10

SUSPENSION AND STEERING SYSTEMS

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1 General information

Refer to illustrations 1.1a, 1.1b, 1.4 and 1.5

FRONT SUSPENSION

The front suspension (see illustrations) is fully independent. Each wheel is connected to the frame by a steering knuckle, upper and lower balljoints and upper and lower control arms. Coil springs and shock absorbers are used on 2WD pick-up models; 4WD models and 2WD SUV models use shocks and torsion bars. A stabilizer bar connected to the frame and to the two lower control arms reduces body roll during cornering.

REAR SUSPENSION

The rear suspension on pick-up models and 2500 SUV models consists of a pair of multi-leaf springs and two shock absorbers (see illustration). The rear axle assembly is attached to the leaf springs by U-bolts. The front ends of the springs are attached to the frame at the front hangers, through rubber bushings. The rear ends of the springs are attached to the frame by shackles which allow the springs to alter their length as they compress and rebound.

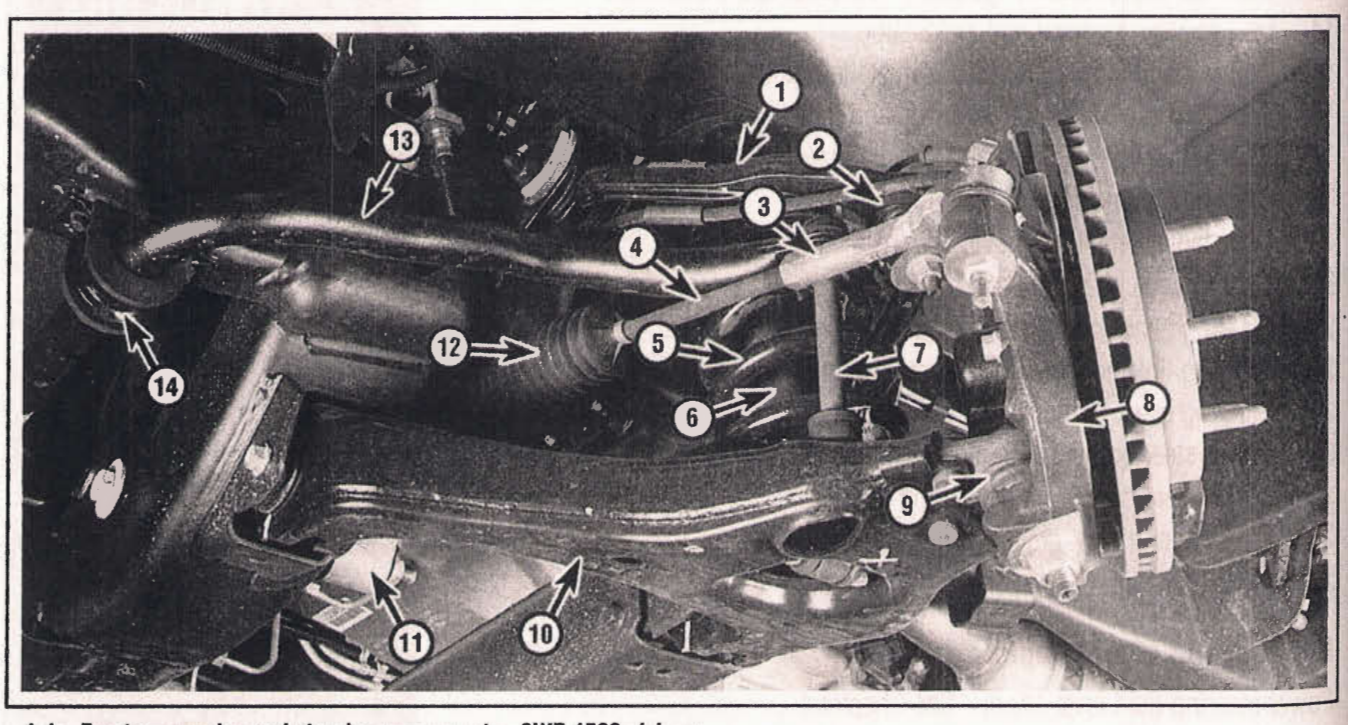
The rear suspension on 1500 SUV models is a five-link design, using coil springs, upper and lower control arms, a lateral link, two shock absorbers and a stabilizer bar (see illustration).

STEERING SYSTEM

The steering system on 2WD 1500 pick-up models consists of a rack-and-pinion steering gear and two adjustable tie-rods. Power assist is standard.

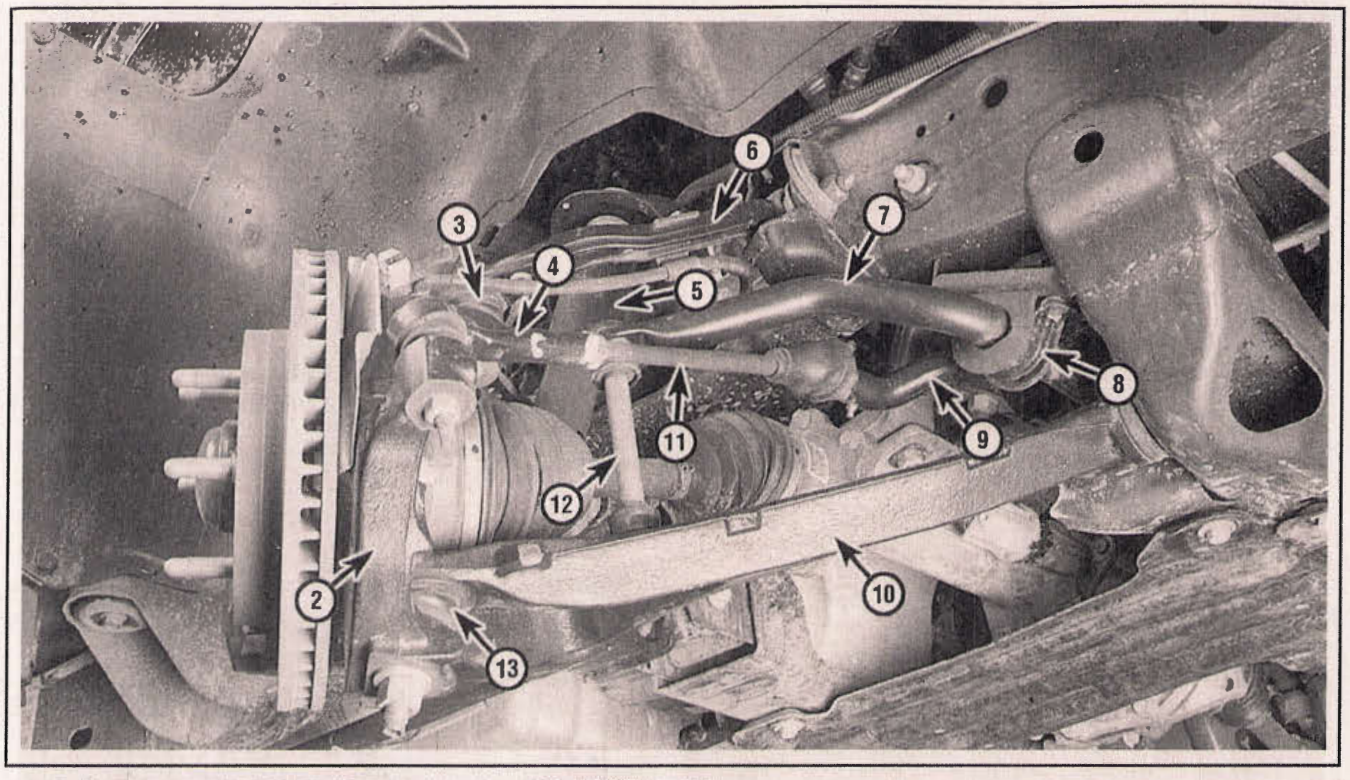
The steering system on other models consists of a recirculating-ball steering gearbox, Pitman arm, idler arm, relay rod, two adjustable tie-rod assemblies (each consisting of an inner tie-rod, adjuster tube and outer tie-rod) and, on some models, a steering damper. When the steering wheel is turned, the gear rotates the Pitman arm which forces the relay rod to one side. The tie-rods, which are connected to the relay rod, transfer steering force to the wheels. The tie-rods are adjustable and are used for toe-in adjustments. The relay rod is supported by the Pitman arm and idler arm. The idler arm pivots on a support attached to the right frame rail. The steering damper, if equipped, is attached to a bracket on the frame and to the relay rod.

An option on 2002 models is a feature called Quadrasteer™, General Motors' name for four-wheel steering. The rear axle on these models is steerable by a rack-and-pinion gear operated by a large electric motor when directed by the rear wheel steering control module, which is mounted above the spare tire. The intent is to improve steerability in low-speed maneuvers, under towing conditions, and provide increased stability at higher speeds. The rather complicated system includes a variety of sensors for yaw/lateral acceleration, steering wheel position, and rear wheel position. A switch on the dash allows the driver to select one of three options: standard two-wheel steering; four-wheel steering; and four-wheel steering for towing situations. In either of the four-wheel steering modes, the module decides which of three steering phases to employ, positive, negative or neutral. In the neutral phase, the rear wheels do not steer, while in the positive phase the rear wheels steer the same direction as the front wheels, and in the negative phase the rear wheels steer in the opposite direction from the front wheels.



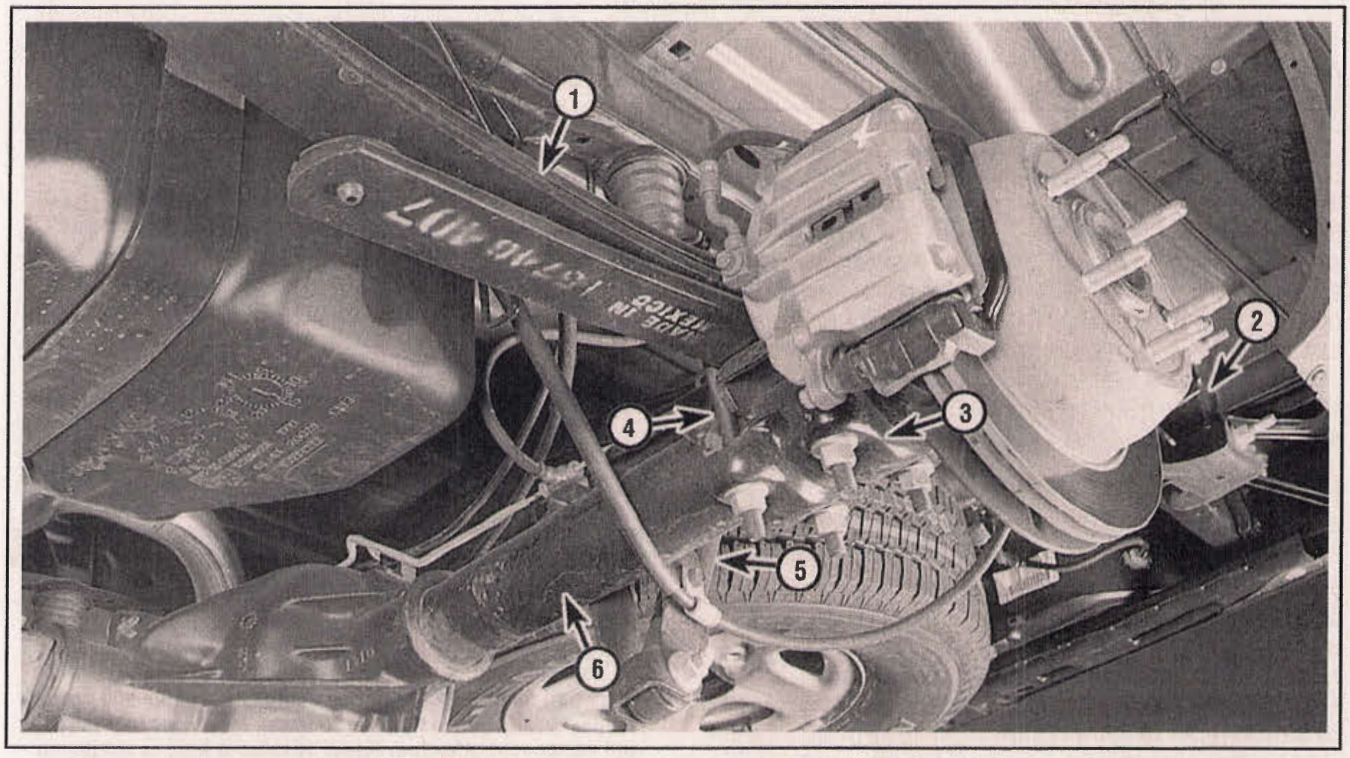
1.1a Front suspension and steering components - 2WD 1500 pick-up

1 *Upper control arm*
2 *Upper balljoint*
3 *Tie-rod end*
4 *Tie-rod*
5 *Coil spring*
6 *Shock absorber*
7 *Stabilizer bar link*
8 *Steering knuckle*
9 *Lower balljoint*
10 *Lower control arm*
11 *Steering gear*
12 *Steering gear boot*
13 *Stabilizer bar*
14 *Stabilizer bar clamp*



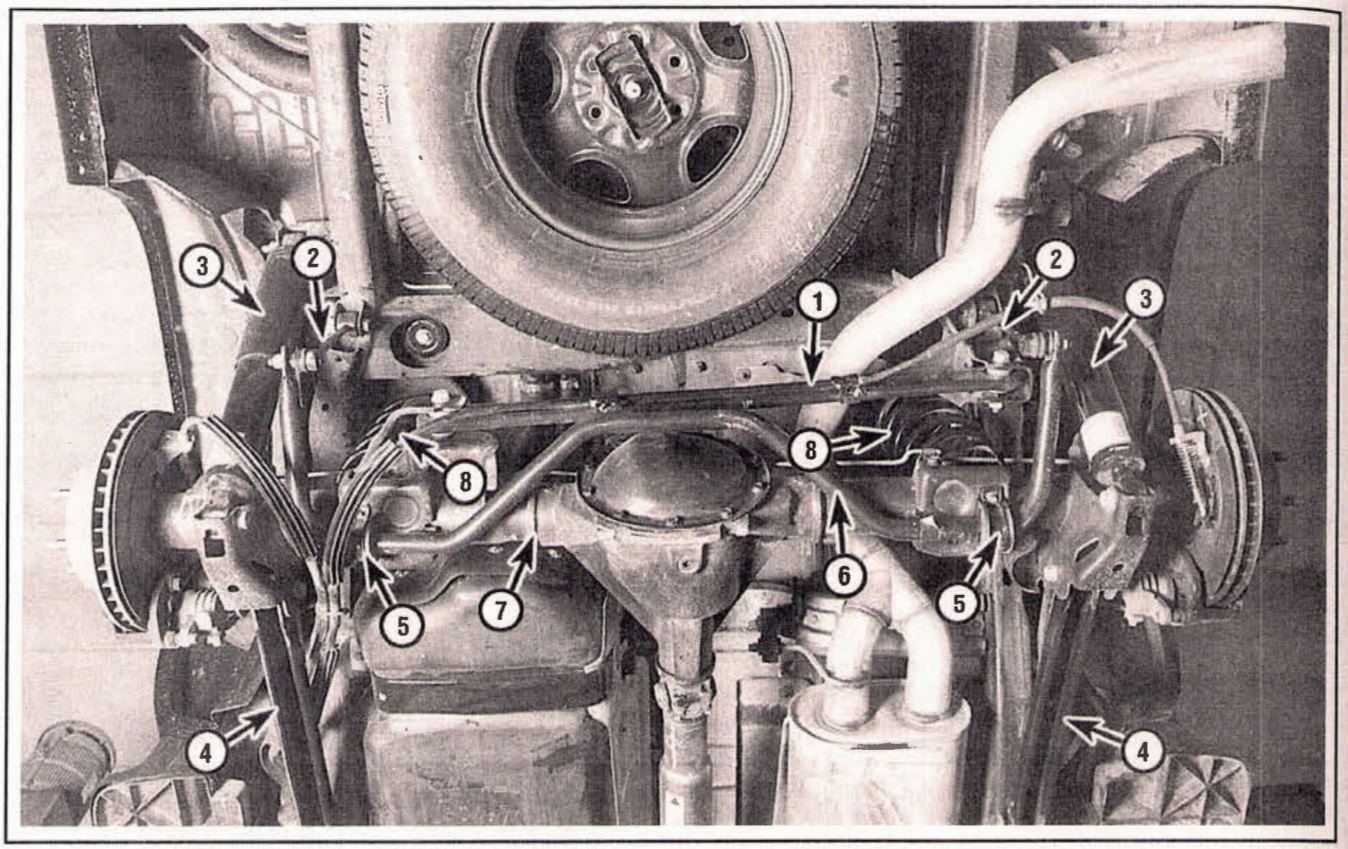
1.1b Front suspension and steering components - 4WD 1500 Suburban

1 *Torsion bar*
2 *Steering knuckle*
3 *Upper balljoint*
4 *Tie-rod end*
5 *Shock absorber*
6 *Upper control arm*
7 *Stabilizer bar*
8 *Stabilizer bar clamp*
9 *Relay rod*
10 *Lower control arm*
11 *Tie-rod*
12 *Stabilizer bar link*
13 *Lower balljoint*



1.4 Rear suspension components - 1500 pick-up

1 *Leaf spring*
2 *Shackle*
3 *Spring plate*
4 *U-bolt*
5 *Shock absorber*
6 *Rear axle*



1.5 Rear suspension components - 4WD 1500 Suburban

1 *Track bar*
2 *Stabilizer bar link*
3 *Shock absorber*
4 *Trailing arm (lower)*
5 *Stabilizer bar clamp*
6 *Stabilizer bar*
7 *Rear axle*
8 *Coil spring*

RIDE CONTROL SYSTEMS

Two types of ride control systems are available as an option; the Selectable Ride System and the Real Time Damping/Autoride system, which also incorporates Automatic Leveling Control (ALC). In the Selectable Ride System, the driver can pick between two shock absorber damping levels; normal or firm. This is accomplished through a solenoid inside each shock absorber which changes the size of the damping orifice. In the Real Time Damping/Autoride system, the shock absorber valving is automatically controlled to suit road conditions and driving style. The Automatic Leveling Control keeps the rear of the vehicle at the proper ride height according to the weight of the payload in the vehicle.

