

# 340 Brakes

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## GENERAL

### WARNING —

- Although semi-metallic and metallic brake friction materials in brake pads or shoes no longer contain asbestos, they produce dangerous dust.
- Brake fluid is poisonous, highly corrosive and dangerous to the environment. Wear safety glasses and rubber gloves when working with brake fluid. Do not siphon brake fluid with your mouth. Immediately clean away any fluid spilled on painted surfaces and wash with water, as brake fluid will remove paint.
- Always use new brake fluid from a fresh, unopened container. Brake fluid will absorb moisture from the air. This can lead to corrosion problems in the braking system, and will also lower the brake fluid's boiling point. Dispose of brake fluid properly.
- Do not reuse self-locking nuts, bolts or fasteners. They are designed to be used only once and may fail if reused. Always replace them with new self-locking fasteners.

BMW E36 models are equipped with vacuum power-assisted four-wheel disc brakes with an integral Antilock Brake System (ABS). Single-piston calipers act on solid or vented front rotors and solid rear rotors. A brake pad wear sensor for each axle indicates when brake pads need replacement. The dual drum-type parking brake system is integrated with the rear brake rotors.

### NOTE —

M3 models have vented directional brake rotors on the rear axle as well as on the front.

## TROUBLESHOOTING

Brake performance is mainly affected by three things: the level and condition of the brake fluid, the system's ability to create and maintain hydraulic pressure, and the condition of the friction components.

Air in the brake fluid will make the brake pedal feel spongy during braking or will increase the brake pedal force required to stop. Fluid contaminated by moisture or dirt can corrode the system. Inspect the brake fluid inside the reservoir. If it is dirty or murky, or is over a year old, the fluid should be replaced.

Visually check the hydraulic system starting at the master cylinder. To check the function of the master cylinder hold the brake pedal down hard with the engine running. The pedal should feel solid and stay solid. If the pedal slowly falls to the floor, either the master cylinder is leaking internally, or fluid is leaking externally. If no leaks can be found, the master cylinder is faulty and should be replaced. Check all brake fluid lines and couplings for leaks, kinks, chafing and corrosion.

Check the brake booster by pumping the brake pedal approximately 10 times with the engine off. Hold the pedal down and start the engine. The pedal should fall slightly. If not, check for any visible faults before suspecting a faulty brake booster. Check for strong vacuum at the vacuum hose fitting at the booster, and check the non-return valve for one-way flow.

Worn or contaminated brake pads will cause poor braking performance. Oil-contaminated or glazed pads will cause stopping distances to increase. Inspect the rotors for glazing, discoloration and scoring. Steering wheel vibration while braking at speed is often caused by warped rotors, but can also be caused by worn suspension components.

## TROUBLESHOOTING

## 340-2 BRAKES

When troubleshooting, keep in mind that tire inflation, wear and temperature can affect braking and suspension. See **310 Front Suspension** for more information on front suspension parts inspection.

**Table a** lists symptoms of brake problems, their probable causes, and suggested corrective actions.

**Table a. Brake System Troubleshooting**

| Symptom                                                 | Probable cause                                                                                                                                                                                                                                                        | Repairs                                                                                                                                                                                                                                                                                            |
|---------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Brake squeal                                            | a. Incorrectly installed brake pads or parking brake shoes<br>b. Brake pad carriers dirty or corroded<br>c. Brake pad anti-rattle springs faulty or missing<br>d. Brake pads heat-glazed or oil-soaked<br>e. Wheel bearings worn (noise most pronounced when turning) | a. Check component installation.<br>b. Remove brake pads and clean calipers.<br>c. Install/replace anti-rattle springs.<br>d. Replace brake pads. Clean rotors. Replace leaking calipers as required.<br>e. Replace worn bearings. See <b>310 Front Suspension</b> or <b>330 Rear Suspension</b> . |
| Pedal goes to floor when braking                        | a. Brake fluid level low due to system leaks<br>b. Master cylinder faulty                                                                                                                                                                                             | a. Check fluid level and inspect hydraulic system for signs of leakage. Fill and bleed system.<br>b. Replace master cylinder.                                                                                                                                                                      |
| Low pedal after system bleeding                         | a. Master cylinder faulty                                                                                                                                                                                                                                             | a. Replace master cylinder.                                                                                                                                                                                                                                                                        |
| Pedal spongy or brakes work only when pedal is pumped   | a. Air in brake fluid<br>b. Master cylinder faulty (internal return spring weak)<br>c. Leaking line or hose unions                                                                                                                                                    | a. Bleed system.<br>b. Replace master cylinder.<br>c. Repair or replace lines and hoses. Bleed system.                                                                                                                                                                                             |
| Excessive braking effort                                | a. Brake pads wet<br>b. Brake pads heat-glazed or oil-soaked<br>c. Vacuum booster or vacuum hose connections to booster faulty                                                                                                                                        | a. Use light pedal pressure to dry pads while driving.<br>b. Replace brake pads. Clean rotors. Replace leaking calipers.<br>c. Inspect vacuum lines. Test vacuum booster and replace as required. Test vacuum non-return valve for one-way air flow.                                               |
| Brakes pulsate, chatter or grab                         | a. Warped brake rotors<br>b. Brake pads worn<br>c. Brake pads heat-glazed or oil-soaked                                                                                                                                                                               | a. Resurface or replace rotors.<br>b. Replace brake pads.<br>c. Replace brake pads. Clean rotors. Replace leaking calipers.                                                                                                                                                                        |
| Uneven braking, car pulls to one side, rear brakes lock | a. Incorrect tire pressures or worn tires<br>b. Brake pads on one side of car heat-glazed or oil-soaked<br>c. Caliper or brake pads binding<br>d. Worn suspension components                                                                                          | a. Inspect tire condition. Check and correct tire pressures.<br>b. Replace brake pads. Clean rotors. Replace leaking calipers.<br>c. Clean and recondition brakes.<br>d. Inspect for worn or damaged suspension components. See <b>310 Front Suspension</b> or <b>330 Rear Suspension</b> .        |
| Brakes drag, bind or overheat                           | a. Brake caliper or brake pads binding<br>b. Master cylinder faulty                                                                                                                                                                                                   | a. Clean or replace caliper.<br>b. Replace master cylinder.                                                                                                                                                                                                                                        |

**WARNING —**

*On cars with All Season Traction (AST), special BMW service equipment is required to properly bleed the ABS/AST system. For safety reasons, the brake system on cars with ABS/AST must not be bled using the procedures described in this repair group.*

Always use new brake fluid from an unopened container. It is important to bleed the entire system when any part of the hydraulic system has been opened. On cars not equipped with traction control (AST), brake system bleeding should be done with a pressure bleeder. On cars with AST, brake bleeding should be done by an authorized BMW dealer.

