Chapter 9
Brakes

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Specifications

General

Brake fluid type	See Chapter 1

Disc brakes

Brake pad minimum thickness	See Chapter 1
Disc lateral runout limit	0.004 inch
Disc minimum thickness	Cast into disc
Minimum pad lining thickness	See Chapter 1

Drum brakes

Maximum drum diameter	Cast into drum
Shoe lining minimum thickness	See Chapter 1

Torque specifications

	Ft-lbs (unless otherwise indicated)	Nm
Caliper mounting bracket bolts	111	150
Caliper mounting bolts	26	35
Master cylinder mounting nuts	13	17
Power brake booster mounting nuts	17	23
Wheel cylinder mounting bolts	108 in-lbs	12
Wheel lug nuts	See Chapter 1	

1 General information

The vehicles covered by this manual are equipped with hydraulically operated front and rear brake systems. The front brakes are disc type and the rear brakes are either drum or disc type. Both the front and rear brakes are self adjusting. The disc brakes automatically compensate for pad wear, while the drum brakes incorporate an adjustment mechanism which is activated as the parking brake is applied.

Hydraulic system

The hydraulic system consists of two separate circuits. The master cylinder has separate reservoirs for the two circuits, and, in the event of a leak or failure in one hydraulic circuit, the other circuit will remain operative. A dual proportioning valve on the firewall provides brake balance between the front and rear brakes.

Power brake booster

The power brake booster, utilizing engine manifold vacuum and atmospheric pressure to provide assistance to the hydraulically operated brakes, is mounted on the firewall in the engine compartment.

Parking brake

The parking brake operates the rear brakes only, through cable actuation. It's activated by a lever mounted in the center console.

Service

After completing any operation involving disassembly of any part of the brake system, always test drive the vehicle to check for proper braking performance before resuming normal driving. When testing the brakes, perform the tests on a clean, dry, flat surface. Conditions other than these can lead to inaccurate test results.

Test the brakes at various speeds with both light and heavy pedal pressure. The vehicle should stop evenly without pulling to one side or the other. Avoid locking the brakes, because this slides the tires and diminishes braking efficiency and control of the vehicle.

Tires, vehicle load and wheel alignment are factors which also affect braking performance.

Precautions

There are some general cautions and warnings involving the brake system on this vehicle:

a) *Use only brake fluid conforming to DOT 3 specifications.*

b) *The brake pads and linings may contain asbestos fibers which are hazardous to your health if inhaled. Whenever you work on brake system components, clean all parts with brake system cleaner. Do not allow the fine dust to become airborne. Also, wear an approved filtering mask.*

c) *Safety should be paramount whenever any servicing of the brake components is performed. Do not use parts or fasteners which are not in perfect condition, and be sure that all clearances and torque specifications are adhered to. If you are at all unsure about a certain procedure, seek professional advice. Upon completion of any brake system work, test the brakes carefully in a controlled area before putting the vehicle into normal service. If a problem is suspected in the brake system, don't drive the vehicle until it's fixed.*

2 Anti-lock Brake System (ABS) - general information

General information

1 The anti-lock brake system is designed to maintain vehicle steerability, directional stability and optimum deceleration under severe braking conditions on most road surfaces. It does so by monitoring the rotational speed of each wheel and controlling the brake line pressure to each wheel during braking. This prevents the wheels from locking up.

2 The ABS system has three main components - the wheel speed sensors, the electronic control unit (ECU) and the hydraulic unit. Four wheel speed sensors - one at each wheel - send a variable voltage signal to the control unit, which monitors these signals, compares them to its program and determines whether a wheel is about to lock up. When a wheel is about to lock up, the control unit signals the hydraulic unit to reduce hydraulic pressure (or not increase it further) at that wheel's brake caliper. Pressure modulation is handled by electrically-operated solenoid valves.

3 If a problem develops within the system, an "ABS" warning light will glow on the dashboard. Sometimes, a visual inspection of the ABS system can help you locate the problem. Carefully inspect the ABS wiring harness. Pay particularly close attention to the harness and connections near each wheel. Look for signs of chafing and other damage caused by incorrectly routed wires. If a wheel sensor harness is damaged, the sensor must be replaced. **Warning:** *Do NOT try to repair an ABS wiring harness. The ABS system is sensitive to even the smallest changes in resistance. Repairing the harness could alter resistance values and cause the system to malfunction. If the ABS wiring harness is damaged in any way, it must be replaced.* **Caution:** *Make sure the ignition is turned off before unplugging or reattaching any electrical connections.*

Diagnosis and repair

4 If a dashboard warning light comes on and stays on while the vehicle is in operation, the ABS system requires attention. Although special electronic ABS diagnostic testing tools are necessary to properly diagnose the system, you can perform a few preliminary checks before taking the vehicle to a dealer service department.

a) *Check the brake fluid level in the reservoir.*

b) *Verify that the computer electrical connectors are securely connected.*

c) *Check the electrical connectors at the hydraulic control unit.*

d) *Check the fuses.*

e) *Follow the wiring harness to each wheel and verify that all connections are secure and that the wiring is undamaged.*

5 If the above preliminary checks do not rectify the problem, the vehicle should be diagnosed by a dealer service department or other qualified repair shop. Due to the complex nature of this system, all actual repair work must be done by a qualified automotive technician.

Wheel speed sensor - removal and installation

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

7 Make sure the ignition key is turned to the Off position.

8 Trace the wiring back from the sensor, detaching all brackets and clips while noting its correct routing, then disconnect the electrical connector.

9 Remove the mounting bolt and carefully pull the sensor out from the knuckle or brake backing plate.

10 Installation is the reverse of the removal procedure. Tighten the mounting bolt securely.

11 Install the wheel and lug nuts, tightening them securely. Lower the vehicle and tighten the lug nuts to the torque listed in the Chapter 1 Specifications.

3 Disc brake pads - replacement

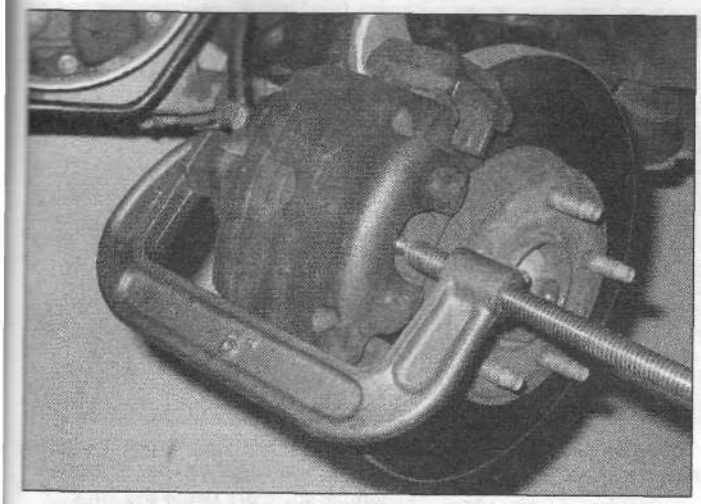
Refer to illustrations 3.5 and 3.6a through 3.6o

Warning: *Disc brake pads must be replaced on both front or both rear wheels at the same time - never replace the pads on only one wheel. Also, the dust created by the brake system is harmful to your health. Never blow it out with compressed air and don't inhale any of it. An approved filtering mask should be worn when working on the brakes. Do not, under any circumstances, use petroleum-based solvents to clean brake parts. Use brake system cleaner only!*

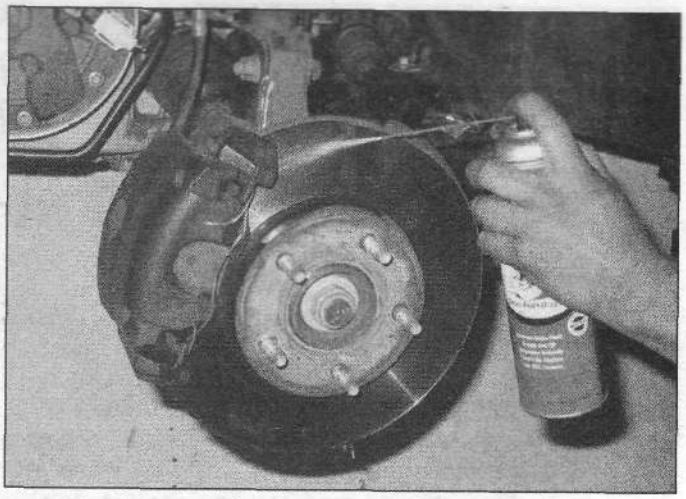
1 Remove the cap from the brake fluid reservoir.

2 Loosen the wheel lug nuts, raise the vehicle and support it securely on jackstands. Block the wheels at the opposite end.

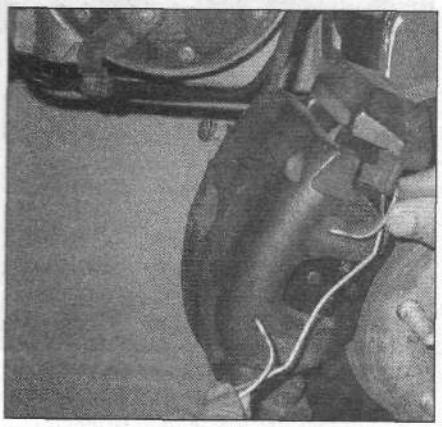
3 Remove the wheels. Work on one brake assembly at a time, using the assembled brake for reference if necessary.



