

Brakes

Disc Brakes - CTS Coupe & Wagon

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Brake Caliper Bleeder Valve- Front (All)	14 N.m	124 lb in
Brake Caliper Bleeder Valve- Rear (All)	13 N.m	115 lb in
Brake Caliper Bolt- Front (J56)	175 N.m	129 lb ft
Brake Caliper Bolt- Rear (J56)	130 N.m	96 lb ft
Brake Caliper Bracket Bolt- Front (JE5, J55)	230 N.m	170 lb ft
Brake Caliper Bracket Bolt- Rear (JE5, J55)	135 N.m	100 lb ft
Brake Caliper Bridge Pin Bolt- (J56)	33 N.m	24 lb ft
Brake Caliper Pin Bolt- Front (JE5, J55)	63 N.m	46 lb ft
Brake Caliper Pin Bolt- Rear (JE5, J55)	60 N.m	44 lb ft
Brake Hose Fitting Bolt- Front and Rear	49 N.m	36 lb ft
Brake Rotor Screw- Front	14 N.m	124 lb in
Brake Rotor Screw- Rear	12 N.m	106 lb in

DISC BRAKE COMPONENT SPECIFICATIONS

Disc Brake Component Specifications

Application	Specification	
	Metric	English
Brake Pads		
• Taper	0.15 mm	0.006 in
Front Brake Rotor JE5		
• Rotor Diameter	316.0 mm	12.44 in
• Rotor Discard Thickness*	28.5 mm	1.122 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 Allowable Thickness Variation	0.025 mm	0.001 in
• Rotor Thickness (New)	30.0 mm	1.181 in
Front Brake Rotor J55		
• Rotor Diameter	345.0 mm	13.58 in

• Rotor Discard Thickness*	28.5 mm	1.122 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 Allowable Thickness Variation	0.025 mm	0.001 in
• Rotor Thickness (New)	30.0 mm	1.181 in
Front Brake Rotor J56		
• Rotor Diameter	370.0 mm	14.567 in
• Rotor Discard Thickness*	32.0 mm	1.259 in
• Rotor Maximum Allowable Assembled Lateral Runout	0.09 mm	0.003 in
• Rotor Maximum Allowable Scoring	1.50 mm	0.059 in
• Rotor Maximum Allowable Thickness Variation	0.025 mm	0.001 in
• Rotor Thickness New	34.0 mm	1.338 in
Rear Brake Rotor JE5		
• Rotor Diameter	315.0 mm	12.40 in
• Rotor Discard Thickness*	21.5 mm	0.846 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 Allowable Thickness Variation	0.025 mm	0.001 in
• Rotor Thickness New	23.0 mm	0.906 in
Rear Brake Rotor J55		
• Rotor Diameter	339.0 mm	13.35 in
• Rotor Discard Thickness*	21.5 mm	0.846 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 Allowable Thickness Variation	0.025 mm	0.001 in
• Rotor Thickness New	23.0 mm	0.906 in
Rear Brake Rotor J56		
• Rotor Diameter	365.0 mm	14.37 in
• Rotor Discard Thickness*	26.0 mm	1.023 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 Allowable Thickness Variation	0.025 mm	0.001 in
• Rotor Thickness New	28.0 mm	1.102 in
* All brake rotors have a minimum thickness dimension cast into them. Replace any rotor that is worn or machined below this specification.		

DIAGNOSTIC INFORMATION AND PROCEDURES

BRAKE ROTOR THICKNESS MEASUREMENT (JE5, J55 FRONT AND REAR, J56 REAR)

WARNING: Refer to Brake Dust Warning .

1. If the inboard friction surface of the brake rotor is not accessible, reposition and support the caliper with the brake pads. Refer to Front Disc Brake Pads Replacement (JE5, J55 (RWD)), Front Disc Brake Pads Replacement (JE5, J55 (AWD)), and/or Rear Disc Brake Pads Replacement (JE5, J55), Rear Disc Brake Pads Replacement (J56).
2. Clean the friction surfaces of the brake rotor with denatured alcohol, or an equivalent approved brake cleaner.

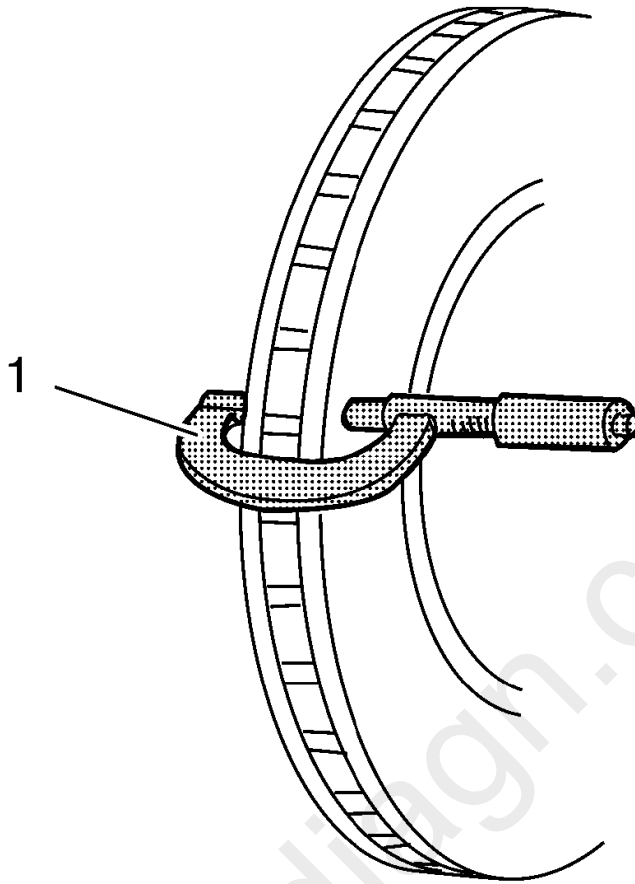


Fig. 1: Micrometer On Brake Rotor
Courtesy of GENERAL MOTORS COMPANY

3. Using a micrometer (1) 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 specifications. Refer to **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 MEASUREMENT (J56 FRONT)

WARNING: Refer to Brake Dust Warning .

NOTE: Due to the floating design of the brake rotor, the front brake rotor cannot be refinished. If the front brake rotor is found to be at or below the minimum specification, it must be replaced.

NOTE: Do not remove the brake rotor from the wheel hub.

1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .
2. Remove the tire and wheel assembly. Refer to Tire and Wheel Removal and Installation .
3. Clean the friction surfaces of the brake rotor with denatured alcohol, or an equivalent approved brake cleaner.

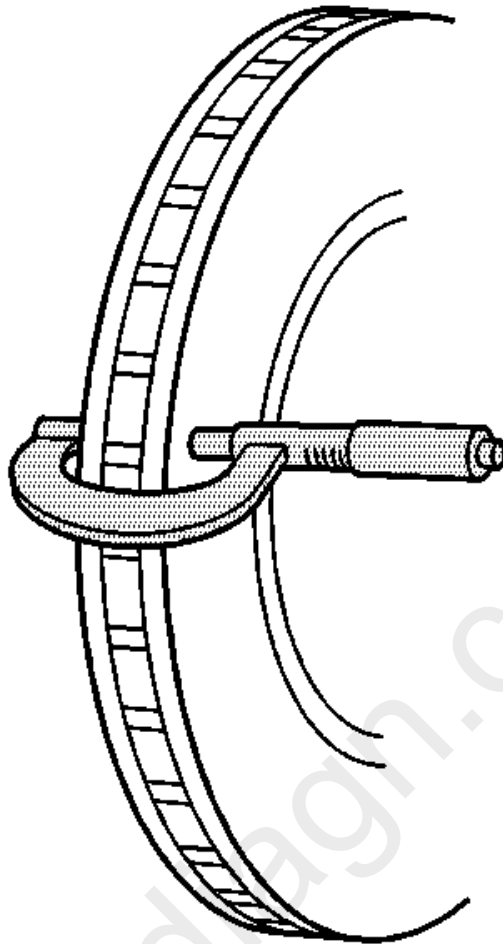


Fig. 2: Measuring Brake Rotor Thickness
Courtesy of GENERAL MOTORS COMPANY

4. 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.

5. Compare the lowest thickness measurement recorded specifications. Refer to **Disc Brake Component Specifications**.
6. If the lowest thickness measurement of the brake rotor is above the brake rotor discard thickness specification, the rotor may be able to be reused, depending upon surface and wear conditions which may be present.
7. If the lowest thickness measurement of the brake rotor is at or below the brake rotor discard thickness specification, the rotor requires replacement.
8. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .

BRAKE ROTOR THICKNESS VARIATION MEASUREMENT

WARNING: Refer to Brake Dust Warning .

NOTE: 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 Front Disc Brake Pads Replacement (JE5, J55 (RWD)), Front Disc Brake Pads Replacement (JE5, J55 (AWD)), Front Disc Brake Pads Replacement (J56), and/or Rear Disc Brake Pads Replacement (JE5, J55), Rear Disc Brake Pads Replacement (J56).
2. Clean the friction surfaces of the brake rotor with denatured alcohol, or an equivalent approved brake cleaner.

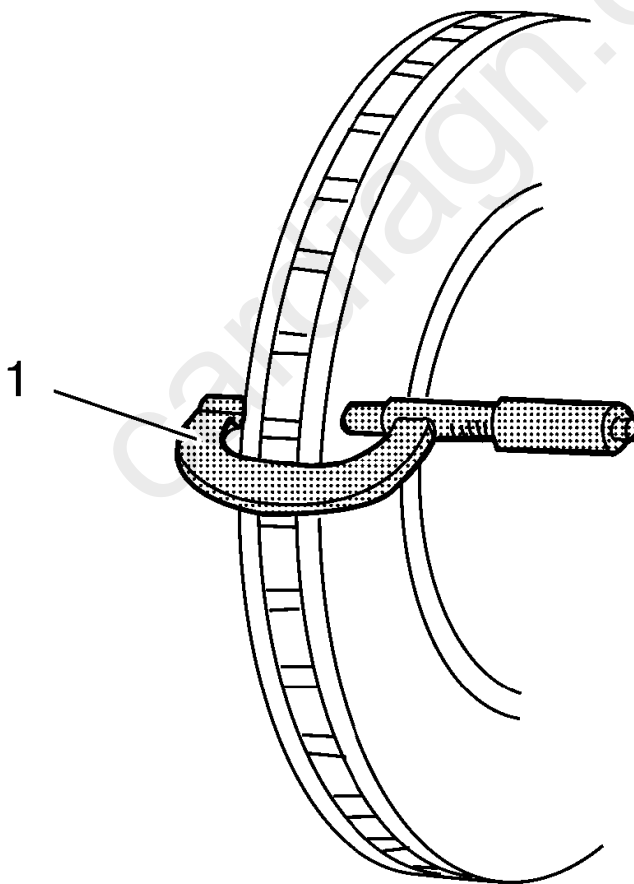


Fig. 3: Micrometer On Brake Rotor
Courtesy of GENERAL MOTORS COMPANY

3. Using a micrometer (1) calibrated in thousandths-of-a-millimeter, or ten-thousandths-of-an-inch, measure and record the thickness of the brake rotor at 4 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: 0.025 mm (0.001 in)

NOTE: **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

WARNING: Refer to Brake Dust Warning .

1. If the inboard friction surface of the brake rotor is not accessible, reposition and support the caliper with the brake pads. Refer to **Front Disc Brake Pads Replacement (JE5, J55 (RWD))**, **Front Disc Brake Pads Replacement (JE5, J55 (AWD))**, **Front Disc Brake Pads Replacement (J56)**, and/or **Rear Disc Brake Pads Replacement (JE5, J55)**, **Rear Disc Brake Pads Replacement (J56)**.

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.

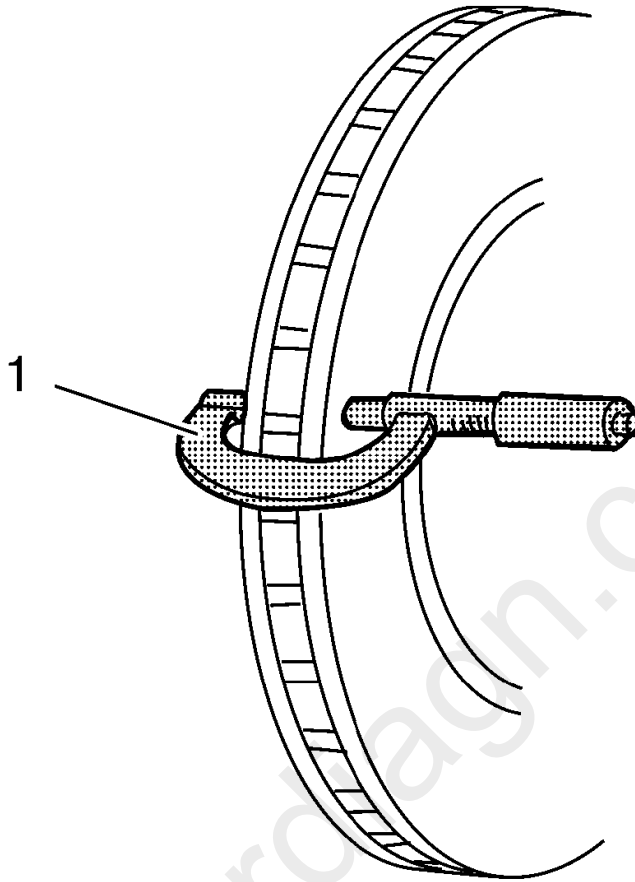


Fig. 4: Micrometer On Brake Rotor
Courtesy of GENERAL MOTORS COMPANY

5. Using a micrometer (1) 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 MEASUREMENT

Special Tools

- **CH-41013** Rotor Resurfacing Kit
- **CH-42450-A** Wheel Hub Resurfacing Kit
- **CH-45101** Hub and Wheel Runout Gauge
- **CH-45101-100** Conical Brake Rotor Washers

For equivalent regional tools, refer to **Special Tools**.

WARNING: Refer to **Brake Dust Warning** .

NOTE:

- 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.

NOTE:

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 **Front Brake Rotor Replacement (JE5, J55 (RWD))**, **Front Brake Rotor Replacement (JE5, J55 (AWD))**, **Front Brake Rotor Replacement (J56)**, and/or **Rear Brake Rotor Replacement (J56)**, **Rear Brake Rotor Replacement (JE5, J55)**.
 2. Using the **CH-42450-A** wheel hub resurfacing kit , thoroughly clean any rust or corrosion from the mating surface of the hub/axle flange.
 3. Using the **CH-41013** rotor resurfacing kit , thoroughly clean any rust or corrosion from the mating surface of the brake rotor.
 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.

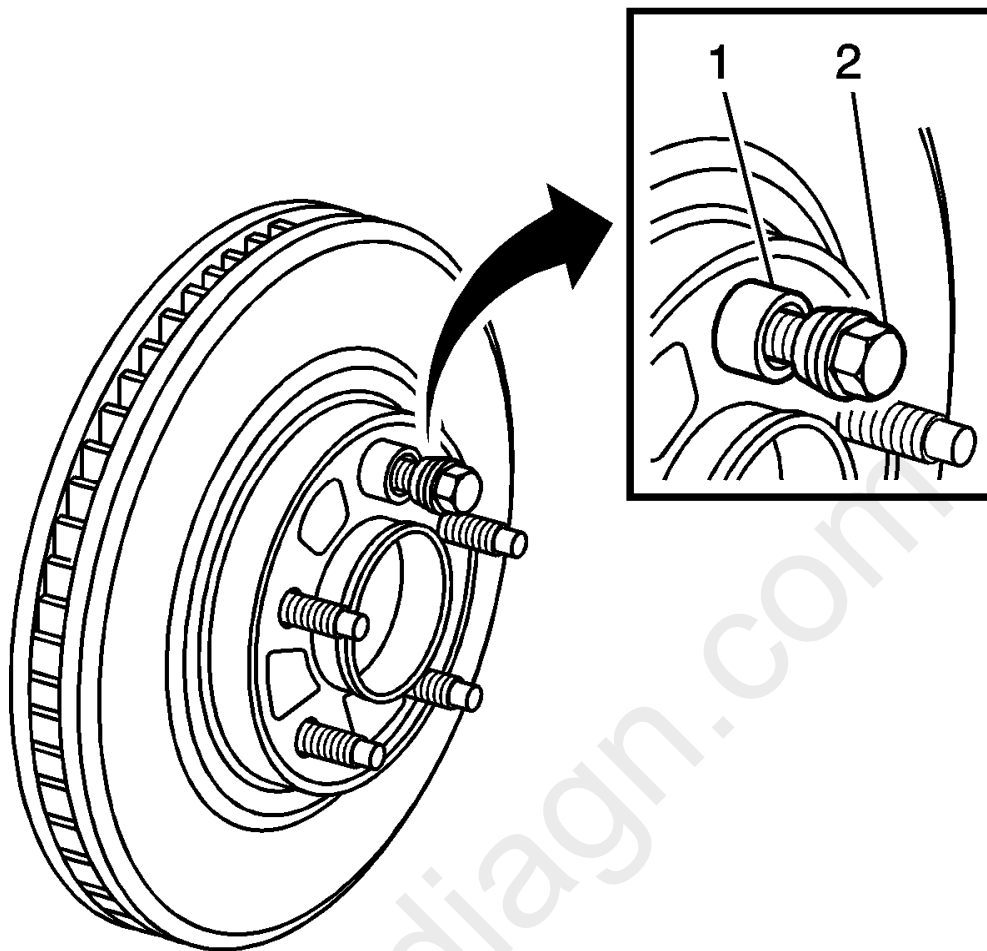


Fig. 5: Identifying Brake Rotor Washers & Lug Nut
Courtesy of GENERAL MOTORS COMPANY

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

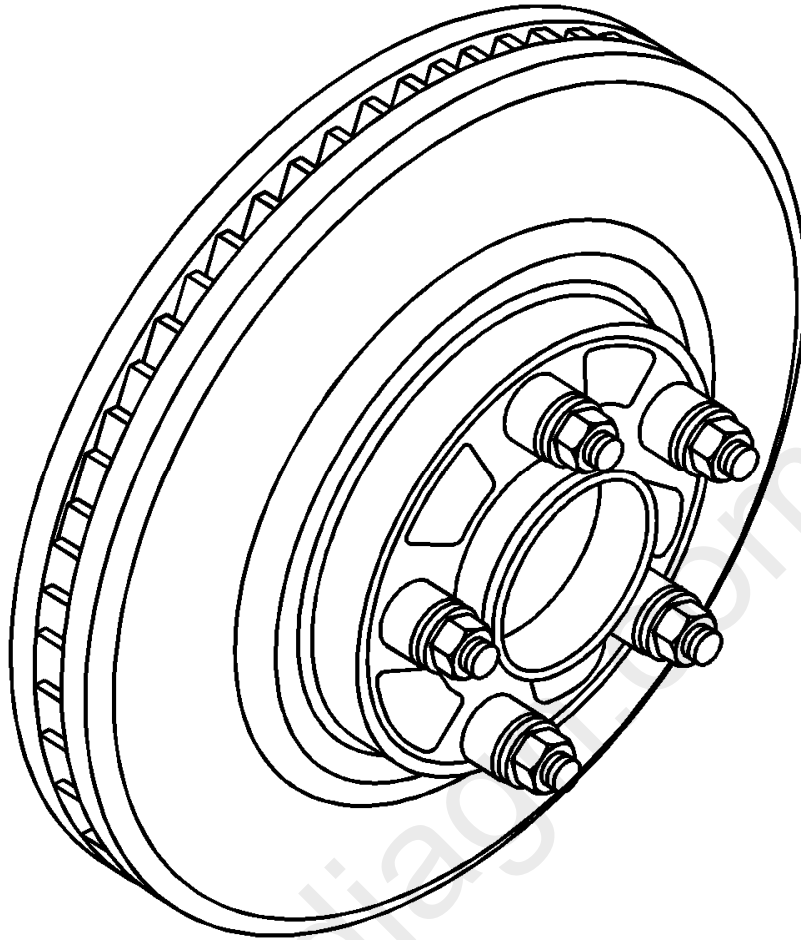


Fig. 6: Identifying Brake Rotor Washers & Lug Nuts
Courtesy of GENERAL MOTORS COMPANY

6. Install the remaining **CH-45101-100** conical brake rotor washers and lug nuts onto the wheel studs and tighten the nuts firmly by hand in a star-pattern.
7. Tighten the lug nuts in a star-pattern to specification. Refer to **Tire and Wheel Removal and Installation** .
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.

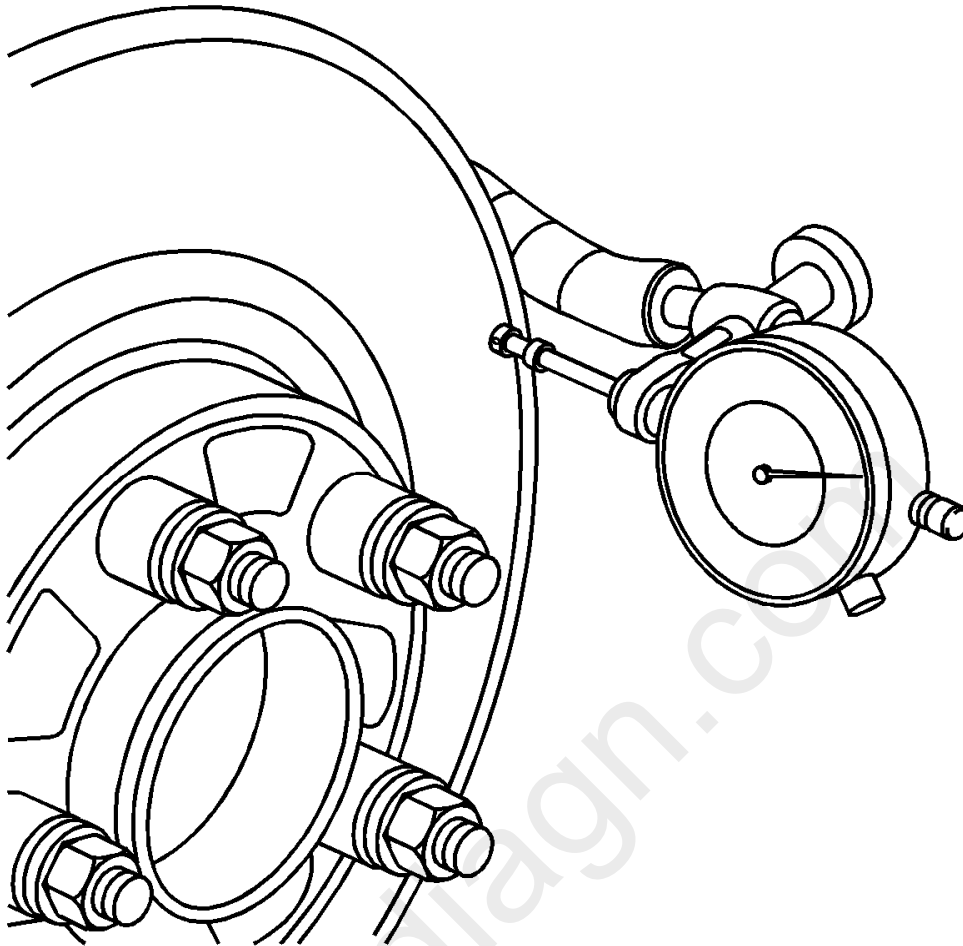


Fig. 7: Using Dial Indicator To Measure Lateral Runout
Courtesy of GENERAL MOTORS COMPANY

10. Mount a dial indicator, **CH-45101** hub and wheel runout gauge , 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.
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, **CH-45101** hub and wheel runout gauge , 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.
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 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 **CH-45101-100** conical brake rotor washers and the lug nuts.

BRAKE PAD INSPECTION

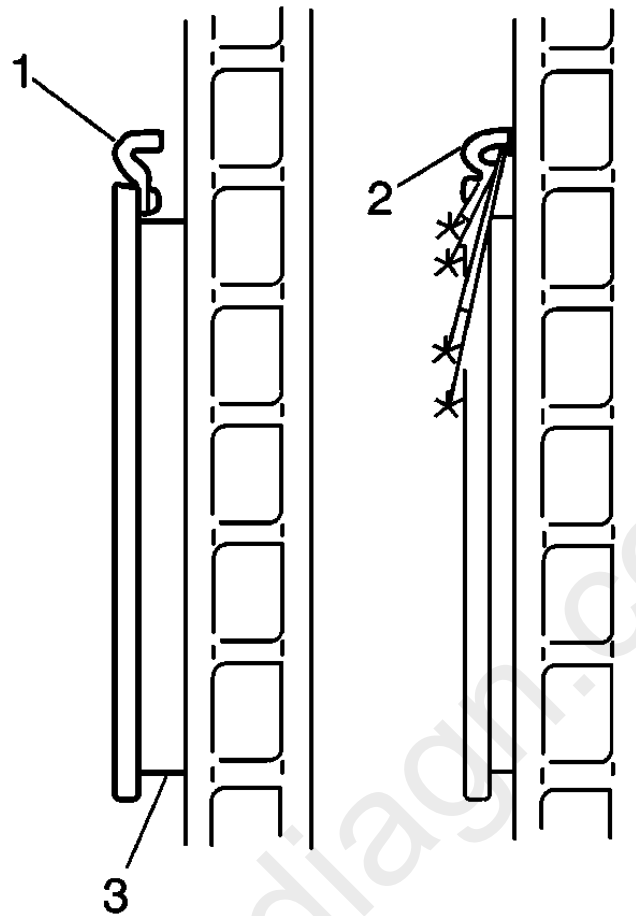


Fig. 8: View Of Brake Pads & Audible Wear Sensors
Courtesy of GENERAL MOTORS COMPANY

WARNING: Refer to Brake Dust Warning .

1. Inspect the disc brake pads at regular intervals, or whenever the tire and wheel assemblies are removed from the vehicle.
2. If replacement is necessary, always replace disc brake pads in axle sets.
3. 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.
4. 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.
5. 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.

6. Replace the disc brake pads when the friction surface (3) is worn to within 0.76 mm (0.030 in) of the mounting plates.
7. 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.
8. 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.
9. Replace the disc brake pads if any have separated from the mounting plates.
10. 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

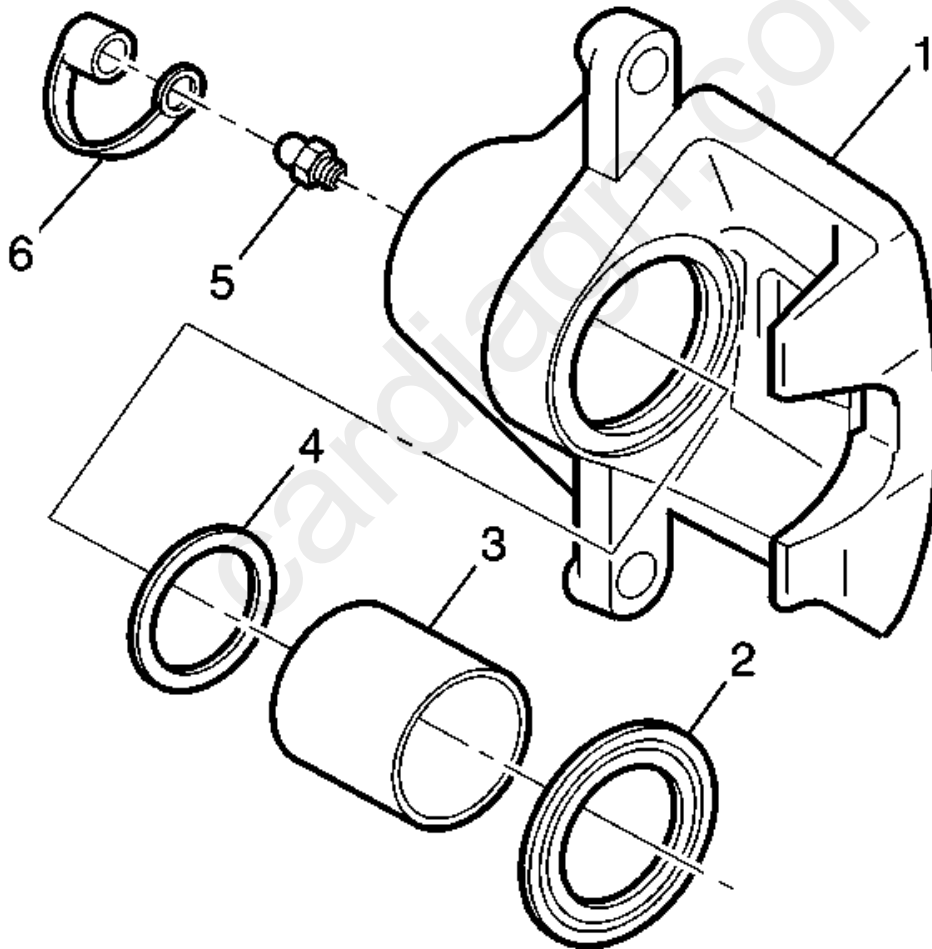


Fig. 9: Exploded View Of Brake Caliper
Courtesy of GENERAL MOTORS COMPANY

WARNING: Refer to Brake Dust Warning .

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.

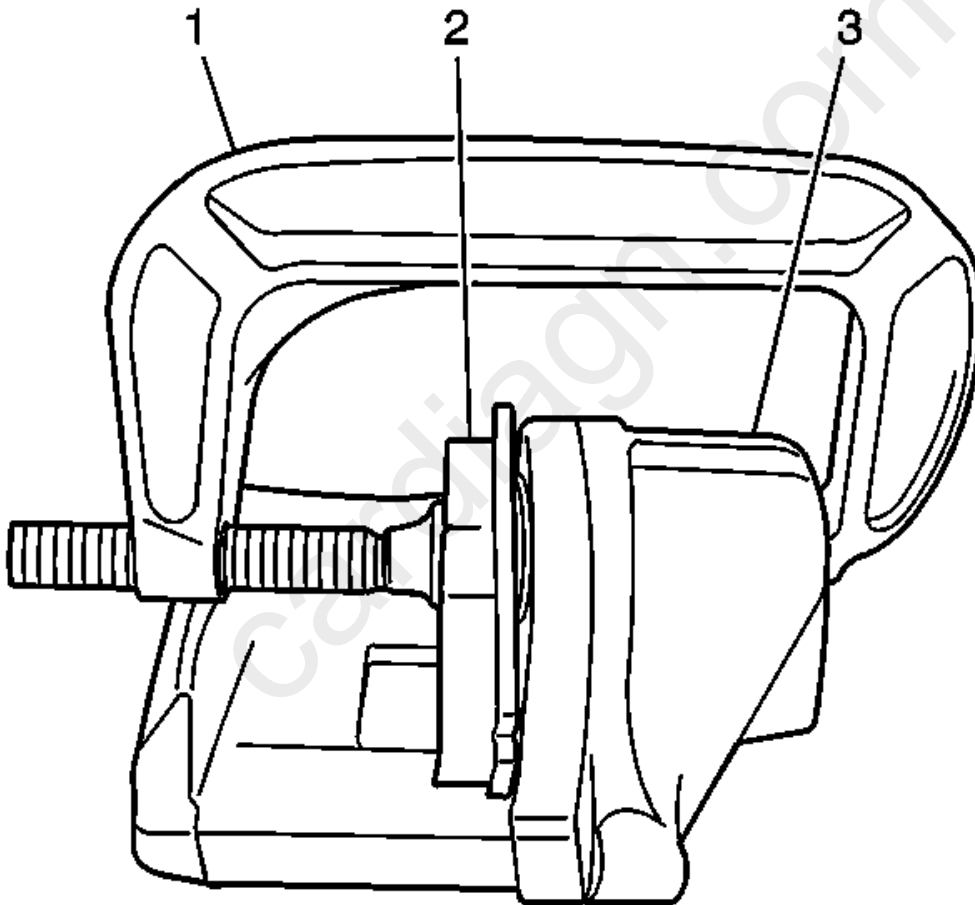


Fig. 10: Compressing Caliper Piston
Courtesy of GENERAL MOTORS COMPANY

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.

FRONT DISC BRAKE MOUNTING AND HARDWARE INSPECTION

WARNING: Refer to **Brake Dust Warning** .

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.
3. 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.
4. Raise and support the vehicle. Refer **Lifting and Jacking the Vehicle** .
5. Remove the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .

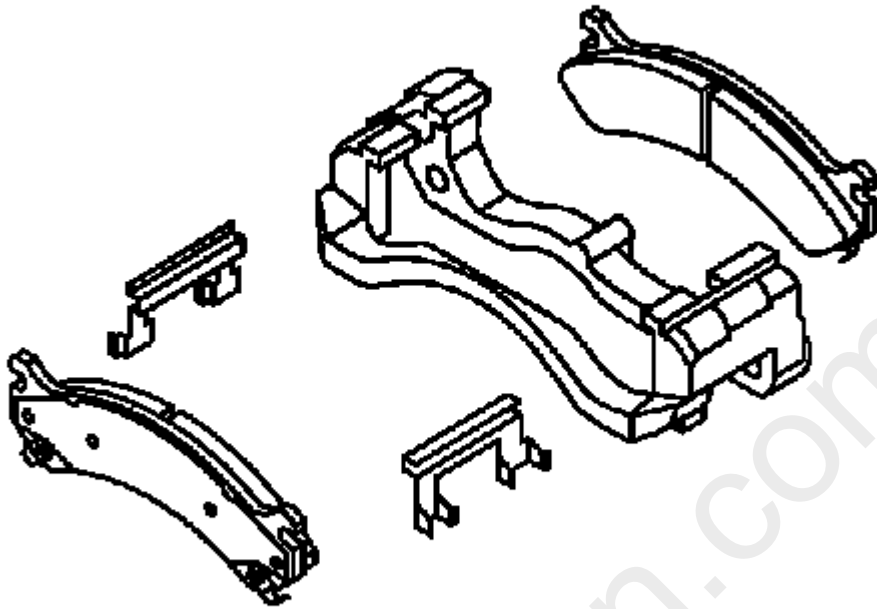


Fig. 11: View Of Disc Brake Pads & Brake Caliper Mounting Bracket
Courtesy of GENERAL MOTORS COMPANY

6. Grasp the brake caliper housing and try to move the brake caliper housing up/down and forward/reverse in relation to the brake caliper mounting bracket. If excessive looseness is observed the brake caliper bracket bushings and/or the brake caliper mounting bolts may need to be replaced.
7. Compress the front caliper pistons.
 - Install a large C-clamp over the top of the caliper housing and against the back of the outboard pad.
 - Slowly tighten the C-clamp until the pistons are pushed completely into the caliper bores.
 - Remove the C-clamp from the caliper.
8. With the pistons compressed into the caliper bores, grasp the brake caliper housing and slide it back and forth on the brake caliper mounting bolts. Check for smooth operation. If the brake caliper housing slide force is high or the brake caliper housing does not slide smoothly, inspect the brake caliper mounting bolts and/or the brake caliper mounting bracket bushings for wear or damage. If wear or damage conditions are found, replacement of the brake caliper mounting bolts and/or the brake caliper mounting bracket bushings is necessary.
9. Remove the brake caliper mounting bolts from the brake caliper mounting bracket and support the brake caliper using heavy mechanics wire. Do Not remove the hydraulic brake hose from the caliper. Refer to **Front Brake Caliper Replacement (JE5, J55 (AWD))**, **Front Brake Caliper Replacement (JE5, J55**

(RWD)), Front Brake Caliper Replacement (J56).

10. Remove the disc brake pads from the brake caliper mounting bracket.
11. Inspect the disc brake pad mounting hardware for the following:
 - Missing mounting hardware
 - Excessive corrosion
 - Bent mounting tabs
 - Looseness at the brake caliper mounting bracket
 - Looseness at the disc brake pads
 - Excessive contaminants in the brake caliper mounting bracket surface and threads.
12. If any of the conditions listed are found, the disc brake pad mounting hardware requires replacement.
13. Ensure the disc brake pads are held firmly in place on the brake caliper mounting bracket, yet slide easily on the mounting hardware without binding.

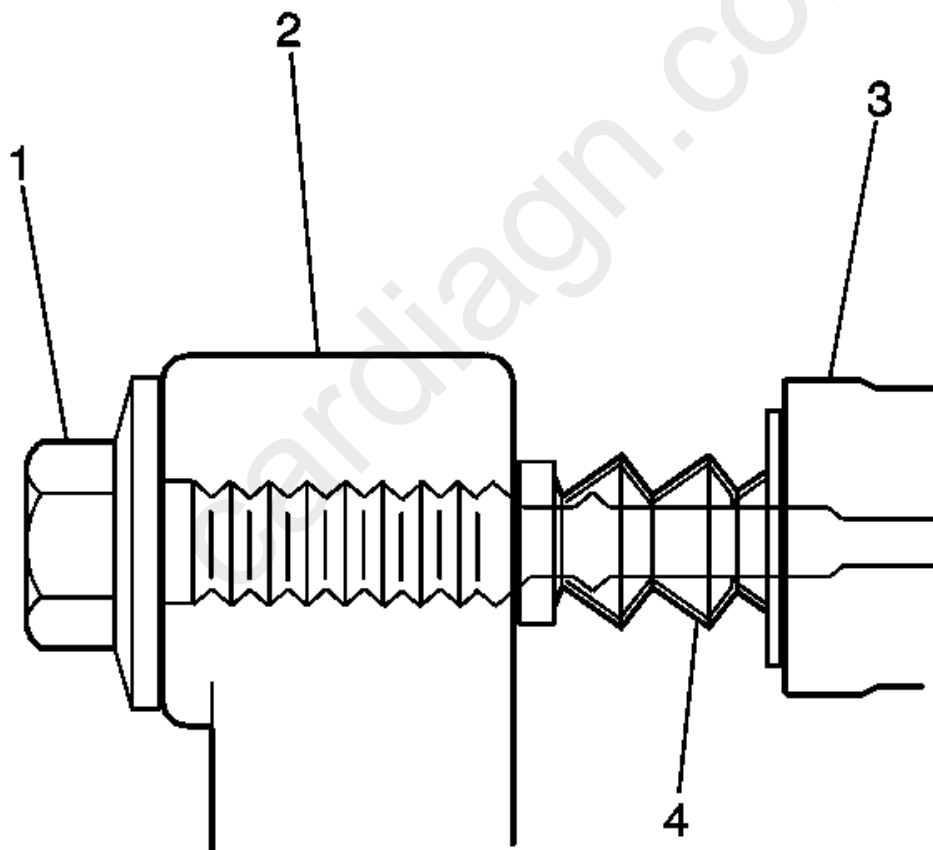


Fig. 12: View Of Caliper, Pin, Boots & Caliper Mounting Bracket
Courtesy of GENERAL MOTORS COMPANY

14. Inspect the brake caliper guide pin bolt (1), brake caliper (2), caliper bracket (3), and the guide pin seal (4) for the following:
 - Binding
 - Seizing
 - Looseness in the brake caliper mounting bracket
 - Bent or damaged brake caliper mounting bolts
 - Cracked or torn boots
 - Missing boots
 - Bent or damaged brake caliper mounting bracket
15. If any of the conditions listed are found then the brake caliper mounting hardware requires replacement.
16. Install the disc brake pads to the brake caliper mounting bracket.
17. Install the disc brake caliper to the brake caliper mounting bracket. Refer to **Front Brake Caliper Replacement (JE5, J55 (AWD))**, **Front Brake Caliper Replacement (JE5, J55 (RWD))**, **Front Brake Caliper Replacement (J56)**.

REAR DISC BRAKE MOUNTING AND HARDWARE INSPECTION

WARNING: Refer to **Brake Dust Warning** .

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.
3. 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.

WARNING: Do not use a service jack in locations other than those specified to lift this vehicle. Lifting the vehicle with a jack in those other locations could cause the vehicle to slip off the jack and roll; this could cause injury or death.

4. Raise and support the vehicle. Refer **Lifting and Jacking the Vehicle** .
5. Remove the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
6. Grasp the brake caliper housing and try to move the brake caliper housing up/down and forward/reverse in relation to the brake caliper mounting bracket. If excessive looseness is observed the brake caliper bracket bushings and/or the brake caliper mounting bolts may need to be replaced.
7. Compress the rear caliper piston.
 - Install a large C-clamp over the top of the caliper housing and against the back of the outboard pad.
 - Slowly tighten the C-clamp until the piston is pushed completely into the caliper bores.
 - Remove the C-clamp from the caliper.
8. With the piston compressed into the caliper bore, grasp the brake caliper housing and slide it back and

forth on the brake caliper mounting bolts. Check for smooth operation. If the brake caliper housing slide force is high or the brake caliper housing does not slide smoothly, inspect the brake caliper mounting bolts and/or the brake caliper mounting bracket bushings for wear or damage. If wear or damage conditions are found, replacement of the brake caliper mounting bolts and/or the brake caliper mounting bracket bushings is necessary.

9. Remove the brake caliper mounting bolts from the brake caliper mounting bracket and support the brake caliper using heavy mechanics wire. Do not disconnect the hydraulic brake hose from the caliper. Refer to **Rear Brake Caliper Replacement (J56)**, **Rear Brake Caliper Replacement (JE5, J55)**.
10. Remove the disc brake pads from the brake caliper mounting bracket.
11. Inspect the disc brake pad mounting hardware for the following:
 - Missing mounting hardware
 - Excessive corrosion
 - Bent mounting tabs
 - Looseness at the brake caliper mounting bracket
 - Looseness at the disc brake pads
 - Excessive contaminants in the brake caliper mounting bracket surface and threads.
12. If any of the conditions listed are found, the disc brake pad mounting hardware requires replacement.
13. Ensure the disc brake pads are held firmly in place on the brake caliper mounting bracket, yet slide easily on the mounting hardware without binding.

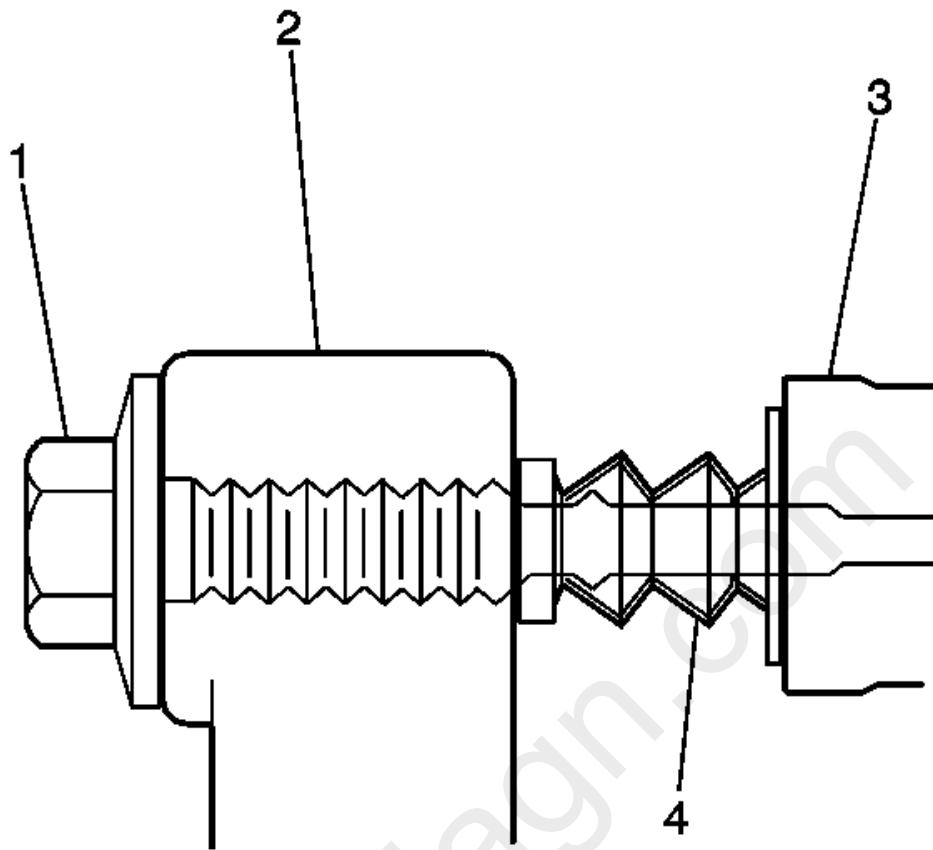


Fig. 13: View Of Caliper, Pin, Boots & Caliper Mounting Bracket
Courtesy of GENERAL MOTORS COMPANY

14. Inspect the caliper bolts (1) for the following:
 - Binding
 - Seizing
 - Looseness in the brake caliper mounting bracket (3)
 - Bent or damaged brake caliper mounting bolts
 - Cracked or torn boots (4)
 - Missing boots
 - Bent or damaged brake caliper mounting bracket (3)
15. If any of the conditions listed are found then the brake caliper mounting hardware requires replacement.
16. Install the disc brake pads to the brake caliper mounting bracket.
17. Install the disc brake caliper to the brake caliper mounting bracket. Refer to **Rear Brake Caliper Replacement (J56)**, **Rear Brake Caliper Replacement (JE5, J55)**.

REPAIR INSTRUCTIONS

FRONT DISC BRAKE PADS REPLACEMENT (JE5, J55 (RWD))

Removal Procedure

WARNING: Refer to Brake Dust Warning .

NOTE: Always replace disc brake pads in axle sets.

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, no brake fluid needs to be removed from the reservoir before proceeding.
3. If the brake fluid level is higher than midway between the maximum full point and the minimum allowable level, remove brake fluid to the midway point before proceeding.
4. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .
5. Remove the tire and wheel assembly. Refer to Tire and Wheel Removal and Installation .
6. Install a C-clamp against the outer brake pad and the rear of the brake caliper body.
7. Slowly tighten the C-clamp until the brake caliper pistons are compressed into the brake caliper bores.

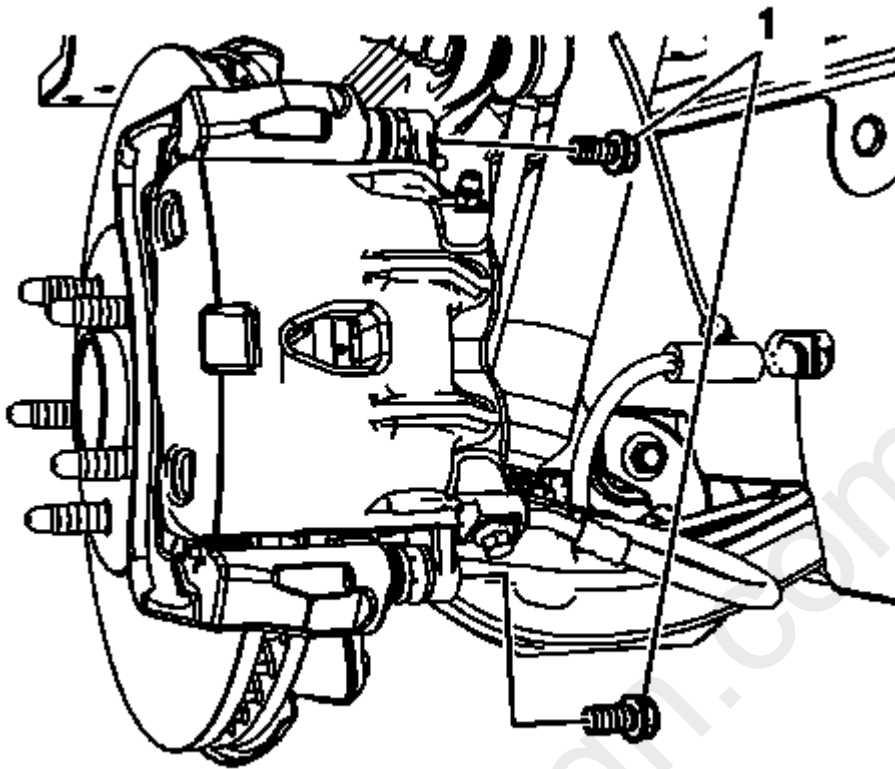


Fig. 14: Identifying Bolts and Caliper Pin
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Support the brake caliper with heavy mechanic 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. Using a backup wrench on the brake caliper guide pin, remove the brake caliper guide pin bolts (1).

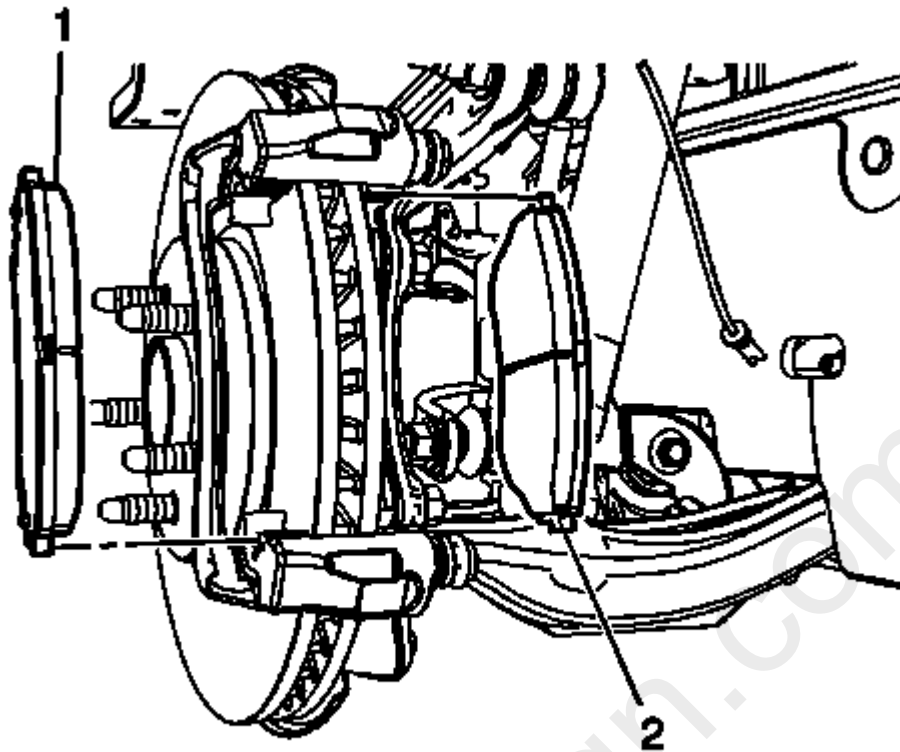


Fig. 15: View of Brake Pads and Rotor
Courtesy of GENERAL MOTORS COMPANY

9. Remove the brake caliper and support with heavy mechanics wire or equivalent.
10. Remove the outer brake pad (1).
11. Remove the inner brake pad (2).
12. Remove the brake pad springs.

Installation Procedure

1. Inspect the brake caliper guide pins, seals and brake pad springs for damage and/or corrosion. Refer to **Front Disc Brake Mounting and Hardware Inspection.**
2. Install the brake pad springs.

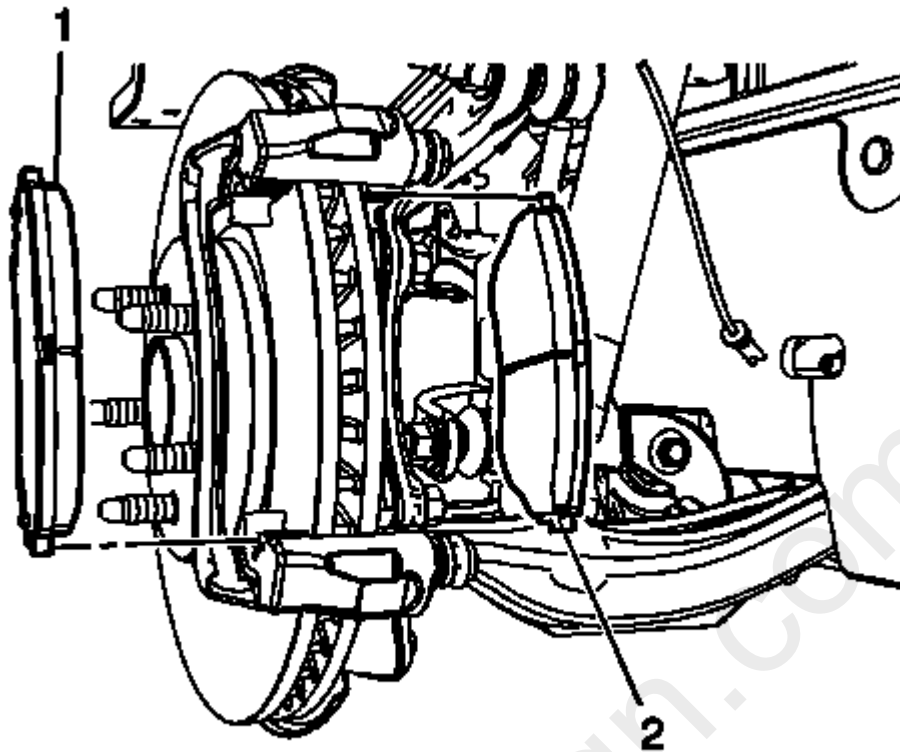


Fig. 16: View of Brake Pads and Rotor
Courtesy of GENERAL MOTORS COMPANY

3. Install the outer brake pad (1).
4. Install the inner brake pad (2).

NOTE: If reusing the brake caliper guide pin bolts, the threads of the brake caliper guide pin bolts and the threads of the guide pins must be free of residue and debris prior to application of threadlocker in order to ensure proper adhesion and fastener retention.

5. If reusing the caliper pin bolts, prepare the bolt and the guide pins for assembly:
 - Thoroughly clean the residue from the guide pin bolt threads by using denatured alcohol or equivalent and allow to dry.
 - Thoroughly clean the residue from the guide pin threads by using denatured alcohol or equivalent and allow to dry.
6. Apply threadlocker GM P/N 12345493 (Canadian P/N 10953488), or equivalent to 2/3 of the threaded length of the brake caliper guide pin bolts. Ensure there are no gaps in the threadlocker along the length of the filled area of the bolt.
7. Allow the threadlocker to cure approximately 10 minutes before installation.

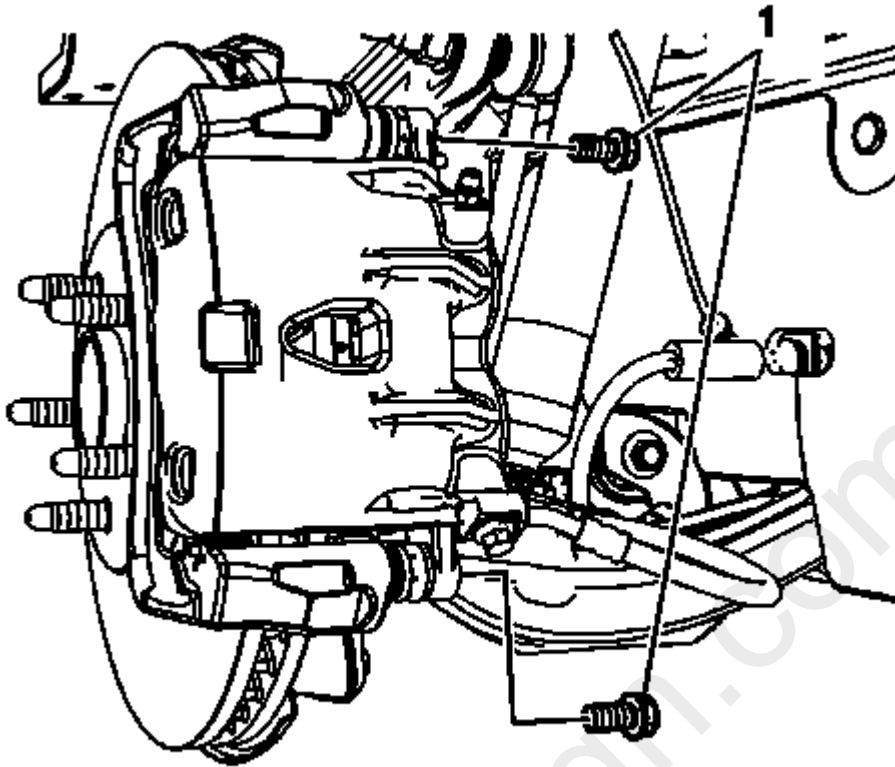


Fig. 17: Identifying Bolts and Caliper Pin
 Courtesy of GENERAL MOTORS COMPANY

8. Install the brake caliper to the caliper bracket.

CAUTION: Refer to Fastener Caution .

9. Using a backup wrench on the brake caliper guide pin, install the brake caliper guide pin bolts (1) and tighten to 63 N.m (46 lb ft).
10. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
11. With the engine OFF, gradually apply the brake pedal to approximately 2/3 of its travel distance.
12. Slowly release the brake pedal.
13. Wait 15 seconds, then repeat steps 11 and 12 until a firm brake pedal apply is obtained. This will properly seat the brake caliper pistons and brake pads.
14. Fill the brake master cylinder reservoir to the proper level. Refer to **Master Cylinder Reservoir Filling** .
15. Burnish the pads and rotors. Refer to **Brake Pad and Rotor Burnishing**.

FRONT DISC BRAKE PADS REPLACEMENT (JE5, J55 (AWD))

Removal Procedure

WARNING: Refer to Brake Dust Warning .

NOTE: Always replace disc brake pads in axle sets.

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, no brake fluid needs to be removed from the reservoir before proceeding.
3. If the brake fluid level is higher than midway between the maximum full point and the minimum allowable level, remove brake fluid to the midway point before proceeding.
4. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .
5. Remove the tire and wheel assembly. Refer to Tire and Wheel Removal and Installation .
6. Install a C-clamp against the outer brake pad and the rear of the brake caliper body.
7. Slowly tighten the C-clamp until the brake caliper pistons are compressed into the brake caliper bores.

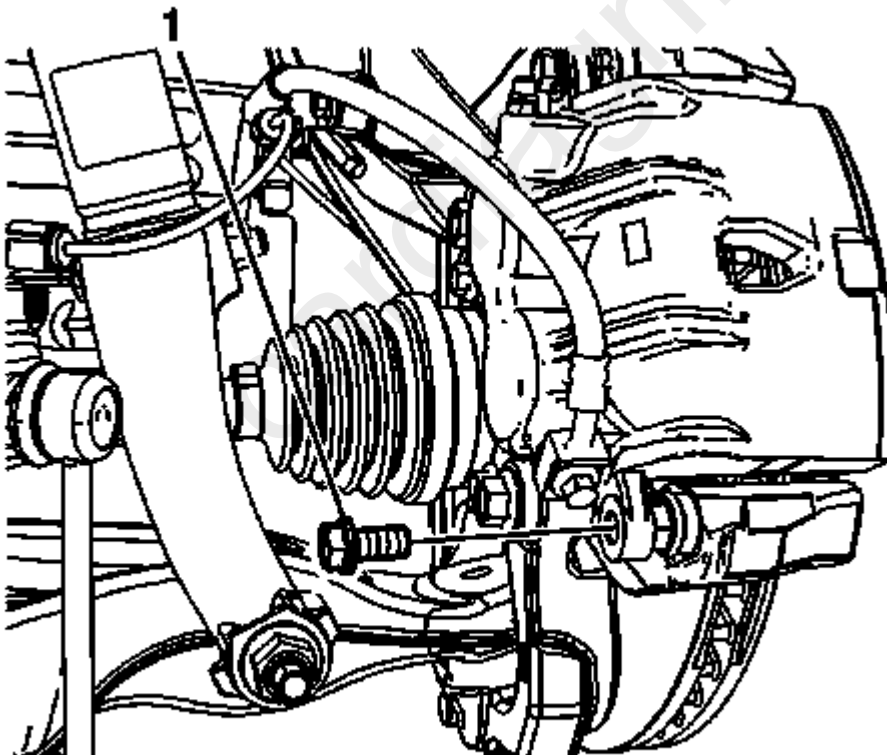


Fig. 18: View of Brake Caliper Pin and Bolt
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Support the brake caliper with heavy mechanic 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. Using a backup wrench on the brake caliper guide pin, remove the lower brake caliper guide pin bolt (1).

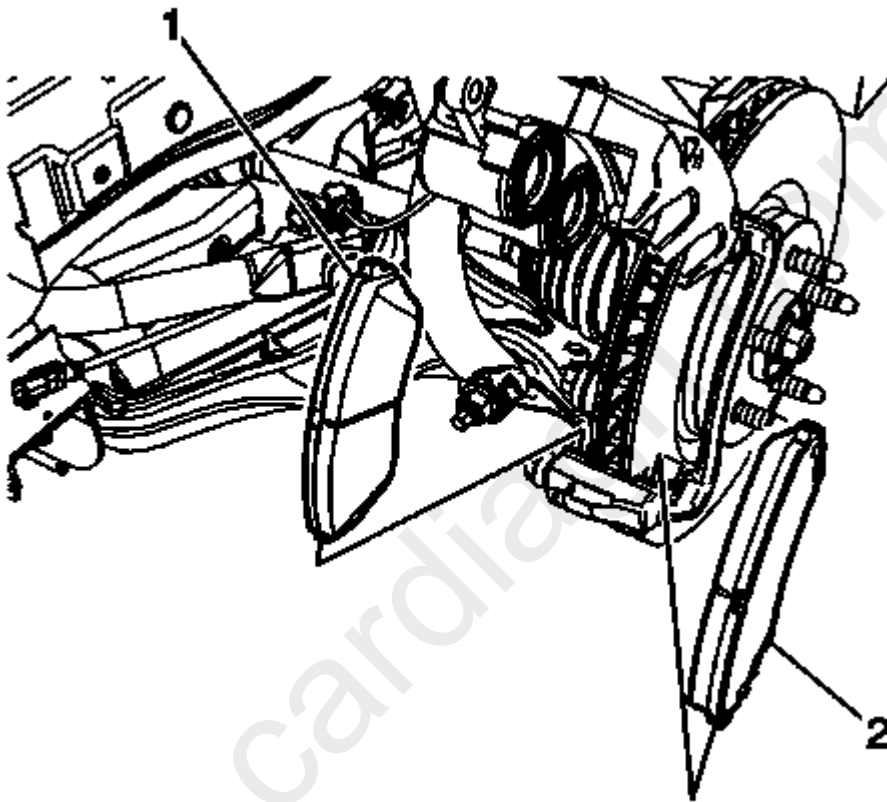


Fig. 19: View of Brake Pads

Courtesy of GENERAL MOTORS COMPANY

9. Pivot the brake caliper upward and support with heavy mechanics wire or equivalent.
10. Remove the inner brake pad (1).
11. Remove the outer brake pad (2).
12. Remove the brake pad springs.

Installation Procedure

1. Inspect the brake caliper guide pins, seals and brake pad springs for damage and/or corrosion. Refer to **Front Disc Brake Mounting and Hardware Inspection.**

2. Install the brake pad springs.

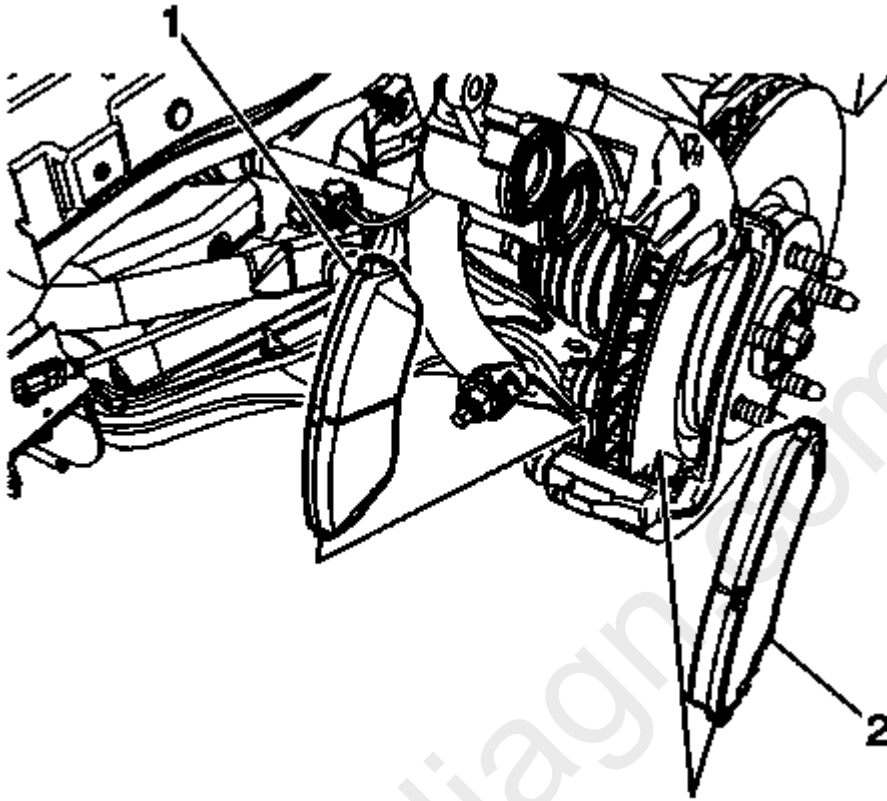


Fig. 20: View of Brake Pads

Courtesy of GENERAL MOTORS COMPANY

3. Install the inner brake pad (1).
4. Install the outer brake pad (2).
5. Pivot the brake caliper into position.

NOTE: If reusing the brake caliper guide pin bolt, the threads of the brake caliper guide pin bolt and the threads of the guide pin must be free of residue and debris prior to application of threadlocker in order to ensure proper adhesion and fastener retention.

