

2006 Chevrolet Impala LS

2006 BRAKES Disc Brakes - Impala

2006 BRAKES**Disc Brakes - Impala****SPECIFICATIONS****FASTENER TIGHTENING SPECIFICATIONS****Fastener Tightening Specifications**

Application	Specification	
	Metric	English
Front Brakes		
• Brake Hose Bolt	54 N.m	40 lb ft
• Brake Rotor Retension Screw	14 N.m	10 lb ft
• Front Caliper Bolts	36 N.m	26 lb ft
• Front Caliper Bracket Bolts	180 N.m	133 lb ft
Rear Brakes		
• Brake Hose Bolt	54 N.m	40 lb ft
• Brake Rotor Retension Screw	14 N.m	10 lb ft
• Rear Caliper Bolts	44 N.m	32 lb ft
• Rear Caliper Bracket Bolts	120 N.m	88 lb ft

DISC BRAKE COMPONENT SPECIFICATIONS**Disc Brake Component Specifications**

Application	Specification	
	Metric	English
Front Brake Pads (16 in and 17 in)		
• Taper	0.15 mm	0.006 in
Front Brake Rotor (16 in)		
• Rotor Diameter	303 mm	11.93 in
• Rotor Discard Thickness	28.6 mm	1.126 in
• Rotor Maximum Allowable Assembled Lateral Runout	0.06 mm	0.002 in
• Rotor Maximum Allowable Scoring	1.50 mm	0.059 in
• Rotor Maximum Thickness Variation	0.025 mm	0.001 in
• Rotor Minimum Allowable Thickness after Refinishing	XX mm	XX in

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• Rotor Thickness (New)	30 mm	1.181 in
Front Brake Rotors (17 in)		
• Rotor Diameter	323 mm	12.72 in
• Rotor Discard Thickness	28.6 mm	1.126 in
• Rotor Maximum Allowable Assembled Lateral Runout	0.06 mm	0.002 in
• Rotor Maximum Allowable Scoring	1.50 mm	0.059 in
• Rotor Maximum Thickness Variation	0.025 mm	0.001 in
• Rotor Minimum Allowable Thickness after Refinishing	29.6 mm	1.165 in
• Rotor Thickness (New)	30 mm	1.181 in
Rear Brake Pads		
• Taper	0.15 mm	0.006 in
Rear Brake Rotor		
• Rotor Diameter	292 mm	11.50 in
• Rotor Discard Thickness	10.5 mm	0.413 in
• Rotor Maximum Allowable Assembled Lateral Runout	0.06 mm	0.002 in
• Rotor Maximum Allowable Scoring	1.50 mm	0.059 in
• Rotor Maximum Thickness Variation	0.025 mm	0.001 in
• Rotor Minimum Allowable Thickness after Refinishing	10.5 mm	0.413 in
• Rotor Thickness (New)	12 mm	0.472 in

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC STARTING POINT - DISC BRAKES

Begin the disc brake system diagnosis with **Diagnostic Starting Point - Hydraulic Brakes** in Hydraulic Brakes. The use of the Diagnostic Starting Point will lead to the identification of the correct procedure for diagnosing the system and where the procedure is located.

BRAKE ROTOR THICKNESS MEASUREMENT

CAUTION: Two different designs of the front brake rotors and front brake pads are used on this vehicle. Do NOT interchange first design and second design parts, or a loss of braking and personal injury could occur.

CAUTION: Refer to Brake Dust Caution in Cautions and Notices.

1. If the inboard friction surface of the brake rotor is not accessible, reposition and support the caliper with the brake pads. Refer to **Brake Pads Replacement - Front** and/or **Brake Pads Replacement - Rear**.
2. Clean the friction surfaces of the brake rotor with denatured alcohol, or an equivalent approved brake cleaner.

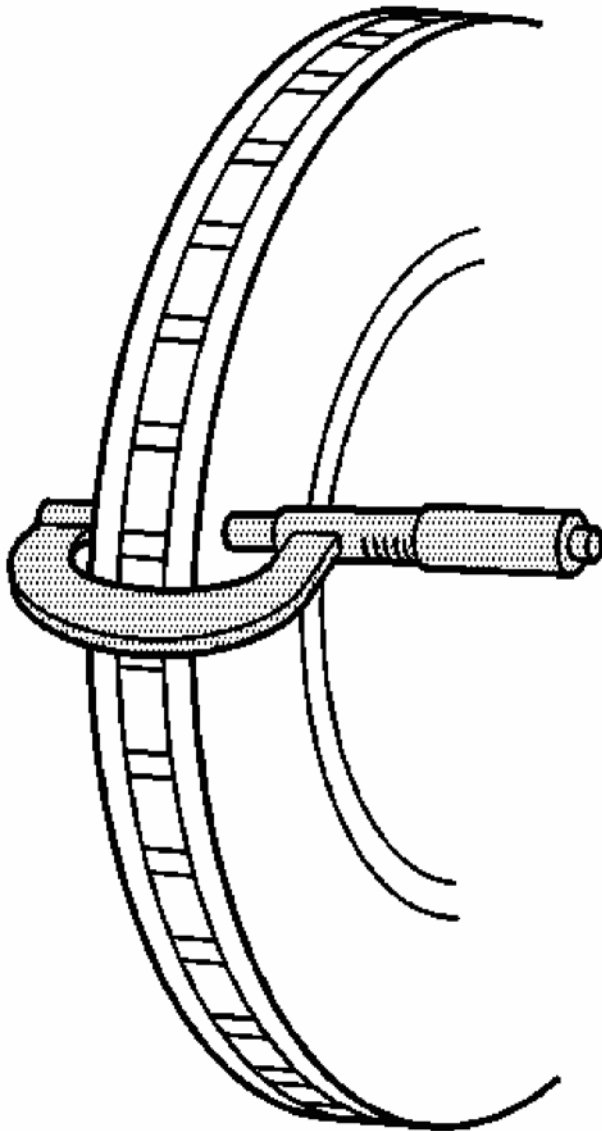


Fig. 1: Measuring Brake Rotor Thickness
Courtesy of GENERAL MOTORS CORP.

3. Using a micrometer calibrated in thousandths-of-a-millimeter, or ten-thousandths-of-an-inch, measure and record the thickness of the brake rotor at four or more points, evenly spaced around the rotor.

Ensure that the measurements are only taken within the friction surfaces and that the micrometer is positioned the same distance from the outer edge of the rotor, about 13 mm (1/2 in), for each measurement.

4. Compare the lowest thickness measurement recorded to the specifications listed in **Disc Brake Component Specifications**.
5. If the lowest thickness measurement of the brake rotor is above the minimum allowable thickness after refinishing specification, the rotor may be able to be refinished, depending upon surface and wear conditions which may be present.
6. If the lowest thickness measurement of the brake rotor is at or below the minimum allowable thickness after refinishing specification, the rotor may not be refinished.
7. If the lowest thickness measurement of the brake rotor is at or below the discard thickness specification, the rotor requires replacement.

BRAKE ROTOR THICKNESS VARIATION MEASUREMENT

CAUTION: Refer to Brake Dust Caution in Cautions and Notices.

IMPORTANT: Any disc brake rotor that exhibits thickness variation exceeding the maximum acceptable level must be refinished or replaced. Thickness variation exceeding the maximum acceptable level can cause brake pulsation.

1. If the inboard friction surface of the brake rotor is not accessible, reposition and support the caliper with the brake pads. Refer to **Brake Pads Replacement - Front** and/or **Brake Pads Replacement - Rear**.
2. Clean the friction surfaces of the brake rotor with denatured alcohol, or an equivalent approved brake cleaner.

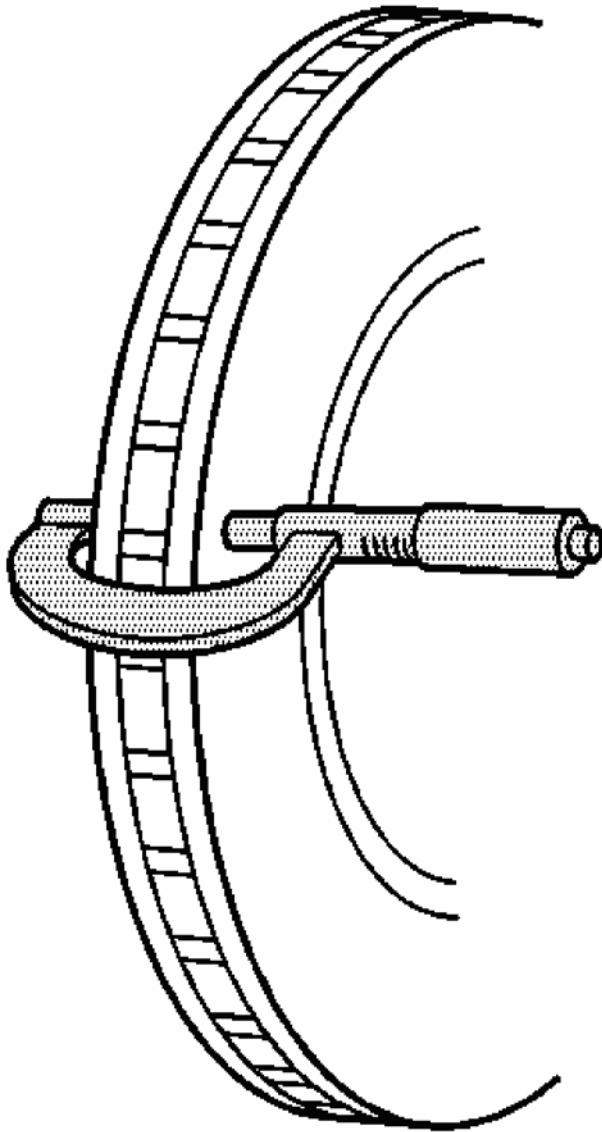


Fig. 2: Measuring Brake Rotor Thickness
Courtesy of GENERAL MOTORS CORP.

3. Using a micrometer calibrated in thousandths-of-a-millimeter, or ten-thousandths-of-an-inch, measure and record the thickness of the brake rotor at four or more points, evenly spaced around the rotor.

Ensure that the measurements are only taken within the friction surfaces and that the micrometer is positioned the same distance from the outer edge of the rotor, about 13 mm (1/2 in), for each measurement.

4. Calculate the difference between the highest and lowest thickness measurements recorded to obtain the amount of thickness variation.
5. Compare the thickness variation measurement to the following specification:

Specification: Brake rotor maximum allowable thickness variation: 0.02 mm (0.001 in)

IMPORTANT: Whenever a brake rotor is refinished or replaced, the assembled lateral runout (LRO) of the rotor must be measured to ensure optimum performance of the disc brakes.

6. If the brake rotor thickness variation measurement exceeds the specification, the rotor requires refinishing or replacement.

BRAKE ROTOR SURFACE AND WEAR INSPECTION

CAUTION: Refer to Brake Dust Caution in Cautions and Notices.

1. If the inboard friction surface of the brake rotor is not accessible, reposition and support the caliper with the brake pads. Refer to Brake Pads Replacement - Front and/or Brake Pads Replacement - Rear.
2. Clean the friction surfaces of the brake rotor with denatured alcohol, or an equivalent approved brake cleaner.
3. Inspect the friction surfaces of the brake rotor for the following Braking Surface Conditions:

- Heavy rust and/or pitting

Light surface rust can be removed with an abrasive disc. Heavy surface rust and/or pitting must be removed by refinishing the rotor.

- Cracks and/or heat spots
- Excessive blueing discoloration

4. If the friction surfaces of the brake rotor exhibit one or more of the Braking Surface Conditions, the rotor requires refinishing or replacement.

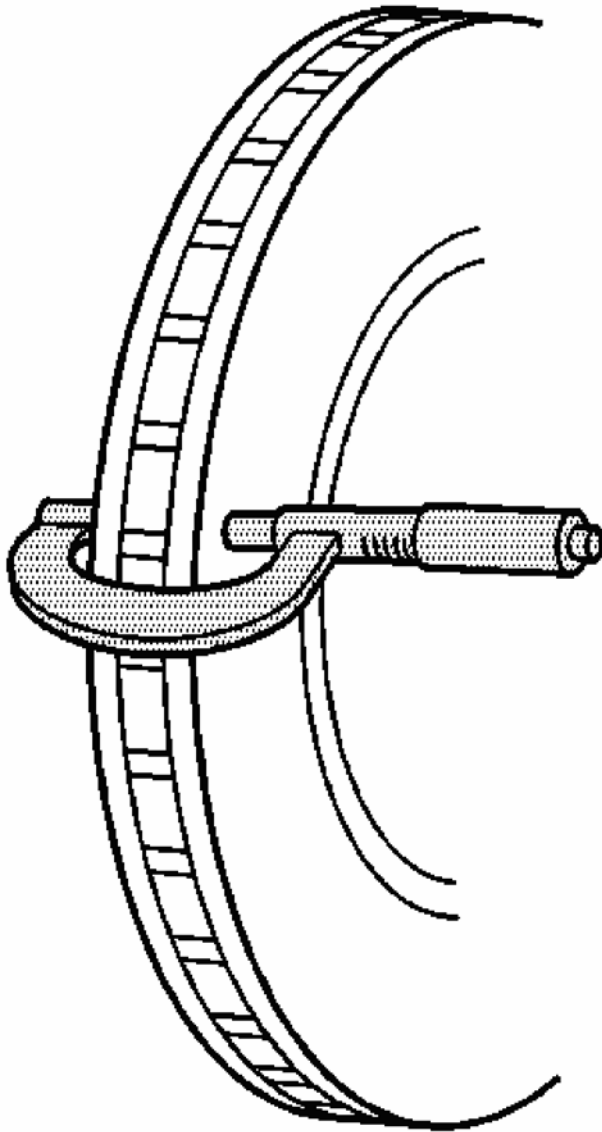


Fig. 3: Measuring Brake Rotor Thickness
Courtesy of GENERAL MOTORS CORP.

5. Using a micrometer calibrated in thousandths-of-a-millimeter, or ten-thousandths-of-an-inch, measure and record the scoring depth of any grooves present on the rotor friction surfaces.
6. Compare the groove scoring depth recorded to the following specification:

Specification: Brake rotor maximum allowable scoring: 1.50 mm (0.059 in)

7. If the brake rotor scoring depth exceeds the specification, or if an excessive amount of scoring is present, the rotor requires refinishing or replacement.

BRAKE ROTOR ASSEMBLED LATERAL RUNOUT (LRO) MEASUREMENT**Tools Required**

- **J 39544-KIT** Torque-Limiting Socket Set, or equivalent. See Special Tools.
- **J 41013** Rotor Resurfacing Kit. See Special Tools.
- **J 42450-A** Wheel Hub Resurfacing Kit. See Special Tools.
- **J 45101** Hub and Wheel Runout Gage. See Special Tools.
- **J 45101-100** Conical Brake Rotor Washers. See Special Tools.

CAUTION: Refer to Brake Dust Caution in Cautions and Notices.

- IMPORTANT:**
- Brake rotor assembled lateral runout (LRO) exceeding the maximum allowable specification can cause thickness variation to develop in the brake rotor over time, usually between 4 800-11 300 km (3,000-7,000 mi).
 - Brake rotor thickness variation **MUST** be checked **BEFORE** checking for assembled lateral runout (LRO). Thickness variation exceeding the maximum acceptable level can cause brake pulsation. Refer to Brake Rotor Thickness Variation Measurement.

1. Matchmark the position of the brake rotor to the wheel studs if this has not been done already.

IMPORTANT: Whenever the brake rotor has been separated from the hub/axle flange, any rust or contaminants should be cleaned from the hub/axle flange and the brake rotor mating surfaces. Failure to do this may result in excessive assembled lateral runout (LRO) of the brake rotor, which could lead to brake pulsation.

2. Inspect the mating surface of the hub/axle flange and the brake rotor to ensure that there are no foreign particles, corrosion, rust, or debris remaining. If the wheel hub/axle flange and/or if the brake rotor mating surfaces exhibit these conditions, perform the following steps:
 1. Remove the brake rotor from the vehicle. Refer to Brake Rotor Replacement - Front and/or Brake Rotor Replacement - Rear.

2. Using the **J 42450-A** , thoroughly clean any rust or corrosion from the mating surface of the hub/axle flange. See **Special Tools**.
3. Using the **J 41013** , thoroughly clean any rust or corrosion from the mating surface of the brake rotor. See **Special Tools**.
4. Clean the friction surfaces of the brake rotor with denatured alcohol, or an equivalent approved brake cleaner.
3. Install the rotor to the hub/axle flange using the matchmark made prior to removal.

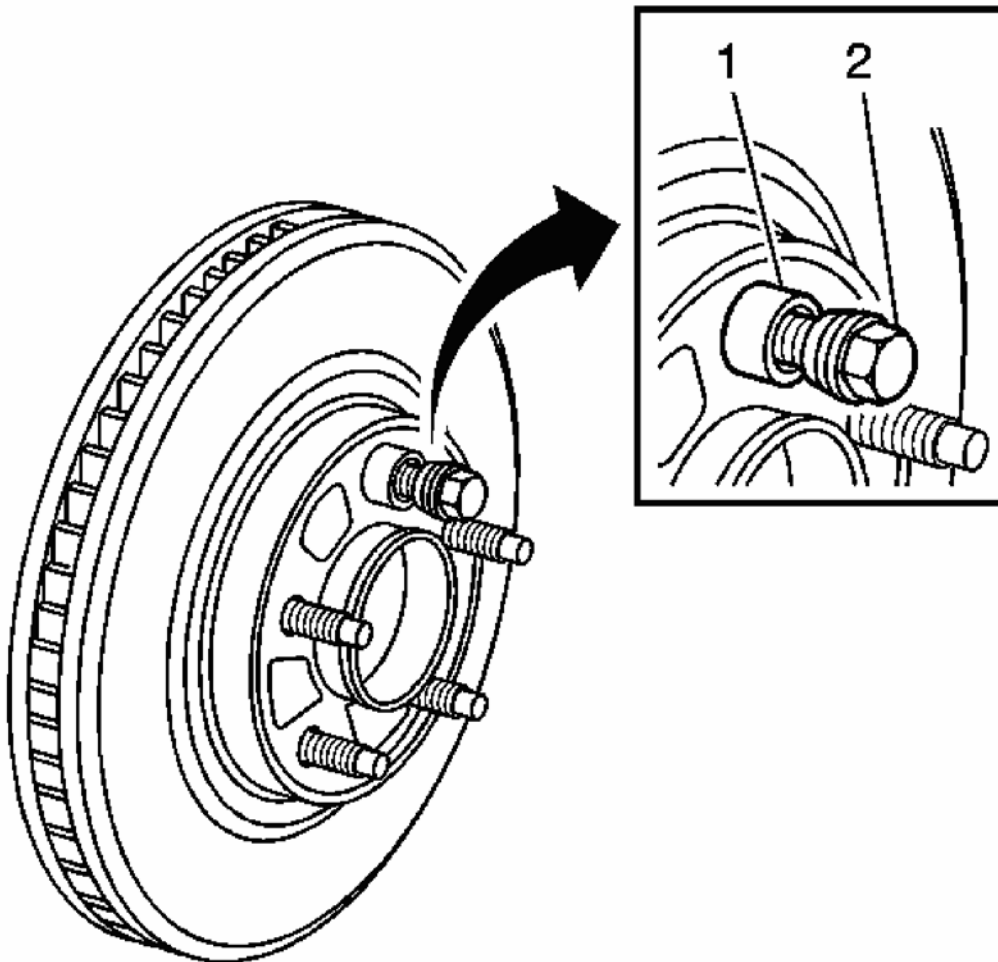


Fig. 4: Identifying J 45101-100 & Lug Nut
Courtesy of GENERAL MOTORS CORP.

4. Hold the rotor firmly in place against the hub/axle flange and install one of the **J 45101-100** (1), and one lug nut (2) onto the upper-most wheel stud. See **Special Tools**.
5. Continue to hold the rotor secure and tighten the lug nut firmly by hand.

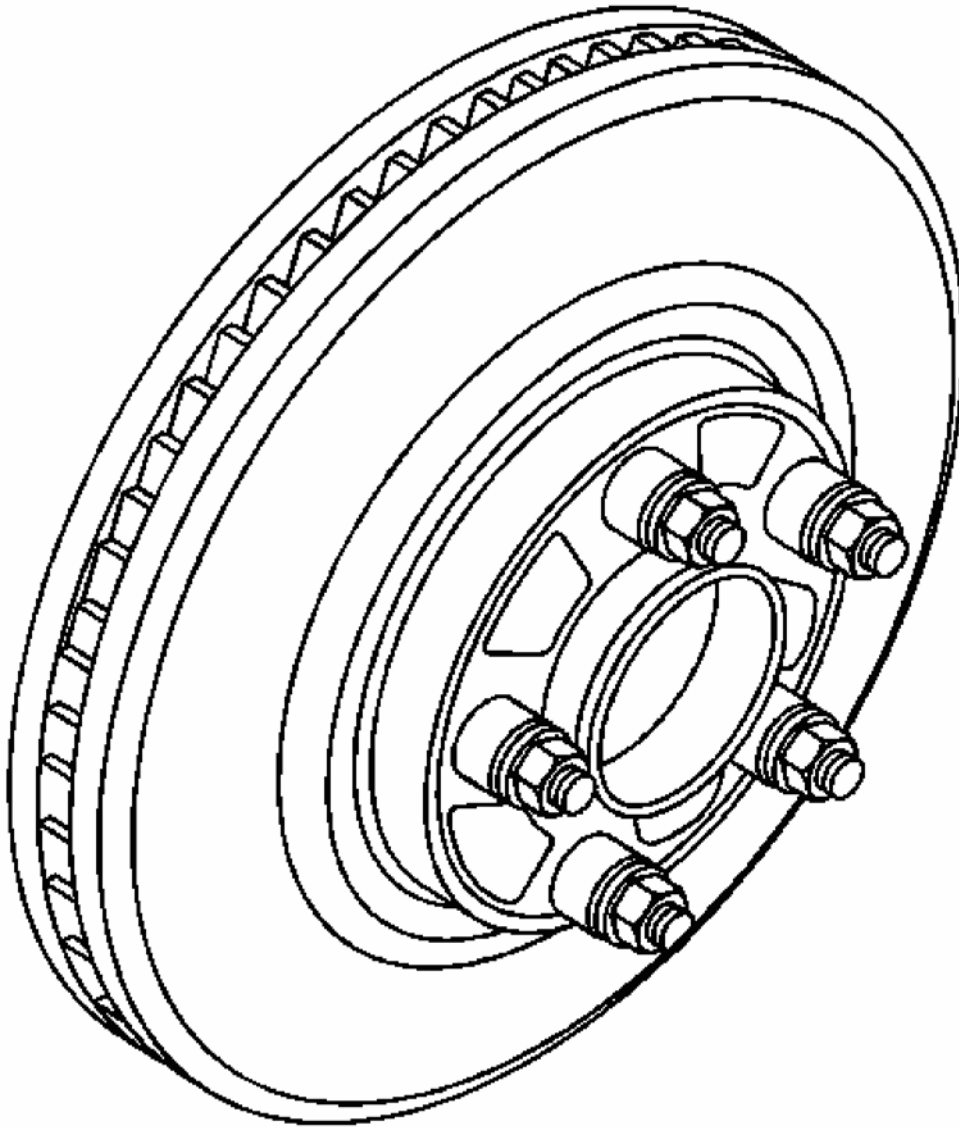


Fig. 5: Installing All J 45101-100s & Lug Nuts
Courtesy of GENERAL MOTORS CORP.

6. Install the remaining **J 45101-100** and lug nuts onto the wheel studs and tighten the nuts firmly by hand in a star-pattern. See **Special Tools**.
7. Using the **J 39544-KIT** , or equivalent, tighten the lug nuts in a star-pattern to specification, in order to properly secure the rotor. See **Special Tools**. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
8. If the brake rotor has been REFINISHED or REPLACED with a new rotor, proceed to

step 14.

9. If the brake rotor meets the following criteria, proceed to step 10.
 - The rotor is within specifications and is being REUSED
 - The rotor has NOT been refinished
 - The rotor does NOT exhibit thickness variation exceeding the maximum allowable level

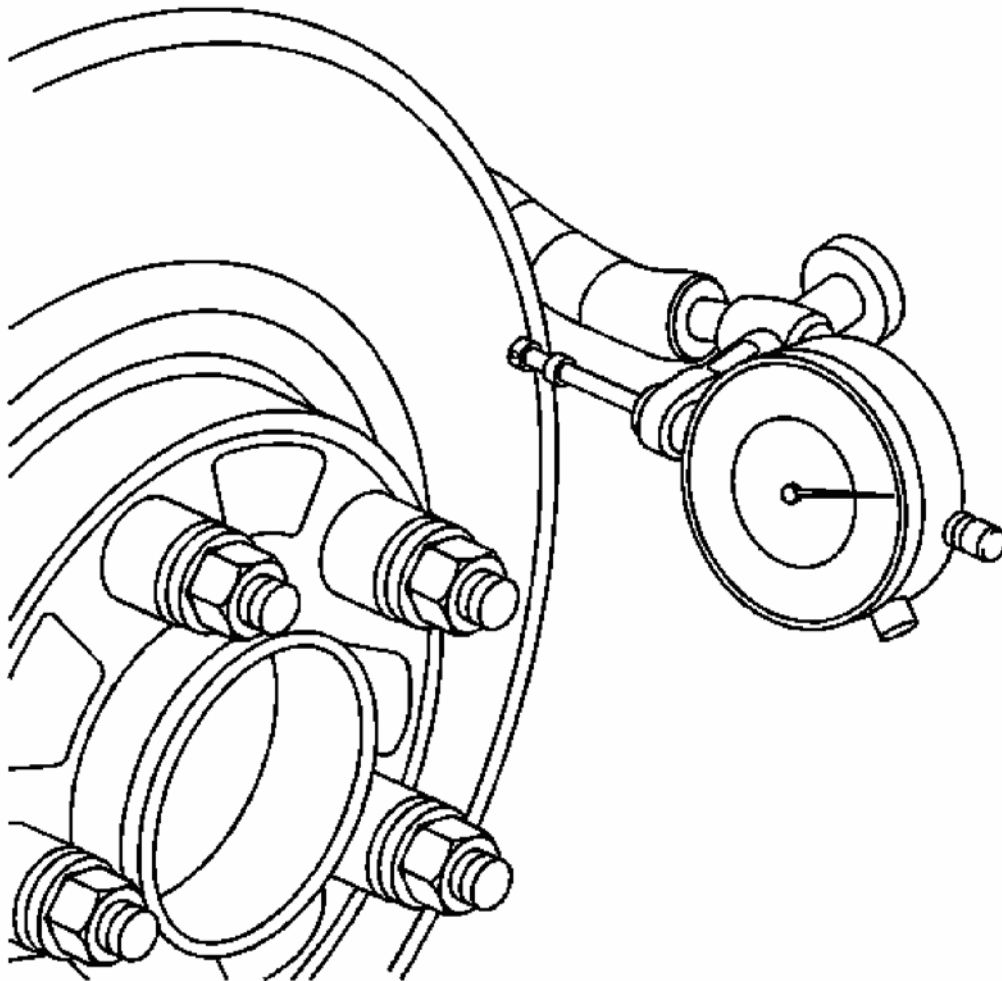


Fig. 6: Mounting Dial Indicator To Measure Lateral Runout
Courtesy of GENERAL MOTORS CORP.

10. Mount a dial indicator, **J 45101** , or equivalent, to the steering knuckle and position the indicator button so it contacts the brake rotor friction surface at a 90 degree angle, approximately 13 mm (0. See **Special Tools**.5 in) from the outer edge of the rotor.

11. Measure and record the assembled LRO of the brake rotor.
 1. Rotate the rotor until the lowest reading is displayed on the indicator dial, then set the dial to zero.
 2. Rotate the rotor until the highest reading is displayed on the dial.
 3. Mark the location of the high spot relative to the nearest wheel stud, or studs.
 4. Measure and record the amount of LRO.

12. Compare the brake rotor assembled LRO to the following specification:

Specification:

- Front brake rotor maximum allowable assembled lateral runout: 0.05 mm (0.002 in)
- Rear brake rotor maximum allowable assembled lateral runout: 0.05 mm (0.002 in)

13. If the brake rotor assembled LRO is within specifications, proceed to step 18.

If the brake rotor assembled LRO exceeds the specification, refinish the rotor to ensure true parallelism, refer to **Brake Rotor Refinishing**. After refinishing the rotor, proceed to step 14.

14. Mount a dial indicator, **J 45101**, or equivalent, to the steering knuckle and position the indicator button so it contacts the brake rotor friction surface at a 90 degree angle, approximately 13 mm (0.5 in) from the outer edge of the rotor. See **Special Tools**.

15. Measure and record the assembled LRO of the brake rotor.
 1. Rotate the rotor until the lowest reading is displayed on the indicator dial, then set the dial to zero.
 2. Rotate the rotor until the highest reading is displayed on the dial.
 3. Mark the location of the high spot relative to the nearest wheel stud, or studs.
 4. Measure and record the amount of LRO.

16. Compare the brake rotor assembled LRO to the following specification:

Specification:

- Front brake rotor maximum allowable assembled lateral runout: 0.05 mm (0.002 in)
- Rear brake rotor maximum allowable assembled lateral runout: 0.05 mm (0.002 in)

17. If the brake rotor assembled LRO measurement exceeds the specification, bring the LRO to within specifications. Refer to **Brake Rotor Assembled Lateral Runout (LRO) Correction**.

18. If the brake rotor assembled LRO measurement is within specification, install the brake

caliper and depress the brake pedal several times to secure the rotor in place before removing the **J 45101-100** and the lug nuts. See **Special Tools**.

BRAKE PAD INSPECTION

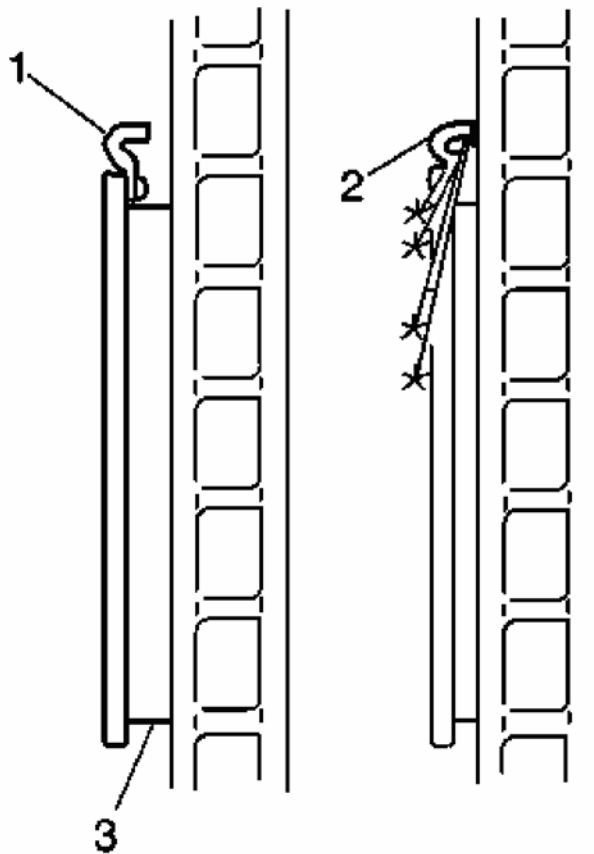


Fig. 7: View Of Brake Pads & Audible Wear Sensors
Courtesy of GENERAL MOTORS CORP.