PRECAUTIONS

Frequently, when working on the suspension or steering system components, you may come across fasteners which seem impossible to loosen. These fasteners on the underside of the vehicle are continually subjected to water, road grime, mud, etc., and can become rusted or "frozen," making them extremely difficult to remove. In order to unscrew these stubborn fasteners without damaging them (or other components), be sure to use lots of penetrating oil and allow it to soak in for a while. Using a wire brush to clean exposed threads will also ease removal of the nut or bolt and prevent damage to the threads. Sometimes a sharp blow with a hammer and punch is effective in breaking the bond between a nut and bolt threads, but care must be taken to prevent the punch from slipping off the fastener and ruining the threads. Heating the stuck fastener and surrounding area with a torch sometimes helps too, but isn't recommended because of the obvious dangers associated with fire. Long breaker bars and extension, or "cheater," pipes will increase leverage, but never use an extension pipe on a ratchet - the ratcheting mechanism could be damaged. Sometimes, turning the nut or bolt in the tightening (clockwise) direction first will help to break it loose. Fasteners that require drastic measures to unscrew should always be replaced with new ones.

Since most of the procedures that are dealt with in this Chapter involve jacking up the vehicle and working underneath it, a good pair of jackstands will be needed. A hydraulic floor jack is the preferred type of jack to lift the vehicle, and it can also be used to support certain components during various operations.

WARNING:

Never, under any circumstances, rely on a jack to support the vehicle while working on it. Also, whenever any of the suspension or steering fasteners are loosened or removed they must be inspected and, if necessary, replaced with new ones of the same part number or of original equipment quality and design. Torque specifications must be followed for proper reassembly and component retention. Never attempt to heat or straighten suspension or steering components. Instead, replace bent or damaged parts with new ones.

2 Shock absorber (front) - removal and installation

1 Loosen the front wheel lug nuts. Raise the front of the vehicle and support it securely on jackstands, then remove the wheel.

2 Support the outer end of the lower control arm with a floor jack (the shock absorber serves as the down-stop for the suspension). The jack must remain in this position throughout the entire procedure.

3 If equipped with a suspension control system, unlock and unplug the electrical connector from the top of the shock absorber.

2WD MODELS

Refer to illustrations 2.4 and 2.6

4 Using a back-up wrench on the stem, remove the shock absorber upper mounting nut (see illustration).

5 Remove the retainer (metal washer) and grommet (rubber washer).

6 Working underneath the vehicle, remove the two bolts that attach the lower end of the shock absorber to the lower control arm (see illustration) and pull the shock out from below.

7 Remove the lower grommet and retainer from the stem.

8 Installation is the reverse of removal. Be sure to tighten the upper mounting nut and the lower mounting bolts to the torque listed in this Chapter's Specifications.

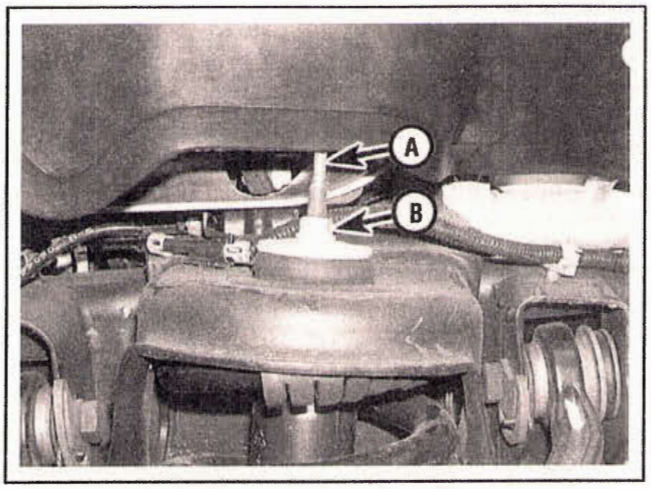
4WD MODELS

Refer to illustration 2.9

9 Remove the shock absorber lower mounting nut and bolt (see illustration). Note the direction in which the bolt points.

10 Using a back-up wrench on the stem, remove the shock absorber upper mounting nut (see illustration 2.4).

11 Remove the shock absorber.



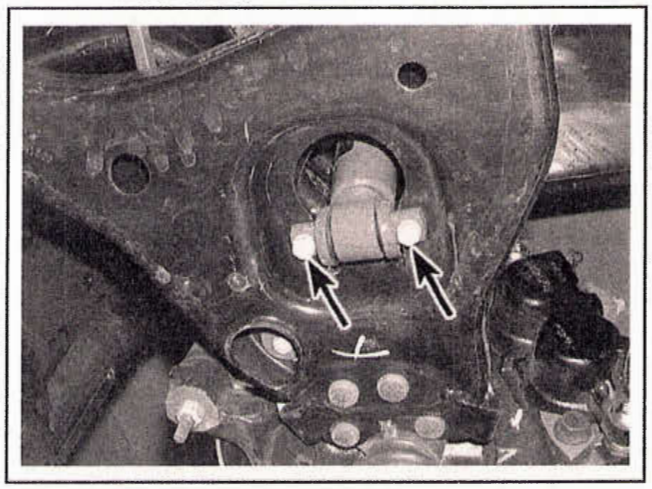
2.4 Hold the shock absorber stem (A) with a wrench to prevent it from turning when the upper mounting nut (B) is loosened (2WD model)

12 Installation is the reverse of removal. Be sure to install the lower mounting bolt so it's pointing in the same direction as it was prior to removal. Tighten all fasteners to the torque listed in this Chapter's Specifications.

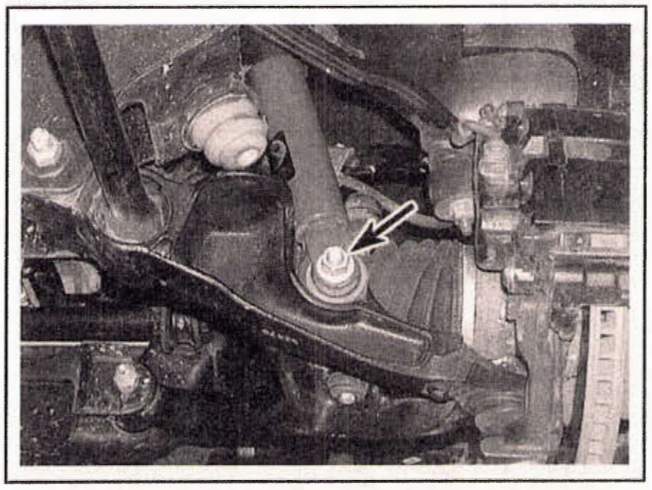
ALL MODELS

13 If equipped with a suspension control system, reconnect the electrical connector to the top of the shock absorber.

14 Install the wheels and lug nuts, lower the vehicle and tighten the lug nuts to the torque listed in the Chapter 1 Specifications.



2.6 Shock absorber lower mounting bolts (arrows) - 2WD models



2.9 Shock absorber lower mounting bolt/nut (arrow) - 4WD models

3 Stabilizer bar and bushings (front) - removal and installation

Refer to illustrations 3.2 and 3.3

1 Raise the vehicle and support it securely on jackstands. On models so equipped, remove the oil pan skid plate.

2 Remove the nuts from the link bolts and remove the link bolts (see illustration).

Note: Be sure to keep the parts for the left and right sides separate.

3 Remove the stabilizer bar bracket bolts (see illustration).

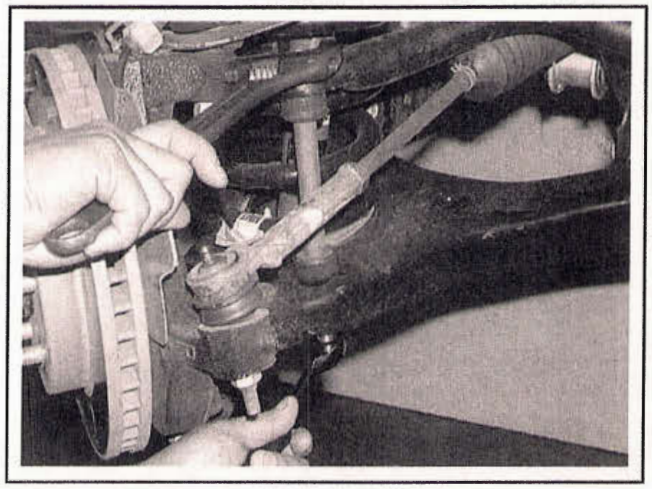
4 Remove the stabilizer bar.

5 Remove the rubber bushings.

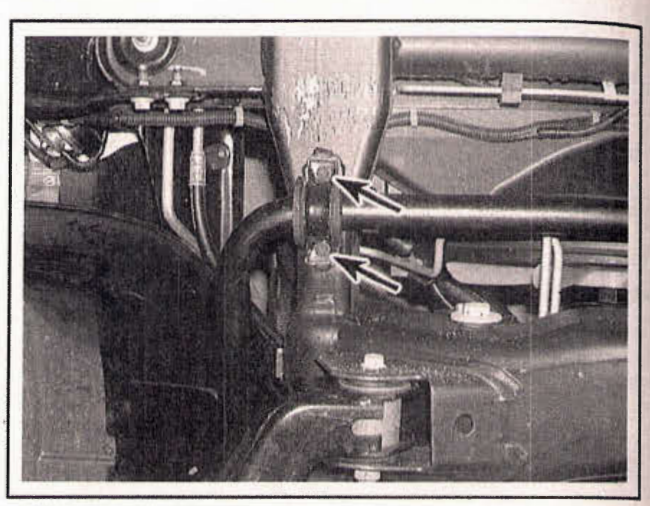
6 Inspect all parts for wear and damage.

7 When you install the rubber bushings on the stabilizer bar, be sure to position them so the slits face toward the front of the vehicle.

8 Installation is otherwise the reverse of removal. Be sure to tighten all fasteners to the torque listed in this Chapter's Specifications.



3.2 Unscrew the stabilizer bar link bolt while holding the nut with a large wrench



3.3 Remove the stabilizer bar bracket bolts (arrows)

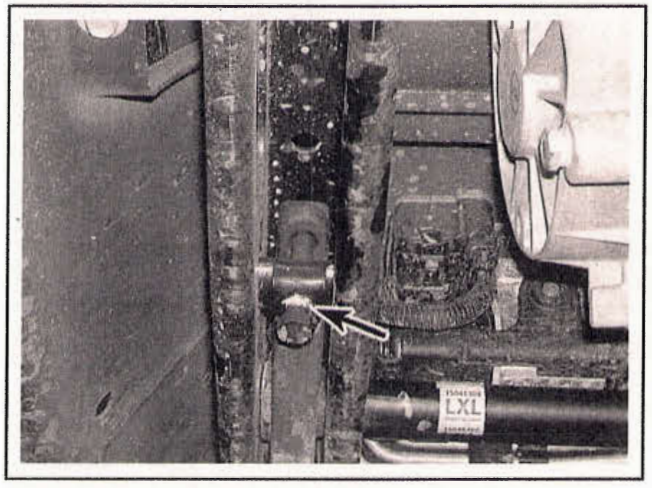
4 Torsion bar - removal and installation

Refer to illustrations 4.1, 4.2, 4.3, 4.4, 4.5, 4.7a, 4.7b, 4.8 and 4.13

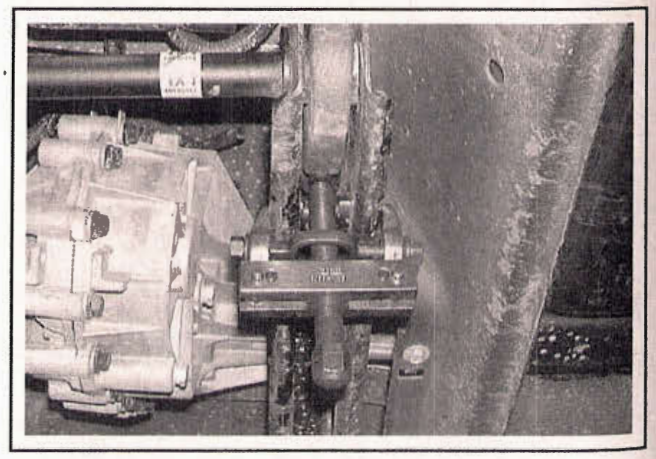
Note: The torsion bars must be removed as a pair, since the torsion bar crossmember must be removed to provide clearance to slide the bars to the rear.

1 Raise the front of the vehicle and support it securely on jackstands. Count the number of threads showing on the torsion bar adjuster bolt and mark the relationship of the bolt to the torsion bar adjuster nut (see illustration).

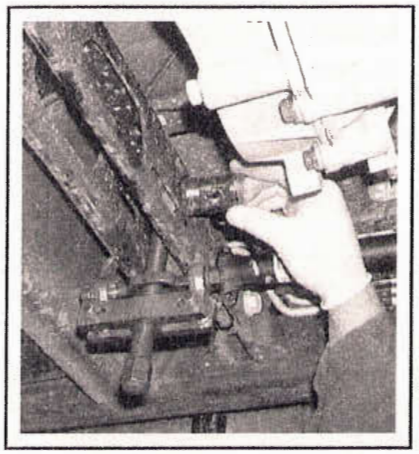
2 In the torsion bar adjuster arm there's a small dimple. Install a puller with its bolt centered on this dimple (see illustration).



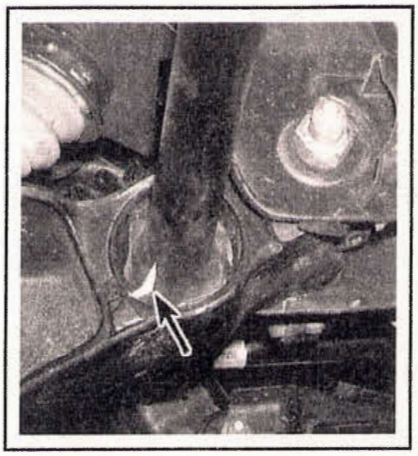
4.1 To ensure proper adjustment of the torsion bar upon reassembly, count the number of threads showing on the torsion bar adjuster bolt and mark the relationship of the bolt to the torsion bar adjuster nut as insurance



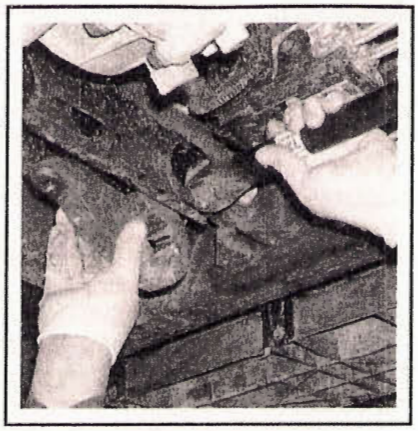
4.2 Install a two-jaw puller as shown, with the fingers hooked around the flange running along each side of the crossmember; make sure the puller bolt is centered on the dimple in the torsion bar adjuster arm; tighten the puller bolt until all tension is removed from the adjuster bolt



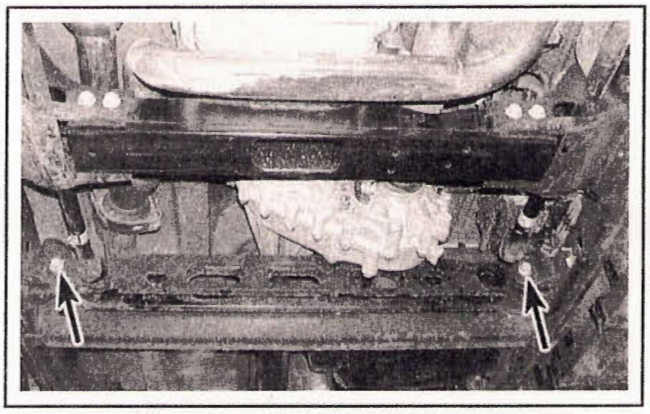
4.3 With tension removed from the adjuster bolt, unscrew the bolt and remove the adjuster nut



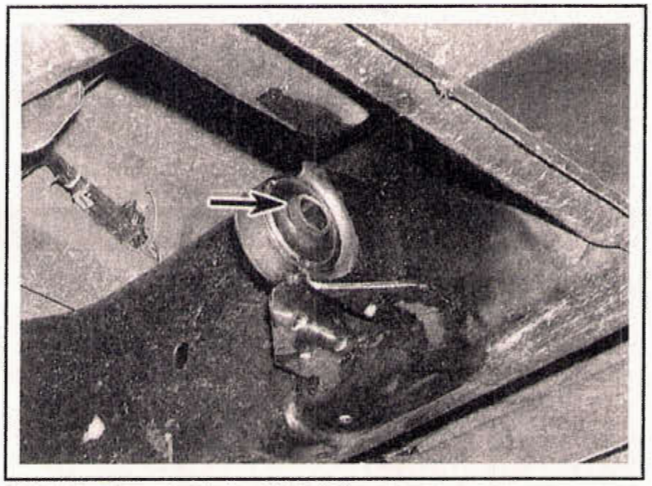
4.4 Mark the relationship of the torsion bar to the lower control arm as shown



4.5 Slide the torsion bar forward through the lower control arm far enough to pull the rear end of the bar out of the crossmember, then remove the torsion bar adjuster arm



4.7a Remove the torsion bar crossmember mounting bolts from both sides (arrows), then remove the crossmember (1500 model shown)



4.7b On 1500 models, the crossmember mounting bushings in the frame are replaceable; they must first be unstaked, then driven out towards the front of the vehicle

3 Turn the puller bolt until all tension is removed from the torsion bar adjuster bolt, then unscrew the torsion bar adjuster bolt and remove the nut (see illustration). Slowly unscrew the puller bolt until the torsion bar unwinds completely and no more tension is on the adjuster arm. Remove the puller.

