8

SUSPENSION AND STEERING

WHEELS

Wheels

REMOVAL & INSTALLATION

See Figures 1, 2, 3, 4 and 5

1. Park the vehicle on a level surface.
2. Remove the jack, tire iron and, if necessary, the spare tire from the storage compartment.
3. Check the owner's manual or refer to Section 1 of this manual for the jacking points on your vehicle. Then, place the jack in the proper position.
4. If equipped with lug nut trim caps, remove them by either unscrewing or pulling them off the lug nuts, as appropriate. Consult the owner's manual, if necessary.
5. If equipped with a wheel cover or hubcap, insert the tapered end of the tire iron in the groove and pry off the cover.
6. Apply the parking brake and block the diagonally opposite wheel with a wheel chock or two.

Wheel chocks may be purchased at your local auto parts store, or a block of wood cut into wedges may be used. If possible, keep one or two of the chocks in your tire storage compartment, in case any of the tires has to be removed on the side of the road.

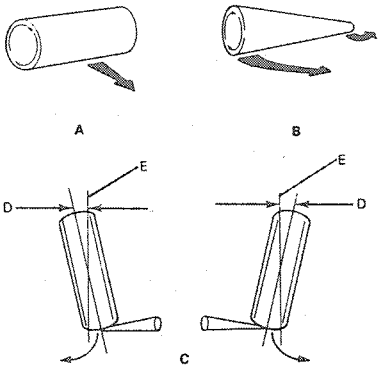
7. If equipped with an automatic transmission/transaxle, place the selector lever in P or Park; with a manual transmission/transaxle, place the shifter in Reverse.
8. With the tires still on the ground, use the tire iron/wrench to break the lug nuts loose.

If a nut is stuck, never use heat to loosen it or damage to the wheel and bearings may occur. If the nuts are seized, one or two heavy hammer blows directly on the end of the bolt usually loosens the rust. Be careful, as continued pounding will likely damage the brake drum or rotor.

9. Using the jack, raise the vehicle until the tire is clear of the ground. Support the vehicle safely using jackstands.
10. Remove the lug nuts, then remove the tire and wheel assembly.

93149P18

Fig. 1 Most styled wheels from Lincoln have a special lug nut that requires a special key. Be careful not to lose the key when changing the lugs



A A CYLINDER WILL ROLL STRAIGHT AHEAD
B A CONE WILL ROLL IN A CIRCLE TOWARD THE SMALL END
C TIRE CONTACTS THE ROAD SURFACE
D POSITIVE CAMBER ANGLE
E VERTICAL

TCCA8P02

Fig. 2 With the vehicle still on the ground, break the lug nuts loose using the wrench end of the tire iron

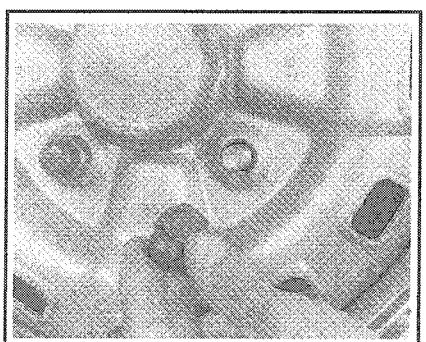
To install:

11. Make sure the wheel and hub mating surfaces, as well as the wheel lug studs, are clean and free of all foreign material. Always remove rust from the wheel mounting surface and the brake rotor or drum. Failure to do so may cause the lug nuts to loosen in service.
12. Install the tire and wheel assembly and hand-tighten the lug nuts.
13. Using the tire wrench, tighten all the lug nuts, in a crisscross pattern, until they are snug.
14. Raise the vehicle and withdraw the jackstand, then lower the vehicle.
15. Using a torque wrench, tighten the lug nuts in a crisscross pattern to 85–105 ft. lbs. (115–142 Nm). Check your owner's manual or refer to Section 1 of this manual for the proper tightening sequence.

WARNING

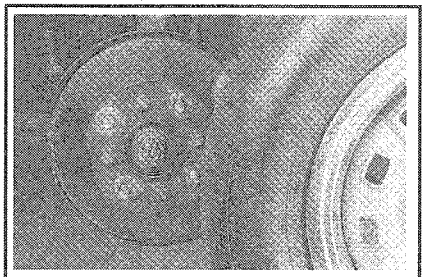
Do not overtighten the lug nuts, as this may cause the wheel studs to stretch or the brake disc (rotor) to warp.

16. If so equipped, install the wheel cover or hubcap. Make sure the valve stem protrudes through the proper opening before tapping the wheel cover into position.
17. If equipped, install the lug nut trim caps by pushing them or screwing them on, as applicable.
18. Remove the jack from under the vehicle, and place the jack and tire iron/wrench in their storage compartments. Remove the wheel chock(s).
19. If you have removed a flat or damaged tire, place it in the storage compartment of the vehicle and take it to your local repair station to have it fixed or replaced as soon as possible.



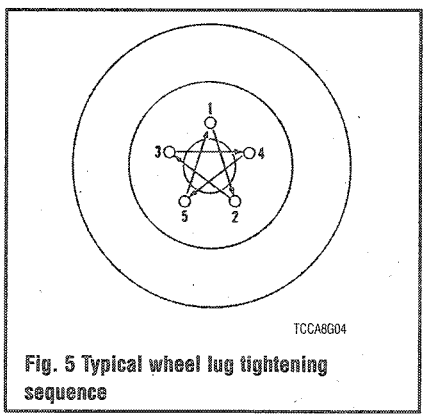
TCCA8P04

Fig. 3 Remove the lug nuts from the studs



TCCA8P05

Fig. 4 Remove the wheel and tire assembly from the vehicle



TCCA8G04

Fig. 5 Typical wheel lug tightening sequence

INSPECTION

Inspect the tires for lacerations, puncture marks, nails and other sharp objects. Repair or replace as necessary. Also, check the tires for treadwear and air pressure as outlined in Check the wheel assemblies for dents, cracks, rust, and metal fatigue. Repair or replace as necessary.

Wheel Lug Studs

REMOVAL & INSTALLATION

With Disc Brakes

See Figures 6, 7 and 8

1. Raise and support the appropriate end of the vehicle safely using jackstands, then remove the wheel.

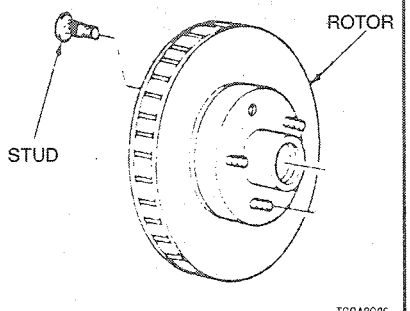


Fig. 6 View of the rotor and stud assembly

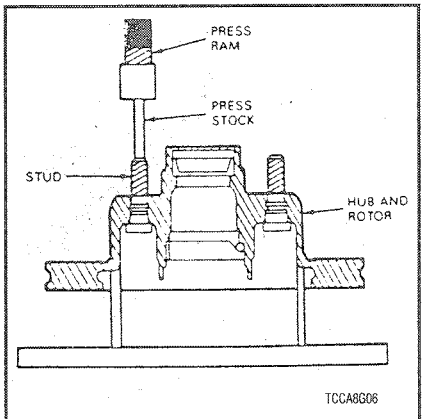


Fig. 7 Pressing the stud from the rotor

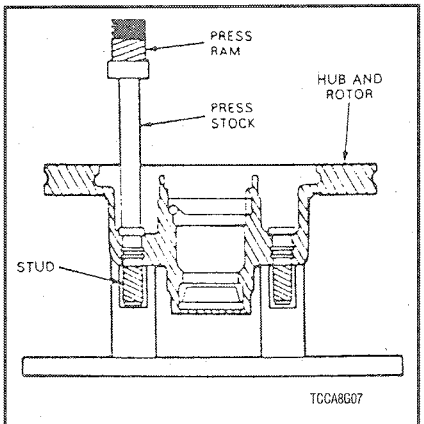


Fig. 8 Use a press to install the stud into the rotor

2. Remove the brake pads and caliper. Support the caliper aside using wire or a coat hanger. For details, please refer to Section 9 of this manual.

3. Remove the outer wheel bearing and lift off the rotor. For details on wheel bearing removal, installation, and adjustment, please refer to Section 1 of this manual.

4. Properly support the rotor using press bars, then drive the stud out using an arbor press.

⇒If a press is not available, CAREFULLY drive the old stud out using a blunt drift. MAKE SURE the rotor is properly supported or it may be damaged.

To install:

5. Clean the stud hole with a wire brush and start the new stud with a hammer and drift pin. Do not use any lubricant or thread sealer.

6. Finish installing the stud with the press

⇒If a press is not available, start the lug stud through the bore in the hub, then position about four flat washers over the stud, and thread the lug nut. Hold the hub/rotor while tightening the lug nut, and the stud should be drawn into position. MAKE SURE THE STUD IS FULLY SEATED, then remove the lug nut and washers.

7. Install the rotor and adjust the wheel bearings.

8. Install the brake caliper and pads.

9. Install the wheel, then remove the jackstands, and carefully lower the vehicle.

10. Tighten the lug nuts to the proper torque.

With Drum Brakes

◗ See Figures 9, 10 and 11

1. Raise the vehicle and safely support it with jackstands, then remove the wheel.

2. Remove the brake drum.

3. If necessary to provide clearance, remove the brake shoes, as outlined in Section 9 of this manual.

4. Using a large C-clamp and socket, press the stud from the axle flange.

5. Coat the serrated part of the stud with liquid soap and place it into the hole.

To install:

6. Position about four flat washers over the stud and thread the lug nut. Hold the flange while tightening the lug nut, and the stud should be drawn into position. MAKE SURE THE STUD IS FULLY SEATED, then remove the lug nut and washers.

7. If applicable, install the brake shoes.

8. Install the brake drum.

9. Install the wheel, then remove the jackstands, and carefully lower the vehicle.

10. Tighten the lug nuts to the proper torque.

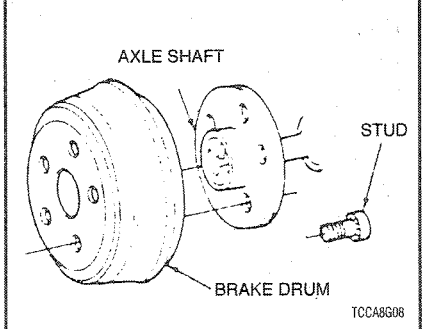


Fig. 9 Exploded view of the drum, axle flange and stud

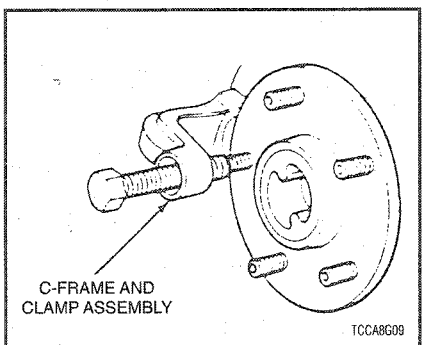


Fig. 10 Use a C-clamp and socket to press out the stud

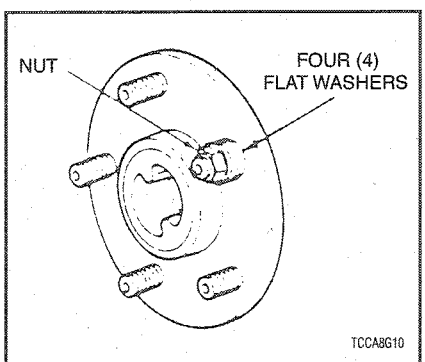


Fig. 11 Force the stud onto the axle flange using washers and a lug nut

FRONT SUSPENSION

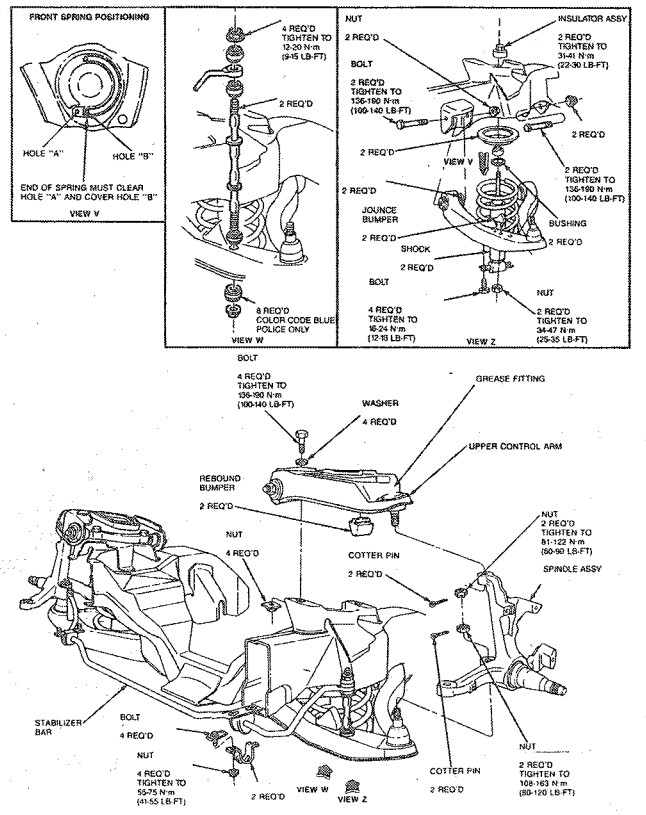


Fig. 12 Typical front suspension—1988–91

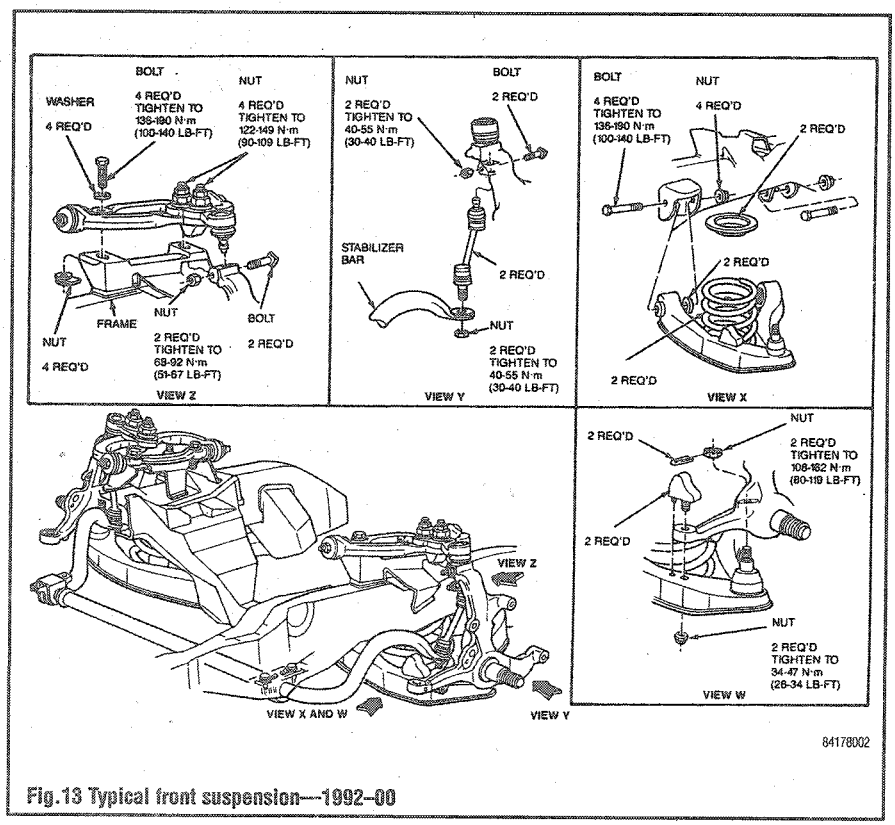


Fig. 13 Typical front suspension—1992–00

Coil Springs

REMOVAL & INSTALLATION

See Figures 14, 15 and 16

1. Raise and safely support the vehicle. Remove the wheel and tire assembly.
2. On 1988–91 Town Car, disconnect the stabilizer bar link from the lower arm.
3. Remove the shock absorber. Remove the steering link from the pitman arm.
4. Using spring compressor tool D78P–5310–A or equivalent, install one plate with the pivot ball seat facing downward into the coils of the spring. Rotate the plate, so it is flush with the upper surface of the lower arm.

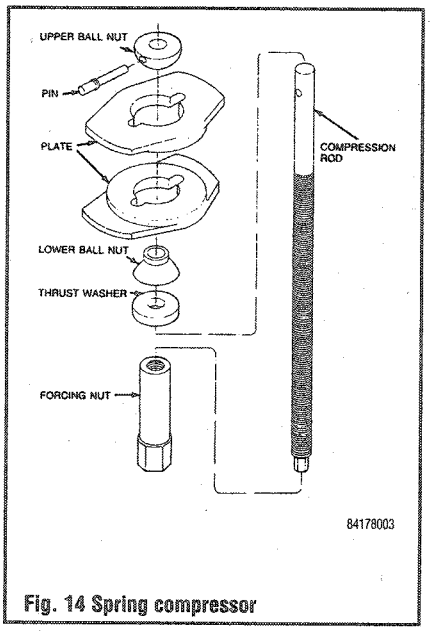


Fig. 14 Spring compressor

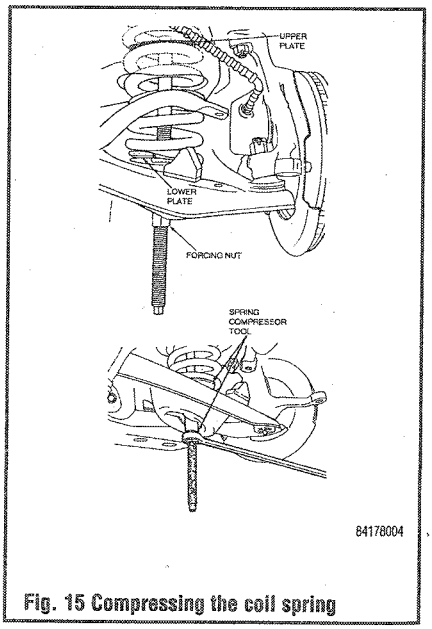


Fig. 15 Compressing the coil spring

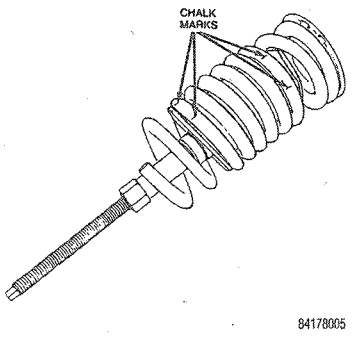


Fig. 16 Positioning the coil spring in the compressor

5. Install the other plate with the pivot ball seat facing upward into the coils of the spring. Insert the upper ball nut through the coils of the spring, so the nut rests in the upper plate.
6. Insert the compression rod into the opening in the lower arm, through the upper and lower plate and upper ball nut. Insert the securing pin through the upper ball nut and compression rod.

➨This pin can only be inserted one way into the upper ball nut because of a stepped hole design.

7. With the upper ball nut secured, turn the upper plate so it walks up the coil until it contacts the upper spring seat. Then back off ½ turn.
8. Install the lower ball nut and thrust washer on the compression rod and screw on the forcing nut. Tighten the forcing nut until the spring is compressed enough so it is free in its seat.
9. Remove the two lower arm pivot bolts, disengage the lower arm from the frame crossmember, and remove the spring.
10. If a new spring is to be installed, perform the following:
    a. Mark the position of the upper and lower plates on the spring with chalk.
    b. With an assistant, compress a new spring for installation and measure the compressed length and the amount of curvature of the old spring.
11. Loosen the forcing nut to relieve the spring tension and remove the tools from the spring.

To install:

12. Assemble the spring compressor and locate in the same position as indicated in Step 10a.
13. Before compressing the coil spring, make sure the upper ball nut securing the pin is inserted properly.
14. Compress the coil spring until the spring height reaches the dimension obtained in Step 10b.
15. Position the coil spring assembly into the lower arm and reverse the removal procedure.

Shock Absorbers

REMOVAL & INSTALLATION

CAUTION

All vehicle applications are equipped with gas-pressurized shock absorbers that will extend unassisted. Do not apply heat or flame to the shock absorber tube.