6. If reusing the caliper pin bolt, prepare the bolt and the guide pin for assembly:
 - Thoroughly clean the residue from the guide pin bolt threads by using denatured alcohol or equivalent and allow to dry.
 - Thoroughly clean the residue from the guide pin threads by using denatured alcohol or equivalent and allow to dry.
7. Apply threadlocker GM P/N 12345493 (Canadian P/N 10953488), or equivalent to 2/3 of the threaded

length of the brake caliper guide pin bolt. Ensure there are no gaps in the threadlocker along the length of the filled area of the bolt.

8. Allow the threadlocker to cure approximately 10 minutes before installation.

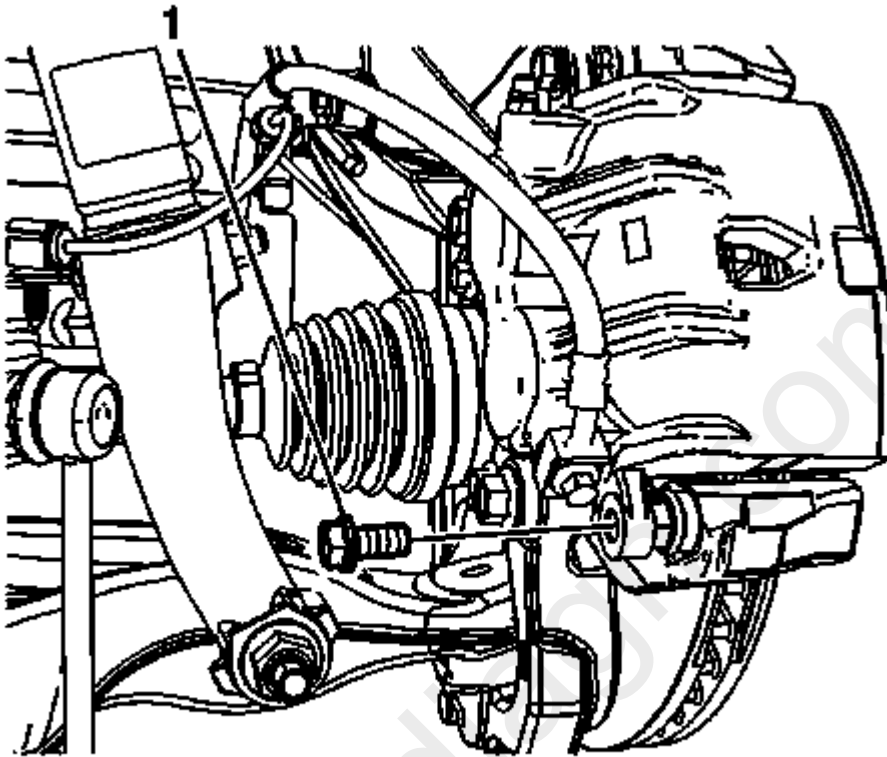


Fig. 21: View of Brake Caliper Pin and Bolt
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

9. Using a backup wrench on the brake caliper guide pin, install the brake caliper guide pin bolt (1) and tighten to 63 N.m (46 lb ft).
10. Install the tire and wheel assembly. Refer to Tire and Wheel Removal and Installation .
11. With the engine OFF, gradually apply the brake pedal to approximately 2/3 of its travel distance.
12. Slowly release the brake pedal.
13. Wait 15 seconds, then repeat steps 11 and 12 until a firm brake pedal apply is obtained. This will properly seat the brake caliper pistons and brake pads.
14. Fill the brake master cylinder reservoir to the proper level. Refer to Master Cylinder Reservoir Filling .
15. Burnish the pads and rotors. Refer to Brake Pad and Rotor Burnishing.

FRONT DISC BRAKE PADS REPLACEMENT (J56)

Removal Procedure

WARNING: Refer to Brake Dust Warning .

NOTE: Always replace disc brake pads in axle sets.

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, no brake fluid needs to be removed from the reservoir before proceeding.
3. If the brake fluid level is higher than midway between the maximum full point and the minimum allowable level, remove brake fluid to the midway point before proceeding.
4. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .
5. Remove the tire and wheel assembly. Refer to Tire and Wheel Removal and Installation .

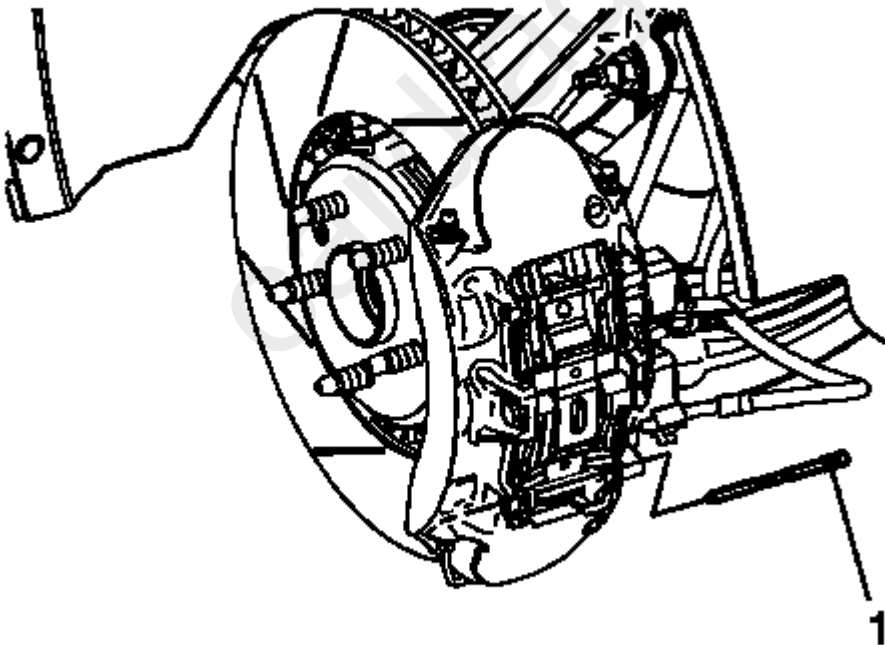


Fig. 22: Identifying Lower Brake Pad Guide Pin
Courtesy of GENERAL MOTORS COMPANY

6. Remove the lower brake pad guide pin (1).

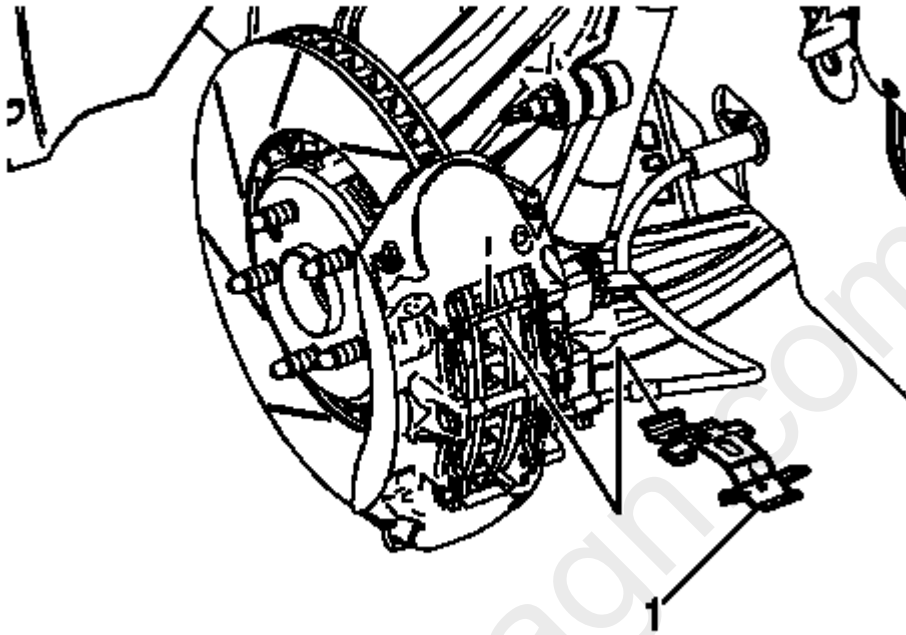


Fig. 23: Identifying Brake Pad Spring
Courtesy of GENERAL MOTORS COMPANY

7. Remove the brake pad spring (1).

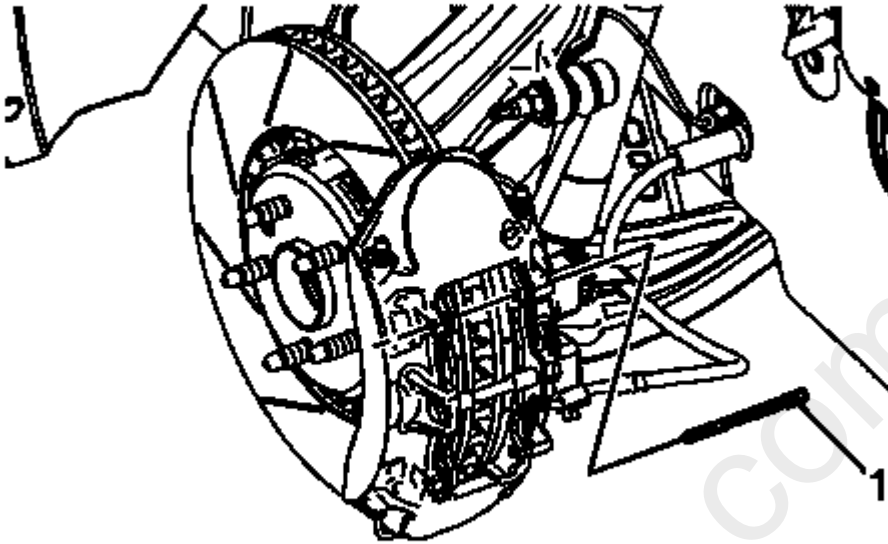


Fig. 24: Identifying Upper Brake Pad Guide Pin
Courtesy of GENERAL MOTORS COMPANY

8. Remove the upper brake pad guide pin (1).

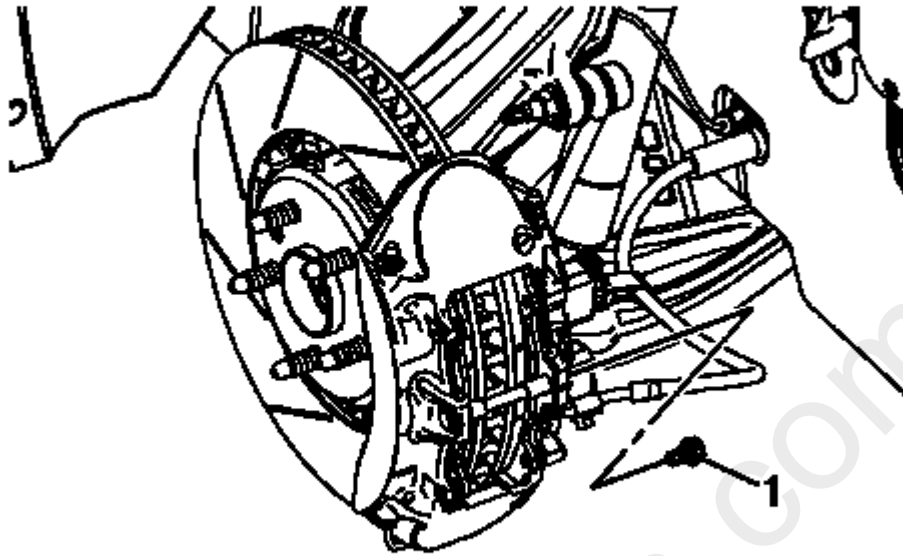


Fig. 25: Identifying Brake Caliper Bridge Pin Bolt
Courtesy of GENERAL MOTORS COMPANY

9. Remove the brake caliper bridge pin bolt (1).

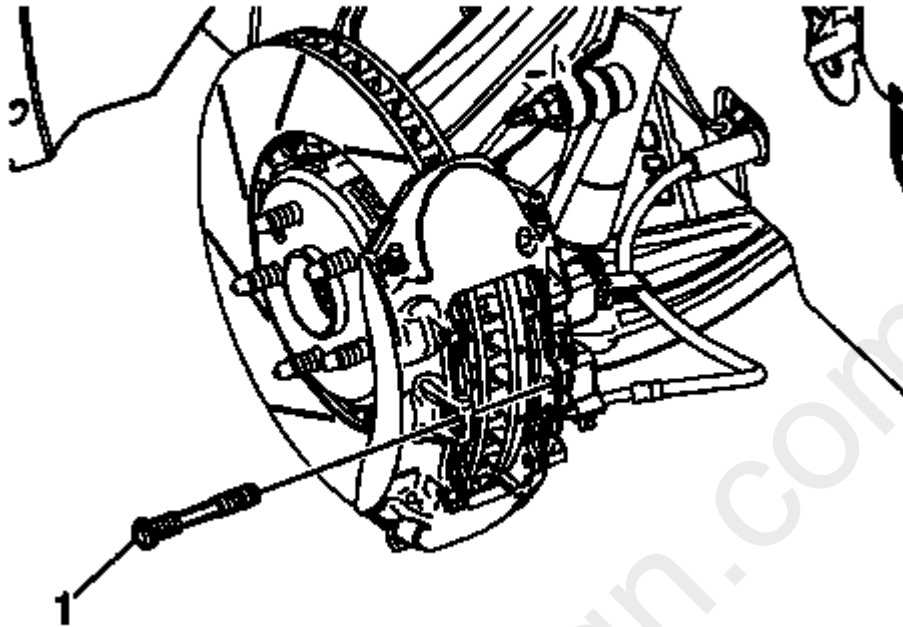


Fig. 26: Identifying Brake Caliper Bridge Pin
Courtesy of GENERAL MOTORS COMPANY

10. Remove the brake caliper bridge pin (1).

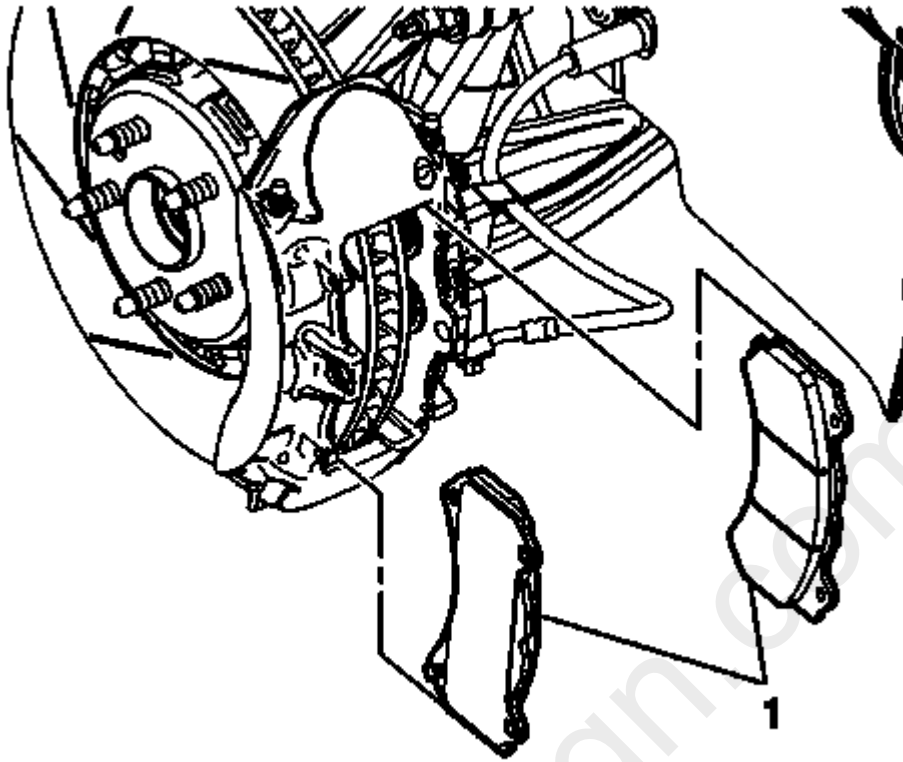


Fig. 27: Identifying Brake Pads

Courtesy of GENERAL MOTORS COMPANY

11. Remove the brake pads (1).
12. Using a spreader tool, carefully push the brake caliper pistons into the caliper bores until fully seated.

Installation Procedure

1. Inspect the brake pad guide pins. If damaged, or corroded replace the guide pin. Do not attempt to clean away any corrosion.
2. Inspect the brake caliper piston boot for damage and/or deterioration, replace if damaged or deteriorated. Refer to **Brake Caliper Inspection**.

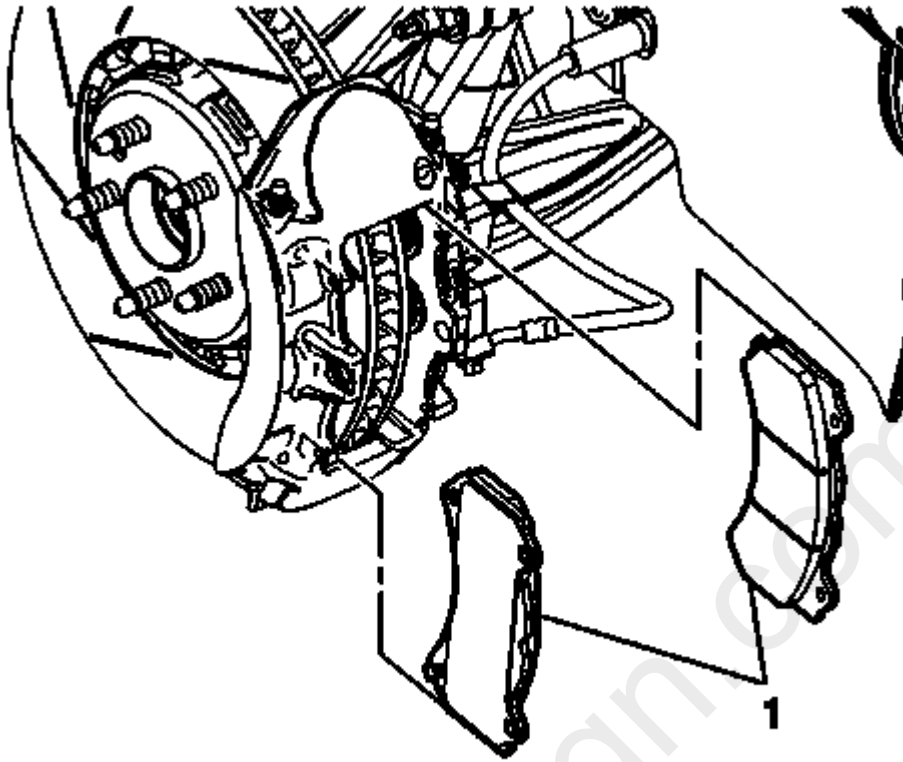


Fig. 28: Identifying Brake Pads

Courtesy of GENERAL MOTORS COMPANY

3. Install the brake pads (1).

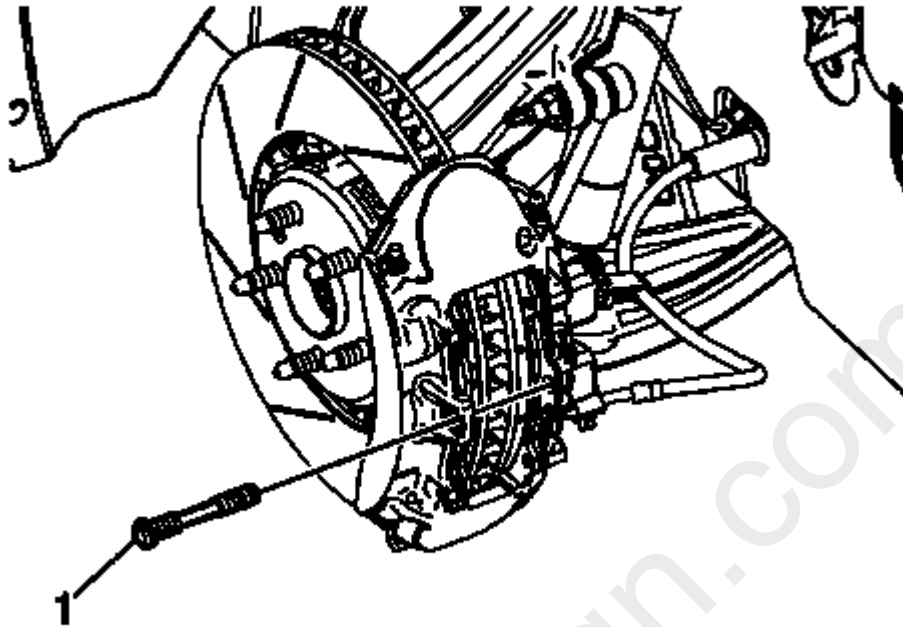


Fig. 29: Identifying Brake Caliper Bridge Pin
Courtesy of GENERAL MOTORS COMPANY

4. Install the brake caliper bridge pin (1).

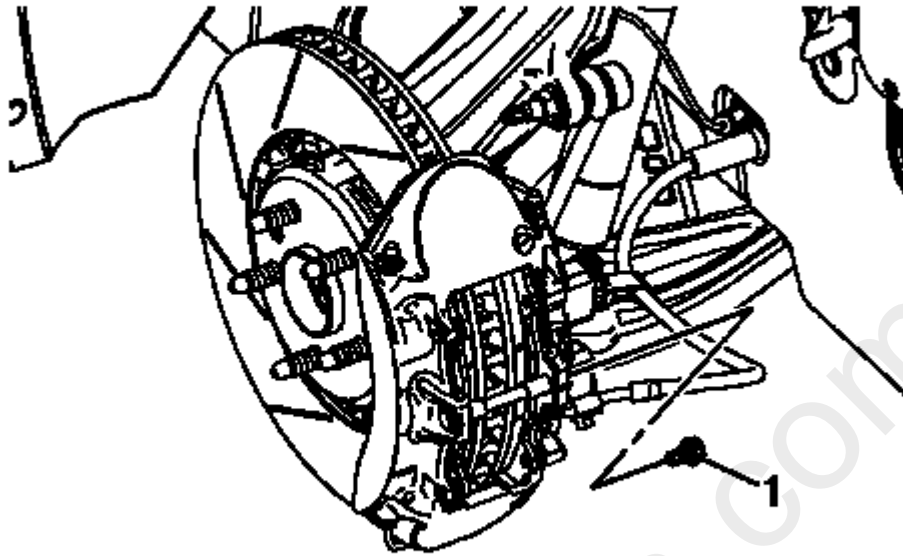


Fig. 30: Identifying Brake Caliper Bridge Pin Bolt
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

5. Install the brake caliper bridge pin bolt (1) and tighten to 33 N.m (24 lb ft).

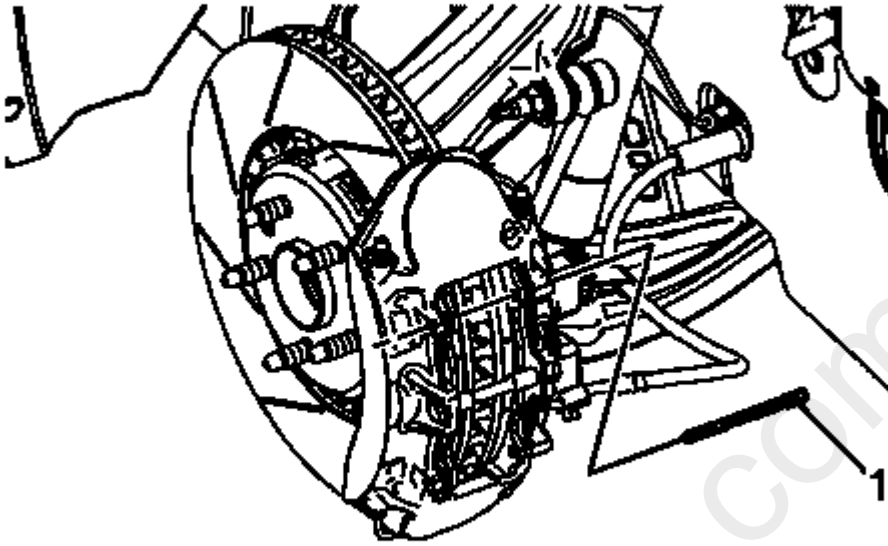


Fig. 31: Identifying Upper Brake Pad Guide Pin
Courtesy of GENERAL MOTORS COMPANY

6. Install the upper brake pad guide pin (1).

Ensure the brake pad guide pin is fully seated in the brake caliper housing.

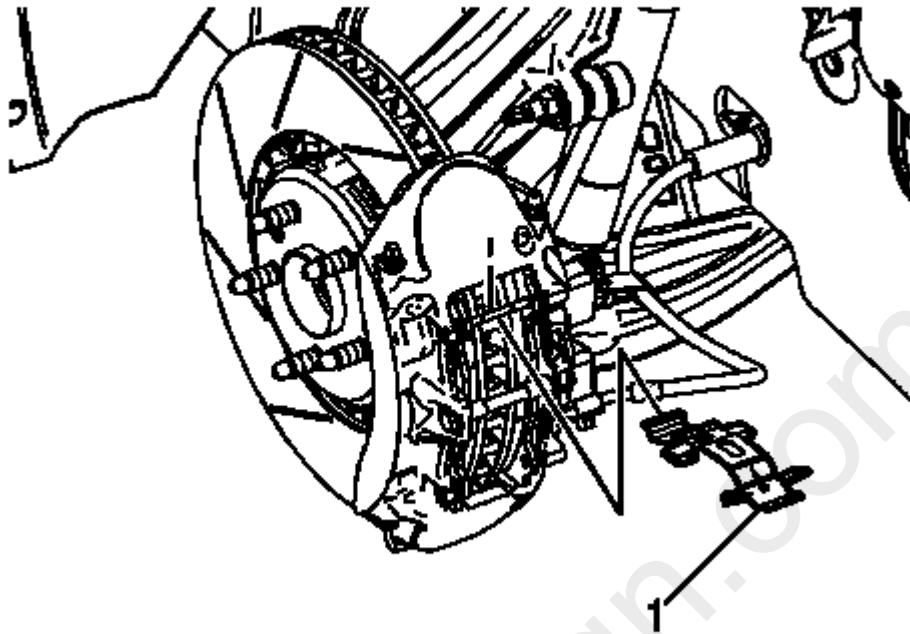


Fig. 32: Identifying Brake Pad Spring
Courtesy of GENERAL MOTORS COMPANY

7. Install the brake pad spring (1).

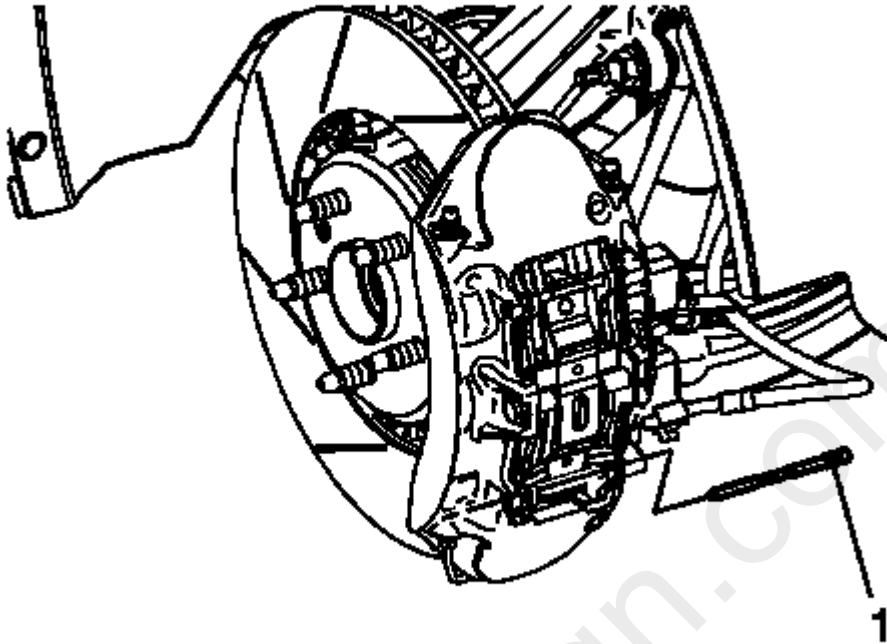


Fig. 33: Identifying Lower Brake Pad Guide Pin
Courtesy of GENERAL MOTORS COMPANY

8. Install the lower brake pad guide pin (1) through the brake caliper and over the edge of the brake pad spring.

Ensure the brake pad guide pin is fully seated in the brake caliper housing.

9. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
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 apply 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** .
14. Burnish the brake pads and rotors. Refer to **Brake Pad and Rotor Burnishing**.

REAR DISC BRAKE PADS REPLACEMENT (JE5, J55)

Removal Procedure

WARNING: Refer to Brake Dust Warning .

NOTE: Always replace disc brake pads in axle sets.

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, no brake fluid needs to be removed from the reservoir before proceeding.
3. If the brake fluid level is higher than midway between the maximum full point and the minimum allowable level, remove brake fluid to the midway point before proceeding.
4. Release the electronic park brake cable tension, if equipped. Refer to Parking Brake Cable Adjuster Disabling (Electric Park Brake) .
5. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .
6. Remove the tire and wheel assembly. Refer to Tire and Wheel Removal and Installation .
7. Install a C-clamp against the outer brake pad and the rear of the brake caliper body.
8. Slowly tighten the C-clamp until the brake caliper pistons are compressed into the brake caliper bores.

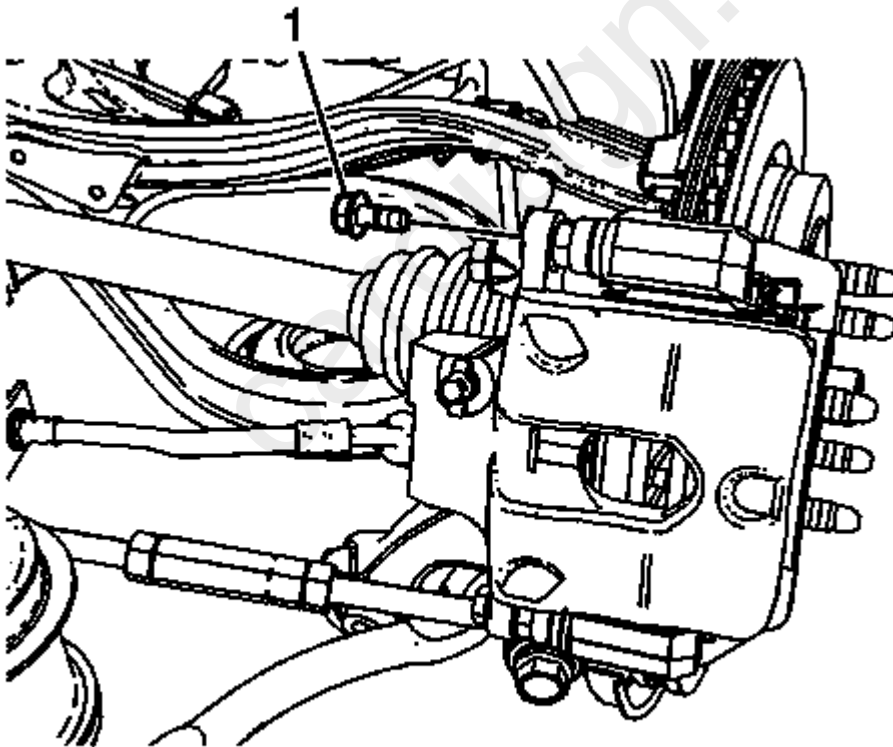


Fig. 34: View of Brake Caliper Pin and Bolt
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Support the brake caliper with heavy mechanic 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.

9. Using a backup wrench on the brake caliper guide pin, remove the upper brake caliper guide pin bolt (1).

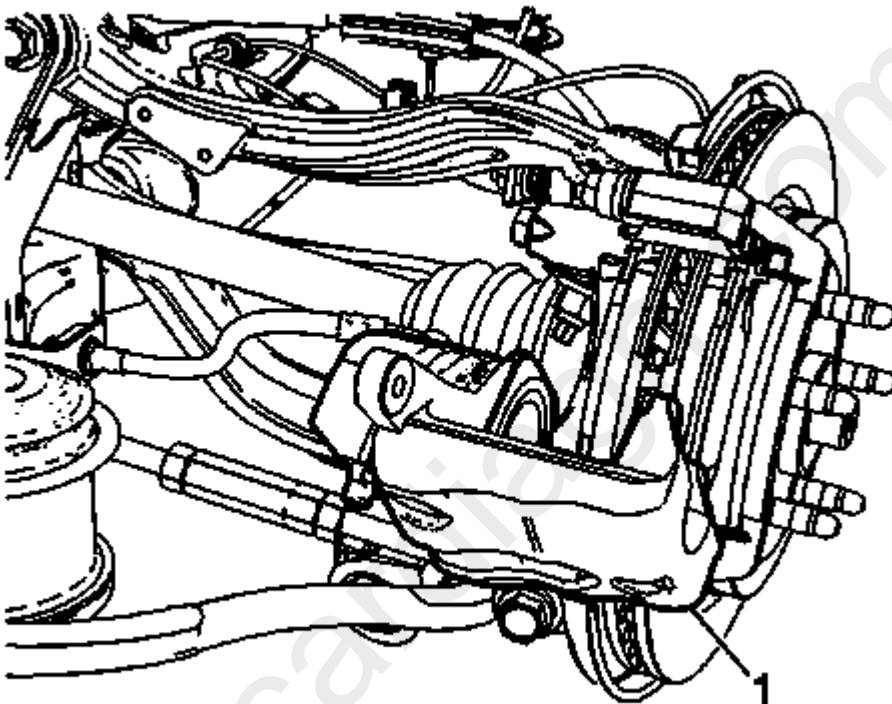


Fig. 35: Identifying Brake Caliper
Courtesy of GENERAL MOTORS COMPANY

10. Pivot the brake caliper (1) forward and support with heavy mechanics wire or equivalent.

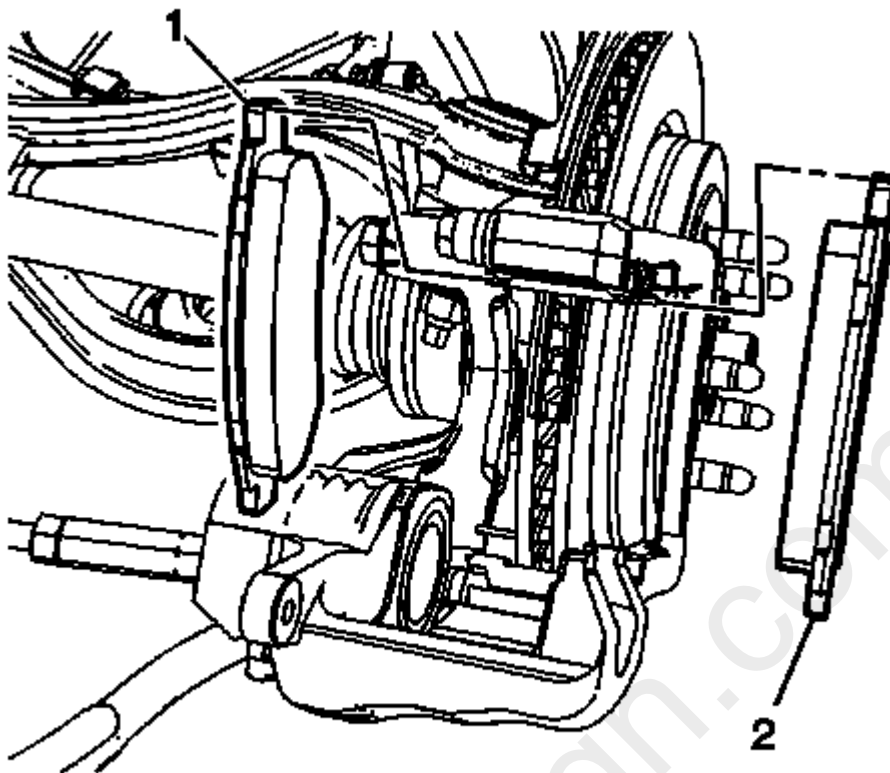


Fig. 36: Identifying Brake Pads

Courtesy of GENERAL MOTORS COMPANY

11. Remove the inner brake pad (1).
12. Remove the outer brake pad (2).

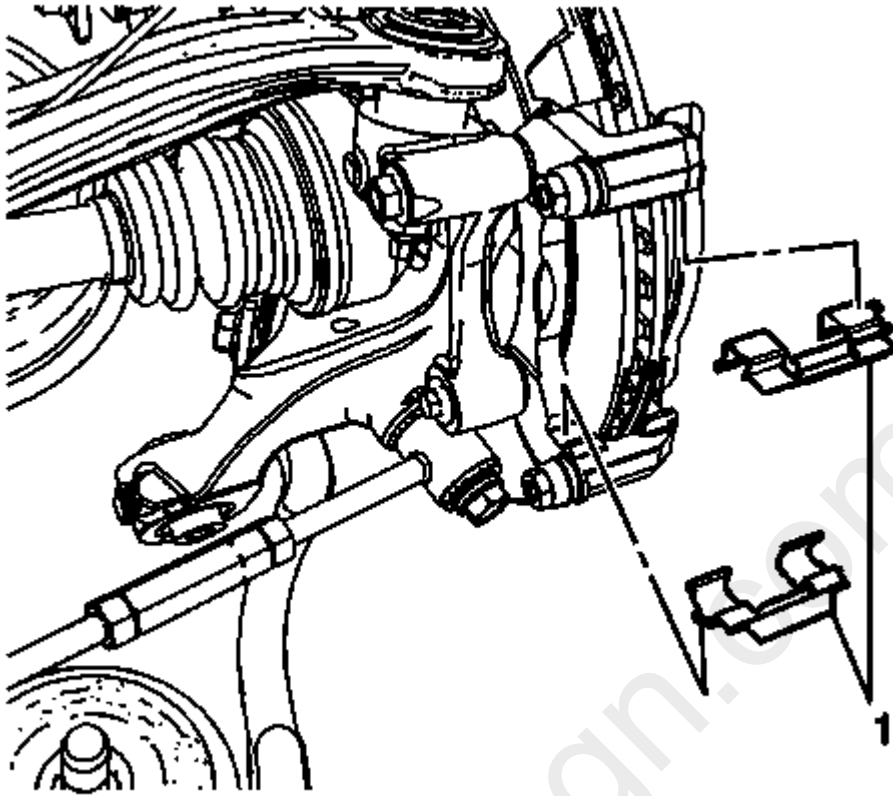


Fig. 37: View of Brake Pad Springs
Courtesy of GENERAL MOTORS COMPANY

13. Remove the brake pad springs (1).

Installation Procedure

1. Inspect the brake caliper guide pins, seals and brake pad springs for damage and/or corrosion. Refer to **Front Disc Brake Mounting and Hardware Inspection.**

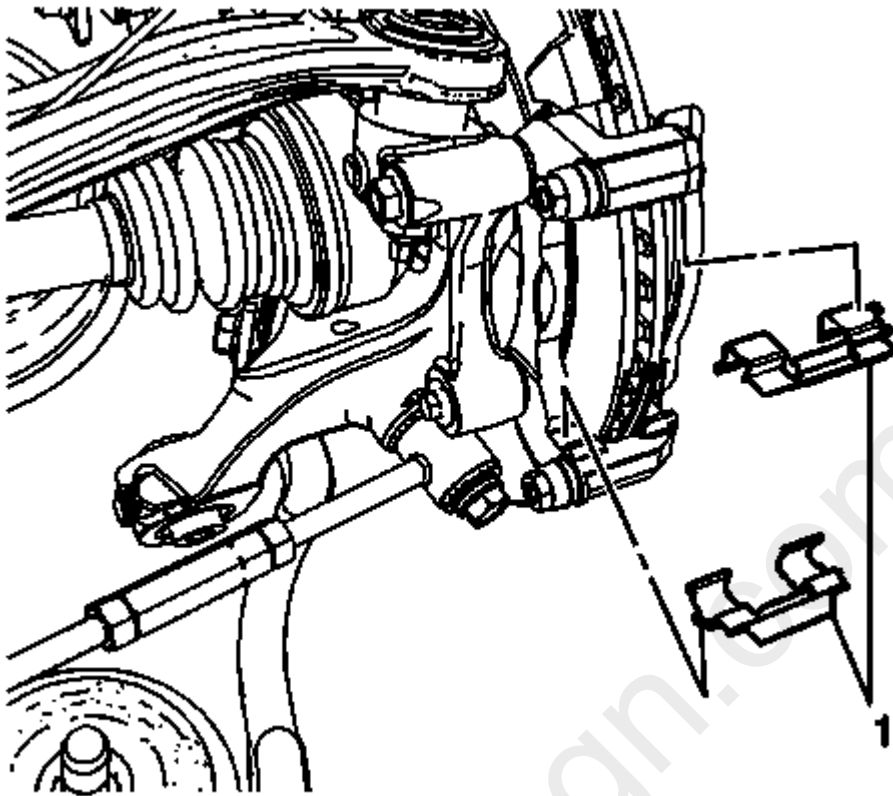


Fig. 38: View of Brake Pad Springs
Courtesy of GENERAL MOTORS COMPANY

2. Install the brake pad springs (1).

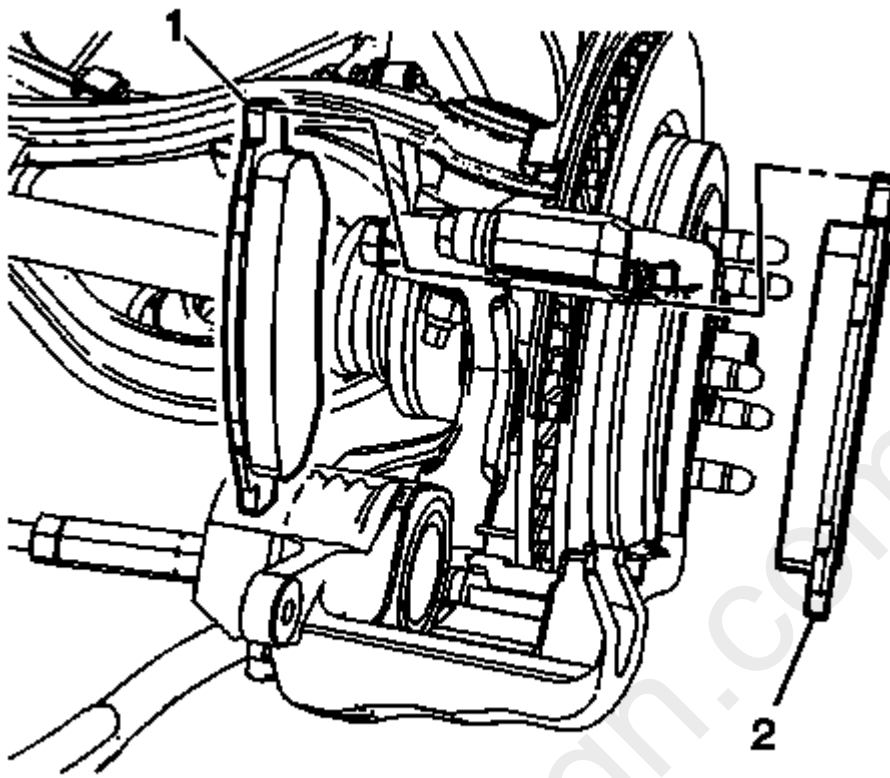


Fig. 39: Identifying Brake Pads

Courtesy of GENERAL MOTORS COMPANY

3. Install the inner brake pad (1).
4. Install the outer brake pad (2).

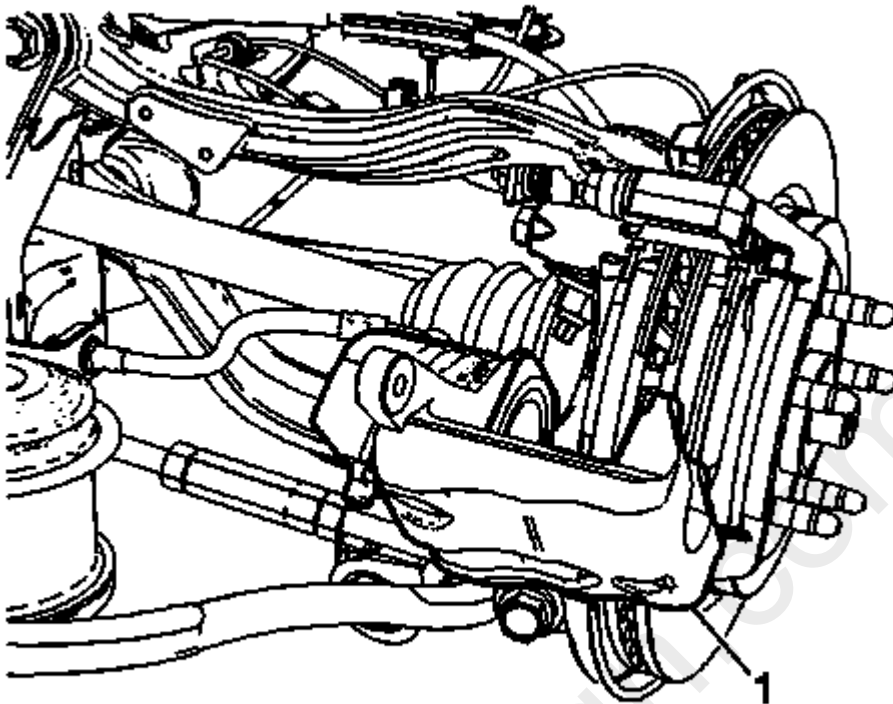


Fig. 40: Identifying Brake Caliper
Courtesy of GENERAL MOTORS COMPANY

5. Pivot the brake caliper (1) into position.

NOTE: If reusing the brake caliper guide pin bolt, the threads of the brake caliper guide pin bolt and the threads of the guide pin must be free of residue and debris prior to application of threadlocker in order to ensure proper adhesion and fastener retention.

6. If reusing the caliper pin bolt, prepare the bolt and the guide pin for assembly:
 - Thoroughly clean the residue from the guide pin bolt threads by using denatured alcohol or equivalent and allow to dry.
 - Thoroughly clean the residue from the guide pin threads by using denatured alcohol or equivalent and allow to dry.
7. Apply threadlocker GM P/N 12345493 (Canadian P/N 10953488), or equivalent to 2/3 of the threaded length of the brake caliper guide pin bolt. Ensure there are no gaps in the threadlocker along the length of the filled area of the bolt.
8. Allow the threadlocker to cure approximately 10 minutes before installation.

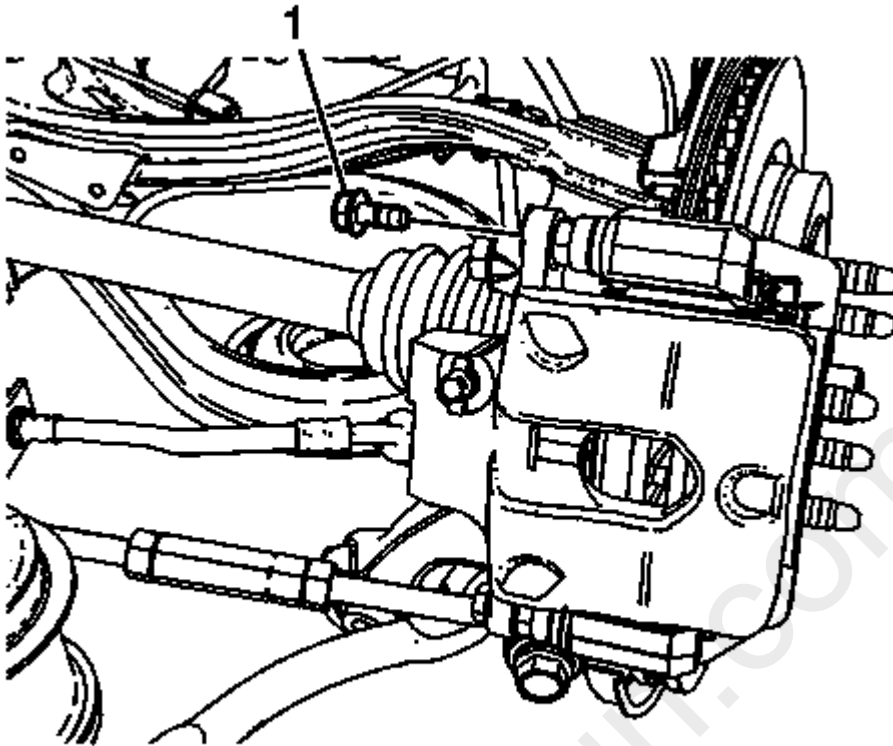


Fig. 41: View of Brake Caliper Pin and Bolt
 Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

9. Using a backup wrench on the brake caliper guide pin, install the brake caliper guide pin bolt (1) and tighten to 60 N.m (44 lb ft).
10. Install the tire and wheel assembly. Refer to Tire and Wheel Removal and Installation .
11. With the engine OFF, gradually apply the brake pedal to approximately 2/3 of its travel distance.
12. Slowly release the brake pedal.
13. Wait 15 seconds, then repeat steps 11 and 12 until a firm brake pedal apply is obtained. This will properly seat the brake caliper pistons and brake pads.
14. Fill the brake master cylinder reservoir to the proper level. Refer to Master Cylinder Reservoir Filling .
15. Set the electronic park brake cable tension, if equipped. Refer to Parking Brake Cable Adjuster Enabling (Electric Park Brake) .
16. Burnish the pads and rotors. Refer to Brake Pad and Rotor Burnishing.

REAR DISC BRAKE PADS REPLACEMENT (J56)

Removal Procedure

WARNING: Refer to Brake Dust Warning .

NOTE: Always replace disc brake pads in axle sets.

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, no brake fluid needs to be removed from the reservoir before proceeding.
3. If the brake fluid level is higher than midway between the maximum full point and the minimum allowable level, remove brake fluid to the midway point before proceeding.
4. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .
5. Remove the tire and wheel assembly. Refer to Tire and Wheel Removal and Installation .

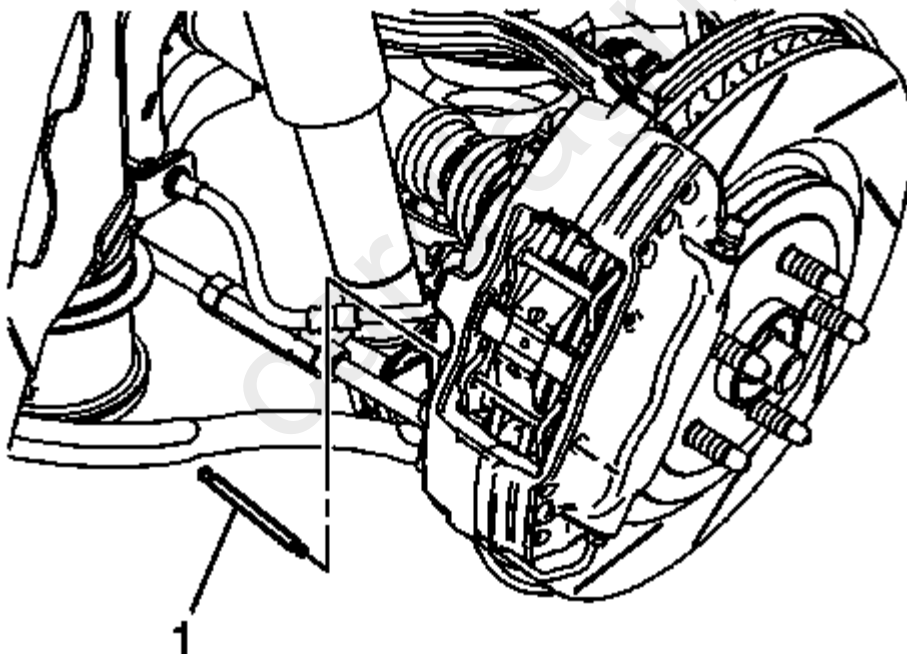


Fig. 42: Identifying Lower Brake Pad Guide Pin
Courtesy of GENERAL MOTORS COMPANY

6. Remove the lower brake pad guide pin (1).

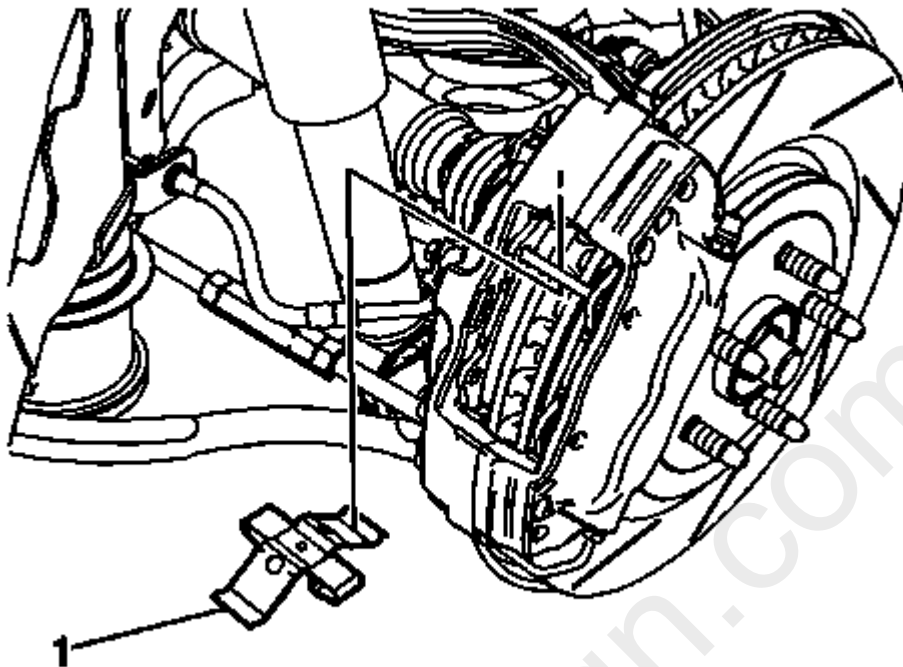


Fig. 43: Identifying Brake Pad Spring
Courtesy of GENERAL MOTORS COMPANY

7. Remove the brake pad spring (1).

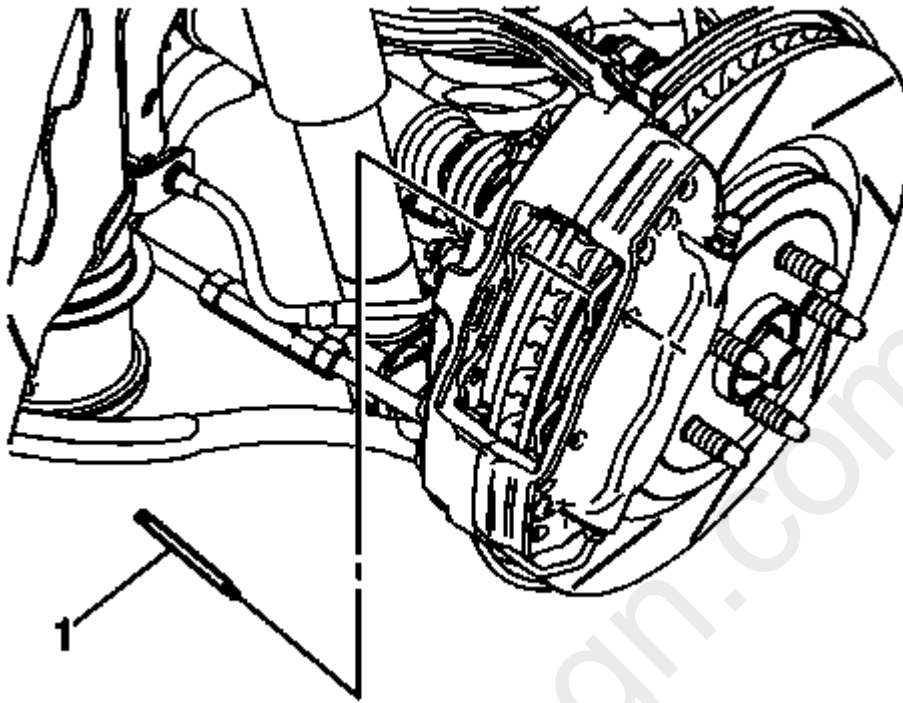


Fig. 44: Identifying Upper Brake Pad Guide Pin
Courtesy of GENERAL MOTORS COMPANY

8. Remove the upper brake pad guide pin (1).

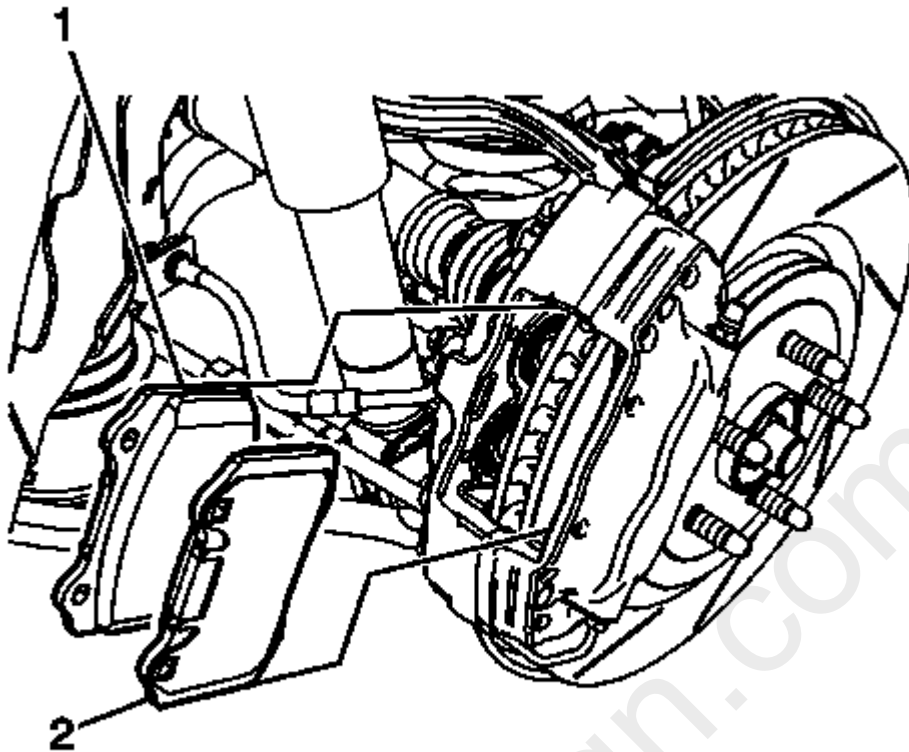


Fig. 45: Identifying Brake Pads
Courtesy of GENERAL MOTORS COMPANY

9. Remove the brake pads (1).
10. Using a spreader tool, carefully push the brake caliper pistons into the caliper bores until fully seated.

Installation Procedure

1. Inspect the brake pad guide pins. If damaged, or corroded replace the guide pin. Do not attempt to clean away any corrosion.
2. Inspect the brake caliper piston boot for damage and/or deterioration, replace if damaged or deteriorated. Refer to **Brake Caliper Inspection**.

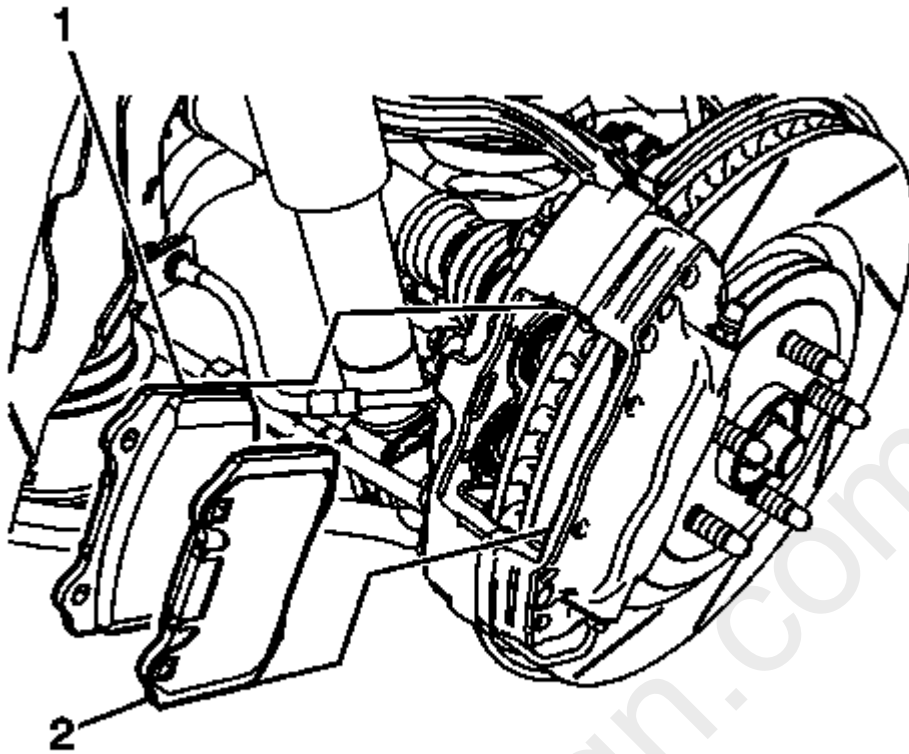


Fig. 46: Identifying Brake Pads
Courtesy of GENERAL MOTORS COMPANY

3. Install the brake pads (1).

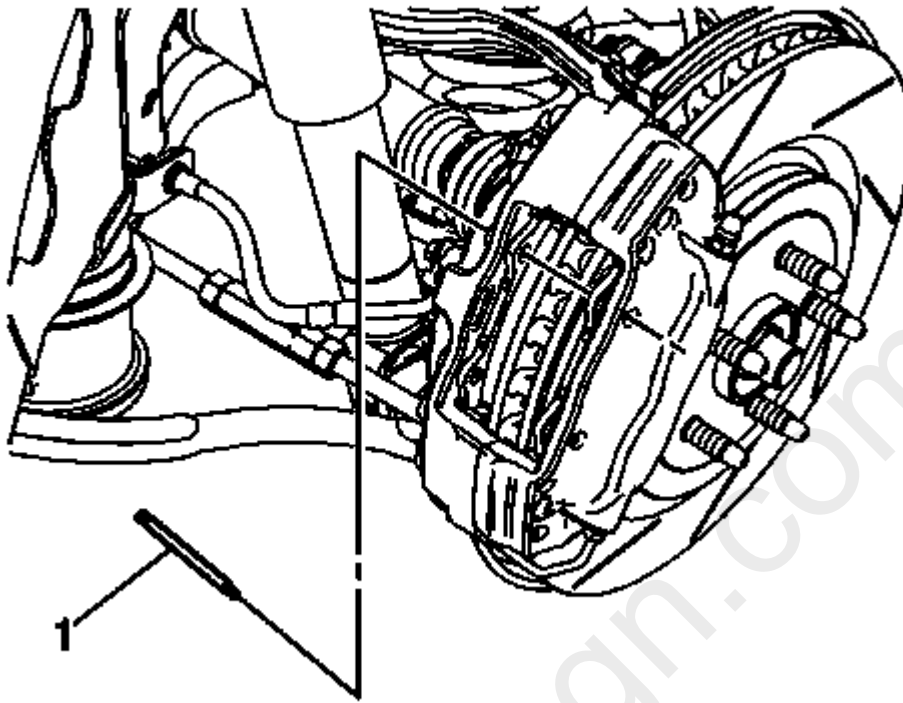


Fig. 47: Identifying Upper Brake Pad Guide Pin
Courtesy of GENERAL MOTORS COMPANY

4. Install the upper brake pad guide pin (1).

Ensure the brake pad guide pin is fully seated in the brake caliper housing.

