SECTION 5B1

FRONT DISC BRAKES

CAUTION: When servicing brake parts, do not create dust by grinding or sanding brake linings, or by cleaning brake parts with a dry brush or compressed air. Many brake parts contain asbestos fibers which can become airborne if dust is created during servicing. Breathing dust containing asbestos fibers may cause serious bodily harm. A water dampened cloth or water based solution should be used to remove any dust on brake parts. Equipment is commercially available to perform this washing function. These wet methods will prevent asbestos fibers from becoming airborne.

NOTICE: Always use the correct fastener in the proper location. When you replace a fastener, use ONLY the exact part number for that application. General Motors will call out those fasteners that require a replacement after removal. General Motors will also call out the fasteners that require thread lockers or thread sealant. UNLESS OTHERWISE SPECIFIED, do not use supplemental coatings (paints, greases, or other corrosion inhibitors) on threaded fasteners or fastener joint interfaces. Generally, such coatings adversely affect the fastener torque and joint clamping force, and may damage the fastener. When you install fasteners, use the correct sequence and tightening specifications. Following these instructions can help you avoid damage to parts and systems.

NOTICE: Avoid spilling brake fluid on any of the vehicle's painted surfaces, wiring cables or electrical connectors. Brake fluid will damage paint and electrical connections. If any fluid is spilled on the vehicle, flush area with water to lessen damage.

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GENERAL DESCRIPTION

CALIPER

The caliper is mounted on the caliper carrier with two caliper pin bolts. These bolts allow the caliper to move laterally against the brake rotor. The caliper is a one-piece casting with the inboard side containing the piston bore. A square cut rubber seal is located in a groove in the piston bore which provides the hydraulic seal between the piston and the caliper wall.

As the brake pedal is pressed, hydraulic pressure is applied to the caliper piston. This pressure pushes the inboard brake pad against the inboard braking surface of the rotor. As the force increases against the rotor, the caliper assembly moves inboard and provides a clamping action on the rotor.

When the brake pedal is released, the piston seal returns to its original position, pulling the piston back into the caliper bore. This will create a running clearance between the inner brake pad and the rotor.

Important

- Replace all components included in the repair kit used to service braking components.
- Lubricate rubber parts with clean brake fluid to ease in assembly.
- Do not use lubricated shop air on brake parts. The lubricant will cause damage to the rubber seals and components.

- If any hydraulic component is removed or disconnected, it will be necessary to bleed all or part of the brake system. For vehicle without the optional Antilock Braking System (ABS), refer to SECTION 5 for brake system bleeding procedures. For vehicle equipped with ABS, refer to SECTION 5E1 for brake system bleeding procedures.
- Always replace brake pads in axle sets.

DIAGNOSIS

BRAKE PAD INSPECTION

Figure 1

Inspect the brake pad every 9,600 km (6,000 miles) and any time the wheels are removed (tire rotation, etc.). Check both ends of the outer pad by looking through the brake pad inspection hole in the caliper (Figure 1). These are the points where the highest rate of wear normally occurs. At the same time, check the thickness of the inner pad to ensure that it has not worn prematurely. Replace pads if minimum thickness has been exceeded.

PAD	LINING MATERIAL THICKNESS
NEW	10.0 mm (0.39 in.)
MINIMUM	2.5 mm (0.10 in.)

BRAKE ROTOR INSPECTION

Brake Rotor Tolerance and Surface Finish

In the manufacturing of brake rotors, tolerances of the braking surfaces for flatness, thickness variations and lateral runout are held very closely. The maintenance of close tolerances on the shape of braking surfaces is necessary to prevent roughness in braking performance.

In addition to these tolerances, the surface's finish must be held to a specified range. The control of the braking surface finish is necessary to avoid pulls, erratic performance and to extend lining life.

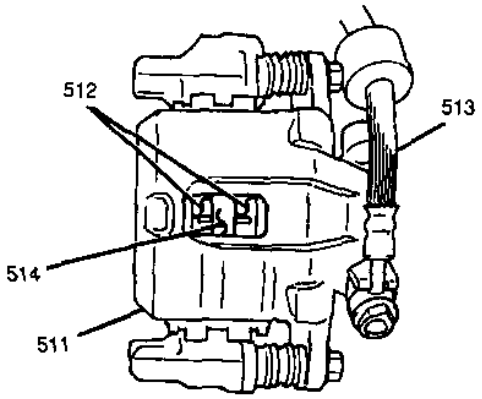
Light scoring of the rotor surfaces not exceeding 0.38 mm (0.015 in.) in depth (which may result from normal use) will not affect brake operation.

Thickness Variation Check

Figure 2

Tool Required:
J 26900-1 Outside Micrometer

Thickness variation can be checked by measuring the thickness of the rotor at four or more points around its circumference with a J 26900-1. All measurements must be made at the same distance in from the edge of the rotor.