1. Remove the nut, washer and bushing from the upper end of the shock absorber.
2. Raise and safely support the vehicle by the frame rails allowing the front wheels to hang.
3. Remove the 2 bolts securing the shock absorber to the lower control arm and remove the shock absorber.

To install:

4. Before installation, purge a new shock of air by repeatedly extending it in its normal position and compressing it while inverted.
5. Install a new bushing and washer on the top of the shock absorber and position the unit inside the front spring. Install the two lower attaching bolts and torque them to 13–16 ft. lbs. (17–23 Nm).
6. Lower the vehicle.
7. Place a new bushing and washer on the shock absorber top stud and install a new attaching nut. Tighten to 26 ft. lbs. (41 Nm).

TESTING

1. Remove the shock absorber from the vehicle.
2. Extend the shock absorber fully while it is right side up, as installed in the vehicle. Then turn it upside down and fully compress it. Repeat this procedure at least 3 times to make sure any trapped air has been expelled.
3. Place the shock absorber right side up in a vise and hand stroke the shock absorber. Check the shock absorber insulators for damage and wear.
4. If the shock absorber is properly primed, in its installed position, and there is a lag or a skip occurring near mid-stroke of the shaft reverse travel direction, the shock absorber must be replaced.
5. Replace the shock absorber if there is any seizing during the shaft full travel, except at either end of the travel.
6. Replace the shock absorber if upon the shaft fast, reverse stroke, there is any noise encountered other than a faint swish, such as a clicking sound.
7. If there are excessive fluid leaks, and the shock absorber action remains erratic after purging air, replace the shock absorber.

MacPherson Struts

REMOVAL & INSTALLATION

◗ See Figures 17 thru 47

1. Place the ignition switch in the **OFF** position and the steering column in the **UNLOCKED** position.
2. Remove the plastic cover from the shock tower to gain access to the upper mounting nuts and dual damping actuator.
3. Remove the two actuator screws and move the actuator aside.
4. Loosen the 3 top mount-to-airspring tower nuts; but do not remove all the nuts at this time.
5. Remove the hub nut.
6. Raise and safely support the vehicle.

➨When raising the vehicle, do not lift by using the lower control arms.


93148P44

Fig. 17 This shield covers the strut housing. You will use a 13mm wrench to remove the nut

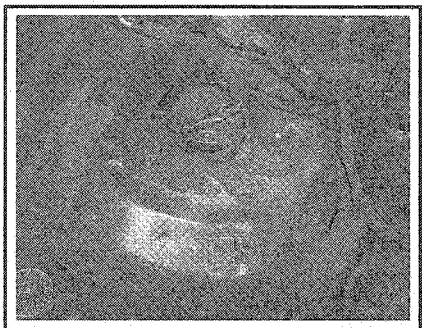

93148P37

Fig. 18 After removing the shield, you will see the suspension actuator

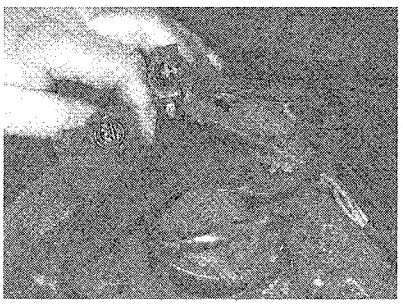
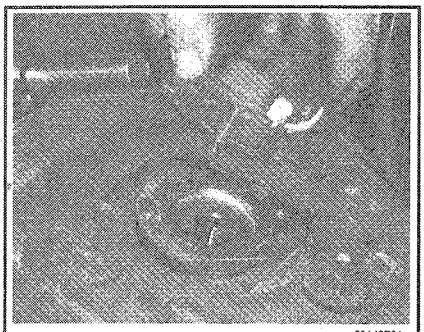

93148P45

Fig. 19 You can unplug the actuator, although it is not necessary to replace the air spring

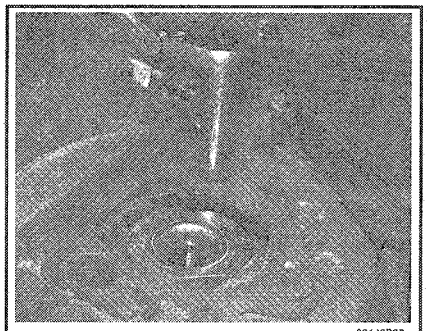

93148P22

Fig. 20 2 screws hold the actuator in place



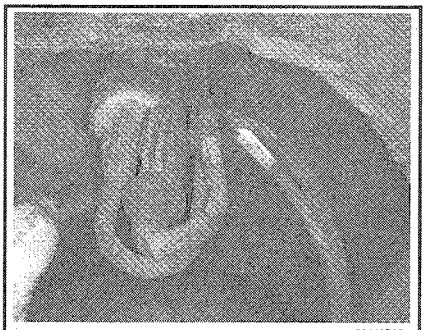
93148P21

Fig. 21 The actuator just lifts off once the screws have been removed



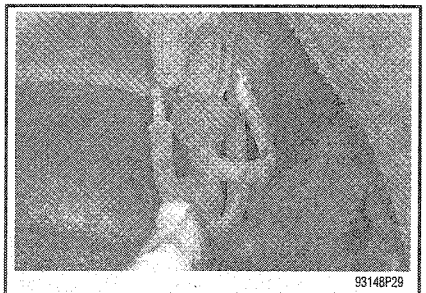
93148P20

Fig. 22 Loosen but do not remove all the top mounted screws



93148P30

Fig. 23 The air spring solenoid must be removed to remove the air spring

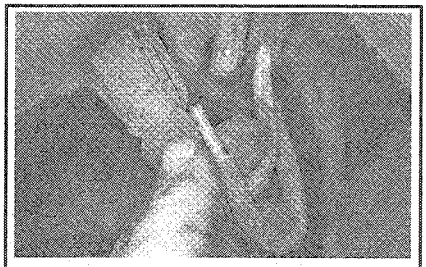


93148P29

Fig. 24 Unplug the air line by pushing in on the air line and colored ring.The ring will seat against the base. Hold the ring against the base and pull the line out of the ring

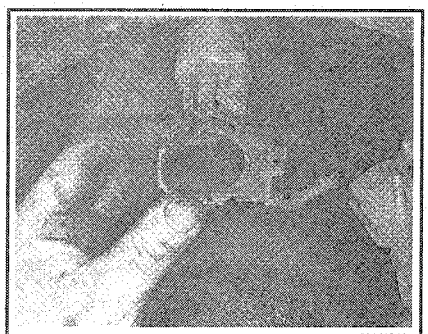
93148P28

Fig. 25 Unplug the electrical connection to the solenoid



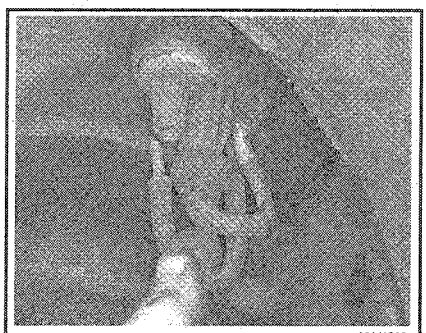
93148P27

Fig. 26 There may be a slight hiss of air when the airline is first disconnected, but even with both connectors in your hand, there should be no air loss from the air spring



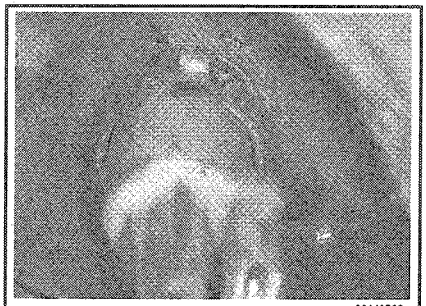
93148P26

Fig. 27 Slid the connector retaining clip off the solenoid



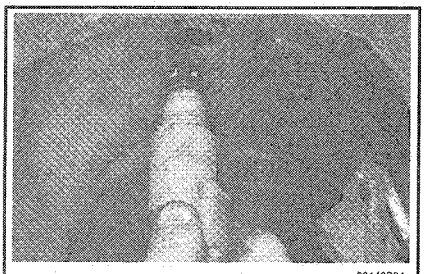
93148P25

Fig. 28 The locking clip has to be removed to release the air pressure from the spring



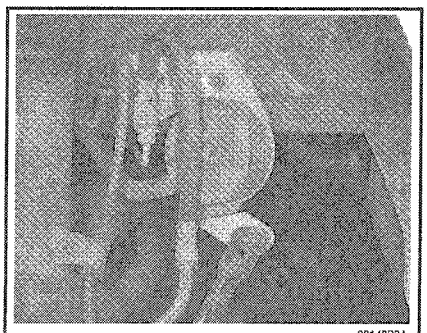
93148P23

Fig. 29 Rotate the air spring solenoid by giving it a twist counterclockwise until it comes to the first stop. Allow the air pressure to release slowly at this position



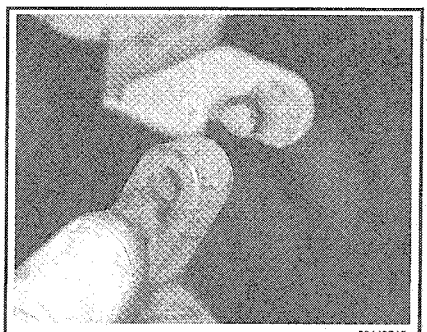
93148P24

Fig. 30 Twist counterclockwise again to the second stop and pull straight down to remove the solenoid from the air spring. Reinstall the solenoid to prevent dirt from entering the air spring



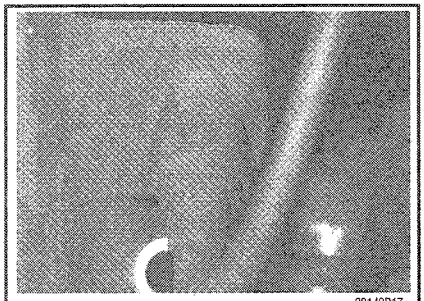
93148P34

Fig. 31 You will have to disassemble the components shown here to remove the air spring assembly



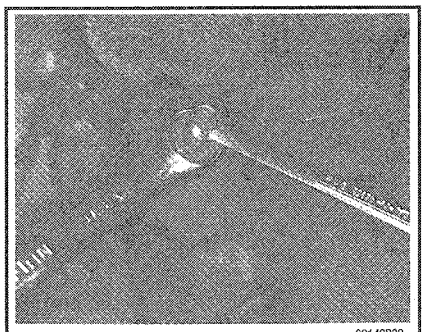
93149P15

Fig. 32 Push on the clip to relieve the tension and pull the height adjusting sensor off the stud



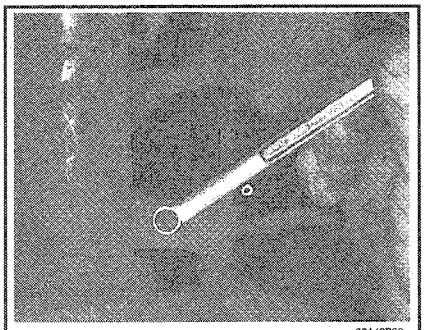
93149P17

Fig. 33 It is safer to remove the brake sensor, but not always possible without destroying it. You can work around it, but do it carefully!!



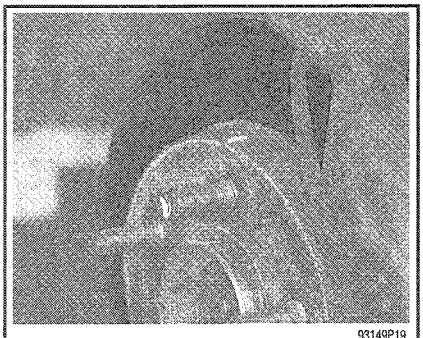
93148P33

Fig. 34 To remove the stabilizer link from the air spring housing, use two wrenches



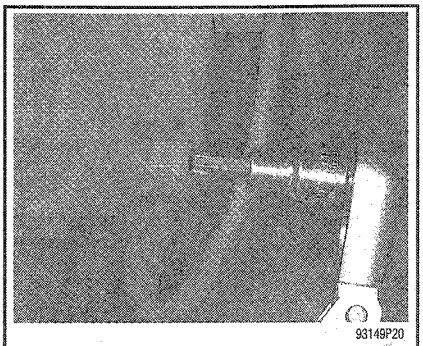
93148P32

Fig. 35 Unbolt the anti-lock brake sensor line from the air spring housing



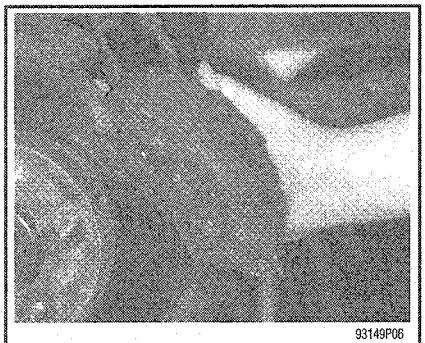
93149P19

Fig. 36 Match mark the rotor and a stud the way you see here



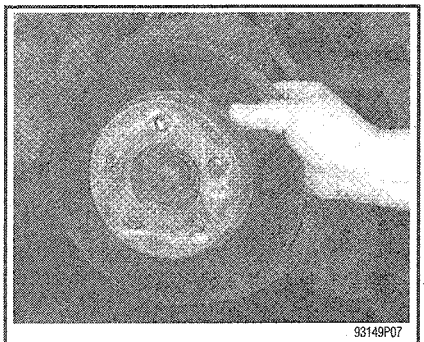
93149P20

Fig. 37 Using a Torx®driver, remove the caliper bolts



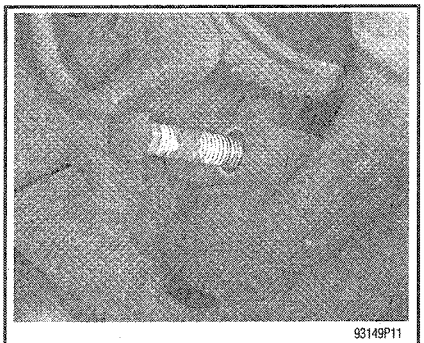
93149P06

Fig. 38 Remove the caliper by sliding it off the spindle



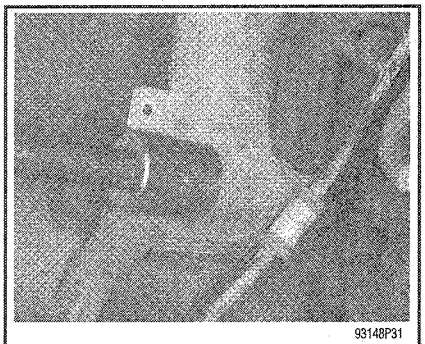
93149P07

Fig. 39 Now slide the rotor off the studs, after making sure you have them match-marked



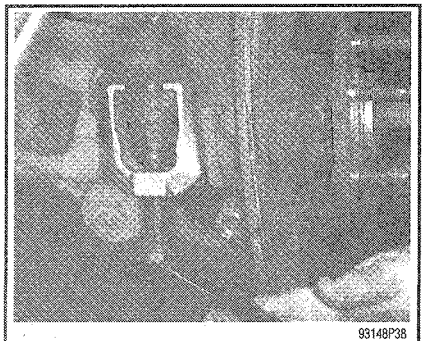
93149P11

Fig. 40 Remove the pinch bolt from the lower arm assembly



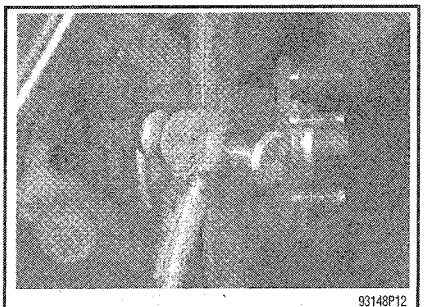
93148P31

Fig. 41 Remove the airspring mounting bolt



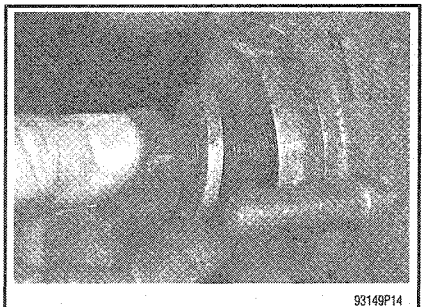
93148P38

Fig. 42 Remove the tie rod from the spindle, using the special tool . . .



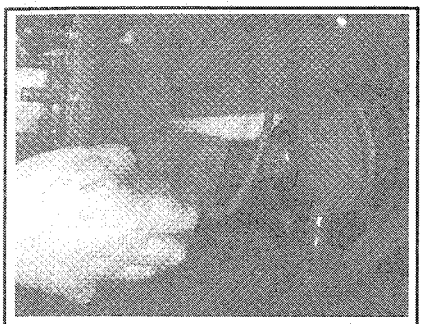
93148P12

Fig. 43 . . . or you can use the peen end of a ball-peen hammer to jar and separate the taper of the tie rod as it sits in the spindle



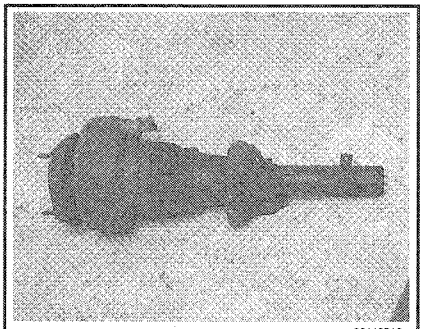
93149P14

Fig. 44 We broke this nut loose with the car on the ground. Now it's just a matter of unscrewing the nut and removing the washer



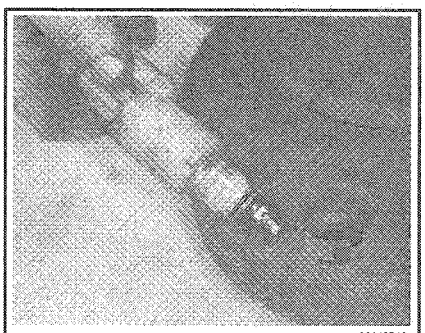
93149P13

Fig. 45 Slide the axle shaft out of the spindle/hub assembly. Be sure to support the axle. Don't let it hang!



93148P19

Fig. 46 The airspring removed from the car



93148P18

Fig. 47 Check the solenoid and airspring to make sure you haven't lost the sealing O-rings

7. Remove the tire and wheel assembly.
8. Remove the brake caliper, then support it on a wire, out of the way. Remove the rotor.
9. At the tie rod end, remove the cotter pin and the castle nut. Discard the cotter pin and nut, and replace with new ones during installation.
10. Using a tie rod end remover tool and the tie rod remover adapter tool, separate the tie rod from the steering knuckle.

⁂ WARNING

Use extreme care not to damage the link ball joint boot seal.

11. Unfasten the stabilizer bar link nut, then remove the stabilizer bar link from the strut.
12. Remove the lower arm-to-steering knuckle pinch bolt and nut; it may be necessary to use a drift punch to remove the bolt. Using a suitable tool, spread the knuckle-to-lower arm pinch joint, then remove the lower arm from the steering knuckle. Discard the pinch nut/bolt and replace with a new one during installation.
13. Remove the halfshaft from the hub and support it with a wire to maintain a level position.

➨When removing the halfshaft, do not allow it to move outward as the internal parts of the tripod CV-joint could separate, causing failure of the joint.

14. Remove the strut-to-steering knuckle pinch bolt. Using a small prybar, spread the pinch bolt joint and separate the strut from the steering knuckle. Remove the steering knuckle/hub assembly from the strut.
15. Remove the 3 top mount-to-airspring tower nuts, then remove the air spring from the vehicle.

To install:

16. Install the air spring assembly and the three top mount-to-airspring tower nuts.
17. Install the steering knuckle and hub assembly to the strut.
18. Install a new strut-to-steering knuckle pinch bolt. Tighten the bolt to 73–97 ft. lbs. (98–132 Nm).
19. Install the halfshaft into the hub.
20. Install the lower arm to the steering knuckle, making sure the ball stud groove is properly positioned. Be very careful not to damage the ball joint seal. Fasten using a new pinch bolt and nut. Tighten to 40–53 ft. lbs. (54–72 Nm).

➨The letters "Top LH" and "Top RH" are molded into the stabilizer bar link for correct assembly to the strut.