4 Mark the relationship of the forward end of the torsion bar to the lower control arm (see illustration). Also mark the relationship of the rear end of the torsion bar to the adjuster arm.

5 Push the torsion bar forward, through the lower control arm, until the rear end of the bar clears the crossmember, then remove the torsion bar adjuster arm (see illustration).

6 Repeat Steps 1 through 5 on the other torsion bar.

7 Unbolt the torsion bar crossmember and remove it (see illustration). On 1500 models, inspect the bushings in the frame bosses where the crossmember mounts. If they're worn or otherwise deteriorated they can be replaced. They are staked in place from behind; once unstaked, they can be driven out of their bores toward the front of the vehicle (see illustration). On 2500 models, check the links that secure the torsion bar crossmember. If they're not in good shape, replace them.

8 Slide the torsion bar to the rear, lower the rear end of the bar down and guide it out through the hole in the frame crossmember (see illustration). If the front end of the bar hangs up in the lower control arm, drive it out of the control arm with a brass drift.

4.8 Guide the torsion bar to the rear and down, being careful not to nick it in the process

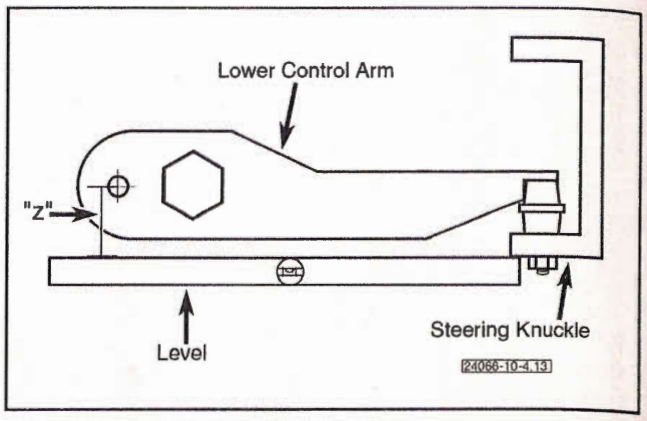
9 Installation is the reverse of removal, but if both torsion bars were removed, be sure to install them on the proper side of the vehicle (they are marked L and R on the ends). Clean out the hexagonal hole in the lower control arm and lube it with multi-purpose grease before inserting the torsion bar into the arm. Also apply some grease to the hex ends of the torsion bar, to the top of the adjuster arm and to the adjuster bolt. Make sure that the alignment marks you made on the torsion bar and the control arm and adjuster arm line up, and that the torsion bar is completely engaged with the adjuster arm.

10 Tighten the crossmember mounting fasteners to the torque values listed in this Chapter's Specifications.

11 Tighten the torsion bar adjuster bolt until the same number of threads are showing and the marks you made on the adjuster bolt and nut are lined up.

12 Lower the vehicle, jounce the front suspension a couple of times, then roll the vehicle back-and-forth a few feet to settle the suspension.

13 Using a bubble level, measure from the centerline of a pivot bolt for the lower control arm to the level, placed against the bottom of the steering knuckle (just inboard of the lower balljoint stud) (see illustration). This distance is known as the "Z" height, and should be as listed in this Chapter's Specifications. If the "Z" height is not as specified, turn the torsion bar adjusting bolt, in or out as necessary, a little at a time until the dimension is correct. This may take a few tries, and it's important to roll the vehicle back and forth and jounce the front end between adjustments, to settle the suspension and get an accurate reading.



4.13 Place a bubble-type level against the bottom of the steering knuckle, level it, then measure from the level to the centerline of a lower control arm pivot bolt; this distance is called the "Z" height

14 Repeat the Z height check and adjustment procedure on the other lower control arm.

15 Repeat Steps 11 and 12 until both sides of the vehicle are set to the proper ride height.

16 Have the front end alignment checked and, if necessary, adjusted.

5 Coil spring (front) - removal and installation

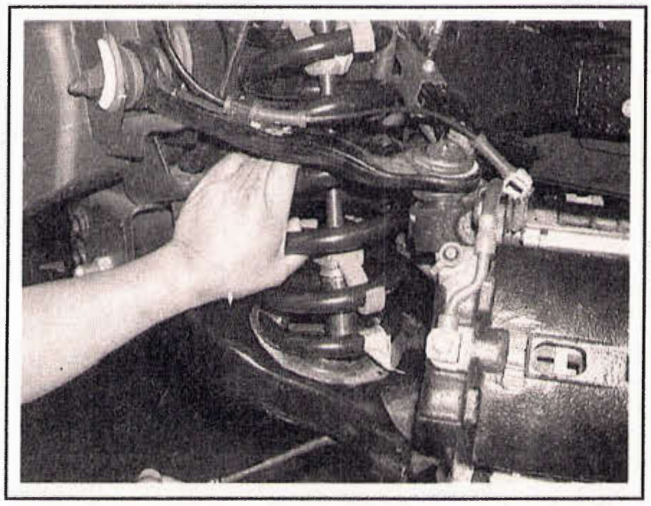
Refer to illustration 5.4

REMOVAL

1 Loosen the wheel lug nuts, raise the vehicle and support it securely on jackstands. Remove the wheel. On models so equipped, remove the oil pan skid plate.

2 Detach the stabilizer bar link from the lower control arm (see Section 3).

3 Support the outer end of the lower control arm with a floor jack, then remove the shock absorber (see Section 2).



5.4 Compress the coil spring with an internal-type spring compressor. Warning: *Make sure the tool is rated for the size of coil spring being compressed (diameter, thickness and length of the spring)*

4 Install a suitable internal type spring compressor in accordance with the tool manufacturer's instructions (see illustration). Compress the spring enough to relieve all pressure from the spring seats (but don't compress it any more than necessary, or it could be ruined). When you can wiggle the spring, it's compressed enough. (You can buy a suitable spring compressor at most auto parts stores or rent one from a tool rental yard.)

5 Once the spring has been compressed, remove the floor jack, then separate the lower control arm balljoint from the steering knuckle (see Section 7).

6 Pull down on the lower control arm and remove the compressed spring.

7 If the spring is to be replaced, slowly loosen the spring compressor until the spring is fully extended, then install the tool on the new spring.

INSTALLATION

8 Place the insulator on top of the coil spring (the upper end of the spring is the end with the more tightly wound coils).

9 Install the top of the spring into the spring pocket and the bottom in the lower control arm.

10 Connect the lower control arm to the steering knuckle (see Section 7). Support the outer end of the control arm with the floor jack, then remove the spring compressor and install the shock absorber.

11 The remainder of installation is the reverse of removal. Tighten all fasteners to the proper torque values. Tighten the wheel lug nuts to the torque listed in the Chapter 1 Specifications.

12 Have the front end alignment checked and, if necessary, adjusted.

6 Upper control arm - removal and installation

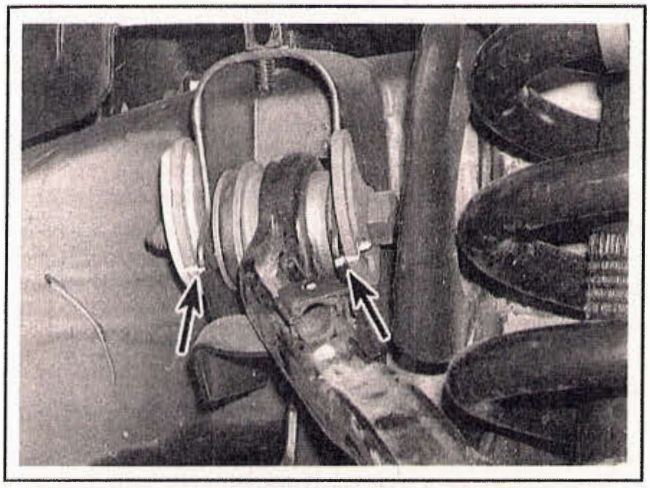
Refer to illustrations 6.2, 6.3 and 6.5

REMOVAL

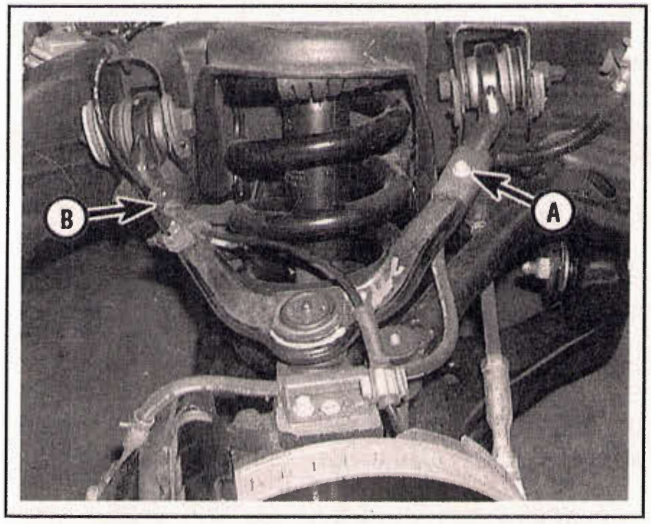
1 Loosen the wheel lug nuts, raise the front of the vehicle and support it securely on jackstands. Remove the wheel. Position a floor jack under the lower control arm in the area underneath the balljoint. Raise the jack slightly to take the spring pressure off the upper control arm.

WARNING:

The jack must remain in this position throughout the entire procedure.



6.2 Mark the relationship of the adjusting cams to the frame brackets (arrows)



6.3 Unbolt the brake hose bracket from the upper control arm (A), then unclip the wiring harness for the ABS wheel speed sensor (B)

2 Mark the relationship of the adjusting cams to the brackets on the frame (see illustration)

3 Unbolt the brake hose bracket from the upper control arm. Also detach the wheel speed sensor wiring harness from the arm (see illustration).

4 If you're working on a 4WD model, remove the driveaxle (see Chapter 8).

Note: If you use a "picklefork" type balljoint separator it isn't necessary to perform this step.

5 To disconnect the upper control arm from the steering knuckle, loosen the upper balljoint nut a few turns (don't remove it), install a balljoint remover and break the balljoint loose from the knuckle. Now remove the nut.

Note: If you don't have the proper balljoint removal tool, a "picklefork" type balljoint separator can be used, but keep in mind that this type of tool will probably destroy the balljoint boot (see illustration).

6 Remove the upper control arm pivot bolts and nuts, noting which way the bolts are installed. Remove the control arm.

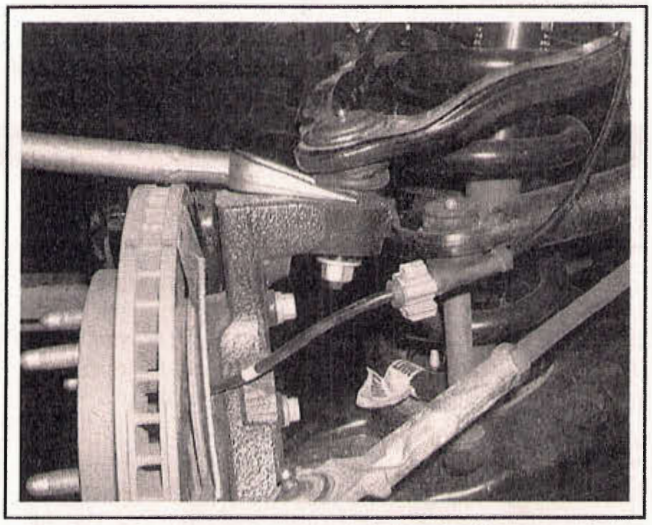
INSTALLATION

7 Position the arm in the frame brackets and install the bolts and nuts. Make sure the marks you made prior to disassembly are aligned, then tighten the bolts or nuts to the torque listed in this Chapter's Specifications.

8 Attach the balljoint to the steering knuckle and tighten the ball-stud nut to the torque listed in this Chapter's Specifications.

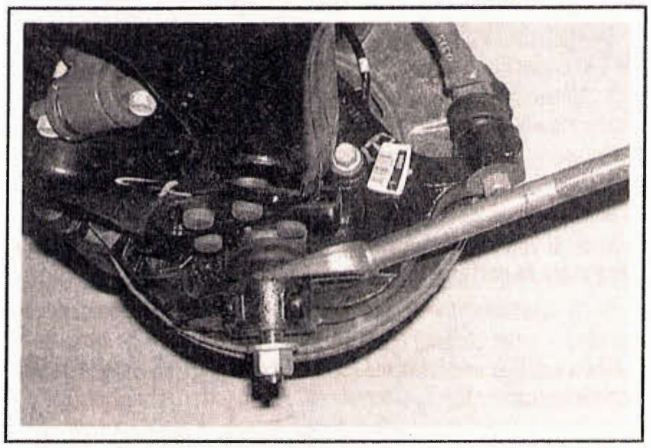
9 The remainder of installation is the reverse of removal. Tighten the wheel lug nuts to the torque listed in the Chapter 1 Specifications.

10 Have the front end alignment checked and, if necessary, adjusted.

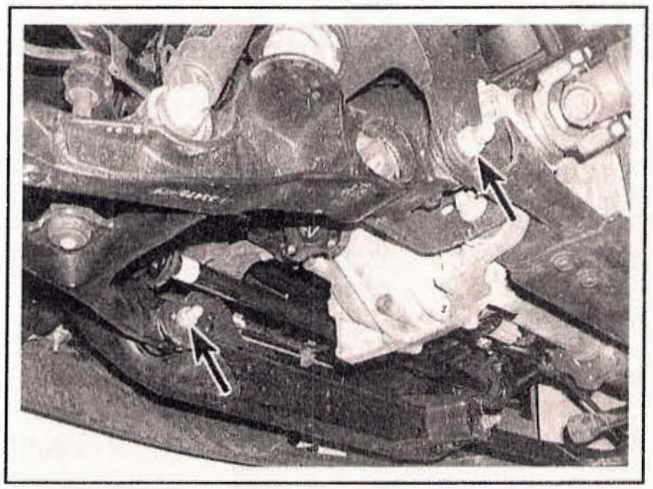


6.5 Separating the upper control arm balljoint from the steering knuckle using a "picklefork" type separator

7 Lower control arm - removal and installation



7.7 Separating the lower control arm balljoint with a "picklefork" type balljoint separator



7.8 Remove the lower control arm pivot bolts (arrows) (1500 4WD model)

Refer to illustrations 7.7 and 7.8

REMOVAL

1 Loosen the wheel lug nuts, raise the vehicle and support it securely on jackstands placed under the frame rails. Remove the wheel.

2 Remove the stabilizer bar link (see Section 3).

3 If you're working on a 4WD model, remove the driveaxle (see Chapter 8).

4 If you're working on a model with coil spring front suspension, compress the coil spring (see Section 5, Steps 3 and 4).

5 If you're working on a model with torsion bar front suspension, remove the torsion bar (see Section 4).

6 If you're working on a model with torsion bar front suspension, remove the shock absorber lower mounting bolt (see Section 2).

7 To disconnect the lower control arm from the steering knuckle, loosen the balljoint nut a few turns (don't remove it), install a balljoint remover and break the balljoint loose from the knuckle. Now remove the nut.

Note: If you don't have the proper balljoint removal tool, a "picklefork" type balljoint separator can be used, but keep in mind that this type of tool will probably destroy the balljoint boot (see illustration).

8 Remove the lower control arm pivot bolts and nuts, noting which way the bolts are installed and, on 4WD models, which way the shoulder on the washers face (they should face the control arm) (see illustration). Pull the lower arm from its frame brackets.

Installation

9 Installation is the reverse of removal. Be sure to tighten all fasteners to the torque values listed in this Chapter's Specifications.

10 Install the wheel and lug nuts. Lower the vehicle and tighten the lug nuts to the torque listed in the Chapter 1 Specifications.

11 If you're working on a model with torsion bar front suspension, be sure to check and adjust the ride ("Z") height (see Section 4).

12 Have the front end alignment checked and, if necessary, adjusted.

8 Balljoints - check and replacement

CHECK

1 Inspect the control arm balljoints for looseness anytime either of them is separated from the steering knuckle. See if you can turn the ballstud in its socket with your fingers. If the balljoint is loose, or if the ballstud can be turned, replace the balljoint. You can also check the balljoints with the suspension assembled as follows.

Upper balljoints

2 Raise the front of the vehicle and support it securely on jackstands placed under the frame rails. Place a floor jack under the lower control arm and raise it slightly.

3 Attach a dial indicator to the upper suspension arm, with the plunger of the indicator touching the steering knuckle, in line with the axle.

4 Grasp the top of the tire and "rock" the tire in-and-out. The dial indicator should indicate no more than 0.030-inch deflection. If the indicated reading exceeds this figure, replace the balljoint.

Lower balljoints

5 Raise the front of the vehicle and support it securely on jackstands placed under the frame rails. Place a floor jack under the lower control arm and raise it slightly.

6 Attach a dial indicator to the lower control arm and position the indicator plunger against the steering knuckle, in-line with the axle.