### BLEEDING BRAKES

Brake bleeding is usually done for one of two reasons: Either to replace old brake fluid as part of routine maintenance or to expel trapped air in the system that resulted from opening the brake hydraulic system during repairs.

**WARNING —**

*On cars with All Season Traction (AST), special BMW service equipment is required to properly bleed the ABS/AST system. For safety reasons, the brake system on cars with ABS/AST must not be bled using the procedures described in this repair group.*

#### BLEEDING BRAKES

When bleeding the brakes, start at the wheel farthest from the master cylinder and progress in the following order:

- right rear brake
- left rear brake
- right front brake
- left front brake

## Pressure bleeding brakes (except cars with AST)

1. Top off brake fluid in reservoir and connect pressure bleeder to reservoir. Connect bleeder hose and bottle to right rear caliper bleeder screw. Pressurize system to approximately 1 bar (14.5 psi).

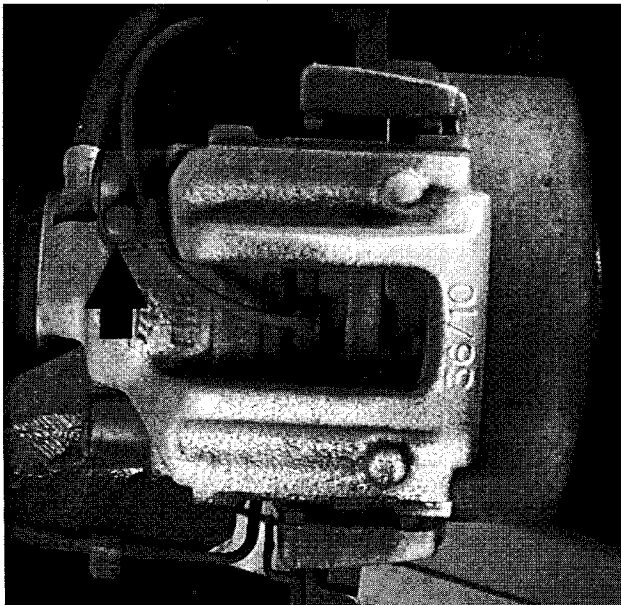
### CAUTION —

*Do not exceed a pressure of 2 bar (29 psi) when pressure bleeding the brake system. Excessive pressure will damage the brake fluid reservoir.*

2. Have a helper hold brake pedal down.
3. Open bleeder screw. See Fig 1. Have helper slowly pump brakes about 10 times with bleeder screw open, holding pedal down on the last pump. When escaping fluid is free of air bubbles, close bleeder screw.

### CAUTION —

*Bleeder hose must always remain submersed in the clean brake fluid whenever the bleeder valve is open.*



0012113

Fig. 1. Brake caliper bleeder screw (arrow).

4. Close bleeder screw and release brake pedal. Refill brake fluid reservoir and proceed to rear left wheel.
5. Proceed with the remaining wheels using the order listed earlier.

### Tightening Torques

- Bleeder screws:
 

|            |       |                |
|------------|-------|----------------|
| 7 mm screw | ..... | 5 Nm (4 ft-lb) |
| 9 mm screw | ..... | 6 Nm (5 ft-lb) |

## BRAKE PADS, CALIPERS, AND ROTORS

The E36 front brake caliper is shown in Fig. 2. The rear brake caliper is shown in Fig. 7.

Brake pads can be replaced without disconnecting the brake fluid hose from the caliper or having to bleed the brakes. The rotors can be replaced without disassembling the wheel hub and bearing. Always machine or replace rotors in pairs. Replace pads in sets.

### WARNING —

- Although semi-metallic and metallic brake friction materials in brake pads or shoes no longer contain asbestos, they produce dangerous dust.
- Treat all brake dust as a hazardous material.
- Do not create dust by grinding, sanding, or cleaning brake friction surfaces with compressed air.
- Breathing any brake dust can cause serious diseases such as cancer, and may result in death.

## Brake pads, replacing

This procedure is applicable to both front and rear brakes. Front and rear brake assemblies are basically the same, except that the rear brake rotors house the parking brake mechanism

1. Raise car and remove wheels.

### WARNING —

*Make sure the car is firmly supported on jack stands designed for the purpose. Place the jack stands beneath a structural chassis point. Do not place jack stands under suspension parts.*

2. Remove plastic caps from guide bolts and then remove guide bolts. See Fig. 3.
3. If applicable, disconnect brake pad wear sensor connector and remove wiring from its holder.
4. Remove anti-rattle clip from caliper. See Fig. 4.

