Chapter 10
Suspension and steering systems

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Specifications

Torque specifications	Ft-lbs (unless otherwise indicated)	Nm
Front suspension		
Balljoint-to-steering knuckle pinch bolt	52	70
Control arm		
Front pivot bolt	85	115
Rear mounting bolt		
2002 and earlier models	148	200
2003 models	133	180
Stabilizer bar		
Bracket bolts	52	70
Link nuts		
2002 and earlier models	35	48
2003 models	32	43
Struts		
Damper shaft nut	76	103
Strut-to-steering knuckle bolts/nuts	85	115
Strut upper mounting nuts		
2003 and earlier models	59	80
2004 models	41	55
2005 and later models	30	40
Rear suspension		
Shock absorber		
Upper mounting nut	156 in-lbs	18
Lower mounting nut	85	115
Upper suspension arm-to-body bolt	85	115
Lower suspension arm-to-body bolt	85	115
Upper suspension arm-to-trailing arm	85	115
Lower suspension arm-to-trailing arm	85	115
Trailing arm-to-body bolt	85	115

Torque specifications (continued)

	Ft-lbs (unless otherwise indicated)	Nm
Steering		
Intermediate shaft pinch bolt	17	23
Power steering pump pulley mounting nut (2.0L four-cylinder engine)	36	49
Power steering pump mounting bolts (2.0L four-cylinder engine)	18	25
Power steering bracket-to-pump bolts (3.0L V6 engine)	18	25
Power steering pump bracket nuts (3.0L V6 engine)	89 in-lbs	10
Power steering pressure and return line-to-steering gear-bracket bolts	89 in-lbs	10
Power steering pressure and return line-to-steering-gear mounting bolt	18	25
Steering column mounting nuts	168 in-lbs	19
Steering column support bolt	144 in-lbs	16
Steering gear mounting bolts	93	126
Steering wheel-to-steering column pinion shaft	132 in-lbs	15
Tie-rod end-to-steering knuckle nut	41	55
U-joint-to-steering gear input shaft pinch bolt	18	24

1 General information

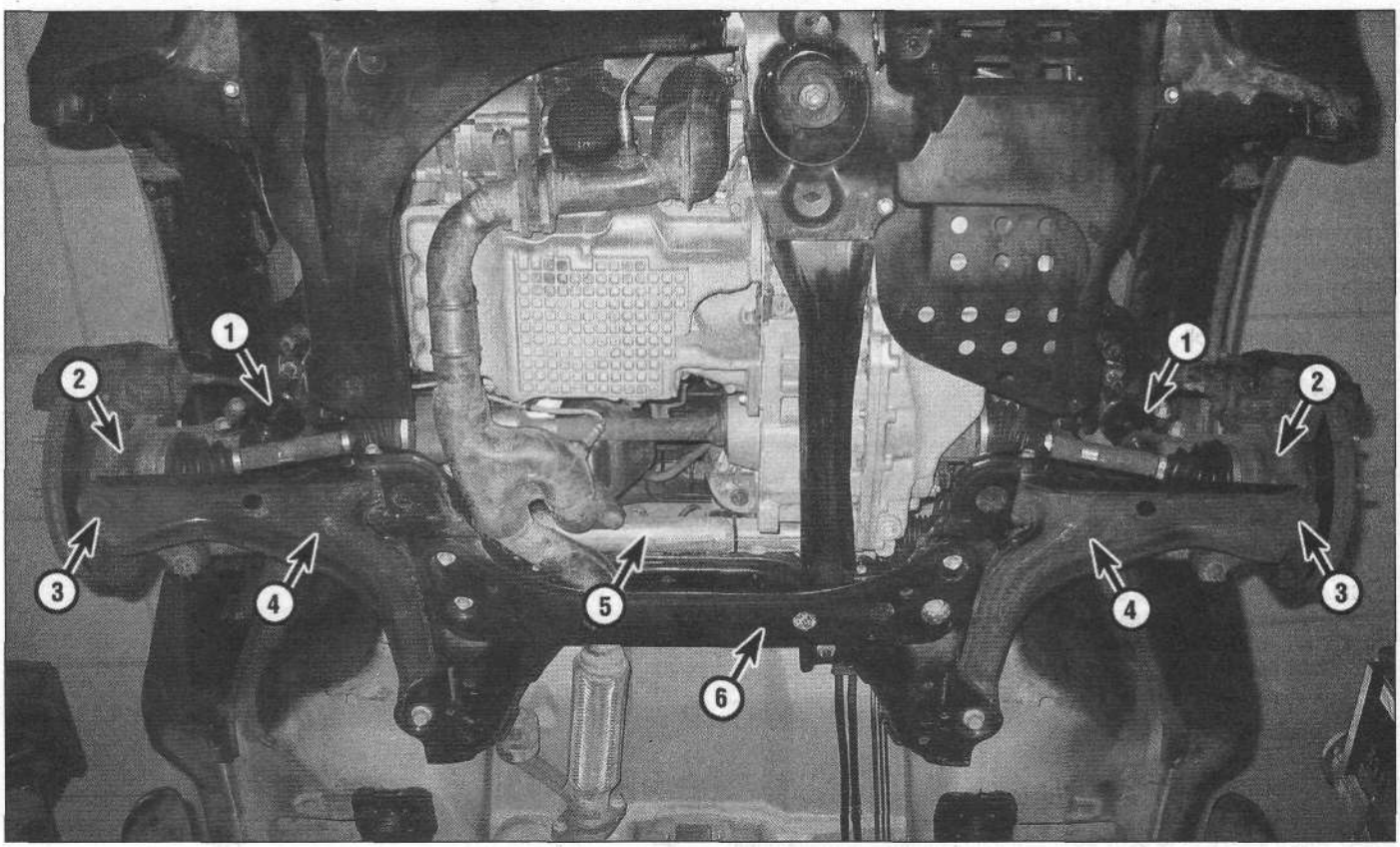
Refer to illustrations 1.1a and 1.1b

The front suspension **(see illustration)** is a MacPherson strut design. The upper end of each strut/coil spring assembly is attached to the vehicle's body strut support. The lower end of the strut assembly is connected to the upper end of the steering knuckle. The steering knuckle is attached to a balljoint mounted on the outer end of the suspension control arm. A stabilizer bar reduces body roll.

The rear suspension **(see illustration)** employs a trailing arm, two lateral suspension arms, a coil spring and shock absorber per side.

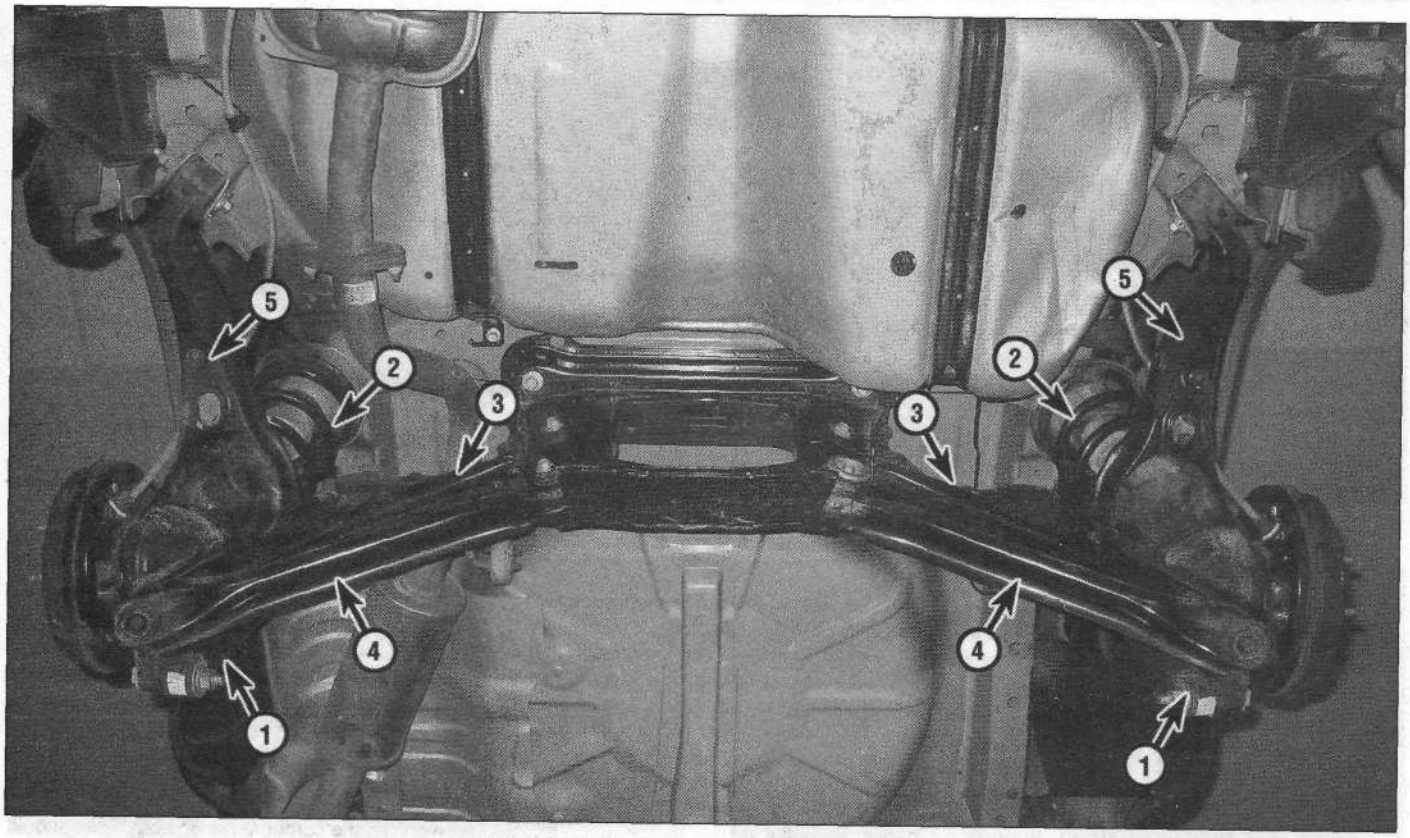
The rack-and-pinion steering gear is located behind the engine/transaxle assembly on the front suspension crossmember and actuates the tie-rods, which are attached to the steering knuckles. The inner ends of the tie-rods are protected by rubber boots which should be inspected periodically for secure attachment, tears and leaking lubricant (which would indicate a failed rack seal).

The power assist system consists of a belt-driven pump and associated lines and



1.1a Front suspension and steering components

1 *Strut/coil spring assembly*
2 *Steering knuckle*
3 *Balljoint*
4 *Control arm*
5 *Steering gear*
6 *Suspension crossmember*



1.1b Typical rear suspension components

1 *Shock absorber*
2 *Coil spring*
3 *Upper suspension arm*
4 *Lower suspension arm*
5 *Trailing arm*

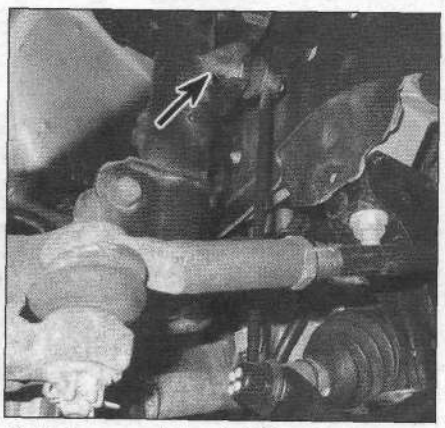
hoses. The fluid level in the power steering pump reservoir should be checked periodically (see Chapter 1).

The steering wheel operates the steering shaft, which actuates the steering gear through universal joints. Looseness in the steering can be caused by wear in the steering shaft universal joints, the steering gear, the tie-rod ends and loose retaining bolts.

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 will break 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 tightening the nut or bolt first will help to break it loose. Fasteners that require drastic measures to remove should always be replaced with new ones.

