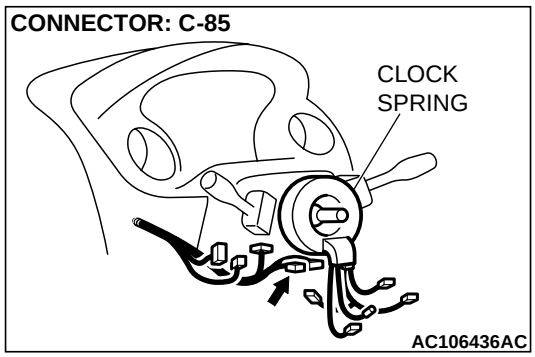
Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

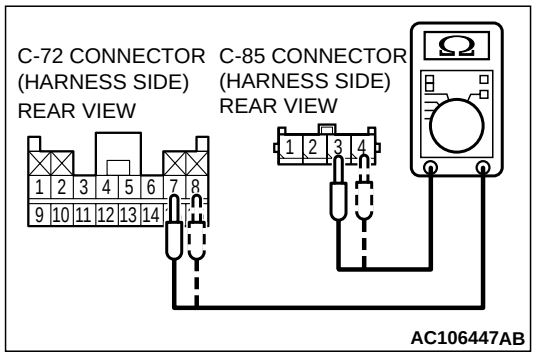
(4) Insert special tool MB991866 into clock spring harness side connector C-85 (terminal No.3 and 4) by backprobing.
(5) Connect the negative battery terminal.
(6) Erase the DTC memory, and then recheck DTC.

Q: Is DTC 22 output?

YES : Go to Step 3.
NO : Replace the clock spring. Refer to P.52B-144. Then go to Step 4.







STEP 3. Check the harness between the SRS-ECU and the clock spring for open circuit.

(1) Disconnect SRS-ECU connector C-72 and clock spring connector C-85, and measure at the wiring harness side.

⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(2) Check the continuity between the following terminals.

C-72 connector		C-85 connector
7	-	3
8	-	4

- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Eras the DTC memory, and recheck if any DTC sets. If DTC 22 sets, replace the SRS-ECU. Refer to P.52B-142. Then go to Step 4.
NO : Repair the harness wires between SRS-ECU connector C-72 and clock spring connector C-85. Then go to Step 4.

STEP 4. Check the DTC.

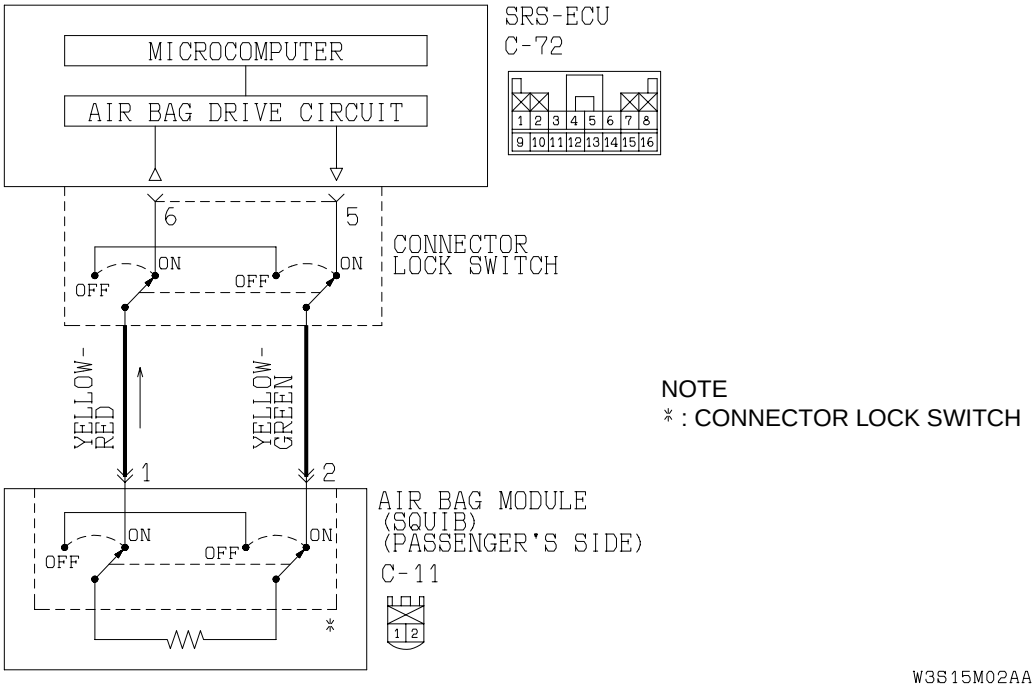
Q: Is DTC 22 output?

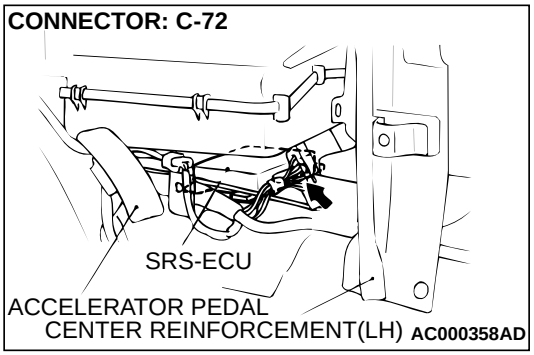
YES : Return to Step 1.

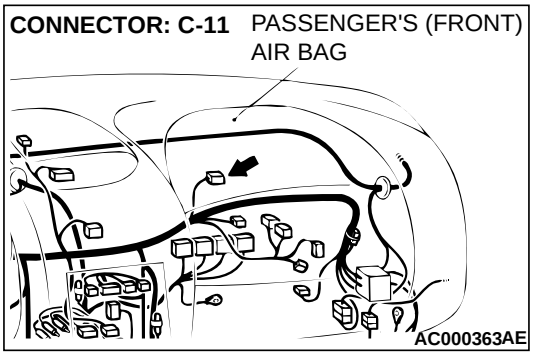
NO : This diagnosis is complete. (If no malfunctions are not found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.)

DTC 24 : Passenger's (Front) Air Bag Module (Squib) System Fault 1 (Short Circuit between Terminals of the Squib Circuit)

Driver's Air Bag Module (Squib) Circuit







CIRCUIT OPERATION

- The SRS-ECU judges how severe a collision is by detecting signals from the left and right side impact sensors and the analog G-sensor. If the impact is over a predetermined level, the SRS-ECU outputs an ignition signal. At this time, if the safing G-sensor is on, the SRS air bag will inflate.
- The ignition signal is input to the air bag module to inflate the air bag.

DTC SET CONDITIONS

- This DTC is set if there is abnormal resistance between the input terminals of the passenger's (front) air bag module (squib). The most likely causes for this code to be set are shown in the table below: However, if no DTC resets, the SRS warning light will be switched off (The DTC will be retained).

TROUBLESHOOTING HINTS

- Improper engaged connector or defective short bar*
- Short circuit between the passenger's (front) air bag module (squib) circuit terminals
- Damaged connector(s)
- Malfunction of the SRS-ECU

*NOTE: *: The squib circuit connectors integrate a "short" bar (which prevents the air bag from deploying unintentionally due to static electricity by shorting the positive wire to the ground wire in the squib circuit when the connectors are disconnected) (Refer to P.52B-20.) Therefore, if the connector C-11 or C-72 is damaged or improperly engaged, the short bar may not be released when the connector is connected.*

DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991865: Dummy resister
- MB991866: Resister harness

STEP 1. Check the DTC.

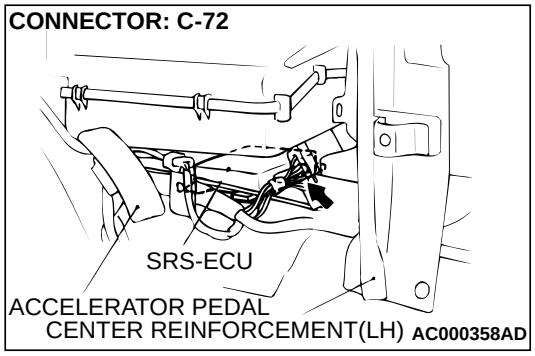
Q: Is DTC 34 output?

YES : Go to Step 2.
NO : Go to Step 3.

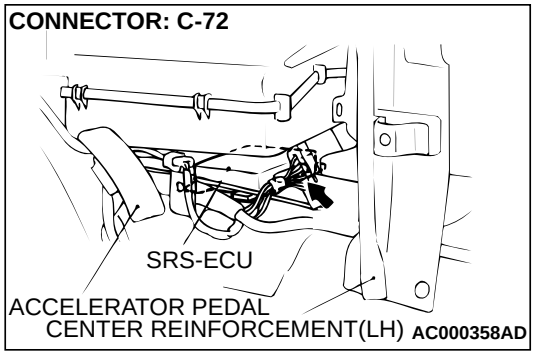
STEP 2. Check SRS-ECU connector C-72.

Q: Is the connector correctly engaged?

YES : Go to Step 3.
NO : Engage the connector correctly. Then go to Step 7.



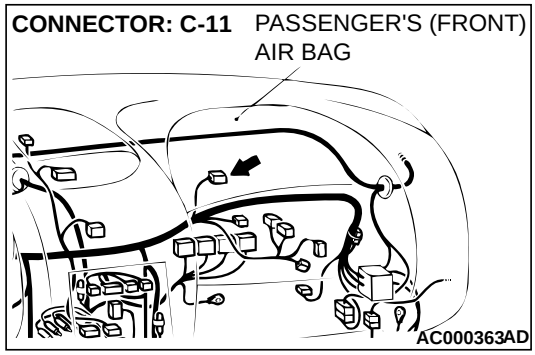
STEP 3. Check SRS-ECU connector C-72 and passenger's connector C-11.



(1) Disconnection connectors C-72 and C-11, and then reconnect them.
(2) Connect the negative battery terminal.
(3) Erase the DTC memory, and then check the DTC.

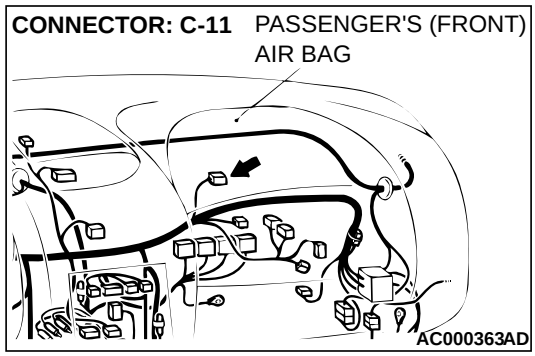
Q: Is DTC 24 output?

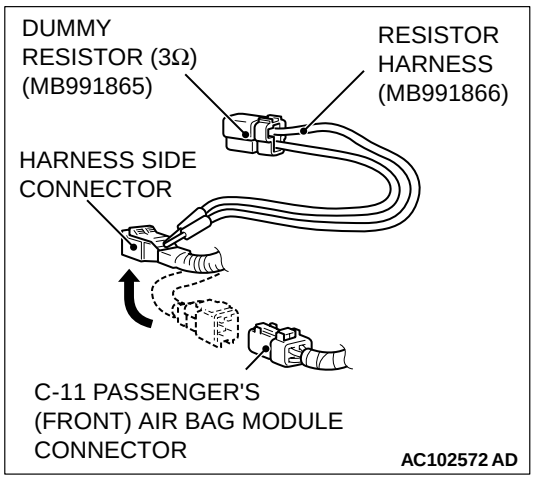
YES : Go to Step 4.
NO : The inspection is complete. (It is assumed that DTC 24 set as connector C-72 or C-11 was engaged improperly.)



STEP 4. Check the passenger's air bag module.

(1) Unclip passenger's air bag module connector C-11.





(2) Connect special tool MB991865 to special tool MB991866.

⚠ CAUTION
Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

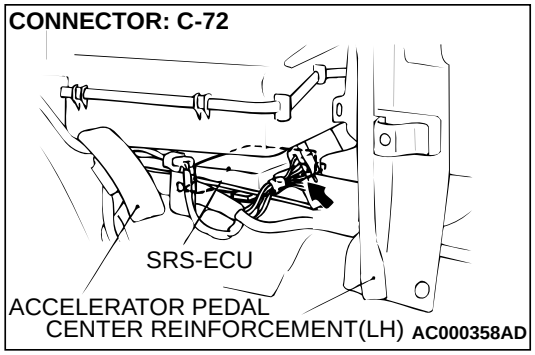
(3) Disconnect the passenger's air bag module connector C-11, and insert special tool MB991866 into the harness side connector by backprobing.
(4) Connect the negative battery terminal.
(5) Erase the DTC memory, and then recheck the DTC.

Q: Is DTC 24 output?

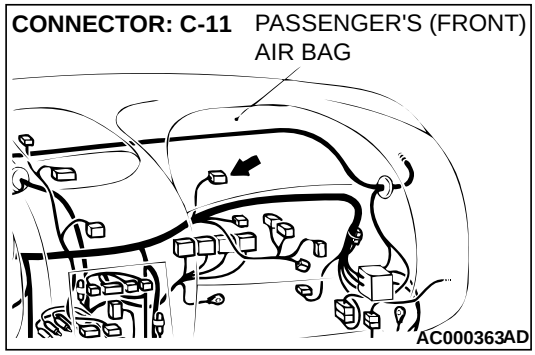
YES : Go to Step 5.
NO : Replace the passenger's air bag module. Refer to P.52B-144. Then go to Step 7.

STEP 5. Check the harness for short circuit between SRS-ECU and the passenger's air bag module.

(1) Disconnect SRS-ECU connector C-72.



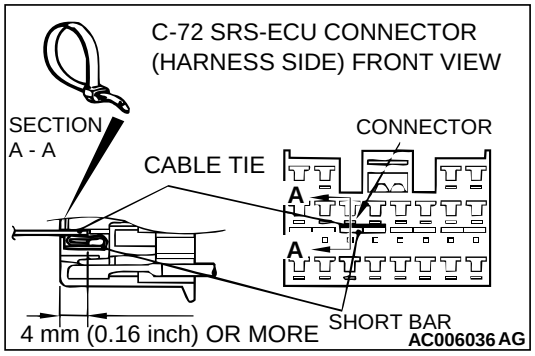
(2) Unclip passenger's air bag module connector C-11.



⚠ CAUTION

To release the short bar in the SRS-ECU connector, disconnect connector C-11 to short the squib circuit.

(3) Disconnect the passenger's air bag module connector C-11.



⚠ CAUTION

Insert an insulator such as a cable tie to a depth of 4mm (0.16 inch) or more, otherwise the short bar will not cable tie release.

(4) Insert a cable tie [3 mm (0.12 inch) wide, 0.5 mm (0.02 inch) thick] between terminals 5, 6 and the short bar to release the short bar.

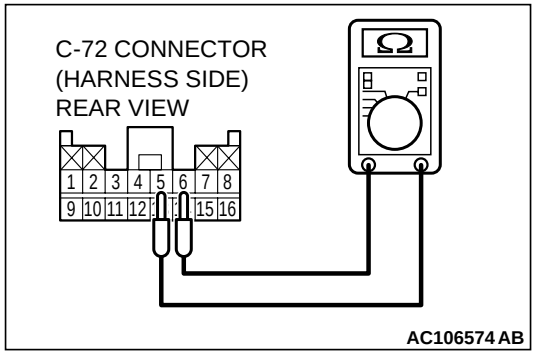
(5) Measure at the wiring harness side.

⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(6) Check the continuity between terminals 5 and 6.

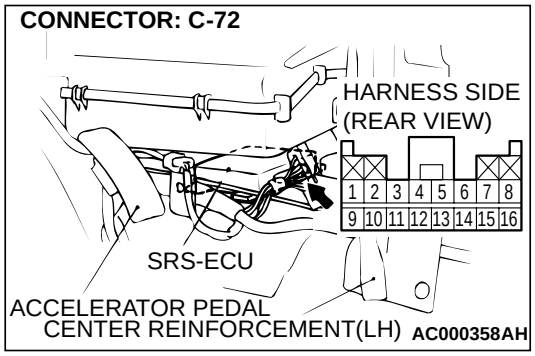
- There should be open circuit.

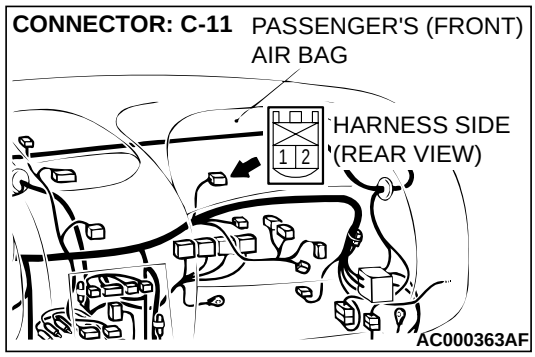


Q: Is the continuity normal?

YES : Eras the DTC memory, and recheck if any DTC sets. If DTC 24 sets, replace the SRS-ECU. Refer to P.52B-142. Then go to Step 7.

NO : Go to Step 6.





STEP 6. Check the harness for short circuit between SRS-ECU connector C-72 (terminal No.5 and 6) and passenger's side air bag module connector C-11 (terminal No.1 and 2).

Q: Are harness wires between SRS-ECU connector C-72 (terminal No.5 and 6) and passenger's side air bag module connector C-11 (terminal No.1 and 2) in good condition?

YES : Go to Step 7.

NO : Repair the harness wires between SRS-ECU connector C-72 and passenger's side air bag module connector C-11. Then go to Step 7.

STEP 7. Check the DTC.

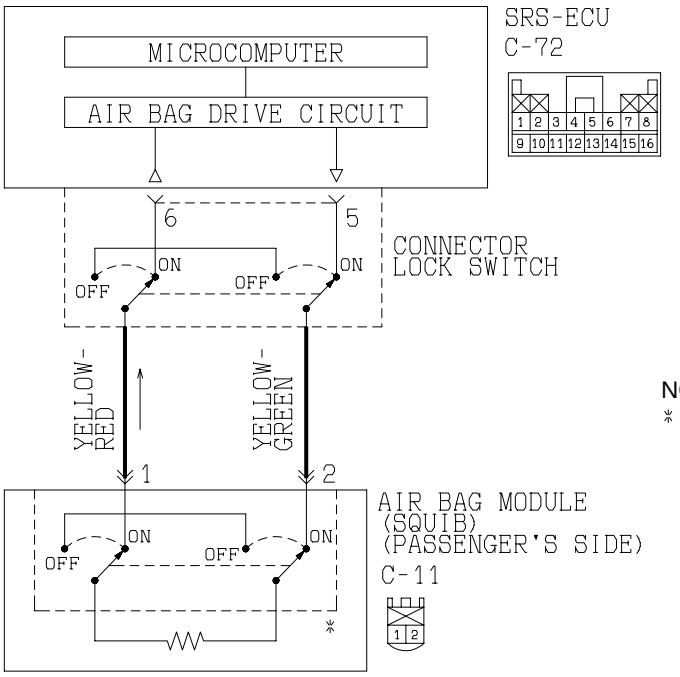
Q: Is DTC 24 output?

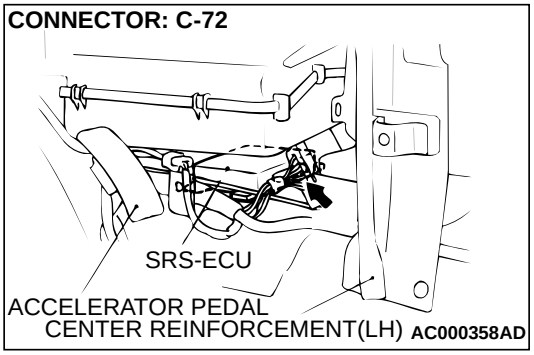
YES : Return to Step 1.

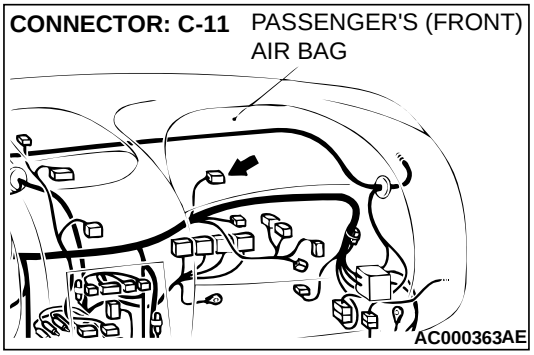
NO : This diagnosis is complete. (If no malfunctions are not found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.)

DTC 25 : Passenger's (Front) Air Bag Module (Squib) System Fault 2 (Open in the Squib Circuit)

Driver's Air Bag Module (Squib) Circuit







CIRCUIT OPERATION

- The SRS-ECU judges how severe a collision is by detecting signals from the front air bag analog G-sensor. If the impact is over a predetermined level, the SRS-ECU outputs an ignition signal. At this time, if the front air bag safing G-sensor is on, the SRS air bag will inflate.
- The ignition signal is input to the air bag module via the clock spring to inflate the air bag.

DTC SET CONDITIONS

- This DTC is set if there is abnormal resistance between the input terminals of the passenger's air bag module (squib). The most likely causes for this code to be set are shown in the table below: However, if no DTC resets, the SRS warning light will be switched off (DTC will be retained).

TROUBLESHOOTING HINTS

- Open circuit in the passenger's air bag module (squib) circuit
- Improper connector contact
- Malfunction of the SRS-ECU

TSB Revision

DIAGNOSIS

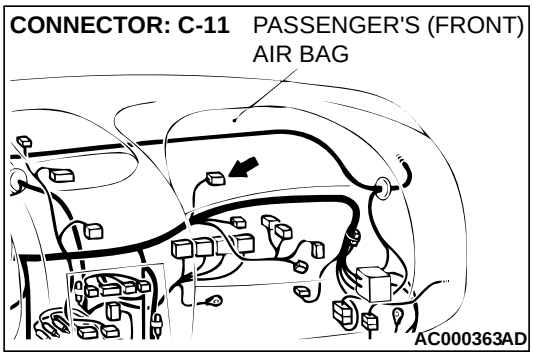
Required Special Tools:

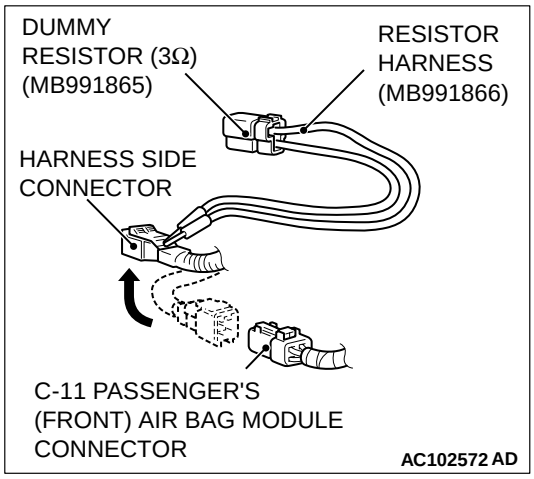
- MB991502: Scan Tool (MUT-II)
- MB991865: Dummy resister
- MB991866 Resister harness

STEP 1. Check the passenger's air bag module.

(1) Disconnect the negative battery terminal.

(2) Unclip passenger's air bag module connector C-11.





(3) Connect special tool MB991865 to special tool MB991866.

⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(4) Disconnect the passenger's air bag module connector C-11, and insert special tool MB991866 into the harness side connector by backprobing.

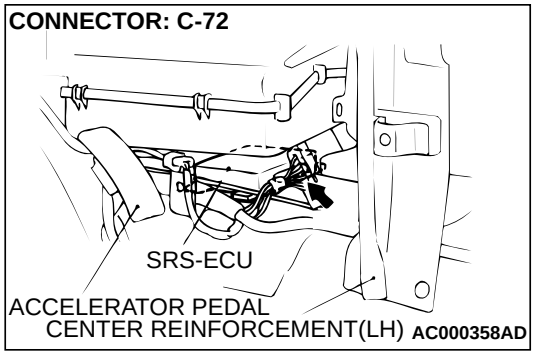
(5) Connect the negative battery terminal.

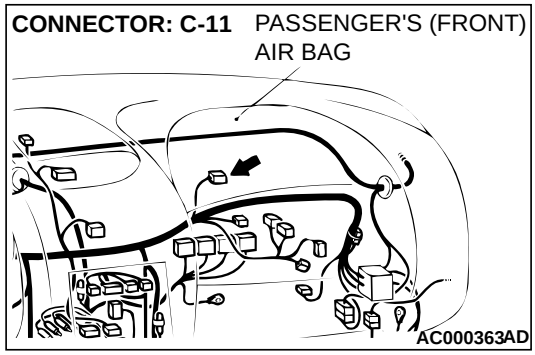
(6) Erase the DTC memory, and then recheck the DTC.

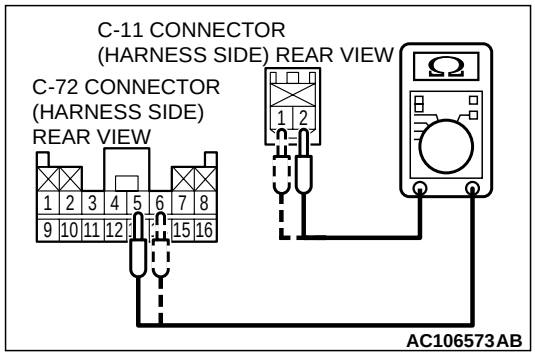
Q: Is DTC 25 output?

YES : Go to Step 2.

NO : Replace the passenger's air bag module. Refer to P.52B-144. Then go to Step 3.







STEP 2. Check the harness for open circuit between SRS-ECU and the passenger's side air bag module.

(1) Unclip passenger's air bag module connector C-11.
(2) Disconnect SRS-ECU connector C-72 and passenger's air bag module connector C-11, and measure at the wiring harness side.

⚠ CAUTION
Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(3) Check the continuity between the following terminals.

C-72 connector		C-11 connector
5	-	2
6	-	1

- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Erase the DTC memory, and recheck if any DTC. If DTC 25 sets, replace the SRS-ECU. Refer to P.52B-142. Then go to Step 3.
NO : Repair the harness wires between SRS-ECU connector C-72 and passenger's side air bag module connector C-11. Then go to Step 3.

STEP 3. Check the DTC.

Q: Is DTC 25 output?

YES : Return to Step 1.
NO : This diagnosis is complete. (If no malfunctions are not found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.)

DTC 34: Connector Lock System Detects Connector Unlocked.

DTC SET CONDITIONS

- This DTC is set if a poor connection at the SRS-ECU is detected. However, if the vehicle condition returns to normal, DTC number 34 will be automatically erased, and the SRS warning light will go out.

TROUBLESHOOTING HINTS

- Damaged connectors
- Malfunction of the SRS-ECU

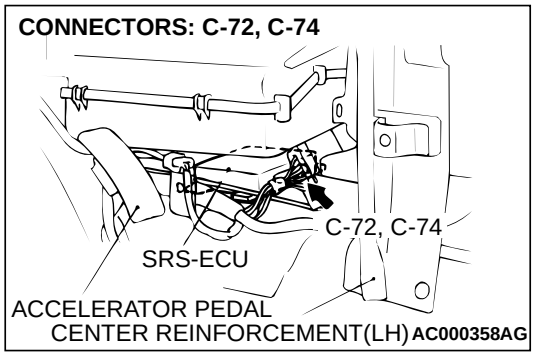
DIAGNOSIS

STEP 1. Check the SRS-ECU connector C-72 <Vehicles without SRS side air bag>/C-72 and C-74 <Vehicles with SRS side air bag>.

Q: Are connectors correctly engaged?

YES : Go to Step 2.

NO : Engage the connectors correctly. Then go to Step 3.



STEP 2. Check SRS-ECU connector C-72 <Vehicles without SRS side air bag>/C-72 and C-74 <Vehicles with SRS side air bag> for damage. If SRS-ECU connectors C-72 and C-74 are damaged, repair or replace them.

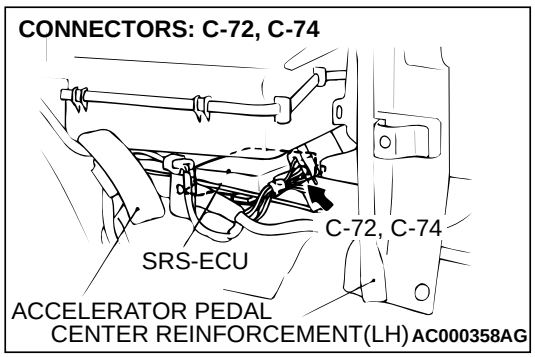
(1) Disconnect SRS-ECU connectors C-72 and C-74.

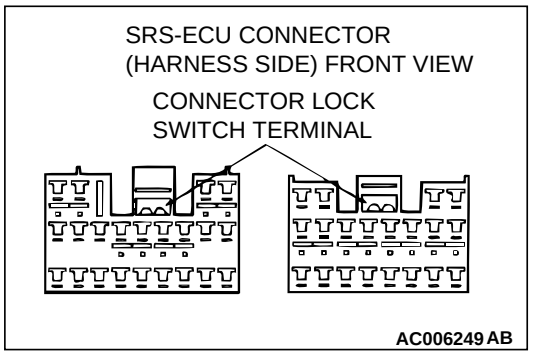
(2) Check the connector lock switch terminal inside the harness side connector for improper contact or deformation.

Q: Are SRS-ECU connectors C-72 and C-74 in good condition?

YES : Eras the DTC memory, and recheck if any DTC sets. If DTC 34 sets, replace the SRS-ECU. Refer to P.52B-142. Then go to Step 3.

NO : Repair or replace the SRS-ECU connector C-72, C-74. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 3.





STEP 3. Check for DTC.

Q: Is DTC 34 output?

YES : There is no action to be taken.

NO : This diagnosis is complete. (If no malfunctions are not found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.)

DTC 35: SRS-ECU Air Bag Condition Monitor Detects Deployed Air Bag.

DTC SET CONDITIONS

- This DTC is set after the air bag has deployed. If this code is output before the air bag has deployed, the cause is probably a malfunction inside the SRS-ECU.

TROUBLESHOOTING HINTS

- Malfunction of the SRS-ECU

DIAGNOSIS

Replace the SRS-ECU. (Refer to P.52B-142.)

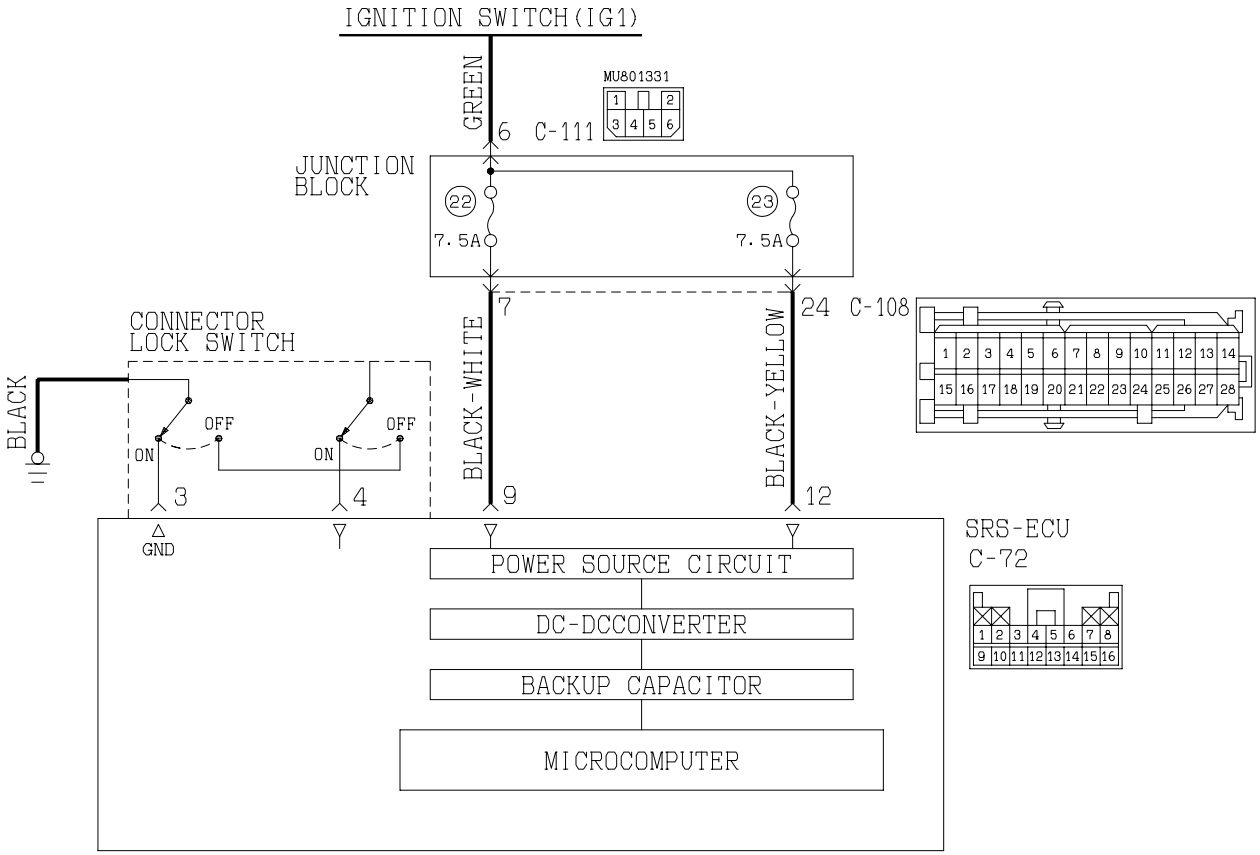
Q: Is DTC 35 output?

YES : There is no action to be taken.

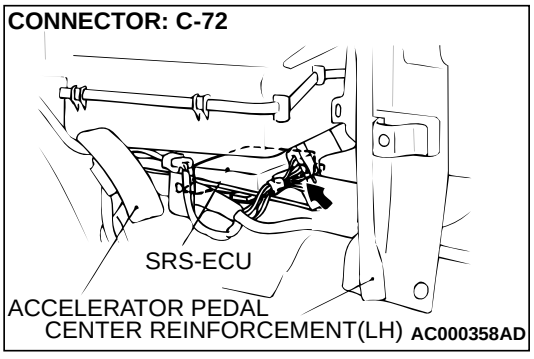
NO : This diagnosis is complete.

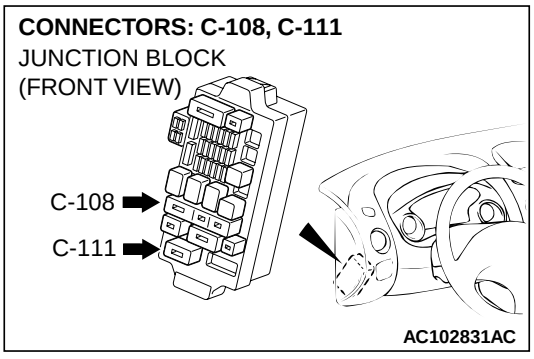
DTC 41: IG1 Power Circuit System (Fuse No.23 Circuit)

IG1 Power Circuit System (Fuse No.23 Circuit)



W3S04M01AA
AC106617AB





CIRCUIT OPERATION

- The SRS-ECU is powered from the ignition switch (IG1).
- The SRS-ECU power is supplied from two circuits. Even if one circuit is shut off, the air bag can inflate.

DTC SET CONDITIONS

- This DTC is set if the voltage between the IG1 terminals (fuse No.23 circuit) and ground is lower than a predetermined value for a continuous period of five second or more. However, if the vehicle condition returns to normal, DTC numbers 41 will be automatically erased, and the SRS warning light will switch off.

TROUBLESHOOTING HINTS

- Damaged wiring harnesses or connectors
- Malfunction of the SRS-ECU

DIAGNOSIS

STEP 1. Check junction block multi-purpose fuse number 23.

Q: Is the fuse burned out?

NO : Go to Step 2.
YES : Go to Step 4.

STEP 2. Check the circuit between the SRS-ECU and the ignition switch (IG1).

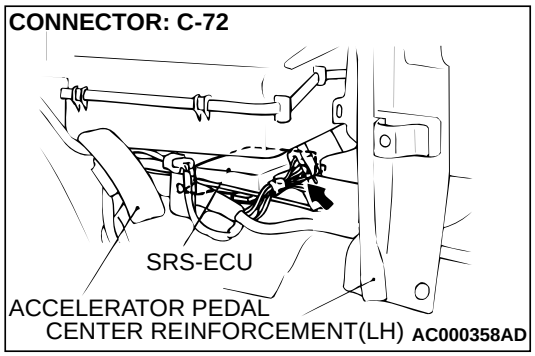
(1) Disconnect SRS-ECU connector C-72.
(2) Connect the negative battery terminal.
(3) Turn the ignition switch to the "ON" position.
(4) Measure at the wiring harness side.

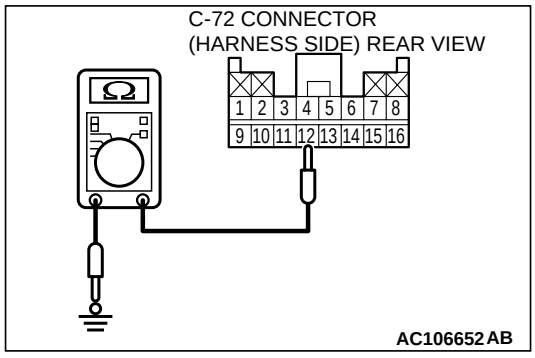
⚠ CAUTION
Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

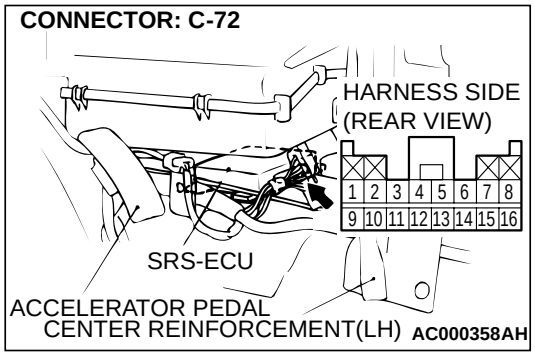
(5) Measure the Voltage between terminal 12 and body ground
- Voltage should be 9 volts or more

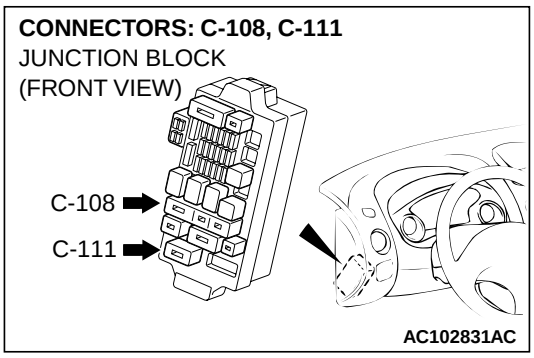
Q: Is the voltage normal?

YES : Erase the DTC memory, and recheck if any DTC sets. If DTC 41 sets, replace the SRS-ECU. Refer to P.52B-142. Then go to Step 10.
NO : Go to Step 3.









STEP 3. Check the harness for open circuit between SRS-ECU connector C-72 (terminal No.9) and the ignition switch (IG1).

NOTE: After inspecting intermediate connectors C-108 and C-111, inspect the wiring harness. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

Q: Are harness between SRS-ECU connector C-72 (terminal No.9) and the ignition switch (IG1) in good condition?

YES : Go to Step 10.

NO : Repair the harness wire between SRS-ECU connector C-72 and the ignition switch (IG1). Then go to Step 10.

STEP 4. Check a burned-out fuse.

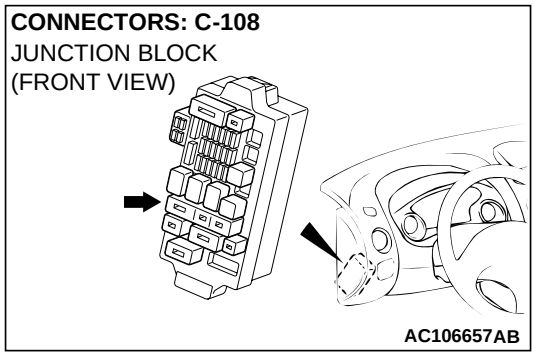
(1) Replace the fuse.
(2) Turn the ignition switch to the "ON" position, wait for at least one minute and then turn the switch off.
(3) Check the fuse.

Q: Is the fuse in good condition?

YES : . Then go to Step 10.

NO : Go to Step 5.

STEP 5. Check the harness for short circuit to ground between the SRS-ECU and the junction block.



(1) Disconnect junction block connector C-108, and measure at the wiring harness side.

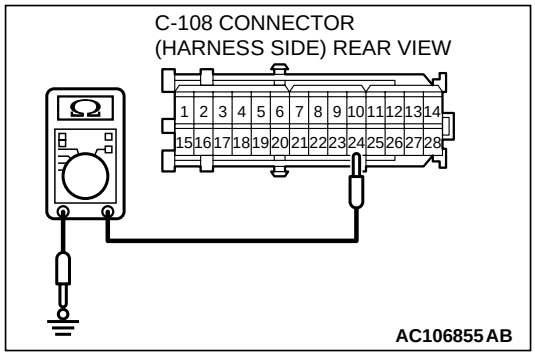
⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

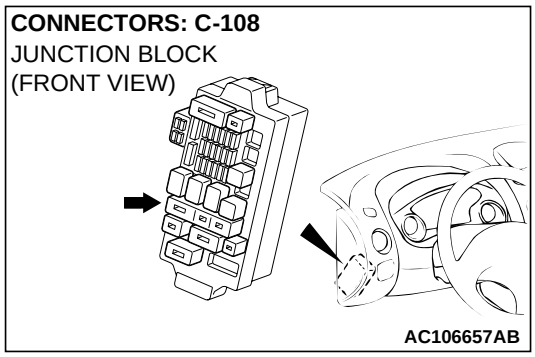
(2) Check the continuity between terminals 24 and body ground.
- There should be open circuit.

Q: Is the continuity normal?

YES : Go to Step 6.
NO : Go to Step 8.



STEP 6. Check the harness for short circuit to ground between the junction block and the combination meter.



(1) Disconnect junction block connector C-108, and measure at the wiring harness side.

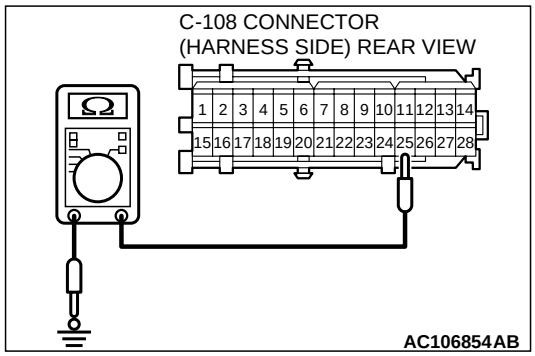
⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

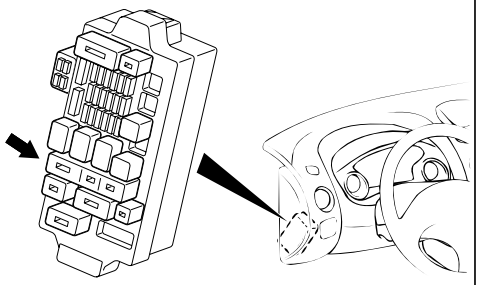
(2) Check the continuity between terminals 25 and body ground.
- There should be open circuit.

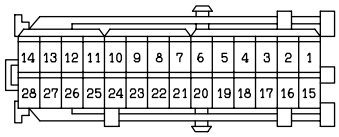
Q: Is the continuity normal?

YES : Check the other circuit, which flows through multi-purpose fuse number 23.
NO : Go to Step 7.



CONNECTOR: C-108
JUNCTION BLOCK
(FRONT VIEW)

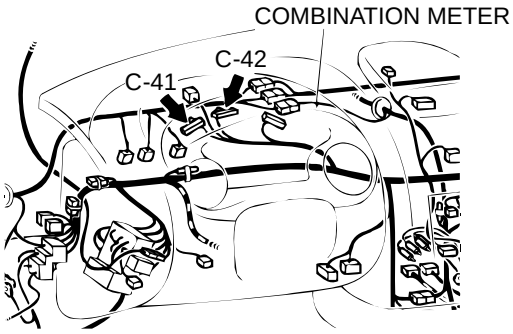




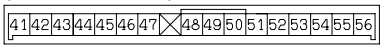
C-108 CONNECTOR
(HARNESS SIDE)
FRONT VIEW

AC106627AB

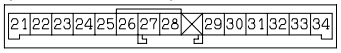
CONNECTORS: C-41, C-42



C-41 CONNECTOR
(HARNESS SIDE) FRONT VIEW



C-42 CONNECTOR
(HARNESS SIDE) FRONT VIEW



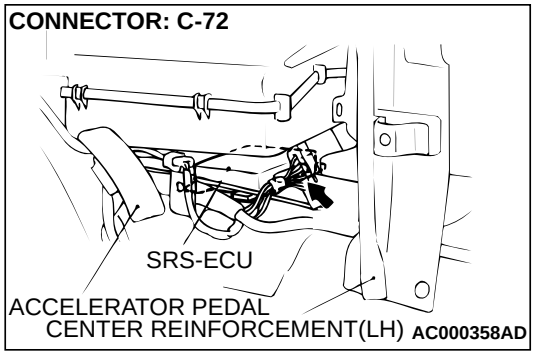
AC106856AB

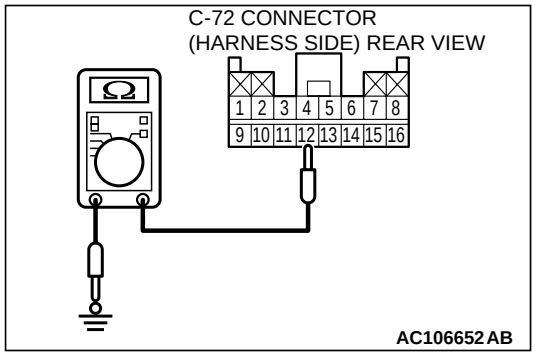
STEP 7. Check the harness for short circuit to ground between junction block connector C-108 (terminal No.25) and combination meter connector C-41 (terminal No.52).
NOTE: After inspecting intermediate connectors C-42, inspect the wiring harness. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

Q: Are harness wires between junction block connector C-108 (terminal No.25) and combination meter connector C-41(terminal No.52) in good condition?

YES : Go to Step 10.

NO : Repair the harness wires between junction block connector C-108 and combination connector C-41. Then go to Step 10.





STEP 8. Check the harness for short circuit to ground between the SRS-ECU and the junction block.

(1) Disconnect SRS-ECU connector C-72, and measure at the wiring harness side.

⚠ CAUTION

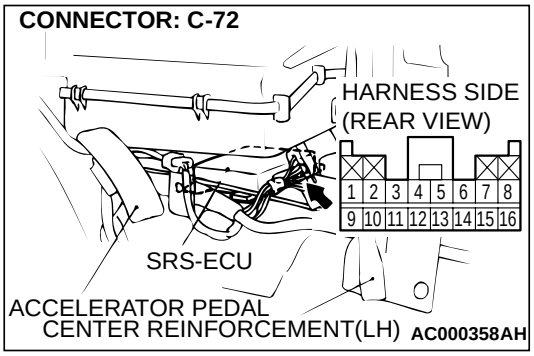
Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

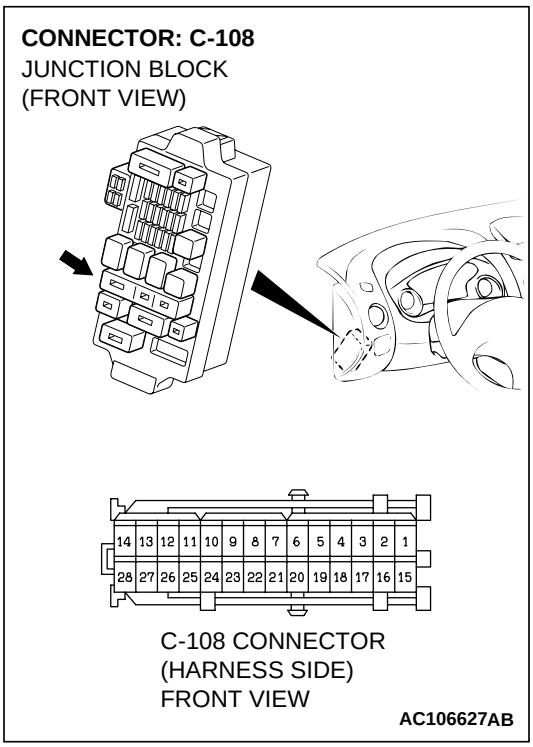
(2) Check the continuity between terminals 12 and body ground.
- There should be open circuit.

Q: Is the circuit normal?

YES : Erase the DTC memory, and recheck if any DTC sets. If DTC 41 sets, replace the SRS-ECU. Refer to P.52B-142. Then go to Step 10.

NO : Go to Step 9.





STEP 9. Check the harness for short circuit ground between SRS-ECU connector C-72 (terminal No.24) and junction block connector C-108 (terminal No.12).

Q: Are harness wires between SRS-ECU connector C-72 (terminal No.24) and junction block connector C-108 (terminal No.12) in good condition?

YES : Go to Step 10.

NO : Repair the harness wires between SRS-ECU connector C-72 and junction block connector C-108. Then go to Step 10.

STEP 10. Check for DTC.

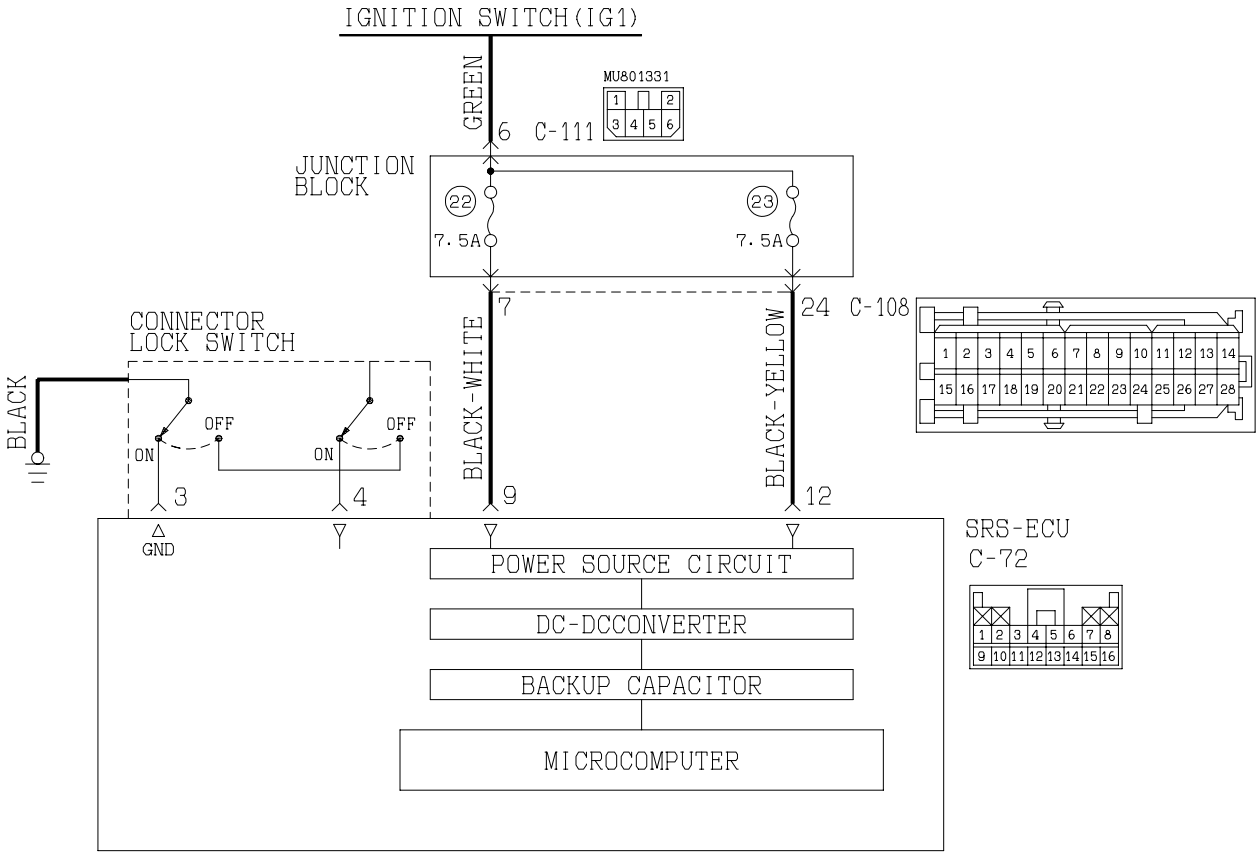
Q: Is DTC 41 output?

YES : Return to Step 1.

NO : This diagnosis is complete. (If no malfunctions are not found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.)

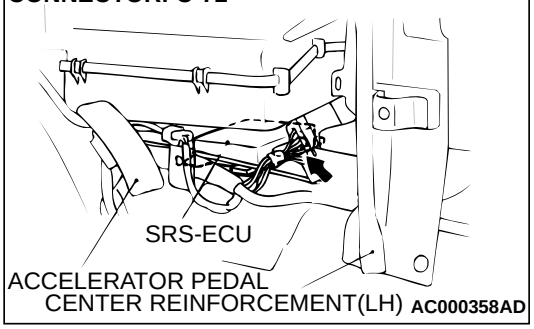
DTC 42: IG1 Power Circuit System (Fuse No.22 Circuit)

IG1 Power Circuit System (Fuse No.22 Circuit)



W3S04M01AA
AC106617AC

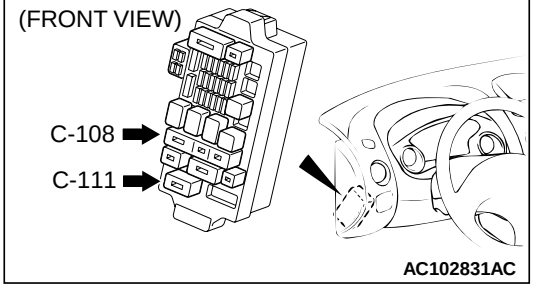
CONNECTOR: C-72



AC000358AD

CONNECTORS: C-108, C-111

JUNCTION BLOCK
(FRONT VIEW)



AC102831AC

TSB Revision

CIRCUIT OPERATION

- The SRS-ECU is powered from the ignition switch (IG1).
- The SRS-ECU power is supplied from two circuits. Even if one circuit is shut off, the air bag can inflate.

DTC SET CONDITIONS

- This DTC is set if the voltage between the IG1 terminals (fuse No.22 circuit) and ground is lower than a predetermined value for a continuous period of five second or more. However, if the vehicle condition returns to normal, DTC numbers 42 will be automatically erased, and the SRS warning light will switch off.

TROUBLESHOOTING HINTS

- Damaged wiring harnesses or connectors
- Malfunction of the SRS-ECU

DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991223 (MB991222): Harness set (Probe)

STEP 1. Check junction block multi-purpose fuse number 22.

Q: Is the fuse burned out?

NO : Go to Step 2.
YES : Go to Step 4.

STEP 2. Check the harness for open circuit between the SRS-ECU and the ignition switch (IG1).

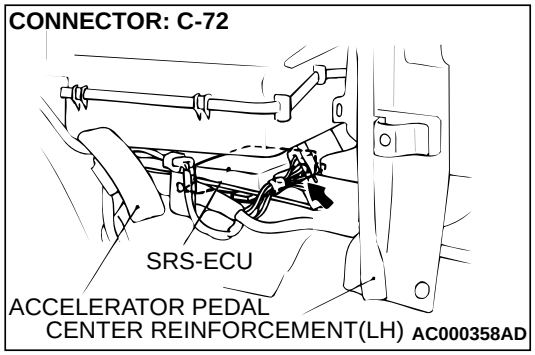
Measurement at SRS-ECU connector C-72.
(1) Disconnect SRS-ECU connector C-72.
(2) Connect the negative battery terminal.
(3) Turn the ignition switch to the "ON" position.

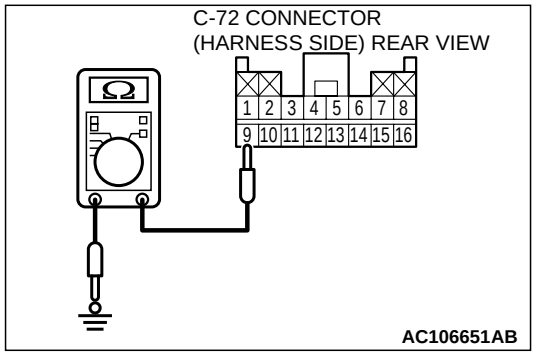
⚠ CAUTION
Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

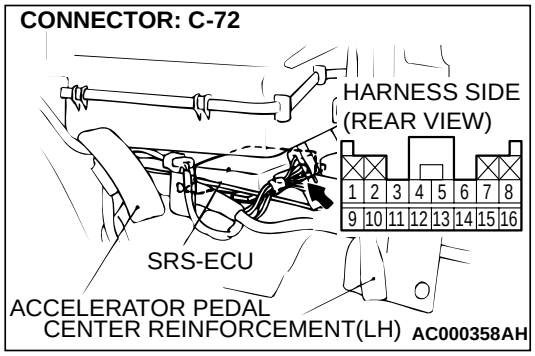
(4) Measure at the wiring harness side.
(5) Measure the voltage between terminal 9 and body ground
- Voltage should be 9 volts or more.

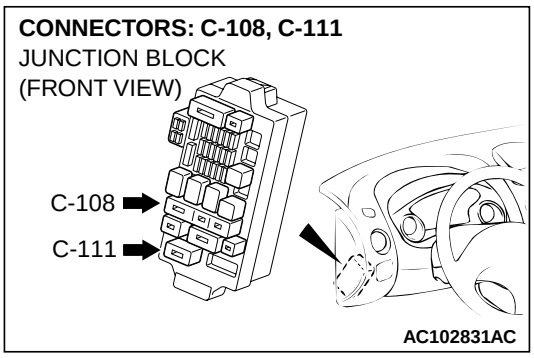
Q: Is the voltage normal?

YES : Erase the DTC memory, and recheck if any DTC sets. If DTC 42 sets, replace the SRS-ECU. Refer to P.52B-142. Then go to Step 8.
NO : Go to Step 3.









STEP 3. Check the harness for open circuit between SRS-ECU connector C-72 (terminal No.9) and the ignition switch (IG1).

NOTE: After inspecting intermediate connectors C-108 and C-111, inspect the wiring harness. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.

Q: Are harness wires between SRS-ECU connector C-72 (terminal No.9) and the ignition switch (IG1) in good condition?

YES : Go to Step 8.

NO : Repair the harness wires between SRS-ECU connector C-72 and the ignition switch (IG1). Then go to Step 8.

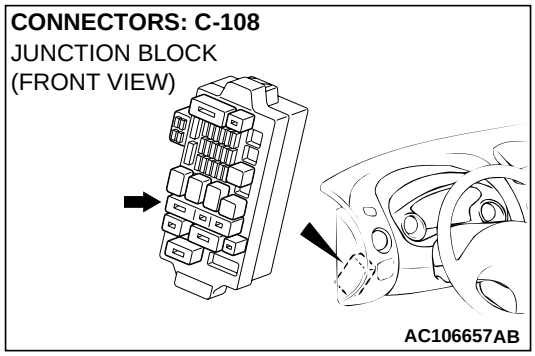
STEP 4. Check a burned-out fuse.

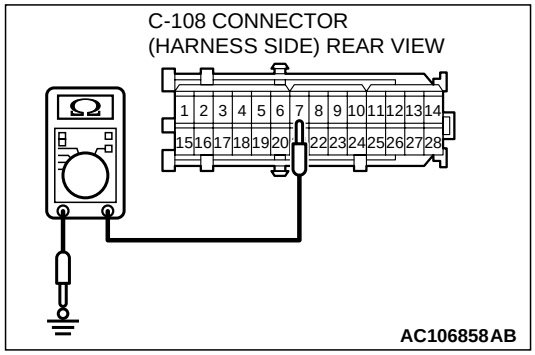
(1) Replace the fuse.
(2) Turn the ignition switch to the "ON" position, wait for at least one minute and then turn the switch off.
(3) Check the fuse.

Q: Is the fuse in good condition?

YES : Go to Step 8.

NO : Go to Step 5.





STEP 5. Check the circuit between the SRS-ECU and the junction block.

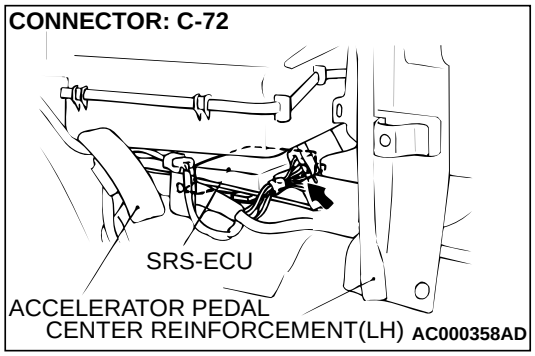
(1) Measure at junction block connector C-108.
(2) Disconnect junction block connector C-108, and measure at the wiring harness side.

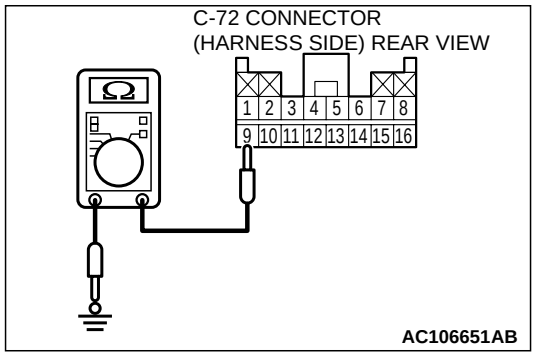
⚠ CAUTION
Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(3) Check the continuity between terminals 7 and body ground.
- There should be open circuit.

Q: Is the circuit normal?

YES : Check the other circuit, which flows through multi-purpose fuse number 22.
NO : Go to Step 6.





STEP 6. Check the harness for short circuit to ground between the SRS-ECU and the junction block.

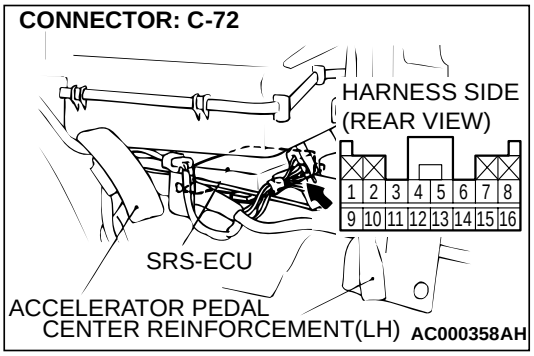
(1) Disconnect SRS-ECU connector C-72, and measure at the wiring harness side.

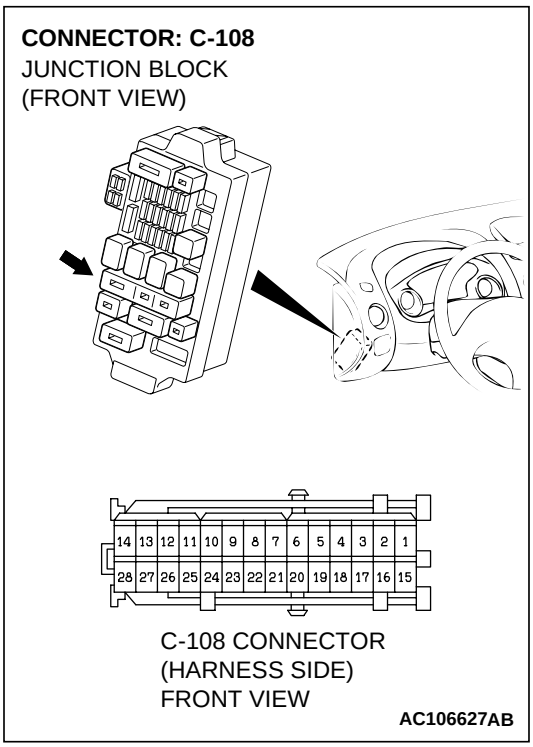
⚠ CAUTION
Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(2) Check the continuity between terminals 9 and body ground.
- There should be open circuit.

Q: Is the continuity normal?

YES : Erase the DTC memory, and recheck if any DTC sets. If DTC 42 sets, replace the SRS-ECU. Refer to P.52B-142. Then go to Step 8.
NO : Go to Step 7.





STEP 7. Check the harness wires between SRS-ECU connector C-72 (terminal No.9) and junction block connector C-108 (terminal No.7).

Q: Are harness wires between SRS-ECU connector C-72 (terminal No.9) and junction block connector C-108 (terminal No.7) in good condition?

YES : Go to Step 8.

NO : Repair the harness wires between SRS-ECU connector C-72 and junction block connector C-108. Then go to Step 8.

STEP 8. Check for DTC.

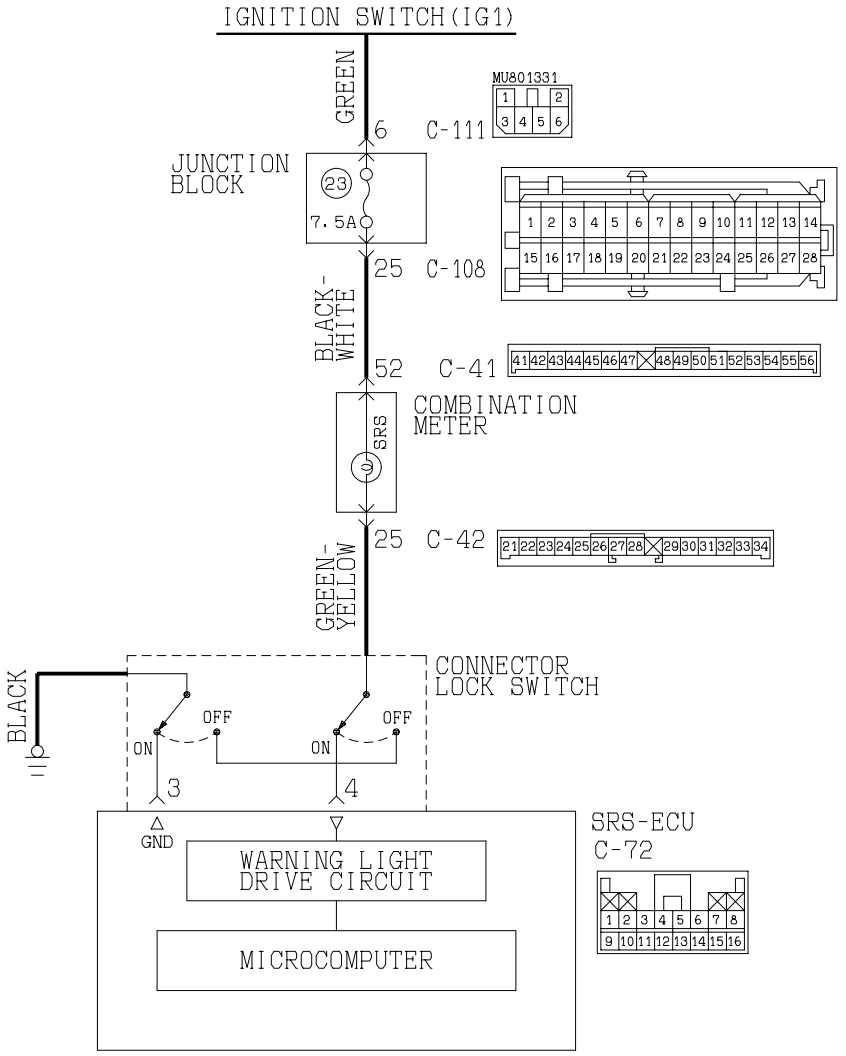
Q: Is DTC 42 output?

YES : Replace the SRS-ECU. Refer to P.52B-142.

NO : This diagnosis is complete. (If no malfunctions are not found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.)

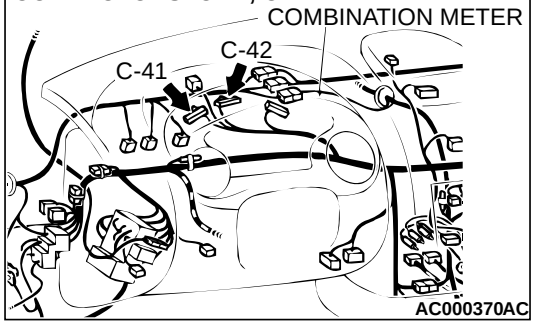
DTC 43: SRS Warning Light Drive Circuit System Fault 1 (Light does not Illuminate.)

SRS Warning Light Drive Circuit



W3S04M03AA
AC106619AB

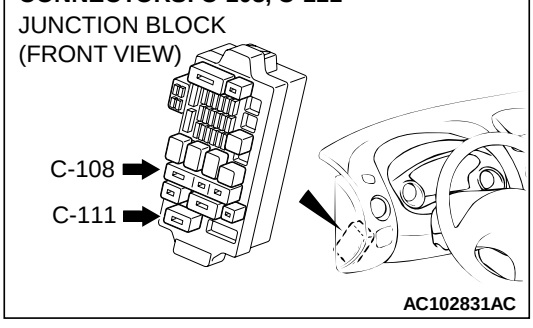
CONNECTORS: C-41, C-42



AC000370AC

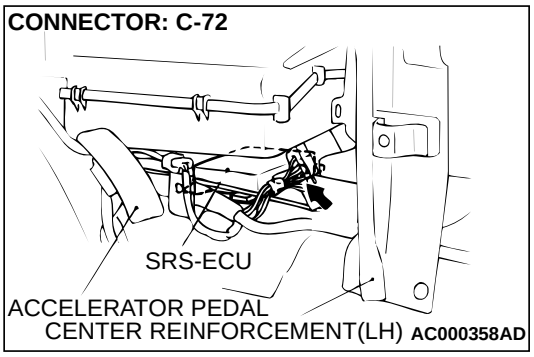
CONNECTORS: C-108, C-111

JUNCTION BLOCK
(FRONT VIEW)



AC102831AC

TSB Revision



CIRCUIT OPERATION

- Power for the SRS warning light is supplied from the ignition switch (IG1) circuit.
- The SRS warning light illuminates when the ignition switch is turned "ON" and goes out after approximately seven seconds if there is not a malfunction in the SRS system.

DTC SET CONDITIONS

- This DTC is set when an open circuit is detected for a continuous period of five seconds while the SRS-ECU is monitoring the SRS warning light and the light is OFF. (transistor OFF.) However, if the vehicle condition returns to normal, DTC 43 will be automatically erased, and the SRS warning light will go out.

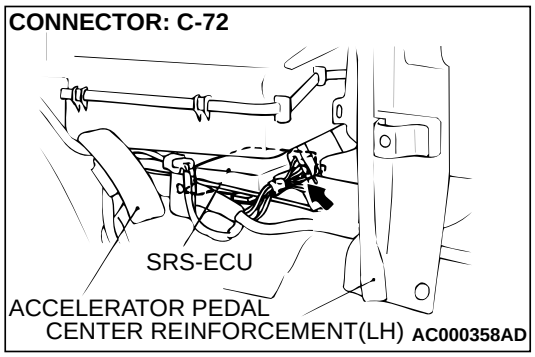
TROUBLESHOOTING HINTS

- Damaged wiring harnesses of connectors
- Blown bulb
- Malfunction of the SRS-ECU
- Malfunction of the combination meter

DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)



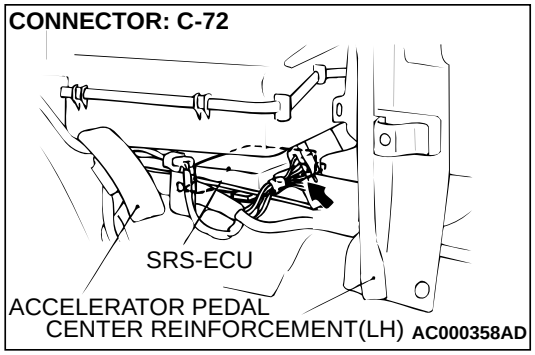
STEP 1. Check the SRS warning light.

(1) Connect the negative battery terminal.
(2) Disconnected the SRS-ECU connector C-72.
(3) Turn the ignition switch to the "ON" position.

Q: Does the warning light illuminate?

YES : Erase the DTC memory, and recheck if any DTC sets. If DTC 43 sets, replace the SRS-ECU. Refer to P.52B-142. Then go to Step 6.

NO : Go to Step 2.



STEP 2. Check the ground line at the SRS-ECU connector C-72.

(1) Disconnect SRS-ECU connector C-72.
(2) Connect the negative battery terminal.

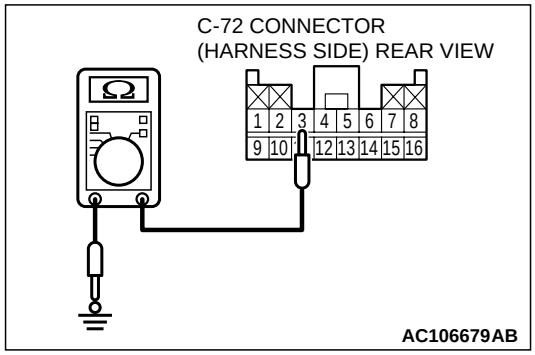
⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(3) Measure the continuity between terminal 3 and ground.
- Should be less than 2 ohm.

Q: Is the continuity normal?

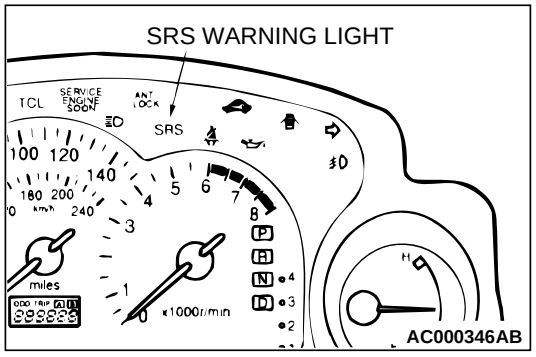
YES : Go to Step 3.
NO : Then go to Step 5.

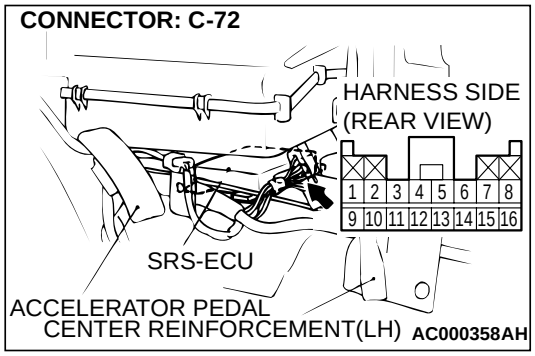


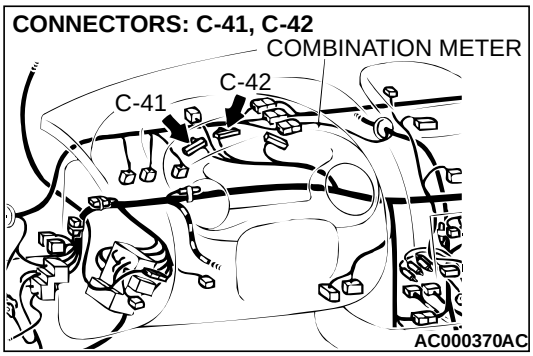
STEP 3. Check the SRS warning light bulb.

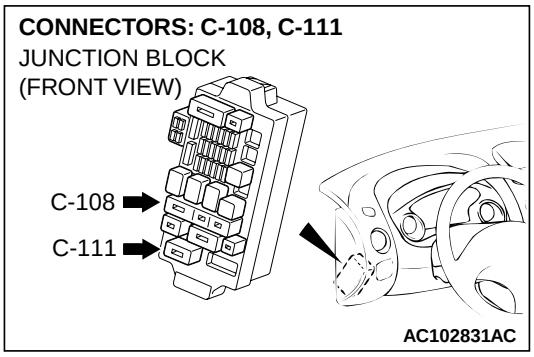
Q: Has the SRS warning light bulb blown?

YES : Replace the SRS warning light bulb. Then go to Step 6.
NO : Go to Step 4.









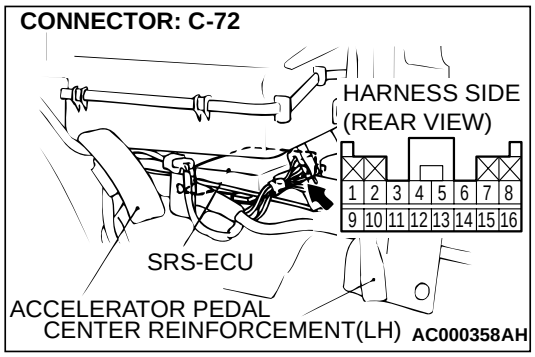
STEP 4. Check the harness for open circuit between SRS-ECU connector C-72 (terminal No.4) and the ignition switch (IG1).

NOTE: After inspecting intermediate connectors C-41, C-42, C-108, C-111 inspect the wiring harness. If intermediate connectors C-41, C-42, C-108, C-111 are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.

Q: Are the harness wires between SRS-ECU connector C-72 (terminal No.4) and the ignition switch (IG1) in good condition?

YES : Replace the combination meter.

NO : Repair the harness wires between SRS-ECU connector E-08 and the ignition switch (IG1). Then go to Step 6.



STEP 5. Check the harness for open circuit between SRS-ECU connector C-72 (terminal No.3) and ground.

Q: Is the harness wire between SRS-ECU connector C-72 (terminal No.3) and ground in good condition?

YES : Go to Step 6.

NO : Repair the harness wires between SRS-ECU connector C-72 and ground. Then go to Step 6.

STEP 6. Check for DTC.

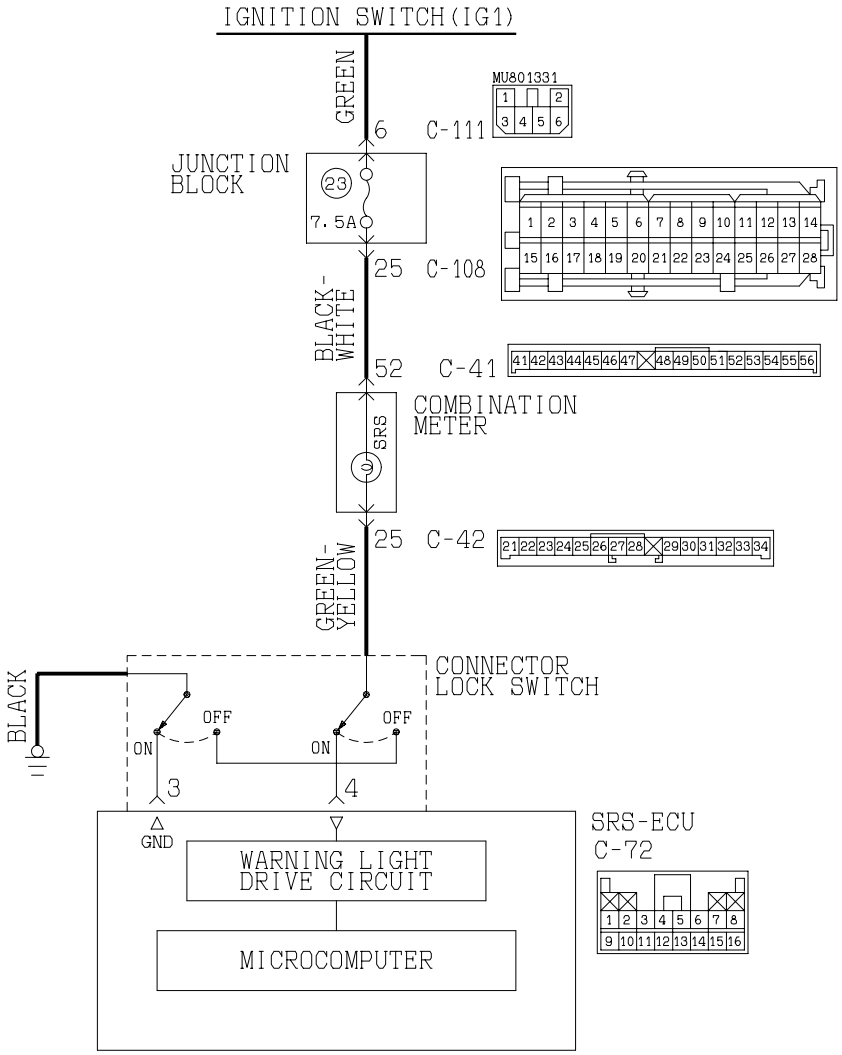
Q: Is DTC 43 output?

YES : There is no action to be taken.

NO : This diagnosis is complete. (If no malfunctions are not found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.)

DTC 43: SRS Warning Light Drive Circuit System Fault 1 (Light does not Switch Off.)

SRS Warning Light Drive Circuit



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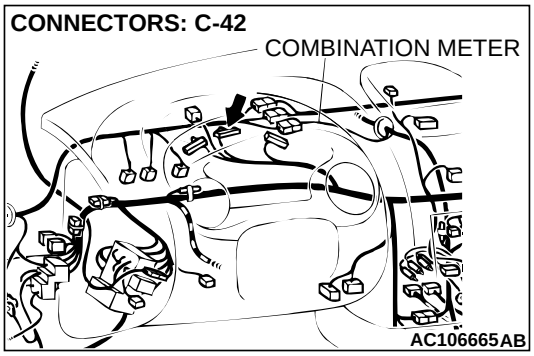
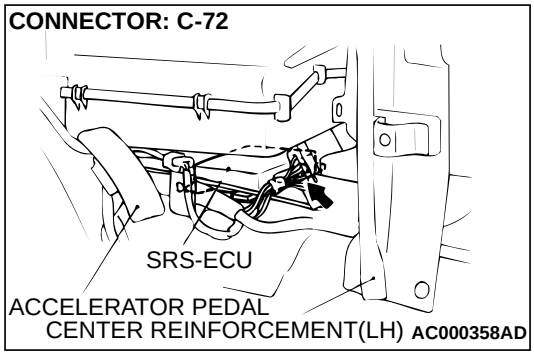
TSB Revision





CIRCUIT OPERATION

- Power for the SRS warning light is supplied from the ignition switch (IG1) circuit.
- The SRS warning light illuminates when the ignition switch is turned "ON" and goes out after approximately seven seconds if there is not a malfunction in the SRS system.

DTC SET CONDITIONS

- This DTC is set when a short to ground occurs in the harness between the SRS warning light and SRS-ECU while SRS-ECU is monitoring the light and the light is ON. However, if the vehicle condition returns to normal, DTC 43 will be automatically erased, and the SRS warning light will go out.

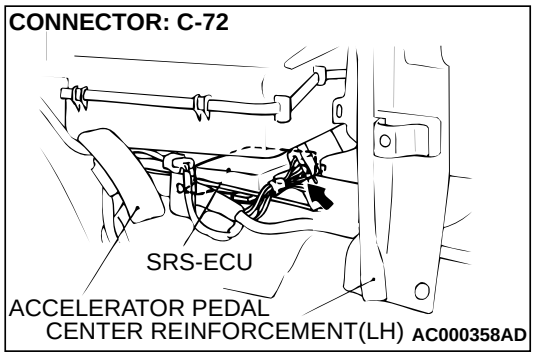
TROUBLESHOOTING HINTS

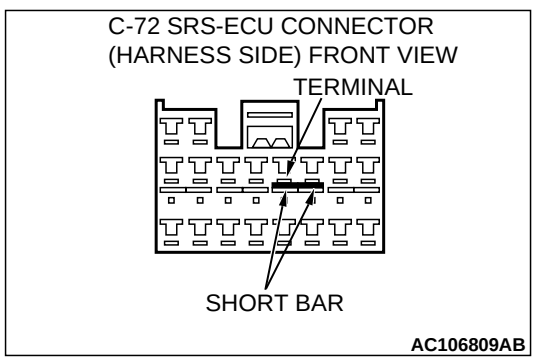
- Damaged wiring harnesses of connectors
- Malfunction of the SRS-ECU
- Malfunction of the combination meter

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)





STEP 1. Check SRS-ECU connector C-72 for damage.

(1) Disconnect SRS-ECU connectors C-72.
(2) Check the warning light terminal short bar inside the harness side connector for improper contact or deformation.

Q: Is SRS-ECU connectors C-72 good condition?

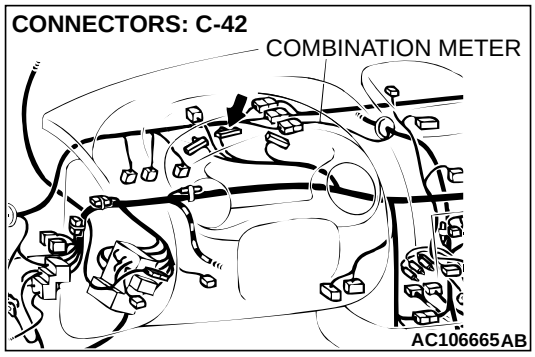
YES : Then go to Step 2.
NO : Repair or replace the SRS-ECU connector C-72. Then go to Step 4.

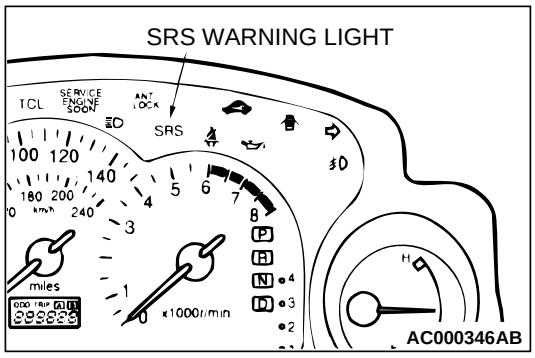
STEP 2. Check the SRS warning light.

(1) Disconnect the combination meter connector C-42.
(2) Connect the negative battery cable.
(3) Turn the ignition switch to the "ON" position.

Q: Does the SRS warning light go out when combination meter connector C-42 is disconnected?

YES : Go to Step 3.
NO : Replace the combination meter. Then go to Step 4.

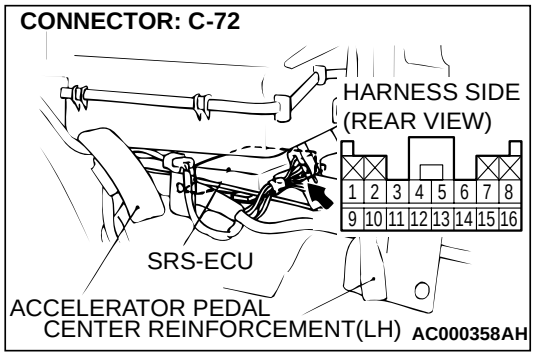


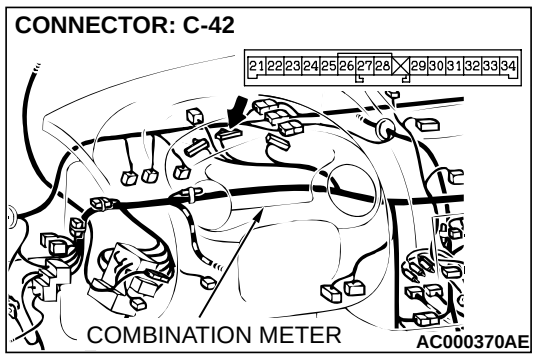


STEP 3. Check the harness for short circuit to ground between SRS-ECU connector C-72 (terminal No.3) and combination meter connector C-42 (terminal No.25).

Q: Is the harness wire between the SRS-ECU connector C-72 (terminal No.3) and combination meter connector C-42 (terminal No.25) in good condition?

YES : Erase the DTC memory, and recheck if any DTC sets. If DTC 43 sets, replace the SRS-ECU. Refer to P.52B-142. Then go to Step 4.
NO : Repair the harness wire between SRS-ECU connector C-72 and combination meter connector C-42. Then go to Step 4.





STEP 4. Check for DTC.

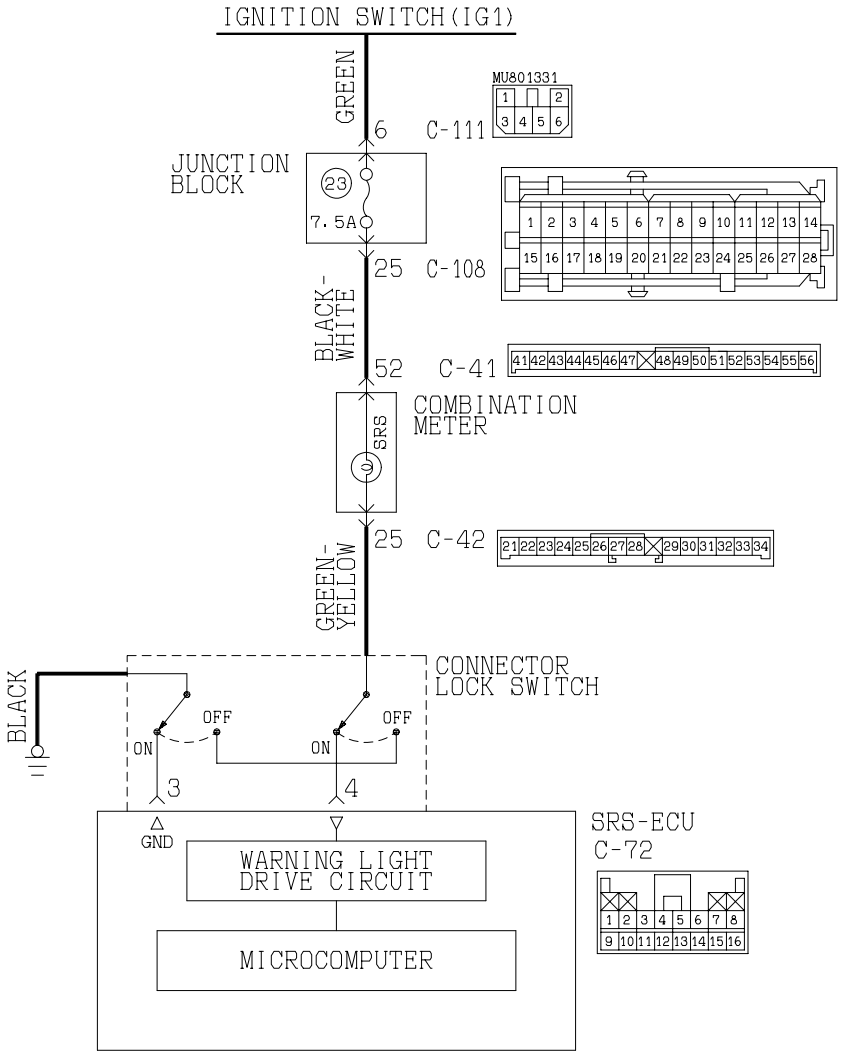
Q: Is DTC 43 output?

YES : There is no action to be taken.

NO : This diagnosis is complete. (If no malfunctions are not found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.)

DTC 44: SRS Warning Light Drive Circuit System Fault 2

SRS Warning Light Drive Circuit



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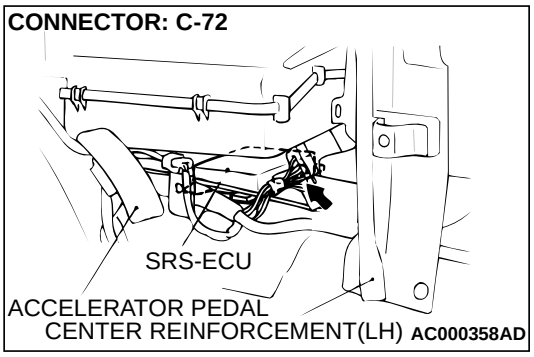


CIRCUIT OPERATION

- Power for the SRS warning light is supplied from the ignition switch (IG1) circuit.
- The SRS warning light illuminates when the ignition switch is turned "ON" and goes out after approximately seven seconds if there is not a malfunction in the SRS system.

DTC SET CONDITIONS

This DTC is set under one of the following cases while the SRS-ECU is monitoring the warning light drive circuit:

- When a short circuit occurs in the warning light drive circuit.
- When a malfunction is detected in the output transistor inside the SRS-ECU.
- However, if the vehicle condition returns to normal, DTC 44 will be automatically erased, and the SRS warning light will go out.

TROUBLESHOOTING HINTS

- Damaged wiring harnesses of connectors
- Malfunction of the SRS-ECU

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)

STEP 1. Check the SRS warning light drive circuit system. Refer to P.52B-129.

Q: Is the SRS warning light drive circuit normal?

YES : Erase the DTC memory, and recheck if any DTC sets. If DTC 43 sets, replace the SRS-ECU. Refer to P.52B-142. Then go to Step 2.

STEP 2. Check for DTC.

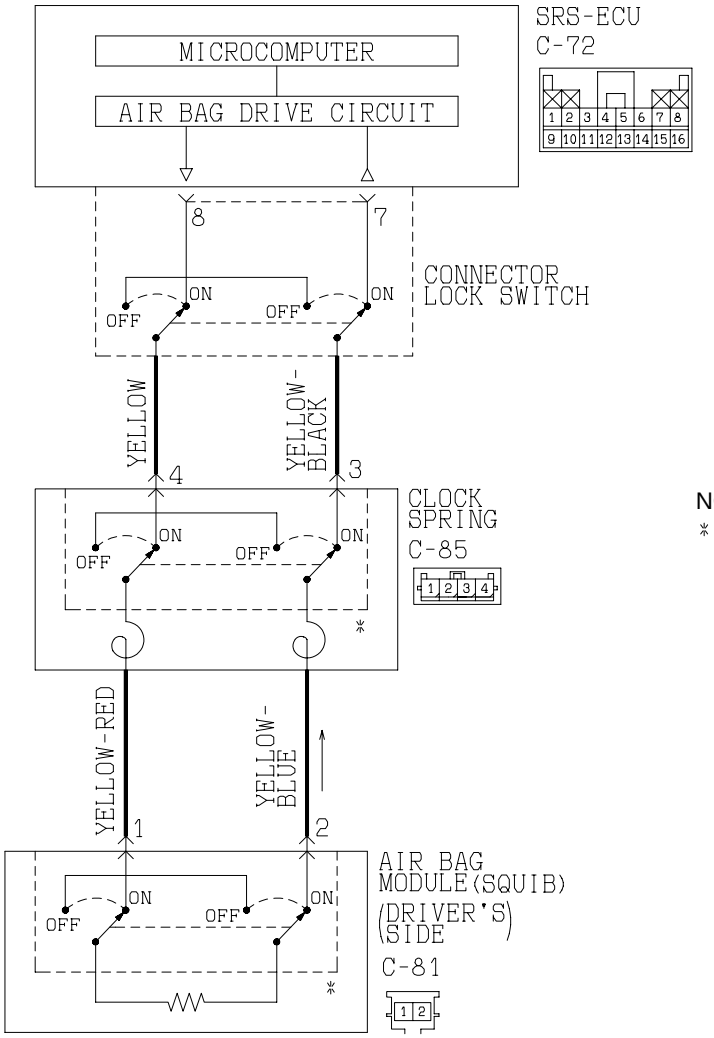
Q: Is DTC 44 output?

YES : There is no action to be taken.

NO : This diagnosis is complete. (If no malfunctions are not found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent MalfunctionP.00-6.)

DTC 61: Driver's Air Bag Module (Squib) System Fault for Power Supply Circuit (Short-Circuited to Power Supply)

Driver's Air Bag Module (Squib) Circuit



NOTE
*: CONNECTOR LOCK SWITCH

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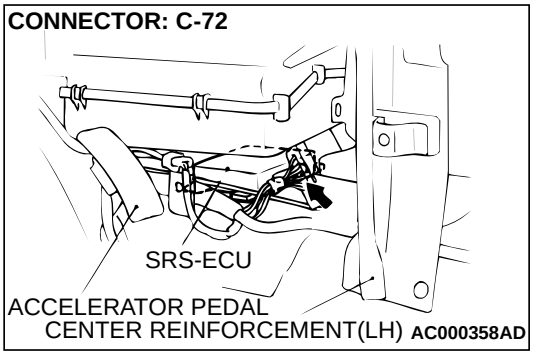
AC106622 AB

CONNECTOR: C-72



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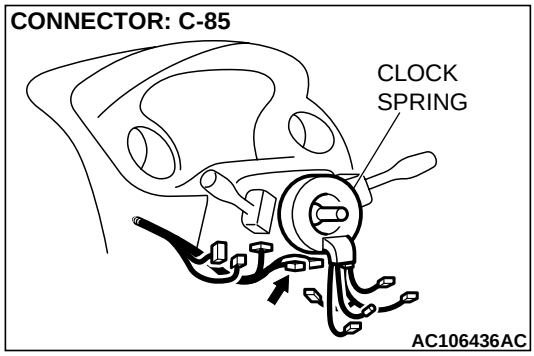
CONNECTOR: C-85



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TSB Revision

CIRCUIT OPERATION

- The SRS-ECU judges how severe a collision is by detecting signals from the front air bag analog G-sensor. If the impact is over a predetermined level, the SRS-ECU outputs an ignition signal. At this time, if the front air bag safing G-sensor is on, the SRS air bag will inflate.
- The ignition signal is input to the air bag module via the clock spring to inflate the air bag.

DTC SET CONDITIONS

- This DTC is set if there is abnormal resistance between the input terminals of the driver's side air bag module (squib). However, if no DTC resets, the SRS warning light will be switched off (DTC will be retained).

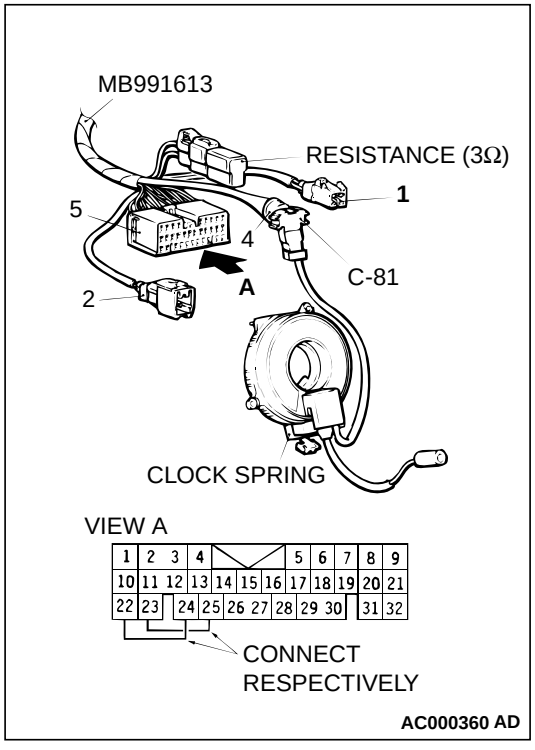
TROUBLESHOOTING HINTS

- Malfunction of the clock spring
- Damaged harness wires and connectors
- Short to the power supply in the driver's air bag module (squib) harness
- Malfunction of the SRS-ECU

DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991613: SRS Check Harness
- MB991865: Dummy resister
- MB991866: Resister harness

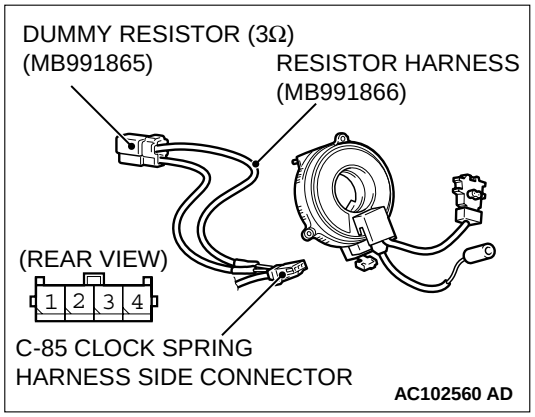


STEP 1. Check the driver's air bag module.

(1) Disconnect the negative battery terminal.
(2) Remove the driver's air bag module. (Refer to P.52B-144.)
(3) Connect connector (4) of special tool MB991613 to clock spring connector C-81.
(4) Connect connector (1) of special tool MB991613 to connector (2).
(5) Connect terminals 22 to 24, and terminals 23 to 25 of special tool MB991613 to connector (5).
(6) Connect the clock spring to the body wiring harness.
(7) Connect the negative battery terminal.
(8) Erase the DTC memory, and then recheck the DTC.

Q: Is DTC 61 set?

YES : Go to Step 2.
NO : Replace the driver's air bag module. Then go to Step 5.



STEP 2. Check the clock spring.

(1) Disconnect the negative battery terminal.
(2) Disconnect the clock spring connector C-85.
(3) Connect special tool MB991865 to special tool MB991866.

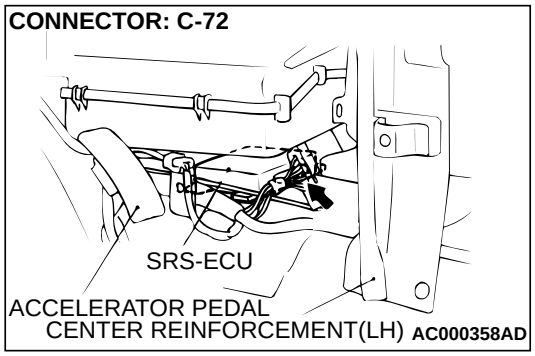
⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(4) Insert special tool MB991866 into clock spring harness side connector C-85 (terminal No.3 and 4) by backprobing.
(5) Connect the negative battery terminal.
(6) Erase the DTC memory, and then recheck the DTC.

Q: Is DTC 61 output?

YES : Go to Step 3.
NO : Replace the clock spring. Then go to Step 5.



STEP 3. Check the harness for short circuit to power supply between the SRS-ECU and the clock spring.

(1) Disconnect SRS-ECU connector C-72.
(2) Disconnect clock spring connector C-85.
(3) Turn the ignition switch to the "ON" position.
(4) Measure at the wiring harness side.

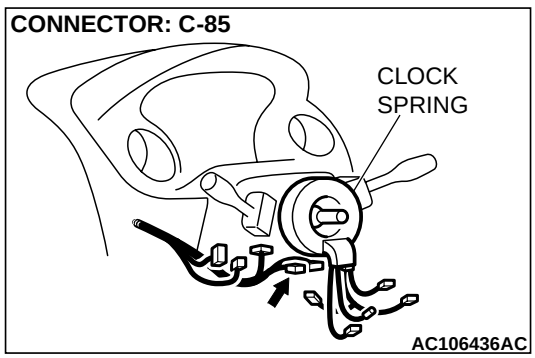
⚠ CAUTION

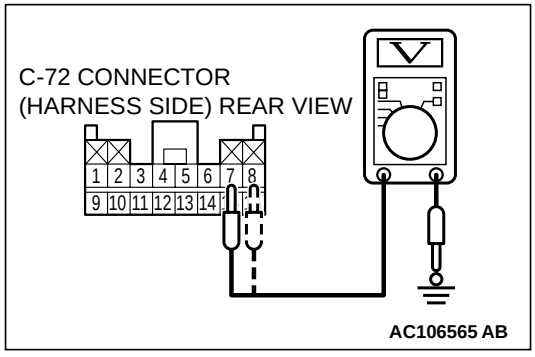
Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

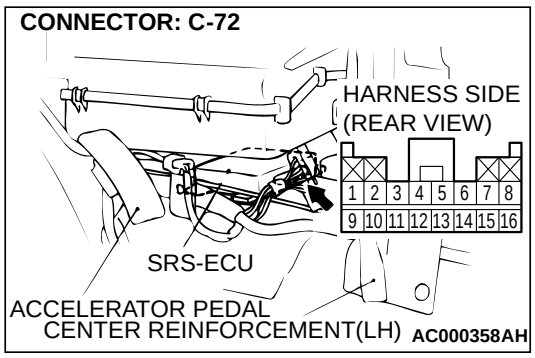
(5) Measure the voltage between terminals 7, 8 and body ground
- Voltage should be 0 volt.

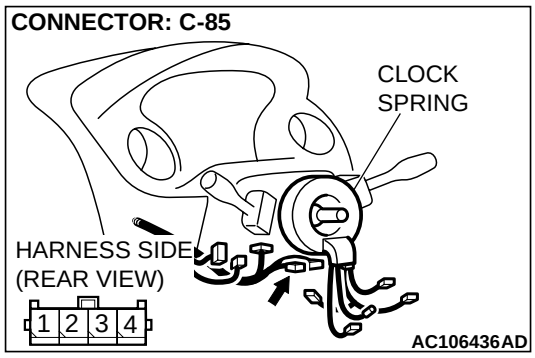
Q: Is the voltage normal?

YES : Erase the DTC memory, and recheck if any DTC sets. If DTC 61 sets. replace the SRS-ECU. Refer to P.52B-142. Then go to Step 5.
NO : Then go to Step 4.









STEP 4. Check the harness for short circuit to power supply between SRS-ECU connector C-72 (terminal No.7 and 8) and clock spring connector C-85 (terminal No.3 and 4).

Q: Are harness wires between the SRS-ECU connector C-72 (terminal No.7 and 8) and clock spring connector C-85 (terminal No.3 and 4) in good condition?

YES : Go to Step 5.

NO : Repair the harness wires between SRS-ECU connector C-72 and clock spring connector C-85. Then go to Step 5.

STEP 5. Check the DTC.

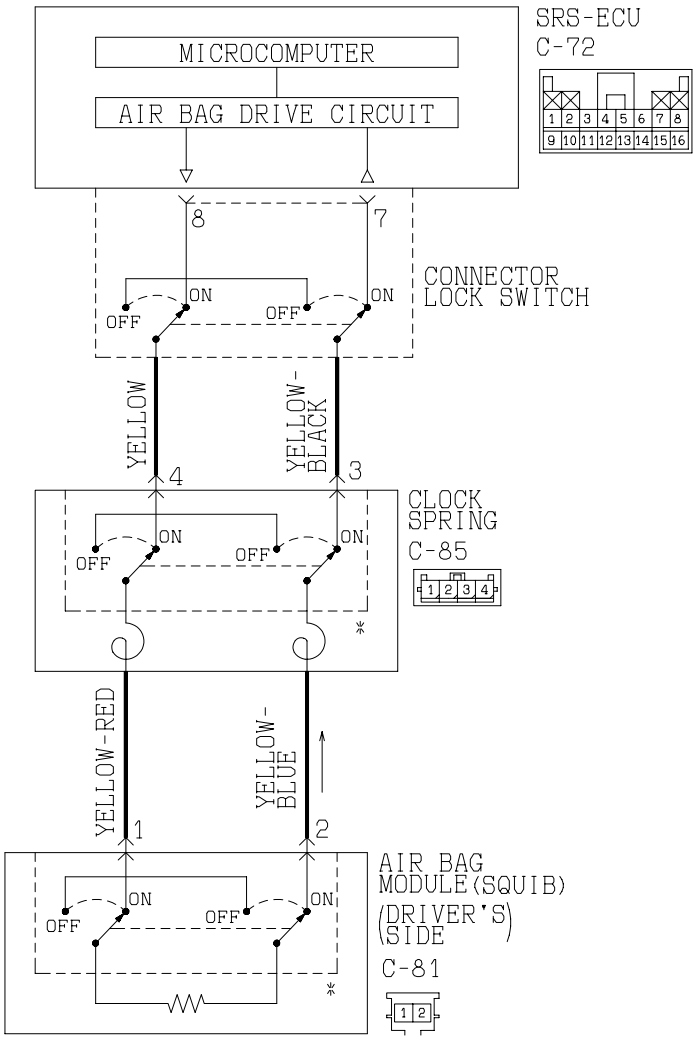
Q: Is DTC 61 output?

YES : Return to Step 1.

NO : This diagnosis is complete. (If no malfunctions are not found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.)

DTC 62: Driver's Air Bag Module (Squib) System Fault for Ground Circuit (Short-Circuited to ground)

Driver's Air Bag Module (Squib) Circuit



NOTE
*: CONNECTOR LOCK SWITCH

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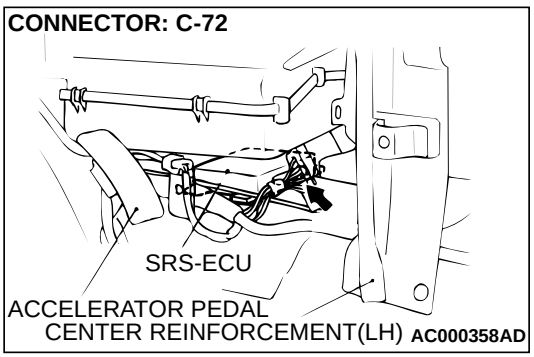
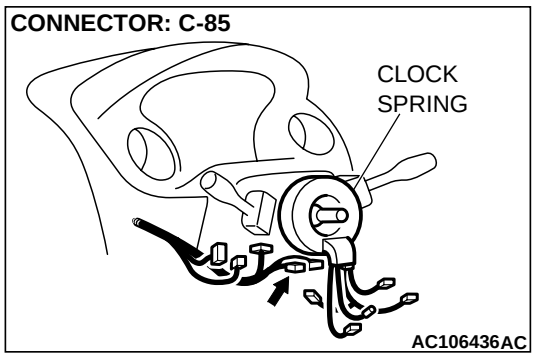
AC106622 AB





TSB Revision

CIRCUIT OPERATION

- The SRS-ECU judges how severe a collision is by detecting signals from the front air bag analog G-sensor. If the impact is over a predetermined level, the SRS-ECU outputs an ignition signal. At this time, if the front air bag safing G-sensor is on, the SRS air bag will inflate.
- The ignition signal is input to the air bag module via the clock spring to inflate the air bag.

DTC SET CONDITIONS

- This DTC is set if there is abnormal resistance between the input terminals of the driver's side air bag module (squib). However, if no DTC resets, the SRS warning light will be switched off (DTC will be retained).

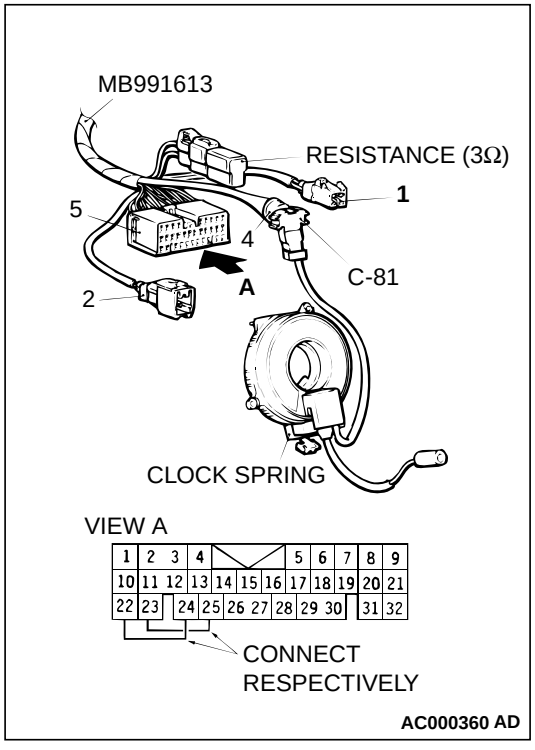
TROUBLESHOOTING HINTS

- Malfunction of the clock spring
- Damaged harness wires and connectors
- Short to the ground in the driver's air bag module (squib) harness
- Malfunction of the SRS-ECU

DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991613: SRS Check Harness
- MB991865: Dummy resister
- MB991866: Resister harness

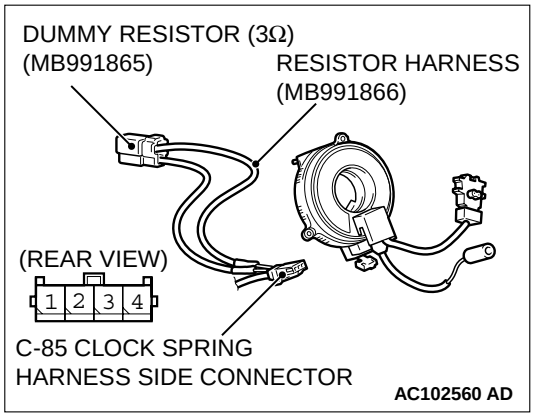


STEP 1. Check the driver's air bag module.

(1) Disconnect the negative battery terminal.
(2) Remove the driver's air bag module. (Refer to P.52B-144.)
(3) Connect connector (4) of special tool MB991613 to clock spring connector C-81.special tool MB991613 to special tool MB991866.
(4) Connect connector (1) of special tool MB991613 to connector (2).
(5) Connect terminals 22 to 24, and terminals 23 to 25 of special tool MB991613 to connector (5).
(6) Connect the clock spring to the body wiring harness.
(7) Connect the negative battery terminal.
(8) Erase the DTC memory, and then recheck the DTC.

Q: Is DTC 22 out put?

YES : Go to Step 2.
NO : Replace the driver's air bag module. Then go to Step 5.



STEP 2. Check the clock spring.

(1) Disconnect the negative battery terminal.
(2) Disconnect the clock spring connector C-85.
(3) Connect special tool MB991865 to special tool MB991866.

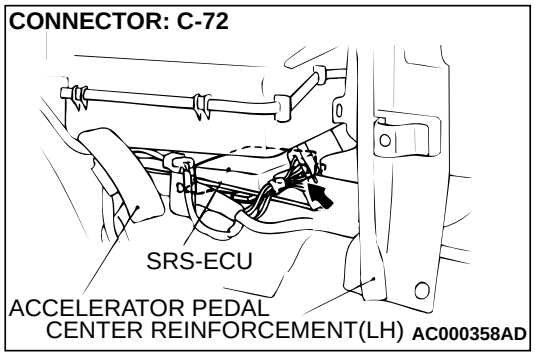
⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(4) Insert special tool MB991866 into clock spring harness side connector C-85 (terminal No.3 and 4) by backprobing.
(5) Connect the negative battery terminal.
(6) Erase the DTC memory, and then recheck the DTC.

Q: Is DTC 62 output?

YES : Go to Step 3.
NO : Replace the clock spring. Then go to Step 5.



STEP 3. Check the harness for short circuit to ground between the SRS-ECU and the clock spring.

(1) Disconnect SRS-ECU connector C-72.
(2) Disconnect the clock spring connector C-85.
(3) Measure at the wiring harness side.

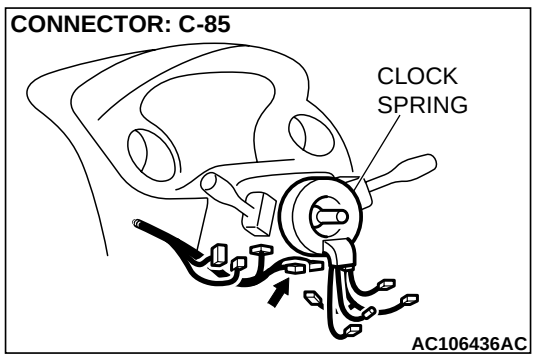
⚠ CAUTION

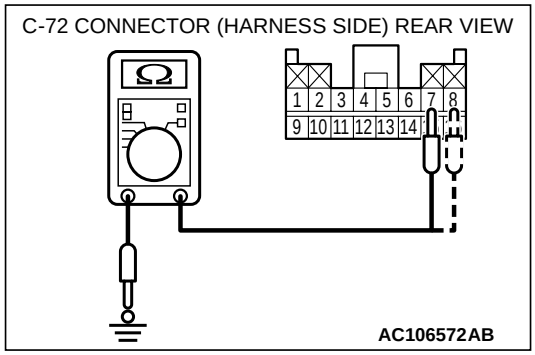
Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

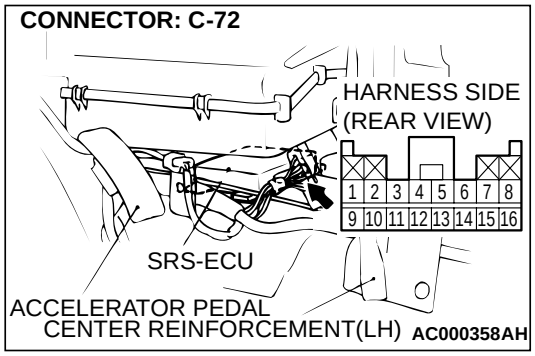
(4) Check the continuity between terminals7, 8 and body ground
- There should be open circuit.

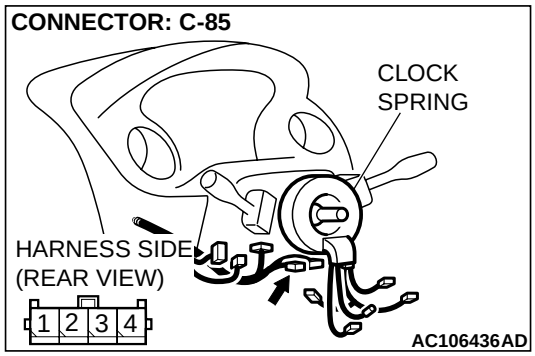
Q: Is the continuity normal?

YES : Erase the DTC memory, and recheck if any DTC sets. If DTC 62 sets, replace the SRS-ECU. Refer to P.52B-142. Then go to Step 5.
NO : Go to Step 4.









STEP 4. Check the harness for short circuit to ground between SRS-ECU connector C-72 (terminal No.7 and 8) and clock spring connector C-85 (terminal No.3 and 4).

Q: Are the harness wires between SRS-ECU connector C-72 (terminal No.7 and 8) and clock spring connector C-85 (terminal No.3 and 4) in good condition?

YES : Go to Step 5.

NO : Repair the harness wires between SRS-ECU connector C-72 and clock spring connector C-85. Then go to Step 5.

STEP 5. Check the DTC.

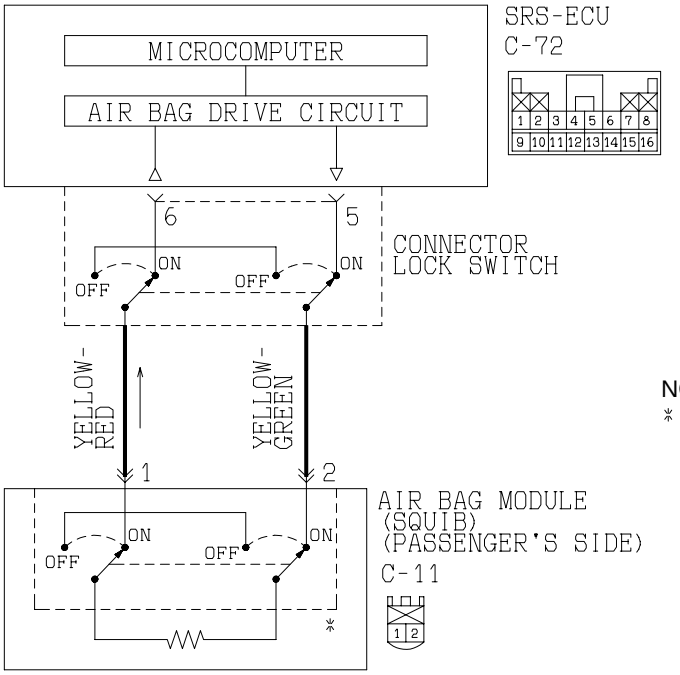
Q: Is DTC 62 output?

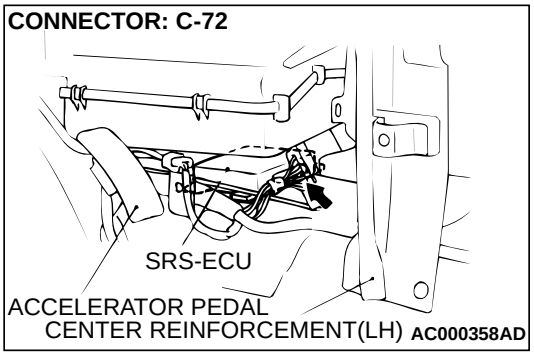
YES : Return to Step 1.

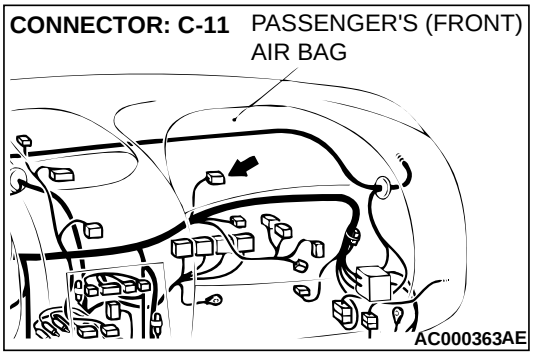
NO : This diagnosis is complete. (If no malfunctions are not found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.)

DTC 64:Passenger's (Front) Air Bag Module (Squib) System Fault for Power Supply Circuit (Short-Circuit to Power Supply)

Driver's Air Bag Module (Squib) Circuit







CIRCUIT OPERATION

- The SRS-ECU judges how severe a collision is by detecting signals from the front air bag analog G-sensor. If the impact is over a predetermined level, the SRS-ECU outputs an ignition signal. At this time, if the front air bag safing G-sensor is on, the SRS air bag will inflate.
- The ignition signal is input to the air bag module via the clock spring to inflate the air bag.

DTC SET CONDITIONS

- This DTC is set if there is abnormal resistance between the input terminals of the passenger's air bag module (squib). However, if no DTC resets, the SRS warning light will be switched off (DTC will be retained).

TROUBLESHOOTING HINTS

- Damaged harness wires and connectors
- Short to the power supply in the passenger's air bag module (squib) harness
- Malfunction of the SRS-ECU

TSB Revision

DIAGNOSIS

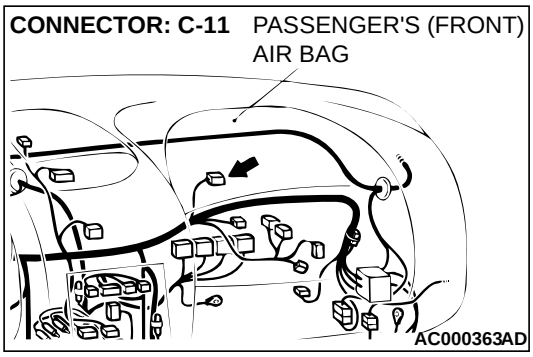
Required Special Tools:

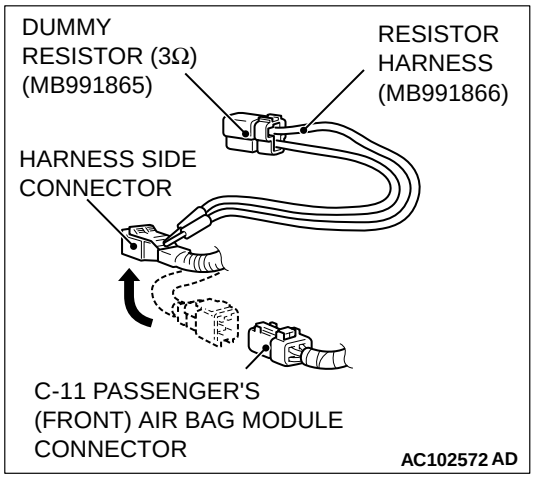
- MB991502: Scan Tool (MUT-II)
- MB991865: Dummy resister
- MB991866: Resister harness

STEP 1. Check the passenger's air bag module.

(1) Disconnect the negative battery terminal.

(2) Unclip passenger's air bag module connector C-11.





(3) Connect special tool MB991865 to special tool MB991866.

⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(4) Disconnect the passenger's air bag module connector C-11, and insert special tool MB991866 into the harness side connector by backprobing.

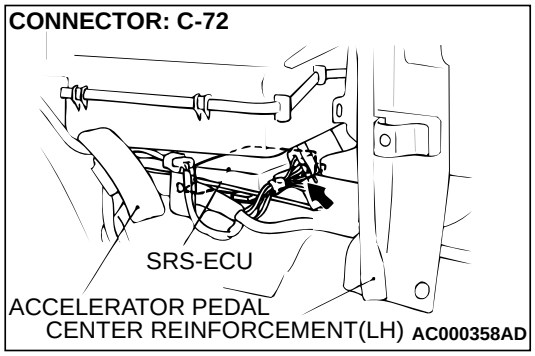
(5) Connect the negative battery terminal.

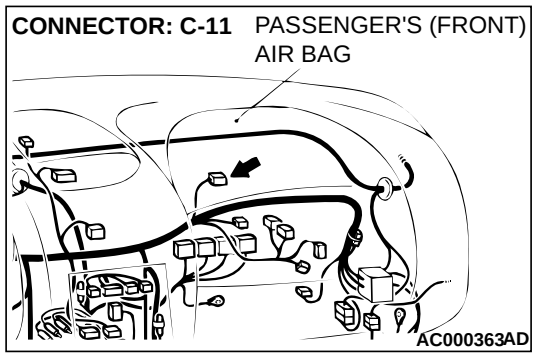
(6) Erase the DTC memory, and then recheck the DTC.

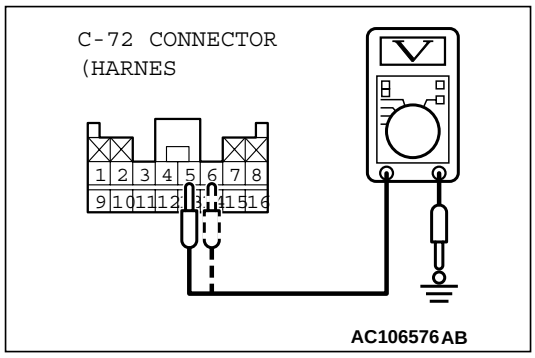
Q: Is DTC 64 output?

YES : Go to Step 2.

NO : Replace the passenger's air bag module. Refer to P.52B-144. Then go to Step 4.







STEP 2. Check the harness for short circuit to power supply between the SRS-ECU and the passenger's air bag module.

Measurement at SRS-ECU connector C-72.
(1) Disconnect SRS-ECU connector C-72.
(2) Unclip passenger’s air bag module connector C-11.
(3) Disconnect the passenger's air bag module connector C-11.
(4) Turn the ignition switch to the "ON" position.
(5) Measure at the wiring harness side.

⚠ CAUTION
Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(6) Measure the voltage between terminals 5, 6 and body ground
- Voltage should be 0 volt.

Q: Is the voltage normal?

YES : Eras the DTC memory, and recheck if any DTC sets. If DTC 64 sets, replace the SRS-ECU. Refer to P.52B-142. Then go to Step 4.

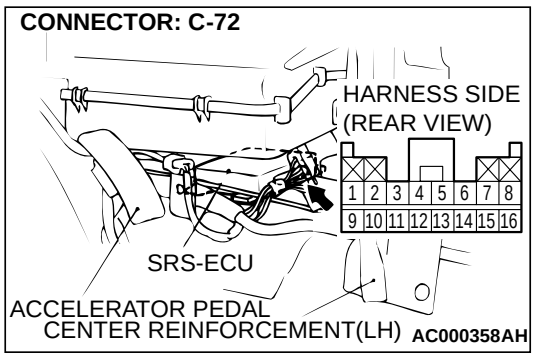
NO : Go to Step 3.

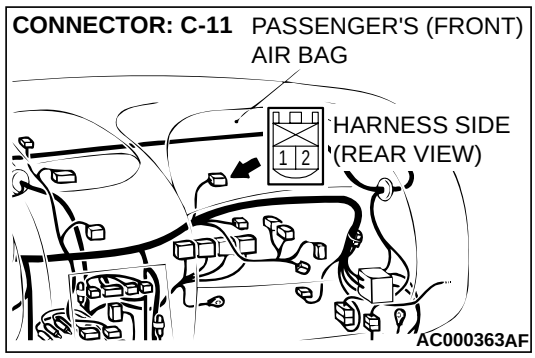
STEP 3. Check the harness wires for short circuit to power supply between SRS-ECU connector C-72 (terminal No.5 and 6) and passenger's air bag module connector C-11 (terminal No.1 and 2).

Q: Are the harness wires between SRS-ECU connector C-72 (terminal No.5 and 6) and passenger's air bag module connector C-11 (terminal No.1 and 2) in good condition?

YES : Go to Step 4.

NO : Repair the harness wires between SRS-ECU connector C-72 and passenger's air bag module connector C-11. Then go to Step 4.





STEP 4. Check the DTC.

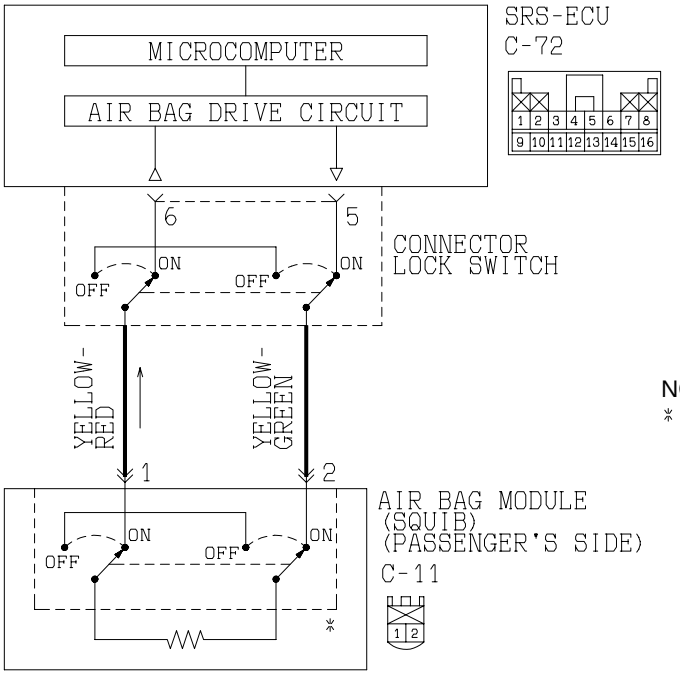
Q: Is DTC 64 output?

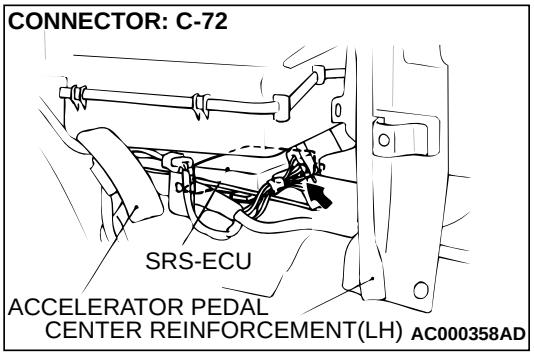
YES : Return to Step 1.

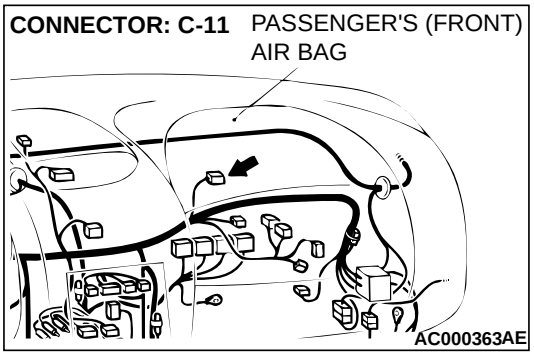
NO : This diagnosis is complete. (If no malfunctions are not found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.)

DTC 65: Passenger's (Front) Air Bag Module (Squib) System Fault for Ground Circuit (Short-Circuit to Ground)

Driver's Air Bag Module (Squib) Circuit







CIRCUIT OPERATION

- The SRS-ECU judges how severe a collision is by detecting signals from the front air bag analog G-sensor. If the impact is over a predetermined level, the SRS-ECU outputs an ignition signal. At this time, if the front air bag safing G-sensor is on, the SRS air bag will inflate.
- The ignition signal is input to the air bag module via the clock spring to inflate the air bag.

DTC SET CONDITIONS

- This DTC is set if there is abnormal resistance between the input terminals of the passenger's air bag module (squib). However, if no DTC resets, the SRS warning light will be switched off (DTC will be retained).

TROUBLESHOOTING HINTS

- Damaged harness wires and connectors
- Short to the ground in the passenger's air bag module (squib) harness
- Malfunction of the SRS-ECU

TSB Revision

DIAGNOSIS

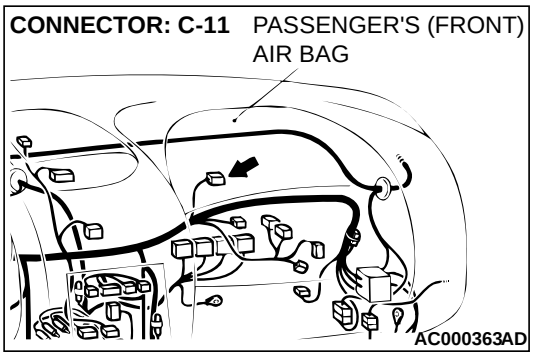
Required Special Tools:

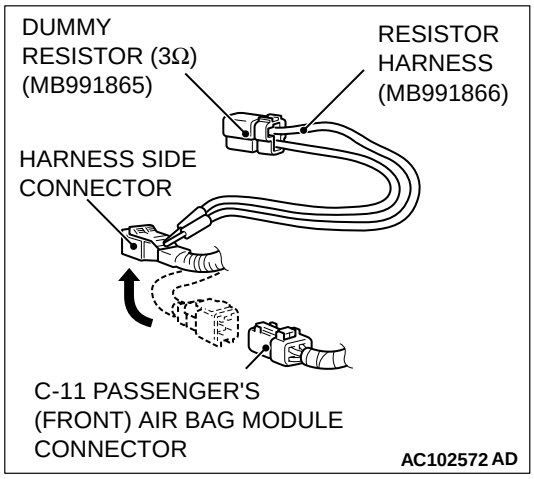
- MB991502: Scan Tool (MUT-II)
- MB991865: Dummy resister
- MB991866: Resister harness

STEP 1. Check the passenger's air bag module.

(1) Disconnect the negative battery terminal.

(2) Unclip passenger's air bag module connector C-11.





(3) Connect special tool MB991865 to special tool MB991866.

⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(4) Disconnect the passenger's air bag module connector C-11, and insert special tool MB991866 into the harness side connector by backprobing.

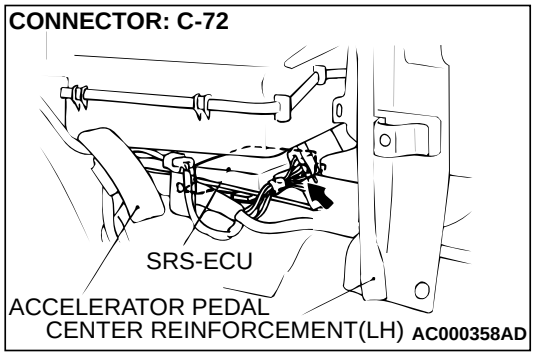
(5) Connect the negative battery terminal.

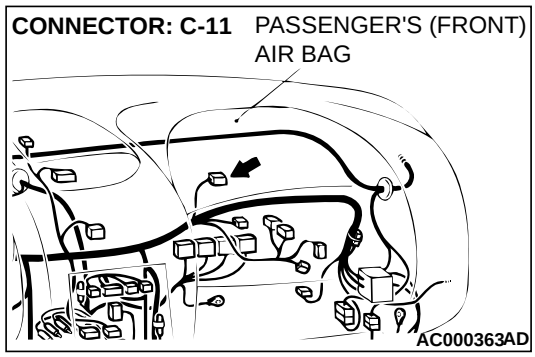
(6) Erase the DTC memory, and then recheck the DTC.

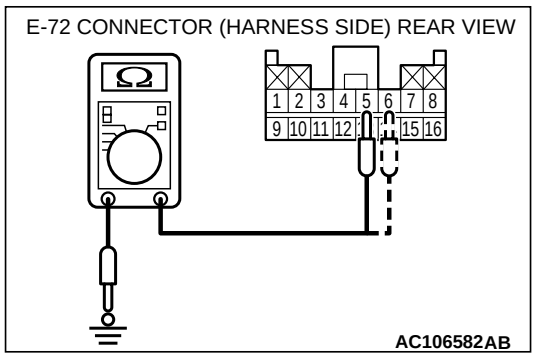
Q: Is DTC 64 output?

YES : Go to Step 2.

NO : Replace the passenger's air bag module. Refer to P.52B-144. Then go to Step 4.







STEP 2. Check the harness for short circuit to ground between the SRS-ECU and the passenger's air bag module.

(1) Disconnect SRS-ECU connector C-72.
(2) Unclip passenger’s air bag module connector C-11.
(3) Disconnect the passenger's air bag module connector C-11.
(4) Measure at the wiring harness side.

⚠ CAUTION
Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(5) Check the continuity between terminals 5, 6 and body ground.
- There should be open circuit.

Q: Is the continuity normal?

YES : Erase the DTC memory, and recheck if any DTC sets. If DTC 65 sets, replace the SRS-ECU. Refer to P.52B-142. Then go to Step 4.

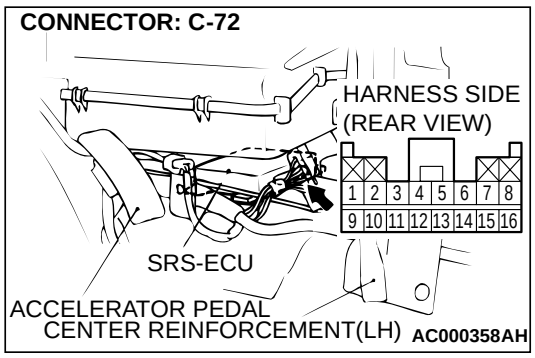
NO : Go to Step 3.

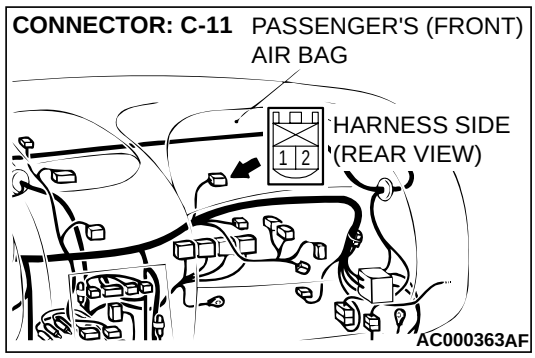
STEP 3. Check the harness wires for short circuit to ground between SRS-ECU connector C-72 (terminal No.5 and 6) and passenger's air bag module connector C-11 (terminal No.1 and 2).

Q: Are the harness wires between SRS-ECU connector C-72 (terminal No.5 and 6) and passenger's air bag module connector C-11 (terminal No.1 and 2) in good condition?

YES : Go to Step 4.

NO : Repair the harness wires between SRS-ECU connector C-72 and passenger's air bag module connector C-11. Then go to Step 4.





STEP 4. Check the DTC.

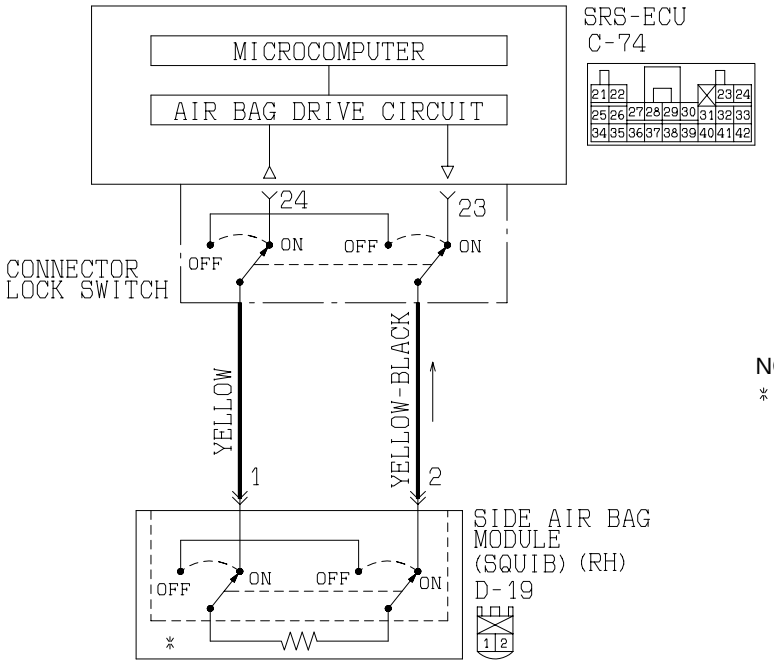
Q: Is DTC 65 output?

YES : Return to Step 1.

NO : This diagnosis is complete. (If no malfunctions are not found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.)

DTC 71: Right Hand Side-Airbag Module (Squib) System Fault 1 (Short Circuit between Terminals of the Squib Circuit)

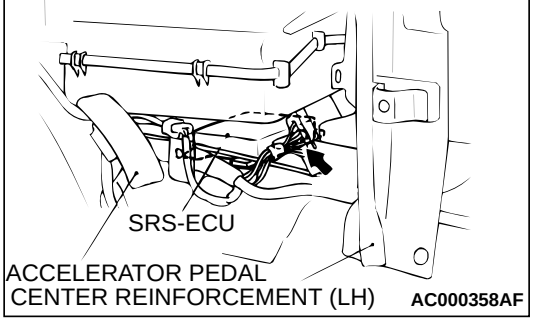
Side Air Bag Module (RH) (Squib) Circuit



NOTE
*: CONNECTOR LOCK SWITCH

W3S15M03AA
AC106624AB

CONNECTOR: C-74



AC000358AF

CONNECTOR: D-19

AC002976AB

CIRCUIT OPERATION

- The SRS-ECU judges how severe a collision is by detecting signals from the left and right side impact sensors. If the impact is over a predetermined level, the SRS-ECU outputs an ignition signal. At this time, if the side air bag safing G-sensor is on, the SRS air bag will inflate.
- The ignition signal is input to the air bag module to inflate the air bag.

DTC SET CONDITIONS

- This DTC is set if there is abnormal resistance between the input terminals of the side-airbag module (RH) (squib).

TSB Revision

TROUBLESHOOTING HINTS

- Improper engaged connector or defective short bar*
- Short between the side air bag module (RH) (squib) circuit terminals
- Damaged connector(s)
- Malfunction of the SRS-ECU

*NOTE: *: The squib circuit connectors integrate a "short" bar (which prevents the air bag from deploying unintentionally due to static electricity by shorting the positive wire to the ground wire in the squib circuit when the connectors are disconnected) (Refer to P.52B-3.) Therefore, if connector C-74 or D-19 is damaged or improperly engaged, the short bar may not be released when the connector is connected.*

DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991865: Dummy resister
- MB991866: Resister harness

STEP 1. Check the DTC.

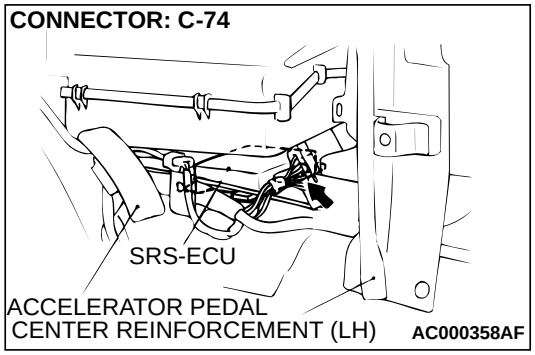
Q: Is DTC 34 output?

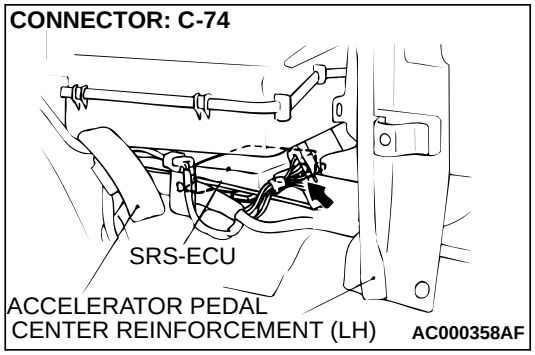
YES : Go to Step 2.
NO : Go to Step 3.

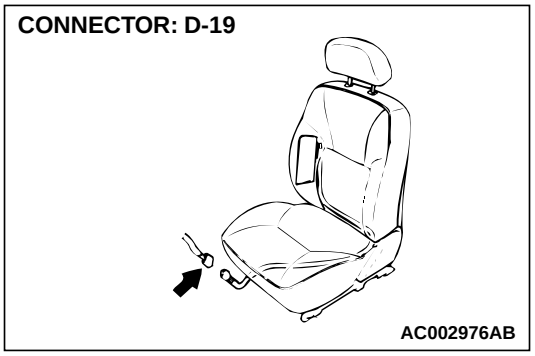
STEP 2. Check SRS-ECU connector C-74.

Q: Is the connector correctly engaged?

YES : Go to Step 3.
NO : Engage the connector correctly. Then go to Step 7.





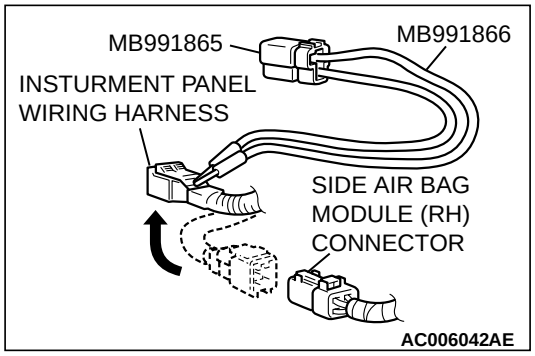


STEP 3. Check SRS-ECU connector C-74 and side-air bag module (RH) connector D-19.

(1) Disconnection connectors C-74 and D-19, and then reconnect them.
(2) Connect the negative battery terminal.
(3) Erase the DTC memory, and then recheck the DTC.

Q: Is DTC 71 output?

YES : Go to Step 4.
NO : The inspection is complete. (It is assumed that DTC 71 set as connector C-74 or D-19 was engaged improperly.)



STEP 4. Check the side-airbag module.

(1) Connect special tool MB991865 to special tool MB991866.

⚠ CAUTION
Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

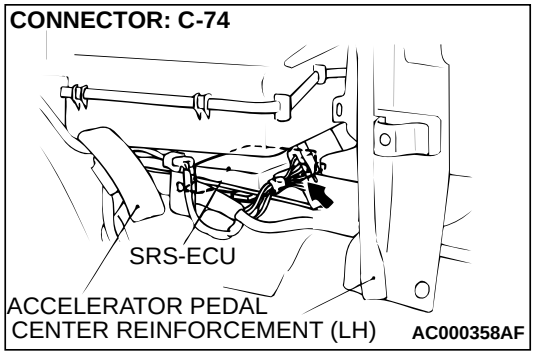
(2) Disconnect the side-airbag module (RH) connector D-19, and insert special tool MB991866 into the harness side connector by backprobing.
(3) Connect the negative battery terminal.
(4) Erase the DTC memory, and then recheck the DTC.

Q: Is DTC 71 output?

YES : Go to Step 5.
NO : Replace the seat back assembly of the front seat (RH). Refer to GROUP 52A, Front Seat P.52A-16. Then go to Step 7.

STEP 5. Check the harness for short circuit between SRS-ECU and the side-airbag module (RH).

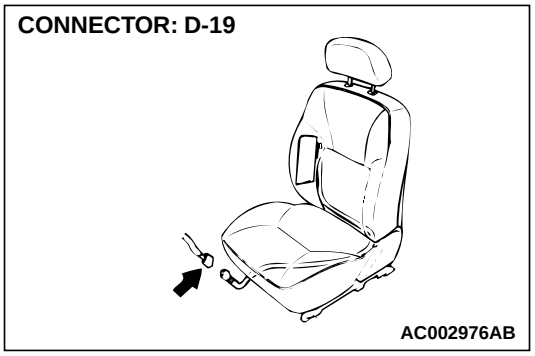
(1) Disconnect SRS-ECU connector C-74.



⚠ CAUTION

To release the short bar in the SRS-ECU connector, disconnect connector D-19 to short the squib circuit.

(2) Disconnect side-airbag module connector D-19.

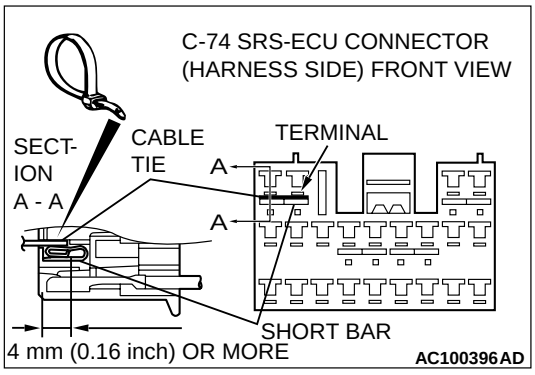


⚠ CAUTION

Insert an insulator such as a cable tie to a depth of 4mm (0.16 inch) or more, otherwise the short bar will not cable tie release.

(3) Insert a cable tie [3 mm (0.12 inch) wide, 0.5 mm (0.02 inch) thick] between terminals 23, 24 and the short bar to release the short bar.

(4) Measure at the wiring harness side.

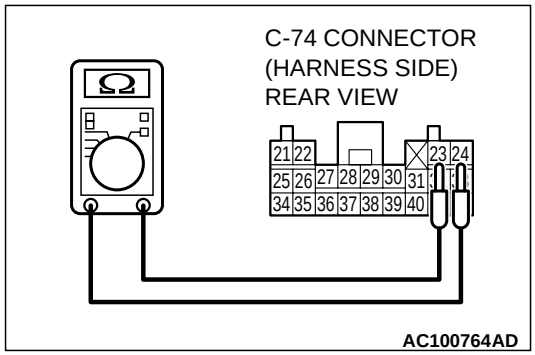


⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(5) Check the continuity between terminals 23 and 24.

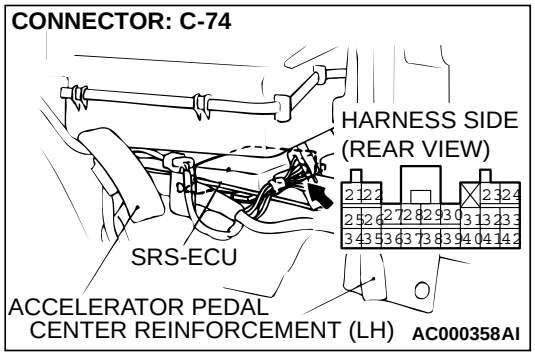
- There should be open circuit.

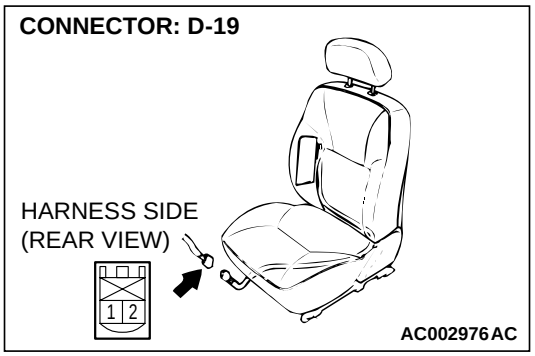


Q: Is the continuity normal?

YES : Erase the DTC memory, and recheck if any DTC sets. If DTC 71 sets, replace the SRS-ECU. Refer to P.52B-142. Then go to Step 7.

NO : Go to Step 6.





STEP 6. Check the harness wires for short circuit between SRS-ECU connector C-74 (terminal No.23 and 24) and side-airbag module (RH) connector D-19 (terminal No.1 and 2)

Q: Are the harness wires between SRS-ECU connector C-74 (terminal No.23 and 24) and side-airbag module (RH) connector D-19 (terminal No.1 and 2) in good condition?

YES : Go to Step 7.

NO : Repair the harness wires between SRS-ECU connector C-74 and side-airbag module connector D-19. Then go to Step 7.

STEP 7. Check for DTC.

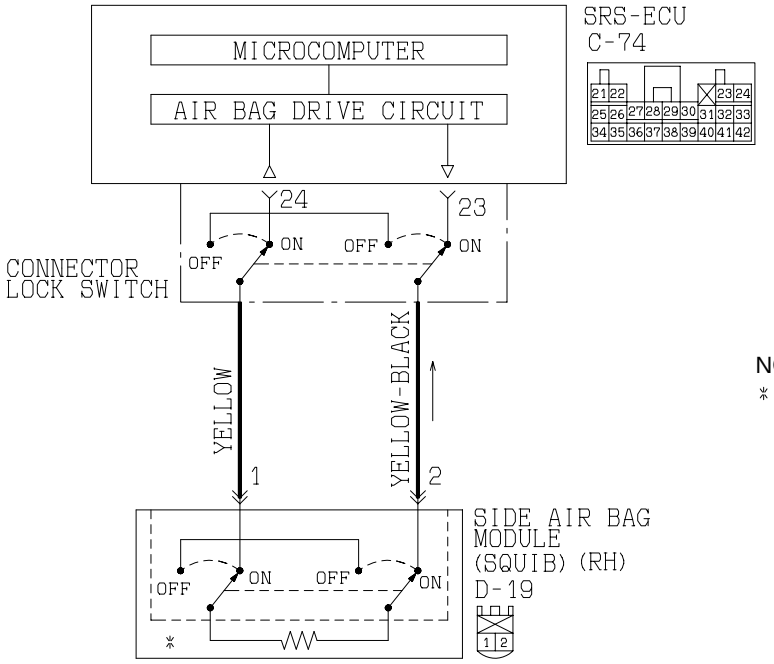
Q: Is DTC 71 output?

YES : Return to Step 1.

NO : This diagnosis is complete. (If no malfunctions are not found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.)

DTC 72: Right Hand Side-Airbag Module (Squib) System Fault 2 (Open in the Squib Circuit)

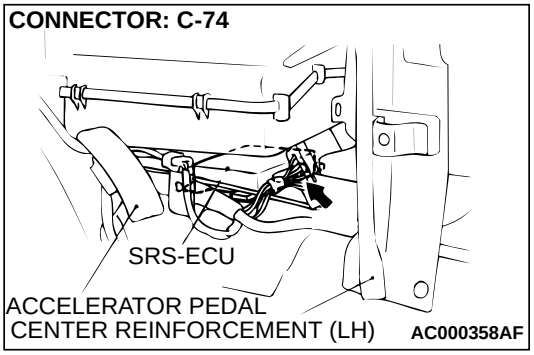
Side Air Bag Module (RH) (Squib) Circuit



NOTE
*: CONNECTOR LOCK SWITCH

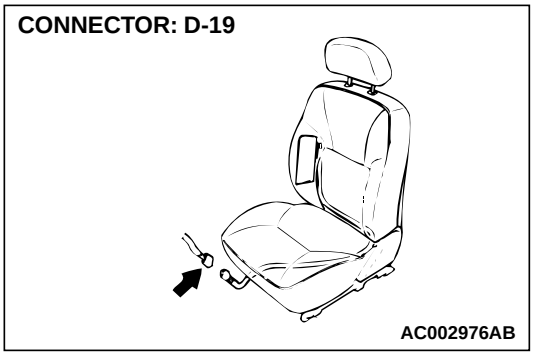
W3S15M03AA
AC106624AB

CONNECTOR: C-74



AC000358AF

CONNECTOR: D-19



AC002976AB

CIRCUIT OPERATION

- The SRS-ECU judges how severe a collision is by detecting signals from the left and right side impact sensors. If the impact is over a predetermined level, the SRS-ECU outputs an ignition signal. At this time, if the side-airbag safing G-sensor is on, the SRS air bag will inflate.
- The ignition signal is input to the air bag module to inflate the air bag.

DTC SET CONDITIONS

- This DTC is set if there is abnormal resistance between the input terminals of the side-airbag module (RH) (squib).

TROUBLESHOOTING HINTS

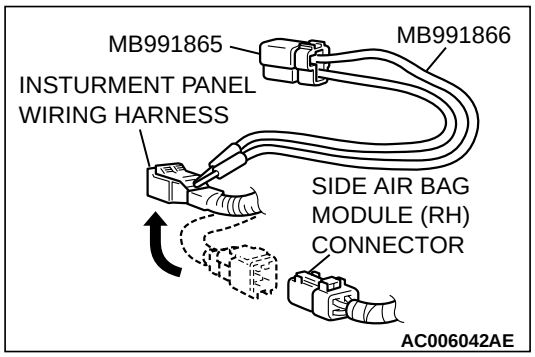
- Open circuit in the side-airbag module (RH) (squib) circuit
- Improper connector contact
- Malfunction of the SRS-ECU

DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991865: Dummy resister
- MB991866: Resister harness

TSB Revision



STEP 1. Check the side-airbag module (RH).

(1) Connect special tool MB991865 to special tool MB991866.

⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(2) Disconnect the side-airbag module (RH) connector D-19, and insert special tool MB991866 into the harness side connector by backprobing.

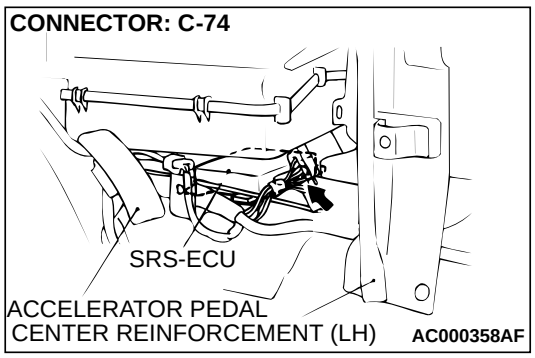
(3) Connect the negative battery terminal.

(4) Erase the DTC memory, and then recheck the DTC.

Q: Is DTC 72 output?

YES : Go to Step 2.

NO : Replace the seat back assembly of the front seat (RH). Refer to GROUP 52A, Front Seat P.52A-16. Then go to Step 3.



STEP 2. Check the harness for open circuit between SRS-ECU and the side-air bag module (RH).

(1) Disconnect SRS-ECU connector C-74 and side-air bag module (RH) connector D-19, and measure at the wiring harness side.

⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(2) Check the continuity between the following terminals.

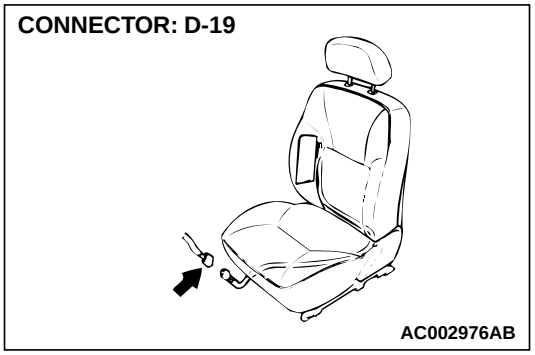
C-74 connector		D-19 connector
23	-	2
24	-	1

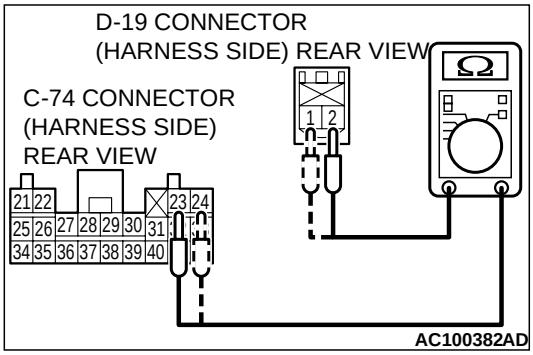
- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Erase the DTC memory, and recheck if any DTC sets. If DTC 72 sets, replace the SRS-ECU. Refer to P.52B-142. Then go to Step 3.

NO : Repair the harness wires between SRS-ECU connector C-74 and side-airbag module (RH) connector D-19. Then go to Step 3.





STEP 3. Check for DTC.

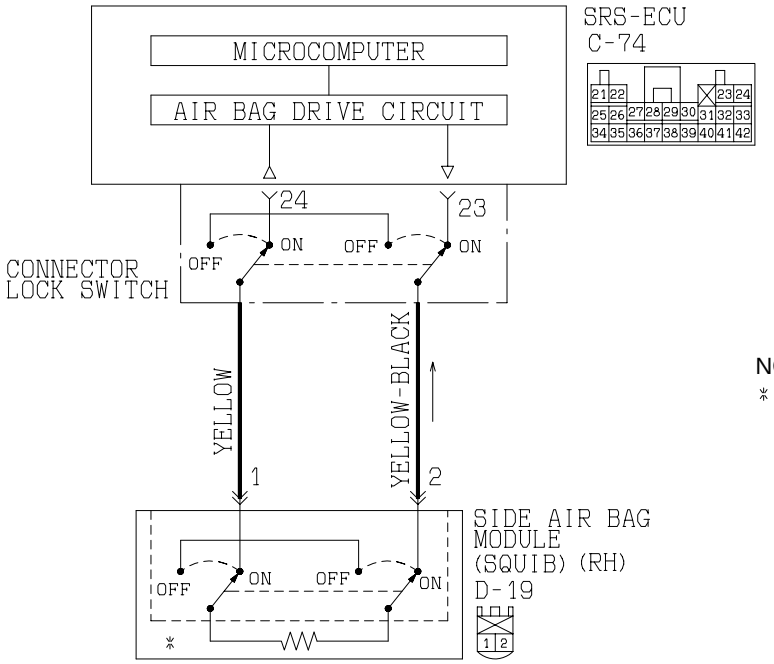
Q: Is DTC 72 output?

YES : Return to Step 1.

NO : This diagnosis is complete. (If no malfunctions are not found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.)

DTC 75: Right Hand Side-Airbag Module (Squib) System Fault Power Supply Circuit (Short-Circuit to Power Supply)

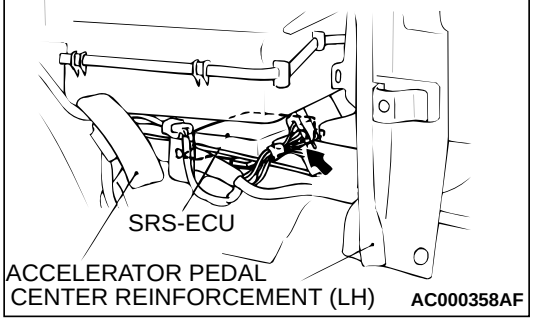
Side Air Bag Module (RH) (Squib) Circuit



NOTE
*: CONNECTOR LOCK SWITCH

W3S15M03AA
AC106624AB

CONNECTOR: C-74



AC000358AF

CONNECTOR: D-19

AC002976AB

CIRCUIT OPERATION

- The SRS-ECU judges how severe a collision is by detecting signals from the left and right side impact sensors. If the impact is over a predetermined level, the SRS-ECU outputs an ignition signal. At this time, if the side-airbag safing G-sensor is on, the SRS air bag will inflate.
- The ignition signal is input to the air bag module to inflate the air bag.

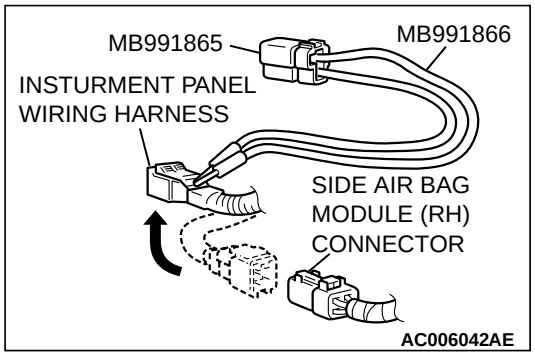
DTC SET CONDITIONS

- This DTC is set if there is abnormal resistance between the input terminals of the side-airbag module (RH) (squib).

TROUBLESHOOTING HINTS

- Damaged wiring harnesses or connectors
- Short to the power supply in the side-airbag module (RH) (squib) harness
- Malfunction of the SRS-ECU

TSB Revision



DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991865: Dummy resister
- MB991866: Resister harness

STEP 1. Check the side-airbag module (RH).

(1) Connect special tool MB991865 to special tool MB991866.

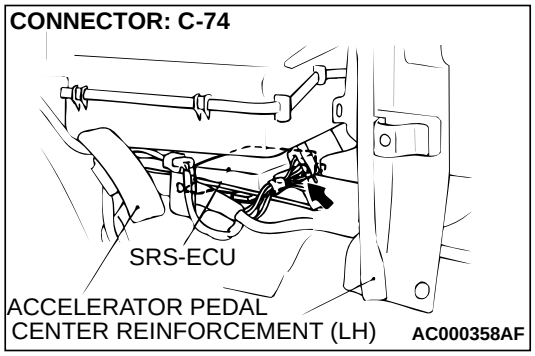
⚠ CAUTION

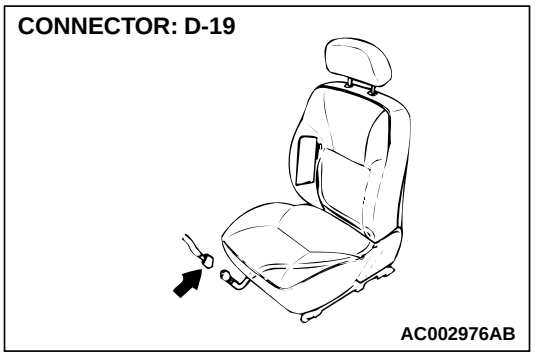
Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

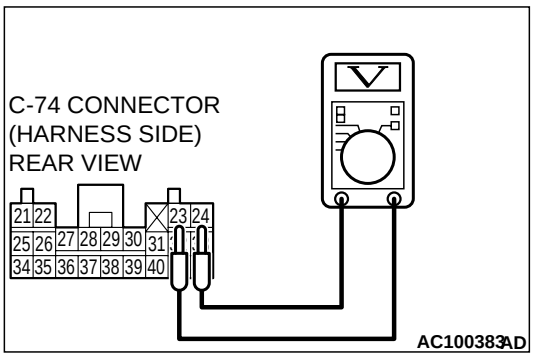
(2) Disconnect the side-airbag module (RH) connector D-19, and insert special tool MB991866 into the harness side connector by backprobing.
(3) Connect the negative battery terminal.
(4) Erase the DTC memory, and then recheck the DTC.

Q: Is the circuit normal?

YES : Go to Step 2.
NO : Replace the seat back assembly of the front seat (RH). Refer to GROUP 52A, Front Seat P.52A-16. Then go to Step 4.







STEP 2. Check the harness for short circuit to power supply between SRS-ECU and the side-airbag module (RH).

Measure at SRS-ECU connector C-74.

(1) Disconnect SRS-ECU connector C-74.
(2) Disconnect side-airbag module (RH) connector D-19.
(3) Turn the ignition switch to the "ON" position.
(4) Measure at the wiring harness side.

⚠ CAUTION

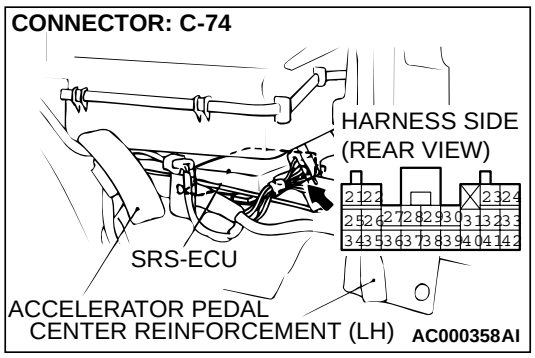
Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

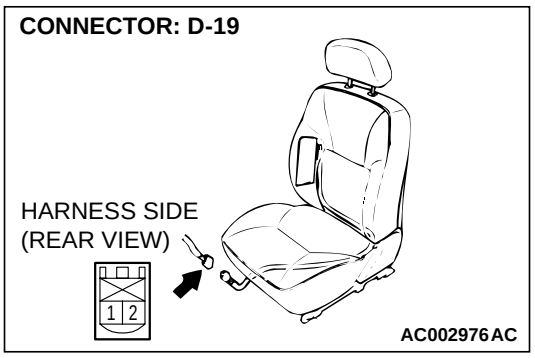
(5) Measure the voltage between terminals 23, 24 and baby ground.
- Voltage should be 0 volt.

Q: Is the voltage normal?

YES : Erase the DTC memory, and recheck if any DTC sets. If DTC 75 sets, replace the SRS-ECU. Refer to P.52B-142. Then go to Step 4.

NO : Go to Step 3.





STEP 3. Check the harness wires for short circuit to power supply between SRS-ECU connector C-74 (terminal No.23 and 24) and side-airbag module (RH) connector D-19 (terminal No.1 and 2).

Q: Are the harness wires between SRS-ECU connector C-74 (terminal No.23 and 24) and side-airbag module (RH) connector D-19 (terminal No.1 and 2) in good condition?

YES : Go to Step 4.

NO : Repair the harness wires between SRS-ECU connector C-74 and side-airbag module (RH) connector D-19. Then go to Step 4.

STEP 4. Check for DTC.

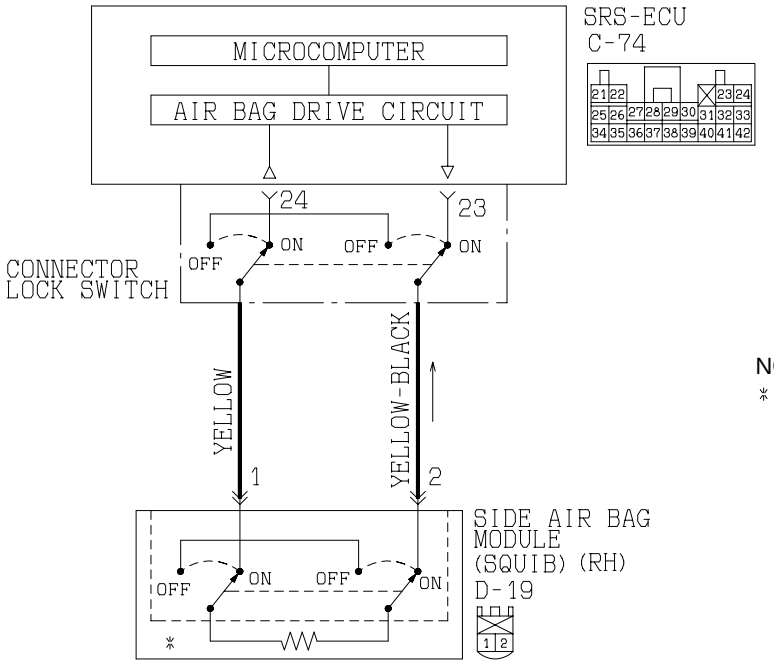
Q: Is DTC 75 output?

YES : Return to Step 1.

NO : This diagnosis is complete. (If no malfunctions are not found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.)

DTC 76: Right Hand Side-Airbag Module (Squib) System Fault Ground Circuit (Short-Circuit to Ground)

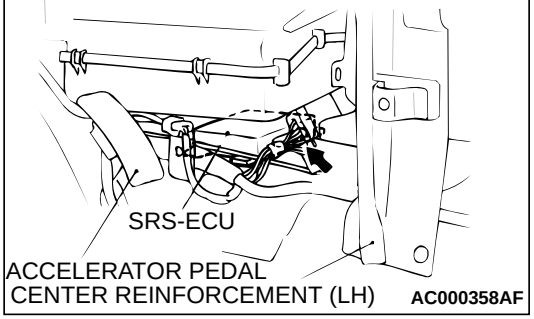
Side Air Bag Module (RH) (Squib) Circuit



NOTE
*: CONNECTOR LOCK SWITCH

W3S15M03AA
AC106624AB

CONNECTOR: C-74



AC000358AF

CONNECTOR: D-19

AC002976AB

CIRCUIT OPERATION

- The SRS-ECU judges how severe a collision is by detecting signals from the left and right side impact sensors. If the impact is over a predetermined level, the SRS-ECU outputs an ignition signal. At this time, if the side-airbag safing G-sensor is on, the SRS air bag will inflate.
- The ignition signal is input to the air bag module to inflate the air bag.

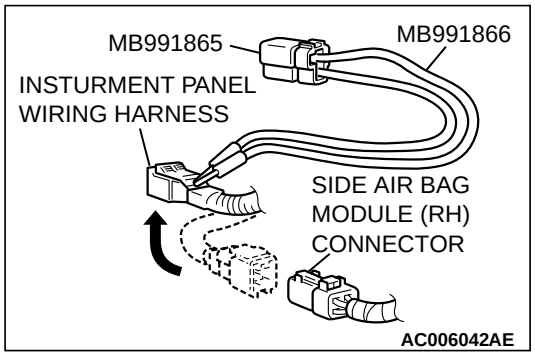
DTC SET CONDITIONS

- This DTC is set if there is abnormal resistance between the input terminals of the side-airbag module (RH) (squib).

TROUBLESHOOTING HINTS

- Damaged wiring harnesses or connectors
- Short to ground in the side-airbag module (RH) (squib) harness
- Malfunction of the SRS-ECU

TSB Revision



DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991865: Dummy resister
- MB991866: Resister harness

STEP 1. Check the side-airbag module (RH).

(1) Connect special tool MB991865 to special tool MB991866.

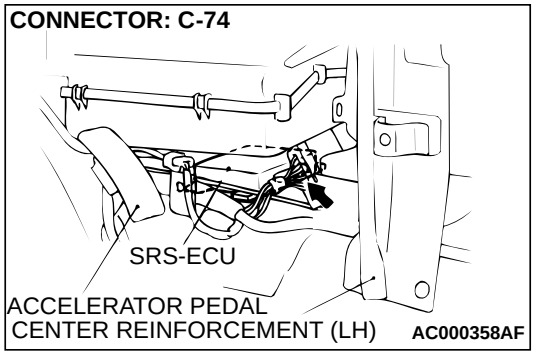
⚠ CAUTION

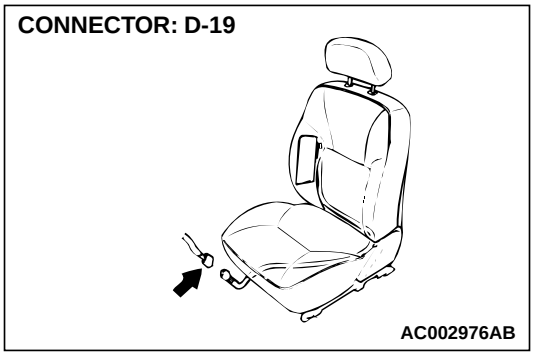
Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

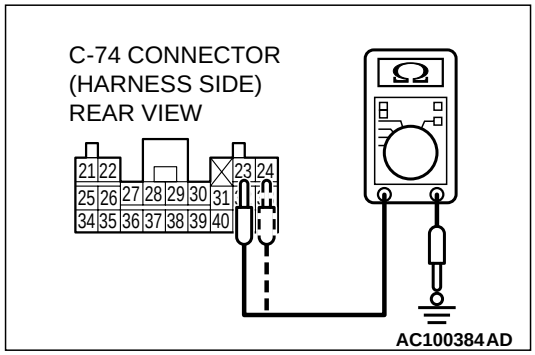
(2) Disconnect the side-airbag module (RH) connector D-19, and insert special tool MB991866 into the harness side connector by backprobing.
(3) Connect the negative battery terminal.
(4) Erase the DTC memory, and then recheck the DTC.

Q: Is DTC 76 output?

YES : Go to Step 2.
NO : Replace the seat back assembly of the front seat (RH). Refer to GROUP 52A, Front Seat P.52A-16. Then go to Step 4.







STEP 2. Check the harness for short circuit to ground between SRS-ECU and the side-airbag module (RH).

(1) Disconnect SRS-ECU connector C-74.
(2) Disconnect side-airbag module (RH) connector D-19.
(3) Measure at the wiring harness side.

⚠ CAUTION

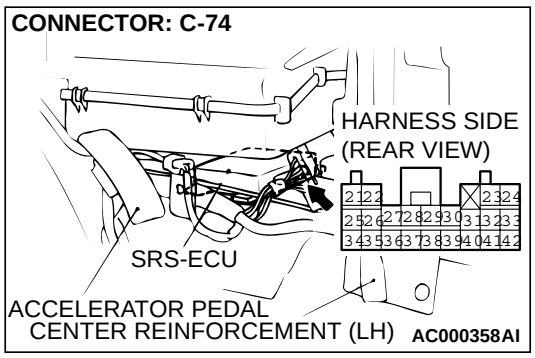
Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

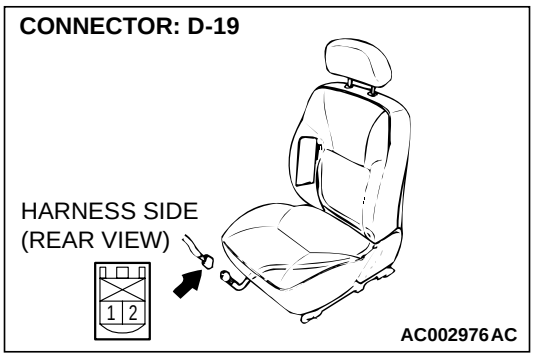
(4) Check the continuity between terminals 23, 24 and body ground.
- There should be open circuit.

Q: Is the continuity normal?

YES : Erase the DTC memory, and recheck if any DTC sets. If DTC 76 sets, replace the SRS-ECU. Refer to P.52B-142. Then go to Step 4.

NO : Go to Step 3.





STEP 3. Check the harness wires for short circuit to ground between SRS-ECU connector C-74 (terminal No.23 and 24) and side-airbag module (RH) connector D-19 (terminal No.1 and 2).

Q: Are the harness wires between SRS-ECU connector C-74 (terminal No.23 and 24) and side-airbag module (RH) connector D-19 (terminal No.1 and 2) in good condition?

YES : Go to Step 4.

NO : Repair the harness wires between SRS-ECU connector C-74 and side-airbag module (RH) connector D-19. Then go to Step 4.

STEP 4. Check for DTC.

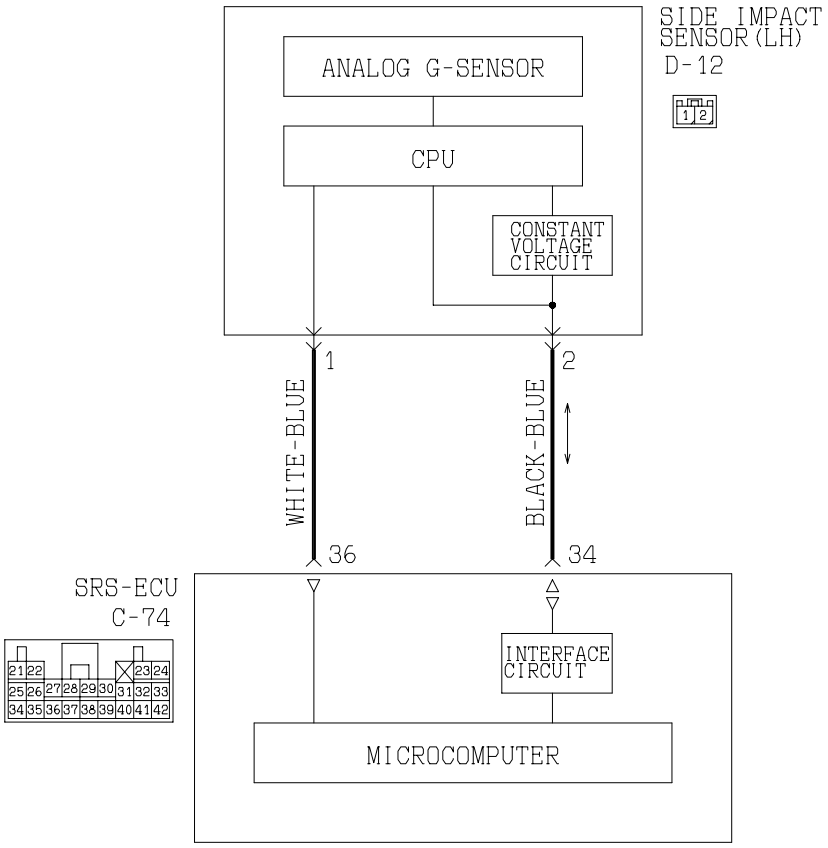
Q: Is DTC 76 output?

YES : Return to Step 1.

NO : This diagnosis is complete. (If no malfunctions are not found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.)

DTC 79: Left Hand Side-airbag Module (Squib) System Fault 5 for Power Supply Circuit
DTC 93: Left Hand Side-airbag Module (Squib) System Fault 6 for Communication System

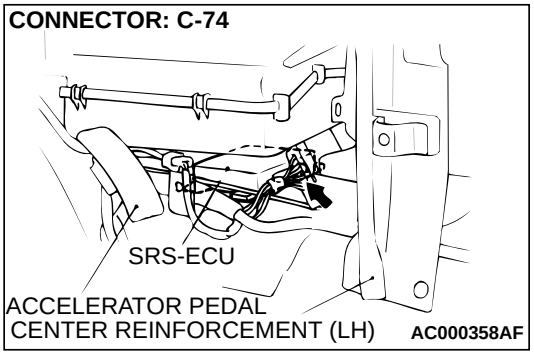
Side Impact Sensor (LH) Circuit



W1S01M01AA

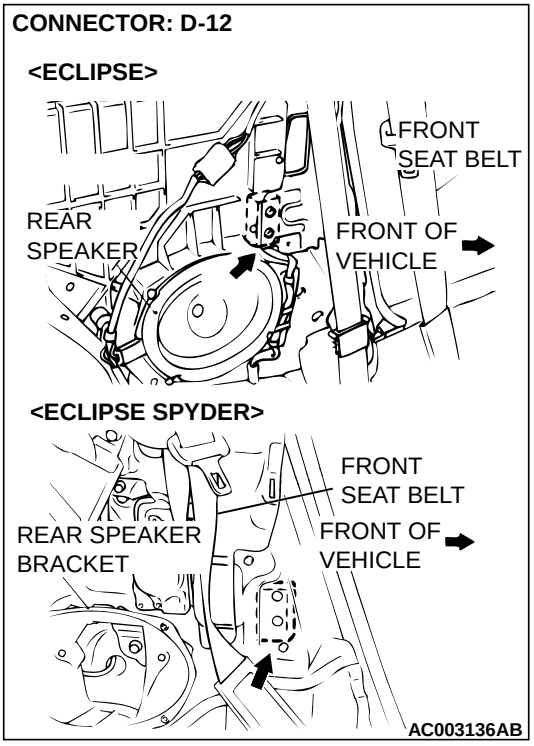
AC003886AB

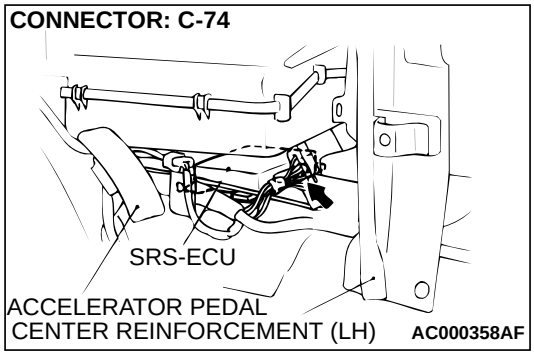
CONNECTOR: C-74



AC000358AF

TSB Revision





CIRCUIT OPERATION

- The SRS-ECU judges how severe a collision is by detecting signals from the left and right side impact sensors. If the impact is over a predetermined level, the SRS-ECU outputs an ignition signal. At this time, if the side-airbag safing G-sensor is on, the SRS air bag will inflate.

DTC SET CONDITIONS

- These DTC are set if communication between the side impact sensor (LH) and the SRS-ECU is not possible or communication is faulty.

TROUBLESHOOTING HINTS

- Damaged wiring harnesses or connectors
- Malfunction of the side impact sensor (LH)
- Malfunction of the SRS-ECU

DIAGNOSIS

Required Special Tool:

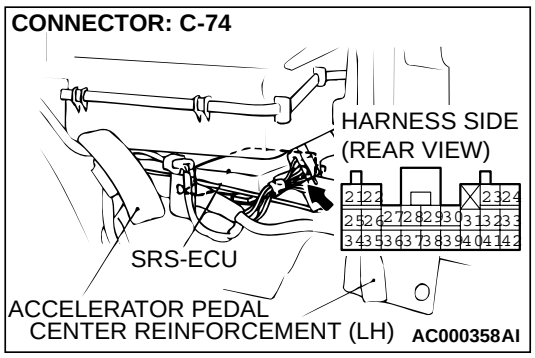
- MB991502: Scan Tool (MUT-II)

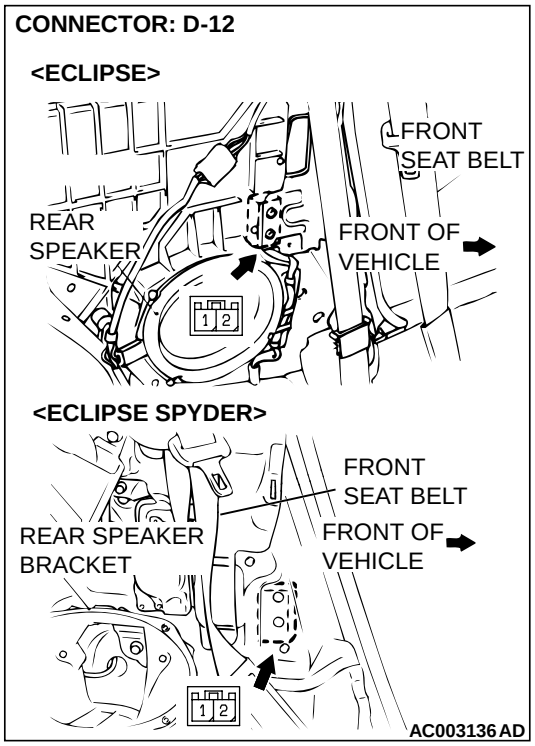
STEP 1. Check the side impact sensor (LH).

(1) Replace the side impact sensor (LH) with the side impact sensor (RH).
(2) Connect the negative battery terminal.
(3) Erase DTC memory, and then recheck the DTC.

Q: Is DTC 89 or 96 output?

YES : Replace the side impact sensor (LH) with a new one. Refer to P.52B-153. Then go to Step 3.
NO : Go to Step 2.





STEP 2. Check the harness wires for open circuit or short circuit between SRS-ECU connector C-74 (terminal No.34 and 36) and side impact sensor (LH) connector D-12 (terminal No.1 and 2).

Q: Are the harness wires between SRS-ECU connector C-74 (terminal No.34 and 36) and side impact sensor (LH) connector D-12 (terminal No.1 and 2) in good condition?

YES : Erase the DTC memory, and recheck if any DTC sets. If DTC 79 or 93 sets, replace the SRS-ECU. Refer to P.52B-142. Then go to Step 3.

NO : Repair the harness wires between SRS-ECU connector C-74 and side impact sensor (LH) connector D-12. Then go to Step 3.

STEP 3. Check for DTC.

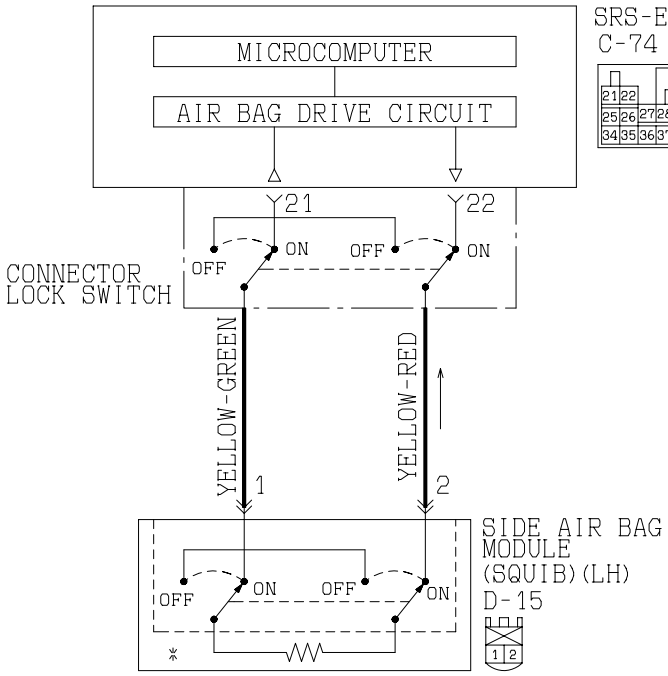
Q: Is DTC 79 output?

YES : Return to Step 1.

NO : This diagnosis is complete. (If no malfunctions are not found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.)

DTC 81: Left Hand Side-Air Bag Module (Squib) System Fault 1 (Short Circuit between Terminals of the Squib Circuit)

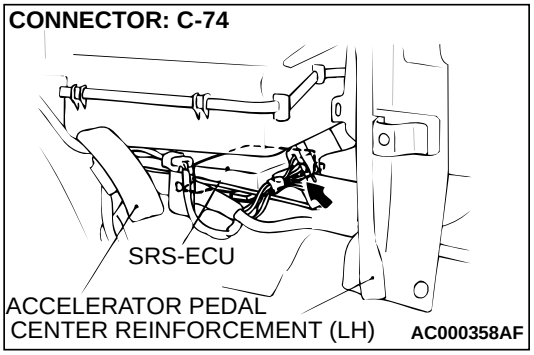
Side Air Bag Module (LH) (Squib) Circuit



NOTE
*: CONNECTOR LOCK SWITCH

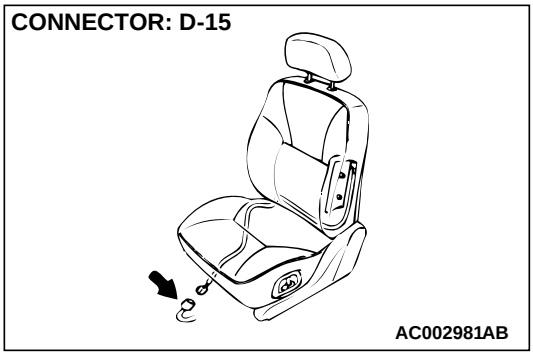
W3S15M04AA
AC106625AB

CONNECTOR: C-74



AC000358AF

CONNECTOR: D-15



AC002981AB

CIRCUIT OPERATION

- The SRS-ECU judges how severe a collision is by detecting signals from the left and right side impact sensors. If the impact is over a predetermined level, the SRS-ECU outputs an ignition signal. At this time, if the side-airbag safing G-sensor is on, the SRS air bag will inflate.
- The ignition signal is input to the air bag module to inflate the air bag.

DTC SET CONDITIONS

- This DTC is set if there is abnormal resistance between the input terminals of the side air bag module (LH) (squib).

TROUBLESHOOTING HINTS

- Improper engaged connector or defective short bar*
- Short circuit between the left-side air bag module (squib) circuit terminals
- Damaged connector(s)
- Malfunction of the SRS-ECU

*NOTE: *: The squib circuit connectors integrate a "short" bar (which prevents the air bag from deploying unintentionally due to static electricity by shorting the positive wire to the ground wire in the squib circuit when the connectors are disconnected) (Refer to P.52B-3.) Therefore, if connector C-74 or D-15 is damaged or improperly engaged, the short bar may not be released when the connector is connected.*

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)
- MB991865: Dummy resister
- MB991866: Resister harness

STEP 1. Check the DTC.

Q: Is DTC 34 output?

YES : Go to Step 2.
NO : Go to Step 3.

STEP 2. Check SRS-ECU connector C-74.

Q: Is the connector correctly engaged?

YES : Go to Step 3.
NO : Engage the connector correctly. Then go to Step 7.

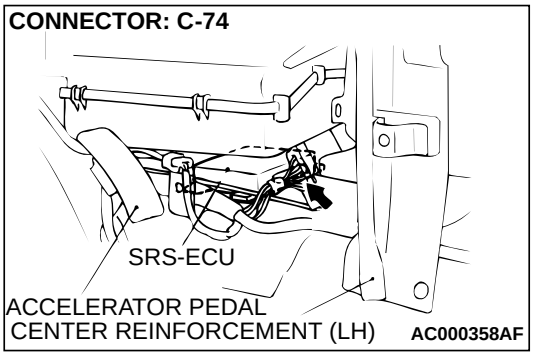
STEP 3. Check SRS-ECU connector C-74 and side-airbag module (LH) connector D-15.

(1) Disconnection connectors C-74 and D-15, and then reconnect them.
(2) Connect the negative battery terminal.
(3) Erase DTC memory, and then recheck the DTC.

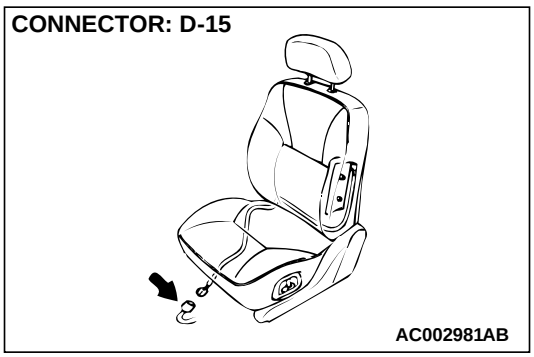
Q: Is DTC 81 output?

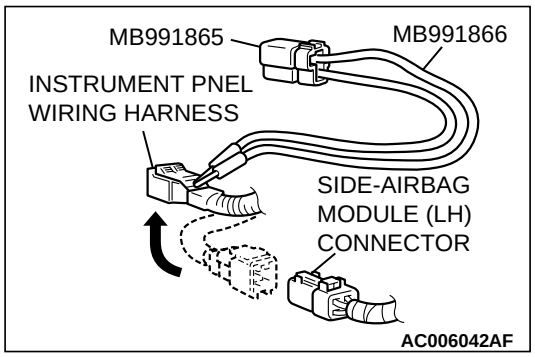
YES : Go to Step 4.
NO : The inspection is complete. (It is assumed that DTC 81 set as connector C-74 or D-15 was engaged improperly.)

CONNECTOR: C-74



CONNECTOR: D-15





STEP 4. Check the side-airbag module (LH).

(1) Connect special tool MB991865 to special tool MB991866.

⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(2) Disconnect the left hand side-airbag (LH) connector D-15, and insert special tool MB991866 into the harness side connector by backprobing.

(3) Connect the negative battery terminal.

(4) Erase DTC memory, and then recheck the DTC.

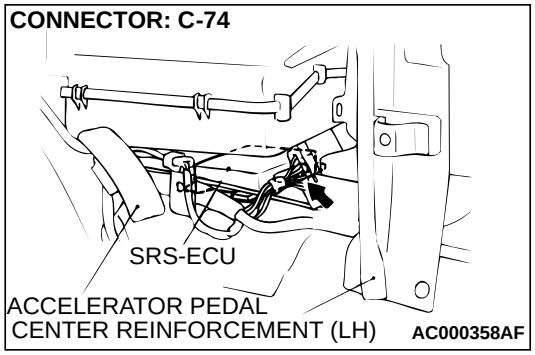
Q: Is DTC 81 output?

YES : Go to Step 5.

NO : Replace the seat back assembly of the front seat (LH). Refer to GROUP 52A, Front Seat P.52A-16. Then go to Step 7.

STEP 5. Check the harness for short circuit between the SRS-ECU and the left hand side-airbag module (LH).

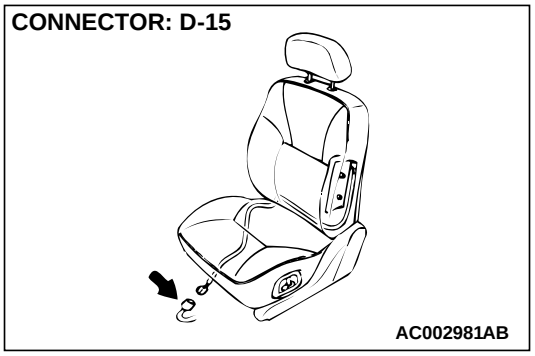
(1) Disconnect SRS-ECU connector C-74.



⚠ CAUTION

To release the short bar in the SRS-ECU connector, disconnect connector D-15 to short the squib circuit.

(2) Disconnect left hand side-airbag module connector D-15.

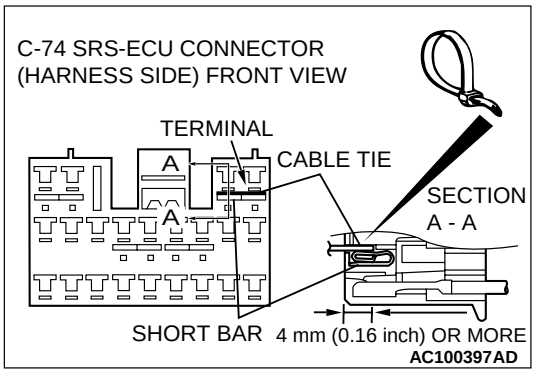


⚠ CAUTION

Insert an insulator such as a cable tie to a depth of 4mm (0.16 inch) or more, otherwise the short bar will not release the cable tie.

(3) Insert a cable tie [3 mm (0.12 inch) wide, 0.5 mm (0.02 inch) thick] between terminals 21, 22 and the short bar to release the short bar.

(4) Measure at the wiring harness side.



⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

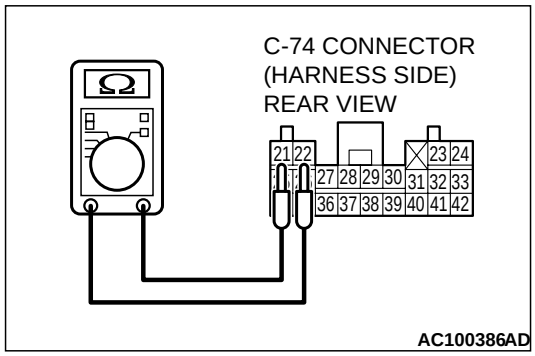
(5) Check the continuity between terminals 21 and 22.

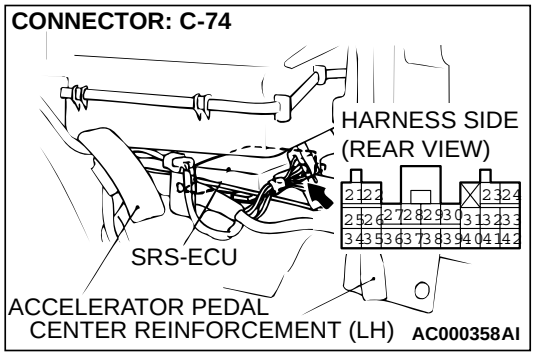
- There should be open circuit.

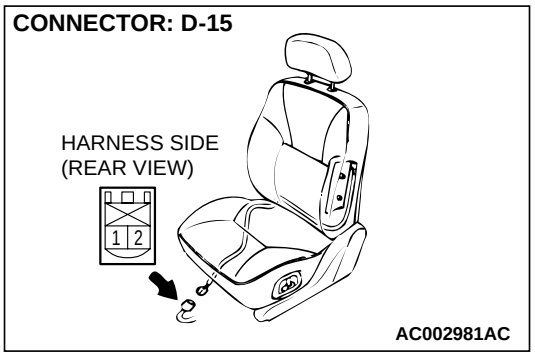
Q: Is the circuit normal?

YES : Erase the DTC memory, and recheck if any DTC sets. If DTC 81 sets, replace the SRS-ECU. Refer to P.52B-142.

NO : Go to Step 6.







STEP 6. Check the harness wires for short circuit between SRS-ECU connector C-74 (terminal No.21 and 22) and side-airbag module (LH) connector D-15 (terminal No.1 and 2).

Q: Are the harness wires between SRS-ECU connector C-74 (terminal No.21 and 22) and side-airbag module (LH) connector D-15 (terminal No.1 and 2) in good condition?

YES : Go to Step 7.

NO : Repair the harness wires between SRS-ECU connector C-74 and side-airbag module (LH) connector D-15. Then go to Step 7.

STEP 7. Check for DTC.

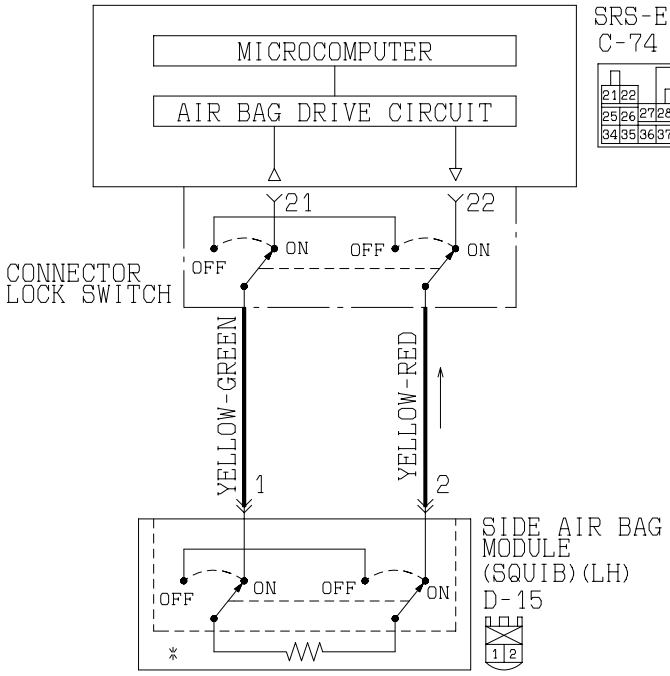
Q: Is DTC 81 output?

YES : Return to Step 1.

NO : This diagnosis is complete. (If no malfunctions are not found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.)

DTC 82:Left Hand Side-Airbag Module (Squib) System Fault 2 (Open in the Squib Circuit)

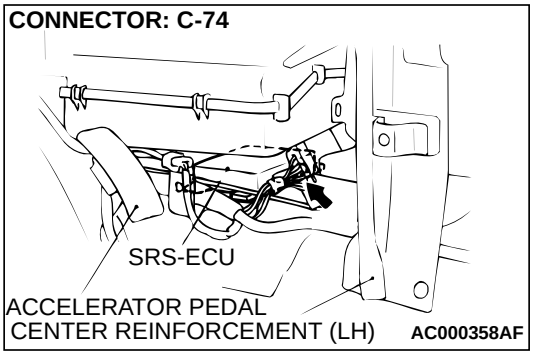
Side Air Bag Module (LH) (Squib) Circuit



NOTE
*: CONNECTOR LOCK SWITCH

W3S15M04AA
AC106625AB

CONNECTOR: C-74



AC000358AF

CONNECTOR: D-15

AC002981AB

CIRCUIT OPERATION

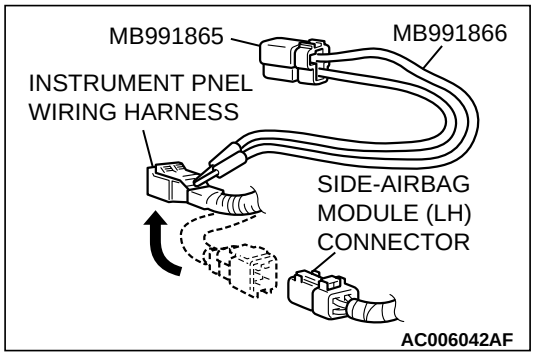
- The SRS-ECU judges how severe a collision is by detecting signals from the left and right side impact sensors. If the impact is over a predetermined level, the SRS-ECU outputs an ignition signal. At this time, if the side-airbag safing G-sensor is on, the SRS air bag will inflate.
- The ignition signal is input to the air bag module to inflate the air bag.

DTC SET CONDITIONS

- This DTC is set if there is abnormal resistance between the input terminals of the side-airbag module (LH) (squib).

TROUBLESHOOTING HINTS

- Open circuit in the left hand side-airbag module (squib) circuit
- Improper connector contact
- Malfunction of the SRS-ECU



DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)
- MB991865: Dummy resister
- MB991866: Resister harness

STEP 1. Check the side-air bag module (LH).

(1) Connect special tool MB991865 to special tool MB991866.

⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(2) Disconnect the left hand side-airbag connector D-15, and insert special tool MB991866 into the harness side connector by backprobing.

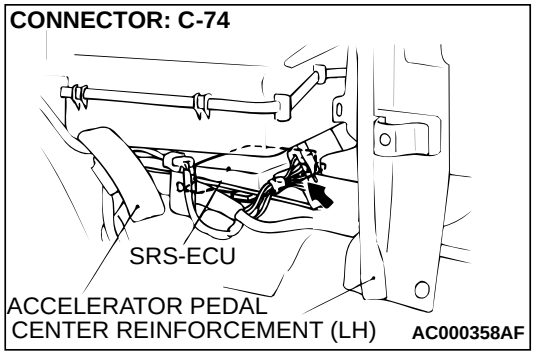
(3) Connect the negative battery terminal.

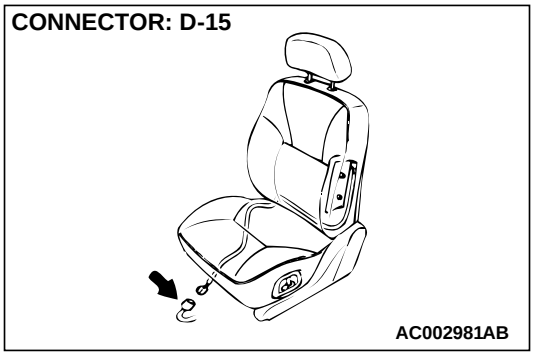
(4) Erase DTC memory, and then recheck the DTC.

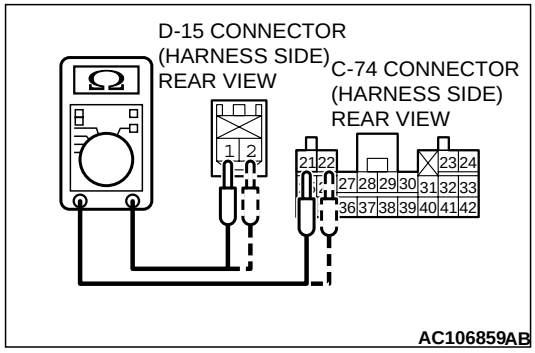
Q: Is DTC 82 output?

YES : Go to Step 2.

NO : Replace the seat back assembly of the front seat (LH). Refer to GROUP 52A, Front Seat P.52A-16. Then go to Step 3.







STEP 2. Check the harness for open circuit between the SRS-ECU and the left hand side-airbag module (LH).

(1) Disconnect SRS-ECU connector C-74 and side-airbag module (LH) connector D-15, and measure at the wiring harness side.

⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(2) Check the continuity between the following terminals.

C-74 connector		D-15 connector
21	-	1
22	-	2

- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Erase the DTC memory, and recheck if any DTC sets. If DTC 82 sets, replace the SRS-ECU. Refer to P.52B-144. Then go to Step 3.

NO : Repair the harness wires between SRS-ECU connector C-74 and side-airbag module (LH) connector D-15. Then go to Step 3.

STEP 3. Check for DTC.

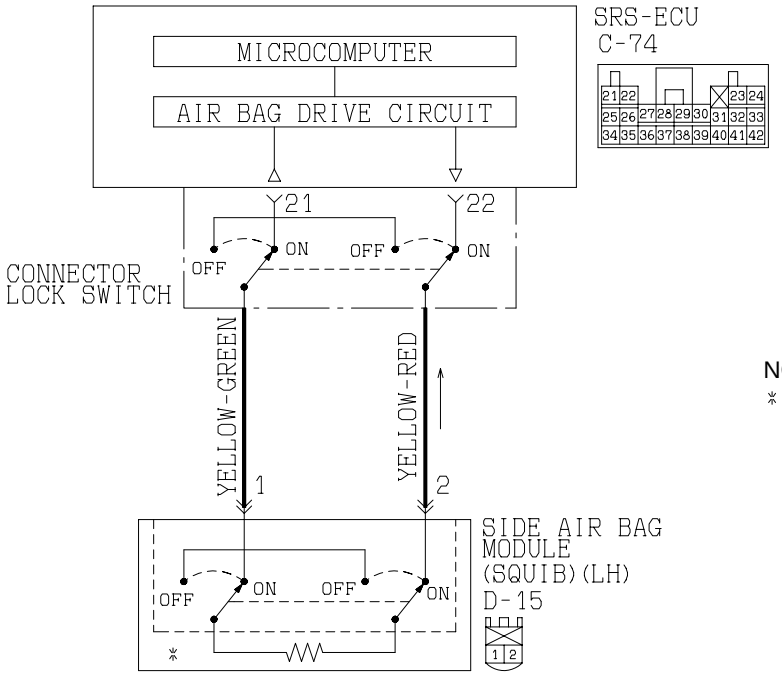
Q: Is DTC 82 output?

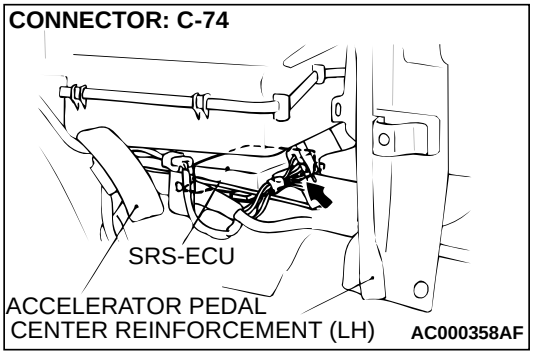
YES : Return to Step 1.

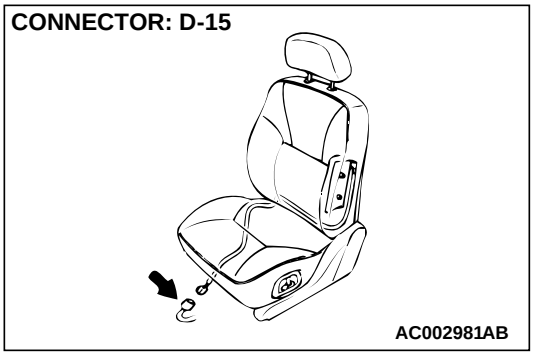
NO : This diagnosis is complete. (If no malfunctions are not found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.)

DTC 85:Left Hand Side-Airbag Module (Squib) System Fault Power Supply circuit (Short-Circuit to Power Supply)

Side Air Bag Module (LH) (Squib) Circuit







CIRCUIT OPERATION

- The SRS-ECU judges how severe a collision is by detecting signals from the left and right side impact sensors. If the impact is over a predetermined level, the SRS-ECU outputs an ignition signal. At this time, if the side-airbag safing G-sensor is on, the SRS air bag will inflate.
- The ignition signal is input to the air bag module to inflate the air bag.

DTC SET CONDITIONS

- This DTC is set if there is abnormal resistance between the input terminals of the side-airbag module (LH) (squib).

TROUBLESHOOTING HINTS

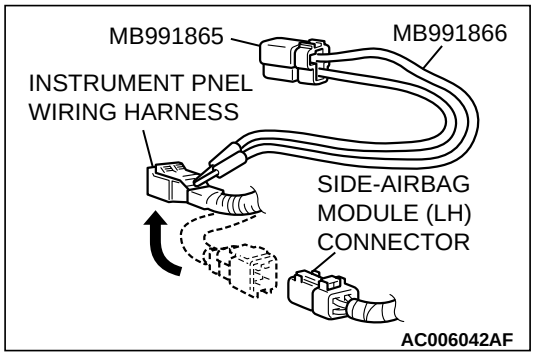
- Damaged wiring harnesses or connectors
- Short to the power supply in the left hand side-airbag module (squib) harness
- Malfunction of the SRS-ECU

TSB Revision

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)
- MB991865: Dummy resister
- MB991866: Resister harness



STEP1. Check the side-airbag module (LH).

(1) Connect special tool MB991865 to special tool MB991866.

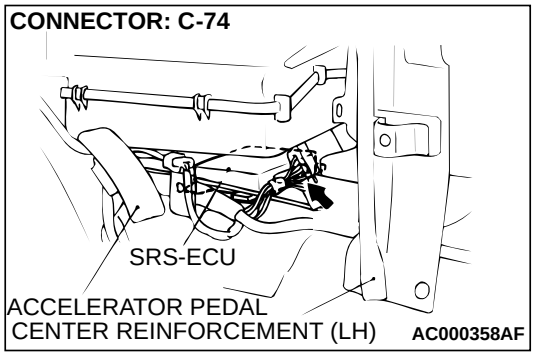
⚠ CAUTION

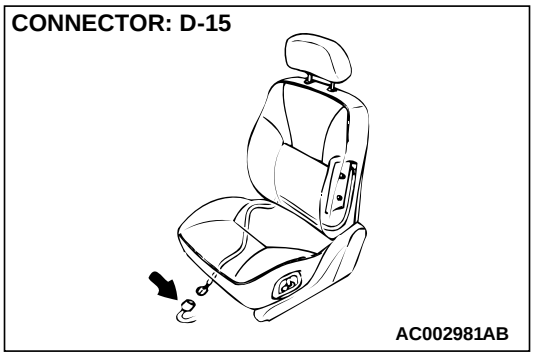
Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

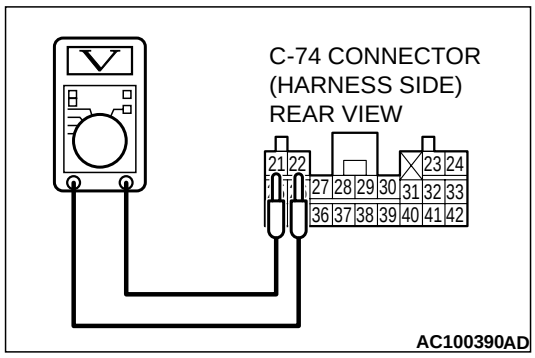
(2) Disconnect the side-airbag module (LH) connector D-15, and insert special tool MB991866 into the harness side connector by backprobing.
(3) Connect the negative battery terminal.
(4) Erase the DTC memory, and then recheck the DTC.

Q: Is DTC 85 output?

YES : Go to Step 2.
NO : Replace the seat back assembly of the front seat (LH). Refer to GROUP 52A, Front Seat P.52A-16. Then go to Step 4.







STEP 2. Check the harness for short circuit to power supply between the SRS-ECU and the side-airbag module (LH).

(1) Disconnect SRS-ECU connector C-74.
(2) Disconnect left hand side-airbag module connector D-15.
(3) TUrn the ignition switch to the "ON" position.
(4) Measure at the wiring harness side.

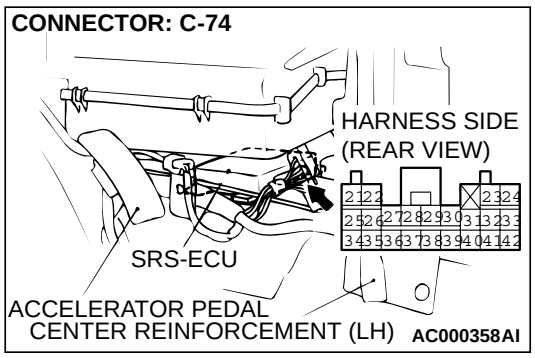
⚠ CAUTION
Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

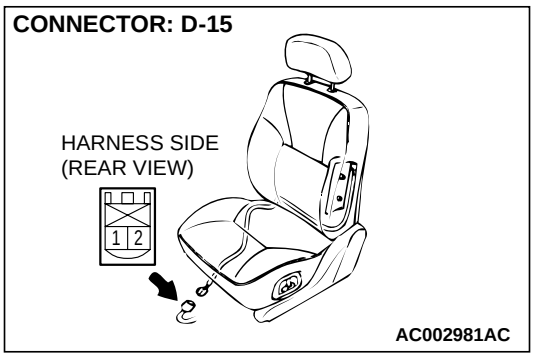
(5) Measure the voltage between terminals 21, 22 and body ground.
- Voltage should be 0 volt.

Q: Is the voltage normal?

YES : Erase the DTC memory, and recheck if any DTC sets. If DTC 85 sets, replace the SRS-ECU. Refer to P.52B-144. Then go to Step 4.

NO : Go to Step 3.





STEP 3. Check the harness wires for short circuit to power supply between SRS-ECU connector C-74 (terminal No.21 and 22) and side-airbag module (LH) connector D-15 (terminal No.1 and 2).

Q: Are the harness wires between SRS-ECU connector C-74 (terminal No.21 and 22) and side-airbag module (LH) connector D-15 (terminal No.1 and 2) in good condition?

YES : Go to Step 4.

NO : Repair the harness wires between SRS-ECU connector C-74 and side-airbag module (LH) connector D-15. Then go to Step 4.

STEP 4. Check the DTC.

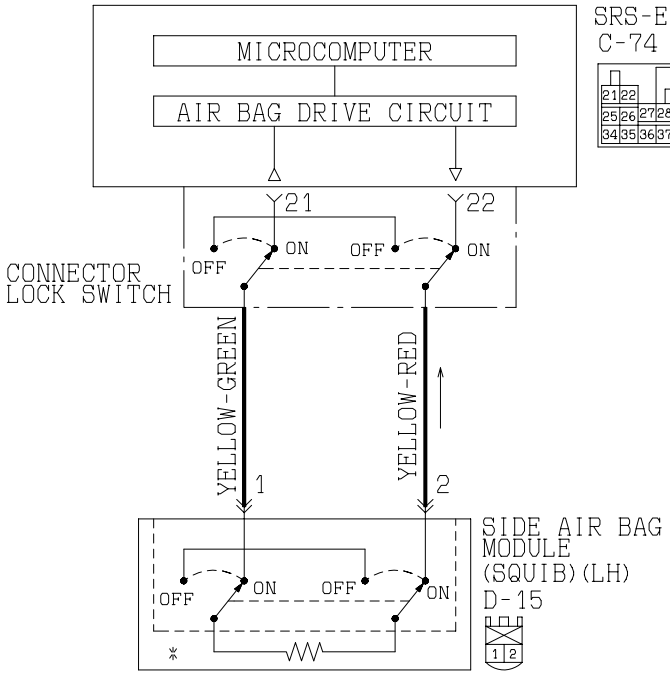
Q: Is DTC 85 output?

YES : Return to Step 1.

NO : This diagnosis is complete. (If no malfunctions are not found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.)

DTC 86:Left Hand Side-Airbag Module (Squib) System Fault Ground Circuit (Short-Circuit to Ground)

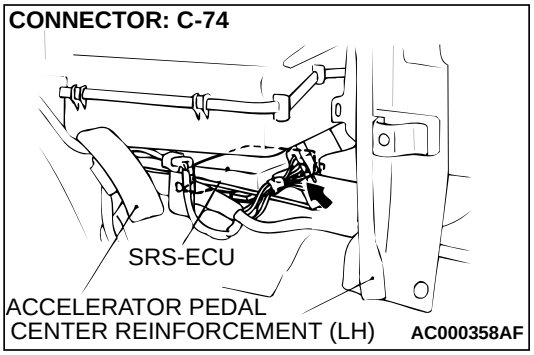
Side Air Bag Module (LH) (Squib) Circuit



NOTE
*: CONNECTOR LOCK SWITCH

W3S15M04AA
AC106625AB

CONNECTOR: C-74



AC000358AF

CONNECTOR: D-15

AC002981AB

CIRCUIT OPERATION

- The SRS-ECU judges how severe a collision is by detecting signals from the left and right side impact sensors. If the impact is over a predetermined level, the SRS-ECU outputs an ignition signal. At this time, if the side-airbag safing G-sensor is on, the SRS air bag will inflate.
- The ignition signal is input to the air bag module to inflate the air bag.

DTC SET CONDITIONS

- This DTC is set if there is abnormal resistance between the input terminals of the side-airbag module (LH) (squib).

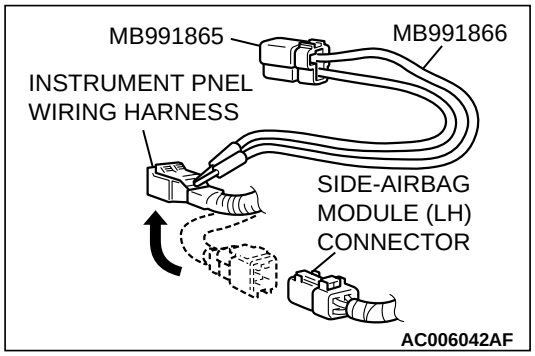
TROUBLESHOOTING HINTS

- Damaged wiring harnesses or connectors
- Short to ground in the left hand side-airbag module (squib) harness
- Malfunction of the SRS-ECU

DIAGNOSIS

Required Special Tool:

- MB991502: Scan Tool (MUT-II)
- MB991865: Dummy resister
- MB991866: Resister harness



STEP1. Check the side-airbag module (LH).

(1) Connect special tool MB991865 to special tool MB991866.

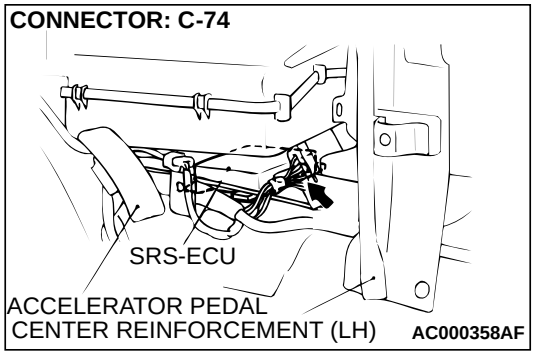
⚠ CAUTION

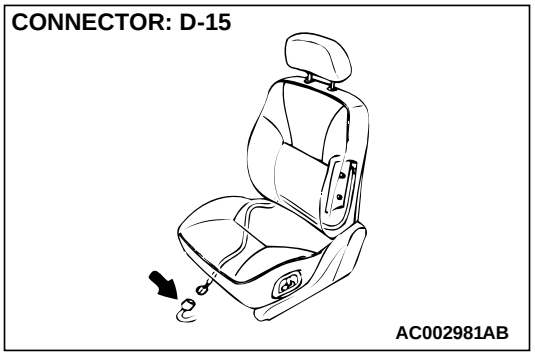
Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

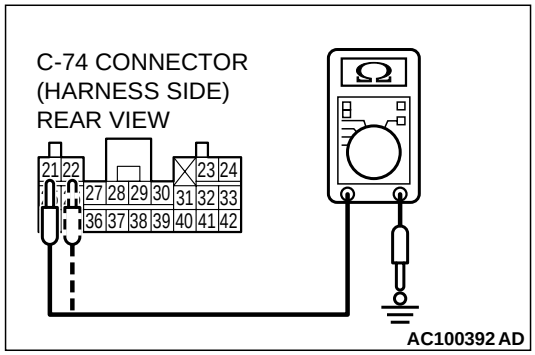
(2) Disconnect the left hand side-airbag module (LH) connector D-15, and insert special tool MB991866 into the harness side connector by backprobing.
(3) Connect the negative battery terminal.
(4) Erase the DTC memory, and then recheck the DTC.

Q: Is DTC 86 output?

YES : Go to Step 2.
NO : Replace the seat back assembly of the front seat (LH). Refer to GROUP 52A, Front Seat P.52A-16. Then go to Step 4.







STEP 2. Check the harness for short circuit to ground between the SRS-ECU and the side-airbag module (LH).

(1) Disconnect SRS-ECU connector C-74.
(2) Disconnect left hand side-airbag module connector D-15.
(3) Measure at the wiring harness side.

⚠ CAUTION

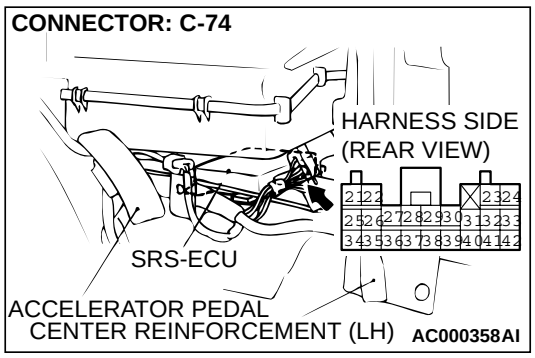
Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

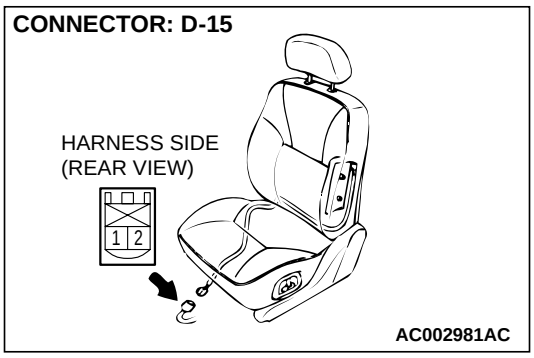
(4) Check the continuity between terminals 21, 22 and body ground.
- There should be open circuit.

Q: Is the continuity normal?

YES : Erase the DTC memory, and recheck if any DTC sets. If DTC 86 sets, replace the SRS-ECU. Refer to P.52B-144. Then go to Step 4.

NO : Go to Step 3.





STEP 3. Check the harness wires for short circuit to ground between SRS-ECU connector C-74 (terminal No.21 and 22) and side-airbag module (LH) connector D-15 (terminal No.1 and 2).

Q: Are the harness wires for short circuit to ground between SRS-ECU connector C-74 (terminal No.21 and 22) and side-airbag module (LH) connector D-15 (terminal No.1 and 2) in good condition?

YES : Go to Step 4.

NO : Repair the harness wires between SRS-ECU connector C-74 and side-airbag module (LH) connector D-15. Then go to Step 4.

STEP 4. Check the DTC.

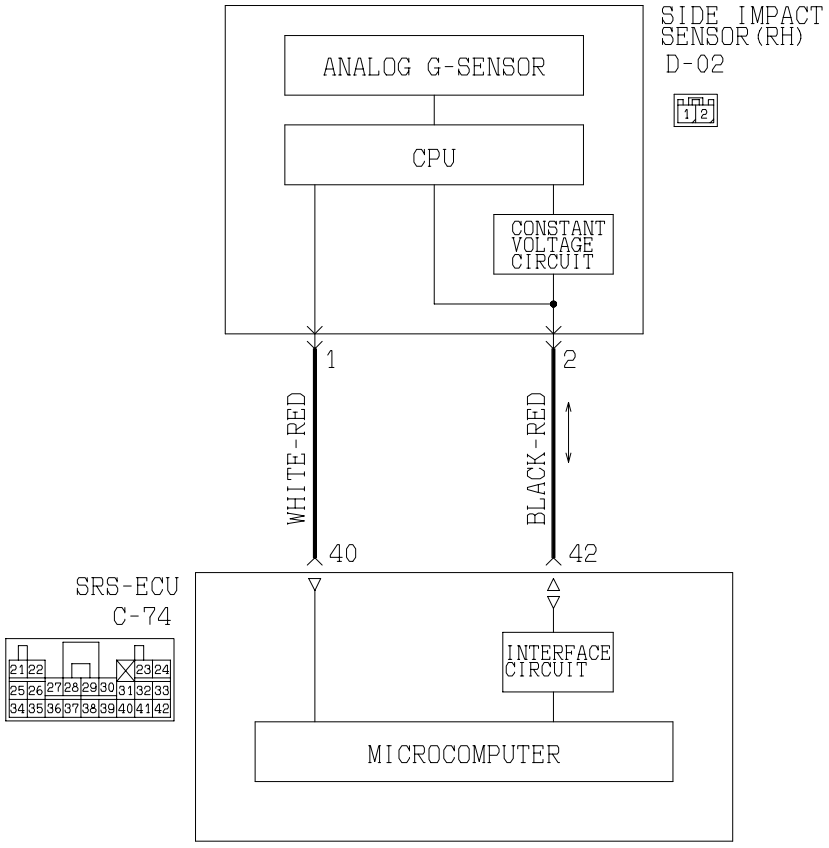
Q: Is DTC 86 output?

YES : Return to Step 1.

NO : This diagnosis is complete. (If no malfunctions are not found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.)

DTC 89: Right Hand Side-airbag Module (Squib) System Fault 5 for Power Supply Circuit
DTC 96: Right Hand Side-airbag Module (Squib) System Fault 6 for Communication System

Side Impact Sensor (RH) Circuit



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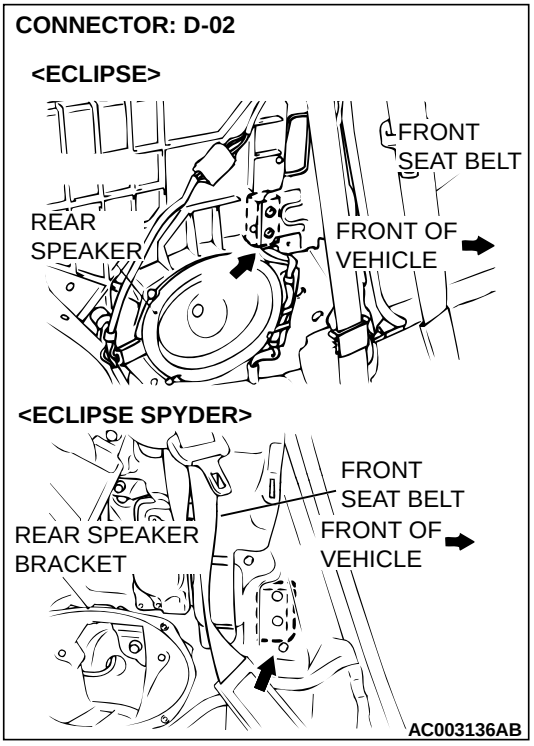
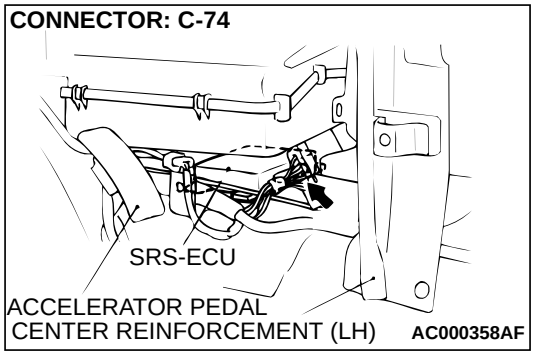




CIRCUIT OPERATION

- The SRS-ECU judges how severe a by detecting signals from the left and right side impact sensors and the analog G-sensor. If the impact is over a predetermined level, the SRS-ECU outputs an ignition signal. At this time, if the safing G-sensor is on, the SRS air bag will inflate.

DTC SET CONDITIONS

- These DTC are set if communication between the side impact sensor (RH) and the SRS-ECU is not possible or faulty.

TROUBLESHOOTING HINTS

- Damaged wiring harnesses or connectors
- Malfunction of the side impact sensor (RH)
- Malfunction of the SRS-ECU

DIAGNOSIS

Required Special Tool:

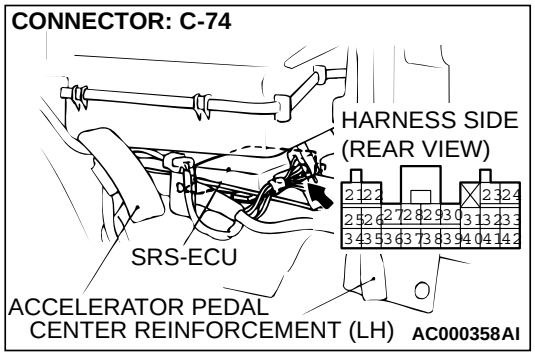
- MB991502: Scan Tool (MUT-II)

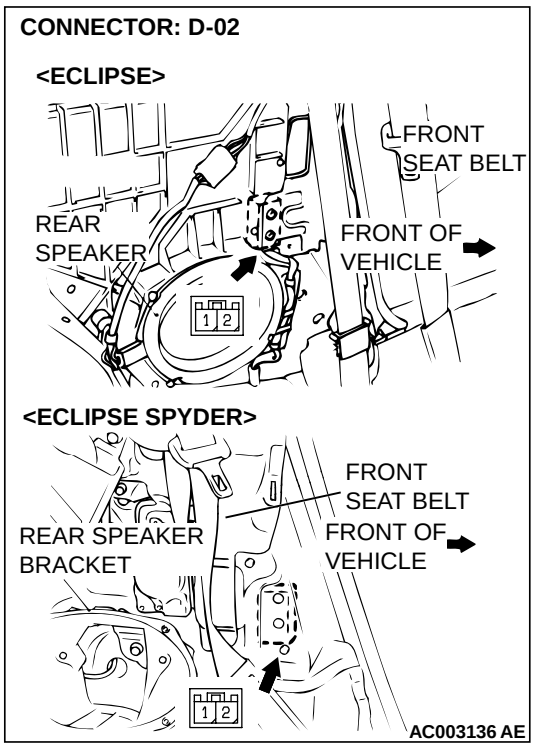
STEP 1. Check the side impact sensor.

(1) Replace the side impact sensor (RH) with the side impact sensor (LH).
(2) Connect the negative battery terminal.
(3) Erase DTC memory.

Q: Is any of DTC 79 or 93 erased and DTC 79 or 93 out put?

YES : Replace the side impact sensor (RH) with a new one. (Refer to P.52B-153.) Then go to Step 3.
NO : Go to Step 2.





STEP 2. Check the harness wires between SRS-ECU connector C-74 (terminal No.40 and 42) and side impact sensor (RH) connector D-02 (terminal No.1 and 2).

Q: Are the harness wires between SRS-ECU connector (terminal No.40 and 42) and side impact sensor (RH) connector D-02 (terminal No.1 and 2) in good condition?

YES : Go to Step 3.

NO : Repair them. Then go to Step 3.

STEP 3. Check for DTC.

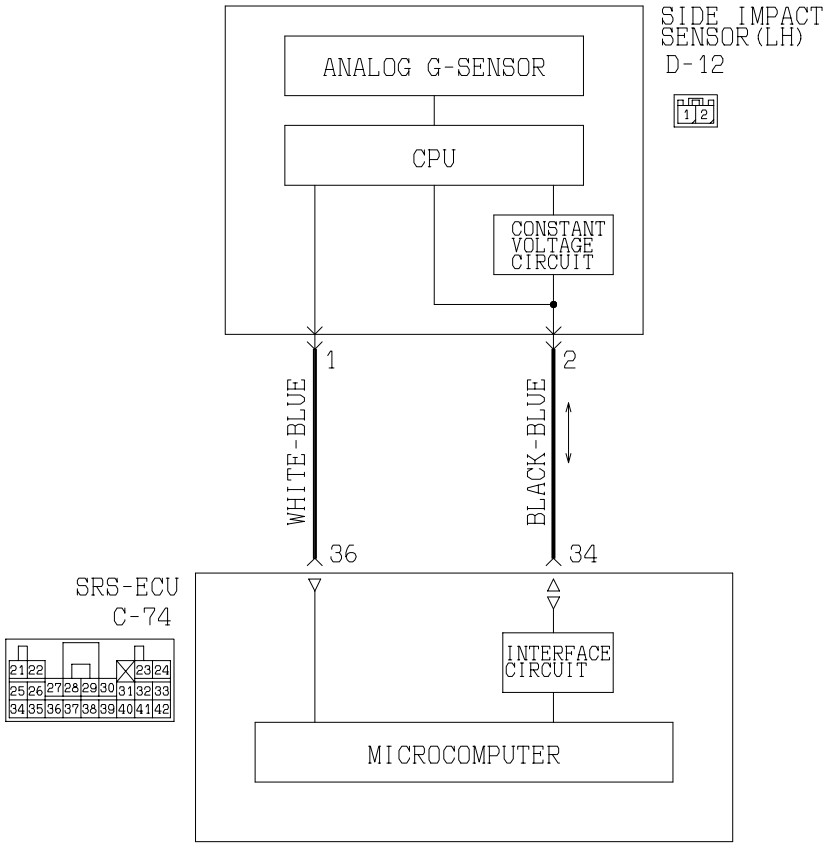
Q: Is any of DTC 89 or 96 output?

YES : Replace the SRS-ECU. (Refer to P.52B-142.)

NO : This diagnosis is complete. (If no malfunctions are not found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.)

DTC 91: Left Hand Side-Impact Sensor Power Supply Circuit System

Side Impact Sensor (LH) Power Supply Circuit



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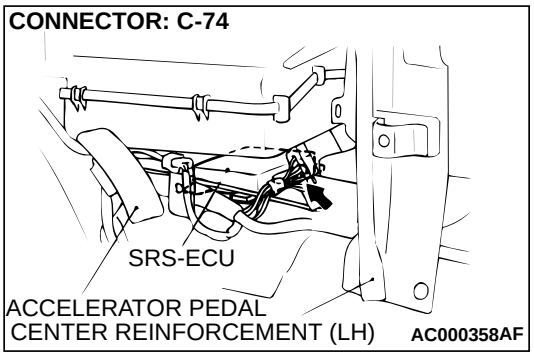

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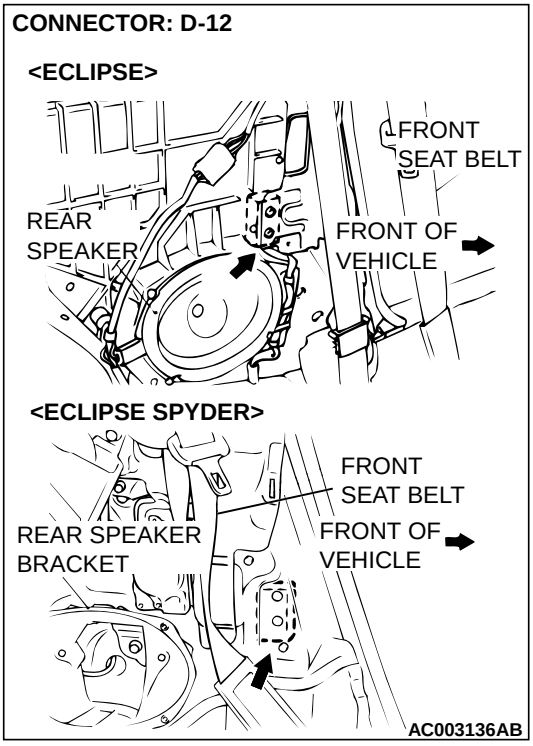


CIRCUIT OPERATION

- The SRS-ECU judges how severe a collision is by detecting signals from the side impact sensor. If the impact is over a predetermined level, the SRS-ECU outputs an ignition signal. At this time, if the side-airbag safing G-sensor is on, the SRS air bag will inflate.

DTC SET CONDITIONS

- This DTC will set when the power supply voltage to the left-side impact sensor remains less than a predetermined value for five seconds. However, if the system returns to normal condition, code number 91 will be erased automatically and the SRS warning light will go out.

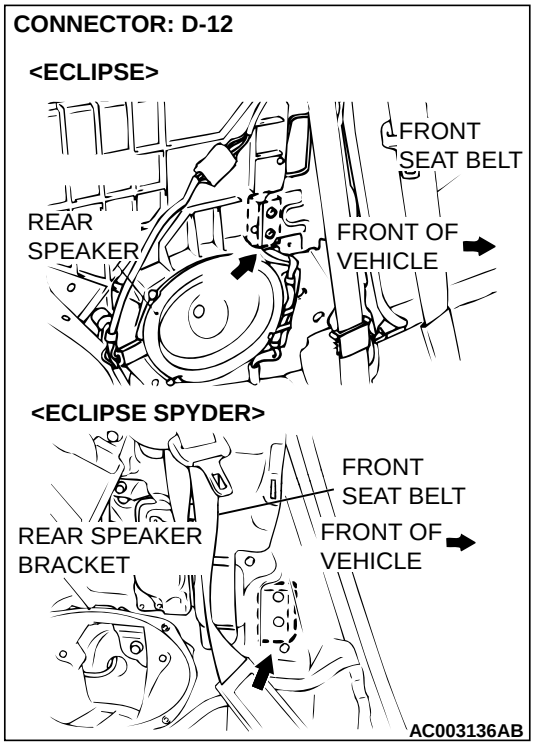
TROUBLESHOOTING HINTS

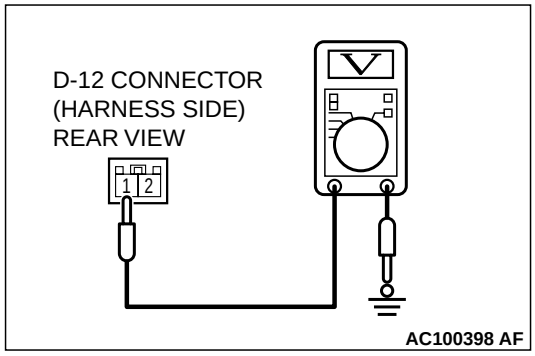
- Damaged wiring harness or connectors
- Malfunction of the side-airbag module (LH) (squib)
- Malfunction of the SRS-ECU

DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991223 (MB991222): Harness set (Probe)





STEP 1. Check the side impact sensor (LH) line at the SRS-ECU connector C-74.

(1) Disconnect left-side side impact sensor connector D-12, and measure at the wiring harness side.
(2) Connect the negative battery terminal.
(3) Turn the ignition switch to the "ON" position.

⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(4) Measure the voltage between terminal 1 and the ground.
- Voltage should be 9 volts or more

Q: Is the voltage normal?

YES : Replace the side impact sensor (LH). Refer to P.52B-153. Then go to Step 3.

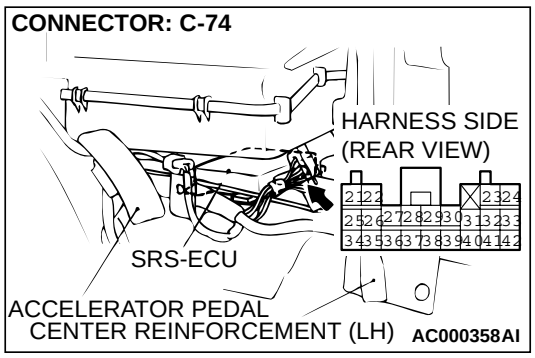
NO : Go to Step 2.

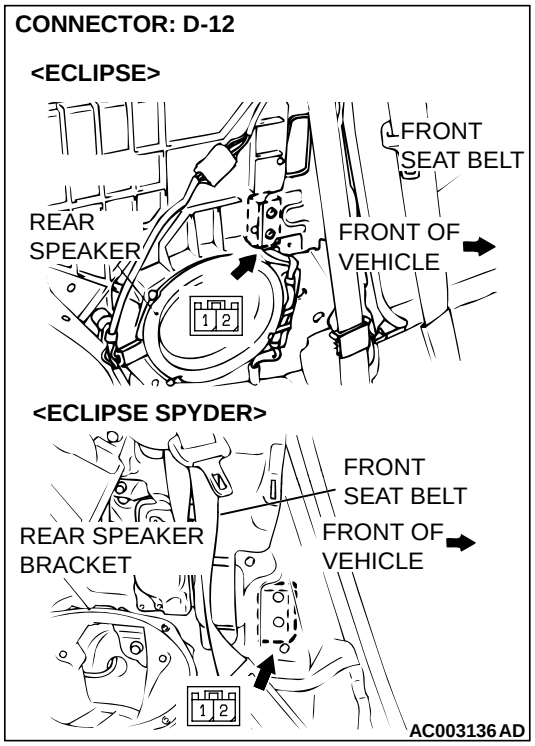
STEP 2. Check the harness wires for open circuit or short circuit between SRS-ECU connector C-74 (terminal No.34 and 36) and side impact sensor (LH) connector D-12 (terminal No.1 and 2).

Q: Are the harness wires between SRS-ECU connector C-74 (terminal No.34 and 36) and side impact sensor (LH) connector D-12 (terminal No.1 and 2) in good condition?

YES : Erase the DTC memory, and recheck if any DTC sets. If DTC 91 steps. Replace the SRS-ECU. Refer to P.52B-142.

NO : Repair the harness wires between SRS-ECU connector C-74 and side impact sensor (LH) connector D-12. Then go to Step 3.





STEP 3. Check DTC.

Q: Is DTC 91 output?

YES : Return to Step 1.

NO : This diagnosis is complete. (If no malfunctions are not found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.)

DTC 92: Left Hand Side-Impact Sensor System for Fault 1
DTC 95: Right Hand Side-Impact Sensor System for Fault 1

DTC SET CONDITIONS
- These DTC are set if the following are detected from the analog G-sensor output.
  - Analog G-sensor is not operating.
  - Analog G-sensor characteristics are abnormal.
  - Analog G-sensor output is abnormal.

TROUBLESHOOTING HINTS
- Malfunction of side impact sensor <LH> (for DTC 92) and side impact sensor <RH> (for DTC 95)

DIAGNOSIS

Required Special Tool:
- MB991502: Scan Tool (MUT-II)

STEP 1. Check for DTC.

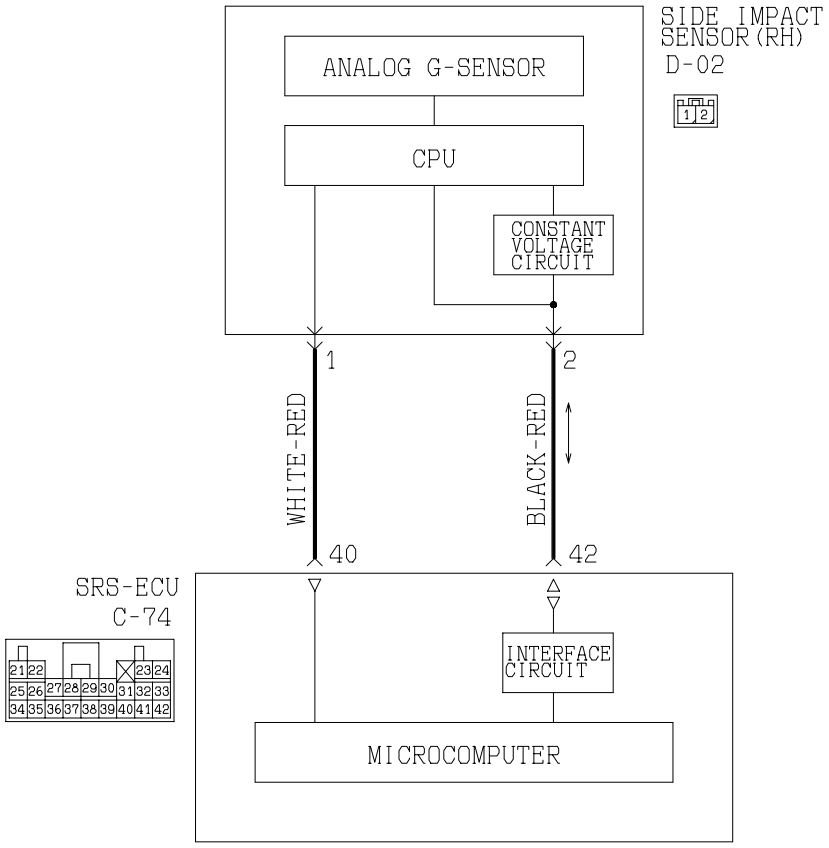
Replace side impact sensor <LH> (for DTC 92) and side impact sensor <RH> (for DTC 95). Refer to P.52B-153.

Q: Is any of DTC 92 or 95 output?

YES : Replace the SRS-ECU. Refer to P.52B-142.
NO : This diagnosis is complete.

DTC 94: Right Hand Side-Impact Sensor Power Supply Circuit System

Side Impact Sensor (RH) Power Supply Circuit



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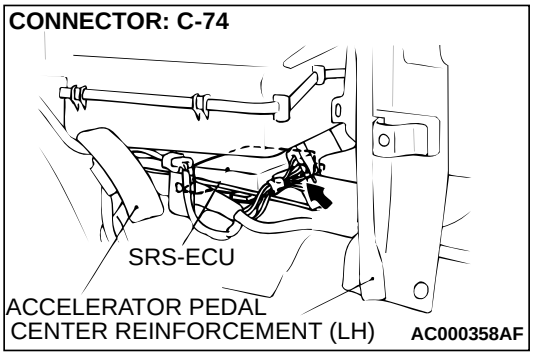
CONNECTOR: C-74



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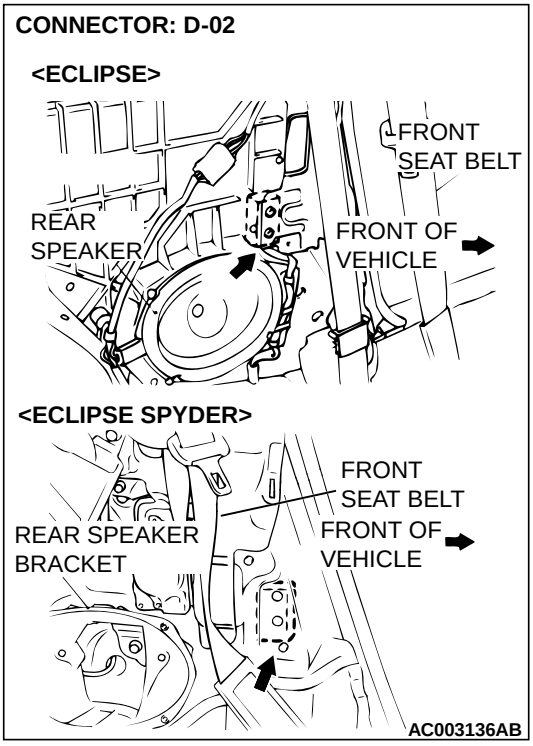


CIRCUIT OPERATION

- The SRS-ECU judges how severe a collision is by detecting signals from the side impact sensor. If the impact is over a predetermined level, the SRS-ECU outputs an ignition signal. At this time, if the side-airbag safing G-sensor is on, the SRS air bag will inflate.

DTC SET CONDITIONS

- This DTC is set if the power supply voltage of the side impact sensor (RH) drops below the rated value for a continuous period of 5 seconds or more. However, DTC number 94 will be automatically cleared and the SRS warning light will switch off if the condition returns to normal.

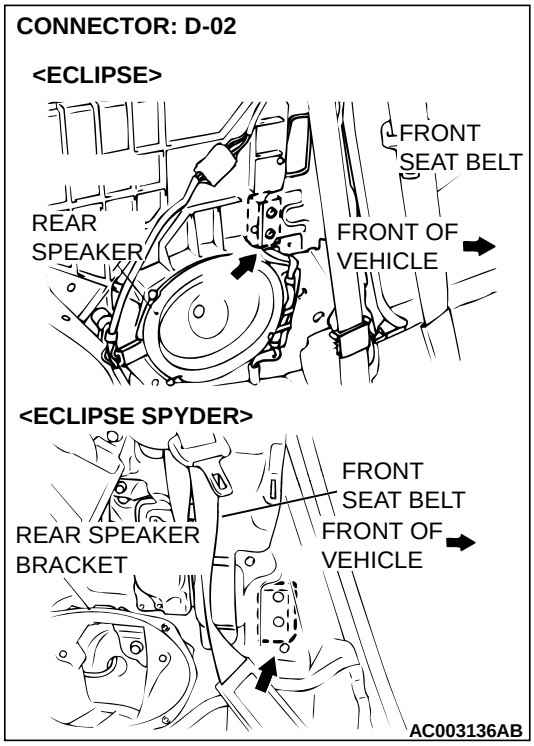
TROUBLESHOOTING HINTS

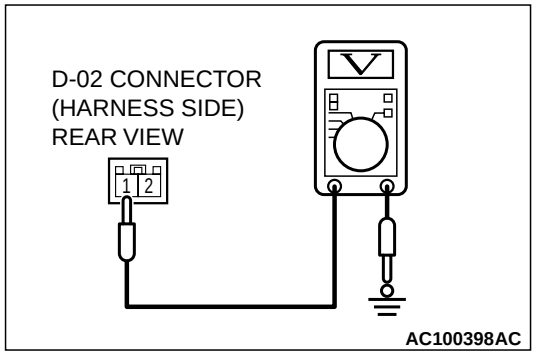
- Damaged wiring harnesses or connectors
- Malfunction of the side-airbag module (RH) (squib)
- Malfunction of the SRS-ECU

DIAGNOSIS

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991223 (MB991222): Harness Set (Probe)





STEP 1. Check the side impact sensor (RH) line at the SRS-ECU connector C-74.

(1) Disconnect side impact sensor (RH) connector D-02, and measure at the wiring harness side.
(2) Connect the negative battery terminal.
(3) Turn the ignition switch to the "ON" position.

⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

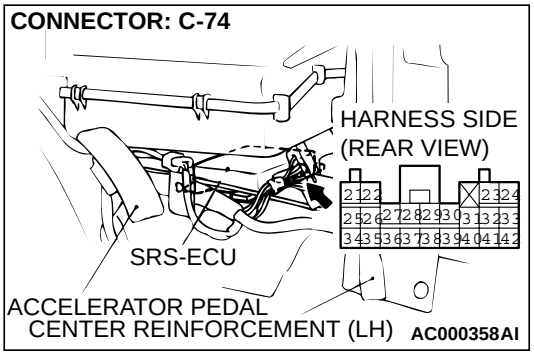
(4) Measure the voltage between terminal 1 and body ground.
- Voltage should be 9 volts or more.

Q: Is the voltage normal?

YES : Replace the side impact sensor (RH). Refer to P.52B-153. Then go to Step 3.

NO : Go to Step 2.

CONNECTOR: C-74



CONNECTOR: D-02

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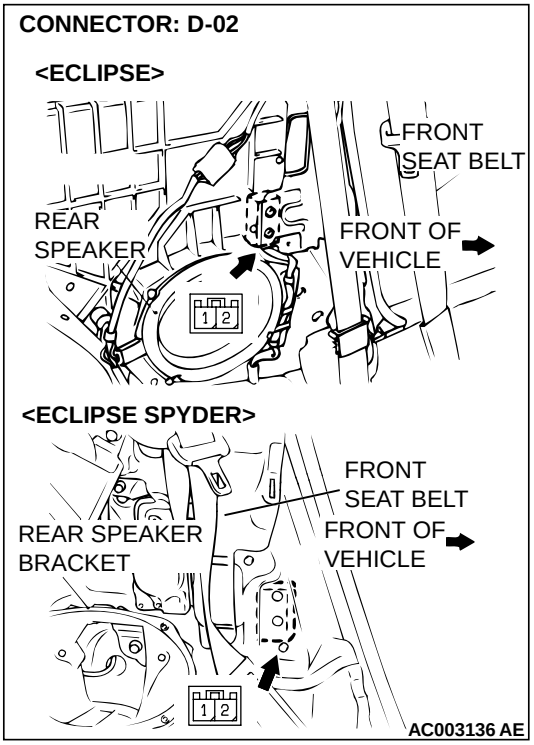

STEP 2. Check the harness wires for open circuit or short circuit between SRS-ECU connector C-74 (terminal No.40 and 42) and side impact sensor (RH) connector D-02 (terminal No.1 and 2).

Q: Are the harness wires between SRS-ECU connector C-74 (terminal No.40 and 42) and side impact sensor (RH) connector D-02 (terminal No.1 and 2) in good condition?

YES : Erase the DTC memory, and recheck if any DTC sets. If DTC 94 sets, replace the SRS-ECU. Refer to P.52B-142. Then go to Step 3.

NO : Repair the harness wires between SRS-ECU connector C-74 and side impact sensor (RH) connector D-02. Then go to Step 3.

STEP 3. Check for DTC.

Q: Is DTC 94 output?

YES : Return to Step 1.

NO : This diagnosis is complete. (If no malfunctions are not found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.)

SRS WARNING LIGHT CHECK

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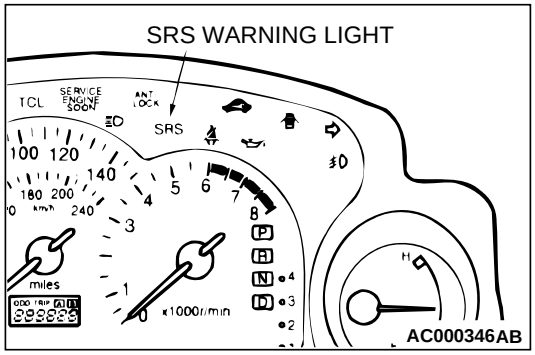
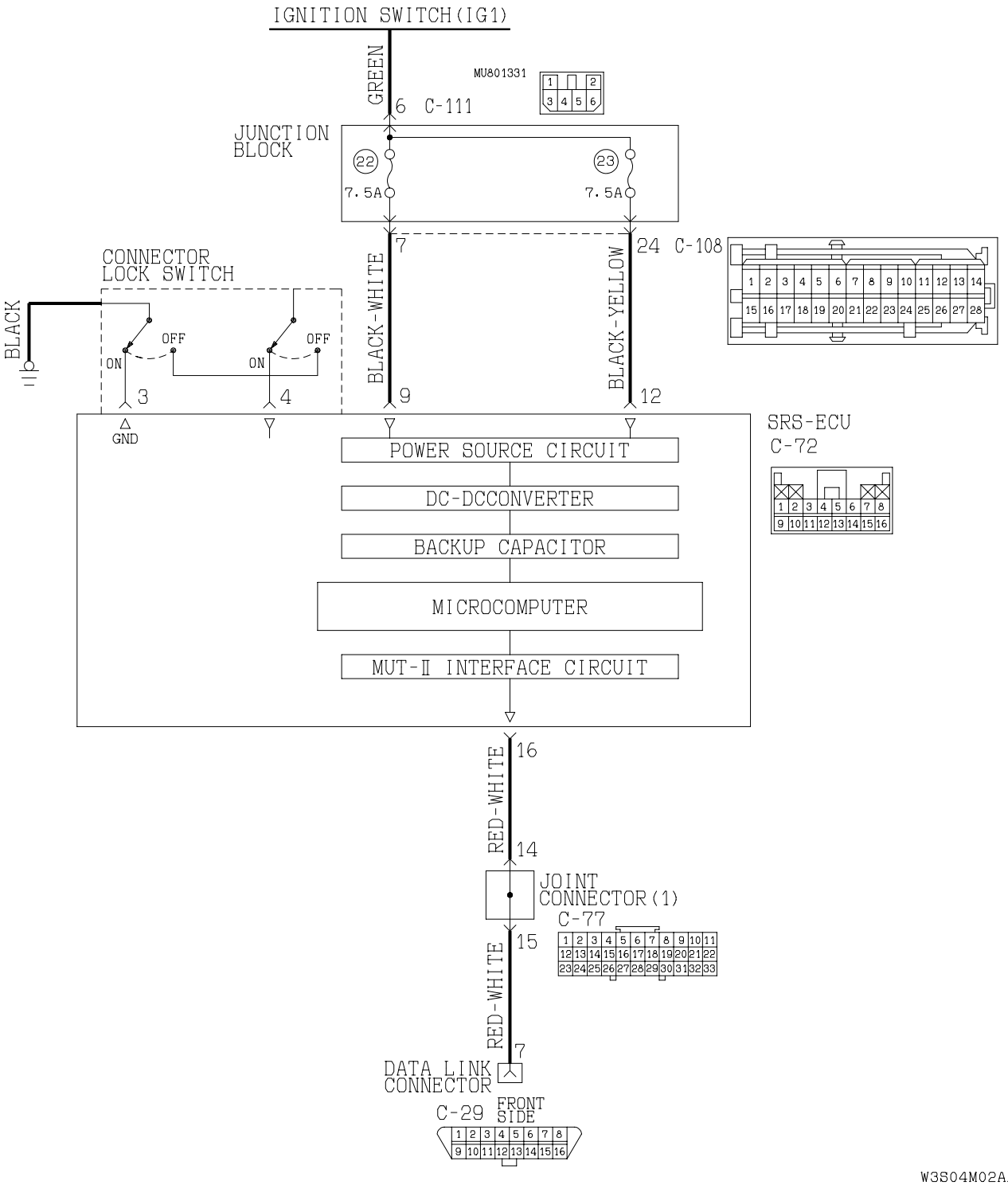


1. Check that the SRS warning light illuminates when the ignition switch is in the "ON" position.
2. Check that it illuminates for approximately 7 seconds and then goes out.
3. If not, check for DTC.

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Communication with scan tool MB991502 is not possible with the SRS system.

SRS-ECU Power Supply Circuit



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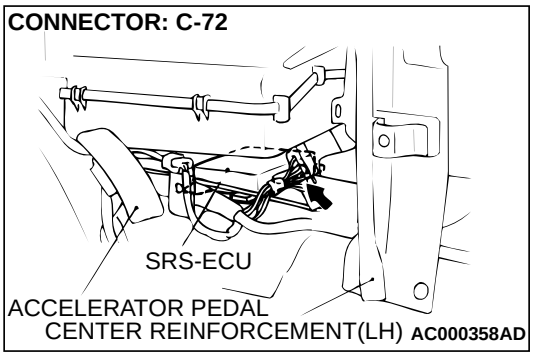
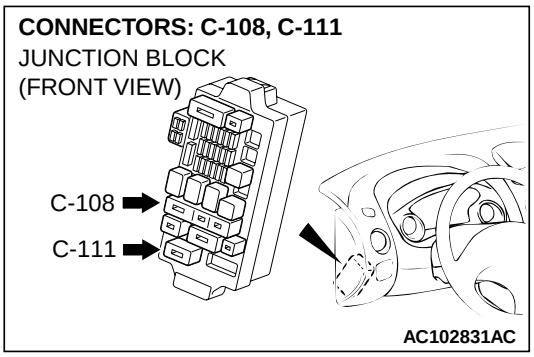
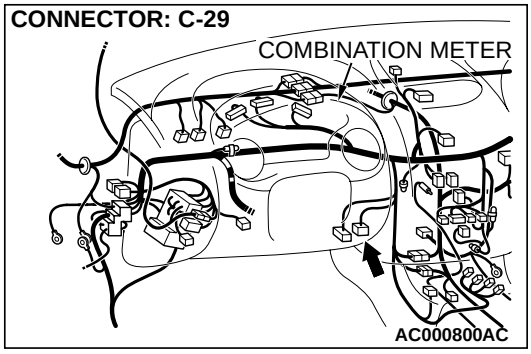
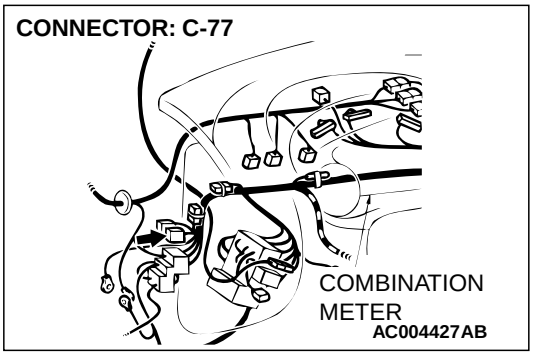








CIRCUIT OPERATION

- The SRS-ECU is powered from the ignition switch (IG1).
- The SRS-ECU power is supplied from two circuits. Even if one circuit is shut off, the air bag can inflate.
- The SRS system diagnosis can be done by connecting scan tool MB991502 to the data link connector.
- The SRS-ECU judges how severe a collision is by detecting signals from the left and right side impact sensors and the analog G-sensor. If the impact is over a predetermined level, the SRS-ECU outputs an ignition signal. At this time, if the safing G-sensor is on, the SRS air bag will inflate.

TECHNICAL DESCRIPTION (COMMENT)

- If communication is not possible with the SRS only, the cause is probably an open circuit in the on-board diagnostic output circuit of the SRS or in the power circuit (including ground circuit).

TROUBLESHOOTING HINTS

- Damaged wiring harnesses or connectors
- Malfunction of the SRS-ECU
- Incorrect scan tool (MUT-II) ROM pack

DIAGNOSIS

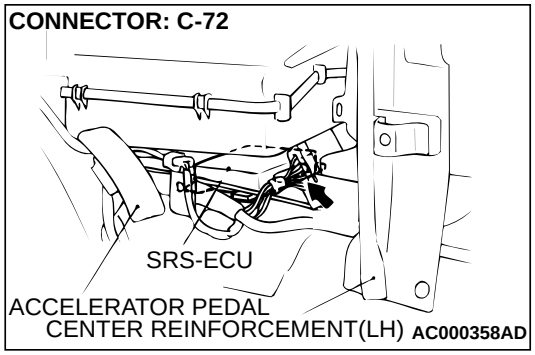
Required Special Tools:

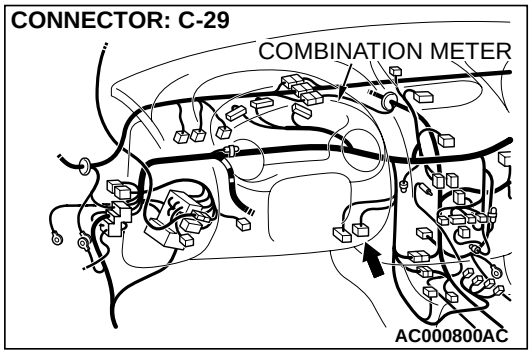
- MB991223 (MB991222): Harness set (Probe)

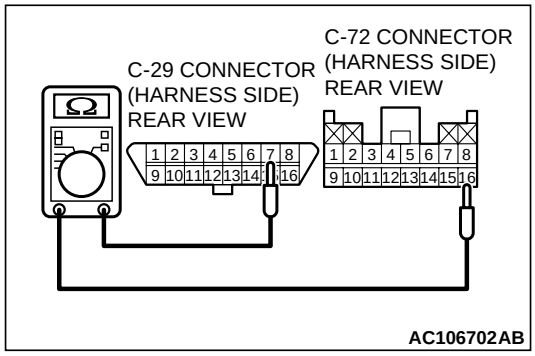
STEP 1. Check that the scan tool can communicate with the other systems.

Q: Can the scan tool communicate with the other systems?

YES : Go to Step 2.
NO : Refer to GROUP 13A, Diagnosis P.13A-434 GROUP 13B, Diagnosis P.13B-530.







STEP 2. Check the communication line between the SRS-ECU and the scan tool.

(1) Disconnect SRS-ECU connector C-72 and data link connector C-29 and measure at the wiring harness side.

⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(2) Check the continuity between the following terminals.

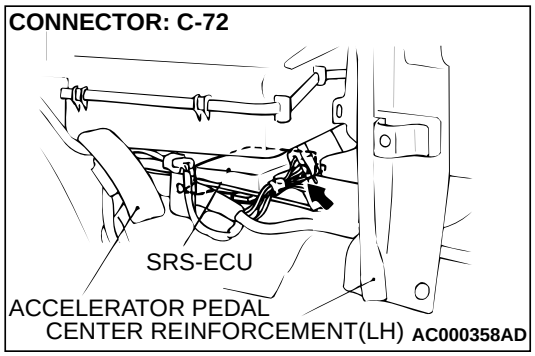
C-72 connector		C-29 connector
16	-	7

- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 3.

NO : Go to Step 5.

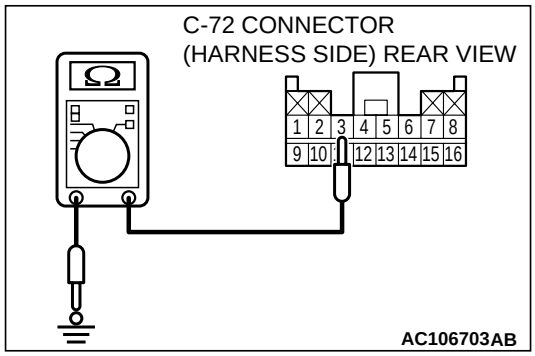


STEP 3. Check the ground circuit to the SRS-ECU.

(1) Disconnect SRS-ECU connector C-72, and measure at the wiring harness side.

⚠ CAUTION

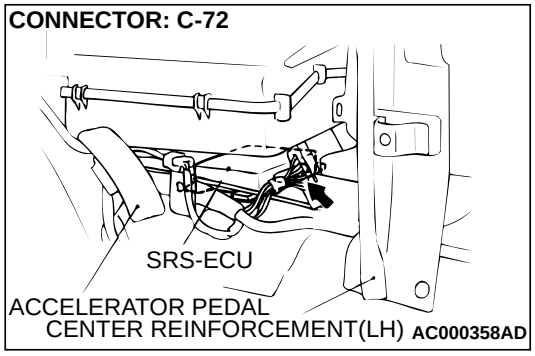
Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.