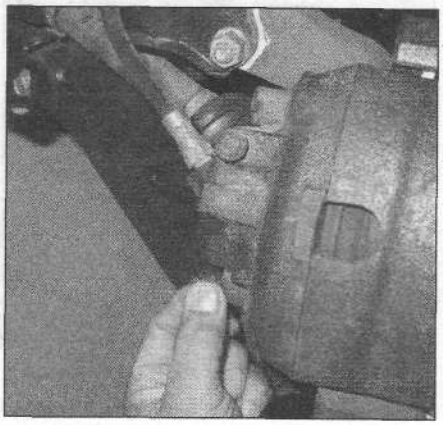
3.5 Before removing the caliper, be sure to depress the piston into the bottom of its bore in the caliper with a large C-clamp to make room for the new pads



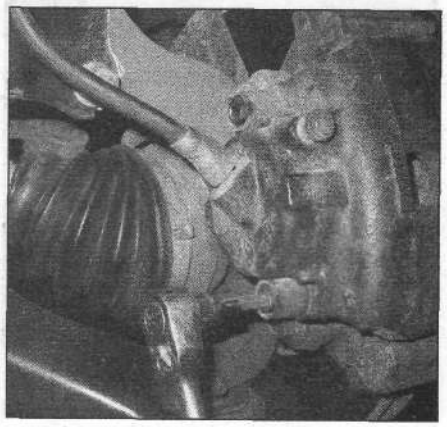
3.6a Always wash the brakes with brake cleaner before disassembling anything



3.6b Remove the brake caliper anti-rattle clip



3.6c Pry the covers off to locate the caliper guide bolts . . .

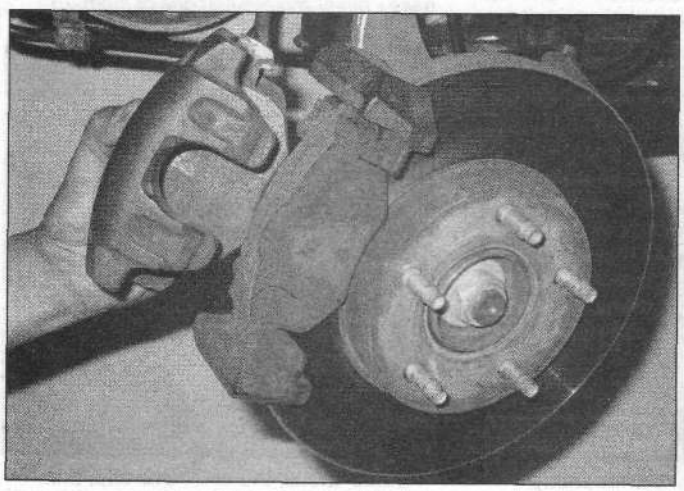


3.6d . . . then loosen and remove the bolts

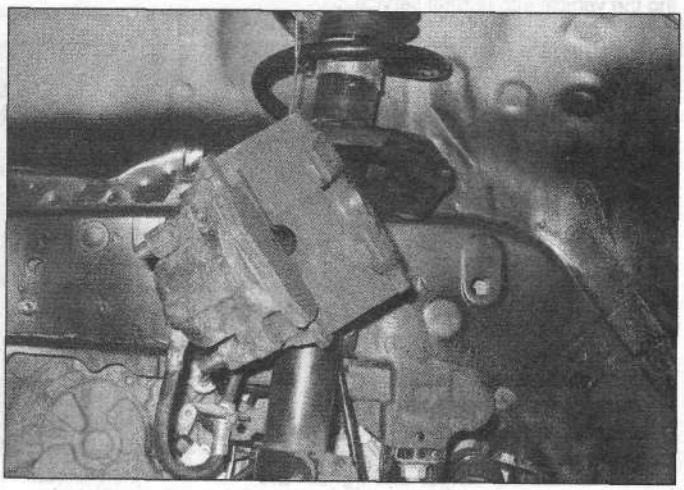
4 Inspect the brake disc carefully as outlined in Section 5. If machining is necessary, follow the information in that Section to remove the disc, at which time the pads can be removed as well.

5 Push the piston back into its bore to provide room for the new brake pads. A C-clamp can be used to accomplish this **(see illustration)**. As the piston is depressed to the bottom of the caliper bore, the fluid in the master cylinder will rise. Make sure that it doesn't overflow. If necessary, siphon off some of the fluid.

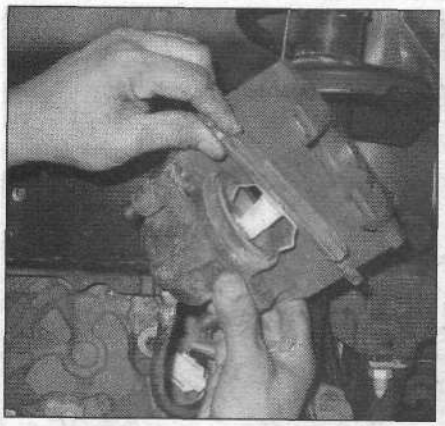
6 Follow the accompanying photos **(illustrations 3.6a through 3.6o)**, for the actual pad replacement procedure. Be sure to stay in order and read the caption under each illustration.



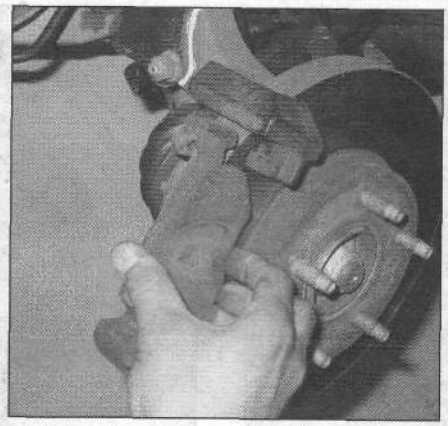
3.6e Remove the caliper



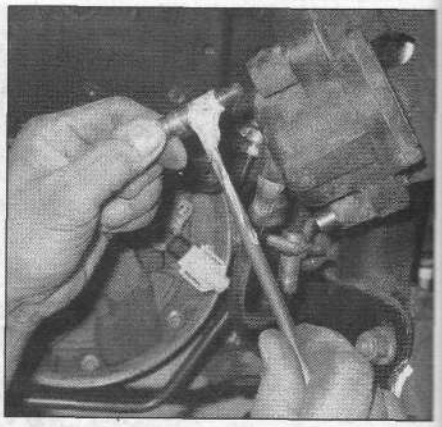
3.6f Never let the caliper hang by the brake hose - use a piece of wire to tie it to the coil spring



3.6g Unclip the inner pad from the piston . . .

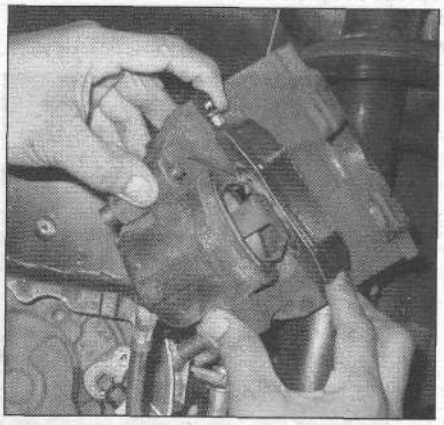


3.6h . . . then remove the outer pad from the caliper mounting bracket

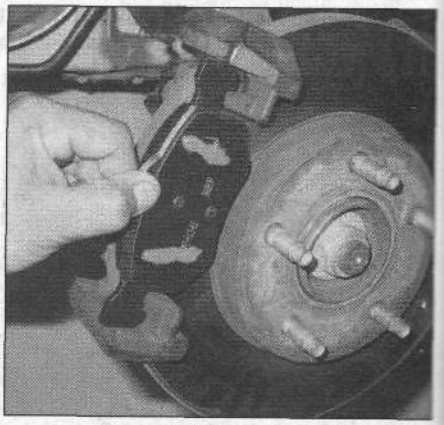


3.6i Pull out the sliding pins and clean them off, then apply a coat of high-temperature grease to the pins

3.6j Apply anti-squeal compound to the back of the pads



3.6k Clip the inner pad into the piston



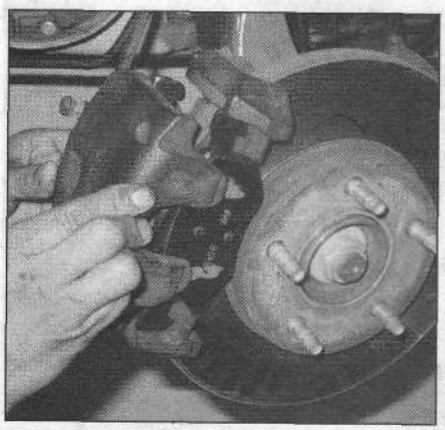
3.6l Install the outer pad

7 When reinstalling the caliper, be sure to tighten the mounting bolts to the torque listed in this Chapter's Specifications. After the job has been completed, firmly depress the brake pedal a few times to bring the pads into contact with the disc. Check the level of the brake fluid, adding some if necessary. Check the operation of the brakes carefully before placing the vehicle into normal service.

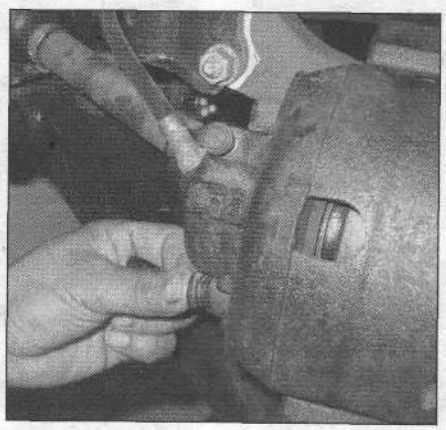
4 Disc brake caliper - removal and installation

Warning: *Dust created by the brake system is harmful to your health. Never blow it out with compressed air and don't inhale any of it. An approved filtering mask should be worn when working on the brakes. Do not, under any circumstances, use petroleum-based solvents to clean brake parts. Use brake system cleaner only.*

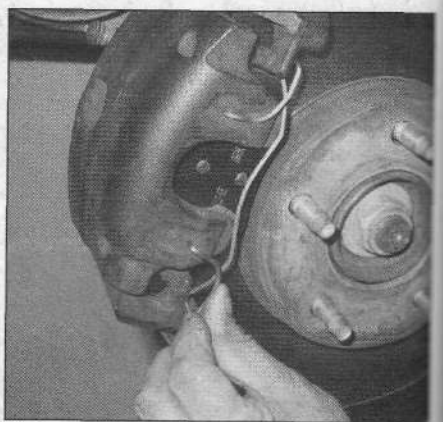
Note: *If replacement is indicated (usually because of fluid leakage), it is recommended that the calipers be replaced, not overhauled. New and factory rebuilt units are available on an exchange basis, which makes this job quite easy. Always replace the calipers in pairs - never replace just one of them.*



