7C

TRANSFER CASE

Section

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1 General information

Four-wheel drive (4WD) models are equipped with a transfer case mounted on the rear of the transmission. Drive is transmitted from the engine, through the transmission and the transfer case, to the front and rear axles by driveshafts.

Here is a list of the transfer cases available on the vehicles covered by this manual:

Manual transfer case
- New Venture - NVG 261 NP2

Automatic transfer cases
- New Venture - NVG 236 NP8
- New Venture - NVG 246-NP8
- New Venture - NVG 149-NP
- New Venture - NVG 149-NP3
- New Venture - NVG 263-NP1
- New Venture - NVG 261-NP2
- Borg Warner - BW 4481-NR3
- Borg Warner - BW 4482-NR4

The manual shift transfer case has four gear selections; 2WD High, 4WD High, 4WD Low and Neutral. The automatic shift transfer case has five gear selections, depending on model; 2WD High, 4WD High, 4WD Low, Neutral and automatic four wheel drive (A4WD).

Avalanche models are equipped with selectable 4WD automatic transfer cases. The New Venture Gear (NVG) 246-NP8 is a part-time transfer case with selectable all-wheel drive (Auto 4WD). In this mode, the on-board computer utilizes sensor information to program all-wheel drive response from the transfer case and driveaxles. The Borg Warner (BW) 4481-NR3 is a one-speed all wheel drive transfer case that utilizes a planetary type differential to distribute a 40/60 torque split, front/rear. The BW 4482-NR4 is a two-speed all wheel drive transfer case that utilizes two different sets of planetary gears to distribute the torque to the driveaxles.

The NVG 149-NP3 is a single speed (single mode), all-wheel drive transfer case that is equipped with a viscous coupling. Once the viscous coupling detects wheel speed slipping, silicone fluid inside the viscous coupling heats from the resistance allowing lock-up between the plates. Torque bias is distributed by a planetary differential gear.

We don't recommend trying to rebuild any of these transfer cases at home. They're difficult to overhaul without special tools, and rebuilt units are available for less than it would cost to rebuild your own. However, there are a number of components that you can check, adjust and/or replace - and those are the items covered in this Chapter.

MANUAL SHIFT-ON-THE-FLY (MSOF) SYSTEM

The manual shift-on-the-fly (MSOF) system allows the driver to manually select one of four ranges: 2WD High, 4WD High, 4WD Low or Neutral. The driver can switch between 2WD High and 4WD High at speeds up to 55 mph (up to 45 mph at temperatures below 32 degrees F). 4WD Low or Neutral can only be engaged or disengaged with the vehicle slowed to a roll at a speed of under three mph and shifting the transmission in Neutral or depressing the clutch pedal on manual transmission equipped vehicles, (this is not a synchronized shift).

When shifting from 2WD to 4WD, the 4WD indicator light on the dash is illuminated and the transfer case switch sends a signal to the front axle shift motor to engage the axle and lock the front driveaxles together.

ELECTRONIC SHIFT-ON-THE-FLY (ESOF) SYSTEM

The electronic shift-on-the-fly (ESOF) system allows the driver the same four ranges (2WD High, 4WD High, 4WD Low or Neutral) as the MSOF system with an additional (fifth) 4WD option called, automatic four-wheel-drive (A4WD). The same rules apply for shifting from 2WD High to 4WD High, and for shifting to 4WD Low or Neutral. However, the means by which a shift is initiated is electronic. Shifting into A4WD range requires the same procedure as shifting into 2WD High or 4WD High where the driver can switch the transfer case into A4WD at speeds up to 55 mph (up to 45 mph at temperatures below 32 degrees F). When shifting into 4WD Low the driver must wait until the 4WD Low light stops blinking and becomes fully illuminated before shifting the transmission into gear.