7 Grasp the bottom of the tire and "rock" the tire in-and-out. The dial indicator should indicate no more than 0.030-inch deflection. If the indicated reading exceeds this figure, replace the balljoint.

REPLACEMENT

Upper balljoint

8 Remove the upper control arm (see Section 6).

9 Take the control arm to an automotive machine shop or other qualified repair facility to have the old balljoint pressed out and the new one pressed in.

10 Install the control arm (see Section 6).
11 Have the front end alignment checked and, if necessary, adjusted.

Lower balljoint

2WD models

12 Remove the lower control arm (see Section 7).
13 Drill out the balljoint rivets as follows: Using a 1/8-inch drill bit, drill a 1/4-inch deep hole in the center of each rivet. Then switch to a 1/2-inch drill bit and finish the job; drill just deep enough to remove the rivet head. Insert a punch through the rivet holes and knock out the rivets.
14 Install the new balljoint on the control arm and secure it with the nuts and bolts supplied with the replacement balljoint. Tighten the nuts to the torque listed in this Chapter's Specifications.
15 Install the control arm (see Section 7).
16 Have the front end alignment checked and, if necessary, adjusted.

4WD models

17 Remove the lower control arm (see Section 7).
18 Take the control arm to an automotive machine shop or other qualified repair facility to have the old balljoint pressed out and the new one pressed in.
19 Install the control arm (see Section 7).
20 Have the front end alignment checked and, if necessary, adjusted.

9 Hub and bearing assembly (front) - removal and installation

♦ Refer to illustrations 9.4, 9.5a, 9.5b and 9.6

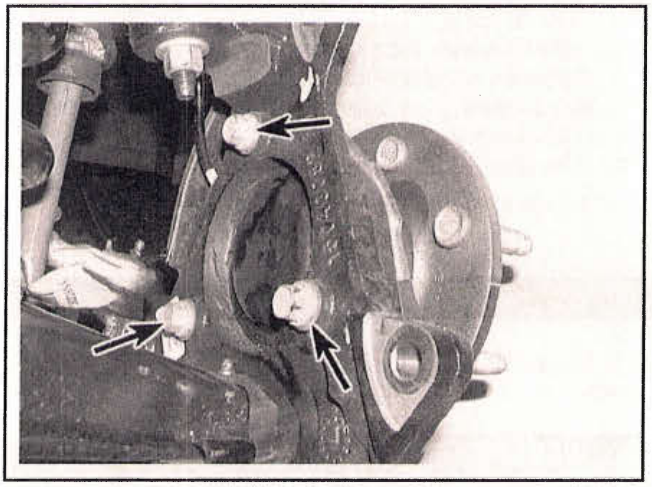
WARNING:

The dust created by the brake system is harmful to your health. Never blow it out with compressed air and don't inhale any of it. Do not, under any circumstances, use petroleum-based solvents to clean brake parts. Use brake system cleaner only.

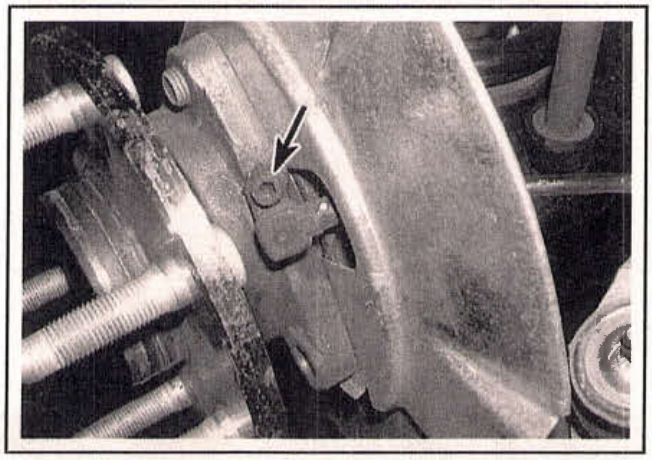
➡Note: The hub and bearing assembly is sealed-for-life. If worn or damaged, it must be replaced as a unit.

REMOVAL

1 Loosen the front wheel lug nuts, raise the vehicle and support it securely on jackstands. Remove the wheel.
2 If you're working on a 4WD model, remove the hub cover, then unscrew the driveaxle/hub nut with a socket and large breaker bar (see Chapter 8). Brace a large prybar across two of the wheel studs or insert a large screwdriver through the center of the brake caliper and into the disc cooling vanes to prevent the hub from turning as the nut is loosened.
3 Remove the brake caliper and hang it out of the way with a piece of wire, then remove the caliper mounting bracket (see Chapter 9). Pull the disc off the hub.

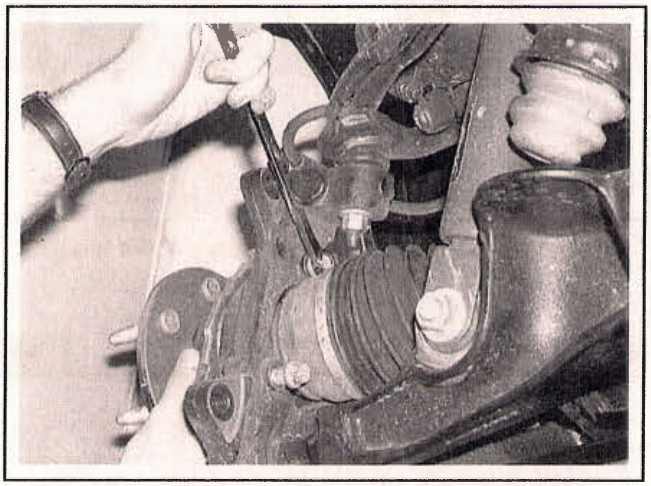


9.5a The hub and bearing assembly on 1500 models is retained by three bolts - on 2500 models it's retained by four bolts



9.4 The ABS wheel speed sensor is retained to the hub by one screw; remove the screw and pull the sensor straight out (don't pry on it)

4 Remove the wheel speed sensor from the hub (see illustration).
5 Working from the back side of the steering knuckle, remove the hub retaining bolts from the steering knuckle (see illustrations).



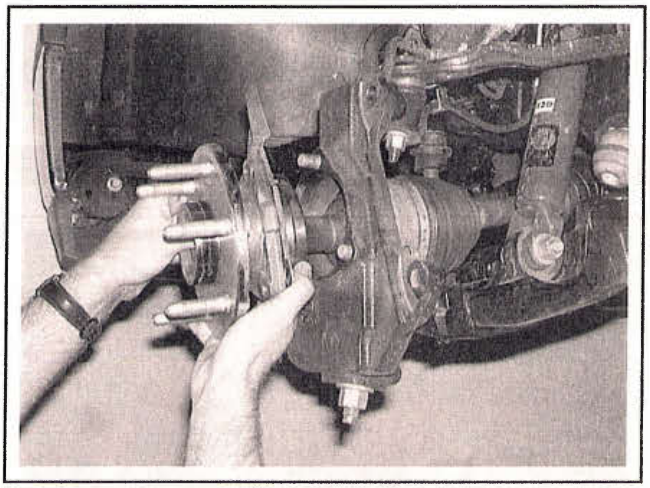
9.5b On 4WD models there's not much room to get a wrench onto the hub bolt heads, especially when they are backed-out a few turns. So, as the bolts are unscrewed, push in on the driveaxle and pull the hub and bearing out of the knuckle to provide clearance

Remove the disc shield.

6 Remove the hub from the steering knuckle. If you're working on a 4WD model, pull the assembly off the driveaxle splines (see illustration).

CAUTION:

Be careful not to pull outward on the driveaxle, as this could separate the inner CV joint components.



9.6 When removing the hub assembly on a 4WD model, don't pull out on the driveaxle; the inner CV joint could become separated

If the driveaxle splines stick in the hub, attach a two-jaw puller to the hub flange and push the stub axle out of the hub. The hub assembly should come right out of the steering knuckle, but if it doesn't, tap it from side-to-side to free it.

INSTALLATION

7 Clean the mating surfaces on the steering knuckle, bearing flange and knuckle bore. If you're working on a 2500 model, make sure the O-ring came out with the hub assembly, and be sure to install a new O-ring on the back of the hub before fitting the hub to the steering knuckle.

8 Insert the hub and bearing assembly into the steering knuckle and, on 4WD models, onto the end of the driveaxle.

➡Note: On 4WD models, lubricate the splines of the driveaxle with multi-purpose grease before installing the hub. Position the disc shield and install the bolts, tightening them to the torque listed in this Chapter's Specifications.

9 Insert the ABS wheel speed sensor into it's hole in the hub, tightening the bolt to the torque listed in the Chapter 9 Specifications.

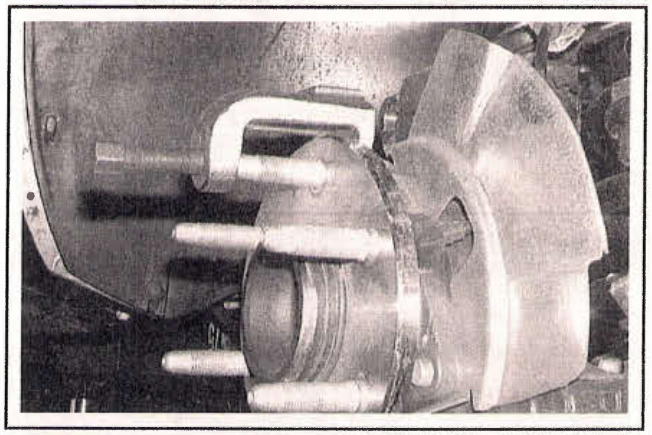
10 Install the brake disc, caliper mounting bracket and caliper (see Chapter 9).

11 On 4WD models, install the hub nut and tighten it securely to seat the driveaxle in the hub. Prevent the axle from turning by inserting a screwdriver through the caliper and into a disc cooling vane.

12 Install the wheel, lower the vehicle and tighten the lug nuts to the torque listed in the Chapter 1 Specifications.

13 If you're working on a 4WD model, tighten the driveaxle/hub nut to the torque listed in the Chapter 8 Specifications.

10 Wheel studs - replacement



10.3 Use a small press tool such as this to push the stud out of the flange

➧ Refer to illustration 10.3

➡Note: This procedure applies to both the front and rear wheel studs.

1 Loosen the wheel lug nuts, raise the vehicle and support it securely on jackstands. Remove the wheel.

2 Remove the brake disc (see Chapter 9).

3 Push the stud out of the hub flange with a press tool (see illustration).

4 Insert the new stud into the hub flange from the back side and install some flat washers and a lug nut on the stud.

5 Tighten the lug nut until the stud is seated in the flange.

6 Reinstall the disc and caliper (see Chapter 9). Install the wheel and lug nuts. Lower the vehicle and tighten the lug nuts to the torque listed in the Chapter 1 Specifications.

11 Steering knuckle - removal and installation

1 Loosen the wheel lug nuts, raise the vehicle and support it securely on jackstands. Remove the wheel.

2 If you're working on a 4WD model, remove the hub cover, then unscrew the driveaxle/hub nut with a socket and large breaker bar (see Chapter 8). Brace a large prybar across two of the wheel studs or insert a large screwdriver through the center of the brake caliper and into the disc cooling vanes to prevent the hub from turning as the nut is loosened.

3 Support the lower control arm with a floor jack. Raise the jack slightly.

WARNING:

The jack must remain in this position throughout the entire procedure.

4 Remove the brake caliper and brake disc (see Chapter 9). Hang the caliper out of the way on a piece of wire (don't disconnect the brake hose).

5 Remove the hub and bearing assembly (see Section 9).

6 Remove the disc splash shield from the steering knuckle.

7 Unbolt the brake hose bracket from the top of the steering knuckle.

8 Disconnect the tie-rod end from the steering knuckle (see Section 20).

9 Disconnect the balljoints from the steering knuckle (see Sections 6 and 7).

10 Remove the steering knuckle.

11 Installation is the reverse of removal. Be sure to tighten the balljoint and tie-rod end fasteners to the torque values listed in this Chapter's Specifications. Tighten the caliper mounting bolts to the torque values listed in the Chapter 9 Specifications. Tighten the driveaxle/hub nut to the torque listed in the Chapter 8 Specifications (4WD models). Tighten the wheel lug nuts to the torque listed in the Chapter 1 Specifications.

12 Shock absorber (rear) - removal and installation

Refer to illustrations 12.4a and 12.4b

1 Raise the rear of the vehicle and support it securely on jackstands placed underneath the frame rails. Block the front wheels so the vehicle doesn't roll off the stands.

Note: It isn't necessary to remove the rear wheels, but doing so will improve access to the shock absorbers.

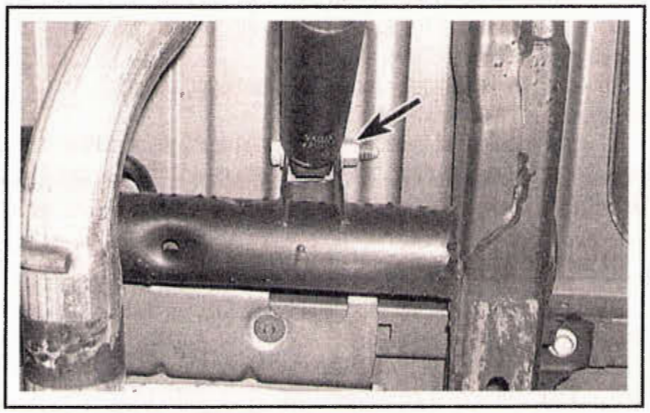
2 If the vehicle is equipped with Real Time Damping or Selectable Ride system, disconnect the electrical connector and the air line, if equipped, from the shock absorber.

3 Support the rear axle with a floor jack placed under the axle tube closest to the shock absorber being removed.

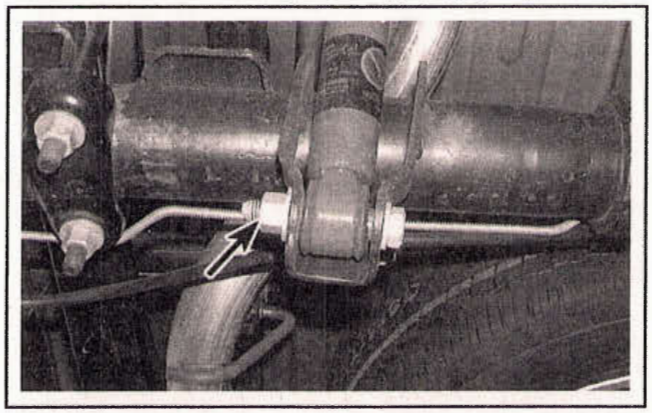
4 Remove the shock absorber upper and lower mounting fasteners (see illustrations).

5 Remove the shock absorber.

6 Installation is the reverse of removal. Tighten all fasteners to the torque values listed in this Chapter's Specifications.



12.4a Rear shock absorber upper mounting nut/bolt



12.4b Rear shock absorber lower mounting nut/bolt

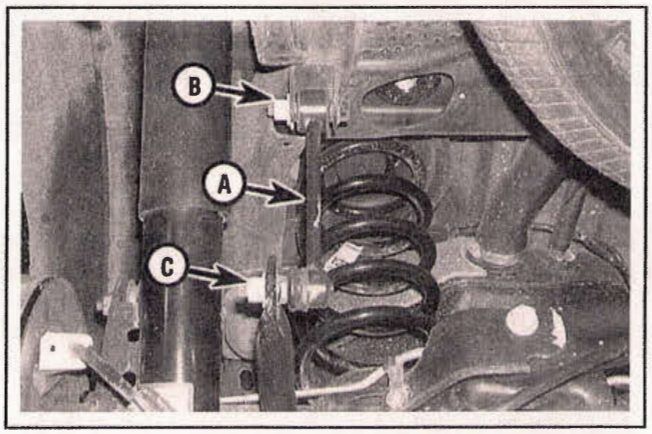
13 Stabilizer bar and bushings (rear) - removal and installation

Refer to illustrations 13.2 and 13.4

1 Loosen the rear wheel lug nuts, raise the rear of the vehicle and support it securely on jackstands. Block the front wheels to keep the vehicle from rolling off the stands. Remove the rear wheels.

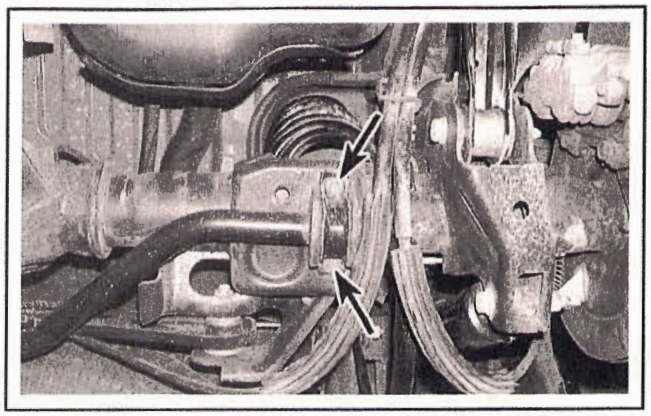
2 Remove the stabilizer bar link-to-frame nuts/bolts (see illustration).

3 Remove the nuts from the lower ends of the links, then separate the link from the bar.



13.2 Stabilizer bar link mounting details

A Link
B Link-to-frame bolt/nut
C Link-to-stabilizer bar nut



13.4 Remove the stabilizer bar clamp bolts from the axle housing

4 Remove the stabilizer bar clamp bolts (see illustration) and remove the stabilizer bar assembly.

5 Inspect the stabilizer bar bushings and link bushings for cracks, tears and other signs of deterioration. Replace as necessary.

6 Installation is the reverse of removal. Be sure to tighten all fasteners to the torque listed in this Chapter's Specifications.