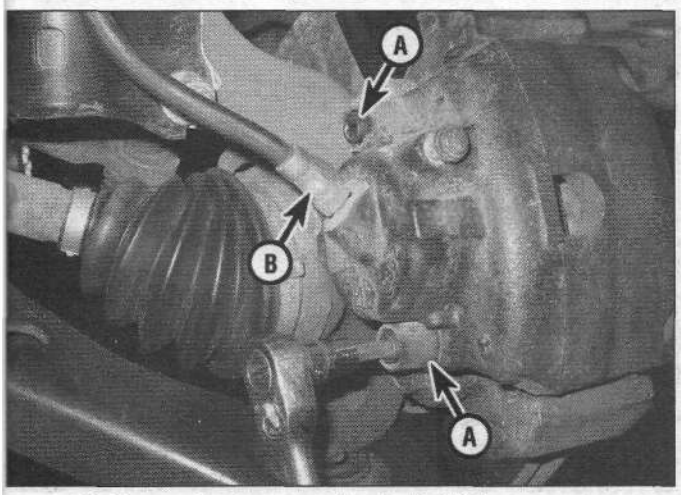
3.6m Install the caliper and tighten the caliper mounting bolts to the torque listed in this Chapter's Specifications



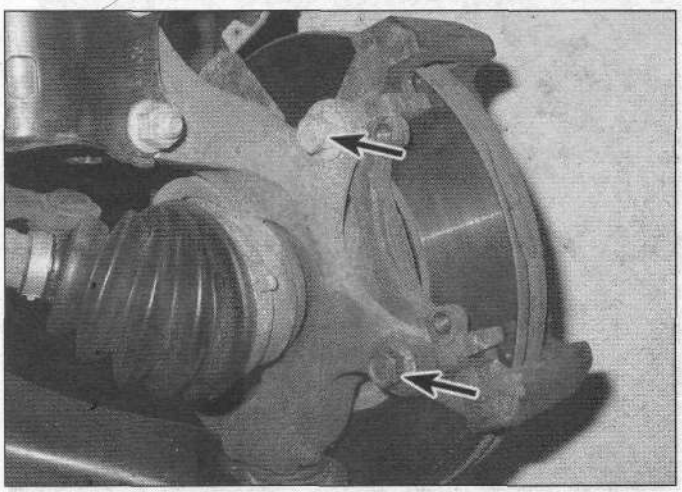
3.6n Install the caliper mounting bolt covers



3.6o Install the anti-rattle clip, then depress the brake pedal a few times to bring the pads into contact with the disc



4.2 Remove the two mounting bolts (A) then unscrew the brake hose (B)



5.2 The caliper mounting bracket is retained by two bolts

Removal

Refer to illustration 4.2

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

2 Break loose the brake hose fitting (but don't try to unscrew it yet), then remove the caliper mounting bolts (see illustration). Lift the caliper off its mounting bracket, then unscrew it from the brake hose. Plug the brake hose to keep contaminants out of the brake system and to prevent losing any more brake fluid than is necessary. **Note:** *If the caliper is being removed for access to another component, don't disconnect the hose.*

3 Remove the inner brake pad from the caliper. If the caliper is being removed for access to another component, hang it from the coil spring with a piece of wire **(see illustration 3.6f)**.

Installation

4 Install the caliper by reversing the removal procedure. Make sure the brake hose isn't twisted.

5 Bleed the brake circuit according to the procedure in Section 10. Make sure there are no leaks from the hose connections. Test the brakes carefully before returning the vehicle to normal service.

5 Brake disc - inspection, removal and installation

Inspection

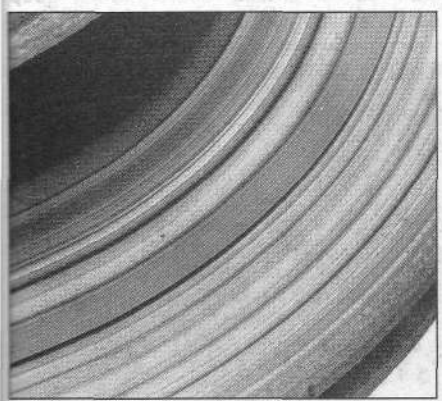
Refer to illustrations 5.2, 5.3, 5.4a, 5.4b, 5.5a and 5.5b

1 Loosen the wheel lug nuts, raise the vehicle and support it securely on jackstands. Remove the wheel and install the lug nuts to hold the disc in place against the hub flange. **Note:** *If the lug nuts don't contact the disc when screwed on all the way, install washers under them.*

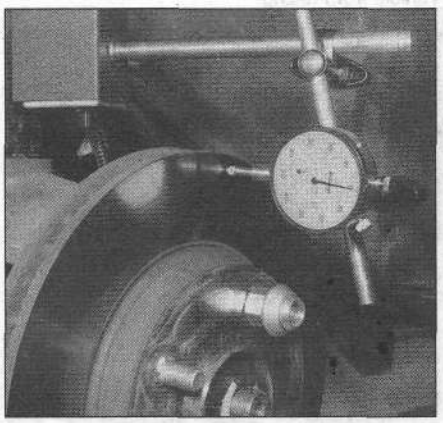
2 Remove the brake caliper as outlined in Section 4. It isn't necessary to disconnect the brake hose. After removing the caliper bolts, suspend the caliper out of the way with a piece of wire **(see illustration 3.6f)**. If you're working on the fornt brakes, remove the two caliper mounting bracket-to-steering knuckle bolts **(see illustration)** and detach the mounting bracket.

3 Visually inspect the disc surface for score marks and other damage. Light scratches and shallow grooves are normal *after use and may not always be detrimental* to brake operation, but deep scoring requires disc removal and refinishing by an automotive machine shop. Be sure to check both sides of the disc **(see illustration)**. If pulsating has been noticed during application of the brakes, suspect disc runout.

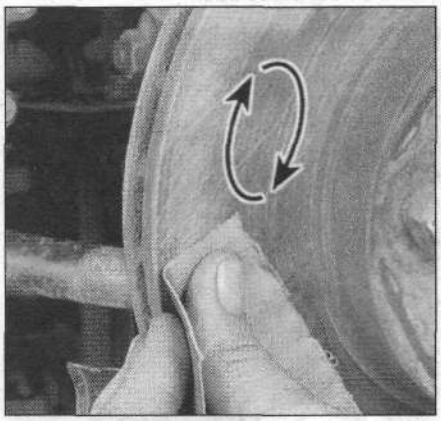
4 To check disc runout, place a dial indicator at a point about 1/2-inch from the outer edge of the disc **(see illustration)**. Set the indicator to zero and turn the disc. The indicator reading should not exceed the specified allowable runout limit. If it does, the disc should be refinished by an automotive machine shop. **Note:** *The discs should be resurfaced regardless of the dial indicator reading, as this will impart a smooth finish and ensure a perfectly flat surface, eliminating any brake pedal pulsation or other undesirable symptoms related to questionable discs. At the very least, if you elect not to have the discs resurfaced, remove the glaze from the surface with emery cloth or sandpaper, using a swirling motion* **(see illustration)**.



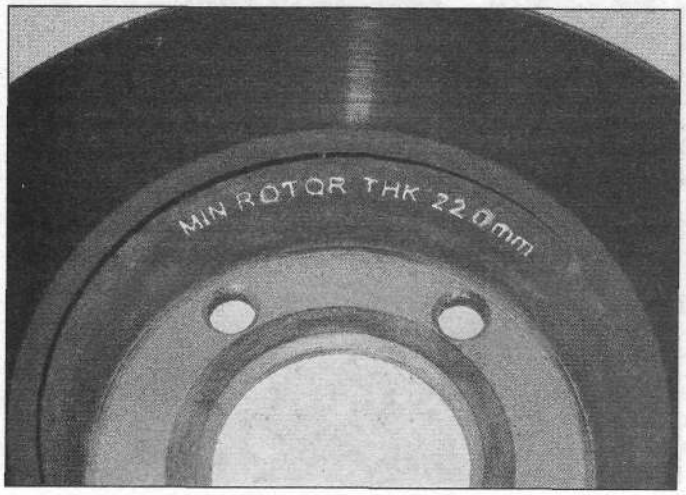
5.3 The brake pads on this vehicle were obviously neglected, as they wore down completely and cut deep grooves into the disc - wear this severe means the disc must be replaced



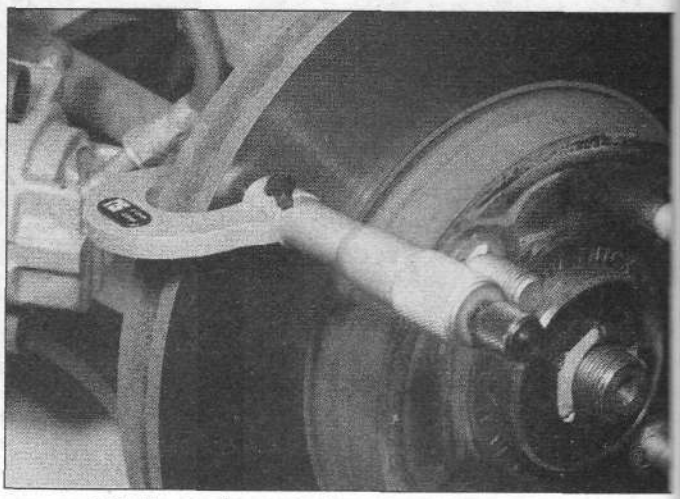
5.4a To check disc runout, mount a dial indicator as shown and rotate the disc



5.4b Using a swirling motion, remove the glaze from the disc surface with sandpaper or emery cloth



5.5a The minimum thickness dimension is cast into the back side of the disc



5.5b Use a micrometer to measure disc thickness

5 It's absolutely critical that the disc not be machined to a thickness under the specified minimum thickness. The minimum (or discard) thickness is cast or stamped into the inside of the disc **(see illustration)**. The disc thickness can be checked with a micrometer **(see illustration)**.

Removal

6 Remove the lug nuts which were installed to hold the disc in place and remove the disc from the hub.

Installation

7 Place the disc in position over the threaded studs.

8 Install the caliper mounting bracket and caliper, tightening the bolts to the torque values listed in this Chapter's Specifications.