- Inspect the disc brake pads at regular intervals, or whenever the tire and wheel assemblies are removed from the vehicle.
- If replacement is necessary, always replace disc brake pads in axle sets.
- Inspect both edges of the disc brake pad friction surfaces (3). The highest rate of wear normally occurs at the trailing edge of the disc brake pads.
- Inspect the thickness of the disc brake pads (3) in order to ensure that they have not worn prematurely. The disc brake pad wear should be approximately even per axle set.
- Both front and rear disc brake pads have integral, audible wear sensors (1). When the

disc brake pad wear reaches the minimum allowable thickness, the wear sensor contacts the disc brake rotor (2). The wear indicator will then produce an audible, high-pitched warning noise during wheel rotation.

- Replace the disc brake pads when the friction surface (3) is worn to within 0.76 mm (0.030 in) of the mounting plates.
- Remove the brake calipers and inspect the friction surfaces of the inner and outer disc brake pads to ensure that they are level. Place the disc brake pad friction surfaces together and measure the gap between the surfaces. If more than 0.13 mm (0.005 in) gap exists midway between the length of the disc brake pads, replace the disc brake pads.
- Verify that any disc brake pad shims that may be required are in place and not damaged or excessively corroded. Replace any missing or damaged shims in order to preserve proper disc brake performance.
- Replace the disc brake pads if any have separated from the mounting plates.
- Inspect the disc brake pads friction surfaces for cracks, fractures, or damage which may cause noise or otherwise impair disc brake performance.

BRAKE CALIPER INSPECTION

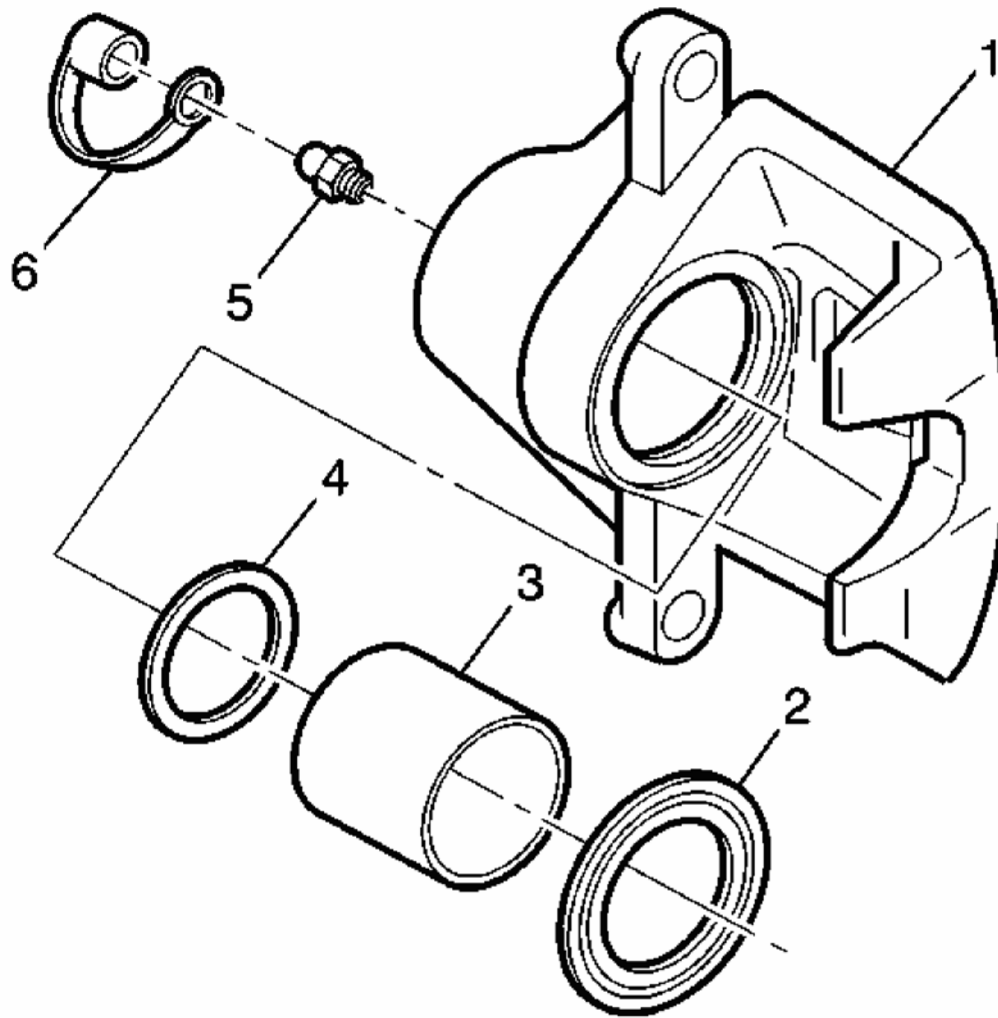


Fig. 8: Exploded View Of Brake Caliper
Courtesy of GENERAL MOTORS CORP.

1. Inspect the brake caliper housing (1) for cracks, excess wear, and/or damage. If any of these conditions are present, the brake caliper requires replacement.
2. Inspect the caliper piston dust boot seal (2) for cracks, tears, cuts, deterioration and/or improper seating in the caliper body. If any of these conditions are present, the brake caliper requires overhaul or replacement.
3. Inspect for brake fluid leakage around the caliper piston dust boot seal (2) and on the disc brake pads. If there is any evidence of brake fluid leakage, the brake caliper requires overhaul or replacement.

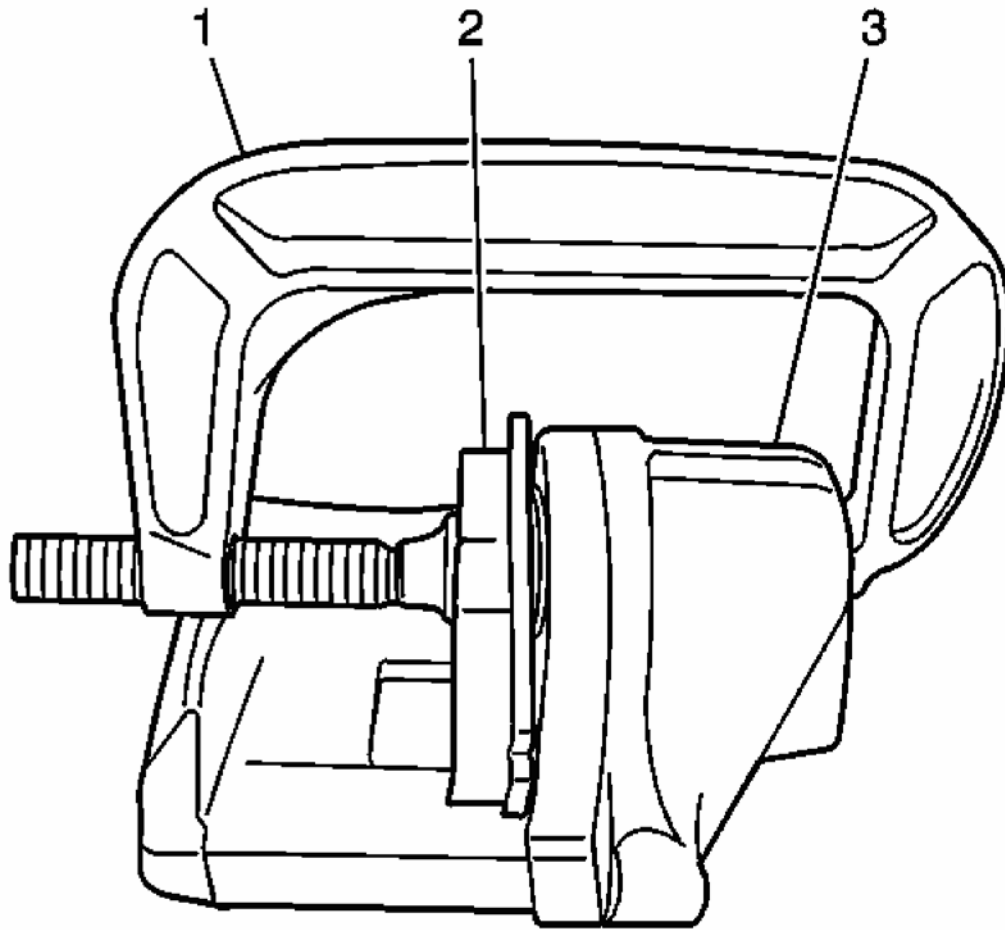


Fig. 9: Compressing Caliper Piston
Courtesy of GENERAL MOTORS CORP.

4. Inspect for smooth and complete travel of the caliper pistons into the caliper bores:

The movement of the caliper pistons into the caliper bores should be smooth and even. If the caliper piston is frozen or difficult to bottom, the caliper requires overhaul or replacement.

- For single piston caliper applications, insert a discarded inner brake pad (2) or block of wood in front of the piston. Using a large C-clamp (1) installed over the body of the caliper (3) and against the brake pad or block of wood, slowly bottom the piston in the bore.
- For dual piston caliper applications, insert a discarded inner brake pad (2) or block of wood in front of the pistons. Using 2 large C-clamps (1) installed over the body

of the caliper (3) and against the brake pad or block of wood, slowly bottom the pistons evenly into the bores.

DISC BRAKE MOUNTING AND HARDWARE INSPECTION - FRONT

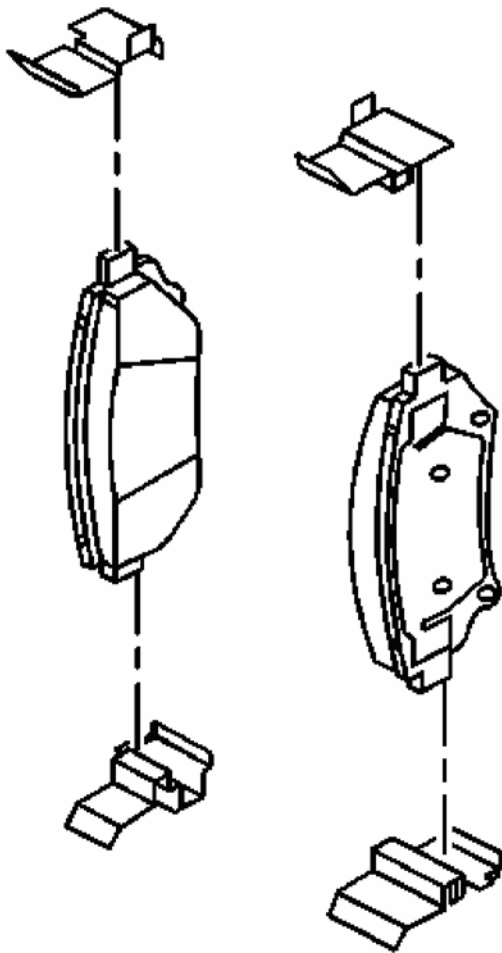


Fig. 10: Disc Brake Pad Mounting Hardware
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to Brake Dust Caution in Cautions and Notices.

1. Remove the disc brake caliper from the caliper mounting bracket.
2. Remove the disc brake pads from the caliper mounting bracket.

3. Inspect the disc brake pad mounting hardware for the following:
 - Missing mounting hardware
 - Excessive corrosion
 - Bent mounting tabs
 - Looseness at the caliper mounting bracket
 - Looseness at the disc brake pads
4. If any of the conditions listed are found, the disc brake pad mounting hardware requires replacement.
5. Ensure the disc brake pads are held firmly in place on the caliper mounting bracket, yet slide easily on the mounting hardware without binding.

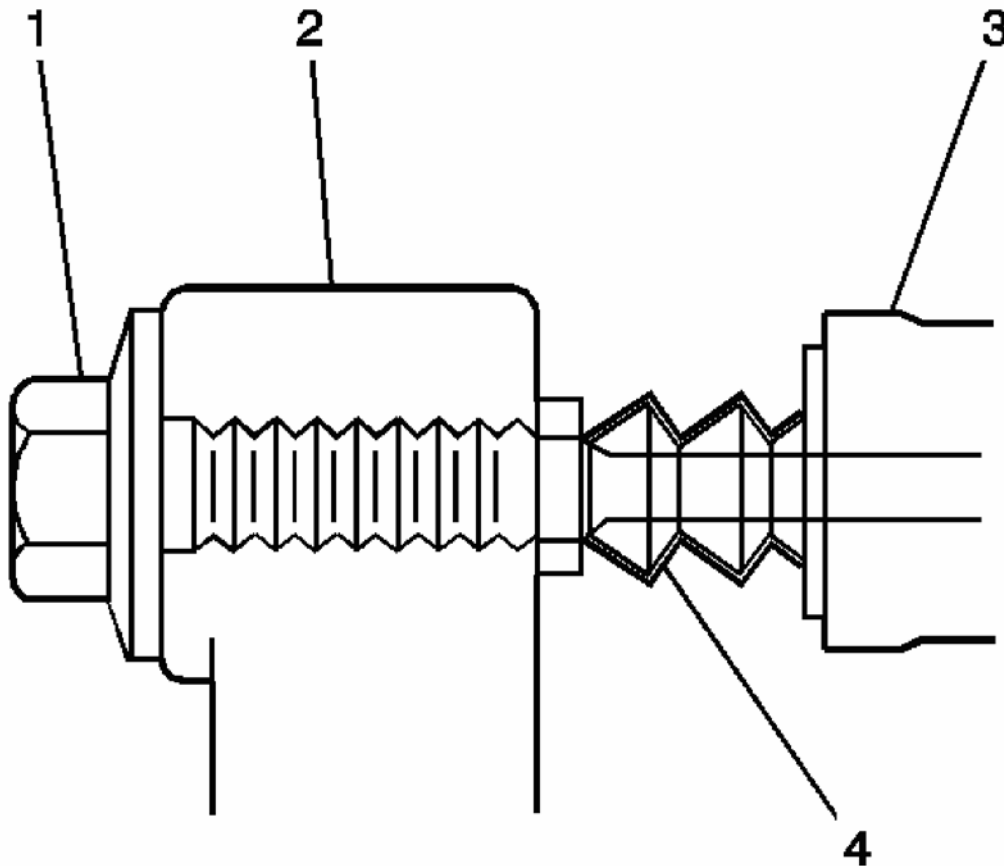


Fig. 11: Inspecting Caliper Bolt
Courtesy of GENERAL MOTORS CORP.

6. Inspect the caliper bolts (1) for the following:

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- Binding
 - Seizing
 - Looseness in the caliper mounting bracket (3)
 - Bent or damaged caliper bolts
 - Cracked or torn boots (4)
 - Missing boots
 - Bent or damaged caliper mounting bracket (3)
7. If any of the conditions listed are found, the caliper mounting hardware requires replacement.
 8. Install the disc brake pads to the caliper mounting bracket.
 9. Install the disc brake caliper to the mounting bracket.

REAR DISC BRAKE MOUNTING AND HARDWARE INSPECTION

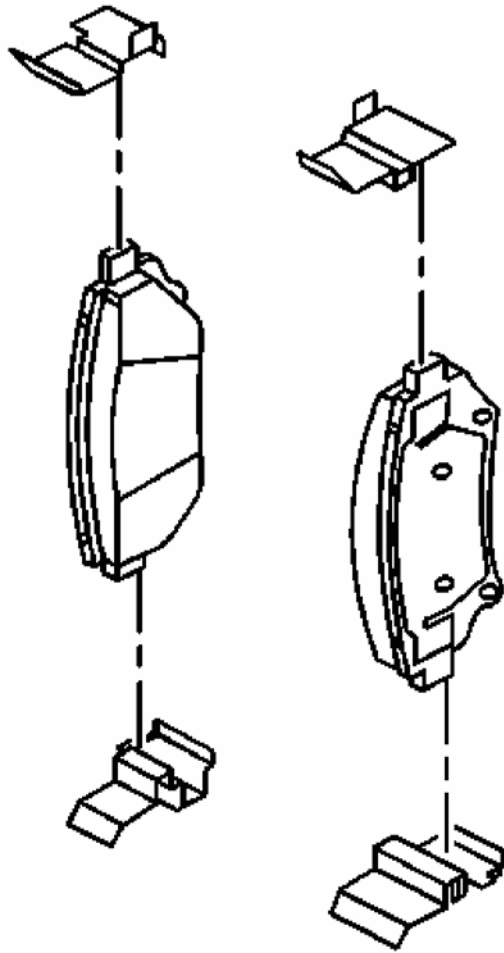


Fig. 12: Disc Brake Pad Mounting Hardware
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to Brake Dust Caution in Cautions and Notices.

1. Inspect the disc brake pad mounting hardware for the following:
 - Missing mounting hardware
 - Excessive corrosion
 - Bent mounting tabs
 - Looseness at the caliper mounting bracket
 - Looseness at the disc brake pads

2. If any of the conditions listed are found, the disc brake pad mounting hardware requires replacement.
3. Ensure the disc brake pads are held firmly in place on the caliper mounting bracket, yet slide easily on the mounting hardware without binding.

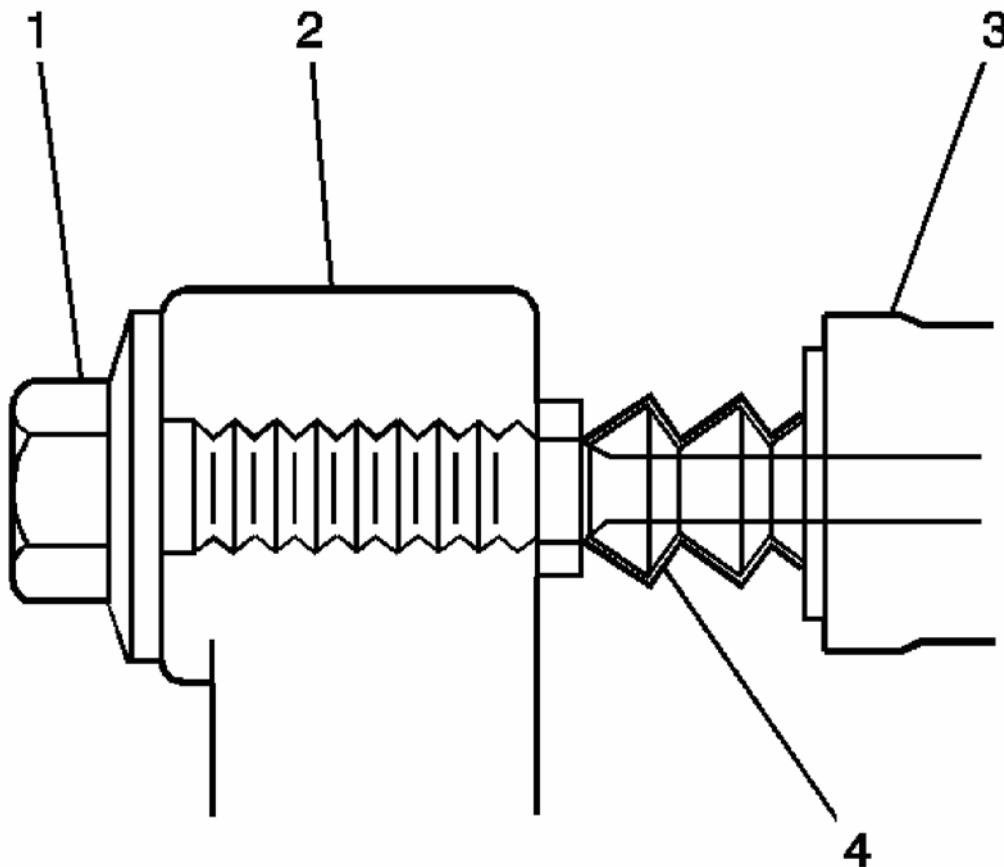


Fig. 13: Inspecting Caliper Bolt
Courtesy of GENERAL MOTORS CORP.

4. Inspect the caliper bolts (1) for the following:
 - Binding
 - Seizing
 - Looseness in the caliper mounting bracket (3)
 - Bent or damaged caliper bolts
 - Cracked or torn boots (4)
 - Missing boots

- Bent or damaged caliper mounting bracket (3)
5. If any of the conditions listed are found, the caliper mounting hardware requires replacement.

REPAIR INSTRUCTIONS

FRONT BRAKE PADS REPLACEMENT

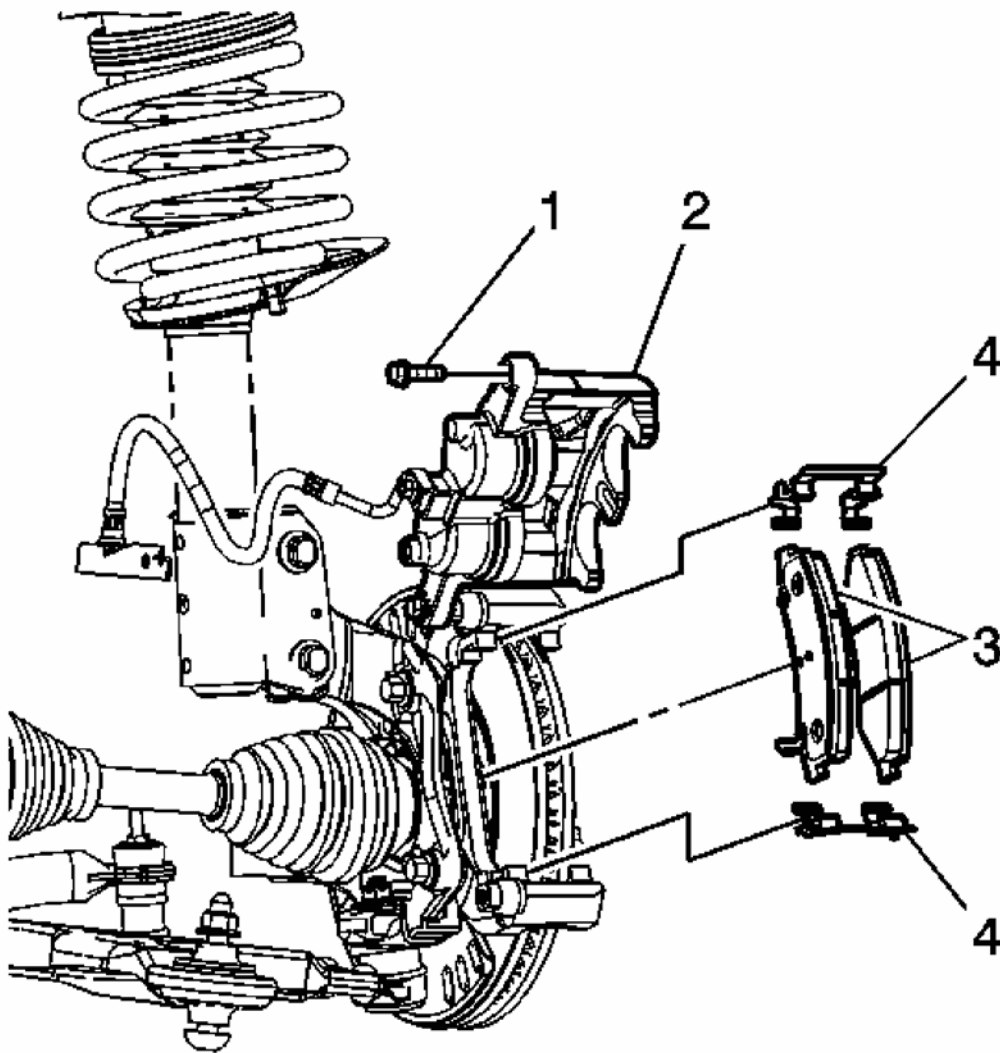


Fig. 14: Replacing Front Brake Pads
Courtesy of GENERAL MOTORS CORP.

2006 Chevrolet Impala LS

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Callout	Component Name
CAUTION: Refer to <u>Brake Dust Caution</u> .	
NOTE: Refer to <u>Fastener Notice</u> .	
Fastener Tightening Specifications: Refer to <u>Fastener Tightening Specifications</u> .	
Preliminary Procedure 1. Raise the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> 2. Remove the tire and wheel. Refer to <u>Tire and Wheel Removal and Installation</u> .	
1	Bolt Tightening Specification: Tighten to 36 N.m (26 lb ft).
2	Brake Caliper Tip: 1. Rotate the caliper up and to the rear until it reaches the 12 o'clock position. 2. Use a mechanics wire or equivalent to hold the brake caliper in the upright position. 3. Using a piece of wood or an old brake pad and a pair of channel locks, gently apply pressure until the pistons are fully seated. BE SURE that the channel locks are CENTERED before applying pressure to seat the pistons.
3	Brake Pads Tip: • If removing the brake pads to service the brake system, please note the position of the brake pads for proper installation. • When replacing the brake pads, ensure that the pad with the wear indicator is positioned on the inside and the wear indicator is pointing down. • Use denatured alcohol and clean, filtered compressed air to clean the brake Pad area.
	Brake Pad Springs Tip:

4

- If removing the Brake Pad Spring to service the brake system, mark the relationship of the Springs to the Mounting Bracket for proper installation.
- Use NEW Brake Pad Springs ONLY when replacing the Brake Pads.

REAR BRAKE PADS REPLACEMENT**Removal Procedure**

CAUTION: Refer to Brake Dust Caution in Cautions and Notices.

1. Inspect the fluid level in the brake master cylinder reservoir.
2. If the brake fluid level is midway between the maximum-full point and the minimum allowable level, then no brake fluid needs to be removed from the reservoir before proceeding. If the brake fluid level is higher than midway between the maximum-full point and the minimum allowable level, then remove brake fluid to the midway point before proceeding.
3. Raise and suitably support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
4. Remove the rear tire and the wheel assembly. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
5. Install a hand tightened lug nut to retain the rotor to the hub.

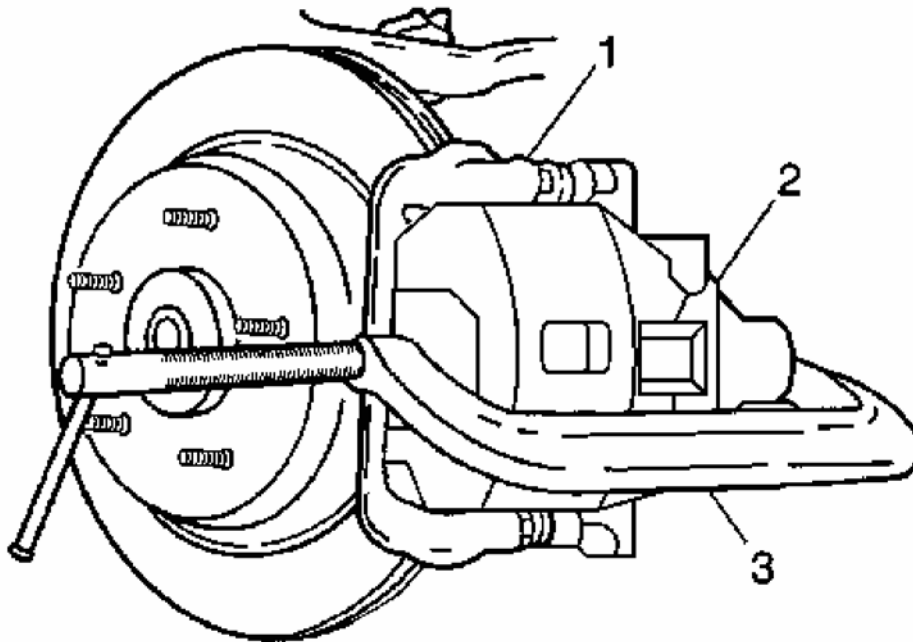


Fig. 15: Pushing In Brake Caliper Piston
Courtesy of GENERAL MOTORS CORP.

6. Compress the caliper piston enough for clearance. Use a C-clamp (3).

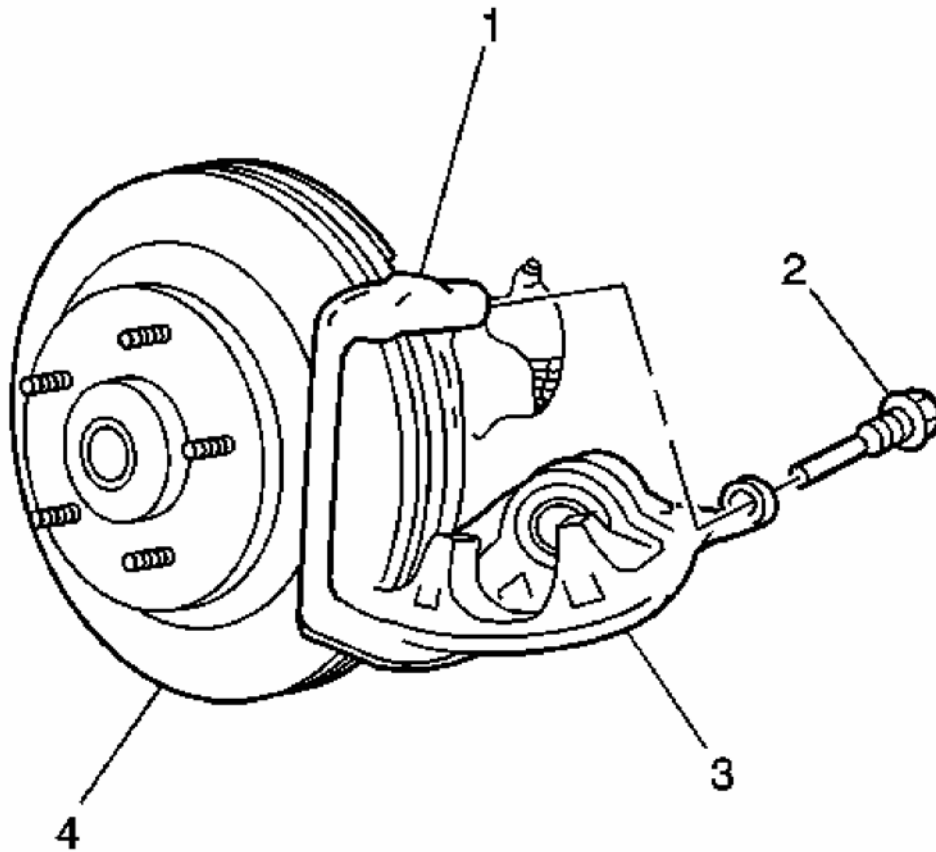


Fig. 16: View Of Upper Caliper Bolt - Rear
Courtesy of GENERAL MOTORS CORP.

7. Remove the upper caliper bolt (2).

NOTE: Use care to avoid damaging pin boot when rotating caliper.