Since most of the procedures 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. 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 any suspension or steering components. Instead, replace any bent or damaged part with a new one.*



2.3 Disconnect the stabilizer bar link rod

2 Strut assembly (front) - removal, inspection and installation

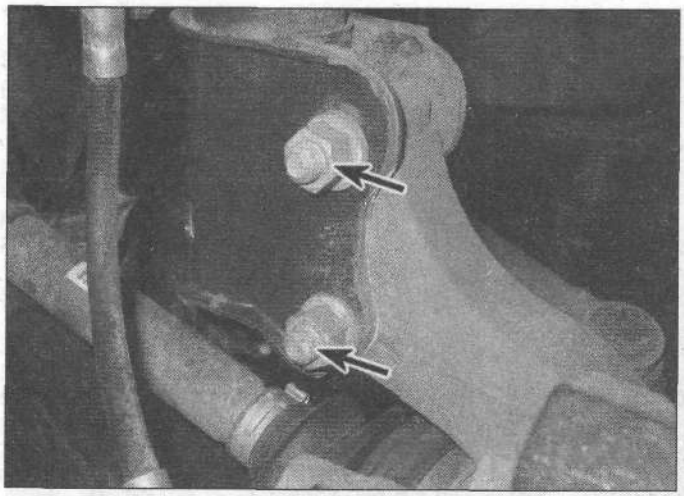
Removal

Refer to illustrations 2.3, 2.4 and 2.6

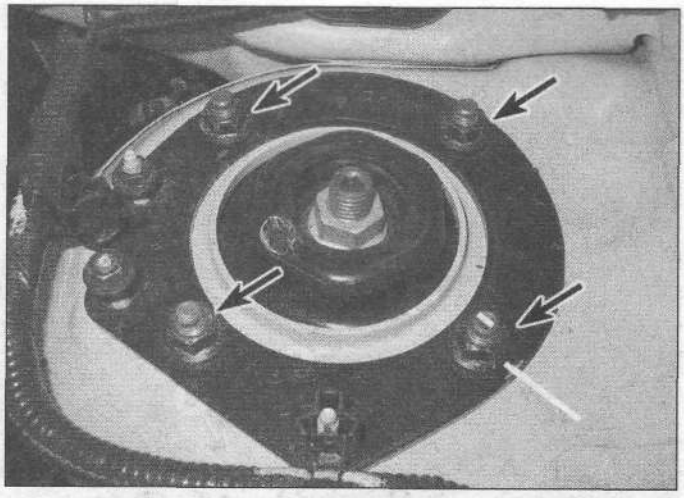
1 Loosen the wheel lug nuts, raise the vehicle and support it securely on jackstands. Remove the wheel.

2 Unbolt the brake hose bracket from the strut. If the vehicle is equipped with ABS, detach the speed sensor wiring harness from the strut by removing the clamp bracket bolt.

3 Detach the stabilizer bar link from the bracket on the strut **(see illustration).**



2.4 To detach the strut from the steering knuckle, remove the two nuts, then knock out the bolts with a hammer and punch



2.6 Mark the relationship of the studs to the bearing plate, then remove the upper mounting nuts

4 Remove the strut-to-knuckle nuts **(see illustration)** and knock the bolts out with a hammer and punch.

5 Separate the strut from the steering knuckle. Be careful not to overextend the inner CV joint. Also, don't let the steering knuckle fall outward and strain the brake hose.

6 Mark the relationship of the outer studs-to-bearing plate **(see illustration).** Support the strut and spring assembly with one hand and remove the four strut-to-body nuts. Remove the assembly out from the fenderwell.

Inspection

7 Check the strut body for leaking fluid, dents, cracks and other obvious damage which would warrant repair or replacement.

8 Check the coil spring for chips or cracks in the spring coating (this will cause premature spring failure due to corrosion). Inspect the spring seat for cuts, hardness and general deterioration.

9 If any undesirable conditions exist, proceed to the strut disassembly procedure (see Section 3).

Installation

10 Guide the strut assembly up into the fenderwell, align the previously made matchmarks and insert the upper mounting studs through the holes in the body. Once the studs protrude, install the nuts so the strut won't fall back through. This is most easily accomplished with the help of an assistant, as the strut is quite heavy and awkward.

11 Slide the steering knuckle into the strut flange and insert the two bolts. Install the nuts, align the previously made matchmarks and tighten them to the torque listed in this Chapter's Specifications.

12 Connect the brake hose bracket to the strut and tighten the bolt securely. If the vehicle is equipped with ABS, install the speed sensor wiring harness bracket.

13 Connect the stabilizer bar link to the strut bracket. Tighten the nut to the torque listed in this Chapter's Specifications.

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

15 Tighten the upper mounting nuts to the torque listed in this Chapter's Specifications.

16 Drive the vehicle to an alignment shop to have the front end alignment checked, and if necessary, adjusted.

3 Strut/spring assembly - replacement

Refer to illustrations 3.3, 3.4, 3.5a, 3.5b, 3.5c, 3.5d and 3.9

Warning: *Before attempting to disassemble the front suspension strut, a tool to hold the coil spring in compression must be obtained. Do not attempt to use makeshift methods. Uncontrolled release of the spring could cause damage and personal injury. Use a high-quality spring compressor, and carefully follow the tool manufacturer's instructions provided with it. After removing the coil spring with the compressor still installed, place it in a safe, isolated area.*

1 If the front suspension struts exhibit signs of wear (leaking fluid, loss of damping capability, sagging or cracked coil springs) then they should be disassembled and overhauled as necessary. The struts themselves cannot be serviced, and should be replaced if faulty; the springs and related components can be replaced individually. To maintain balanced characteristics on both sides of the vehicle, the components on both sides should be replaced at the same time.

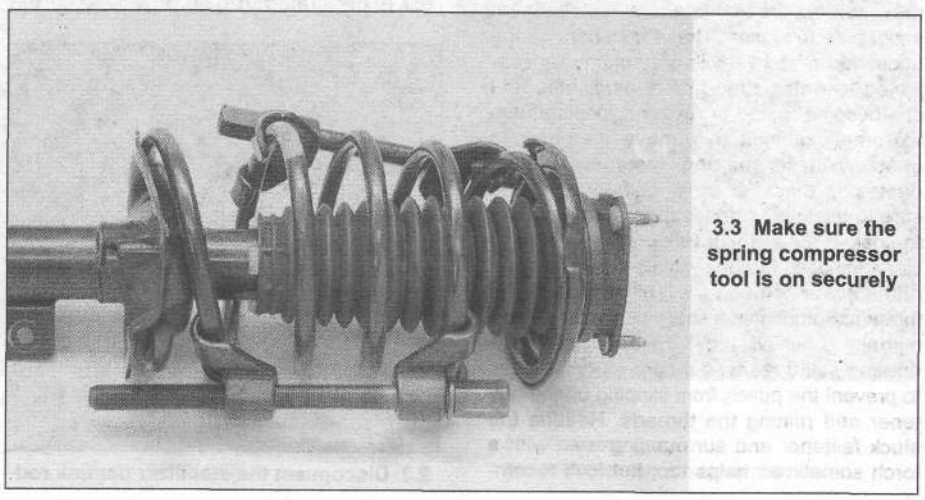
2 With the strut removed from the vehicle (see Section 2), clean away all external dirt, then mount it in a vise.

3 Install the coil spring compressor tools (ensuring that they are fully engaged), and compress the spring until all tension is relieved from the upper mount **(see illustration)**.

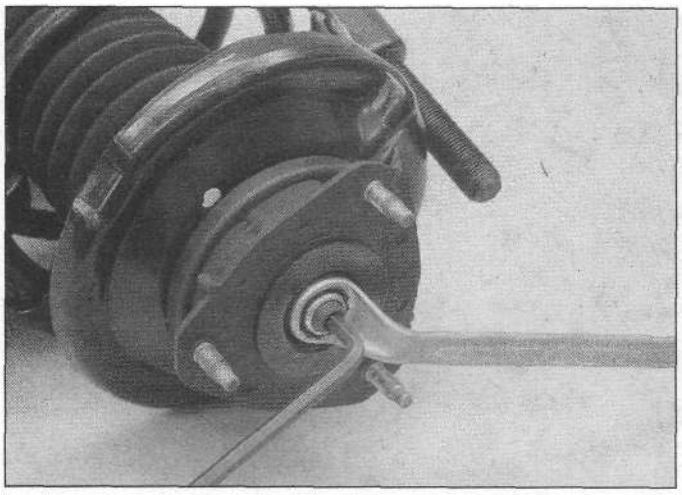
4 Hold the strut piston rod with an Allen key and unscrew the thrust bearing retaining nut with a box-end wrench **(see illustration)**.

5 Withdraw the top mounting, thrust bearing, upper spring seat and spring, followed by the boot and the bump stop **(see illustrations)**.

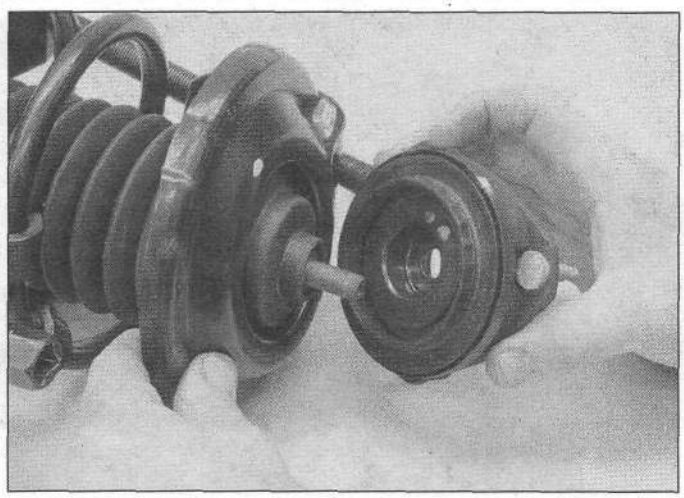
6 If a new spring is to be installed, the original spring must now be carefully released



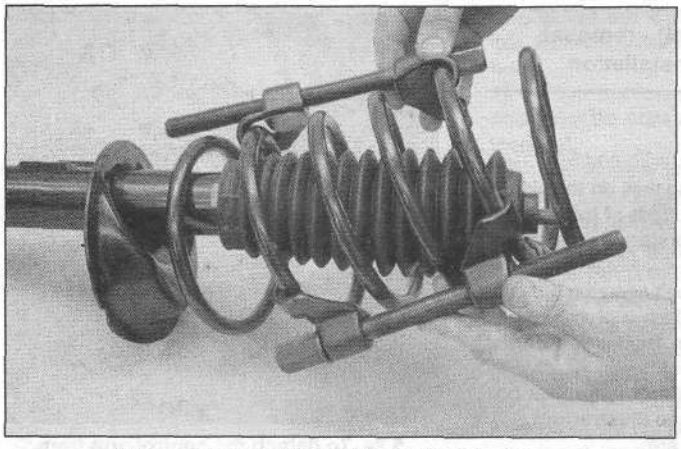
3.3 Make sure the spring compressor tool is on securely



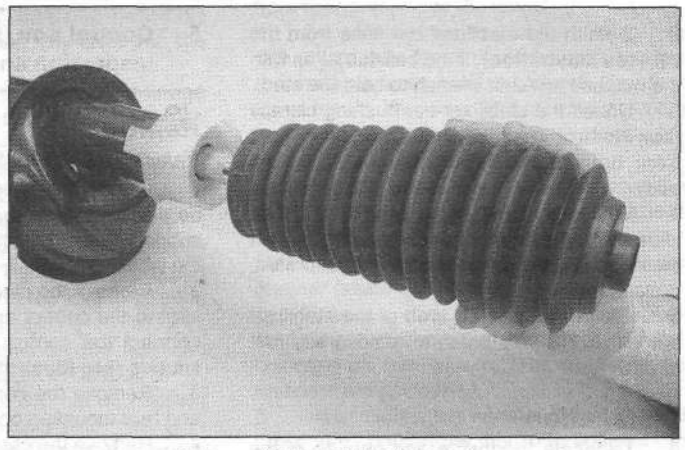
3.4 Loosen and remove the retaining nut



3.5a Remove the upper bearing and spring seat . . .