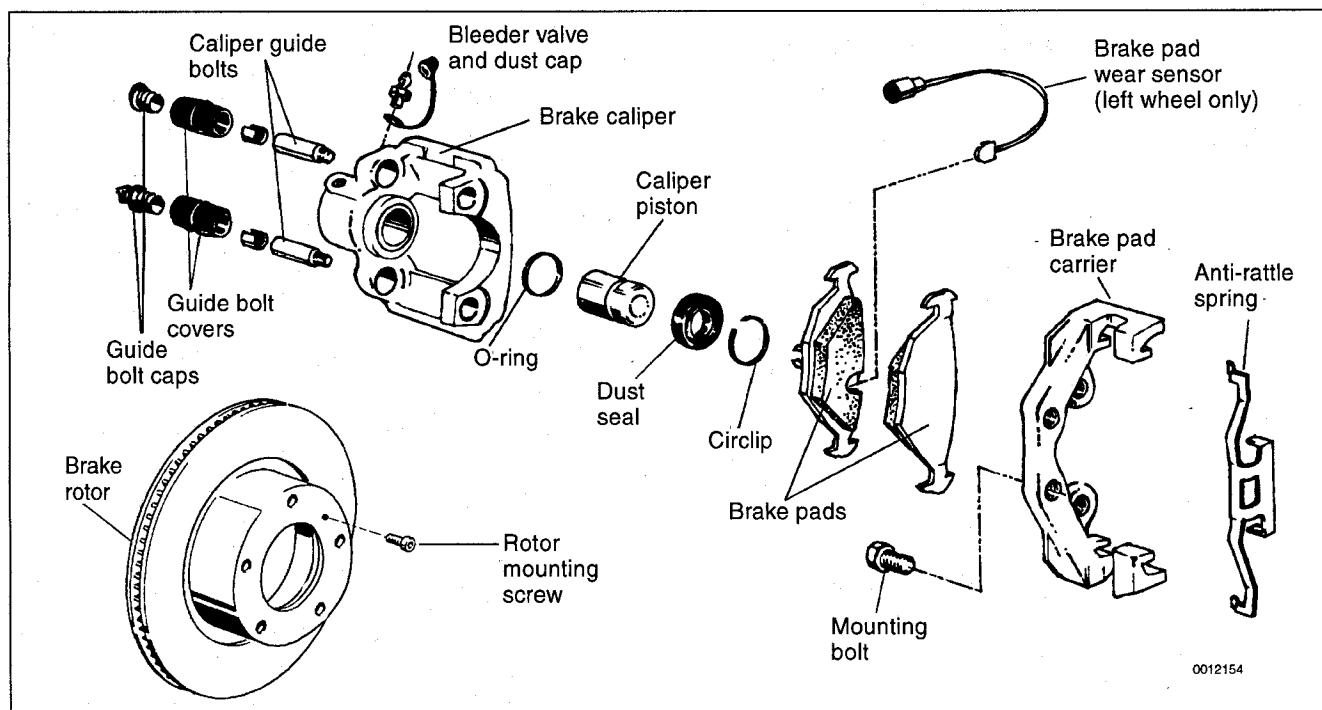


**Fig. 2.** Front brake caliper assembly.

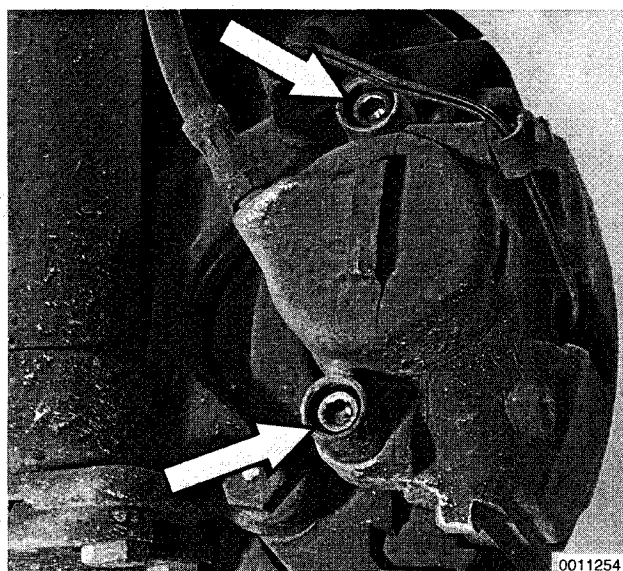


**Fig. 3.** Brake caliper guide bolts (arrows).

5. Pull caliper straight off rotor.

**CAUTION —**

Do not let the brake caliper hang from the brake hose. Suspend it from the chassis using stiff wire.

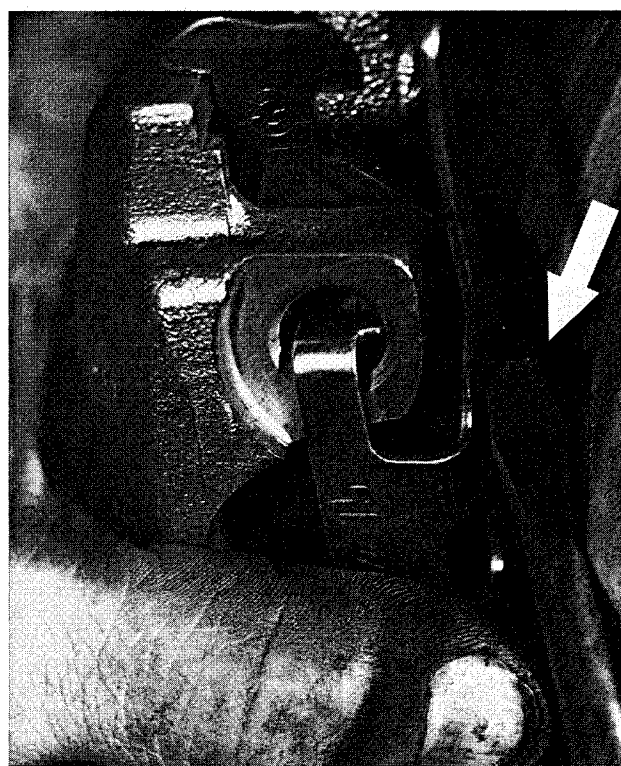


**Fig. 4.** Removing anti-rattle clip by unhooking at top and bottom. Use screwdriver as an aid (arrow).

**NOTE —**

If there is a ridge on the rotor edge, the caliper piston will have to be pushed back into the caliper before the caliper can be removed.

6. Remove brake pads from caliper. Where applicable, carefully pry pad wear sensor from pad. See Fig. 5.

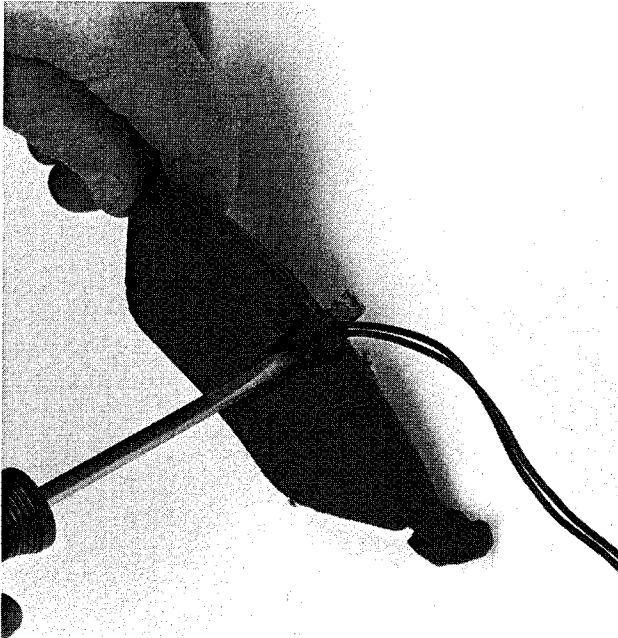


**Fig. 5.** Removing brake pad wear sensor.

0012156

7. Inspect brake caliper for signs of leakage. Check that the caliper piston slides smoothly into caliper. Replace caliper if any faults are found.

**CAUTION —**

*With the pads removed, residual hydraulic pressure may cause the caliper piston to slide out. Use a wooden block to hold the piston in place.*

8. Insert brake pad wear sensor into cutout in new pad where applicable.

**NOTE —**

*If the brake lining indicator light illuminated prior to brake pad replacement, the wear sensor should be replaced.*

9. Slowly press piston back into caliper. Use care not to damage piston dust seal. See Fig. 6.

**NOTE —**

- Open caliper bleeder screw when pressing piston back into caliper. Catch expelled fluid in appropriate container. This procedure is highly recommended in the case of cars with ABS.

- Open the bleeder screw only when applying force to the piston. Do not allow air to be drawn in through the bleeder screw.

- Pressing the caliper piston in may cause the brake fluid reservoir to overflow. To prevent this, use a clean syringe to first remove some fluid from the reservoir.