(2) Check the continuity between terminals 3 and body ground.
- Should be less than 2 ohm.

Q: Is the continuity normal?

YES : Go to Step 4.
NO : Go to Step 6.



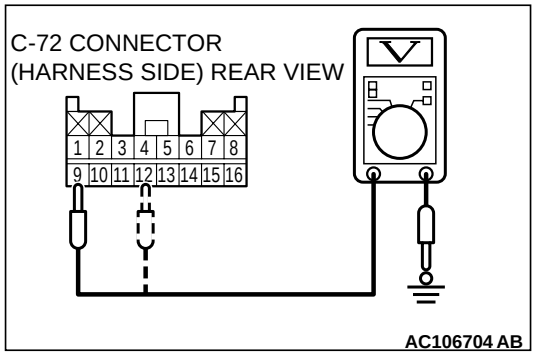
STEP 4. Check the power supply circuit to the SRS-ECU.

(1) Disconnect SRS-ECU connector C-72, and measure at the wiring harness side.
(2) Connect the negative battery terminal.
(3) Turn the ignition switch to the "ON" position.

⚠ CAUTION

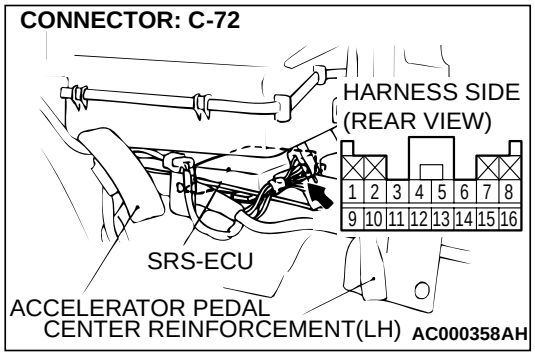
Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

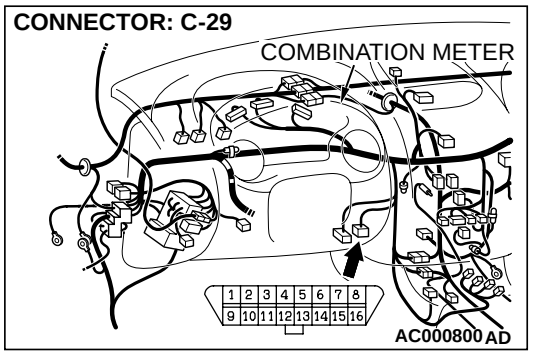
(4) Measure the voltage between terminals 9, 12 and body ground
- Voltage should be 9 volts or more.

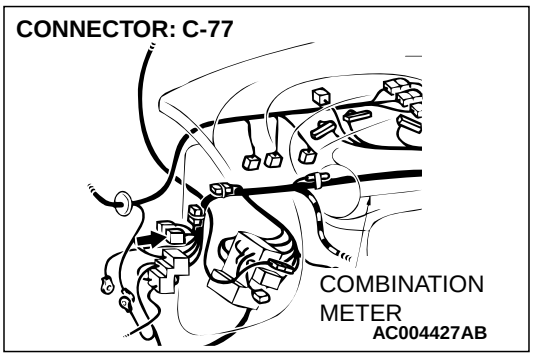


Q: Is the voltage normal?

YES : Replace SRS-ECU. Refer to P.52B-142. Then go to Step 8.
NO : Go to Step 7.





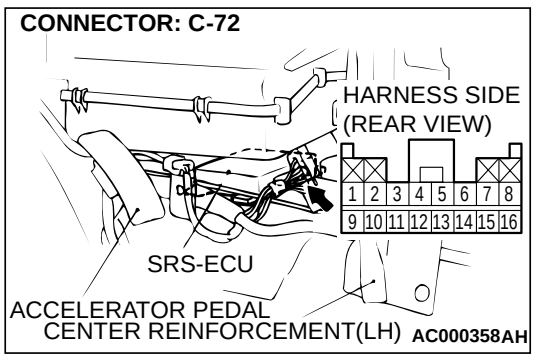


STEP 5. Check the harness wires between SRS-ECU connector C-72 (terminal No.16) and data link connector C-29 (terminal No.7).

NOTE: After inspecting intermediate connector C-77 inspect the wiring harness.
If the intermediate connector C-77 is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.
Go to Step 8.

Q: Are the harness wires between SRS-ECU connector C-72 (terminal No.16) and data link connector C-29 (terminal No.7) in good condition?

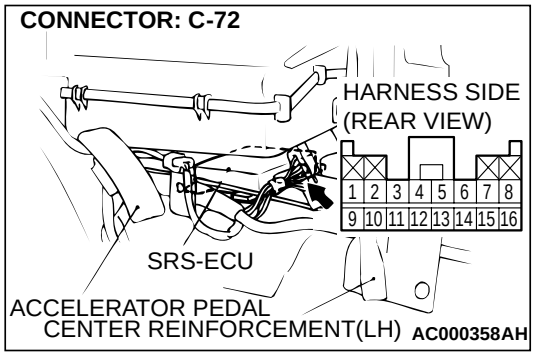
YES : Go to step 8.
NO : Repair the harness wires between SRS-ECU connector C-72 and data link connector C-29. Then go to Step 8.

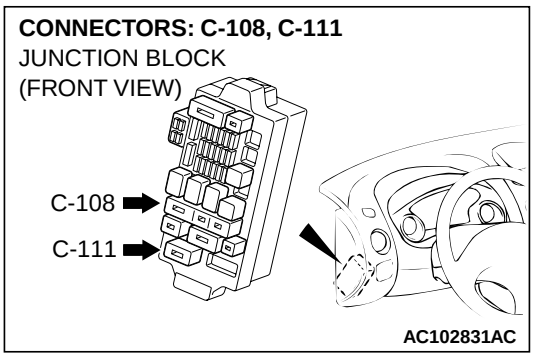


STEP 6. Check the harness wires between SRS-ECU connector C-72 (terminal No.3) and ground.

Q: Are the harness wires between SRS-ECU connector C-72 (terminal No.3) and ground in good condition?

YES : Go to Step 8.
NO : Repair the harness wires between SRS-ECU connector C-72 and ground. Then go to Step 8.





STEP 7. Check the harness wires between SRS-ECU connector C-72 (terminal No.9 and 12) and ignition switch (IG1).

NOTE: After inspecting intermediate connector C-108, C-111 inspect the wiring harness.
If the intermediate connector C-108, C-111 is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.
Go to Step 8.

Q: Are the harness wires between SRS-ECU connector C-72 (terminal No.9 and 12) and ignition switch (IG1) in good condition?

YES : Go to Step 8.
NO : Repair the harness wires between SRS-ECU connector C-72 and ignition switch (IG1). Then go to Step 8.

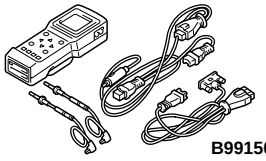
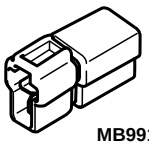
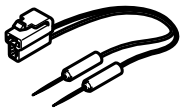
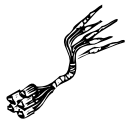
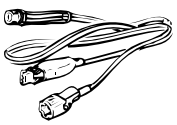
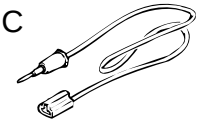
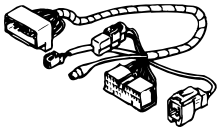
STEP 8. Check symptoms.

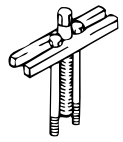
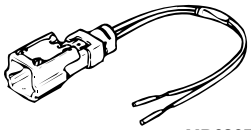
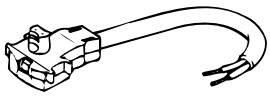
Q: Does the scan tool communicate normally with the SRS system?

YES : This diagnosis is complete. (If no malfunctions are not found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.)
NO : There is no action to be taken.

SPECIAL TOOLS

M1524000700204

TOOL	TOOL NUMBER AND NAME	REPLACED BY MILLER TOOL NUMBER	APPLICATION
 B991502	MB991502 Scan tool (MUT-II)	MB991496-OD	• Reading diagnostic trouble codes • Erasing diagnostic trouble codes • Reading vehicle data for a specific period • Reading erase times (Refer to MUT-II operating instructions)
 MB991865	MB991865 Dummy resistor	–	SRS air bag circuit check
 MB991866	MB991866 Resistor harness	–	
A  B  C  D MB991223AG	MB991223 A: MB991219 B: MB991220 C: MB991221 D: MB991222 Harness set A: Test harness B: LED harness C: LED harness adapter D: Probe	–	Checking the continuity and measuring the voltage at the SRS-ECU harness connector
 MB991613	MB991613 SRS check harness	MB991613	Clock spring check

TOOL	TOOL NUMBER AND NAME	REPLACED BY MILLER TOOL NUMBER	APPLICATION
 MB990803	MB990803 Steering wheel puller	General service tool	Removal of steering wheel
 MB686560	MB686560 SRS air bag adapter harness A	General service tool	• Deployment of air bag module (Front passenger's side) inside the vehicle • Deployment of air bag module (Front passenger's side) outside the vehicle
 MB628919	MR203491 or MB628919 SRS air bag adapter harness B	General service tool	Deployment of air bag module (Driver's side) outside the vehicle

TEST EQUIPMENT

M1524000800126

TOOL	NAME	USE
AC000019AB	Digital multi-meter Use a multi-meter for which the maximum test current is 2 mA or less at the minimum range of resistance measurement	Checking the SRS electrical circuitry with SRS check harness

SRS MAINTENANCE

M1524003900111

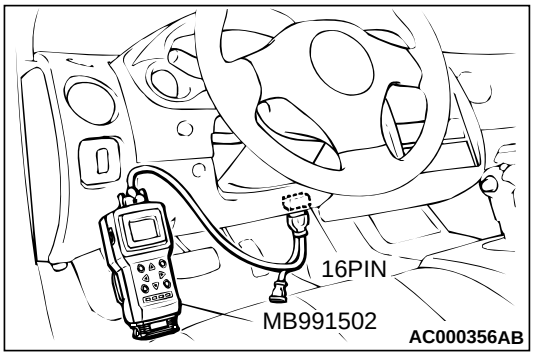
The SRS must be inspected by an authorized dealer up to 10 years after the date of vehicle registration. (Refer to GROUP 00, Maintenance Service – SRS Maintenance P.00-59.)

POST-COLLISION DIAGNOSIS

M1524001100205

To inspect and service the SRS after a collision (whether or not the air bags have deployed), perform the following steps.

SRS-ECU MEMORY CHECK



Required Special Tool:

- MB991502: Scan tool (MUT-II)

⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

1. Connect scan tool MB991502 to the data link connector (16-pin).

   NOTE: If the battery power supply has been disconnected or disrupted by the collision, scan tool MB991502 cannot communicate with the SRS-ECU. Check the battery then check and, if necessary, repair the front wiring harness and the instrument panel wiring harness before proceeding.
2. Read (and write down) all displayed DTC. (Refer to P.52B-21.)
3. Read the data list (fault duration and how many times memories are erased) using scan tool MB991502.

Data list

NO.	SERVICE DATA ITEM	APPLICABILITY
92	Number indicating how often the memory is cleared	Maximum time to be stored: 250
93	How long a problem has lasted (How long it takes from the occurrence of the problem till the first air bag squib igniting signal)	Maximum time to be stored: 9,999 minutes (approximately 7 days)
94	How long a problem has lasted (How long it takes from the first air bag squib igniting signal till now.)	

4. Erase the DTC and, after waiting 5 seconds or more, read (and write down) all displayed DTC. (Refer to P.52B-21.)

REPAIR PROCEDURE

WHEN FRONT AIR BAGS DEPLOY IN A COLLISION.

1. Replace the following parts with new ones.
   - SRS-ECU (Refer to P.52B-142.)
   - Air bag modules (driver's and front passenger's) (Refer to P.52B-144.)
2. Check the following parts and replace if there are any malfunctions.
   - Clock spring (Refer to P.52B-144.)
   - Steering wheel, steering column and intermediate joint
     (1) Check the wiring harness (built into the steering wheel) and connectors for damage, and terminals for deformation.
     (2) Install the air bag module to check fit or alignment with the steering wheel.
     (3) Check the steering wheel for noise, binds or difficult operation and excessive free play.
3. Check the wiring harnesses for binding, the connectors for damage, poor connections, and the terminals for deformation. (Refer to P.52B-17.)

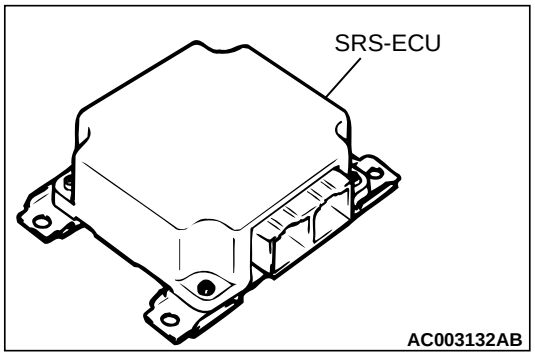
WHEN SIDE-AIRBAG DEPLOYS IN A COLLISION.

1. Replace the following parts with new ones.
   - SRS-ECU (Refer to P.52B-142.)
   - Side impact sensors (Refer to P.52B-153.)
   - Front seat back assembly (Refer to GROUP 52A, Front Seat P.52A-16.)
2. Check the wiring harnesses for binding, the connectors for damage, poor connections, and the terminals for deformation. (Refer to P.52B-17.)

WHEN AIR BAG DOES NOT DEPLOY IN LOW-SPEED COLLISION.

Check the SRS components. If the SRS components are showing any visible damage such as dents, cracks, or deformation, replace them with new ones. Concerning parts removed for inspection, replacement with new parts and cautionary points for working, refer to appropriate INDIVIDUAL COMPONENT SERVICE P.52B-141.

SRS-ECU



1. Check the SRS-ECU case and brackets for dents, cracks or deformation.
2. Check the connector for damage, and the terminals for deformation.

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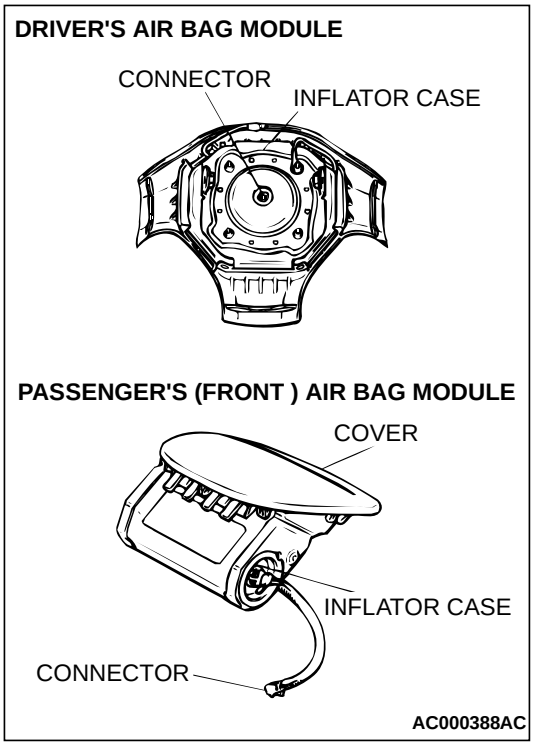
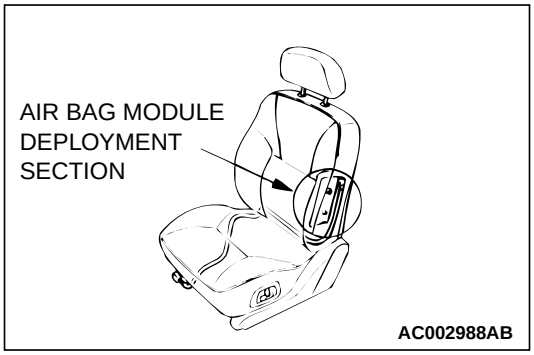


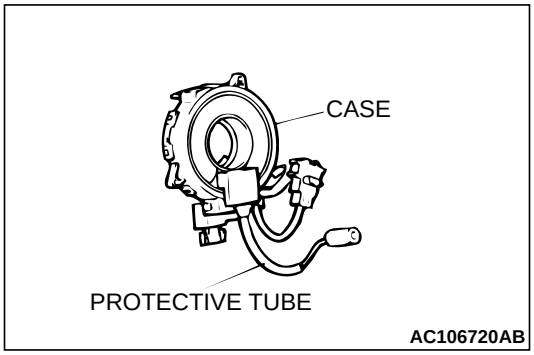
Air bag modules

1. Check the pad cover for dents, cracks or deformation.
2. Check the connector for damage, terminals deformities, and the harness for binding.
3. Check the air bag inflator case for dents, cracks or deformities.
4. Install the driver's air bag module to the steering wheel to check fit or alignment with the steering wheel.
5. Install the passenger's (front) air bag module to the instrument panel and crossmember to check fit or alignment.
6. Install the passenger's (front) air bag module cover to the instrument panel to check fit or alignment.



Front seat back assembly (Side-airbag module)

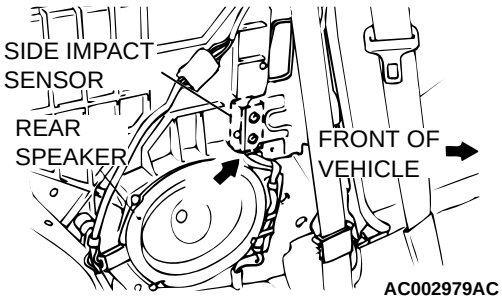
1. Check that there is no abnormality in the seat air bag module deployment section.
2. Check that there is no connector damage, bent terminals or clamping of the harness.



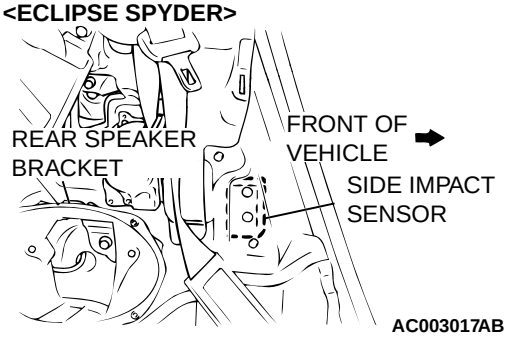
Clock spring

1. Check the clock spring connectors and protective tube for damage, and the terminals for deformation.
2. Visually check the case for damage.

<ECLIPSE>



<ECLIPSE SPYDER>



Side impact sensor

NOTE: The illustration at left shows the side impact sensor (LH). The position of the side impact sensor (RH) is symmetrical to this.

1. Check that there is no bending or corrosion in the center pillar.
2. Check that there is no denting, breakage or bending of the side impact sensor.
3. Check that there is no clamping of the harness, connector damage or bent terminals.

Steering wheel, steering column and intermediate joint

1. Check the wiring harness (built into the steering wheel) and the connectors for damage, and the terminals for deformation.
2. Install the air bag module to check fit or alignment with the steering wheel.
3. Check the steering wheel for noise, binding or difficult operation and excessive free play.

Harness connector

Check the harnesses for binding, the connectors for damage, poor connection, and the terminals for deformation. (Refer to P.52B-17.)

INDIVIDUAL COMPONENT SERVICE

M1524002900129

⚠ ***WARNING***

- ***The SRS components should not be subjected to heat over 93°C (200°F), so remove the SRS-ECU, air bag modules (driver's side and front passenger's side), front seat assemblies (side air back module), clock spring, side impact sensors before drying or baking the vehicle after painting. Recheck the SRS system operability after reinstalling them. (Refer to GROUP 00, Maintenance Service - SRS Maintenance P.00-59.)***
- ***If the SRS components are removed for the purpose of checking, sheet metal repair, painting, etc., they should be stored in a clean, dry place until they are reinstalled.***

If the SRS components are to be removed or replaced as a result of maintenance, diagnosis, etc., follow the appropriate procedure in this section. (SRS Air Bag Control Unit: refer to P.52B-142, Air Bag Modules and Clock Spring: refer to P.52B-144, Side impact sensors: refer to P.52B-153.)

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SRS CONTROL UNIT (SRS-ECU)

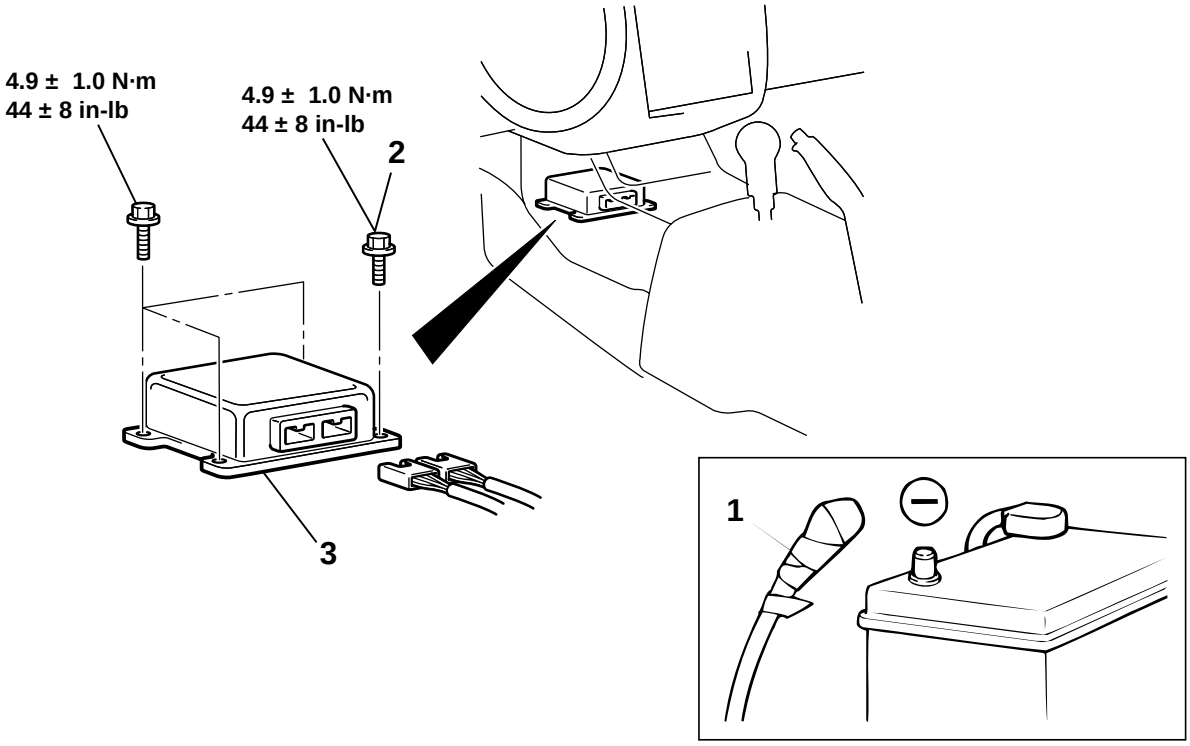
M1524002100123

⚠ WARNING

- ***Never attempt to disassemble or repair the SRS-ECU. If faulty, replace it.***
- ***Do not drop or subject the SRS-ECU to impact or vibration. If denting, cracking, deformation, or rust are discovered in the SRS-ECU, replace it with a new SRS-ECU. Discard the old one.***
- ***After deployment of an air bag, replace the SRS-ECU with a new one.***
- ***Never use an ohmmeter on or near the SRS-ECU, and use only the special test equipment described on P.52B-137.***

REMOVAL AND INSTALLATION

Pre-removal Operation	Post-installation Operation
• Turn the ignition switch to the "LOCK" (OFF) position. • Floor Console Removal (Refer to GROUP 52A, Floor Console P.52A-8.)	• Floor Console Installation (Refer to GROUP 52A, Floor Console P.52A-8.)



AC003160AB

REMOVAL STEPS

<<A>>
1. NEGATIVE (–) BATTERY CABLE CONNECTION
2. BRACKET MOUNTING BOLT (GROUNDING BOLT)
3. SRS-ECU

INSTALLATION STEPS

>>A<<
3. SRS-ECU

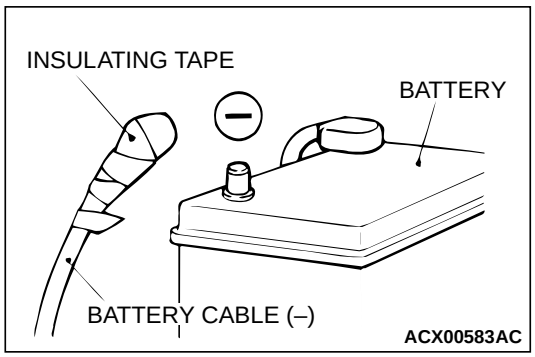
>>B<<
2. BRACKET MOUNTING BOLT (GROUNDING BOLT)
1. NEGATIVE (–) BATTERY CABLE CONNECTION

>>C<<
- POST-INSTALLATION INSPECTION

TSB Revision

REMOVAL SERVICE POINT

<<A>>NEGATIVE (–) BATTERY CABLE DISCONNECTION



⚠ ***DANGER***

Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P.52B-17.)

⚠ ***WARNING***

Battery posts, terminals and related accessories contain lead and lead compounds. WASH HANDS AFTER HANDLING.

Disconnect the negative battery cable from the battery and tape the terminal to prevent accidental connection and deployment.

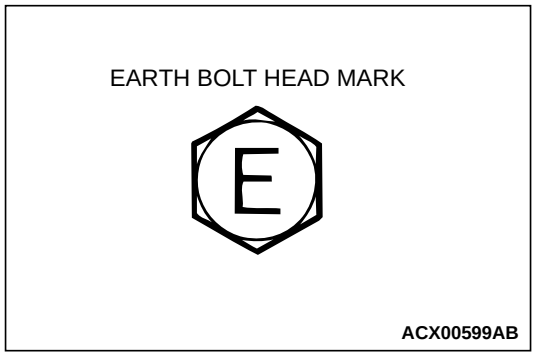
INSTALLATION SERVICE POINTS

>>A<< SRS-ECU INSTALLATION

⚠ ***WARNING***

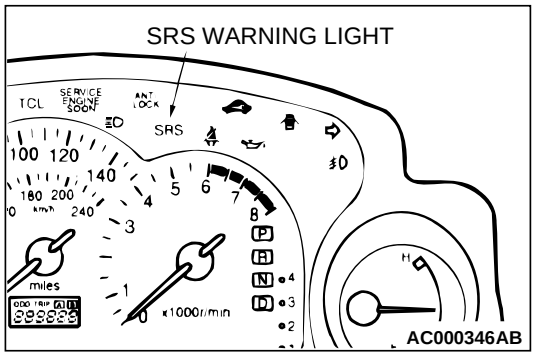
The SRS may not activate if the SRS-ECU is not installed properly, which could result in serious injury or death to the vehicle's driver or front passenger.

>>B<< BRACKET MOUNTING BOLT (GROUNDING BOLT) INSTALLATION



Check the head mark "E" on the bolt and attach the grounding bolt.

>>C<< POST-INSTALLATION INSPECTION



1. Reconnect the negative (–) battery cable.
2. Turn the ignition switch to the "ON" position.
3. Does the "SRS" warning light illuminate for approximately 7 seconds, and then remain off for at least 5 seconds after turning "OFF"?
4. If yes, the SRS system is functioning properly. If no, refer to P.52B-129.

INSPECTION

M1524002200119

⚠ ***WARNING***

If a dent, crack, deformation or rust is discovered, replace the SRS-ECU with a new one.

- Check the SRS-ECU and brackets for dents, cracks or deformation.
- Check the SRS-ECU connector for damage, and the terminals for deformation.

NOTE: Refer to P.52B-23 for inspection of SRS-ECU for other than physical damage.

AIR BAG MODULE(S) AND CLOCK SPRING

AIR BAG MODULES AND CLOCK SPRING REMOVAL AND INSTALLATION

M1524002400209

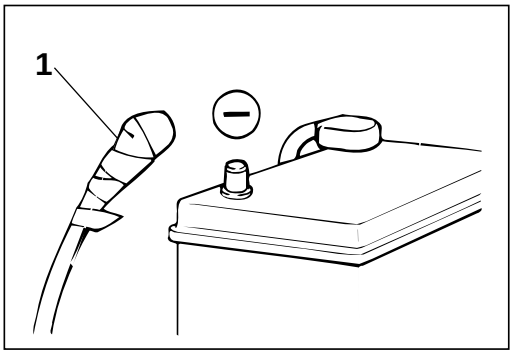
⚠ ***WARNING***

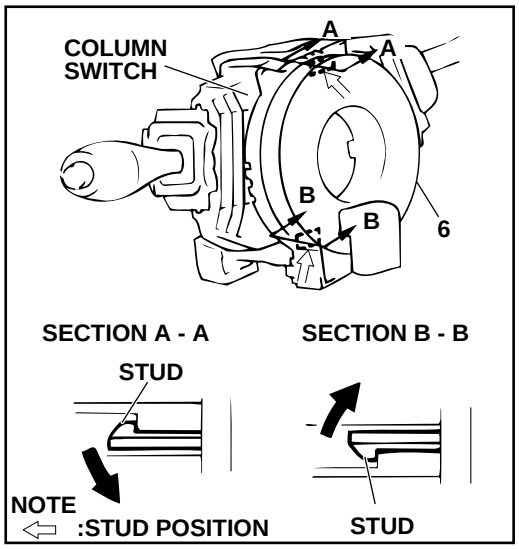
- ***Never attempt to disassemble or repair the air bag modules or clock spring. If faulty, replace it.***
- ***Do not drop the air bag modules or clock spring or allow contact with water, grease or oil. Replace it if a dent, crack, deformation or rust is detected.***
- ***The air bag modules should be stored on a flat surface with the pad cover facing upward. Do not place anything on top of it.***
- ***Do not expose the air bag modules to temperatures over 93°C (200°F).***
- ***After deployment of an air bag, replace the clock spring with a new one.***
- ***Wear gloves and safety glasses when handling air bags that have already deployed.***
- ***An undeployed air bag module should only be disposed of in accordance with the procedures. (Refer to P.52B-157.)***

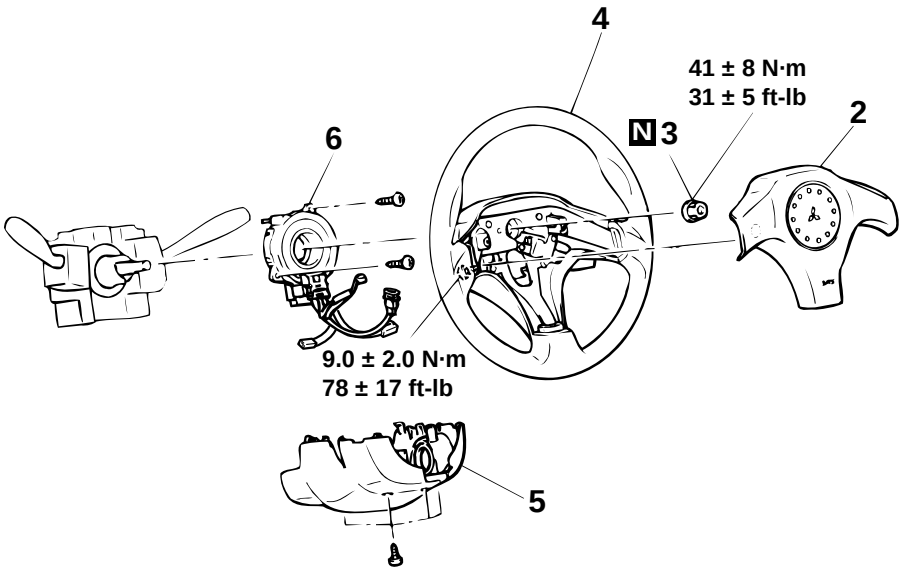
<Side-airbag module>

For removal and installation of the front seatback assembly with side-airbag module, refer to GROUP 52A, Front Seat P.52A-16.

REMOVAL AND INSTALLATION
<Driver's air bag module, clock spring>







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AIR BAG MODULE REMOVAL STEPS

<<A>> 1. NEGATIVE (–) BATTERY CABLE CONNECTION
<<B>> 2. DRIVER'S AIR BAG MODULE

CLOCK SPRING REMOVAL STEPS

<<A>> 1. NEGATIVE (–) BATTERY CABLE CONNECTION
<<B>> 2. DRIVER'S AIR BAG MODULE
3. STEERING WHEEL NUT
<<C>> 4. STEERING WHEEL
5. COLUMN COVER LOWER
<<D>> 6. CLOCK SPRING

AIR BAG MODULE INSTALLATION STEPS

>>A<< • PRE-INSTALLATION INSPECTION
>>D<< 2. DRIVER'S AIR BAG MODULE
1. NEGATIVE (–) BATTERY CABLE CONNECTION
>>E<< • POST-INSTALLATION INSPECTION

CLOCK SPRING INSTALLATION STEPS

>>A<< • PRE-INSTALLATION INSPECTION
>>B<< 6. CLOCK SPRING
5. COLUMN COVER LOWER
>>C<< 4. STEERING WHEEL
3. STEERING WHEEL NUT
>>D<< 2. DRIVER'S AIR BAG MODULE

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CLOCK SPRING INSTALLATION STEPS (Continued)

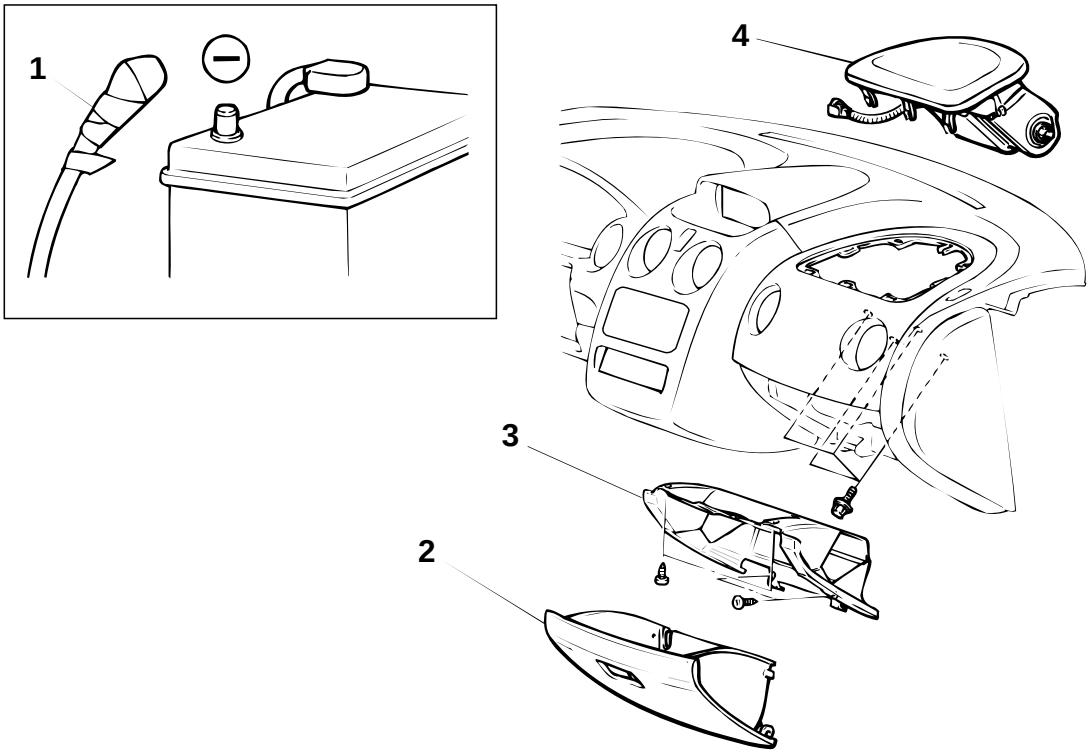
1. NEGATIVE (–) BATTERY CABLE CONNECTION

>>E<< • POST-INSTALLATION INSPECTION

Required Special Tools:

- MB990502: Scan Tool (MUT-II)
- MB990803: Steering Wheel Puller
- MB991613: SRS Check Harness

<Passenger's (front) air bag module>



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AIR BAG MODULE REMOVAL STEPS

<<A>> 1. NEGATIVE (–) BATTERY CABLE CONNECTION
2. GLOVE BOX OUTER
3. GLOVE BOX INNER
<<E>> 4. PASSENGER'S (FRONT) AIR BAG MODULE

AIR BAG MODULE INSTALLATION STEPS

>>A<< • PRE-INSTALLATION INSPECTION
4. PASSENGER'S (FRONT) AIR BAG MODULE

AIR BAG MODULE INSTALLATION STEPS (Continued)

3. GLOVE BOX INNER
2. GLOVE BOX OUTER
1. NEGATIVE (–) BATTERY CABLE CONNECTION

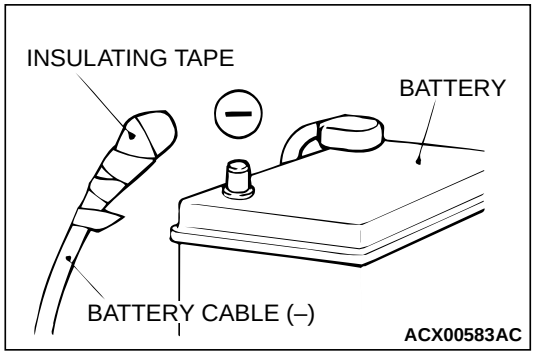
>>E<< • POST-INSTALLATION INSPECTION

Required Special Tools:

- MB990502: Scan Tool (MUT-II)
- MB990803: Steering Wheel Puller
- MB991613: SRS Check Harness

REMOVAL SERVICE POINTS

<<A>> NEGATIVE (–) BATTERY CABLE DISCONNECTION



⚠ ***DANGER***

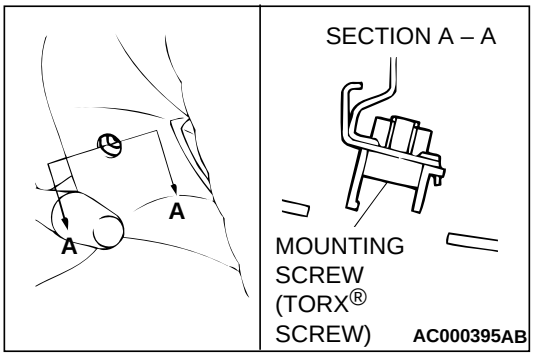
Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P.52B-17.)

⚠ ***WARNING***

Battery posts, terminals and related accessories contain lead and lead compounds. WASH HANDS AFTER HANDLING.

Disconnect the negative (–) battery cable from the battery and tape the terminal to prevent accidental connection and air bag(s) deployment.

<<B>> DRIVER'S AIR BAG MODULE REMOVAL

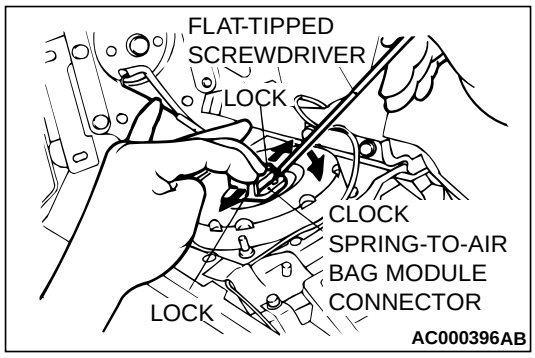


1. Remove the air bag module mounting screws (TORX® screws) at the sides of the steering wheel.

   NOTE: Do not remove the screws from the holders.

⚠ ***WARNING***

The removed air bag module should be stored in a clean, dry place with the pad cover face up.

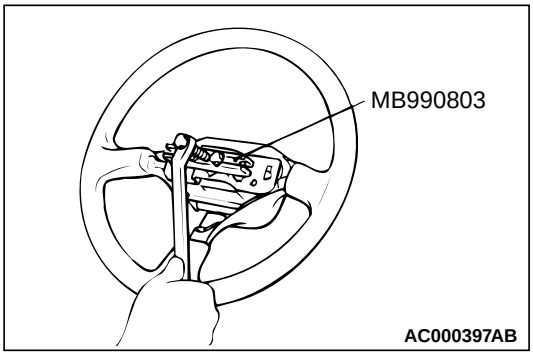


⚠ **CAUTION**

When disconnecting the air bag module-to-clock spring connector, take care not to apply excessive force to it.

2. When disconnecting the connector of the clock spring from the air bag module, press the air bag's lock toward the outer side to spread to open. Use a flat-tipped screwdriver, as shown in the figure at the left, to pry gently to remove the connector.

<<C>> STEERING WHEEL REMOVAL



⚠ **CAUTION**

Do not hammer on the steering wheel. Doing so may damage the collapsible column mechanism.

<<D>> CLOCK SPRING REMOVAL

⚠ ***WARNING***

The removed clock spring should be stored in a clean, dry place.

<<E>> PASSENGER'S (FRONT) AIR BAG MODULE REMOVAL

⚠ ***WARNING***

The removed air bag module should be stored in a clean, dry place with the pad cover face up.

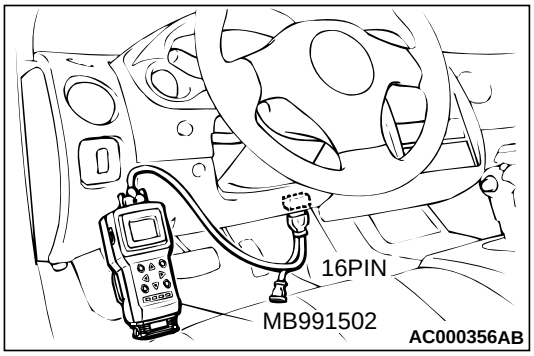
INSTALLATION SERVICE POINTS

>>A<< PRE-INSTALLATION INSPECTION

⚠ ***WARNING***

Dispose of air bag modules only according to the specified procedure. (Refer to P.52B-157.)

1. When installing the new air bag modules and clock spring, refer to "INSPECTION (P.52B-151)."
2. Connect the negative (–) battery cable.



⚠ **CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

3. Connect scan tool MB991502 to the data link connector.
4. Turn the ignition switch to the "ON" position.
5. Conduct diagnostic test using scan tool MB991502 to ensure entire SRS operates properly.

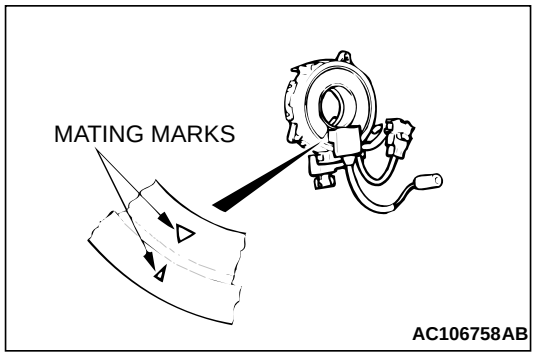
⚠ ***DANGER***

Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P.52B-17.)

⚠ ***WARNING***

Battery posts, terminals and related accessories contain lead and lead compounds. WASH HANDS AFTER HANDLING.

6. Turn the ignition switch to the "LOCK" (OFF) position. Disconnect the negative (–) battery cable and tape the terminal to prevent accidental connection and air bags deployment.



>>B<< CLOCK SPRING INSTALLATION

⚠ WARNING

Ensure that the clock spring's mating marks are properly aligned. If not, the steering wheel may not rotate completely during a turn, or the flat cable in the clock spring could be damaged. This would prevent normal SRS operation and possibly cause serious injury to the driver.

Align the mating marks of the clock spring. Turn the front wheels to the straight-ahead position. Then install the clock spring to the column switch.

<Mating Mark Alignment>

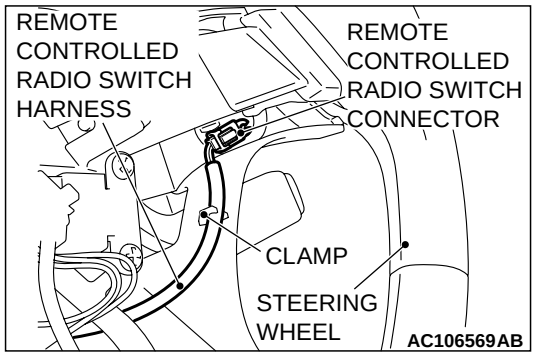
Turn the clock spring clockwise fully. Then turn it back approximately 3 turns counterclockwise to align the mating marks.

>>C<< STEERING WHEEL INSTALLATION

⚠ CAUTION

When installing the steering wheel, ensure that the harness of the clock spring does not become caught or tangled.

1. Before installing the steering wheel, turn the vehicle's front wheels to the straight-ahead position and align the mating marks of the clock spring.
2. After installing the steering wheel, the remote controlled radio switch harness should be clamped at right and left sides as shown.
3. After securing the remote controlled radio switch harness, turn the steering wheel all the way in both directions to confirm that the steering wheel rotation is normal.

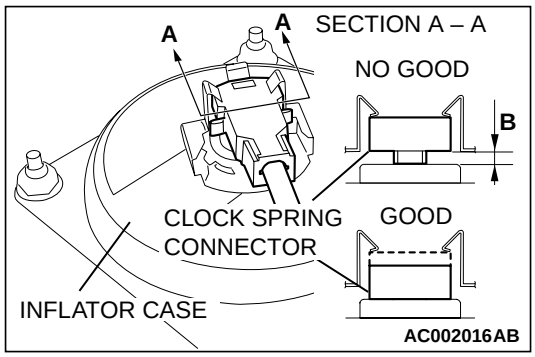


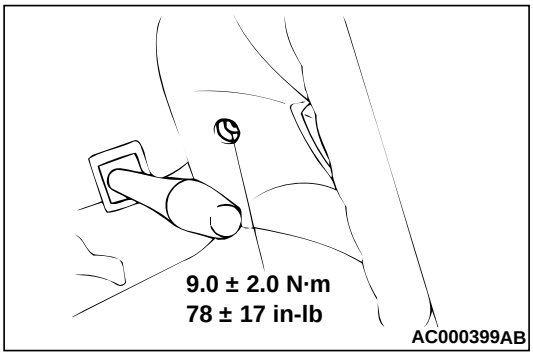
>>D<< DRIVER'S AIR BAG MODULE INSTALLATION

⚠ CAUTION

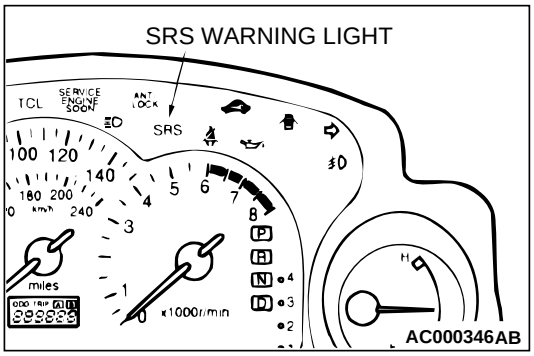
If there is gap at place B shown in the illustration, that means the connector is not firmly inserted, i.e. not correctly connected. In such a case, insert connector to the place, where there remains no gap at place B shown in the illustration.

1. Connect the clock spring connector securely.





2. Tighten the air bag module mounting screws to 9.0 ± 2.0 N·m (78 ± 17 in-lb).



>>E<< POST-INSTALLATION INSPECTION

1. Reconnect the negative (–) battery cable.
2. Turn the ignition switch to the "ON" position.
3. Does the SRS warning light illuminate for approximately 7 seconds, and then remain off for at least 5 seconds after turning "OFF"?
4. If yes, the SRS system is functioning properly. If no, refer to P.52B-129.

INSPECTION

M1524002500206

AIR BAG MODULE CHECK

⚠ ***DANGER***

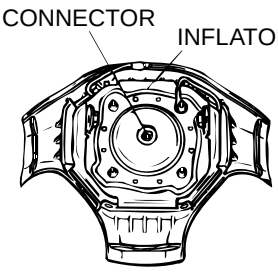
Never attempt to measure the circuit resistance of the air bag modules (squib) even if you are using the specified tester. If the circuit resistance is measured with a tester, accidental air bag deployment will result in serious personal injury.

⚠ ***WARNING***

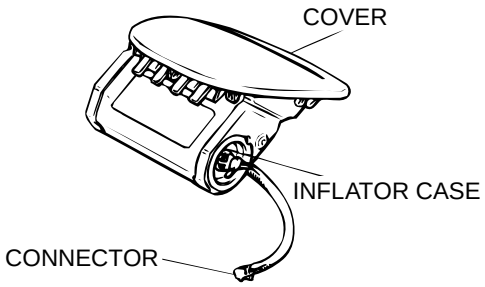
If any component damage is found during the following inspection, replace the air bag module with a new one. Dispose of the old one according to the specified procedure. (Refer to P.52B-157.)

1. Check the pad cover for dents, cracks or deformation.
2. Check the connectors for damage, the terminals for deformation, and the harness for binds.
3. Check the air bag inflator case for dents, cracks or deformation.
4. Install the driver's air bag module to the steering wheel and check fit and alignment with the wheel.
5. Install the passenger's (front) air bag module to the instrument panel and crossmember, and check fit and alignment.

DRIVER'S AIR BAG MODULE



PASSENGER'S (FRONT) AIR BAG MODULE



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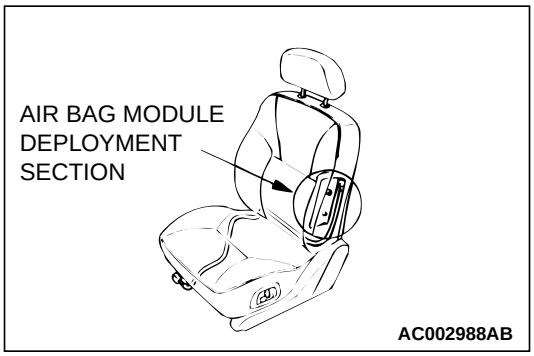
FRONT SEATBACK ASSEMBLY WITH SIDE-AIRBAG MODULE CHECK

⚠ ***DANGER***

Never attempt to measure the circuit resistance of the air bag module (squib) even if you are using the specified tester. If the circuit resistance is measured with a tester, accidental air bag deployment will result in serious personal injury.

⚠ ***WARNING***

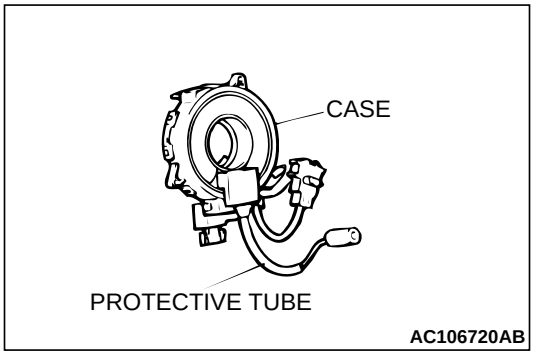
If any improper part is found during the following inspection, replace the front seatback assembly with a new one. Dispose of the old one according to the specified procedure. (Refer to P.52B-157.)



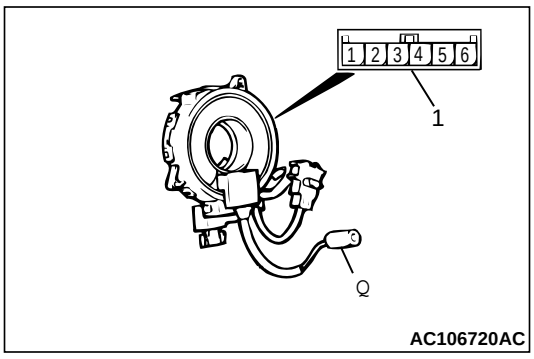
1. Check the air bag module deployment section for dents or deformation.
2. Check connector for damage, terminals for deformation, and harness for binds.

CLOCK SPRING CHECK

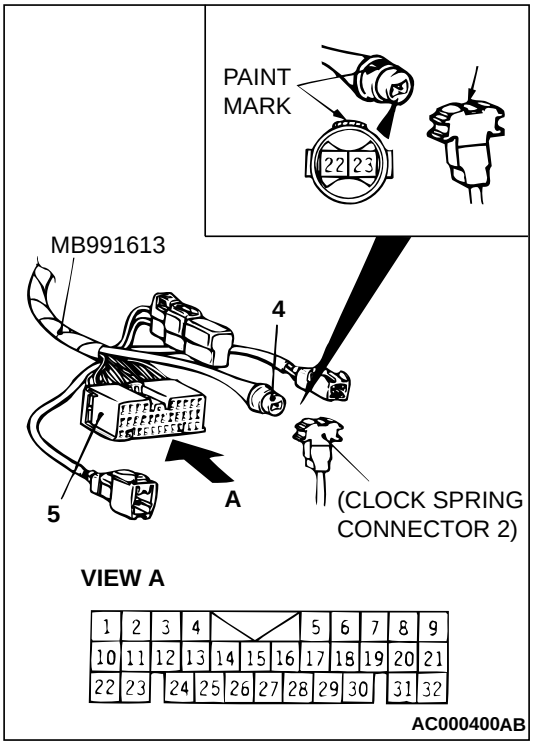
If any malfunction is found in steps 1 through 4, replace the clock spring with a new one.



1. Check the connectors and protective tube for damage, and the terminals for deformation.
2. Visually check the case for damage.



3. Check that there is continuity among the clock spring connectors number 1 and number 2.
   Connect terminal 1 of the connector number 1 and connector number 2.



4. Align the paint mark of special tool MB991613 connector number 4 with the notch in clock spring connector number 2 (arrow in the illustration) to connect the connectors number 2 and 4.
5. Measure the resistance between the terminals 22 and 23 of special tool MB991613 connector number 5.

   Standard value: less than 0.4 Ω

SIDE IMPACT SENSOR

M1524004600083

Side impact sensors are installed behind the center pillar trims on both driver and passenger sides of the vehicle.

⚠ WARNING

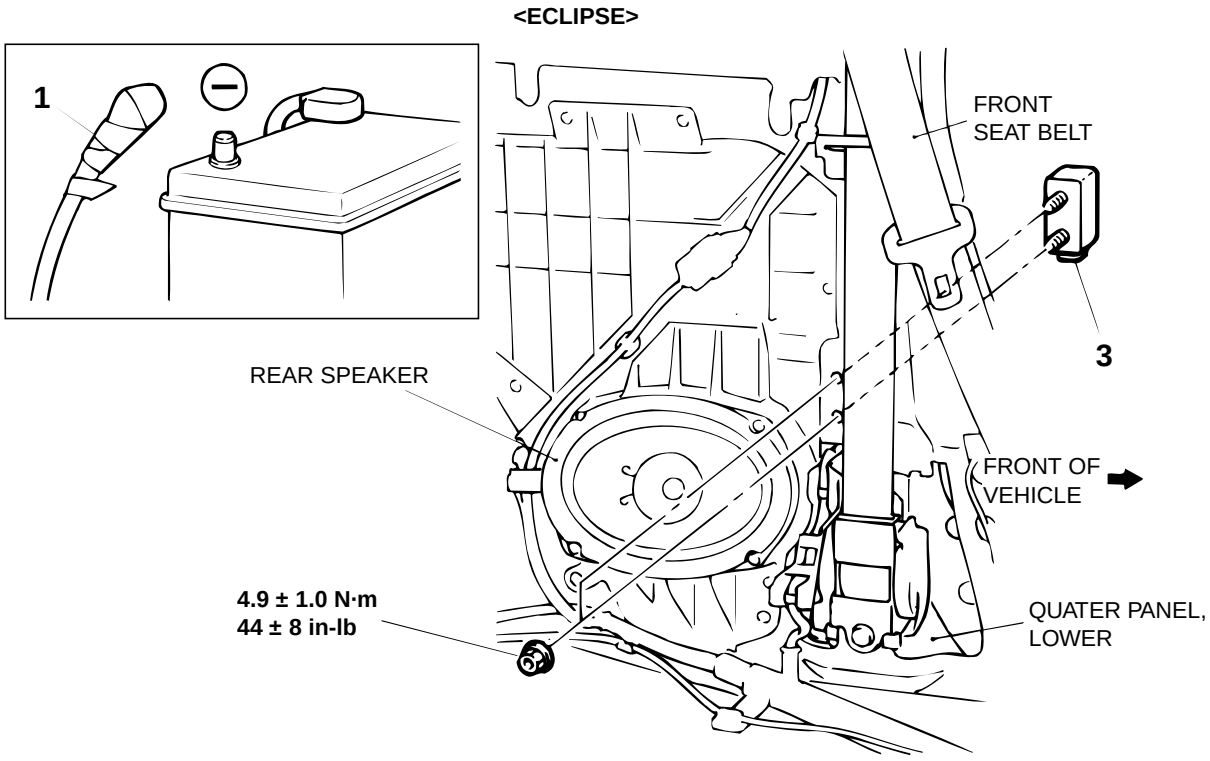
- ***Never attempt to disassemble or repair the side impact sensor. If faulty, replace it.***
- ***Do not drop or subject the side impact sensor to impact or vibration. Replace the side impact sensor, if dents, cracking, deformation, or rust are present.***
- ***Replace the side impact sensor after the air bag has deployed.***

REMOVAL AND INSTALLATION

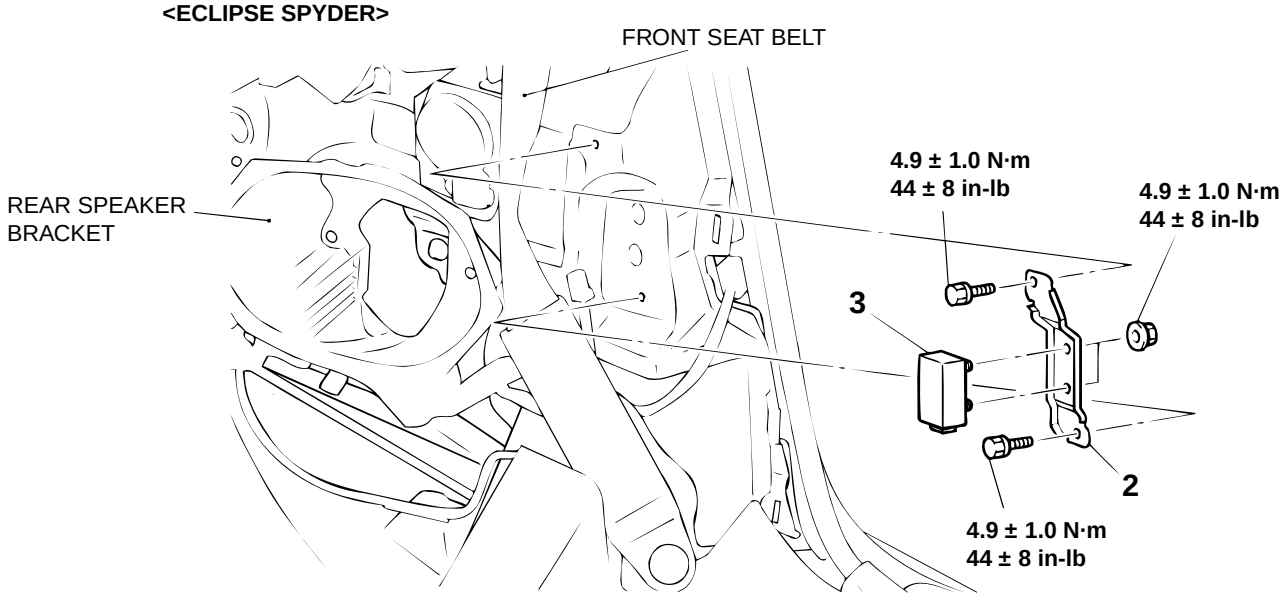
Pre-removal Operation	Post-installation Operation
• Turn the ignition key to the "LOCK" (OFF) position. • Rear Seat Cushion Removal (Refer to GROUP 52A, Rear Seat P.52A-20.) • Rear Seat Belt Removal (Refer to Rear Seat Belt P.52A-27.) • Quarter Trim, Lower Removal (Refer to GROUP 52A, Trims P.52A-9.)	• Quarter Trim, Lower Installation (Refer to GROUP 52A, Trims P.52A-9.) • Rear Seat Belt Installation (Refer to Rear Seat Belt P.52A-27.) • Rear Seat Cushion Installation (Refer to GROUP 52A, Rear Seat P.52A-20.)

NOTE: The following illustration shows the side impact sensor (LH). The position of the side impact sensor (RH) is symmetrical to this.

<ECLIPSE>



<ECLIPSE SPYDER>



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REMOVAL STEPS

<<A>>
1. NEGATIVE (–) BATTERY CABLE CONNECTION
2. SIDE IMPACT SENSOR BRACKET
3. SIDE IMPACT SENSOR

INSTALLATION STEPS

>>A<< • PRE-INSTALLATION INSPECTION

>>B<<
3. SIDE IMPACT SENSOR
2. SIDE IMPACT SENSOR BRACKET
1. NEGATIVE (–) BATTERY CABLE CONNECTOR

>>C<< • POST-INSTALLATION INSPECTION

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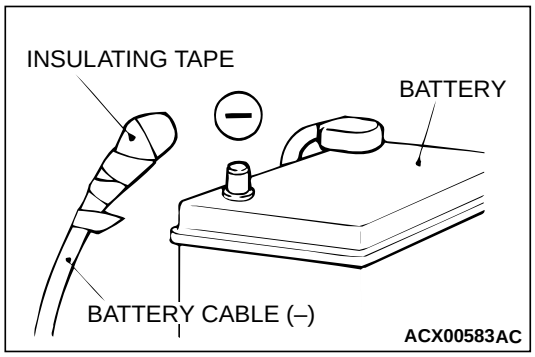
REMOVAL SERVICE POINT



<<A>> NEGATIVE (–) BATTERY CABLE DISCONNECTION

⚠ ***DANGER***

Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P.52B-17.)

⚠ ***WARNING***

Battery posts, terminals and related accessories contain lead and lead compounds. WASH HANDS AFTER HANDLING.

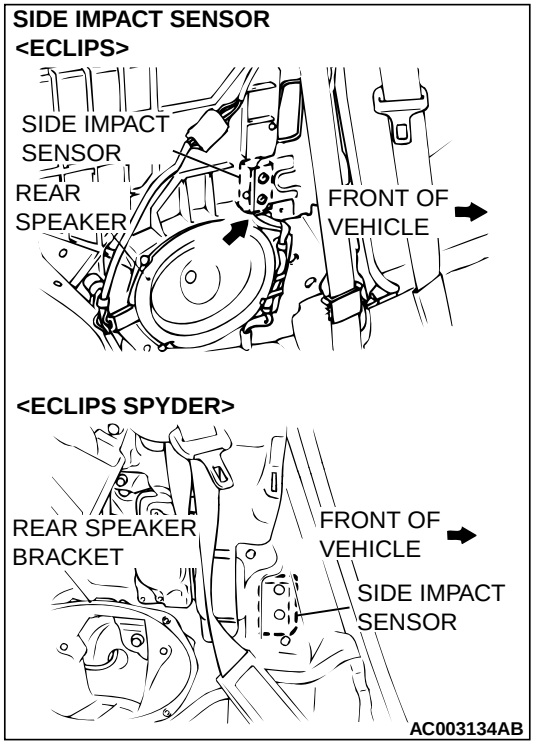
Disconnect the negative (–) battery cable from the battery and tape the terminal to prevent accidental connection and air bag deployment.

INSTALLATION SERVICE POINTS

>>A<< PRE-INSTALLATION INSPECTION

Check the side impact sensor for dents, breakage and bending and measure the resistance between the terminals (Refer to P.52B-120 or P.52B-125.), even when installing a new side impact sensor.

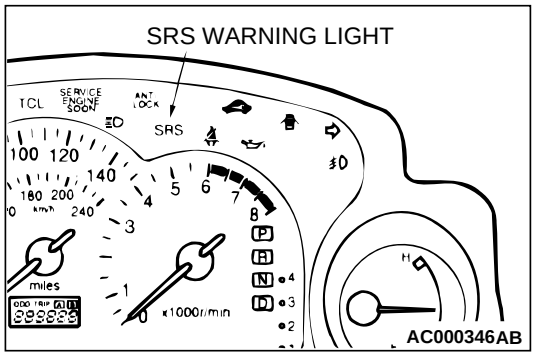
>>B<< SIDE IMPACT SENSOR INSTALLATION



⚠ ***WARNING***

If the side impact sensor is not installed securely and correctly, the side air bag may not operate normally.

Securely connect the connector.



>>C<< POST-INSTALLATION INSPECTION

1. Reconnect the negative (–) battery cable.
2. Turn the ignition switch to the "ON" position.
3. Does the SRS warning light illuminate for approximately 7 seconds, and then remain off for at least 5 seconds after turning "OFF"?
4. If yes, the SRS system is functioning properly. If no, refer to P.52B-129.

INSPECTION

M1524004700080

⚠ ***WARNING***

If a dent, crack, deformation or rust is detected, replace with a new sensor.

NOTE: For checking of the side impact sensor other than described above, refer to the section concerning SRS diagnosis. (Refer to P.52B-120 or P.52B-125.)

- Check the side impact sensor and bracket for dents, cracks or deformation.
- Check the connector for damage, and terminal for deformation.
- Check that there is no bending or corrosion in the center pillar.

AIR BAG MODULE DISPOSAL PROCEDURES

M1524001200194

Before disposing of an air bag or a vehicle equipped with an air bag, follow the procedures below to deploy the air bag.

UNDEPLOYED AIR BAG MODULE DISPOSAL

Required Special Tools:
MB628919 or MR203491: SRS Air Bag Adapter Harness B
MB686560: SRS Air Bag Adapter Harness A

⚠ ***WARNING***

- ***If the vehicle is to be scrapped or otherwise disposed of, deploy the air bags inside the vehicle. If the vehicle will continue to be used and only the air bag modules are to be disposed of, deploy the air bags outside the vehicle.***
- ***Since a large amount of smoke is produced when the air bag is deployed, avoid residential areas whenever possible.***
- ***Since there is loud noise when the air bags are deployed, avoid residential areas whenever possible. If anyone is nearby, give warning of the impending noise.***
- ***Suitable ear protection should be worn by personnel performing these procedures or by people in the immediate area.***

DEPLOYMENT INSIDE THE VEHICLE (when disposing of a vehicle) <Driver's air bag module>

1. Move the vehicle to an isolated spot.

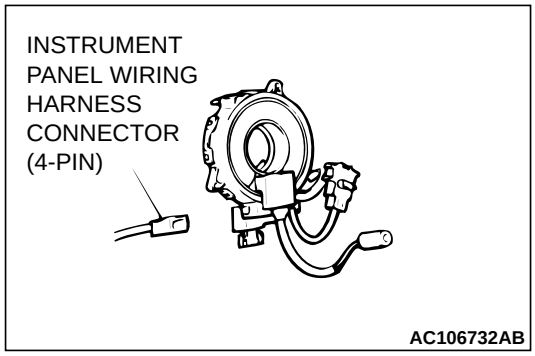
⚠ ***DANGER***

Wait at least 60 seconds after disconnecting the battery cables before doing any further work. (Refer to P.52B-17.)

⚠ ***WARNING***

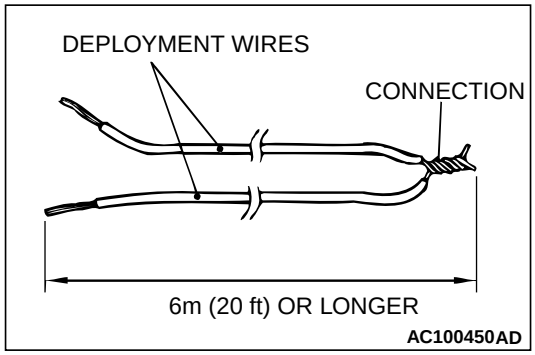
Battery posts, terminals and related accessories contain lead and lead compounds. WASH HANDS AFTER HANDLING.

2. Disconnect the negative (–) and positive (+) battery cables from the battery terminals, and then remove the battery from the vehicle. (Refer to GROUP 54A, Battery P.54A-8.)



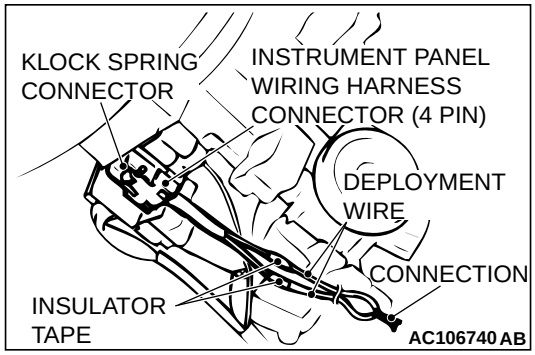
3. Remove the steering column cover lower.
4. Remove the connection between the clock spring two-pin connector and the instrument panel wiring harness connector (four-pin).

   NOTE: If the clock spring connector is disconnected from the instrument panel wiring harness, both electrodes of the clock spring connector will be automatically shorted to prevent unintended deployment of the air bag due to static electricity, etc.

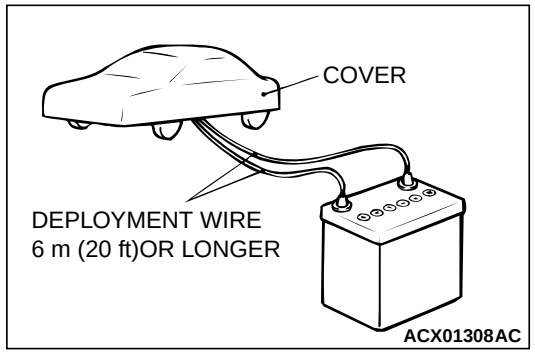


5. Obtain two suitable wires, which are 6 meters (20 feet) or longer, as deployment wires. Then connect the wires at one end to short.

   NOTE: This prevents the air bags from unintentional deployment caused by static.



6. Cut off the instrument panel wiring harness connector from the wiring harness with nippers. Connect the two connector wires to the deployment wires, and insulate the connections with plastic tape. Then connect the instrument panel wiring harness connector to the clock spring, and route the deployment wires out of the vehicle.



⚠ WARNING

If the glass is scratched, air bag deployment could cause it to crack and fly out of the vehicle, so always put a cover over the vehicle.

7. To suppress the operation sound as much as possible completely close all door windows, close the doors and put the cover on the vehicle.

⚠ ***WARNING***

- ***Before deploying the air bag in this manner, first check to be sure that there is no one in or near the vehicle. Wear safety glasses.***
- ***The inflator will be quite hot immediately following the deployment, so wait at least 30 minutes to allow it to cool before attempting to handle it. Although not poisonous, do not inhale gas from the air bag deployment. See Deployed Air Bag Module Disposal Procedures (Refer to P.52B-167.) for post-deployment handling instructions.***
- ***If the air bag module fails to deploy, do not go near the module. Contact the MMSA Tech Line.***

8. At a location as far away from the vehicle as possible, disconnect the two connected wires from each other, and connect them to the two terminals of the battery (which has been removed from the vehicle) to deploy the air bag.
9. After deployment, dispose of the air bag module according to the Deployed Air Bag Module Disposal Procedures. (Refer to P.52B-167.)

DEPLOYMENT INSIDE THE VEHICLE (when disposing of a vehicle) <Passenger's (front) air bag module>

1. Move the vehicle to an isolated spot.

⚠ DANGER

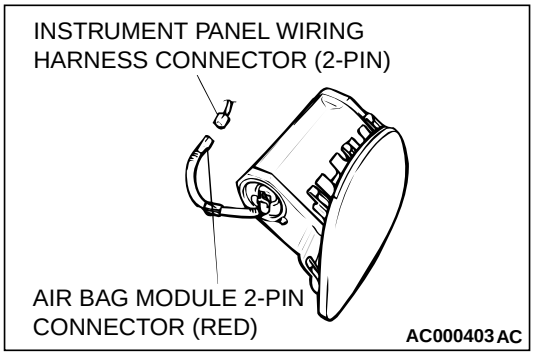
Wait at least 60 seconds after disconnecting the battery cables before doing any further work. (Refer to P.52B-17.)

⚠ WARNING

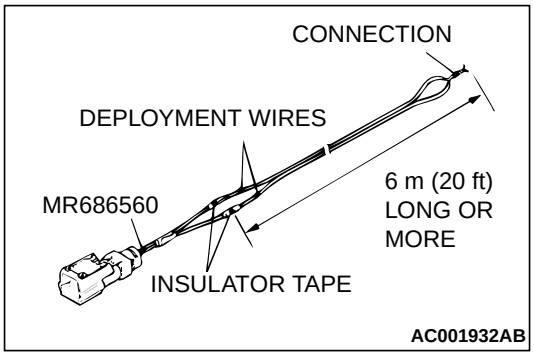
Battery posts, terminals and related accessories contain lead and lead compounds. WASH HANDS AFTER HANDLING.

2. Disconnect the negative (–) and positive (+) battery cables from the battery terminals, and then remove the battery from the vehicle. (Refer to GROUP 54A, Battery P.54A-8.)
3. Remove the glove box.
4. Remove the connection between the passenger's (front) air bag module connector (red two-pin) and the instrument panel wiring harness connector.

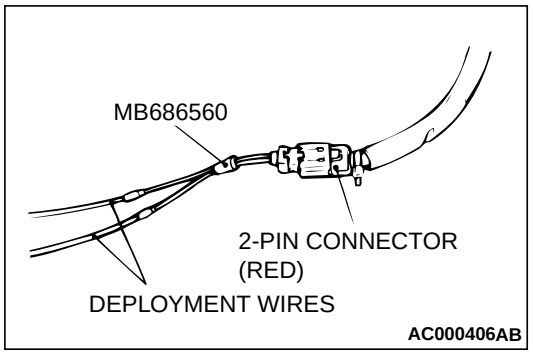
   NOTE: If the air bag module connector is disconnected from the instrument panel wiring harness, both electrodes of the air bag module connector will be automatically shorted to prevent unintended deployment of the air bag due to static electricity, etc.

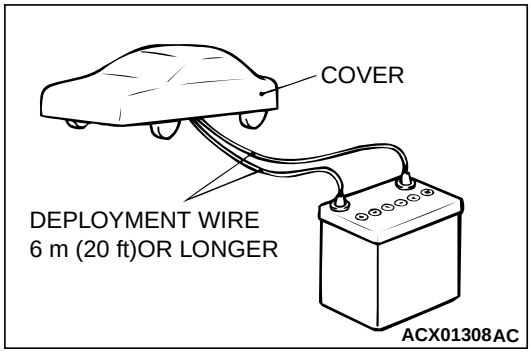


5. Connect deployment wires, each 6 meters (20 feet) or longer, to the two leads of special tool MB686560, and cover the connections with insulation tape. The other ends of the deployment wires should be connected to each other (short-circuited), to prevent sudden unexpected deployment of the air bag module.



6. Connect the passenger's (front) air bag module two-pin connector to special tool MB686560 and move the deployment wires out of the vehicle.





⚠ WARNING

If the glass is scratched, air bag deployment could cause it to crack and fly out of the vehicle, so always put a cover over the vehicle.

7. To suppress the operation sound as much as possible completely close all door windows, close the doors and put the cover on the vehicle.

⚠ WARNING

- ***Before deploying the air bag in this manner, first check to be sure that there is no one in or near the vehicle. Wear safety glasses.***
- ***The inflator will be quite hot immediately following the deployment, so wait at least 30 minutes to allow it to cool before attempting to handle it. Although not poisonous, do not inhale gas from the air bag deployment. See Deployed Air Bag Module Disposal Procedures (Refer to P.52B-167.) for post-deployment handling instructions.***
- ***If the air bag module fails to deploy, do not go near the module. Contact the MMSA Tech Line.***

8. At a location as far away from the vehicle as possible, disconnect the two connected wires from each other, and connect them to the two terminals of the battery (which has been removed from the vehicle) to deploy the air bag.
9. After deployment, dispose of the air bag module according to the Deployed Air Bag Module Disposal Procedures. (Refer to P.52B-167.)

DEPLOYMENT INSIDE THE VEHICLE (when disposing of a vehicle) <Side-airbag module>

1. Move the vehicle to an isolated spot.

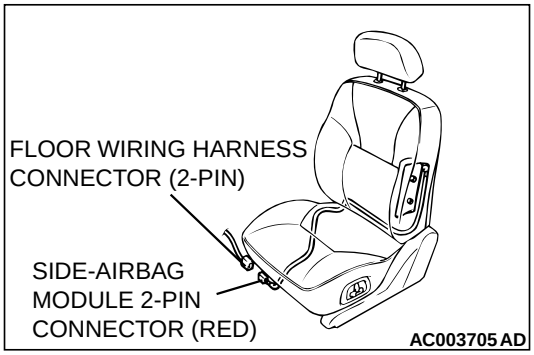
⚠ DANGER

Wait at least 60 seconds after disconnecting the battery cables before doing any further work. (Refer to P.52B-17.)

⚠ WARNING

Battery posts, terminals and related accessories contain lead and lead compounds. WASH HANDS AFTER HANDLING.

2. Disconnect the negative (–) and positive (+) battery cables from the battery terminals, and then remove the battery from the vehicle. (Refer to GROUP 54A, Battery P.54A-8.)

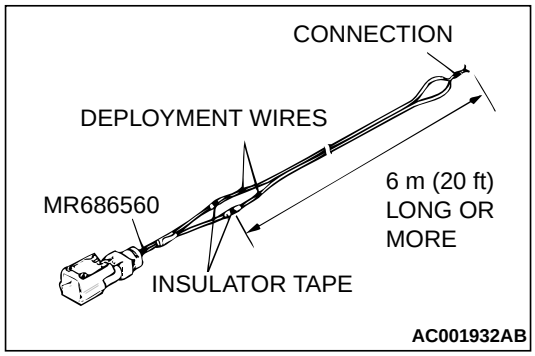


⚠ ***WARNING***

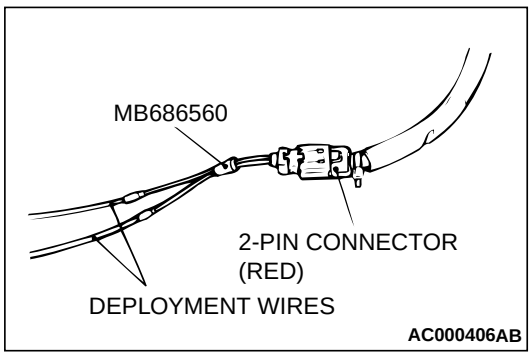
The side-airbag modules for both the driver's side and passenger's side should be deployed.

3. To deploy the side-airbag module: Remove the connection between the side-airbag module connector (red two-pin) and the floor wiring harness connector.

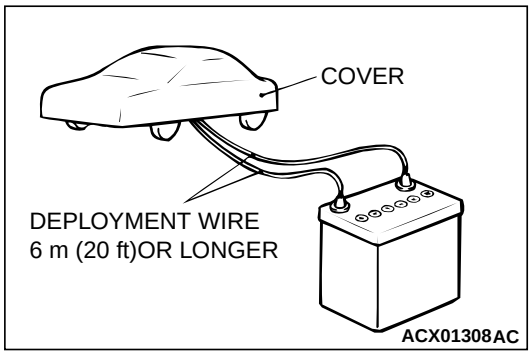
   NOTE: If the side-airbag module connector is disconnected from the floor wiring harness, both electrodes of the air bag module connector will be automatically shorted to prevent unintended deployment of the air bag due to static electricity, etc.



4. Connect deployment wires, each 6 meters (20 feet) or longer, to the two leads of special tool MB686560, and cover the connections with insulation tape. The other ends of the deployment wires should be connected to each other (short-circuited), to prevent sudden unexpected deployment of the air bag module.



5. Connect the side-airbag module two-pin connector to special tool MB686560 and move the deployment wires out of the vehicle.



⚠ ***WARNING***

If the glass is scratched, air bag deployment could cause it to crack and fly out of the vehicle, so always put a cover over the vehicle.

6. To suppress the operation sound as much as possible completely close all door windows, close the doors and put the vehicle.

⚠ WARNING

- ***Before deploying the air bag in this manner, first check to be sure that there is no one in or near the vehicle. Wear safety glasses.***
- ***The inflator will be quite hot immediately following the deployment, so wait at least 30 minutes to allow it to cool before attempting to handle it. Although not poisonous, do not inhale gas from the air bag deployment. See Deployed Air Bag Module Disposal Procedures (Refer to P.52B-167.) for post-deployment handling instructions.***
- ***If the air bag module fails to deploy, do not go near the module. Contact the MMSA Tech Line.***

7. At a location as far away from the vehicle as possible, disconnect the two connected wires from each other, and connect them to the two terminals of the battery (which has been removed from the vehicle) to deploy the air bag.
8. After deployment, dispose of the air bag module according to the Deployed Air Bag Module Disposal Procedures. (Refer to P.52B-167.)

DEPLOYMENT OUTSIDE THE VEHICLE <Driver's air bag module>

⚠ DANGER

Wait at least 60 seconds after disconnecting the battery cables before doing any further work. (Refer to P.52B-17.)

⚠ WARNING

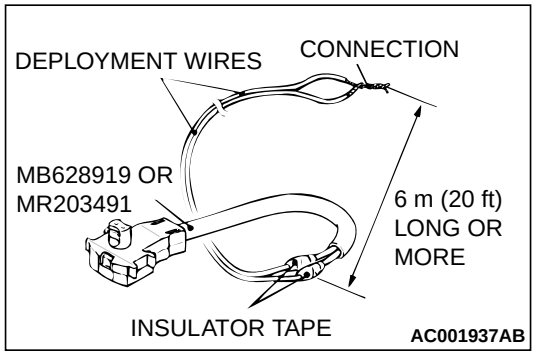
- ***Battery posts, terminals and related accessories contain lead and lead compounds. WASH HANDS AFTER HANDLING.***
- ***Deploy the air bag in a wide, flat area at least 6 meters (20 feet) away from obstacles and other people.***
- ***Do not perform deployment outside if a strong wind is blowing. If there is a slight breeze, place the air bag module downwind from the battery.***

1. Disconnect the negative (–) and positive (+) battery cables from the battery terminals, and then remove the battery from the vehicle. (Refer to GROUP 54A, Battery P.54A-8.)

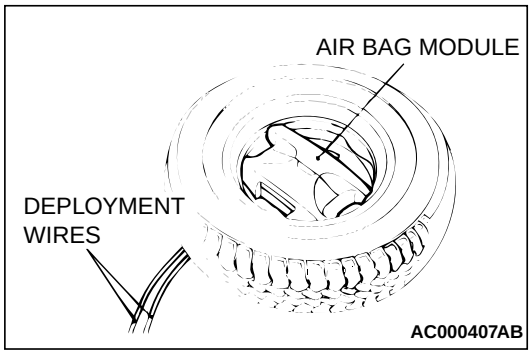
⚠ WARNING

Store the air bag module on a flat surface with the pad cover facing up. Do not place anything on top of it.

2. Remove the air bag module from the vehicle. (Refer to P.52B-144.)



3. Connect deployment wires, each 6 meters (20 feet) or longer, to the two leads of special tool MB628919 or MR203491, and cover the connections with insulation tape. The other ends of the deployment wires should be connected to each other (short-circuited), to prevent sudden unexpected deployment of the air bag module.

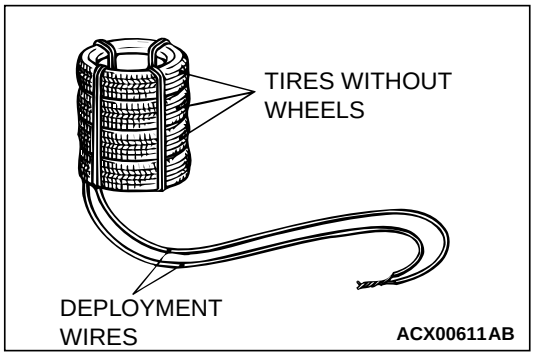


4. Take special tool MB628919 or MR203491 that is connected to the wires, pass it beneath an old tire wheel assembly, and connect it to the air bag module.

⚠ CAUTION

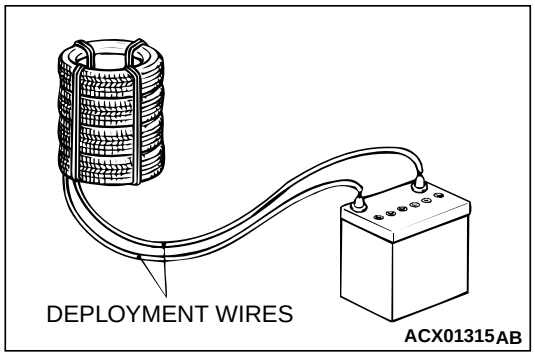
The adapter harness (special tool MB628919 or MR203491) below the wheel should be loose. If it is too tight, the reaction when the air bag deploys could damage the adaptor harness.

5. Pass the thick wire through the air bag module mounting hole, and then secure the air bag module to an old tire with a wheel in it so that the pad on the module is facing upwards.
6. Place three old tires without wheels on top of the tire secured to the air bag module, and secure all tires together with ropes (four locations).



⚠ WARNING

- ***Before deployment, check carefully to be sure that no one is nearby.***
- ***The inflator will be quite hot immediately following the deployment, so wait at least 30 minutes to allow it to cool before attempting to handle it. Although not poisonous, do not inhale gas from air bag deployment. See Deployed Air Bag Module Disposal Procedures (Refer to P.52B-167.) for post-deployment handling instructions.***
- ***If the air bag fails to deploy, do not go near the module. Contact the MMSA Tech Line.***



7. At a location as far away from the air bag module as possible, and from a shielded position, disconnect the two connected wires from each other, and connect them to the two terminals of the battery (which has been removed from the vehicle) to deploy the air bag.
8. Discard the deployed air bag module as specified in Deployed Air Bag Module Disposal Procedures. (Refer to P.52B-167.)

DEPLOYMENT OUTSIDE THE VEHICLE <Passenger's (front) air bag module>

⚠ ***DANGER***

Wait at least 60 seconds after disconnecting the battery cables before doing any further work. (Refer to P.52B-17.)

⚠ ***WARNING***

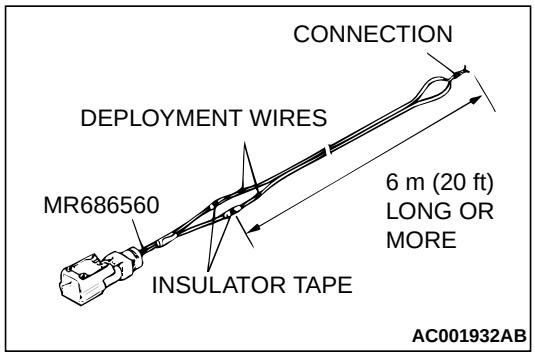
- ***Battery posts, terminals and related accessories contain lead and lead compounds. WASH HANDS AFTER HANDLING.***
- ***Deploy the air bag in a wide, flat area at least 6 meters (20 feet) away from obstacles and other people.***
- ***Do not perform deployment outside if a strong wind is blowing. If there is a slight breeze, place the air bag module downwind from the battery.***

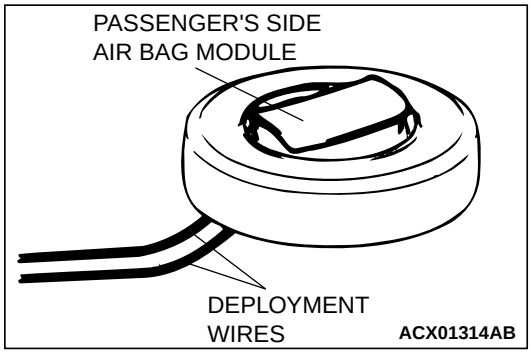
1. Disconnect the negative (–) and positive (+) battery cables from the battery terminals, and then remove the battery from the vehicle. (Refer to GROUP 54A, Battery P.54A-8.)

⚠ ***WARNING***

Store the air bag module on a flat surface with the pad cover facing up. Do not place anything on top of it.

2. Remove the air bag module from the vehicle. (Refer to P.52B-144.)
3. Connect two wires, each 6 meters (20 feet) or longer, to the two leads of special tool MB686560, and cover the connections with insulation tape. The other ends of the two wires should be connected to each other (short-circuited), to prevent sudden unexpected deployment of the air bag module.



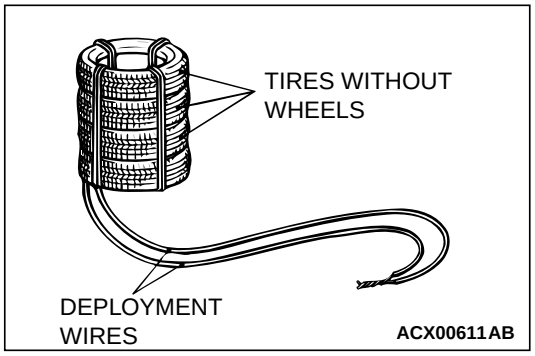


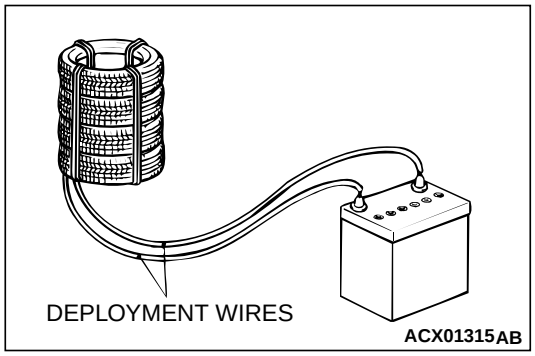
4. Connect the deployment wires to special tool MB686560, pass it beneath the tire and wheel assembly, and connect it to the air bag module.

⚠ **CAUTION**

- **The adapter harness (special tool MR686560) below the wheel should be loose. If it is too tight, the reaction when the air bag deploys could damage the adaptor harness**
- **During deployment, the connector of special tool MB686560 must not be between the tires.**

5. Pass the thick wire through the air bag module mounting hole, and then secure the air bag module to an old tire with a wheel in it so that the pad on the module is facing upwards.





6. Place three old tires without wheels on top of the tire secured to the air bag module, and secure all tires together with ropes (four locations).

⚠ *WARNING*

- ***Before deployment, check carefully to be sure that no one is nearby.***
- ***The inflator will be quite hot immediately following the deployment, so wait at least 30 minutes to allow it to cool before attempting to handle it. Although not poisonous, do not inhale gas from air bag deployment. See Deployed Air Bag Module Disposal Procedures (Refer to P.52B-167) for post-deployment handling instructions.***
- ***If the air bag fails to deploy, do not go near the module. Contact the MMSA Tech Line.***

7. At a location as far away from the air bag module as possible, and from a shielded position, disconnect the two connected wires from each other, and connect them to the two terminals of the battery (which has been removed from the vehicle) to deploy the air bag.
8. Discard the deployed air bag module as specified in Deployed Air Bag Module Disposal Procedures. (Refer to P.52B-167.)

DEPLOYMENT OUTSIDE VEHICLE <Side-airbag module>

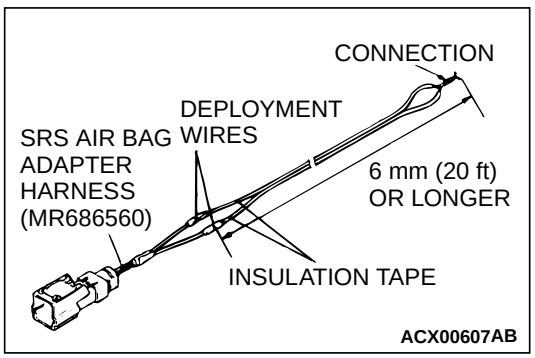
1. Remove the front seatback assembly with side-airbag module from the vehicle. (Refer to P.52A-16.)

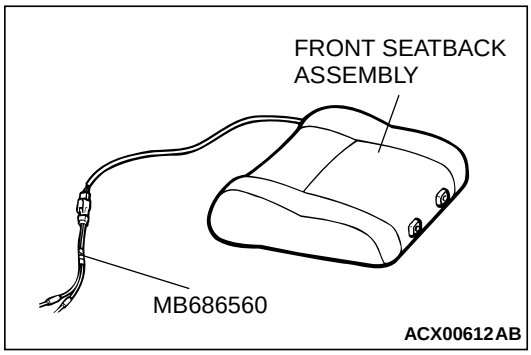
⚠ CAUTION

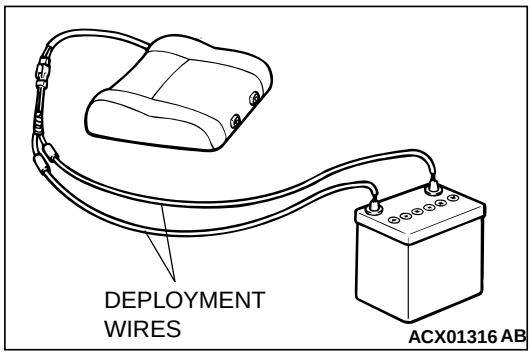
Once disconnected, both electrodes of the side-airbag module connector short automatically to prevent accidental deployment caused by static etc. Still, in consideration of the accidental deployment, store the air bag module on flat place with deployment surface facing up. Also, do not put anything on it.

2. Connect deployment wires 6 meters (20 feet) or longer with the SRS air bag adapter harness respectively. Insulate the connections with tape.

   Also, connect the other ends of the deployment wires each other to short, thereby preventing the side-airbag from accidental deployment caused by static etc.







3. Place the front seat back assembly with its back contact with the ground.
4. Connect the SRS air bag adapter harness with the deployment wires to the side air bag module connector.

⚠ CAUTION

- **Before the deployment, see that no one is near the front seatback assembly.**
- **The deployment makes the inflator of the side-airbag very hot. Before handling the inflator, wait more than 30 minutes for cooling.**
- **If the side-airbag module fails to deploy although the procedure is respected, do not go near the module. Contact the MMSA Tech Line.**

5. Disconnect the deployment wires as far from the front seat back assembly possible and connect the harnesses to the battery removed from the vehicle. Then, deploy.
6. Remove the deployed air bag module from the seatback assembly and discard as specified in Deployed Air Bag Module Disposal Procedures. (Refer to P.52B-167.)

DEPLOYED AIR BAG MODULE DISPOSAL

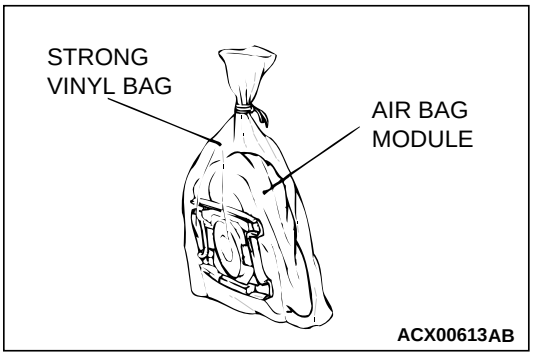
After deployment, the air bag module should be disposed of in the same manner as any other scrap parts, adhering to local laws and/or legislation. Observe the following precautions during air bag disposal:

1. The inflator will be quite hot immediately following deployment, so wait at least 30 minutes to allow it cool before attempting to handle it.
2. Do not put water or oil on the air bag after deployment.

⚠ WARNING

If after following these precautions, any material does get into the eyes or on the skin, immediately rinse the affected area with a large amount of clean water. If any irritation develops, seek medical attention.

3. There may be material on the deployed air bag module, that could irritate the eye and/or skin. Wear gloves and safety glasses when handling a deployed air bag module.



4. Tightly seal the air bag module in a strong plastic bag for disposal.
5. Be sure to always wash your hands after completing this operation.

SPECIFICATIONS

M1524004900114

FASTENER TIGHTENING SPECIFICATIONS

ITEMS	SPECIFICATIONS
Air bag module (driver's side) mounting screw	9.0 ± 2.0 N·m (78 ± 17 in-lb)
Side impact sensor bracket bolt	4.9 ± 1.0 N·m (44 ± 8 in-lb)
Side impact sensor mounting nut	4.9 ± 1.0 N·m (44 ± 8 in-lb)
SRS-ECU mounting bolt	4.9 ± 1.0 N·m (44 ± 8 in-lb)
Steering wheel nut	41 ± 8 N·m (31 ± 5 ft-lb)

SERVICE SPECIFICATION

M1524000400117

ITEM	STANDARD VALUE
Clock spring resistance Ω	Less than 0.4

GROUP 55

HEATING AND AIR CONDITIONING

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Continued on next page

WARNINGS REGARDING SERVICING OF SUPPLEMENTAL RESTRAINT SYSTEM (SRS) EQUIPPED VEHICLES

⚠ WARNING

- ***Improper service or maintenance of any component of the SRS, or any SRS-related component, can lead to personal injury or death to service personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).***
- ***Service or maintenance of any SRS component or SRS-related component must be performed only at an authorized MITSUBISHI dealer.***
- ***MITSUBISHI dealer personnel must thoroughly review this manual, and especially its GROUP 52B - Supplemental Restraint System (SRS) before beginning any service or maintenance of any component of the SRS or any SRS-related component.***

NOTE
The SRS includes the following components: SRS air bag control unit, SRS warning light, front impact sensors, air bag module, clock spring, and interconnecting wiring. Other SRS-related components (that may have to be removed/installed in connection with SRS service or maintenance) are indicated in the table of contents by an asterisk (*).

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INSPECTION 55-39

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GENERAL INFORMATION

M1552000100135

The heater system uses a two-way-flow full-air-mix system that features high performance and low operating noise. It includes an independent face air blowing function.

Items		Specifications
Heater unit	Type	Two-way-flow full-air-mix system
Heater control assembly		Dial type
Compressor	Model	Scroll type <MSC90C>
Dual pressure switch kPa (psi)	High-pressure switch	ON to OFF: 2,942 (426.7), OFF to ON: 2,354 (341.4)
	Low-pressure switch	ON to OFF: 196 (28.4), OFF to ON: 221 (32.1)
Refrigerant and quantity g (oz)		R-134a (HFC-134a), Approximately 415 – 435 (14.6 – 15.3)

SAFETY PRECAUTIONS

⚠ ***WARNING***

Wear safety goggles and gloves when servicing the refrigeration system to prevent severe damage to eyes and hands.

Because R-134a refrigerant is a hydro fluorocarbon (HFC) which contains hydrogen atoms in place of chlorine atoms, it will not cause damage to the ozone layer.

Ozone filters out harmful radiation from the sun. To assist in protecting the ozone layer, Mitsubishi Motors Corporation recommends an R-134a refrigerant recycling device.

Refrigerant R-134a is transparent and colorless in both the liquid and vapor state. Since it has a boiling point of –29.8°C (–21.64°F) at atmospheric pressure, it will be a vapor at all normal temperatures and pressures. The vapor is heavier than air, non-flammable, and non-explosive. The following precautions must be observed when handling R-134a.

⚠ ***WARNING***

Do not heat R-134a above 40°C (104.0°F) or it may catch fire and explode.

R-134a evaporates so rapidly at normal atmospheric pressures and temperatures that it tends to freeze anything it contacts. For this reason, extreme care must be taken to prevent any liquid refrigerant from contacting the skin and especially the eyes. Always wear safety goggles when servicing the refrigeration part of the A/C system. Keep a bottle of sterile mineral oil handy when working on the refrigeration system.

1. Should any liquid refrigerant get into the eyes, use a few drops of mineral oil to wash them out. R-134a is rapidly absorbed by the oil.
2. Next splash the eyes with plenty of cold water.
3. Call your doctor immediately even though irritation has ceased after treatment.

⚠ **CAUTION**

Keep R-134a containers upright when charging the system.

In most instances, moderate heat is required to bring the pressure of the refrigerant in its container above the pressure of the system when charging or adding refrigerant.

A bucket or large pan of hot water not over 40°C (104.0°F) is all the heat required for this purpose. Do not heat the refrigerant container with a blow torch or any other means that would raise temperature and pressure above this temperature. Do not weld or steam clean on or near the system components or refrigerant lines.

⚠ ***WARNING***

The leak detector for R-134a should be used to check for refrigerant gas leaks.

⚠ **CAUTION**

Do not allow liquid refrigerant to touch bright metal or it will be stained.

When metering R-134a into the refrigeration system keep the supply tank or cans in an upright position. If the refrigerant container is on its side or upside down, liquid refrigerant will enter the system and damage the compressor.

Refrigerant will tarnish bright metal and chrome surfaces, and in combination with moisture can severely corrode all metal surfaces.

OPERATION

Condenser fan and radiator fan control

- For the operation of each fan, refer to GROUP 14, Diagnosis - Symptom Chart P.14-3.

Compressor control

When operating the air conditioning switch

- The air thermo sensor, which senses the temperature of the air flowing out of the evaporator, deactivates the compressor at 5 °C (41.0 °F) or below.
- The dual pressure switch turns OFF when the refrigerant pressure becomes excessively high or low, thus protecting the compressor circuit. (See Table below.)
- When the air thermo sensor is activated, the dual pressure switch is ON, and the ignition switch, blower switch, and air conditioning switch are ON, the A/C compressor relay is energized.

When operating the air outlet changeover control knob

- When the air outlet changeover control knob is moved to DEFROSTER or DEFROSTER/FOOT position, the defroster switch, which is connected in series to the air conditioning switch, is turned on. The other compressor control than the above is the same as that when operating the air conditioning switch.

When compressor locks <vehicles with 3.0 L engine>

- Since the compressor and alternator are driven by the same belt, the electric generating function of the alternator also stops when the belt is broken. In order to assure the electric generating function of the alternator, there is an A/C-ECU to prevent breaking of the belt due to slipping when the compressor locks. The A/C-ECU makes a comparative calculation of the compressor revolutions and the engine revolutions which are detected by the revolution pick-up sensor. When 70% or more slip ratio continues for 3 seconds or more, the A/C compressor relay goes from on to off; at the same time, the operation display in the air conditioner switch blinks to announce an abnormality.

A/C Compressor Relay ON Conditions

Ignition switch (IG2)		ON	*NOTE: A/C compressor relay is de-energized when any one switch, sensor or control unit shown on the left turns off.* *NOTE: The * marked device measures the temperature of the outlet air, and according to the control characteristics of the magnetic clutch for the compressor, the automatic compressor controller outputs the "HI" signal (12V). When air of 5°C (41.0°F) or less blows out of the evaporator, the compressor magnetic clutch will be turned off.*
Blower switch		ON	
Air conditioning switch or defroster switch		ON	
Air thermo sensor		*	
Dual pressure switch	Low-pressure side 221 kPa (32.1 psi) or higher	ON	
	High-pressure side 2,942 kPa (426.7 psi) or below	ON	
A/C compressor relay driving transistor (within automatic compressor controller and engine control module <M/T>, powertrain control module <A/T>)		ON	

MANUAL A/C DIAGNOSIS

INTRODUCTION TO HEATER, AIR CONDITIONING AND VENTILATION DIAGNOSIS

M1552012200184

With this system, after the outside air or inside air is taken in through the damper, it is fed to the evaporator by the blower fan and motor and cooled. The air cooled by the air mix damper is mixed appropriately with the warmed air to achieve a comfortable temperature. If the A/C does not operate or the cooled air is not discharged, the machine components or relay may be faulty.

HEATER, AIR CONDITIONING AND VENTILATION DIAGNOSTIC TROUBLESHOOTING STRATEGY

M1552009600201

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted most of the possible ways to find a heater, air conditioning and ventilation fault.

1. Gather information from the customer.
2. Verify that the condition described by the customer exists.
3. Find the malfunction by following the Symptom Chart.
4. Verify malfunction is eliminated.

SYMPTOM CHART

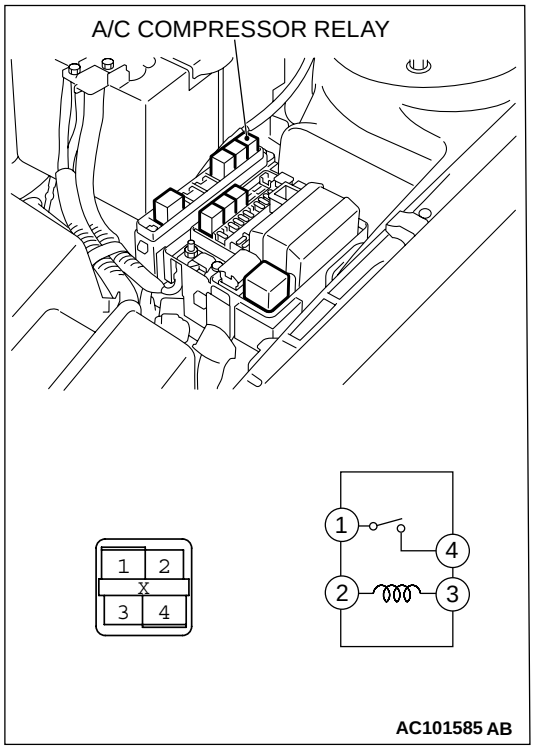
M1552009900257

SYMPTOMS	INSPECTION PROCEDURE	REFERENCE PAGE
When the ignition switch is "ON," the A/C does not operate.	1	P.55-6
When the air outlet changeover control knob is moved to DEFROSTER or DEFROSTER/FOOT position, the A/C or the inside/outside air changeover damper motor does not operate.	2	P.55-9
When the A/C is operating, temperature inside the passenger compartment does not decrease (cool air is not emitted).	3	P.55-10
Blower fan and motor does not turn.	4	P.55-12
Blower fan and motor does not stop turning.	5	P.55-14
When the A/C is operating condenser fan or radiator fan does not turn.*	6	P.55-16
The A/C indicator flashes <vehicles with 3.0L engine>.	7	P.55-17
When the heater control knob is set to the "MAX COOL" position, the air conditioning does not cool sufficiently.	8.	P.55-19
Warm air does not go out from the air outlets.	9.	P.55-21

NOTE: For symptoms marked with an asterisk the condenser fan might not operate when there is an air conditioning low load from the air conditioning condenser control, so remove the battery terminal (–) and then check the symptoms after 5 minutes since initial start control after reconnection.

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: When the Ignition Switch is "ON" the A/C does not Operate.



DIAGNOSIS

STEP 1. Check for refrigerant leaks.

Q: Is the refrigerant leaking?

YES : Repair the leak. Then go to Step 11.
NO : Go to Step 2.

STEP 2. Check for excessive refrigerant.

Q: Is the refrigerant in good condition?

YES : Go to Step 3.
NO : Use the refrigerant recovery station to remove all of the refrigerant, and then calculate the amount of the refrigerant and charge it. Then go to Step 11.

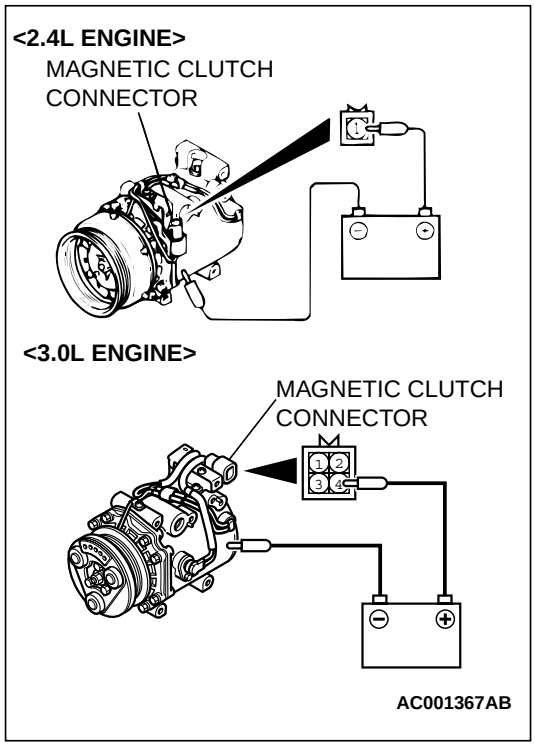
STEP 3. Check the A/C compressor relay continuity.

Follow the table below to check the A/C compressor relay for continuity.

BATTERY VOLTAGE	TESTER CONNECTION	SPECIFIED CONDITION
Not applied	1 – 4	Open circuit
• Connect terminal 2 to the positive battery terminal • Connect terminal 3 to the negative battery terminal	1 – 4	Less than 2 ohm

Q: Is the A/C compressor relay in good condition?

YES : Go to Step 4.
NO : Replace. Then go to Step 11.

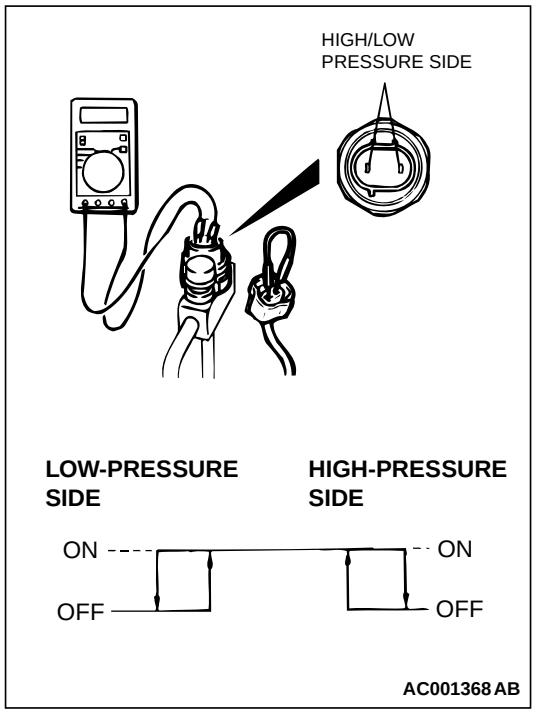


STEP 4. Check the magnetic clutch operation.

Connect the battery (+) terminal to the compressor magnetic clutch connector terminal 1; <2.4L engine>/terminal 4; <3.0L engine>, and ground the battery (–) terminal to the body of the compressor.

Q: Can the sound of the magnetic clutch (click) be heard?

YES : Go to Step 5.
NO : Replace. Then go to Step 11.



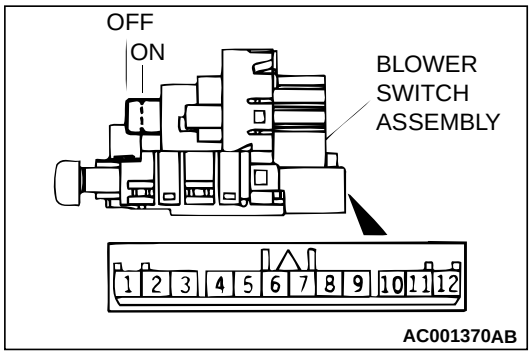
STEP 5. Check the dual pressure switch operation.

(1) Remove the dual pressure switch connector and connect the high/low pressure side terminals located on the harness side as shown in the illustration.
(2) Install a gauge manifold to the high-pressure side service valve of the refrigerant line. (Refer to P.55-26.)
(3) When the high/low pressure sides of the dual pressure switch are at operation pressure (ON) and the resistance is less than 2 ohm between the respective terminals, then the condition is normal. If open loop, replace the switch.

ITEMS	SWITCH POSITION	
	being turned on	being turned off
Low-pressure side kPa (psi)	221 (32.1)	196 (28.4)
High-pressure side kPa (psi)	2,354 (341.4)	2,942 (426.7)

Q: Is the dual pressure switch operating properly?

YES : Go to Step 6.
NO : Replace the switch. Then go to Step 11.



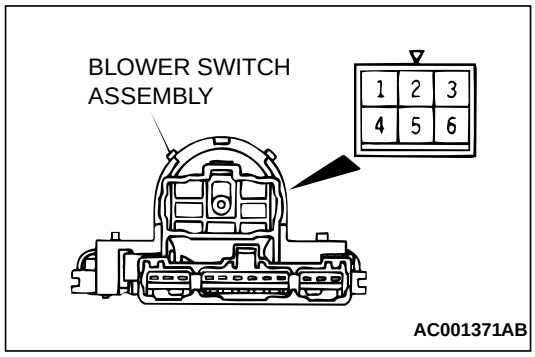
STEP 6. Check the A/C switch continuity.

Follow the table below to check the A/C switch for continuity.

SWITCH POSITION	TESTER CONNECTION (CONNECTOR B)	SPECIFIED CONDITION
OFF	5 – 6	Open circuit
ON	5 – 6	Less than 2 ohm

Q: Is the A/C switch continuity in good condition?

YES : Go to Step 7.
NO : Replace. Then go to Step 11.



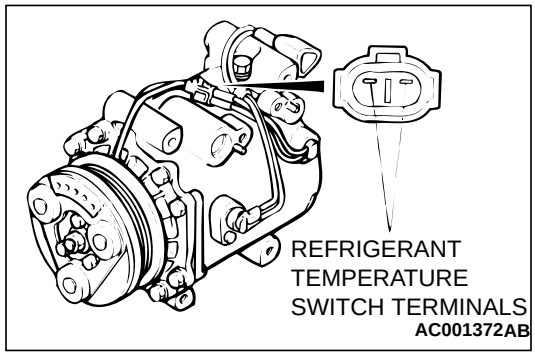
STEP 7. Check the blower switch continuity.

Follow the table below to check the blower switch for continuity.

SWITCH POSITION	TESTER CONNECTION (CONNECTOR A)	SPECIFIED CONDITION
0 (OFF)	1 – 3, 3 – 4, 3 – 5, 3 – 6	Open circuit
1 (LO)	3 – 5	Less than 2 ohm
2 (ML)	1 – 3	Less than 2 ohm
3 (MH)	3 – 6	Less than 2 ohm
4 (HI)	3 – 4	Less than 2 ohm

Q: Is the blower switch continuity in good condition?

YES : Go to Step 8.
NO : Replace. Then go to Step 11.



STEP 8. Check the refrigerant-temperature switch operation.

When the A/C is off, check that there is less than 2 ohm between the refrigerant-temperature switch terminals.

Q: Is the refrigerant-temperature switch in good condition?

YES : Go to Step 9.
NO : If the switch has an open circuit, replace the switch. Then go to Step 11.

STEP 9. Measure the automatic compressor controller terminal voltage.

Refer to P.55-22.

Q: Is the automatic compressor controller terminal voltage good?

YES : Go to Step 10.
NO : Replace. Then go to Step 11.

STEP 10. Measure the engine control module <M/T>/the powertrain control module <A/T> terminal voltage.
Refer to GROUP 13A, Diagnosis – Check at the Engine Control Module (ECM) <M/T> or Powertrain Control Module (PCM) <A/T> <2.4L engine>P.13A-554.
Refer to GROUP 13B, Diagnosis – Check at the Engine Control Module (ECM) <M/T> or Powertrain Control Module (PCM) <A/T> <3.0L engine>P.13B-655 .

Q: Is the terminal voltage in good condition?

YES : Go to Step 11.
NO : Replace. Then go to Step 11.

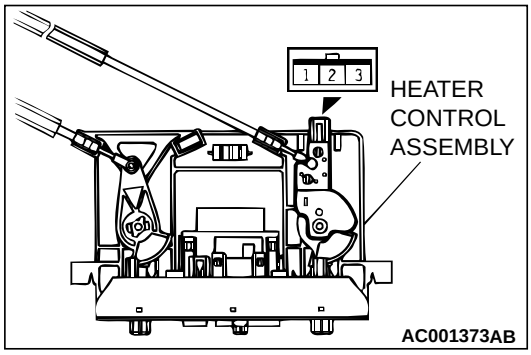
STEP 11. Check symptoms.

Q: Is the A/C operating properly?

YES : This diagnosis is complete. (If no malfunctions are not found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.)
NO : Go to Step 1.

INSPECTION PROCEDURE 2: When the Air Outlet Changeover Control Knob is moved to Defroster or Defroster/Foot Position, the A/C or the Inside/Outside Air Changeover Damper Motor does not Operate.

DIAGNOSIS



STEP 1. Check the defroster switch continuity.
Follow the table below to check the defroster switch for continuity.

AIR OUTLET CHANGEOVER CONTROL KNOB POSITION	TESTER CONNECTION	SPECIFIED CONDITION
At the "DEFROSTER" or "DEFROSTER/FOOT" position	2 – 3	Less than 2 ohm
At the other positions	1 – 3	Less than 2 ohm

Q: Is the defroster switch in good condition?

YES : Go to Step 2.
NO : Replace. Then go to Step 2.

STEP 2. Check each A/C part.
Refer to Inspection Procedure 1.

Q: Is the A/C operating properly?

YES : This diagnosis is complete. (If no malfunctions are not found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.)

NO : Go to Step 1.

INSPECTION PROCEDURE 3: When the A/C is Operating, Temperature Inside the Passenger Compartment does not Decrease (Cool Air not Emitted).

DIAGNOSIS

STEP 1. Check for refrigerant leaks.

Q: Is the refrigerant leaking?

YES : Repair. Then go to Step 6.

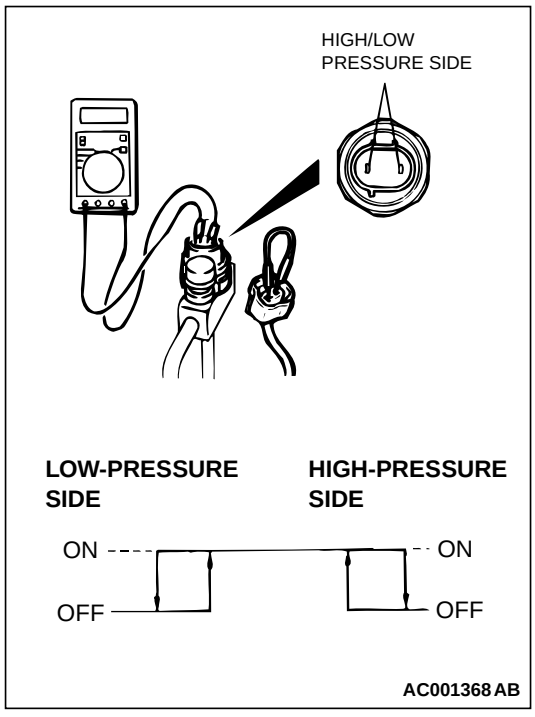
NO : Go to Step 2.

STEP 2. Check the dual pressure switch operation.

(1) Remove the dual pressure switch connector and connect the high/low pressure side terminals located on the harness side as shown in the illustration.

(2) Install a gauge manifold to the high-pressure side service valve of the refrigerant line. (Refer to P.55-26.)

(3) When the high/low pressure sides of the dual pressure switch are at operation pressure (ON) and there is continuity between the respective terminals.

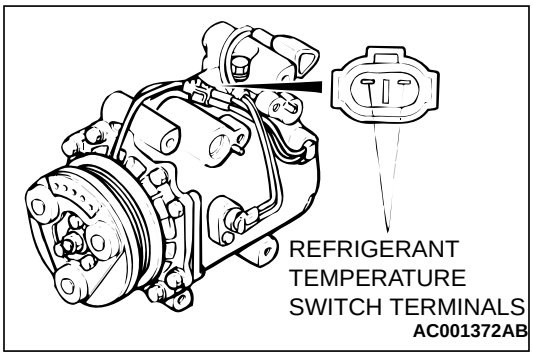


ITEMS	SWITCH POSITION	
	being turned on	being turned off
Low-pressure side kPa (psi)	221 (32.1)	196 (28.4)
High-pressure side kPa (psi)	2,354 (341.4)	2,942 (426.7)

Q: When the high/low pressure sides of the dual pressure switch are at operation pressure (ON), is there continuity between the respective terminals?

YES : Go to Step 3.

NO : Replace the switch. Then go to Step 6.



STEP 3. Check the refrigerant-temperature switch operation.

Q: When the A/C is off, check that there is continuity between the refrigerant-temperature switch terminals. Is the circuit open loop?

YES : Replace the switch. Then go to Step 6.
NO : If less than 2 ohm, go to Step 4.

STEP 4. Measure the automatic compressor controller terminal voltage.

Q: Is the automatic compressor controller terminal voltage in good condition?

YES : Go to Step 5.
NO : Replace. Then go to Step 6.

STEP 5. Measure the engine control module <M/T>/the powertrain control module <A/T> terminal voltage.

(1) Refer to GROUP 13A, Diagnosis – Check at The Engine Control Module (ECM) <M/T> or Powertrain Control Module (PCM) <A/T> <2.4L engine>P.13A-554 .
(2) Refer to GROUP 13B, Diagnosis – Check at The Engine Control Module (ECM) <M/T> or Powertrain Control Module (PCM) <A/T> <3.0L engine>P.13B-655 .

Q: Is the voltage in good condition?

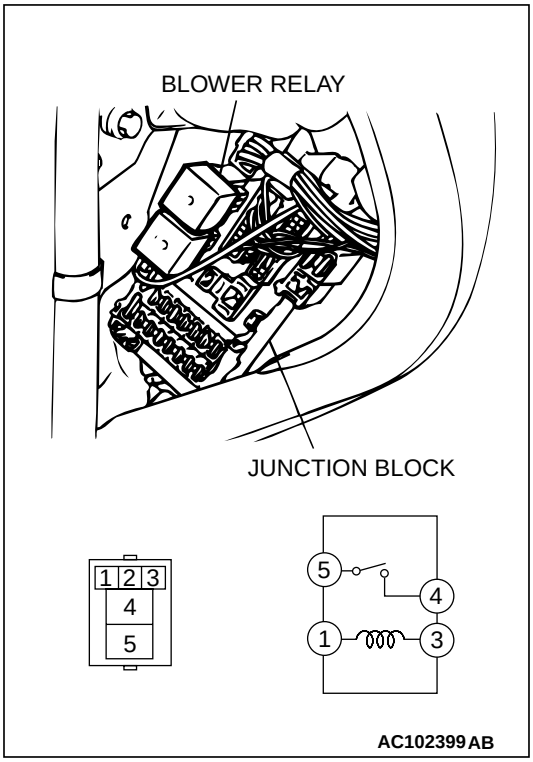
YES : Go to Step 6.
NO : Replace. Then go to Step 6.

STEP 6. Check symptoms.

Q: Is the cool air discharged?

YES : This diagnosis is complete. (If no malfunctions are not found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.)
NO : Go to Step 1.

INSPECTION PROCEDURE 4: Blower Fan and Motor does not Turn.



DIAGNOSIS

STEP 1. Check the blower relay continuity.

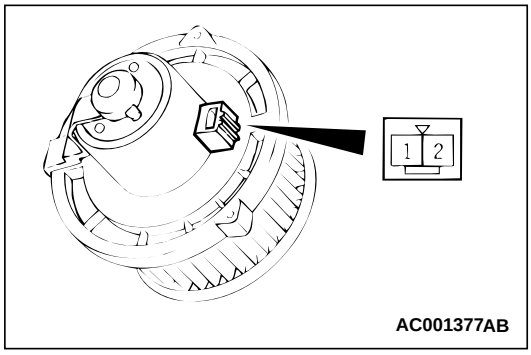
Follow the table below to check the blower relay for continuity.

BATTERY VOLTAGE	TESTER CONNECTION	SPECIFIED CONDITION
Not applied	4 – 5	Open circuit
• Connect terminal 3 to the positive battery terminal • Connect terminal 1 to the negative battery terminal	4 – 5	Less than 2 ohm

Q: Is the blower relay continuity in good condition?

YES : Go to Step 2.

NO : Replace. Then go to Step 5.



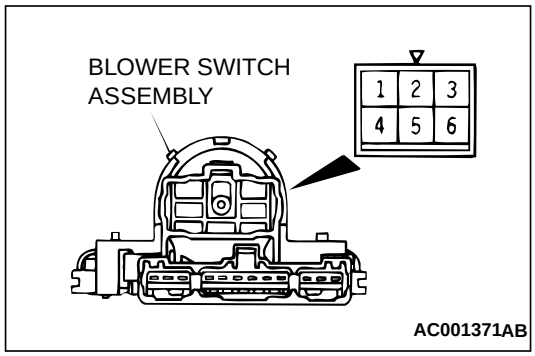
STEP 2. Check the blower fan and motor operation.

When battery voltage is applied between the terminals, check that the motor operates.

Q: Is there any abnormal noise?

YES : Go to Step 3.

NO : Replace. Then go to Step 5.



STEP 3. Check the blower switch continuity.

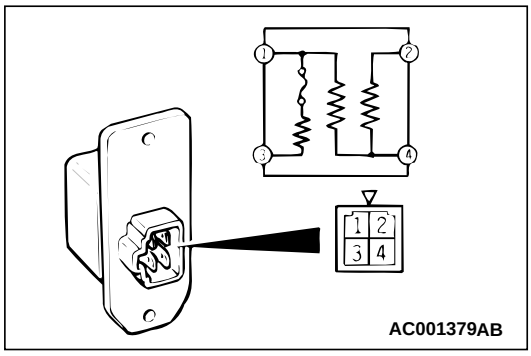
Follow the table below to check the blower switch for continuity.

SWITCH POSITION	TESTER CONNECTION (CONNECTOR A)	SPECIFIED CONDITION
0 (OFF)	1 – 3, 3 – 4, 3 – 5, 3 – 6	Open circuit
1 (LO)	3 – 5	Less than 2 ohm
2 (ML)	1 – 3	Less than 2 ohm
3 (MH)	3 – 6	Less than 2 ohm
4 (HI)	3 – 4	Less than 2 ohm

Q: Is the blower switch continuity in good condition?

YES : Go to Step 4.

NO : Replace. Then go to Step 5.



STEP 4. Check the resistor resistance value.

Use an ohmmeter to measure the resistance between the terminals as indicated below. Check that the measured value is at the standard value.

Standard value:

MEASUREMENT TERMINAL	STANDARD VALUE Ω
Between terminals 3 and 2 (LO)	2.3
Between terminals 3 and 4 (ML)	1.1
Between terminals 3 and 1 (MH)	0.4

Q: Is the measured value at the standard value?

YES : Go to Step 5.

NO : Replace. Then go to Step 5.

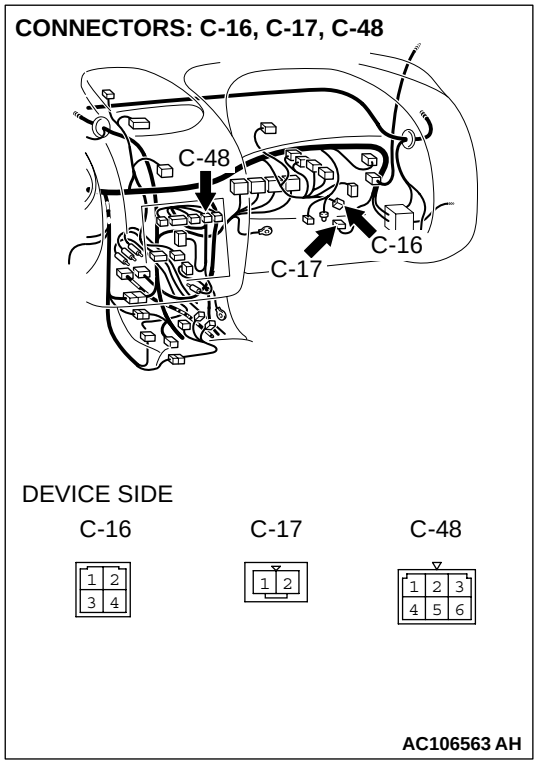
STEP 5. Check symptoms.

Q: Is the blower fan and motor turned?

YES : This diagnosis is complete. (If no malfunctions are not found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.)

NO : Go to Step 1.

INSPECTION PROCEDURE 5: Blower Fan and Motor does not Stop Turning.



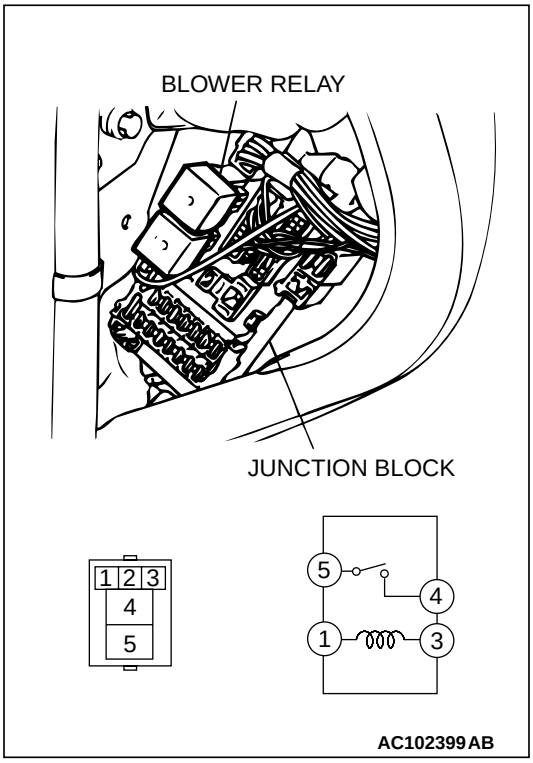
DIAGNOSIS

STEP 1. Check the wiring harness between the blower fan and motor connector C-17 (terminal 1), the resistor connector C-16 (terminals 1, 2, 3 and 4) and the blower switch connector C-48 (terminals 1, 4, 5 and 6).

Q: Is the wiring harness between the blower fan and motor connector C-17 (terminal 1), the resistor connector C-16(terminal 1, 2, 3 and 4), and the blower switch connector C-48 (terminals 1, 4, 5 and 6) in good condition?

YES : Go to Step 2.

NO : Repair the wiring harness. Then go to Step 4.



STEP 2. Check the blower relay continuity.

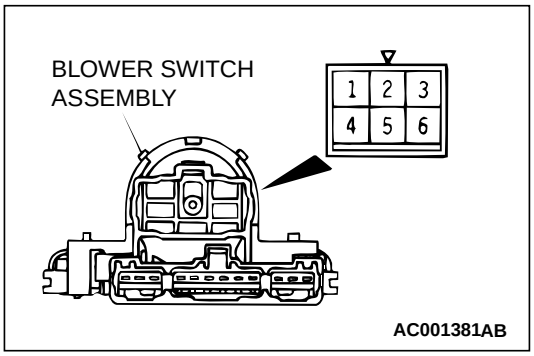
Follow the table below to check the blower relay for continuity.

BATTERY VOLTAGE	TESTER CONNECTION	SPECIFIED CONDITION
Not applied	4 – 5	Open circuit
• Connect terminal 3 to the positive battery terminal • Connect terminal 1 to the negative battery terminal	4 – 5	Less than 2 ohm

Q: Is the blower relay continuity in good condition?

YES : Go to Step 3.

NO : Replace. Then go to Step 4.



STEP 3. Check the blower switch continuity.

Follow the table below to check the blower switch for continuity.

SWITCH POSITION	TESTER CONNECTION (CONNECTOR A)	SPECIFIED CONDITION
0 (OFF)	1 – 3, 3 – 4, 3 – 5, 3 – 6	Open circuit
1 (LO)	3 – 5	Less than 2 ohm
2 (ML)	1 – 3	Less than 2 ohm
3 (MH)	3 – 6	Less than 2 ohm
4 (HI)	3 – 4	Less than 2 ohm

Q: Is the blower switch continuity in good condition?

YES : Go to Step 4.

NO : Replace. Then go to Step 4.

STEP 4. Check symptoms.

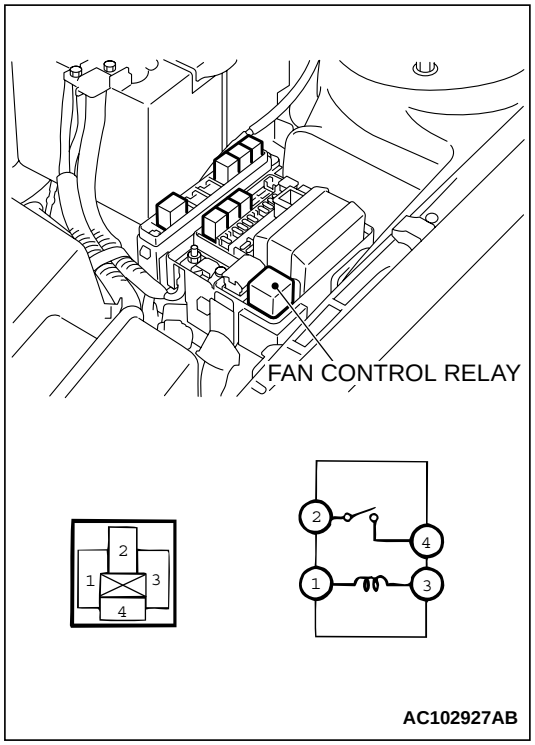
Q: Does the blower motor stop turning?

YES : This diagnosis is complete. (If no malfunctions are not found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.)

NO : Go to Step 1.

INSPECTION PROCEDURE 6: When the A/C is Operating Condenser Fan or Radiator Fan does not Turn.

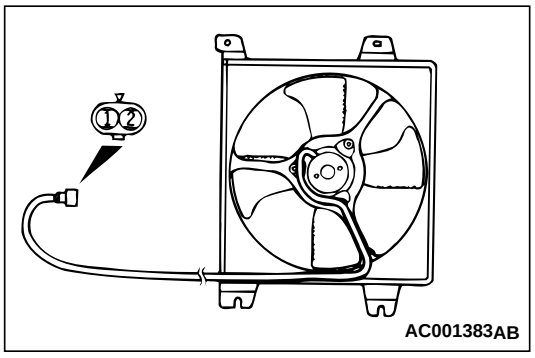
DIAGNOSIS



STEP 1. Check the fan control relay continuity.
Follow the table below to check the fan control relay for continuity.

BATTERY VOLTAGE	TESTER CONNECTION	SPECIFIED CONDITION
Not applied	1 – 4	Open circuit
• Connect terminal 3 to the positive battery terminal • Connect terminal 2 to the negative battery terminal	1 – 4	Less than 2 ohm

Q: Is the fan control relay continuity in good condition?
YES : Go to Step 2.
NO : Replace. Then go to Step 4.



STEP 2. Check the condenser fan motor operation <vehicles with 3.0L engine>.
Check to be sure that the condenser fan motor operates when battery voltage is applied to terminal 2 and terminal 1 grounded.

Q: Is the condenser fan motor operating correctly?
YES : Go to Step 3.
NO : Replace. Then go to Step 3.

STEP 3. Measure the fan controller terminal voltage.
Refer to GROUP 14, On-vehicle Service – Fan Control Module Check P.14-19.

Q: Is the fan controller terminal voltage in good condition?
YES : Go to Step 4.
NO : Replace. Then go to Step 4.

STEP 4. Check symptoms.

NOTE: Condenser fan might not operate when there is an air conditioning low load from the air conditioning condenser control, so remove the negative battery terminal and then check the symptoms after 5 minutes since initial start control after reconnecting.

Q: Is the condenser fan or radiator fan operating correctly?

YES : This diagnosis is complete. (If no malfunctions are not found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.)

NO : Go to Step 1.

INSPECTION PROCEDURE 7: The A/C Indicator Flashes <Vehicles with 3.0L Engine>

THE A/C INDICATOR FLASHES.

STEP 1. Check the drive belt tension.

Refer to GROUP 00, Lubrication and Maintenance Service – Drive Belts P.00-34.

Q: Is the drive belt tension in good condition?

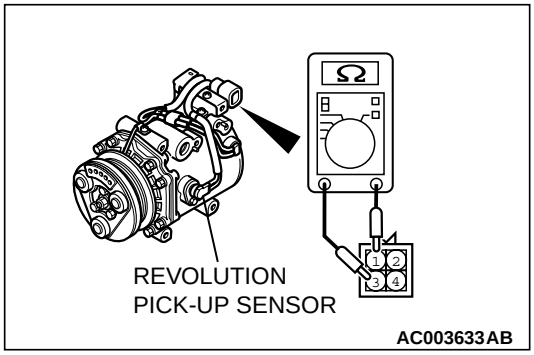
YES : Go to Step 2.

NO : Repair. Then go to Step 5.

STEP 2. Check the revolution pick-up sensor.

Measure the resistance between terminals 1 and 3. Check that the measured value is at the standard value.

Standard value: 405 ± 35 Ω when the ambient temperature is 20 °C (68 °F)



Q: Is the measured value at the standard value?

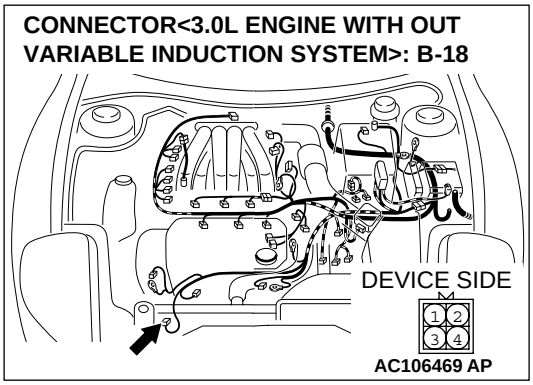
YES : Go to Step 3.

NO : Replace. Then go to Step 5.

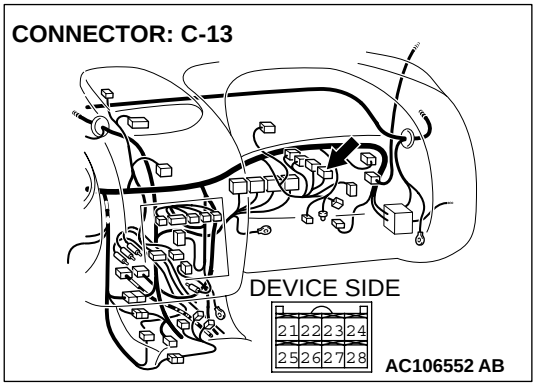
STEP 3. Check the harness wire between the compressor connector B-18 (terminals 1, 3 and 4) and automatic compressor controller connector C-13 (terminals 21, 23 and 24).

NOTE: Also check intermediate connector B-13 and C-28. If intermediate connectors B-13 and C-28 is damaged, repair or replace the connector as described in GROUP 00E, Harness Connector Inspection P.00E-2.

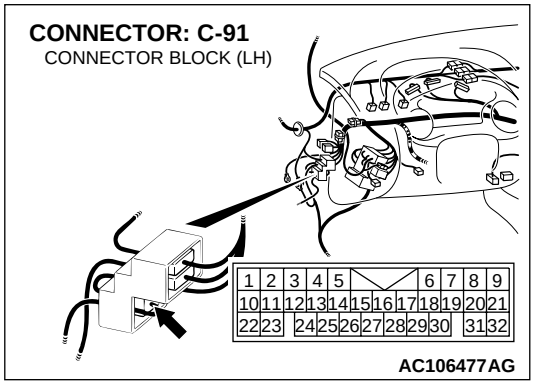
CONNECTOR<3.0L ENGINE WITH OUT VARIABLE INDUCTION SYSTEM>: B-18



CONNECTOR: C-13



CONNECTOR: C-91
CONNECTOR BLOCK (LH)



Q: Is the harness wire between the compressor connector B-18 (terminals 1, 3 and 4) and automatic compressor controller connector C-13 (terminals 21, 23 and 24) in good condition?

YES : Go to Step 4.
NO : Repair. Then go to Step 5.

STEP 4. Measure the automatic compressor controller terminal voltage.

Refer to P.55-22.

Q: Is the automatic compressor controller terminal voltage in good condition?

YES : Go to Step 5.
NO : Replace. Then go to Step 5.

STEP 5. Check symptoms.

Q: Does the A/C indicator flashes?

YES : Go to Step 1.

NO : This diagnosis is complete. (If no malfunctions are not found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.)

INSPACTION PROCEDURE 8: When the Heater Control Knob is Set to the "MAX COOL" Position, the Air-Conditioning does not Cool Sufficiently.

DIAGNOSIS

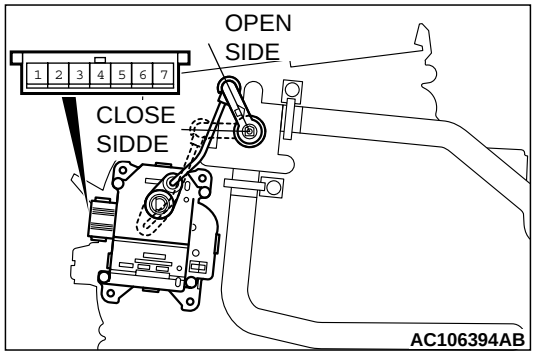
STEP 1. Check for refrigerant leaks.

Q: Is the refrigerant leaking?

YES : Repair. Then go to Step 4.

NO : Go to Step 2.

STEP 2. Check the water shut motor



⚠ CAUTION

When the motor stops, disconnect the battery cable.

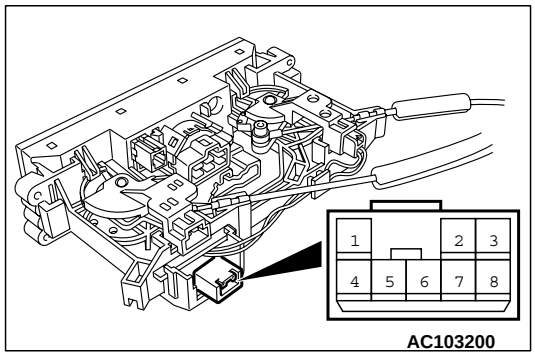
Follow the table below to check the water shut motor for correct operation.

LEVER POSITION	BATTERY CONNECTION	LEVER OPERATION
At the open position	• Connect terminal 1 to the positive battery terminal • Connect terminal 7 to the negative battery terminal	The lever moves from the open position to the closed position
At the close position	• Connect terminal 1 to the positive battery terminal • Connect terminal 5 to the negative battery terminal	The lever moves from the closed position to the open position

Q: Does water shut motor work normally?

YES : Go to Step 3.

NO : Replace. Then go to Step 4.



STEP 3. Check the water shut valve controller continuity.
Follow the table below to check the water shut valve controller for continuity.

SWITCH POSITION	BATTERY CONNECTION	TESTER CONNECTION	SPECIFIED CONDITION
At the "MAX COOL" position	• Connect terminal 1 to the positive battery terminal • Connect terminal 5 to the negative battery terminal	5 – 6	Less than 2 ohm
		2 – 5	Open circuit
At the other positions	Not applied	2 – 5	Less than 2 ohm
		5 – 6	Open circuit

Q: Is the water shut valve controller in good condition?

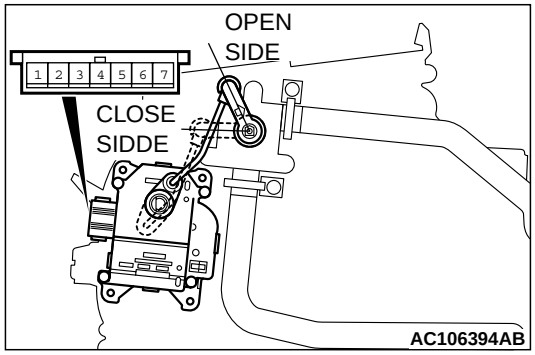
YES : Go to Step 4.
NO : Replace. Then go to Step 4.

STEP 4. Check symptoms.

Q: Is the cool air discharged?

YES : This diagnosis is complete. (If no malfunctions are not found in all steps, an intermittent malfunction is suspected. Refer to Introduction, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.)
NO : Go to Step 1.

INSPACTION PROCEDURE 9: Warm Air does not Go Out From the Air Outlets



DIAGNOSIS

STEP 1. Check the water shut motor

⚠ CAUTION

When the motor stops, disconnect battery cable.

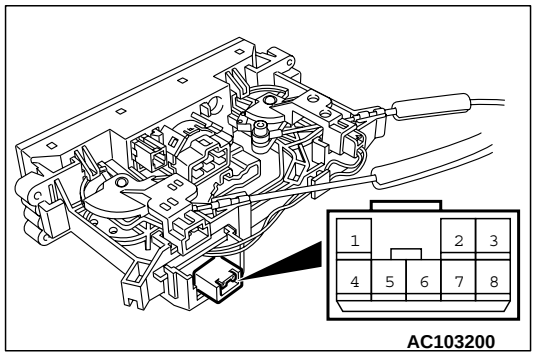
Follow the table below to check the water shut motor for correct operation.

LEVER POSITION	BATTERY CONNECTION	LEVER OPERATION
At the open position	• Connect terminal 1 to the positive battery terminal • Connect terminal 7 to the negative battery terminal	The lever moves from the open position to the closed position
At the close position	• Connect terminal 1 to the positive battery terminal • Connect terminal 5 to the negative battery terminal	The lever moves from the closed position to the open position

Q: Does water shut motor work normally?

YES : Go to Step 2.

NO : Replace. Then go to Step 3.



STEP 2. Check the water shut valve controller continuity.
Follow the table below to check the water shut valve controller for continuity.

SWITCH POSITION	BATTERY CONNECTION	TESTER CONNECTION	SPECIFIED CONDITION
At the "MAX COOL" position	• Connect terminal 1 to the positive battery terminal • Connect terminal 5 to the negative battery terminal	5 – 6	Less than 2 ohm
		2 – 5	Open circuit
At the other positions	Not applied	2 – 5	Less than 2 ohm
		5 – 6	Open circuit

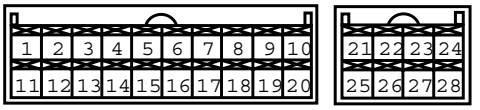
Q: Is the water shut valve controller in good condition?
YES : Go to Step 3.
NO : Replace. Then go to Step 3.

STEP 3. Check symptoms.

Q: Is the cool air discharged?
YES : This diagnosis is complete. (If no malfunctions are not found in all steps, an intermittent malfunction is suspected. Refer to Introduction, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.)
NO : Go to Step 1 .

CHECK AT ECU TERMINAL

M1552010300237



TERMINAL NO.	INSPECTION	INSPECTION REQUIREMENTS	NORMAL CONDITION
1	Power supply	Ignition switch: "LOCK" (OFF)	0 V
		Ignition switch: "ON"	Battery positive voltage
2	Input from thermistor sensor to controller	Ignition switch and A/C switch: OFF	0 V
		Ignition switch and A/C switch: ON	2 – 5 V
3	Thermistor sensor power supply	Ignition switch and A/C switch: OFF	0 V
		Ignition switch and A/C switch: ON	5 V

TERMINAL NO.	INSPECTION	INSPECTION REQUIREMENTS	NORMAL CONDITION
4, 5	Output from controller to engine control module <M/T>/ powertrain control module <A/ T>	Air thermistor sensor detection temperature: 5°C (41.0°F) or less	0 V
		Air thermistor sensor detection temperature: 55C (46.45F) or less	Battery positive voltage
6	–	–	–
7	Input from A/C switch (outside/ inside air selection damper control switch) to controller	• Outside air switch: ON • Inside air switch: OFF	0 V
		• Outside air switch: OFF • Inside air switch: ON	Battery positive voltage
8	Input from defroster switch (FOOT) to controller	Defroster switch (FOOT): ON	0 V
		Defroster switch (FOOT): OFF	Battery positive voltage
9	Input from defroster switch (DEF) to controller	Defroster switch (DEF): ON	0 V
		Defroster switch (DEF): OFF	Battery positive voltage
10	Input from A/C switch to controller	A/C switch: OFF	0 V
		A/C switch: ON	Battery positive voltage
11	Ground	Always	0 V
12	–	–	–
13	Input from A/C switch (outside/ inside air selection damper control switch) to controller	• Outside air switch: ON • Inside air switch: OFF	Battery positive voltage
		• Outside air switch: OFF • Inside air switch: ON	0 V
14	Input from A/C switch (IND) to controller	A/C switch: OFF	0 V
		A/C switch: ON	Battery positive voltage
15	–	–	–
16	Output from controller to outside/inside air selection damper control motor	• Outside air switch: ON • Inside air switch: OFF	Battery positive voltage
		• Outside air switch: OFF • Inside air switch: ON	0 V
17	Output from controller to outside/inside air selection damper control motor	• Outside air switch: ON • Inside air switch: OFF	0 V
		• Outside air switch: OFF • Inside air switch: ON	Battery positive voltage
18	Input from taillight relay to controller	Taillight relay: OFF	0 V
		Taillight relay: ON	Battery positive voltage
19	Input from blower switch (LO) to controller	Blower switch (LO): OFF	0 V
		Blower switch (LO): ON	Battery positive voltage
20	–	–	–
21	Input from A/C compressor relay to controller	A/C compressor relay: OFF	0 V
		A/C compressor relay: ON	Battery positive voltage

TERMINAL NO.	INSPECTION	INSPECTION REQUIREMENTS	NORMAL CONDITION
22	Input from distributor assembly to controller	Ignition switch: "LOCK" (OFF)	0 V
		Ignition switch: "ON" (engine stopped)	Battery positive voltage
		Ignition switch: "ON" (engine stopped)	0 V – Battery positive voltage
23	Revolution pick-up sensor power supply	Ignition switch and A/C switch: OFF	0 V
		Ignition switch and A/C switch: ON	5 V
24	Input from revolution pick-up sensor relay to controller	A/C compressor relay: OFF	0 V
		A/C compressor relay: ON	2 – 5 V

TROUBLESHOOTING HINT

M1552013400147

Condenser fan and radiator fan control

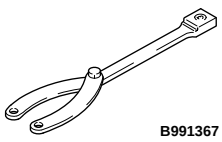
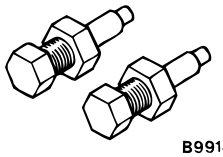
- Refer to GROUP 14, Diagnosis – Symptom Chart P.14-3.

Compressor control

- Refer to P.55-3.

SPECIAL TOOLS

M1552000600174

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 B991367	MB991367 Special spanner	MB991367-01	Armature mounting nut of compressor removal and installation
 B991386	MB991386 Pin	MIT217213	Armature mounting nut of compressor removal and installation

ON-VEHICLE SERVICE

REFRIGERANT LEVEL TEST

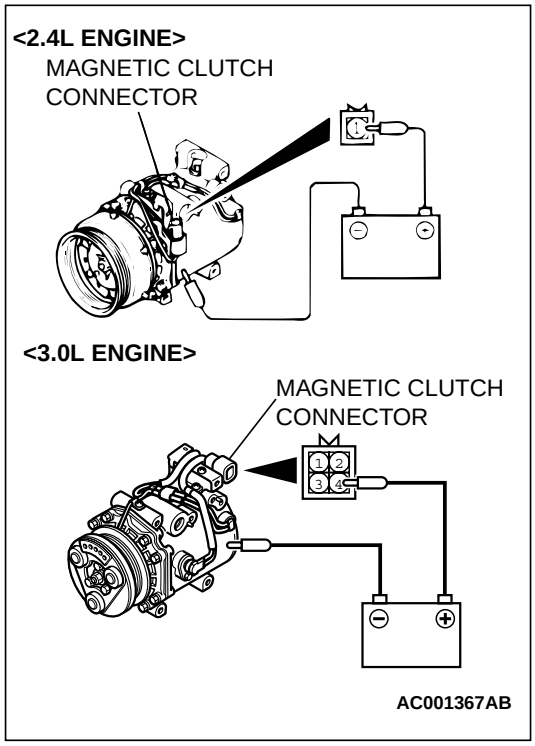
M1552008400196

Use the refrigerant recovery station to remove all of the refrigerant, and then calculate the amount of the refrigerant and charge it.

MAGNETIC CLUTCH TEST

M1552008500245

1. Disconnect the magnetic clutch connector to the magnetic clutch.



2. Connect positive battery voltage directly to the connector for the magnetic clutch.
3. If the magnetic clutch is normal, there will be "click." If the pullet and armature do not make contact ("click"), there is a malfunction.

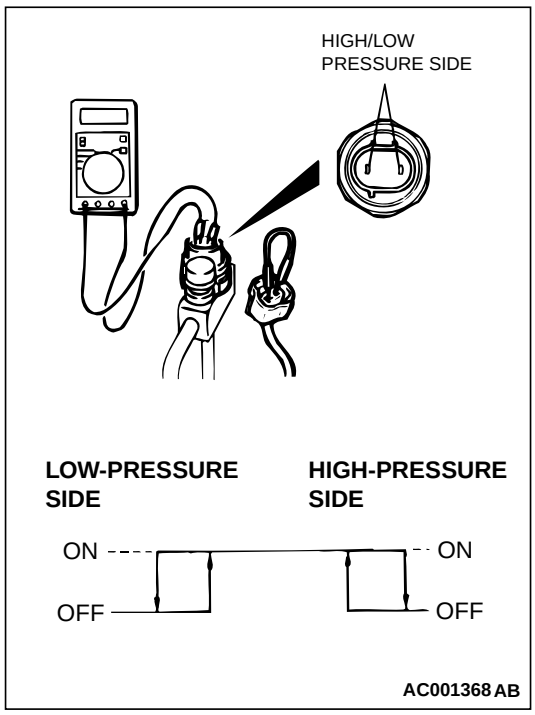
RECEIVER DRIER TEST

M1552008600156

Operate the unit and check the piping temperature by touching the receiver drier outlet and inlet.
If there is a difference in the temperatures, the receiver drier is restricted.
Replace the receiver drier.

PRESSURE SWITCH CHECK

M1552010400171



1. Remove the dual pressure switch connector and connect the high/low pressure side terminals located on the harness side as shown in the illustration.
2. Install a gauge manifold to the high-pressure side service valve of the refrigerant line. (Refer to P.55-26.)
3. When the high/low pressure sides of the dual pressure switch are at operation pressure (ON) and there is continuity between the respective terminals, then the condition is normal. If there is no continuity, replace the switch.

ITEMS	SWITCH POSITION	
	OFF to ON	ON to OFF
Low-pressure side kPa (psi)	221 (32.1)	196 (28.4)
High-pressure side kPa (psi)	2,354 (341.4)	2,942 (426.7)

COMPRESSOR DRIVE BELT ADJUSTMENT

M1552001000175

Refer to GROUP 00, Maintenance Service – Drive Belts P.00-44.

CHARGING

M1552001200180

Use the refrigerant recovery station to charge the refrigerant.

METHOD BY USING REFRIGERANT RECOVERY AND RECYCLING UNIT

Using the refrigerant recovery and recycling unit, refill the refrigerant.

NOTE: Refer to that Refrigerant Recovery and Recycling Unit Instruction Manual for operation of the unit.

DISCHARGING SYSTEM

Use the refrigerant recovery unit to discharge refrigerant gas from the system.

NOTE: Refer to that Refrigerant Recovery and Recycling Unit Instruction Manual for operation of the unit.

REFILLING OF OIL IN THE A/C SYSTEM

Too little oil will provide inadequate compressor lubrication and cause a compressor failure. Too much oil will increase discharge air temperature.

When a compressor is installed at the factory, it contains 120 cm^3 (4.1 floz) of refrigerant oil. While the A/C system is in operation, the oil is carried through the entire system by the refrigerant. Some of this oil will be trapped and retained in various parts of the system.

When the following system components are changed, it is necessary to add oil to the system to replace the oil being removed with the component.

Compressor oil: SUN PAG 56

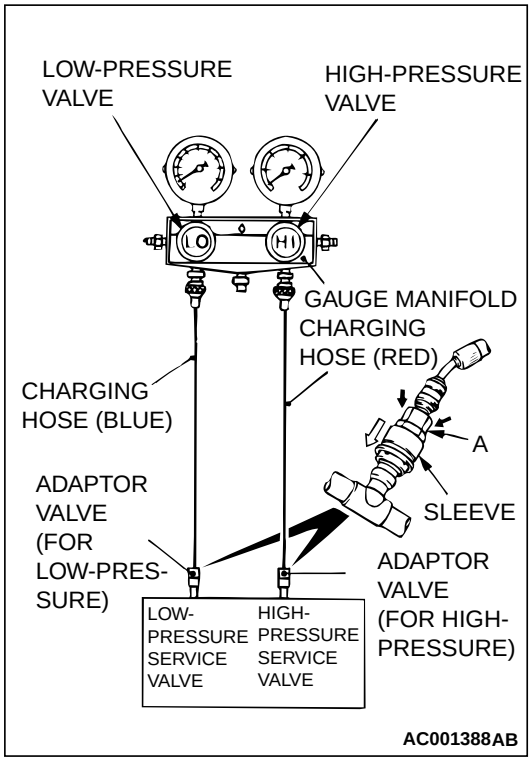
Quantity:

- **Evaporator: 60 cm^3 (2.0 floz)**
- **Condenser: 15 cm^3 (0.5 floz)**
- **Suction hose: 10 cm^3 (0.3 floz)**

PERFORMANCE TEST

M1552001400173

The vehicles to be tested should be in a place that is not in direct sunlight.



1. Close the high and low-pressure valve of the gauge manifold.
2. Connect the charging hose (blue) to the low-pressure valve and connect the charging hose (red) to the high-pressure valve of the gauge manifold.
3. Install the quick joint (for low-pressure) to the charging hose (blue), and connect the quick joint (for high-pressure) to the charging hose (red).

⚠ CAUTION

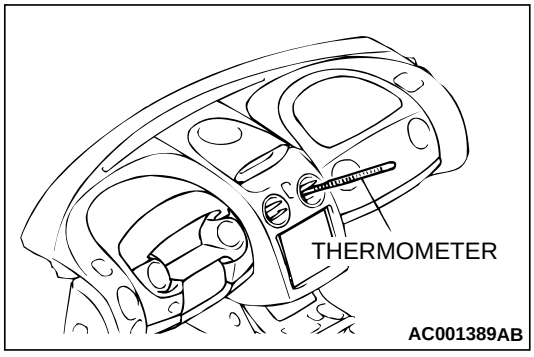
- **To connect the quick joint, press section A firmly against the service valve until a click is heard.**
- **When connecting, run your hand along the hose while pressing to ensure that there are no bends in the hose.**

NOTE: The high-pressure service valve is on A/C pipe and the low-pressure service valve is on the suction hose.

4. Connect the quick joint (for low-pressure) to the low-pressure service valve and connect the quick joint (for high-pressure) to the high-pressure service valve.
5. Start the engine.
6. Set the A/C controls as follows:
   - A/C switch: A/C – ON position
   - Mode selection: FACE position
   - Temperature control: MAXIMUM COOLING position
   - Air selection: RECIRCULATION position
   - Blower switch: "4" (Fast) position
7. Adjust engine speed to 1,500 r/min with A/C clutch engaged.
8. Engine should be warmed up with doors and windows closed.
9. Insert a thermometer in the center air outlet and operate the engine for 20 minutes.

NOTE: If the clutch cycles, take the reading before the clutch disengages.

10. Note the discharge air temperature.



Performance Temperature Chart

GARAGE AMBIENT TEMPERATURE °C (°F)	**20 (68)**	**25 (77)**	**35 (95)**	**40 (104)**
Discharge air temperature °C (°F)	5.0 – 10.0 (42 – 50)	6.0 – 10.5 (43 – 51)	7.5 – 12.0 (46 – 54)	7.5 – 12.5 (46 – 55)
Compressor high pressure kPa (psi)	1,540 – 1,935 (224 – 281)	1,618 – 2,000 (235 – 290)	2,070 – 2,205 (301 – 320)	2,140 – 2,620 (311 – 380)
Compressor low pressure kPa (psi)	125 – 155 (18 – 23)	125 – 155 (18 – 23)	150 – 180 (22 – 26)	145 – 190 (21 – 28)

TSB Revision

REFRIGERANT LEAK REPAIR PROCEDURE

M1552001500158

LOST CHARGE

If the system has lost all charge due to a leak:

1. Evacuate the system. (Refer to P.55-26.)
2. Charge the system with approximately 0.453 kg (1 pound) of refrigerant.
3. Check for leaks.
4. Discharge the system.
5. Repair leaks.

⚠ CAUTION

Replacement filter-drier units must be sealed while in storage. The drier used in these units will saturate water quickly upon exposure to the atmosphere. When installing a drier, have all tools and supplies ready for quick assembly to avoid keeping the system open any longer than necessary.

6. Replace receiver drier.
7. Evacuate and charge system.

LOW CHARGE

If the system has not lost all of its refrigerant charge; locate and repair all leaks. If it is necessary to increase the system pressure to find the leak (because of an especially low charge) add refrigerant. If it is possible to repair the leak without discharging the refrigerant system, use the procedure for correcting low refrigerant level.

COMPRESSOR NOISE CHECK

You must first know the conditions when the noise occurs. These conditions are: weather, vehicle speed, in gear or neutral, engine temperature or any other special conditions.
Noises that develop during A/C operation can often be misleading. For example: what sounds like a failed front bearing or connecting rod, may be caused by loose bolts, nuts, mounting brackets, or a loose clutch assembly. Verify accessory drive belt tension (power steering or generator).
Improper accessory drive belt tension can cause a misleading noise when the compressor is engaged and little or no noise when the compressor is disengaged.
Drive belts are speed-sensitive. That is, at different engine speeds, and depending upon belt tension, belts can develop unusual noises that are often mistaken for mechanical problems within the compressor.

HANDLING TUBING AND FITTINGS

Kinks in the refrigerant tubing or sharp bends in the refrigerant hose lines will greatly reduce the capacity of the entire system. High pressures are produced in the system when it is operating. Extreme care must be exercised to make sure that all connections are pressure tight. Dirt and moisture can enter the system when it is opened for repair or replacement of lines or components. The following precautions must be observed. The system must be completely discharged before opening any fitting of connection in the refrigeration system. Open fittings with caution even after the system has been discharged. If any pressure is noticed as a fitting is loosened, allow trapped pressure to bleed off very slowly.
Never attempt to rebend formed lines to fit. Use the correct line for the installation you are servicing. A good rule for the flexible hose lines is keep the radius of all bends at least 10 times the diameter of the hose.
Sharper bends will reduce the flow of refrigerant. The flexible hose lines should be routed so that they are at least 80 mm (3.1 inches) from the exhaust manifold. It is good practice to inspect all flexible hose lines at least once a year to make sure they are in good condition and properly routed.
On standard plumbing fittings with O-rings, these O-rings are not reusable.

M1552008700153

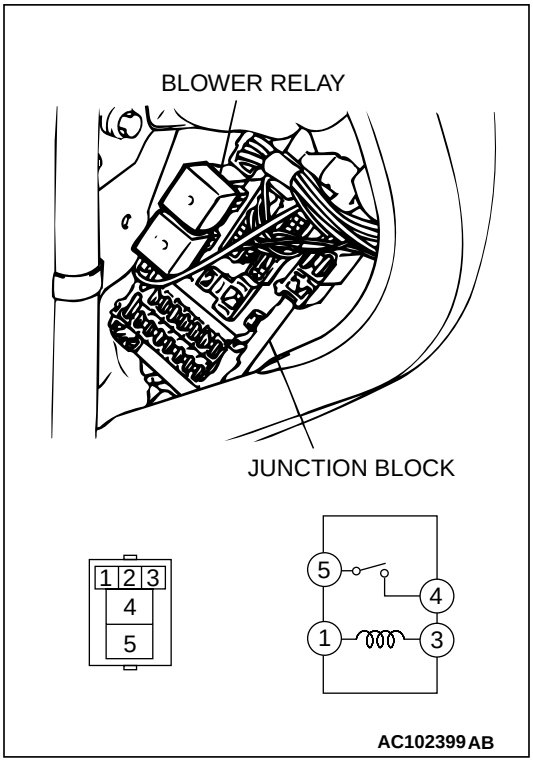
ADJUSTMENT

1. Select a quiet area for testing. Duplicate conditions as much as possible. Switch compressor on and off several times to clearly identify compressor noise. To duplicate high ambient conditions (high head pressure), restrict air flow through condenser. Install manifold gauge set to make sure discharge pressure doesn't exceed 2,070 kPa (300.2 psi).
2. Tighten all compressor mounting bolts, clutch mounting bolt, and compressor drive belt. Check to assure clutch coil is tight (no rotation or wobble).
3. Check refrigerant hoses for rubbing or interference that can cause unusual noises.
4. Check refrigerant charge. (Refer to P.55-26.)
5. Recheck compressor noise as in Step 1.
6. If noise still exists, loosen compressor mounting bolts and retighten. Repeat Step 1.
7. If noise continues, replace compressor and repeat Step 1.

INSPECTION

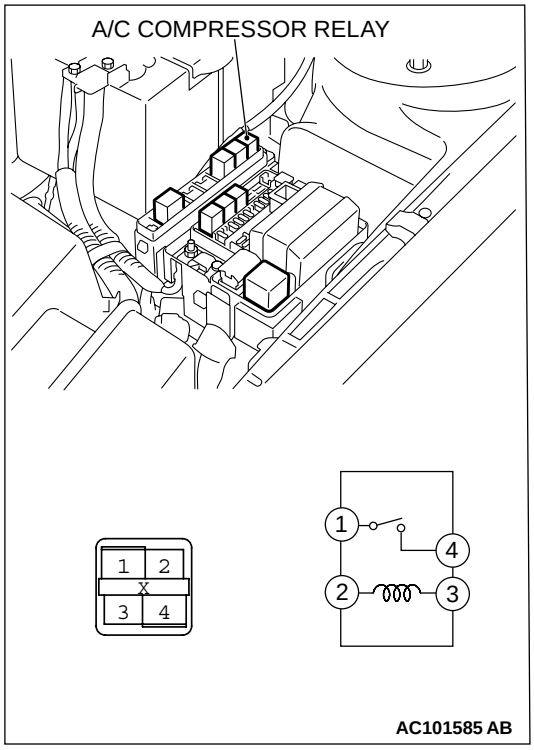
M1551006300093

BLOWER RELAY CONTINUITY CHECK



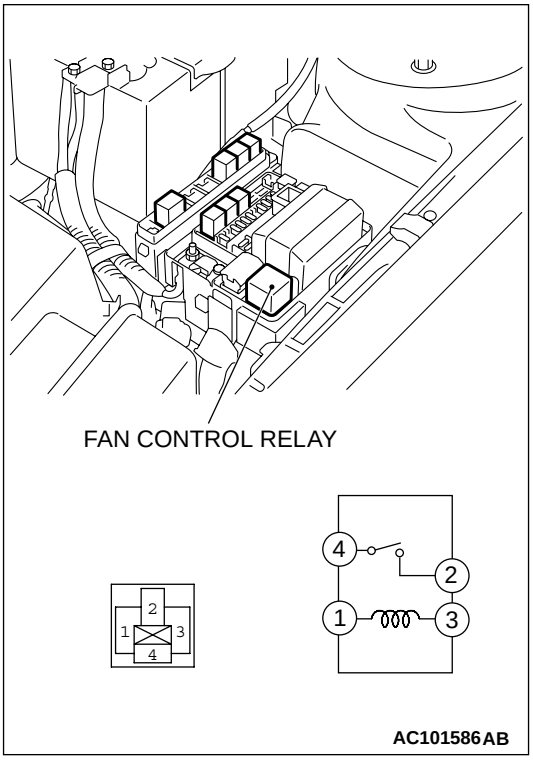
BATTERY VOLTAGE	TESTER CONNECTION	SPECIFIED CONDITION
Not applied	4 – 5	Open circuit
• Connect terminal 3 to the positive battery terminal • Connect terminal 1 to the negative battery terminal	4 – 5	Less than 2 ohm

A/C COMPRESSOR RELAY CONTINUITY CHECK



BATTERY VOLTAGE	TESTER CONNECTION	SPECIFIED CONDITION
Not applied	1 – 4	Open circuit
• Connect terminal 2 to the positive battery terminal • Connect terminal 3 to the negative battery terminal	1 – 4	Less than 2 ohm

FAN CONTROL RELAY CONTINUITY CHECK



BATTERY VOLTAGE	TESTER CONNECTION	SPECIFIED CONDITION
Not applied	1 – 4	Open circuit
• Connect terminal 3 to the positive battery terminal • Connect terminal 2 to the negative battery terminal	1 – 4	Less than 2 ohm

IDLE-UP OPERATION CHECK

M1552001600188

1. Before inspection and adjustment, set vehicle in the following condition:
   - Engine coolant temperature: 80 – 90 °C (176.0 - 194.0 °F)
   - Lights, electric cooling fan and accessories: Set to OFF
   - Transmission: Neutral ("N" or "P" for vehicles with A/T)
   - Steering wheel: Straightforward
2. Check whether or not the idle speed is the standard value.
   <2.4L Engine>: Refer to GROUP 13A, On-vehicle Service – Basic Idle Speed Adjustment P.13A-577.
   <3.0L Engine>: Refer to GROUP 13B, On-vehicle Service – Basic Idle Speed Adjustment P.13B-679.
   Standard value:
   - **<2.4L engine> 750 ± 100 r/min**
   - **<3.0L engine> 700 ± 100 r/min**

   NOTE: . Check 4 minutes after idling begins.
3. When the A/C is running after turning the A/C switch to ON, and the blower switch to the 3(MH) or 4(HI) position, check to be sure that the idle speed is at the standard value.
   Standard value: 850 ± 100 r/min

   NOTE: . The engine control module <M/T>/the powertrain control module <A/T> determines whether the A/C load is low or high according to the output signal from the automatic compressor controller.

   NOTE: . It is not necessary to make an adjustment, because the idling speed is automatically adjusted by the ISC system. If, however, a deviation from the standard value occurs for some reason, check the ISC system.

   NOTE: . Check 4 minutes after idling begins.

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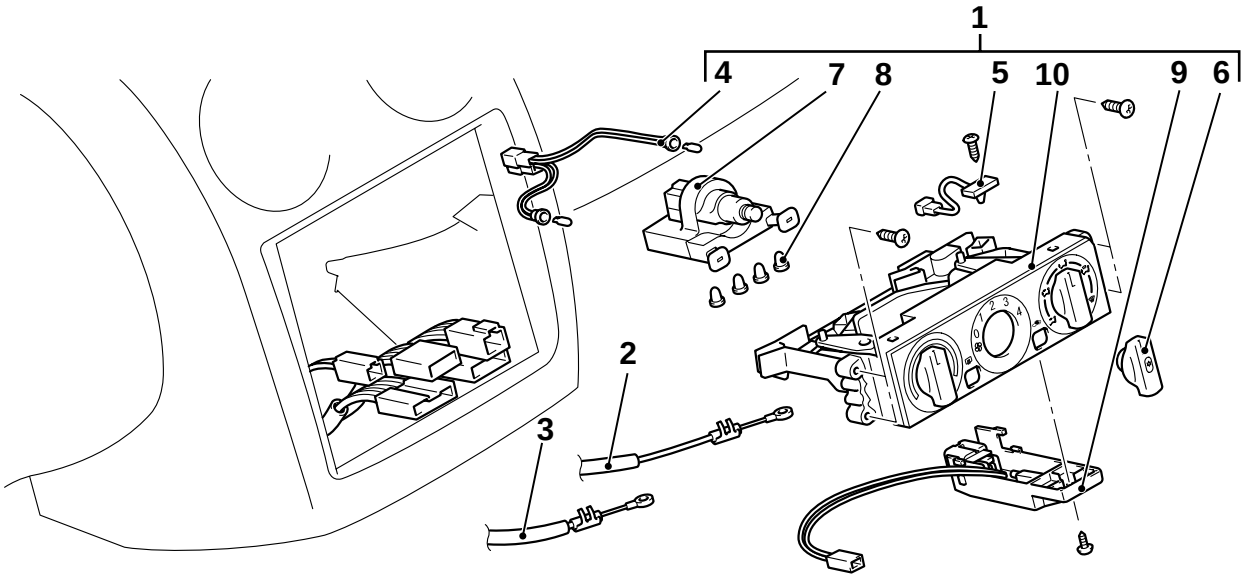
HEATER CONTROL ASSEMBLY AND A/C SWITCH

REMOVAL AND INSTALLATION

M1552002400154

Pre-removal and Post-installation Operation
- Center Panel Assembly, Front Driver's Side Under Cover and Front Passenger's Side Under Cover Removal and Installation (Refer to GROUP 52A, Instrument Panel P.52A-3.)
- Radio and Tape Player Removal and Installation (Refer to GROUP 54A, Audio System - Radio and Tape Player, CD Player and CD Auto Changer P.54A-217.)
- Floor Console Removal and Installation (Refer to GROUP 52A, Floor Console P.52A-8.)
- Instrument Panel Center Reinforcement Removal and Installation (Refer to GROUP 52A, Instrument Panel P.52A-3.)
- Foot Duct (LH) Removal and Installation (Refer to P.55-54.)



AC106418AB

REMOVAL STEPS

<<A>> >>A<< 1. HEATER CONTROL ASSEMBLY
<<B>> 2. AIR OUTLET CHANGEOVER DAMPER LINK CABLE
<<B>> 3. AIR MIX DAMPER LEVER CABLE
4. BULB HARNESS
5. DEFROSTER SWITCH

REMOVAL STEPS (Continued)

6. KNOB ASSEMBLY
7. HEATER CONTROL PANEL
8. BULB
9. WATER SHUT VALVE CONTROLLER
10. BLOWER SWITCH ASSEMBLY

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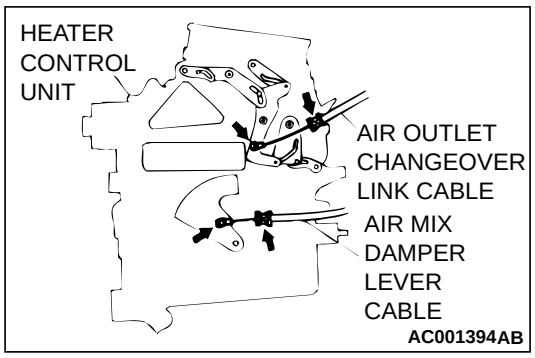
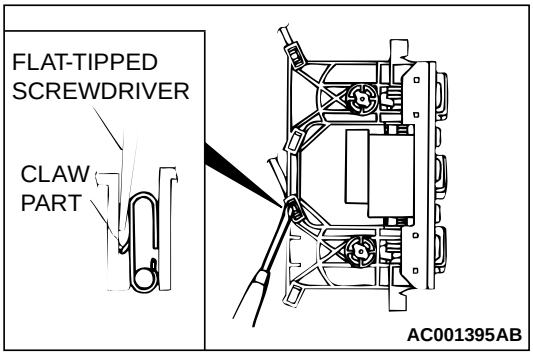
REMOVAL SERVICE POINTS



<<A>> HEATER CONTROL ASSEMBLY REMOVAL

After disconnecting the heater/cooler unit side connections of the air mix damper lever cable and air outlet changeover link cable, remove the heater control assembly.



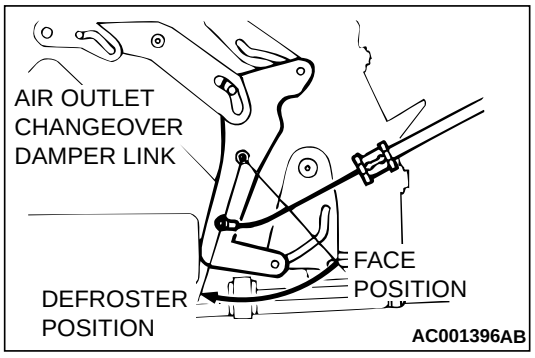
<<B>> AIR MIX DAMPER LEVER CABLE, AIR OUTLET CHANGEOVER DAMPER LINK CABLE REMOVAL

Insert a flat-tipped screwdriver into the control base clip from inner side, and then remove the cable by lifting the claw part of the clip.

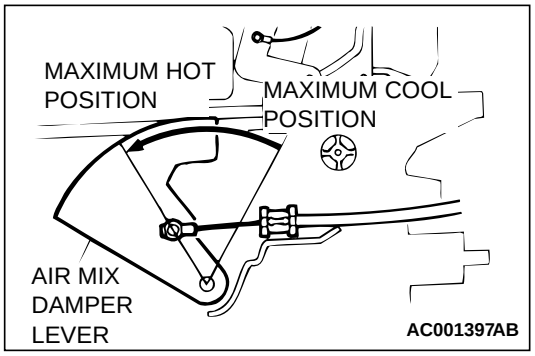
INSTALLATION SERVICE POINT

>>A<< HEATER CONTROL ASSEMBLY INSTALLATION

1. Follow the steps below to install the air outlet changeover damper link cable.
   (1) Set the air outlet changeover control knob on the heater control assembly to the defroster position.
   (2) Set the air outlet changeover damper link of the heater/cooler unit to the defroster position as shown in the illustration, and then connect the cable to the link pin.
   (3) Push the outer cable in the direction so that there is no looseness, and then secure it with the clip.



2. Follow the steps below to install the air mix damper lever cable.
   (1) Set the temperature control knob on the heater control assembly to the maximum hot position.



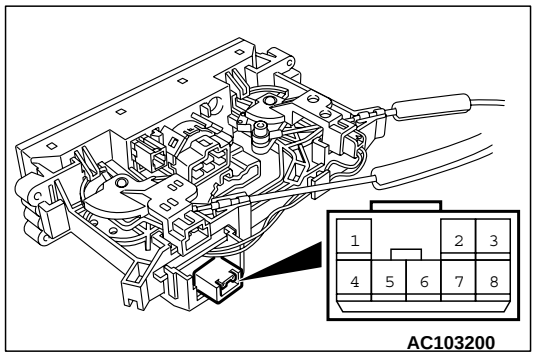
(2) Set the air mix damper lever of the heater/cooler unit to the maximum hot position as shown in the illustration, and then connect the cable to the lever pin.
(3) Push the outer cable in the direction so that there is no looseness, and then secure it with the clip.

3. After installation, ensure that each damper operates smoothly by operating the heater control assembly knob.

INSPECTION

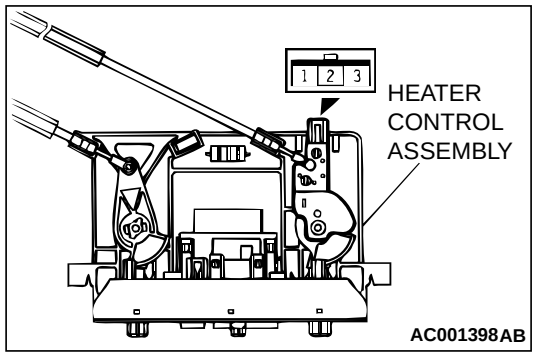
M1552014300198

WATER SHUT VALVE CONTROLLER CONTINUITY CHECK

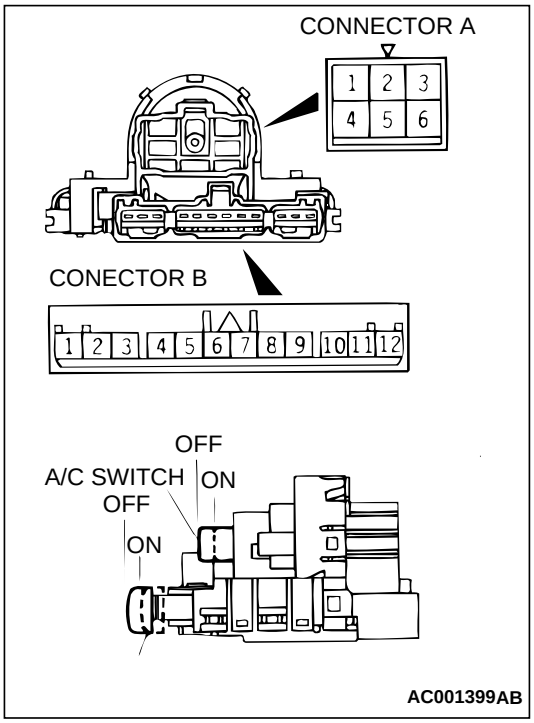


SWITCH POSITION	BATTERY CONNECTION	TESTER CONNECTION	SPECIFIED CONDITION
At the "MAX COOL" position	• Connect terminal 1 to the positive battery terminal • Connect terminal 5 to the negative battery terminal	5 – 6	Less than 2 ohm
		2 – 5	Open circuit
At the other positions	Not applied	2 – 5	Less than 2 ohm
		5 – 6	Open circuit

DEFROSTER SWITCH CONTINUITY CHECK



AIR OUTLET CHANGEOVER CONTROL KNOB POSITION	TESTER CONNECTION	SPECIFIED CONDITION
At the "DEFROSTER" or "DEFROSTER/FOOT" position	2 – 3	Less than 2 ohm
At the other positions	1 – 3	Less than 2 ohm



BLOWER SWITCH ASSEMBLY CONTINUITY CHECK

1. BLOWER SWITCH

SWITCH POSITION	TESTER CONNECTION (CONNECTOR A)	SPECIFIED CONDITION
0 (OFF)	1 – 3, 3– 4, 3 – 5, 3 – 6	Open circuit
1 (LO)	3 – 5	Less than 2 ohm
2 (ML)	1 – 3	Less than 2 ohm
3 (MH)	3 – 6	Less than 2 ohm
4 (HI)	3 – 4	Less than 2 ohm

2. A/C SWITCH

SWITCH POSITION	TESTER CONNECTION (CONNECTOR B)	SPECIFIED CONDITION
OFF	5 – 6	Open circuit
ON	5 – 6	Less than 2 ohm

3. INSIDE/OUTSIDE AIR CHANGEOVER SWITCH

SWITCH POSITION	TESTER CONNECTION (CONNECTOR B)	SPECIFIED CONDITION
INSIDE AIR	4 – 5	Open circuit
OUTSIDE AIR	4 – 5	Less than 2 ohm

HEATER UNIT, HEATER CORE, BLOWER ASSEMBLY, EVAPORATOR UNIT

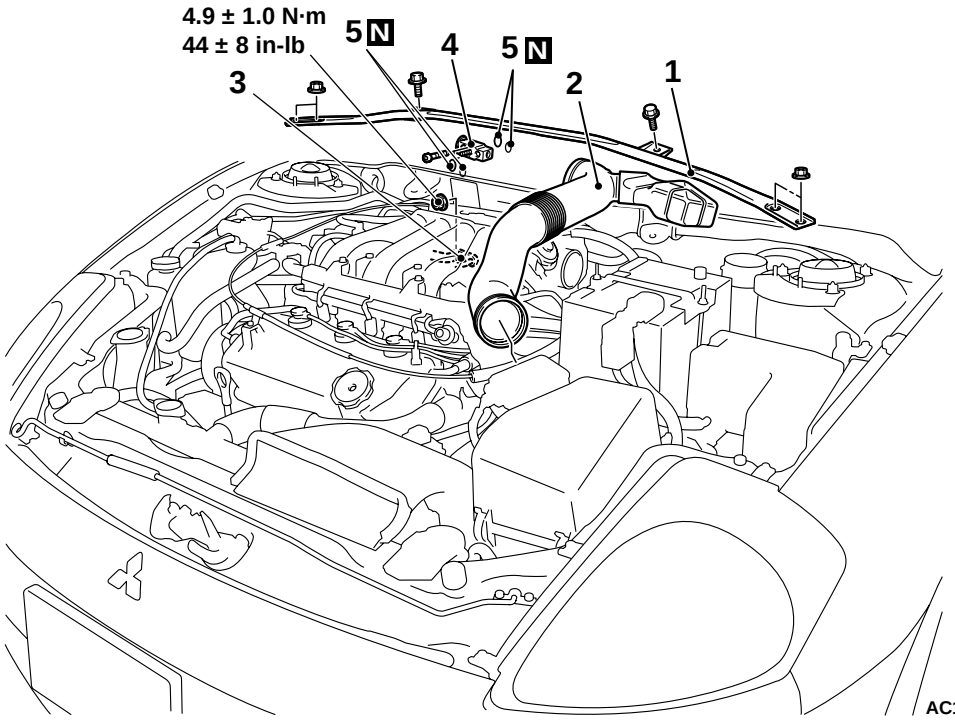
REMOVAL AND INSTALLATION

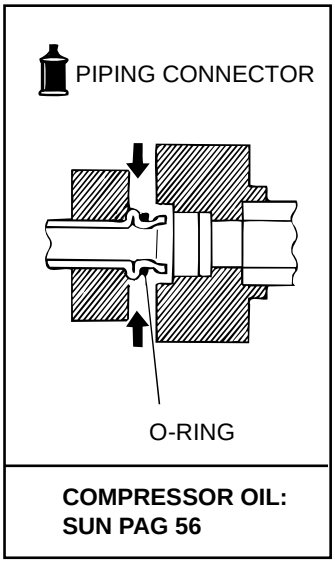
M1552011600134

⚠ ***WARNING***

When removing and installing the heater unit, do not let it bump against the SRS-ECU or the components.

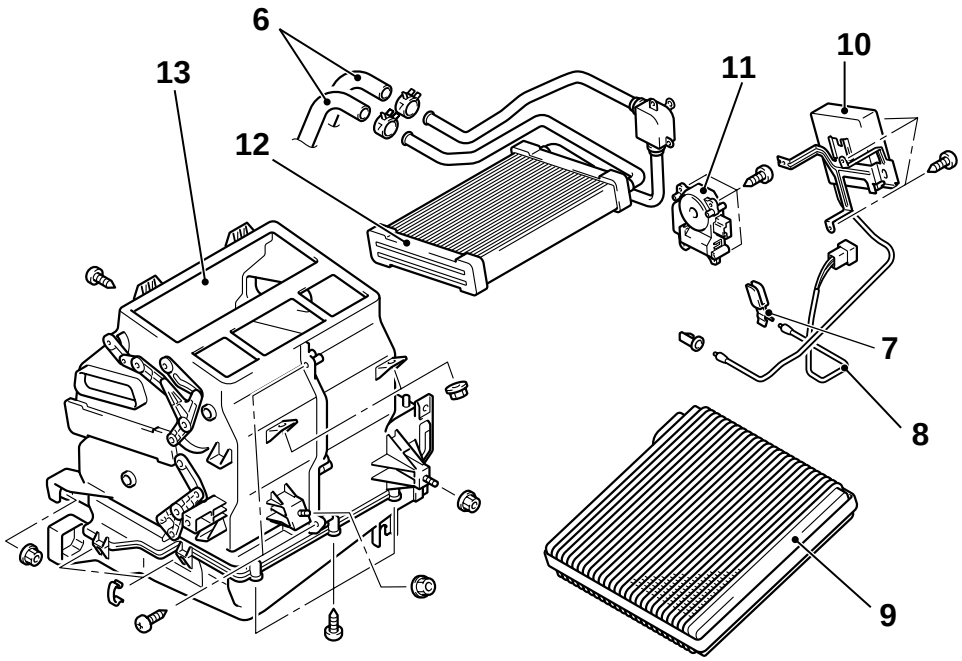
Pre-removal and Post-installation Operation
- Front Driver's Side Under Cover, Center Panel Assembly, Glove Box and Front Passenger's Side Under Cover Removal and Installation (Refer to GROUP 52A, Instrument Panel P.52A-3.)
- Joint Duct Removal and Installation (Refer to P.55-38.)





COMPRESSOR OIL: SUN PAG 56

TSB Revision



AC106431AB

REMOVAL STEPS

1. STRUT TOWER BAR ASSEMBLY
2. AIR INTAKE HOSE
   - REFRIGERANT DISCHARGING AND CHARGING (REFER TO P.55-26.)

<<A>> 3. A/C PIPE ???<VEHICLES WITH A/C>

4. EXPANSION VALVE
5. O-RING
6. HEATER HOSE
7. THERMISTOR SENSOR CLIP
8. THERMISTOR SENSOR

>>B<< 9. EVAPORATOR

10. AUTOMATIC COMPRESSOR CONTROLLER
    - ENGINE COOLANT DRAINING AND REFILLING [REFER TO GROUP 00, MAINTENANCE SERVICE - ENGINE COOLANT (CHANGE) P.00-56.]

REMOVAL STEPS (Continued)

- RADIO AND TAPE PLAYER (REFER TO GROUP 54A, AUDIO SYSTEM - RADIO, TAPE PLAYER, CD PLAYER AND CD AUTO CHANGER P.54A-217.)
- HEATER CONTROL ASSEMBLY (REFER TO P.55-31.)
- INSTRUMENT PANEL ASSEMBLY (REFER TO GROUP 52A, INSTRUMENT PANEL P.52A-3.)
- FRONT DECK CROSSMEMBER
- FLOOR CONSOLE (REFER TO GROUP 52A, FLOOR CONSOLE P.52A-8.)
- INSTRUMENT PANEL CENTER REINFORCEMENT (REFER TO GROUP 52A, INSTRUMENT PANEL P.52A-3.)
- FOOT DUCT (LH/RH) (REFER TO P.55-54.)

11. WATER SHUT MOTOR

>>A<< 12. HEATER CORE

13. HEATER/COOLER UNIT

REMOVAL SERVICE POINT

<<A>> A/C PIPE REMOVAL

⚠ CAUTION

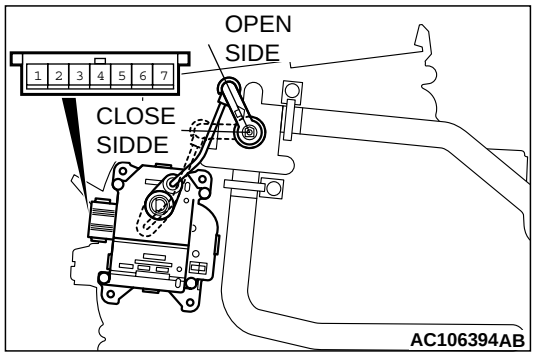
Seal the pipes completely, otherwise the compressor oil and receiver will absorb water vapor easily, possibly damaging the compressor and deteriorating performance.

Plug the disconnected pipe and the evaporator nipple to prevent foreign material from getting into them.

INSTALLATION SERVICE POINT

>>A<< HEATER CORE INSTALLATION

After replacing the heater core, check that the water shut valve is at "OPEN" position when refilling engine coolant.



>>B<< EVAPORATOR INSTALLATION

When replacing the evaporator, refill with a specified amount of compressor oil and install it.

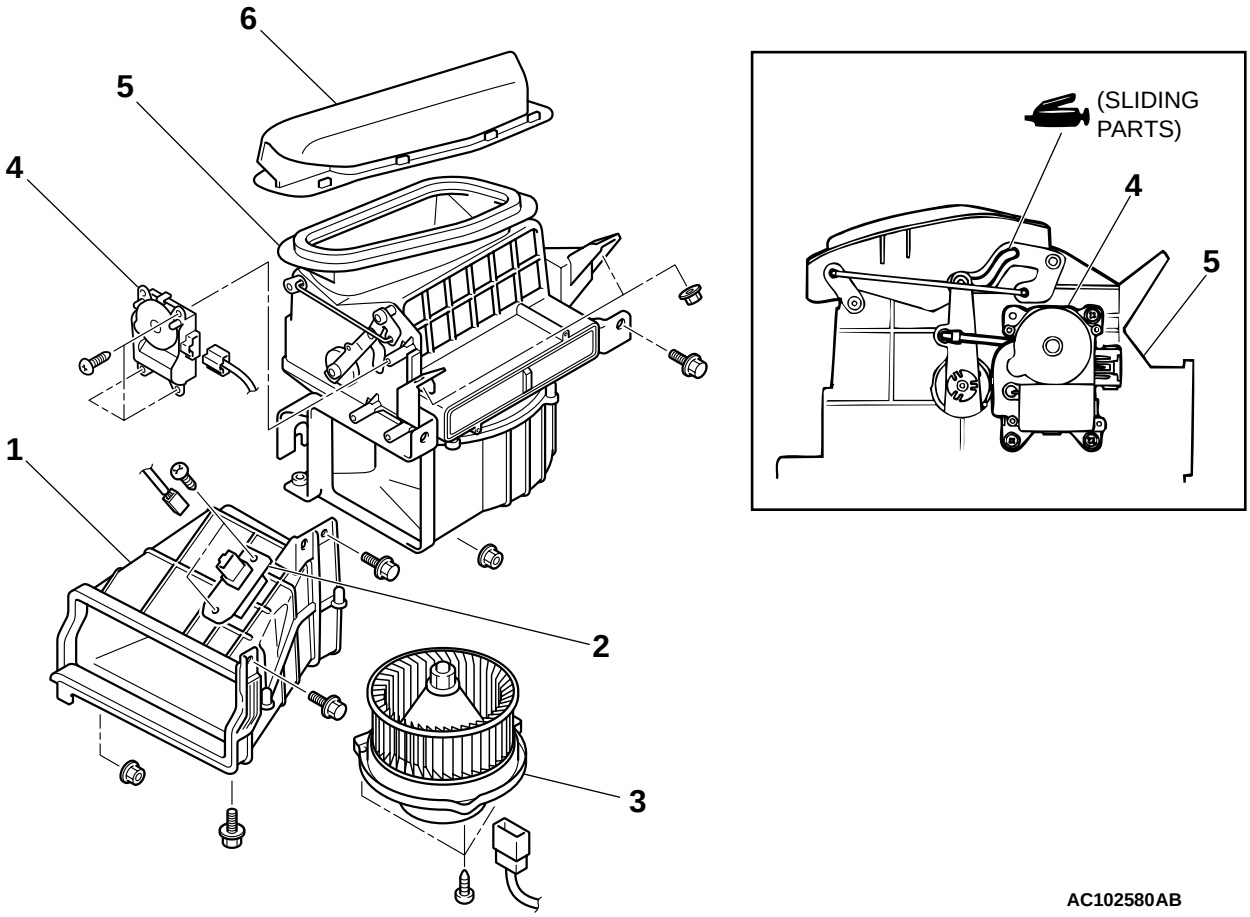
Compressor oil: SUN PAG 56

Quantity: 60 cm^3 (2.0 floz)

BLOWER ASSEMBLY AND RESISTOR

REMOVAL AND INSTALLATION

M1551002800182



AC102580AB

REMOVAL STEPS

- GLOVE BOX (OUTER AND INNER) (REFER TO GROUP 52A, INSTRUMENT PANEL P.52A-3.)

1. JOINT DUCT
2. RESISTOR

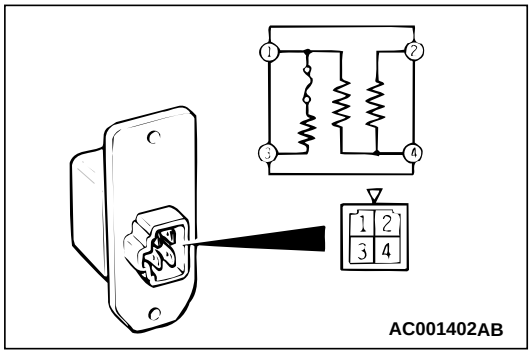
REMOVAL STEPS (Continued)

3. BLOWER FAN AND MOTOR
4. INSIDE/OUTSIDE AIR CHANGEOVER DAMPER MOTOR
5. BLOWER ASSEMBLY
6. BLOWER DUCT

INSPECTION

M1551006300101

RESISTER CHECK



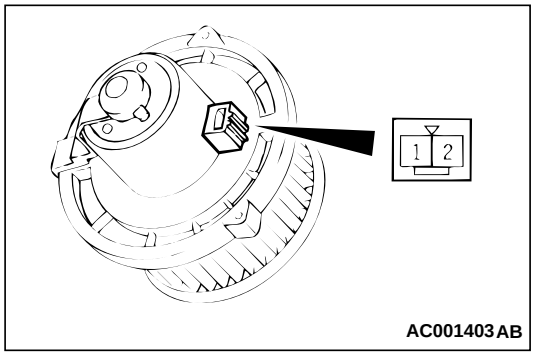
AC001402AB

Use an ohmmeter to measure the resistance between the terminals. Check that the measured value is at the standard value.

Standard value:

MEASUREMENT TERMINAL	STANDARD VALUE Ω
Between terminals 3 and 2 (LO)	2.3
Between terminals 3 and 4 (ML)	1.1
Between terminals 3 and 1 (MH)	0.4

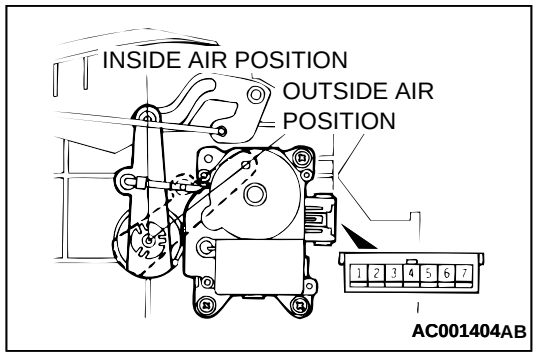
BLOWER FAN AND MOTOR CHECK



AC001403AB

When battery voltage is applied between the terminals, check that the motor operates. Also, check that there is no abnormal noise.

INSIDE/OUTSIDE AIR CHANGEOVER DAMPER MOTOR



AC001404AB

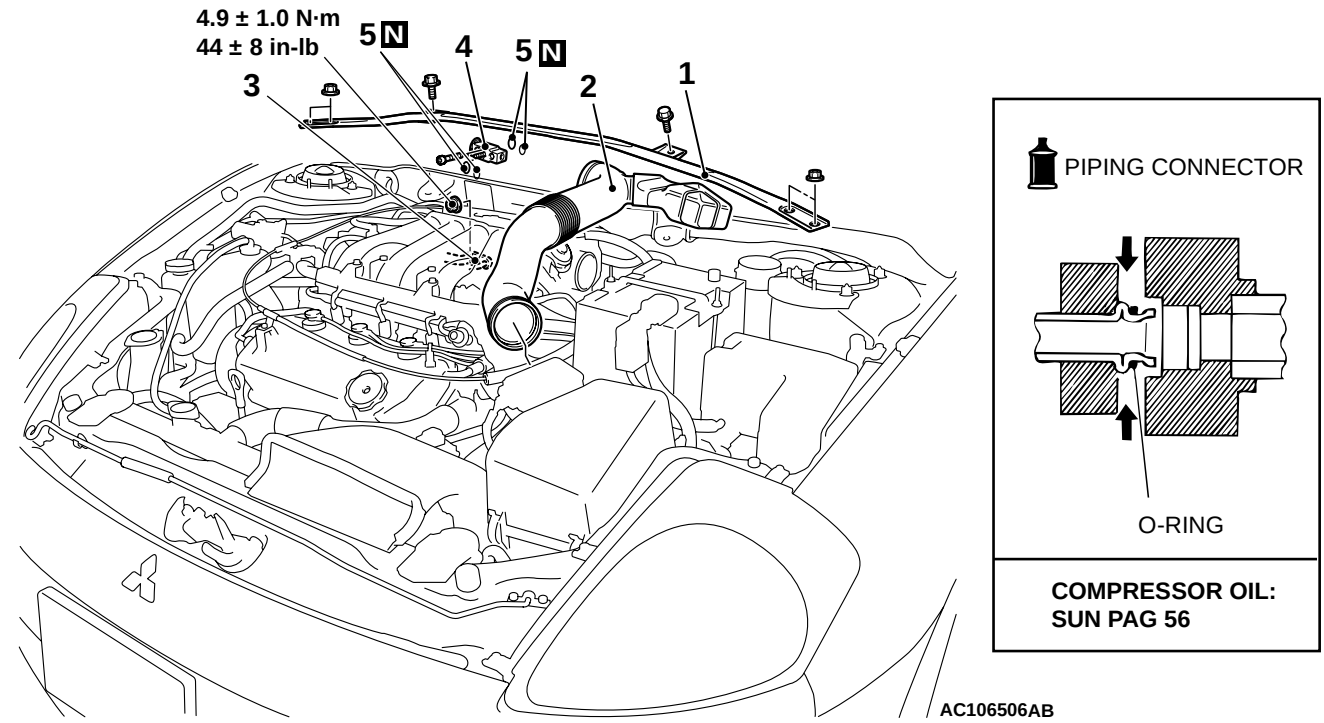
⚠ CAUTION
Cut off the battery voltage when the damper is in the inside/outside air position.

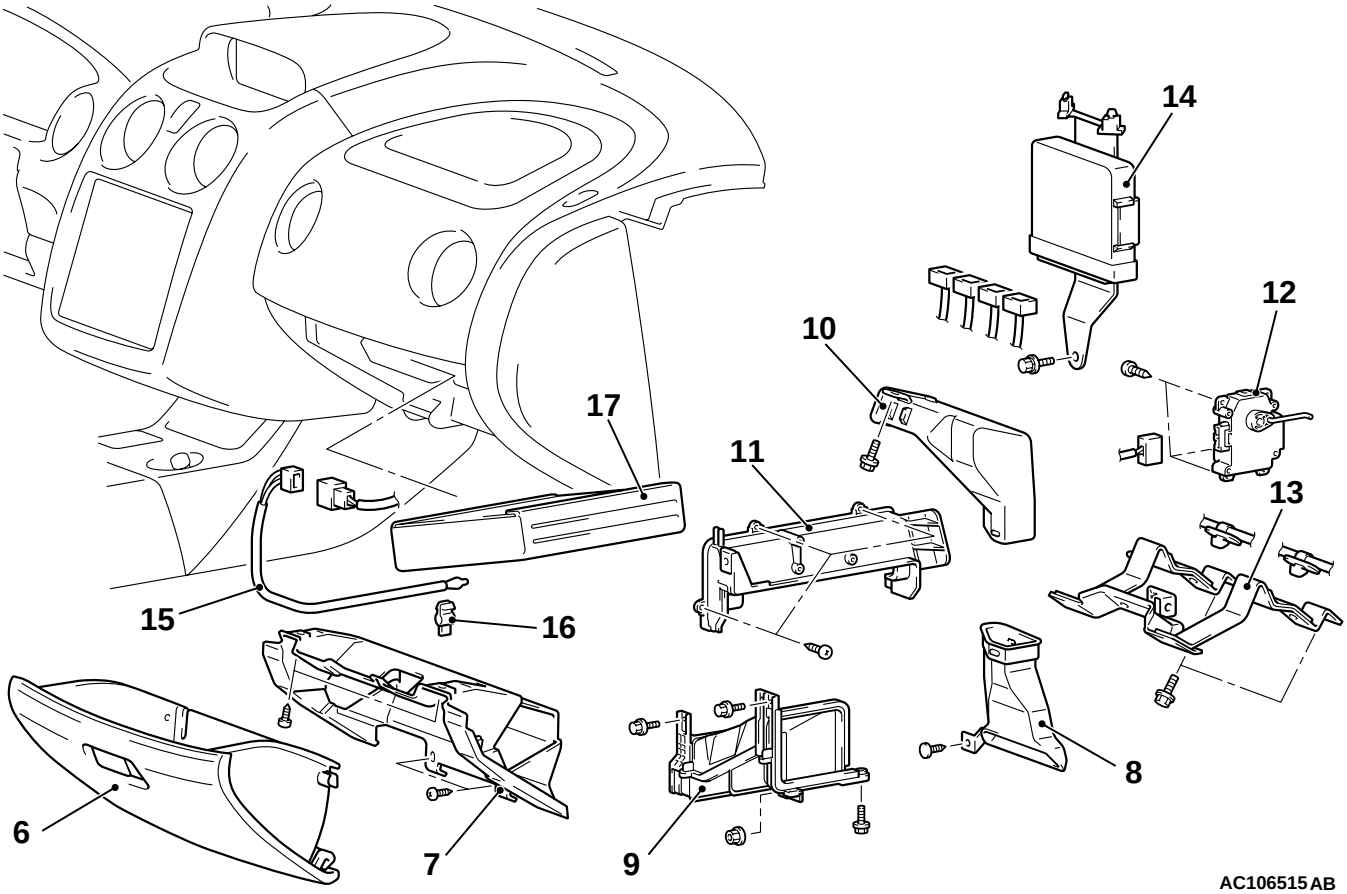
LEVER POSITION	BATTERY CONNECTION	LEVER OPERATION
At the inside recirculation position	• Connect terminal 1 to the positive battery terminal • Connect terminal 7 to the negative battery terminal	The lever moves from the inside air recirculation position to the outside air position
At the outside air position	• Connect terminal 1 to the positive battery terminal • Connect terminal 5 to the negative battery terminal	The lever moves from the outside air position to the inside air recirculation position

EVAPORATOR ASSEMBLY

REMOVAL AND INSTALLATION

M1552003600098





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REMOVAL STEPS

1. STRUT TOWER BAR ASSEMBLY
2. AIR INTAKE HOSE
- REFRIGERANT DISCHARGING AND CHARGING (REFER TO P.55-26.)

<<A>> 3. A/C PIPE CONNECTION
4. EXPANSION VALVE
5. O-RING
6. GLOVE BOX, OUTER
7. GLOVE BOX INNER

REMOVAL STEPS (Continued)

8. FOOT DUCT LOWER (RH)
9. JOINT DUCT
10. FOOT DUCT UPPER (RH)
11. EVAPORATOR COVER
12. INSIDE/OUTSIDE AIR CHANGEOVER DAMPER MOTOR
13. KNEE ABSORBER
14. ECM<M/T> OR PCM <A/T>
15. THERMISTOR SENSOR
16. THERMISTOR SENSOR CLIP

<<A>> 17. EVAPORATOR

REMOVAL SERVICE POINT

<<A>> FLEXIBLE SUCTION HOSE, LIQUID PIPE B, AND THE EXPANSION DISCONNECTION

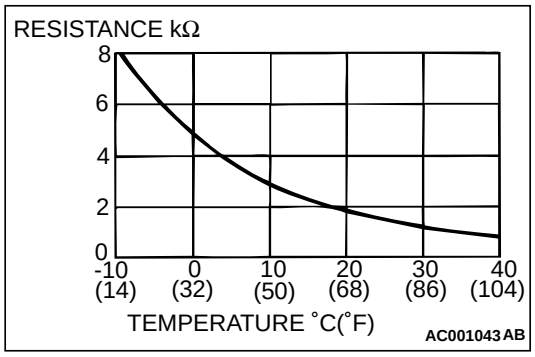
⚠ CAUTION

As the compressor oil and receiver are highly moisture absorbent, use a non-porous material to hose and nipples.
To prevent the entry of dust or other foreign bodies, plug the dismantled hose and the nipples of the expansion valves.

INSPECTION

M1552014300239

THERMISTOR SENSOR INSPECTION



When the resistance between the sensor terminals is measured under two or more temperature conditions, the resistance should approximately satisfy the illustrated values.

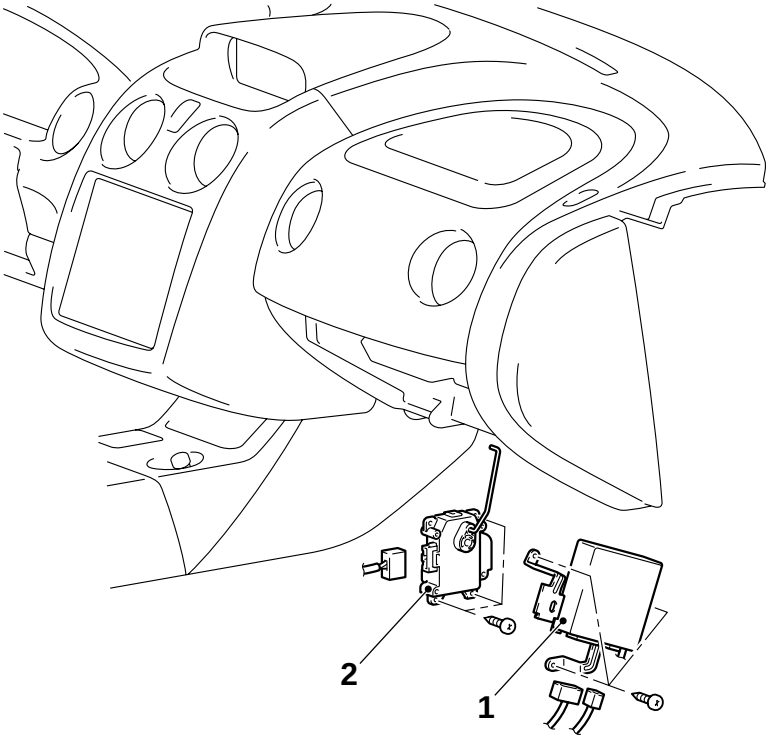
NOTE: The temperature at the check should not exceed the range in the graph.

WATER SHUT MOTOR

WATER SHUT MOTOR REMOVAL AND INSTALLATION

M1552016100026

REMOVAL AND INSTALLATION



AC106658AB

REMOVAL STEPS

- GLOVE BOX (REFER TO GROUP 52A, INSTRUMENT PANEL P.52A-3.)
- CENTER PANEL ASSEMBLY (REFER TO GROUP 52A, INSTRUMENT PANEL P.52A-3.)

REMOVAL STEPS (Continued)

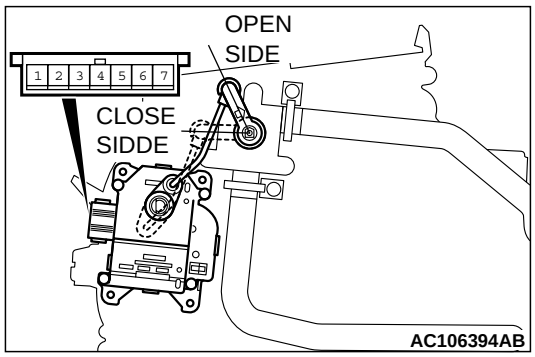
- UNDER COVER AND FOOT DUCT RH (REFER TO GROUP 55A, INSTRUMENT PANEL P.55-54.)

1. AUTOMATIC COMPRESSOR CONTROLLER
2. WATER SHUT MOTOR

INSPECTION

M1552016200023

WATER SHUT MOTOR CHECK



⚠ CAUTION
When the motor stops, disconnect battery cable.

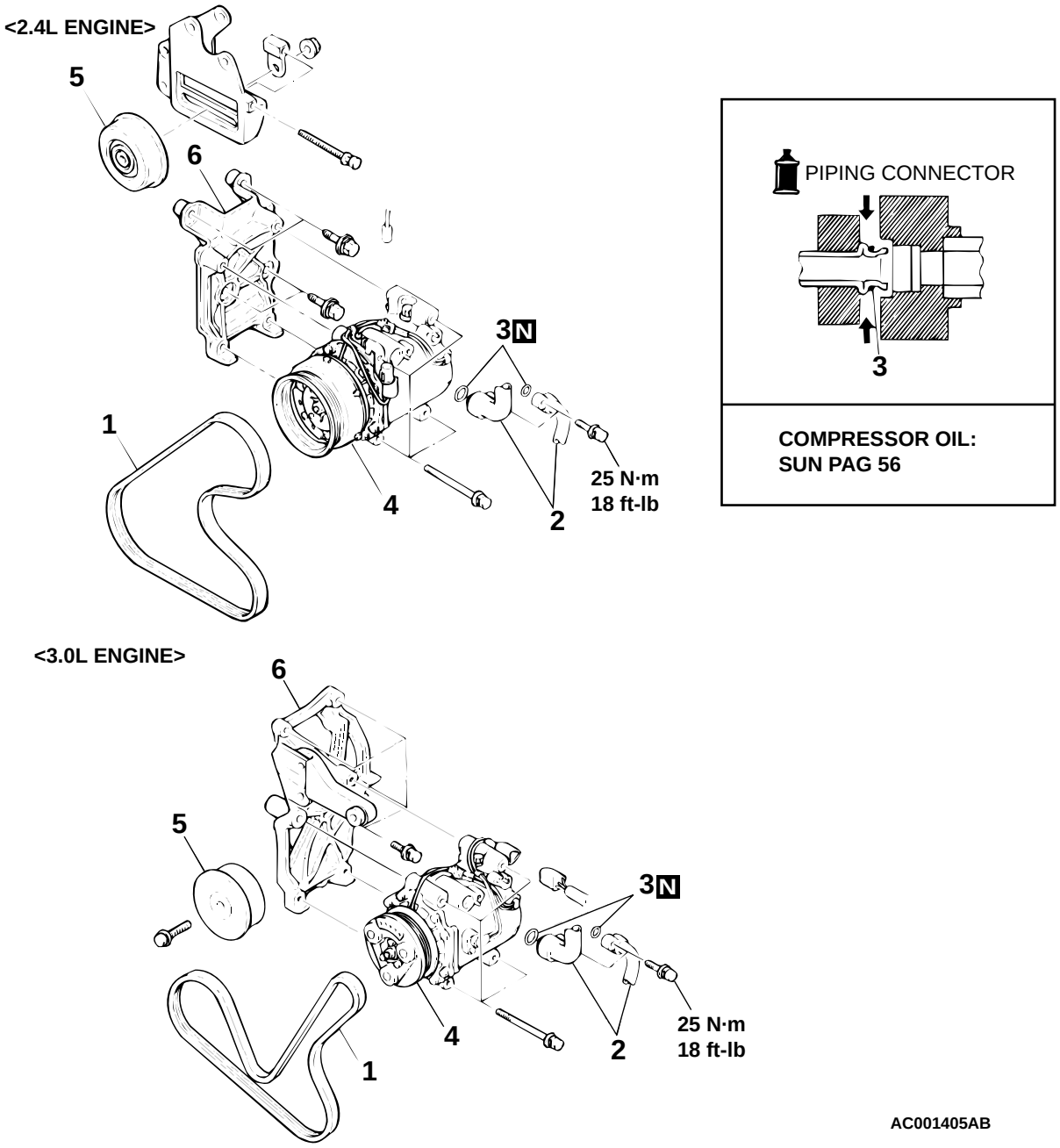
LEVER POSITION	BATTERY CONNECTION	LEVER OPERATION
At the open position	• Connect terminal 1 to the positive battery terminal • Connect terminal 7 to the negative battery terminal	The lever moves from the open position to the closed position
At the close position	• Connect terminal 1 to the positive battery terminal • Connect terminal 5 to the negative battery terminal	The lever moves from the closed position to the open position

COMPRESSOR ASSEMBLY AND TENSION PULLEY

REMOVAL AND INSTALLATION

M1552004100126

Pre-removal Operation	Post-installation Operation
• Refrigerant Discharging (Refer to P.55-26.)	• Drive Belt Tension Adjustment (Refer to GROUP 00, Maintenance Service – Drive Belt P.00-44.) • Refrigerant Charging (Refer to P.55-26.)



REMOVAL STEPS

- CONDENSER FAN MOTOR <3.0L ENGINE> (REFER TO P.55-50.)

<<A>> 1. DRIVE BELT

<<B>> 2. DISCHARGE HOSE AND SUCTION HOSE

3. O-RING

<<C>> >>A<< 4. COMPRESSOR

5. TENSION PULLEY

6. COMPRESSOR BRACKET

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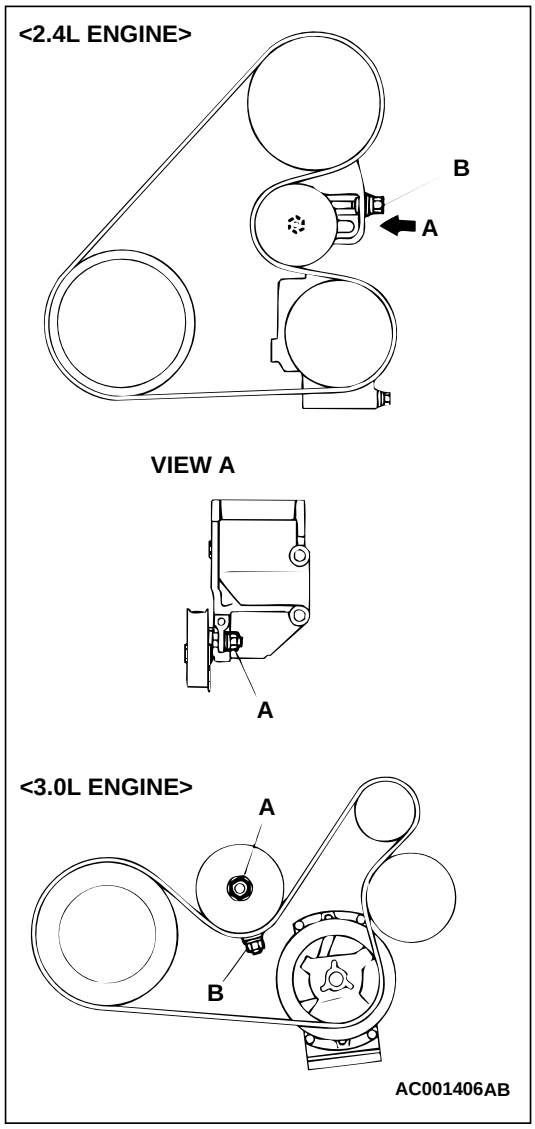


REMOVAL SERVICE POINTS

<<A>> DRIVE BELT REMOVAL

1. Loosen the nut "A" for holding.
2. Loosen the bolt "B" for adjustment.
3. Remove the drive belt.

<<B>> DISCHARGE HOSE AND SUCTION HOSE DISCONNECTION

⚠ CAUTION

Seal the hoses completely, otherwise the compressor oil and receiver will absorb water vapor easily, possibly damaging the compressor and deteriorating performance.
Plug the disconnected hose and compressor nipple to prevent foreign matter from getting into them.

<<C>> COMPRESSOR REMOVAL

When removing the compressor, be careful not to spill the compressor oil.

INSTALLATION SERVICE POINT

>>A<< COMPRESSOR INSTALLATION

If a new compressor is installed, first adjust the amount of oil according to the procedures described below, and then install the compressor.

1. Measure the amount [X cm^3 (X floz)] of oil within the removed compressor.
2. Drain (from the new compressor) the amount of oil calculated according to the following formula, and then install the new compressor.
   New compressor oil amount

100 cm^3 – X cm^3 = Y cm^3 (3.4 floz – X floz = Y floz)

NOTE: Y cm^3 (Y floz) indicates the amount of oil in the refrigerant line, the condenser, the evaporator, etc.

NOTE: When replacing the following parts at the same times as the compressor, subtract the rated oil amount of the each part from Y cm^3 (Y floz) and discharge from the new compressor.

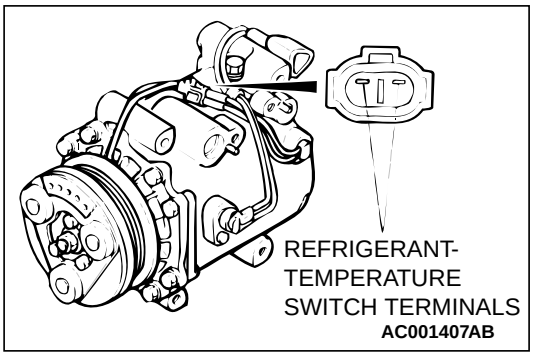
Quantity:

- **Evaporator: 60 cm^3 (2.0 floz)**
- **Condenser: 15 cm^3 (0.5 floz)**
- **Suction hose: 10 cm^3 (0.3 floz)**
- **Receiver: 10 cm^3 (0.3 floz)**

INSPECTION

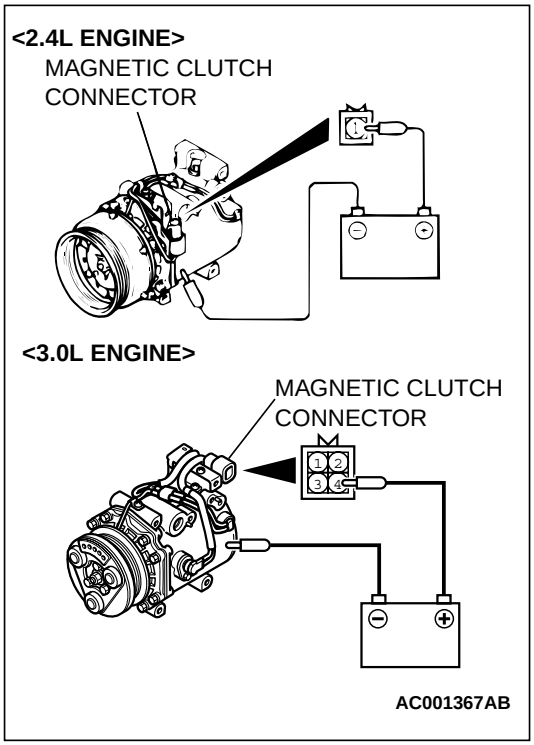
M1552014300206

REFRIGERANT TEMPRATURE SWICH CHECK



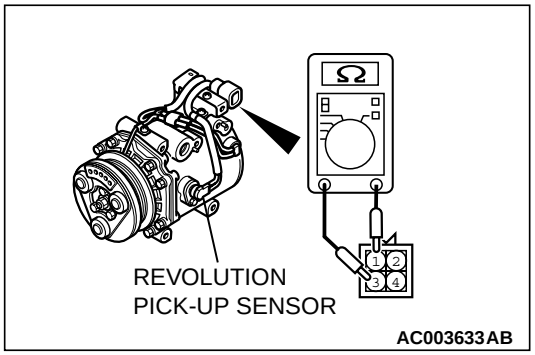
When the A/C is off, check that there is continuity between the refrigerant-temperature switch terminals. If not, replace the switch.

COMPRESSOR MAGNETIC CLUTCH OPERETION CHECK



Connect the battery (+) terminal to the compressor magnetic clutch connector terminal 3, and ground the battery (–) terminal to the body of the compressor. The condition is normal if the sound of the magnetic clutch ("click") can be heard.

REVOLUTION PICK-UP SENSOR CHECK



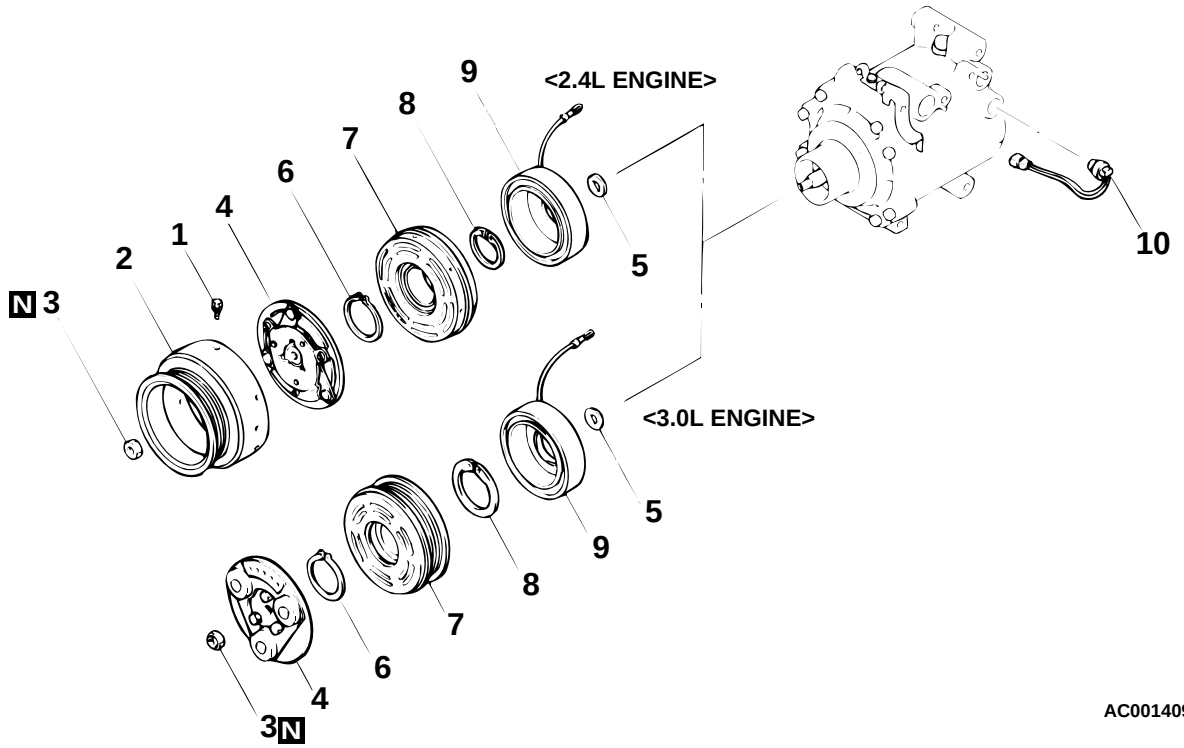
Measure the resistance between terminals 1 and 3. Check that the measured value is at the standard value.

Standard value: 405 ± 35 Ω when the ambient temperature is 20 °C (68 °F)

MAGNETIC CLUTCH

DISASSEMBLY AND ASSEMBLY

M1552004600206



MAGNETIC CLUTCH DISASSEMBLY STEPS

1. BOLT <2.4L ENGINE>
2. PULLEY <2.4L ENGINE>

>>E<< • AIR GAP ADJUSTMENT

<<A>> >>D<< 3. NUT

>>C<< 4. ARMATURE PLATE

5. SHIMS

>>B<< 6. SNAP RING

7. ROTOR

8. SNAP RING

>>A<< 9. CLUTCH COIL

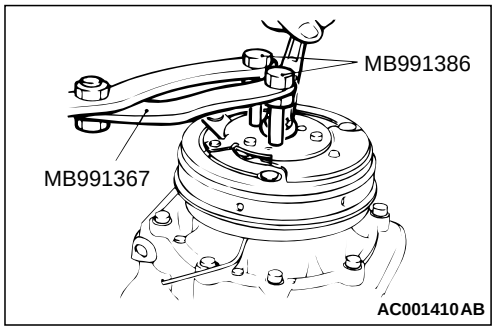
REFRIGERANT TEMPERATURE SWITCH REMOVAL

10. REFRIGERANT TEMPERATURE SWITCH

Required Special Tools:

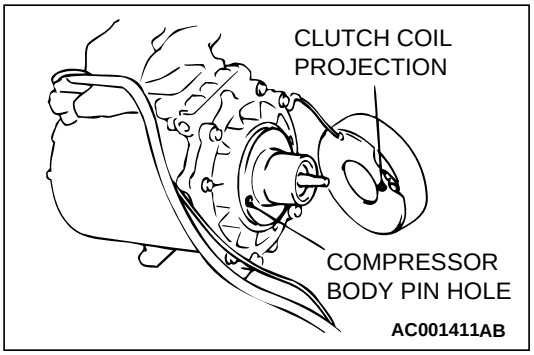
- MB991367: Special Spanner
- MB991386: Pin

DISASSEMBLY SERVICE POINT

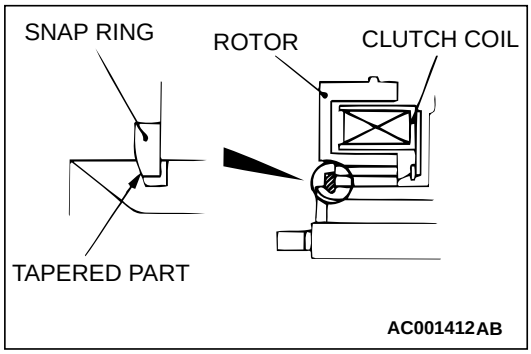


<<A>> NUT REMOVAL
Use special tools MB991367 and MB991386 to hold the magnetic clutch, and remove the nut.

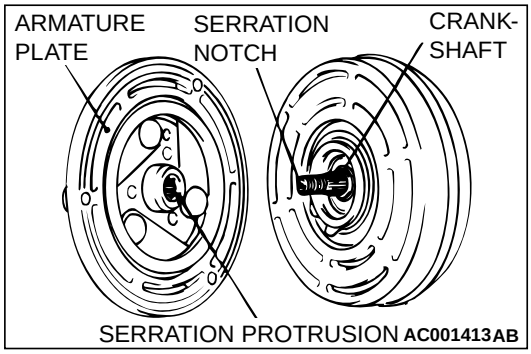
ASSEMBLY SERVICE POINTS



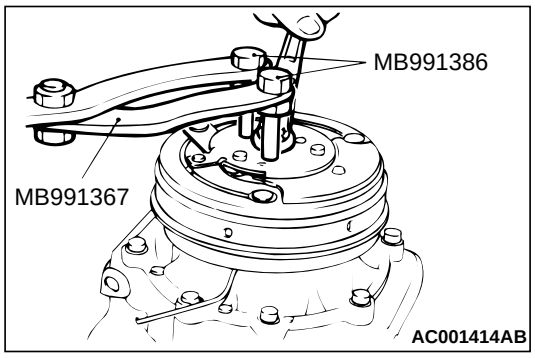
>>A<< CLUTCH COIL INSTALLATION
When installing the clutch coil to the A/C compressor body, install so that the pin hole of the A/C compressor body and the clutch coil projection are aligned.



>>B<< SNAP RING INSTALLATION
Install the snap ring so that the tapered surface is to the outside.

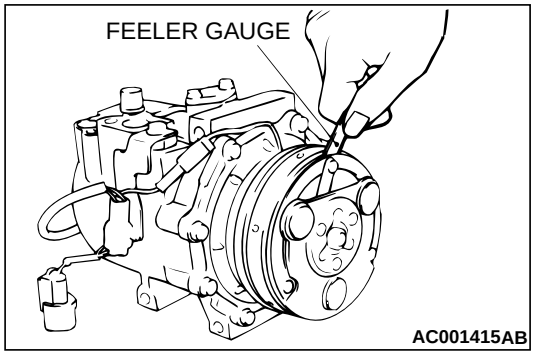


>>C<< ARMATURE PLATE INSTALLATION
Align the serration protrusion on the crankshaft with the notch on the armature and install.



>>D<< NUT INSTALLATION

Use special tools MB991367 and MB991386 to hold the magnetic clutch, and tighten the nut in the same manner as for removal.



>>E<< AIR GAP ADJUSTMENT

Check whether or not the air gap of the clutch is within the standard value.

Standard value:

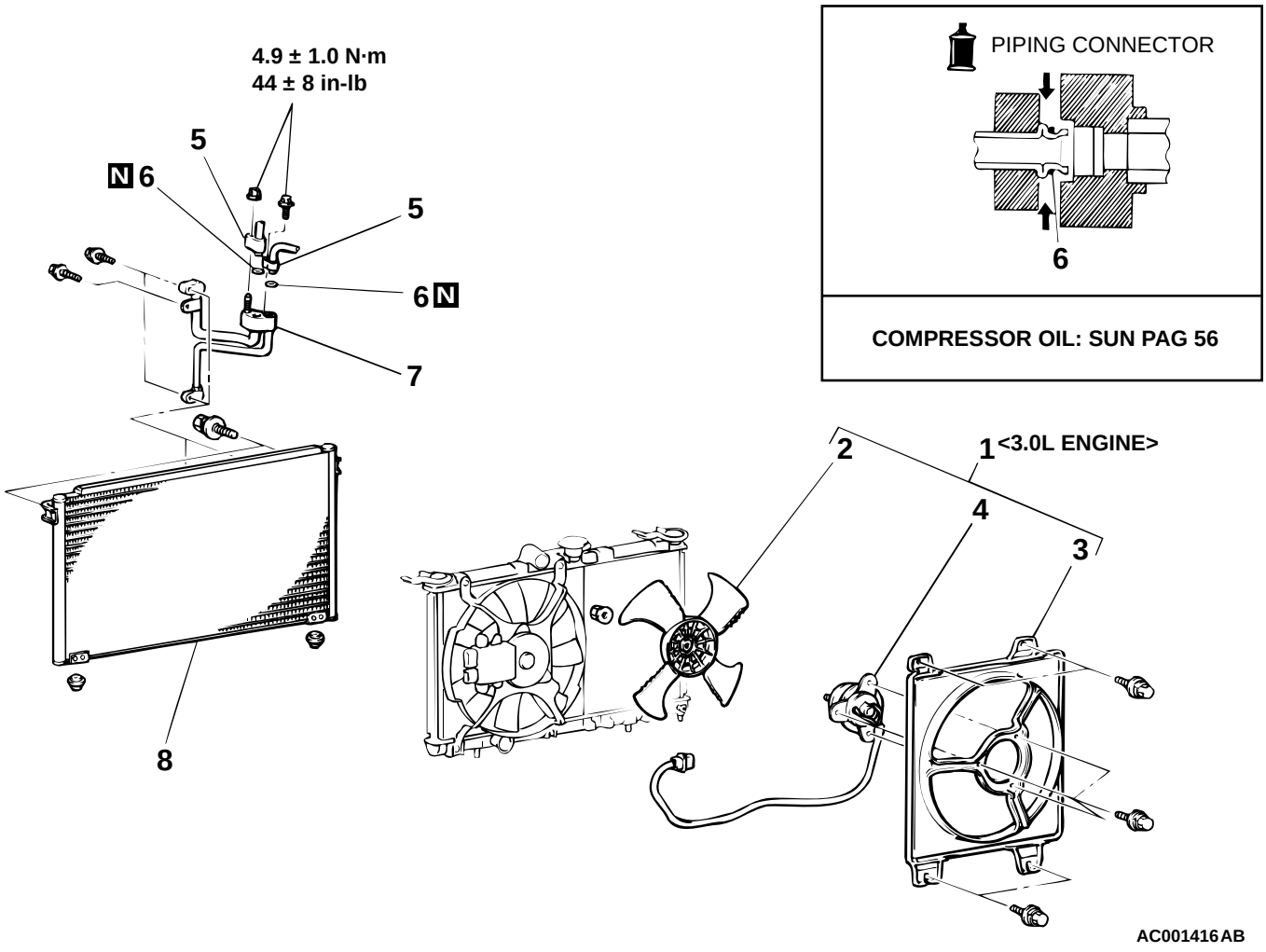
- **<2.4L engine> 0.3 – 0.5 mm (0.012 – 0.020 inch)**
- **<3.0L engine> 0.4 – 0.6 mm (0.016 – 0.024 inch)**

NOTE: If there is a deviation of the air gap from the standard value, make the necessary adjustment by adjusting the number of shims.

CONDENSER AND CONDENSER FAN MOTOR

REMOVAL AND INSTALLATION

M1552006700180



CONDENSER FAN MOTOR <3.0L ENGINE> REMOVAL STEPS

1. CONDENSER FAN MOTOR AND SHROUD ASSEMBLY
2. CONDENSER FAN
3. SHROUD
4. CONDENSER FAN MOTOR

CONDENSER REMOVAL STEPS

- REFRIGERANT DISCHARGING AND CHARGING (REFER TO P.55-26.)
- AIR CLEANER (REFER TO GROUP 15, AIR CLEANER P.15-6.)

<<A>>

CONDENSER REMOVAL STEPS (Continued)

- FRONT BUMPER ASSEMBLY, AIR GUIDE DUCT AND FRONT FOG LIGHT BRACKET (LH) (REFER TO GROUP 51, FRONT BUMPER P.51-4.)

5. DISCHARGE HOSE AND LIQUID PIPE A
6. O-RING
7. FITTING ASSEMBLY

>>A<<

8. CONDENSER

TSB Revision

REMOVAL SERVICE POINT

<<A>> LIQUID PIPE A/DISCHARGE HOSE DISCONNECTION

⚠ CAUTION

Seal the hoses completely, otherwise the compressor oil and receiver will absorb water vapor easily, possibly damaging the compressor and deteriorating performance.

Plug the disconnected pipe, hose and condenser nipple to prevent foreign material from getting into them.

INSTALLATION SERVICE POINT

>>A<< CONDENSER INSTALLATION

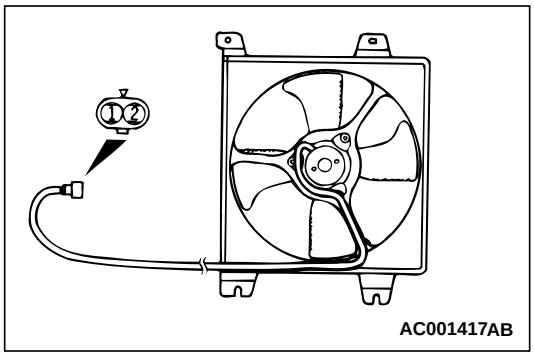
When replacing the condenser, refill it with a specified amount of compressor oil and install it. (to the vehicle).

- **Compressor oil: SUN PAG 56**
- **Quantity: 15 cm^3 (0.5 floz)**

INSPECTION

M1552014300217

CONDENSER FAN MOTOR CHECK



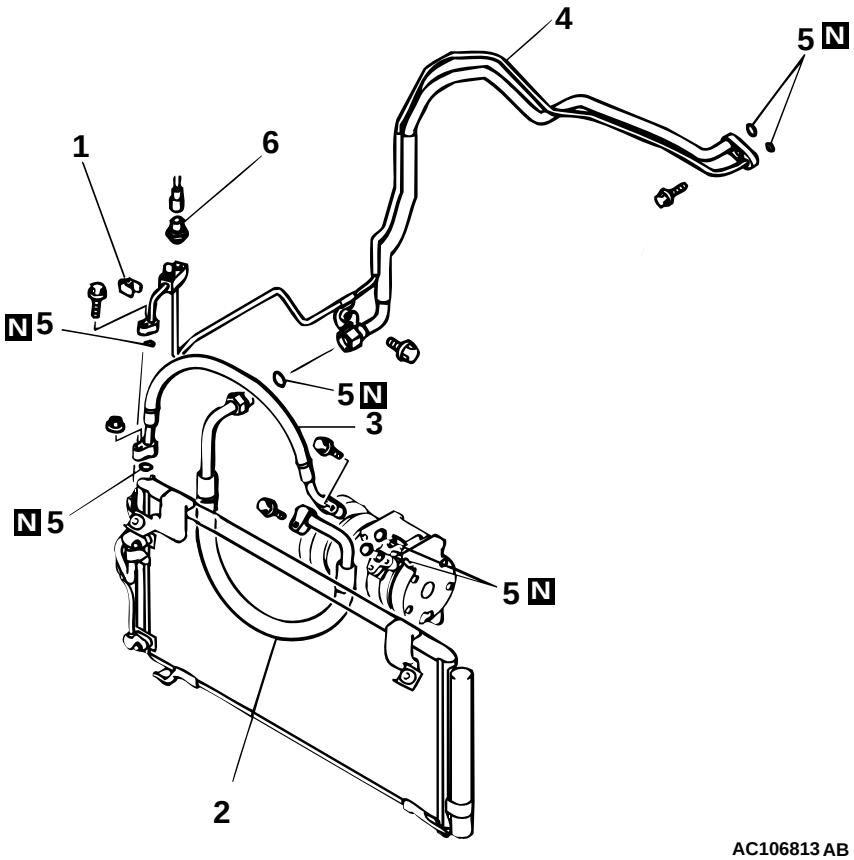
Check to be sure that the condenser fan motor operates when battery voltage is applied to terminal 2 and terminal 1 grounded.

REFRIGERANT LINE

REFRIGERANT LINE REMOVAL

M1552017000011

Pre-removal and Post-installation Operation
- Refrigerant Discharging (Refer to P.55-26.)



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REMOVAL STEPS
1. CLAMP

<<A>> 2. SUCTION HOSE
- FRONT BUMPER ASSEMBLY, AIR GUIDE DUCT AND FRONT FOG LIGHT BRACKET (LH) (REFER TO GROUP 51, FRONT BUMPER P.51-4.)

<<A>> 3. DISCHARGE HOSE

REMOVAL STEPS (Continued)

<<B>> 4. A/C PIPE
5. O-RING
6. DUAL PRESSURE SWITCH

REMOVAL SERVICE POINT

<<A>> HOSE/PIPE DISCONNECTION

⚠ CAUTION

Seal the hoses completely, otherwise the compressor oil and receiver will absorb water vapor easily, possibly damaging the compressor and deteriorating performance.

Plug the disconnected hose, the condenser, the evaporator and the compressor nipple to prevent foreign material from getting into them.

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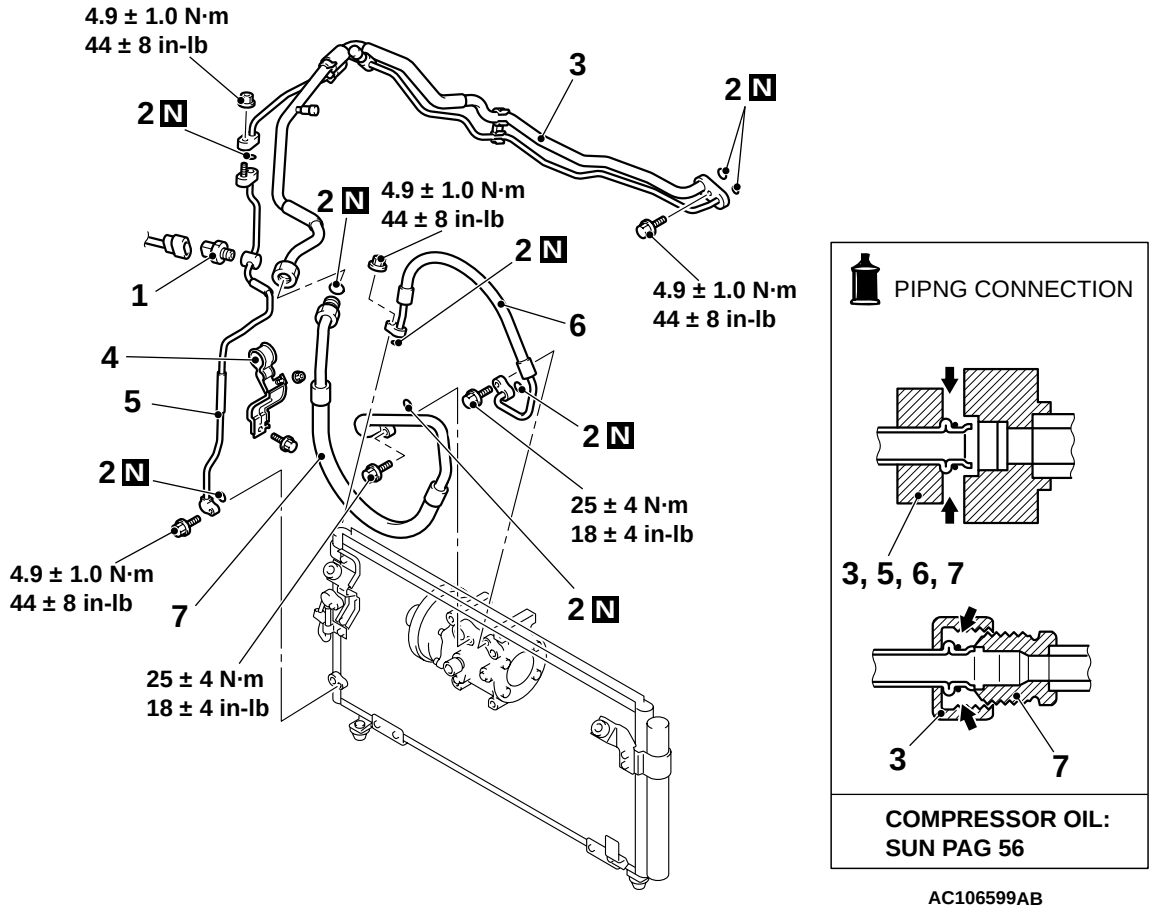
<<B>> A/C PIPE DISCONNECTION
Cut off the A/C pipe as it is too long to remove. To install the A/C pipe, its replacement pipe is available.

REFRIGERANT LINE INSTALLATION

M1552017100018

Pre-removal and Post-installation Operation
- Refrigerant Charging (Refer to P.55-26.)



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INSTALLATION STEPS
1. DUAL PRESSURE SWITCH
2. O-RING
>>B<< 3. A/C PIPE
4. LIQUID PIPE A

INSTALLATION STEPS (Continued)
5. DISCHARGE HOSE
>>A<< 6. SUCTION HOSE
7. CLAMP

INSTALLATION SERVICE POINT

>>A<< SUCTION HOSE INSTALLATION
When replacing the suction hose, refill them with a specified amount of compressor oil, and then install them.

Compressor oil: SUN PAG 56

Quantity:
- **Suction hose: 10 cm^3 (0.3 floz)**

>>B<< A/C PIPE INSTALLATION
The A/C replacement pipe is available. To install the pipe, the replacement pipe should be used.

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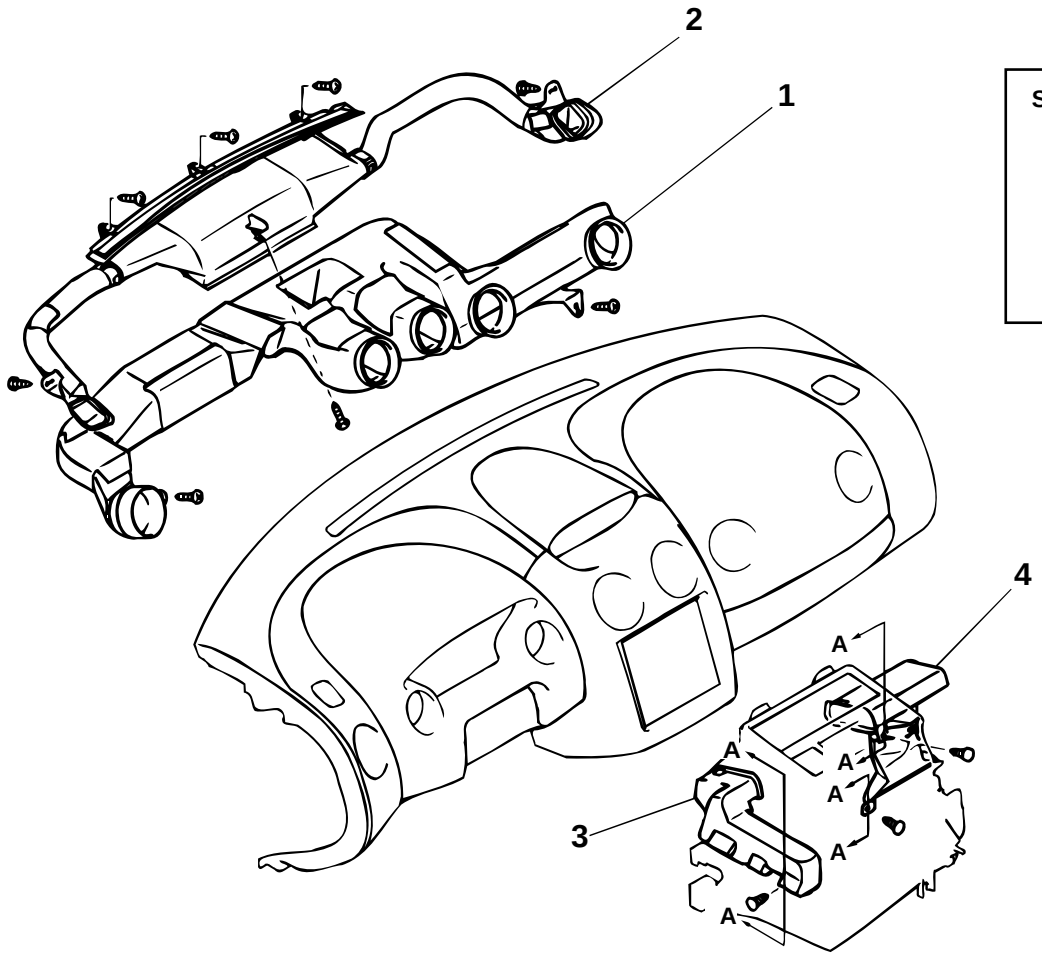
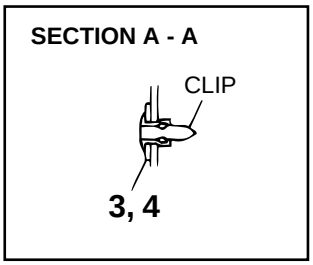
VENTILATORS

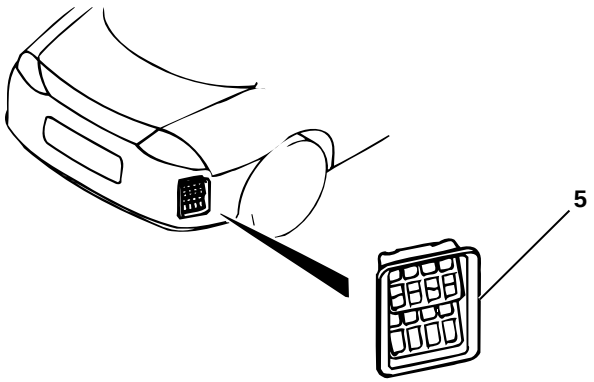
REMOVAL AND INSTALLATION

M1553001600170





AC001419 AB



AC003602

DISTRIBUTION DUCT AND DEFROSTER NOZZLE ASSEMBLY REMOVAL STEPS

- INSTRUMENT PANEL ASSEMBLY (REFER TO GROUP 52A, INSTRUMENT PANEL P.52A-3.)

DISTRIBUTION DUCT AND DEFROSTER NOZZLE ASSEMBLY REMOVAL STEPS

1. DISTRIBUTION DUCT
2. DEFROSTER NOZZLE ASSEMBLY

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FOOT DUCT REMOVAL STEPS
- CENTER PANEL ASSEMBLY, INSTRUMENT PANEL UNDER COVER, GLOVE BOX OUTER AND GLOVE BOX INNER (REFER TO GROUP 52A, INSTRUMENT PANEL P.52A-8.)
- RADIO AND TAPE PLAYER (REFER TO GROUP 54A, AUDIO SYSTEM - RADIO, TAPE PLAYER, CD PLAYER AND CD AUTO CHANGER P.54A-217.)
- HEATER CONTROL ASSEMBLY (REFER TO P.55-31.)
- INSTRUMENT PANEL CENTER REINFORCEMENT (REFER TO GROUP 52A, INSTRUMENT PANEL P.52A-3.)

3. FOOT DUCT (LH)

FOOT DUCT REMOVAL STEPS
- JOINT DUCT (REFER TO P.55-38.)

4. FOOT DUCT (RH)

REAR VENTILATION DUCT ASSEMBLY REMOVAL STEPS
- REAR BUMPER ASSEMBLY (REFER TO GROUP 51, REAR BUMPER P.51-7.)

5. REAR VENTILATION DUCT ASSEMBLY

NOTE: For the front deck garnish, refer to GROUP 51, Windshield Wiper and Washer P.51-17.

NOTE: For the center/side air outlet assembly and side defroster grille, refer to GROUP 52A, Instrument Panel P.52A-3.

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1552012100154

ITEMS	SPECIFICATIONS
A/C pipe mounting bolt (heater/cooler unit side)	4.9 ± 1.0 N·m (44 ± 8 in-lb)
A/C pipe mounting bolt (condenser side)	4.9 ± 1.0 N·m (44 ± 8 in-lb)
A/C pipe mounting nut (suction hose side)	13 ± 2 N·m (109 ± 21 in-lb)
Discharge hose mounting bolt (compressor side)	25 ± 4 N·m (18 ± 4 ft-lb)
Discharge hose mounting nut (condenser side)	4.9 ± 1.0 N·m (44 ± 8 in-lb)
Suction hose mounting bolt (compressor side)	25 ± 4 N·m (18 ± 4 ft-lb)

GENERAL SPECIFICATIONS

M1552000200121

ITEMS			MANUAL AIR CONDITIONING
Heater/cooler unit			Full-air mix type providing stratified cool and warm air flows
Heater control			Dial type
Air conditioning switch			Push-button type
Compressor			MSC90C (Scroll type)
Dual pressure switch kPa (psi)	High-pressure switch	ON to OFF	2,942 (426.7)
		OFF to ON	2,354 (341.4)
	Low-pressure switch	ON to OFF	196 (28.4)
		OFF to ON	221 (32.1)
Refrigerant	Type		R134a (HFC-134a)
	Amount g (oz)		Approximately 415 – 435 (14.6 – 15.3)

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SERVICE SPECIFICATIONS

M1552000300151

ITEMS		STANDARD VALUE
Idle speed r/min	2.4L engine	750 ± 100*
	3.0L engine	700 ± 100*
Idle-up speed r/min		850 ± 100*
Resistor (for blower motor) Ω	LO	2.3
	ML	1.1
	MH	0.4
Air gap (magnetic clutch) mm (in)	2.4L engine	0.3 – 0.5 (0.012 – 0.020)
	3.0L engine	0.4 – 0.6 (0.016 – 0.024)

NOTE: The rpm marked by an asterisk should be checked 4 minutes after idling begins.

LUBRICANTS

M1552000400158

ITEMS	SPECIFIED LUBRICANTS	QUANTITY
Each connection of refrigerant line	SUN PAG 56	As required
Compressor refrigerant unit lubricant cm^3 (floz)	SUN PAG 56	100 (3.4)

GROUP 70

COMPONENT LOCATIONS

CONTENTS

FUSIBLE LINK, FUSE AND IOD OR STORAGE CONNECTOR 70-2

INSPECTION TERMINAL 70-3

GROUNDING 70-4

GROUNDING CABLE 70-8

RELAY 70-9

SENSOR 70-10

CONTROL UNIT 70-17

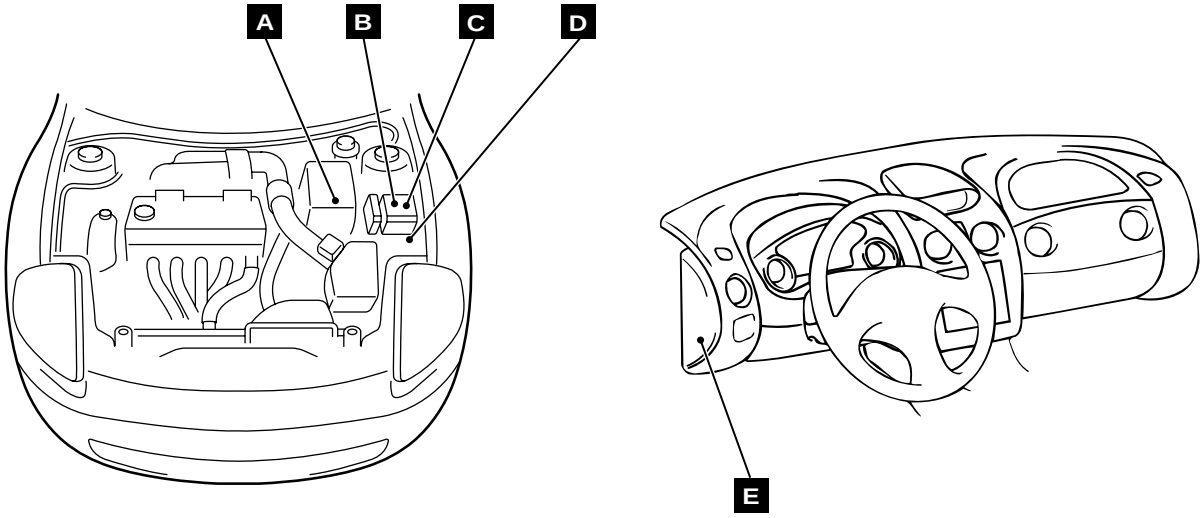
SOLENOID AND SOLENOID VALVE 70-20

OTHER DEVICES 70-22

FUSIBLE LINK, FUSE AND IOD OR STORAGE CONNECTOR

M1701000100227

NAME	SYMBOL	NAME	SYMBOL
Fuses No.1 to 4	E	Fusible link No.1 to 5	B
Fuses No.6 to 25 (Engine compartment)	C	Fusible link No.26	A
		Fusible link No.27	D
Fuses No.5 to 24 (Passenger compartment)	E	IOD or storage connector	C



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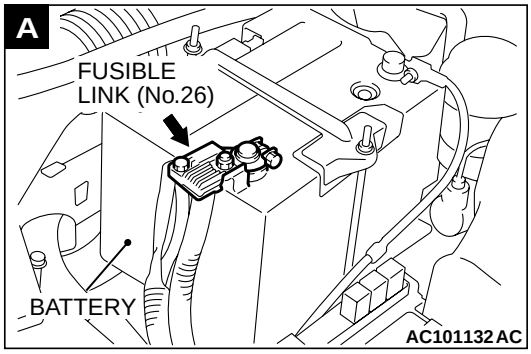

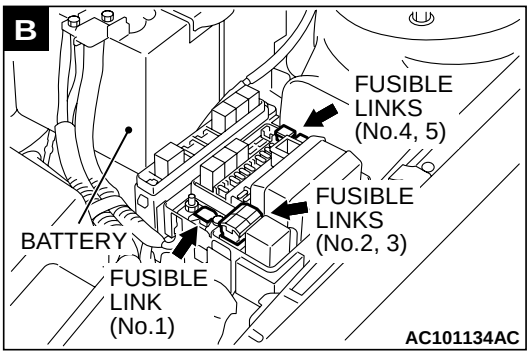

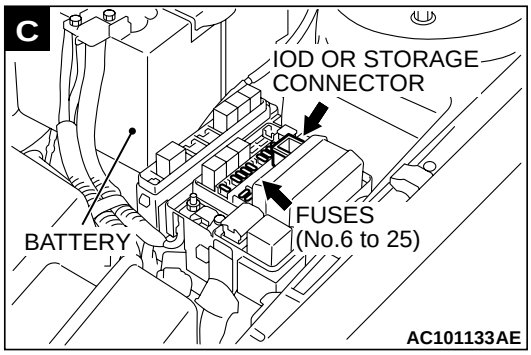

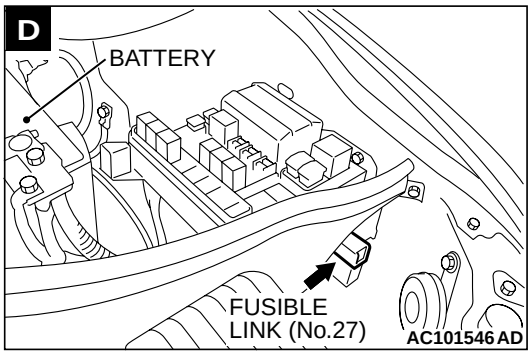

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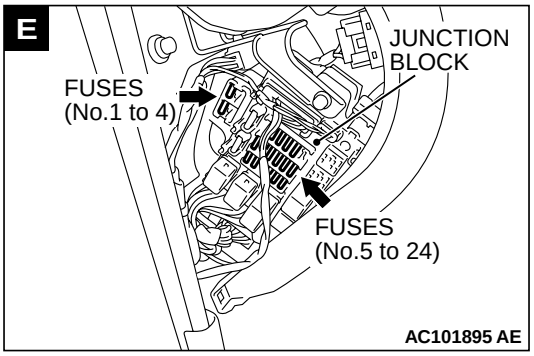
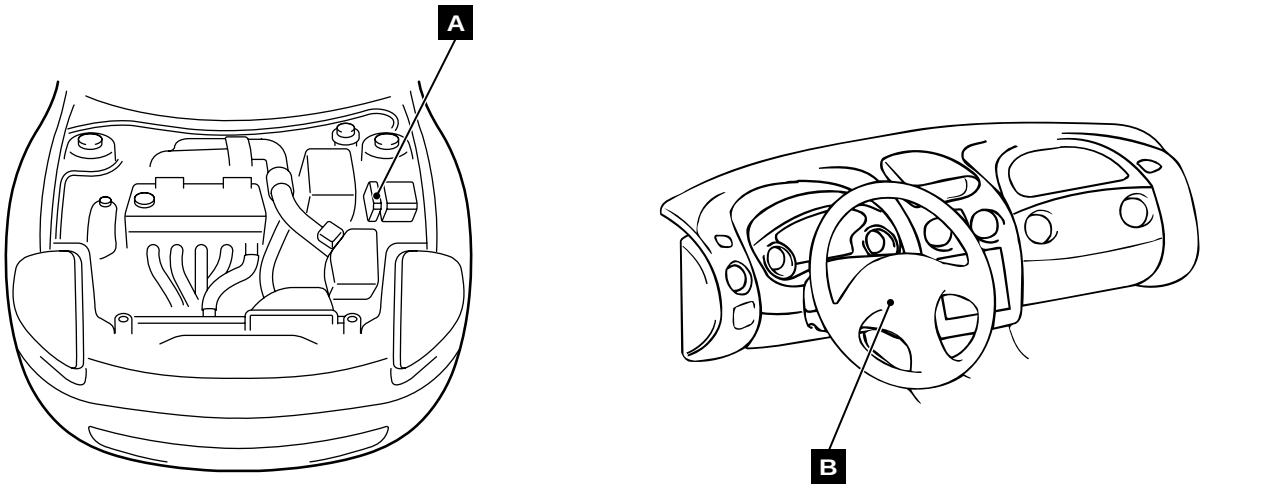
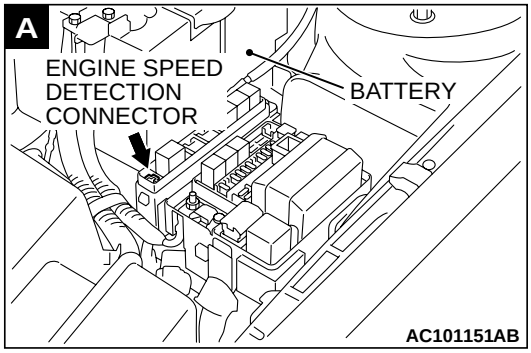


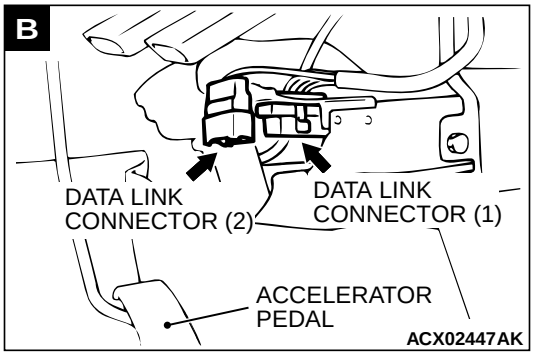
INSPECTION TERMINAL

M1701000200224

NAME	SYMBOL	NAME	SYMBOL
Data link connector	B	Engine speed detection connector	A







GROUNDING

M1701000300221

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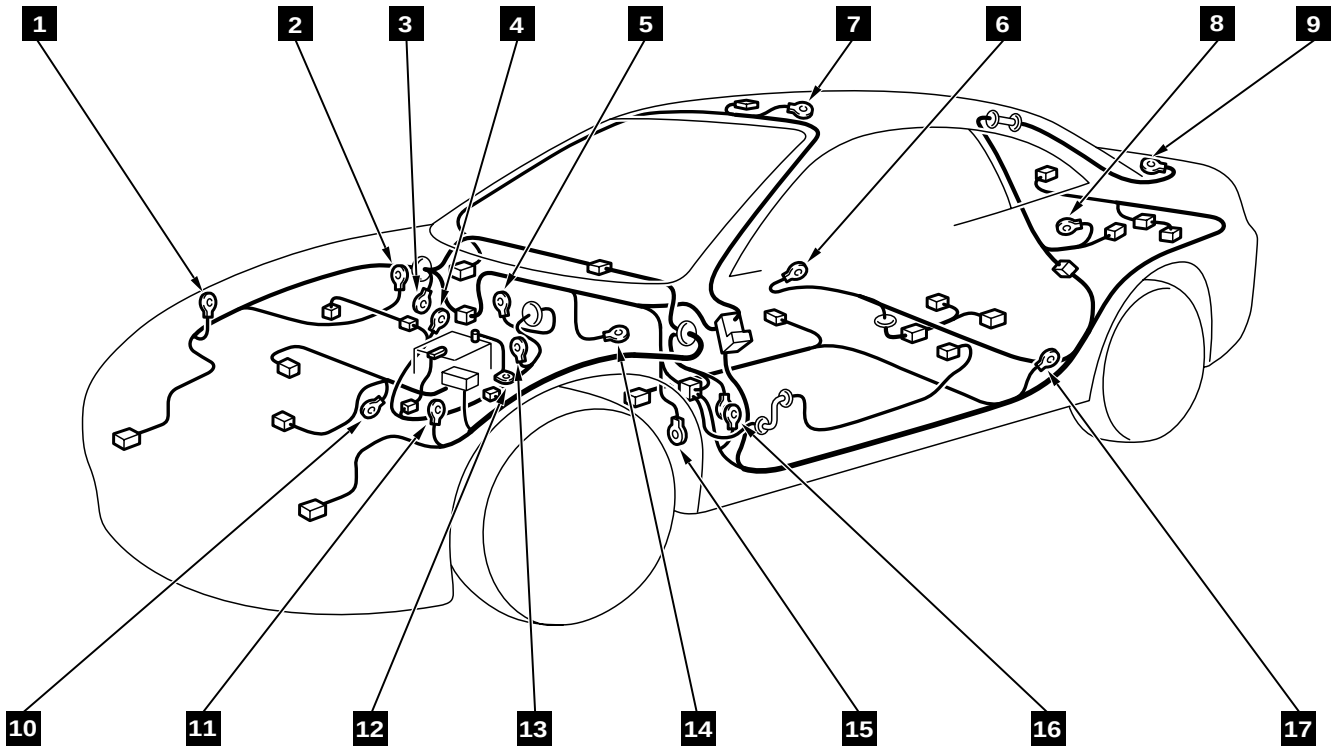

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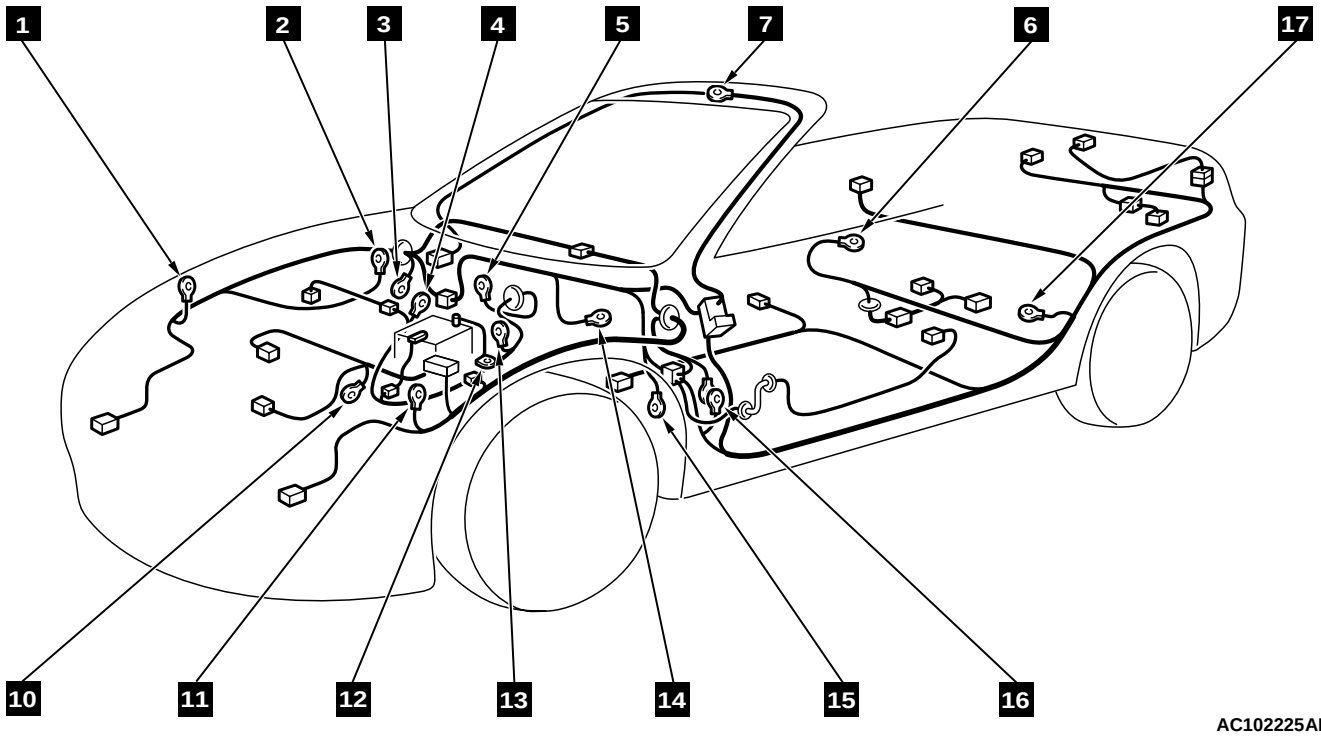

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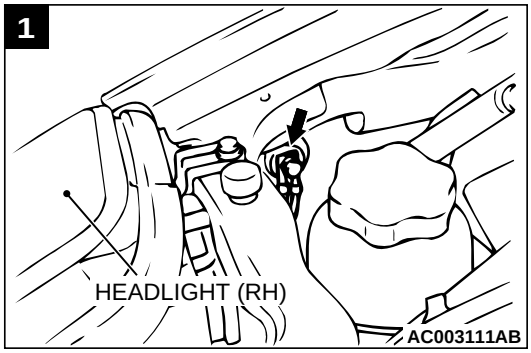
NOTE: 1 to 17 numbers correspond to the body ground point numbers in CIRCUIT DIAGRAMS.