511 CALIPER
512 BRAKE PADS
513 BRAKE HOSE
514 BRAKE ROTOR

EJS0155B1

Figure 1—Brake Pad Inspection Hole

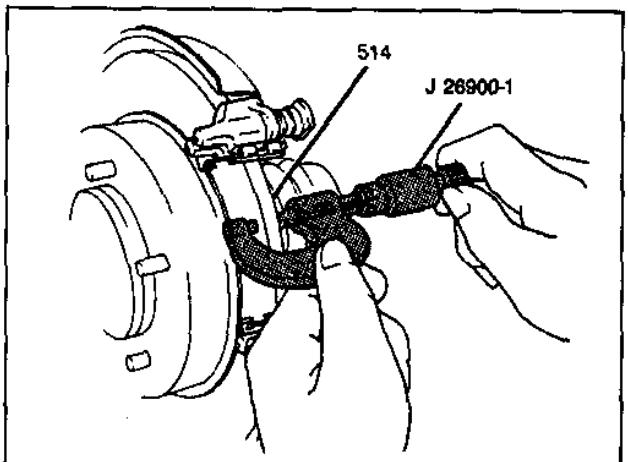
A rotor that varies by more than 0.013 mm (0.0005 in.) can cause pedal pulsation and/or front end vibration during brake applications. A rotor that does not meet these specifications should be refinished to specifications or replaced.

Lateral Runout Check

Figure 3

Tools Required:
J 8001 Dial Indicator Set
J 26900-13 Magnetic Base

1. Raise and suitably support vehicle. Refer to SECTION 0A.
2. Remove wheel and tire assembly. Refer to SECTION 3E.
3. Remove caliper. Refer to "Caliper" under "On-Vehicle Service" later in this section.



514 BRAKE ROTOR

EJS0165B1

Figure 2—Measuring Rotor Thickness

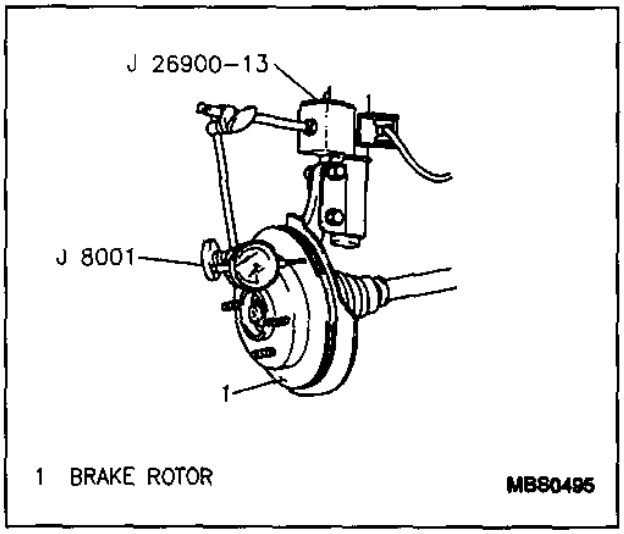


Figure 3—Measuring Rotor Lateral Runout

4. Invert and install all four wheel nuts to retain brake rotor.
5. Fasten a J 26900-13 and a J 8001 to the strut so that the indicator button contacts the brake rotor about 10 mm (0.39 in.) from the rotor edge (Figure 3).
6. Zero the J 8001.
7. Move the rotor one complete revolution and observe the total indicated runout.

Measure

- If lateral runout exceeds 0.15 mm (0.006 in.), clean wheel hub and rotor mating surfaces and measure again. If lateral runout still exceeds specifications, index the rotor on the hub one or two bolt positions from the original position. If the lateral runout cannot be corrected by indexing the rotor, check the hub and bearing assembly for excessive play. If hub and bearing assembly are within specifications, refer to "Brake Rotor Tolerance and Surface Finish" earlier in this section. A rotor that does not meet the lateral runout specification should be refinished or replaced as necessary.

ON-VEHICLE SERVICE

CALIPER

Figures 4, 5 and 6

Remove or Disconnect

1. Siphon two-thirds of the brake fluid from the *master cylinder fluid reservoir.*
2. Raise and suitably support vehicle. Refer to SECTION 0A.
3. Wheel. Refer to SECTION 3E.
4. Position C-clamp around the outer pad and caliper and tighten until the piston bottoms in its bore.
5. Brake hose union bolt (Figure 5). Place a container beneath brake hose to catch escaping brake fluid. Discard the two union fitting washers.
6. Two caliper pin bolts (Figure 6).
7. Caliper assembly from vehicle.
8. Inboard anti-noise shim from caliper (if required).

Install or Connect

1. Inboard anti-noise shim to caliper (if removed).
2. Caliper assembly to vehicle; *secure with two* caliper pin bolts.

Tighten

- Caliper pin bolts to 27 N.m (20 lbs. ft.).

3. Brake hose union bolt with two new union fitting washers.

Tighten

- Brake hose union bolt to 23 N.m (17 lbs. ft.).

4. Wheel. Refer to SECTION 3E.
5. Lower vehicle.
6. Fill master cylinder fluid reservoir. Refer to SECTION 5.
7. Bleed brake system. Refer to SECTION 5 (SECTION 5E1 if equipped with ABS).

BRAKE PADS

Figures 4, 7, 8 and 9

Remove or Disconnect

1. Siphon two-thirds of the brake fluid from the master cylinder fluid reservoir.
2. Raise and suitably support vehicle. Refer to SECTION 0A.
3. Wheel. Refer to SECTION 3E.
4. Position C-clamp around the outer pad and caliper and tighten until the piston bottoms in its bore.
5. Brake hose E-clip (Figure 7).
6. Two caliper pin bolts (Figure 6).
7. Caliper assembly from caliper carrier. Suspend caliper with wire to prevent damage to the brake hose (Figure 8).
8. Inboard anti-noise shim from caliper and discard (Figure 4).
9. Outboard anti-noise shim from outboard brake pad and discard (Figure 4).
10. Inboard and outboard brake pads from caliper carrier (Figure 9).
11. Two anti-rattle springs from caliper carrier.