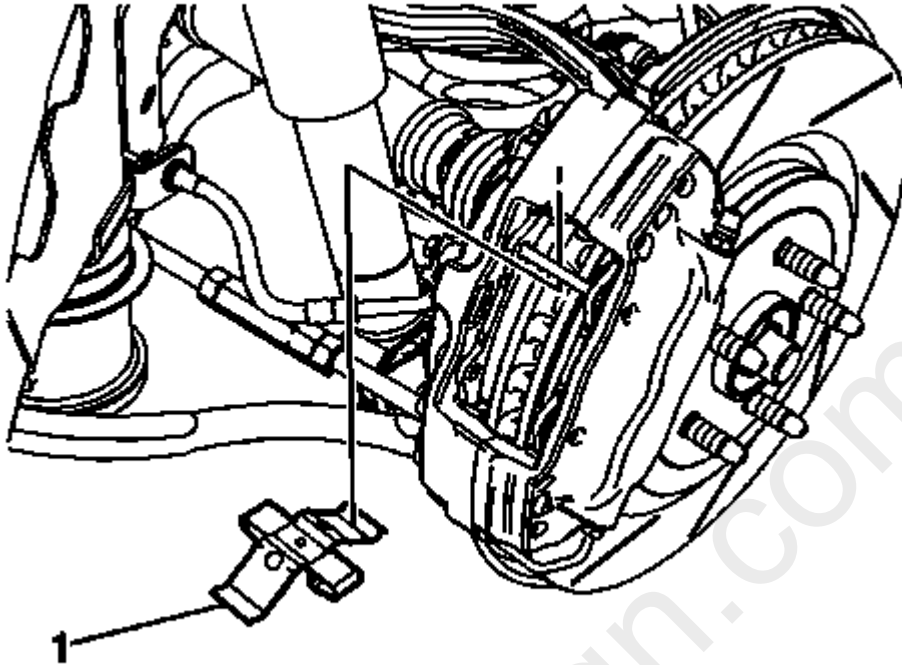


Fig. 48: Identifying Brake Pad Spring
Courtesy of GENERAL MOTORS COMPANY

5. Install the brake pad spring (1).

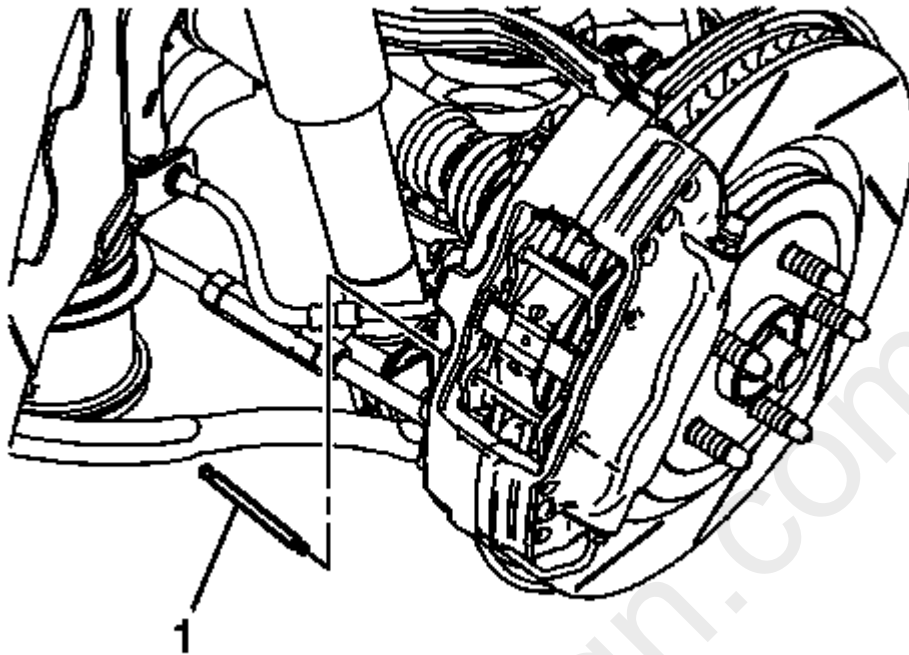


Fig. 49: Identifying Lower Brake Pad Guide Pin
Courtesy of GENERAL MOTORS COMPANY

6. Install the lower brake pad guide pin (1) through the brake caliper and over the edge of the brake pad spring.

Ensure the brake pad guide pin is fully seated in the brake caliper housing.

7. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
8. With the engine OFF, gradually apply the brake pedal to approximately 2/3 of its travel distance.
9. Slowly release the brake pedal.
10. Wait 15 seconds, then repeat steps 8 and 9 until a firm brake pedal apply is obtained; this will properly seat the brake caliper pistons and brake pads.
11. Fill the brake master cylinder reservoir to the proper level. Refer to **Master Cylinder Reservoir Filling** .
12. Burnish the brake pads and rotors. Refer to **Brake Pad and Rotor Burnishing**.

BRAKE PAD AND ROTOR BURNISHING

WARNING: Road test a vehicle under safe conditions and while obeying all traffic laws. Do not attempt any maneuvers that could jeopardize vehicle control.

Failure to adhere to these precautions could lead to serious personal injury and vehicle damage.

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).

NOTE: 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 (JE5, J55 (RWD))

Removal Procedure

WARNING: Refer to Brake Dust Warning .

WARNING: Refer to Brake Fluid Irritant Warning .

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

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, no brake fluid needs to be removed from the reservoir before proceeding.
3. If the brake fluid level is higher than midway between the maximum full point and the minimum allowable level, remove brake fluid to the midway point before proceeding.
4. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .
5. Remove the tire and wheel assembly. Refer to Tire and Wheel Removal and Installation .
6. Install a C-clamp against the outer brake pad and the rear of the brake caliper body.
7. Slowly tighten the C-clamp until the brake caliper pistons are compressed into the brake caliper bores.

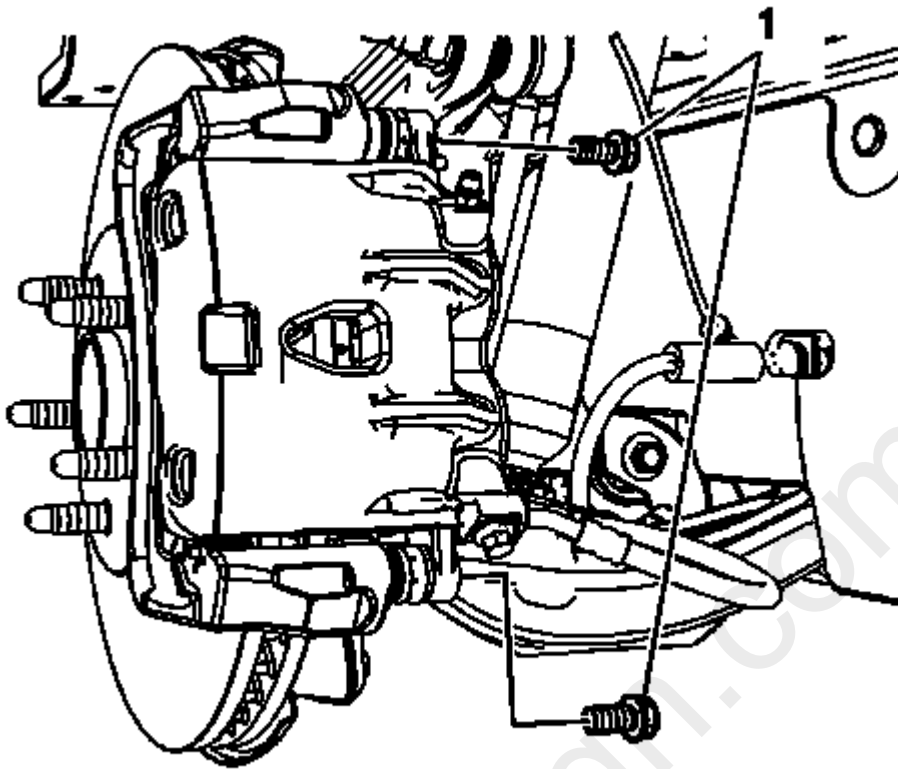


Fig. 50: Identifying Bolts and Caliper Pin
Courtesy of GENERAL MOTORS COMPANY

8. Using a backup wrench on the brake caliper guide pin, remove the brake caliper guide pin bolts (1).

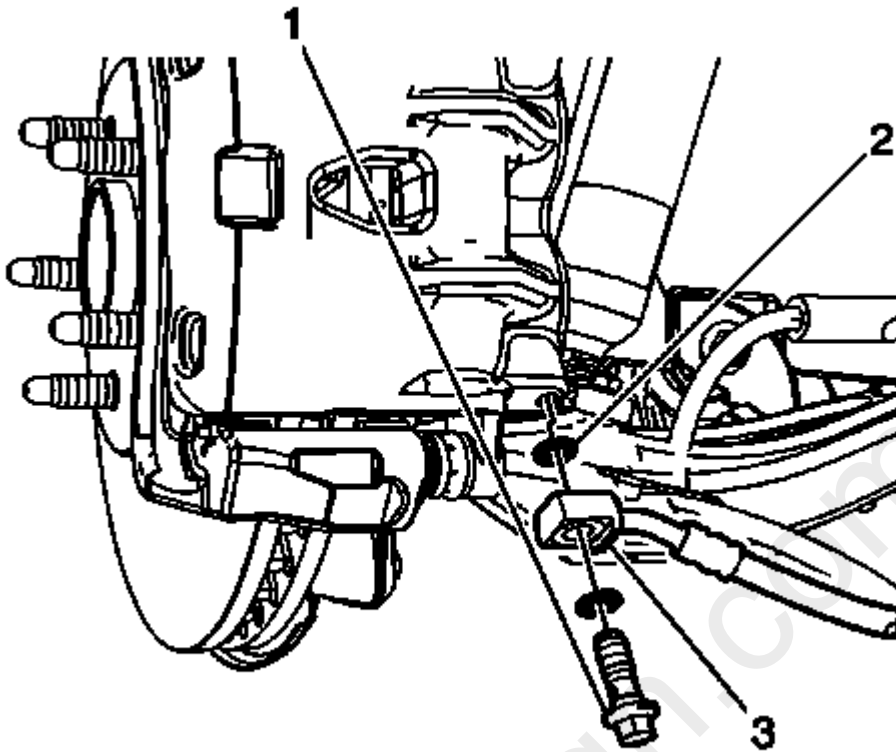


Fig. 51: View of Hose Fitting and Bolt
Courtesy of GENERAL MOTORS COMPANY

9. Remove the brake hose fitting bolt (1).
10. Remove the brake hose fitting gaskets (2) and the brake hose (3).

Discard the brake hose fitting gaskets.

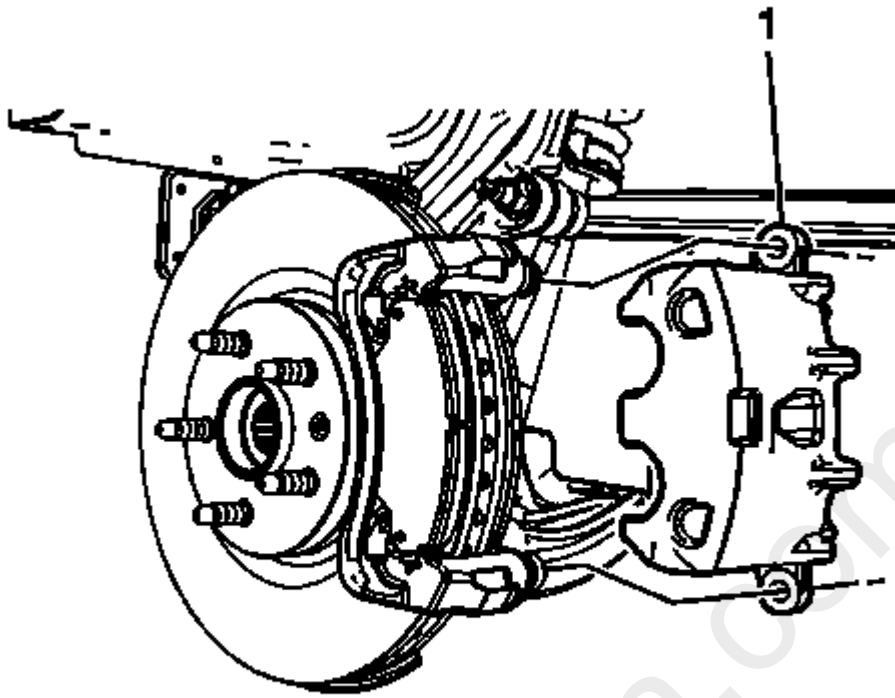


Fig. 52: Identifying Brake Caliper and Rotor
Courtesy of GENERAL MOTORS COMPANY

11. Remove the brake caliper (1).

Installation Procedure

1. Inspect the brake caliper guide pins, seals and brake pad springs for damage and/or corrosion. Refer to **Front Disc Brake Mounting and Hardware Inspection.**

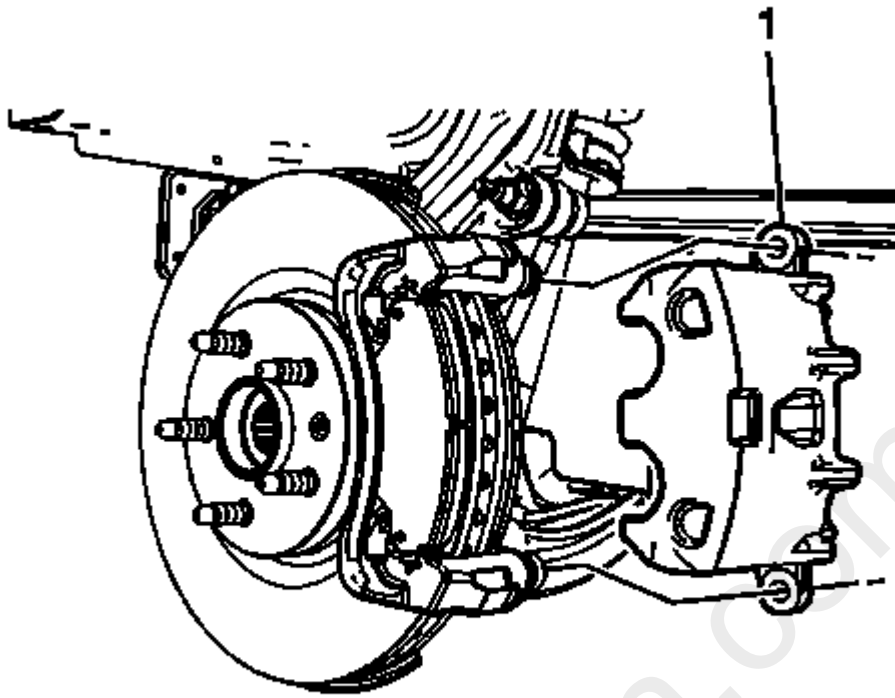


Fig. 53: Identifying Brake Caliper and Rotor
Courtesy of GENERAL MOTORS COMPANY

2. Install the brake caliper (1).

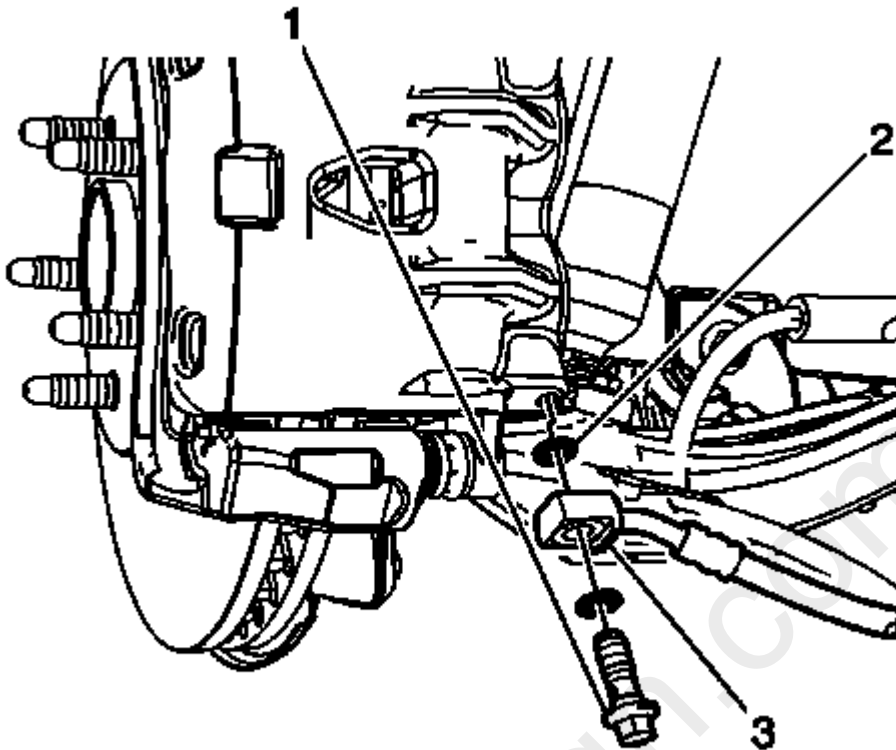


Fig. 54: View of Hose Fitting and Bolt
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

3. Assemble the brake hose fitting bolt (1) and 2 new brake hose fitting gaskets (2) to the brake hose (3) and tighten the fitting bolt to 49 N.m (36 lb ft).

NOTE: If reusing the brake caliper guide pin bolts, the threads of the brake caliper guide pin bolts and the threads of the guide pins must be free of residue and debris prior to application of threadlocker in order to ensure proper adhesion and fastener retention.

4. If reusing the caliper pin bolts, prepare the bolts and the guide pins for assembly:
 - Thoroughly clean the residue from the guide pin bolt threads by using denatured alcohol or equivalent and allow to dry.
 - Thoroughly clean the residue from the guide pin threads by using denatured alcohol or equivalent and allow to dry.
5. Apply threadlocker GM P/N 12345493 (Canadian P/N 10953488), or equivalent to 2/3 of the threaded

length of the brake caliper guide pin bolts. Ensure there are no gaps in the threadlocker along the length of the filled area of the bolts.

6. Allow the threadlocker to cure approximately 10 minutes before installation.

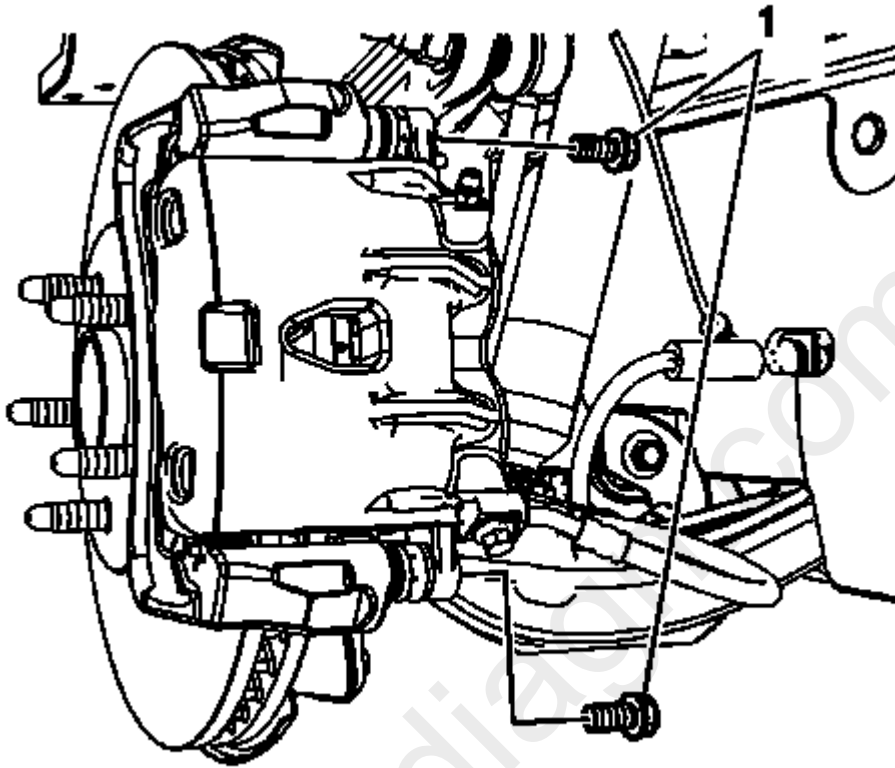


Fig. 55: Identifying Bolts and Caliper Pin
Courtesy of GENERAL MOTORS COMPANY

7. Using a backup wrench on the brake caliper guide pin, install the brake caliper guide pin bolts (1) and tighten to 63 N.m (46 lb ft).
8. Bleed the hydraulic brake system. Refer to **Hydraulic Brake System Bleeding (Manual)** , **Hydraulic Brake System Bleeding (Pressure)** .
9. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
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 apply 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** .

FRONT BRAKE CALIPER REPLACEMENT (JE5, J55 (AWD))

Removal Procedure

WARNING: Refer to Brake Dust Warning .

WARNING: Refer to Brake Fluid Irritant Warning .

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

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, no brake fluid needs to be removed from the reservoir before proceeding.
3. If the brake fluid level is higher than midway between the maximum full point and the minimum allowable level, remove brake fluid to the midway point before proceeding.
4. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .
5. Remove the tire and wheel assembly. Refer to Tire and Wheel Removal and Installation .
6. Install a C-clamp against the outer brake pad and the rear of the brake caliper body.
7. Slowly tighten the C-clamp until the brake caliper pistons are compressed into the brake caliper bores.

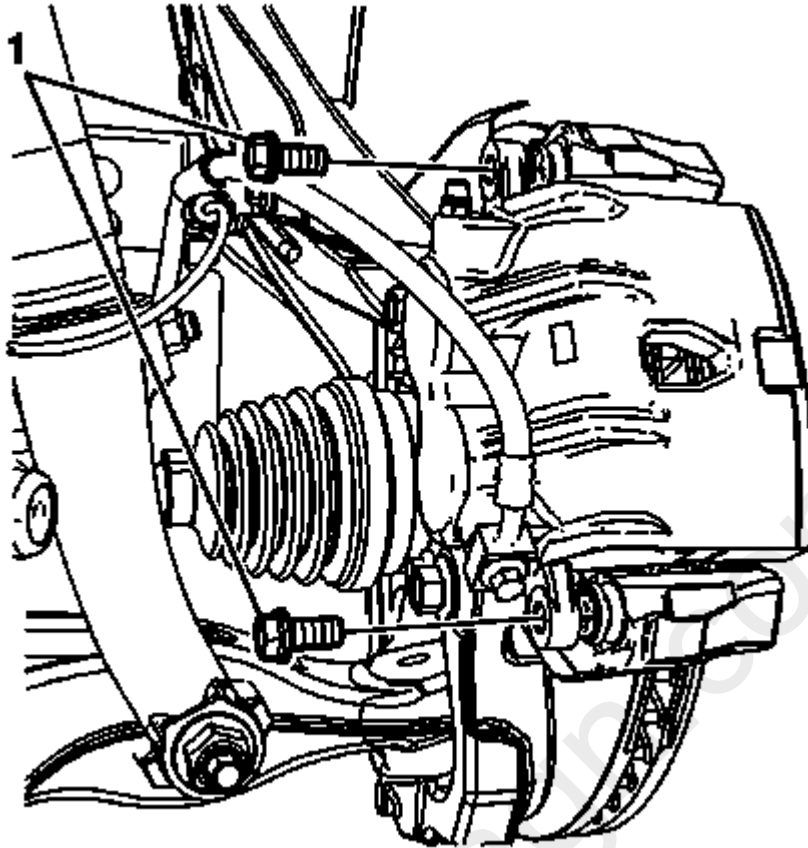


Fig. 56: View of Brake Caliper, Guide and Bolts
Courtesy of GENERAL MOTORS COMPANY

8. Using a backup wrench on the brake caliper guide pin, remove the brake caliper guide pin bolts (1).

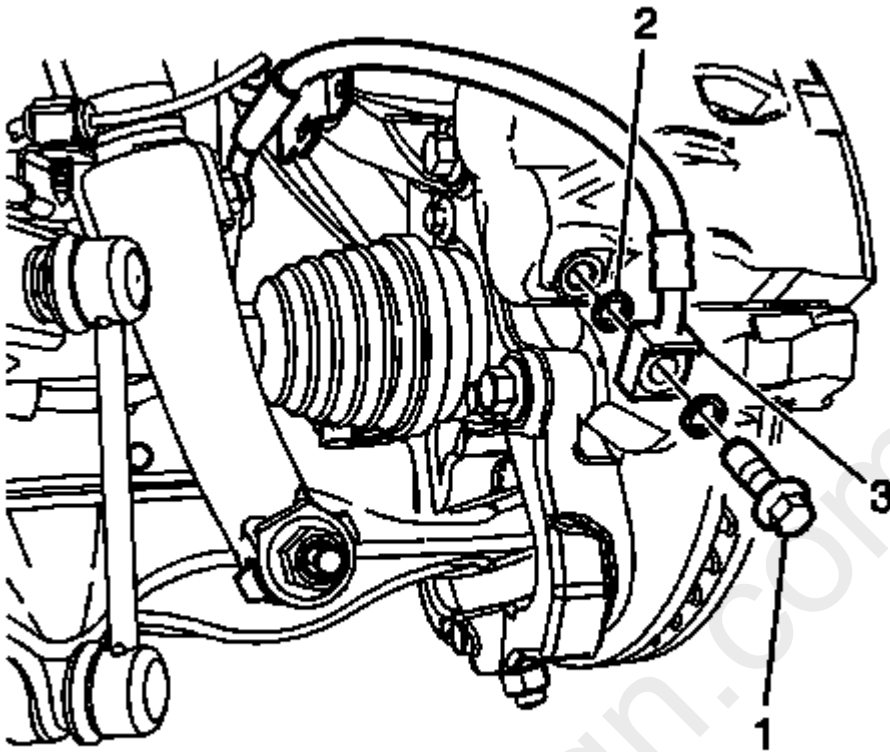


Fig. 57: Identifying Brake Hose and Bolt
Courtesy of GENERAL MOTORS COMPANY

9. Remove the brake hose fitting bolt (1).
10. Remove the brake hose fitting gaskets (2) and the brake hose (3).

Discard the brake hose fitting gaskets.

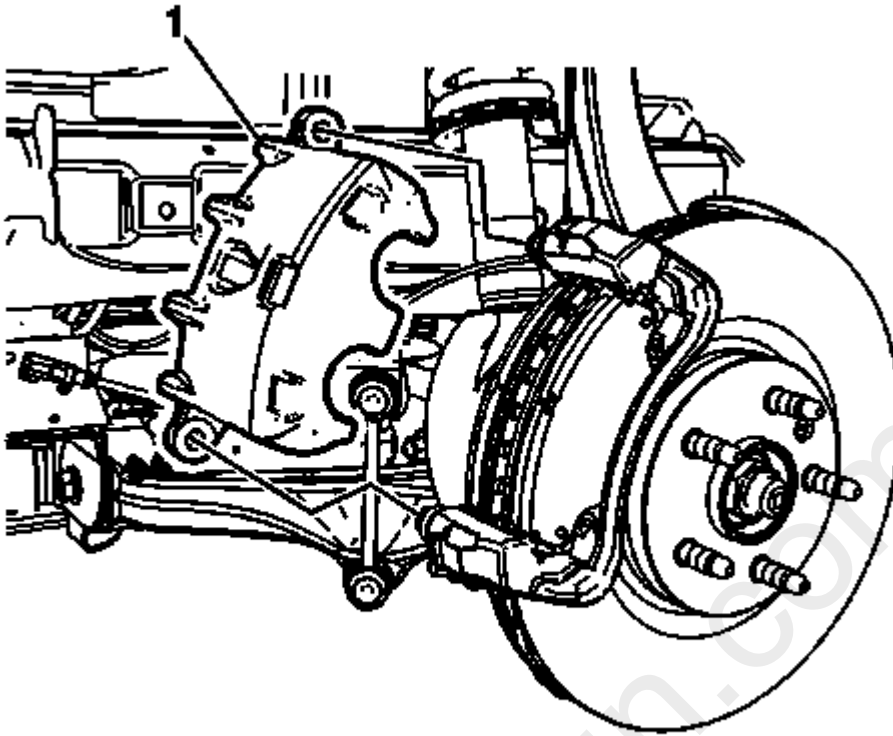


Fig. 58: View of Caliper and Rotor
Courtesy of GENERAL MOTORS COMPANY

11. Remove the brake caliper (1).

Installation Procedure

1. Inspect the brake caliper guide pins, seals and brake pad springs for damage and/or corrosion. Refer to **Front Disc Brake Mounting and Hardware Inspection.**

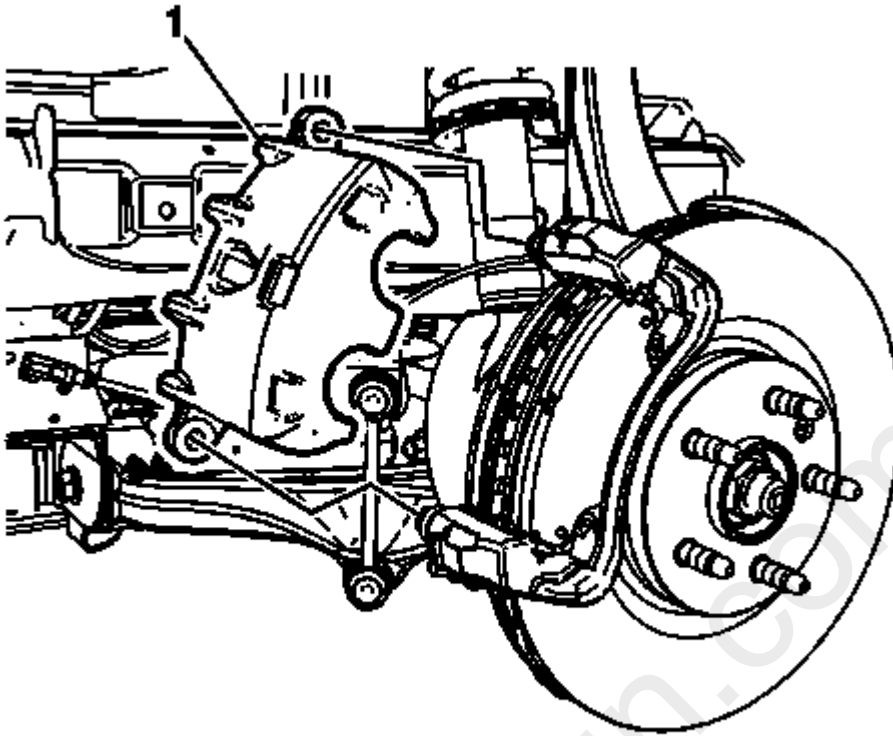


Fig. 59: View of Caliper and Rotor
Courtesy of GENERAL MOTORS COMPANY

2. Install the brake caliper (1).

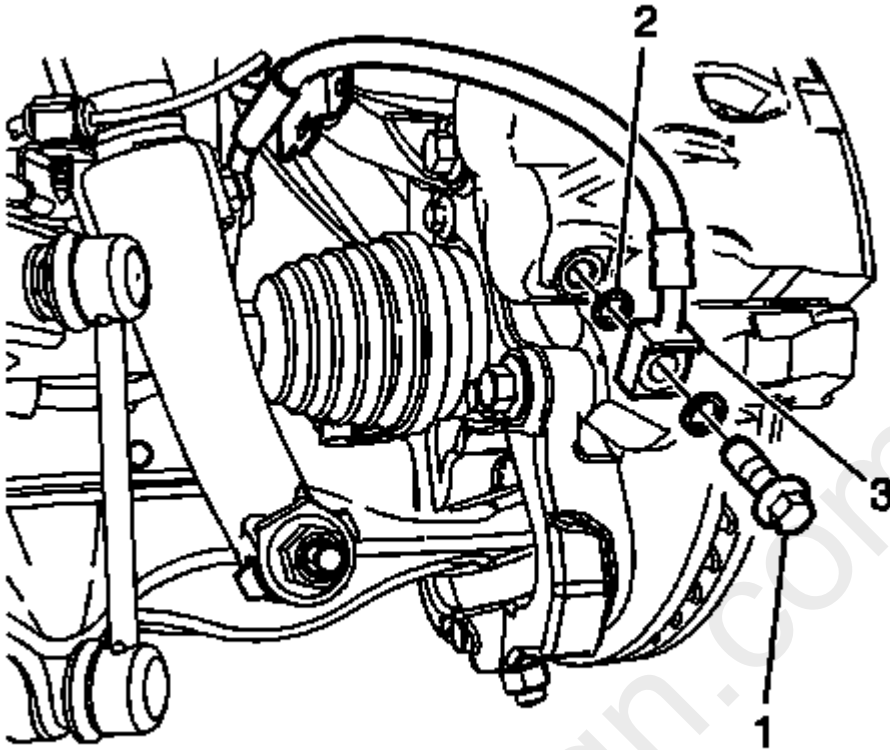


Fig. 60: Identifying Brake Hose and Bolt
Courtesy of GENERAL MOTORS COMPANY

3. Assemble the brake hose fitting bolt (1) and 2 new brake hose fitting gaskets (2) to the brake hose (3).

CAUTION: Refer to Fastener Caution .

4. Install the brake hose assembly to the caliper and tighten the fitting bolt to 49 N.m (36 lb ft).

NOTE: If reusing the brake caliper guide pin bolts, the threads of the brake caliper guide pin bolts and the threads of the guide pins must be free of residue and debris prior to application of threadlocker in order to ensure proper adhesion and fastener retention.

5. If reusing the caliper pin bolts, prepare the bolts and the guide pins for assembly:
 - Thoroughly clean the residue from the guide pin bolt threads by using denatured alcohol or equivalent and allow to dry.
 - Thoroughly clean the residue from the guide pin threads by using denatured alcohol or equivalent and allow to dry.

6. Apply threadlocker GM P/N 12345493 (Canadian P/N 10953488), or equivalent to 2/3 of the threaded length of the brake caliper guide pin bolts. Ensure there are no gaps in the threadlocker along the length of the filled area of the bolts.
7. Allow the threadlocker to cure approximately 10 minutes before installation.

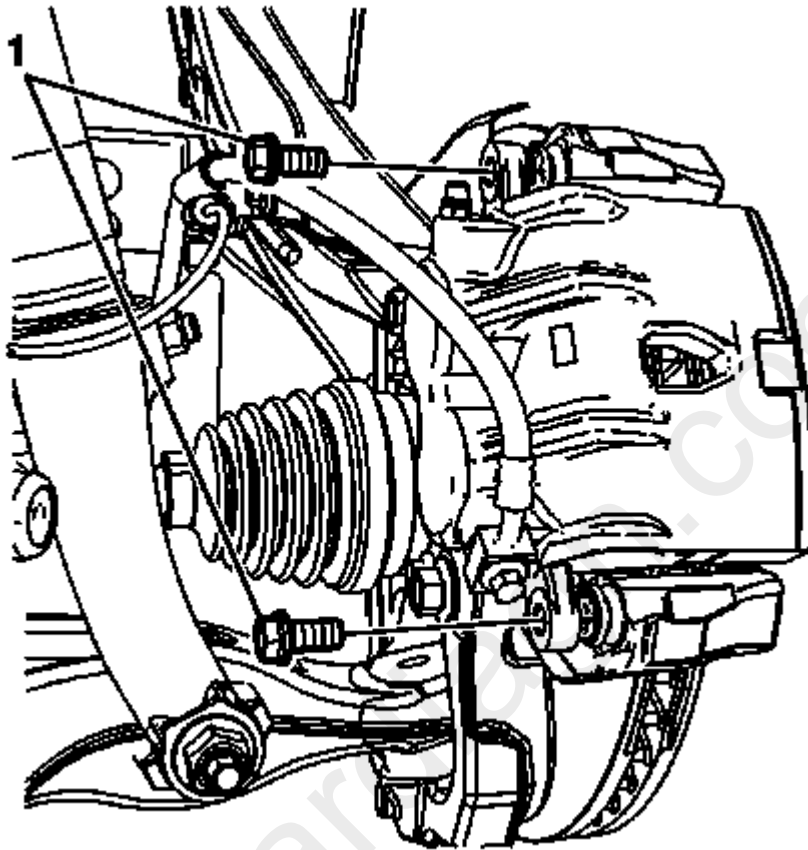


Fig. 61: View of Brake Caliper, Guide and Bolts
Courtesy of GENERAL MOTORS COMPANY

8. Using a backup wrench on the brake caliper guide pin, install the brake caliper guide pin bolts (1) and tighten to 63 N.m (46 lb ft).
9. Bleed the hydraulic brake system. Refer to Hydraulic Brake System Bleeding (Manual) , Hydraulic Brake System Bleeding (Pressure) .
10. Install the tire and wheel assembly. Refer to Tire and Wheel Removal and Installation .
11. With the engine OFF, gradually apply the brake pedal to approximately 2/3 of its travel distance.
12. Slowly release the brake pedal.
13. Wait 15 seconds, then repeat steps 11 and 12 until a firm brake pedal apply is obtained. This will properly seat the brake caliper pistons and brake pads.
14. Fill the brake master cylinder reservoir to the proper level. Refer to Master Cylinder Reservoir Filling .

FRONT BRAKE CALIPER REPLACEMENT (J56)

Removal Procedure

WARNING: Refer to Brake Fluid Irritant Warning .

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

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, no brake fluid needs to be removed from the reservoir before proceeding.
3. If the brake fluid level is higher than midway between the maximum-full point and the minimum allowable level, remove brake fluid to the midway point before proceeding.
4. Remove the brake pads. Refer to Front Disc Brake Pads Replacement (J56).

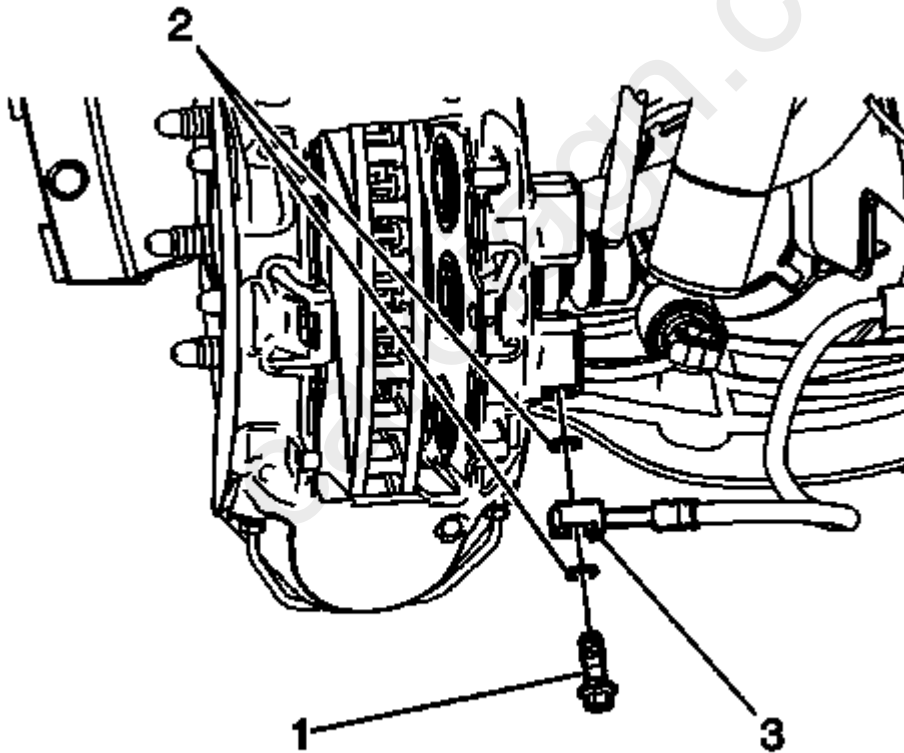


Fig. 62: Identifying Brake Hose Components
Courtesy of GENERAL MOTORS COMPANY

5. Remove the brake hose fitting bolt (1).

Cap the brake caliper inlet port to prevent brake fluid loss and contamination.

NOTE: Do not reuse the brake hose fitting gaskets.

6. Remove and discard the brake hose fitting gaskets (2) from the brake hose (3).

Cap the brake hose fitting to prevent brake fluid loss and contamination.

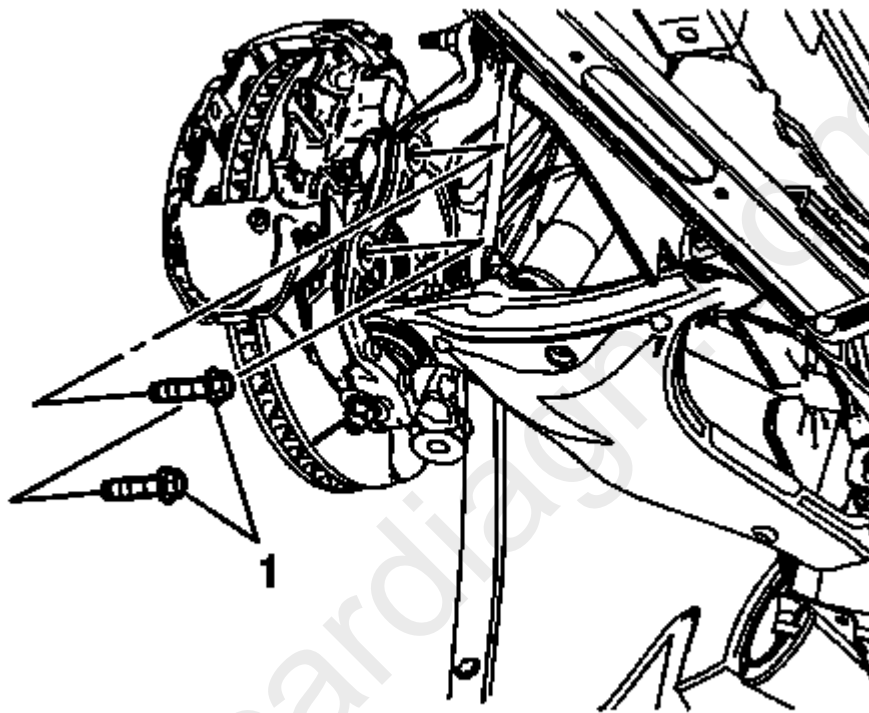


Fig. 63: Identifying Brake Caliper Bolts
Courtesy of GENERAL MOTORS COMPANY

7. Remove the brake caliper bolts (1).

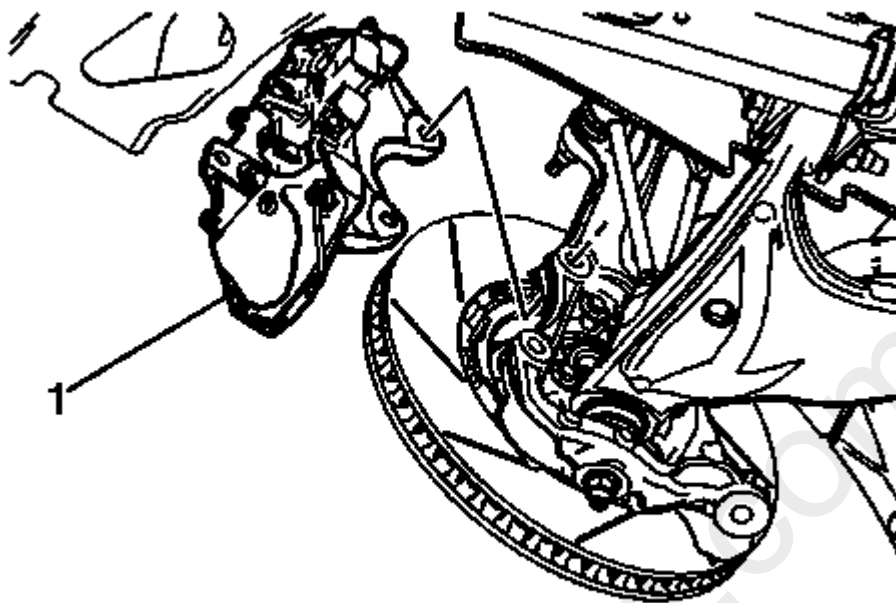


Fig. 64: Identifying Brake Caliper
Courtesy of GENERAL MOTORS COMPANY

8. Remove the brake caliper (1).

Installation Procedure

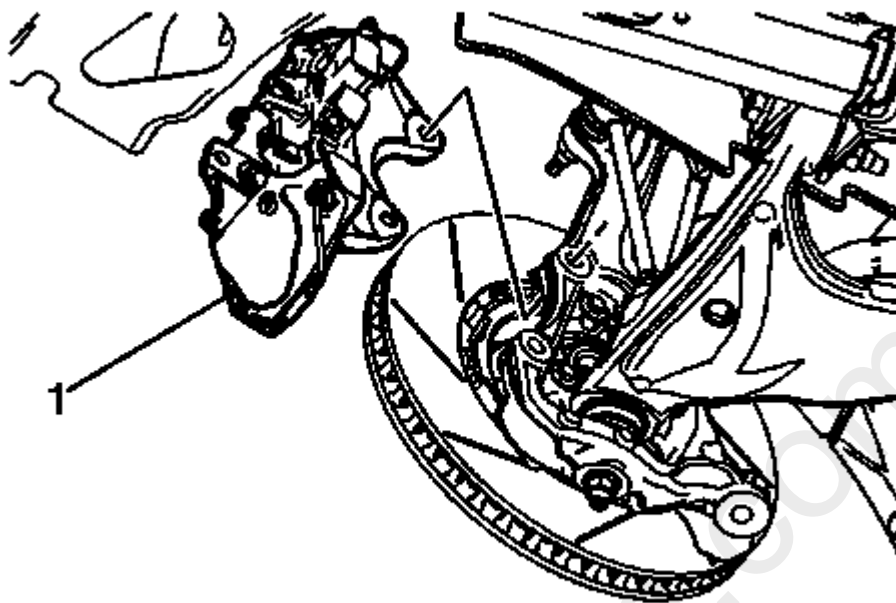


Fig. 65: Identifying Brake Caliper
Courtesy of GENERAL MOTORS COMPANY

1. Install the brake caliper (1).

NOTE: If reusing the brake caliper to knuckle mounting bolts, the threads of the bolts and the threads of the knuckle mounting holes must be free of residue and debris prior to application of threadlocker in order to ensure proper adhesion and fastener retention.

2. Prepare the bolts and the threaded holes for assembly:
 - Thoroughly clean the residue from the bolt threads by using denatured alcohol or equivalent and allow to dry.
 - Thoroughly clean the residue from the threaded holes by using denatured alcohol or equivalent and allow to dry.
3. Apply threadlocker GM P/N 12345493 (Canadian P/N 10953488), or equivalent to 2/3 of the threaded length of the brake caliper bolts. Ensure there are no gaps in the threadlocker along the length of the filled area of the bolts.

Allow the threadlocker to cure approximately 10 minutes before installation.

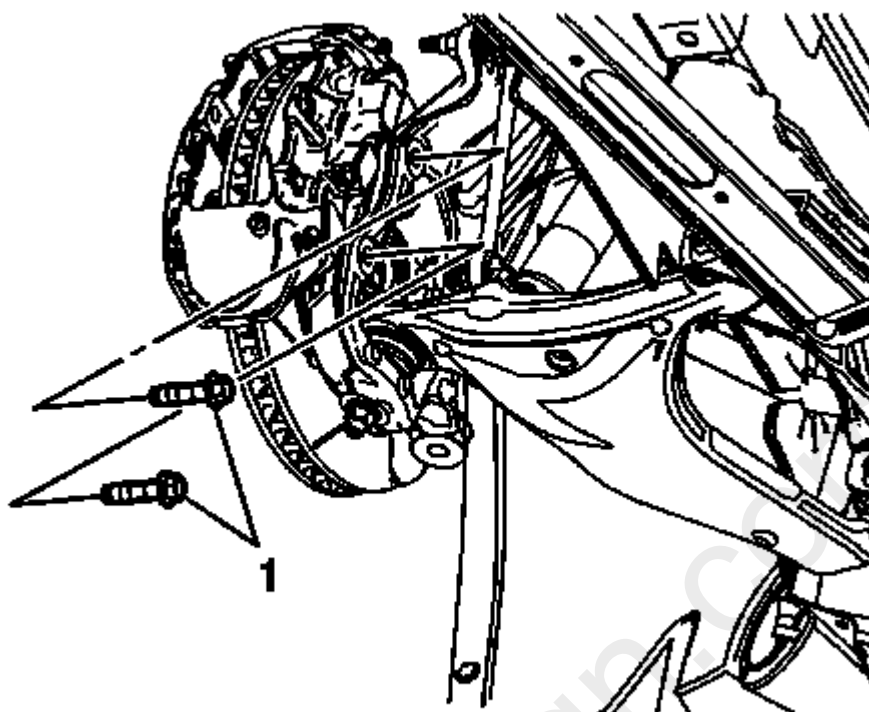


Fig. 66: Identifying Brake Caliper Bolts
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

4. Install the brake caliper bolts (1) and tighten to 175 N.m (129 lb ft).

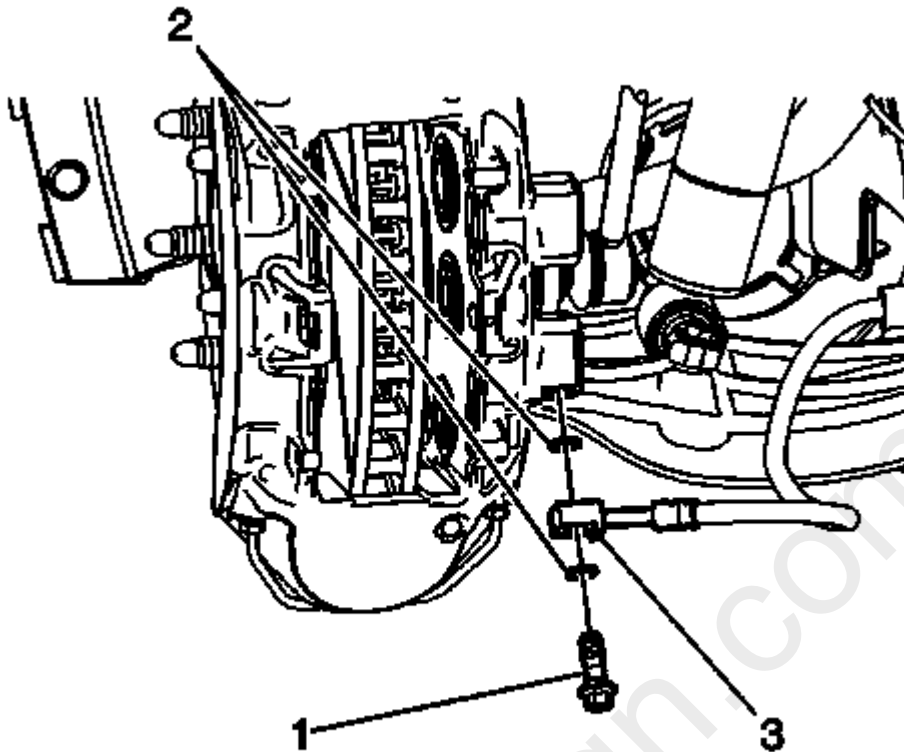


Fig. 67: Identifying Brake Hose Components
Courtesy of GENERAL MOTORS COMPANY

5. Assemble the brake hose fitting bolt (1) and the 2 new brake hose fitting gaskets (2) to the brake hose (3).
6. Install the brake hose assembly to the brake caliper and tighten the brake hose fitting bolt to 49 N.m (36 lb ft).
7. Install the brake pads. Refer to **Front Disc Brake Pads Replacement (J56)**.
8. Bleed the hydraulic brake system. Refer to **Hydraulic Brake System Bleeding (Manual)** , **Hydraulic Brake System Bleeding (Pressure)** .

REAR BRAKE CALIPER REPLACEMENT (JE5, J55)

Removal Procedure

WARNING: Refer to **Brake Dust Warning** .

WARNING: Refer to **Brake Fluid Irritant Warning** .

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

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, no brake fluid needs to be removed from the reservoir before proceeding.
3. If the brake fluid level is higher than midway between the maximum full point and the minimum allowable level, remove brake fluid to the midway point before proceeding.
4. Release the electronic park brake cable tension, if equipped. Refer to **Parking Brake Cable Adjuster Disabling (Electric Park Brake)** .
5. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
6. Remove the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
7. Install a C-clamp against the outer brake pad and the rear of the brake caliper body.
8. Slowly tighten the C-clamp until the brake caliper piston is compressed into the brake caliper bore.

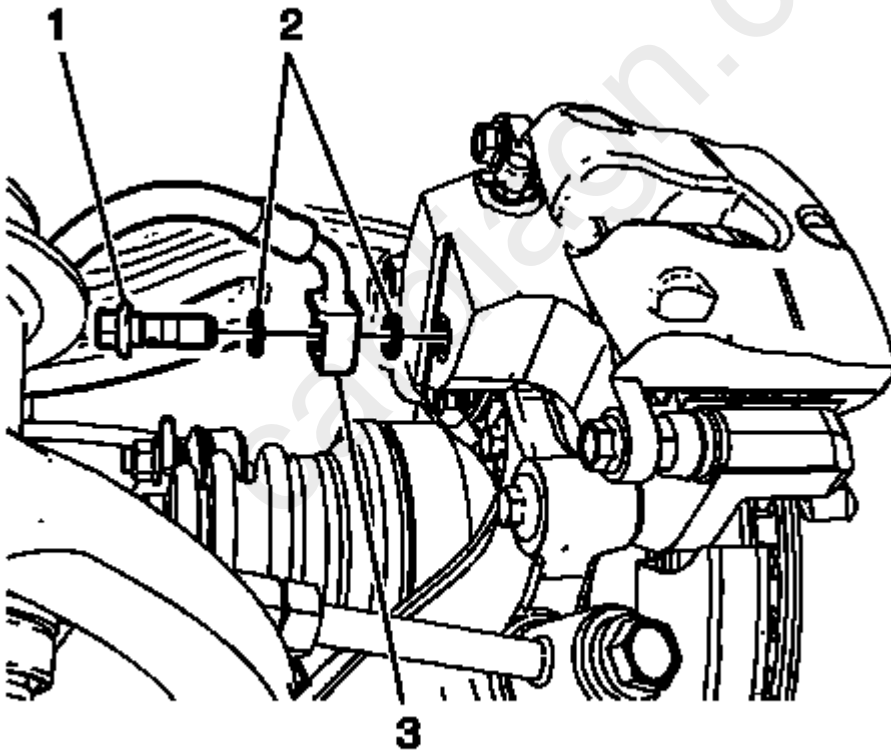


Fig. 68: View of Hose Fitting, Gaskets and Bolt
Courtesy of GENERAL MOTORS COMPANY

9. Remove the brake hose fitting bolt (1).

NOTE: Do not reuse the brake hose fitting gaskets.

10. Remove the brake hose fitting gaskets (2) and the brake hose (3).

Discard the brake hose fitting gaskets.

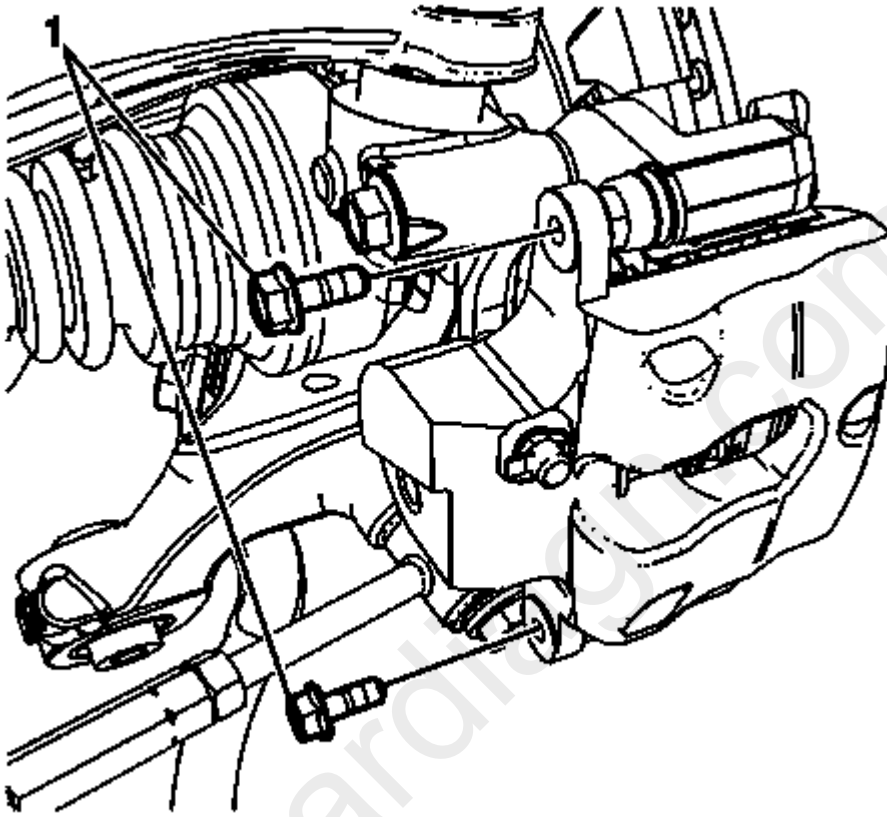


Fig. 69: View of Caliper, Pin and Bolts
Courtesy of GENERAL MOTORS COMPANY

11. Using a backup wrench on the brake caliper guide pin, remove the brake caliper guide pin bolts (1).

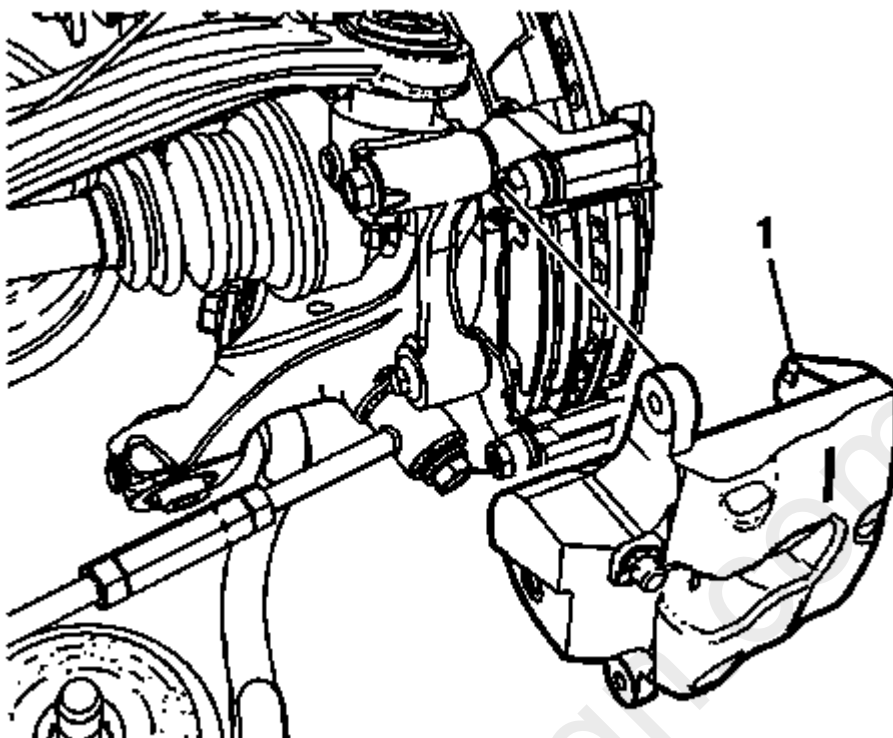


Fig. 70: Identifying Caliper
Courtesy of GENERAL MOTORS COMPANY

12. Remove the brake caliper (1).

Installation Procedure

1. Inspect the brake caliper guide pins, seals and brake pad springs for damage and/or corrosion. Refer to **Rear Disc Brake Mounting and Hardware Inspection.**

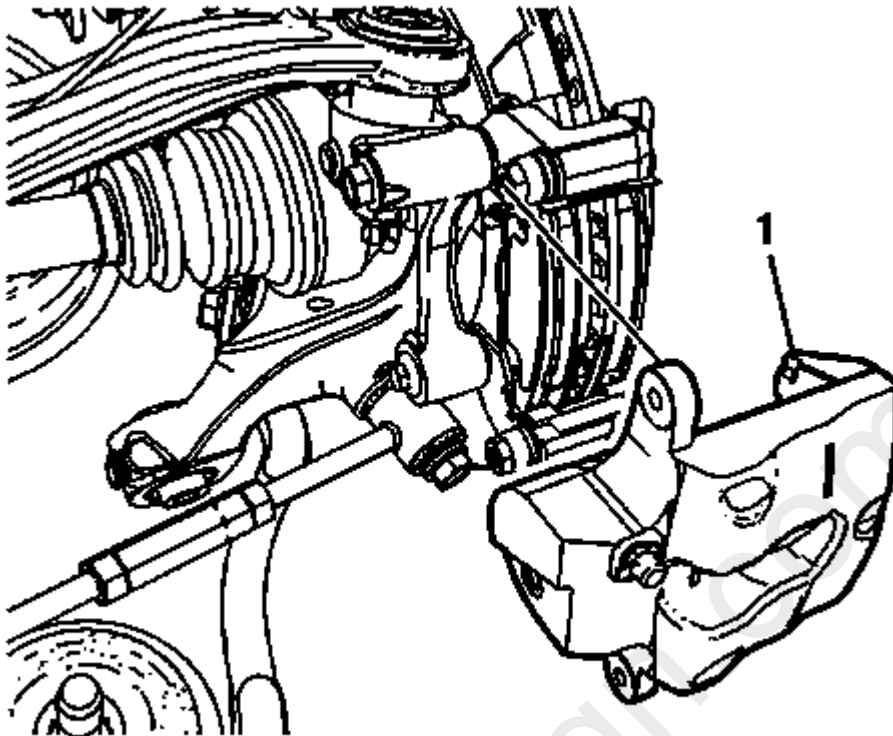


Fig. 71: Identifying Caliper
Courtesy of GENERAL MOTORS COMPANY

2. Install the brake caliper (1).

NOTE: If reusing the brake caliper guide pin bolts, the threads of the brake caliper guide pin bolts and the threads of the guide pins must be free of residue and debris prior to application of threadlocker in order to ensure proper adhesion and fastener retention.

3. If reusing the caliper pin bolts, prepare the bolts and the guide pins for assembly:
 - Thoroughly clean the residue from the guide pin bolt threads by using denatured alcohol or equivalent and allow to dry.
 - Thoroughly clean the residue from the guide pin threads by using denatured alcohol or equivalent and allow to dry.
4. Apply threadlocker GM P/N 12345493 (Canadian P/N 10953488), or equivalent to 2/3 of the threaded length of the brake caliper guide pin bolts. Ensure there are no gaps in the threadlocker along the length of the filled area of the bolts.
5. Allow the threadlocker to cure approximately 10 minutes before installation.

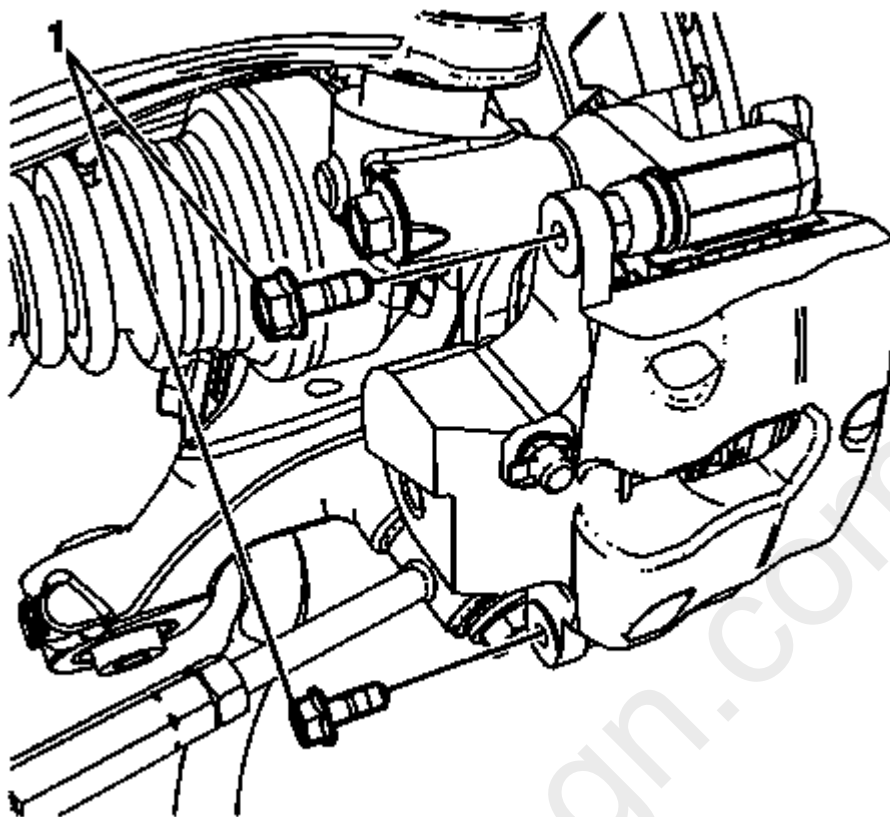


Fig. 72: View of Caliper, Pin and Bolts
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

6. Using a backup wrench on the brake caliper guide pin, install the brake caliper guide pin bolts (1) and tighten to 60 N.m (44 lb ft).

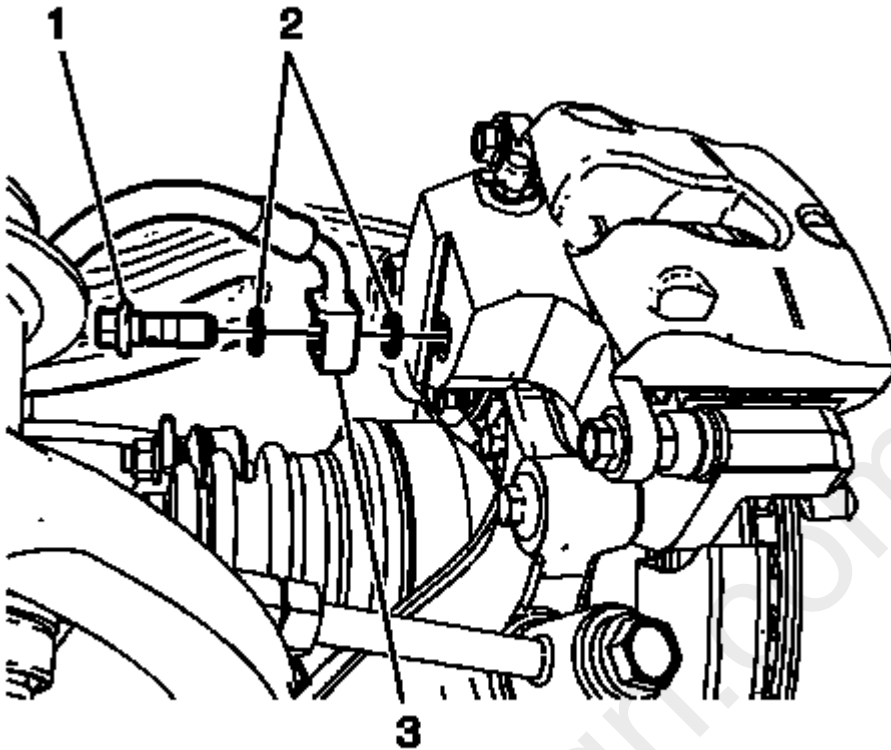


Fig. 73: View of Hose Fitting, Gaskets and Bolt
 Courtesy of GENERAL MOTORS COMPANY

7. Assemble the brake hose fitting bolt (1) and 2 new brake hose fitting gaskets (2) to the brake hose (3).
8. Install the brake hose assembly to the caliper and tighten the fitting bolt to 49 N.m (36 lb ft).
9. Bleed the hydraulic brake system. Refer to **Hydraulic Brake System Bleeding (Manual)** , **Hydraulic Brake System Bleeding (Pressure)** .
10. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
11. With the engine OFF, gradually apply the brake pedal to approximately 2/3 of its travel distance.
12. Slowly release the brake pedal.
13. Wait 15 seconds, then repeat steps 11 and 12 until a firm brake pedal apply is obtained. This will properly seat the brake caliper piston and brake pads.
14. Fill the brake master cylinder reservoir to the proper level. Refer to **Master Cylinder Reservoir Filling** .
15. Set the electronic park brake cable tension, if equipped. Refer to **Parking Brake Cable Adjuster Enabling (Electric Park Brake)** .