0012157

**Fig. 6.** Brake caliper piston being pressed into caliper to make room for new pads. Use a rag to protect caliper piston and seals.

10. Thoroughly clean inner and outer surfaces of brake rotor. Inspect rotor for cracks, signs of overheating and scoring.
11. Measure thickness of rotor. See **Table b**. If rotor does not pass minimum thickness requirements, or is damaged, replace as described later.
12. Thoroughly clean all contact points on caliper and brake pad carrier. Clean guide bolts and make sure they slide freely.
13. Lightly coat pad contact points with brake anti-squeal paste. Place outer brake pad onto caliper. Apply a small amount of grease to the top and bottom contact points where the caliper contacts the pad carrier.
14. Place inner brake pad (with locating spring) onto brake caliper piston. Route pad wear sensor wiring through caliper opening and bleeder dust cap.
15. The remainder of installation is reverse of removal.
  - Do not lubricate guide bolts.
  - Once brake assembly is installed depress brake pedal several times before driving vehicle.

## Tightening Torques

- Brake caliper to brake pad carrier (guide bolt) ..... 30 Nm (22 ft-lb)
- Road wheel to hub ..... 100±10 Nm (74±7 ft-lb)

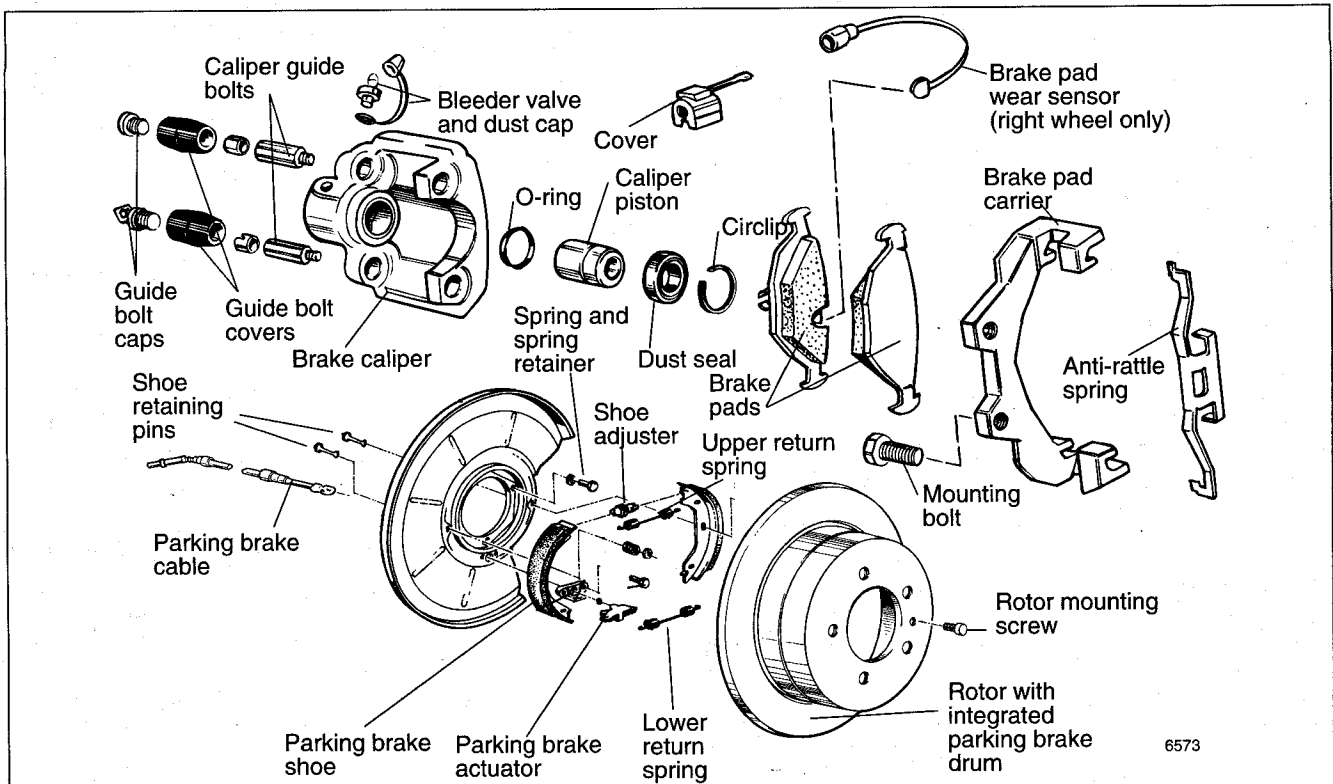


Fig. 7. Rear brake caliper assembly.

## Brake caliper, removing and installing

1. Raise car and remove wheel.

**WARNING —**  
Make sure the car is firmly supported on jack stands designed for the purpose.

2. Loosen brake hose fitting at caliper. Do not remove.
3. Remove caliper mounting bolts from steering arm (front caliper) or from trailing arm (rear caliper). See Fig. 8.
4. Press piston back into caliper and slide caliper off brake rotor. Spin caliper off brake hose.
5. Inspect brake caliper for signs of leakage. Check that caliper piston slides smoothly into caliper. Replace caliper if any faults are found.
6. Installation is reverse of removal. Bleed entire brake system before driving car. See **Bleeding Brakes**.

### Tightening Torques

- Front brake caliper to steering arm . . 110 Nm (81 ft-lb)
- Rear brake caliper to trailing arm . . . 67 Nm (50 ft-lb)
- Brake fluid hose to caliper . . . 17-19 Nm (13-14 ft-lb)
- Road wheel to hub . . . . . 100±10 Nm (74±7 ft-lb)

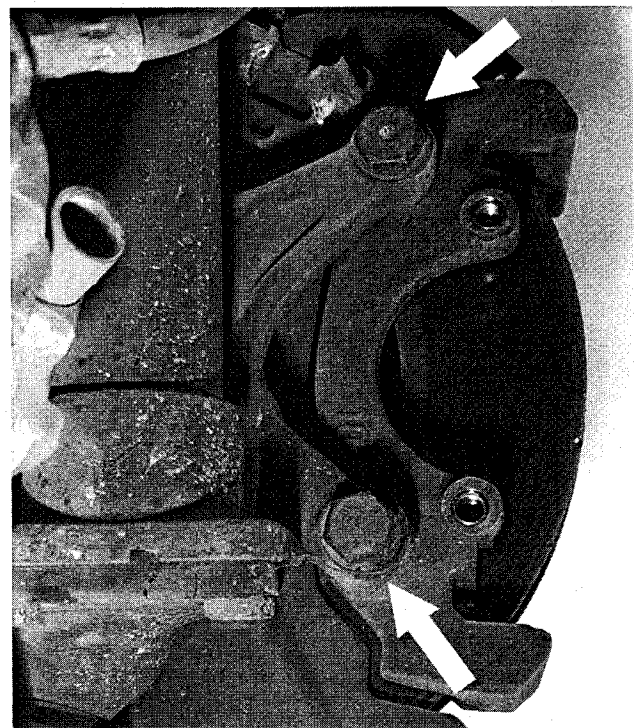


Fig. 8. Front brake pad carrier mounting bolts (arrows). Rear caliper mounting bolts are similar.