21. Install the stabilizer link to the strut, making sure the link is positioned properly, then install a new stabilizer bar link nut. Tighten to 57–75 ft. lbs. (77–102 Nm).
22. Using a new castle/slotted nut, install the tie rod end onto the knuckle. Tighten the nut to 23–35 ft. lbs. (31–47 Nm).
23. Install the disc brake rotor, caliper, and tire/wheel assembly. Tighten the wheel lug nuts to 85–105 ft. lbs. (115–142 Nm).
24. Tighten the three top mount-to-air spring tower nuts to 23–29 ft. lbs. (31–40 Nm).
25. Lower the vehicle partially.
26. Turn on the air suspension switch and fill the air spring as follows:
    - Place the air suspension service switch in the **ON**position.
    - Turn the ignition switch **OFF**.
    - Connect a battery charger to reduce the battery drain.
    - Open the access door in the left-hand luggage compartment trim panel to plug the Super Star II tester or an equivalent scan tool, into the air suspension diagnostics wiring harness connector.
    - Set the tester to EEC-IV/MCU mode. Also set the tester to FAST mode. Release the tester button to the HOLD (up) position and turn the tester **ON**.
    - Depress the tester button to TEST (down) position. A Code 10 will be displayed. Within 2 minutes, a Code 13 will be displayed. After Code 13 is displayed, release the tester button to HOLD (up) position, wait 5 seconds, and depress the tester button to TEST (down) position. Ignore any codes displayed.
    - Release the tester button to the HOLD (up) position. Wait at least 20 seconds, then depress the tester button to TEST (down) position. Within 10 seconds, the codes will be displayed in the order shown.
    - Within 4 seconds after Code 24/25 is displayed, release the tester button to the HOLD (up) position. Waiting longer than 4 seconds may result in Functional Test 31 being entered. The compressor will fill the air springs with air as long as the tester button is in the HOLD (up) position. To stop filling the air springs, depress the tester button to the TEST (down) position.

➨It is possible to overheat the compressor during this operation. If the compressor overheats, the self-resetting circuit breaker in the compressor will open and remain open for about 15 minutes. This allows the compressor to cool down.

    - To exit Functional Test 24/25, disconnect the tester and turn the ignition switch OFF.

27. Lower the vehicle.
28. Then tighten the hub nut to 170–203 ft. lbs. (230–275 Nm).
29. Depress the brake pedal a few times before moving the vehicle.

Upper Ball Joint

INSPECTION

▶ See Figure 48

1. Raise the vehicle and place floor jacks beneath the lower control arms.
2. Make sure the front wheel bearings are properly adjusted.
3. Inspect the lower ball joint and replace the lower control arm assembly, if required.
4. Have an assistant grasp the bottom of the tire and move the wheel in and out.
5. As the wheel is being moved, observe the upper control arm where the spindle attaches to it. Any movement between the upper part of the spindle and the upper control arm indicates a bad ball joint, which must be replaced.

REMOVAL & INSTALLATION

1988–91 Vehicles

➨Ford Motor Company recommends replacement of the upper control arm and ball joint as an assembly. However, aftermarket replacement parts are available, which can be installed using the following procedure.

1. Raise the vehicle and support it on the frame points so the front wheels fall to their full down position. Remove the wheel and tire assembly.
2. Drill a ⅛ in. hole completely through each ball joint attaching rivet.

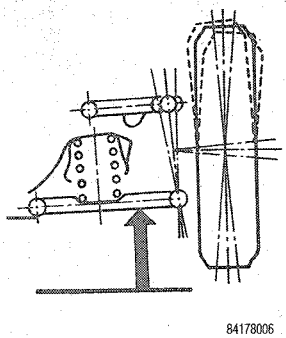


Fig. 48 Checking the upper ball joint

3. Using a large chisel, cut off the head of each rivet and drive them from the arm.
4. Place a jack under the lower arm and raise the arm to compress the coil spring.
5. Remove the cotter pin and attaching nut from the ball joint stud.
6. Using a ball joint removal tool, loosen the ball joint stud from the spindle and remove the ball joint from the arm.

To install:

7. Clean all metal burrs from the arm and install the new ball joint, using the service part nuts and bolts to attach the ball joint. Do not attempt to rivet the ball joint once it has been removed.
8. Install the ball joint stud into the spindle. Tighten the ball joint-to-upper spindle nut to 60–90 ft. lbs. (81–122 Nm). Continue to tighten until the slot for the cotter pin is aligned. Install a new cotter pin.
9. Install the wheel and tire assembly and lower the vehicle. Check front end alignment.

1992–00 Vehicles

See Figure 49

1. Raise and safely support the vehicle with safety stands under the frame behind the lower arm. Remove the wheel and tire assembly.
2. Position a floor jack under the lower arm at the lower ball joint area. The floor jack will support the spring load on the lower arm.

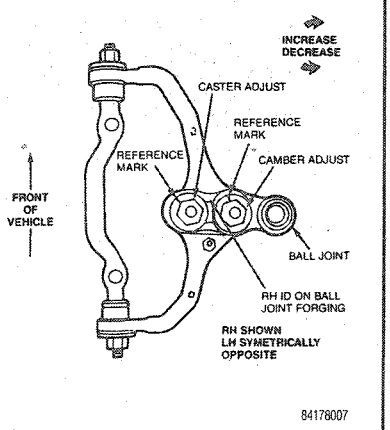


Fig. 49 Upper control arm assembly—1992–99 Town Cars

3. Remove the retaining nut and pinch bolt from the upper ball joint stud.
4. Mark the position of the alignment cams. When replacing the ball joint this will approximate the current alignment.
5. Remove the 2 nuts retaining the ball joint to the upper arm. Remove the ball joint and spread the slot with a suitable prybar to separate the ball joint stud from the spindle.

To install:

The upper ball joints differ from side to side. Be sure to use the proper ball joint on each side.

6. Position the ball joint on the upper arm and insert the ball stud into the spindle.
7. Install the pinch bolt and retaining nut. Tighten to 67 ft. lbs. (92 Nm).
8. Install the alignment cams to the approximate position at removal. If not marked, install in neutral position.
9. Install the 2 nuts attaching the ball joint to the arm. Hold the cams and tighten the nuts to 90–109 ft. lbs. (122–149 Nm) on 1992 vehicles or 107–129 ft. lbs. (145–175 Nm) on 1999–99 Town Cars.
10. Remove the floor jack from the lower arm and install the wheel and tire assembly. Remove the safety stands and lower the vehicle.
11. Check and adjust the front end alignment.

Lower Ball Joint

INSPECTION

See Figure 50

1. Support the vehicle in normal driving position with ball joints loaded.
2. Wipe the grease fitting and ball joint cover checking surface clean. The checking surface is the round boss into which the grease fitting is threaded.
3. The checking surface should project outside the cover. If the checking surface is inside the cover, replace the lower control arm assembly.

REMOVAL & INSTALLATION

The ball joint is an integral part of the lower control arm. If the ball joint is defective, the entire lower control arm must be replaced.

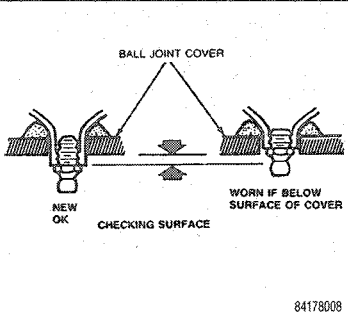


Fig. 50 Checking the lower ball joint

Stabilizer Bar

REMOVAL & INSTALLATION

1. Raise the front of the vehicle and place jackstands under the lower control arms.
2. On 1988–91 vehicles, remove the link nuts and disconnect the stabilizer bar from the links.
3. On 1992–00 vehicles, remove the retaining nuts from the pinch bolts at the spindles. Spread the slots in the spindles with a prybar to free the ball studs. Be careful not to damage the ball joint stud seal.
4. Remove the stabilizer bar brackets from the frame and remove the stabilizer bar. If worn, cut the insulators from the stabilizer bar.
5. On 1992–00 vehicles, remove the retaining nuts from the ball joint studs at the end of the bar. Use removal tool 3290–D or equivalent to separate the links from the ends of the stabilizer bar.

To install:

6. Coat the necessary parts of the stabilizer bar with rubber lubricant. Slide new insulators onto the stabilizer bar.
7. On 1992–00 vehicles, install the ball joint links into the ends of the bar with the retaining nuts. Tighten to 30–40 ft. lbs. (40–55 Nm).
8. On 1988–91 vehicles, attach the ends of the stabilizer bar to the lower control arm with new nuts and links. Tighten the nuts to 9–15 ft. lbs. (12–20 Nm). Install the insulator brackets and tighten the bolts to 14–26 ft. lbs. (19–35 Nm).
9. On 1992–00 vehicles, position the bar under the vehicle and engage the upper ball joint links to the spindles. Install the insulator brackets with the retaining nuts. Tighten the pinch bolts and nuts at the spindles to 30–40 ft. lbs. (40–55 Nm) Tighten the bracket-to-frame nuts to 44–59 ft. lbs. (59–81 Nm).

Upper Control Arm

REMOVAL & INSTALLATION

1988–91 Town Car

1. Raise and safely support the vehicle on safety stands positioned on the frame just behind the lower arm. Remove the wheel and tire assembly.
2. Remove the cotter pin from the upper ball joint stud nut. Loosen the nut a few turns but do not remove.
3. Install ball joint press T57P–3006–B or equivalent, between the upper and lower ball joint studs with the adapter screw on top.

This tool should be seated firmly against the ends of both studs, not against the nuts or lower stud cotter pin.

4. With a wrench, turn the adapter screw until the tool places the stud under compression. Tap the spindle near the upper stud with a hammer to loosen the stud in the spindle.

Do not loosen the stud from the spindle with tool pressure only. Do not contact the boot seal with the hammer.

5. Remove the tool from between the ball joint studs and place a floor jack under the lower arm.

6. Remove the upper arm attaching bolts and the upper arm.

To install:

7. Transfer the rebound bumper from the old arm to the new arm, or replace the bumper if worn or damaged.

8. Position the upper arm shaft to the frame bracket. Install the 2 attaching bolts and washers. Tighten to 100–140 ft. lbs. (136–190 Nm).

9. Connect the upper ball joint stud to the spindle and install the attaching nut. Tighten the nut to 60–90 ft. lbs. (81–122 Nm). Continue to tighten the nut until the slot for the cotter pin is aligned. Install a new cotter pin.

10. Install the wheel and tire assembly and lower the vehicle. Check the front end alignment.

1992–00 Town Cars

1. Raise and safely support the vehicle on safety stands positioned on the frame just behind the lower arm.

2. Remove the wheel and tire assembly and position a floor jack under the lower arm.

3. Remove the retaining nut from the upper ball joint stud to spindle pinch bolt. Tap the pinch bolt to remove from the spindle.

4. Using a suitable prybar, spread the slot to allow the ball joint stud to release out of the spindle.

5. Remove the upper arm retaining bolts and the upper arm.

To install:

6. Transfer the rebound bumper from the old arm to the new arm, or replace the bumper if worn or damaged.

7. Use reference marks from the camber and caster cams as initial settings.

8. Position the upper arm shaft to the frame bracket. Install the 2 retaining bolts and washers. Position the arm in the center of the slot adjustment range and tighten to 100–140 ft. lbs.

9. Connect the upper ball joint stud to the spindle and install the retaining pinch bolt and nut. Tighten the nut to 67 ft. lbs. (92 Nm).

10. Install the wheel and tire assembly and lower the vehicle. Check the front end alignment.

CONTROL ARM BUSHING REPLACEMENT

See Figures 51, 52, 53, 54 and 55

1. Remove the upper control arm from the vehicle.

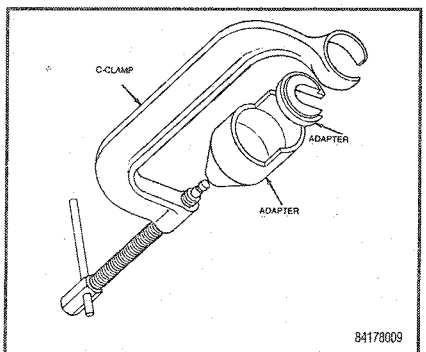


Fig. 51 Control arm bushing C-clamp tool and adapters

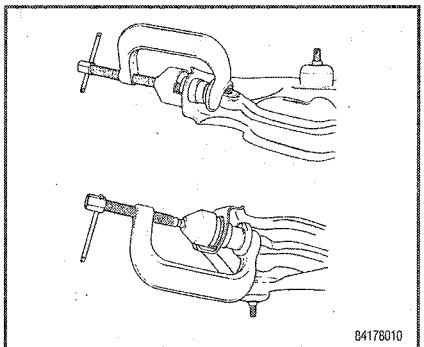


Fig. 52 Control arm bushing removal—1988–91 vehicles

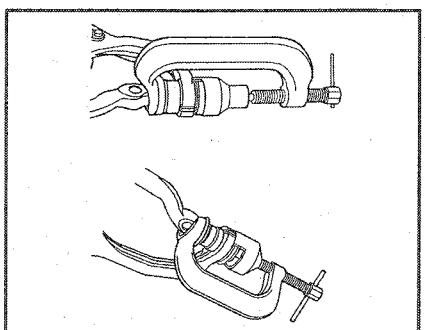


Fig. 53 Control arm bushing removal—1992–99 vehicles

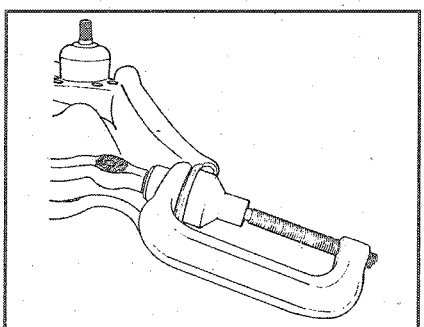


Fig. 54 Control arm bushing installation—1988–91 vehicles

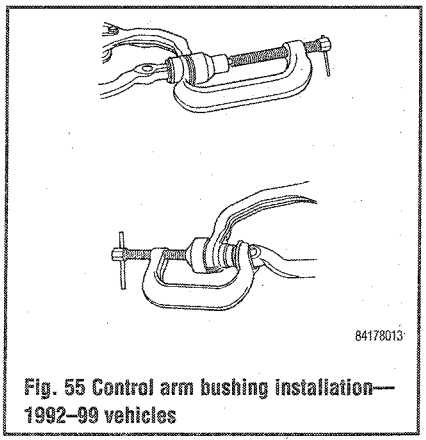


Fig. 55 Control arm bushing installation—1992–99 vehicles

2. Remove the nuts and washers from both ends of the control arm shaft. Discard the nuts.

3. Press the bushings from the control arm and shaft using C-clamp tool T74P–3044–A1 or equivalent, and its adapters.

4. Position the shaft and new bushings to the upper control arm. Use the C-clamp tool and adapters to press the new bushings into place.

5. Make sure the control arm shaft is positioned so the serrated side contacts the frame.

6. Install an inner washer, rear bushing only, and 2 outer washers with new nuts on each end of the shaft. Tighten the nuts to 85–100 ft. lbs. (115–136 Nm).

Lower Control Arm

REMOVAL & INSTALLATION

1. Raise the front of the vehicle and position safety stands on the frame behind the lower control arms. Remove the wheel and tire assembly.

2. Remove the brake caliper and suspend with a length of wire; do not let the caliper hang by the brake hose. Remove the brake rotor and dust shield. Remove the anti-lock brake sensor, if equipped.

3. Remove the jounce bumper; inspect and save for installation if in good condition. Remove the shock absorber.

4. On 1988–91 vehicles, disconnect the stabilizer link from the lower arm.

5. Disconnect the steering center link from the pitman arm.

6. Remove the cotter pin and loosen the lower ball joint stud nut 1–2 turns.

➡Do not remove the nut at this time.

7. On 1988–91 vehicles, install a suitable ball joint press tool to place the ball joint stud under compression. With the stud under compression, tap the spindle sharply with a hammer to loosen the stud in the spindle. Remove the ball joint press tool.

8. On 1992–99 vehicles, tap the spindle boss sharply to relieve the stud pressure. Tap the spindle sharply, near the lower stud, with a hammer to loosen the stud in the spindle.

9. Place a floor jack under the lower arm. Remove the coil spring as described in this Section.

10. Remove the ball joint nut and remove the lower control arm.

To install:

11. Position the arm assembly ball joint stud into the spindle and install the nut. Tighten to 80–120 ft. lbs. (108–163 Nm). Continue to tighten until the slot for the cotter pin is aligned. Install a new cotter pin.

12. Position the coil spring into the upper spring pocket and raise the lower arm, aligning the holes in the arm with the holes in the crossmember. Install the bolts and nuts with the washer installed on the front bushing. Do not tighten at this time.

➡Make sure the pigtail of the lower coil of the spring is in the proper location of the seat on the lower arm, between the 2 holes.

13. Remove the spring compressor tool.

14. Connect the steering center link at the pitman arm and install the nut. Tighten to 44–46 ft.

lbs. (59–63 Nm). Continue to tighten until the slot for the cotter pin is aligned. Install a new cotter pin.

15. Install the shock absorber and the jounce bumper.

16. Install the dust shield, rotor and caliper. Install the anti-lock brake sensor, if equipped.

17. On 1988–91 vehicles, position the stabilizer link to the lower control arm and install the link, bushing and retaining nut. Tighten to 9–15 ft. lbs. (12–20 Nm).

18. Install the wheel and tire assembly and lower the vehicle. With the vehicle supported on the wheels and tires at normal curb height, tighten the lower control arm-to-crossmember bolts to 109–140 ft. lbs. (148–190 Nm).

19. Check the front end alignment.

CONTROL ARM BUSHING REPLACEMENT

The control arm bushings are integral with the lower control arm. If the bushings are defective, the entire lower control arm must be replaced.

Spindle

REMOVAL & INSTALLATION

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

2. Position safety stands on the frame behind the lower control arms. Remove the wheel and tire assembly.

3. Remove the brake caliper and suspend with a length of wire; do not let the caliper hang by the brake hose. Remove the brake rotor and dust shield. Remove the anti-lock brake sensor, if equipped.

4. Disconnect the tie rod end from the spindle using removal tool 3290–D or equivalent.

5. On 1988–91 vehicles, proceed as follows:

   a. Remove and discard the cotter pins from both ball joint studs and loosen the stud nuts 1–two turns. Do not remove the nuts at this time.

   b. Position a suitable ball joint press tool between the upper and lower ball joint studs. Turn the tool with a wrench until the tool places the studs under compression.

   c. Using a hammer sharply hit the spindle near the studs to loosen the studs from the spindle.

6. On 1992–00 vehicles, proceed as follows:

   a. Remove and discard the cotter pin from the lower ball joint stud and loosen the stud nut 1–two turns. Do not remove the nut at this time.

   b. Using a hammer sharply hit the spindle near the stud to loosen the stud from the spindle.

   c. Remove the pinch bolts from the upper ball joint and stabilizer link ball joint at the spindle.

7. Position a floor jack under the lower control arm at the lower ball joint area, and raise the jack to support the lower arm.

➡The jack will support the spring load on the lower control arm.

8. On 1988–91 vehicles, remove the upper and lower ball joint stud nuts and remove the spindle.

9. On 1992–00 vehicles, remove the lower ball joint stud nut. Pry the slots with a suitable prybar at the upper ball joint and link ball joint to separate from the spindle. Remove the spindle.

To install:

10. On 1992–00 vehicles, position the spindle on the stabilizer bar upper ball joint stud. Install the pinch bolt and loosely install the nut.

11. Position the spindle on the lower ball joint stud and install the stud nut. Tighten the nut to 80–119 ft. lbs. (108–162 Nm). Continue to tighten the nut until a slot for the cotter pin is aligned. Install a new cotter pin.

12. Raise the lower arm and guide the upper ball joint stud into the spindle.

13. On 1988–91 vehicles, install the upper ball joint stud nut and tighten to 60–90 ft. lbs. (81–122 Nm). Continue to tighten the nut until a slot for the cotter pin is aligned. Install a new cotter pin.

14. On 1992–00 vehicles, install the upper ball joint stud pinch bolt and nut. Tighten the nut to 67 ft. lbs. (92 Nm). Tighten the stabilizer link to spindle pinch bolt nut to 30–50 ft. lbs. (40–55 Nm).