REAR BRAKE CALIPER REPLACEMENT (J56)

Removal Procedure

WARNING: Refer to Brake Fluid Irritant Warning .

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

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, no brake fluid needs to be removed from the reservoir before proceeding.
3. If the brake fluid level is higher than midway between the maximum-full point and the minimum allowable level, remove brake fluid to the midway point before proceeding.
4. Remove the brake pads. Refer to Rear Disc Brake Pads Replacement (J56).

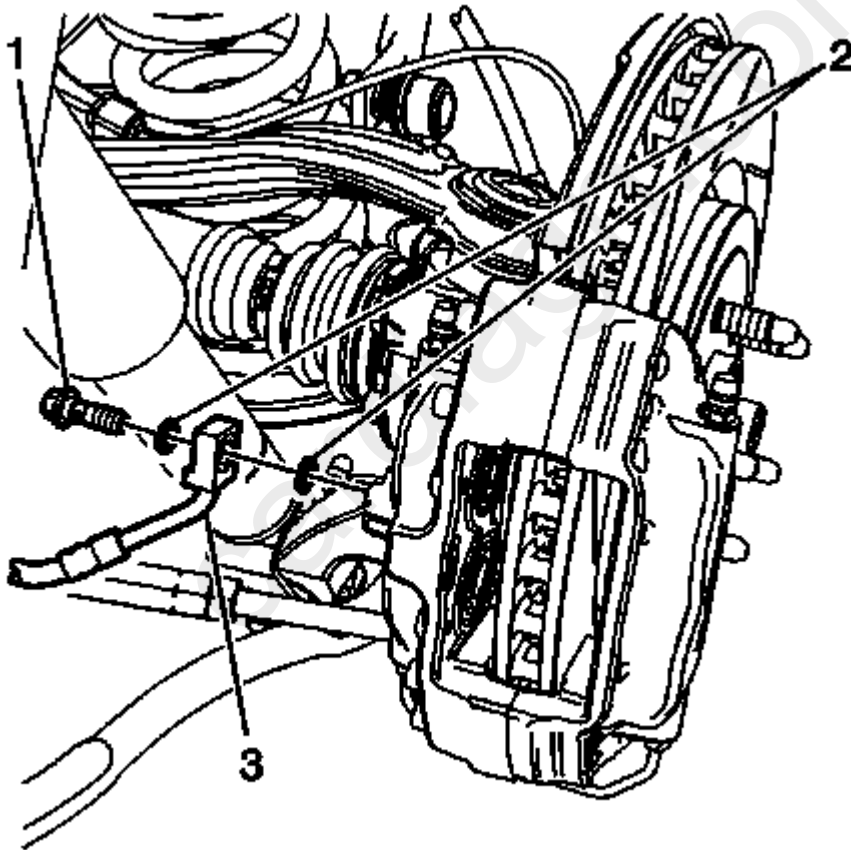


Fig. 74: Identifying Brake Hose Components
Courtesy of GENERAL MOTORS COMPANY

5. Remove the brake hose fitting bolt (1).

Cap the brake caliper inlet port to prevent brake fluid loss and contamination.

NOTE: Do not reuse the brake hose fitting gaskets.

6. Remove and discard the brake hose fitting gaskets (2) from the brake hose (3).

Cap the brake hose fitting to prevent brake fluid loss and contamination.

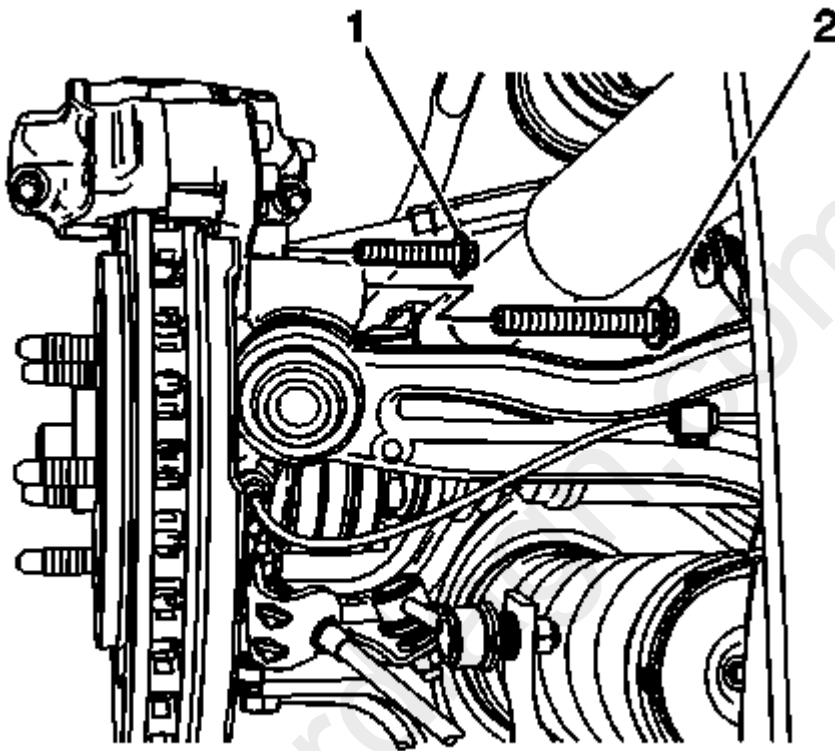


Fig. 75: Identifying Brake Caliper Bolts
Courtesy of GENERAL MOTORS COMPANY

7. Remove the lower brake caliper bolt (1).
8. Remove the upper brake caliper bolt (2) and the brake caliper.

Installation Procedure

NOTE: If reusing the brake caliper to knuckle mounting bolts, the threads of the bolts and the threads of the knuckle mounting holes must be free of residue and debris prior to application of threadlocker in order to ensure proper adhesion and fastener retention.

1. Prepare the bolts and the threaded holes for assembly:
 - Thoroughly clean the residue from the bolt threads by using denatured alcohol or equivalent and

allow to dry.

- Thoroughly clean the residue from the threaded holes by using denatured alcohol or equivalent and allow to dry.
2. Apply threadlocker GM P/N 12345493 (Canadian P/N 10953488), or equivalent to 2/3 of the threaded length of the brake caliper bolts. Ensure there are no gaps in the threadlocker along the length of the filled area of the bolts.

Allow the threadlocker to cure approximately 10 minutes before installation.

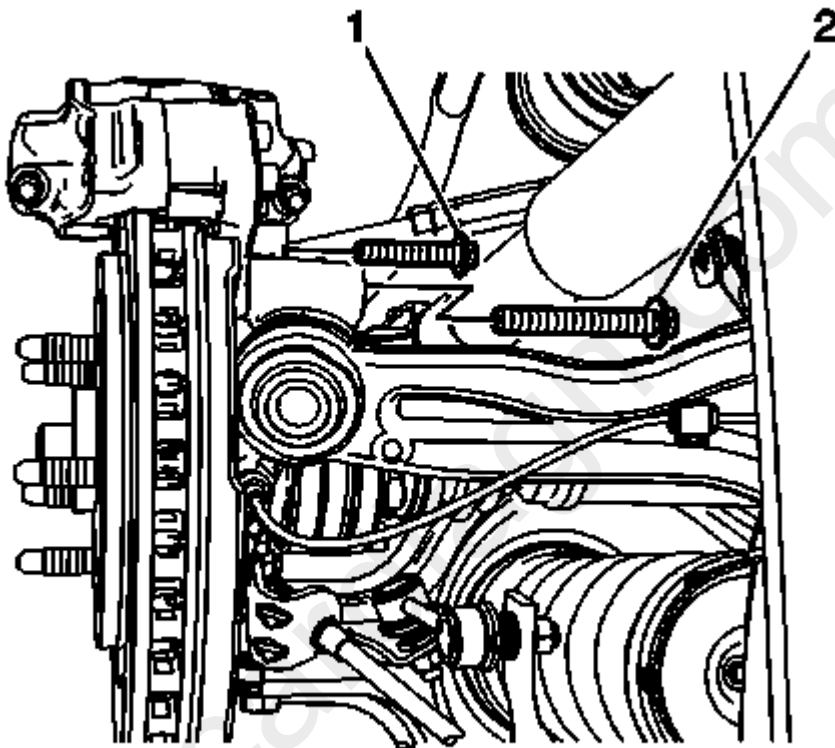


Fig. 76: Identifying Brake Caliper Bolts

Courtesy of GENERAL MOTORS COMPANY

3. Hand install the lower brake caliper bolt (1) and the upper brake caliper bolt (2).

CAUTION: Refer to Fastener Caution .

4. Tighten the brake caliper bolts to 130 N.m (96 lb ft).

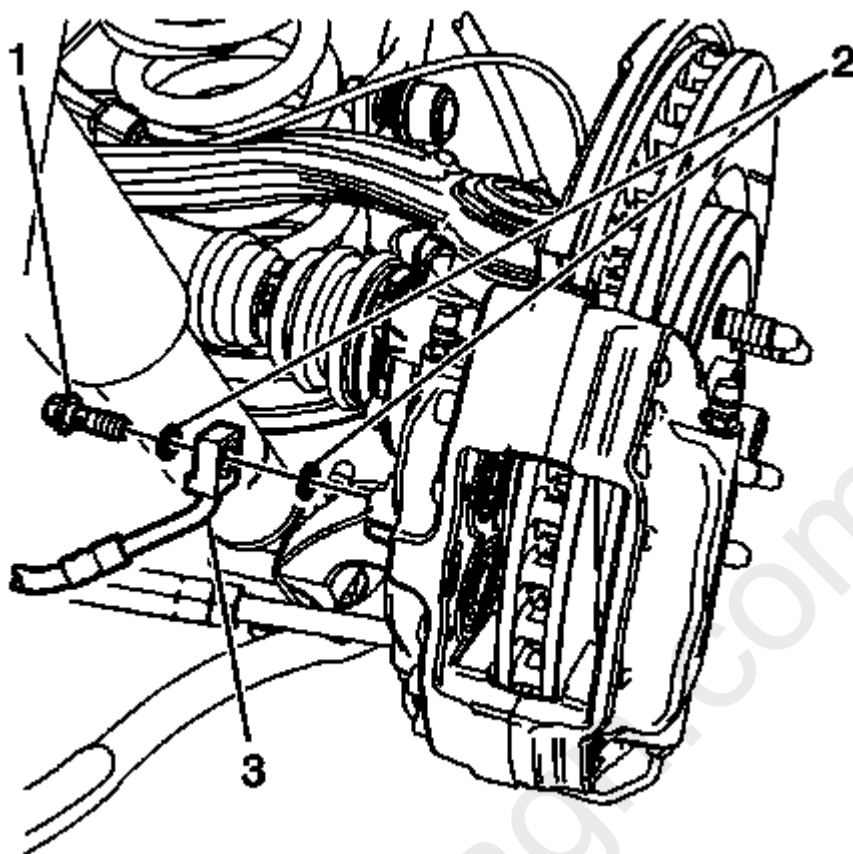


Fig. 77: Identifying Brake Hose Components
Courtesy of GENERAL MOTORS COMPANY

5. Assemble the brake hose fitting bolt (1) and the 2 new brake hose fitting gaskets (2) to the brake hose (3)
6. Install the brake hose assembly to the brake caliper and tighten the brake hose fitting bolt to 49 N.m (36 lb ft).
7. Install the brake pads. Refer to **Front Disc Brake Pads Replacement (J56)**.
8. Bleed the hydraulic brake system. Refer to **Hydraulic Brake System Bleeding (Manual)** , **Hydraulic Brake System Bleeding (Pressure)** .

FRONT BRAKE CALIPER OVERHAUL (JE5, J55)

WARNING: Refer to **Brake Fluid Irritant Warning** .

WARNING: Refer to **Brake Dust Warning** .

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

Disassembly Procedure

WARNING: 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:

- Replace all the components included in the repair kits used to service this brake caliper.
- Lubricate the rubber parts with new Delco Supreme 11®, GM P/N 12377967 (Canadian P/N 992667) or equivalent DOT-3 brake fluid to make assembly easier.
- If any hydraulic component is removed or disconnected, it may be necessary to bleed all or part of the brake system.
- The torque values specified are for dry, non-lubricated fasteners.
- Perform the service operations on a clean bench, free from all mineral oil materials.

1. Remove the brake caliper from the vehicle. Refer to **Front Brake Caliper Replacement (JE5, J55 (AWD)), Front Brake Caliper Replacement (JE5, J55 (RWD))**.
2. Drain the brake fluid from the brake caliper.

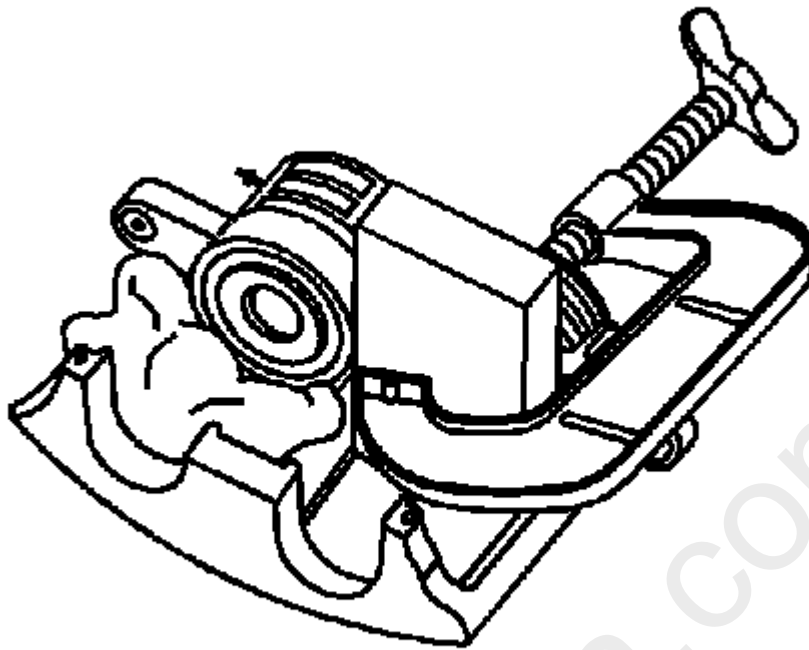


Fig. 78: View Of C-Clamp Over Body Of Brake Caliper
Courtesy of GENERAL MOTORS COMPANY

CAUTION: 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.

3. Place a 25 mm (1 in) block of wood between the caliper and the piston.
4. Install a large C-clamp over the body of the brake caliper with the C-clamp ends against the rear of the caliper body and against the block of wood.
5. Carefully remove the brake caliper piston by directing low pressure compressed air into the brake caliper inlet hole.
6. Remove the C-clamp from the caliper.
7. Remove the block of wood from the caliper.
8. Install clean cloths to pad the interior of the caliper housing between the remaining caliper piston and the caliper body.
9. To cover the open caliper bore place a 25 mm (1 in) block of wood between the caliper body and the brake caliper dust boot seal.
10. Install a large C-clamp over the body of the brake caliper with the C-clamp ends against the rear of the

caliper body and against the block of wood.

11. Carefully remove the brake caliper piston by directing low pressure compressed air into the brake caliper inlet hole.
12. Remove the C-clamp from the caliper.
13. Remove the block of wood from the caliper.

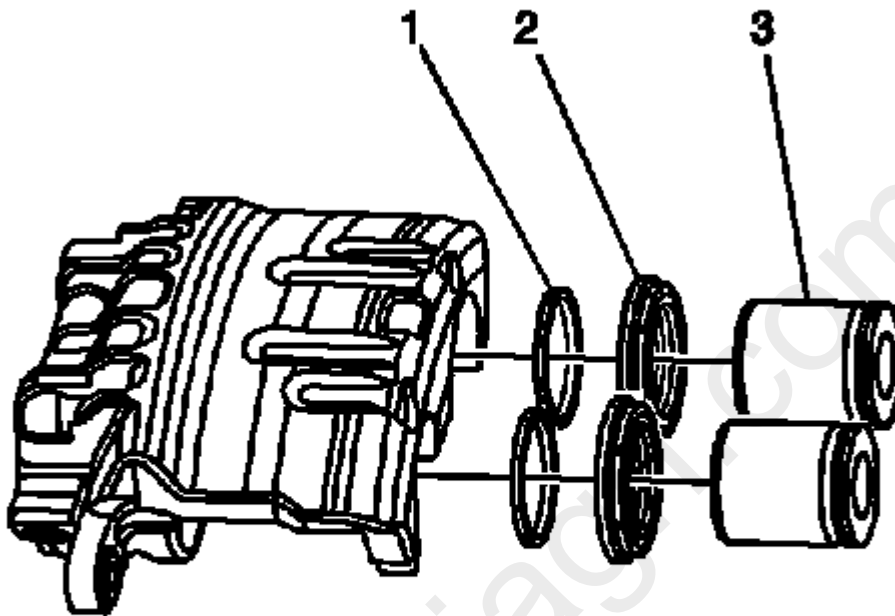


Fig. 79: View Of Piston Seals - Front
Courtesy of GENERAL MOTORS COMPANY

14. Remove the piston dust boot seals (2) from the seal counter-bores in the brake caliper and discard the boot seals.
15. Using a small wooden or plastic tool, remove the piston seals (1) from the brake caliper bores and discard the piston seals.

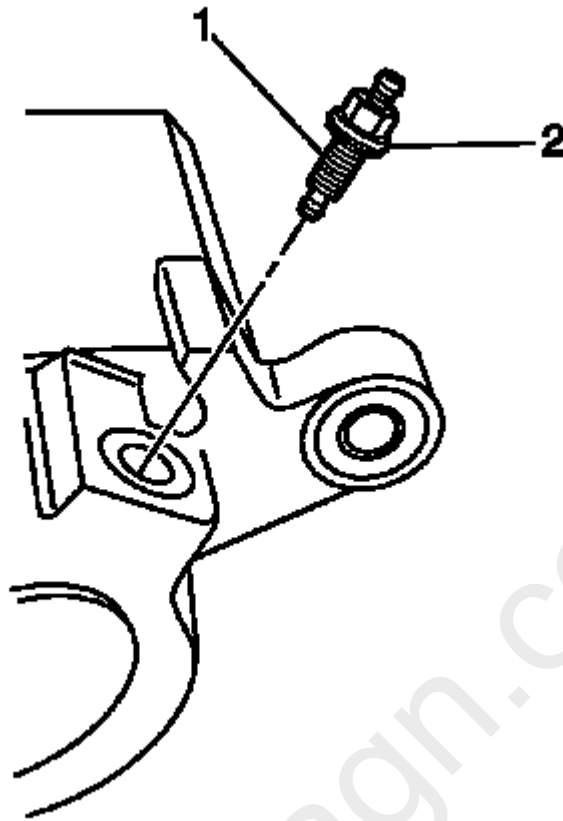


Fig. 80: View Of Brake Caliper Bleeder Valve
Courtesy of GENERAL MOTORS COMPANY

16. Remove the brake caliper bleeder valve cap.
17. Remove the brake caliper bleeder valve (1).
18. Remove the brake caliper bleeder valve seal (2) and discard.

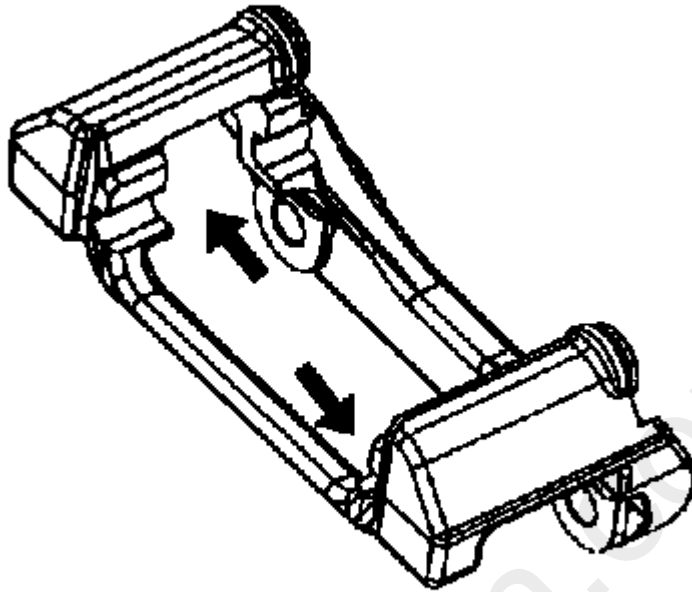


Fig. 81: Inspecting Brake Caliper Mounting Bracket Guide Surfaces
Courtesy of GENERAL MOTORS COMPANY

NOTE: Do not use abrasives to clean the brake caliper pistons.

19. Inspect the brake caliper mounting bracket guide surfaces for corrosion and wear. Remove and replace the brake caliper mounting bracket if damaged or worn .
20. Clean the brake caliper piston bores and seal counter-bores with denatured alcohol, or equivalent.
21. Clean the brake caliper pistons with denatured alcohol, or equivalent.
22. Dry the caliper piston bores and counter-bores with non-lubricated, filtered air.
23. Dry the brake caliper pistons with non-lubricated, filtered air.
24. Inspect the caliper bores for cracks, scoring, pitting, excessive corrosion.
25. If light corrosion is present in the caliper bores, attempt to remove the imperfection with a fine emery paper. If the imperfection cannot be removed, replace the caliper assembly.
26. If cracks, scoring, pitting, and excessive corrosion are present in the caliper bores, replace the caliper assembly.
27. Inspect the caliper pistons for cracks, scoring, and/or damage. Replace the caliper pistons if any of these conditions exist.

Assembly Procedure

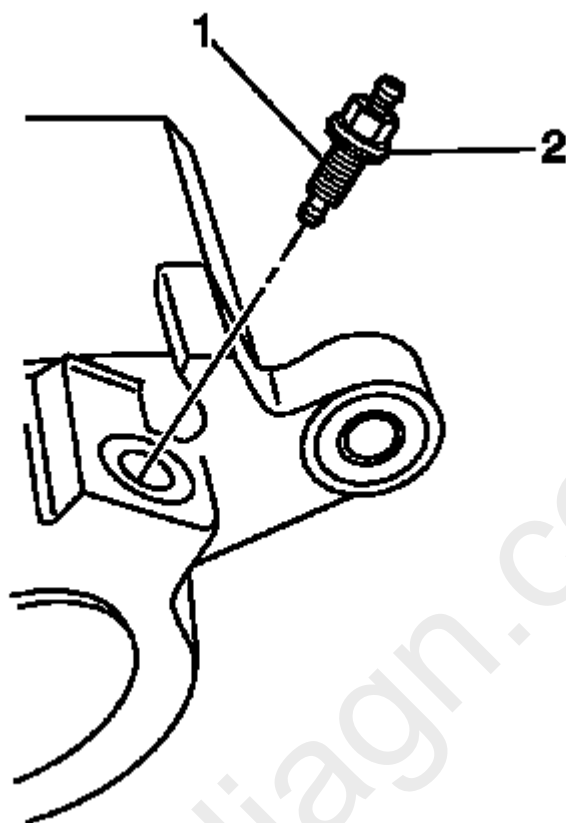


Fig. 82: View Of Brake Caliper Bleeder Valve
Courtesy of GENERAL MOTORS COMPANY

1. Install the valve stem seal (2) over the threaded end of the bleeder valve (1).

CAUTION: Refer to Fastener Caution .

2. Install the brake caliper bleeder valve (1).

Tighten

Tighten the bleeder valve to 14 N.m (124 lb in).

3. Install the brake caliper bleeder valve cap.

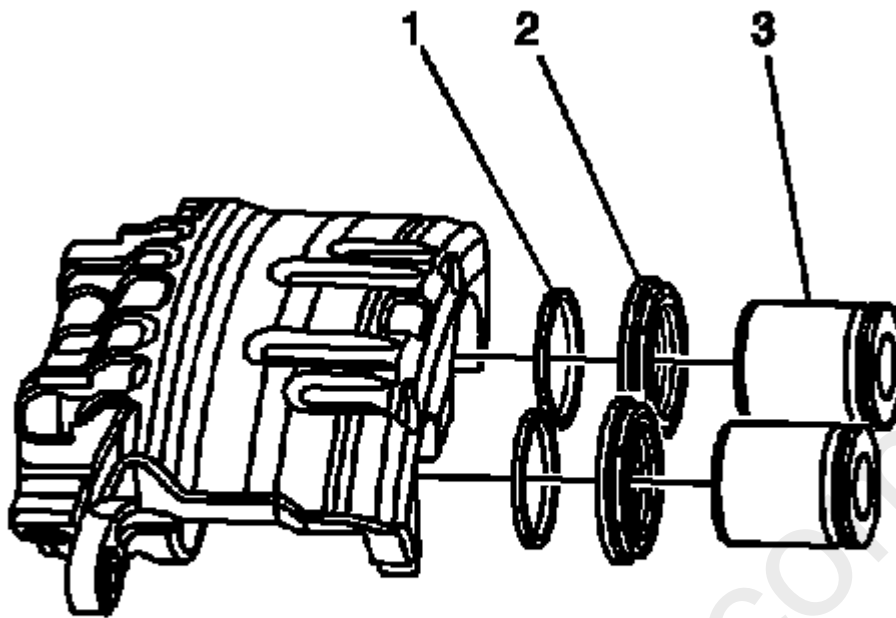


Fig. 83: View Of Piston Seals - Front
Courtesy of GENERAL MOTORS COMPANY

4. Lubricate the new piston seals (1) 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.
5. Install lubricated piston seals into the brake caliper bore seal grooves.
6. Make sure the seals are not twisted.

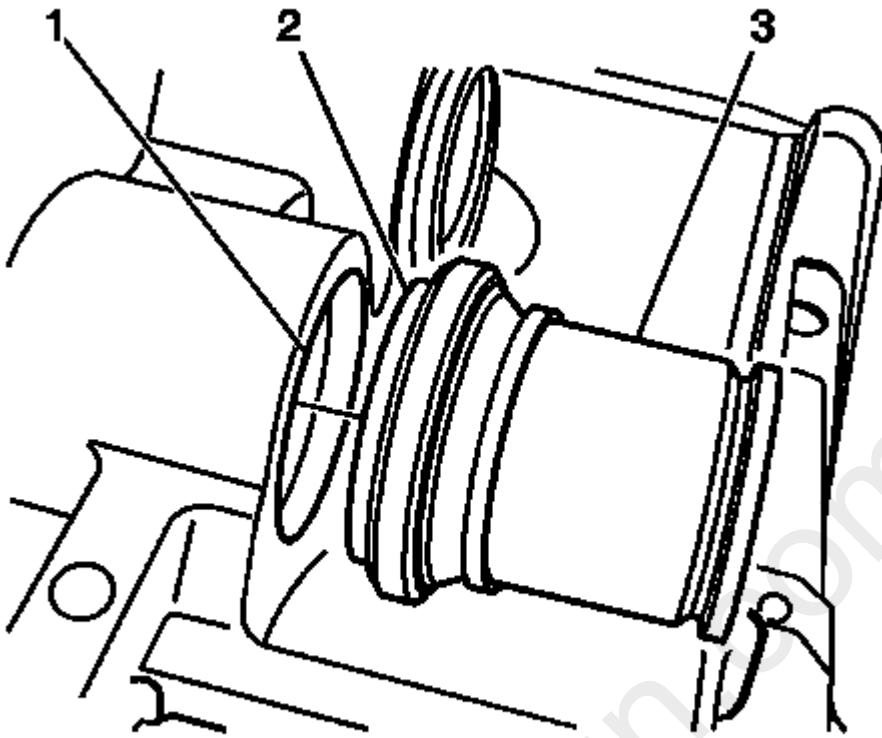


Fig. 84: View Of Piston & Dust Boot
Courtesy of GENERAL MOTORS COMPANY

7. Install the piston dust boot (2) over the end of the piston (3) so that the fold will face toward the brake caliper housing piston bore opening.
8. Seat the caliper dust boot into the brake caliper bore groove (1) and slide the piston into the brake caliper bore.

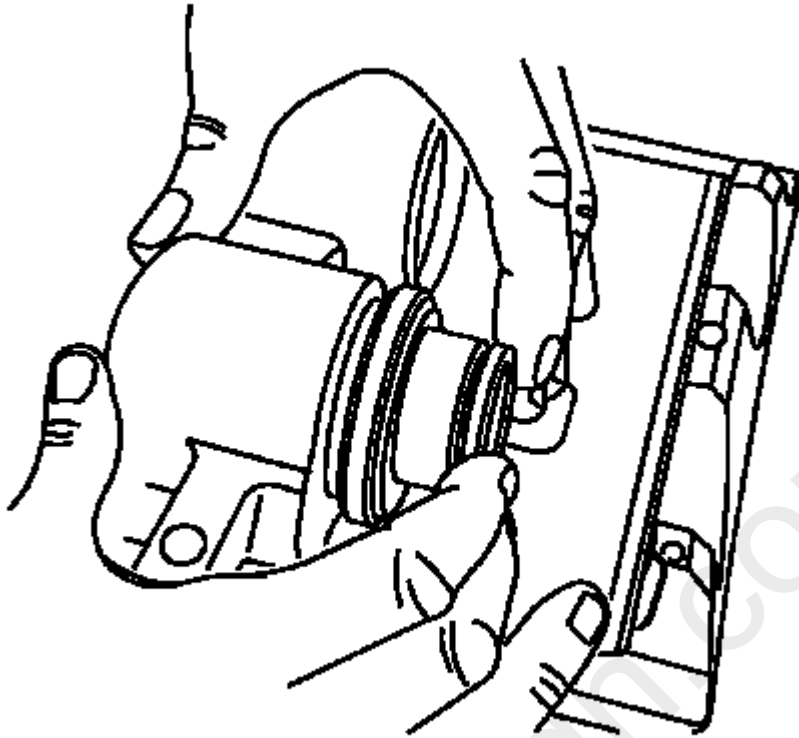


Fig. 85: Pushing Piston To Bottom Of Brake Caliper Bore
Courtesy of GENERAL MOTORS COMPANY

9. Using your fingers, carefully push the piston to the bottom of the brake caliper bore.
10. Ensure the caliper dust boot is properly seated into the piston groove and into the groove in the brake caliper bore.
11. Repeat steps 5 - 10 for the remaining piston.
12. Install the brake caliper to the vehicle. Refer to **Front Brake Caliper Replacement (JE5, J55 (AWD))**, **Front Brake Caliper Replacement (JE5, J55 (RWD))**.

FRONT BRAKE CALIPER OVERHAUL (J56)

WARNING: Refer to **Brake Fluid Irritant Warning** .

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

CAUTION: This brake caliper is coated with a specialized paint. Use care when

handling and servicing to ensure the paint does not get chipped or scratched. Clean any brake fluid from painted surfaces with denatured alcohol, or equivalent, as soon as possible.

NOTE:

- Replace all the components included in the repair kits used to service this brake caliper.
- Lubricate the rubber parts with GM approved brake fluid from a clean, sealed brake fluid container.
- If any hydraulic component is removed or disconnected, it may be necessary to bleed all or part of the brake system.
- The torque values specified are for dry, non-lubricated fasteners.
- Perform the service operations on a clean bench, free from all mineral oil materials.

Disassembly Procedure

WARNING: 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.

CAUTION: 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.

NOTE:

It will be necessary to fabricate one or more blocks of wood to the following dimensions to be used during this procedure:

- Must fabricate 2 blocks: 19 mm (3/4 in) X 51 mm (2 in) X 51 mm (2 in)
- Optional to fabricate 1 block, rather than using an old brake pad: 19 mm (3/4 in) X 51 mm (2 in) X 184 mm (7 in)

1. Remove the brake caliper from the vehicle. Refer to **Front Brake Caliper Replacement (J56)**.
2. Drain the brake fluid from the brake caliper.
3. Place the caliper in a vise using plastic vise caps or suitable material to protect the caliper mounting bosses from the vise jaws.

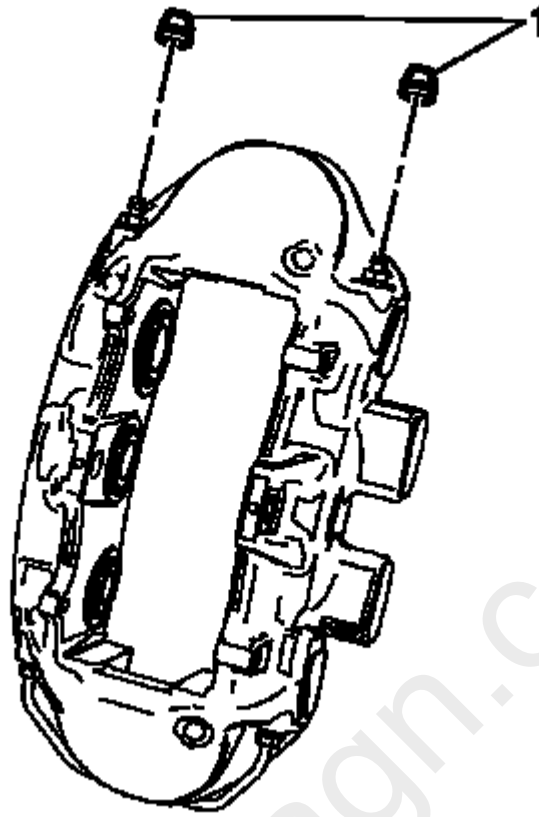


Fig. 86: Brake Caliper Bleeder Valve Caps
Courtesy of GENERAL MOTORS COMPANY

4. Remove the brake caliper bleeder valve caps (1).

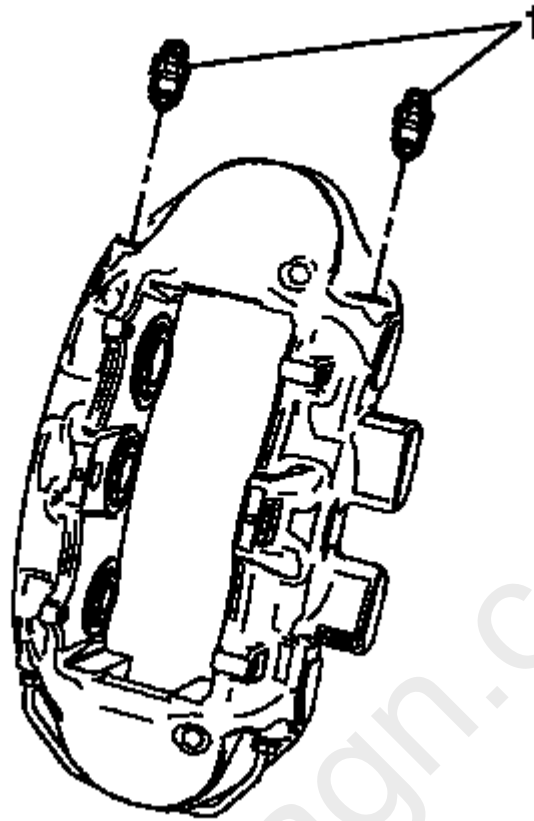


Fig. 87: Brake Caliper Bleeder Valves
Courtesy of GENERAL MOTORS COMPANY

5. Remove the brake caliper bleeder valves (1).

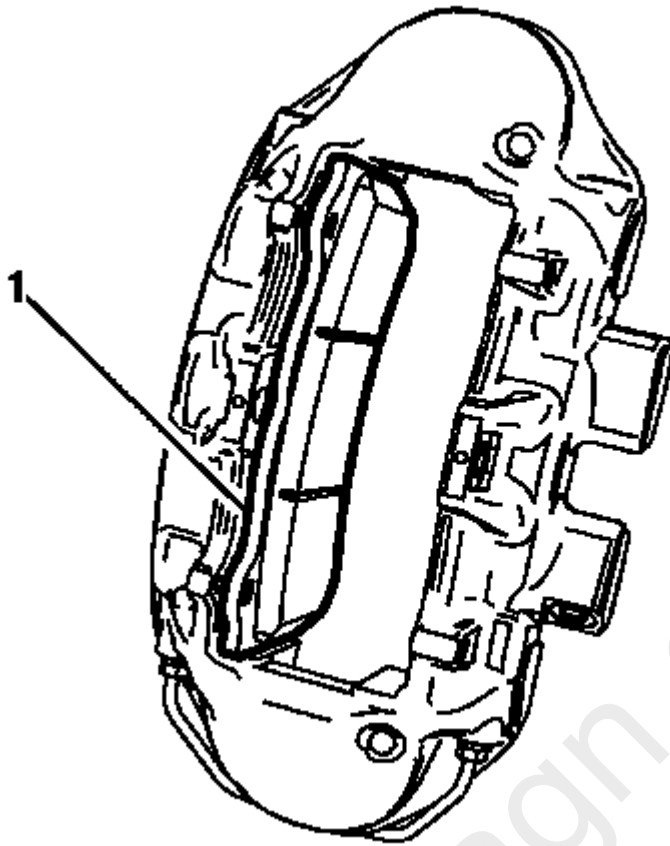


Fig. 88: Old Brake Pad

Courtesy of GENERAL MOTORS COMPANY

6. Place an old brake pad (1) or the fabricated 184 mm (7 in) long block of wood over 3 adjoining piston bores and secure in place with a non-marring C-clamp.

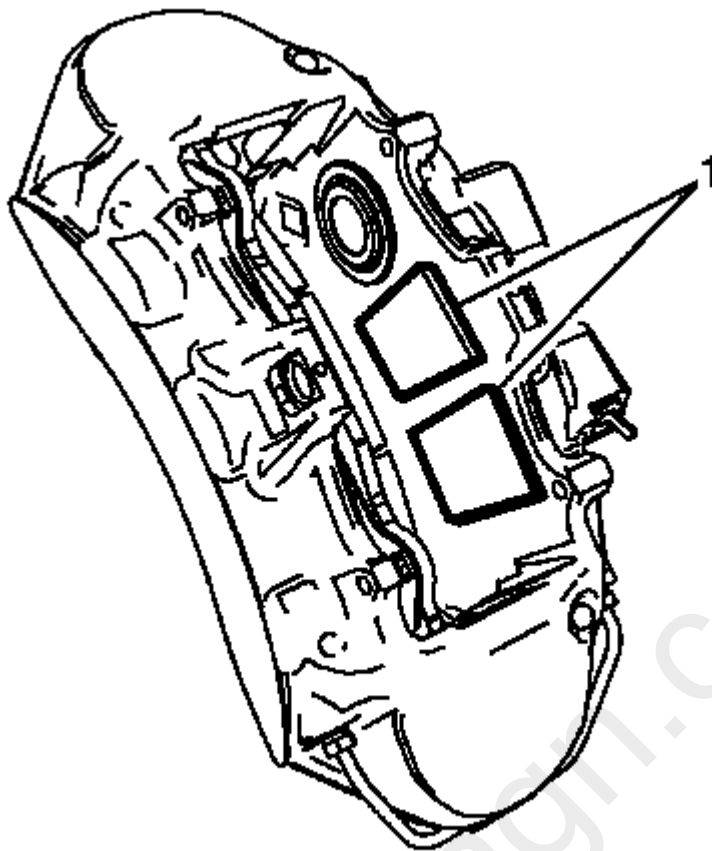


Fig. 89: Wood Blocks Over Piston Bores
Courtesy of GENERAL MOTORS COMPANY

7. Place the 2 fabricated 51 mm (2 in) long blocks of wood (1) over 2 of the adjoining piston bores and secure in place with a non-marring C-clamp.
8. Use clean cloths to cushion the interior of caliper housing during removal of the piston.

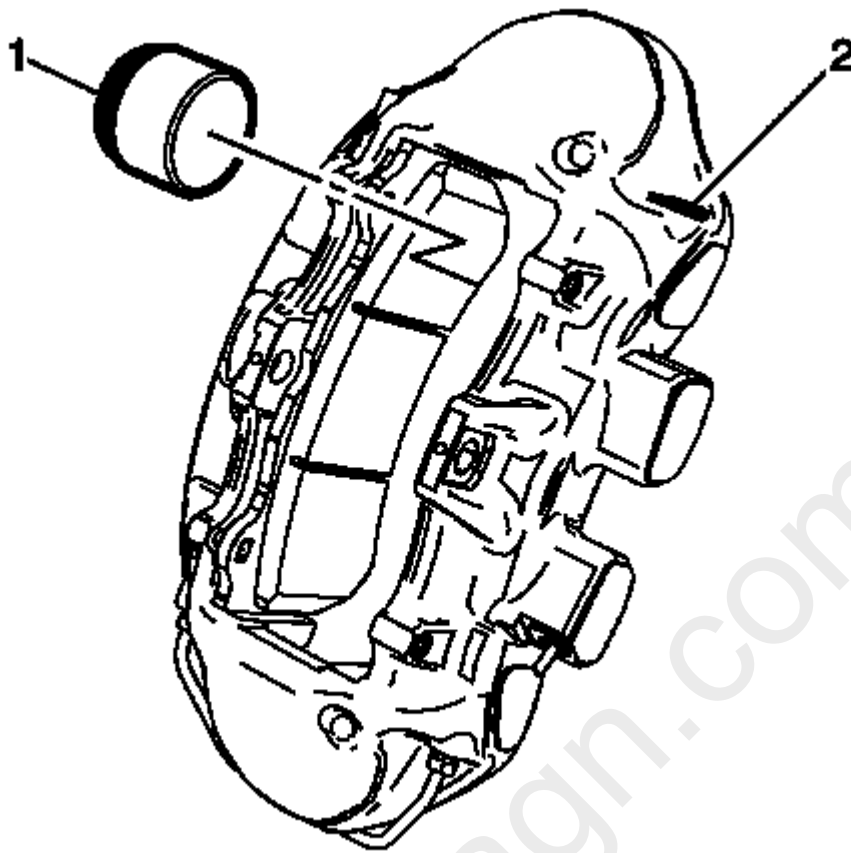


Fig. 90: Brake Caliper Piston & Brake Bleeder Valve Hole
Courtesy of GENERAL MOTORS COMPANY

9. Carefully remove the brake caliper piston (1) by directing low pressure compressed air into the brake bleeder valve hole (2).
10. Move one of the fabricated 51 mm (2 in) long block of woods over the emptied piston bore and secure it in place with a non-marring C-clamp.
11. Carefully remove the brake caliper piston by directing low pressure compressed air into the brake bleeder valve hole.
12. Repeat steps 10 and 11 for the remaining brake caliper piston.
13. Repeat steps 6 through 11 for the opposite side of the caliper.

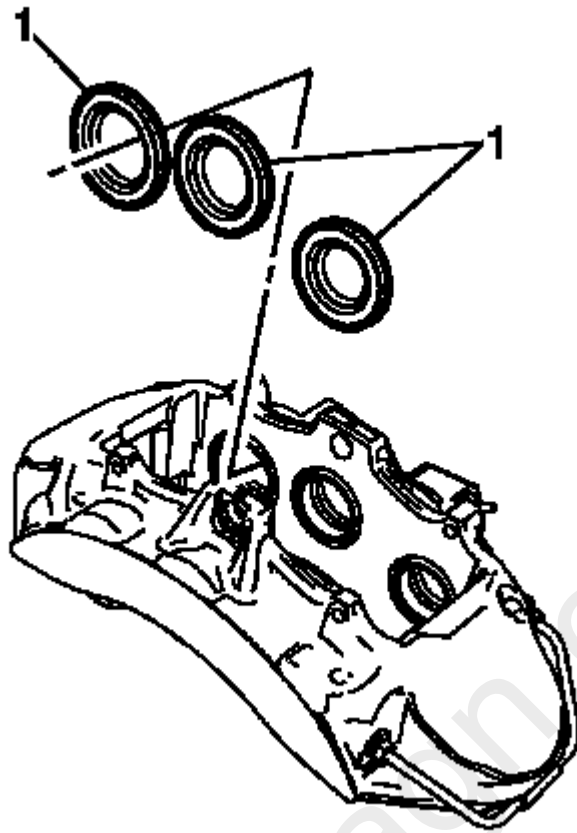


Fig. 91: Brake Caliper Dust Boot Seals
Courtesy of GENERAL MOTORS COMPANY

NOTE: Do not scratch the brake caliper piston bores.

14. Using a non-marring, flat-bladed tool, remove and discard the brake caliper dust boot seals (1).

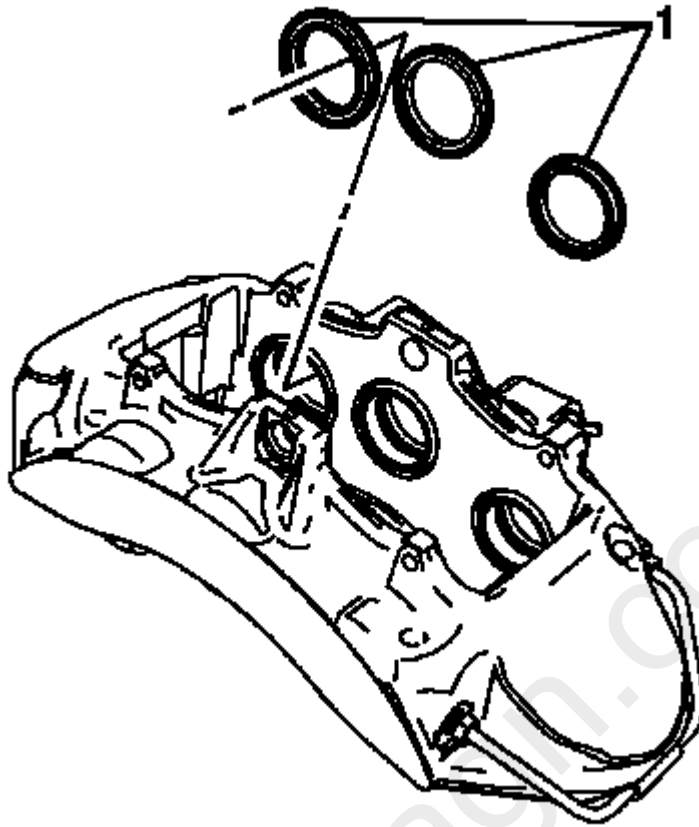


Fig. 92: Brake Caliper Piston Seals
Courtesy of GENERAL MOTORS COMPANY

NOTE: Do not scratch the brake caliper piston bores.

15. Using a non-marring, flat-bladed tool, remove and discard the brake caliper piston seals (1).
16. Remove the caliper from the vise and clean the entire caliper with denatured alcohol, or equivalent.
17. Dry the caliper piston bores with non-lubricated filtered air.
18. Inspect the caliper cylinder bores and piston seal counter-bores for scratches, cracks, pitting, and/or corrosion.

NOTE: Do not clean the caliper piston bores by honing or cleaning with abrasives.

19. If the caliper piston bores are scratched, cracked, or pitted, or if corrosion cannot be cleaned with denatured alcohol, replace the caliper assembly.

Assembly Procedure

1. Install the new piston dust boot seals over the pistons. Make sure the dust boot seal is properly seated on

the piston, in the dust boot seal groove.

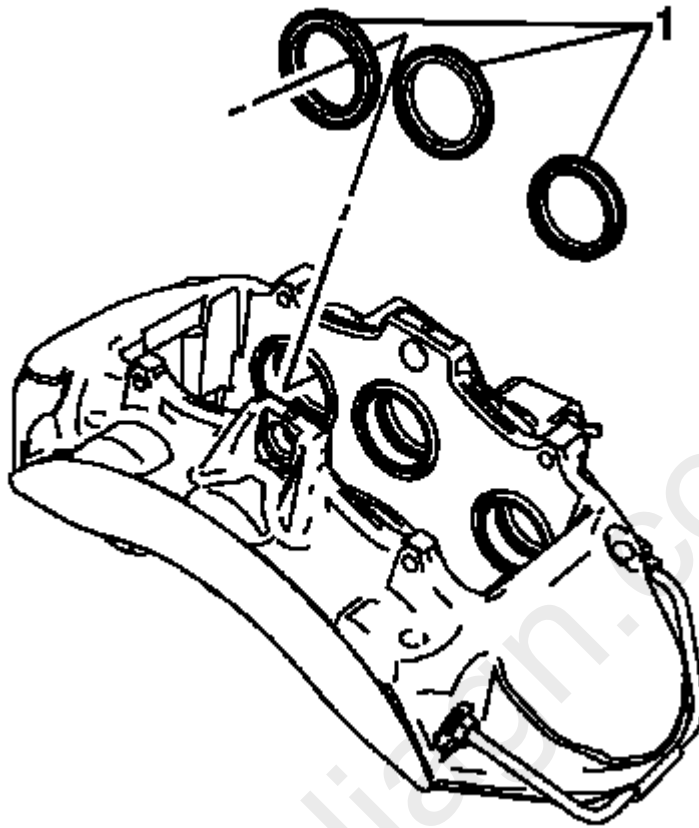


Fig. 93: Brake Caliper Piston Seals
Courtesy of GENERAL MOTORS COMPANY

2. Lubricate the new brake caliper piston seals (1) with GM approved or equivalent brake fluid from a clean, sealed brake fluid container.
3. Install the new piston seals into the brake caliper piston bore grooves. Make sure the seals are not twisted.
4. Apply a thin coat of GM approved or equivalent brake fluid from a clean, sealed brake fluid container, onto the caliper piston bores and the outer surface of the caliper pistons.
5. Install the piston and dust boot assemblies into the correct caliper bores. Press the pistons and dust boot seals all the way in by hand.
6. Place a clean old brake pad or the fabricated 184 mm (7 in) long block of wood over adjoining piston bores and apply light pressure with non-marring C-clamp. This will ensure the dust boots and pistons are fully seated into the caliper.
7. Repeat step 6 for the opposite pistons.

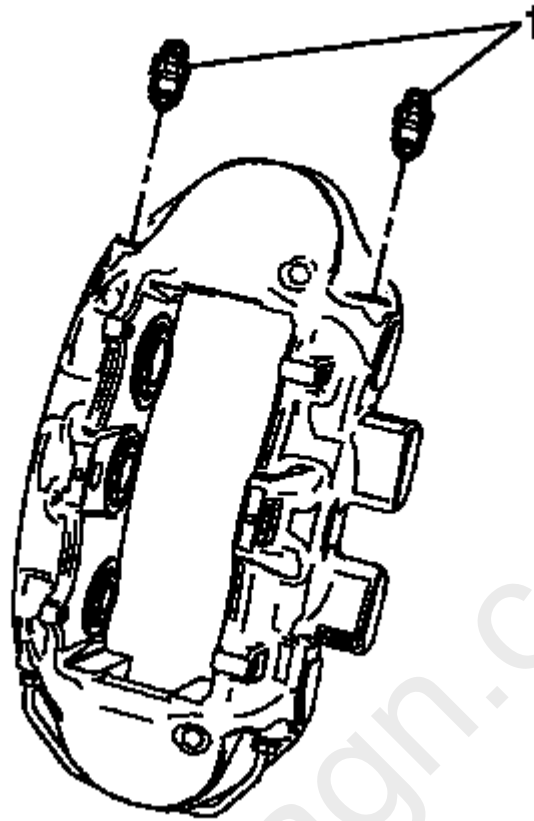


Fig. 94: Brake Caliper Bleeder Valves
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

8. Install the brake caliper bleeder valves (1) and tighten to 14 N.m (124 lb in).

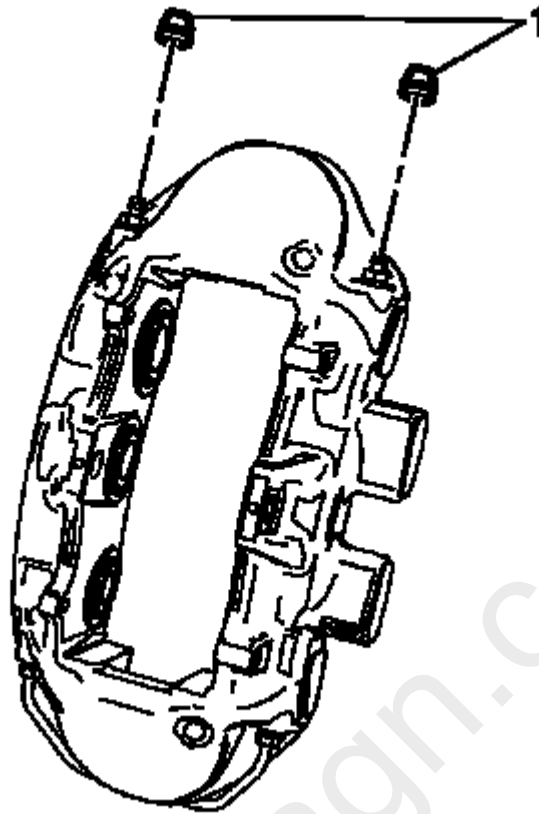


Fig. 95: Brake Caliper Bleeder Valve Caps
Courtesy of GENERAL MOTORS COMPANY

9. Install the brake caliper bleeder valve caps (1).
10. Install the caliper to the vehicle. Refer to **Front Brake Caliper Replacement (J56)**.

REAR BRAKE CALIPER OVERHAUL (JE5, J55)

WARNING: Refer to **Brake Fluid Irritant Warning** .

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

Disassembly Procedure

WARNING: 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:

- Replace all the components included in the repair kits used to service this brake caliper.
- Lubricate the rubber parts with GM approved brake fluid from a clean, sealed brake fluid container to make assembly easier.
- If any hydraulic component is removed or disconnected, it may be necessary to bleed all or part of the brake system.
- The torque values specified are for dry, non-lubricated fasteners.
- Perform the service operations on a clean bench, free from all mineral oil materials.

1. Remove the brake caliper from the vehicle. Refer to Rear Brake Caliper Replacement (JE5, J55).

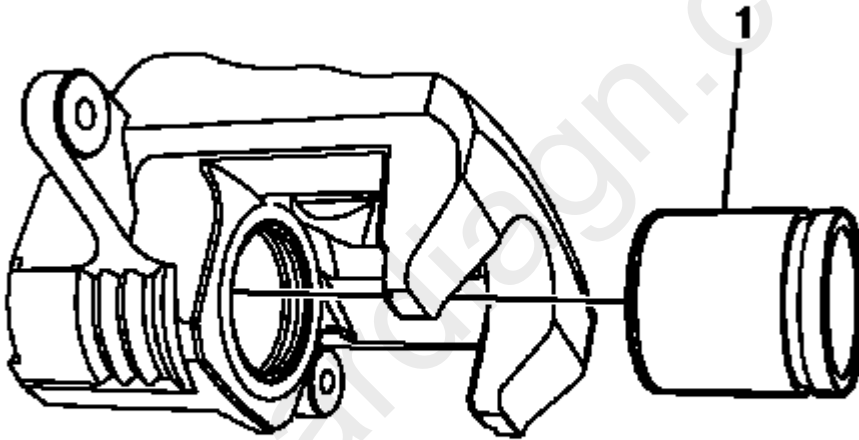


Fig. 96: Identifying Brake Caliper Piston
Courtesy of GENERAL MOTORS COMPANY

CAUTION: 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 (1) from the caliper bore by directing low pressure compressed air into the caliper bore through the brake hose inlet port.

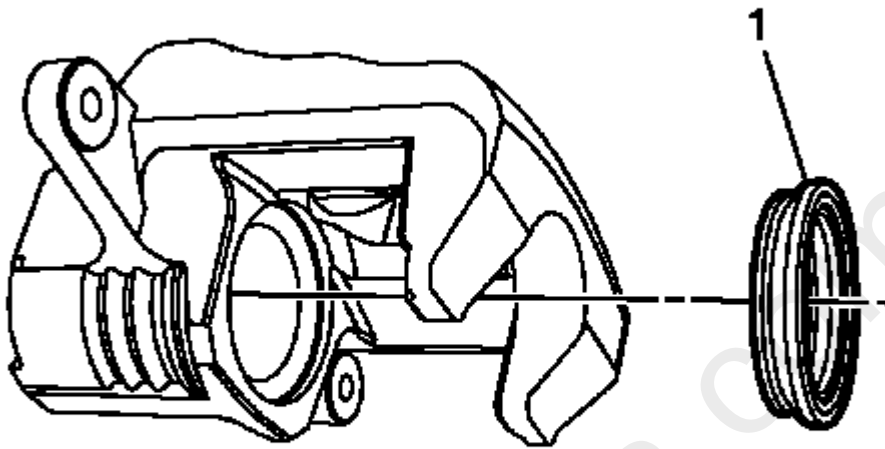


Fig. 97: Identifying Brake Caliper Piston Dust Boot Seal
Courtesy of GENERAL MOTORS COMPANY

3. Using a small wooden or plastic tool, remove the brake caliper piston dust boot seal (1) from the brake caliper housing.

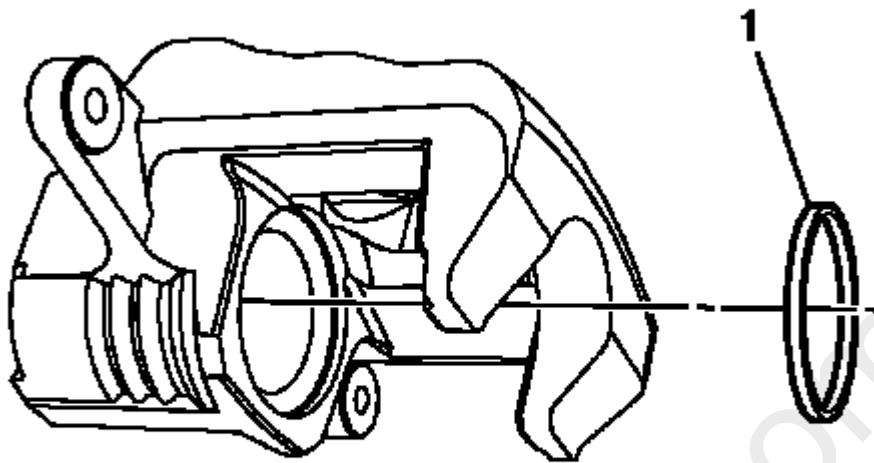


Fig. 98: Identifying Brake Caliper Piston Seal
Courtesy of GENERAL MOTORS COMPANY

4. Using a small wooden or plastic tool, remove the brake caliper piston seal (1) from the brake caliper housing.

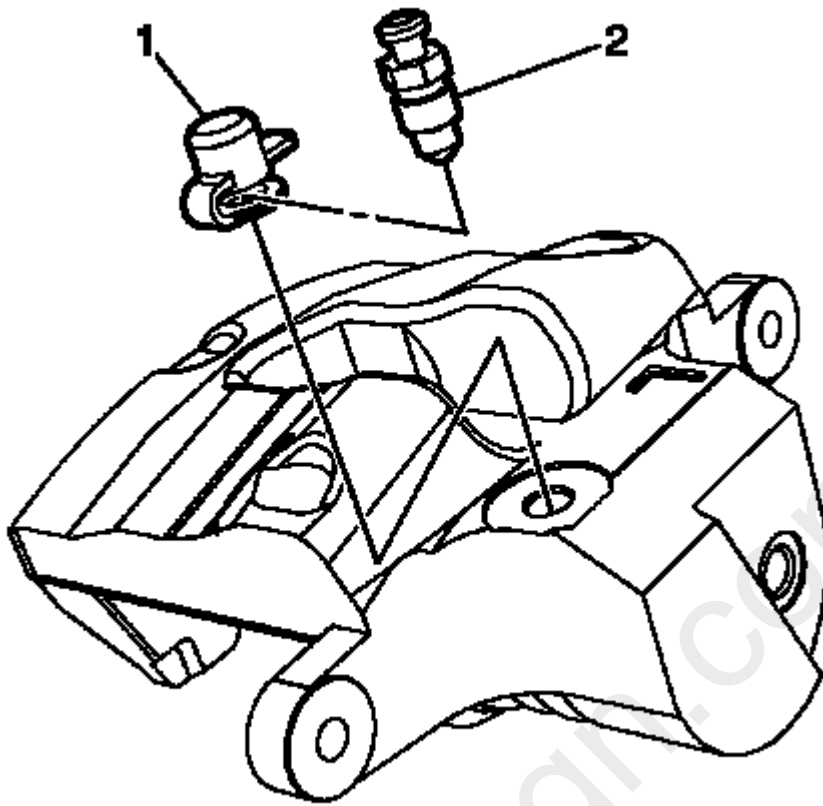


Fig. 99: Identifying Brake Caliper Bleeder Valve Cap & Bleeder Valve
Courtesy of GENERAL MOTORS COMPANY

5. Remove the brake caliper bleeder valve cap (1) and bleeder valve (2).
6. Clean the brake caliper piston bore with denatured alcohol, or equivalent.
7. Inspect the caliper bore for cracks, scoring, pitting and excessive corrosion.
8. If light corrosion is present in the caliper bore, remove the corrosion with emery cloth, or equivalent.
9. If excessive corrosion exists that cannot be removed, replace the brake caliper.

Assembly Procedure

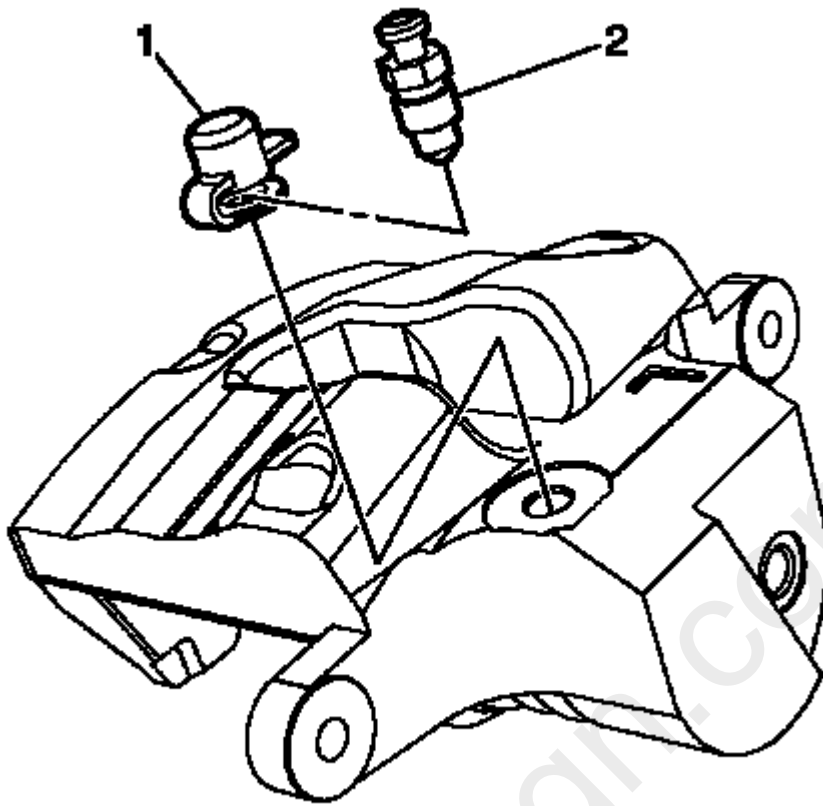


Fig. 100: Identifying Brake Caliper Bleeder Valve Cap & Bleeder Valve
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

1. Install the brake caliper bleeder valve cap (1) and bleeder valve (2) and tighten to 14 N.m (124 lb in).

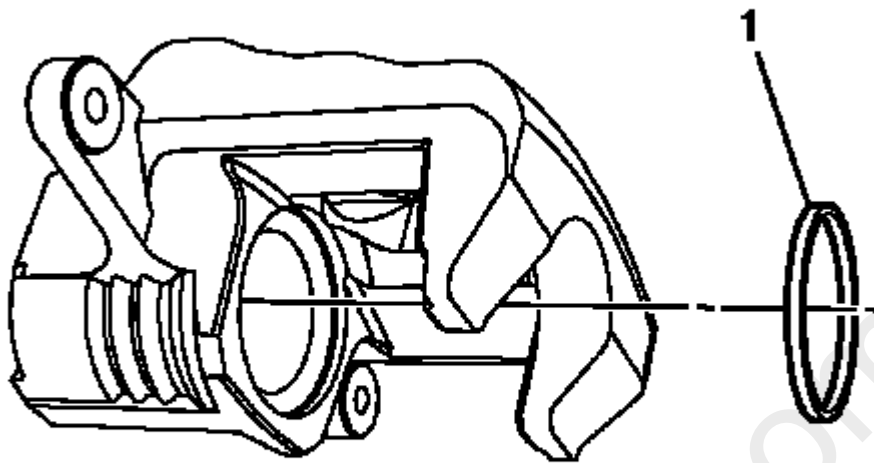


Fig. 101: Identifying Brake Caliper Piston Seal
Courtesy of GENERAL MOTORS COMPANY

2. Lubricate the brake caliper piston seal with GM approved brake fluid from a clean, sealed brake fluid container.
3. Install the brake caliper piston seal (1) into the brake caliper housing groove.