3.5b . . . then carefully remove the spring . . .

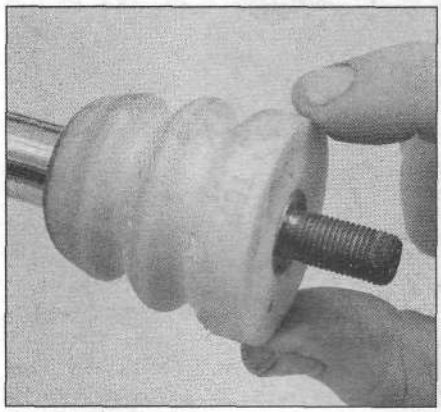


3.5c . . . followed by the boot . . .

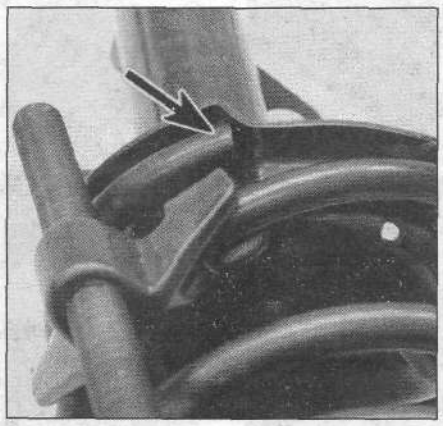
from the compressor. If it is to be re-used, the spring can be left in compression.

7 With the strut assembly now completely disassembled, examine all the components for wear and damage, and check the bearing for smoothness of operation. Replace components as necessary.

8 Examine the strut for signs of fluid leakage. Check the strut piston rod for signs of pitting along its entire length, and check the strut body for signs of damage. Test the operation of the strut, while holding it in an upright position, by moving the piston through a full stroke, and then through short strokes of 2 to 4 inches. In both cases, the resistance felt should be smooth and continuous. If the resistance is jerky, uneven, or if there is any visible sign of wear or damage to the strut, replacement is necessary.



3.5d . . . and the bump stop



3.9 When installing the spring, make sure the ends fit into the recessed portion of the seats

9 Reassembly is a reversal of dismantling, noting the following points:

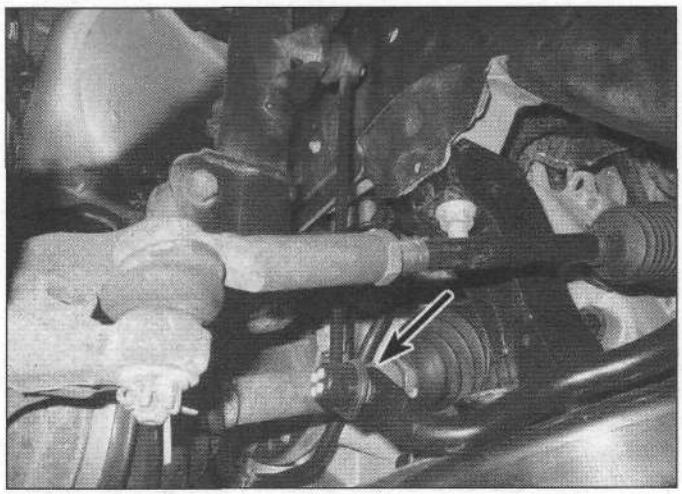
a) *The coil springs must be installed with the paint mark at the bottom.*
b) *Make sure that the coil spring ends are correctly located in the upper and lower seats before releasing the compressor* **(see illustration)**.
c) *Check that the bearing is correctly installed on the piston rod seat.*
d) *Tighten the thrust bearing retaining nut to the specified torque.*

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

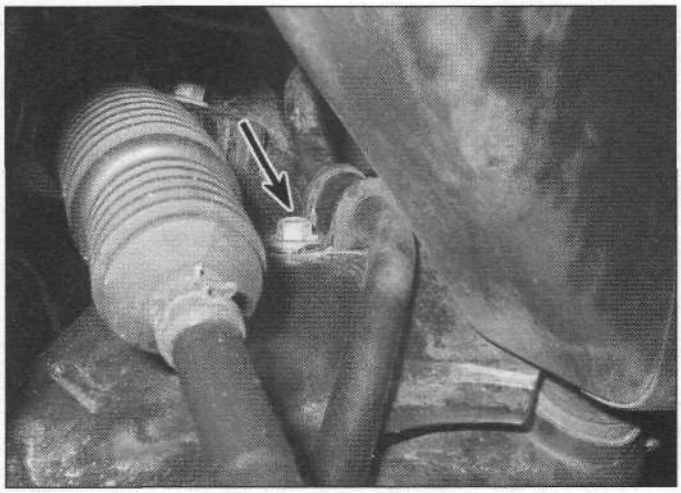
Removal

Refer to illustrations 4.2 and 4.3

1 Loosen the front 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 stands. Remove the front wheels.



4.2 Remove the lower nut and detach the link from the bar



4.3 Stabilizer bar bracket bolt (other bolt not visible in photo)

2 Detach the stabilizer bar links from the bar **(see illustration)**. If the ballstud turns with the nut, use an Allen wrench to hold the stud.

3 Unbolt the stabilizer bar bushing clamps **(see illustration)**. Guide the stabilizer bar out from between the crossmember and the body.

4 While the stabilizer bar is off the vehicle, slide off the retainer bushings and inspect them. If they're cracked, worn or deteriorated, replace them.

5 Clean the bushing area of the stabilizer bar with a stiff wire brush to remove any rust or dirt.

Installation

6 Lubricate the inside and outside of the new bushing with vegetable oil (used in cooking) to simplify reassembly. **Caution:** *Don't use petroleum or mineral-based lubricants or brake fluid - they will lead to deterioration of the bushings.* The slits of the bushings must face the rear of the vehicle.

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

5 Control arm (front) - removal, inspection and installation

Removal

Refer to illustrations 5.2a, 5.2b and 5.3

1 Loosen the wheel lug nuts on the side to be dismantled, raise the front of the vehicle, support it securely on jackstands and remove the wheel.

2 Remove the pinch bolt securing the balljoint to the control arm. Use a prybar to disconnect the control arm from the steering knuckle **(see illustrations)**.

3 Remove the control arm front pivot bolt and rear mounting bolt **(see illustration)**.

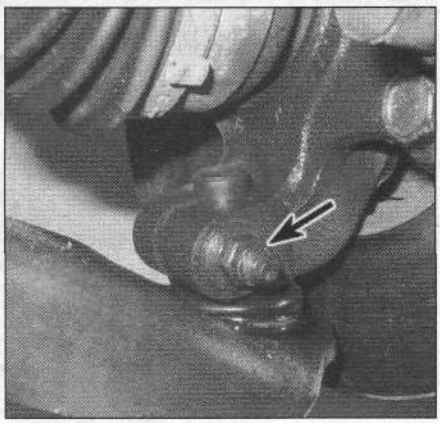
4 Remove the control arm.

Inspection

5 Check the control arm for distortion and the bushings for wear, replacing parts as necessary. Do not attempt to straighten a bent control arm.

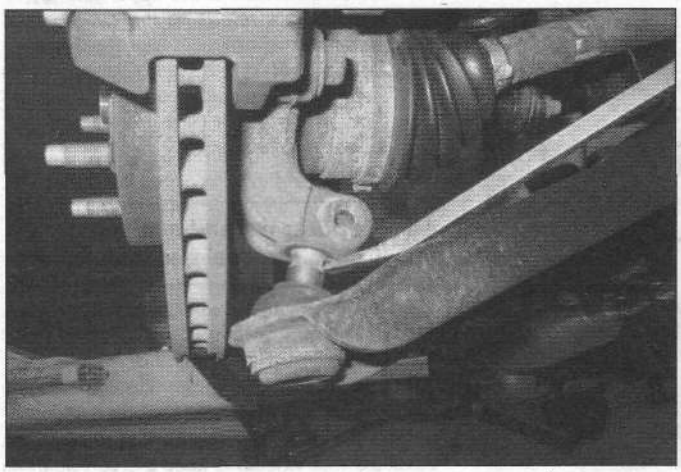
Installation

6 Installation is the reverse of removal.

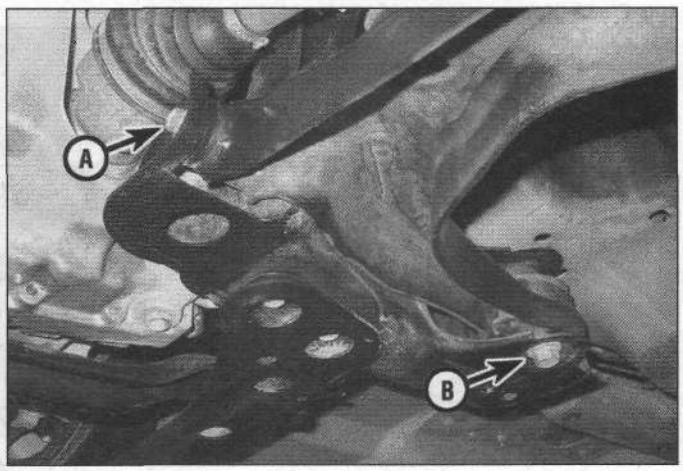


5.2a To detach the control arm from the steering knuckle balljoint, remove this nut and bolt . . .

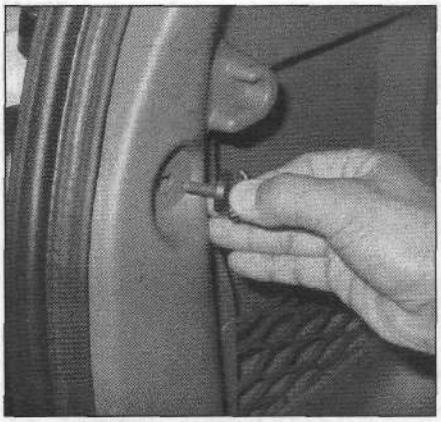
Tighten all of the fasteners to the torque values listed in this Chapter's Specifications. **Note:** *Before tightening the pivot bolt and the bolt on the rear of the control arm, raise the outer end of the control arm with a floor jack to simulate normal ride height.*



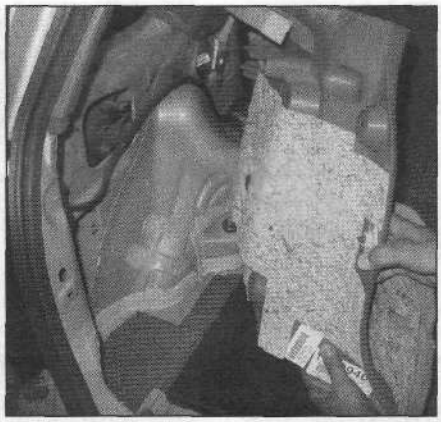
5.2b . . . and pry the balljoint out of the steering knuckle with a large prybar or screwdriver



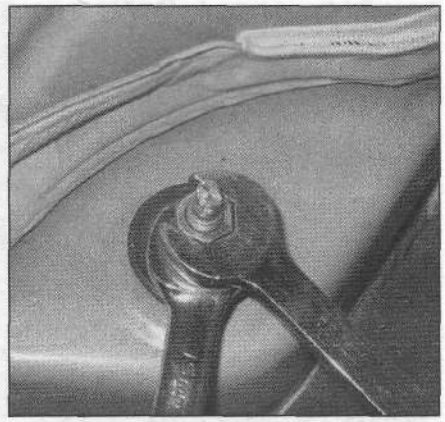
5.3 To detach the front of the control arm from the crossmember, remove the pivot bolt (A) and the rear mounting bolt (B)



8.3a Remove the fasteners securing the rear trim cover . . .



8.3b . . . followed by the trim cover . . .