14 Leaf spring - removal and installation

Refer to illustrations 14.7, 14.8 and 14.9

REMOVAL

1 If you're removing the left leaf spring, relieve the fuel system pressure (see Chapter 4).

2 Loosen the rear wheel lug nuts, raise the rear of the vehicle and support it securely on jackstands placed underneath the frame rails. Block the front wheels to keep the vehicle from rolling off the stands. Remove the rear wheels.

3 Remove the trailer hitch, if so equipped.

4 If you're removing the left leaf spring, remove the fuel tank (see Chapter 4).

5 If you're removing the right leaf spring, unbolt the rear portion of the exhaust system from the collector flange, then detach the system from its rubber hangers to position it toward the center of the vehicle (this is to provide clearance for the front mounting bolt removal).

6 Support the axle with a floor jack placed under the axle tube and raise it slightly to take the weight of the axle.

7 Remove the four U-bolt nuts and washers (see illustration), the spring plate and the two U-bolts. Discard the U-bolts (the manufacturer recommends using new ones during installation).

8 At the front end of the spring, remove the nut and bolt from the spring-to-front bracket (see illustration).

9 At the rear end of the spring, remove the spring shackle-to-frame nut and bolt (see illustration).

10 Lower the jack slightly and remove the spring assembly. If necessary, remove the shackle from the spring.

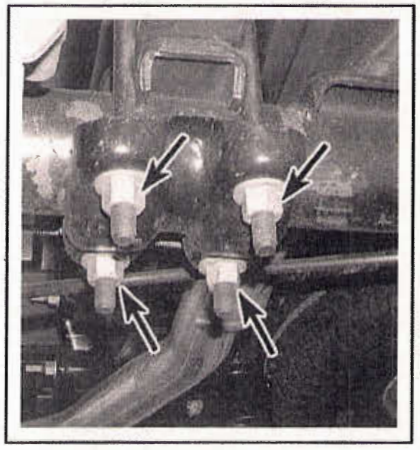
11 If the bushings at the ends of the spring are worn or deteriorated, an automotive machine shop or dealer service department can press the old ones out and press new ones in.

INSTALLATION

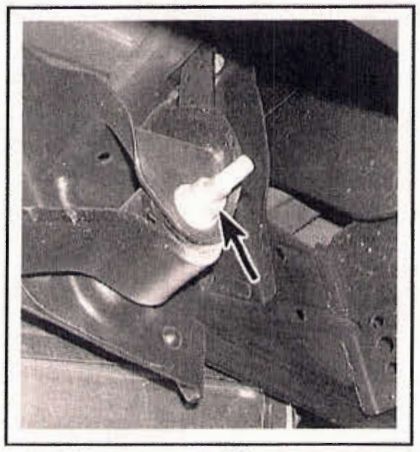
12 If removed, install the shackle to the spring, but don't tighten the nut yet.

13 Place the spring in position and install the forward mounting bolt and nut, but don't tighten the nut yet.

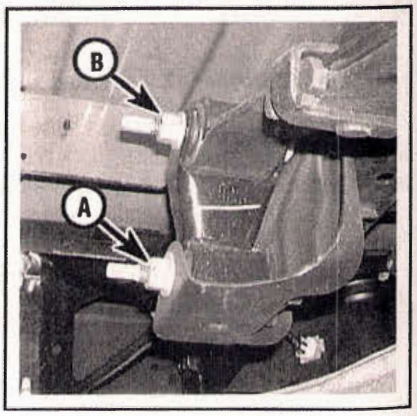
14 Raise the axle on the jack until it mates properly with the spring. Install the spring plate and new U-bolts, then install the nuts and washers. Tighten the U-bolt nuts to the torque listed in this Chapter's



14.7 Remove the four U-bolt nuts and washers, then remove the spring plate and the two U-bolts



14.8 At the front end of the leaf spring, remove the nut and bolt that attach the spring to the frame bracket



14.9 At the rear end of the spring, remove the spring shackle-to-frame nut and bolt (A); the shackle-to-spring nut and bolt (B) can't be removed until the spring and shackle are removed from the vehicle

Specifications.

15 Tighten the front mounting bolt/nut, the shackle-to-frame bolt/nut and the spring-to-shackle bolt/nut to the torque values listed in this Chapter's Specifications.

16 The remainder of installation is the reverse of the removal procedure.

17 Install the wheel and lug nuts. Lower the vehicle and tighten the lug nuts to the torque listed in the Chapter 1 Specifications.

15 Coil spring (rear) - removal and installation

REMOVAL

1 Loosen the rear wheel lug nuts. Raise the rear of the vehicle and support it securely on jackstands placed underneath the frame rails. Block the front wheels to prevent the vehicle from rolling. Remove the rear wheels.

2 If equipped with Real Time Damping, disconnect the sensor link.

3 Support the rear axle housing with a floor jack placed underneath the differential.

4 Disconnect the rigid brake lines from the junction block on the rear brake hose, then unbolt the junction block from the axle housing (see Chapter 9). Plug the hose fitting to prevent excessive fluid loss and the entry of air and contamination.

5 Detach the rear axle vent hose.

6 Unbolt the track bar from the bracket on the rear axle housing (see Section 16).

7 Disconnect the lower ends of the shock absorbers from the axle housing (see Sec-tion 12).

8 Slowly lower the floor jack until the coil springs are fully extended, then remove the springs and insulators.

9 Check the condition of the insulators. If they're cracked, hardened or otherwise deteriorated, replace them.

INSTALLATION

10 Place the springs and insulators in position on the axle and raise the axle until the ends of the springs engage properly with their upper mounts (an assistant would be helpful).

11 Continue to raise the axle until the shock absorbers can be connected to the axle housing. Install the bolts and nuts, tightening them to the torque listed in this Chapter's Specifications.

12 Connect the track bar to the axle, tightening the bolt to the torque listed in this Chapter's Specifications.

13 Reattach the vent hose.

14 Reconnect the brake lines to the brake hose, then connect the hose to the axle housing. Bleed the rear brakes (see Chapter 9).

15 If equipped with Real Time Damping, reconnect the sensor link.

16 Install the wheels and lug nuts. Lower the vehicle and tighten the lug nuts to the torque listed in the Chapter 1 Specifications.

16 Suspension arms (rear) - removal and installation

➡Note: This procedure applies to models with coil spring rear suspension only.

TRAILING ARMS

♦ Refer to illustrations 16.2 and 16.2b

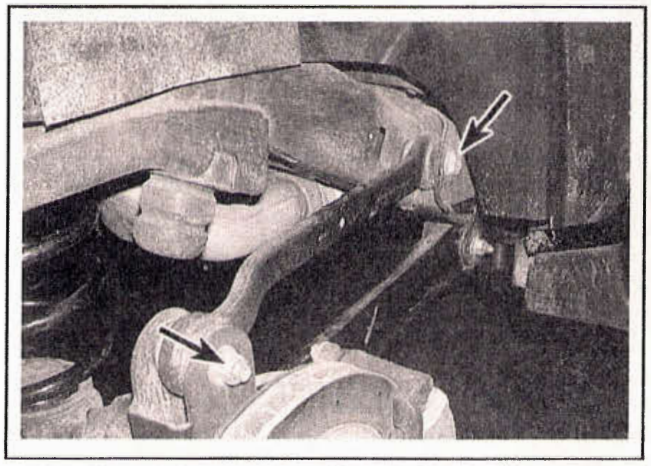
WARNING:

Remove and install only one arm at a time. This will prevent the axle housing from shifting on the jack.

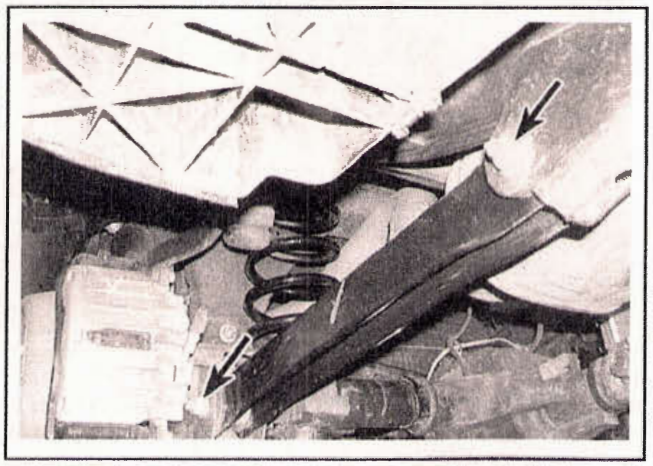
1 Loosen the rear wheel lug nuts. Raise the rear of the vehicle and support it securely on jackstands placed underneath the frame rails. Block the front wheels to prevent the vehicle from rolling. Remove the wheel(s).

2 Support the rear axle with a floor jack, then remove the nuts, washers and bolts from each end of the trailing arm (see illustrations)

3 Remove the arm. Check the bushings in the arm for cracking, hardness or other signs of deterioration. If the bushings are in need of replacement, check with your local auto parts store or dealer parts department regarding the availability of replacement bushings. If replacement bushings are available, take the arm and the bushings to an automotive machine shop or other qualified repair facility to have



16.2a Upper trailing arm mounting details



16.2b Lower trailing arm mounting details

the old ones pressed out and the new ones pressed in.

4 Installation is the reverse of removal. Before tightening the bolts/nuts, raise the rear axle with a floor jack to simulate normal ride height, then tighten the fasteners to the torque listed in this Chapter's Specifications.

TRACK BAR

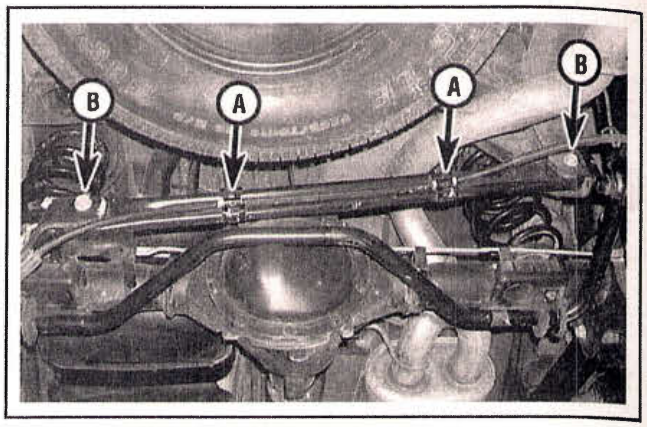
Refer to illustration 16.7

5 Raise the rear of the vehicle and support it securely on jackstands placed underneath the frame rails. Block the front wheels to prevent the vehicle from rolling.

6 Detach the parking brake cable from the clips on the arm.

7 Remove the nuts/bolts from each end of the bar (see illustration).

8 Remove the bar. Check the bushings in the bar for cracking, hardness or other signs of deterioration. If the bushings are in need of replacement, check with your local auto parts store or dealer parts department regarding the availability of replacement bushings. If replacement bushings are available, take the bar and the bushings to an automotive machine shop or other qualified repair facility to have the old ones pressed out and the new ones pressed in.



16.7 Track bar mounting details

A Parking brake cable clip *B Mounting bolt*

9 Installation is the reverse of removal. Before tightening the bolts/nuts, raise the rear axle with a floor jack to simulate normal ride height, then tighten the fasteners to the torque listed in this Chapter's Specifications.

17 Steering wheel - removal and installation

WARNING:

These models are equipped with airbags. Always disable the airbag system (see Chapter 12) before working in the vicinity of any airbag system component to avoid the possibility of accidental deployment of the airbag, which could cause personal injury.

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 information at the front of this manual).

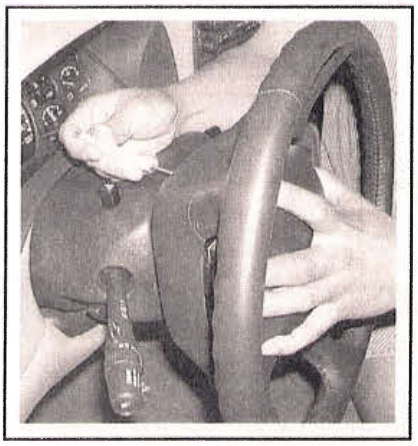
REMOVAL

Refer to illustrations 17.3a, 17.3b, 17.4, 17.6, 17.7 and 17.8

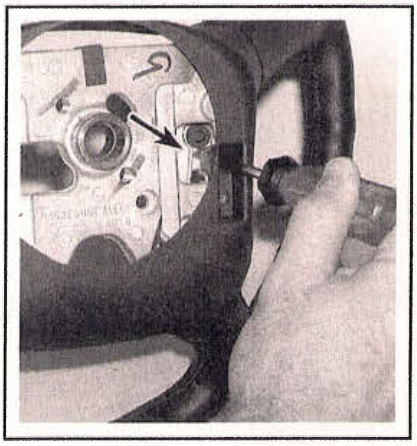
1 Park the vehicle with the wheels pointing straight ahead. Disconnect the cable from the negative terminal of the battery.

2 Refer to Chapter 12 and disable the airbag system.

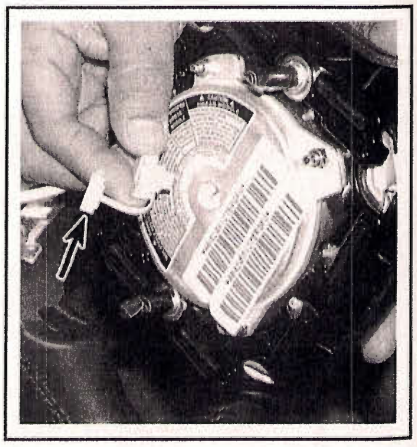
3 Turn the steering wheel 90-degrees to gain access to the hole in the backside (the side facing the dash) of the steering wheel. Insert a screwdriver into the hole for the spring clip that retains the airbag module (see illustrations) and push the spring aside to release the pin. Now turn the steering wheel 180-degrees in the other direction and do the same thing to release the other pin.



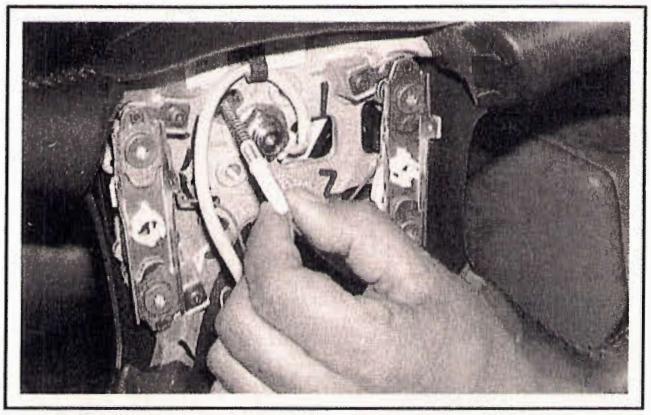
17.3a To release the pins that secure the airbag module to the steering wheel, insert a screwdriver into the holes in the back side of the steering wheel . . .



17.3b . . . and pry each spring clip (arrow) aside to clear the pin (there are two pins; one on each side of the steering wheel) - steering wheel removed for clarity



17.4 Pry up the connector lock (arrow), then pull the connector out of the airbag module



17.6 To unplug the electrical connector for the horn, push it in and turn it counterclockwise to release it

4 Pry up the connector lock and unplug the yellow electrical connector from the module (see illustration). Set the module aside in a safe, isolated area, with the airbag side of the module facing UP.

WARNING:

When carrying the airbag module, keep the driver's (trim) side of it away from your body, and when you set it down, make sure the driver's side is facing up.

5 Center the steering wheel.

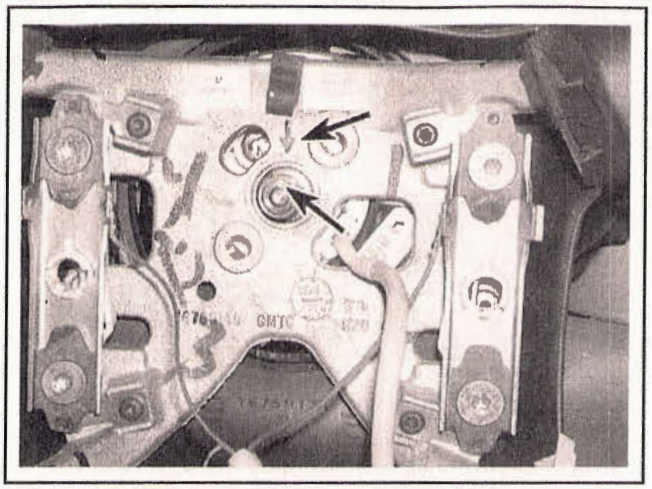
6 Unplug the electrical connector for the horn (see illustration).

7 Remove the steering wheel retaining nut and mark the position of the steering wheel to the shaft, if marks don't already exist or don't line up (see illustration).

8 Use a puller to detach the steering wheel from the shaft (see illustration).

WARNING:

Do not hammer on the shaft or the puller in an attempt to loosen the wheel from the shaft.



17.7 Check to see if there are alignment marks on the steering wheel and the steering shaft; if there are none, make your own

9 Lift the steering wheel from the shaft.

WARNING:

Don't allow the steering shaft to turn with the steering wheel removed. If the shaft turns, the airbag clockspring will become uncentered, which may cause the wire inside to break when the vehicle is returned to service.