9 Install the wheel, then lower the vehicle to the ground. Tighten the lug nuts to the torque listed in the Chapter 1 Specifications. Depress the brake pedal a few times to bring the brake pads into contact with the disc. Bleeding won't be necessary unless the brake hose was disconnected from the caliper. Check the operation of the brakes carefully before driving the vehicle.

6 Drum brake shoes - replacement

Refer to illustrations 6.4 and 6.6a through 6.6w

Warning: *Drum brake shoes must be replaced on both wheels at the same time - never replace the shoes on only one wheel. Also, the dust created by the brake system is harmful to your health. Never blow it out with compressed air and don't inhale any of it. An approved filtering mask should be worn when working on the brakes. Do not, under any circumstances, use petroleum-based solvents to clean brake parts. Use brake system cleaner only!*

Caution: *Whenever the brake shoes are replaced, the return and hold-down springs should also be replaced. Due to the continuous heating/cooling cycle the springs are subjected to, they can lose tension over a period of time and may allow the shoes to drag on the drum and wear at a much faster rate than normal.*

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

2 Release the parking brake.

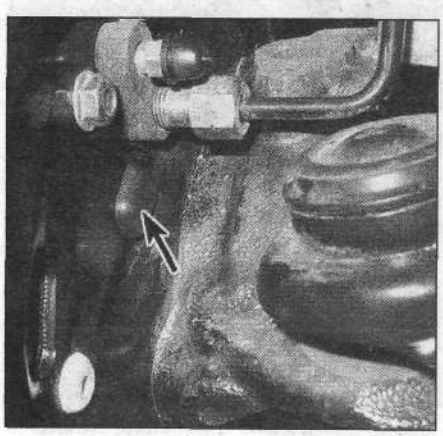
3 Remove the wheel. **Note:** *All four rear brake shoes must be replaced at the same time, but to avoid mixing up parts, work on only one brake assembly at a time.*

4 Remove the brake drum. **Note:** *If the brake drum cannot be easily pulled off the axle and shoe assembly, make sure the parking brake is completely released. If the drum still cannot be pulled off, the brake shoes will have to be retracted. This is done by first removing the plug from the brake drum* **(see illustration).** *With the plug removed, pull the lever off the adjuster star wheel with a hooked tool while turning the adjuster wheel with another screwdriver, moving the shoes away from the drum. The drum should now come off.*

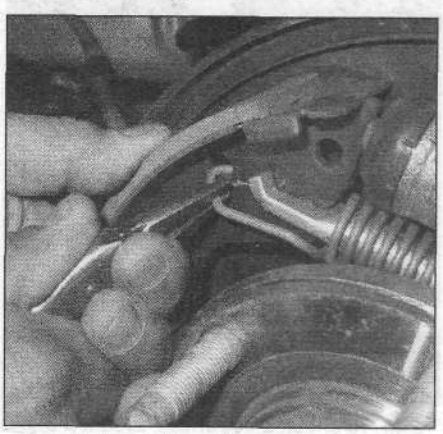
5 Clean the brake shoe assembly with brake system cleaner before beginning work.

6 Follow the accompanying illustrations for the brake shoe replacement procedure **(see illustrations 6.6a through 6.6w).** Be sure to stay in order and read the caption under each illustration.

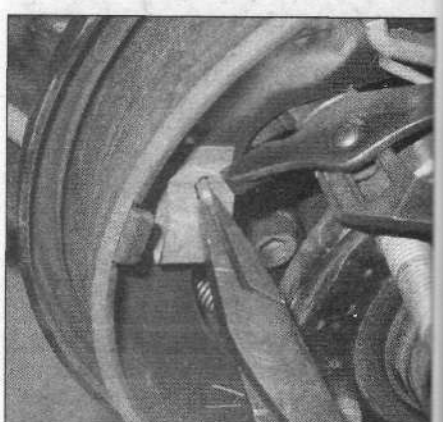
7 Before reinstalling the drum, it should be checked for cracks, score marks, deep scratches and hard spots, which will appear



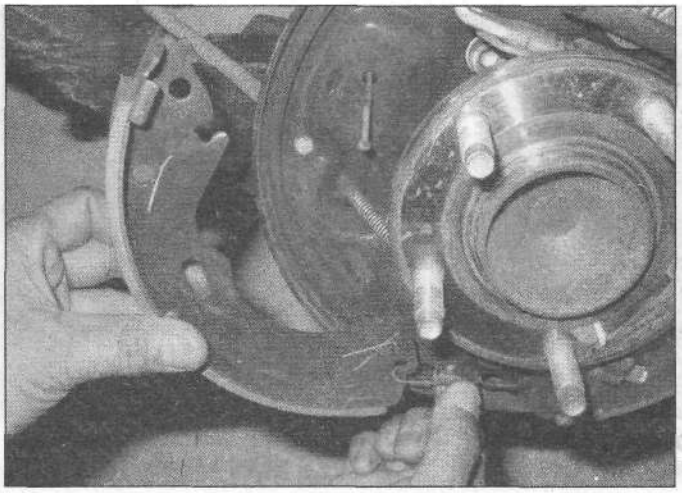
6.4 Remove this plug for access to the adjuster star wheel



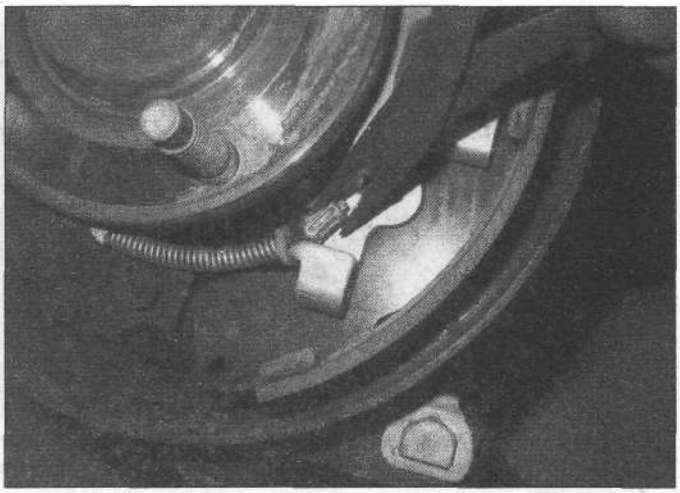
6.6a Unhook the return spring from its hole in the front shoe



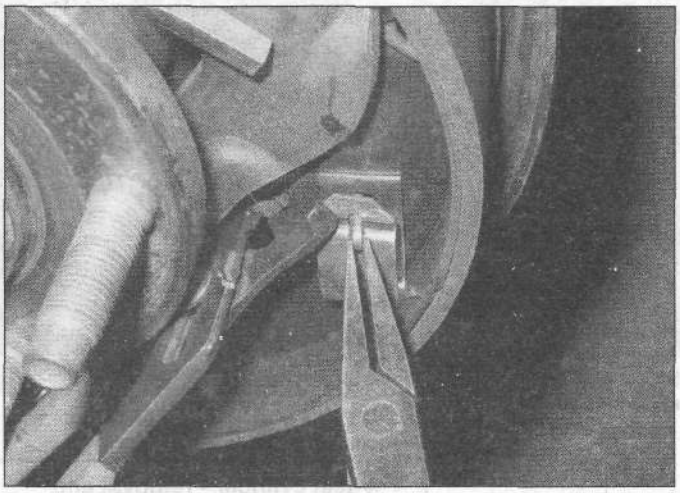
6.6b Unhook the front brake shoe hold-down clip



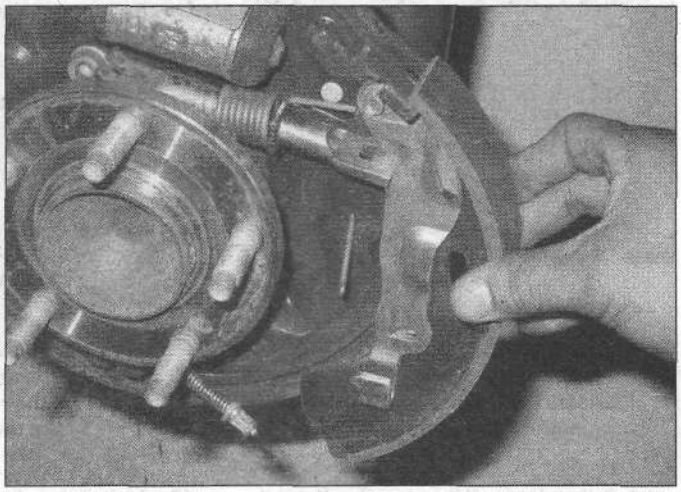
6.6c Remove the front shoe and disengage the anchor spring



6.6d Disengage the cable from the parking brake lever



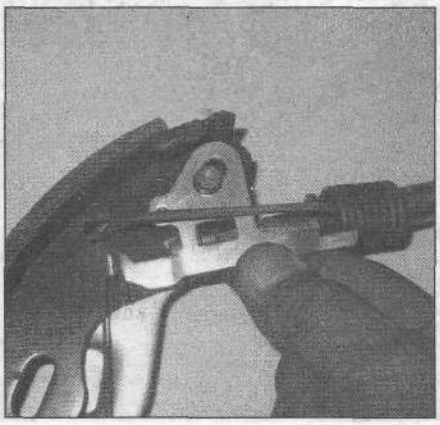
6.6e Unhook the rear brake shoe hold-down clip



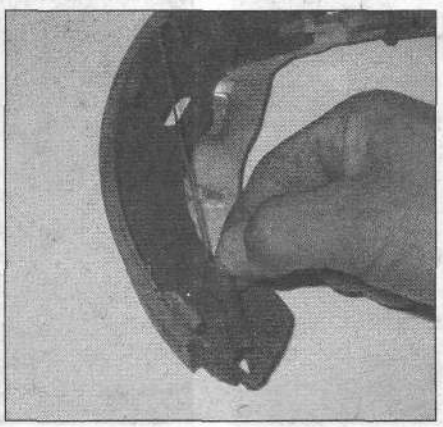
6.6f Remove the rear shoe assembly

as small discolored areas. If the hard spots cannot be removed with fine emery cloth or if any of the other conditions listed above exist, the drum must be taken to an automotive machine shop to have it resurfaced. **Note:** *Professionals recommend resurfacing the drums each time a brake job is done. Resurfacing will eliminate the possibility of out-of-round drums. If the drums are worn so much that they can't be resurfaced without exceeding the maximum allowable diameter (stamped or cast into the drum), then new ones will be required. At the very least, if you elect not to have the drums resurfaced, remove the glaze from the surface with emery cloth using a swirling motion.*