15. Connect the tie rod end to the spindle. Install the nut and tighten to 43–46 ft. lbs. (59–63 Nm). Continue to tighten the nut until the slot for the cotter pin is aligned with the cut in the bolt and install a new cotter pin.

16. Install the brake dust shield, caliper, rotor, and anti-lock brake sensor, if equipped.

17. Install the wheel and tire assembly and lower the vehicle.

18. Check the front end alignment.

Front Wheel Bearings

REPLACEMENT

1988–91 Vehicles

1. Raise and support the vehicle safely.

2. Remove the wheel and tire assembly and the disc brake caliper. Suspend the caliper with a length of wire; do not let it hang from the brake hose.

3. Pry off the dust cap. Tap out and discard the cotter pin. Remove the nut retainer.

4. Being careful not to drop the outer bearing, pull off the brake disc and wheel hub assembly.

5. Remove the inner grease seal using a prybar. Remove the inner wheel bearing.

6. Clean the wheel bearings with solvent and inspect them for pits, scratches, and excessive wear. Wipe all the old grease from the hub and inspect the bearing races (cups). If either bearings or races are damaged, the bearing races must be removed and the bearings and races replaced as an assembly.

7. If the bearings are to be replaced, drive out the races (cups) from the hub using a brass drift, or pull them from the hub using a puller.

8. Make sure the spindle, hub and bearing assemblies are clean before installation.

To install:

9. If the bearing races (cups) were removed, install new ones using a suitable bearing race installer. Pack the bearings with high-temperature wheel bearing grease using a bearing packer. If a packer is not available, work as much grease as possible between the rollers and cages using your hands.

10. Coat the inner surface of the hub and bearing races (cups) with grease.

11. Install the inner bearing in the hub. Using a seal installer, install a new grease seal into the hub. Lubricate the lip of the seal with grease.

12. Install the hub/disc assembly on the spindle, being careful not to damage the oil seal.

13. Install the outer bearing, washer, and spindle nut. Install the caliper and the wheel and tire assembly. Adjust the bearings as follows:

   a. Loosen the adjusting nut three turns and rock the wheel in and out a few times to release the brake pads from the rotor.

   b. While rotating the wheel and hub assembly in a counterclockwise direction, tighten the adjusting nut to 17–25 ft. lbs. (23–34 Nm).

   c. Back off the adjusting nut ½ turn, then retighten to 10–28 inch lbs. (1.1–3.2 Nm).

   d. Install the nut retainer and a new cotter pin. Replace the grease cap.

14. Lower the vehicle. Before driving the vehicle, pump the brake pedal several times to restore normal brake pedal travel.

1992–00 Vehicles

◗ See Figures 56, 57 and 58

1. Raise and safely support the vehicle. Remove the wheel and tire assembly.

2. Remove and discard the grease cap from the hub.

3. Remove the brake caliper. Suspend the caliper with a length of wire; do not let it hang from the brake hose.

4. Remove the rotor. If the factory installed push on nuts are installed, remove them first.

5. Remove and discard the wheel hub nut.

6. Remove the hub and bearing assembly.

To install:

7. Install the hub and bearing assembly. Install a new wheel hub nut and tighten to 189–254 ft. lbs. (255–345 Nm).

8. Install the rotor and push on nuts, if equipped. Install a new grease cap.

9. Install the brake caliper.

10. Install the wheel and tire assembly and lower the vehicle.

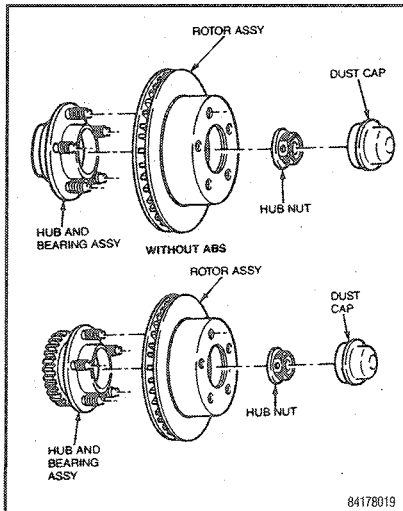


Fig. 56 Front wheel bearing assembly—1992–00 vehicles

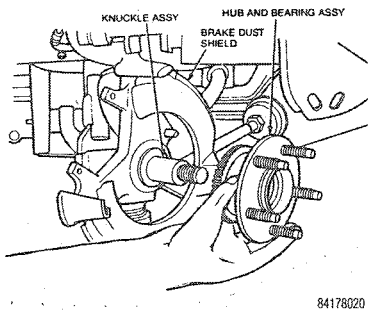


Fig. 57 Front wheel hub and bearing assembly removal—1992–00 vehicles

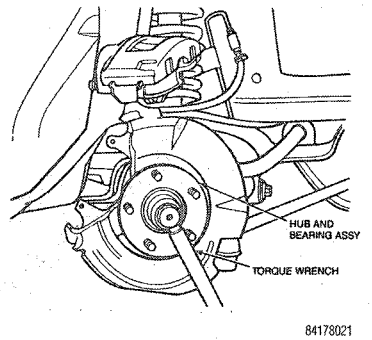


Fig. 58 Front wheel hub and bearing assembly installation—1992–00 vehicles

Wheel Alignment

If the tires are worn unevenly, if the vehicle is not stable on the highway or if the handling seems uneven in spirited driving, the wheel alignment should be checked. If an alignment problem is suspected, first check for improper tire inflation and other possible causes. These can be worn suspension or steering components, accident damage or even unmatched tires. If any worn or damaged components are found, they must be replaced before the wheels can be properly aligned. Wheel alignment requires very expensive equipment and involves minute adjustments which must be accurate; it should only be performed by a trained technician. Take your vehicle to a properly equipped shop.

Following is a description of the alignment angles which are adjustable on most vehicles and how they affect vehicle handling. Although these angles can apply to both the front and rear wheels, usually only the front suspension is adjustable.

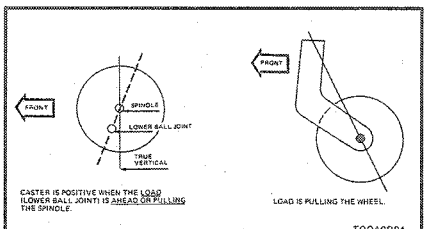


Fig. 59 Caster affects straight-line stability. Caster wheels used on shopping carts, for example, employ positive caster

CASTER

See Figure 59

Looking at a vehicle from the side, caster angle describes the steering axis rather than a wheel angle. The steering knuckle is attached to a control arm or strut at the top and a control arm at the bottom. The wheel pivots around the line between these points to steer the vehicle. When the upper point is tilted back, this is described as positive caster. Having a positive caster tends to make the wheels self-centering, increasing directional stability. Excessive positive caster makes the wheels hard to steer, while an uneven caster will cause a pull to one side. Overloading the vehicle or sagging rear springs will affect caster, as will raising the rear of the vehicle. If the rear of the vehicle is lower than normal, the caster becomes more positive.

CAMBER

See Figure 60

Looking from the front of the vehicle, camber is the inward or outward tilt of the top of wheels. When the tops of the wheels are tilted in, this is negative camber; if they are tilted out, it is positive. In a turn, a slight amount of negative camber helps maximize contact of the tire with the road. However, too much negative camber compromises straight-line stability, increases bump steer and torque steer. .

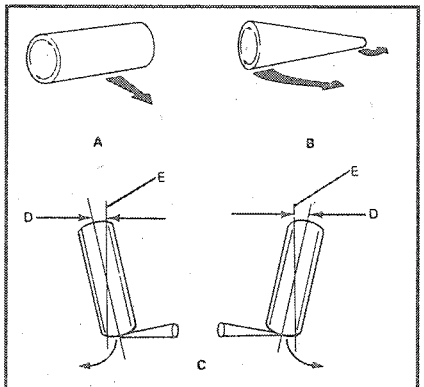


Fig. 60 Camber influences tire contact with the road

TOE

See Figure 61

Looking down at the wheels from above the vehicle, toe angle is the distance between the front of the wheels, relative to the distance between the back of the wheels. If the wheels are closer at the front, they are said to be toed-in or to have negative toe. A small amount of negative toe enhances directional stability and provides a smoother ride on the highway.

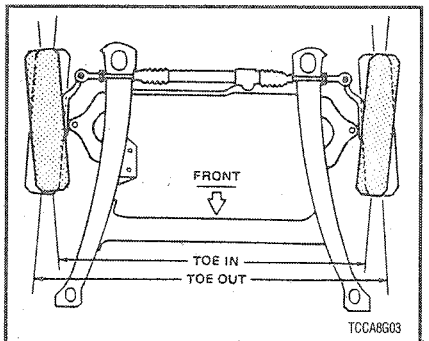


Fig. 61 With toe-in, the distance between the wheels is closer at the front than at the rear

REAR SUSPENSION

The rear axle is suspended from the vehicle frame by 2 upper and 2 lower control arms. Two coil or air springs are connected between the rear axle and the frame. Ride control is provided by 2 shock absorbers mounted between the coil springs upper seats and brackets welded to the axle tube.

In addition, some vehicles are equipped with a stabilizer bar to control side roll.

All suspension fasteners are important attaching parts in that they could affect the performance of vital parts and systems, and/or could result in major service expense. Any part must be replaced with one of the same part number or with an exact equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during assembly to ensure proper part retention.

CAUTION

If equipped with air suspension, the air suspension switch, located in the trunk on the right-hand trim panel, must be turned OFF before raising the vehicle. Failure to turn the air suspension switch off may result in unexpected inflation or deflation of the air springs, which may result in the vehicle shifting, possibly causing personal injury.

Coil Springs

REMOVAL & INSTALLATION

See Figures 64, 65, 66, 67 and 68

1. Raise and safely support the vehicle. Place jack stands under the frame side rails.
2. Support the rear axle housing.

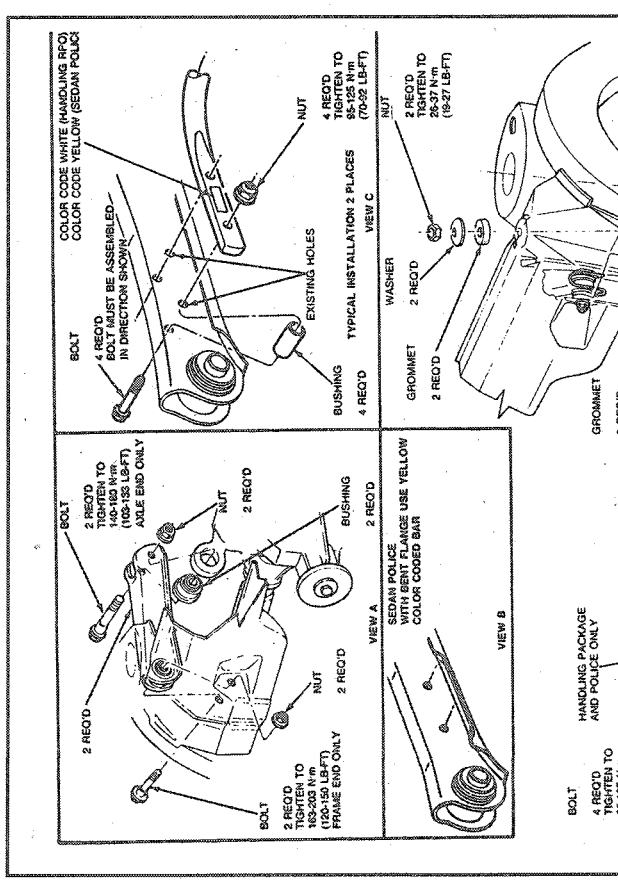


Fig. 62 Rear suspension—1988–91 vehicles

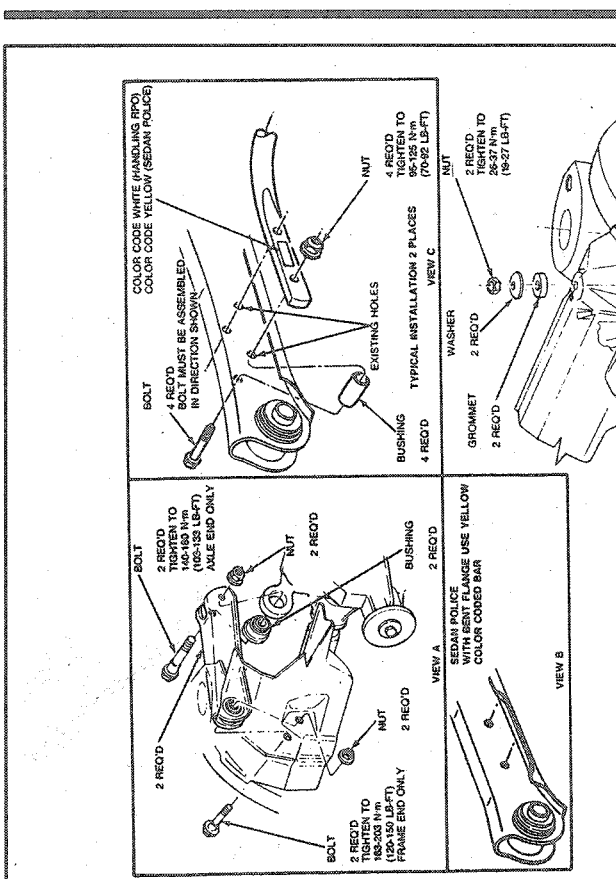


Fig. 63 Rear suspension—1992–93 vehicles, except air suspension

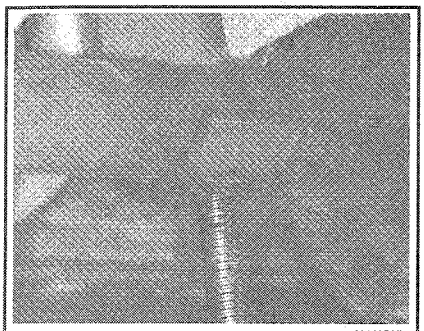

93148P07

Fig. 64 Support the rear axle housing with an adjustable hoist

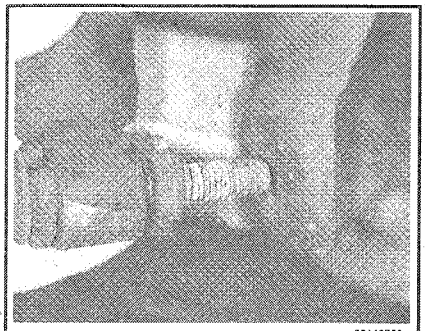

93148P06

Fig. 65 Remove the nut and slide the bolt out of the lower mounting ear

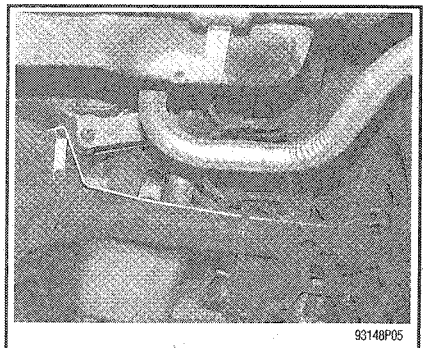

93148P05

Fig. 66 Lower the hoist until the spring pressure is completely relieved

3. Remove the rear stabilizer bar, if equipped.
4. Disconnect the lower studs of both rear shock absorbers from the mounting brackets on the axle tube.
5. Unsnap the right parking brake cable from the right upper arm retainer before lowering the axle.
6. Lower the axle housing until the coil springs are released. Remove the springs and insulators.

To install:

7. Position the spring in the upper and lower seats with an insulator between the upper end of the spring and frame seat.
8. Raise the axle and connect the shock absorbers to the mounting brackets. Install new retaining nuts and tighten to 56–76 ft. lbs. (77–103 Nm).

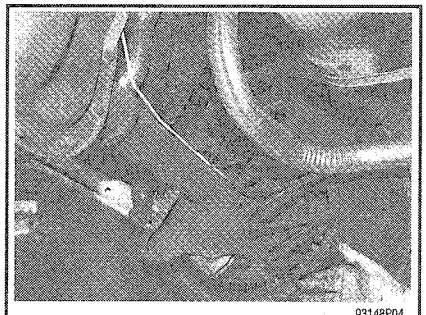

93148P04

Fig. 67 Remove the spring from its seat on the rear axle. Save and reuse any coil spring covers or noise insulators

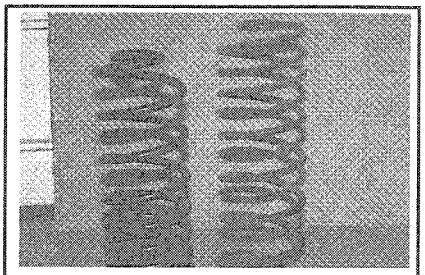

93148P02

Fig. 68 Do not be fooled by the unsprung length of a new spring. The new spring is shorter, it is a heavier duty design. It will not compress as much as the old spring and the car rides higher in the rear

9. Snap the right parking cable into the upper arm retainer. Install the stabilizer bar, if equipped.
10. Remove the support from the rear axle housing and lower the vehicle.

Air Springs

REMOVAL & INSTALLATION

See Figures 69 thru 79

Town Car and Mark

CAUTION

Before servicing any air suspension component, disconnect power to the system by turning the air suspension switch OFF or by disconnecting the negative battery cable. Do not remove an air spring under any circumstances when there is pressure in the air spring. Do not remove any components supporting an air spring without either exhausting the air or providing support for the air spring.

1. Turn the air suspension switch **OFF**.
2. Raise and safely support the vehicle on the frame. The suspension must be fully down with no load.
3. Remove the heat shield, as required. Remove the spring retainer clip.
4. Remove the air spring solenoid as follows:
   a. Disconnect the electrical connector and then disconnect the air line.

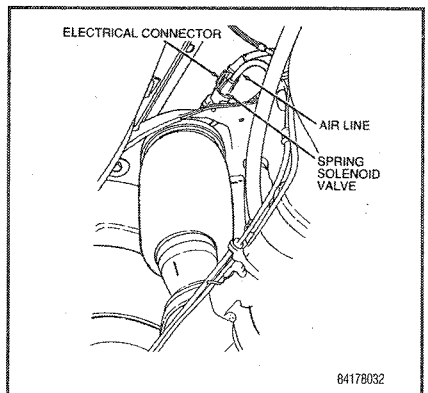


Fig. 69 Air spring solenoid location

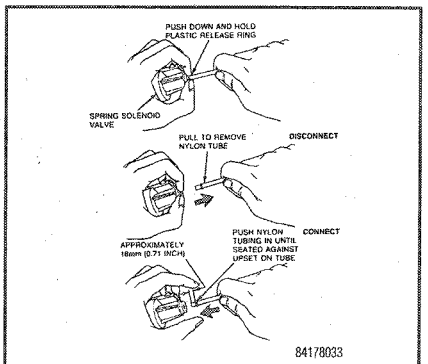


Fig. 70 Air line connect/disconnect procedure

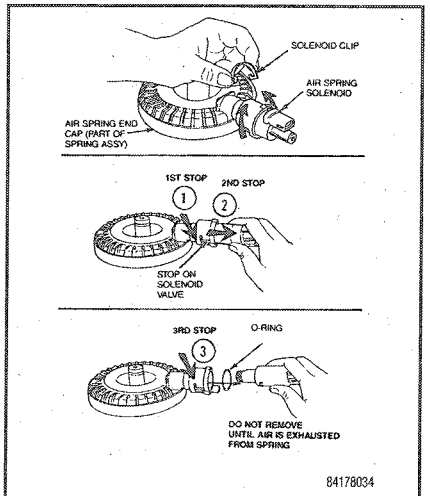


Fig. 71 Air spring solenoid removal—reverse sequence for installation

b. Remove the solenoid clip.
c. Rotate the solenoid counterclockwise to the first stop.
d. Pull the solenoid straight out slowly to the second stop to bleed air from the system.

CAUTION

Do not fully release the solenoid until the air is completely bled from the air spring or personal injury may result.