Measure

Tool Required:
J 26900-5 Vernier Caliper

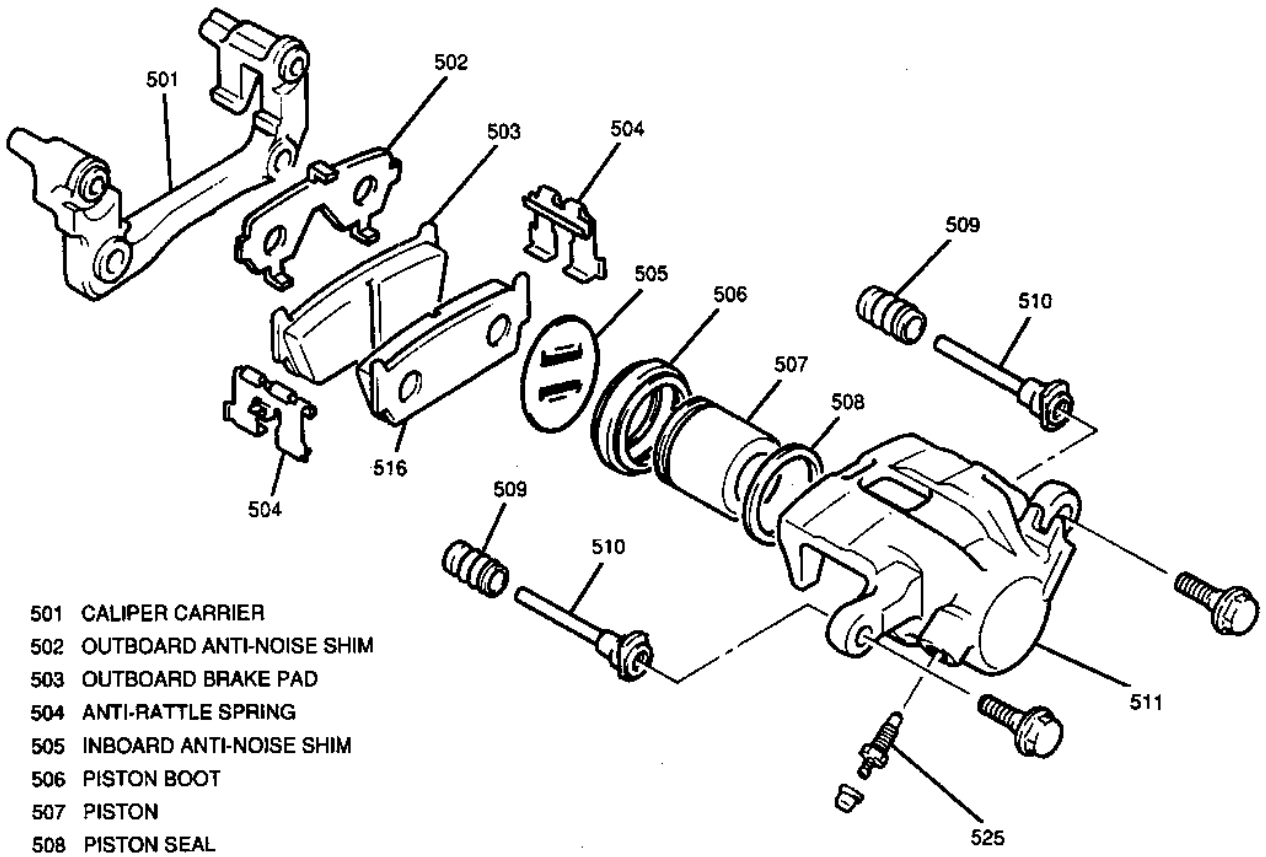


Figure 4—Caliper Assembly

- Brake pads for wear. Using a J 26900-5, measure the thickness of the brake pad and backing plate (Figure 10). If pad thickness does not fall within specification, replace them. On 2-door models, the minimum pad thickness is 6 mm (0.240 in.). On 4-door models, the minimum pad thickness is 7.5 mm (0.295 in.).

Install or Connect

1. Two anti-rattle springs to caliper carrier.
2. New outboard anti-noise shim to outboard brake pad.
3. New inboard anti-noise shim to caliper.
4. Inboard and outboard brake pads to caliper carrier.
5. Caliper assembly to caliper carrier; secure with two caliper pin bolts.

Tighten

- Caliper pin bolts to 27 N.m (20 lbs. ft.).

6. Brake hose E-clip.
7. Wheel. Refer to SECTION 3E.
8. Lower vehicle.
9. Fill master cylinder fluid reservoir. Refer to SECTION 5.

Burnishing Brake Pads and Rotors

After brake pads have been replaced and/or brake rotors have been refinished, it is recommended that the new braking surface be broken in, or burnished. This can be accomplished by making 20 stops from 48 km/h (30 mph), using medium to firm brake pedal pressure. Take care to avoid overheating the brakes.