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## Brake rotor, removing and installing

Brake rotors should always be replaced in pairs.

### NOTE —

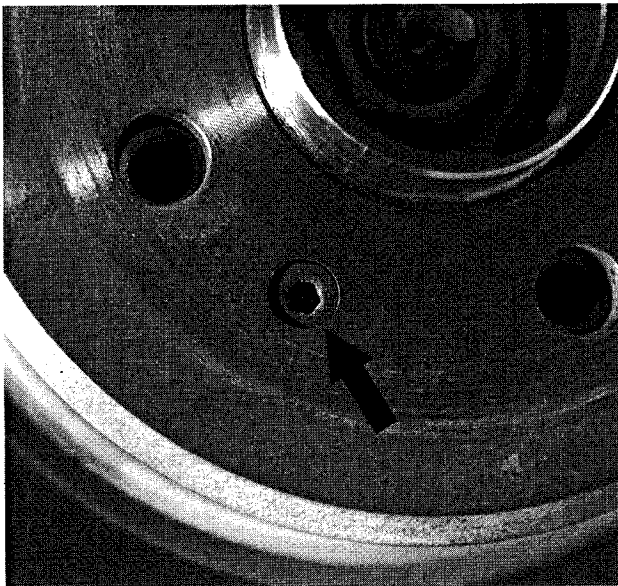
M3 models use directional brake rotors and must be installed on the proper side. Part numbers are cast into the rotors. A part that ends in an odd number is a left rotor. One that ends in an even number is a right rotor.

1. Remove caliper as described above and hang from chassis using stiff wire.

### NOTE —

Do not loosen caliper brake hose.

2. Remove mounting screw holding rotor to wheel hub. See Fig. 9.



0011259

Fig. 9. Brake rotor mounting screw (arrow).

3. Inspect rotor for excessive grooving, cracks, and warping. Check rotor thickness. See **Table b**.

### NOTE —

On original equipment rotors, the minimum allowable thickness is stamped on the rotor hub. Measure the rotor braking surface with a micrometer at eight to ten different points and use the smallest measurement recorded.

4. Installation is reverse of removal.

- Clean rotor with brake cleaner before installing.
- If brake fluid hose was removed or loosened, brake system must be bled as described above under **Bleeding Brakes**.

5. Once brake assembly is installed, depress brake pedal several times to adjust caliper and pads.

- Pedal should feel firm and be at proper height.
- Check fluid level. Top up if necessary.

### NOTE —

When installing new rear brake rotors, the parking brake should be adjusted. See **Parking Brake**.

### Tightening Torques

- Brake rotor to wheel hub . . . . . 16 Nm (12 ft-lb)
- Front brake caliper to steering arm. . . 110 Nm (81 ft-lb)
- Rear brake caliper to trailing arm . . . 67 Nm (50 ft-lb)
- Road wheel to hub . . . . . 100 ± 10 Nm (74 ± 7 ft-lb)

Table b. Brake Rotor Reconditioning Specifications

|                                          | Front               | Rear                |
|------------------------------------------|---------------------|---------------------|
| Vented rotor wear limit (min. thickness) | 20.4 mm (0.803 in.) |                     |
| Solid rotor wear limit (min. thickness)  |                     | 8.4 mm (0.331 in.)  |
| M3 models wear limit (min. thickness)    | 26.4mm (0.977 in.)  | 18.4 mm (0.723 in.) |
| Axial runout (max.)                      |                     |                     |
| rotor removed                            | 0.05 mm (0.002 in.) | 0.05 mm (0.002 in.) |
| rotor installed                          | 0.20 mm (0.008 in.) | 0.20 mm (0.008 in.) |

### CAUTION —

M3 brake rotors must not be machined.

## MASTER CYLINDER

The brake master cylinder is mounted to the front of the vacuum booster on the driver side bulkhead.

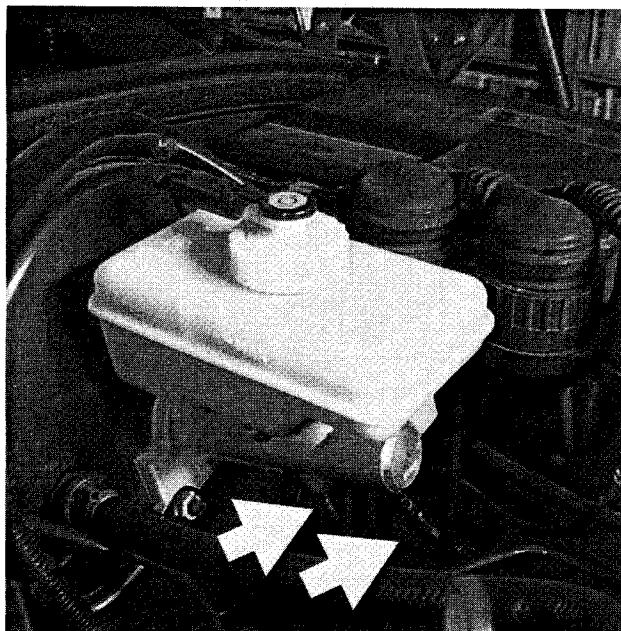
### Master cylinder, removing and installing

1. Using a clean syringe, empty brake fluid reservoir.

### WARNING —

Brake fluid is highly corrosive and dangerous to the environment. Dispose of it properly.

2. Disconnect brake fluid level sender connector from fluid reservoir cap.
3. Disconnect brake fluid lines from master cylinder. See Fig. 10. Disconnect hydraulic clutch system supply line.
4. Unscrew mounting nuts and remove master cylinder from brake booster.
5. Make sure all nuts, fluid couplings, thread bores, and mating surfaces are clean.



0012164

**Fig. 10.** Brake fluid lines at master cylinder (arrows).

6. If fluid reservoir was removed, install it carefully using new sealing grommets.
7. Mount master cylinder to brake booster using a new O-ring and new self-locking nuts.