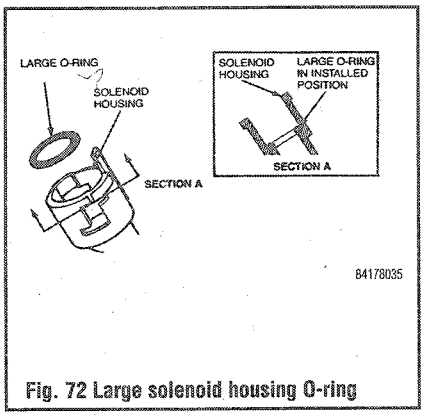


Fig. 72 Large solenoid housing O-ring

e. After the air is fully bled from the system, rotate counterclockwise to the third stop and remove the solenoid from the solenoid housing. Remove the large O-ring from the solenoid housing.

5. Remove the spring piston-to-axle spring seat as follows:

a. Insert air spring removal tool T90P–5310–A or equivalent, between the axle tube and the spring seat on the forward side of the axle.

b. Position the tool so its flat end rests on the piston knob. Push downward, forcing the piston and retainer clip off the axle spring seat.

6. Remove the air spring.

To install:

7. Install the air spring solenoid as follows:

a. Check the solenoid O-rings for cuts or abrasion. Replace the O-rings as required. Lightly grease the O-ring area of the solenoid and the larger solenoid housing O-ring with silicone dielectric compound.

b. Insert the solenoid into the air spring end cap and rotate clockwise to the third stop, push in to the second stop, then rotate clockwise to the first stop.

c. Install the solenoid clip. Inspect the wire harness connector and ensure the rubber gasket is in place at the bottom of the connector cavity.

8. Install the air spring into the frame spring seat, taking care to keep the solenoid air and electrical connections clean and free of damage.

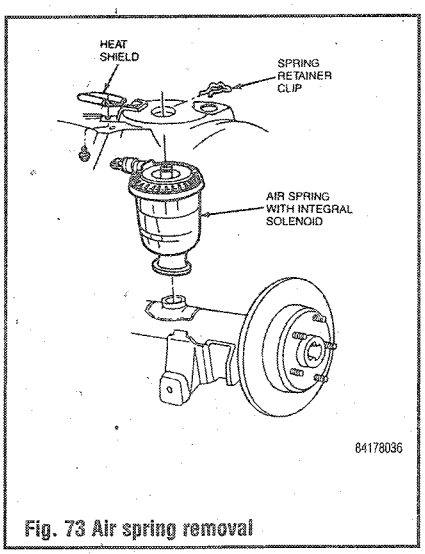


Fig. 73 Air spring removal

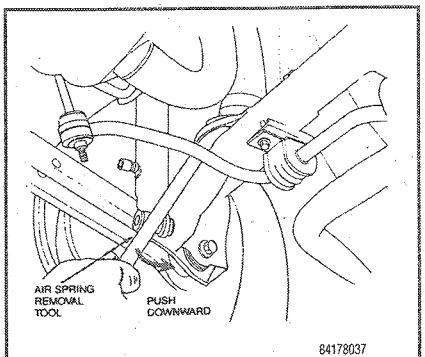


Fig. 74 Removing the spring piston-to-axle spring seat

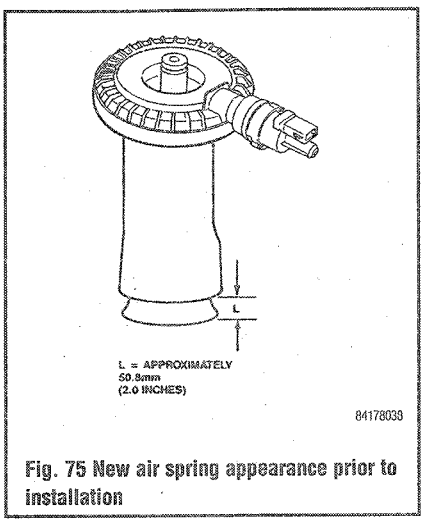


Fig. 75 New air spring appearance prior to installation

9. Connect the push on spring retainer clip to the knob of the spring cap from the top side of the frame spring seat.

10. Connect the air line and electrical connector to the solenoid. Install the heat shield to frame spring seat, if required.

11. Align the air spring piston to axle seats. Squeeze to increase pressure and push downward on the piston, snapping the piston to axle seat at rebound and supported by the shock absorber.

⇒The air springs may be damaged if the suspension is allowed to compress before the spring is inflated.

12. Refill the air spring as follows:

a. Turn the air suspension switch **ON**. The ignition switch must be **ON** and the engine running or a battery charger must be connected to the battery to reduce battery drain.

b. Fold back or remove the right luggage compartment trim panel and connect SUPER STAR II tester 007–0041–A or equivalent to the air suspension diagnostic connector, which is located near the air suspension switch.

c. Set the tester to EEC-IV/MCU mode. Also set the tester to FAST mode. Release the tester button to the HOLD (up) position and turn the tester **ON**.

d. Depress the tester button to TEST (down) position. A Code 10 will be displayed. Within 2 minutes, a Code 13 will be displayed. After Code 13 is displayed, release the tester button to HOLD (up) position, wait 5 seconds, and depress the tester button to TEST (down) position. Ignore any codes displayed.

e. Release the tester button to the HOLD (up) position. Wait at least 20 seconds, then depress the tester button to TEST (down) position. Within

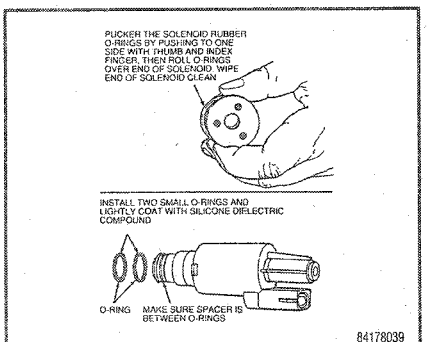


Fig. 76 Installing new O-rings on the air spring solenoid

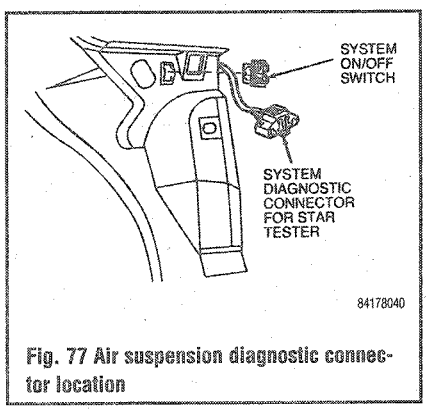


Fig. 77 Air suspension diagnostic connector location

Code	Description
23	Vent Rear
26	Compress Rear
31	Cycle Compressor On and Off Repeatedly
32	Cycle Vent Solenoid Valve Open and Closed Repeatedly
33	Cycle Spring Solenoid Valves Open and Closed Repeatedly

84178041

Fig. 78 Air suspension codes

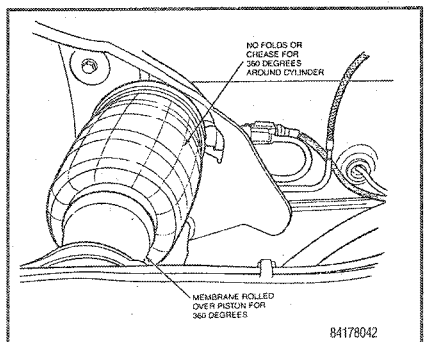
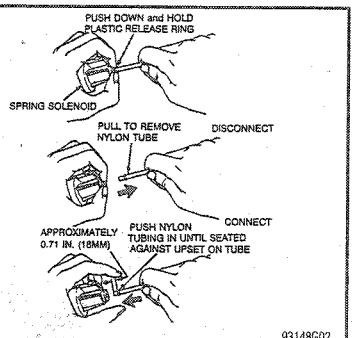


Fig. 79 Correct air spring appearance after installation

Code	Description
21	Vent R.F.
22	Vent L.F.
23	Vent R.R.
24	Inflate R.F.
25	Inflate L.F.
26	Inflate R.R.
27	Vent L.R.
28	Inflate L.R.

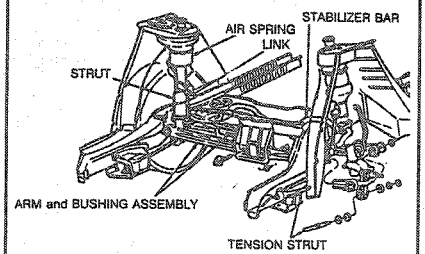
93148G01

Fig. 80 Air suspension spring fill codes



93148G02

Fig. 81 Air suspension airline connect and disconnect procedure



93148G03

Fig. 82 Rear suspension schematic for Continental

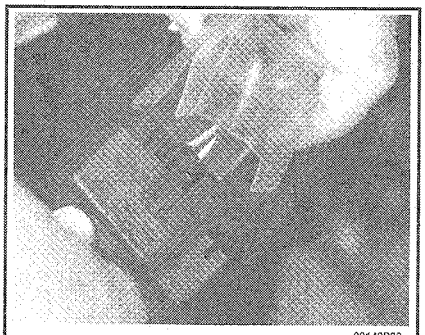
10 seconds, the codes will be displayed in the order shown.

f. Within 4 seconds after Code 26/28 is displayed, release the tester button to the HOLD (up) position. Waiting longer than 4 seconds may result in Functional Test 31 being entered. The compressor will fill the air springs with air as long as the tester button is in the HOLD (up) position. To stop filling the air springs, depress the tester button to the TEST (down) position.

⇒It is possible to overheat the compressor during this operation. If the compressor overheats, the self-resetting circuit breaker in the compressor will open and remain open for about 15 minutes. This allows the compressor to cool down.

g. To exit Functional Test 26/28, disconnect the tester and turn the ignition switch OFF.

13. Lower the vehicle.



93148P08

Fig. 83 Plugging in to the diagnostic connector in the luggage compartment

Continental

◗ See Figures 80, 81, 82 and 83

1. Turn off the air suspension switch located in the luggage compartment.
2. From inside the luggage compartment, disconnect the electrical connector from the dual dampening actuator.
3. Loosen but do not remove the three nuts retaining the strut to the upper body.
4. Raise and support the vehicle sagely. Remove the wheel and tire assembly.

⇒Do not raise the vehicle by the tension strut.

5. Disconnect the airline and electrical connector from the solenoid from the solenoid valve.
6. Remove the brake hose retainer at the strut bracket.
7. Disconnect the parking brake cable from the brake caliper. Remove all the wire retainer and parking brake cable retainers from the lower suspension arm.
8. Disconnect the height sensor link from the ball stud pin on the lower arm.
9. Remove the caliper assembly from the spindle and position it off to the side with a piece of wire. Do not kink or place a load on the brake hose.
10. Bleed the air spring by performing the following:
    - Remove the solenoid clip.
    - Rotate the solenoid counterclockwise to the first stop.
    - Slowly pull the solenoid straight out to the second stop and bleed the air from the system.
    - After the air is fully bled from the system, rotate the solenoid to the third stop and remove the solenoid from the housing.
11. Mark the position of the notch on the toe adjustment cam.
12. Remove the torsion spring clamp from the spindle-to-strut bolt.
13. Remove the nut from the inboard bushing on the suspension arm.
14. Install the torsion spring remover tool T88p-5310-a or the equivalent, on the suspension arm. Pry up on the tool and arm using a ¾ inch drive ratchet to relieve the pressure on the pivot bolt. An assistant may be required to pull outboard on the spindle simultaneously to fully relieve the tension on the bolt. Remove the bolt and lower arm. Repeat this procedure for the opposite arm.
15. Remove the torsion spring from the arms.
16. Remove the stabilizer `U' bracket from the body.
17. Remove the nut, washer, and insulator attaching the stabilizer bar to the link. Separate the stabilizer bar from the link.
18. Remove the nut, washer, and insulator retaining the tension strut to the spindle. Move the spindle rearward enough to separate it from the tension strut.
19. Remove and discard the strut-to-spindle pinch joint as required to assist in removing the bolt.
20. Separate the spindle from the strut. Remove the spindle as an assembly with the arms attached.
21. From inside the luggage compartment area, support the shock strut by hand and remove and discard the 3 upper mount-to-body nuts. Do not drop the strut when removing the upper nuts. Guide the electric actuator wire through the opening to prevent snagging and damage while removing the strut assembly.

To install:

22. Install the solenoid valve on the air spring.
23. Guide the electric actuator wire through the opening and install the strut assembly. Install the 3 new upper mount nuts.
24. Install the spindle and arms to the strut. Install a new strut-too-spindle pinch bolt. Do not tighten the bolt until the control arms are attached to the body and the cams are centered.
25. Position the tension strut to the spindle. Install the insulator, washer and nut retaining the tension strut to the spindle. Tighten the nut to 35–50 ft. lbs. (48–68Nm).
26. Install the stabilizer to the link. Install the insulator, washer, and retaining nut. Tighten the nut to 5–7 ft. lbs. (7–9.5 Nm).
27. Install the stabilizer `U' bracket to the body. Tighten the bolt to 25–37 ft. lbs. (34–50 Nm).
28. Install the torsion spring to the arms.
29. Position the inboard bushing using the torsion spring remover tool, and install the bolt. An assistant may be required to pull out board on the spindle to align the bushing so the bolt can be inserted. Repeat the procedure for the opposite lower arm.
30. Install the nut to the inboard bushing on the suspension arm but do not tighten at this time.
31. Tighten the spindle to strut bolt to 51–70 ft. lbs. 68–95 Nm).
32. Set the toe adjustment cam to the alignment mark.
33. Remove the wire from the caliper and install the caliper to the spindle.
34. Connect the height sensor link to the ball stud pin on the lower arm.
35. Install the torsion spring clamp and secure.
36. Install all the wire retainers and the parking brake cable retainers to the lower suspension arm.
37. Connect the parking brake cable to the brake caliper and install the brake hose retainer at the strut bracket.
38. Connect the air line and the electrical connector to the solenoid valve.
39. Install the wheel and tire assembly and partially lower the vehicle.
40. Tighten the 3 nuts retaining the strut to the upper body to 19–26 ft. lbs. (26–35 Nm).
41. From inside the luggage compartment, con-

nect the electrical connector for the dual dampening actuator.

42. Turn on the air suspension switch and fill the air spring as follows:
- Place the air suspension service switch in the **ON** position.
- Turn the ignition switch **OFF**.
- Connect a battery charger to reduce the battery drain.
- Open the access door in the left-hand luggage compartment trim panel to plug the Super Star II tester or an equivalent scan tool, into the air suspension diagnostics wiring harness connector.
- Set the tester to EEC-IV/MCU mode. Also set the tester to FAST mode. Release the tester button to the HOLD (up) position and turn the tester **ON**.
- Depress the tester button to TEST (down) position. A Code 10 will be displayed. Within 2 minutes, a Code 13 will be displayed. After Code 13 is displayed, release the tester button to HOLD (up) position, wait 5 seconds, and depress the tester button to TEST (down) position. Ignore any codes displayed.
- Release the tester button to the HOLD (up) position. Wait at least 20 seconds, then depress the tester button to TEST (down) position. Within 10 seconds, the codes will be displayed in the order shown.
- Within 4 seconds after Code 26/28 is displayed, release the tester button to the HOLD (up) position. Waiting longer than 4 seconds may result in Functional Test 31 being entered. The compressor will fill the air springs with air as long as the tester button is in the HOLD (up) position. To stop filling the air springs, depress the tester button to the TEST (down) position.

⇒It is possible to overheat the compressor during this operation. If the compressor overheats, the self-resetting circuit breaker in the compressor will open and remain open for about 15 minutes. This allows the compressor to cool down.

- To exit Functional Test 26/28, disconnect the tester and turn the ignition switch OFF.

43. Lower the vehicle.

Shock Absorbers

REMOVAL & INSTALLATION

Without Automatic Leveling

◗ See Figure 84

⁂ CAUTION

All vehicle applications are equipped with gas-pressurized shock absorbers that will extend unassisted. Do not apply heat or flame to the shock absorber tube.

1. If equipped with air suspension, turn the air suspension switch **OFF**.
2. Raise and safely support the vehicle. Make sure the rear axle is supported.

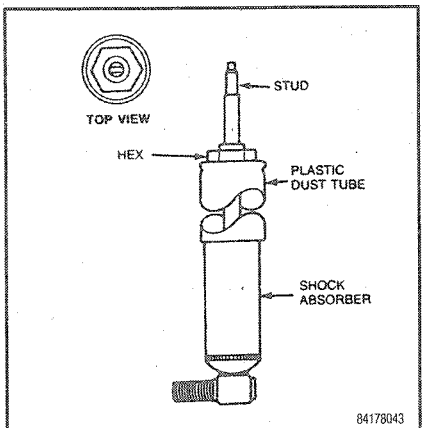


Fig. 84 Rear shock absorber—except with automatic leveling suspension

3. To assist in removing the upper attachment on shock absorbers using a plastic dust tube, place and open end wrench onto the hex stamped into the metal cap of the dust tube. For shock absorbers with a steel dust tube, simply grasp the tube to prevent stud rotation when loosening the retaining nut.
4. Remove the shock absorber retaining nut, washer, and insulator from the stud on the upper side of the frame. Discard the nut. Compress the shock to clear the hole in the frame and remove the inner insulator and washer from the upper retaining stud.
5. Remove the self-locking retaining nut and disconnect the shock absorber lower stud from the mounting bracket on the rear axle.

To install:

6. Prime the new shock absorber as follows:
   a. With the shock absorber right side up (as installed in the vehicle), extend it fully.
   b. Turn the shock upside down and fully compress it.
   c. Repeat the previous 2 steps at least 3 times to make sure any trapped air has been expelled.
7. Place the inner washer and insulator on the upper retaining stud and position the shock absorber with the stud through the hole in the frame.
8. While holding the shock absorber in position, install the outer insulator, washer, and a new stud nut on the upper side of the frame. Tighten the nut to 25 ft. lbs. (34 Nm).
9. Extend the shock absorber and place the lower stud in the mounting bracket hole on the rear axle housing. Install a new self-locking nut and tighten to 56–76 ft. lbs. (77–103 Nm).
10. Lower the vehicle and, if equipped, turn the air suspension switch **ON**.

With Automatic Leveling

◗ See Figures 85, 86 and 87

⁂ WARNING

When removing and installing rear air shock absorbers, it is very important that this procedure be followed exactly. Failure to do so may result in damaged shock absorbers.

1. Make sure the ignition switch is in the **OFF** position.
2. Disconnect the height sensor connector link before allowing the rear axle to hang free.
3. Raise and safely support the vehicle so the suspension arms hang free. The rear shock absorbers will vent air through the compressor and a hissing noise will be heard. When the noise stops, the air lines can be disconnected. A residual pressure of 8–24 psi will remain in the air lines.
4. Disconnect the air line by pushing in on the retainer ring(s) and pulling the line(s) out.
5. Remove the top retaining nut, washer, and bushing.
6. Remove the bottom retaining nut and washer. Remove the shock absorber.

To install:

7. Position the shock absorber and install the bottom retaining washer and nut. Tighten to 52–85 ft. lbs. (70–115 Nm).

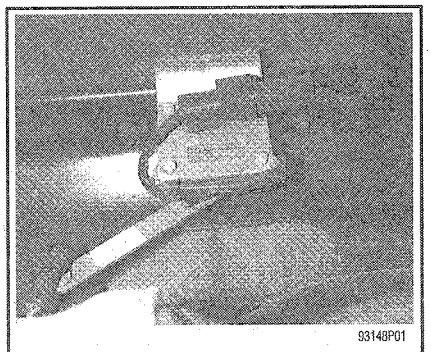


Fig. 85 This is the height sensor for air adjustable rear shocks

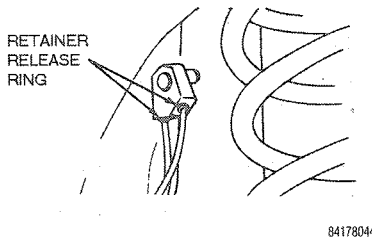


Fig. 86 Disconnect/connect the air lines here

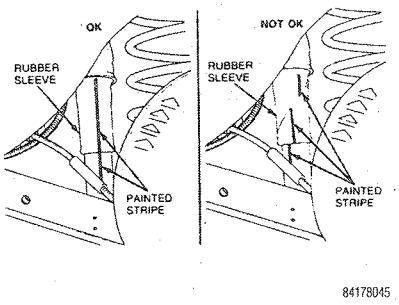


Fig. 87 Make sure the rubber sleeve on the air shock absorber is not wrapped up

8. Install the top bushing, washer, and retaining nut. Tighten to 14–26 ft. lbs. (19–35 Nm).

➨Check the rubber sleeve on the shock absorber to be sure it is not wrapped up. To assist in identifying wrap-up during installation, a white stripe is on the rubber sleeve and on the shock absorber body. The stripes should align. To correct a wrap-up condition, loosen the upper shock retaining nut and turn the shock to align the stripes. Retighten the retaining nut.