When any range is selected at a switch on the dash, the transfer case shift control module receives a voltage signal commanding it to energize the transfer case shift motor, thus rotating the sector shaft (clockwise or counterclockwise) and shifting the transfer case into the appropriate gear. After the transfer case is positioned in the appropriate gear, the transmission control module will send a signal to engage the front axle. The transfer case encoder is mounted to the shift motor and is used to relay sector shaft position back to the transfer case shift control module. The transfer case also incorporates a motor lock to assure that the transfer case remains in the current gear position. When the A4WD button is depressed the motor lock remains in adaptive mode so it can be applied or released as the transfer case shift control module determines whether the vehicle should be placed in 2WD or 4WD.

The automatic four-wheel-drive (A4WD) feature allows the transfer case to shift from 2WD High to 4WD High under varying road conditions. When the transfer case shift control module receives rotating wheel slip information from speed sensors mounted at the front and rear output shafts of the transfer case, the shift control module will engage the shift control motor to shift the transfer case from 2WD to 4WD. When the shift control module receives information that wheel rotation is the same at both axles, it will send a signal to the shift control motor to shift the transfer case back into 2WD.

A handy feature of the NVG 263-NP1 transfer case is that it has a Neutral position. In this position, the transmission and transfer case are not forced to rotate when the vehicle is being towed, saving wear and tear on these components. To engage Neutral, push both the 4Lo and 2Hi buttons at the same time, and hold for ten seconds. A red Neutral light will come on at the switch panel to the left of the steering wheel.

2 Shift lever (manual-shift models) - removal and installation

1 Raise the front of the vehicle and support it securely on jackstands.

2 Working under the vehicle, detach the shift linkage from the shift control lever. This is accomplished by simply pulling the shift linkage ball socket off the shift lever ball pivot.

3 Working in the passenger compartment of the vehicle, unscrew the shift lever knob.

4 Remove the shift lever bezel retaining screws and remove the bezel.

5 Remove the shift lever retaining bolts and remove the shift lever.

6 Installation is the reverse of removal.

3 Shift linkage (manual-shift models) - adjustment

1 Place the shift lever in the 2WD High position. Have an assistant hold the lever in the indicated position, or tape it in place.
2 Raise the vehicle and support it securely on jackstands.
3 Loosen the adjustment bolt at the center of the shift linkage.
4 Make sure the ball sockets at each end of the shift linkage are securely seated on the ball pivots at the transfer case and the shift lever.
5 Verify that the transfer case range lever is in the 2WD High position.

➡Note: When the transfer case range lever is in the 2WD High position on the NVG 261 transfer case, it will be positioned in the third detent from the rear (two clicks from the rearmost position).

6 Tighten the shift linkage adjustment bolt to the torque listed in this Chapter's Specifications.
7 Lower the vehicle and check the operation of the transfer case.

4 Transfer case control switch (electric-shift models) - replacement

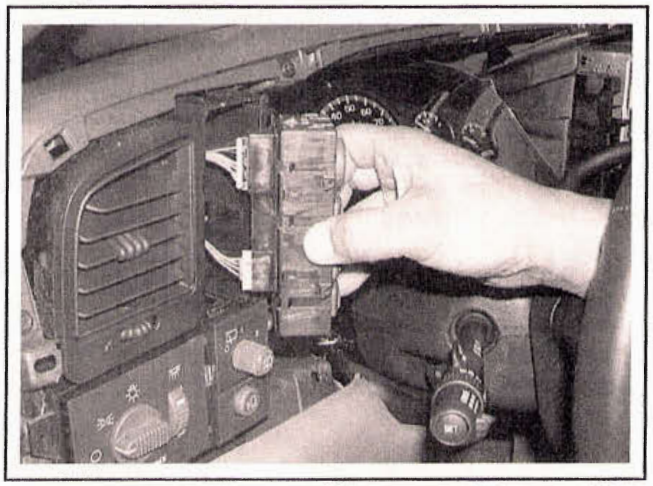
Refer to illustration 4.3

1 Disconnect the cable from the negative terminal of the battery.

CAUTION:

On models equipped with the Theftlock audio system, be sure the lockout feature is turned off before performing any procedure which requires disconnecting the battery (see the front of this manual).