TSB Revision

1



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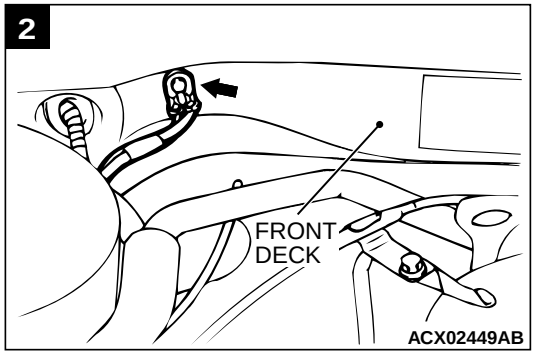

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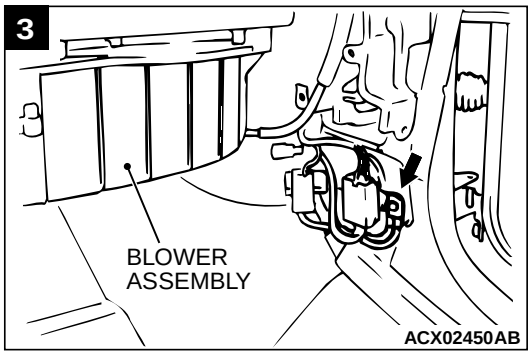
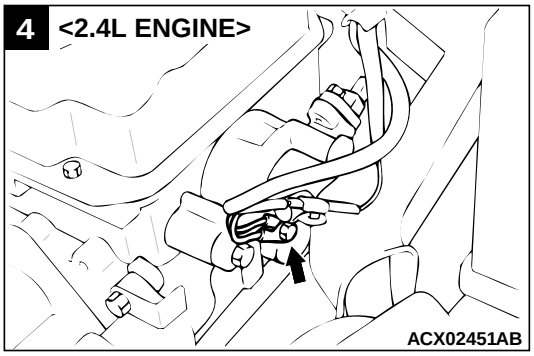


4 <2.4L ENGINE>



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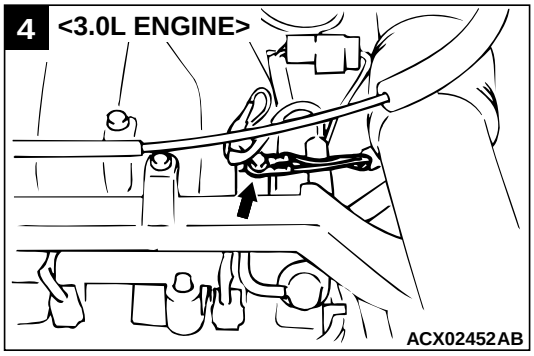

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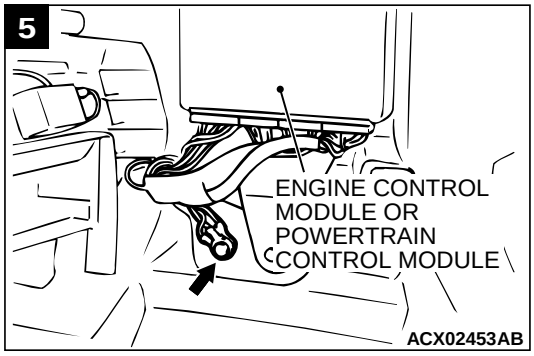

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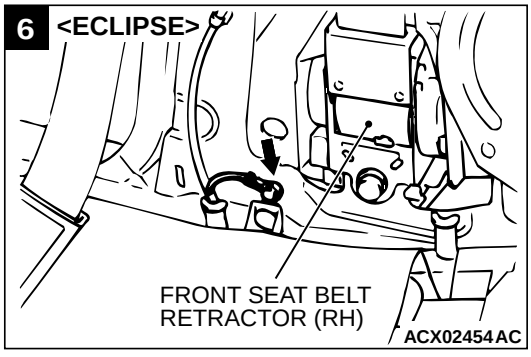

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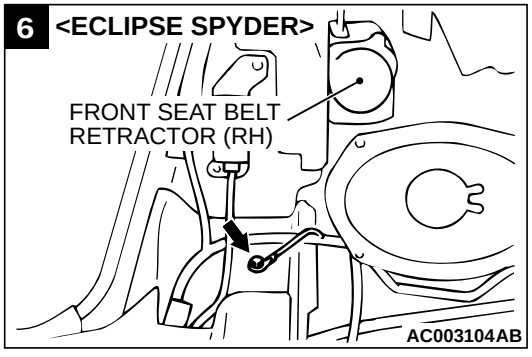

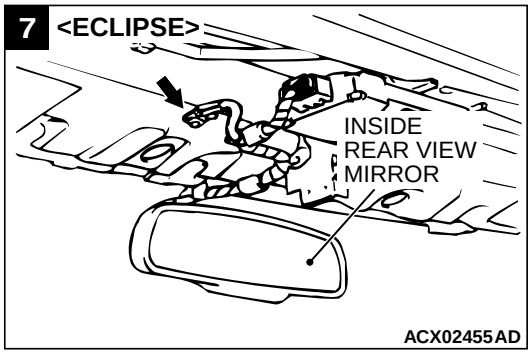
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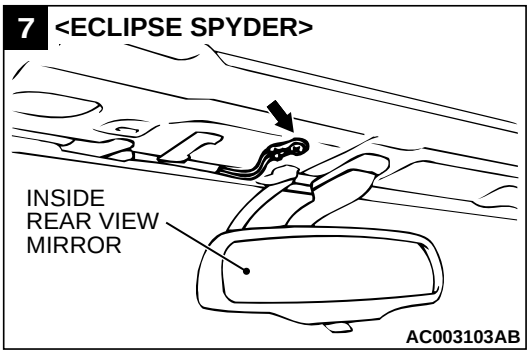
INSIDE
REAR VIEW
MIRROR
ACX02455AD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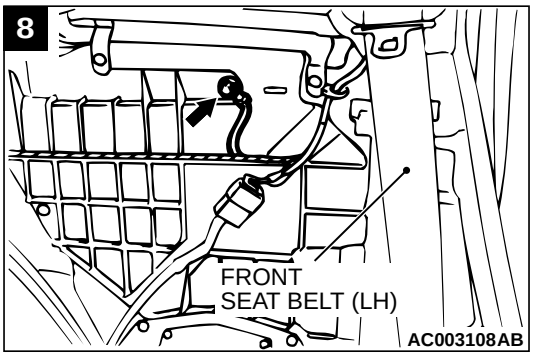
INSIDE
REAR VIEW
MIRROR
AC003103AB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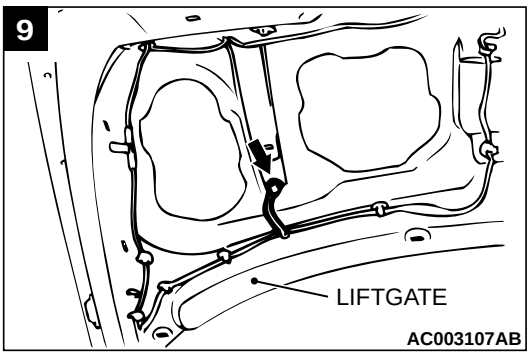
FRONT
SEAT BELT (LH)
AC003108AB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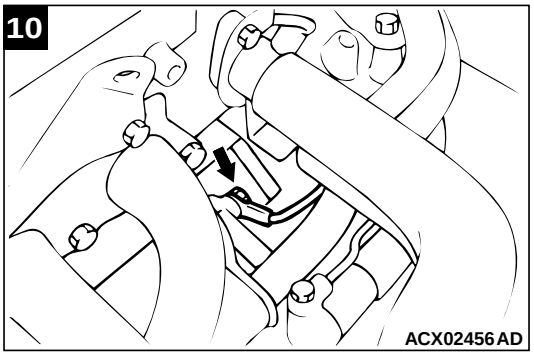
LIFTGATE
AC003107AB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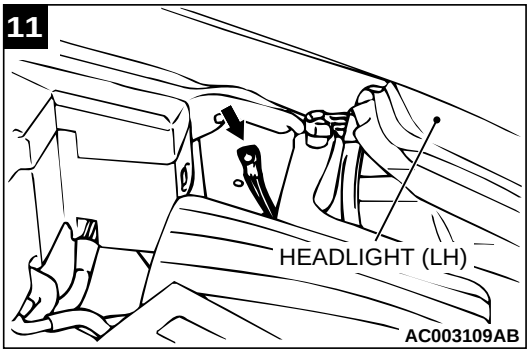
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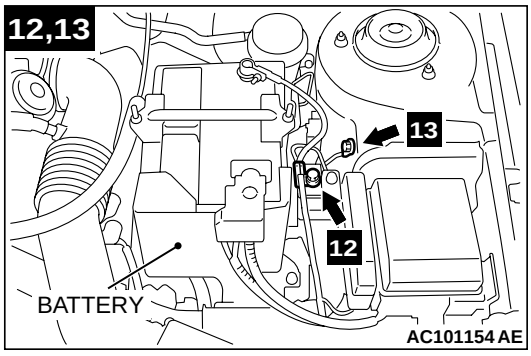
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12
BATTERY
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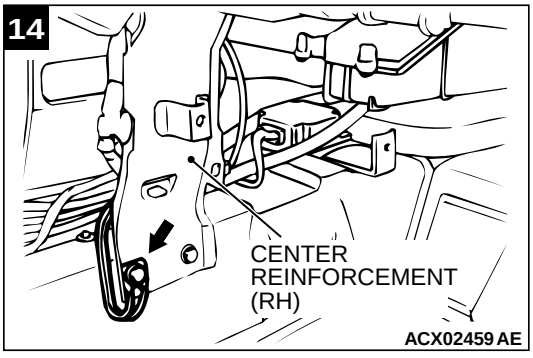
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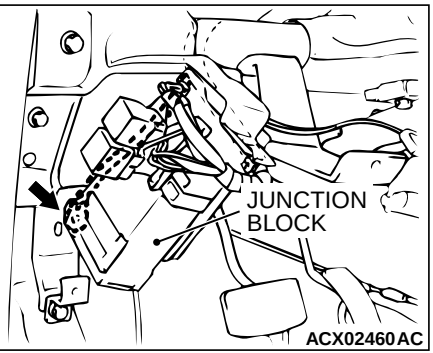
CENTER
REINFORCEMENT
(RH)
ACX02459AE

15



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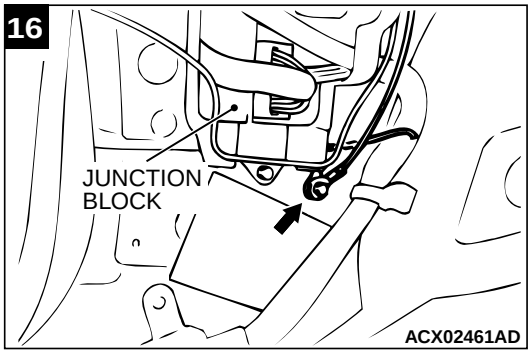

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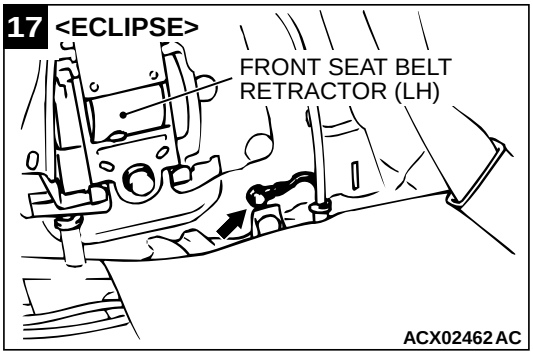

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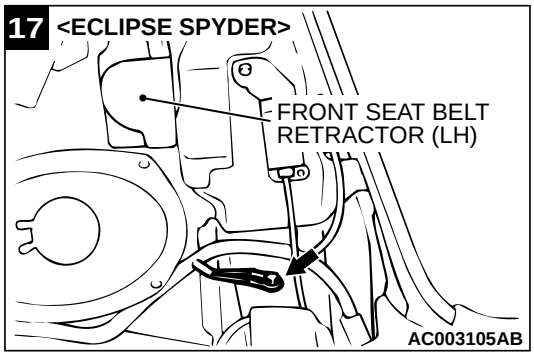

GROUNDING CABLE

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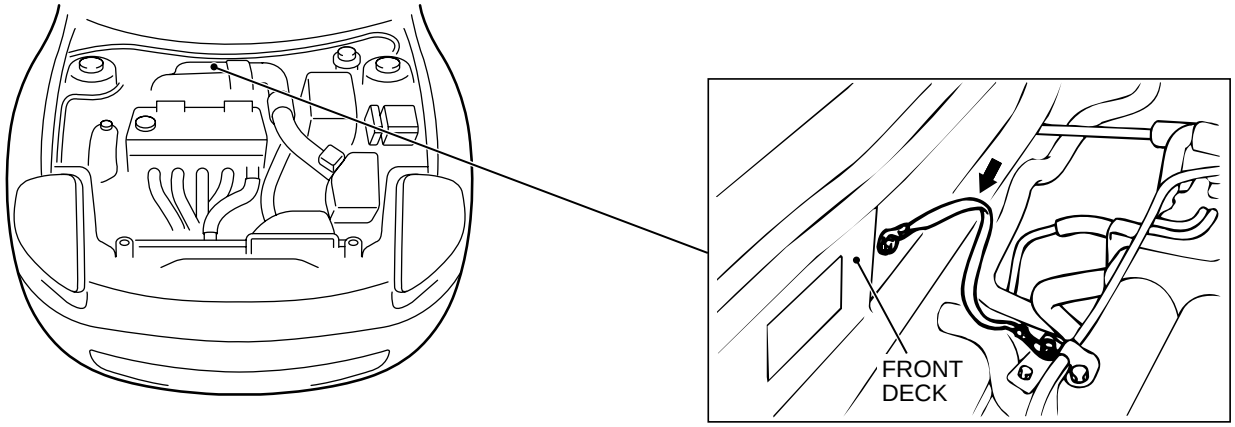

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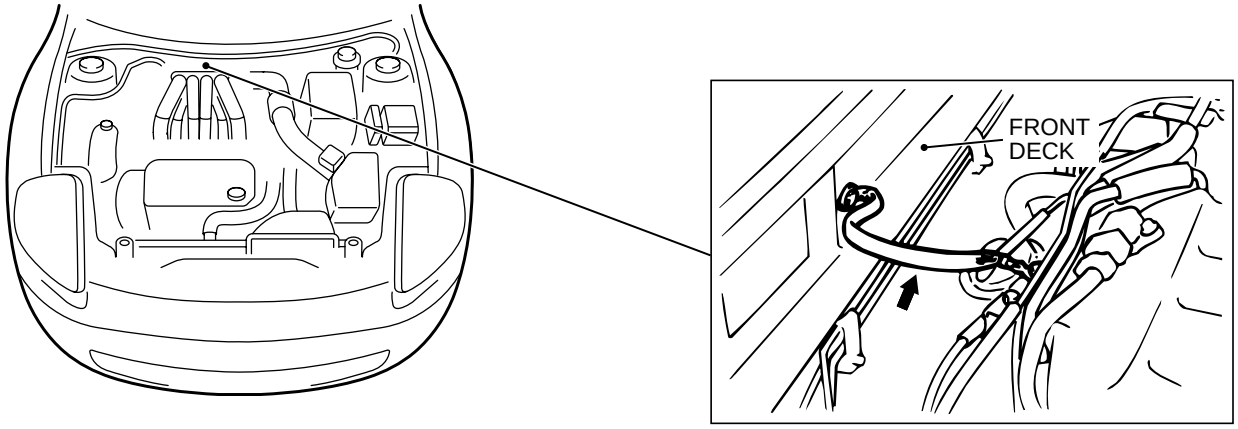


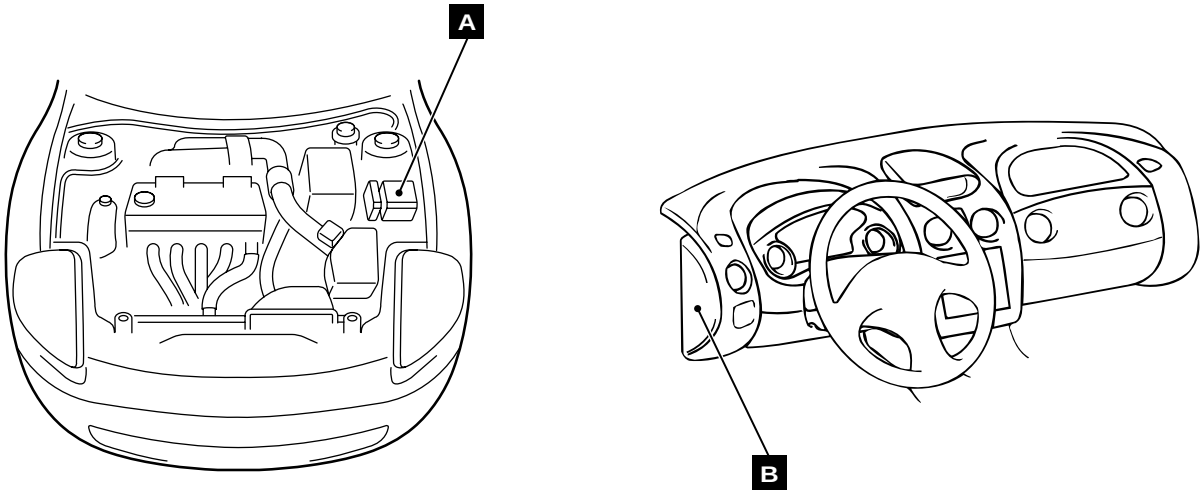
AC102226AB

TSB Revision

RELAY

M1701000400217

NAME	SYMBOL	NAME	SYMBOL
A/C compressor relay	A	Fuel pump relay (2)	B
A/T control relay	A	Horn relay	A
Blower relay	B	MFI relay	A
Defogger relay	B	Power window relay	B
Fan control relay	A	Starter relay <M/T>	A
Fog light relay	A	Theft-alarm horn relay	A
Fuel pump relay (1)	B		



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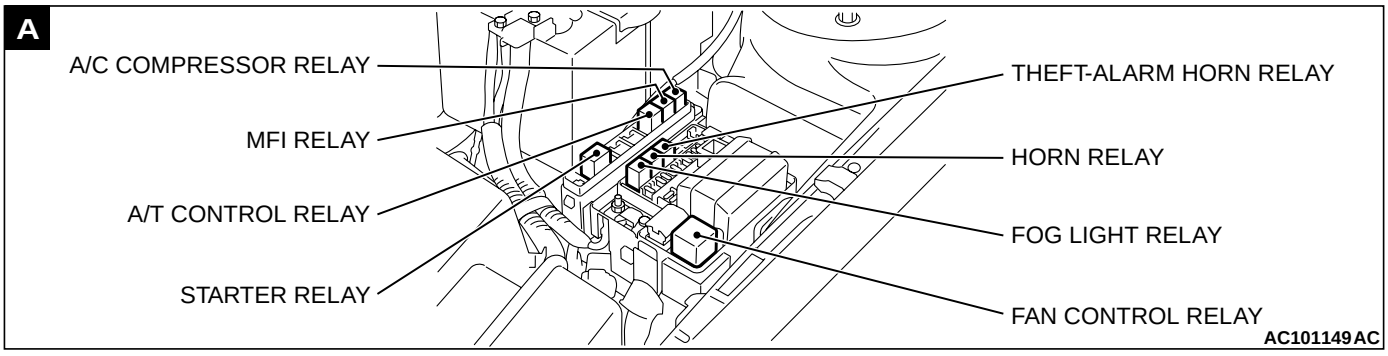

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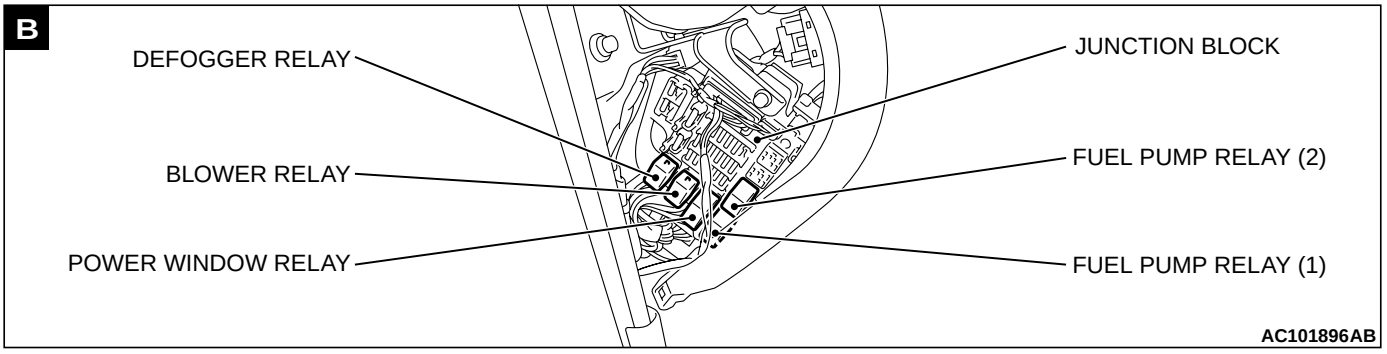

AC101896AB

TSB Revision

SENSOR

M1701000600244

NAME	SYMBOL	NAME	SYMBOL
A/C compressor assembly (with built-in lock sensor)	R	Knock sensor <3.0L Engine>	O
A/T control solenoid valve assembly (with built-in A/T fluid temperature sensor)	K	Left bank heated oxygen sensor (front) <3.0L Engine>	U
Air thermo sensor <A/C>	W	Left bank heated oxygen sensor (rear) <3.0L Engine>	T
Ambient temperature sensor <Multi center display>	J	Manifold differential pressure sensor <2.4L Engine>	B
Camshaft position sensor <2.4L Engine>	H	Manifold differential pressure sensor <3.0L Engine>	P
Compass sensor <Multi center display>	Y	Output shaft speed sensor <A/T>	E
Crankshaft position sensor <2.4L Engine>	F	Right bank heated oxygen sensor (front) <3.0L Engine>	N
Crankshaft position sensor <3.0L Engine>	S	Right bank heated oxygen sensor (rear) <3.0L Engine>	Z
Distributor assembly (with built-in top dead center sensor) <3.0L Engine>	M	Side impact sensor <Side air bag>	b
Engine coolant temperature sensor <2.4L Engine>	I	Thermistor sensor <A/C>	X
Engine coolant temperature sensor <3.0L Engine>	V	Throttle position sensor <2.4L Engine>	C
Fuel tank differential pressure sensor	a	Throttle position sensor <3.0L Engine>	Q
Fuel pump module (with built-in fuel temperature sensor)	a	Vehicle speed sensor <M/T>	D
Heated oxygen sensor (front) <2.4L Engine>	G	Volume air flow sensor	L
Heated oxygen sensor (rear) <2.4L Engine>	c	Wheel speed sensor (front) <ABS>	d
Input shaft speed sensor <A/T>	E	Wheel speed sensor (rear) <ABS>	e
Knock sensor <2.4L Engine>	A		

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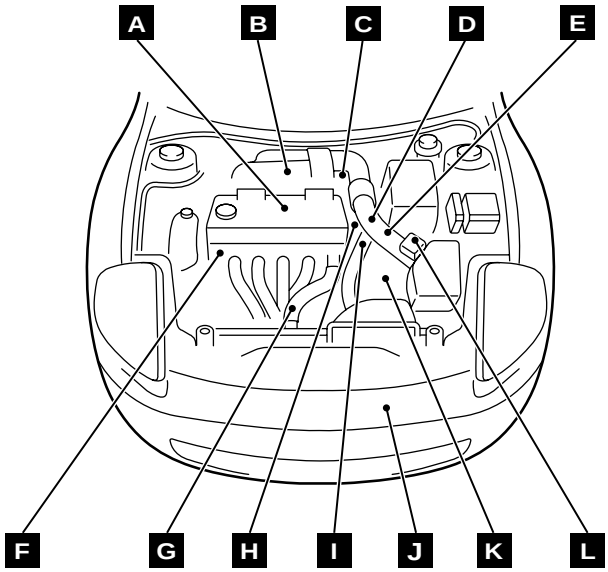

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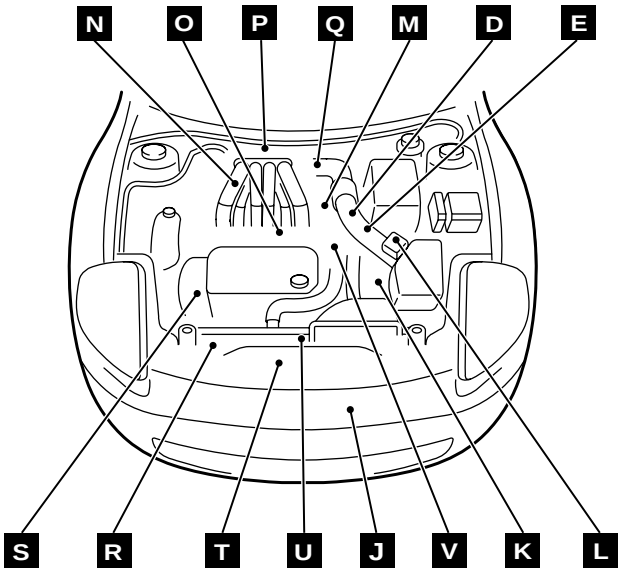

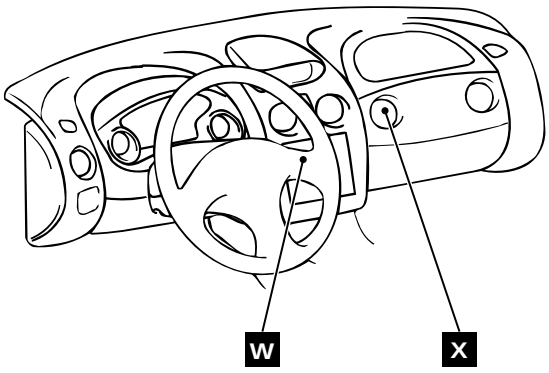

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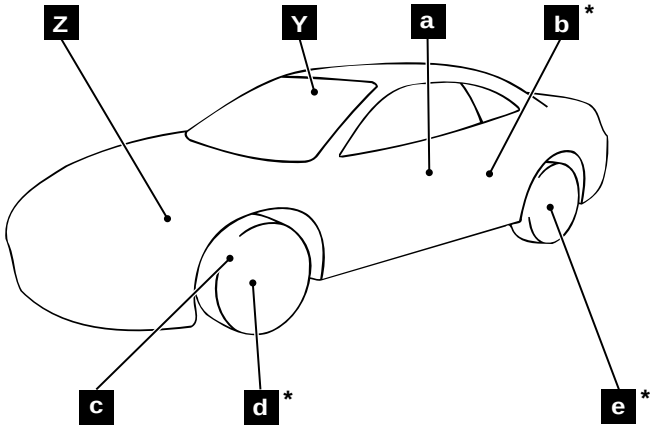

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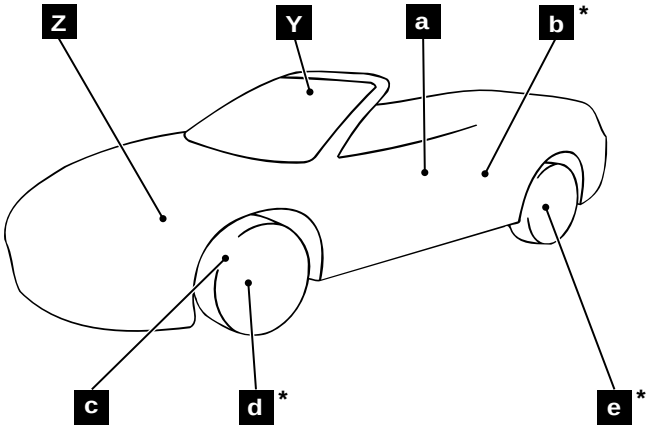

AC102253AC

*NOTE: The * symbols indicate also equipped at the right side.*

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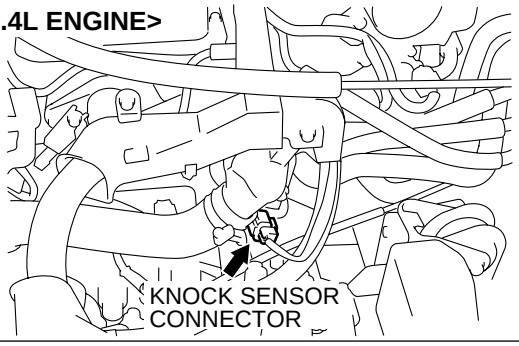

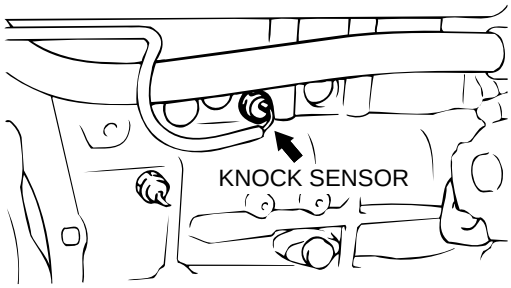

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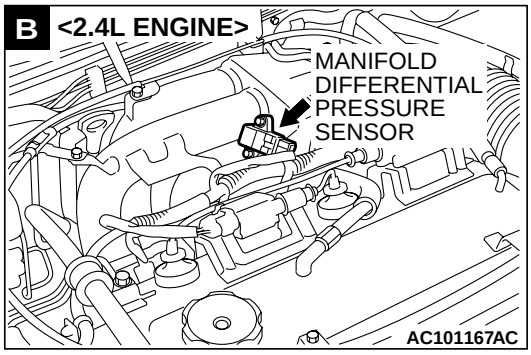

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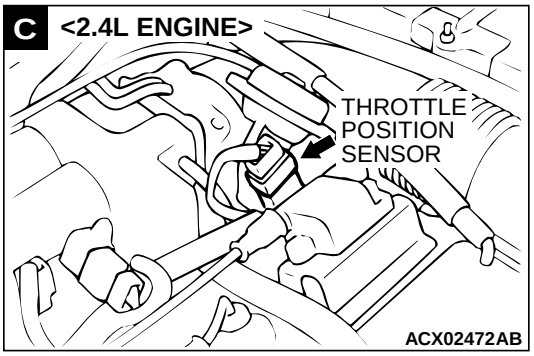

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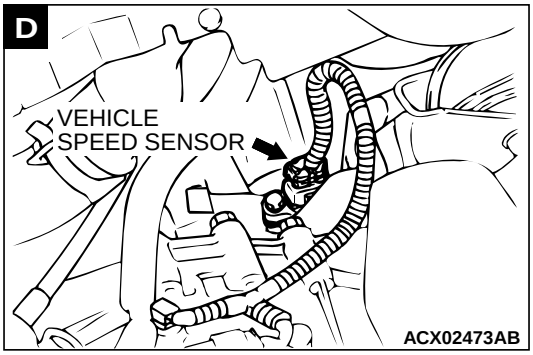

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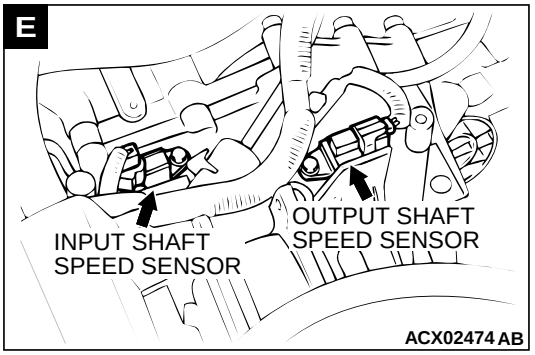

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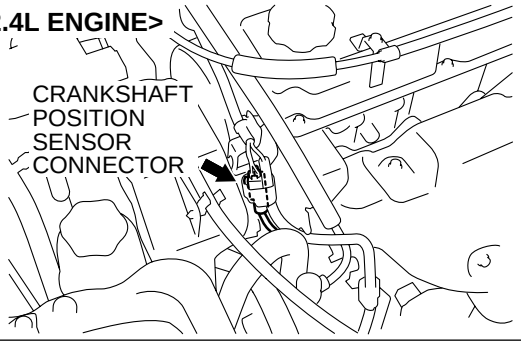

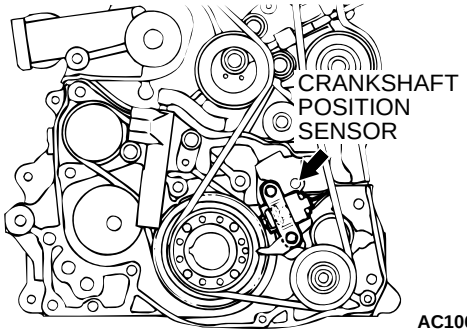

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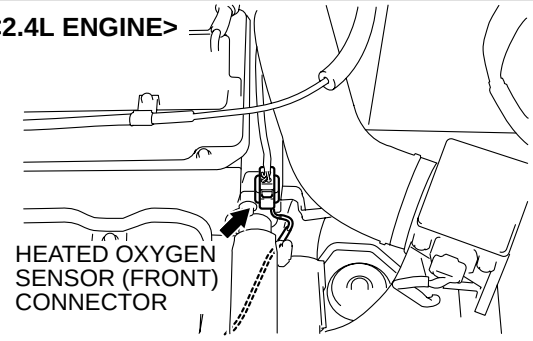

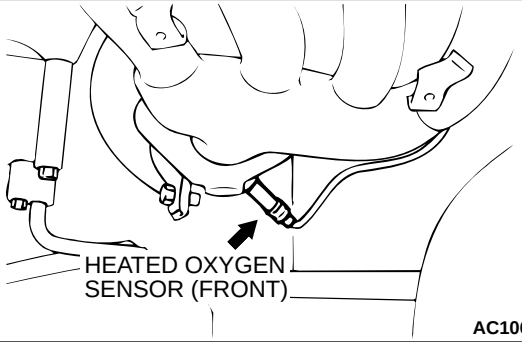

AC106204 AB

TSB Revision

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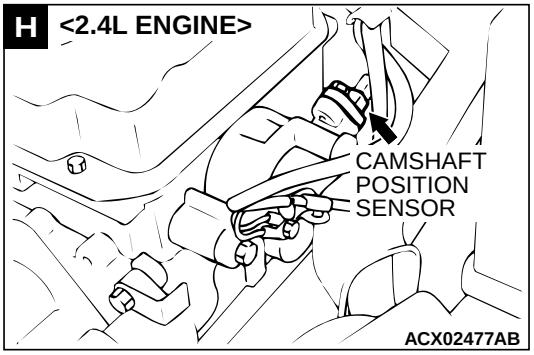

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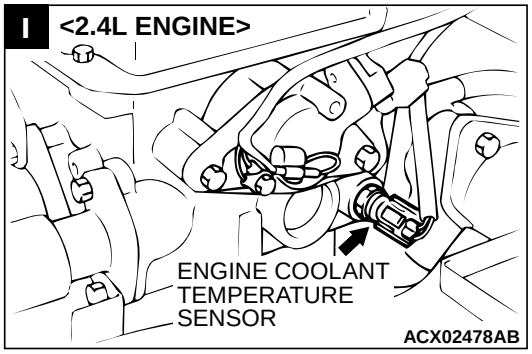

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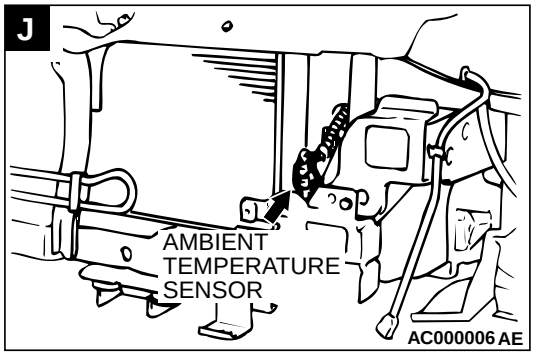

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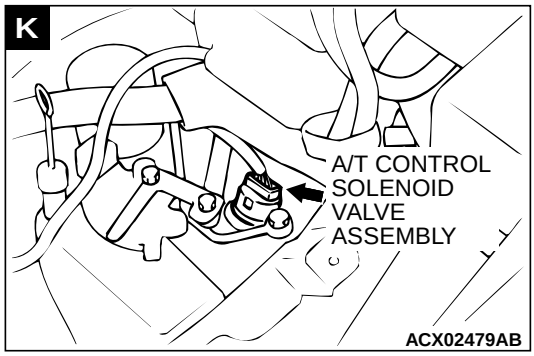

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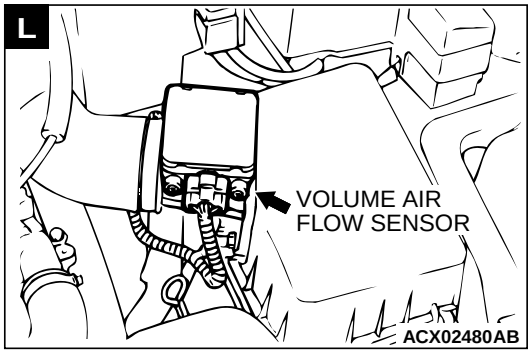

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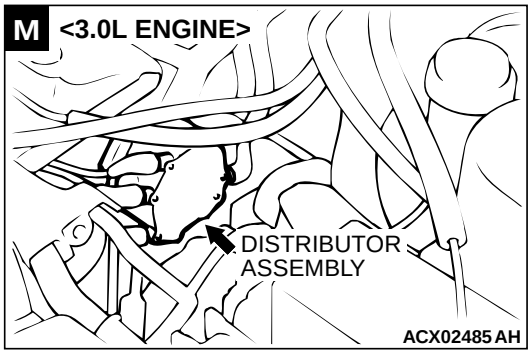

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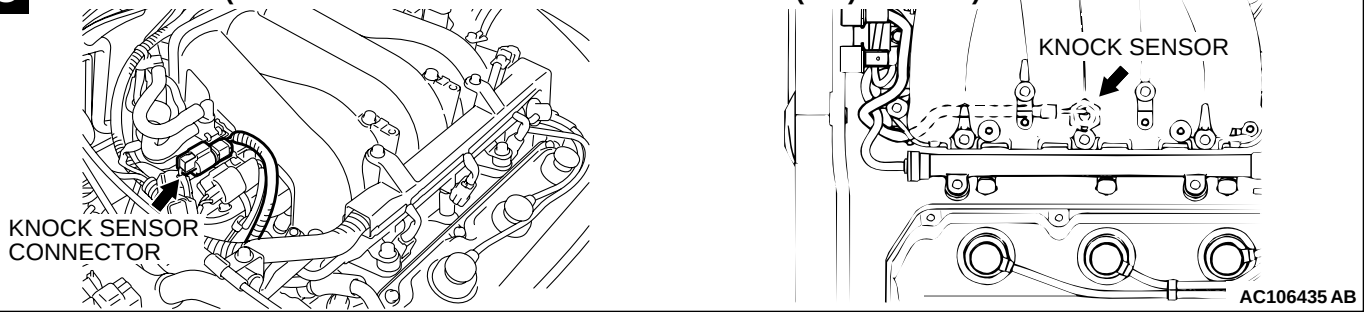

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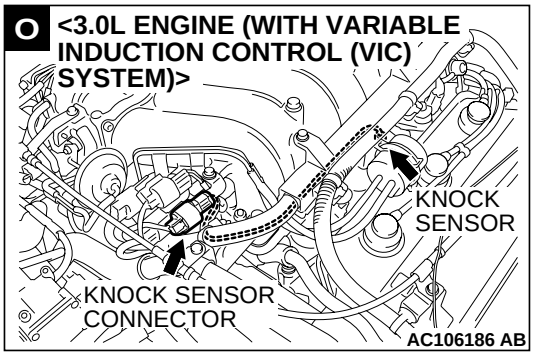

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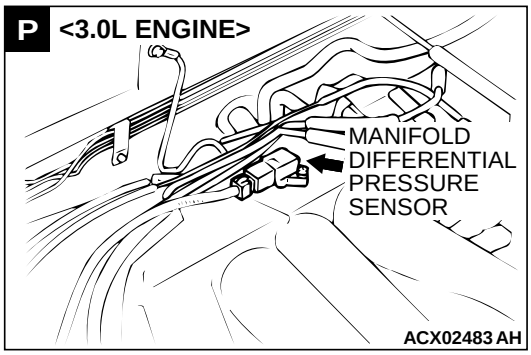

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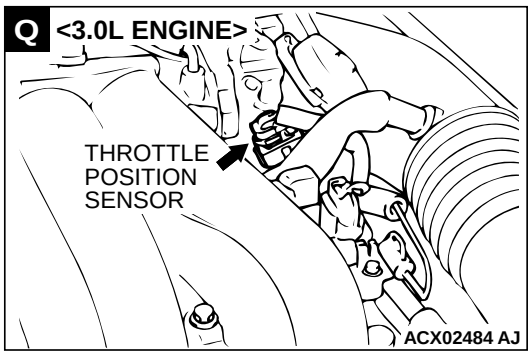

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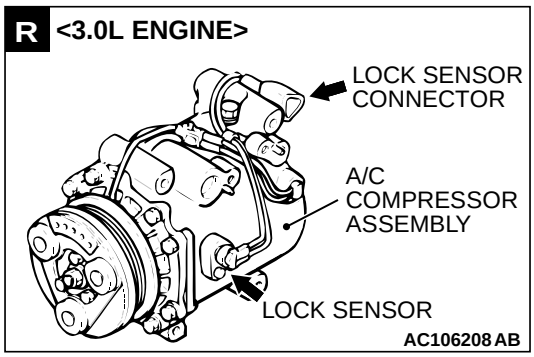

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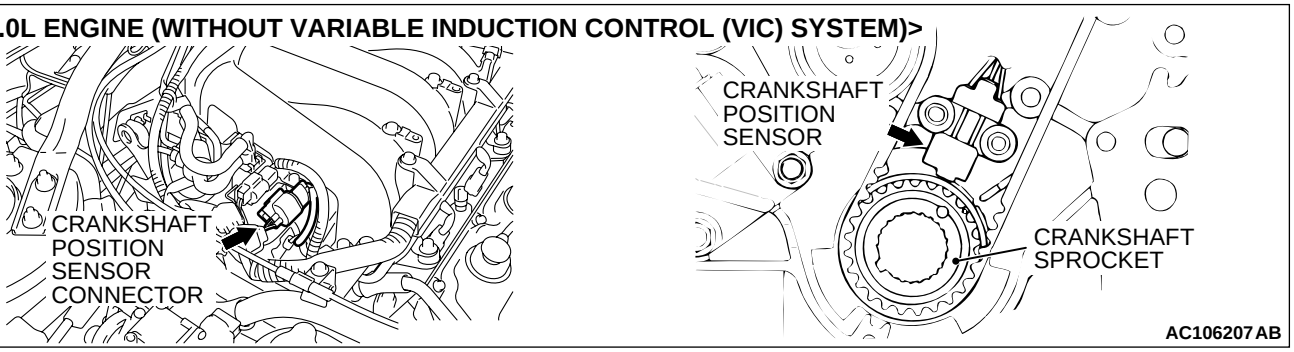
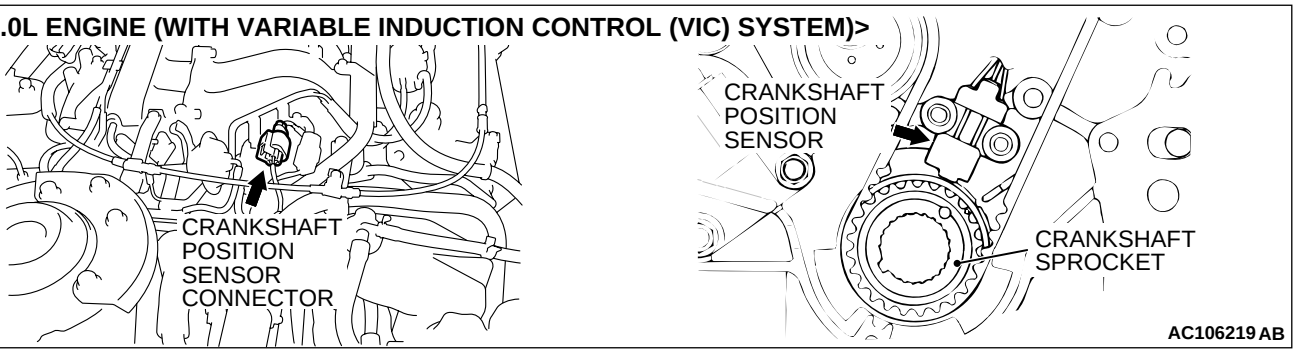
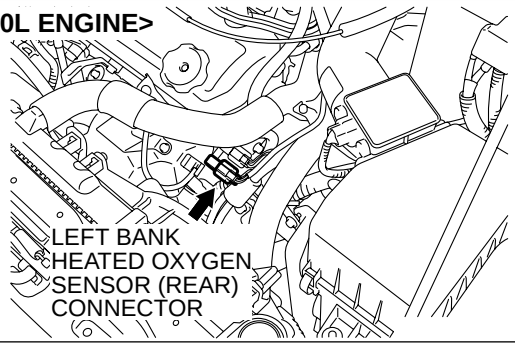


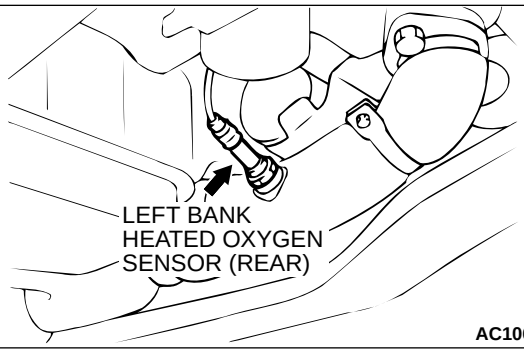
S <3.0L ENGINE (WITH VARIABLE INDUCTION CONTROL (VIC) SYSTEM)>



TSB Revision

T <3.0L ENGINE>





AC106209 AB

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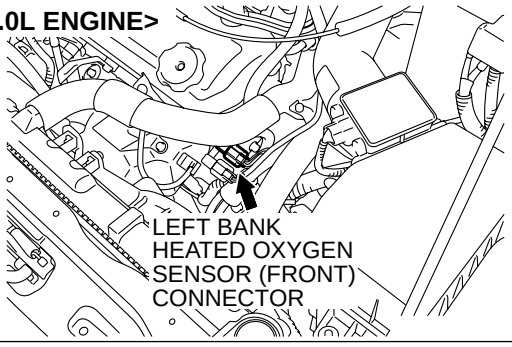

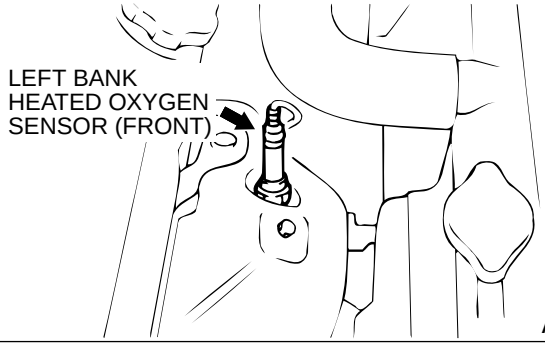

AC106211 AB

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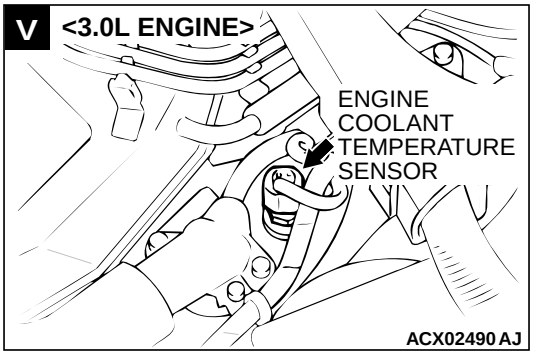

ACX02490 AJ

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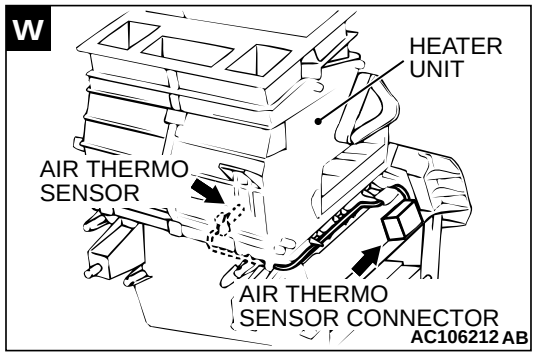

AC106212 AB

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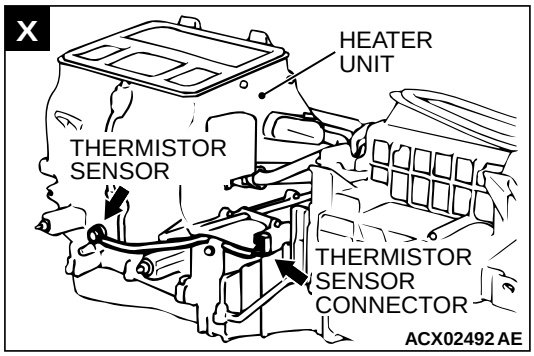

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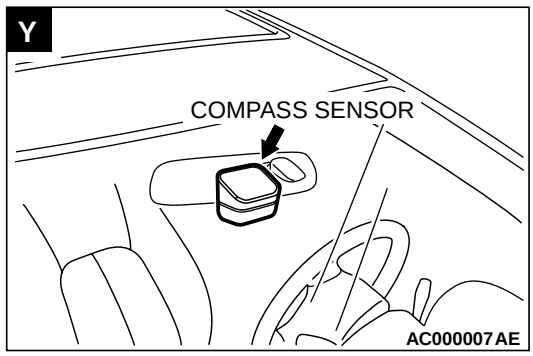
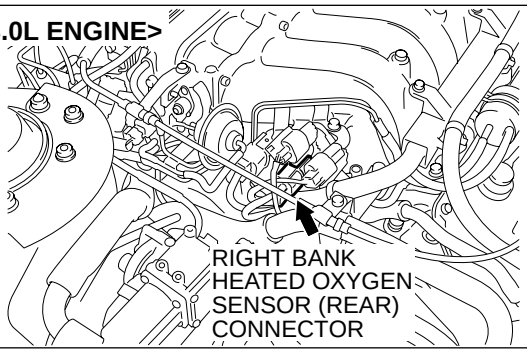
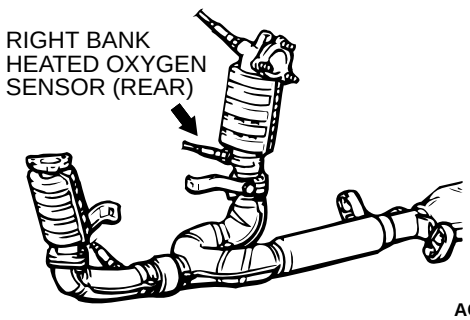


AC000007 AE

Z <3.0L ENGINE>





AC106215 AB

TSB Revision

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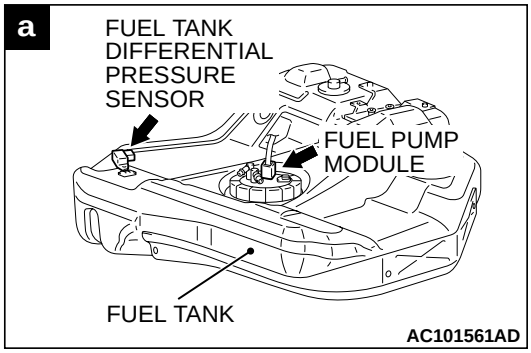

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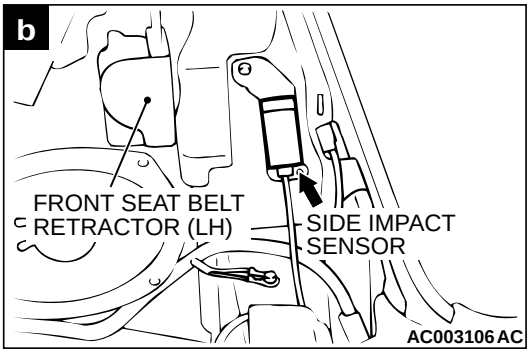

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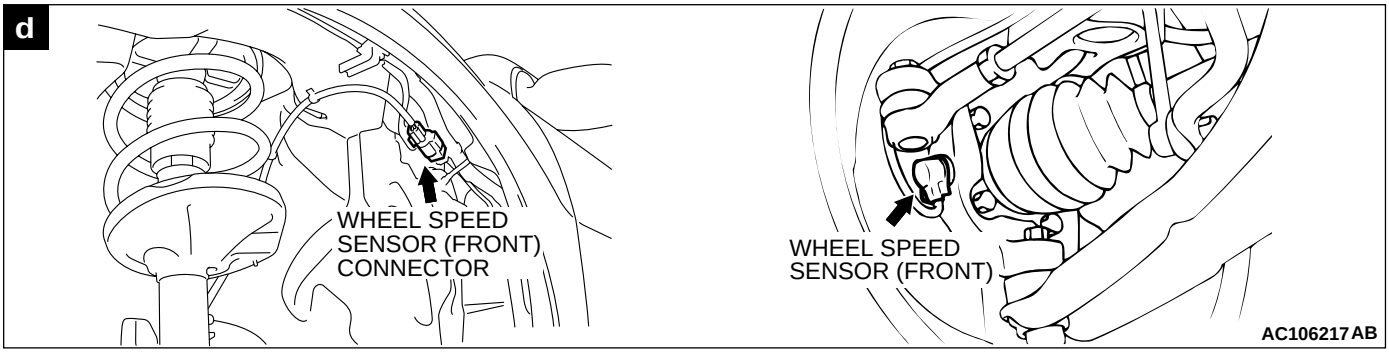

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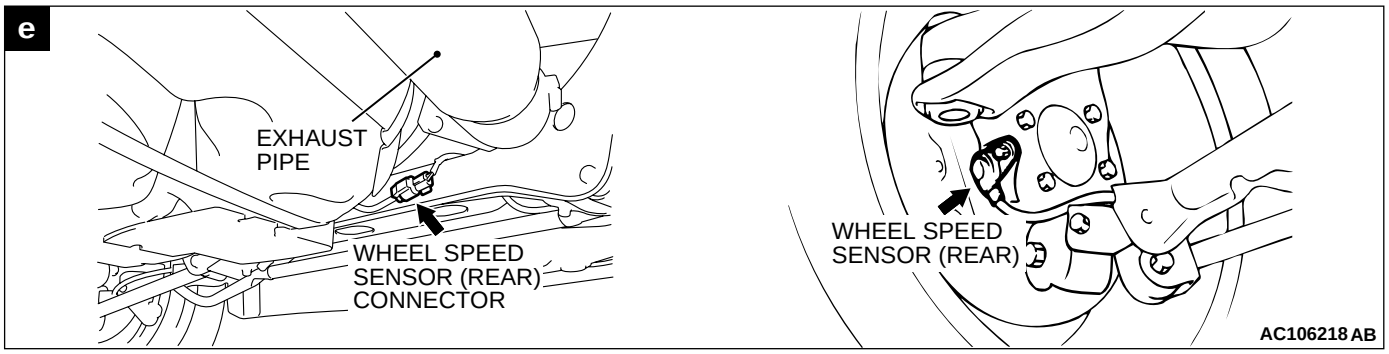
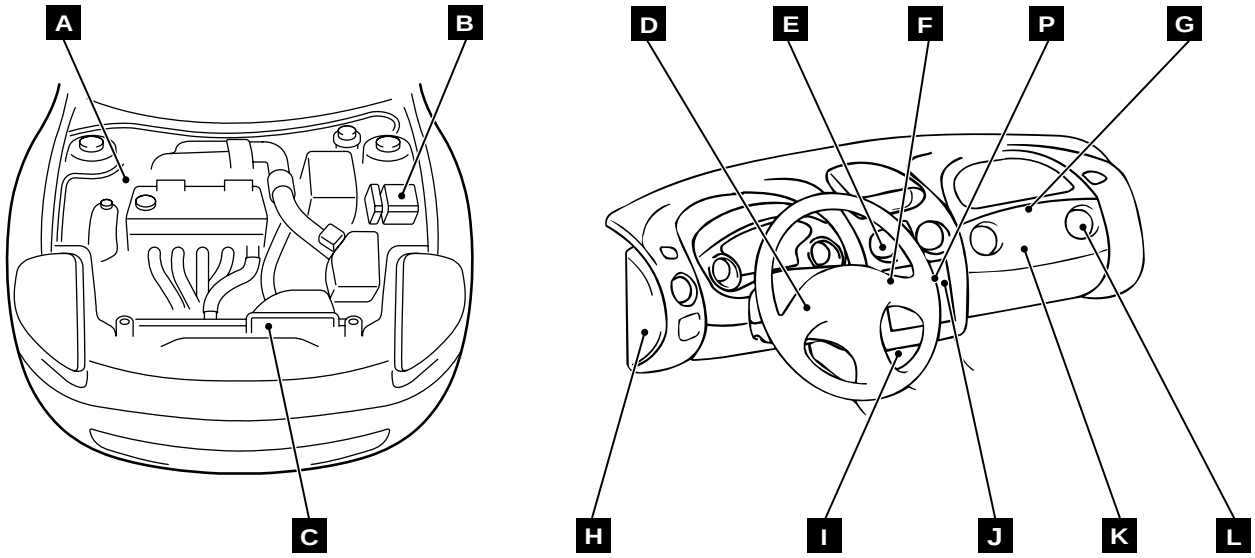


CONTROL UNIT

M1701000700199

NAME	SYMBOL	NAME	SYMBOL
ABS-ECU	A	Immobilizer-ECU	J
Auto-cruise control-ECU	F	Motor antenna assembly (with built-in motor antenna-ECU) <ECLIPSE SPYDER>	O
Automatic compressor controller <A/C>	G		
Column-ECU	D		
Compass-ECU <Multi center display>	L	Multi center display unit	E
Convertible top control module <ECLIPSE SPYDER>	N	Powertrain control module <A/T>	K
		SRS-ECU	I
Engine control module <M/T>	K	Sunroof motor assembly (with built-in CPU) <ECLIPSE>	M
ETACS-ECU	H		
Fan controller	C	Water shut valve controller <ECLIPSE>	P
Front-ECU	B		



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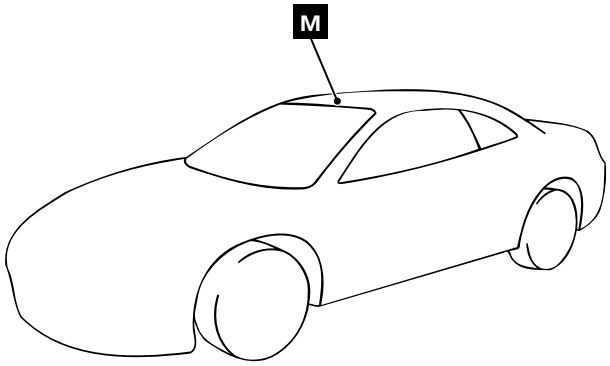

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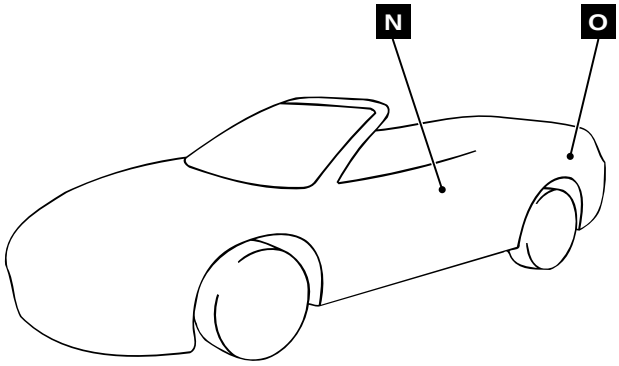

AC102264 AC

TSB Revision

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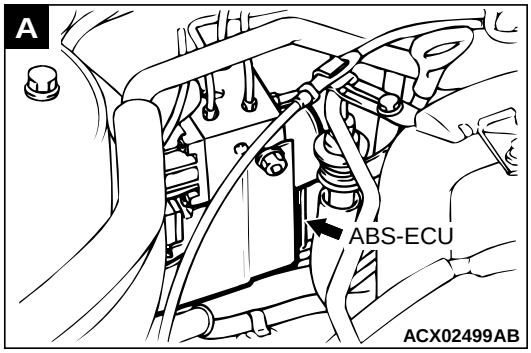
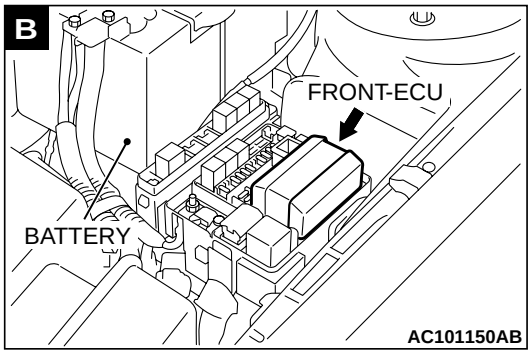
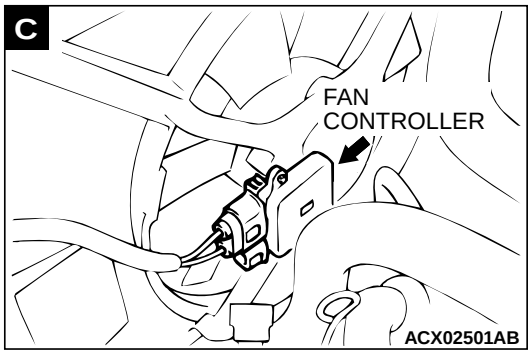

ABS-ECU
ACX02499AB

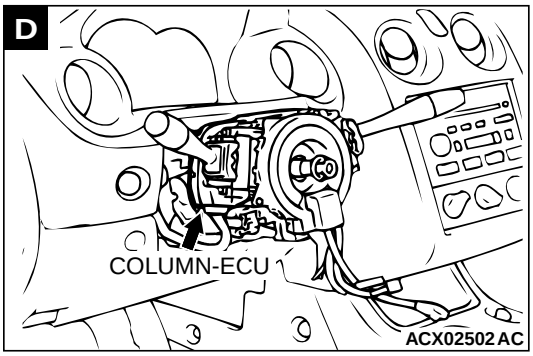
B


FRONT-ECU
BATTERY
AC101150AB

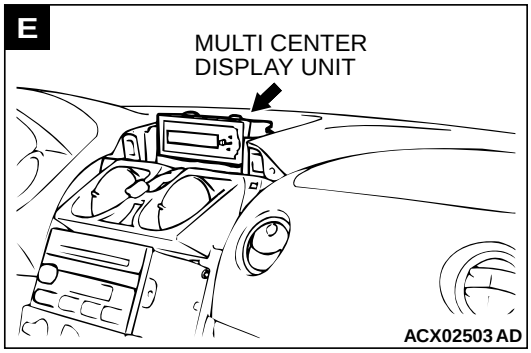
C


FAN
CONTROLLER
ACX02501AB

D


COLUMN-ECU
ACX02502AC

E


MULTI CENTER
DISPLAY UNIT
ACX02503AD

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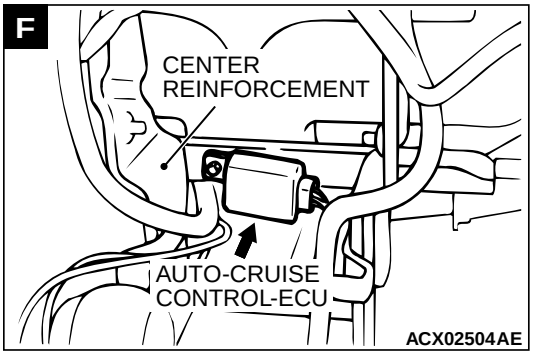
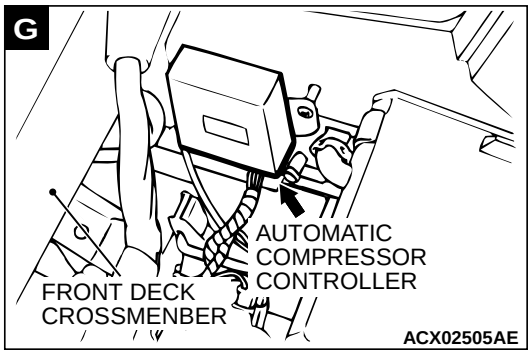
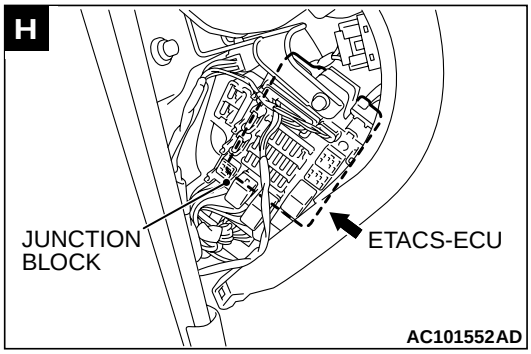

CENTER
REINFORCEMENT
AUTO-CRUISE
CONTROL-ECU
ACX02504AE

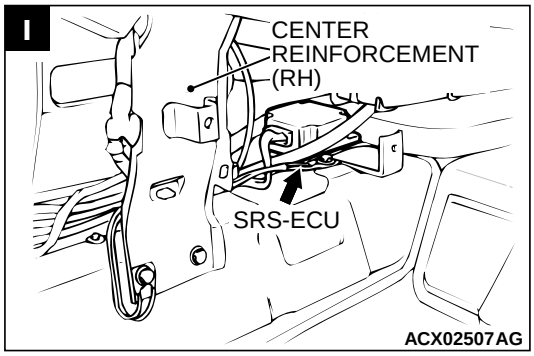
G


AUTOMATIC
COMPRESSOR
CONTROLLER
FRONT DECK
CROSSMENBER
ACX02505AE

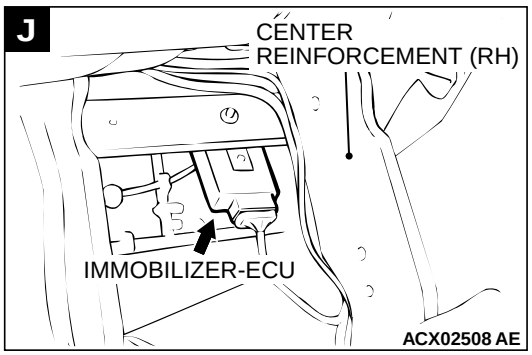
H


JUNCTION
BLOCK
ETACS-ECU
AC101552AD

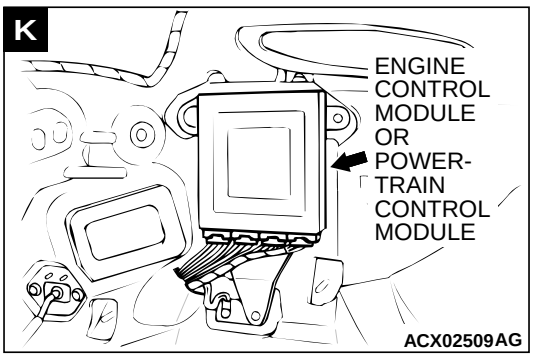
I


CENTER
REINFORCEMENT
(RH)
SRS-ECU
ACX02507AG

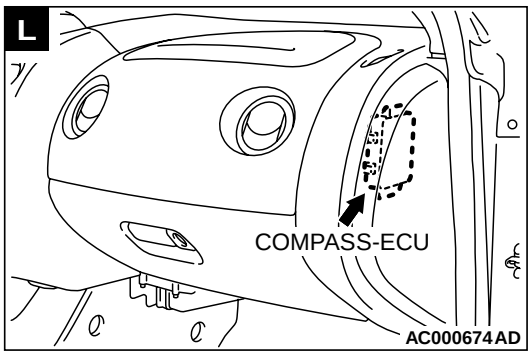
J


CENTER
REINFORCEMENT (RH)
IMMOBILIZER-ECU
ACX02508 AE

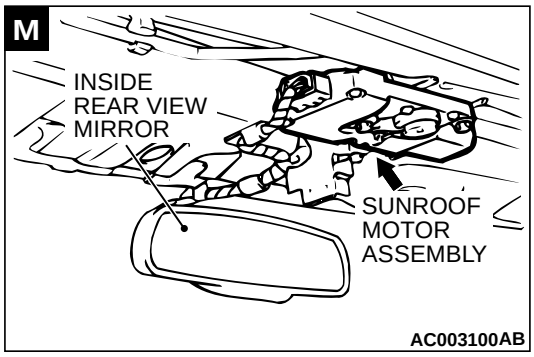
K


ENGINE
CONTROL
MODULE
OR
POWER-
TRAIN
CONTROL
MODULE
ACX02509AG

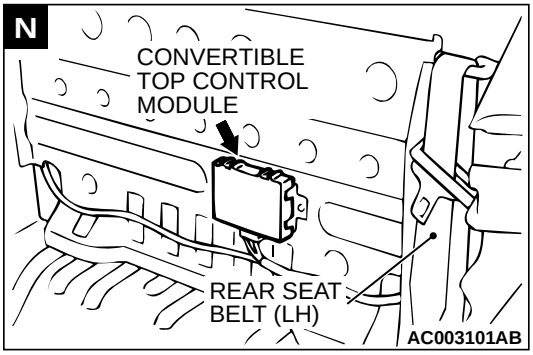
L


COMPASS-ECU
AC000674AD

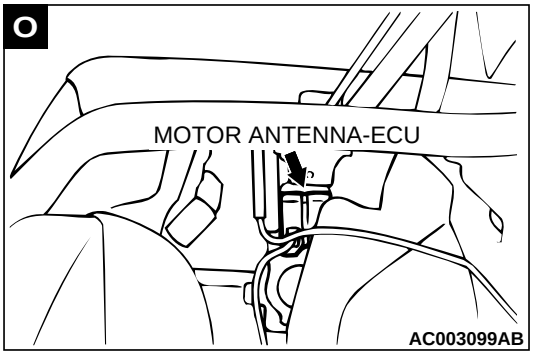
M


INSIDE
REAR VIEW
MIRROR
SUNROOF
MOTOR
ASSEMBLY
AC003100AB

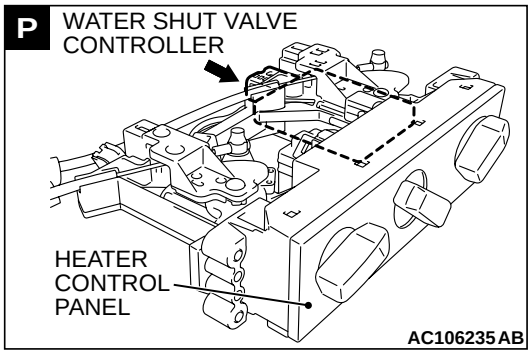
N


CONVERTIBLE
TOP CONTROL
MODULE
REAR SEAT
BELT (LH)
AC003101AB

O


MOTOR ANTENNA-ECU
AC003099AB

P

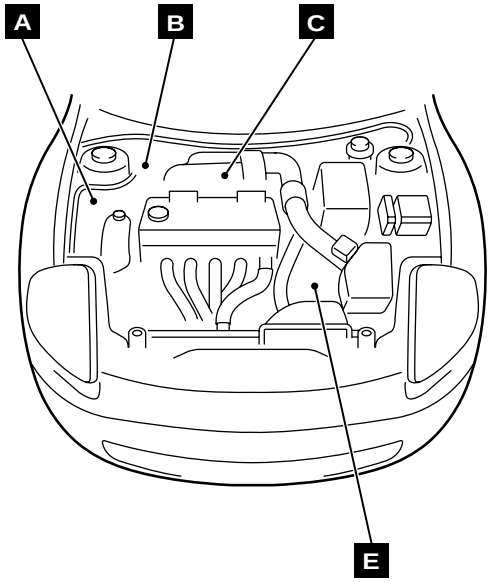

WATER SHUT VALVE
CONTROLLER
HEATER
CONTROL
PANEL
AC106235AB

SOLENOID AND SOLENOID VALVE

M1701000800215

NAME	SYMBOL	NAME	SYMBOL
A/T control solenoid valve assembly	E	Evaporative emission purge solenoid valve <3.0L Engine (with variable induction control (VIC) system)>	G
Auto-cruise control vacuum pump (with built-in control valve and release valve)	A	Evaporative emission purge solenoid valve <3.0L Engine (without variable induction control (VIC) system)>	D
EGR solenoid valve <2.4L Engine>	C	Evaporative emission ventilation solenoid	F
EGR solenoid valve <3.0L Engine>	D	Hydraulic unit (with built-in ABS solenoid valve)	B
Evaporative emission purge solenoid valve <2.4L Engine>	C	Variable induction control solenoid valve <3.0L Engine (with variable induction control (VIC) system)>	D

<2.4L ENGINE>



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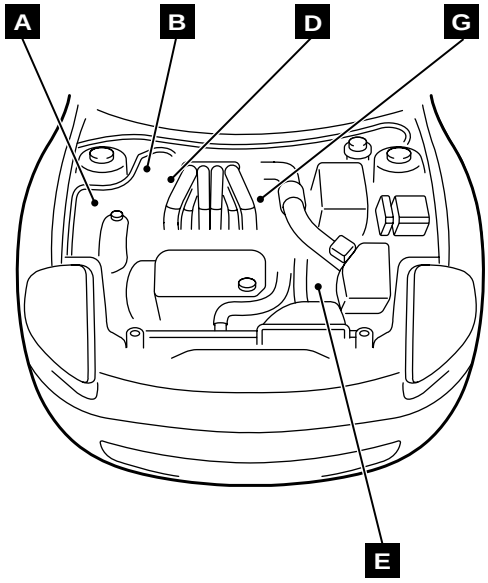

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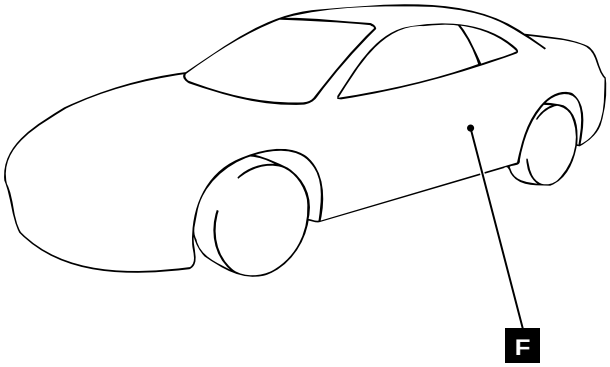

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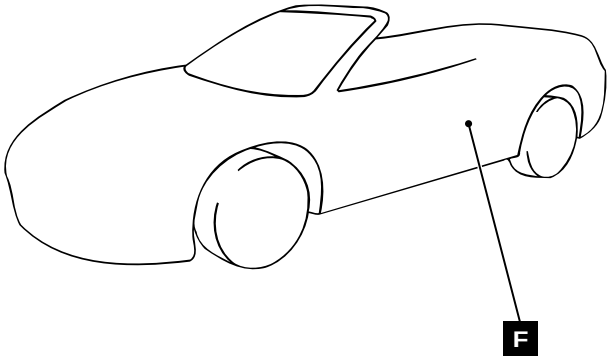
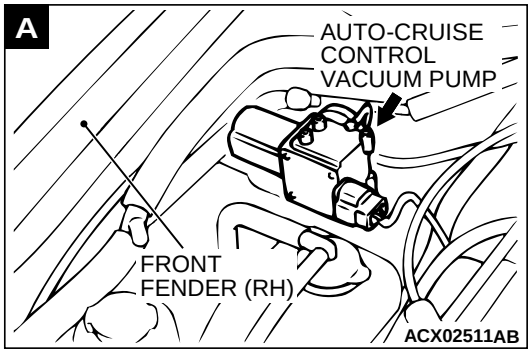


AC102269 AC

TSB Revision

A



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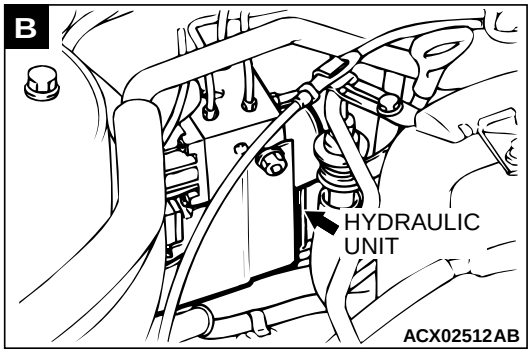
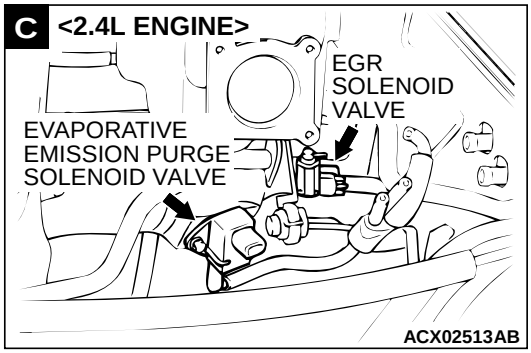
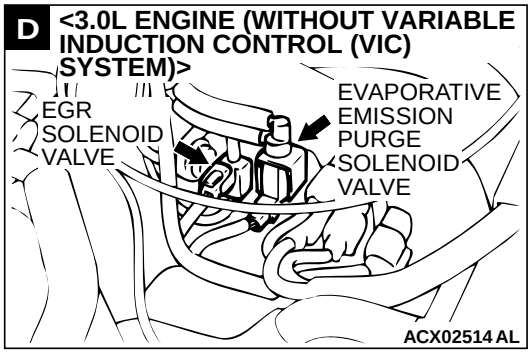


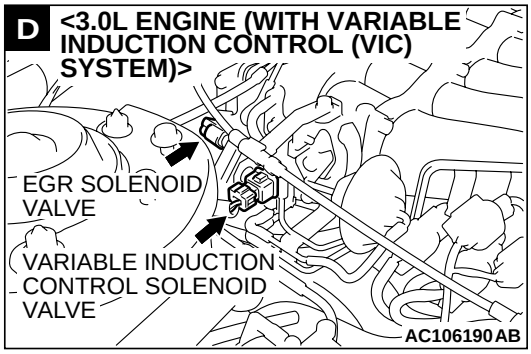
C <2.4L ENGINE>



D <3.0L ENGINE (WITHOUT VARIABLE INDUCTION CONTROL (VIC) SYSTEM)>



D <3.0L ENGINE (WITH VARIABLE INDUCTION CONTROL (VIC) SYSTEM)>



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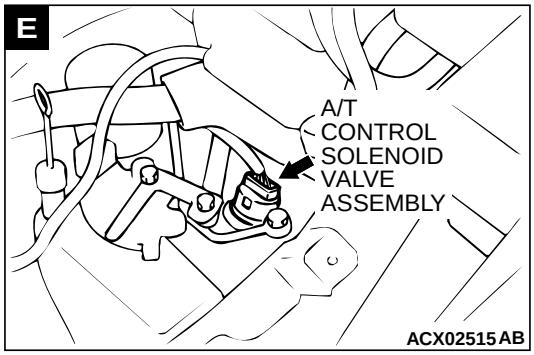

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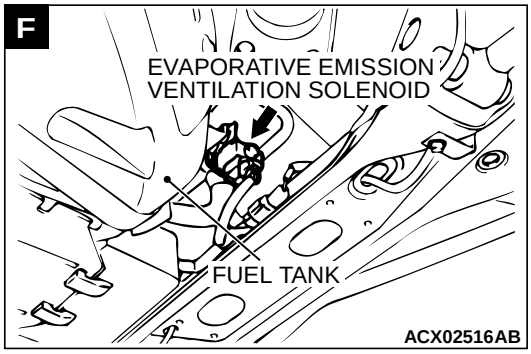
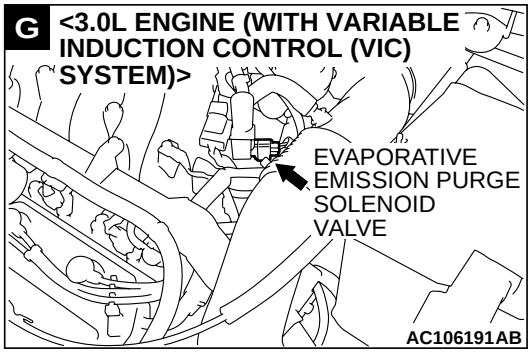


G <3.0L ENGINE (WITH VARIABLE INDUCTION CONTROL (VIC) SYSTEM)>

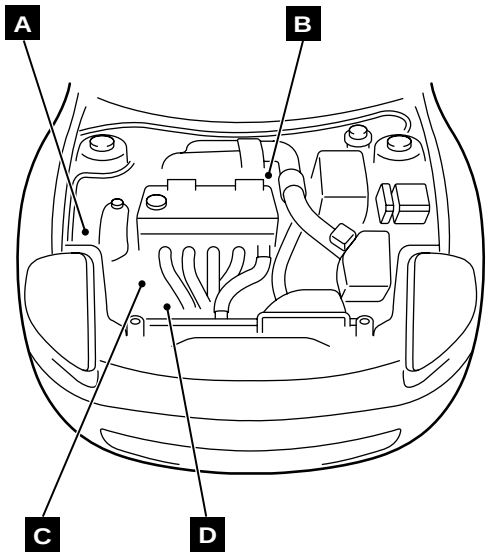


OTHER DEVICES

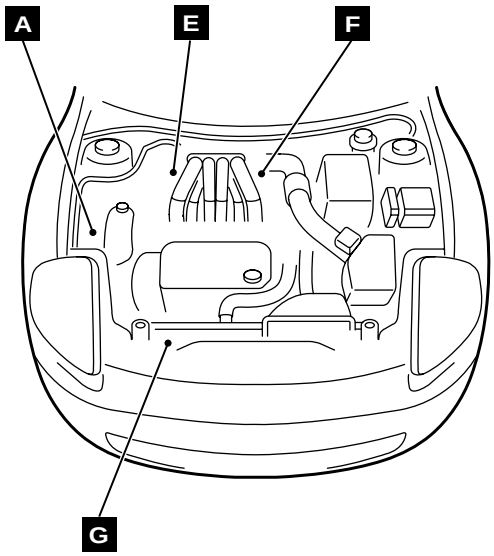
M1701005600186

NAME	SYMBOL	NAME	SYMBOL
A/C compressor assembly (built-in A/C refrigerant temperature switch) <2.4L Engine>	D	Idle air control motor <3.0L Engine>	F
A/C compressor assembly (built-in A/C refrigerant temperature switch) <3.0L Engine>	G	Power steering pressure switch <2.4L Engine>	C
Dual pressure switch	A	Power steering pressure switch <3.0L Engine>	E
Idle air control motor <2.4L Engine>	B		

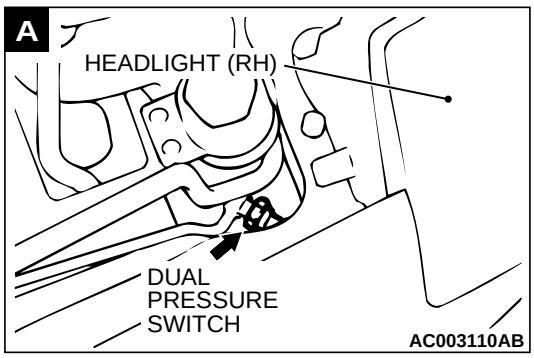
<2.4L ENGINE>

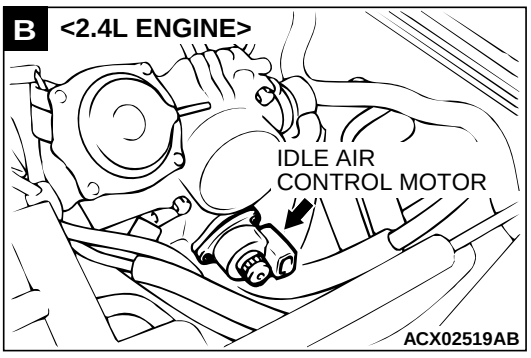


<3.0L ENGINE>



AC102271AB





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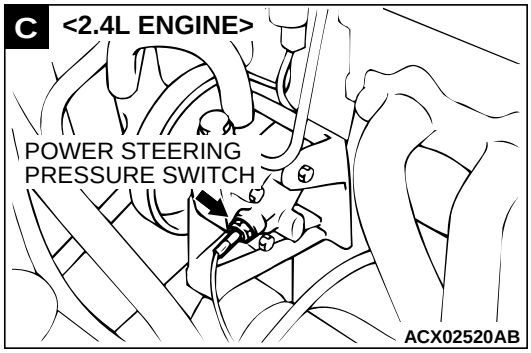
C <2.4L ENGINE>



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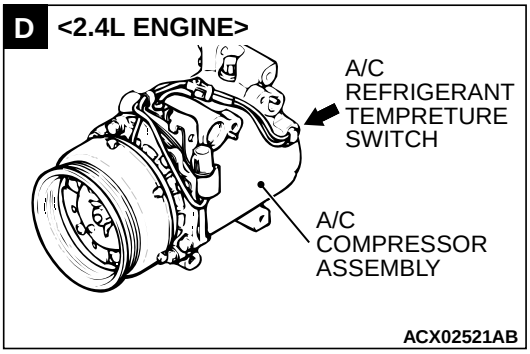

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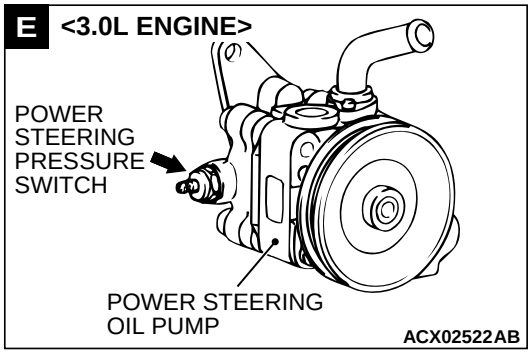
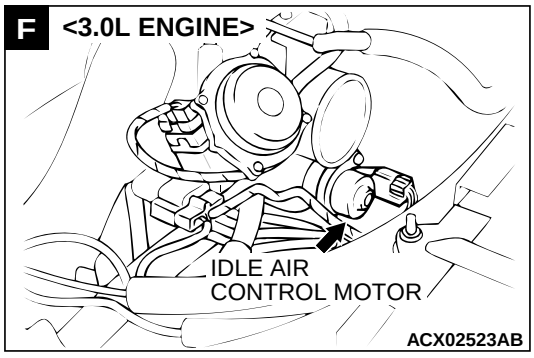
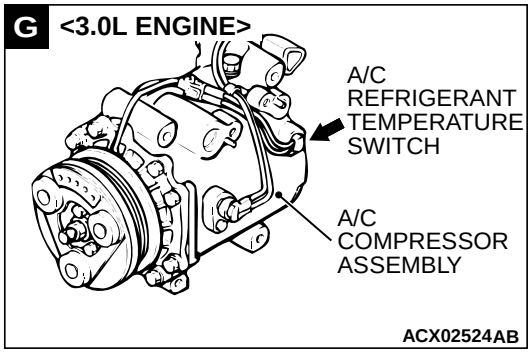


F <3.0L ENGINE>



G <3.0L ENGINE>



NOTES

GROUP 80A

CONFIGURATION DIAGRAMS

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OVERALL CONFIGURATION DIAGRAM <ECLIPSE> 80A-2

OVERALL CONFIGURATION DIAGRAM <ECLIPSE SPYDER> 80A-3

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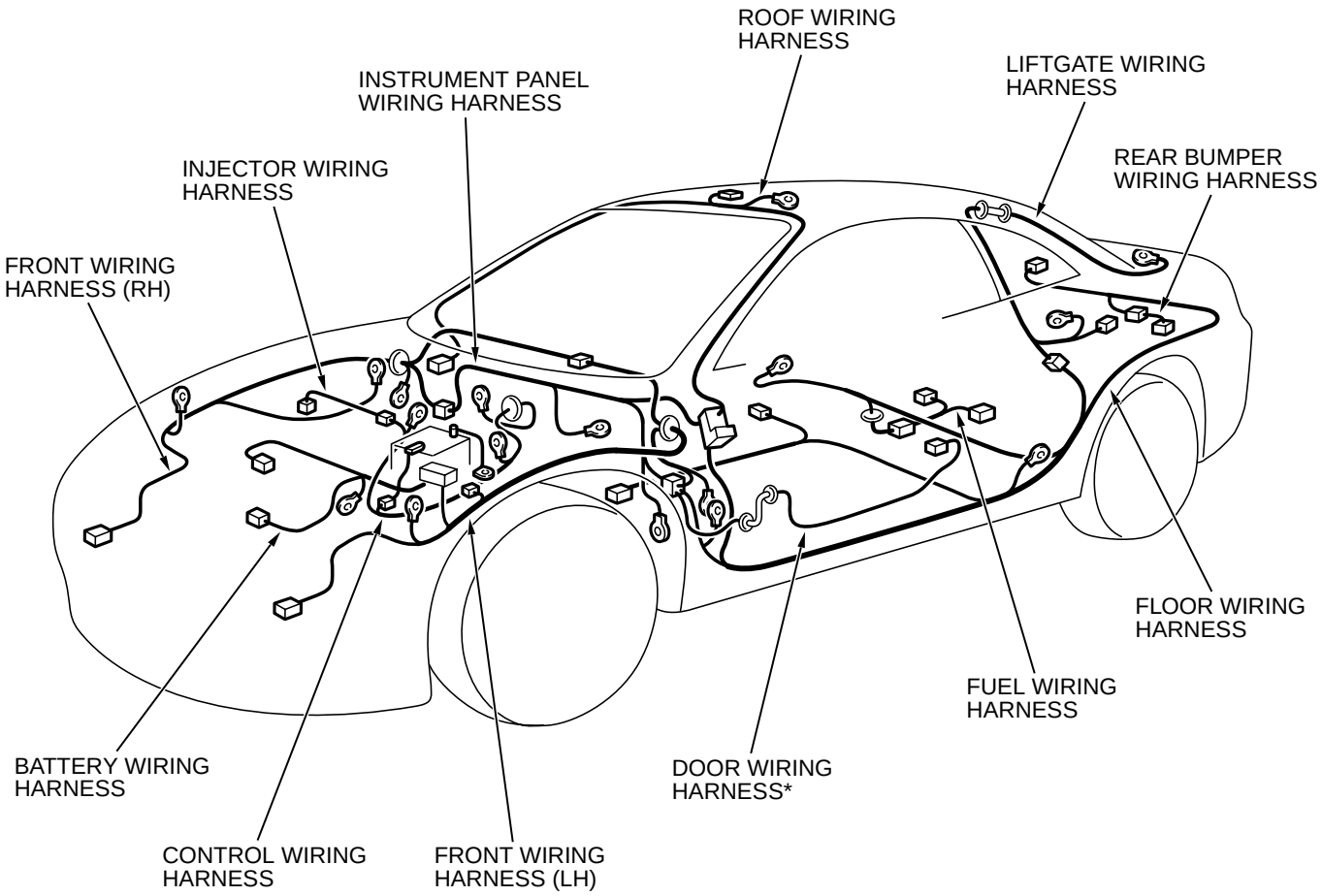
LUGGAGE COMPARTMENT <ECLIPSE SPYDER> 80A-32

OVERALL CONFIGURATION DIAGRAM <ECLIPSE>

M1801000100321



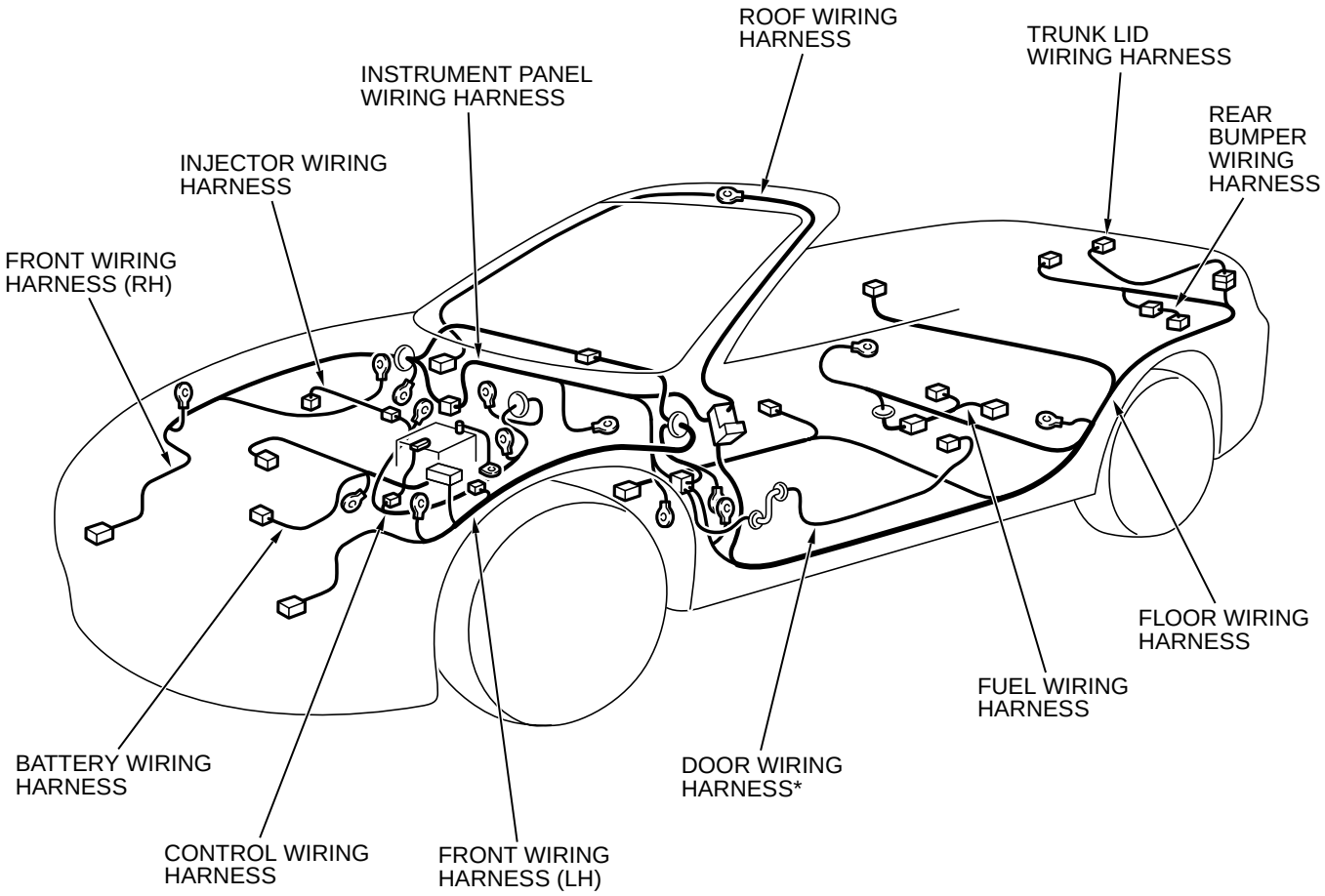
AC101825AB

NOTE:

1. *This illustration shows only major wiring harnesses.*
2. **: also equipped at the right side.*

OVERALL CONFIGURATION DIAGRAM <ECLIPSE SPYDER>

M1801000100332



AC101824AB

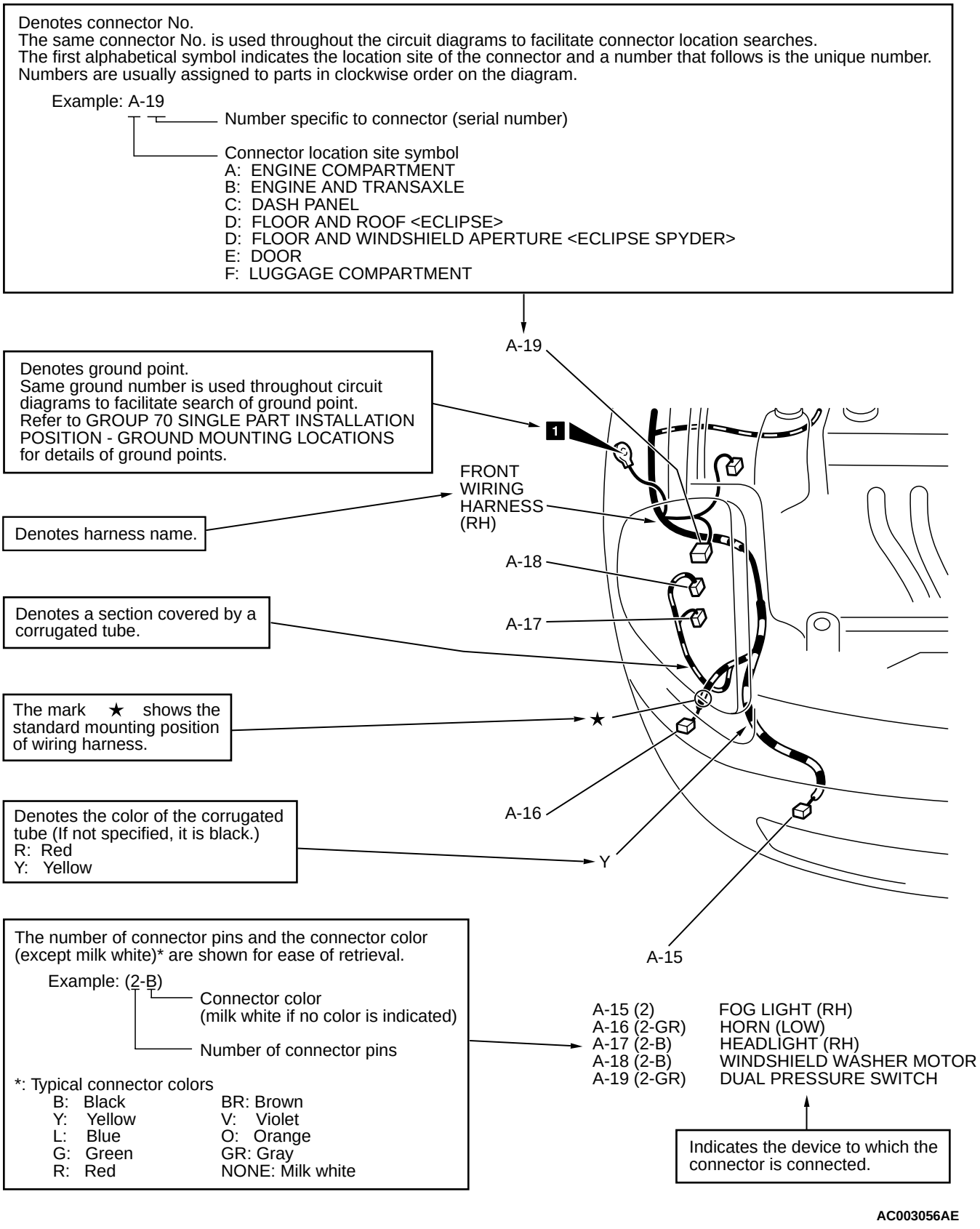
NOTE:

1. *This illustration shows only major wiring harnesses.*
2. **: also equipped at the right side.*

HOW TO READ CONFIGURATION DIAGRAMS

M1801000200265

The wiring harness diagrams clearly show the connector locations and harness routings at each site on actual vehicles.



AC003056AE

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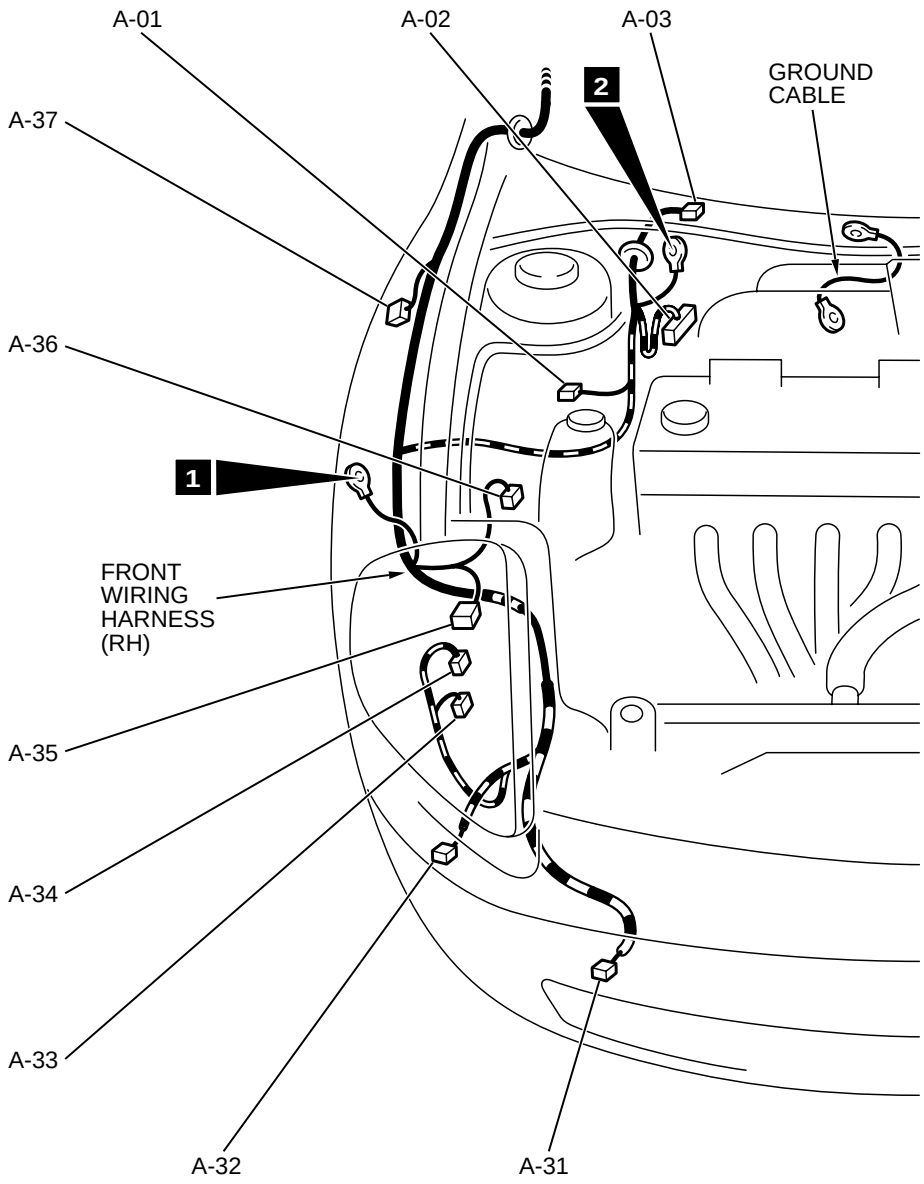
NOTES

ENGINE COMPARTMENT

M1801000300381

Connector symbol

A



AC106113AB

A-01	(4-B)	AUTO-CRUISE CONTROL VACUUM PUMP
A-02	(31-B)	ABS-ECU
A-03	(5-B)	WINDSHIELD WIPER MOTOR
A-04X	(4)	FOG LIGHT RELAY
A-05X	(4)	HORN RELAY
A-06X	(4)	THEFT-ALARM HORN RELAY <THEFT-ALARM SYSTEM>
A-09X	(4)	FAN CONTROL RELAY
A-10X	(11)	FRONT-ECU
A-11X	(11)	FRONT-ECU
A-12X	(1)	ENGINE SPEED DETECTION CONNECTOR
A-13X	(5)	STARTER RELAY <M/T>
A-17X	(4)	A/T CONTROL RELAY
A-18X	(4)	MFI RELAY
A-19X	(4)	A/C COMPRESSOR RELAY
A-22	(2-B)	WHEEL SPEED SENSOR (FRONT: LH) <ABS>

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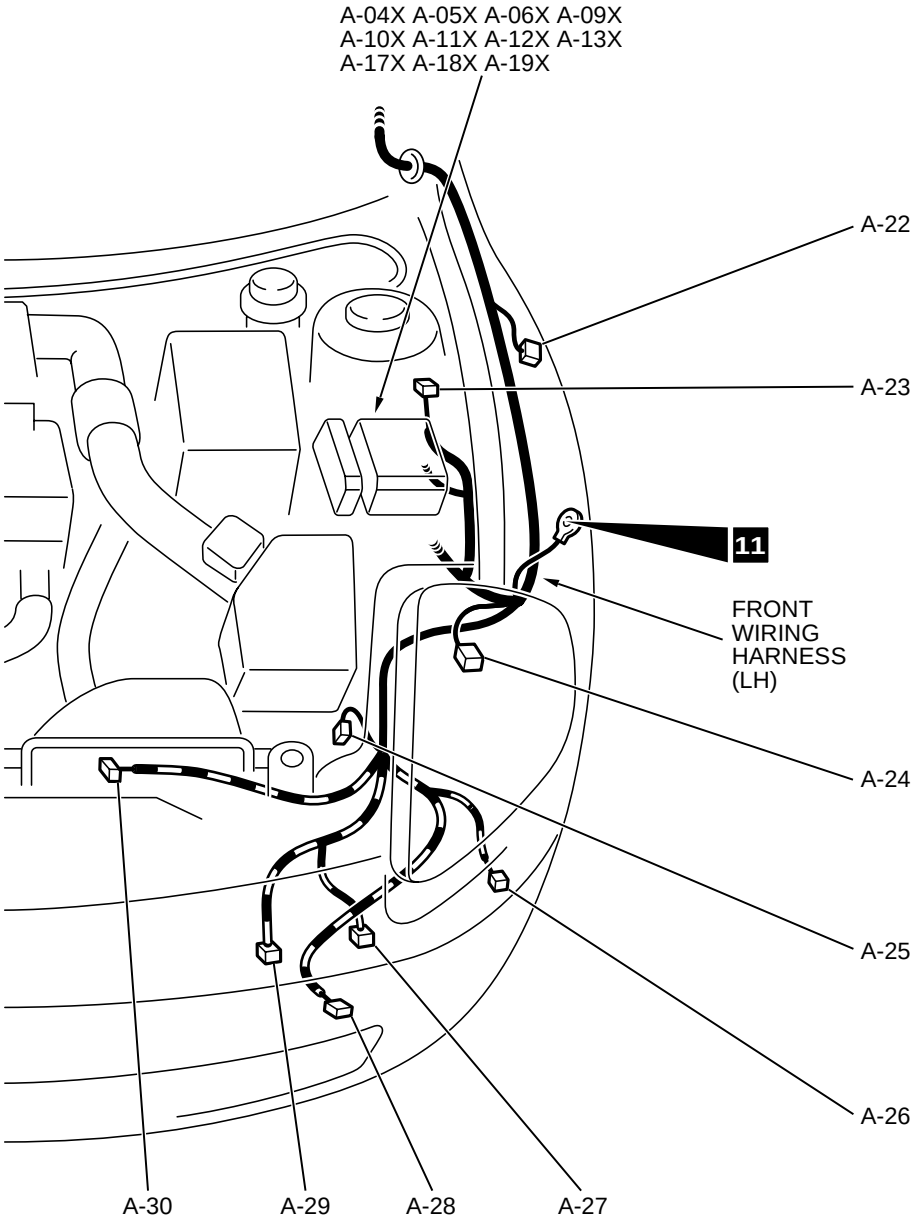

CONNECTOR COLOR CODE
B: BLACK
BR: BROWN
G: GREEN
GR: GRAY
L: BLUE
NONE: MILK WHITE
O: ORANGE
R: RED
V: VIOLET
Y: YELLOW

AC106133AB

A-23	(2)	HOOD SWITCH <THEFT-ALARM SYSTEM>
A-24	(3-B)	HEADLIGHT (LH)
A-25	(1-B)	THEFT-ALARM HORN <THEFT-ALARM SYSTEM>
A-26	(3-B)	FRONT COMBINATION LIGHT (LH)
A-27	(1-B)	HORN
A-28	(2-B)	FOG LIGHT (LH)
A-29	(2-B)	AMBIENT TEMPERATURE SENSOR <MULTI CENTER DISPLAY>
A-30	(3-GR)	FAN CONTROLLER
A-31	(2-B)	FOG LIGHT (RH)
A-32	(3-B)	FRONT COMBINATION LIGHT (RH)
A-33	(2-B)	WINDSHIELD WASHER MOTOR
A-34	(2)	REAR WASHER MOTOR <ECLIPSE>
A-35	(3-B)	HEADLIGHT (RH)
A-36	(2-BR)	DUAL PRESSURE SWITCH <A/C>
A-37	(2-B)	WHEEL SPEED SENSOR (FRONT: RH) <ABS>

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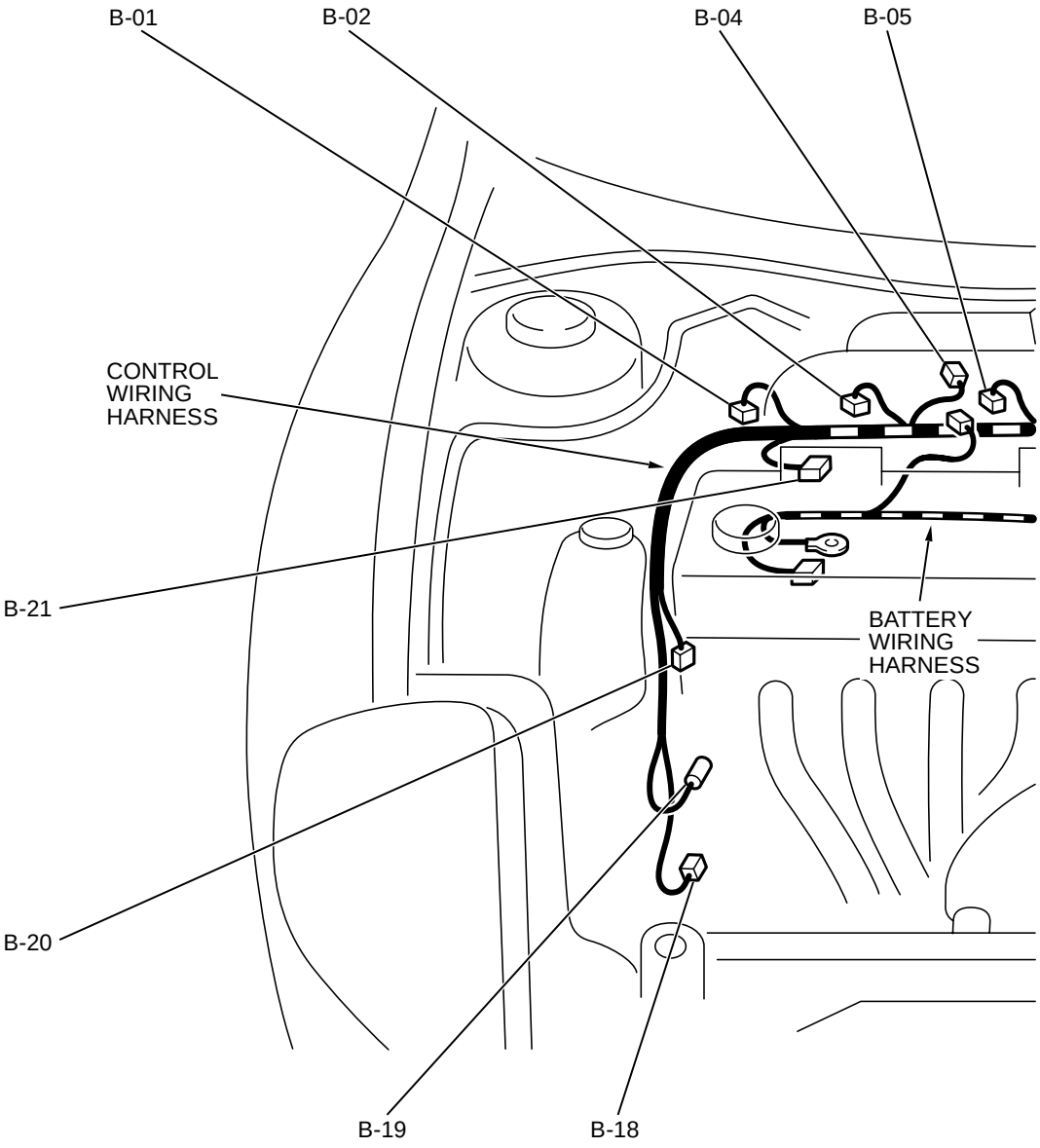
ENGINE AND TRANSAXLE <2.4L ENGINE>

M1801000400270

Connector symbol

B -01 thru -21

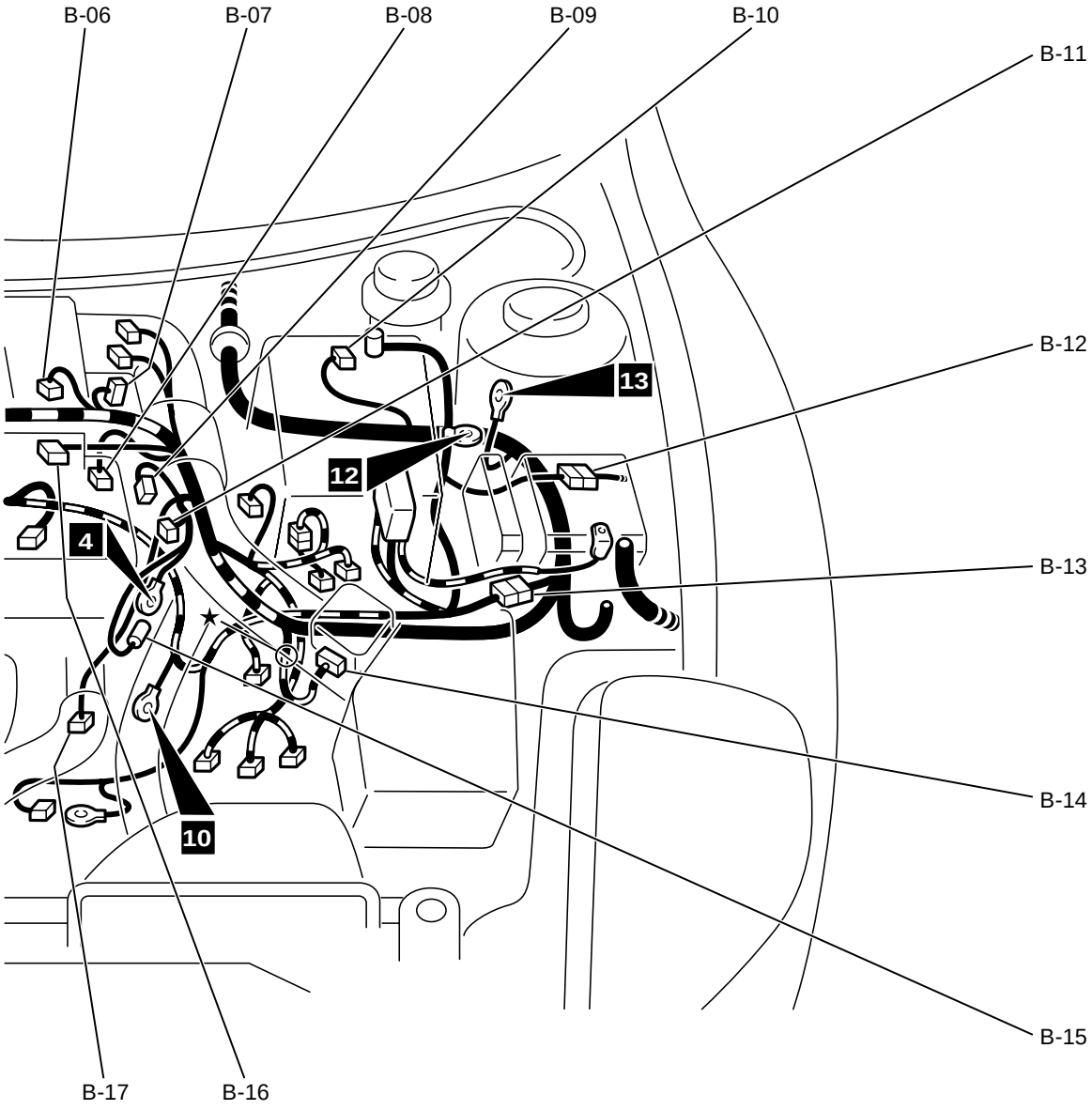


CONNECTOR COLOR CODE
B: BLACK
BR: BROWN
G: GREEN
GR: GRAY
L: BLUE
NONE: MILK WHITE
O: ORANGE
R: RED
V: VIOLET
Y: YELLOW

AC106134 AB

B-01	(2-GR)	INJECTOR 1
B-02	(2-GR)	INJECTOR 2
B-04	(3-B)	MANIFOLD DIFFERENTIAL PRESSURE SENSOR
B-05	(2-GR)	INJECTOR 3
B-06	(2-GR)	INJECTOR 4
B-07	(4-B)	THROTTLE POSITION SENSOR
B-08	(1-B)	ENGINE COOLANT TEMPERATURE GAUGE UNIT
B-09	(3-B)	CAMSHAFT POSITION SENSOR
B-10	(2-B)	BRAKE FLUID LEVEL SWITCH
B-11	(2-B)	ENGINE COOLANT TEMPERATURE SENSOR

TSB Revision



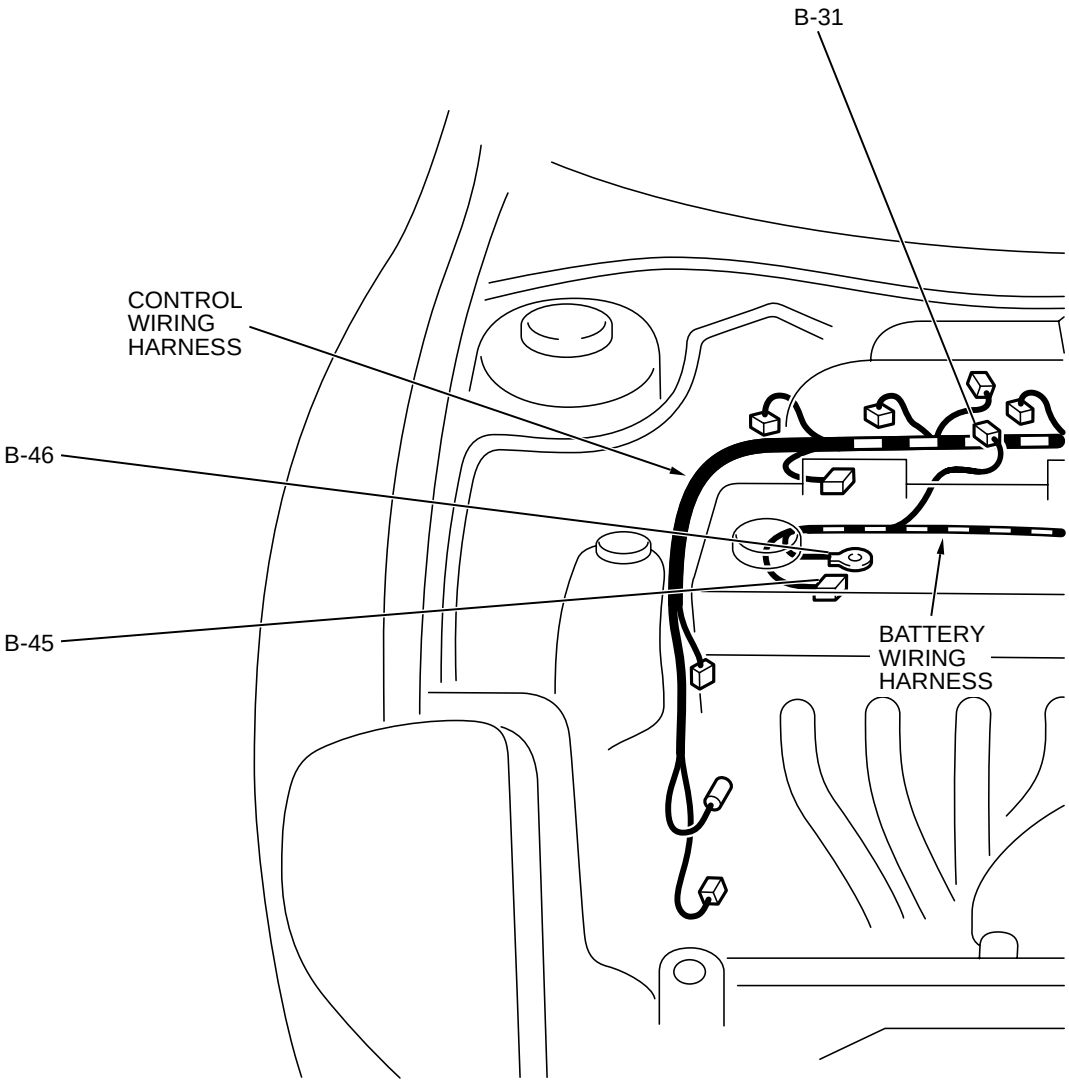
AC106114 AB

B-12	(4-B)	FRONT WIRING HARNESS (LH) AND BATTERY WIRING HARNESS COMBINATION
B-13	(8-B)	CONTROL WIRING HARNESS AND BATTERY WIRING HARNESS COMBINATION
B-14	(7-B)	VOLUME AIR FLOW SENSOR
B-15	(1-B)	CAPACITOR
B-16	(3-GR)	IGNITION COIL 1
B-17	(4-B)	HEATED OXYGEN SENSOR (FRONT)
B-18	(1-B)	A/C COMPRESSOR ASSEMBLY
B-19	(1)	POWER STEERING PRESSURE SWITCH
B-20	(3-B)	CRANKSHAFT POSITION SENSOR
B-21	(3-GR)	IGNITION COIL 2

ENGINE AND TRANSAXLE <2.4L ENGINE> (CONTINUED)

Connector symbol

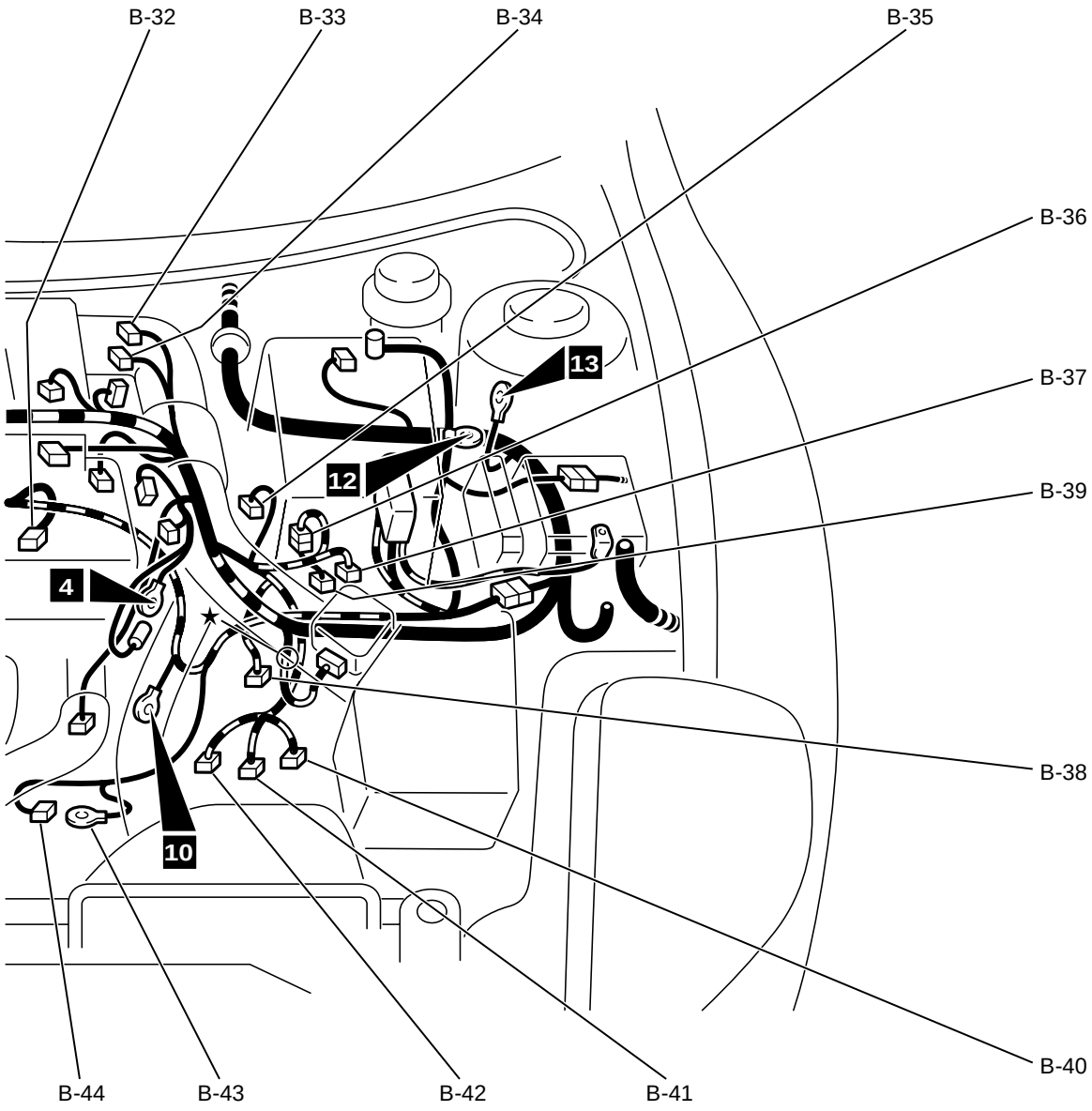
B -31 thru -46



CONNECTOR COLOR CODE
B: BLACK
BR: BROWN
G: GREEN
GR: GRAY
L: BLUE
NONE: MILK WHITE
O: ORANGE
R: RED
V: VIOLET
Y: YELLOW

AC106134 AC

B-31	(2-BR)	EGR SOLENOID VALVE
B-32	(1-B)	OIL PRESSURE SWITCH
B-33	(2-B)	EVAPORATIVE EMISSION PURGE SOLENOID VALVE
B-34	(6-B)	IDLE AIR CONTROL MOTOR
B-35	(2-GR)	KNOCK SENSOR
B-36	(3-B)	CONTROL WIRING HARNESS AND VEHICLE SPEED SENSOR WIRING HARNESS COMBINATION <M/T>
B-37	(2-B)	BACKUP LIGHT SWITCH <M/T>
B-38	(3-GR)	OUTPUT SHAFT SPEED SENSOR <A/T>
B-39	(3-B)	VEHICLE SPEED SENSOR <M/T>

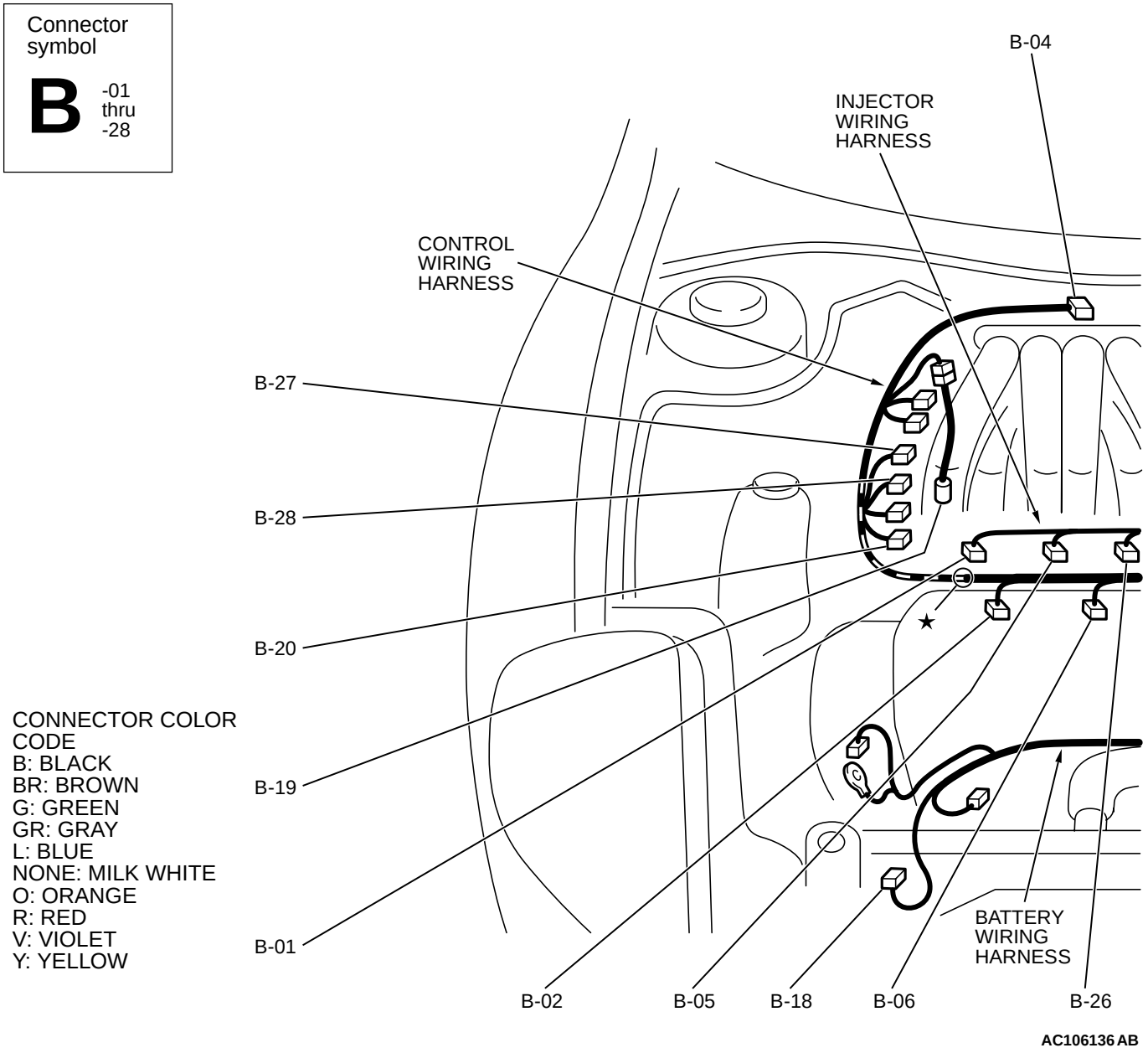


AC106114AC

B-40	(10-GR)	A/T CONTROL SOLENOID VALVE ASSEMBLY
B-41	(10-B)	PARK/NEUTRAL POSITION SWITCH <A/T>
B-42	(3-B)	INPUT SHAFT SPEED SENSOR <A/T>
B-43	(1)	STARTER
B-44	(1-B)	STARTER
B-45	(4-GR)	GENERATOR
B-46	(1)	GENERATOR

ENGINE AND TRANSAXLE <3.0L ENGINE (WITHOUT VARIABLE INDUCTION CONTROL (VIC) SYSTEM) >

M1801000400281



AC106136 AB

B-01	(2-GR)	INJECTOR 1
B-02	(2-GR)	INJECTOR 2
B-04	(3-B)	MANIFOLD DIFFERENTIAL PRESSURE SENSOR
B-05	(2-GR)	INJECTOR 3
B-06	(2-GR)	INJECTOR 4
B-07	(4-B)	THROTTLE POSITION SENSOR
B-08	(1-B)	ENGINE COOLANT TEMPERATURE GAUGE UNIT
B-10	(2-B)	BRAKE FLUID LEVEL SWITCH
B-11	(2-B)	ENGINE COOLANT TEMPERATURE SENSOR
B-12	(4-B)	FRONT WIRING HARNESS (LH) AND BATTERY WIRING HARNESS COMBINATION
B-13	(8-B)	CONTROL WIRING HARNESS AND BATTERY WIRING HARNESS COMBINATION

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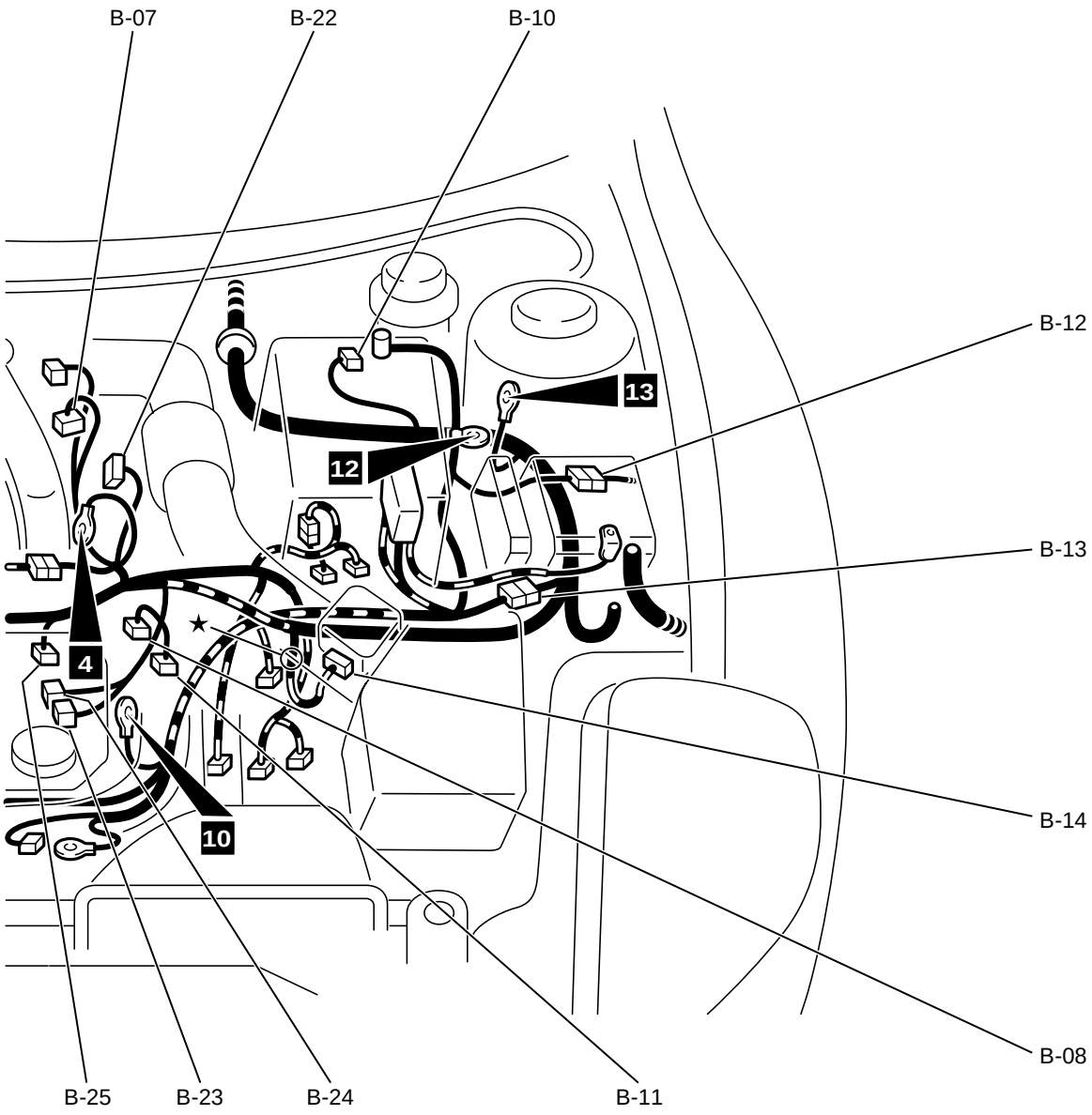
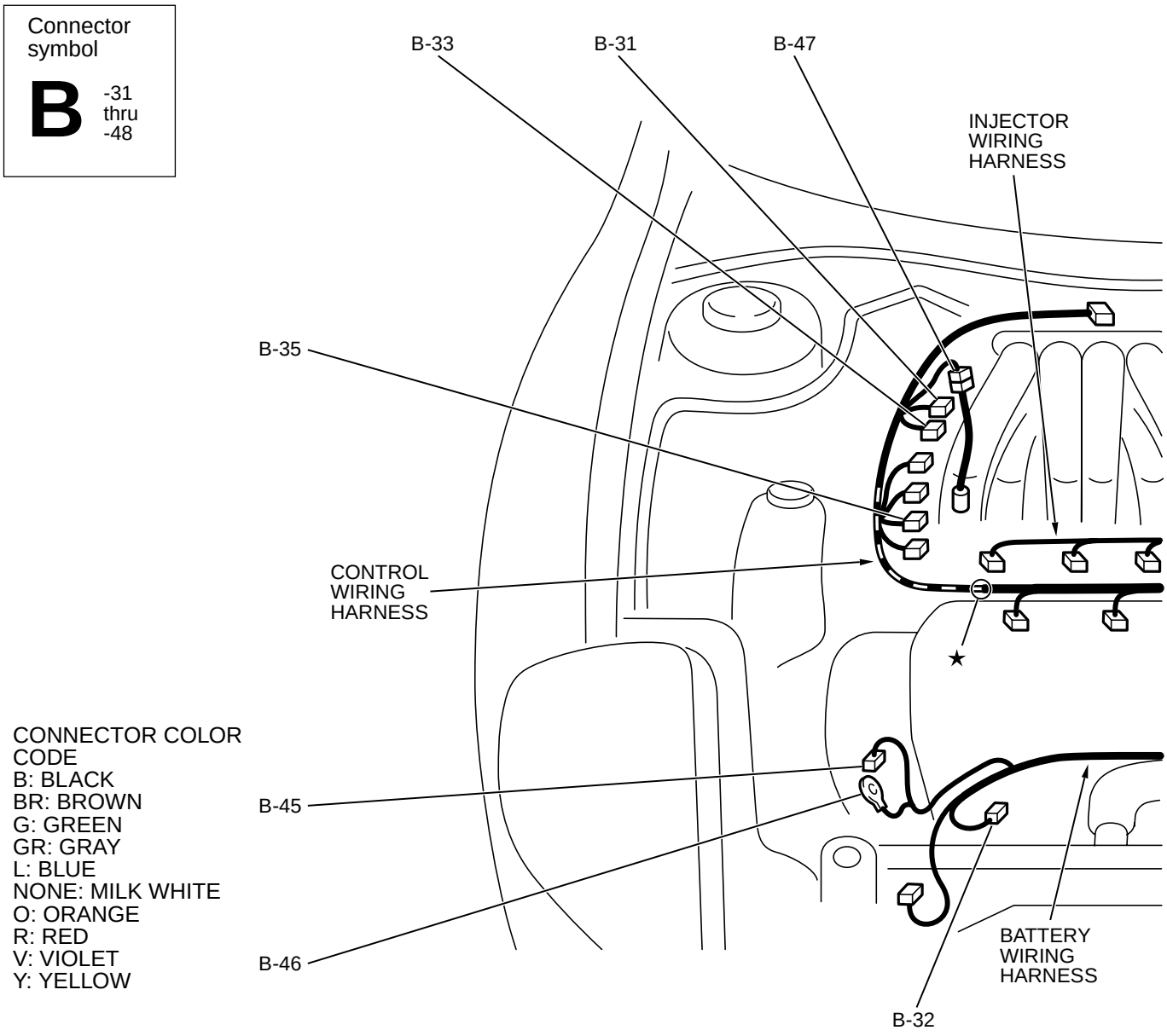


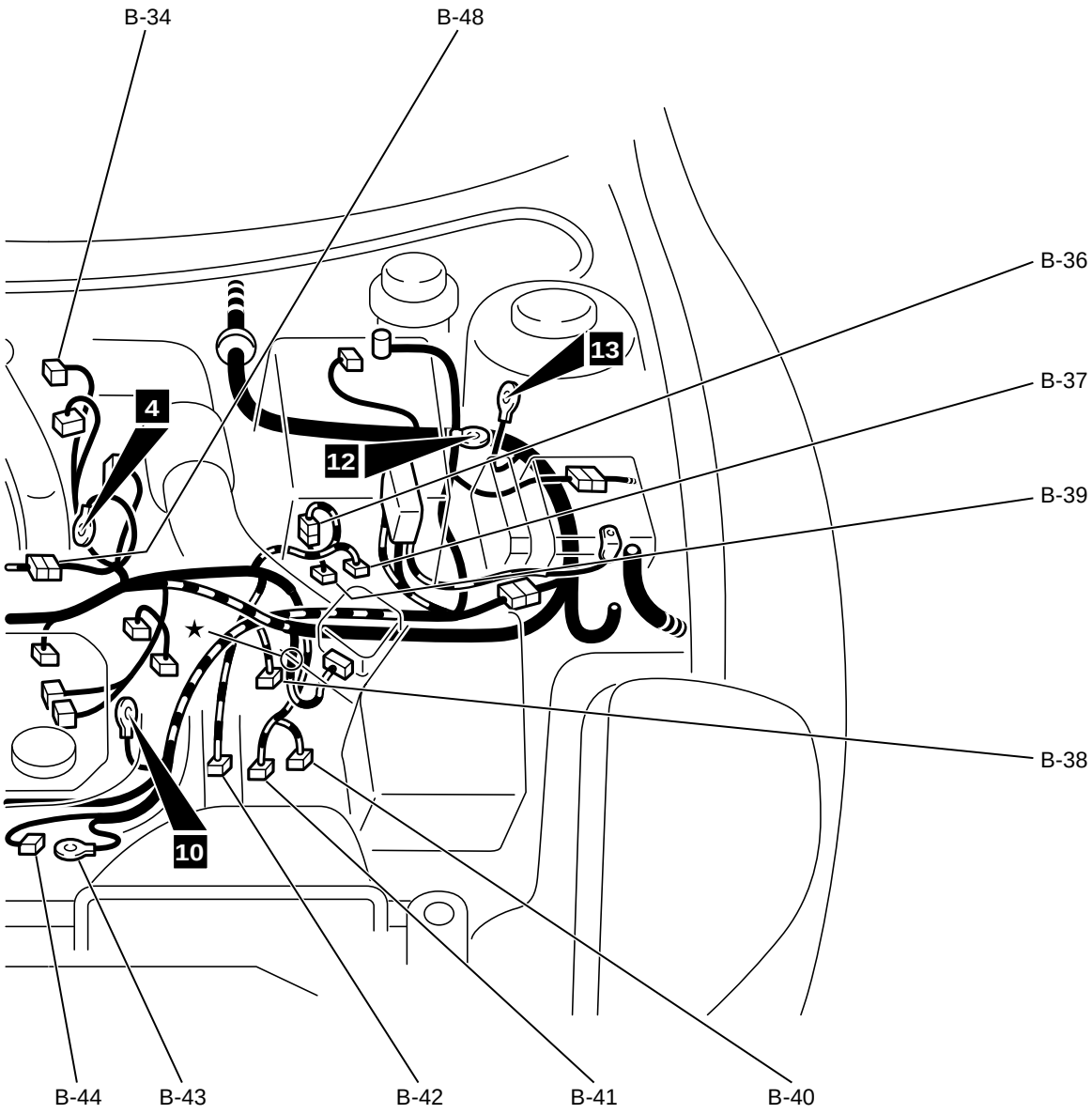
AC106137AB

B-14	(7-B)	VOLUME AIR FLOW SENSOR
B-18	(4-B)	A/C COMPRESSOR ASSEMBLY
B-19	(1)	POWER STEERING PRESSURE SWITCH
B-20	(3-B)	CRANKSHAFT POSITION SENSOR
B-22	(7-B)	DISTRIBUTOR ASSEMBLY
B-23	(4-GR)	LEFT BANK HEATED OXYGEN SENSOR (REAR)
B-24	(4-B)	LEFT BANK HEATED OXYGEN SENSOR (FRONT)
B-25	(2-GR)	INJECTOR 6
B-26	(2-GR)	INJECTOR 5
B-27	(4-B)	RIGHT BANK HEATED OXYGEN SENSOR (FRONT)
B-28	(4-GR)	RIGHT BANK HEATED OXYGEN SENSOR (REAR)

ENGINE AND TRANSAXLE <3.0L ENGINE (WITHOUT VARIABLE INDUCTION CONTROL (VIC) SYSTEM) > (CONTINUED)



B-31	(2-BR)	EGR SOLENOID VALVE
B-32	(1-B)	OIL PRESSURE SWITCH
B-33	(2-B)	EVAPORATIVE EMISSION PURGE SOLENOID VALVE
B-34	(6-B)	IDLE AIR CONTROL MOTOR
B-35	(2-GR)	KNOCK SENSOR
B-36	(3-B)	CONTROL WIRING HARNESS AND VEHICLE SPEED SENSOR WIRING HARNESS COMBINATION <M/T>
B-37	(2-B)	BACKUP LIGHT SWITCH <M/T>
B-38	(3-GR)	OUTPUT SHAFT SPEED SENSOR <A/T>
B-39	(3-B)	VEHICLE SPEED SENSOR <M/T>
B-40	(10-GR)	A/T CONTROL SOLENOID VALVE ASSEMBLY
B-41	(10-B)	PARK/NEUTRAL POSITION SWITCH <A/T>



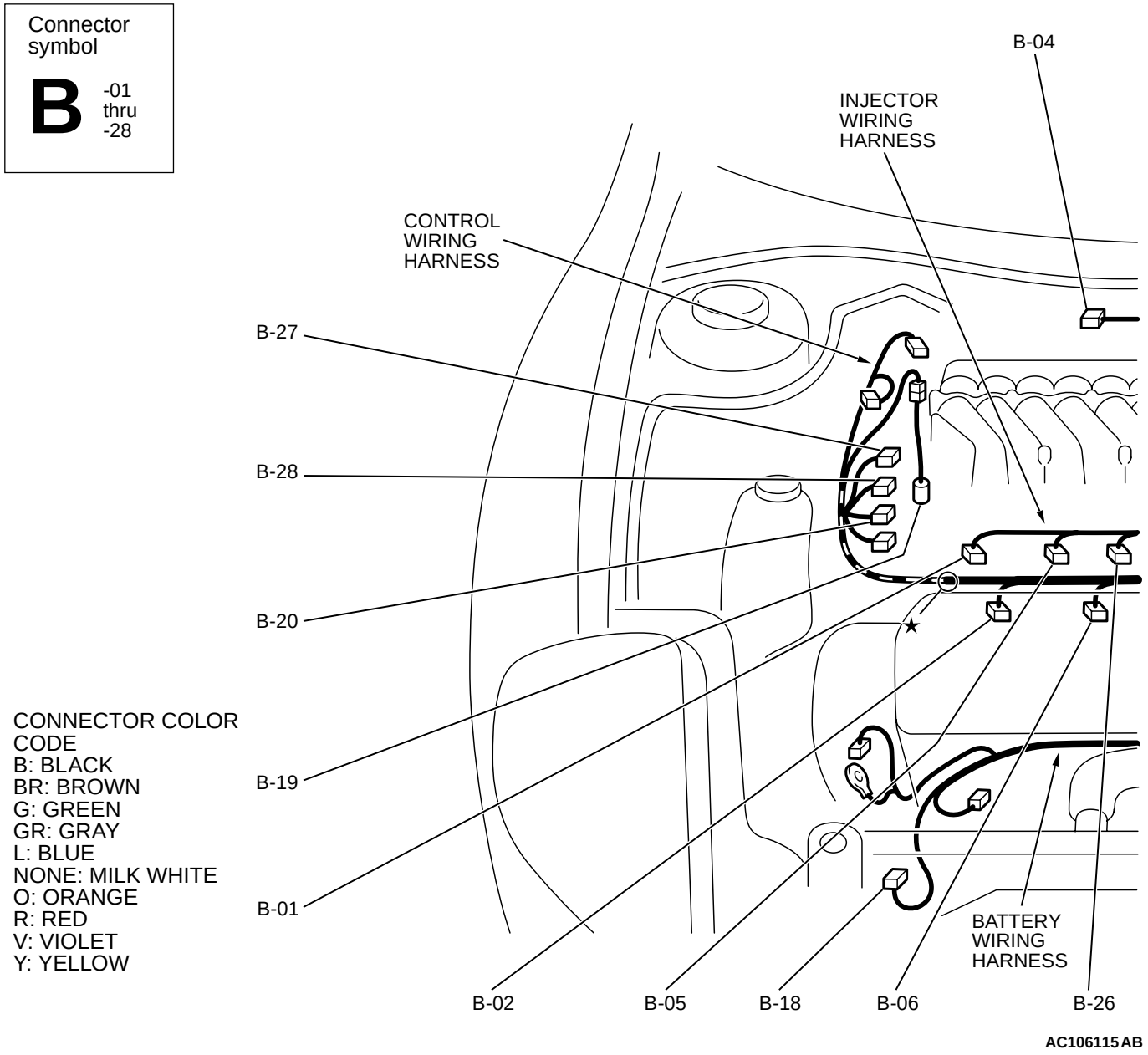
AC106137 AC

B-42	(3-B)	INPUT SHAFT SPEED SENSOR <A/T>
B-43	(1)	STARTER
B-44	(1-B)	STARTER
B-45	(4-GR)	GENERATOR
B-46	(1)	GENERATOR
B-47	(1-B)	CONTROL WIRING HARNESS AND POWER STEERING WIRING HARNESS COMBINATION
B-48	(4-B)	CONTROL WIRING HARNESS AND INJECTOR WIRING HARNESS COMBINATION

TSB Revision

ENGINE AND TRANSAXLE <3.0L ENGINE (WITH VARIABLE INDUCTION CONTROL (VIC) SYSTEM) >

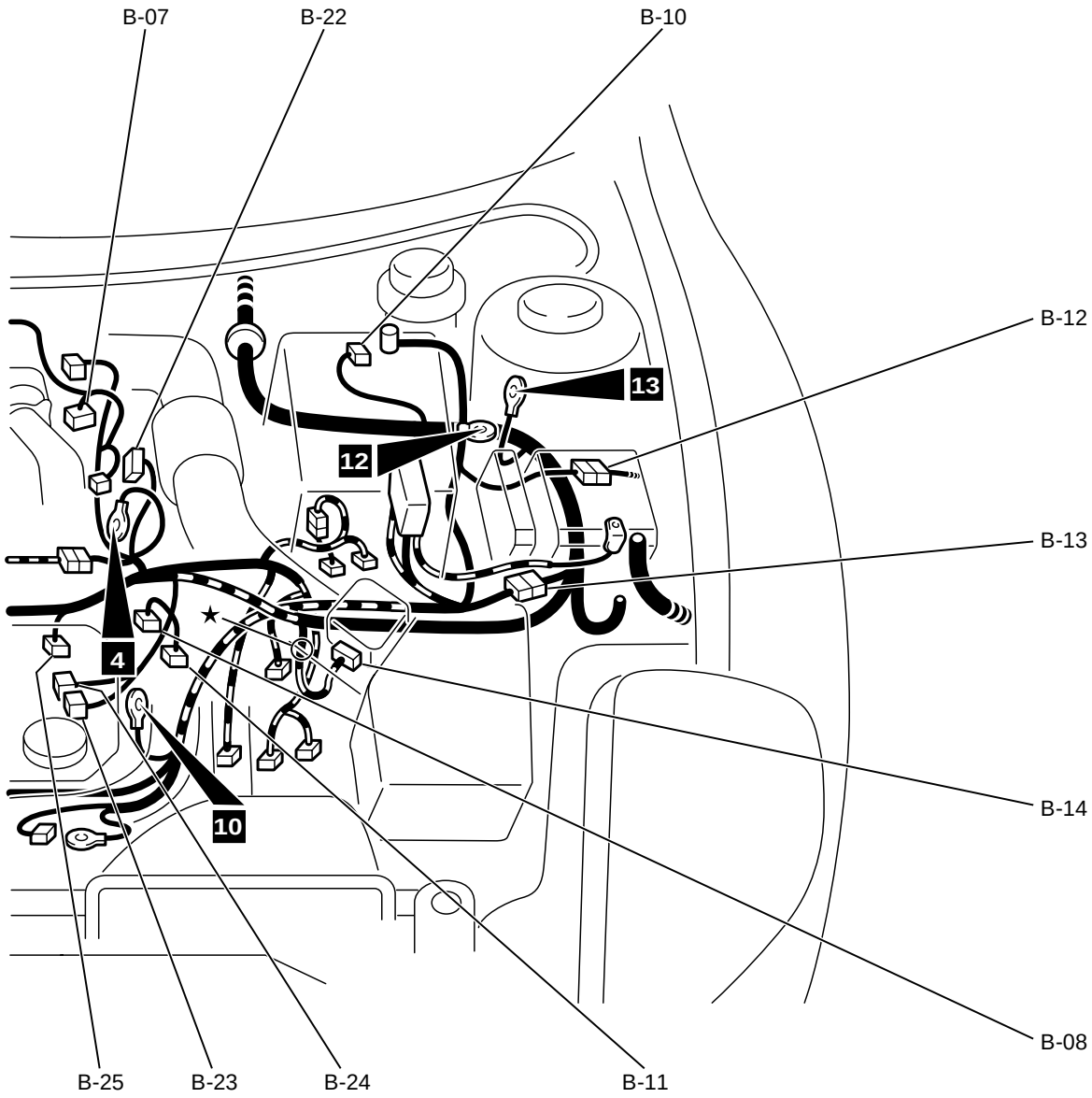
M1801000400292



AC106115AB

B-01	(2-GR)	INJECTOR 1
B-02	(2-GR)	INJECTOR 2
B-04	(3-B)	MANIFOLD DIFFERENTIAL PRESSURE SENSOR
B-05	(2-GR)	INJECTOR 3
B-06	(2-GR)	INJECTOR 4
B-07	(4-B)	THROTTLE POSITION SENSOR
B-08	(1-B)	ENGINE COOLANT TEMPERATURE GAUGE UNIT
B-10	(2-B)	BRAKE FLUID LEVEL SWITCH
B-11	(2-B)	ENGINE COOLANT TEMPERATURE SENSOR
B-12	(4-B)	FRONT WIRING HARNESS (LH) AND BATTERY WIRING HARNESS COMBINATION
B-13	(8-B)	CONTROL WIRING HARNESS AND BATTERY WIRING HARNESS COMBINATION

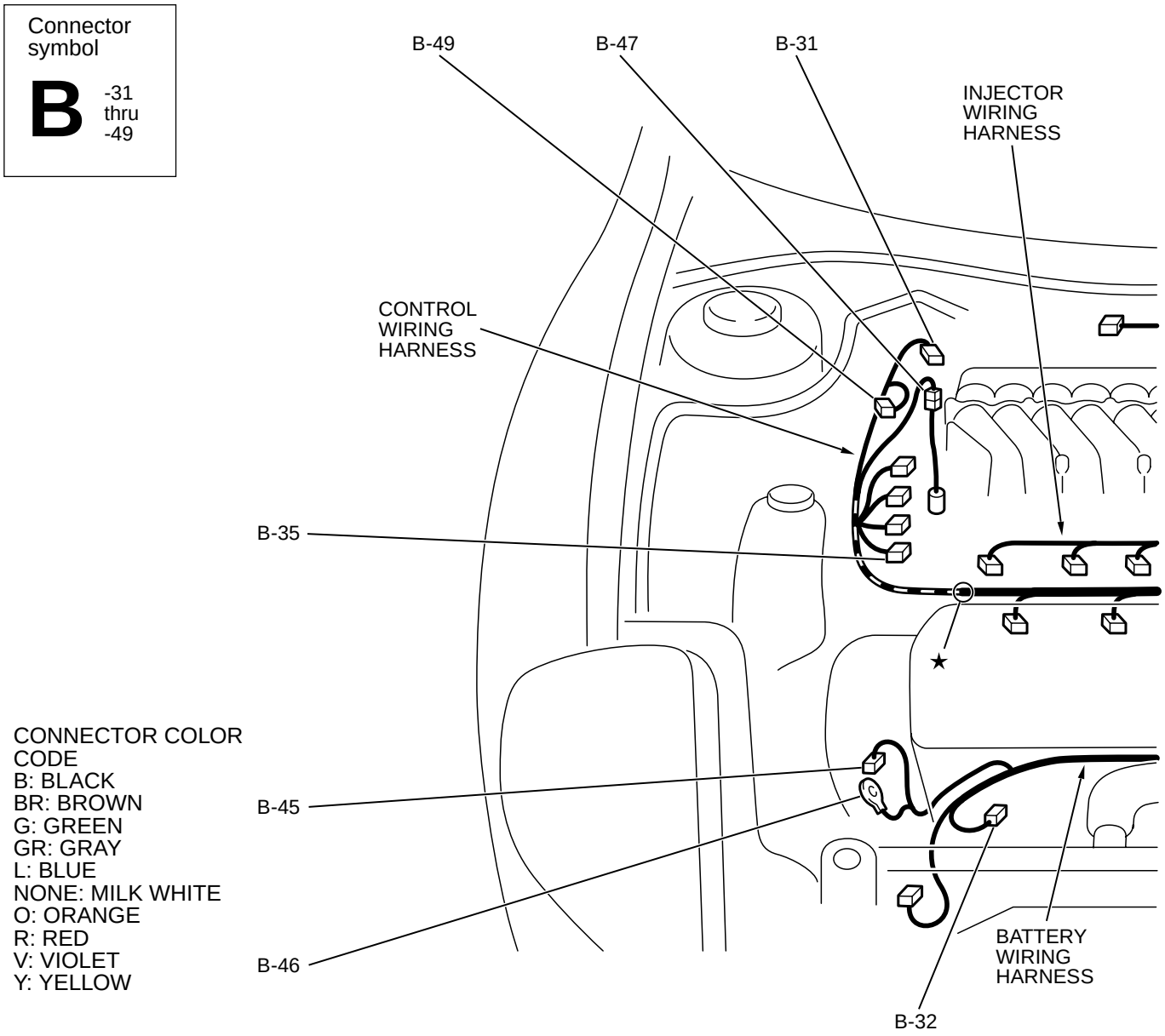
TSB Revision



AC106116 AB

B-14	(7-B)	VOLUME AIR FLOW SENSOR
B-18	(4-B)	A/C COMPRESSOR ASSEMBLY
B-19	(1)	POWER STEERING PRESSURE SWITCH
B-20	(3-B)	CRANKSHAFT POSITION SENSOR
B-22	(7-B)	DISTRIBUTOR ASSEMBLY
B-23	(4-GR)	LEFT BANK HEATED OXYGEN SENSOR (REAR)
B-24	(4-B)	LEFT BANK HEATED OXYGEN SENSOR (FRONT)
B-25	(2-GR)	INJECTOR 6
B-26	(2-GR)	INJECTOR 5
B-27	(4-B)	RIGHT BANK HEATED OXYGEN SENSOR (FRONT)
B-28	(4-GR)	RIGHT BANK HEATED OXYGEN SENSOR (REAR)

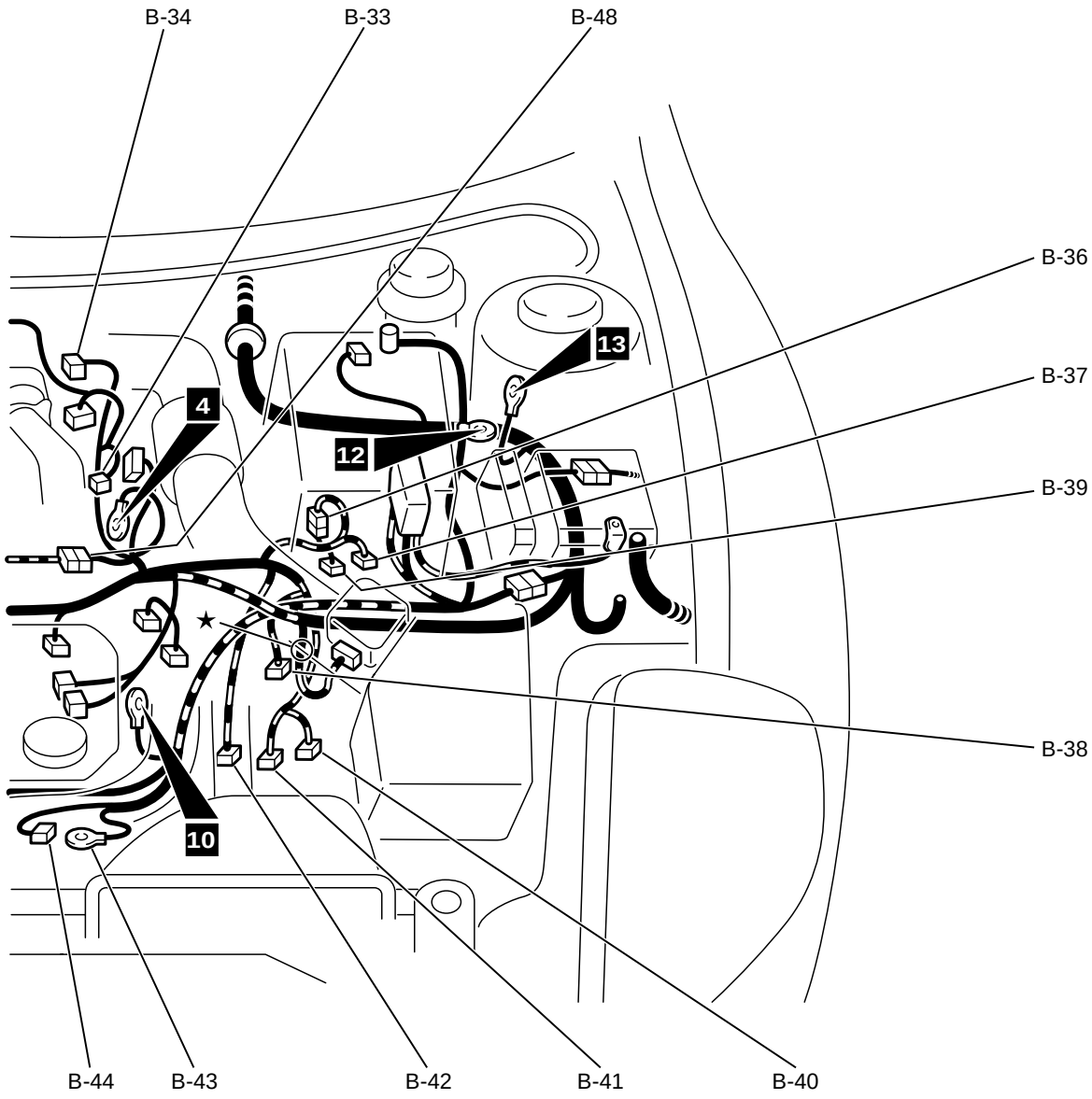
ENGINE AND TRANSAXLE <3.0L ENGINE (WITH VARIABLE INDUCTION CONTROL (VIC) SYSTEM) > (CONTINUED)



AC106115 AC

B-31	(2-BR)	EGR SOLENOID VALVE
B-32	(1-B)	OIL PRESSURE SWITCH
B-33	(2-B)	EVAPORATIVE EMISSION PURGE SOLENOID VALVE
B-34	(6-B)	IDLE AIR CONTROL MOTOR
B-35	(2-GR)	KNOCK SENSOR
B-36	(3-B)	CONTROL WIRING HARNESS AND VEHICLE SPEED SENSOR WIRING HARNESS COMBINATION <M/T>
B-37	(2-B)	BACKUP LIGHT SWITCH <M/T>
B-38	(3-GR)	OUTPUT SHAFT SPEED SENSOR <A/T>
B-39	(3-B)	VEHICLE SPEED SENSOR <M/T>
B-40	(10-GR)	A/T CONTROL SOLENOID VALVE ASSEMBLY
B-41	(10-B)	PARK/NEUTRAL POSITION SWITCH <A/T>

TSB Revision



AC106116 AC

B-42	(3-B)	INPUT SHAFT SPEED SENSOR <A/T>
B-43	(1)	STARTER
B-44	(1-B)	STARTER
B-45	(4-GR)	GENERATOR
B-46	(1)	GENERATOR
B-47	(1-B)	CONTROL WIRING HARNESS AND POWER STEERING WIRING HARNESS COMBINATION
B-48	(4-B)	CONTROL WIRING HARNESS AND INJECTOR WIRING HARNESS COMBINATION
B-49	(2-B)	VARIABLE INDUCTION CONTROL SOLENOID VALVE

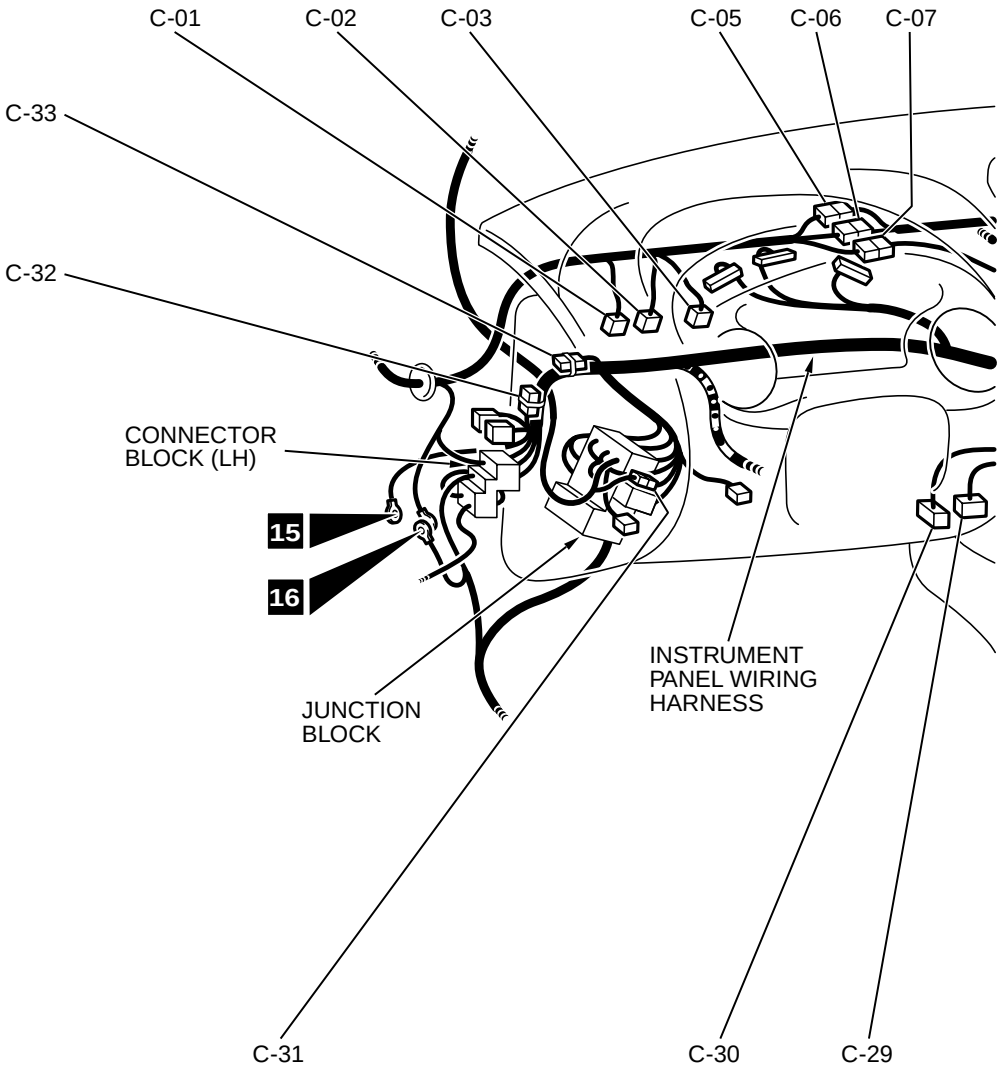
TSB Revision

DASH PANEL

M1801000600348

Connector symbol

C -01 thru -40

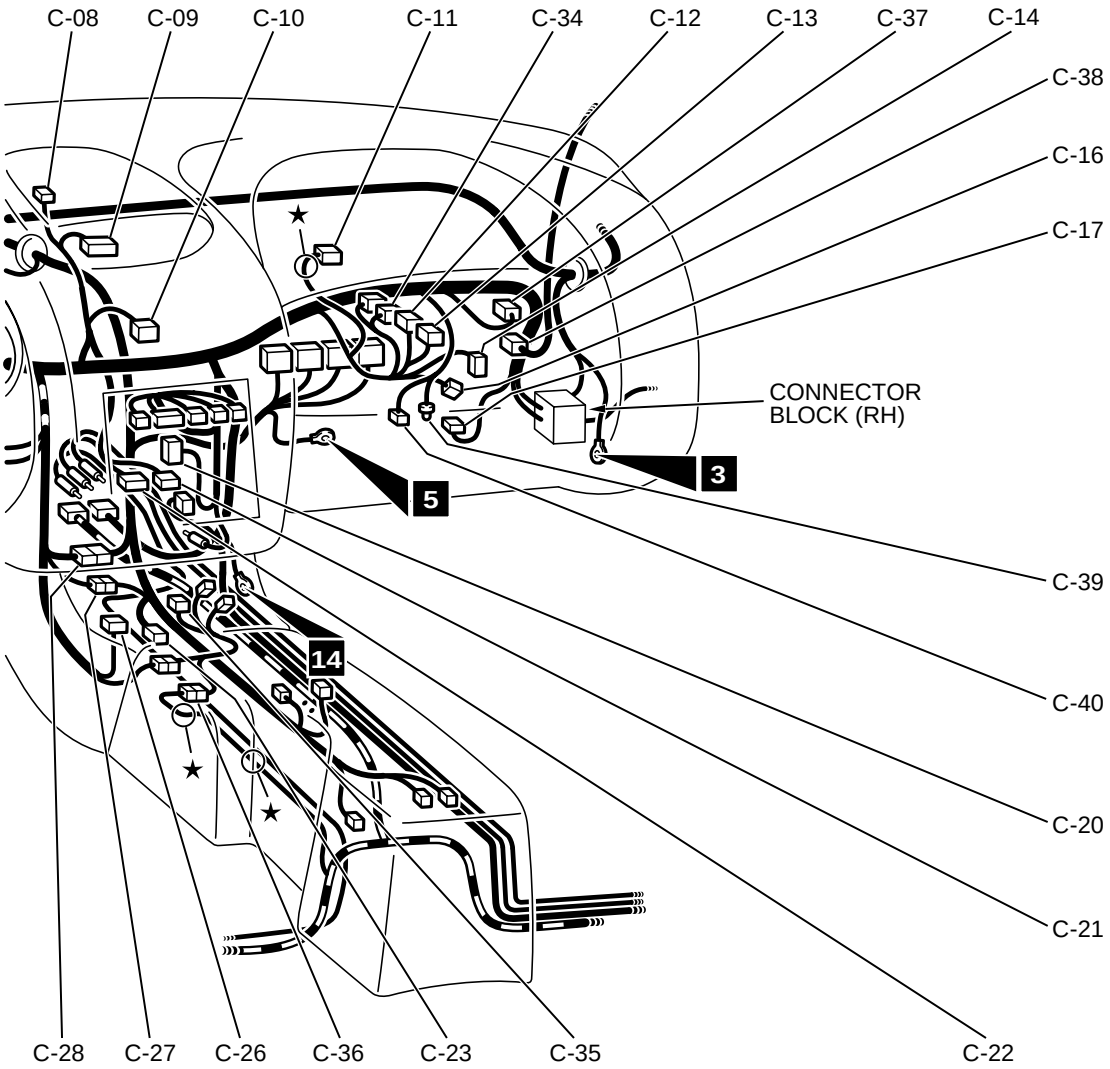


CONNECTOR COLOR CODE
B: BLACK
BR: BROWN
G: GREEN
GR: GRAY
L: BLUE
NONE: MILK WHITE
O: ORANGE
R: RED
V: VIOLET
Y: YELLOW

AC101831AD

C-01	(4)	CLUTCH PEDAL POSITION SWITCH <AUTO-CRUISE CONTROL SYSTEM (M/T)>
C-02	(2)	INTERLOCK SWITCH <M/T>
C-03	(4)	STOPLIGHT SWITCH
C-05	(2-B)	FRONT WIRING HARNESS (LH) AND FRONT WIRING HARNESS (RH) COMBINATION <ABS>
C-06	(18)	FRONT WIRING HARNESS (LH) AND FRONT WIRING HARNESS (RH) COMBINATION
C-07	(8)	FRONT WIRING HARNESS (LH) AND CONTROL WIRING HARNESS COMBINATION
C-08	(2)	CENTER SPEAKER
C-09	(20)	MULTI CENTER DISPLAY UNIT
C-10	(4)	HAZARD WARNING SWITCH
C-11	(2-R)	AIR BAG MODULE (SQUIB) (PASSENGER'S SIDE)
C-12	(20-B)	AUTOMATIC COMPRESSOR CONTROLLER <A/C>
C-13	(8-B)	AUTOMATIC COMPRESSOR CONTROLLER <A/C (3.0L ENGINE)>
C-14	(7)	OUTSIDE/INSIDE AIR SELECTION DAMPER CONTROL MOTOR
C-16	(4)	BLOWER RESISTOR
C-17	(2)	BLOWER MOTOR
C-20	(16-B)	AUTO-CRUISE CONTROL-ECU
C-21	(8)	RADIO, TAPE PLAYER, CD PLAYER AND CD AUTO CHANGER
C-22	(14)	RADIO, TAPE PLAYER, CD PLAYER AND CD AUTO CHANGER

TSB Revision



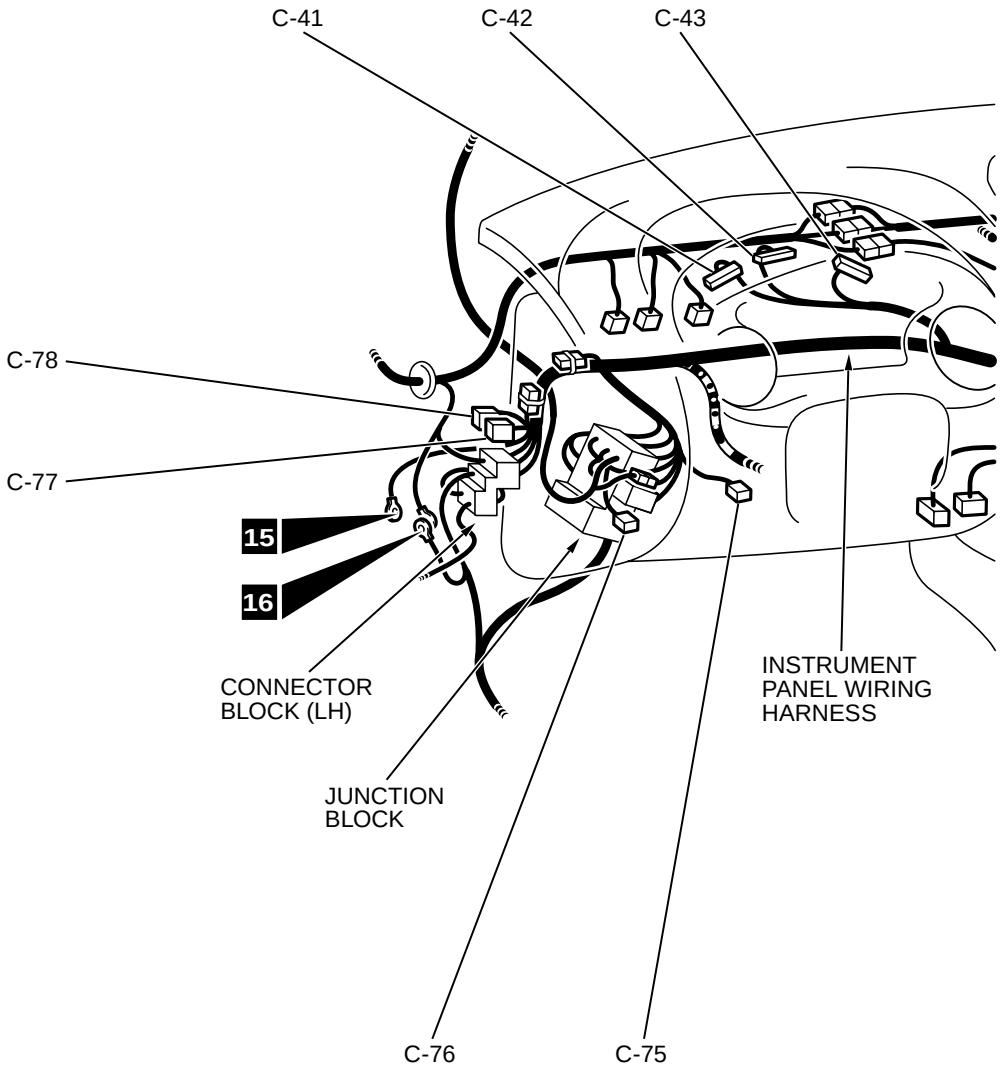
AC106117 AB

C-23	(6)	HEATED OXYGEN SENSOR (REAR) <2.4L ENGINE>
C-26	(9)	REMOTE CONTROLLED MIRROR SWITCH <ECLIPSE SPYDER>
C-27	(10)	INSTRUMENT PANEL WIRING HARNESS AND CONTROL WIRING HARNESS COMBINATION <SPORT MODE TYPE A/T>
C-28	(38)	INSTRUMENT PANEL WIRING HARNESS AND CONTROL WIRING HARNESS COMBINATION
C-29	(16-B)	DATA LINK CONNECTOR
C-30	(12)	DATA LINK CONNECTOR
C-31	(4)	INSTRUMENT PANEL WIRING HARNESS AND ROOF WIRING HARNESS COMBINATION <ECLIPSE (SUNROOF) >
C-32	(1)	JUMPER CONNECTOR <THEFT-ALARM SYSTEM>
C-33	(1)	JUMPER CONNECTOR <THEFT-ALARM SYSTEM>
C-34	(2)	THERMISTOR SENSOR <HEATER AND A/C>
C-35	(8-B)	CONVERTIBLE TOP SWITCH <ECLIPSE SPYDER>
C-36	(2)	FLOOR WIRING HARNESS AND CONSOLE WIRING HARNESS COMBINATION <ECLIPSE SPYDER>
C-37	(8-B)	COMPASS-ECU <MULTI CENTER DISPLAY>
C-38	(6)	COMPASS-ECU <MULTI CENTER DISPLAY>
C-39	(2)	GLOVE BOX LIGHT
C-40	(2)	GLOVE BOX LIGHT SWITCH

TSB Revision

DASH PANEL (CONTINUED)

Connector symbol
C -41 thru -79, -121 thru -122



CONNECTOR COLOR CODE
B: BLACK
BR: BROWN
G: GREEN
GR: GRAY
L: BLUE
NONE: MILK WHITE
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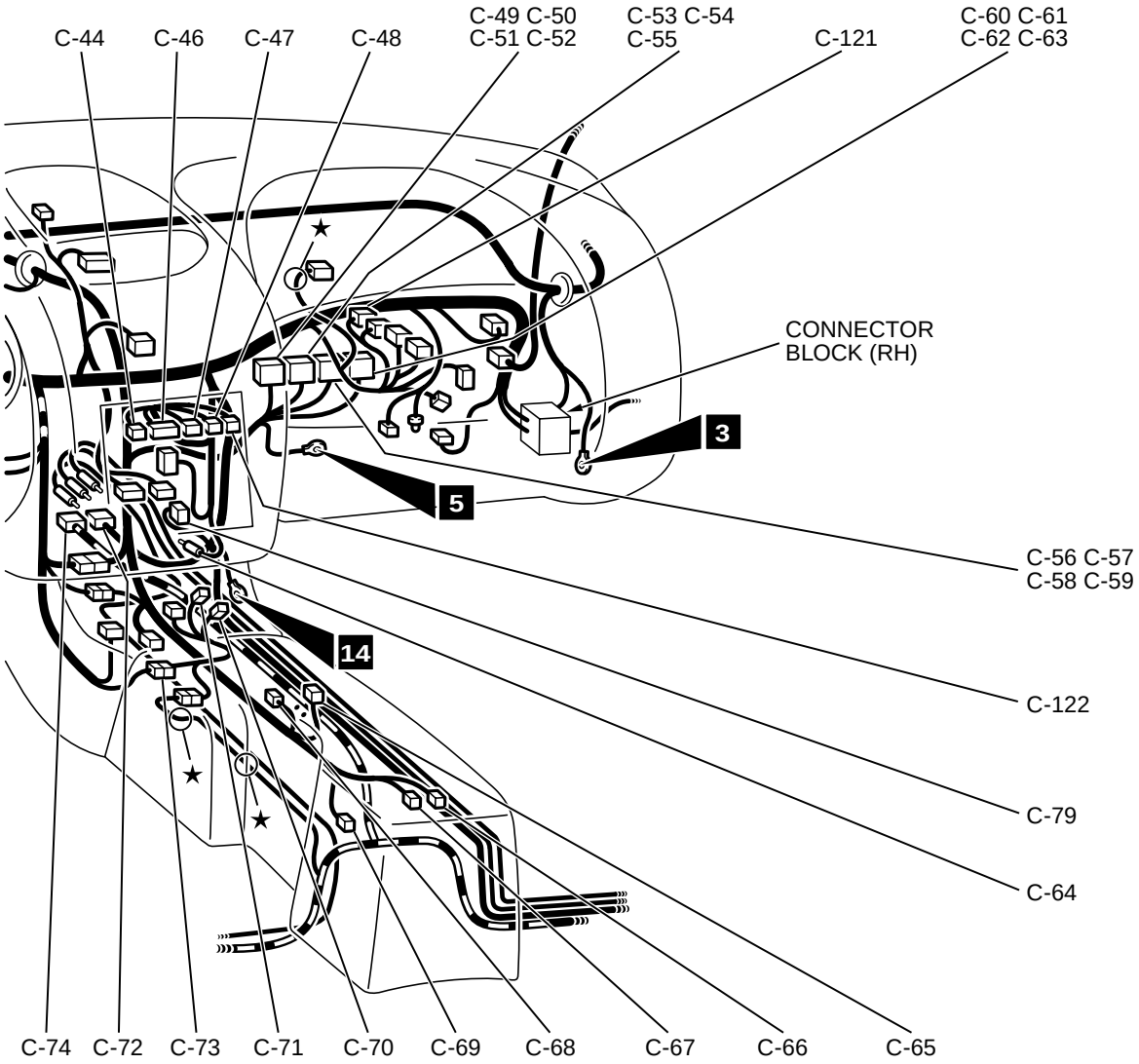
V: VIOLET
Y: YELLOW

AC101831AE

C-41	(16-B)	COMBINATION METER
C-42	(14)	COMBINATION METER
C-43	(16)	COMBINATION METER
C-44	(2)	HEATER CONTROL PANEL ILLUMINATION LIGHT
C-46	(12)	A/C SWITCH
C-47	(3)	DEFROSTER SWITCH
C-48	(6)	BLOWER SWITCH
C-49	(26-G)	ENGINE CONTROL MODULE <2.4L ENGINE-M/T>
C-50	(35-GR)	POWERTRAIN CONTROL MODULE <2.4L ENGINE-A/T>
C-51	(35-GR)	ENGINE CONTROL MODULE <3.0L ENGINE-M/T>
C-52	(35-GR)	POWERTRAIN CONTROL MODULE <3.0L ENGINE-A/T>
C-53	(16-G)	ENGINE CONTROL MODULE <2.4L ENGINE-M/T>
C-54	(26-GR)	POWERTRAIN CONTROL MODULE <2.4L ENGINE-A/T>
C-55	(26-GR)	POWERTRAIN CONTROL MODULE <3.0L ENGINE-A/T>
C-56	(12-G)	ENGINE CONTROL MODULE <2.4L ENGINE-M/T>
C-57	(28-GR)	POWERTRAIN CONTROL MODULE <2.4L ENGINE-A/T>
C-58	(28-GR)	ENGINE CONTROL MODULE <3.0L ENGINE-M/T>
C-59	(28-GR)	POWERTRAIN CONTROL MODULE <3.0L ENGINE-A/T>
C-60	(22-G)	ENGINE CONTROL MODULE <2.4L ENGINE-M/T>

TSB Revision



AC106117 AC

C-61 (30-GR) POWERTRAIN CONTROL MODULE <2.4L ENGINE-A/T>
C-62 (30-GR) ENGINE CONTROL MODULE <3.0L ENGINE-M/T>
C-63 (30-GR) POWERTRAIN CONTROL MODULE <3.0L ENGINE-A/T>
C-64 (2) ASHTRAY ILLUMINATION LIGHT
C-65 (6) SHIFT SWITCH ASSEMBLY <WITH SPORT MODE TYPE A/T>
C-66 (1) ACCESSORY SOCKET
C-67 (1-B) ACCESSORY SOCKET
C-68 (2) A/T SELECTOR LEVER POSITION ILLUMINATION LIGHT <WITHOUT SPORT MODE TYPE A/T>
C-69 (1-B) PARKING BRAKE SWITCH
C-70 (1-B) CIGARETTE LIGHTER
C-71 (1) CIGARETTE LIGHTER
C-72 (16-Y) SRS-ECU
C-73 (3) INSTRUMENT PANEL WIRING HARNESS AND CONSOLE WIRING HARNESS COMBINATION
C-74 (22-Y) SRS-ECU <WITH SIDE AIR BAG>
C-75 (3) RHEOSTAT
C-76 (7) FOG LIGHT SWITCH
C-77 (33) JOINT CONNECTOR (1)
C-78 (33) JOINT CONNECTOR (2)
C-79 (12) IMMOBILIZER-ECU
C-121 (7) WATER SHUT VALVE MOTOR <ECLIPSE>
C-122 (8) WATER SHUT VALVE CONTROLLER <ECLIPSE>

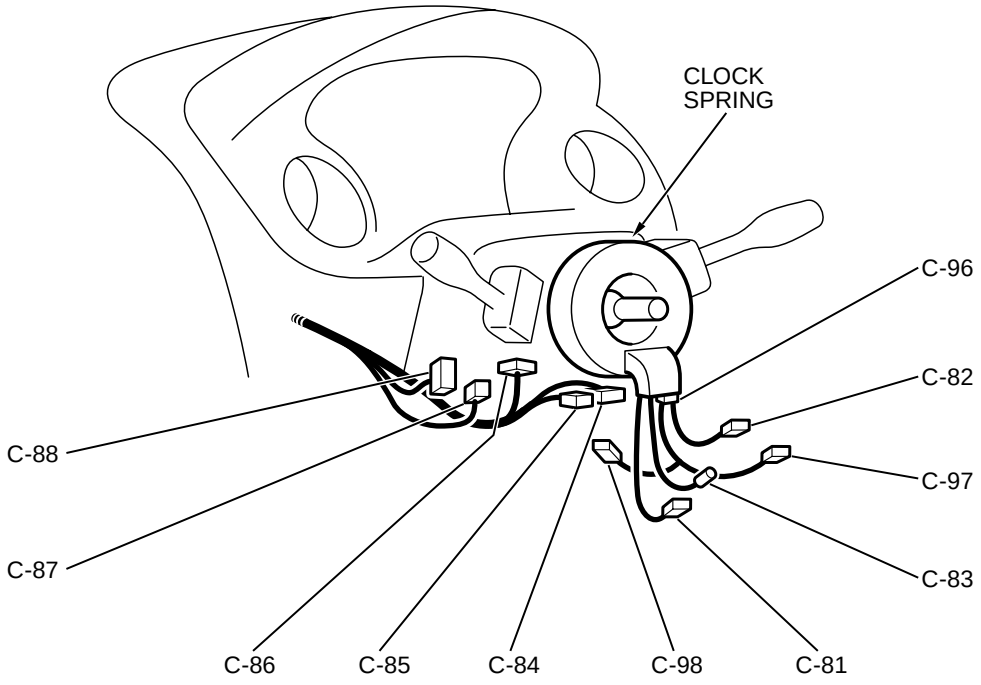
TSB Revision

DASH PANEL (CONTINUED)

Connector symbol

C -81 thru -98

STEERING COLUMN

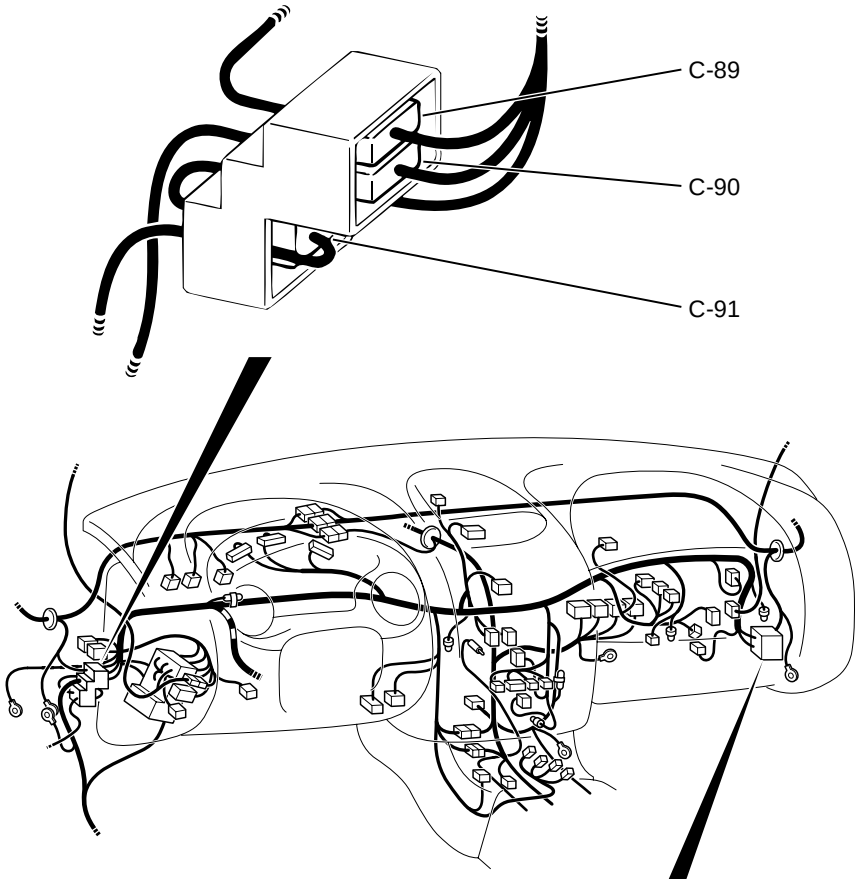


AC106118 AB

C-81	(2)	AIR BAG MODULE (SQUIB) (DRIVER'S SIDE)
C-82	(3)	AUTO-CRUISE CONTROL SWITCH
C-83	(1)	HORN SWITCH
C-84	(6-B)	CLOCK SPRING
C-85	(4-Y)	CLOCK SPRING
C-86	(10)	COLUMN SWITCH
C-87	(6)	IGNITION SWITCH
C-88	(7)	KEY REMINDER SWITCH
C-89	(38)	INSTRUMENT PANEL WIRING HARNESS AND FRONT WIRING HARNESS (LH) COMBINATION
C-90	(43)	INSTRUMENT PANEL WIRING HARNESS AND FLOOR WIRING HARNESS COMBINATION

TSB Revision

CONNECTOR BLOCK (LH)



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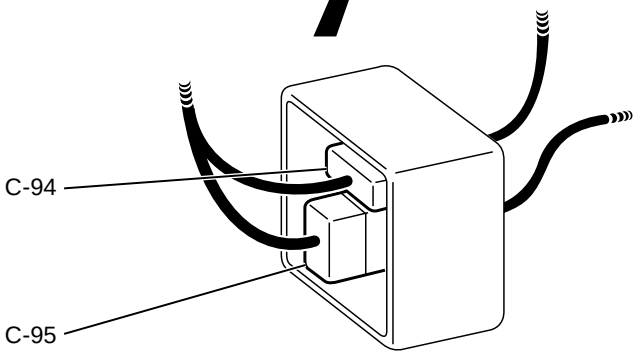
CONNECTOR BLOCK (RH)



ACX02057AG

C-91	(32-B)	INSTRUMENT PANEL WIRING HARNESS AND DOOR WIRING HARNESS (LH) COMBINATION
C-94	(20)	INSTRUMENT PANEL WIRING HARNESS AND FRONT WIRING HARNESS (RH) COMBINATION
C-95	(32)	INSTRUMENT PANEL WIRING HARNESS AND DOOR WIRING HARNESS (RH) COMBINATION
C-96	(5)	CLOCK SPRING AND CLOCK SPRING WIRING HARNESS COMBINATION
C-97	(2)	REMOTE CONTROLLED RADIO SWITCH (RH)
C-98	(2)	REMOTE CONTROLLED RADIO SWITCH (LH)

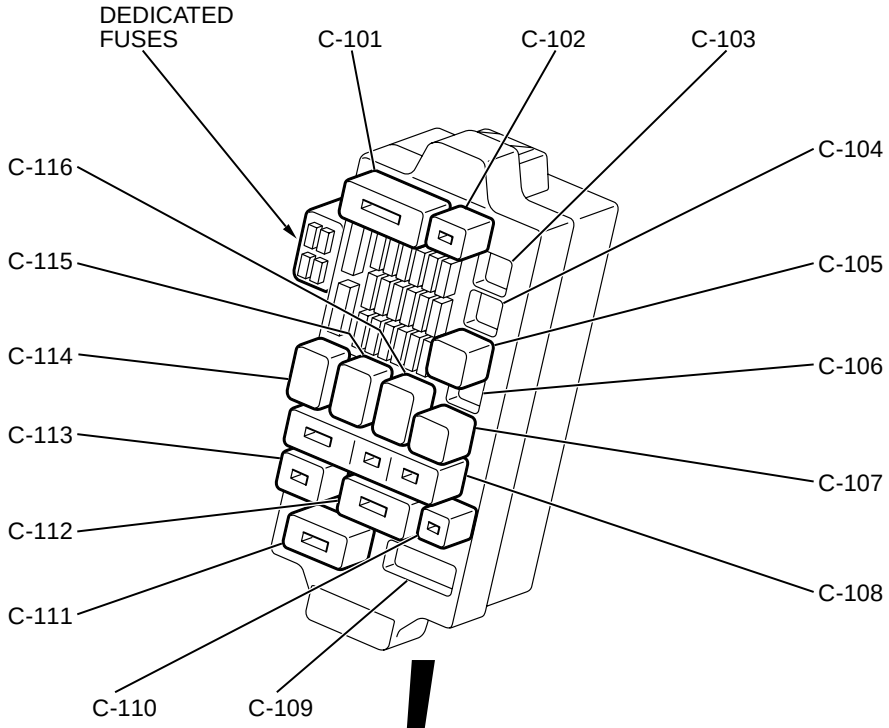
TSB Revision

DASH PANEL (CONTINUED)

Connector symbol

C -101 thru -119

JUNCTION BLOCK (FRONT VIEW)



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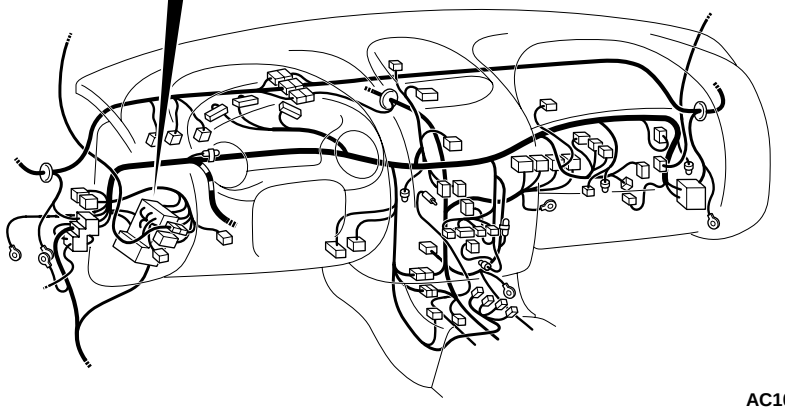
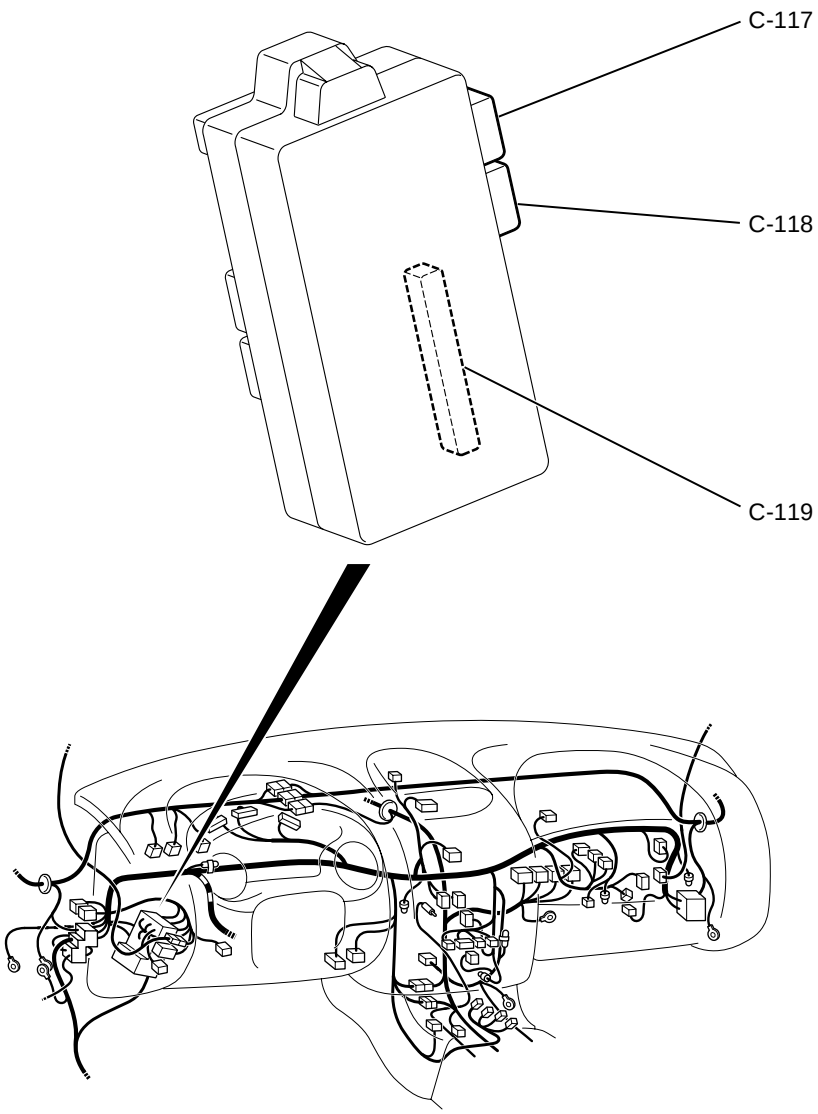


AC106139AB

C-101	(15)	FLOOR WIRING HARNESS AND JUNCTION BLOCK COMBINATION
C-102	(3)	ROOF WIRING HARNESS AND JUNCTION BLOCK COMBINATION
C-103	(4)	NO CONNECTION
C-104	(4)	NO CONNECTION
C-105	(4)	FUEL PUMP RELAY (2)
C-106	(4)	NO CONNECTION
C-107	(4)	FUEL PUMP RELAY (1)
C-108	(28)	INSTRUMENT PANEL WIRING HARNESS AND JUNCTION BLOCK COMBINATION
C-109	(13)	NO CONNECTION
C-110	(2)	INSTRUMENT PANEL WIRING HARNESS AND JUNCTION BLOCK COMBINATION

JUNCTION BLOCK (REAR VIEW)

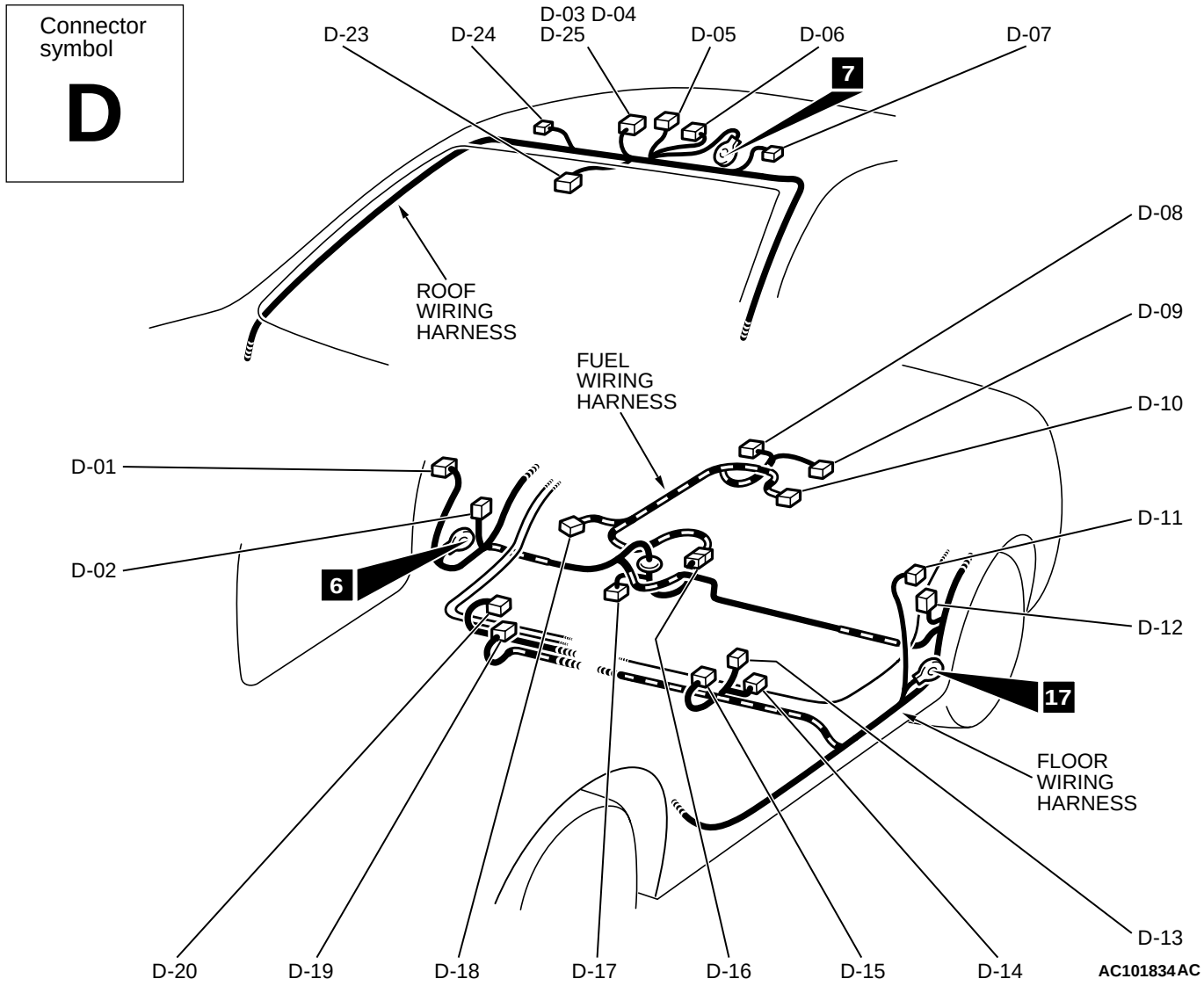


AC106140 AB

C-111	(6)	INSTRUMENT PANEL WIRING HARNESS AND JUNCTION BLOCK COMBINATION
C-112	(14)	INSTRUMENT PANEL WIRING HARNESS AND JUNCTION BLOCK COMBINATION
C-113	(1-B)	INSTRUMENT PANEL WIRING HARNESS AND JUNCTION BLOCK COMBINATION
C-114	(5)	DEFOGGER RELAY
C-115	(5)	BLOWER RELAY
C-116	(5)	POWER WINDOW RELAY
C-117	(24)	ETACS-ECU
C-118	(24-GR)	ETACS-ECU
C-119	(20)	ETACS-ECU

FLOOR AND ROOF <ECLIPSE>

M1801000900286

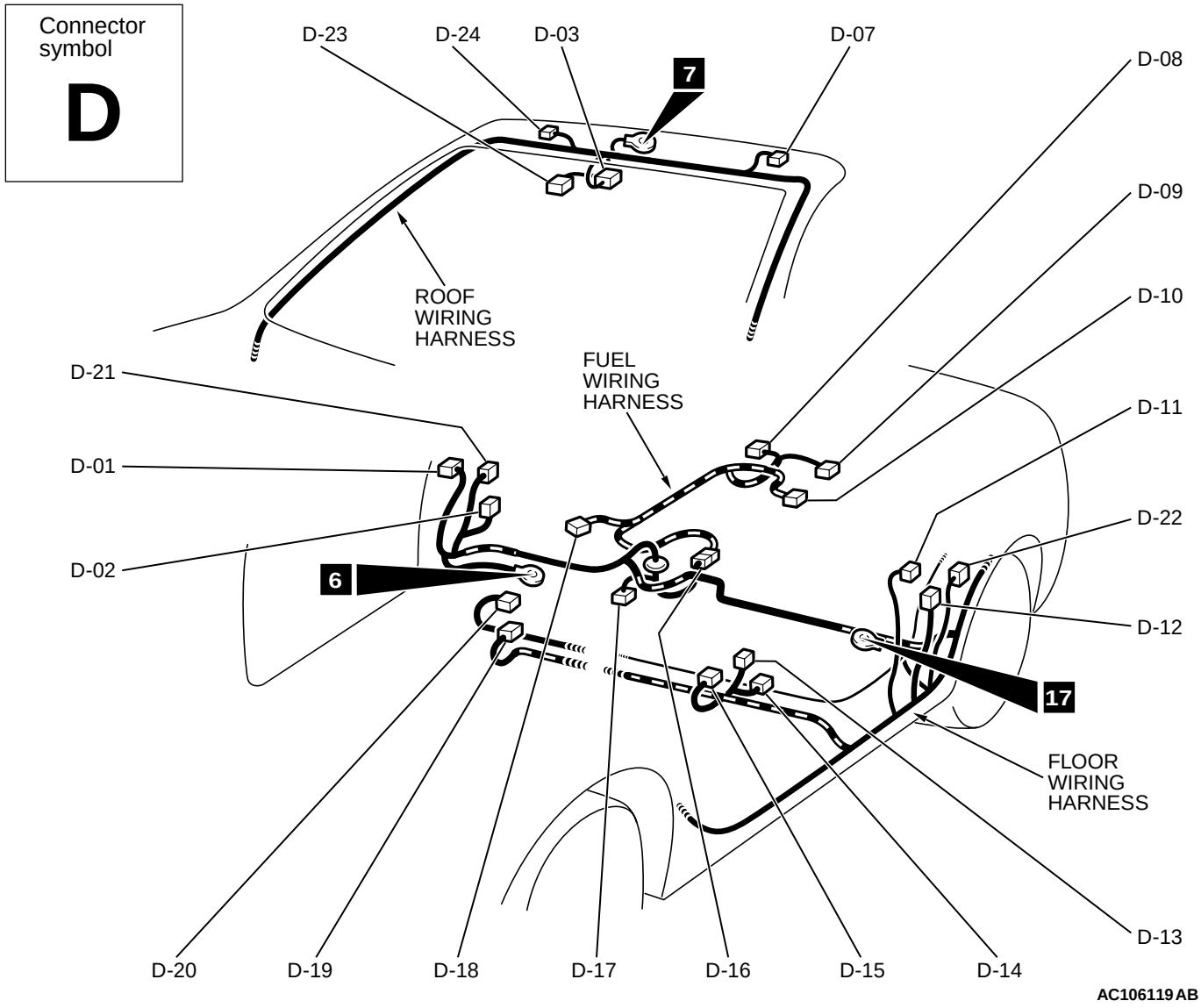


D-01	(3)	DOOR SWITCH (RH)
D-02	(2)	SIDE IMPACT SENSOR (RH) <WITH SIDE AIR BAG>
D-03	(7-B)	DOME LIGHT ASSEMBLY <WITH SUNROOF, WITHOUT VANITY MIRROR LIGHT>
D-04	(3)	DOME LIGHT ASSEMBLY <WITHOUT SUNROOF>
D-05	(6-B)	SUNROOF SWITCH
D-06	(10)	SUNROOF ASSEMBLY
D-07	(2)	VANITY MIRROR LIGHT (LH)
D-08	(2-GR)	WHEEL SPEED SENSOR (REAR: RH) <ABS>
D-09	(2-B)	WHEEL SPEED SENSOR (REAR: LH) <ABS>
D-10	(2-B)	EVAPORATIVE EMISSION VENTILATION SOLENOID
D-11	(3)	DOOR SWITCH (LH)
D-12	(2)	SIDE IMPACT SENSOR (LH) <WITH SIDE AIR BAG>
D-13	(2)	SEAT BELT SWITCH
D-14	(2)	POWER SEAT ASSEMBLY
D-15	(2-R)	SIDE AIR BAG MODULE (SQUIB) (LH)
D-16	(10-B)	FLOOR WIRING HARNESS AND FUEL WIRING HARNESS COMBINATION
D-17	(5-GR)	FUEL PUMP MODULE
D-18	(3-B)	FUEL TANK DIFFERENTIAL PRESSURE SENSOR
D-19	(2-R)	SIDE AIR BAG MODULE (SQUIB) (RH)
D-20	(18)	AMPLIFIER <7-SPEAKER SYSTEM>
D-23	(5-B)	COMPASS SENSOR <MULTI CENTER DISPLAY>
D-24	(2)	VANITY MIRROR LIGHT (RH)
D-25	(7-B)	DOME LIGHT ASSEMBLY <WITH SUNROOF AND VANITY MIRROR LIGHT>

TSB Revision

FLOOR AND WINDSHIELD APERTURE <ECLIPSE SPYDER>

M1801000900297



D-01	(3)	DOOR SWITCH (RH)
D-02	(2)	SIDE IMPACT SENSOR (RH) <WITH SIDE AIR BAG>
D-03	(7-B)	DOME LIGHT ASSEMBLY
D-07	(2)	VANITY MIRROR LIGHT (LH)
D-08	(2-GR)	WHEEL SPEED SENSOR (REAR: RH) <ABS>
D-09	(2-B)	WHEEL SPEED SENSOR (REAR: LH) <ABS>
D-10	(2-B)	EVAPORATIVE EMISSION VENTILATION SOLENOID
D-11	(3)	DOOR SWITCH (LH)
D-12	(2)	SIDE IMPACT SENSOR (LH) <WITH SIDE AIR BAG>
D-13	(2)	SEAT BELT SWITCH
D-14	(2)	POWER SEAT ASSEMBLY
D-15	(2-R)	SIDE AIR BAG MODULE (SQUIB) (LH)
D-16	(10-B)	FLOOR WIRING HARNESS AND FUEL WIRING HARNESS COMBINATION
D-17	(5-GR)	FUEL PUMP MODULE
D-18	(3-B)	FUEL TANK DIFFERENTIAL PRESSURE SENSOR
D-19	(2-R)	SIDE AIR BAG MODULE (SQUIB) (RH)
D-20	(18)	AMPLIFIER <7-SPEAKER SYSTEM>
D-21	(2-B)	REAR SPEAKER (RH)
D-22	(2-B)	REAR SPEAKER (LH)
D-23	(5-B)	COMPASS SENSOR <MULTI CENTER DISPLAY>
D-24	(2)	VANITY MIRROR LIGHT (RH)

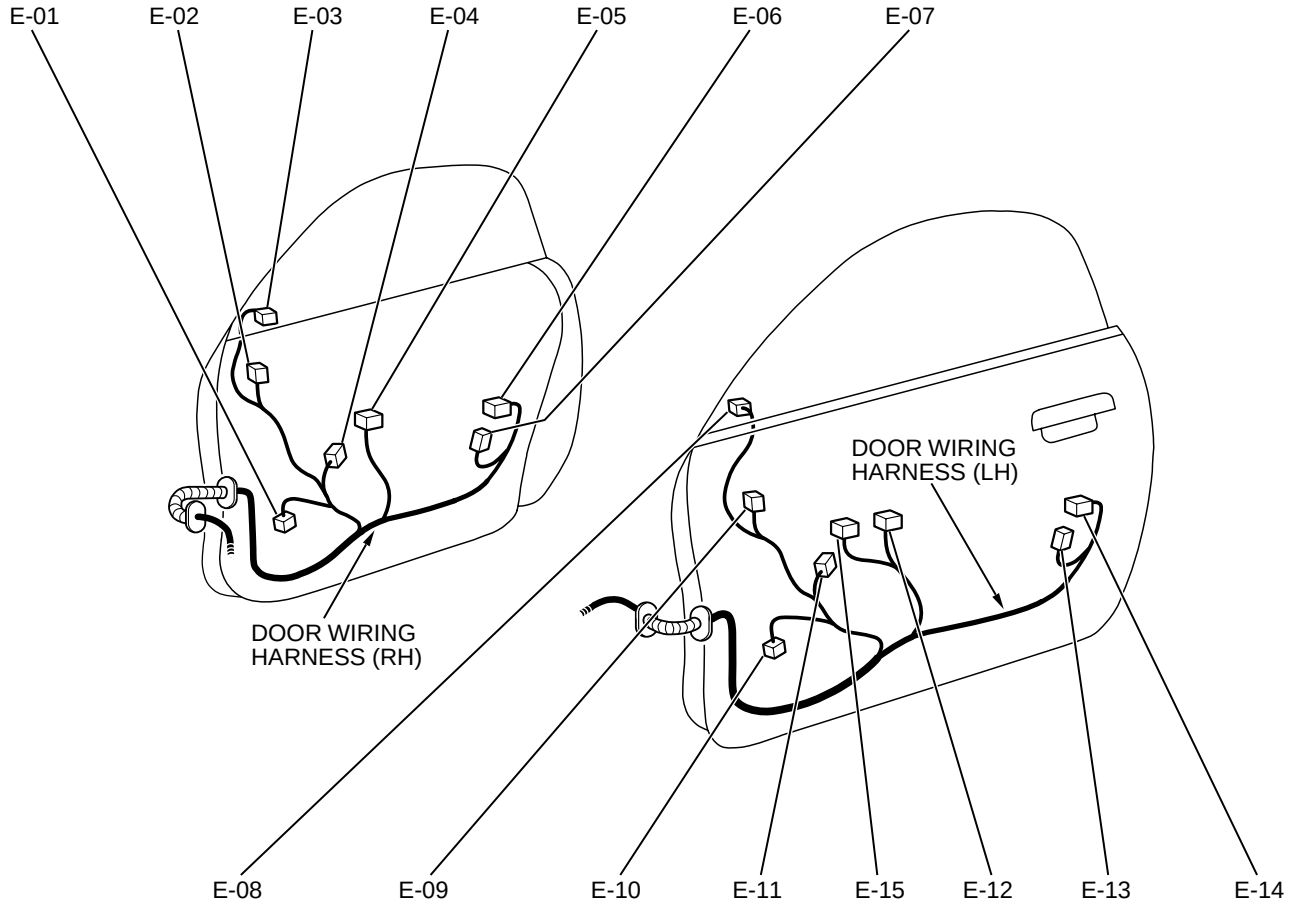
TSB Revision

DOOR

M1801001400295

Connector symbol

E



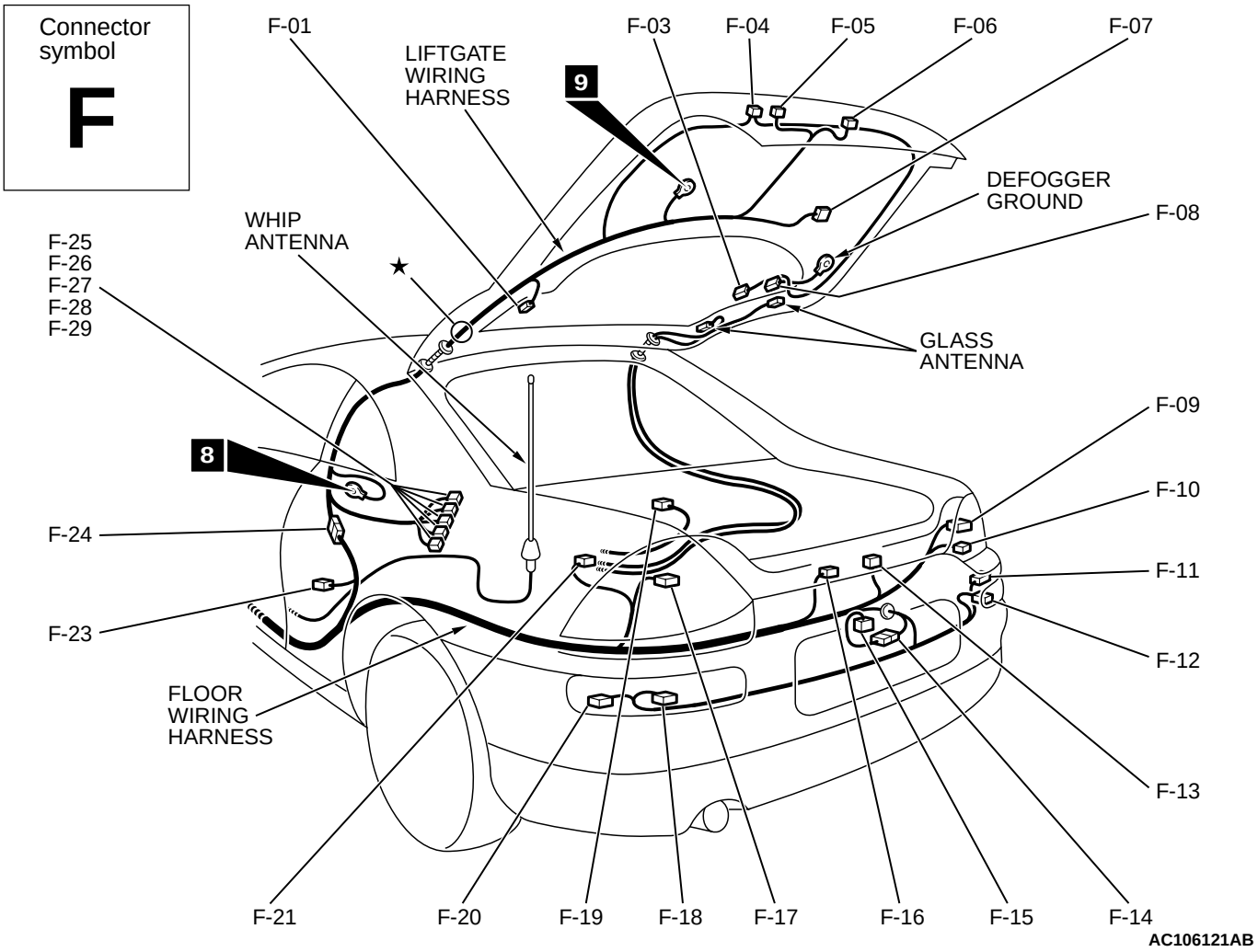
AC106120 AB

E-01	(2)	DOOR SPEAKER (RH)
E-02	(5)	REMOTE CONTROLLED MIRROR (RH)
E-03	(2)	TWEETER (RH) <6, 7-SPEAKER SYSTEM>
E-04	(2)	POWER WINDOW MOTOR (RH)
E-05	(8)	POWER WINDOW SUB SWITCH
E-06	(3-B)	DOOR LOCK KEY CYLINDER SWITCH (RH)
E-07	(6-B)	DOOR LOCK ACTUATOR (RH)
E-08	(2)	TWEETER (LH) <6, 7-SPEAKER SYSTEM>
E-09	(5)	REMOTE CONTROLLED MIRROR (LH)
E-10	(2)	DOOR SPEAKER (LH)
E-11	(2)	POWER WINDOW MOTOR (LH)
E-12	(10)	POWER WINDOW MAIN SWITCH
E-13	(6-B)	DOOR LOCK ACTUATOR (LH)
E-14	(3-B)	DOOR LOCK KEY CYLINDER SWITCH (LH)
E-15	(9)	REMOTE CONTROLLED MIRROR SWITCH <ECLIPSE>

TSB Revision

LUGGAGE COMPARTMENT <ECLIPSE>

M1801001500184

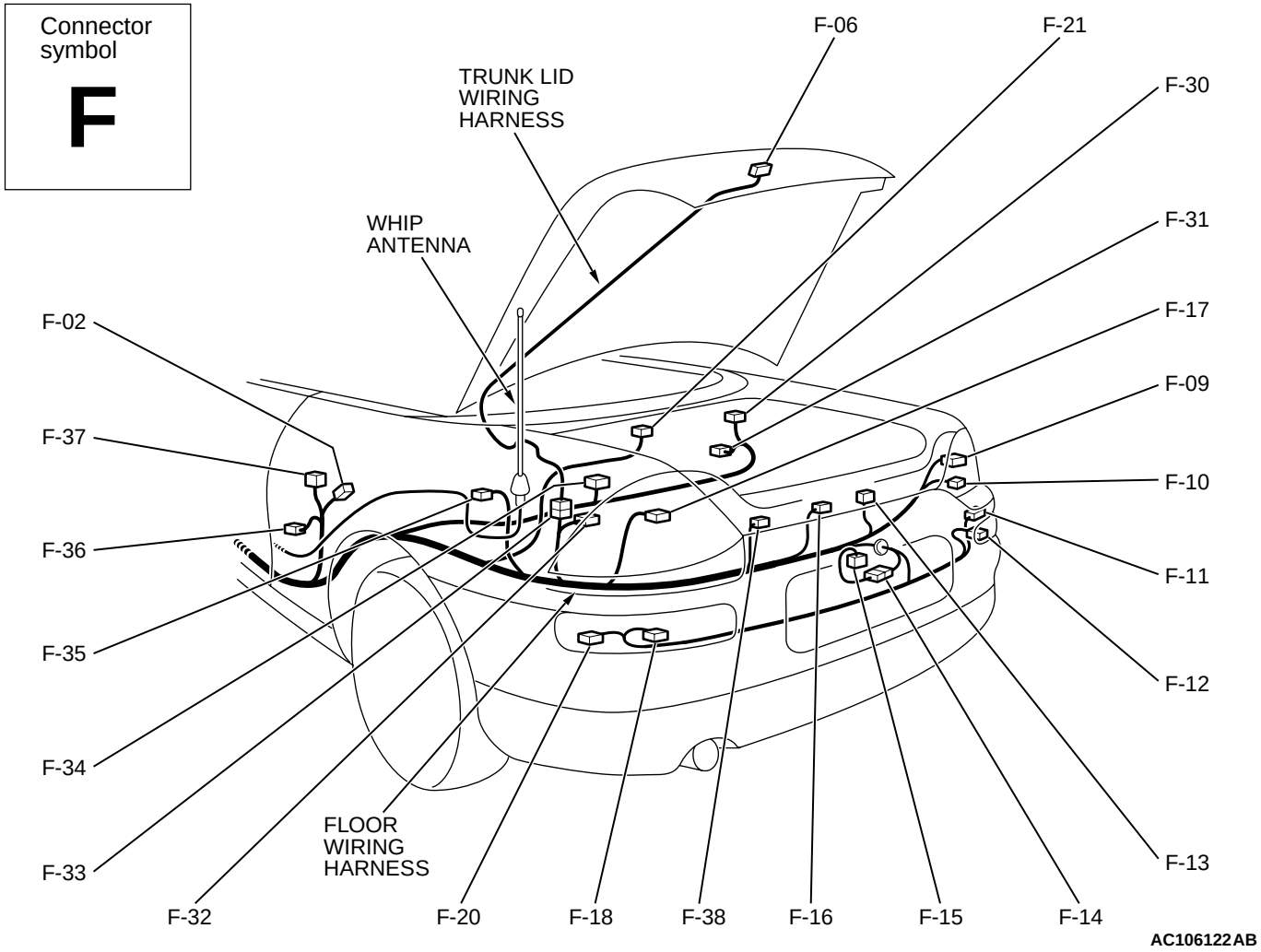


F-01	(1-B)	DEFOGGER (+)
F-03	(1-B)	DEFOGGER (–) <GLASS ANTENNA>
F-04	(2)	CHOKE COIL <GLASS ANTENNA>
F-05	(1-B)	CHOKE COIL <GLASS ANTENNA>
F-06	(2-GR)	HIGH MOUNTED STOPLIGHT
F-07	(3-B)	REAR WIPER MOTOR
F-08	(1-B)	DEFOGGER (–) <WHIP ANTENNA>
F-09	(6)	REAR COMBINATION LIGHT (RH)
F-10	(2)	LIFTGATE LOCK KEY CYLINDER SWITCH <WITH THEFT-ALARM SYSTEM>
F-11	(2-GR)	REAR SIDE MARKER LIGHT (RH)
F-12	(2)	BACKUP LIGHT (RH)
F-13	(1-B)	LIFTGATE LIGHT SWITCH <WITHOUT THEFT-ALARM SYSTEM>
F-14	(2-B)	FLOOR WIRING HARNESS AND REAR BUMPER WIRING HARNESS COMBINATION
F-15	(2-GR)	LICENSE PLATE LIGHT
F-16	(2-B)	LIFTGATE LATCH SWITCH <WITH THEFT-ALARM SYSTEM>
F-17	(6)	REAR COMBINATION LIGHT (LH)
F-18	(2-B)	BACKUP LIGHT (LH)
F-19	(2-B)	REAR SPEAKER (RH)
F-20	(2-GR)	REAR SIDE MARKER LIGHT (LH)
F-21	(2)	LUGGAGE COMPARTMENT LIGHT
F-23	(2-B)	REAR SPEAKER (LH)
F-24	(6)	FLOOR WIRING HARNESS AND LIFTGATE WIRING HARNESS COMBINATION
F-25	(1-B)	CAPACITOR <GLASS ANTENNA>
F-26	(1-B)	CAPACITOR <GLASS ANTENNA>
F-27	(1-B)	CAPACITOR <GLASS ANTENNA>
F-28	(1-B)	CAPACITOR <GLASS ANTENNA>
F-29	(1-B)	CAPACITOR <GLASS ANTENNA>

TSB Revision

LUGGAGE COMPARTMENT <ECLIPSE SPYDER>

M1801001500195



F-02	(2)	DEFOGGER
F-06	(2-GR)	HIGH MOUNTED STOPLIGHT
F-09	(6)	REAR COMBINATION LIGHT (RH)
F-10	(2)	TRUNK LID LOCK KEY CYLINDER SWITCH <WITH THEFT-ALARM SYSTEM>
F-11	(2-GR)	REAR SIDE MARKER LIGHT (RH)
F-12	(2)	BACKUP LIGHT (RH)
F-13	(1-B)	TRUNK LIGHT SWITCH <WITHOUT THEFT-ALARM SYSTEM>
F-14	(2-B)	FLOOR WIRING HARNESS AND REAR BUMPER WIRING HARNESS COMBINATION
F-15	(2-GR)	LICENSE PLATE LIGHT
F-16	(2-B)	TRUNK LID LATCH SWITCH <WITH THEFT-ALARM SYSTEM>
F-17	(6)	REAR COMBINATION LIGHT (LH)
F-18	(2-B)	BACKUP LIGHT (LH)
F-20	(2-GR)	REAR SIDE MARKER LIGHT (LH)
F-21	(2)	TRUNK LIGHT
F-30	(2)	TOPSTACK DRIVE MOTOR (RH)
F-31	(2)	POWER WINDOW MOTOR (QUARTER: RH)
F-32	(3)	CONVERTIBLE TOP BYPASS SWITCH
F-33	(2)	FLOOR WIRING HARNESS AND TRUNK LID WIRING HARNESS COMBINATION
F-34	(14)	CONVERTIBLE TOP CONTROL MODULE
F-35	(8)	MOTOR ANTENNA ASSEMBLY
F-36	(2)	POWER WINDOW MOTOR (QUARTER: LH)
F-37	(2)	TOPSTACK DRIVE MOTOR (LH)
F-38	(2)	TRUNK LID OPENER ACTUATOR

TSB Revision

GROUP 80B

SPLICE LOCATIONS

CONTENTS

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ENGINE AND TRANSAXLE 80B-6

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FLOOR AND ROOF <ECLIPSE> 80B-14

FLOOR AND WINDSHIELD APERTURE <ECLIPSE SPYDER> 80B-15

DOOR 80B-16

LUGGAGE COMPARTMENT <ECLIPSE> 80B-17

LUGGAGE COMPARTMENT <ECLIPSE SPYDER> 80B-18

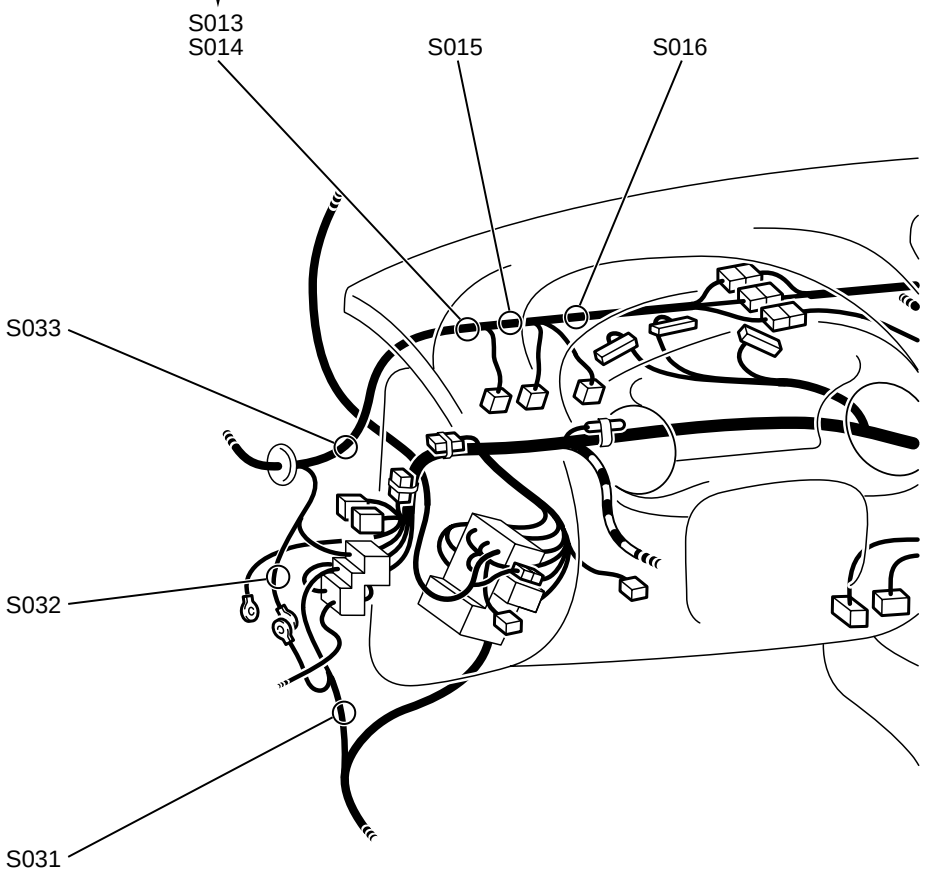
HOW TO READ SPLICE LOCATIONS

M1802000100261

"Splice locations" describes splice points of each wiring harness on an actual vehicle.

Indicates a splice point number.
The splice point numbers are identical to those in "CIRCUIT DIAGRAMS," making them easy to use.
In addition, the splice point numbers are usually numbered clockwise.

Example: S 013
- Sequential number
- Prefix meaning splice point



AC003587 AB

INDEX

M1802000900342

This index shows the page numbers where the splice locations are.

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S006	P.80B-5	S036	P.80B-6	S066	P.80B-8	S096	P.80B-8
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S008	P.80B-6	S038	P.80B-6	S068	P.80B-8	S098	P.80B-8
S009	P.80B-6	S039	P.80B-6	S069	P.80B-8	S099	P.80B-8
S010	P.80B-6	S040	P.80B-6	S070	P.80B-8	S100	P.80B-8
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S013	P.80B-6	S043	P.80B-6	S073	P.80B-8	S103	P.80B-8
S014	P.80B-6	S044	P.80B-6	S074	P.80B-8	S104	P.80B-8
S015	P.80B-6	S045	P.80B-6	S075	P.80B-8	S105	P.80B-8
S016	P.80B-6	S046	P.80B-6	S076	P.80B-8	S106	P.80B-8
S017	P.80B-6	S047	P.80B-6	S077	P.80B-8	S107	P.80B-8
S018	P.80B-6	S048	P.80B-6	S078	P.80B-8	S108	P.80B-8
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S022	P.80B-6	S052	P.80B-6	S082	P.80B-8	S112	P.80B-8
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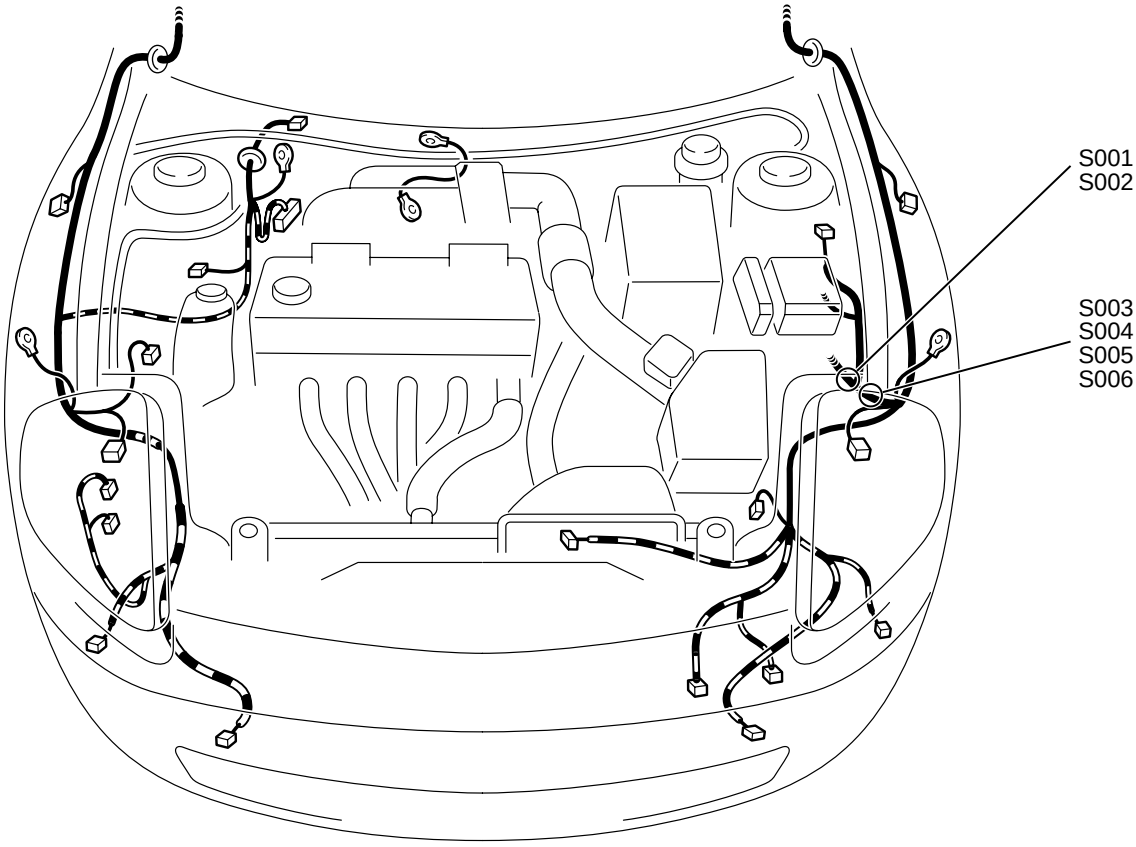
S144	P.80B-8	S168	P.80B-8	S192	P.80B-16		

ENGINE COMPARTMENT

M1802000200279



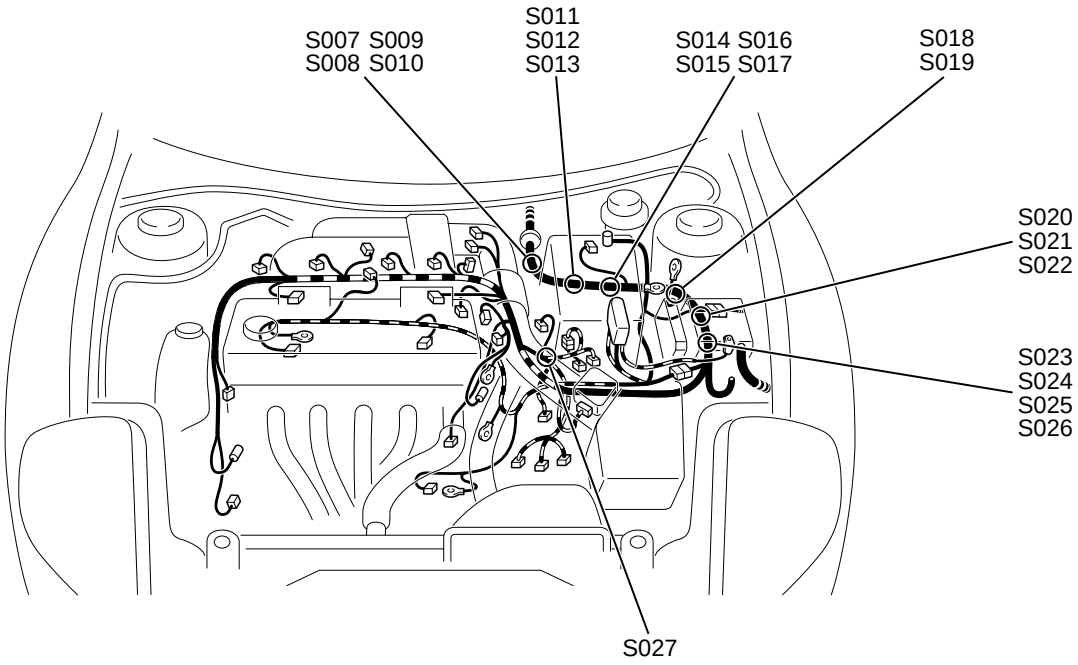
AC106437AB

TSB Revision

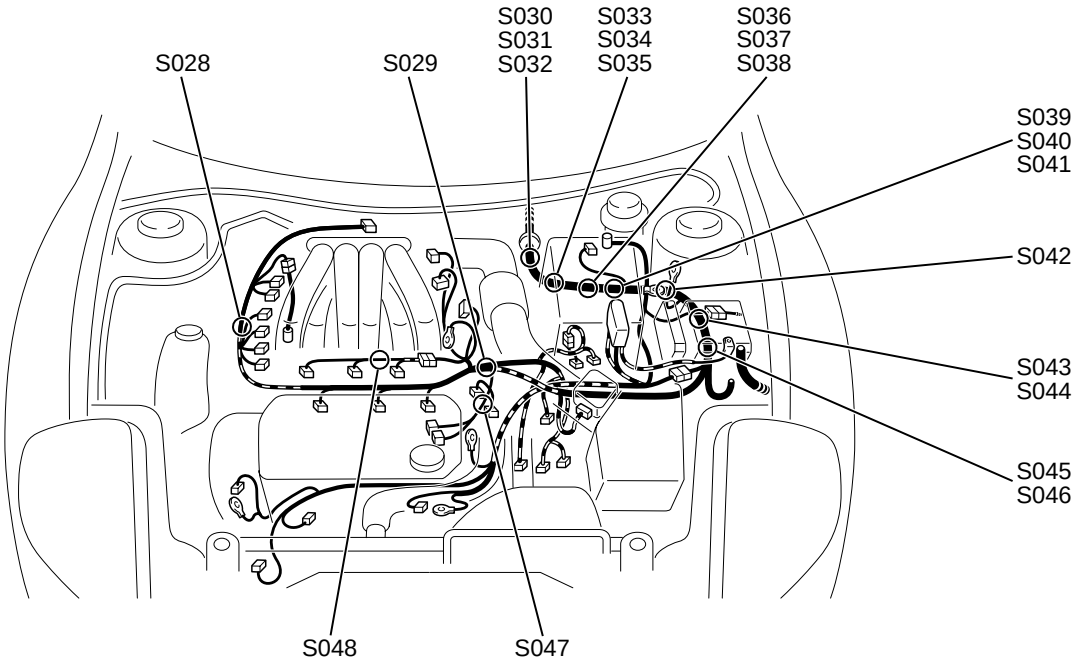
ENGINE AND TRANSAXLE

M1802001400157

2.4L ENGINE

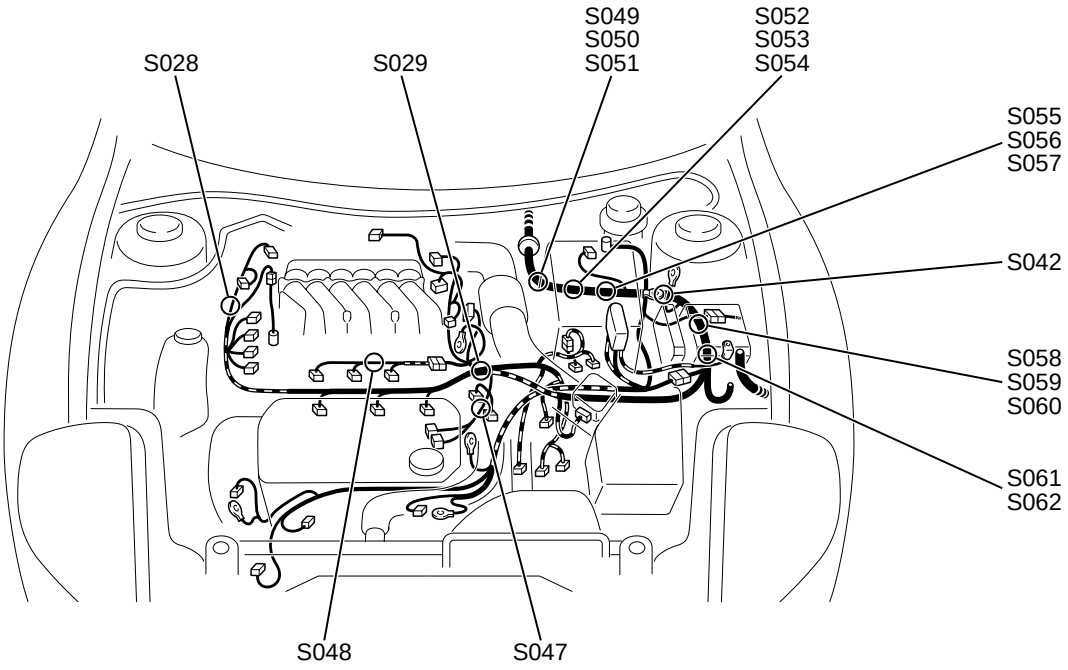


3.0L ENGINE <WITHOUT VARIABLE INDUCTION CONTROL (VIC) SYSTEM>



AC106438 AB

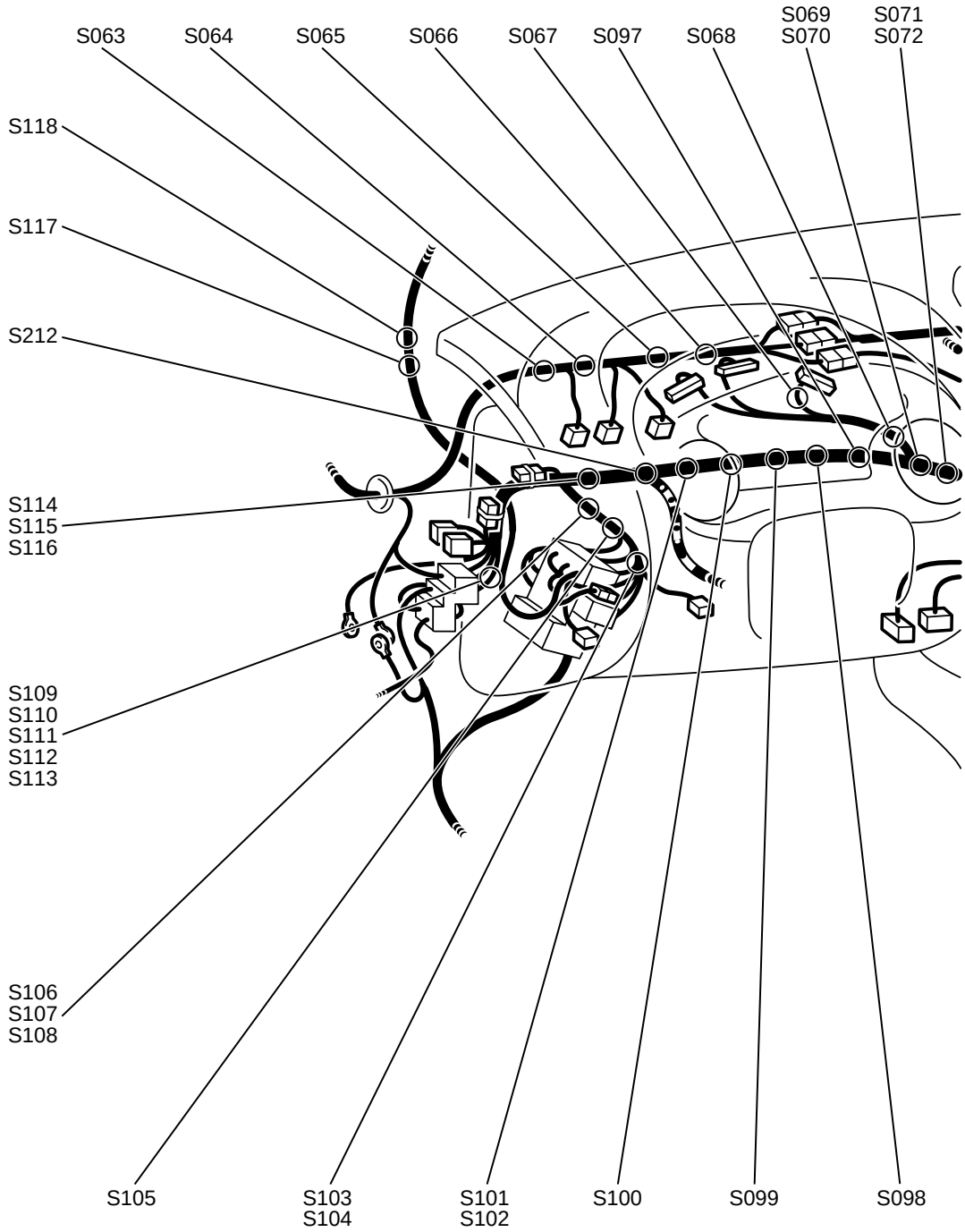
3.0L ENGINE <WITH VARIABLE INDUCTION CONTROL (VIC) SYSTEM>



AC106439AB

DASH PANEL

M1802000300276



AC102635AC

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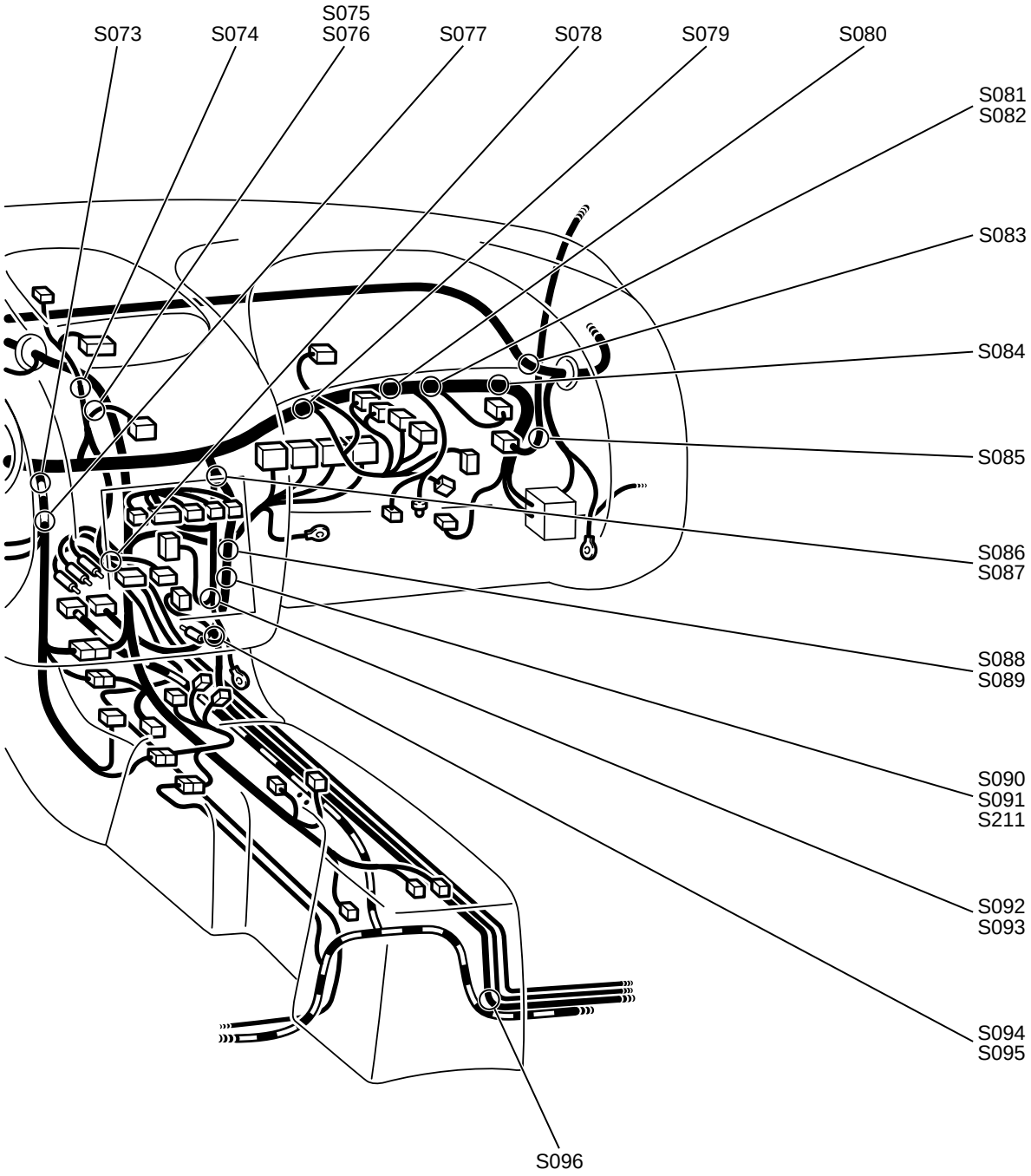
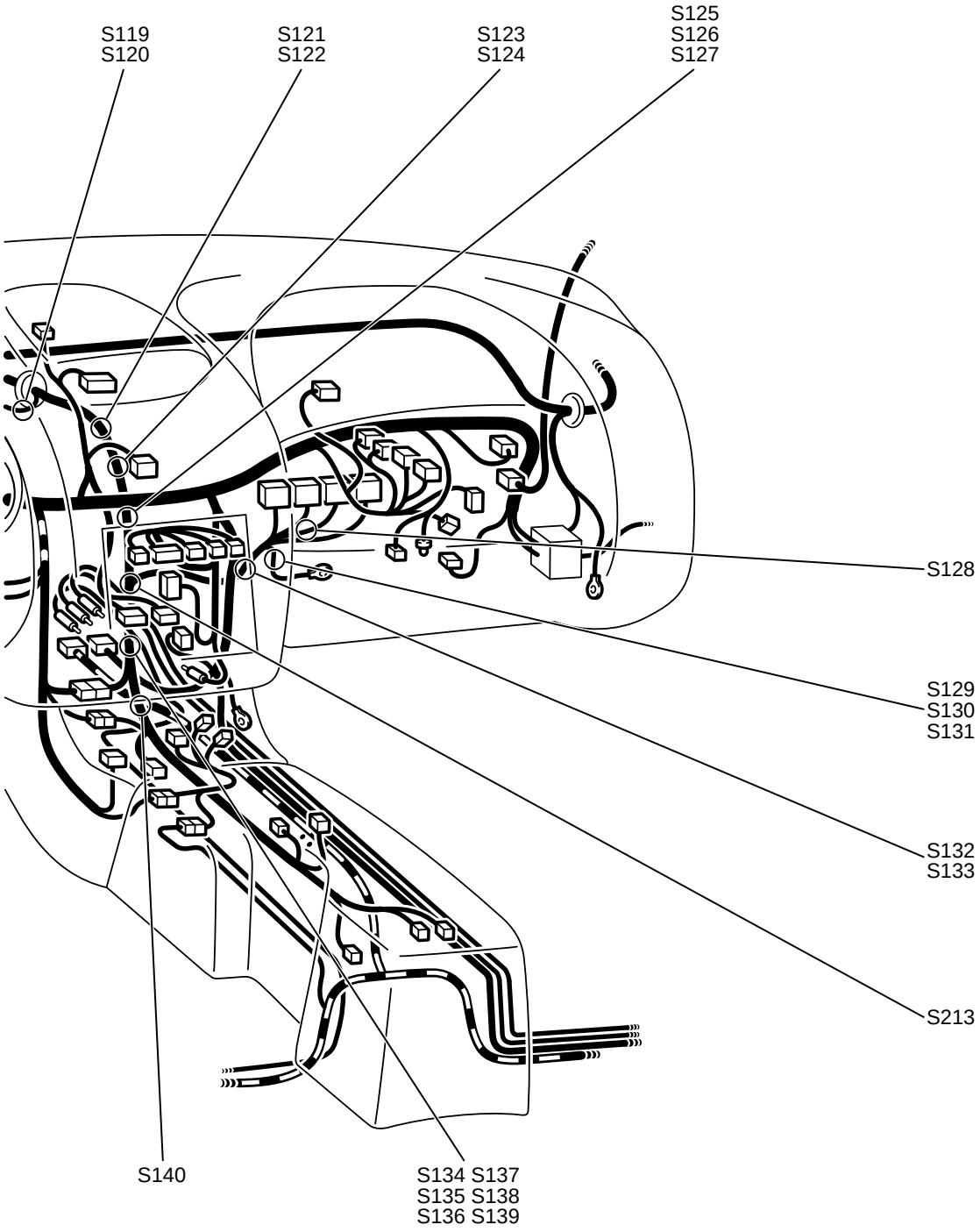


AC106440 AB

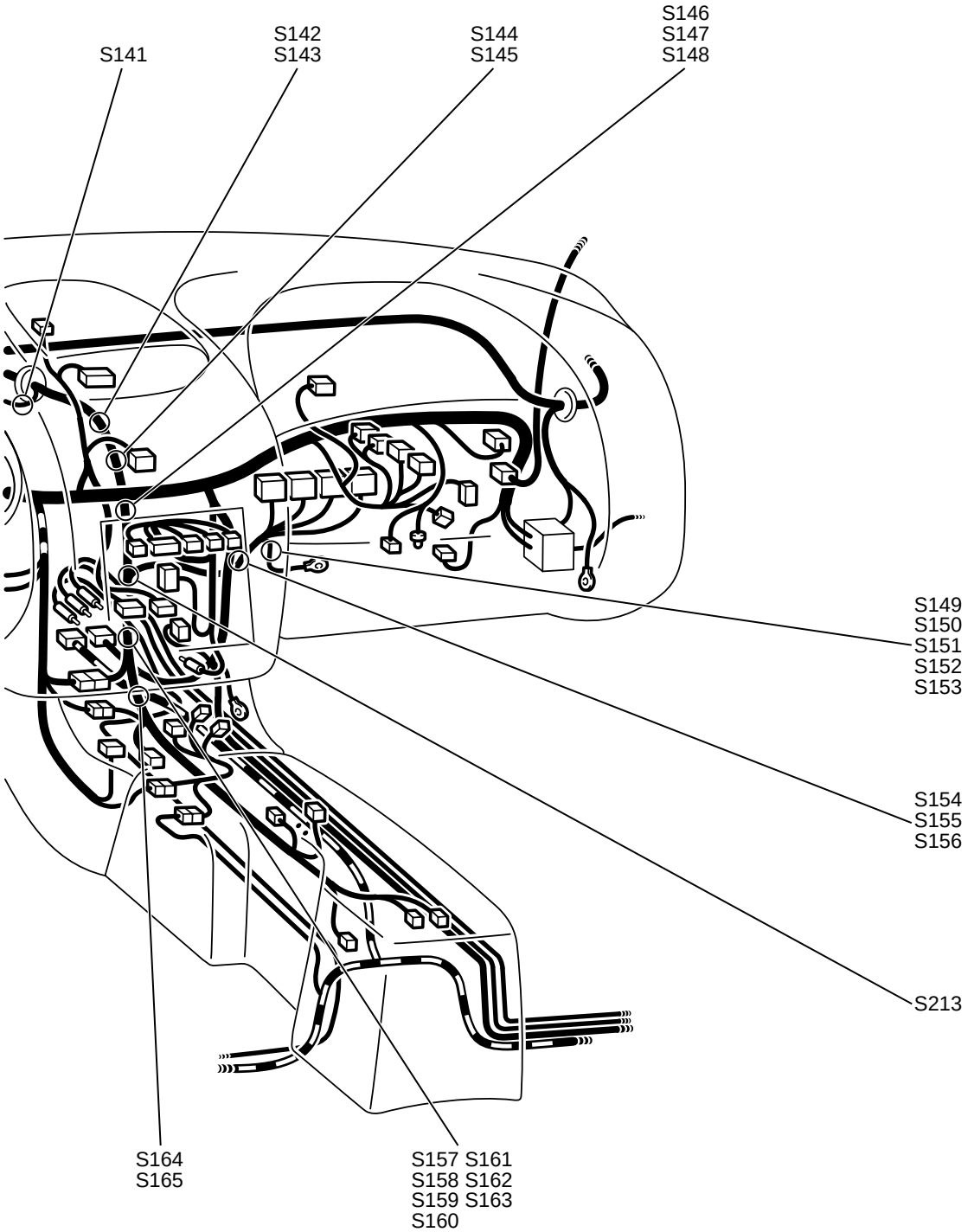
TSB Revision

2.4L ENGINE



AC106441AB

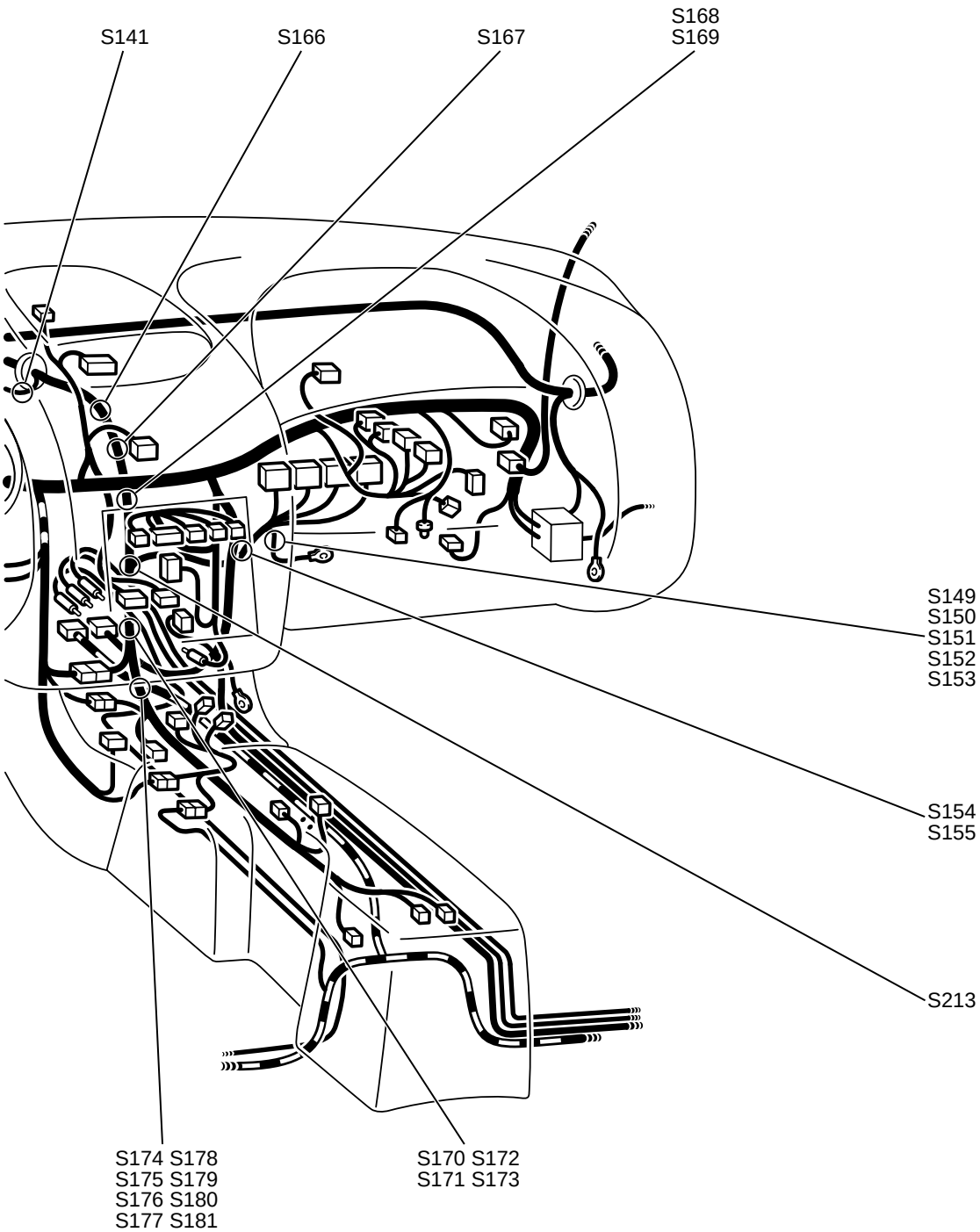
3.0L ENGINE <WITHOUT VARIABLE INDUCTION CONTROL (VIC) SYSTEM>



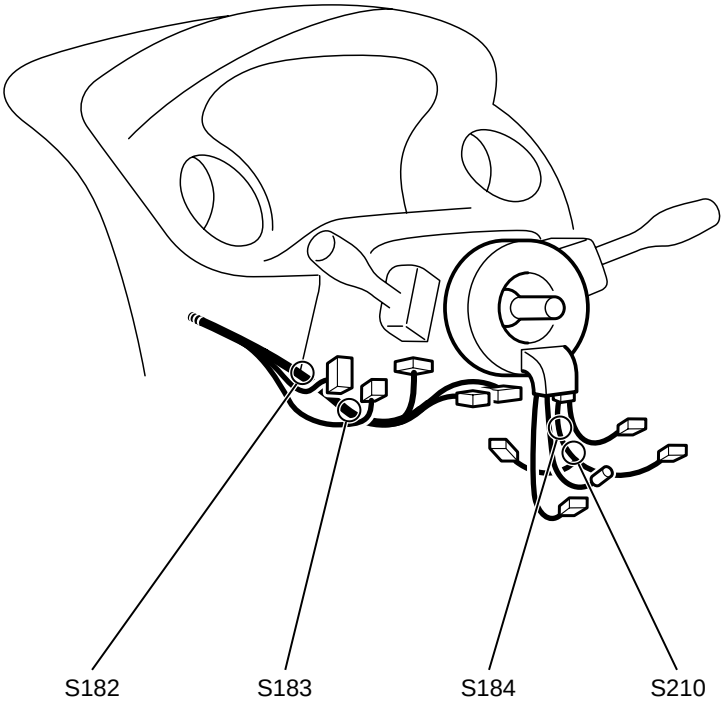
AC106441AC

TSB Revision

3.0L ENGINE <WITH VARIABLE INDUCTION CONTROL (VIC) SYSTEM>



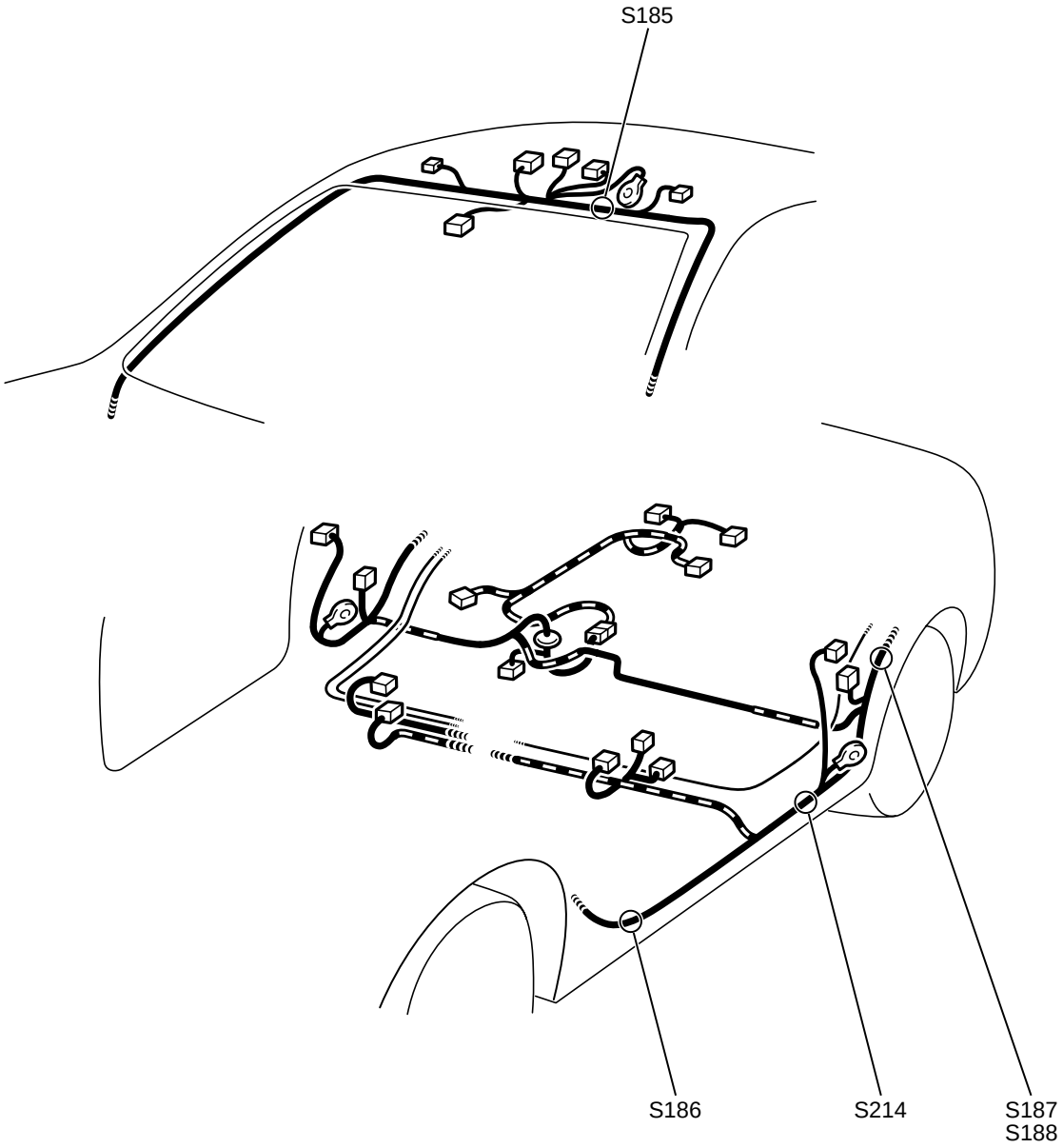
STEERING COLUMN



AC106442 AB

FLOOR AND ROOF <ECLIPSE>

M1802001200261

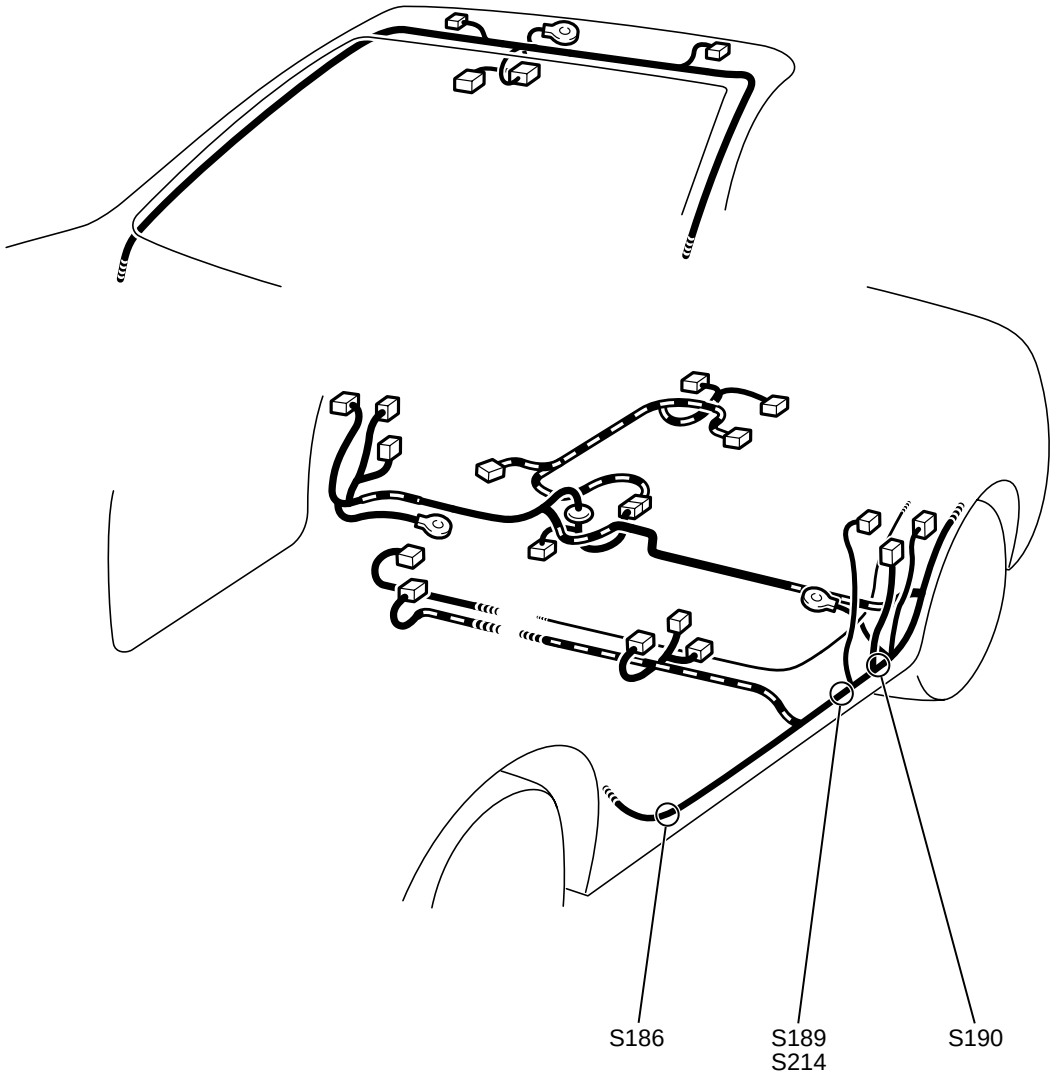


AC102639AC

TSB Revision

FLOOR AND WINDSHIELD APERTURE <ECLIPSE SPYDER>

M1802001200272



AC106443 AB

DOOR

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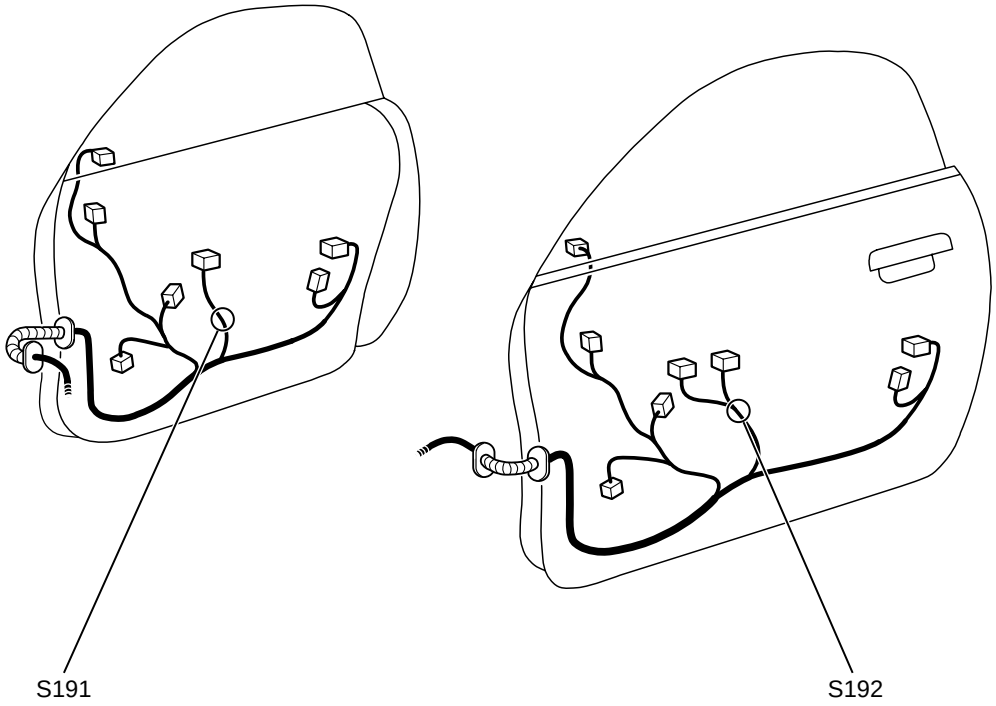

AC106444 AB

LUGGAGE COMPARTMENT <ECLIPSE>

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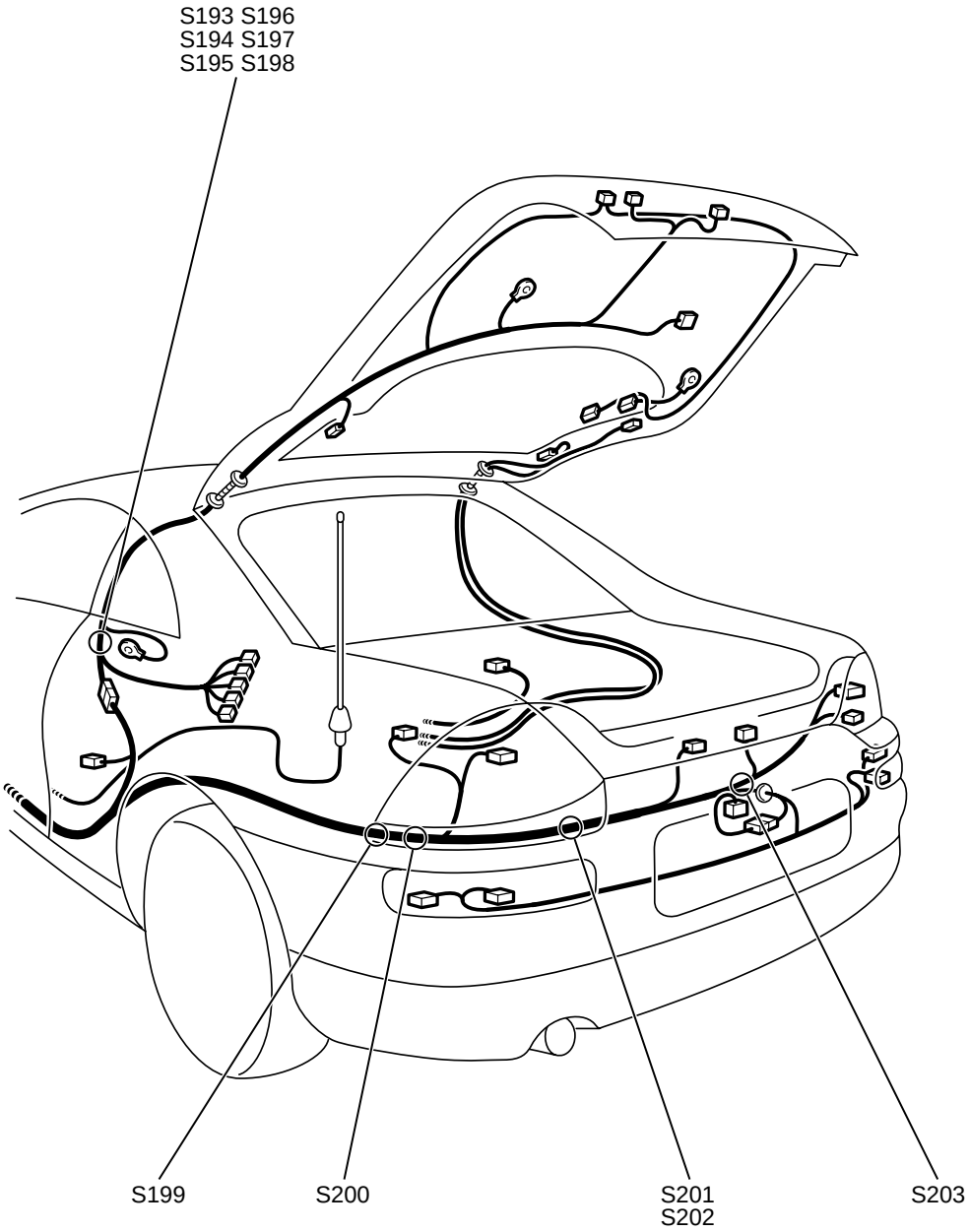
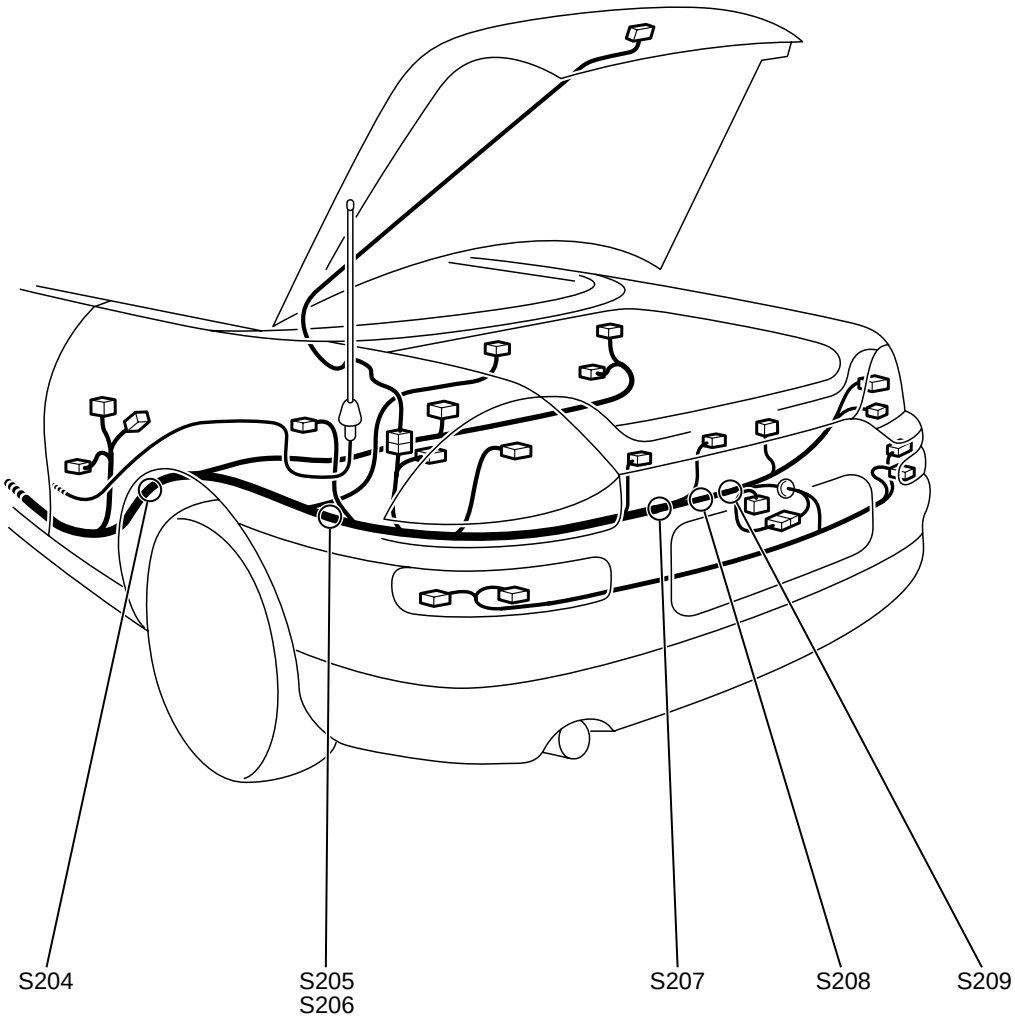


AC106445AB

TSB Revision

LUGGAGE COMPARTMENT <ECLIPSE SPYDER>

M1802000700122



AC106446AB

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GROUP 90

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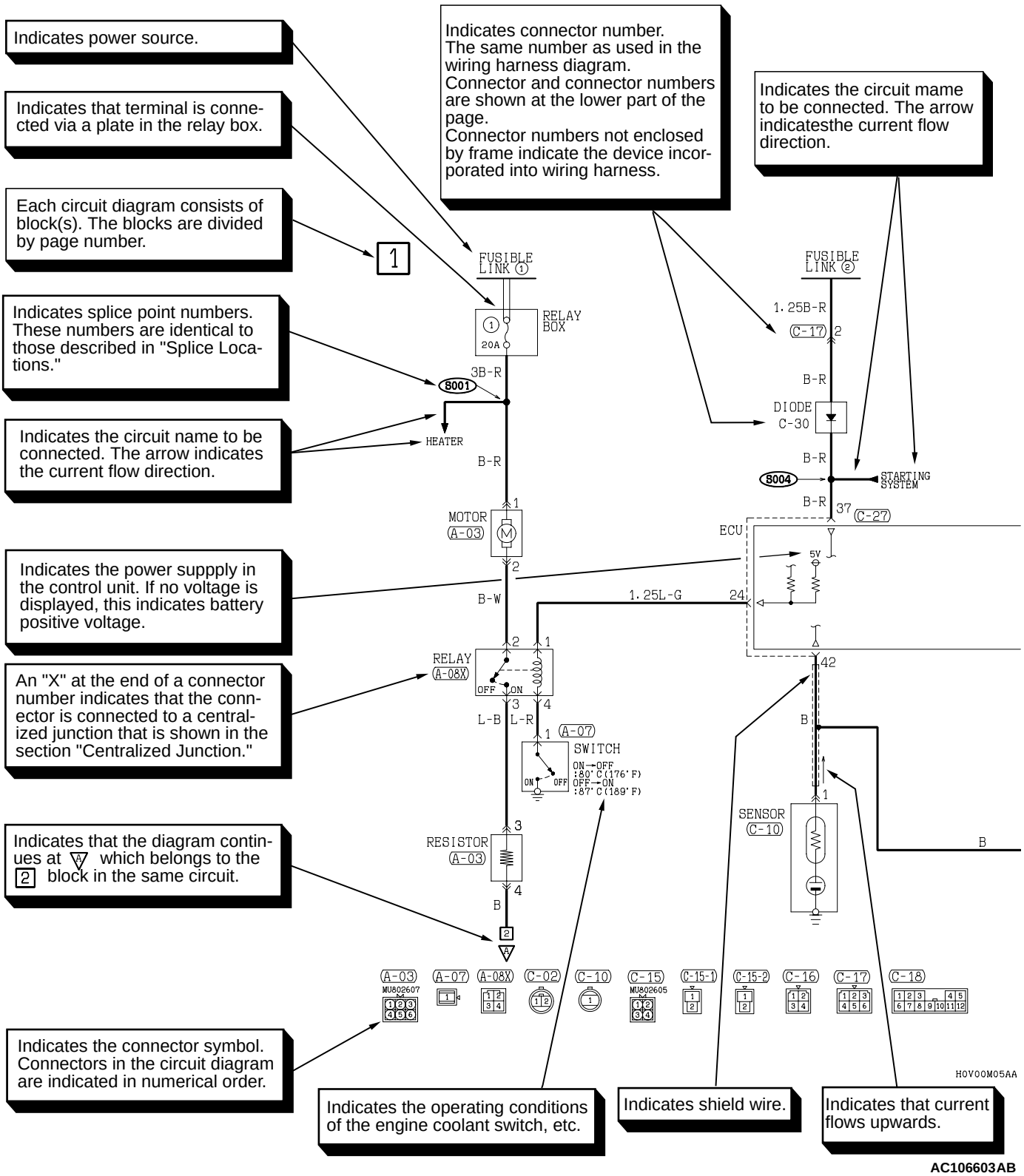
HOW TO READ CIRCUIT DIAGRAMS

M1901000100373

The circuit of each system from the fuse (or fusible link) to ground is shown. The power supply is shown at the top and the ground at the bottom to facilitate understanding of how the current flows.