9. Connect the air line to the shock absorber by pushing in on the retainer ring and installing the air line.

10. Connect the height sensor connecting link and lower the vehicle.

TESTING

Except Air Shock Absorbers

1. Remove the shock absorber from the vehicle.
2. Extend the shock absorber fully while it is right side up, as installed in the vehicle. Then turn it upside down and fully compress it. Repeat this procedure at least 3 times to make sure any trapped air has been expelled.
3. Place the shock absorber right side up in a vise and hand stroke the shock absorber. Check the shock absorber insulators for damage and wear.
4. If the shock absorber is properly primed, in its installed position, and there is a lag or a skip occurring near mid-stroke of the shaft reverse travel direction, the shock absorber must be replaced.
5. Replace the shock absorber if there is any seizing during the shaft full travel, except at either end of the travel.
6. Replace the shock absorber if upon the shaft fast, reverse stroke, there is any noise encountered other than a faint swish, such as a clicking sound.
7. If there are excessive fluid leaks, and the shock absorber action remains erratic after purging air, replace the shock absorber.

Control Arms

REMOVAL & INSTALLATION

Upper Control Arm

➨If one upper control arm requires replacement, also replace the upper control arm on the other side of the vehicle. If both upper arms are to be replaced, remove and install one at a time to prevent the axle from rolling or slipping sideways. If both upper control arms and both lower control arms are to be removed at the same time, remove both coil or air springs, as detailed in this Section.

1. If equipped, turn the air suspension switch **OFF**.
2. Raise the vehicle and support the frame side rails with jack stands.
3. Support the rear axle under the differential pinion nose as wheel as under the axle.
4. Unsnap the parking brake cable from the upper arm retainer. If equipped, disconnect the height sensor from the ball stud on the left upper control arm.
5. Remove and discard the nut and bolt retaining the upper arm to the axle housing. Disconnect the arm from the housing.
6. Remove and discard the nut and bolt retaining the upper arm to the frame bracket and remove the arm.

To install:

7. Hold the upper arm in place on the front arm bracket and install a new retaining bolt and self-locking nut. Do not tighten at this time.
8. Secure the upper arm to the axle housing with new retaining bolts and nuts. The bolts must be pointed toward the front of the vehicle.
9. Raise the suspension with a jack until the upper arm rear pivot hole is in position with the hole in the axle bushing. Install a new pivot bolt and nut with the nut facing inboard.
10. Tighten the upper arm-to-axle pivot bolts to 103–132 ft. lbs. (140–180 Nm) and upper arm-to-frame pivot bolts to 119–149 ft. lbs. (162–203 Nm).
11. Snap the parking brake cable into the upper arm retainer. Connect the height sensor to the ball stud on the left upper arm, if equipped.
12. Remove the supports from the frame and axle and lower the vehicle. If equipped, turn the air suspension switch **ON**.

Lower Control Arm

➨If one lower control arm requires replacement, also replace the lower control arm on the other side of the vehicle. If both upper control arms and both lower control arms are to be removed at the same time, remove both coil or air springs, as detailed in this Section.

1. If equipped, turn the air suspension switch **OFF**.
2. Mark the rear shock absorber tube relative to the protective sleeve with the vehicle in the normal ride height position.
3. Raise the vehicle and support the frame side rails with jack stands. Allow the axle housing to hang with the shock absorbers fully extended to relieve spring pressure.
4. Remove the stabilizer bar, if equipped.
5. Support the axle with jack stands under the differential pinion nose as well as under the axle.
6. Remove and discard the lower arm pivot bolts and nuts and remove the lower arm.

To install:

7. Position the lower arm to the frame bracket and axle. Install new bolts and nuts with the nuts facing outboard.
8. Raise the axle to the normal ride height position, compressing the shock absorbers to the marks made during the removal procedure. Tighten the lower arm-to-axle pivot bolt to 103–132 ft. lbs. (140–180 Nm) and lower arm-to-frame pivot bolt to 119–149 ft. lbs. (162–203 Nm).
9. Install the stabilizer bar, if equipped.
10. Remove the jack stands and lower the vehicle. If equipped, turn the air suspension switch **ON**.

Stabilizer Bar

REMOVAL & INSTALLATION

1. If equipped, turn the air suspension switch **OFF**.
2. Raise the vehicle and support the frame side rails with jack stands. Allow the axle housing to hang with the shock absorbers fully extended.
3. On 1988–91 vehicles, remove the bolts, nuts and spacers retaining the stabilizer bar to the lower control arms and remove the stabilizer bar. Discard the bolts and nuts.
4. On 1992–99 vehicles, disconnect the stabilizer bar arms from the links. Remove the bolts and brackets retaining the stabilizer bar to the rear axle and remove the stabilizer bar.

To install:

5. On 1988–91 vehicles, align the 4 holes in the stabilizer bar with the holes in the lower control arms. Install the color coded end of the bar on the right side of the vehicle. Install 4 new bolts and nuts and the existing spacers. Tighten to 70–92 ft. lbs. (95–125 Nm).
6. On 1992–99 vehicles, install 2 brackets onto the stabilizer bar insulators and hook both brackets into the T-slot of the rear axle bracket. Install the retaining bolts and tighten to 16–21 ft. lbs. (21–29 Nm). Connect the stabilizer bar eyes to the links using insulators, nuts and washers. Tighten to 13–17 ft. lbs. (17–23 Nm).
7. Remove the jack stands and lower the vehicle. If equipped, turn the air suspension switch **ON**.

STEERING

Steering Wheel

REMOVAL & INSTALLATION

1988–89 Vehicles

1. Disconnect the negative battery cable.
2. Remove the horn pad and cover assembly. Disconnect the horn electrical connector.
3. Disconnect the cruise control switch electrical connector, if equipped.
4. Remove and discard the steering wheel bolt. Remove the steering wheel using a suitable puller.

➨Do not use a knock-off type steering wheel puller or strike the retaining bolt with a hammer. This could cause damage to the steering shaft bearing.

To install:

5. Align the index marks on the steering wheel and shaft and install the steering wheel.
6. Install a new steering wheel retaining bolt and tighten to 30–35 ft. lbs. (41–47 Nm).
7. Connect the cruise control electrical connector, if equipped.
8. Connect the horn electrical connector and install the horn pad and cover.
9. Connect the negative battery cable.

1990–00 Vehicles

See Figures 88 and 89

CAUTION

The air bag system must be disarmed, before working on the system. Failure to do so may result in deployment of the air bag and possible personal injury.

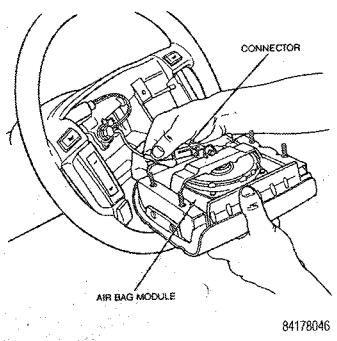


Fig. 88 Removing the air bag module from the steering wheel

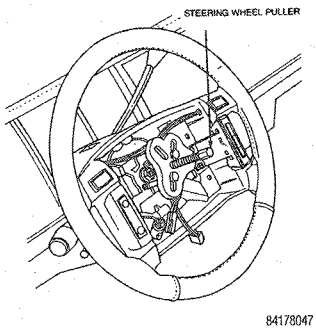


Fig. 89 Removing the steering wheel using a puller

1. Center the front wheels in the straight-ahead position.
2. Properly disarm the air bag system; see the procedure in Section 6.
3. Remove the 4 air bag module retaining nuts and lift the module off the steering wheel. Disconnect the air bag wire harness from the air bag module and remove the module from the steering wheel.

CAUTION

When carrying a live air bag, make sure the bag and trim cover are pointed away from the body. In the unlikely event of an accidental deployment, the bag will then deploy with minimal chance of injury. When placing a live air bag on a bench or other surface, always face the bag and trim cover up, away from the surface. This will reduce the motion of the module if it is accidentally deployed.

4. Disconnect the cruise control wire harness from the steering wheel, if equipped.
5. Remove and discard the steering wheel bolt. Remove the steering wheel using a suitable puller. Route the contact assembly wire harness through the steering wheel as the wheel is lifted off the shaft.

⇨Do not use a knock-off type steering wheel puller or strike the retaining bolt with a hammer. This could cause damage to the steering shaft bearing.

To install:

6. Make sure the front wheels are in the straight-ahead position.
7. Route the contact assembly wire harness through the steering wheel opening at the 3 o'clock position and install the steering wheel on the steering shaft. The steering wheel and shaft alignment marks should be aligned. Make sure the air bag contact wire is not pinched.
8. Install a new steering wheel retaining bolt and tighten to 23–33 ft. lbs. (31–45 Nm).
9. Connect the cruise control wire harness to the wheel and snap the connector assembly into the steering wheel clip. Make sure the wiring is not trapped between the steering wheel and contact assembly.
10. Connect the air bag wire harness to the air bag module and install the module to the steering wheel. Tighten the module retaining nuts to 24–32 inch lbs. (2.7–3.7 Nm).
11. Enable the air bag system according to the procedure in Section 6.

Multi-Function/Combination Switch

The combination switch incorporates the turn signal, dimmer and windshield wiper switch functions on 1990–99 vehicles. The combination switch incorporates only the turn signal and dimmer function on 1988–89 vehicles. For windshield wiper switch removal and installation on 1988 –89 vehicles, refer to the procedure in this Section.

REMOVAL & INSTALLATION

1988–89 Vehicles

See Figure 90

1. Disconnect the negative battery cable.
2. Remove the switch lever by grasping and pulling straight out.
3. Remove the steering column cover retaining screws and remove the cover.
4. Remove the shroud retaining screws and remove the shroud.
5. With the wiring connectors exposed, carefully lift the connector retainer tabs and disconnect the connectors.
6. Remove the switch retaining screws and lift up the switch assembly.
7. Installation is the reverse of the removal procedure.

1990–00 Vehicles

See Figures 91, 92, 93 and 94

1. Disconnect the negative battery cable.
2. If equipped with tilt column, move to the lowest position and remove the tilt lever.

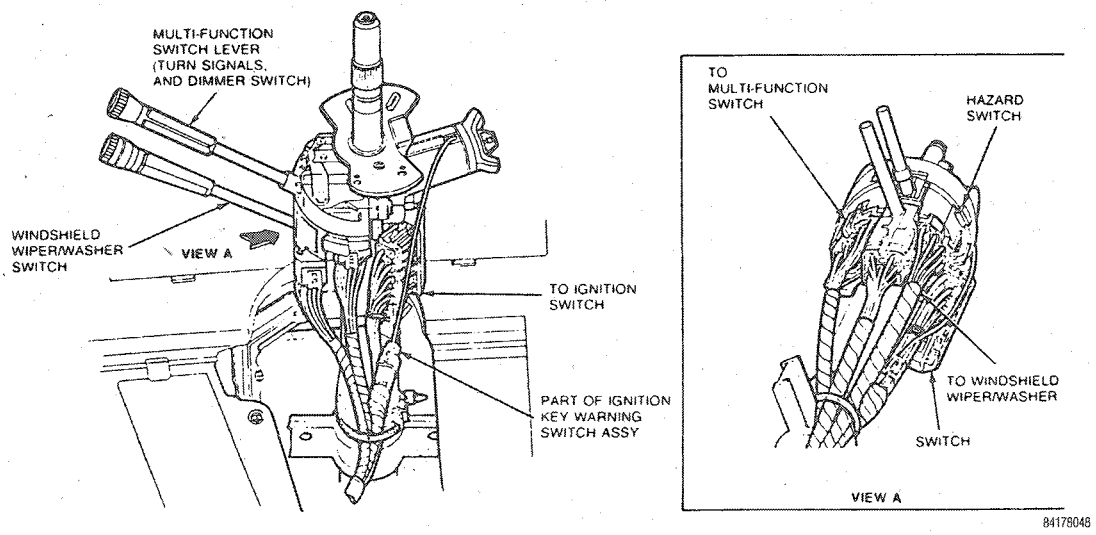


Fig. 90 Combination switch and windshield wiper switch locations—1988 vehicles

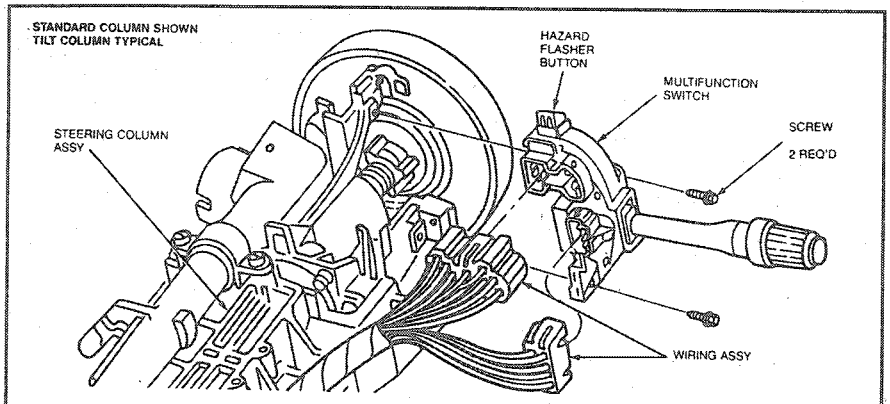


Fig. 91 Combination switch—1990–93 vehicles

3. Remove the ignition lock cylinder; refer to the procedure in this Section.
4. Remove the shroud screws and remove the upper and lower shrouds.
5. Remove the 2 self-tapping screws attaching the combination switch to the steering column casting and remove the switch.
6. Remove the wiring harness retainer and disconnect the 2 electrical connectors.

To install:

7. Installation is the reverse of the removal procedure.

Windshield Wiper Switch

REMOVAL & INSTALLATION

1988–89 Vehicles

1. Disconnect the negative battery cable.
2. Remove the split steering column cover retaining screws.
3. Separate the halves and remove the wiper switch retaining screws.
4. Disconnect the electrical connector and remove the wiper switch.
5. The installation of the wiper switch is the reverse of the removal procedure.

Ignition Switch

REMOVAL & INSTALLATION

See Figures 95 thru 105

1. Disconnect the negative battery cable.
2. On 1988–89 vehicles with tilt column, remove the upper extension shroud by unsnapping the shroud from the retaining clip at the 9 o'clock position.
3. Remove the steering column shroud by removing the attaching screws. On 1990–99 vehicles, remove the tilt lever, if equipped.
4. On 1990–99 vehicles, remove the instrument panel lower steering column cover.
5. Disconnect the electrical connector from the ignition switch.
6. Rotate the ignition key lock cylinder to the **RUN** position.
7. Remove the 2 screws attaching the ignition switch.
8. Disengage the ignition switch from the actuator pin and remove the switch.

To install:

9. Adjust the new ignition switch by sliding the carrier to the **RUN** position.

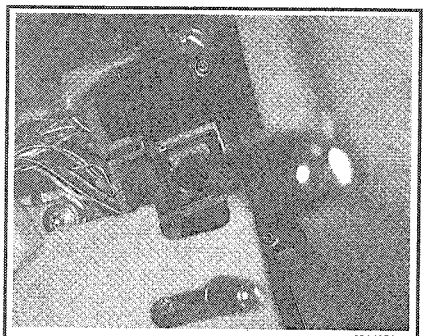

93146P04

Fig. 92 After removing the upper shroud, you can see where the multi-function switch mounts

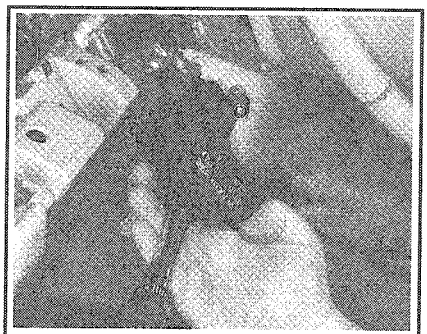

93146P03

Fig. 93 Removing the Torx® head screws will disengage the switch from the steering column

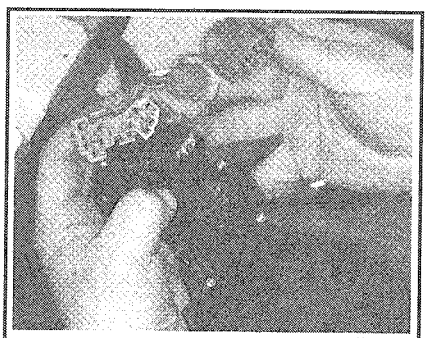

93146P02

Fig. 94 There are two plugs to unplug to replace the switch

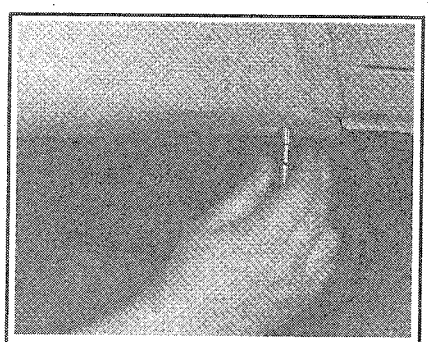

93146P20

Fig. 95 Remove the lower dash panel (knee brace)

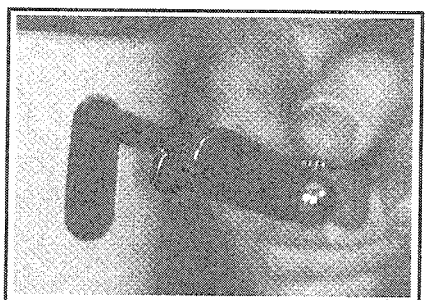

93146P32

Fig. 96 Remove the tilt lever by using a small open-end wrench on the flats to turn it. Then remove the lower steering column shroud

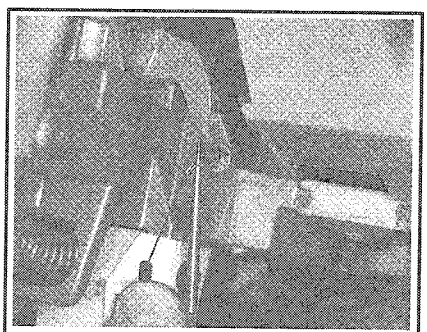

93146P22

Fig. 97 Using a small pointed tool, a seal pick works just fine, disengage the loop for the PRNDL indicator from the stud

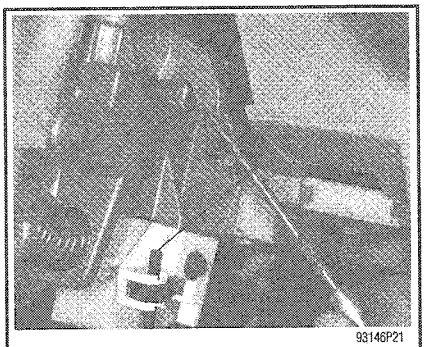

93146P21

Fig. 98 Just insert the pick into the loop and allow the wire to slid down the pick

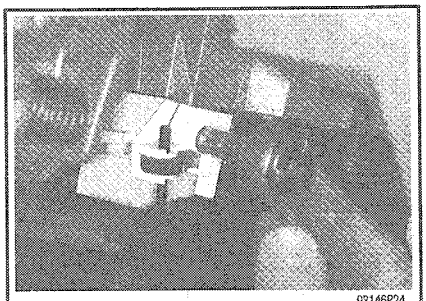

93146P24

Fig. 99 Unscrew the one retaining screw from the adjuster, although there is no reason to completely remove it from the adjusting block

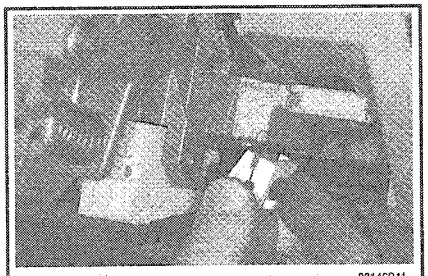

93146P41

Fig. 100 Pull it away from the column and allow it to hang out of the way. Do not allow the thumbscrew to turn and no adjustments to the PRNDL indicator should be needed on installation