8.3c . . . then unscrew the two upper shock mounting nuts

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

8 It's a good idea to have the front wheel alignment checked and, if necessary, adjusted after this job has been performed.

6 Steering knuckle and hub - removal and installation

Warning: *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.*

Removal

1 Remove the wheel cover and loosen, but don't remove, the driveaxle/hub nut. Loosen the wheel lug nuts, raise the vehicle and support it securely on jackstands, then remove the wheel.

2 Remove the brake caliper (don't disconnect the hose) and the brake disc (see Chapter 9), and disconnect the brake hose from the strut. Hang the caliper from the coil spring with a piece of wire - don't let it hang by the brake hose.

3 If the vehicle is equipped with ABS, remove the wheel speed sensor (see Chapter 9).

4 Loosen, but don't remove the strut-to-steering knuckle nuts and bolts (see Section 2).

5 Separate the tie-rod end from the steering knuckle arm (see Section 14).

6 Remove the balljoint-to-steering knuckle pinch bolt (see Section 5).

7 Remove the driveaxle/hub nut and push the driveaxle from the hub as described in Chapter 8. Support the end of the driveaxle with a piece of wire.

8 Remove the balljoint from the steering knuckle (see Section 5).

9 The strut-to-knuckle bolts can now be removed.

10 Carefully separate the steering knuckle from the strut.

Installation

11 Guide the knuckle and hub assembly into position, inserting the driveaxle into the hub.

12 Push the knuckle into the strut flange and install the bolts and nuts, but don't tighten them yet.

13 Connect the balljoint to the knuckle and tighten the pinch bolt/nut to the torque listed in this Chapter's Specifications.

14 Attach the tie-rod to the steering knuckle arm (see Section 14). Tighten the strut bolt nuts and the tie-rod nut to the torque listed in this Chapter's Specifications.

15 Place the brake disc on the hub and install the caliper as outlined in Chapter 9.

16 Install the driveaxle/hub nut and tighten it securely, but not completely yet.

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

18 Tighten the driveaxle/hub nut to the torque listed in the Chapter 8 Specifications. Install the wheel cover.

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

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

Due to the special tools and expertise required to press the hub and bearing from the steering knuckle, this job should be left to a professional mechanic. However, the steering knuckle and hub may be removed and the assembly taken to an automotive machine shop or other qualified repair facility equipped with the necessary tools. See Section 6 for the steering knuckle and hub removal procedure.

8 Shock absorber (rear) - removal, inspection and installation

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

1 Loosen the wheel lug nuts, raise the vehicle and support it securely on jackstands. Block the front wheels to prevent the vehicle from rolling. Remove the wheel.

2 Support the rear end of the trailing arm with a floor jack. Raise the jack slightly to take the spring pressure off the shock absorber lower mount. **Warning:** *The jack must remain in this position throughout the entire procedure.*

3 Working inside the vehicle, remove the rear quarter trim panel for access to the shock absorber upper mounting nut. Remove the nuts, upper retainer, bushing and lower retainer **(see illustrations)**.

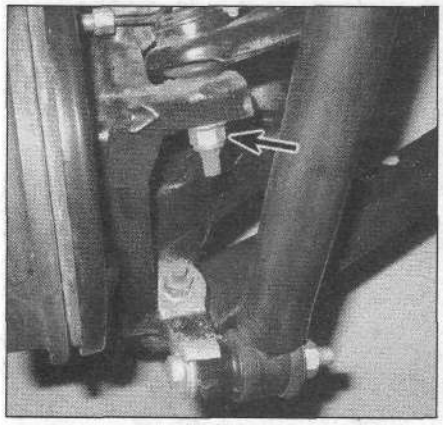
4 Unscrew the shock absorber lower mounting nut, then pull the shock off the mounting pin **(see illustration)**. Note how the retainers are positioned.

5 Installation is the reverse of the removal procedure. Tighten the mounting fasteners to the torque listed in this Chapter's Specifications.

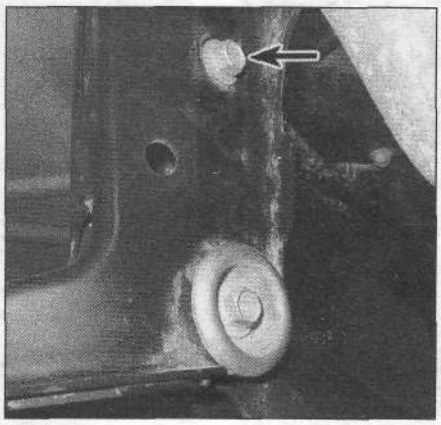
9 Suspension arms (rear) - removal and installation

1 Loosen the wheel lug nuts, raise the vehicle and support it securely on jackstands. Block the front wheels to prevent the vehicle from rolling. Remove the wheel.

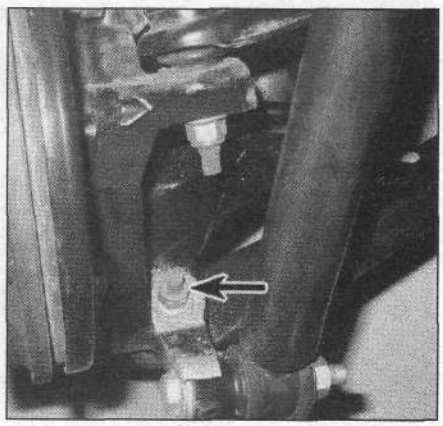
8.4 Shock absorber lower mounting bolt



9.2 Remove the nut from the upper ballstud



9.3 Remove the upper pivot bolt from the inner end of the upper suspension arm



9.5 Remove the nut from the lower ballstud

Upper suspension arm

Refer to illustrations 9.2 and 9.3

2 Remove the nut from the upper ballstud at the outer end of the arm **(see illustration)**, then separate the arm from the boss on the trailing arm. If the ballstud sticks in its boss, a two-jaw puller or balljoint removal tool can be used to force it out.

3 Remove the pivot bolt from the inner end of the arm **(see illustration)**. Remove the arm from the vehicle.

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

Lower suspension arm

Refer to illustrations 9.5 and 9.6

5 Remove the nut from the lower ballstud at the outer end of the arm **(see illustration)**, then separate the arm from the boss on the trailing arm. If the ballstud sticks in its boss, use a balljoint removal tool to force it out.

6 Remove the pivot bolt from the inner end of the arm **(see illustration)**. Remove the arm from the vehicle.

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

Trailing arm

Refer to illustration 9.13

8 Remove the coil spring (see Section 10).

9 Remove the brake shoe assembly (see Chapter 9).

10 Unbolt the brake hose and brake line brackets from the trailing arm. Unbolt the parking brake cable brackets from the trailing arm.

11 If equipped, remove the ABS wheel speed sensor and unbolt the harness brackets from the trailing arm.

12 Remove the hub and bearing assembly (see Section 11). Separate the brake backing plate from the trailing arm and suspend it out of the way with a piece of wire or string.

13 Mark the relationship of the toe adjusting cam to the trailing arm mounting bracket **(see illustration)**.

14 Unscrew the pivot bolt and separate the trailing arm from the vehicle.

15 Inspect the trailing arm pivot bushing for signs of deterioration. If it is in need of replacement, take the trailing arm to an automotive machine shop to have the bushing replaced.

16 Installation is the reverse of removal, noting the following points:

a) Align the matchmarks on the toe adjusting cam and the mounting bracket.
b) Before fully tightening the trailing arm pivot bolt, raise the rear end of the trailing arm with a floor jack to simulate normal ride height.
c) Tighten all fasteners to the proper torque specifications.
d) It won't be necessary to bleed the brakes unless a hydraulic fitting was loosened.
e) Have the rear wheel alignment checked and, if necessary, adjusted.

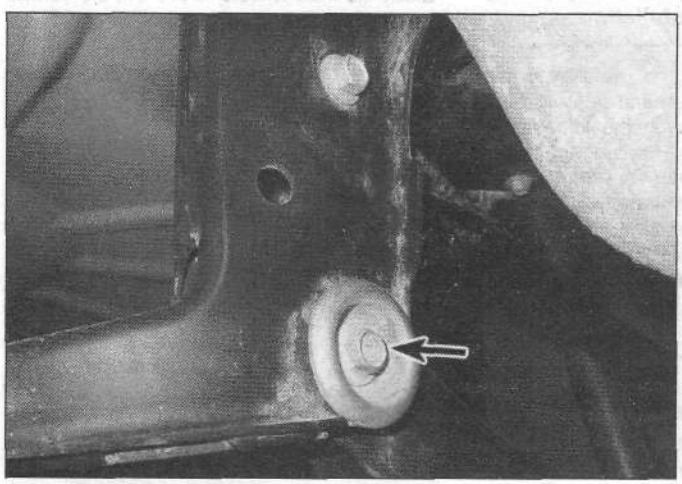
10 Coil spring (rear) - removal and installation

Refer to illustration 10.2, 10.3 and 10.7

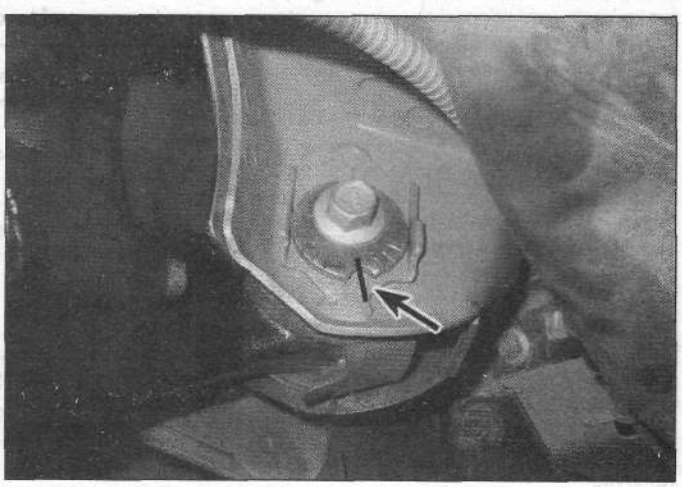
Warning: *Always replace the springs as a set - never replace just one of them.*

1 Loosen the wheel lug nuts, raise the vehicle and support it securely on jackstands. Block the front wheels to prevent the vehicle from rolling. Remove the wheel.