NOTE: Support the brake caliper with heavy mechanic's wire, or equivalent, whenever it is separated from its mount and the hydraulic flexible brake hose is still connected. Failure to support the caliper in this manner will cause the flexible brake hose to bear the weight of the caliper, which may cause damage to the brake hose and in turn may cause a brake fluid leak.

8. Pivot the caliper down in order to access the pads. It is not necessary to remove the caliper.

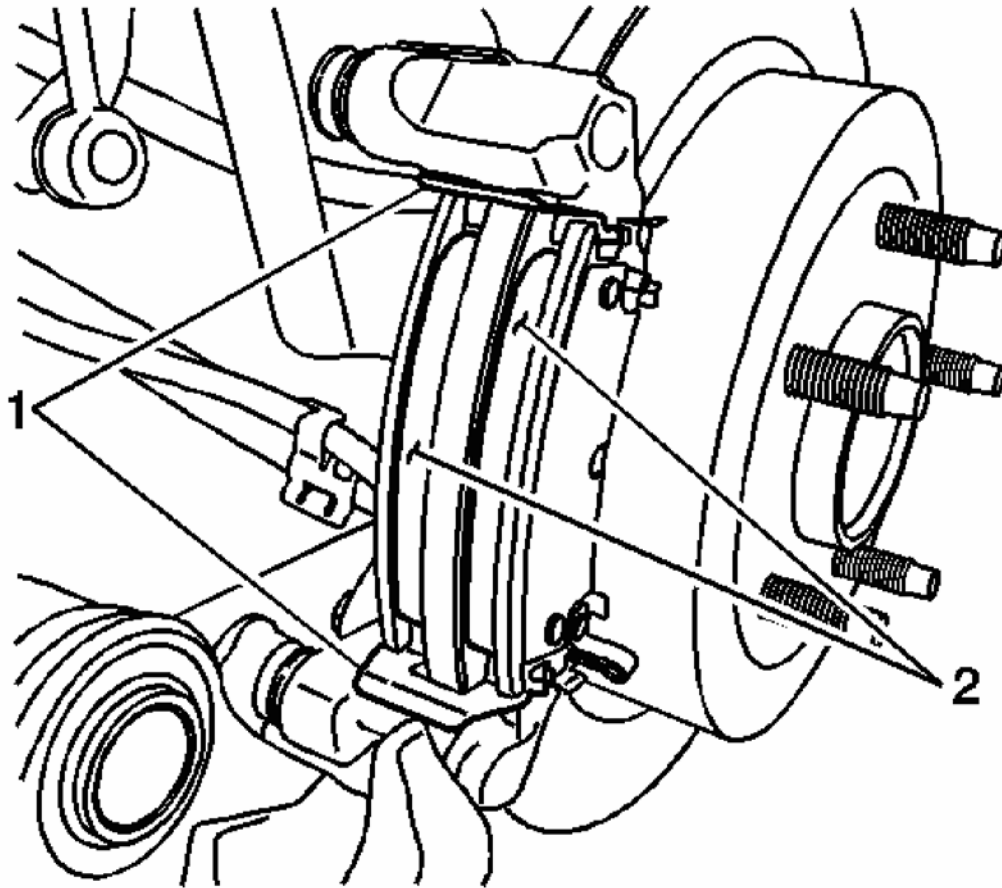


Fig. 17: Rear Brake Pads & Clips
Courtesy of GENERAL MOTORS CORP.

9. Remove the brake pads (2) from the caliper bracket.
10. Remove the 2 pad clips (1) from the caliper bracket.
11. Inspect the caliper mounting hardware for the following conditions:
 - Cuts
 - Tears
 - Deterioration

Replace any hardware if damage exists. Refer to **Disc Brake Mounting and Hardware Inspection - Rear**.

12. Inspect the caliper dust boot for the following conditions:

- Cuts
- Tears
- Deterioration

Replace the caliper dust boot if damage exists. Refer to **Brake Caliper Inspection**.

13. Inspect the caliper bolts for corrosion or damage. If corrosion exists, use new caliper bolts when installing the caliper.

Installation Procedure

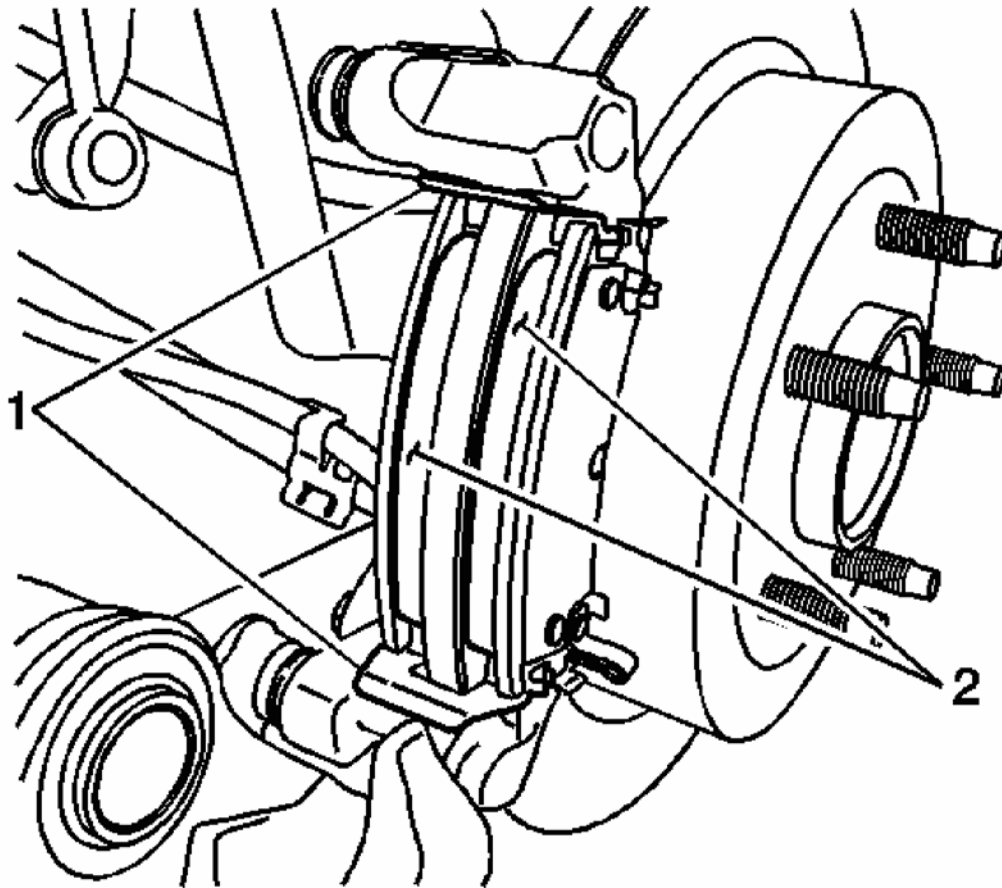


Fig. 18: Rear Brake Pads & Clips
Courtesy of GENERAL MOTORS CORP.

1. Bottom the piston into the caliper bore.

Use a C-clamp before installing new brake pads in order to compress the piston. Use an old brake pad or wooden block across the face of the piston to avoid damage to the piston or the caliper boot.

2. Install the 2 retainers (1) to the caliper bracket.

IMPORTANT: The wear sensor is on the outside pad. The sensor is positioned at the trailing or downward edge of the pad during forward wheel rotation.

3. Install the pads (2) to the caliper bracket.

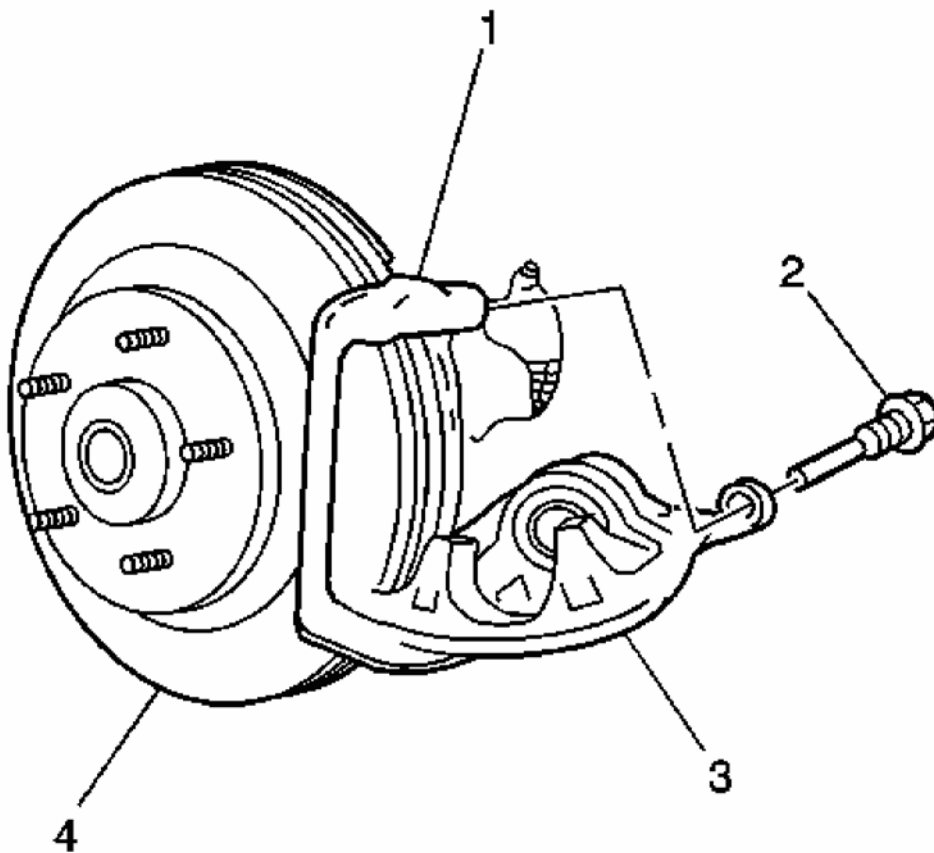


Fig. 19: View Of Upper Caliper Bolt - Rear
Courtesy of GENERAL MOTORS CORP.

NOTE: Use care to avoid damaging pin boot when rotating caliper.

4. Swing the caliper (3) upward in position around the pads.
5. Lubricate the bolt and the bolt boot. Use silicone grease.

NOTE: Refer to FASTENER NOTICE in Cautions and Notices.

6. Install the upper caliper bolt (2).

Tighten: Tighten the caliper bolt to 44 N.m (32 lb ft).

7. Remove the wheel lug nut retaining the rotor to the hub.
8. Install the rear tire and the wheel assembly. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels. Align the previous marks on the wheel, hub and bearing.
9. Lower the vehicle.
10. With the engine OFF, gradually apply the brake pedal to approximately 2/3 of its travel distance.
11. Slowly release the brake pedal.
12. Wait 15 seconds, then repeat steps 10 and 11 until a firm brake pedal is obtained. This will properly seat the brake caliper pistons and brake pads.
13. Fill the brake master cylinder reservoir to the proper level. Refer to **Master Cylinder Reservoir Filling** in Hydraulic Brakes.
14. Burnish the pads and rotors. Refer to **Burnishing Pads and Rotors**.

BURNISHING PADS AND ROTORS

CAUTION: Refer to ROAD TEST CAUTION in Cautions and Notices.

Burnishing the brake pads and brake rotors is necessary in order to ensure that the braking surfaces are properly prepared after service has been performed on the disc brake system.

This procedure should be performed whenever the disc brake rotors have been refinished or replaced, and/or whenever the disc brake pads have been replaced.

1. Select a smooth road with little or no traffic.
2. Accelerate the vehicle to 48 km/h (30 mph).

IMPORTANT: Use care to avoid overheating the brakes while performing

this step.

3. Using moderate to firm pressure, apply the brakes to bring the vehicle to a stop. Do not allow the brakes to lock.
4. Repeat steps 2 and 3 until approximately 20 stops have been completed. Allow sufficient cooling periods between stops in order to properly burnish the brake pads and rotors.

FRONT BRAKE CALIPER REPLACEMENT

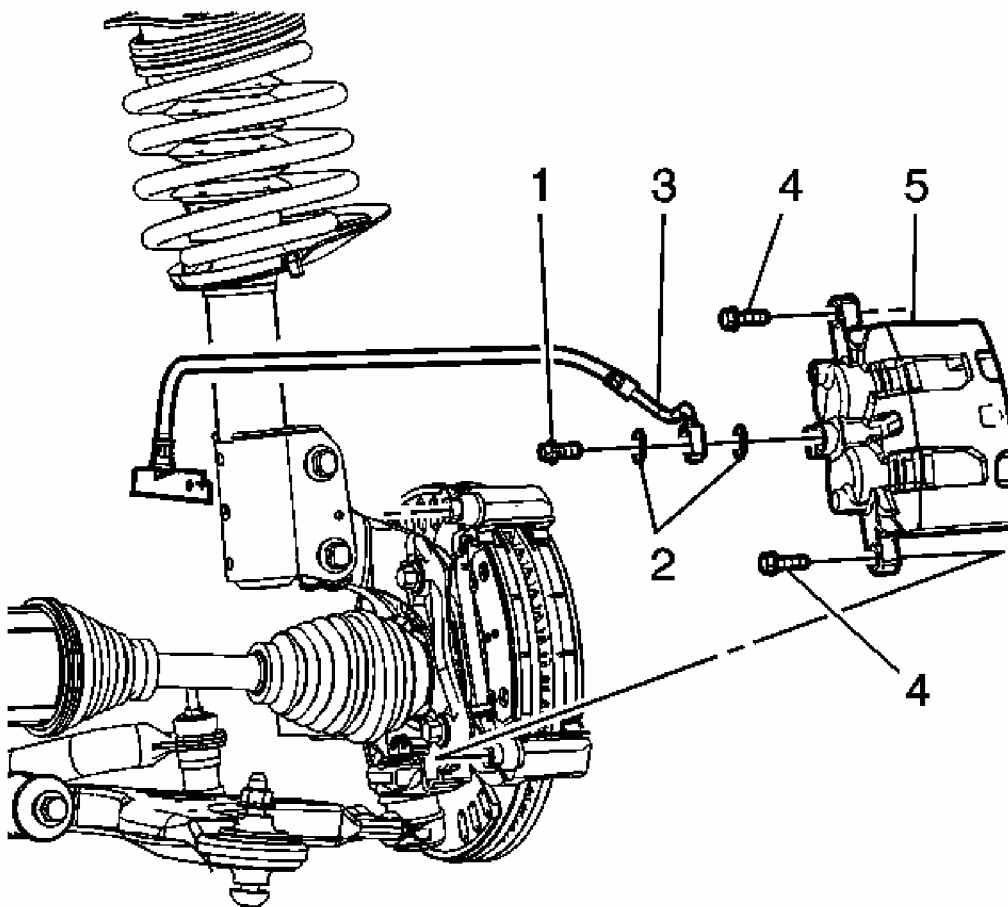


Fig. 20: Replacing Front Brake Caliper
Courtesy of GENERAL MOTORS CORP.

Brake Caliper Replacement - Front

Callout	Component Name
CAUTION:	

Refer to Brake Dust
Caution .

CAUTION:
Refer to Brake Fluid Irritant
Caution .

CAUTION:
Refer to Brake Fluid Effects on Paint and Electrical Components
Notice .

NOTE:
Refer to Fastener
Notice .

Fastener Tightening Specifications: Refer to Fastener Tightening Specifications.

Preliminary Procedure

1. Raise the vehicle. Refer to Lifting and Jacking the Vehicle .
2. Remove the tire and wheel. Refer to Tire and Wheel Removal and Installation .

1	Brake Hose Bolt Tightening Specification: Tighten to 54 N.m (40 lb ft).
2	Brake Hose Washer (Qty: 2) Tip: DO NOT reuse the brake hose washers, Use NEW ONLY.
3	Brake Hose Tip: • Cap or plug the brake hose to ensure that the Brake System DOES NOT become contaminated and to prevent leaks. • Relocate the brake hose to the side. Secure the brake Hose with the fitting facing UP at the highest point without damaging the brake hose.
4	Brake Caliper Bolts (Qty: 2) Tightening Specifications: Tighten to 36 N.m (40 lb ft).
5	Brake Caliper Tip: • If removing the brake caliper to service the brake system, it is NOT necessary to remove the brake hose from the brake caliper. Reposition the brake caliper to the side and support the caliper

mechanics wire or equivalent.

- Bleed the brakes. Refer to **Hydraulic Brake System Bleeding (Manual)** or **Hydraulic Brake System Bleeding (Pressure)** .

REAR BRAKE CALIPER REPLACEMENT

Removal Procedure

CAUTION: Refer to **Brake Dust Caution** in Cautions and Notices.

CAUTION: Refer to **Brake Fluid Irritant Caution** in Cautions and Notices.

NOTE: Refer to **Brake Fluid Effects on Paint and Electrical Components Notice** in Cautions and Notices.

1. Inspect the fluid level in the brake master cylinder reservoir.
2. If the brake fluid level is midway between the maximum-full point and the minimum allowable level, then no brake fluid needs to be removed from the reservoir before proceeding. If the brake fluid level is higher than midway between the maximum-full point and the minimum allowable level, then remove brake fluid to the midway point before proceeding.
3. Raise and suitably support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
4. Remove the rear tire and the wheel assembly. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
5. Hand tighten 2 wheel lug nuts to retain the rotor to the hub.

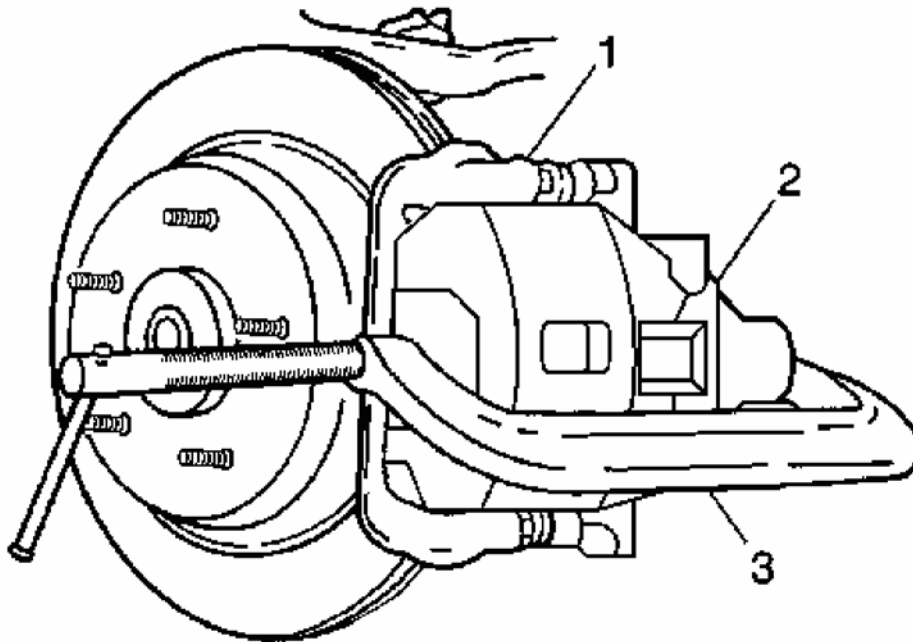


Fig. 21: Pushing In Brake Caliper Piston
Courtesy of GENERAL MOTORS CORP.

6. Install a large C-clamp (3) over the top of the brake caliper (2) and against the back of the outboard brake pad.
7. Tighten the C-clamp (3) until the caliper piston is pushed into the caliper bore enough to slide the caliper off the rotor.
8. Remove the C-clamp (3) from the caliper.

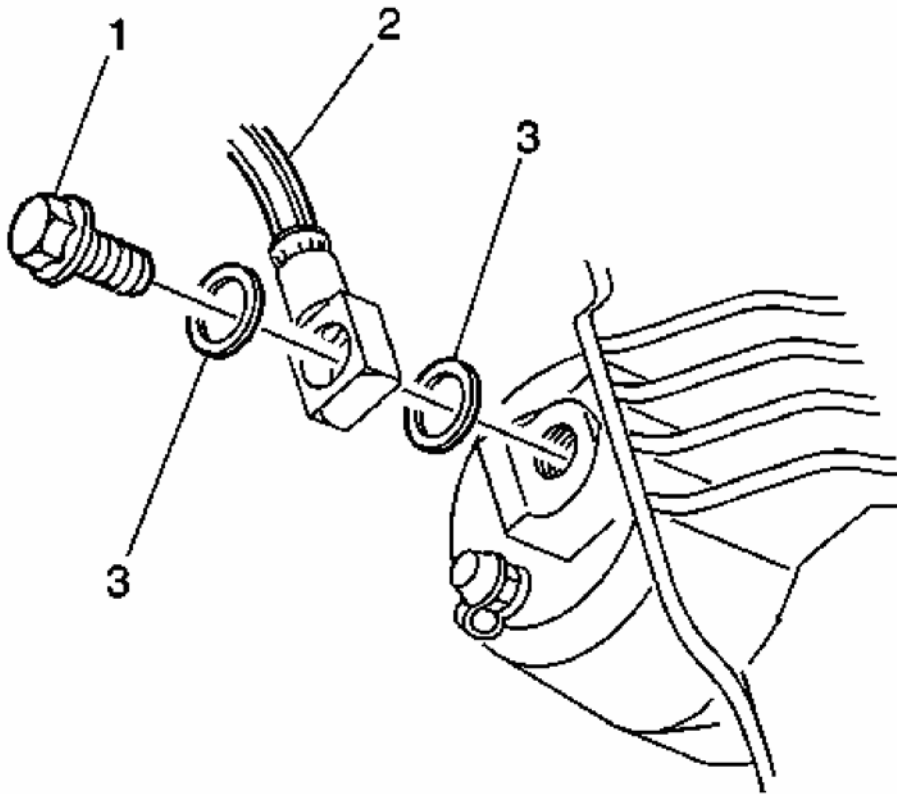


Fig. 22: Identifying Brake Hose & Components
Courtesy of GENERAL MOTORS CORP.

9. Remove the brake hose-to-caliper bolt (1) from the caliper.

Discard the 2 copper brake hose gaskets (3). These gaskets may be stuck to the brake caliper and/or the brake hose end.

10. Plug the opening in the rear brake hose (2) to prevent excessive brake fluid loss and contamination.

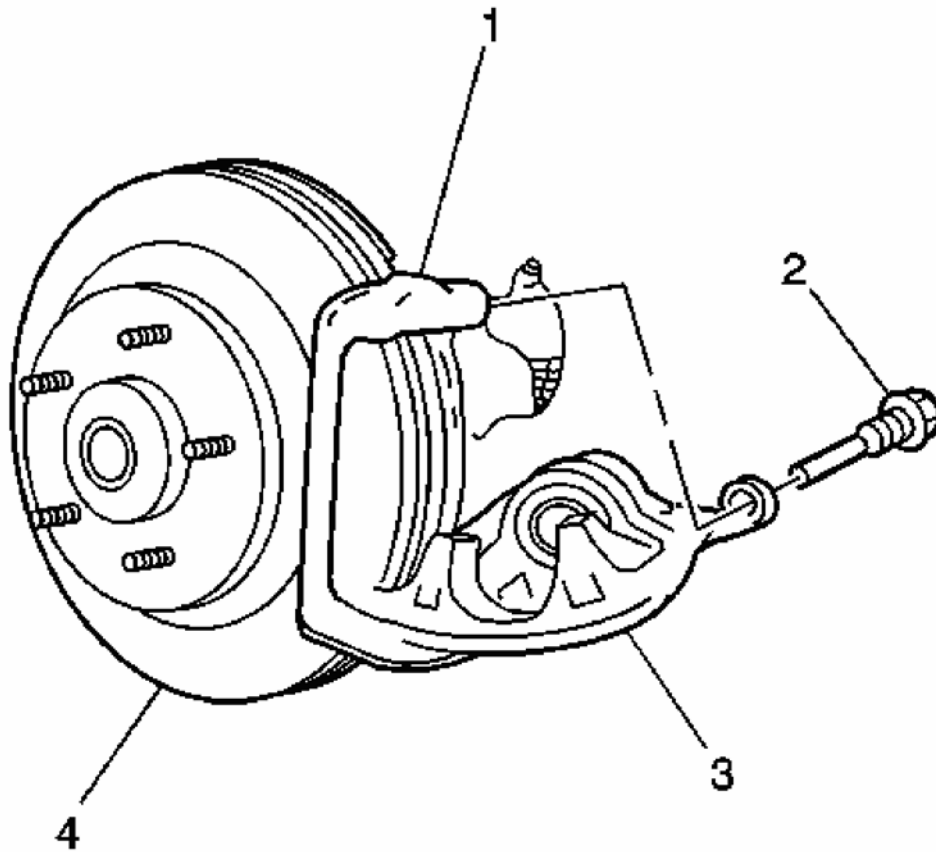


Fig. 23: View Of Upper Caliper Bolt - Rear
Courtesy of GENERAL MOTORS CORP.

11. Remove the caliper bolts (1 and 3).
12. Remove the caliper (3) from the rotor (4) and the caliper bracket (1).
13. Inspect the caliper bracket bolt boots on the caliper bracket for the following conditions:
 - Cuts
 - Tears
 - Deterioration

Replace any damaged caliper bracket bolt boots. Refer to **Disc Brake Hardware Replacement - Rear**.

14. Inspect the caliper bolts (2) for corrosion or damage. If corrosion is found, use new

caliper bolts, including bushings, when installing caliper.

Installation Procedure

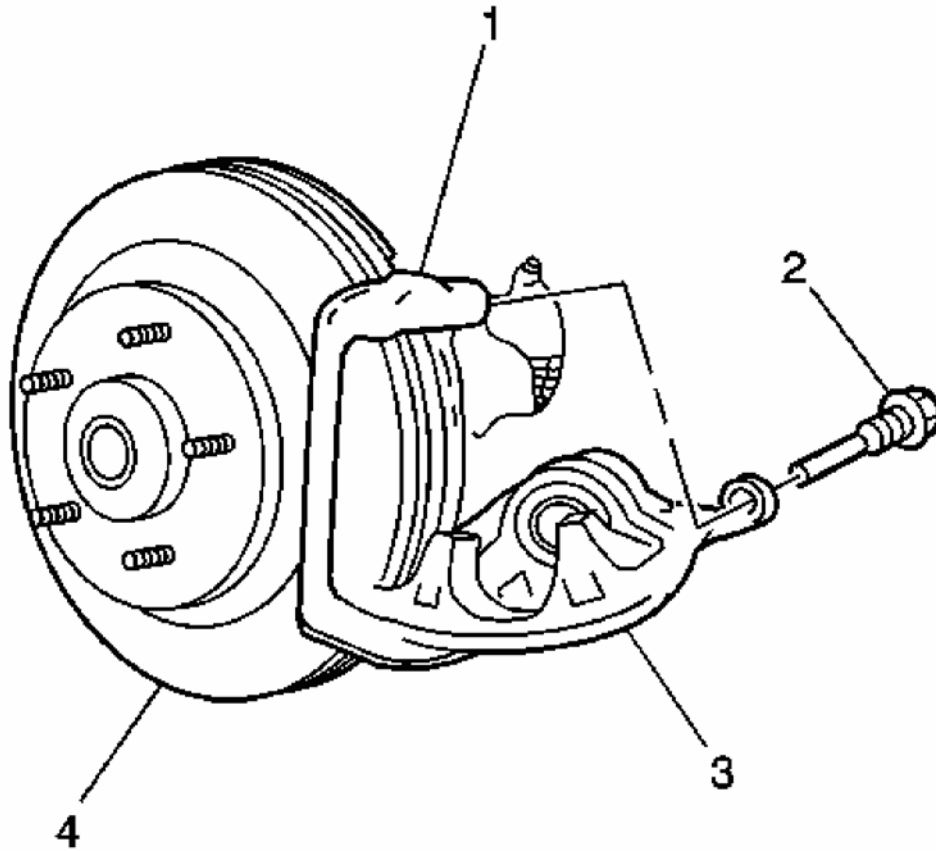


Fig. 24: View Of Upper Caliper Bolt - Rear
Courtesy of GENERAL MOTORS CORP.

1. Install the caliper (3) over the rotor (4) and the caliper bracket (1). Ensure that the bushings are in place.

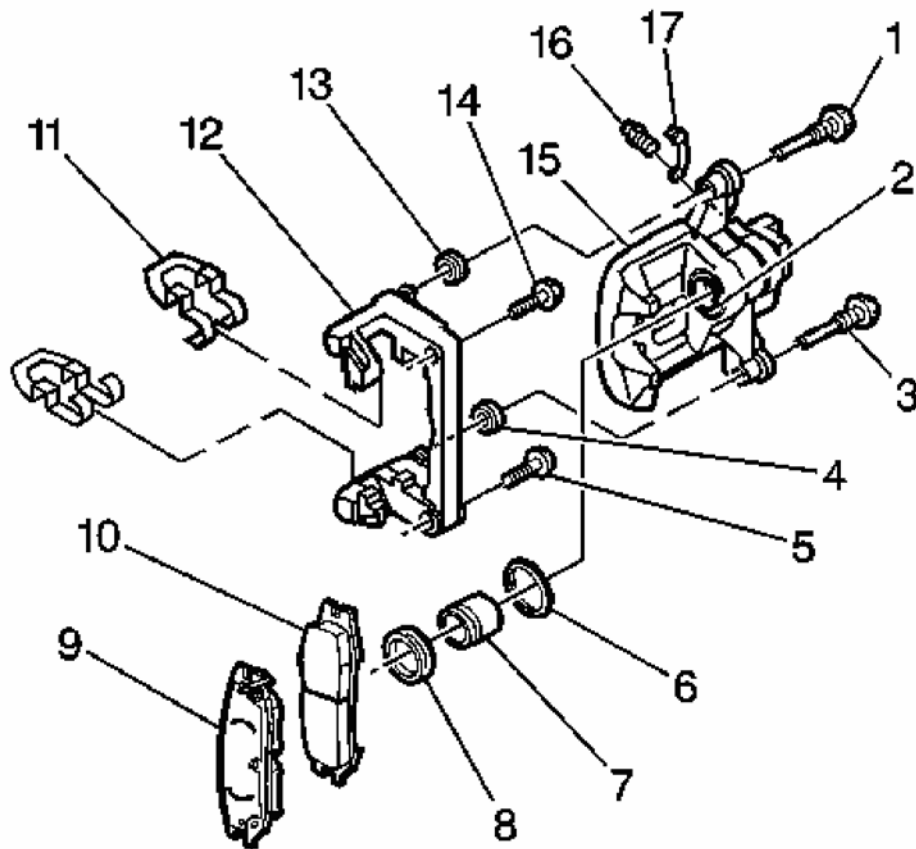


Fig. 25: Exploded View Of Rear Brake Caliper Components
 Courtesy of GENERAL MOTORS CORP.

2. Lubricate the caliper bolts (1 and 3). Use silicone grease. Do not lubricate the threads.
3. Lubricate the 2 bolt boots (13 and 4) in the caliper bracket (12). Use silicone grease.

NOTE: Refer to **FASTENER NOTICE** in Cautions and Notices.