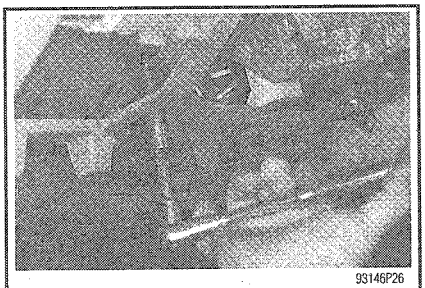

93146P26

Fig. 101 Unscrew the four nuts holding the steering column up in place. It is not necessary to totally remove all of them from the mounting studs. Just drop the column enough for working clearance


93146P39

Fig. 102 Using a small ratchet set, unbolt the electrical connector from the left side of the steering column

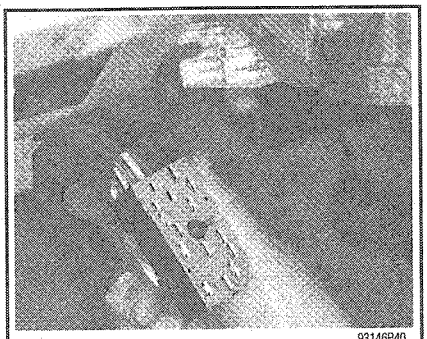

93146P40

Fig. 103 Pull gently on the connector to disengage all the terminals from the harness connector

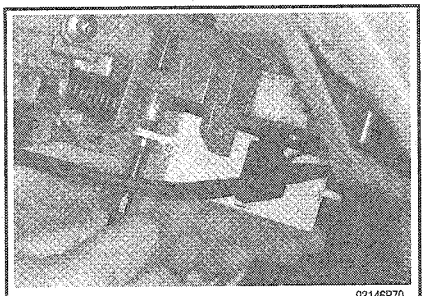

93146P70

Fig. 104 This is the right side of the steering column. It houses the ignition switch. You will need a Torx ®driver to remove the screws holding the ignition switch in place


93146P71

Fig. 105 When removing the ignition switch, remember that the locator pin is in the RUNposition. Be sure to install the new one in the same position

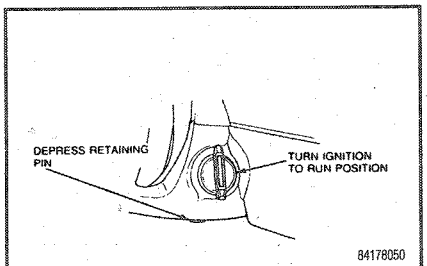


Fig. 106 Lock cylinder removal—vehicles with functional locks

10. Check to ensure that the ignition key lock cylinder is in the **RUN** position. The **RUN** position is achieved by rotating the key lock cylinder approximately 90 degrees from the **LOCK** position.
11. Install the ignition switch onto the actuator pin.
12. Align the switch mounting holes and install the attaching screws. Tighten the screws to 50–69 inch lbs. (5.6–7.9 Nm).
13. Connect the electrical connector to the ignition switch.
14. Connect the negative battery cable. Check the ignition switch for proper function in **START** and **ACC** positions. Make sure the column is locked in the **LOCK** position.
15. Install the remaining components in the reverse order of removal.

Ignition Lock Cylinder

REMOVAL & INSTALLATION

Functional Lock

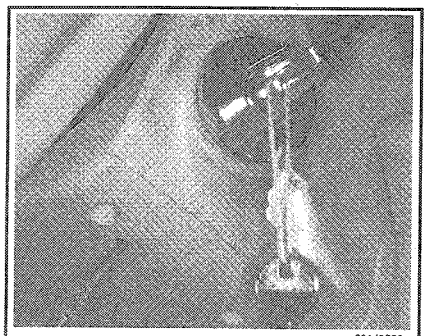
See Figures 106, 107 and 108

The following procedure is for vehicles with functioning lock cylinders. Ignition keys are available for these vehicles or the ignition key numbers are known and the proper key can be made.

1. Disconnect the negative battery cable. If equipped, properly disarm the air bag system; refer to Section 6.
2. On 1988 vehicles, remove the trim shroud halves by removing the attaching screws. Remove the electrical connector from the key warning switch.
3. Turn the ignition to the **RUN** position.
4. Place a ⅛ in. diameter wire pin or small drift punch in the hole in the casting surrounding the lock cylinder and depress the retaining pin while pulling out on the lock cylinder to remove it from the column housing.

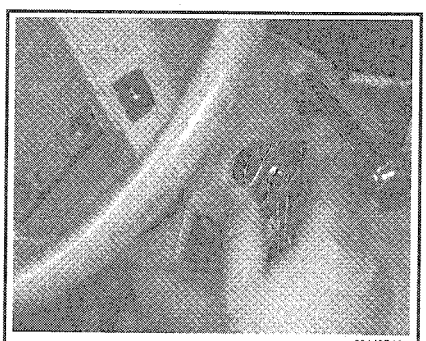
To install:

5. To install the lock cylinder, turn it to the **RUN** position and depress the retaining pin. Insert



93148P39

Fig. 107 Move the key to the RUN position, insert a probe or small diameter tool into the access hole to depress the button



93148P41

Fig. 108 Once the button is depressed, you can pull the lock switch out of the steering column housing

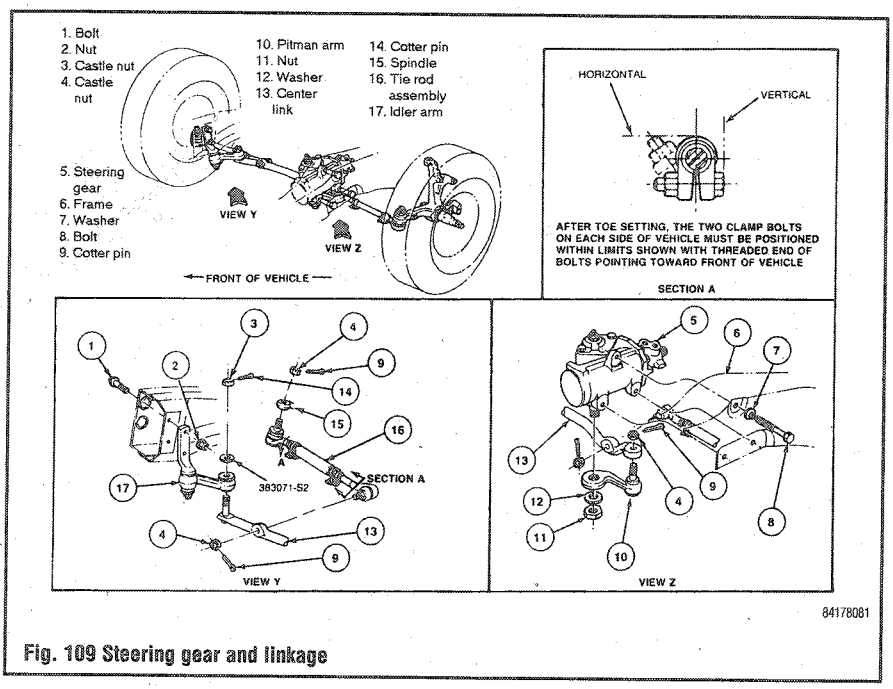


Fig. 109 Steering gear and linkage

the lock cylinder into its housing in the lock cylinder casting.

6. Make sure the cylinder is fully seated and aligned in the interlocking washer before turning the key to the **OFF** position. This action will permit the cylinder retaining pin to extend into the hole in the lock cylinder housing.

7. Using the ignition key, rotate the cylinder to ensure the correct mechanical operation in all positions.

8. Check for proper start in **P** or **N**. Also make sure the start circuit cannot be actuated in **D** or **R** positions and that the column is locked in the **LOCK** position.

9. Connect the key warning buzzer electrical connector and install the trim shrouds, if required.

Non-Functional Lock

The following procedure is for vehicles with non-functioning locks. On these vehicles, the lock cylinder cannot be rotated due to a lost or broken key, the key number is not known, or the lock cylinder cap is damaged and/or broken, preventing the lock cylinder from rotating.

1. Disconnect the negative battery cable. If equipped, properly disarm the air bag system; refer to Section 6.

2. Remove the steering wheel; refer to the procedure in this Section.

3. On 1988–89 vehicles, remove the trim shroud halves by removing the attaching screws. Remove the electrical connector from the key warning switch.

4. On 1988–90 vehicles, drill out the retaining pin using a ⅛ in. diameter drill, being careful not to drill deeper than ½ in. Position a chisel at the base of the ignition lock cylinder. Strike the chisel with sharp blows, using a hammer, to break the cap away from the lock cylinder.

5. On 1991–99 vehicles, use channel lock or vise grip type pliers to twist the lock cylinder cap until it separates from the lock cylinder.

6. Drill approximately 1¾ in. into the middle of the ignition key slot, using a ⅜ in. diameter drill bit. Drill until the lock cylinder breaks loose from the breakaway base of the lock cylinder. Remove the lock cylinder and drill shavings from the lock cylinder housing.

7. Remove the snapring or retainer, washer, and steering column lock gear. Thoroughly clean all drill shavings and other foreign materials from the casting.

8. Inspect the lock cylinder housing for damage and replace, as necessary.

To install:

9. Install the ignition lock cylinder and check for smooth operation.

10. Connect the electrical connector to the key warning switch and install the trim shrouds, if necessary.

11. Install the steering wheel and connect the negative battery cable.

Steering Linkage

See Figure 109

REMOVAL & INSTALLATION

Pitman Arm

See Figures 110 thru 116

1. Position the front wheels in the straight-ahead position.

2. Raise and safely support the vehicle.

3. Remove and discard the cotter pin from the castellated nut that attaches the center link to the pitman arm. Remove the castellated nut.

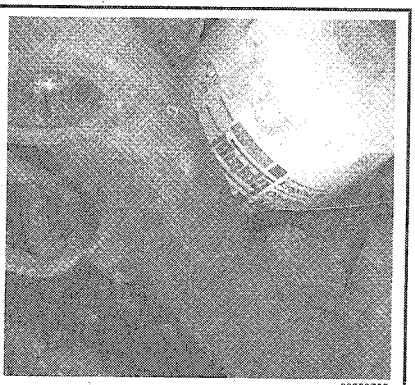
4. Disconnect the center link from the pitman arm using removal tool 3290–D or equivalent.

5. Remove the pitman arm retaining nut and lockwasher

6. Make sure the front wheel are in the straight-ahead position. Remove the pitman arm from the steering gear sector shaft using pitman arm puller T64P–3590–F or equivalent.

89608P35

Fig. 110 Remove and discard the cotter pin from the castellated nut that attaches the center link to the pitman arm



89608P36

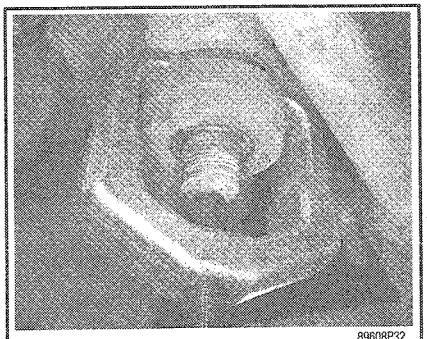
Fig. 111 Remove the castellated nut

89608P30

Fig. 112 A large deepwell socket, typically 1 5/16 in., is needed to remove the pitman arm retaining nut

89608P31

Fig. 113 Remove the pitman arm retaining nut and lockwasher



89608P32

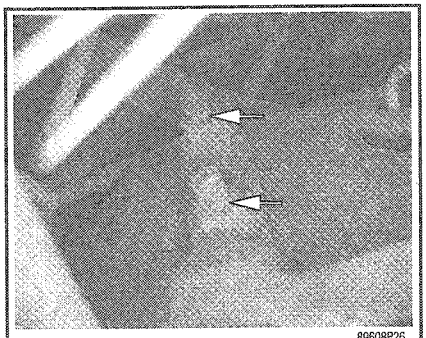
Fig. 114 Install a suitable pitman arm puller onto the pitman arm

89608P33

Fig. 115 Carefully tighten the puller's forcing screw until the pitman arm breaks loose

89608P34

Fig. 116 Remove the pitman arm from the steering gear sector shaft



89608P26

Fig. 117 Remove the bolts and nuts holding the idler arm to the frame

To install:

7. With the front wheels in the straight-ahead position, place the pitman arm, pointing it rearward, on the sector shaft. Align the blind tooth on the pitman arm with the blind tooth on the steering gear sector shaft.
8. Install the nut and lockwasher and tighten to 233–250 ft. lbs. (316–338 Nm).
9. Install the center link on the pitman arm and install the castellated nut. Tighten the nut to 43–47 ft. lbs. (59–63 Nm) and install a new cotter pin.

➡If, after the nut has been torqued, the nut castellations and stud hole do not align for cotter pin installation, tighten the nut further until the cotter pin can be installed. Never back off the nut.

10. Lower the vehicle.

Idler Arm

◗ See Figure 117

1. Raise and safely support the vehicle.
2. Remove the cotter pin, nut, and washer retaining the center link to the idler arm. Discard the cotter pin.
3. Remove the center link from the idler arm.
4. Remove the bolts and nuts holding the idler arm to the frame and remove the idler arm.

To install:

5. Install the idler arm to the frame with the bolts and nuts. Tighten to 85–97 ft. lbs. (115–132 Nm).
6. Place the idler arm and front wheels in the straight-ahead position to maintain steering wheel alignment and prevent bushing damage.
7. Install the center link nut and washer and tighten to 43–47 ft. lbs. (59–63 Nm). Install a new cotter pin.

➡If, after the nut has been torqued, the nut castellations and stud hole do not align for cotter pin installation, tighten the nut further until the cotter pin can be installed. Never back off the nut.

8. Lower the vehicle.

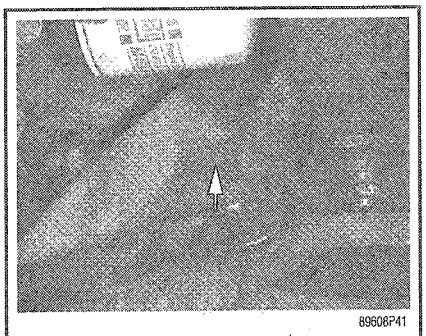
Center Link

◗ See Figure 118

1. Raise and safely support the vehicle.
2. Remove the cotter pins and nuts that attach the inner tie rod ends to the center link. Discard the cotter pins.
3. Disconnect the inner tie rod ends from the center link using removal tool 3290–D or equivalent.
4. Remove the cotter pin and nut that retains the pitman arm to the center link. Disconnect the pitman arm from the center link using removal tool 3290–D or equivalent.
5. Remove the cotter pin and nut retaining the idler arm to the center link and remove the center link. Discard the cotter pin.

To install:

6. Position the center link to the pitman arm and idler arm and loosely install the nuts. Place the idler arm and front wheels in the straight-ahead position to maintain steering wheel alignment and prevent bushing damage. Tighten the nuts to 43–47 ft. lbs. (59–63 Nm) and install new cotter pins.



89608P41

Fig. 118 Remove the cotter pins and nuts that attach the inner tie rod ends to the center link

➡If, after the nut has been torqued, the nut castellations and stud hole do not align for cotter pin installation, tighten the nut further until the cotter pin can be installed. Never back off the nut.

7. Install the tie rode ends on the center link and tighten the nuts to 43–47 ft. lbs. (59–63 Nm). Install new cotter pins.
8. Lower the vehicle.
9. Check the toe and adjust, if necessary.

Tie Rod Ends

See Figures 119 thru 125

1. Raise and support the vehicle safely.
2. Remove the cotter pin and nut from the tie rod end ball stud.
3. Loosen the tie rod adjusting sleeve clamp bolts and remove the rod end from the spindle arm or center link, using removal tool 3290–D or equivalent.
4. Remove the tie rod end from the sleeve, counting the exact number of turns required doing so. Discard all parts removed from the sleeve.

To install:

5. Install the new tie rod end into the sleeve, using the exact number of turns it took to remove the old one. Install the tie rod end ball stud into the spindle arm or center link.
6. Install the stud nut. Tighten to 43–47 ft. lbs. (59–63 Nm) and install a new cotter pin.

⇒If, after the nut has been torqued, the nut castellations and stud hole do not align for cotter pin installation, tighten the nut further until the cotter pin can be installed. Never back off the nut.

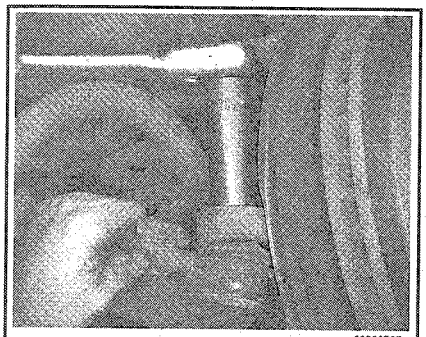
7. Check the toe and adjust if necessary. Loosen the clamps from the sleeve and oil the sleeve, clamps, bolts, and nuts. Position the adjusting sleeve clamps as shown in the figure, then tighten the clamp nuts to 20–22 ft. lbs. (27–29 Nm).

Power Steering Gear

REMOVAL & INSTALLATION

See Figure 126

1. Disconnect the negative battery cable.
2. Remove the stone shield.
3. Tag the pressure and return lines so they may be reassembled in their original positions.
4. Disconnect the pressure and return lines from the steering gear. Plug the lines and ports in the gear to prevent the entry of dirt.
5. Remove the clamp bolts retaining the flexible coupling to the steering gear.
6. Raise and safely support the vehicle.

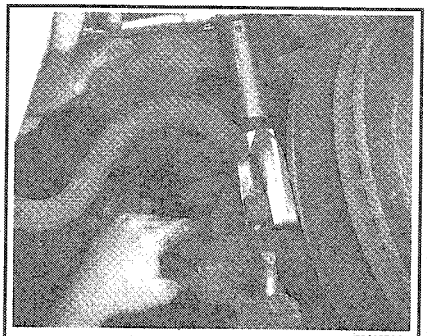


89608P37

Fig. 119 Remove the tie rod end-to-steering knuckle retaining nut

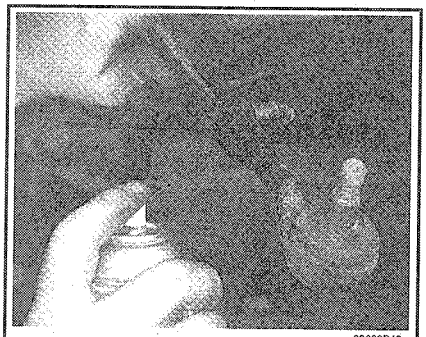
89608P38

Fig. 120 A special removal tool like this one from Lisle® can be used to remove the tie rod end from the knuckle. Just install the tool on the tie rod end and tighten the forcing screw to . . .



89608P39

Fig. 121 . . . remove the tie rod end from the knuckle

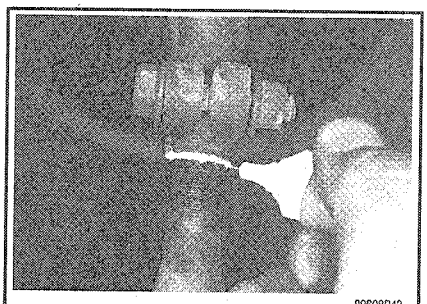


89608P40

Fig. 122 Spraying a quality rust penetrant onto the tie rod adjusting sleeve is a good idea before attempting to remove it

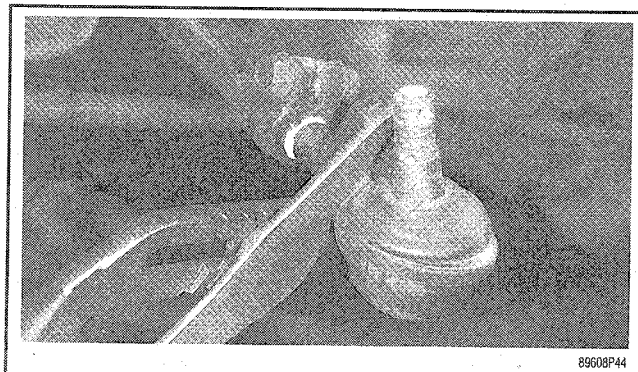
89608P42

Fig. 123 Loosen the adjusting sleeve bolt



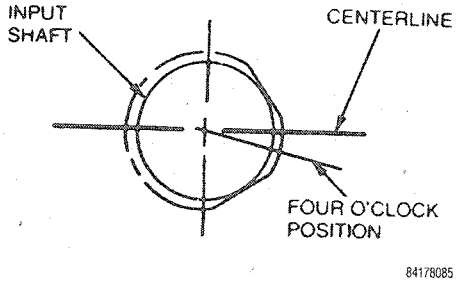
89608P43

Fig. 124 Mark the tie rod end before removal to ensure reinstallation as close as possible to the previous alignment position



89608P44

Fig. 125 Grasp the tie rod end with a pair of pliers or other suitable tool and slowly turn it out of the adjusting sleeve to remove it



84178085

Fig. 126 During installation, position the steering gear input shaft as shown on 1992–00 vehicles

7. Remove the nut from the sector shaft.
8. Remove the pitman arm from the sector shaft with pitman arm removal tool T64P–3590–F or equivalent. Remove the tool from the pitman arm.