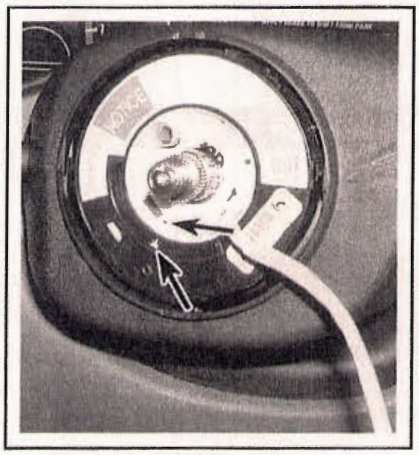
INSTALLATION

Refer to illustrations 17.10, 17.11, 17.12a and 17.12b

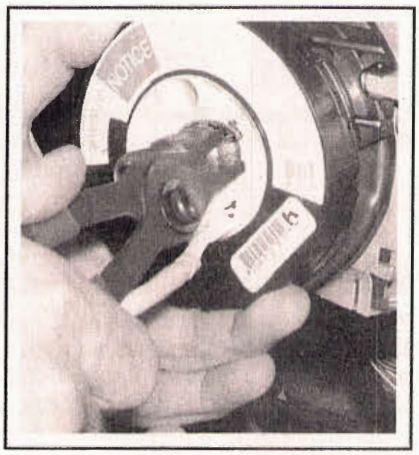
10 Before installing the steering wheel, make sure the airbag clockspring is centered (see illustration).

11 If the airbag system clockspring is not centered, remove the steering column covers (see Chapter 11). Remove the snap-ring (see illustration) and lift the clockspring off the steering column. You may have to cut a plastic wire-tie securing the clockspring harness to the steering column.

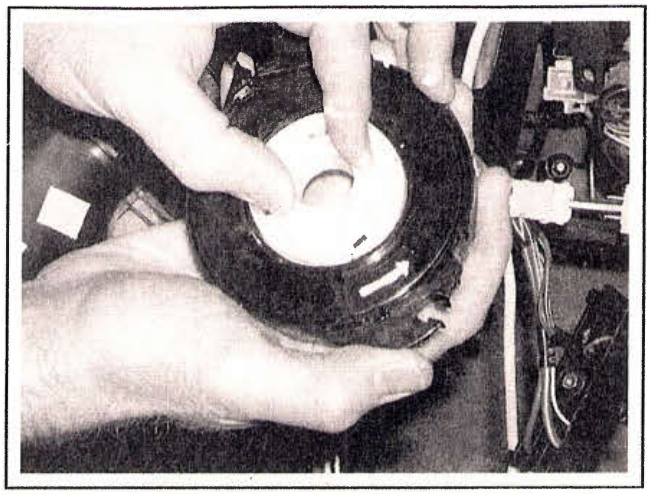
17.8 Remove the steering wheel with a puller that bolts to the hub of the wheel - do not try to hammer the steering wheel off or you will damage the column



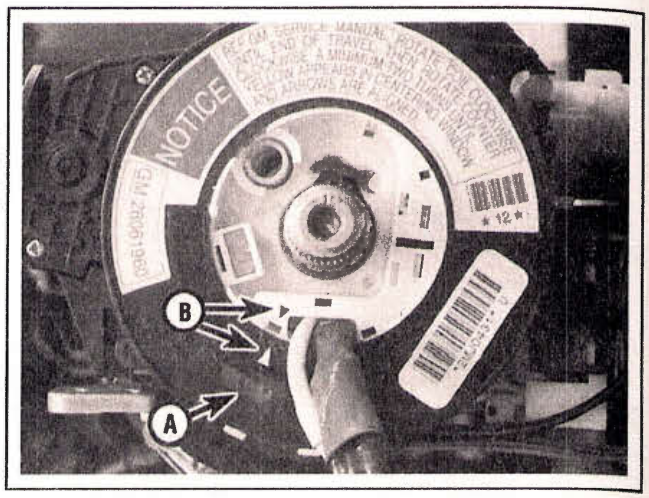
17.10 When the clockspring is centered, the arrow on the housing will be aligned with the arrow on the hub



17.11 The clockspring is retained to the steering shaft with a snap-ring



17.12a To center the clockspring, hold it with its underside facing up, depress the spring lock and rotate the hub in the direction of the arrow until it stops, then turn it in the opposite direction 2-1/2 turns



17.12b On clocksprings with a centering window, the clockspring is centered when the window (A) appears yellow and the two arrows (B) are aligned

12 Center the clockspring:

➡Note: There are two types of clocksprings, alignment window type and windowless type. Each type is equipped with either a lock spring or without a lock spring on the back of the assembly. Follow the directions carefully depending on the type.

a) *If your clockspring does not have a window on the front, turn it over and depress the spring lock (if equipped) on the back, then rotate the hub in the direction of the arrow on the housing until it stops (don't apply too much force). Now turn the hub 2-1/2 turns in the opposite direction until the arrows on the front are aligned (see illustration 17.10), release the spring lock tab. Proceed to the next Step.*

b) *If your clockspring has a window on the front, turn it over and depress the spring lock (if equipped) on the back, hold it face up and turn the hub clockwise until it stops (don't apply excessive force). Now slowly turn the hub counterclockwise at least two turns until the window turns yellow and the arrows on the hub and the housing are in alignment (see illustrations). Proceed to the next step.*

13 Install the clockspring and snap-ring. Secure the wiring harness with a new wire-tie, making sure the harness isn't kinked. Install the steering column covers. Install the wheel on the steering shaft, aligning the marks.

14 Install the steering wheel nut and tighten it to the torque listed in this Chapter's Specifications.

15 Plug in the horn wire, push down and twist it clockwise to lock it in place.

16 Connect the airbag connector to the back of the airbag module. Make sure the connector lock is securely engaged.

17 Position the airbag module on the steering wheel and push it in until the pins on the module engage with the spring clips.

18 Refer to Chapter 12 for the procedure to enable the airbag system.

18 Steering column - removal and installation

➧ Refer to illustrations 18.6, 18.7, 18.8a and 18.8b

WARNING:

The models covered by this manual are equipped with airbags. Always disable the airbag system when working in the vicinity of airbag system components (see Chapter 12).

REMOVAL

1 Park the vehicle with the wheels pointing straight ahead. Disconnect the cable from the negative terminal of the battery. Disable the airbag system (see Chapter 12).

2 Remove the steering wheel (see Section 17), then turn the ignition key to the LOCK position to prevent the steering shaft from turning.

CAUTION:

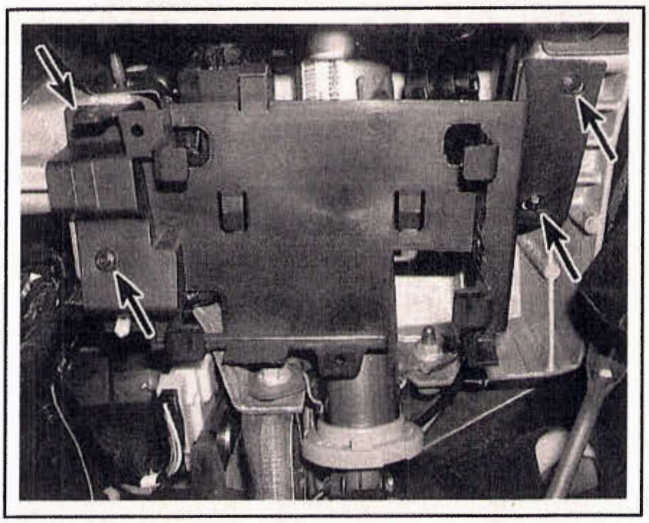
If this is not done, the airbag clockspring could be damaged.

3 Remove the knee bolster and the reinforcement behind it (see Chapter 11). On models with a column-mounted shifter, detach the shift cable from the shift lever on the column (see Chapter 7B).

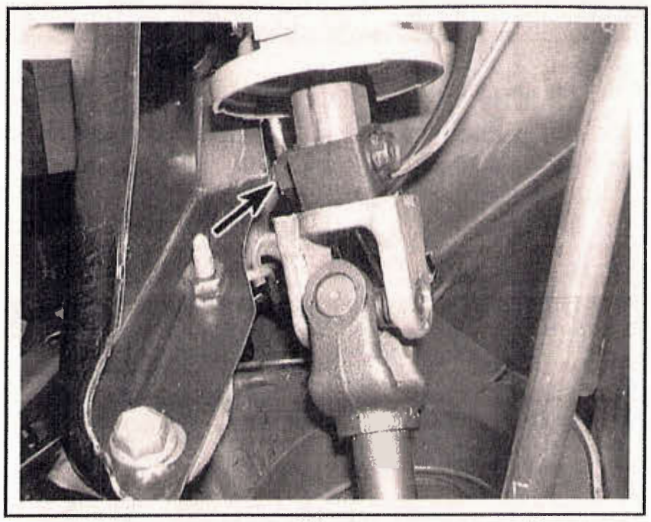
4 If the vehicle is equipped with a tilt column, unscrew the tilt lever.

5 Remove the steering column shrouds (see Chapter 11).

6 Disconnect the electrical connectors for the steering column harness and pry out the retaining clip securing the harness to the column.



18.6 Body Control Module (BCM) mounting screws (arrows)



18.7 Upper intermediate shaft-to-steering column shaft bolt and nut; don't attempt to unscrew the bolt, since it's staked to an anti-rotation bracket. Unscrew the nut (arrow) then pull the bolt out

Remove the Body Control Module (BCM) and bracket from below the steering column (see illustration). Follow the yellow wiring harness from the airbag clockspring and disconnect it from the BCM.

7 Remove the shaft coupler nut and remove the bolt securing the steering shaft to the upper intermediate shaft (see illustration).

➡Note: Unscrew the nut, not the bolt.

Mark the relationship of the intermediate shaft to the steering column shaft.

8 Remove the steering column mounting nuts (see illustrations), lower the column and pull it to the rear, making sure nothing is still connected. Separate the intermediate shaft from the steering shaft and remove the column.

INSTALLATION

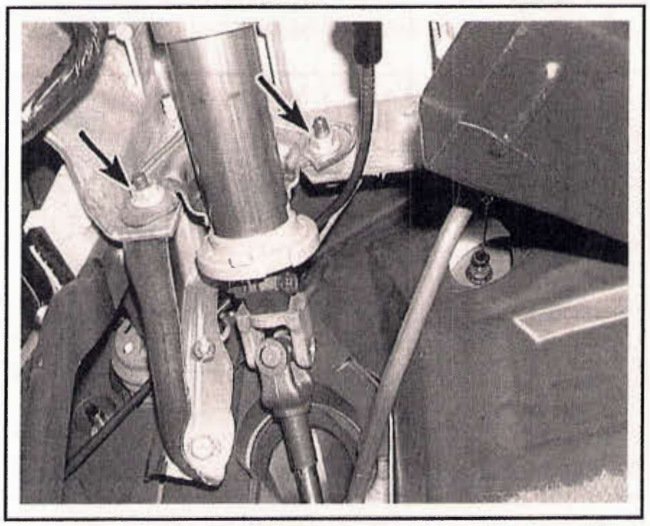
➡Note: If a new column is being installed, check to see if a shipping lock pin is present. If so, remove it.

9 Guide the steering column into position, connect the intermediate shaft, then install the mounting nuts, but don't tighten them yet.

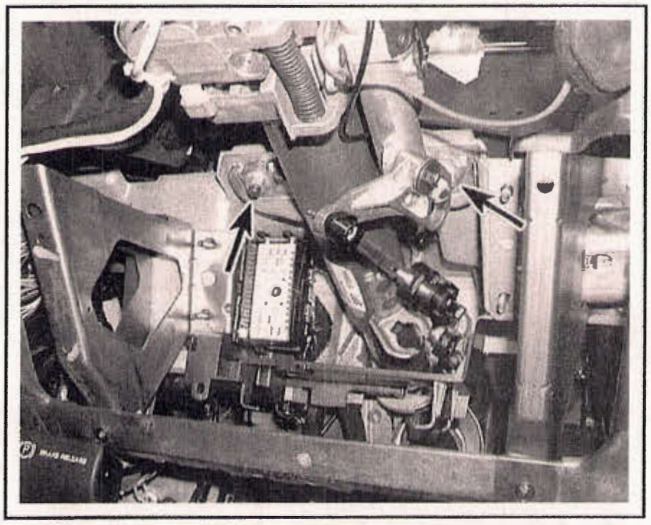
10 Install the coupler bolt and nut, then tighten the nut to the torque listed in this Chapter's Specifications.

11 Tighten the column mounting nuts to the torque listed in this Chapter's Specifications.

12 The remainder of installation is the reverse of removal. Adjust the shift cable following the procedures described in Chapter 7B.



18.8a Remove the steering column lower mounting nuts (arrows)



18.8b Remove the steering column upper mounting nuts (arrows)

19 Intermediate shaft - removal and installation

Refer to illustration 19.3

1 Park the vehicle with the wheels pointing straight ahead. Disconnect the cable from the negative terminal of the battery. Disable the airbag system (see Chapter 12).

2 Turn the ignition key to the LOCK position to prevent the steering shaft from turning.

CAUTION:

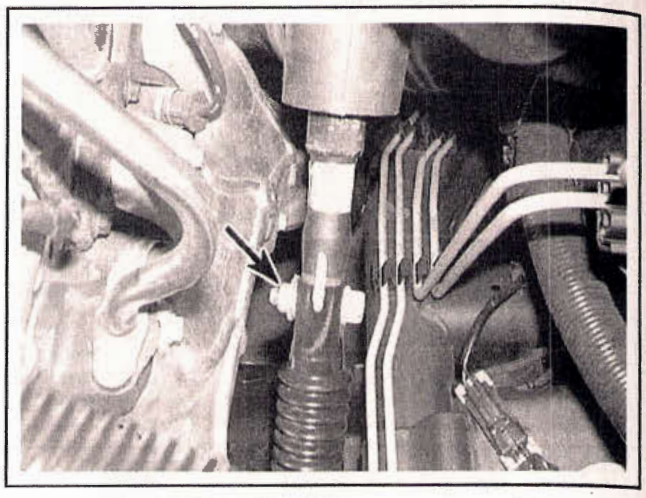
If this is not done, the airbag clockspring could be damaged.

3 Working under the hood, mark the relationship of the upper intermediate shaft to the lower intermediate shaft (see illustration). Remove the shaft coupler nut and remove the bolt securing the lower intermediate shaft to the upper intermediate shaft.

4 Mark the relationship of the lower intermediate shaft to the steering gear input shaft, then remove the intermediate shaft-to-steering gear pinch bolt (see Section 23).

5 Slide the lower portion of the intermediate shaft downwards and off the upper intermediate shaft, the remove the lower shaft from the steering gear.

6 If it is necessary to remove the upper portion of the intermediate shaft, refer to Section 18, Step 7.



19.3 Mark the relationship of the upper and lower halves of the intermediate shaft, then remove the coupler nut and bolt

7 Installation is the reverse of removal. Be sure to align the matchmarks and tighten the coupler bolt/nut and the shaft-to-steering gear pinch bolt to the torque listed in this Chapter's Specifications.

20 Tie-rod ends - removal and installation

Refer to illustrations 20.2, 20.3a and 20.3b

Note: This procedure applies to 2WD and 4WD models.

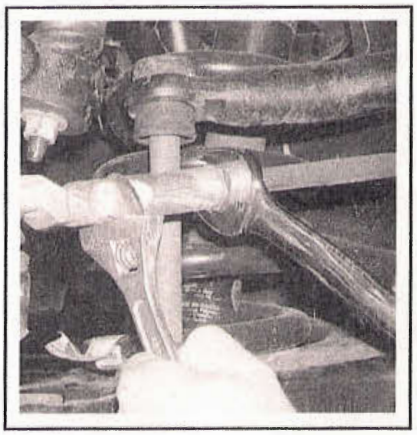
REMOVAL

1 Loosen the wheel lug nuts, raise the front of the vehicle and support it securely on jackstands. Apply the parking brake and block the rear wheels to keep the vehicle from rolling off the jackstands. Remove the wheel.

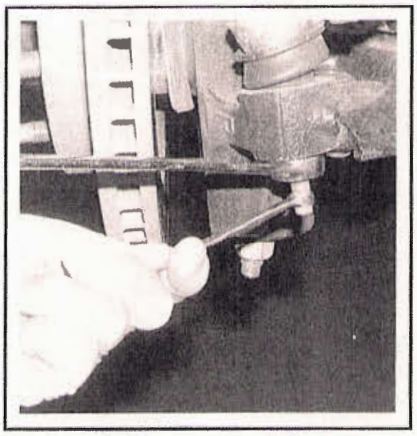
2 Break loose the tie-rod end jam nut (see illustration). Don't back the nut off; once it has just been loosened, it will serve as the point to which the tie-rod end will be threaded. If you are removing the tie-rod end to replace the steering gear boot on a model with rack-and-pinion steering, mark the threads of the tie-rod on the inner side of the nut.

3 Loosen (but don't remove) the nut on the tie-rod end ballstud and disconnect the tie-rod end from the steering knuckle arm with a puller (see illustrations).

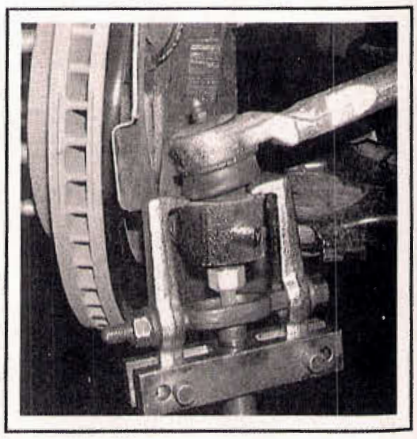
4 Unscrew the tie-rod end from the tie-rod.