2 Remove the instrument cluster bezel (see Chapter 11).
3 Pull out the retaining tabs and remove the transfer case control switch from the instrument panel (see illustration).
4 Unplug the electrical connectors from the rear of the switch and remove the switch from the vehicle.
5 Installation is the reverse of removal.

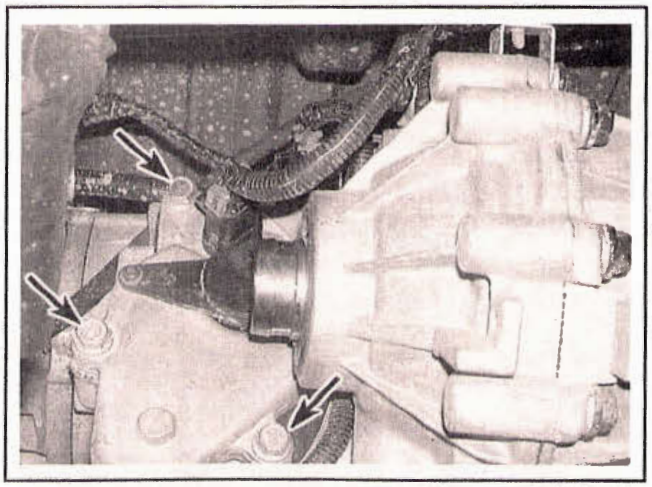


4.3 Lift up the retaining tabs and pull the transfer case control switch out of the instrument panel, then disconnect the electrical connectors

5 Transfer case shift motor (electric-shift models) - replacement

Refer to illustration 5.5

1 Raise the vehicle and place it securely on jackstands.
2 Remove the stone shields from below the transfer case.
3 Remove the front driveshaft (see Chapter 8).
4 Unplug the shift motor electrical connector.
5 Detach the retaining bolts and remove the electric shift motor and encoder assembly (see illustration).
6 Inspect the rubber gasket for tears and cracks and replace it if necessary. If the gasket is good it can be reused.
7 Position the gasket and the shift motor in place on the transfer case and install the bolts. Tighten the shift motor retaining bolts to the torque listed in this Chapter's Specifications.
8 Installation is the reverse of removal.