⁂ WARNING

Do not damage the seals and/or gear housing. Do not use a non-approved tool such as a pickle fork.

9. Support the steering gear and remove the steering gear retaining bolts.
10. Work the gear free of the flex coupling and remove the gear.
11. If the flex coupling did not come off with the gear, lift it off the shaft.

To install:

12. Turn the steering wheel to the straight-ahead position.
13. Center the steering gear input shaft with the indexing flat facing downward on 1989–91 vehicles. On 1992–98 vehicles, center the steering gear input shaft with the centerline of the 2 indexing flats at 4 o'clock.
14. Slide the steering gear input shaft into the flex coupling and into place on the frame side rail. Install the retaining bolts and tighten to 50–65 ft. lbs. (68–88 Nm).
15. Make sure the wheels are in the straight-ahead position. Install the pitman arm on the sector shaft and install the lockwasher and nut. Tighten the nut to 233–250 ft. lbs. (316–338 Nm).
16. Move the flex coupling into place on the steering gear input shaft. Install the retaining bolt and tighten to 20–30 ft. lbs. (27–41 Nm).
17. Connect the pressure and return lines to the steering gear and tighten the lines. Fill the reservoir and turn the steering wheel from stop-to-stop to distribute the fluid. Check the fluid level and add fluid, if necessary.
18. Start the engine and turn the steering wheel from left to right.
19. Check for leaks.
20. Install the stone shield.

Power Steering Pump

REMOVAL & INSTALLATION

See Figures 127 and 128

1. Disconnect the negative battery cable.
2. Disconnect the fluid return hose at the pump and drain the fluid into a container.
3. Remove the pressure hose from the pump and, if necessary, drain the fluid into a container. Do not remove the fitting from the pump.
4. Disconnect the belt from the pulley. On 5.0L engines, use pulley removal tool T69L–10300–B or equivalent, to remove the pulley.
5. Remove the mounting bolts and remove the pump.

To install:

6. On 5.0L engines, place the pump on the mounting bracket and install the bolts at the front of the pump. Tighten to 30–45 ft. lbs. (40–62 Nm).
7. On 4.6L engines, place the pump on the mounting bosses of the engine block and install the bolts at the side of the pump. Tighten to 15–22 ft. lbs. (20–30 Nm).

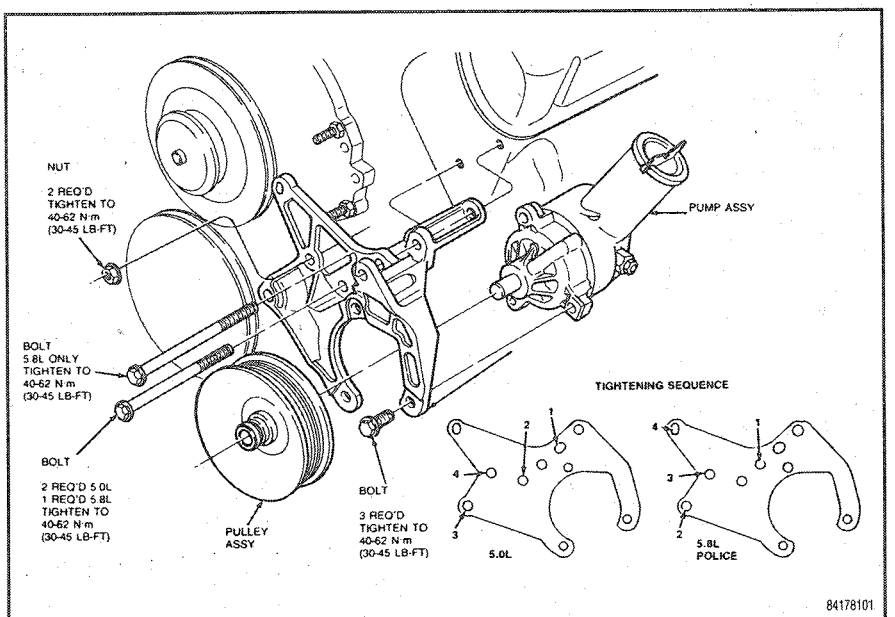


Fig. 127 Power steering pump—5.0L

8. On 5.0L engines, install the pump pulley using pulley replacer tool T65P–3A733–C or equivalent.
9. Place the belt on the pump pulley and adjust the tension, if necessary.
10. Install the pressure hose to the pump fitting. Tighten the tube nut with a tube nut wrench rather than with an open-end wrench. Tighten to 20–25 ft. lbs. (27–34 Nm) on 1989–91 vehicles or 35–45 ft. lbs. (47–60 Nm) on 1992–98 vehicles.

➨Do not overtighten this fitting. Swivel and/or end play of the fitting is normal and does not indicate a loose fitting. Over-tightening the tube nut can collapse the tube nut wall, resulting in a leak and requiring replacement of the entire pressure hose assembly. Use of an open-end wrench to tighten the nut can deform the tube nut hex, which may result in improper torque and may make further servicing of the system difficult.

11. Connect the return hose to the pump and tighten the clamp.
12. Fill the reservoir with the proper type and quantity of fluid.
13. Bleed the air from the system.

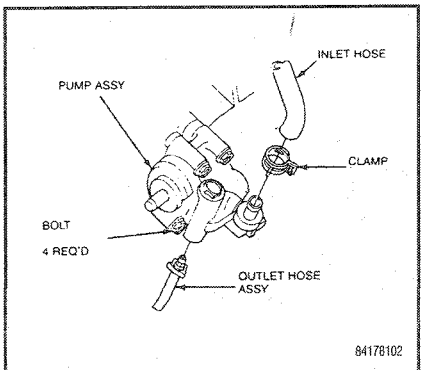


Fig. 128 Power steering pump—4.6L engine

BLEEDING

1. Disconnect the ignition coil.
2. Raise and safely support the vehicle so the front wheels are off the floor.
3. Fill the power steering fluid reservoir.
4. Crank the engine with the starter and add fluid until the level remains constant.
5. While cranking the engine, rotate the steering wheel from lock-to-lock.

➨The front wheels must be off the floor during lock-to-lock rotation of the steering wheel.

6. Check the fluid level and add fluid, if necessary.
7. Connect the ignition coil wire. Start the engine and allow it to run for several minutes.
8. Rotate the steering wheel from lock-to-lock.
9. Shut off the engine and check the fluid level. Add fluid, if necessary.
10. If air is still present in the system, purge the system of air using power steering pump air evacuator tool 021–00014 or equivalent, as follows:
    a. Make sure the power steering pump reservoir is full to the COLD FULL mark on the dipstick or to just above the minimum indication on the reservoir.
    b. Tightly insert the rubber stopper of the air evacuator assembly into the pump reservoir fill neck.
    c. Apply 15 in. Hg maximum vacuum on the pump reservoir for a minimum of 3 minutes with the engine idling. As air purges from the system, vacuum will fall off. Maintain adequate vacuum with the vacuum source.
    d. Release the vacuum and remove the vacuum source. Fill the reservoir to the COLD FULL mark or to just above the minimum indication on the reservoir.
    e. With the engine idling, apply 15 in. Hg vacuum to the pump reservoir. Slowly cycle the steering wheel from lock-to-lock every 30 seconds for approximately 5 minutes. Do not hold the steering wheel on the stops while cycling.

Maintain adequate vacuum with the vacuum source as the air purges.

f. Release the vacuum and remove the vacuum source. Add fluid, if necessary.

g. Start the engine and cycle the steering wheel.

h. Check for oil leaks at all connections.

11. In severe cases of aeration, it may be necessary to repeat the purging procedure.

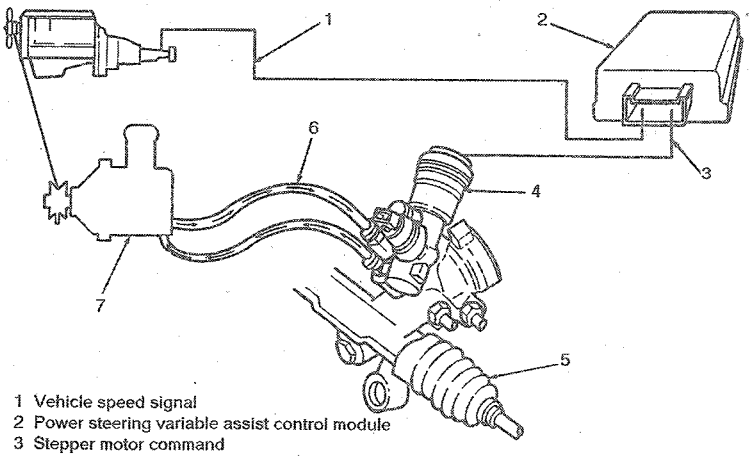
Power Rack and Pinion Steering Gear

REMOVAL & INSTALLATION

See Figures 129 thru 135

The Variable Assist Power Steering (VAPS) system used on these vehicles consists of a microprocessor based module, a power rack and pinion steering gear, an actuator valve assembly, hose assemblies and a high efficiency power steering pump.

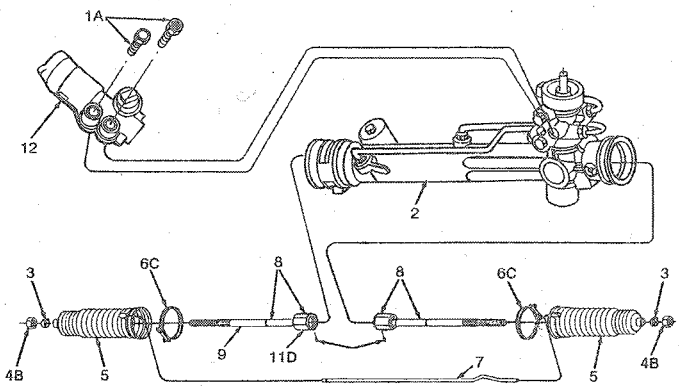
1. Disconnect the negative battery cable.
2. From inside the vehicle, remove the nuts securing the steering column tube boot to the cowl panel.
3. Remove the two bolts retaining the steering column gear input shaft coupling to the power steering gear shaft and yoke assembly.
4. Set the steering column tube boot aside. Remove the pinch bolt at the power steering gear shaft and yoke assembly, then remove the steering column gear input shaft coupling.
5. Raise the vehicle and support safely. Remove the front wheel and tire assemblies. Support the vehicle under the rear edge of the subframe with jack stands.
6. Remove the tie rod cotter pins and nuts. Remove the left and right-side tie rod ends from the steering knuckle.
7. Mark the position of the jam nut (to maintain the alignment), then remove the tie rod ends from the spindle tie rod.
8. Remove the nuts from the gear-to-subframe attaching bolts.
9. Remove the rear subframe-to-body attaching bolts.
10. Remove the exhaust pipe-to-catalytic converter attachment.
11. Lower the vehicle carefully until the sub-



1 Vehicle speed signal
2 Power steering variable assist control module
3 Stepper motor command
4 Power steering auxiliary actuator
5 Power steering short rack
6 Power steering pressure hose
7 Power steering pump

86878115

Fig. 129 View of the Variable Assist Power Steering (VAPS) system components



1 Power steering control valve bolt
2 Steering gear housing assy
3 Steering gear boot camp
4 Nut
5 Tie rod bellows
6 Clamp
7 Power steering gear rack tube
8 Front wheel spindle tie rod
9 Spindle rod
10 Roll pin
11 Ball joint housing
12 Power steering auxiliary actuator
A Tighten to 27-34 Nm (20-25 lb.ft.)
B Tighten to 47-68 Nm (35-50 lb.ft.)
C Tighten to 2.2-3.4 Nm (20-30 lb.in.)
D Tighten to 75-88 Nm (55-65 lb.ft.)

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Fig. 130 Exploded view of the Variable Assist Power Steering (VAPS) system

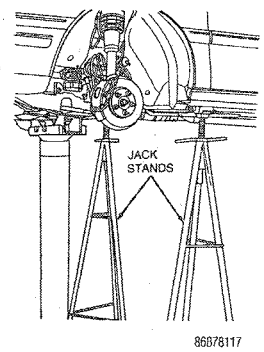

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Fig. 131 Support the vehicle under the rear edge of the subframe with jack stands

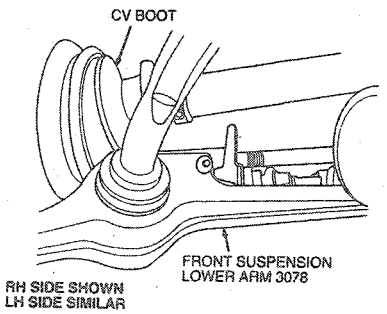

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Fig. 132 Remove the nuts from the gear-to-subframe attaching bolts

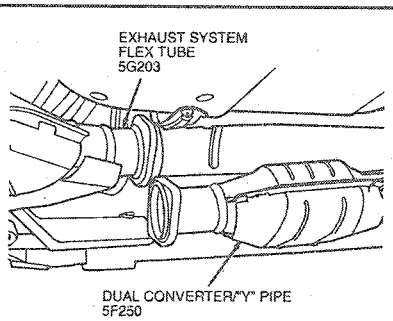

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Fig. 133 Remove the exhaust pipe-to-catalytic converter attachment

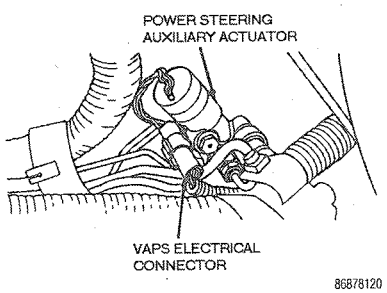

Fig. 134 Disengage the VAPS electrical connectors from the actuator assembly

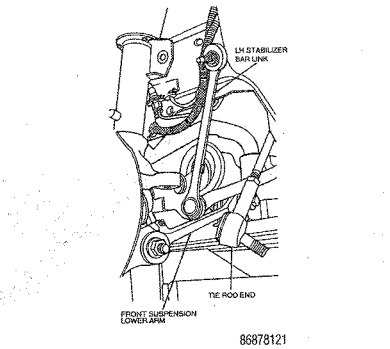

Fig. 135 Remove the left-side sway/stabilizer bar link

frame separates from the body approximately 4 in. (102 mm).

12. Remove the heat shield band, then fold the shield down.
13. Disengage the VAPS electrical connectors from the actuator assembly.
14. Rotate the gear to clear the bolts from the subframe and pull to the left to facilitate line fitting removal.
15. Position a suitable drain pan under the vehicle, then remove the line fittings. Remove the O-rings from the fitting connections, then replace with new ones during installation.
16. Remove the left-hand side sway/stabilizer bar link.
17. Remove the steering gear assembly through the left wheel well.

To install:

18. Install new Teflon® O-rings into the line fittings.
19. Place the gear attachment bolts in the gear housing.
20. Install the steering gear assembly through the left wheel well.
21. Connect and tighten the line fittings to the steering gear assembly.
22. Engage the VAPS electrical connectors.
23. Position the steering gear into the subframe.
24. Install the tie rod ends onto the front wheel spindle tie rod.
25. Install the heat shield band.
26. Attach the tie rod ends onto the knuckle. Install the nuts and secure with new cotter pins.
27. Attach the sway/stabilizer bar link.
28. Raise the vehicle until the subframe contacts the body. Install the rear subframe attaching bolts.
29. Install the gear-to-front subframe nuts, then tighten to 85–100 ft. lbs. (115–135 Nm).
30. Attach the exhaust pipe to the catalytic converter.
31. Install the wheels, then remove the jackstands, and carefully lower the vehicle. Tighten the lug nuts to 85–105 ft. lbs. (115–142 Nm).
32. From inside the vehicle, push the steering column tube boot end out of the vehicle, then install over the steering gear housing.
33. Install the steering column gear input shaft coupling to the power steering gear shaft and yoke assembly. Tighten the bolt to 30–38 ft. lbs. (41–51 Nm).
34. Install the inner steering column tube boot to the cowl panel.
35. Install the input shaft coupling to the steering gear shaft and yoke assembly.
36. Fill the power steering system with Premium Power Steering Fluid E6AZ-19582-AA or equivalent.
37. Bleed the power steering system. For details, please refer to the procedure located later in this section.
38. Connect the negative battery cable, then check the system for leaks and proper operation.
39. If necessary, have the alignment checked by a reputable repair shop.

TORQUE SPECIFICATIONS

Components	English	Metric
Front strut top mount-to-body nut	23-29 ft. lbs.	30-40 Nm
Air bag retaining screws	8-10 ft. lbs.	11-13 Nm
Front tension strut-to-body nut	73-97 ft. lbs.	98-132 Nm
Front stabilizer link-to-bar nuts	35-46 ft. lbs.	47-63 Nm
Front stabilizer link-to-strut nuts	57-75 ft. lbs.	77-103 Nm
Front stabilizer U-bracket	23-29 ft. lbs.	30-40 Nm
Front height sensor service stud	11-14 ft. lbs.	14-20 Nm
Strut-to-knuckle retaining nuts	73-97 ft. lbs.	98-132 Nm
Tension strut-to-subframe	73-97 ft. lbs.	98-132 Nm
Tension strut-to-control arm	73-97 ft. lbs.	98-132 Nm
Control arm-to-knuckle retaining nut	39-53 ft. lbs.	53-72 Nm
Control arm-to-subframe bolts	73-97 ft. lbs.	98-132 Nm
Front strut-to-spindle bolt	73-97 ft. lbs.	98-132 Nm
Front control arm-to-spindle nut	40-52 ft. lbs.	54-71 Nm
Front tension strut-to-spindle nut	73-97 ft. lbs.	98-132 Nm
Tie rod end-to-steering knuckle nut	23-25 ft. lbs.	31-47 Nm
Tie rod end jam nuts	35-50 ft. lbs.	48-68 Nm
Hub nut	170-202 ft. lbs.	230-275 Nm
Rear control arm-to-spindle nuts	45-59 ft. lbs.	60-80 Nm
Rear strut top mount-to-body nut	20-25 ft. lbs.	26-34 Nm
Rear stabilizer link-to-strut nut	62-79 in. lbs.	7-9 Nm
Rear stabilizer U-bracket bolt	27-32 ft. lbs.	36-44 Nm
Rear strut-to-spindle bolt	45-59 ft. lbs.	60-80 Nm
Rear tension strut-to-spindle nut	35-46 ft. lbs.	47-63 Nm
Rear control arm-to-body nut	51-67 ft. lbs.	68-92 Nm
Wheel lug nuts	80-105 ft. lbs.	115-142 Nm
Power rack and pinion		
Rack-to-subframe retaining bolts	85-105 ft. lbs.	115-142 Nm
Power steering hose unions	23 ft. lbs.	31 Nm
Power steering pump		
Pressure hose fitting	25-34 ft. lbs.	34-47 Nm
Pump retaining bolts	30-45 ft. lbs.	40-62 Nm
Intermediate shaft-to-steering gear retaining bolt	30-38 ft. lbs.	41-51 Nm
VAPS actuator-to-rack	20-25 ft. lbs.	27-34 Nm
Steering wheel retaining bolt	37 ft. lbs.	50 Nm
Steering yoke-to-steering gear shaft retaining bolt	15-20 ft. lbs.	20-27 Nm
Subframe bolts	81-110 ft. lbs.	110-150 Nm
Wheel lug nuts	62 ft. lbs.	85 Nm
Inner tie rod-to-rack	55-65 ft. lbs.	75-88 Nm

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