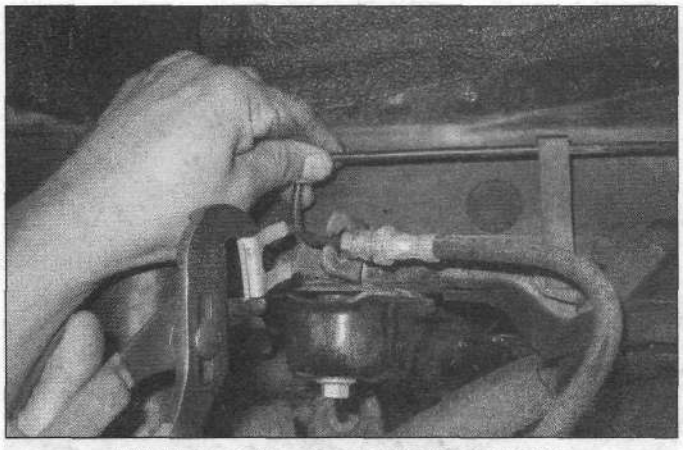
2 Unclip the brake line from the body and trailing arm mounting brackets **(see illustration)**. **Note:** *On models with rear disc brakes, remove the caliper and set it aside.*



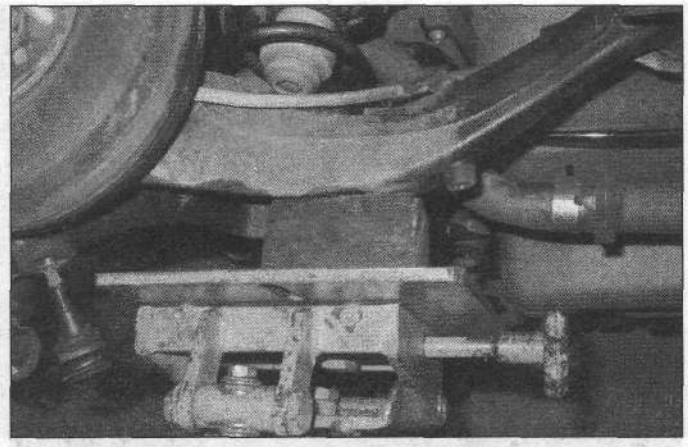
9.6 Remove the lower pivot bolt from the inner end of the lower suspension arm



9.13 Mark the relationship of the toe adjusting cam to the trailing arm mounting bracket

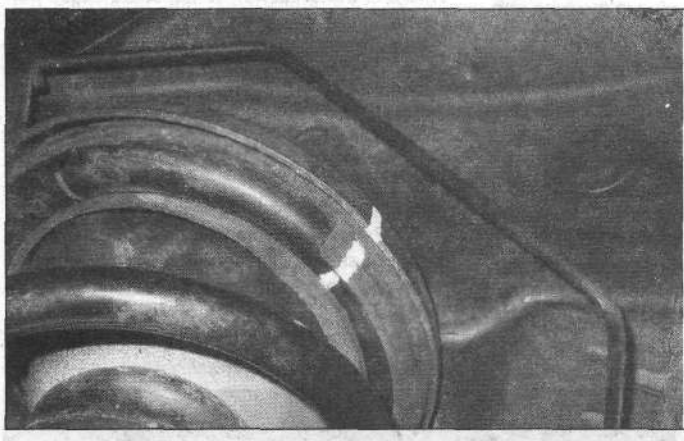


10.2 Remove the clip securing the brake line



10.3 Using a floor jack, support the trailing arm

3 Support the trailing arm with a floor jack **(see illustration).**
4 If equipped, remove the ABS wheel speed sensor and unbolt the harness brackets from the trailing arm.
5 Remove the pivot bolt on the inner end of the upper suspension arm and loosen the pivot bolt on the inner end of the lower suspension arm.
6 Detach the lower end of the shock absorber from the trailing arm **(see illustration 8.4).**
7 Mark the position of the spring to the spring insulator **(see illustration).**
8 Slowly lower the floor jack, pull the trailing arm down and remove the coil spring.
9 Check the spring for cracks and chips, replacing the springs as a set if any defects are found. Also check the upper insulator for damage and deterioration, replacing it if necessary.
10 Installation is the reverse of removal. Be sure to position the lower end of the coil spring in the depressed area of the trailing arm. Tighten all fasteners to the proper torque specifications.



10.7 Mark the relationship of the spring to the spring insulator

11 Hub and bearing assembly (rear) - removal and installation

Due to the special tools and expertise required to press the hub and bearing from the steering knuckle, this job should be left to a professional mechanic. However, the trailing arm may be removed and the assembly taken to an automotive machine shop or other qualified repair facility equipped with the necessary tools. See Section 9 for the trailing arm removal procedure.

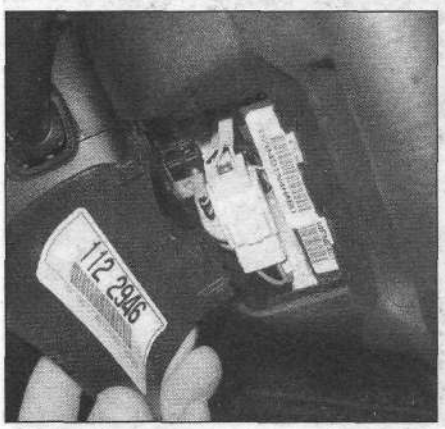
12 Steering wheel - removal and installation

Warning 1: *These models are equipped with a Supplemental Restraint System (SRS), more commonly known as airbags. Always disable the airbag system before working in the vicinity of any airbag system component to avoid the possibility of accidental deployment of the airbag(s), which could cause personal injury* (see Chapter 12).
Warning 2: *Do not use a memory saving device to preserve the PCM or radio memory when working on or near airbag system components.*

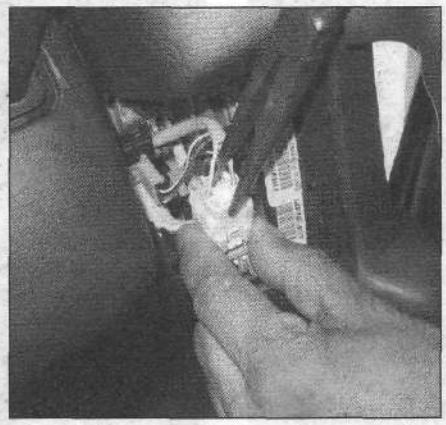
Removal

Refer to illustrations 12.2, 12.3, 12.4, 12.5, and 12.7

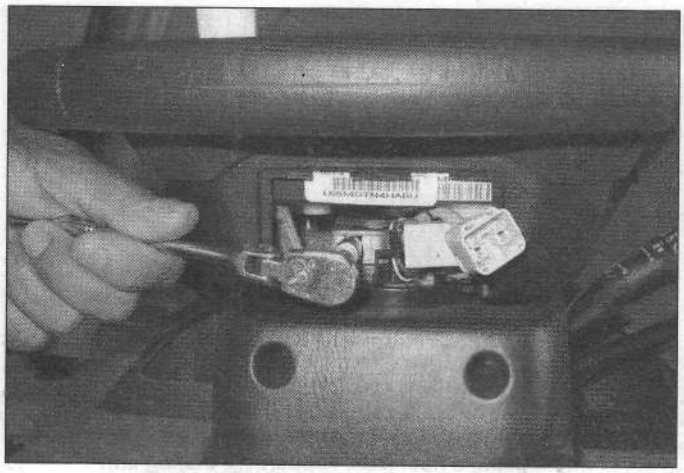
1 Turn the ignition key to Off, then disconnect the cable from the negative terminal of the battery. Wait at least two minutes before proceeding.
2 Turn the steering wheel so the wheels are pointing straight ahead. Open the cover on the bottom of the steering wheel **(see illustration).**
3 Disengage the connector lock and disconnect the airbag module electrical connector **(see illustration).**



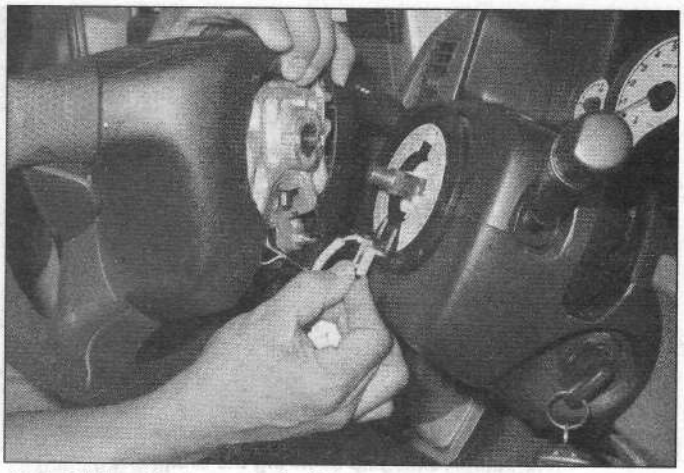
12.2 At the bottom of the steering wheel, open the cover to gain access to the airbag harness



12.3 With a pair of pliers, disengage the airbag connector



12.4 Using a socket, loosen the steering wheel pinion bolt



12.5 Lift the steering wheel off the steering shaft then unplug the electrical connector

4 Inside the cover, loosen the pinion shaft and release the steering wheel from the steering column **(see illustration).**

5 Pull the off the steering wheel and unplug the electrical connector for the horn **(see illustration).** Set the steering wheel/airbag module in a safe, isolated area. **Warning:** *Carry the steering wheel/airbag module with the trim side facing away from you, and set the steering wheel/airbag module down with the trim side facing up. Don't place anything on top of the steering wheel/airbag module.*

6 If it is necessary to remove the clockspring, remove the steering column covers (see Chapter 11).

7 Unplug the clockspring electrical connector, then remove the three screws and detach it from the combination switch **(see illustration).**

Installation

Refer to illustration 12.8

8 When installing the clockspring, make absolutely sure that the clockspring is centered with the arrow on the clockspring pointing up. This shouldn't be a problem as long as you taped the clockspring and you have not turned the steering shaft while the wheel was removed. If for some reason the hub was turned, center the clockspring by turning the hub clockwise by hand until it stops (but don't force it, as the cable could break). Rotate the hub counterclockwise about 2-3/4 turns and align the two pointers **(see illustration).**

9 If removed, reinstall the steering column covers (see Chapter 11).

10 To install the wheel, plug in the horn connector and place the steering wheel on the steering shaft.

11 Inside the cover, tighten the pinion shaft to the torque listed in this Chapter's Specifications.

12 Plug in the electrical connector for the airbag module and close the locking device.

13 After you've reconnected the battery, the Powertrain Control Module (PCM) must relearn its idle and fuel mixture trim strategy for optimum driveability and performance (see Chapter 5, Section 1 for this procedure).

13 Steering column - removal and installation

Warning 1: *These models are equipped with a Supplemental Restraint System (SRS), more commonly known as airbags. Always disable the airbag system before working in the vicinity of any airbag system component to avoid the possibility of accidental deployment of the airbag(s), which could cause personal injury* (see Chapter 12).

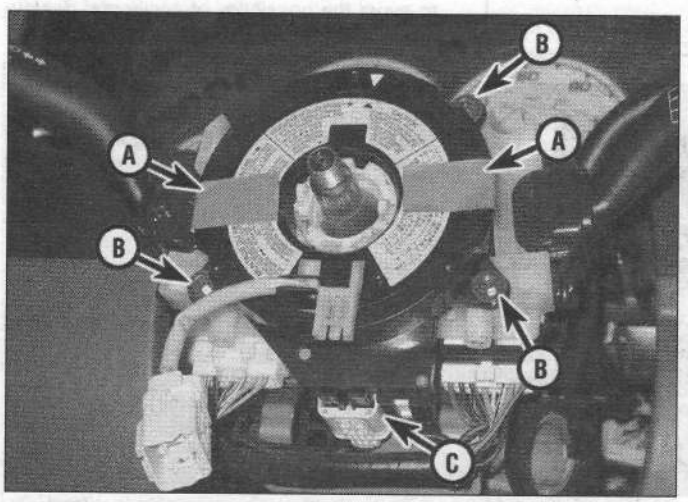
Warning 2: *Do not use a memory saving device to preserve the PCM or radio memory when working on or near airbag system components.*

Removal

Refer to illustrations 13.7, 13.8a and 13.8b

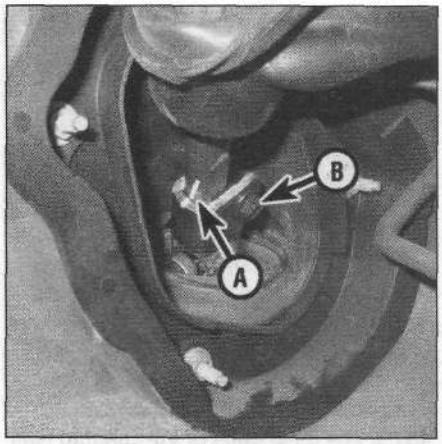
1 Park the vehicle with the wheels pointing straight ahead. Disconnect the cable from the negative terminal of the battery (see Chapter 5).