CALIPER CARRIER

Figures 6 through 11

Remove or Disconnect

1. Siphon two-thirds of the brake fluid from the master cylinder fluid reservoir.

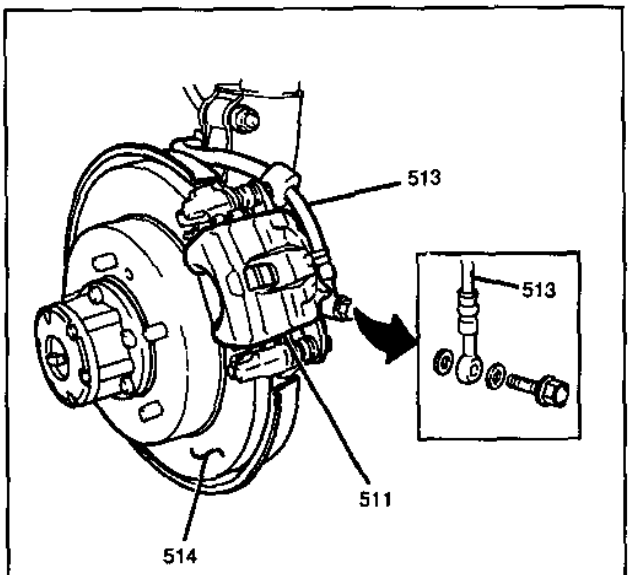


Figure 5—Brake Hose-to-Caliper Connection

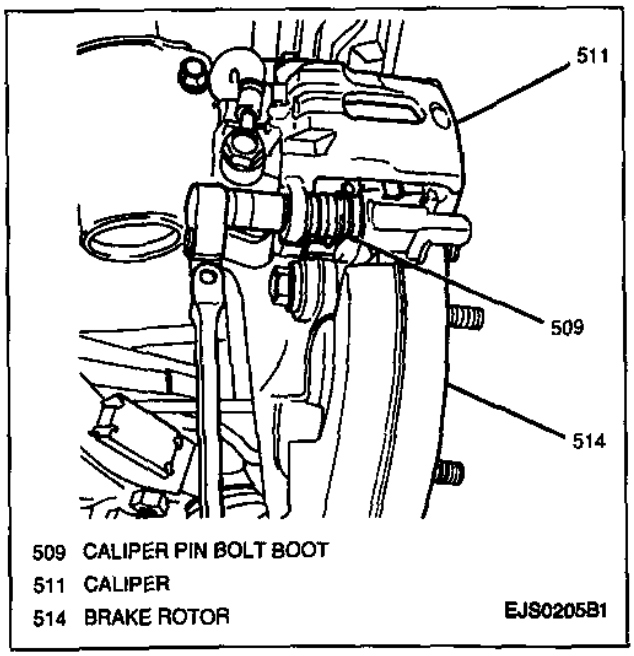


Figure 6—Removing Caliper Pin Bolts

2. Raise and suitably support vehicle. Refer to SECTION 0A.
3. Wheel. Refer to SECTION 3E.
4. Position C-clamp around the outer pad and caliper and tighten until the piston bottoms in its bore.
5. Brake hose E-clip (Figure 7).
6. Two caliper pin bolts (Figure 6).

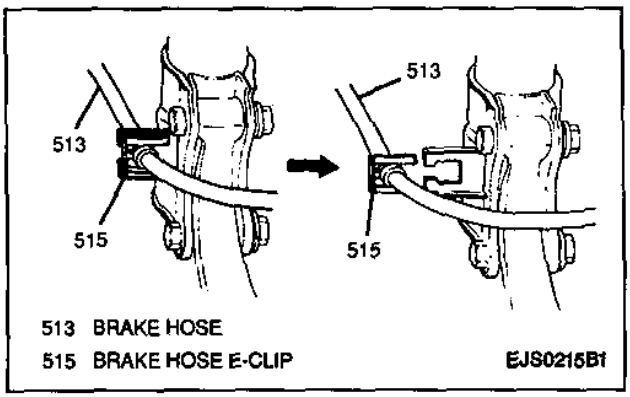


Figure 7—Brake Hose E-Clip

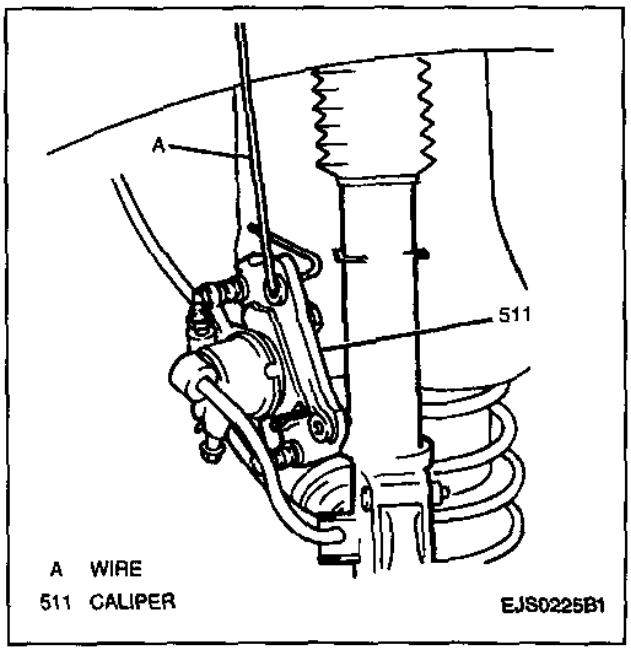


Figure 8—Suspending Caliper

7. Caliper assembly from caliper carrier. Suspend caliper with wire to prevent damage to the brake hose (Figure 8).
8. Inboard and outboard brake pads from caliper carrier (Figure 9).
9. Two anti-rattle springs from caliper carrier.
10. Two mounting bolts and caliper carrier from vehicle (Figure 11).
11. Two caliper pins, with boots, from caliper carrier (if required).