4. Install the caliper bolts (1 and 3). Ensure that the bolt boots fit securely in the groove of the caliper bolts. Be sure not to pinch or tear the boots. If the boots are damaged, they must be replaced.

Tighten: Tighten the bolts to 44 N.m (32 lb ft).

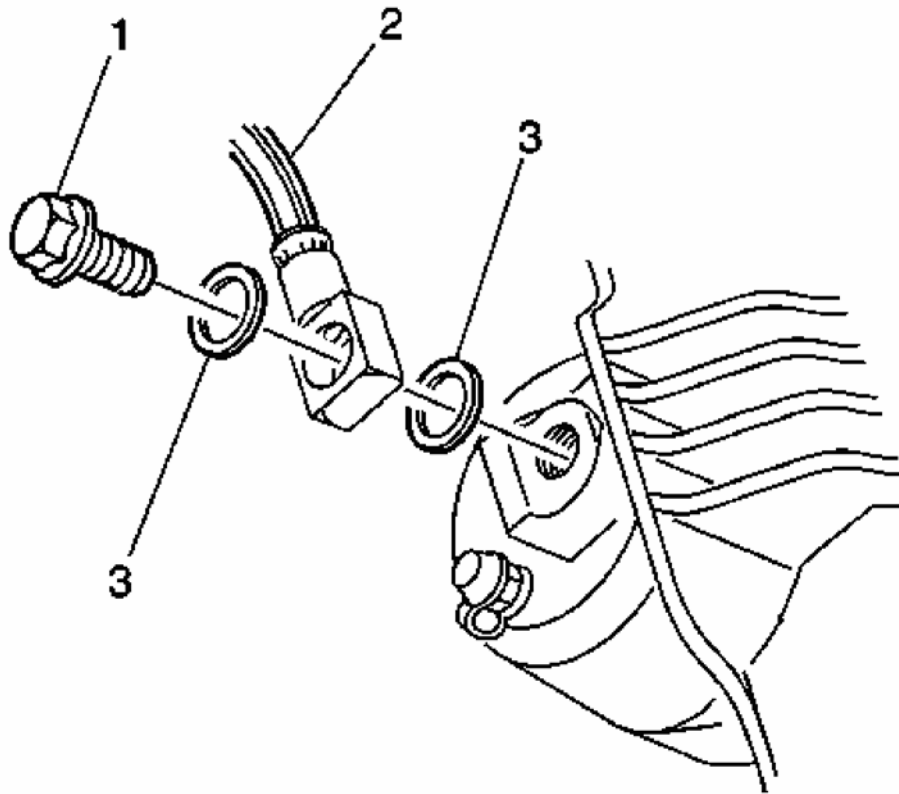


Fig. 26: Identifying Brake Hose & Components
 Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Install NEW copper gaskets.

5. Assemble the brake hose bolt (1) and the NEW copper brake hose gaskets (3) to the brake hose (2).
6. Install the brake hose-to-caliper bolt to the brake caliper.

Tighten: Tighten the bolt to 54 N.m (40 lb ft).

7. Remove the 2 wheel lug nuts retaining the rotor to the hub.
8. Install the rear tire and the wheel assembly. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
9. Lower the vehicle.
10. Fill the master cylinder to the proper level with clean brake fluid. Refer to **Master**

Cylinder Reservoir Filling in Hydraulic Brakes.

11. Bleed the brake system. Refer to **Hydraulic Brake System Bleeding (Manual)** or **Hydraulic Brake System Bleeding (Pressure)** in Hydraulic Brakes.
12. Inspect the hydraulic brake system for brake fluid leaks.

FRONT BRAKE CALIPER OVERHAUL

Tools Required

- **J 8092** Universal Driver Handle 3/4 inch-10
- **J 45863** Boot Seal Installer

CAUTION: Refer to **Brake Fluid Irritant Caution** .

Disassembly Procedure

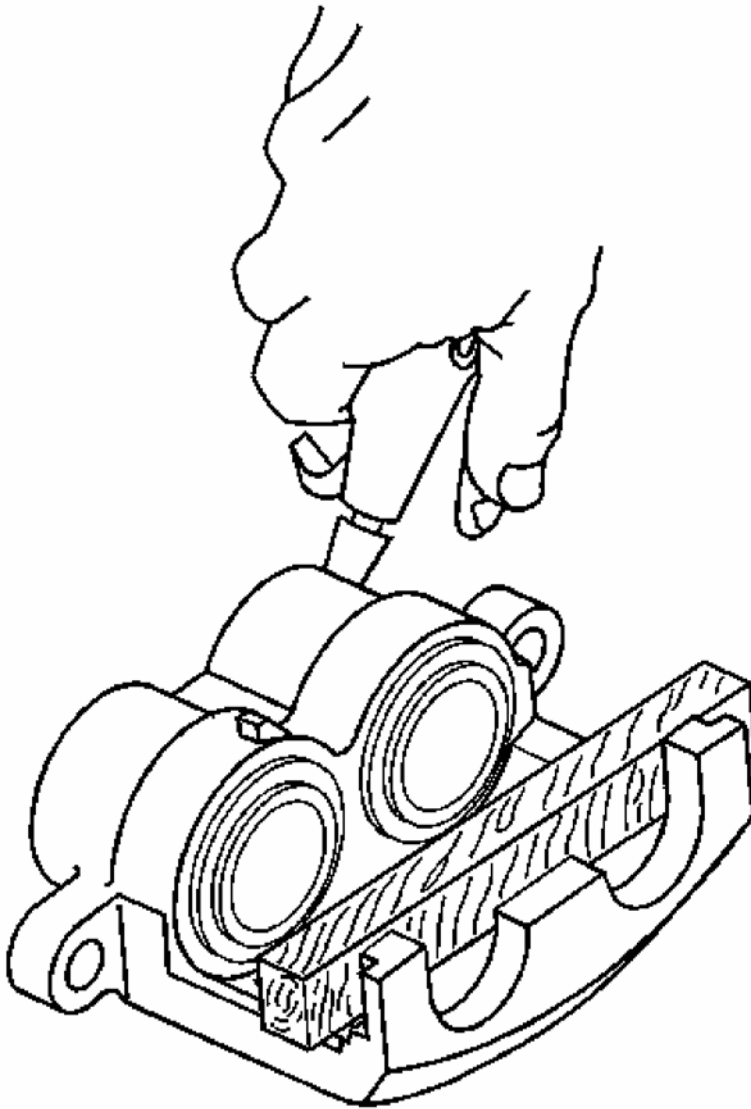


Fig. 27: Applying Air To Brake Caliper
Courtesy of GENERAL MOTORS CORP.

1. Drain all the brake fluid from the caliper.

CAUTION: Do not place your fingers in front of the piston in order to catch or protect the piston while applying compressed air. This could result in serious injury.

IMPORTANT: In the following service procedure, the caliper piston may

become damage when it is removed from the brake caliper assembly. If this happens, DO NOT reuse the piston. Discard and replaced with new.

2. Install the brake caliper in a suitable holding devise.
3. Insert a piece of wood in the brake caliper.
4. Cover the brake caliper with a shop towel.
5. Using compressed filtered, non-lubricated air, apply the air to the remove the pistons from the brake caliper.

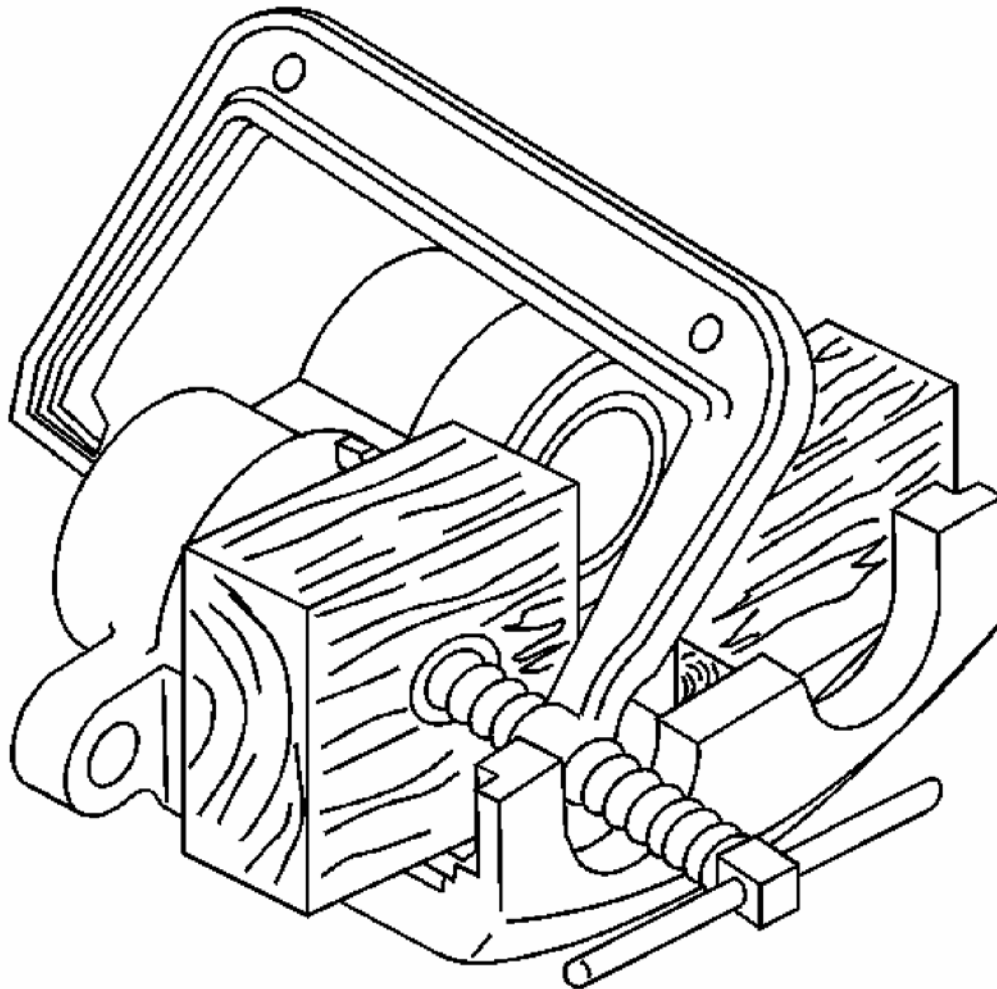


Fig. 28: Clamping Brake Caliper
Courtesy of GENERAL MOTORS CORP.

6. If one of the pistons fails to be removed from the brake caliper, perform the following steps.
 1. Reposition the piston that has been removed back in the brake caliper.
 2. Using a small block of wood and a C-clamp, slowly tighten the C-clamp until the piston it is half way in the brake caliper. It does not have to be fully seated.
 3. Position a second block of wood in front of the piston that remains in the brake caliper.
 4. Cover the brake caliper with a shop towel.
 5. Using compress filtered, non lubricated air, apply the air to the remove the pistons from the brake caliper.

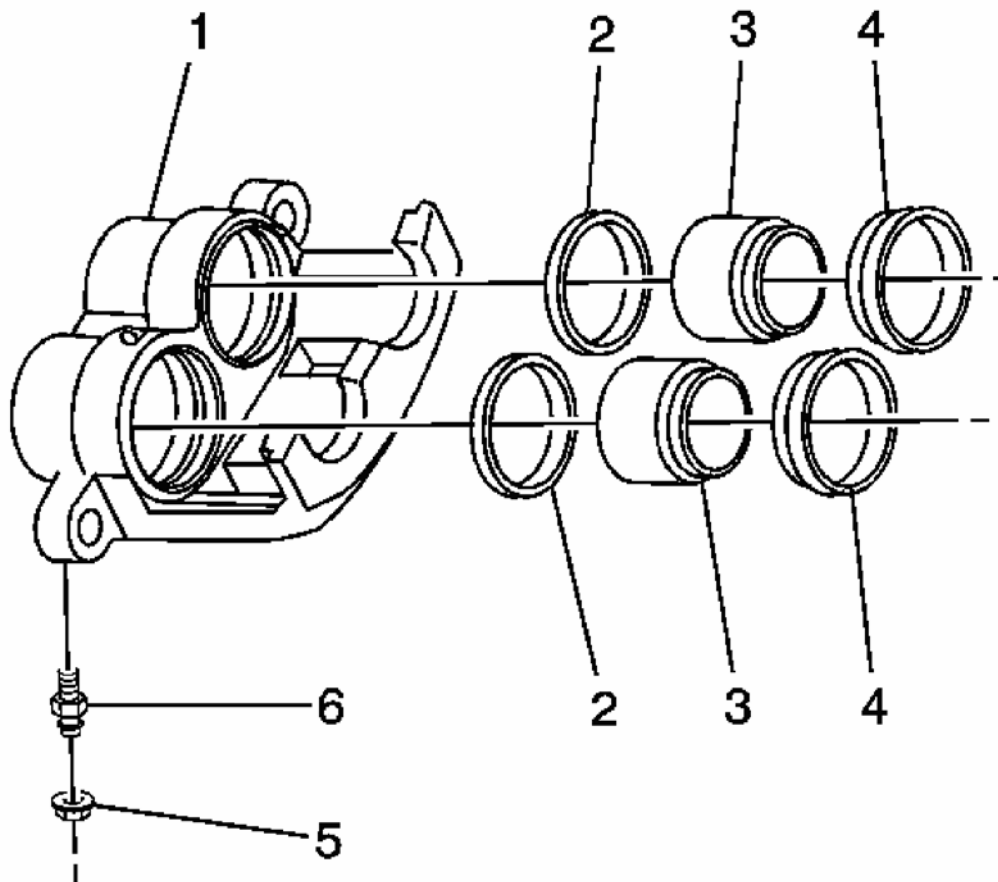


Fig. 29: Exploded View Of Brake Caliper
Courtesy of GENERAL MOTORS CORP.

7. Remove the pistons (3) from the caliper bores.

8. Remove the piston seals (2) from the caliper bores. Do not use a metal tool.
9. Remove the bleeder valve cap (5).
10. Remove the bleeder valve (6) from the caliper housing (1).
11. Clean the bleeder valve, the caliper bores, the caliper passages and the pistons with denatured alcohol. Dry the parts and blow out the brake fluid passages. Use dry and filtered compressed air.

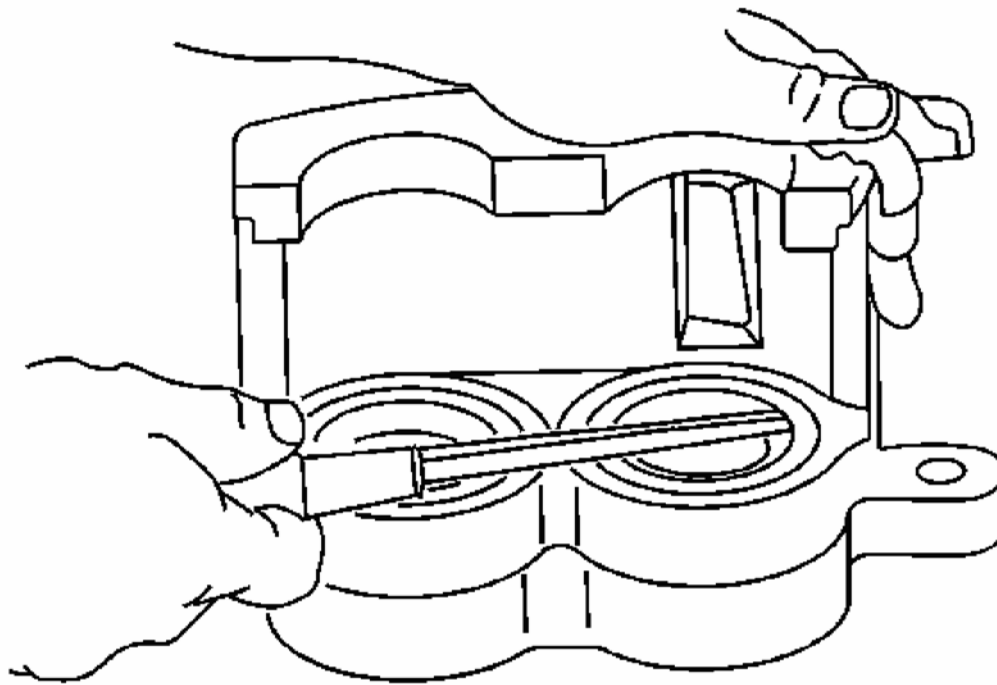


Fig. 30: Removing Caliper Boots
Courtesy of GENERAL MOTORS CORP.

12. Remove the boots from the caliper bores. Do not scratch the caliper bores.
13. Replace the pistons or the caliper if any of the following conditions exist:
 - Scoring in the caliper bores
 - Corrosion in the caliper bores
 - Pitting in the caliper bores
 - Damage to the pistons (phenolic)
14. Clean the brake caliper assembly with denatured alcohol.
15. Dry with filtered, lubricated compressed air.

Assembly Procedure

IMPORTANT: When applying the clean brake fluid to the piston bores and pistons, only apply the brake fluid to one bore at a time. This is done to ensure that the brake caliper, seals and pistons DO NOT become contaminated with dirt or other foreign material.

1. Apply a small amount of clean DOT-3 brake fluid to the piston, piston seal, and piston bore.

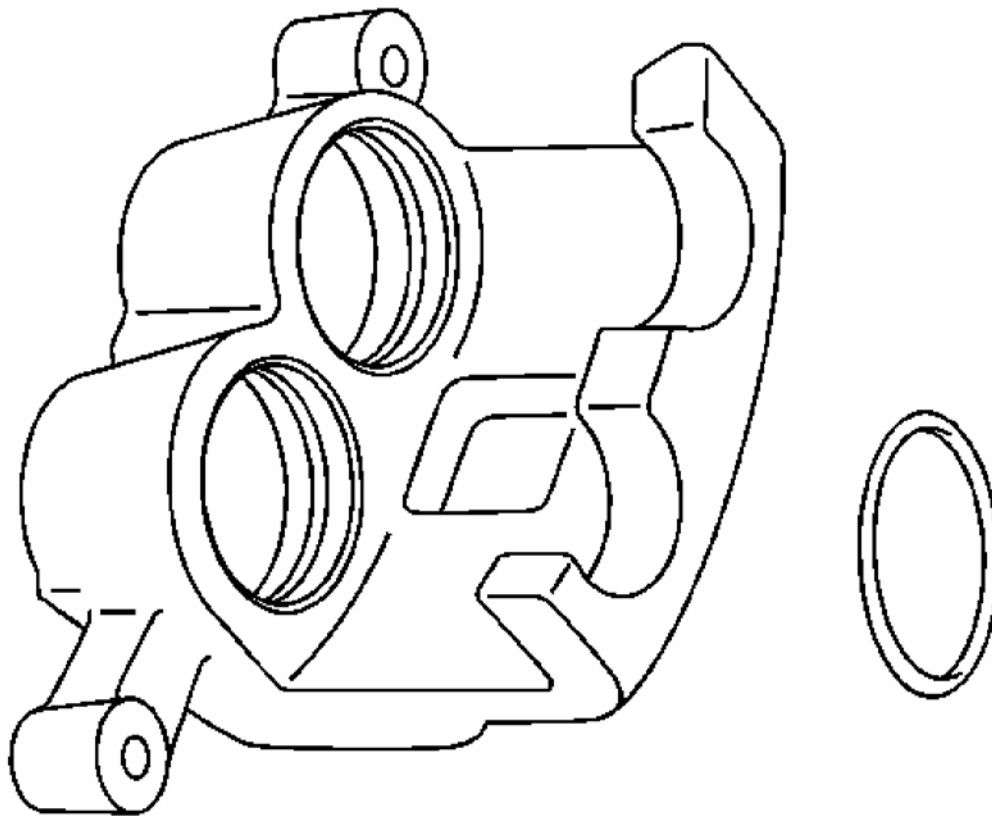


Fig. 31: View Of Brake Caliper Piston Seal
Courtesy of GENERAL MOTORS CORP.

2. Install the piston seal in the brake caliper.

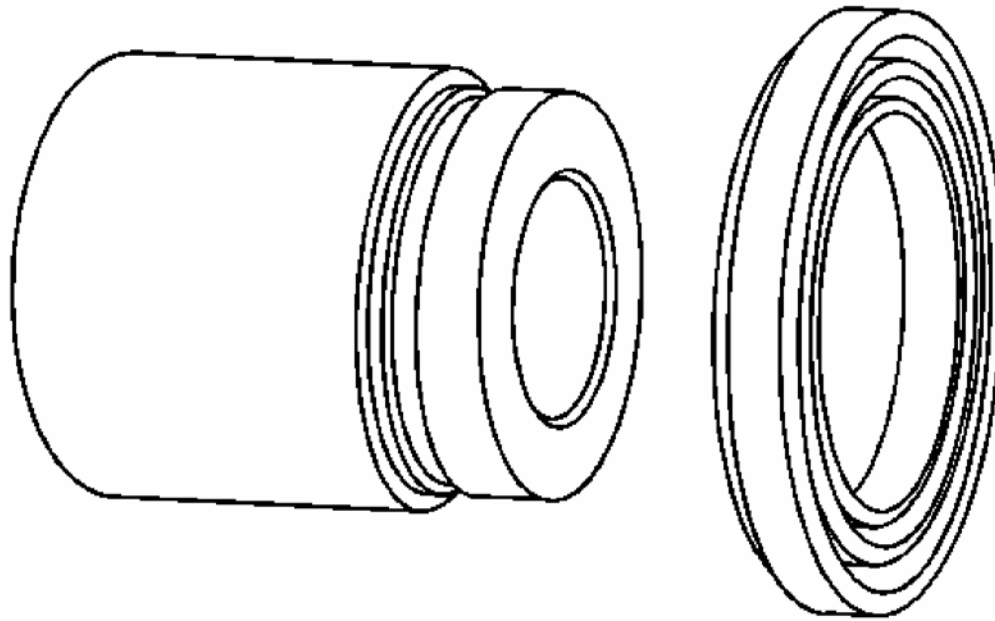


Fig. 32: View Of Piston Dust Seal
Courtesy of GENERAL MOTORS CORP.

3. Install the dust seal on the piston.

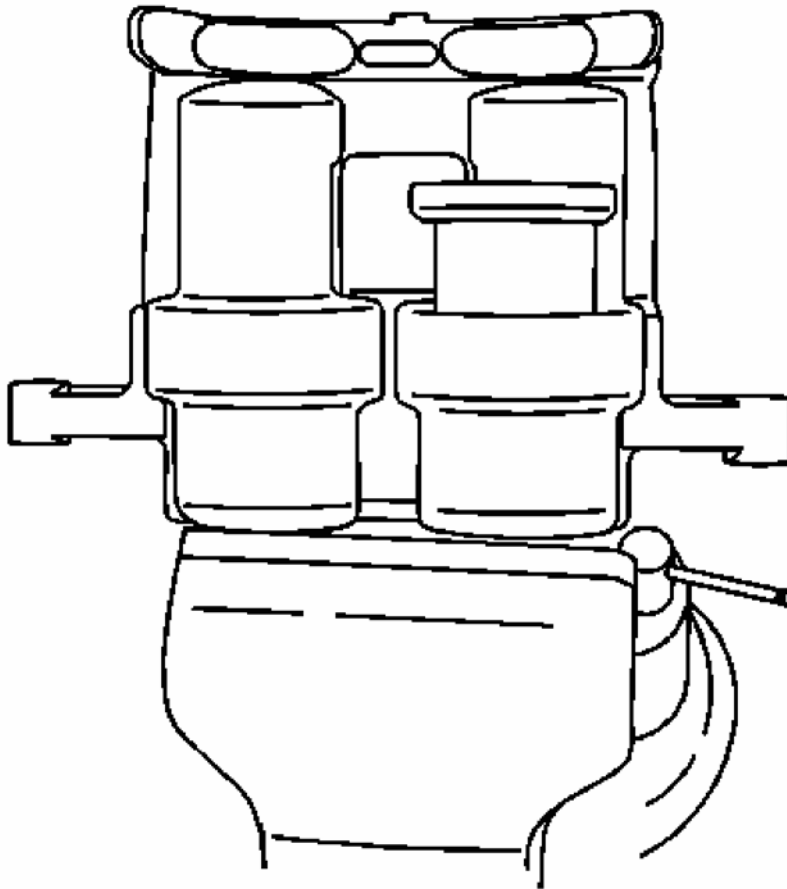


Fig. 33: Installing Piston To Brake Caliper
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Position the piston in the bore so that it is straight and level.

4. Install the piston in the brake caliper.

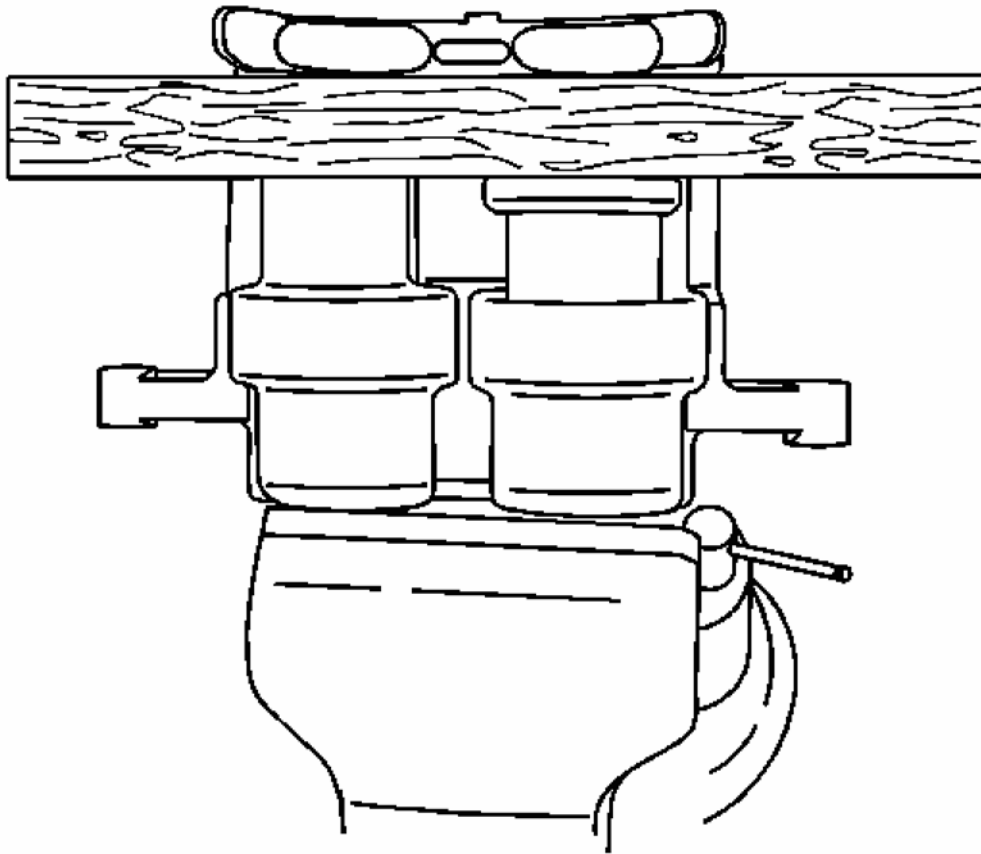


Fig. 34: Installing Piston Into Bore
Courtesy of GENERAL MOTORS CORP.

5. Position a piece of wood across the piston to be installed.
6. Applying equal pressure by hand while pushing down, install the piston in the bore.
7. Remove the piece of wood.

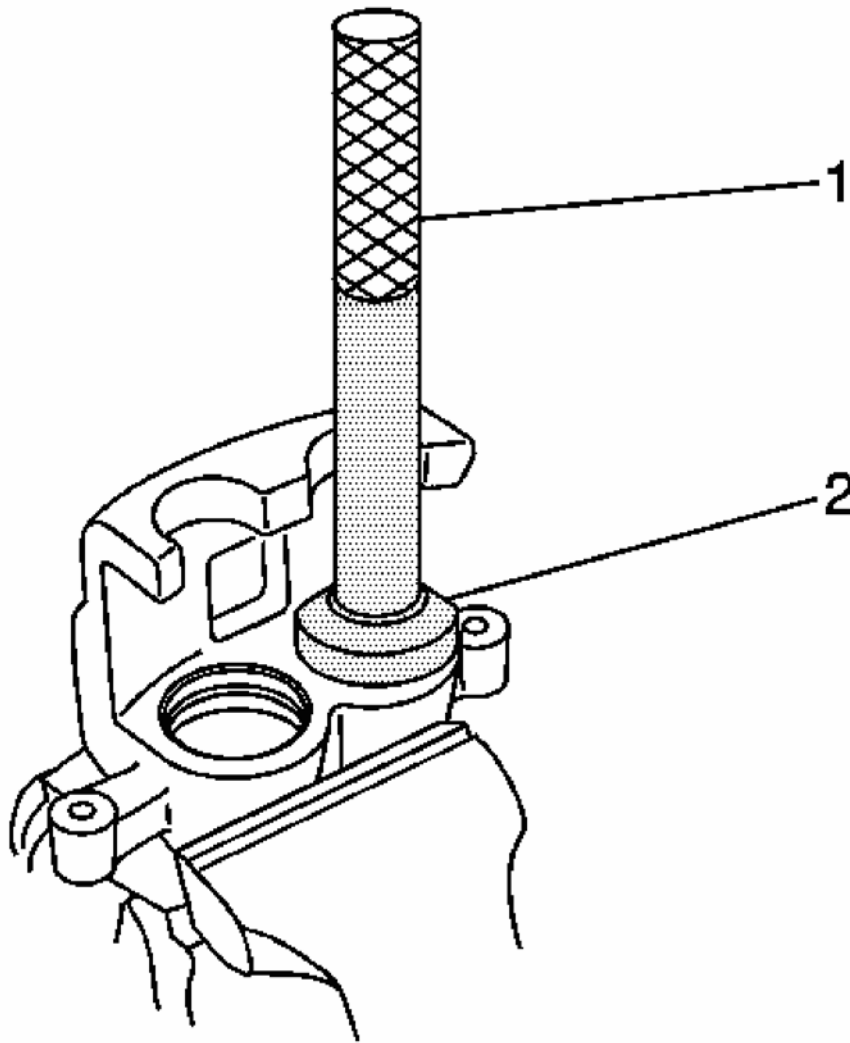


Fig. 35: Installing Piston Dust Seal
Courtesy of GENERAL MOTORS CORP.