Ensure the brake caliper piston seal is properly seated in the caliper housing groove and is not distorted.

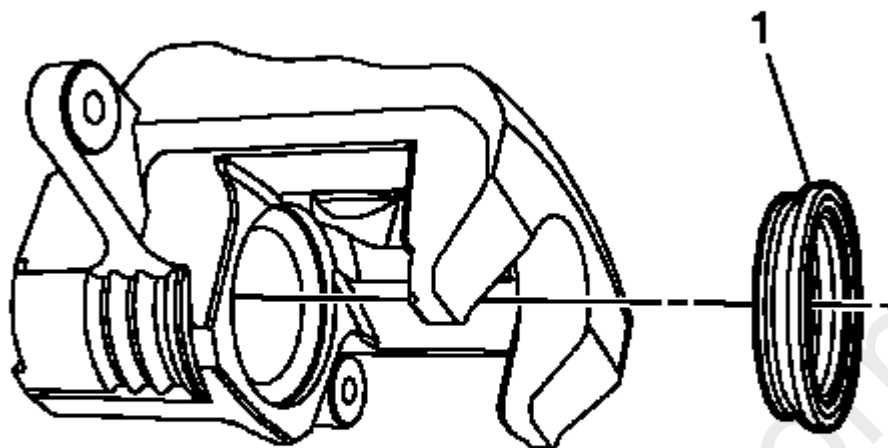


Fig. 102: Identifying Brake Caliper Piston Dust Boot Seal
Courtesy of GENERAL MOTORS COMPANY

4. Install the brake caliper piston dust boot seal (1) into the brake caliper housing.
5. Lightly lubricate the brake caliper piston dust boot seal lip with GM approved brake fluid from a clean, sealed brake fluid container.
6. Lightly lubricate the brake caliper piston with GM approved brake fluid from a clean, sealed brake fluid container.

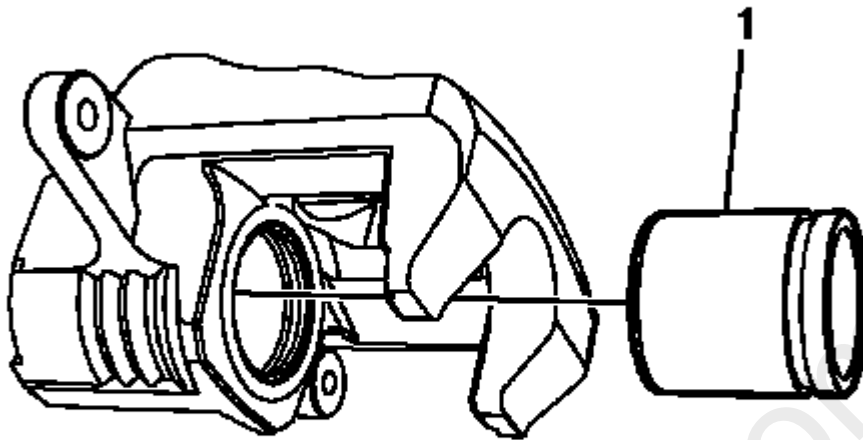


Fig. 103: Identifying Brake Caliper Piston
Courtesy of GENERAL MOTORS COMPANY

7. Place the brake caliper piston (1) in the brake caliper housing bore and press the brake caliper piston squarely into the brake caliper.
8. Install the brake caliper. Refer to **Rear Brake Caliper Replacement (JE5, J55)**.

REAR BRAKE CALIPER OVERHAUL (J56)

WARNING: Refer to **Brake Fluid Irritant Warning** .

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

CAUTION: Do not remove the caliper external crossover tube or separate the 2 caliper halves. If the crossover tube and/or the caliper halves are separated, corrosion and damage to the caliper may result.

CAUTION: This brake caliper is coated with a specialized paint. Use care when handling and servicing to ensure the paint does not get chipped or scratched. Clean any brake fluid from painted surfaces with denatured alcohol, or equivalent, as soon as possible.

NOTE:

- Replace all the components included in the repair kits used to service this brake caliper.
- Lubricate the rubber parts with new Delco Supreme 11®, GM P/N 12377967 (Canadian P/N 992667) or equivalent DOT-3 brake fluid to make assembly easier.
- If any hydraulic component is removed or disconnected, it may be necessary to bleed all or part of the brake system.
- The torque values specified are for dry, non-lubricated fasteners.
- Perform the service operations on a clean bench, free from all mineral oil materials.

Disassembly Procedure

WARNING: 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.

CAUTION: 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.

NOTE:

It will be necessary to fabricate one or more blocks of wood to the following dimensions to be used during this procedure:

- Must fabricate 1 block: 19 mm (3/4 in) X 51 mm (2 in) X 51 mm (2 in)
- Optional to fabricate 1 block, rather than using an old brake pad: 19 mm (3/4 in) X 51 mm (2 in) X 127 mm (5 in)
- Optional to fabricate 1 block to cushion piston removal: 19 mm (3/4 in) X 51 mm (2 in) X 127 mm (5 in)

1. Remove the brake caliper from the vehicle. Refer to **Rear Brake Caliper Replacement (J56)**.
2. Drain the brake fluid from the brake caliper.
3. Place the caliper in a vise using plastic vise caps or suitable material to protect the caliper mounting bosses from the vise jaws.

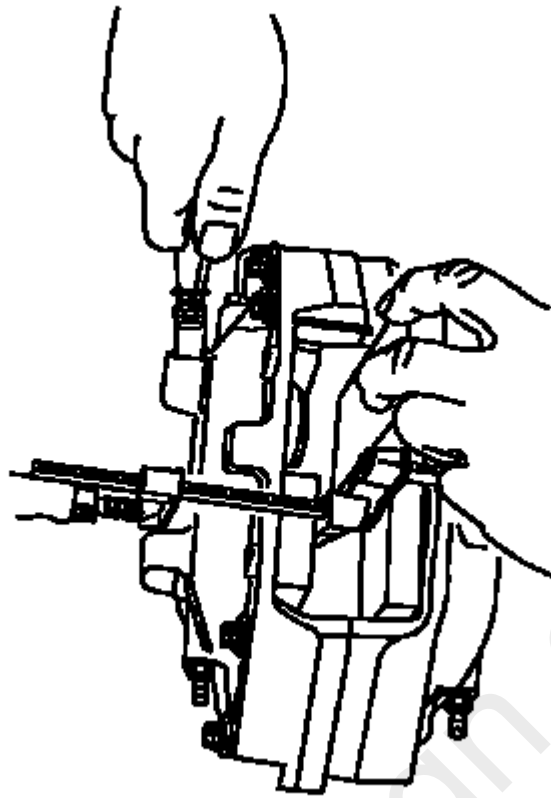


Fig. 104: Blocking Piston Bores

Courtesy of GENERAL MOTORS COMPANY

4. Place an old brake pad or the fabricated 127 mm (5 in) long block of wood over 2 adjoining piston bores and secure in place with a non-marring C-clamp.
5. Place the fabricated 51 mm (2 in) long block of wood over one of the opposing piston bores and secure it in place with a non-marring C-clamp.
6. Use clean cloths or the other fabricated 127 mm (5 in) long block of wood to pad the interior of caliper housing during removal of the piston.
7. Carefully remove the brake caliper piston by directing low pressure compressed air into the brake caliper inlet hole. If the dust boot seal slides out with the piston, remove the dust boot seal from piston and reinstall the seal into the caliper.
8. Move the fabricated 51 mm (2 in) long block of wood over the emptied piston bore and secure it in place with a non-marring C-clamp.
9. Move the clean cloths or the other fabricated 127 mm (5 in) long block of wood to pad the interior of caliper housing during the removal of the piston.
10. Carefully remove the brake caliper piston by directing low pressure compressed air into the brake caliper inlet hole. If the dust boot seal slides out with the piston, remove the dust boot seal from piston and reinstall the seal into the caliper.
11. Repeat steps 4 through 10 for the opposite side of the caliper.

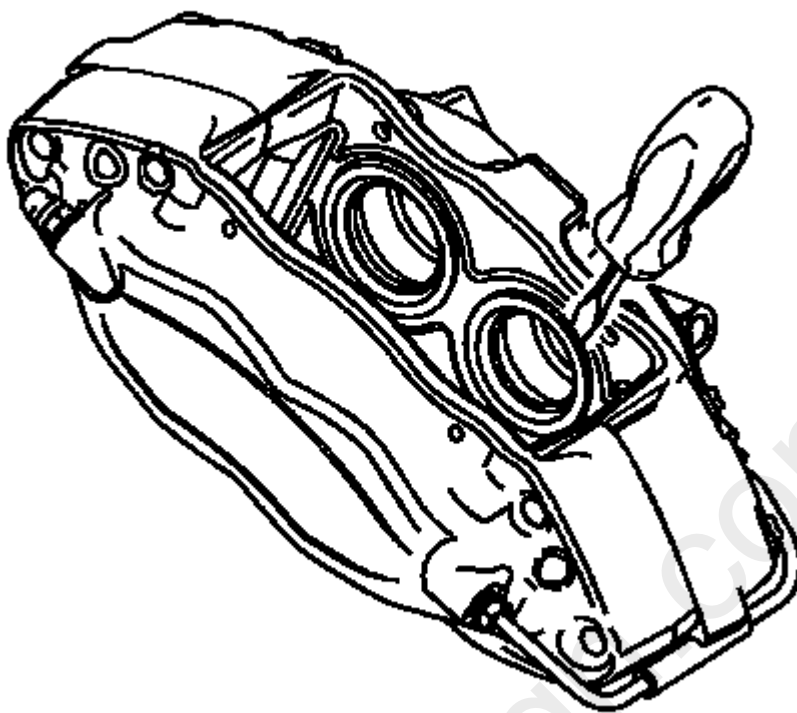


Fig. 105: Removing Dust Boot Seals
Courtesy of GENERAL MOTORS COMPANY

12. Using care to not scratch or mar the painted surfaces or piston bore, remove all the dust boot seals using a flat-bladed tool. Discard the dust boot seals.

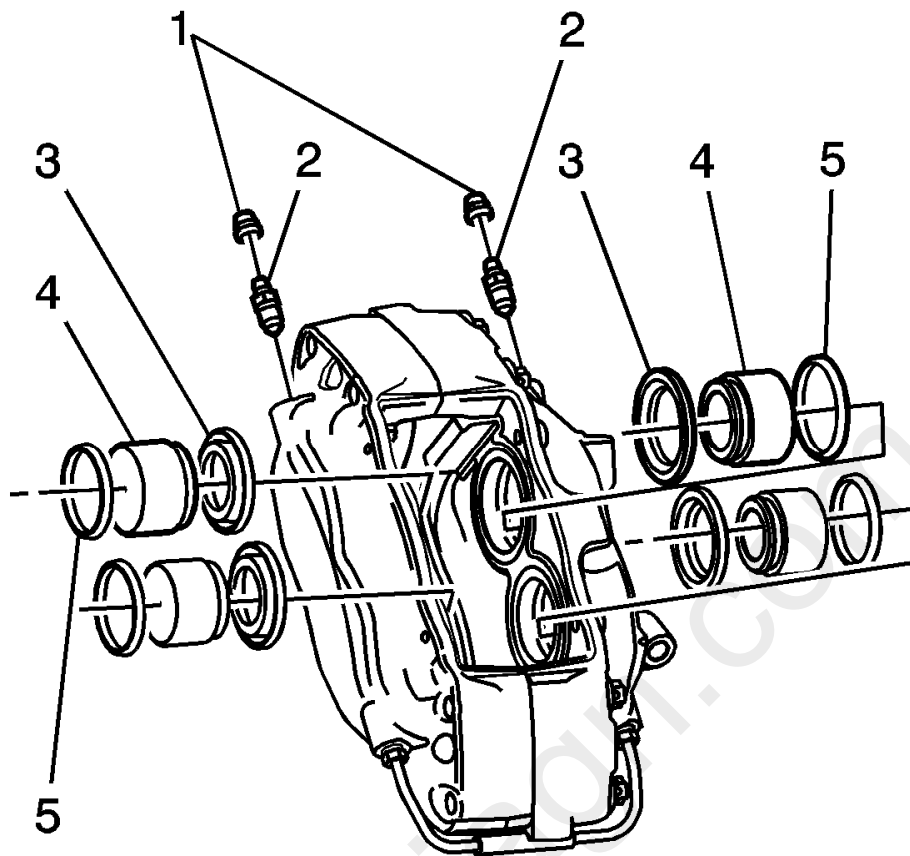


Fig. 106: Exploded View Of Caliper
 Courtesy of GENERAL MOTORS COMPANY

13. Using wooden or plastic tool, remove the piston seals (5) from the piston bores. Discard the piston seals.
14. Remove both brake caliper bleeder caps and valves (1, 2).
15. Remove the caliper from the vise and clean the entire caliper with denatured alcohol, or equivalent.
16. Dry the caliper piston bores with non-lubricated filtered air. Make sure the external crossover pipe and the internal fluid ports are clean and free of obstructions.
17. Inspect the caliper cylinder bores and piston seal counter-bores for scratches, cracks, pitting, and/or corrosion.

NOTE: Do not clean the caliper piston bores by honing or cleaning with abrasives.

18. If the caliper piston bores are scratched, cracked, or pitted, or if corrosion cannot be cleaned with denatured alcohol, replace the caliper assembly.

Assembly Procedure

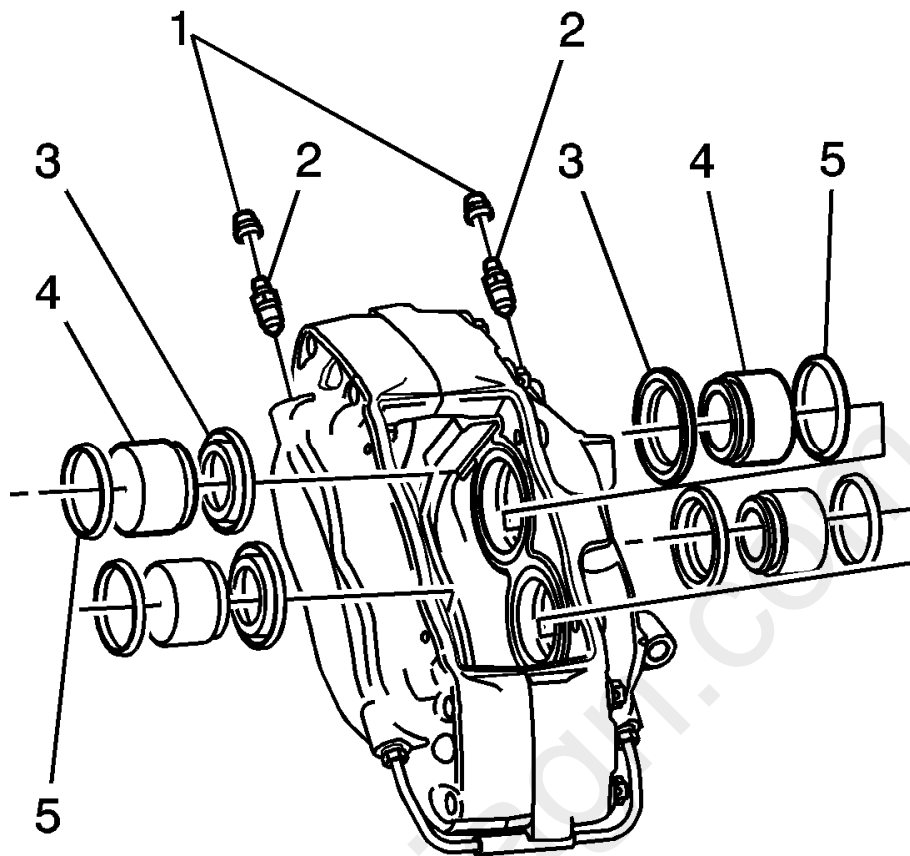


Fig. 107: Exploded View Of Caliper
Courtesy of GENERAL MOTORS COMPANY

1. Install the new piston dust boot seals (3) over the pistons (4). Make sure the dust boot seal is properly seated on the piston, in the dust boot seal groove.
2. Lubricate the new piston seals (5) 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.
3. Install the lubricated, new piston seals (5) into the brake caliper bore seal grooves. Make sure the seals are not twisted.
4. 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 caliper piston bores and the outer surface of the caliper pistons.
5. Install the piston and dust boot assemblies into the correct caliper bores. Press the pistons and dust boot seals all the way in by hand.
6. Place a clean old brake pad or the fabricated 127 mm (5 in) long block of wood over 2 adjoining piston bores and apply light pressure with non-marring C-clamp. This will ensure the dust boots and pistons are fully seated into the caliper.
7. Repeat step 6 for the opposite pistons.

CAUTION: Refer to Fastener Caution .

8. Install the brake caliper bleeder valves (2) and tighten to 13 N.m (115 lb in).
9. Install the brake caliper bleeder valve caps (1).
10. Install the caliper to the vehicle. Refer to Rear Brake Caliper Replacement (J56).

FRONT BRAKE CALIPER HARDWARE REPLACEMENT (JE5, J55 (RWD))

Removal Procedure

WARNING: Refer to Brake Dust Warning .

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

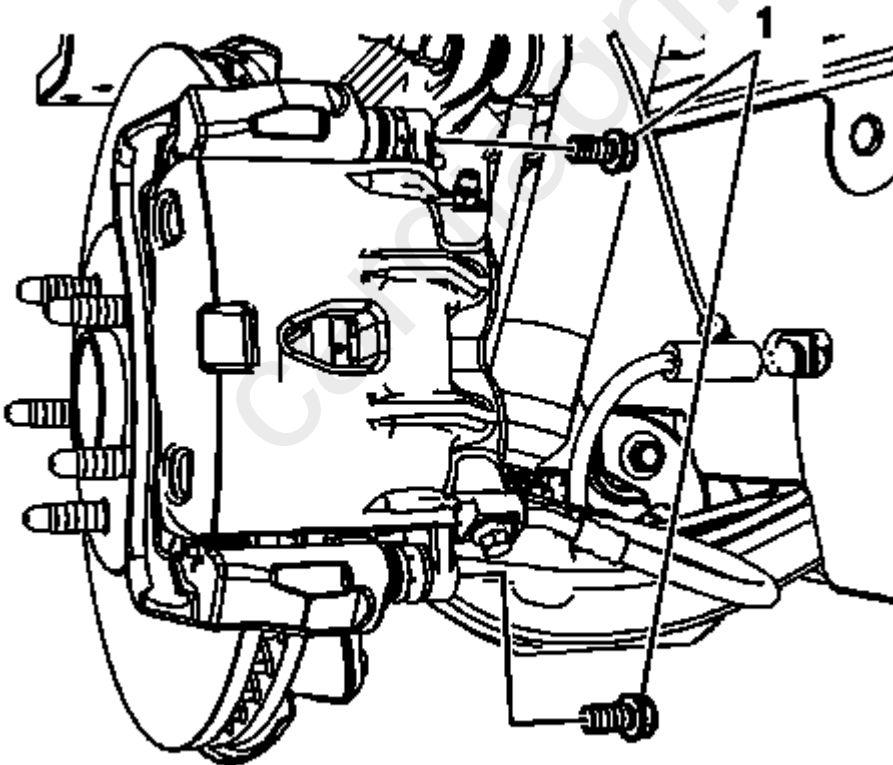


Fig. 108: Identifying Bolts and Caliper Pin
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Support the brake caliper with heavy mechanic 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.

3. Using a backup wrench on the brake caliper guide pin, remove the brake caliper guide pin bolts (1).

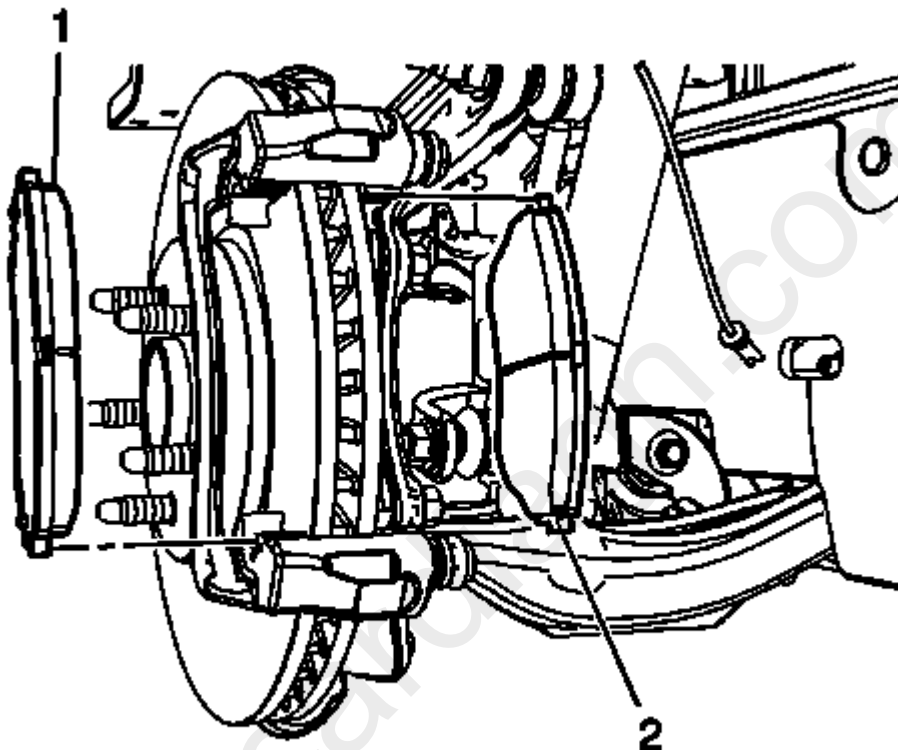


Fig. 109: View of Brake Pads and Rotor
Courtesy of GENERAL MOTORS COMPANY

4. Remove the brake caliper and support with heavy mechanics wire or equivalent.
5. Remove the outer brake pad (1).
6. Remove the inner brake pad (2).
7. Remove the brake pad springs.

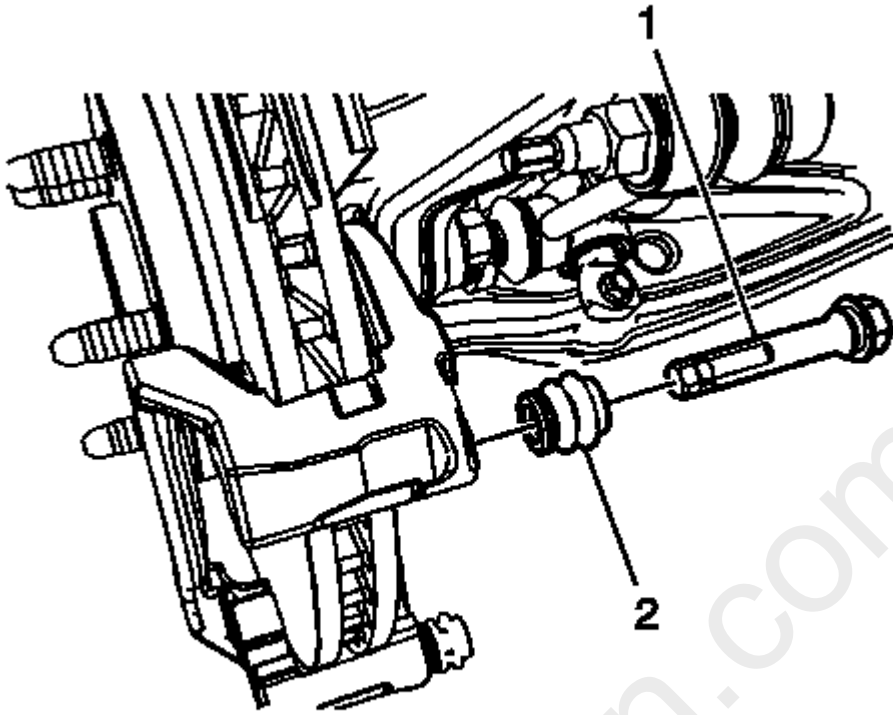


Fig. 110: View of Caliper and Guide Pin
Courtesy of GENERAL MOTORS COMPANY

NOTE: The upper brake caliper guide pin is equipped with a bushing.

8. Remove the upper brake caliper guide pin (1).
9. Remove the upper guide pin seal (2).

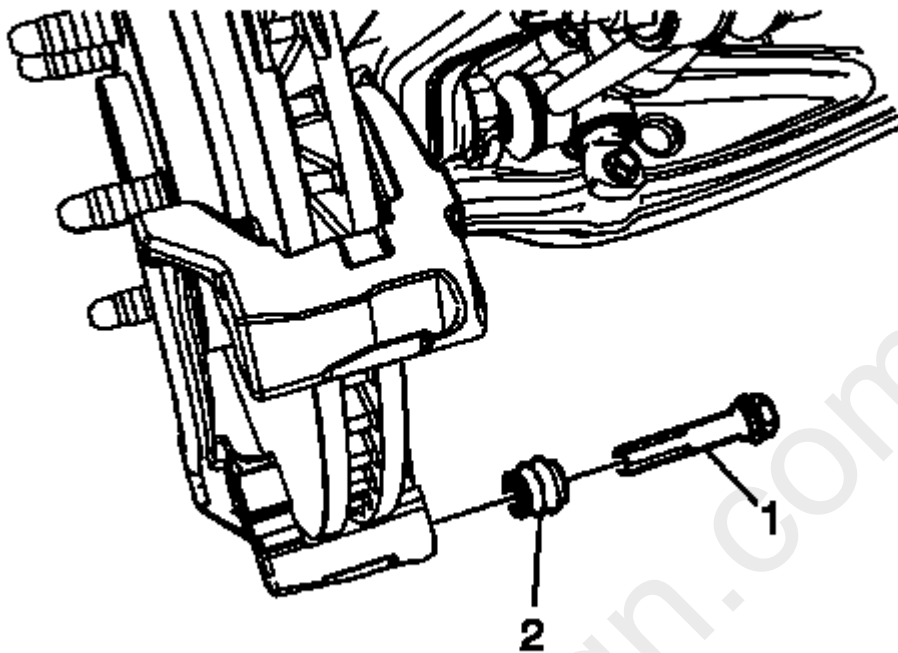


Fig. 111: View of Caliper and Guide Pin
Courtesy of GENERAL MOTORS COMPANY

10. Remove the lower brake caliper guide pin (1).
11. Remove the lower guide pin seal (2).

Installation Procedure

1. Inspect the brake caliper guide pins, seals and brake pad springs for damage and/or corrosion. Refer to **Front Disc Brake Mounting and Hardware Inspection.**

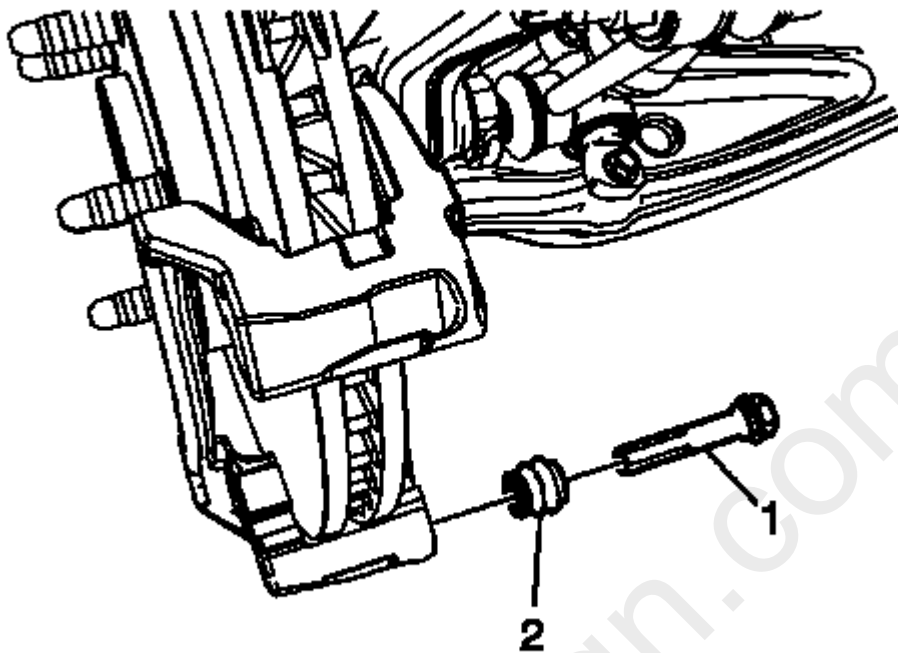


Fig. 112: View of Caliper and Guide Pin
Courtesy of GENERAL MOTORS COMPANY

2. Apply a thin coat of high temperature silicone brake lubricant the brake caliper guide pin.
3. Install the lower brake caliper guide pin (1) to the guide pin seal (2).

Ensure the guide pin seal is fully seated in the groove of the brake caliper guide pin.

4. Install the lower guide pin and seal to the brake caliper bracket.

Ensure the guide pin seal is fully seated in the groove of the brake caliper bracket.

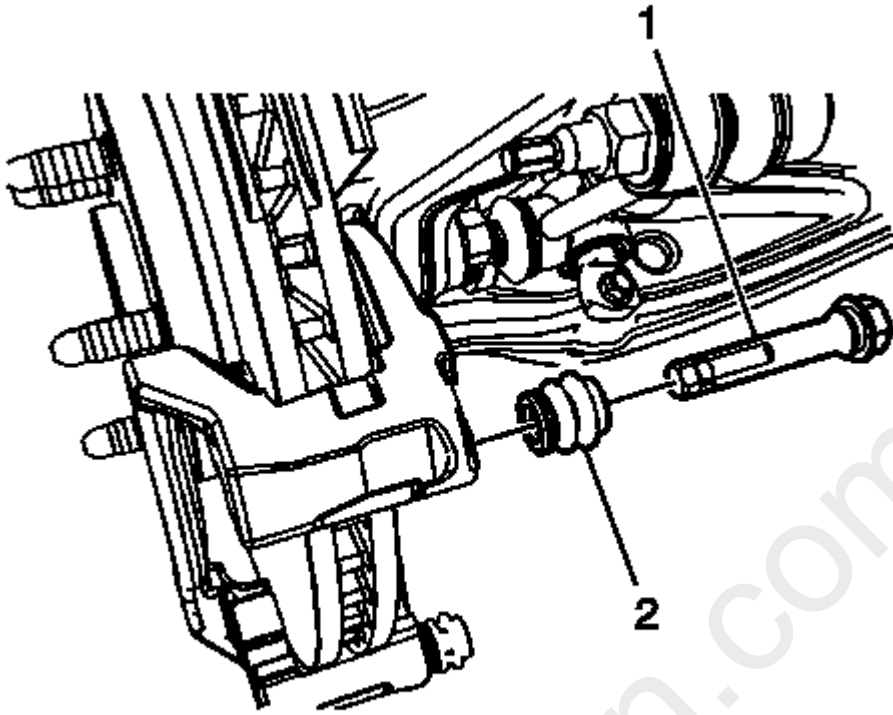


Fig. 113: View of Caliper and Guide Pin
Courtesy of GENERAL MOTORS COMPANY

NOTE: The upper brake caliper guide pin is equipped with a bushing.

5. Apply a thin coat of high temperature silicone brake lubricant the brake caliper guide pin.
6. Install the upper brake caliper guide pin (1) to the guide pin seal (2).

Ensure the guide pin seal is fully seated in the groove of the brake caliper guide pin.

7. Install the upper guide pin and seal to the brake caliper bracket.

Ensure the guide pin seal is fully seated in the groove of the brake caliper bracket.

8. Install the brake pad springs.

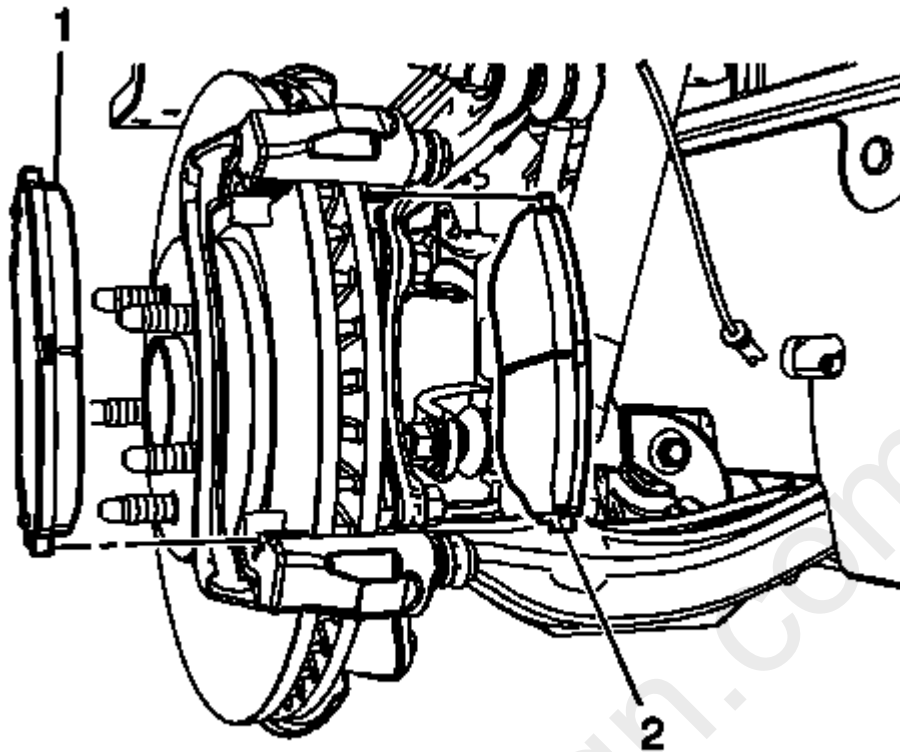


Fig. 114: View of Brake Pads and Rotor
Courtesy of GENERAL MOTORS COMPANY

9. Install the outer brake pad (1).
10. Install the inner brake pad (2).

NOTE: If reusing the brake caliper guide pin bolts, the threads of the brake caliper guide pin bolts and the threads of the guide pins must be free of residue and debris prior to application of threadlocker in order to ensure proper adhesion and fastener retention.

11. If reusing the caliper pin bolts, prepare the bolts and the guide pins for assembly:
 - Thoroughly clean the residue from the guide pin bolt threads by using denatured alcohol or equivalent and allow to dry.
 - Thoroughly clean the residue from the guide pin threads by using denatured alcohol or equivalent and allow to dry.
12. Apply threadlocker GM P/N 12345493 (Canadian P/N 10953488), or equivalent to 2/3 of the threaded length of the brake caliper guide pin bolts. Ensure there are no gaps in the threadlocker along the length of the filled area of the bolts.
13. Allow the threadlocker to cure approximately 10 minutes before installation.

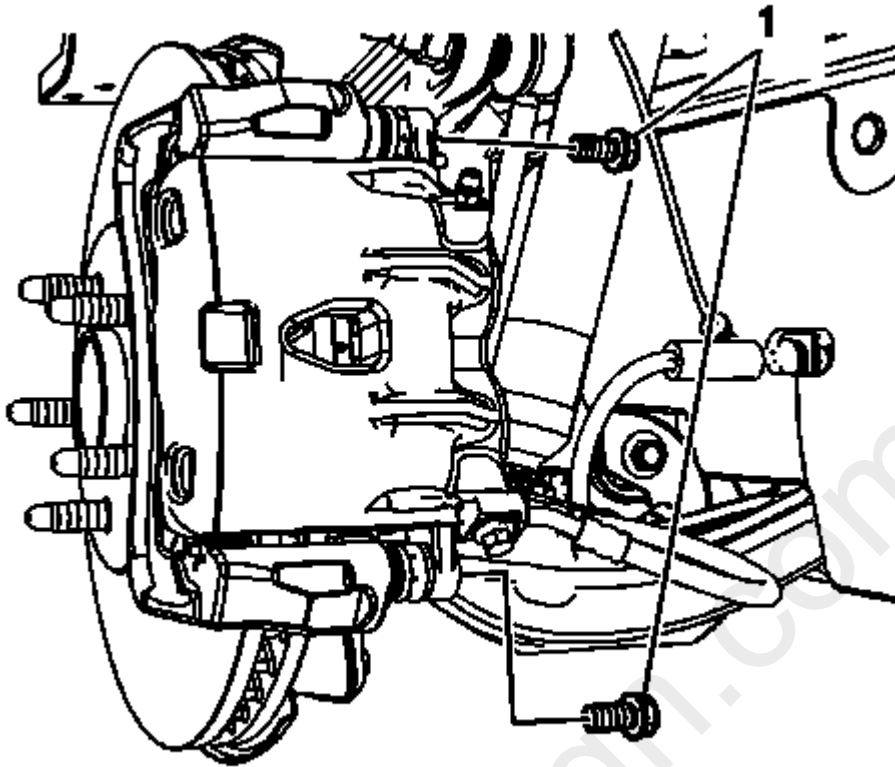


Fig. 115: Identifying Bolts and Caliper Pin
Courtesy of GENERAL MOTORS COMPANY

14. Install the brake caliper to the caliper bracket.

CAUTION: Refer to Fastener Caution .

15. Using a backup wrench on the brake caliper guide pins, install the brake caliper guide pin bolts (1) and tighten to 63 N.m (46 lb ft).
16. Install the tire and wheel assembly. Refer to Tire and Wheel Removal and Installation .

FRONT BRAKE CALIPER HARDWARE REPLACEMENT (JE5, J55 (AWD))

Removal Procedure

WARNING: Refer to Brake Dust Warning .

1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .

2. Remove the tire and wheel assembly. Refer to Tire and Wheel Removal and Installation .

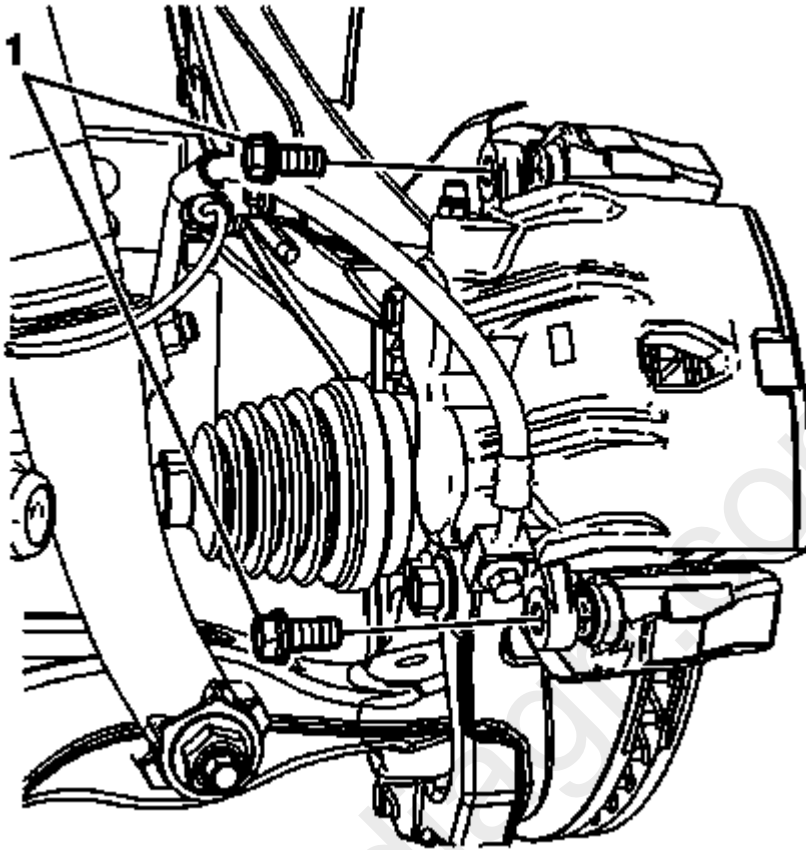


Fig. 116: View of Brake Caliper, Guide and Bolts
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Support the brake caliper with heavy mechanic 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.

3. Using a backup wrench on the brake caliper guide pin, remove the brake caliper guide pin bolts (1).
4. Remove the brake caliper and support with heavy mechanics wire or equivalent.

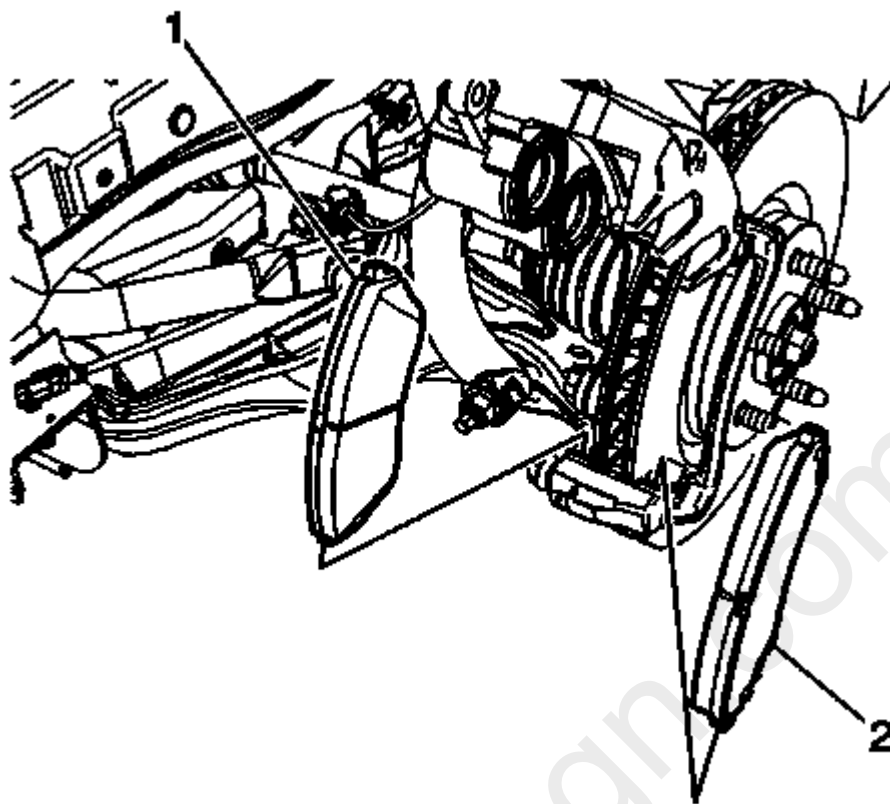


Fig. 117: View of Brake Pads

Courtesy of GENERAL MOTORS COMPANY

5. Remove the inner brake pad (1).
6. Remove the outer brake pad (2).
7. Remove the brake pad springs.

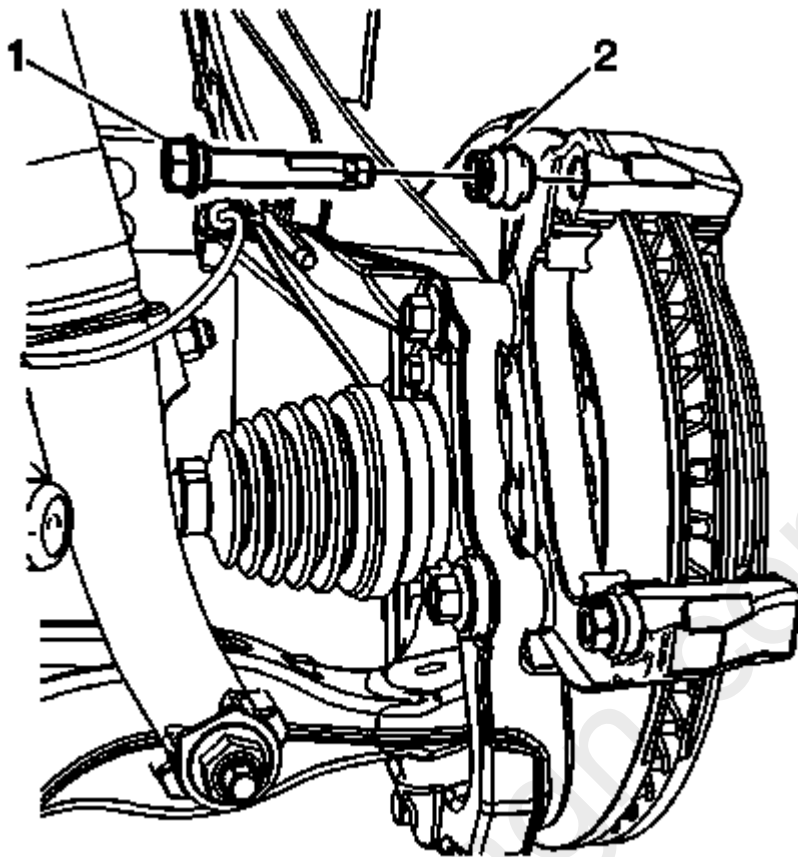


Fig. 118: View of Caliper Guide Pin
Courtesy of GENERAL MOTORS COMPANY

NOTE: The upper brake caliper guide pin is equipped with a bushing.

8. Remove the upper brake caliper guide pin (1).
9. Remove the upper brake caliper guide pin seal (2).

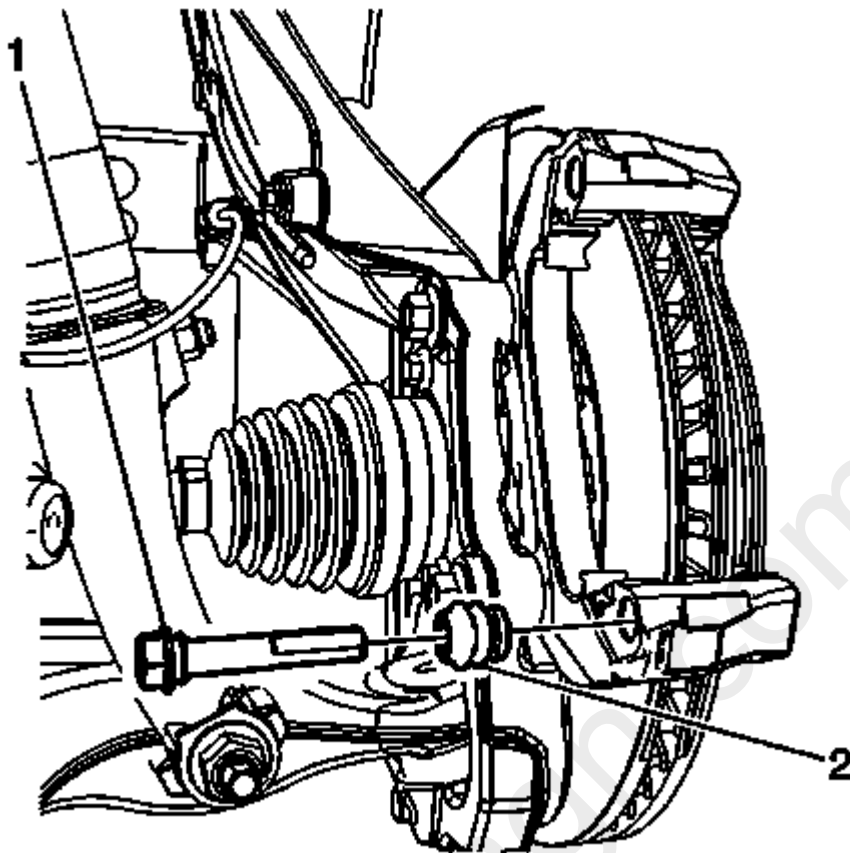


Fig. 119: View of Brake Caliper and Pin
Courtesy of GENERAL MOTORS COMPANY

10. Remove the lower brake caliper guide pin (1).
11. Remove the lower brake caliper guide pin seal (2).

Installation Procedure

1. Inspect the brake caliper guide pins, seals and brake pad springs for damage and/or corrosion. Refer to **Front Disc Brake Mounting and Hardware Inspection.**

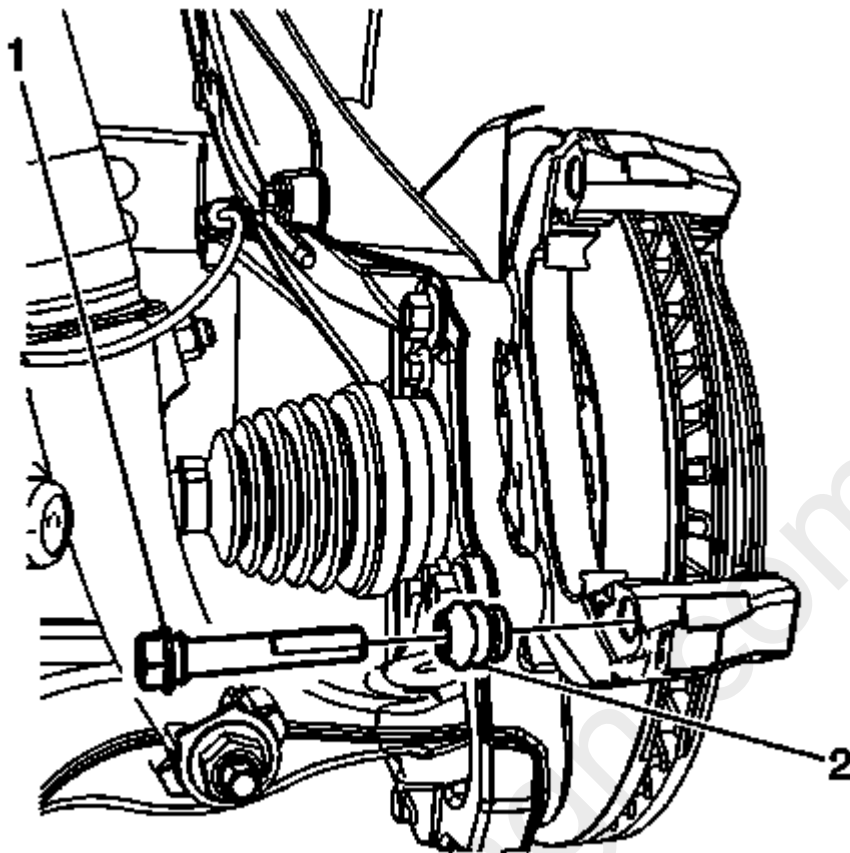


Fig. 120: View of Brake Caliper and Pin
Courtesy of GENERAL MOTORS COMPANY

2. Apply a thin coat of high temperature silicone brake lubricant to the brake caliper guide pin.
3. Install the lower brake caliper guide pin (1) to the guide pin seal (2).

Ensure the guide pin seal is fully seated in the groove of the brake caliper guide pin.

4. Install the lower guide pin and seal to the brake caliper bracket.

Ensure the guide pin seal is fully seated in the groove of the brake caliper bracket.

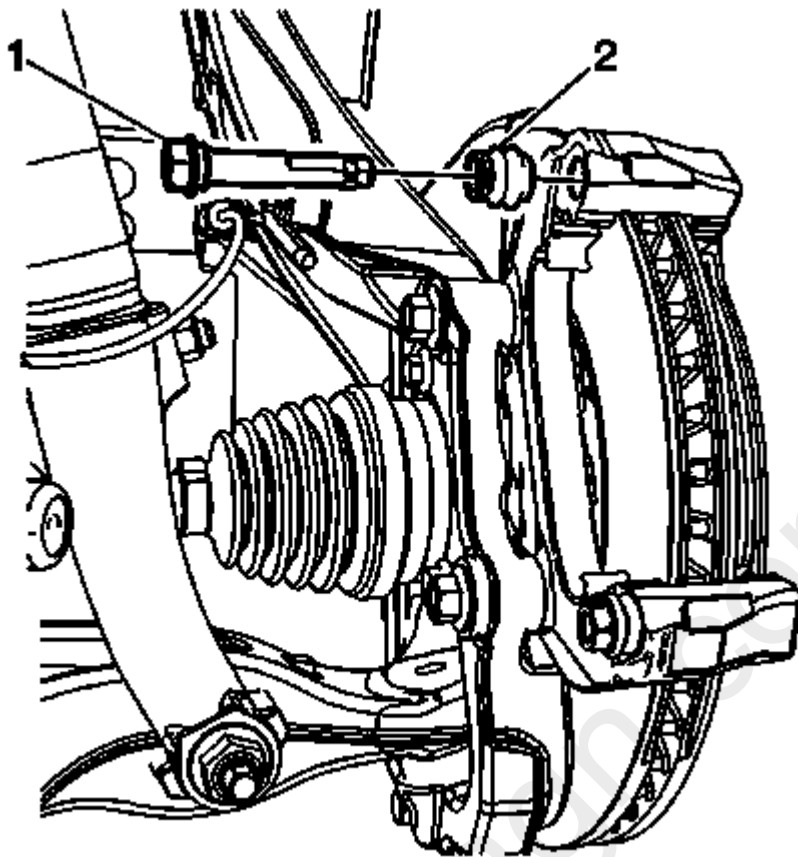


Fig. 121: View of Caliper Guide Pin
Courtesy of GENERAL MOTORS COMPANY

5. Apply a thin coat of high temperature silicone brake lubricant to the brake caliper guide pin.
6. Install the upper brake caliper guide pin (1) to the guide pin seal (2).

Ensure the guide pin seal is fully seated in the groove of the brake caliper guide pin.

7. Install the upper guide pin and seal to the brake caliper bracket.

Ensure the guide pin seal is fully seated in the groove of the brake caliper bracket.

8. Install the brake pad springs.

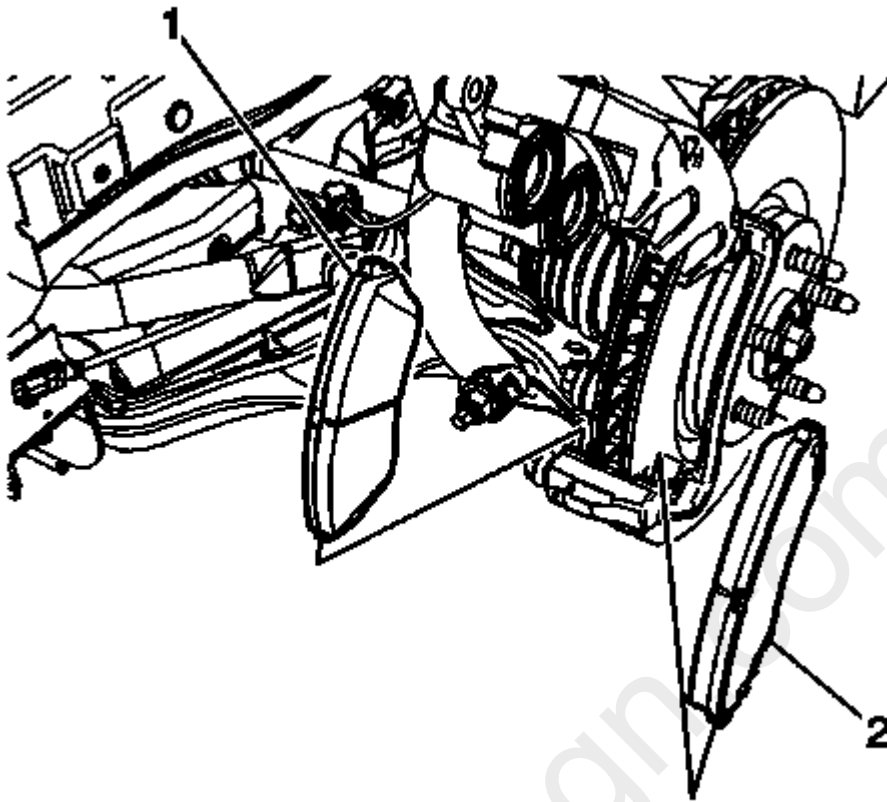


Fig. 122: View of Brake Pads

Courtesy of GENERAL MOTORS COMPANY

9. Install the inner brake pad (1).
10. Install the outer brake pad (2).

NOTE: If reusing the brake caliper guide pin bolt, the threads of the brake caliper guide pin bolt and the threads of the guide pin must be free of residue and debris prior to application of threadlocker in order to ensure proper adhesion and fastener retention.

11. If reusing the caliper pin bolts, prepare the bolts and the guide pins for assembly:
 - Thoroughly clean the residue from the guide pin bolt threads by using denatured alcohol or equivalent and allow to dry.
 - Thoroughly clean the residue from the guide pin threads by using denatured alcohol or equivalent and allow to dry.
12. Apply threadlocker GM P/N 12345493 (Canadian P/N 10953488), or equivalent to 2/3 of the threaded length of the brake caliper guide pin bolts. Ensure there are no gaps in the threadlocker along the length of the filled area of the bolts.
13. Allow the threadlocker to cure approximately 10 minutes before installation.

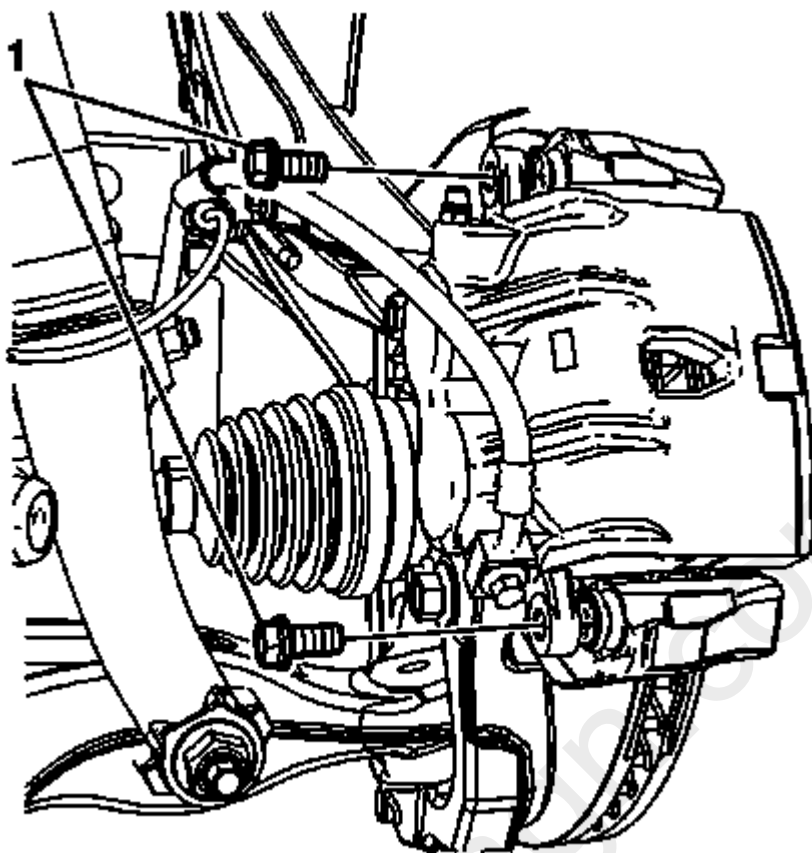


Fig. 123: View of Brake Caliper, Guide and Bolts
Courtesy of GENERAL MOTORS COMPANY

14. Install the brake caliper to the caliper bracket.

CAUTION: Refer to Fastener Caution .

15. Using a backup wrench on the brake caliper guide pins, install the brake caliper guide pin bolts (1) and tighten to 63 N.m (46 lb ft).
16. Install the tire and wheel assembly. Refer to Tire and Wheel Removal and Installation .

FRONT BRAKE CALIPER HARDWARE REPLACEMENT (J56)

Removal Procedure

WARNING: Refer to Brake Dust Warning .

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, no brake fluid needs to be removed from the reservoir before proceeding.
3. If the brake fluid level is higher than midway between the maximum full point and the minimum allowable level, remove brake fluid to the midway point before proceeding.
4. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
5. Remove the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .

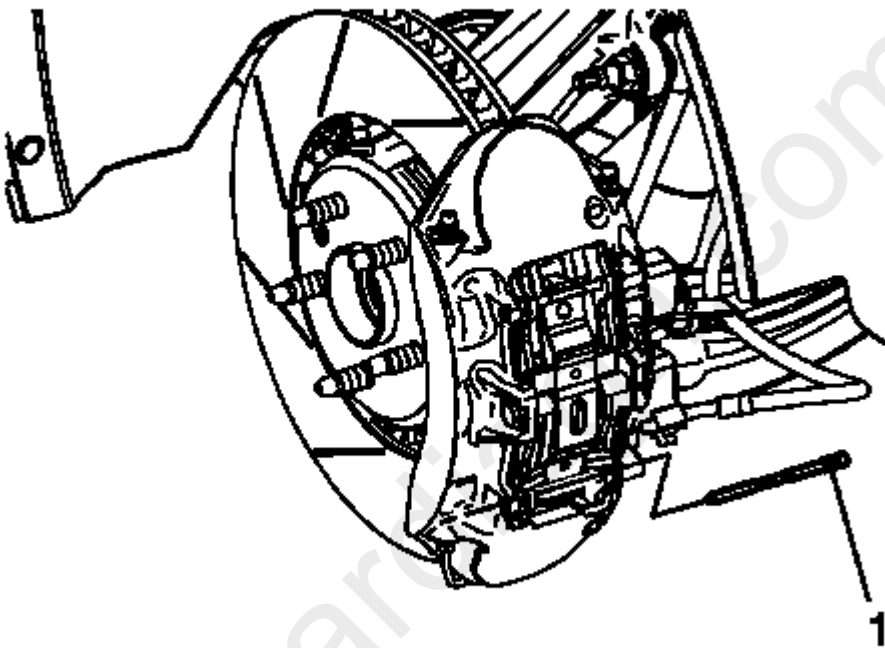


Fig. 124: Identifying Lower Brake Pad Guide Pin
Courtesy of GENERAL MOTORS COMPANY

6. Remove the lower brake pad guide pin (1).

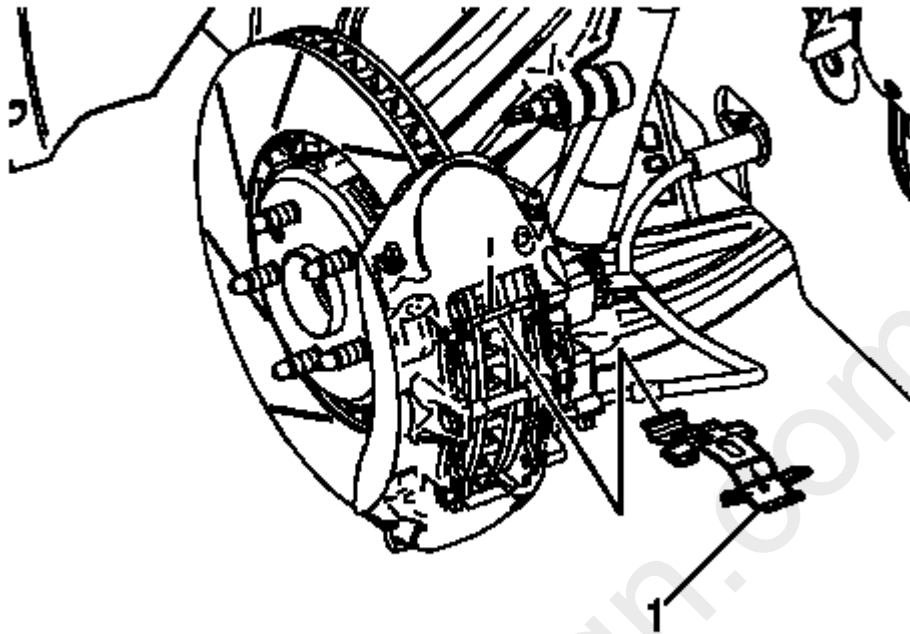


Fig. 125: Identifying Brake Pad Spring
Courtesy of GENERAL MOTORS COMPANY

7. Remove the brake pad spring (1).

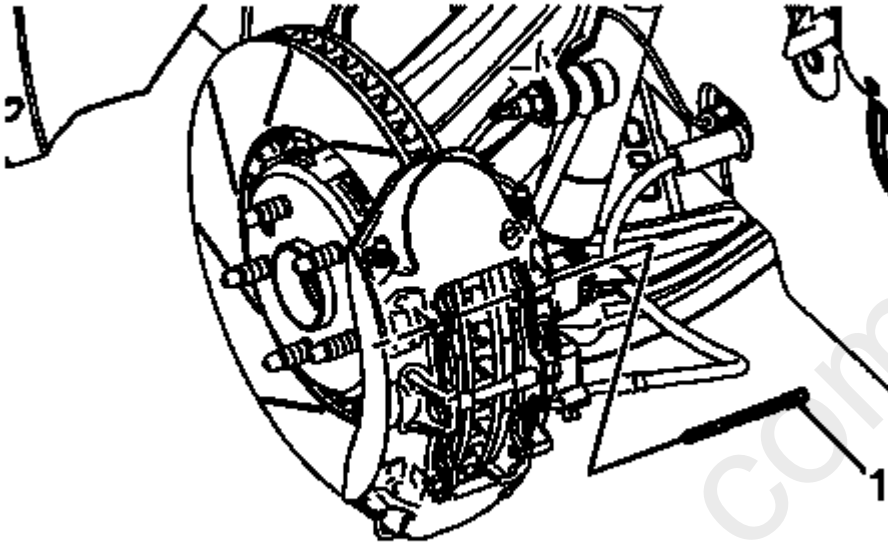


Fig. 126: Identifying Upper Brake Pad Guide Pin
Courtesy of GENERAL MOTORS COMPANY

8. Remove the upper brake pad guide pin (1).

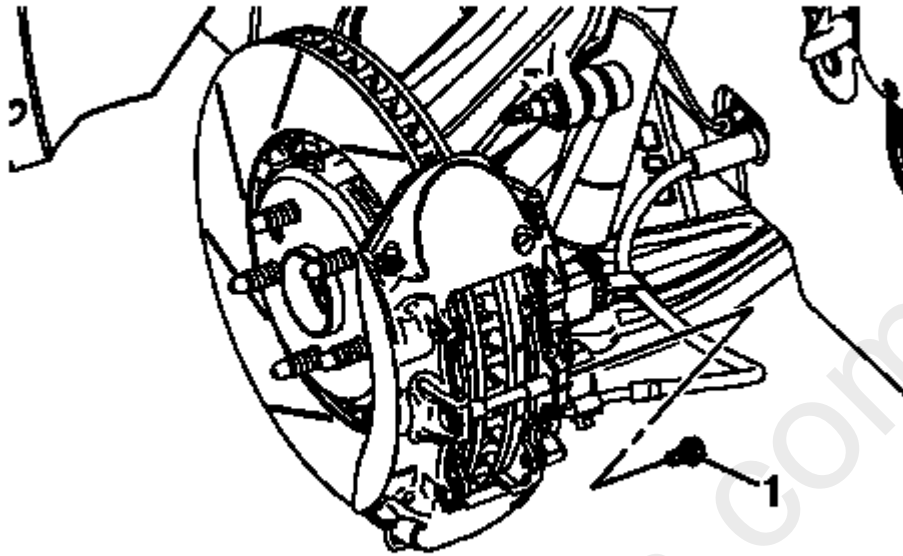


Fig. 127: Identifying Brake Caliper Bridge Pin Bolt
Courtesy of GENERAL MOTORS COMPANY

9. Remove the brake caliper bridge pin bolt (1).

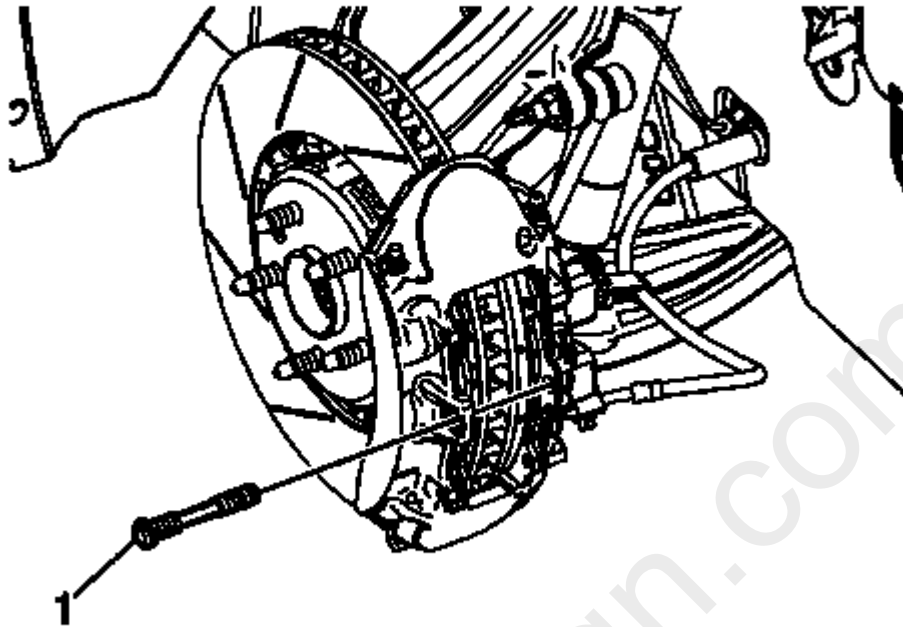


Fig. 128: Identifying Brake Caliper Bridge Pin
Courtesy of GENERAL MOTORS COMPANY

10. Remove the brake caliper bridge pin (1).

Installation Procedure

1. Inspect the brake pad guide pins. If damaged, or corroded replace the guide pin. Do not attempt to clean away any corrosion.
2. Inspect the brake caliper bridge pin and bolt assembly. If damaged, or corroded replace the brake caliper bridge pin and bolt assembly. Do not attempt to clean away any corrosion.
3. Inspect the brake caliper piston boot for damage and/or deterioration, replace if damaged or deteriorated. Refer to **Brake Caliper Inspection**.