Install or Connect

1. Two caliper pins, with boots, to caliper carrier (if removed).
2. Caliper carrier to vehicle; secure with two mounting bolts.

Tighten

- Caliper carrier mounting bolts to 88 N.m (65 lbs. ft.).

3. Two anti-rattle springs to caliper carrier.

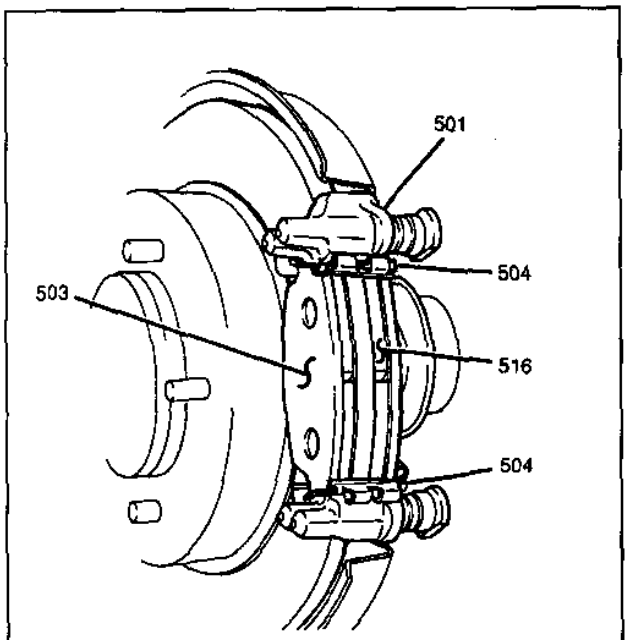


Figure 9—Brake Pads

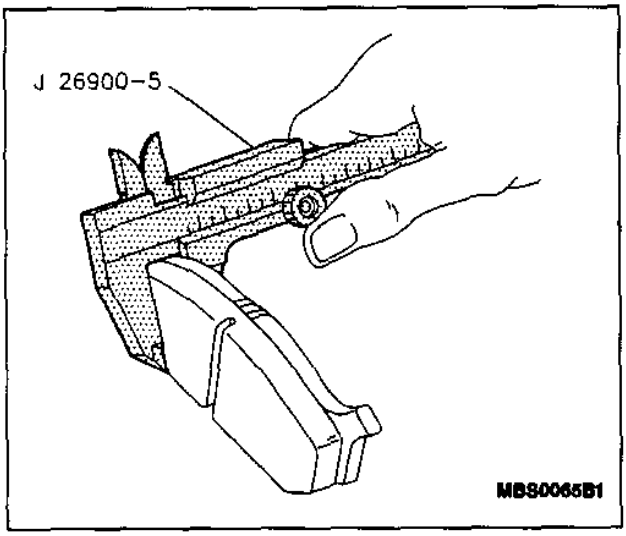


Figure 10—Measuring Pad Thickness

4. Inboard and outboard brake pads to caliper carrier.
5. Caliper to caliper carrier; secure with two caliper pin bolts.

Tighten

- Caliper pin bolts to 27 N.m (20 lbs. ft.).

6. Brake hose E-clip.
7. Wheel. Refer to SECTION 3E.
8. Lower vehicle.
9. Fill master cylinder fluid reservoir. Refer to SECTION 5.

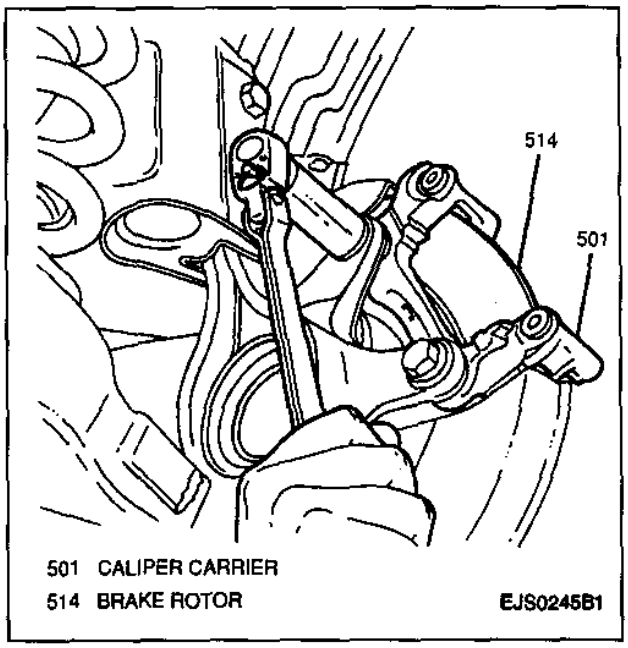


Figure 11—Removing Caliper Carrier Mounting Bolts

BRAKE ROTOR

Figures 2, 3, 8, 12, 13 and 14

Remove or Disconnect

1. Siphon two-thirds of the brake fluid from the master cylinder fluid reservoir.
2. Raise and suitably support vehicle. Refer to SECTION 0A.
3. Wheel. Refer to SECTION 3E.
4. Position C-clamp around the outer pad and caliper and tighten until the piston bottoms in its bore.