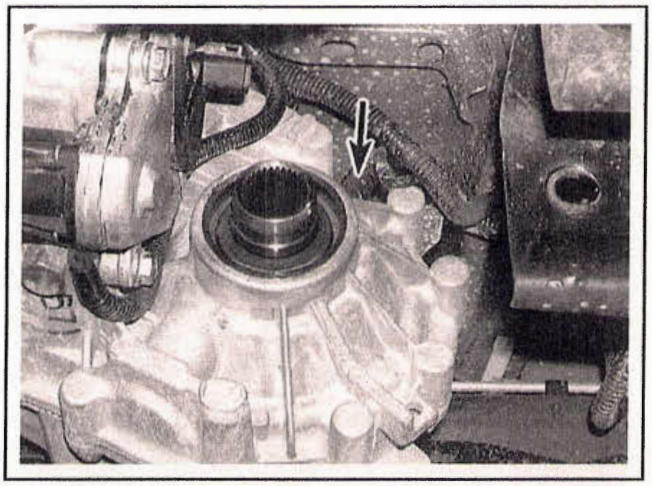


5.5 Disconnect the electrical connector and remove the electric shift motor retaining bolts (arrows)

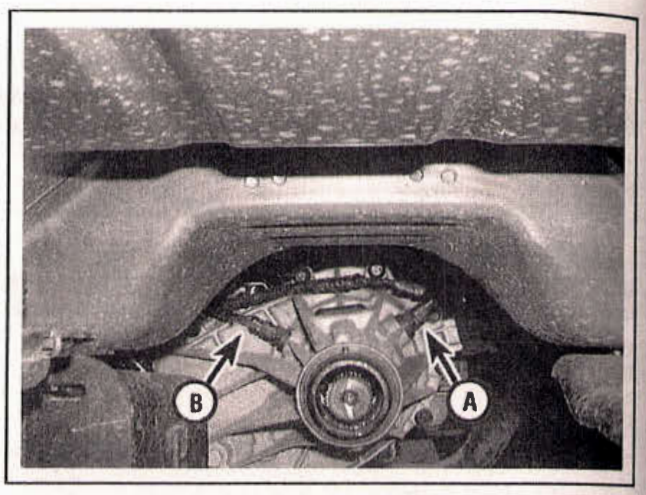
6 Transfer case speed sensors (electric shift models) - general information

Refer to illustrations 6.1a and 6.1b

There are a variety of electric-shift transfer cases on the models covered by this manual and several different combinations of speed sensors available. Early electric-shift transfer cases are equipped with three sensors; input and output shaft speed sensors and a vehicle speed sensor (VSS) (see illustrations). The vehicle speed sensor (VSS) sends information to the PCM for the driveability program and is located at the rear output shaft. Later transfer case technology combines these sensors into one or two sensors for gathering data for the computer. The procedure for checking and replacement of the output shaft speed sensor is essentially the same as the procedure for the vehicle speed sensor (VSS). A scan tool can easily access speed sensor data and trouble codes. Refer to the vehicle speed sensor (VSS) replacement procedure in Chapter 6.



6.1a Location of the transfer case front output shaft speed sensor on an NVG 246 transfer case



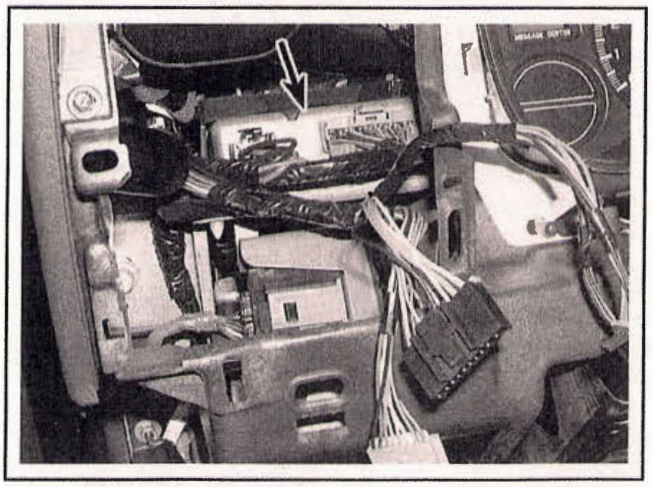
6.1b Location of the transfer case rear output shaft speed sensor (A) and the vehicle speed sensor (B) on early 4WD models

7 Transfer case control module (electric-shift models) - replacement

Refer to illustration 7.1

1 The transfer case control module is located under the left side of the instrument panel, behind the headlight switch (see illustration).

2 Disconnect the cable from the negative terminal of the battery.



7.1 The transfer case control module (arrow) is located to the left of the instrument cluster behind the headlight switch

CAUTION:

On models equipped with the Theftlock audio system, be sure the lockout feature is turned off before performing any procedure which requires disconnecting the battery (see the front of this manual).

3 Remove the instrument panel cowl support bracket. Refer to Chapter 11 and read through the entire instrument panel removal procedure before attempting to remove it. The instrument panel removal procedure is quite lengthy and can be particularly difficult for a beginner. Perform only the steps necessary to remove the plastic cowl support bracket surrounding the instrument cluster.

➡Note: On 2001 and later models, only the instrument cluster bezel needs to be removed to replace the transfer case shift control module.

4 Once the instrument panel cowl support bracket is removed from the vehicle, disconnect the electrical connectors from the control module.