8. Using the **J 8092** (1) and the **J 45863** (2), install the piston dust seal in the brake caliper.

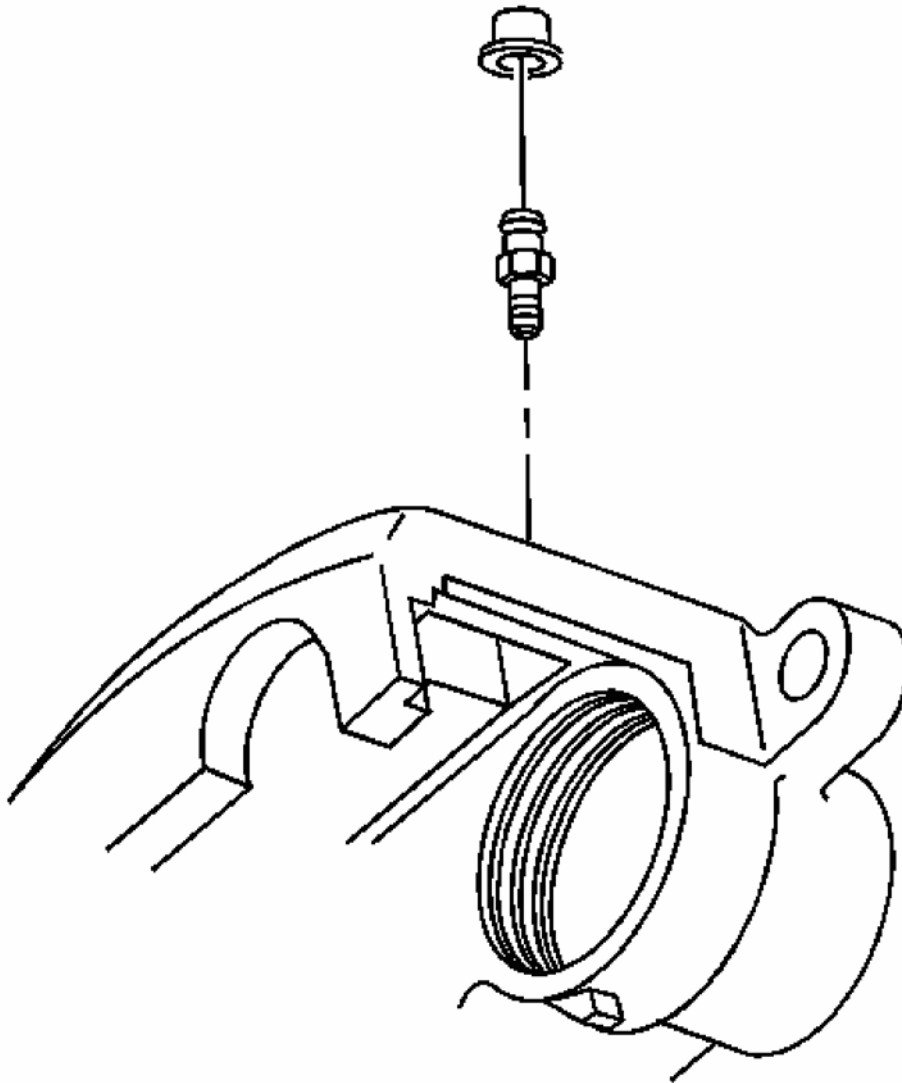


Fig. 36: View Of Bleeder Valve Cap
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice .

9. Install the bleeder valve in the brake caliper housing.

Tighten: Tighten the bleeder valve to 19 N.m (14 lb ft).

10. Install bleeder valve cap.

BRAKE CALIPER OVERHAUL - REAR

Removal Procedure

CAUTION: Refer to Brake Dust Caution in Cautions and Notices.

CAUTION: Refer to Brake Fluid Irritant Caution in Cautions and Notices.

NOTE: Refer to Brake Fluid Effects on Paint and Electrical Components Notice in Cautions and Notices.

1. Remove the rear brake caliper from the vehicle. Refer to Brake Caliper Replacement - Rear.

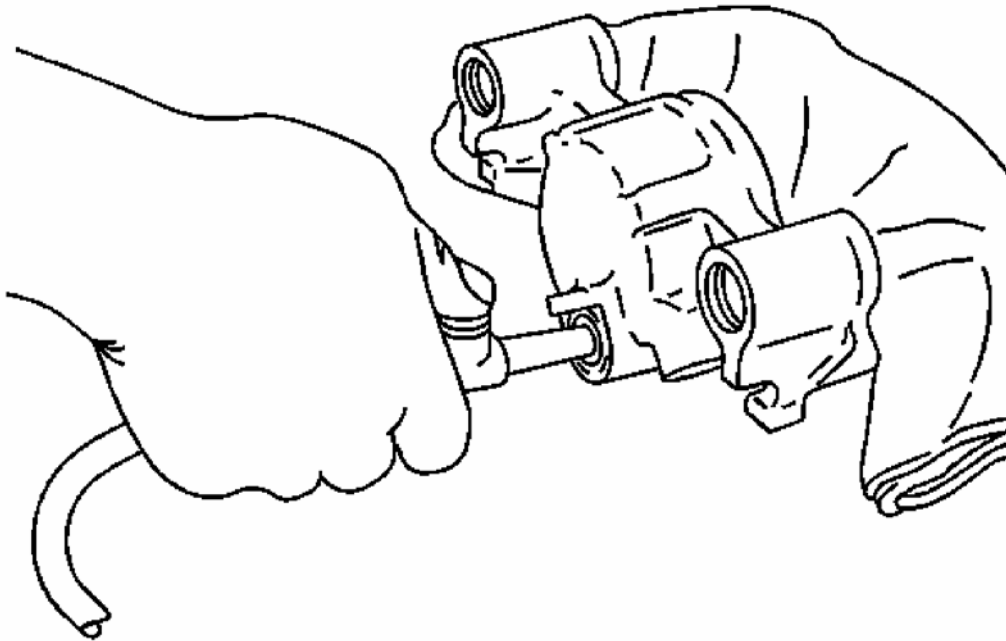


Fig. 37: Removing Brake Caliper Piston Using Low Pressure Compressed Air
Courtesy of GENERAL MOTORS CORP.

CAUTION: Do not place fingers in front of the caliper piston(s) in an attempt to catch or protect it when applying compressed air. The piston(s) can fly out with force

and could result in serious bodily injury.

NOTE: Use clean cloths to pad interior of caliper housing during piston removal. Use just enough air to ease the pistons out of the bores. If the pistons are blown out, even with the padding provided, it may be damaged.

2. Remove the brake caliper piston from the caliper bore by directing low pressure compressed air into the caliper bore through the fluid inlet hole.

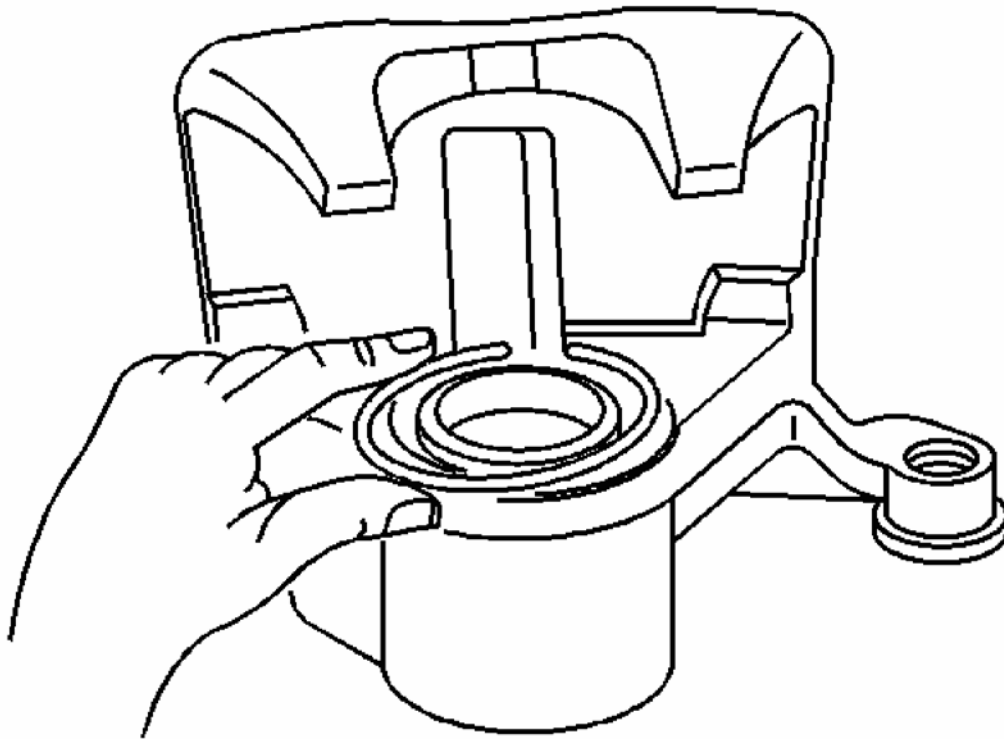


Fig. 38: View Of Dust Boot Retaining Ring
Courtesy of GENERAL MOTORS CORP.

3. Remove the retaining ring that secures the dust boot to the caliper housing.

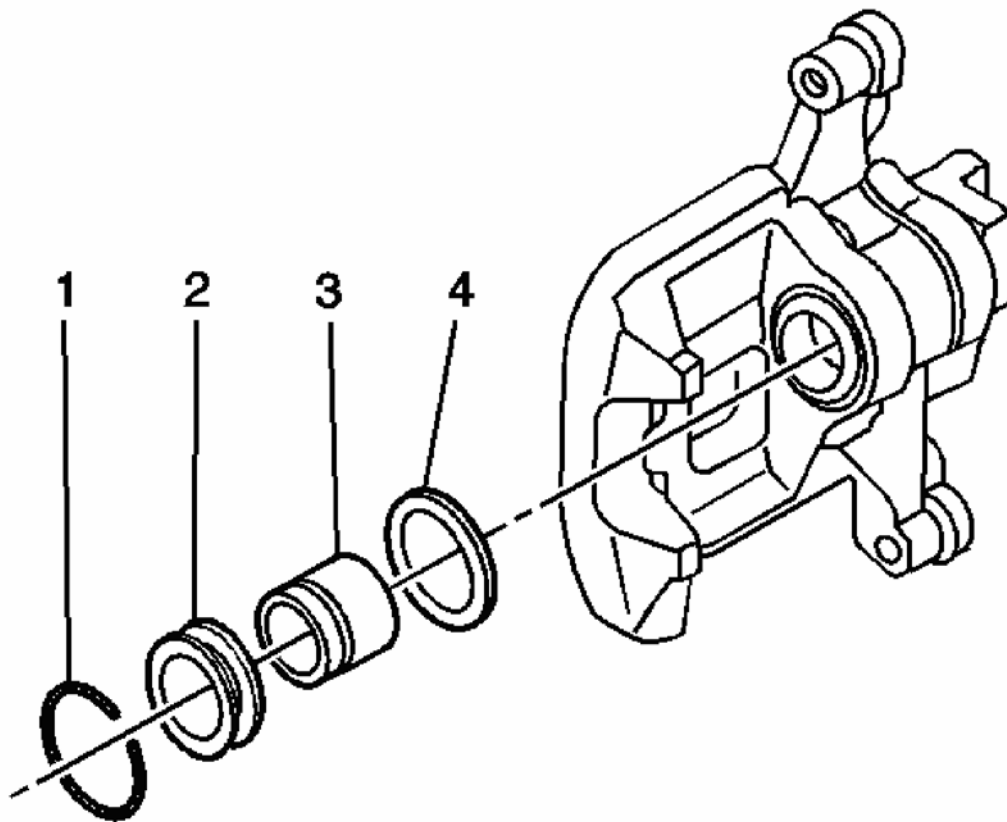


Fig. 39: Exploded View Of Brake Caliper
Courtesy of GENERAL MOTORS CORP.

4. Remove the piston dust boot seal (2) from the seal counterbore in the caliper. Discard the boot seal.
5. Using a small wooden or plastic tool, remove the piston seal (4) from the caliper bore. Discard the piston seal.

IMPORTANT: Do not use abrasives to clean the brake caliper piston.

6. Clean the brake caliper piston bore and seal counterbore, and the caliper piston with denatured alcohol, or equivalent.
7. Dry the caliper piston bore and counterbore, and the piston with non-lubricated, filtered air.
8. Inspect the caliper bore for cracks, scoring, pitting, excessive rust, and/or excessive corrosion.

9. If light rust or light corrosion are present in the caliper bore, attempt to remove the imperfection with a fine emery paper. If the imperfection cannot be removed, replace the caliper assembly.
10. If cracks, scoring, pitting, excessive rust, and/or excessive corrosion are present in the caliper bore, replace the caliper assembly.
11. Inspect the caliper piston for cracks, scoring, and/or damage to the chrome plating. Replace the caliper piston if any of these conditions exist.

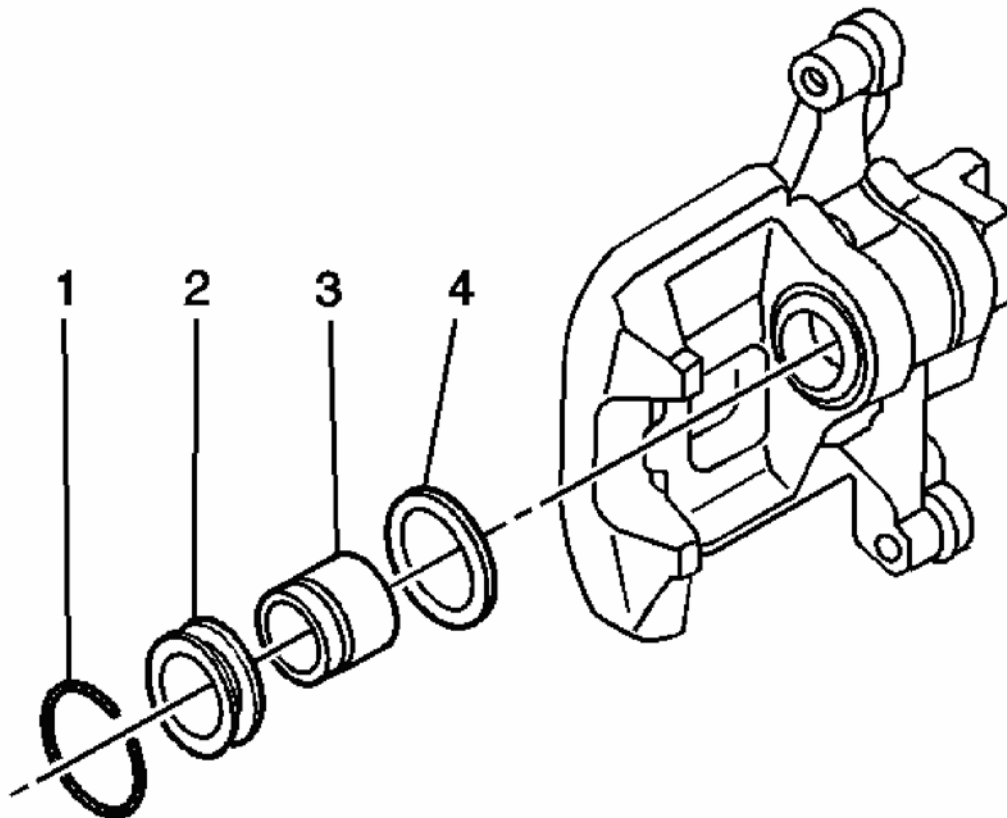
Installation Procedure

Fig. 40: Exploded View Of Brake Caliper
Courtesy of GENERAL MOTORS CORP.

1. Lubricate the new piston seal (4) with Delco Supreme 11®, GM P/N 12377967 (Canadian P/N 992667), or equivalent DOT-3 brake fluid from a clean, sealed brake fluid container.
2. Install the lubricated, new piston seal (4) into the caliper bore.

3. Apply a thin coat of Delco Supreme 11®, GM P/N 12377967 (Canadian P/N 992667) or equivalent, DOT-3 brake fluid from a clean, sealed brake fluid container onto the outer surface area of the caliper piston (3).

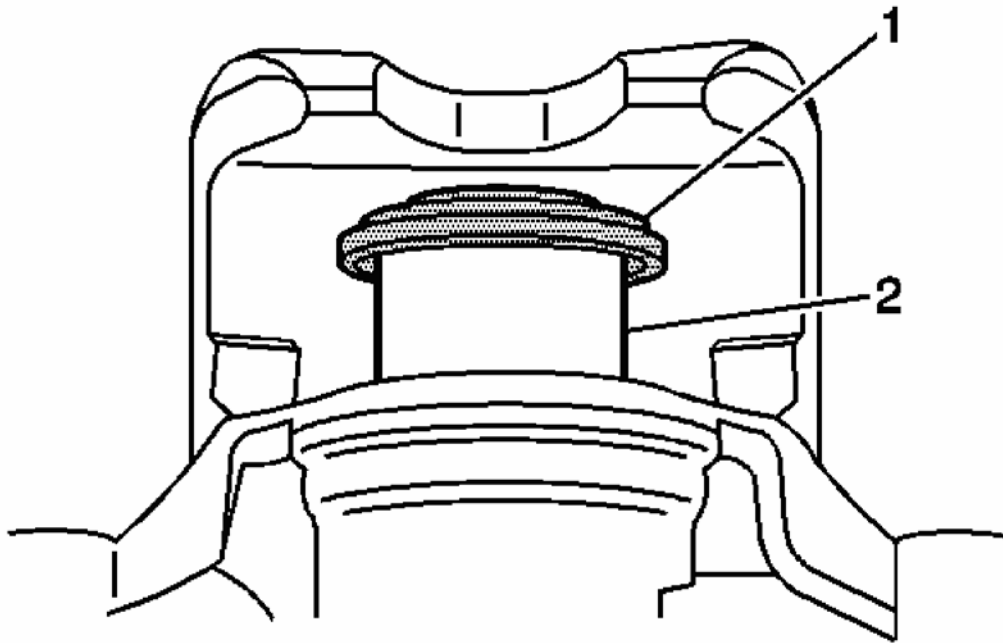


Fig. 41: Identifying Caliper Piston & Piston Dust Boot Seal
Courtesy of GENERAL MOTORS CORP.

4. Install the bottom half of the caliper piston (2) into the caliper bore.
5. Install the new piston dust boot seal (1) over the caliper piston (2).
6. Compress the caliper piston (2) to the bottom of the caliper bore.
7. Fully seat the piston dust boot seal (1) into caliper counterbore.

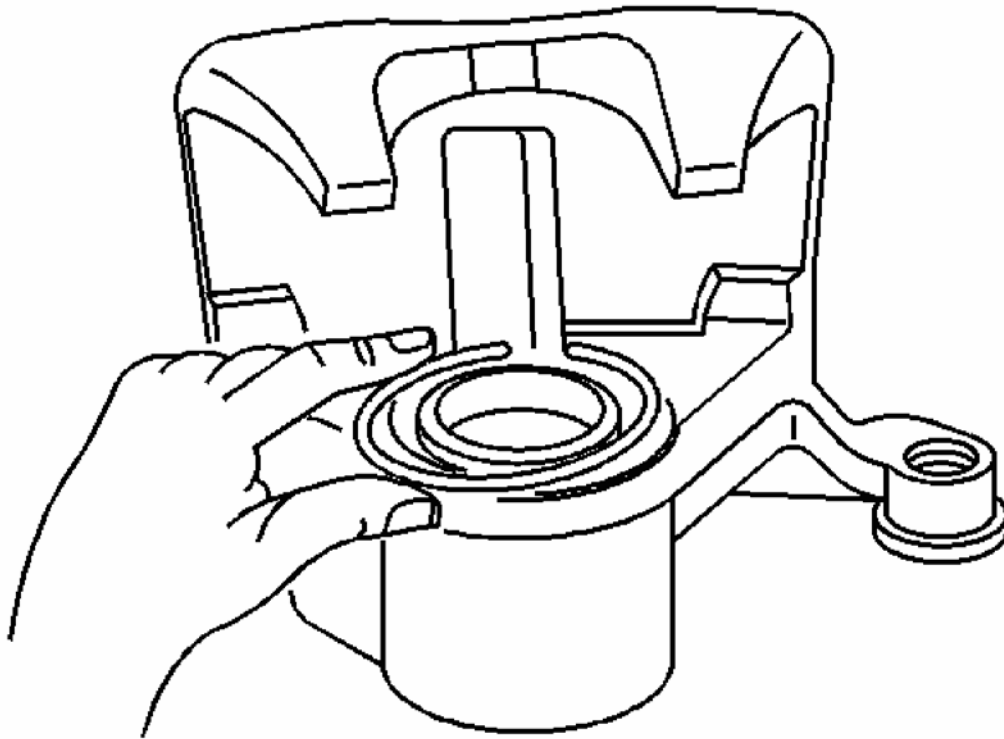


Fig. 42: View Of Dust Boot Retaining Ring
Courtesy of GENERAL MOTORS CORP.

8. Install the retaining ring that secures the dust boot to the caliper housing.
9. Install the bleeder valve and cap to the caliper and tighten the valve securely.
10. Install the rear brake caliper to the vehicle. Refer to **Brake Caliper Replacement - Rear**.

FRONT DISC BRAKE HARDWARE REPLACEMENT

Removal Procedure

CAUTION: Refer to **Brake Dust Caution** in Cautions and Notices.

NOTE: Support the brake caliper with heavy mechanic's wire, or equivalent, whenever it is separated from its mount and the hydraulic flexible brake hose is still connected. Failure to support the caliper in this manner will cause the flexible brake hose to bear the weight of the caliper, which may cause damage to the

brake hose and in turn may cause a brake fluid leak.

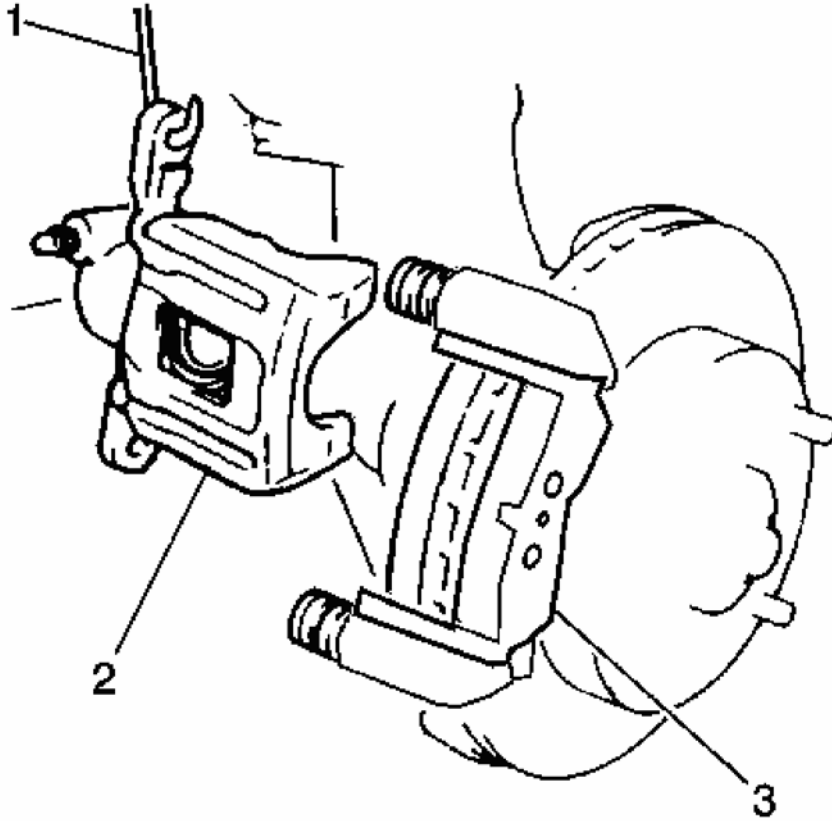


Fig. 43: View Of Brake Caliper And Caliper Bracket
Courtesy of GENERAL MOTORS CORP.

1. Remove the brake caliper from the mounting bracket and support the brake caliper (2) with heavy mechanic's wire (1), or equivalent. Discard the old caliper pin bolts, new bolts are supplied in the hardware kit. It is not necessary to disconnect the hydraulic brake flexible hose from the caliper. Refer to **Brake Caliper Replacement - Front**.

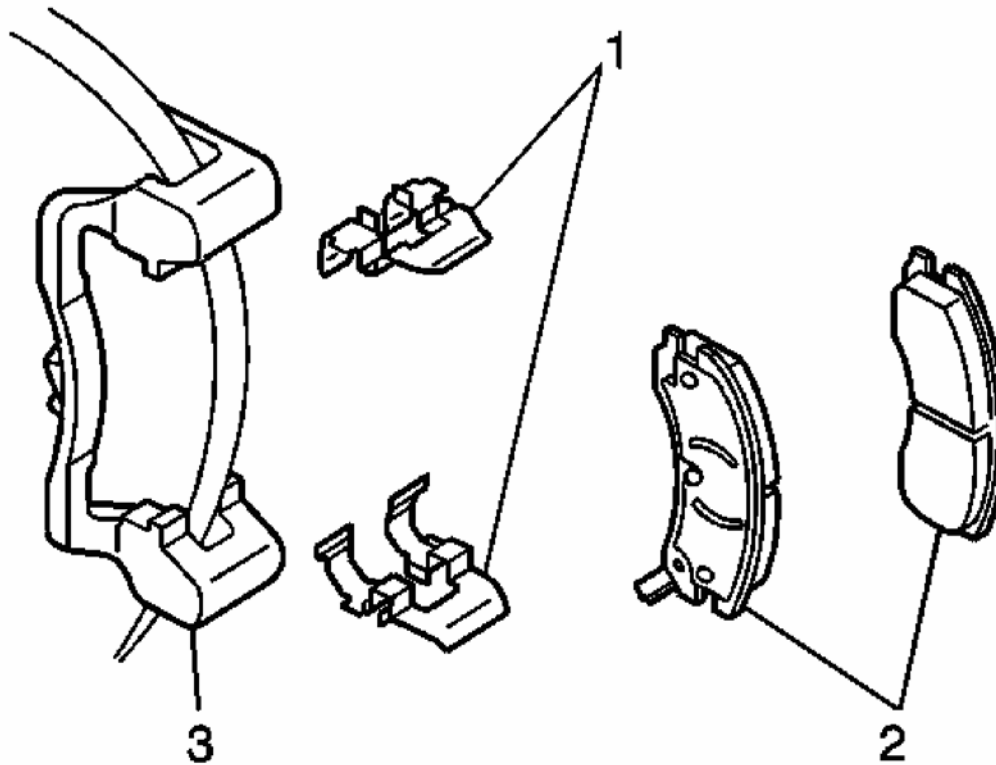


Fig. 44: View Of Brake Pads, Brake Pad Retainers, & Caliper Bracket
Courtesy of GENERAL MOTORS CORP.

2. Remove the brake pads (2) from the brake caliper bracket.
3. Remove the brake pad retainers (1) from the brake caliper bracket.

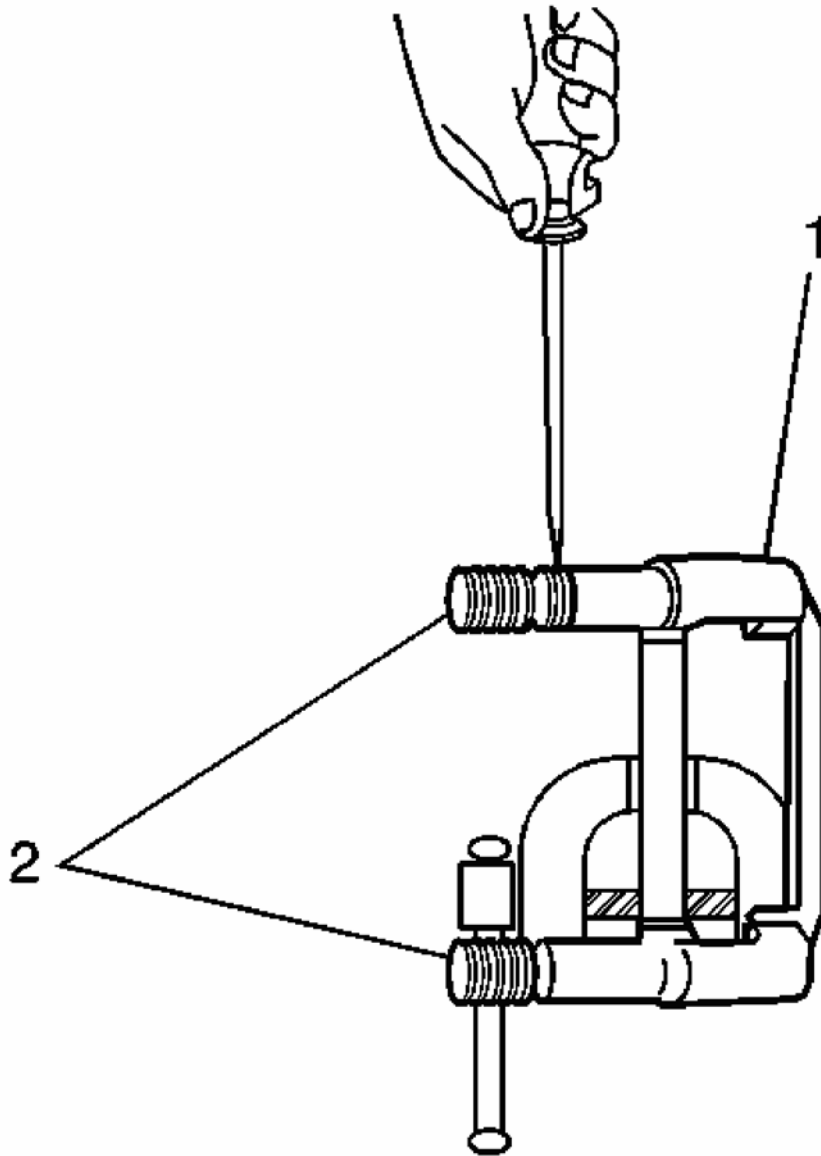


Fig. 45: Removing Front Caliper Pin Boots From Bracket
Courtesy of GENERAL MOTORS CORP.

4. Remove the brake caliper bracket. Refer to **Brake Caliper Bracket Replacement - Front**.
5. Mount the brake caliper bracket (1) in a vise.
6. Using a flat bladed tool or punch carefully remove the caliper pin boots (2) from brake caliper bracket (1).

IMPORTANT:

- Clean the caliper bracket with denatured alcohol.
- Dry with low pressure, non-lubricated, filtered air.
- Inspect the brake caliper bracket for damage. If damaged, replace the bracket.