AC106603AB

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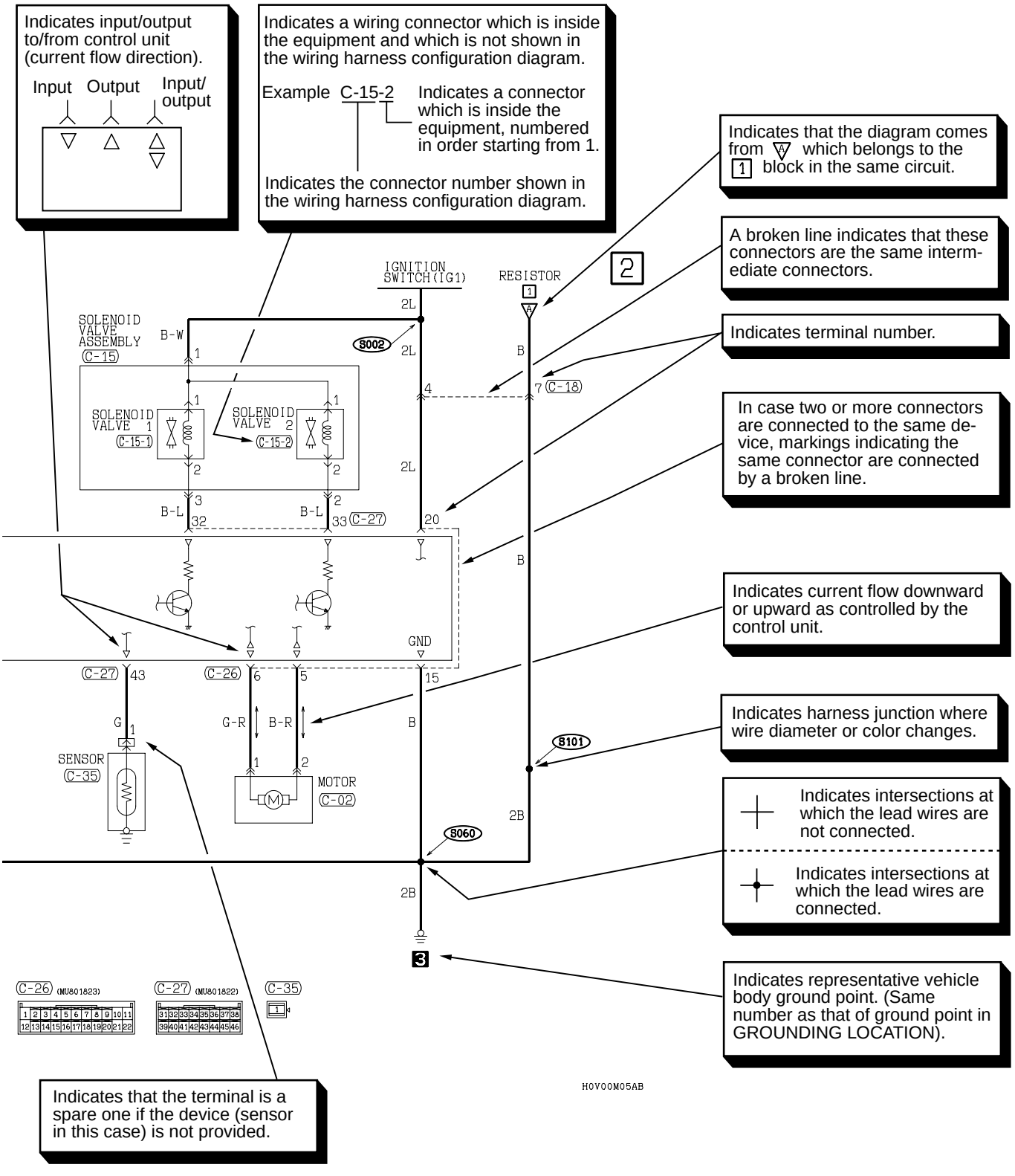
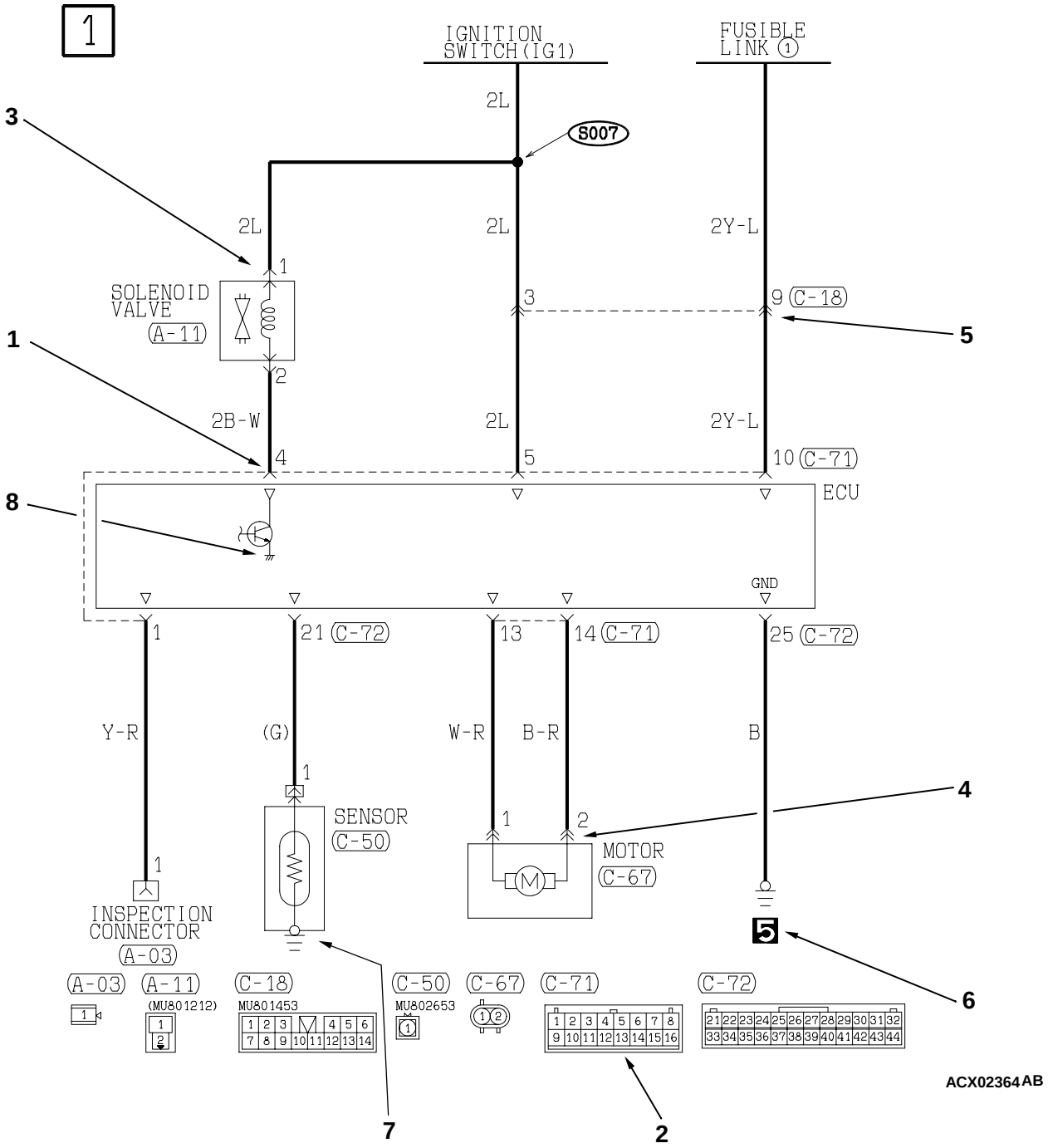
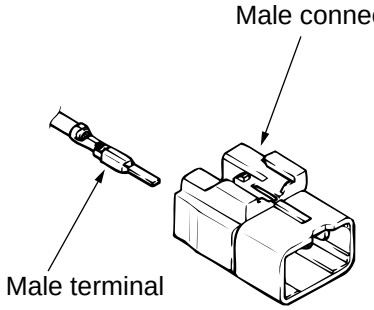
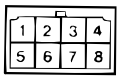
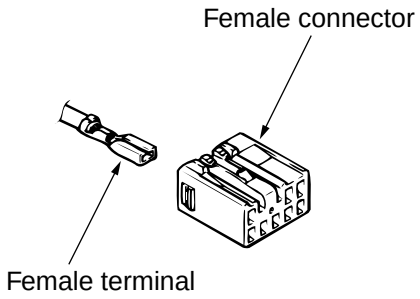
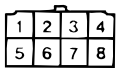
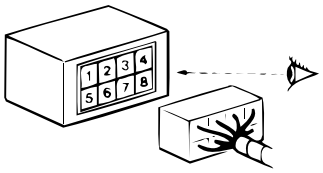
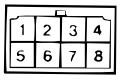
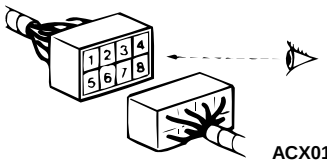
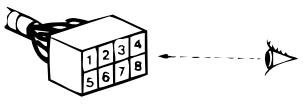
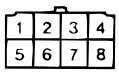


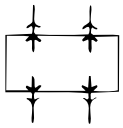
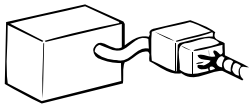
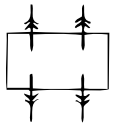
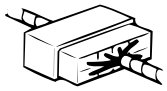
AC106604AB

TSB Revision

CONNECTOR/GROUNDING INDICATIONS

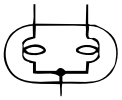
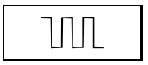
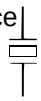
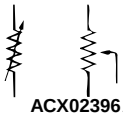
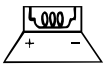
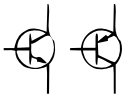


ITEM	NO.	CONNECTOR/GROUNDING	SYMBOL	CONTENTS
Connector and terminal marking	1	 ACX01251AB	Male terminal ACX01252AB	The male and female terminals are indicated as shown. The connector with male terminal(s) is called as male connector and indicated by two connector contour lines, while the connector with female terminal(s) is called as female connector and indicated by single connector contour line.
			ale connector  ACX01253AB	
		 ACX01254AB	Female terminal ACX01255AB	
			Female connector  ACX01256AB	
Connector symbol marking	2	Device  ACX01257AB	 ACX01253	The symbol indicates the connector is viewed as shown. At a device connection, the connector symbol on the device side is shown. For an intermediate connector, the male connector symbol is shown. For spare connectors and check connectors, no device is connected, and so the harness-side connector symbol is shown for these connectors. For the data link connector, its contents differ from the previous description. Refer to "scan tool operation instruction" in detail.
		Intermediate connector  ACX01258AB		
		Spare cnnector, check connector  ACX01816AB	 ACX01256	

ITEM	NO.	CONNECTOR/GROUNDING	SYMBOL	CONTENTS
Connector connection marking	3	Direct connection type ACX01260 AB	 ACX01261	Connection between a device and the harness is either by direct insertion in the device (direct connection type) or by connection with a harness connector furnished on the device side furnished (harness connection type). The two types are indicated as illustrated.
	4	Harness connection type  ACX01262 AB	 ACX01263	
	5	Intermediate connector  ACX01264 AB	ACX01265	
Ground markings	6	Body ground ACX01273 AB	ACX01274	Grounding is either by body ground, device ground or control unit interior ground. These are indicated as illustrated.
	7	Device ground ACX01275 AB	ACX01276	
	8	Ground in control unit ACX01277AB	ACX01278	

SYMBOLS (EXCEPT CONNECTOR AND GROUNDING)

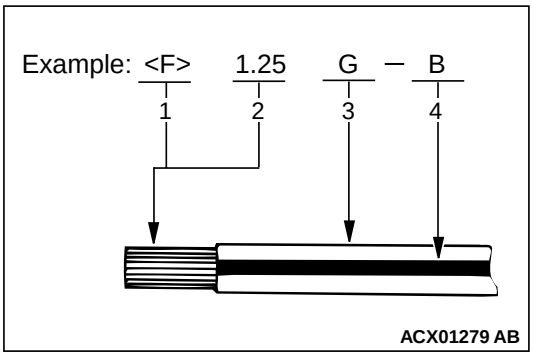
Devices appearing in circuit diagrams are indicated by the following symbols.

Battery ACX02377AB	Buzzer ACX02378AB	Capacitor ACX02379AB	Electrolytic capacitor ACX02380AB	Variable capacitor ACX02381AB	Coil ACX02382AB
Diode ACX02383AB	Light emitting diode ACX02384AB	Photo diode ACX02385AB	Zener diode ACX02386AB	Dual bulb  ACX02387AB	Single bulb ACX02388AB
Fuse ACX02389AB	Fusible link ACX02390AB	Horn ACX02391AB	Motor ACX02392AB	Pulse generator  ACX02393AB	Piezoelectric device  ACX02394AB
Resistor ACX02395AB	Variable resistor  ACX02396AB	Speaker  ACX02397AB	Thermistor ACX02398AB	Transistor  ACX02399AB	Photo transistor ACX02400AB

WIRE COLOR CODES

Wire colors are identified by the following color codes.

CODE	WIRE COLOR	CODE	WIRE COLOR	CODE	WIRE COLOR	CODE	WIRE COLOR
B	Black	L	Blue	R	Red	Y	Yellow
BR	Brown	LG	Light green	SB	Sky blue	–	–
G	Green	O	Orange	V	Violet	–	–
GR	Gray	P	Pink	W	White	–	–



If a cable has two colors, the first of the two color code characters indicates the basic color (color of the cable coating) and the second indicates the marking color.

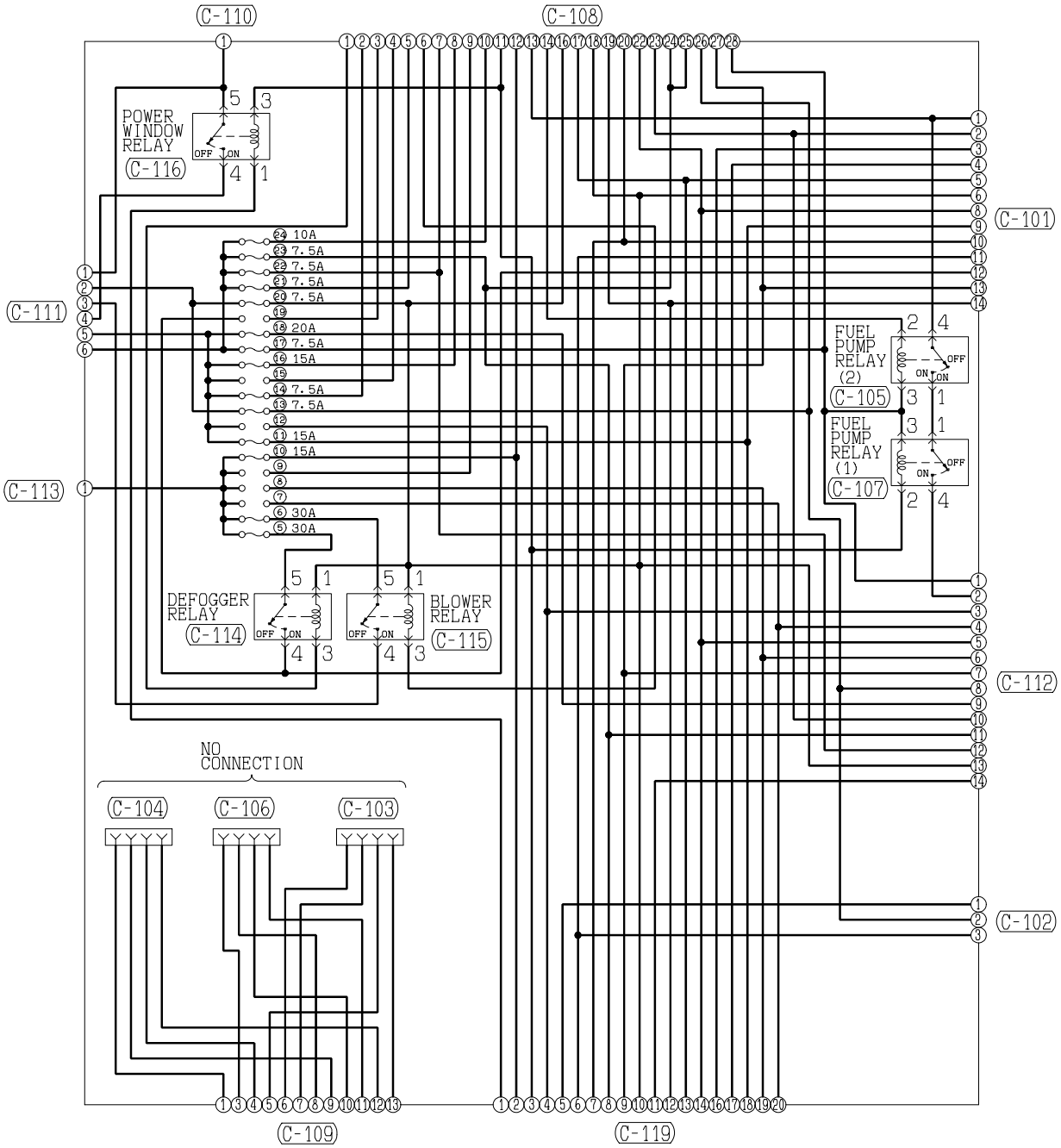
NO.	MEANING
1	<F>: Flexible wire
	<T>: Twisted wire
2	Wire size (mm^2)*
3	Basic color (color of the cable coating)
4	Marking color

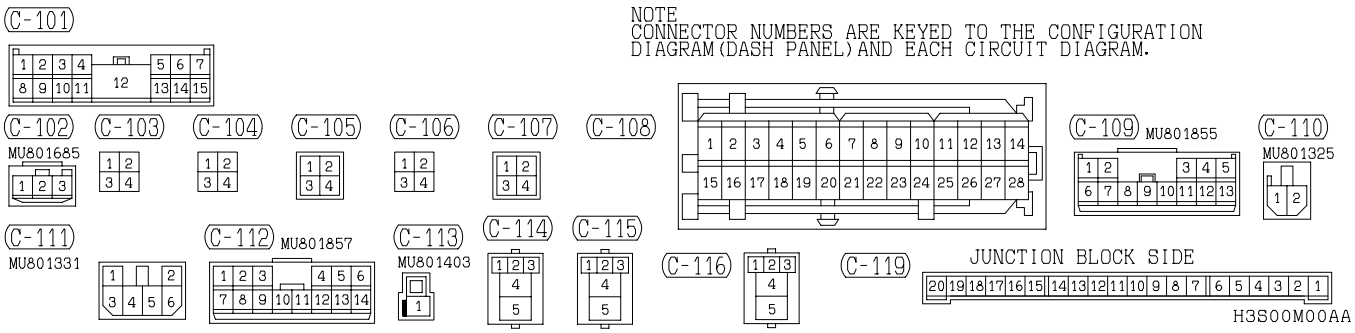
NOTE:

**: No code indicates 0.5 mm^2(0.0008 in^2). Cable color code in parentheses indicates 0.3 mm^2 (0.0005 in^2).*

JUNCTION BLOCK

M1901000200347





NOTE
CONNECTOR NUMBERS ARE KEYED TO THE CONFIGURATION DIAGRAM(DASH PANEL)AND EACH CIRCUIT DIAGRAM.

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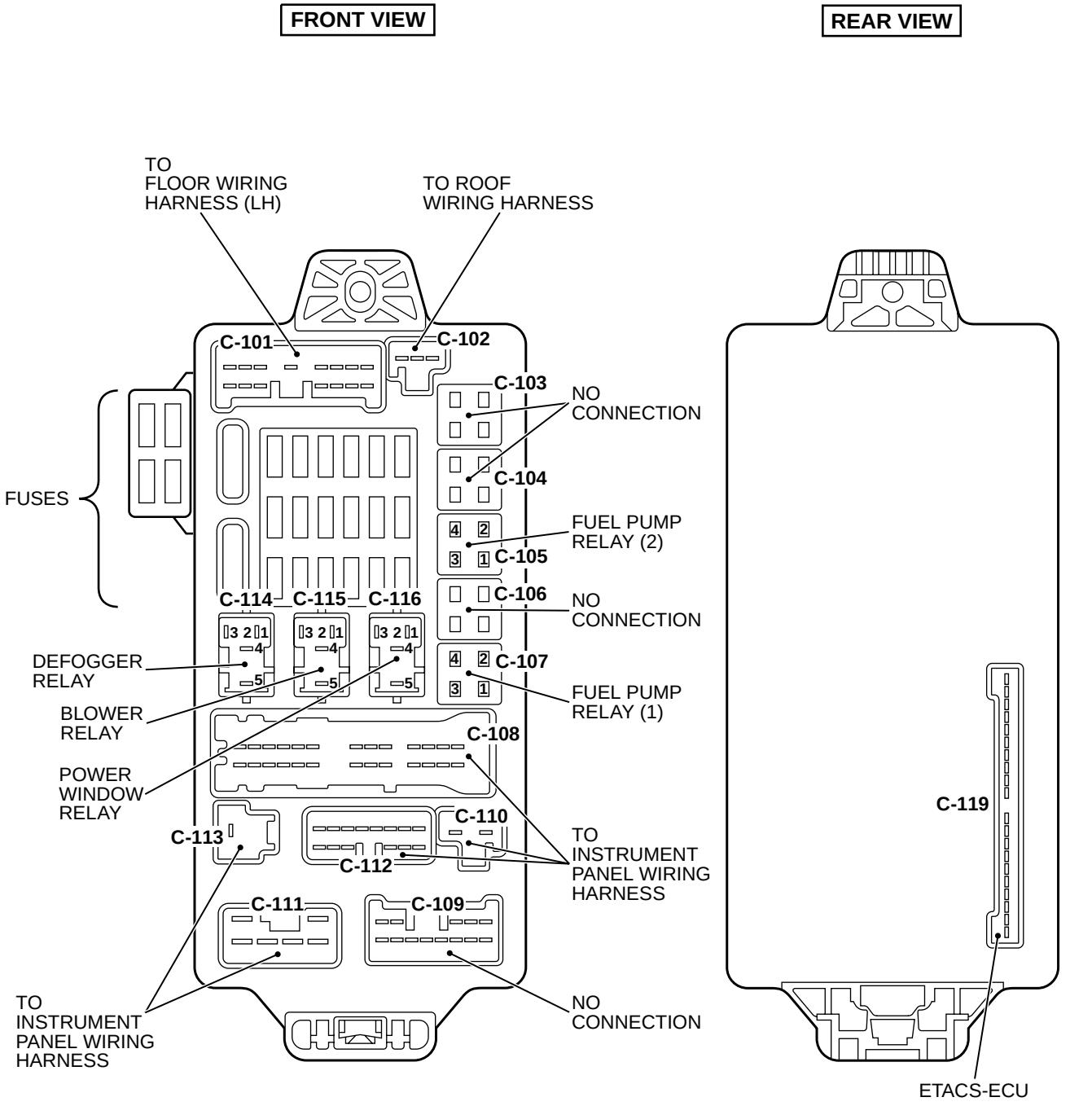
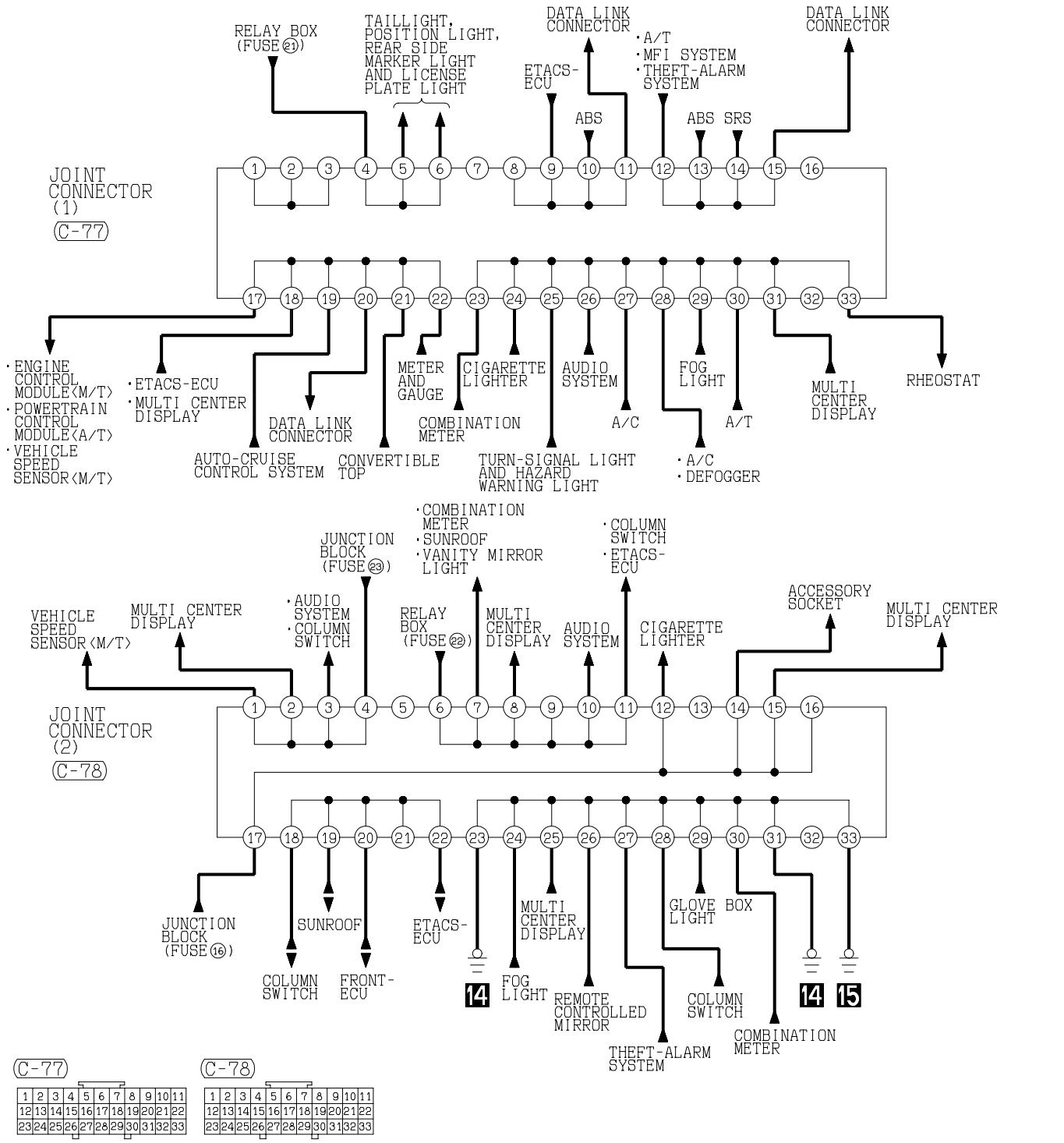

FRONT VIEW
REAR VIEW
TO
FLOOR WIRING
HARNESS (LH)
TO ROOF
WIRING HARNESS
C-101
C-102
C-103
NO
CONNECTION
C-104
FUSES
FUEL PUMP
RELAY (2)
C-105
C-114
C-115
C-116
C-106
NO
CONNECTION
DEFOGGER
RELAY
C-107
FUEL PUMP
RELAY (1)
BLOWER
RELAY
C-108
POWER
WINDOW
RELAY
C-110
C-113
TO
INSTRUMENT
PANEL WIRING
HARNESS
C-112
C-111
C-109
TO
INSTRUMENT
PANEL WIRING
HARNESS
NO
CONNECTION
C-119
ETACS-ECU
AC106605AB

JOINT CONNECTOR

M1901014200339

NOTE
IN THE ACTUAL VEHICLE, SOME OF THE JOINT CONNECTOR TERMINALS IN THE SAME BUS ARE USED, SO IN SOME CASES, THE TERMINAL ARRANGEMENT INDICATED ON THE CIRCUIT DIAGRAMS DO NOT AGREE WITH THE ONES IN THE ACTUAL VEHICLE.



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CENTRALIZED JUNCTION

M1901000300333

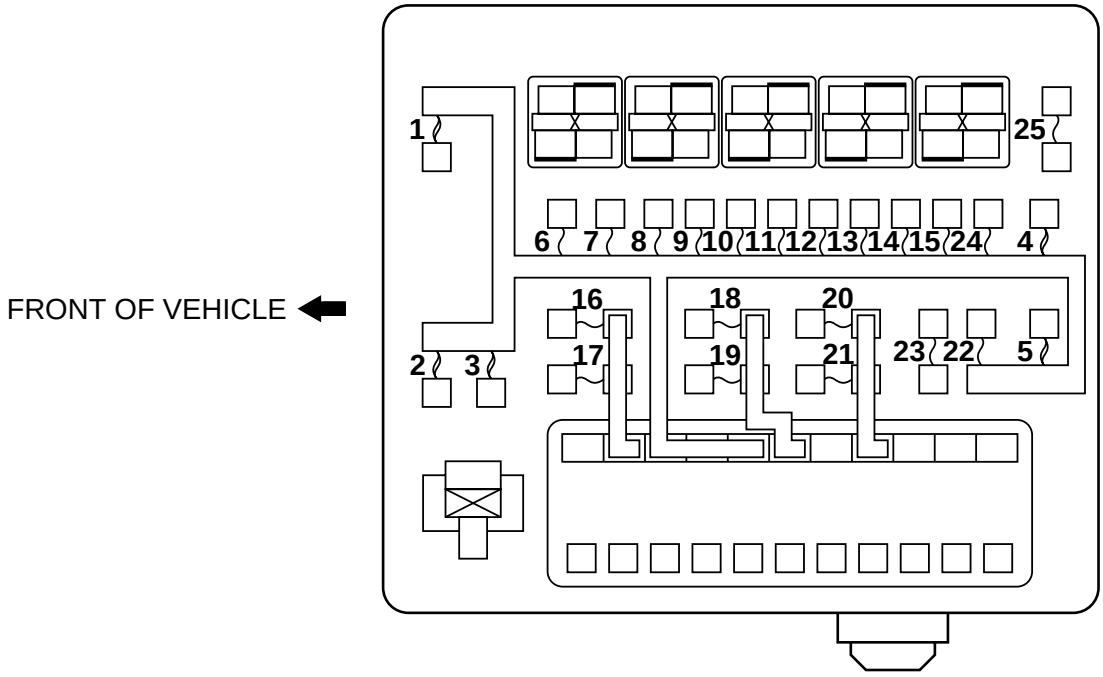
FUSIBLE LINK AND FUSE

ENGINE COMPARTMENT

NO.	POWER SUPPLY CIRCUIT	NAME	RATED CAPACITY (A)	HOUSING COLOR	LOAD CIRCUIT
1	Battery	Fusible link	60	Yellow	Fuse No.5, 6, 10 (in junction block) circuit
2			50	Red	Fan controller
3			60	Yellow	ABS-ECU
4			40	Green	Ignition switch circuit, theft-alarm horn and theft-alarm horn relay
5			30	Pink	Fuse No.1, 3 (in junction block) circuit, convertible top control module, power seat assembly, power window main switch and power window motor
6		Fuse	15	Blue	Combination meter and fog light
7			–	–	–
8			15	Blue	Horn and horn relay
9			20	Yellow	Camshaft position sensor, crankshaft position sensor, distributor assembly, EGR solenoid valve, engine control module, evaporative emission purge solenoid, evaporative emission ventilation solenoid, heated oxygen sensor, idle air control motor, immobilizer-ECU, injector, MFI relay, powertrain control module, variable induction control solenoid valve and volume air flow sensor
10			10	Red	A/C compressor assembly and automatic compressor controller
11			15	Blue	ABS-ECU, auto-cruise control-ECU, capacitor, high-mounted stoplight, immobilizer-ECU, powertrain control module and rear combination light
12			–	–	–
13			7.5	Brown	Generator
14			10	Red	ETACS-ECU
15			20	Yellow	A/T control solenoid valve assembly and powertrain control module

NO.	POWER SUPPLY CIRCUIT	NAME	RATED CAPACITY (A)	HOUSING COLOR	LOAD CIRCUIT
16	Front-ECU (Headlight relay: High)	Fuse	10	Red	Headlight (RH)
17			10	Red	Headlight (LH)
18	Front-ECU (Headlight relay: Low)		10	Red	Headlight (RH)
19			10	Red	Headlight (LH)
20	Front-ECU (Taillight relay)		7.5	Brown	A/C switch, A/T selector lever position illumination light, ashtray illumination light, automatic compressor controller, combination meter, fog light switch, front combination light (RH), glove box light, hazard warning light switch, heater control panel illumination light, multi center display unit, radio, tape player, CD player, rear combination light (RH), rear side marker light (RH) and rheostat
21			7.5	Brown	Front combination light (LH), license plate light, rear combination light (LH) and rear side marker light (LH)
22	Battery		10	Red	Column switch, combination meter, ETACS-ECU, front-ECU, motor antenna assembly, multi center display unit, radio, tape player, CD player, sunroof motor assembly and vanity mirror light
23	Ignition switch (ACC)		10	Red	ETACS-ECU, motor antenna assembly, radio, tape player and CD player
24	Battery		15	Blue	Fuel pump module
25			–	–	–
26		Fusible link	120	White	Generator
27			30	Pink	Convertible top control module

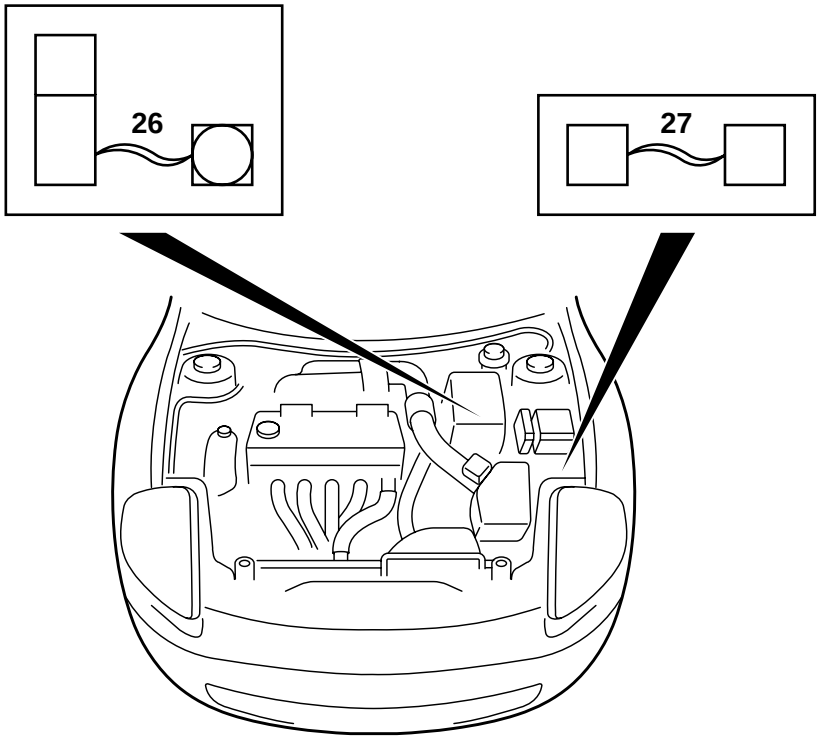
(RELAY BOX IN ENGINE COMPARTMENT)



AC106661AB

(CONNECTED DIRECTLY TO BATTERY POSITIVE TERMINAL)

(CONNECTED IN FRONT OF THE RELAY BOX)



AC106662AB

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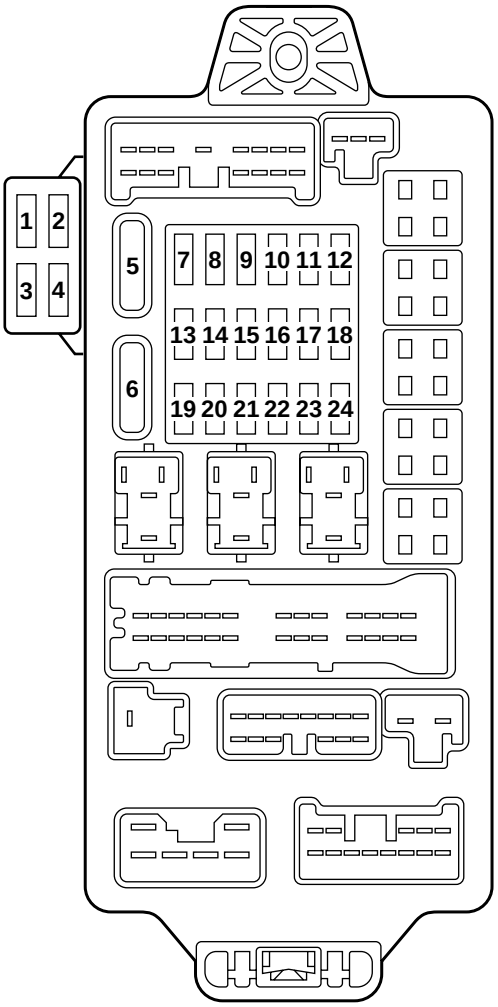
PASSENGER COMPARTMENT

NO.	POWER SUPPLY CIRCUIT	NAME	RATED CAPACITY (A)	HOUSING COLOR	LOAD CIRCUIT
1	Fusible link No.5	Fuse	20	Yellow	Amplifier
2	–		–	–	–
3	Fusible link No.5		20	Yellow	Sunroof motor assembly
4	–		–	–	–
5	Fusible link No.1		30	Green	Capacitor, choke coil and defogger
6			30	Green	Automatic compressor controller, blower motor and resistor
7			–	–	–
8			–	–	–
9			–	–	–
10			15	Blue	Combination meter, data link connector and ETACS-ECU
11	Ignition switch (ACC)		15	Blue	Capacitor, ETACS-ECU and rear wiper motor
12			–	–	–
13	Ignition switch (IG2)		7.5	Brown	ABS-ECU, convertible top control module and sunroof motor assembly
14	Ignition switch (ACC)		7.5	Brown	Remote controlled mirror
15			–	–	–
16			15	Blue	Accessory socket, cigarette lighter and multi center display unit
17	Ignition switch (IG1)		7.5	Brown	Engine control module, fuel pump relay and powertrain control module
18	Ignition switch (ACC)		20	Yellow	Front-ECU and windshield wiper motor
19	–		–	–	–
20	Ignition switch (IG2)		7.5	Brown	A/C compressor relay, A/C switch, automatic compressor controller, blower relay, defogger relay, front-ECU, outside/inside air selection damper control motor, water shut motor and water shut valve controller
21	Ignition switch (IG1)		7.5	Brown	Auto-cruise control-ECU and auto-cruise control switch
22			7.5	Brown	Backup light, combination meter, ETACS-ECU, input shaft speed sensor, output shaft speed sensor, powertrain control module and SRS-ECU

NO.	POWER SUPPLY CIRCUIT	NAME	RATED CAPACITY (A)	HOUSING COLOR	LOAD CIRCUIT
23	Ignition switch (IG1)	Fuse	7.5	Brown	Column switch, combination meter, ETACS-ECU, motor antenna assembly, multi center display unit, SRS-ECU and vehicle speed sensor
24			10	Red	Capacitor, distributor assembly and ignition coil

(IN JUNCTION BLOCK)

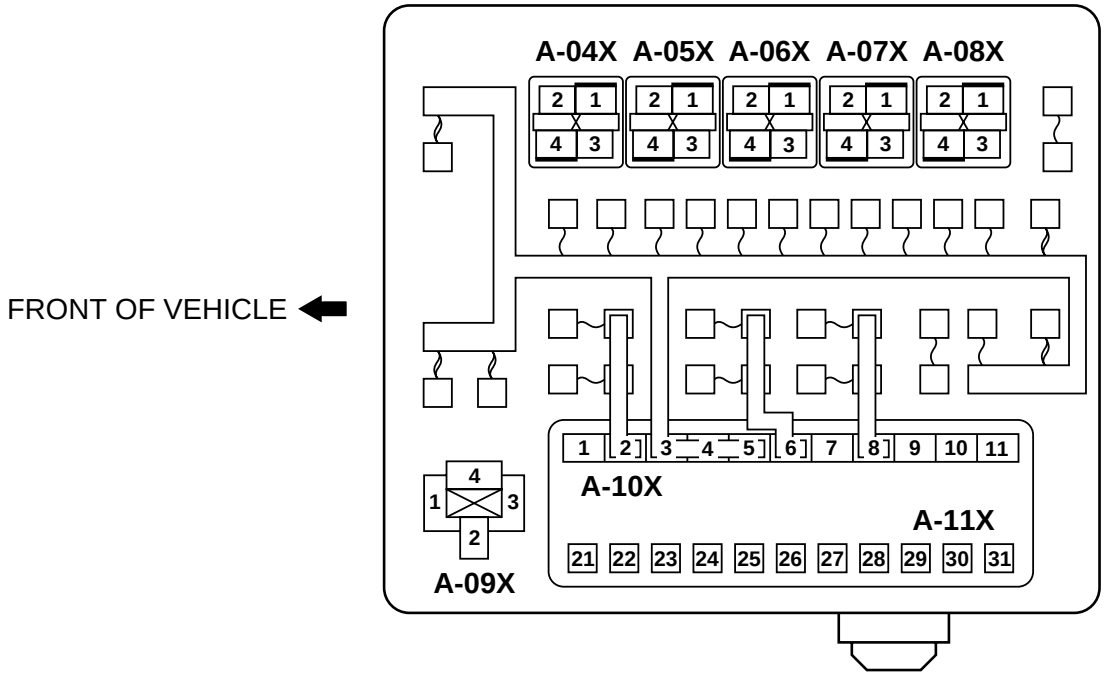


AC106682AB

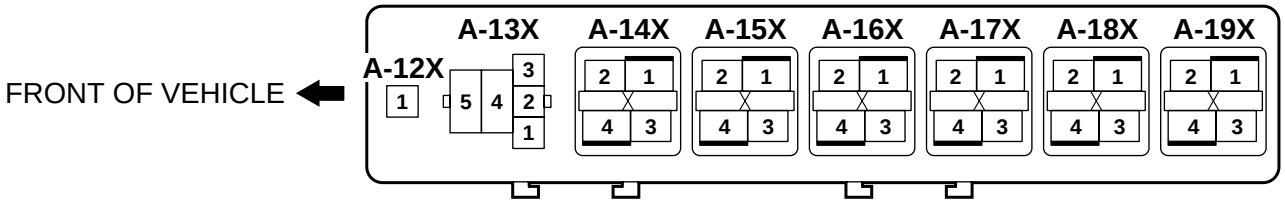
CENTRALIZED RELAY

CONNECTOR NO.	NAME	CONNECTOR NO.	NAME
A-04X	Fog light relay	A-12X	Engine speed detection connector
A-05X	Horn relay	A-13X	Starter relay
A-06X	Theft-alarm horn relay	A-14X	–
A-07X	–	A-15X	–
A-08X	–	A-16X	–
A-09X	Fan control relay	A-17X	A/T control relay
A-10X	Front-ECU	A-18X	MFI relay
A-11X	Front-ECU	A-19X	A/C compressor relay

(RELAY BOX IN ENGINE COMPARTMENT)



AC106661AC

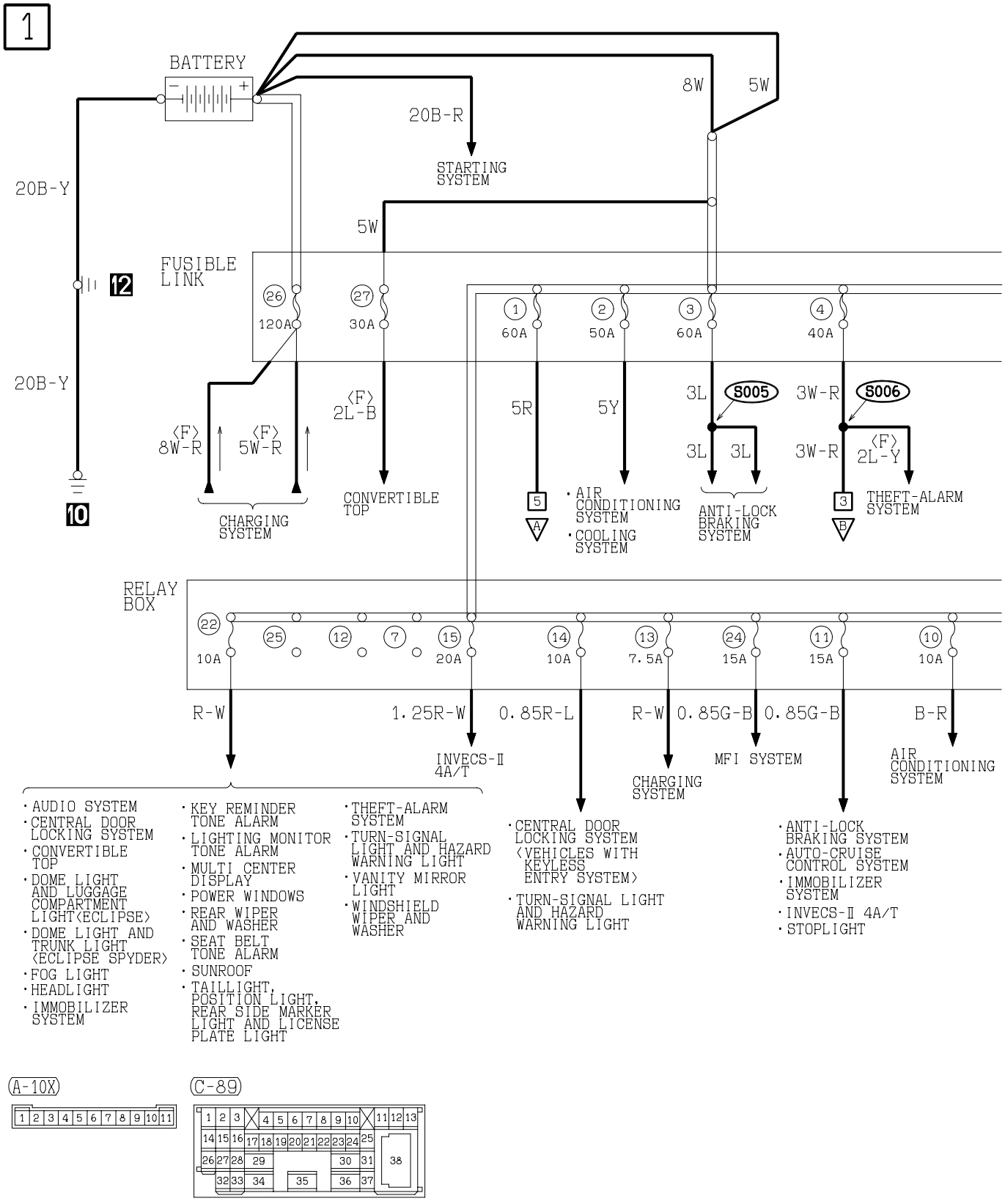


AC106656AB

NOTES

POWER DISTRIBUTION SYSTEM

M1901000400363



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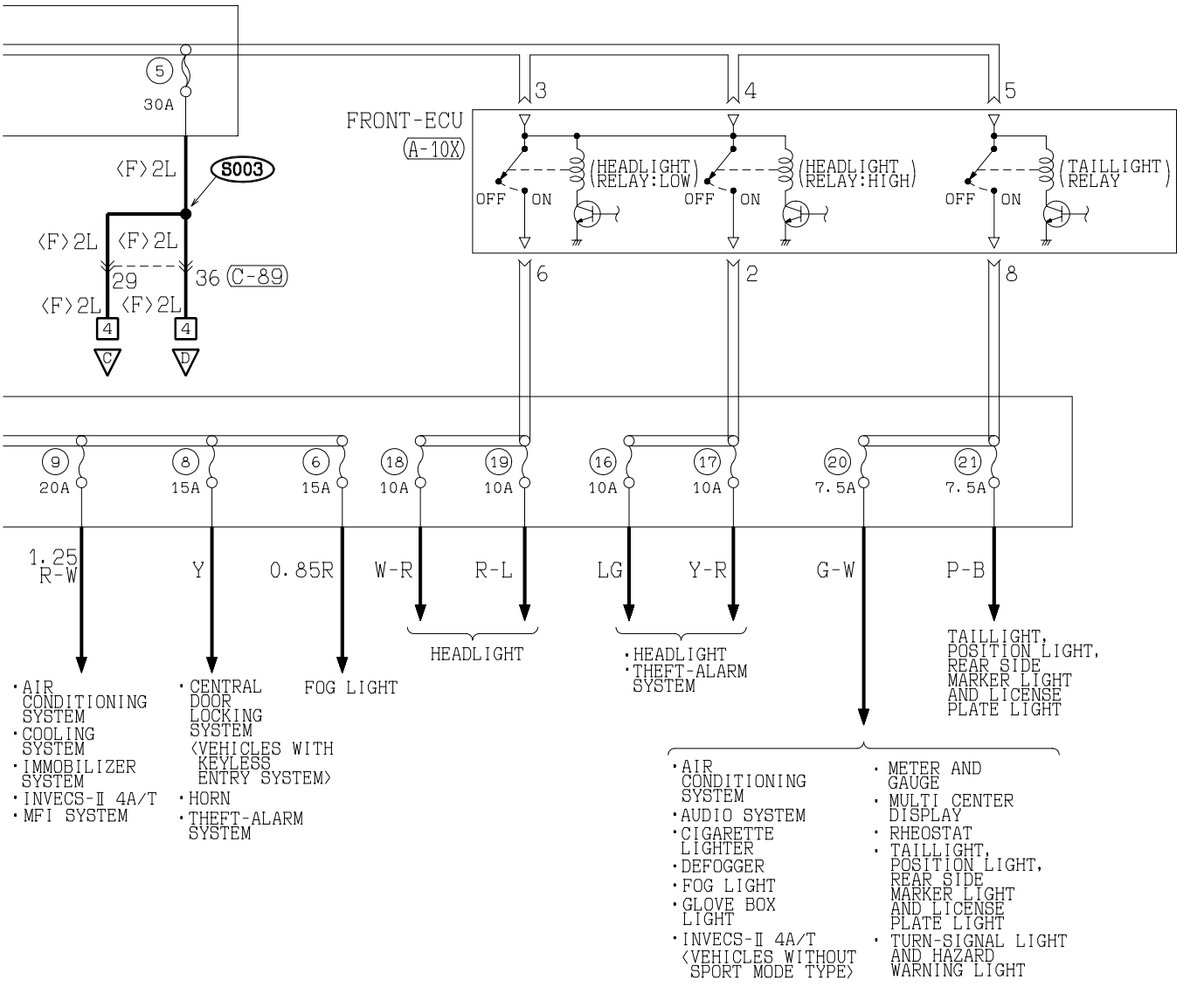
2



WIRE COLOR CODE

B :BLACK	LG:LIGHT GREEN	G :GREEN	L :BLUE	W :WHITE	Y :YELLOW	SB:SKY BLUE
BR:BROWN	O :ORANGE	GR:GRAY	R :RED	P :PINK	V :VIOLET	

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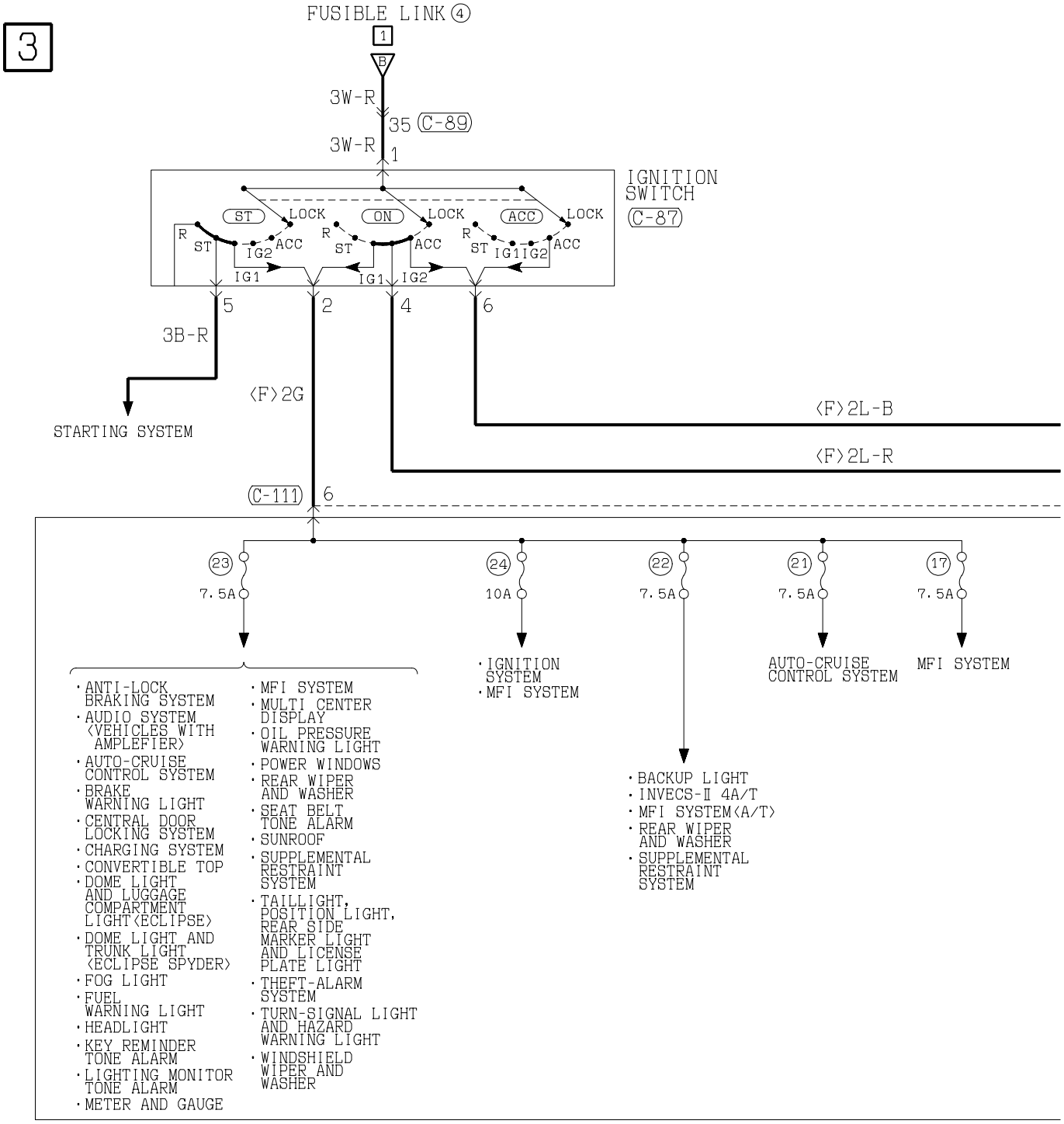
POWER DISTRIBUTION SYSTEM (CONTINUED)



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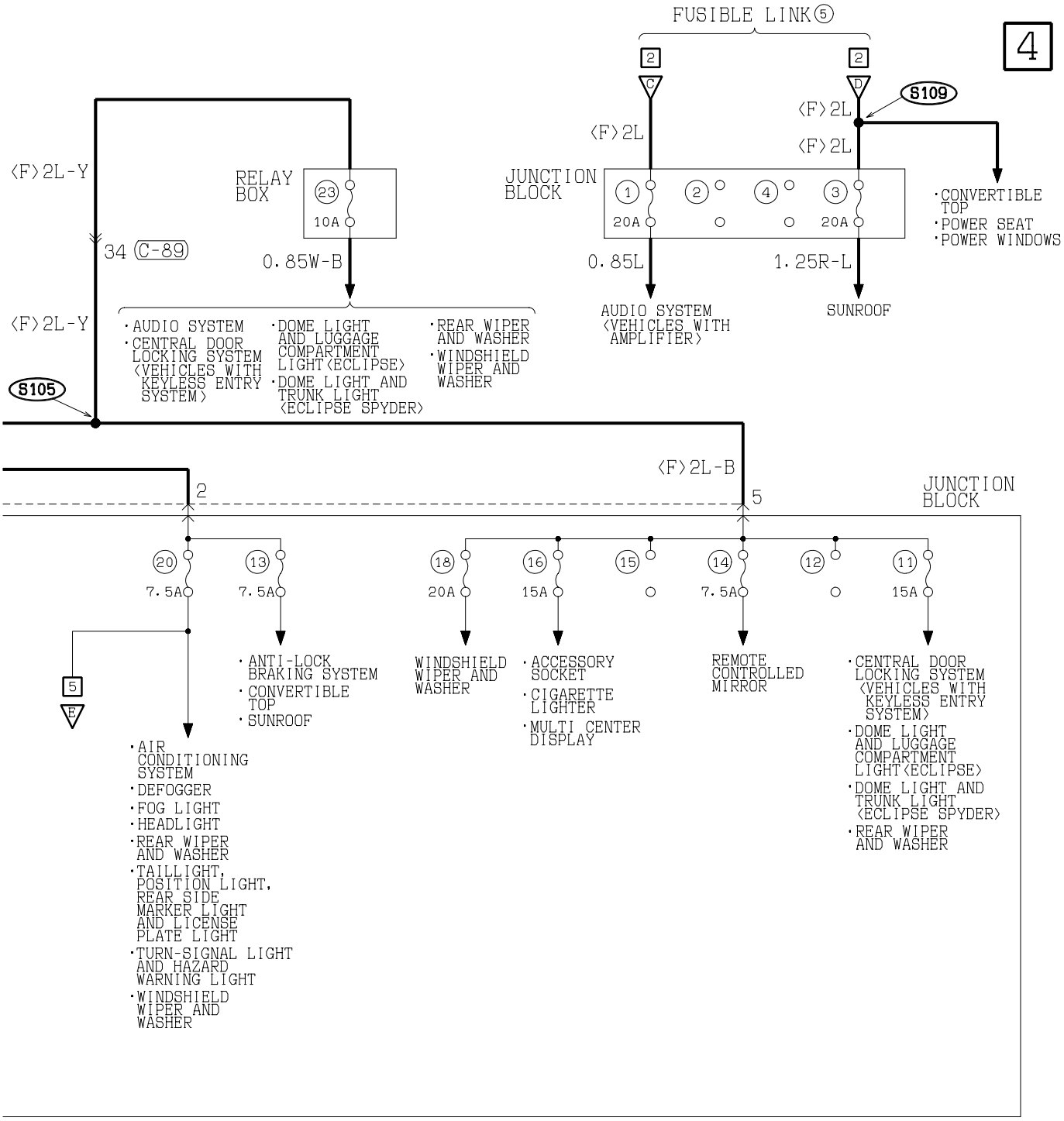

WIRE COLOR CODE

B :BLACK	LG:LIGHT GREEN	G :GREEN	L :BLUE	W :WHITE	Y :YELLOW	SB:SKY BLUE
BR:BROWN	O :ORANGE	GR:GRAY	R :RED	P :PINK	V :VIOLET	

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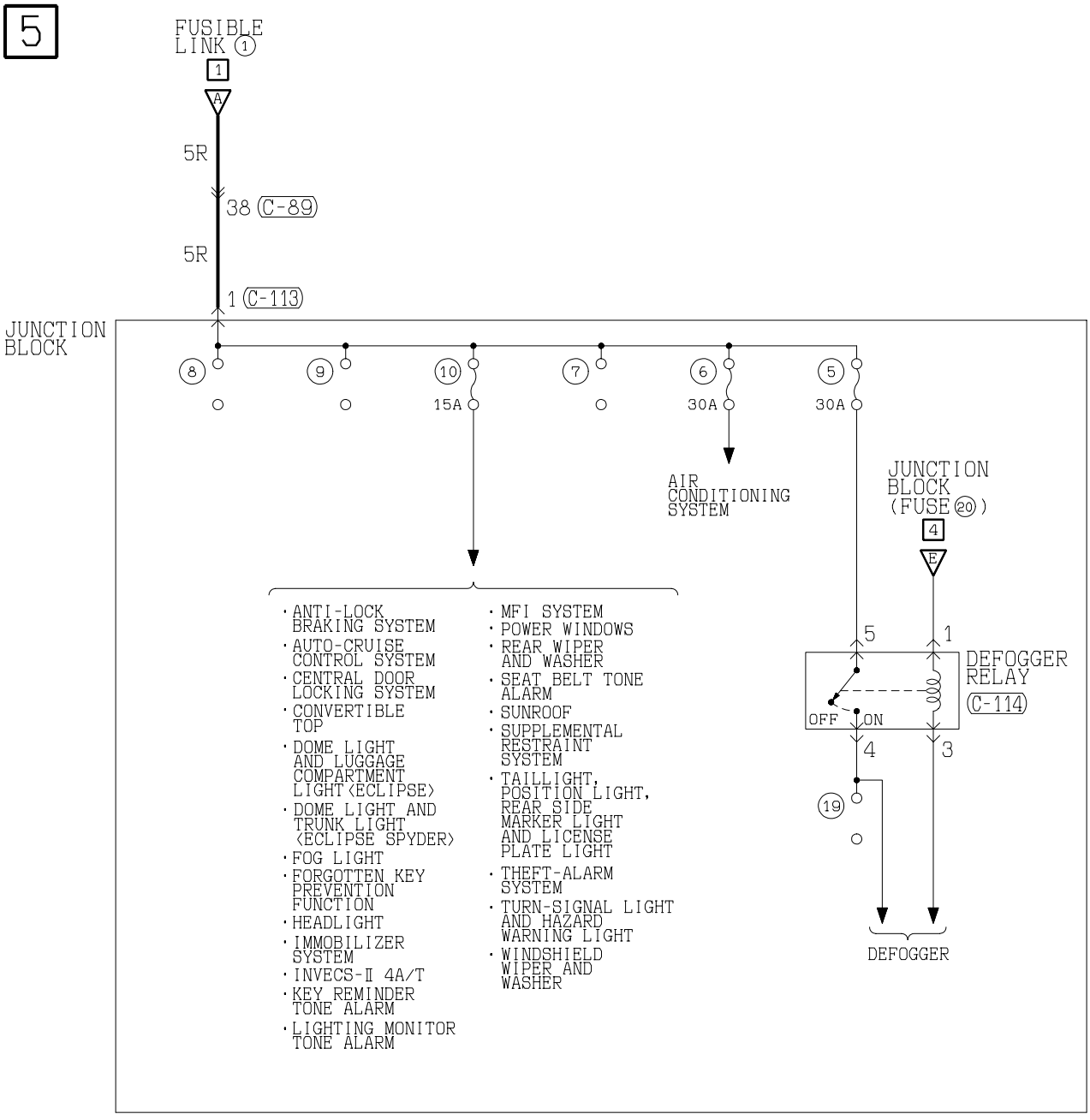
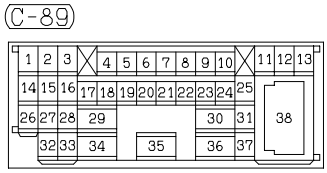
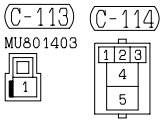
TSB Revision

POWER DISTRIBUTION SYSTEM (CONTINUED)







WIRE COLOR CODE

B :BLACK	LG:LIGHT GREEN	G :GREEN	L :BLUE
BR:BROWN	O :ORANGE	GR:GRAY	R :RED
W :WHITE	SB:SKY BLUE	P :PINK	Y :YELLOW
V :VIOLET			

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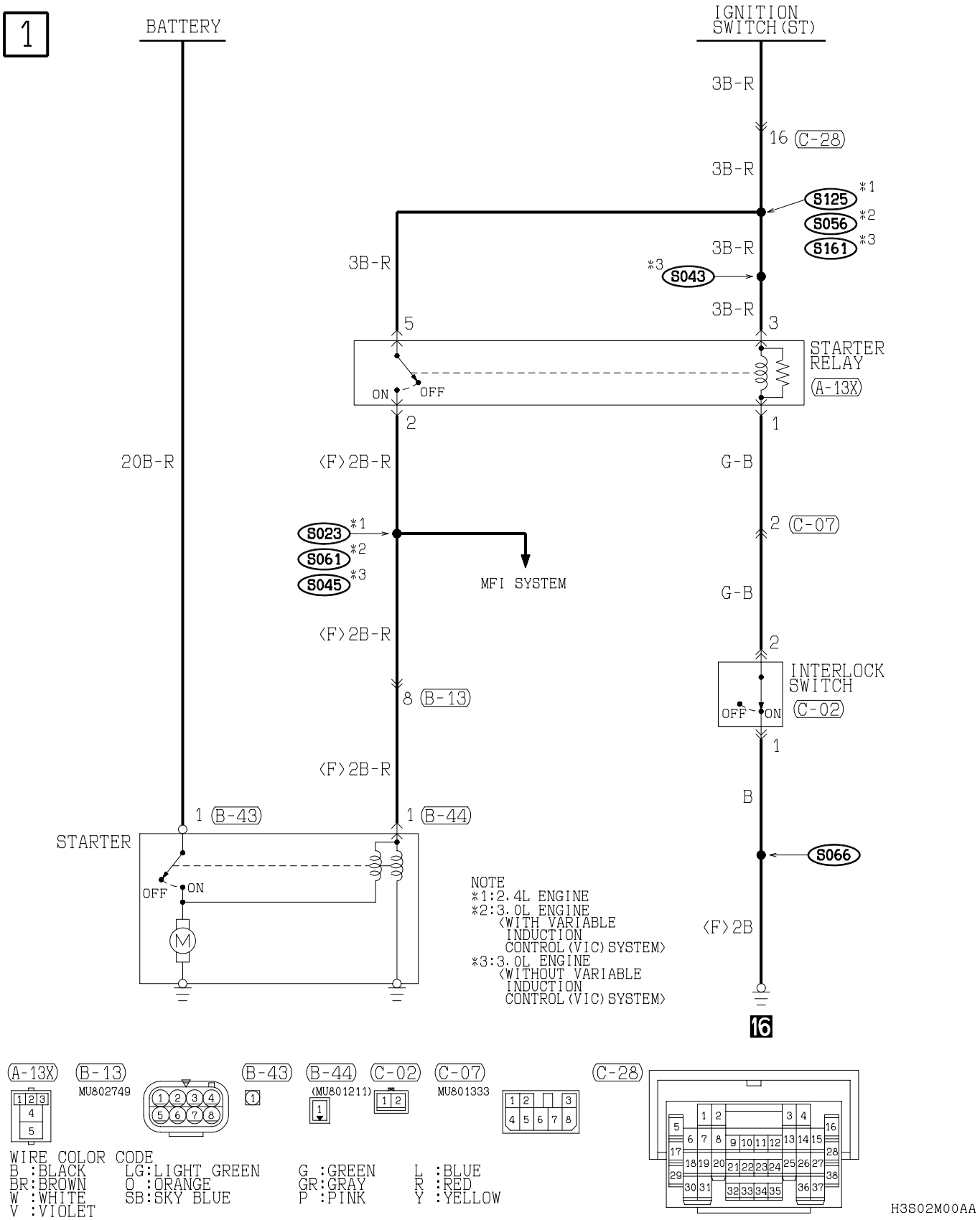
NOTES

STARTING SYSTEM <M/T>

M1901000500531



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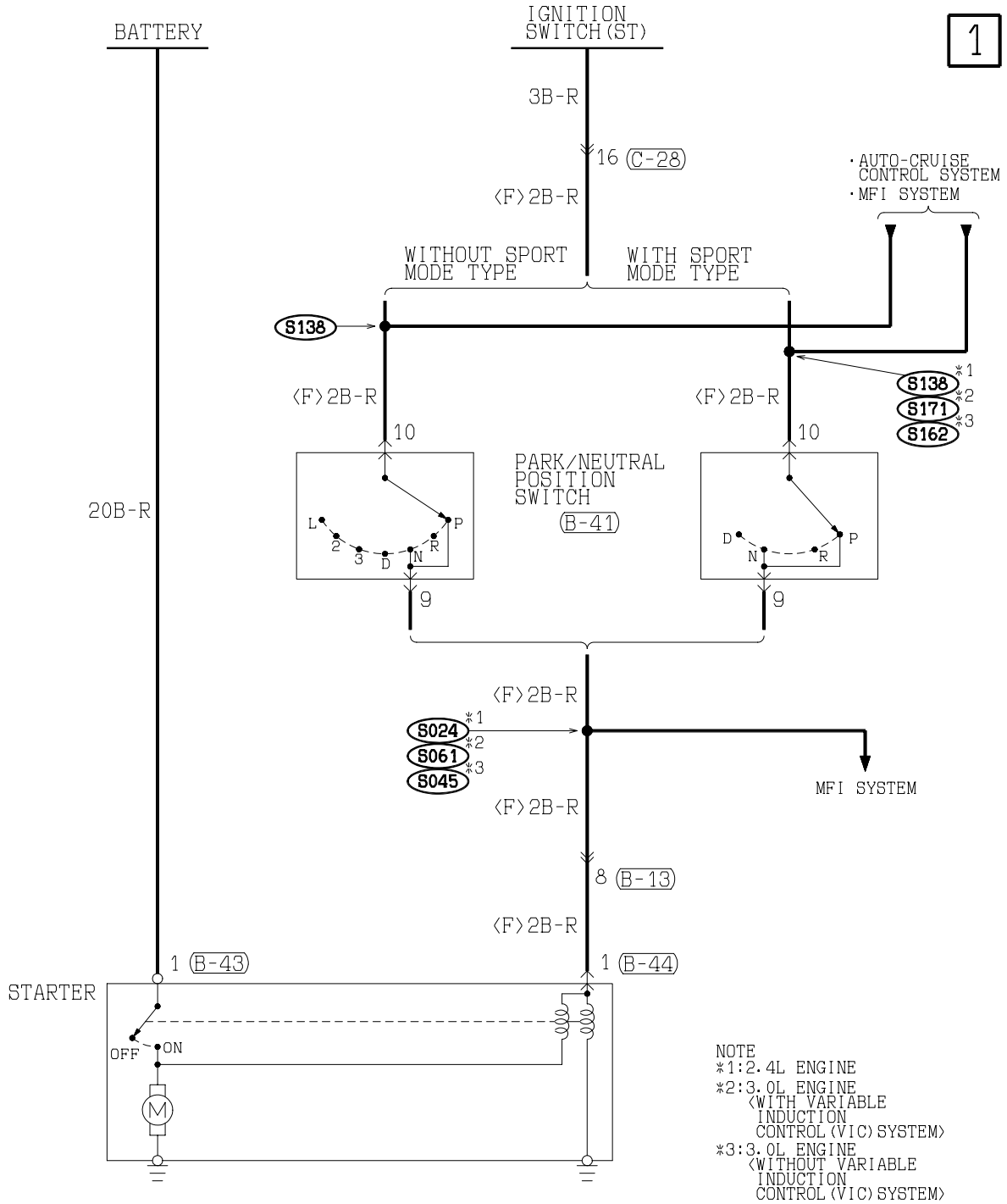
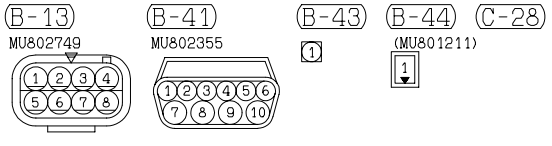
STARTING SYSTEM <A/T>

M1901000500542



NOTE
*1:2.4L ENGINE
*2:3.0L ENGINE
⟨WITH VARIABLE INDUCTION CONTROL(VIC)SYSTEM⟩
*3:3.0L ENGINE
⟨WITHOUT VARIABLE INDUCTION CONTROL(VIC)SYSTEM⟩



WIRE COLOR CODE

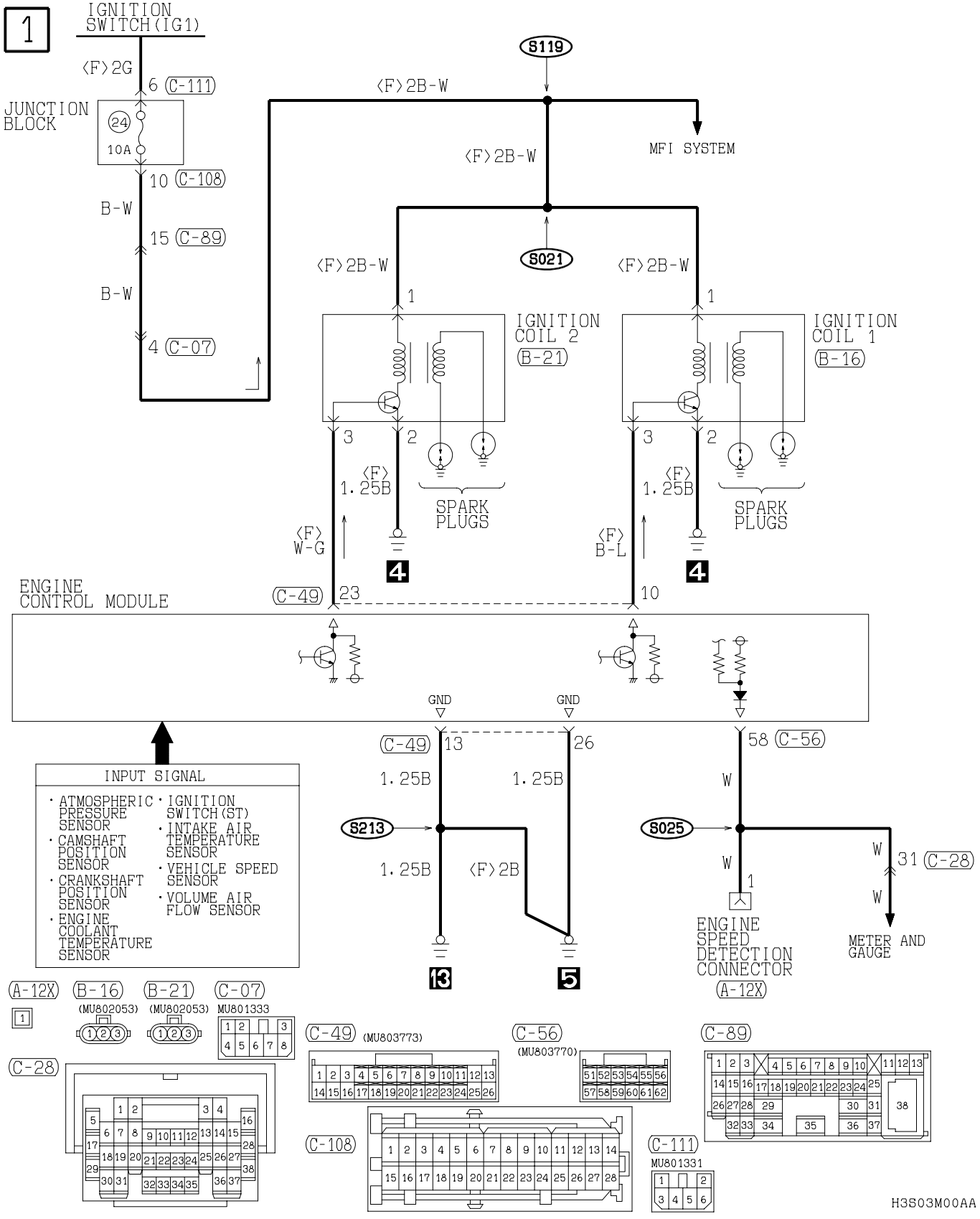
B	:BLACK	BR	:BROWN
G	:GREEN	GR	:GRAY
L	:BLUE	LG	:LIGHT GREEN
O	:ORANGE	P	:PINK
R	:RED	SB	:SKY BLUE
V	:VIOLET	W	:WHITE
Y	:YELLOW		

H3S02M01AA

TSB Revision

IGNITION SYSTEM <2.4L ENGINE-M/T>

M1901000600709



TSB Revision

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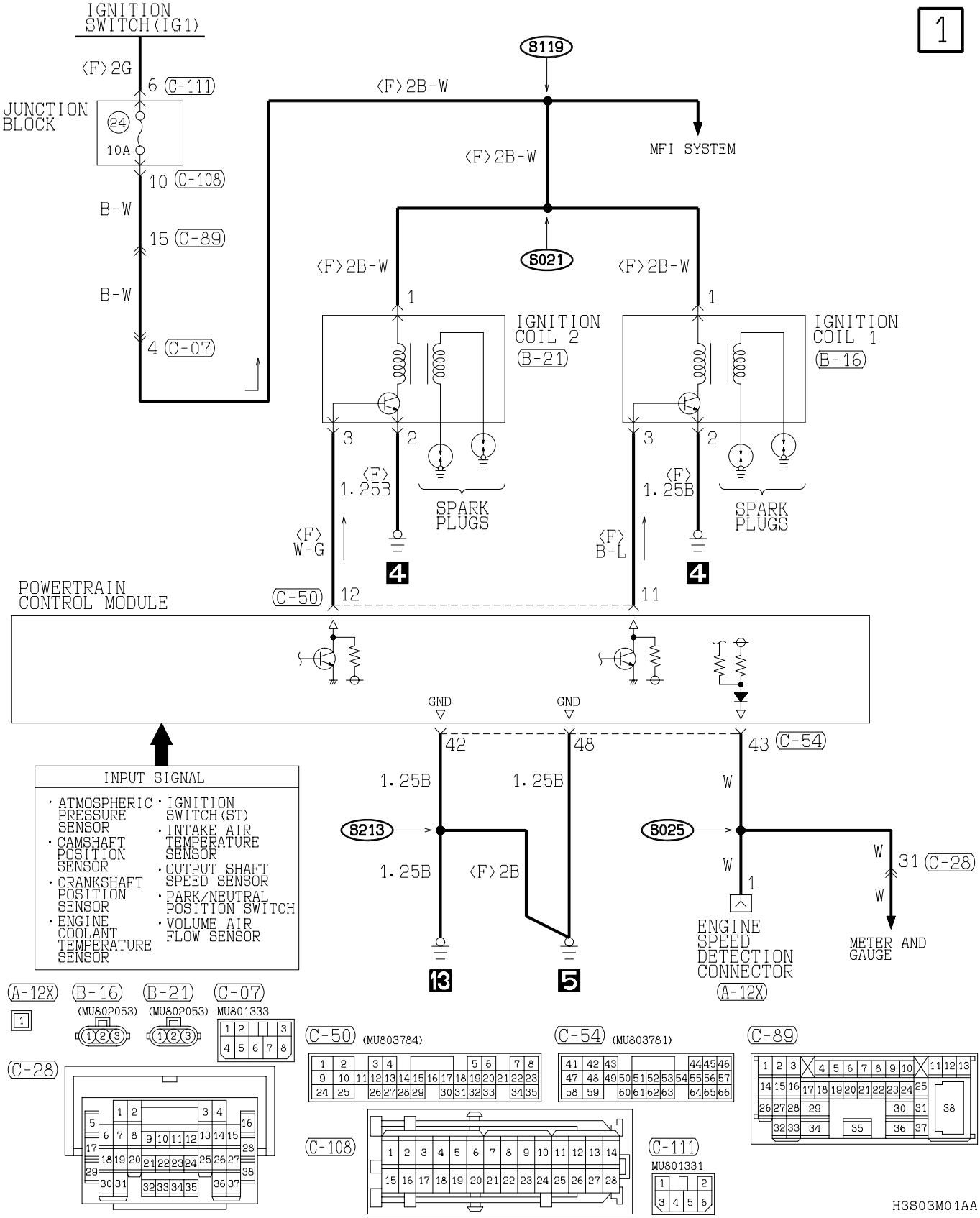
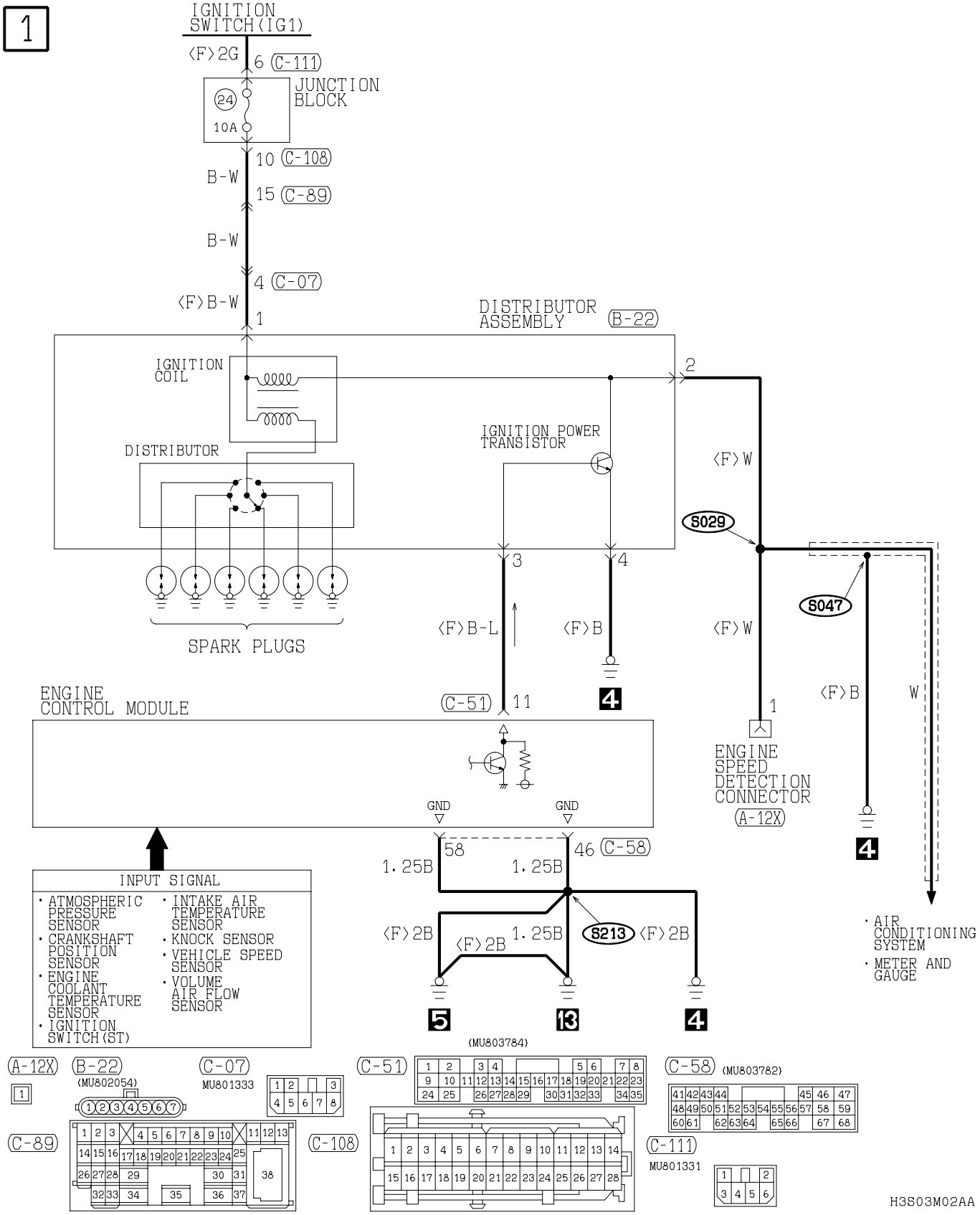


TSB Revision

IGNITION SYSTEM <3.0L ENGINE-M/T>

M1901000600721



TSB Revision

IGNITION SYSTEM <3.0L ENGINE-A/T>

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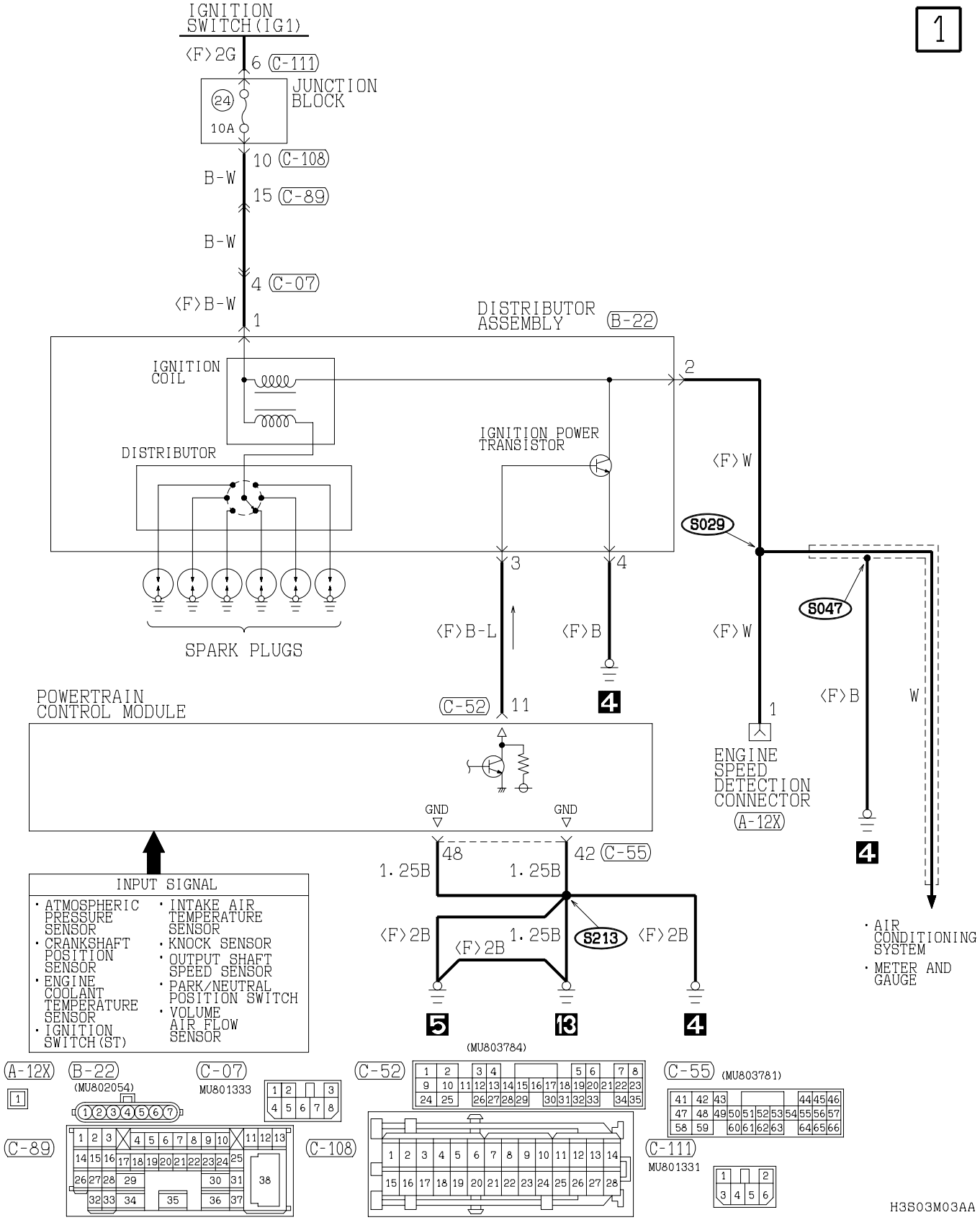
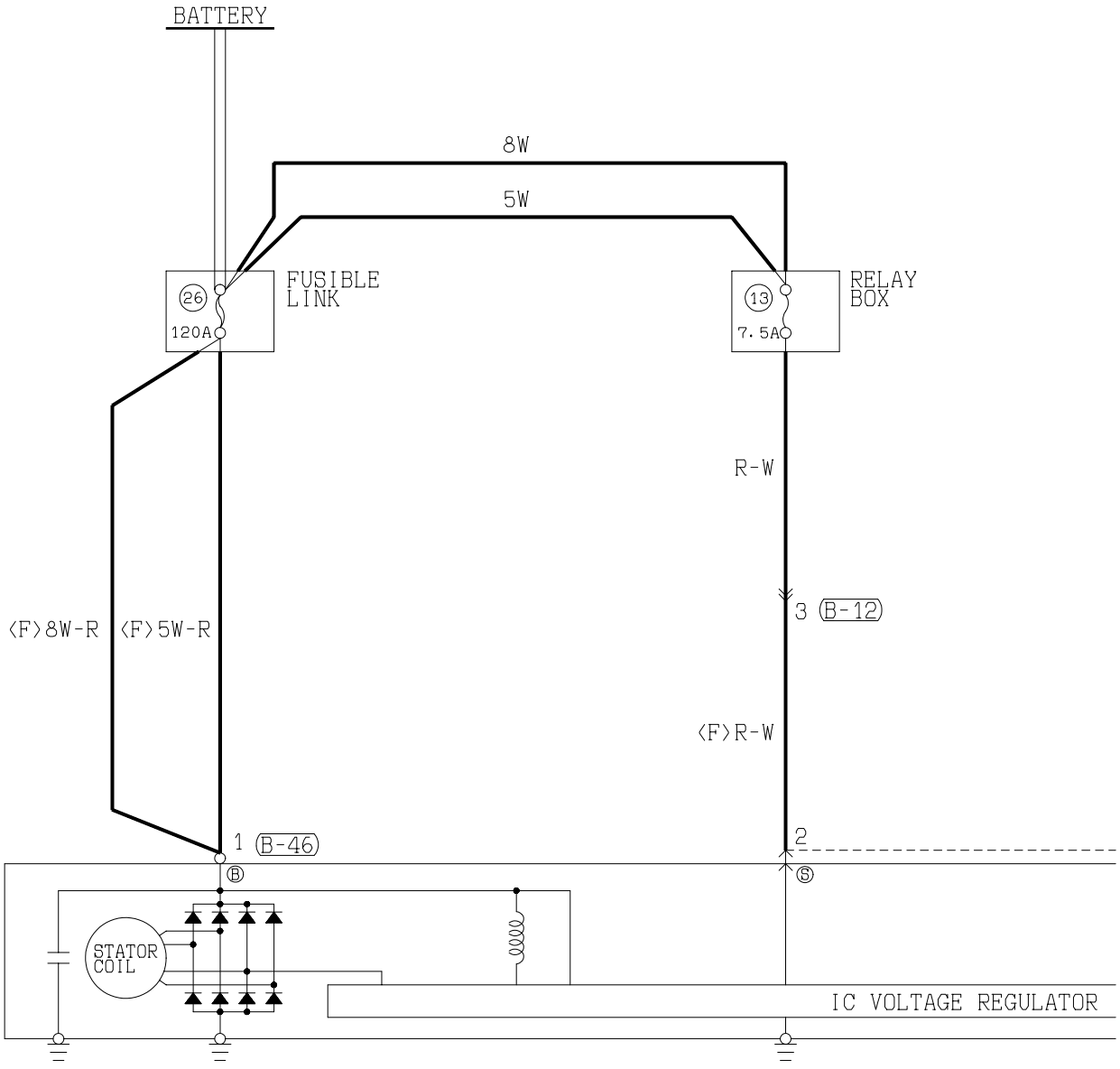


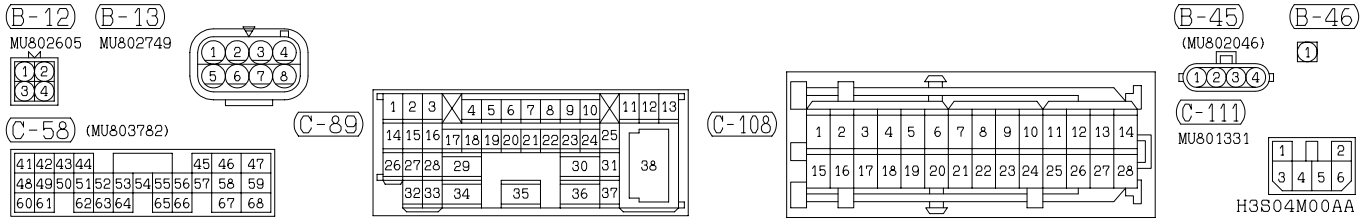
TSB Revision

CHARGING SYSTEM <M/T>

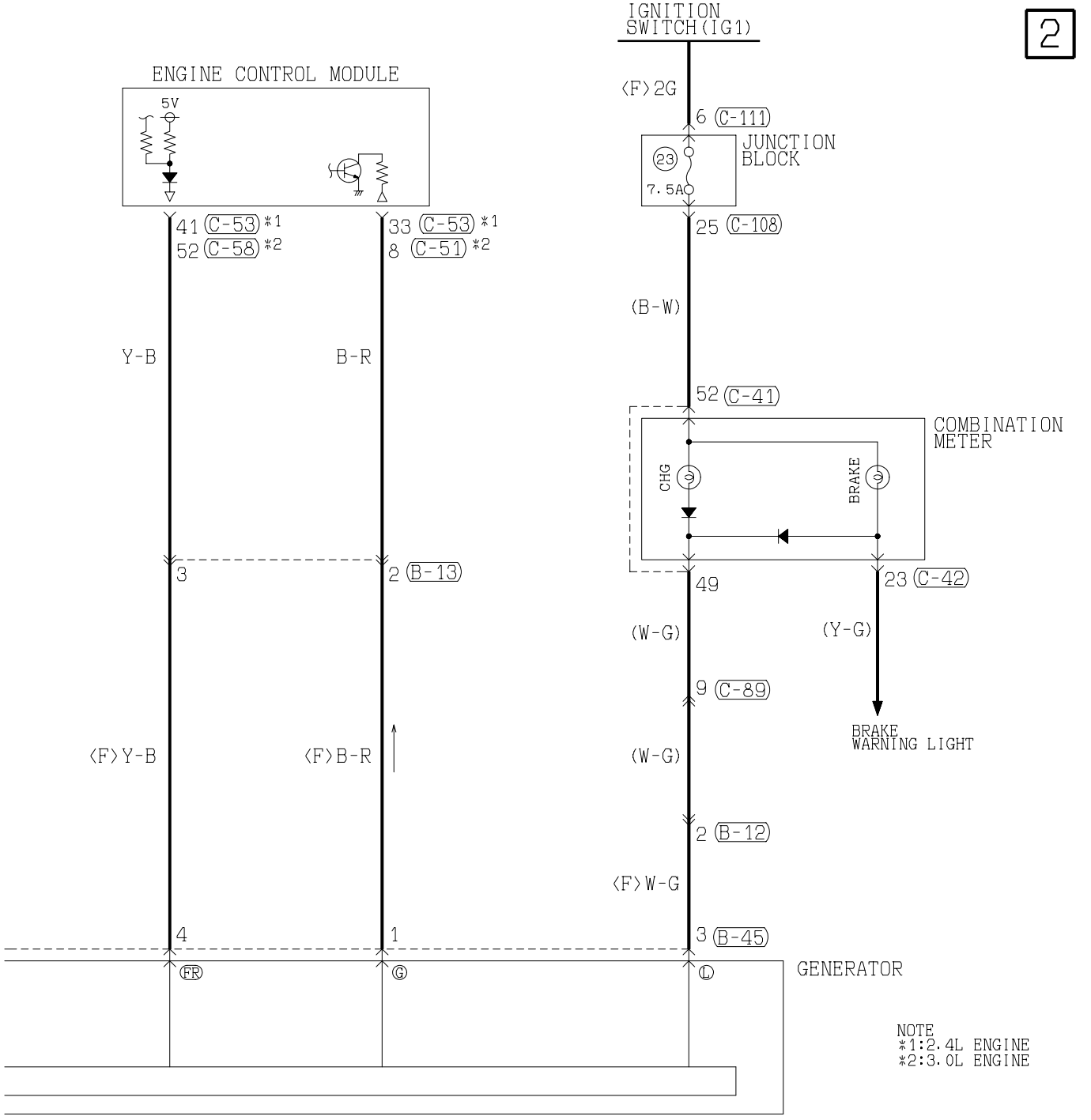
M1901000700438

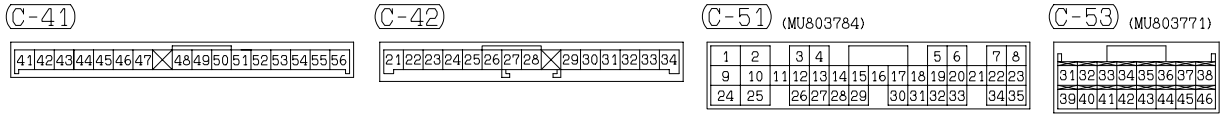
1





TSB Revision





WIRE COLOR CODE

B :BLACK	LG:LIGHT GREEN	G :GREEN	L :BLUE	W :WHITE	Y :YELLOW	SB:SKY BLUE
BR:BROWN	O :ORANGE	GR:GRAY	R :RED	P :PINK	V :VIOLET	

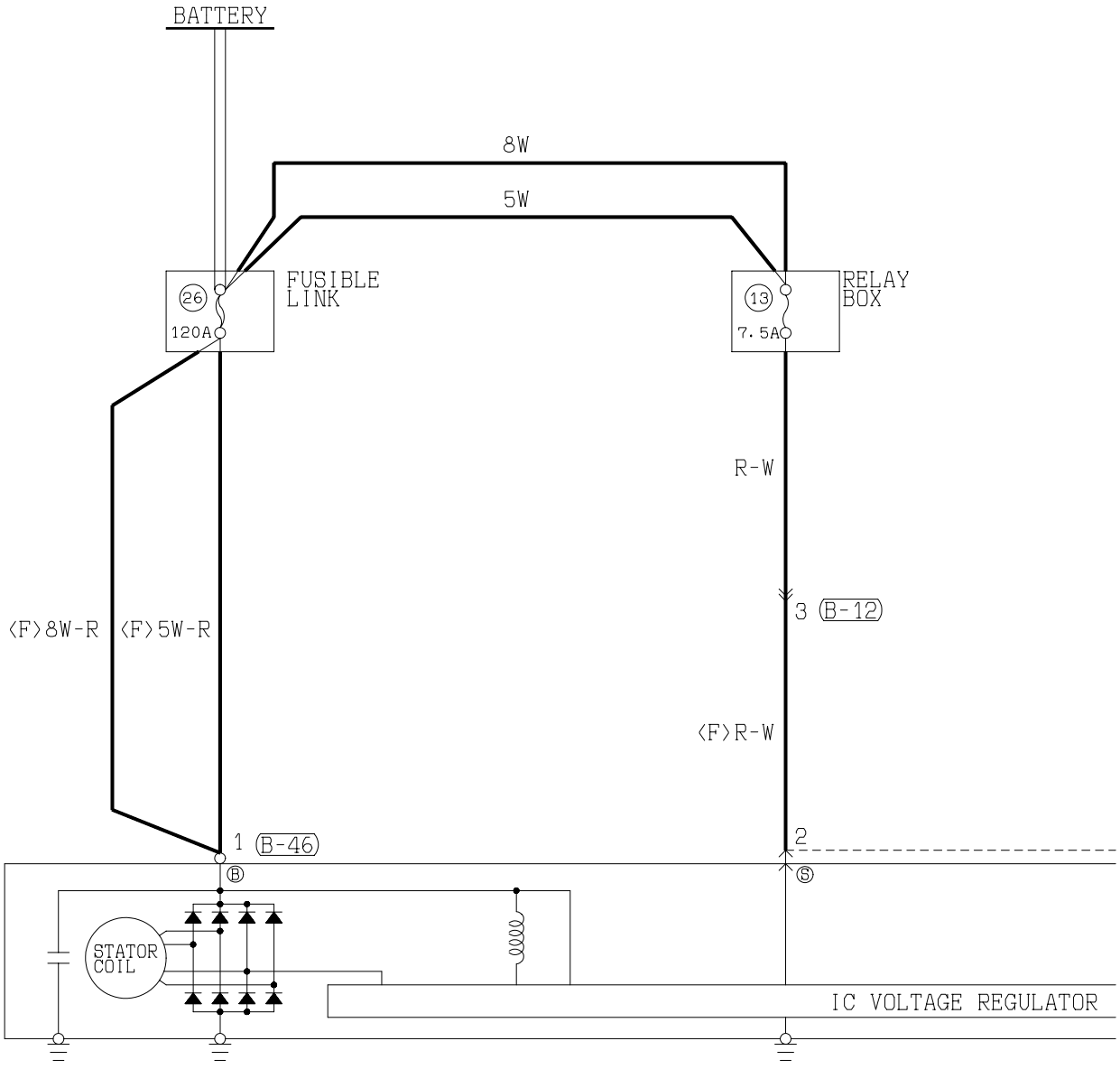
H3S04M00AB

TSB Revision

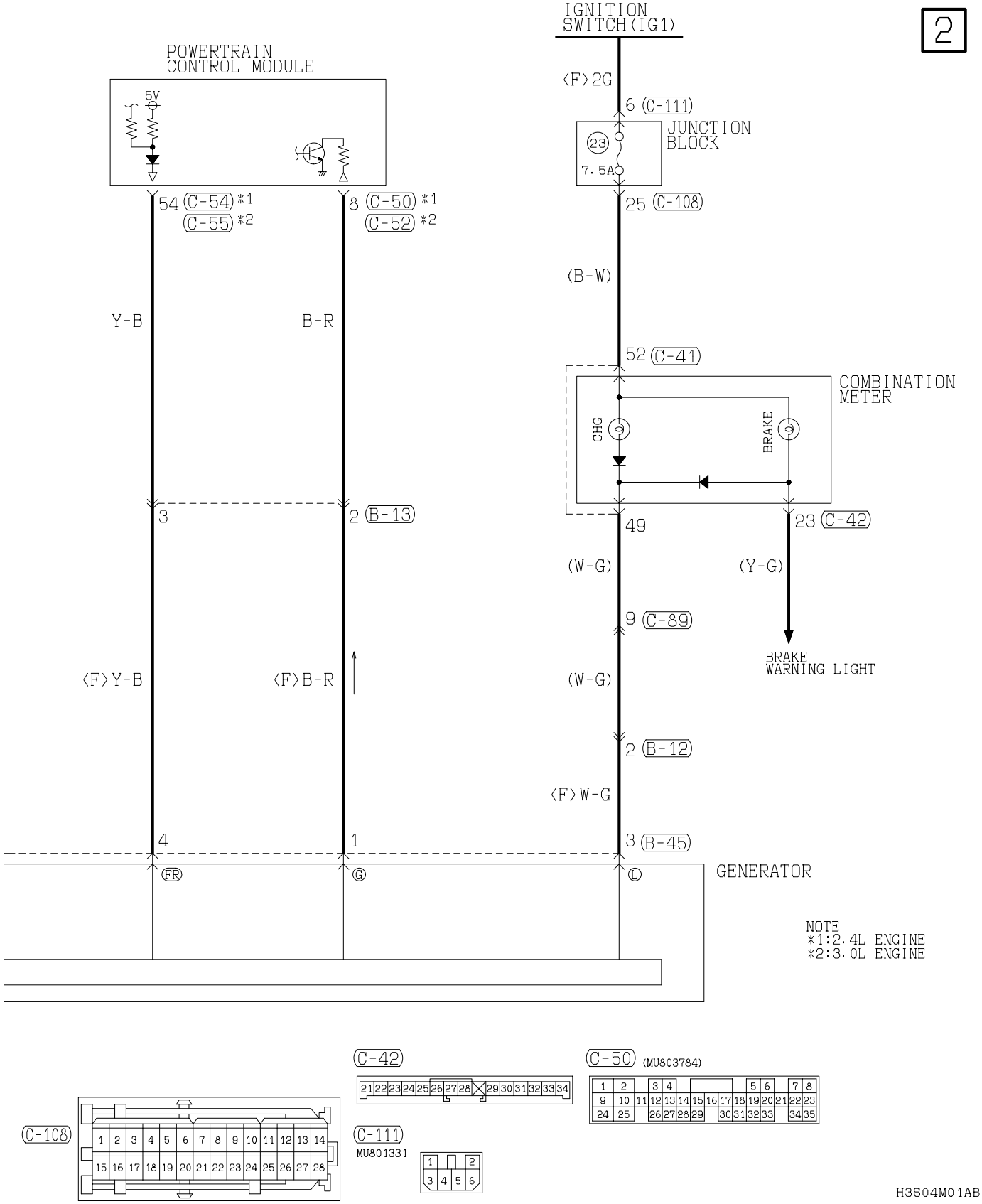
CHARGING SYSTEM <A/T>

M1901000700449

1



TSB Revision



TSB Revision

MFI SYSTEM <2.4L ENGINE-M/T>

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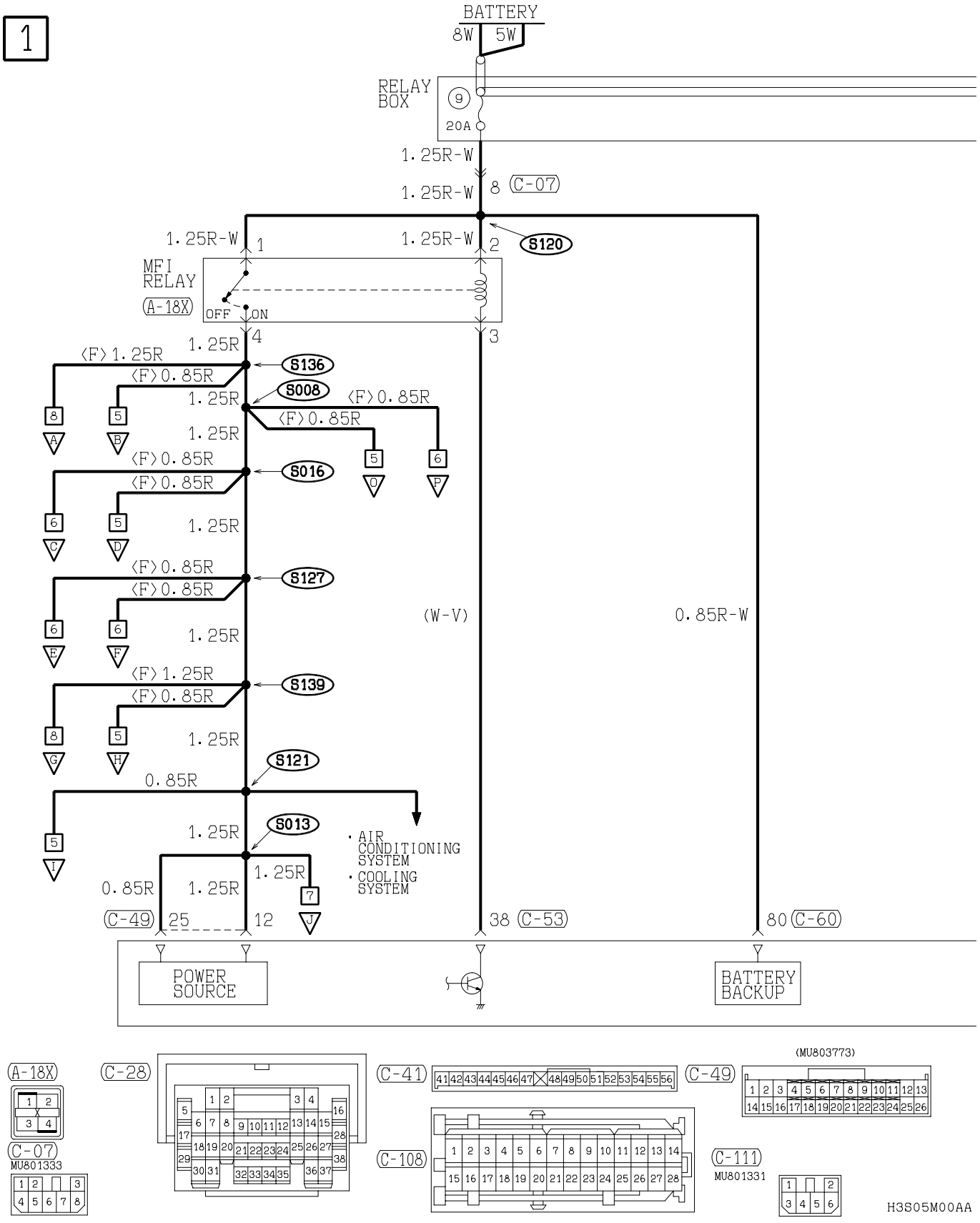
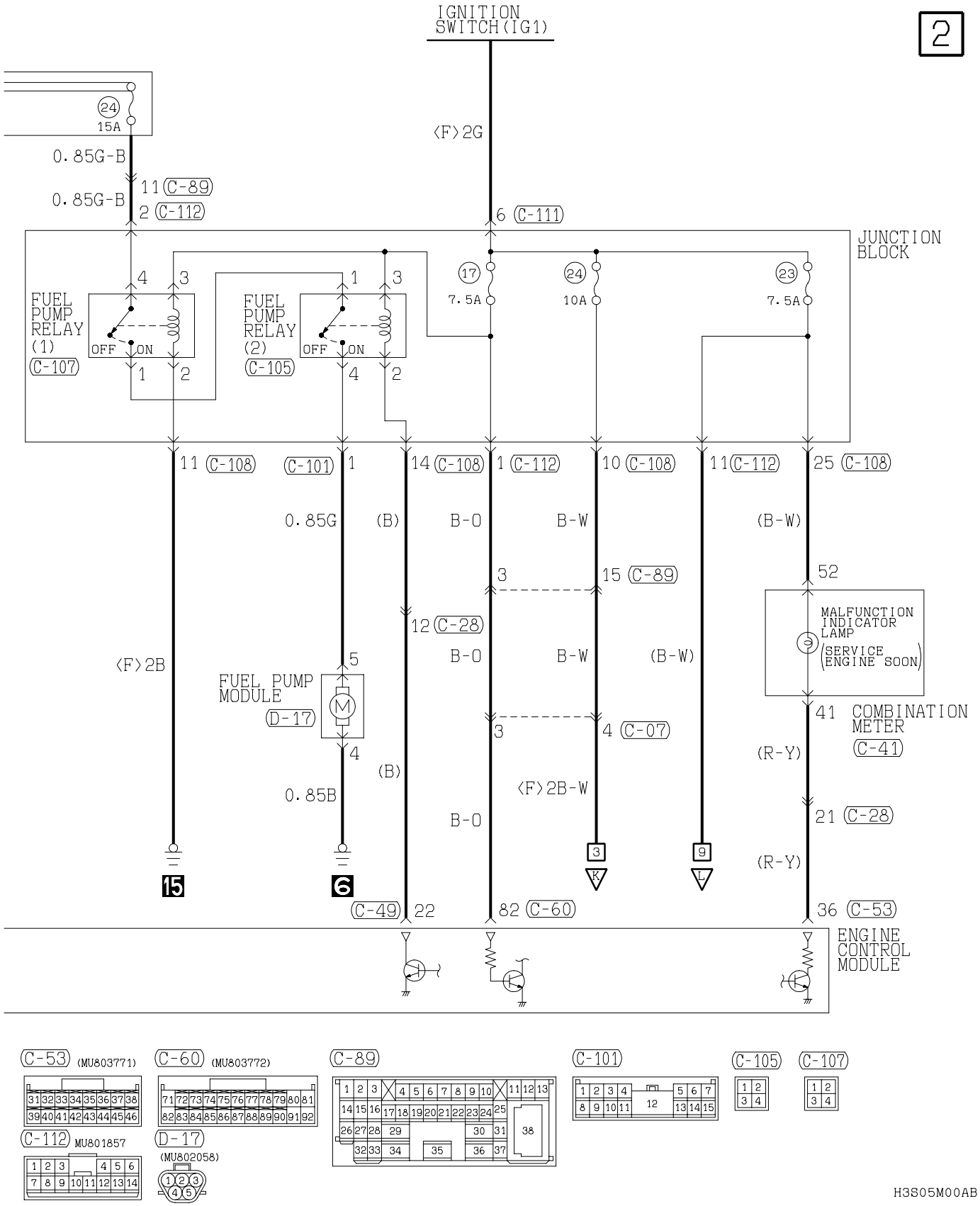
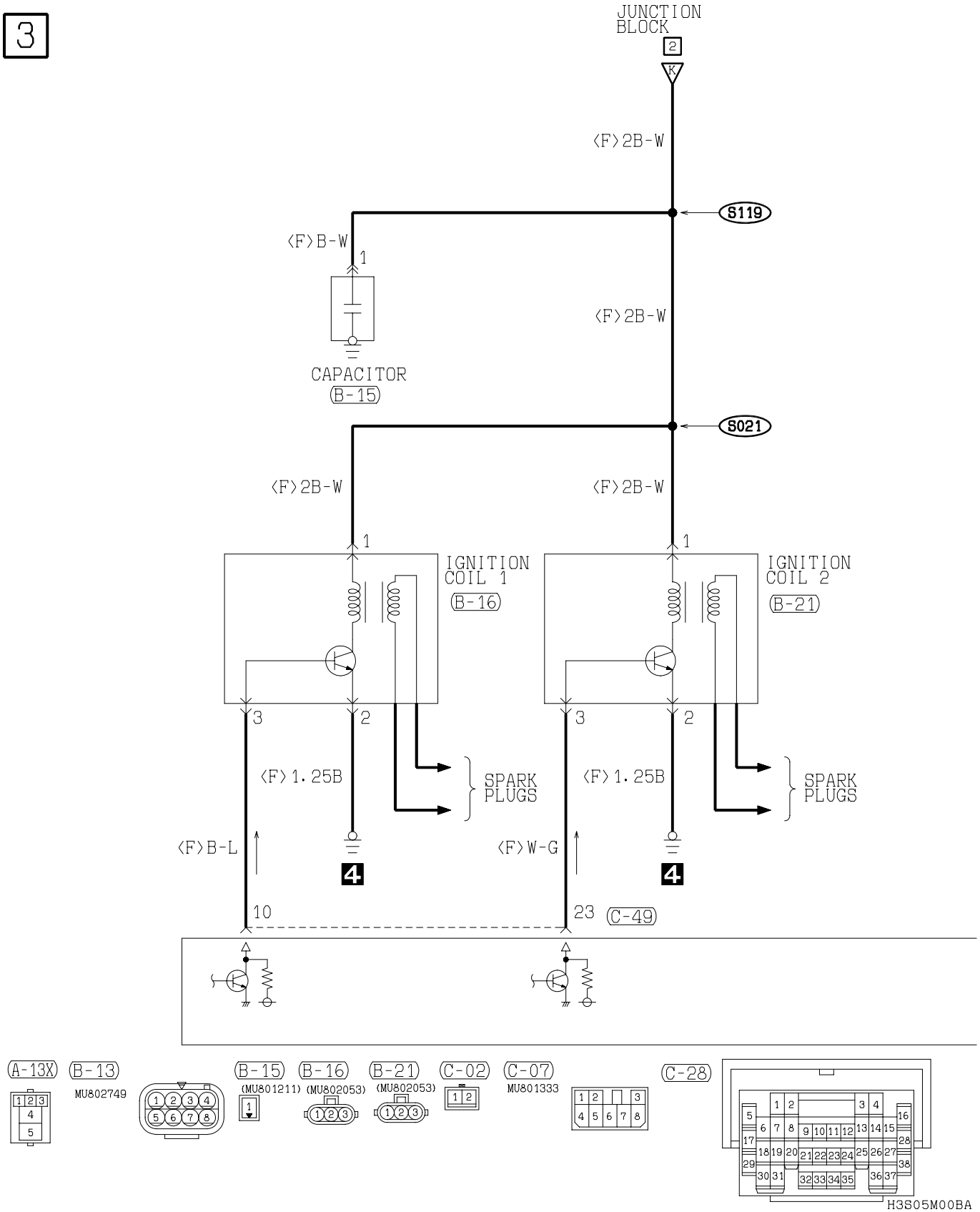


TSB Revision



TSB Revision

MFI SYSTEM <2.4L ENGINE-M/T> (CONTINUED)



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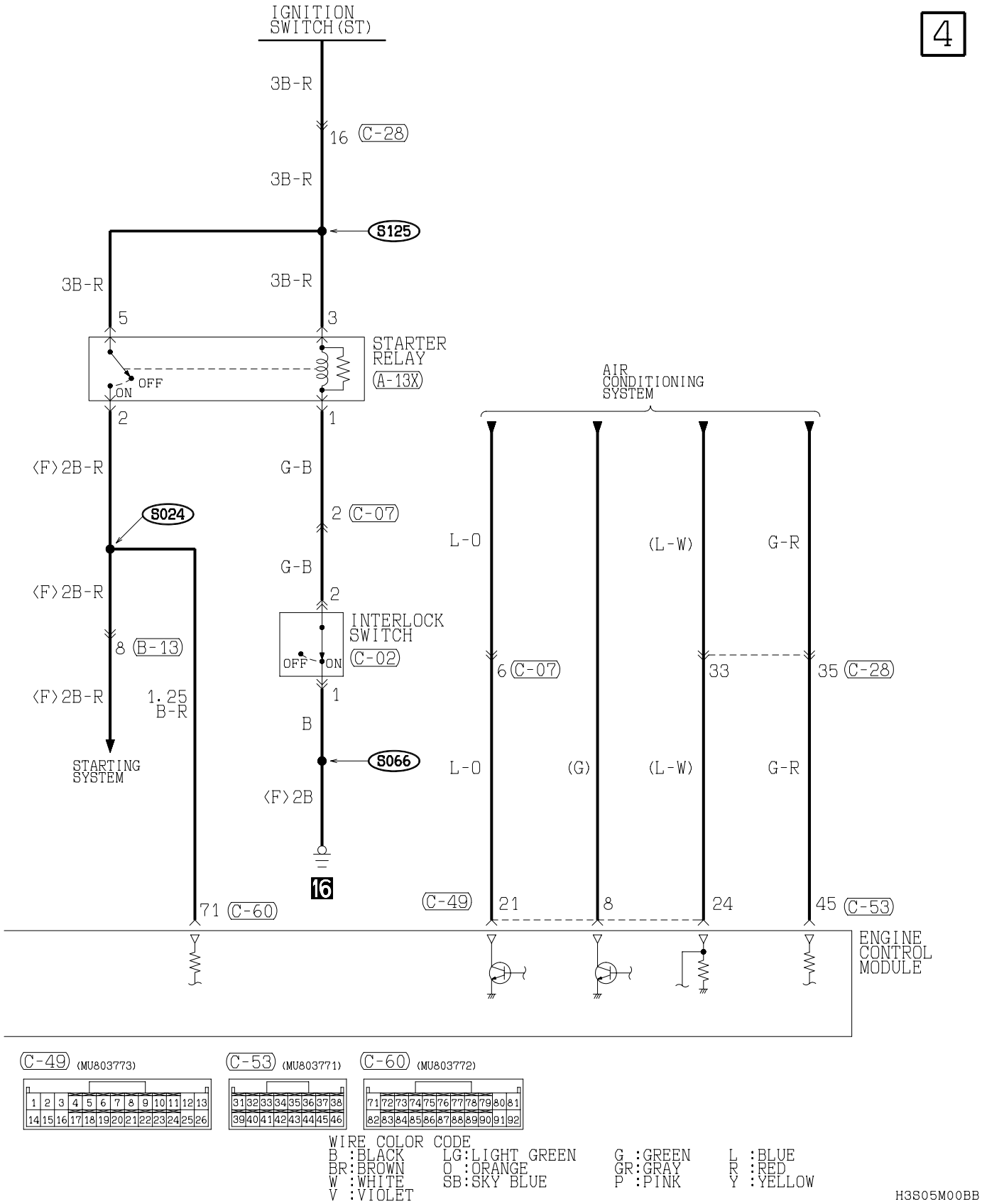

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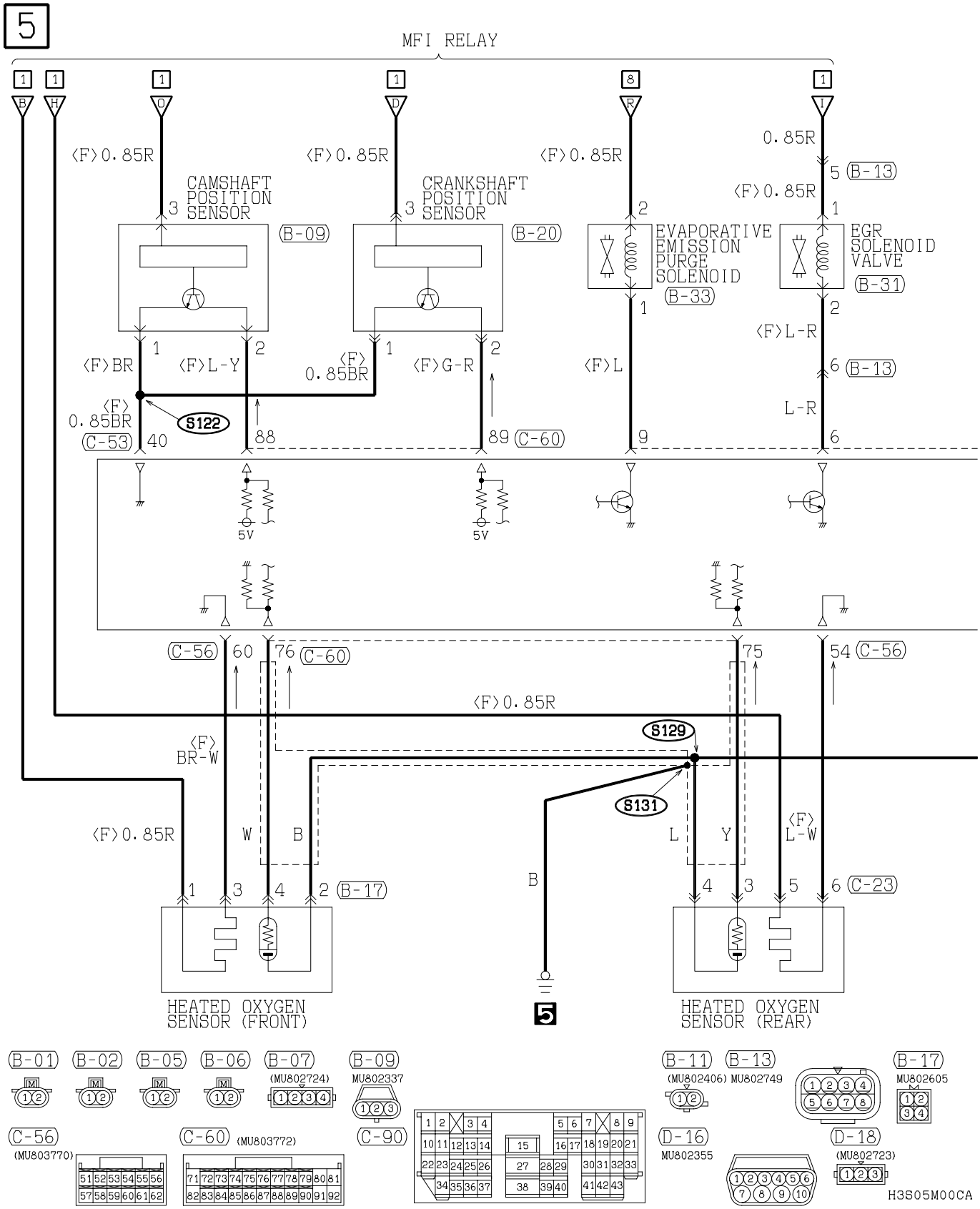
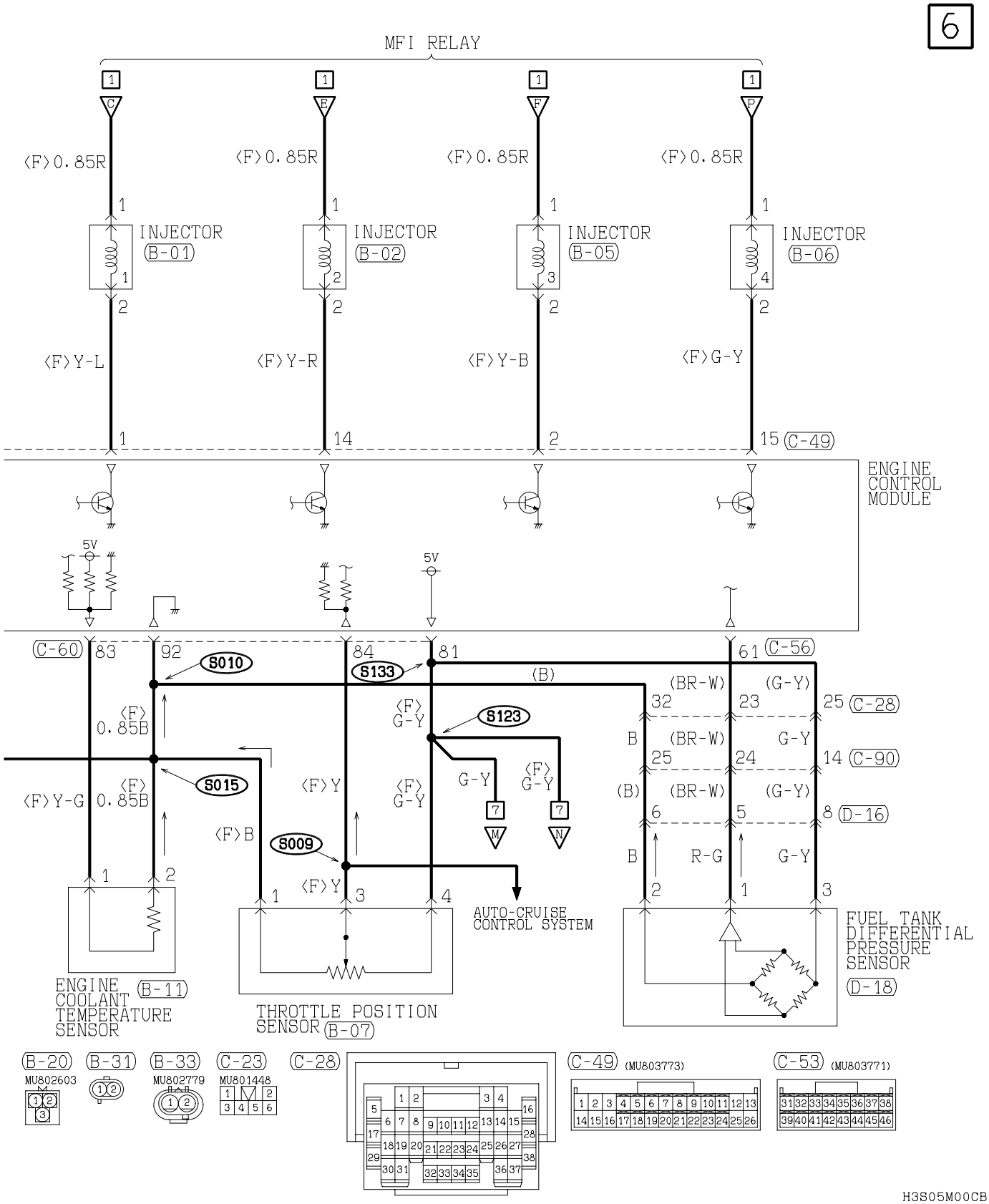
MFI SYSTEM <2.4L ENGINE-M/T> (CONTINUED)

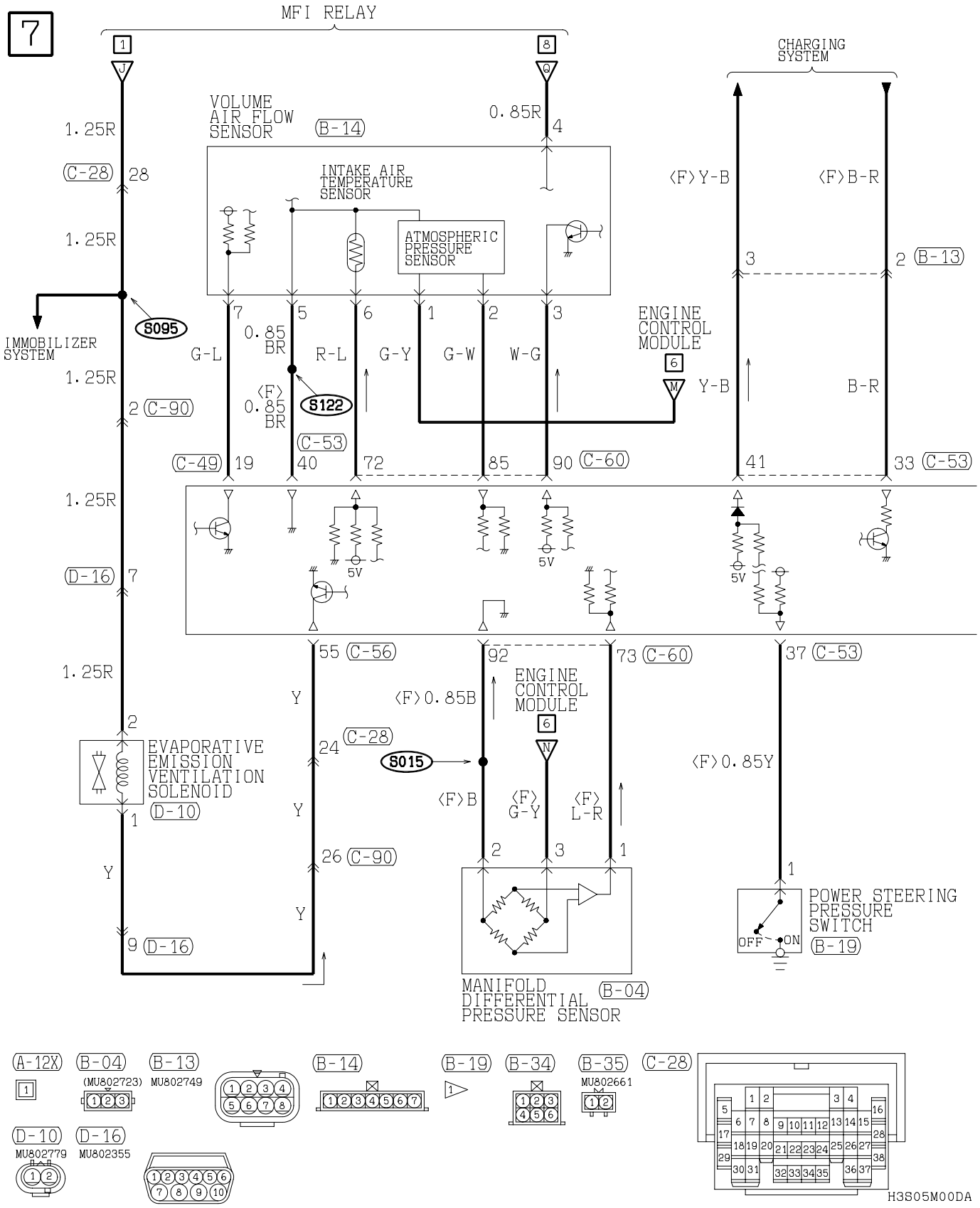


TSB Revision



TSB Revision

MFI SYSTEM <2.4L ENGINE-M/T> (CONTINUED)



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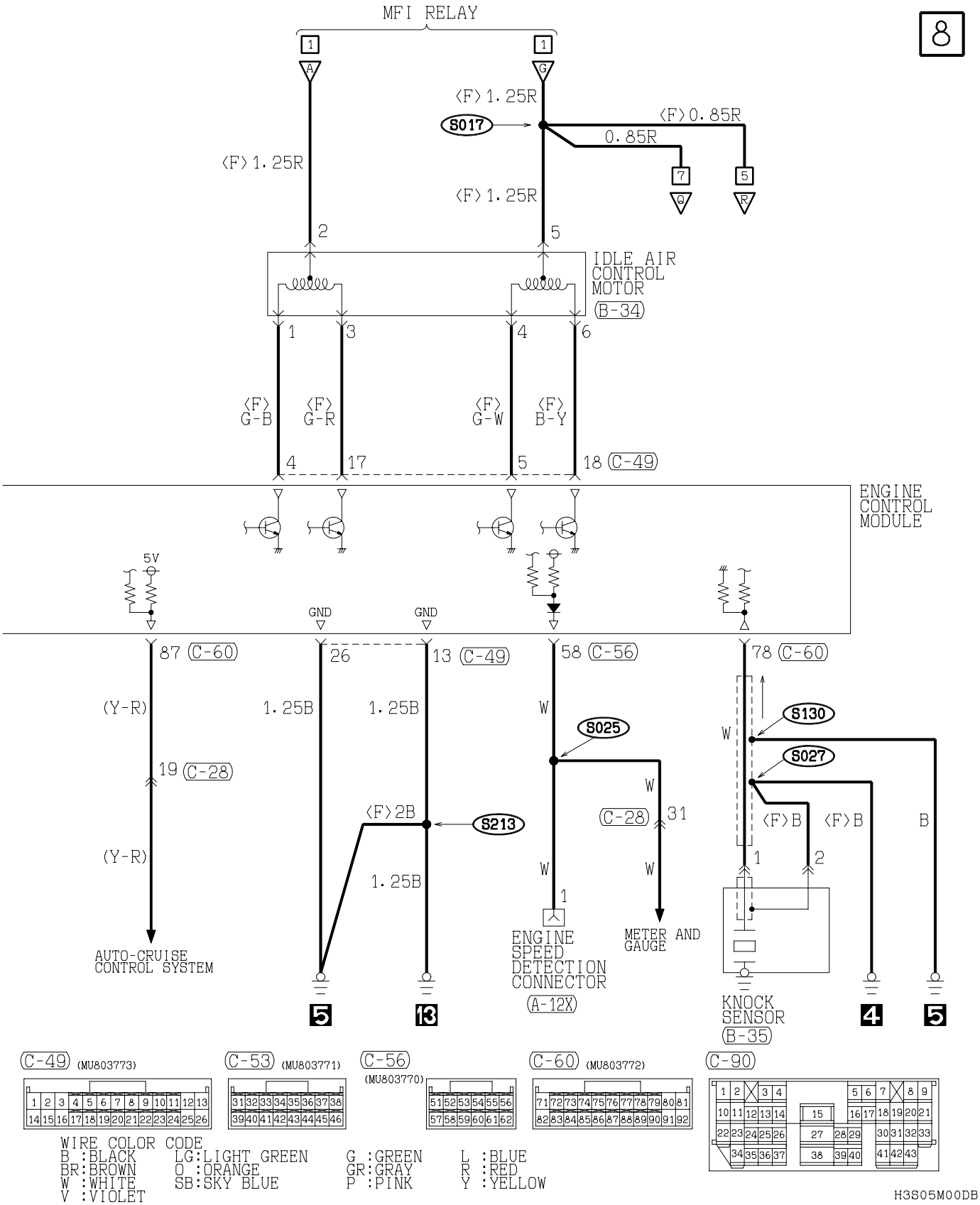
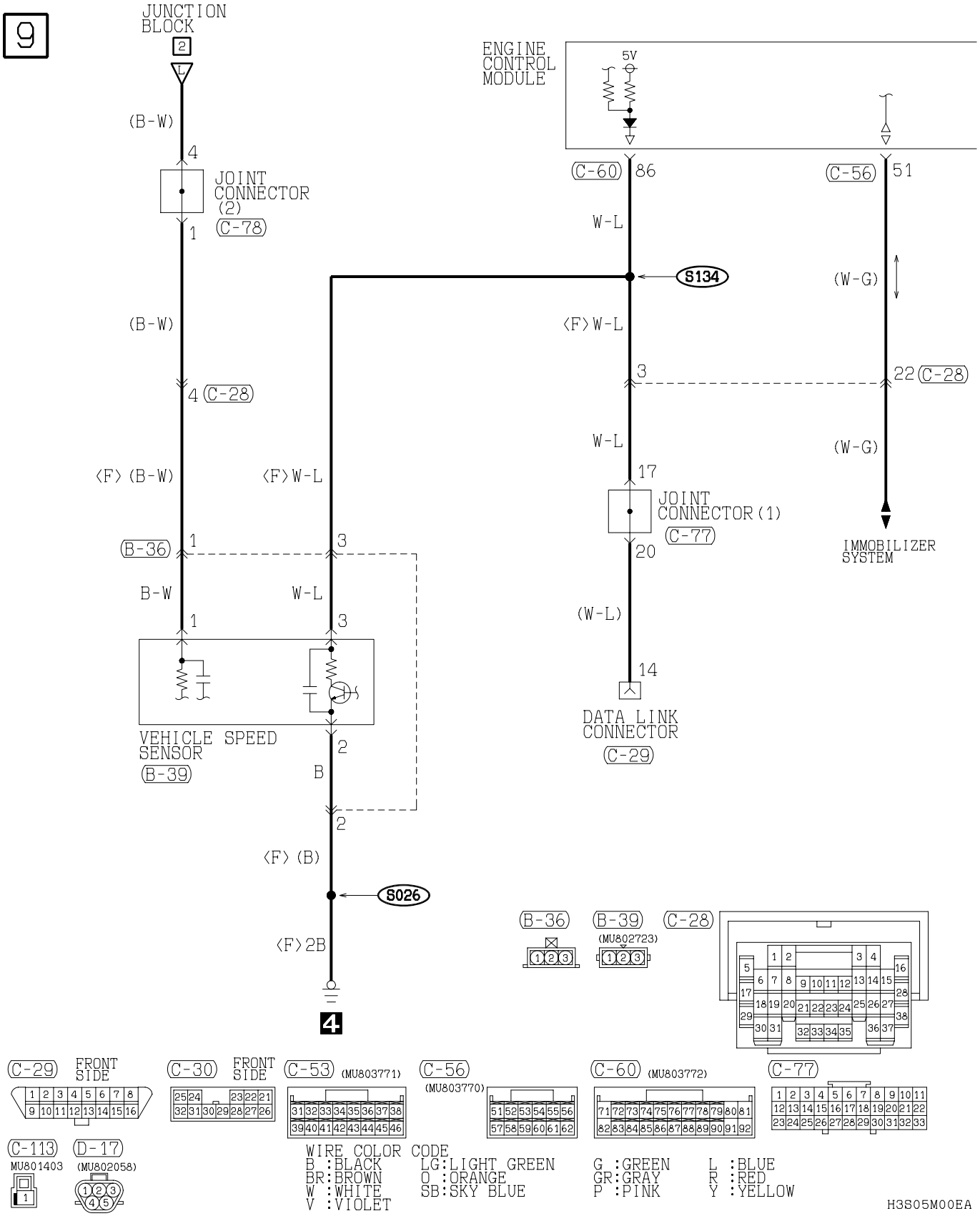


TSB Revision

MFI SYSTEM <2.4L ENGINE-M/T> (CONTINUED)



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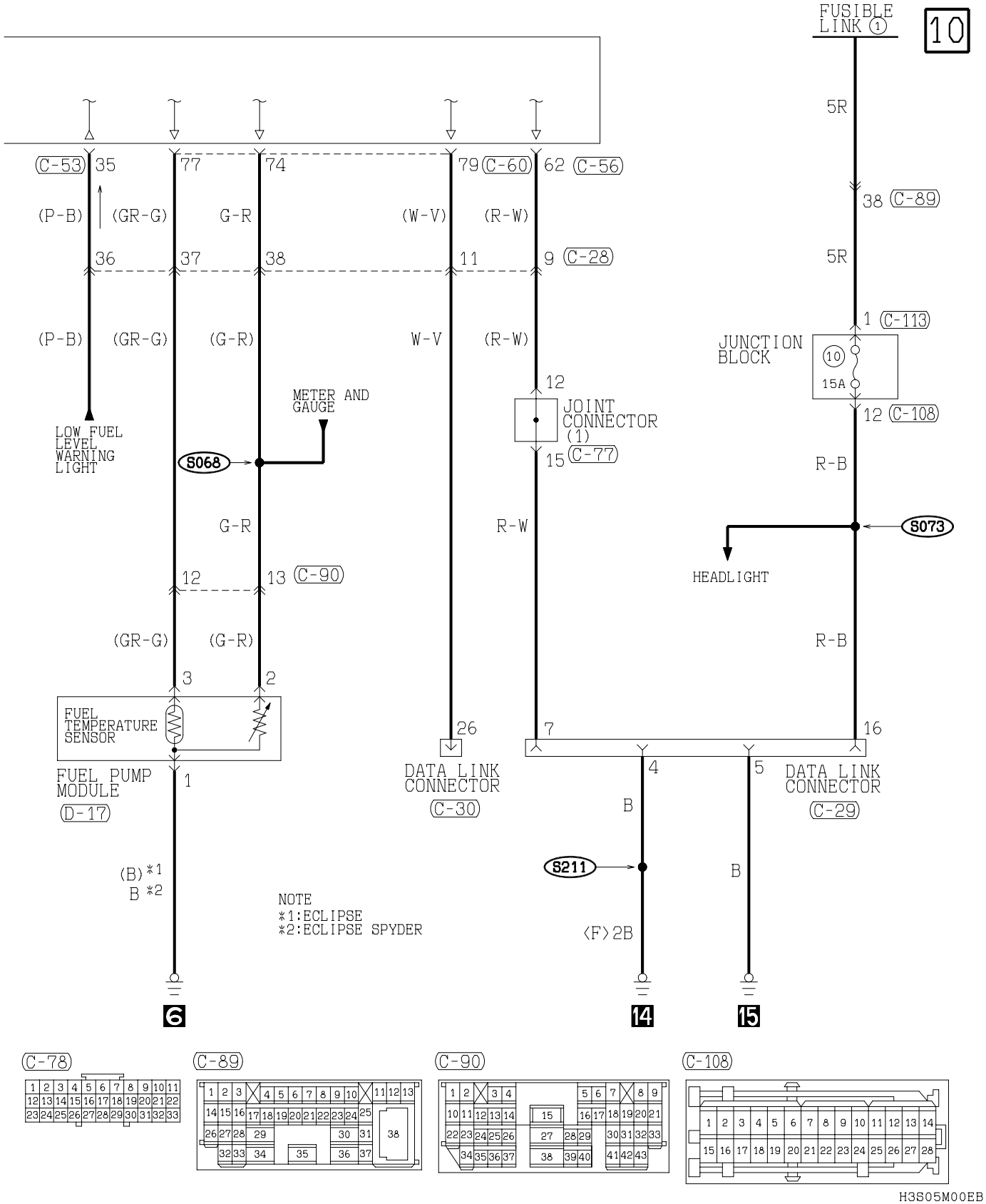
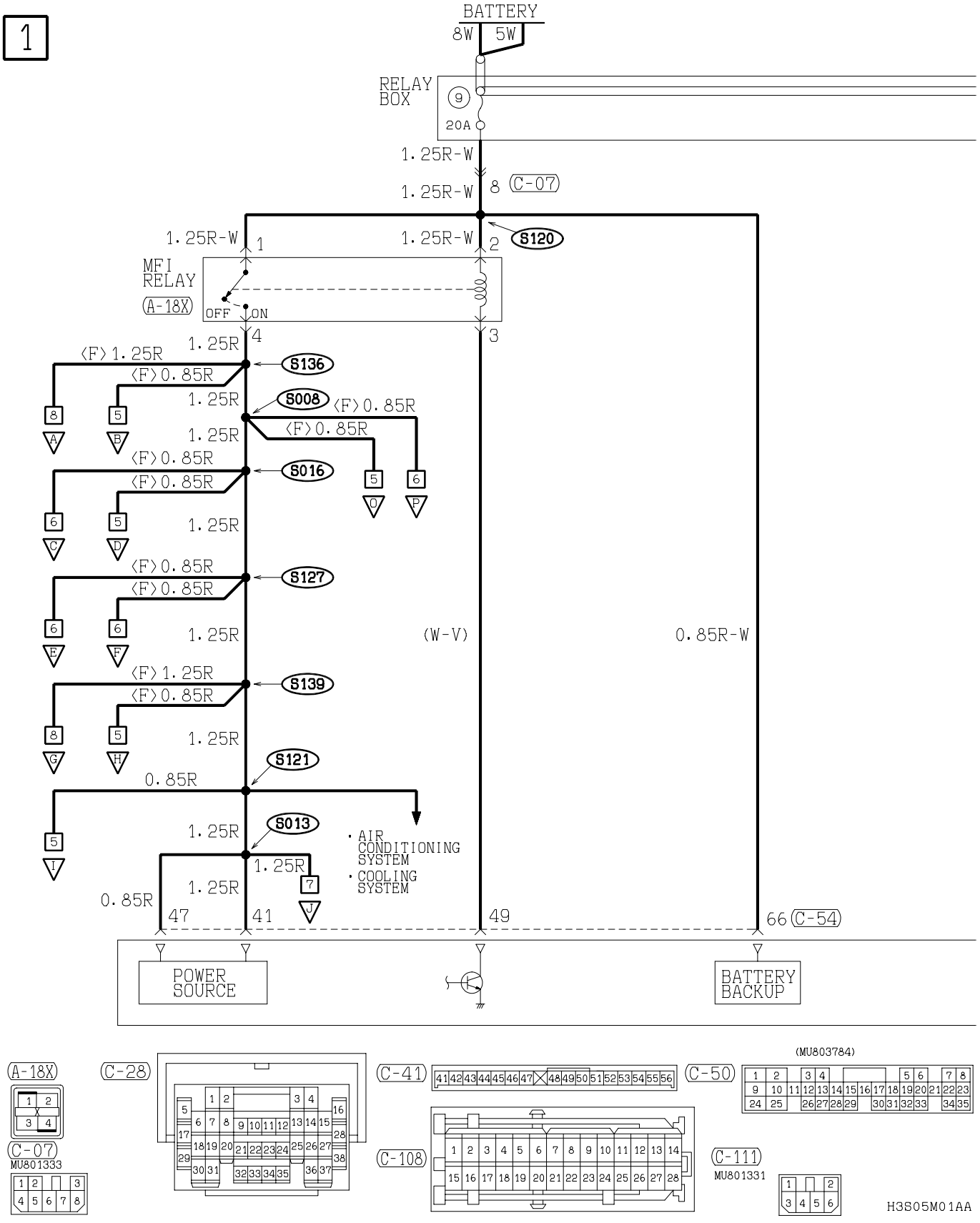


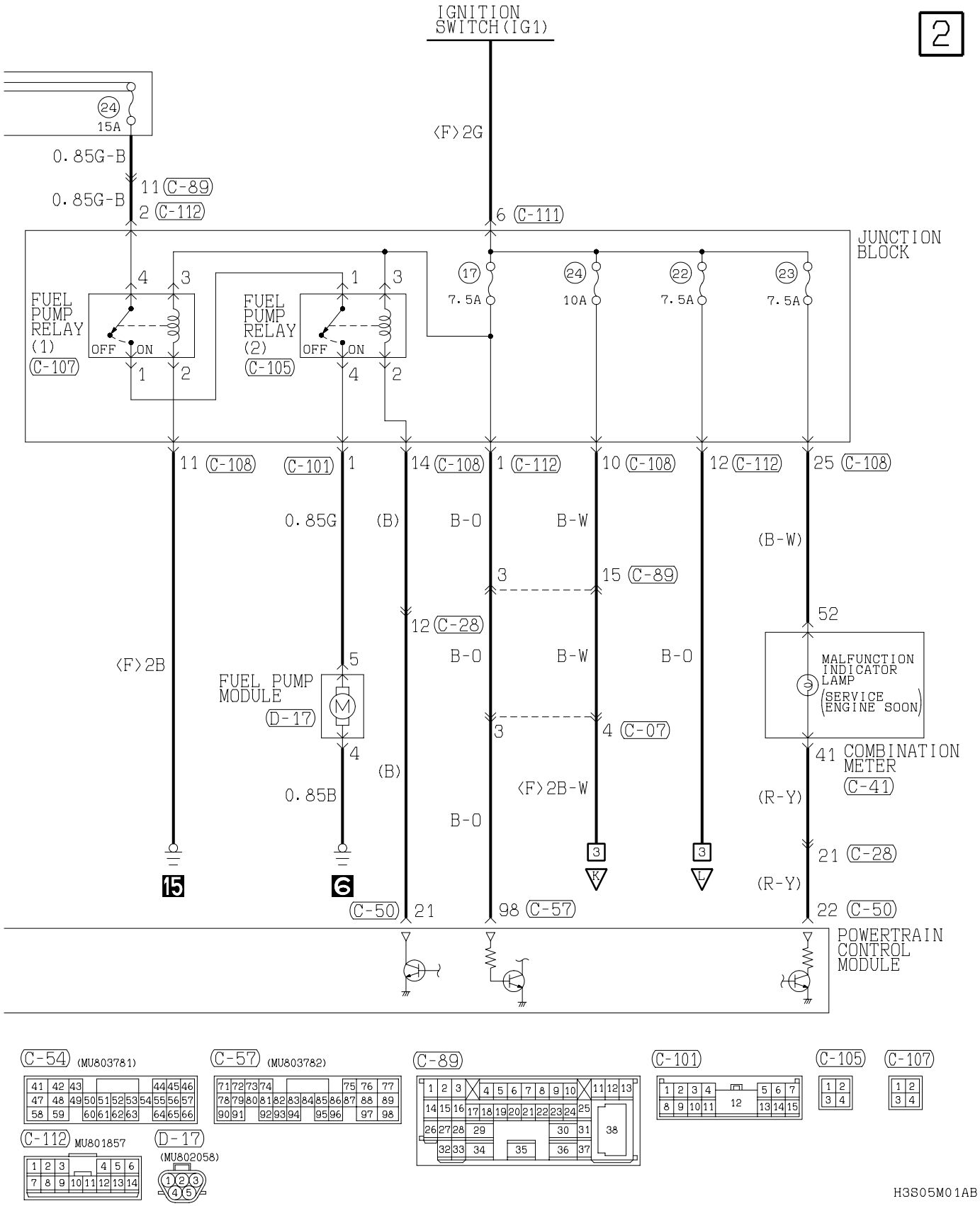
TSB Revision

MFI SYSTEM <2.4L ENGINE-A/T>

M1901000800695



TSB Revision



TSB Revision

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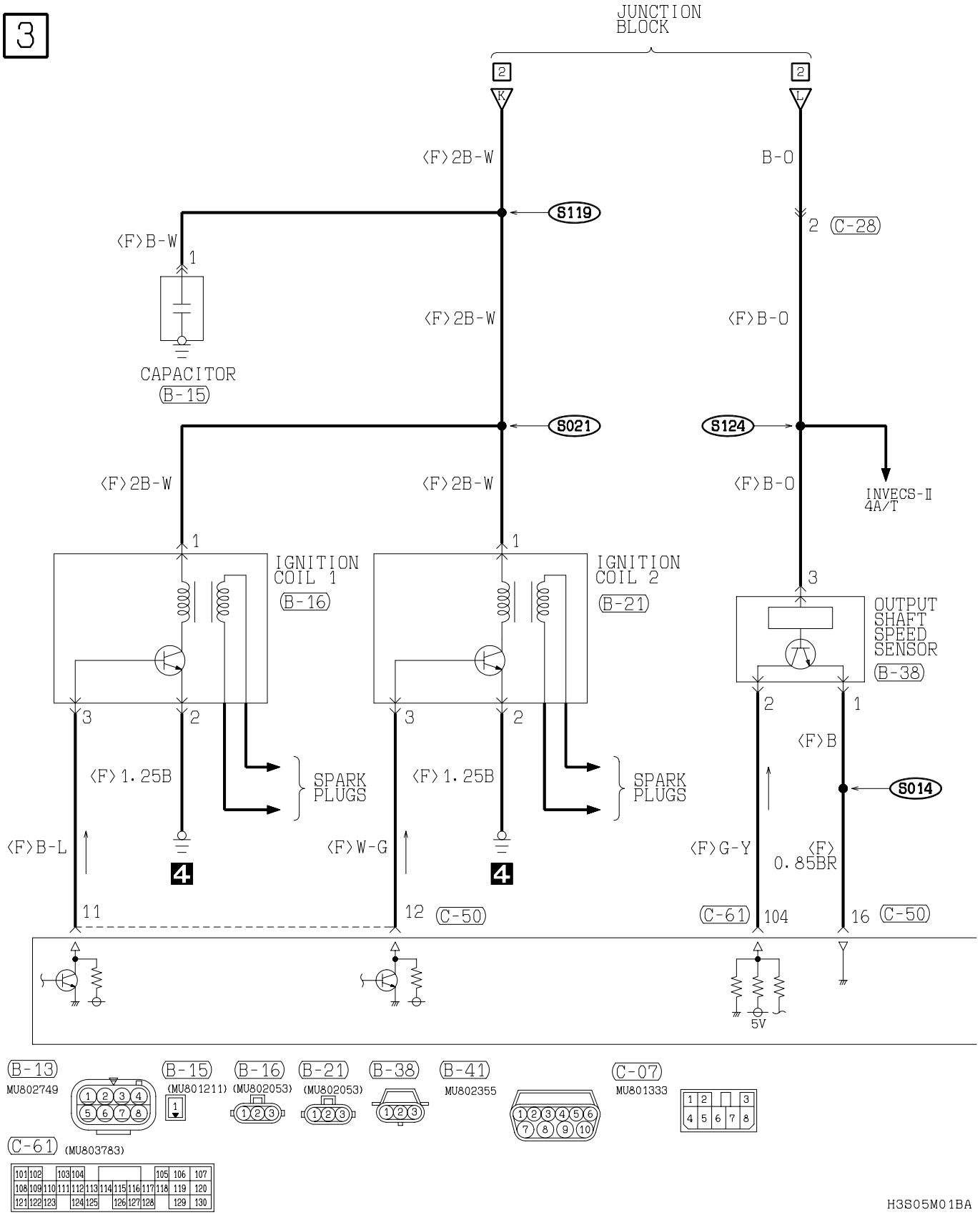
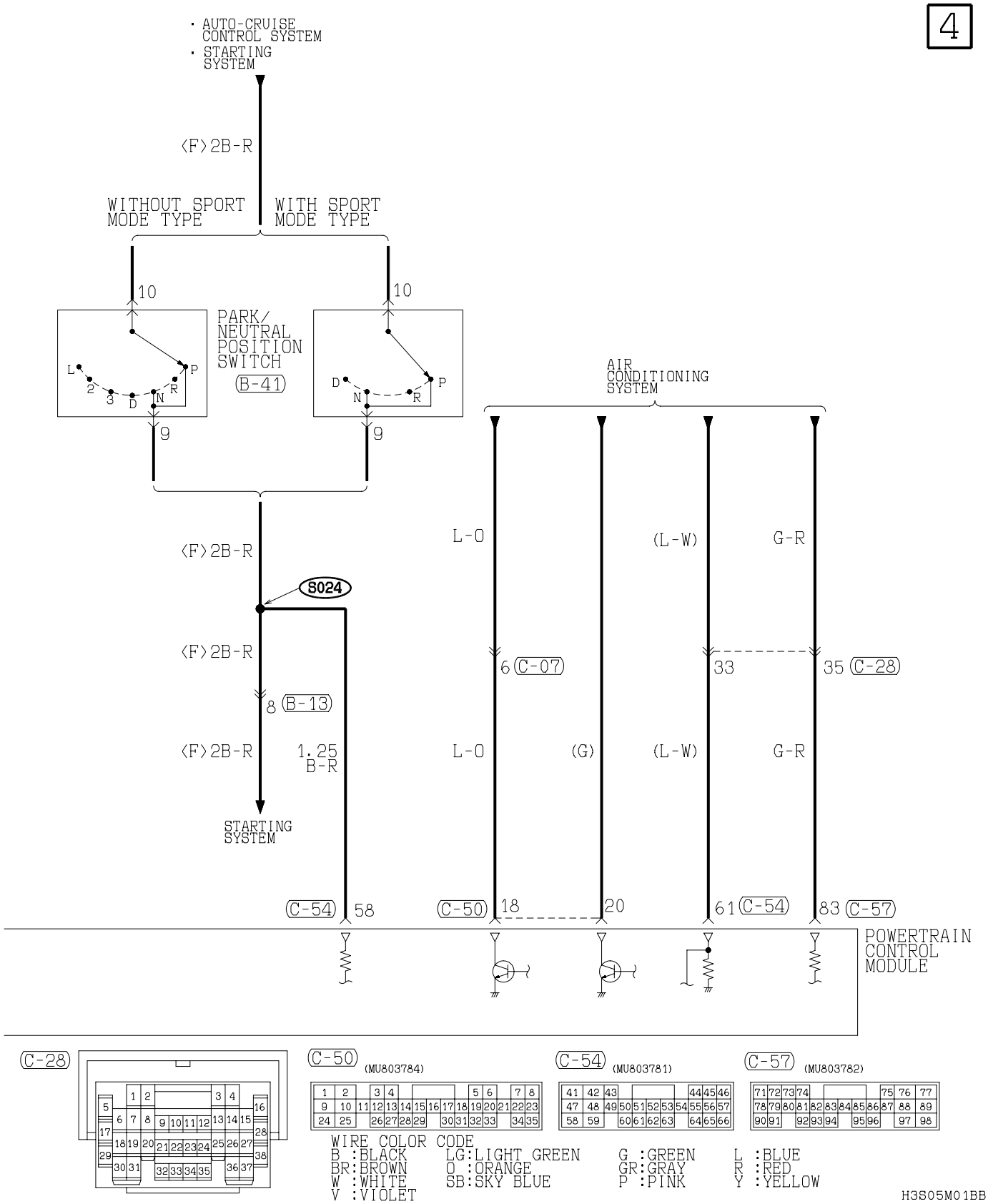


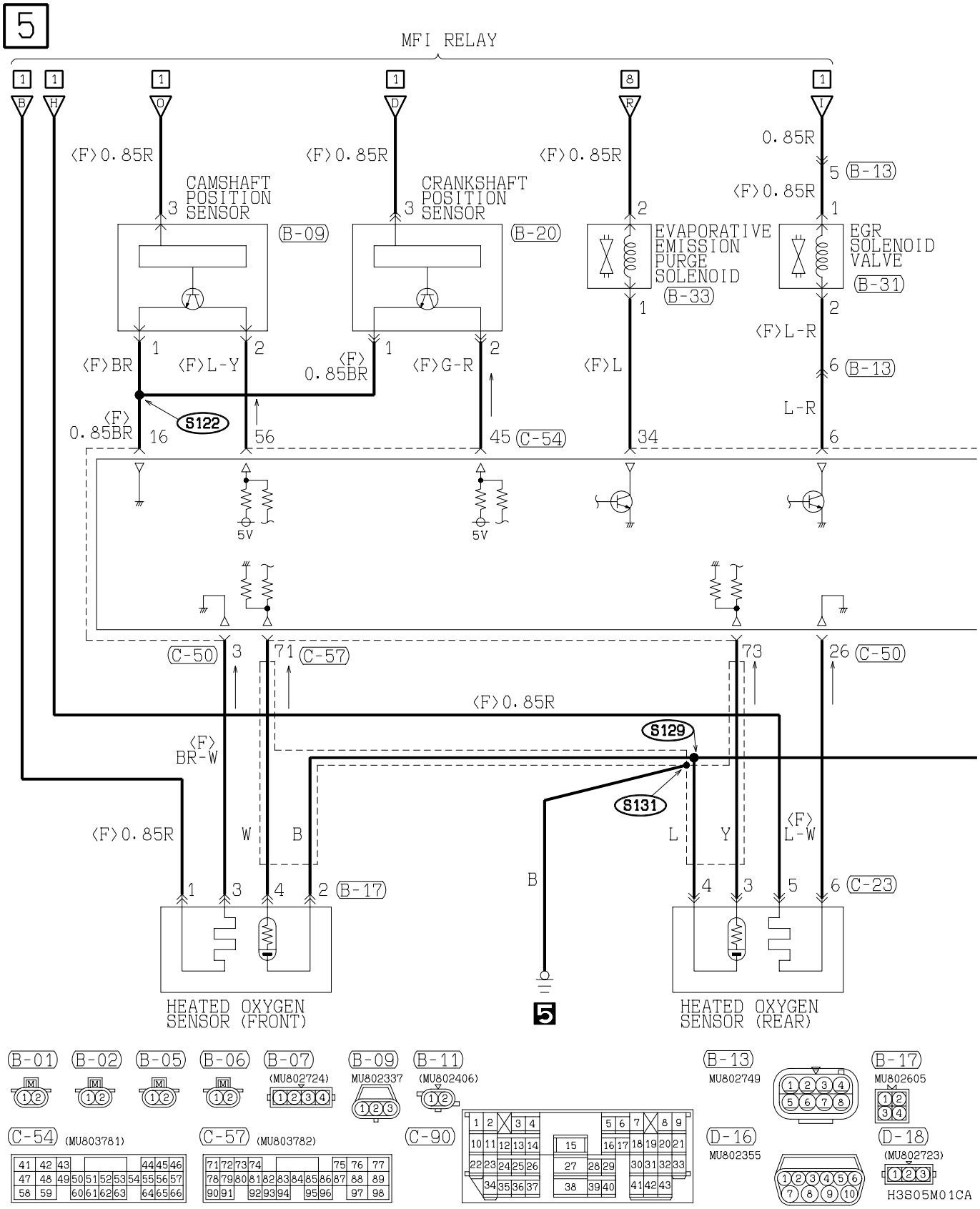
TSB Revision

4

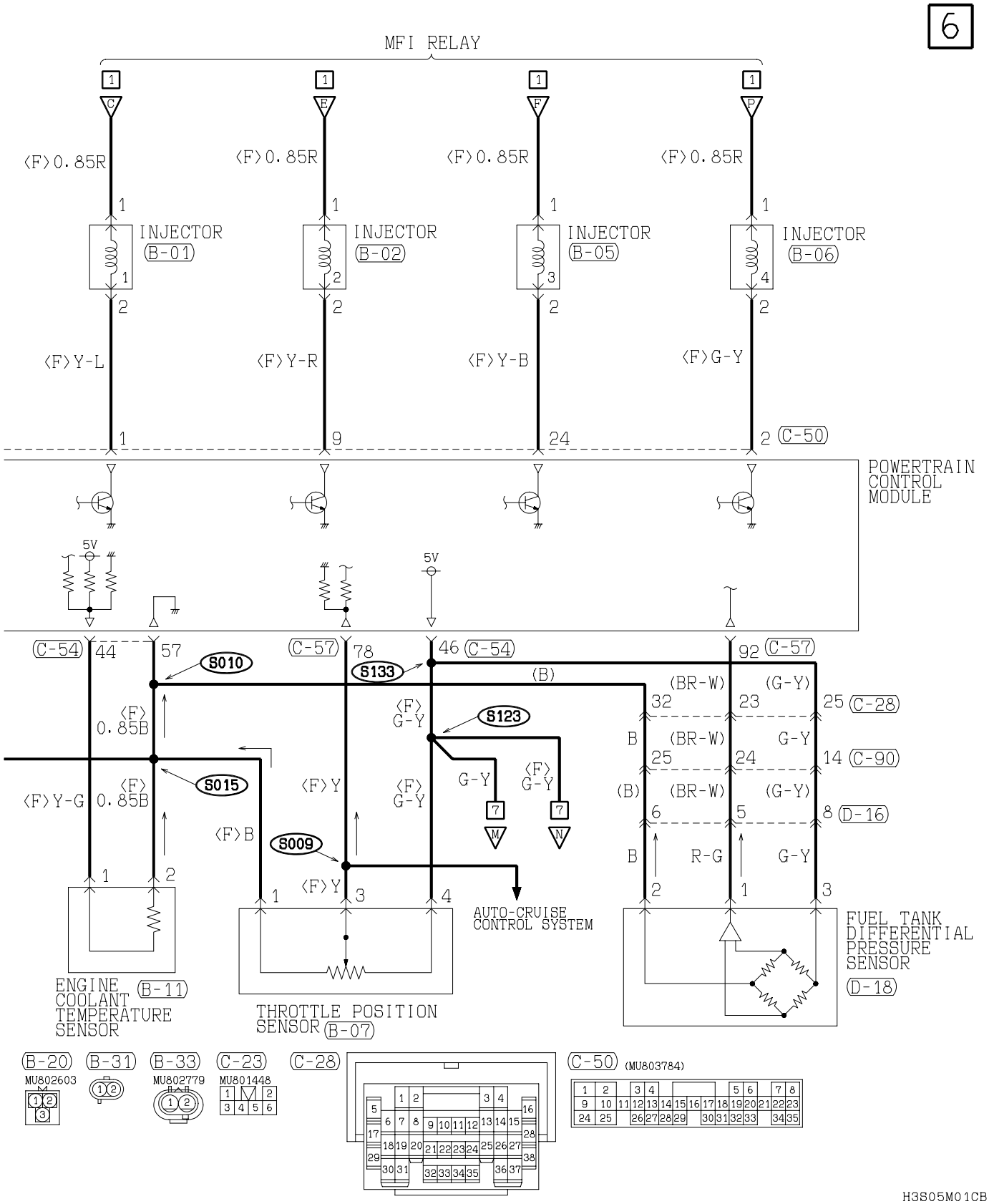


TSB Revision

MFI SYSTEM <2.4L ENGINE-A/T> (CONTINUED)



TSB Revision



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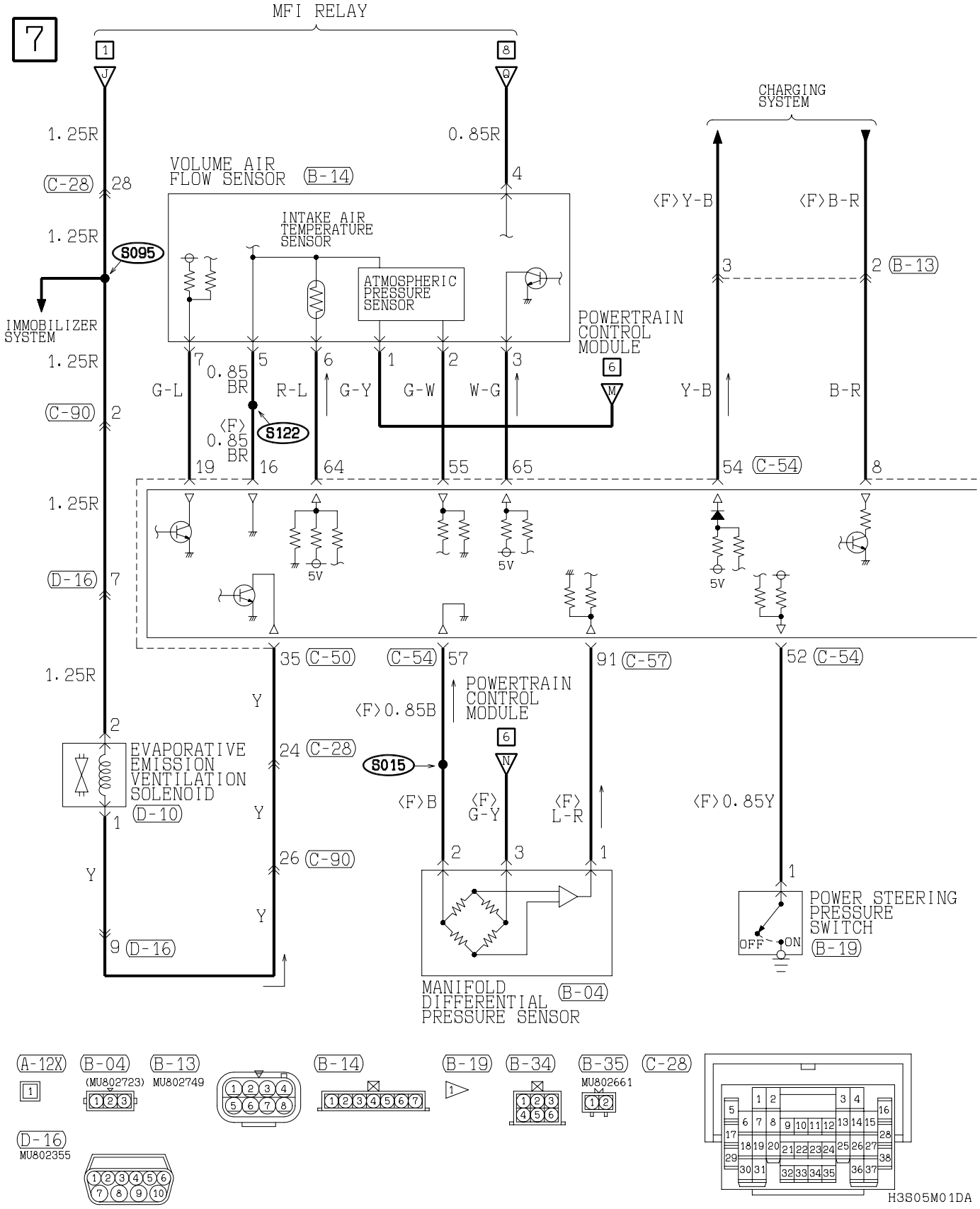
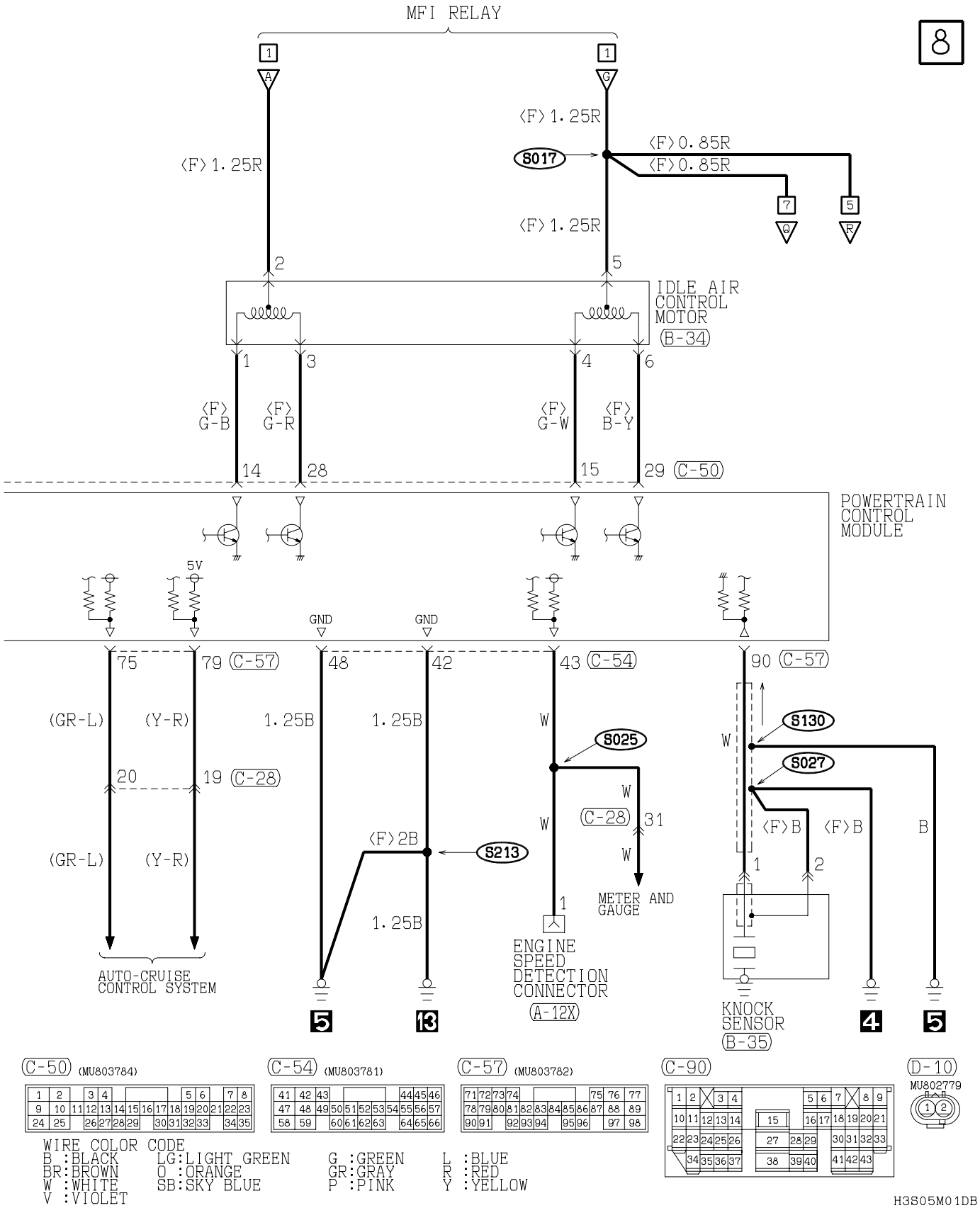
MFI SYSTEM <2.4L ENGINE-A/T> (CONTINUED)

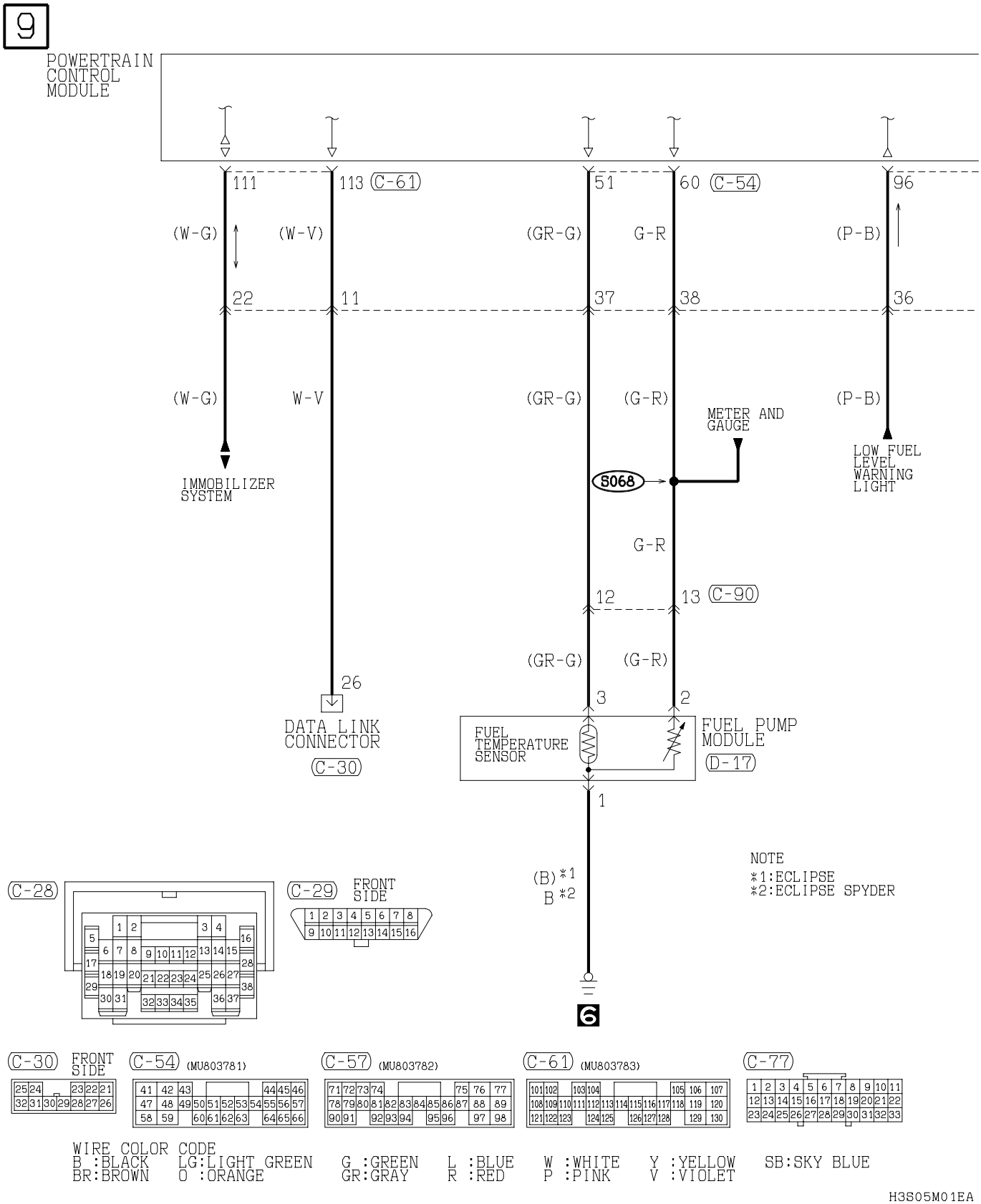


TSB Revision



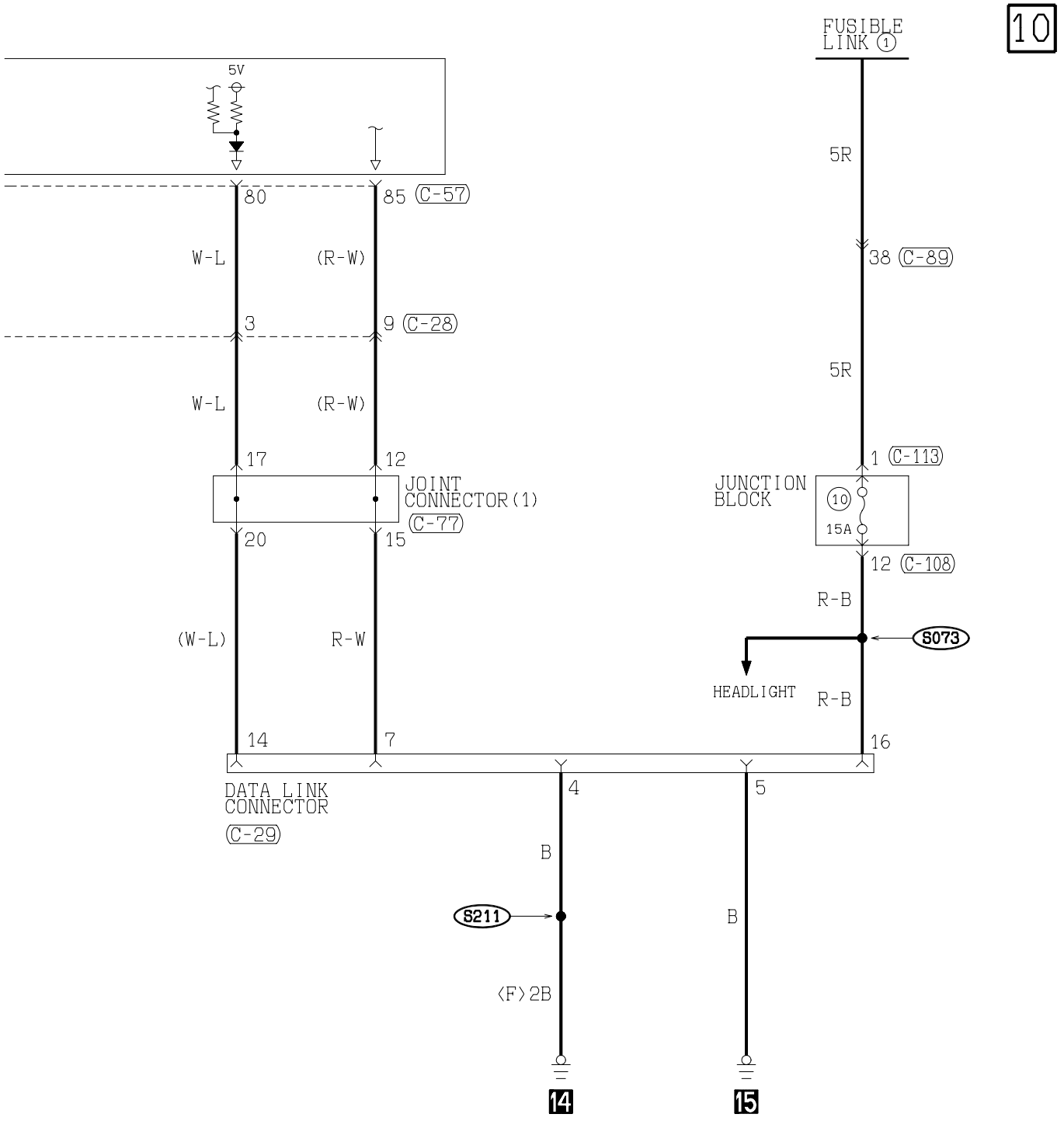
TSB Revision

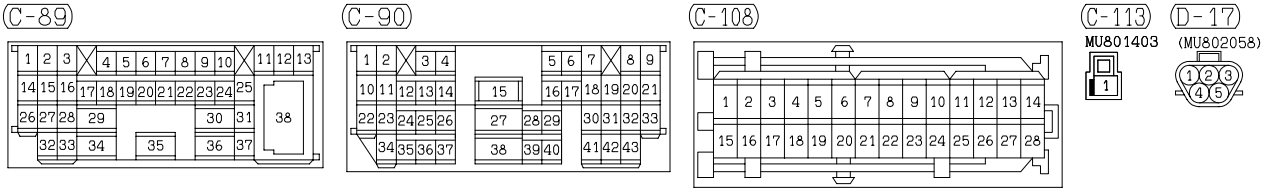
MFI SYSTEM <2.4L ENGINE-A/T> (CONTINUED)



H3S05M01EA

TSB Revision



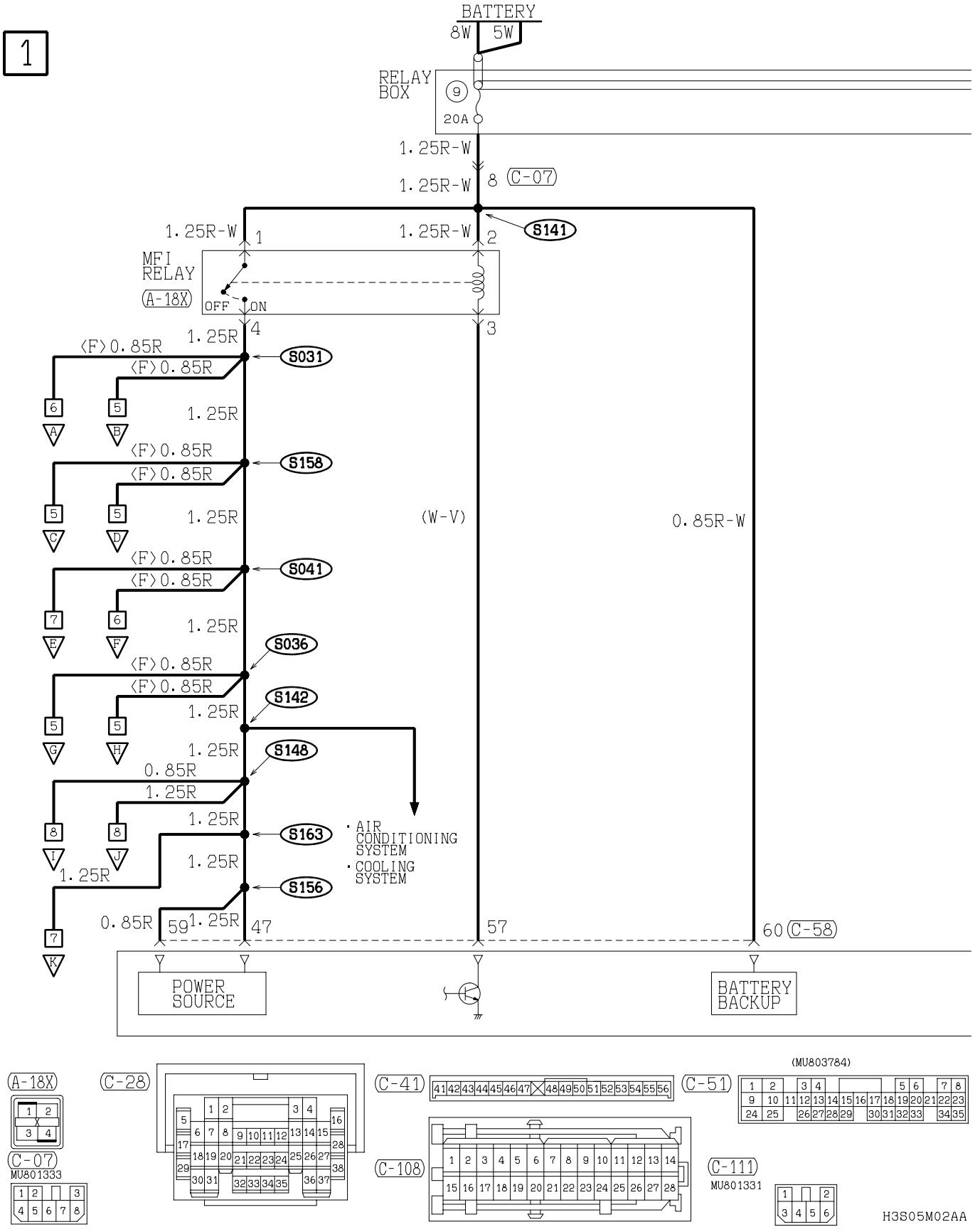


H3S05M01EB

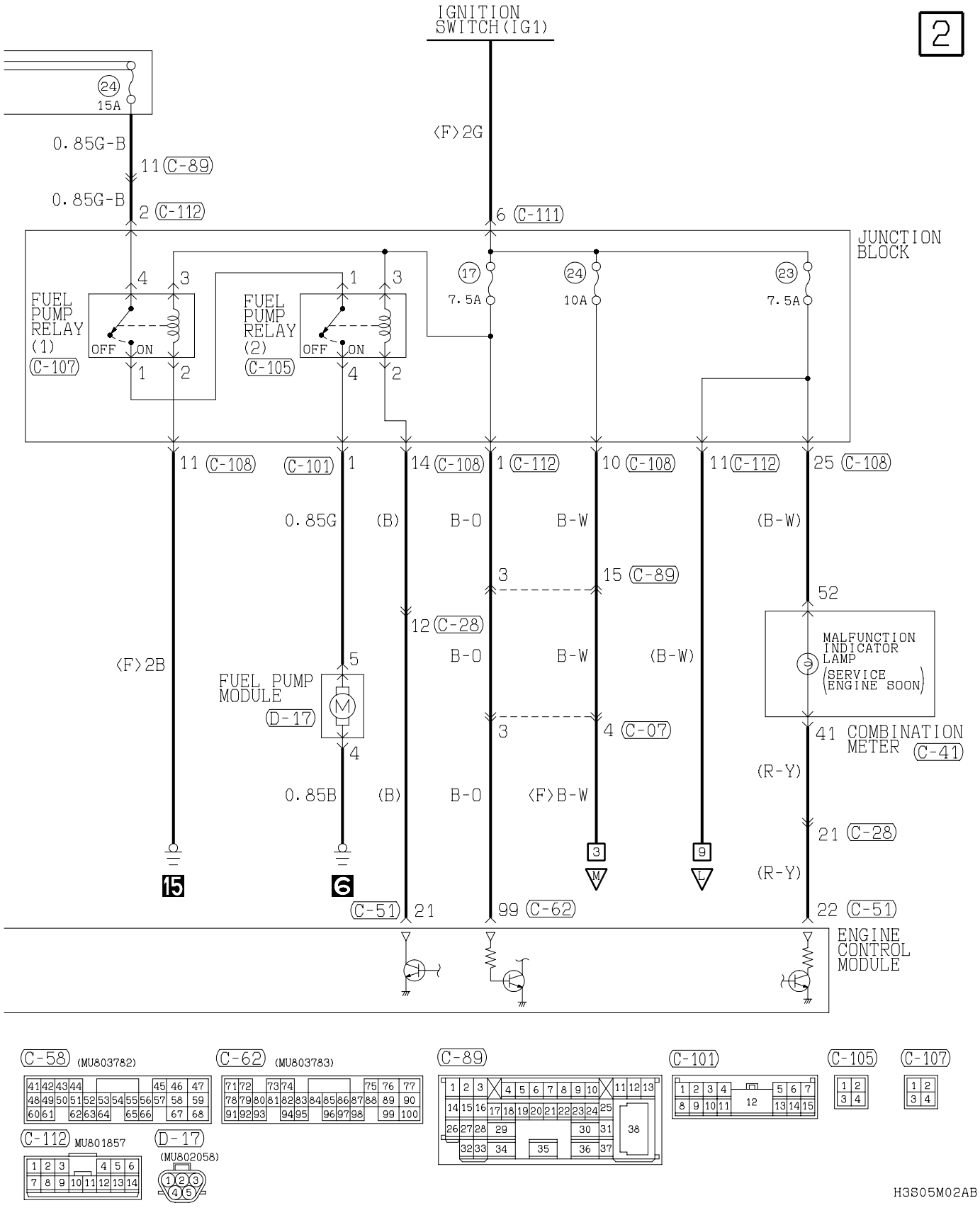
TSB Revision

MFI SYSTEM <3.0L ENGINE-M/T (WITHOUT VARIABLE INDUCTION CONTROL (VIC) SYSTEM)>

M1901000800703



TSB Revision



C-58 (MU803782)

C-62 (MU803783)

C-89

C-101

C-105

C-107

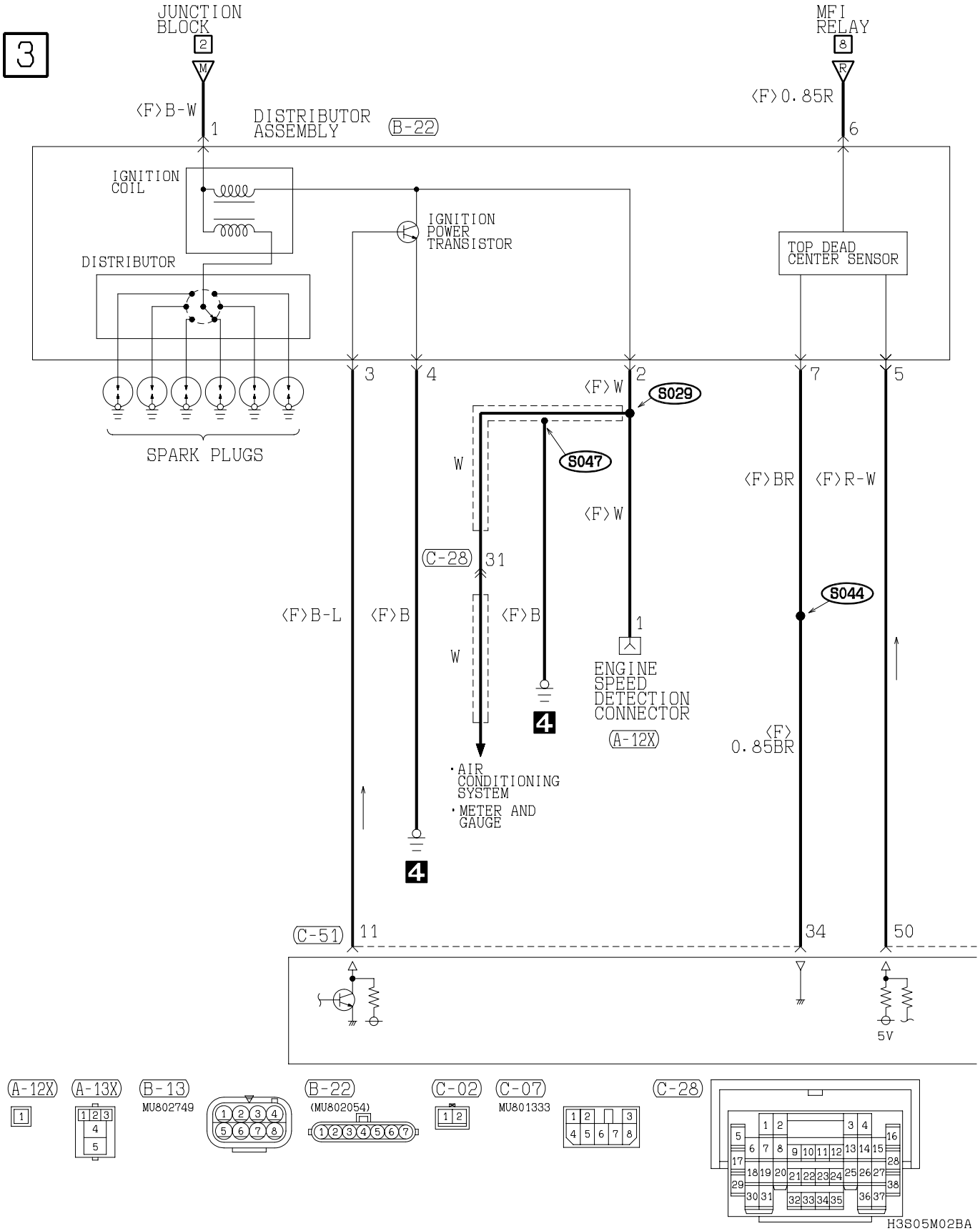
C-112 MU801857

D-17 (MU802058)

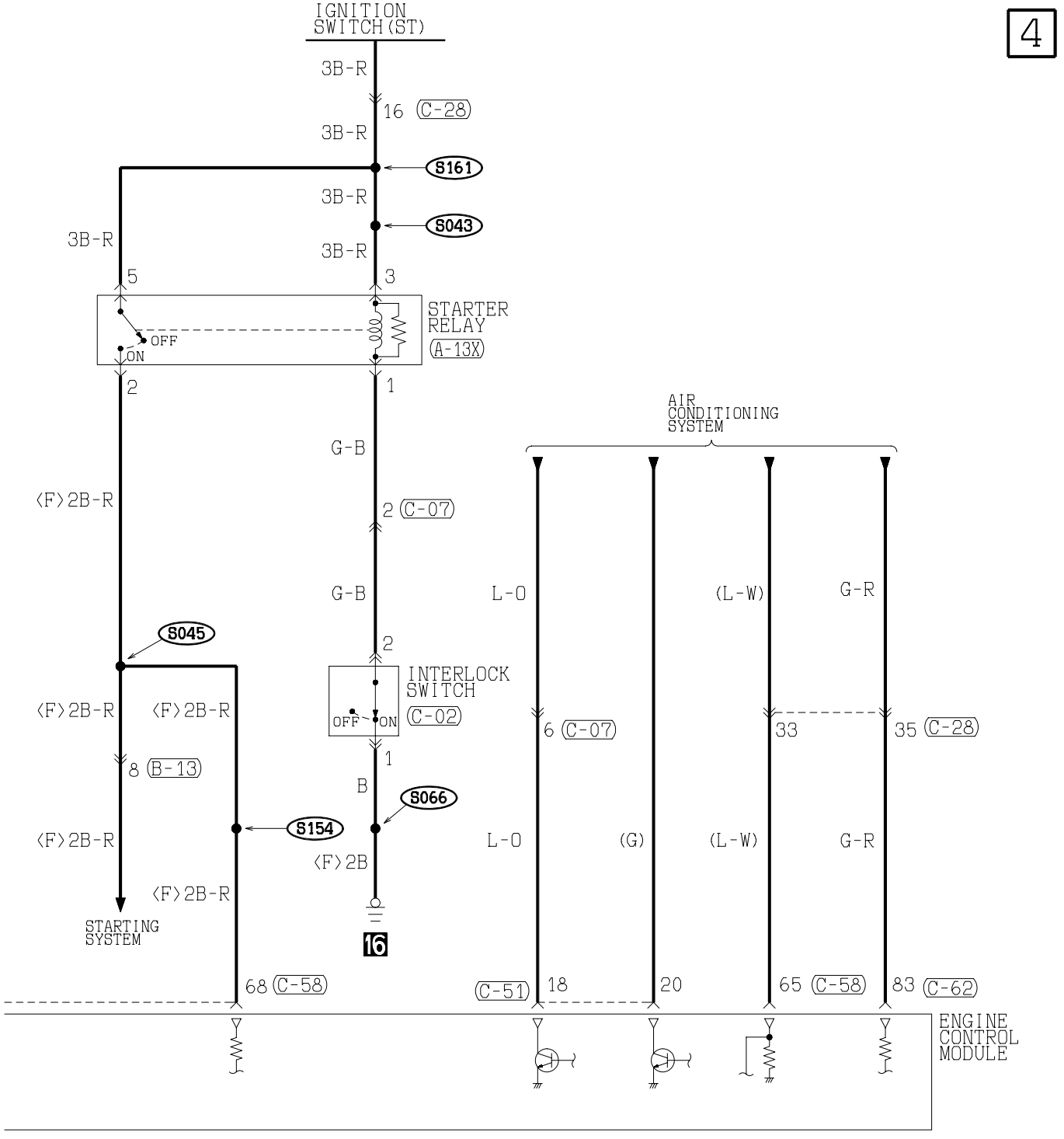
H3S05M02AB

TSB Revision

MFI SYSTEM <3.0L ENGINE-M/T (WITHOUT VARIABLE INDUCTION CONTROL (VIC) SYSTEM)> (CONTINUED)



TSB Revision



C-51 (MU803784)

1	2		3	4				5	6		7	8		
9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
24	25		26	27	28	29		30	31	32	33		34	35

C-58 (MU803782)

41	42	43	44						45	46	47			
48	49	50	51	52	53	54	55	56	57	58	59			
60	61		62	63	64		65	66		67	68			

C-62 (MU803783)

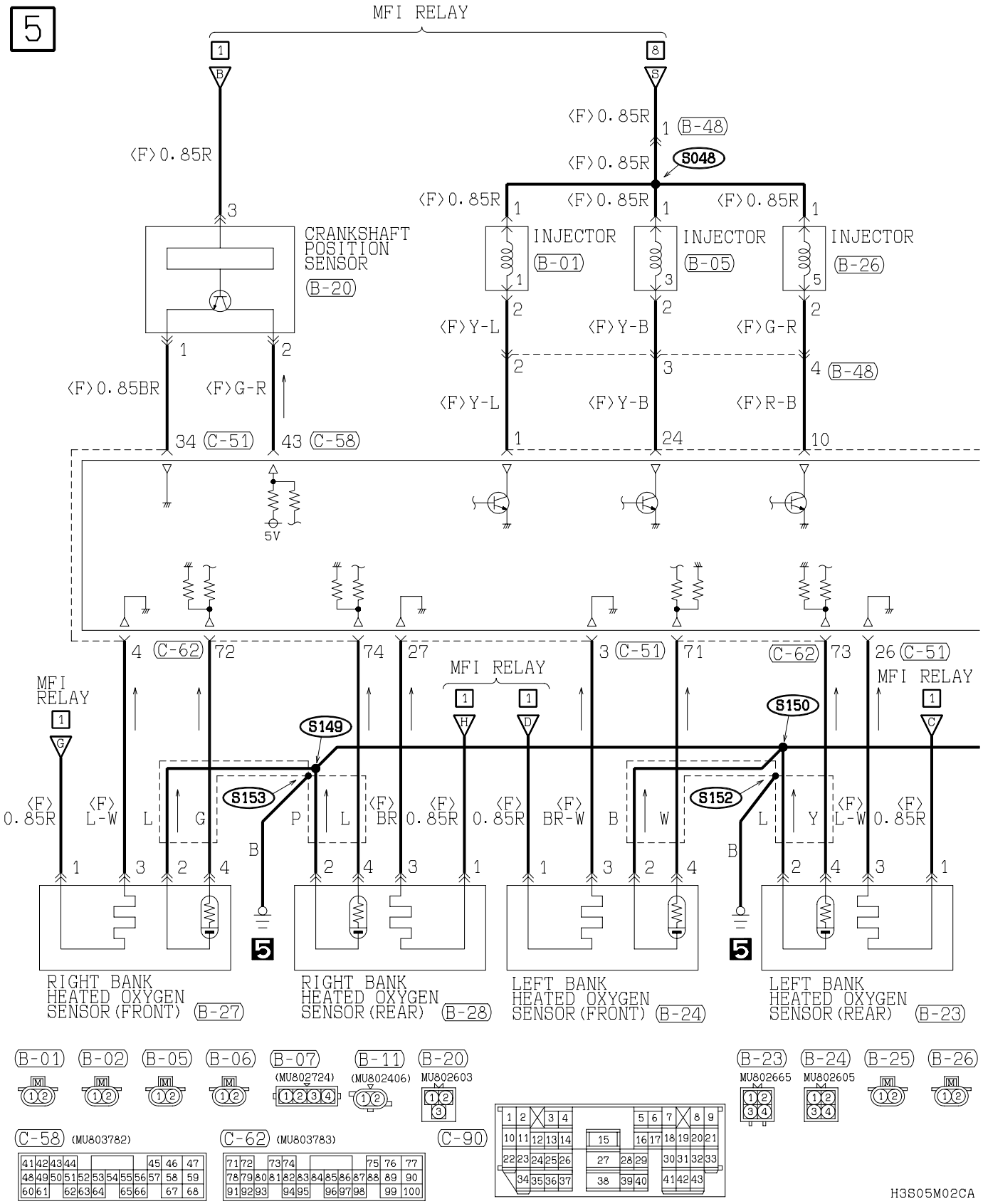
71	72		73	74					75	76	77			
78	79	80	81	82	83	84	85	86	87	88	89	90		
91	92	93		94	95		96	97	98		99	100		

WIRE COLOR CODE
B :BLACK BR:BROWN G :GREEN GR:GRAY L :BLUE LG:LIGHT GREEN O :ORANGE
P :PINK R :RED SB:SKY BLUE V :VIOLET W :WHITE Y :YELLOW

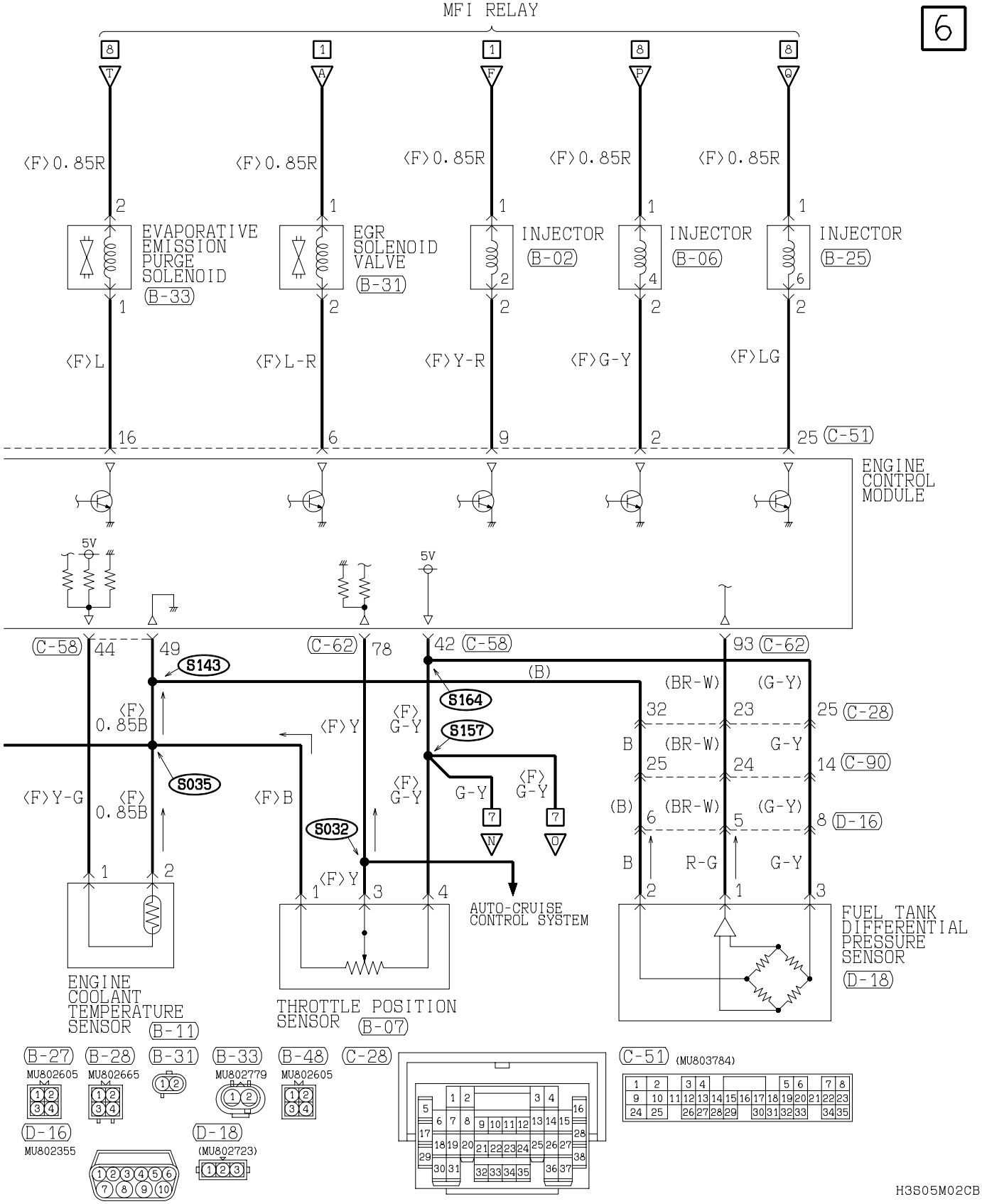
H3S05M02BB

TSB Revision

MFI SYSTEM <3.0L ENGINE-M/T (WITHOUT VARIABLE INDUCTION CONTROL (VIC) SYSTEM)> (CONTINUED)

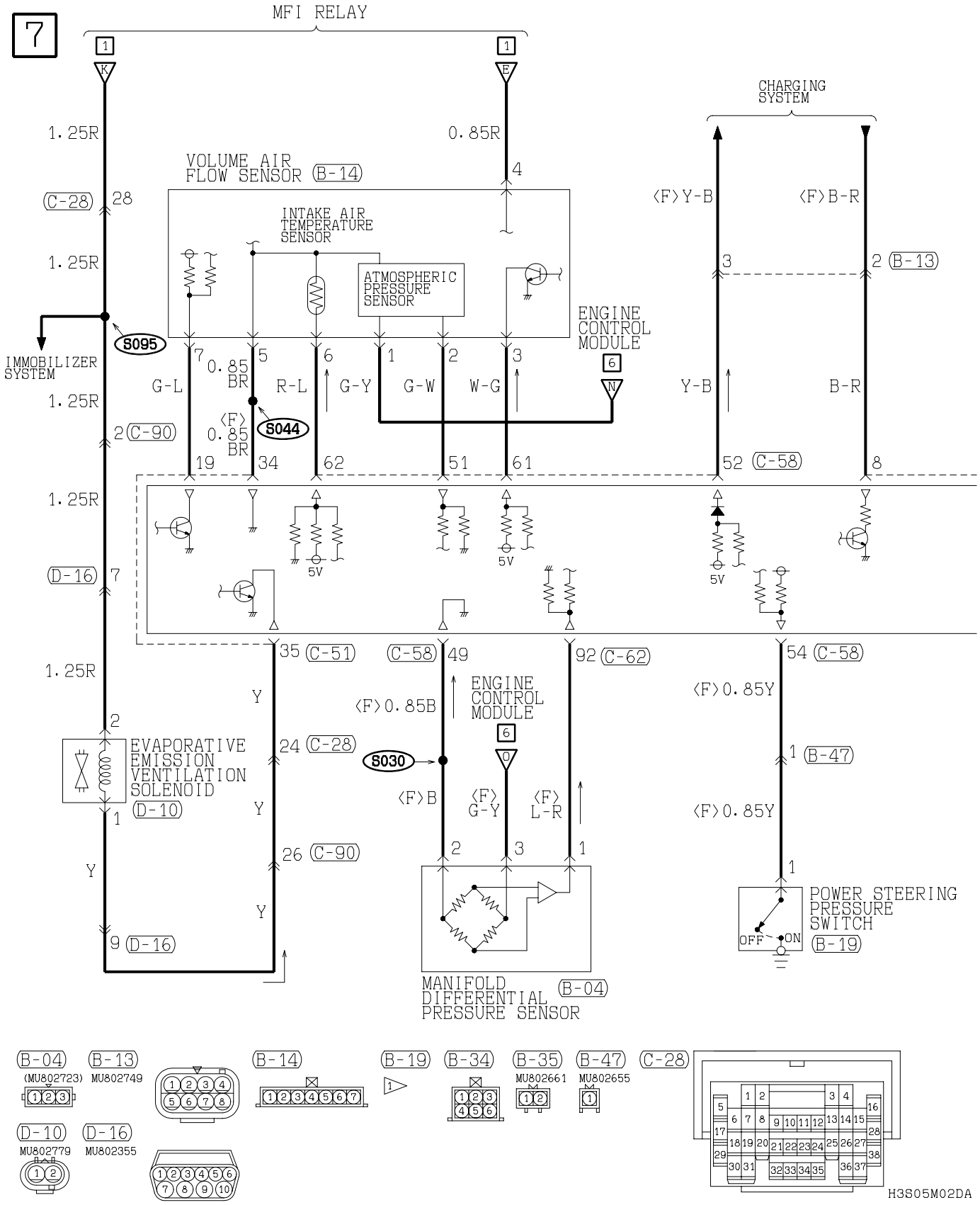


TSB Revision

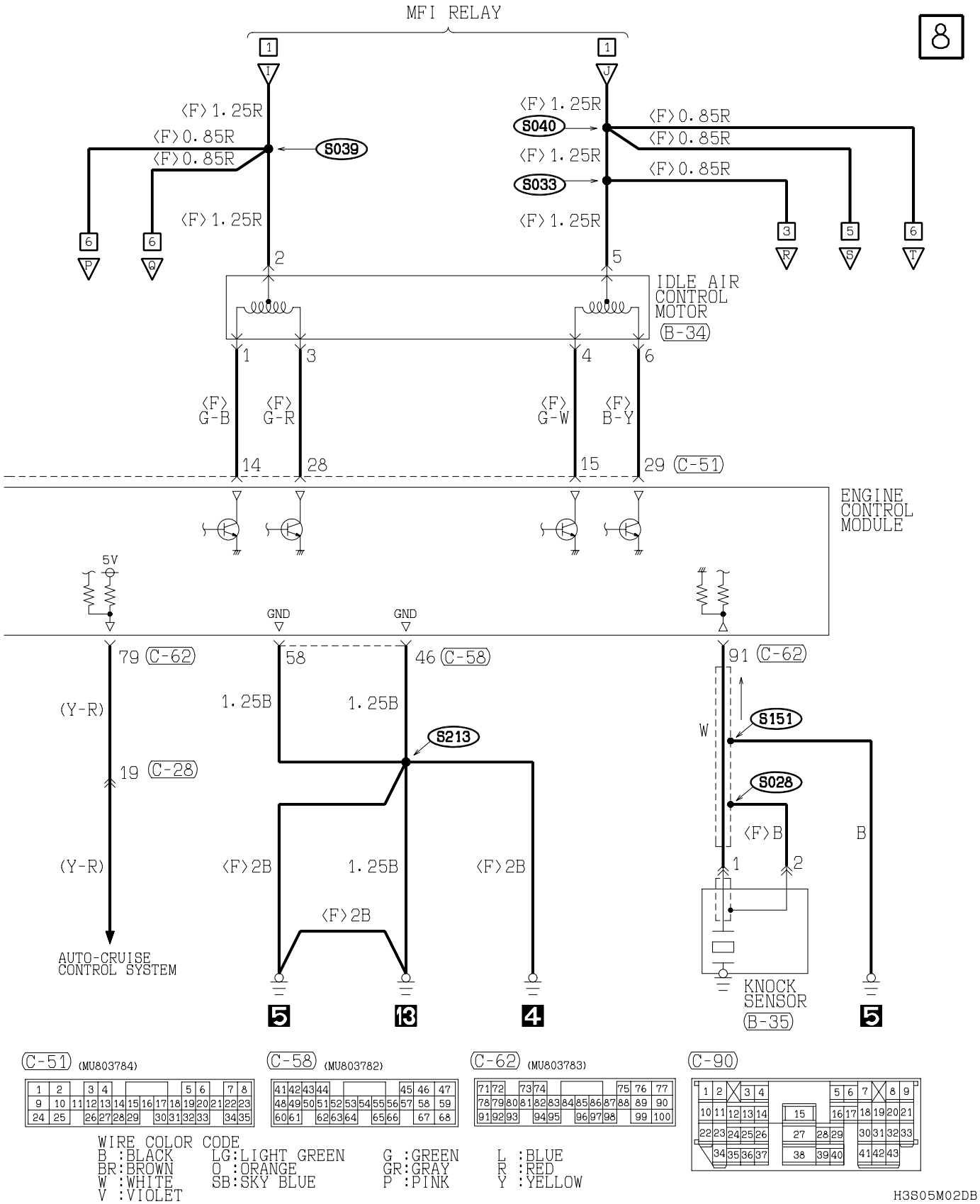


TSB Revision

MFI SYSTEM <3.0L ENGINE-M/T (WITHOUT VARIABLE INDUCTION CONTROL (VIC) SYSTEM)> (CONTINUED)



TSB Revision



C-51 (MU803784)

1	2		3	4				5	6		7	8		
9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
24	25		26	27	28	29		30	31	32	33		34	35

C-58 (MU803782)

41	42	43	44							45	46	47		
48	49	50	51	52	53	54	55	56	57	58	59			
60	61		62	63	64		65	66		67	68			

C-62 (MU803783)

71	72		73	74						75	76	77		
78	79	80	81	82	83	84	85	86	87	88	89	90		
91	92	93		94	95		96	97	98		99	100		

C-90

1	2	X	3	4				5	6	7	X	8	9	
10	11	12	13	14		15			16	17	18	19	20	21
22	23	24	25	26		27	28	29		30	31	32	33	
34	35	36	37			38	39	40		41	42	43		

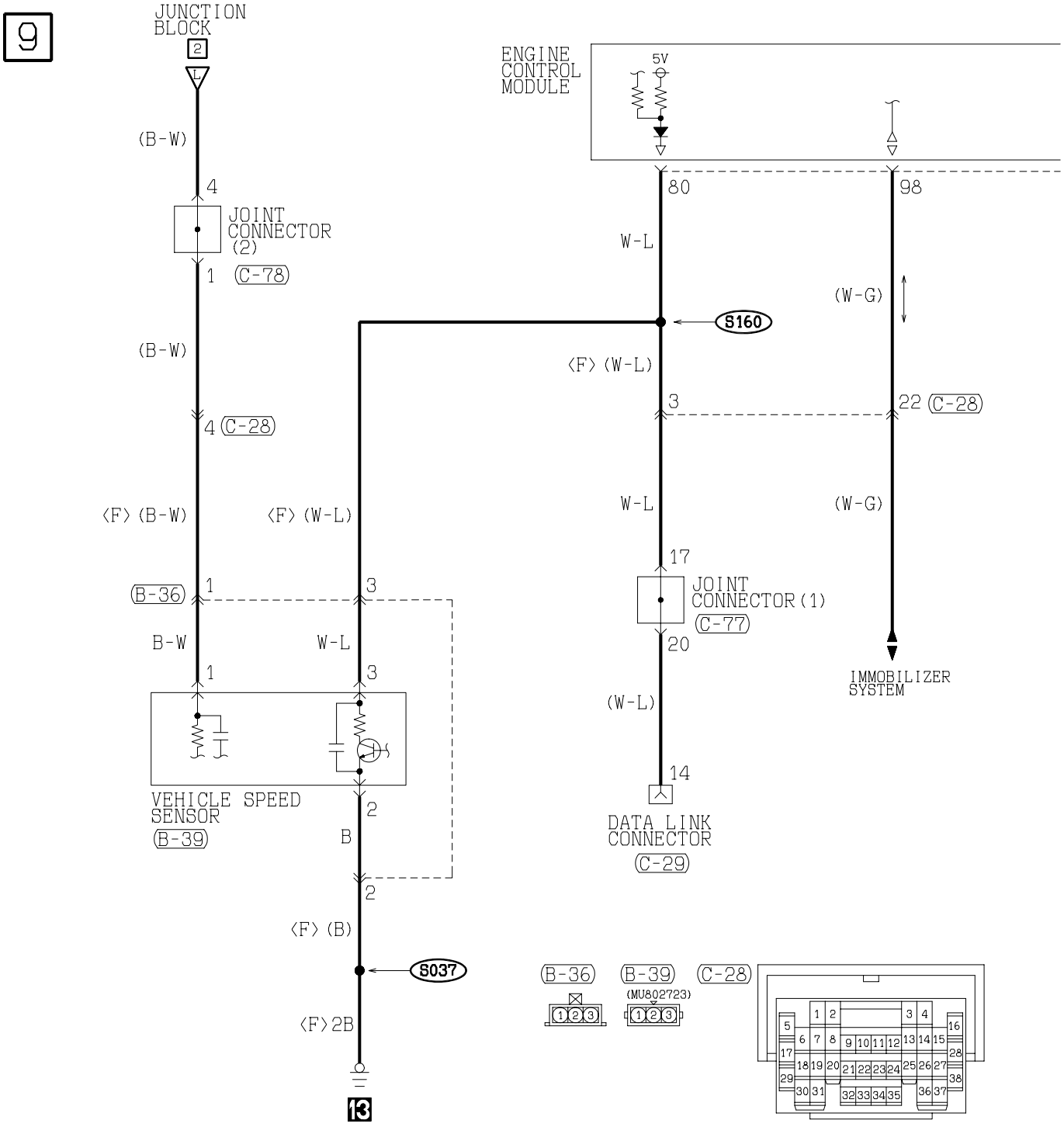
WIRE COLOR CODE

B :BLACK	LG:LIGHT GREEN	G :GREEN	L :BLUE
BR:BROWN	O :ORANGE	GR:GRAY	R :RED
W :WHITE	SB:SKY BLUE	P :PINK	Y :YELLOW
V :VIOLET			

H3S05M02DB

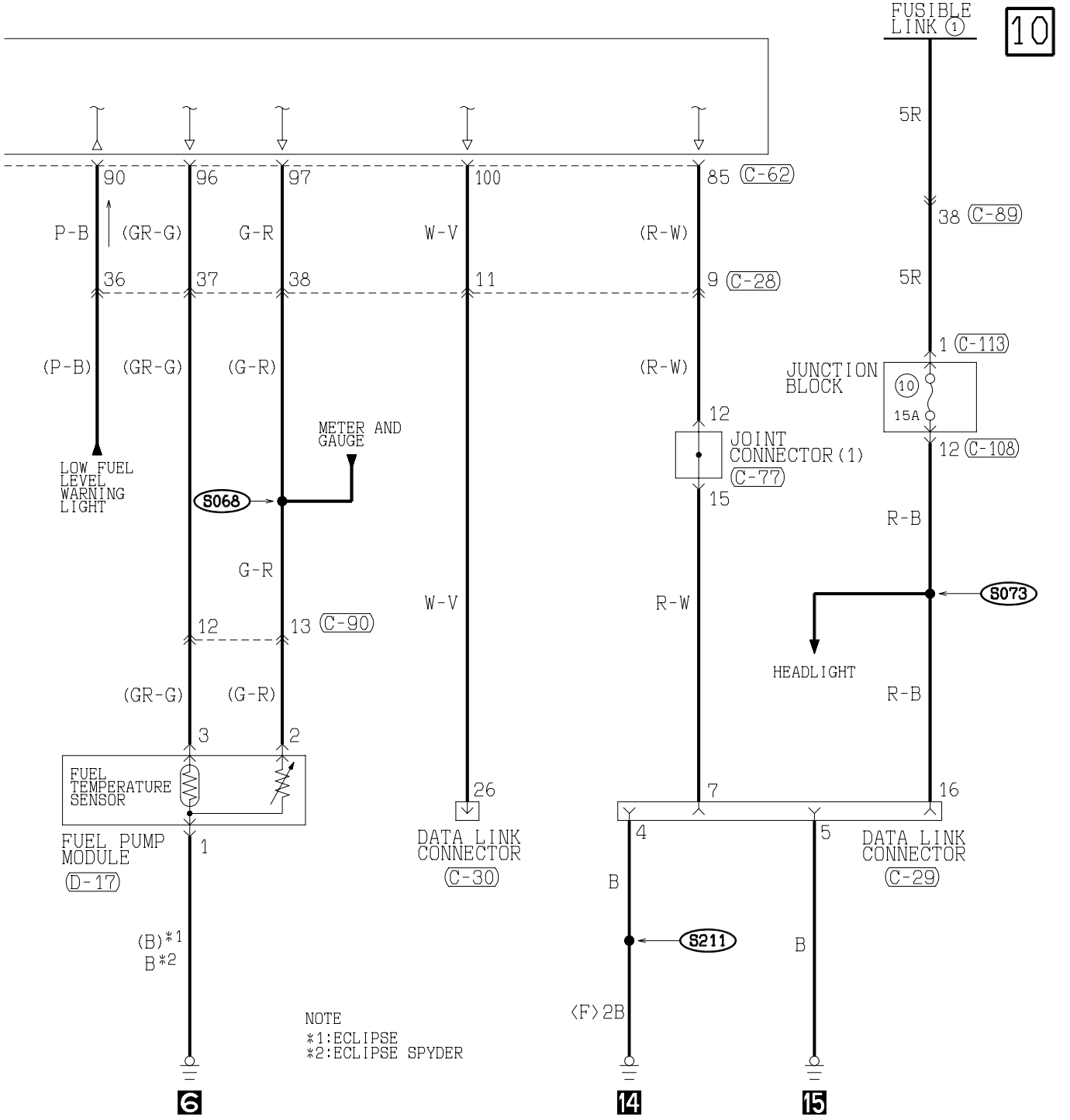
TSB Revision

MFI SYSTEM <3.0L ENGINE-M/T (WITHOUT VARIABLE INDUCTION CONTROL (VIC) SYSTEM)> (CONTINUED)



H3S05M02EA

TSB Revision

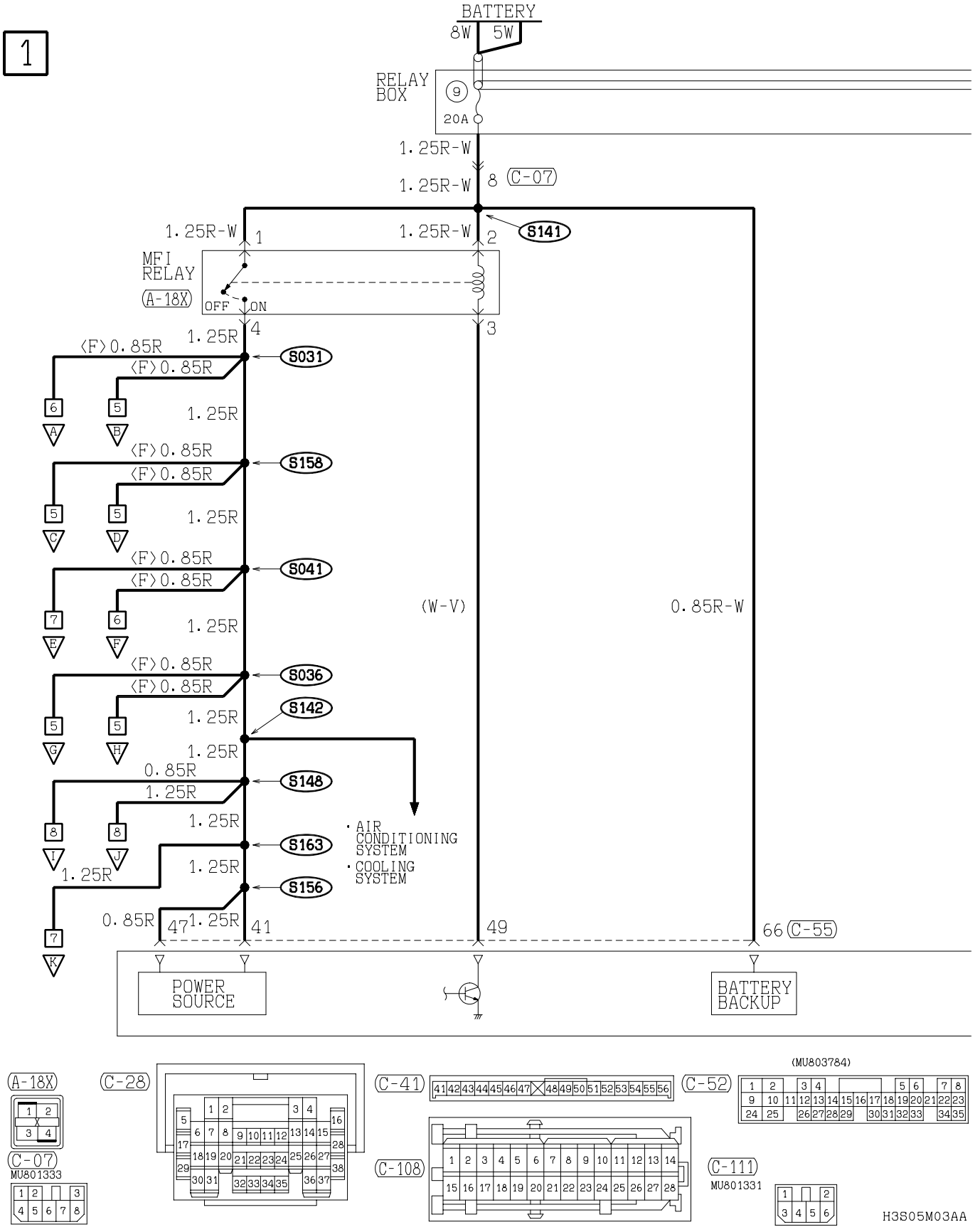


H3S05M02EB

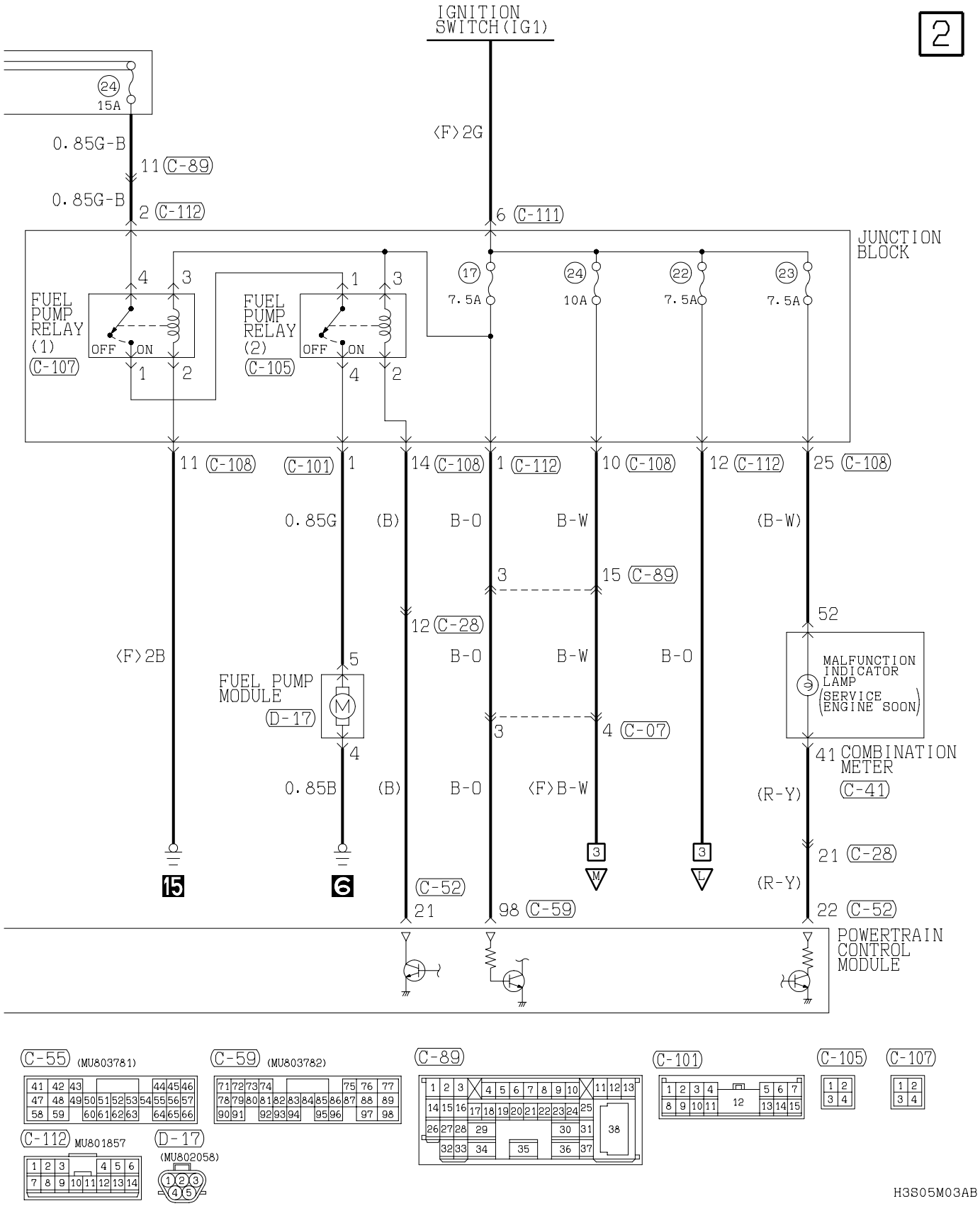
TSB Revision

MFI SYSTEM <3.0L ENGINE-A/T (WITHOUT VARIABLE INDUCTION CONTROL (VIC) SYSTEM)>

M1901000800714

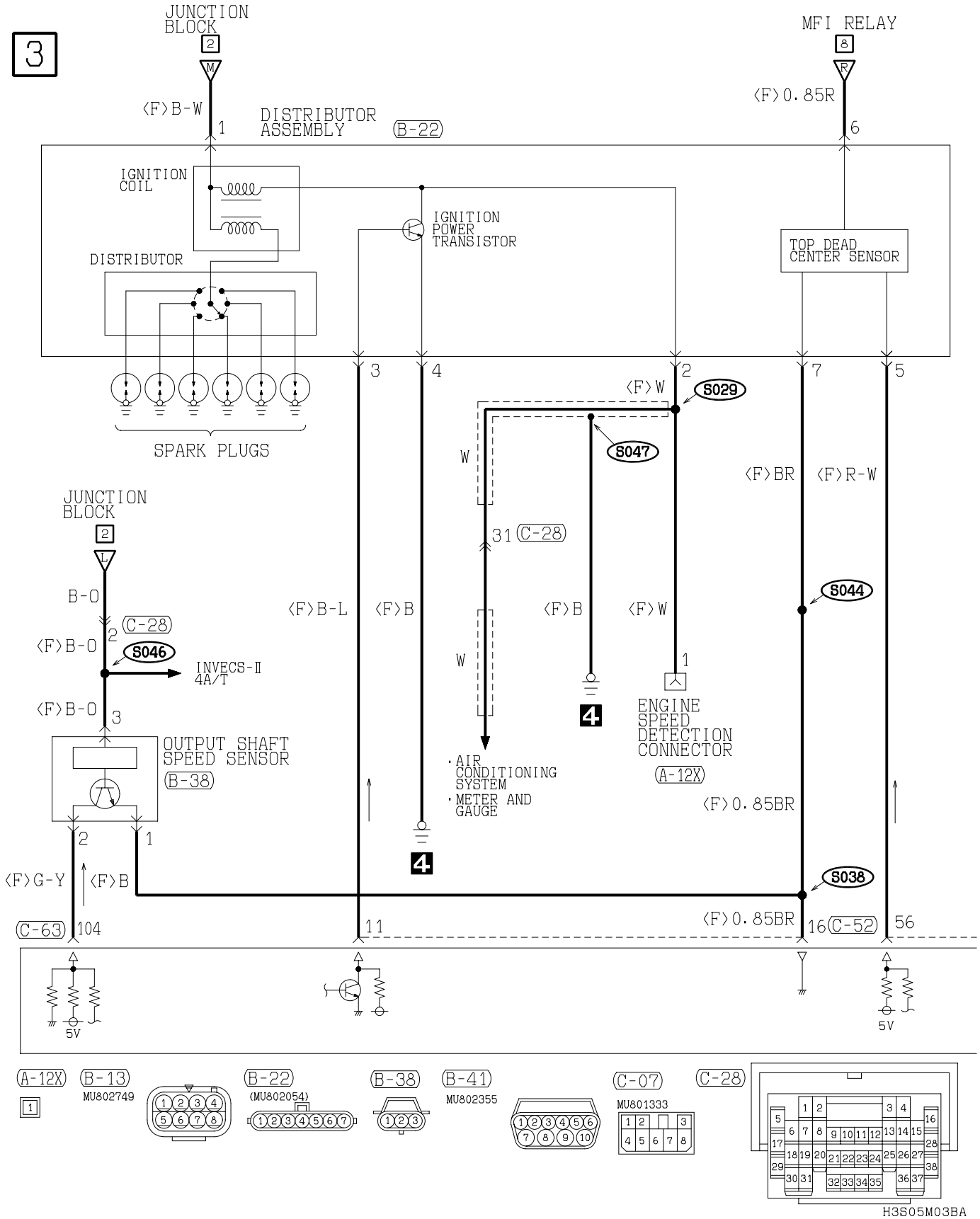


TSB Revision



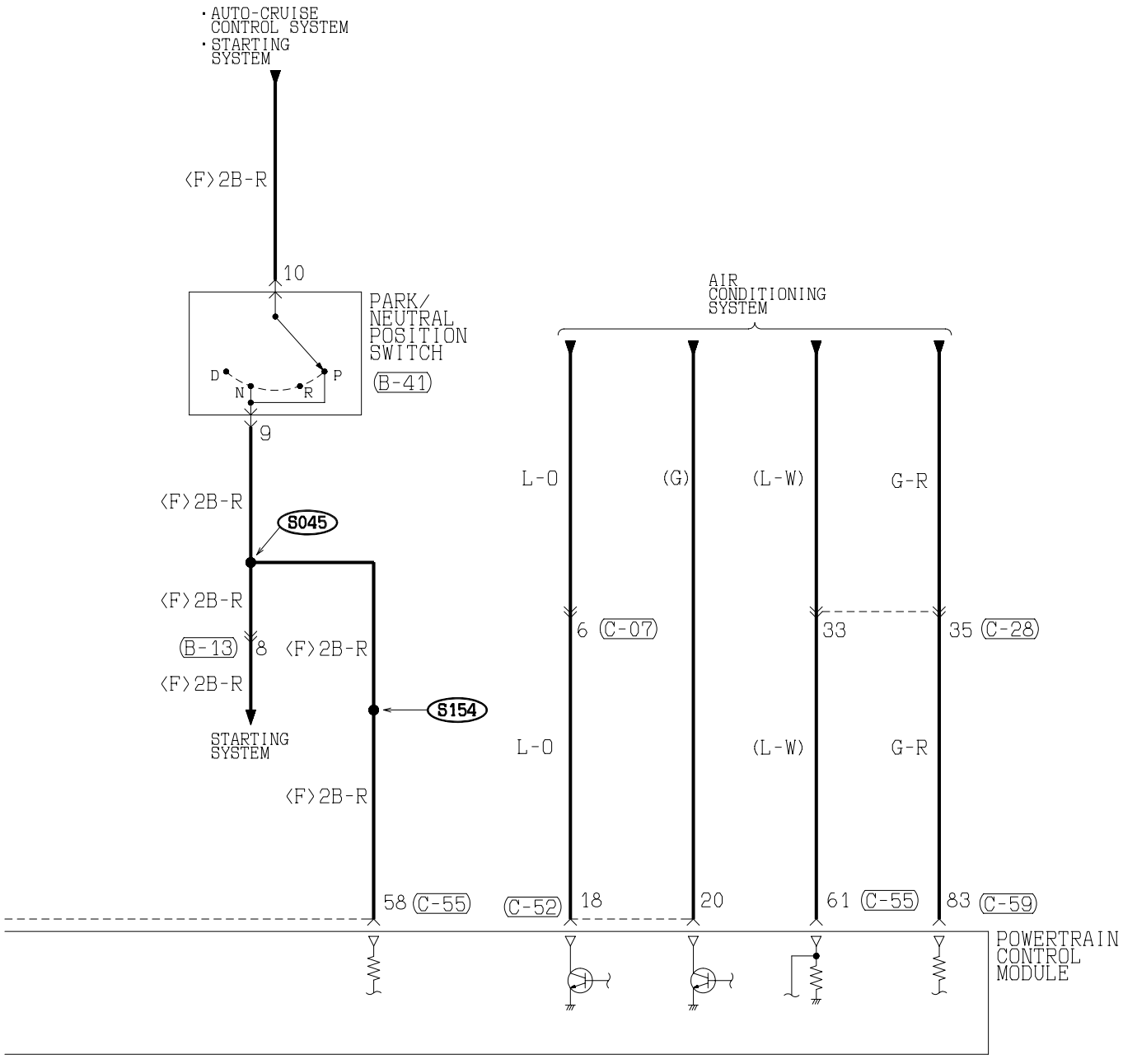
TSB Revision

MFI SYSTEM <3.0L ENGINE-A/T (WITHOUT VARIABLE INDUCTION CONTROL (VIC) SYSTEM)> (CONTINUED)



TSB Revision

4



C-52 (MU803784)

1	2		3	4				5	6		7	8		
9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
24	25		26	27	28	29		30	31	32	33		34	35

C-55 (MU803781)

41	42	43									44	45	46	
47	48	49	50	51	52	53	54	55	56	57				
58	59		60	61	62	63		64	65	66				

C-59 (MU803782)

71	72	73	74								75	76	77	
78	79	80	81	82	83	84	85	86	87	88	89			
90	91		92	93	94		95	96		97	98			

C-63 (MU803783)

101	102		103	104							105	106	107	
108	109	110	111	112	113	114	115	116	117	118	119	120		
121	122	123		124	125		126	127	128		129	130		

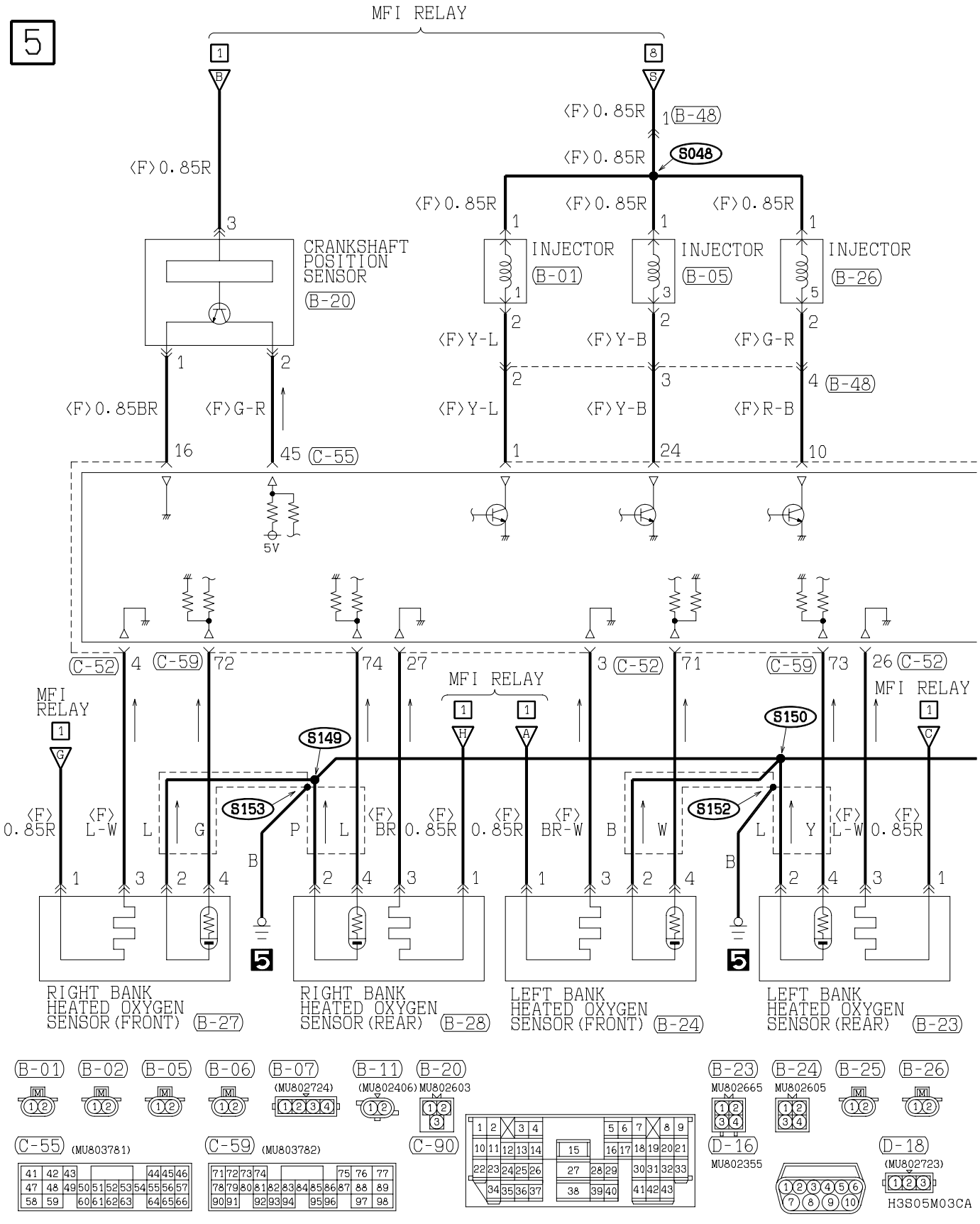
WIRE COLOR CODE

B :BLACK	BR:BROWN	G :GREEN	GR:GRAY	L :BLUE	LG:LIGHT GREEN	O :ORANGE
P :PINK	R :RED	SB:SKY BLUE	V :VIOLET	W :WHITE	Y :YELLOW	

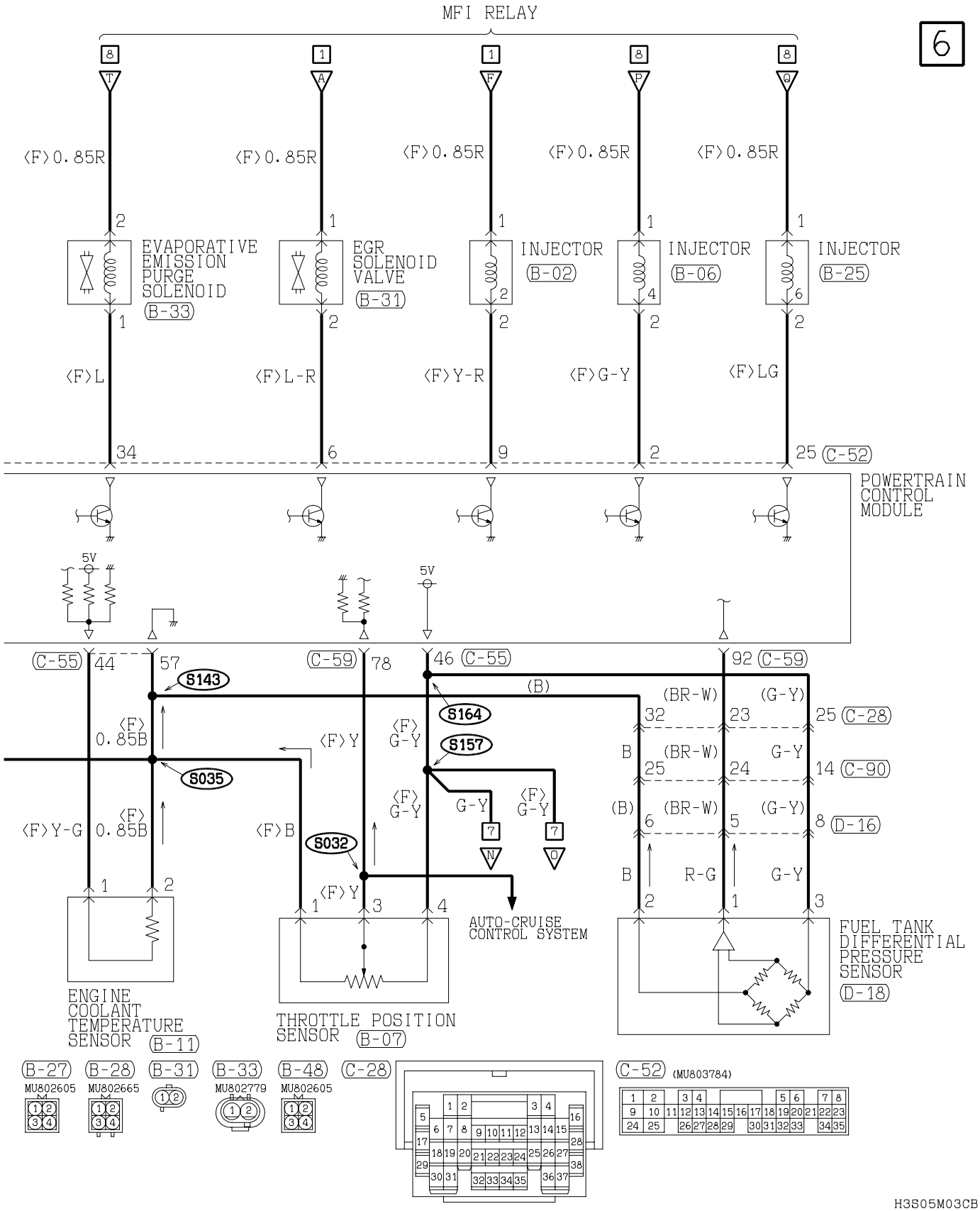
H3S05M03BB

TSB Revision

MFI SYSTEM <3.0L ENGINE-A/T (WITHOUT VARIABLE INDUCTION CONTROL (VIC) SYSTEM)> (CONTINUED)