5 Slide the transfer case control module out of its retaining bracket and remove it from the vehicle.

6 Installation is the reverse of removal.

8 Oil seal - replacement

Refer to illustrations 8.3a, 8.3b, 8.4a, 8.4b, 8.6a and 8.6b

Note: This procedure applies to both the front and rear output shaft seals.

1 Raise the vehicle and support it securely on jackstands.

2 If you're replacing the front seal, remove the front driveshaft; if you're replacing the rear seal, remove the rear driveshaft (see Chapter 8).

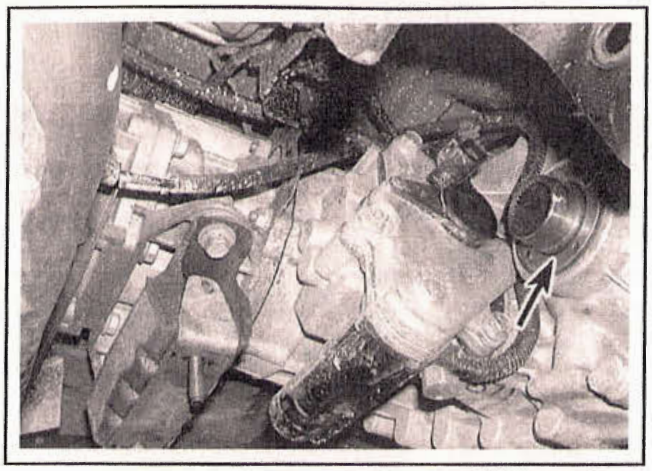
3 If you're replacing the front seal it will be necessary to obtain a slide hammer and remove the seal retainer (see illustrations).

4 To remove the either output shaft seal, simply pry the seal out with a screwdriver or a seal removal tool (see illustrations). Don't damage the seal bore.

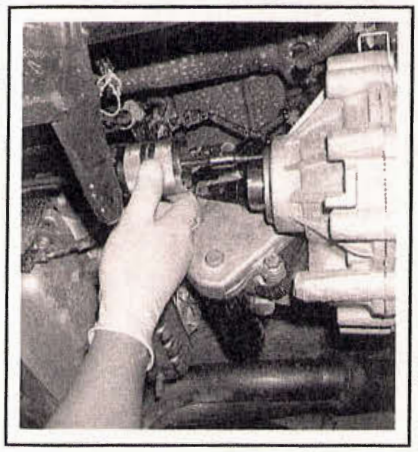
5 Lubricate the new seal lips with petroleum jelly.

6 Drive the seal into place with a seal driver or a large socket (see illustration). The outside diameter of the socket should be slightly smaller than the outside diameter of the seal. If you replaced the front seal, it will be necessary to drive the front seal retainer back into the transfer case housing in the same manner (see illustration).

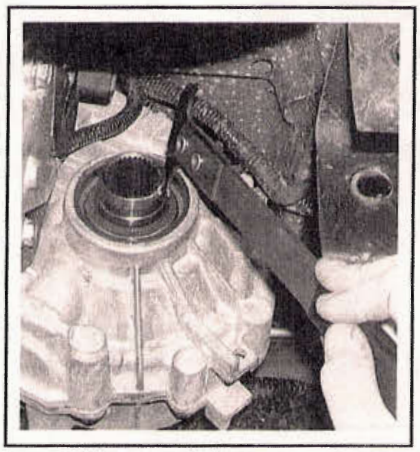
7 The remainder of installation is the reverse of removal.