7. Thoroughly clean the caliper bracket bores of all lubricant.

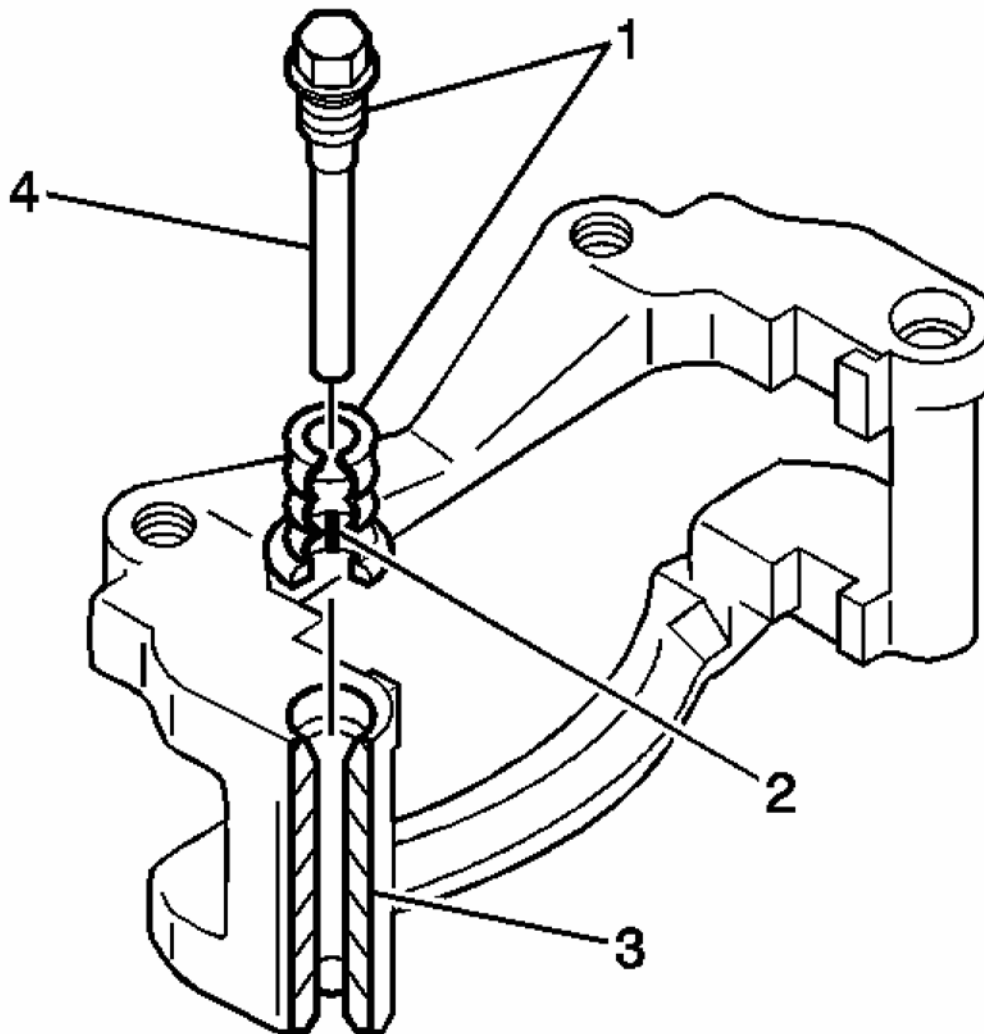
Installation Procedure

Fig. 46: Installing Pin Bolts & Boots
Courtesy of GENERAL MOTORS CORP.

1. Lubricate the bores (3), the inside part of the bolt boot (2) and the caliper pin bolts (4) with GM P/N 18047666, or equivalent.
2. Press the new caliper pin bolt boots into the caliper pin bores.
3. Install the brake caliper bracket. Refer to **Brake Caliper Bracket Replacement - Front**.

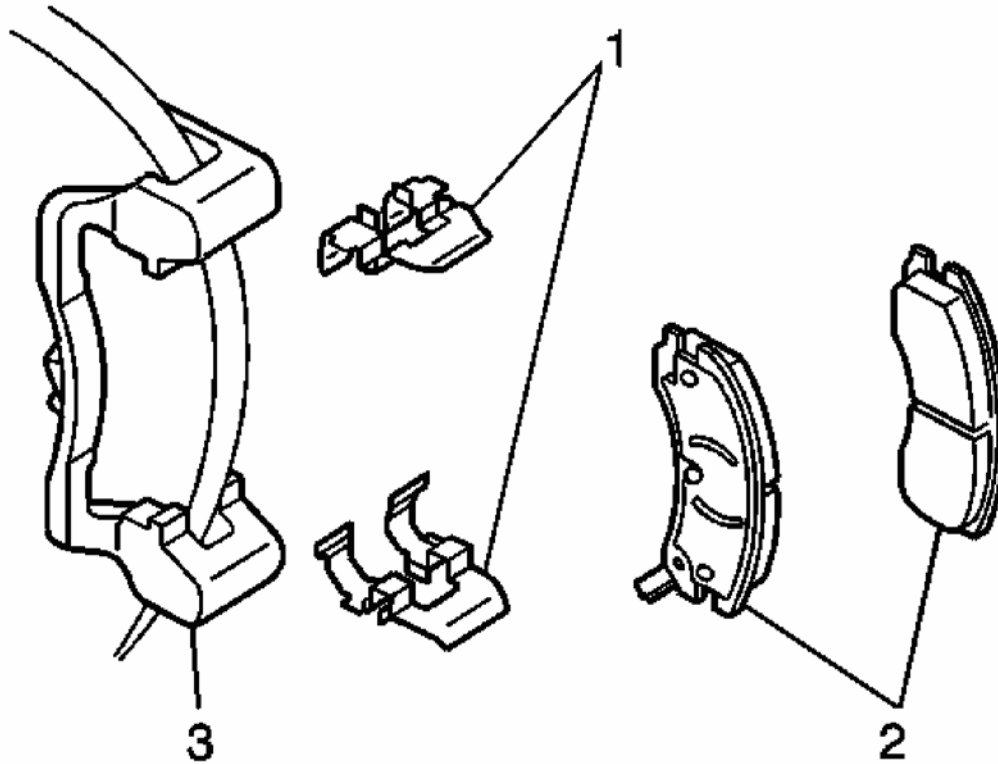


Fig. 47: View Of Brake Pads, Brake Pad Retainers, & Caliper Bracket
Courtesy of GENERAL MOTORS CORP.

4. Install the brake pad retainers (1) to the caliper bracket.
5. Install the brake pads (2) to the caliper bracket.

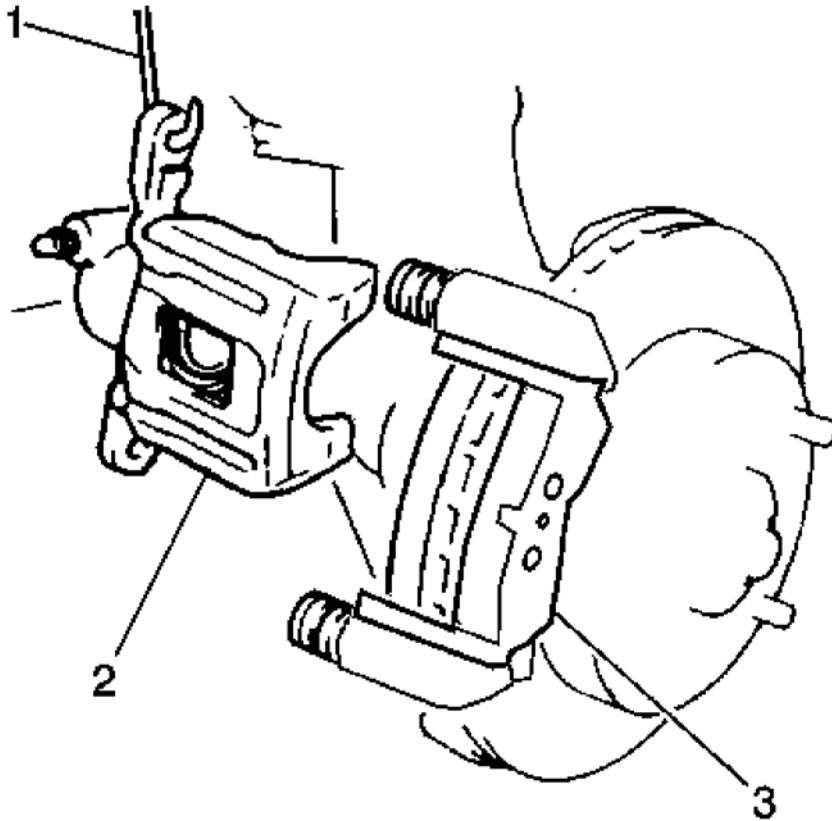


Fig. 48: View Of Brake Caliper And Caliper Bracket
Courtesy of GENERAL MOTORS CORP.

6. Remove the heavy mechanics wire (1) and install the brake caliper. Refer to **Brake Caliper Replacement - Front**.

REAR DISC BRAKE HARDWARE REPLACEMENT

Removal Procedure

CAUTION: Refer to **Brake Dust Caution** in Cautions and Notices.

NOTE: Support the brake caliper with heavy mechanic's wire, or equivalent, whenever it is separated from its mount and the hydraulic flexible brake hose is still connected. Failure to support the caliper in this manner will cause the flexible brake hose to

bear the weight of the caliper, which may cause damage to the brake hose and in turn may cause a brake fluid leak.

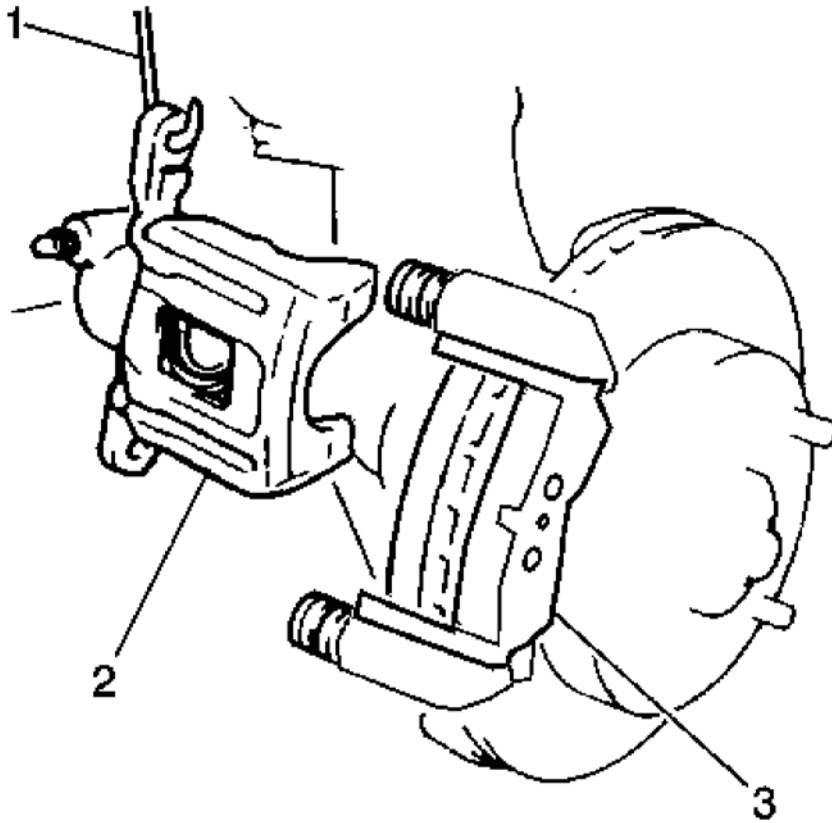


Fig. 49: View Of Brake Caliper And Caliper Bracket
Courtesy of GENERAL MOTORS CORP.

1. Remove the brake caliper from the mounting bracket and support the brake caliper (2) with heavy mechanic's wire (1), or equivalent. It is not necessary to disconnect the hydraulic brake flexible hose from the caliper. Refer to **Brake Caliper Replacement - Rear**.

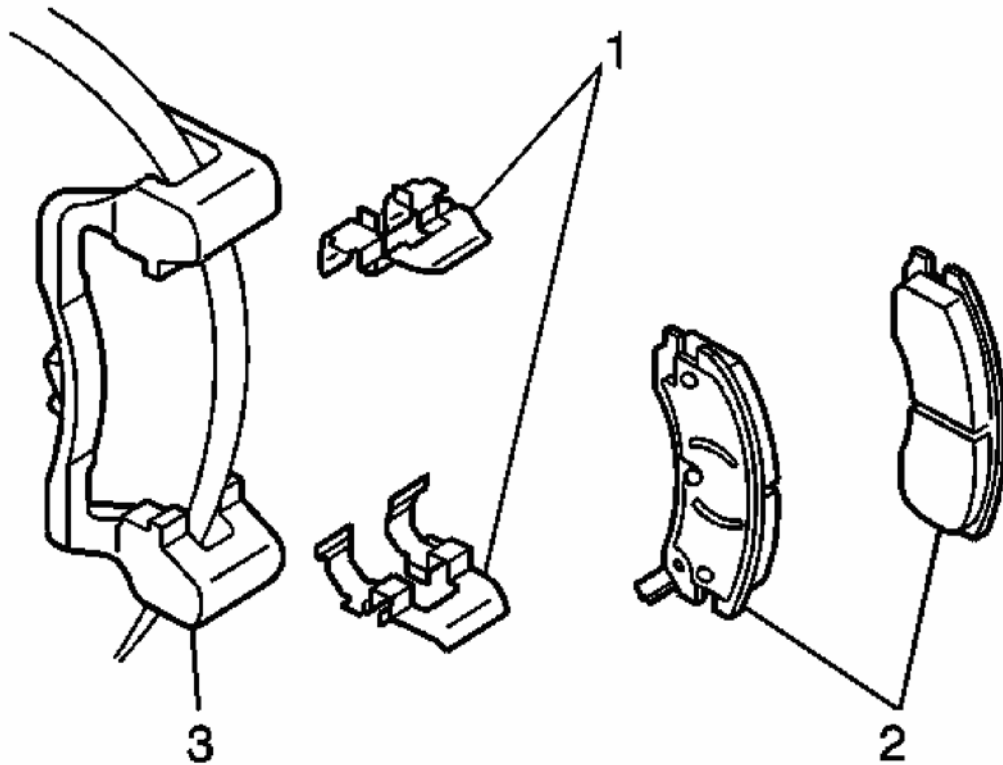


Fig. 50: View Of Brake Pads, Brake Pad Retainers, & Caliper Bracket
Courtesy of GENERAL MOTORS CORP.

2. Remove the brake pads (2) from the brake caliper bracket (1).
3. Remove the brake pad retainers (1) from the brake caliper bracket (3).
4. Remove the brake caliper bracket (3). Refer to **Brake Caliper Bracket Replacement - Rear**.
5. Mount the brake caliper bracket (3) in a vise.

Installation Procedure

1. Clean all parts in clean, denatured alcohol.
2. Dry with low pressure, non-lubricated, filtered air.
3. Inspect the brake caliper bracket for cracks. If cracked, replace bracket.
4. Lubricate the brake caliper pin bolt sleeves with high temperature silicone lubricant.
5. Install the brake caliper bracket. Refer to **Brake Caliper Bracket Replacement - Rear**.

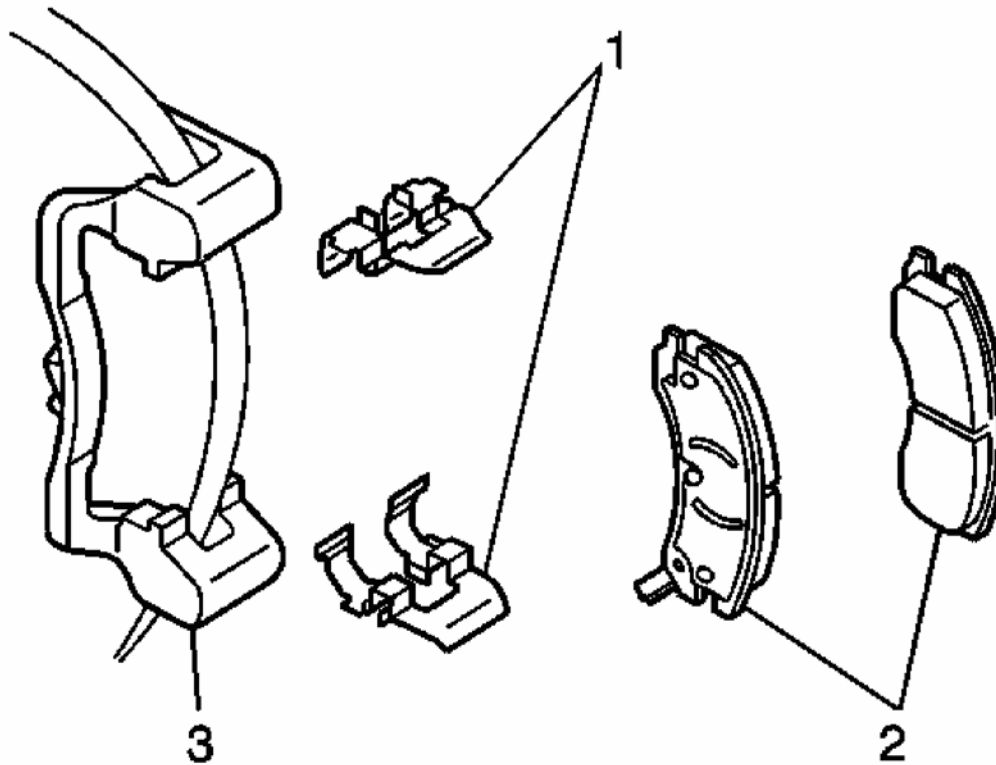


Fig. 51: View Of Brake Pads, Brake Pad Retainers, & Caliper Bracket
Courtesy of GENERAL MOTORS CORP.

6. Install the brake pad retainers (1) to the bracket caliper bracket (3).
7. Install the brake pads (2) to the bracket caliper bracket (3).
8. Install the brake caliper to the brake caliper bracket. Refer to **Brake Caliper Replacement - Rear**.

FRONT BRAKE CALIPER BRACKET REPLACEMENT

Removal Procedure

CAUTION: Refer to **Brake Dust Caution** in Cautions and Notices.

NOTE: Support the brake caliper with heavy mechanic's wire, or equivalent, whenever it is separated from its mount and the hydraulic flexible brake hose is still connected. Failure to support the caliper in this manner will cause the flexible brake hose to

bear the weight of the caliper, which may cause damage to the brake hose and in turn may cause a brake fluid leak.

1. Remove the caliper from the mounting bracket and support the caliper with heavy mechanics wire or equivalent. It is not necessary to disconnect the hydraulic brake flexible hose from the caliper. Refer to **Brake Caliper Replacement - Front**.
2. Remove the front brake pads.

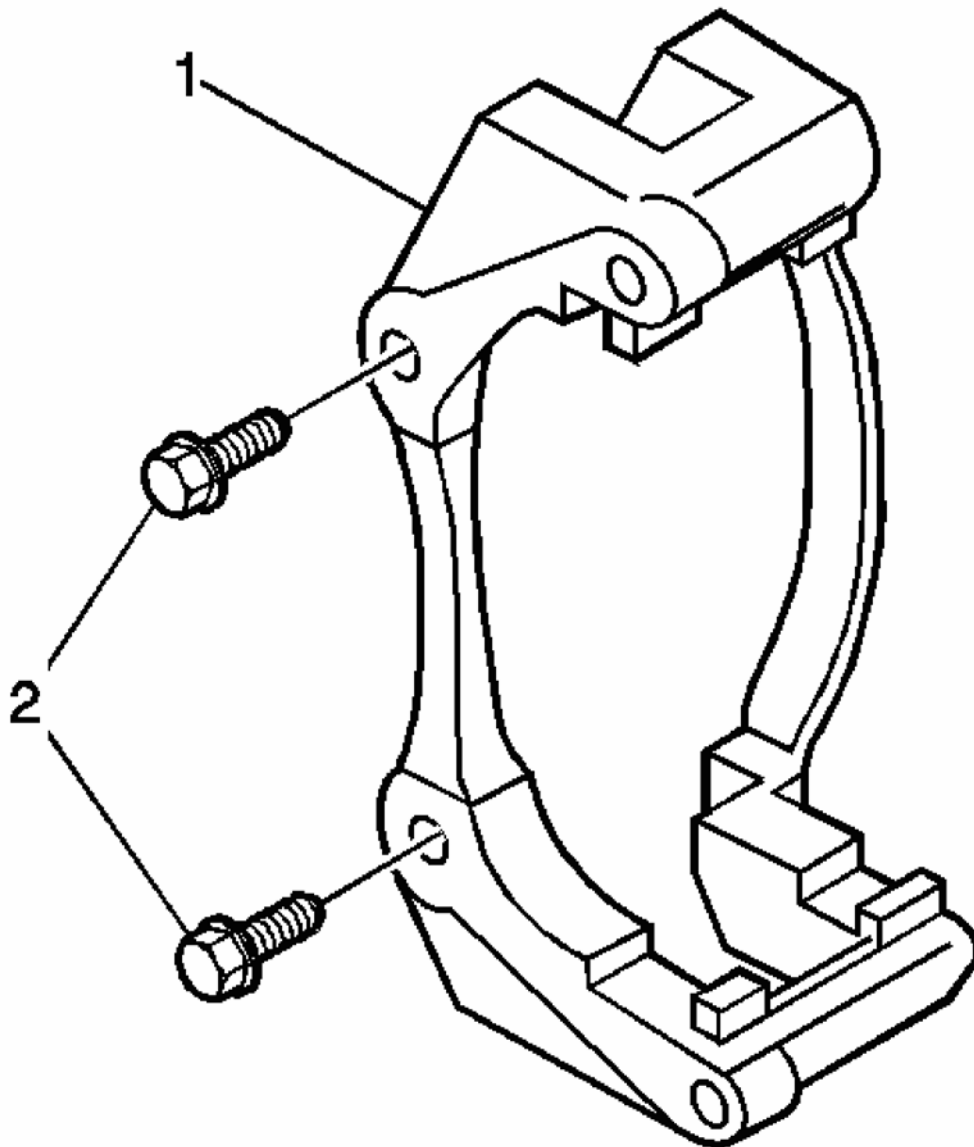


Fig. 52: Removing/Installing Brake Caliper Bracket & Bolts

Courtesy of GENERAL MOTORS CORP.

3. Remove the caliper bracket bolts (2).
4. Remove the caliper bracket (1).

Installation Procedure

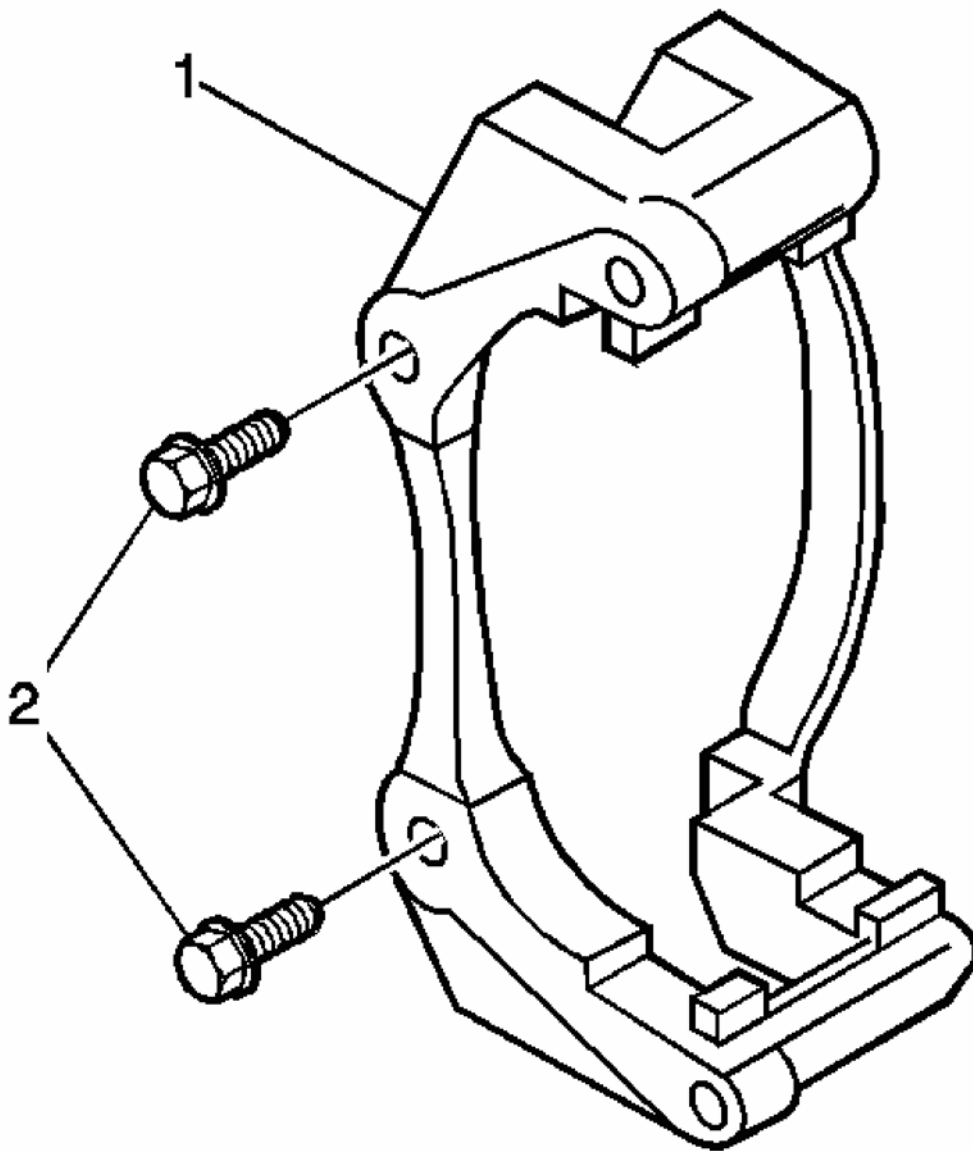


Fig. 53: Removing/Installing Brake Caliper Bracket & Bolts
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: To ensure that the proper clamp load will be present when installed. It is imperative that the threads on the caliper bracket bolts, as well as the mounting holes in the knuckle, be cleaned of all debris and inspected before proceeding with installation.

1. Clean and visually inspect threads of the caliper bracket bolts (2) and mounting holes in the knuckle.
2. Apply THREADLOCKER, GM P/N 12345493 (Canadian P/N 10953488) or equivalent, to the threads of the brake caliper bracket bolts (2).

NOTE: Refer to FASTENER NOTICE in Cautions and Notices.

3. Install the caliper bracket (1) with the bracket bolts (2).

Tighten: Tighten the caliper bracket bolts to 180 N.m (133 lb ft).

4. Install the front brake pads.
5. Install the caliper. Refer to Brake Caliper Replacement - Front.

REAR BRAKE CALIPER BRACKET REPLACEMENT

Removal Procedure

CAUTION: Refer to Brake Dust Caution in Cautions and Notices.

NOTE: Support the brake caliper with heavy mechanic's wire, or equivalent, whenever it is separated from its mount and the hydraulic flexible brake hose is still connected. Failure to support the caliper in this manner will cause the flexible brake hose to bear the weight of the caliper, which may cause damage to the brake hose and in turn may cause a brake fluid leak.

1. Remove the caliper from the mounting bracket and support the caliper with heavy mechanics wire or equivalent. It is not necessary to disconnect the hydraulic brake flexible hose from the caliper. Refer to Brake Caliper Replacement - Rear.
2. Remove the rear brake pads.

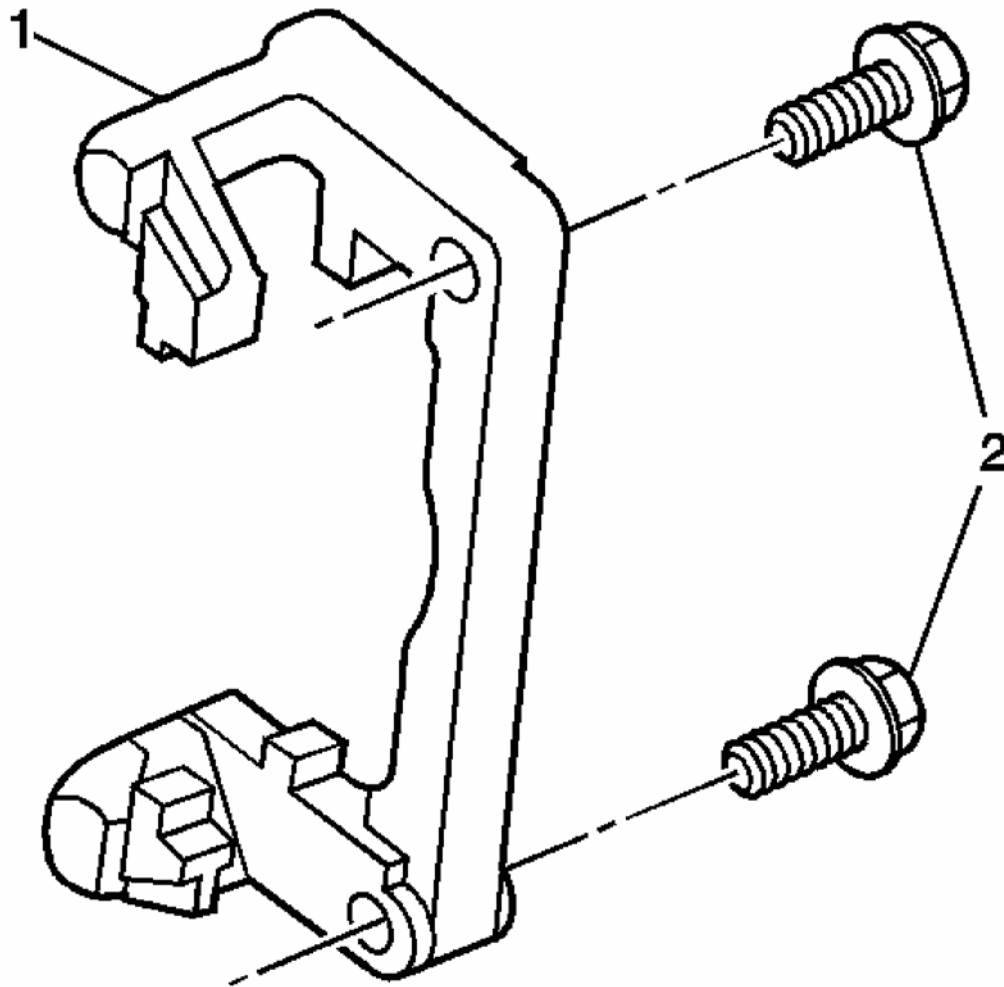


Fig. 54: View Of Caliper Bracket Bolts
Courtesy of GENERAL MOTORS CORP.