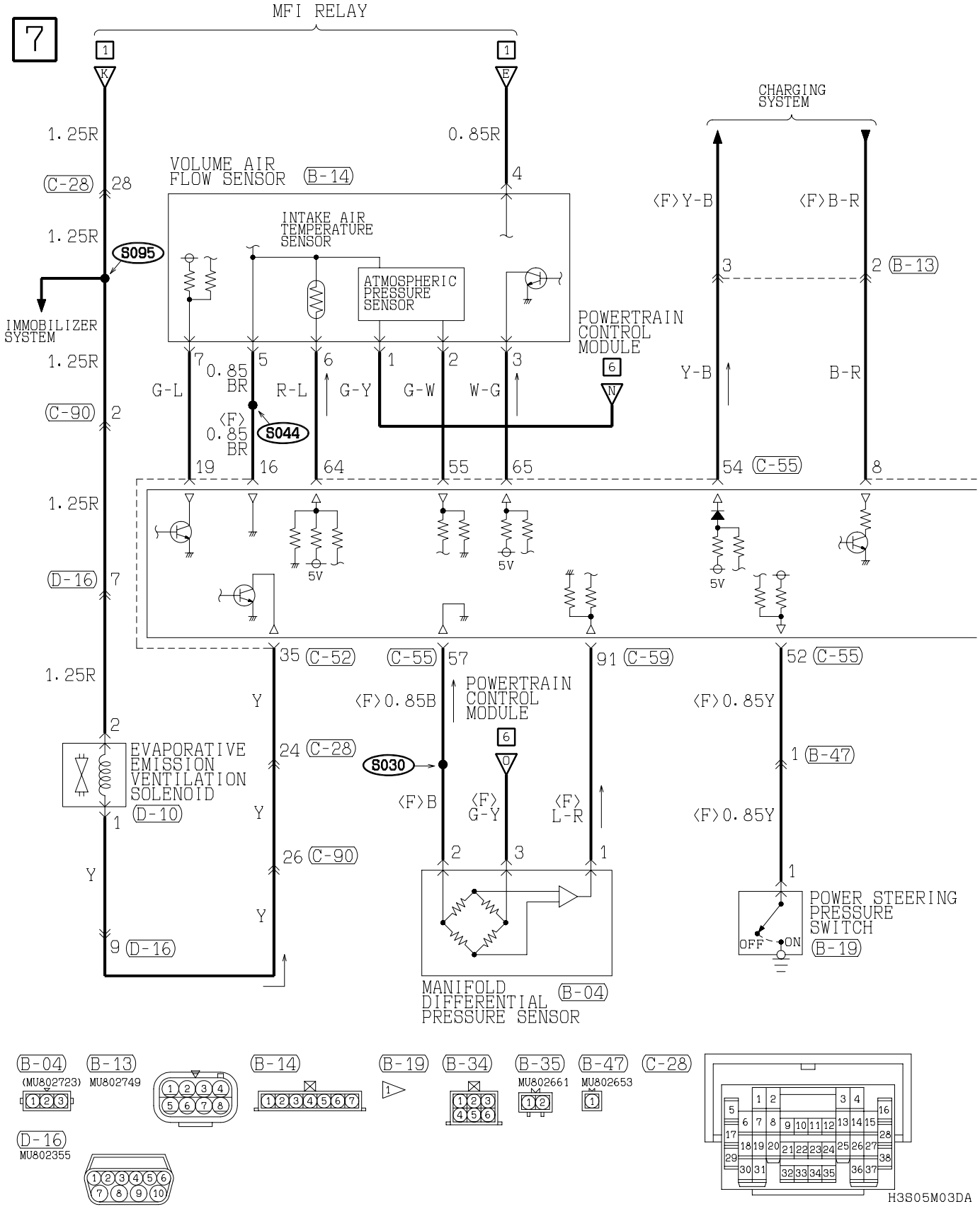


TSB Revision

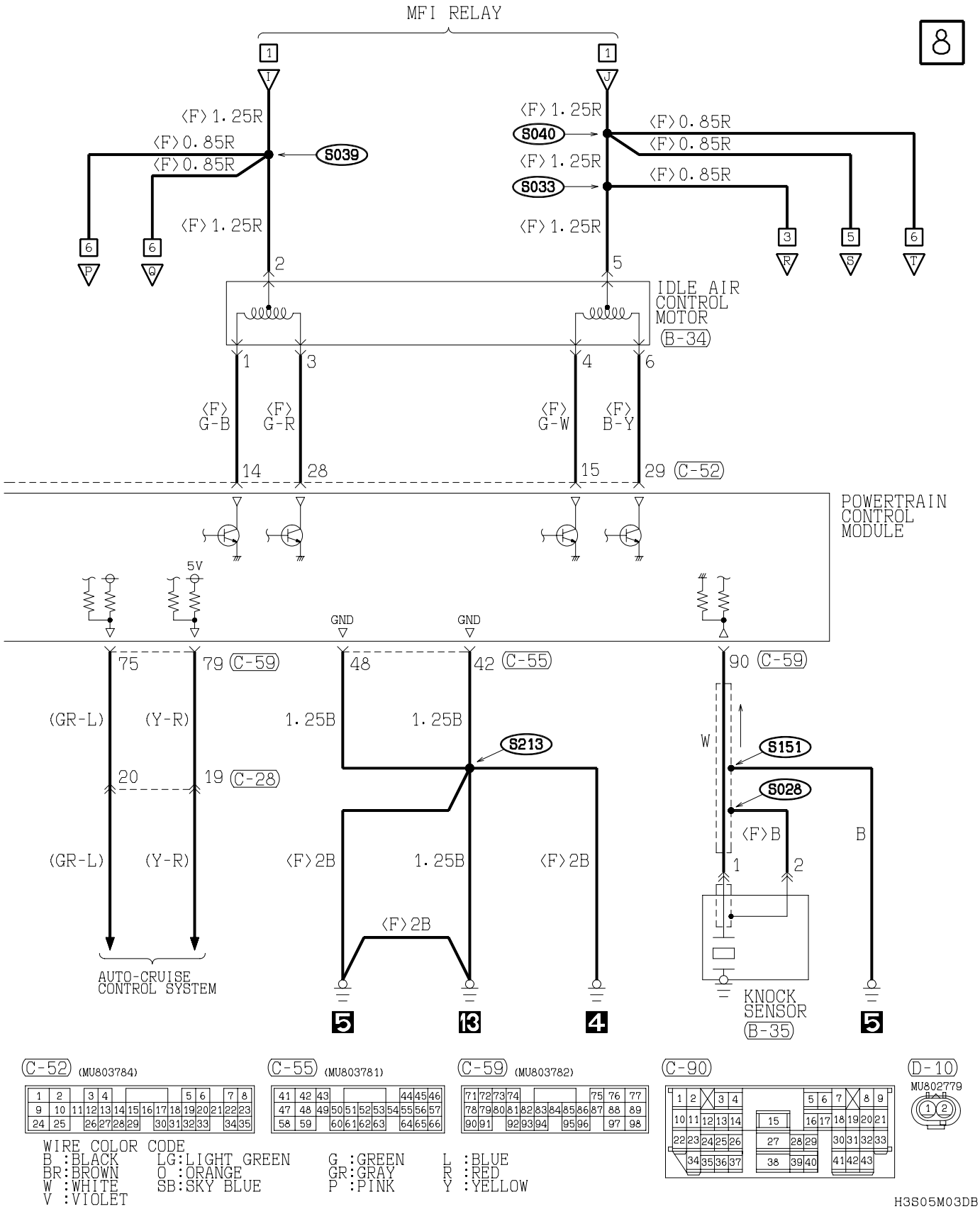


TSB Revision

MFI SYSTEM <3.0L ENGINE-A/T (WITHOUT VARIABLE INDUCTION CONTROL (VIC) SYSTEM)> (CONTINUED)



TSB Revision



C-52 (MU803784)

1	2		3	4				5	6		7	8		
9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
24	25		26	27	28	29		30	31	32	33		34	35

C-55 (MU803781)

41	42	43									44	45	46	
47	48	49	50	51	52	53	54	55	56	57				
58	59		60	61	62	63		64	65	66				

C-59 (MU803782)

71	72	73	74								75	76	77	
78	79	80	81	82	83	84	85	86	87	88	89			
90	91		92	93	94		95	96		97	98			

C-90

1	2		3	4				5	6	7		8	9	
10	11	12	13	14		15		16	17	18	19	20	21	
22	23	24	25	26		27	28	29		30	31	32	33	
	34	35	36	37		38	39	40		41	42	43		

D-10 MU802779

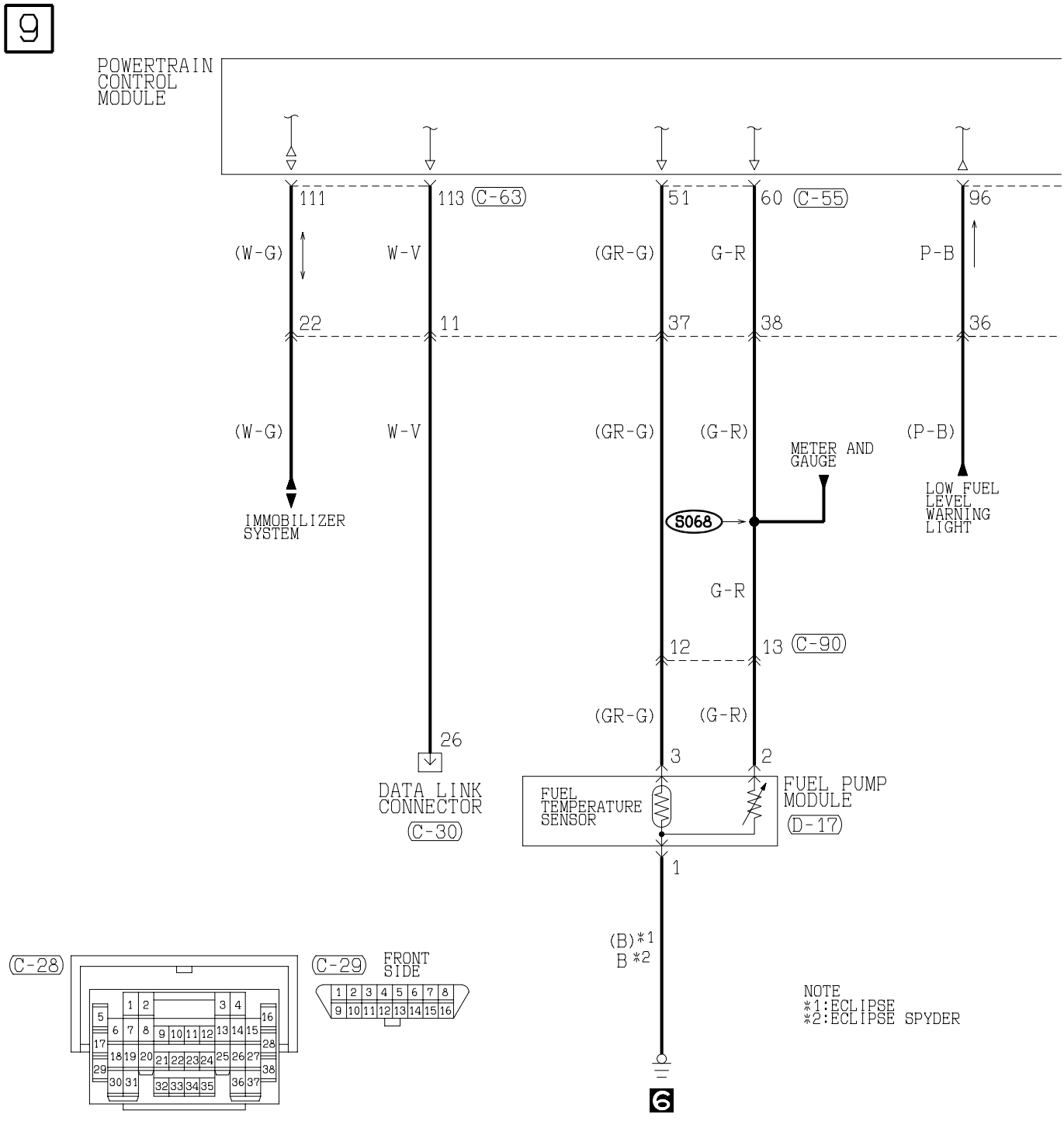
WIRE COLOR CODE

B :BLACK	LG:LIGHT GREEN	G :GREEN	L :BLUE
BR:BROWN	O :ORANGE	GR:GRAY	R :RED
W :WHITE	SB:SKY BLUE	P :PINK	Y :YELLOW
V :VIOLET			

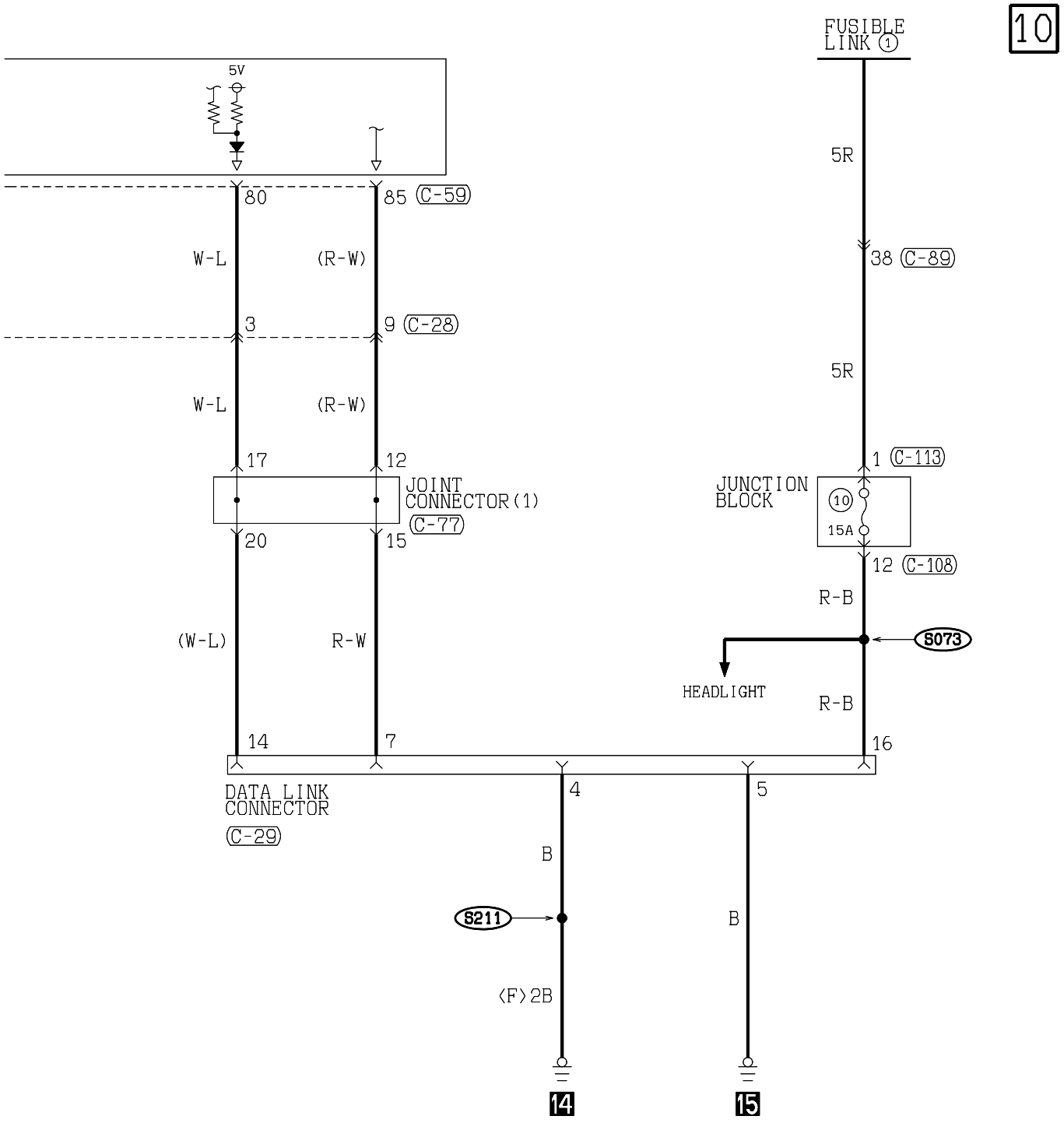
H3S05M03DB

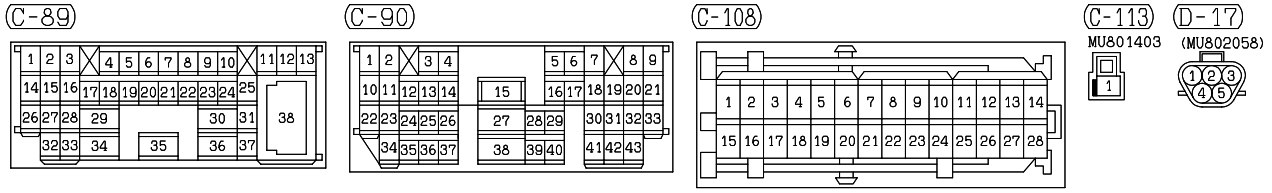
TSB Revision

MFI SYSTEM <3.0L ENGINE-A/T (WITHOUT VARIABLE INDUCTION CONTROL (VIC) SYSTEM)> (CONTINUED)



TSB Revision



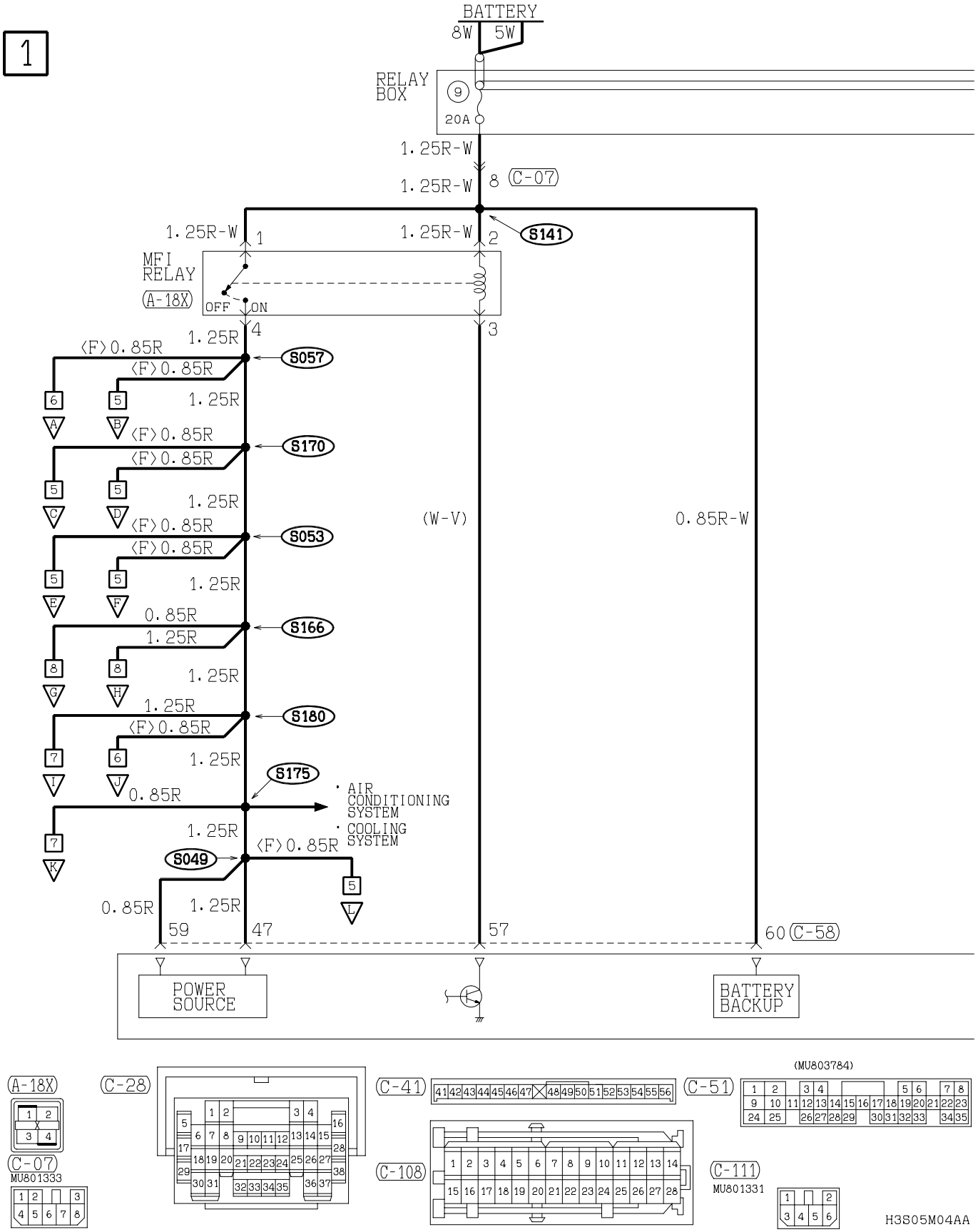


H3S05M03EB

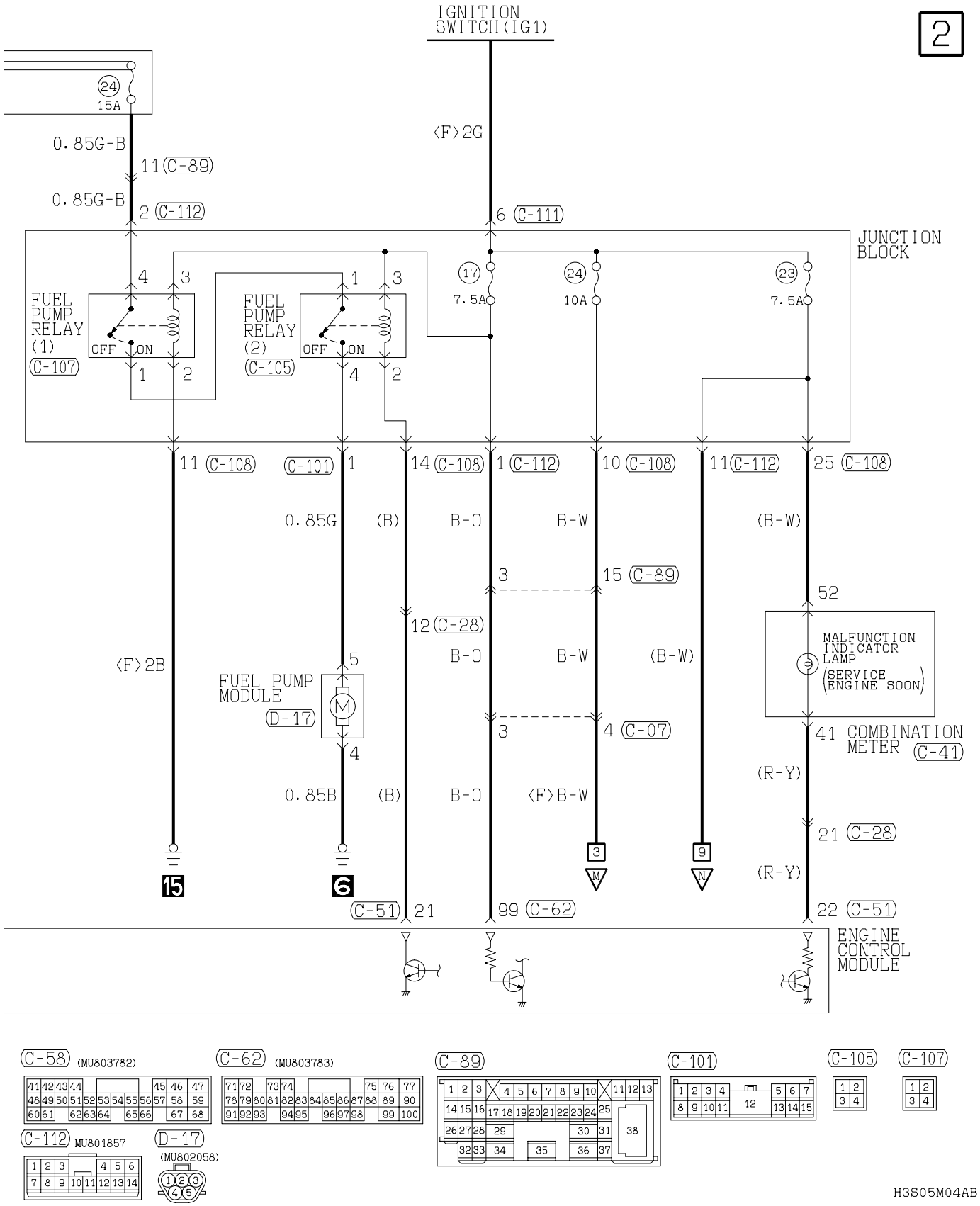
TSB Revision

MFI SYSTEM <3.0L ENGINE-M/T (WITH VARIABLE INDUCTION CONTROL (VIC) SYSTEM)>

M1901000800725



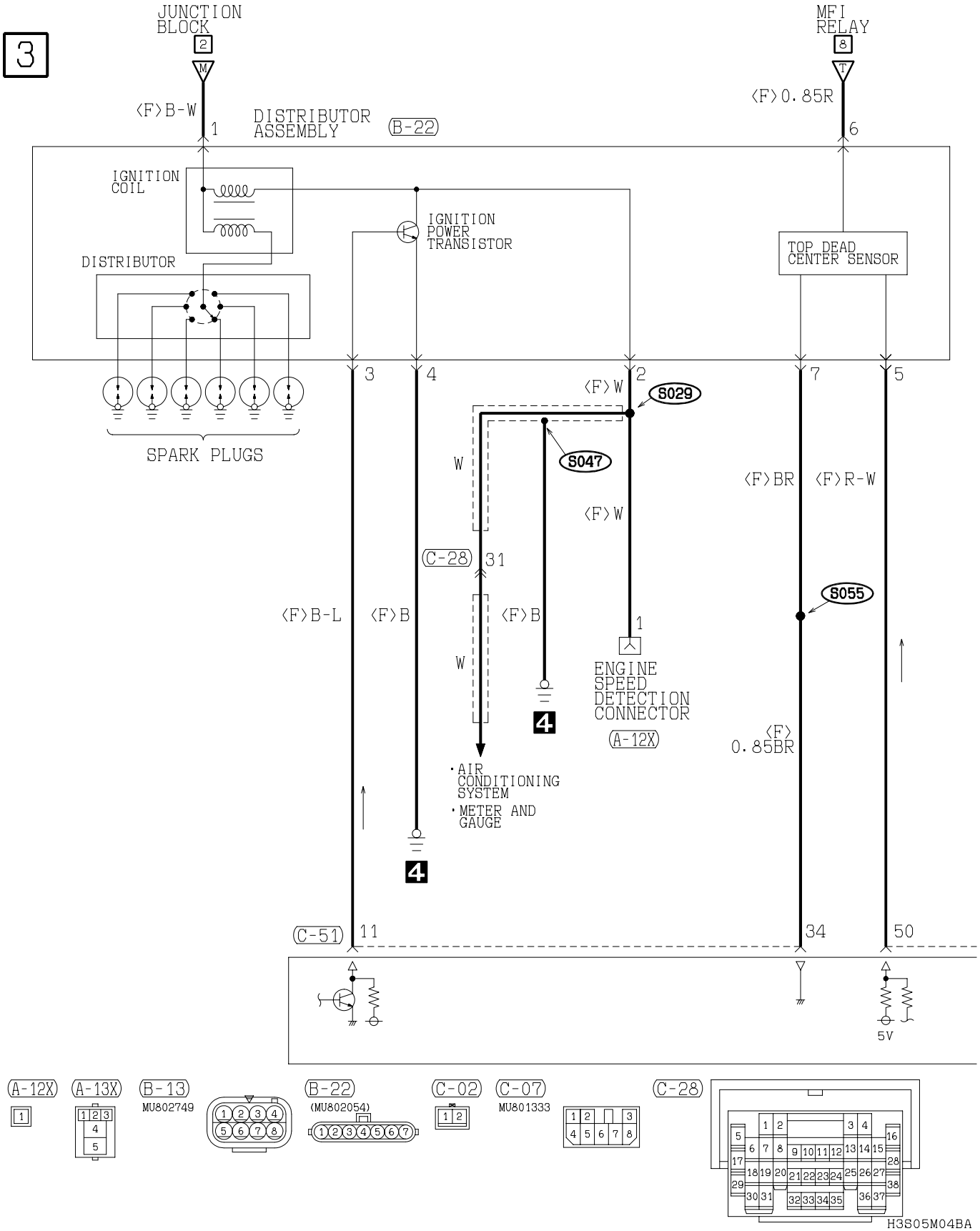
TSB Revision



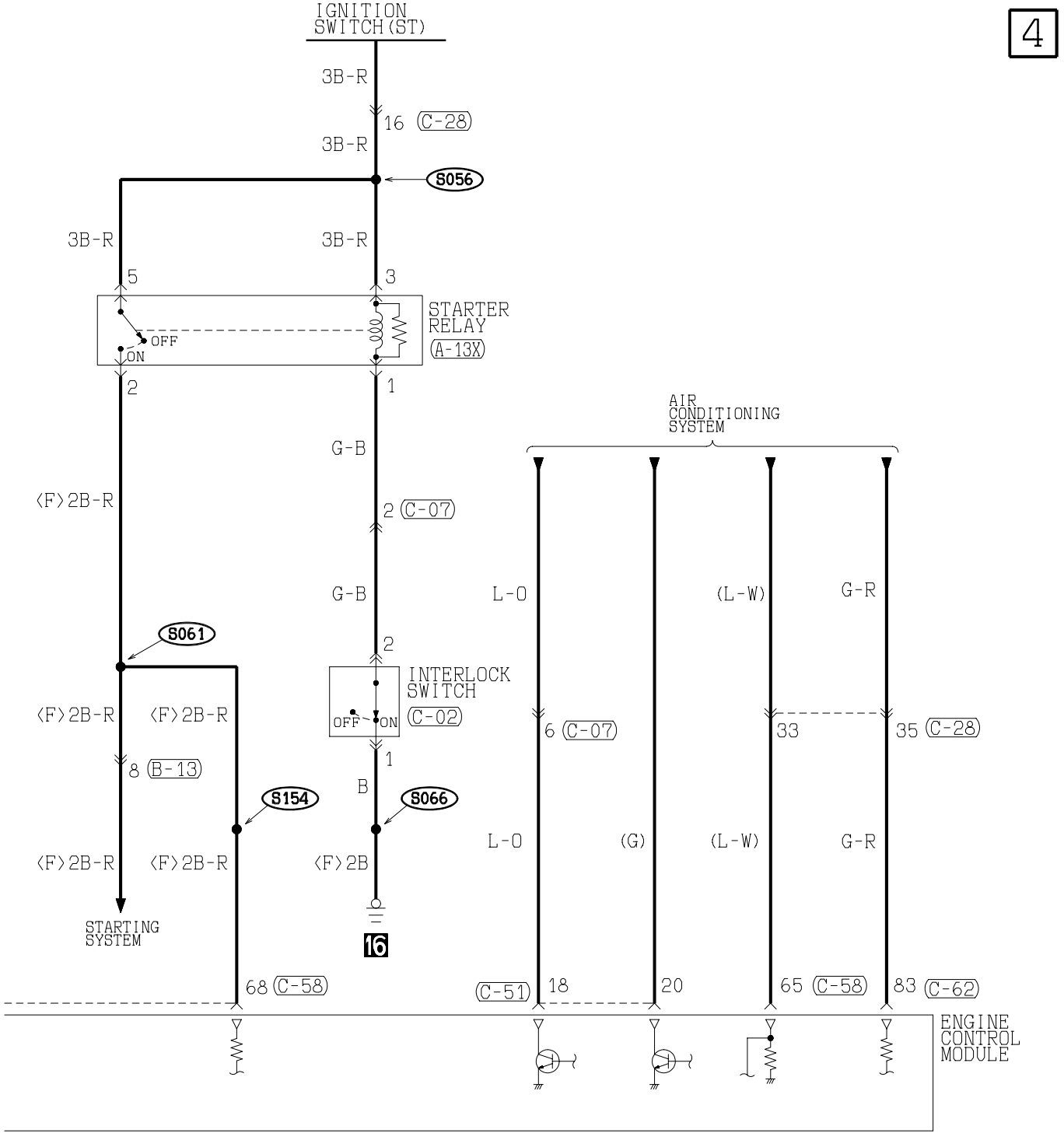
H3S05M04AB

TSB Revision

MFI SYSTEM <3.0L ENGINE-M/T (WITH VARIABLE INDUCTION CONTROL (VIC) SYSTEM)> (CONTINUED)



TSB Revision



C-51 (MU803784)

1	2		3	4				5	6		7	8		
9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
24	25		26	27	28	29		30	31	32	33		34	35

C-58 (MU803782)

41	42	43	44					45	46	47				
48	49	50	51	52	53	54	55	56	57	58	59			
60	61		62	63	64		65	66		67	68			

C-62 (MU803783)

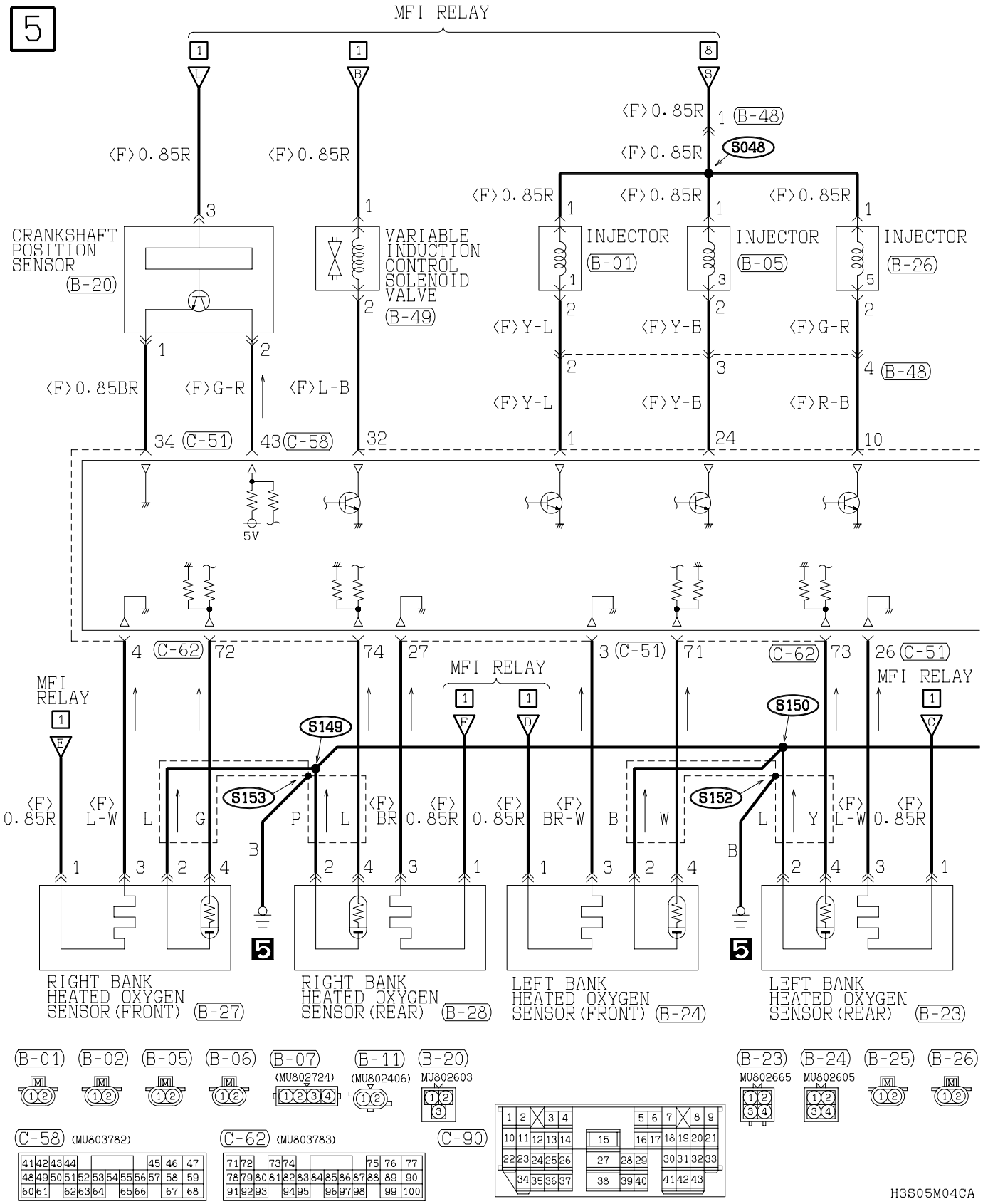
71	72		73	74				75	76	77				
78	79	80	81	82	83	84	85	86	87	88	89	90		
91	92	93		94	95		96	97	98		99	100		

WIRE COLOR CODE
B :BLACK BR:BROWN G :GREEN GR:GRAY L :BLUE LG:LIGHT GREEN O :ORANGE
P :PINK R :RED SB:SKY BLUE V :VIOLET W :WHITE Y :YELLOW

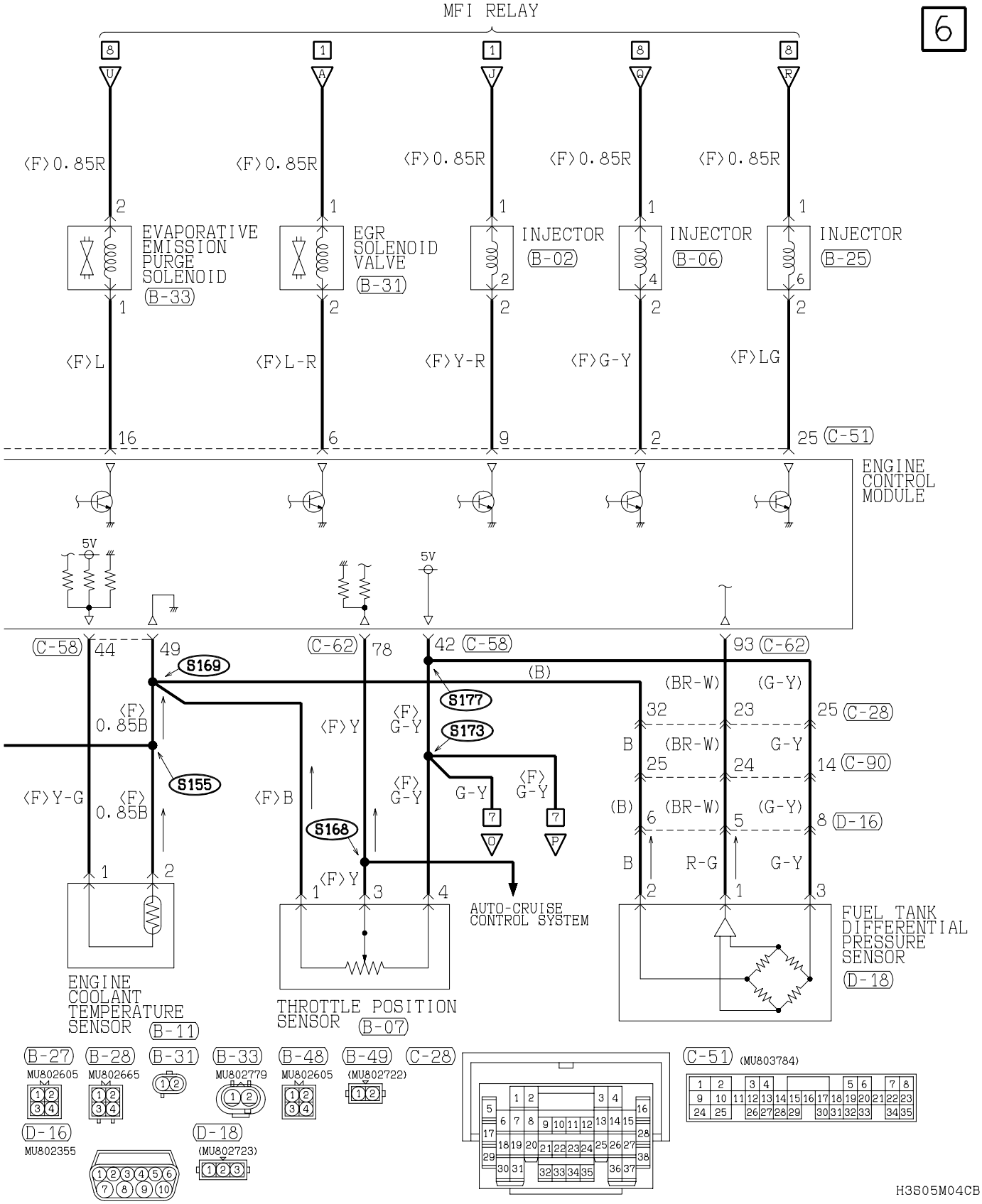
H3S05M04BB

TSB Revision

MFI SYSTEM <3.0L ENGINE-M/T (WITH VARIABLE INDUCTION CONTROL (VIC) SYSTEM)> (CONTINUED)

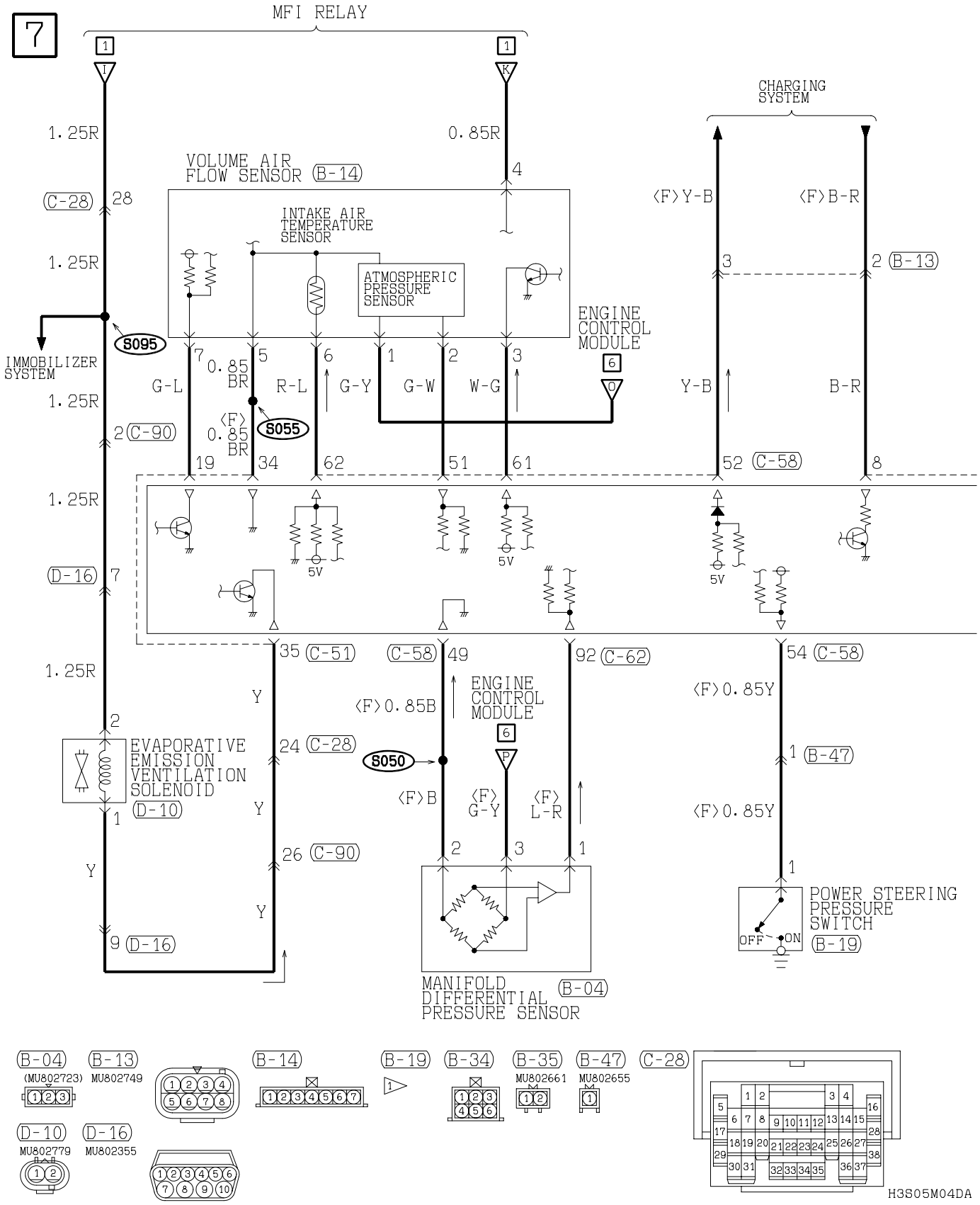


TSB Revision

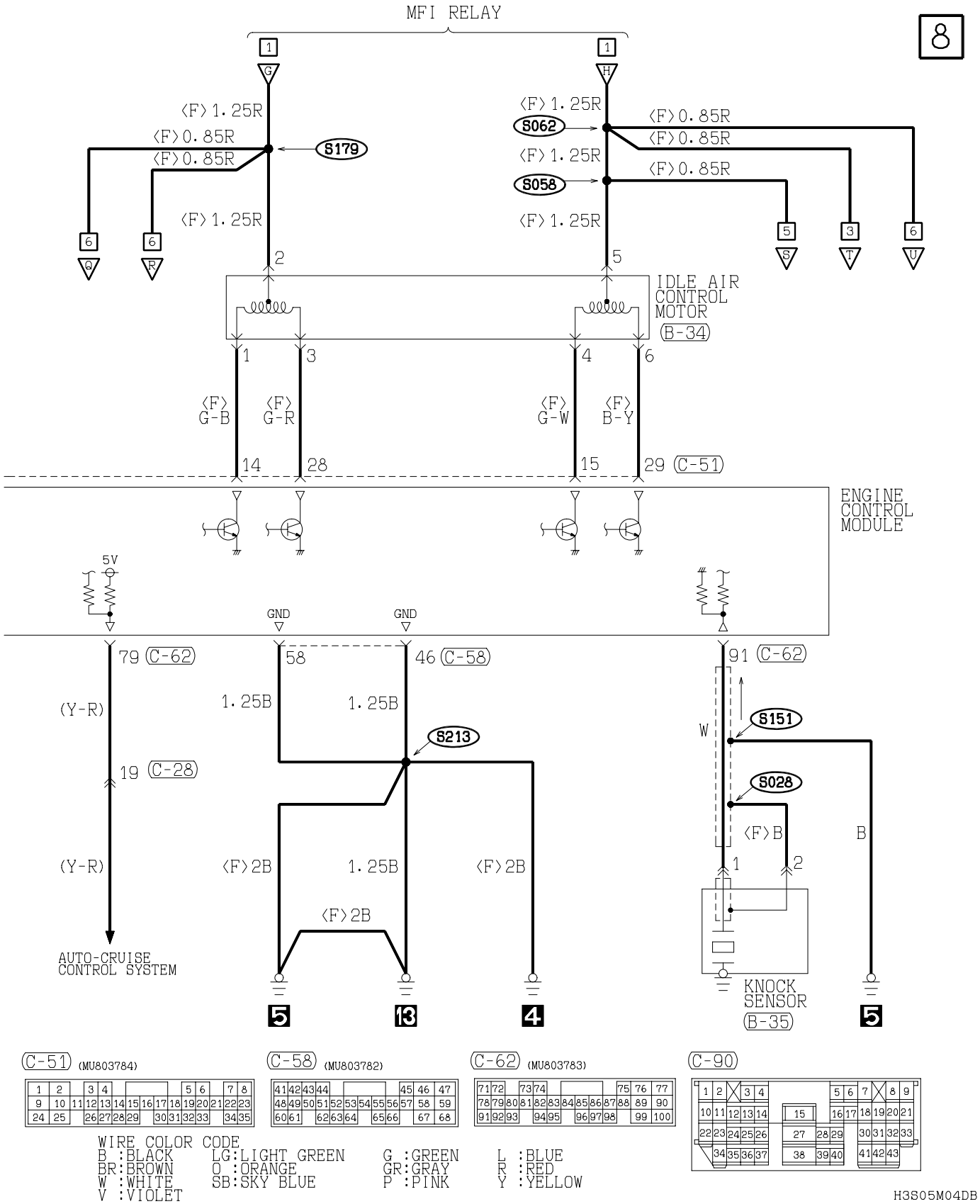


TSB Revision

MFI SYSTEM <3.0L ENGINE-M/T (WITH VARIABLE INDUCTION CONTROL (VIC) SYSTEM)> (CONTINUED)



TSB Revision



C-51 (MU803784)

1	2		3	4				5	6		7	8		
9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
24	25		26	27	28	29		30	31	32	33		34	35

C-58 (MU803782)

41	42	43	44							45	46	47		
48	49	50	51	52	53	54	55	56	57	58	59			
60	61		62	63	64		65	66		67	68			

C-62 (MU803783)

71	72		73	74						75	76	77		
78	79	80	81	82	83	84	85	86	87	88	89	90		
91	92	93		94	95		96	97	98		99	100		

C-90

1	2	X	3	4				5	6	7	X	8	9	
10	11	12	13	14		15			16	17	18	19	20	21
22	23	24	25	26		27	28	29		30	31	32	33	
34	35	36	37			38	39	40		41	42	43		

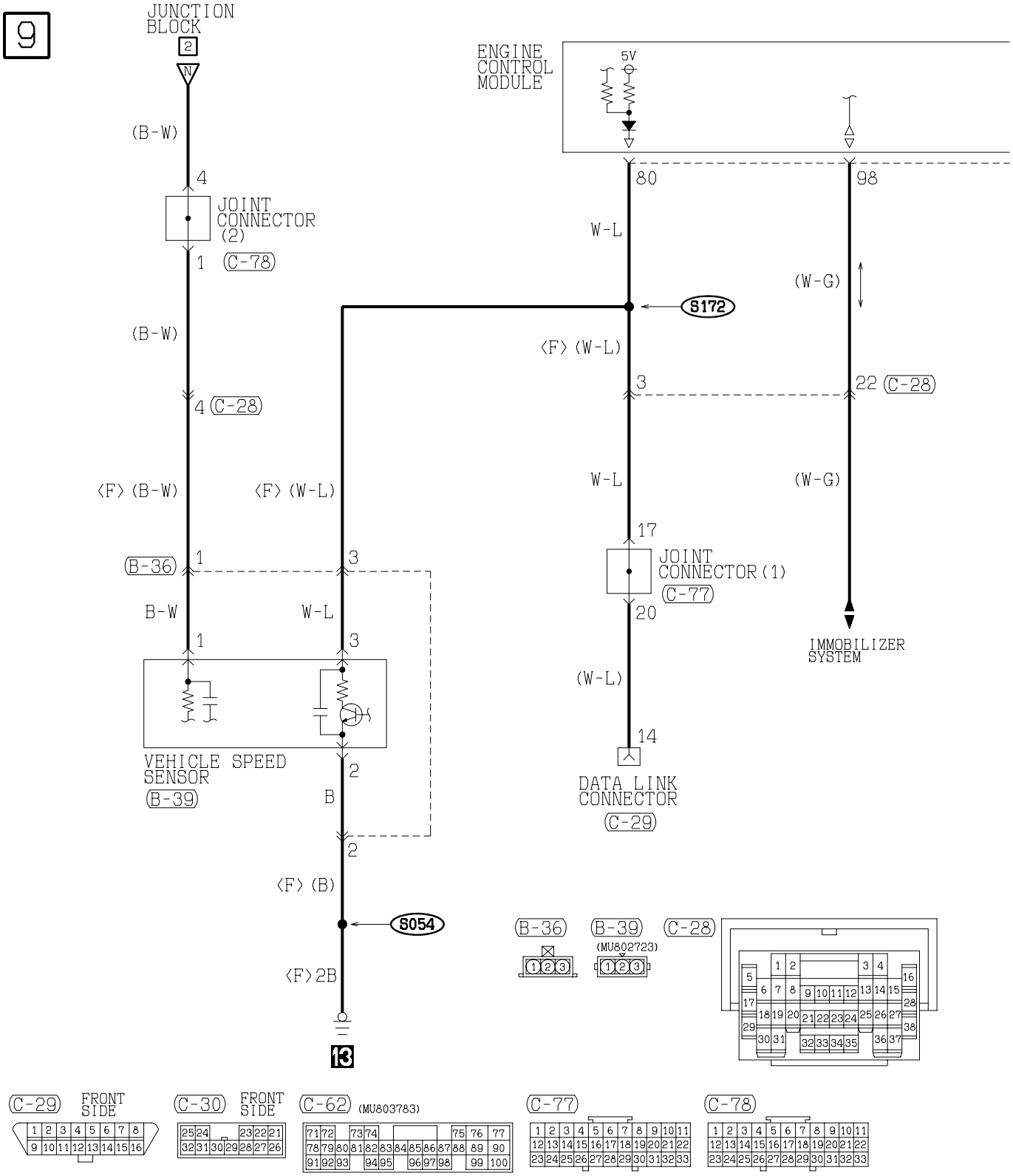
WIRE COLOR CODE

B :BLACK	LG:LIGHT GREEN	G :GREEN	L :BLUE
BR:BROWN	O :ORANGE	GR:GRAY	R :RED
W :WHITE	SB:SKY BLUE	P :PINK	Y :YELLOW
V :VIOLET			

H3S05M04DB

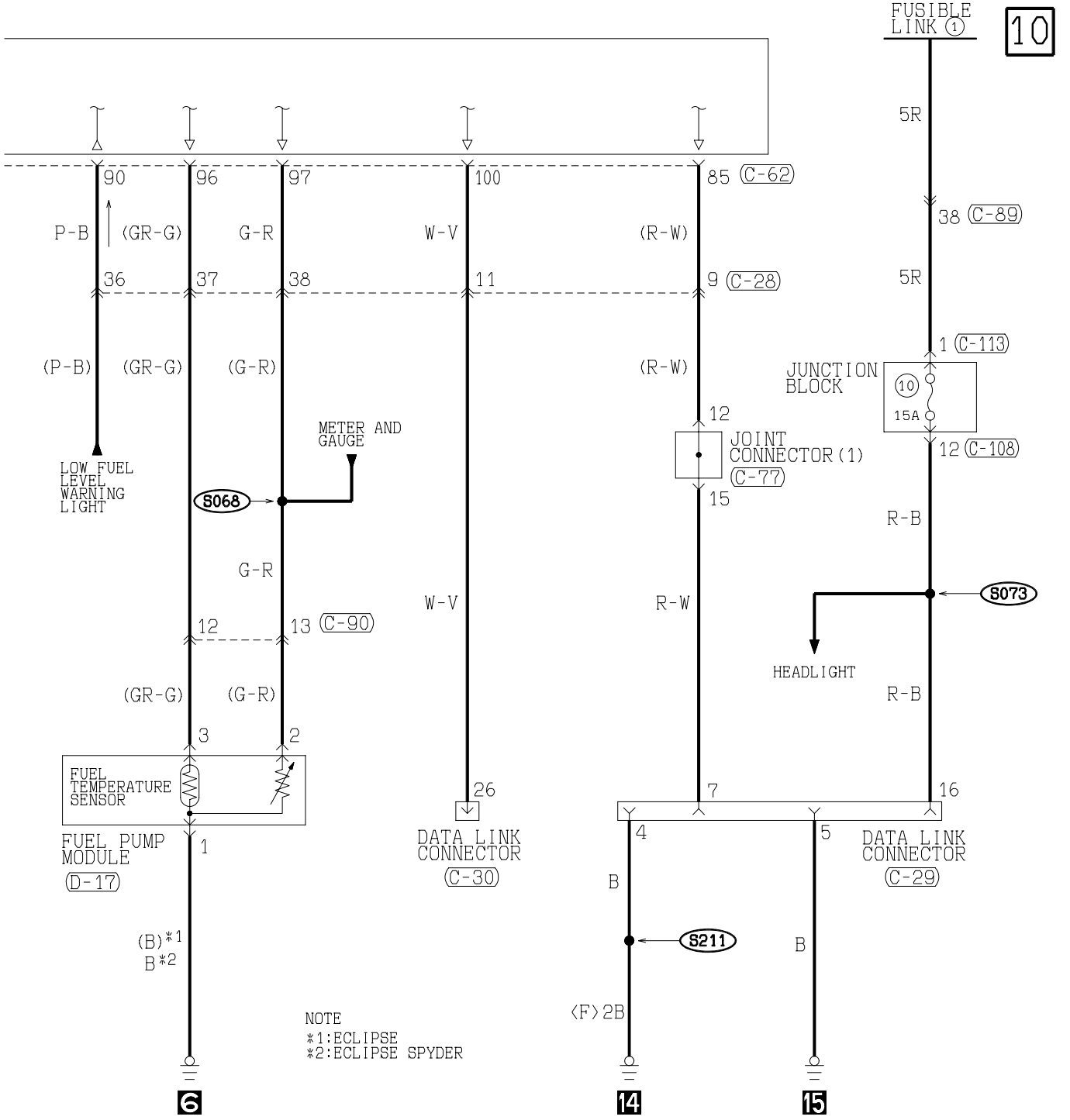
TSB Revision

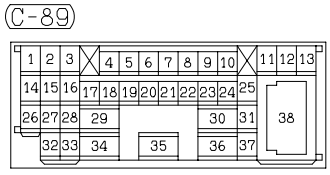
MFI SYSTEM <3.0L ENGINE-M/T (WITH VARIABLE INDUCTION CONTROL (VIC) SYSTEM)> (CONTINUED)

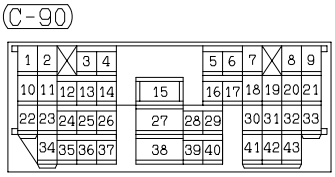


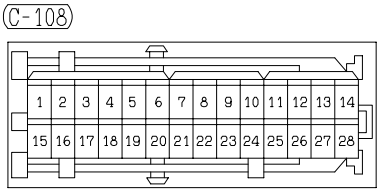
H3S05M04EA

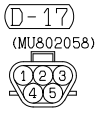
TSB Revision









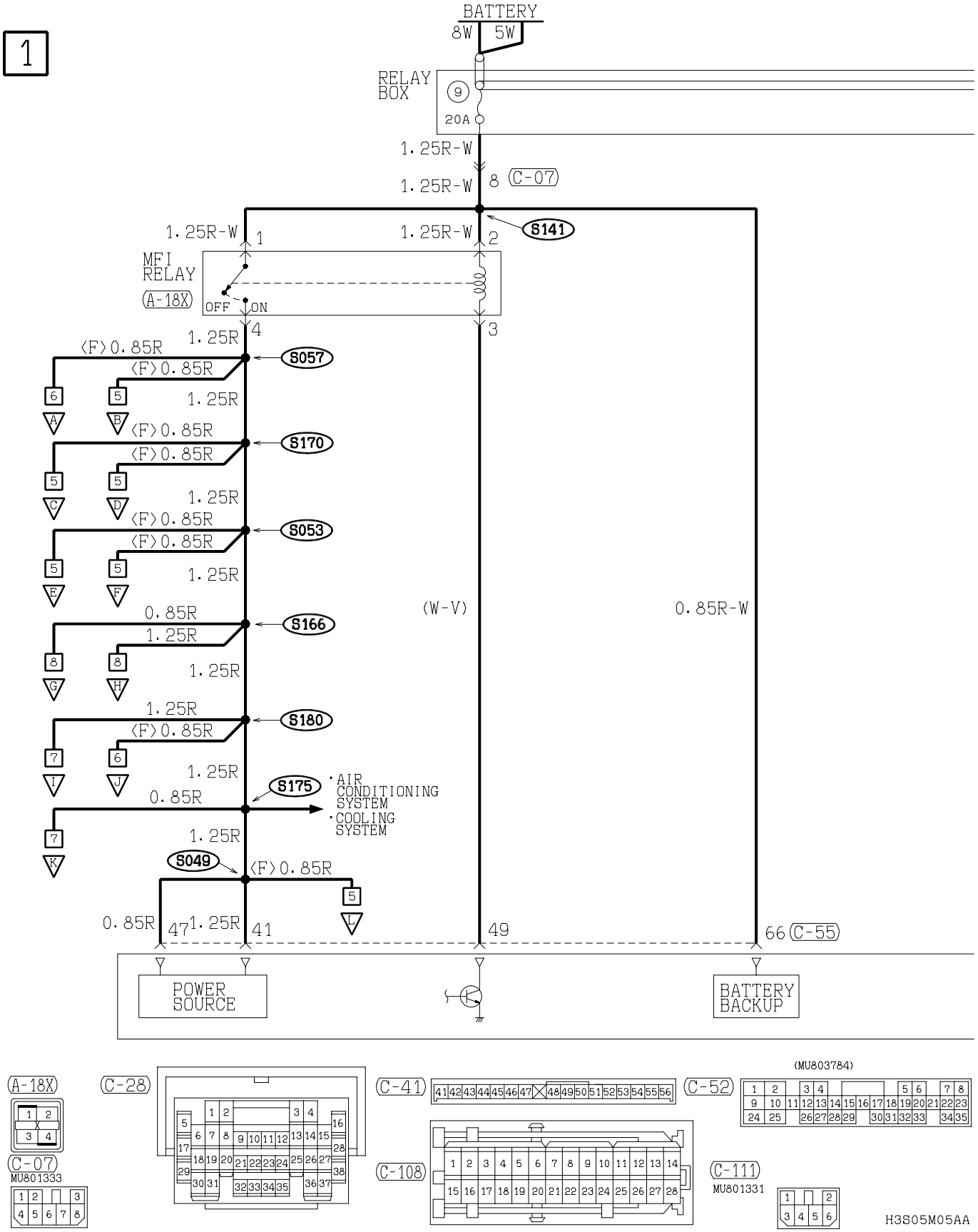


H3S05M04EB

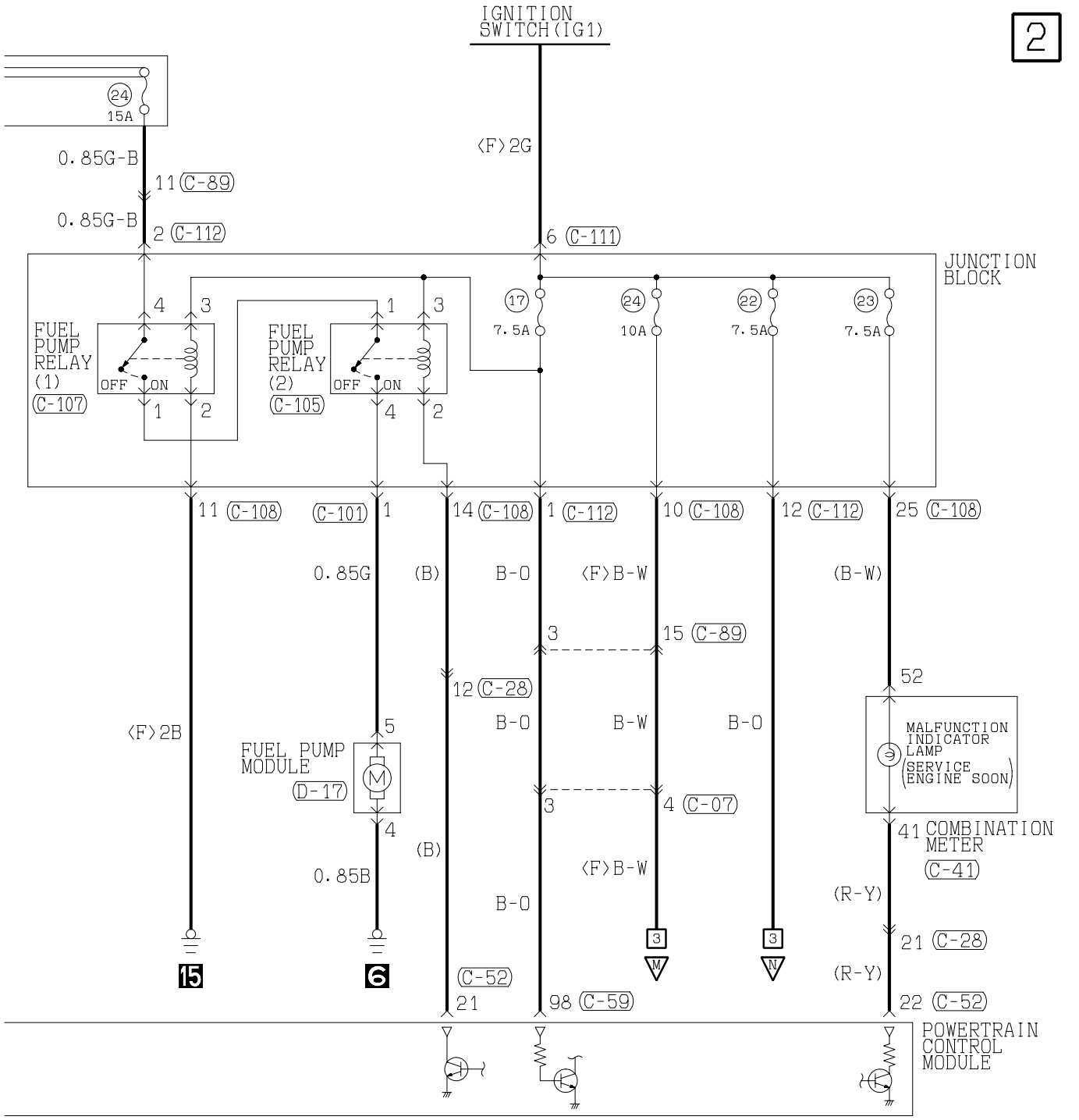
TSB Revision

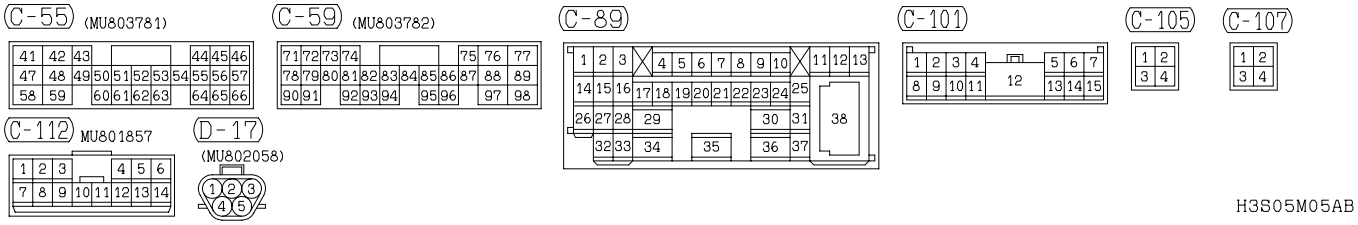
MFI SYSTEM <3.0L ENGINE-A/T (WITH VARIABLE INDUCTION CONTROL (VIC) SYSTEM)>

M1901000800736



TSB Revision

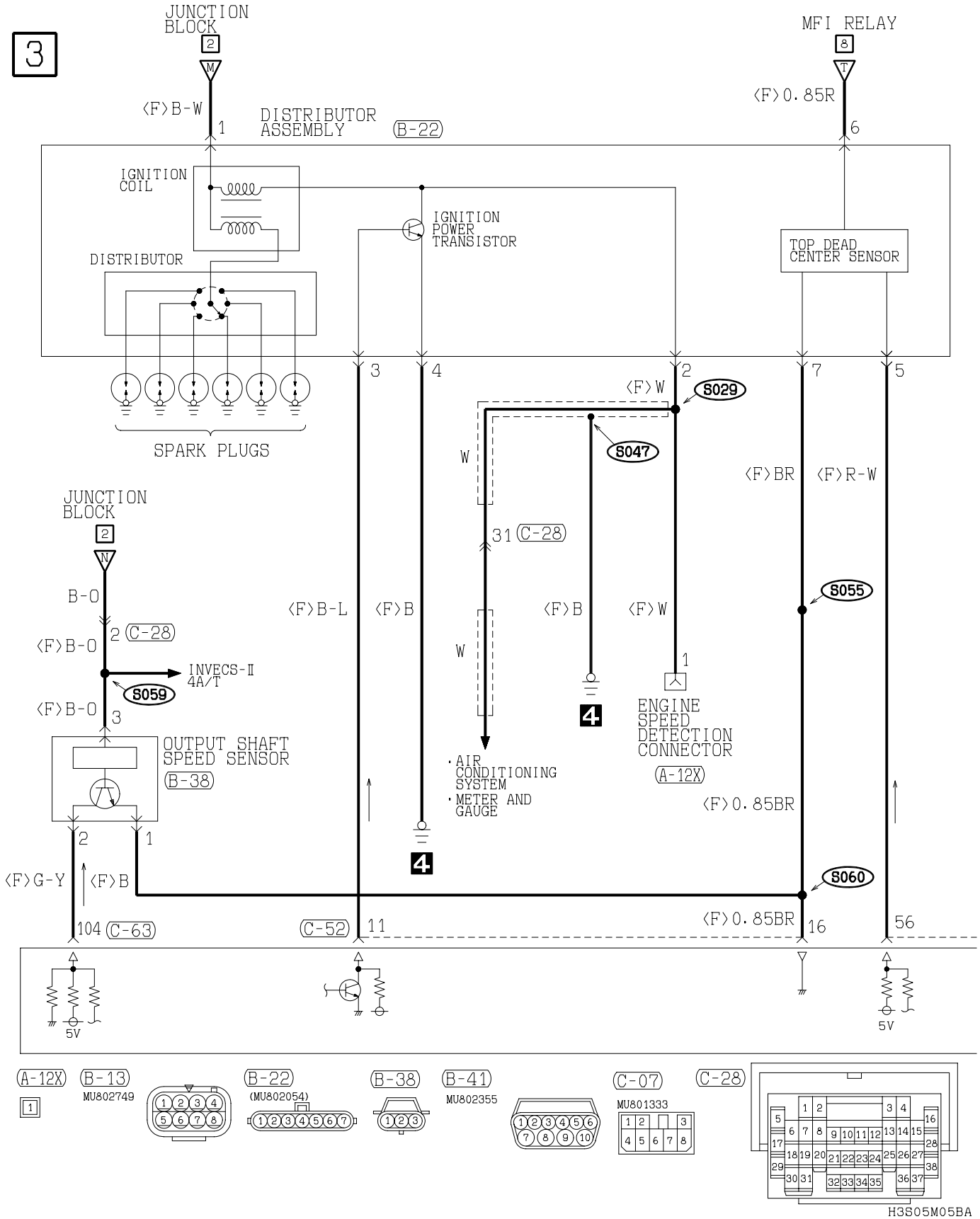




H3S05M05AB

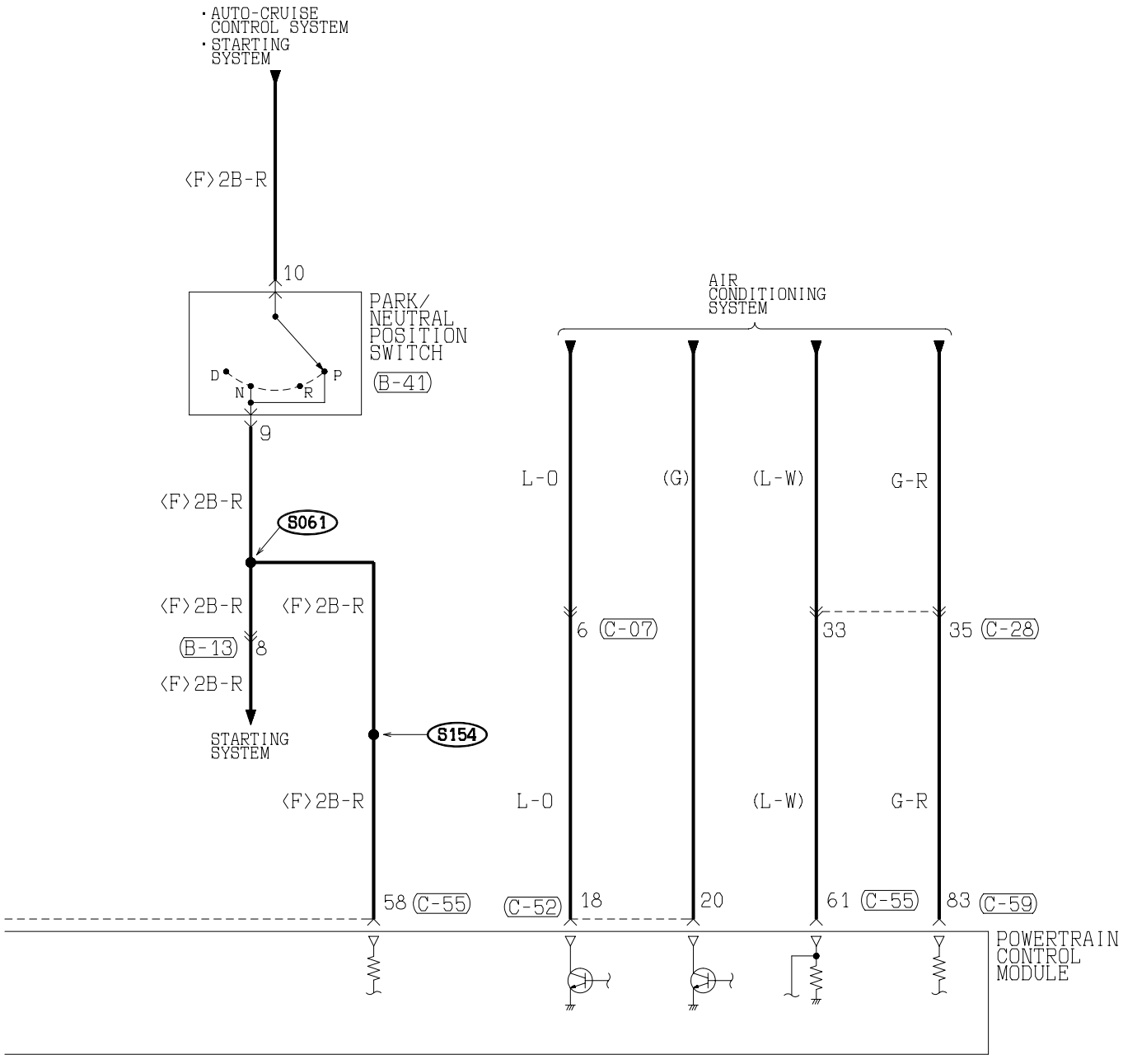
TSB Revision

MFI SYSTEM <3.0L ENGINE-A/T (WITH VARIABLE INDUCTION CONTROL (VIC) SYSTEM)> (CONTINUED)



TSB Revision

4



C-52 (MU803784)

1	2		3	4				5	6		7	8		
9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
24	25		26	27	28	29		30	31	32	33		34	35

C-55 (MU803781)

41	42	43						44	45	46				
47	48	49	50	51	52	53	54	55	56	57				
58	59		60	61	62	63		64	65	66				

C-59 (MU803782)

71	72	73	74					75	76	77				
78	79	80	81	82	83	84	85	86	87	88	89			
90	91		92	93	94		95	96		97	98			

C-63 (MU803783)

101	102		103	104				105	106	107				
108	109	110	111	112	113	114	115	116	117	118	119	120		
121	122	123		124	125		126	127	128		129	130		

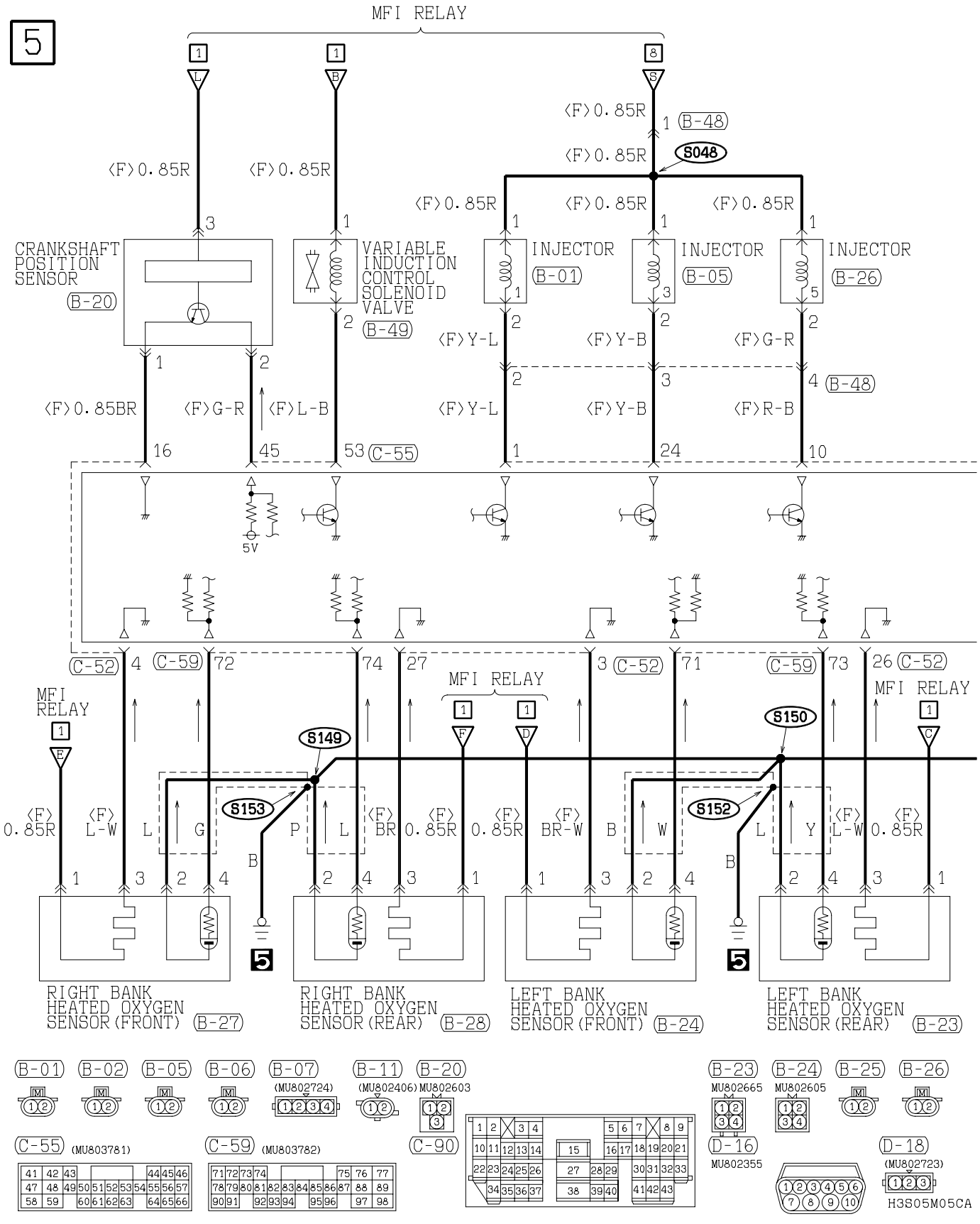
WIRE COLOR CODE

B :BLACK	BR:BROWN	G :GREEN	GR:GRAY	L :BLUE	LG:LIGHT GREEN	O :ORANGE
P :PINK	R :RED	SB:SKY BLUE	V :VIOLET	W :WHITE	Y :YELLOW	

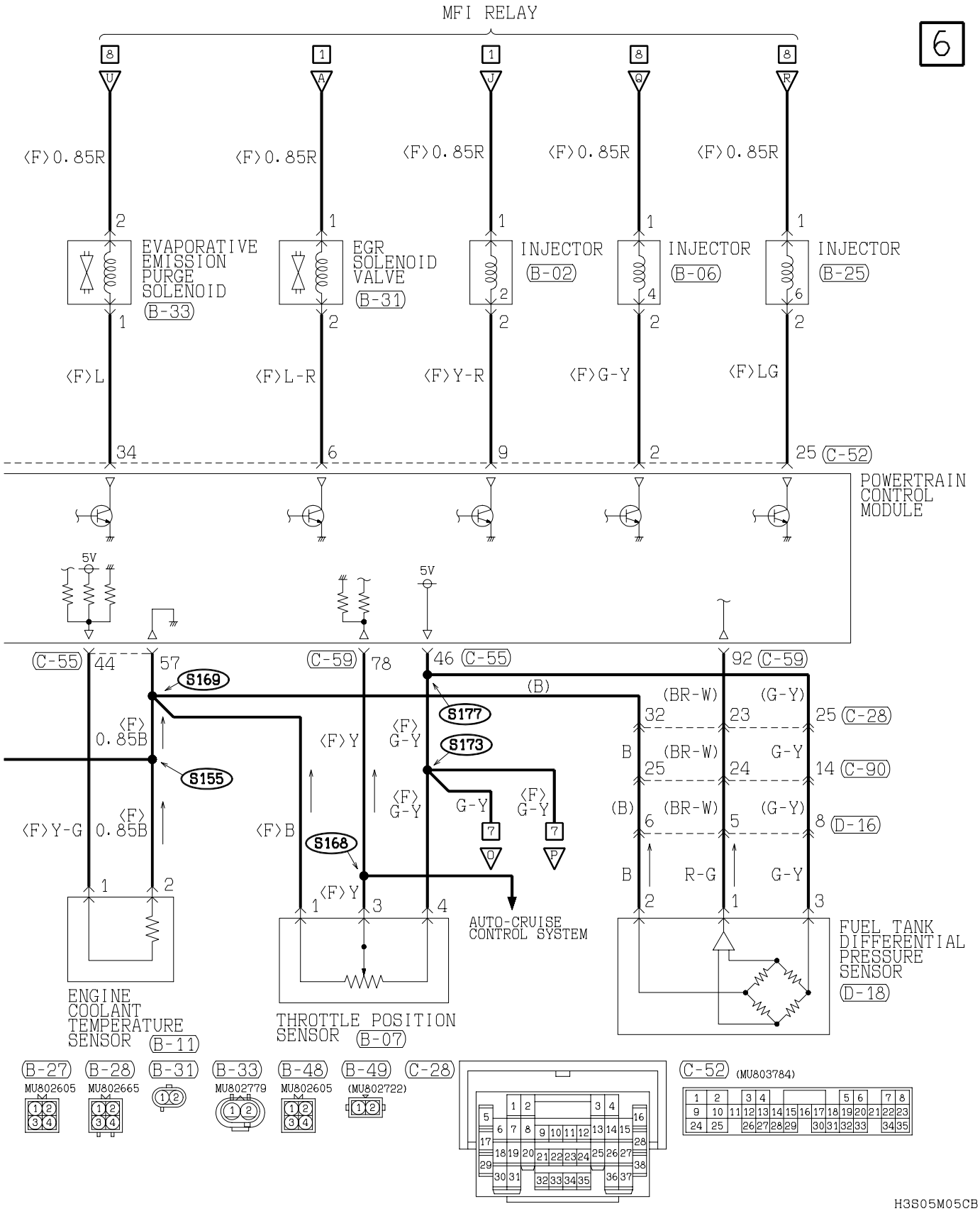
H3S05M05BB

TSB Revision

MFI SYSTEM <3.0L ENGINE-A/T (WITH VARIABLE INDUCTION CONTROL (VIC) SYSTEM)> (CONTINUED)

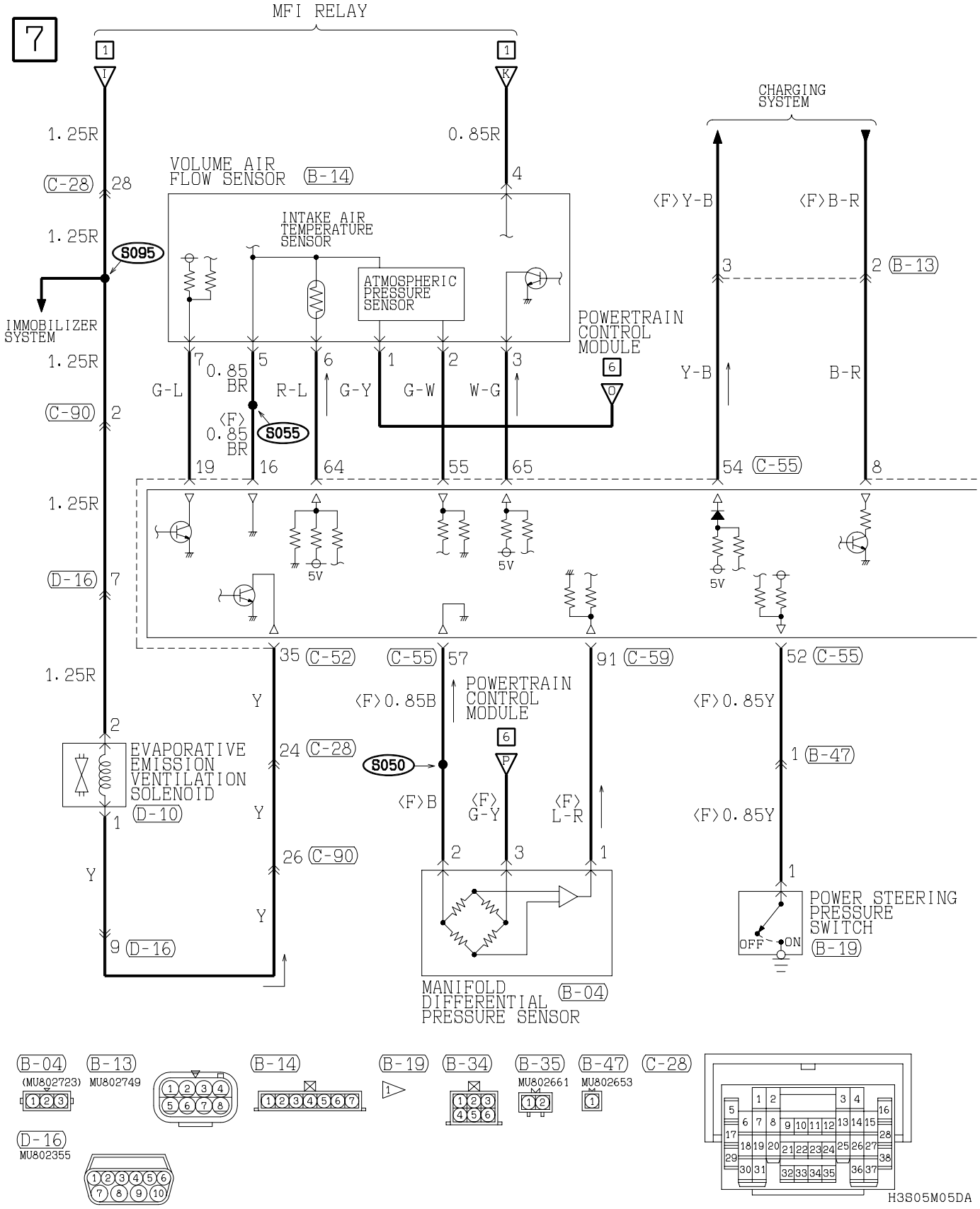


TSB Revision

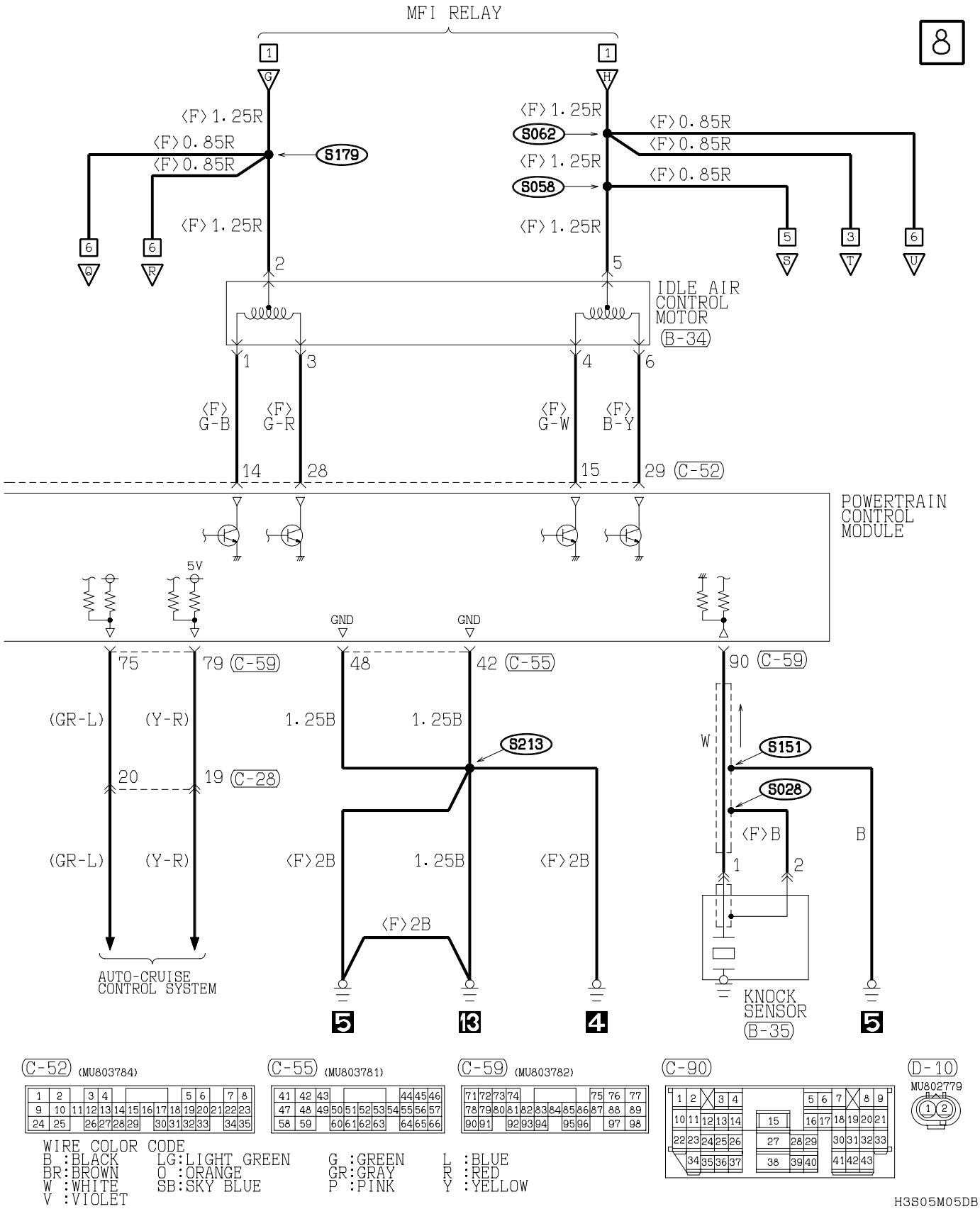


TSB Revision

MFI SYSTEM <3.0L ENGINE-A/T (WITH VARIABLE INDUCTION CONTROL (VIC) SYSTEM)> (CONTINUED)

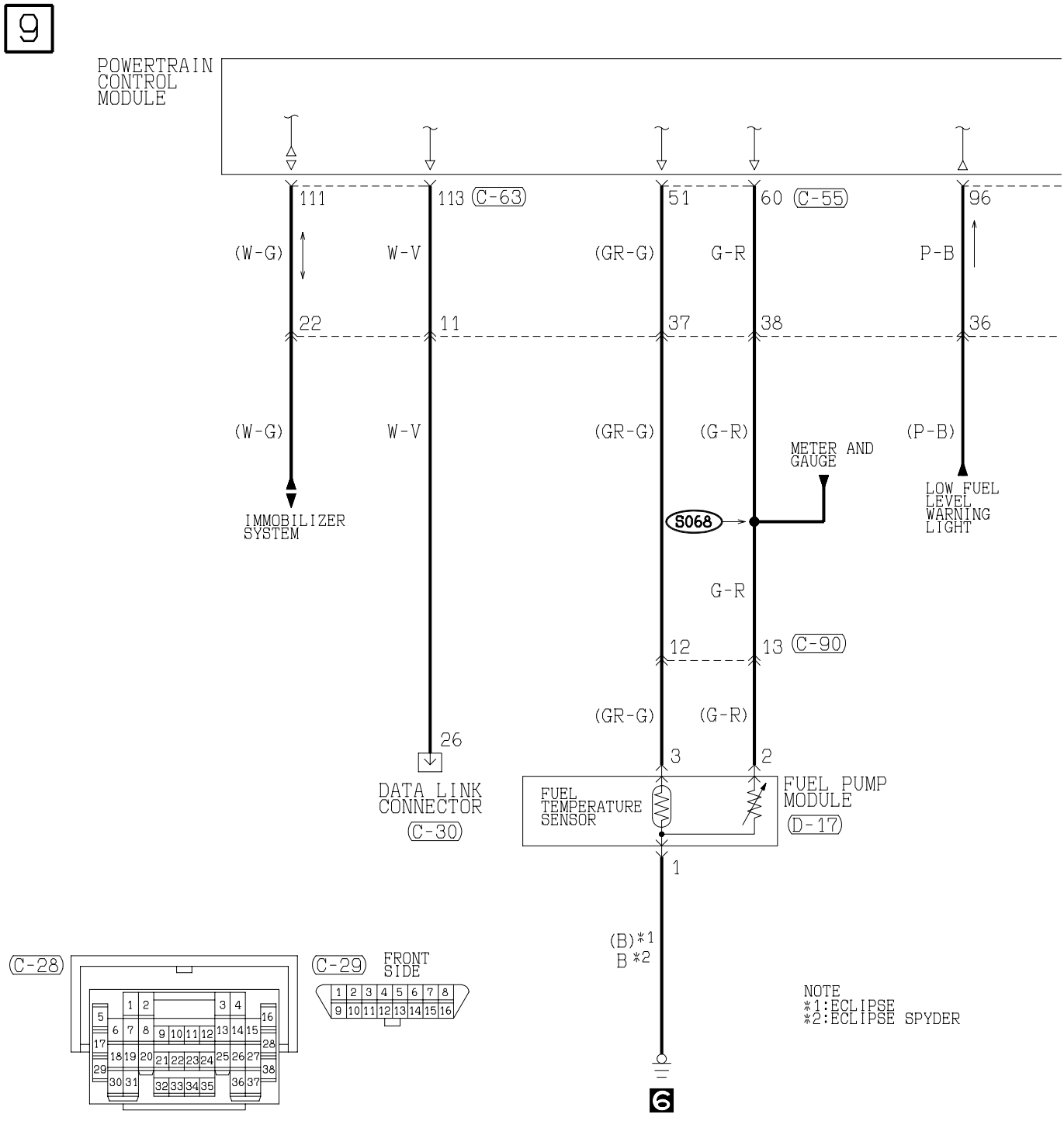


TSB Revision



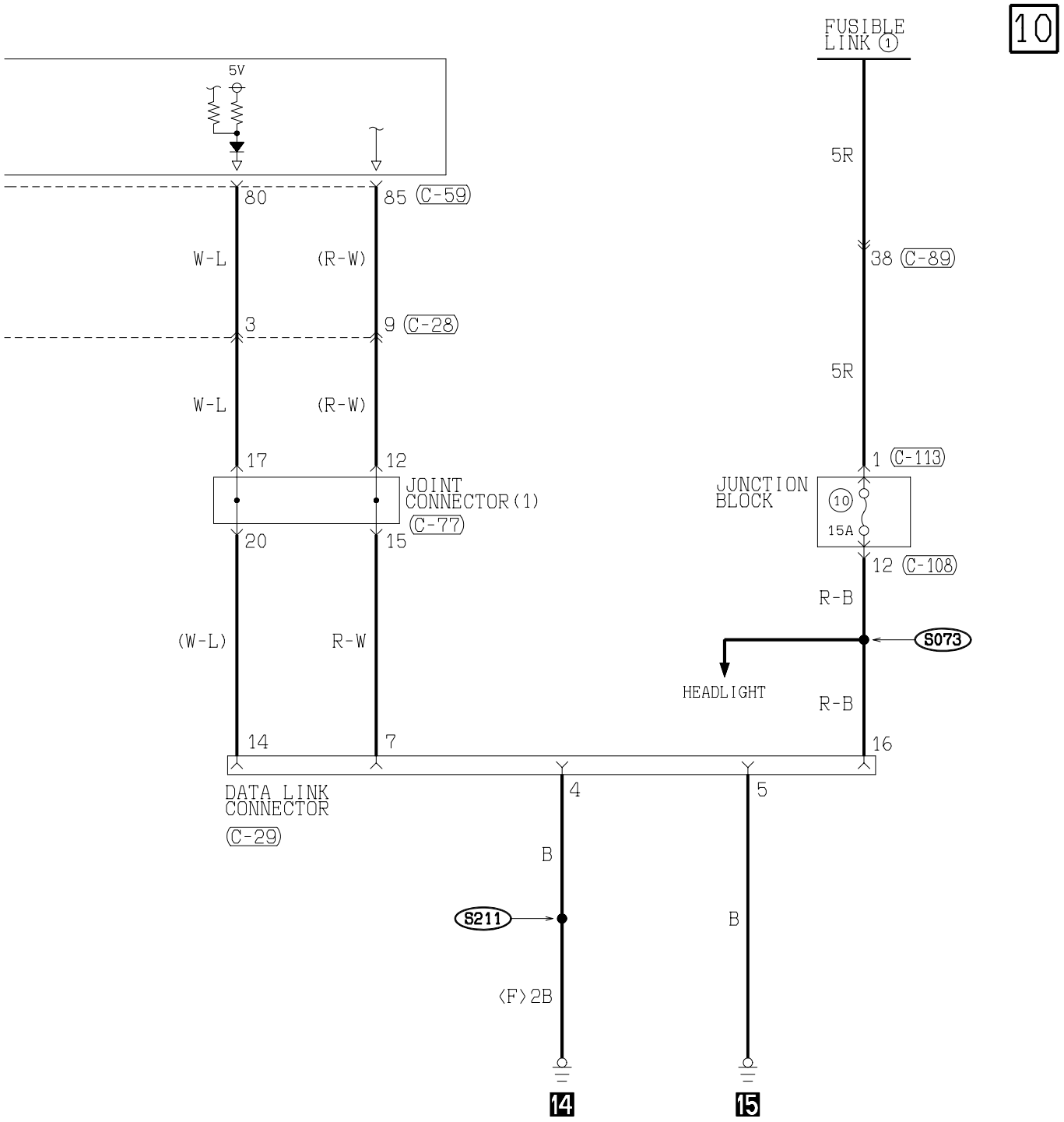
TSB Revision

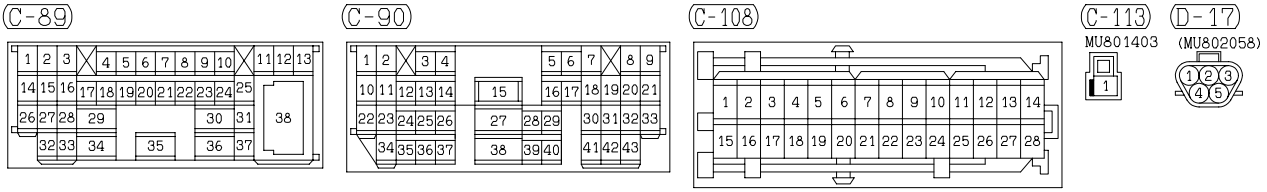
MFI SYSTEM <3.0L ENGINE-A/T (WITH VARIABLE INDUCTION CONTROL (VIC) SYSTEM)> (CONTINUED)



H3S05M05EA

TSB Revision



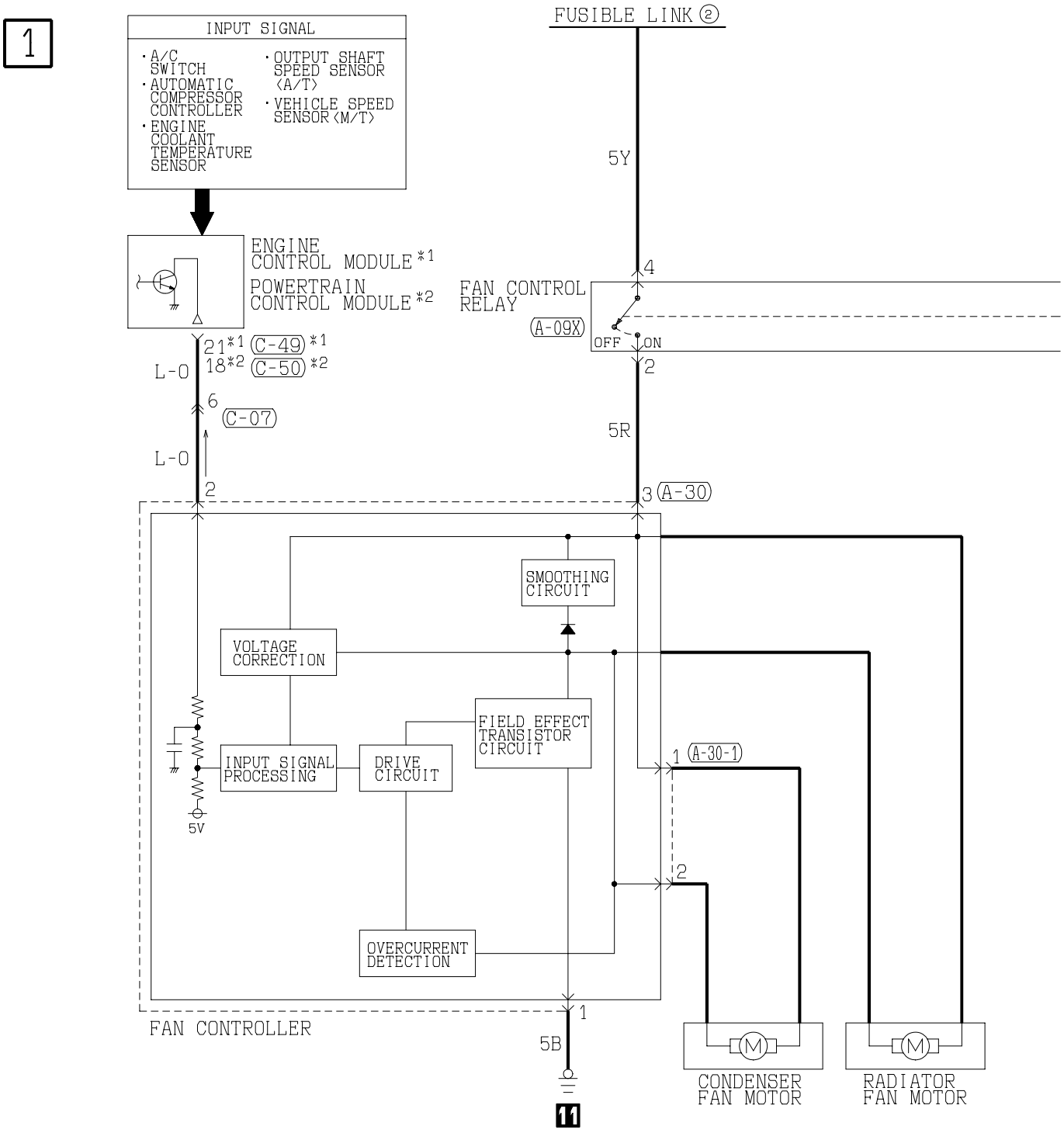


H3S05M05EB

TSB Revision

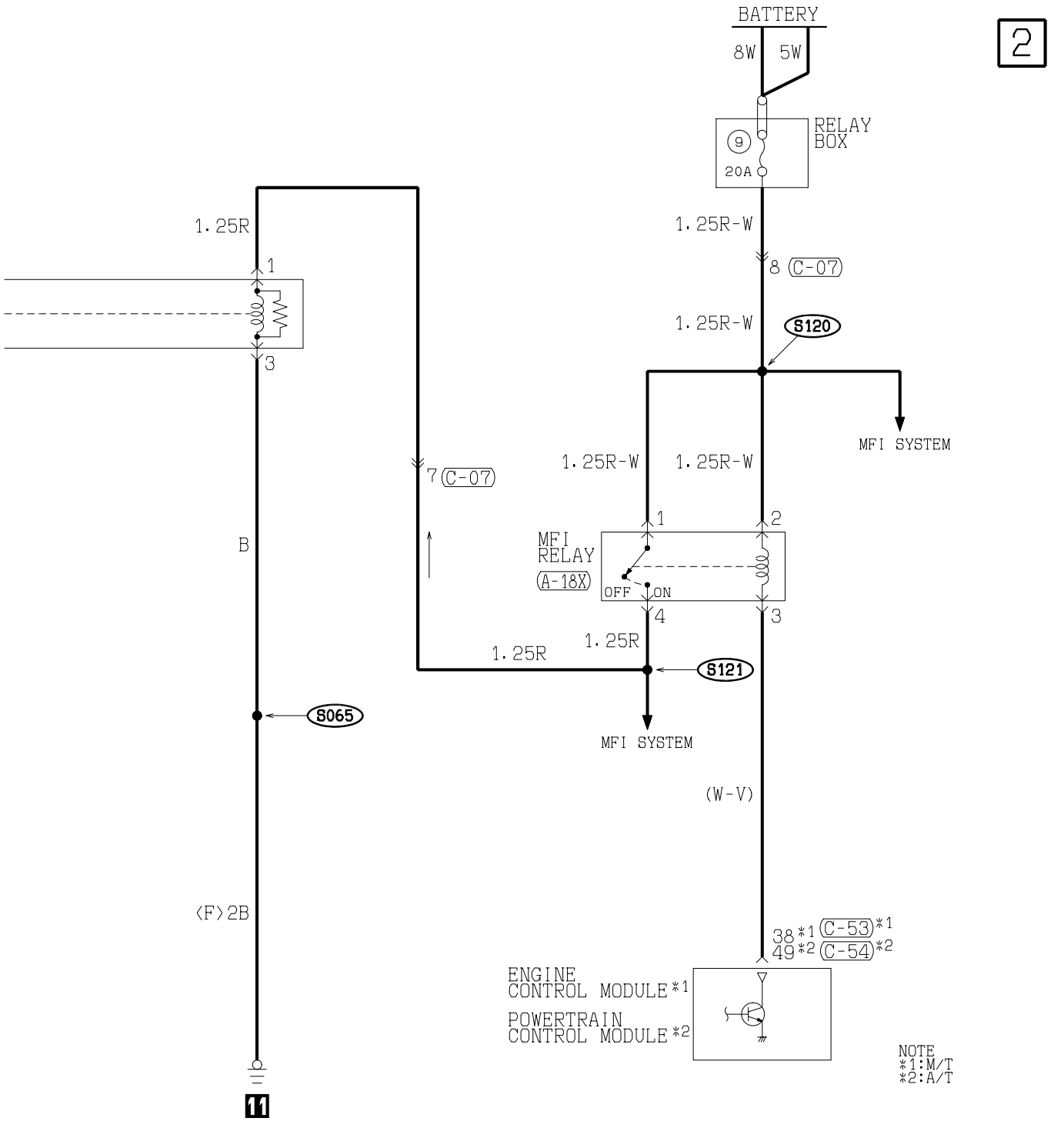
COOLING SYSTEM <2.4L ENGINE>

M1901001000272



H3S06M00AA

TSB Revision



C-53 (MU803771)

31	32	33	34	35	36	37	38	
39	40	41	42	43	44	45	46	

C-54 (MU803781)

41	42	43						44	45	46			
47	48	49	50	51	52	53	54	55	56	57			
58	59		60	61	62	63		64	65	66			

WIRE COLOR CODE

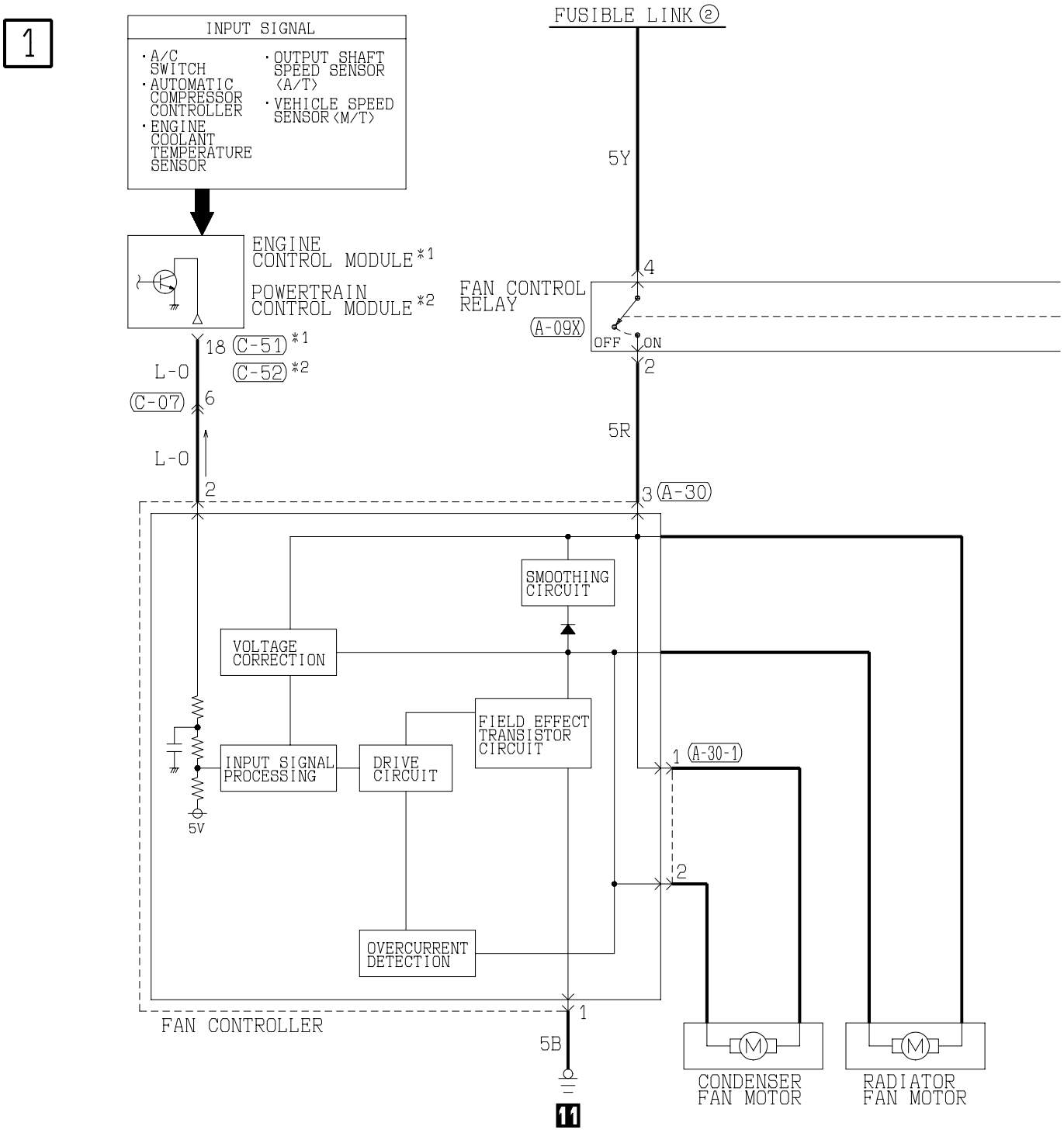
B :BLACK	BR:BROWN	G :GREEN	GR:GRAY	L :BLUE	LG:LIGHT GREEN	O :ORANGE
P :PINK	R :RED	SB:SKY BLUE	V :VIOLET	W :WHITE	Y :YELLOW	

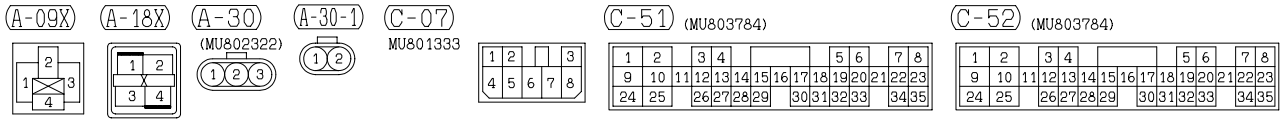
H3S06M00AB

TSB Revision

COOLING SYSTEM <3.0L ENGINE>

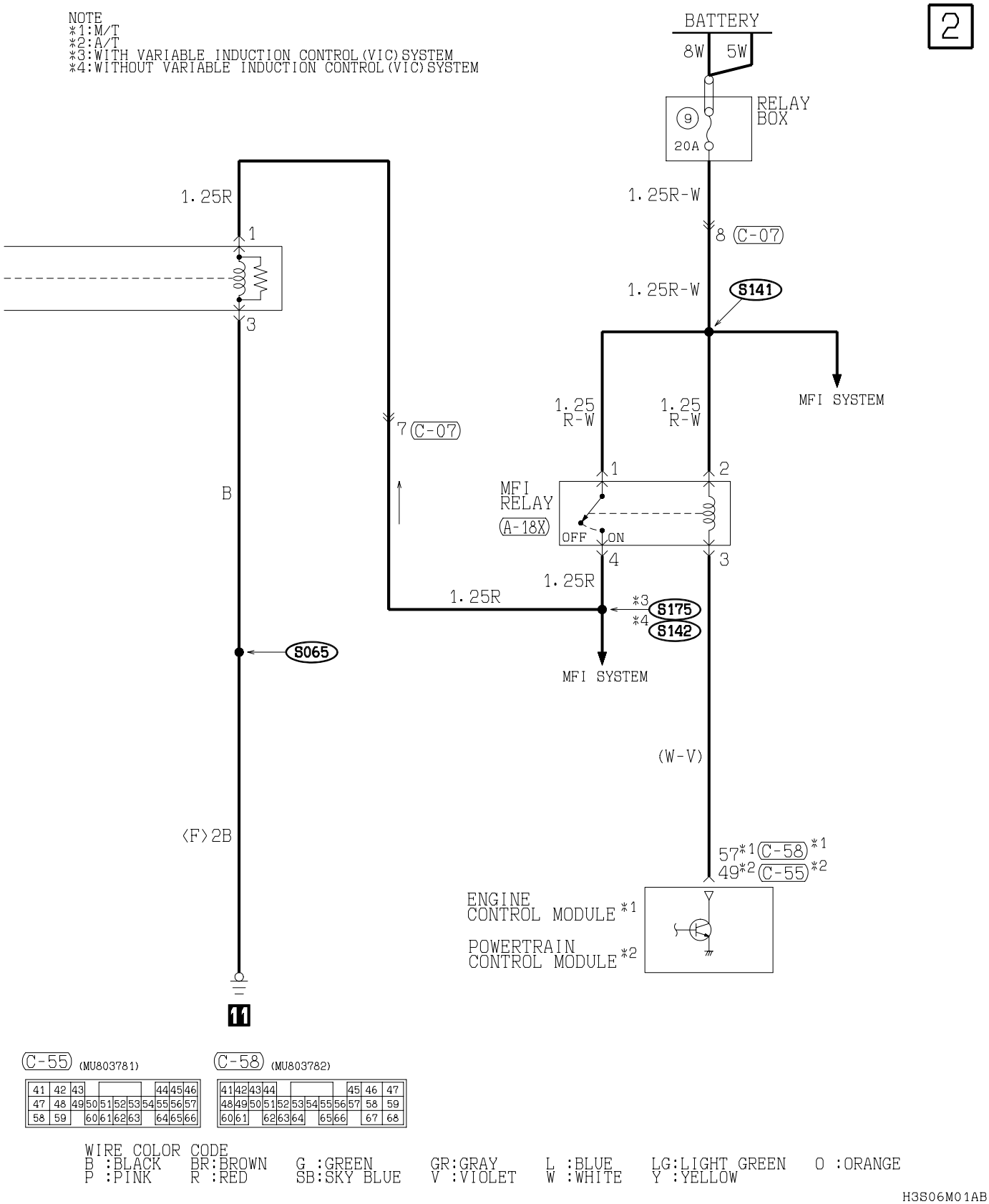
M1901001000283





H3S06M01AA

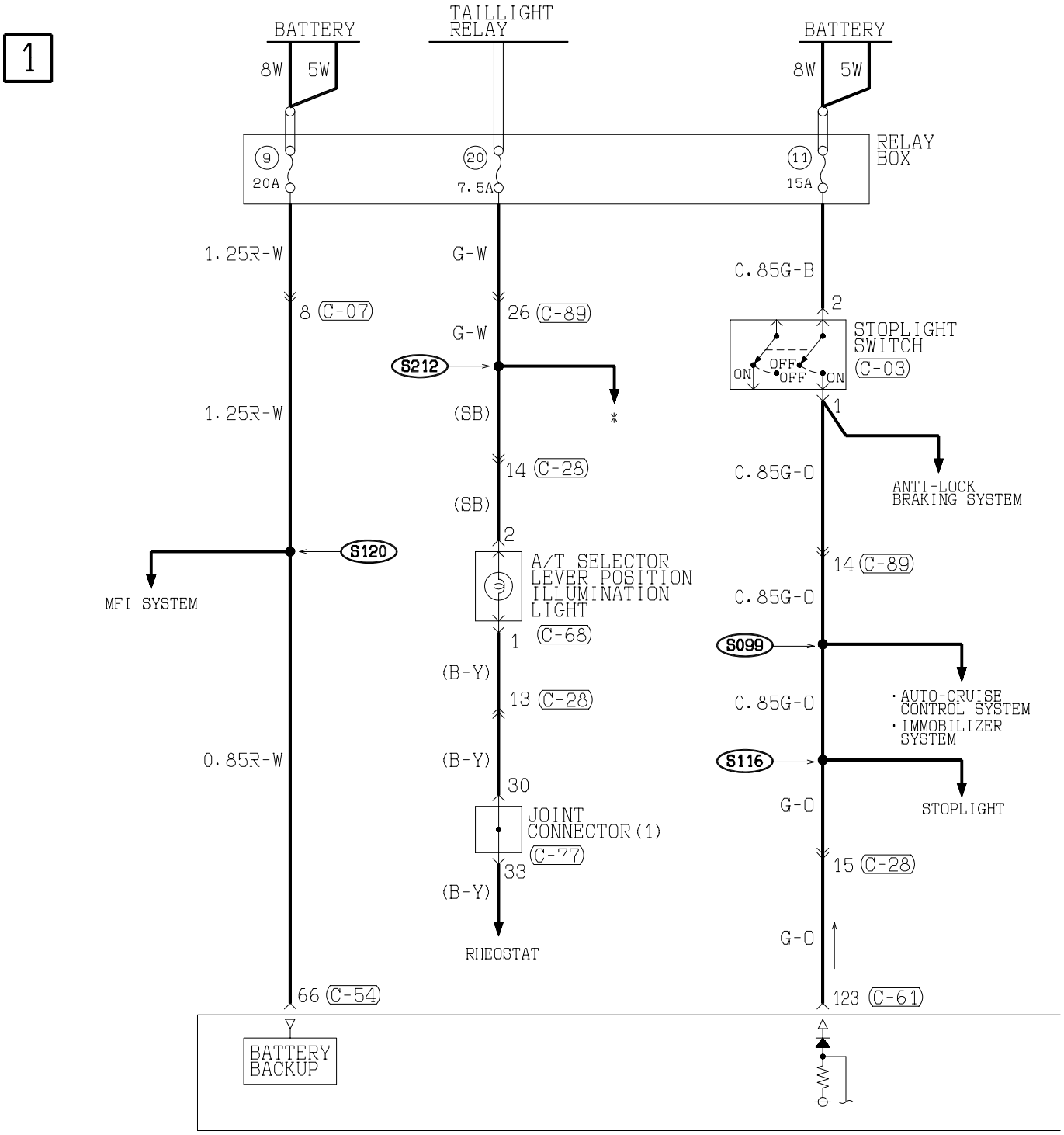
TSB Revision

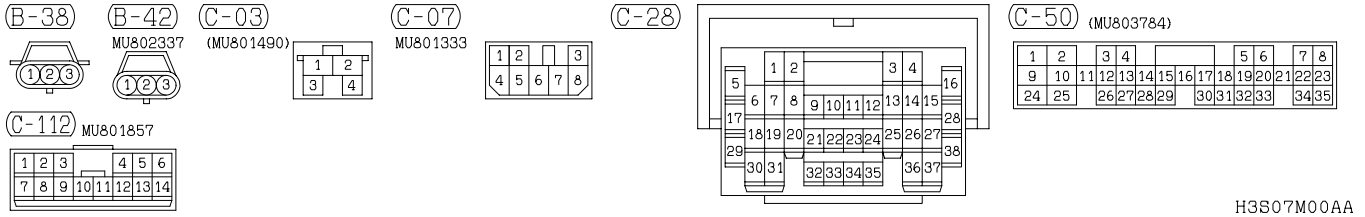


TSB Revision

INVECS-II 4A/T <VEHICLES WITHOUT SPORT MODE TYPE>

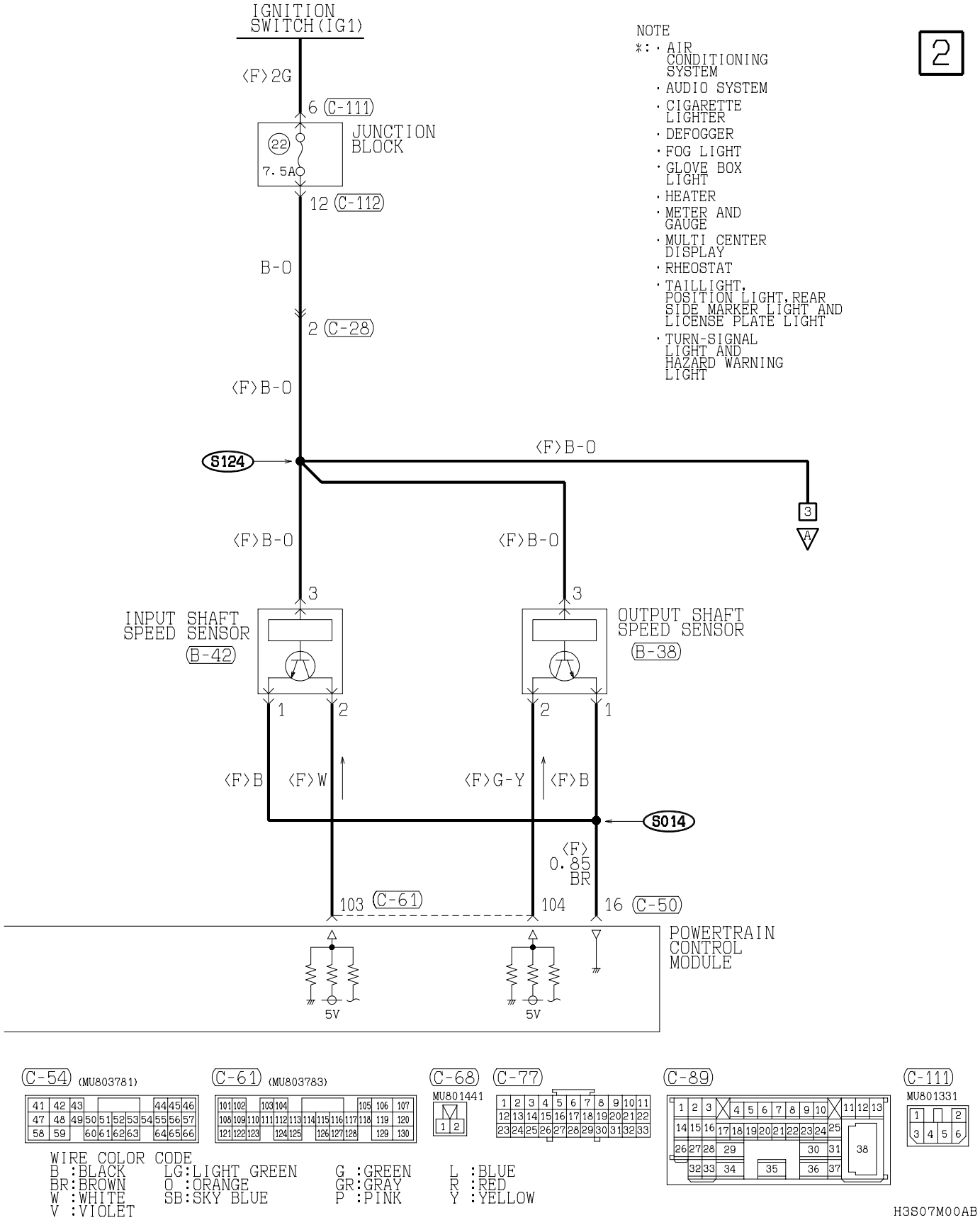
M1901016200465





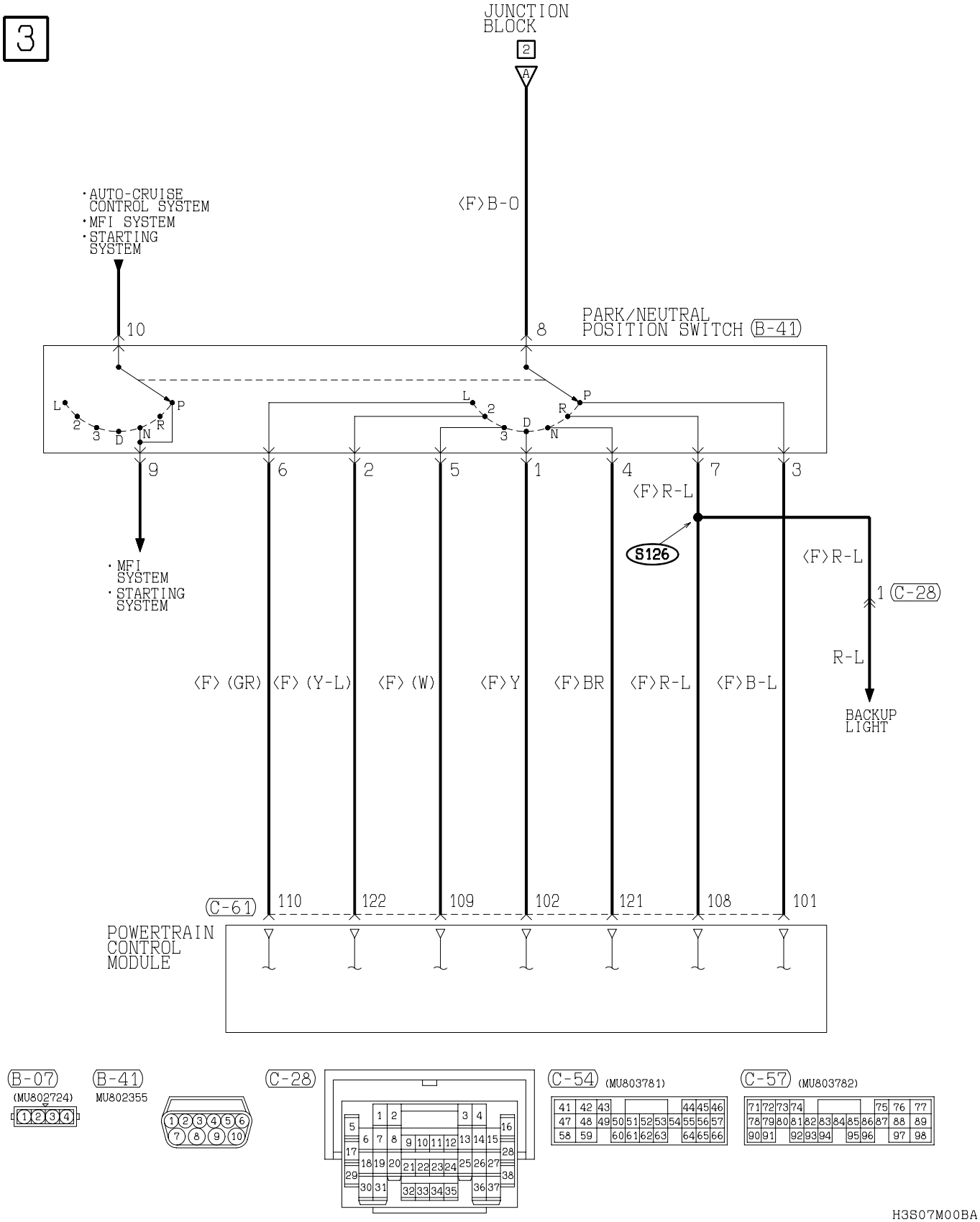
H3S07M00AA

TSB Revision

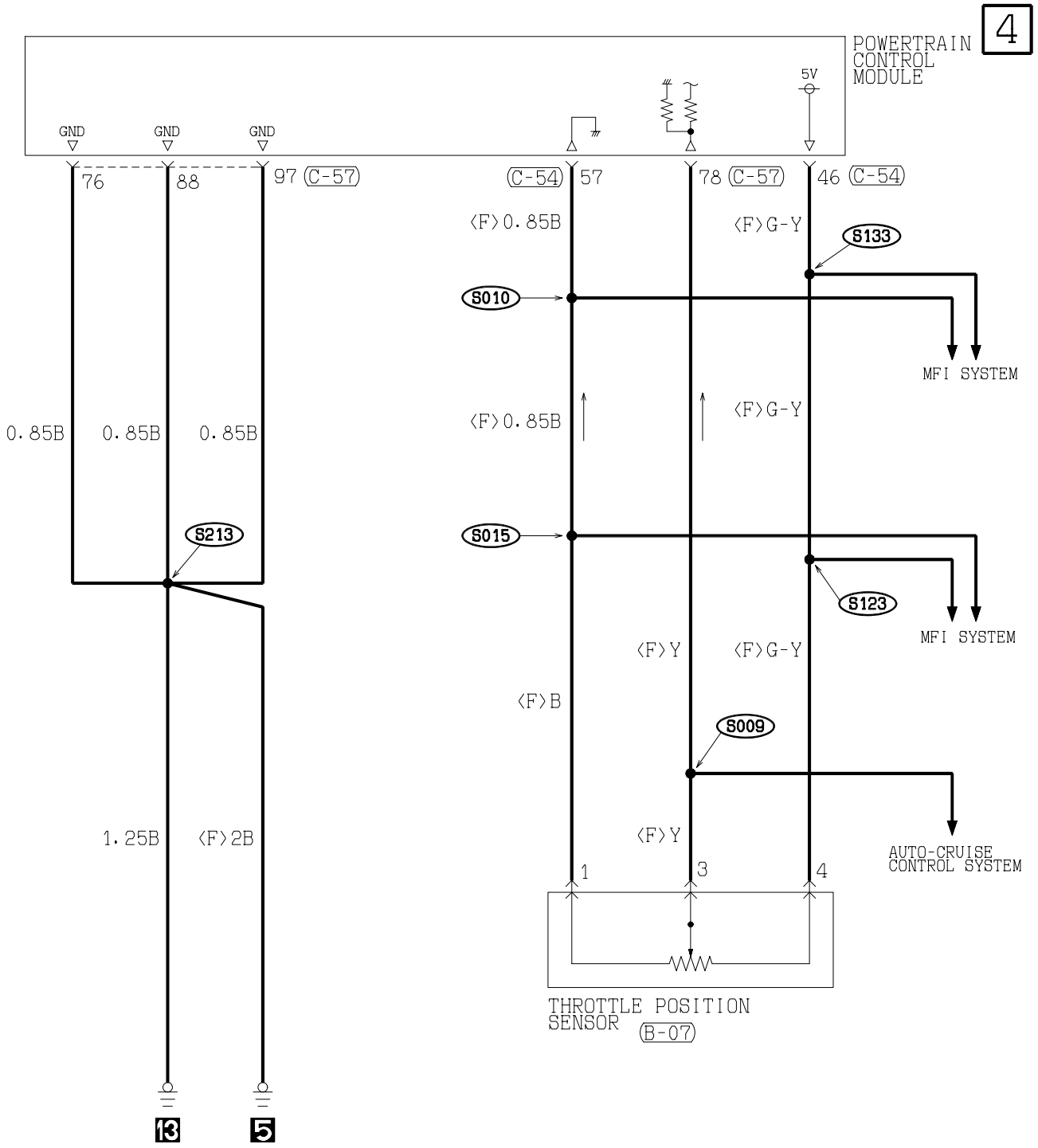


TSB Revision

INVECS-II 4A/T <VEHICLES WITHOUT SPORT MODE TYPE> (CONTINUED)



TSB Revision



C-61 (MU803783)

101	102		103	104					105	106	107		
108	109	110	111	112	113	114	115	116	117	118	119	120	
121	122	123		124	125		126	127	128		129	130	

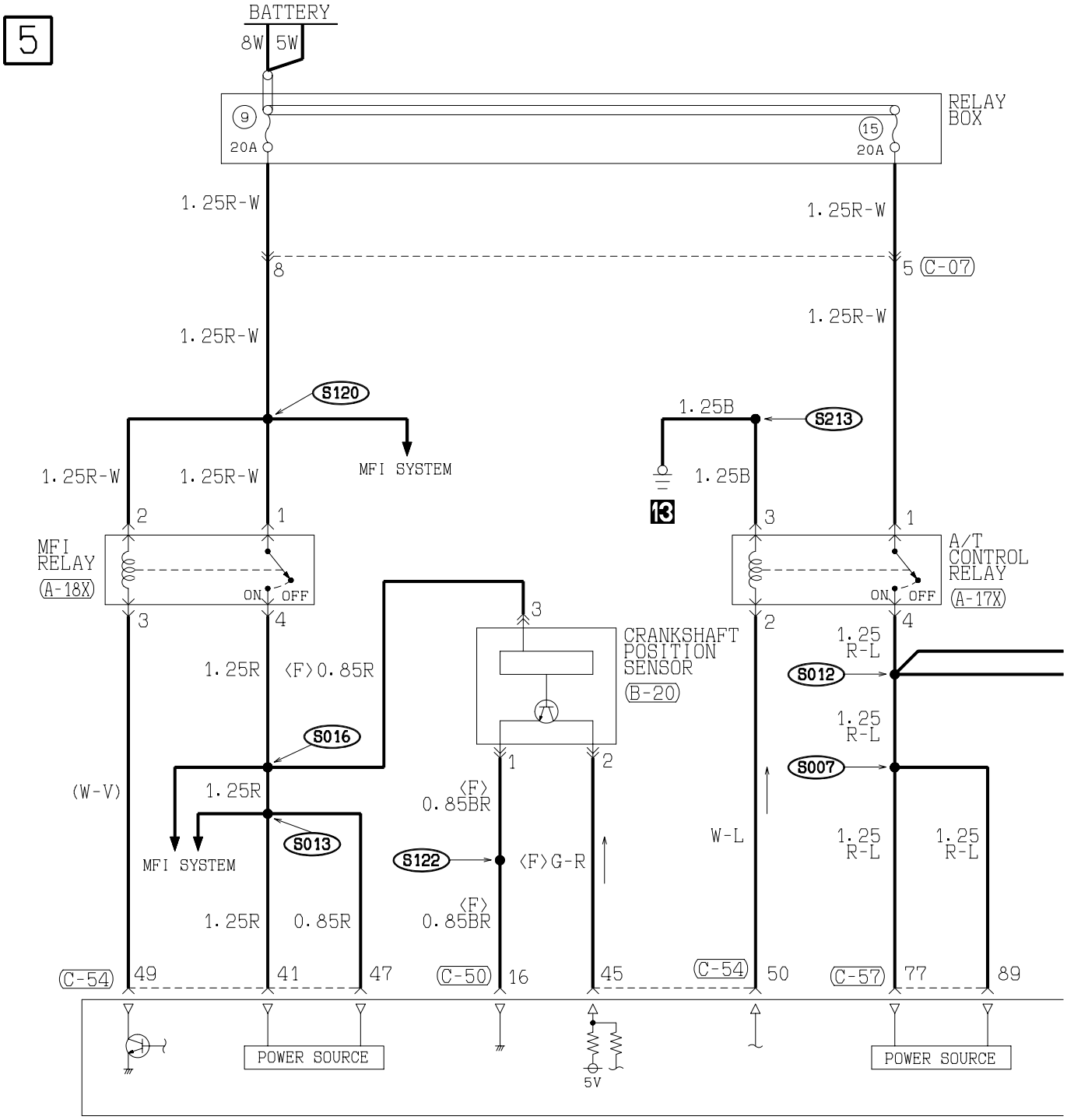
WIRE COLOR CODE

B :BLACK	BR:BROWN	G :GREEN	GR:GRAY	L :BLUE	LG:LIGHT GREEN	O :ORANGE
P :PINK	R :RED	SB:SKY BLUE	V :VIOLET	W :WHITE	Y :YELLOW	

H3S07M00BB

TSB Revision

INVECS-II 4A/T <VEHICLES WITHOUT SPORT MODE TYPE> (CONTINUED)

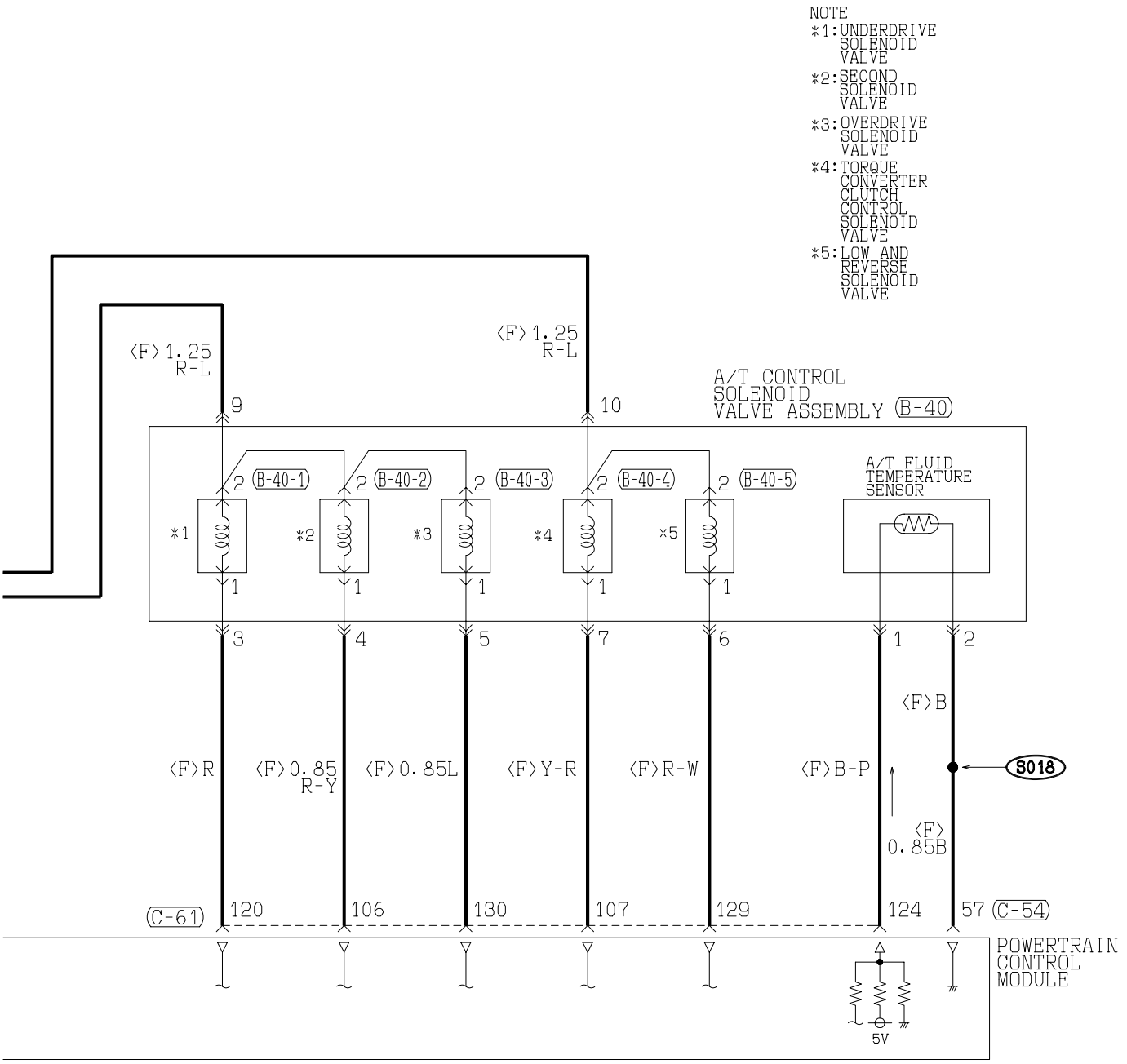


A-17X A-18X B-20 MU802603 B-40 (MU802362) B-40-1 (MU801212) B-40-2 (MU801212) B-40-3 (MU801212) B-40-4 (MU801212) B-40-5 (MU801212) C-07 MU801333

H3S07M00CA

TSB Revision

6



C-50 (MU803784)

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24	25		26	27	28	29		30	31	32	33		34	35

C-54 (MU803781)

41	42	43									44	45	46	
47	48	49	50	51	52	53	54	55	56	57				
58	59		60	61	62	63		64	65	66				

C-57 (MU803782)

71	72	73	74								75	76	77	
78	79	80	81	82	83	84	85	86	87	88	89			
90	91		92	93	94		95	96		97	98			

C-61 (MU803783)

101	102		103	104							105	106	107	
108	109	110	111	112	113	114	115	116	117	118	119	120		
121	122	123		124	125		126	127	128		129	130		

WIRE COLOR CODE

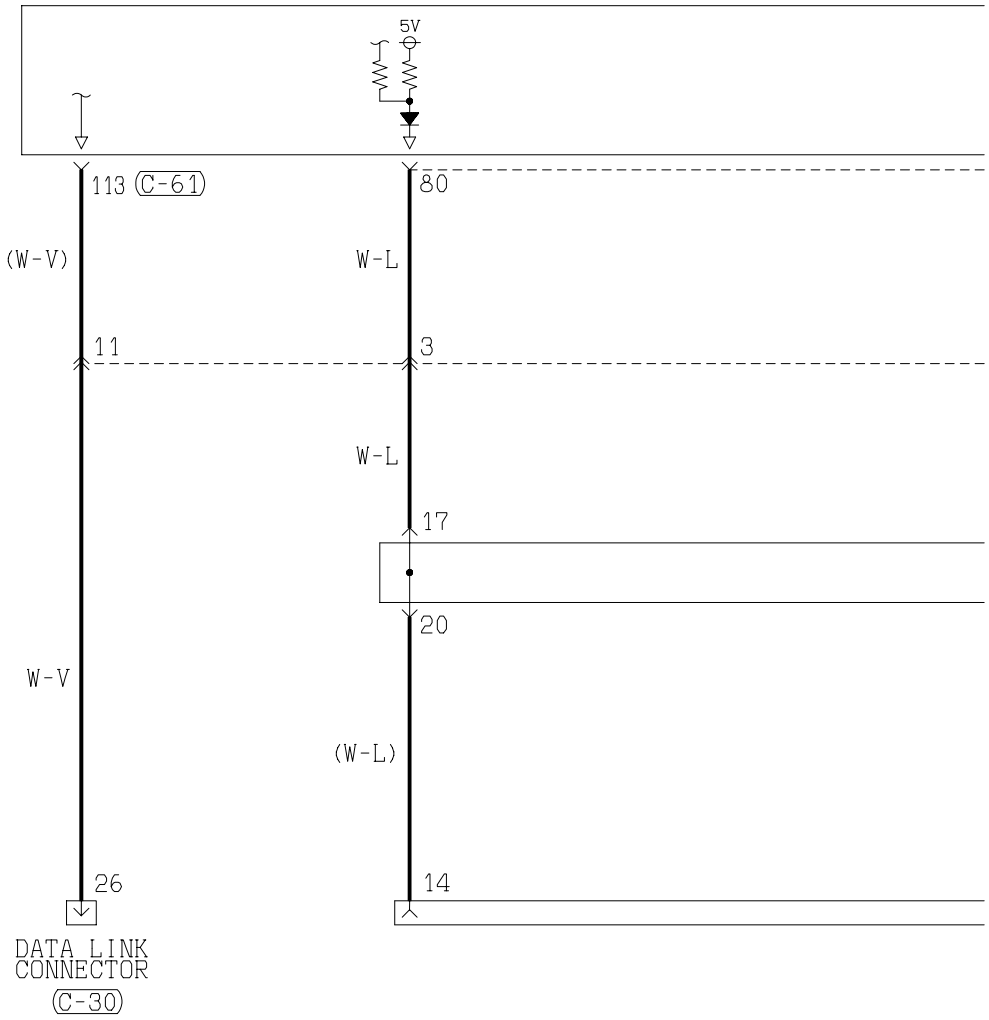
B :BLACK	BR:BROWN	G :GREEN	GR:GRAY	L :BLUE	LG:LIGHT GREEN	O :ORANGE	
P :PINK	R :RED	SB:SKY BLUE	V :VIOLET	W :WHITE	Y :YELLOW		

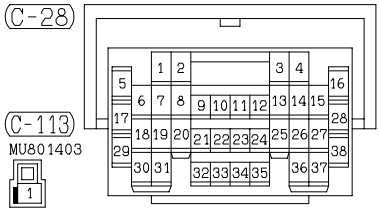
H3S07M00CB

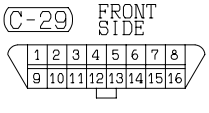
TSB Revision

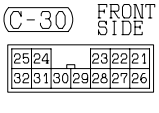
INVECS-II 4A/T <VEHICLES WITHOUT SPORT MODE TYPE> (CONTINUED)

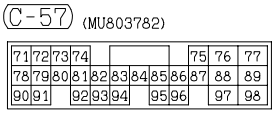
7









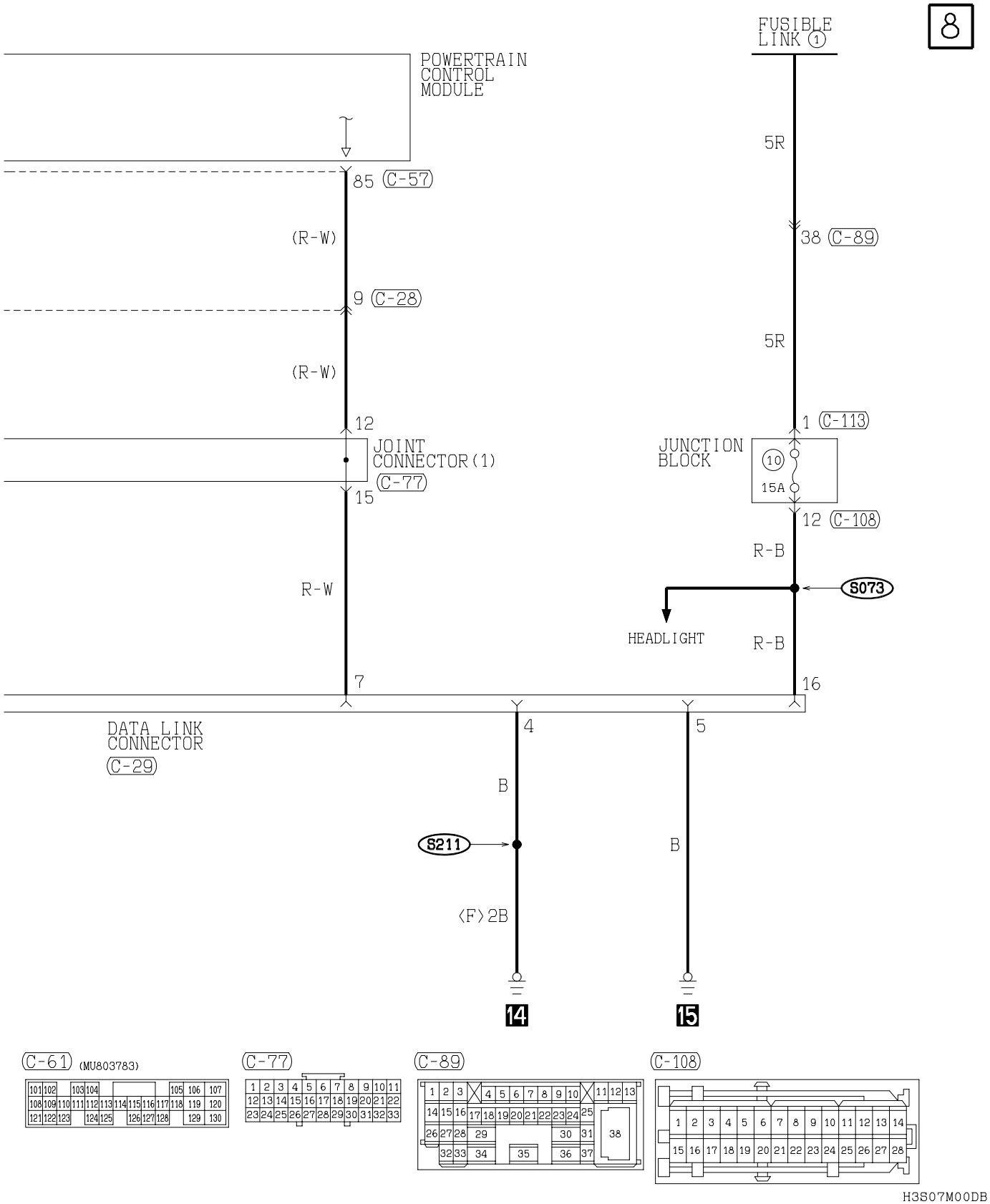


WIRE COLOR CODE

B :BLACK	LG:LIGHT GREEN	G :GREEN	L :BLUE
BR:BROWN	O :ORANGE	GR:GRAY	R :RED
W :WHITE	SB:SKY BLUE	P :PINK	Y :YELLOW
V :VIOLET			

H3S07M00DA

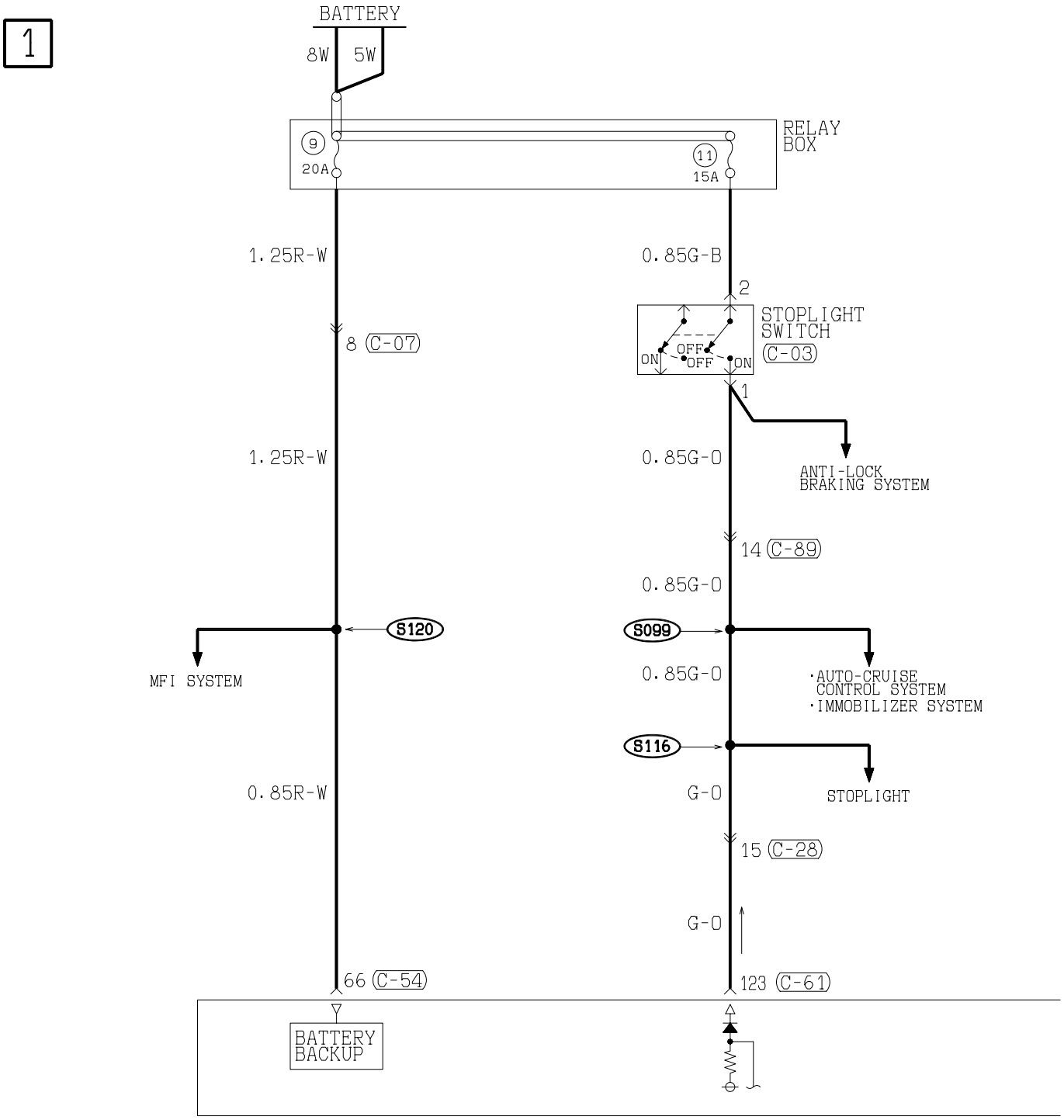
TSB Revision

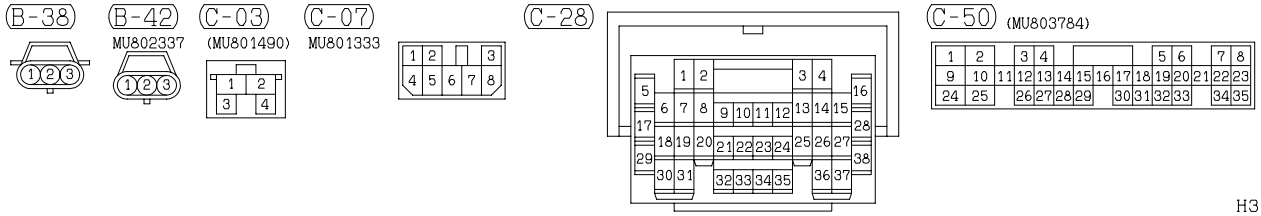


TSB Revision

INVECS-II 4A/T <VEHICLES WITH SPORT MODE TYPE (2.4L ENGINE)>

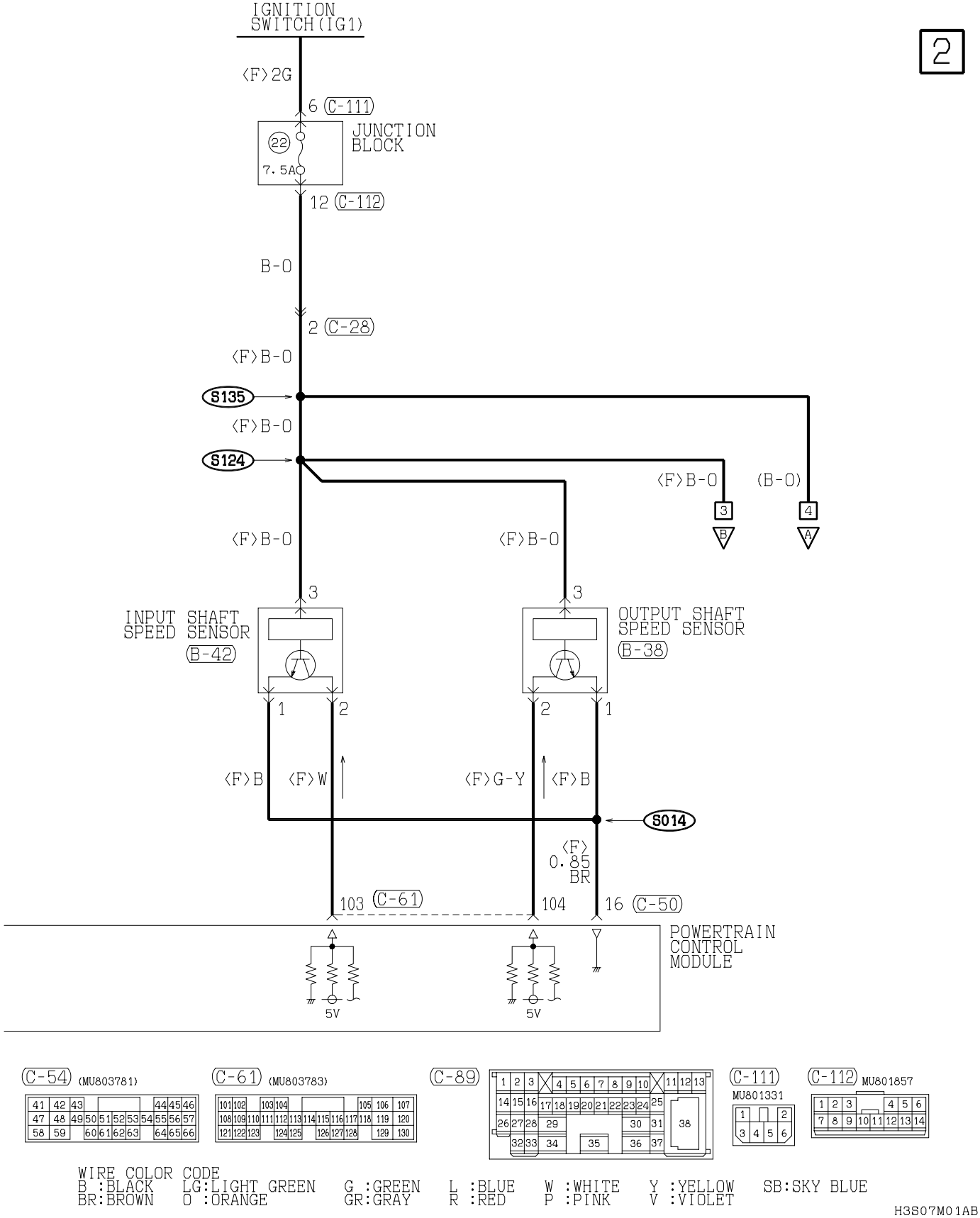
M1901016200476





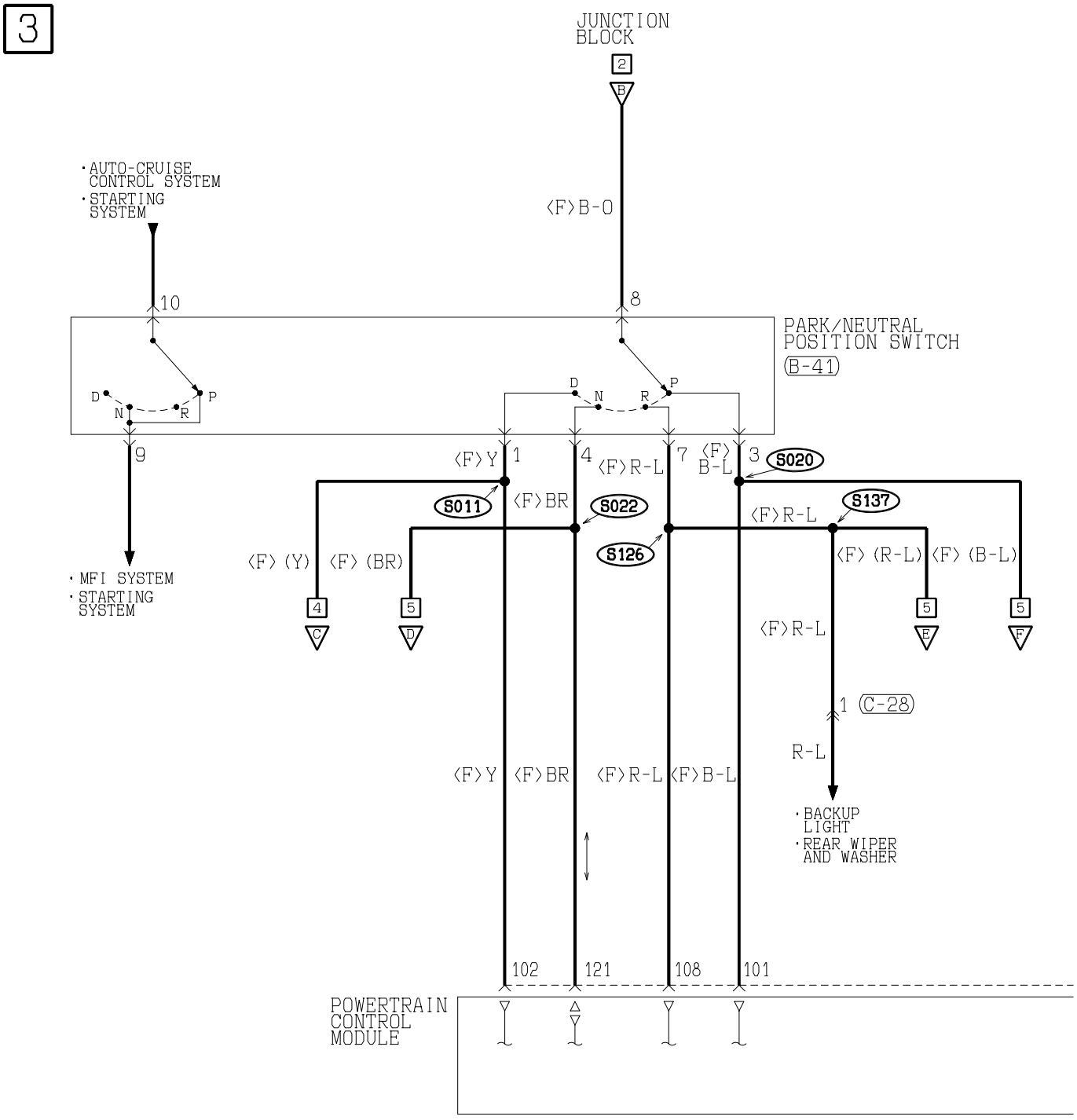
H3S07M01AA

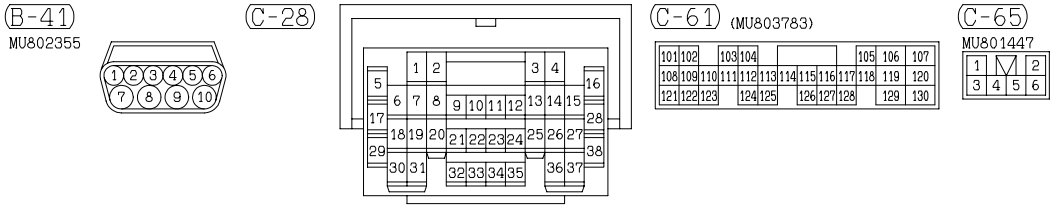
TSB Revision



TSB Revision

INVECS-II 4A/T <VEHICLES WITH SPORT MODE TYPE (2.4L ENGINE)> (CONTINUED)





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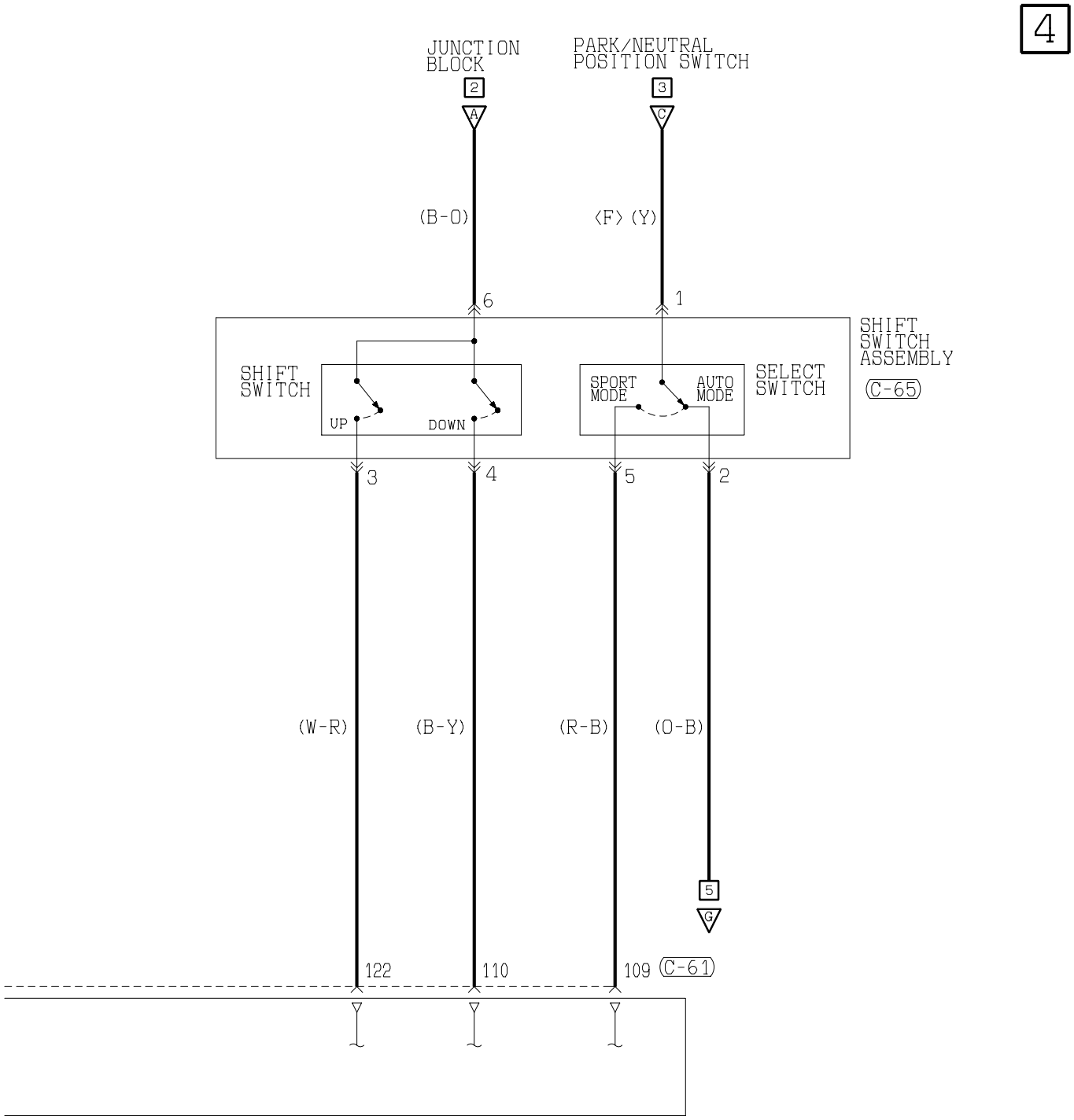
TSB Revision



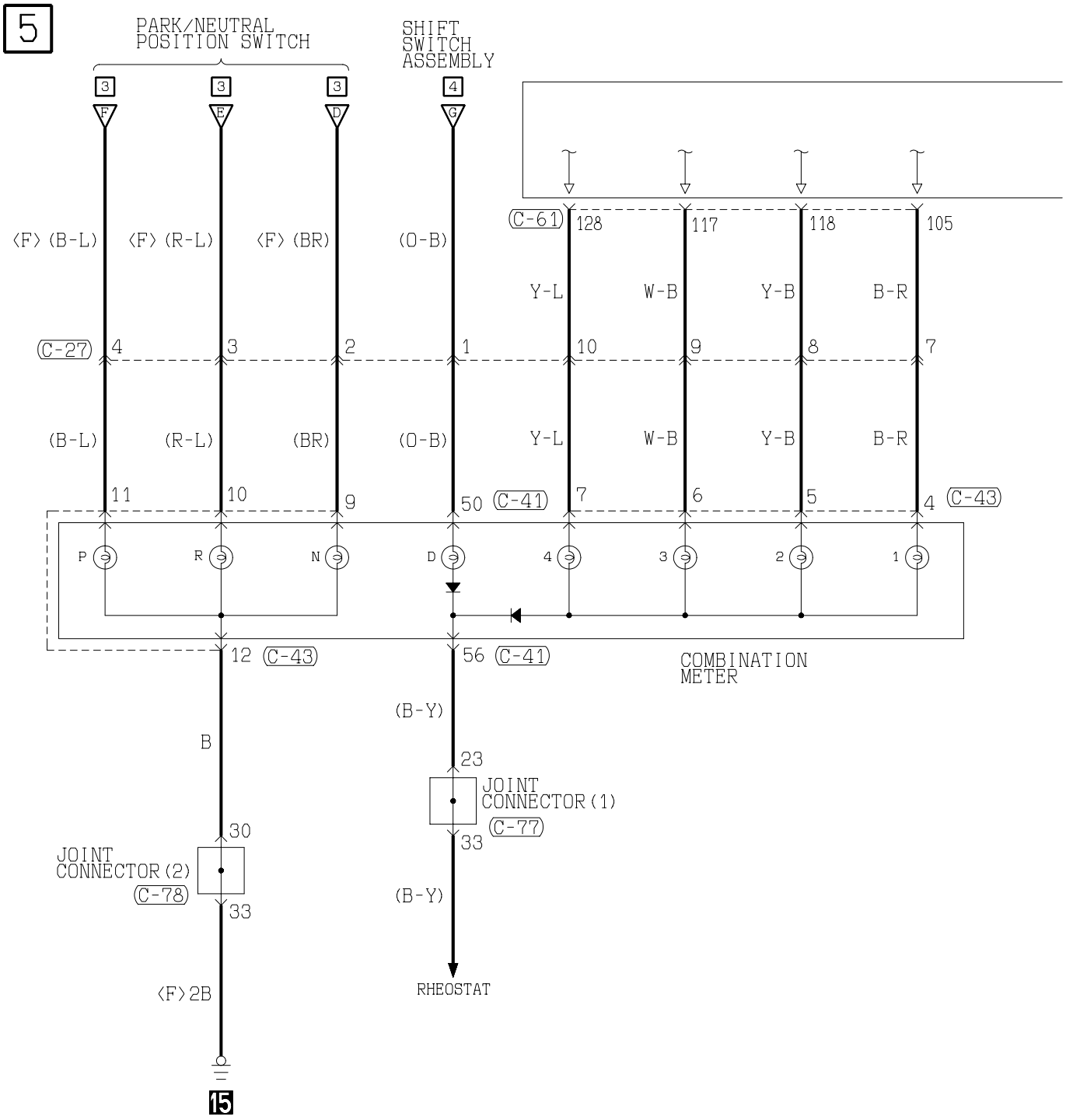
WIRE COLOR CODE

B :BLACK	BR:BROWN	G :GREEN	GR:GRAY	L :BLUE	LG:LIGHT GREEN	O :ORANGE
P :PINK	R :RED	SB:SKY BLUE	V :VIOLET	W :WHITE	Y :YELLOW	

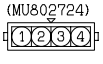
H3S07M01BB

TSB Revision

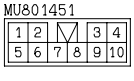
INVECS-II 4A/T <VEHICLES WITH SPORT MODE TYPE (2.4L ENGINE)> (CONTINUED)



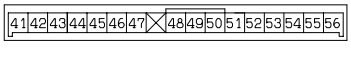
B-07 (MU802724)



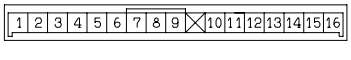
C-27 MU801451



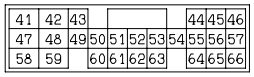
C-41



C-43



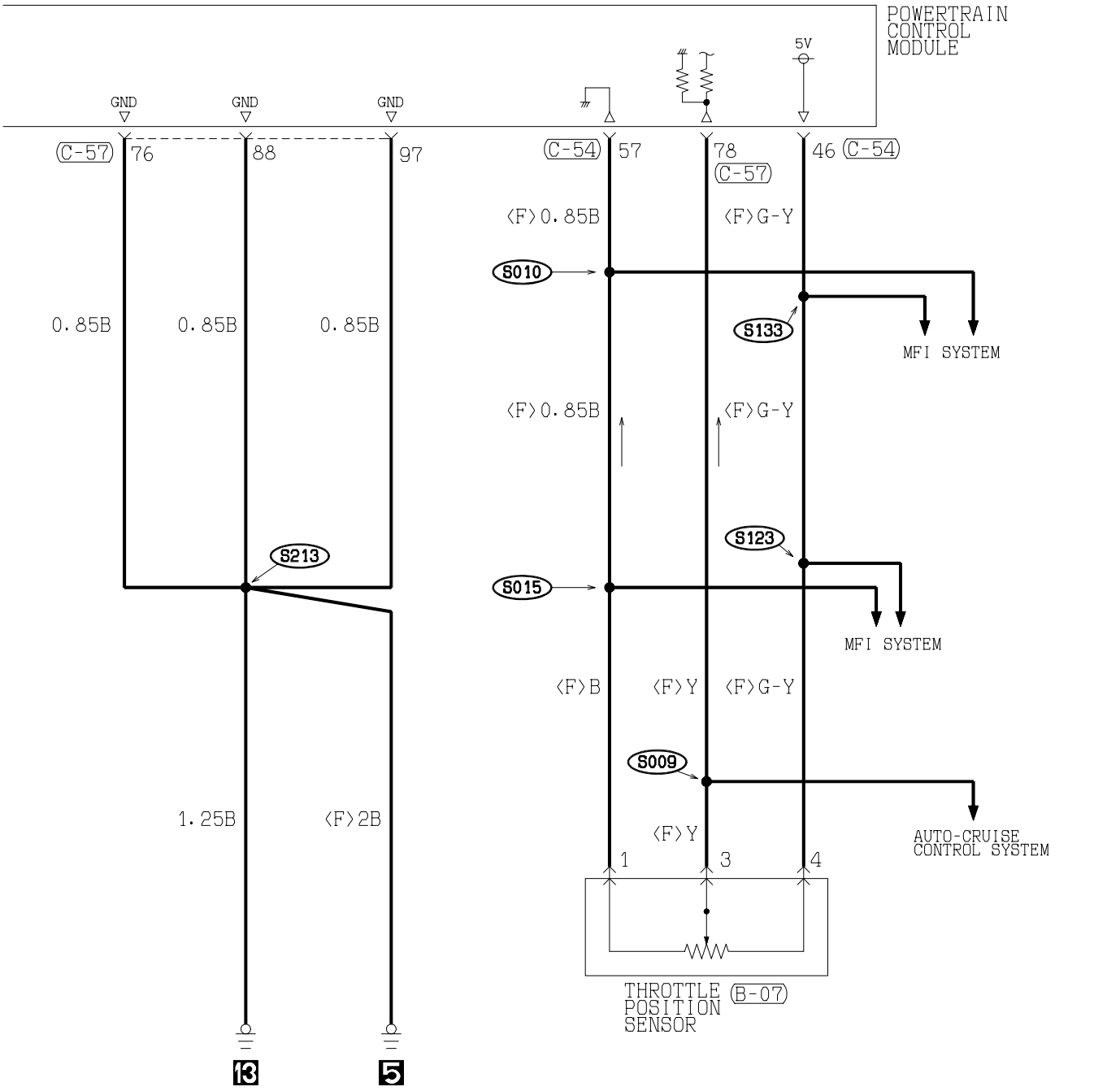
C-54 (MU803781)

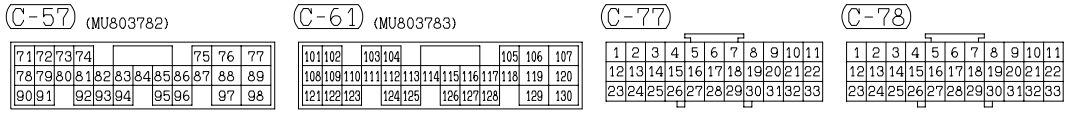


H3S07M01CA

TSB Revision

6





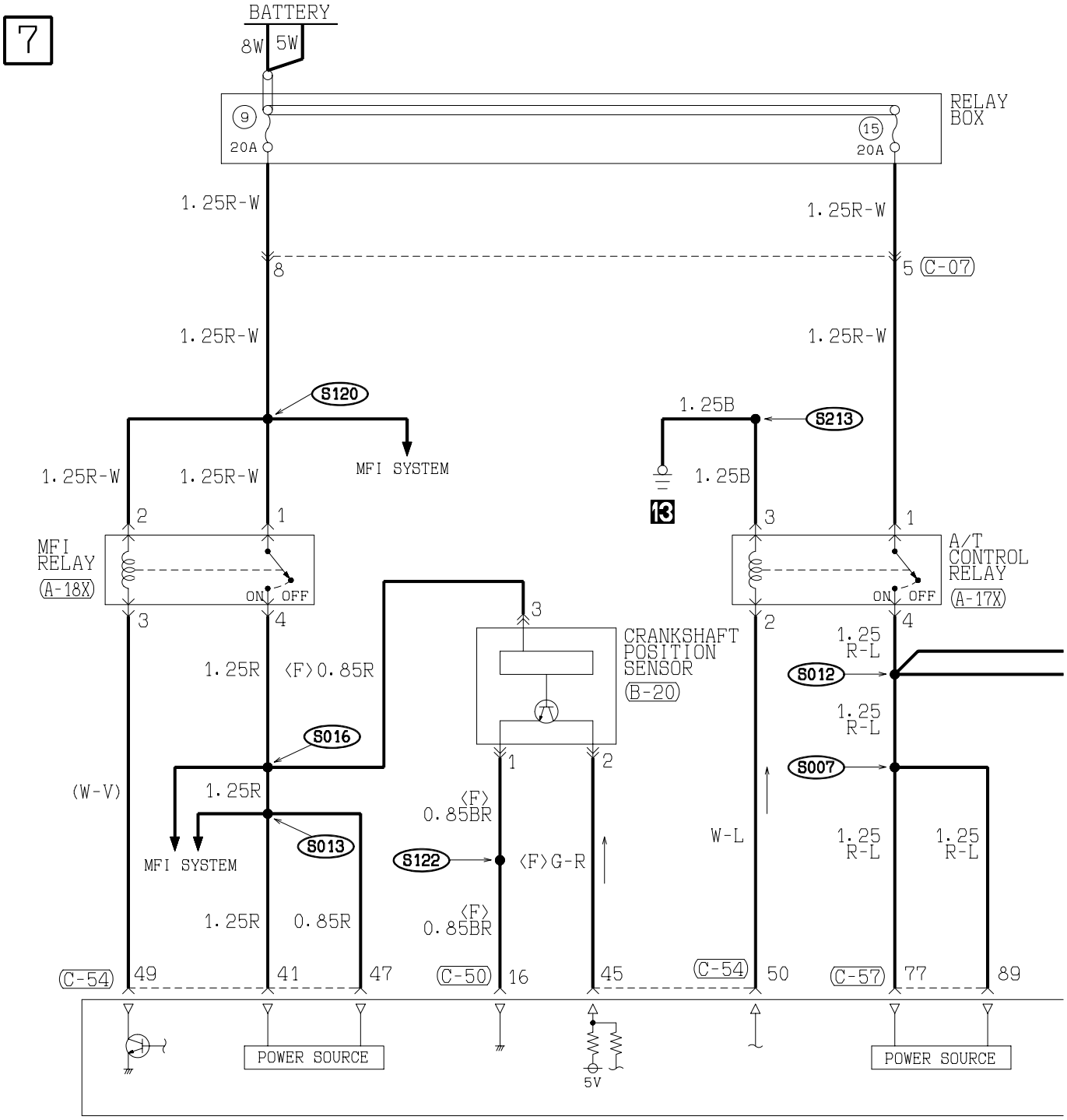
WIRE COLOR CODE

B :BLACK	BR:BROWN	G :GREEN	GR:GRAY	L :BLUE	LG:LIGHT GREEN	O :ORANGE	
P :PINK	R :RED	SB:SKY BLUE	V :VIOLET	W :WHITE	Y :YELLOW		

H3S07M01CB

TSB Revision

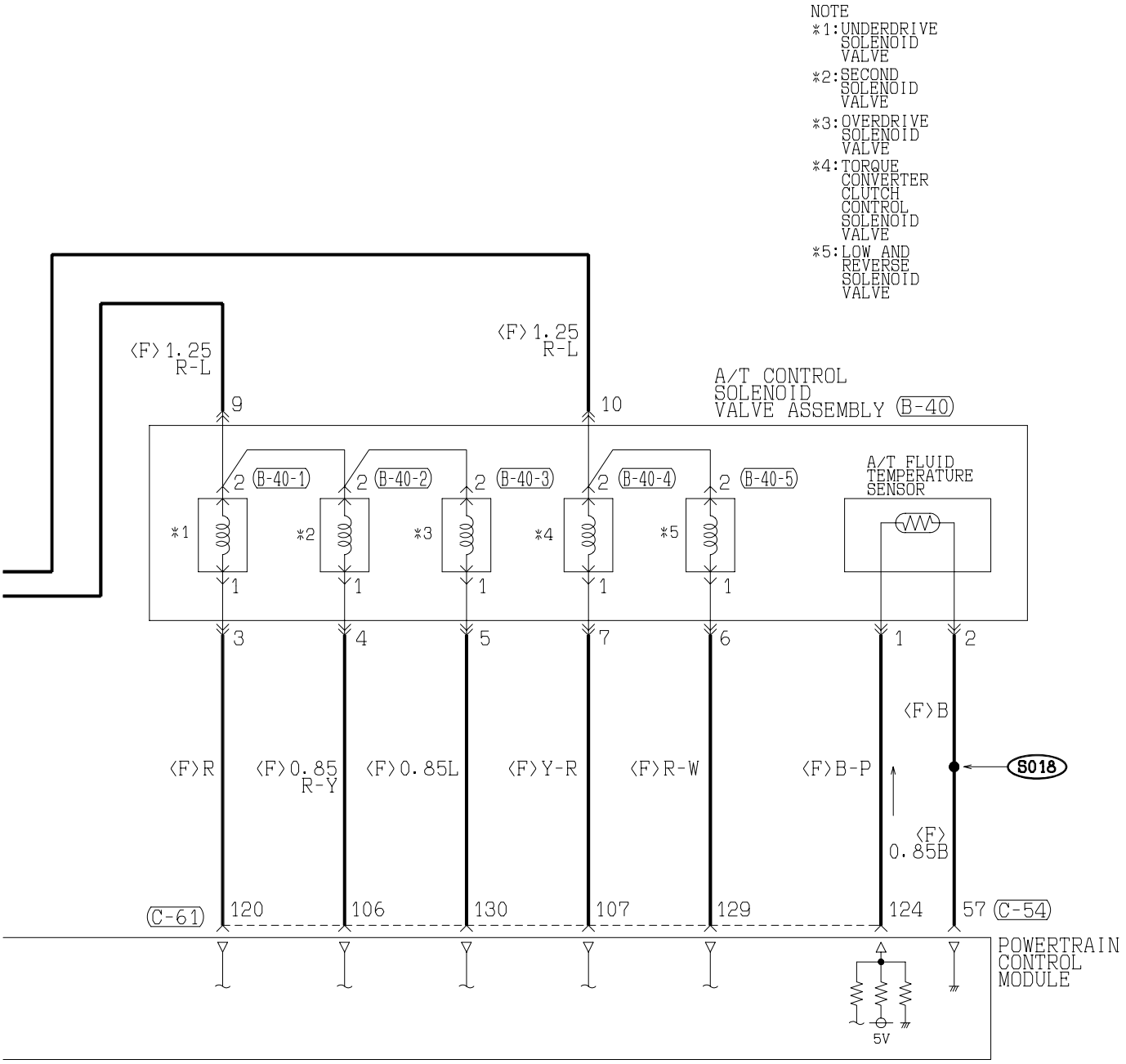
INVECS-II 4A/T <VEHICLES WITH SPORT MODE TYPE (2.4L ENGINE)> (CONTINUED)



H3S07M01DA

TSB Revision

8



C-50 (MU803784)

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24	25		26	27	28	29		30	31	32	33		34	35

C-54 (MU803781)

41	42	43									44	45	46	
47	48	49	50	51	52	53	54	55	56	57				
58	59		60	61	62	63		64	65	66				

C-57 (MU803782)

71	72	73	74								75	76	77	
78	79	80	81	82	83	84	85	86	87	88	89			
90	91		92	93	94		95	96		97	98			

C-61 (MU803783)

101	102		103	104							105	106	107	
108	109	110	111	112	113	114	115	116	117	118	119	120		
121	122	123		124	125		126	127	128		129	130		

WIRE COLOR CODE

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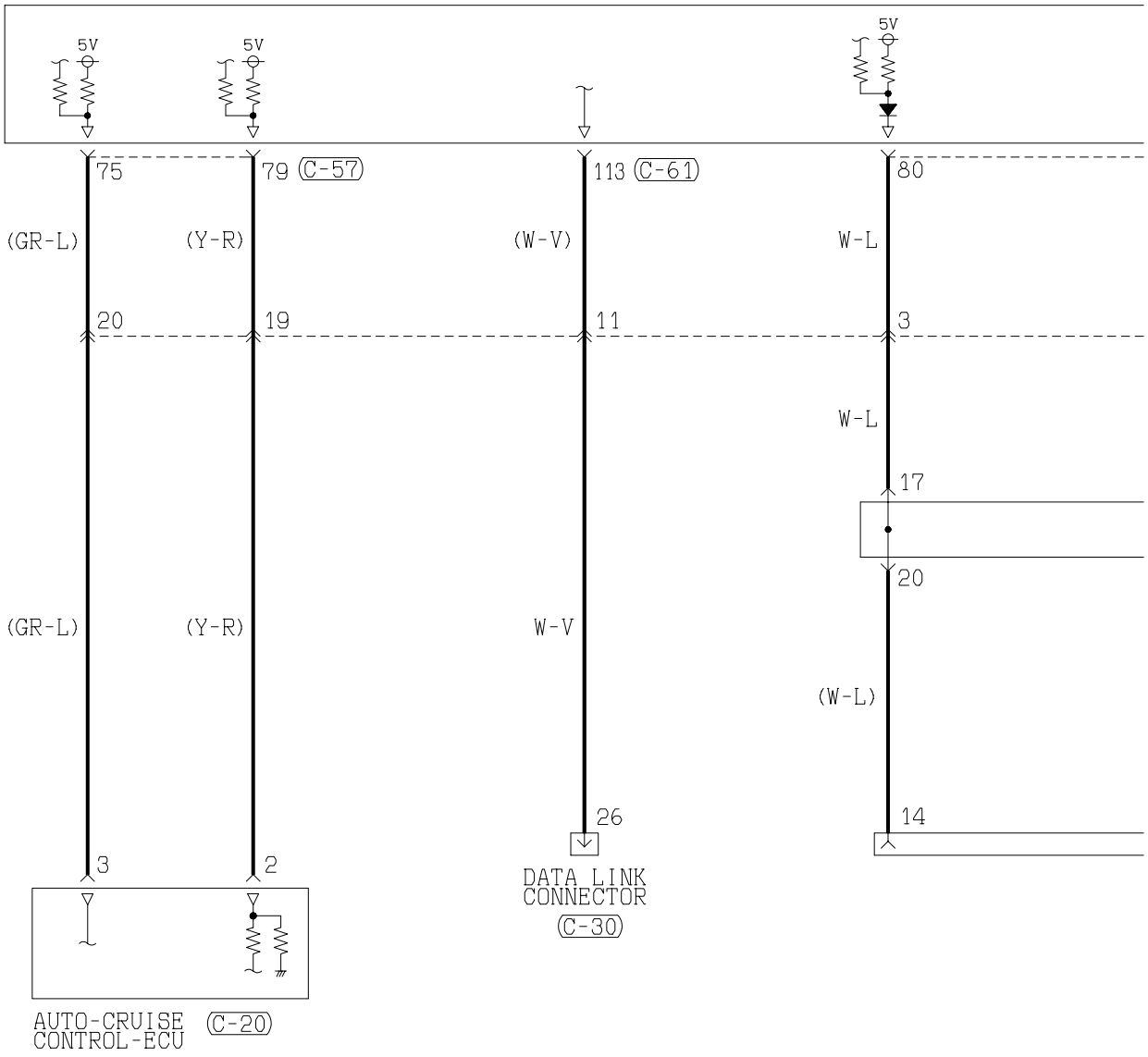
P :PINK	R :RED	SB:SKY BLUE	V :VIOLET	W :WHITE	Y :YELLOW		

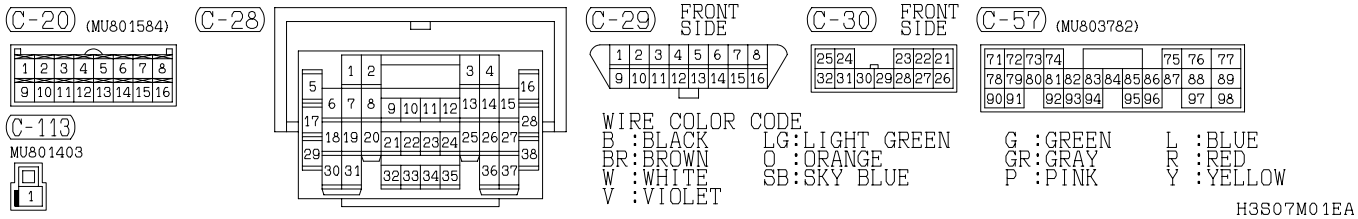
H3S07M01DB

TSB Revision

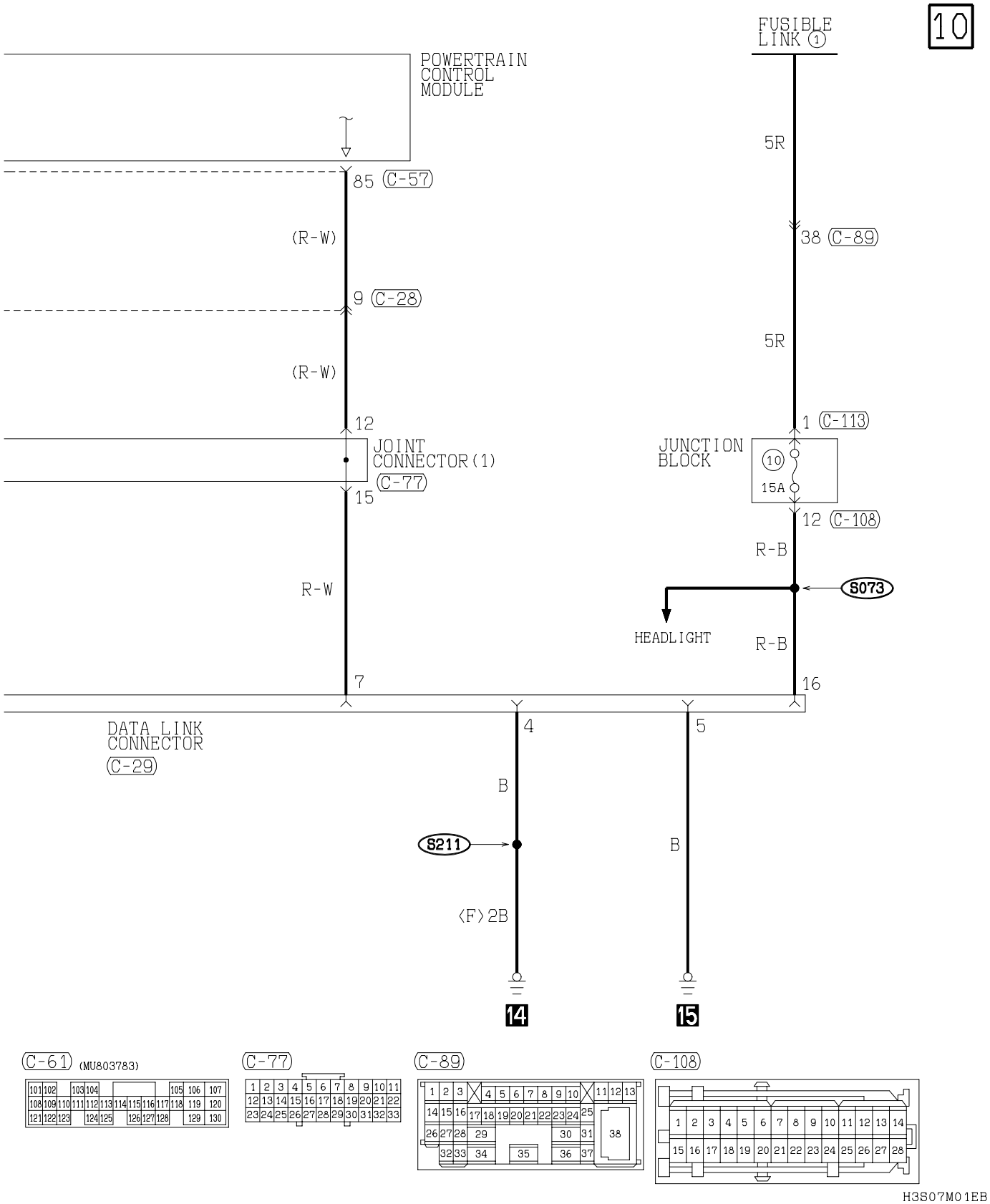
INVECS-II 4A/T <VEHICLES WITH SPORT MODE TYPE (2.4L ENGINE)> (CONTINUED)

9





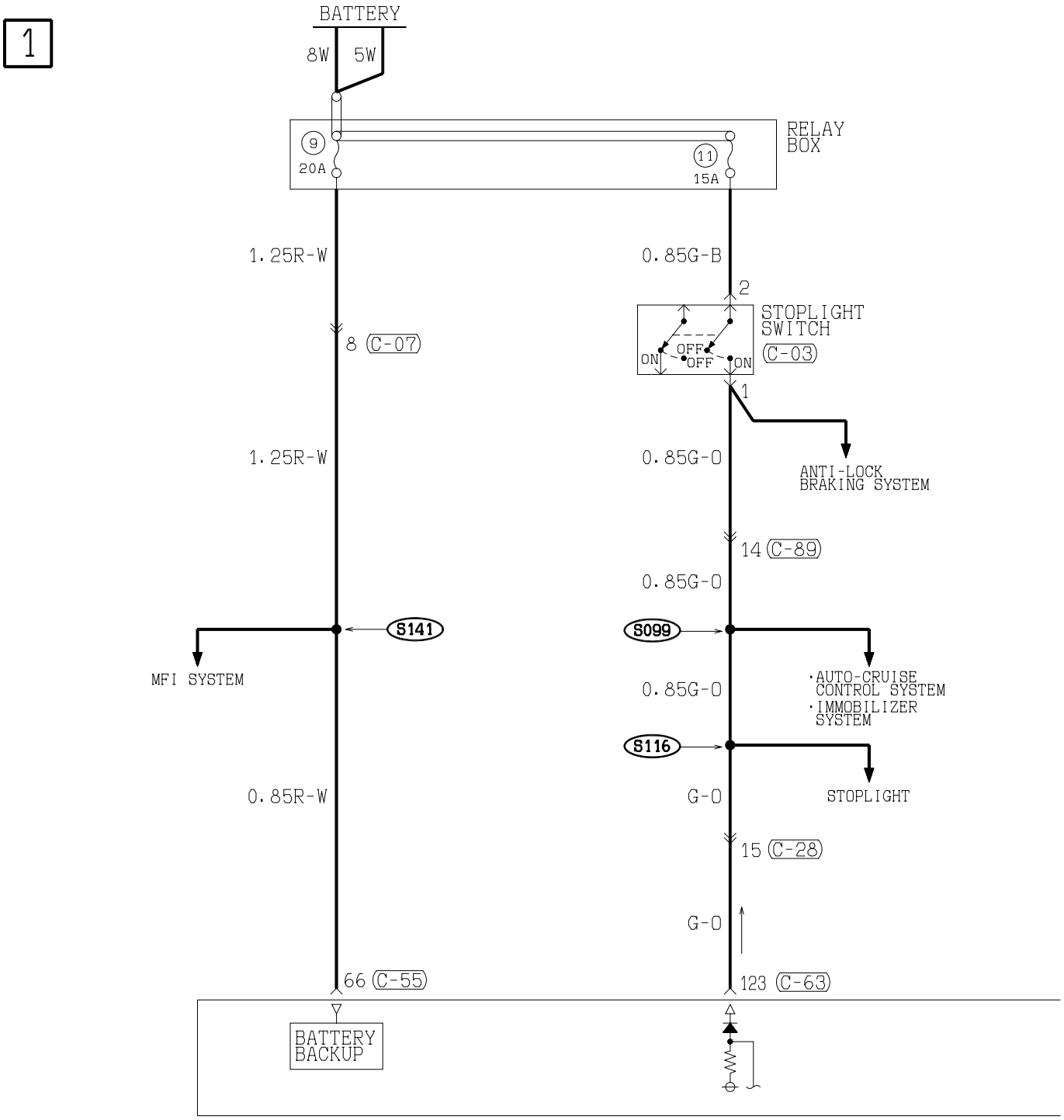
TSB Revision

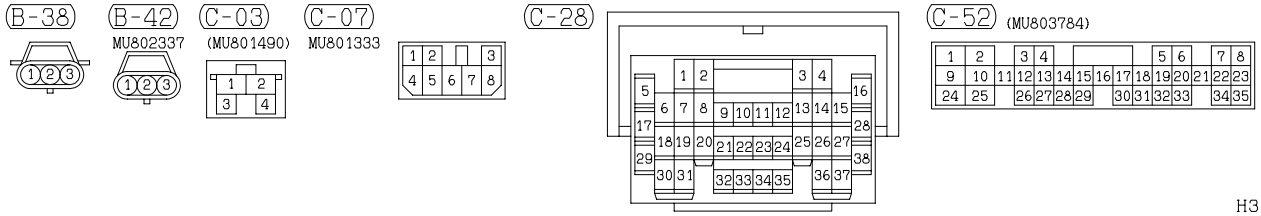


TSB Revision

INVECS-II 4A/T <VEHICLES WITH SPORT MODE TYPE (3.0L ENGINE)>

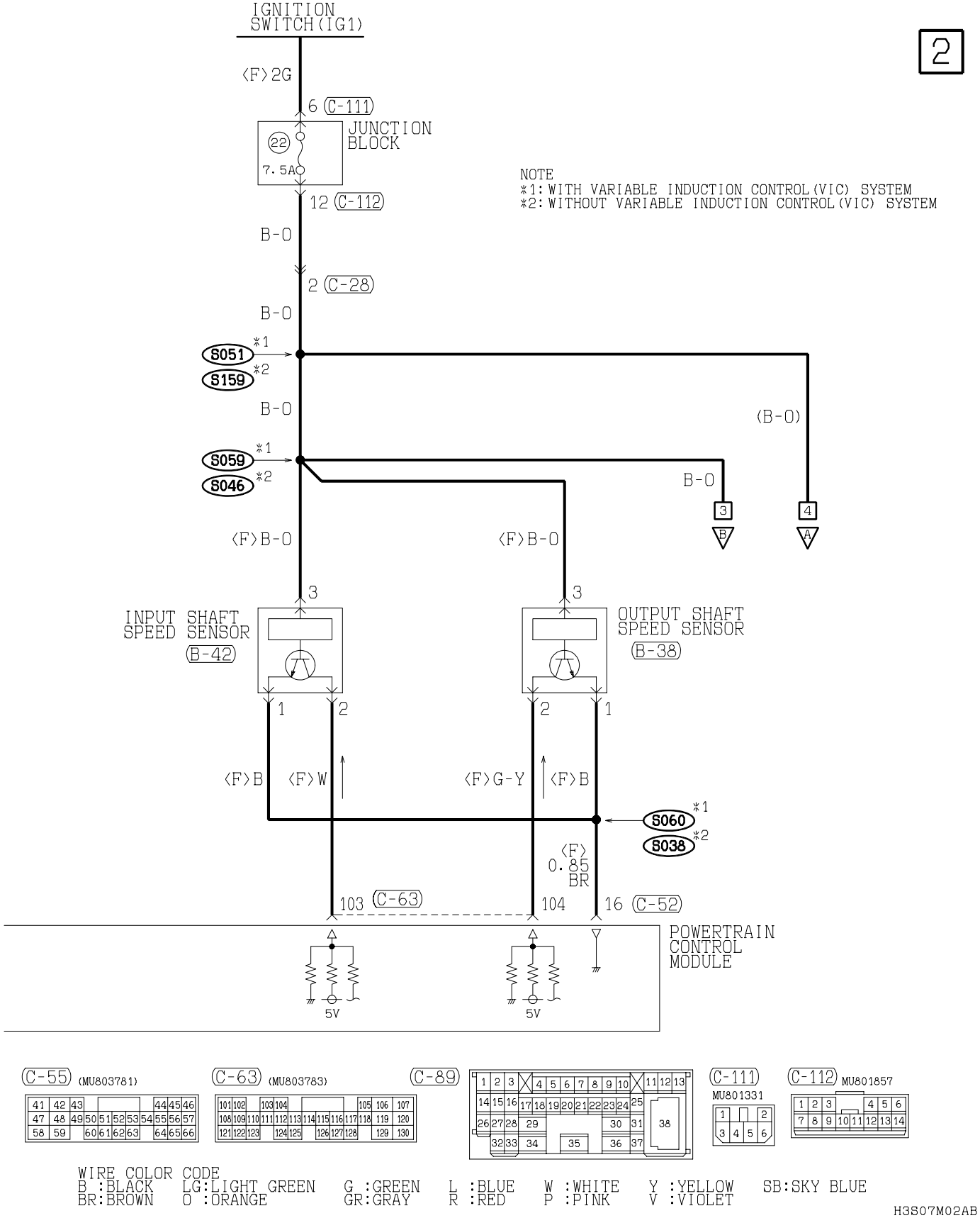
M1901016200487





H3S07M02AA

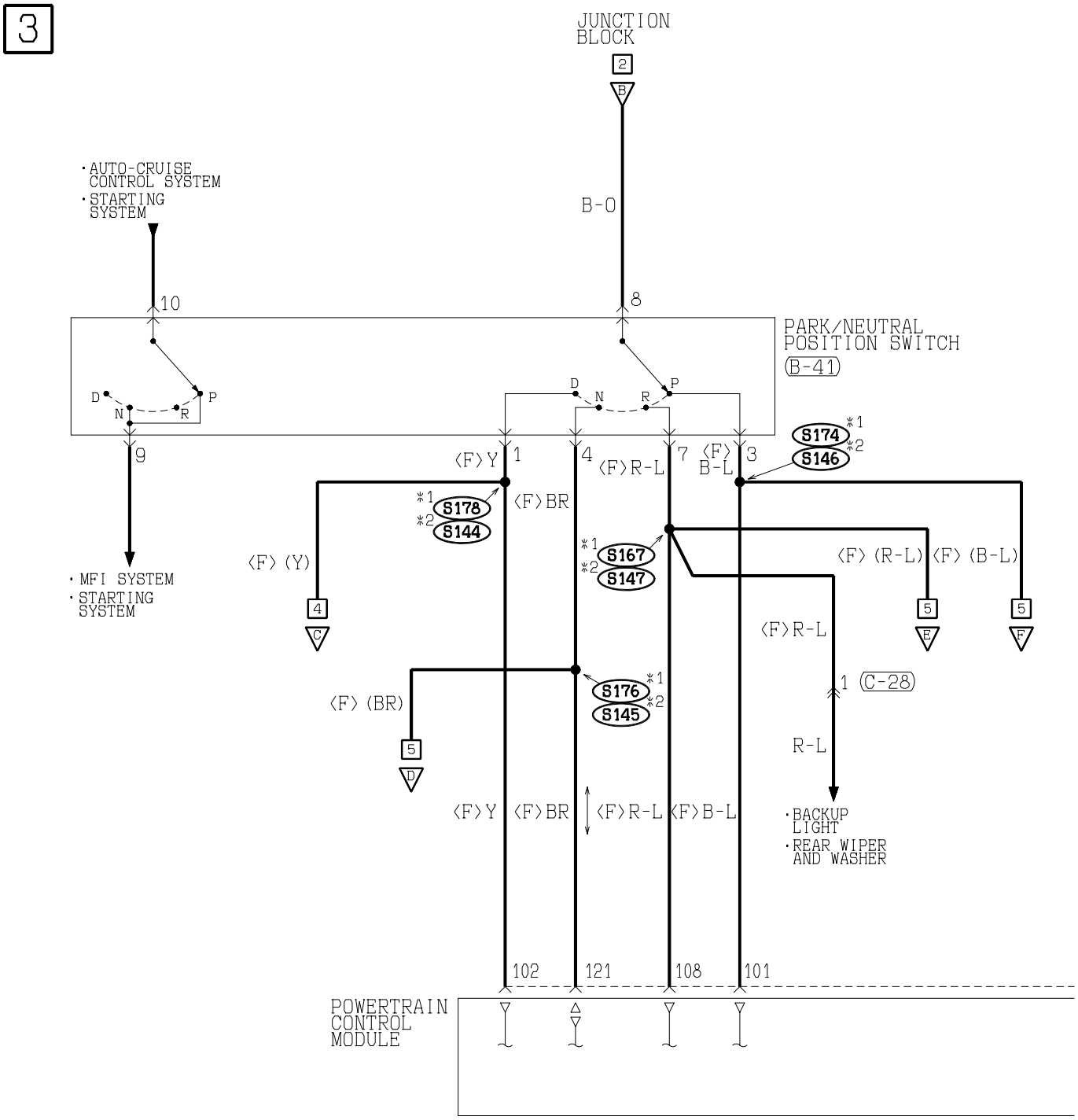
TSB Revision

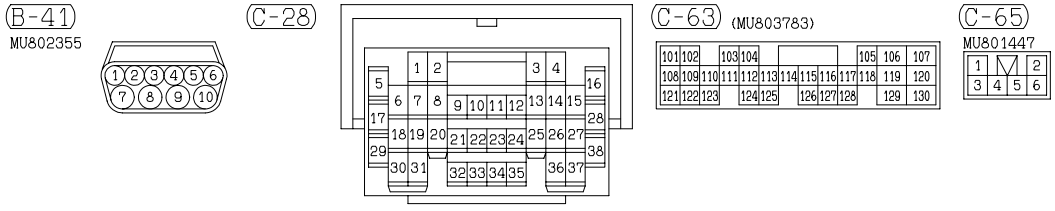


H3S07M02AB

TSB Revision

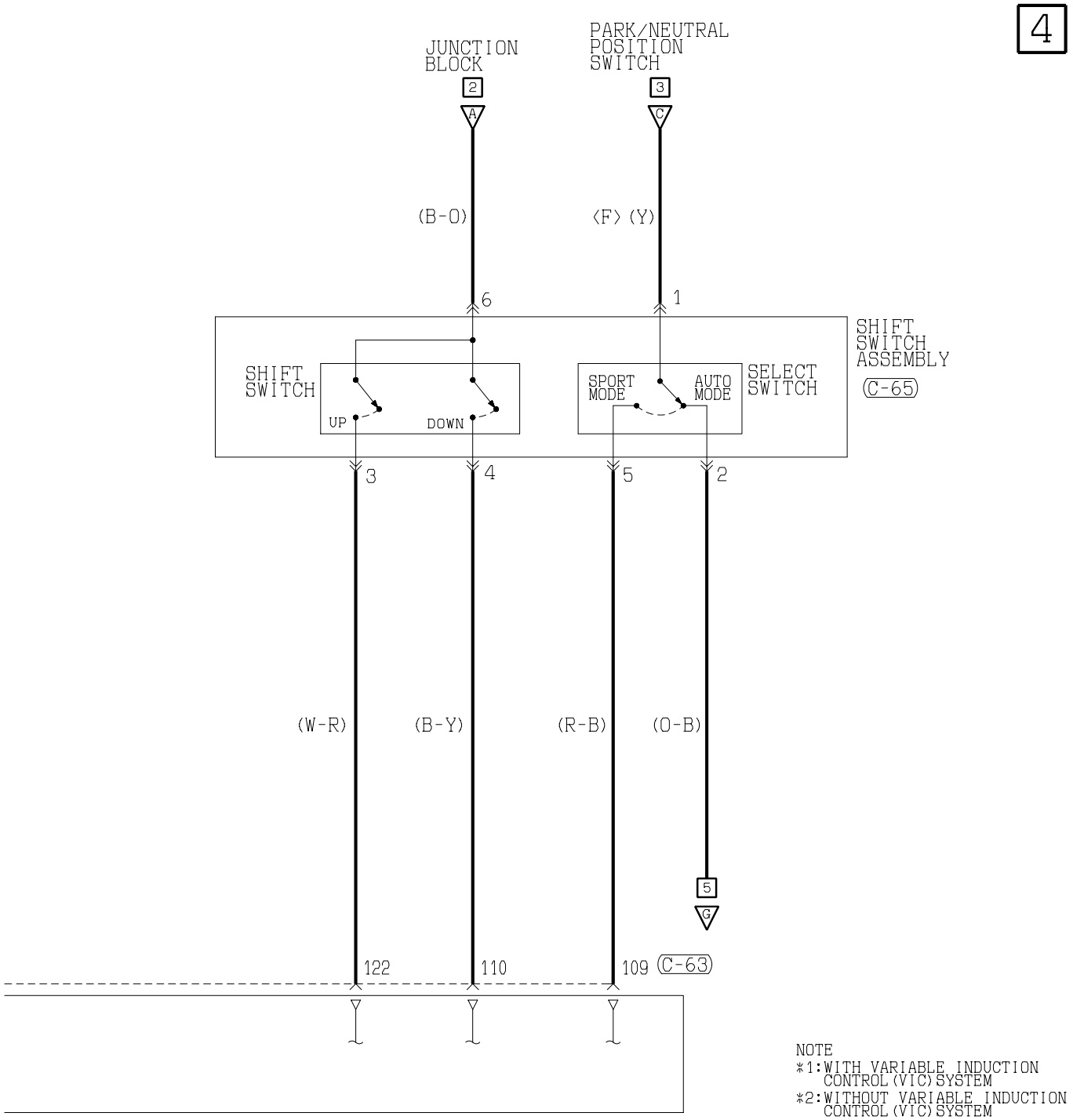
INVECS-II 4A/T <VEHICLES WITH SPORT MODE TYPE (3.0L ENGINE)> (CONTINUED)





H3S07M02BA

TSB Revision



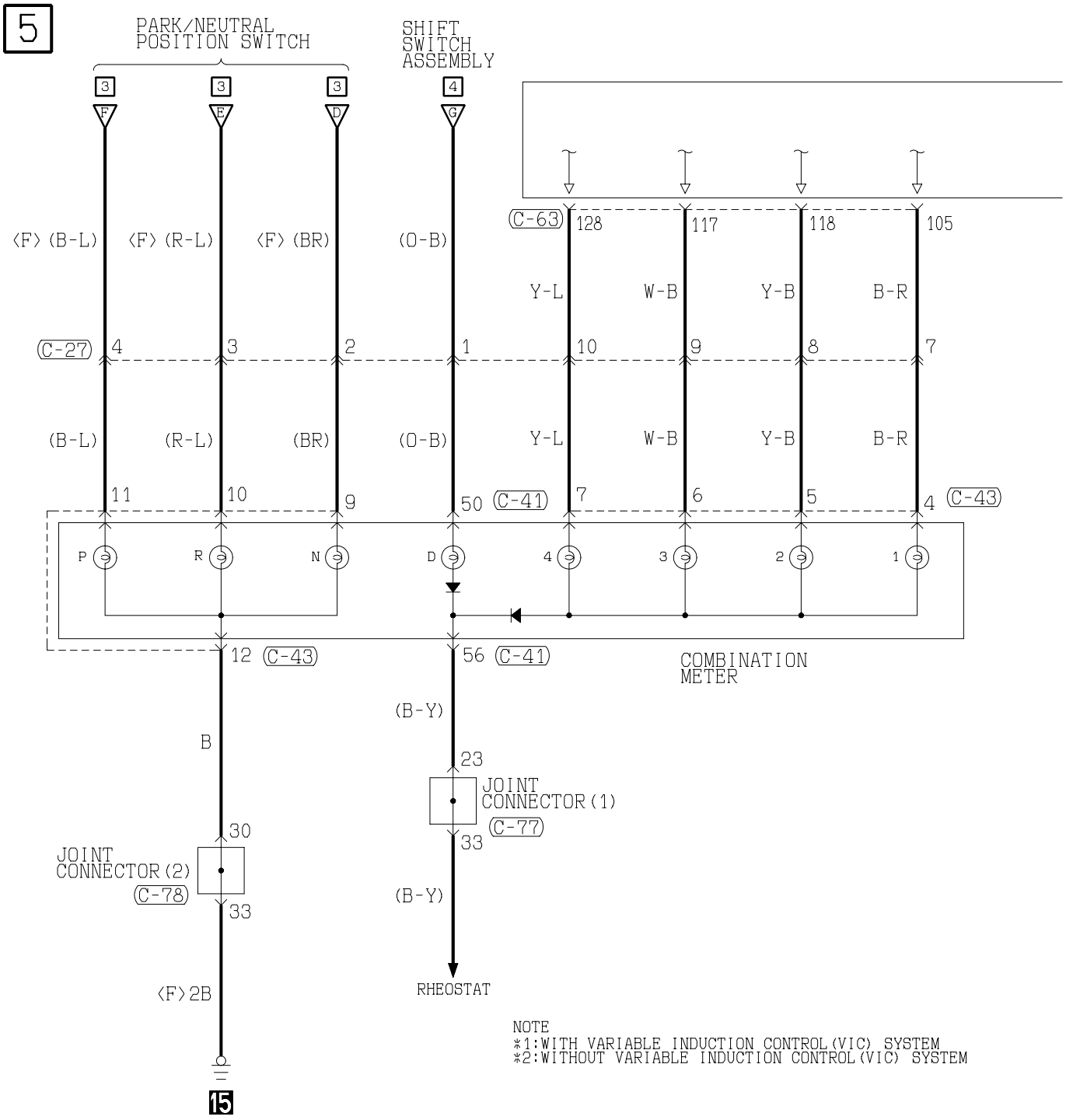
WIRE COLOR CODE

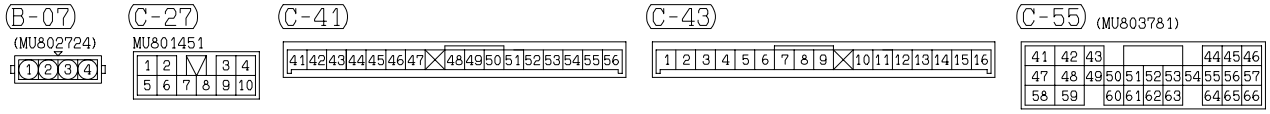
B :BLACK	BR:BROWN	G :GREEN	GR:GRAY	L :BLUE	LG:LIGHT GREEN	O :ORANGE	
P :PINK	R :RED	SB:SKY BLUE	V :VIOLET	W :WHITE	Y :YELLOW		

H3S07M02BB

TSB Revision

INVECS-II 4A/T <VEHICLES WITH SPORT MODE TYPE (3.0L ENGINE)> (CONTINUED)





H3S07M02CA

TSB Revision

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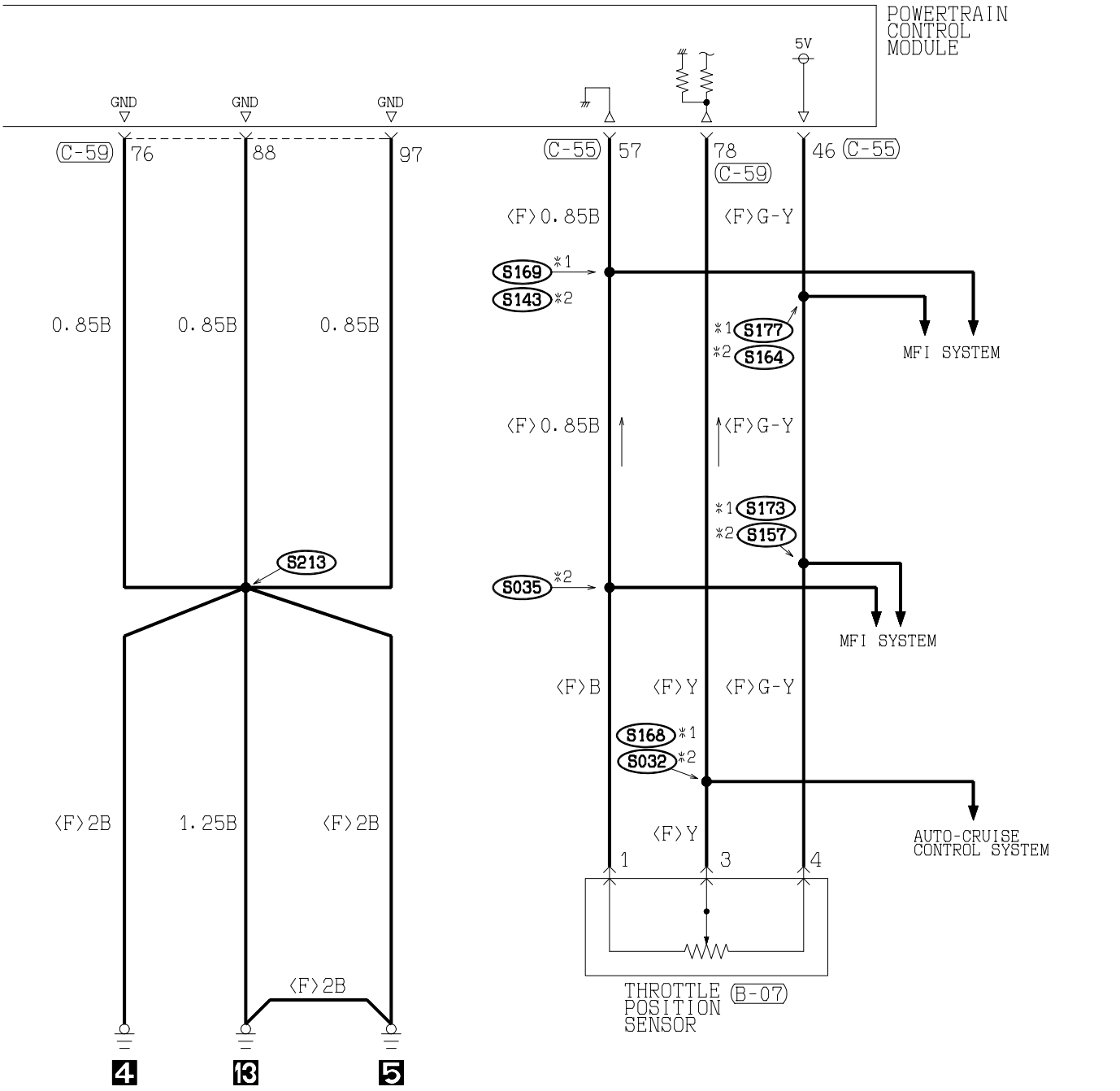


C-59 (MU803782)

71	72	73	74					75	76	77		
78	79	80	81	82	83	84	85	86	87	88	89	
90	91		92	93	94		95	96		97	98	

C-63 (MU803783)

101	102		103	104					105	106	107	
108	109	110	111	112	113	114	115	116	117	118	119	120
121	122	123		124	125		126	127	128		129	130

C-77

1	2	3	4	5	6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	22
23	24	25	26	27	28	29	30	31	32	33

C-78

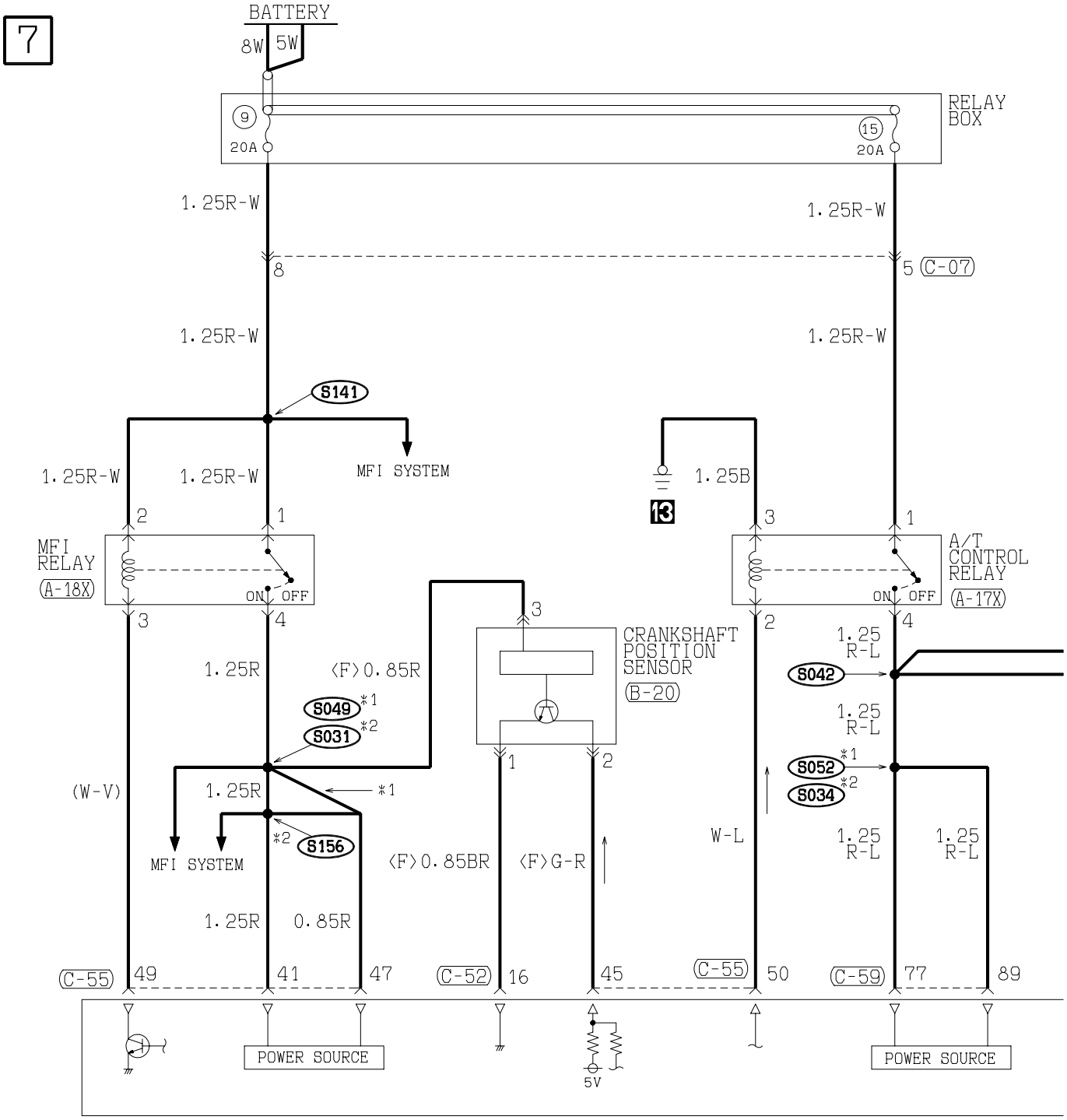
1	2	3	4	5	6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	22
23	24	25	26	27	28	29	30	31	32	33

WIRE COLOR CODE
B :BLACK BR:BROWN G :GREEN GR:GRAY L :BLUE LG:LIGHT GREEN O :ORANGE
P :PINK R :RED SB:SKY BLUE V :VIOLET W :WHITE Y :YELLOW

H3S07M02CB

TSB Revision

INVECS-II 4A/T <VEHICLES WITH SPORT MODE TYPE (3.0L ENGINE)> (CONTINUED)



H3S07M02DA

TSB Revision

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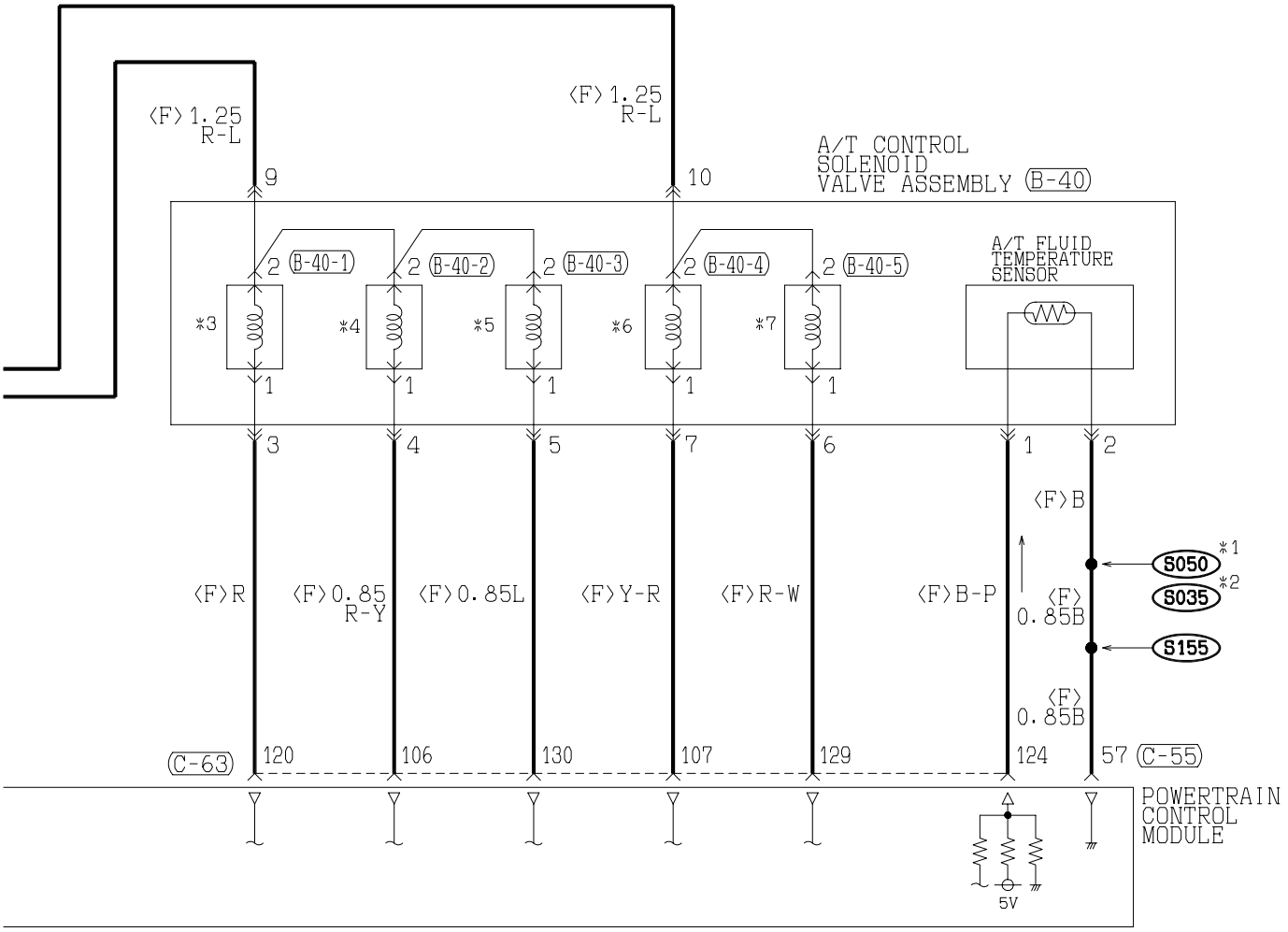
NOTE
*1: WITH VARIABLE INDUCTION CONTROL(VIC) SYSTEM
*2: WITHOUT VARIABLE INDUCTION CONTROL(VIC) SYSTEM
*3: UNDERDRIVE SOLENOID VALVE
*4: SECOND SOLENOID VALVE
*5: OVERDRIVE SOLENOID VALVE
*6: TORQUE CONVERTER CLUTCH CONTROL SOLENOID VALVE
*7: LOW AND REVERSE SOLENOID VALVE



C-52 (MU803784)

1	2		3	4				5	6		7	8		
9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
24	25		26	27	28	29		30	31	32	33		34	35

C-55 (MU803781)

41	42	43									44	45	46	
47	48	49	50	51	52	53	54	55	56	57				
58	59		60	61	62	63		64	65	66				

C-59 (MU803782)

71	72	73	74								75	76	77	
78	79	80	81	82	83	84	85	86	87	88	89			
90	91		92	93	94		95	96		97	98			

C-63 (MU803783)

101	102		103	104							105	106	107	
108	109	110	111	112	113	114	115	116	117	118	119	120		
121	122	123		124	125		126	127	128		129	130		

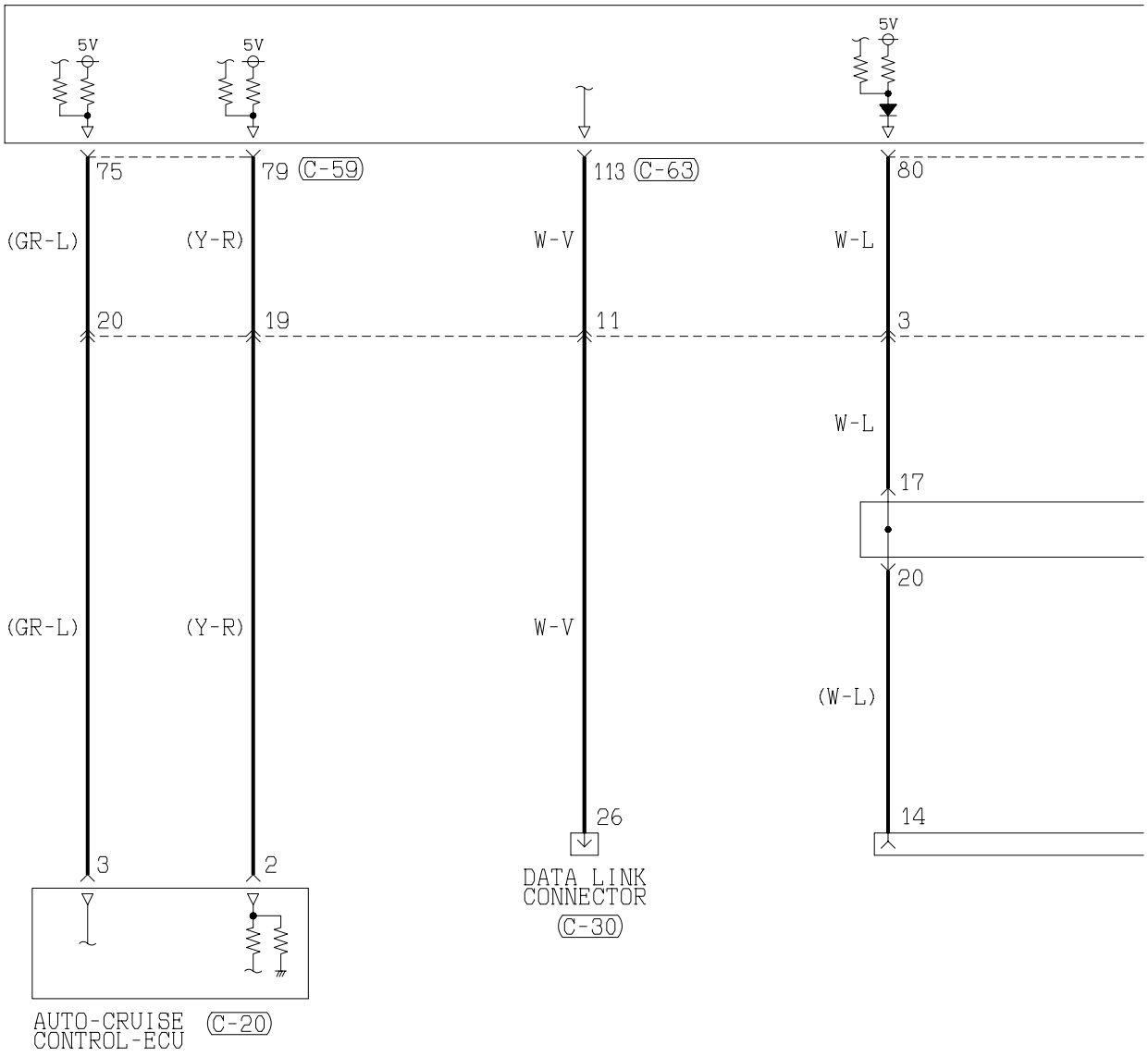
WIRE COLOR CODE
B :BLACK BR:BROWN G :GREEN GR:GRAY L :BLUE LG:LIGHT GREEN O :ORANGE
P :PINK R :RED SB:SKY BLUE V :VIOLET W :WHITE Y :YELLOW

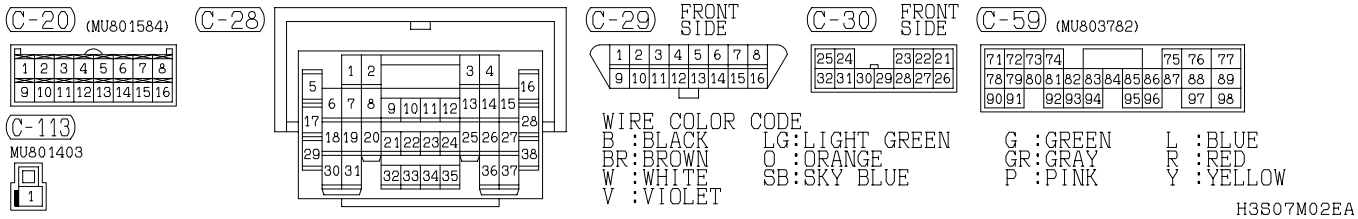
H3S07M02DB

TSB Revision

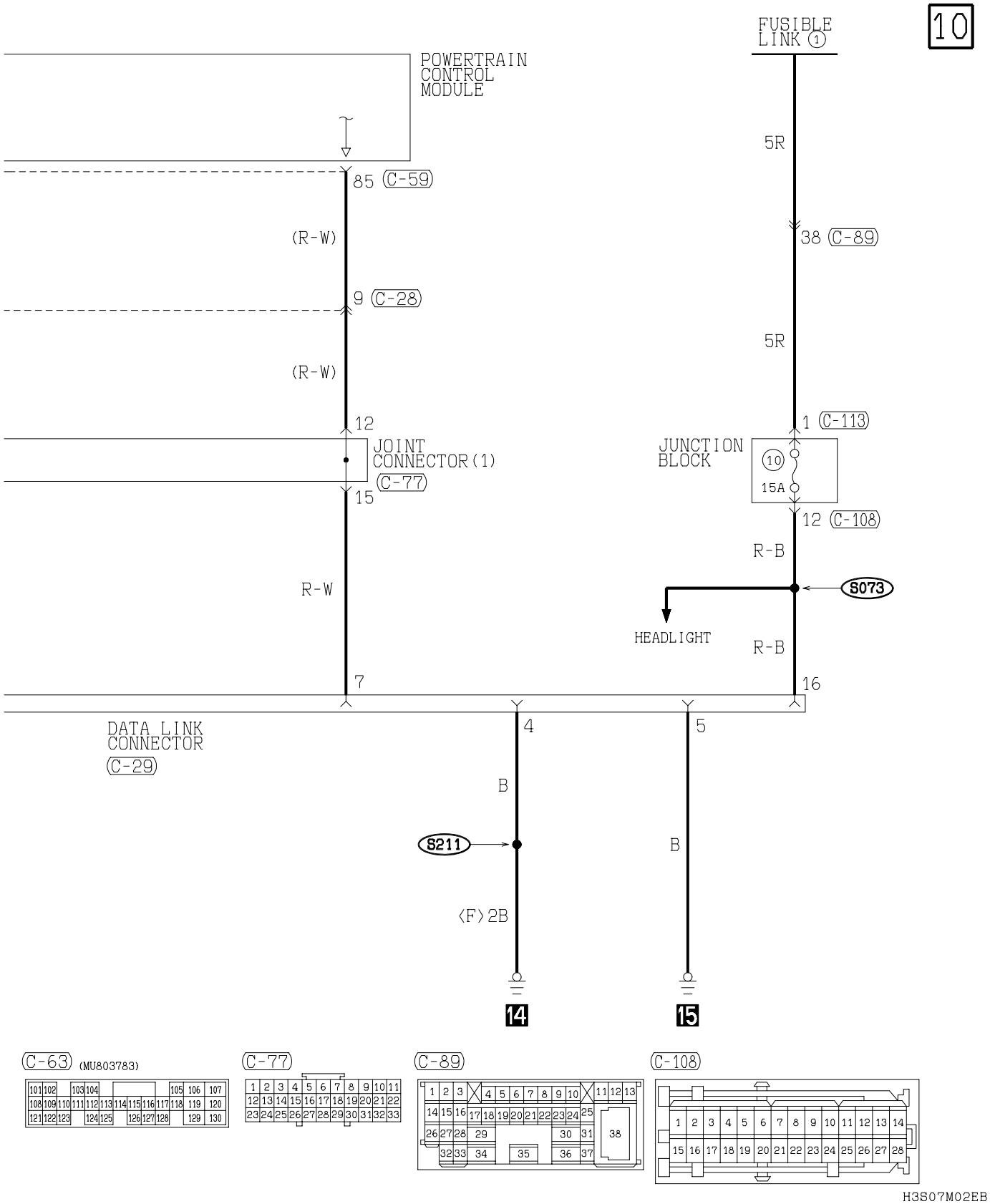
INVECS-II 4A/T <VEHICLES WITH SPORT MODE TYPE (3.0L ENGINE)> (CONTINUED)

9





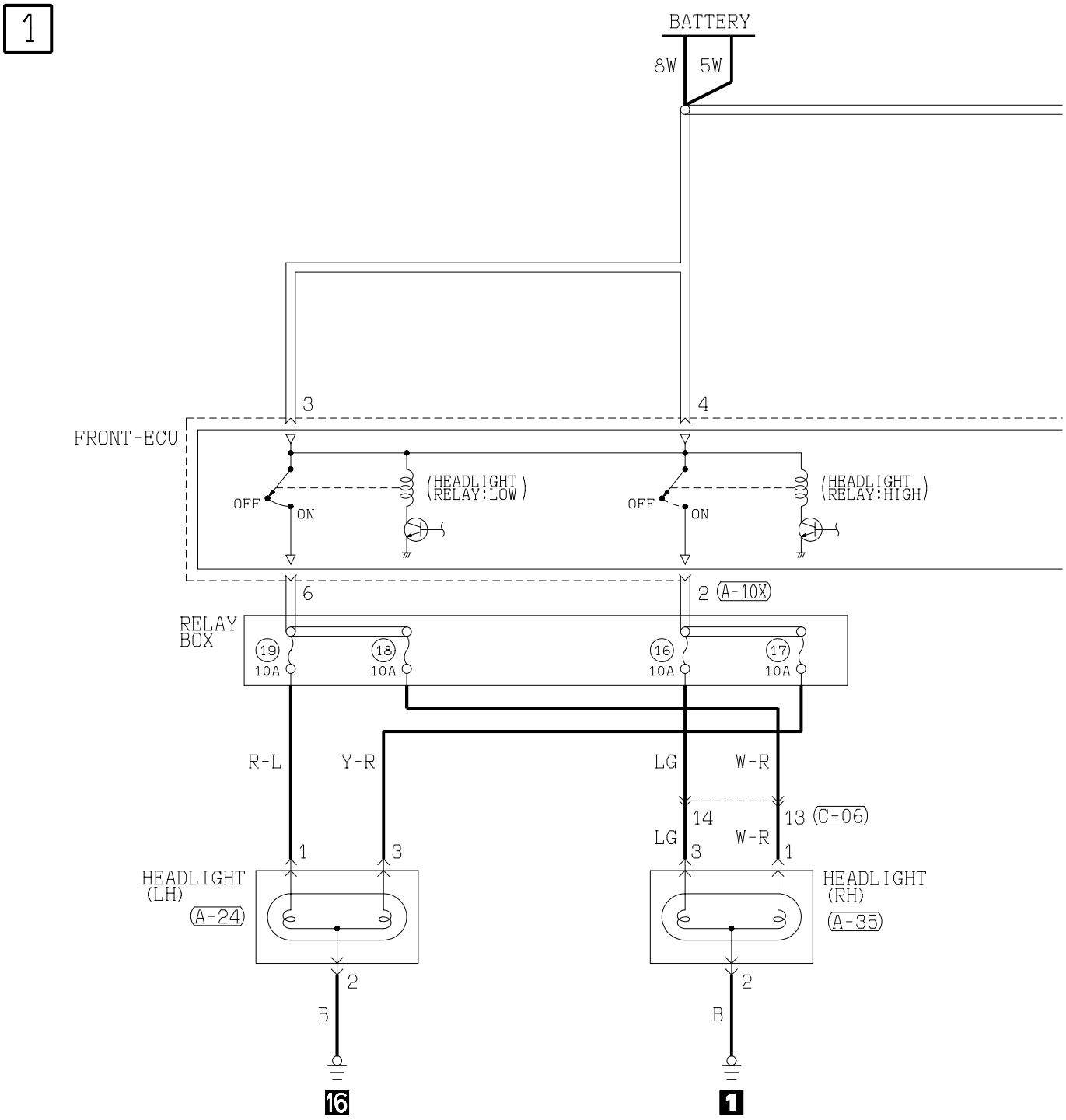
TSB Revision



TSB Revision

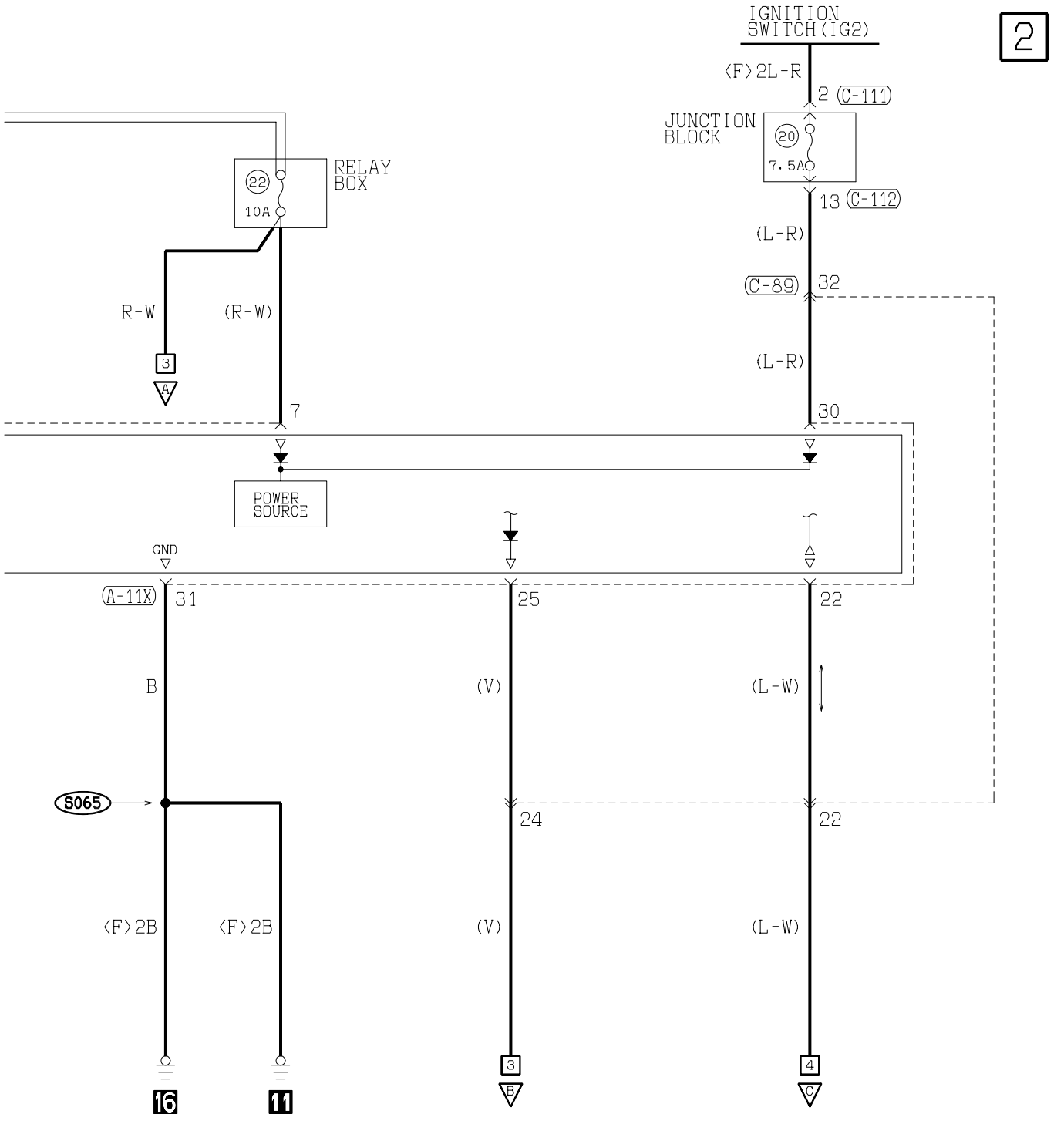
HEADLIGHT

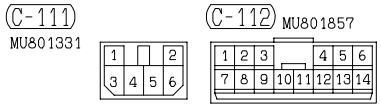
M1901001500352



H3S08M00AA

TSB Revision





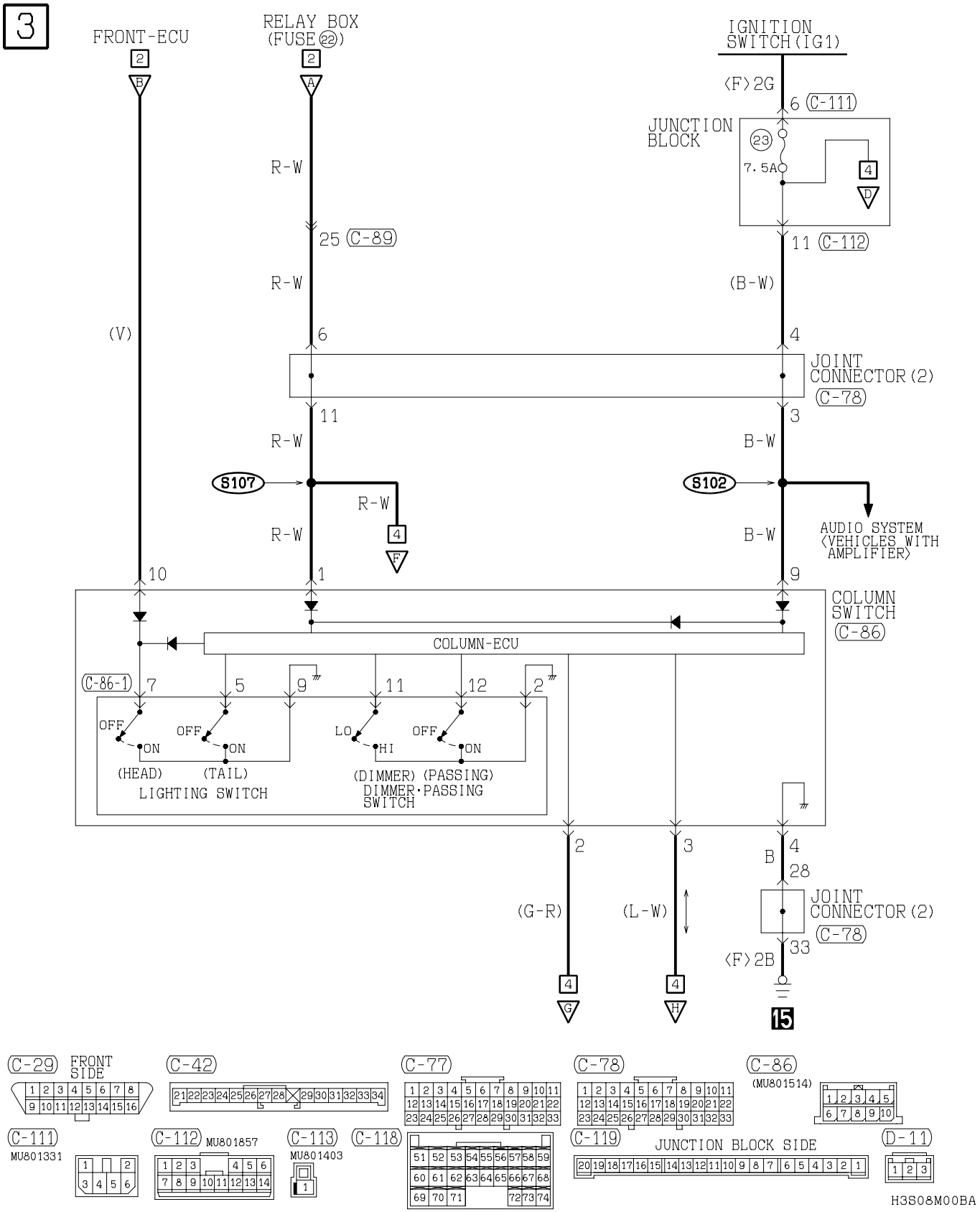
WIRE COLOR CODE

B :BLACK	LG:LIGHT GREEN	G :GREEN	L :BLUE	W :WHITE	Y :YELLOW	SB:SKY BLUE
BR:BROWN	O :ORANGE	GR:GRAY	R :RED	P :PINK	V :VIOLET	

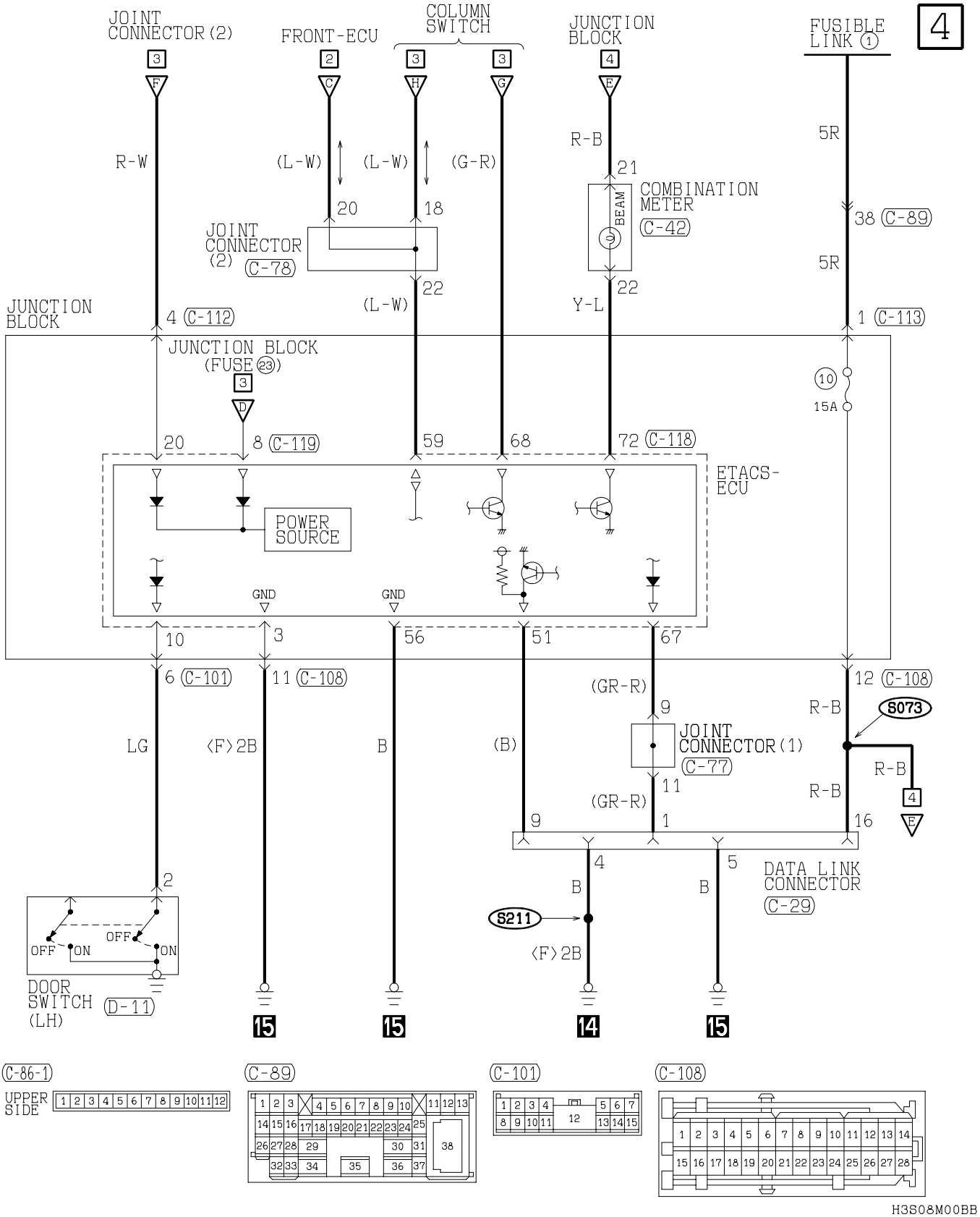
H3S08M00AB

TSB Revision

HEADLIGHT (CONTINUED)



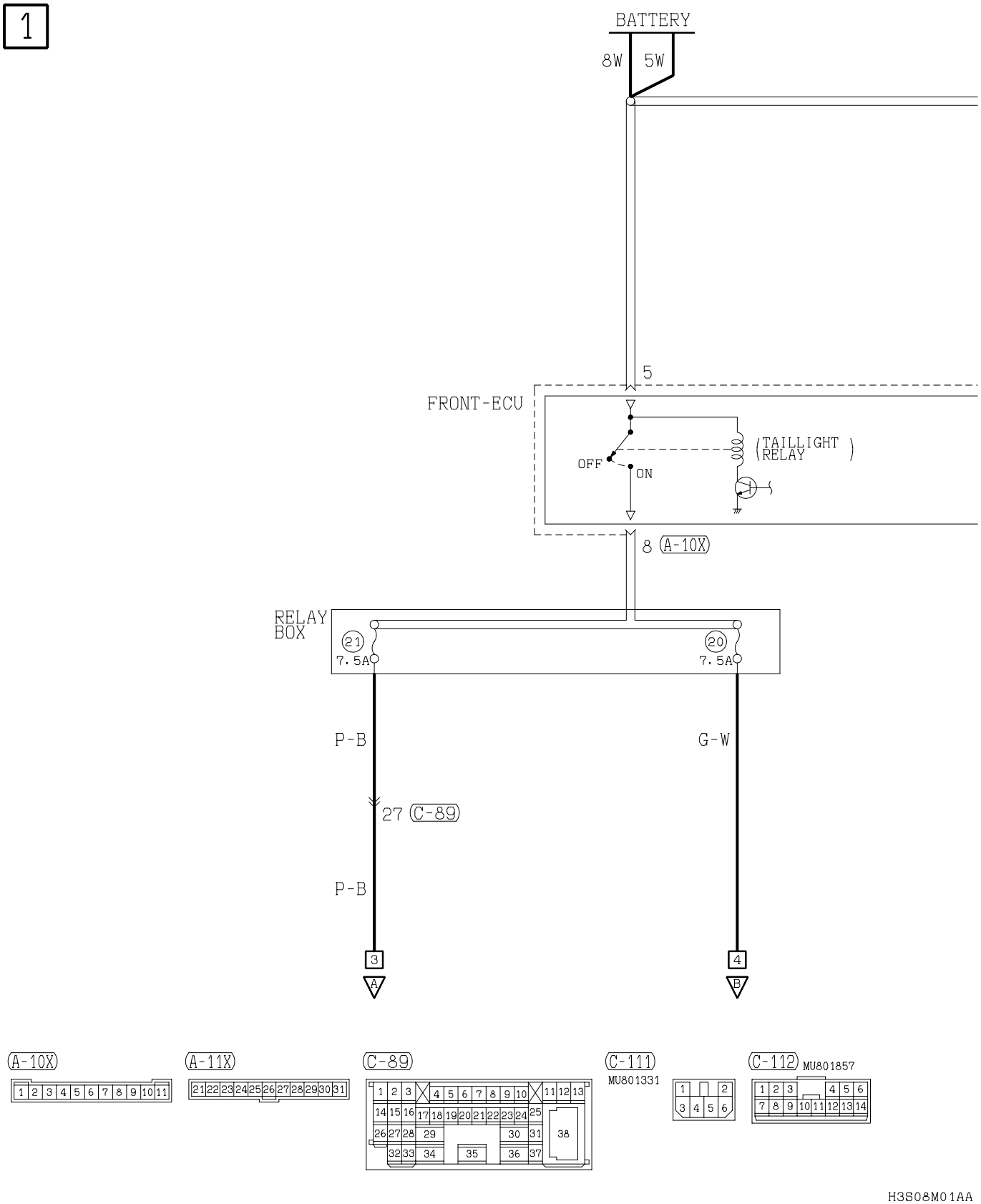
TSB Revision



TSB Revision

TAILLIGHT, POSITION LIGHT, REAR SIDE MARKER LIGHT AND LICENSE PLATE LIGHT

M1901013000086



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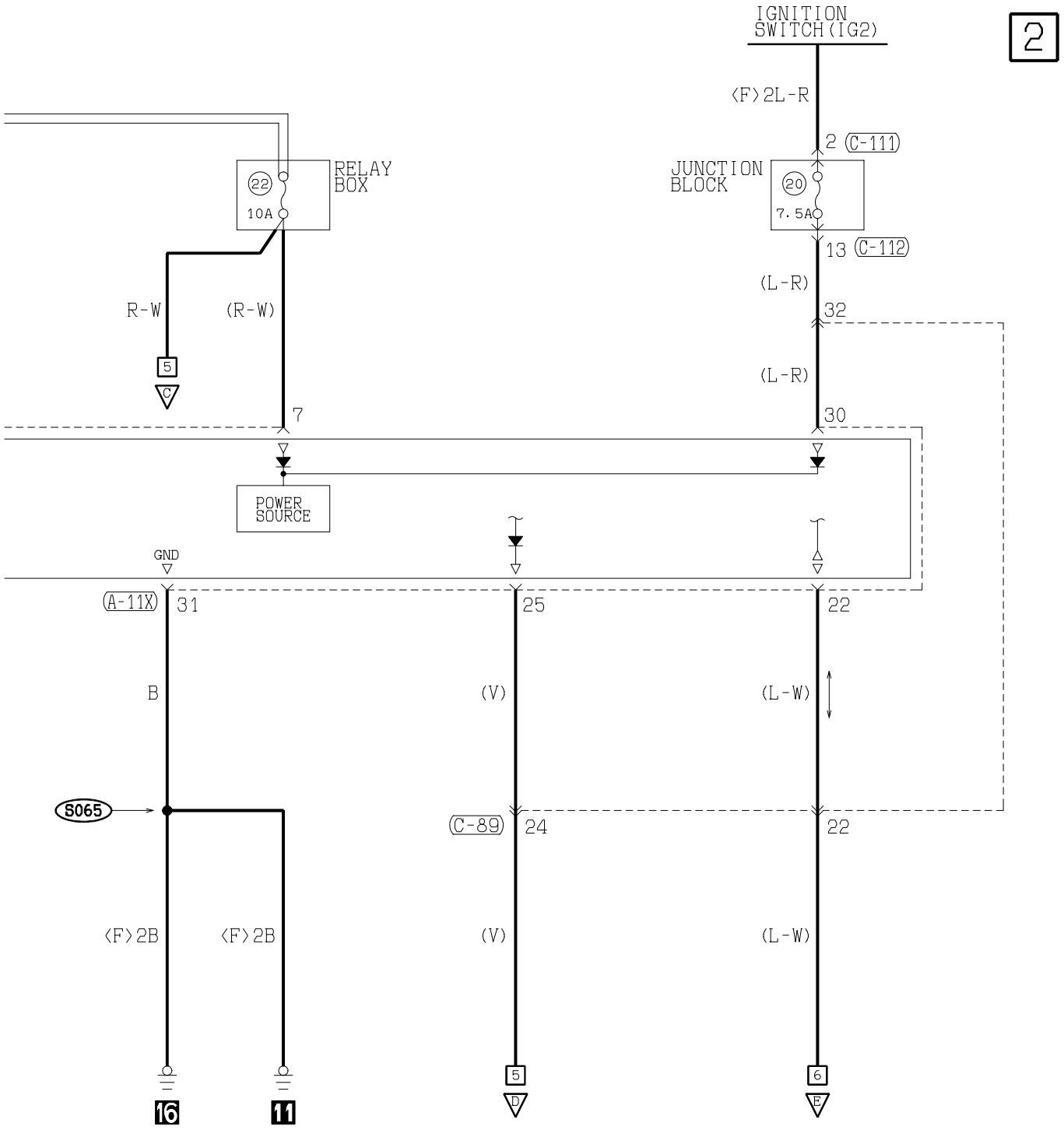


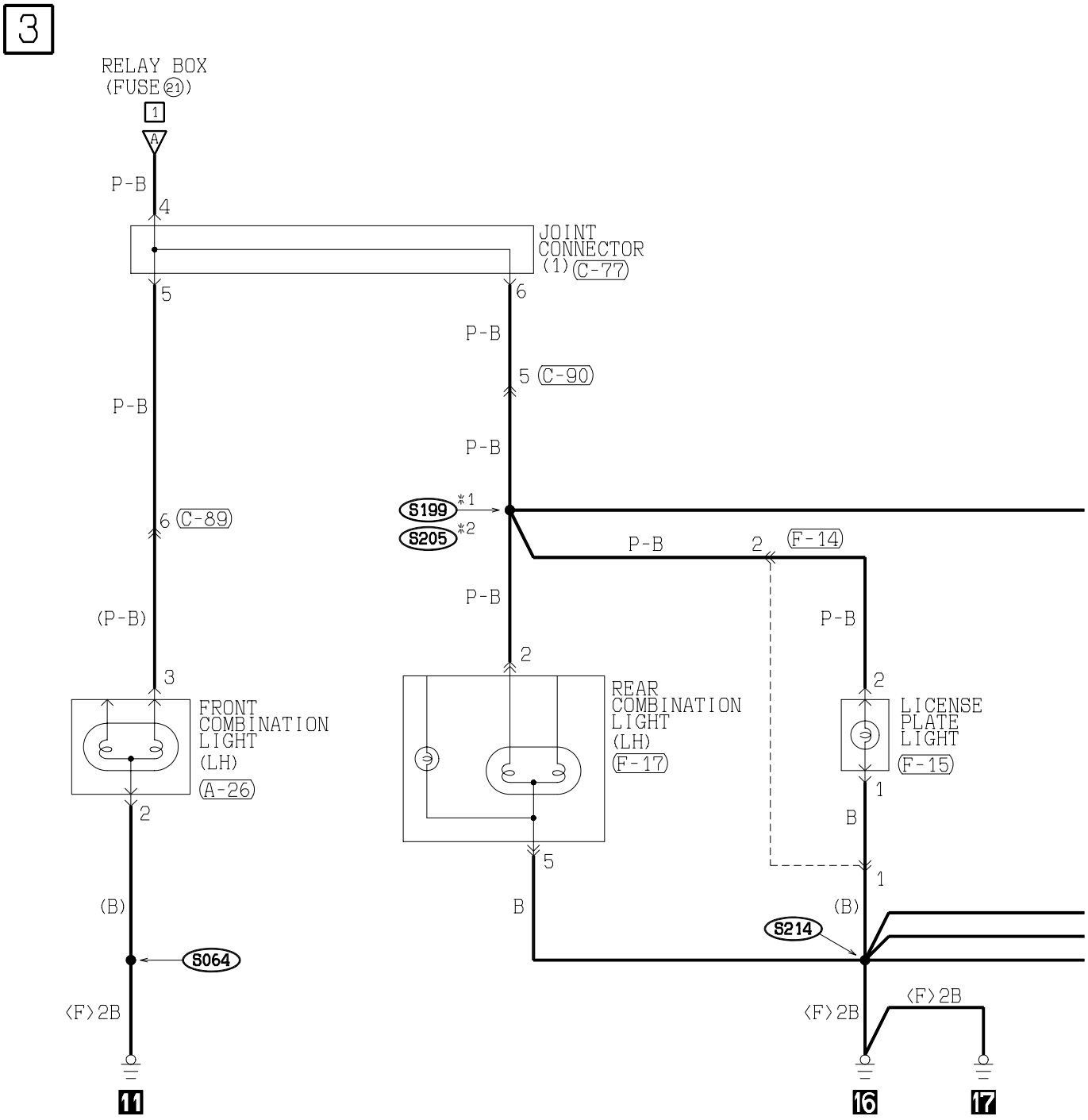
WIRE COLOR CODE

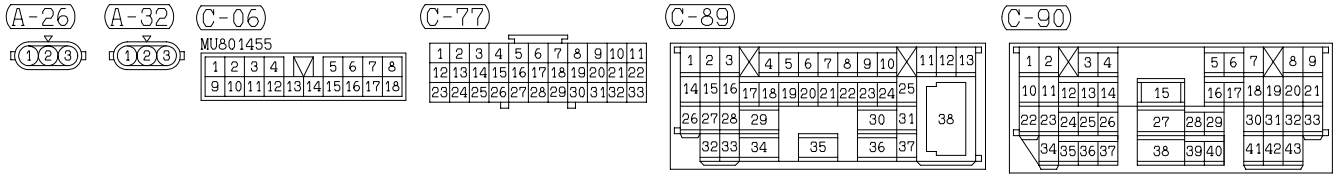
B :BLACK	LG:LIGHT GREEN	G :GREEN	L :BLUE	W :WHITE	Y :YELLOW	SB:SKY BLUE
BR:BROWN	O :ORANGE	GR:GRAY	R :RED	P :PINK	V :VIOLET	

H3S08M01AB

TSB Revision

TAILLIGHT, POSITION LIGHT, REAR SIDE MARKER LIGHT AND LICENSE PLATE LIGHT (CONTINUED)





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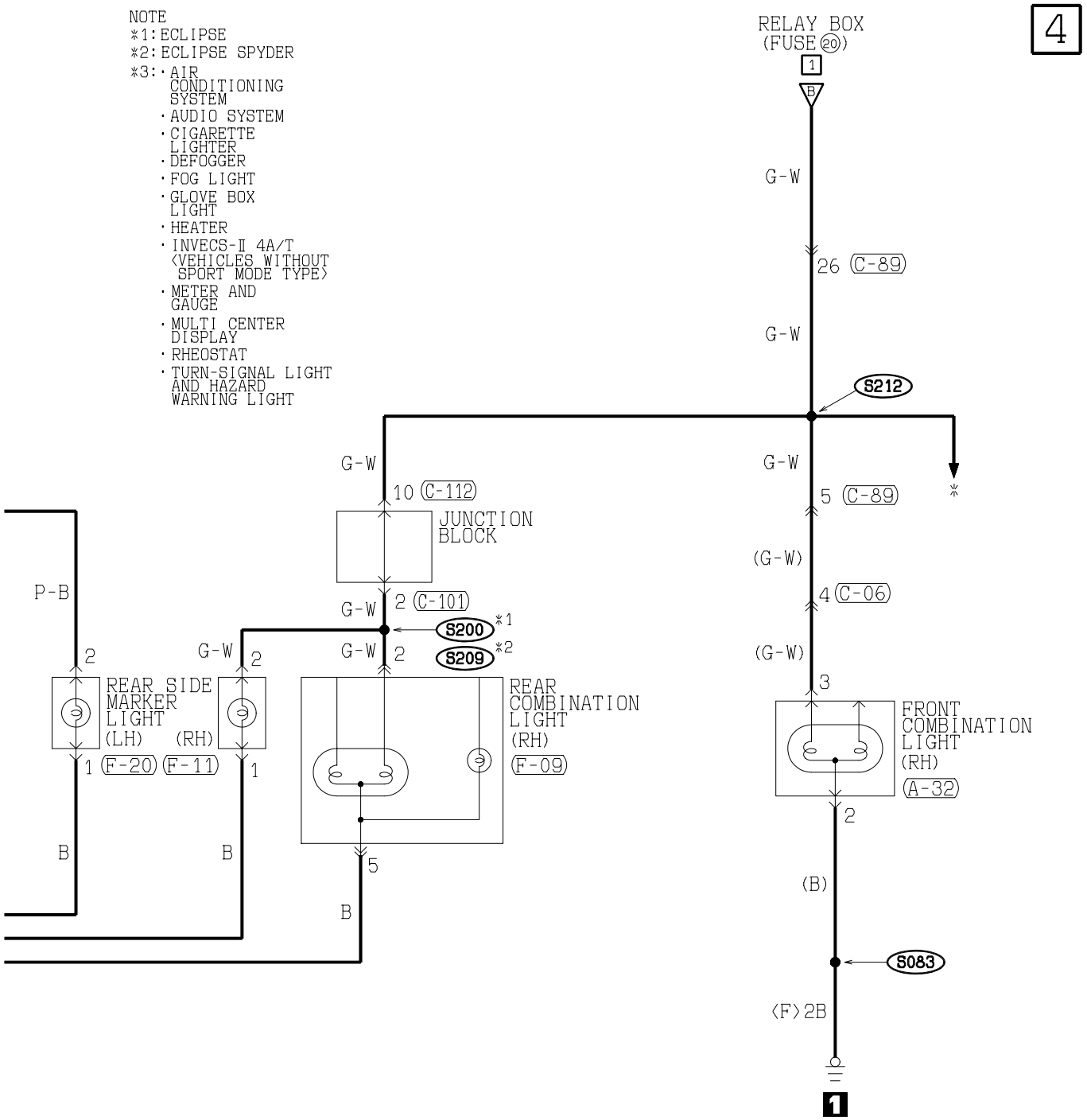
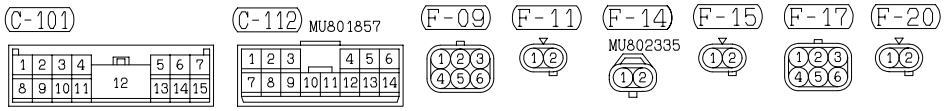