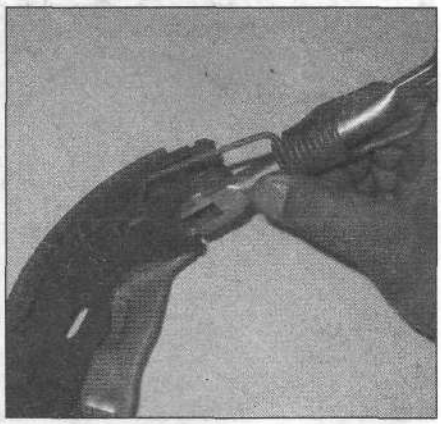
8 Install the brake drum on the axle flange. Using a screwdriver inserted through the adjusting hole in the brake drum **(see illustration 6.4)**, turn the adjuster star wheel until the brake shoes drag on the drum as the drum is



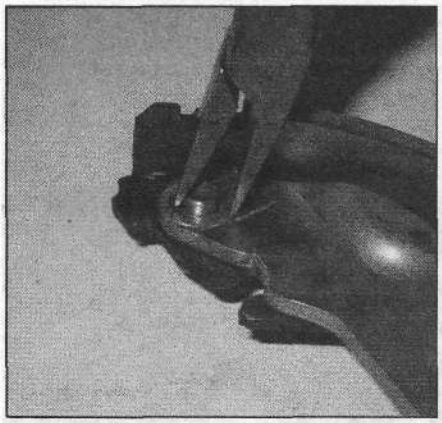
6.6g On the rear shoe, remove the self-adjust lever . . .



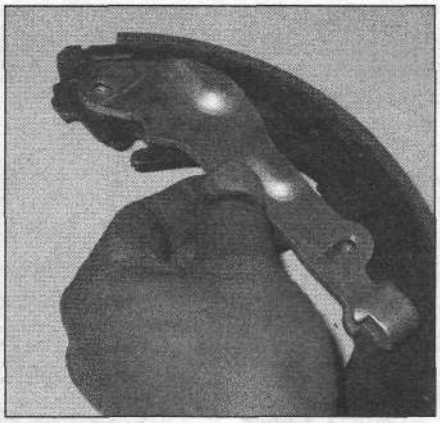
6.6h . . . and spring . . .



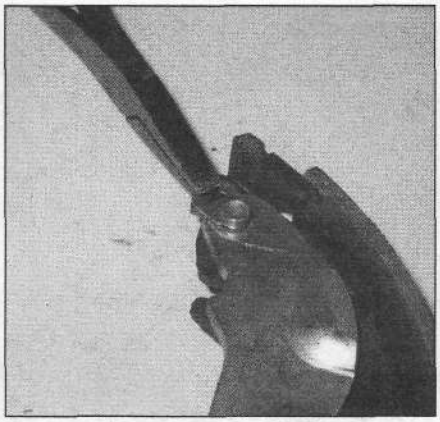
6.6i . . . then remove the adjuster screw and return spring



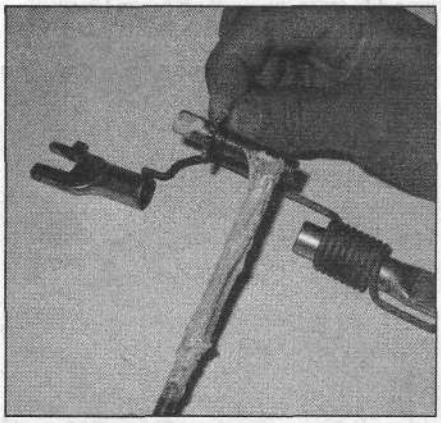
6.6j Pry open the C-clip and detach the parking brake lever from the rear shoe



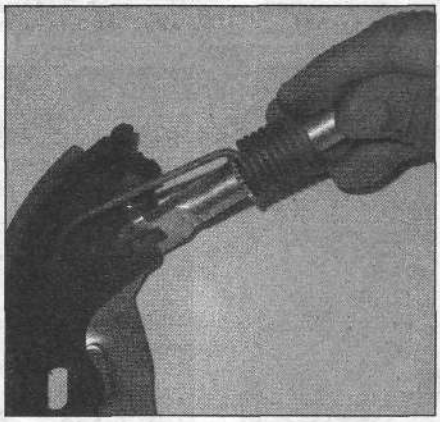
6.6k Place the parking brake lever on the new rear shoe . . .



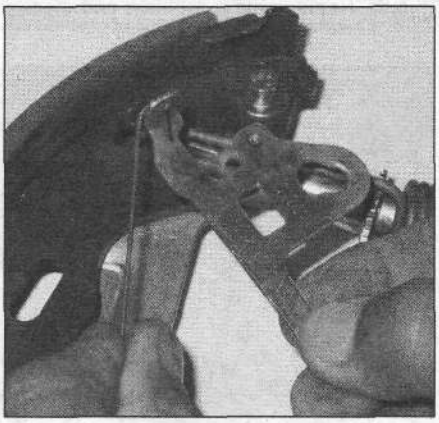
6.6l . . . and secure it in place with the C-clip



6.6m Clean the adjuster screw then lubricate the threads and ends with high-temperature grease



6.6n Insert the adjuster screw into into its slot on the rear shoe and attach the return spring



6.6o Attach the self-adjust lever and spring

rotated, then back off the star wheel until the shoes don't drag. Reinstall the plug in the drum.

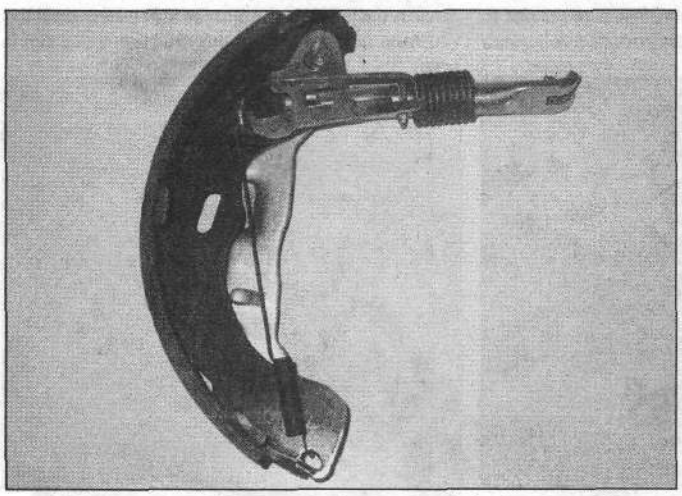
9 Mount the wheel and install the lug nuts. Lower the vehicle and tighten the lug nuts to the torque listed in the Chapter 1 Specifications.

10 Make a number of forward and reverse stops and operate the parking brake to adjust the brakes until satisfactory pedal action is obtained.

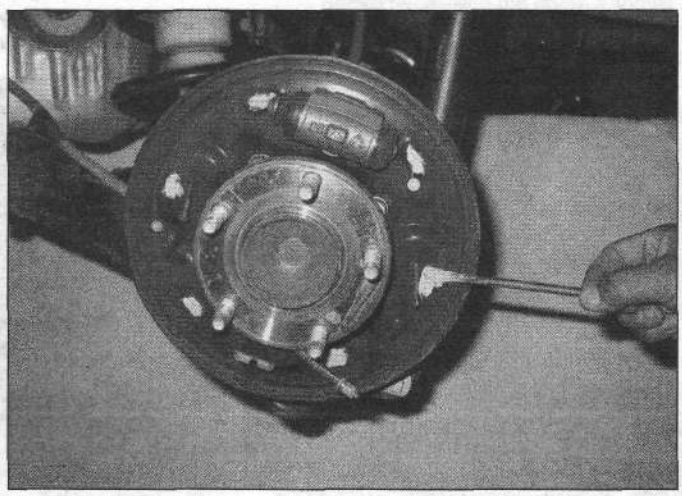
11 Check the operation of the brakes carefully before driving the vehicle.

7 Wheel cylinder - removal and installation

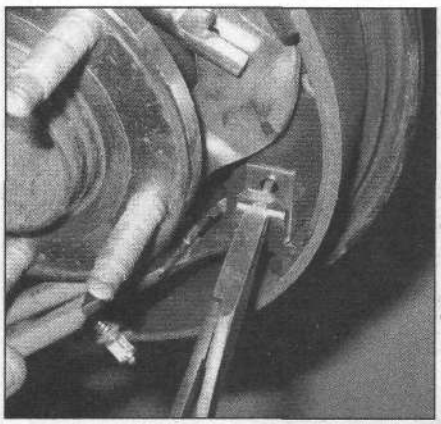
Note: *If replacement is indicated (usually because of fluid leakage or sticky operation), it is recommended that the wheel cylinders be replaced, not overhauled. Always replace the*



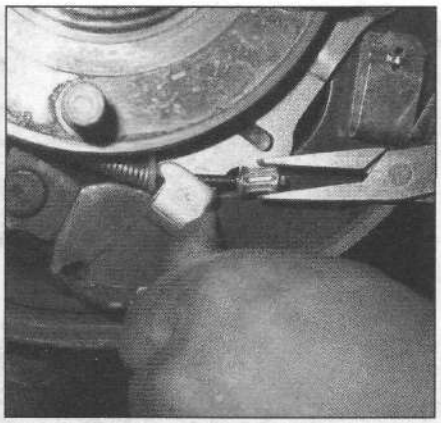
6.6p Rear view of assembled rear shoe/adjuster assembly



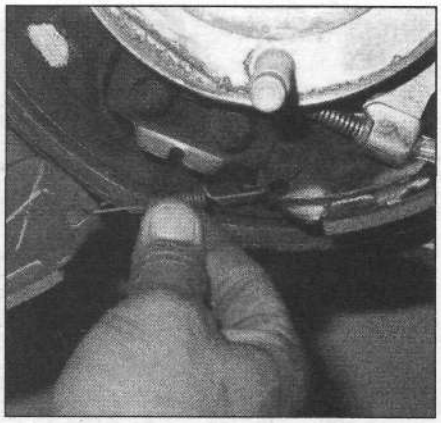
6.6q Apply high-temperature grease to the friction points of the backing plate