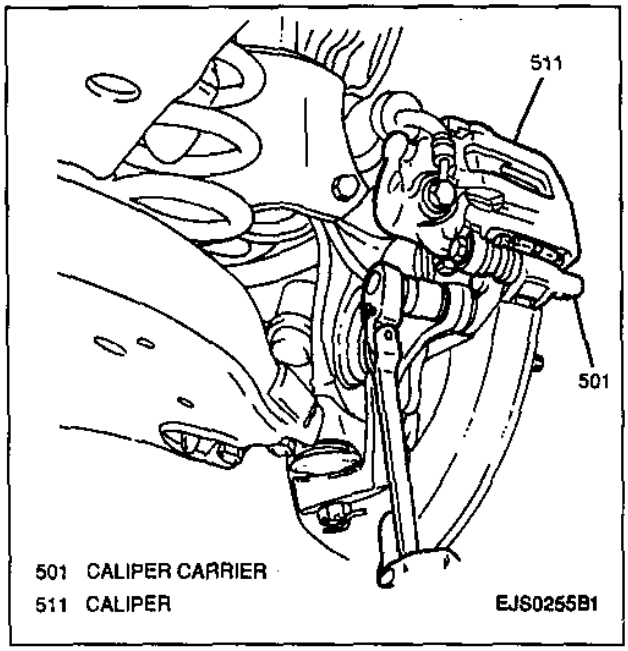


Figure 12—Removing Caliper/Caliper Carrier as an Assembly

5. Brake hose E-clip.
6. Two caliper carrier mounting bolts (Figure 12).
7. Lift caliper/caliper carrier, along with brake pads, off of brake rotor (Figure 13).
8. Suspend caliper/caliper carrier with a wire to prevent damage to the brake hose (Figure 8).

Measure

Tools Required:
J 8001 Dial Indicator Set
J 26900-1 Outside Micrometer
J 26900-13 Magnetic Base

1. Disc brake rotor lateral runout using a J 8001 and a J 26900-13 (Figure 3). If lateral runout exceeds 0.15 mm (0.006 in.), the rotor must be machined to bring within specification.
2. Disc brake rotor thickness using a J 26900-1 (Figure 2). On 2-door models, if rotor thickness is less than 8.0 mm (0.315 in.), the rotor must be replaced. On 4-door models, if rotor thickness is less than 15.0 mm (0.590 in.), the rotor must be replaced.
3. Brake rotor from wheel hub. If rotor cannot be removed by hand, install two 8 mm bolts into rotor. Tightening the bolts will force rotor off of wheel hub (Figure 14).

Install or Connect

1. Brake rotor to wheel hub.
2. Caliper/caliper carrier into position; secure with two caliper carrier mounting bolts.

Tighten

- Caliper carrier mounting bolts to 88 N.m (65 lbs. ft.).

3. Brake hose E-clip.
4. Wheel. Refer to SECTION 3E.
5. Lower vehicle.
6. Fill master cylinder fluid reservoir. Refer to SECTION 5.

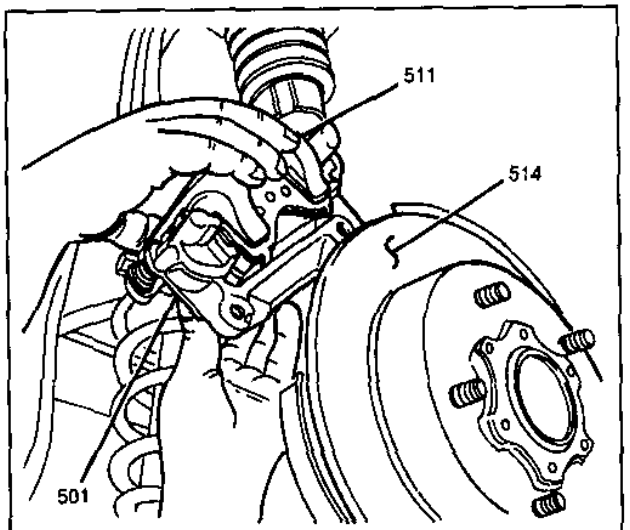


Figure 13—Removing Caliper/Caliper Carrier from Brake Rotor

UNIT REPAIR

REFINISHING BRAKE ROTORS

Do not refinish brake rotors when performing routine brake maintenance such as replacing worn disc brake pads. Refinish a rotor only under the following circumstances:

- There is a complaint of brake pulsation.
- There are heat spots or excessive scoring.

All brake rotors have a minimum thickness dimension cast into them. This dimension is the minimum wear dimension and not a refinish dimension. Do not use a brake rotor that will not meet the specifications. If the rotor thickness will be less than 8.0 mm (0.315 in.) after refinishing, the rotor must be replaced. A rotor which has been refinished too thin will not have proper heat transfer capabilities.