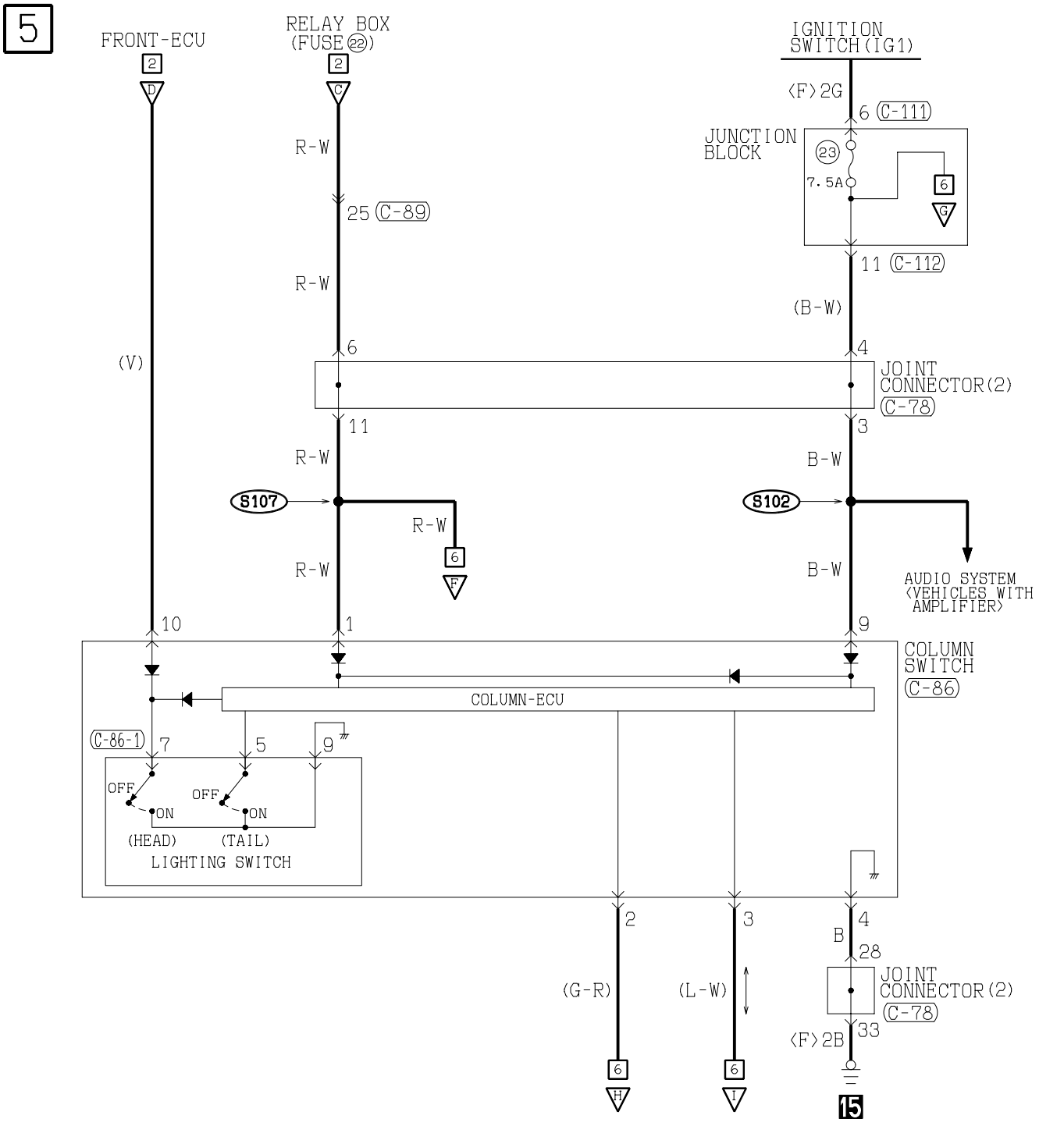
WIRE COLOR CODE

B :BLACK	BR:BROWN	G :GREEN	GR:GRAY	L :BLUE	LG:LIGHT GREEN	O :ORANGE	
P :PINK	R :RED	SB:SKY BLUE	V :VIOLET	W :WHITE	Y :YELLOW		

H3S08M01BB

TSB Revision

TAILLIGHT, POSITION LIGHT, REAR SIDE MARKER LIGHT AND LICENSE PLATE LIGHT (CONTINUED)



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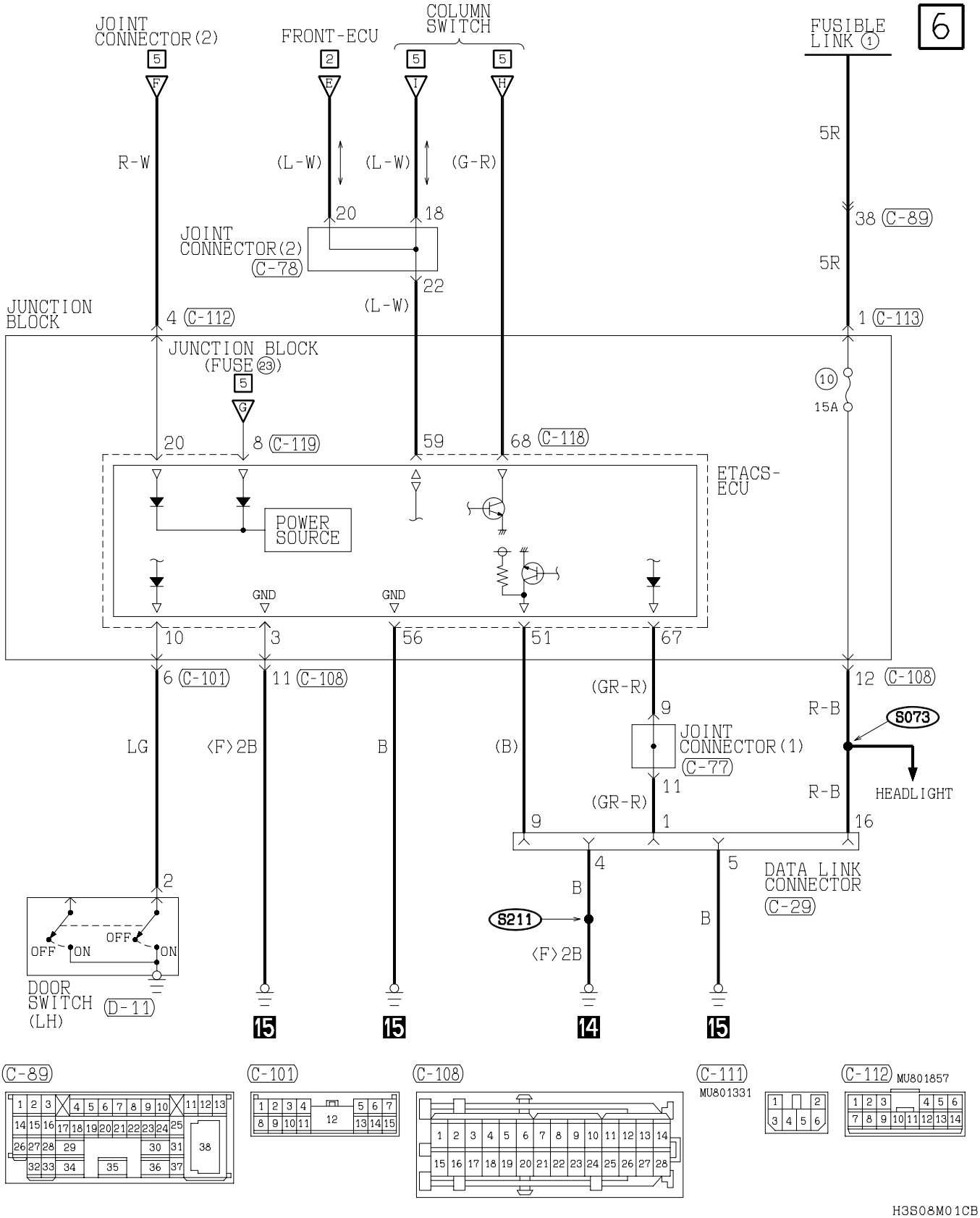
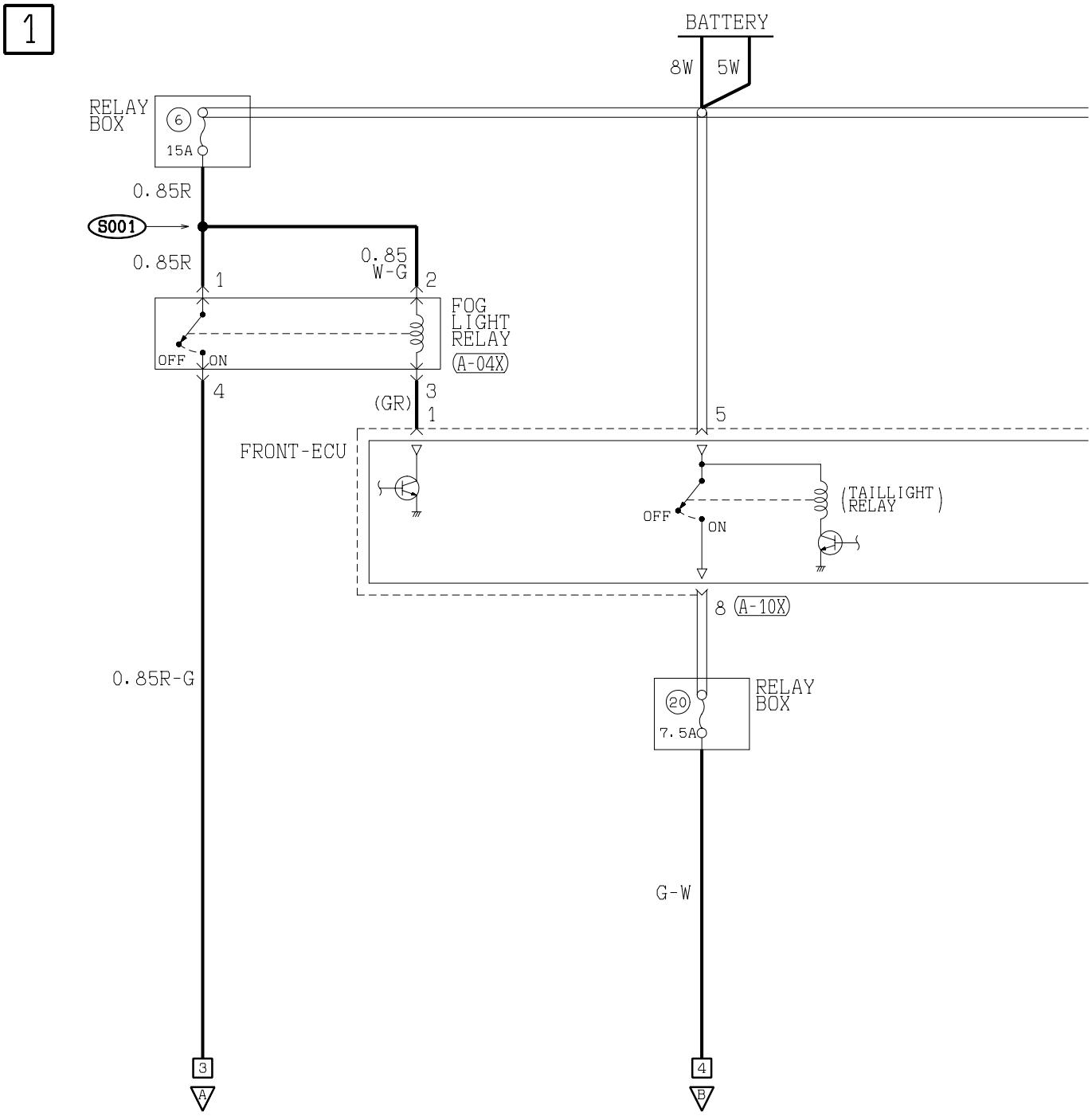
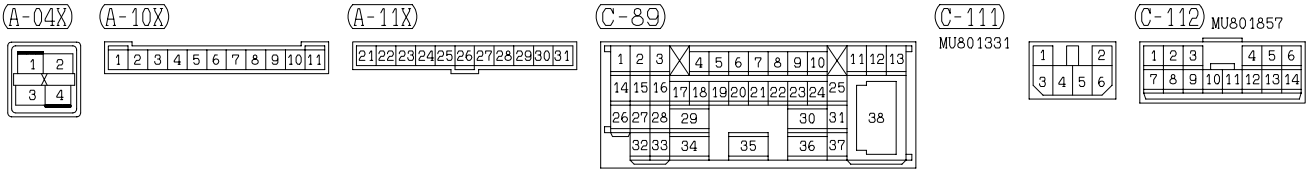


TSB Revision

FOG LIGHT

M1901001800245





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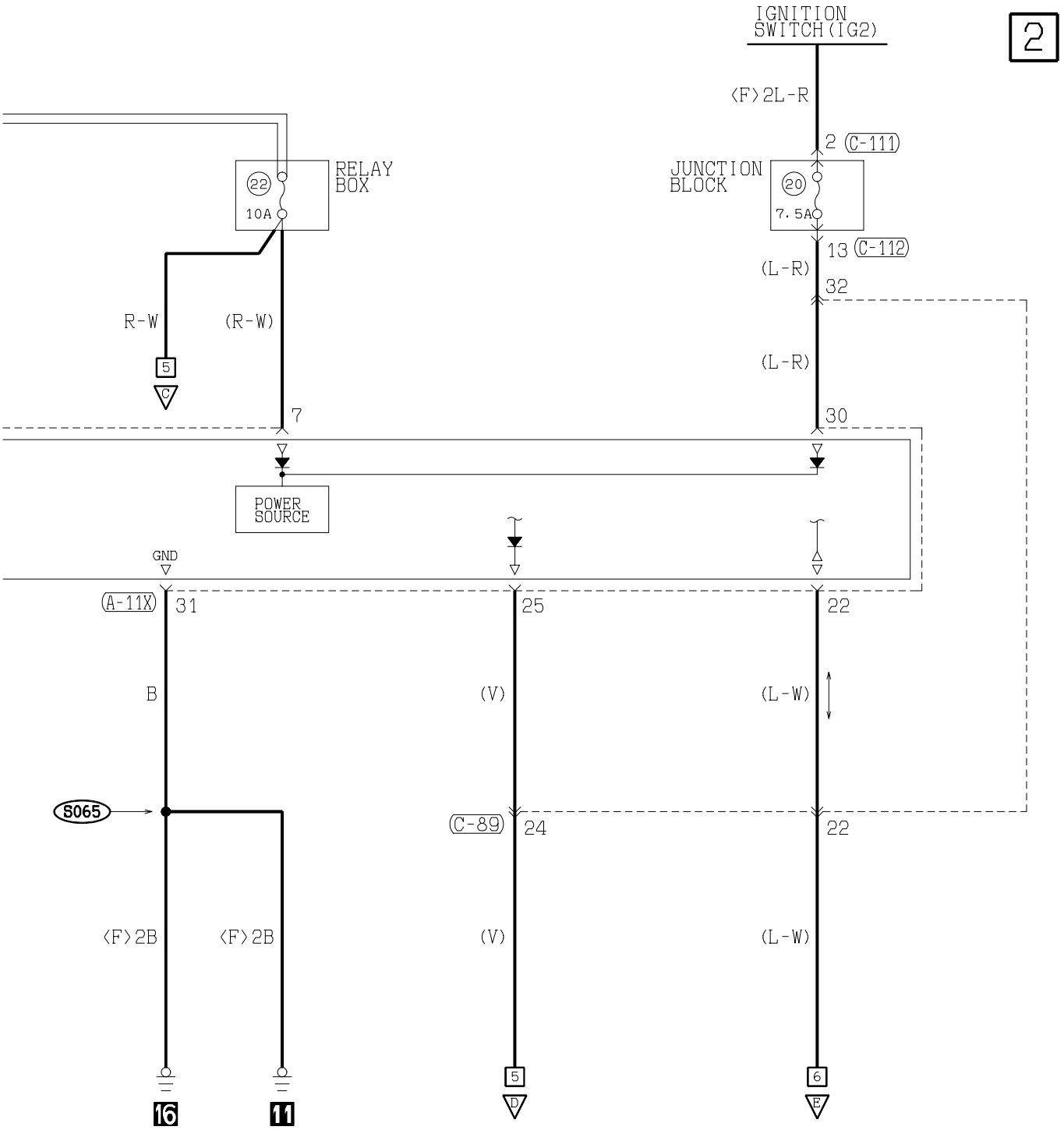
TSB Revision



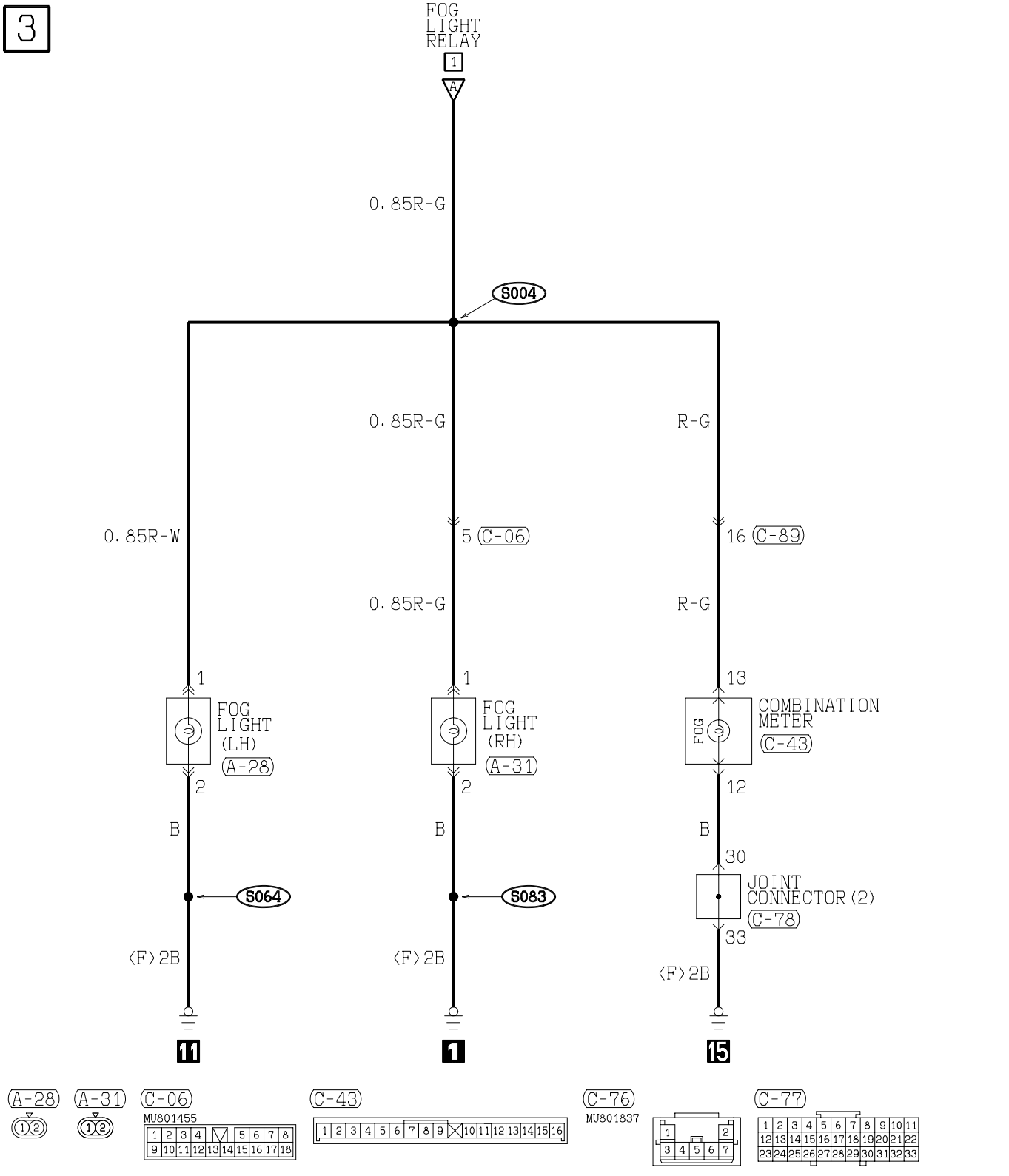
WIRE COLOR CODE

B :BLACK	LG:LIGHT GREEN	G :GREEN	L :BLUE	W :WHITE	Y :YELLOW	SB:SKY BLUE
BR:BROWN	O :ORANGE	GR:GRAY	R :RED	P :PINK	V :VIOLET	

H3S08M02AB

TSB Revision

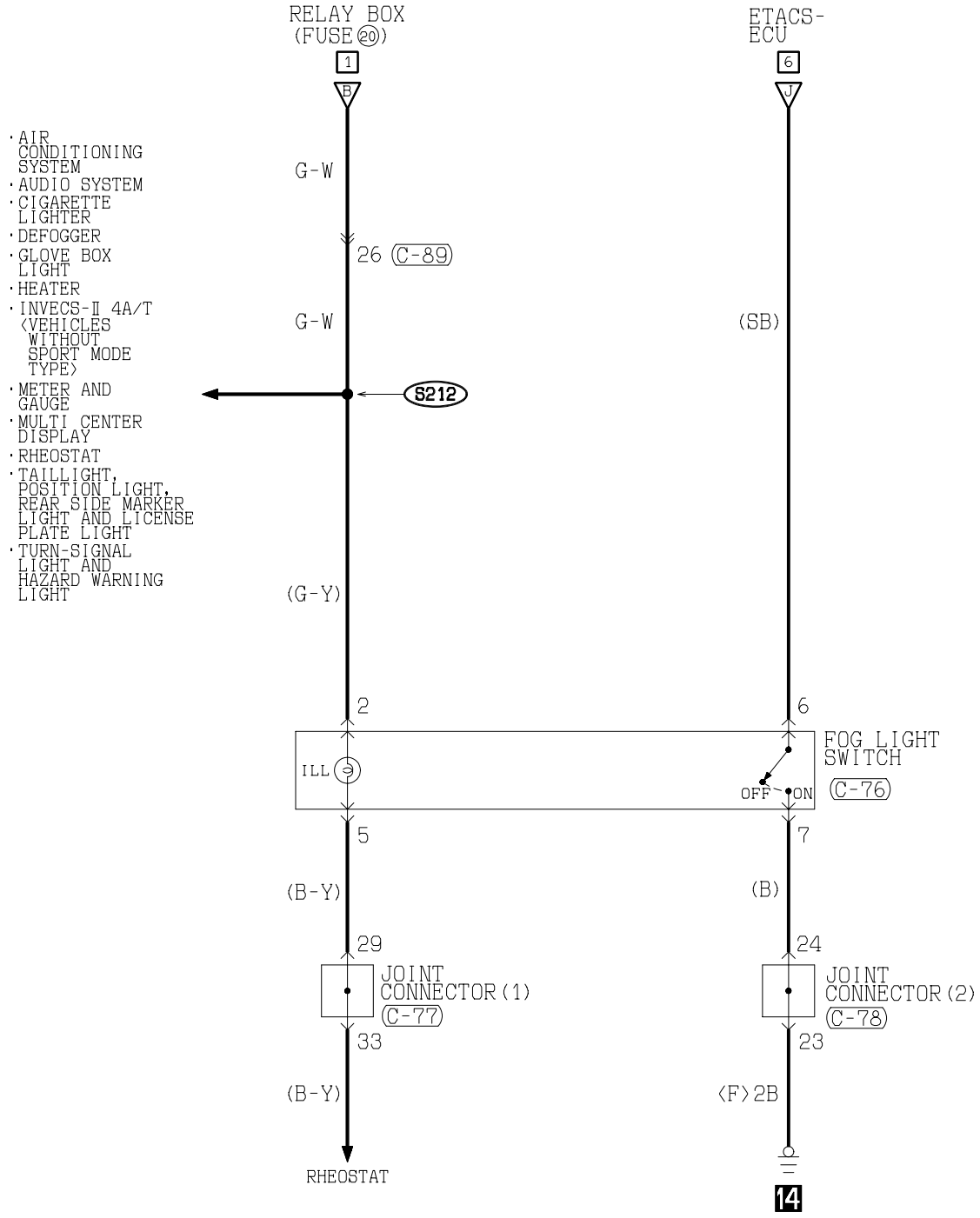
FOG LIGHT (CONTINUED)



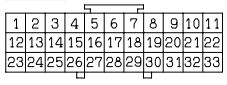
H3S08M02BA

TSB Revision

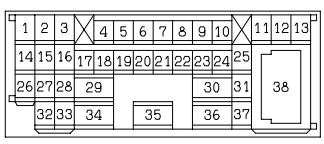
4



C-78



C-89



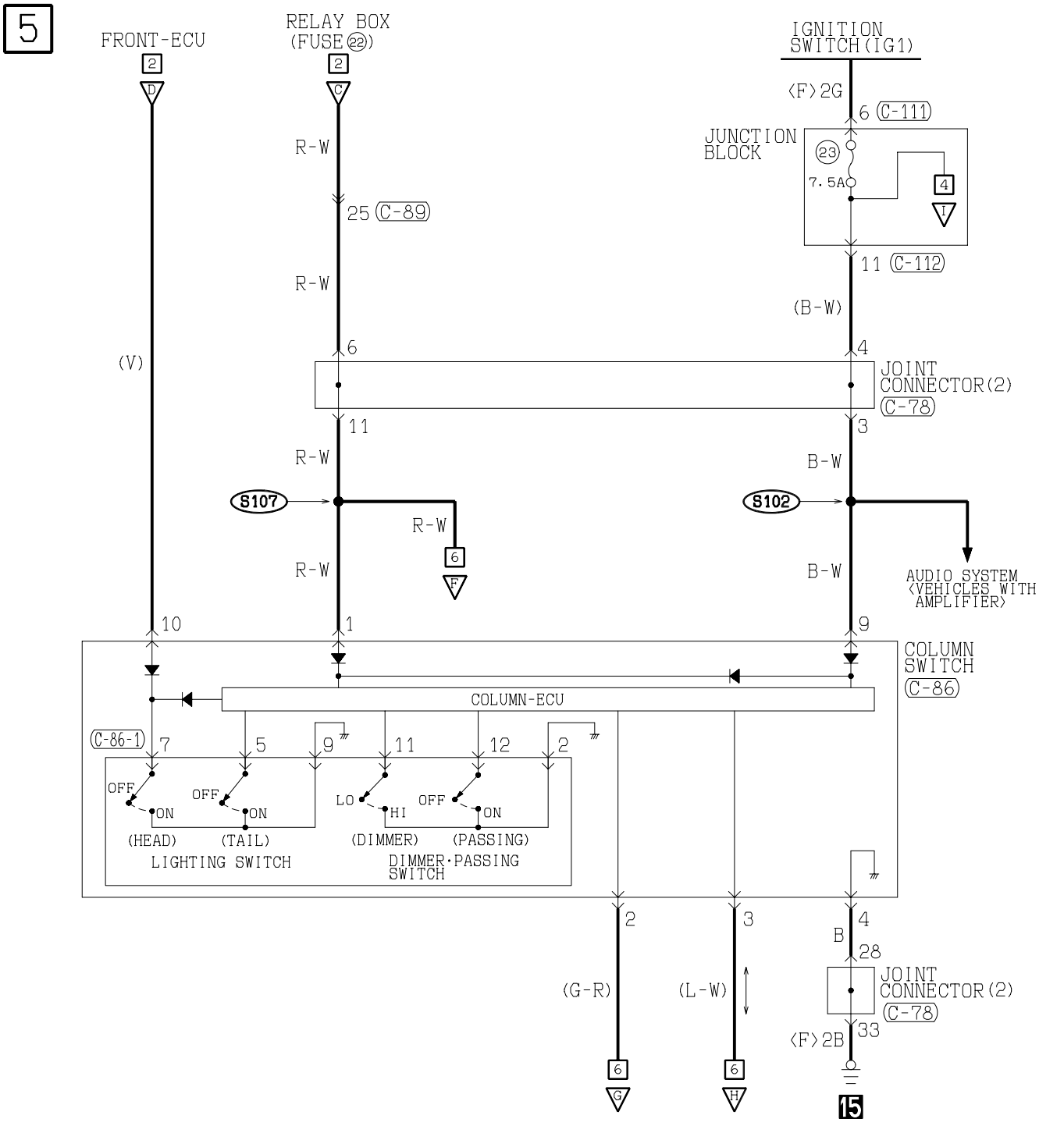
WIRE COLOR CODE

B :BLACK	LG:LIGHT GREEN	G :GREEN	L :BLUE
BR:BROWN	O :ORANGE	GR:GRAY	R :RED
W :WHITE	SB:SKY BLUE	P :PINK	Y :YELLOW
V :VIOLET			

H3S08M02BB

TSB Revision

FOG LIGHT (CONTINUED)



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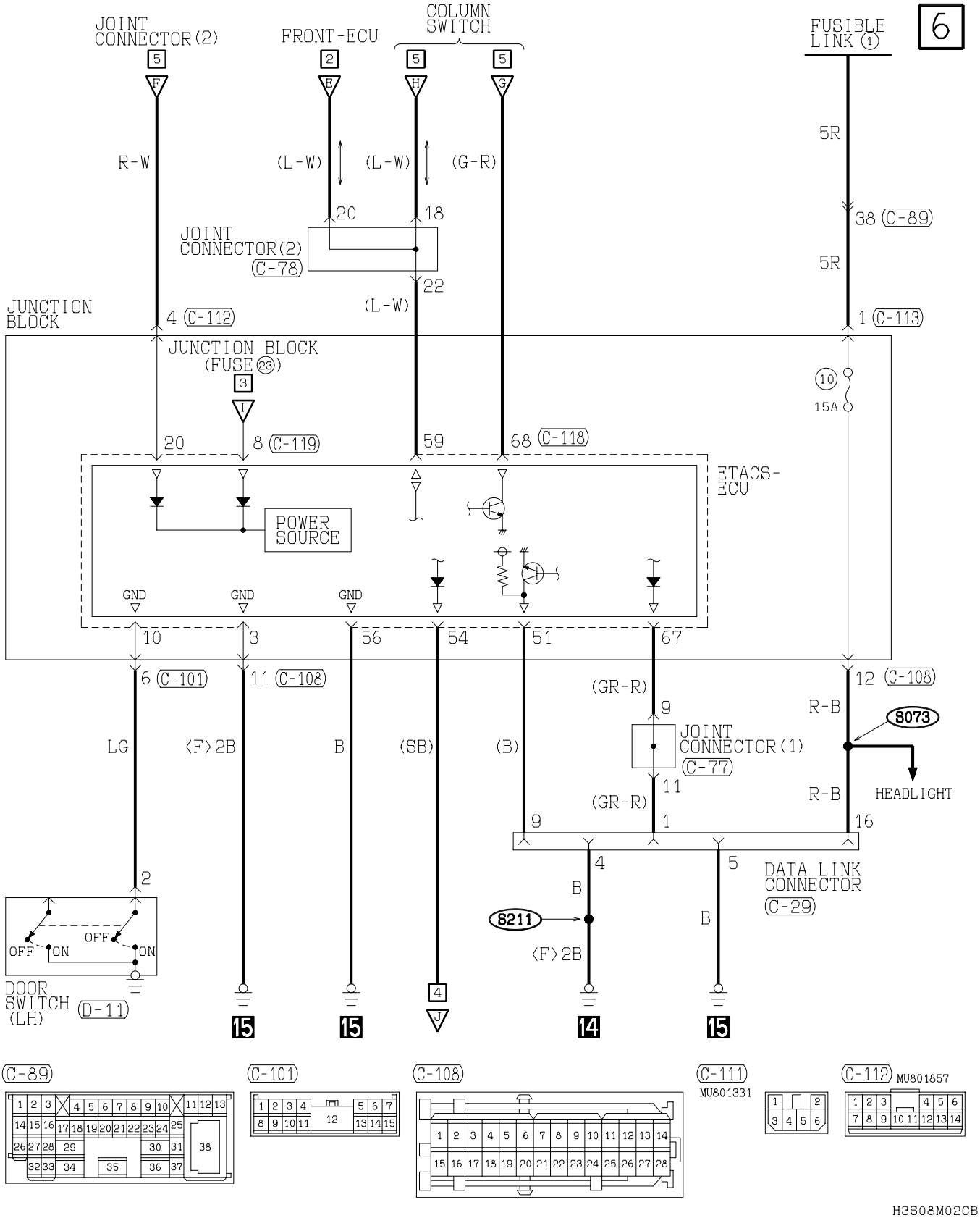
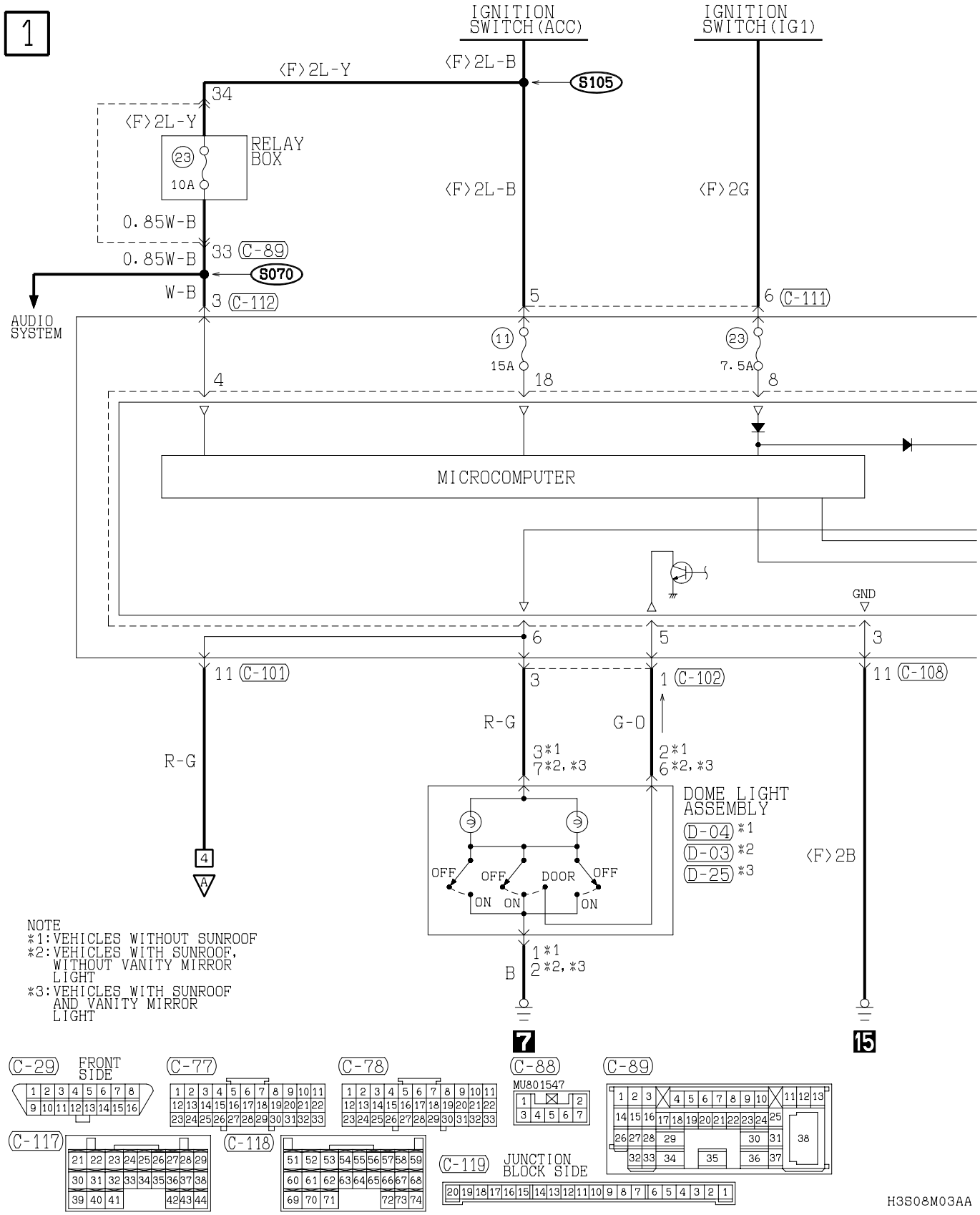


TSB Revision

DOME LIGHT AND LUGGAGE COMPARTMENT LIGHT <ECLIPSE>

M1901002100186



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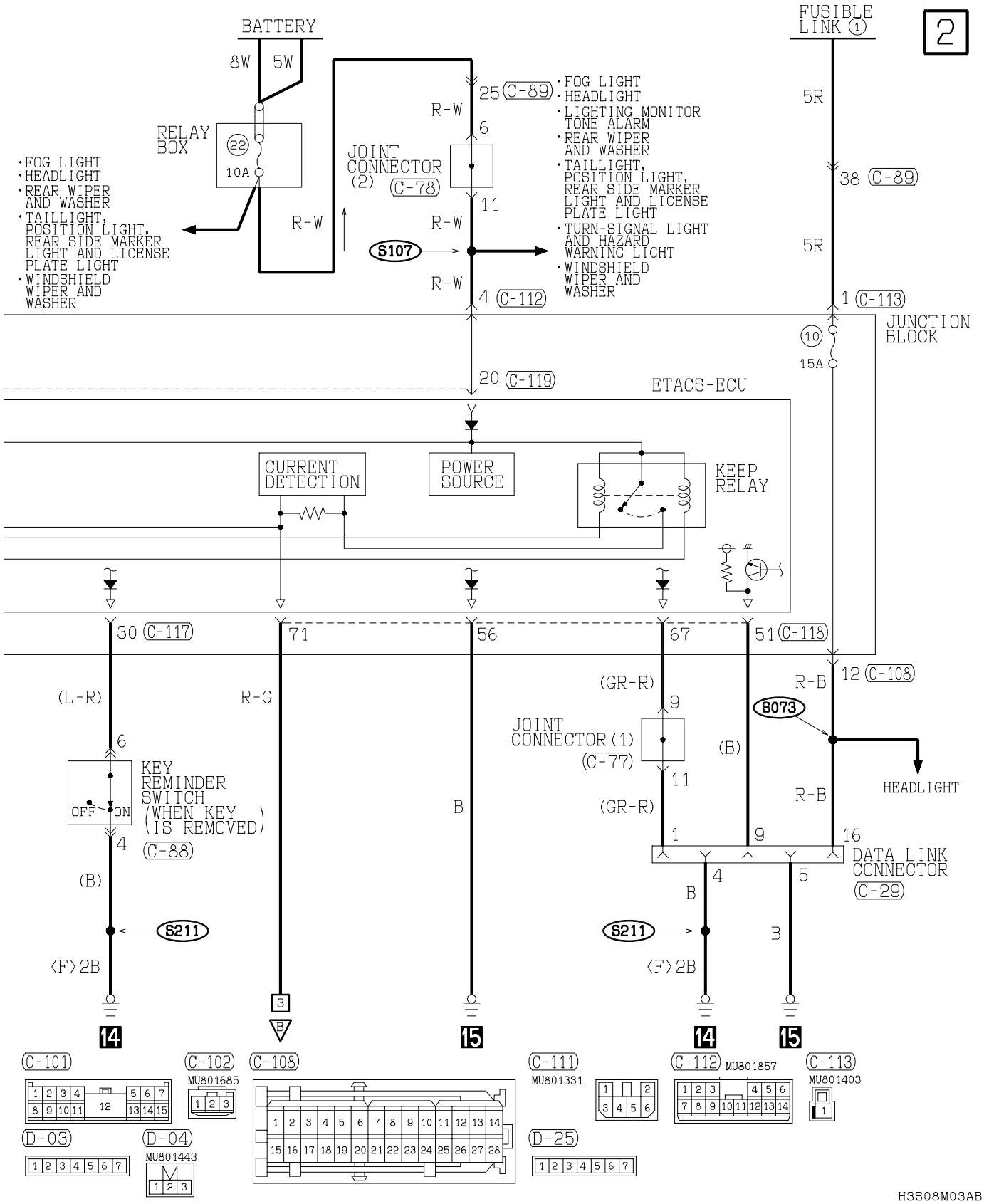
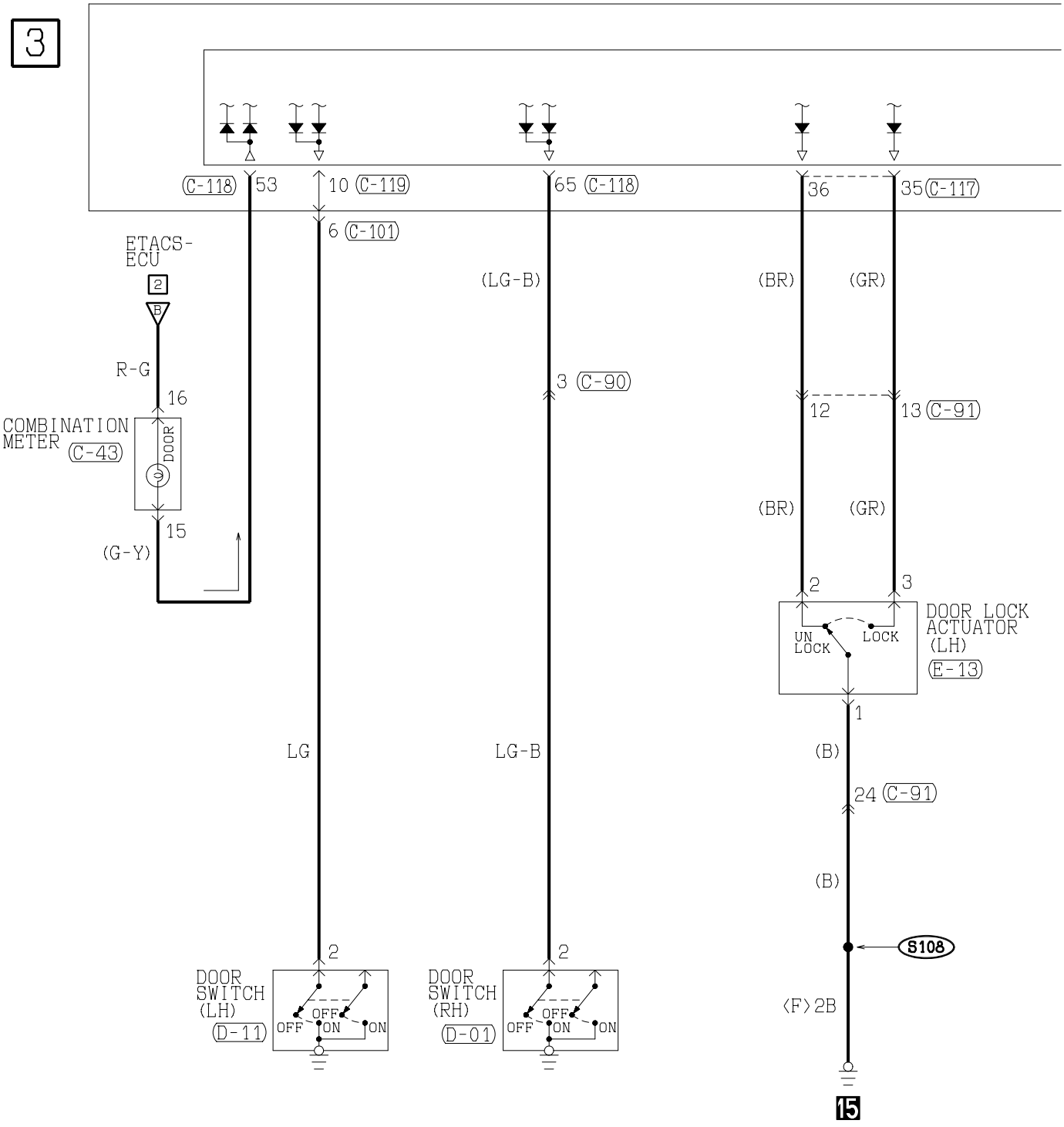


TSB Revision

DOME LIGHT AND LUGGAGE COMPARTMENT LIGHT <ECLIPSE> (CONTINUED)



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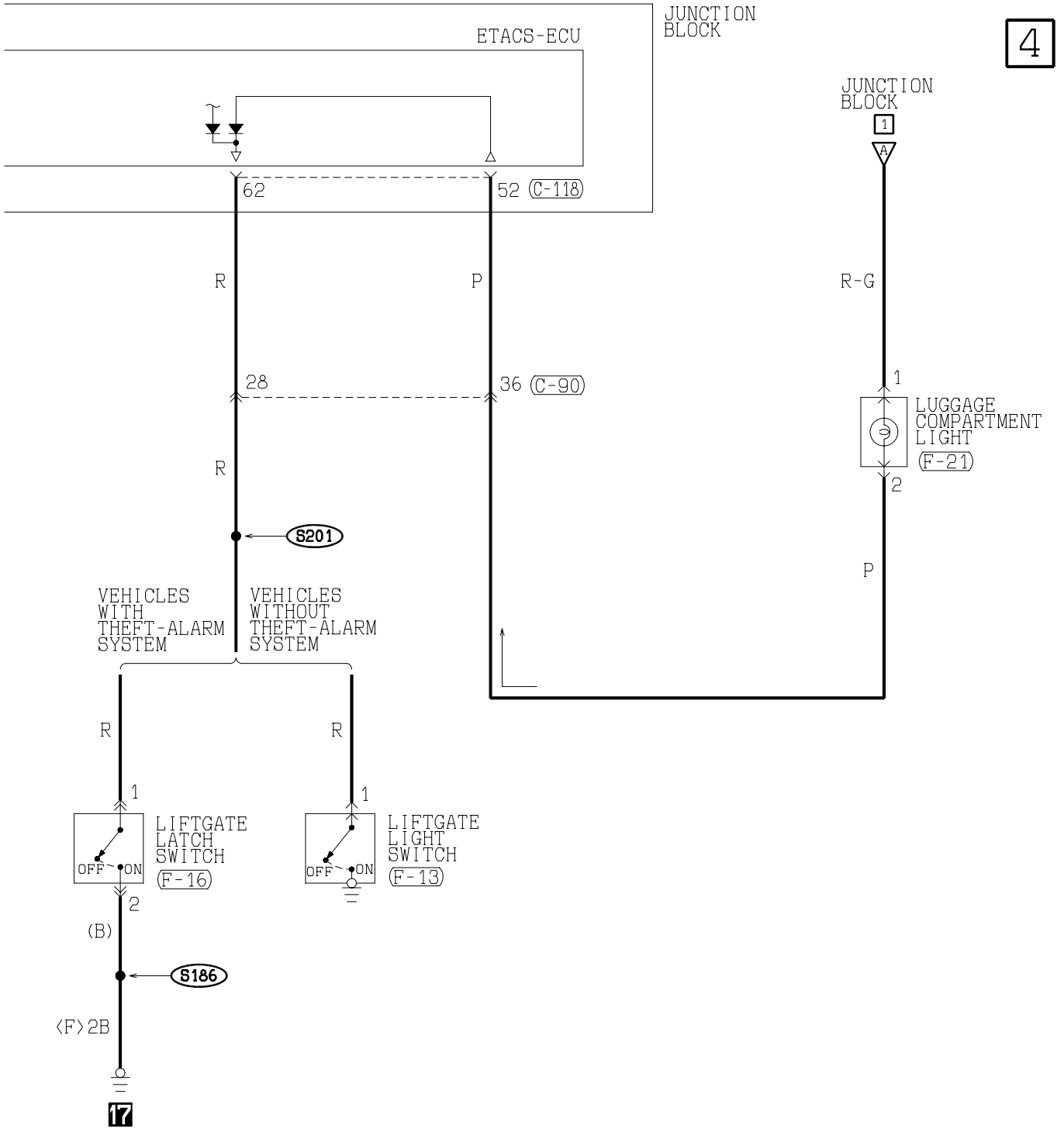
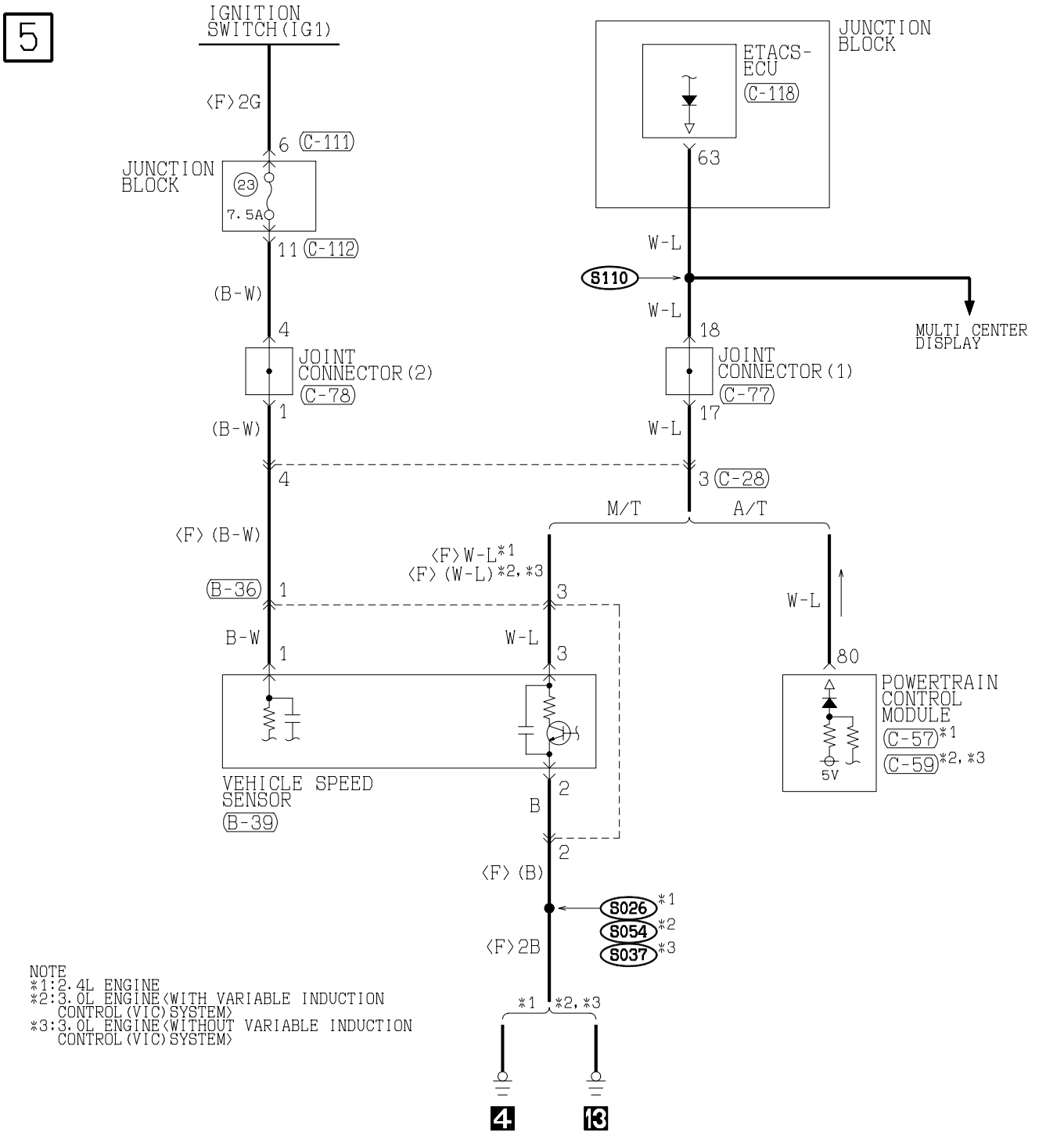


TSB Revision

DOME LIGHT AND LUGGAGE COMPARTMENT LIGHT <ECLIPSE> (CONTINUED)

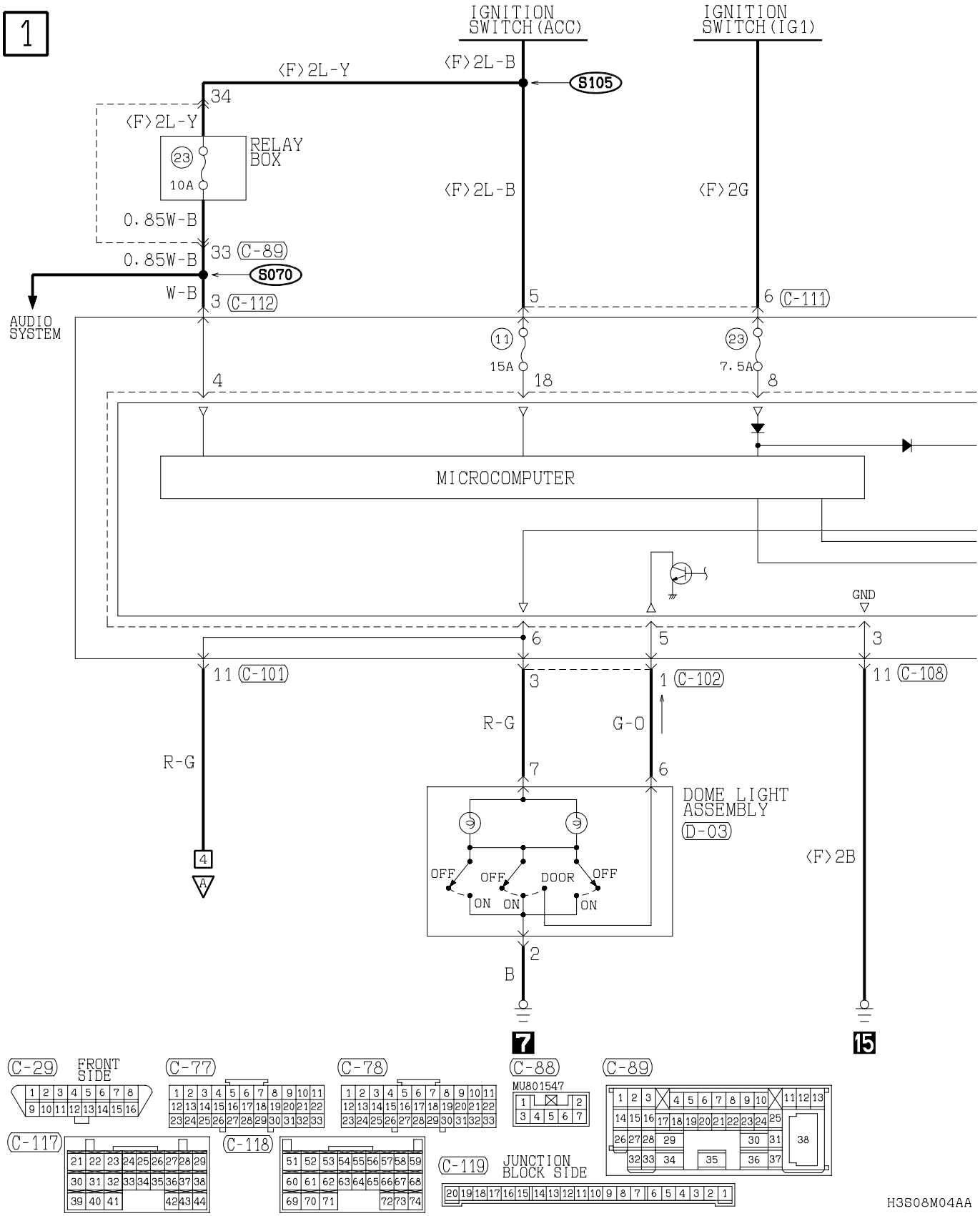


TSB Revision

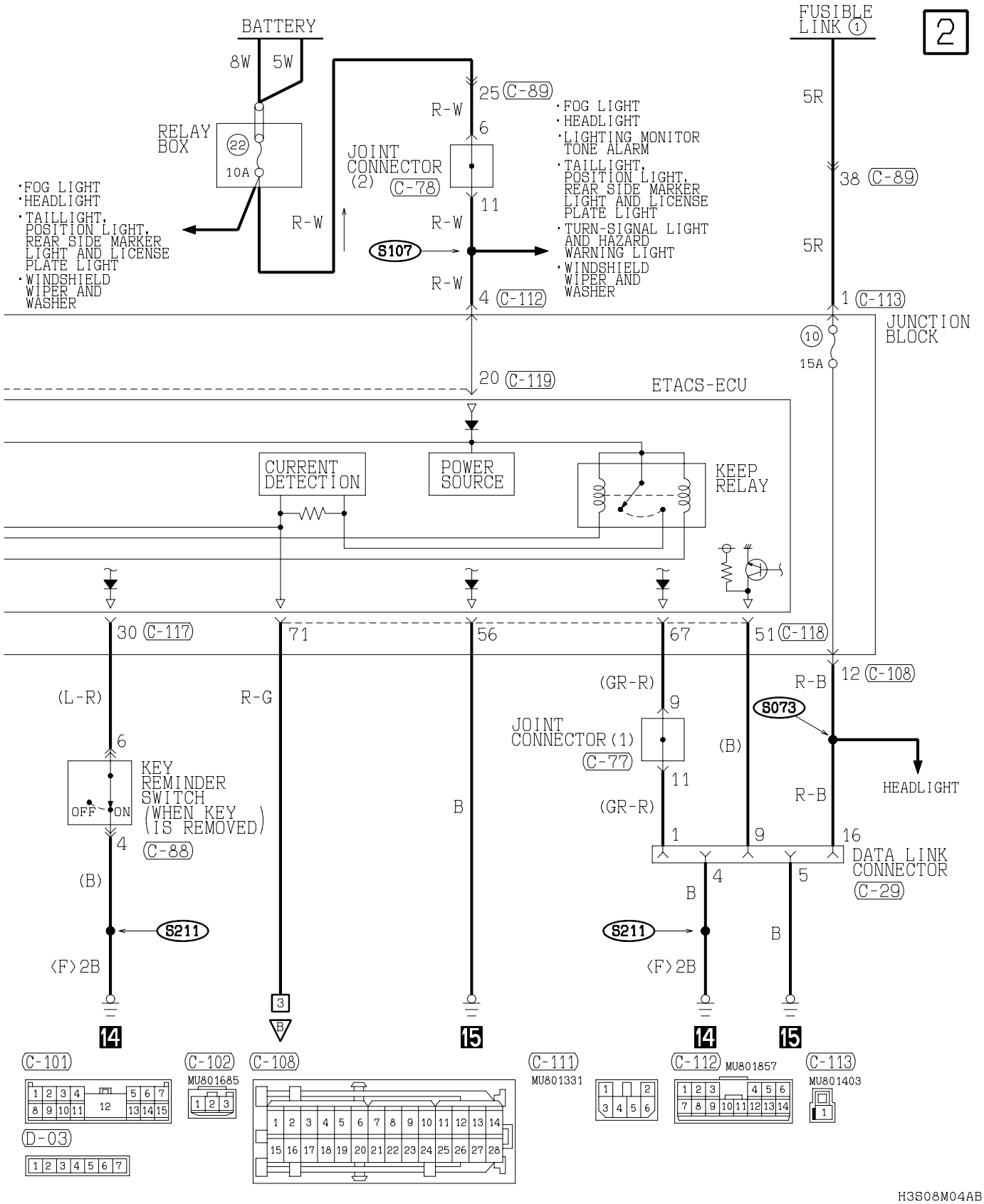
NOTES

DOME LIGHT AND TRUNK LIGHT <ECLIPSE SPYDER>

M1901002100197

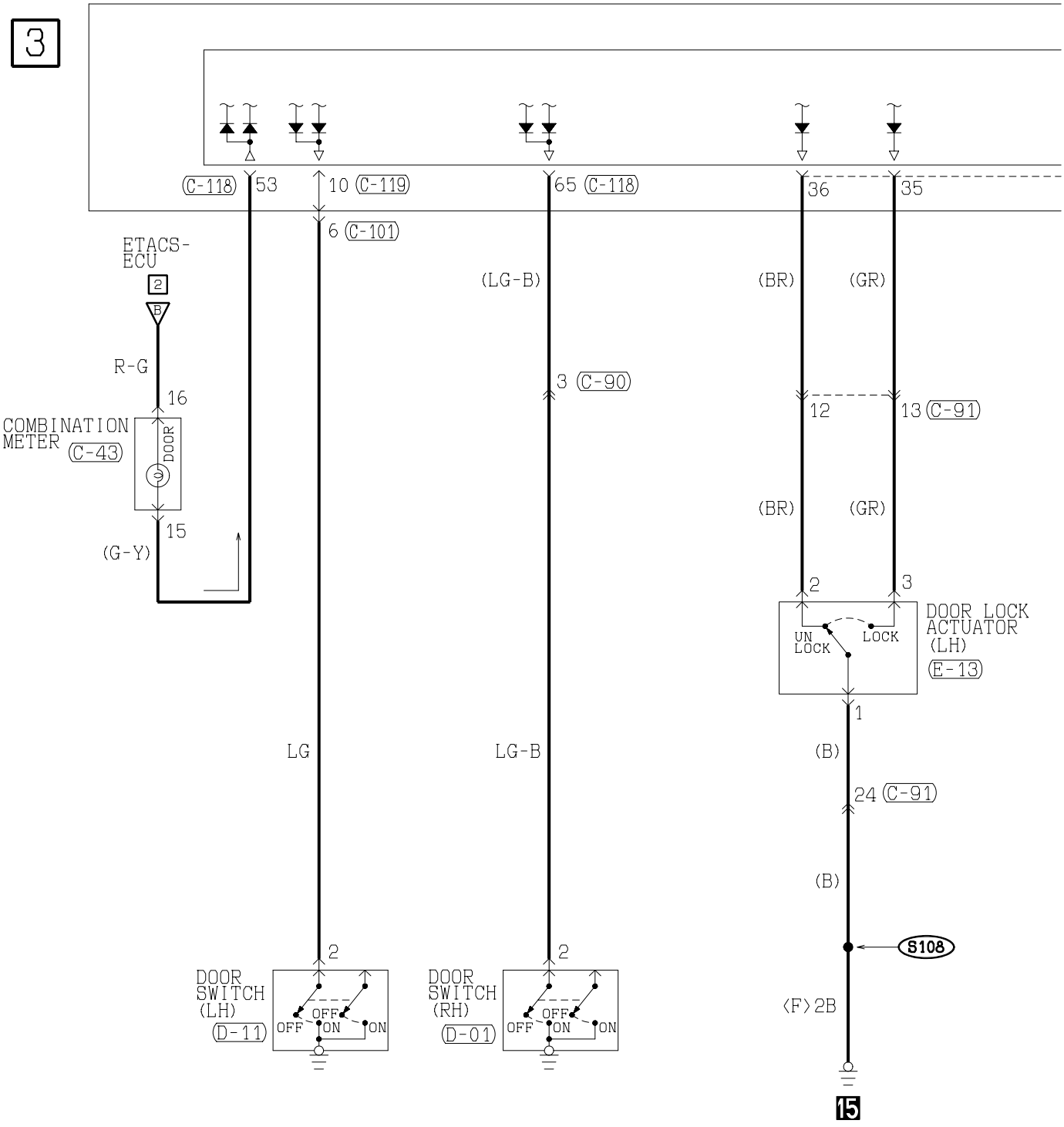


TSB Revision



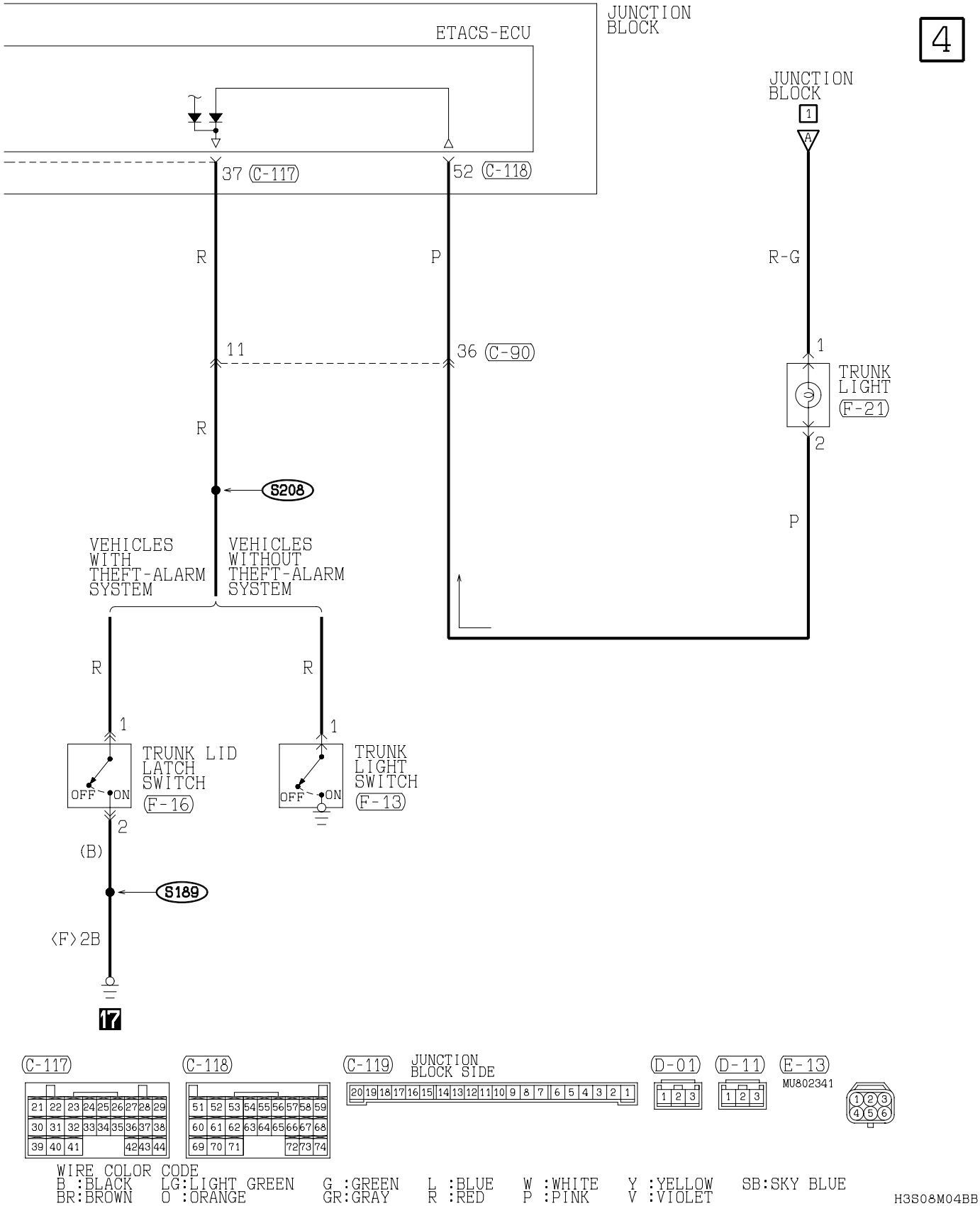
TSB Revision

DOME LIGHT AND LUGGAGE COMPARTMENT LIGHT <ECLIPSE SPYDER> (CONTINUED)



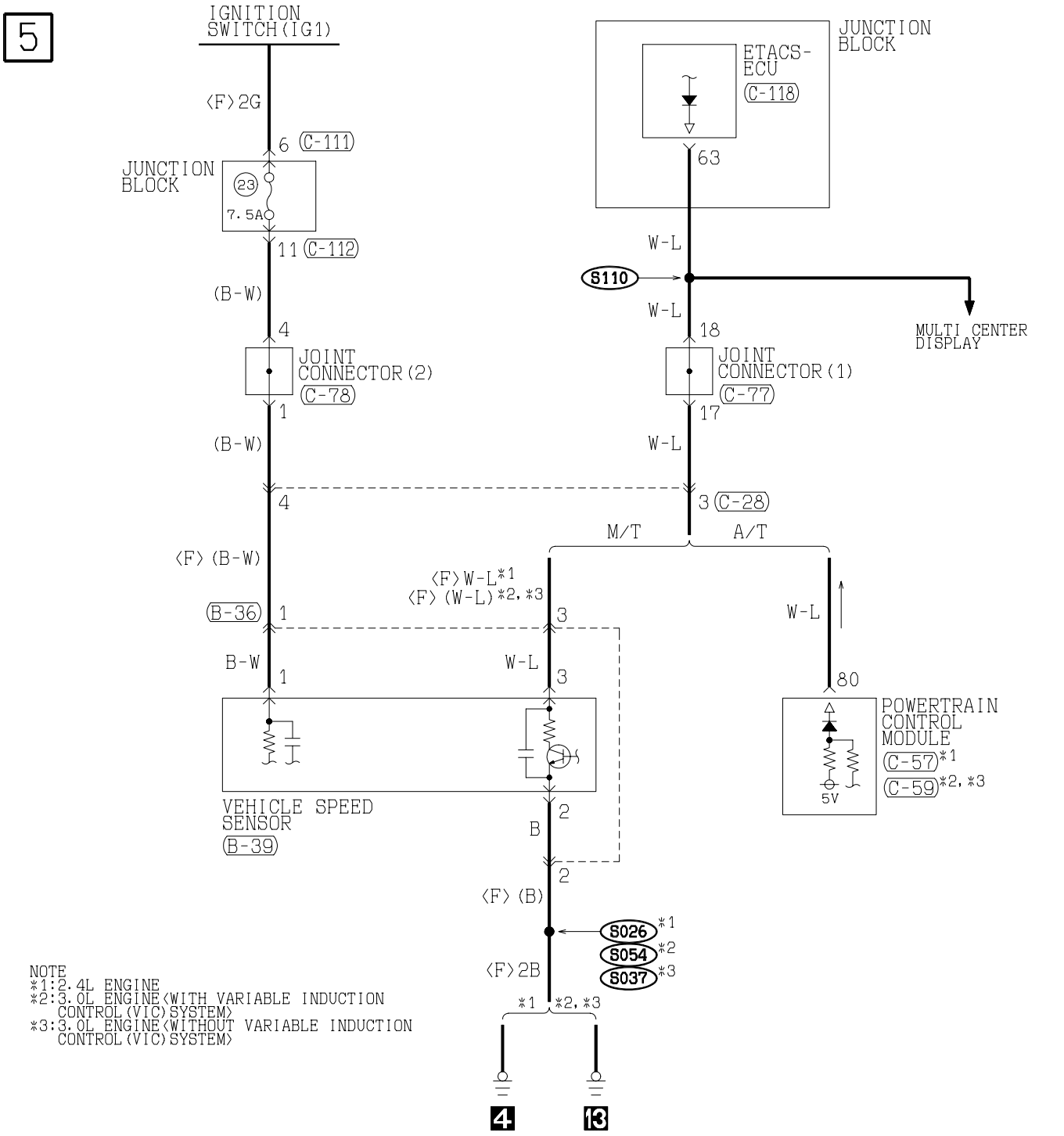
H3S08M04BA

TSB Revision



TSB Revision

DOME LIGHT AND LUGGAGE COMPARTMENT LIGHT <ECLIPSE SPYDER> (CONTINUED)

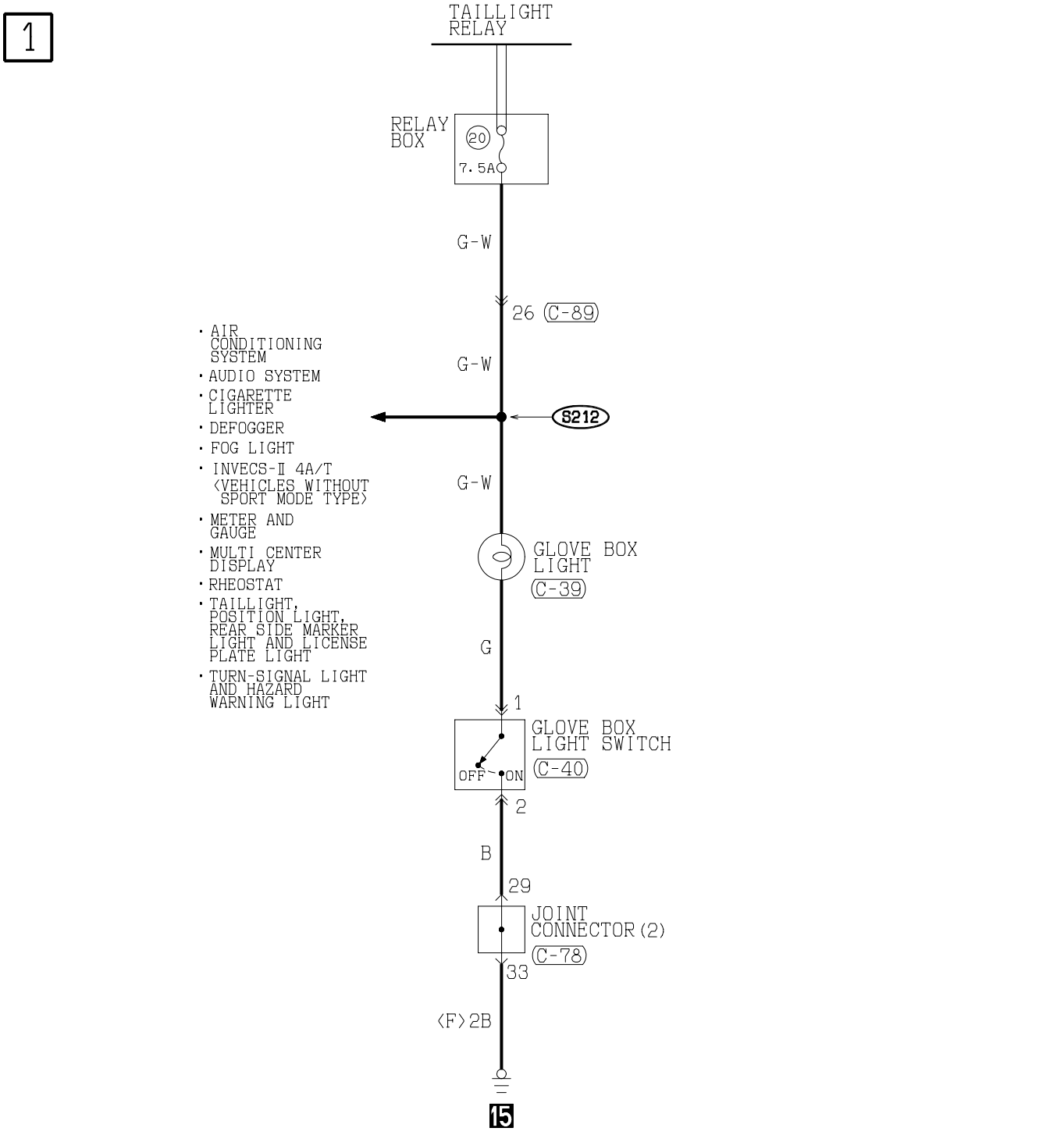


TSB Revision

NOTES

GLOVE BOX LIGHT

M1901002200194

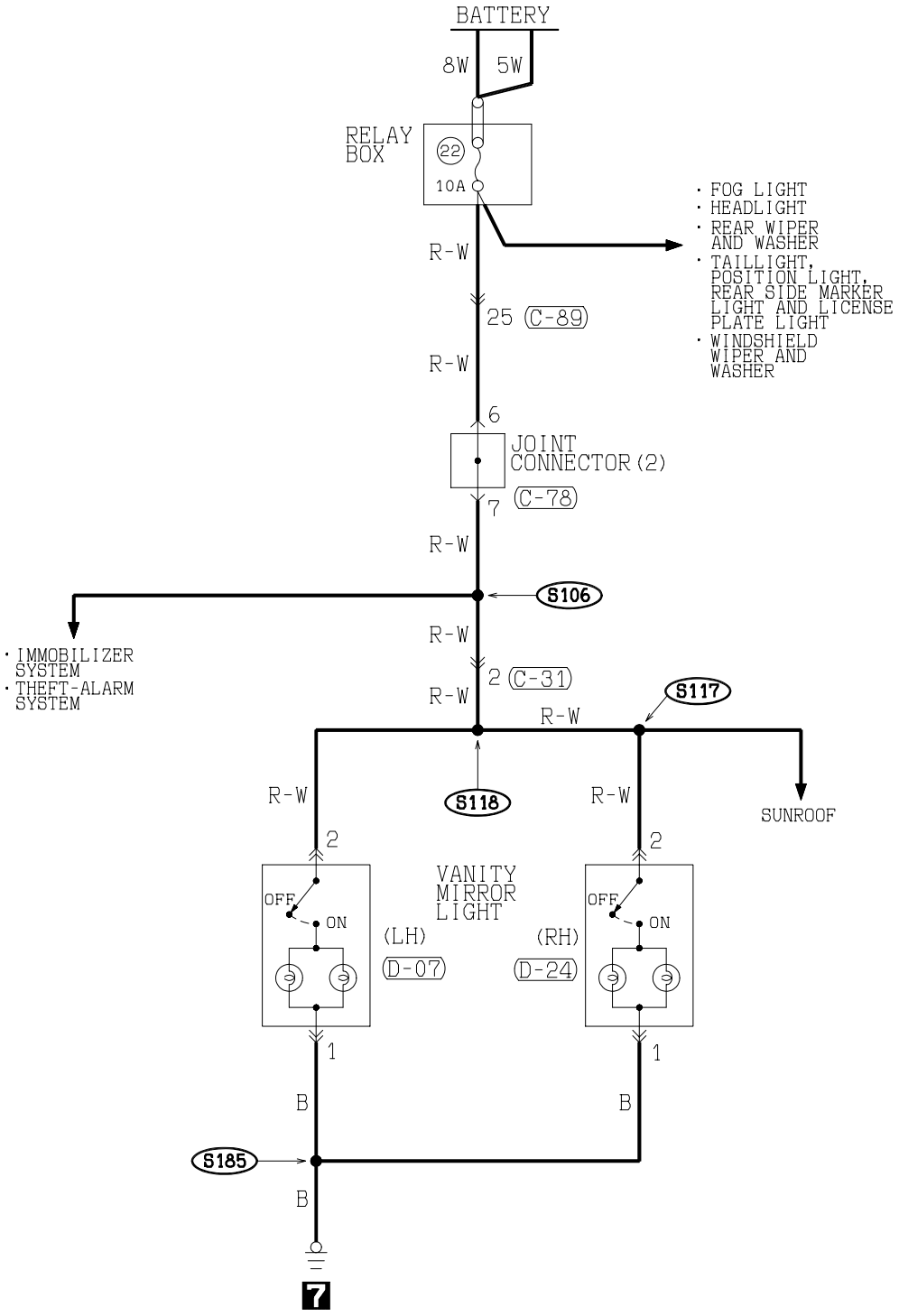


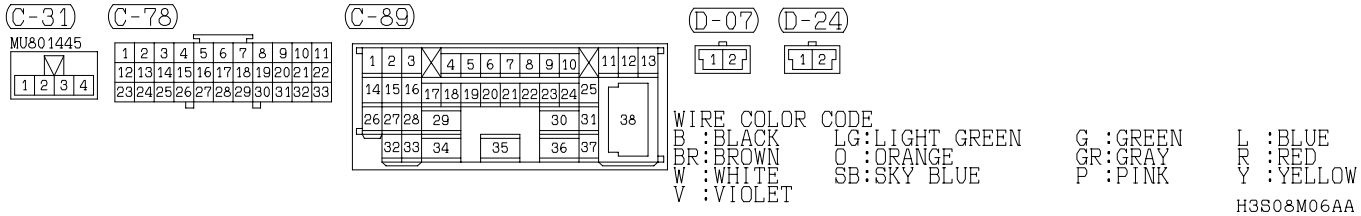
H3S08M05AA

TSB Revision

VANITY MIRROR LIGHT

M1901002400206



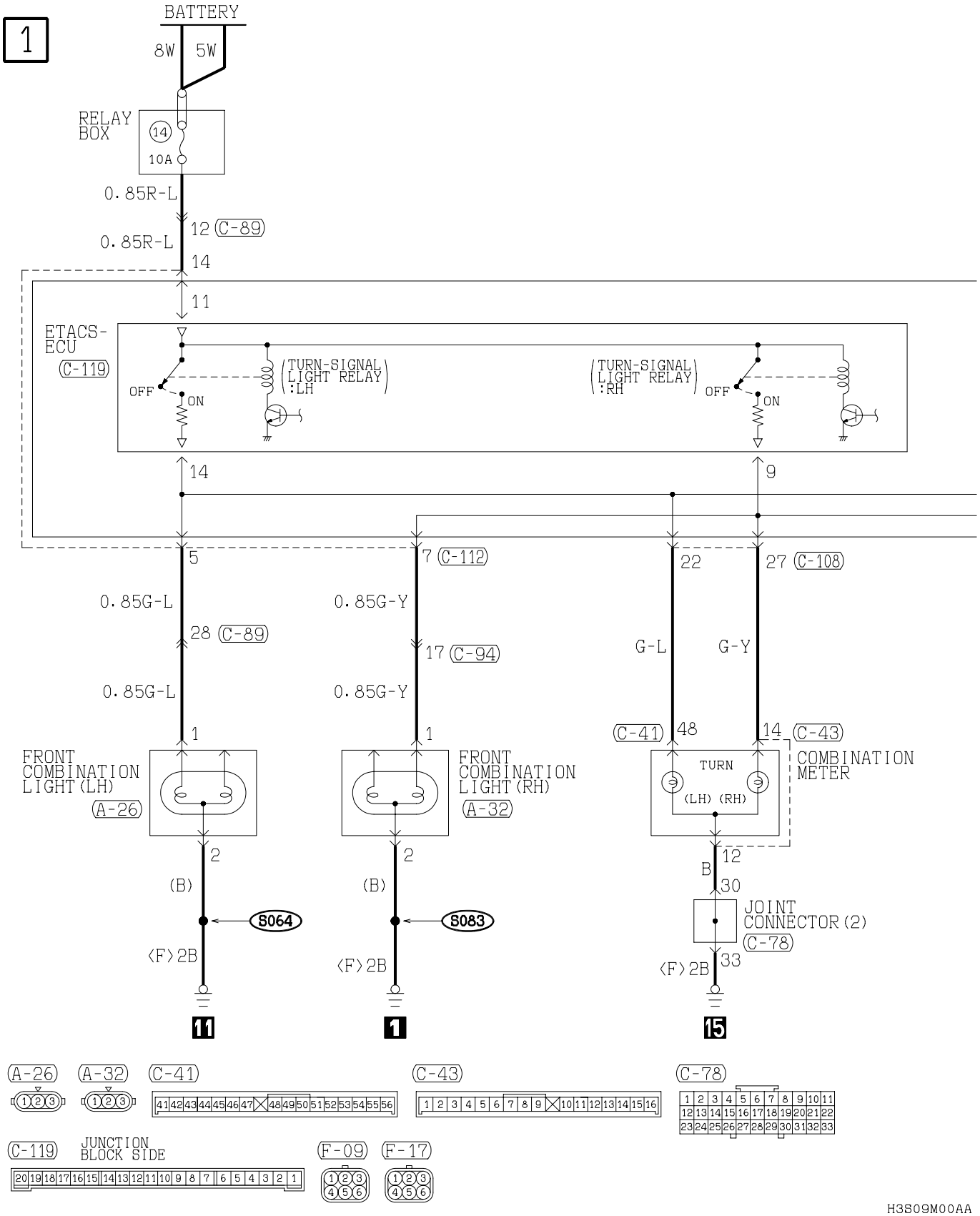


H3S08M06AA

TSB Revision

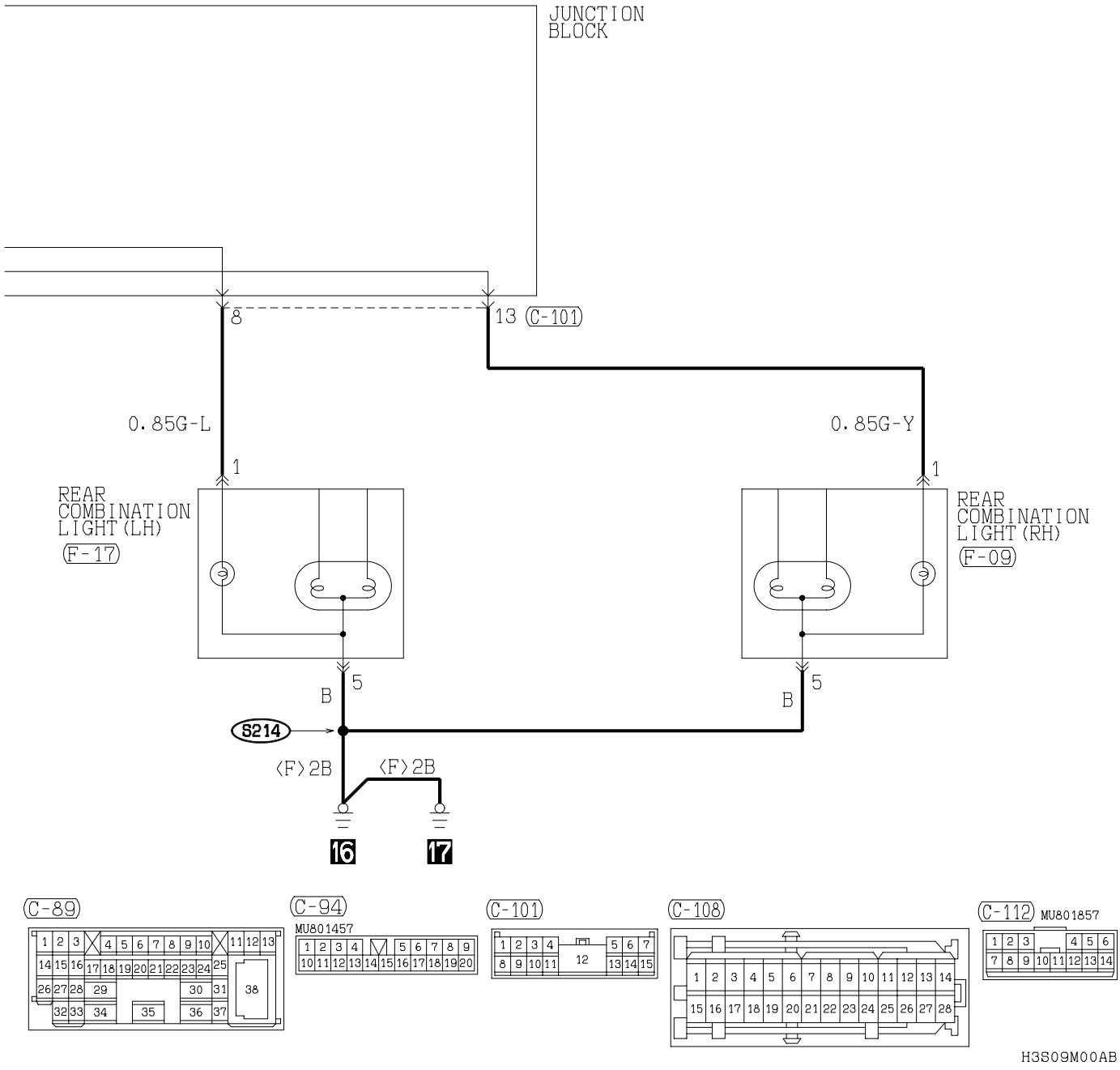
TURN-SIGNAL LIGHT AND HAZARD WARNING LIGHT

M1901002900427



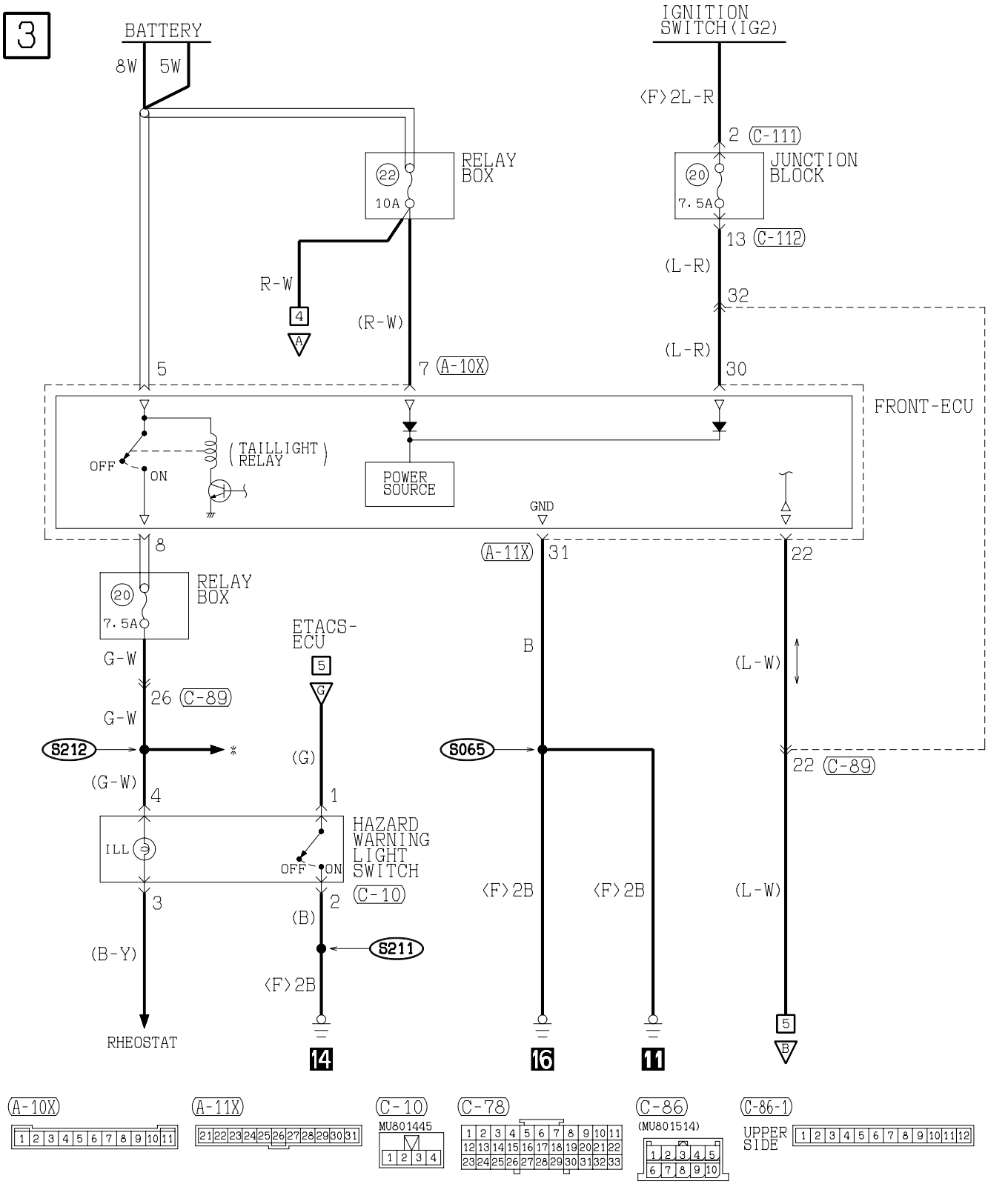
TSB Revision

2



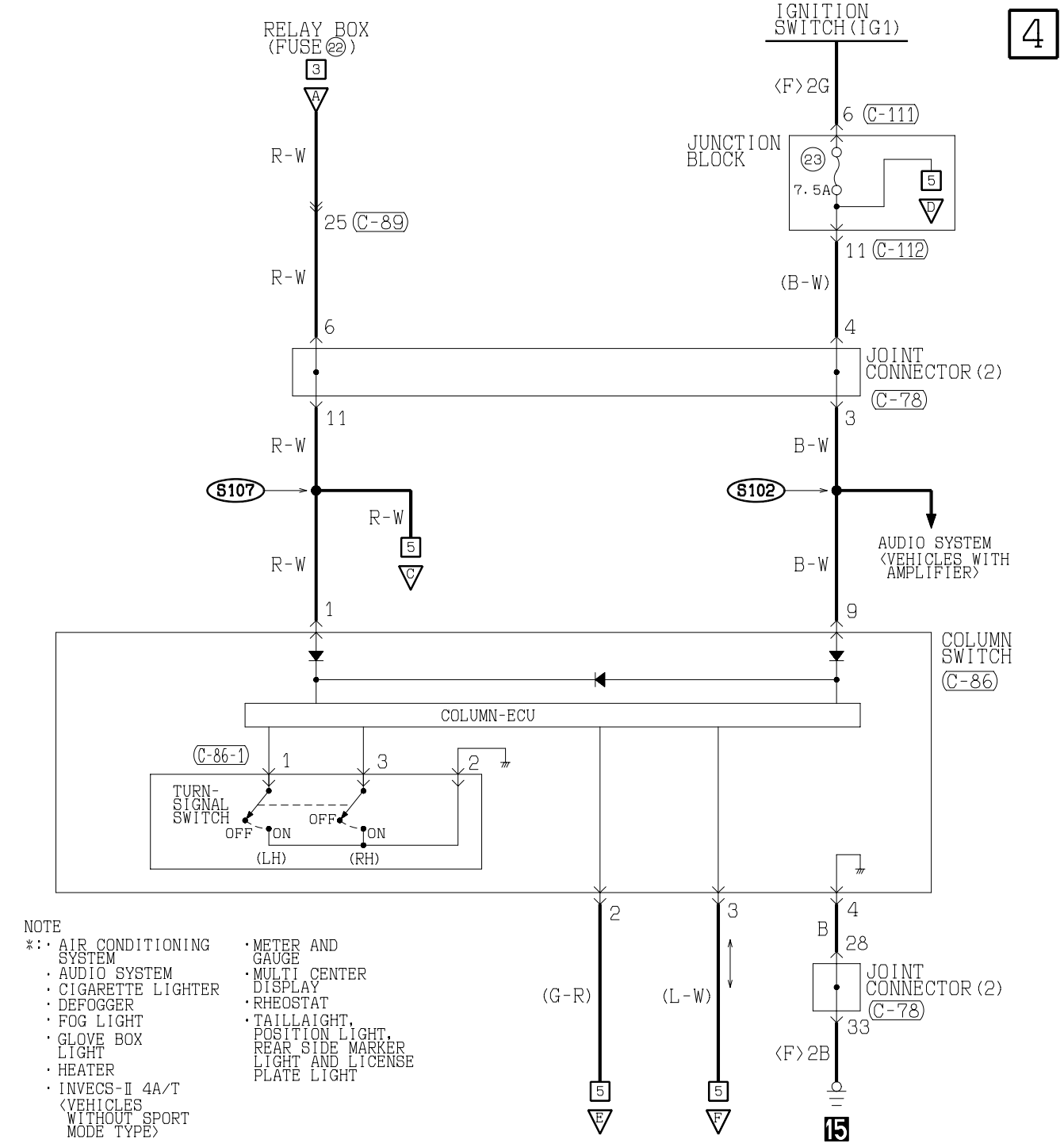
TSB Revision

TURN-SIGNAL LIGHT AND HAZARD WARNING LIGHT (CONTINUED)



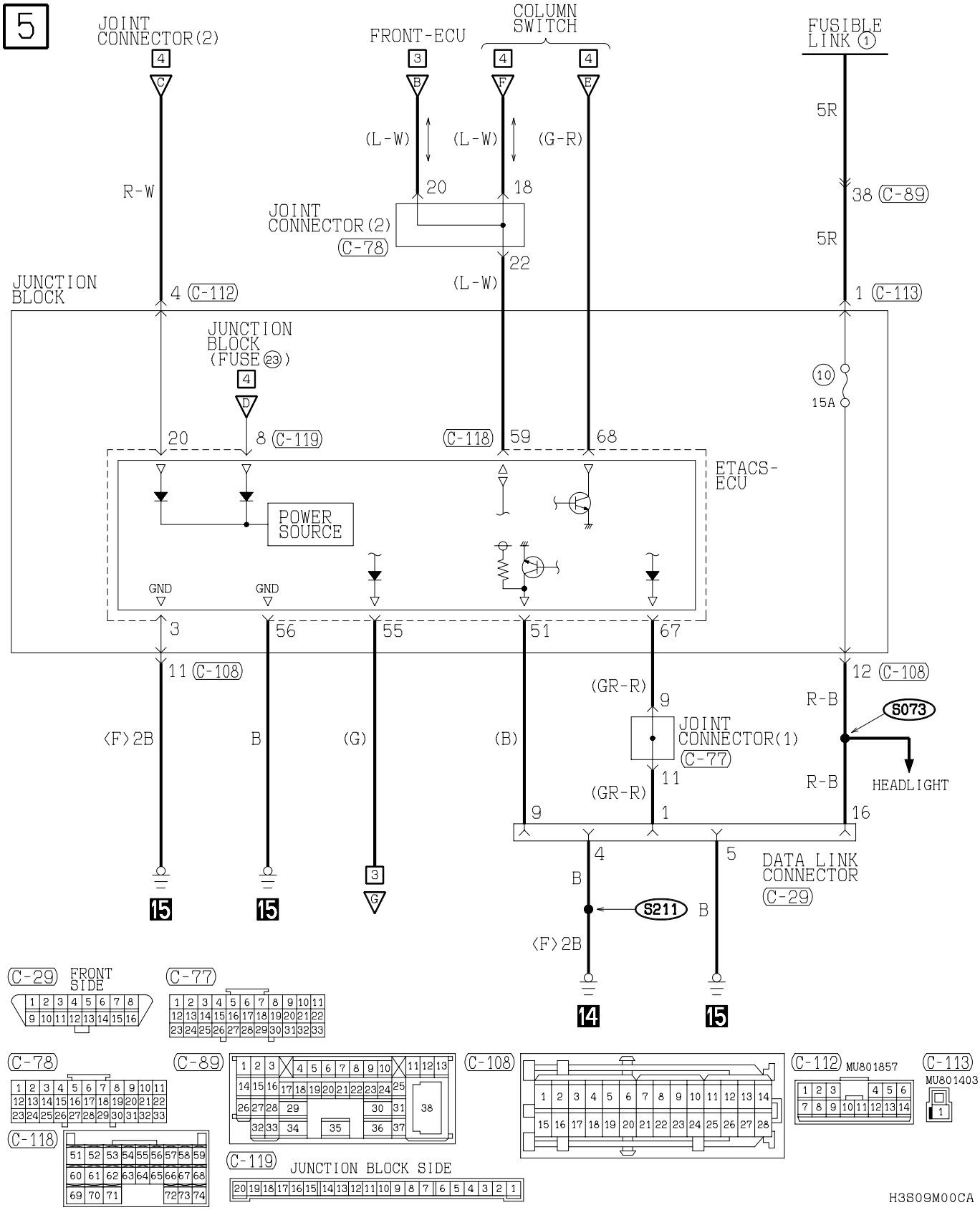
H3S09M00BA

TSB Revision



TSB Revision

TURN-SIGNAL LIGHT AND HAZARD WARNING LIGHT (CONTINUED)

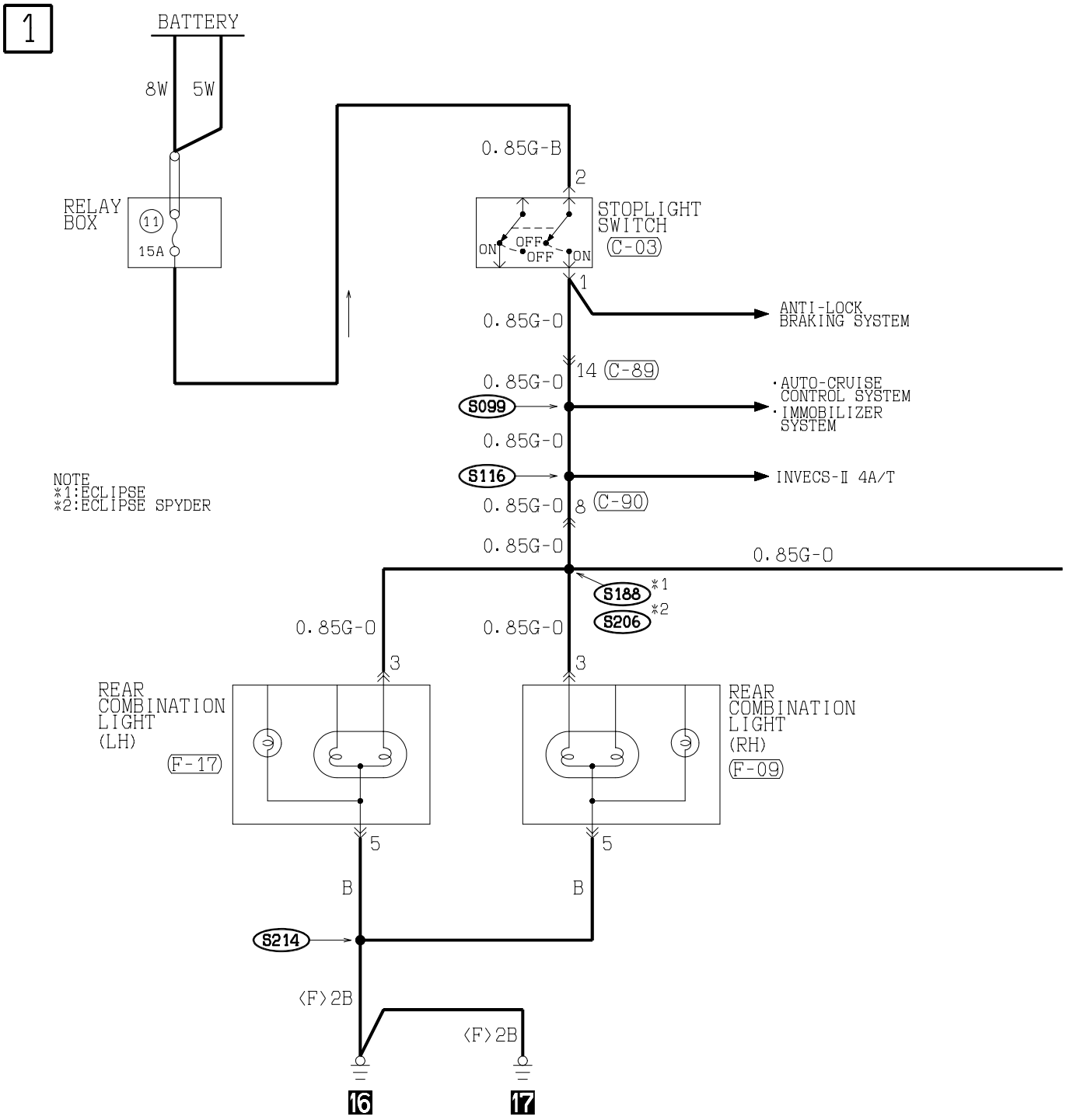


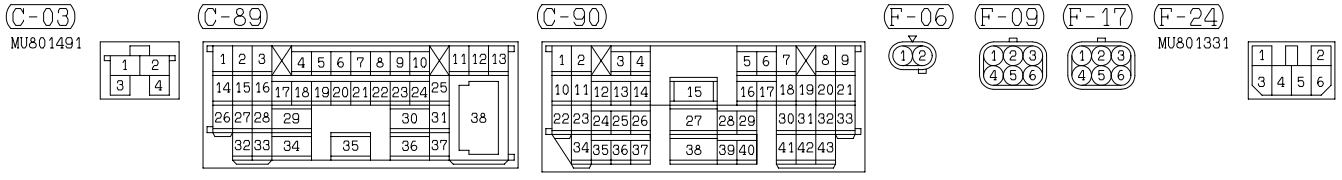
TSB Revision

NOTES

STOPLIGHT

M1901003000386

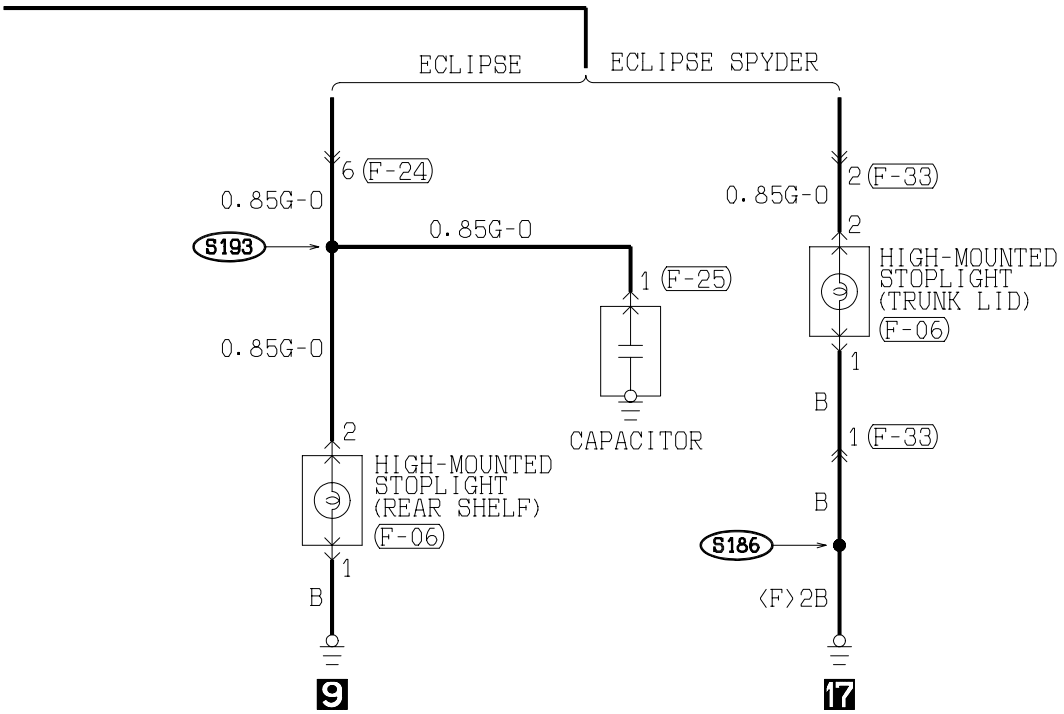


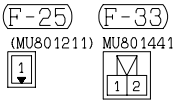


H3S09M01AA

TSB Revision

2





WIRE COLOR CODE

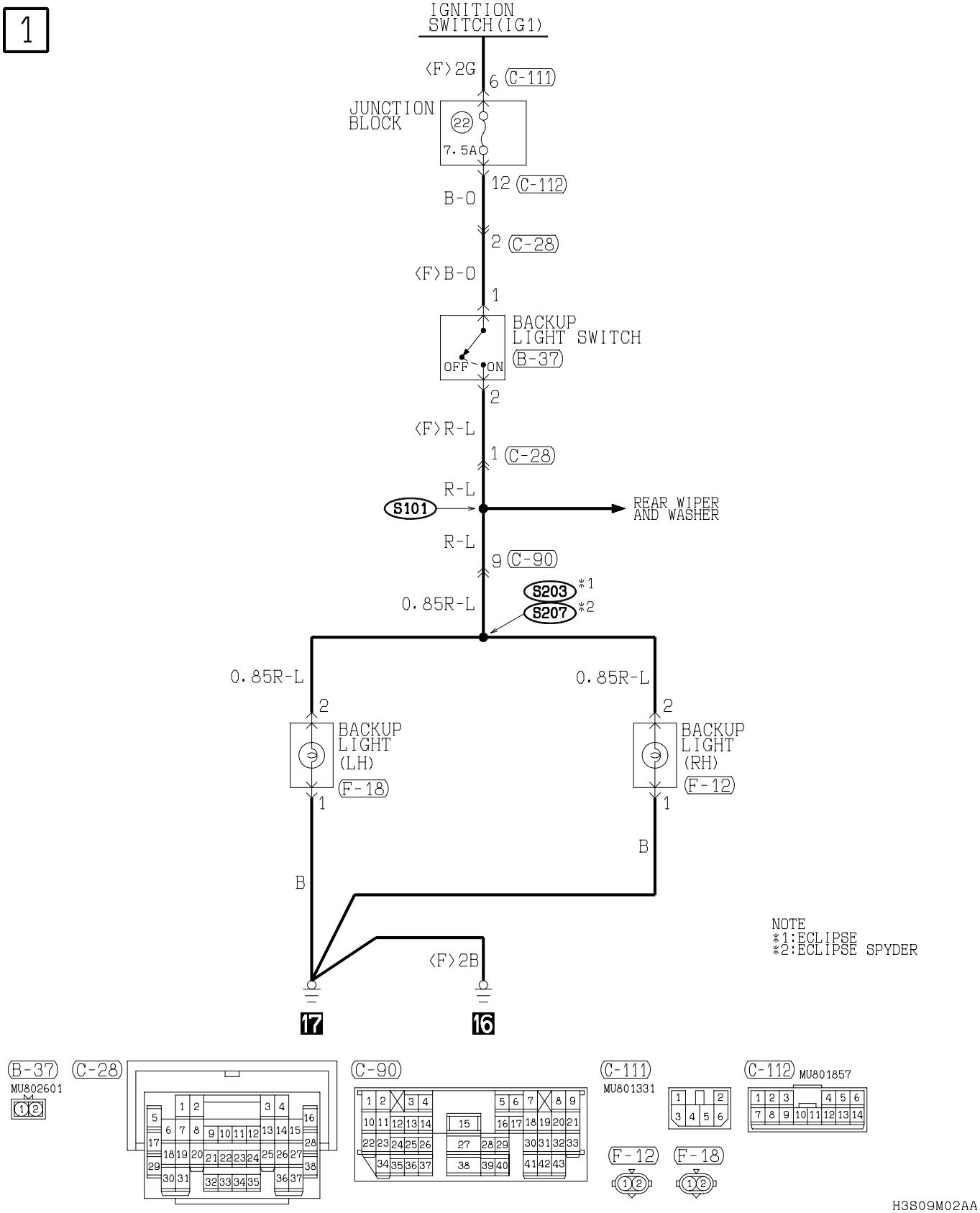
B :BLACK	LG:LIGHT GREEN	G :GREEN	L :BLUE	W :WHITE	Y :YELLOW	SB:SKY BLUE
BR:BROWN	O :ORANGE	GR:GRAY	R :RED	P :PINK	V :VIOLET	

H3S09M01AB

TSB Revision

BACKUP LIGHT <M/T>

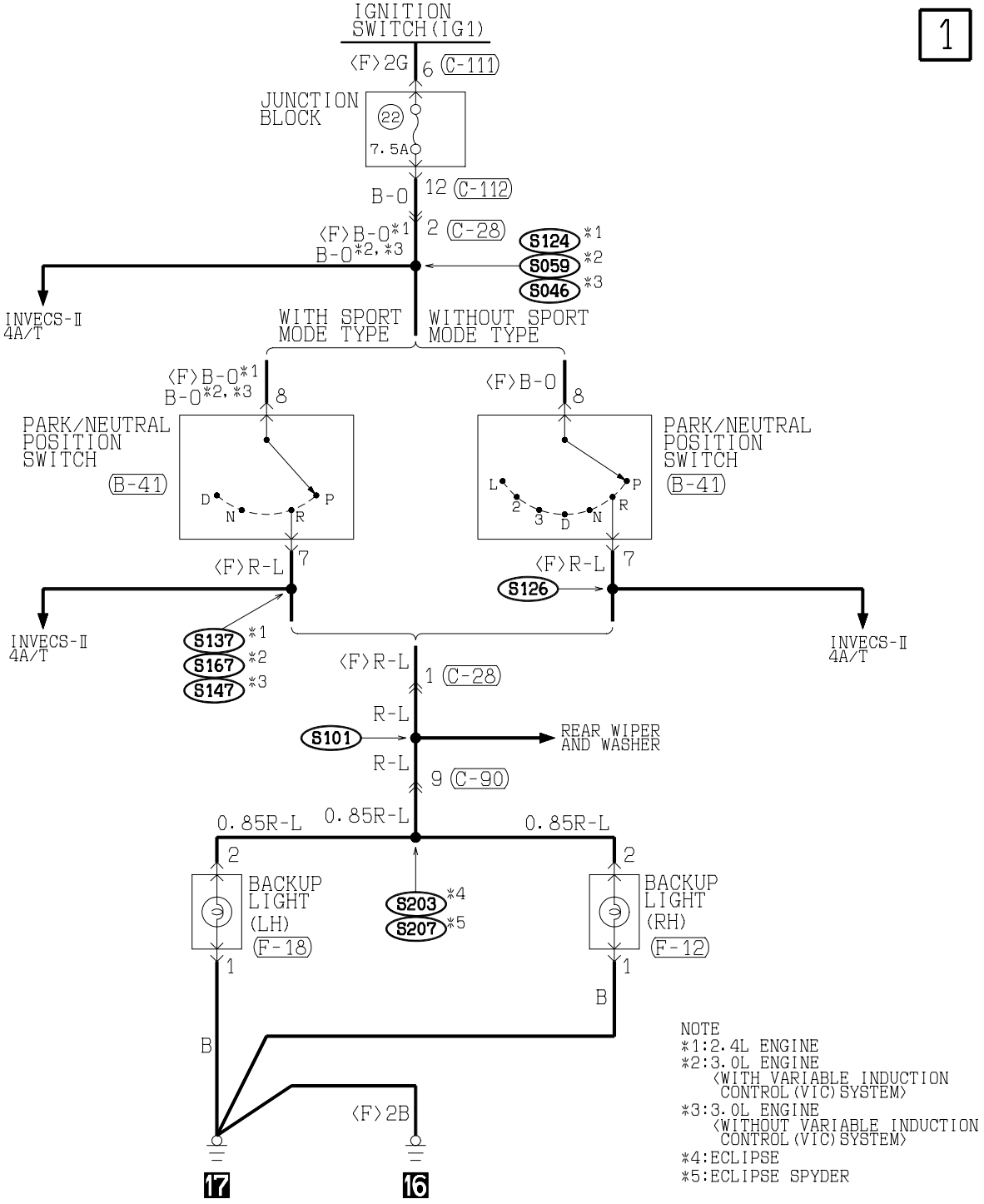
M1901003100424

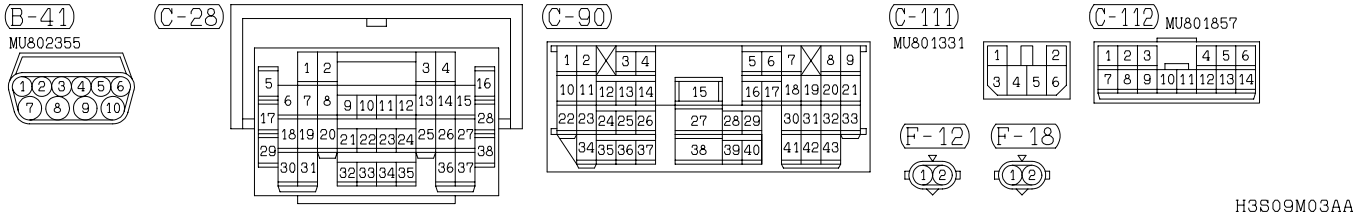


TSB Revision

BACKUP LIGHT <A/T>

M1901003100435





H3S09M03AA

TSB Revision

HORN

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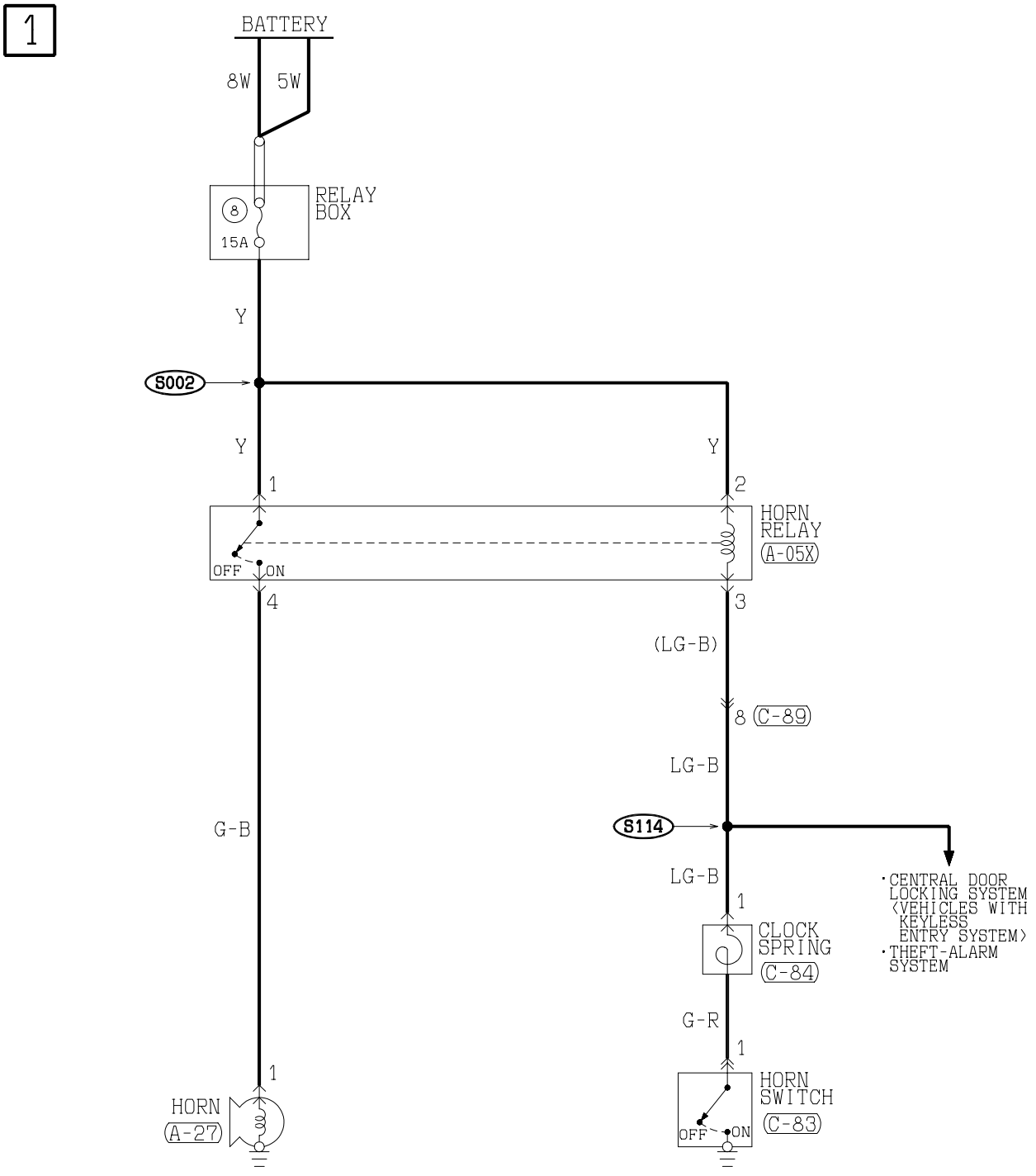


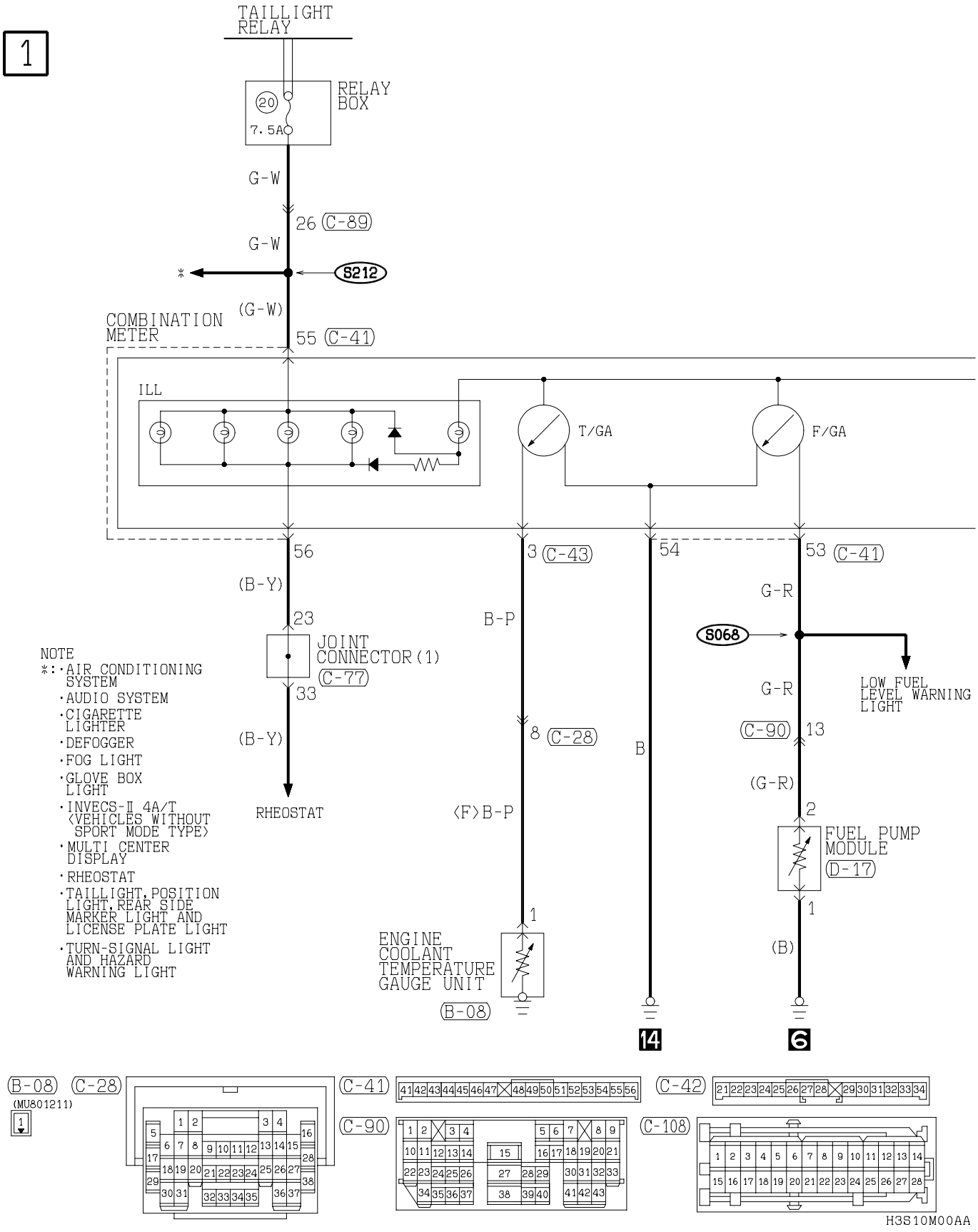
H3S09M04AA

TSB Revision

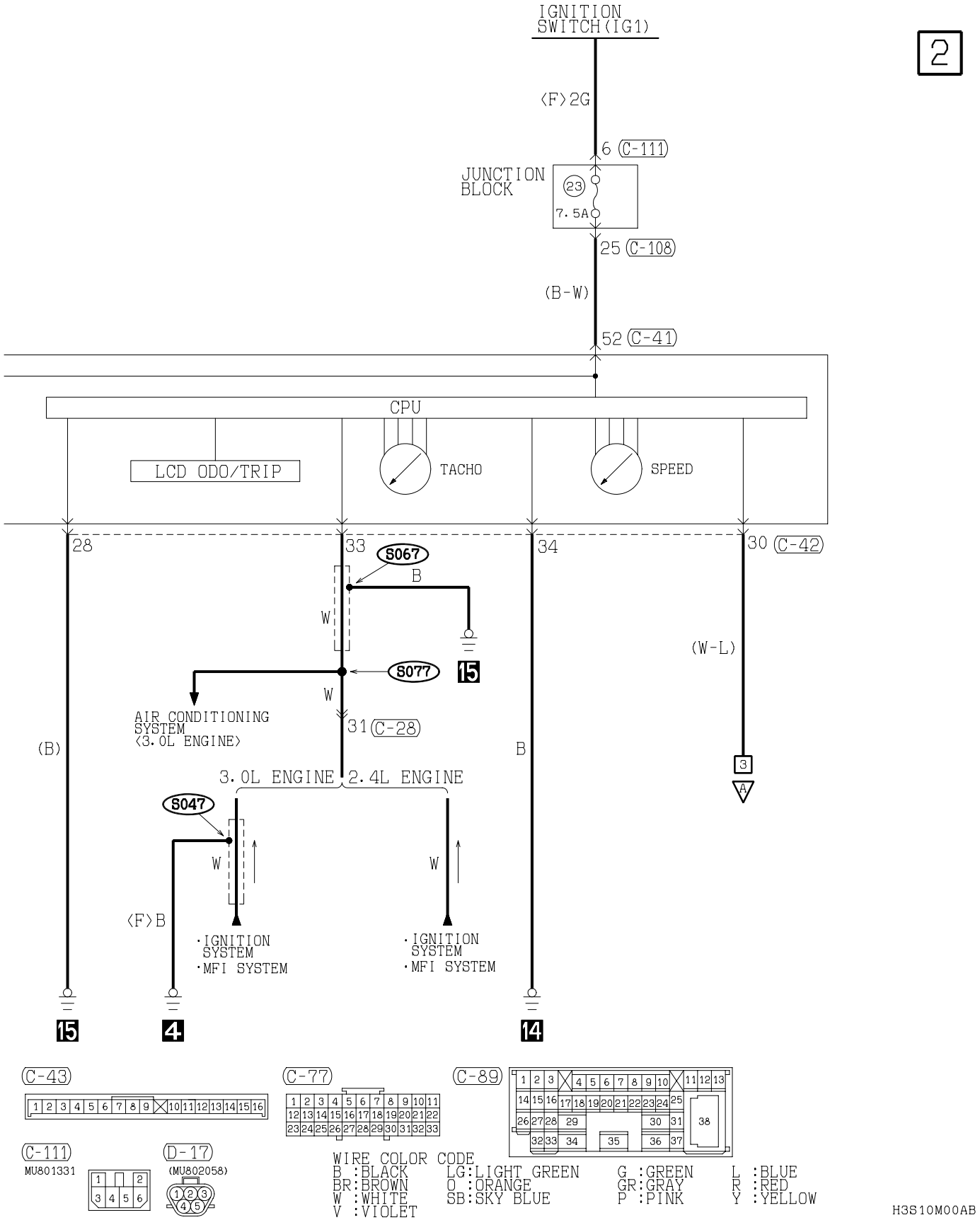
NOTES

METER AND GAUGE

M1901003500336

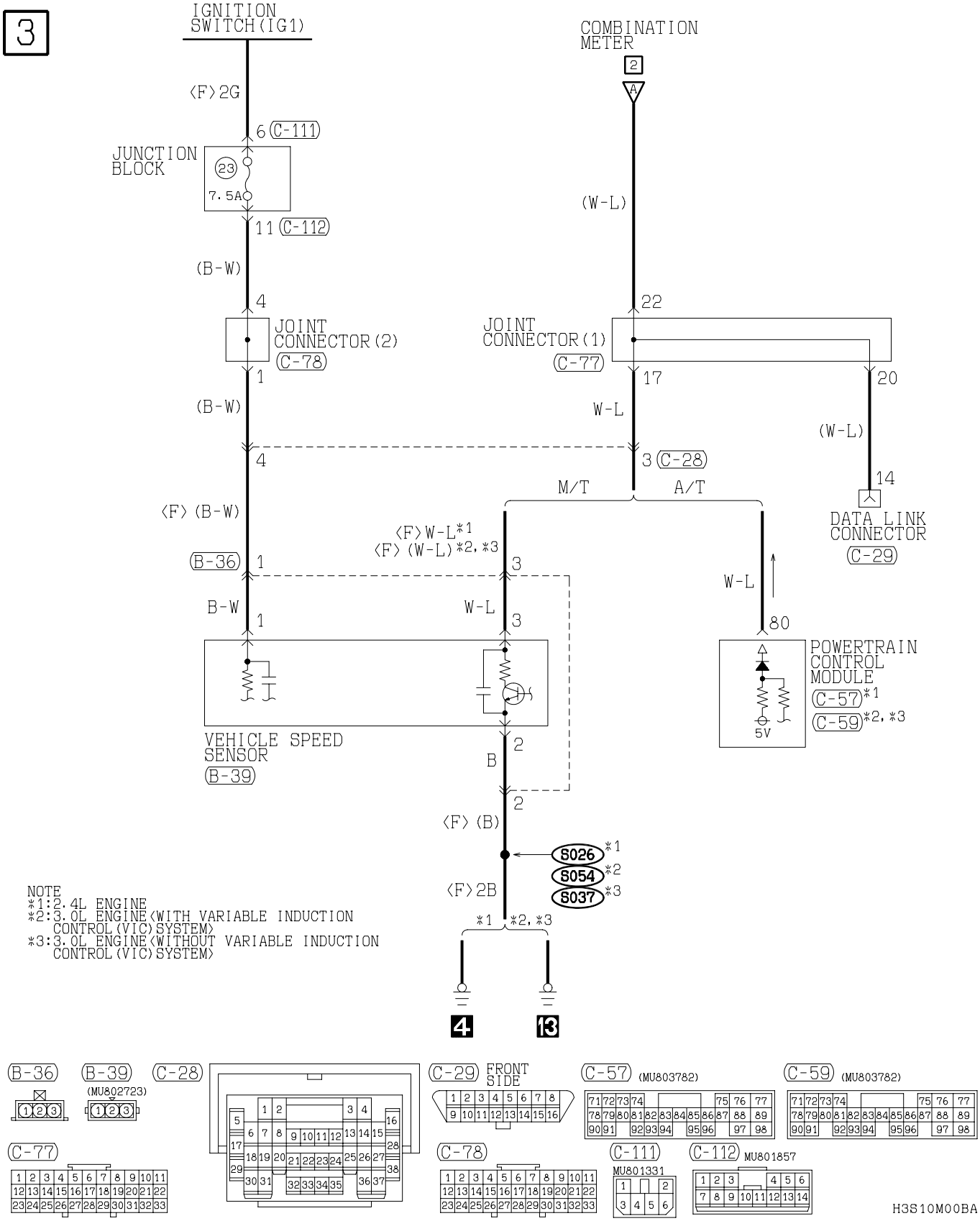


TSB Revision



TSB Revision

METER AND GAUGE (CONTINUED)

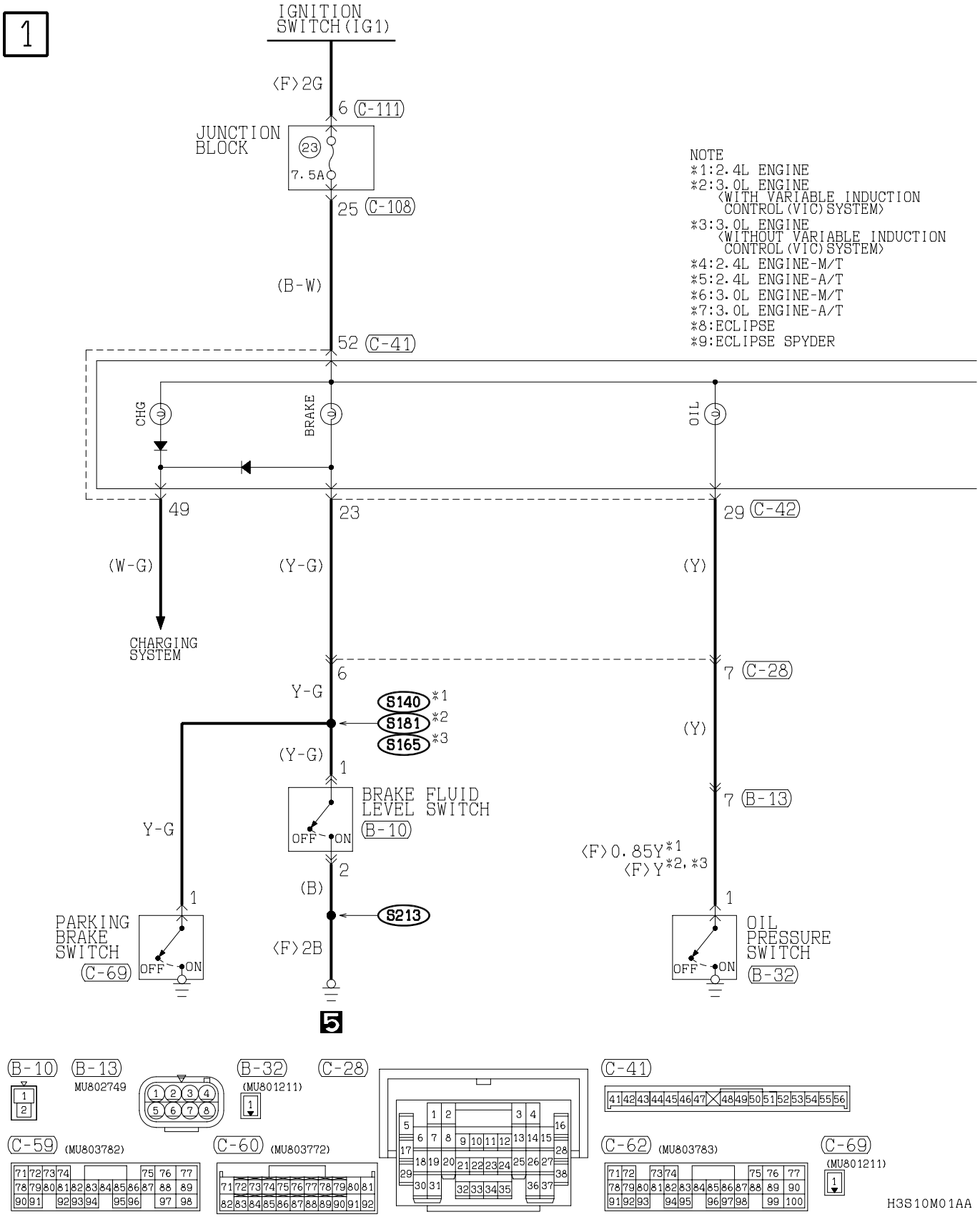


TSB Revision

NOTES

BRAKE WARNING LIGHT, OIL PRESSURE WARNING LIGHT, FUEL WARNING LIGHT

M1901011800310



TSB Revision

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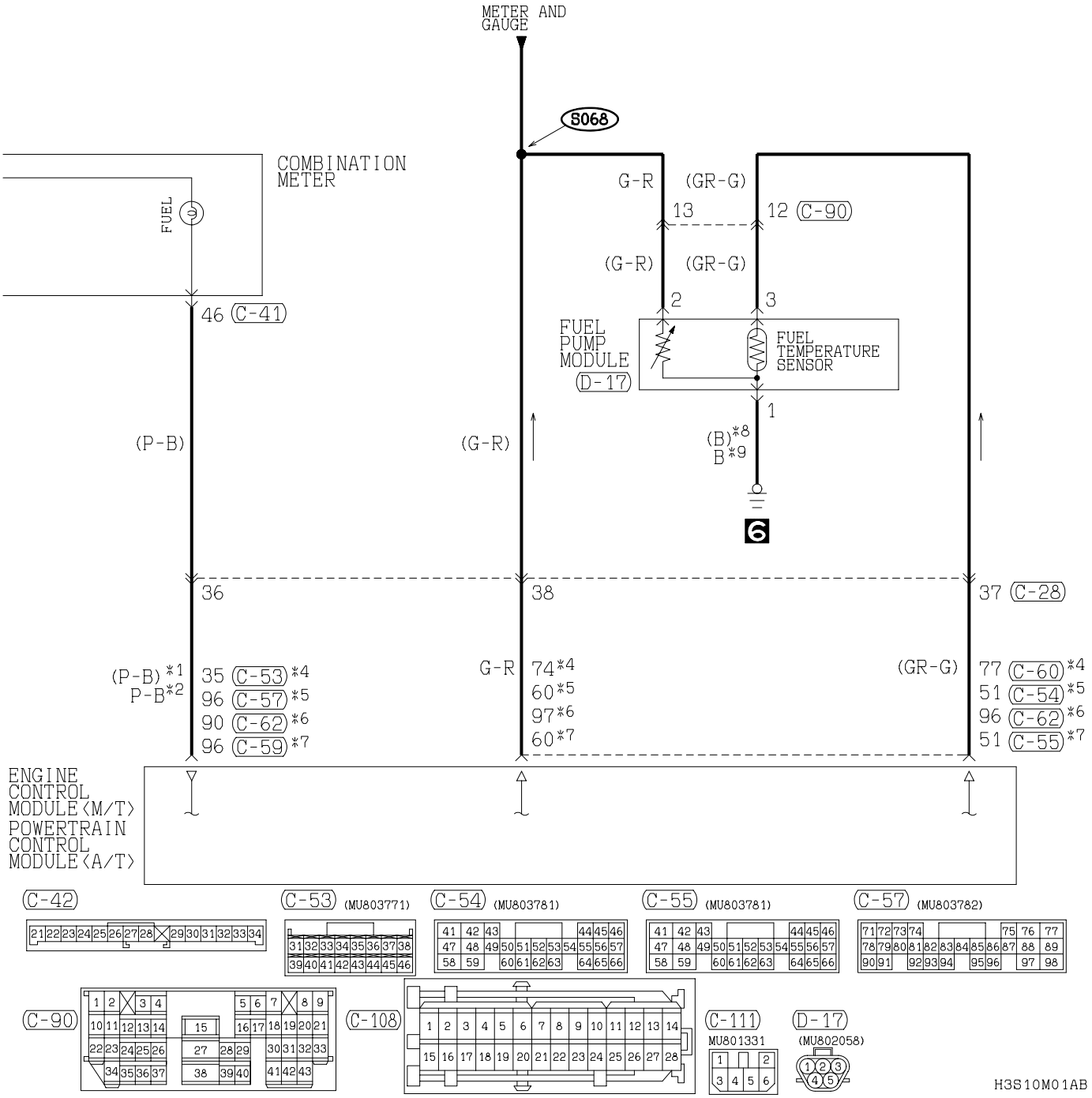
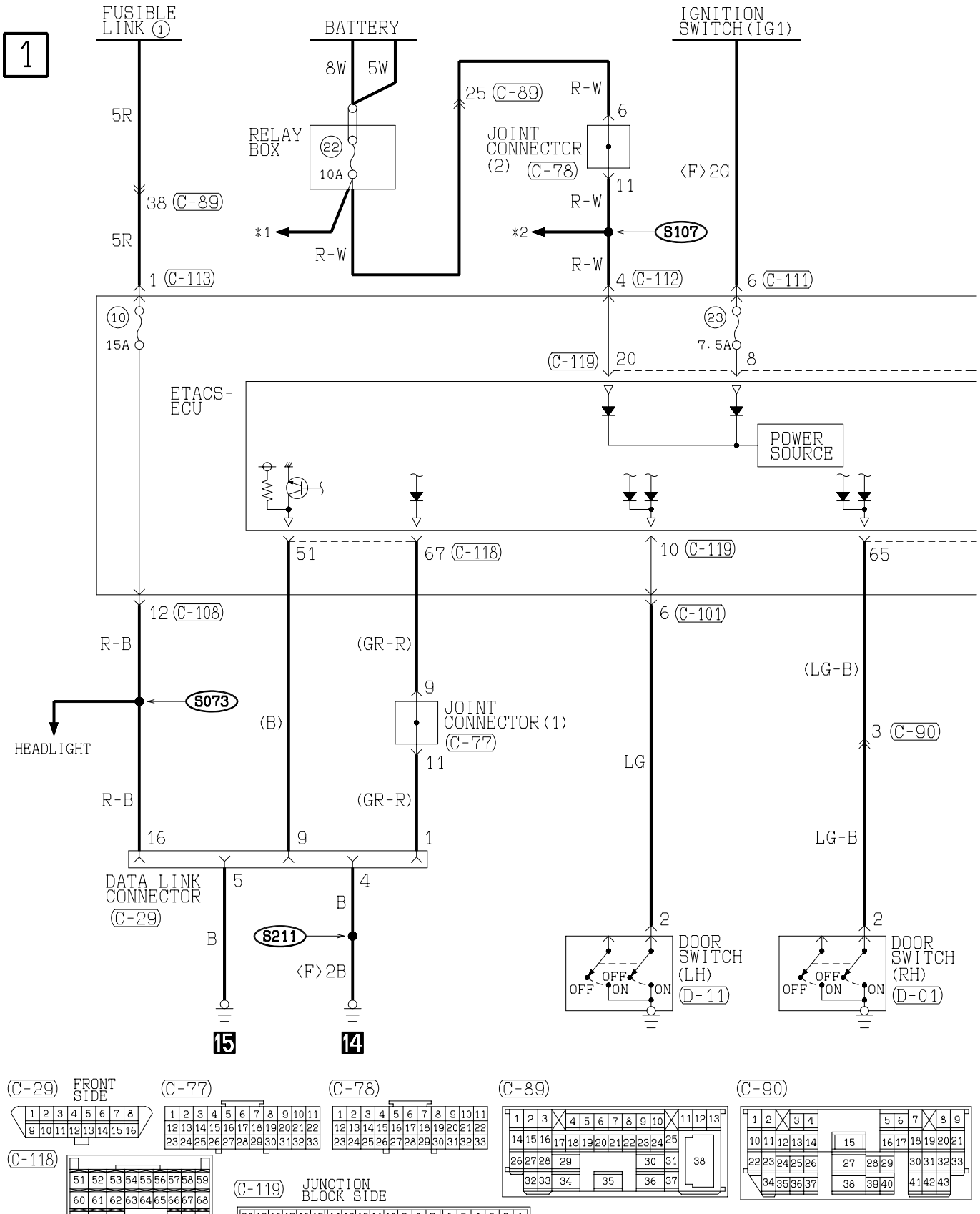


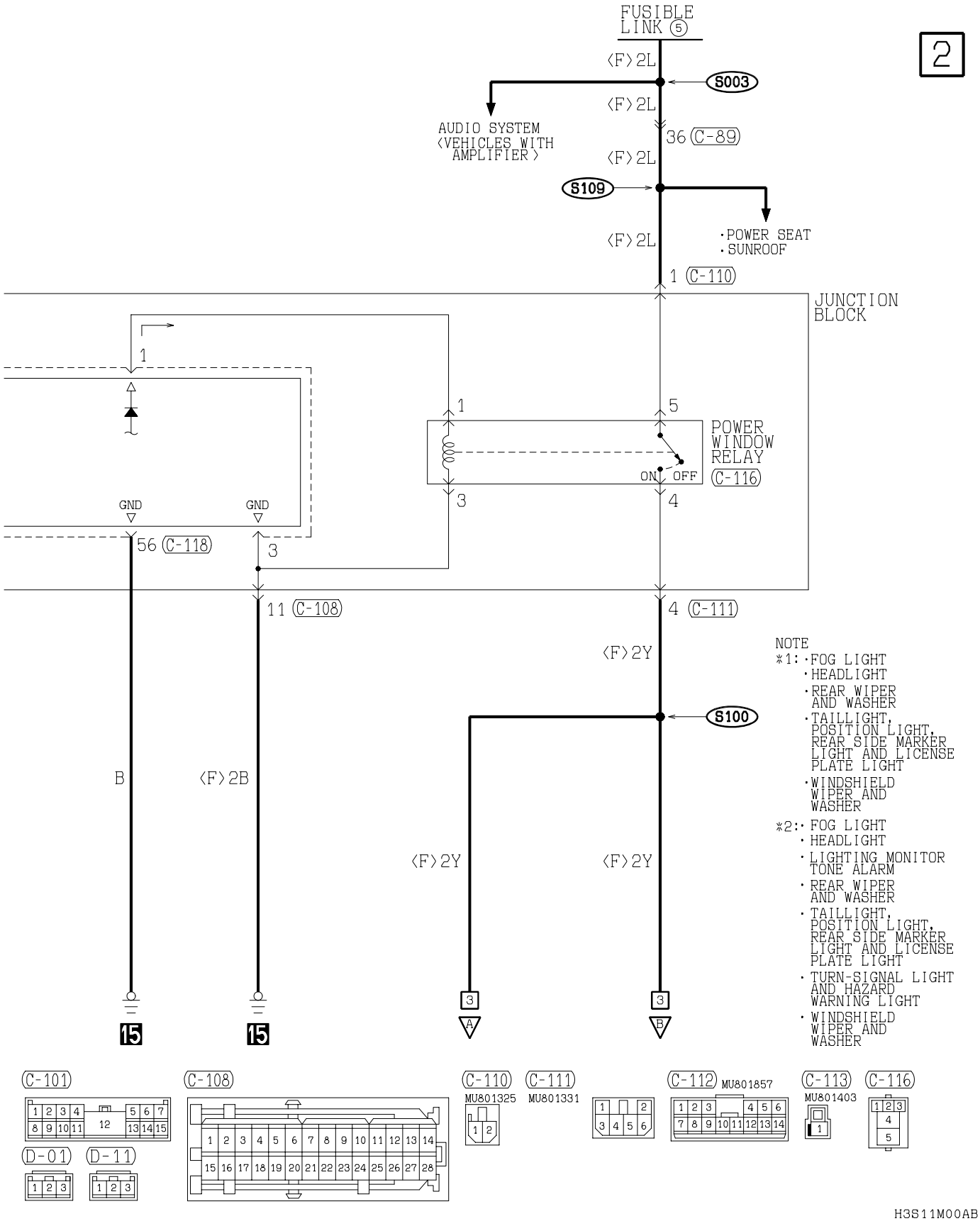
TSB Revision

POWER WINDOWS <ECLIPSE>

M1901004600422

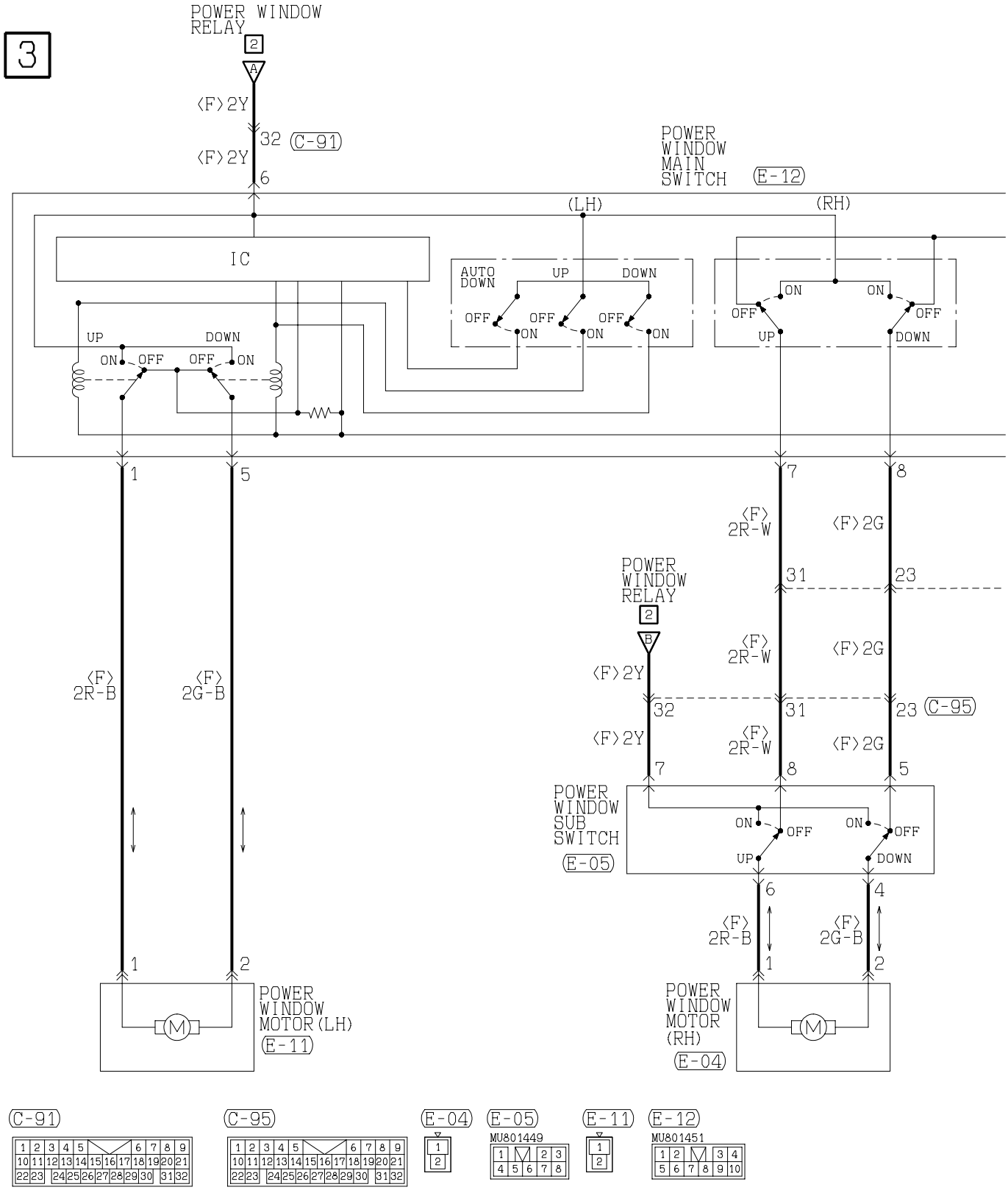


TSB Revision



TSB Revision

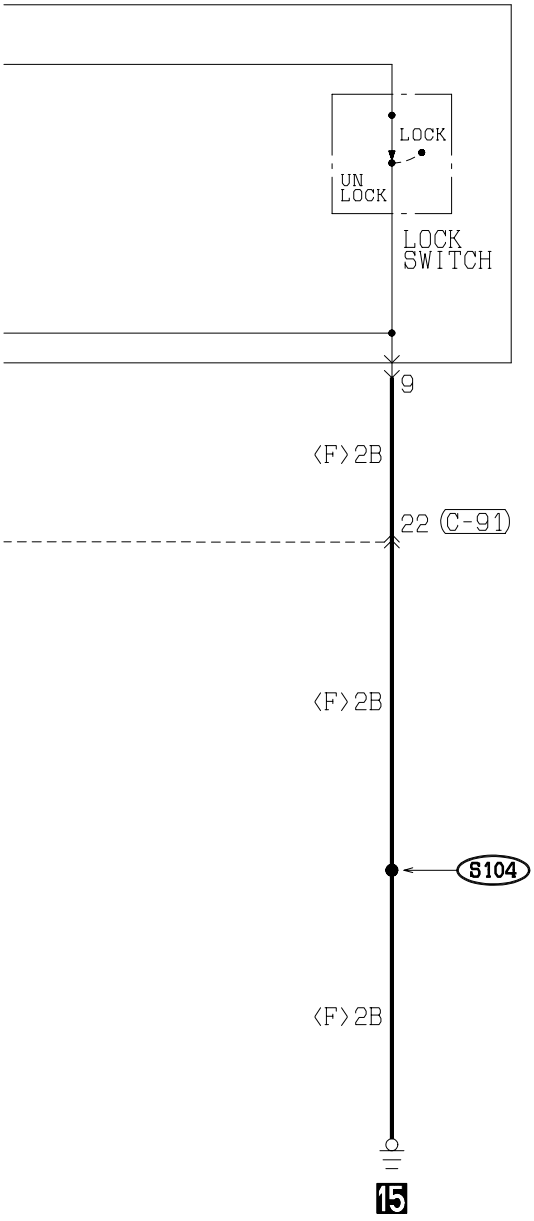
POWER WINDOWS <ECLIPSE> (CONTINUED)



H3S11M00BA

TSB Revision

4



WIRE COLOR CODE
B :BLACK BR:BROWN G :GREEN GR:GRAY L :BLUE LG:LIGHT GREEN O :ORANGE
P :PINK R :RED SB:SKY BLUE V :VIOLET W :WHITE Y :YELLOW

H3S11M00BB

TSB Revision

POWER WINDOWS <ECLIPSE SPYDER>

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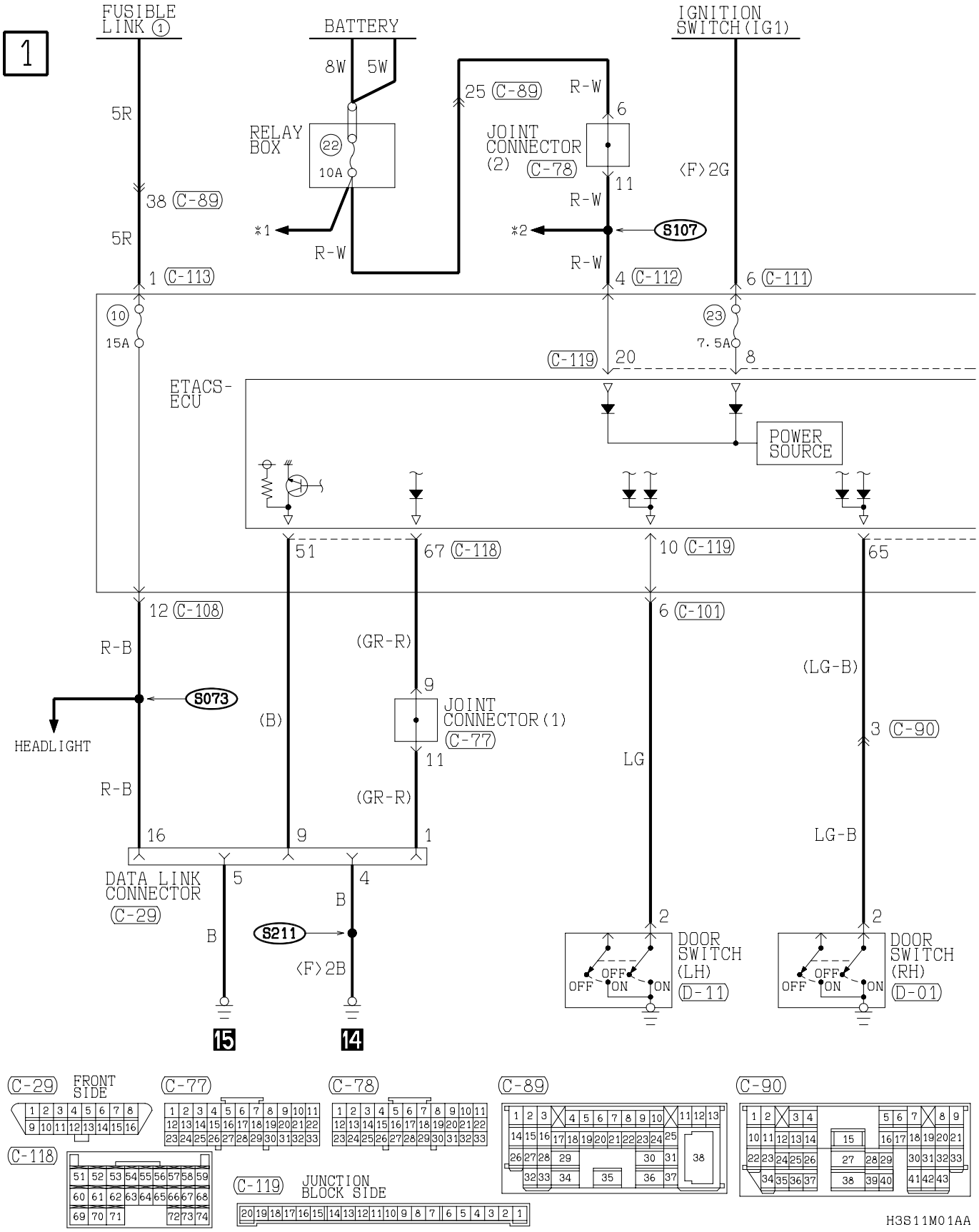
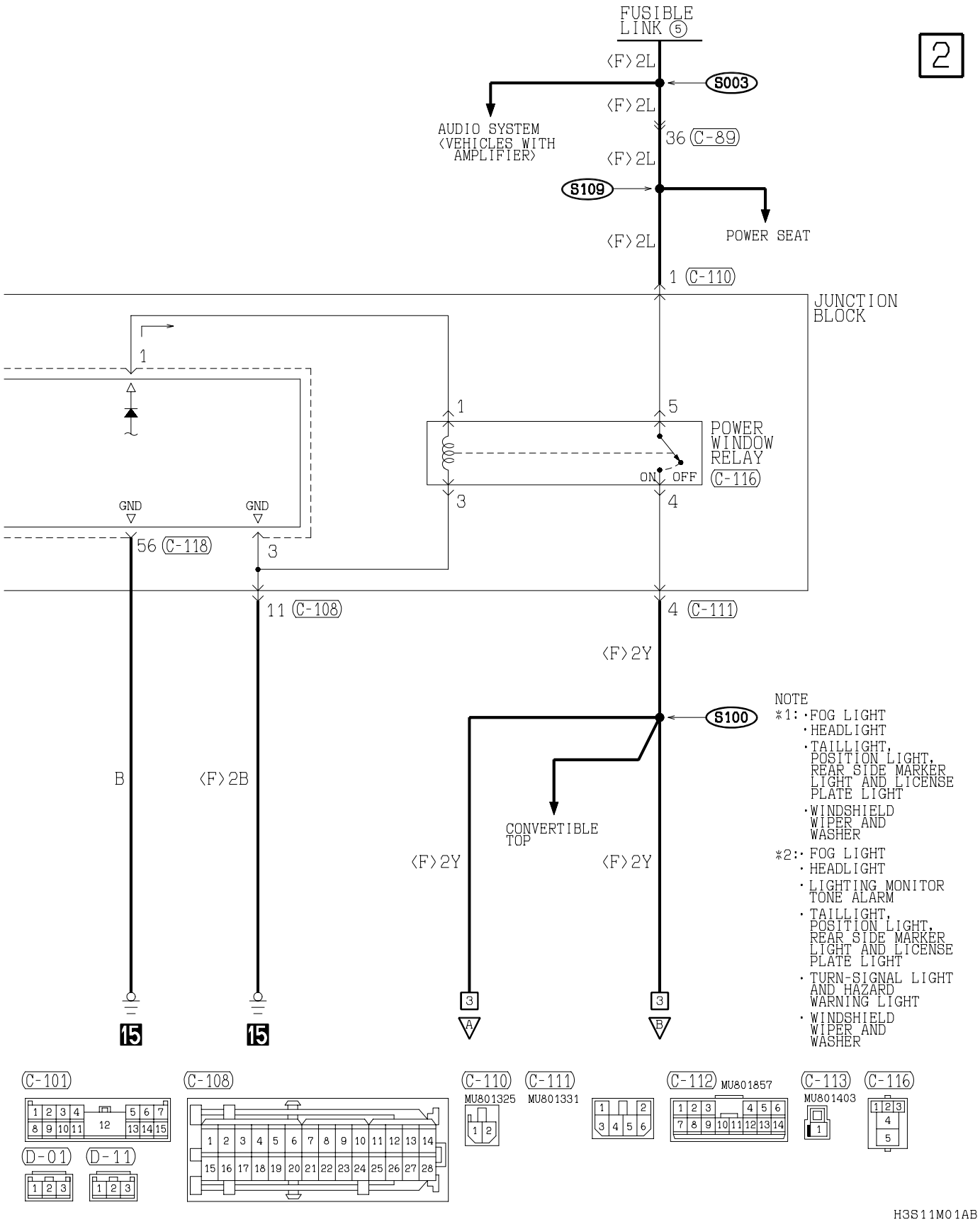
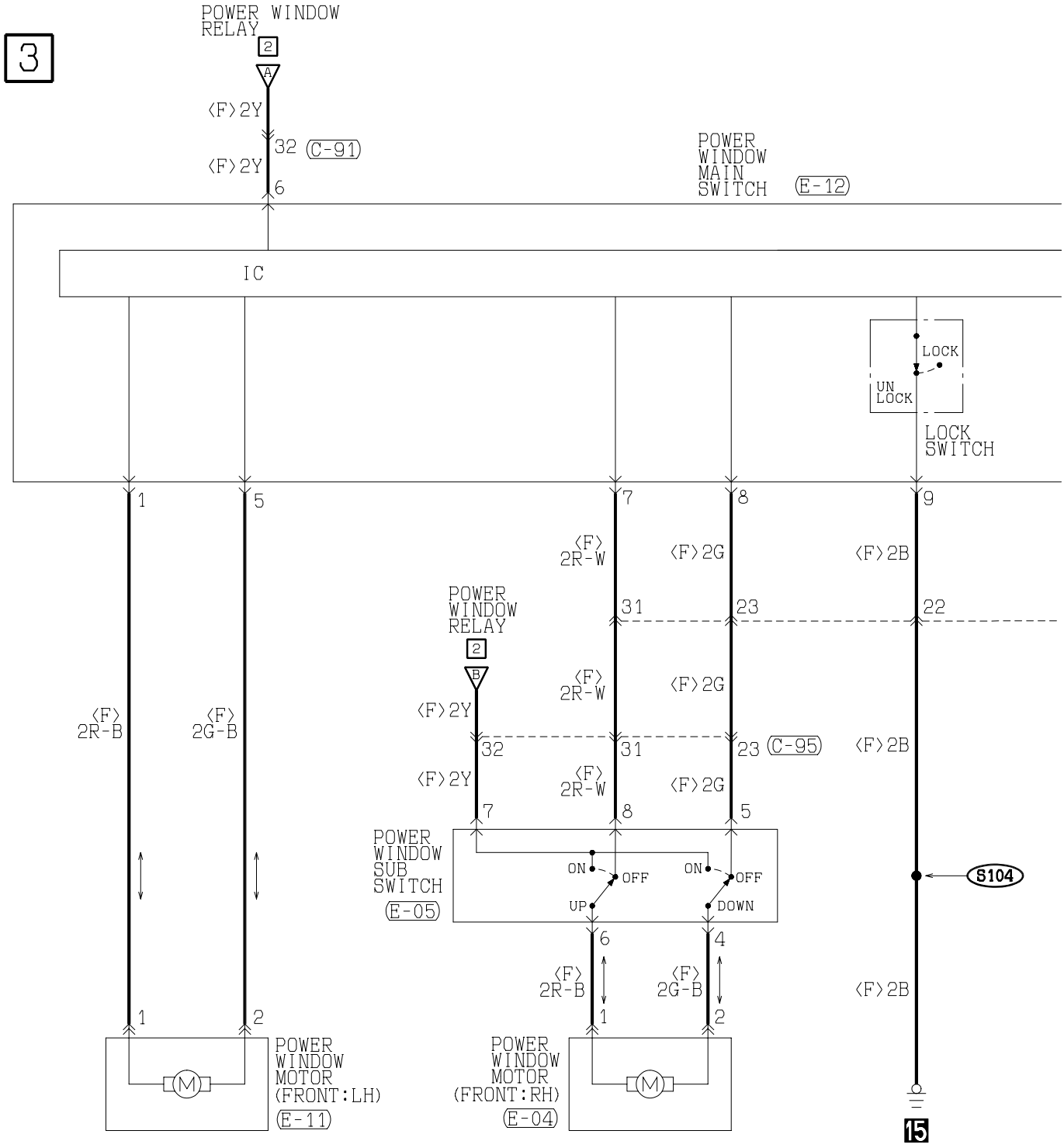


TSB Revision



TSB Revision

POWER WINDOWS <ECLIPSE SPYDER> (CONTINUED)



H3S11M01BA

TSB Revision

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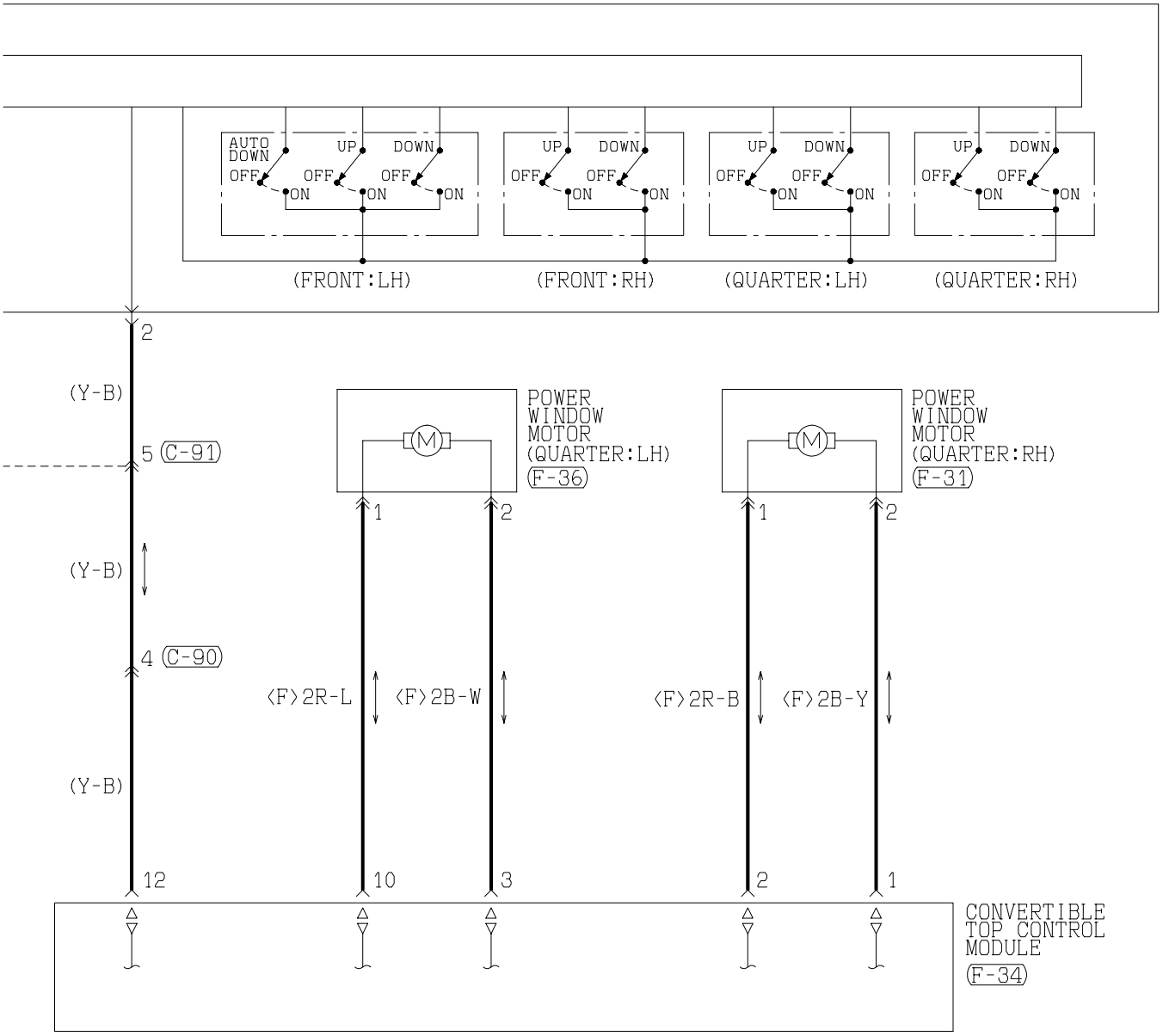
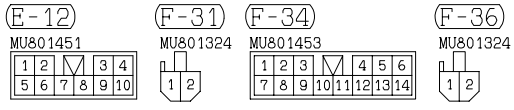




WIRE COLOR CODE

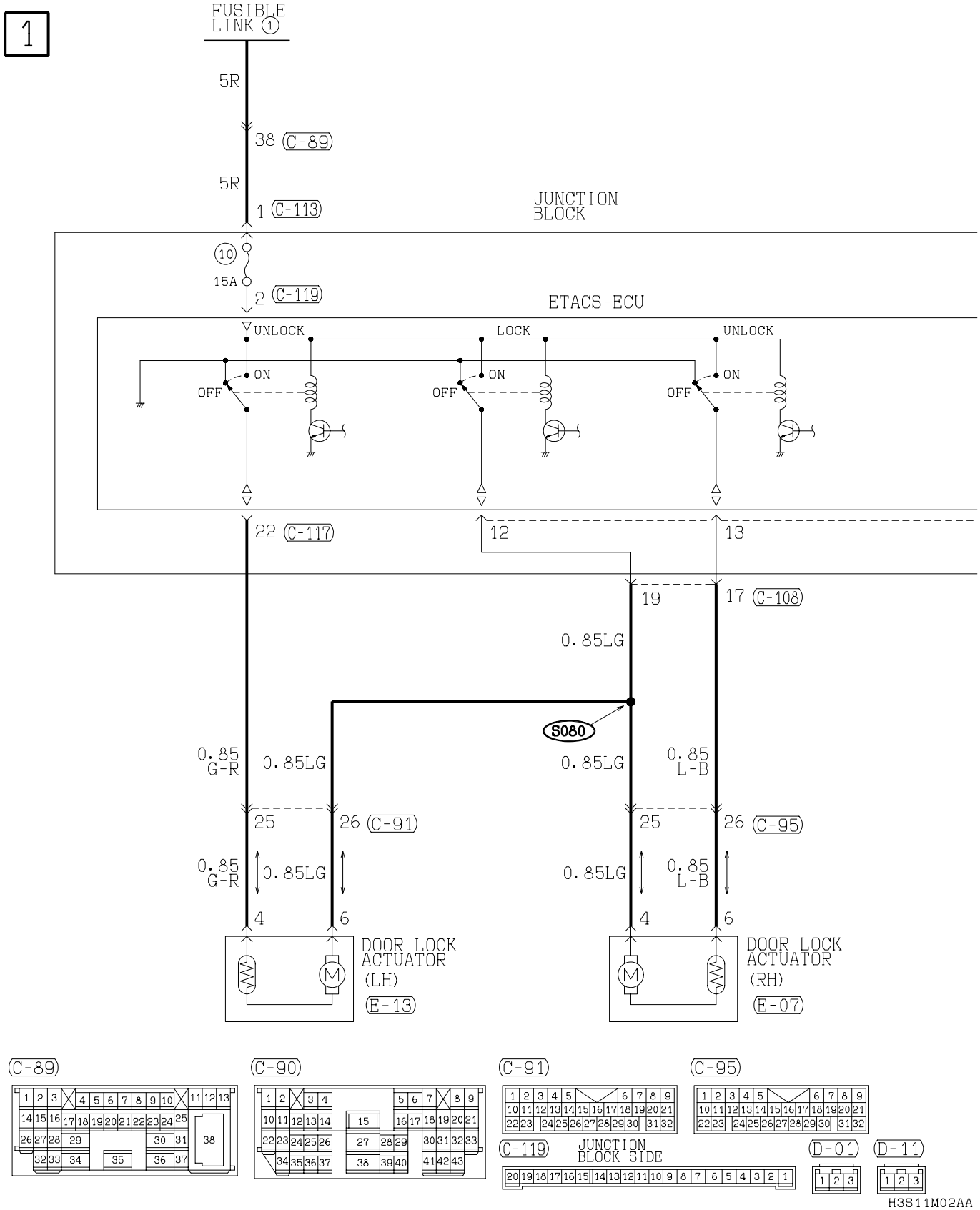
B :BLACK	BR:BROWN	G :GREEN	GR:GRAY	L :BLUE	LG:LIGHT GREEN	O :ORANGE
P :PINK	R :RED	SB:SKY BLUE	V :VIOLET	W :WHITE	Y :YELLOW	

H3S11M01BB

TSB Revision

CENTRAL DOOR LOCKING SYSTEM <VEHICLES WITHOUT KEYLESS ENTRY SYSTEM>

M1901004700582



TSB Revision

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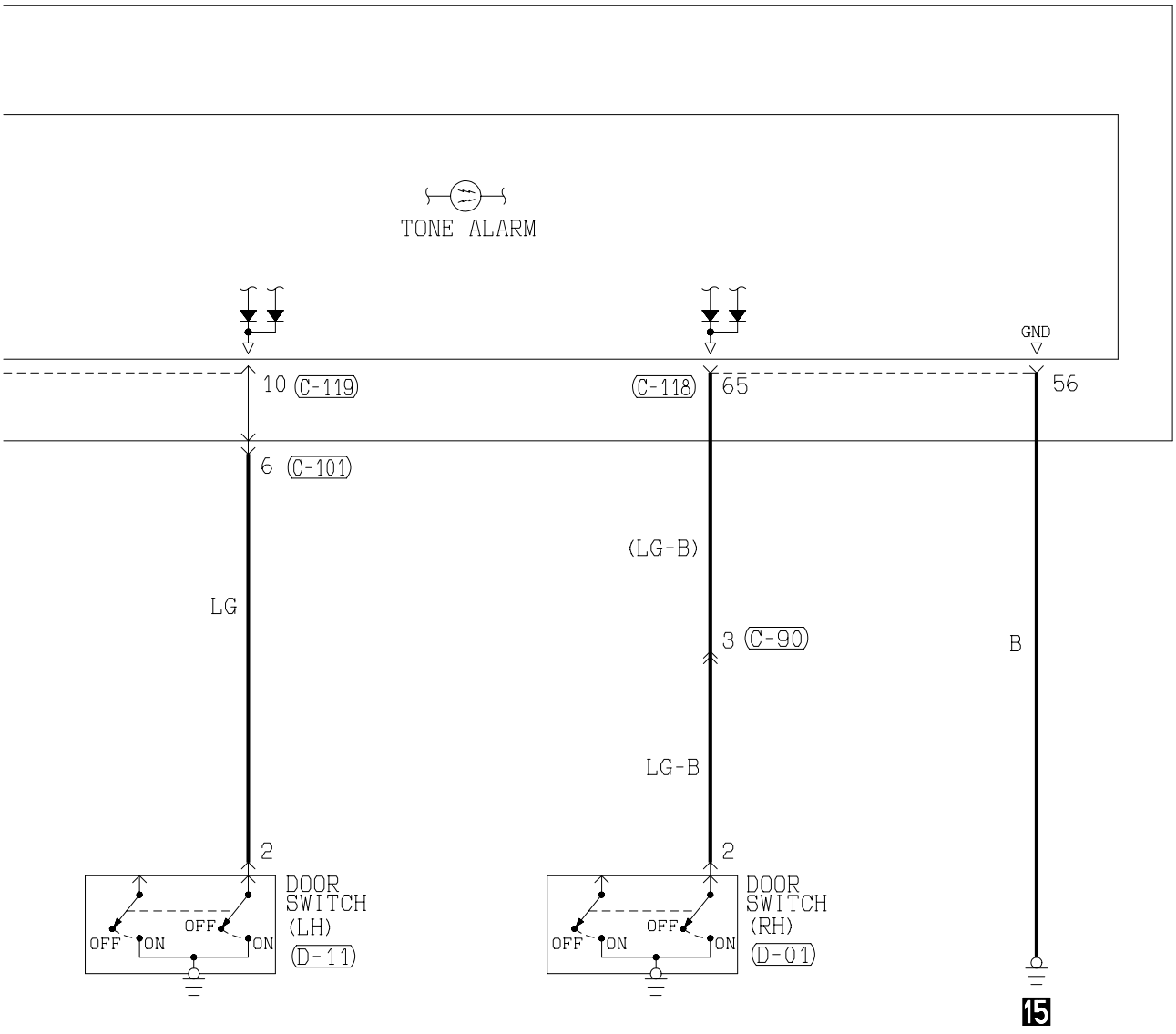
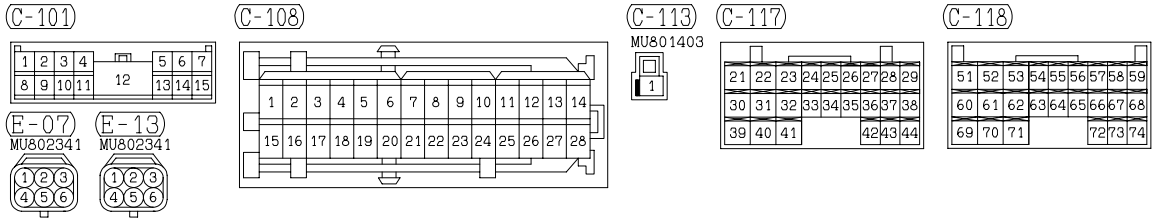
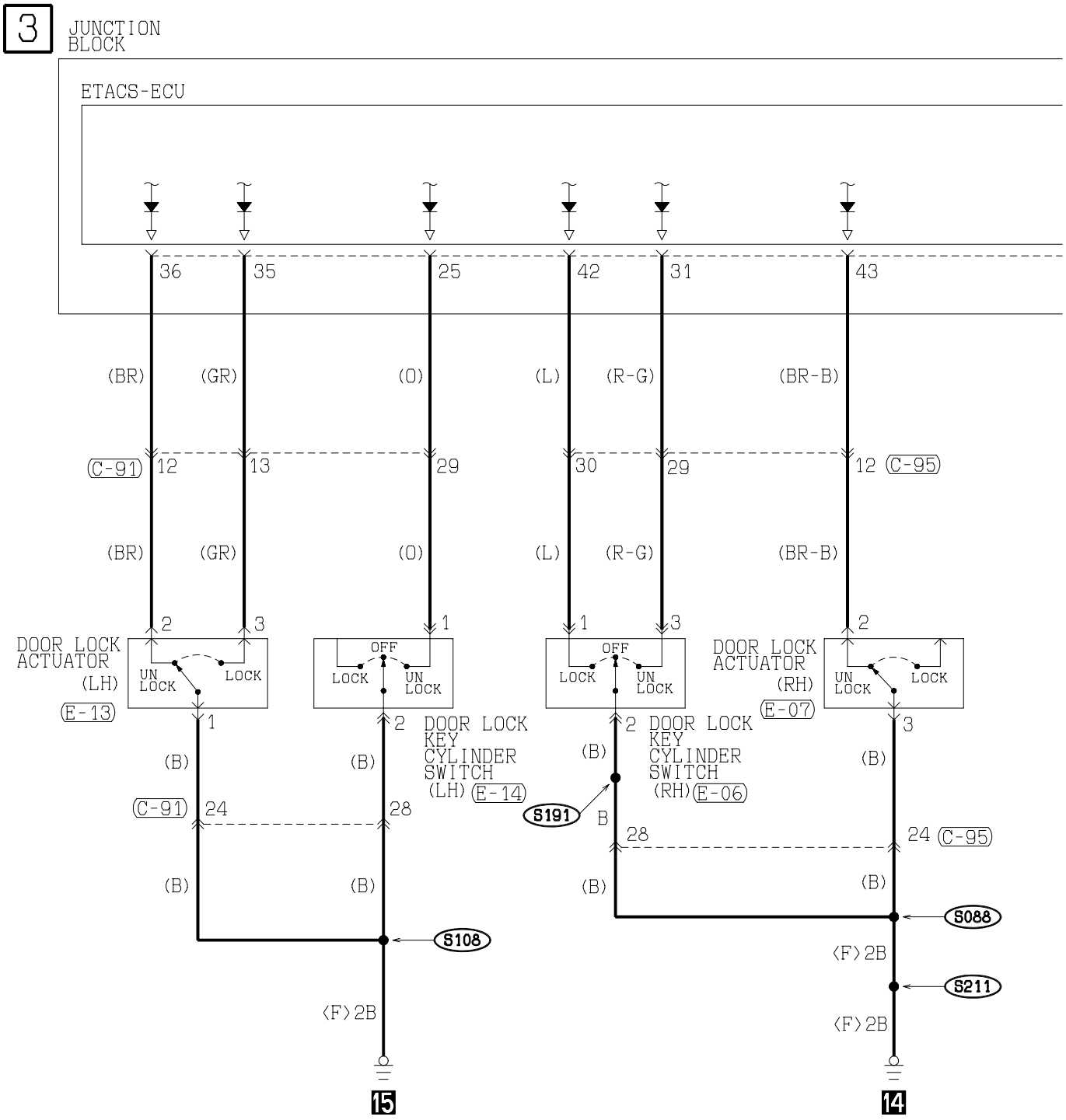


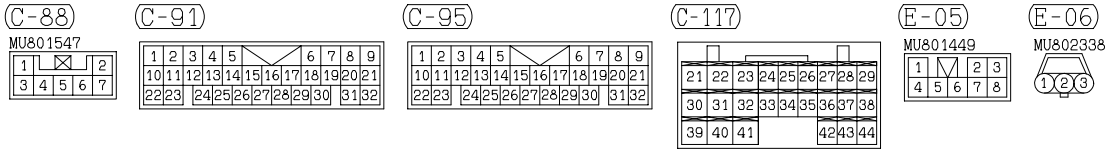


H3S11M02AB

TSB Revision

CENTRAL DOOR LOCKING SYSTEM <VEHICLES WITHOUT KEYLESS ENTRY SYSTEM> (CONTINUED)





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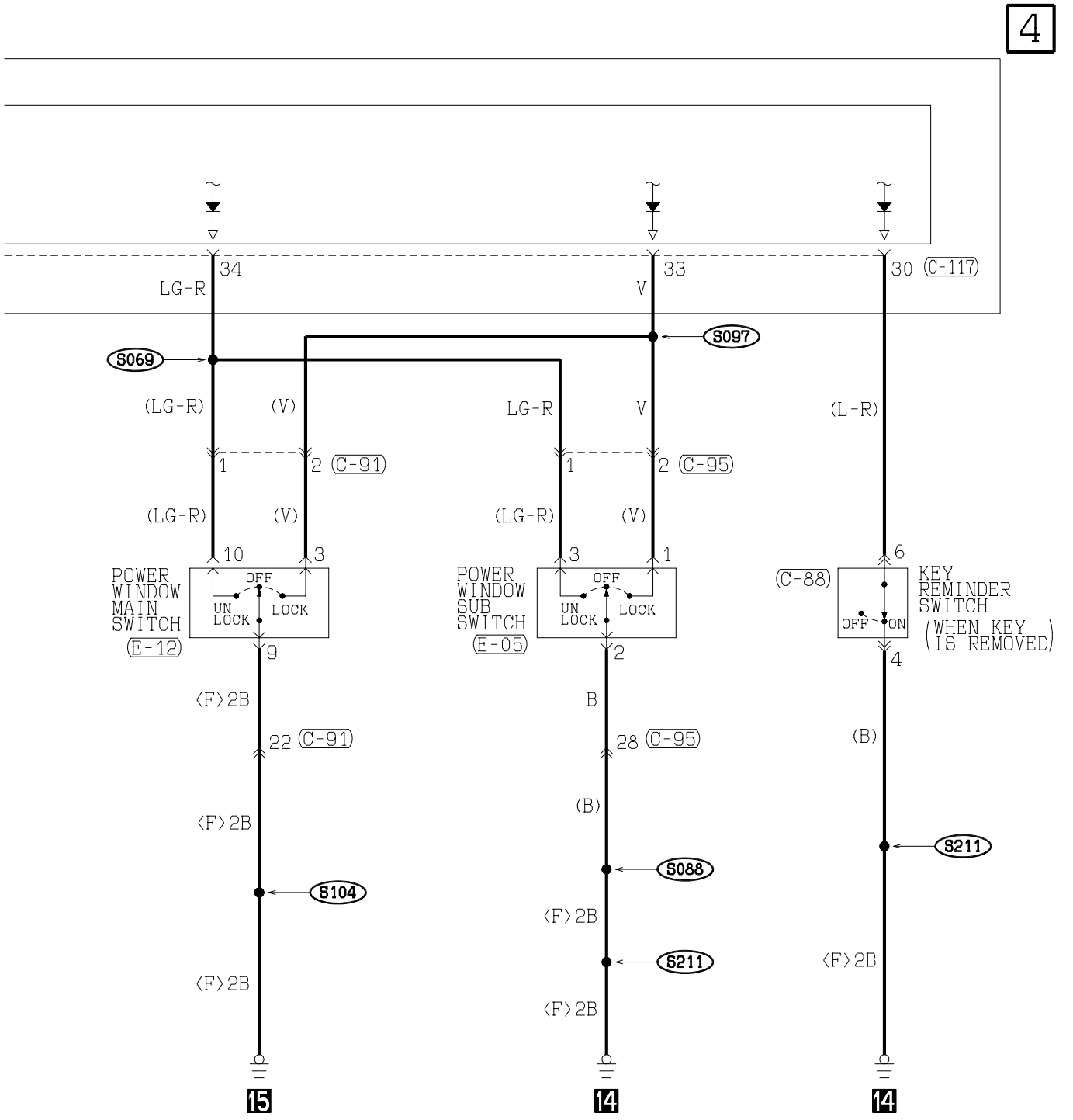
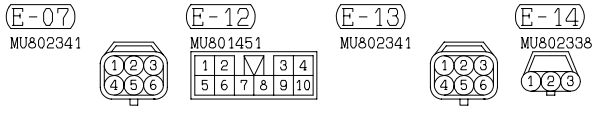
TSB Revision





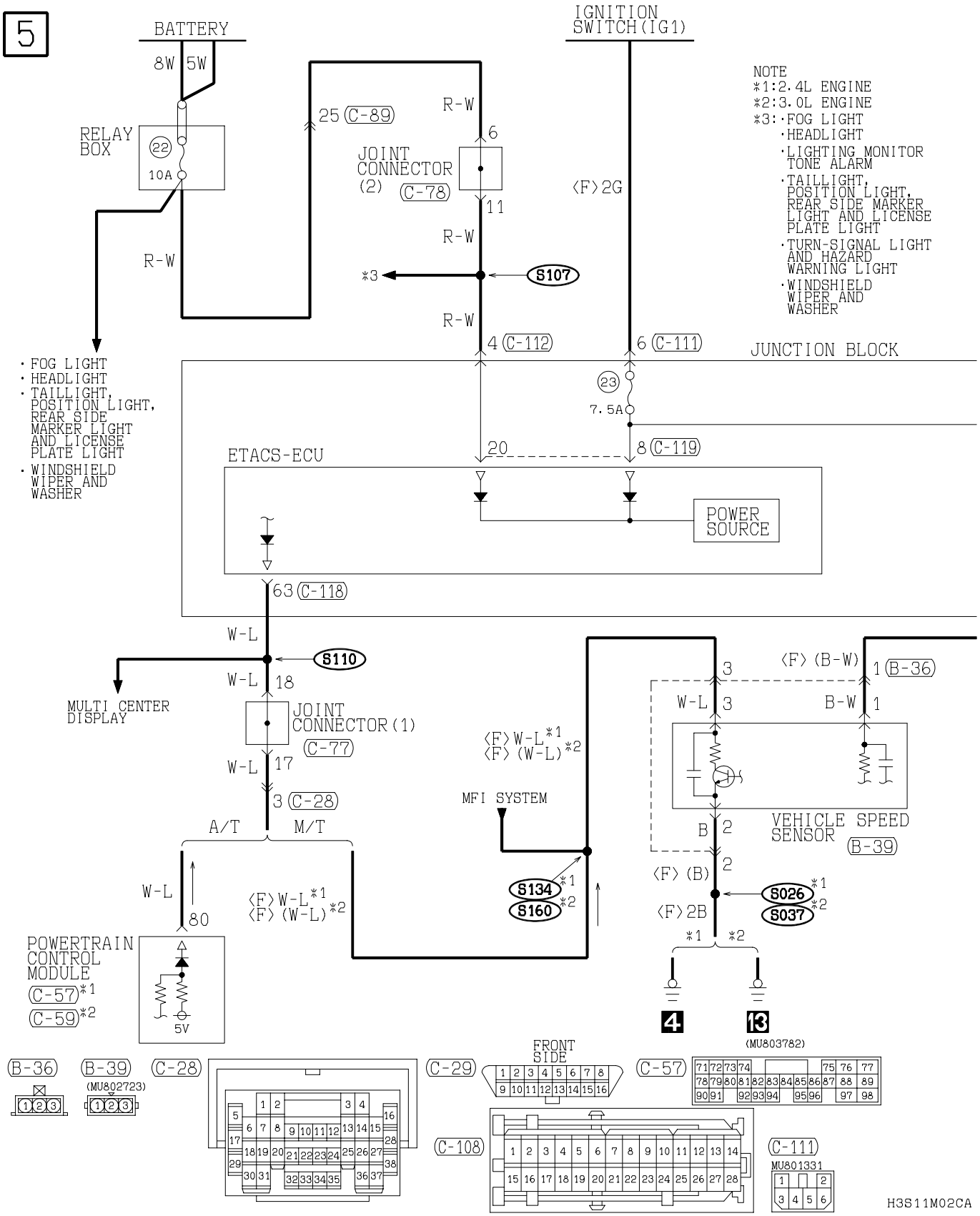
WIRE COLOR CODE

B :BLACK	BR:BROWN	G :GREEN	GR:GRAY	L :BLUE	LG:LIGHT GREEN	O :ORANGE	
P :PINK	R :RED	SB:SKY BLUE	V :VIOLET	W :WHITE	Y :YELLOW		

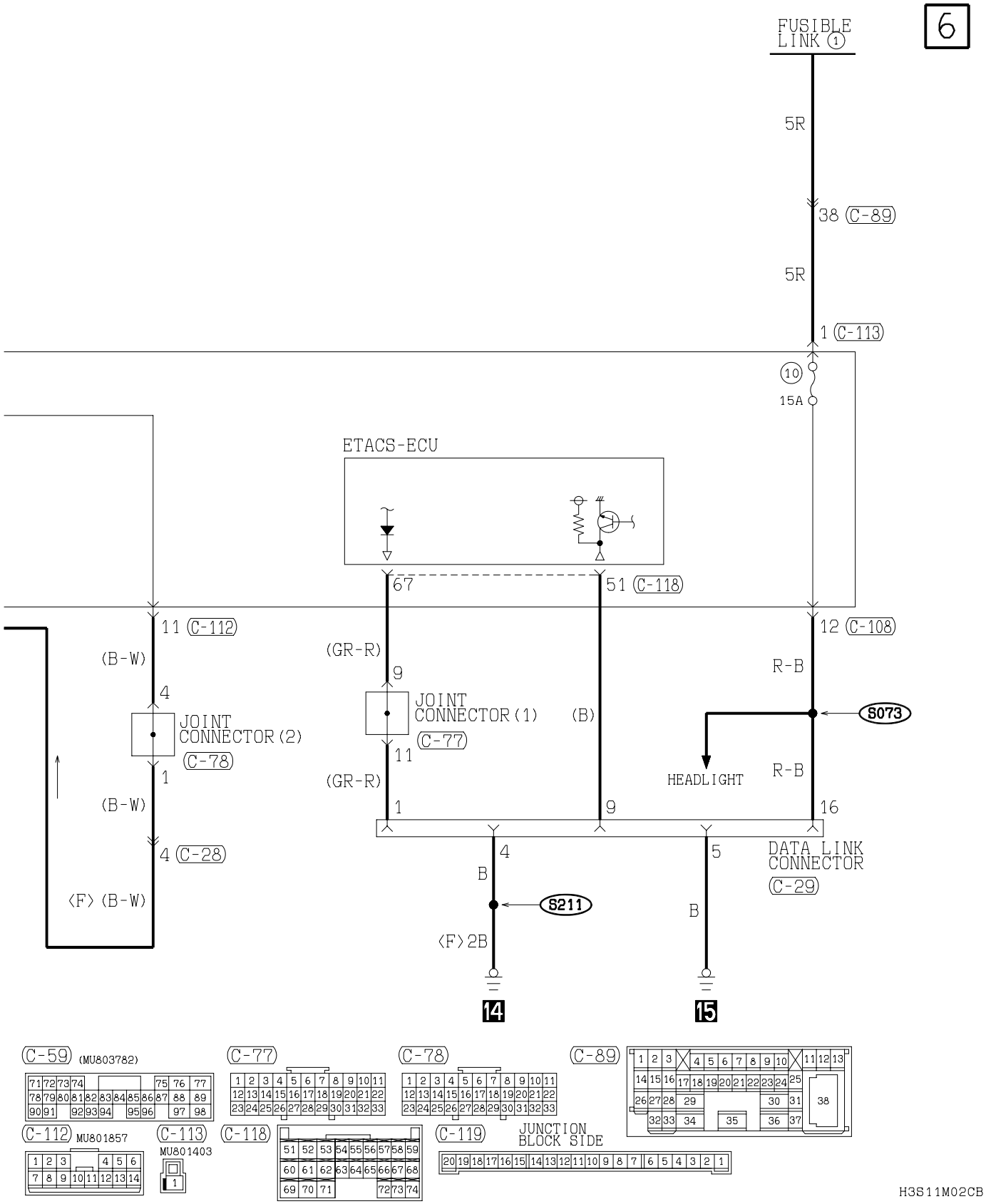
H3S11M02BB

TSB Revision

CENTRAL DOOR LOCKING SYSTEM <VEHICLES WITHOUT KEYLESS ENTRY SYSTEM> (CONTINUED)



TSB Revision



TSB Revision

CENTRAL DOOR LOCKING SYSTEM <VEHICLES WITH KEYLESS ENTRY SYSTEM (WITHOUT THEFT-ALARM SYSTEM)>

M1901004700593

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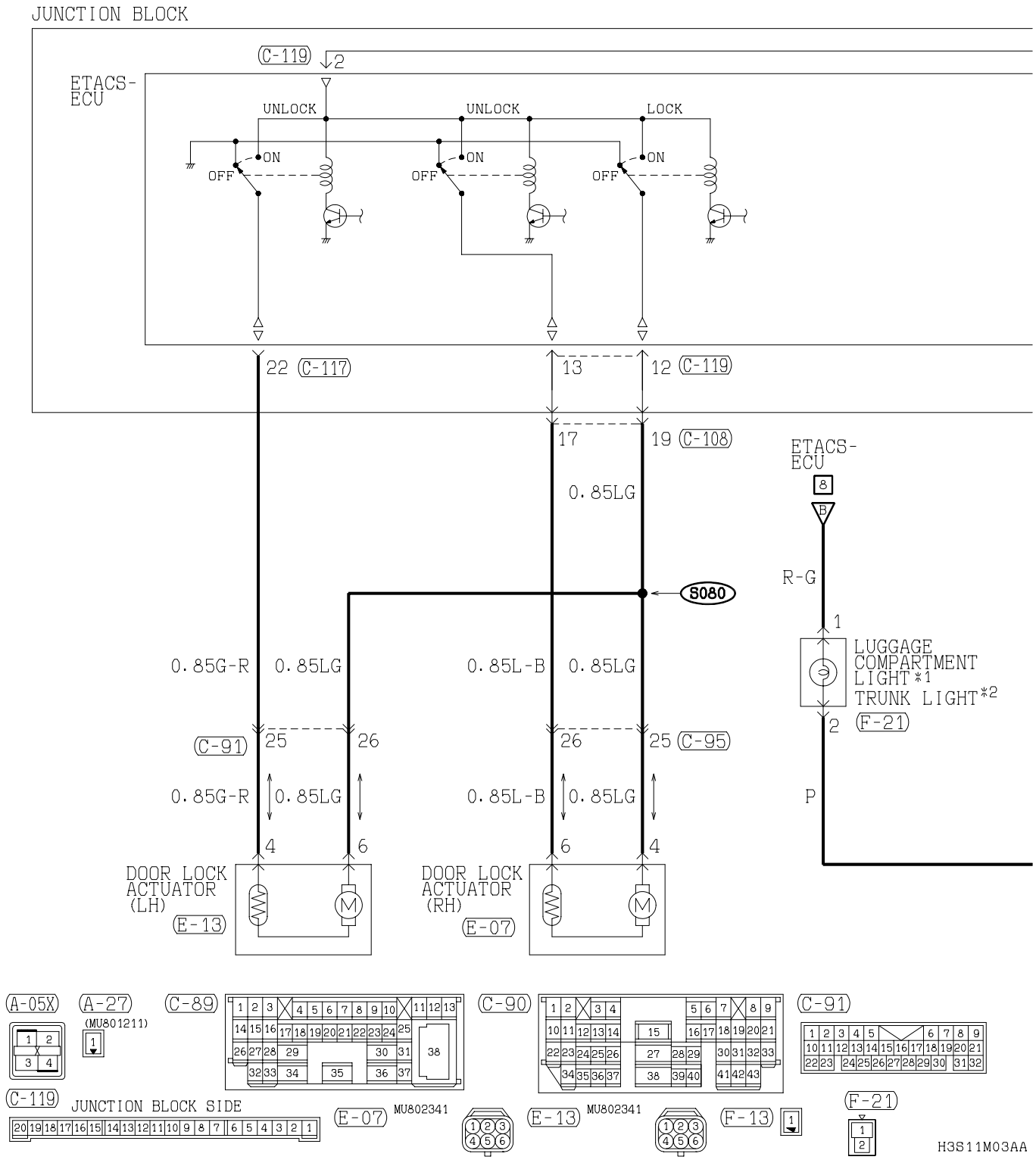
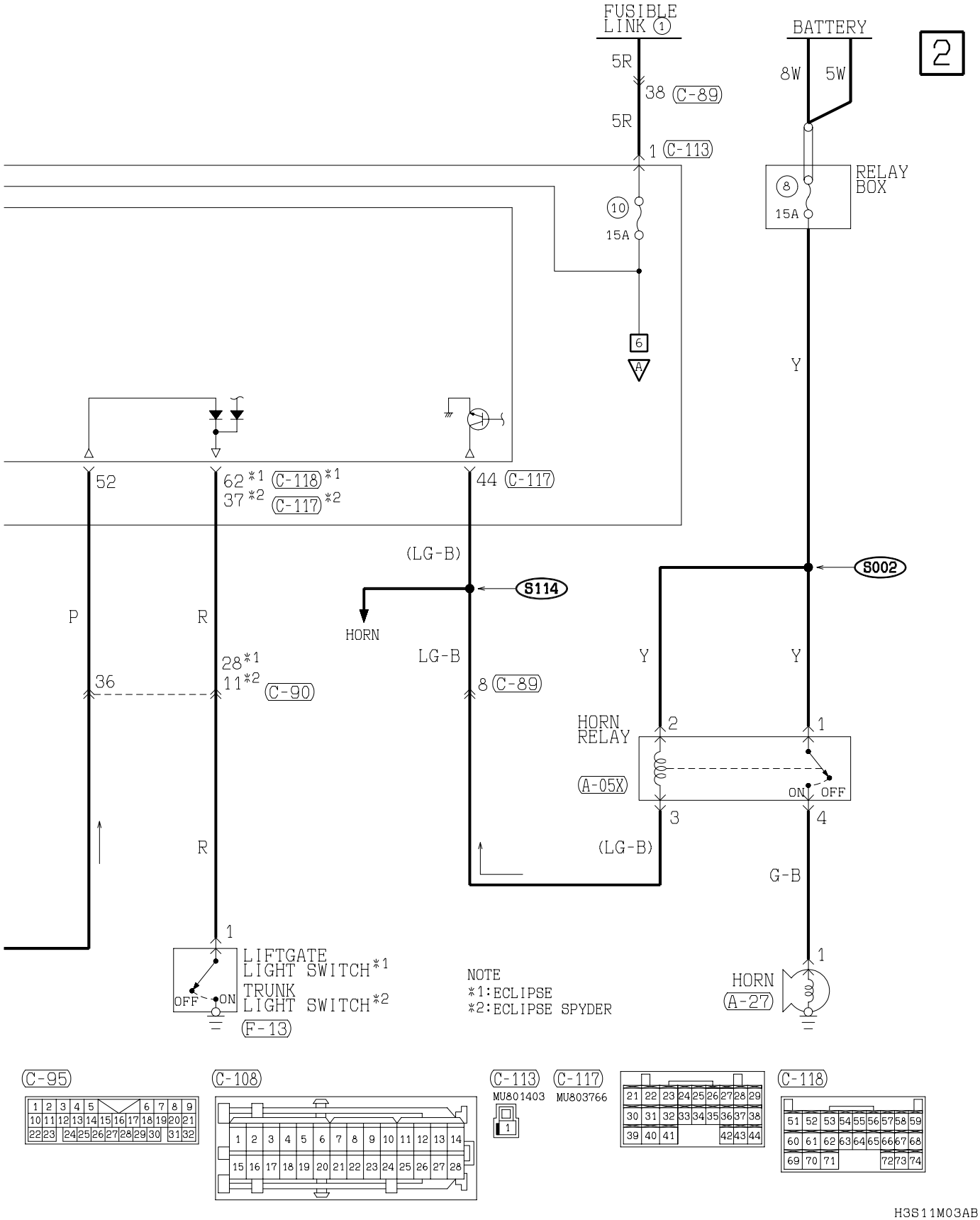


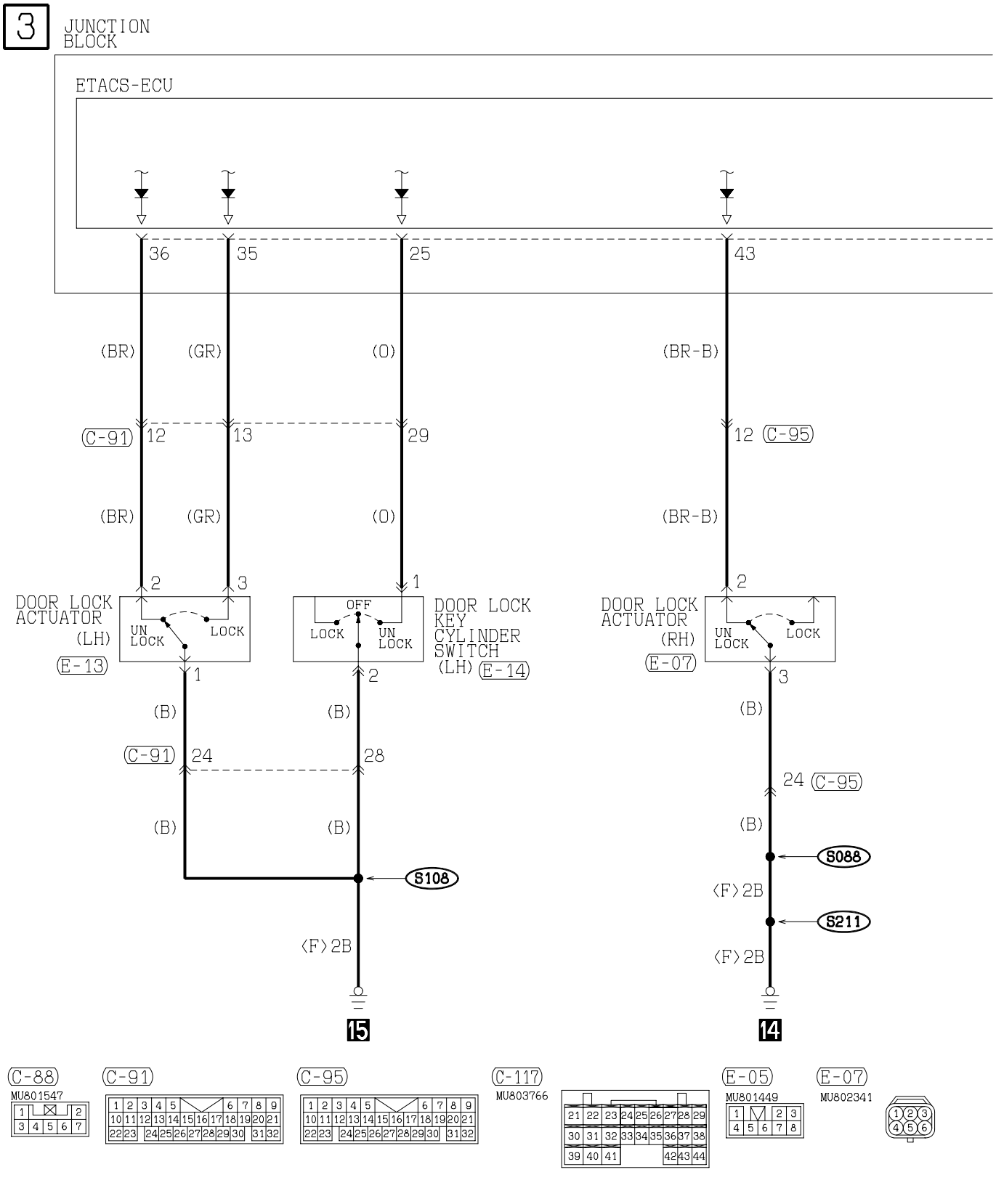
TSB Revision



H3S11M03AB

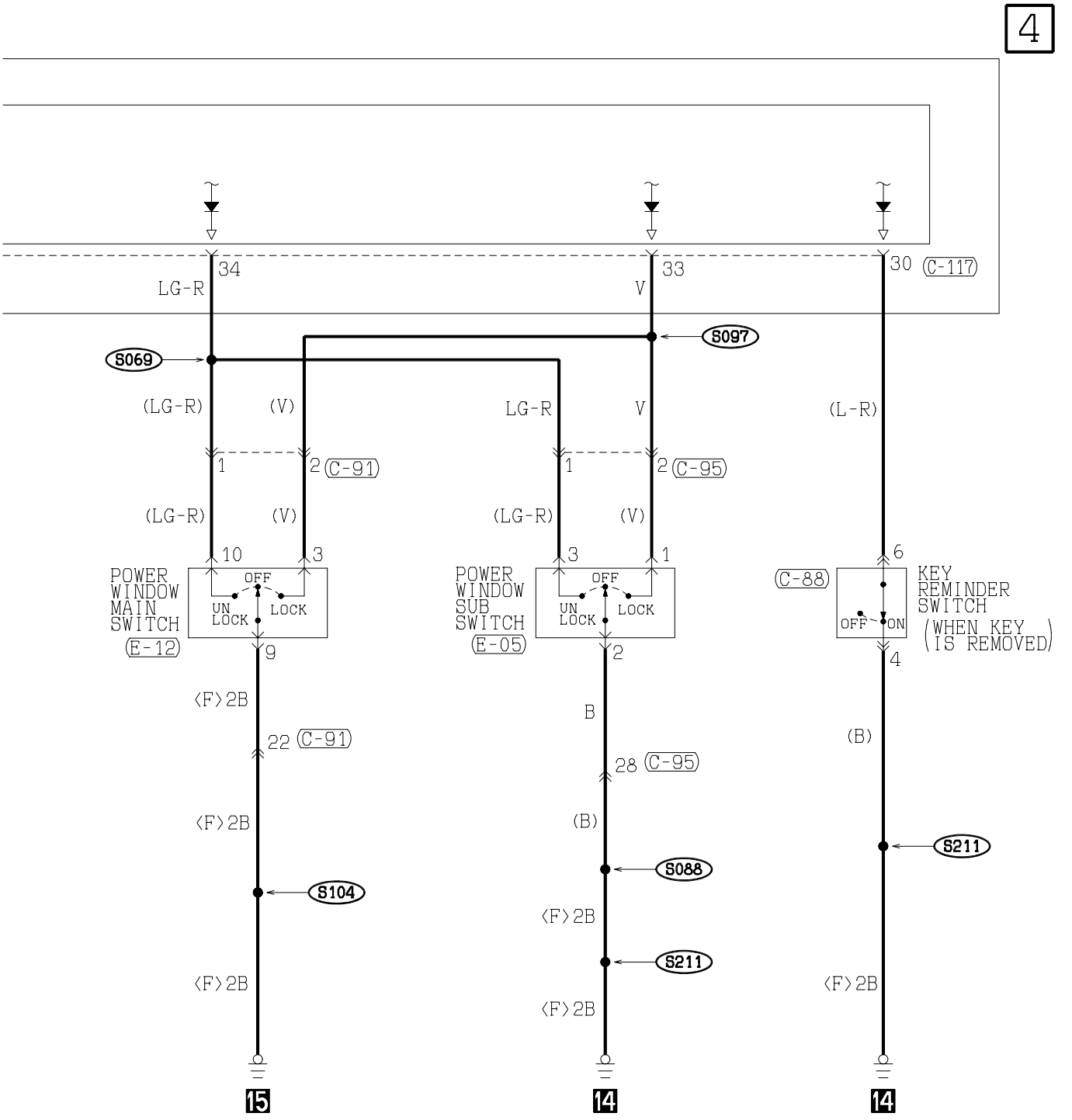
TSB Revision

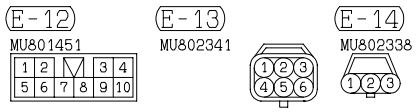
CENTRAL DOOR LOCKING SYSTEM <VEHICLES WITH KEYLESS ENTRY SYSTEM (WITHOUT THEFT-ALARM SYSTEM)> (CONTINUED)



H3S11M03BA

TSB Revision





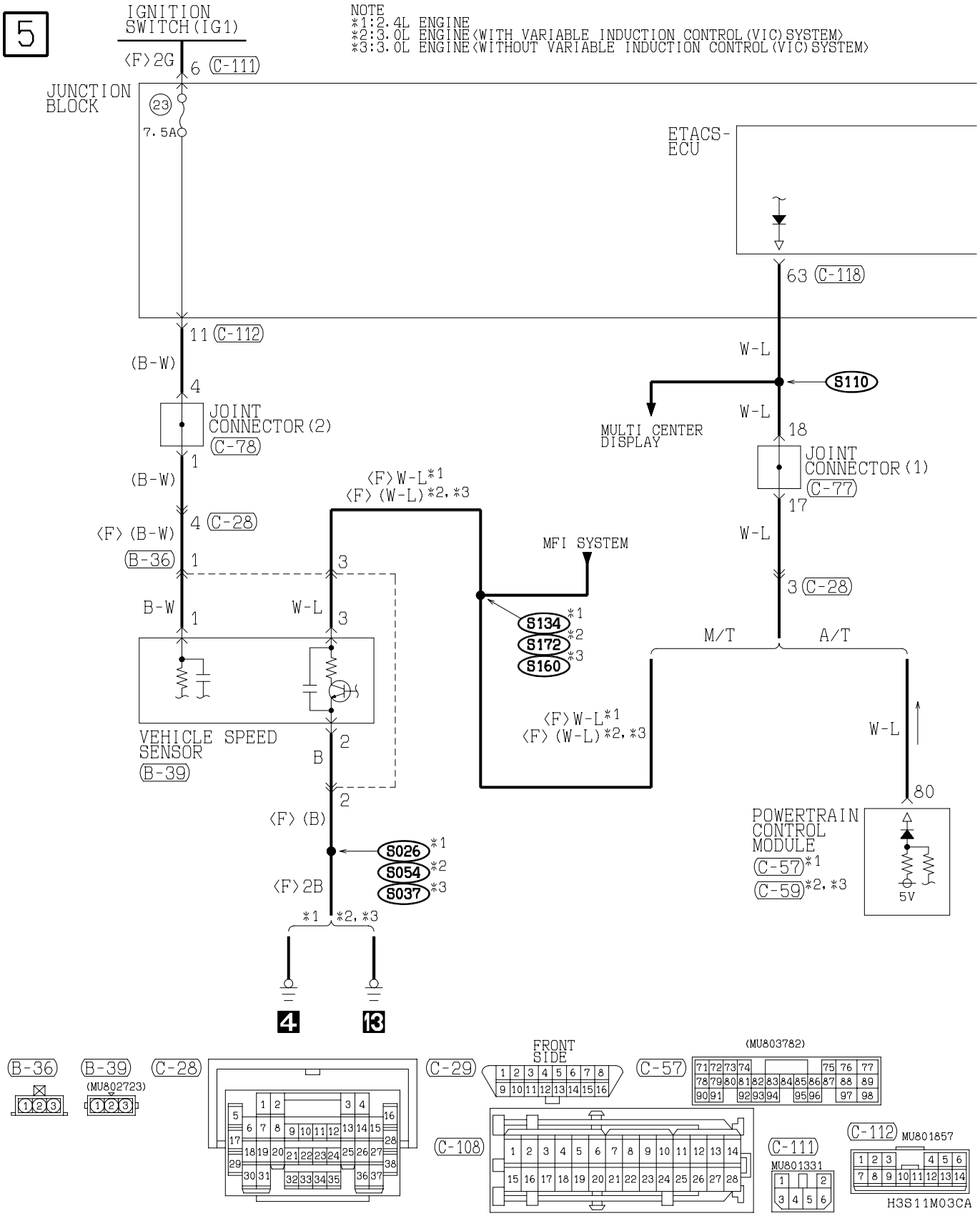
WIRE COLOR CODE

B :BLACK	BR:BROWN	G :GREEN	GR:GRAY	L :BLUE	LG:LIGHT GREEN	O :ORANGE	
P :PINK	R :RED	SB:SKY BLUE	V :VIOLET	W :WHITE	Y :YELLOW		

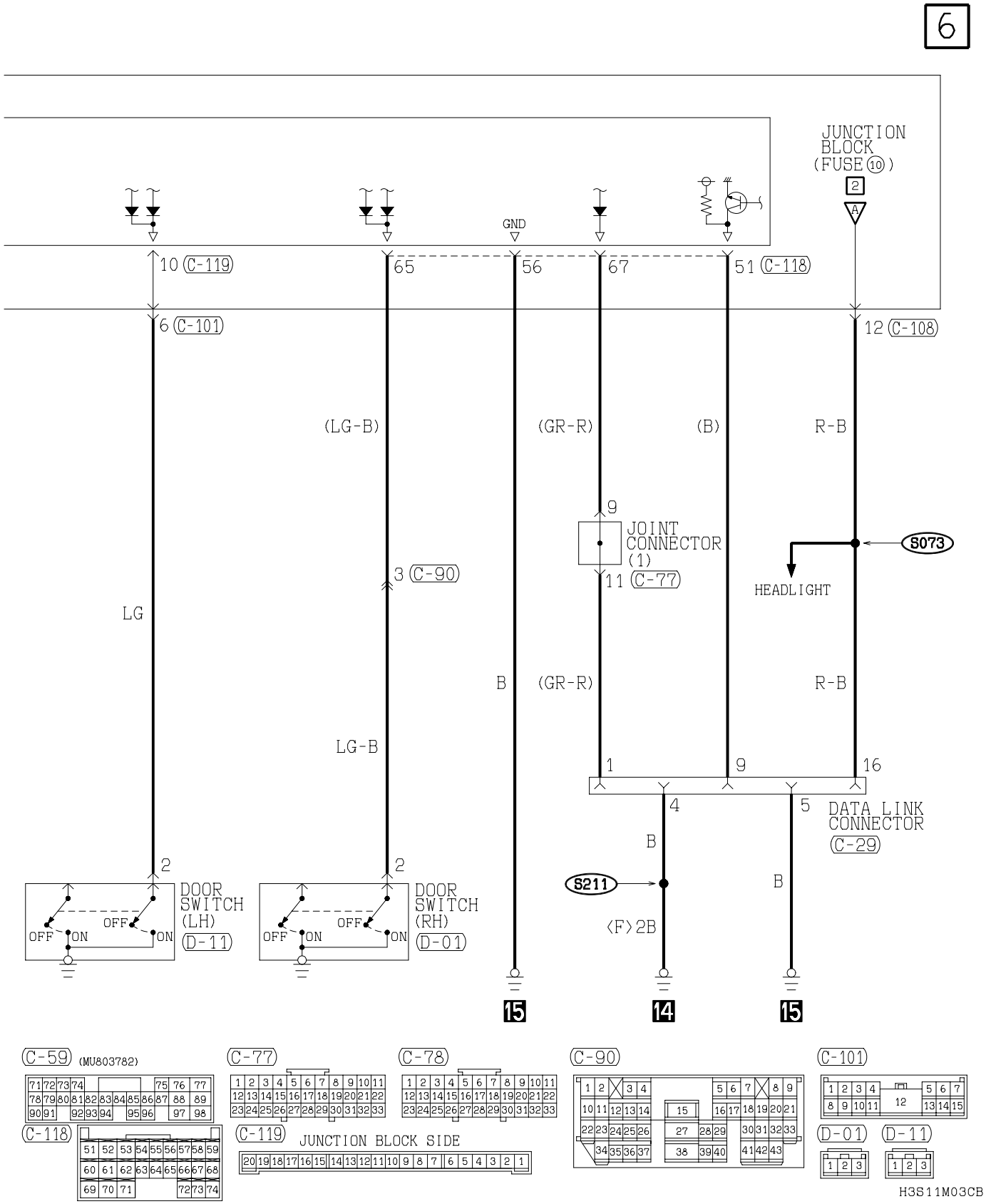
H3S11M03BB

TSB Revision

CENTRAL DOOR LOCKING SYSTEM <VEHICLES WITH KEYLESS ENTRY SYSTEM (WITHOUT THEFT-ALARM SYSTEM)> (CONTINUED)

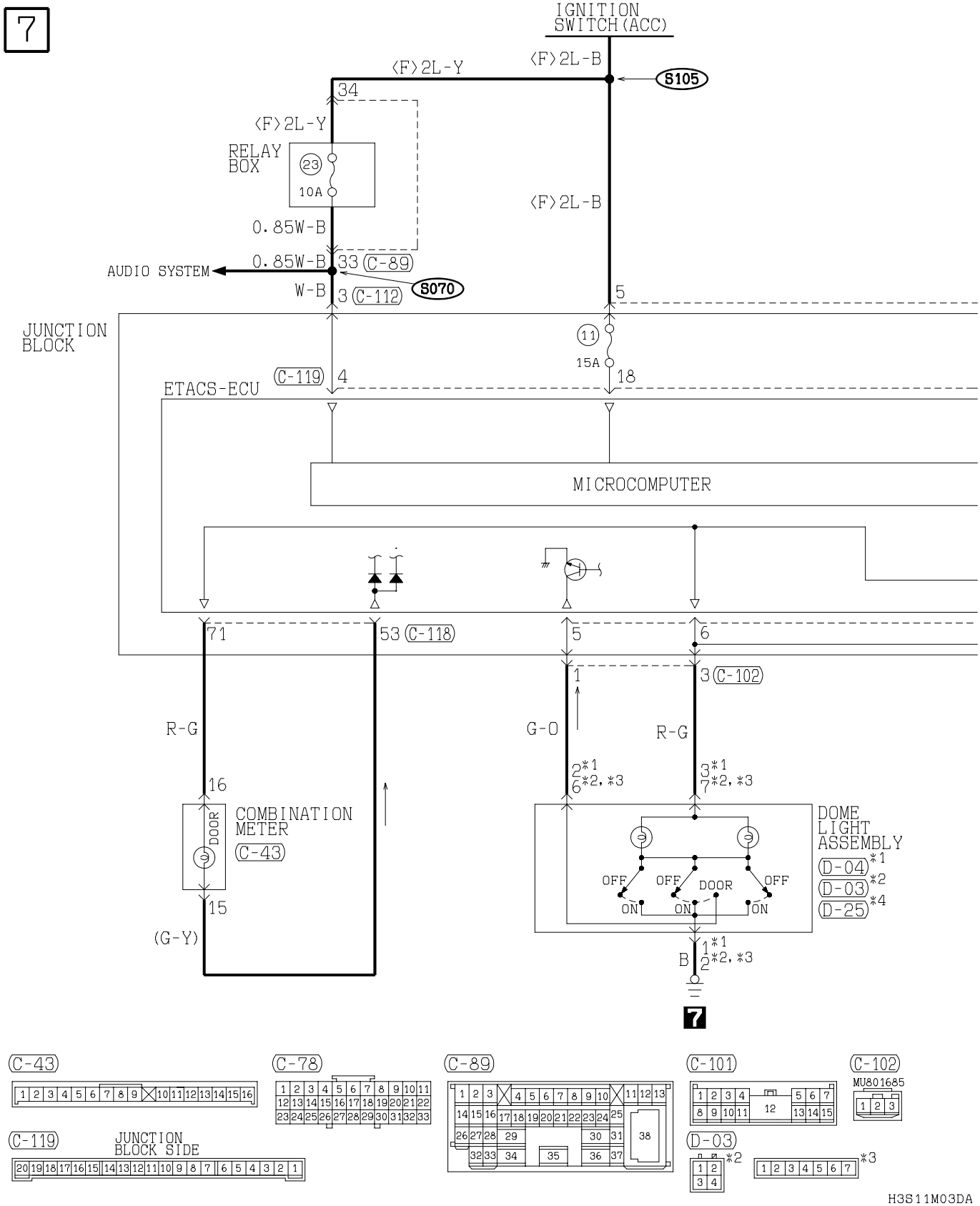


TSB Revision

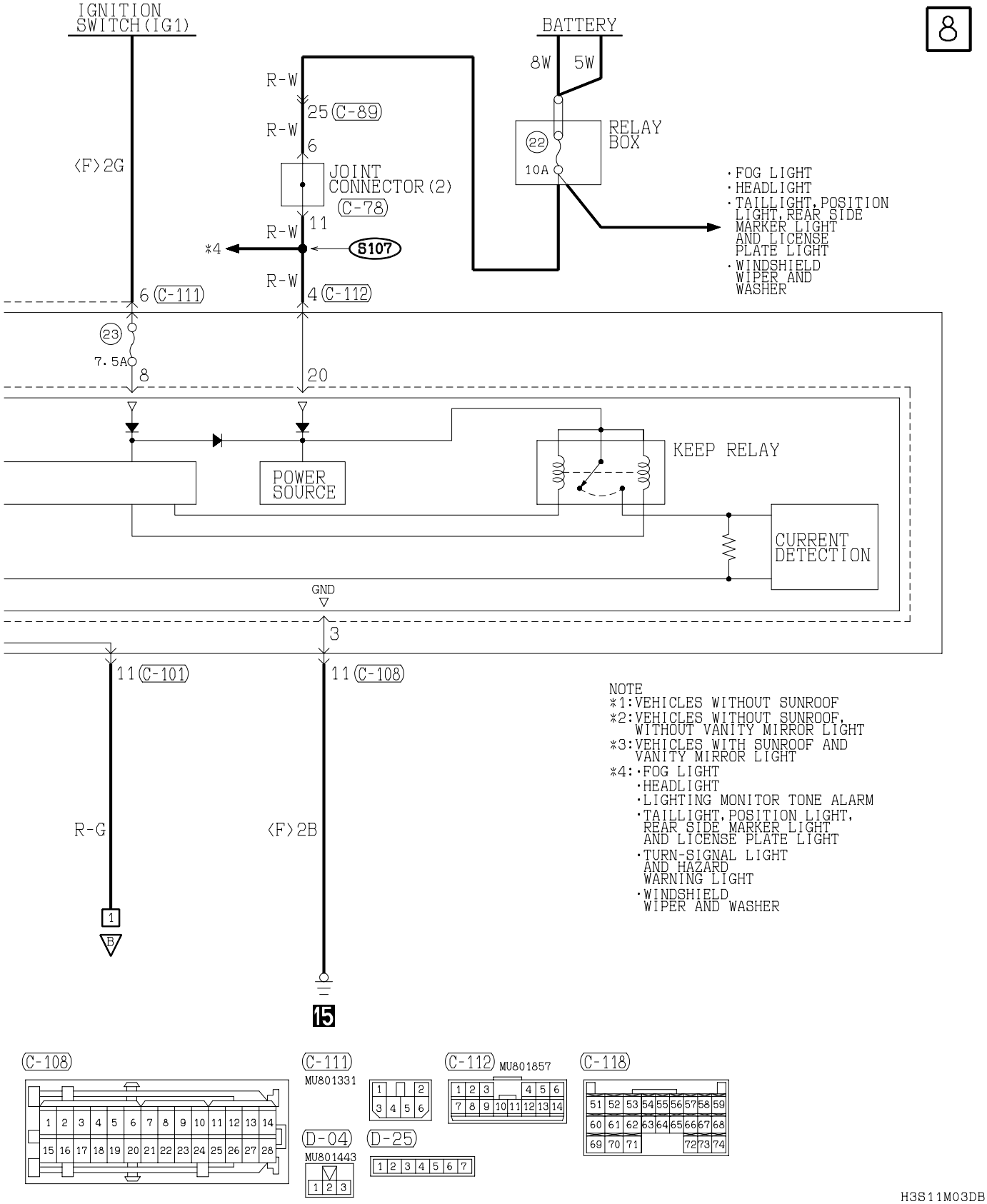


TSB Revision

CENTRAL DOOR LOCKING SYSTEM <VEHICLES WITH KEYLESS ENTRY SYSTEM (WITHOUT THEFT-ALARM SYSTEM)> (CONTINUED)

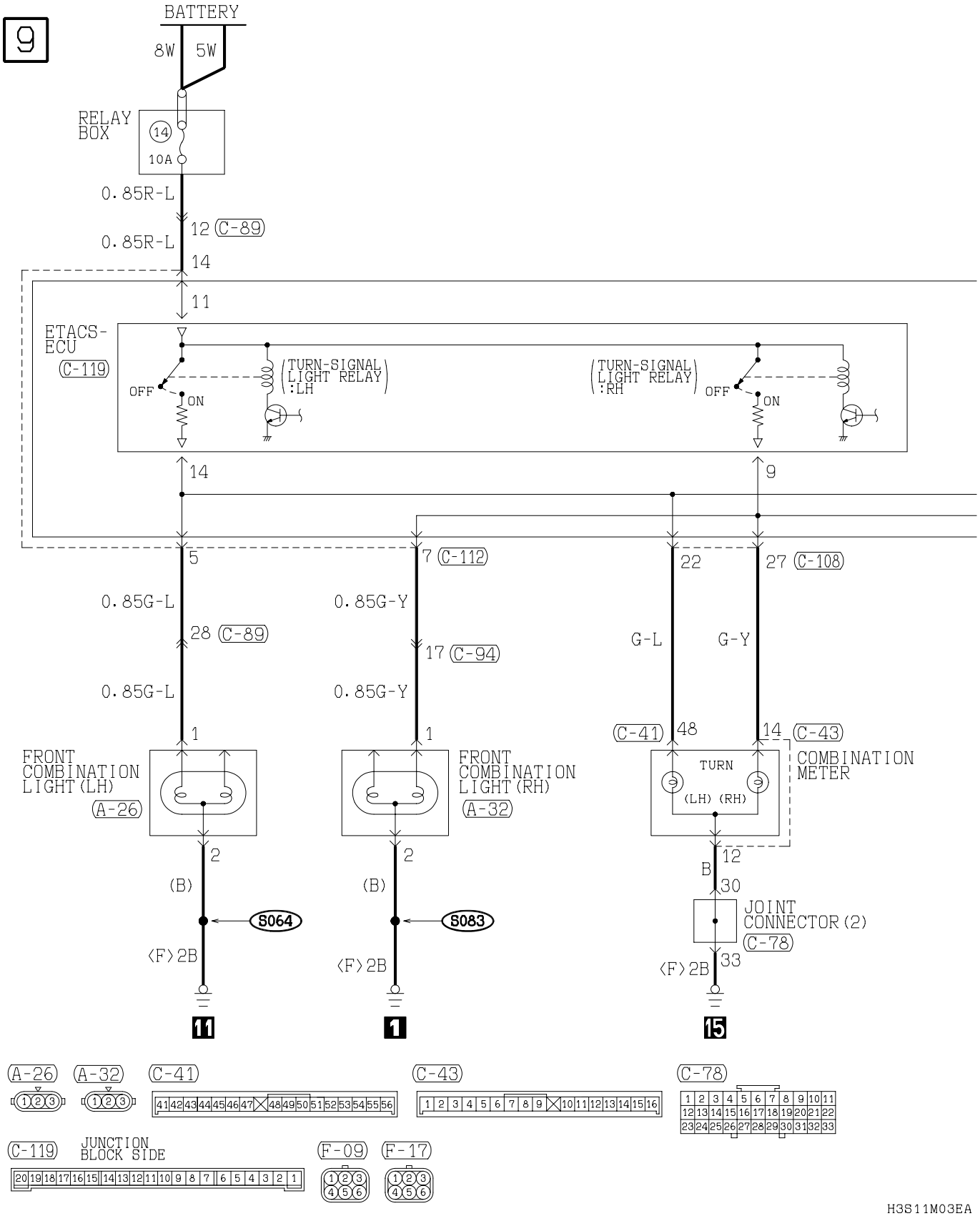


TSB Revision



TSB Revision

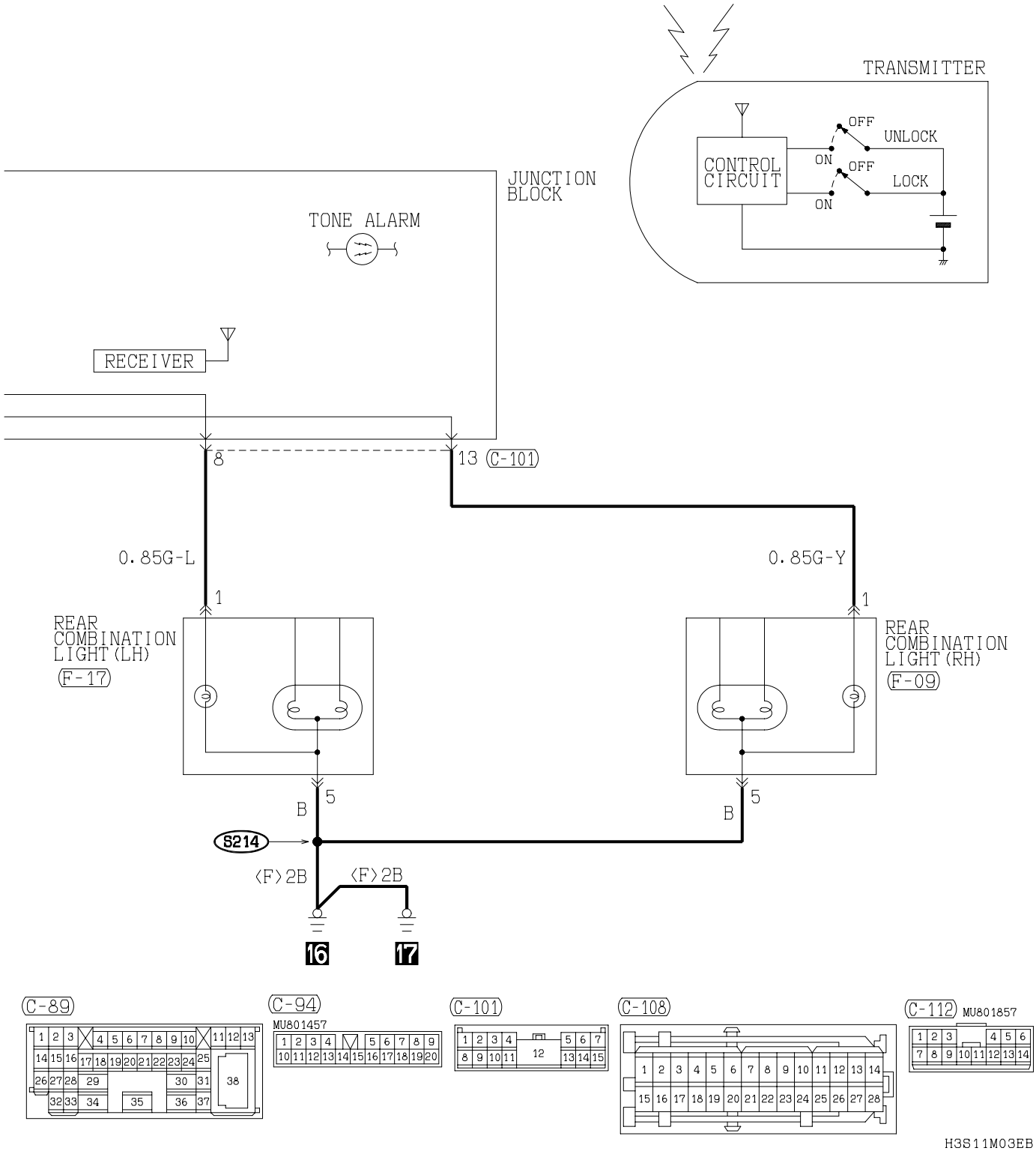
CENTRAL DOOR LOCKING SYSTEM <VEHICLES WITH KEYLESS ENTRY SYSTEM (WITHOUT THEFT-ALARM SYSTEM)> (CONTINUED)



H3S11M03EA

TSB Revision

10



TSB Revision

CENTRAL DOOR LOCKING SYSTEM <VEHICLES WITH KEYLESS ENTRY SYSTEM (WITH THEFT-ALARM SYSTEM)>

M1901004700601

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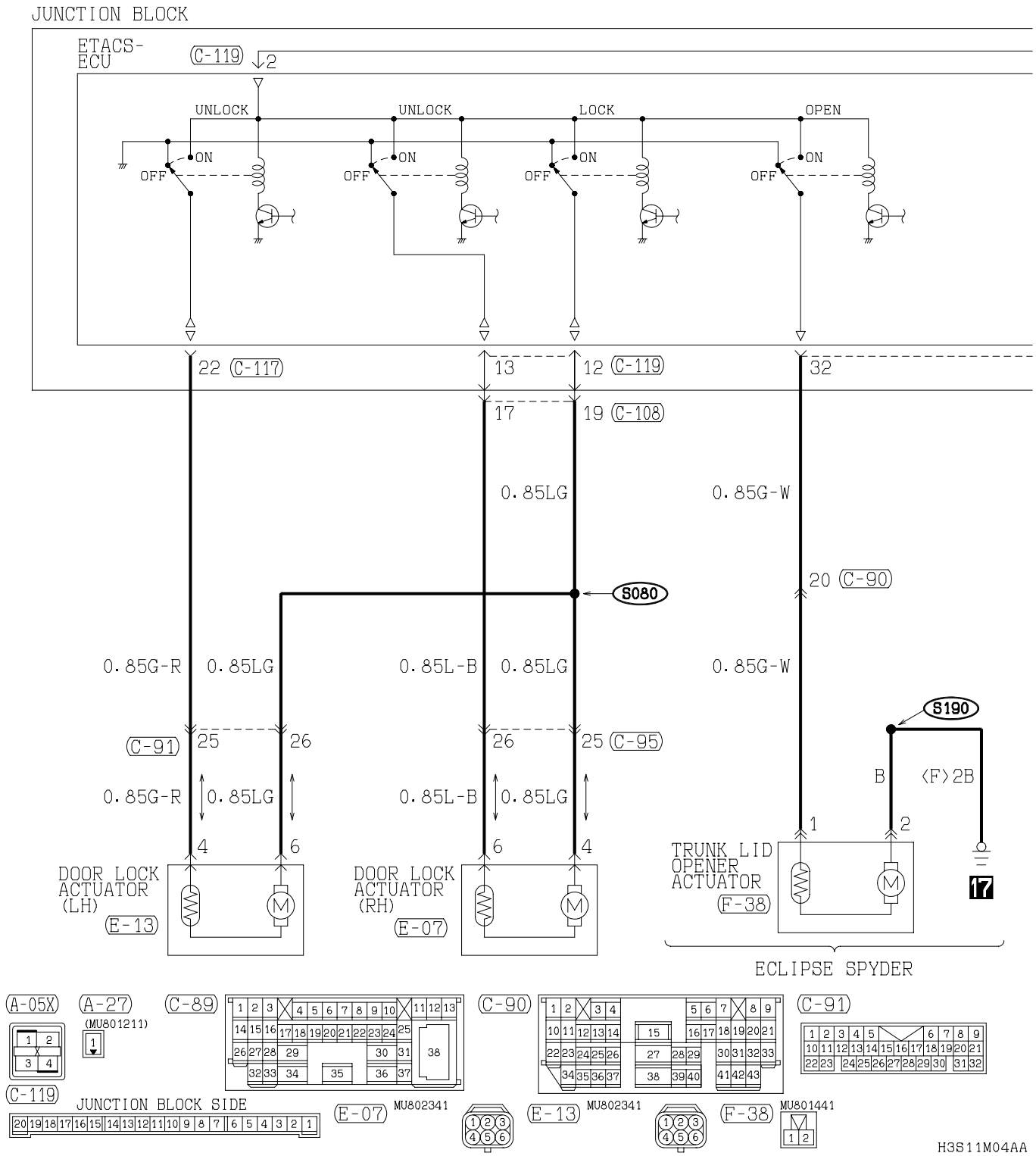
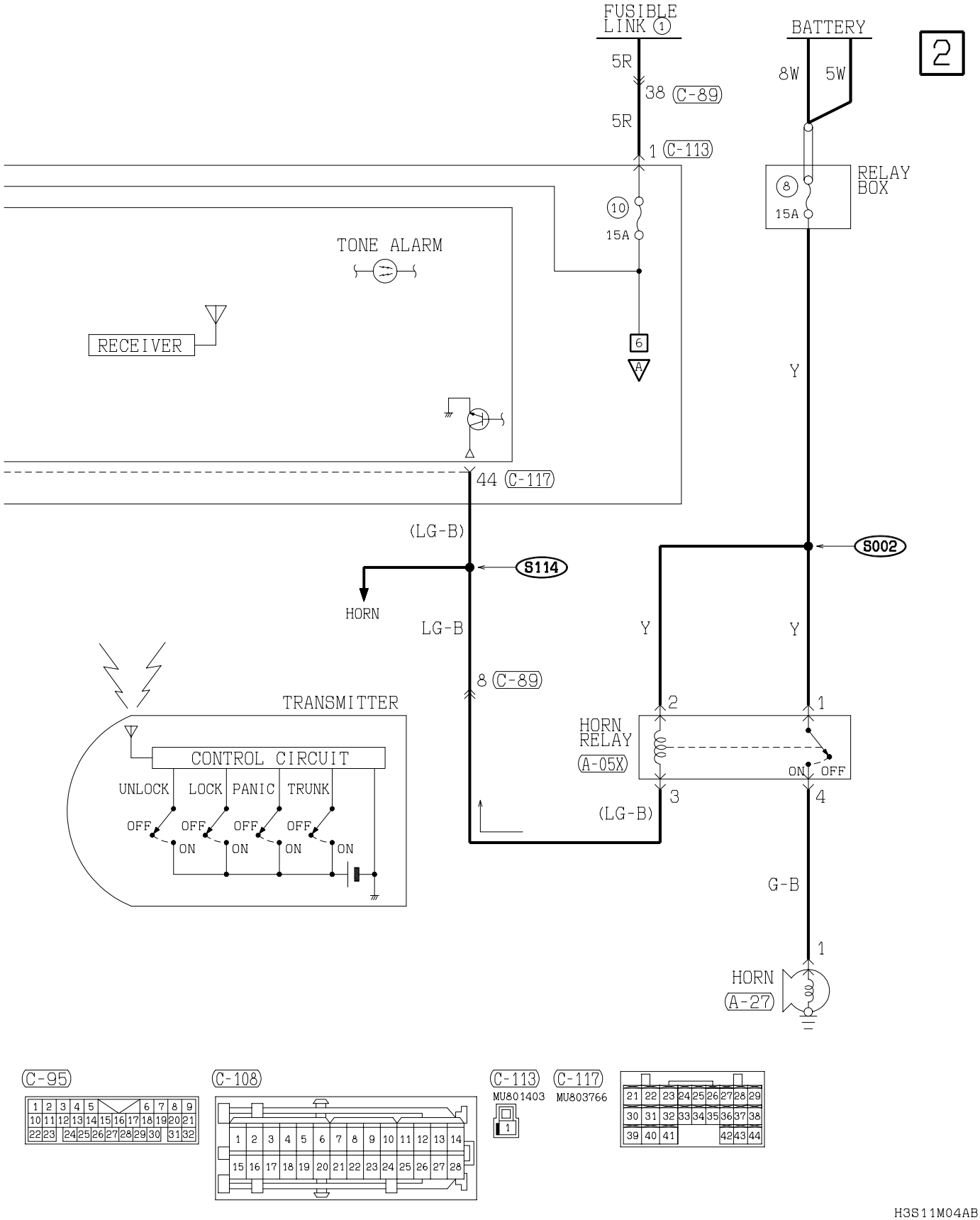


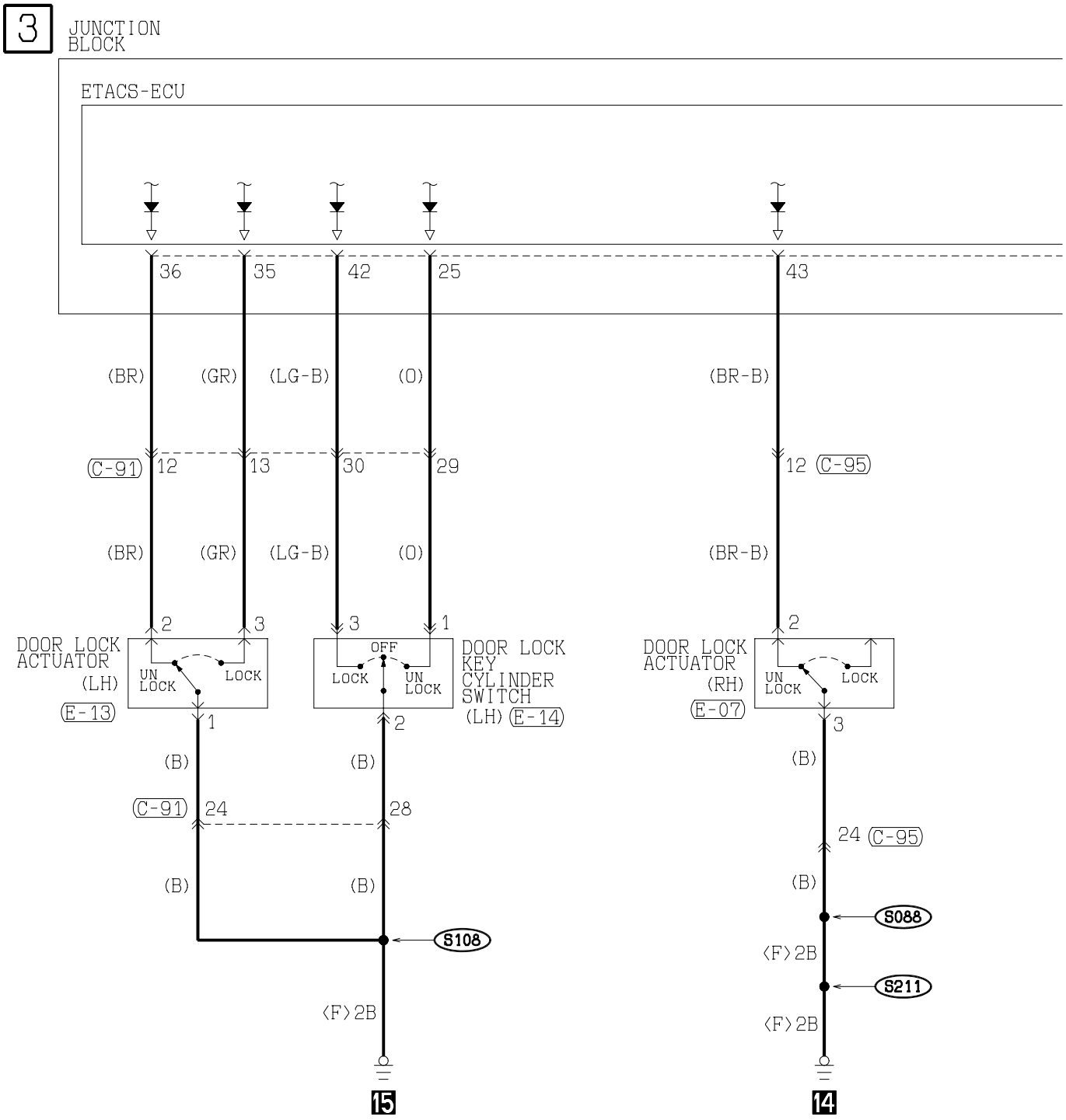
TSB Revision

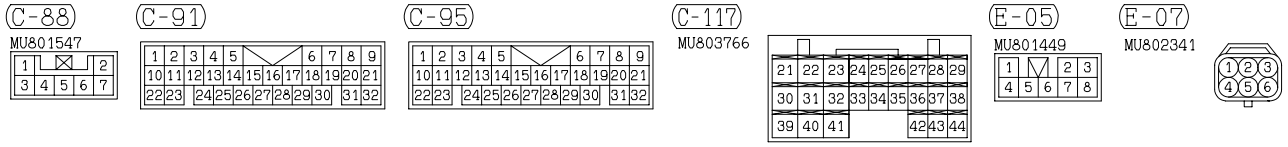


H3S11M04AB

TSB Revision

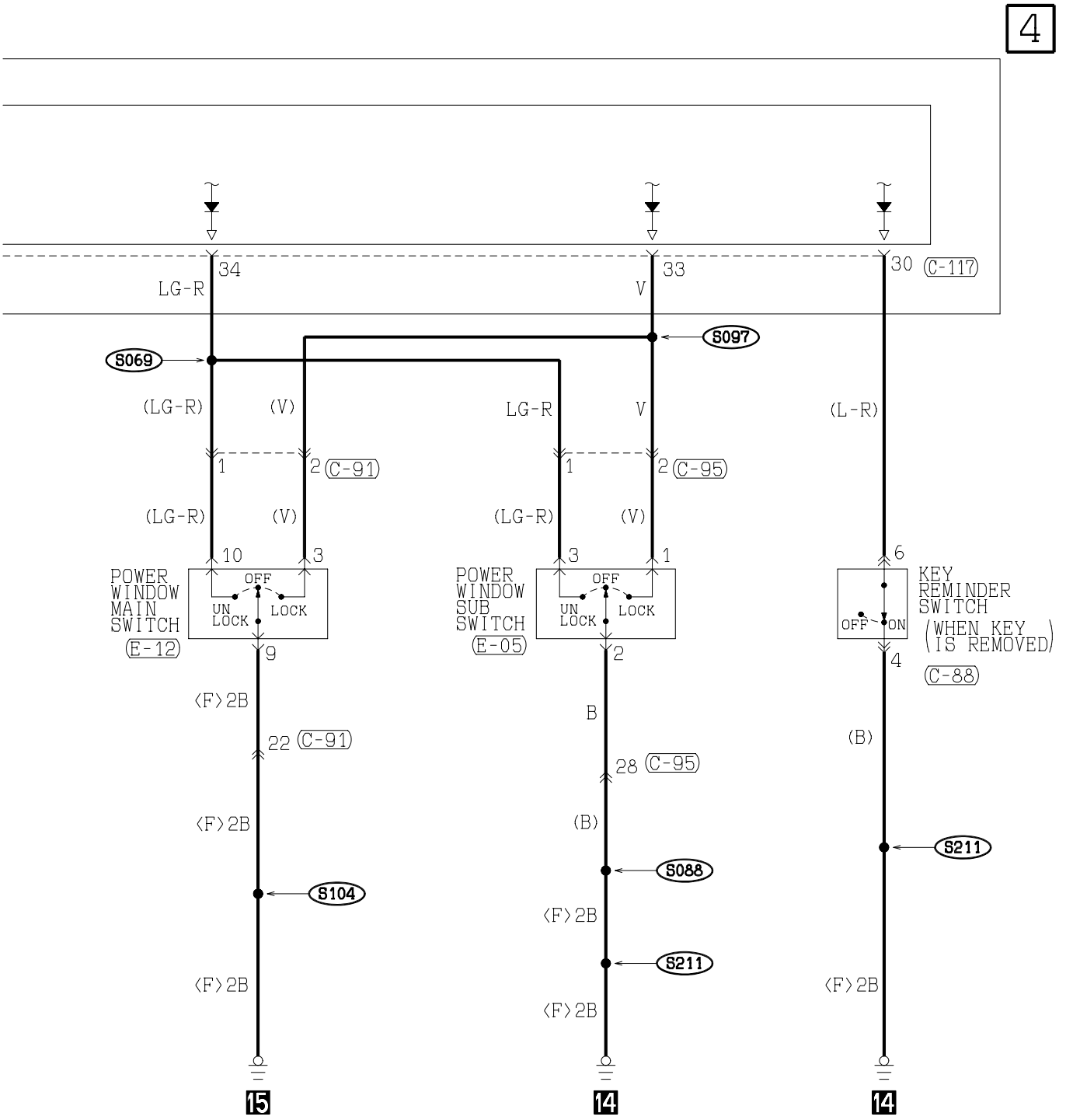
CENTRAL DOOR LOCKING SYSTEM <VEHICLES WITH KEYLESS ENTRY SYSTEM (WITH THEFT-ALARM SYSTEM)> (CONTINUED)

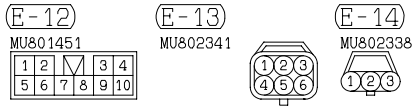




H3S11M04BA

TSB Revision





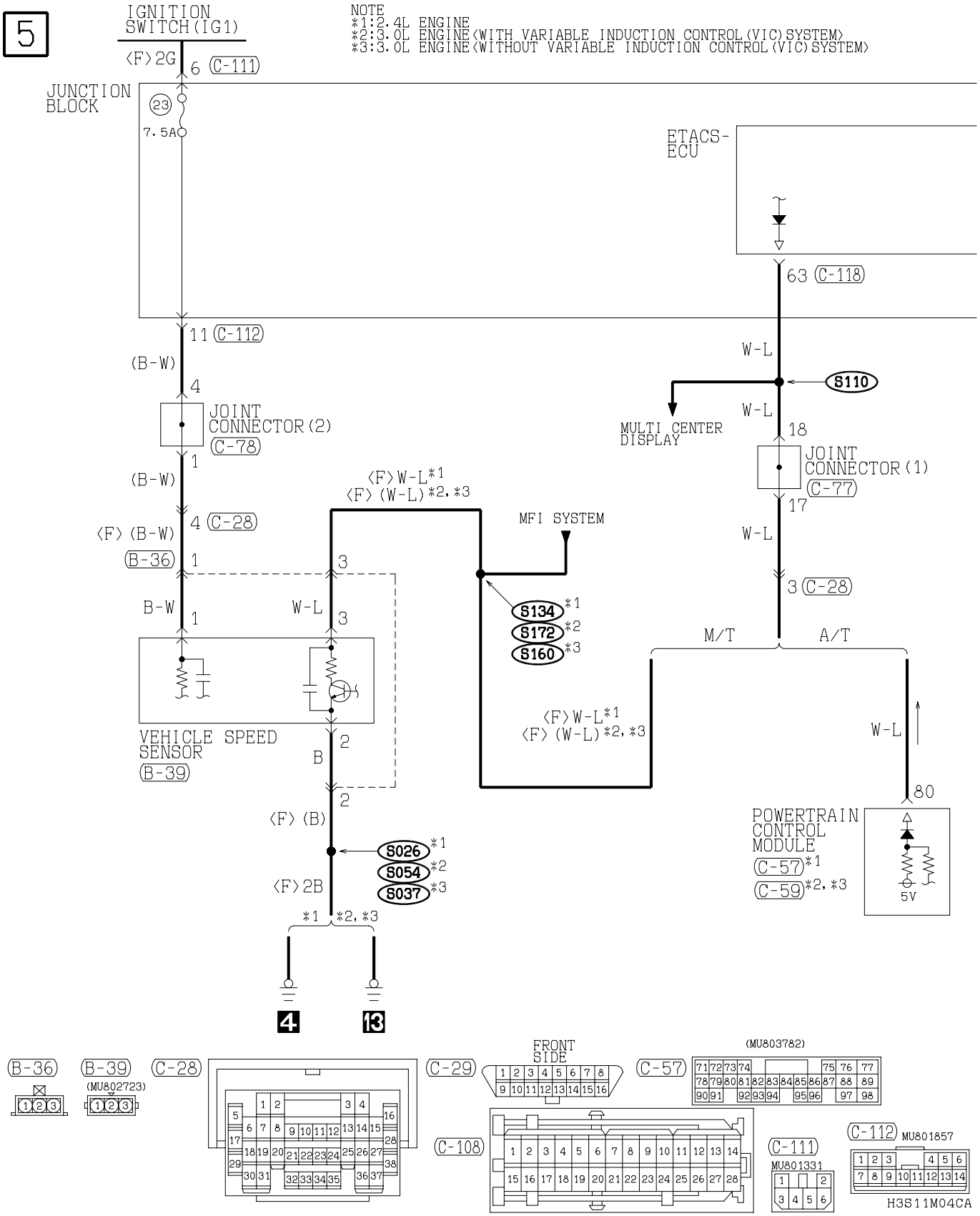
WIRE COLOR CODE

B :BLACK	BR:BROWN	G :GREEN	GR:GRAY	L :BLUE	LG:LIGHT GREEN	O :ORANGE	
P :PINK	R :RED	SB:SKY BLUE	V :VIOLET	W :WHITE	Y :YELLOW		

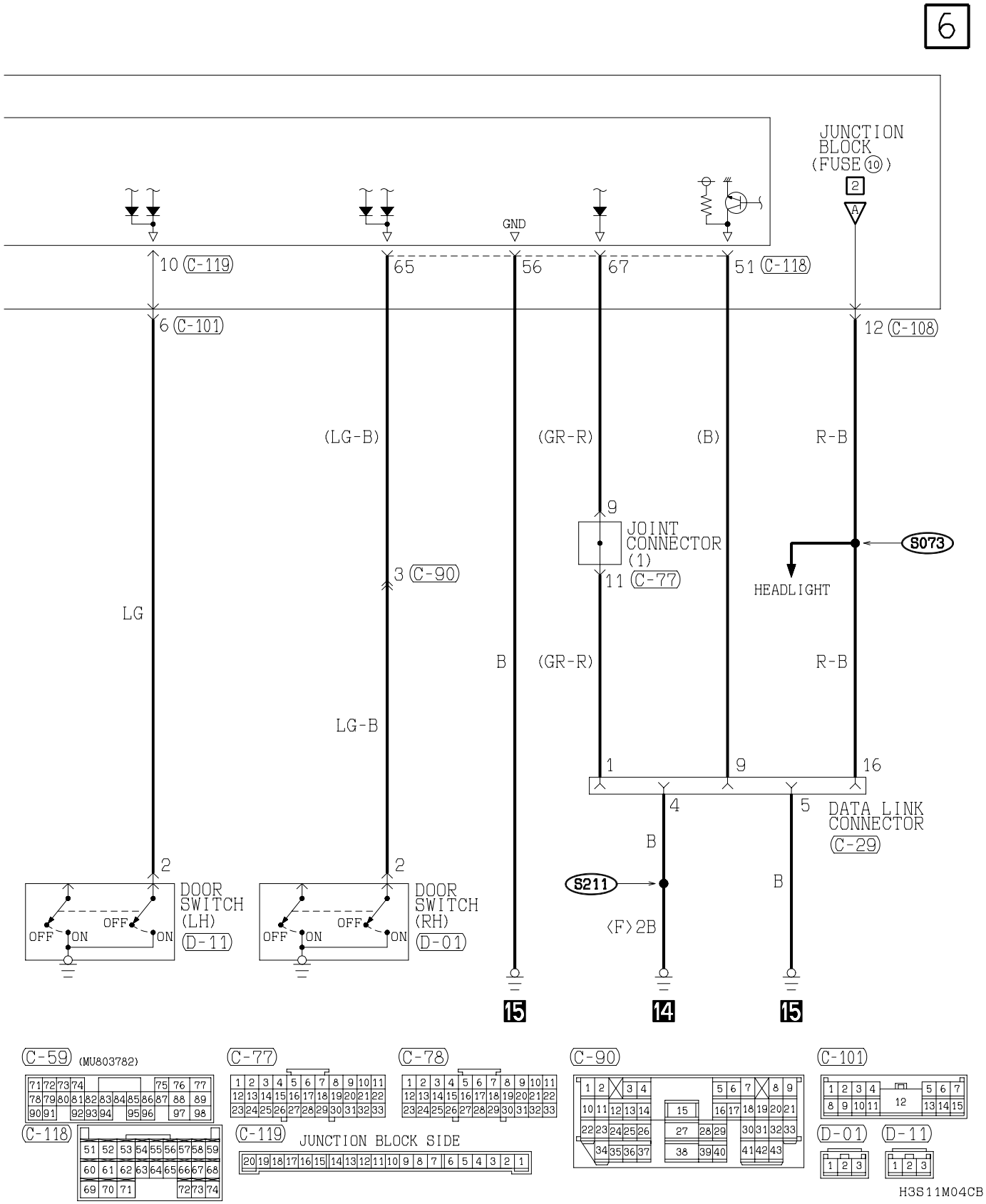
H3S11M04BB

TSB Revision

CENTRAL DOOR LOCKING SYSTEM <VEHICLES WITH KEYLESS ENTRY SYSTEM (WITH THEFT-ALARM SYSTEM)> (CONTINUED)

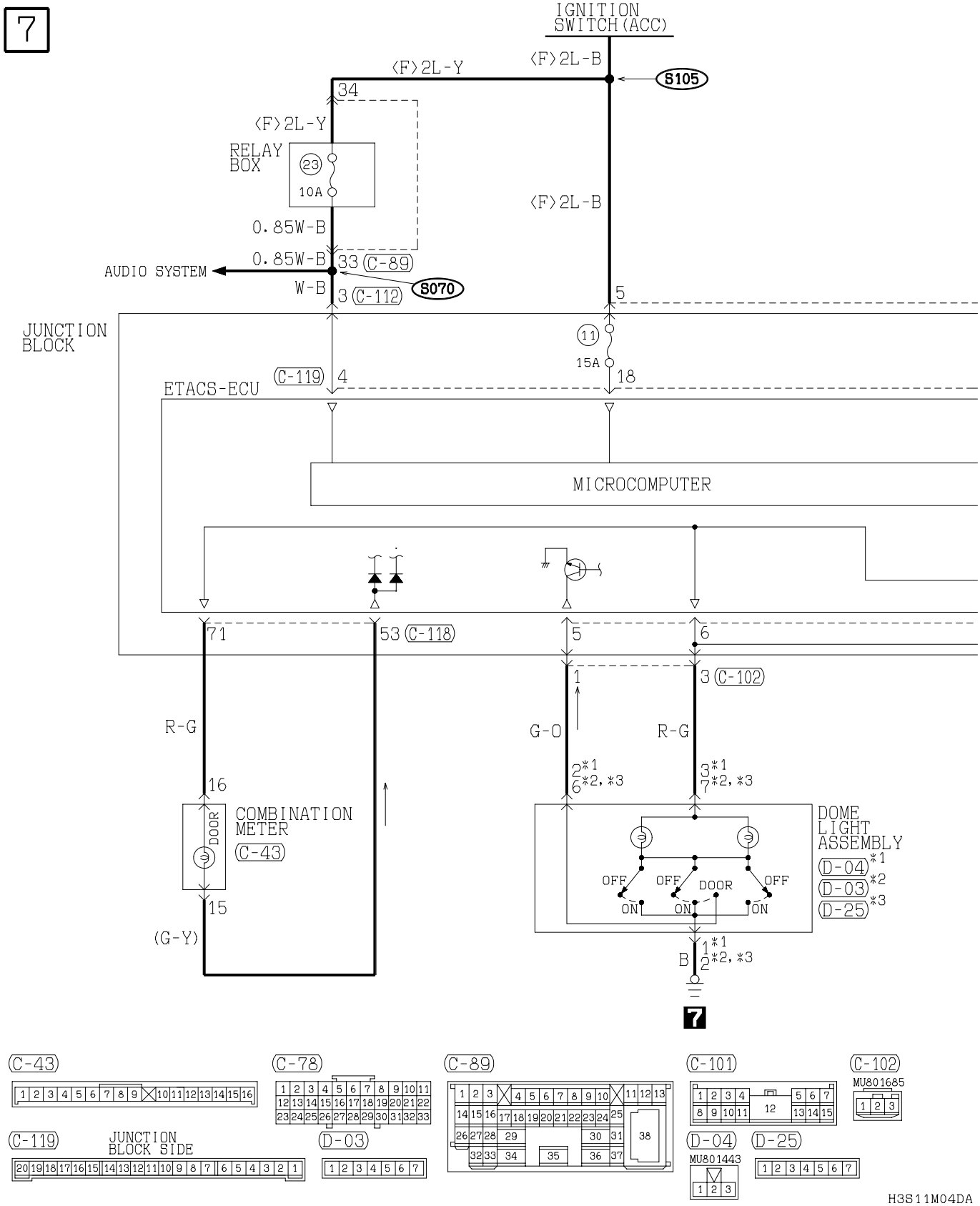


TSB Revision

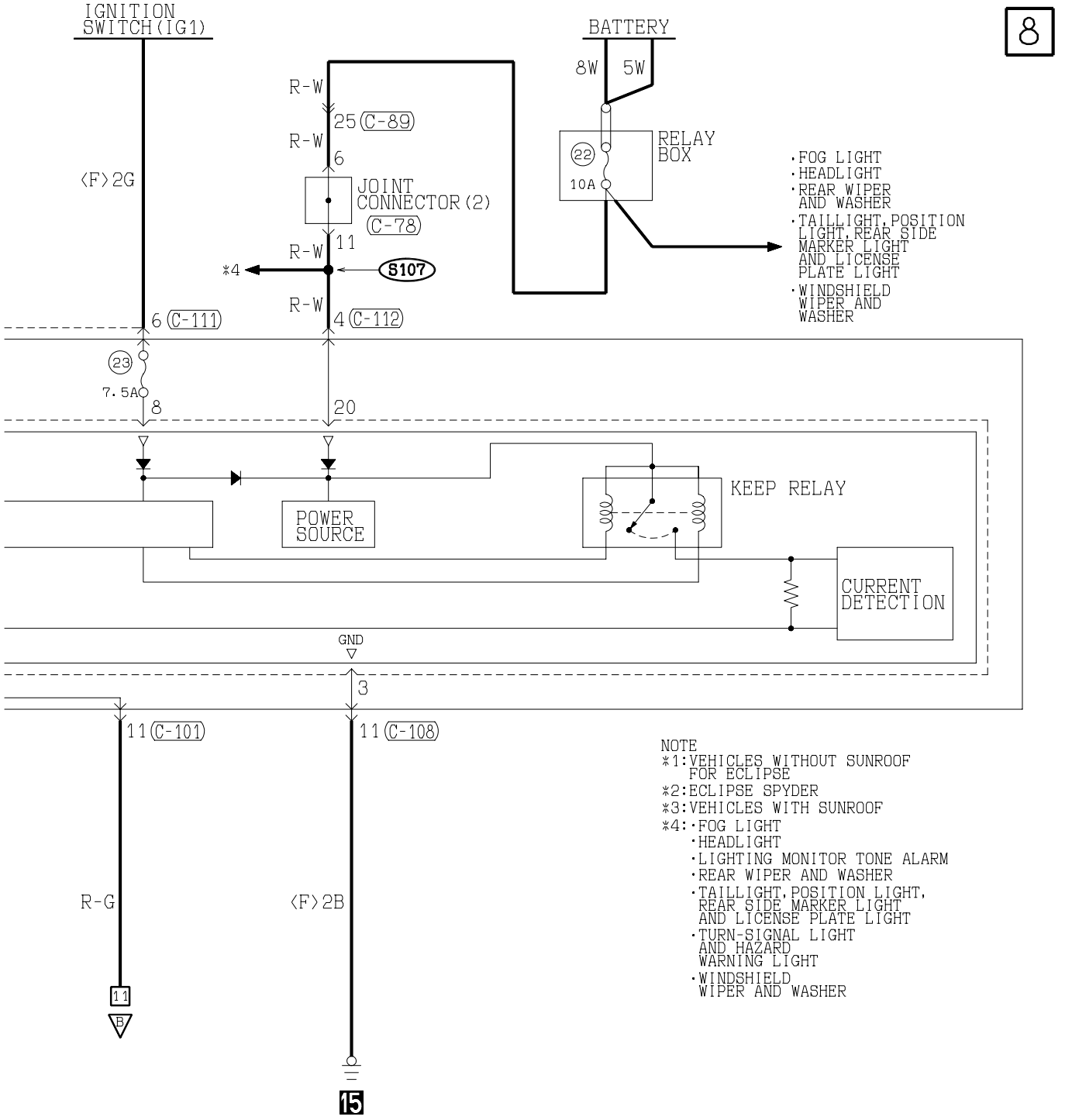


TSB Revision

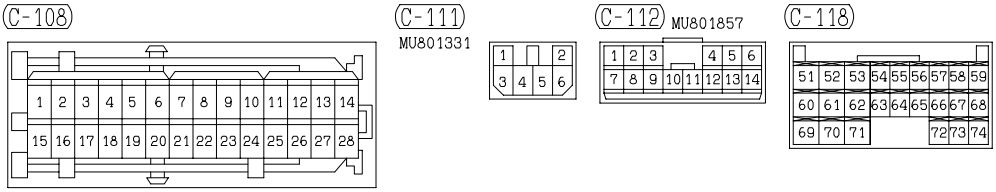
CENTRAL DOOR LOCKING SYSTEM <VEHICLES WITH KEYLESS ENTRY SYSTEM (WITH THEFT-ALARM SYSTEM)> (CONTINUED)



TSB Revision



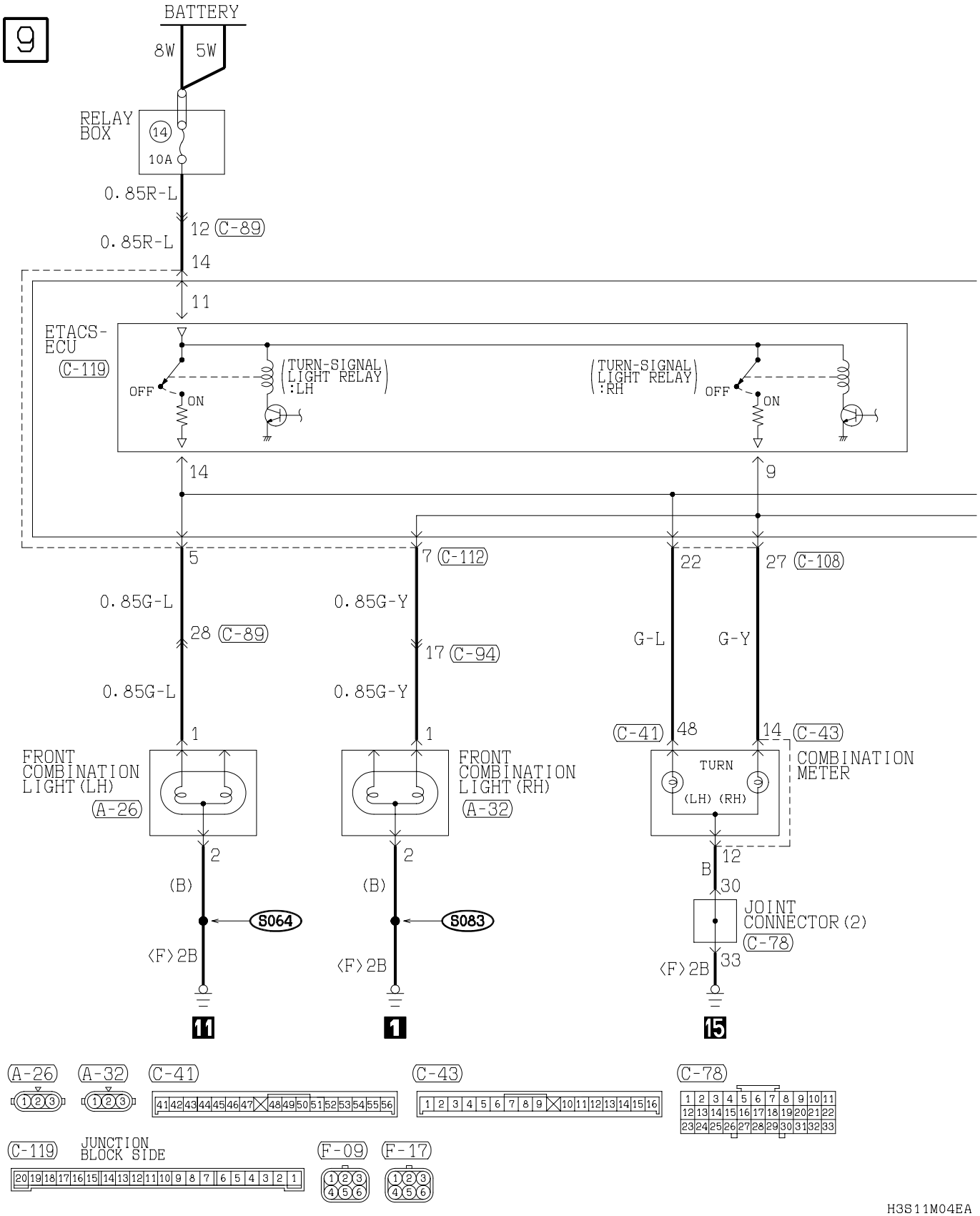
NOTE
*1:VEHICLES WITHOUT SUNROOF FOR ECLIPSE
*2:ECLIPSE SPYDER
*3:VEHICLES WITH SUNROOF
*4:·FOG LIGHT
·HEADLIGHT
·LIGHTING MONITOR TONE ALARM
·REAR WIPER AND WASHER
·TAILLIGHT,POSITION LIGHT, REAR SIDE MARKER LIGHT AND LICENSE PLATE LIGHT
·TURN-SIGNAL LIGHT AND HAZARD WARNING LIGHT
·WINDSHIELD WIPER AND WASHER