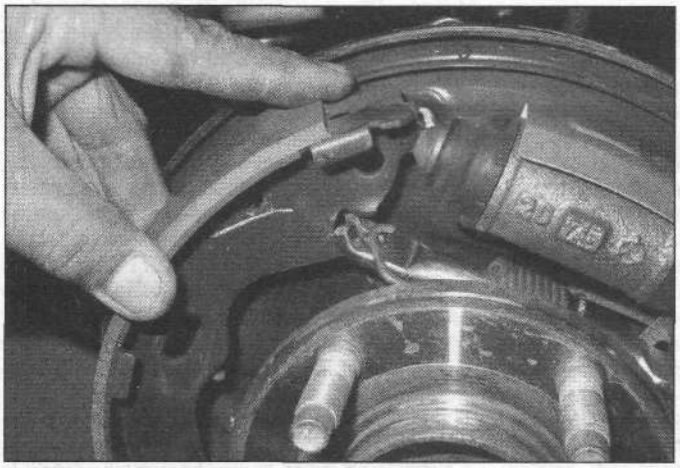
6.6r Attach the rear brake shoe hold-down clip



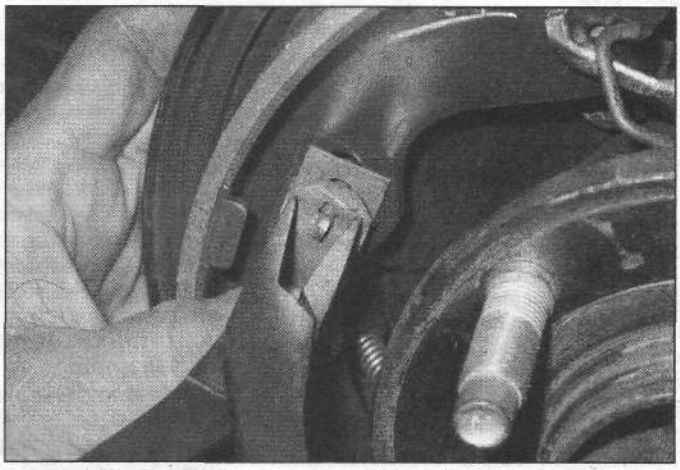
6.6s Attach the parking brake cable to the parking brake lever



6.6t Attach the anchor spring to the bottom of each shoe



6.6u Install the adjuster screw, making sure it engages the slot in the front shoe



6.6v Secure the front shoe with the hold-down clip

wheel cylinders in pairs - never replace just one of them.

Removal

Refer to illustration 7.4

1 Raise the rear of the vehicle and support it securely on jackstands. Block the front wheels to keep the vehicle from rolling.

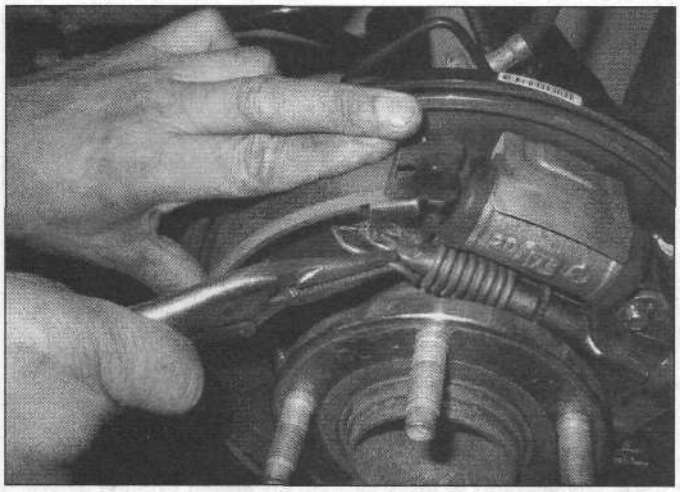
2 Remove the brake shoe assembly (see Section 6).

3 Remove all dirt and foreign material from around the wheel cylinder.

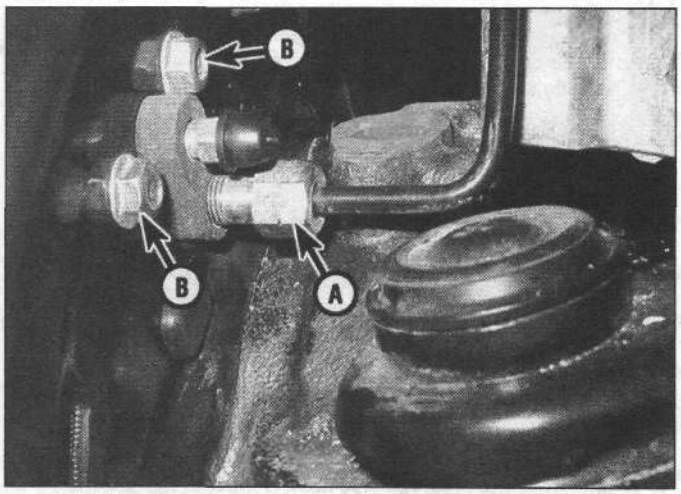
4 Disconnect the brake line **(see illustration).** Don't pull the brake line away from the wheel cylinder.

5 Remove the wheel cylinder mounting bolts.

6 Detach the wheel cylinder from the brake backing plate and immediately plug the brake line to prevent fluid loss and contamination.



6.6w Attach the upper return spring to the hole in the front shoe



7.4 Disconnect the brake line (A) then remove the wheel cylinder mounting bolts (B)

Installation

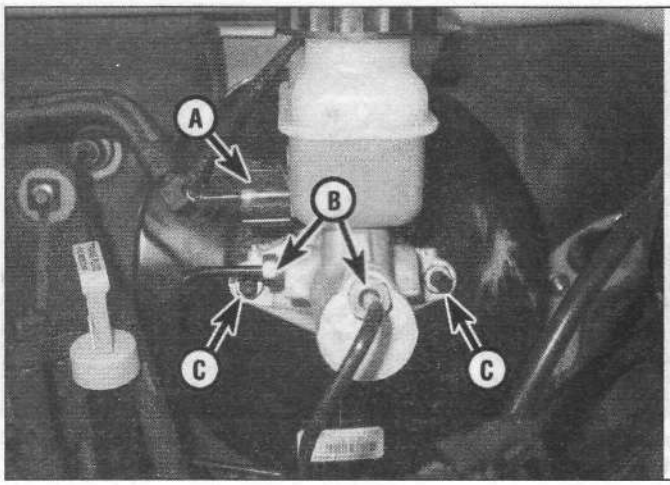
7 Place the wheel cylinder in position and install the bolts finger tight. Connect the brake line to the cylinder, being careful not to cross thread the fitting. Tighten the wheel cylinder mounting bolts to the torque listed in this Chapter's Specifications. Now tighten the brake line fitting securely.

8 Install the brake shoe assembly (see Section 6).

9 Bleed the brakes (see Section 10).

10 Check the operation of the brakes carefully before driving the vehicle.

8 Master cylinder - removal and installation



8.5 Master cylinder mounting details

A Fluid level warning switch connector
B Brake line fittings
C Mounting nuts

Removal

Refer to illustrations 8.5 and 8.7

1 The master cylinder is located in the engine compartment, mounted to the power brake booster.

2 Remove as much fluid as you can from the reservoir with a syringe, such as an old turkey baster. **Warning:** *If a baster is used, never again use it for the preparation of food.*

3 Place rags under the fluid fittings and prepare caps or plastic bags to cover the ends of the lines once they are disconnected. **Caution:** *Brake fluid will damage paint. Cover all body parts and be careful not to spill fluid during this procedure.*

4 On manual transaxle models, disconnect the clutch master cylinder supply hose from the brake fluid reservoir.

5 Loosen the fittings at the ends of the brake lines where they enter the master cylinder **(see illustration)**. To prevent rounding off the corners on these nuts, the use of a flare-nut wrench, which wraps around the nut, is preferred. Pull the brake lines slightly away from the master cylinder and plug the ends to prevent contamination.

6 Disconnect the electrical connector at the brake fluid level switch on the master cylinder reservoir, then remove the nuts attaching the master cylinder to the power booster. Pull the master cylinder off the studs and out of the engine compartment. Again, be careful not to spill the fluid as this is done.

7 If a new master cylinder is being installed, remove the reservoir from the master cylinder and transfer it to the new master cylinder. **Note:** *Be sure to install new seals when transferring the reservoir* **(see illustration).**

Installation

Refer to illustrations 8.9 and 8.14

8 Bench bleed the new master cylinder before installing it. Mount the master cylinder in a vise, with the jaws of the vise clamping on the mounting flange.

9 Attach a pair of master cylinder bleeder tubes to the outlet ports of the master cylinder **(see illustration)**.

10 Fill the reservoir with brake fluid of the recommended type (see Chapter 1).

11 Slowly push the pistons into the master cylinder (a large Phillips screwdriver can be used for this) - air will be expelled from the pressure chambers and into the reservoir. Because the tubes are submerged in fluid, air can't be drawn back into the master cylinder when you release the pistons.

12 Repeat the procedure until no more air bubbles are present.

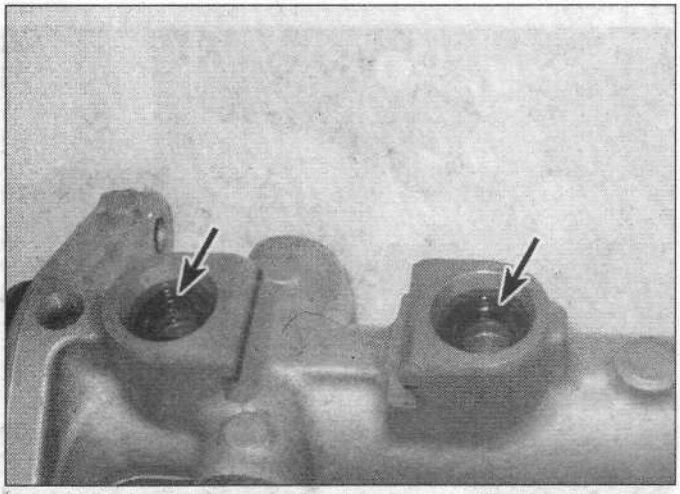
13 Remove the bleed tubes, one at a time, and install plugs in the open ports to prevent fluid leakage and air from entering. Install the reservoir cap.