**CAUTION —**

*Use care not to over-torque the master cylinder mounting nuts. This could damage the brake booster and prevent proper vacuum build-up.*

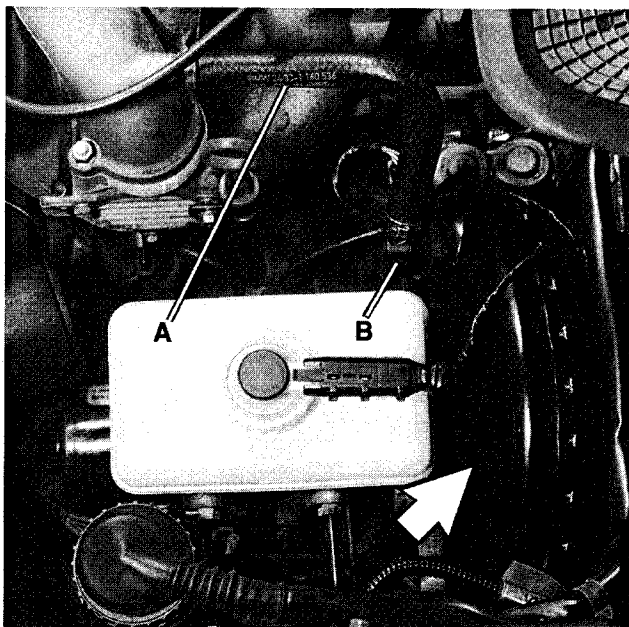
8. Connect all brake fluid lines. Connect hydraulic clutch hose to brake fluid reservoir.
9. Reconnect fluid level sender, and bleed entire brake system as described earlier.

**Tightening Torque**

- Brake master cylinder to brake booster ..... 26 Nm (18 ft-lb)
- Brake fluid hose to caliper .... 17-19 Nm (13-14 ft-lb)

## BRAKE BOOSTER

The brake booster is mounted to the bulkhead on the driver side of the engine compartment, directly behind the brake master cylinder. See Fig. 11.



0013225

**Fig. 11.** Brake booster (arrow). **A** is vacuum hose from intake manifold. **B** is one-way valve. Intake manifold vacuum acts on a large diaphragm in the brake booster to reduce brake pedal effort.

## Brake booster, removing and installing

1. Disconnect negative (–) cable from battery.

**CAUTION —**

*Prior to disconnecting the battery, read the battery disconnection cautions given at the front of this manual on page viii.*

2. Using a clean syringe, empty brake fluid reservoir.

**WARNING —**

*Brake fluid is highly corrosive and dangerous to the environment. Dispose of it properly.*

3. Remove brake fluid level sender connector from reservoir cap.
4. Disconnect brake fluid lines from master cylinder. Plug openings.
5. Disconnect engine vacuum hose from brake booster.

6. Disconnect ABS electrical connectors. Label and then disconnect brake lines from hydraulic brake unit. Plug openings. See Fig. 12.

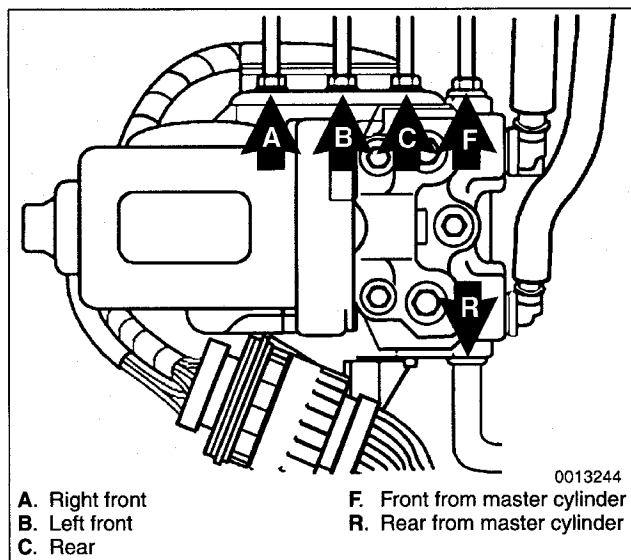


Fig. 12. Brake fluid lines at ABS hydraulic unit.

**WARNING —**

• On cars with All Season Traction (AST), special BMW service equipment is required to properly bleed the Antilock Brake System (ABS). Removal of the ABS hydraulic unit is not recommended unless this equipment is available. For safety reasons, the brake system on cars with ABS must not be bled using the procedures described in this repair group.

• Do not mix up the fluid lines at the ABS hydraulic unit. Label all connections before disconnecting.

7. Remove ABS hydraulic unit from engine compartment.
8. Working inside car, remove panel(s) from beneath steering column to access pedal assembly. See **513 Interior Trim**.
9. Remove clip and clevis pin from brake booster pushrod and disconnect it from brake pedal. Remove brake booster mounting nuts. See Fig. 13.
10. Working in engine compartment, remove brake booster together with master cylinder.
11. If booster or master cylinder O-ring is being replaced, disconnect master cylinder from brake booster.
12. Make sure all nuts, fluid couplings, thread bores and mating surfaces are clean.

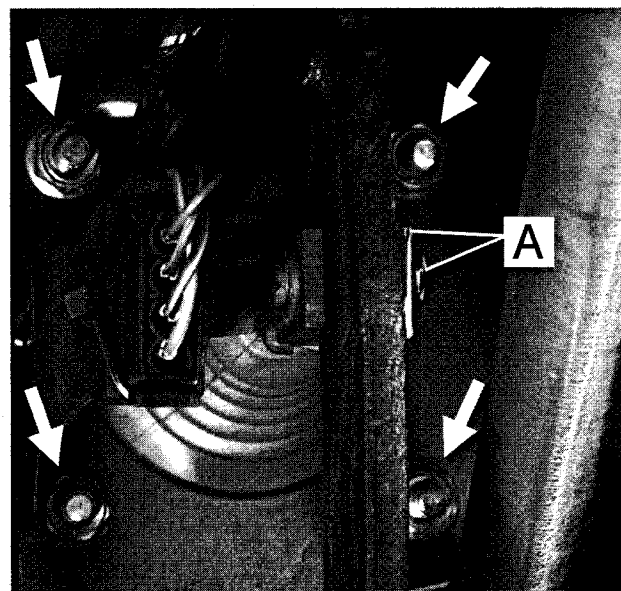


Fig. 13. Brake pedal clevis pin and retaining clip (A). Brake booster mounting nuts shown at arrows.

13. If necessary, mount master cylinder to vacuum booster using a new O-ring and new self-locking nuts.

**CAUTION —**

Do not over-torque the master cylinder mounting bolts. This could damage the brake booster and prevent proper vacuum build-up.

14. Installation is reverse of removal.
  - Bleed brakes as described earlier.
  - Check and, if necessary, adjust brake light switch above brake pedal.