H3S11M04DB

TSB Revision

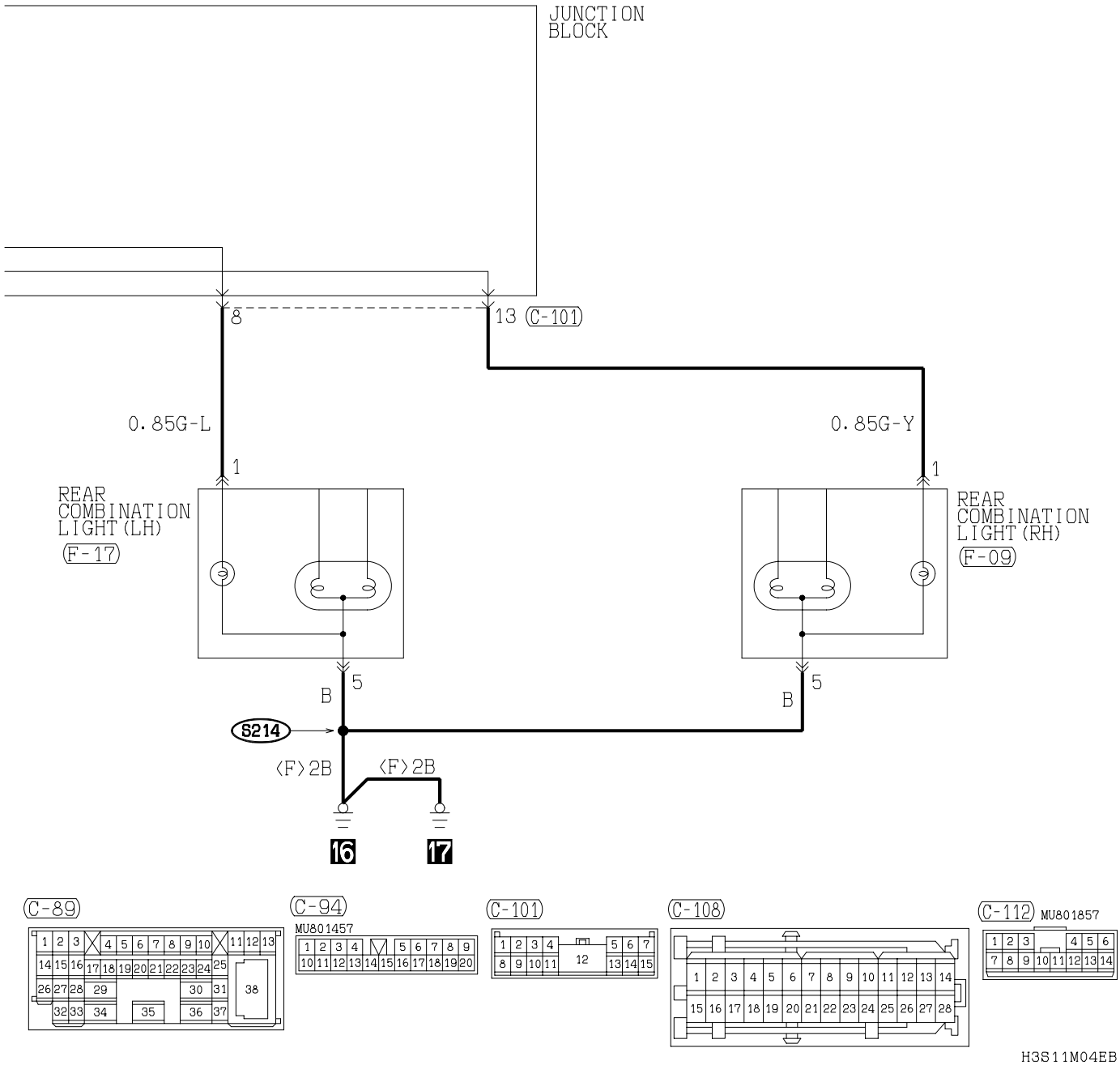
CENTRAL DOOR LOCKING SYSTEM <VEHICLES WITH KEYLESS ENTRY SYSTEM (WITH THEFT-ALARM SYSTEM)> (CONTINUED)



H3S11M04EA

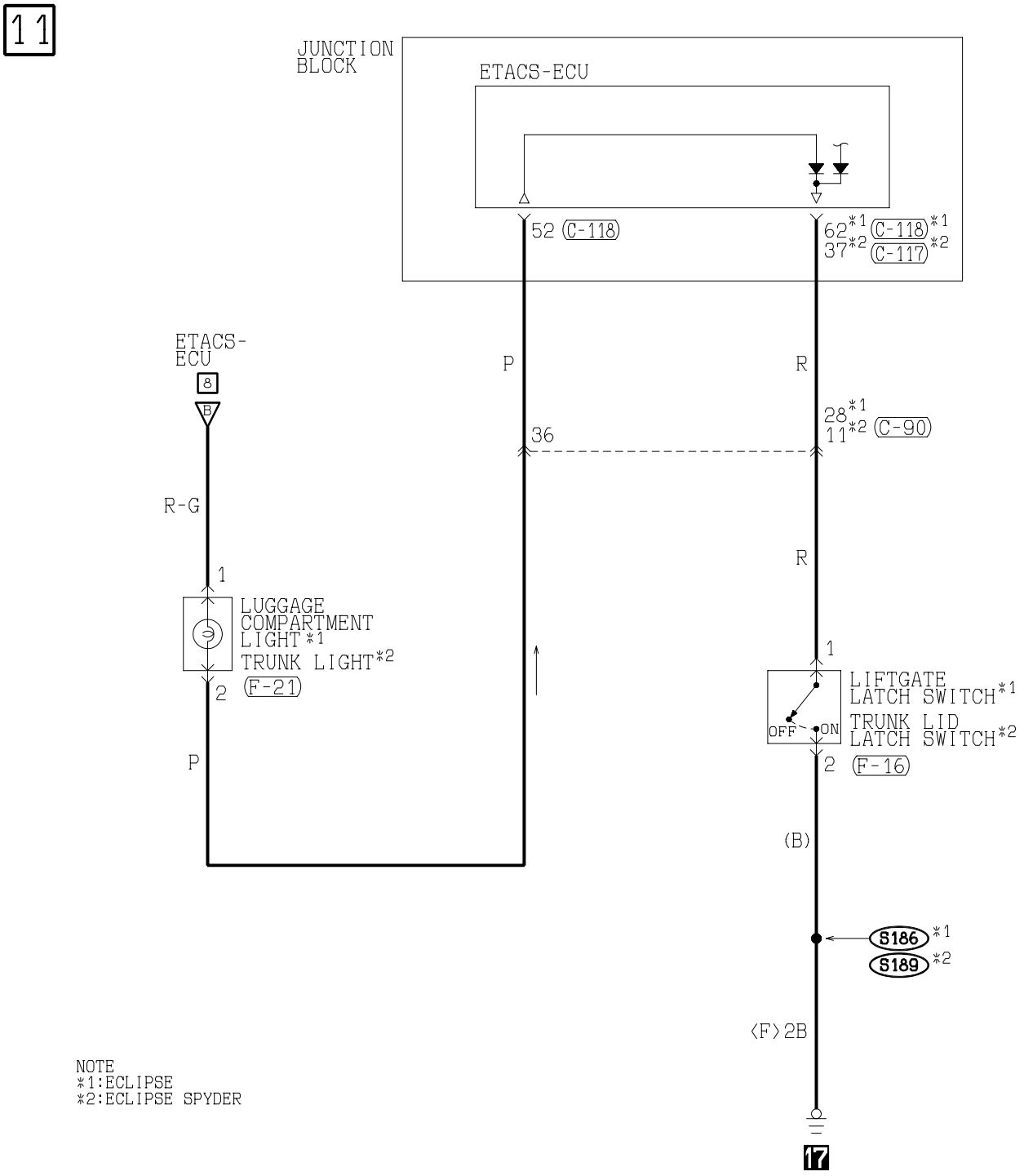
TSB Revision

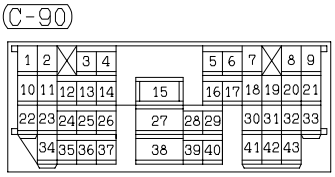
10

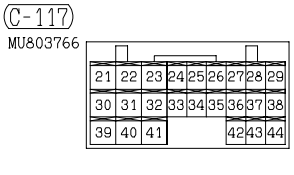


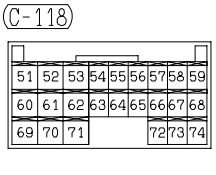
TSB Revision

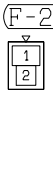
CENTRAL DOOR LOCKING SYSTEM <VEHICLES WITH KEYLESS ENTRY SYSTEM (WITH THEFT-ALARM SYSTEM)> (CONTINUED)











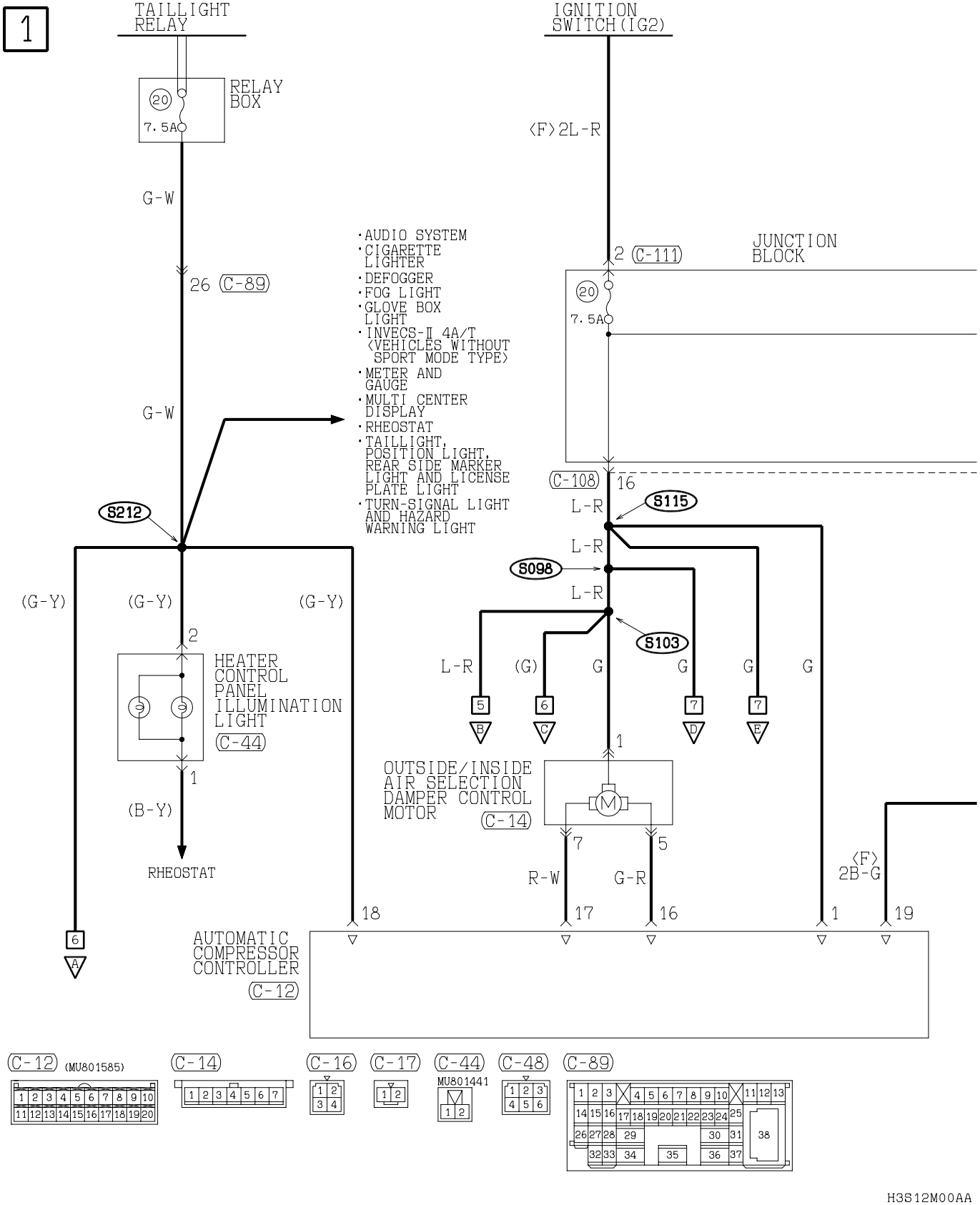
H3S11M04FA

TSB Revision

NOTES

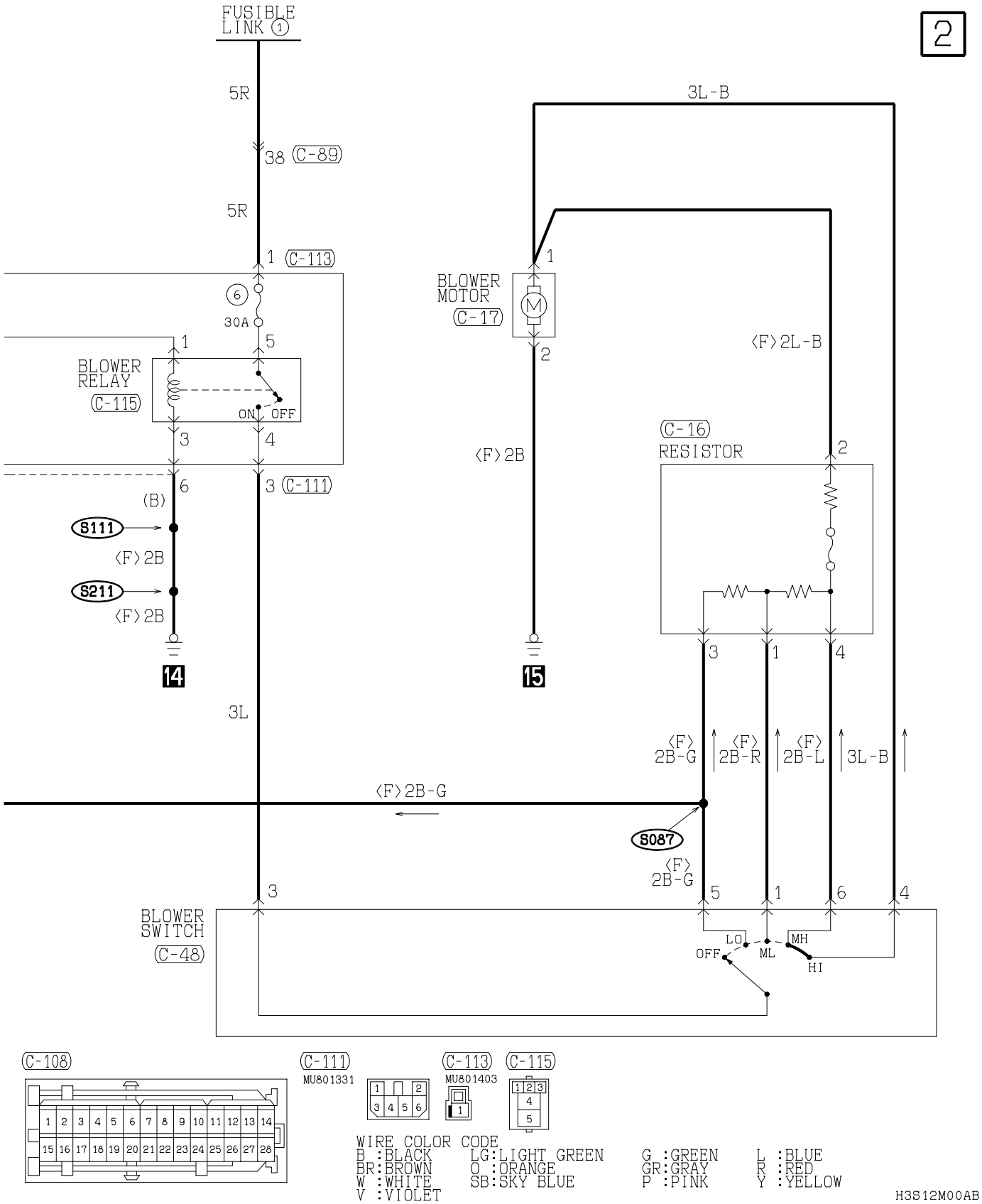
AIR CONDITIONING SYSTEM <2.4L ENGINE (ECLIPSE)>

M1901005500558



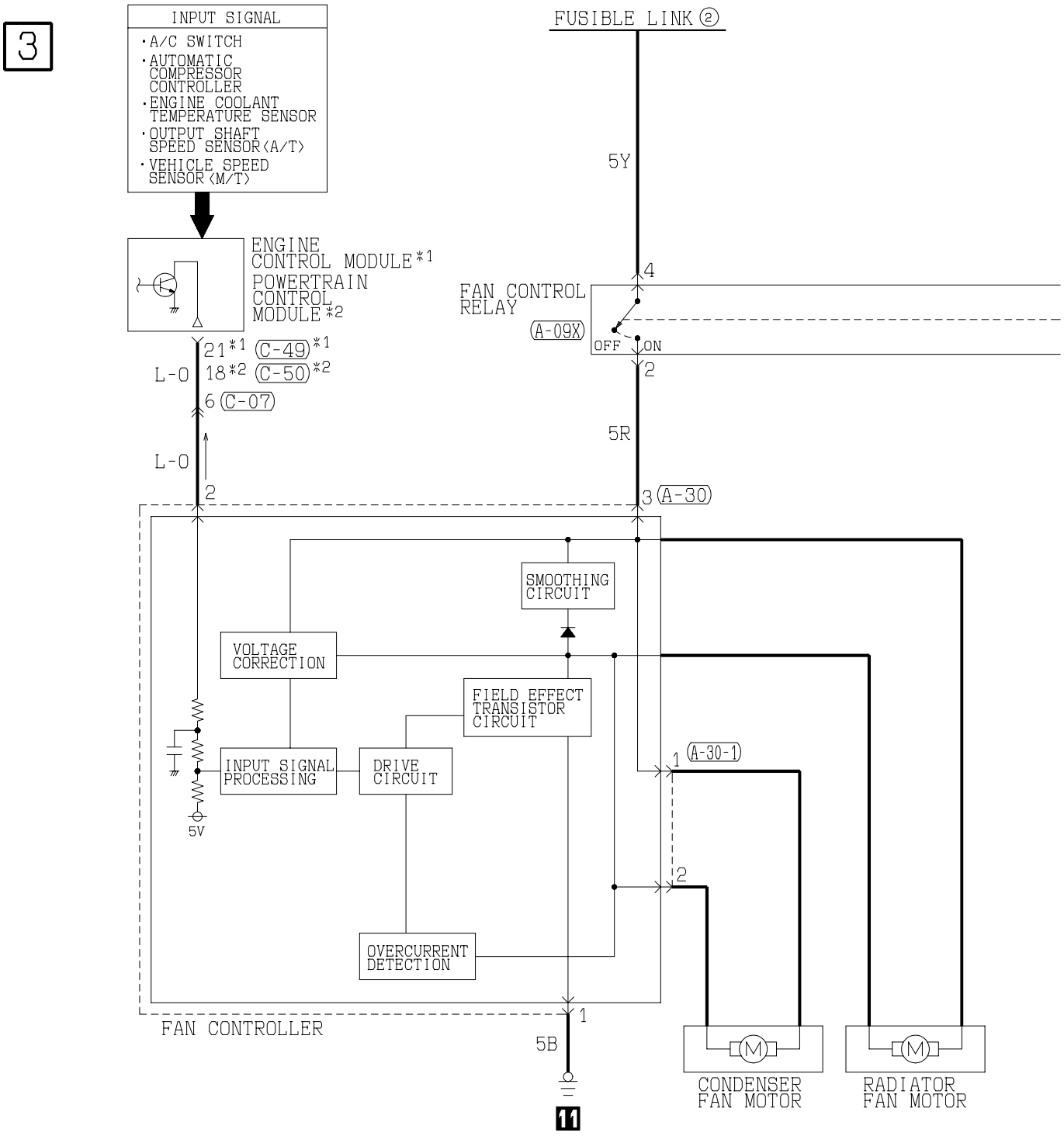
H3S12M00AA

TSB Revision



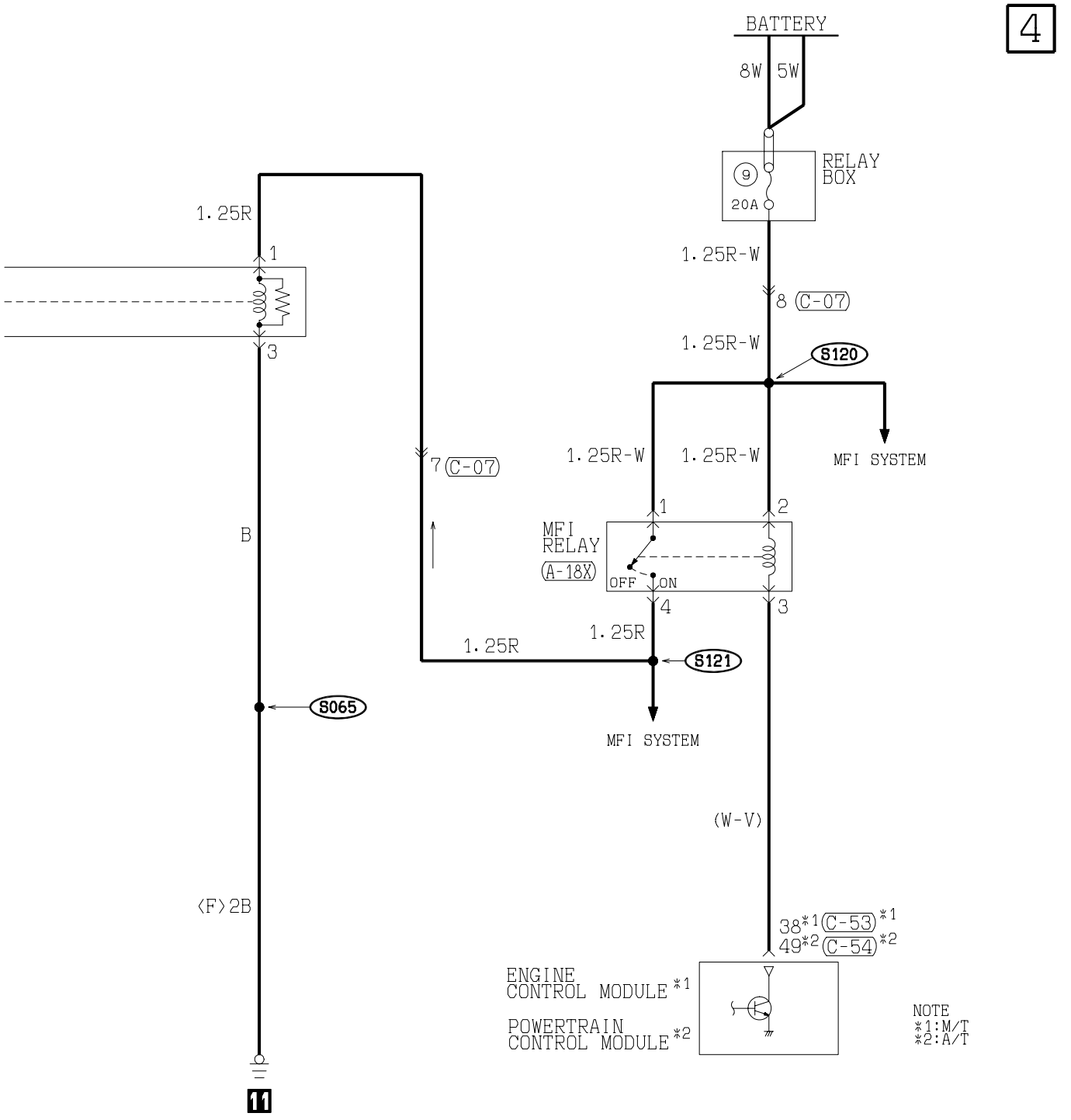
TSB Revision

AIR CONDITIONING SYSTEM <2.4L ENGINE (ECLIPSE)> (CONTINUED)



H3S12M00BA

TSB Revision



C-53 (MU803771)

31	32	33	34	35	36	37	38	
39	40	41	42	43	44	45	46	

C-54 (MU803781)

41	42	43						44	45	46			
47	48	49	50	51	52	53	54	55	56	57			
58	59		60	61	62	63		64	65	66			

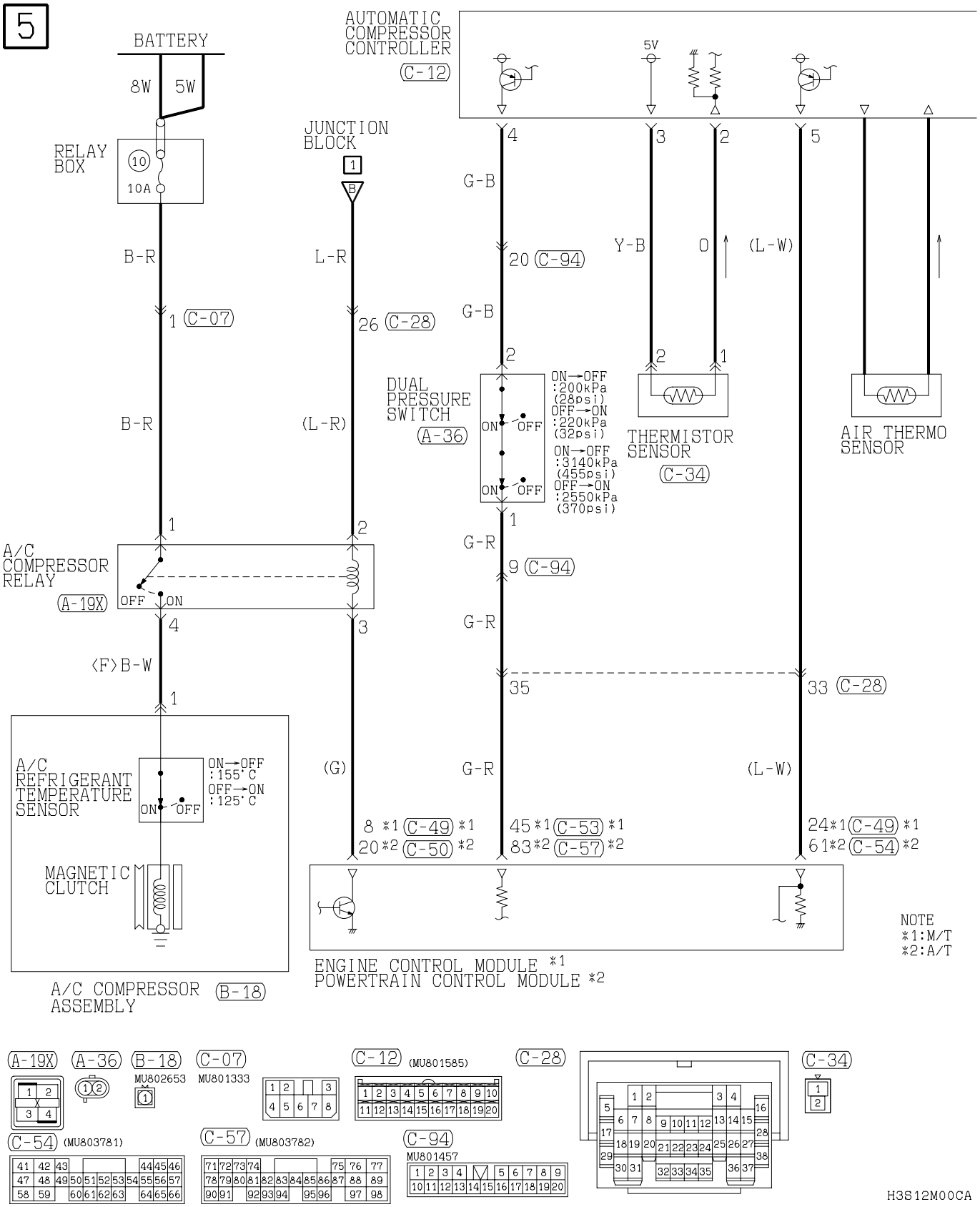
WIRE COLOR CODE

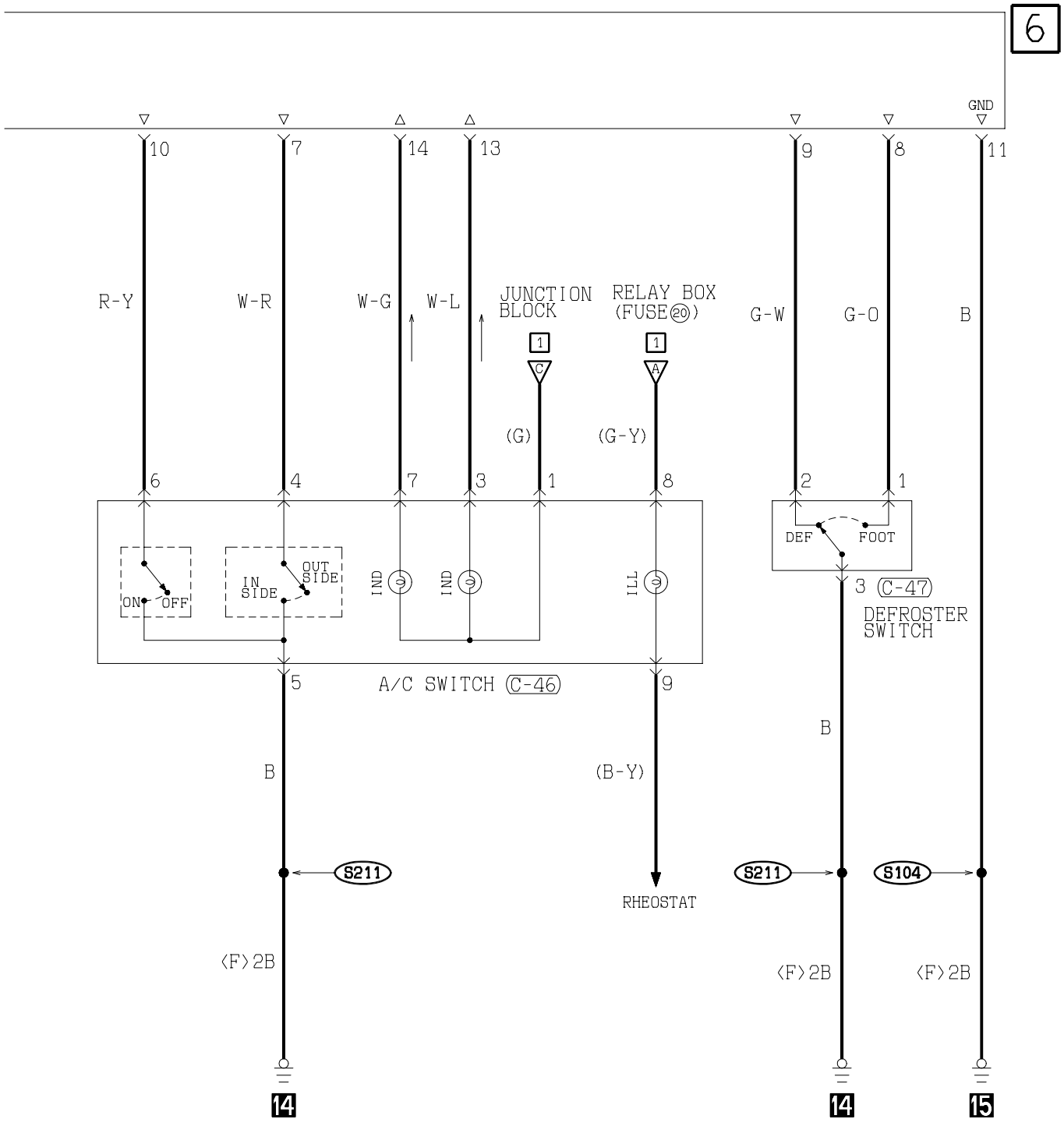
B :BLACK	BR:BROWN	G :GREEN	GR:GRAY	L :BLUE	LG:LIGHT GREEN	O :ORANGE	
P :PINK	R :RED	SB:SKY BLUE	V :VIOLET	W :WHITE	Y :YELLOW		

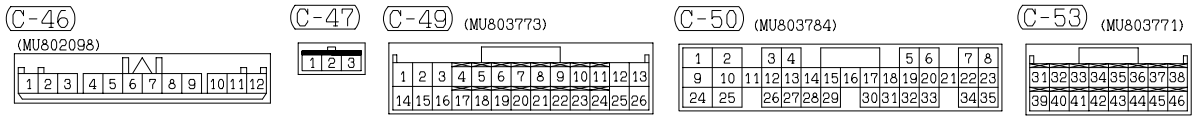
H3S12M00BB

TSB Revision

AIR CONDITIONING SYSTEM <2.4L ENGINE (ECLIPSE)> (CONTINUED)







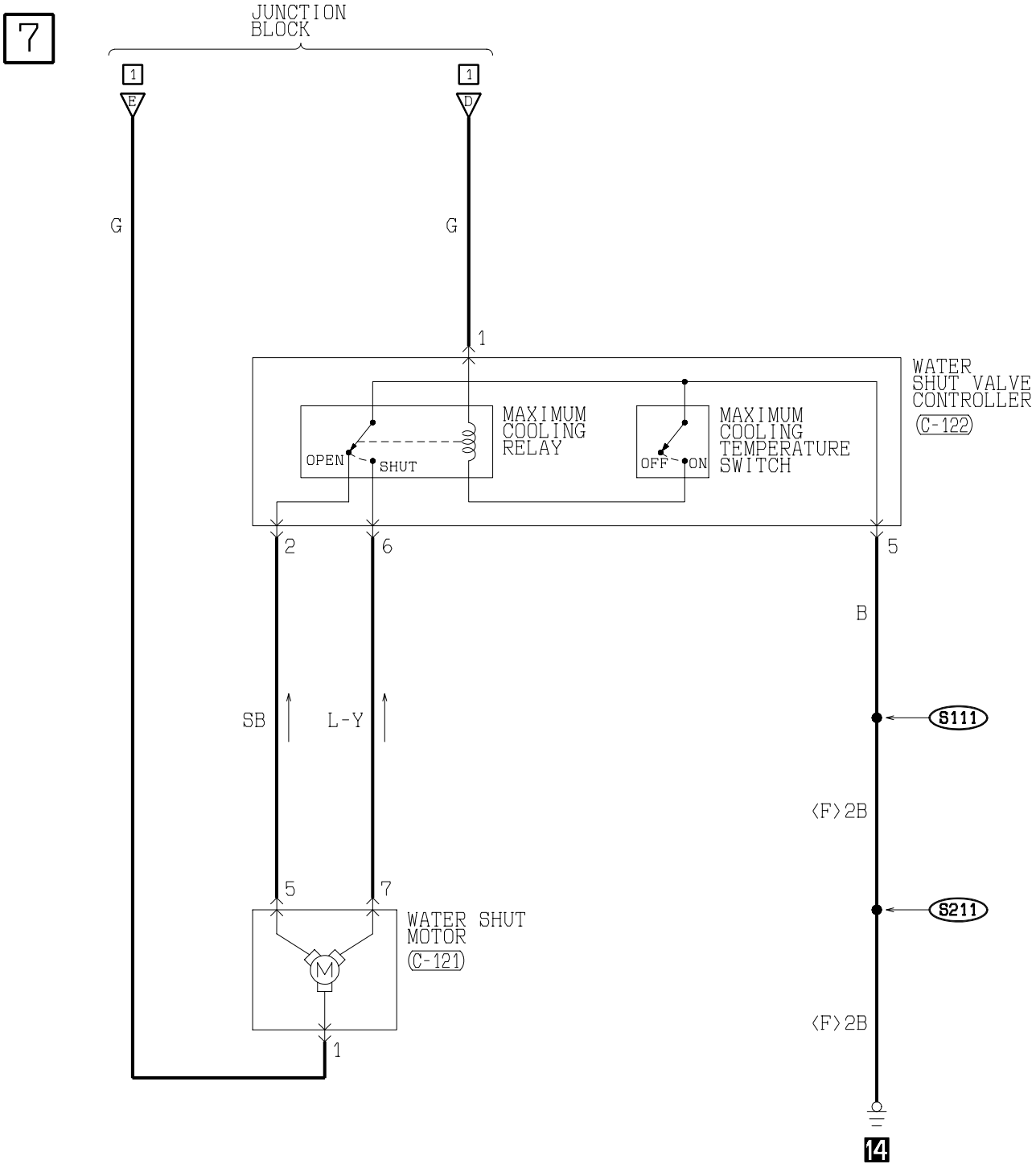
WIRE COLOR CODE

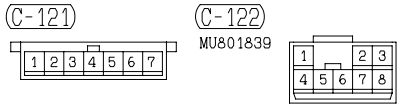
B :BLACK	LG:LIGHT GREEN	G :GREEN	L :BLUE	W :WHITE	Y :YELLOW	SB:SKY BLUE
BR:BROWN	O :ORANGE	GR:GRAY	R :RED	P :PINK	V :VIOLET	

H3S12M00CB

TSB Revision

AIR CONDITIONING SYSTEM <2.4L ENGINE (ECLIPSE)> (CONTINUED)





WIRE COLOR CODE

B :BLACK	LG:LIGHT GREEN	G :GREEN	L :BLUE	W :WHITE	Y :YELLOW	SB:SKY BLUE	
BR:BROWN	O :ORANGE	GR:GRAY	R :RED	P :PINK	V :VIOLET		

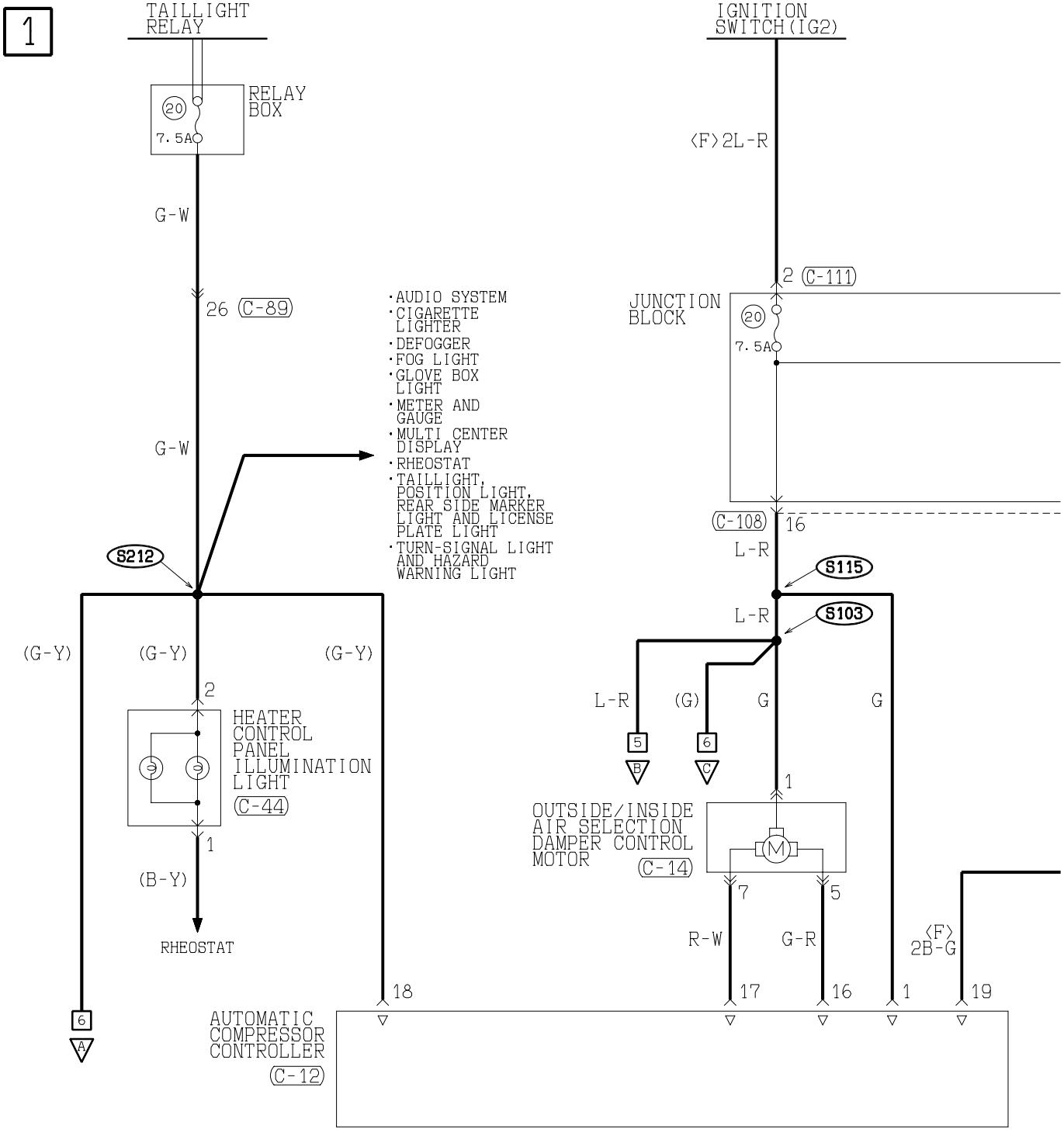
H3S12M00DA

TSB Revision

NOTES

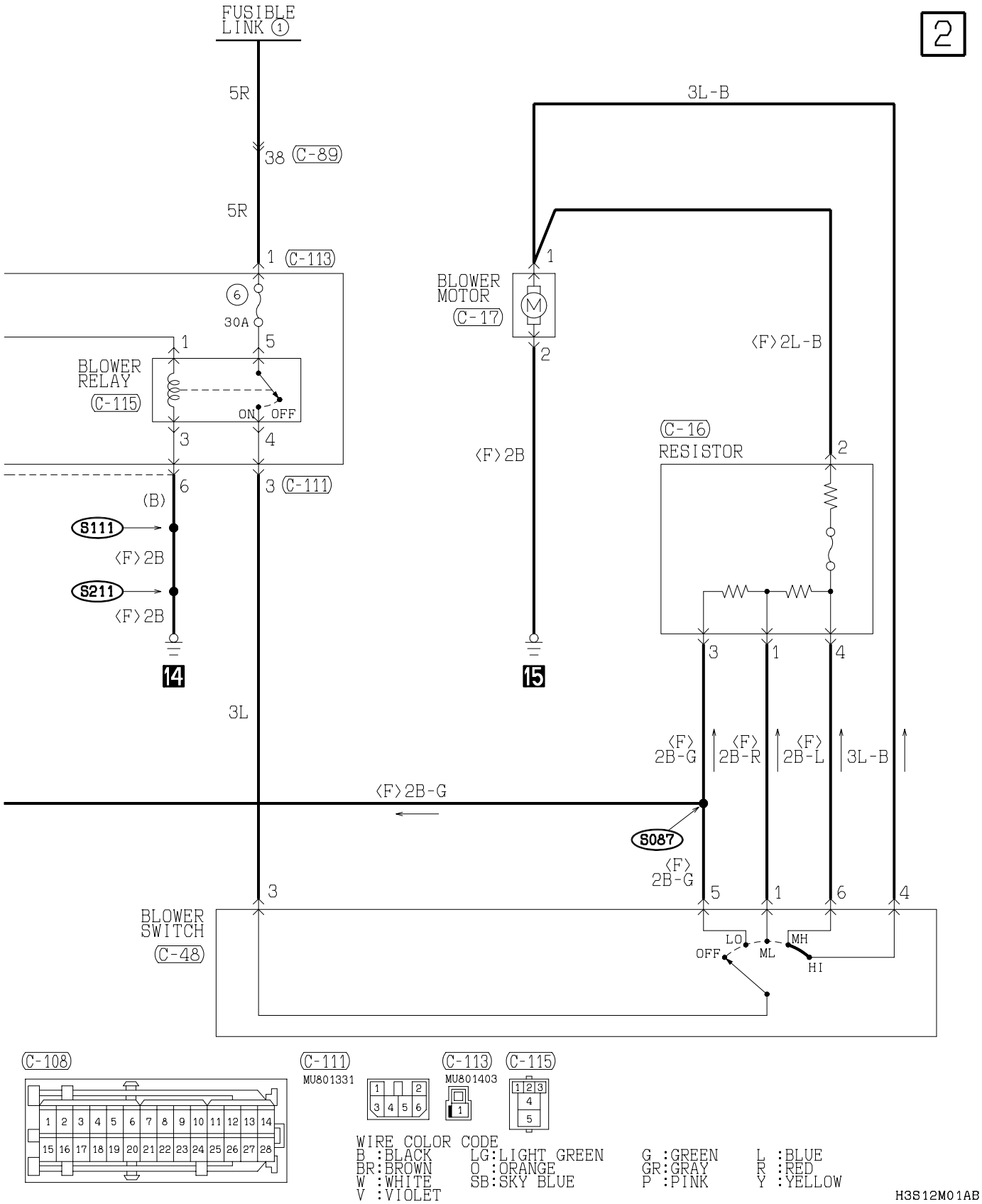
AIR CONDITIONING SYSTEM <2.4L ENGINE (ECLIPSE SPYDER)>

M1901005500569



H3S12M01AA

TSB Revision



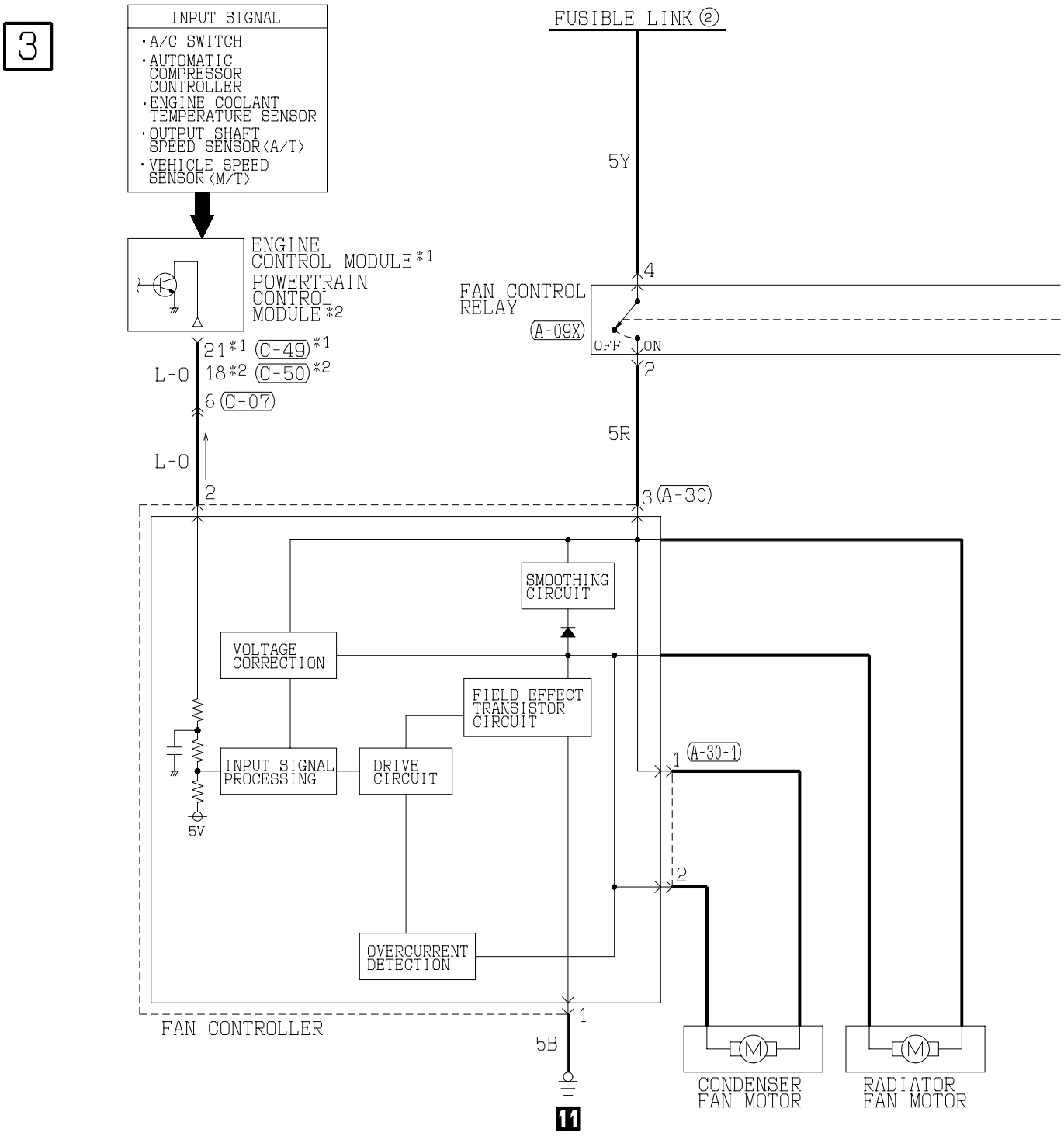
WIRE COLOR CODE

B :BLACK	LG:LIGHT GREEN	G :GREEN	L :BLUE
BR:BROWN	O :ORANGE	GR:GRAY	R :RED
W :WHITE	SB:SKY BLUE	P :PINK	Y :YELLOW
V :VIOLET			

H3S12M01AB

TSB Revision

AIR CONDITIONING SYSTEM <2.4L ENGINE (ECLIPSE SPYDER)> (CONTINUED)



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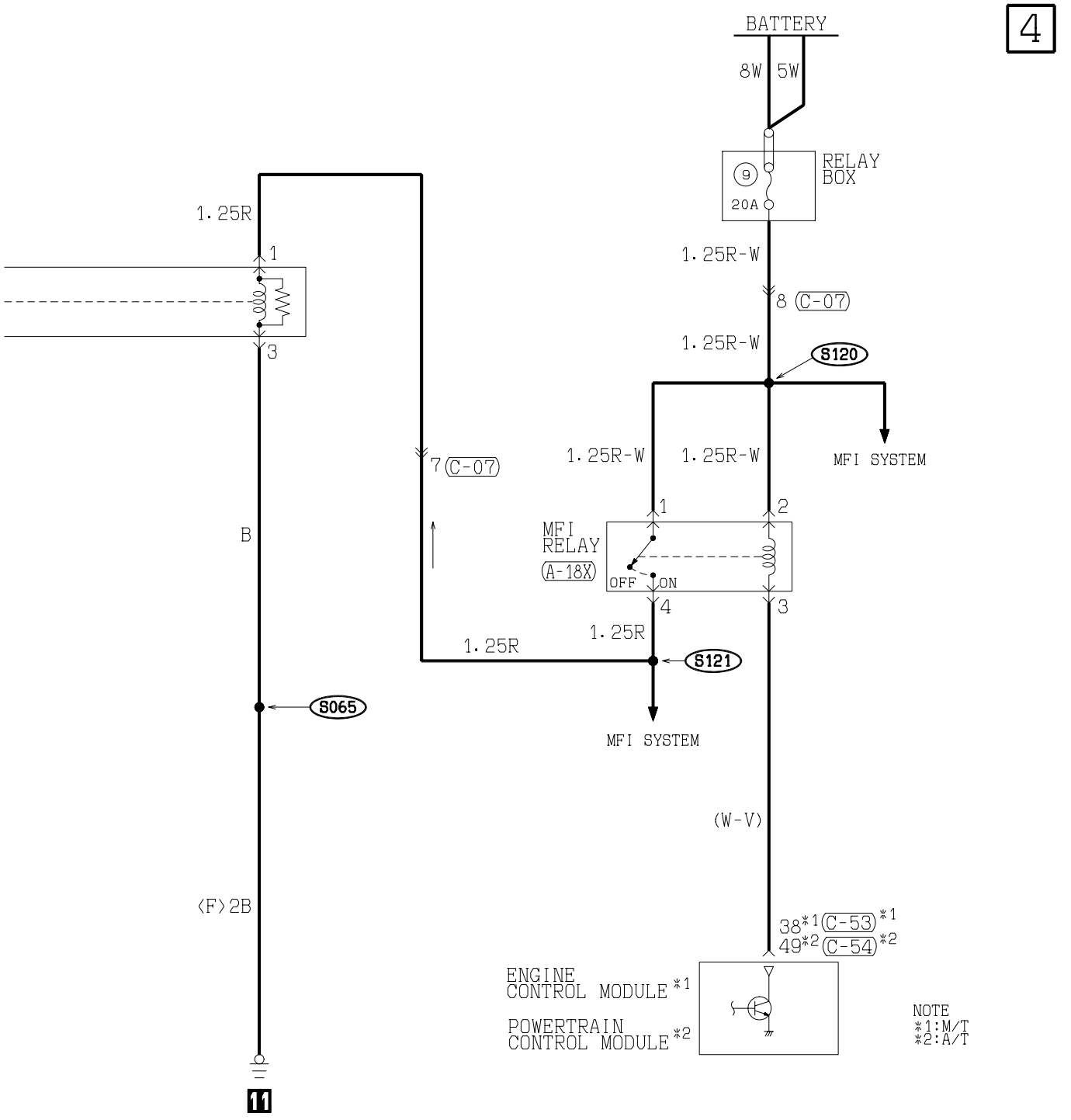
TSB Revision



C-53 (MU803771)

31	32	33	34	35	36	37	38	
39	40	41	42	43	44	45	46	

C-54 (MU803781)

41	42	43								44	45	46		
47	48	49	50	51	52	53	54	55	56	57				
58	59		60	61	62	63		64	65	66				

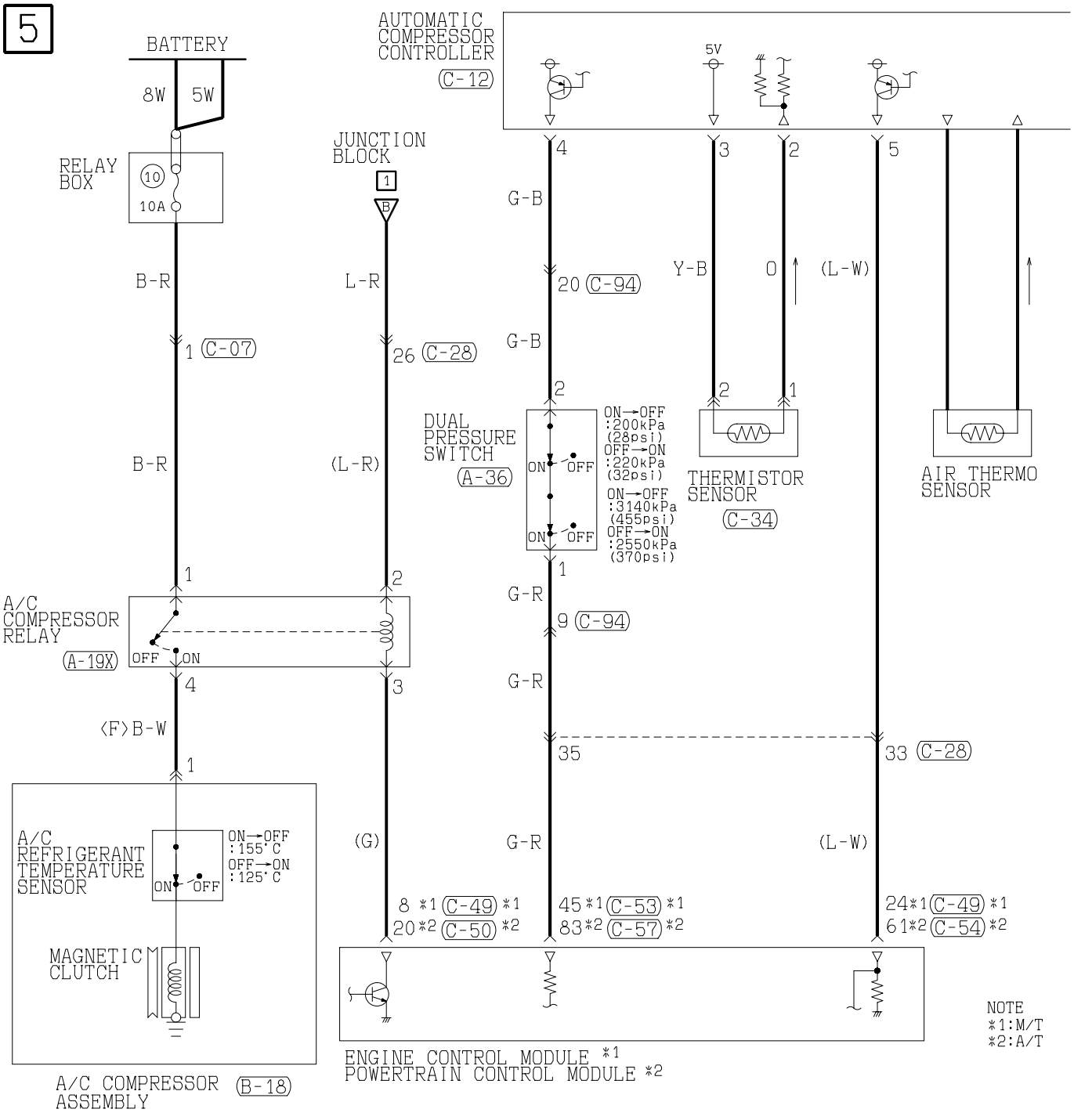
WIRE COLOR CODE

B :BLACK	BR:BROWN	G :GREEN	GR:GRAY	L :BLUE	LG:LIGHT GREEN	O :ORANGE	
P :PINK	R :RED	SB:SKY BLUE	V :VIOLET	W :WHITE	Y :YELLOW		

H3S12M01BB

TSB Revision

AIR CONDITIONING SYSTEM <2.4L ENGINE (ECLIPSE SPYDER)> (CONTINUED)



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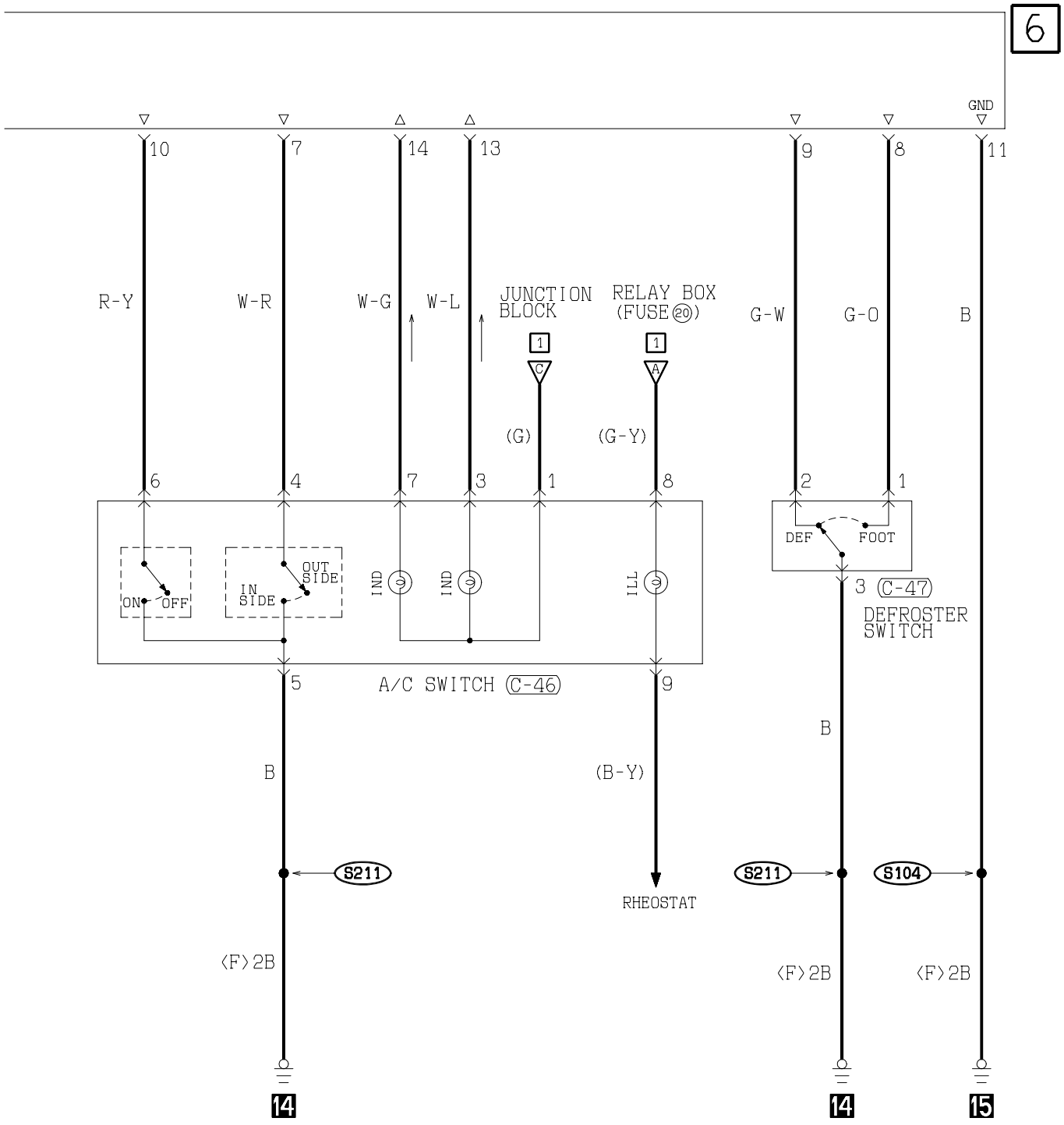
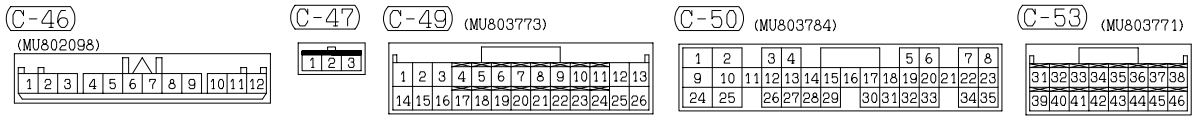




WIRE COLOR CODE

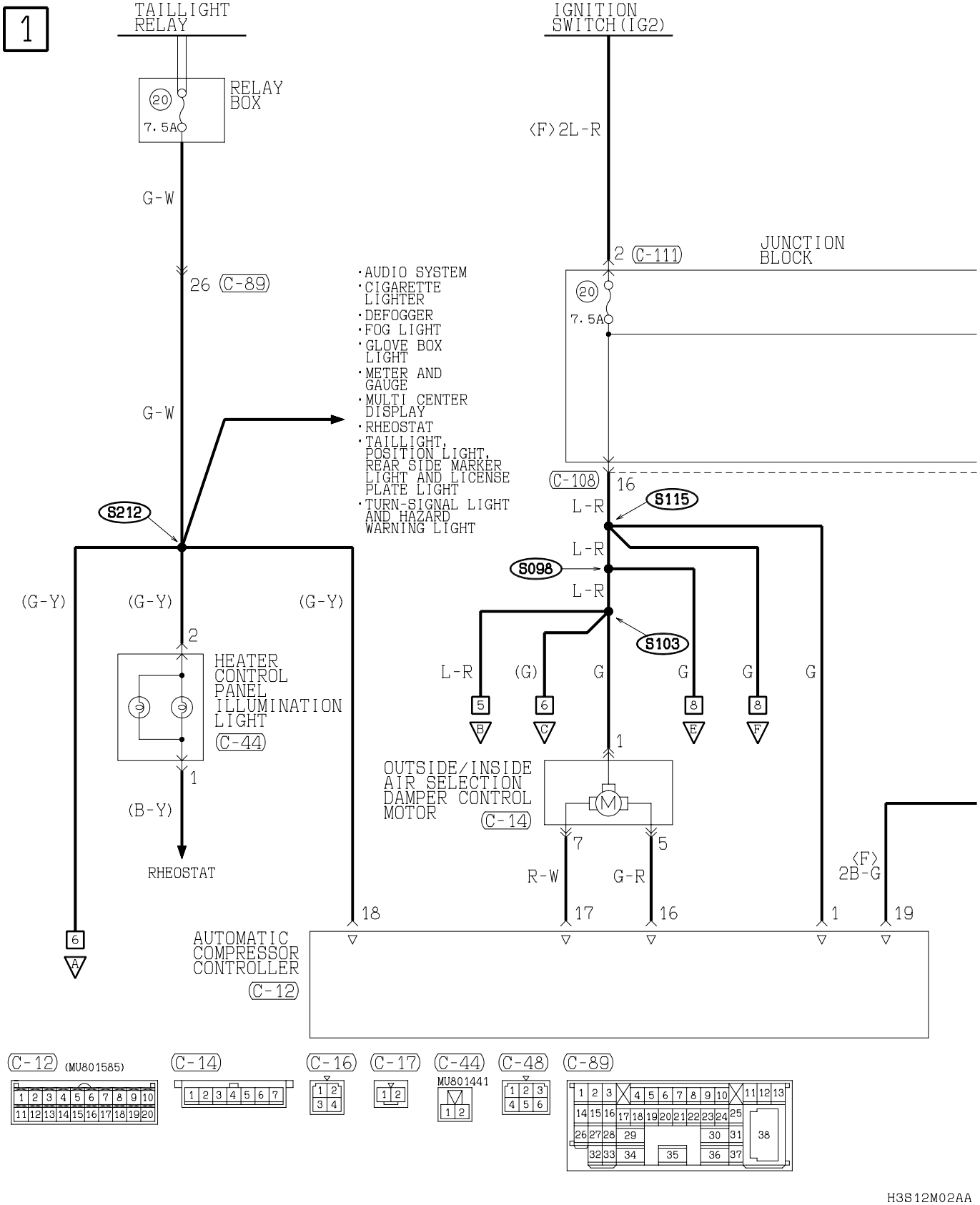
B :BLACK	LG:LIGHT GREEN	G :GREEN	L :BLUE	W :WHITE	Y :YELLOW	SB:SKY BLUE	
BR:BROWN	O :ORANGE	GR:GRAY	R :RED	P :PINK	V :VIOLET		

H3S12M01CB

TSB Revision

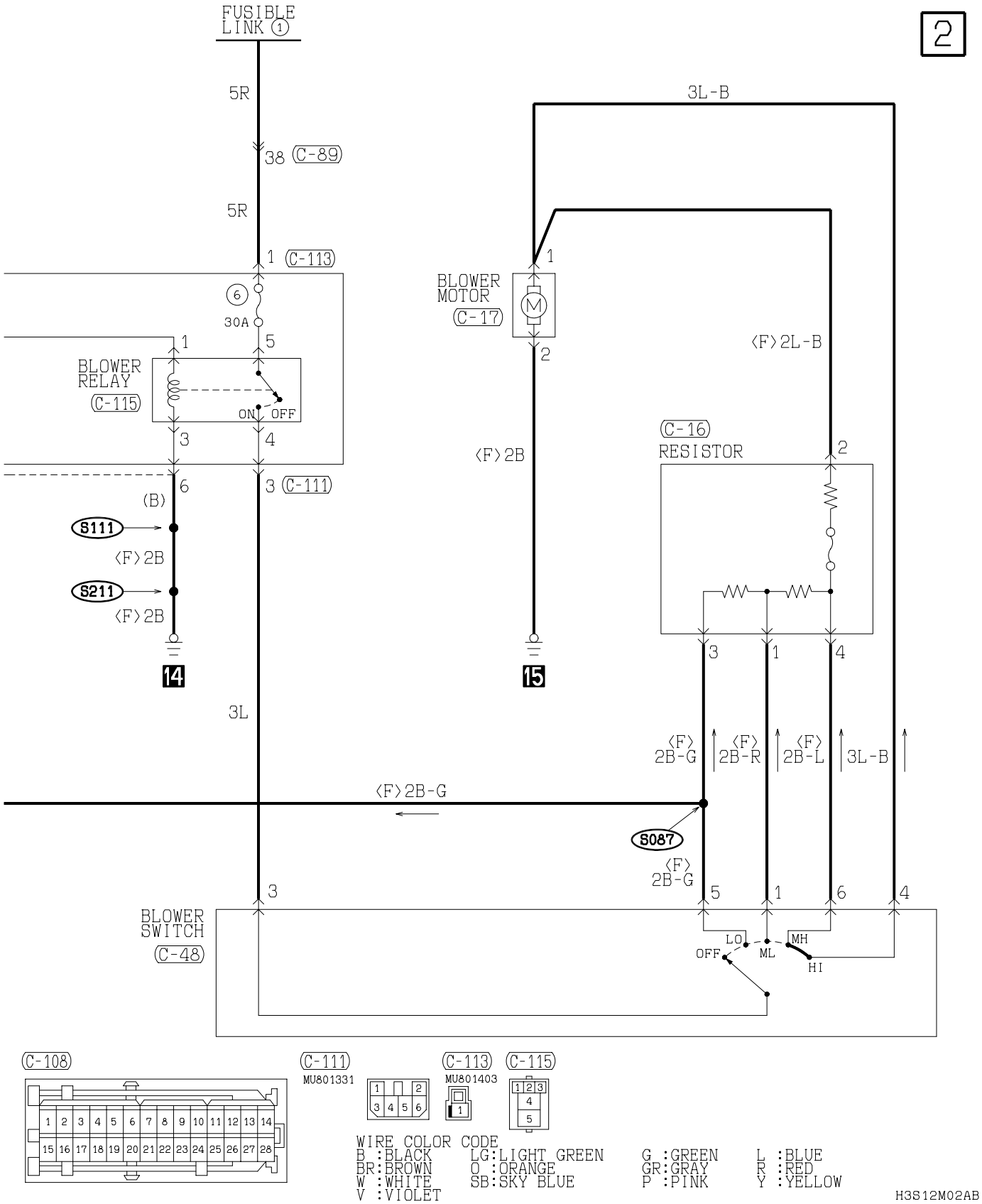
AIR CONDITIONING SYSTEM <3.0L ENGINE (ECLIPSE)>

M1901005500570



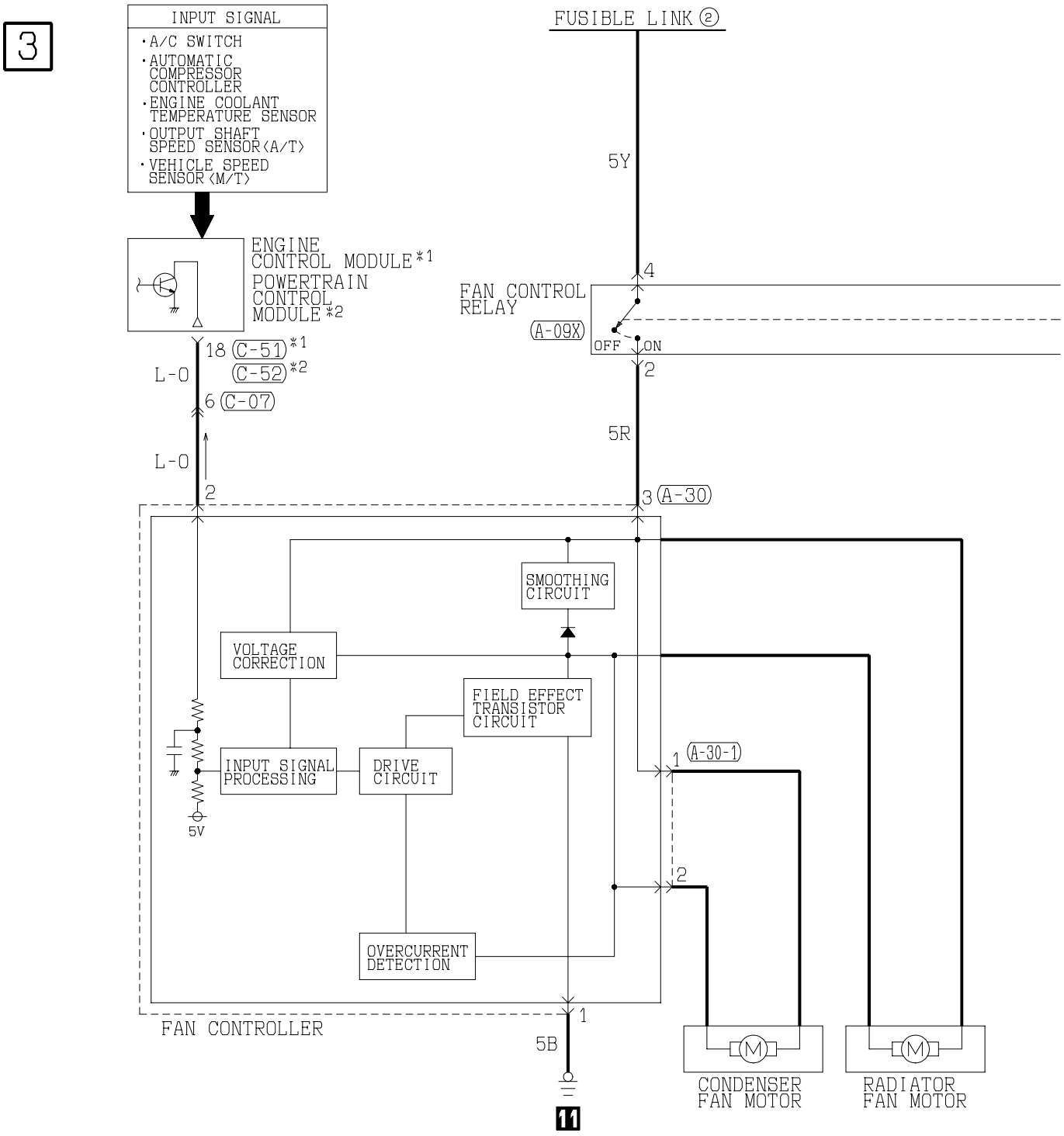
H3S12M02AA

TSB Revision



TSB Revision

AIR CONDITIONING SYSTEM <3.0L ENGINE (ECLIPSE)> (CONTINUED)



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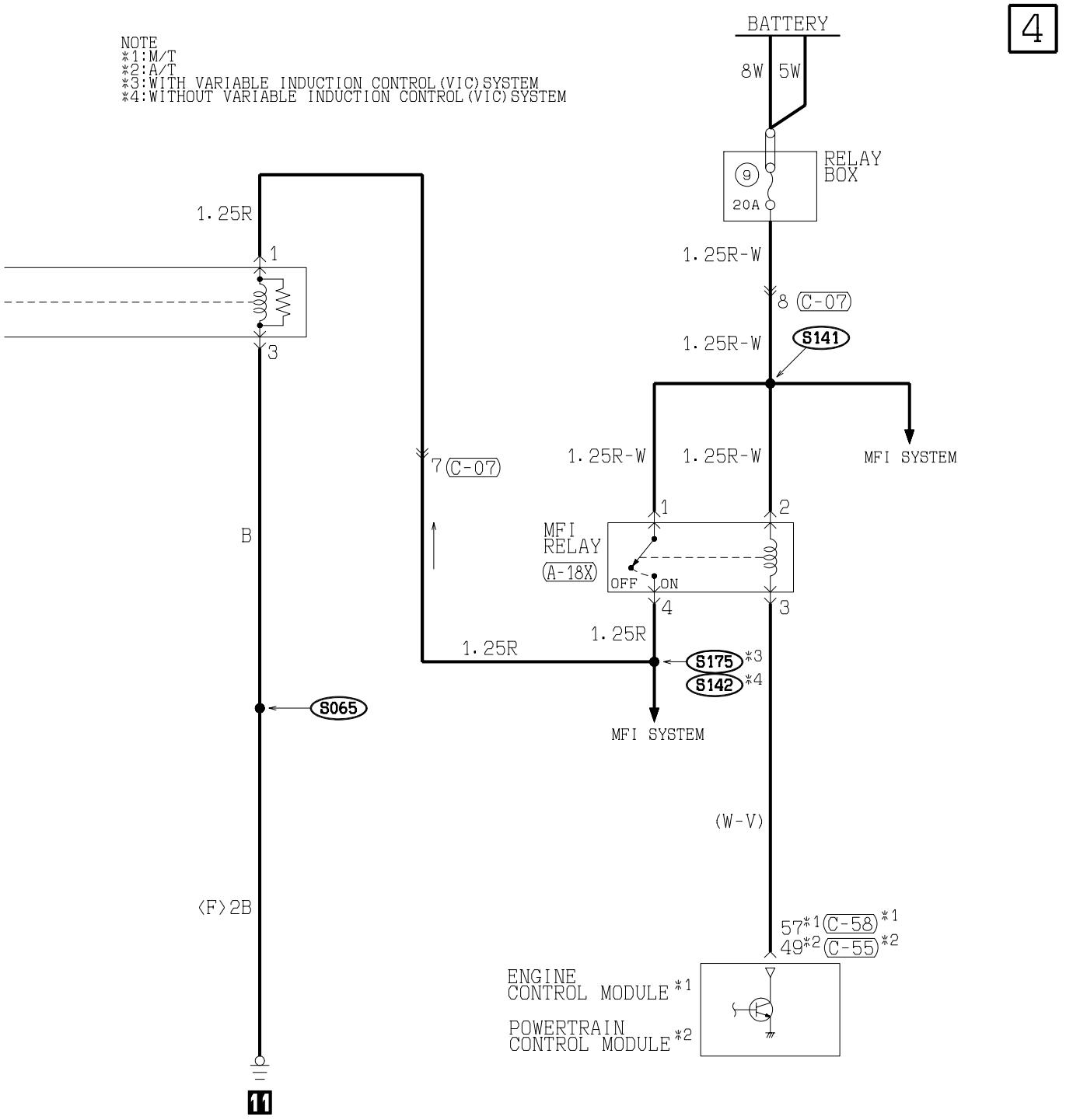
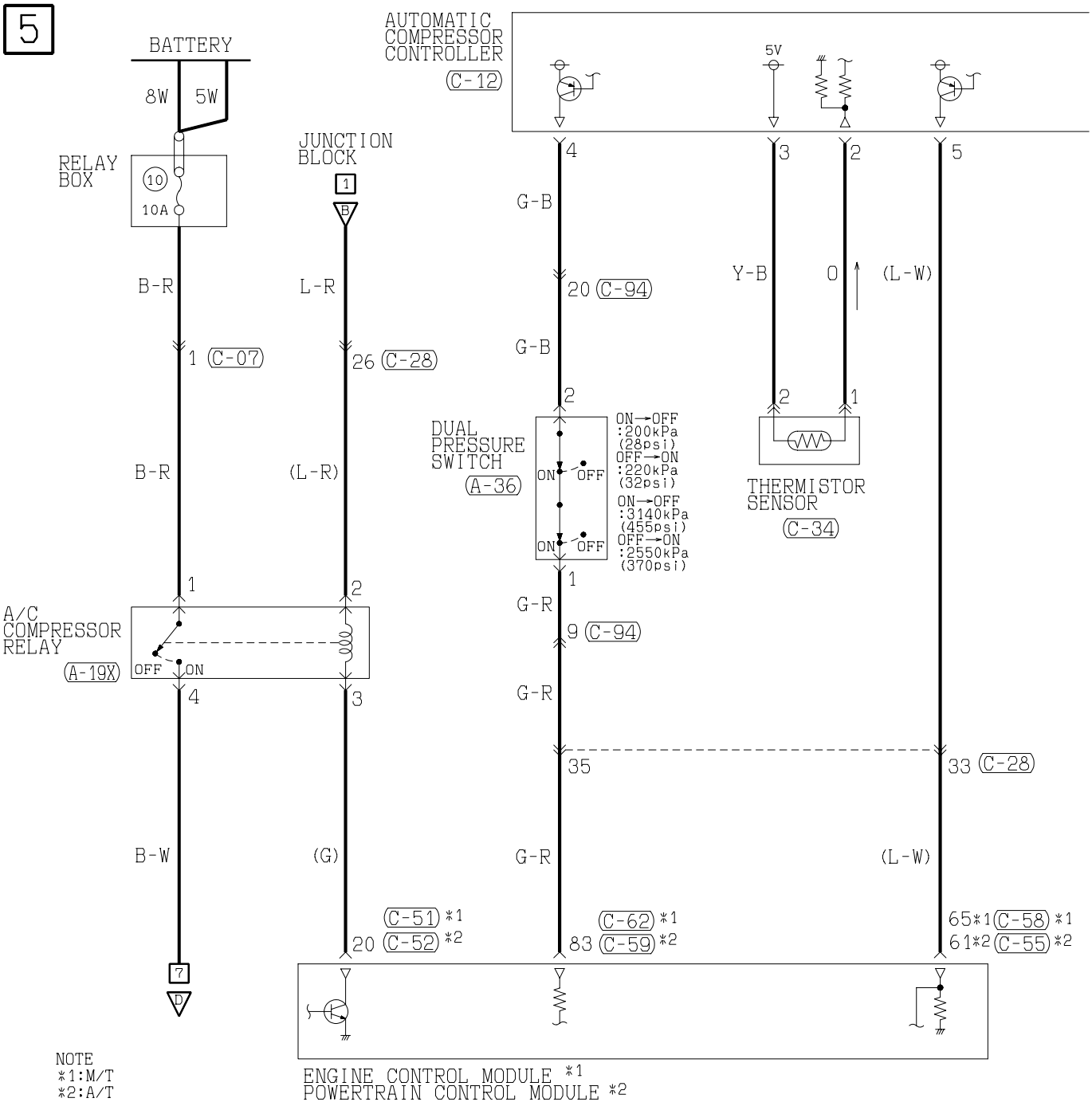
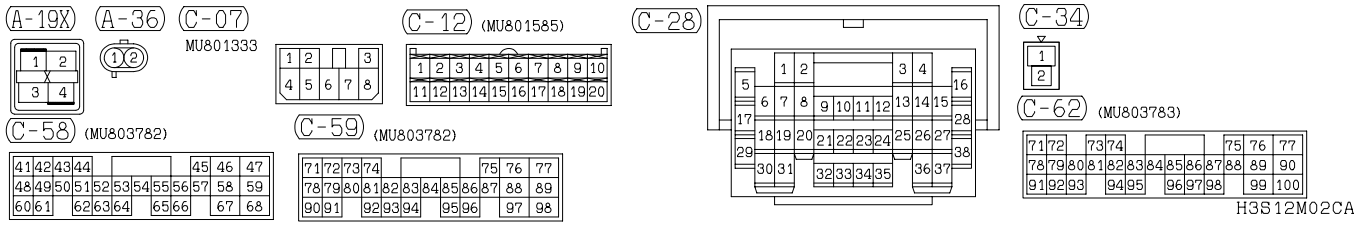
TSB Revision



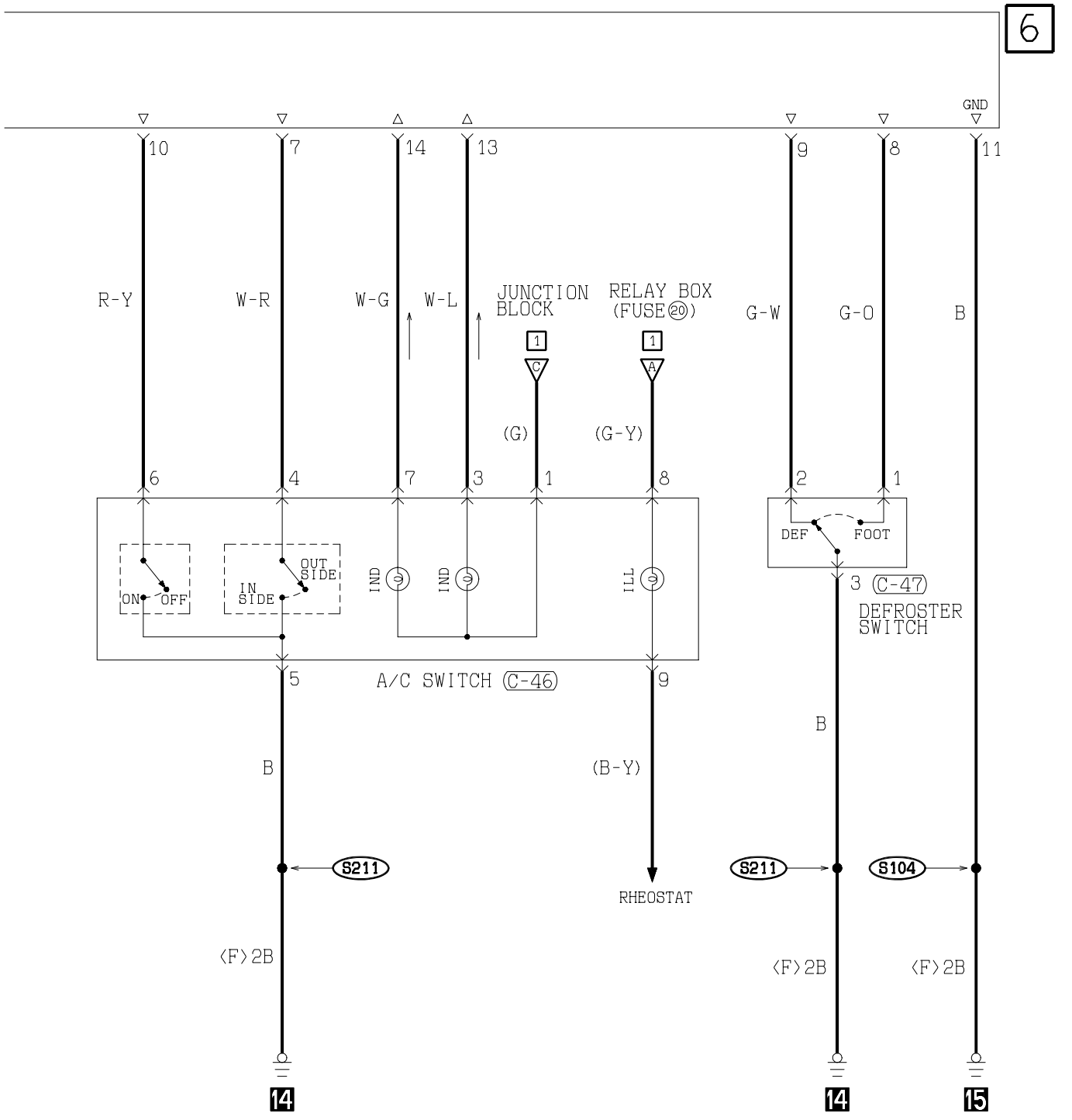
TSB Revision

AIR CONDITIONING SYSTEM <3.0L ENGINE (ECLIPSE)> (CONTINUED)

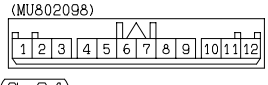




TSB Revision

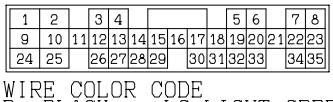


C-46 (MU802098)

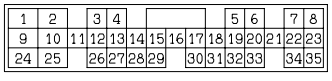


C-47

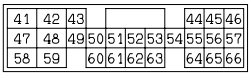
C-51 (MU803784)



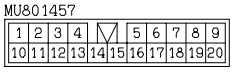
C-52 (MU803784)



C-55 (MU803781)



C-94
MU801457



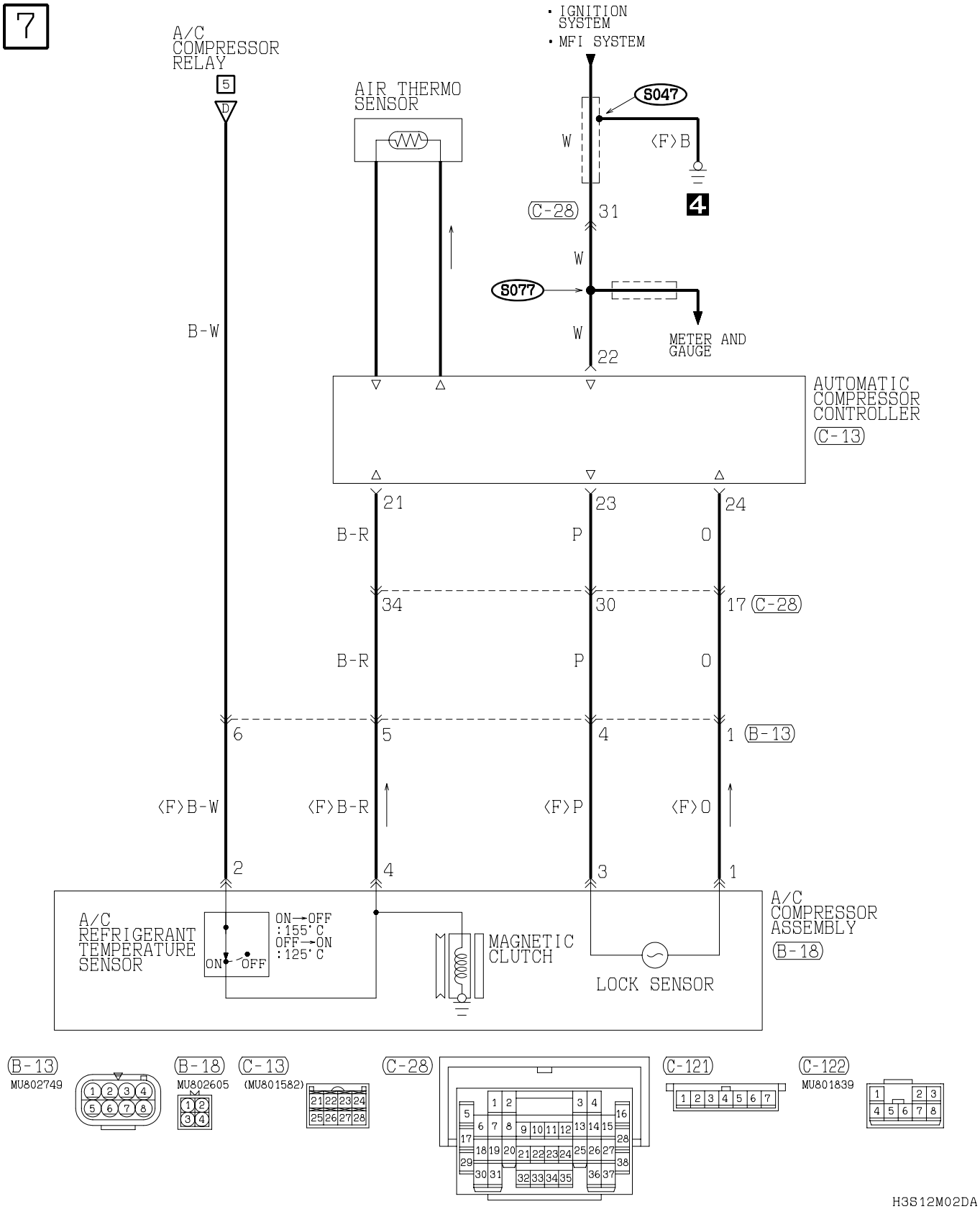
WIRE COLOR CODE

B	:BLACK	LG	:LIGHT GREEN	G	:GREEN	L	:BLUE
BR	:BROWN	O	:ORANGE	GR	:GRAY	R	:RED
W	:WHITE	SB	:SKY BLUE	P	:PINK	Y	:YELLOW
V	:VIOLET						

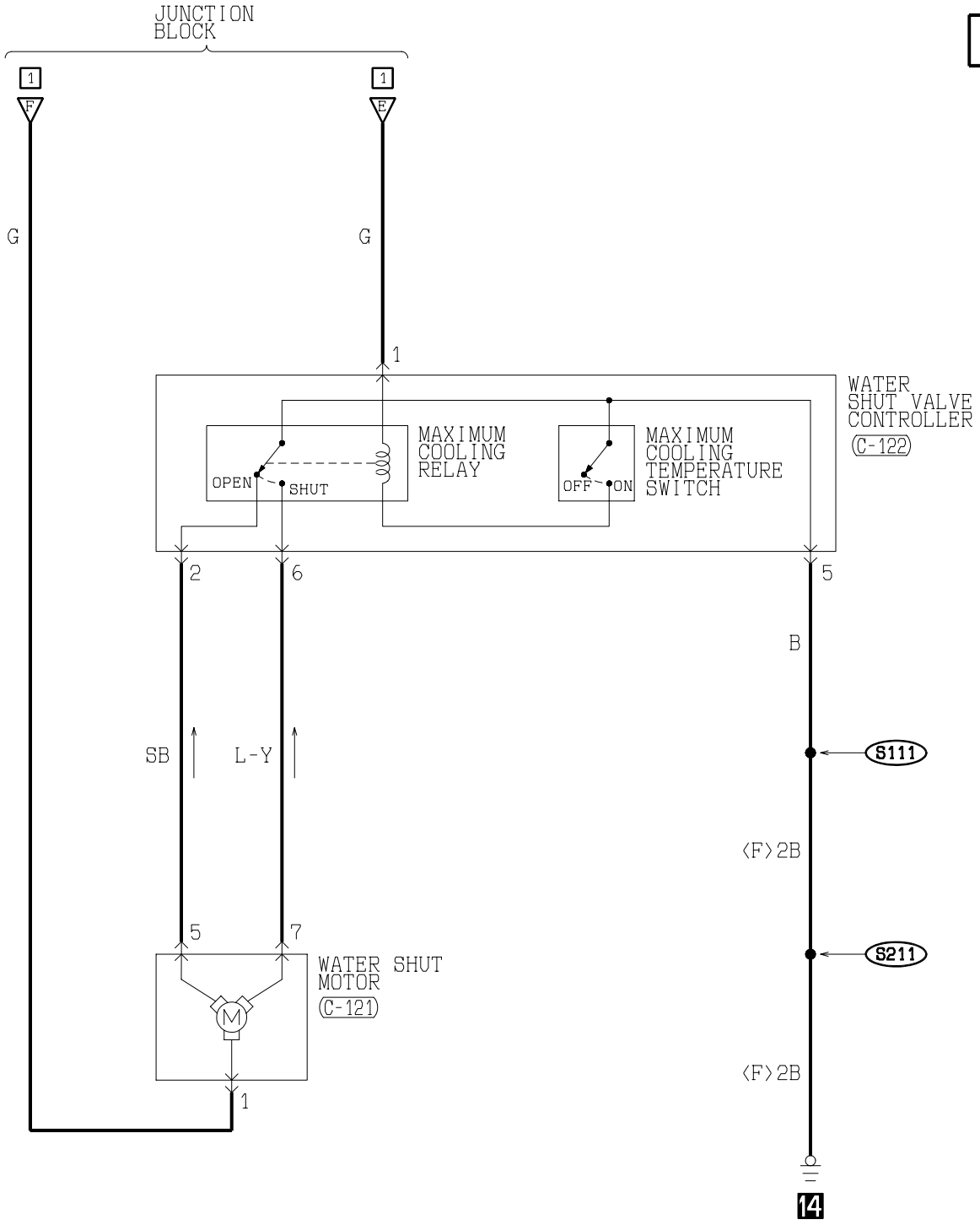
H3S12M02CB

TSB Revision

AIR CONDITIONING SYSTEM <3.0L ENGINE (ECLIPSE)> (CONTINUED)



TSB Revision



WIRE COLOR CODE

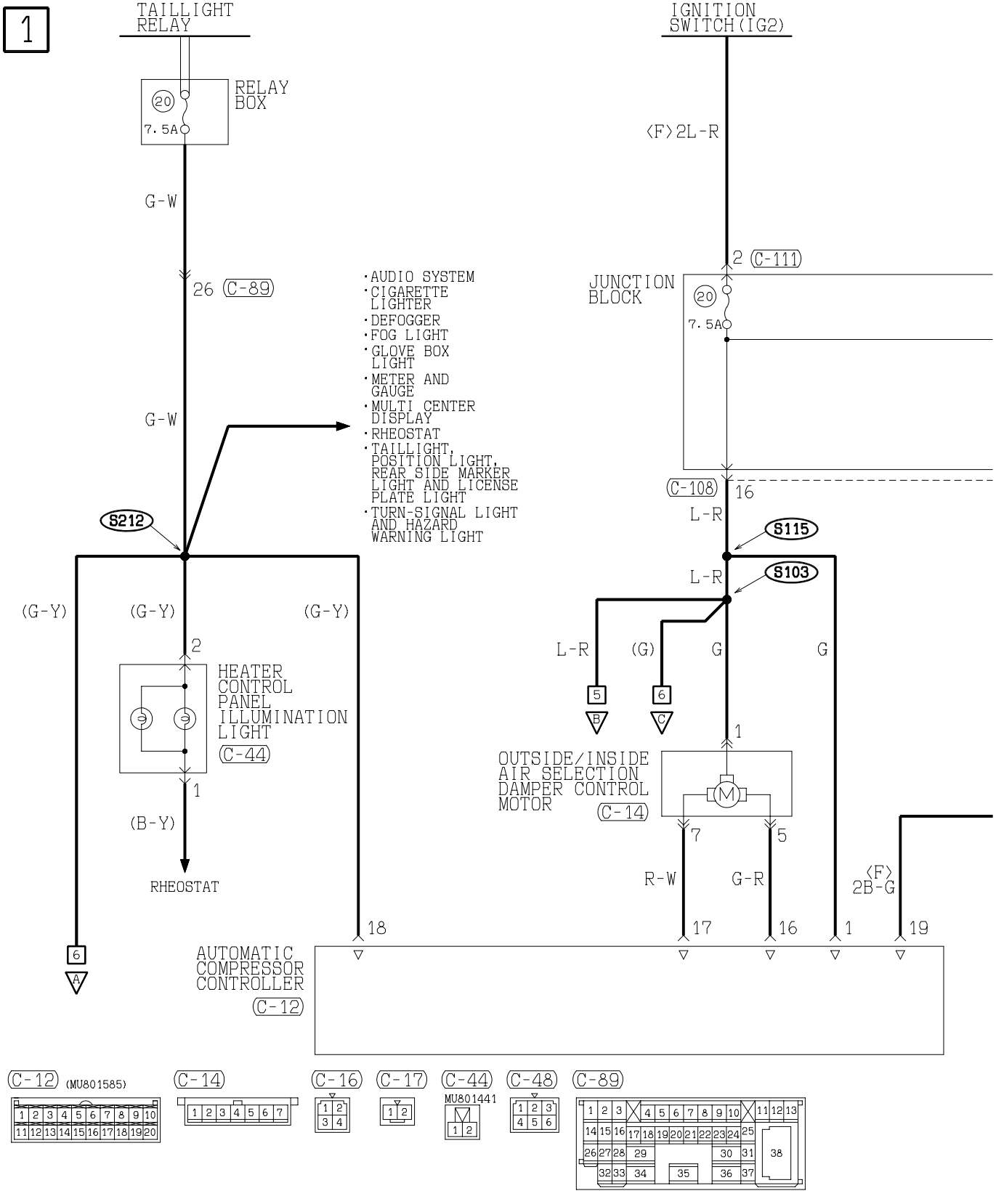
B :BLACK	LG:LIGHT GREEN	G :GREEN	L :BLUE	W :WHITE	Y :YELLOW	SB:SKY BLUE	
BR:BROWN	O :ORANGE	GR:GRAY	R :RED	P :PINK	V :VIOLET		

H3S12M02DB

TSB Revision

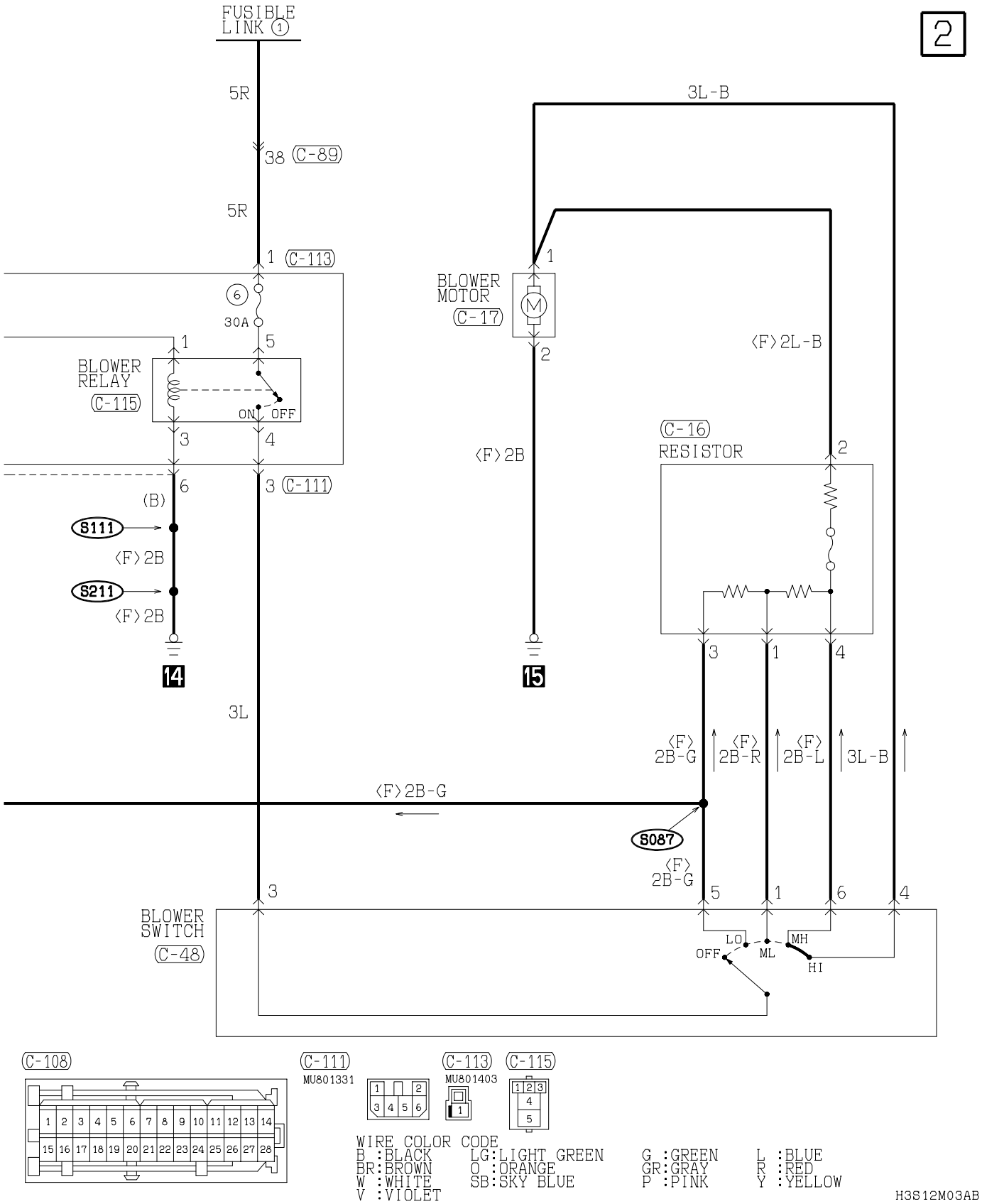
AIR CONDITIONING SYSTEM <3.0L ENGINE (ECLIPSE SPYDER)>

M1901005500581



H3S12M03AB

TSB Revision



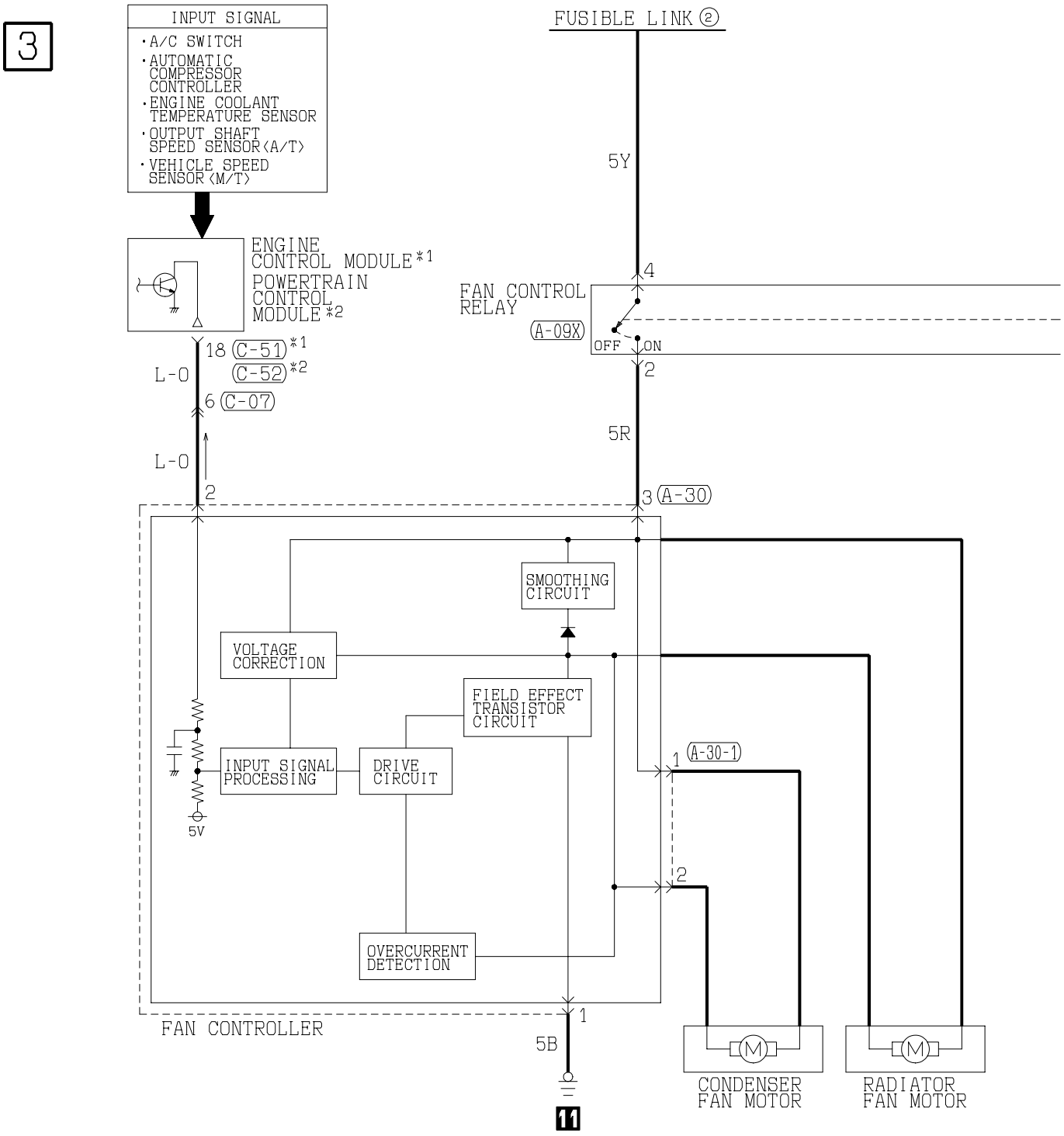
WIRE COLOR CODE

B :BLACK	LG:LIGHT GREEN	G :GREEN	L :BLUE
BR:BROWN	O :ORANGE	GR:GRAY	R :RED
W :WHITE	SB:SKY BLUE	P :PINK	Y :YELLOW
V :VIOLET			

H3S12M03AB

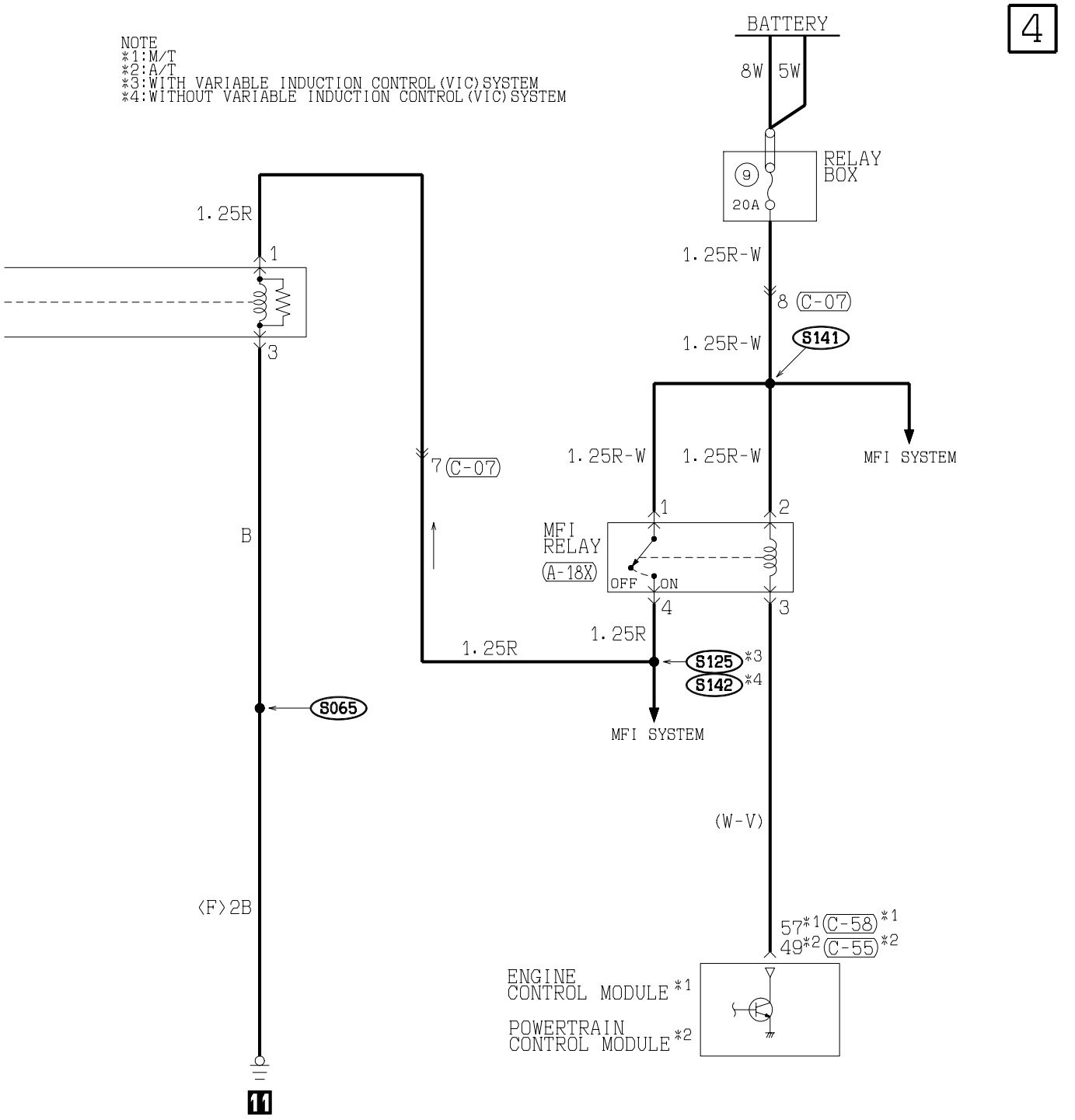
TSB Revision

AIR CONDITIONING SYSTEM <3.0L ENGINE (ECLIPSE SPYDER)> (CONTINUED)



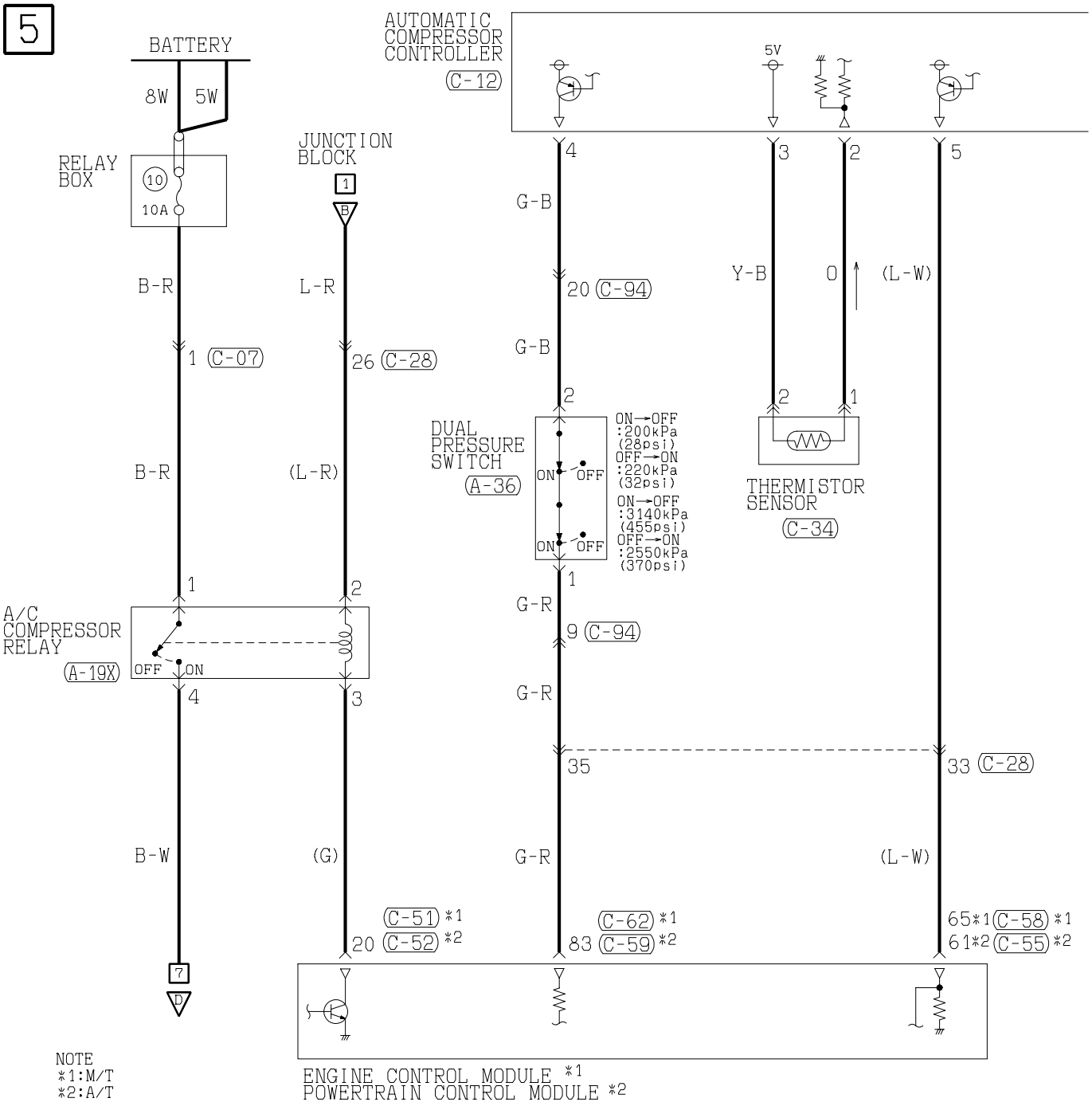
H3S12M03BA

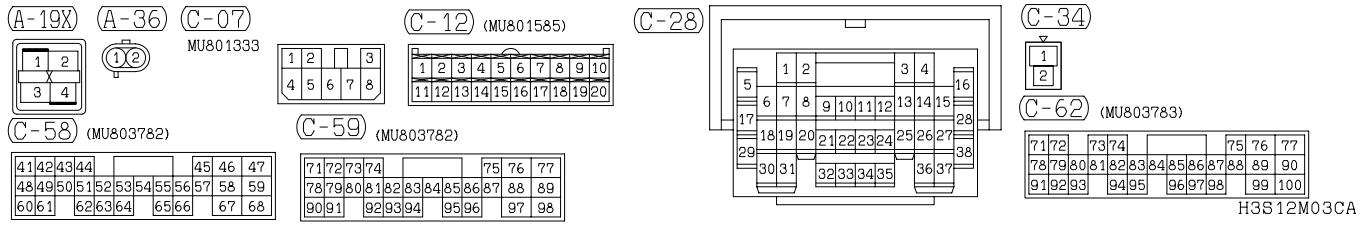
TSB Revision



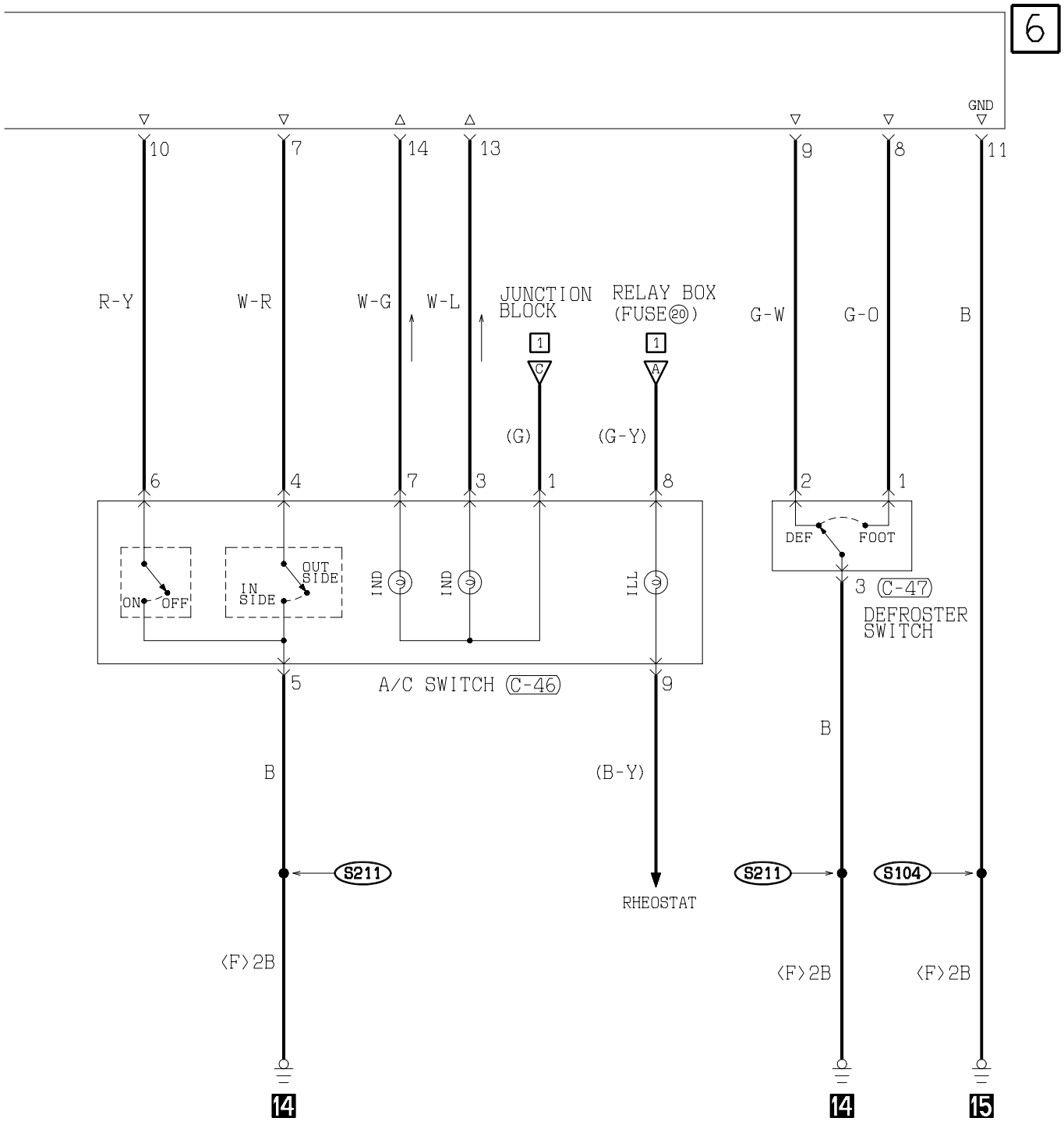
TSB Revision

AIR CONDITIONING SYSTEM <3.0L ENGINE (ECLIPSE SPYDER)> (CONTINUED)

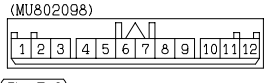




TSB Revision

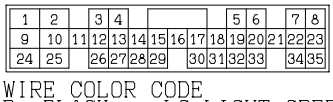


C-46 (MU802098)

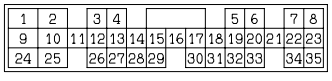


C-47

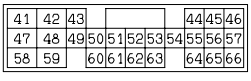
C-51 (MU803784)



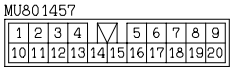
C-52 (MU803784)



C-55 (MU803781)



C-94
MU801457



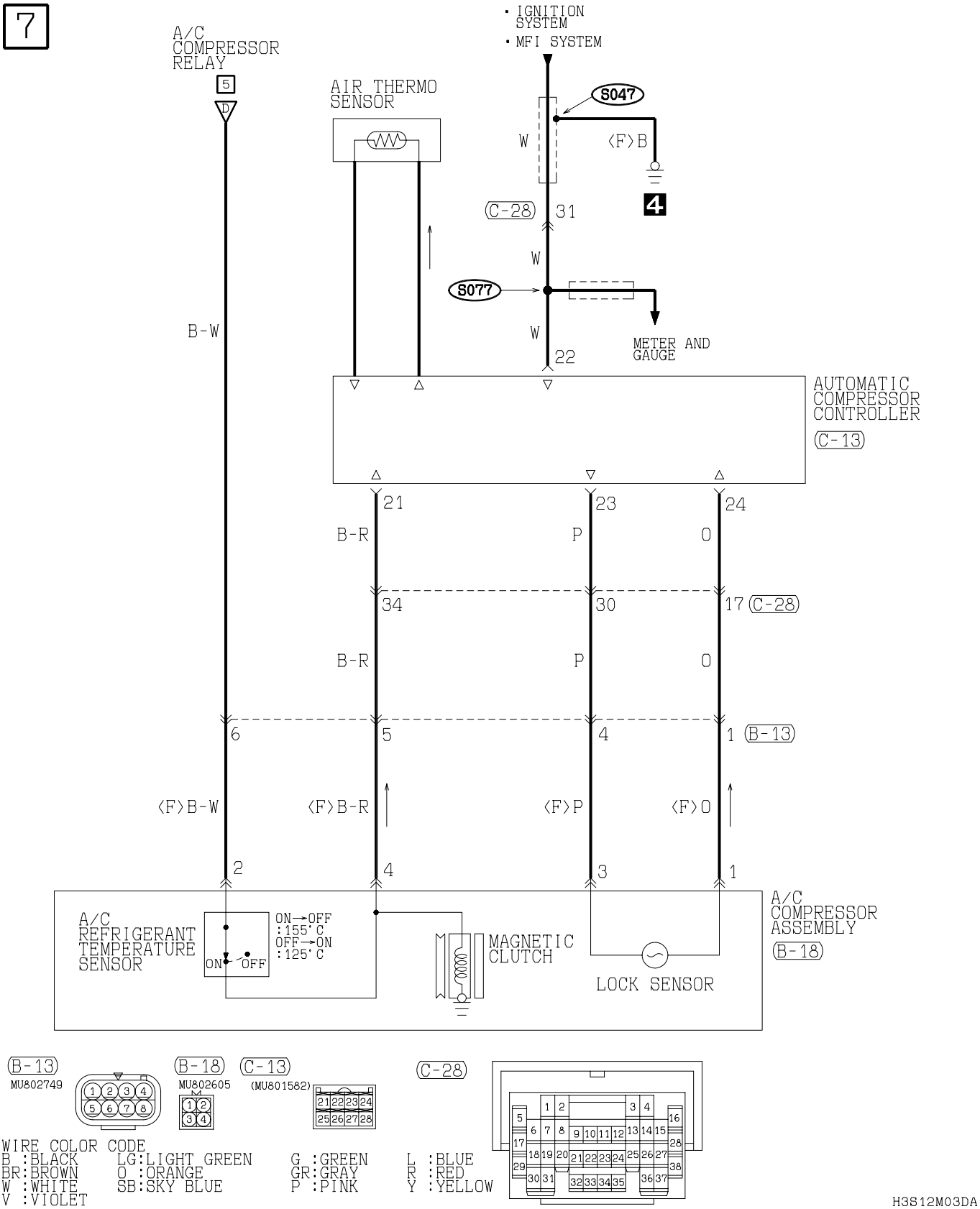
WIRE COLOR CODE

B	:BLACK	LG	:LIGHT GREEN	G	:GREEN	L	:BLUE
BR	:BROWN	O	:ORANGE	GR	:GRAY	R	:RED
W	:WHITE	SB	:SKY BLUE	P	:PINK	Y	:YELLOW
V	:VIOLET						

H3S12M03CB

TSB Revision

AIR CONDITIONING SYSTEM <3.0L ENGINE (ECLIPSE SPYDER)> (CONTINUED)

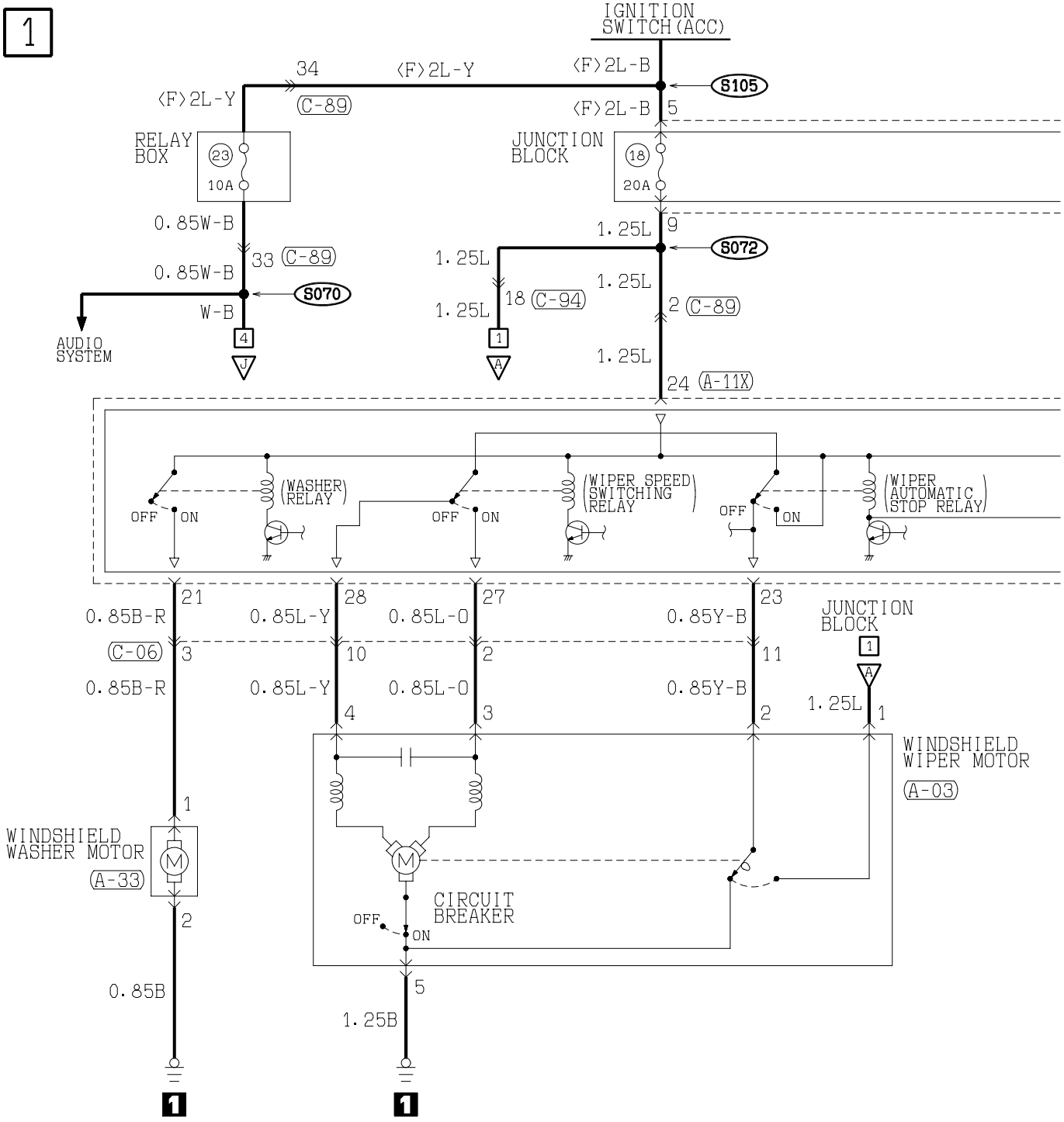


TSB Revision

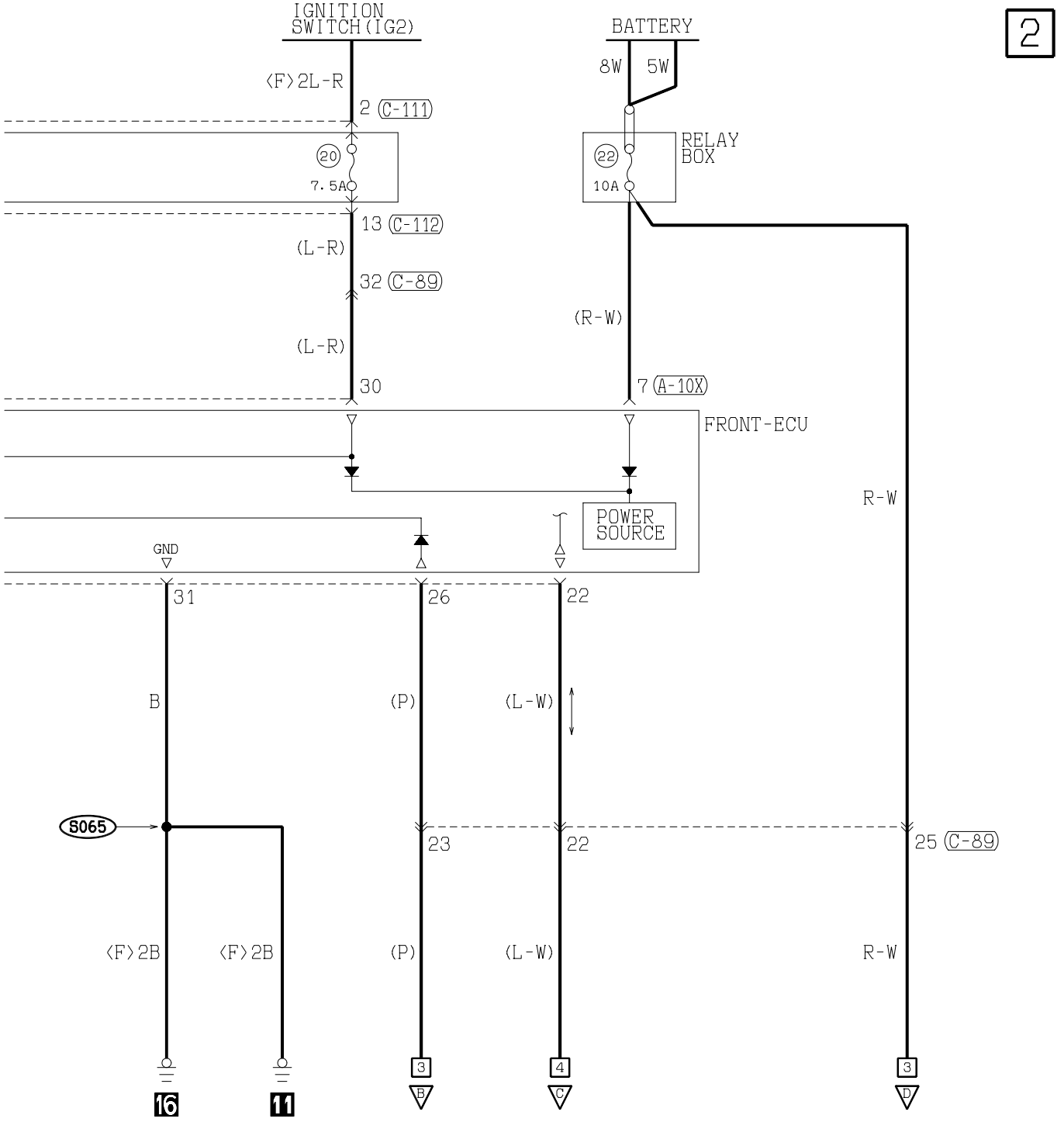
NOTES

WINDSHIELD WIPER AND WASHER

M1901006100315

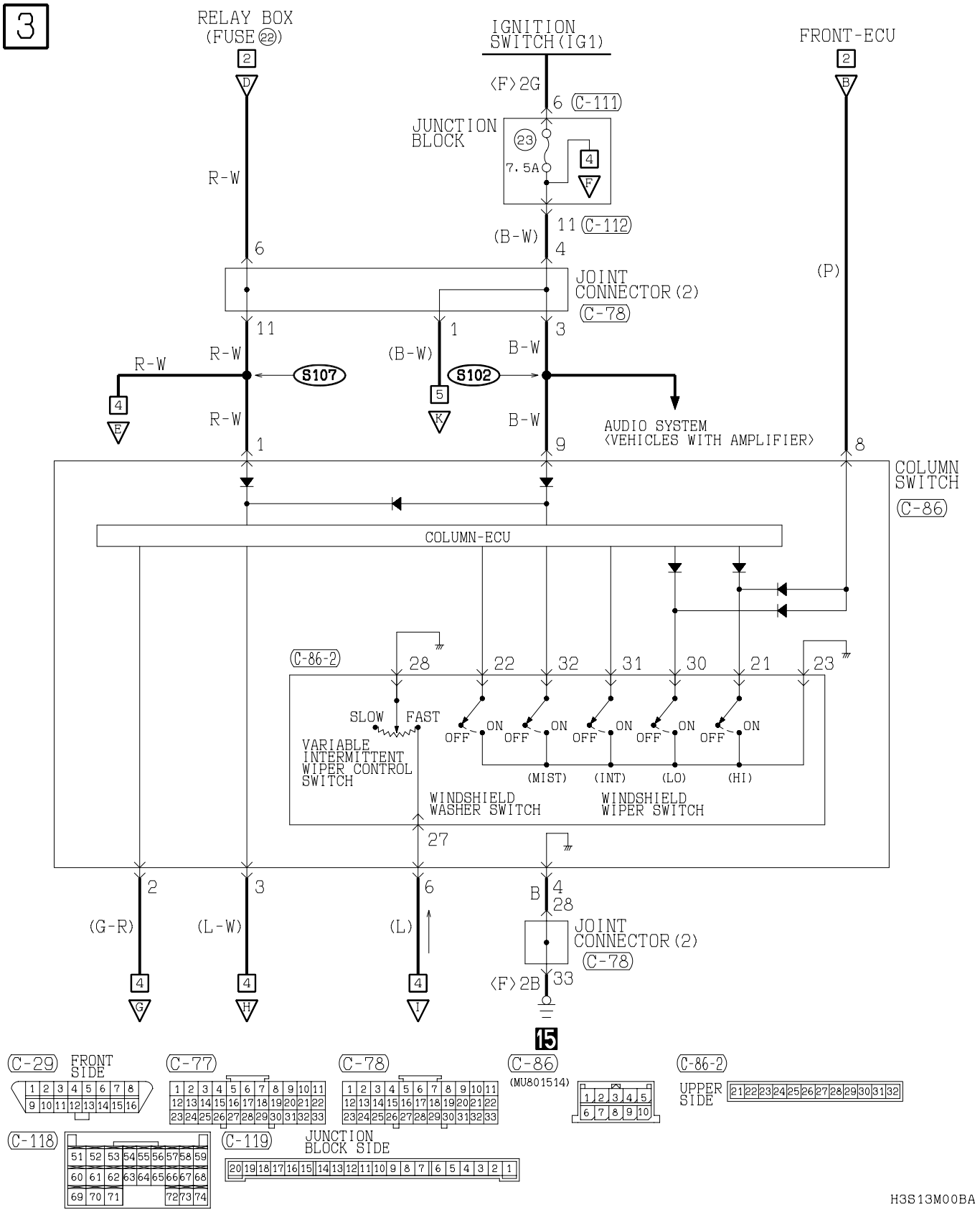


TSB Revision

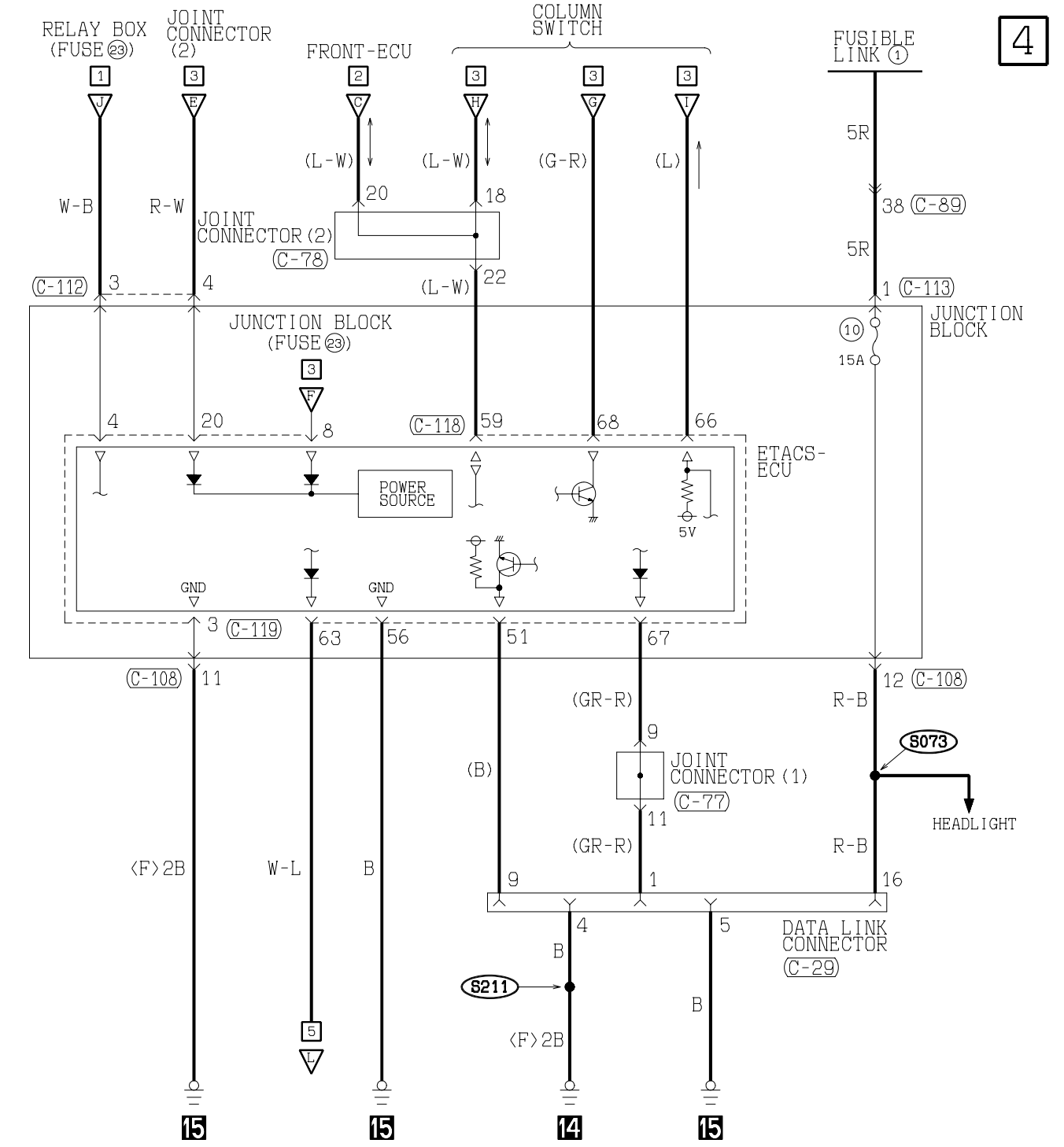


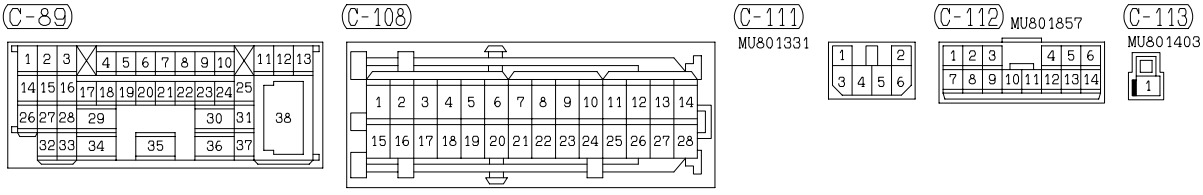
TSB Revision

WINDSHIELD WIPER AND WASHER (CONTINUED)



TSB Revision

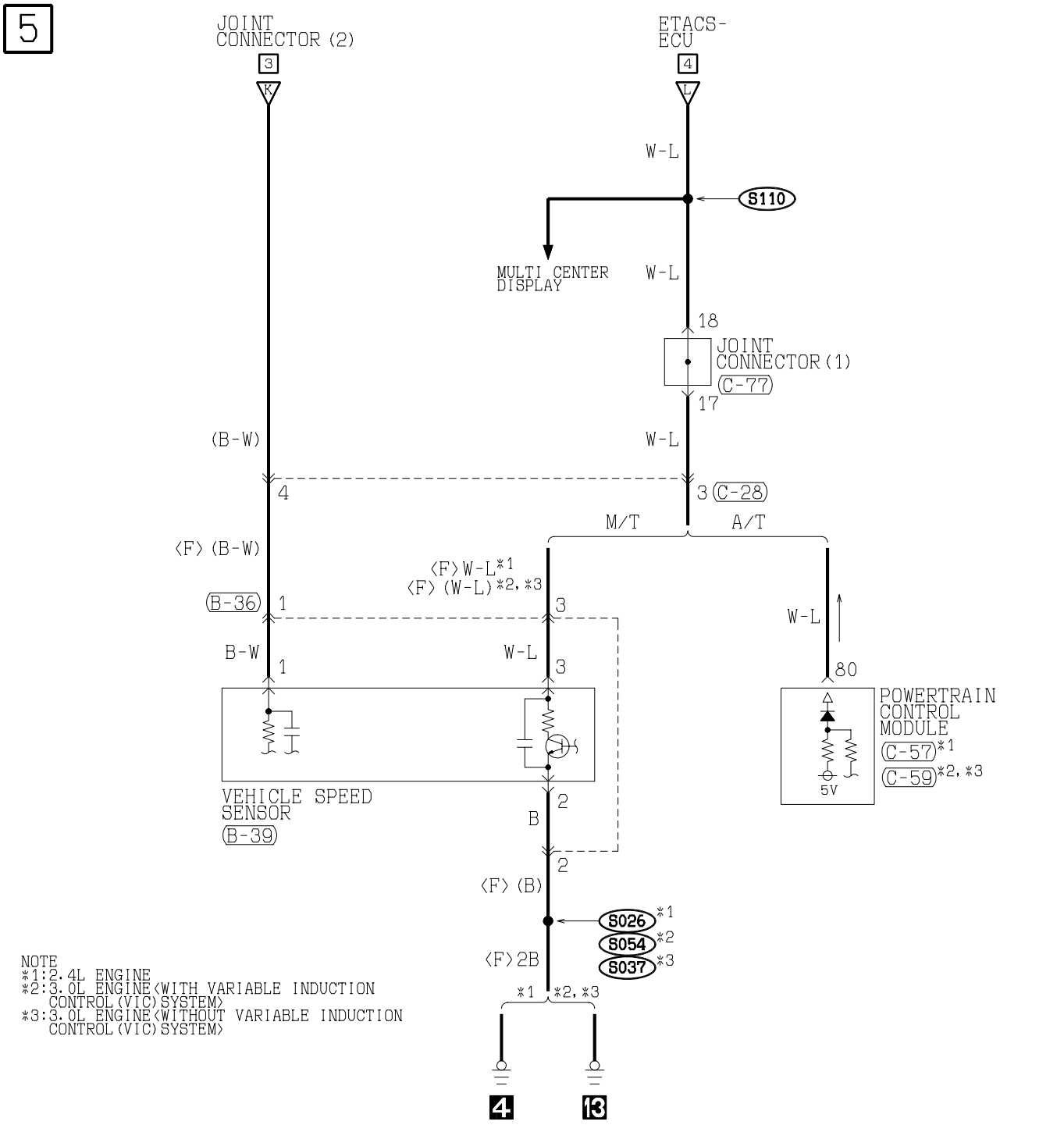




H3S13M00BB

TSB Revision

WINDSHIELD WIPER AND WASHER (CONTINUED)

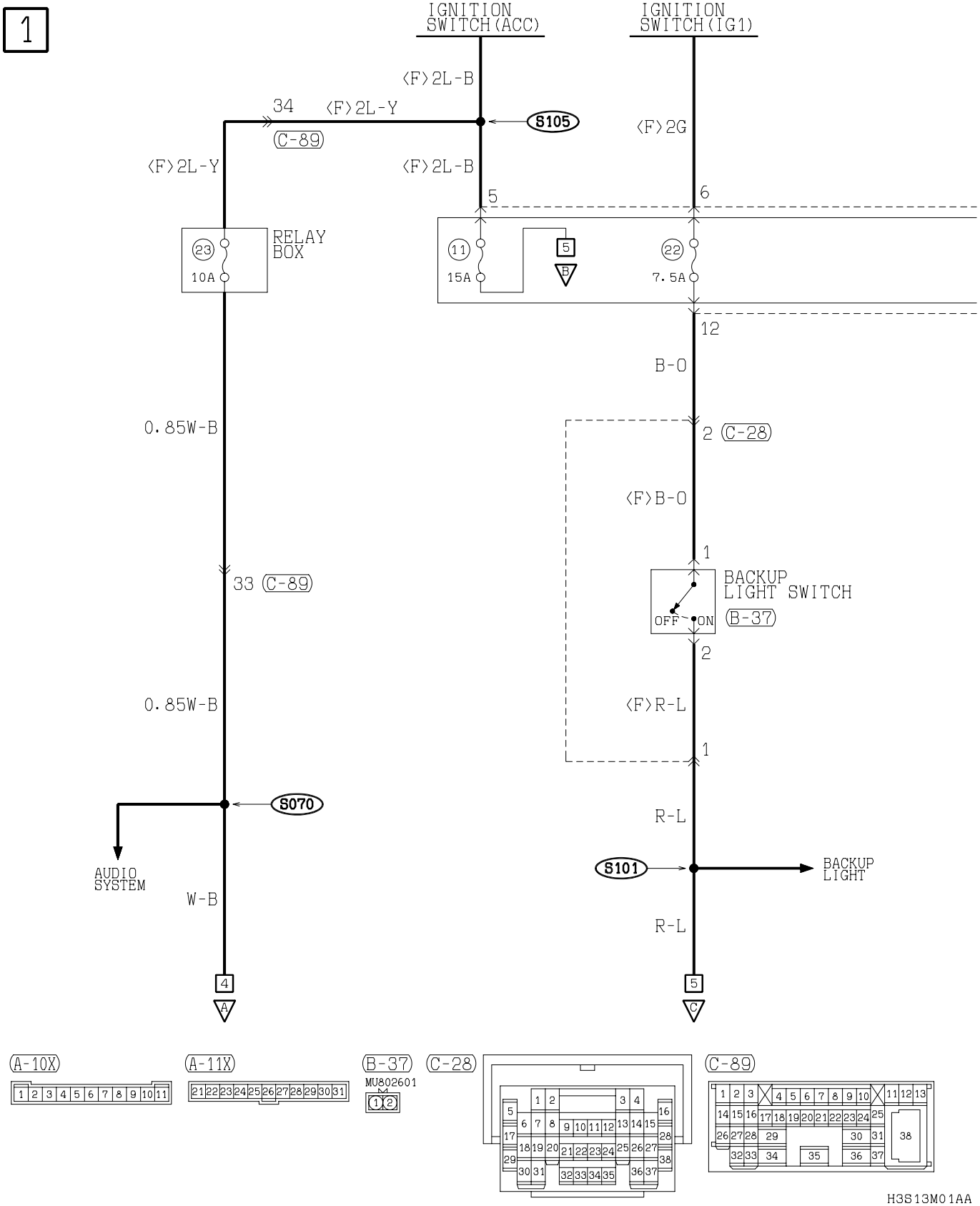


TSB Revision

NOTES

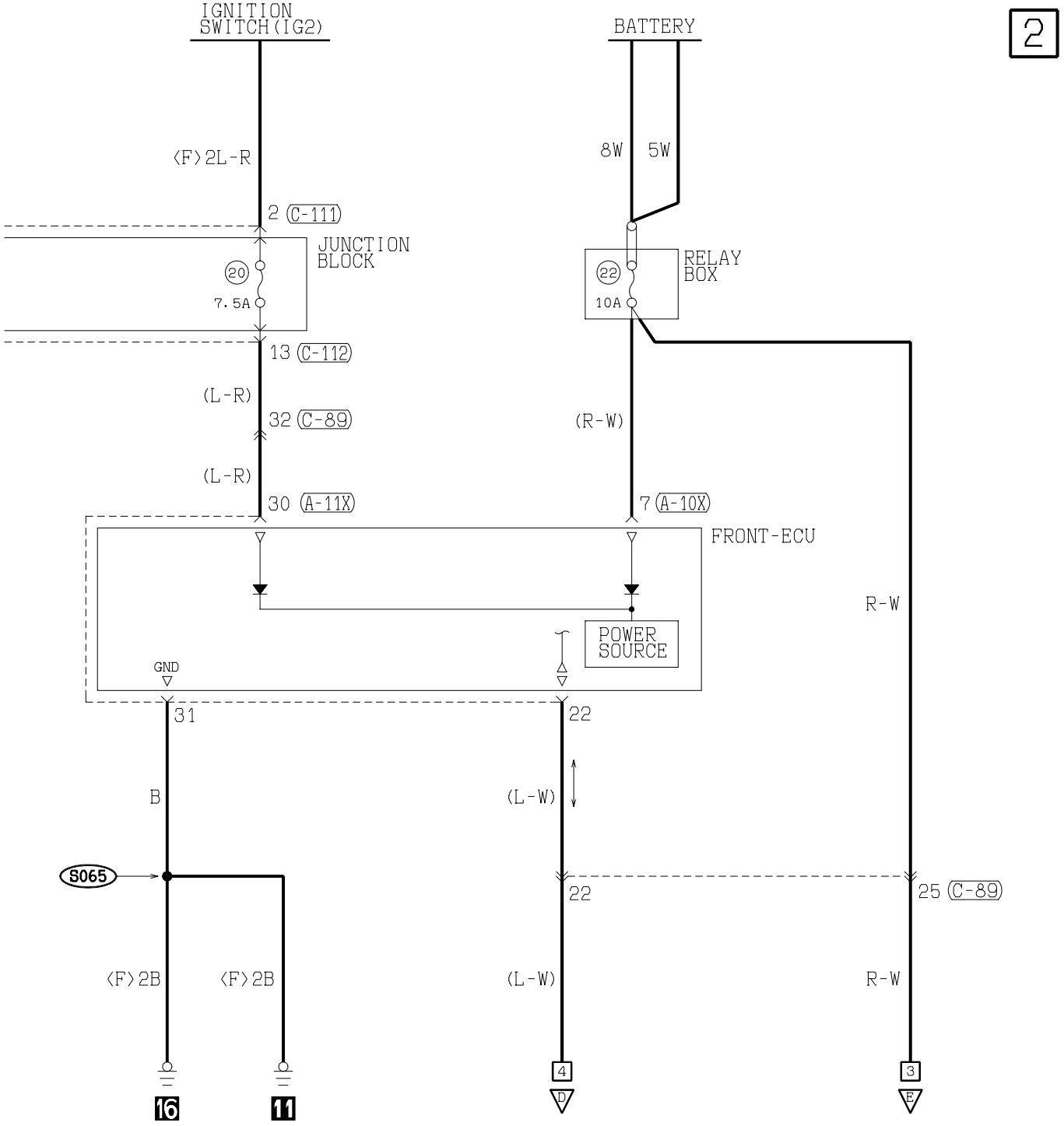
REAR WIPER AND WASHER <M/T>

M1901006200282



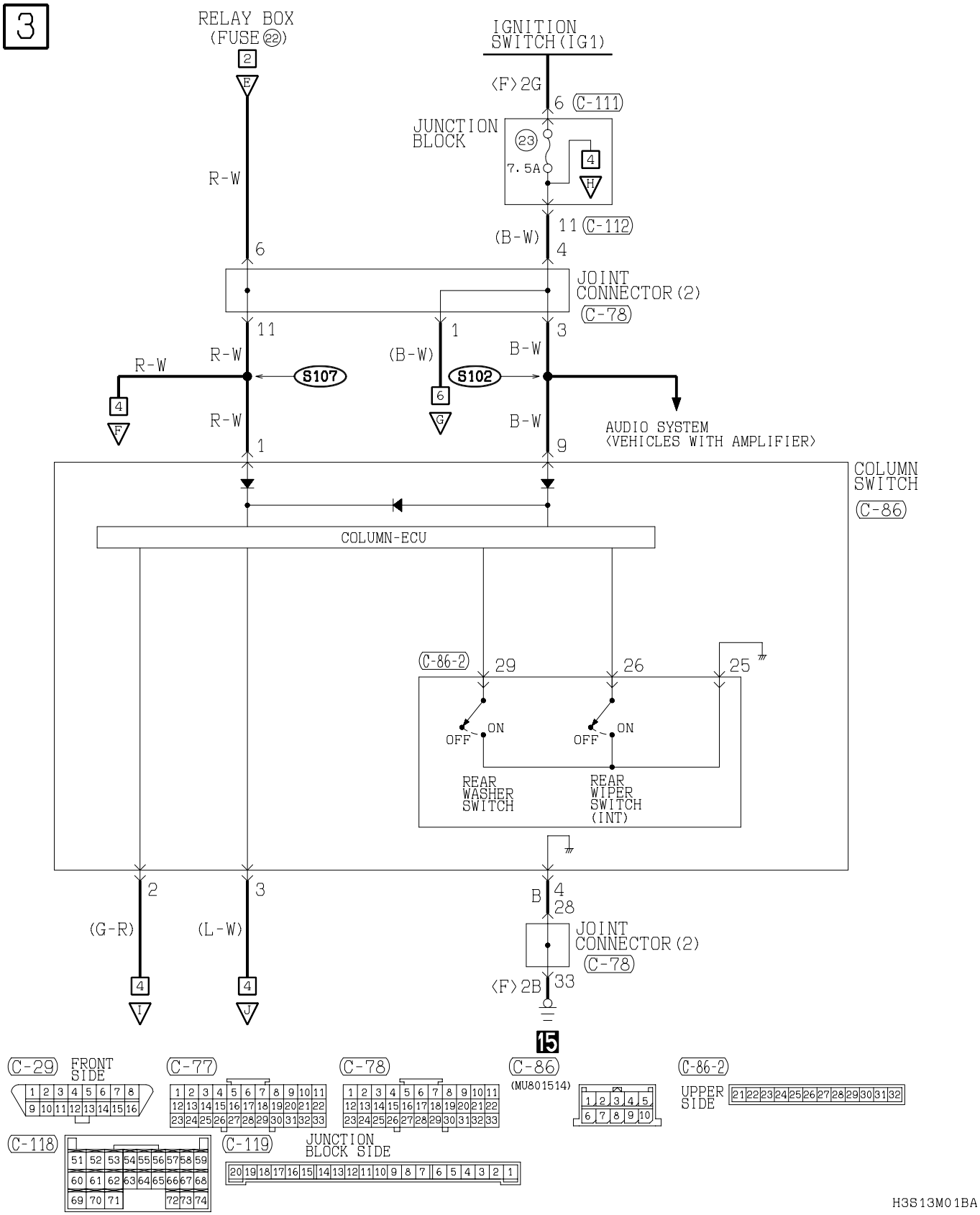
H3S13M01AA

TSB Revision

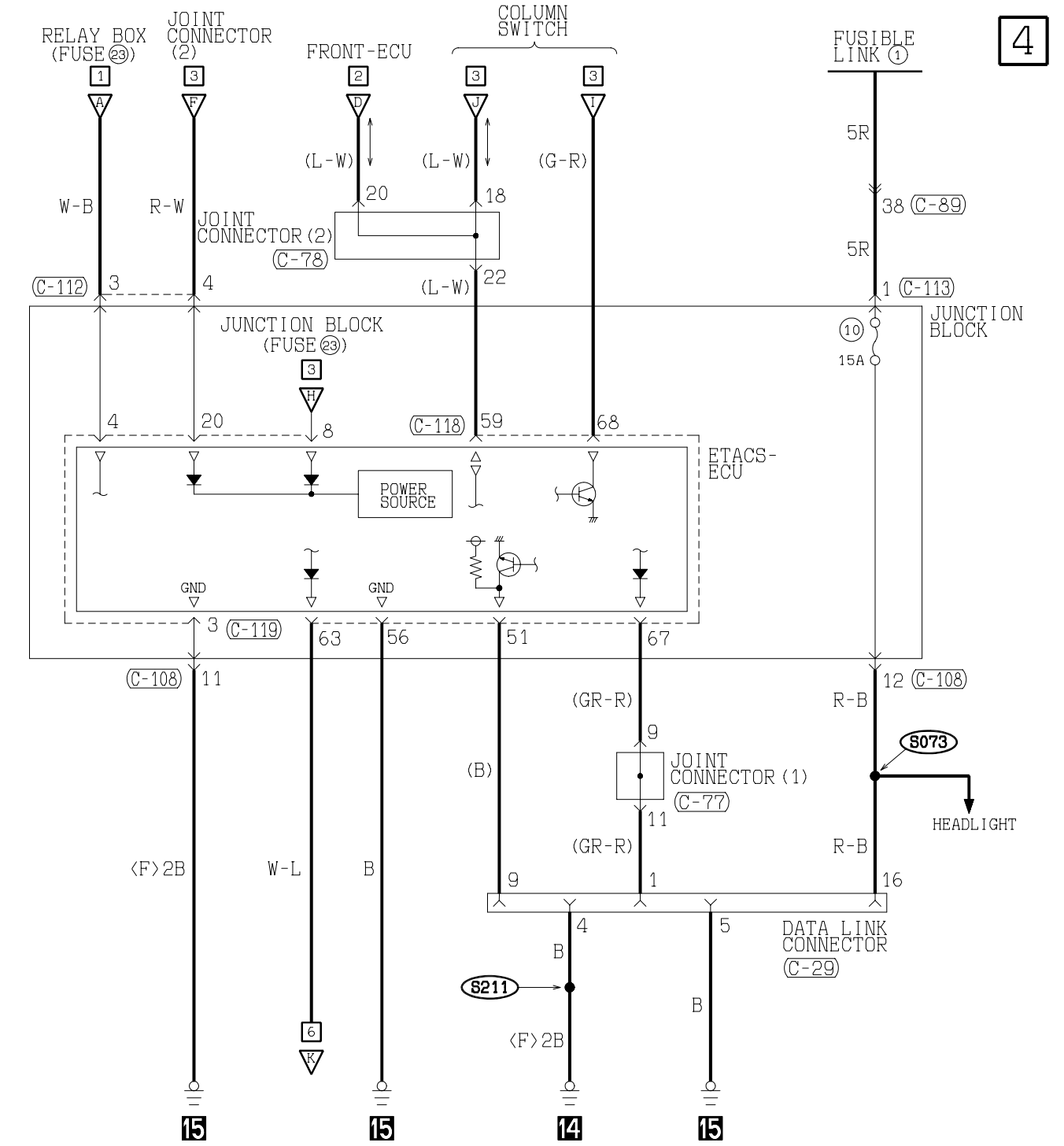


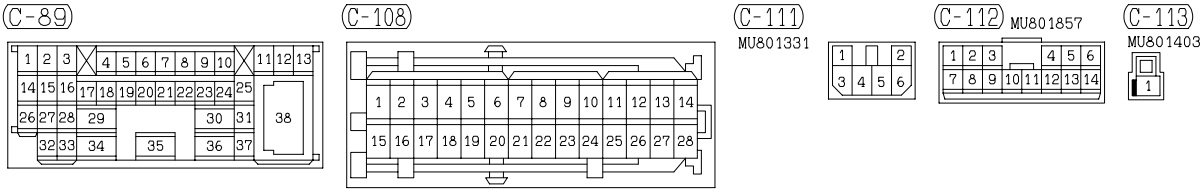
TSB Revision

REAR WIPER AND WASHER <M/T> (CONTINUED)



TSB Revision

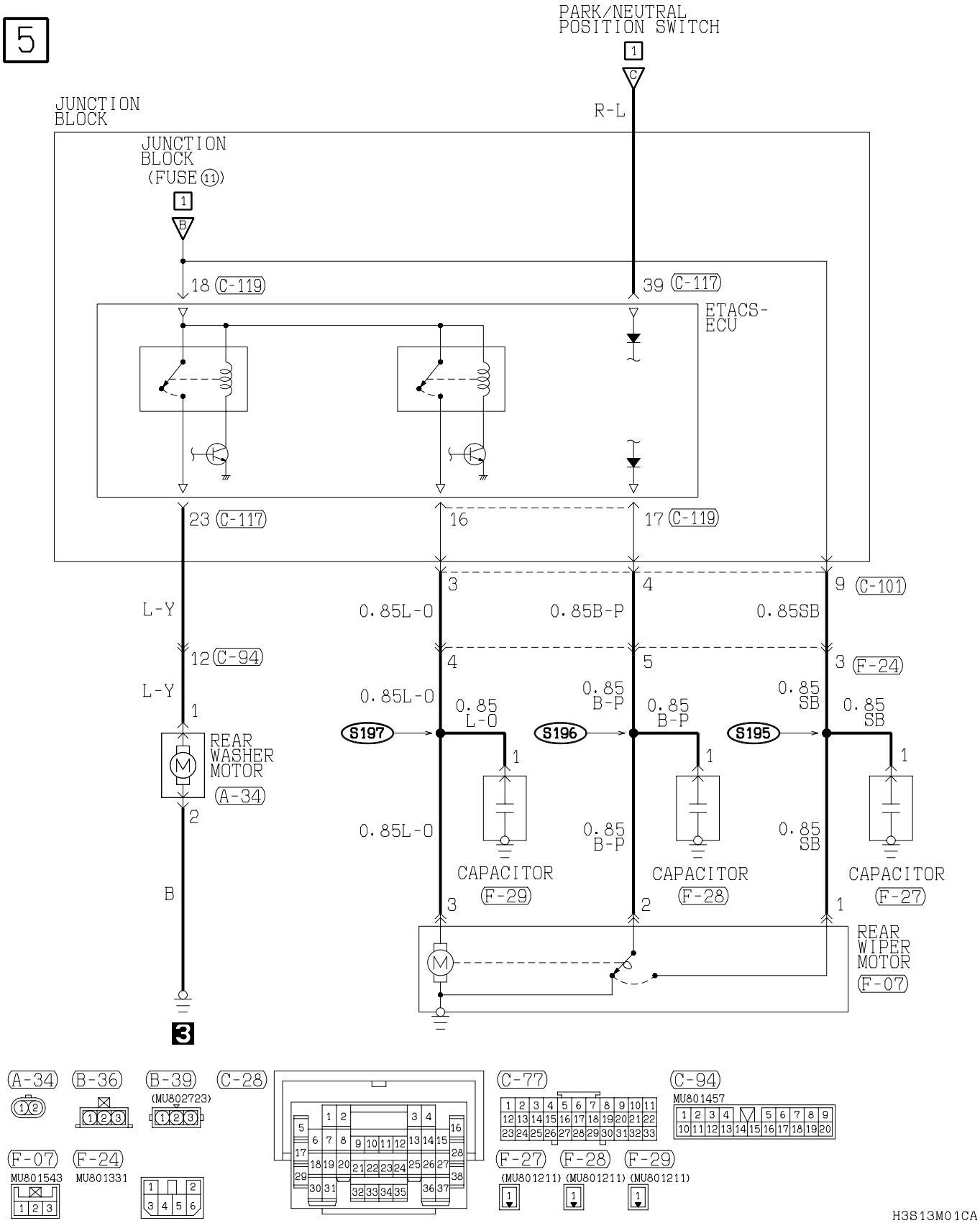




H3S13M01BB

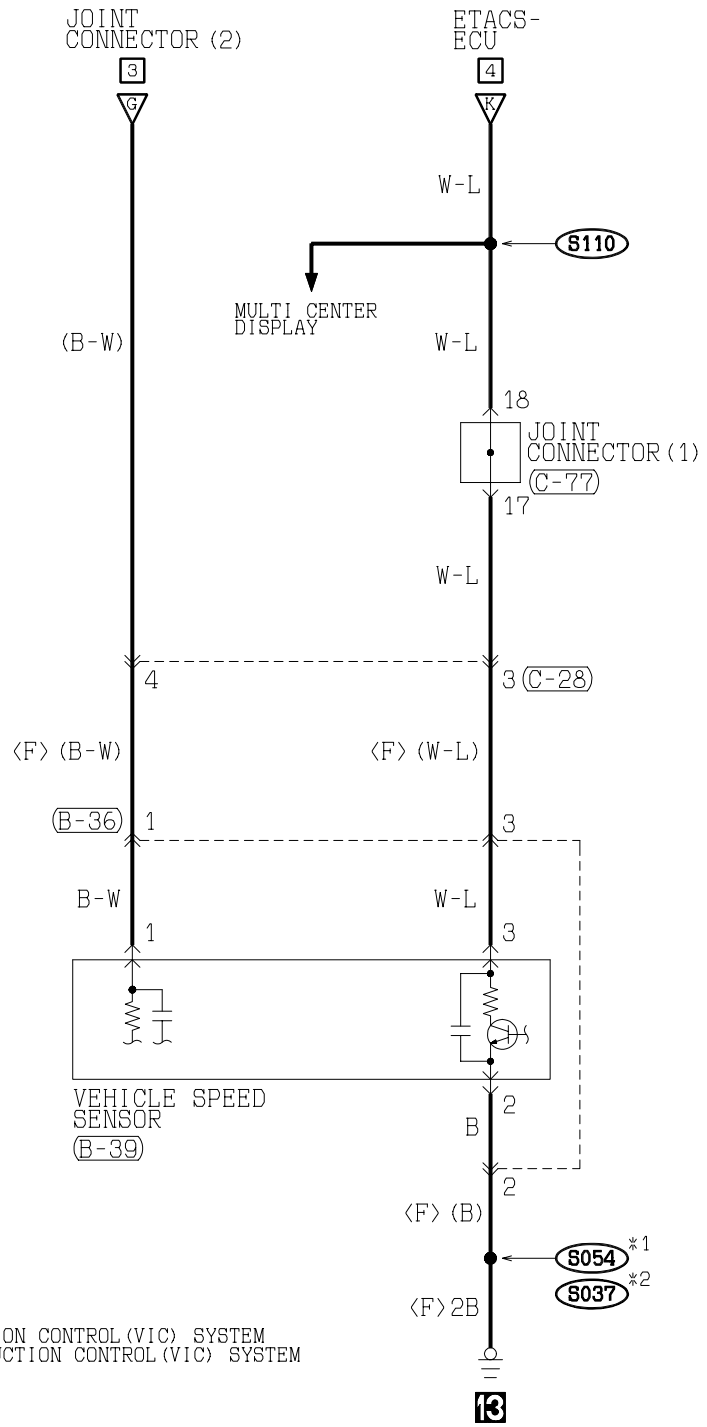
TSB Revision

REAR WIPER AND WASHER <M/T> (CONTINUED)



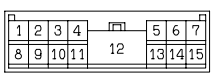
TSB Revision

6

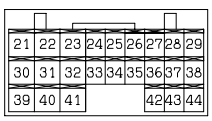


NOTE
*1: WITH VARIABLE INDUCTION CONTROL (VIC) SYSTEM
*2: WITHOUT VARIABLE INDUCTION CONTROL (VIC) SYSTEM

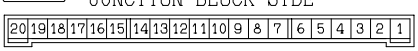
C-101



C-117
MU803766



C-119 JUNCTION BLOCK SIDE



WIRE COLOR CODE

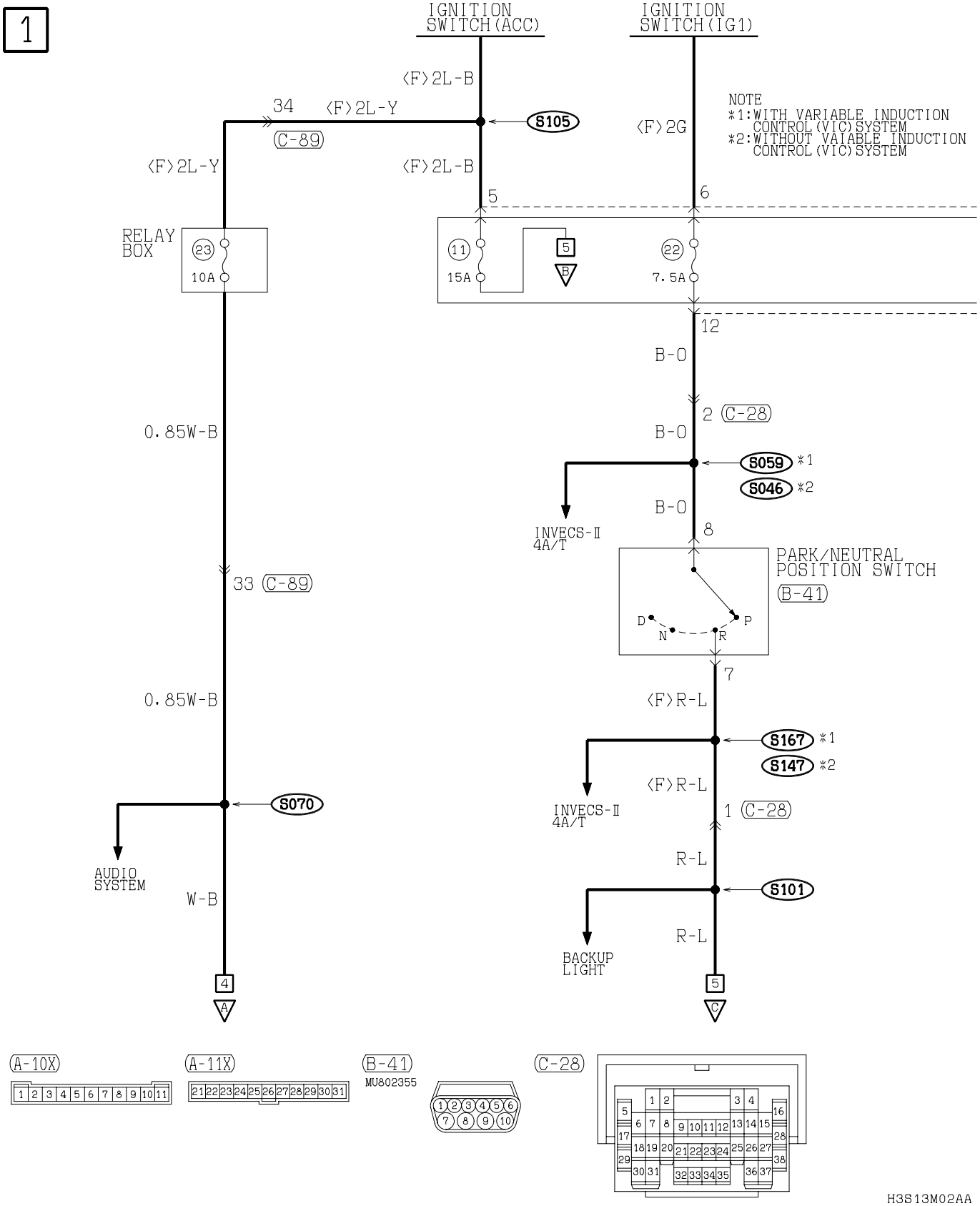
B :BLACK	LG:LIGHT GREEN	G :GREEN	L :BLUE
BR:BROWN	O :ORANGE	GR:GRAY	R :RED
W :WHITE	SB:SKY BLUE	P :PINK	Y :YELLOW
V :VIOLET			

H3S13M01CB

TSB Revision

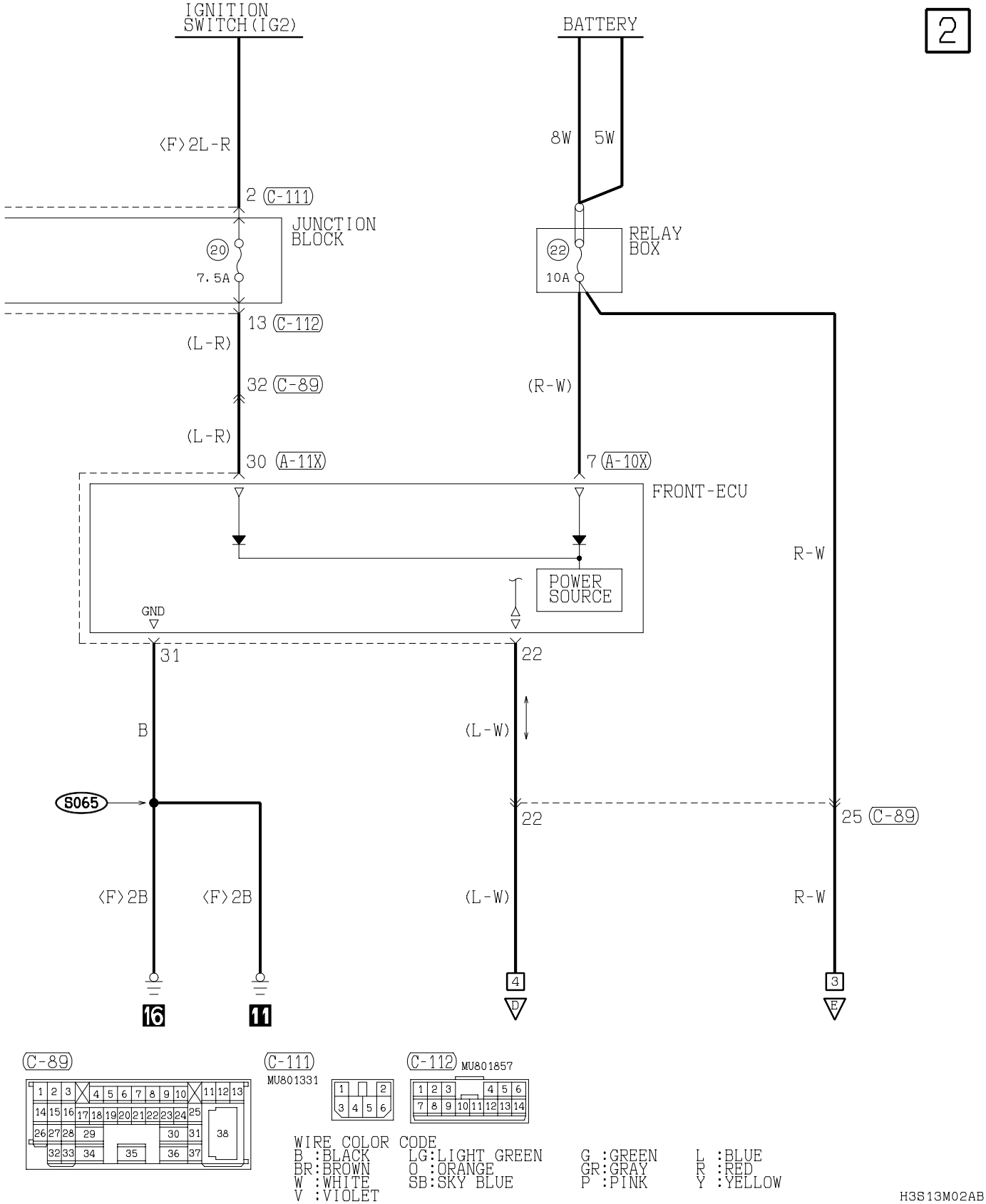
REAR WIPER AND WASHER <A/T>

M1901006200293



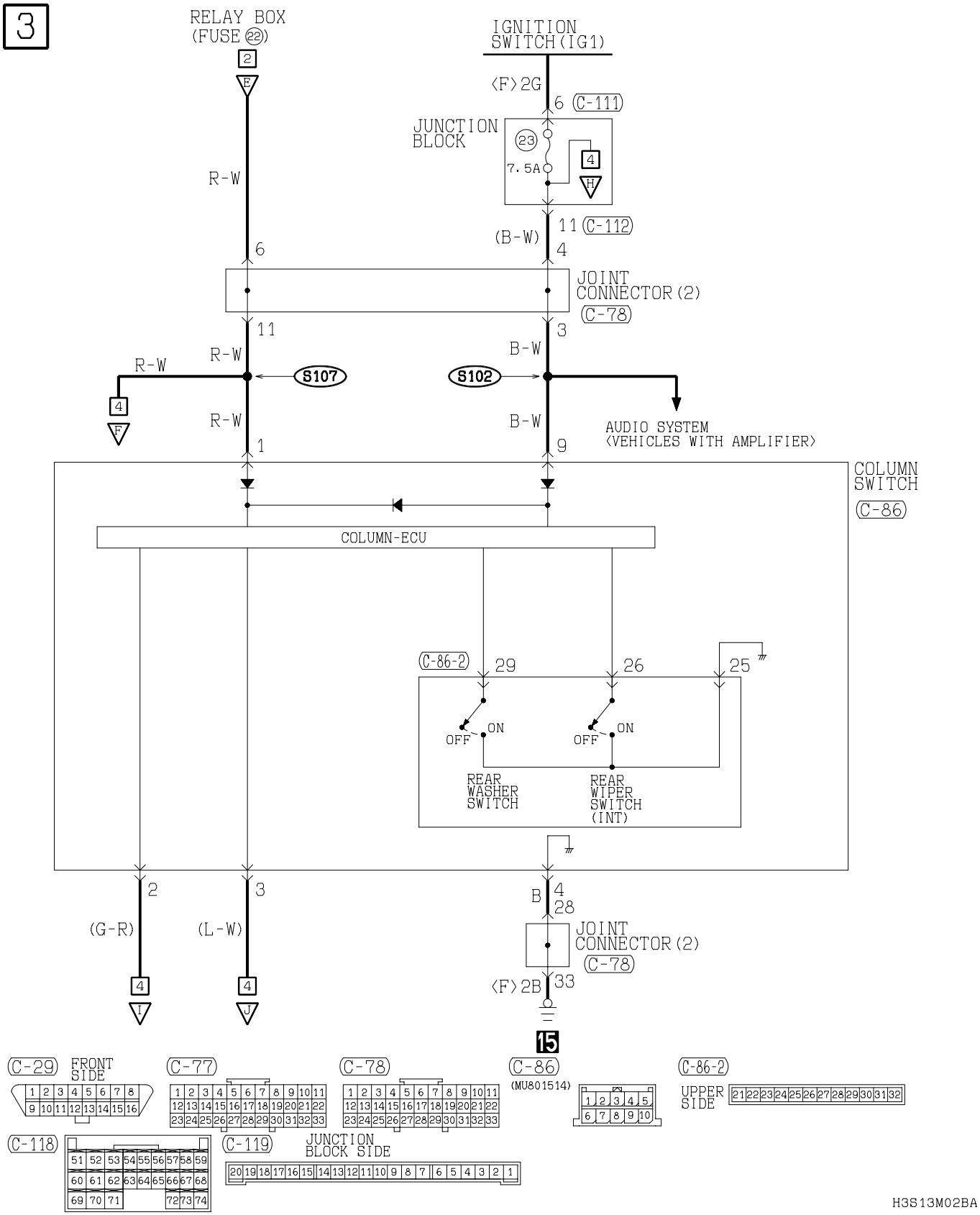
H3S13M02AA

TSB Revision

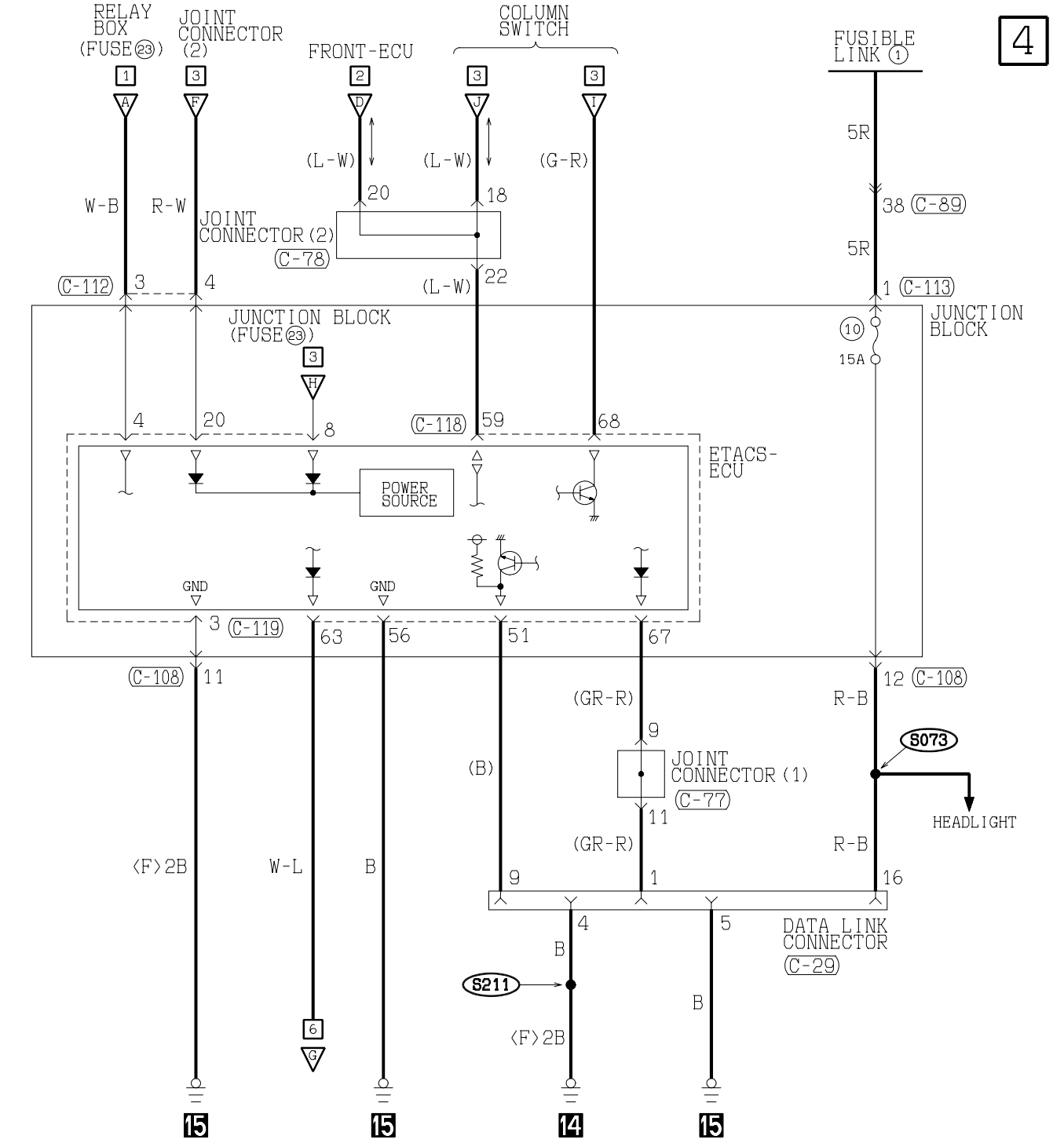


TSB Revision

REAR WIPER AND WASHER <A/T> (CONTINUED)

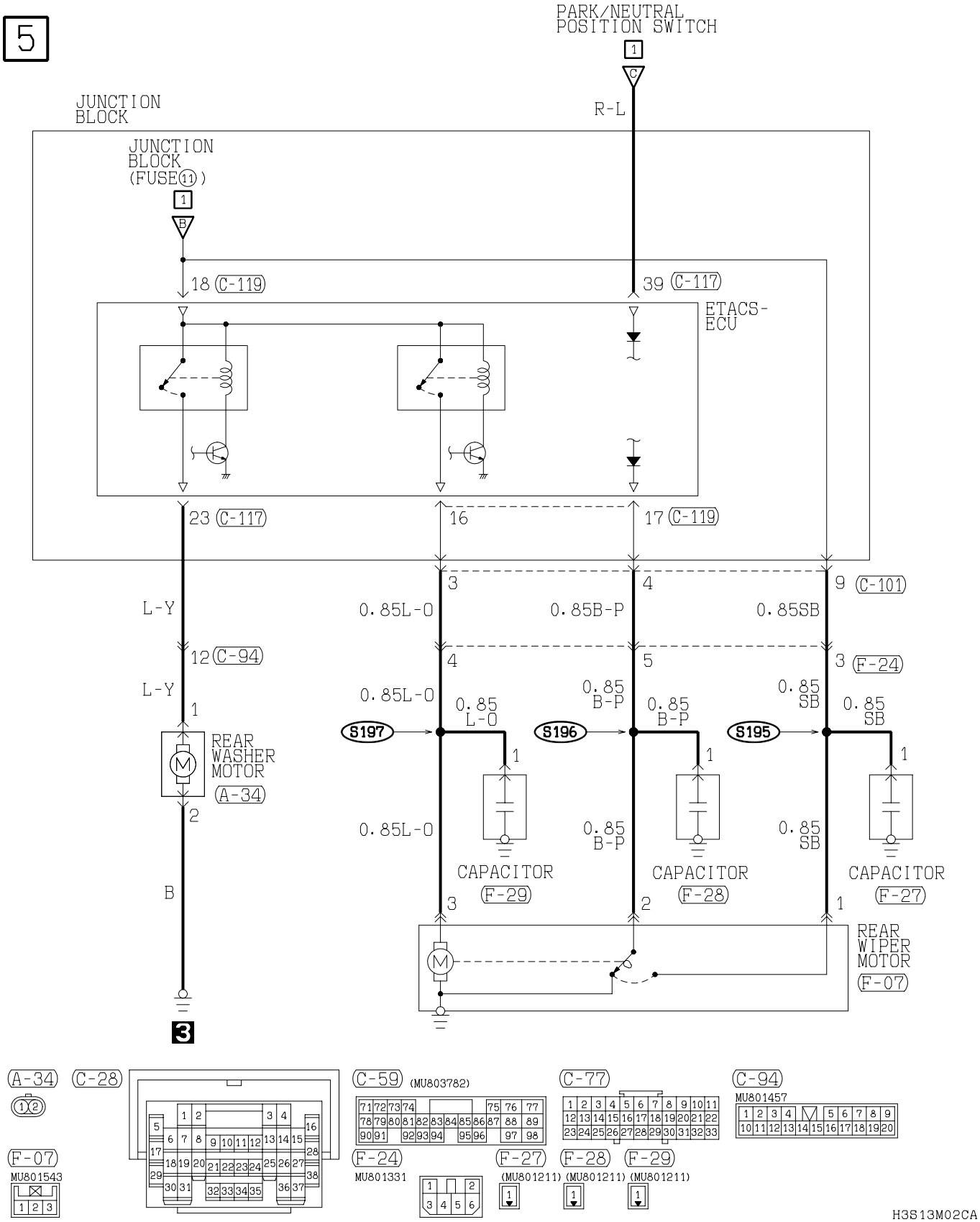


TSB Revision



TSB Revision

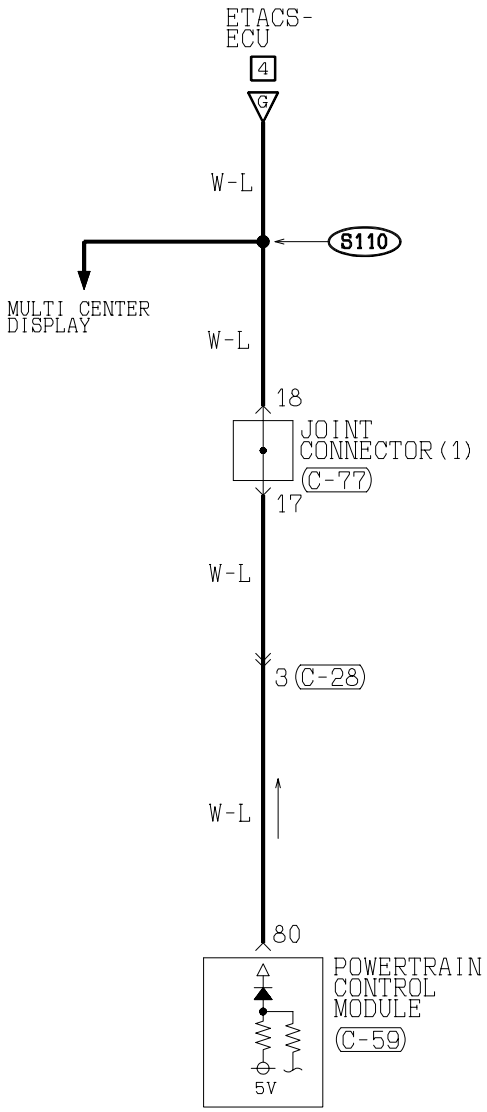
REAR WIPER AND WASHER <A/T> (CONTINUED)



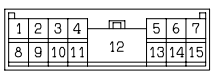
H3S13M02CA

TSB Revision

6

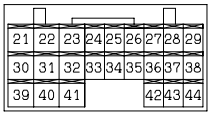


C-101

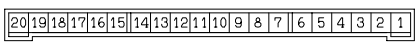


C-117

MU803766



C-119 JUNCTION BLOCK SIDE



WIRE COLOR CODE

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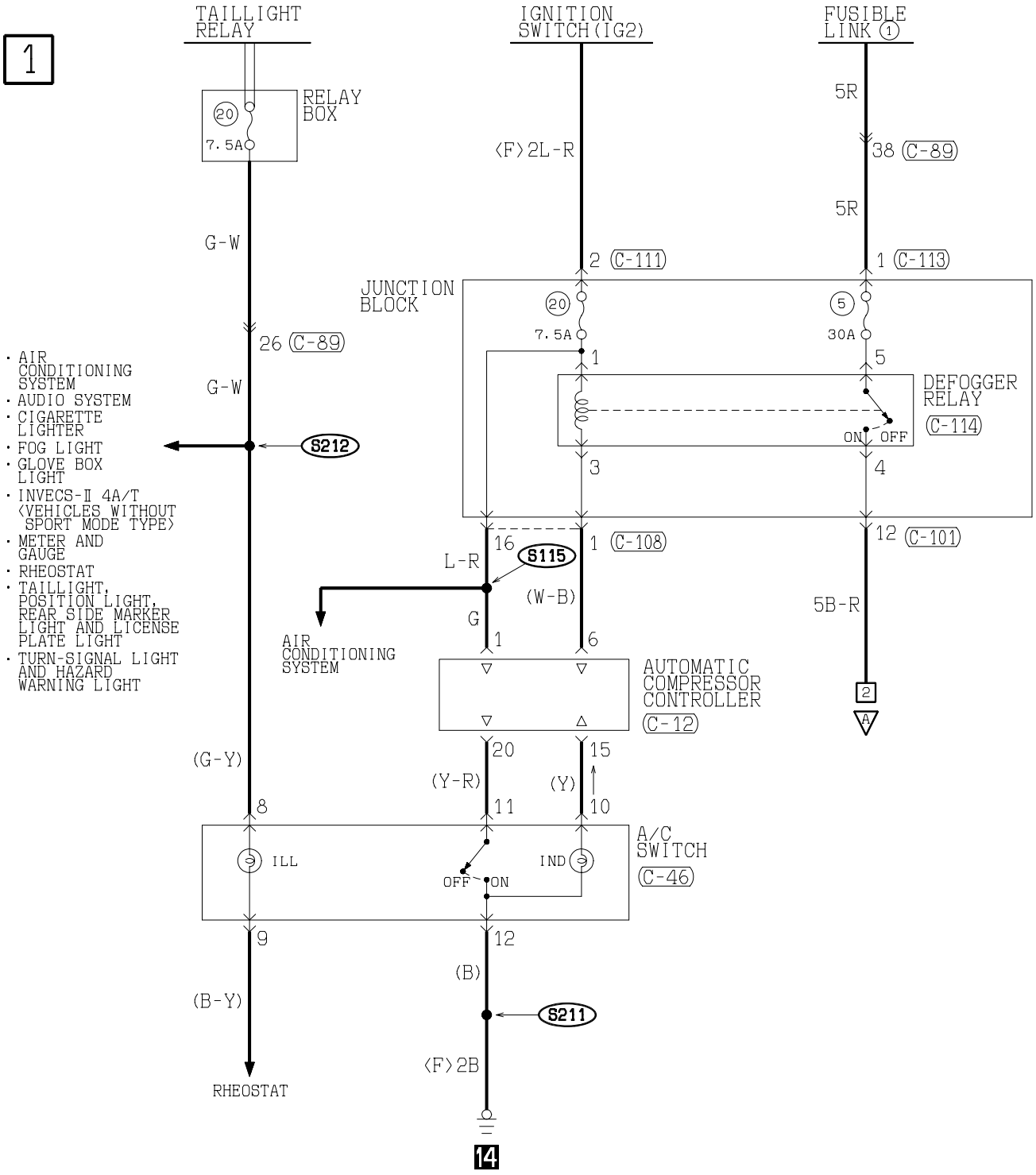
W :WHITE	SB:SKY BLUE	P :PINK	Y :YELLOW
V :VIOLET			

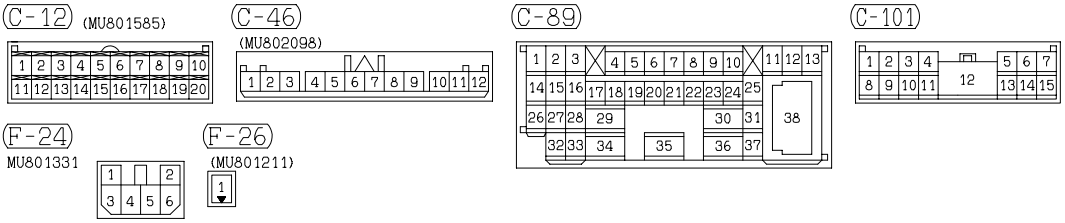
H3S13M02CB

TSB Revision

DEFOGGER <ECLIPSE>

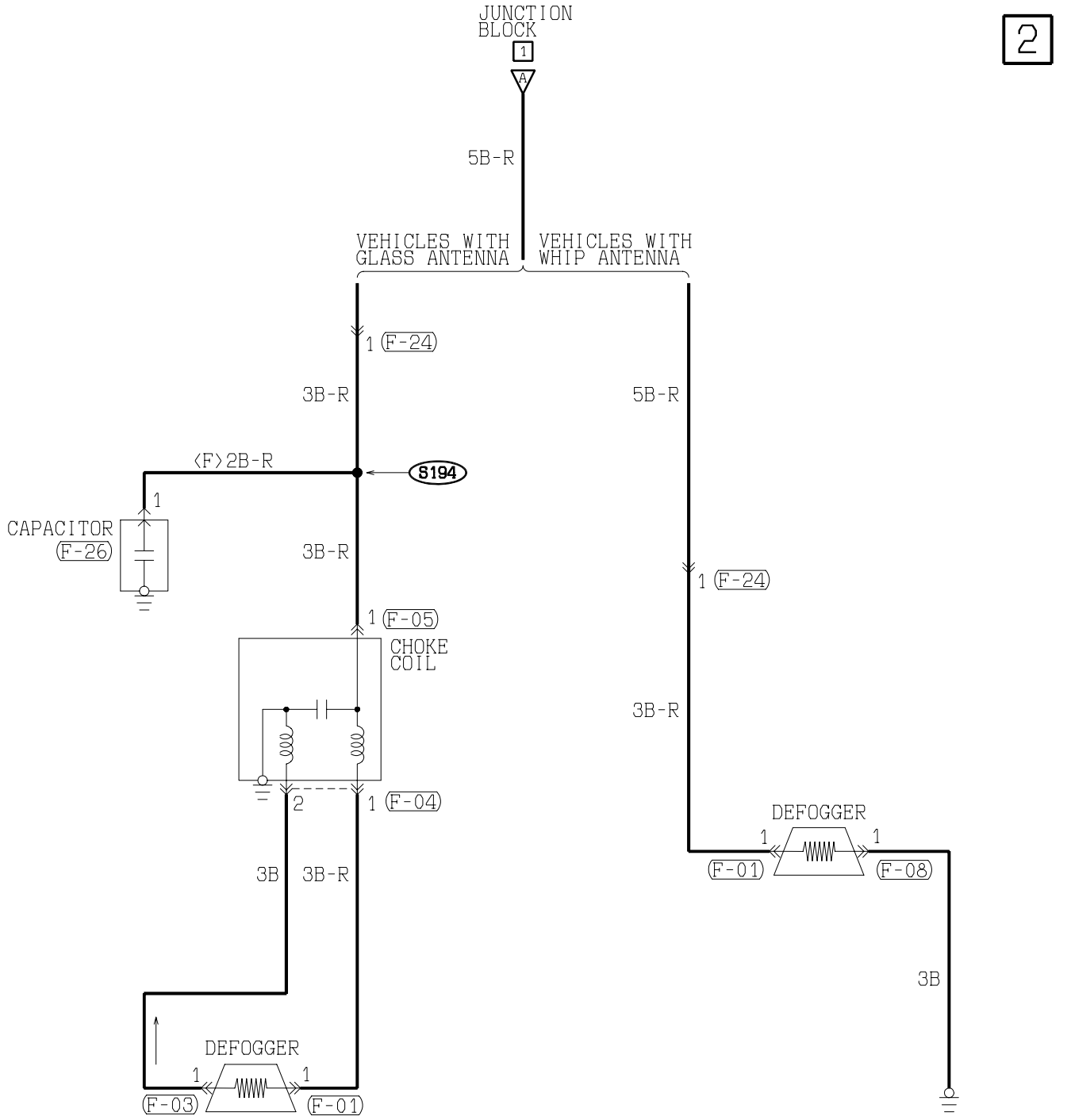
M1901006400208





H3S13M03AA

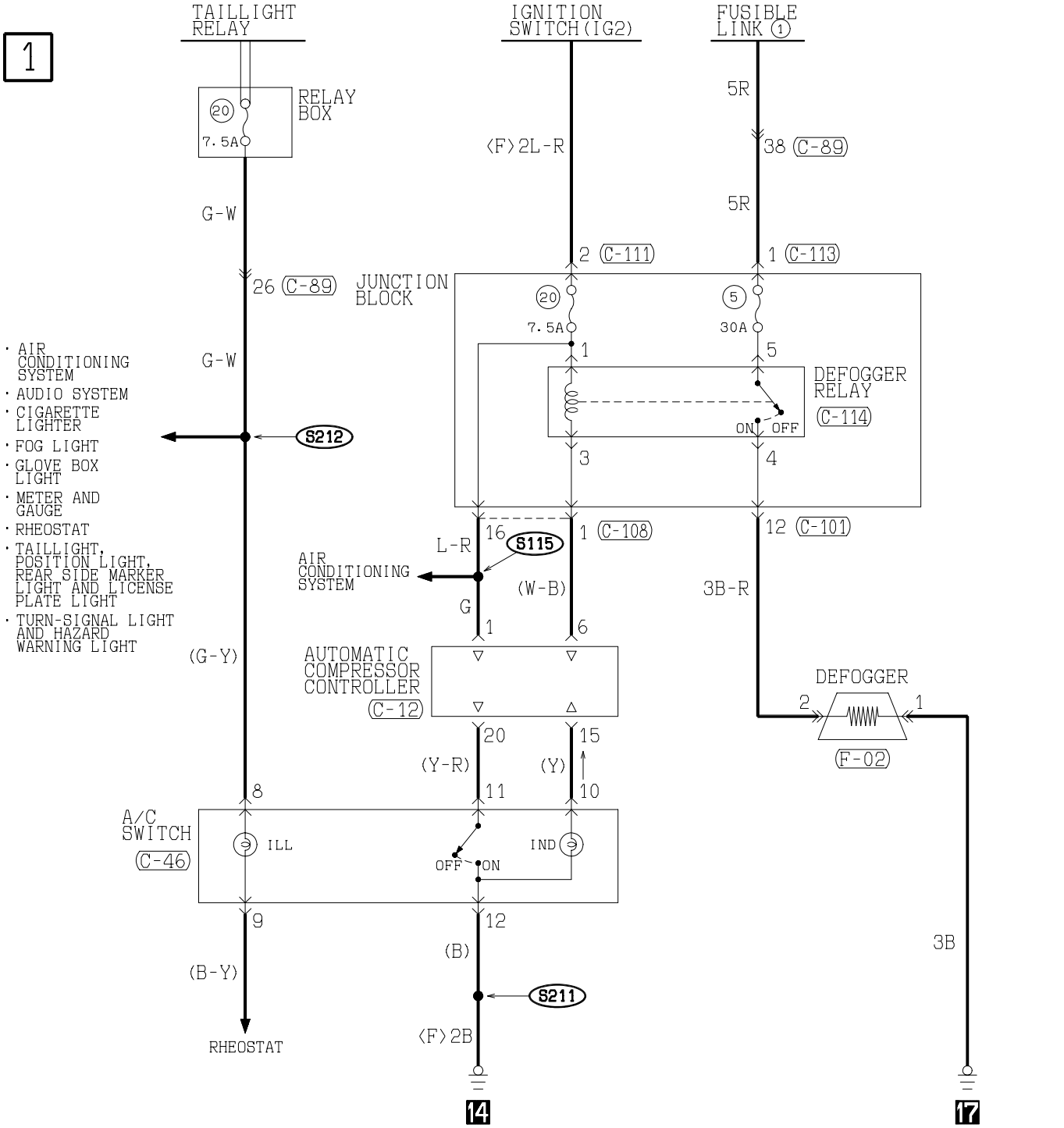
TSB Revision



TSB Revision

DEFOGGER <ECLIPSE SPYDER>

M1901006400219

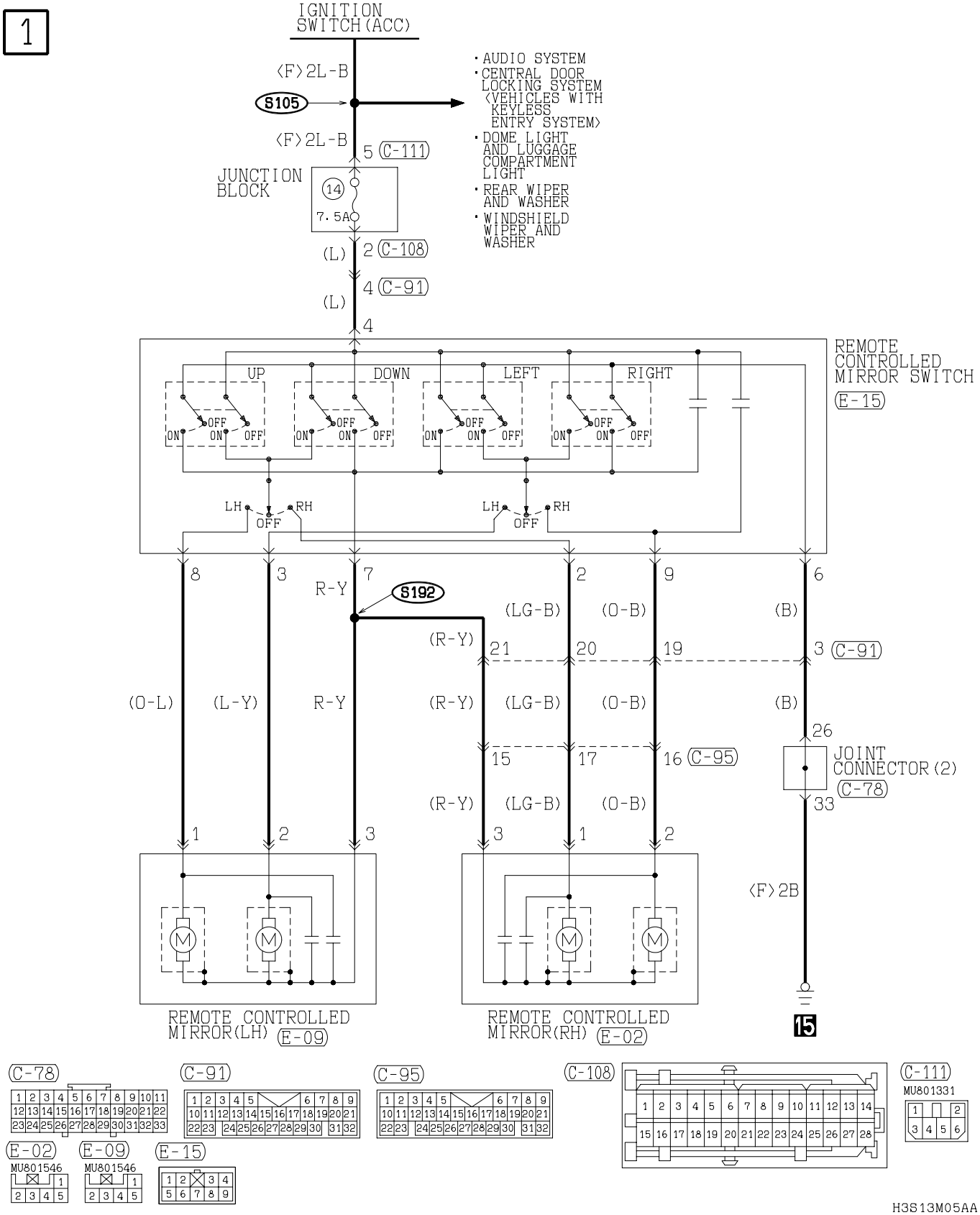


TSB Revision

NOTES

REMOTE CONTROLLED MIRROR <ECLIPSE>

M1901006500294

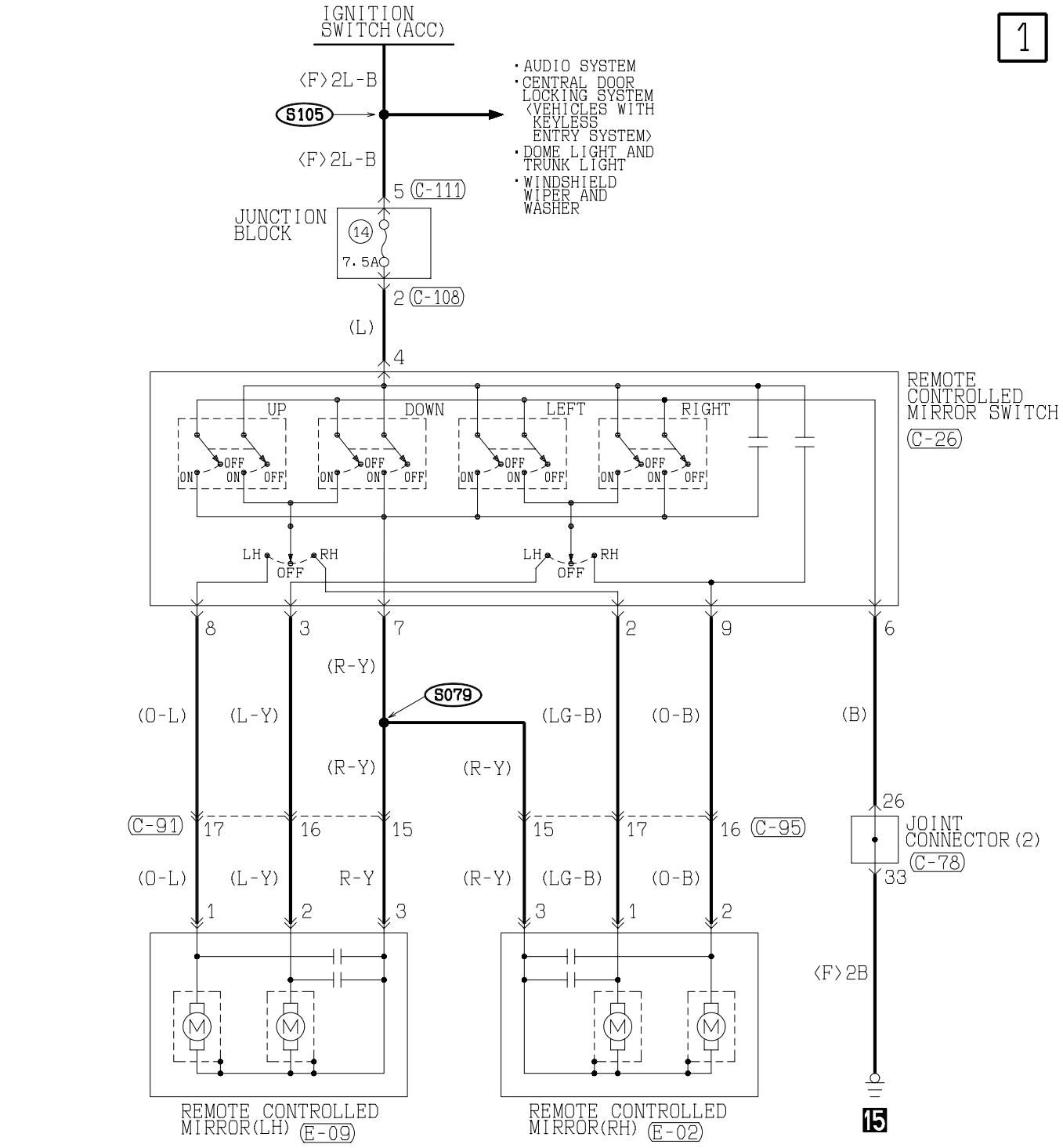


H3S13M05AA

TSB Revision

REMOTE CONTROLLED MIRROR <ECLIPSE SPYDER>

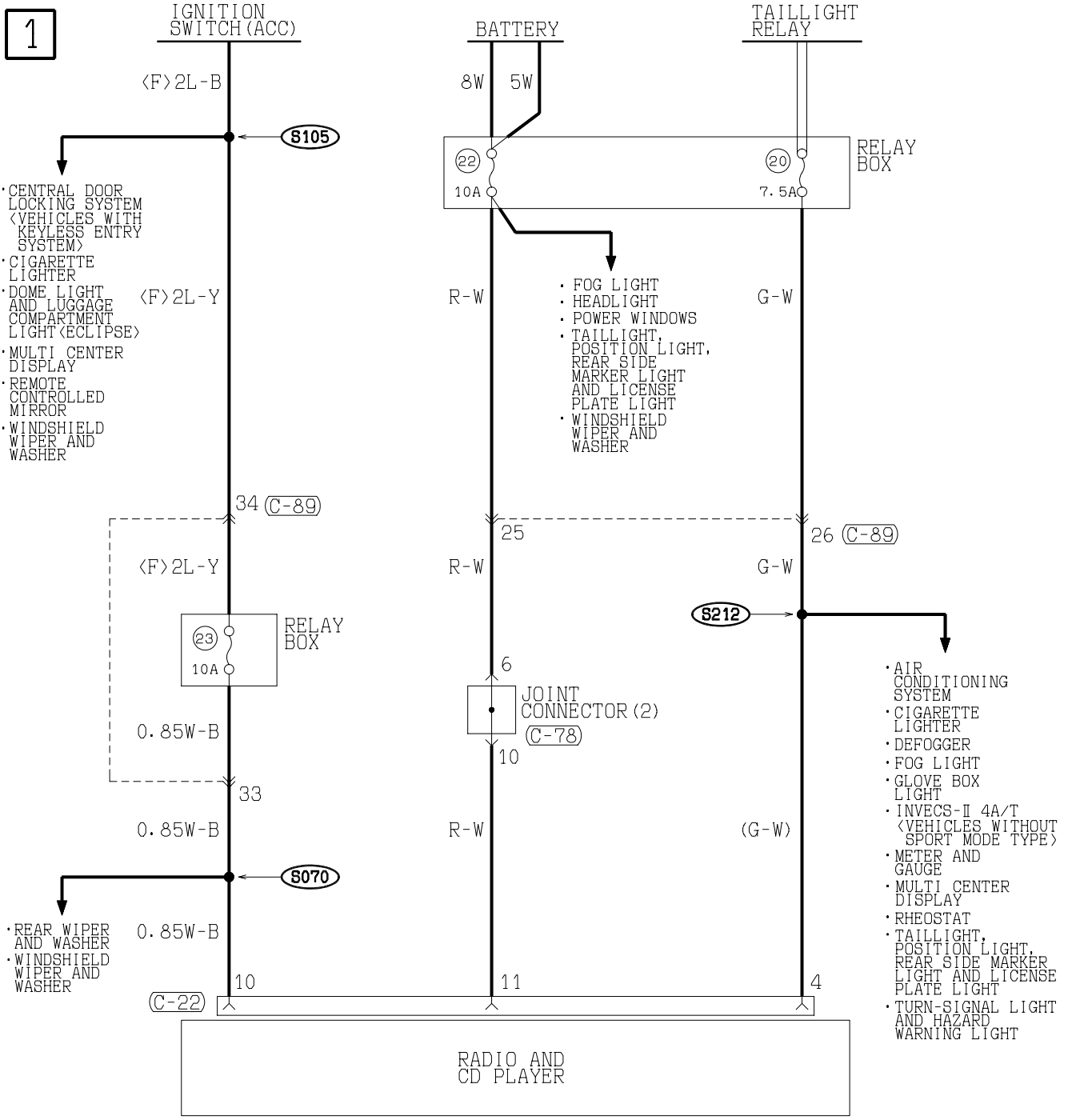
M1901006500302

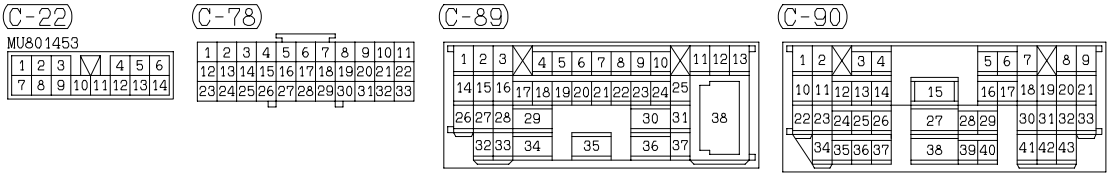


TSB Revision

AUDIO SYSTEM <VEHICLES WITHOUT AMPLIFIER>

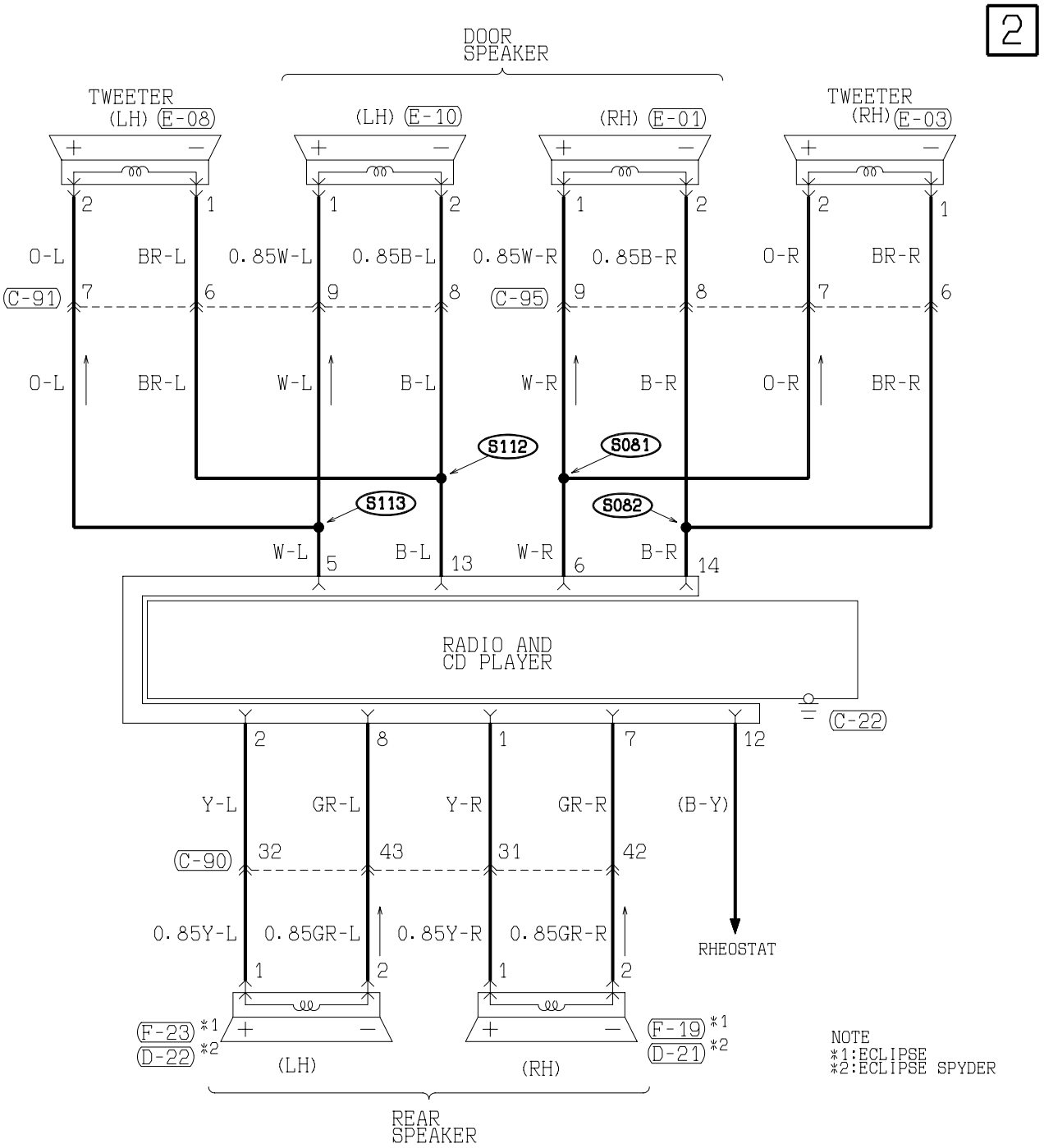
M1901015600341





H3S14M00AA

TSB Revision



C-91

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C-95

1	2	3	4	5					6	7	8	9										
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D-21 MU801671 (1, 2)
D-22 MU801671 (1, 2)
E-01 MU801671 (1, 2)
E-03 (1, 2)
E-08 (1, 2)
E-10 MU801671 (1, 2)
F-19 MU801671 (1, 2)
F-23 MU801671 (1, 2)

WIRE COLOR CODE

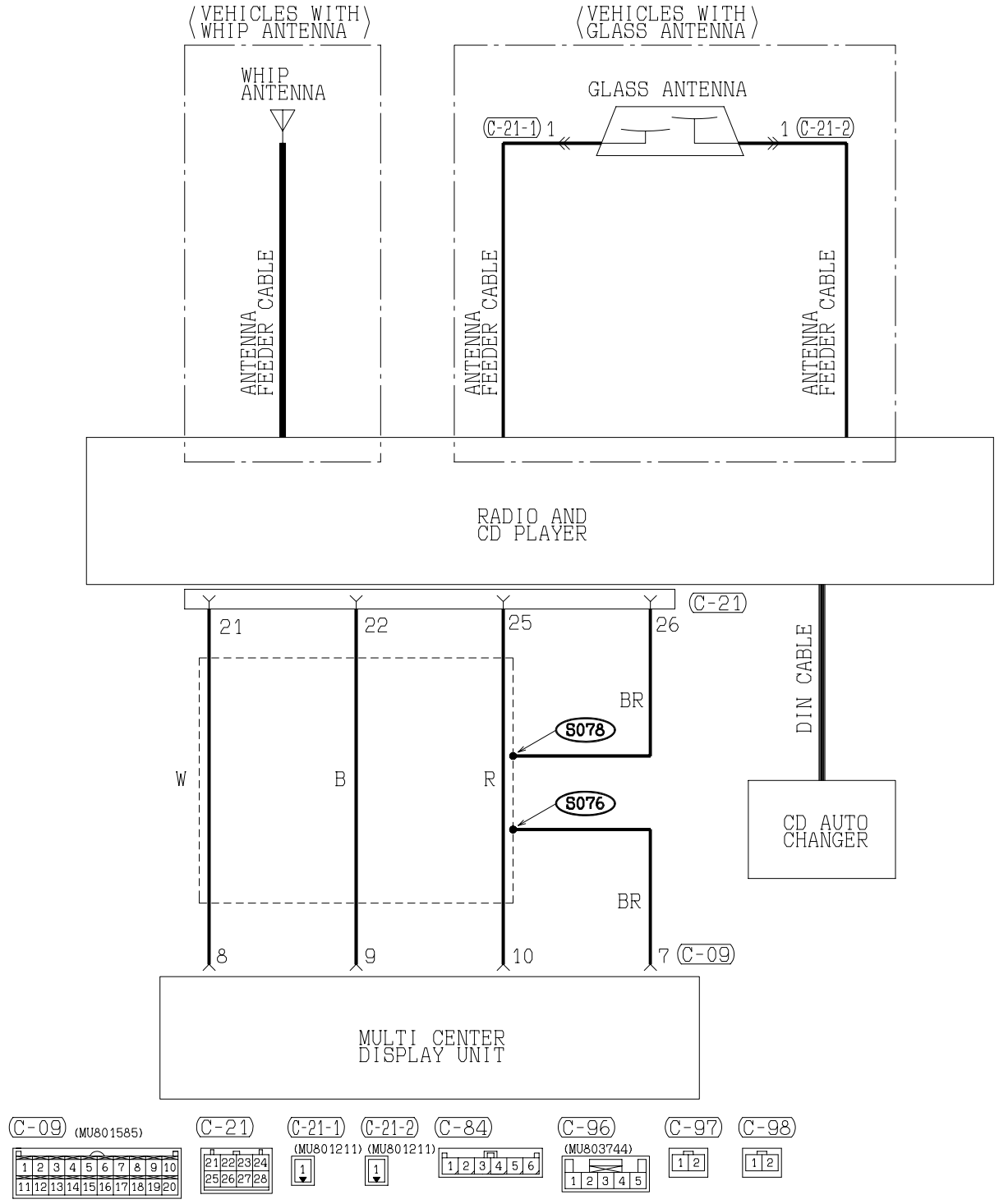
B :BLACK	LG:LIGHT GREEN	G :GREEN	L :BLUE	W :WHITE	Y :YELLOW	SB:SKY BLUE
BR:BROWN	O :ORANGE	GR:GRAY	R :RED	P :PINK	V :VIOLET	

H3S14M00AB

TSB Revision

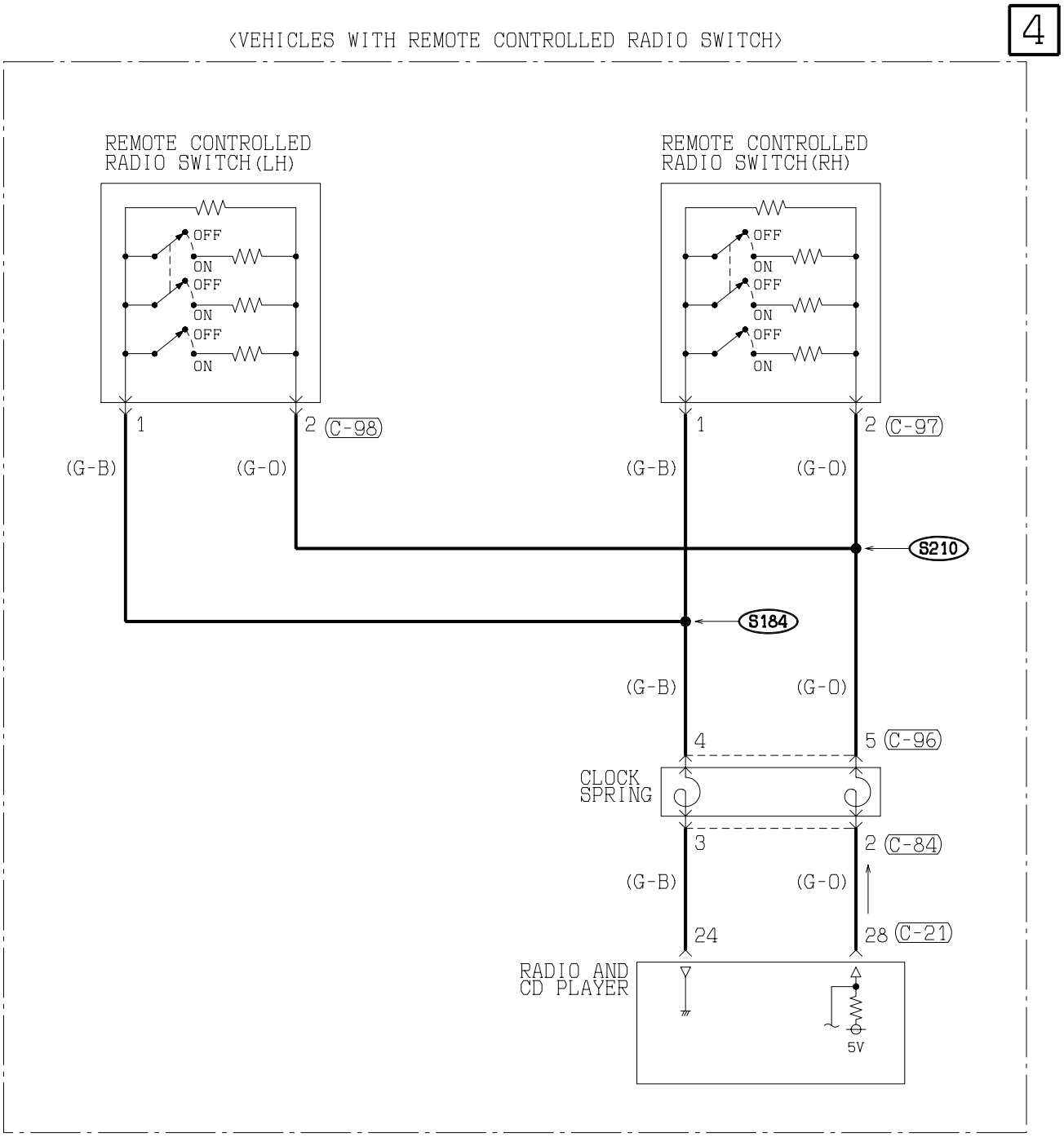
AUDIO SYSTEM <VEHICLES WITHOUT AMPLIFIER> (CONTINUED)

3



H3S14M00BA

TSB Revision



WIRE COLOR CODE

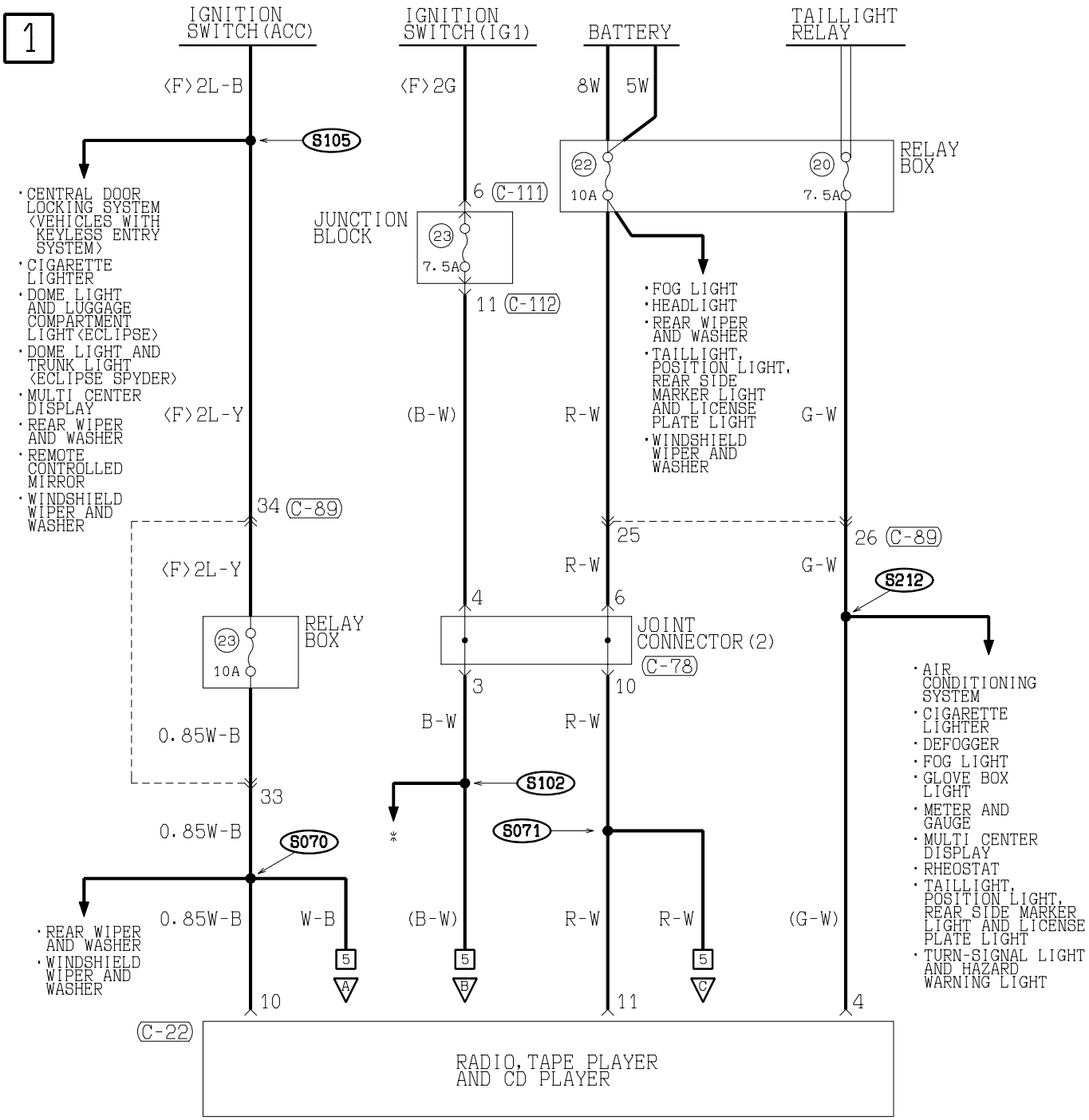
B :BLACK	LG:LIGHT GREEN	G :GREEN	L :BLUE	W :WHITE	Y :YELLOW	SB:SKY BLUE
BR:BROWN	O :ORANGE	GR:GRAY	R :RED	P :PINK	V :VIOLET	

H3S14M00BB

TSB Revision

AUDIO SYSTEM <VEHICLES WITH AMPLIFIER>

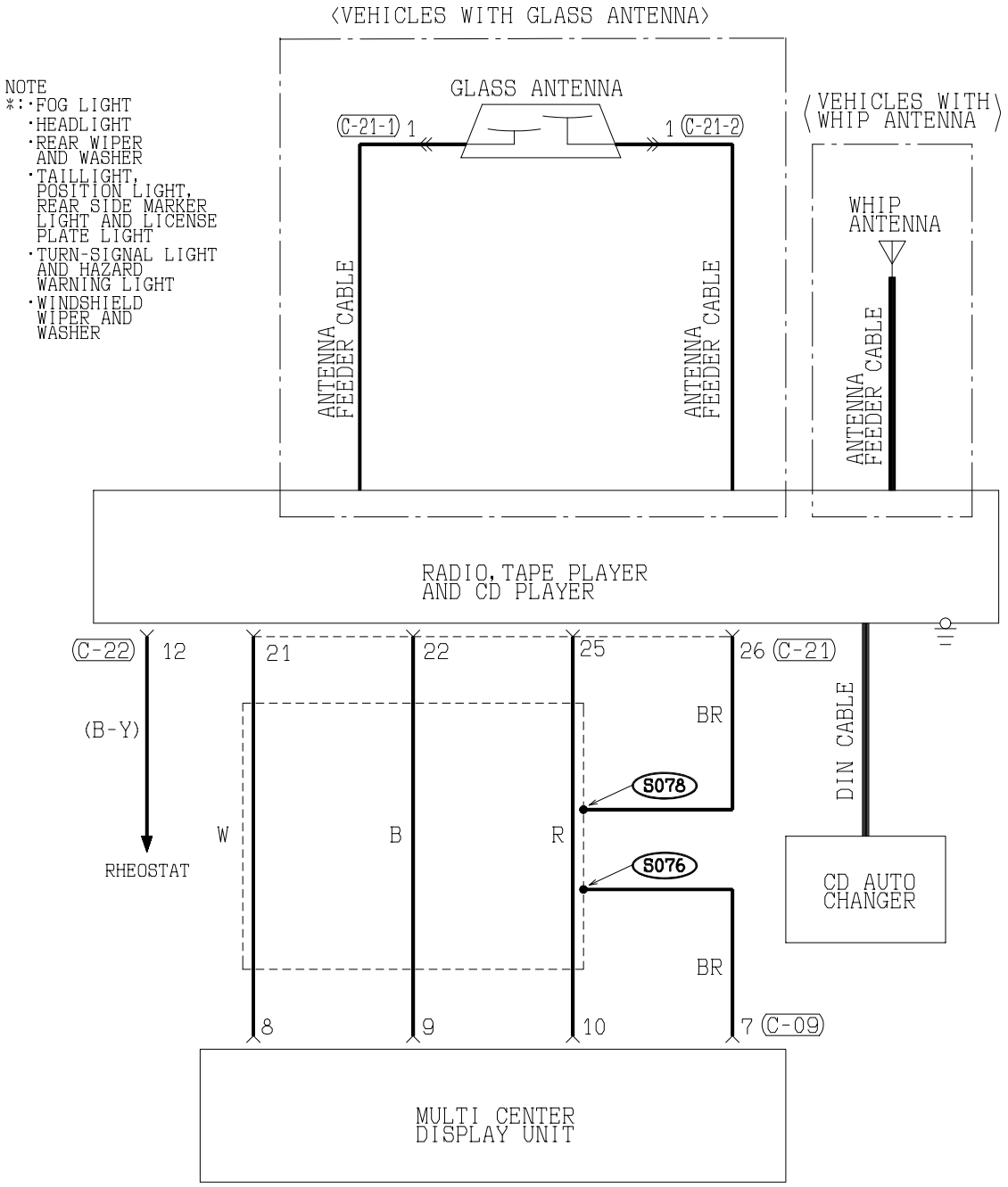
M1901015600352

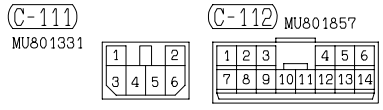


H3S14M01AA

TSB Revision

2





WIRE COLOR CODE

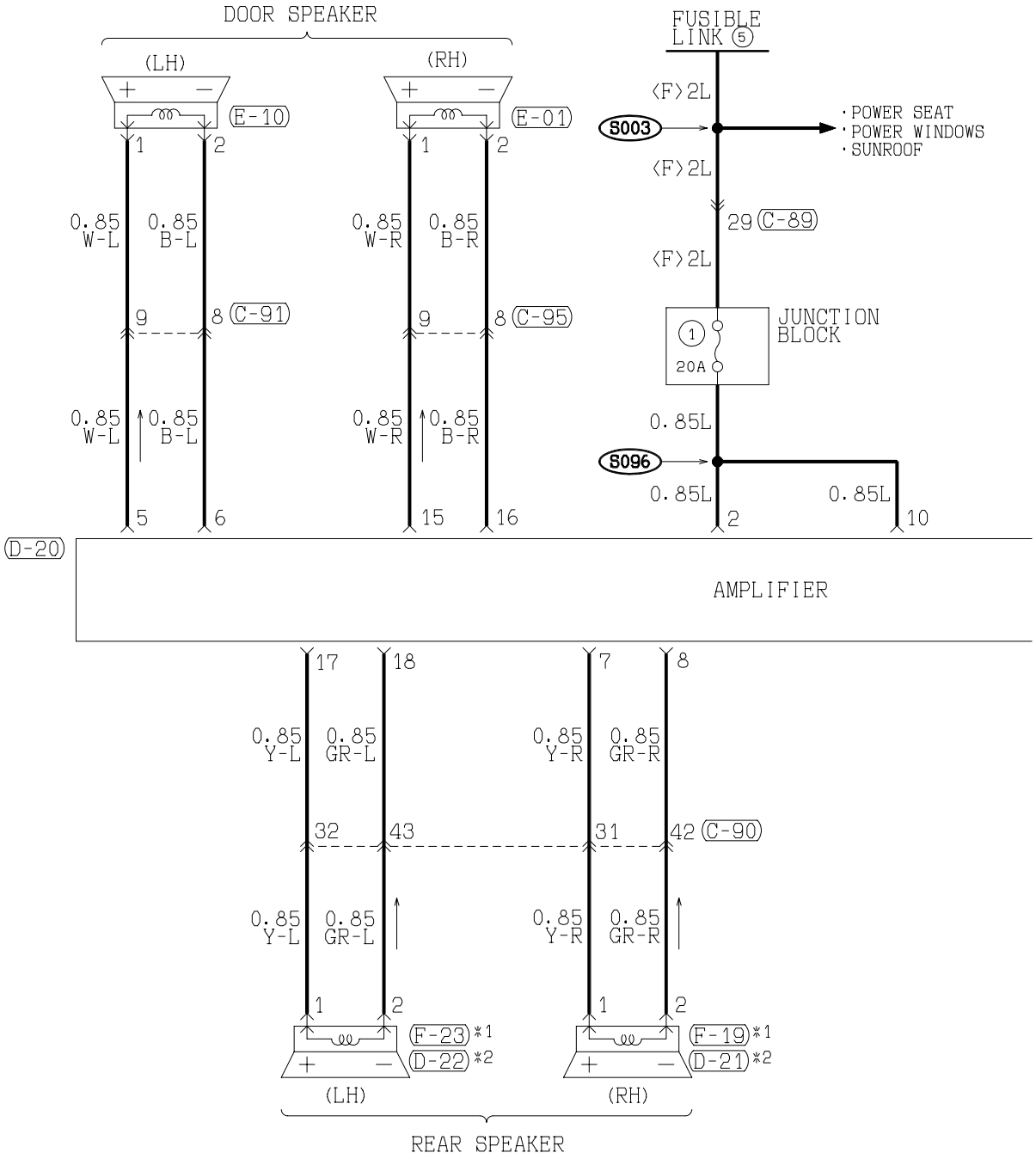
B :BLACK	BR:BROWN	G :GREEN	GR:GRAY	L :BLUE	LG:LIGHT GREEN	O :ORANGE	
P :PINK	R :RED	SB:SKY BLUE	V :VIOLET	W :WHITE	Y :YELLOW		

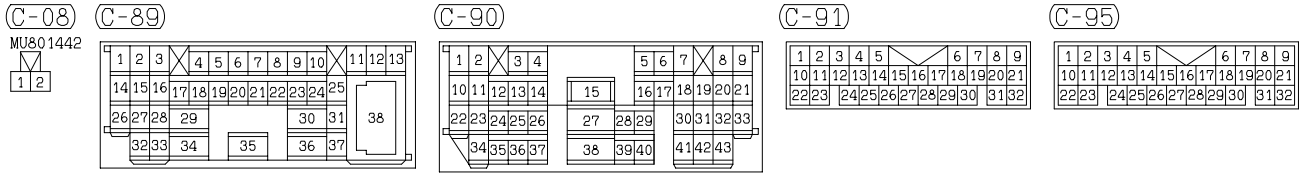
H3S14M01AB

TSB Revision

AUDIO SYSTEM <VEHICLES WITH AMPLIFIER> (CONTINUED)

3

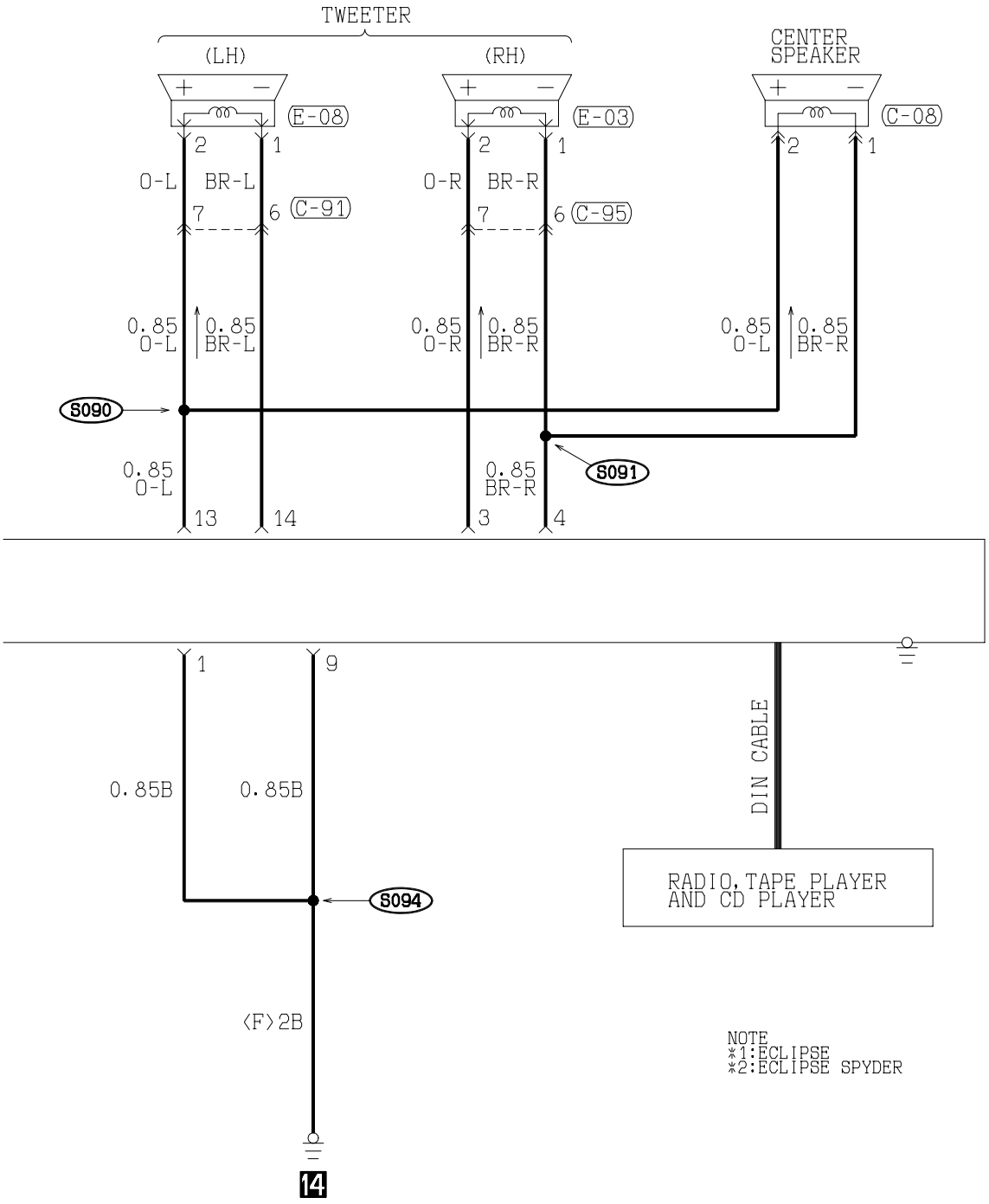




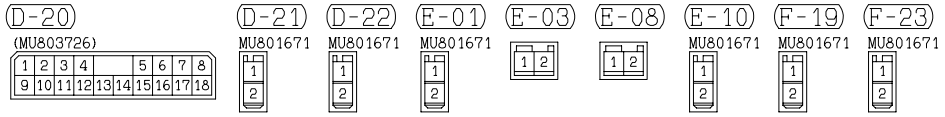
H3S14M01BA

TSB Revision

4



NOTE
*1:ECLIPSE
*2:ECLIPSE SPYDER

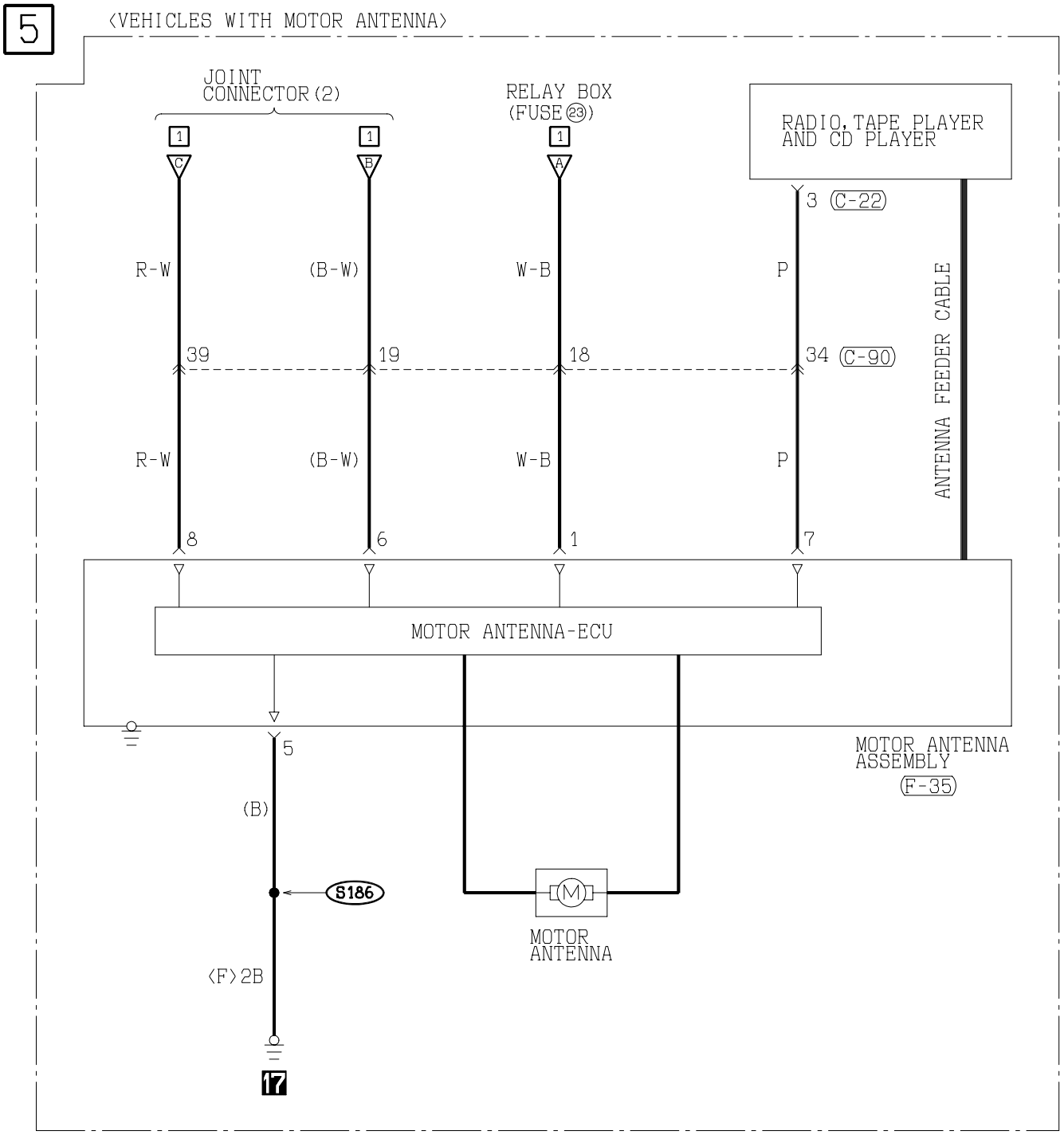


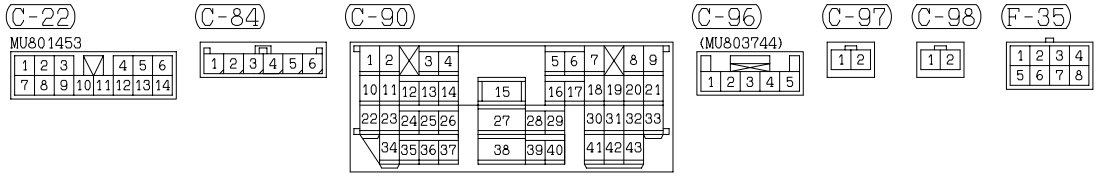
WIRE COLOR CODE
B :BLACK BR:BROWN G :GREEN GR:GRAY L :BLUE LG:LIGHT GREEN O :ORANGE
P :PINK R :RED SB:SKY BLUE V :VIOLET W :WHITE Y :YELLOW

H3S14M01BB

TSB Revision

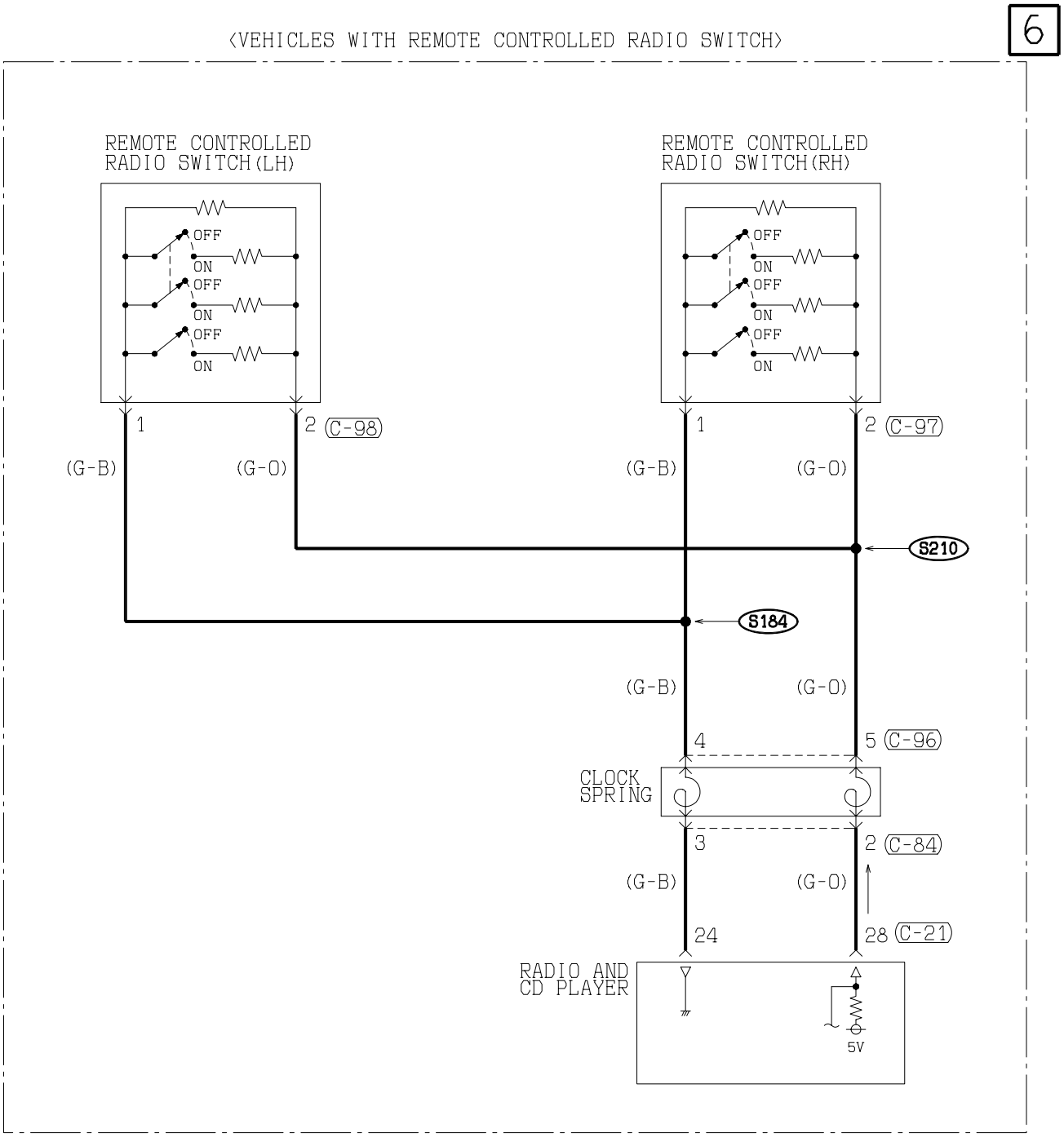
AUDIO SYSTEM <VEHICLES WITH AMPLIFIER> (CONTINUED)





H3S14M01CA

TSB Revision



WIRE COLOR CODE

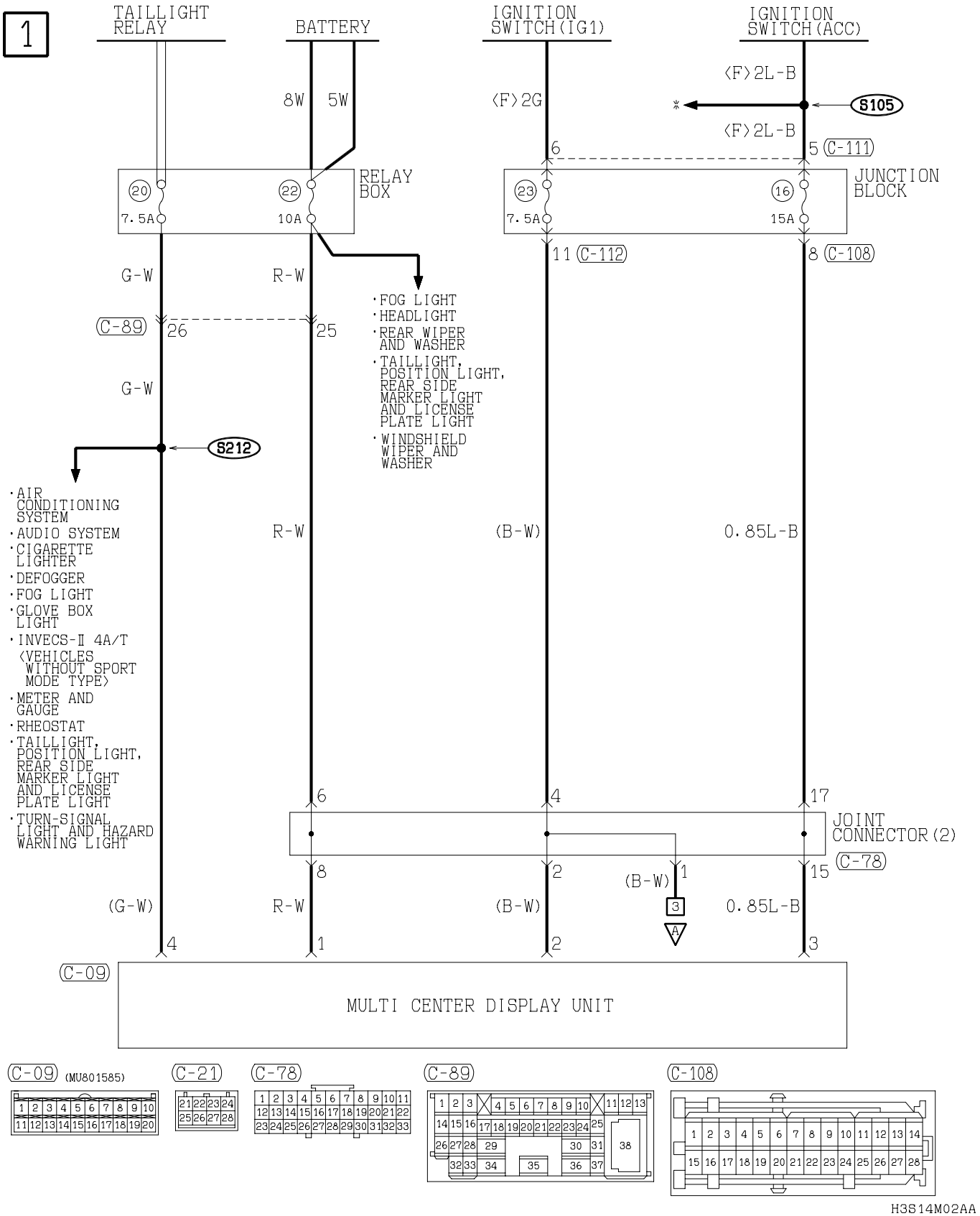
B :BLACK	LG:LIGHT GREEN	G :GREEN	L :BLUE	W :WHITE	Y :YELLOW	SB:SKY BLUE
BR:BROWN	O :ORANGE	GR:GRAY	R :RED	P :PINK	V :VIOLET	

H3S14M01CB

TSB Revision

MULTI CENTER DISPLAY

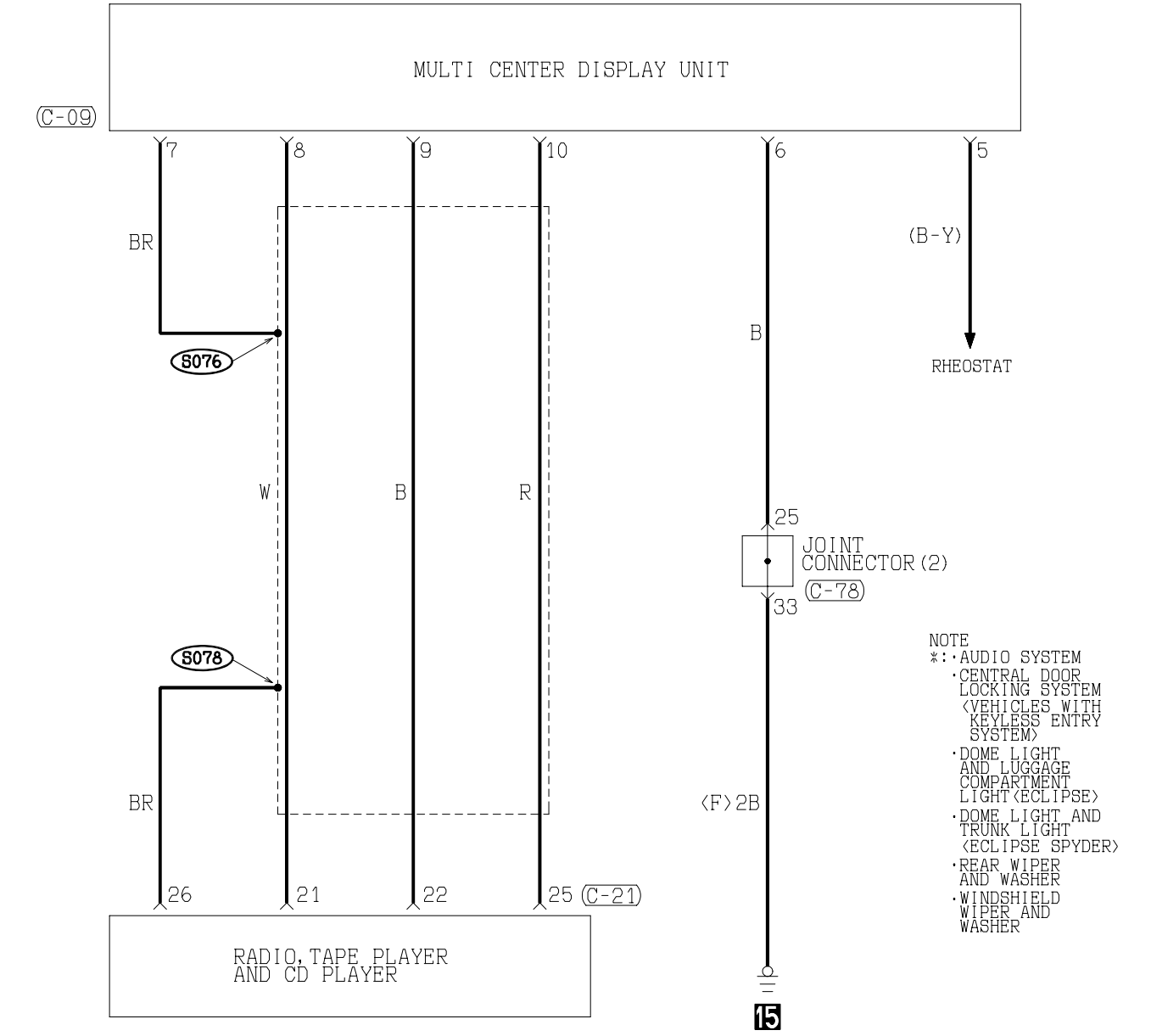
M1901018000014

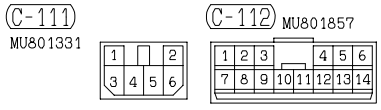


H3S14M02AA

TSB Revision

2





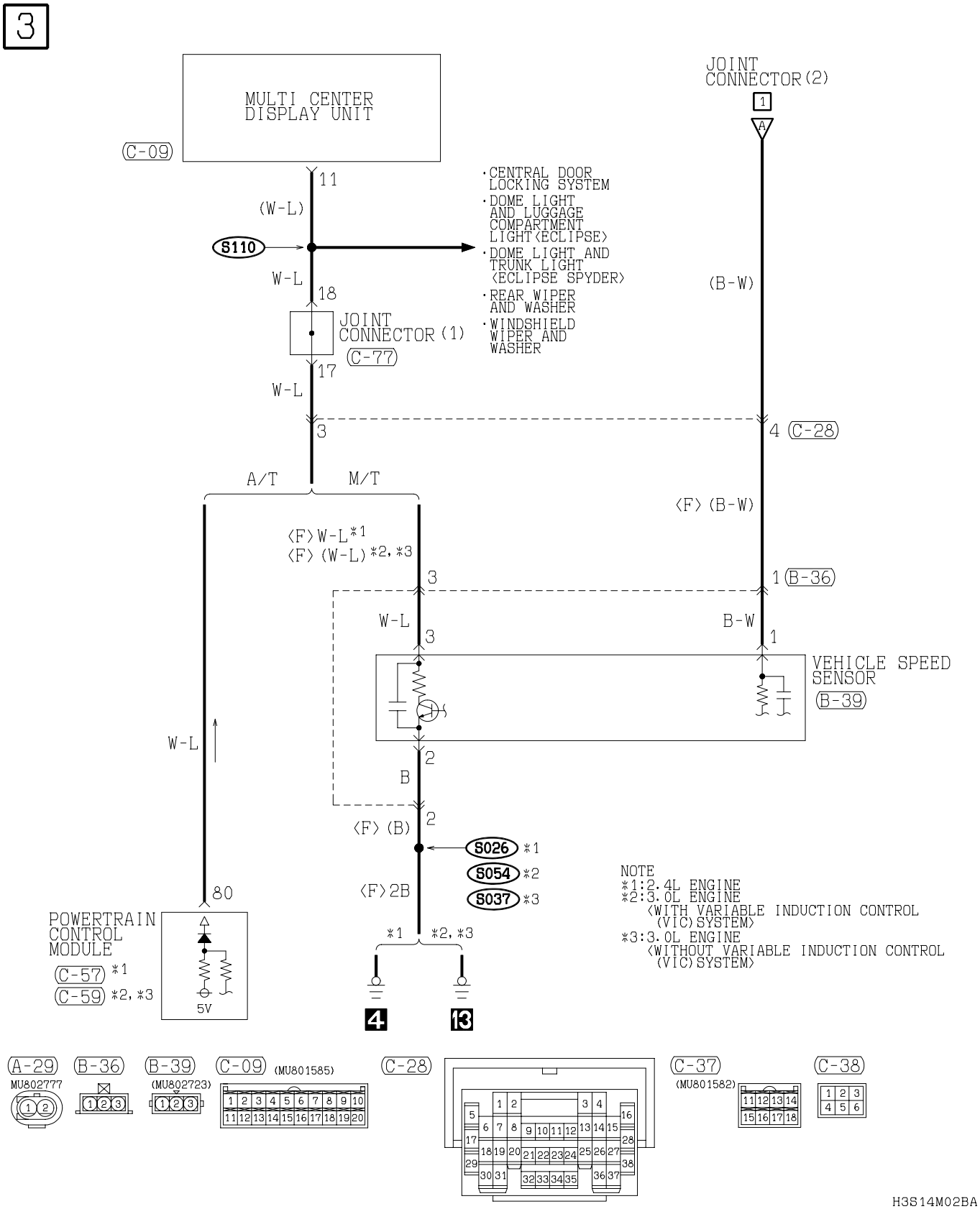
WIRE COLOR CODE

B :BLACK	BR:BROWN	G :GREEN	GR:GRAY	L :BLUE	LG:LIGHT GREEN	O :ORANGE	
P :PINK	R :RED	SB:SKY BLUE	V :VIOLET	W :WHITE	Y :YELLOW		