3. Remove the caliper bracket bolts (2).
4. Remove the caliper bracket (1).

Installation Procedure

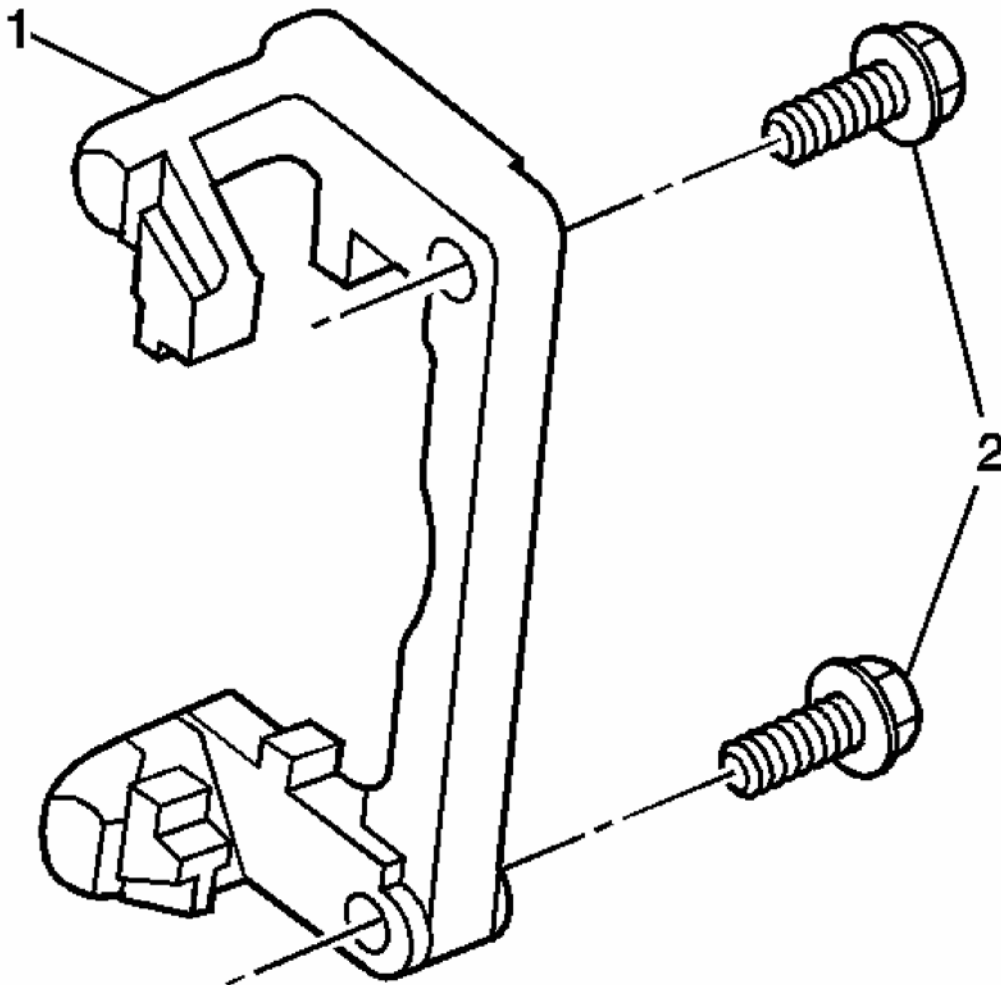


Fig. 55: View Of Caliper Bracket Bolts
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: To ensure that the proper clamp load will be present when installed. It is imperative that the threads on the caliper bracket bolts, as well as the mounting holes in the knuckle, be cleaned of all debris and inspected before proceeding with installation.

1. Clean and visually inspect threads of the caliper bracket bolts (2) and mounting holes in the knuckle.
2. Apply THREADLOCKER, GM P/N 12345493 (Canadian P/N 10953488), or equivalent to the threads of the brake caliper bracket bolts (2).

NOTE: Refer to FASTENER NOTICE in Cautions and Notices.

3. Install the caliper bracket (1) with the bracket bolts (2).

Tighten: Tighten the caliper bracket bolts to 115 N.m (85 lb ft).

4. Install the rear brake pads.
5. Install the caliper. Refer to Brake Caliper Replacement - Rear.

FRONT BRAKE ROTOR REPLACEMENT

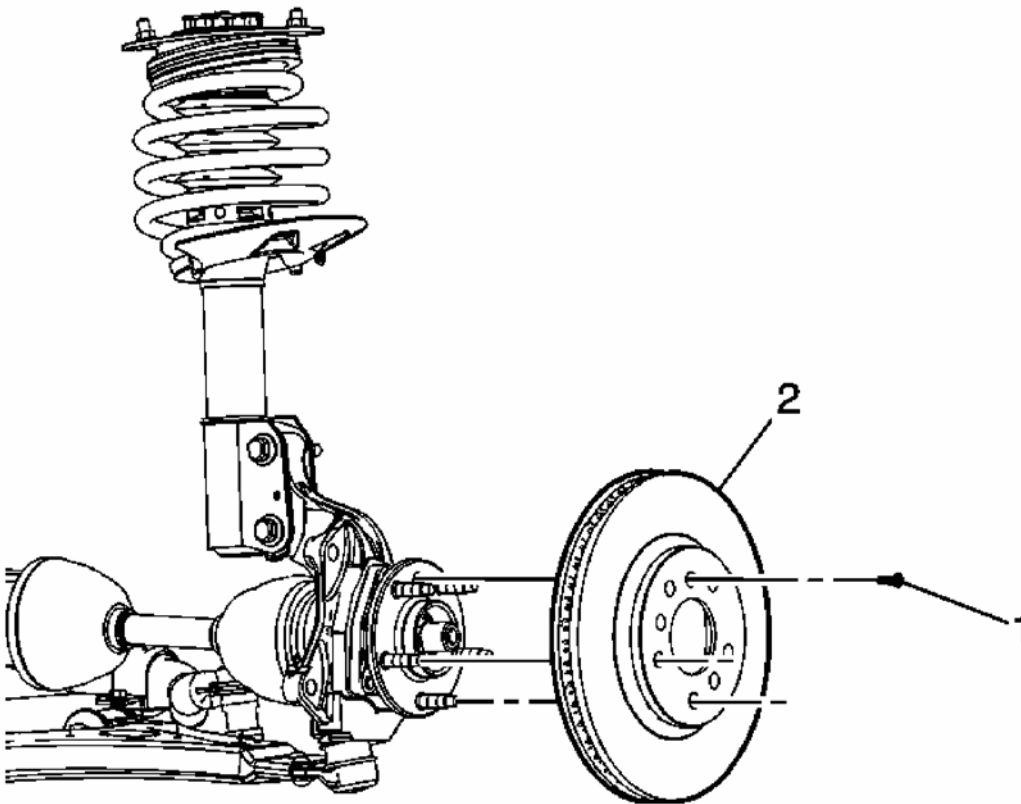


Fig. 56: Replacing Front Brake Rotor
Courtesy of GENERAL MOTORS CORP.

Brake Rotor Replacement - Front

Callout	Component Name
CAUTION: Refer to Brake Dust	

Caution .**NOTE:**

Refer to **Fastener**
Notice .

Fastener Tightening Specifications: Refer to **Fastener Tightening Specifications.**

Preliminary Procedure

1. Remove the tire and wheel. Refer to **Tire and Wheel Removal and Installation .**
2. Remove the brake caliper mounting bracket. Refer to **Brake Caliper Bracket Replacement - Front**

1	Retaining Screw Tightening Specifications: Tighten to 10 N.m (89 lb in)
2	Brake Rotor Tip: • If removing the rotor to service the brake system, mark the relationship of the rotor to the wheel stud for proper installation. • Using the J 41013 , clean the contact area of the brake rotor and the wheel bearing if the rotor is to be reused. See Special Tools. • Using the J 42450-A , remove the rust and dirt from the contact area of the wheel bearing if replacing the rotor. See Special Tools. • Check for Lateral Runout (LRO), refer to Brake Rotor Assembled Lateral Runout (LRO) Correction

REAR BRAKE ROTOR REPLACEMENT

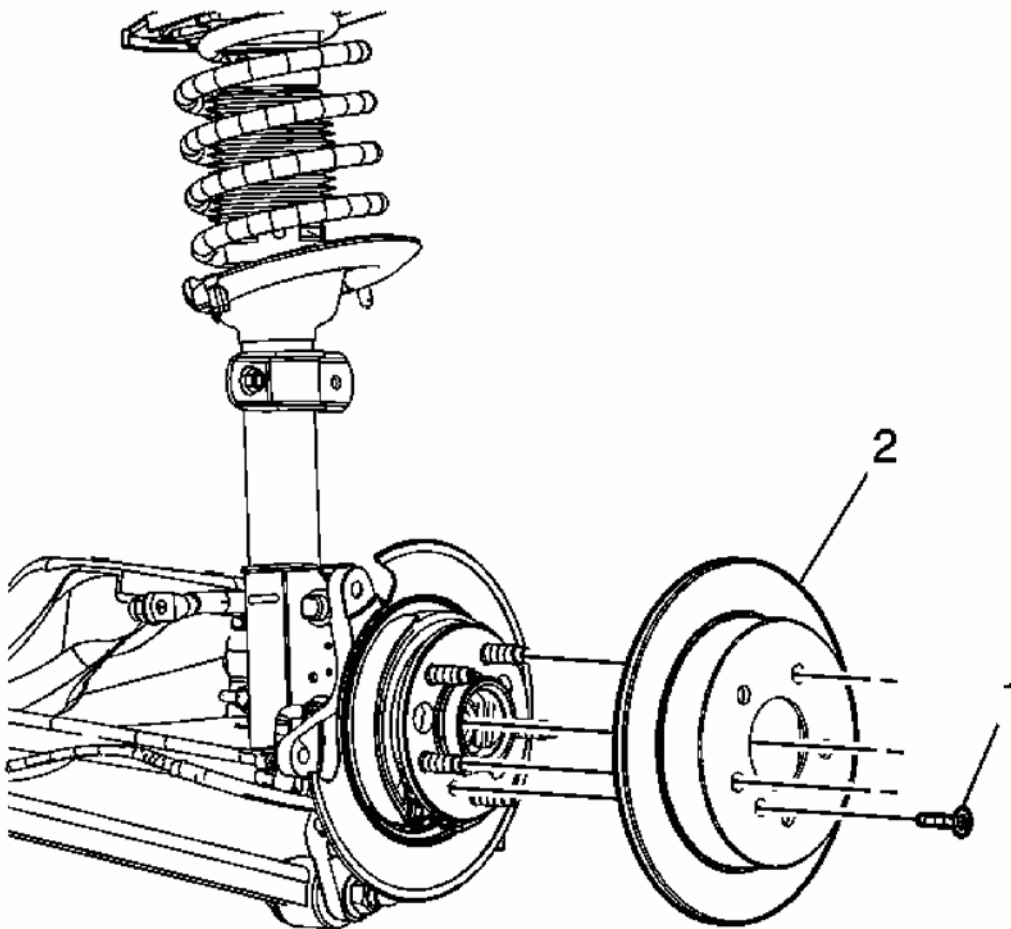


Fig. 57: Replacing Rear Brake Rotor
Courtesy of GENERAL MOTORS CORP.

Brake Rotor Replacement - Rear

Callout	Component Name
CAUTION: Refer to <u>Brake Dust Caution</u> .	
NOTE: Refer to <u>Fastener Notice</u> .	
Fastener Tightening Specifications: Refer to <u>Fastener Tightening Specifications</u> .	
Preliminary Procedure	

1. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle**
2. Remove the tire and wheel. Refer to **Tire and Wheel Removal and Installation**
3. Remove the rear brake caliper mounting bracket. Refer to **Brake Caliper Bracket Replacement - Rear**.

1

Rotor Retention Screw

Tightening Specifications: Tighten to 14 N.m (10 lb ft).

2

Brake Rotor

Tip:

- If removing the rotor to service the brake system, mark the relationship of the rotor to the wheel stud for proper installation.
- Using the **J 41013** , clean the contact area of the brake rotor and the wheel bearing/hub if the rotor is to be reused. See **Special Tools**.
- Using the **J 42450-A** , remove the rust and dirt from the contact area of the wheel bearing/hub if replacing the rotor. See **Special Tools**.
- Check for Lateral Runout (LRO), refer to **Brake Rotor Assembled Lateral Runout (LRO) Correction**

REAR DISC BRAKE BACKING PLATE REPLACEMENT**Removal Procedure**

CAUTION: Refer to **Brake Dust Caution** in Cautions and Notices.

CAUTION: Refer to **Brake Fluid Irritant Caution** in Cautions and Notices.

NOTE: Refer to **Brake Fluid Effects on Paint and Electrical Components Notice** in Cautions and Notices.

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Remove the rear wheels and tires. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.

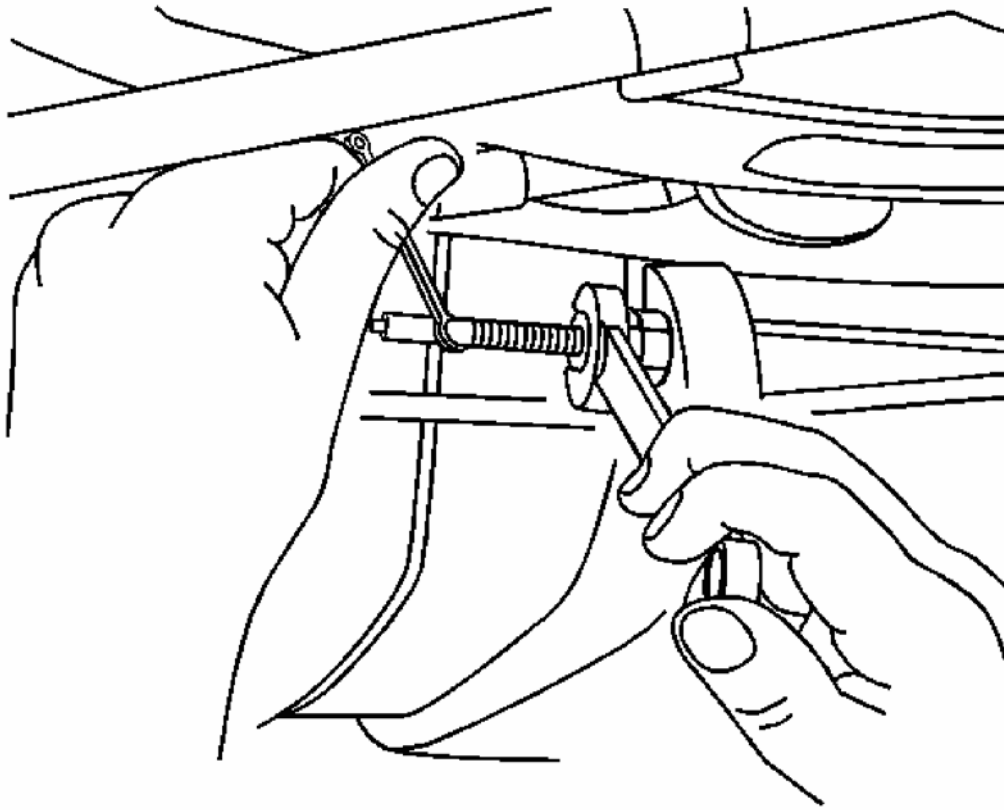


Fig. 58: Adjusting Park Brake Tension At Equalizer Assembly
Courtesy of GENERAL MOTORS CORP.

3. Relieve the park brake system tension at the equalizer assembly.
4. Remove the rear caliper bracket. Refer to **Brake Caliper Bracket Replacement - Rear**.
5. Remove the rear rotor. Refer to **Brake Rotor Replacement - Rear**.

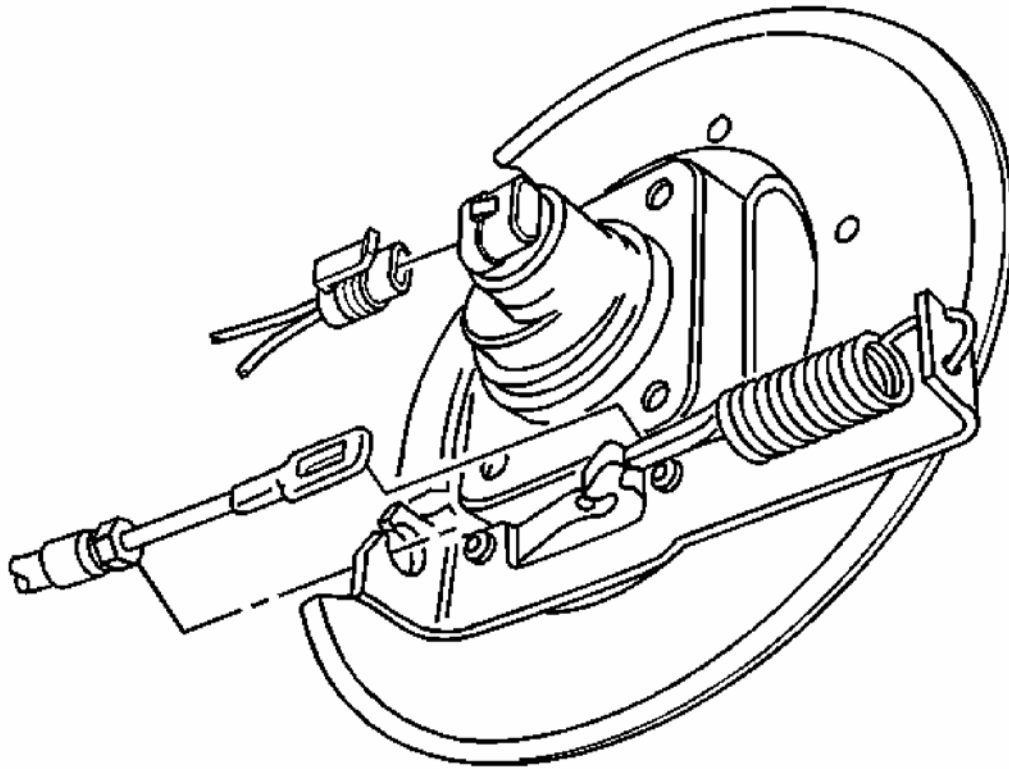


Fig. 59: View Of Rear Park Brake Cable & Wheel Speed Sensor Electrical Connector

Courtesy of GENERAL MOTORS CORP.

6. Disconnect and remove the rear park brake cable from the bracket at the rear wheel. Refer to **Park Brake Cable Replacement - Rear (Z7U)** in Park Brake.
7. Disconnect the park brake cable return spring from the park brake actuator and bracket at the rear wheel.
8. Remove the rear hub. Refer to **Wheel Bearing/Hub Replacement - Rear** in Rear Suspension.

The rear hub, backing plate, park brake cable bracket, and park brake actuator will be removed as an assembly.

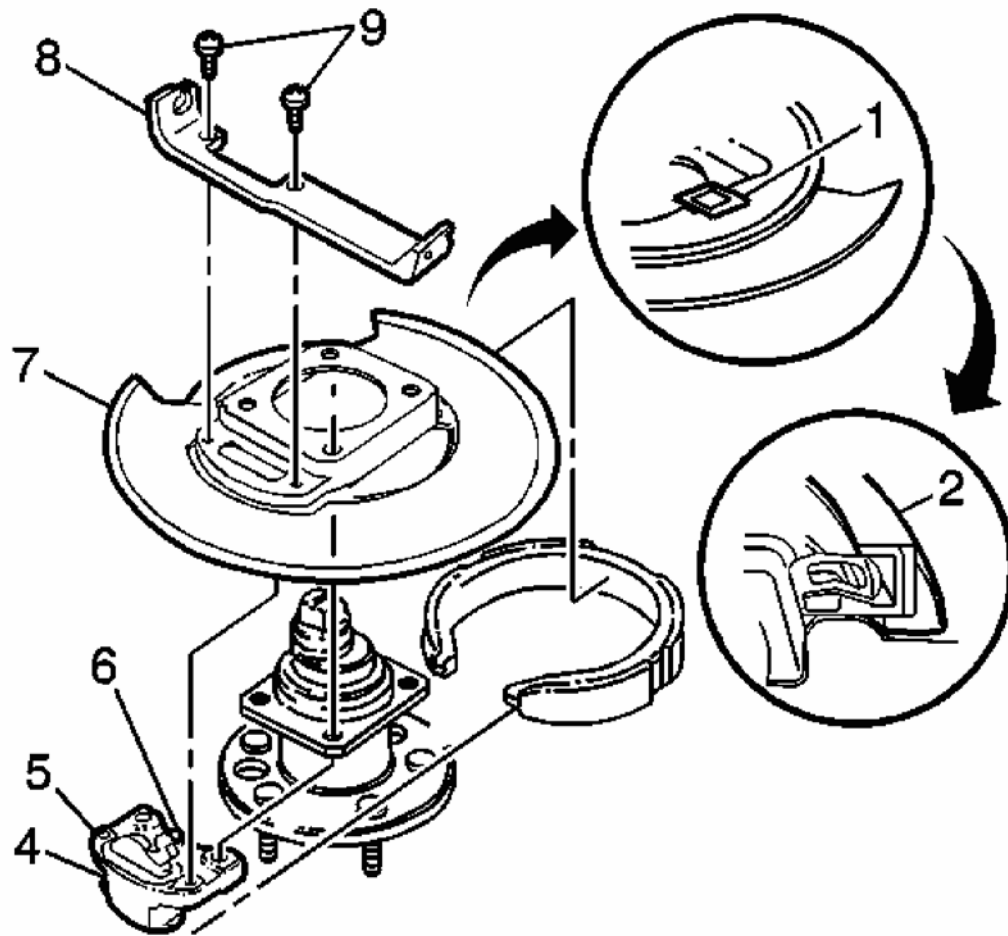


Fig. 60: Identifying Parking Brake Components
Courtesy of GENERAL MOTORS CORP.

9. Remove the 2 retainers (9) and the park brake cable bracket (8) from the park brake actuator (4). Position aside the rear hub.
10. Remove the park brake shoe and actuator (4) from the backing plate (7).

Installation Procedure

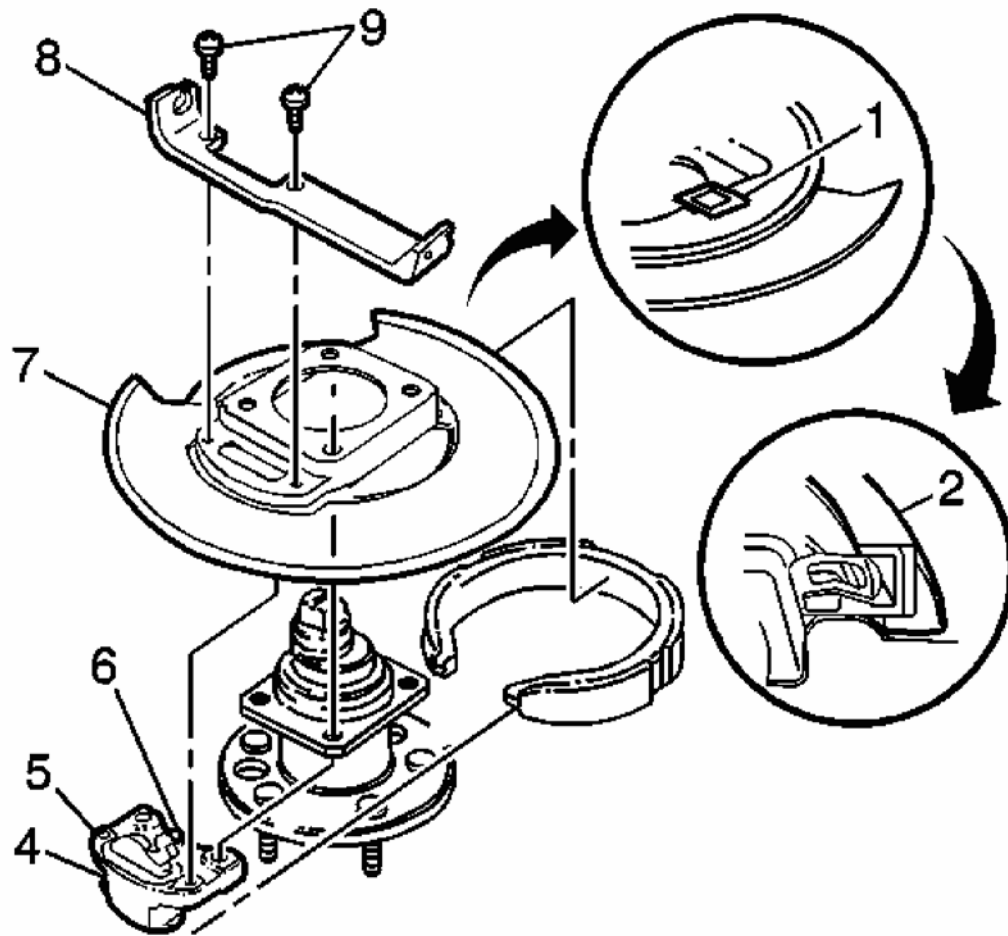


Fig. 61: Identifying Parking Brake Components
Courtesy of GENERAL MOTORS CORP.

1. Install the park brake shoe and actuator (4) onto the backing plate (7).
2. Position the park brake shoe, actuator (4), and backing plate (7) over the rear hub.
3. Install the park brake cable bracket (8) and the two retainers (9).
4. Install the rear hub. Refer to **Wheel Bearing/Hub Replacement - Rear** in Rear Suspension.

The rear hub, backing plate, park brake cable bracket, and park brake actuator will be installed as an assembly.

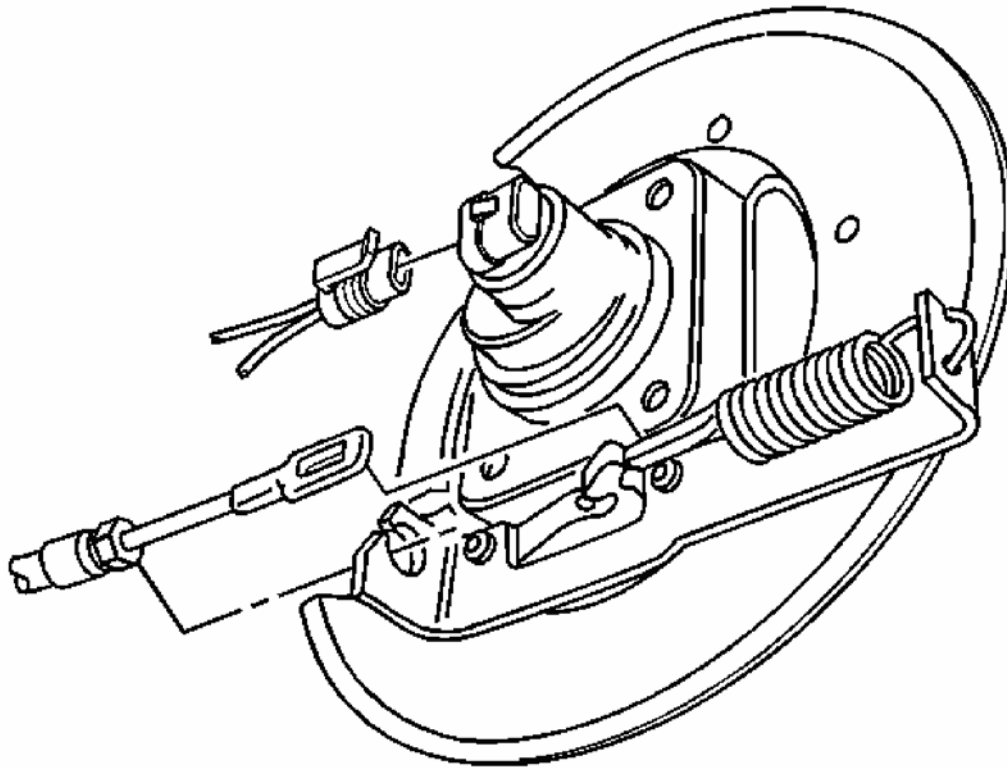


Fig. 62: View Of Rear Park Brake Cable & Wheel Speed Sensor Electrical Connector

Courtesy of GENERAL MOTORS CORP.

5. Install and connect the rear park brake cable to the bracket at the rear wheel. Refer to **Park Brake Cable Replacement - Rear (Z7U)** in Park Brake.
6. Connect the park brake cable return spring to the park brake actuator and bracket at the rear wheel.
7. Install the rear rotor. Refer to **Brake Rotor Replacement - Rear**.
8. Install the rear caliper bracket. Refer to **Brake Caliper Bracket Replacement - Rear**.
9. Install the rear wheels and tires. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
10. Adjust the park brake at the equalizer. Refer to **Park Brake Adjustment** in Park Brake.
11. Lower the vehicle.

IMPORTANT:

- **Brake rotor thickness variation MUST be checked BEFORE checking for assembled lateral runout (LRO). Thickness variation exceeding the maximum acceptable level can cause brake pulsation. Refer to Brake Rotor Thickness Variation Measurement.**
- **Brake rotor assembled lateral runout (LRO) exceeding the maximum allowable specification can cause thickness variation to develop in the brake rotor over time, usually between 4 800-11 300 km (3,000-7,000 mi). Refer to Brake Rotor Assembled Lateral Runout (LRO) Measurement.**

Review the following acceptable methods for bringing the brake rotor assembled LRO to within specifications. Determine which method to use for the specific vehicle being repaired.

- The indexing method of correcting assembled LRO is most effective when the LRO specification is only exceeded by a relatively small amount: 0.025-0.127 mm (0.001-0.005 in). Indexing is used to achieve the best possible match of high spots to low spots between related components. Refer to Brake Rotor Assembled Lateral Runout (LRO) Correction - Indexing.
- The correction plate method of correcting assembled LRO involves the addition of a tapered plate between the brake rotor and the hub/axle flange. The correction plate method can be used to correct LRO that exceeds the specification by up to 0.23 mm (0.009 in). Refer to Brake Rotor Assembled Lateral Runout (LRO) Correction - Correction Plates.
- The on-vehicle brake lathe method is used to bring the LRO to within specifications through compensating for LRO while refinishing the brake rotor. Refer to Brake Rotor Assembled Lateral Runout (LRO) Correction - On-Vehicle Lathe.

If the assembled LRO cannot be corrected using these methods, then other components must be suspected as causing and/or contributing to the LRO concern.

BRAKE ROTOR ASSEMBLED LATERAL RUNOUT (LRO) CORRECTION - INDEXING**Tools Required**

- **J 39544-KIT** Torque-Limiting Socket Set, or equivalent. See Special Tools.
- **J 45101-100** Conical Brake Rotor Washers. See Special Tools.

CAUTION: Refer to Brake Dust Caution in Cautions and Notices.

IMPORTANT:

- **Brake rotor thickness variation MUST be checked BEFORE**

checking for assembled lateral runout (LRO). Thickness variation exceeding the maximum acceptable level can cause brake pulsation. Refer to Brake Rotor Thickness Variation Measurement.

- Brake rotor assembled lateral runout (LRO) exceeding the maximum allowable specification can cause thickness variation to develop in the brake rotor over time, usually between 4 800-11 300 km (3,000-7,000 mi). Refer to Brake Rotor Assembled Lateral Runout (LRO) Measurement.