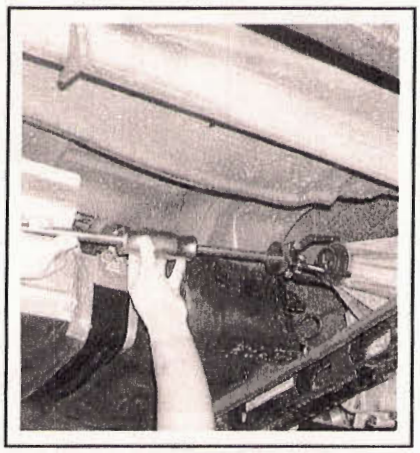
8.3a When removing the transfer case front oil seal retainer (arrow) it will be necessary to support the transmission with a jack and a block of wood, and remove the transmission crossmember - note the holes on the front of the seal retainer (this is where the hooked end of the slide hammer will be inserted)



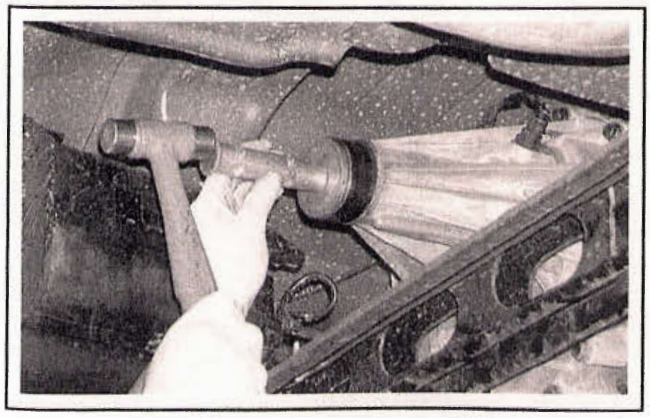
8.3b Using a slide hammer to remove the front seal retainer



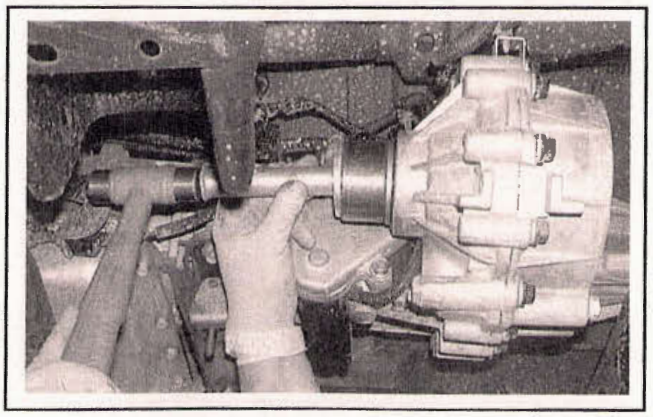
8.4a When removing the front output shaft seal it will be necessary to pierce the seal in order to get behind it and pry the seal out



8.4b The rear output shaft seal can be removed with conventional tools or a slide hammer with a three jaw adapter



8.6a Drive the new transfer case seals into place with a seal driver, large socket or section of tubing



8.6b The front oil seal retainer can be driven back into place in the same manner

9 Transfer case - removal and installation

Refer to illustrations 9.7a, 9.7b, 9.11a and 9.11b

1 Disconnect the cable from the negative terminal of the battery.

CAUTION:

On models equipped with the Theftlock audio system, be sure the lockout feature is turned off before performing any procedure which requires disconnecting the battery (see the front of this manual).

2 On models with a manually shifted transfer case, put the transfer case in 2WD High position.

3 Raise the vehicle and support it securely on jackstands.

4 Remove the stone shields (if equipped).

5 Drain the transfer case lubricant (see Chapter 1).

6 Remove the front and rear driveshafts (see Chapter 8).

7 Unplug all electrical connectors and detach the vent hose from the top of the transfer case (see illustrations).

8 On manually shifted models, disconnect the shift linkage from the transfer case. This is accomplished by simply pulling the shift linkage ball socket off the ball pivot on the transfer case shift lever.

9 Remove any transmission-to-transfer case support braces. Raise the transmission enough to remove the transmission mount (see Chapter 7A or 7B), then support the transmission on a jack or jack-stands.

10 Support the transfer case with a jack - preferably a special jack made for this purpose. Safety chains will help steady the transfer case on the jack.