2 Remove the steering wheel (see Sec-

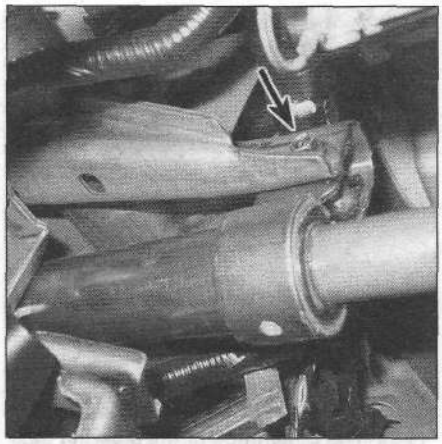


12.7 Apply two pieces of tape to the clockspring to prevent it from rotating (A), then remove the three airbag clockspring mounting screws (B) and disconnect the electrical connectors (C)

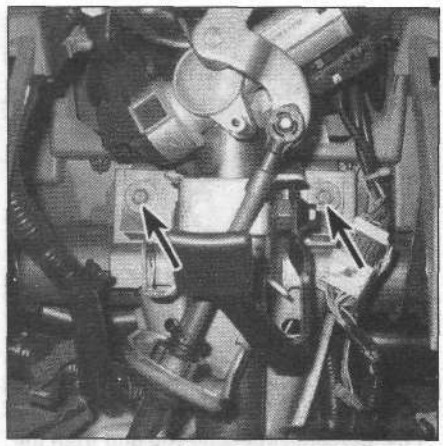
12.8 The clockspring must be centered with the arrow pointing up



13.7 Mark the U-joint-to-intermediate shaft (A), then remove the pinch bolt and nut (B)



13.8a Remove the bolt at the top of the steering column . . .



13.8b . . . and the two bolts securing the underside

tion 12), then turn the ignition key to the LOCK position to prevent the steering shaft from turning. **Caution:** *If this is not done, the air-bag clockspring could be damaged.*

3 Remove the steering column covers (see Chapter 11).

4 Remove the clockspring (see Section 12).

5 Disconnect the electrical connectors for the multi-function switch (see Chapter 12).

6 If equipped, remove the shift cable from the shift lever and cable mounting bracket (see Chapter 7 Part B).

7 Mark the relationship of the U-joint to the intermediate shaft, then remove and discard the pinch bolt and nut **(see illustration)**.

8 Remove the steering column mounting fasteners **(see illustrations)**, lower the column and pull it to the rear, making sure nothing is still connected, then remove the column.

Installation

9 Guide the steering column into position, then install the steering column mounting fasteners and tighten them to the torque listed in this Chapter's Specifications.

10 Connect the U-joint to the intermediate shaft. Install a new intermediate shaft pinch bolt and nut, tightening it to the torque listed in this Chapter's Specifications.

11 The remainder of installation is the reverse of removal. After you've reconnected the battery, the Powertrain Control Module (PCM) must relearn its idle and fuel mixture trim strategy for optimum driveability and performance (see Chapter 5, Section 1 for this procedure).

14 Tie-rod ends - removal and installation

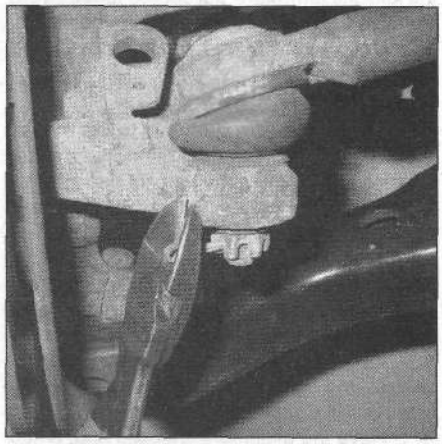
Removal

Refer to illustrations 14.2, 14.3a, 14.3b and 14.4

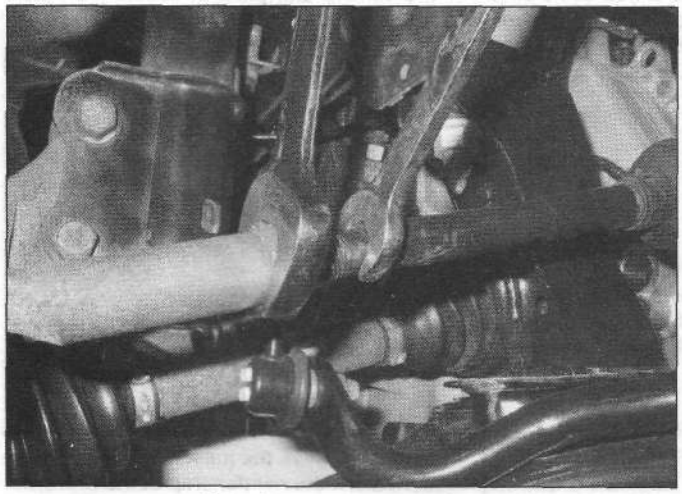
1 Loosen the front wheel lug nuts. Apply the parking brake, raise the front of the vehicle and support it securely on jackstands. Remove the front wheel.

2 Remove the cotter pin **(see illustration)** and loosen the nut on the tie-rod end stud.

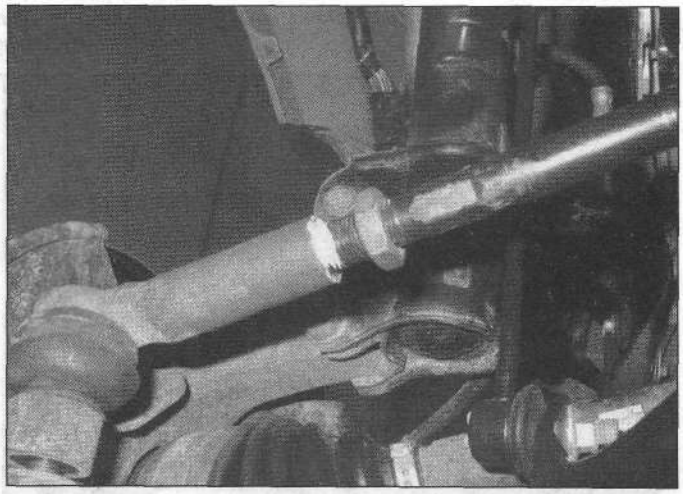
3 Hold the tie-rod with a pair of locking pliers or wrench and loosen the jam nut enough to mark the position of the tie-rod end in relation to the threads **(see illustrations)**.



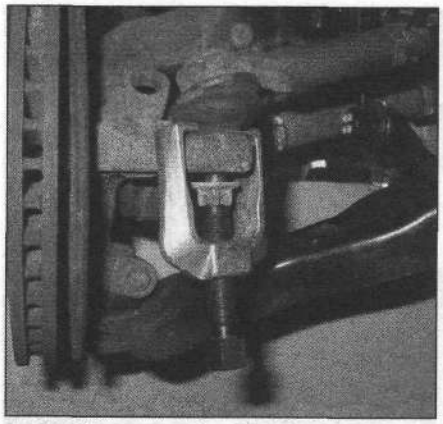
14.2 Remove the cotter pin from the castle nut and loosen - but don't remove - the nut



14.3a Loosen the jam nut . . .



14.3b . . . then mark the position of the tie-rod end in relation to the threads



14.4 Disconnect the tie-rod end from the steering knuckle arm with a puller

4 Disconnect the tie-rod end from the steering knuckle arm with a puller **(see illustration)**. Remove the nut and detach the tie-rod end.
5 Unscrew the tie-rod end from the tie-rod.

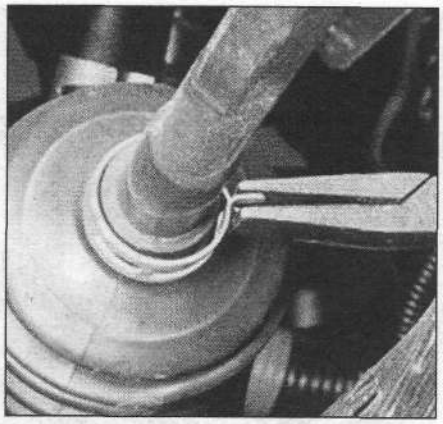
Installation

6 Thread the tie-rod end on to the marked position and insert the stud into the steering knuckle arm. Tighten the jam nut securely.
7 Install the castle nut on the stud and tighten it to the torque listed in this Chapter's Specifications. Install a new cotter pin. If the hole for the cotter pin doesn't line up with one of the slots in the nut, tighten the nut an additional amount until it does.
8 Install the wheel and lug nuts. Lower the vehicle and tighten the lug nuts to the torque listed in the Chapter 1 Specifications.
9 Have the alignment checked and, if necessary, adjusted.

15 Steering gear boots - replacement

Refer to illustrations 15.3a and 15.3b

1 Loosen the lug nuts, raise the vehicle and support it securely on jackstands. Remove the wheel.
2 Remove the tie-rod end and jam nut (see Section 14).

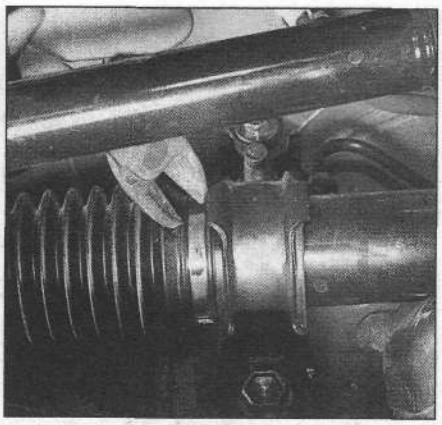


15.3a The outer ends of the steering gear boots are secured by band-type clamps; they're easily released with a pair of pliers

3 Remove the outer steering gear boot clamp with a pair of pliers **(see illustration)**. Cut off the inner boot clamp with a pair of diagonal cutters **(see illustration)**. Slide off the boot.
4 Before installing the new boot, wrap the threads and serrations on the end of the steering rod with a layer of tape so the small end of the new boot isn't damaged.
5 Slide the new boot into position on the steering gear until it seats in the groove in the steering rod and install new clamps.
6 Remove the tape and install the tie-rod end (see Section 14).
7 Install the wheel and lug nuts. Lower the vehicle and tighten the lug nuts to the torque listed in the Chapter 1 Specifications.

16 Steering gear - removal and installation

Warning: *These models are equipped with airbags. Always disable the airbag system before working in the vicinity of airbag system components* (see Chapter 12). *Make sure the steering column shaft is not turned while the steering gear is removed or you could damage the airbag system clockspring. To prevent the shaft from turning, turn the ignition key to the lock position before beginning work, and run the seat belt through the steering wheel and clip it into its latch.*



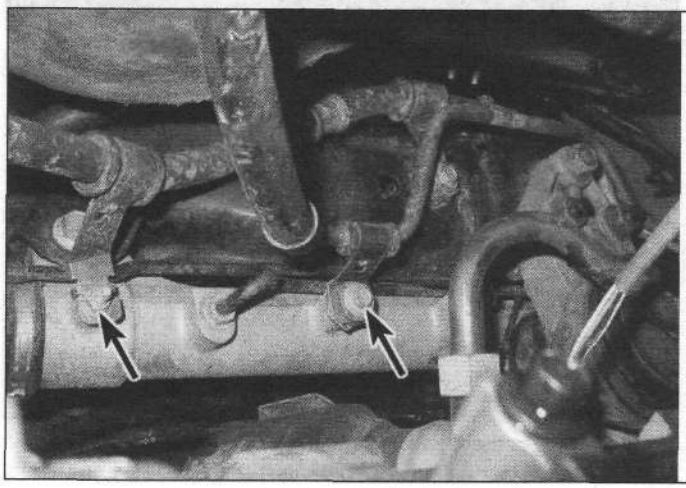
15.3b The inner ends of the steering gear boots are retained by boot clamps which must be cut off and discarded

Removal

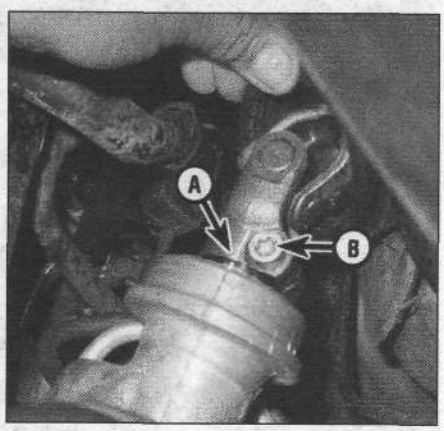
Refer to illustrations 16.3, 16.8, 16.9 and 16.10