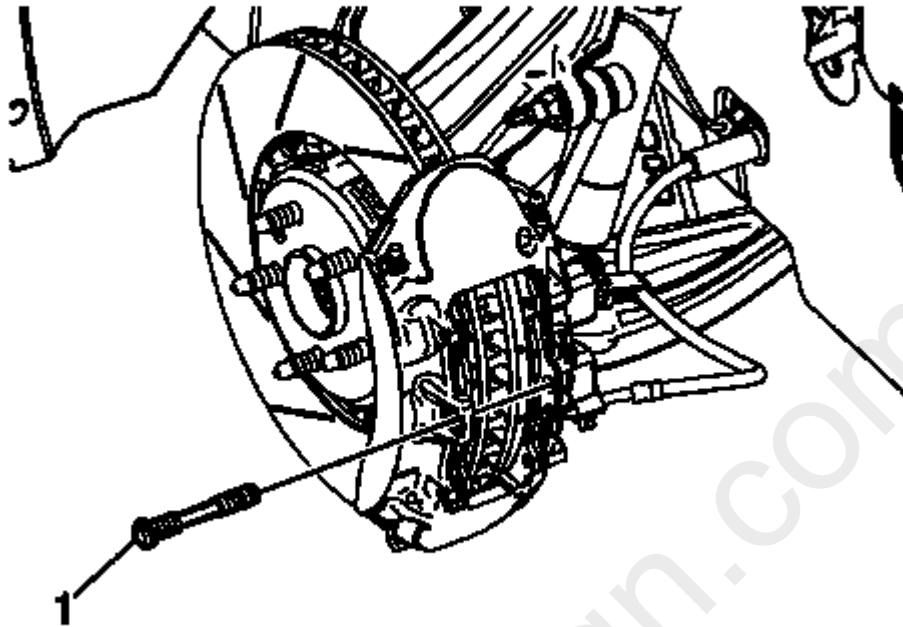


Fig. 129: Identifying Brake Caliper Bridge Pin
Courtesy of GENERAL MOTORS COMPANY

4. Install the brake caliper bridge pin (1).

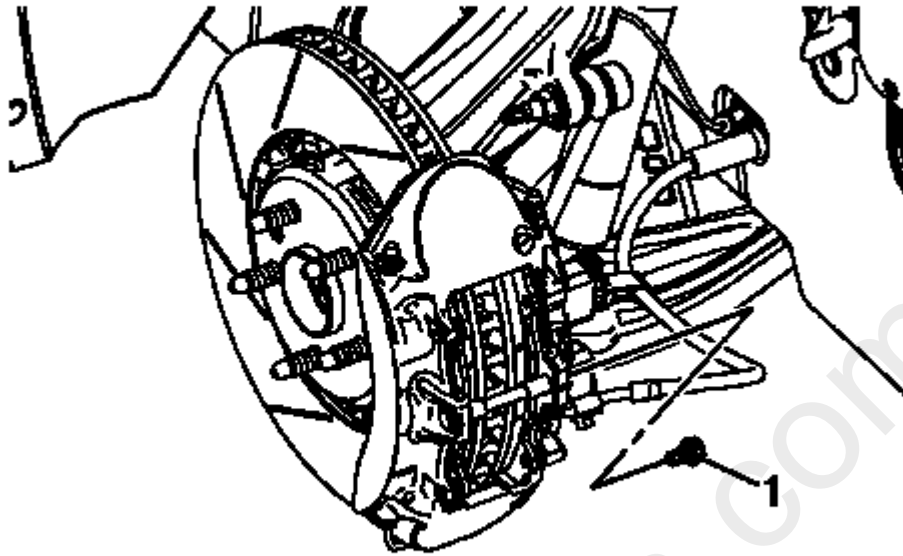


Fig. 130: Identifying Brake Caliper Bridge Pin Bolt
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

5. Install the brake caliper bridge pin bolt (1) and tighten to 33 N.m (24 lb ft).

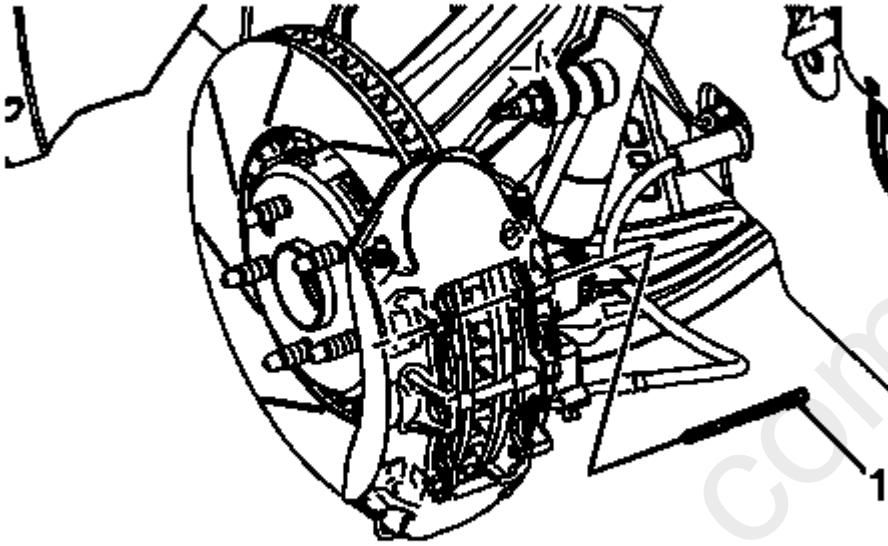


Fig. 131: Identifying Upper Brake Pad Guide Pin
Courtesy of GENERAL MOTORS COMPANY

6. Install the upper brake pad guide pin (1).

Ensure the brake pad guide pin is fully seated in the brake caliper housing.

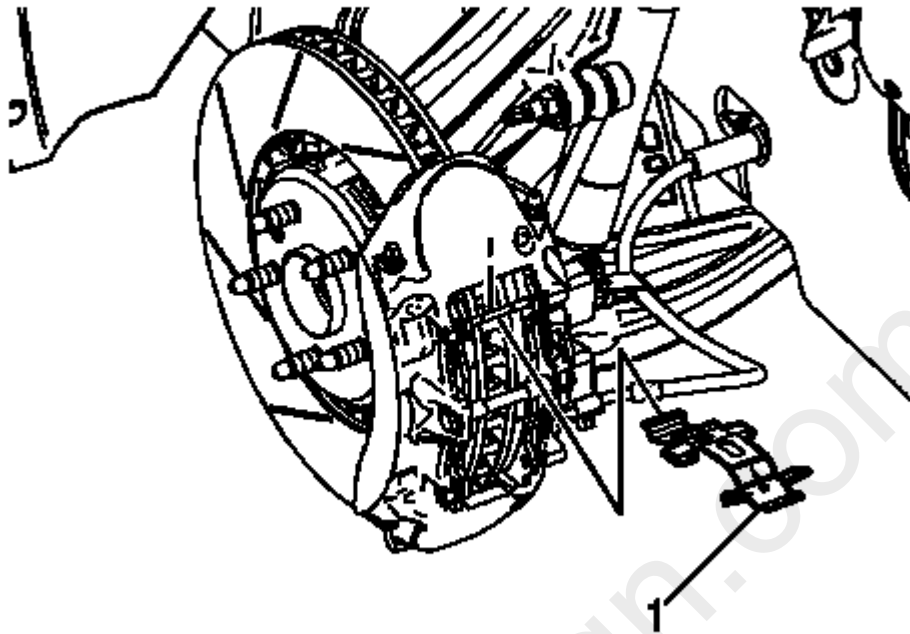


Fig. 132: Identifying Brake Pad Spring
Courtesy of GENERAL MOTORS COMPANY

7. Install the brake pad spring (1).

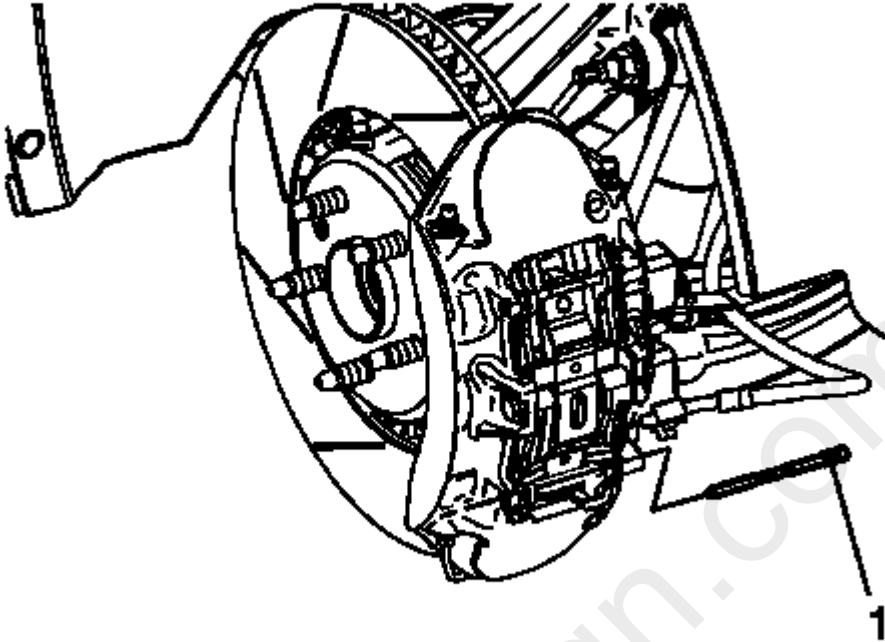


Fig. 133: Identifying Lower Brake Pad Guide Pin
Courtesy of GENERAL MOTORS COMPANY

8. Install the lower brake pad guide pin (1) through the brake caliper and over the edge of the brake pad spring.

Ensure the brake pad guide pin is fully seated in the brake caliper housing.

9. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
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 apply 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** .

REAR BRAKE CALIPER HARDWARE REPLACEMENT (JE5, J55)

Removal Procedure

WARNING: Refer to **Brake Dust Warning** .

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

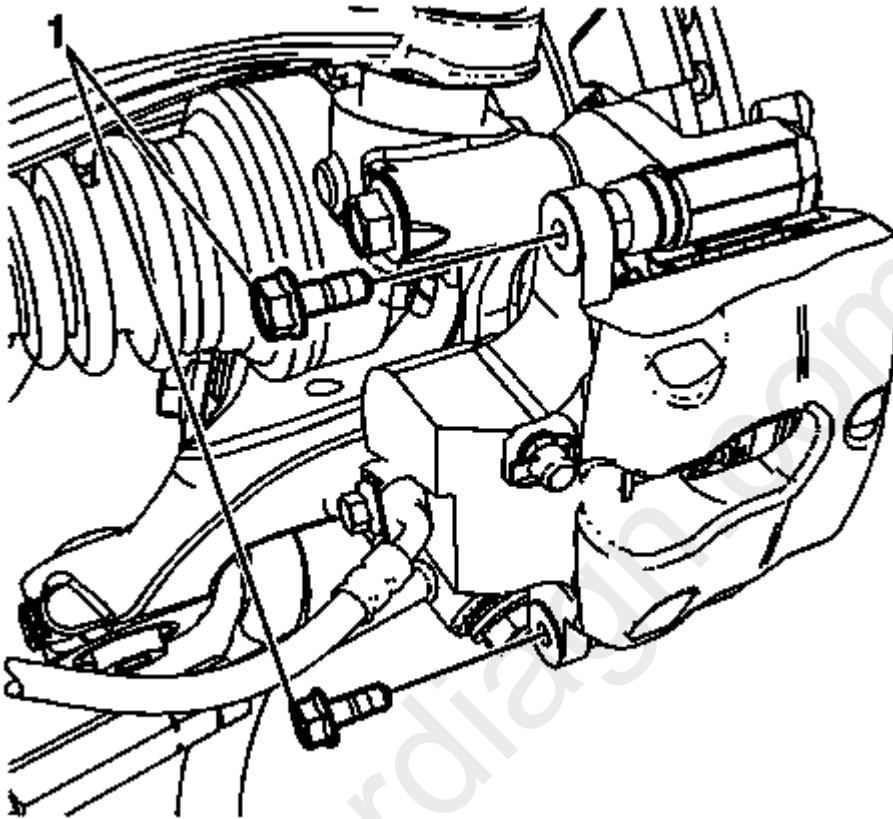


Fig. 134: View of Brake Caliper Guide Pins and Bolts
Courtesy of GENERAL MOTORS COMPANY

3. Using a backup wrench on the brake caliper guide pins, remove the brake caliper guide pin bolts (1).

CAUTION: Support the brake caliper with heavy mechanic 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.

4. Remove the brake caliper and support with heavy mechanics wire or equivalent.

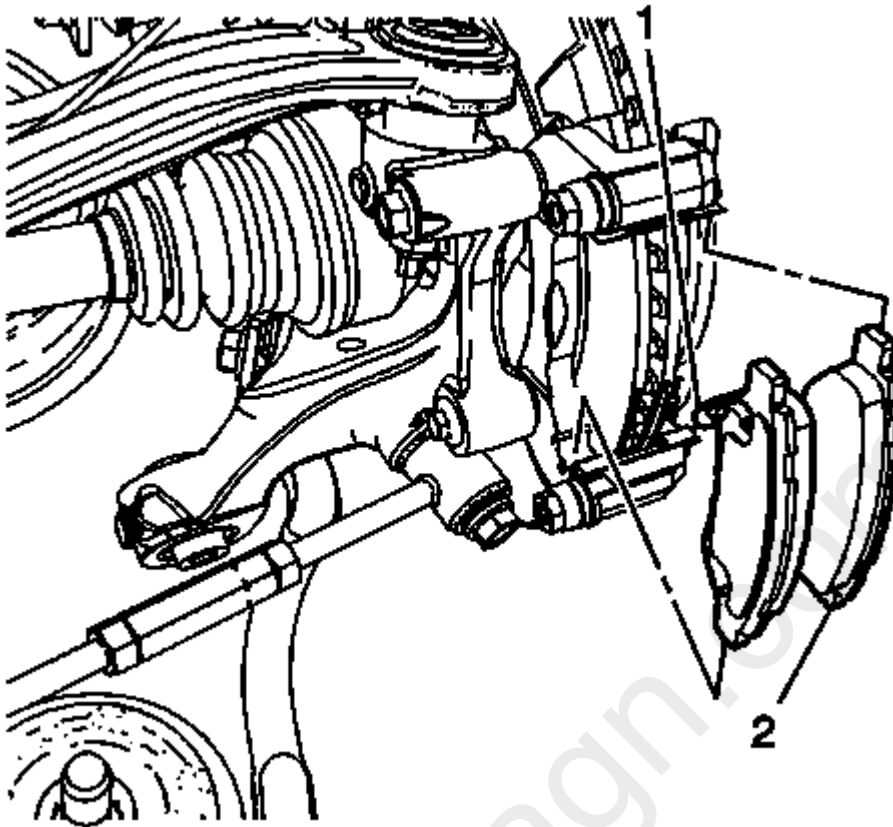


Fig. 135: View of Inner Brake Pad
Courtesy of GENERAL MOTORS COMPANY

5. Remove the inner brake pad (1).
6. Remove the outer brake pad (2).

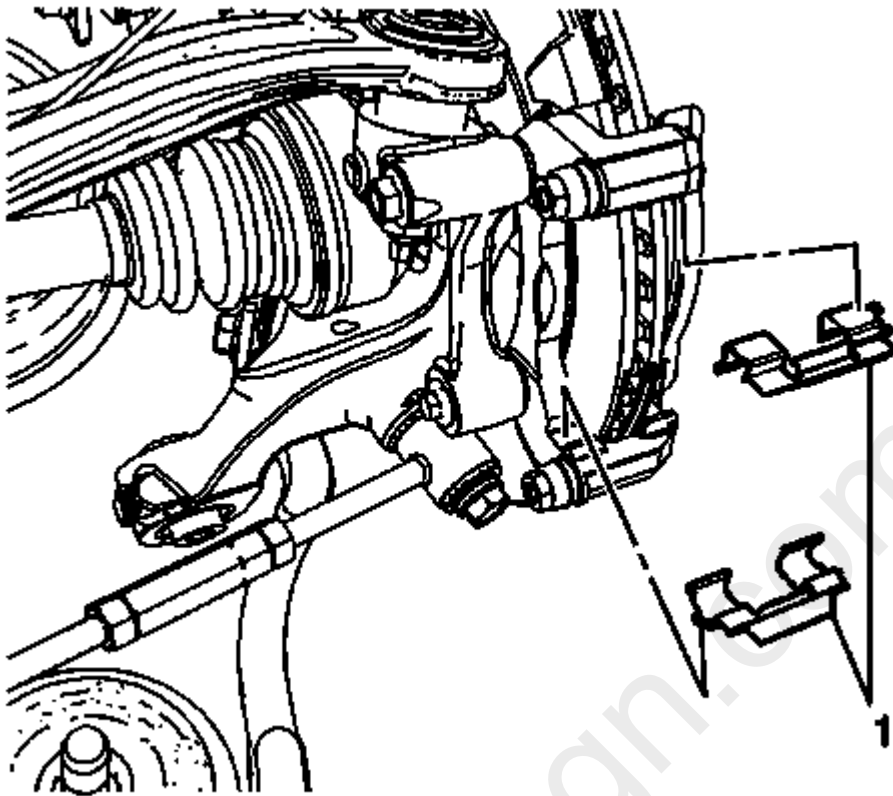


Fig. 136: View of Brake Pad Springs
Courtesy of GENERAL MOTORS COMPANY

7. Remove the brake pad springs (1).

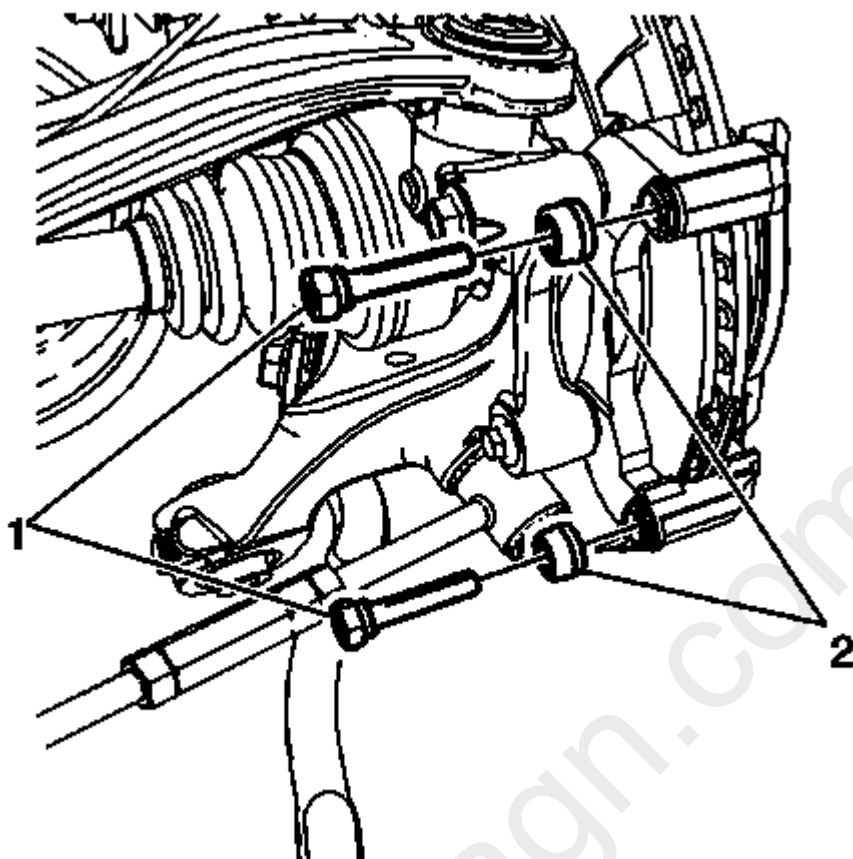


Fig. 137: View of Caliper Guide Pins and Seals
Courtesy of GENERAL MOTORS COMPANY

8. Remove the brake caliper guide pins (1) and seals (2).

Installation Procedure

1. Inspect the brake caliper guide pins, seals and brake pad springs for damage and/or corrosion. Refer to **Rear Disc Brake Mounting and Hardware Inspection.**

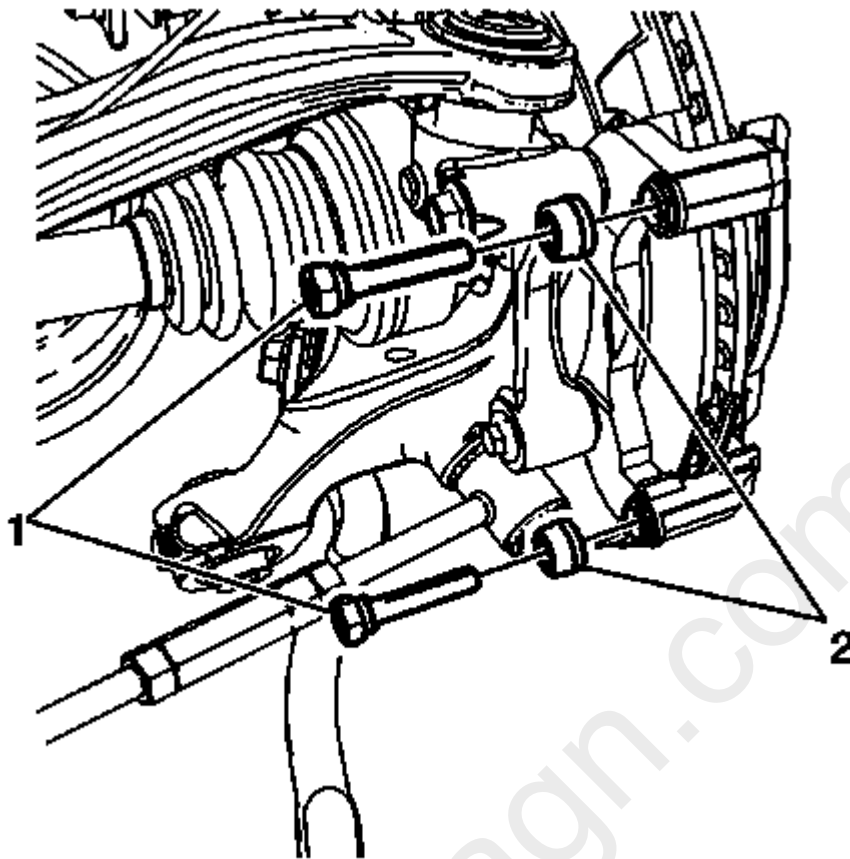


Fig. 138: View of Caliper Guide Pins and Seals
Courtesy of GENERAL MOTORS COMPANY

2. Apply a thin coat of high temperature silicone brake lubricant the brake caliper guide pins.
3. Install the brake caliper guide pins (1) to the guide pin seals (2).

Ensure the guide pin seals are fully seated in the groove of the brake caliper guide pins.

4. Install the brake caliper guide pins and seals to the brake caliper bracket.

Ensure the guide pin seals are fully seated in the groove of the brake caliper bracket.

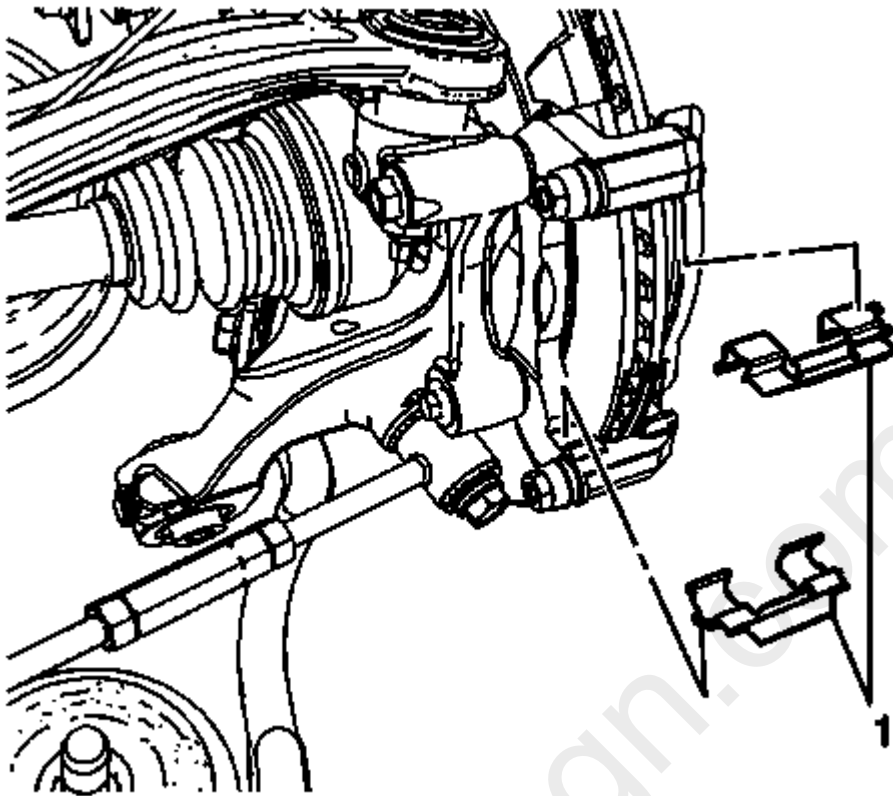


Fig. 139: View of Brake Pad Springs
Courtesy of GENERAL MOTORS COMPANY

5. Install the brake pad springs (1).

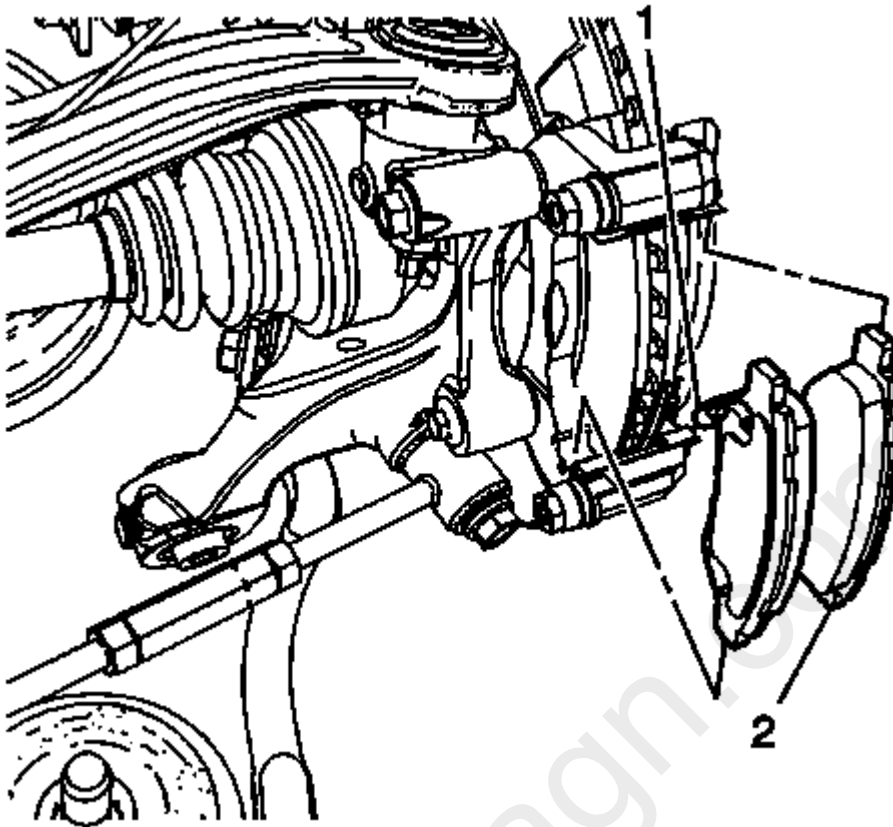


Fig. 140: View of Inner Brake Pad
Courtesy of GENERAL MOTORS COMPANY

6. Install the inner brake pad (1).
7. Install the outer brake pad (2).

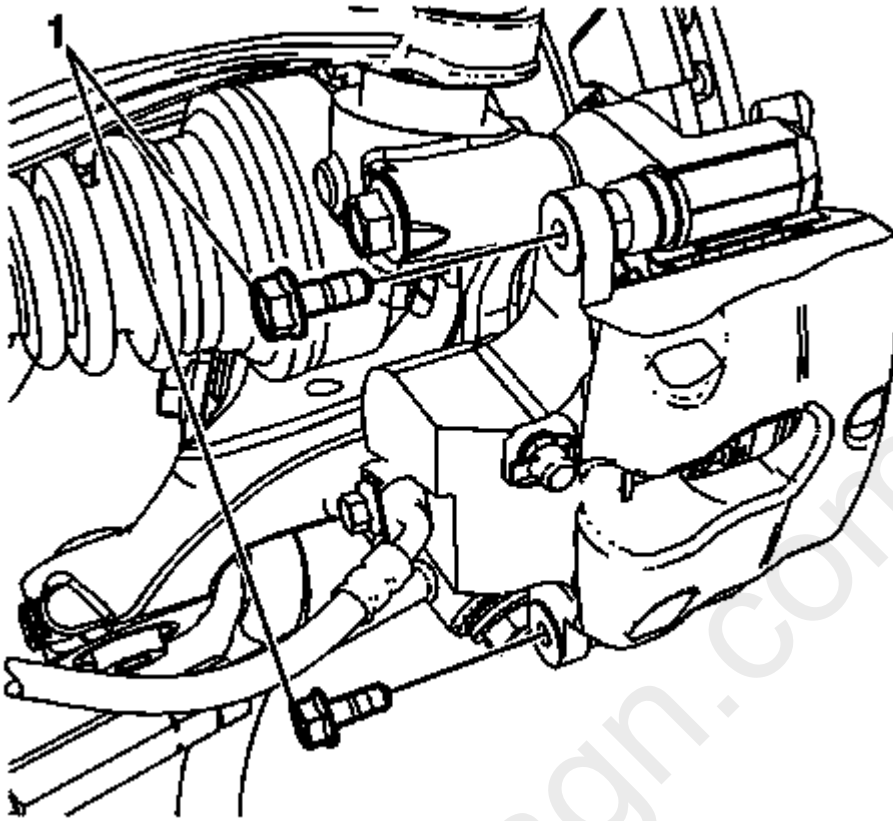


Fig. 141: View of Brake Caliper Guide Pins and Bolts
Courtesy of GENERAL MOTORS COMPANY

8. Install the brake caliper to the brake caliper bracket.
9. Using a backup wrench on the brake caliper guide pins, install the brake caliper guide pin bolts (1).

NOTE: If reusing the brake caliper guide pin bolts, the threads of the brake caliper guide pin bolts and the threads of the guide pins must be free of residue and debris prior to application of threadlocker in order to ensure proper adhesion and fastener retention.

10. If reusing the caliper pin bolts, prepare the bolts and the guide pins for assembly:
 - Thoroughly clean the residue from the guide pin bolt threads by using denatured alcohol or equivalent and allow to dry.
 - Thoroughly clean the residue from the guide pin threads by using denatured alcohol or equivalent and allow to dry.
11. Apply threadlocker GM P/N 12345493 (Canadian P/N 10953488), or equivalent to 2/3 of the threaded length of the brake caliper guide pin bolts. Ensure there are no gaps in the threadlocker along the length of the filled area of the bolts.
12. Allow the threadlocker to cure approximately 10 minutes before installation.

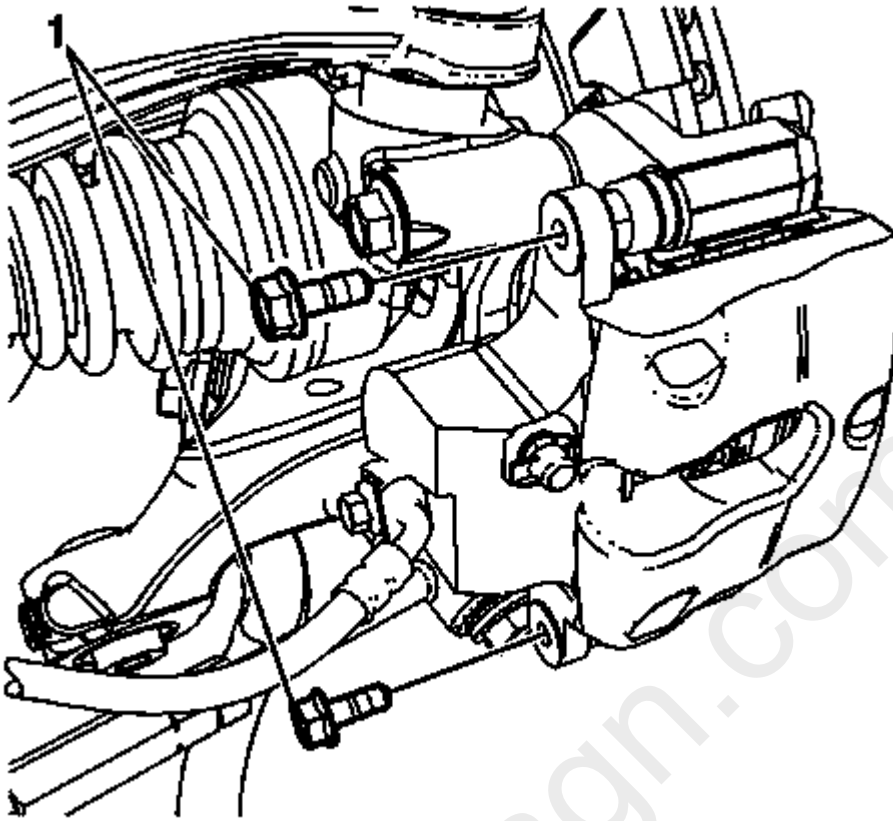


Fig. 142: View of Brake Caliper Guide Pins and Bolts
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

13. Using a backup wrench on the brake caliper guide pins, install the brake caliper guide pin bolts (1) and tighten to 60 N.m (44 lb ft).
14. Install the tire and wheel assembly. Refer to Tire and Wheel Removal and Installation .

REAR BRAKE CALIPER HARDWARE REPLACEMENT (J56)

Removal Procedure

WARNING: Refer to Brake Dust Warning .

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, no brake fluid needs to be removed from the reservoir before proceeding.

3. If the brake fluid level is higher than midway between the maximum full point and the minimum allowable level, remove brake fluid to the midway point before proceeding.
4. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
5. Remove the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .

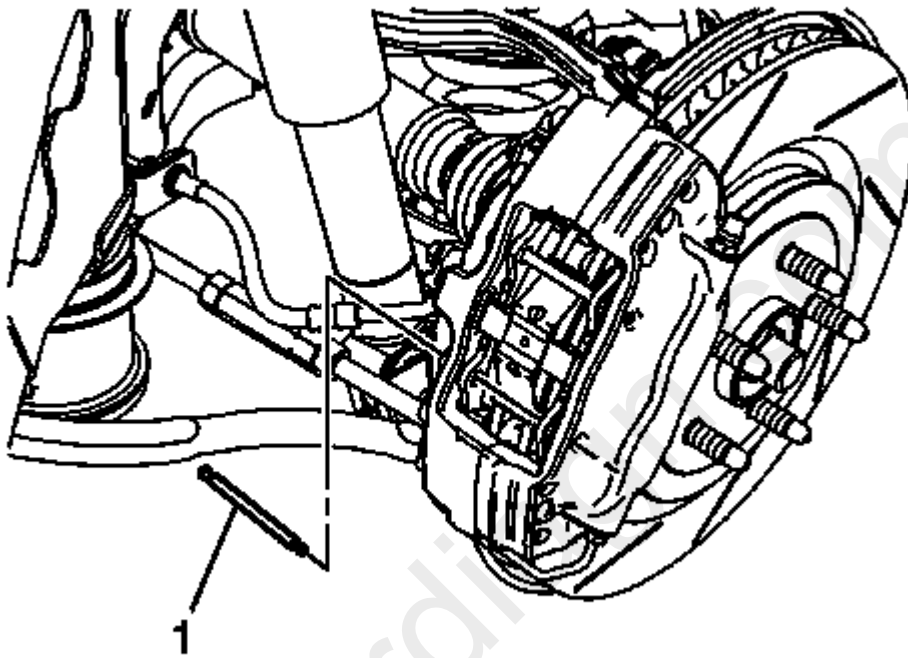


Fig. 143: Identifying Lower Brake Pad Guide Pin
Courtesy of GENERAL MOTORS COMPANY

6. Remove the lower brake pad guide pin (1).

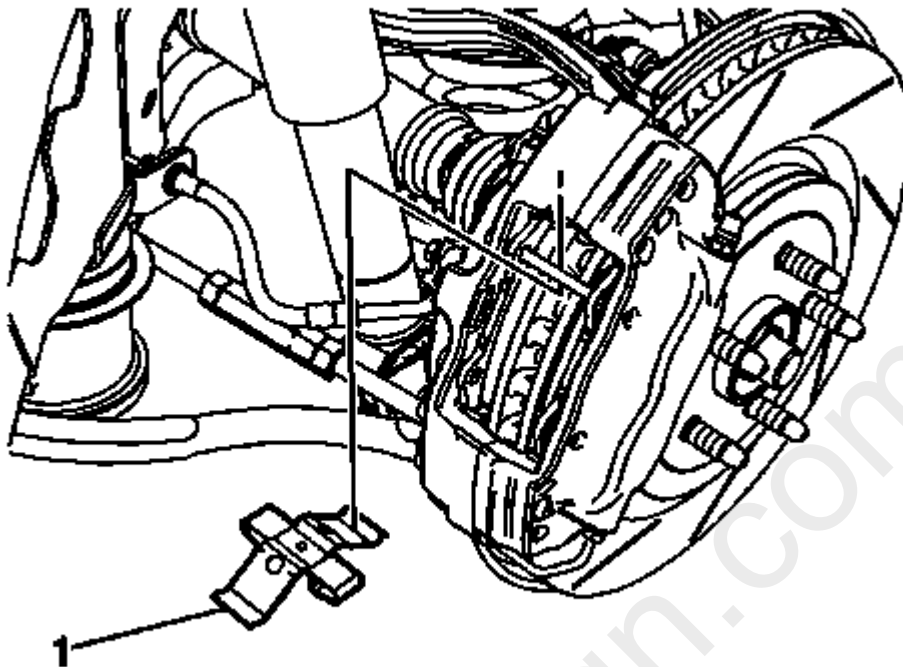


Fig. 144: Identifying Brake Pad Spring
Courtesy of GENERAL MOTORS COMPANY

7. Remove the brake pad spring (1).

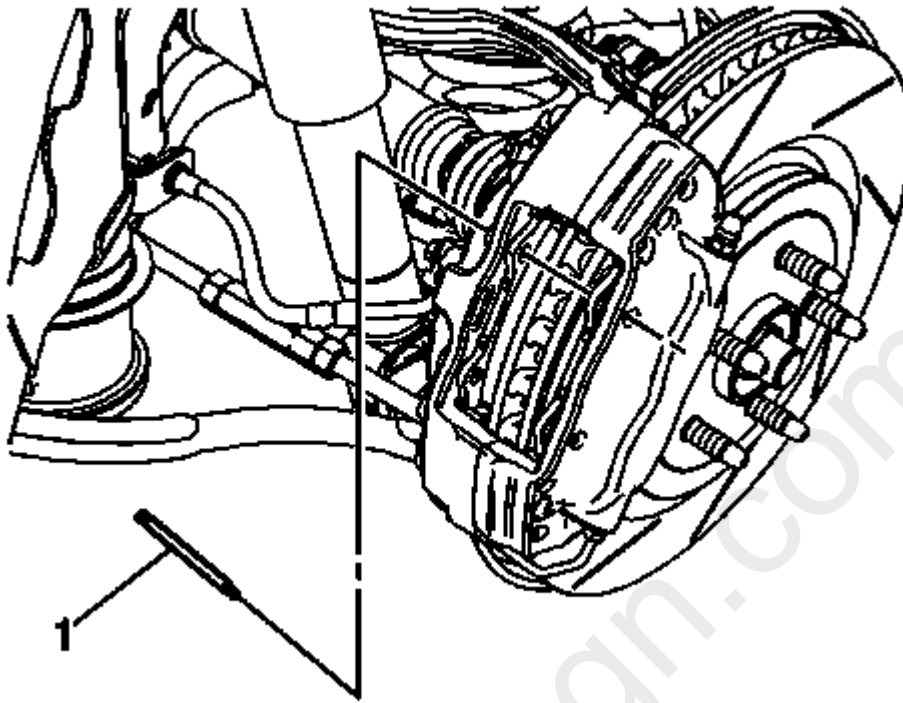


Fig. 145: Identifying Upper Brake Pad Guide Pin
Courtesy of GENERAL MOTORS COMPANY

8. Remove the upper brake pad guide pin (1).

Installation Procedure

1. Inspect the brake pad guide pins. If damaged, or corroded replace the guide pin. Do not attempt to clean away any corrosion.
2. Inspect the brake caliper piston boot for damage and/or deterioration, replace if damaged or deteriorated. Refer to **Brake Caliper Inspection**.

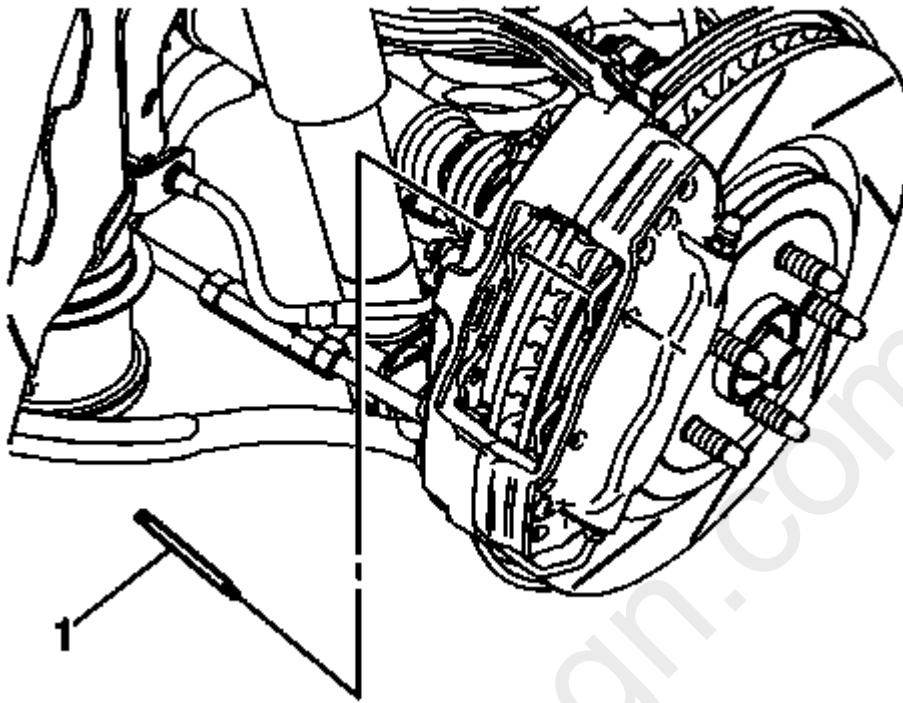


Fig. 146: Identifying Upper Brake Pad Guide Pin
Courtesy of GENERAL MOTORS COMPANY

3. Install the upper brake pad guide pin (1).

Ensure the brake pad guide pin is fully seated in the brake caliper housing.

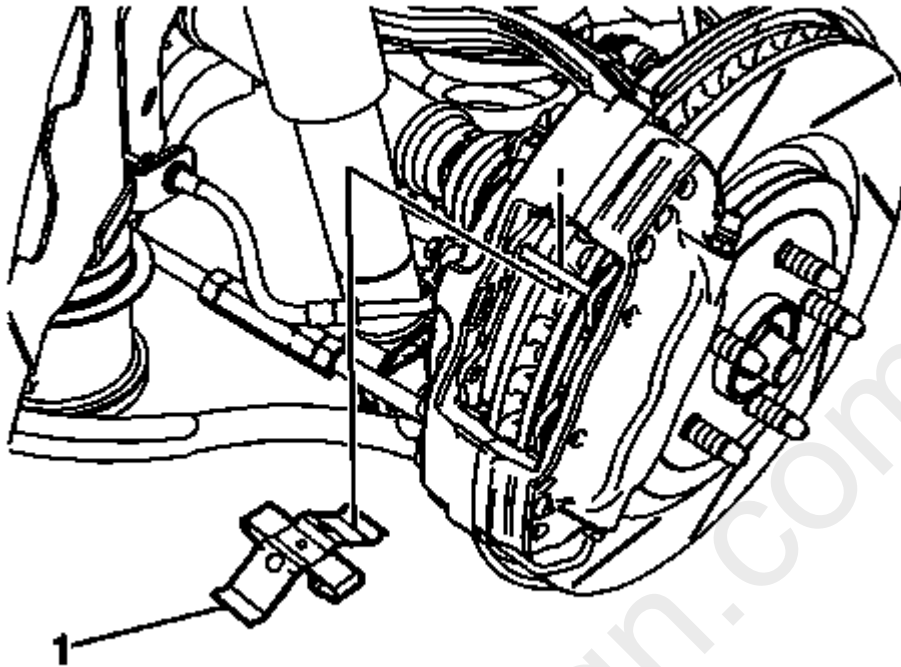


Fig. 147: Identifying Brake Pad Spring
Courtesy of GENERAL MOTORS COMPANY

4. Install the brake pad spring (1).

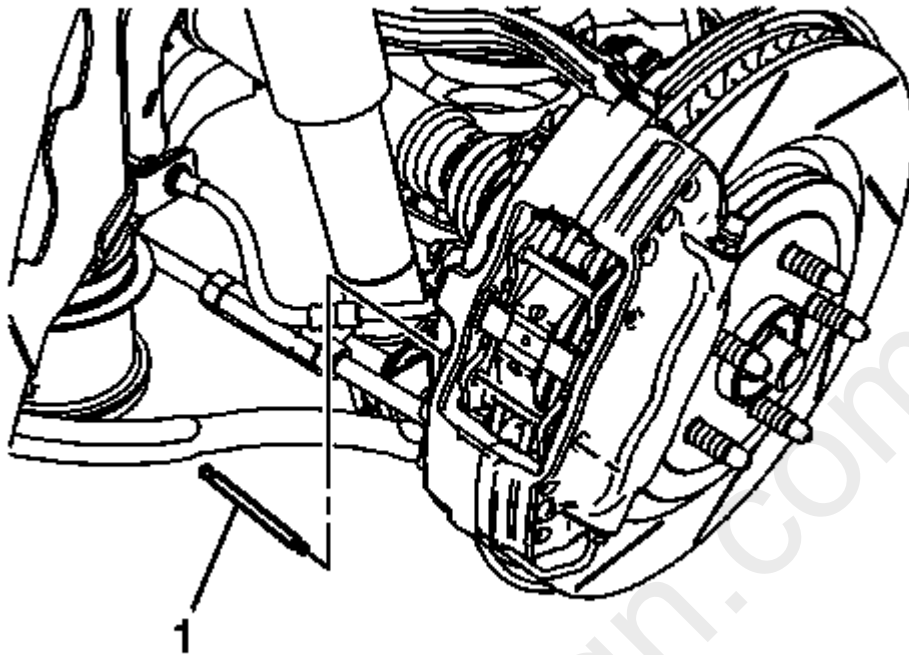


Fig. 148: Identifying Lower Brake Pad Guide Pin
Courtesy of GENERAL MOTORS COMPANY

5. Install the lower brake pad guide pin (1) through the brake caliper and over the edge of the brake pad spring.

Ensure the brake pad guide pin is fully seated in the brake caliper housing.

6. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
7. With the engine OFF, gradually apply the brake pedal to approximately 2/3 of its travel distance.
8. Slowly release the brake pedal.
9. Wait 15 seconds, then repeat steps 7 and 8 until a firm brake pedal apply is obtained; this will properly seat the brake caliper pistons and brake pads.
10. Fill the brake master cylinder reservoir to the proper level. Refer to **Master Cylinder Reservoir Filling** .

FRONT BRAKE CALIPER BRACKET REPLACEMENT (RWD)

Removal Procedure

WARNING: Refer to **Brake Dust Warning** .

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

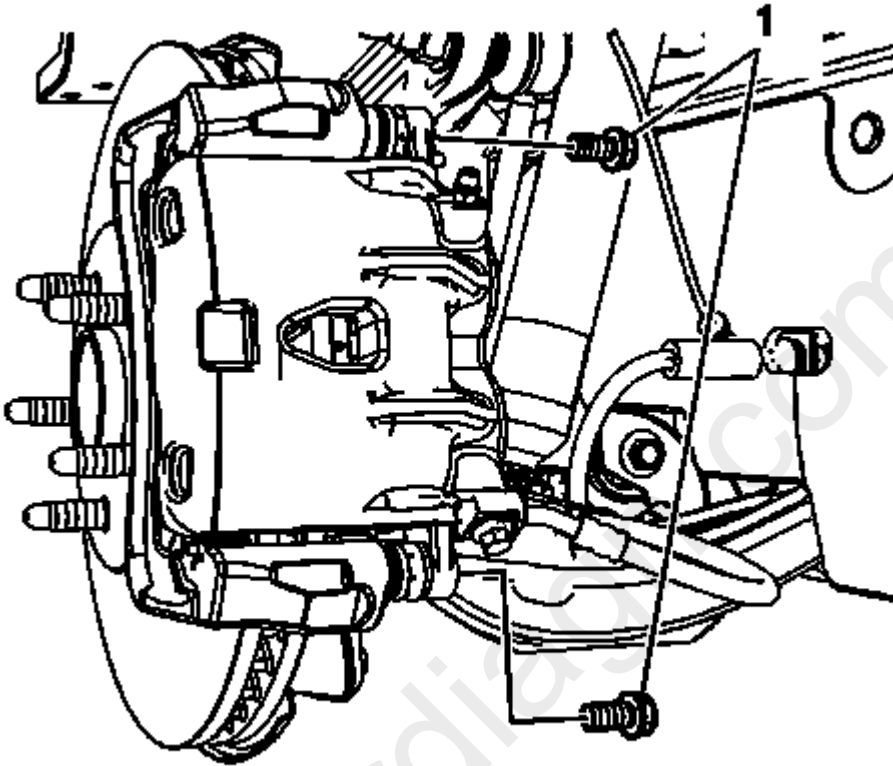


Fig. 149: Identifying Bolts and Caliper Pin
Courtesy of GENERAL MOTORS COMPANY

3. Using a backup wrench on the brake caliper guide pins, remove the guide pin bolts (1).

CAUTION: Support the brake caliper with heavy mechanic 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.

4. Remove the brake caliper and support with heavy mechanics wire or equivalent.

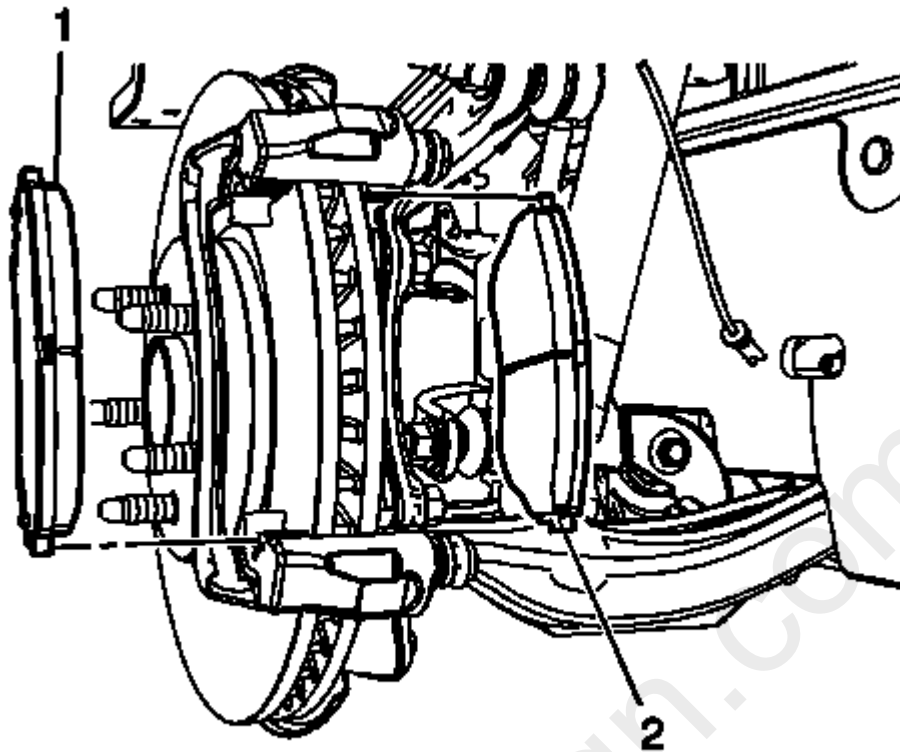


Fig. 150: View of Brake Pads and Rotor
Courtesy of GENERAL MOTORS COMPANY

5. Remove the outer brake pad (1).
6. Remove the inner brake pad (2).
7. Remove the brake pad springs.

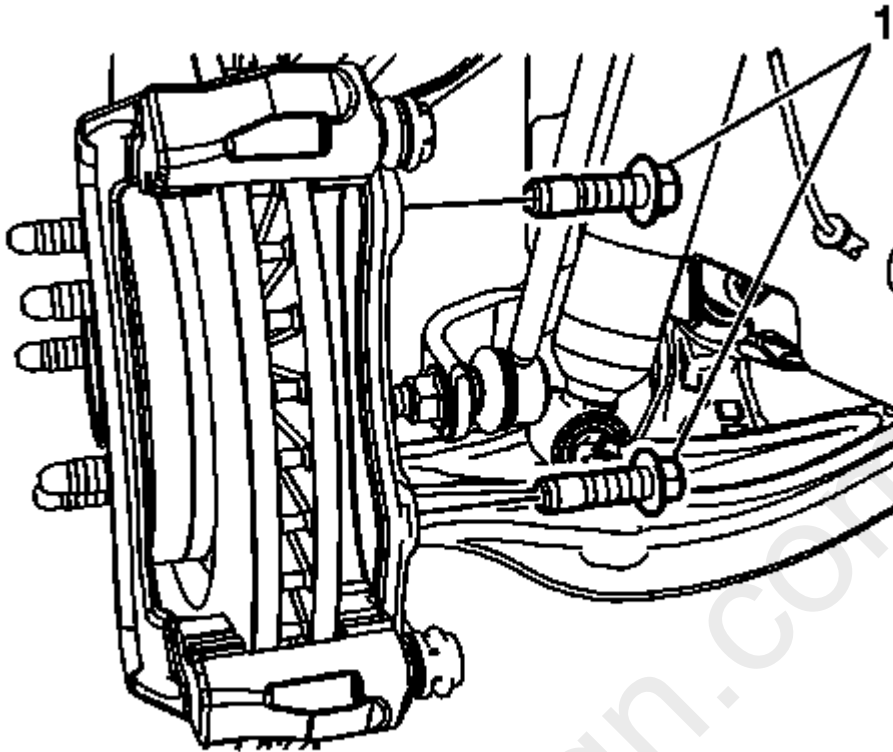


Fig. 151: View of Caliper Bracket Bolts
Courtesy of GENERAL MOTORS COMPANY

8. Remove the brake caliper bracket bolts (1).

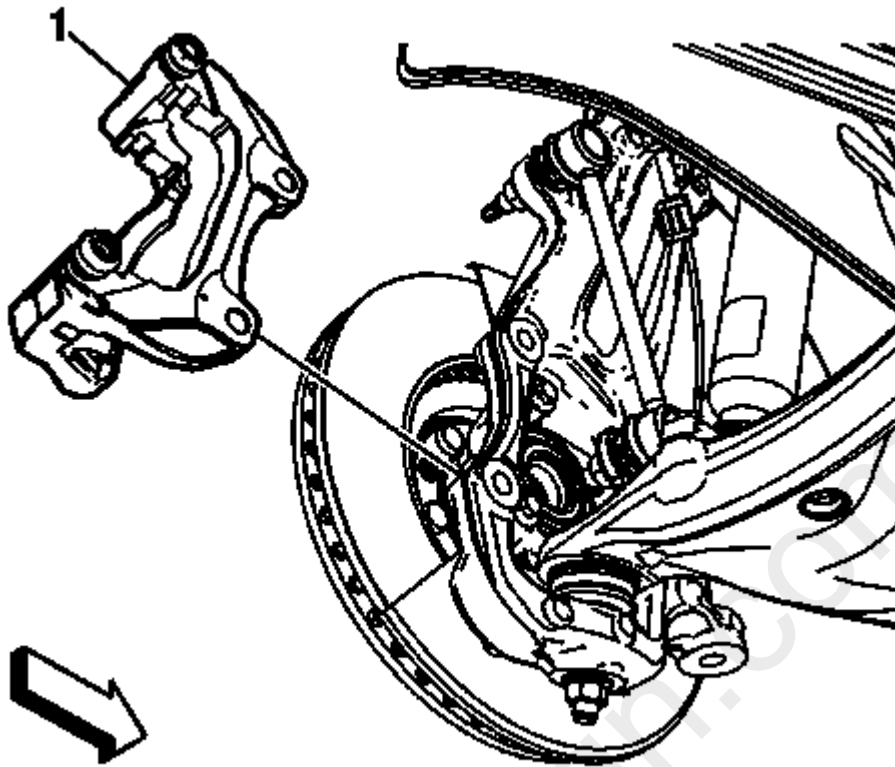


Fig. 152: View of Caliper Bracket and Rotor
Courtesy of GENERAL MOTORS COMPANY

9. Remove the brake caliper bracket (1).
10. Inspect the disc brake hardware. Refer to **Front Disc Brake Mounting and Hardware Inspection.**

Installation Procedure

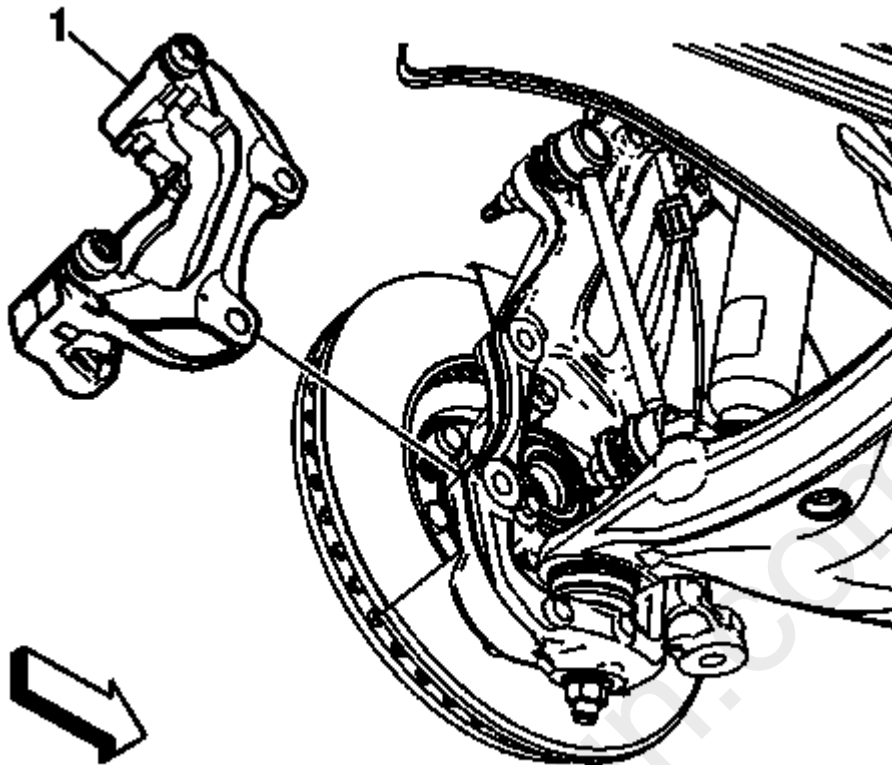


Fig. 153: View of Caliper Bracket and Rotor
Courtesy of GENERAL MOTORS COMPANY

1. Install the brake caliper bracket (1).

NOTE: If reusing the caliper bracket bolts the threads of the caliper bracket bolts and the threads of the knuckle mounting holes must be free of residue and debris prior to application of threadlocker in order to ensure proper adhesion and fastener retention.

2. Prepare the bolts and the threaded holes for assembly:
 - Thoroughly clean the residue from the bolt threads by using denatured alcohol or equivalent and allow to dry.
 - Thoroughly clean the residue from the threaded holes by using denatured alcohol or equivalent and allow to dry.
 - Apply threadlocker GM P/N 12345493 (Canada P/N 10953488), or equivalent to 2/3 of the threaded length of the lower caliper bracket bolts. Ensure there are no gaps in the threadlocker along the length of the filled area of the bolts.
 - Allow the threadlocker to cure approximately 10 minutes before installation.