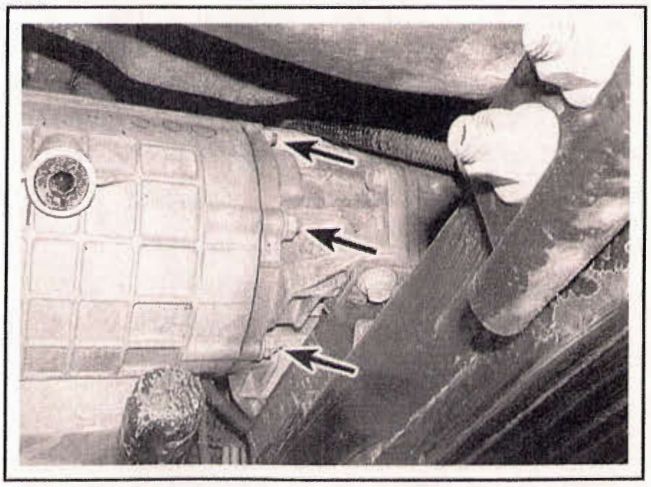
11 Remove the transmission-to-transfer case nuts (manual transmission) or the adapter-to-transfer case nuts (automatic transmission) (see illustrations). Don't lose the washers.

12 Make a final check that all wires and hoses have been disconnected from the transfer case, then move the transfer case and jack toward the rear of the vehicle until the transfer case is clear of the transmission. Keep the transfer case level as this is done. Once the input shaft is clear, lower the transfer case and remove it from under the vehicle.

13 Installation is the reverse of removal. Be sure to tighten the transmission-to-transfer case nuts to the torque listed in this Chapter's Specifications. On manually shifted models be sure adjust the transfer case shift linkage (see Section 3).

9.7a Detach the vent hose (arrow) from the top of the transfer case and the support bracket

9.7b Also detach any wiring harness retaining clips



9.11a Passenger side transfer case mounting nuts (arrows) (automatic transmission model shown)

9.11b Driver's side transfer case mounting nuts (arrows) (transmission crossmember removed for clarity)

10 Transfer case overhaul - general information

Overhauling a transfer case is a difficult job for the do-it-yourselfer. It involves the disassembly and reassembly of many small parts. Numerous clearances must be precisely measured and, if necessary, changed with select-fit spacers and snap-rings. As a result, if transfer case problems arise, it can be removed and installed by a competent do-it-yourselfer, but overhaul should be left to a transmission repair shop. Rebuilt transfer cases may be available - check with your dealer parts department and auto parts stores. At any rate, the time and money involved in an overhaul is almost sure to exceed the cost of a rebuilt unit.

Nevertheless, it's not impossible for an inexperienced mechanic to rebuild a transfer case if the special tools are available and the job is done in a deliberate step-by-step manner so nothing is overlooked.

The tools necessary for an overhaul include internal and external snap-ring pliers, a bearing puller, a slide hammer, a set of pin punches, a dial indicator and possibly a hydraulic press. In addition, a large, sturdy workbench and a vise or transmission stand will be required.

During disassembly of the transfer case, make careful notes of how each piece comes off, where it fits in relation to other pieces and what holds it in place. Note how parts are installed when you remove them; this will make it much easier to get the transfer case back together.

Before taking the transfer case apart for repair, it will help if you have some idea what area of the transfer case is malfunctioning. Certain problems can be closely tied to specific areas in the transfer case, which can make component examination and replacement easier. Refer to the Troubleshooting section at the front of this manual for information regarding possible sources of trouble.

Torque specifications	Ft-lbs (unless otherwise indicated)
Shift lever-to-floor pan bolts	108 in-lbs
Shift linkage adjustment bolt	132 in-lbs
Shift motor mounting bolts	18
Transfer case-to-transmission bolts	37
Transfer case-to-transmission support braces	37