**Tightening Torques**

- Brake master cylinder to brake booster . . . . . 26 Nm (18 ft-lb)
- Brake booster to bulkhead . . . . . 22 Nm (16 ft-lb)
- Brake fluid line to master cylinder or ABS hydraulic unit . . . . . 17-19 Nm (13-14 ft-lb)

**NOTE —**

When replacing the brake booster one-way valve or vacuum hose, install the valve so that the molded arrow is pointing toward the intake manifold. Use new hose clamps.

## PARKING BRAKE

The parking brake is a brake drum system integrated into the rear brake rotors. See Fig. 14.

Adjustment of the shoes may be necessary compensate for wear. The parking brake should also be adjusted any time the cable, the rear brake rotor, or the parking brake shoes are replaced.

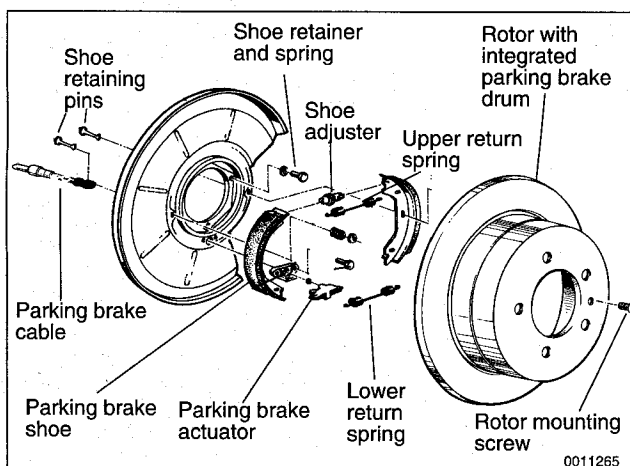


Fig. 14. Parking brake shoe assembly.

### Parking brake, adjusting

The parking brake can be adjusted with the wheels installed, although the rear wheels will have to be raised off the ground.

1. Lift parking brake lever boot out of console. While holding cables stationary, loosen parking brake cable nuts until cables are completely slack. See Fig. 15.
2. Raise rear of car.

#### **WARNING —**

*Make sure the car is firmly supported on jack stands designed for the purpose. Place the jack stands beneath a structural chassis point. Do not place jack stands under suspension parts.*

3. Remove one lug bolt from each rear wheel. Turn road wheel until lug bolt hole lines up with parking brake adjuster (approximately 65° to rear of wheel centerline). See Fig. 16.
4. Using a screwdriver, turn adjuster to expand brake shoes until road wheel can no longer turn, then back adjuster off. Repeat procedure on other rear wheel.

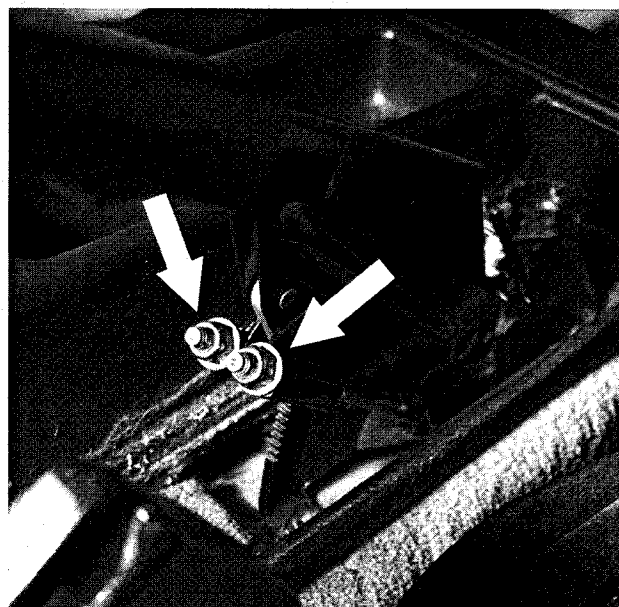


Fig. 15. Parking brake cable adjusting nuts (arrows).

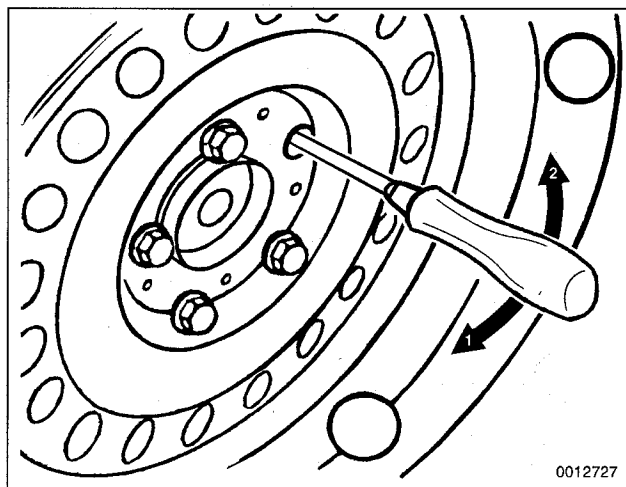


Fig. 16. Access parking brake shoe adjuster approximately 65° to rear of vertical. Use flat-bladed screwdriver to turn adjuster. On left wheel, turn adjuster in direction 1 to expand shoes. On right wheel, turn adjuster in direction 2 to expand shoes.

#### **Parking Brake Adjusting (initial)**

- Back off adjuster through wheel lug bolt hole  
ex. M3 models ..... 18 notches  
M3 models ..... 8 notches

5. Working inside car, set parking brake several times to seat cable. Then pull parking brake lever up four notches. Tighten cable adjusting nuts until it is just possible to turn rear wheels with slight resistance.
6. Release lever and make sure rear wheels turn freely.

### PARKING BRAKE

7. Turn on ignition. Check that light comes on as soon as lever is pulled up.
8. Install parking brake lever boot. Install road wheel lug bolts.

#### Tightening Torque

- Road wheel to hub . . . . . 100±10 Nm (74±7 ft-lb)

### Parking brake shoes, removing and installing

1. Raise rear of car and remove road wheels.

#### WARNING —

Make sure the car is firmly supported on jack stands designed for the purpose. Place the jack stands beneath a structural chassis point. Do not place jack stands under suspension parts.

2. Without disconnecting brake fluid hose, remove rear brake calipers from trailing arms. Remove rear brake rotors. See **Brake Pads, Calipers and Rotors**.

#### CAUTION —

Do not let the brake caliper assembly hang from the brake hose. Support caliper from chassis with strong wire.

3. Unhook upper return spring from brake shoes. Remove shoe retainers by pushing them in and rotating ¼ turn. BMW special tool no. 34 4 000 can be used to remove retainers, if needed.
4. Spread shoes apart and lift them out.