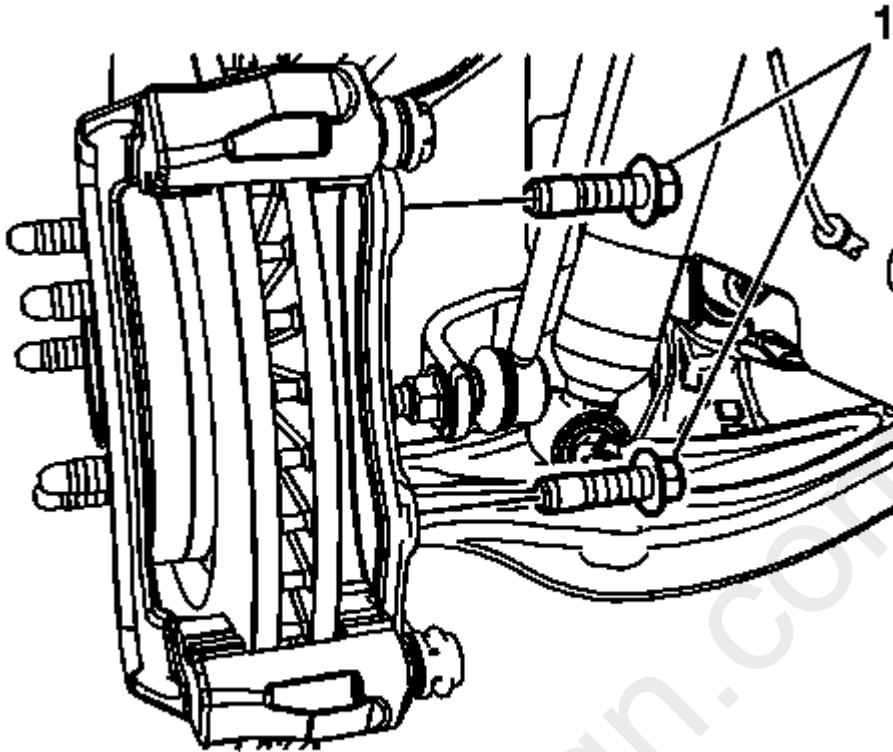


Fig. 154: View of Caliper Bracket Bolts
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

3. Install the brake caliper bracket bolts (1) and tighten to 230 N.m (170 lb ft).
4. Install the brake pad springs.

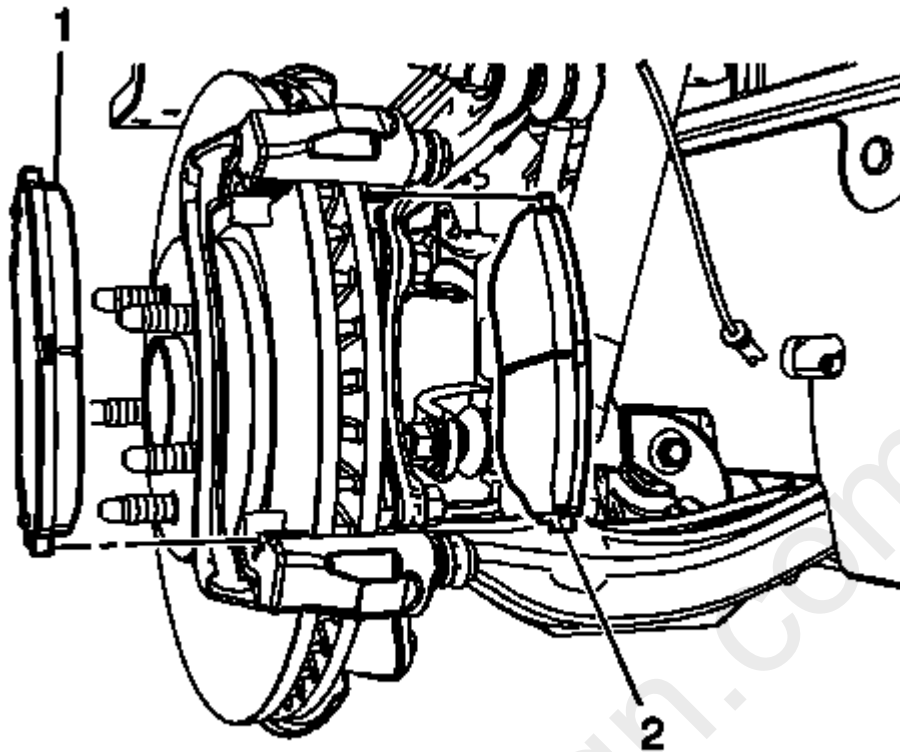


Fig. 155: View of Brake Pads and Rotor
Courtesy of GENERAL MOTORS COMPANY

5. Install the outer brake pad (1).
6. Install the inner brake pad (2).

NOTE: If reusing the caliper bracket bolts the threads of the caliper bracket bolts and the threads of the knuckle mounting holes must be free of residue and debris prior to application of threadlocker in order to ensure proper adhesion and fastener retention.

7. Prepare the bolts and the threaded holes for assembly:
 - Thoroughly clean the residue from the bolt threads by using denatured alcohol or equivalent and allow to dry.
 - Thoroughly clean the residue from the threaded holes by using denatured alcohol or equivalent and allow to dry.
 - Apply threadlocker GM P/N 12345493 (Canada P/N 10953488), or equivalent to 2/3 of the threaded length of the lower caliper bracket bolts. Ensure there are no gaps in the threadlocker along the length of the filled area of the bolts.
 - Allow the threadlocker to cure approximately 10 minutes before installation.

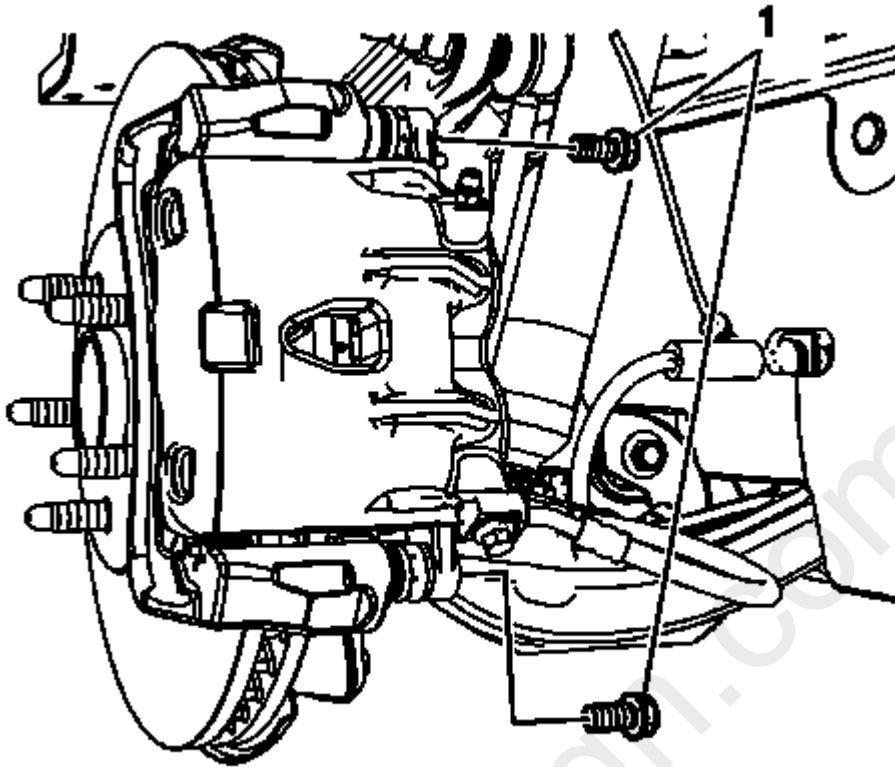


Fig. 156: Identifying Bolts and Caliper Pin
Courtesy of GENERAL MOTORS COMPANY

8. Install the brake caliper to the caliper bracket.
9. Using a backup wrench on the brake caliper guide pins, install the guide pin bolts (1) and tighten to 63 N.m (46 lb ft).
10. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .

FRONT BRAKE CALIPER BRACKET REPLACEMENT (AWD)

Removal Procedure

WARNING: Refer to **Brake Dust Warning** .

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

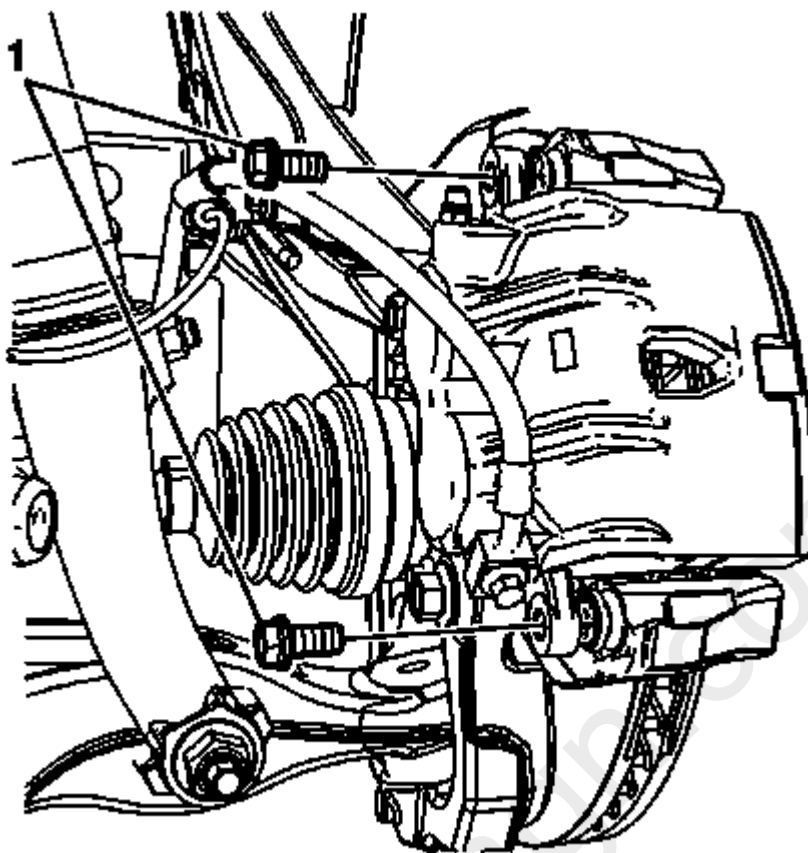


Fig. 157: View of Brake Caliper, Guide and Bolts
Courtesy of GENERAL MOTORS COMPANY

3. Using a backup wrench on the brake caliper guide pins, remove the guide pin bolts (1).

CAUTION: Support the brake caliper with heavy mechanic 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.

4. Remove the brake caliper and support with heavy mechanics wire or equivalent.

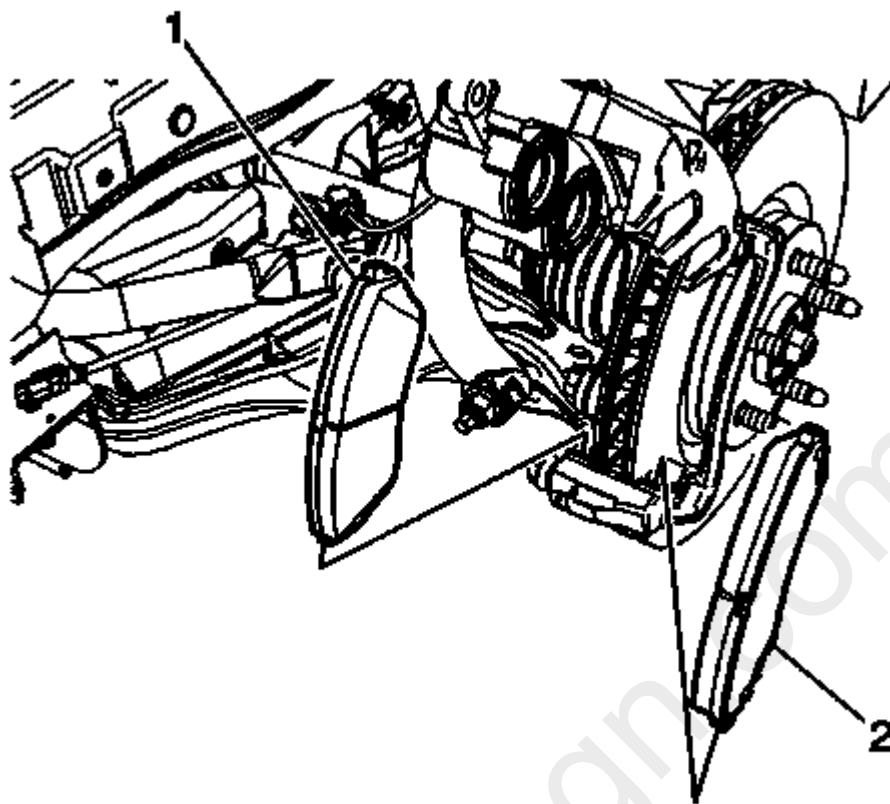


Fig. 158: View of Brake Pads

Courtesy of GENERAL MOTORS COMPANY

5. Remove the inner brake pad (1).
6. Remove the outer brake pad (2).
7. Remove the brake pad springs.

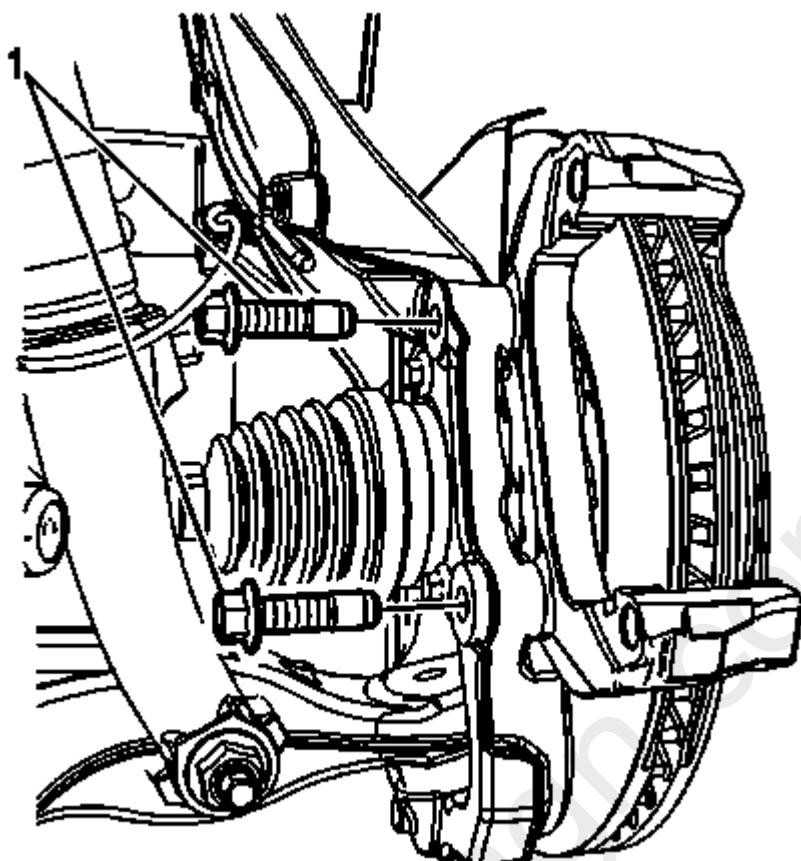


Fig. 159: View of Caliper Bracket Bolts
Courtesy of GENERAL MOTORS COMPANY

8. Remove the brake caliper bracket bolts (1).

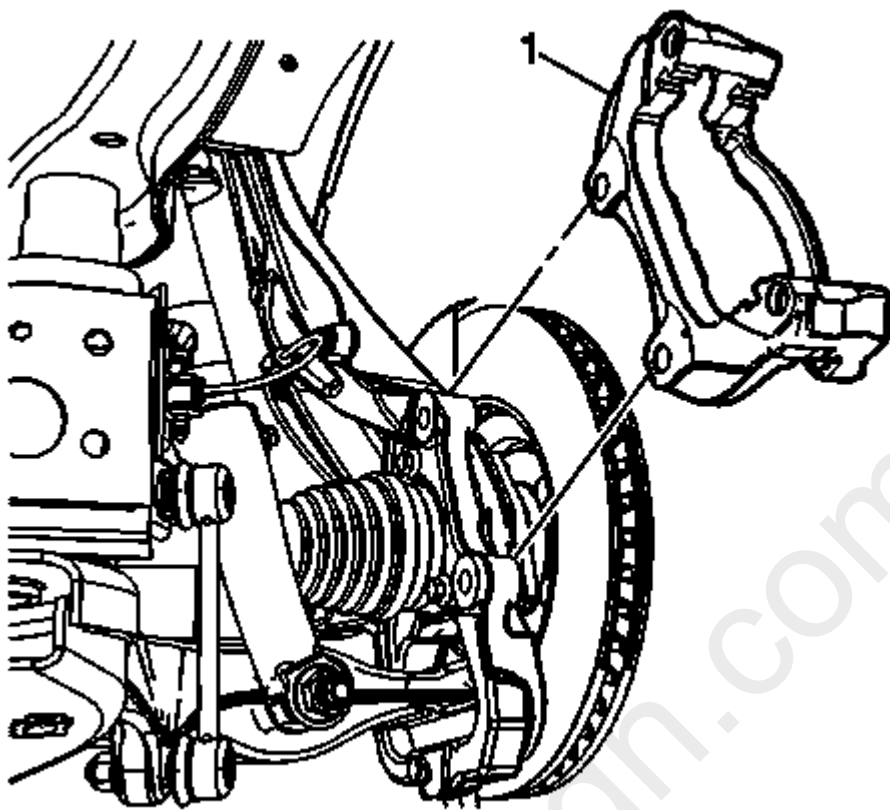


Fig. 160: View of Caliper Bracket
Courtesy of GENERAL MOTORS COMPANY

9. Remove the brake caliper bracket (1).
10. Inspect the disc brake hardware. Refer to **Front Disc Brake Mounting and Hardware Inspection.**

Installation Procedure

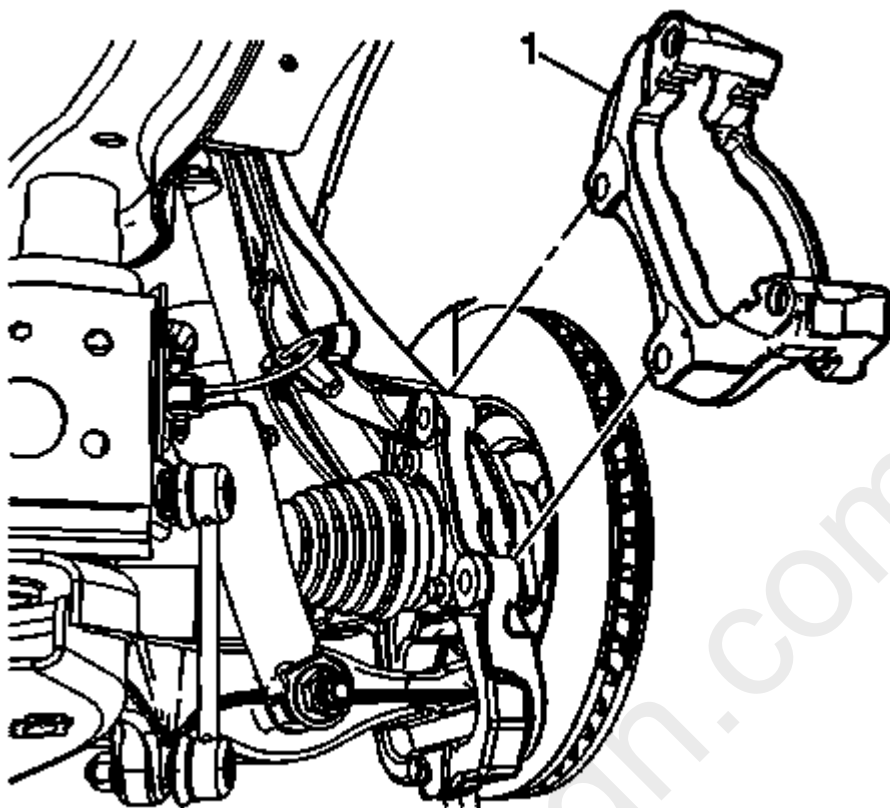


Fig. 161: View of Caliper Bracket
Courtesy of GENERAL MOTORS COMPANY

1. Install the brake caliper bracket (1).

NOTE: If reusing the caliper bracket bolts the threads of the caliper bracket bolts and the threads of the knuckle mounting holes must be free of residue and debris prior to application of threadlocker in order to ensure proper adhesion and fastener retention.

2. Prepare the bolts and the threaded holes for assembly:
 - Thoroughly clean the residue from the bolt threads by using denatured alcohol or equivalent and allow to dry.
 - Thoroughly clean the residue from the threaded holes by using denatured alcohol or equivalent and allow to dry.
 - Apply threadlocker GM P/N 12345493 (Canada P/N 10953488), or equivalent to 2/3 of the threaded length of the lower caliper bracket bolts. Ensure there are no gaps in the threadlocker along the length of the filled area of the bolts.
 - Allow the threadlocker to cure approximately 10 minutes before installation.

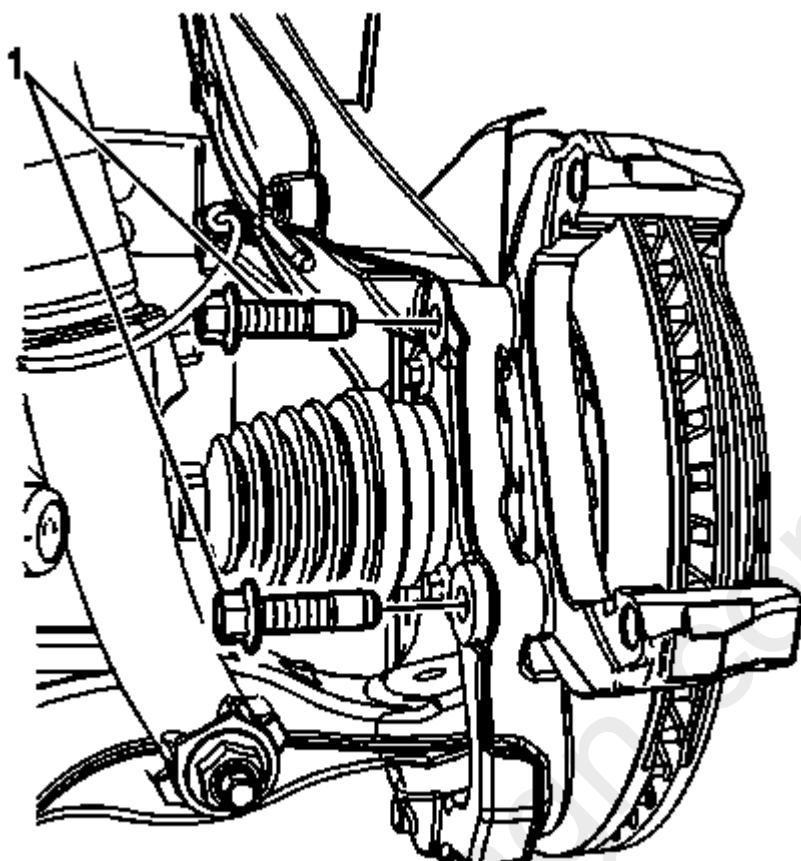


Fig. 162: View of Caliper Bracket Bolts
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

3. Install the brake caliper bracket bolts (1) and tighten to 230 N.m (170 lb ft).
4. Install the brake pad springs.

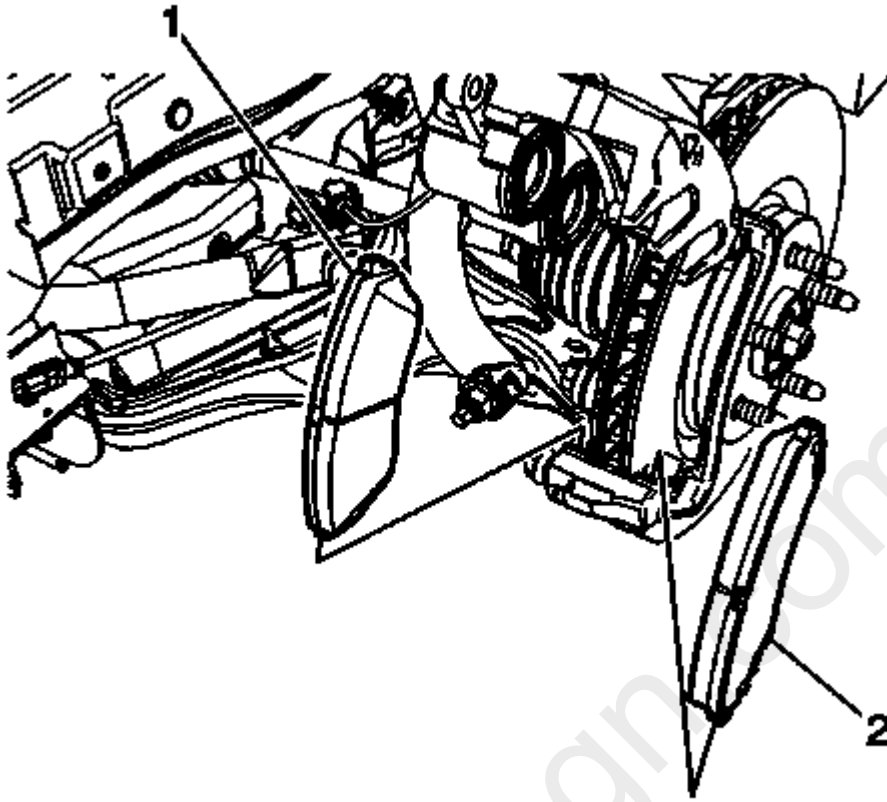


Fig. 163: View of Brake Pads

Courtesy of GENERAL MOTORS COMPANY

5. Install the inner brake pad (1).
6. Install the outer brake pad (2).

NOTE: If reusing the caliper bracket bolts the threads of the caliper bracket bolts and the threads of the knuckle mounting holes must be free of residue and debris prior to application of threadlocker in order to ensure proper adhesion and fastener retention.

7. Prepare the bolts and the threaded holes for assembly:
 - Thoroughly clean the residue from the bolt threads by using denatured alcohol or equivalent and allow to dry.
 - Thoroughly clean the residue from the threaded holes by using denatured alcohol or equivalent and allow to dry.
 - Apply threadlocker GM P/N 12345493 (Canada P/N 10953488), or equivalent to 2/3 of the threaded length of the lower caliper bracket bolts. Ensure there are no gaps in the threadlocker along the length of the filled area of the bolts.
 - Allow the threadlocker to cure approximately 10 minutes before installation.

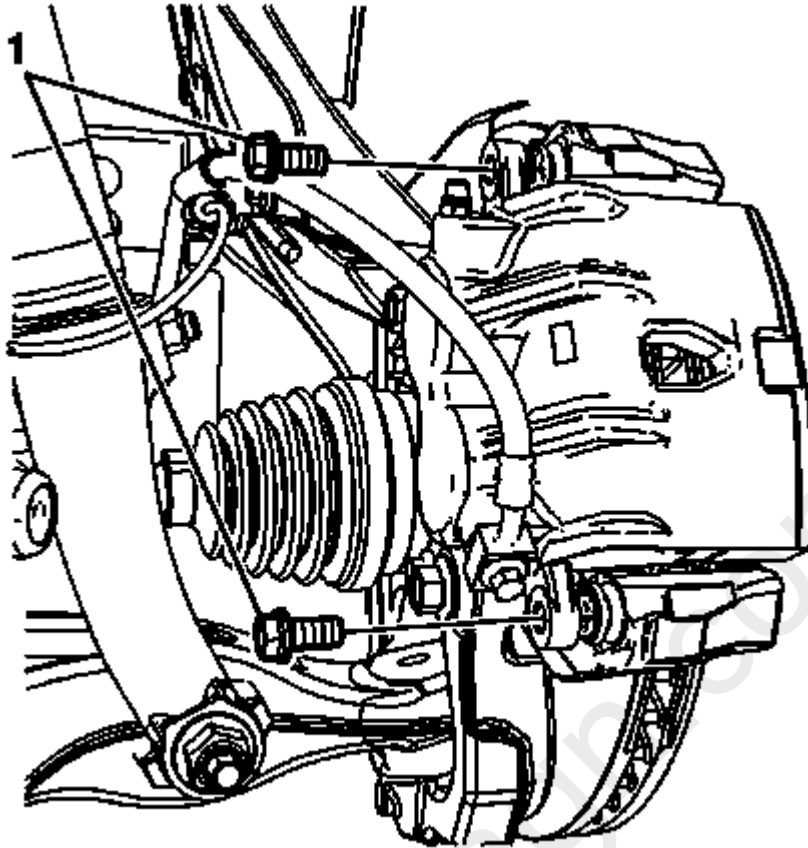


Fig. 164: View of Brake Caliper, Guide and Bolts
Courtesy of GENERAL MOTORS COMPANY

8. Install the brake caliper to the caliper bracket.
9. Using a backup wrench on the brake caliper guide pins, install the guide pin bolts (1) and tighten to 63 N.m (46 lb ft).
10. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .

REAR BRAKE CALIPER BRACKET REPLACEMENT

Removal Procedure

WARNING: Refer to **Brake Dust Warning** .

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

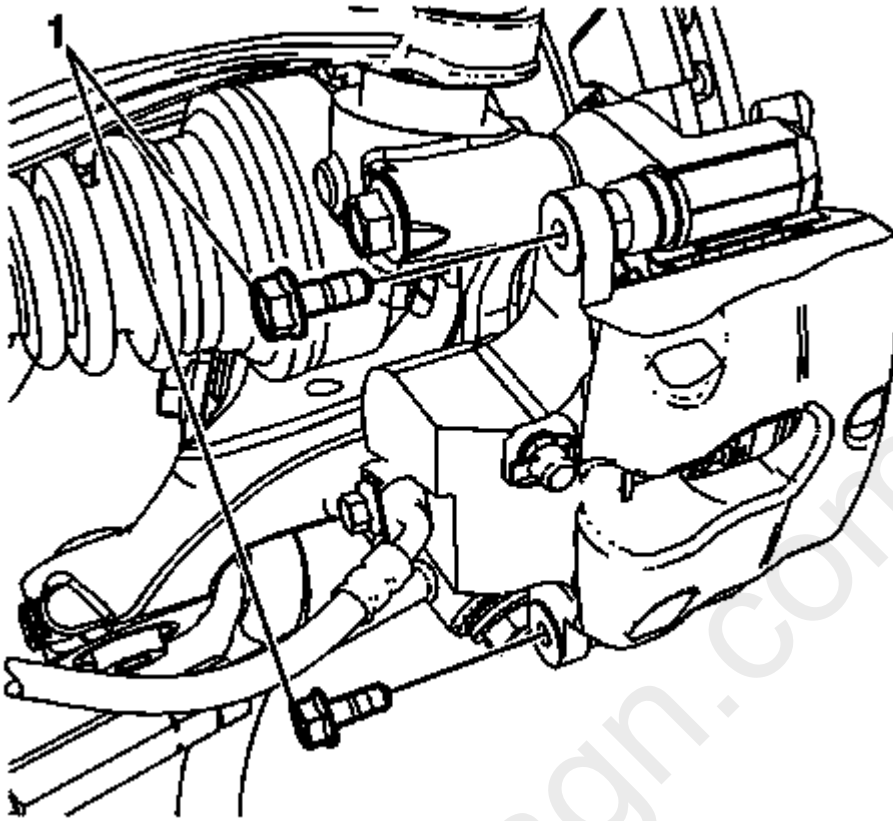


Fig. 165: View of Brake Caliper Guide Pins and Bolts
Courtesy of GENERAL MOTORS COMPANY

3. Using a backup wrench on the brake caliper guide pins, remove the guide pin bolts (1).

CAUTION: Support the brake caliper with heavy mechanic 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.

4. Remove the brake caliper and support with heavy mechanics wire or equivalent.

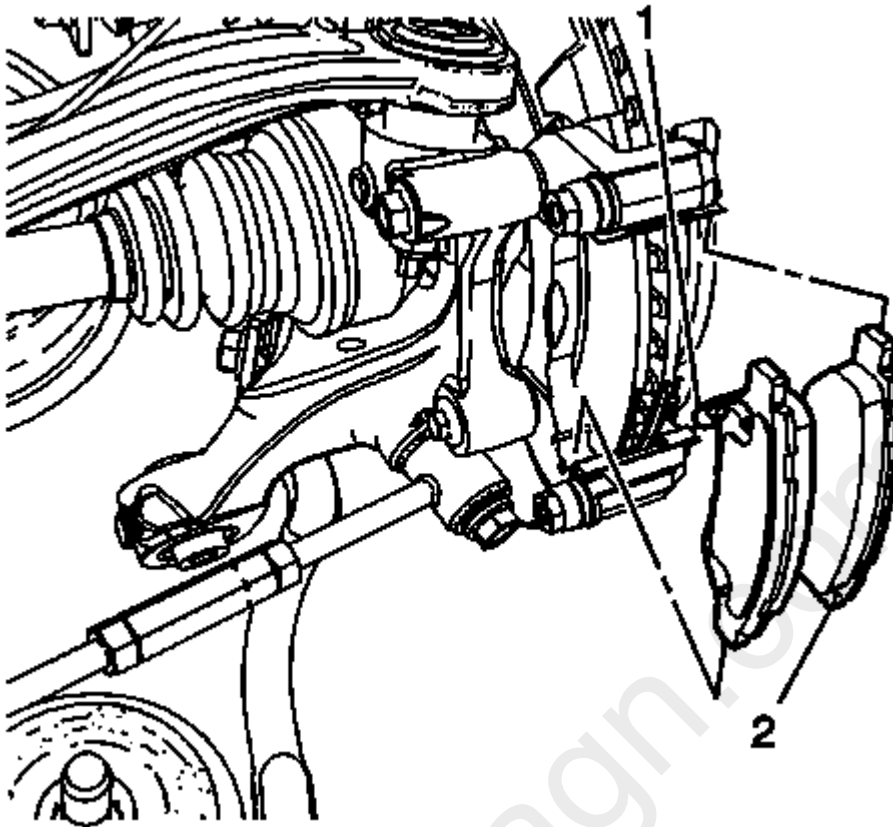


Fig. 166: View of Inner Brake Pad
Courtesy of GENERAL MOTORS COMPANY

5. Remove the inner brake pad (1).
6. Remove the outer brake pad (2).

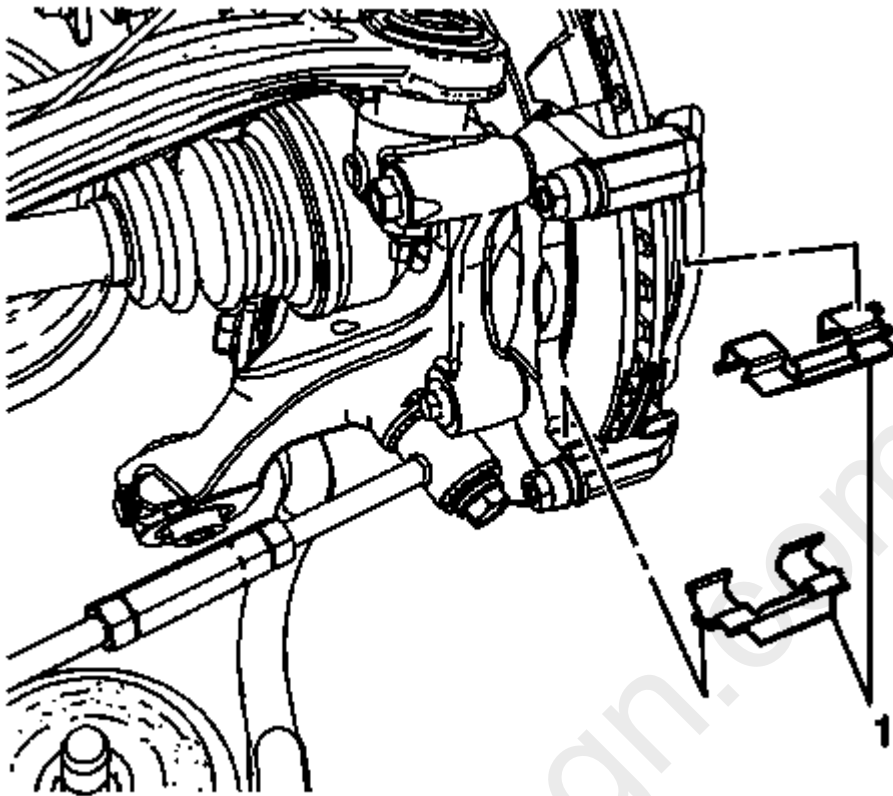


Fig. 167: View of Brake Pad Springs
Courtesy of GENERAL MOTORS COMPANY

7. Remove the brake pad springs (1).

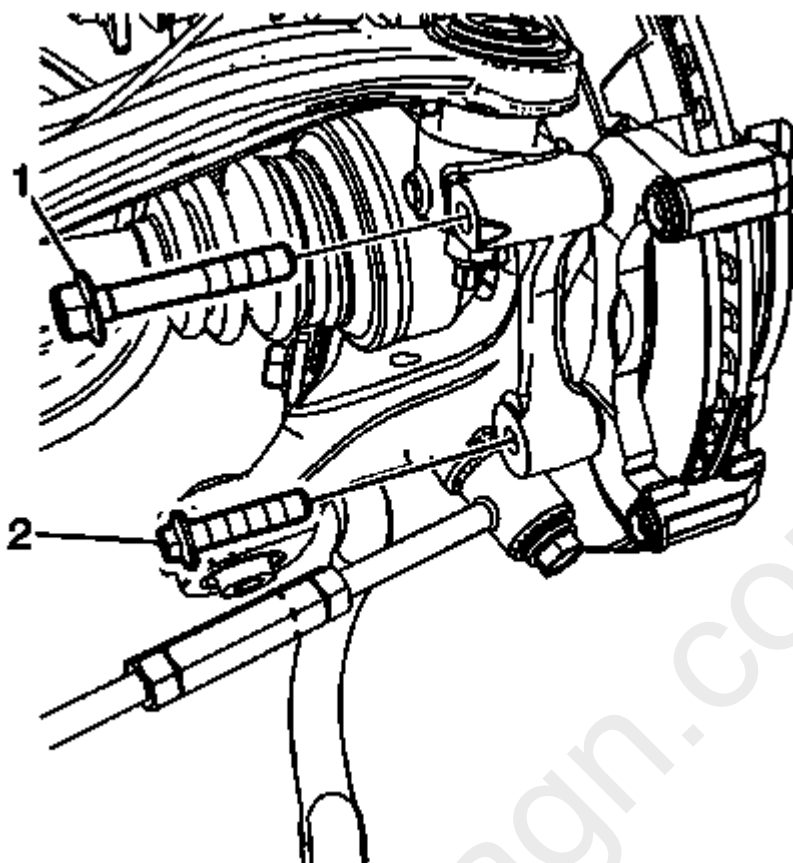


Fig. 168: View of Caliper Bracket and Bolts
Courtesy of GENERAL MOTORS COMPANY

8. Remove the upper brake caliper bracket bolt (1).
9. Remove the lower brake caliper bracket bolt (2).

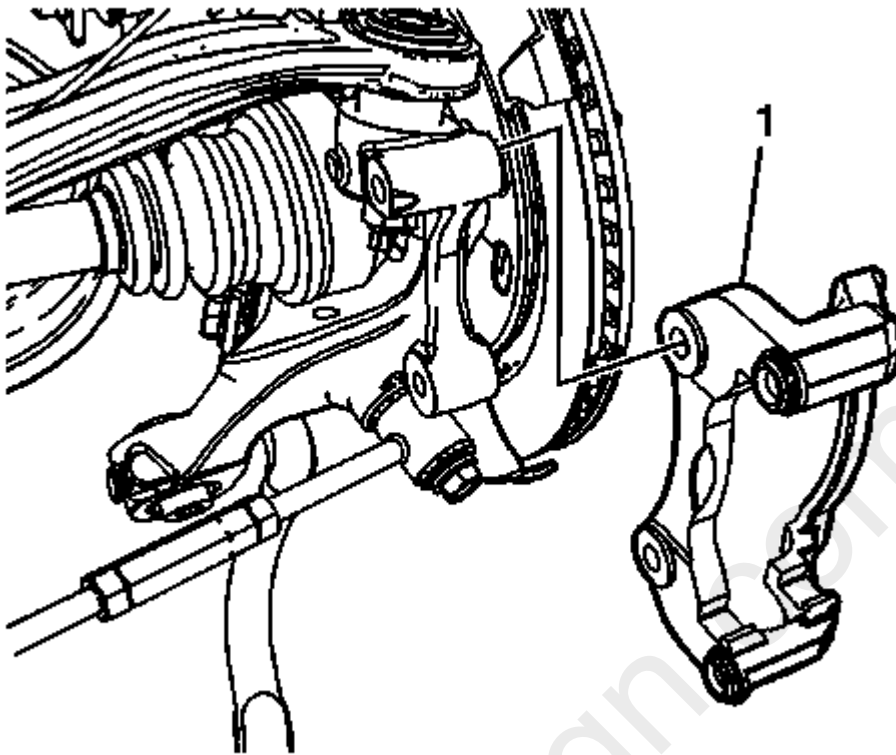


Fig. 169: View of Caliper Bracket Assembly
Courtesy of GENERAL MOTORS COMPANY

10. Remove the brake caliper bracket (1).
11. Inspect the disc brake hardware. Refer to **Rear Disc Brake Mounting and Hardware Inspection.**

Installation Procedure

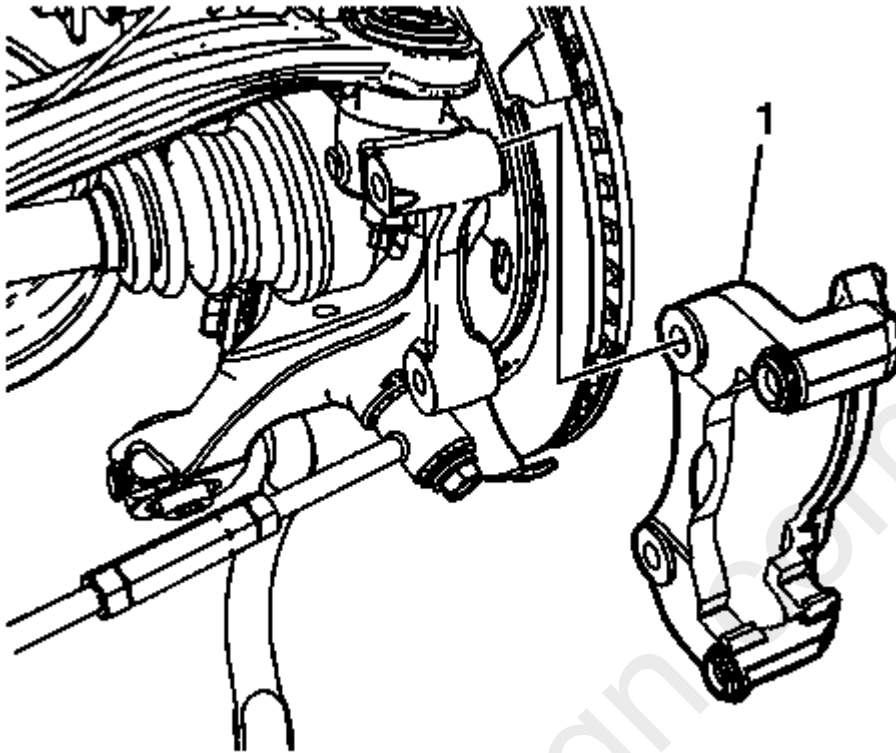


Fig. 170: View of Caliper Bracket Assembly
Courtesy of GENERAL MOTORS COMPANY

1. Install the brake caliper bracket (1).

NOTE: If reusing the caliper bracket bolts the threads of the caliper bracket bolts and the threads of the knuckle mounting holes must be free of residue and debris prior to application of threadlocker in order to ensure proper adhesion and fastener retention.

2. Prepare the bolts and the threaded holes for assembly:
 - Thoroughly clean the residue from the bolt threads by using denatured alcohol or equivalent and allow to dry.
 - Thoroughly clean the residue from the threaded holes by using denatured alcohol or equivalent and allow to dry.
 - Apply threadlocker GM P/N 12345493 (Canada P/N 10953488), or equivalent to 2/3 of the threaded length of the lower caliper bracket bolts. Ensure there are no gaps in the threadlocker along the length of the filled area of the bolts.
 - Allow the threadlocker to cure approximately 10 minutes before installation.

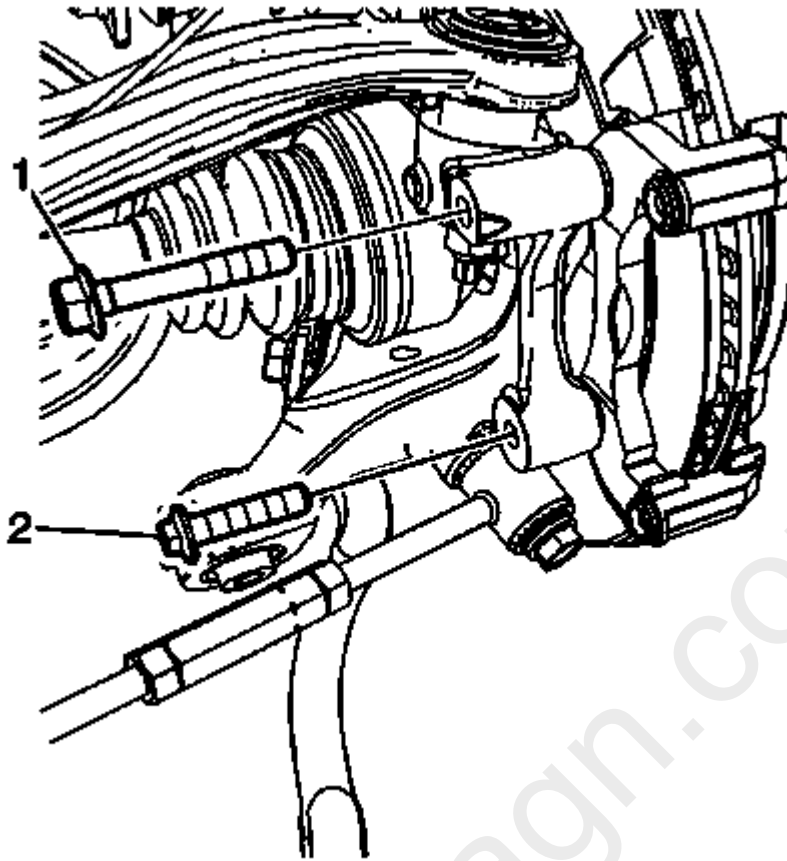


Fig. 171: View of Caliper Bracket and Bolts
Courtesy of GENERAL MOTORS COMPANY

3. Loosely install the upper brake caliper bracket bolt (1).
4. Loosely install the lower brake caliper bracket bolt (2).

CAUTION: Refer to Fastener Caution .

5. Tighten the upper and lower brake caliper bracket bolts to 135 N.m (100 lb ft).

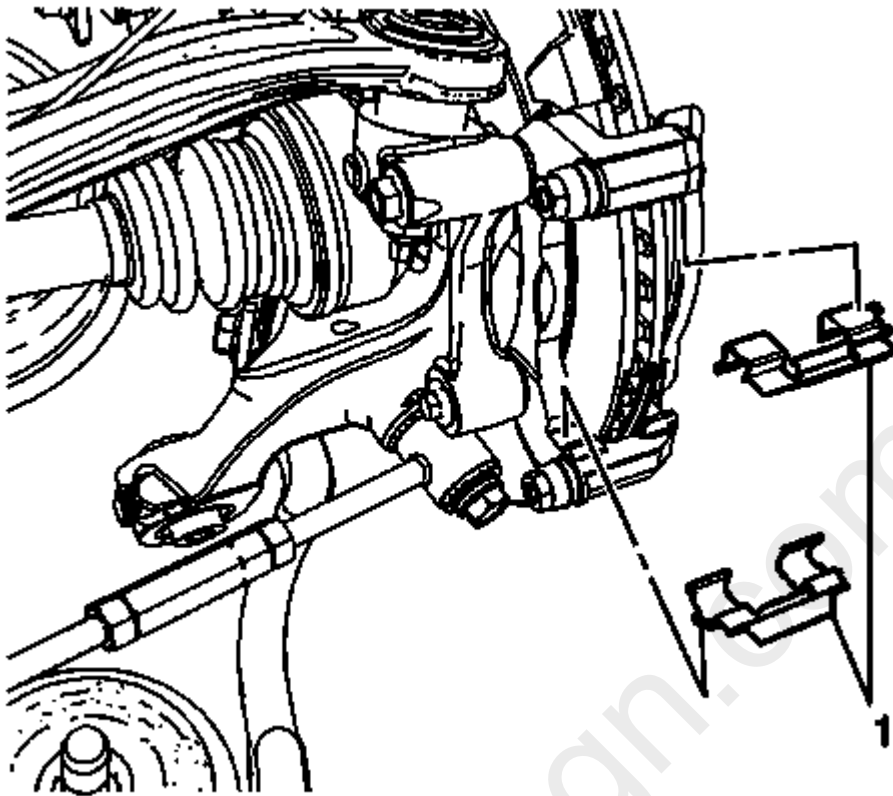


Fig. 172: View of Brake Pad Springs
Courtesy of GENERAL MOTORS COMPANY

6. Install the brake pad springs (1).

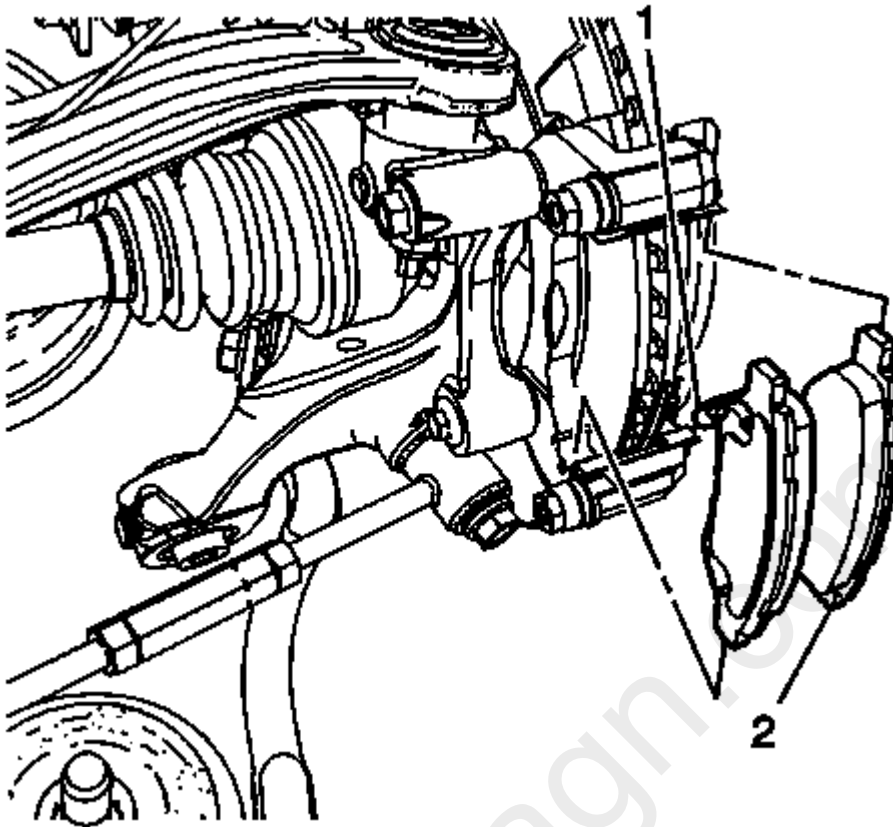


Fig. 173: View of Inner Brake Pad
Courtesy of GENERAL MOTORS COMPANY

7. Install the inner brake pad (1).
8. Install the outer brake pad (2).

NOTE: If reusing the caliper bracket bolts the threads of the caliper bracket bolts and the threads of the knuckle mounting holes must be free of residue and debris prior to application of threadlocker in order to ensure proper adhesion and fastener retention.

9. Prepare the bolts and the threaded holes for assembly:
 - Thoroughly clean the residue from the bolt threads by using denatured alcohol or equivalent and allow to dry.
 - Thoroughly clean the residue from the threaded holes by using denatured alcohol or equivalent and allow to dry.
 - Apply threadlocker GM P/N 12345493 (Canada P/N 10953488), or equivalent to 2/3 of the threaded length of the lower caliper bracket bolts. Ensure there are no gaps in the threadlocker along the length of the filled area of the bolts.
 - Allow the threadlocker to cure approximately 10 minutes before installation.

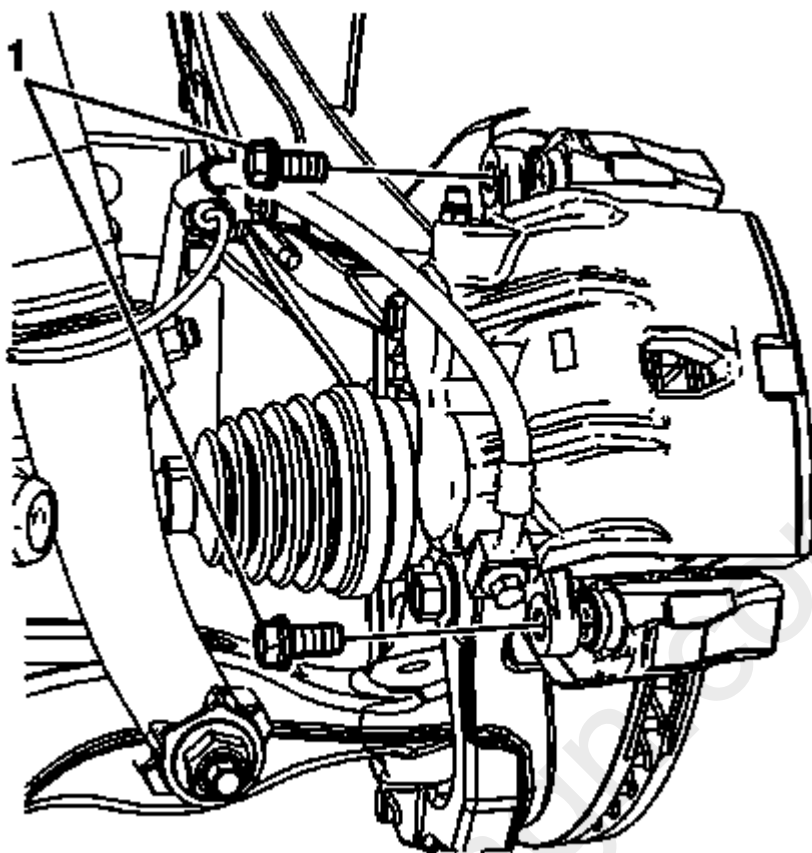


Fig. 174: View of Brake Caliper, Guide and Bolts
Courtesy of GENERAL MOTORS COMPANY

10. Install the brake caliper to the caliper bracket.
11. Using a backup wrench on the brake caliper guide pins, install the guide pin bolts (1) and tighten to 60 N.m (44 lb ft).
12. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .

FRONT BRAKE ROTOR REPLACEMENT (JE5, J55 (RWD))

Special Tools

- **J-41013** Rotor Resurfacing Kit
- **J-42450-A** Wheel Hub Resurfacing Kit

Removal Procedure

WARNING: Refer to **Brake Dust Warning** .

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

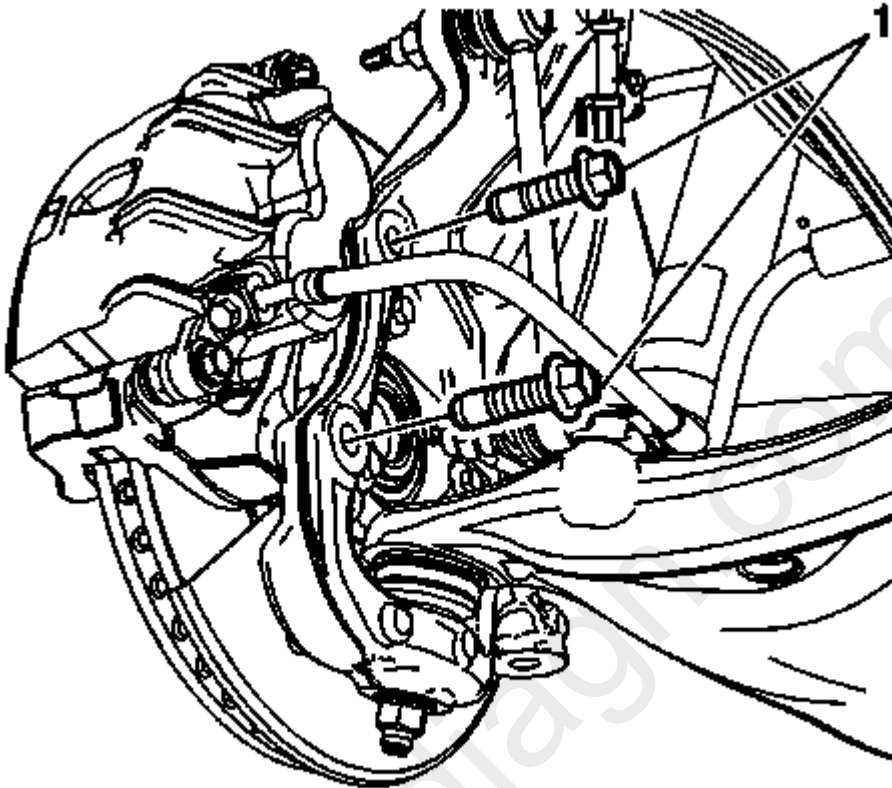


Fig. 175: View of Caliper Bracket and Bolts
Courtesy of GENERAL MOTORS COMPANY

3. Remove the brake caliper bracket bolts (1).

CAUTION: Support the brake caliper with heavy mechanic 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.

4. Remove the brake caliper and bracket assembly and support with heavy mechanics wire or equivalent.

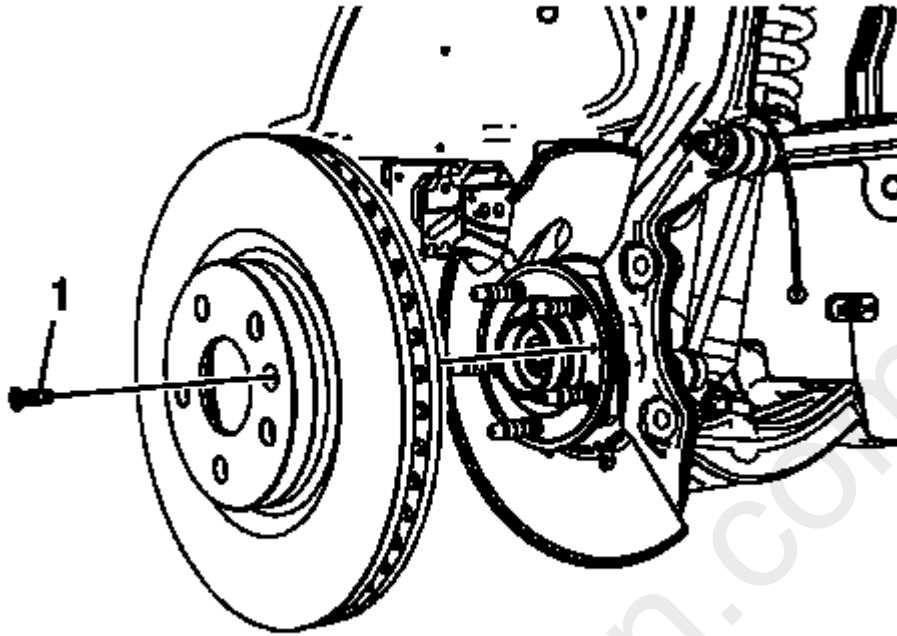


Fig. 176: View of Brake Rotor and Flange
Courtesy of GENERAL MOTORS COMPANY

5. Matchmark the position of the brake rotor to the wheel studs.
6. Remove the brake rotor screw (1).
7. Remove the brake rotor.

Installation Procedure

NOTE: 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.

1. Using the **J-42450-A** Wheel Hub Resurfacing Kit , thoroughly clean any rust or corrosion from the mating surface of the hub/axle flange.
2. Using the **J-41013** Rotor Resurfacing Kit , thoroughly clean any rust or corrosion from the mating surface and mounting surface of the brake rotor.
3. Inspect the mating surfaces of the hub/axle flange and the rotor to ensure that there are no foreign particles or debris remaining.

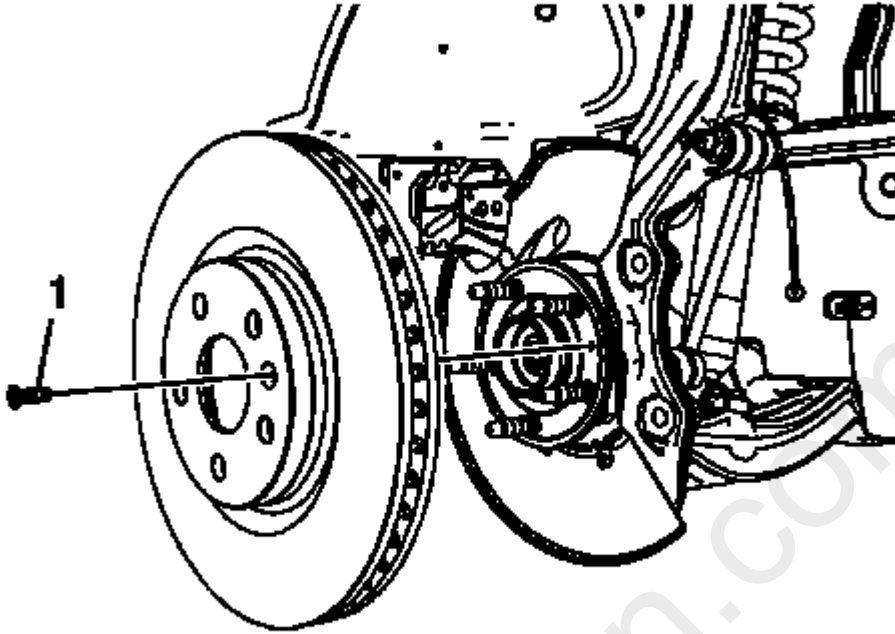


Fig. 177: View of Brake Rotor and Flange
Courtesy of GENERAL MOTORS COMPANY

4. Install the brake rotor to the hub/axle flange. Use the matchmark made prior to removal for proper orientation to the flange.

CAUTION: Refer to Fastener Caution .

5. Install the brake rotor screw (1) and tighten to 14 N.m (124 lb in).

NOTE: If reusing the caliper bracket bolts the threads of the caliper bracket bolts and the threads of the knuckle mounting holes must be free of residue and debris prior to application of threadlocker in order to ensure proper adhesion and fastener retention.

6. Prepare the bolts and the threaded holes for assembly:
 - Thoroughly clean the residue from the bolt threads by using denatured alcohol or equivalent and allow to dry.
 - Thoroughly clean the residue from the threaded holes by using denatured alcohol or equivalent and

allow to dry.

- Apply threadlocker GM P/N 12345493 (Canada P/N 10953488), or equivalent to 2/3 of the threaded length of the lower caliper bracket bolts. Ensure there are no gaps in the threadlocker along the length of the filled area of the bolts.
- Allow the threadlocker to cure approximately 10 minutes before installation.

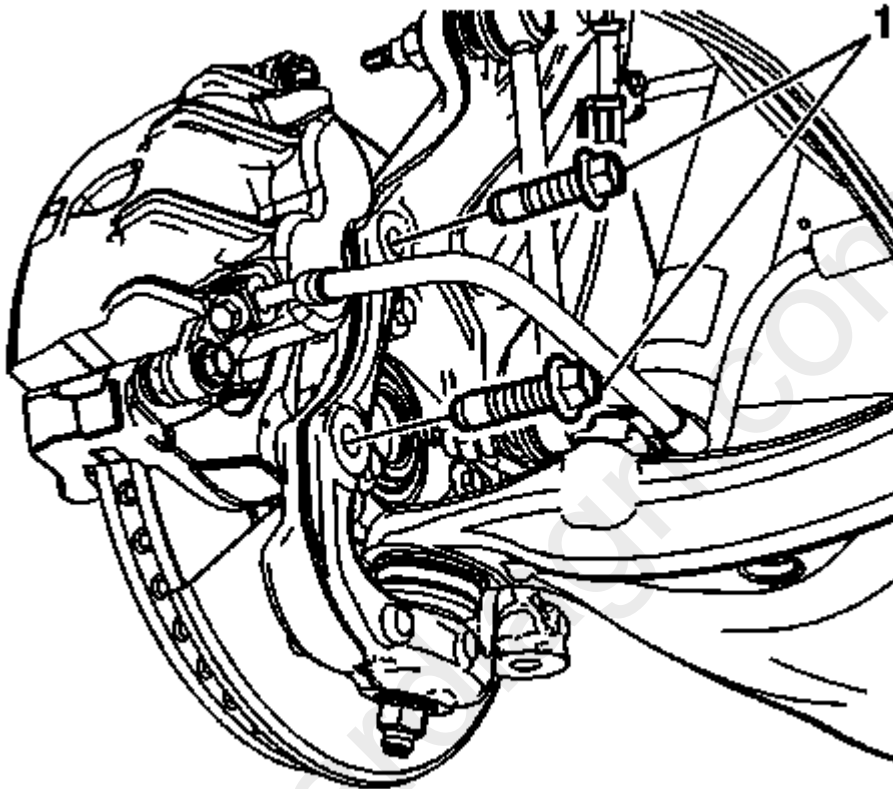


Fig. 178: View of Caliper Bracket and Bolts
Courtesy of GENERAL MOTORS COMPANY

7. Install the brake caliper and bracket assembly to the knuckle.
8. Install the brake caliper bracket bolts (1) and tighten to 230 N.m (170 lb ft).
9. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
10. If the brake rotor was refinished or replaced, or if new brake pads were installed, burnish the pads and rotors. Refer to **Brake Pad and Rotor Burnishing**.