20.2 Hold the tie-rod end with a wrench while loosening the jam nut



20.3a If the ballstud turns while attempting to loosen the nut, hold it stationary with a small wrench



20.3b Back-off the ballstud nut a few turns, then separate the tie-rod end from the steering knuckle with a puller (leaving the nut on the ballstud will prevent the tie-rod end from separating violently)

INSTALLATION

5 If the jam nut was removed, thread it onto the tie-rod until it meets the mark applied in Step 2. Thread the tie-rod end onto the tie-rod until it contacts the jam nut, then connect the tie-rod end to the steering arm. Install the ballstud nut and tighten it to the torque listed in this Chapter's Specifications.

6 Tighten the jam nut securely and install the wheel. Lower the vehicle and tighten the lug nuts to the torque listed in the Chapter 1 Specifications.

7 Have the front end alignment checked and, if necessary, adjusted.

21 Steering gear boots - replacement

Refer to illustration 21.4

Note: This procedure applies to models with rack-and-pinion steering only.

1 Loosen the wheel lug nuts, raise the front of the vehicle and support it securely on jackstands. Remove the wheels.

2 Remove the tie-rod ends from the tie-rods (see Section 20).

3 Remove the tie-rod end jam nuts.

WARNING:

The manufacturer recommends replacing the jam nuts with new ones whenever they are removed.

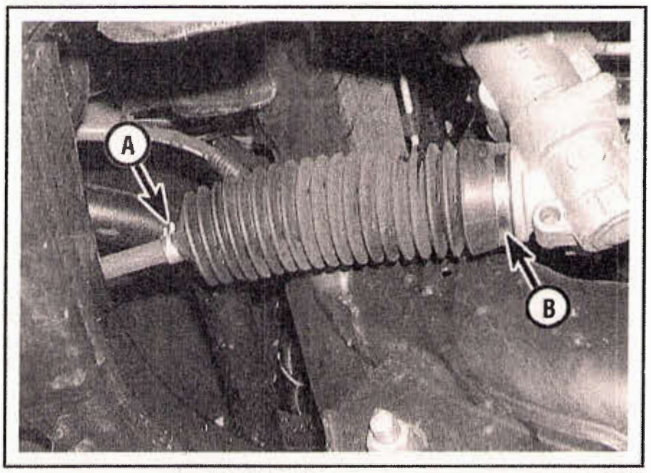
4 Remove the outer boot clamps with a pair of pliers, then cut off the inner boot clamps and discard them (see illustration).

5 Mark the location of the breather tube (if used) in relation to the rack assembly, then remove the boots and the tube. Apply some grease to the exposed ends of the toothed rack before installing new boots.

6 Install a new clamp on the inner end of the boot.

7 Apply multi-purpose grease to groove on the tie-rod (where the outer end of the boot will ride) and the mounting grooves on the steering gear (where the inner boot end will be clamped).

8 Line up the breather tube with the marks made during removal and slide the new boot onto the steering gear housing.



21.4 The outer clamp (A) on the steering gear boot can be squeezed and removed with a pair of pliers; the inner clamp (B) must be cut off

9 Make sure the boot isn't twisted, then tighten the new inner clamp.

10 Install the outer clamps and tie-rod end jam nuts.

11 Install the tie-rod ends (see Section 20).

12 Have the front-end alignment checked and, if necessary, adjusted.

22 Steering linkage - inspection, removal and installation

Note: This Section applies to all models except those with rack-and-pinion steering.

INSPECTION

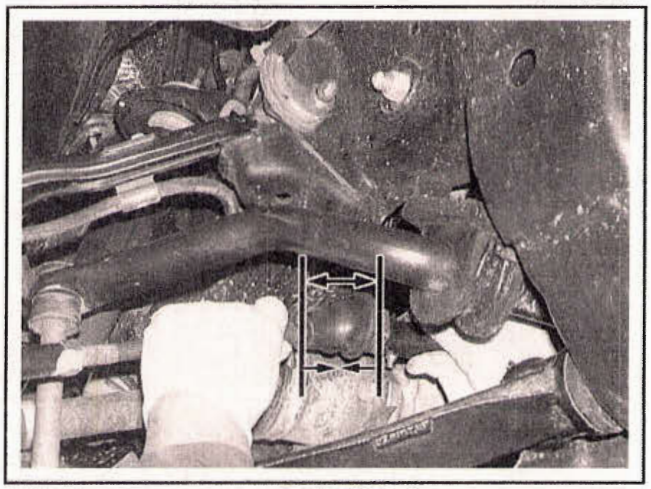
Refer to illustration 22.4

1 The steering linkage (see illustration 1.1b) connects the steering gear to the front wheels and keeps the wheels in proper relation to each other. The linkage consists of the Pitman arm, the idler arm, the relay rod, two adjustable tie-rods and, on some models, a steering damper. The Pitman arm, which is fastened to the steering gear shaft, moves the relay rod back-and-forth. The relay rod is supported on the other end by a frame-mounted idler arm. The back-and-forth motion of the relay rod is transmitted to the steering knuckles through a pair of tie-rod assemblies.

2 Unlock the steering wheel.

3 Raise the front of the vehicle and support it securely with jackstands placed underneath the frame rails.

4 Grasp the relay rod and the tie-rod and try to push them together



22.4 Try to move the tie-rod in-and-out of the relay rod - if there is more than 1/32-inch of play between the tie-rod and relay rod, replace the relay rod assembly

and pull them apart (see illustration). If there is more than 1/32-inch of play, replace the relay rod/tie-rod assembly. Now push up and pull down on the tie-rod end; if it moves more than 1/8-inch, replace the tie-rod end.

5 Push up, then pull down on the relay rod end of the idler arm, exerting a force of approximately 25 pounds each way. Measure the total distance the end of the arm travels. If the play is greater than 5/64-inch, replace the idler arm.

6 Check for torn ballstud boots and bent or damaged linkage components.

REMOVAL AND INSTALLATION

Tie-rod end

7 Refer to Section 20 for the tie-rod end replacement procedure.

Tie-rod

8 The tie-rods are an integral part of the relay rod and cannot be replaced separately.

Relay rod

9 Raise the vehicle and support it securely on jackstands. Apply the parking brake.

10 Detach the tie-rod ends from the steering knuckle arms, then remove the tie-rod ends from the tie-rods (see Section 20).

11 If equipped with a steering damper, separate the damper from the relay rod.

12 Separate the relay rod from the Pitman arm.

13 Separate the relay rod from the idler arm.

14 Installation is the reverse of the removal procedure. Use new nuts on all of the ballstuds. If the ballstuds spin when attempting to tighten the nuts, force them into the tapered holes with a large pair of pliers. Be sure to tighten all of the nuts to the torque listed in this Chapter's Specifications.

Idler arm

Refer to illustration 22.16

15 Raise the vehicle and support it securely on jackstands. Apply the parking brake.

16 Loosen but do not remove the idler arm-to-relay rod nut (see illustration).

17 Separate the idler arm from the relay rod with a two jaw puller. Remove the nut. Discard the nut - don't reuse it.

18 Remove the idler arm-to-frame bolts (see illustration 22.16).

19 To install the idler arm, position it on the frame and install the bolts, tightening them to the torque listed in this Chapter's Specifications.

20 Insert the idler arm ballstud into the relay rod and install a new nut. Tighten the nut to the torque listed in this Chapter's Specifications. If the ballstud spins when attempting to tighten the nut, force it into the tapered hole with a large pair of pliers.

Pitman arm

Refer to illustrations 22.25 and 22.26

21 Raise the vehicle and support it securely on jackstands.

22 Remove the relay rod nut from the Pitman arm ballstud. Discard the nut - don't reuse it.

23 Using a puller, separate the relay rod from the Pitman arm ballstud.

24 Remove the steering gear (see Section 23).

25 Remove the Pitman arm nut and washer and discard the nut - use a new one during installation (see illustration). Mark the Pitman arm and the steering gear shaft to ensure proper alignment at reassembly time (only if the same Pitman arm is going to be used).

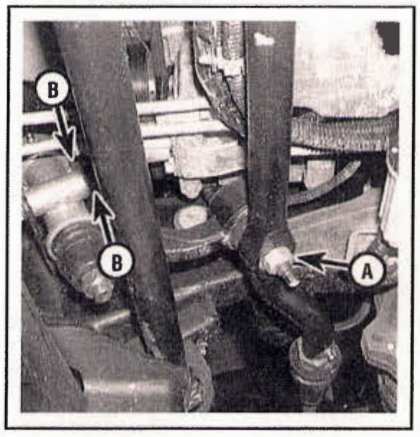
26 Remove the Pitman arm with a Pitman arm puller or a two-jaw puller (see illustration).

27 Inspect the ballstud threads for damage. Inspect the ballstud seal for excessive wear. Clean the threads on the ballstud.

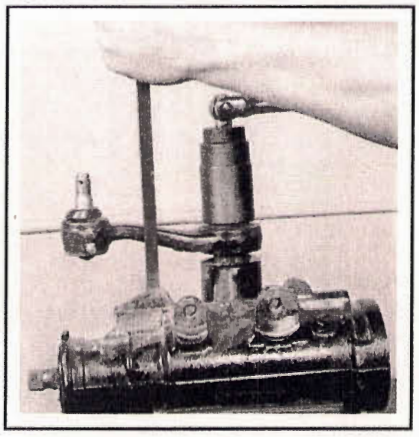
28 Installation is the reverse of removal. Make sure the marks you made on the Pitman arm and Pitman shaft are aligned, and be sure to use a new nut.

STEERING DAMPER

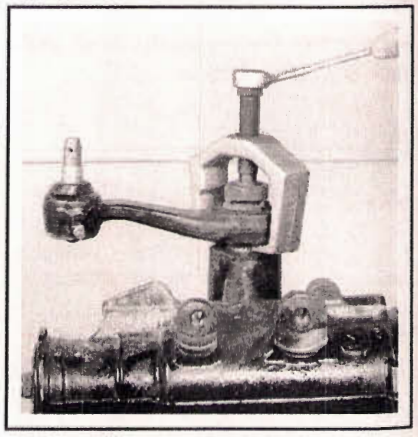
29 Inspect the steering damper for fluid leakage. A slight film of fluid near the shaft seal is normal, but if there's excessive fluid present and



22.16 Remove the idler arm ballstud nut (A) and separate the ballstud from the relay rod with a puller, then remove the idler arm mounting nuts and bolts (B)



22.25 With the steering gear secured in a vise, use a prybar to hold the Pitman arm and break loose the Pitman arm nut. Be sure to mark the relationship of the Pitman arm to the steering gear shaft before pulling it off



22.26 Remove the Pitman arm with a Pitman arm puller (shown here) or a heavy-duty two-jaw puller

it's obviously coming from the steering damper, replace the damper.

30 Inspect the steering damper bushing for excessive wear. If it's in bad shape, replace the damper.

31 To test the damper itself, disconnect it from the relay rod. Using as much travel as possible, extend and compress the damper. The resistance should be smooth and constant for each stroke. If any binding, dead spots or unusual noises are present, replace the damper.

32 Remove the damper ballstud-to-relay rod nut. Separate the damper from the relay rod using a small puller.

33 Remove the steering damper mounting bolt and nut, then remove the damper.

34 Installation is the reverse of removal.

WARNING:

The manufacturer recommends using new nuts on the ballstuds during installation.

Tighten the fasteners to the torque values listed in this Chapter's Specifications.

23 Steering gear - removal and installation

WARNING:

DO NOT allow the steering column shaft to rotate with the steering gear removed or damage to the airbag system could occur. As a method of preventing the shaft from turning, wrap the seat belt around the rim of the steering wheel and buckle the belt in place.

MODELS WITH RACK-AND-PINION STEERING GEAR

Refer to illustrations 23.3, 23.5 and 23.6

1 Loosen the front wheel lug nuts, raise the front of the vehicle and support it securely on jackstands. Apply the parking brake. Remove the wheels.

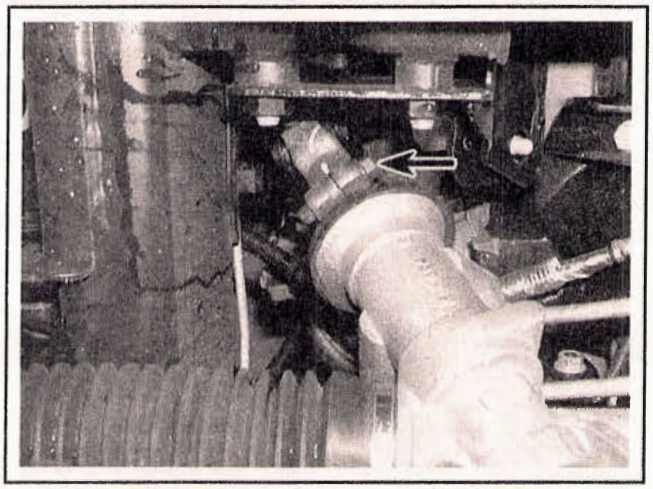
2 Remove the under-vehicle splash shield. Also remove the skid plate bolts and the skid plate, if equipped. Refer to Section 3 and remove the stabilizer bar.

3 Mark the relationship of the intermediate shaft coupler to the steering gear input shaft and remove the pinch bolt (see illustration).

4 Detach the tie-rod ends from the steering knuckles (see Section 20).

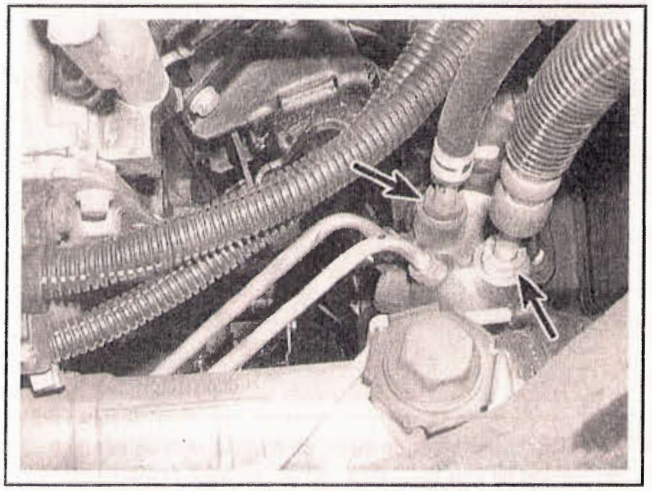
5 Position a drain pan under the steering gear. Using a flare-nut wrench, if available, unscrew the power steering pressure and return lines from the steering gear (see illustration). Cap the lines to prevent leakage.

6 Unscrew the mounting nuts, remove the washers and slide the bolts forward into the frame. Lower the steering gear from the vehicle (see illustration).

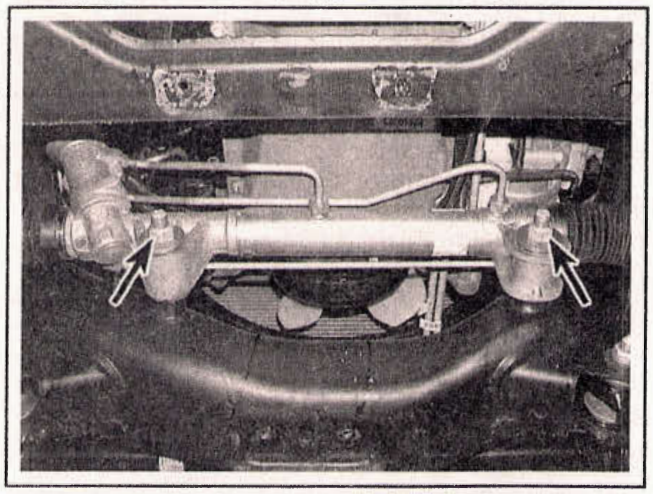


23.3 Remove the pinch bolt from the lower end of the intermediate shaft

7 Installation is the reverse of removal. Be sure to tighten all fasteners to the torque values listed in this Chapter's Specifications. Tighten the wheel lug nuts to the torque listed in the Chapter 1 Specifications. Check the power steering fluid level and add some, if necessary (see Chapter 1), then bleed the system as described in Section 25.



23.5 Unscrew the pressure and return line fittings from the power steering gear



23.6 Rack-and-pinion steering gear mounting nuts/bolts

MODELS WITH RECIRCULATING BALL STEERING GEAR

8 Raise the front of the vehicle and support it securely on jackstands. Apply the parking brake.

9 Remove the under-vehicle splash shield. Also remove the skid plate bolts and the skid plate, if equipped.

10 Mark the relationship of the intermediate shaft coupler to the steering gear input shaft, then remove the pinch bolt from the coupler.

11 Position a drain pan under the steering gear, then unscrew the power steering lines from the steering gear. Use a flare-nut wrench, if available, to prevent rounding-off the fittings.

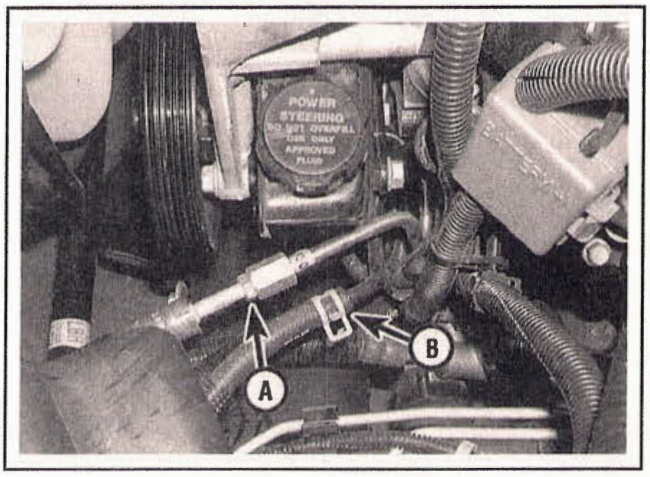
12 Separate the relay rod from the Pitman arm.

13 Remove the steering gear retaining bolts from the frame rail, then detach the steering gear from the frame and remove it.