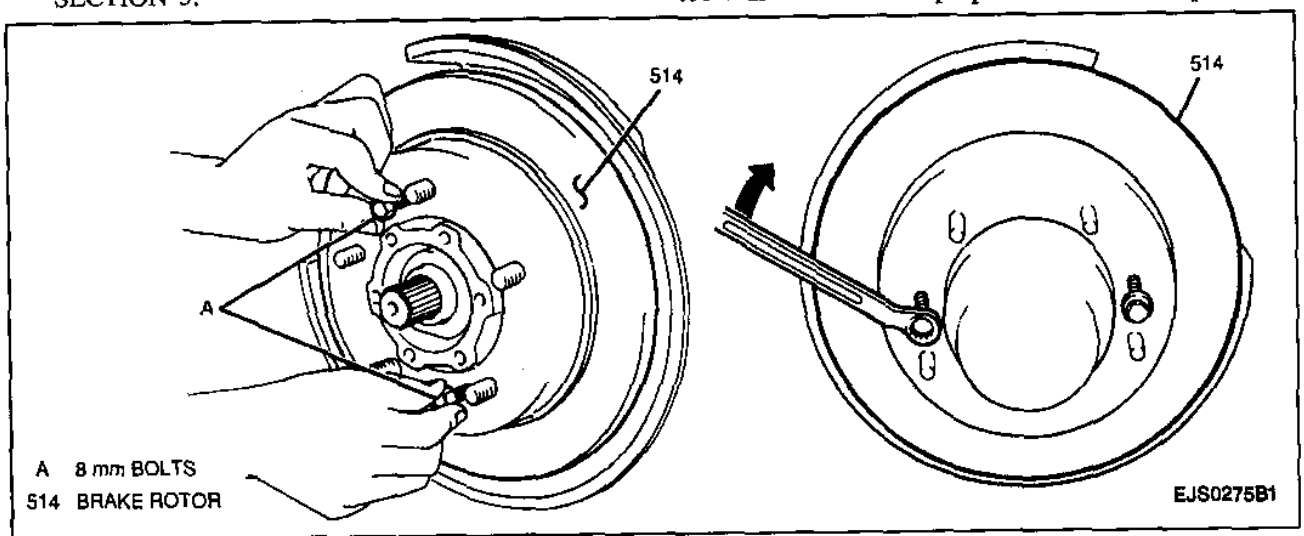


Figure 14—Removing Brake Rotor

Accurate control of the rotor tolerances is necessary for proper performance of the disc brakes. Machining of the rotor should be done only with precision equipment. Machining equipment should be serviced on a regular basis following the manufacturer' s recommended maintenance procedure.

When refinishing rotors, the attaching adapters, tool holders, vibration dampeners and tool bits must be in good condition. Always use sharp cutting tools or bits and use only replacement cutting bits recommended by the equipment manufacturer. Dull or worn tools leave a poor surface finish which will affect initial braking performance. Vibration dampening attachments should always be used when refinishing braking surfaces. These attachments eliminate tool chatter and will result in better surface finish. Make sure these adapters are clean and free of nicks.

Off-Vehicle Procedure

Locate the deepest score and turn the rotor micrometer knobs until the tool bit bottoms out at the deepest point of the score. Zero the scale and back out the tool bits. Advance the cutter handwheel until the bits have cleared the inner edge of the rotor face. Adjust the micrometer knobs for approximately 0.0127 mm (0.0005 in.) more than the first reading. This will ensure clearing the rotor in one cut.

The optimum speed for refinishing braking surfaces is a spindle speed of 200 rpm. Crossfeed for rough cutting should range from 0.15 to 0.25 mm (0.006 to 0.010 in.) per revolution. Finish cuts should be made at crossfeed no greater than 0.05 mm (0.002 in.) per revolution.

It is very important that the rotor surface be made nondirectional by dressing the rotor surfaces with a sanding disc power tool such as Ammco 8350 Safe Swirl Disc Rotor Grinder, or equivalent, using 120 grit aluminum oxide sandpaper. Sand each rotor surface with moderate pressure for a minimum of 60 seconds. An alternate method is to use a sanding block with 150 grit aluminum oxide sandpaper. With the rotor turning at approximately 150 rpm, sand each rotor surface for a minimum of 60 seconds using moderate pressure. After the rotor has been sanded, clean each surface with denatured alcohol or suitable brake cleaner.

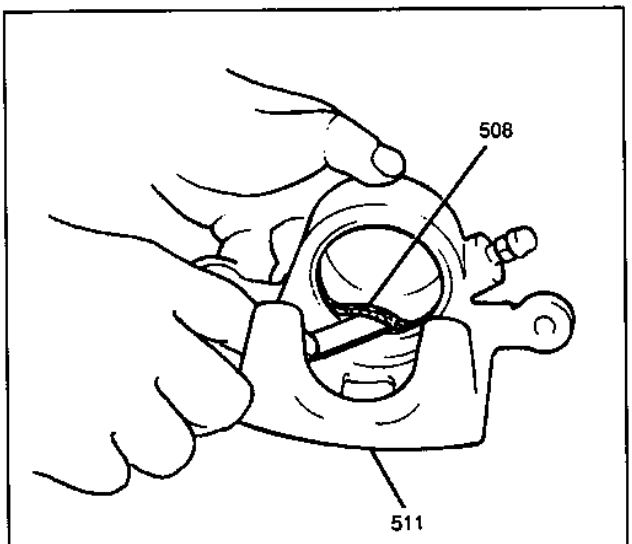
After refinishing rotors, replace any rotor that will not meet a minimum thickness of 8.0 mm (0.315 in.). Do not use a brake rotor that will not meet specifications.