#### NOTE —

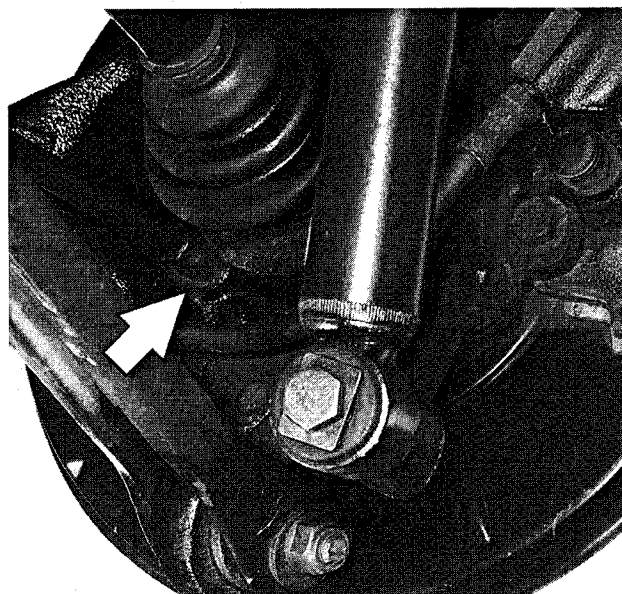
When removing the brake shoes the shoe expander pivot pin in the brake actuator may fall out.

5. Inspect shoe expander to make sure it functions properly. Apply a thin coat of grease to sliding parts and pins.
6. Installation is reverse of removal. Be sure to adjust parking brake cables as described earlier.

### Parking brake cable, replacing

1. Raise rear of car and remove road wheels.
2. Remove rear brake caliper and rotor. See **Brake Pads, Calipers and Rotors**.
3. Working inside car, lift parking brake lever boot out of console. Remove cable adjusting nut. Refer to Fig. 15.

4. Remove parking brake shoes as described above.
5. Disconnect cable from parking brake actuator and then remove parking brake cable from cable holder on trailing arm. See Fig. 17.



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Fig. 17. Parking brake cable insertion point in rear trailing arm (arrow).

6. Slide cable out of housing.

#### NOTE —

On some models it may be necessary to remove rear muffler to access the brake cable(s).

7. Installation is reverse of removal. Adjust parking brake as described earlier.

### ANTILOCK BRAKE SYSTEM (ABS)

Two versions of the Antilock Brake System (ABS) are installed on the cars covered by this manual. Early cars use the Teves Mark IV G ABS. Later cars use the Teves Mark 20-I ABS. The main difference between the two systems is that the Mark 20-I system integrates the ABS control module into the hydraulic unit as a single component.

ABS is designed to be maintenance free. There are no adjustments that can be made to the system. Repair and troubleshooting of the major ABS components requires special test equipment and knowledge and should be done by an authorized BMW dealer.

ABS is self-tested by the ABS diagnostic unit each time the car is started. Once the test is complete, the ABS dashboard light turns off. If the light remains lit or comes on at any time during driving, a system fault has occurred and ABS is electronically disabled. The conventional braking system remains fully functioning.

## ABS Inspection

A visual inspection of the ABS may help to locate system faults. If no visual faults can be found and the ABS light remains on, have the system diagnosed by an authorized BMW dealer.

Carefully inspect the entire ABS wiring harness, particularly the pulse sensor harnesses and connectors near each wheel. Look for chafing or damage due to incorrectly routed wires.

Carefully remove the wheel speed sensors. Clean the sensor tips. Inspect the toothed wheel on the wheel hub. Check for missing, clogged or corroded teeth, or other damage that could alter the clearance between the sensor tip and the toothed wheel.

### NOTE —

*If a toothed ring is damaged, the entire wheel hub must be replaced. See 310 Front Suspension or 330 Rear Suspension.*

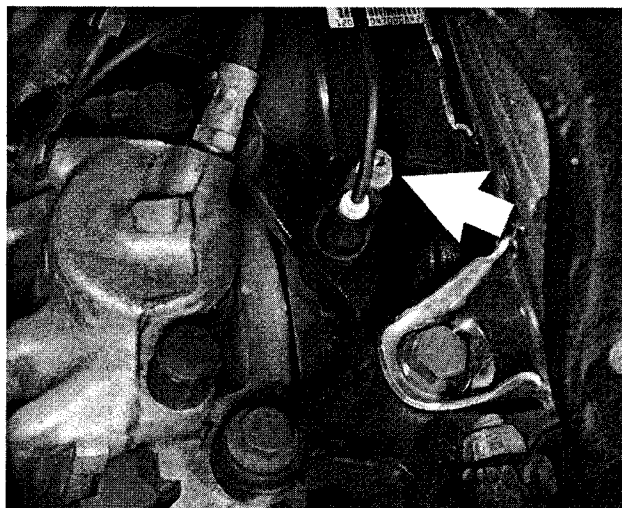
## ABS wheel speed sensors, replacing

1. Raise applicable end of car.

### WARNING —

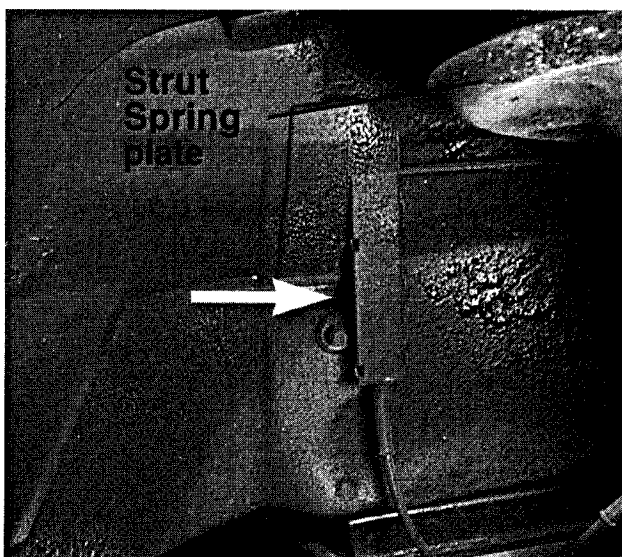
*Make sure the car is firmly supported on jack stands designed for the purpose. Place the jack stands beneath a structural chassis point. Do not place jack stands under suspension parts.*

2. Unscrew wheel speed sensor mounting bolt. Remove sensor from its housing. See Fig. 18. Remove harness from retaining mounts.
3. Front ABS sensor: Working in front wheel housing, disconnect and remove sensor. See Fig. 19.
4. Rear ABS sensor: Working in rear wheel housing, disconnect and remove sensor.
5. During installation, apply thin coat of Molykote® Long-term 2 or an equivalent grease to pulse sensor and housing.



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Fig. 18. Front ABS pulse sensor mounting bolt (arrow).



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Fig. 19. Front ABS wheel speed electrical connector (arrow) in wheel well.

6. Installation is reverse of removal.