Note: *On some vehicles equipped with the 3.0L V6 engine, it may be necessary to remove the EGR valve (see Chapter 6).*

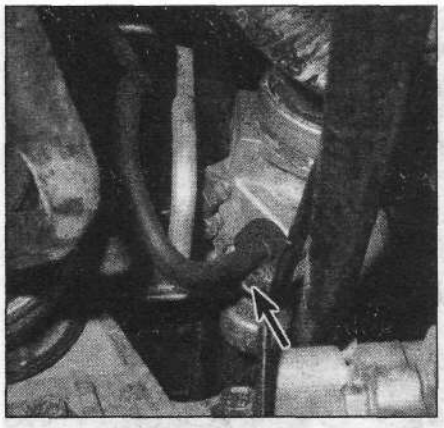
1 Disconnect the cable from the negative terminal of the battery (see Chapter 5).
2 Remove the rear transaxle mount and bracket (see Chapter 7 Part B).
3 Detach the power steering pressure and return line bracket bolts **(see illustration).**
4 From inside the vehicle under the dashboard, slide the steering shaft boot up from the firewall and remove and discard the intermediate shaft pinch bolt and nut (see Section 13).
5 Drain the power steering fluid from the remote power steering reservoir. This can be accomplished with a suction gun or large syringe, or by disconnecting the fluid hose and draining the fluid into a container.
6 Loosen the front wheel lug nuts. Raise the vehicle and place it securely on jack-



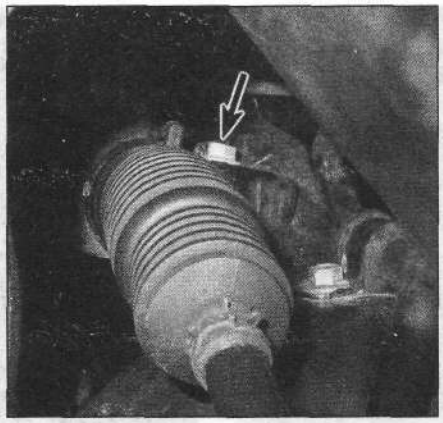
16.3 Remove the fasteners securing the pressure and return line brackets



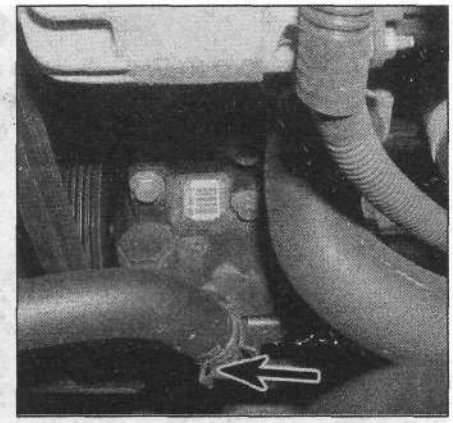
16.8 Remove the universal joint cover, then mark the relationship of the universal joint to the steering gear input shaft (A) and remove the U-joint pinch bolt (B)



16.9 Remove the bolt securing the power steering pressure and return lines



16.10 Steering gear mounting bolt (left side shown, right side similar)



17.6 Disconnect the supply hose from the pump

stands. Remove both front wheels.

7 Detach the tie-rod ends from the steering knuckles (see Section 14).

8 Mark the U-joint and the steering gear input shaft with alignment markings for later installation, then separate the U-joint from the steering gear input shaft **(see illustration).**

9 Place a drain pan under the steering gear and detach the power steering pressure and return lines **(see illustration).** Cap the ends to prevent excessive fluid loss and contamination.

10 Remove the two steering gear mounting bolts **(see illustration).**

11 Remove the steering gear from the vehicle.

Installation

12 Installation is the reverse of removal, noting the following points:

a) When connecting the steering gear input shaft to the intermediate shaft U-joint, be sure to align the matchmarks, and install a new pinch bolt and nut

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

c) Tighten all fasteners for the rear transaxle mount and mounting bracket to the torque listed in the Chapter 7 Specifications

d) Tighten the lug nuts to the torque listed in the Chapter 1 Specifications.

*e) After you've reconnected the battery, the Powertrain Control Module (PCM) must relearn its idle and fuel mixture trim strategy for optimum driveability and performance (*see Chapter 5, Section 1 *for this procedure).*

*f) Fill the power steering reservoir with the recommended fluid (*see Chapter 1*). Bleed the power steering hydraulic system as described in Section 18.*

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

17 Power steering pump - removal and installation

Refer to illustrations 17.6, 17.7, 17.8, 17.12, 17.14, 17.18a and 17.18b

1 Disconnect the cable from the negative battery terminal (see Chapter 5).

2 Using a large syringe or suction gun, suck as much fluid out of the power steering fluid reservoir as possible. Place a drain pan under the vehicle to catch any fluid that spills out when the hoses are disconnected.

Removal

Four-cylinder engine

3 Remove the drivebelt (see Chapter 1).

4 Disconnect the electrical connector at the power steering pump.

5 Unscrew and remove the bolt securing the high pressure fluid line support bracket. Using a flare-nut wrench, unscrew the pressure line fitting from the pump.

6 Disconnect the supply hose from the power steering pump **(see illustration).**

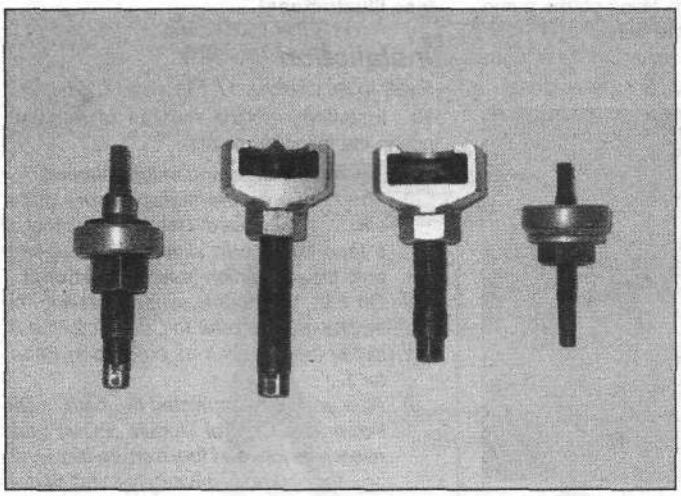
7 Unscrew and remove the four mounting bolts, and withdraw the power steering pump from its bracket. The pulley can be removed on the work bench, using a pulley removal tool **(see illustration).**

V6 engine

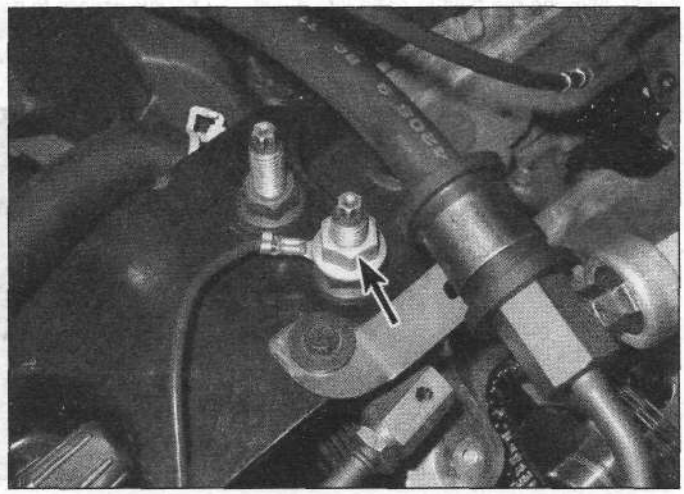
8 Remove the ground wire **(see illustration).**

9 Loosen the right front wheel lug nuts. Raise the front the vehicle and support it securely on jackstands, then remove the wheel. Remove the drivebelt (see Chapter 1).

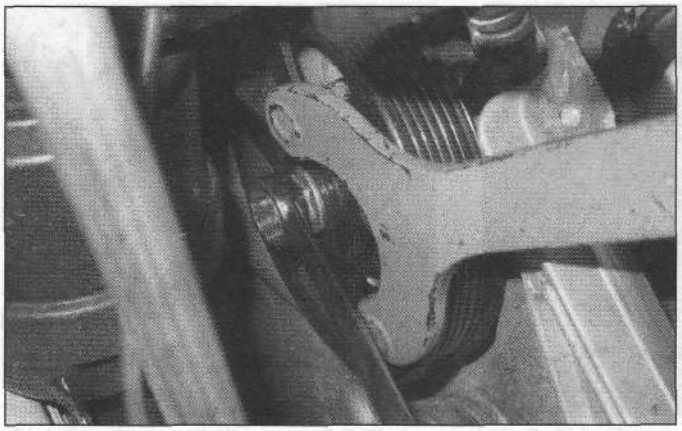
10 Install the wheel and lower the vehicle to



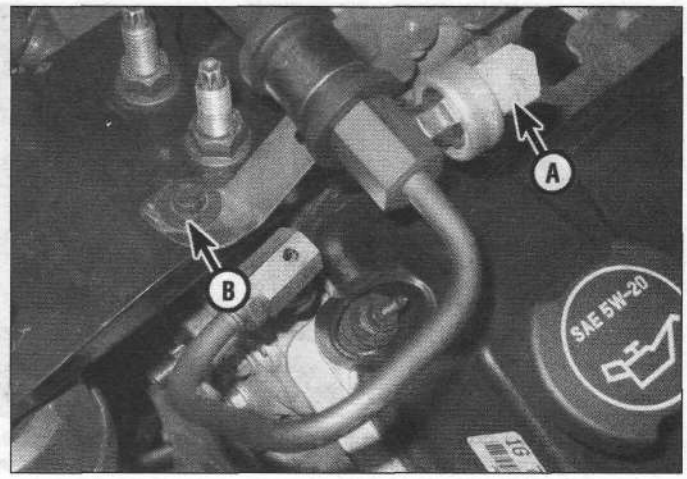
17.7 A pulley removal kit is needed to remove the power steering pulley from the four-cylinder engine pump



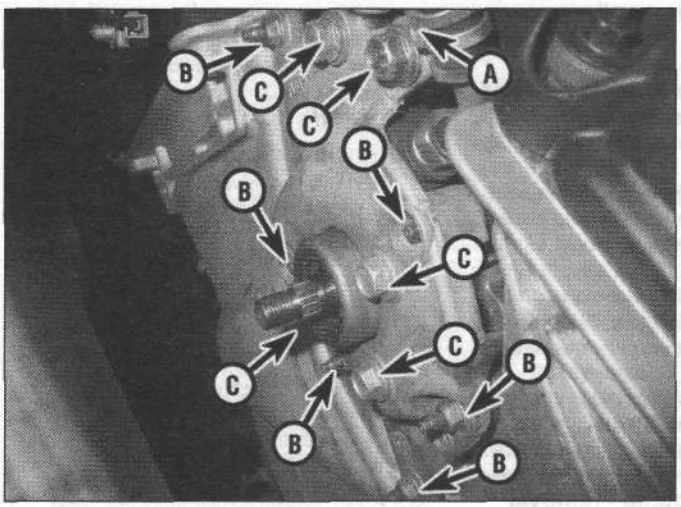
17.8 Remove the nut securing the ground strap



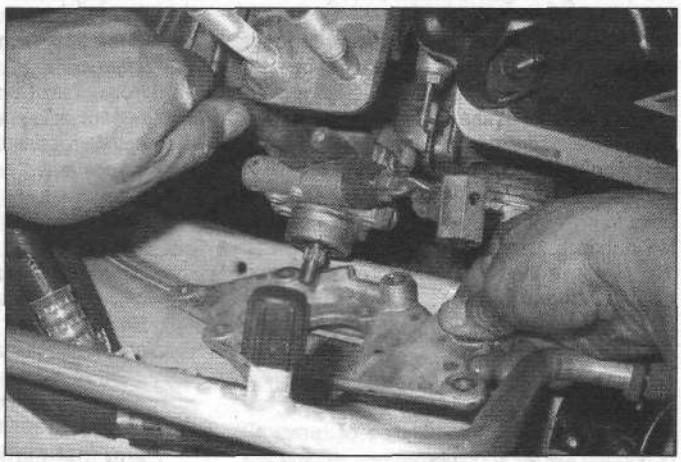
17.12 With the pulley secured, remove the pulley mounting nut



17.14 Unplug the electrical connector (A), then remove the bolt securing the pressure line bracket (B)



17.18a Remove the screw securing the pressure line bracket (A) followed by the six mounting nuts (B), then remove the five bolts securing the mounting bracket (C) . . .