CALIPER

Figures 4, 15, 16 and 17

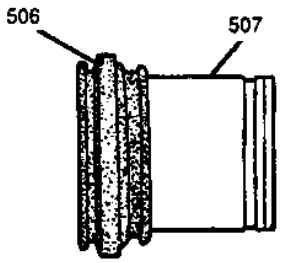
Disassemble

- Insert a block of hard wood into the caliper interior to catch the piston as it is forced out of the bore with compressed air.



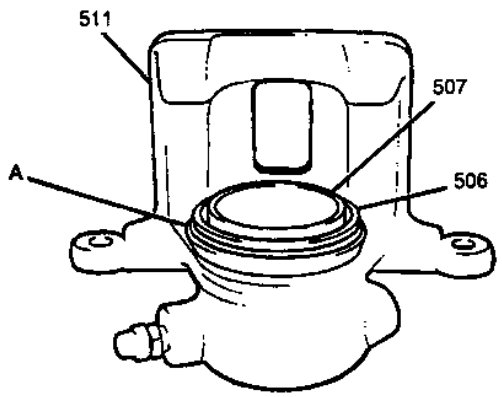
508 PISTON SEAL
511 CALIPER
EJS0285B1

Figure 15—Removing Piston Seal from Caliper



506 PISTON BOOT
507 PISTON
EJS0295B1

Figure 16—Piston with Piston Boot



A PISTON BOOT GROOVE
506 PISTON BOOT
507 PISTON
511 CALIPER
EJS0305B1

Figure 17—Piston Boot Groove

CAUTION: Do not place fingers in front of the piston in an attempt to catch or protect the piston when applying compressed air to the caliper brake hose connector hole. Serious injury could result. Use only enough air to ease the piston out of the bore. If the piston is blown out, even with the block of wood in place, damage may occur.

1. Piston from caliper by applying compressed air to the caliper brake hose connector hole.
2. Rubber boot from caliper groove.
3. Piston seal from caliper (Figure 15).
4. Bleeder valve from caliper.
5. Caliper pin bolts, with boots, from caliper.

Clean

- Bleeder valve, caliper bore, caliper passages and piston with denatured alcohol. Use dry compressed air to dry parts and blow out passages.

Inspect

1. Piston for scoring, corrosion, and any damage to the chrome plating. Replace piston if any of these conditions are observed.
2. Caliper bore for scoring, pitting and corrosion. Use crocus cloth to polish out any light corrosion. If corrosion cannot be removed, replace the caliper.

Assemble

1. New caliper pin bolts and boots into caliper.
2. Bleeder valve to caliper.
3. New piston seal into caliper bore.
4. New piston boot onto piston (Figure 16).
5. Piston into caliper.
6. Fit piston boot onto caliper groove (Figure 17).

SPECIFICATIONS

FASTENER TORQUES

Brake Hose Union Bolt	23 N.m (17 lbs. ft.)
Caliper Pin Bolts	27 N.m (20 lbs. ft.)
Caliper Carrier Mounting Bolts	88 N.m (65 lbs. ft.)

BRAKE PAD LININGS

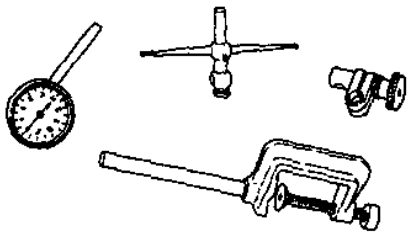
Pad Lining Material Thickness	
2 Door:	
Lining Material Only:	
New	10.0 mm (0.39 in.)
Minimum Thickness	2.5 mm (0.10 in.)
Lining Material Plus Backing Plate:	
New	15.0 mm (0.590 in.)
Minimum Thickness	6.0 mm (0.240 in.)
4 Door:	
Lining Material Only:	
New	10.0 mm (0.39 in.)
Minimum Thickness	2.5 mm (0.10 in.)
Lining Material Plus Backing Plate:	
New	15.5 mm (0.610 in.)
Minimum Thickness	7.5 mm (0.295 in.)

BRAKE ROTOR

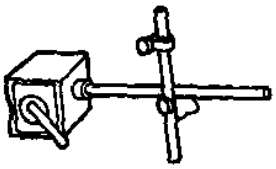
Rotor Thickness:	
2-Door:	
New	10 mm (0.394 in.)
Minimum	8.0 mm (0.315 in.)
4-Door:	
New	17 mm (0.670 in.)
Minimum	15.0 mm (0.590 in.)
Rotor Lateral Runout—Maximum	0.15 mm (0.006 in.)

SPECIAL TOOLS

1
J 8001



2
J 26900-13



3
J 26900-1

1 DIAL INDICATOR SET
2 MAGNETIC BASE
3 OUTSIDE MICROMETER

EJS0315B1