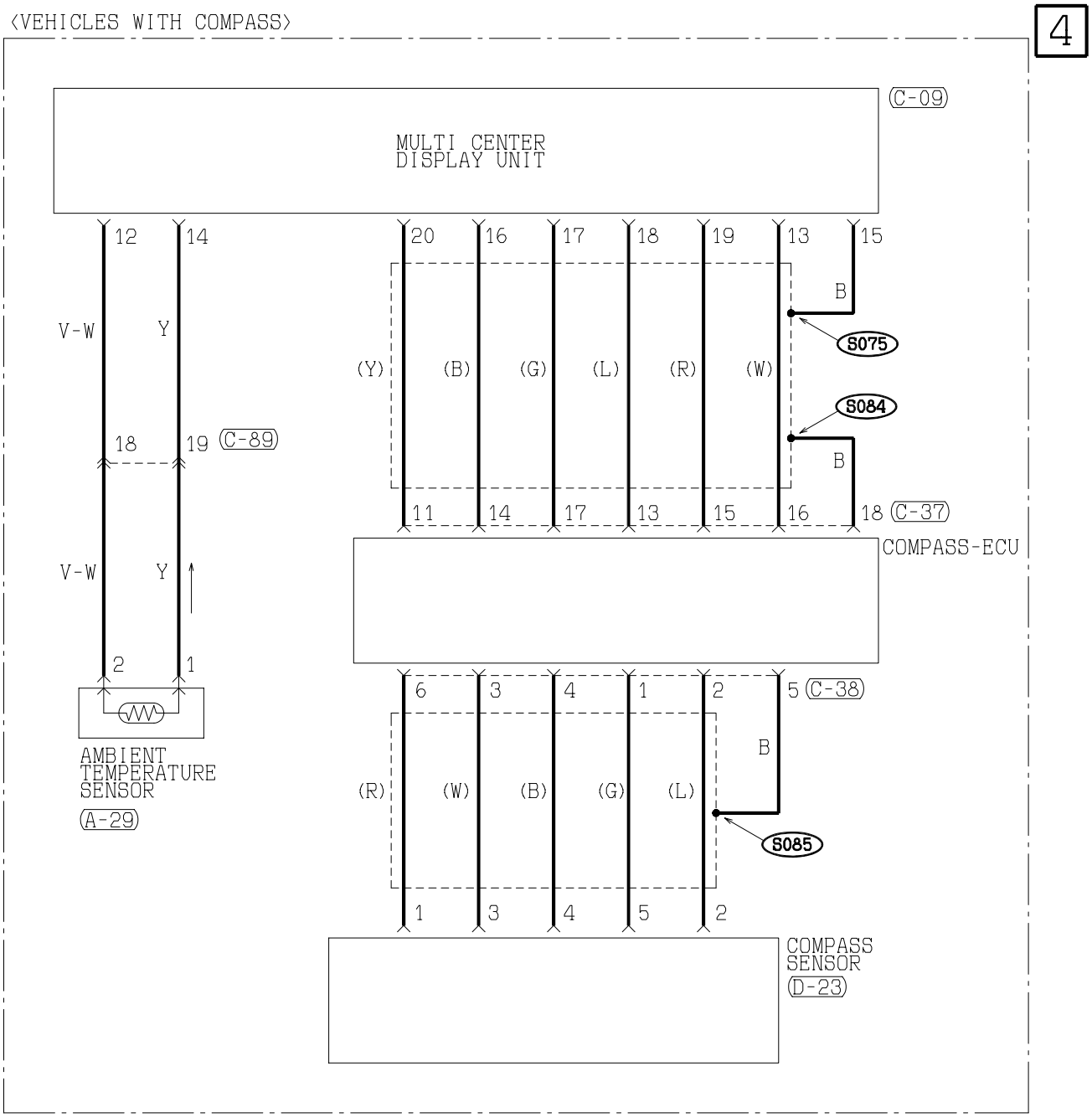
H3S14M02AB

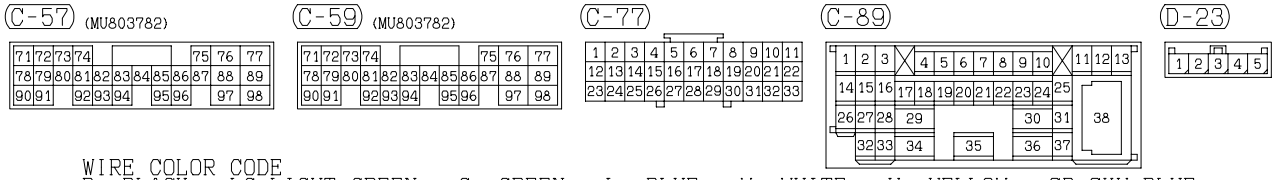
TSB Revision

MULTI CENTER DISPLAY (CONTINUED)



TSB Revision





WIRE COLOR CODE

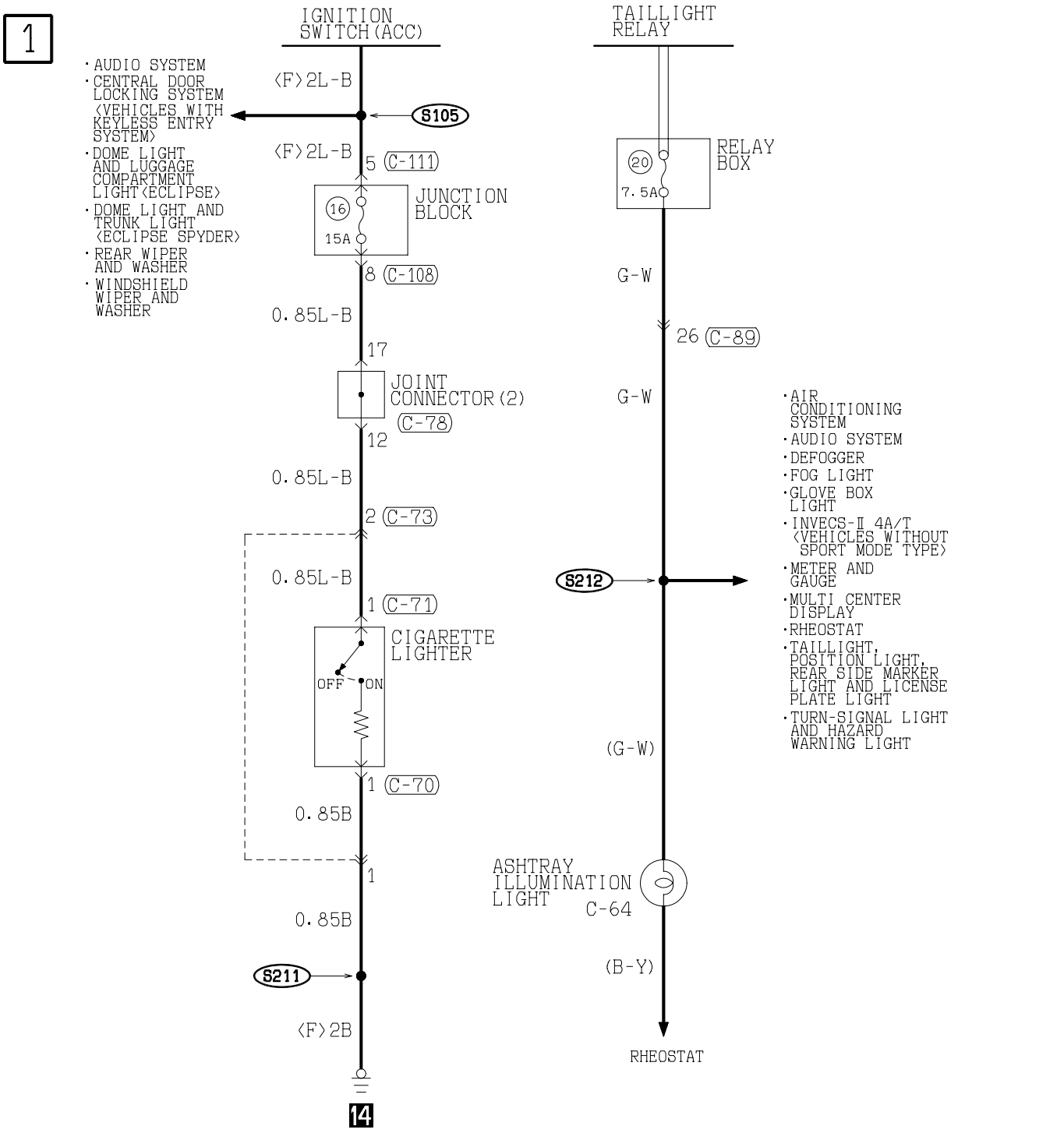
B :BLACK	LG:LIGHT GREEN	G :GREEN	L :BLUE	W :WHITE	Y :YELLOW	SB:SKY BLUE	
BR:BROWN	O :ORANGE	GR:GRAY	R :RED	P :PINK	V :VIOLET		

H3S14M02BB

TSB Revision

CIGARETTE LIGHTER

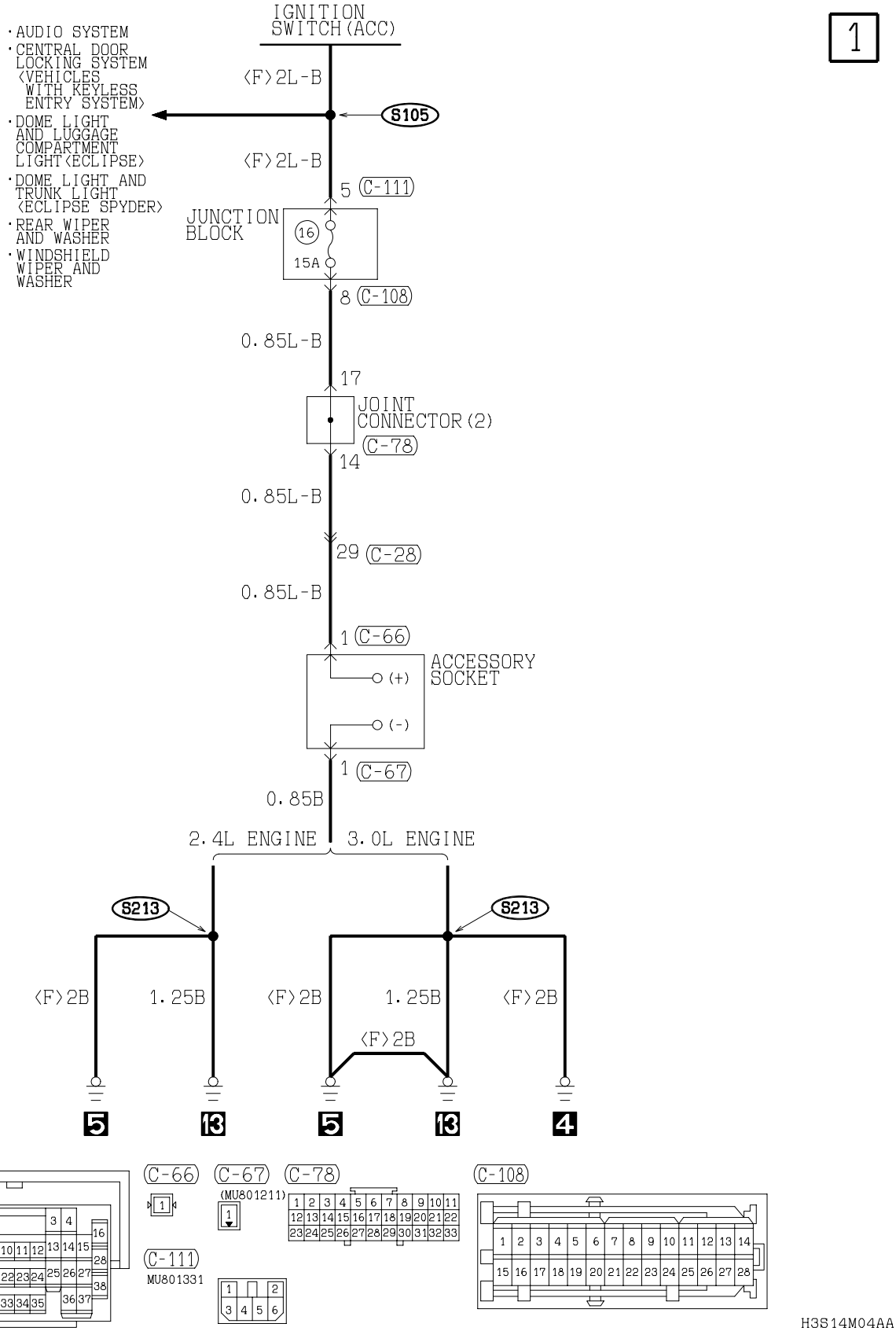
M1901007800298



TSB Revision

ACCESSORY SOCKET

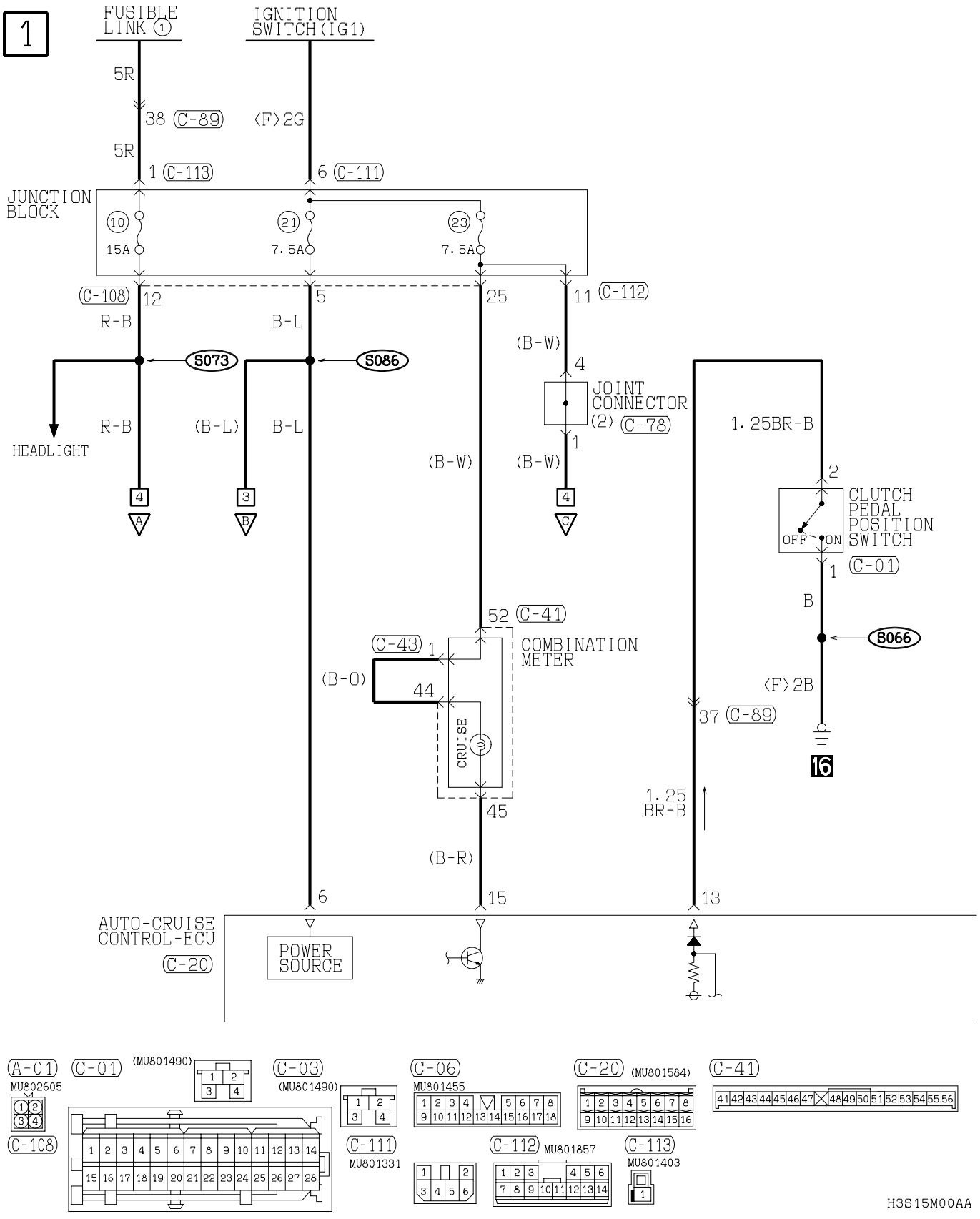
M1901007900273



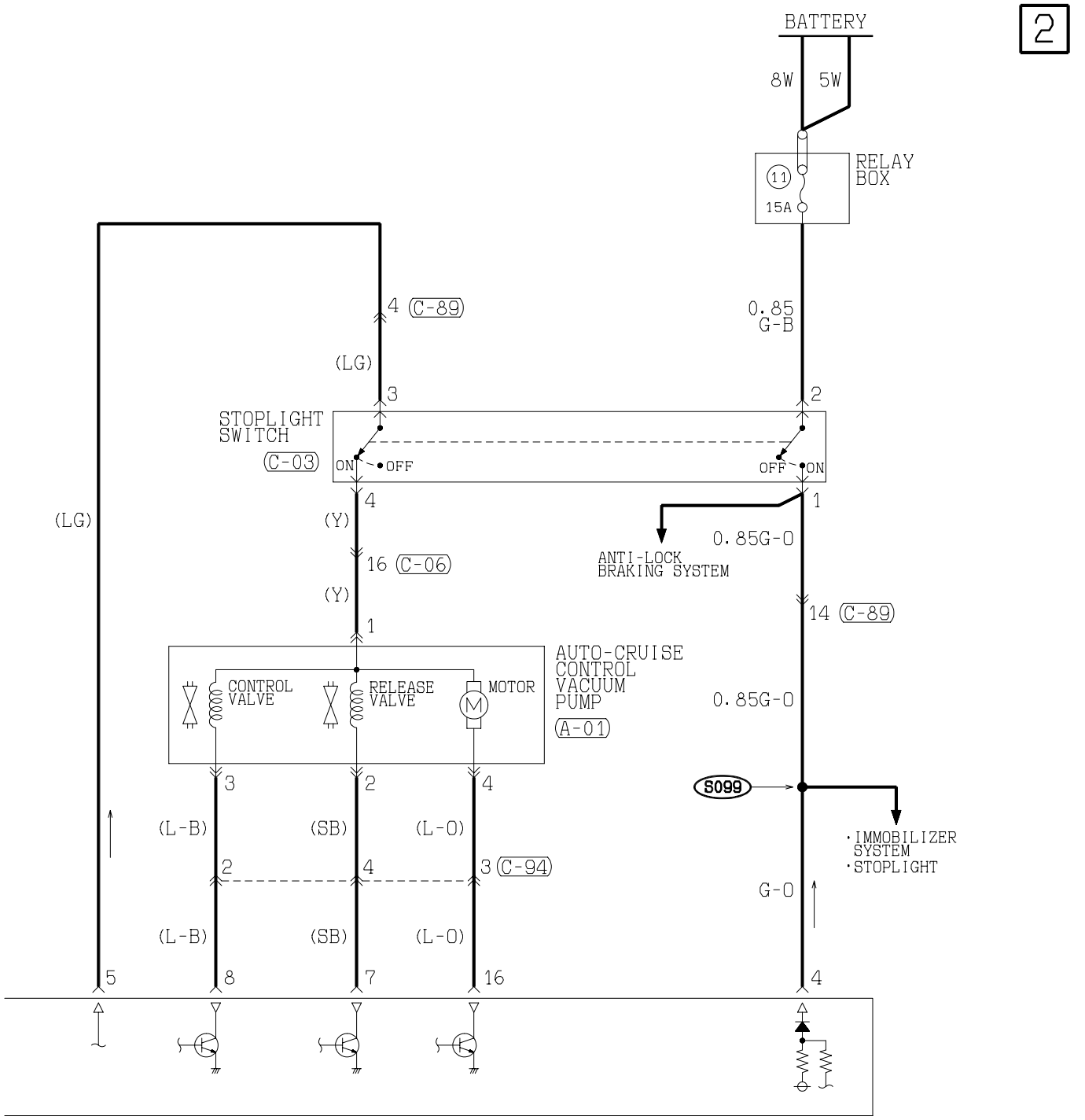
TSB Revision

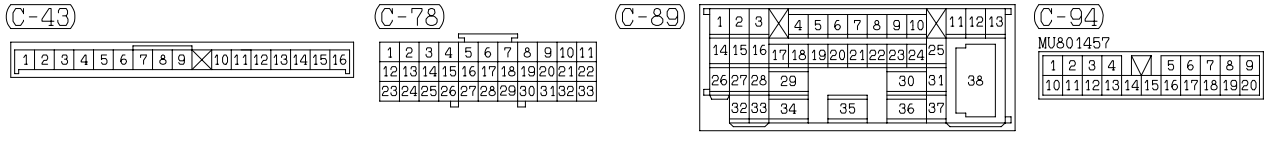
AUTO-CRUISE CONTROL SYSTEM <2.4L ENGINE-M/T>

M1901009300653



TSB Revision





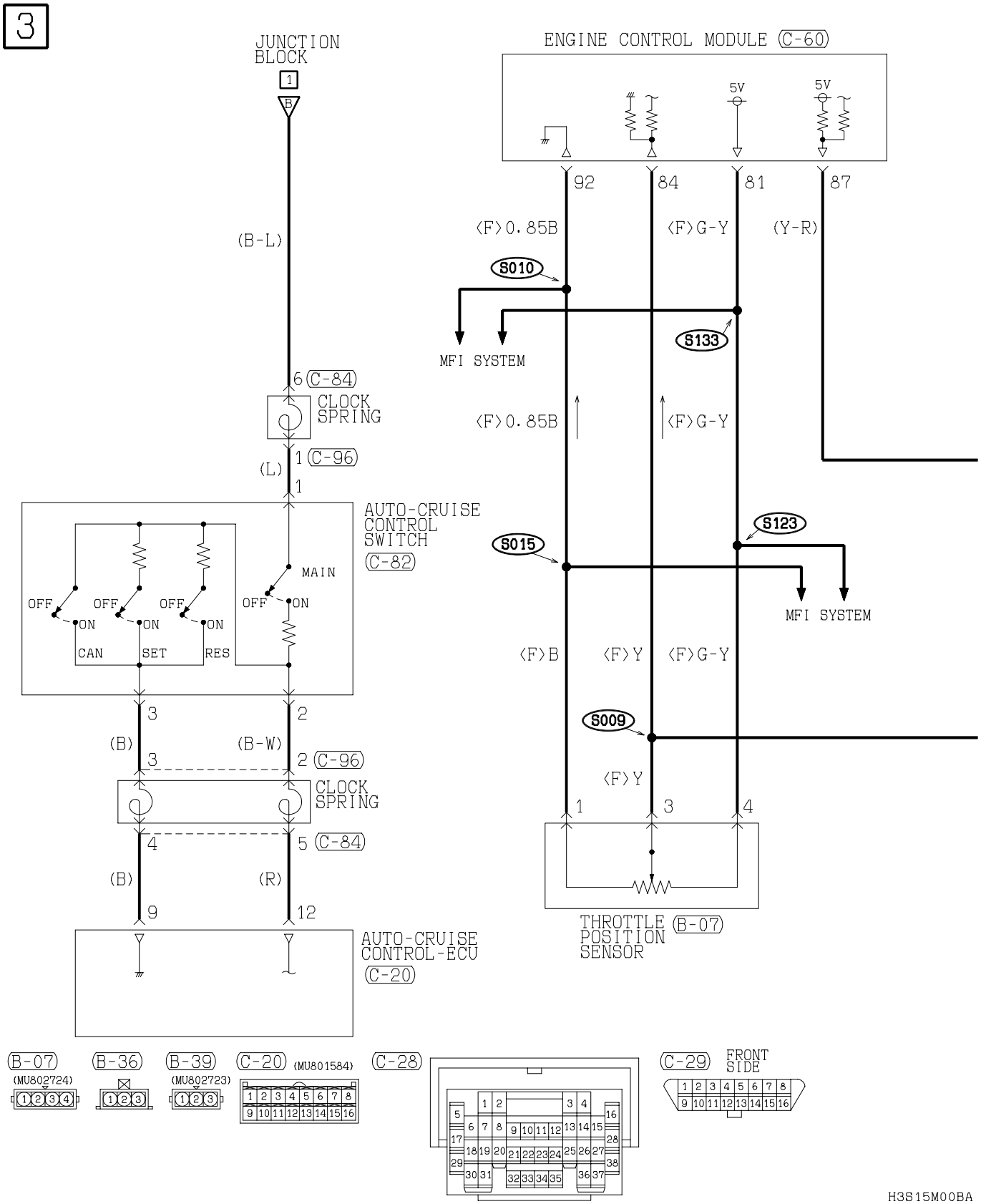
WIRE COLOR CODE

B :BLACK	LG:LIGHT GREEN	G :GREEN	L :BLUE	W :WHITE	Y :YELLOW	SB:SKY BLUE
BR:BROWN	O :ORANGE	GR:GRAY	R :RED	P :PINK	V :VIOLET	

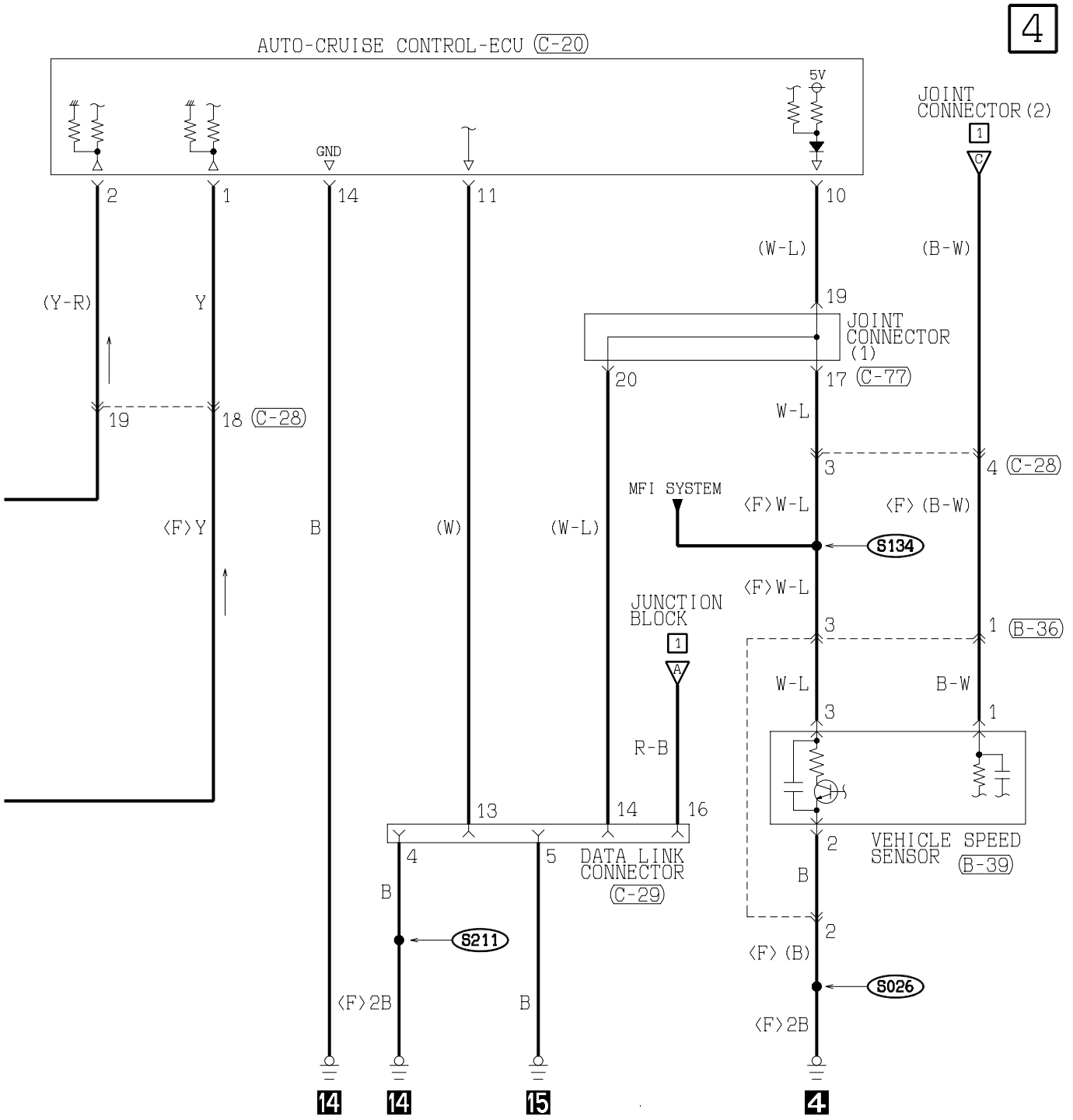
H3S15M00AB

TSB Revision

AUTO-CRUISE CONTROL SYSTEM <2.4L ENGINE-M/T> (CONTINUED)



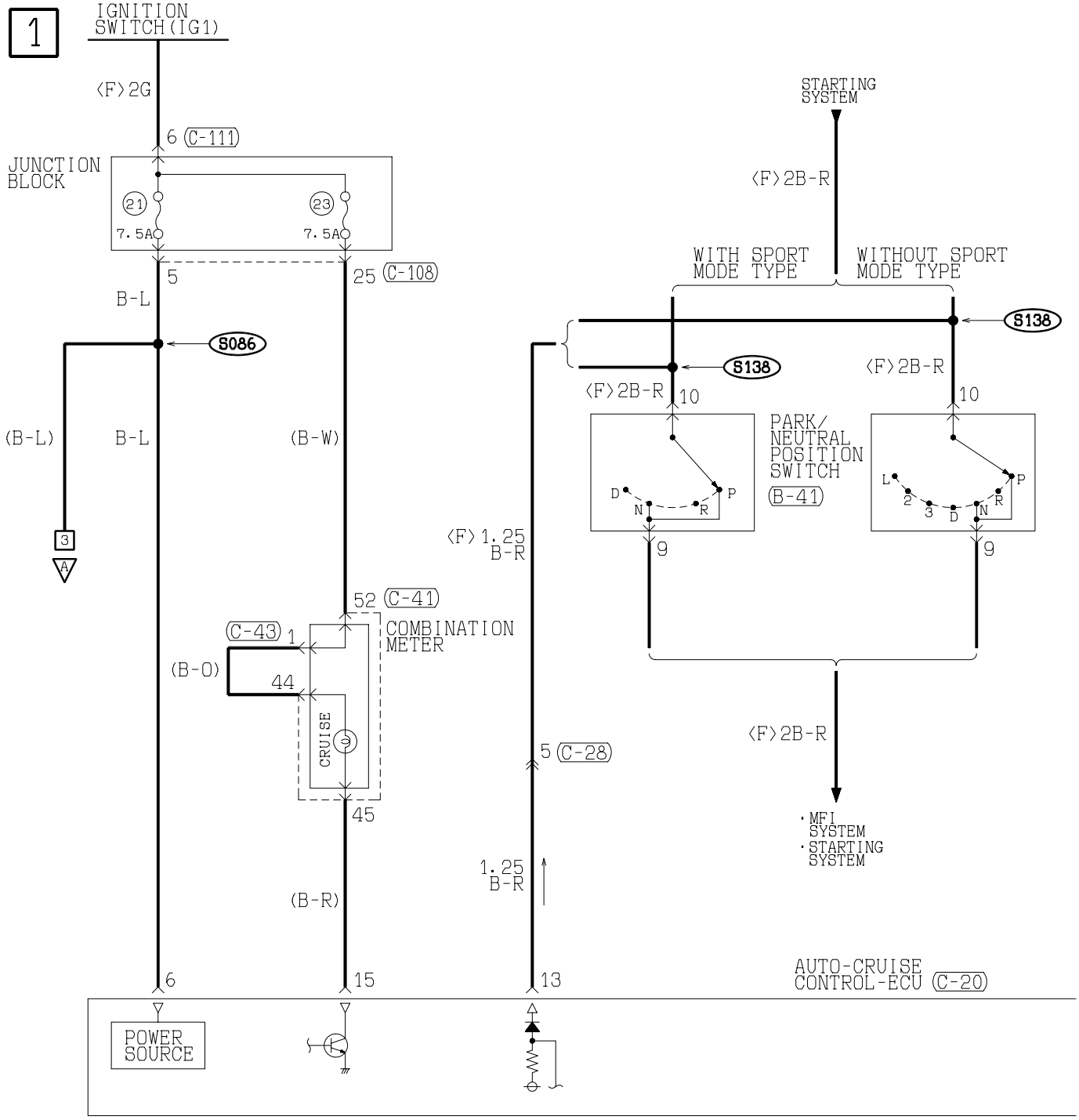
TSB Revision

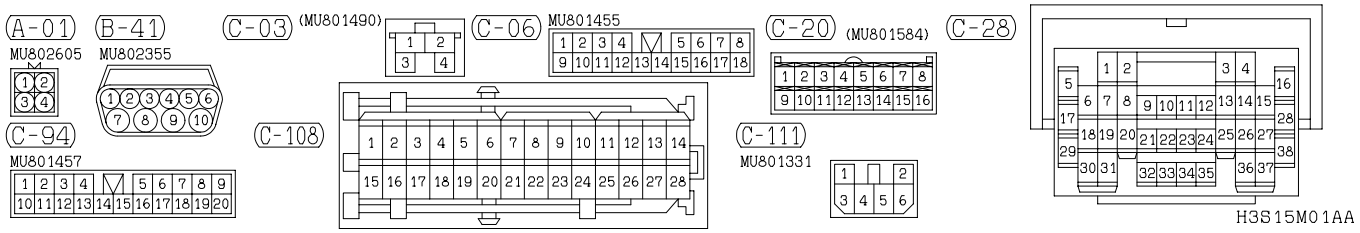


TSB Revision

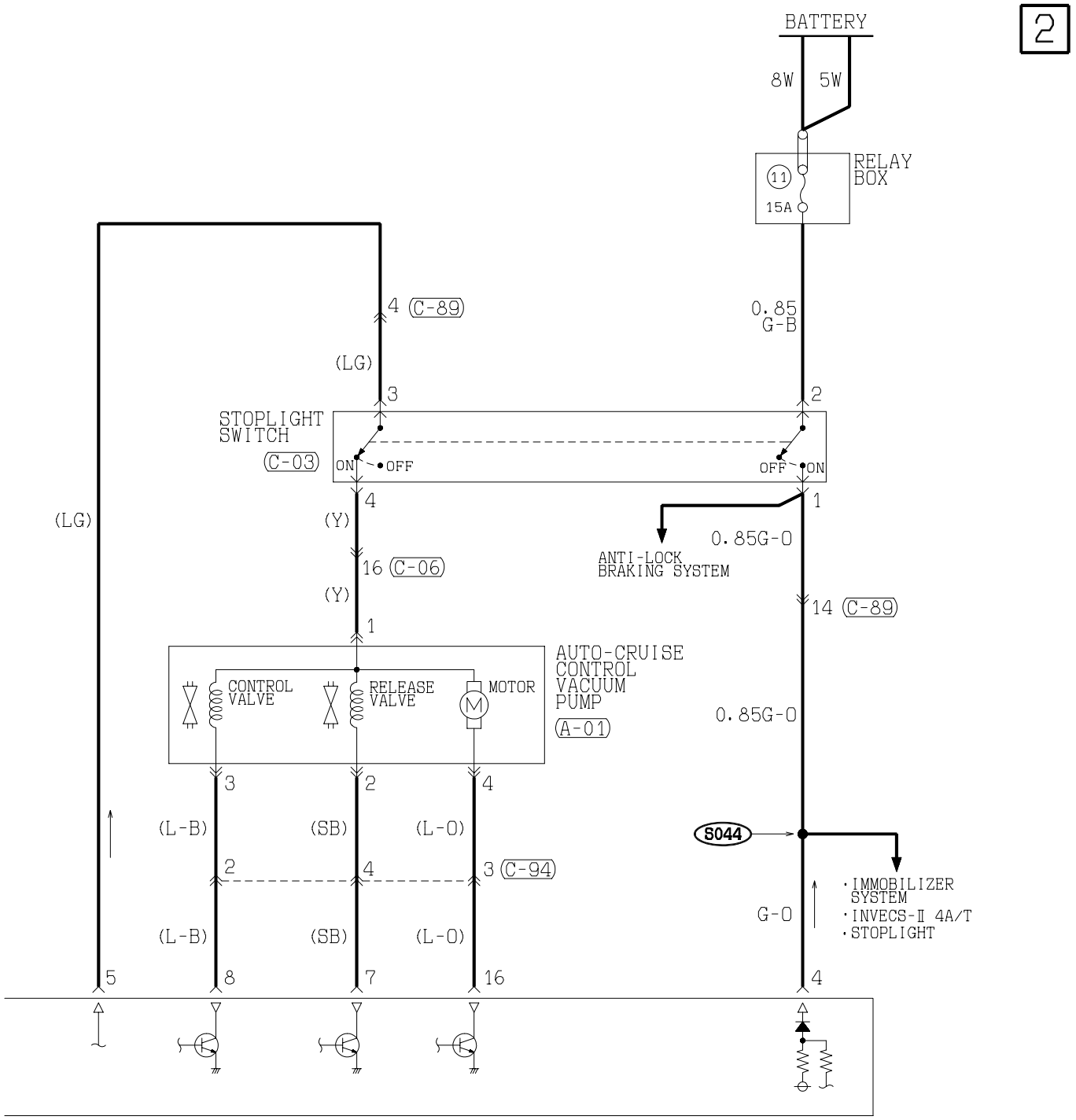
AUTO-CRUISE CONTROL SYSTEM <2.4L ENGINE-A/T>

M1901009300664





TSB Revision



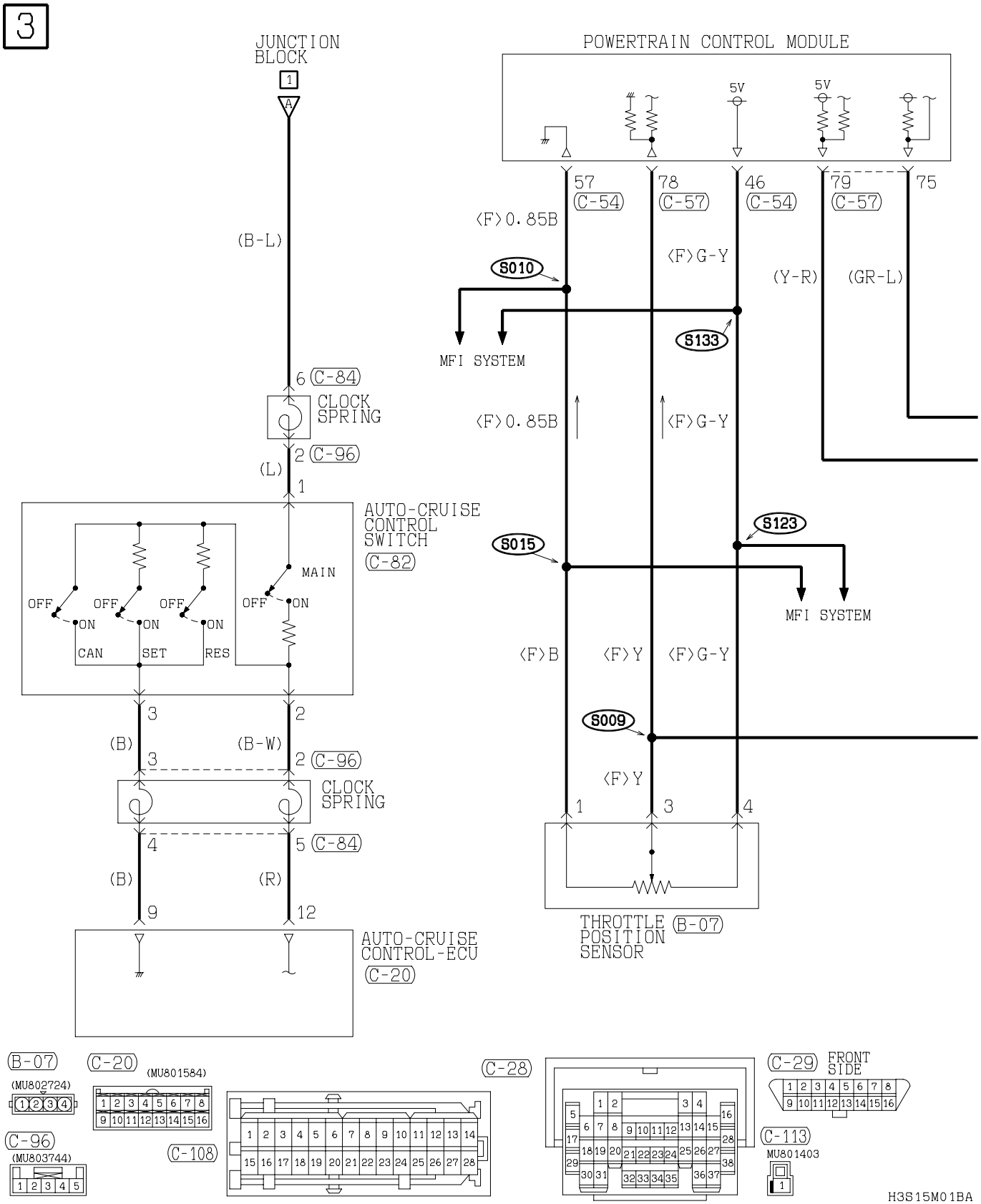
WIRE COLOR CODE

B :BLACK	LG:LIGHT GREEN	G :GREEN	L :BLUE	W :WHITE	Y :YELLOW	SB:SKY BLUE
BR:BROWN	O :ORANGE	GR:GRAY	R :RED	P :PINK	V :VIOLET	

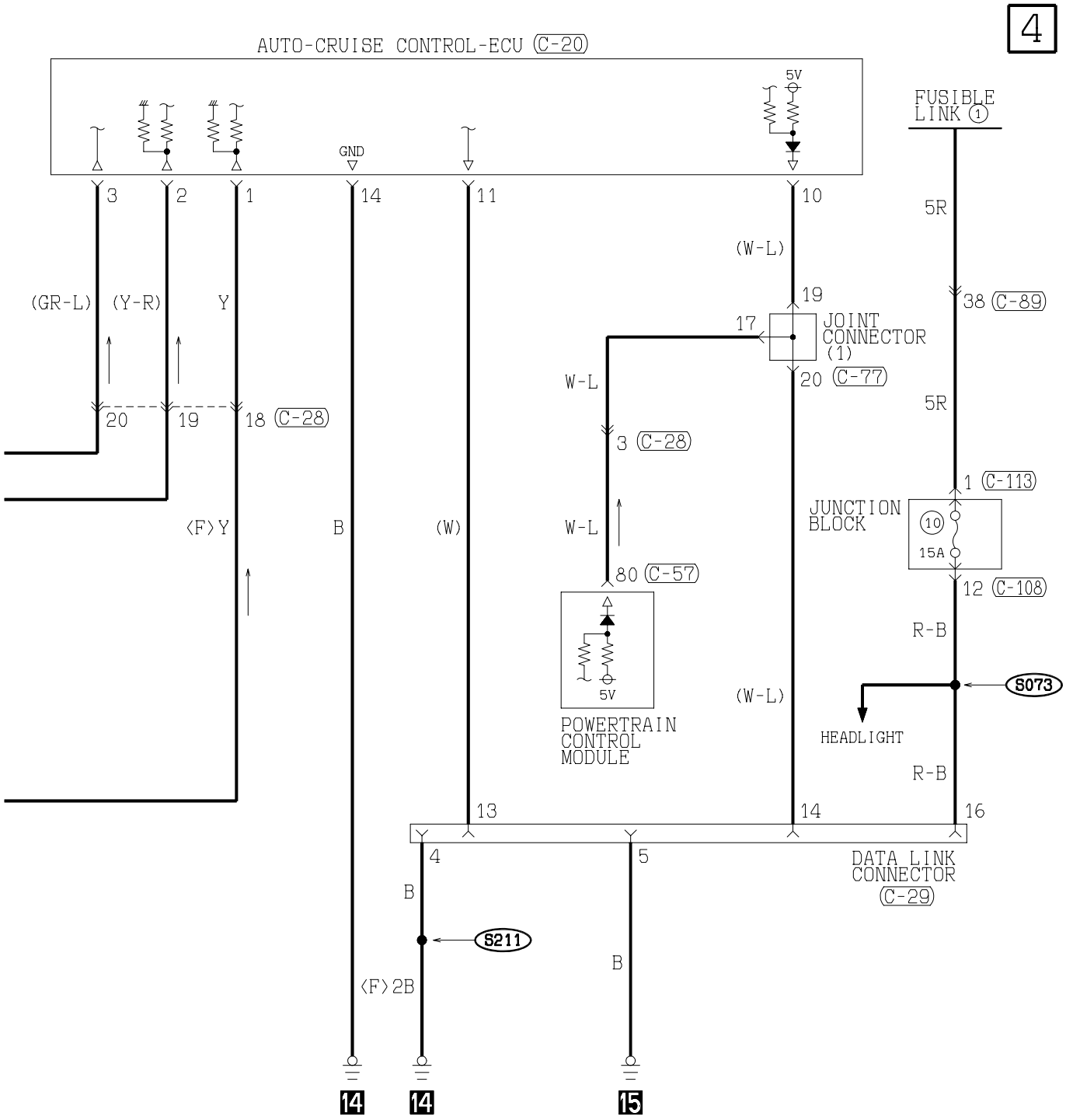
H3S15M01AB

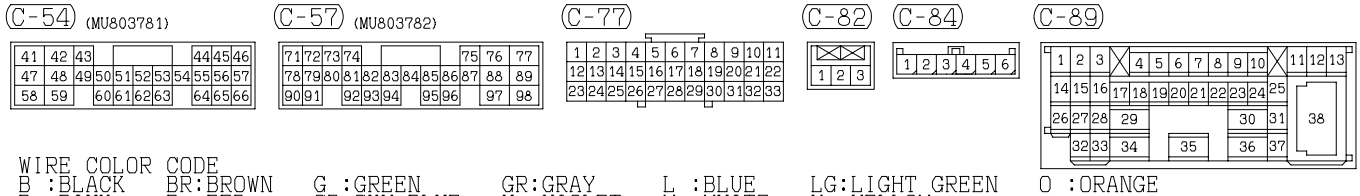
TSB Revision

AUTO-CRUISE CONTROL SYSTEM <2.4L ENGINE-A/T> (CONTINUED)



TSB Revision





WIRE COLOR CODE

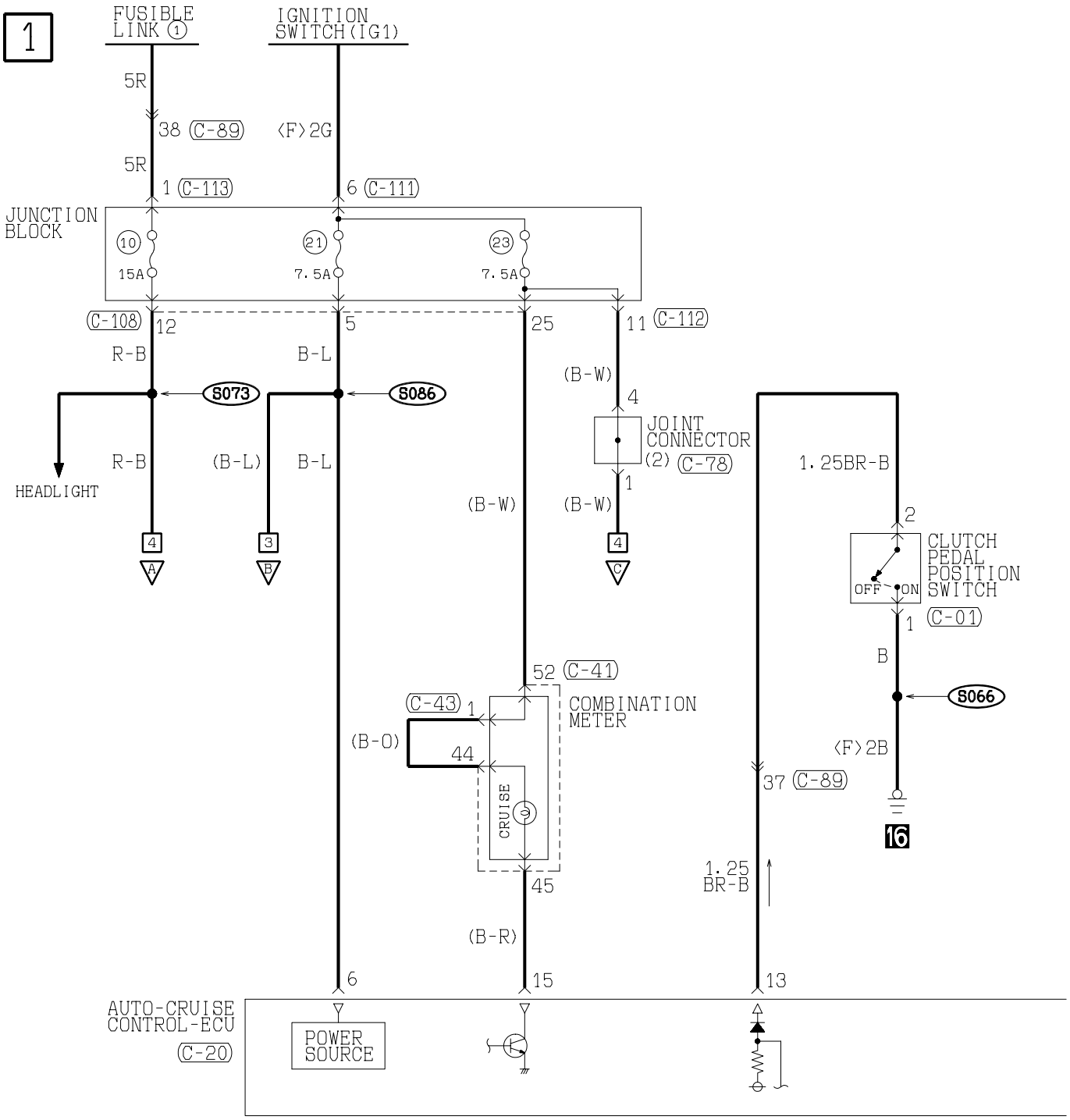
B :BLACK	BR:BROWN	G :GREEN	GR:GRAY	L :BLUE	LG:LIGHT GREEN	O :ORANGE	
P :PINK	R :RED	SB:SKY BLUE	V :VIOLET	W :WHITE	Y :YELLOW		

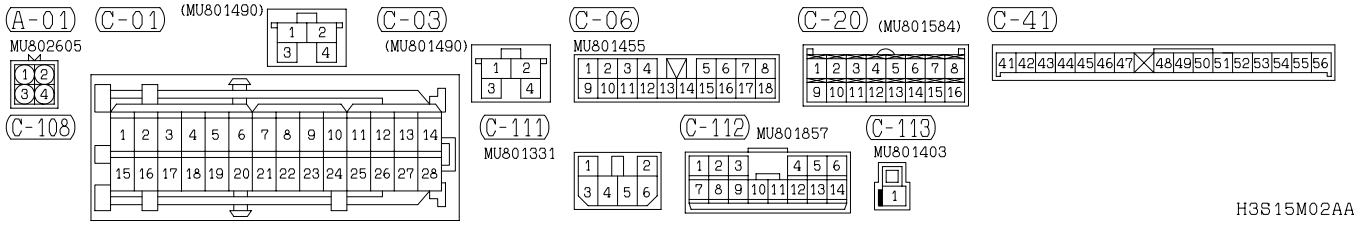
H3S15M01BB

TSB Revision

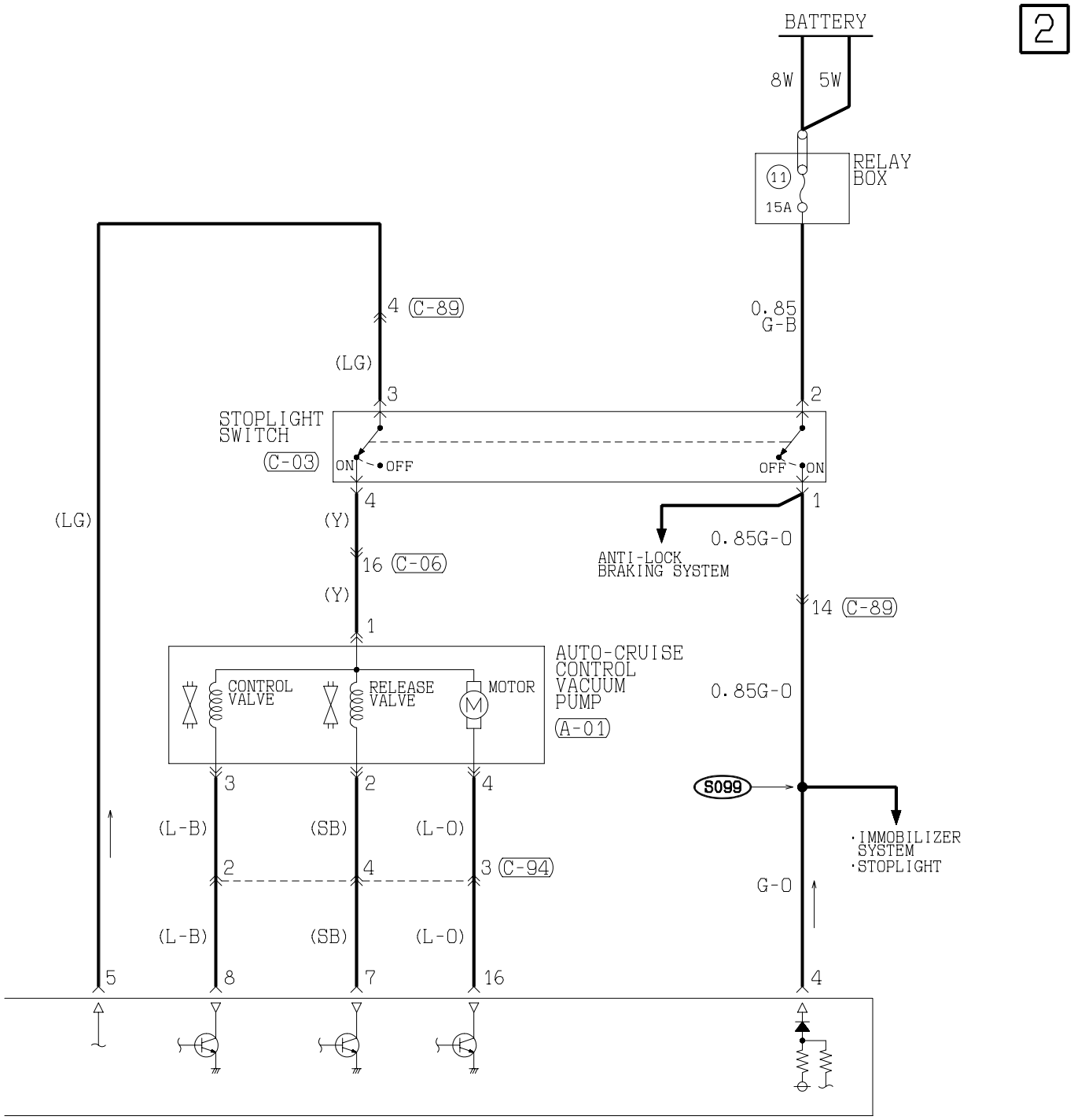
AUTO-CRUISE CONTROL SYSTEM <3.0L ENGINE-M/T>

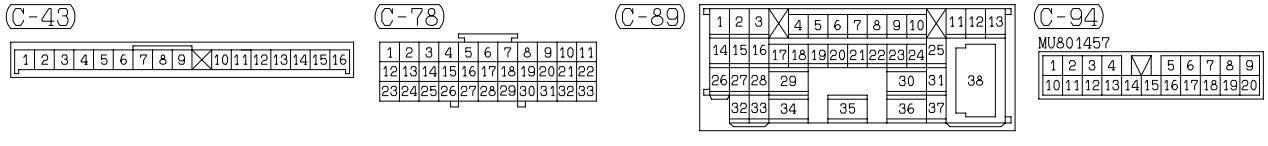
M1901009300675





TSB Revision





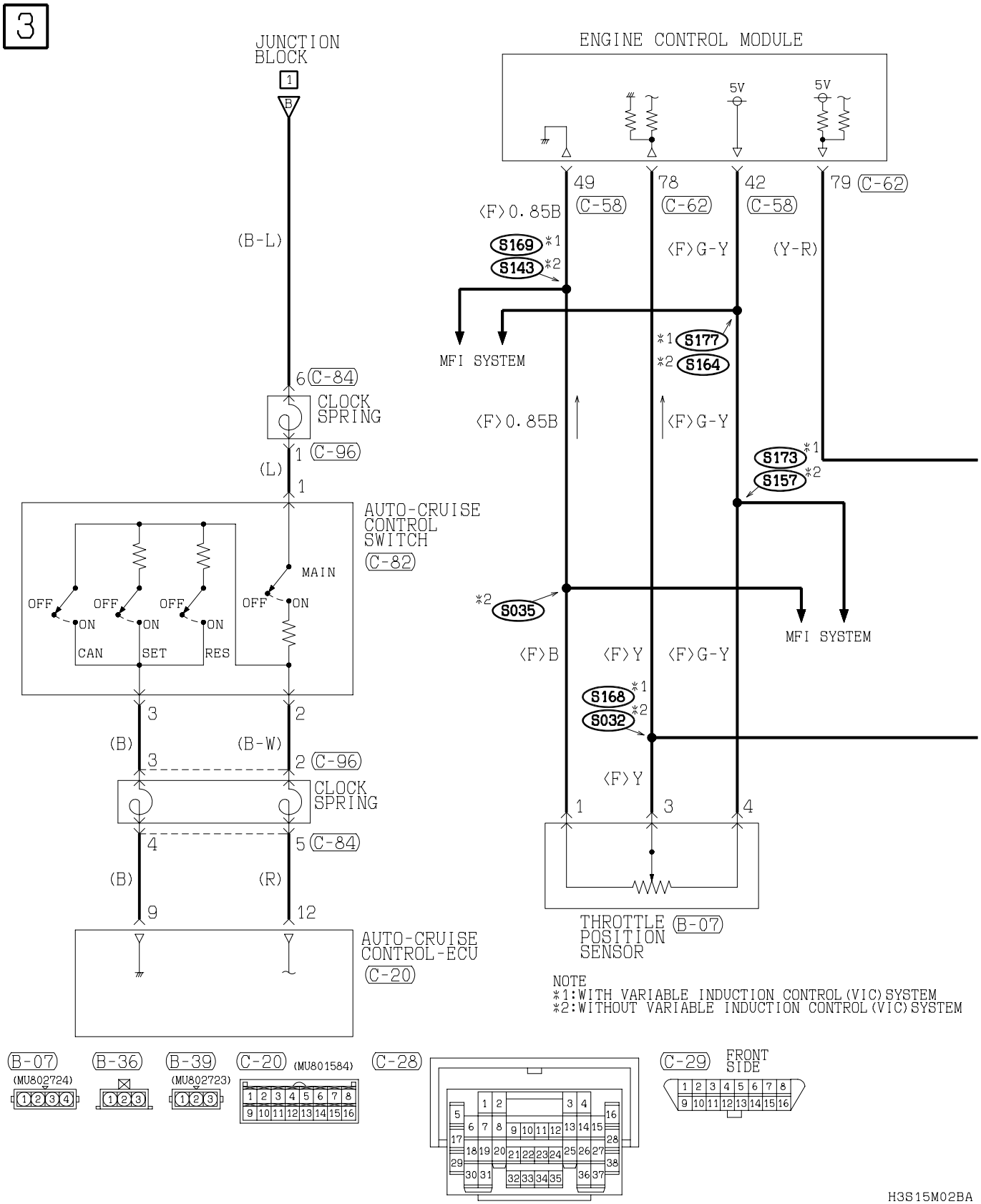
WIRE COLOR CODE

B :BLACK	LG:LIGHT GREEN	G :GREEN	L :BLUE	W :WHITE	Y :YELLOW	SB:SKY BLUE
BR:BROWN	O :ORANGE	GR:GRAY	R :RED	P :PINK	V :VIOLET	

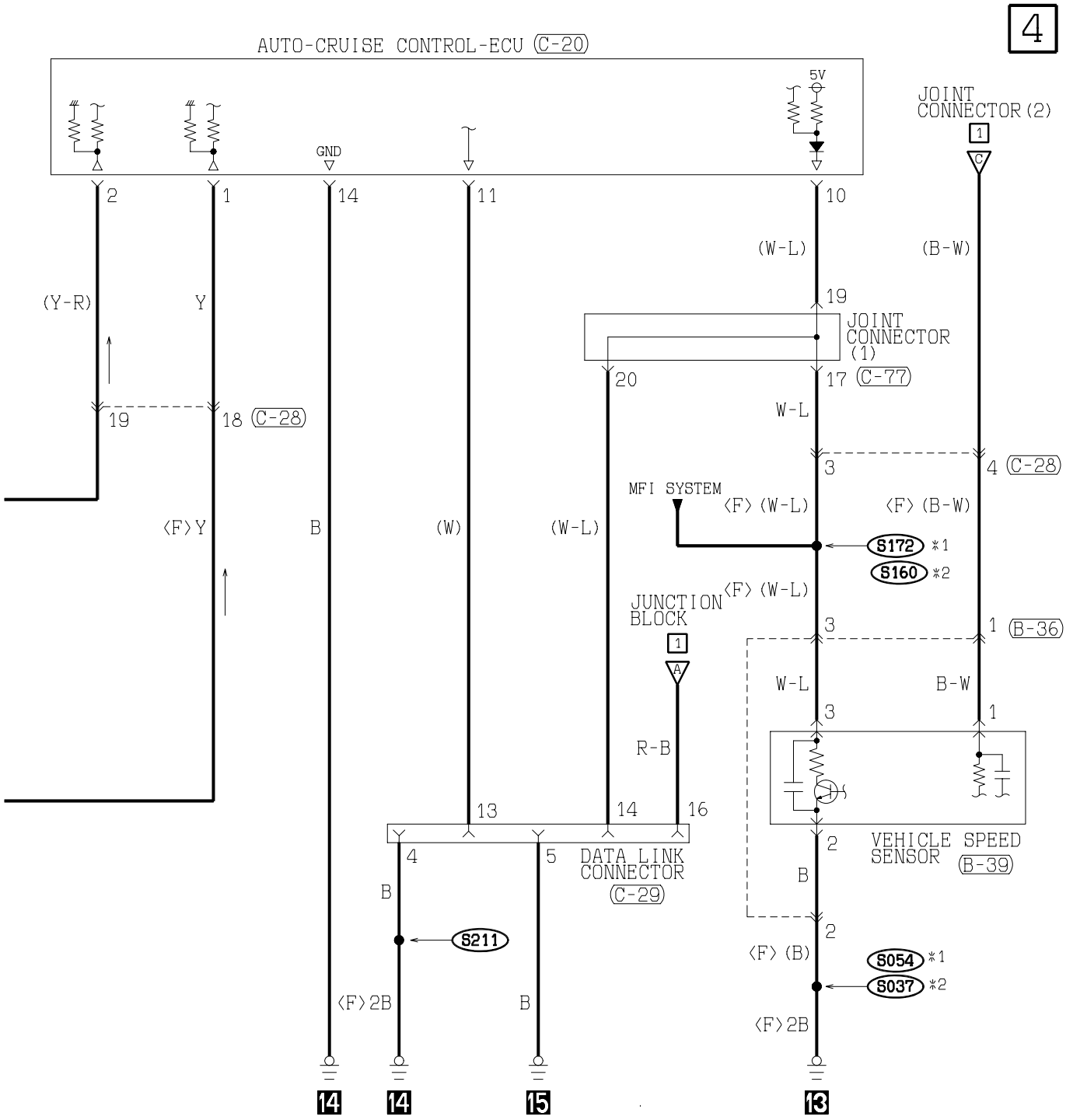
H3S15M02AB

TSB Revision

AUTO-CRUISE CONTROL SYSTEM <3.0L ENGINE-M/T> (CONTINUED)



TSB Revision



C-58 (MU803782)

41	42	43	44					45	46	47				
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C-62 (MU803783)

71	72		73	74					75	76	77			
78	79	80	81	82	83	84	85	86	87	88	89	90		
91	92	93		94	95		96	97	98		99	100		

C-77

1	2	3	4	5	6	7	8	9	10	11	
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23	24	25	26	27	28	29	30	31	32	33	

C-82

1	2	3

C-84

1	2	3	4	5	6

C-96 (MU803744)

1	2	3	4	5

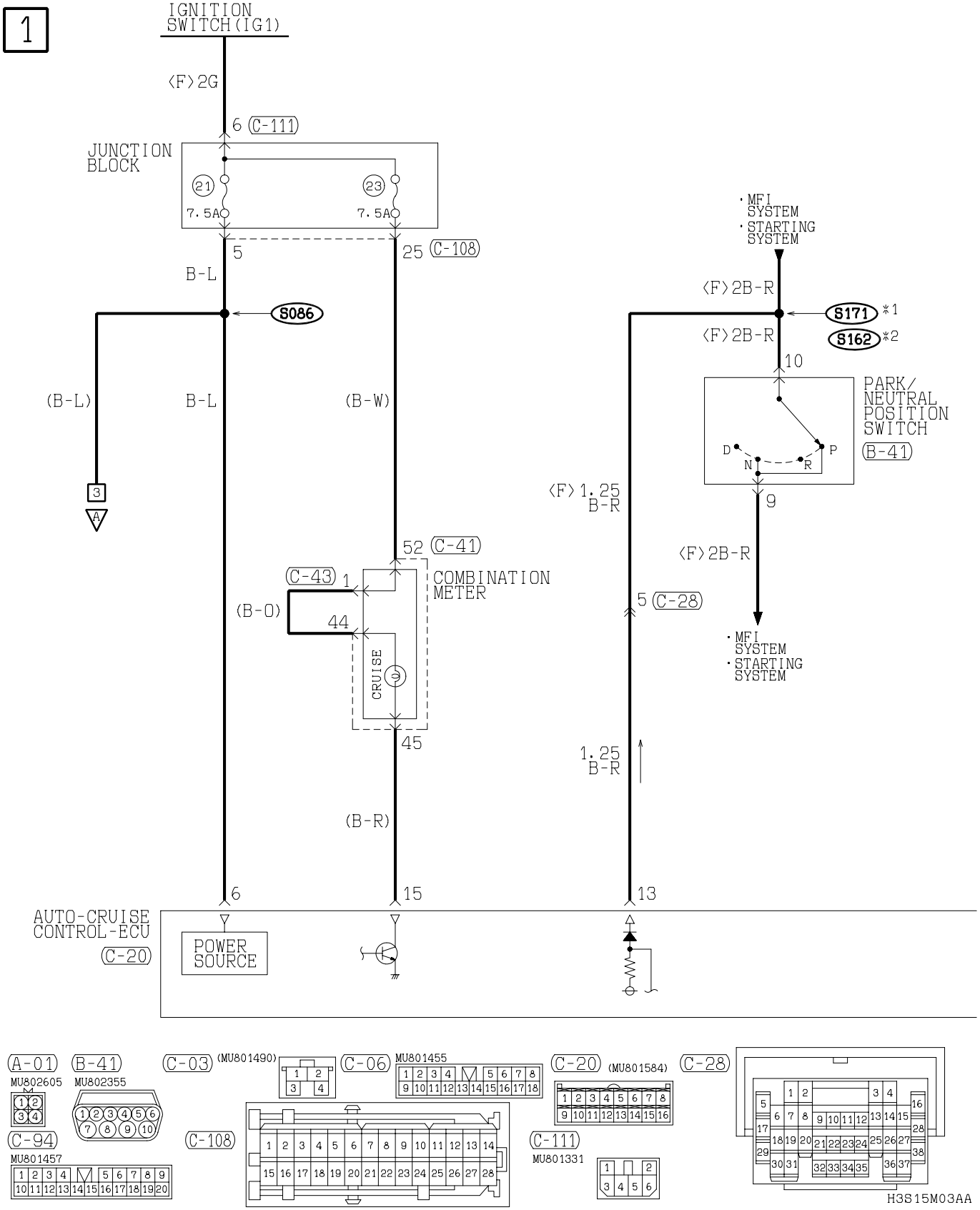
WIRE COLOR CODE
B :BLACK BR:BROWN G :GREEN GR:GRAY L :BLUE LG:LIGHT GREEN O :ORANGE
P :PINK R :RED SB:SKY BLUE V :VIOLET W :WHITE Y :YELLOW

H3S15M02BB

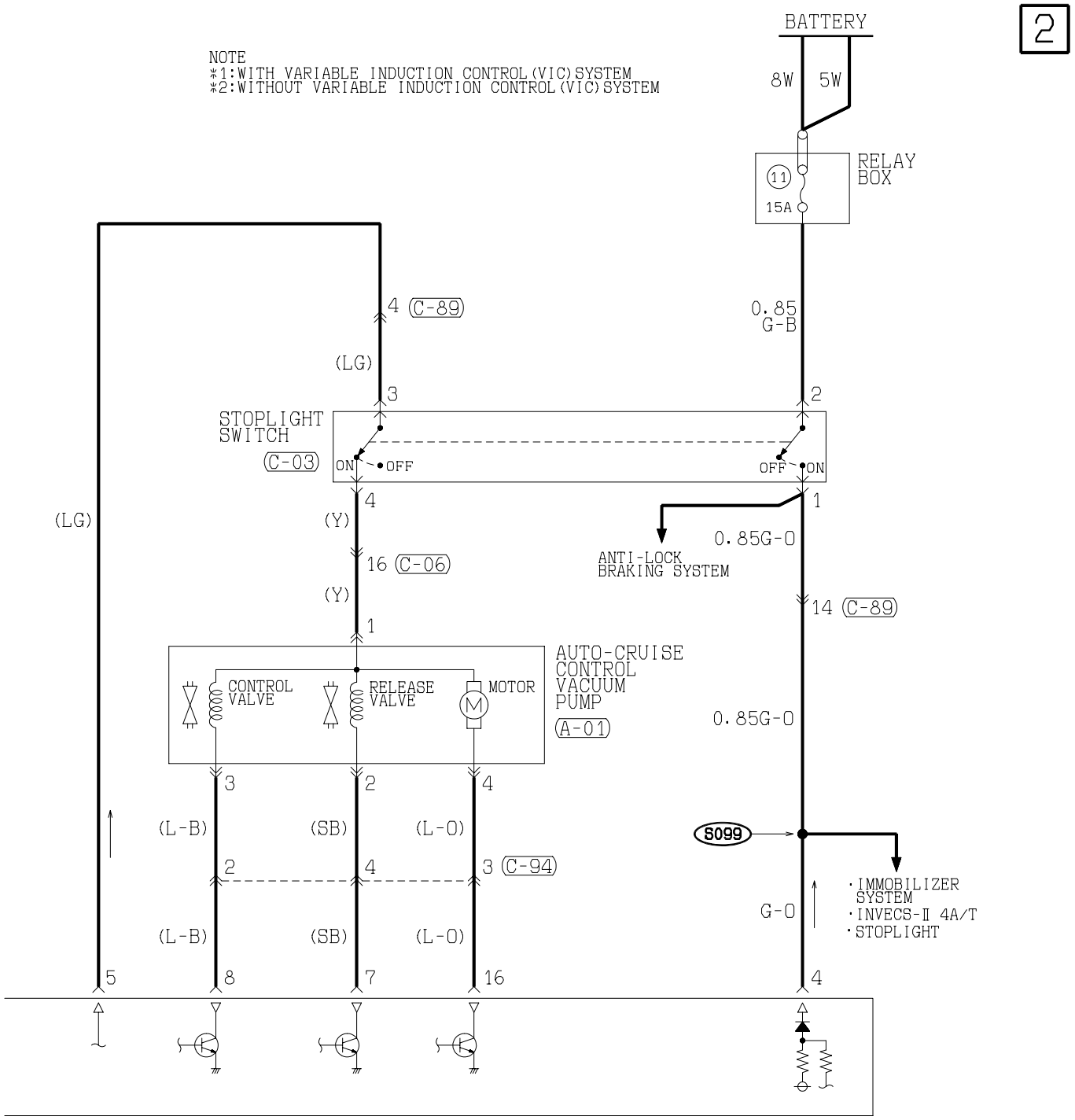
TSB Revision

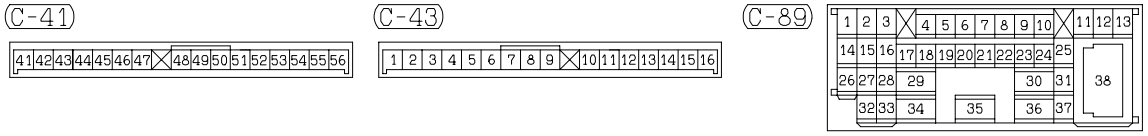
AUTO-CRUISE CONTROL SYSTEM <3.0L ENGINE-A/T>

M1901009300686



TSB Revision





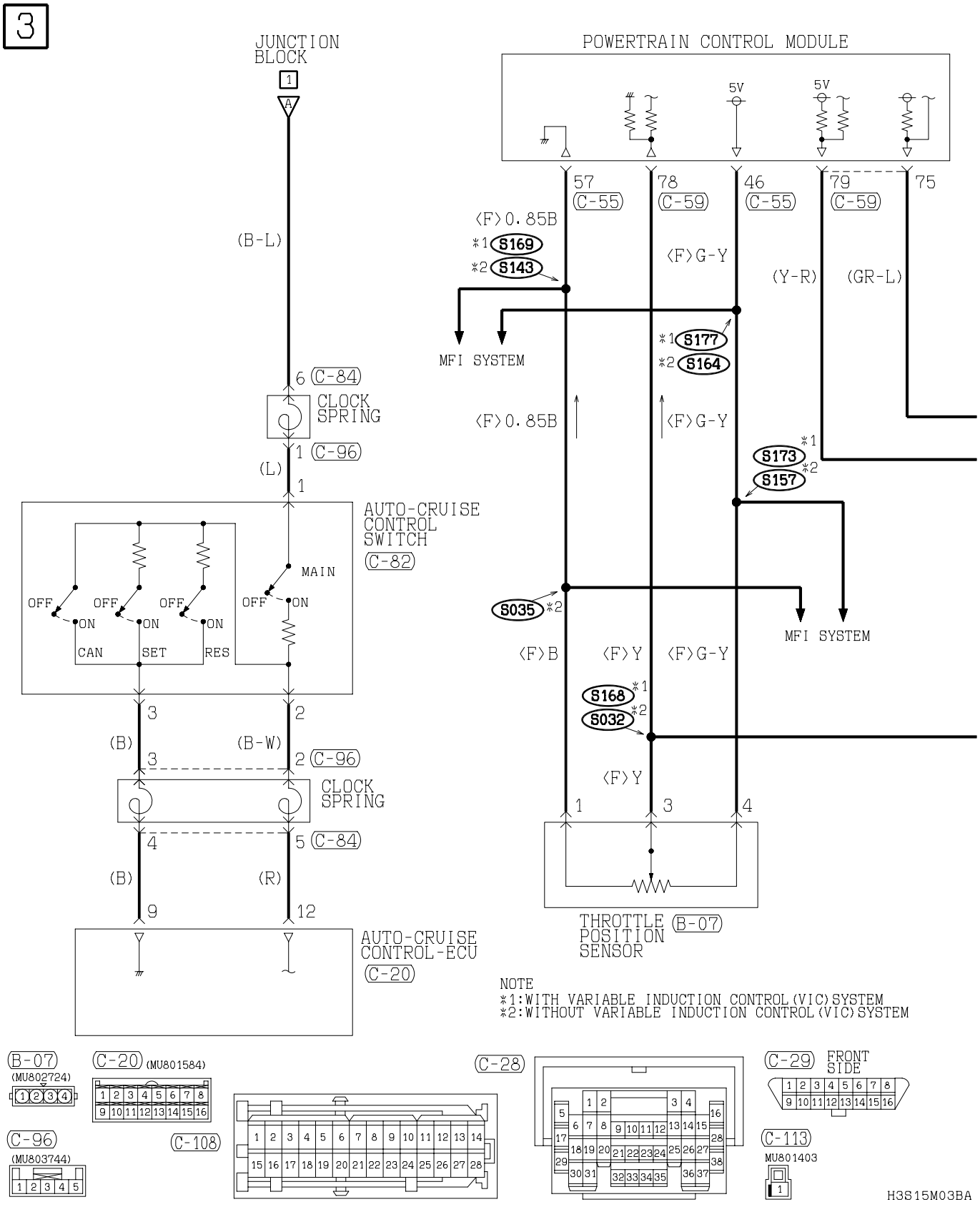
WIRE COLOR CODE

B :BLACK	LG:LIGHT GREEN	G :GREEN	L :BLUE	W :WHITE	Y :YELLOW	SB:SKY BLUE
BR:BROWN	O :ORANGE	GR:GRAY	R :RED	P :PINK	V :VIOLET	

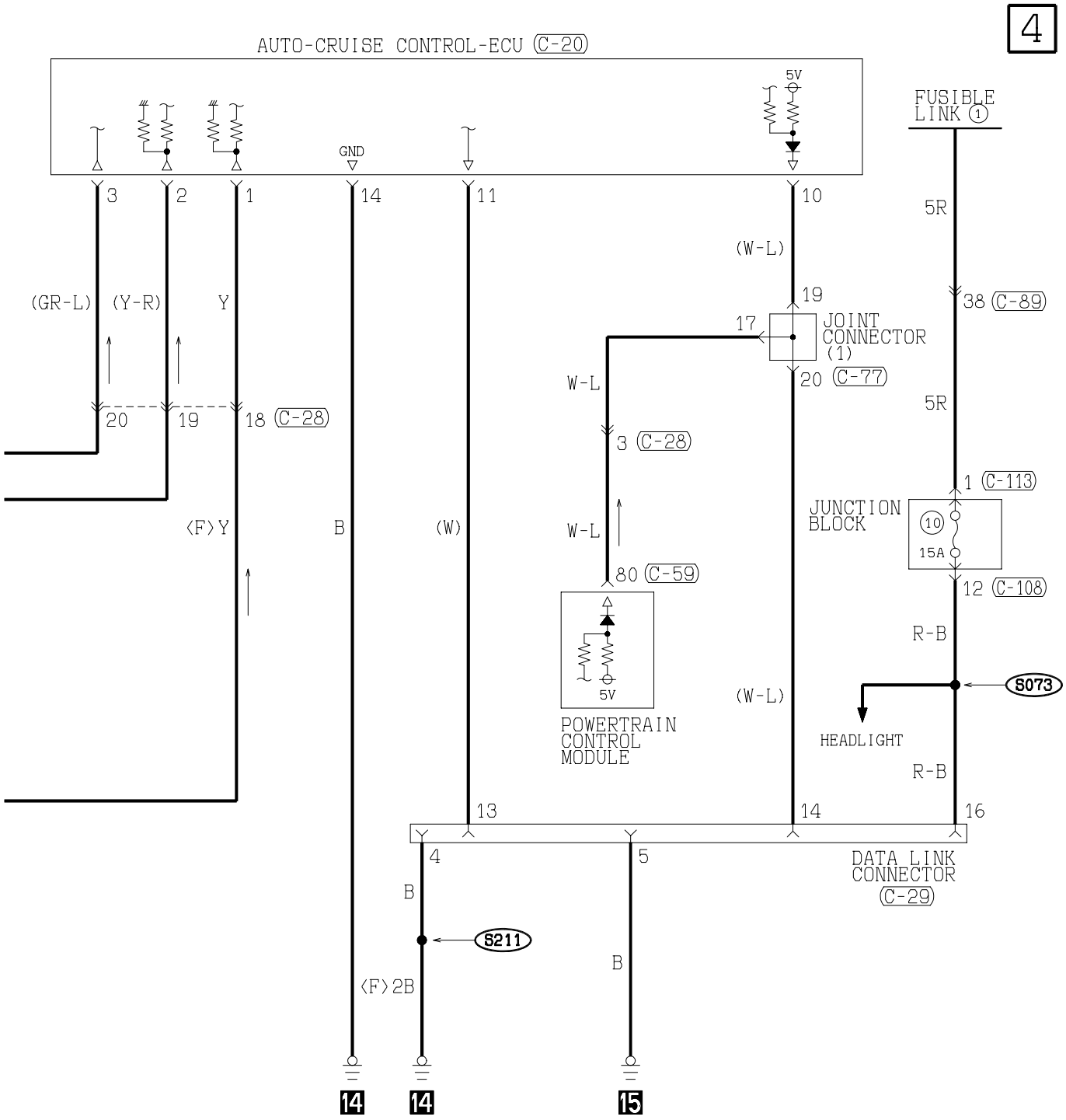
H3S15M03AB

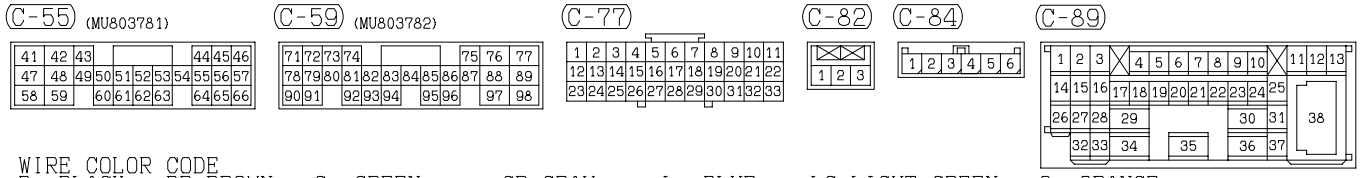
TSB Revision

AUTO-CRUISE CONTROL SYSTEM <3.0L ENGINE-A/T> (CONTINUED)



TSB Revision





WIRE COLOR CODE

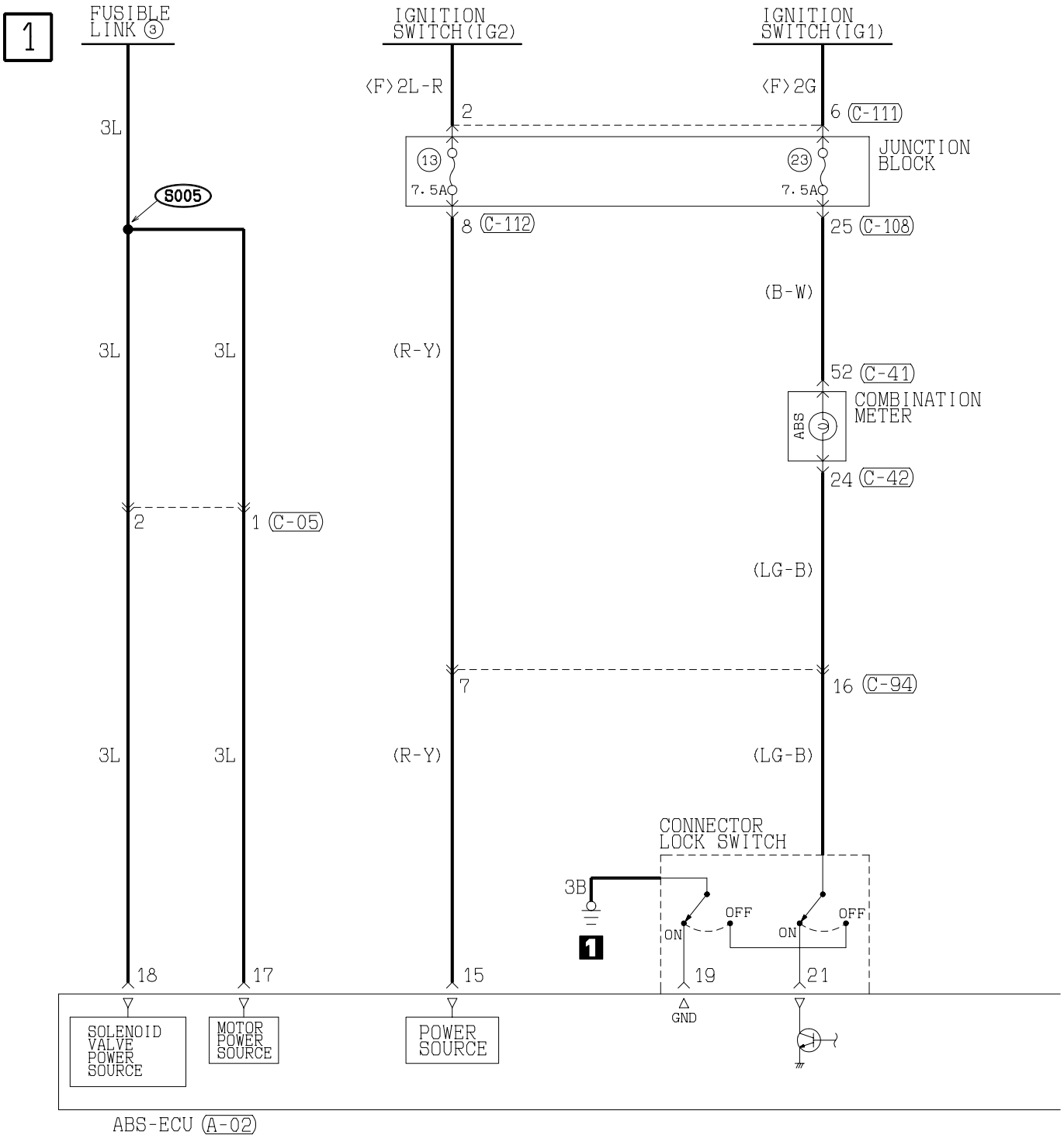
B :BLACK	BR:BROWN	G :GREEN	GR:GRAY	L :BLUE	LG:LIGHT GREEN	O :ORANGE	
P :PINK	R :RED	SB:SKY BLUE	V :VIOLET	W :WHITE	Y :YELLOW		

H3S15M03BB

TSB Revision

ANTI-LOCK BRAKING SYSTEM (ABS) <VEHICLES WITHOUT TCL>

M1901008400505

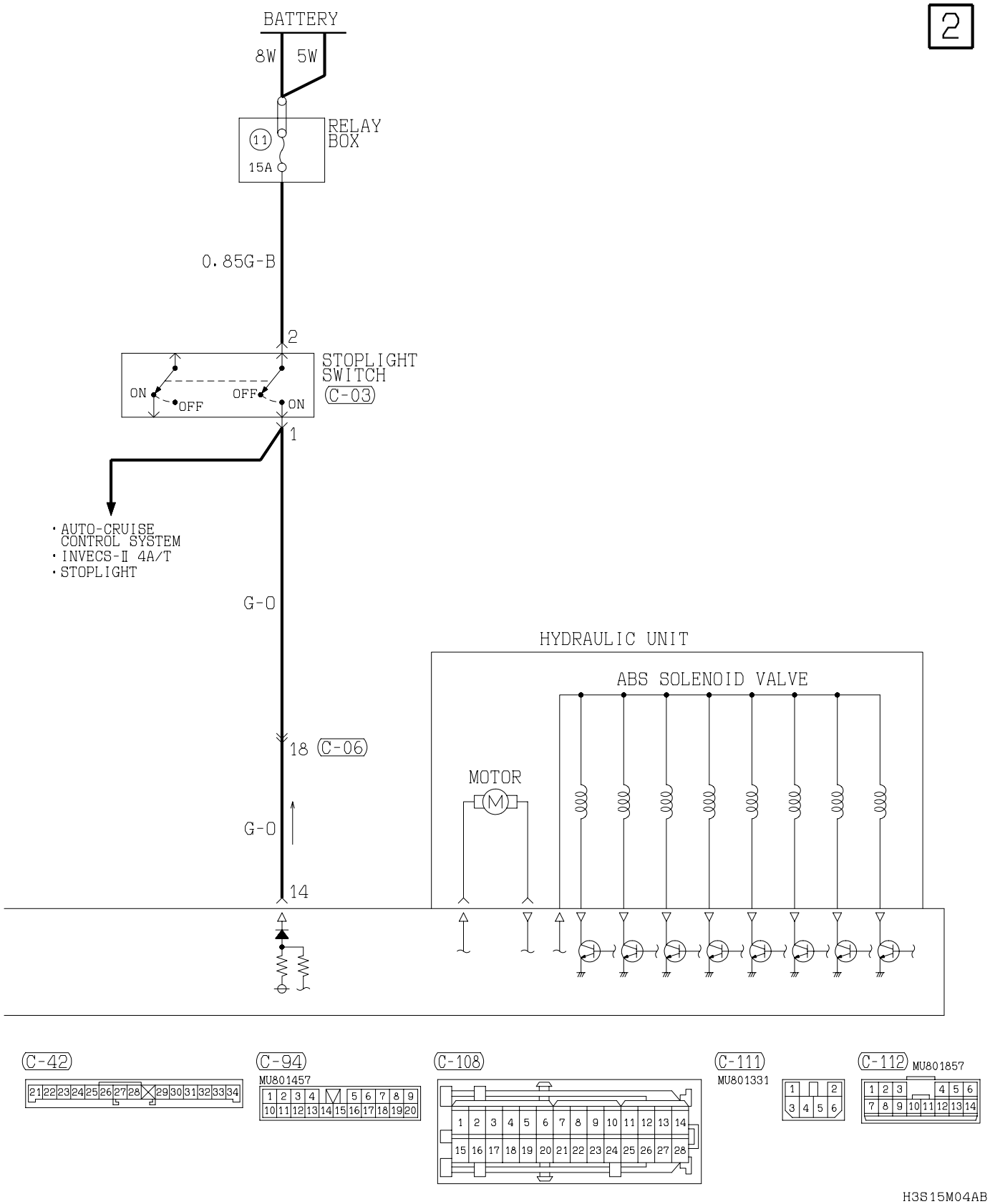


WIRE COLOR CODE

B :BLACK	LG:LIGHT GREEN	G :GREEN	L :BLUE	W :WHITE	Y :YELLOW	SB:SKY BLUE	
BR:BROWN	O :ORANGE	GR:GRAY	R :RED	P :PINK	V :VIOLET		

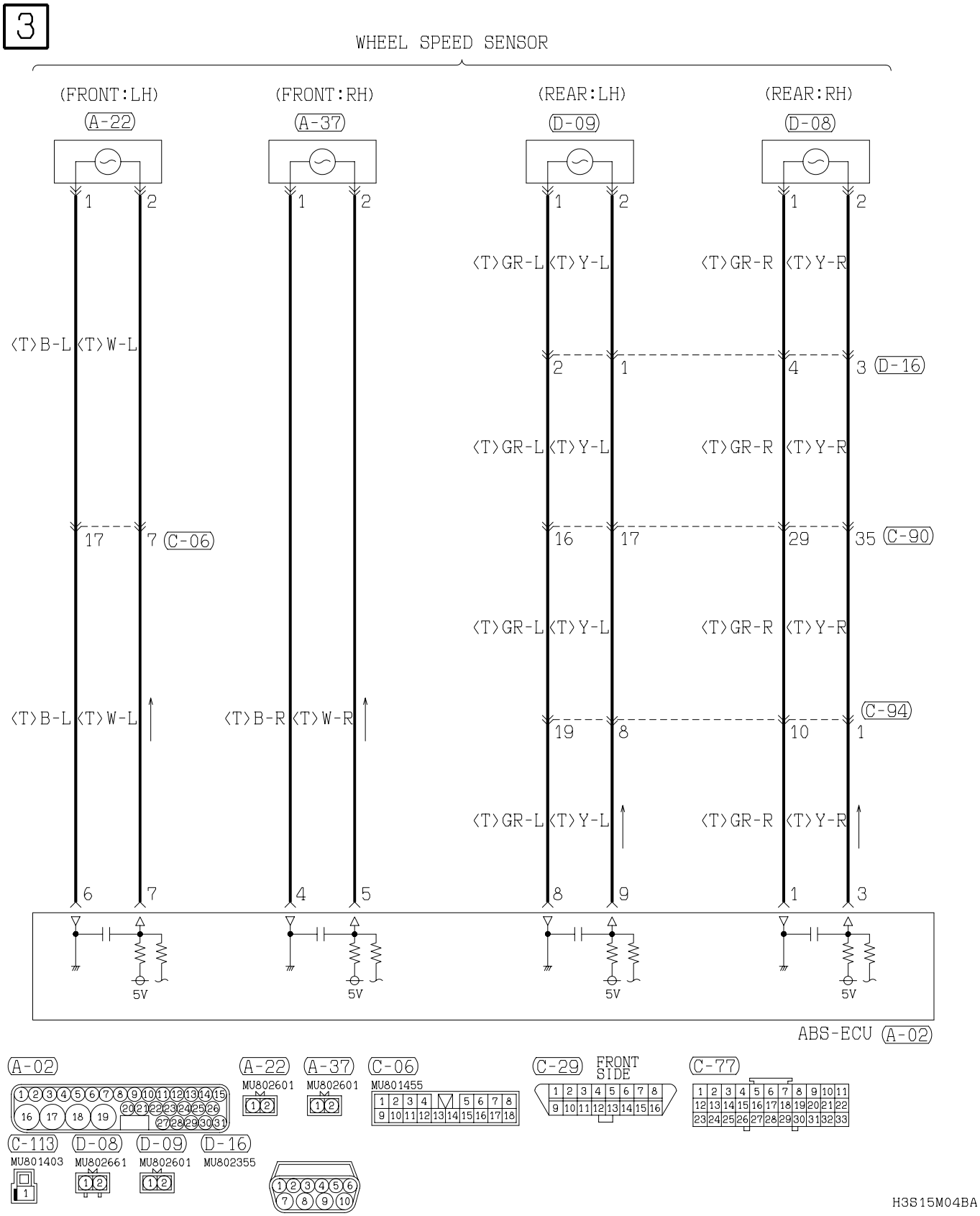
H3S15M04AA

TSB Revision



TSB Revision

ANTI-LOCK BRAKING SYSTEM (ABS) <VEHICLES WITHOUT TCL> (CONTINUED)



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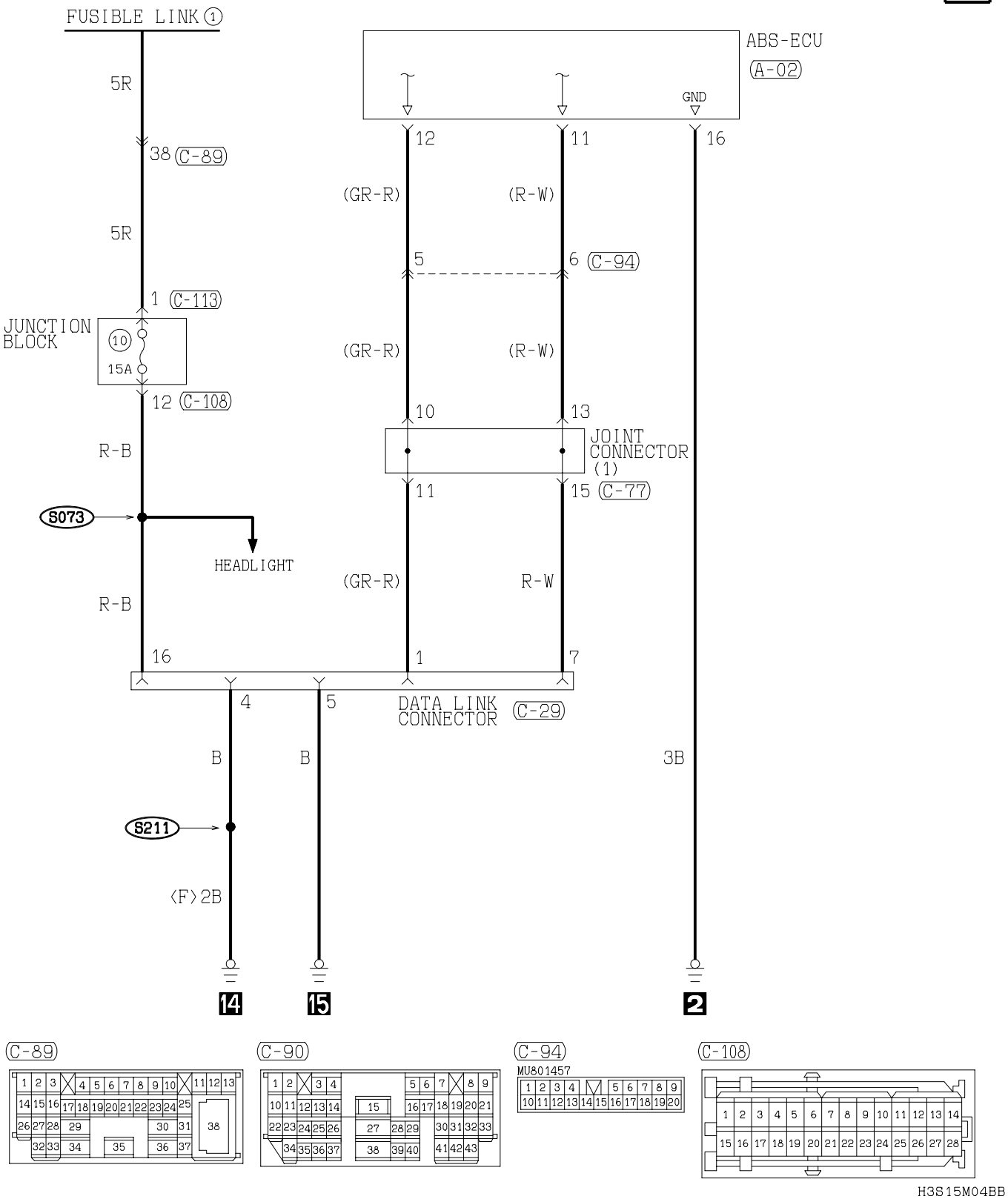
TSB Revision

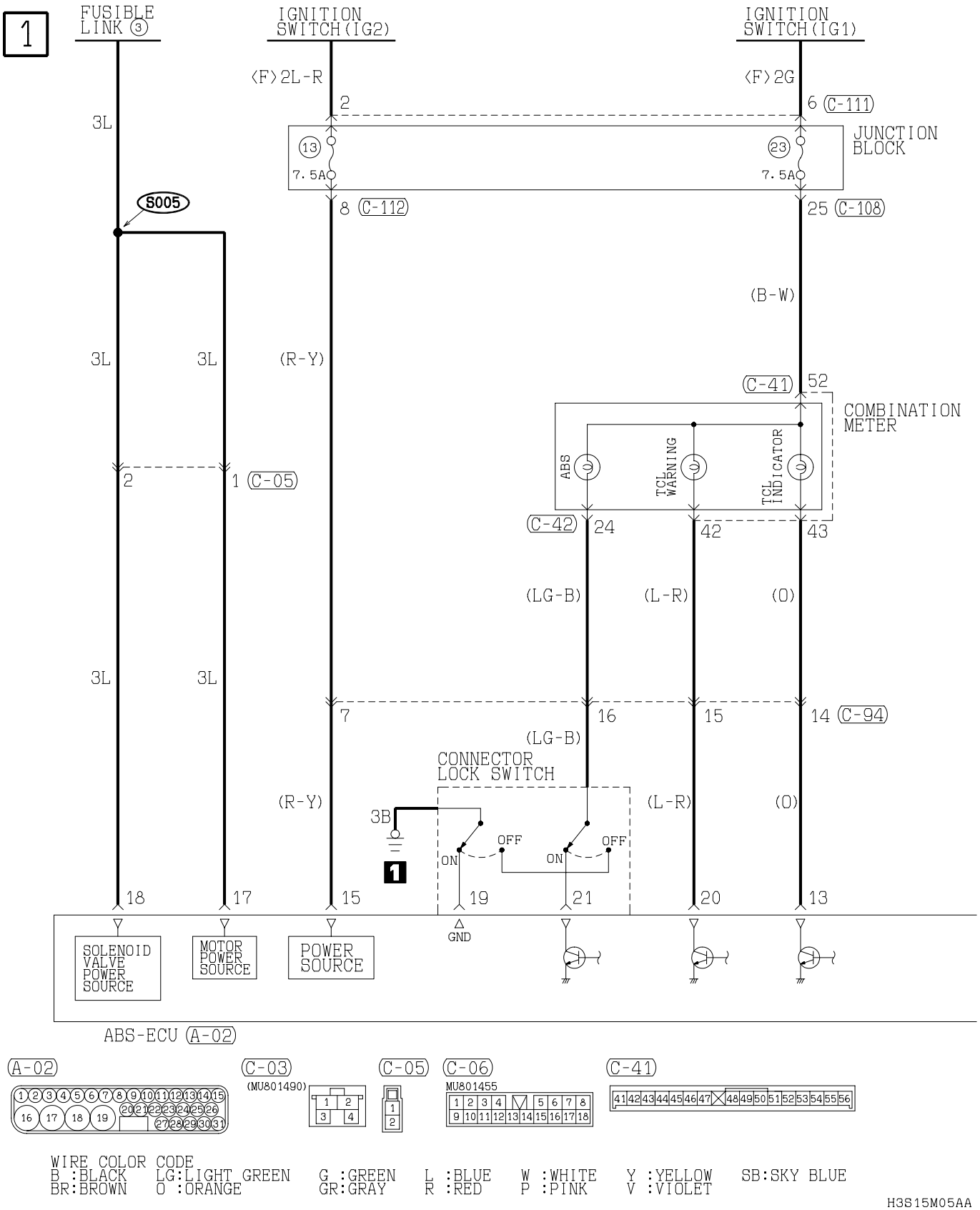
4



TSB Revision

ANTI-LOCK BRAKING SYSTEM (ABS) <VEHICLES WITH TCL>

M1901008400516

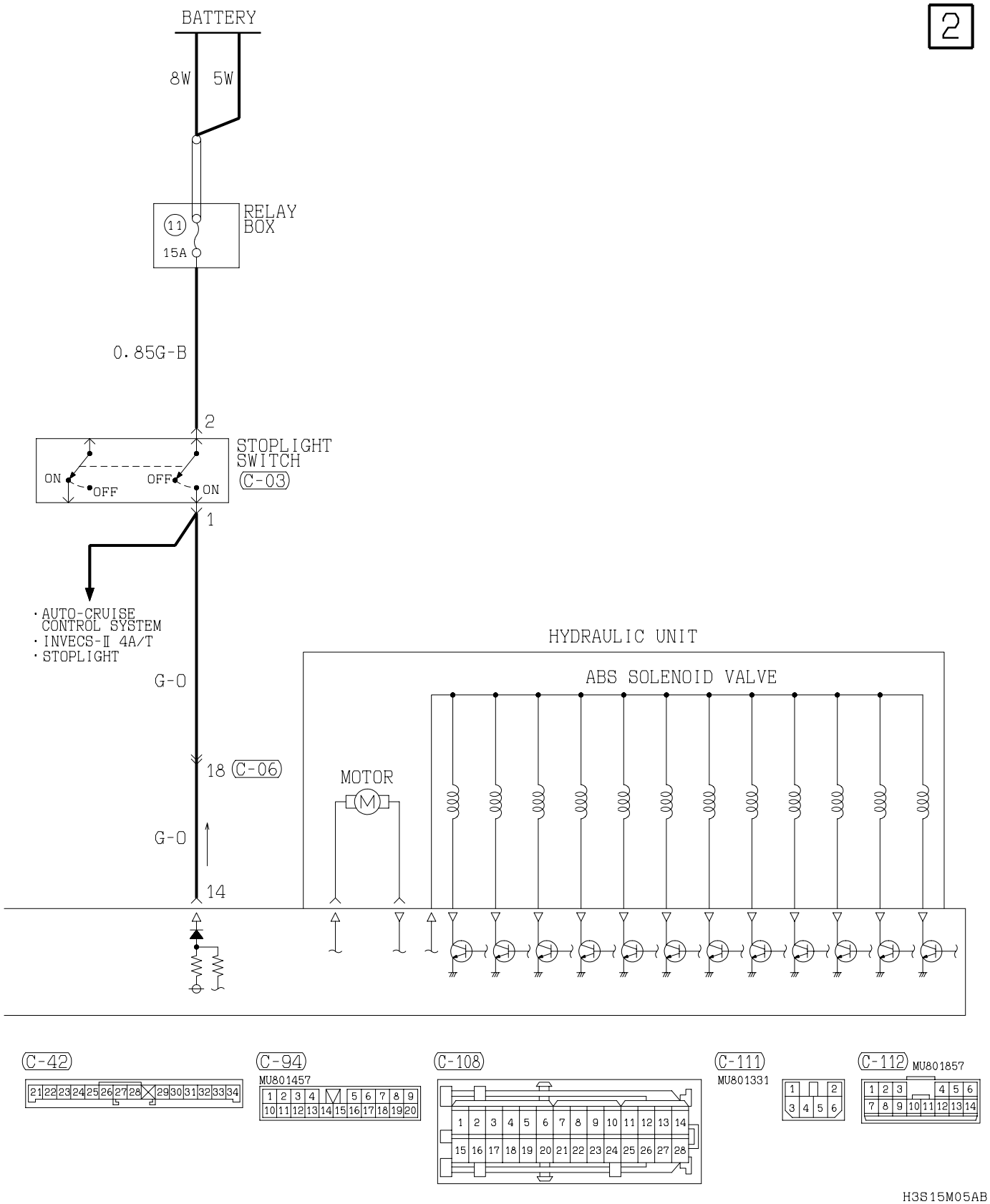


WIRE COLOR CODE

B :BLACK	LG:LIGHT GREEN	G :GREEN	L :BLUE	W :WHITE	Y :YELLOW	SB:SKY BLUE	
BR:BROWN	O :ORANGE	GR:GRAY	R :RED	P :PINK	V :VIOLET		

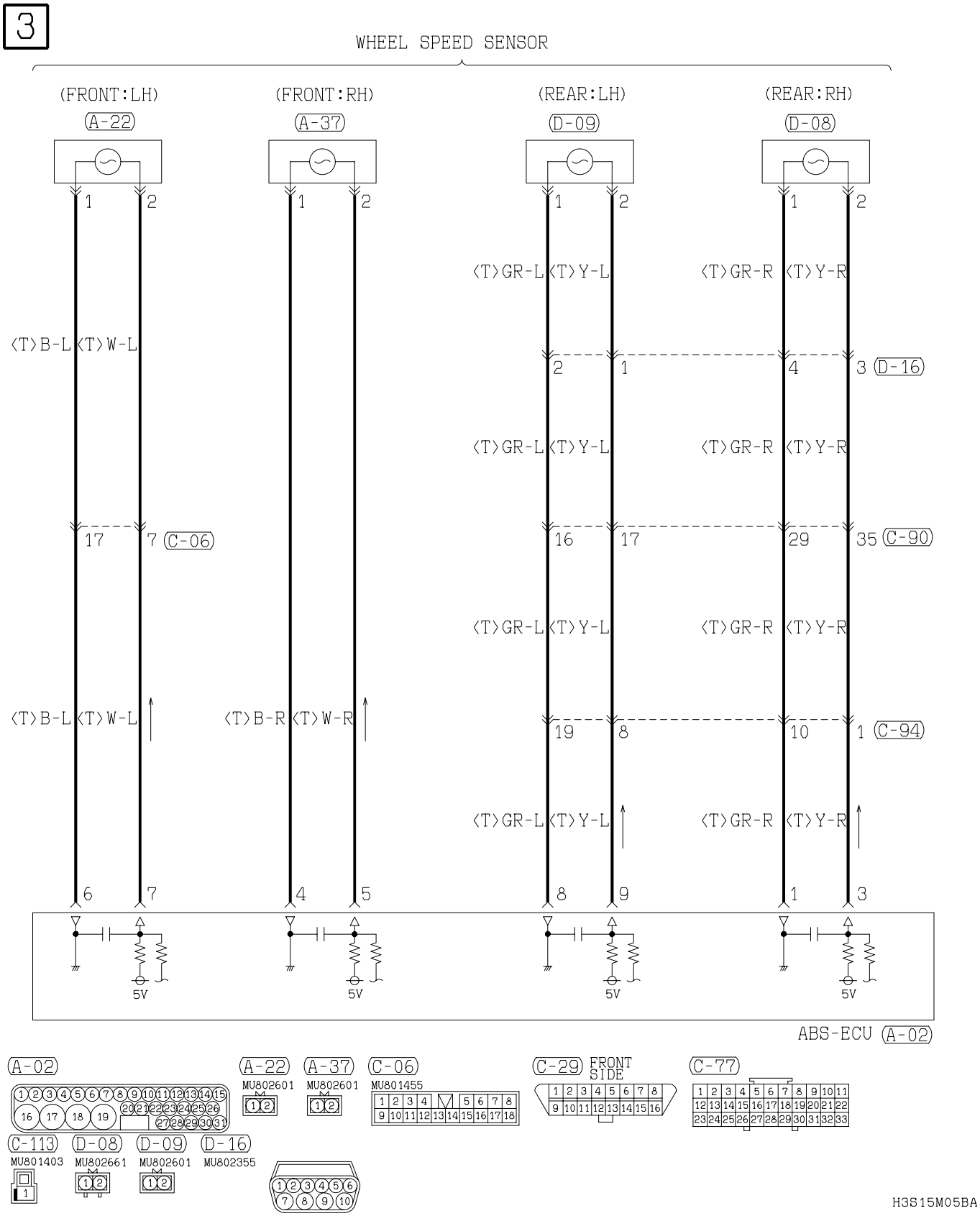
H3S15M05AA

TSB Revision



TSB Revision

ANTI-LOCK BRAKING SYSTEM (ABS) <VEHICLES WITH TCL> (CONTINUED)



TSB Revision

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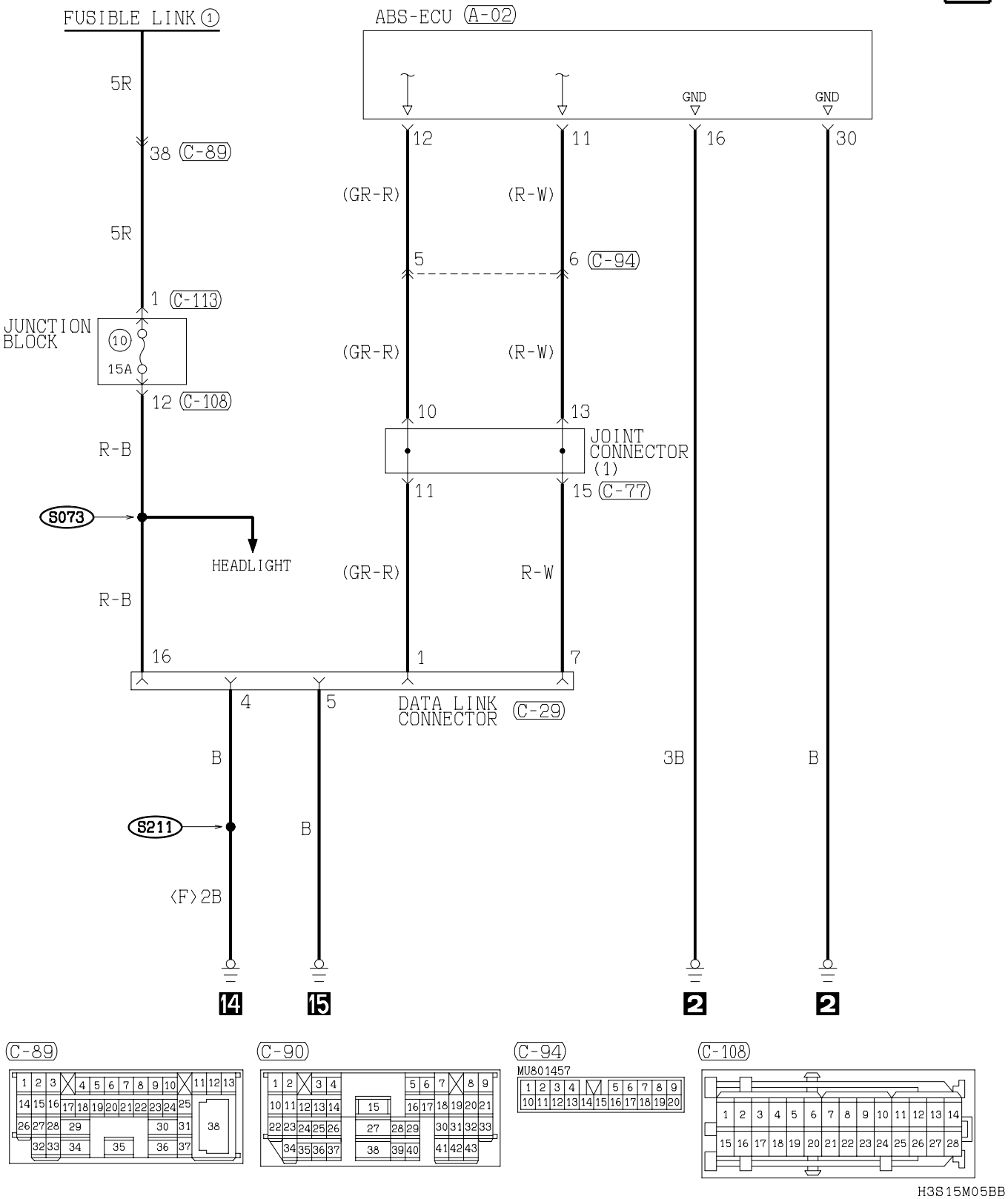
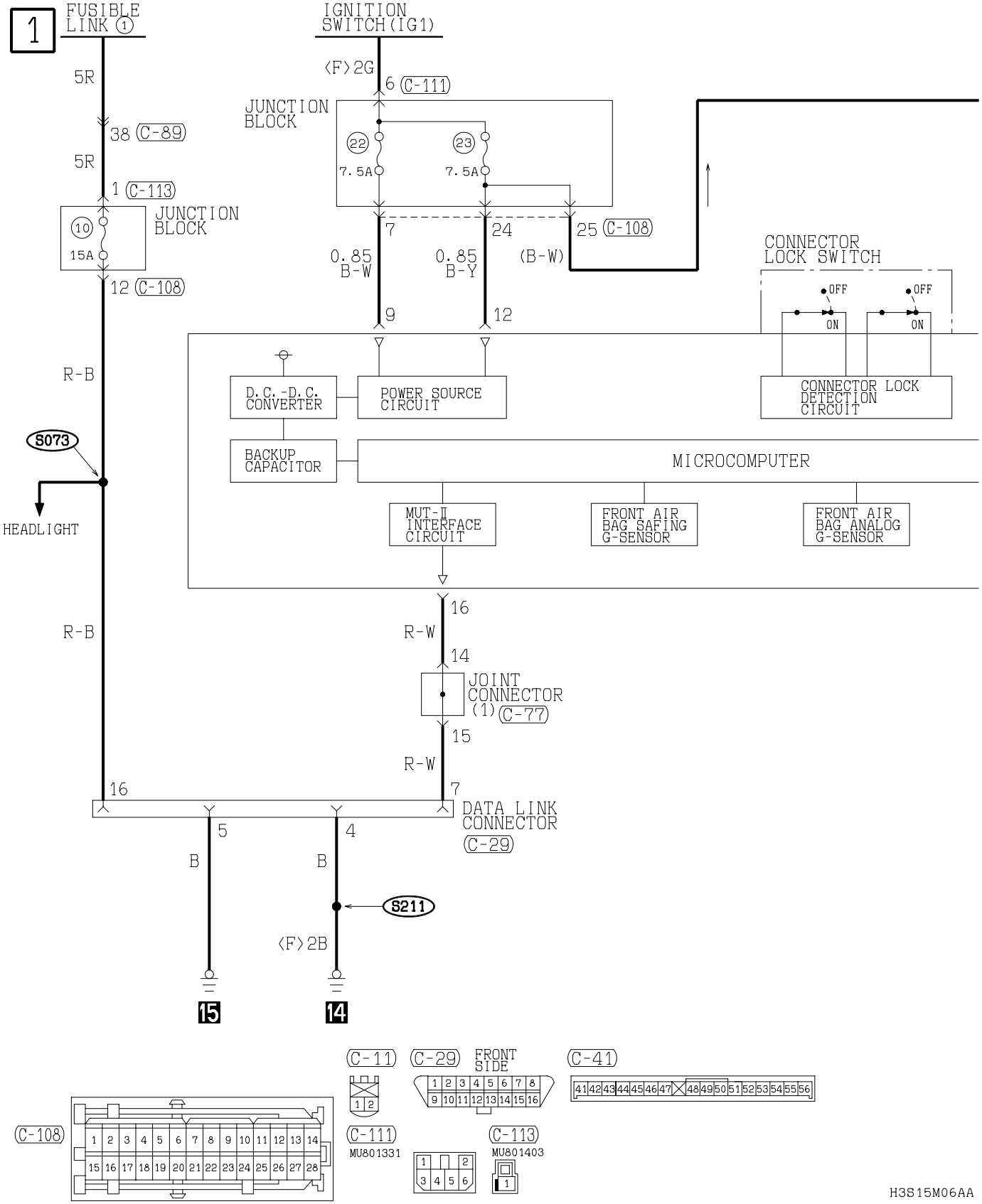


TSB Revision

SUPPLEMENTAL RESTRAINT SYSTEM (SRS) <VEHICLES WITHOUT SIDE AIR BAG>

M1901009700435



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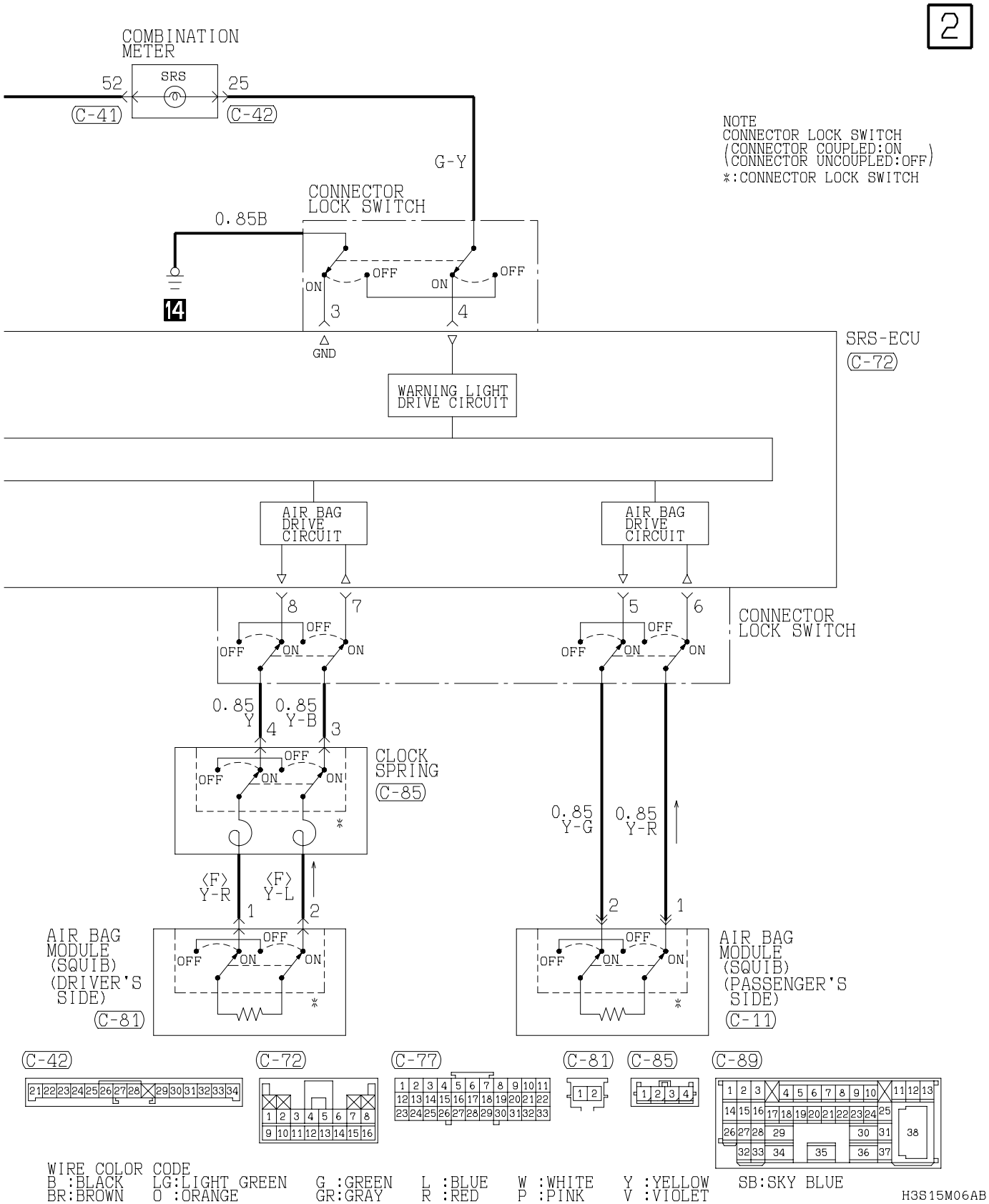
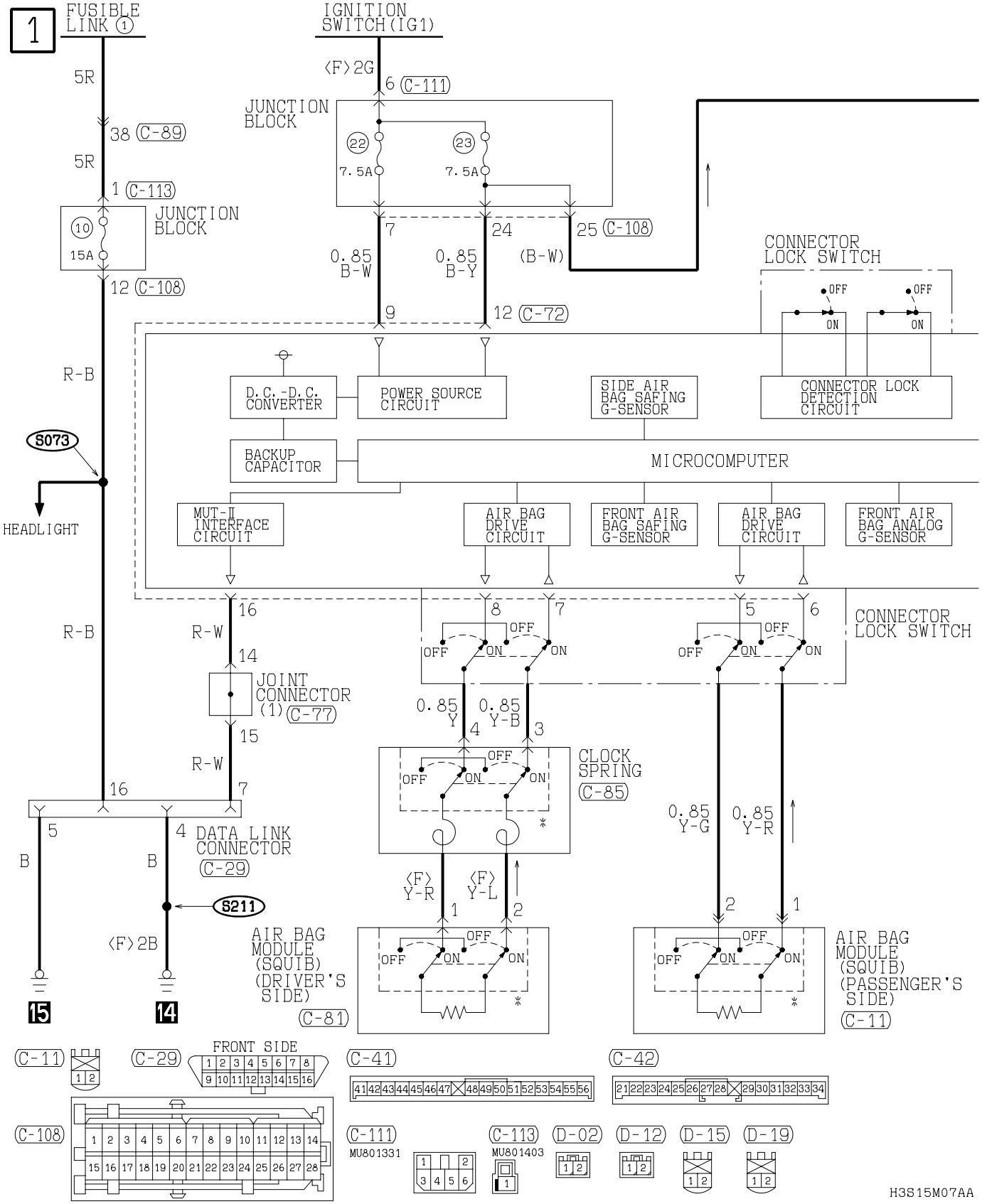


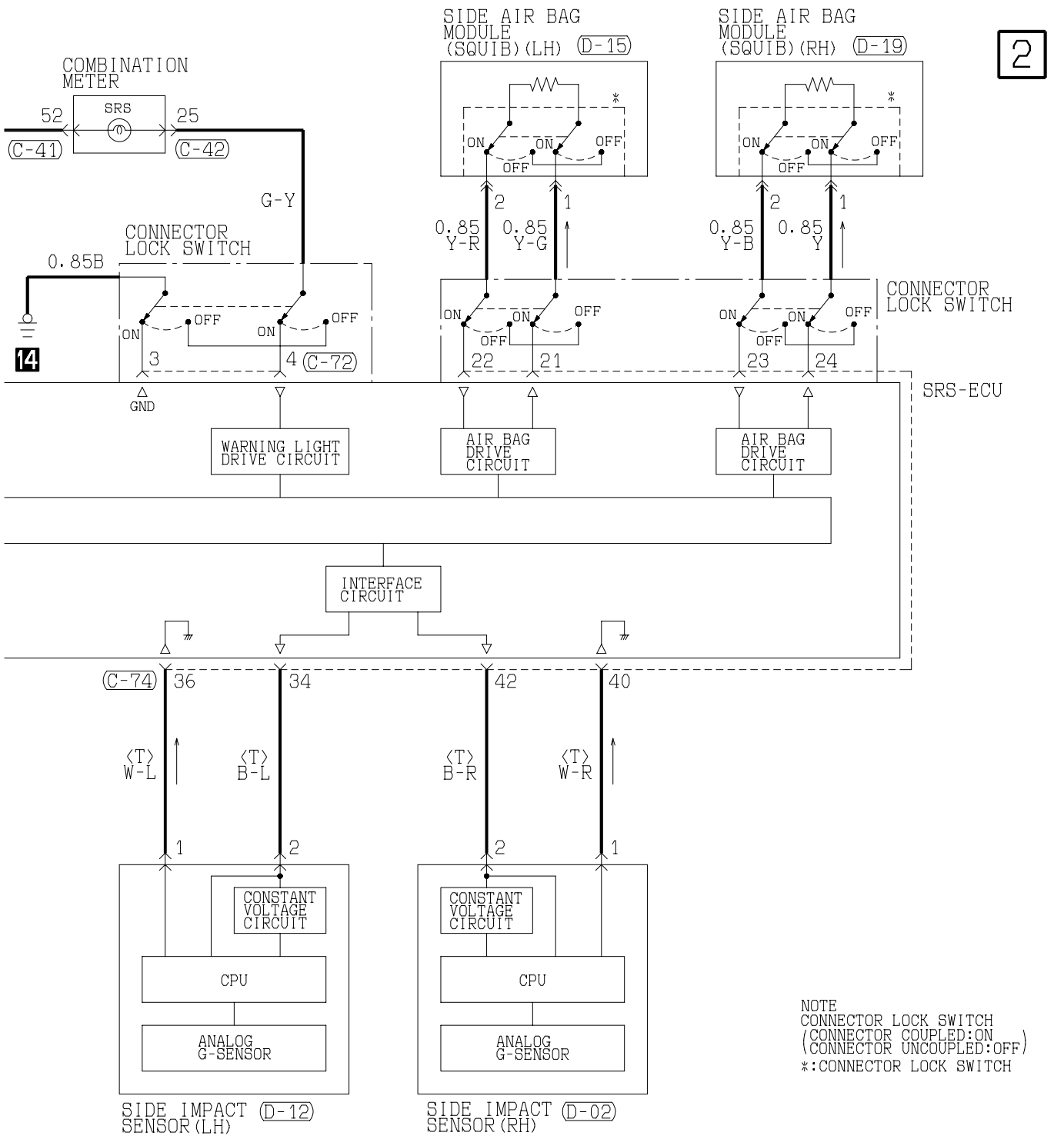
TSB Revision

SUPPLEMENTAL RESTRAINT SYSTEM (SRS) <VEHICLES WITH SIDE AIR BAG>

M1901009700446



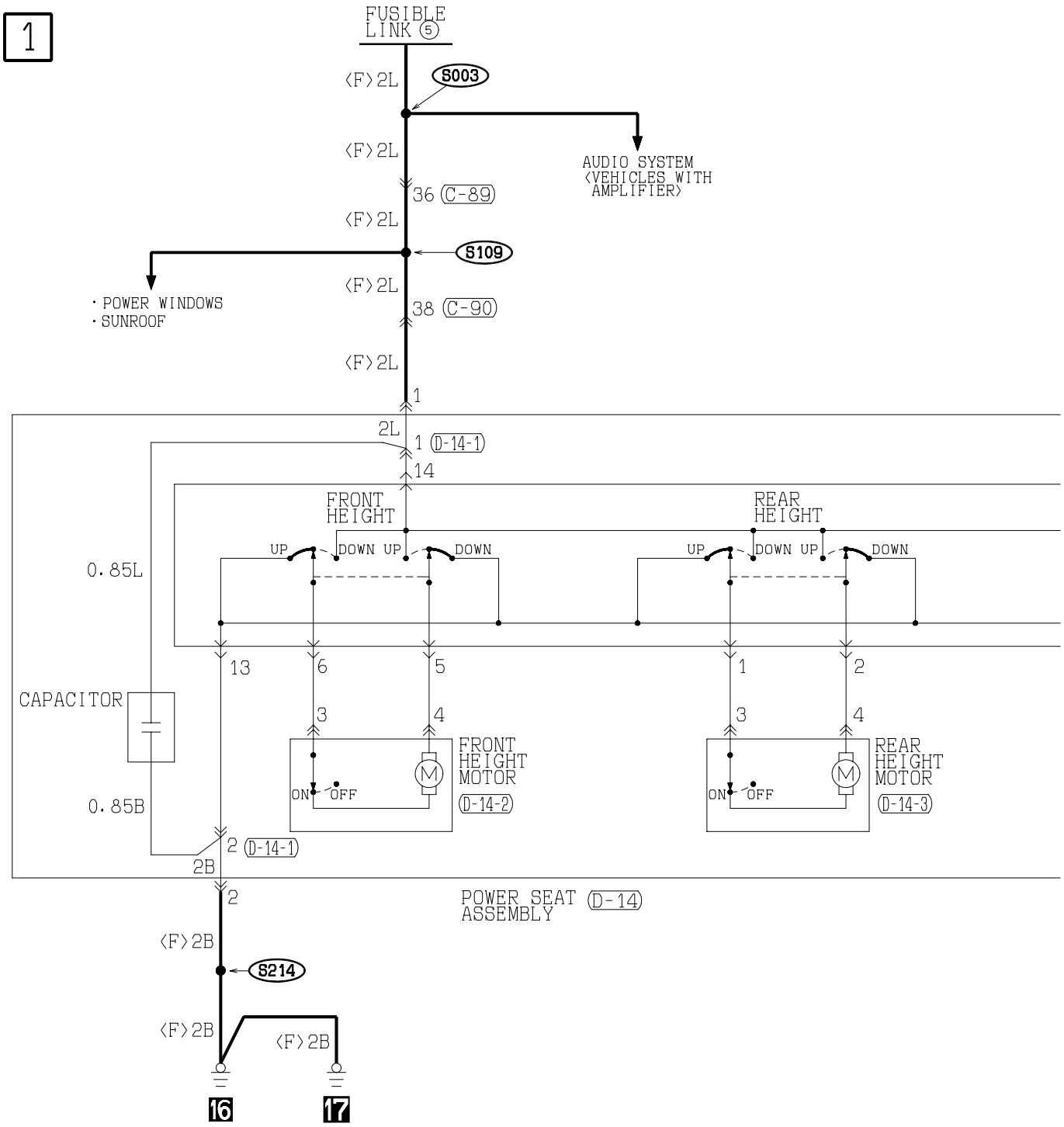
TSB Revision



TSB Revision

POWER SEAT

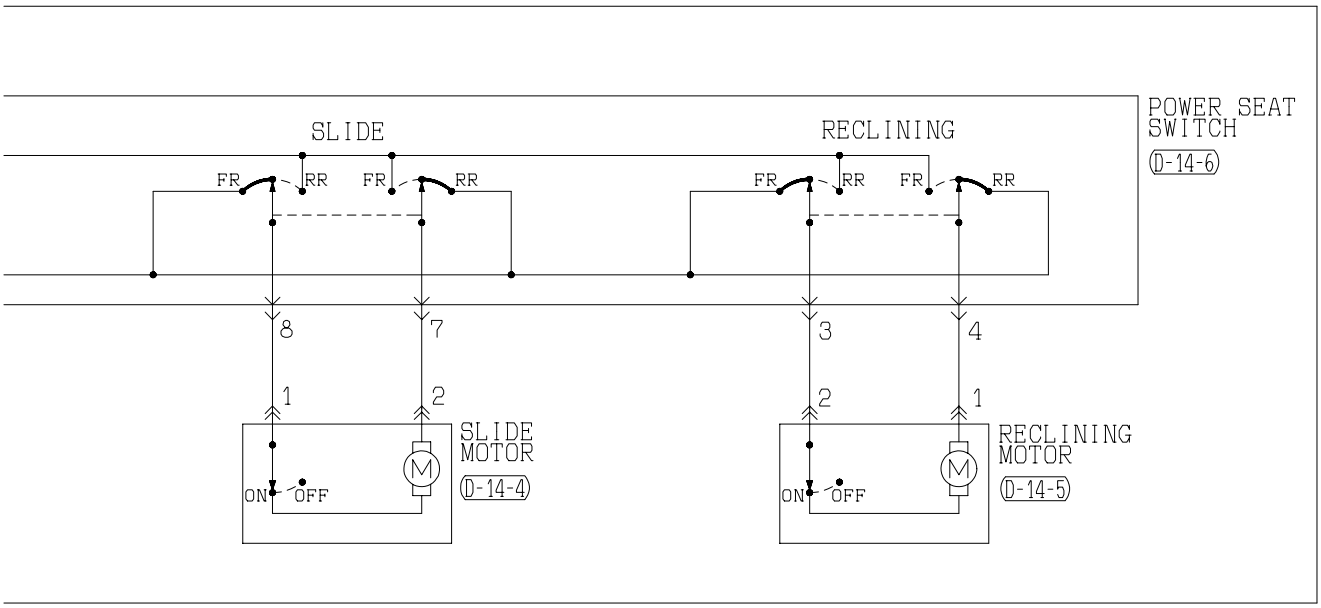
M1901010400193



H3S15M08AA

TSB Revision

2



D-14-6

MU801453

1	2	3		4	5	6
7	8	9	10	11	12	13	14

WIRE COLOR CODE

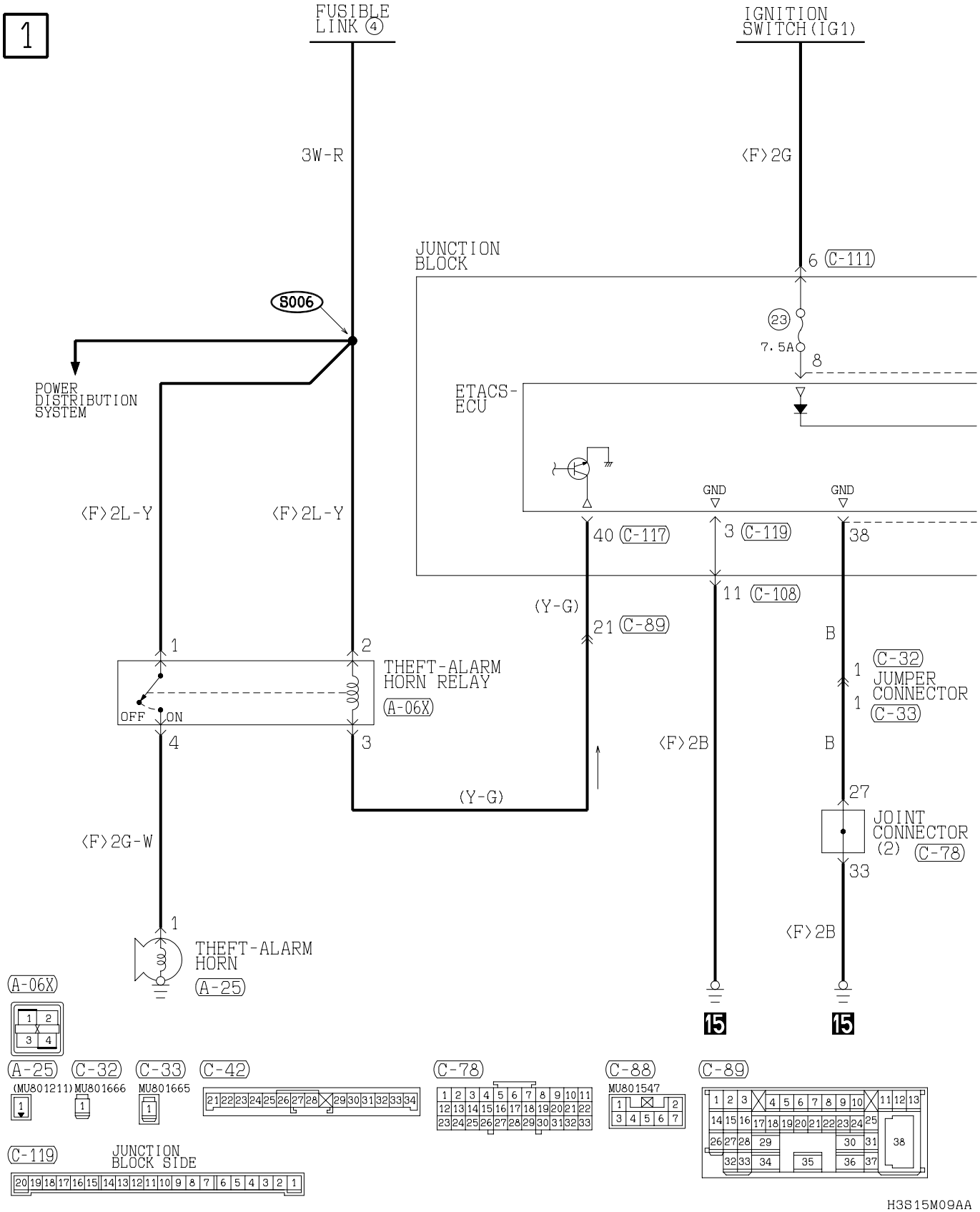
B :BLACK	BR:BROWN	G :GREEN	GR:GRAY	L :BLUE	LG:LIGHT GREEN	O :ORANGE
P :PINK	R :RED	SB:SKY BLUE	V :VIOLET	W :WHITE	Y :YELLOW	

H3S15M08AB

TSB Revision

THEFT-ALARM SYSTEM

M1901012400315



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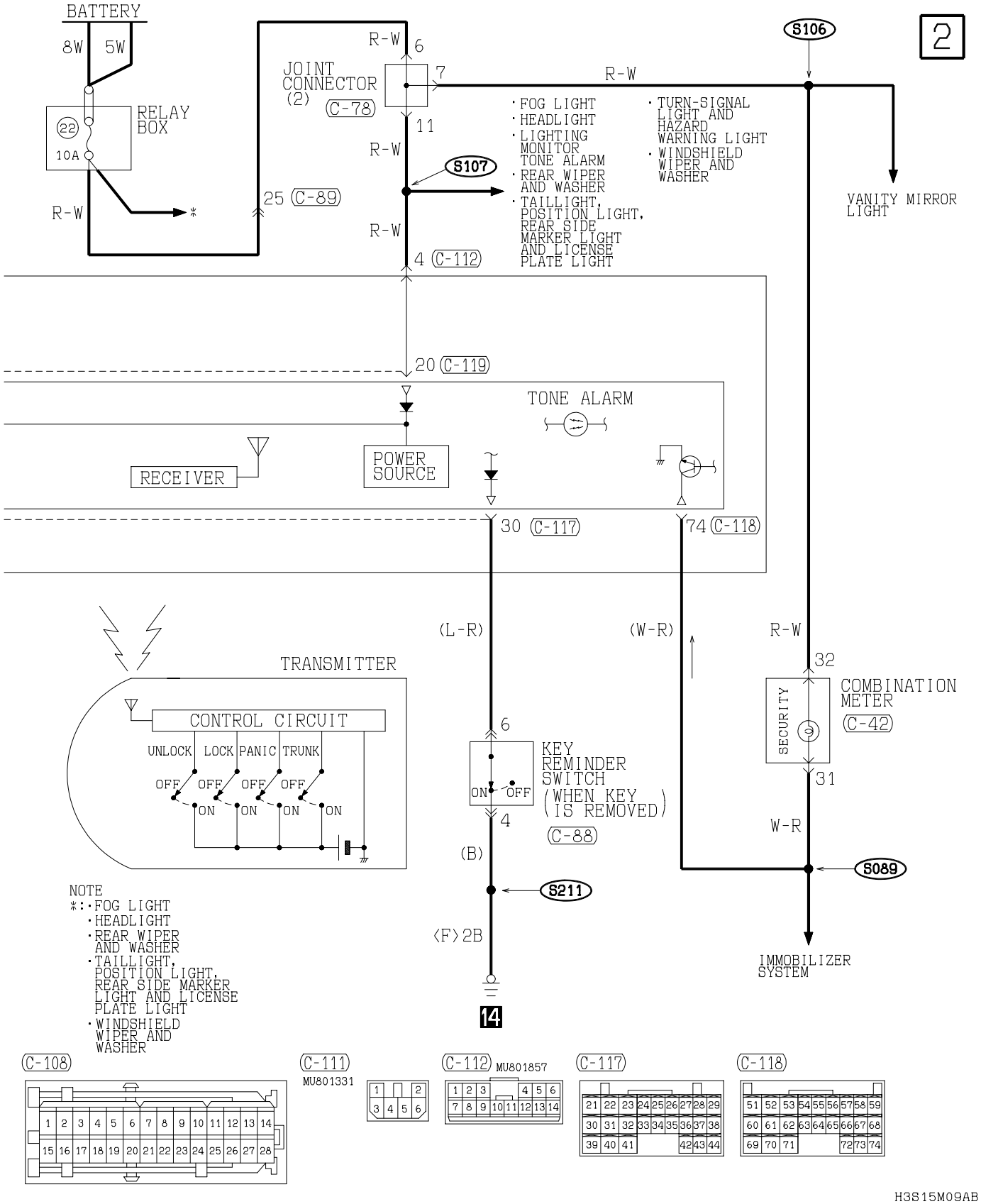
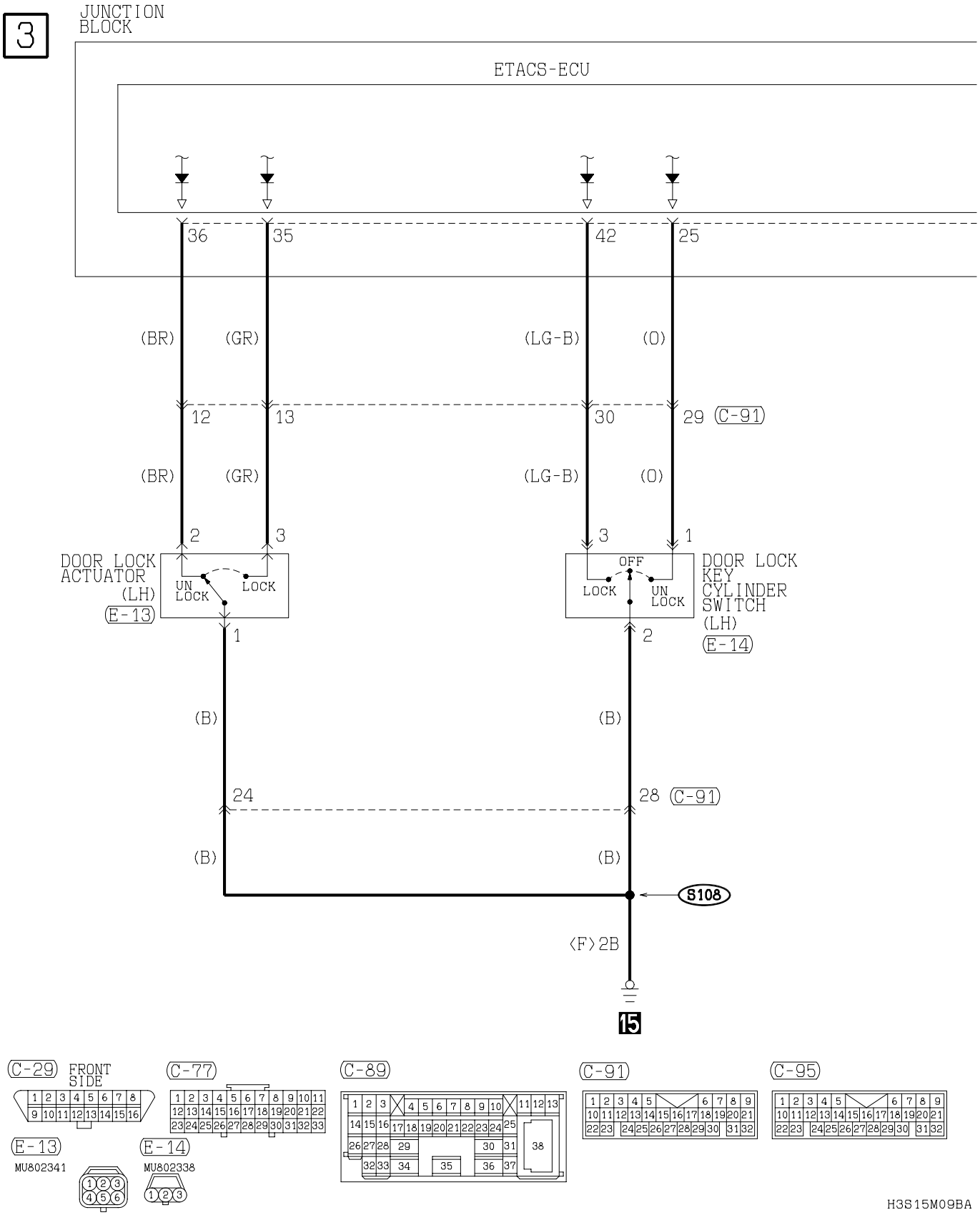
TSB Revision



TSB Revision

THEFT-ALARM SYSTEM (CONTINUED)



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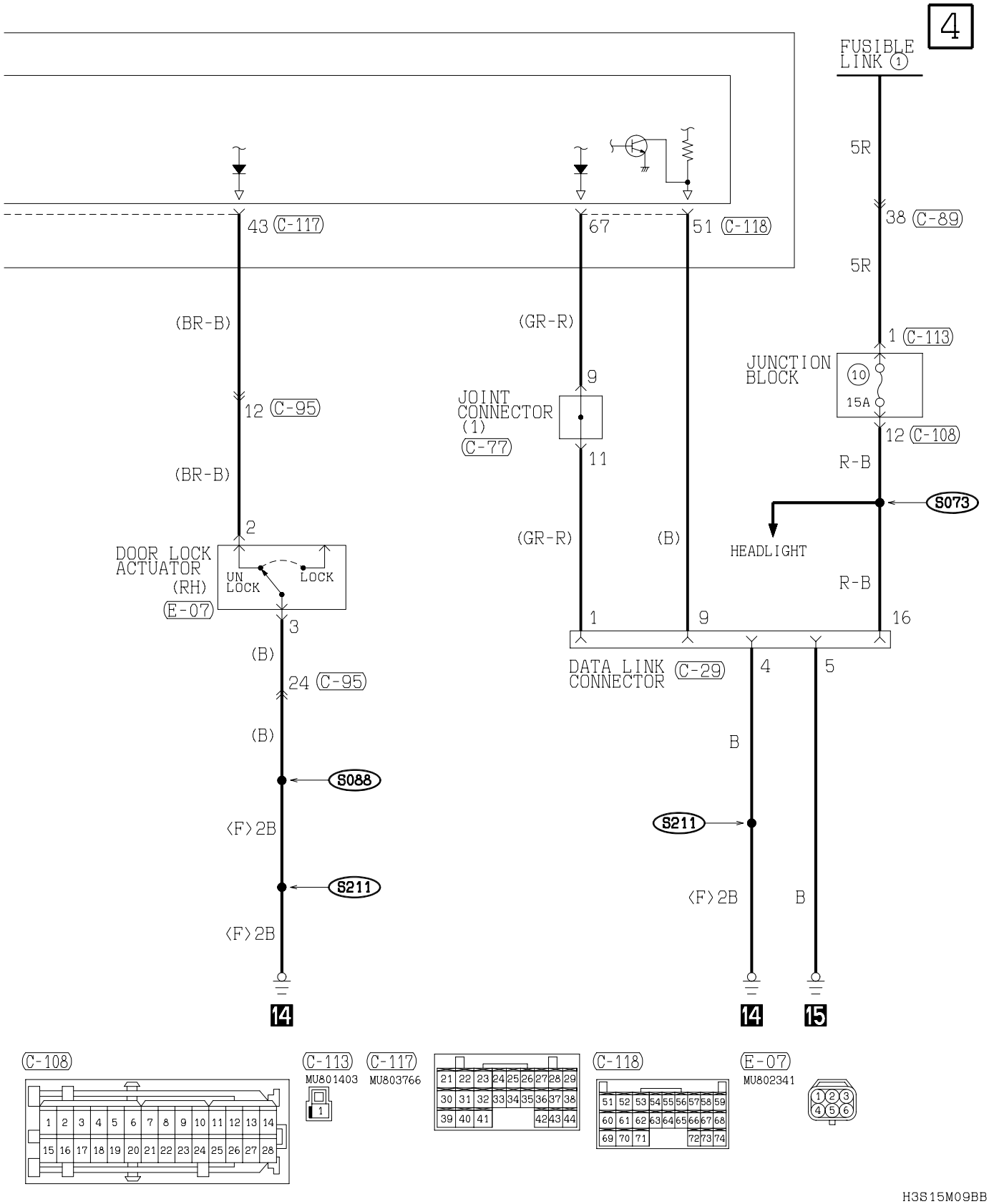

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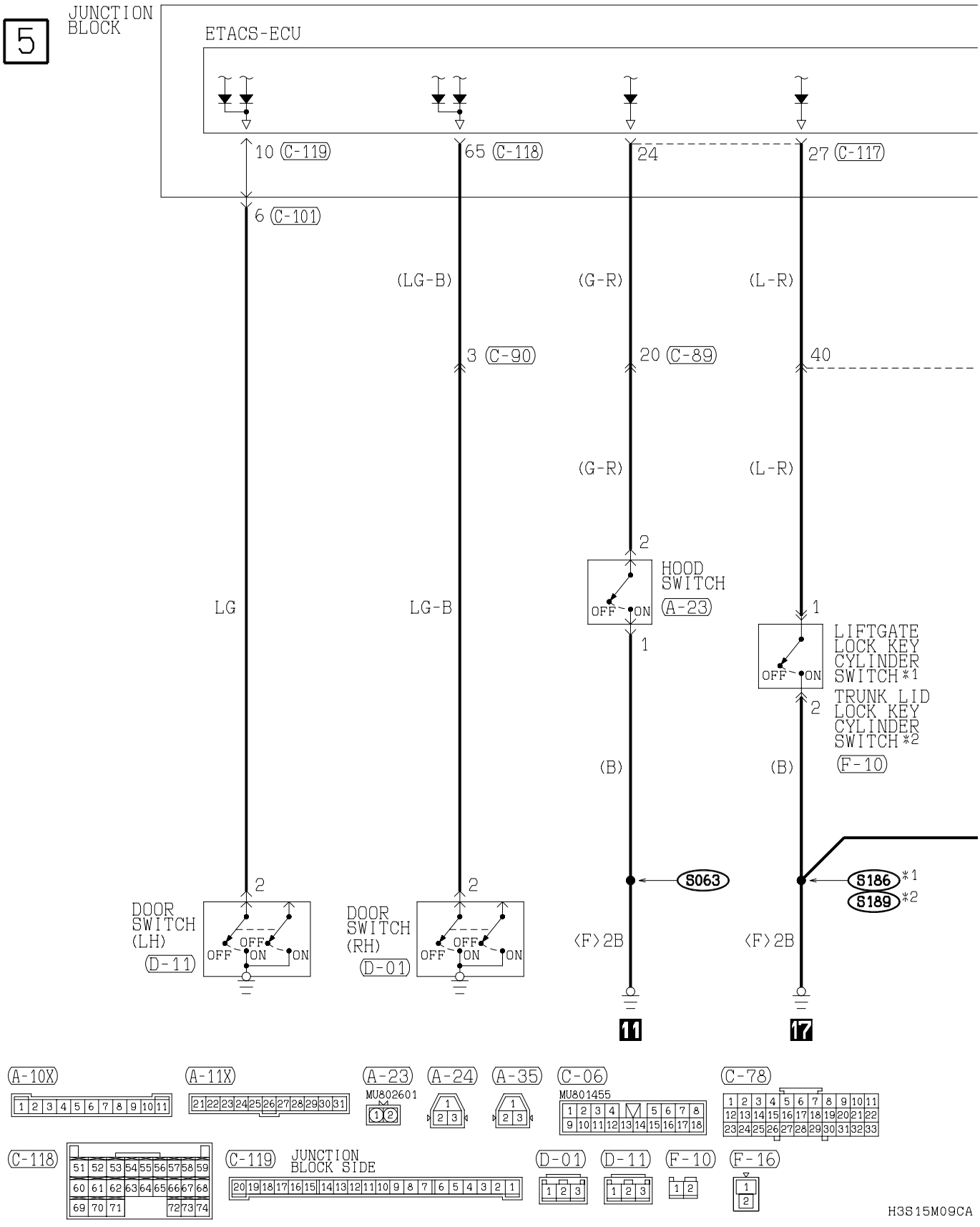
TSB Revision

THEFT-ALARM SYSTEM (CONTINUED)



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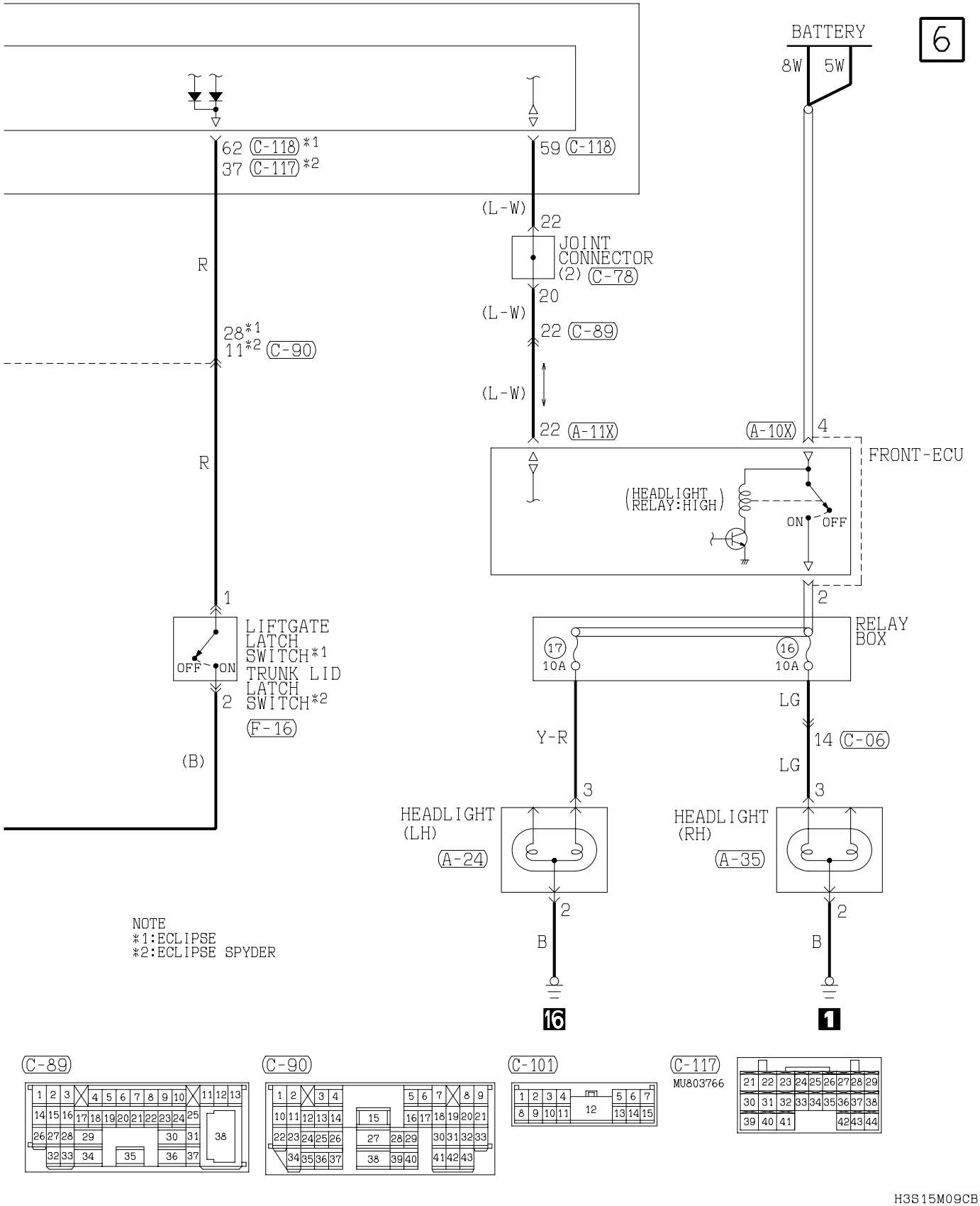

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TSB Revision

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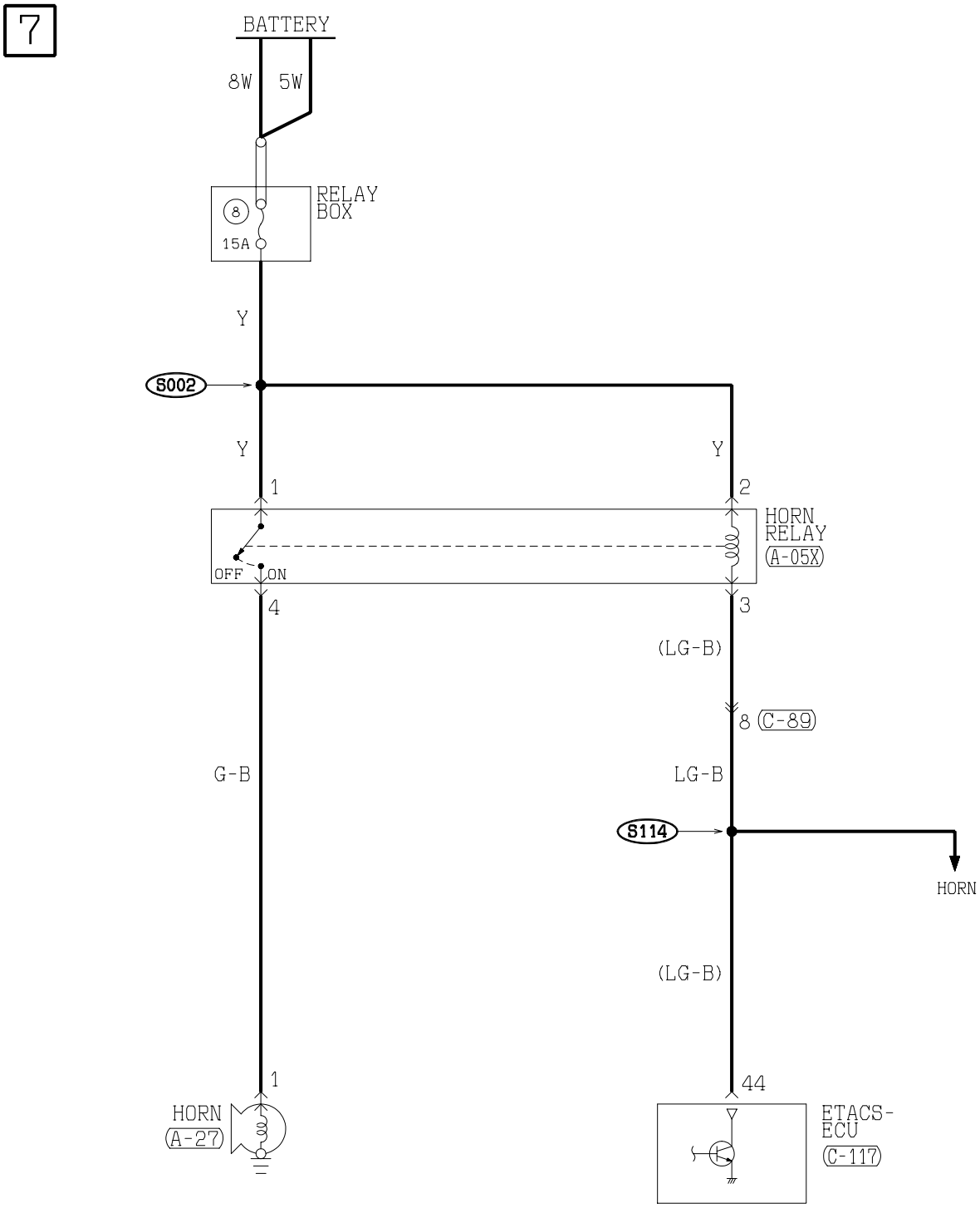

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TSB Revision

NOTES

FORGOTTEN KEY PREVENTION FUNCTION

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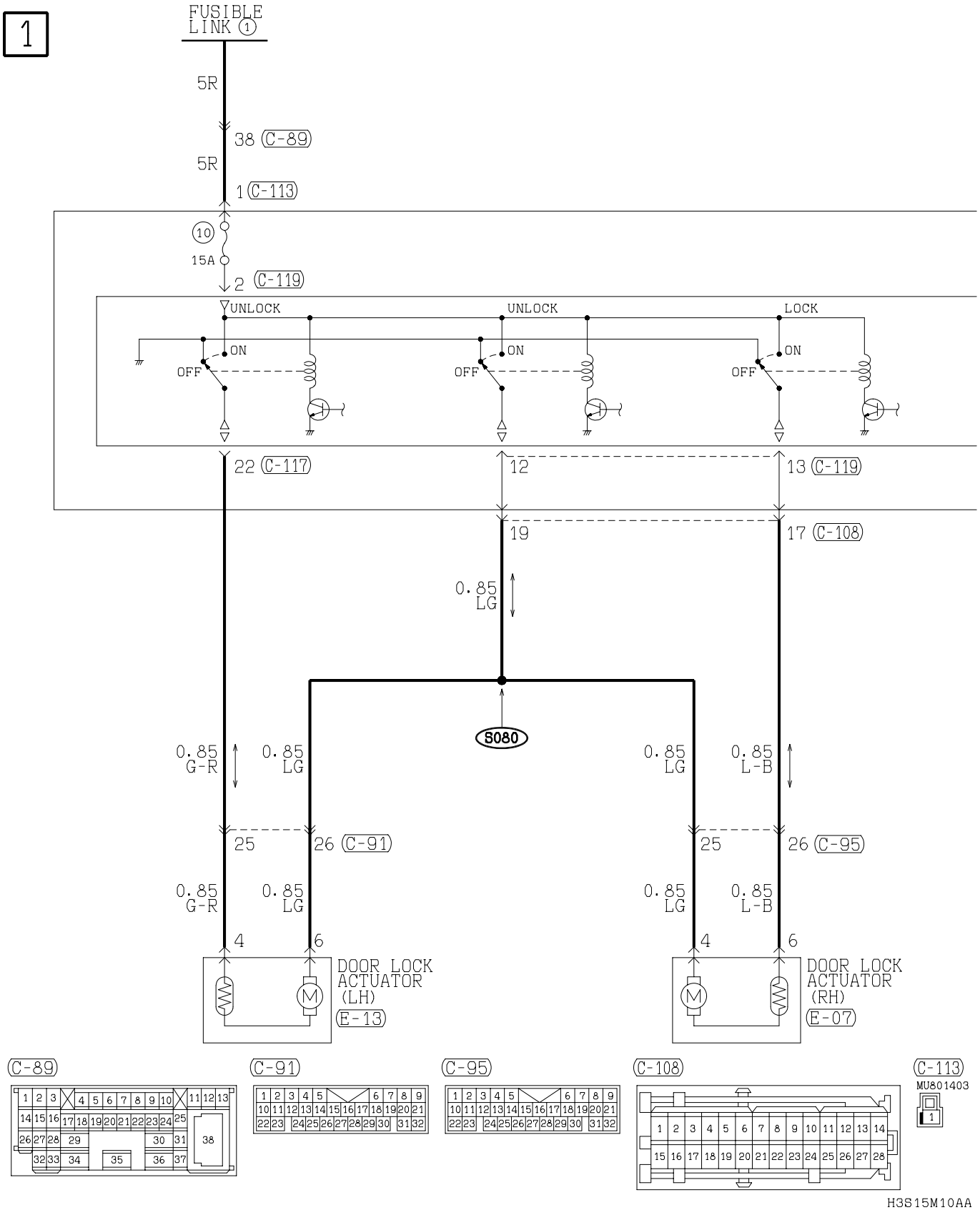

TSB Revision

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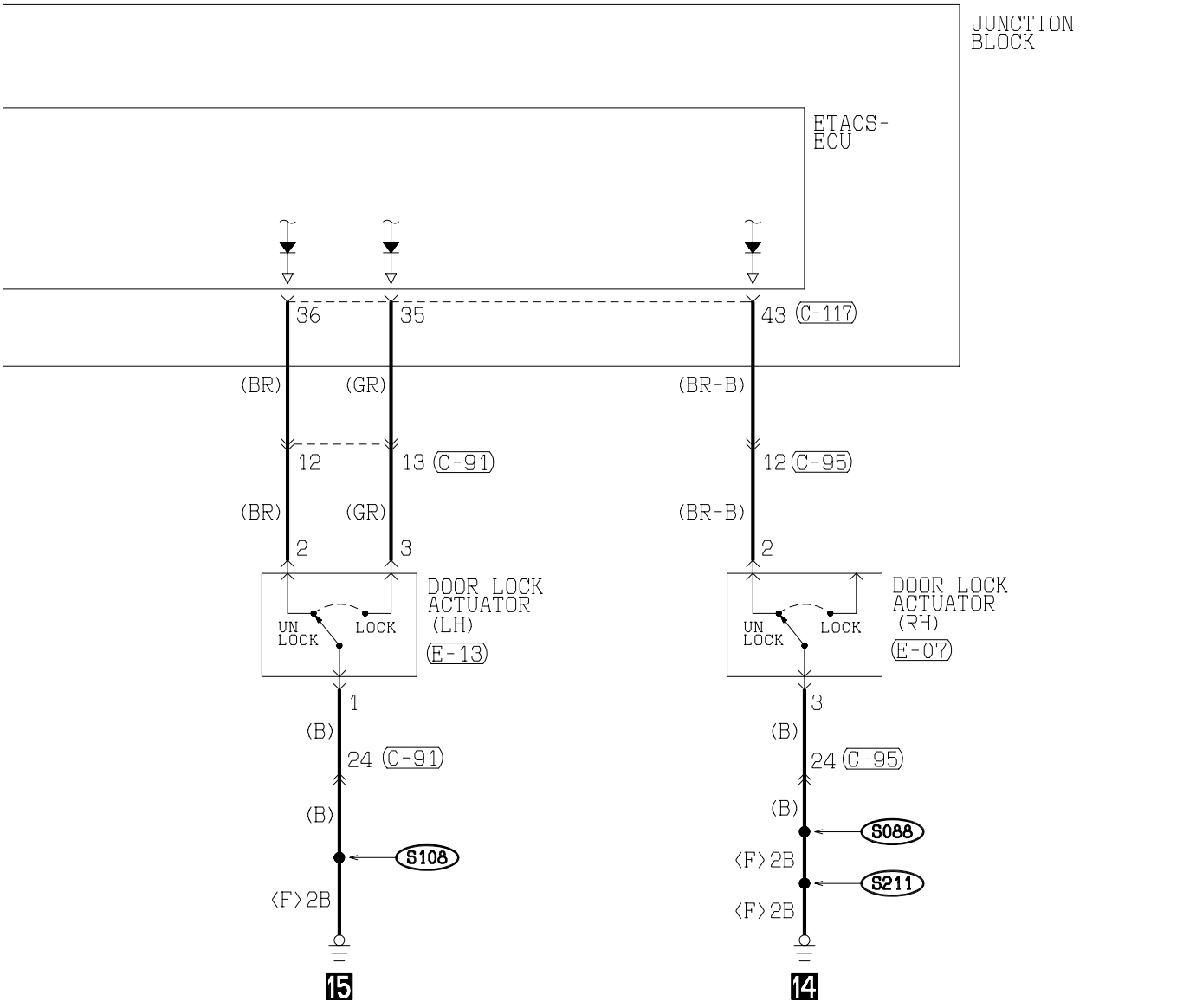

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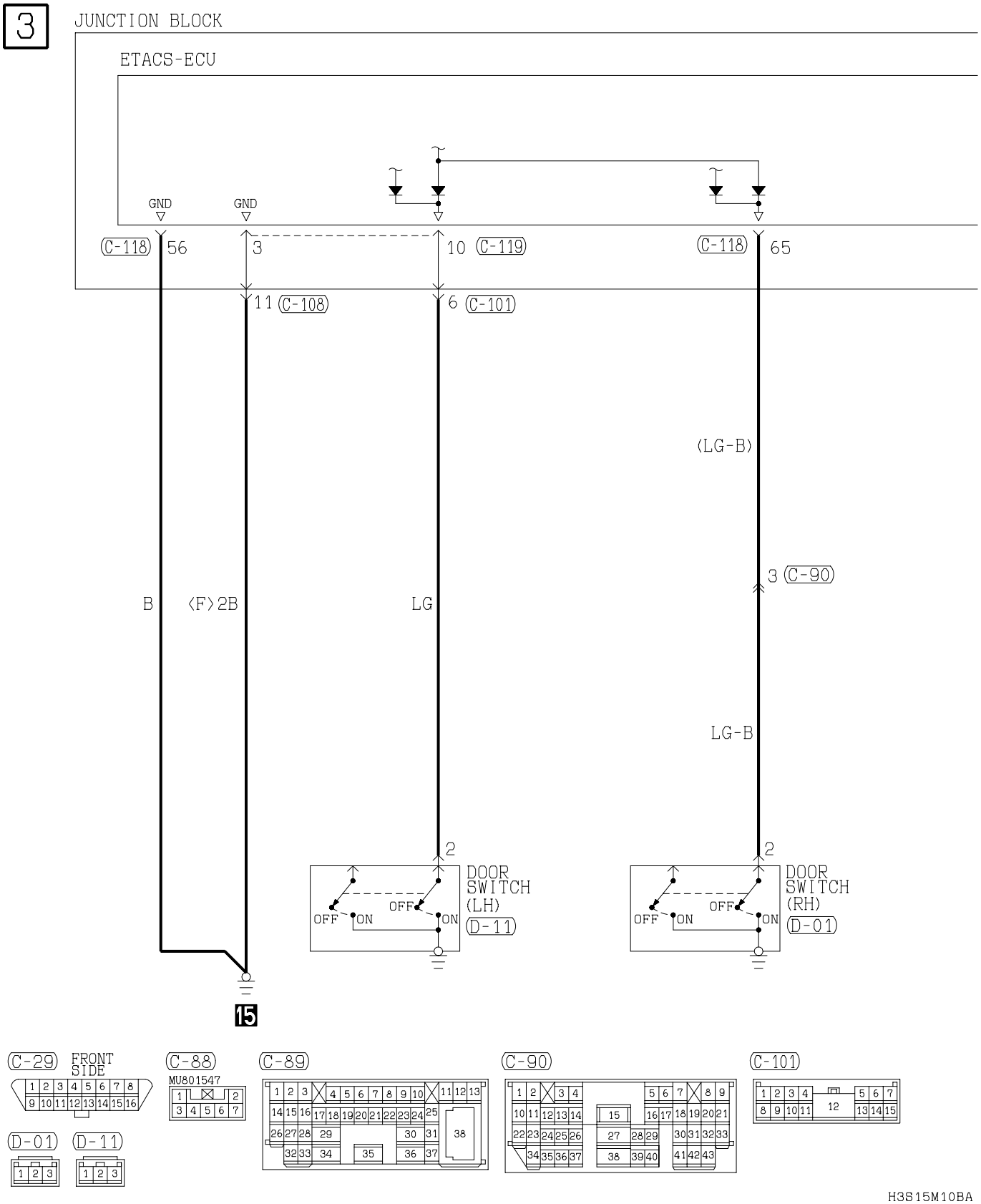
FORGOTTEN KEY PREVENTION FUNCTION (CONTINUED)



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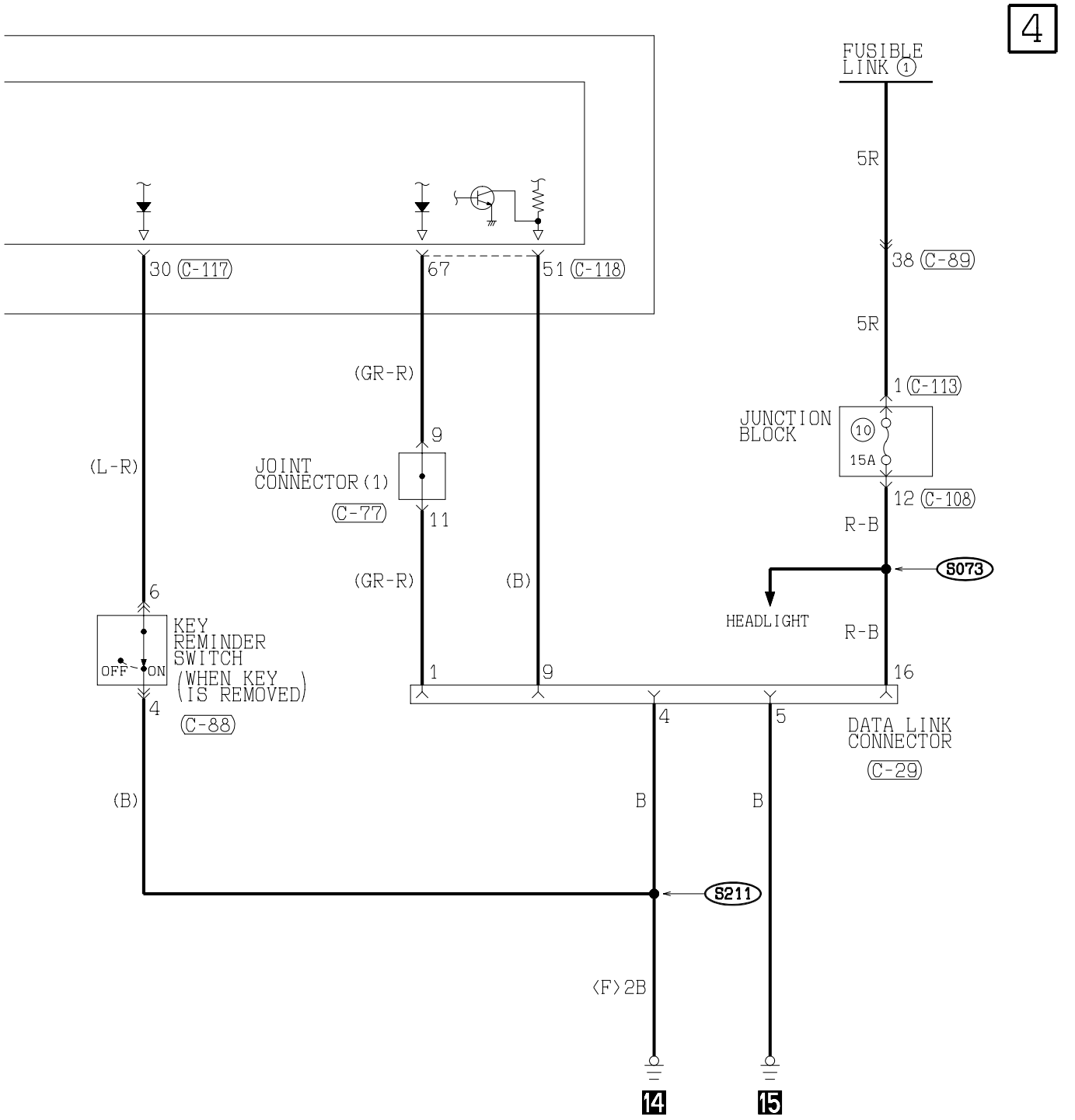

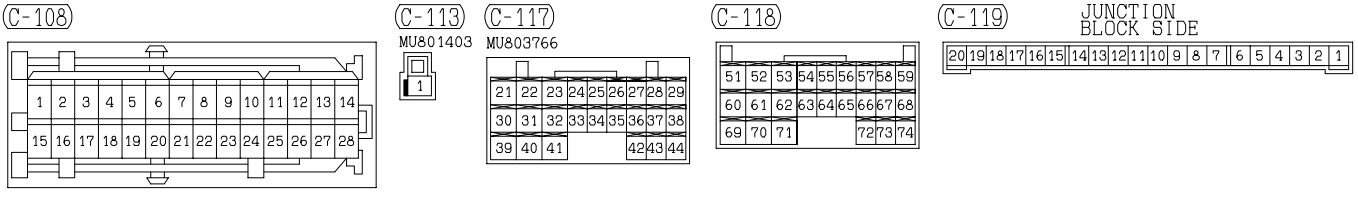

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TSB Revision

LIGHTING MONITOR TONE ALARM

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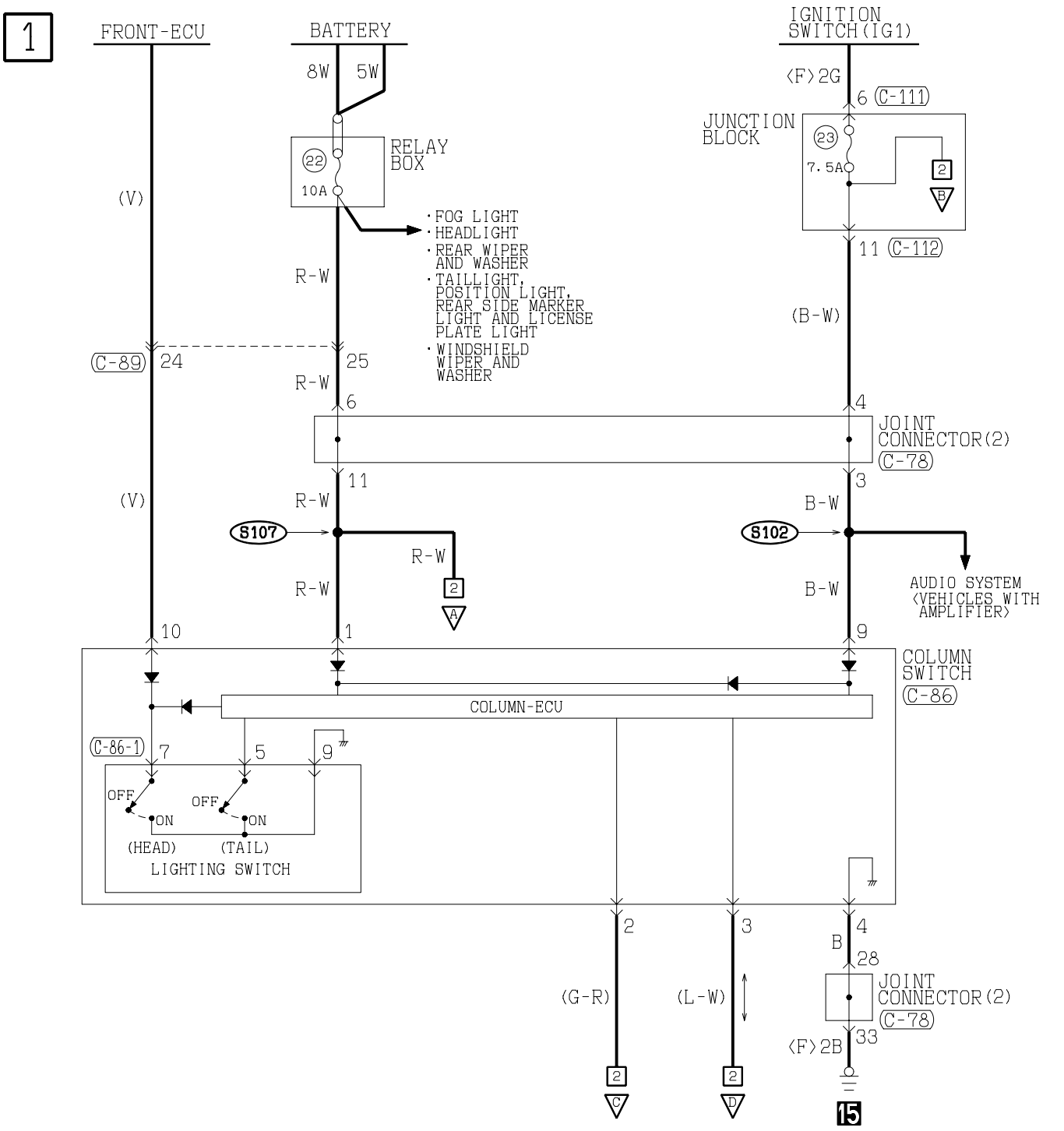

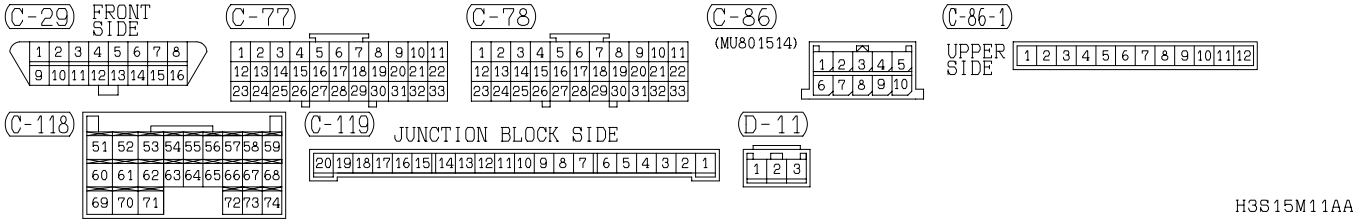

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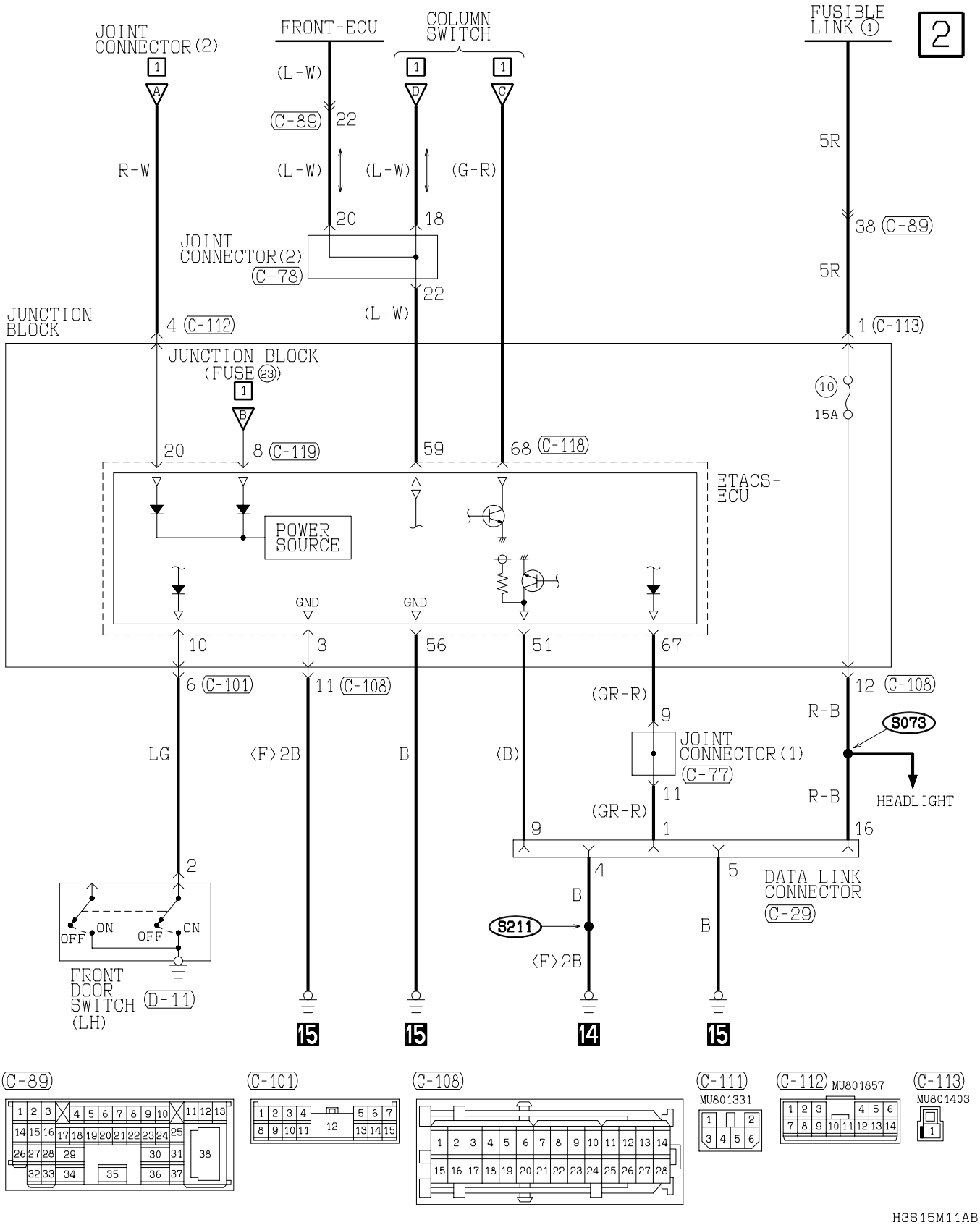
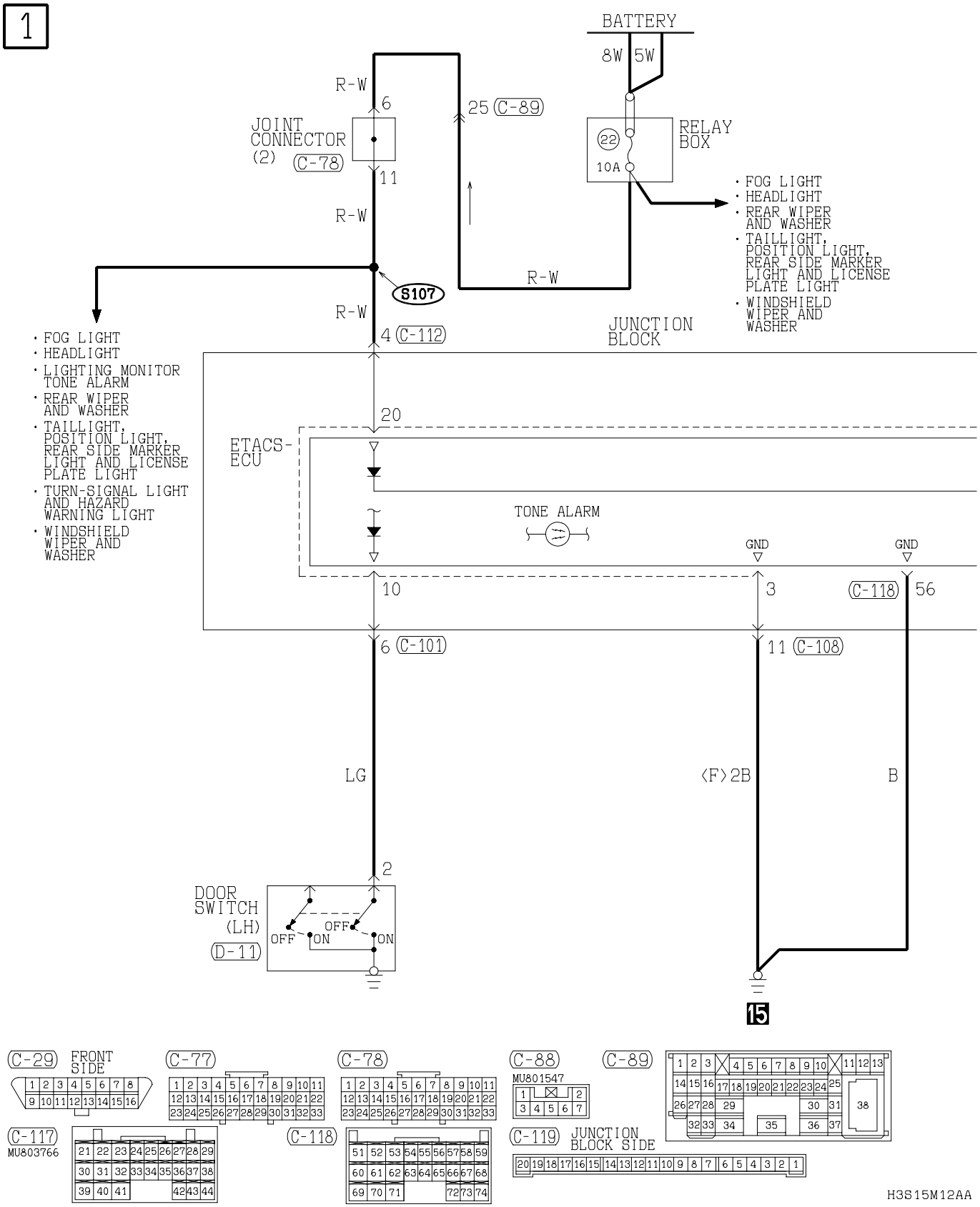


TSB Revision

KEY REMINDER TONE ALARM

M1901011300252



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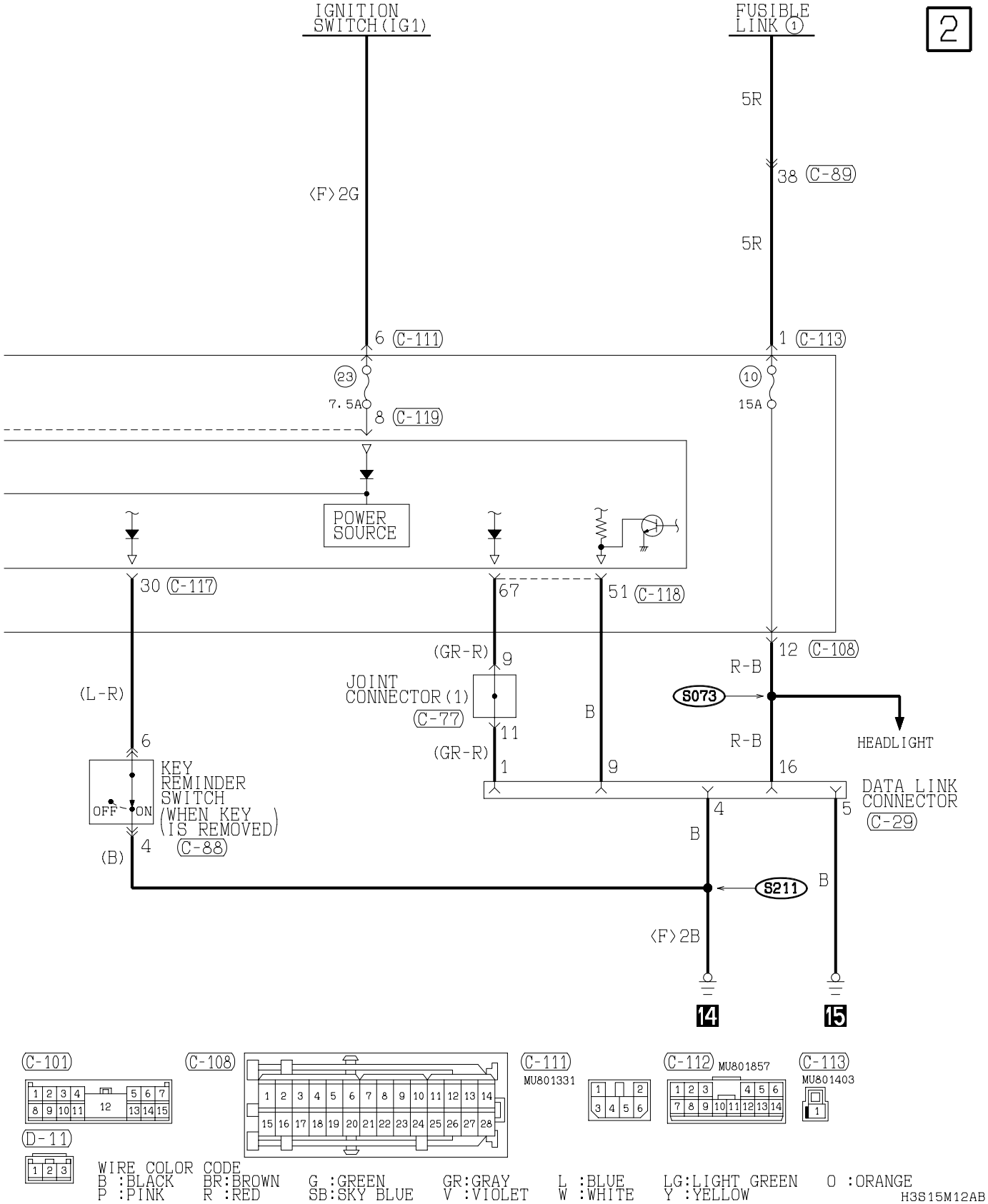
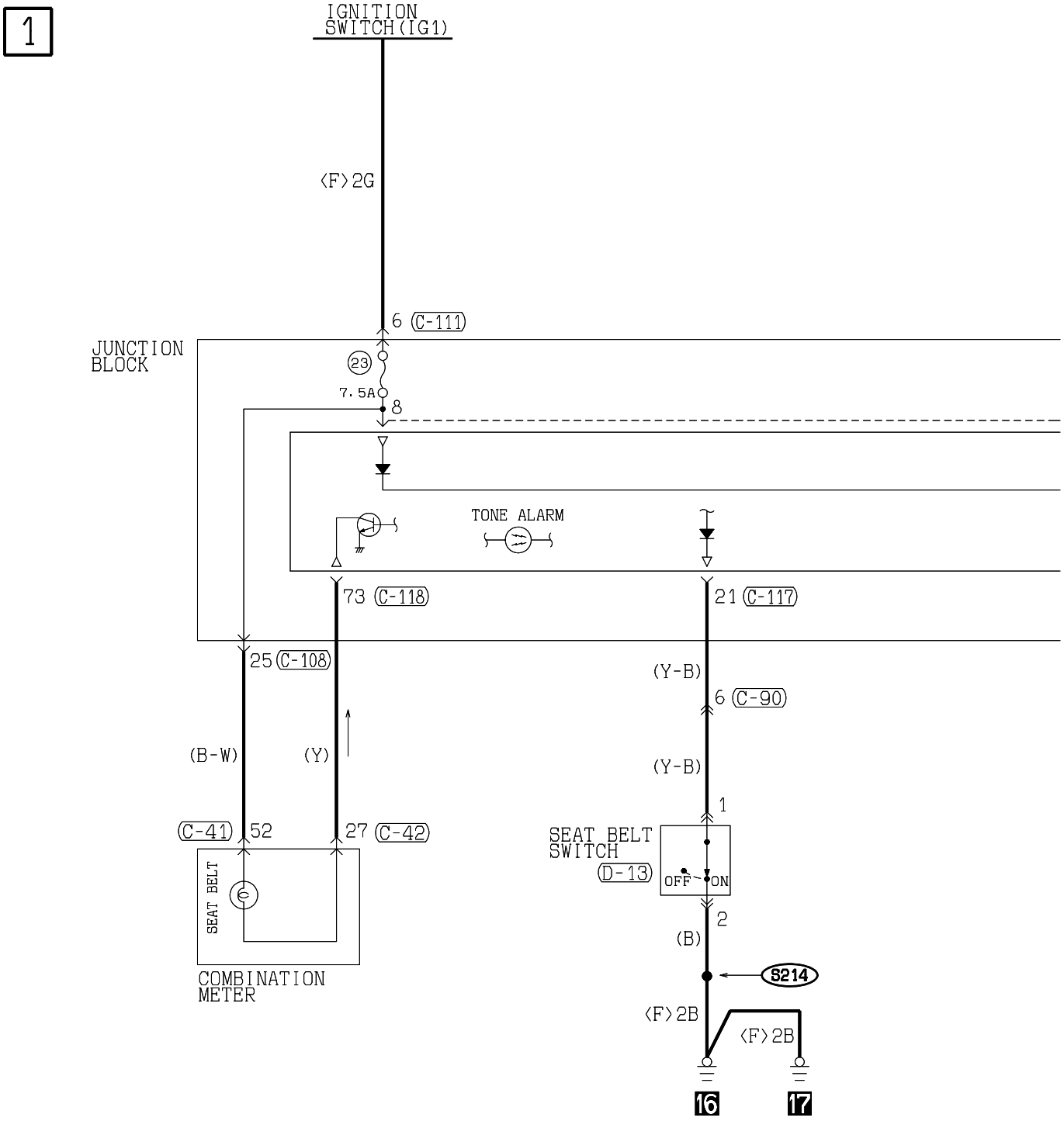
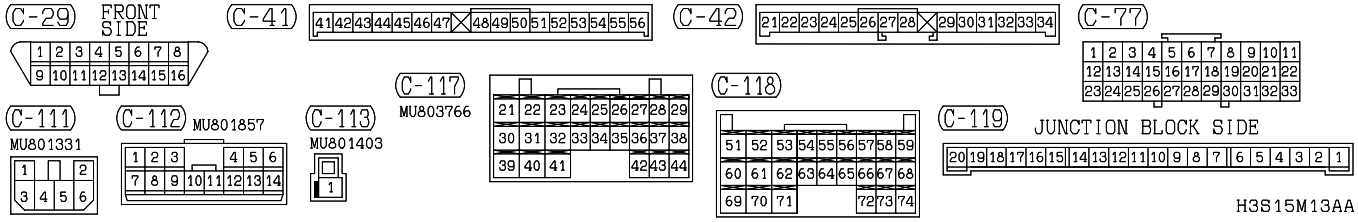


TSB Revision

SEAT BELT TONE ALARM

M1901011200318





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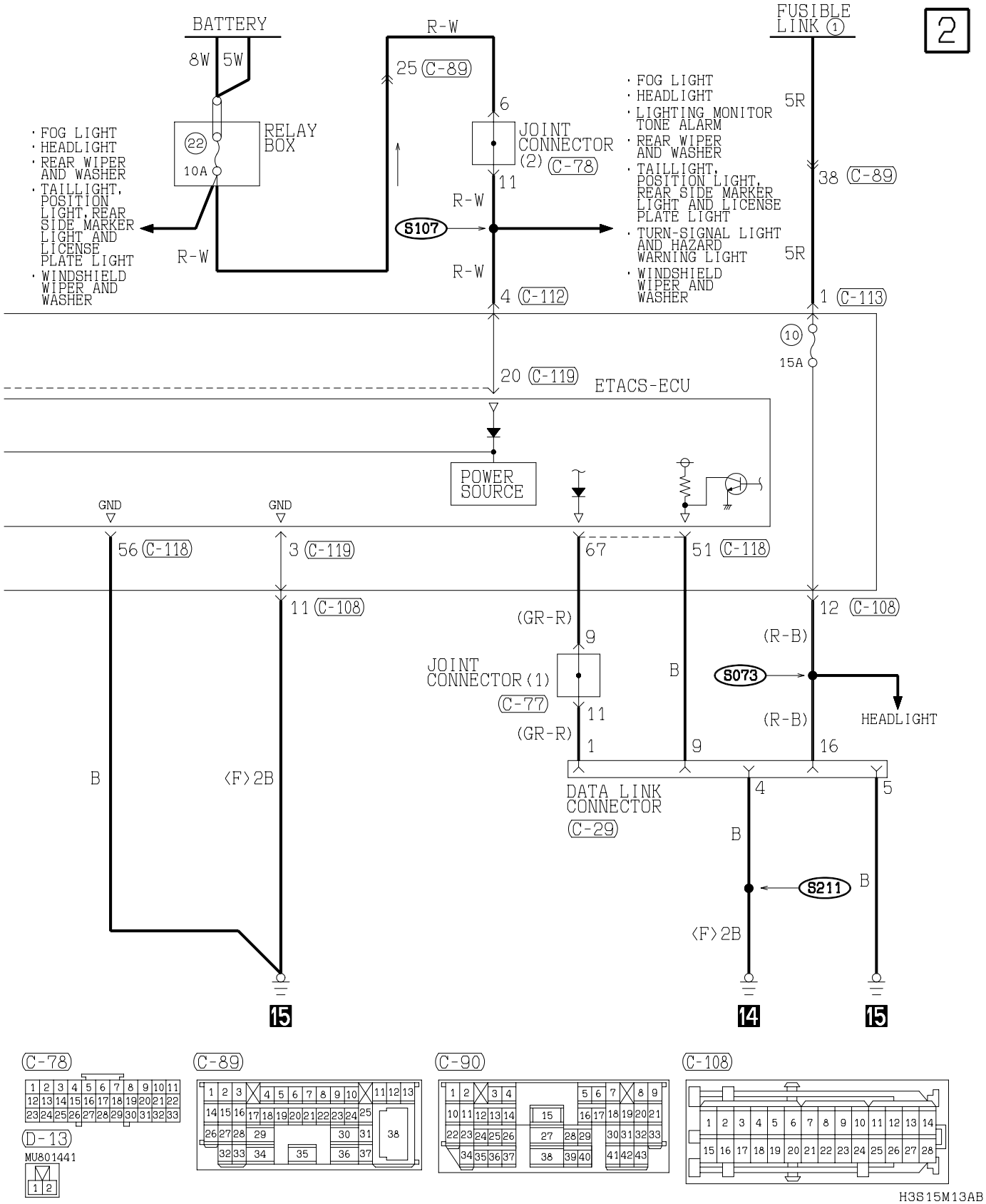

TSB Revision

IMMOBILIZER SYSTEM <2.4L ENGINE-M/T>

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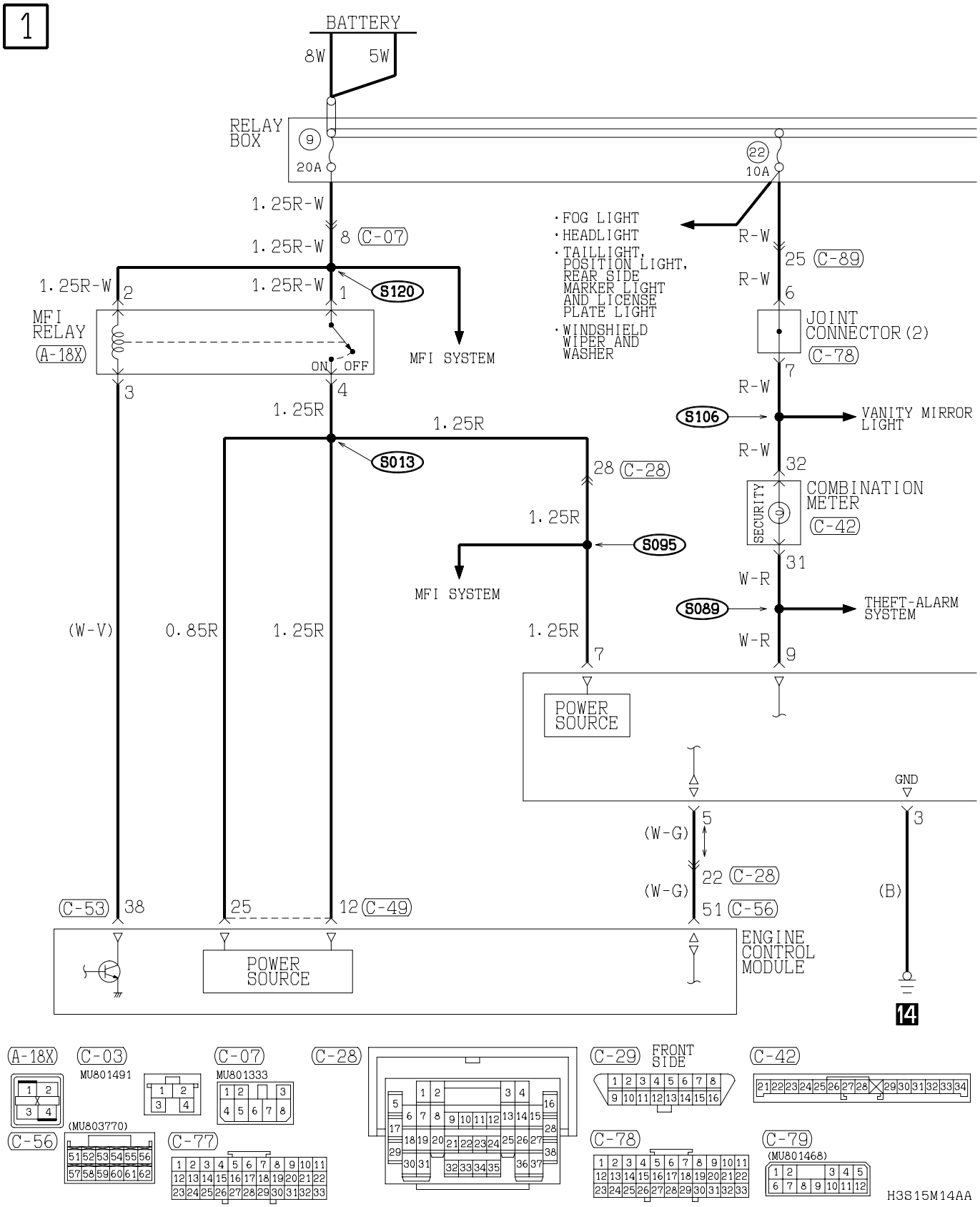

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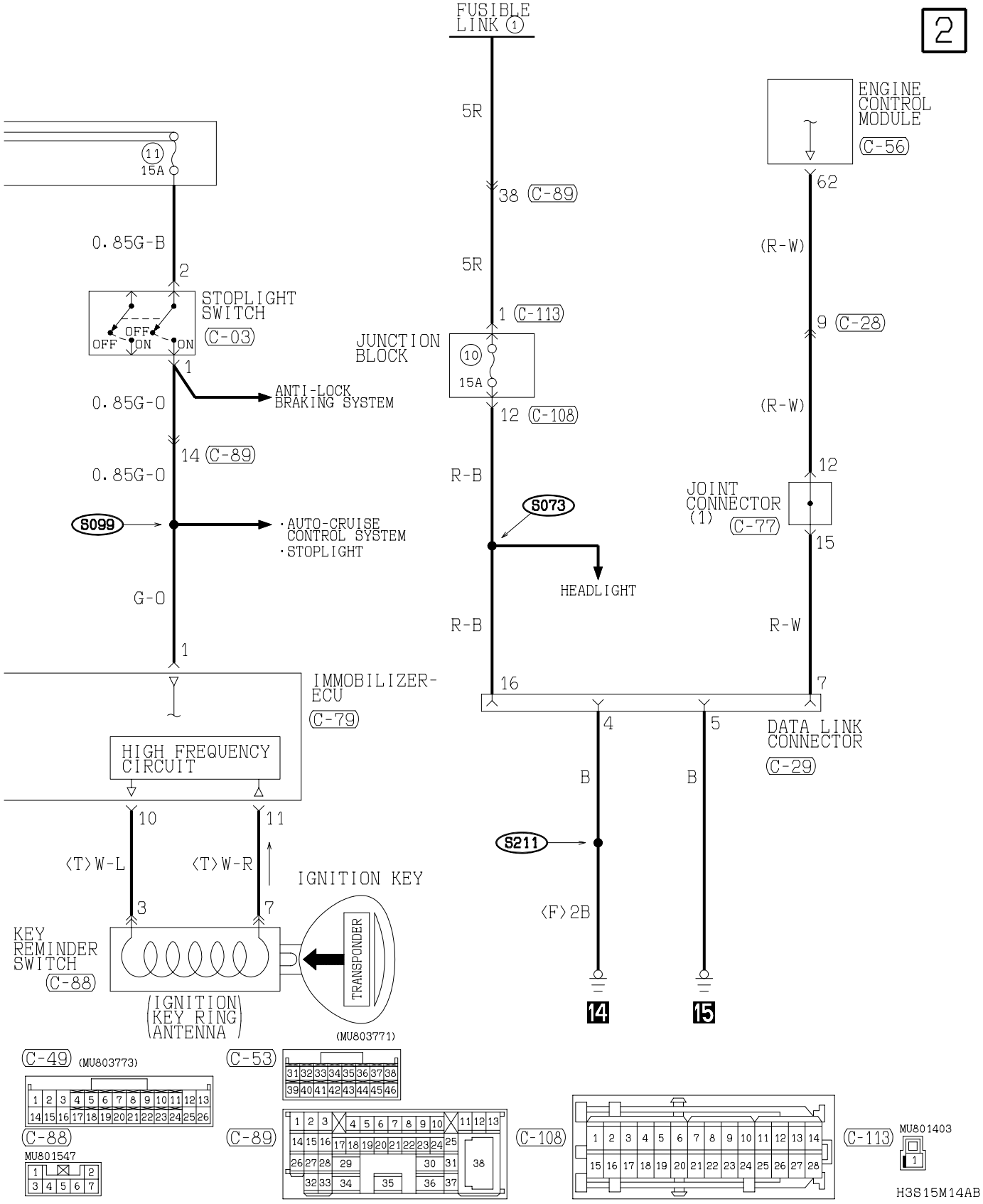

TSB Revision

IMMOBILIZER SYSTEM <2.4L ENGINE-A/T>

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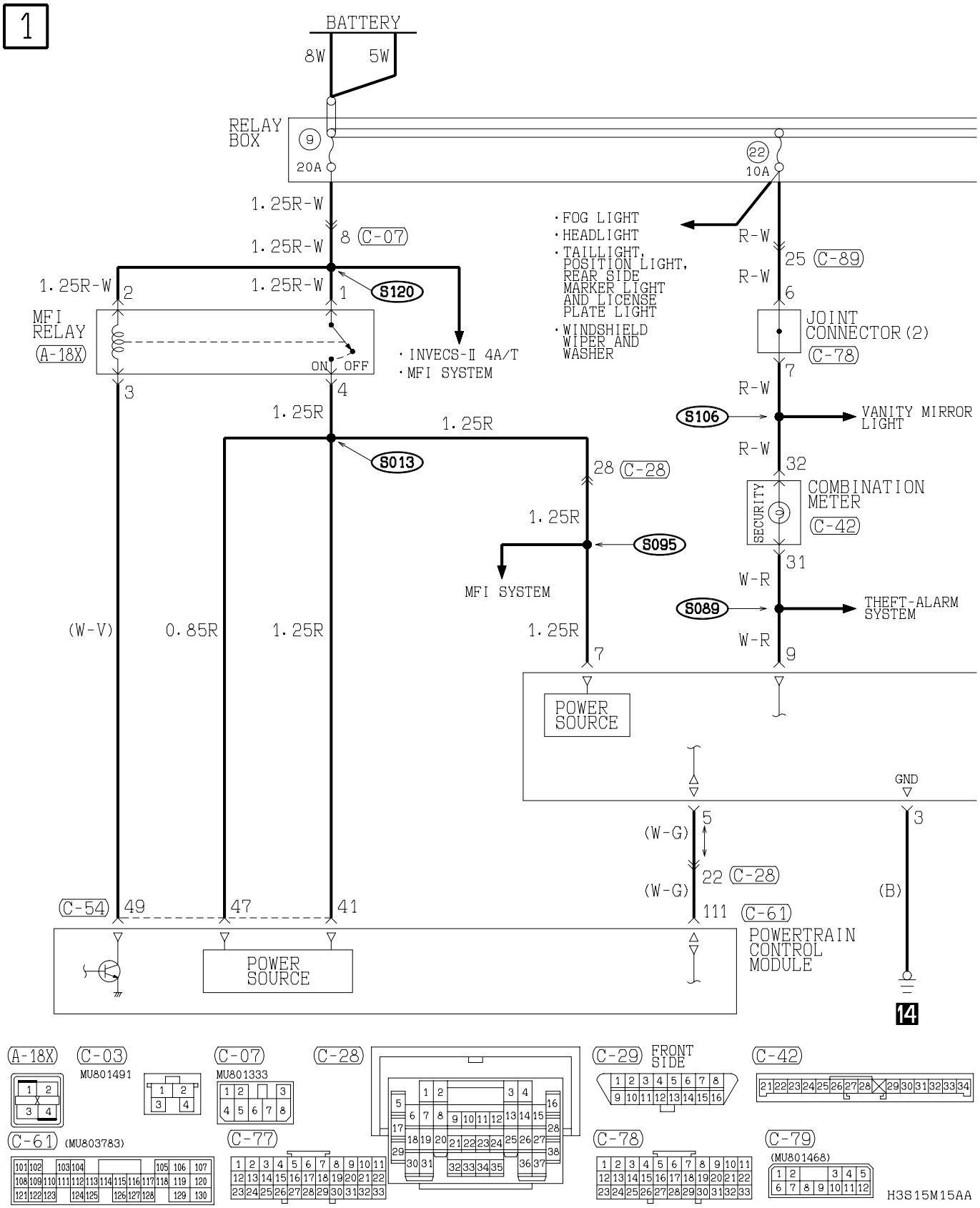

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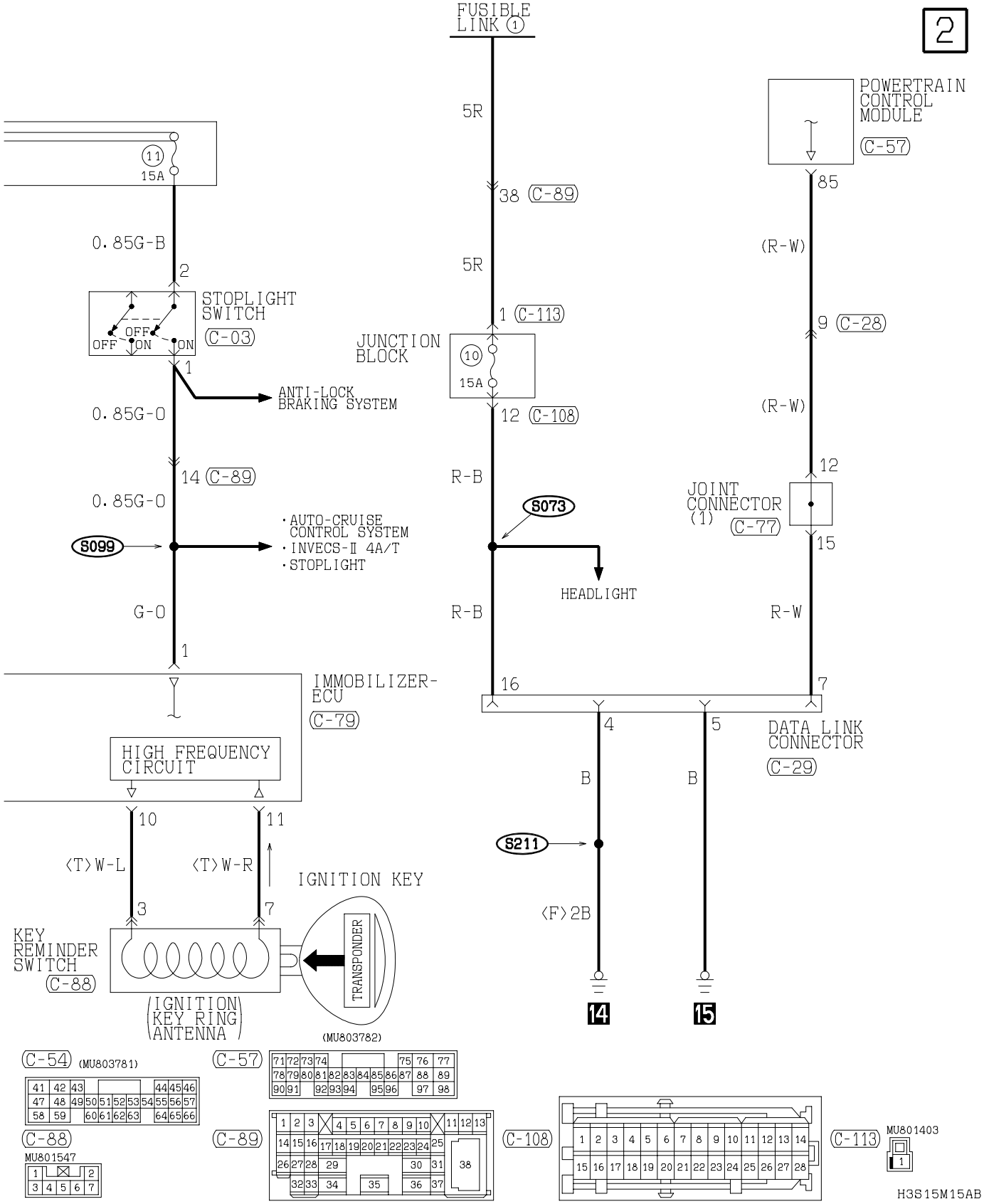

TSB Revision

IMMOBILIZER SYSTEM <3.0L ENGINE-M/T>

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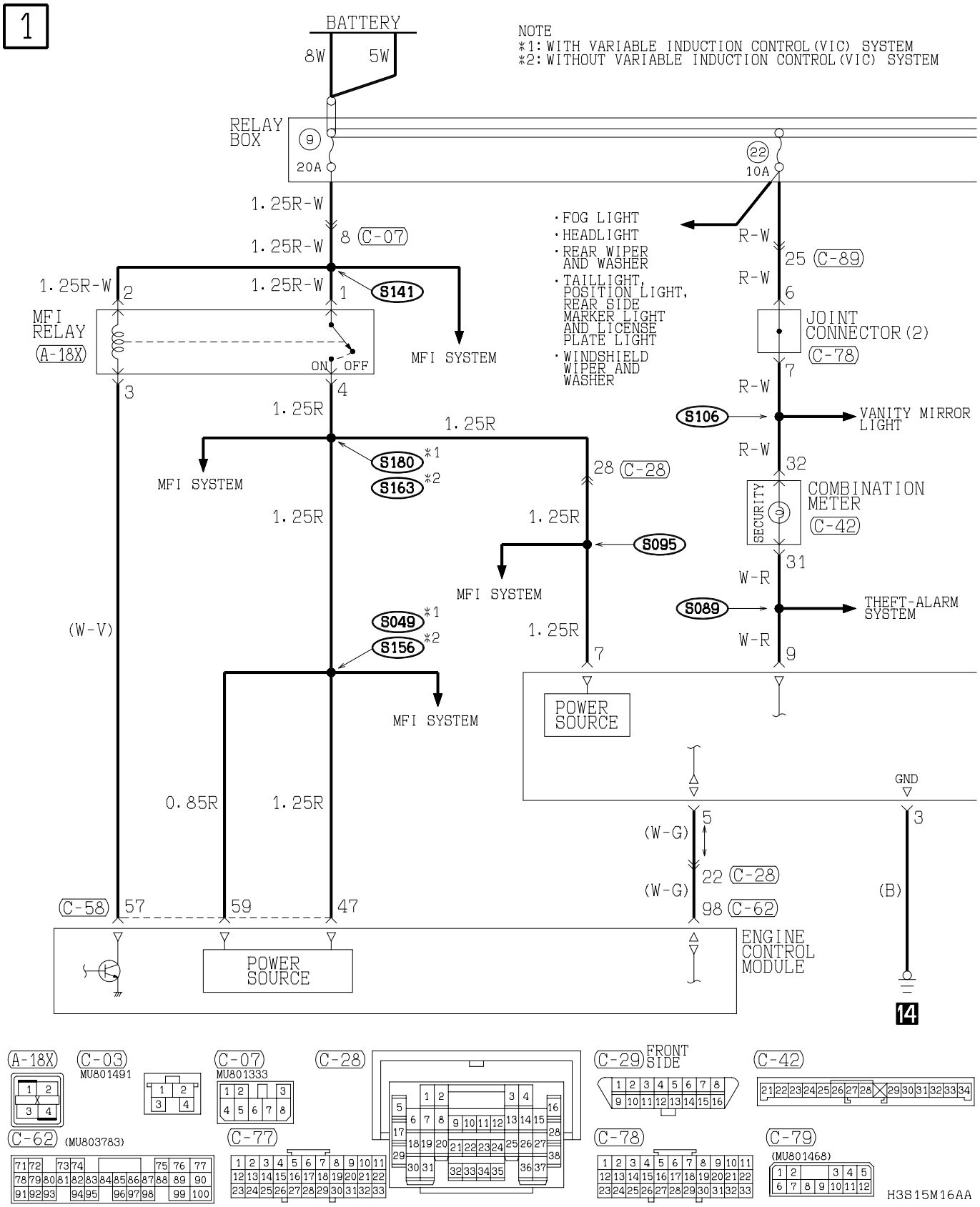

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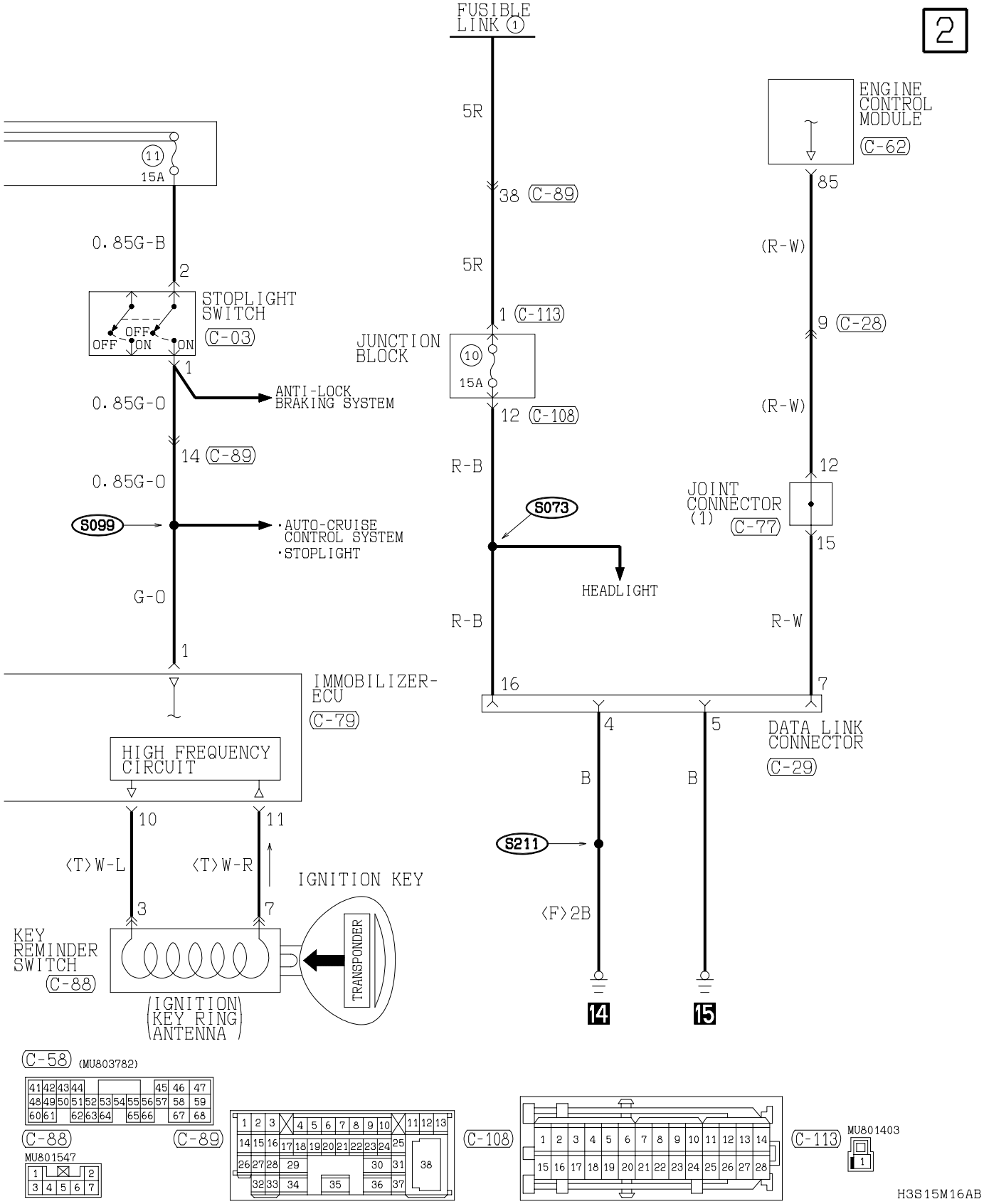

TSB Revision

IMMOBILIZER SYSTEM <3.0L ENGINE-A/T>

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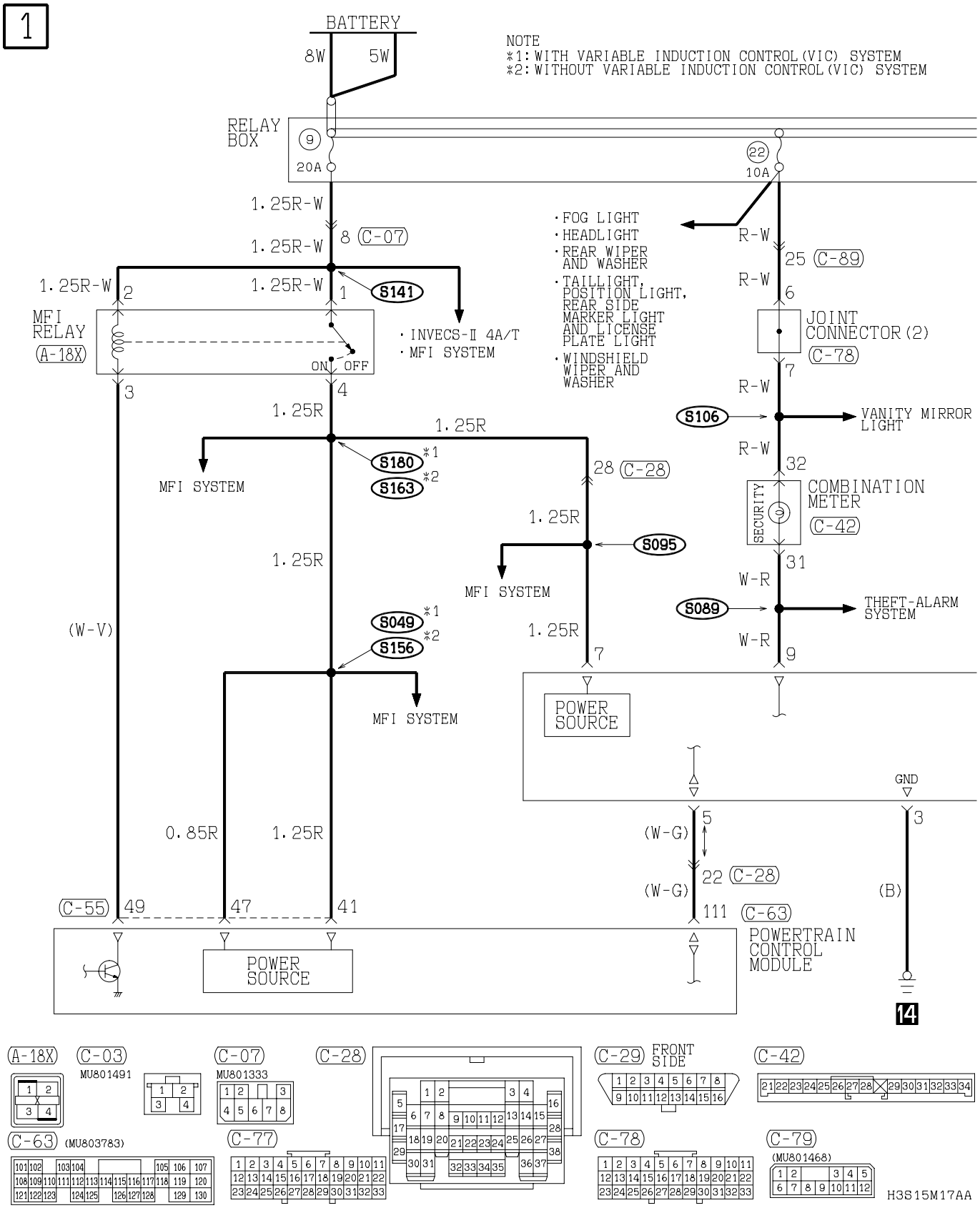

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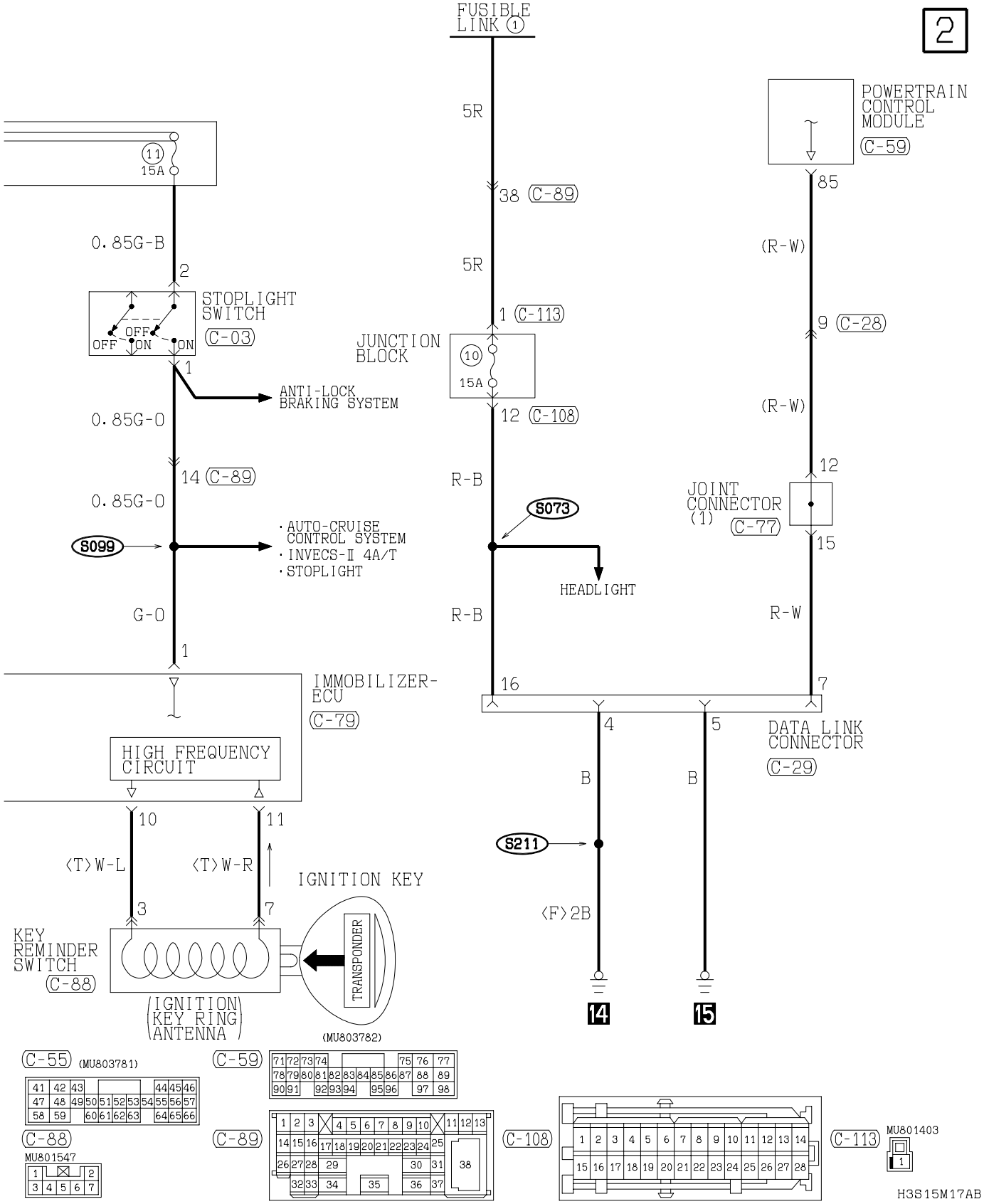
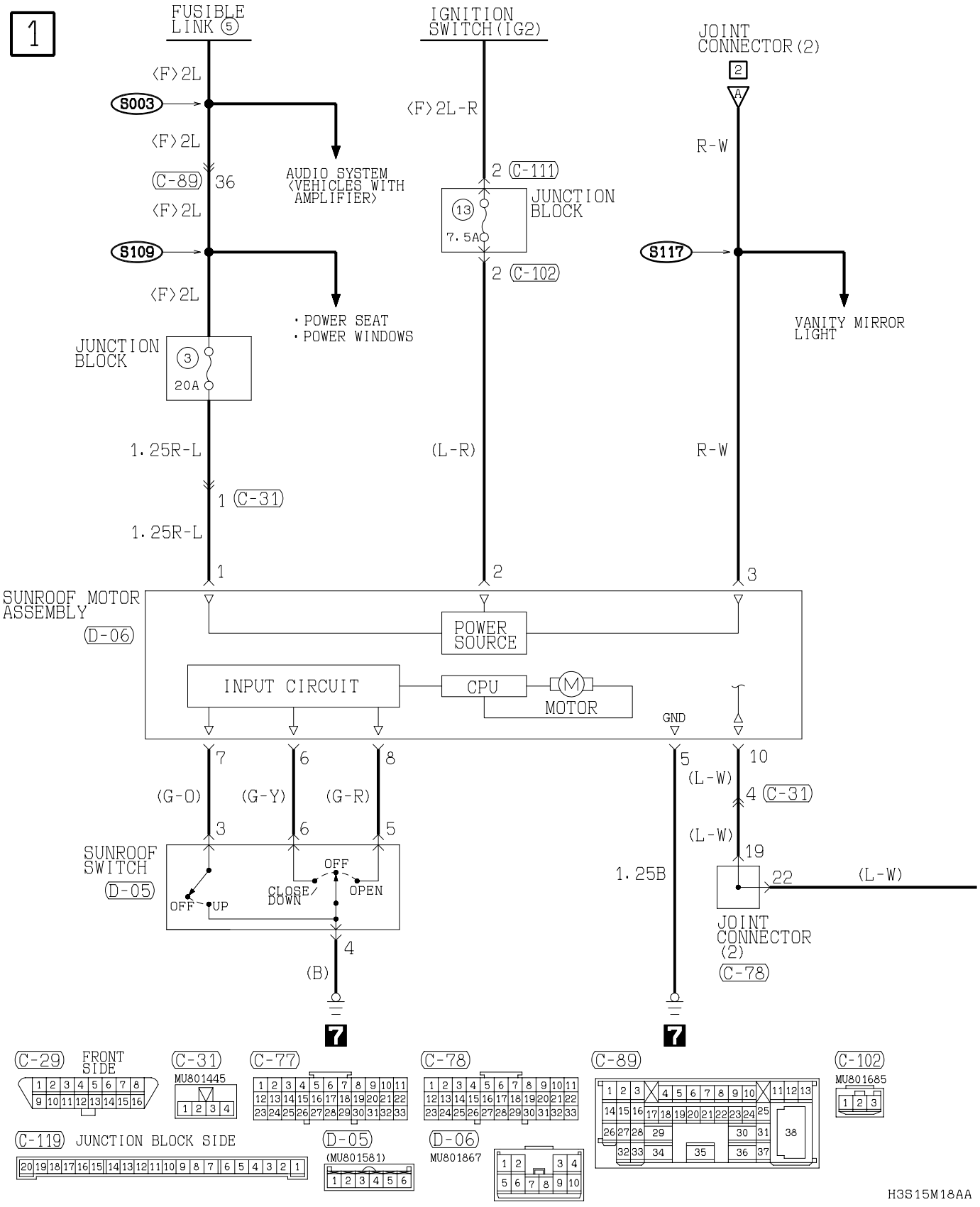


TSB Revision

SUNROOF

M1901009900280



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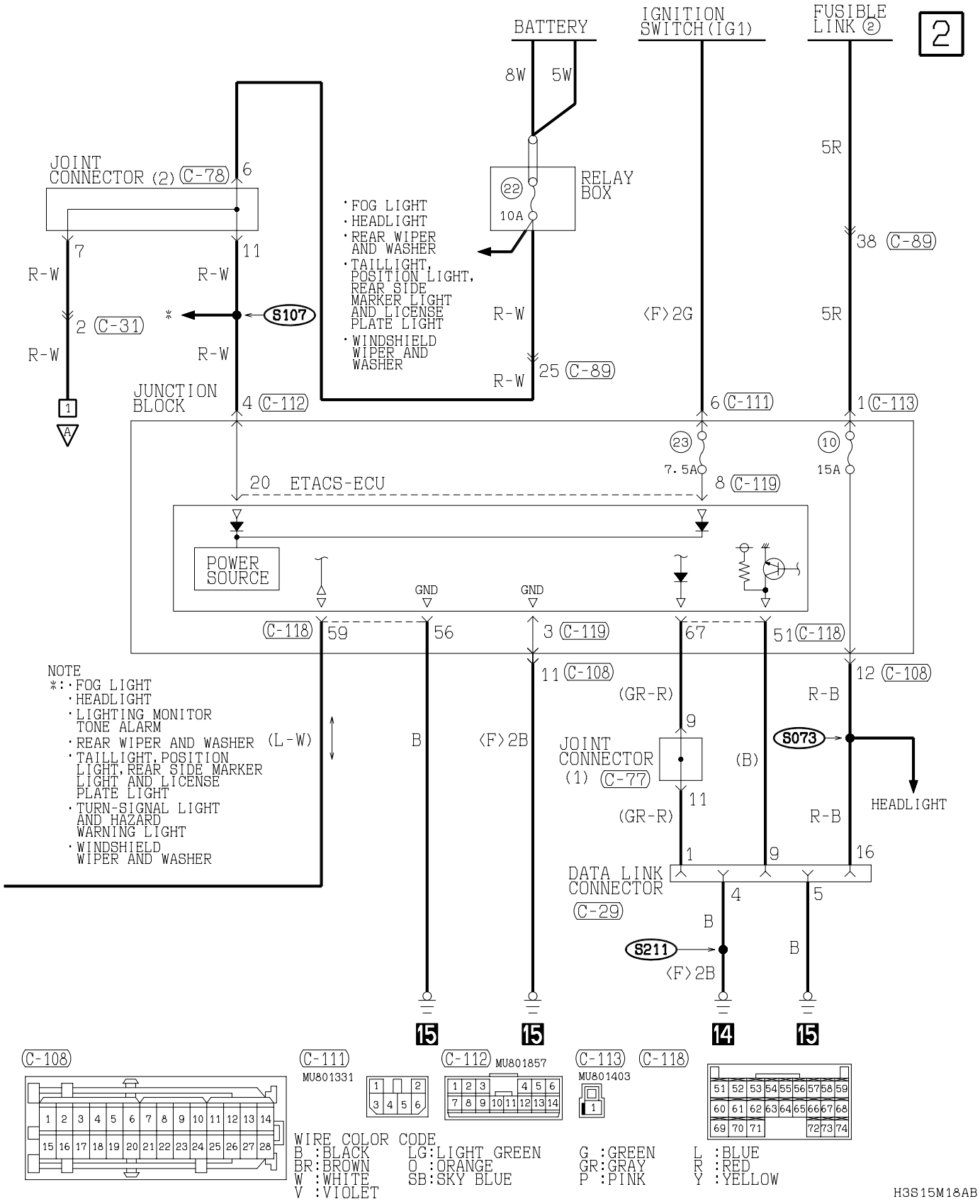
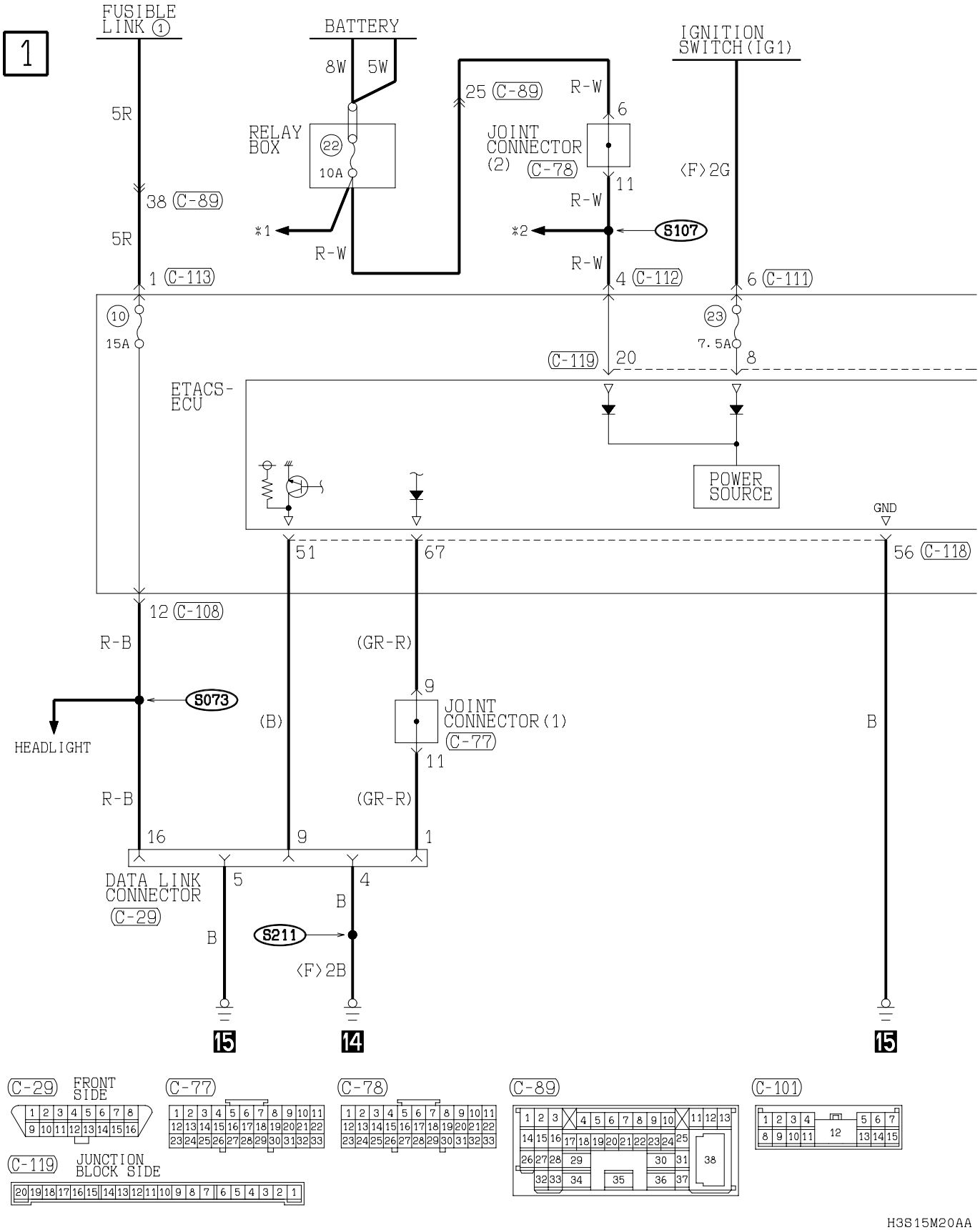


TSB Revision

CONVERTIBLE TOP

M1901015000060



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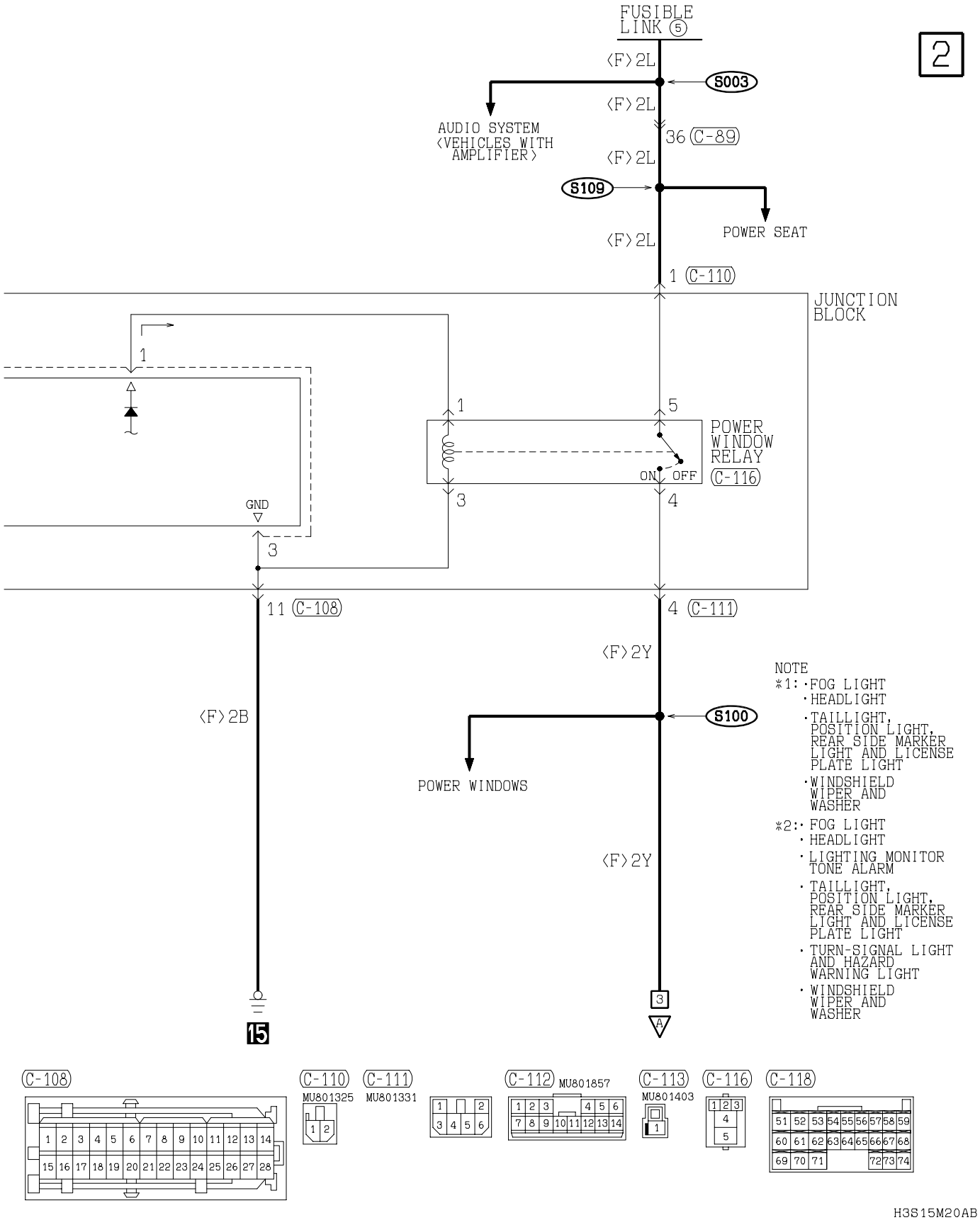
TSB Revision



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TSB Revision

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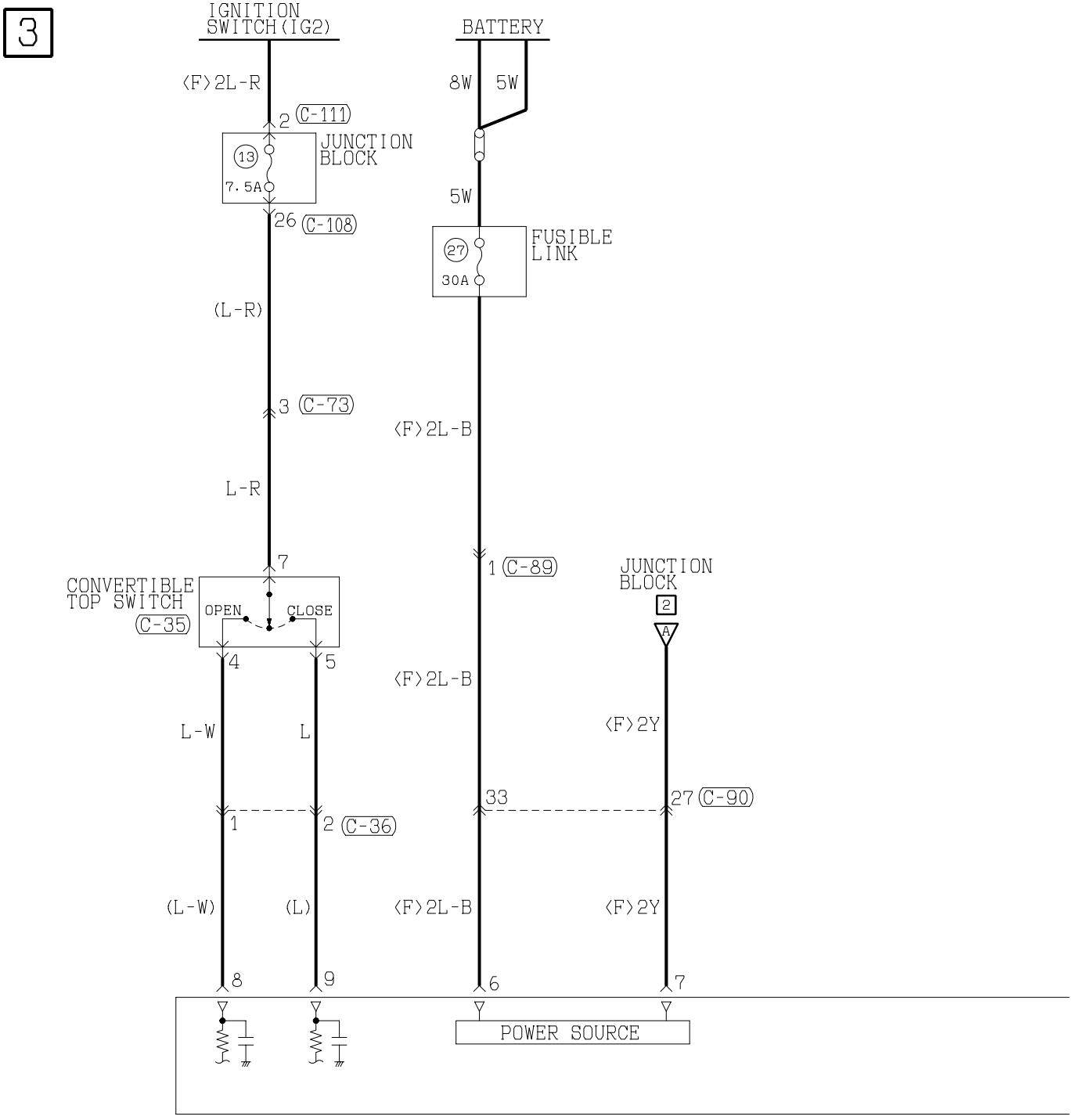

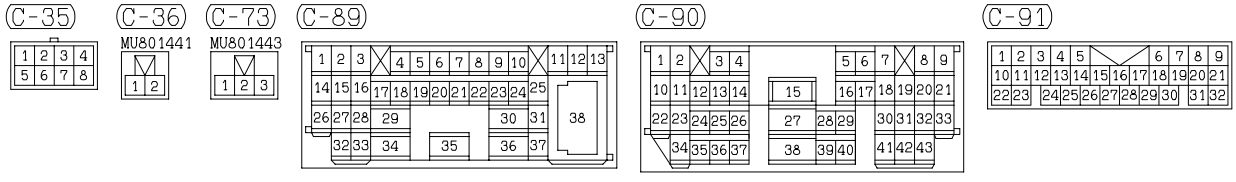

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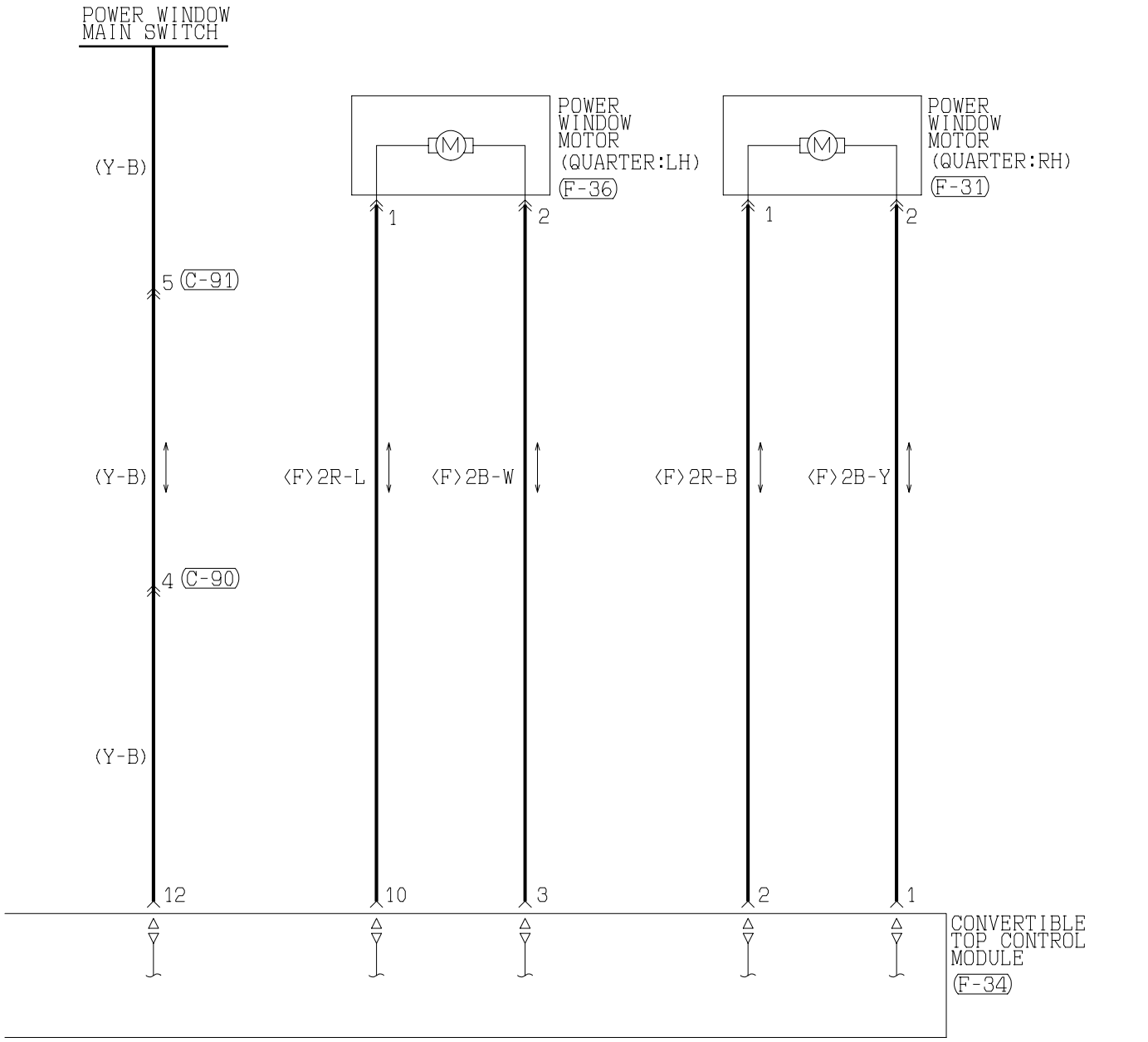

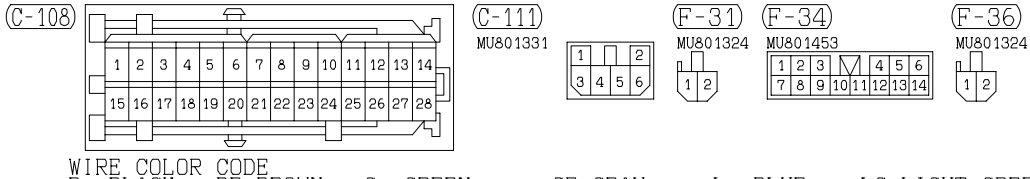

WIRE COLOR CODE

B :BLACK	BR:BROWN	G :GREEN	GR:GRAY	L :BLUE	LG:LIGHT GREEN	O :ORANGE
P :PINK	R :RED	SB:SKY BLUE	V :VIOLET	W :WHITE	Y :YELLOW	

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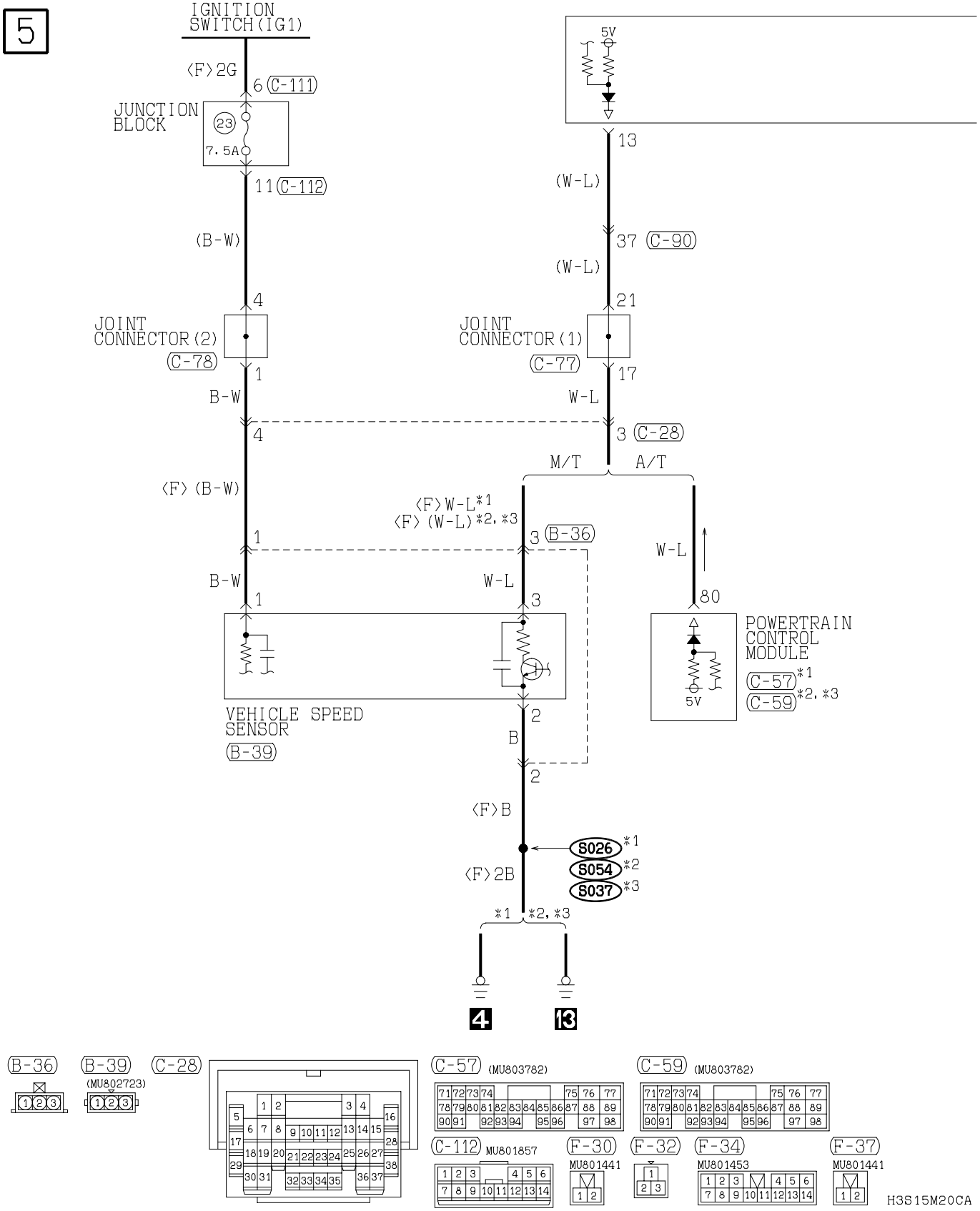

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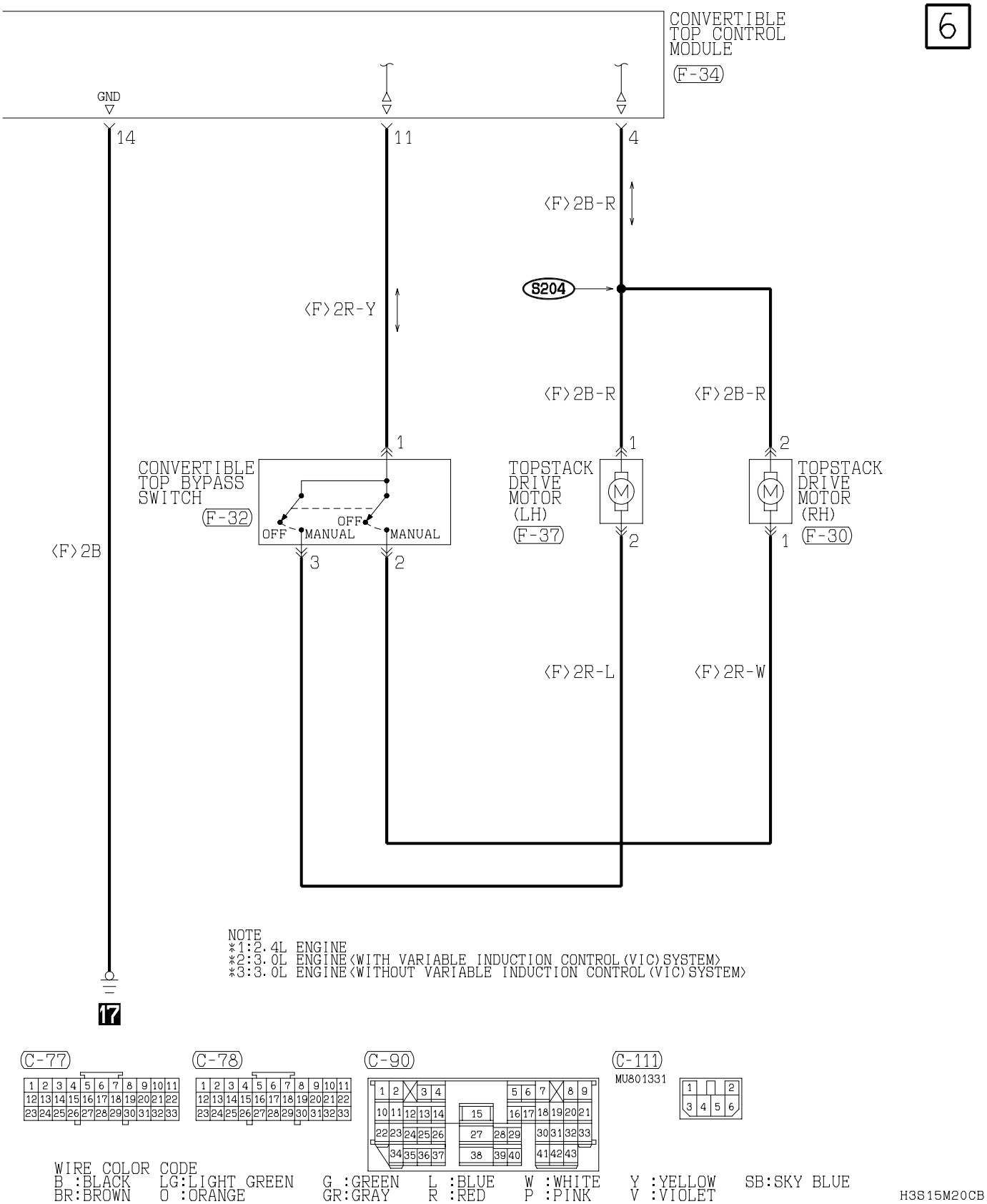

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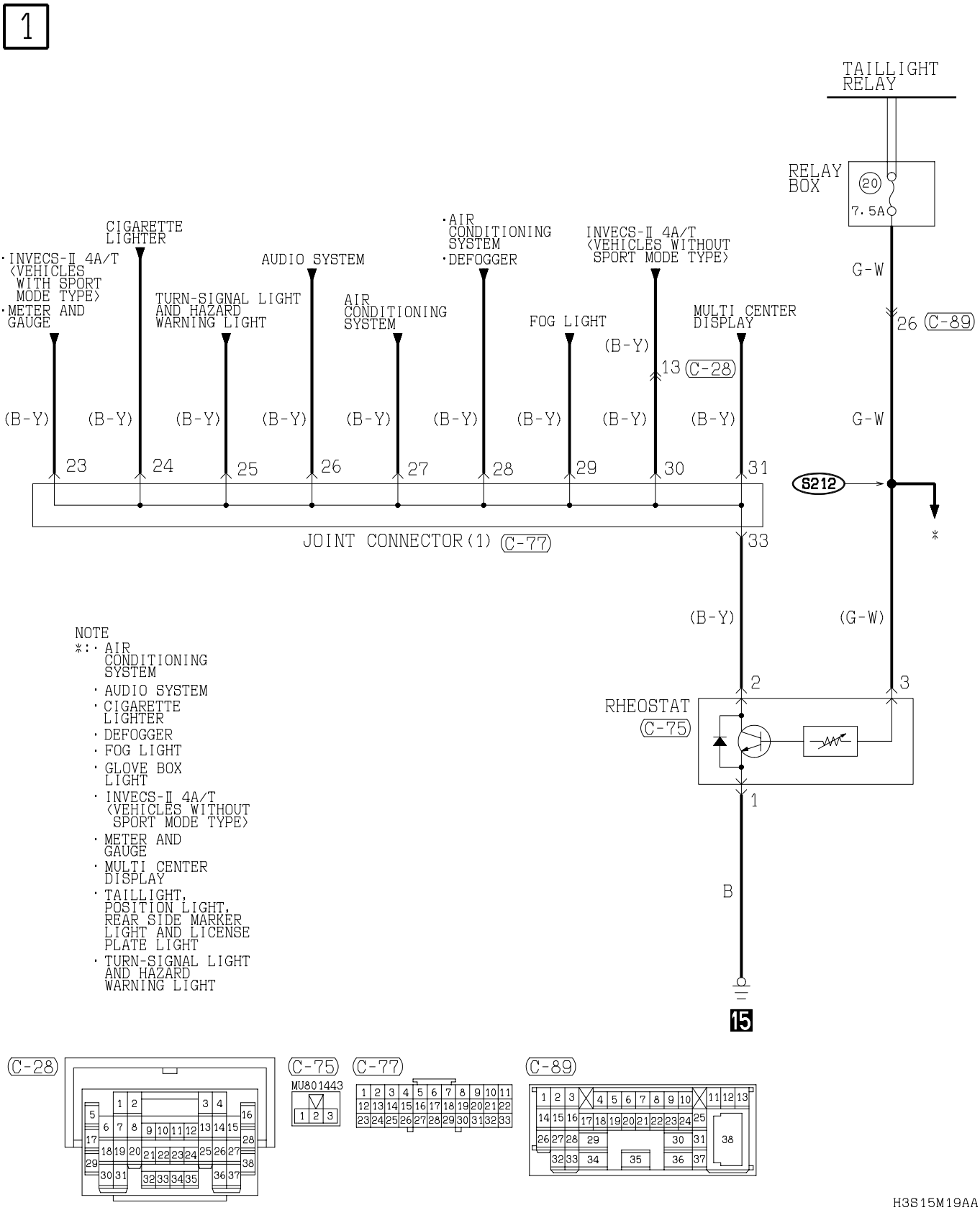

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