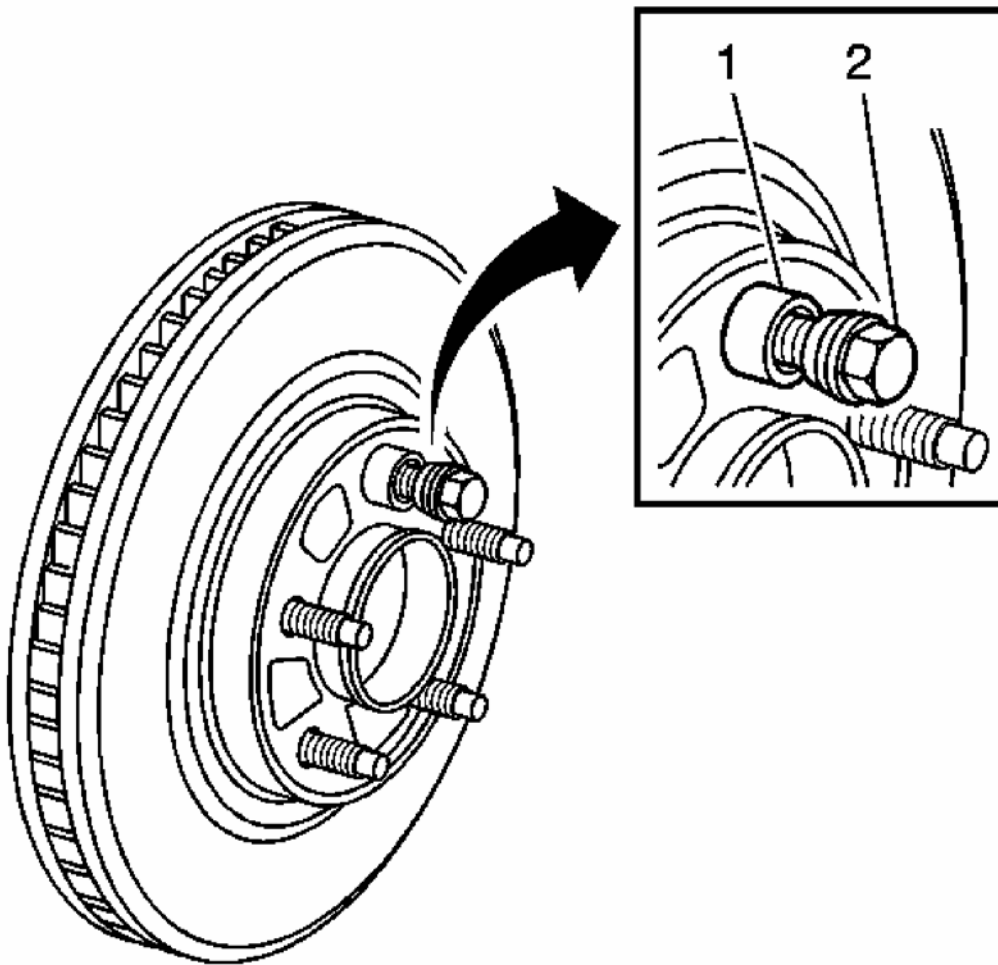


Fig. 63: Identifying J 45101-100 & Lug Nut
Courtesy of GENERAL MOTORS CORP.

1. Remove the **J 45101-100** and the lug nuts that were installed during the assembled

LRO measurement procedure. See **Special Tools**.

2. Inspect the mating surface of the hub/axle flange and the brake rotor to ensure that there are no foreign particles or debris remaining.
3. Index the brake rotor in a different orientation to the hub/axle flange.
4. Hold the rotor firmly in place against the hub/axle flange and install one of the **J 45101-100** (1) and one lug nut (2) onto the upper-most wheel stud. See **Special Tools**.
5. Continue to hold the rotor secure and tighten the lug nut firmly by hand.

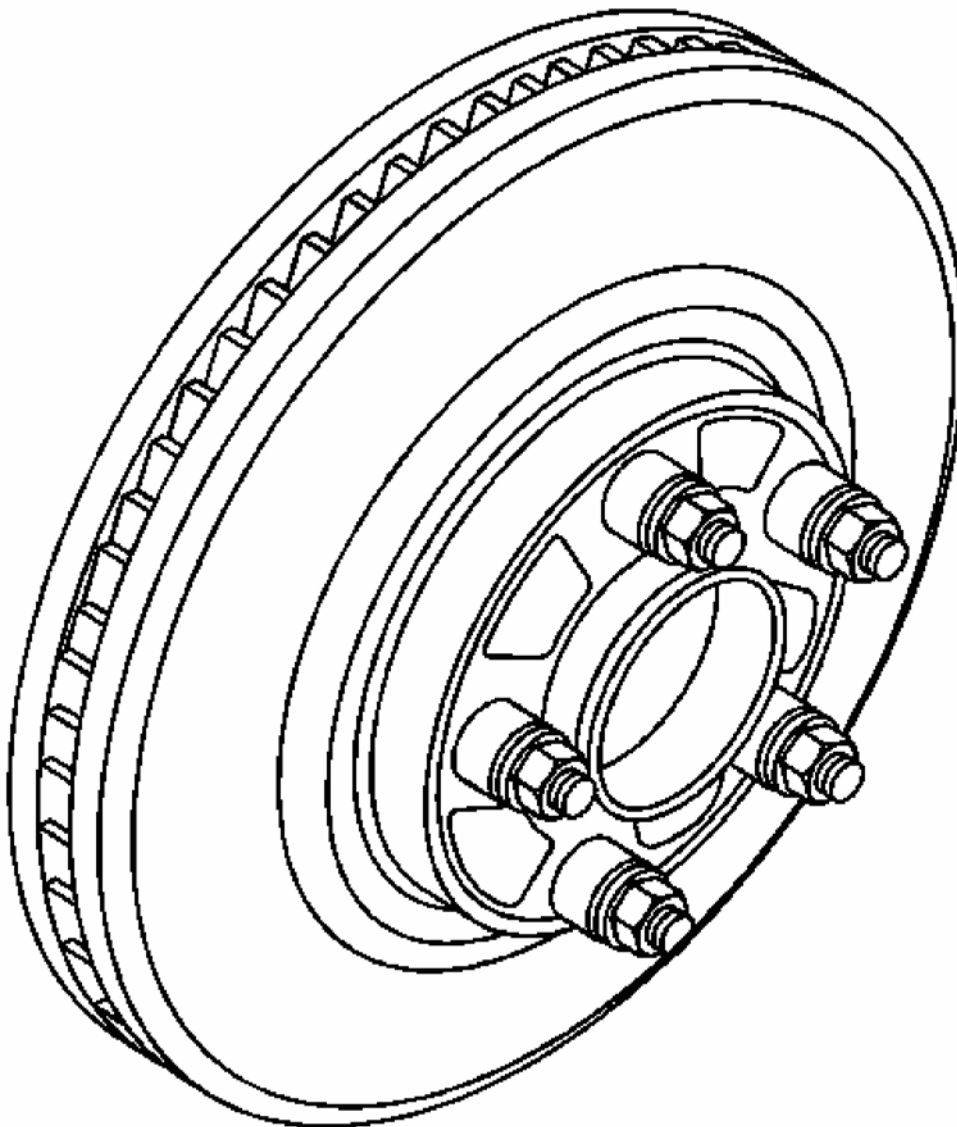


Fig. 64: Installing All J 45101-100s & Lug Nuts

Courtesy of GENERAL MOTORS CORP.

6. Install the remaining **J 45101-100** and lug nuts onto the wheel studs and tighten the nuts firmly by hand in a star-pattern. See **Special Tools**.
7. Using the **J 39544-KIT**, or equivalent, tighten the lug nuts in a star-pattern to specification, in order to properly secure the rotor. See **Special Tools**. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
8. Measure the assembled LRO of the brake rotor. Refer to **Brake Rotor Assembled Lateral Runout (LRO) Measurement**.
9. Compare the amount of change between this measurement and the original measurement.
10. If this measurement is within specifications, proceed to step 14.
11. If this measurement still exceeds specifications, repeat steps 1-9 until the best assembled LRO measurement is obtained.
12. Matchmark the final location of the rotor to the wheel studs if the orientation is different than it was originally.
13. If the brake rotor assembled LRO measurement still exceeds the maximum allowable specification, refer to **Brake Rotor Assembled Lateral Runout (LRO) Correction**.
14. If the brake rotor assembled LRO is within specification, install the brake caliper and depress the brake pedal several times to secure the rotor in place before removing the **J 45101-100** and the lug nuts. See **Special Tools**.

BRAKE ROTOR ASSEMBLED LATERAL RUNOUT (LRO) CORRECTION - CORRECTION PLATES

Tools Required

- **J 39544-KIT** Torque-Limiting Socket Set, or equivalent. See **Special Tools**.
- **J 45101-100** Conical Brake Rotor Washers. See **Special Tools**.

CAUTION: Refer to **Brake Dust Caution** in Cautions and Notices.

IMPORTANT:

- Brake rotor thickness variation **MUST** be checked **BEFORE** checking for assembled lateral runout (LRO). Thickness variation exceeding the maximum acceptable level can cause brake pulsation. Refer to **Brake Rotor Thickness Variation Measurement**.
- Brake rotor assembled lateral runout (LRO) exceeding the maximum allowable specification can cause thickness variation to develop in the brake rotor over time, usually between 4 800-11 300 km (3,000-7,000 mi). Refer to Brake

2006 Chevrolet Impala LS

2006 BRAKES Disc Brakes - Impala

Rotor Assembled Lateral Runout (LRO) Measurement.

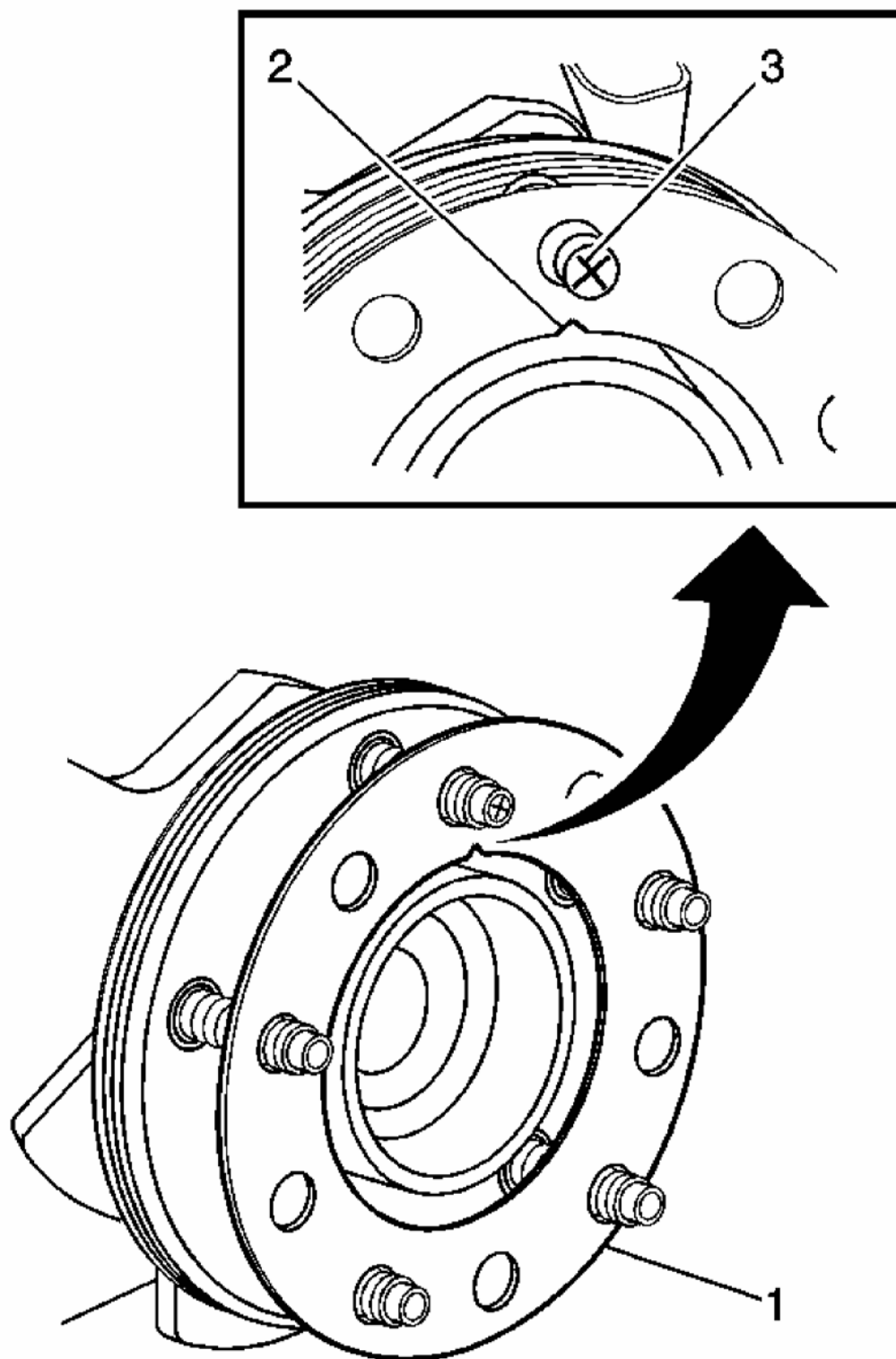


Fig. 65: Identifying Correction Plate, High Spot Mark & V-Shaped Notch

Courtesy of GENERAL MOTORS CORP.

1. Rotate the brake rotor to position the high spot, identified and marked during the brake rotor assembled LRO measurement procedure, to face upward.
2. Remove the **J 45101-100** and the lug nuts that were installed during the assembled LRO measurement procedure and/or the indexing correction procedure. See **Special Tools**.
3. Inspect the mounting surface of the hub/axle flange and the brake rotor to ensure that there are no foreign particles or debris remaining.
4. Select the correction plate, following the manufacturer's instructions, which has a specification closest to the assembled LRO measurement.

For example: If the assembled LRO measurement was 0.076 mm (0.003 in), the 0.076 mm (0.003 in) correction plate would be used. If the measurement was 0.127 mm (0.005 in), the 0.152 mm (0.006 in) correction plate would be used.

5. Determine the positioning for the correction plate (1) using the high spot mark (3) made during the brake rotor assembled LRO measurement procedure.

IMPORTANT:

- **Do NOT install used correction plates in an attempt to correct brake rotor assembled lateral runout (LRO).**
 - **Do NOT stack up, or install more than one correction plate onto one hub/axle flange location, in an attempt to correct brake rotor assembled LRO.**
6. Install the correction plate (1) onto the hub/axle flange, with the V-shaped notch (2) orientated to align with the high spot mark (3), that was positioned to face upward.

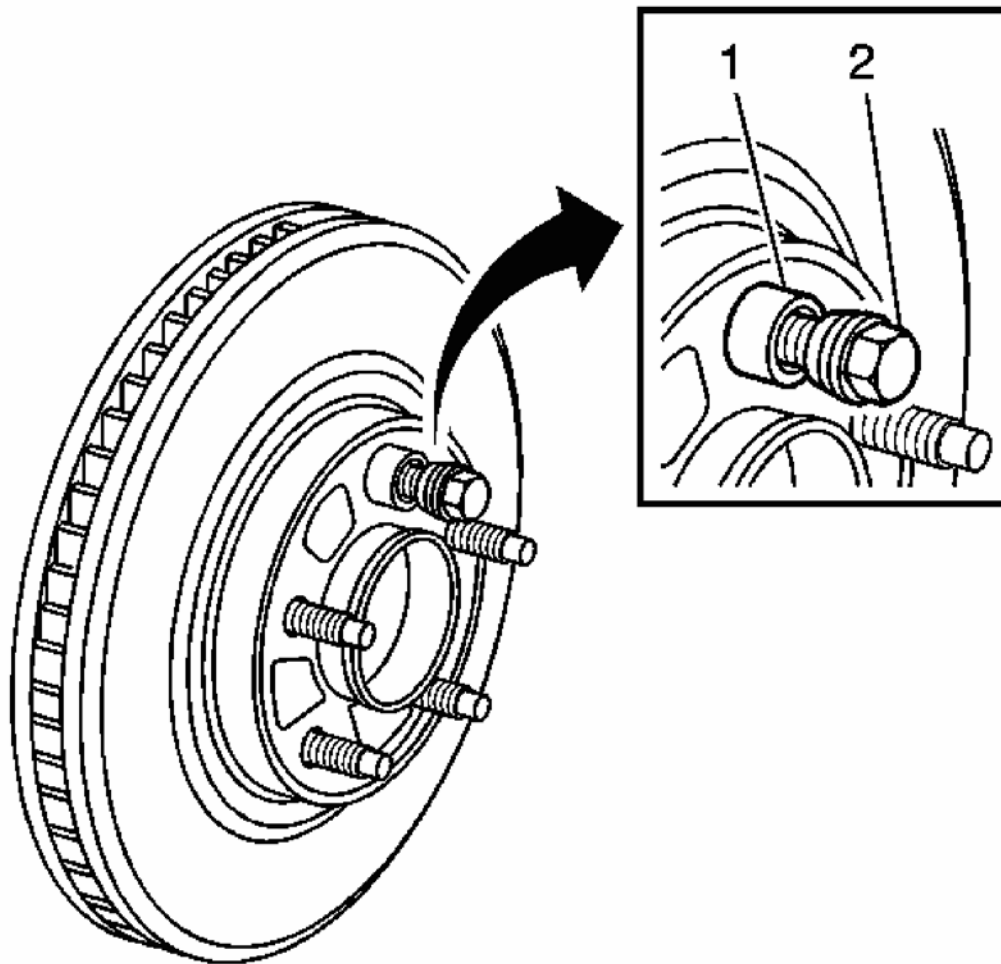


Fig. 66: Identifying J 45101-100 & Lug Nut
Courtesy of GENERAL MOTORS CORP.

7. Install the brake rotor to the hub/axle flange. Use the matchmark made prior to removal for proper orientation to the flange.
8. Hold the rotor firmly in place against the hub/axle flange and install one of the **J 45101-100** (1) and one lug nut (2) onto the upper-most wheel stud. See **Special Tools**.
9. Continue to hold the rotor secure and tighten the lug nut firmly by hand.

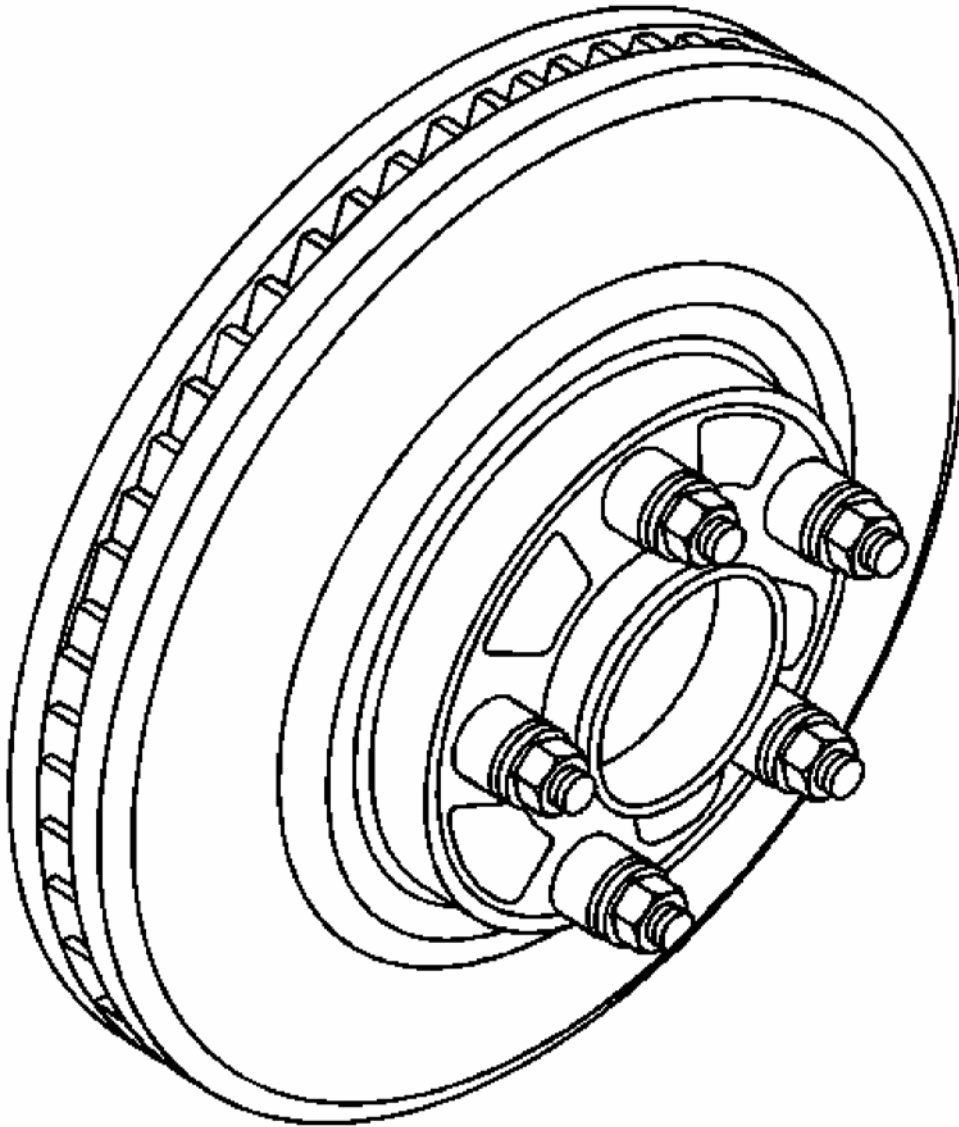


Fig. 67: Installing All J 45101-100s & Lug Nuts
Courtesy of GENERAL MOTORS CORP.

10. Install the remaining **J 45101-100** and lug nuts onto the wheel studs and tighten the nuts firmly by hand in a star-pattern. See **Special Tools**.
11. Using the **J 39544-KIT** , or equivalent, tighten the lug nuts in a star-pattern to specification, in order to properly secure the rotor. See **Special Tools**. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
12. Measure the assembled LRO of the brake rotor. Refer to **Brake Rotor Assembled**

Lateral Runout (LRO) Measurement.

13. If the brake rotor assembled LRO measurement still exceeds the maximum allowable specification, refer to **Brake Rotor Assembled Lateral Runout (LRO) Correction.**
14. If the brake rotor assembled LRO measurement is within specification, install the brake caliper and depress the brake pedal several times to secure the rotor in place before removing the **J 45101-100** and the lug nuts. See **Special Tools.**

BRAKE ROTOR ASSEMBLED LATERAL RUNOUT (LRO) CORRECTION - ON-VEHICLE LATHE**Tools Required**

J 45101-100 Conical Brake Rotor Washers. See **Special Tools.**

CAUTION: Refer to **Brake Dust Caution** in Cautions and Notices.

IMPORTANT:

- Brake rotor thickness variation **MUST** be checked **BEFORE** checking for assembled lateral runout (LRO). Thickness variation exceeding the maximum acceptable level can cause brake pulsation. Refer to **Brake Rotor Thickness Variation Measurement.**
- Brake rotor assembled lateral runout (LRO) exceeding the maximum allowable specification can cause thickness variation to develop in the brake rotor over time, usually between 4 800-11 300 km (3,000-7,000 mi). Refer to **Brake Rotor Assembled Lateral Runout (LRO) Measurement.**

1. Ensure that the caliper and caliper bracket that are already being supported, are clear from contacting any rotating components, such as the brake rotor.
2. Remove the **J 45101-100** and the lug nuts that were installed during the assembled LRO measurement procedure and/or the indexing correction procedure. See **Special Tools.**
3. Inspect the mounting surface of the hub/axle flange and the brake rotor to ensure that there are no foreign particles or debris remaining.
4. Set up the lathe, following the manufacturer's instructions.
5. Refinish the brake rotor, following the brake lathe manufacturer's instructions.
6. After each successive cut, inspect the brake rotor thickness. Refer to **Brake Rotor Thickness Measurement.**
7. If at any time the brake rotor exceeds the minimum allowable thickness after refinish specification, the brake rotor must be replaced. After replacing the rotor, proceed to step 10.

8. After refinishing the brake rotor, use the following procedure in order to obtain the desired non-directional finish:
 1. Follow the brake lathe manufacturer's recommended speed setting for applying a non-directional finish
 2. Using moderate pressure, apply the non-directional finish:
 - If the lathe is equipped with a non-directional finishing tool, apply the finish with 120 grit aluminum oxide sandpaper
 - If the lathe is not equipped with a non-directional finishing tool, apply the finish with a sanding block and 150 grit aluminum oxide sandpaper
 3. After applying a non-directional finish, clean each friction surface of the brake rotor with denatured alcohol, or an equivalent approved brake cleaner
9. Remove the lathe from the vehicle.
10. Measure the assembled LRO of the brake rotor. Refer to **Brake Rotor Assembled Lateral Runout (LRO) Measurement**.
11. If the brake rotor assembled LRO measurement still exceeds the maximum allowable specification, refer to **Brake Rotor Assembled Lateral Runout (LRO) Correction**.
12. If the brake rotor assembled LRO is within specification, install the brake caliper and depress the brake pedal several times to secure the rotor in place before removing the **J 45101-100** and the lug nuts. See **Special Tools**.

BRAKE ROTOR REFINISHING

Tools Required

- **J 41013** Rotor Resurfacing Kit. See **Special Tools**.
- **J 42450-A** Wheel Hub Resurfacing Kit. See **Special Tools**.

CAUTION: Refer to **Brake Dust Caution** in Cautions and Notices.

- IMPORTANT:**
- The disc brake rotors do not require refinishing as part of routine brake system service. New disc brake rotors do not require refinishing.

Do not refinish disc brake rotors in an attempt to correct the following conditions:

- Brake system noise - squeal, growl, groan
- Uneven and/or premature disc brake pad wear
- Superficial or cosmetic corrosion/rust of the disc brake rotor friction surface

- Scoring of the disc brake rotor friction surface less than the maximum allowable specification
- Before refinishing a brake rotor, the rotor **MUST** first be checked for adequate thickness to allow the rotor to be refinished and remain above the minimum allowable thickness after refinish specification. Refer to Brake Rotor Thickness Measurement.

Disc brake rotors should only be refinished if they have adequate thickness to be refinished and if one or more of the following conditions exist:

- Thickness variation in excess of the maximum allowable specification
- Excessive corrosion/rust and/or pitting
- Cracks and/or heat spots
- Excessive blueing discoloration
- Scoring of the disc brake rotor surface in excess of the maximum allowable specification
- Disc brake rotors may need to be refinished as part of the process for correcting brake rotor assembled lateral runout (LRO) that exceeds the maximum allowable specification.

IMPORTANT: Whenever the brake rotor has been separated from the hub/axle flange, clean any rust or contaminants from the hub/axle flange and the brake rotor mating surfaces. Failure to do this may result in increased assembled lateral runout (LRO) of the brake rotor, which could lead to brake pulsation.

1. Using the **J 42450-A**, thoroughly clean any rust or corrosion from the mating surface of the hub/axle flange. See Special Tools.
2. Using the **J 41013**, thoroughly clean any rust or corrosion from the mating surface and mounting surface of the brake rotor. See Special Tools.
3. Inspect the mating surfaces of the hub/axle flange and the rotor to ensure that there are no foreign particles or debris remaining.
4. Mount the brake rotor to the brake lathe according to the lathe manufacturer's instructions, ensuring that all mounting attachments and adapters are clean and free of debris.
5. Ensure that any vibration dampening attachments are securely in place.
6. With the brake lathe running, slowly bring in the cutting tools until they just contact the

brake rotor friction surfaces.

7. Observe the witness mark on the brake rotor. If the witness mark extends approximately three-quarters or more of the way around the brake rotor friction surface on each side, the brake rotor is properly mounted to the lathe.
8. If the witness mark does not extend three-quarters or more of the way around the brake rotor, re-mount the rotor to the lathe.
9. Following the brake lathe manufacturer's instructions, refinish the brake rotor.
10. After each successive cut, inspect the brake rotor thickness. Refer to **Brake Rotor Thickness Measurement**.
11. If at any time the brake rotor exceeds the minimum allowable thickness after refinish specification, the brake rotor must be replaced.
12. After refinishing the brake rotor, use the following procedure in order to obtain the desired non-directional finish:
 1. Follow the brake lathe manufacturer's recommended speed setting for applying a non-directional finish
 2. Using moderate pressure, apply the non-directional finish:
 - If the lathe is equipped with a non-directional finishing tool, apply the finish with 120 grit aluminum oxide sandpaper
 - If the lathe is not equipped with a non-directional finishing tool, apply the finish with a sanding block and 150 grit aluminum oxide sandpaper
 3. After applying a non-directional finish, clean each friction surface of the brake rotor with denatured alcohol, or an equivalent approved brake cleaner
13. Remove the brake rotor from the brake lathe.
14. Measure the assembled lateral runout (LRO) of the brake rotor to ensure optimum performance of the disc brakes. Refer to **Brake Rotor Assembled Lateral Runout (LRO) Measurement**.
15. If the brake rotor assembled LRO measurement exceeds the specification, bring the LRO to within specifications. Refer to **Brake Rotor Assembled Lateral Runout (LRO) Correction**.

DESCRIPTION AND OPERATION

DISC BRAKE SYSTEM DESCRIPTION AND OPERATION

System Component Description

The disc brake system consists of the following components:

Disc Brake Pads

Applies mechanical output force from the hydraulic brake calipers to friction surfaces of brake rotors.

Disc Brake Rotors

Uses mechanical output force applied to friction surfaces from the disc brake pads to slow speed of tire and wheel assembly rotation.

Disc Brake Pad Hardware

Secures disc brake pads firmly in proper relationship to the hydraulic brake calipers. Enables a sliding motion of brake pads when mechanical output force is applied.

Disc Brake Caliper Hardware

Provides mounting for hydraulic brake caliper and secures the caliper firmly in proper relationship to caliper bracket. Enables a sliding motion of the brake caliper to the brake pads when mechanical output force is applied.

System Operation

Mechanical output force is applied from the hydraulic brake caliper pistons to the inner brake pads. As the pistons press the inner brake pads outward, the caliper housings draw the outer brake pads inward. This allows the output force to be equally distributed. The brake pads apply the output force to the friction surfaces on both sides of the brake rotors, which slows the rotation of the tire and wheel assemblies. The correct function of both the brake pad and brake caliper hardware is essential for even distribution of braking force.

SPECIAL TOOLS AND EQUIPMENT

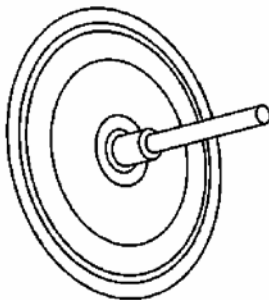
SPECIAL TOOLS

Special Tools

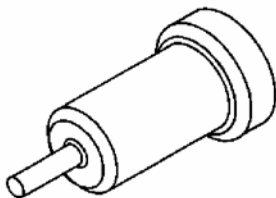
Illustration	Tool Number/ Description
	J 39544-KIT Complete Torque Socket Set - 10 Pieces

2006 Chevrolet Impala LS

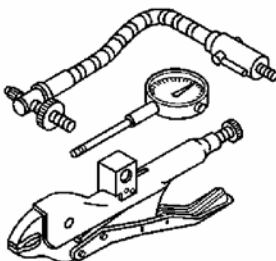
2006 BRAKES Disc Brakes - Impala



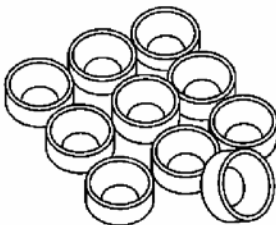
J 41013
Rotor Resurfacing Kit



J 42450-A
Wheel Hub Resurfacing Kit



J 45101
Hub and Wheel Runout Gage



J 45101-100
Conical Brake Rotor Washers