14 Install the master cylinder over the studs on the power brake booster and tighten the attaching nuts only finger tight at this time. **Note:** *Be sure to install a new O-ring into the sleeve of the master cylinder* **(see illustration).**

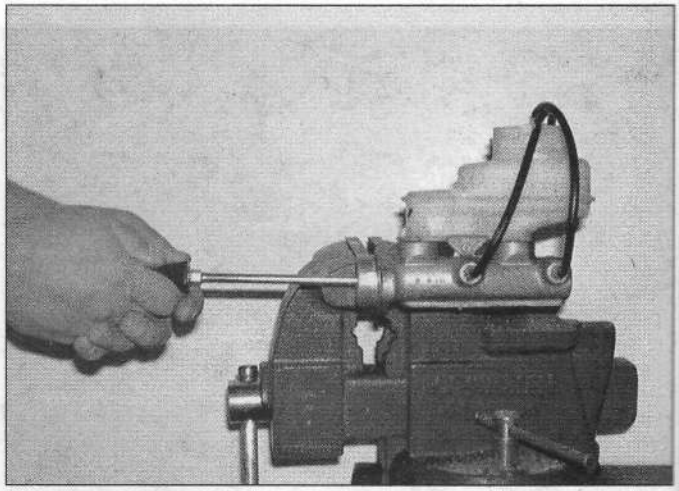
15 Thread the brake line fittings into the master cylinder. Since the master cylinder is still a bit loose, it can be moved slightly in order for the fittings to thread in easily. Do not strip the threads as the fittings are tightened.

16 Fully tighten the mounting nuts, then the brake line fittings. Tighten the nuts to the torque listed in this Chapter's Specifications.

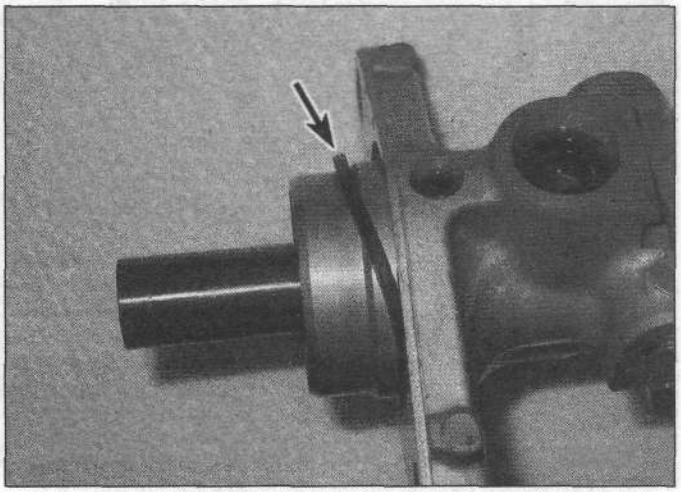
17 Fill the master cylinder reservoir with fluid, then bleed the master cylinder and the brake system as described in Section 10. To bleed the cylinder on the vehicle, have an



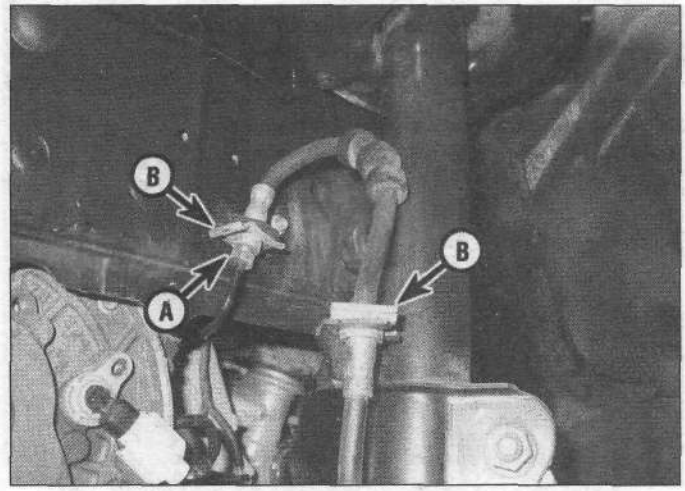
8.7 After the reservoir has been removed, replace the O-rings with new ones



8.9 The best way to bleed air from the master cylinder before installing it on the vehicle is with a pair of bleeder tubes that direct brake fluid into the reservoir during bleeding



8.14 Install a new O-ring onto the master cylinder sleeve



9.3 Unscrew the brake line threaded fitting with a flare-nut wrench to protect the fitting corners from being rounded off (A), then pull off the U-clips (B) with a pair of pliers (front shown, rear similar)

assistant depress the brake pedal and hold the pedal to the floor. Loosen the fitting to allow air and fluid to escape. Repeat this procedure on both fittings until the fluid is clear of air bubbles. **Caution:** *Have plenty of rags on hand to catch the fluid - brake fluid will ruin painted surfaces. After the bleeding procedure is completed, rinse the area under the master cylinder with clean water.*

18 Test the operation of the brake system carefully before placing the vehicle into normal service. **Warning:** *Do not operate the vehicle if you are in doubt about the effectiveness of the brake system. It is possible for air to become trapped in the anti-lock brake system hydraulic control unit, so, if the pedal continues to feel spongy after repeated bleedings or the BRAKE or ANTI-LOCK light stays on, have the vehicle towed to a dealer service department or other qualified shop to be bled with the aid of a scan tool.*

9 Brake hoses and lines - inspection and replacement

1 About every six months, with the vehicle raised and placed securely on jackstands, the flexible hoses which connect the steel brake lines with the front and rear brake assemblies should be inspected for cracks, chafing of the outer cover, leaks, blisters and other damage. These are important and vulnerable parts of the brake system and inspection should be complete. A light and mirror will be needed for a thorough check. If a hose exhibits any of the above defects, replace it with a new one.

Flexible hoses

Refer to illustration 9.3

2 Clean all dirt away from the ends of the hose.

3 To disconnect a brake hose from the brake line, unscrew the metal tube nut with a flare nut wrench, then remove the U-clip from the female fitting at the bracket and remove the hose from the bracket **(see illustration).**

4 Disconnect the hose from the caliper, discarding the sealing washers on either side of the fitting.

5 Using new sealing washers, attach the new brake hose to the caliper or wheel cylinder.

6 To reattach a brake hose to the metal line, insert the end of the hose through the frame bracket, make sure the hose isn't twisted, then attach the metal line by tightening the tube nut fitting securely. Install the U-clip at the frame bracket. **Note:** *The weight of the vehicle must be on the suspension, so the vehicle should not be raised while positioning the hose.*

7 Carefully check to make sure the suspension or steering components don't make contact with the hose. Have an assistant push down on the vehicle and also turn the steering wheel lock-to-lock during inspection.

8 Bleed the brake system (see Section 10).

Metal brake lines

9 When replacing brake lines, be sure to use the correct parts. Don't use copper tubing for any brake system components. Purchase steel brake lines from a dealer parts department or auto parts store.

10 Prefabricated brake line, with the tube ends already flared and fittings installed, is available at auto parts stores and dealer parts departments. These lines can be bent to the proper shapes using a tubing bender.

11 When installing the new line make sure it's well supported in the brackets and has plenty of clearance between moving or hot components.

12 After installation, check the master cylinder fluid level and add fluid as necessary. Bleed the brake system as outlined in Section 10 and test the brakes carefully before placing the vehicle into normal operation.

10 Brake hydraulic system - bleeding

Refer to illustration 10.8

Warning 1: *If air has found its way into the hydraulic control unit, the system must be bled with the use of a scan tool. If the brake pedal feels "spongy" even after bleeding the brakes, or the ABS light on the instrument panel does not go off, or if you have any doubts whatsoever about the effectiveness of the brake system, have the vehicle towed to a dealer service department or other repair shop equipped with the necessary tools for bleeding the system.*

Warning 2: *Wear eye protection when bleeding the brake system. If the fluid comes in contact with your eyes, immediately rinse them with water and seek medical attention.*

Note: *Bleeding the brake system is necessary to remove any air that's trapped in the system when it's opened during removal and installation of a hose, line, caliper, wheel cylinder or master cylinder.*

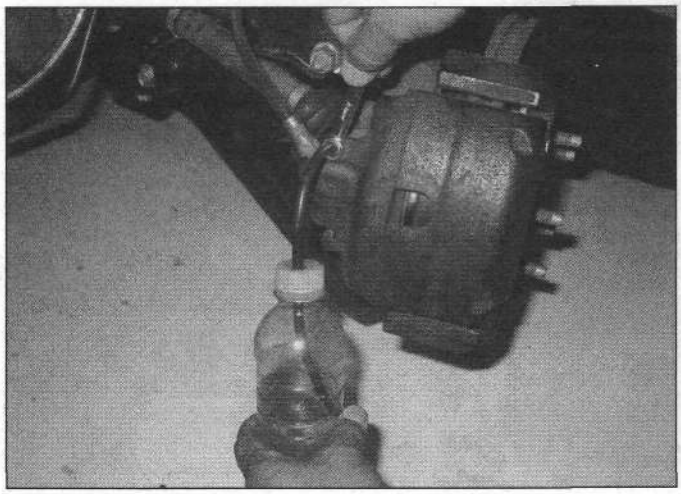
1 It will probably be necessary to bleed the system at all four brakes if air has entered the system due to low fluid level, or if the brake lines have been disconnected at the master cylinder.