17.18b . . . and carefully remove the bracket and pump

the ground.

11 Support the engine with a floor jack and block of wood.

12 Remove the pulley from the power steering pump **(see illustration).**

13 Disconnect the fluid return hose from the pump, allowing the fluid to drain into a suitable container.

14 Unplug the electrical connector from the power steering fluid pressure switch and remove the bolt securing the pressure line bracket **(see illustration).**

15 Disconnect the power steering pressure hose from the pump, allowing the fluid to drain into a suitable container. Use two wrenches; a backup wrench to hold the fitting on the pump tube, the other to loosen the fitting.

16 Under the power steering reservoir, remove the refrigerant line bracket-to-body nut.

17 Remove the upper engine mount (see Chapter 2 Part B).

18 Unscrew the power steering mounting bolts, then remove the bracket and the pump **(see illustrations).**

Installation

Refer to illustrations 17.19a and 17.19b

19 Installation is the reverse of removal, noting the following points:

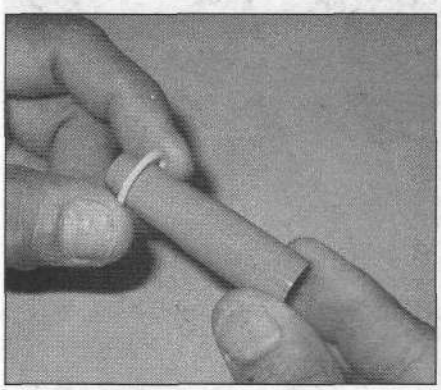
a) *Tighten the bolts and unions securely.*

b) *The O-ring on the high-pressure outlet should be replaced. Use a special tool or a tapered tube to slide the new O-ring onto the pipe union* **(see illustrations).**

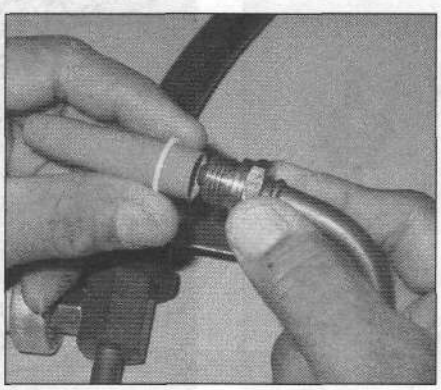
c) *On 3.0L V6 models, when installing the engine mounts refer to Chapter 2 Part B.*

d) *Install the drivebelt as outlined in Chapter 1.*

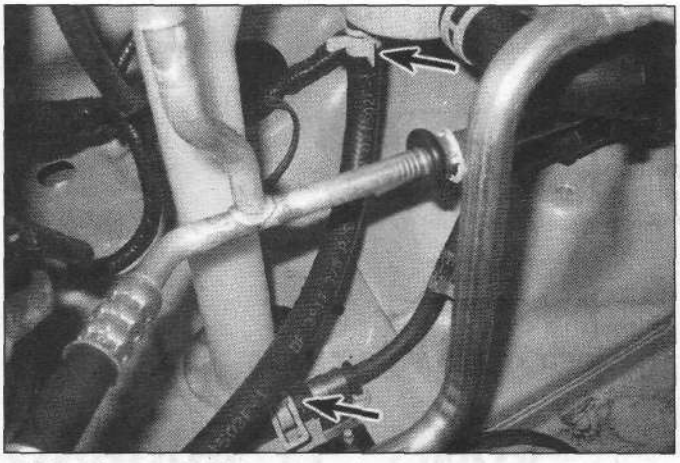
e) *After you've reconnected the battery, the Powertrain Control Module (PCM) must relearn its idle and fuel mixture trim strategy for optimum driveability and performance (*see Chapter 5, Section 1 *for this procedure).*



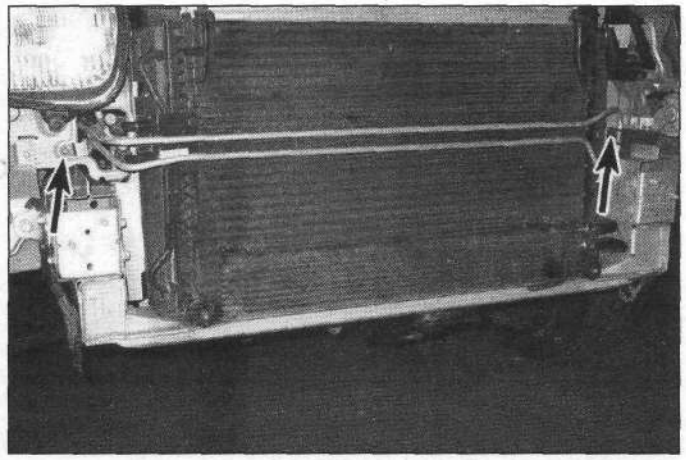
17.19a Slide the teflon seal onto the seal tool . . .



17.19b . . . then slide it onto the fitting



19.2 Using a pair pliers, release the clamps securing the hoses



19.4 Remove the two fasteners securing the cooler

f) Fill the power steering reservoir with the recommended fluid (see Chapter 1). *Bleed the power steering hydraulic system as described in Section 18.*

18 Power steering system - bleeding

1 The power steering system must be bled whenever a line is disconnected. Bubbles can be seen in power steering fluid that has air in it and the fluid will often have a tan or milky appearance. Low fluid level can cause air to mix with the fluid, resulting in a noisy pump as well as foaming of the fluid.

2 Open the hood and check the fluid level in the reservoir, adding the specified fluid necessary to bring it up to the proper level (see Chapter 1).

3 Start the engine and slowly turn the steering wheel several times from left-to-right and back again. Do not turn the wheel completely from lock-to-lock. Check the fluid level, topping it up as necessary until it remains steady and no more bubbles are visible.

19 Power steering fluid cooler - removal and installation

Removal

Refer to illustrations 19.2 and 19.4

1 Using a large syringe or suction gun, suck as much fluid out of the power steering fluid reservoir as possible. Place a drain pan under the vehicle to catch any fluid that spills out when the hoses are disconnected.

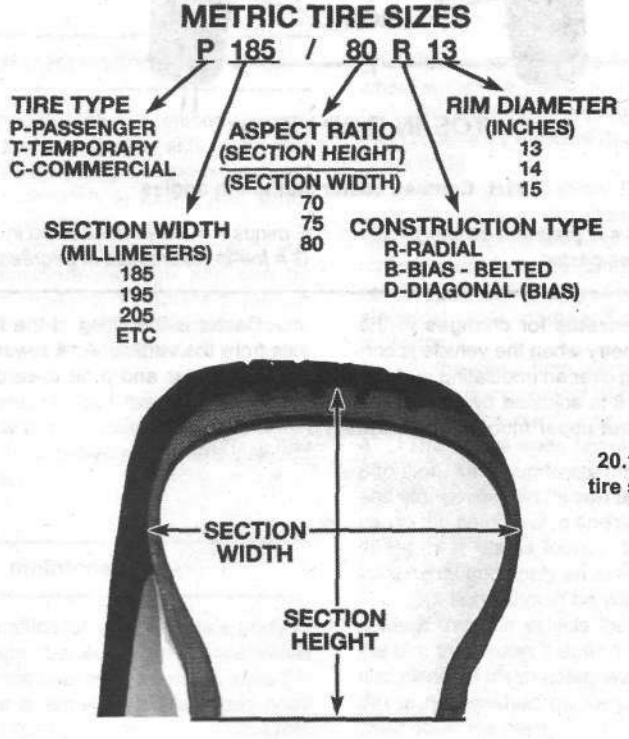
2 Disconnect the cooler hoses **(see illustration).**

3 Remove the front bumper cover (see Chapter 11).

4 Unscrew the fluid cooler mounting nuts and remove the cooler from the vehicle **(see illustration).**

Installation

5 Installation is the reverse of removal. Fill the power steering reservoir with the recommended fluid (see Chapter 1). Bleed the power steering hydraulic system as described in Section 18.



20.1 Metric tire size code

20 Wheels and tires - general information

Refer to illustration 20.1

1 All vehicles covered by this manual are equipped with metric-sized fiberglass or steel belted radial tires **(see illustration).** 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.

2 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).

3 Wheels must be replaced if they are 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.

4 Tire and wheel balance is important in

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.

21 Wheel alignment - general information

Refer to illustration 21.1

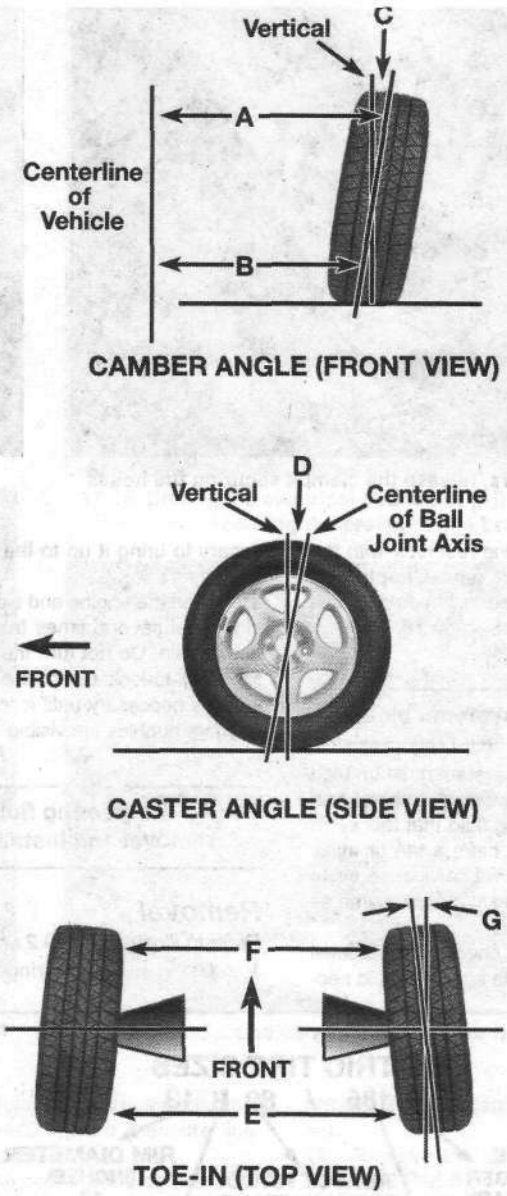
A wheel alignment refers to the adjustments made to the wheels so they are in proper angular relationship to the suspension and the ground. Wheels that are out of proper alignment not only affect vehicle control, but also increase tire wear. The front end angles normally measured are camber, caster and toe-in **(see illustration)**. Toe-in and camber are adjustable; if the caster is not correct, check for bent components. Rear toe-in is also adjustable.

Getting the proper 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 a wheel 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 wheels. The purpose of a toe specification is to ensure parallel rolling of the 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. On the front end, toe-in is controlled by the tie-rod end position on the tie-rod. On the rear end, it's controlled by a cam at the front of the suspension trailing arm. Incorrect toe-in will cause the tires to wear improperly by making them scrub against the road surface.

Camber is the tilting of the wheels from vertical when viewed from one end 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 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. On the front end it is adjusted by altering the position of the strut upper mount in the strut tower.

Caster is the tilting of the front steering axis from the vertical. A tilt toward the rear is positive caster and a tilt toward the front is negative caster.



21.1 Camber, caster and toe-in angles

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