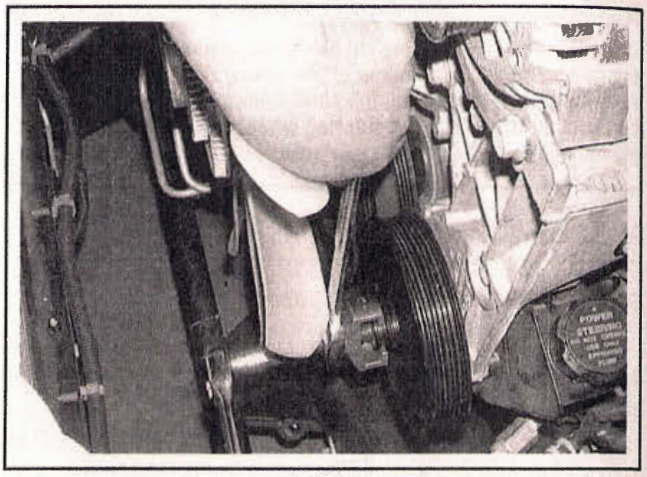
14 If you're installing a new steering gear or a new Pitman arm, remove the Pitman arm from the steering gear sector shaft (see Section 22).

15 Installation is the reverse of removal. Be sure to tighten all fasteners to the torque values listed in this Chapter's Specifications. Check the power steering fluid level and add some, if necessary (see Chapter 1), then bleed the system as described in Section 25.

24 Power steering pump - removal and installation



24.3 Detach the power steering pressure line (A) and return hose (B) from the lines coming out of the pump



24.4 Remove the pulley from the power steering pump with a pulley removal tool

REMOVAL

Refer to illustrations 24.3, 24.4 and 24.5

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 information at the front of this manual).

2 Remove the radiator upper fan shroud (see Chapter 3) and the serpentine drivebelt (see Chapter 1).

3 Position a drain pan under the power steering pump. Disconnect the pressure and return hoses from the hard lines coming out of the pump (see illustration). Plug the hoses to prevent contaminants from entering.

4 Using a special power steering pump pulley remover, remove the pulley from the pump (see illustration).

5 Remove the pump mounting fasteners (see illustration) and lift the pump from the vehicle, taking care not to spill fluid on the painted surfaces.

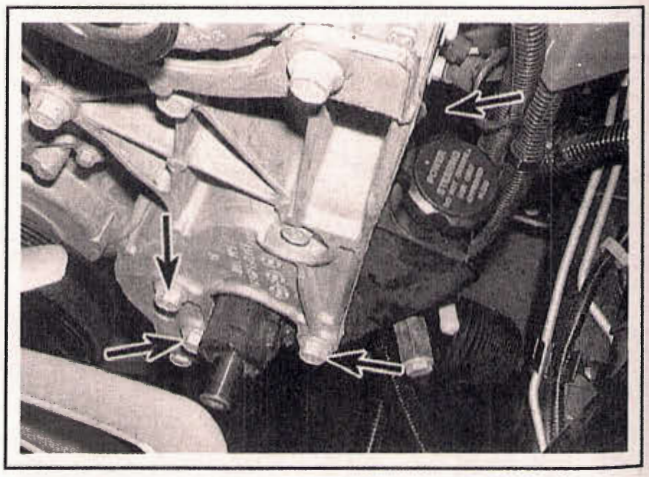
INSTALLATION

Refer to illustrations 24.8a and 24.8b

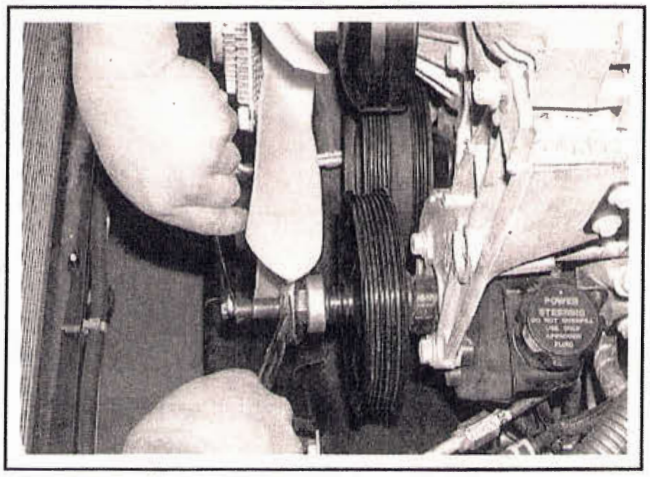
6 Position the pump in the mounting bracket and install the mounting bolts or nuts. Tighten the fasteners to the torque listed in this Chapter's Specifications.

7 Connect the hoses to the pump. Tighten the fittings securely.

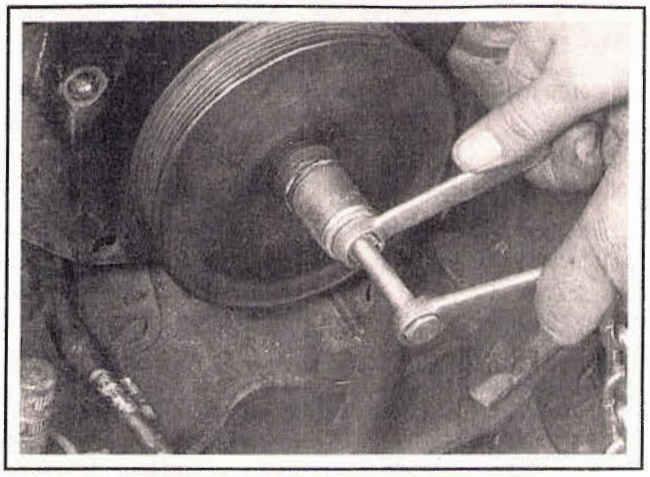
8 Press the pulley onto the shaft using a special pulley installer tool (see illustrations). An alternative tool can be fabricated from a long bolt, nut, washer and a socket of the same diameter as the pulley hub.



24.5 The power steering pump on models with V8 engines is retained by four bolts (the bolt on the back of the pump securing the bracket to the engine is not visible in this photo); on V6 models it's retained by two nuts, both accessed from the back of the pump



24.8a Press the pulley onto the shaft using a pulley installation tool - don't attempt to drive it on with a hammer or push it on with a traditional press!



24.8b An alternative to the special pulley installer tool can be fabricated from a long bolt with the same thread pitch as the internal threads of the pump shaft, a nut, washer and a socket that's the same diameter as the pulley hub

Push the pulley onto the shaft until the front of the hub is flush with the shaft, but no further.

9 Install the drivebelt and fan shroud.

10 Fill the power steering reservoir with the recommended fluid (see Chapter 1) and bleed the system following the procedure described in the next Section.

25 Power steering system - bleeding

1 Following any operation in which the power steering fluid lines have been disconnected, the power steering system must be bled to remove all air and obtain proper steering performance.

2 With the front wheels in the straight ahead position, check the power steering fluid level and, if low, add fluid until it reaches the Cold mark on the dipstick.

3 Start the engine and allow it to run at fast idle. Recheck the fluid level and add more if necessary to reach the Cold mark on the dipstick.

4 Bleed the system by turning the wheels from side-to-side, without hitting the stops. This will work the air out of the system. Keep the reservoir full of fluid as this is done.

5 When the air is worked out of the system, return the wheels to the straight ahead position and leave the vehicle running for several more minutes before shutting it off. Recheck the fluid level.

6 Road test the vehicle to be sure the steering system is functioning normally and noise free.

7 Recheck the fluid level to be sure it's up to the Hot mark on the dipstick while the engine is at normal operating temperature. Add fluid if necessary (see Chapter 1).

26 Wheels and tires - general information

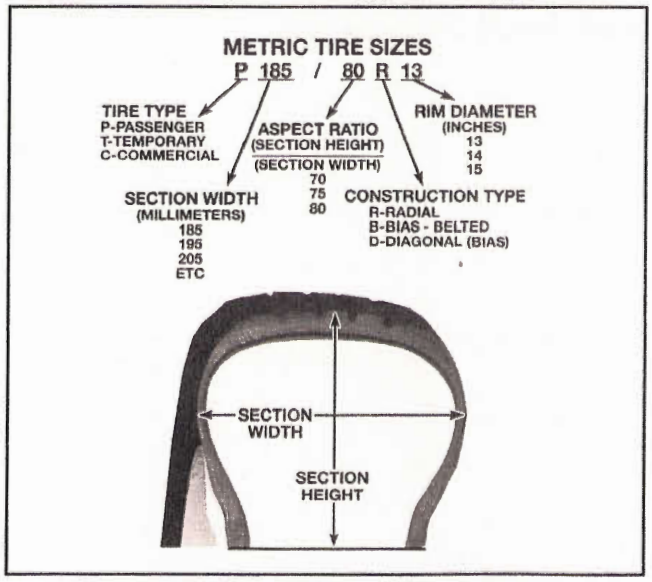
♦ Refer to illustration 26.1

Most vehicles covered by this manual are equipped with metric-size fiberglass or steel belted radial tires (see illustration), or inch-pattern light truck tires. Use of other size or type of tires may affect the ride and handling of the vehicle. Don't mix different types of tires, such as radials and bias belted, on the same vehicle as handling may be seriously affected. It's recommended that tires be replaced in pairs on the same axle, but if only one tire is being replaced, be sure it's the same size, structure and tread design as the other.

Because tire pressure has a substantial effect on handling and wear, the pressure on all tires should be checked at least once a month or before any extended trips (see Chapter 1).

Wheels must be replaced if they're bent, dented, leak air, have elongated bolt holes, are heavily rusted, out of vertical symmetry or if the lug nuts won't stay tight. Wheel repairs that use welding or peening are not recommended.

Tire and wheel balance is important to the overall handling, braking and performance of the vehicle. Unbalanced wheels can adversely affect handling and ride characteristics as well as tire life. Whenever a tire is installed on a wheel, the tire and wheel should be balanced by a shop with the proper equipment.



26.1 Metric tire size code

27 Front end alignment - general information

Refer to illustration 27.1

Note: On models equipped with the Quadrasteer™ option, the vehicle should always have a "four-wheel" alignment at a qualified shop whenever an alignment is done.

A front end alignment (see illustration) refers to the adjustments made to the front wheels so they're in proper angular relationship to the suspension and the ground. Front wheels that are out of proper alignment not only affect steering control, but also increase tire wear.

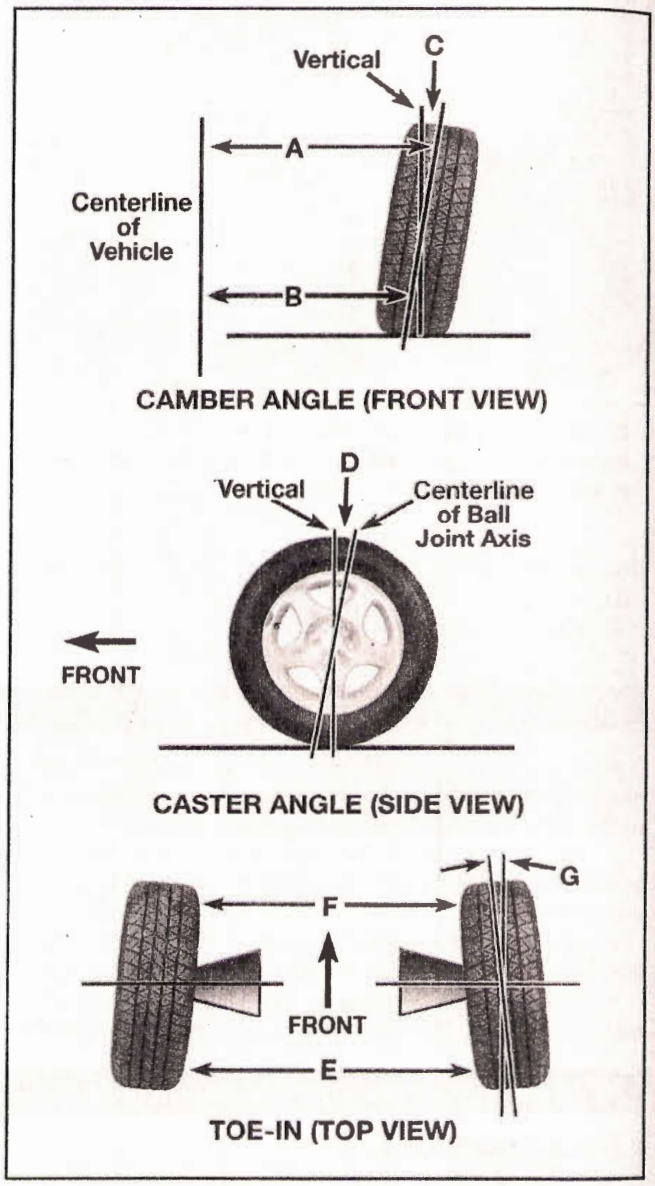
Getting the proper front wheel alignment is a very exacting process, one in which complicated and expensive machines are necessary to perform the job properly. Because of this, you should have a technician with the proper equipment perform these tasks. We will, however, use this space to give you a basic idea of what is involved with front end alignment so you can better understand the process and deal intelligently with the shop that does the work.

Toe-in is the turning in of the front wheels. The purpose of a toe specification is to ensure parallel rolling of the front wheels. In a vehicle with zero toe-in, the distance between the front edges of the wheels will be the same as the distance between the rear edges of the wheels. The actual amount of toe-in is normally only a fraction of an inch. Toe-in is adjusted by turning the tie-rod in the tie-rod end to lengthen or shorten the tie-rod. Incorrect toe-in will cause the tires to wear improperly by making them scrub against the road surface.

Camber is the tilting of the front wheels from vertical when viewed from the front of the vehicle. When the wheels tilt out at the top, the camber is said to be positive (+). When the wheels tilt in at the top the camber is negative (-). The amount of tilt is measured in degrees from the vertical and this measurement is called the camber angle. This angle affects the amount of tire tread which contacts the road and compensates for changes in the suspension geometry when the vehicle is cornering or traveling over an undulating surface. Camber is adjusted by turning the upper control arm pivot bolts, one way or the other, in equal amounts.

Caster is the tilting of the top of the front steering axis from vertical. A tilt toward the rear is positive caster and a tilt toward the front is negative caster. Caster is adjusted by turning the upper control arm pivot bolts, one way or the other, in opposite directions.

When making adjustments to the front end alignment, the caster is set first, then the camber, then the toe-in.



27.1 Front end alignment details

A minus B = C (degrees camber)
D = degrees caster
E minus F = toe-in (measured in inches)
G = toe-in (expressed in degrees)

Specifications

General

Power steering fluid type	See Chapter 1
Front suspension "Z" height (models with torsion bars) (see illustration 4.13)	
SS models	3.5 to 4 inches
All others	4.7 inches

Torque specifications — Ft-lbs (unless otherwise indicated)

Front suspension

Shock absorber	
Upper mounting nut	15
Lower mounting bolts (2WD models)	19
Lower mounting bolt/nut (4WD models)	59
Upper control arm pivot bolt nuts	140
Lower control arm pivot bolt nuts	
1999 through 2002	110
2003	
2WD	107
4WD	110
2004 and later	129
Balljoint-to-steering knuckle nut	
1999 and 2000	
Upper	37
Lower	74
2001	
Upper	74
Lower	101
2002 and later	
Upper	37
Lower	74
Balljoint (replacement)-to-lower control arm nuts	52
Stabilizer bar	
Link nut	89 in-lbs
Clamp bolts	
1999 through 2004	
1500 models	24
2500 models	39
2005	37
Hub/bearing assembly-to-steering knuckle bolts	133
Torsion bar crossmember-to-frame bolts/nuts	70

Rear suspension

Shock absorber	
Upper bolt/nut	
1999 through 2004	70
2005 and later	15

Torque specifications (continued) Ft-lbs (unless otherwise indicated)

Lower bolt/nut	
1999 through 2004	70
2005 and later	
2WD	18
4WD	59
Stabilizer bar	
Link nuts	48
Clamp bolts	24
Leaf spring	
1999 through 2002	
U-bolt nuts	
14 mm U-bolts	59
16 mm U-bolts	89
Spring-to-frame (front hanger) bolt/nut	92
Rear shackle bolts/nuts	70
2003 and later	
U-bolt nuts	
1500	53
2500	110
Spring-to-frame (front hanger) bolt/nut	110
Rear shackle bolts/nuts	70
Trailing arm bolts/nuts	
Upper	77
Lower	89
Track bar bolts/nuts	77

Steering

Steering gear-to-frame bolts/nuts (rack-and-pinion)	
1999 and 2000	92
2001 and later	136
Steering gear-to-frame bolts (recirculating ball)	110
Intermediate shaft pinch bolt	33
Tie-rod end-to-steering knuckle nut	
1999 through 2001	33
2002	
Avalanche	33
All others	48
2003 and 2004	48
2005 and later	
1500	37
2500	48
Steering linkage (non rack-and-pinion)	
Pitman shaft nut	184
Pitman arm-to-relay rod nut	46
Idler arm mounting bolts/nuts	73
Idler arm ballstud nut	46
Steering damper-to-relay rod nut	
1999 through 2002	
except 2002 Silverado	46
2002 Silverado and all 2003 and later	30
Steering damper-to-frame bolt/nut	30

Torque specifications (continued) Ft-lbs (unless otherwise indicated)

Steering column	
Steering wheel nut	29
Steering column bracket bolts/nuts	
1999 through 2003	22
2004 and later	156 in-lbs
Shaft coupler bolt	35
Power steering pump	
Mounting nuts (V6 engines)	37
Mounting bolts (V8 engines)	37
Wheel lug nuts	See Chapter 1