2 If a brake line was disconnected only at a wheel, then only that caliper or wheel cylinder must be bled.

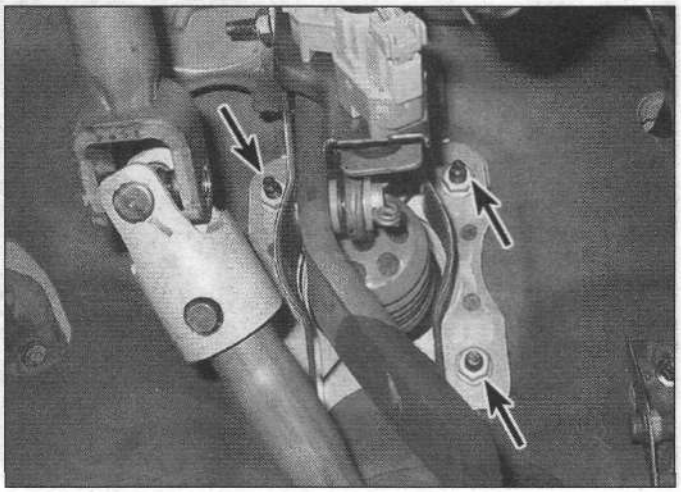
3 If a brake line is disconnected at a fitting located between the master cylinder and any of the brakes, that part of the system served by the disconnected line must be bled.

4 Remove any residual vacuum (or hydraulic pressure) from the brake power booster by applying the brake several times with the engine off.

5 Remove the master cylinder reservoir cap and fill the reservoir with brake fluid. Reinstall the cap. **Note:** *Check the fluid level often during the bleeding operation and add fluid as*



10.8 When bleeding the brakes, a hose is connected to the bleed screw at the caliper and submerged in brake fluid - air will be seen as bubbles in the tube and container (all air must be expelled before moving to the next wheel)



11.9 To detach the power brake booster from the firewall, remove these four nuts (one nut not visible in picture)

necessary to prevent the fluid level from falling low enough to allow air bubbles into the master cylinder.

6 Have an assistant on hand, as well as a supply of new brake fluid, an empty clear plastic container, a length of plastic, rubber or vinyl tubing to fit over the bleeder valve and a wrench to open and close the bleeder valve.

7 Beginning at the right rear wheel, loosen the bleeder screw slightly, then tighten it to a point where it's snug but can still be loosened quickly and easily.

8 Place one end of the tubing over the bleeder screw fitting and submerge the other end in brake fluid in the container **(see illustration)**.

9 Have the assistant slowly depress the brake pedal and hold it in the depressed position.

10 While the pedal is held depressed, open the bleeder screw just enough to allow a flow of fluid to leave the valve. Watch for air bubbles to exit the submerged end of the tube. When the fluid flow slows after a couple of seconds, tighten the screw and have your assistant release the pedal.

11 Repeat Steps 9 and 10 until no more air is seen leaving the tube, then tighten the bleeder screw and proceed to the left rear wheel, the right front wheel and the left front wheel, in that order, and perform the same procedure. Be sure to check the fluid in the master cylinder reservoir frequently.

12 Never use old brake fluid. It contains moisture which can boil, rendering the brake system inoperative.

13 Refill the master cylinder with fluid at the end of the operation.

14 Check the operation of the brakes. The pedal should feel solid when depressed, with no sponginess. If necessary, repeat the entire process. **Warning:** *Do not operate the vehicle if you are in doubt about the effectiveness of the brake system. It is possible for air to become trapped in the anti-lock brake system hydraulic control unit, so, if the pedal continues to feel spongy after repeated bleedings or the BRAKE or ANTI-LOCK light stays on, have the vehicle towed to a dealer service department or other qualified shop to be bled with the aid of a scan tool.*

11 Power brake booster - check, removal and installation

Refer to illustration 11.9

Operating check

1 Depress the brake pedal several times with the engine off and make sure that there is no change in the pedal reserve distance.

2 Depress the pedal and start the engine. If the pedal goes down slightly, operation is normal.

Airtightness check

3 Start the engine and turn it off after one or two minutes. Depress the brake pedal several times slowly. If the pedal goes down farther the first time but gradually rises after the second or third depression, the booster is airtight.

4 Depress the brake pedal while the engine is running, then stop the engine with the pedal depressed. If there is no change in the pedal reserve travel after holding the pedal for 30 seconds, the booster is airtight.

Removal and installation

5 Disassembly of the power unit requires special tools and is not ordinarily performed by the home mechanic. If a problem develops, it's recommended that a new or factory rebuilt unit be installed.

6 In the engine compartment, remove the nuts attaching the master cylinder to the booster and carefully pull the master cylinder forward until it clears the mounting studs. Be careful not to bend or kink the brake lines. On 3.0L models it may be necessary to disconnect the EVAP canister purge valve (see Chapter 6).

7 Disconnect the vacuum hose where it attaches to the power brake booster.

8 In the passenger compartment, remove the retaining pin and washer, then disconnect the pushrod from the top of the brake pedal.

9 Remove the nuts attaching the booster to the firewall **(see illustration)**.

10 Carefully lift the booster unit away from the firewall and out of the engine compartment.

11 To install the booster, place it into position and tighten the retaining nuts to the torque listed in this Chapter's Specifications. Connect the pushrod to the brake pedal.

12 Install the master cylinder. Reconnect the vacuum hose.

13 Carefully test the operation of the brakes before placing the vehicle in normal service.

12 Parking brake - adjustment

Drum brakes

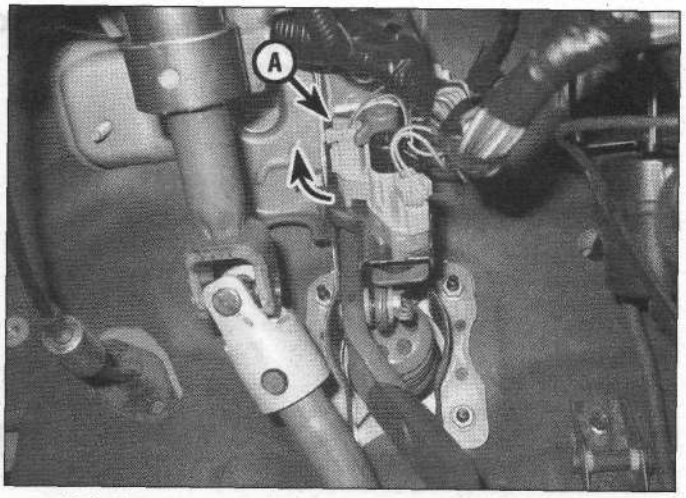
Refer to illustration 12.3

1 The parking brake lever, when properly adjusted, should travel three to five clicks, when a moderate pulling force is applied. If it travels less than the specified minimum number of clicks, there's a chance the parking brake might not be releasing completely and might be dragging on the drum. If the lever can be pulled up more than the specified maximum number of clicks, the parking brake may not hold adequately on an incline, allowing the car to roll.

2 To gain access to the parking brake cable adjuster, remove the center console trim panels (see Chapter 11).

3 If equipped, remove the locking clip. With a wrench, turn the adjusting nut until the

12.3 Turn the adjusting nut until the desired handle travel is obtained (center console removed for clarity)



14.1 Disconnect the electrical connector (A) then rotate the switch clockwise to remove it

desired travel is attained **(see illustration)**.

4 Install the center console trim panels.

Disc brakes

5 Release the parking brake lever.

6 Remove the parking brake lever boot by squeezing inward on the bottom of the boot, then lift the boot to access the adjustment nut.

7 Adjust the nut so when the lever is pulled, you hear or feel five clicks of the lever's ratchet mechanism.

8 Verify the parking brake is actually holding the vehicle when applied.

13 Parking brake shoes (models with rear disc brakes) - replacement

1 Release the parking brake.

2 Loosen the rear wheel lug nuts. Raise the vehicle and support it securely on jackstands. Remove the wheels. Be sure to block the front tires.

3 Remove the brake calipers (see Section 4) and the brake discs (see Section 5).

4 Clean the parking brake assembly with brake system cleaner before beginning work.

5 Remove the brake shoe retracting spring.

6 Remove the adjusting screw spring, then remove the adjusting screw.

7 Remove the hold-down springs from the shoes.

8 Remove the parking brake shoes.

9 Clean the brake disc/parking brake drum and check it for score marks, deep grooves, hard spots (which will appear as small discolored areas) and cracks. If the disc/drum is worn, scored or out-of-round, it can be resurfaced by an automotive machine shop.

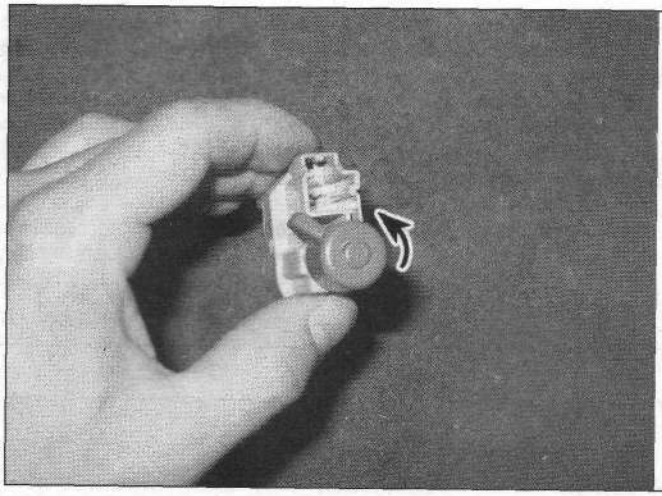
10 Install the shoes by reversing the removal procedure. Turn the adjusting screw so the disc just fits over the new shoes. When the disc is installed, the shoes should not rub as the disc is turned. If you have a brake shoe adjusting gauge, adjust the diameter of the shoes to 0.042-inch less than that of the drum surface of the rear brake disc.

11 Repeat this procedure for the other parking brake assembly.

12 Install the brake discs (see Section 5) and the brake calipers (see Section 4).

13 Remove the rubber plug from the brake backing plate and, using a screwdriver or brake adjusting tool, turn the adjusting screw star wheel until the parking brake shoes start to drag as the disc is turned, then back off the star wheel until the shoes don't drag.

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



14.2 Rotate the knob counterclockwise until it stops to unlock the switch

14 Brake light switch - replacement

Refer to illustrations 14.1 and 14.2

1 Disconnect the electrical connector at the switch, then rotate the switch counterclockwise and remove the switch **(see illustration)**.

2 To unlock the new switch, rotate the knob counterclockwise **(see illustration)**.

3 Start the engine, depress and hold the brake pedal then install the switch turning it clockwise.

4 Connect the switch electrical connector.