FRONT BRAKE ROTOR REPLACEMENT (JE5, J55 (AWD))

Special Tools

- J-41013 Rotor Resurfacing Kit

- J-42450-A Wheel Hub Resurfacing Kit

Removal Procedure

WARNING: Refer to Brake Dust Warning .

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

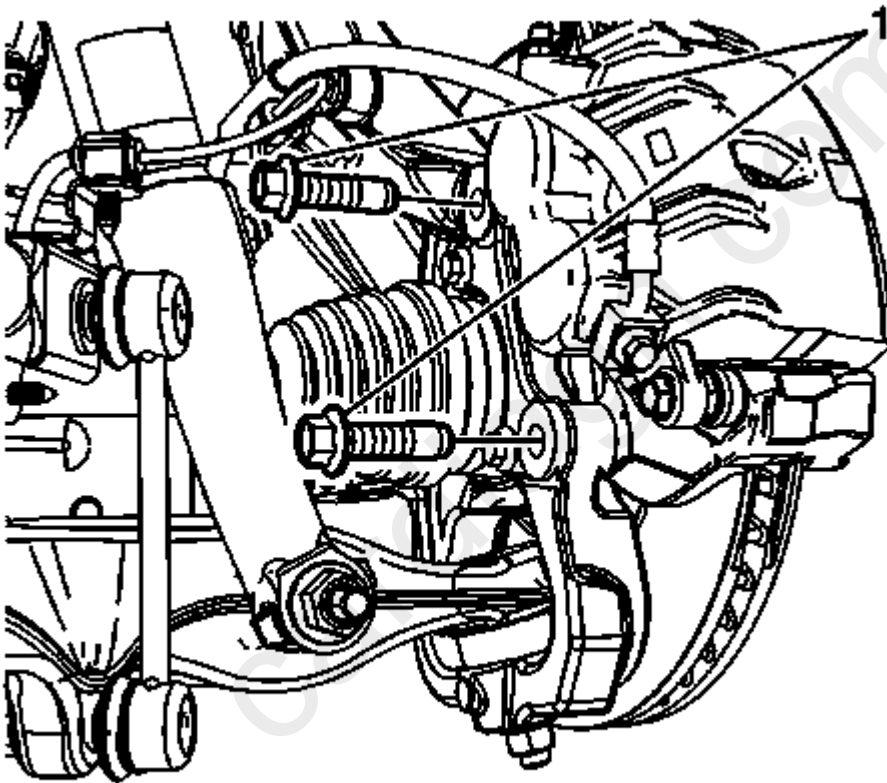


Fig. 179: View of Caliper and Bracket Assembly
Courtesy of GENERAL MOTORS COMPANY

3. Remove the brake caliper bracket bolts (1).

CAUTION: Support the brake caliper with heavy mechanic 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.

4. Remove the brake caliper and bracket assembly and support with heavy mechanics wire or equivalent.

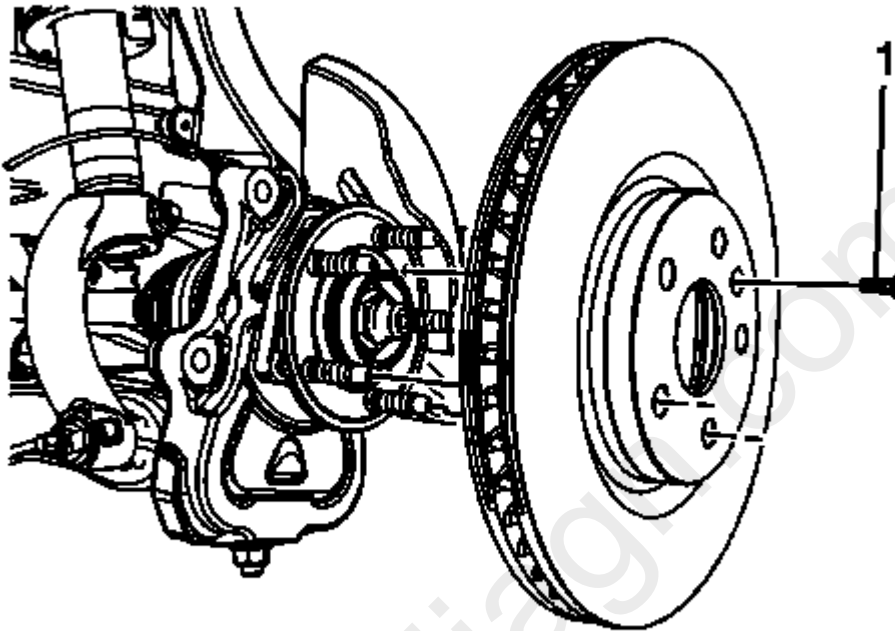


Fig. 180: View of Brake Rotor and Flange
Courtesy of GENERAL MOTORS COMPANY

5. Matchmark the position of the brake rotor to the wheel studs.
6. Remove the brake rotor screw (1).
7. Remove the brake rotor.

Installation Procedure

NOTE: 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.

1. Using the **J-42450-A** Wheel Hub Resurfacing Kit , thoroughly clean any rust or corrosion from the mating surface of the hub/axle flange.

2. Using the **J-41013** Rotor Resurfacing Kit , thoroughly clean any rust or corrosion from the mating surface and mounting surface of the brake rotor.
3. Inspect the mating surfaces of the hub/axle flange and the rotor to ensure that there are no foreign particles or debris remaining.

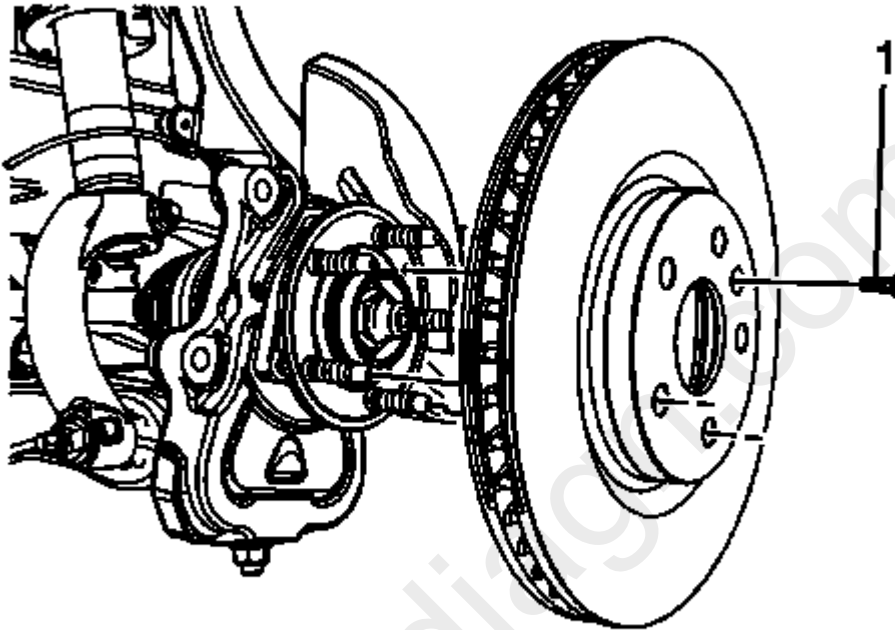


Fig. 181: View of Brake Rotor and Flange
Courtesy of GENERAL MOTORS COMPANY

4. Install the brake rotor to the hub/axle flange. Use the matchmark made prior to removal for proper orientation to the flange.

CAUTION: Refer to Fastener Caution .

5. Install the brake rotor screw (1) and tighten to 14 N.m (124 lb in).

NOTE: If reusing the caliper bracket bolts the threads of the caliper bracket bolts and the threads of the knuckle mounting holes must be free of residue and debris prior to application of threadlocker in order to ensure proper adhesion and fastener retention.

6. Prepare the bolts and the threaded holes for assembly:
 - Thoroughly clean the residue from the bolt threads by using denatured alcohol or equivalent and allow to dry.
 - Thoroughly clean the residue from the threaded holes by using denatured alcohol or equivalent and allow to dry.
 - Apply threadlocker GM P/N 12345493 (Canada P/N 10953488), or equivalent to 2/3 of the threaded length of the lower caliper bracket bolts. Ensure there are no gaps in the threadlocker along the length of the filled area of the bolts.
 - Allow the threadlocker to cure approximately 10 minutes before installation.

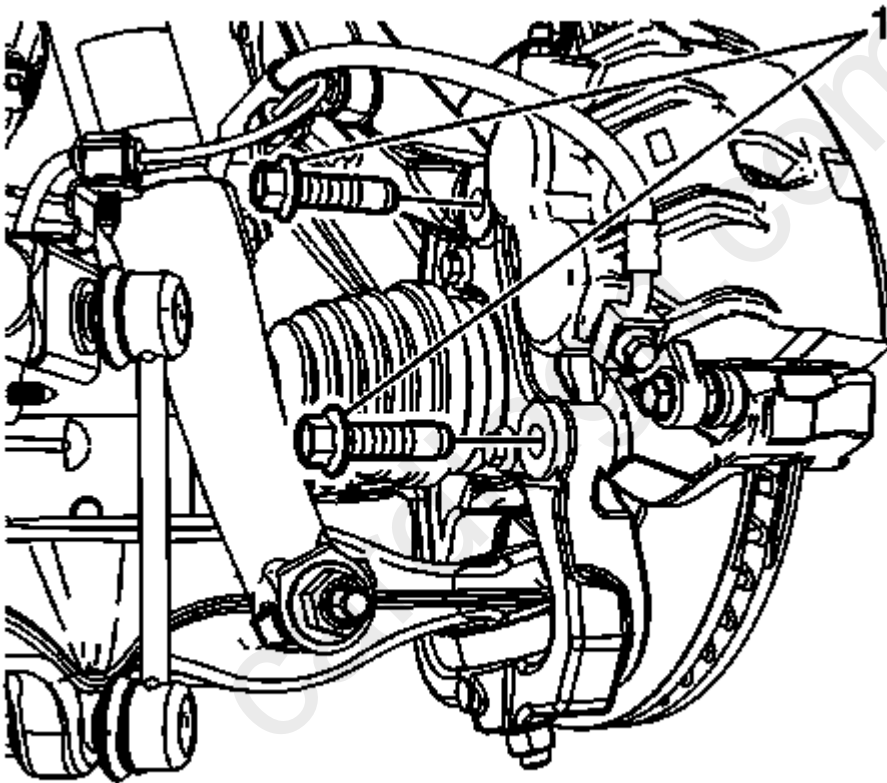


Fig. 182: View of Caliper and Bracket Assembly
Courtesy of GENERAL MOTORS COMPANY

7. Install the brake caliper and bracket assembly to the knuckle.
8. Install the brake caliper bracket bolts (1) and tighten to 230 N.m (170 lb ft).
9. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
10. If the brake rotor was refinished or replaced, or if new brake pads were installed, burnish the pads and rotors. Refer to **Brake Pad and Rotor Burnishing**.

FRONT BRAKE ROTOR REPLACEMENT (J56)

Special Tools

- J-41013 Rotor Resurfacing Kit
- J-42450-A Wheel Hub Resurfacing Kit

Removal Procedure

WARNING: Refer to Brake Dust Warning .

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, no brake fluid needs to be removed from the reservoir before proceeding.
3. If the brake fluid level is higher than midway between the maximum full point and the minimum allowable level, remove brake fluid to the midway point before proceeding.
4. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .
5. Remove the tire and wheel assembly. Refer to Tire and Wheel Removal and Installation .
6. If reinstalling the brake rotor, match mark the brake rotor relationship to the wheel hub.

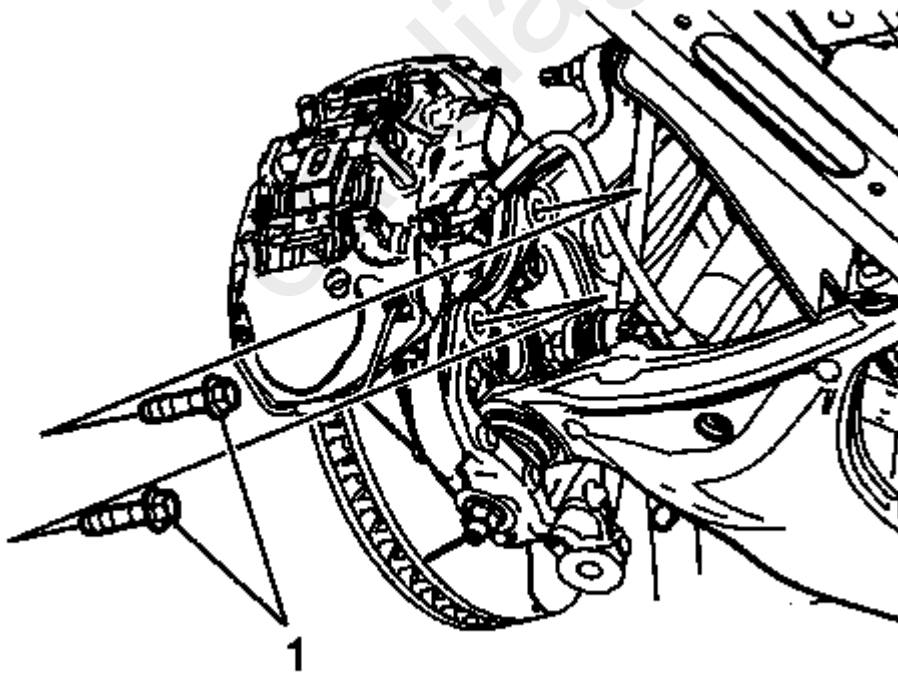


Fig. 183: Identifying Brake Caliper Bolts

Courtesy of GENERAL MOTORS COMPANY

7. Remove the brake caliper bolts (1).

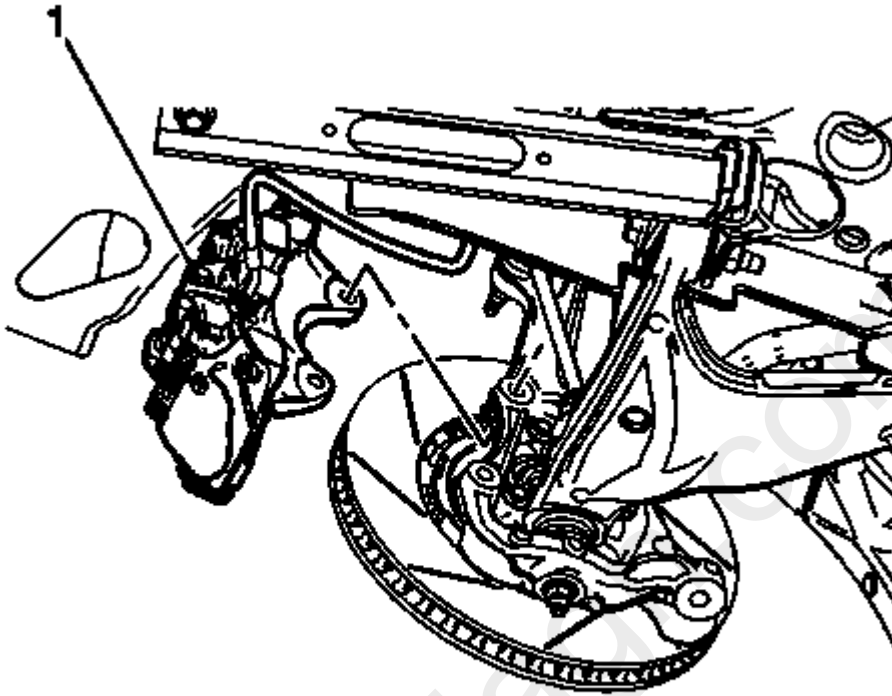


Fig. 184: Identifying Brake Caliper

Courtesy of GENERAL MOTORS COMPANY

CAUTION: Support the brake caliper with heavy mechanic 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. Remove the brake caliper (1) and support with heavy mechanics wire or equivalent.

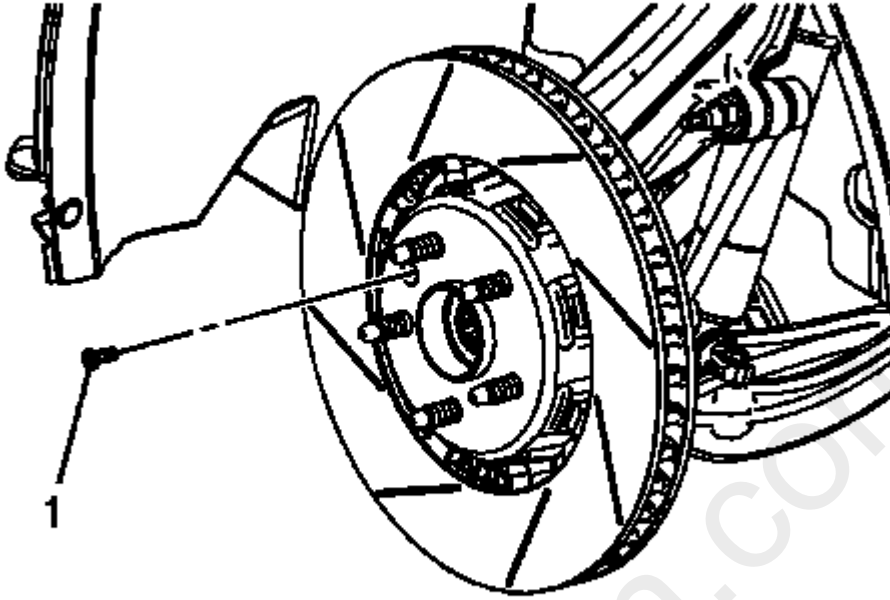


Fig. 185: Identifying Brake Rotor Screw
Courtesy of GENERAL MOTORS COMPANY

9. Remove the brake rotor screw (1).

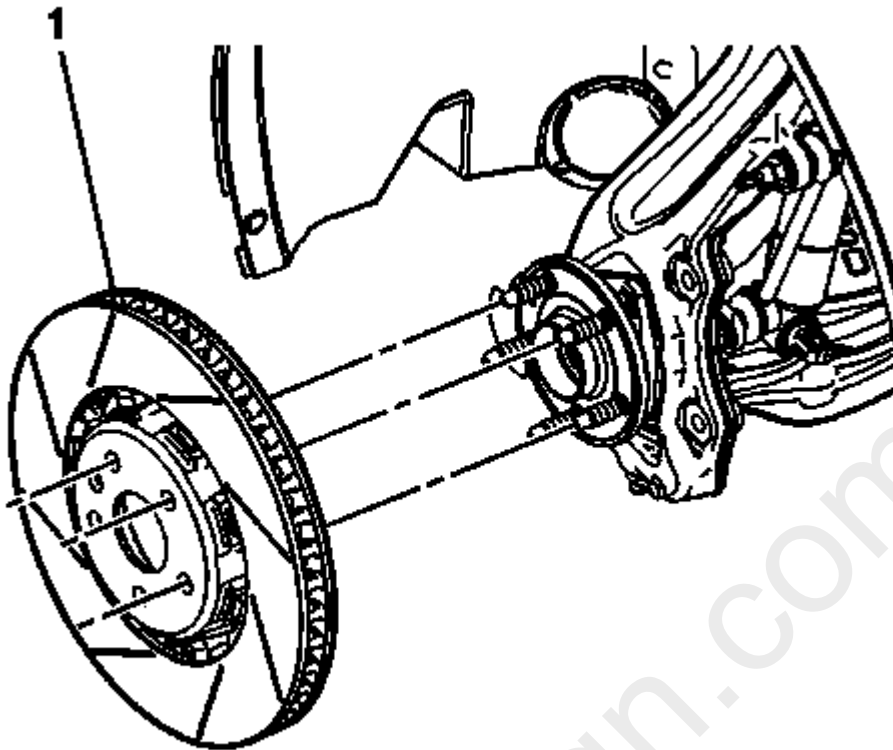


Fig. 186: Identifying Brake Rotor
Courtesy of GENERAL MOTORS COMPANY

10. Remove the brake rotor (1).

Installation Procedure

NOTE: 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.

1. Using the **J-42450-A** Wheel Hub Resurfacing Kit , thoroughly clean any rust or corrosion from the mating surface of the hub/axle flange.
2. Using the **J-41013** Rotor Resurfacing Kit , thoroughly clean any rust or corrosion from the mating surface and mounting surface of the brake rotor.

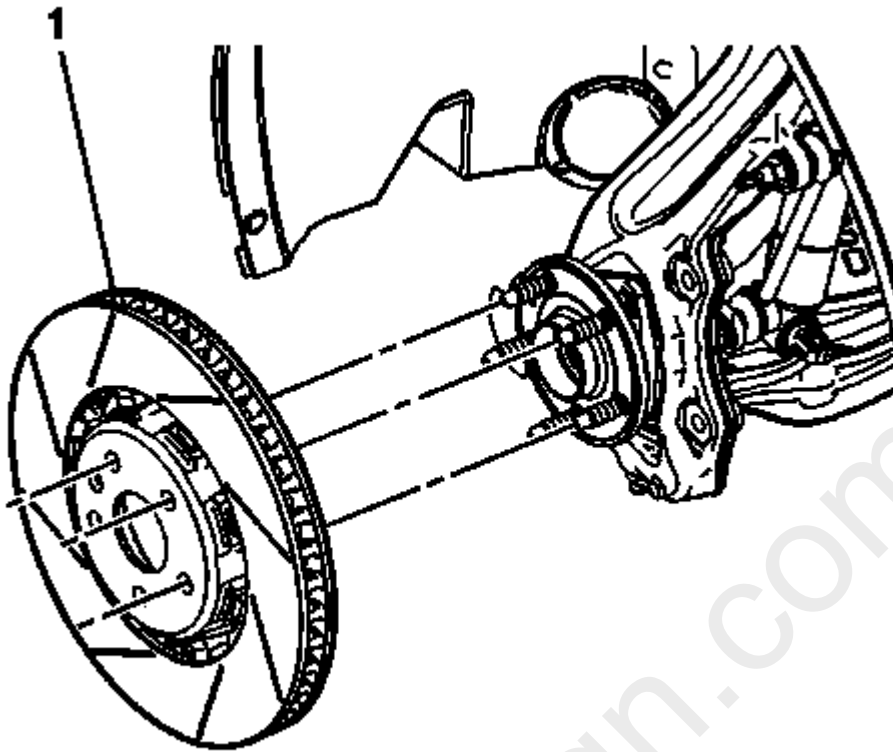


Fig. 187: Identifying Brake Rotor
Courtesy of GENERAL MOTORS COMPANY

3. Install the brake rotor (1).

Align the match mark made prior to the brake rotor removal, if necessary.

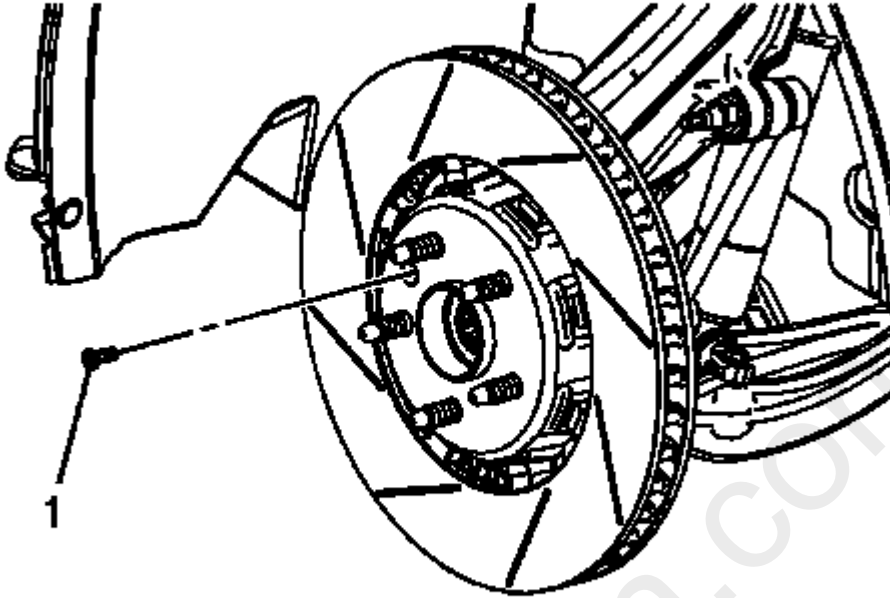


Fig. 188: Identifying Brake Rotor Screw
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

4. Install the brake rotor screw (1) and tighten to 14 N.m (124 lb in).

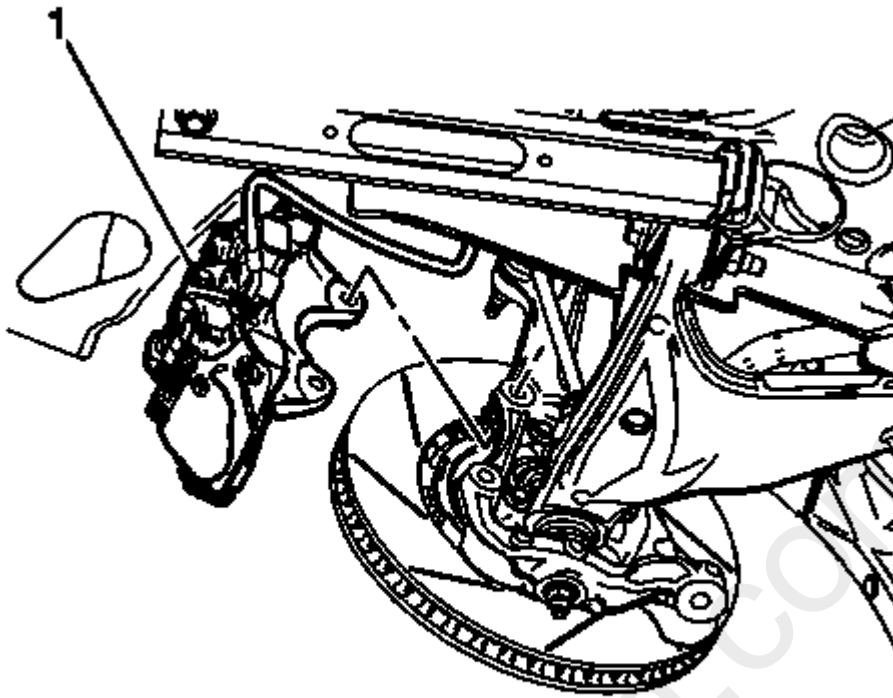


Fig. 189: Identifying Brake Caliper
Courtesy of GENERAL MOTORS COMPANY

5. Install the brake caliper (1).

NOTE: If reusing the brake caliper to knuckle mounting bolts the threads of the bolts and the threads of the knuckle mounting holes must be free of residue and debris prior to application of threadlocker in order to ensure proper adhesion and fastener retention.

6. Prepare the bolts and the threaded holes for assembly:
 - Thoroughly clean the residue from the bolt threads by using denatured alcohol or equivalent and allow to dry.
 - Thoroughly clean the residue from the threaded holes by using denatured alcohol or equivalent and allow to dry.
7. Apply threadlocker GM P/N 12345493 (Canadian P/N 10953488), or equivalent to 2/3 of the threaded length of the caliper to knuckle mounting bolts. Ensure that there are no gaps in the threadlocker along the length of the filled area of the bolts.
8. Allow the threadlocker to cure approximately 10 minutes before installation.

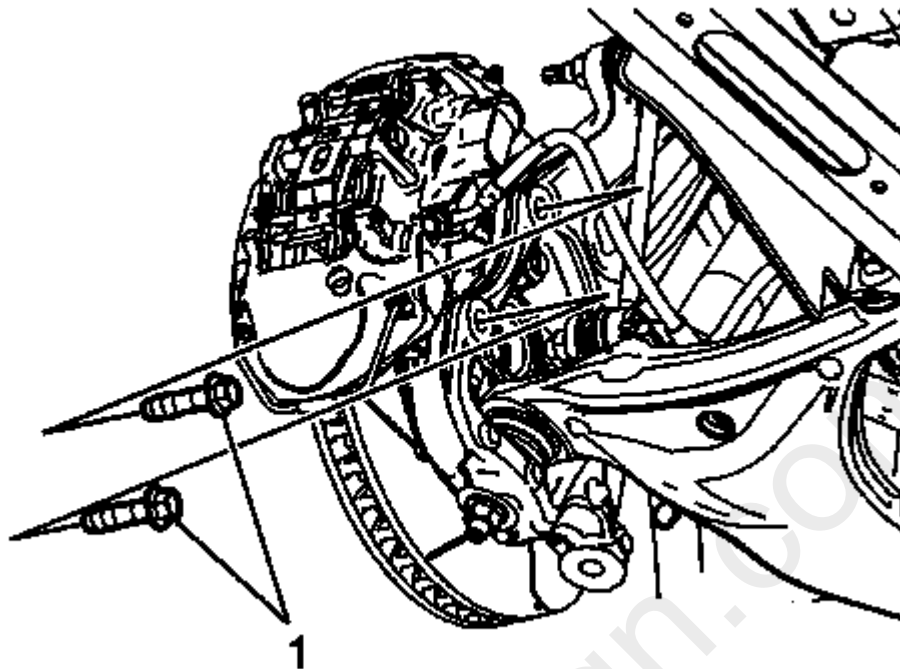


Fig. 190: Identifying Brake Caliper Bolts
Courtesy of GENERAL MOTORS COMPANY

9. Install the brake caliper bolts (1) and tighten to 175 N.m (129 lb ft).
10. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
11. If the brake rotor was refinished or replaced, or if new brake pads were installed, burnish the brake pads and rotors. Refer to **Brake Pad and Rotor Burnishing**.

REAR BRAKE ROTOR REPLACEMENT (JE5, J55)

Special Tools

- **J-41013** Rotor Resurfacing Kit
- **J-42450-A** Wheel Hub Resurfacing Kit

Removal Procedure

WARNING: Refer to **Brake Dust Warning** .

1. Block the rear drive wheels.
2. Release the electronic park brake cable tension, if equipped. Refer to **Parking Brake Cable Adjuster Disabling (Electric Park Brake)** .
3. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
4. Remove the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .

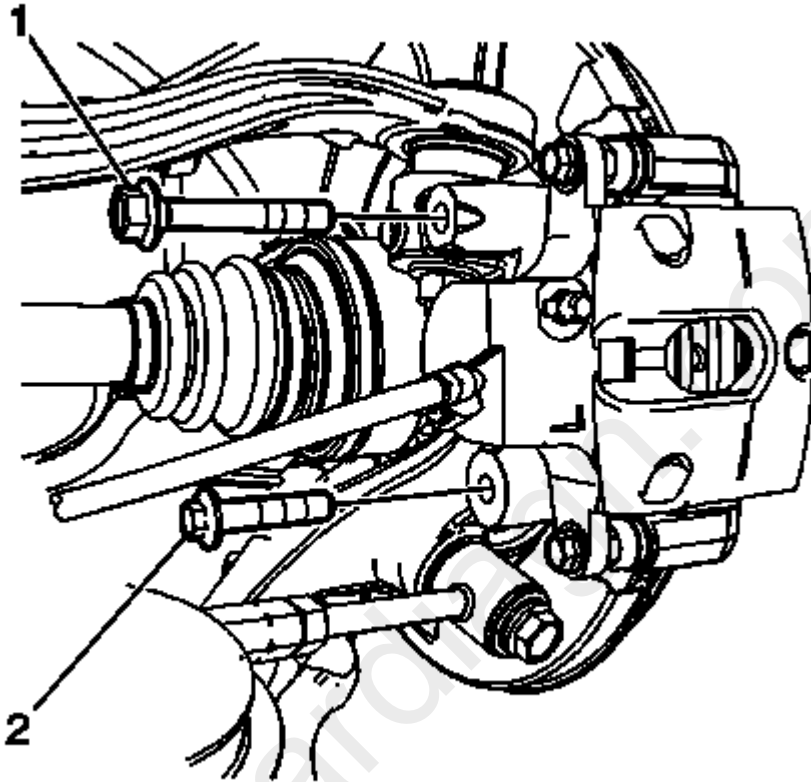


Fig. 191: View of Caliper and Bracket Bolts
Courtesy of GENERAL MOTORS COMPANY

5. Remove the upper brake caliper bracket bolt (1).
6. Remove the lower brake caliper bracket bolt (2).

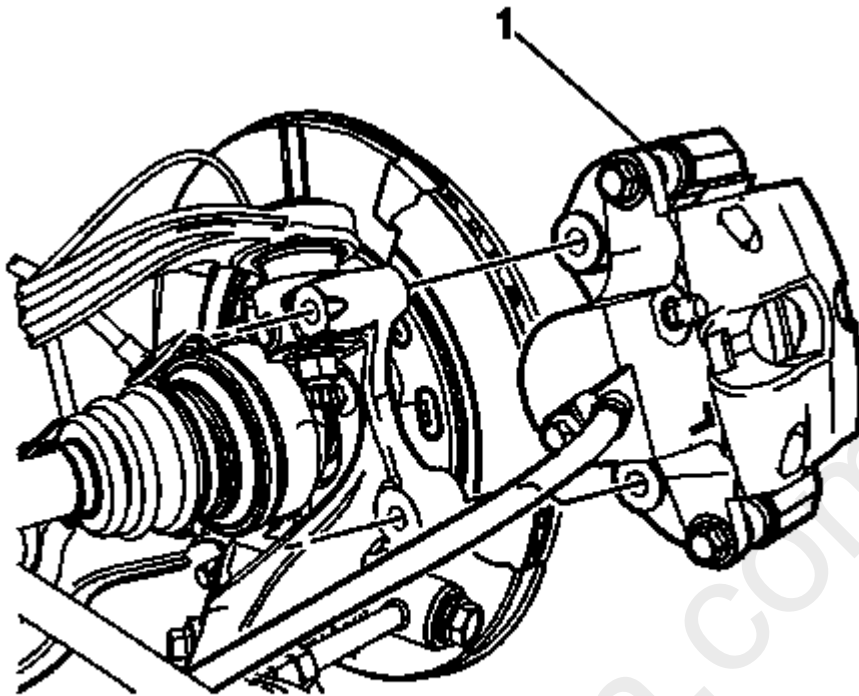


Fig. 192: View of Caliper & Bracket Assembly
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Support the brake caliper with heavy mechanic 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.

7. Remove the brake caliper and bracket assembly (1) and support with heavy mechanics wire or equivalent.

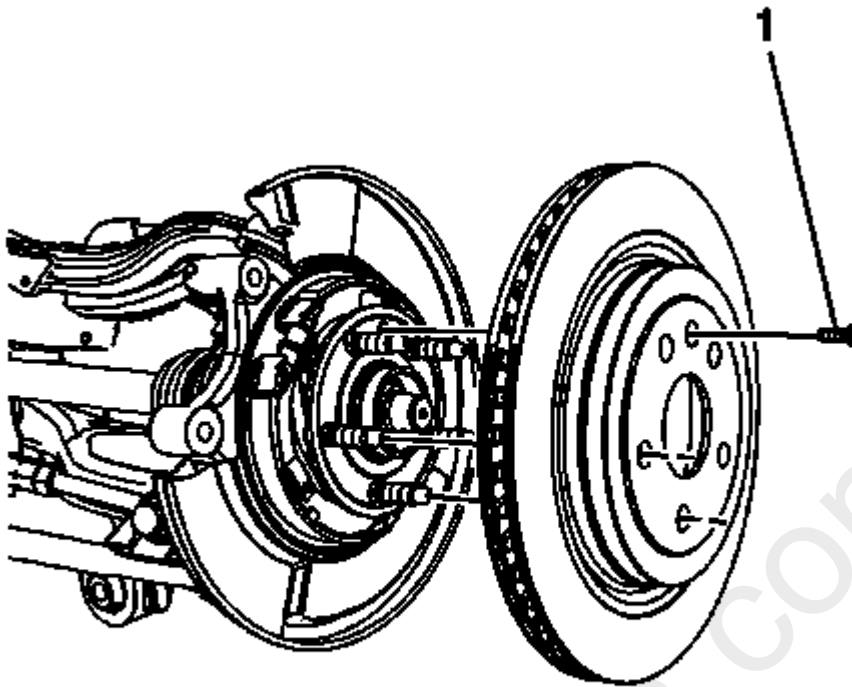


Fig. 193: View of Rotor and Studs
Courtesy of GENERAL MOTORS COMPANY

8. Matchmark the position of the brake rotor to the wheel studs.
9. Remove the brake rotor screw (1).
10. Remove the brake rotor.

Installation Procedure

NOTE: 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.

1. Using the **J-42450-A** Wheel Hub Resurfacing Kit , thoroughly clean any rust or corrosion from the mating surface of the hub/axle flange.
2. Using the **J-41013** Rotor Resurfacing Kit , thoroughly clean any rust or corrosion from the mating surface and mounting surface of the brake rotor.
3. Inspect the mating surfaces of the hub/axle flange and the rotor to ensure that there are no foreign particles or debris remaining.

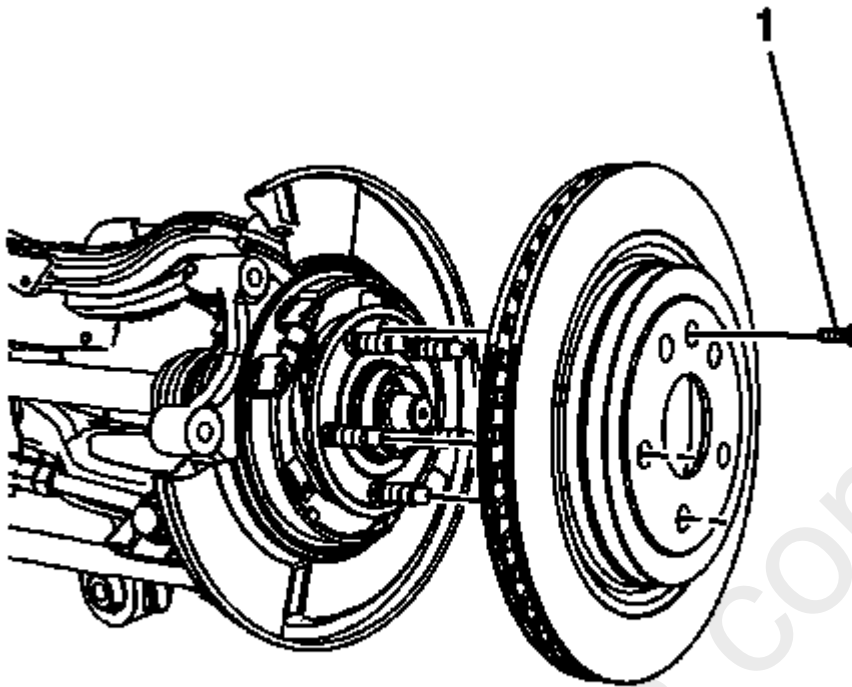


Fig. 194: View of Rotor and Studs
Courtesy of GENERAL MOTORS COMPANY

4. Install the brake rotor to the hub/axle flange. Use the matchmark made prior to removal for proper orientation to the flange.

CAUTION: Refer to Fastener Caution .

5. Install the brake rotor screw (1) and tighten to 12 N.m (106 lb in).

NOTE: If reusing the caliper bracket bolts the threads of the caliper bracket bolts and the threads of the knuckle mounting holes must be free of residue and debris prior to application of threadlocker in order to ensure proper adhesion and fastener retention.

6. Prepare the bolts and the threaded holes for assembly:
 - Thoroughly clean the residue from the bolt threads by using denatured alcohol or equivalent and allow to dry.
 - Thoroughly clean the residue from the threaded holes by using denatured alcohol or equivalent and

allow to dry.

- Apply threadlocker GM P/N 12345493 (Canada P/N 10953488), or equivalent to 2/3 of the threaded length of the lower caliper bracket bolts. Ensure there are no gaps in the threadlocker along the length of the filled area of the bolts.
- Allow the threadlocker to cure approximately 10 minutes before installation.

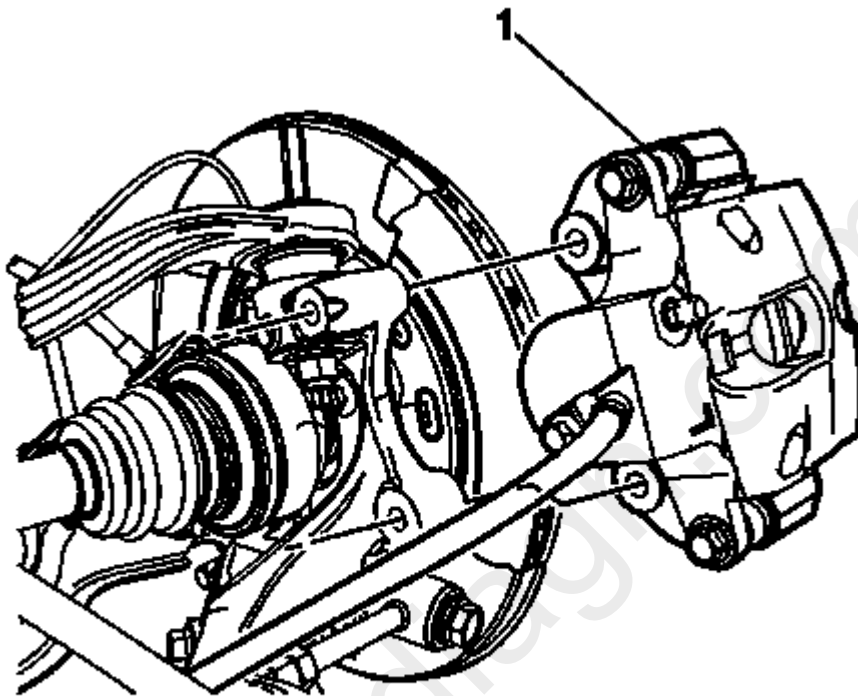


Fig. 195: View of Caliper & Bracket Assembly
Courtesy of GENERAL MOTORS COMPANY

7. Install the brake caliper and bracket assembly (1).

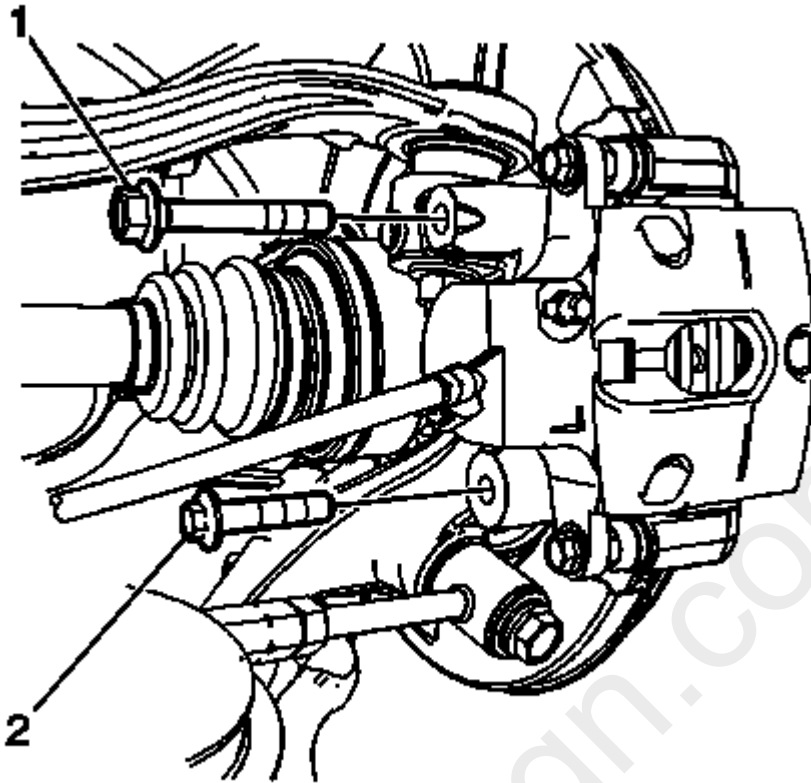


Fig. 196: View of Caliper and Bracket Bolts
Courtesy of GENERAL MOTORS COMPANY

8. Install the upper brake caliper bracket bolt (1) and tighten to 135 N.m (100 lb ft).
9. Install the lower brake caliper bracket bolt (2) and tighten to 135 N.m (100 lb ft).
10. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
11. Set the electronic park brake cable tension. Refer to **Parking Brake Cable Adjuster Enabling (Electric Park Brake)** .
12. If the brake rotor was refinished or replaced, or if new brake pads were installed, burnish the pads and rotors. Refer to **Brake Pad and Rotor Burnishing**.

REAR BRAKE ROTOR REPLACEMENT (J56)

Special Tools

- **J-2619-A** Slide Hammer w/Adapter
- **J-41013** Rotor Resurfacing Kit
- **J-42450-A** Wheel Hub Resurfacing Kit
- **J-46277** Rotor Removal Tool

Removal Procedure

WARNING: Refer to Brake Dust Warning .

1. Block the rear drive wheels.
2. Release the electronic park brake cable tension, if equipped. Refer to Parking Brake Cable Adjuster Disabling (Electric Park Brake) .
3. Turn the ignition to the OFF position.
4. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .
5. Remove the tire and wheel assembly. Refer to Tire and Wheel Removal and Installation .
6. If reinstalling the brake rotor, match mark the brake rotor relationship to the wheel hub.

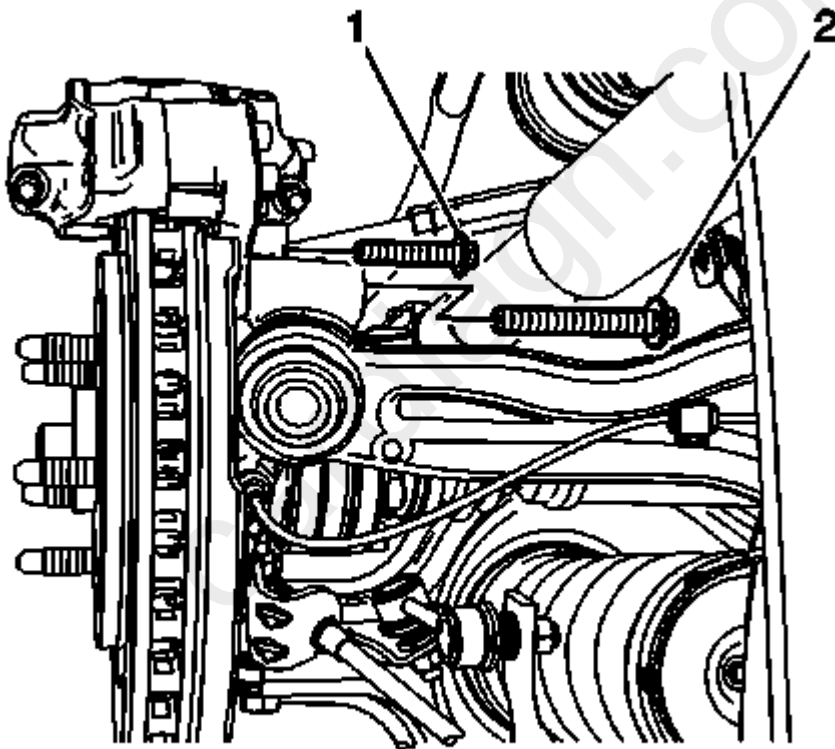


Fig. 197: Identifying Brake Caliper Bolts
Courtesy of GENERAL MOTORS COMPANY

7. Remove the lower brake caliper bolt (1).
8. Remove the upper brake caliper bolt (2).

CAUTION: Support the brake caliper with heavy mechanic 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.

9. Remove the brake caliper and support with heavy mechanics wire or equivalent.

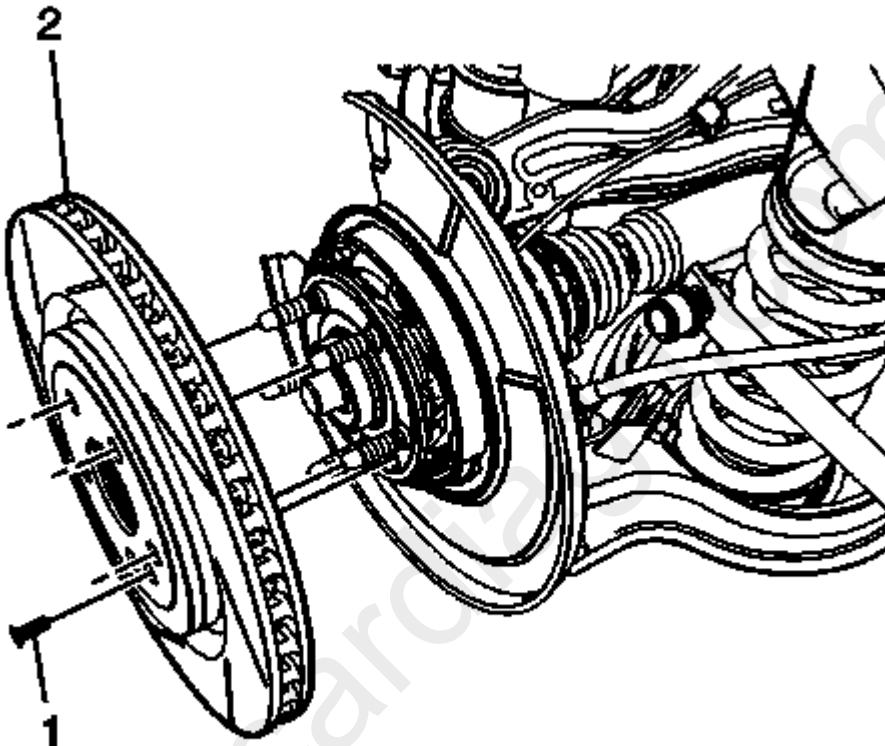


Fig. 198: Identifying Brake Rotor & Screw
Courtesy of GENERAL MOTORS COMPANY

10. Remove the brake rotor screw (1).
11. Remove the brake rotor (2).
12. If the brake rotor cannot be removed, perform the following:
 1. Assemble the **J-2619-A** Slide Hammer w/Adapter to the **J-46277** Rotor Removal Tool.
 2. Insert the **J-46277** Rotor Removal Tool between the rotor friction surfaces in the vent section of the brake rotor.

Do not place the **J-46277** Rotor Removal Tool on the friction surface of the brake rotor.

3. Using the **J-2619-A** Slide Hammer w/Adapter and the **J-46277** Rotor Removal Tool , remove the brake rotor from the wheel hub assembly.
13. Inspect the park brake components for the following conditions:
 - Bent or broken hold down springs
 - Broken, cracked, or worn park brake shoe lining
 - Bent or damaged park brake shoe
 - Worn, bent, or damaged parking brake backing plate
14. If any of the above listed conditions are found, repair or replace the damaged park brake components.

Installation Procedure

NOTE: 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.

1. Using the **J-42450-A** Wheel Hub Resurfacing Kit , thoroughly clean any rust or corrosion from the mating surface of the hub/axle flange.
2. Using the **J-41013** Rotor Resurfacing Kit , thoroughly clean any rust or corrosion from the mating surface and mounting surface of the brake rotor.

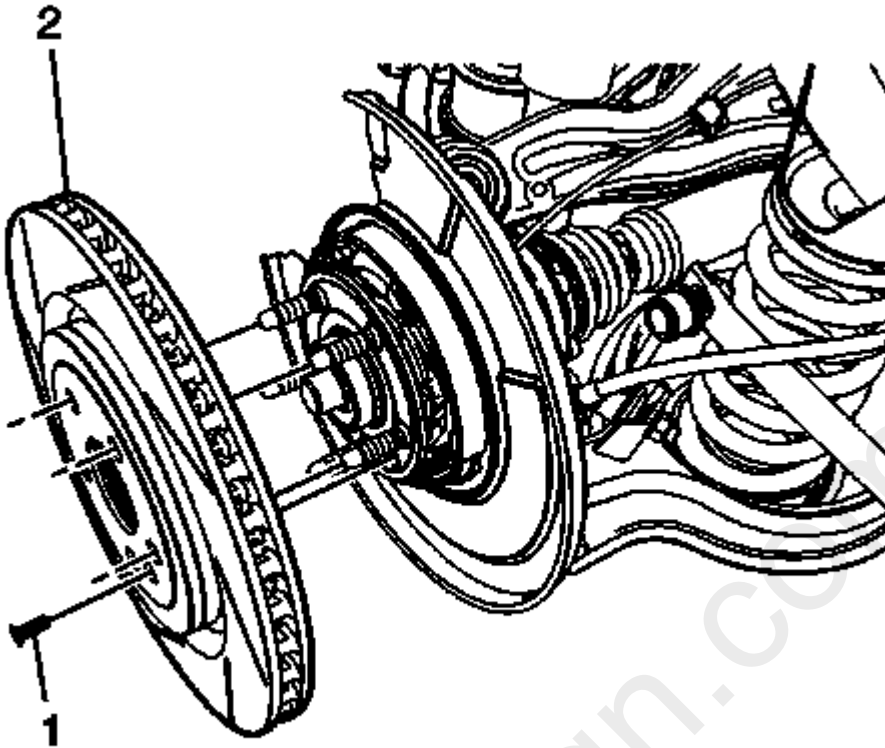


Fig. 199: Identifying Brake Rotor & Screw
Courtesy of GENERAL MOTORS COMPANY

3. Install the brake rotor screw (1) and the brake rotor (2).

Align the match mark made prior to the brake rotor removal, if necessary.

CAUTION: Refer to Fastener Caution .

4. Tighten the brake rotor screw to 12 N.m (106 lb in).

NOTE: If reusing the brake caliper to knuckle mounting bolts the threads of the bolts and the threads of the knuckle mounting holes must be free of residue and debris prior to application of threadlocker in order to ensure proper adhesion and fastener retention.

5. Prepare the bolts and the threaded holes for assembly:
 - Thoroughly clean the residue from the bolt threads by using denatured alcohol or equivalent and allow to dry.

- Thoroughly clean the residue from the threaded holes by using denatured alcohol or equivalent and allow to dry.
6. Apply threadlocker GM P/N 12345493 (Canadian P/N 10953488), or equivalent to 2/3 of the threaded length of the caliper to knuckle mounting bolts. Ensure that there are no gaps in the threadlocker along the length of the filled area of the bolts.
 7. Allow the threadlocker to cure approximately 10 minutes before installation.
 8. Position the brake caliper to the suspension knuckle.

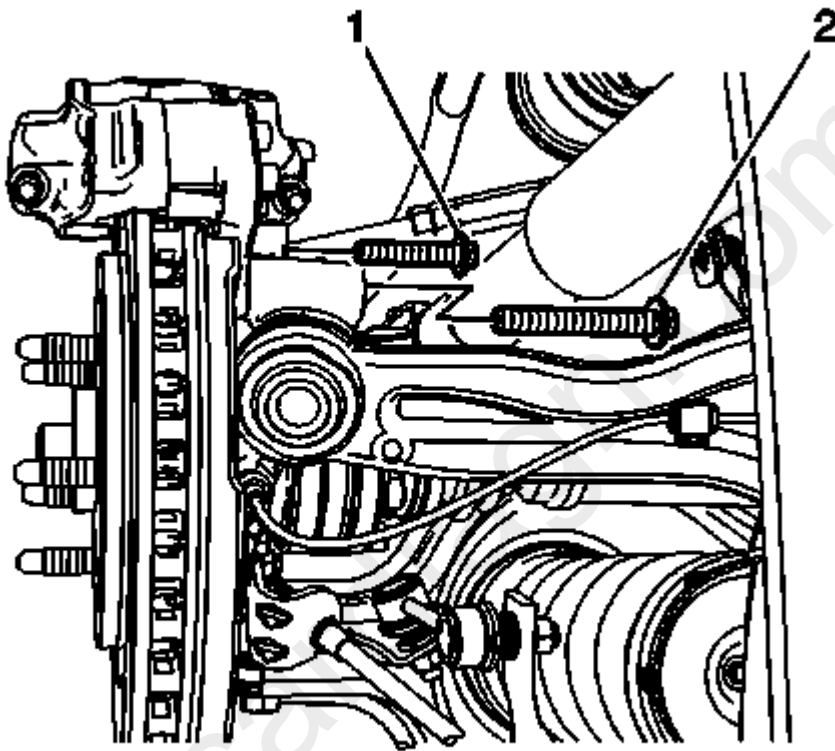


Fig. 200: Identifying Brake Caliper Bolts
Courtesy of GENERAL MOTORS COMPANY

9. Hand install the lower brake caliper bolt (1) and the upper brake caliper bolt (2).
10. Tighten the brake caliper bolts to 130 N.m (96 lb ft).
11. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
12. Set the electronic park brake cable tension. Refer to **Parking Brake Cable Adjuster Enabling (Electric Park Brake)** .
13. If the brake rotor was refinished or replaced, or if new brake pads were installed, burnish the brake pads and rotors. Refer to **Brake Pad and Rotor Burnishing**.

FRONT BRAKE SHIELD REPLACEMENT (RWD)

Removal Procedure

WARNING: Refer to Brake Dust Warning .

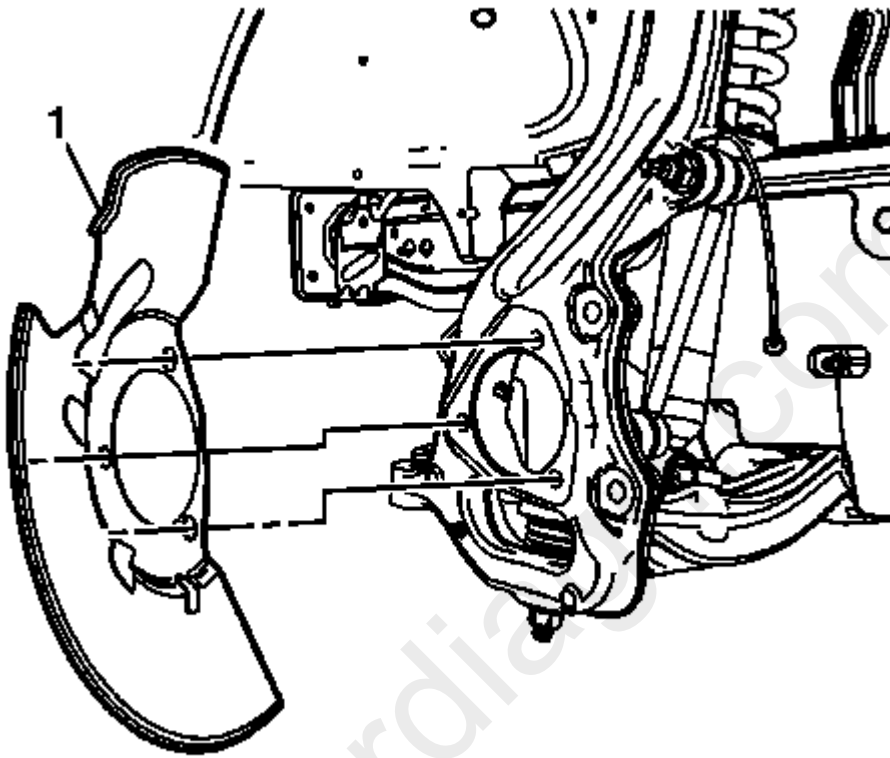


Fig. 201: View of Front Brake Shield
Courtesy of GENERAL MOTORS COMPANY

1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .
2. Remove the tire and wheel assembly. Refer to Tire and Wheel Removal and Installation .
3. Remove the wheel speed sensor. Refer to Front Wheel Speed Sensor Replacement (RWD) .
4. Remove the front wheel bearing and hub assembly. Refer to Front Wheel Bearing and Hub Replacement (RWD) .
5. Remove the front brake shield (1).

Installation Procedure

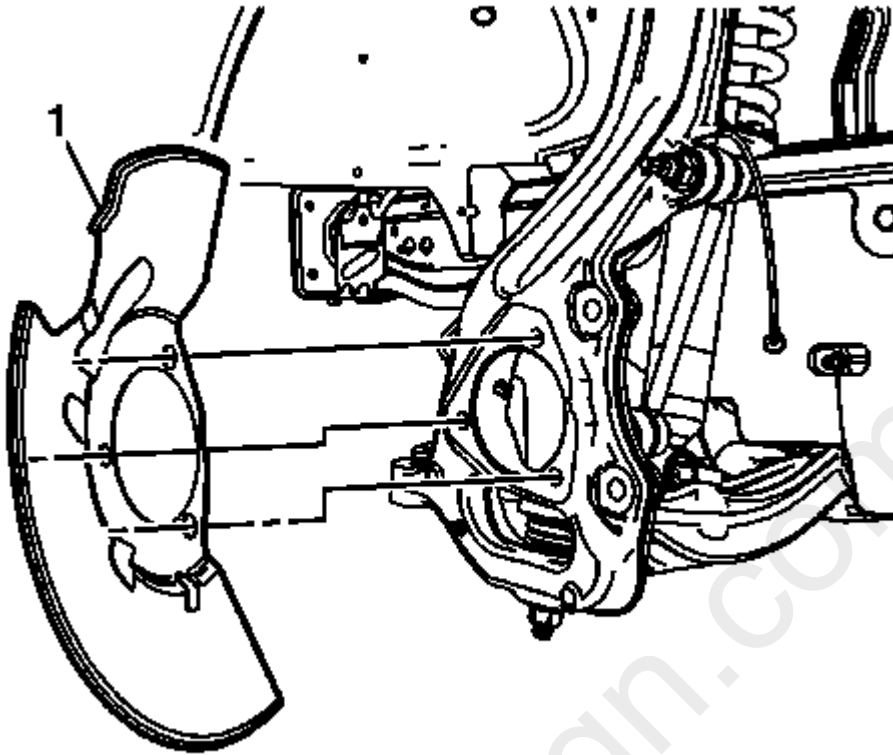


Fig. 202: View of Front Brake Shield
Courtesy of GENERAL MOTORS COMPANY

1. Install the front brake shield (1).
2. Install the front wheel bearing and hub assembly. Refer to **Front Wheel Bearing and Hub Replacement (RWD)** .
3. Install the wheel speed sensor. Refer to **Front Wheel Speed Sensor Replacement (RWD)** .
4. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .

FRONT BRAKE SHIELD REPLACEMENT (AWD)

Removal Procedure

WARNING: Refer to **Brake Dust Warning** .

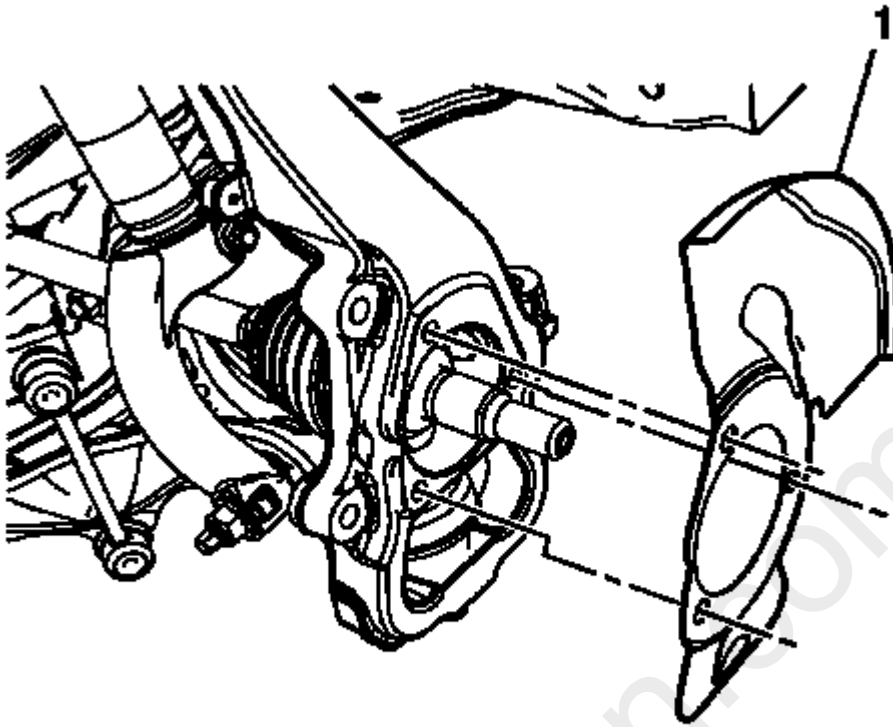


Fig. 203: View of Brake Shield

Courtesy of GENERAL MOTORS COMPANY

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Remove the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
3. Remove the wheel speed sensor. Refer to **Front Wheel Speed Sensor Replacement (AWD)** .
4. Remove the front wheel bearing and hub assembly. Refer to **Front Wheel Bearing and Hub Replacement (AWD)** .
5. Remove the front brake shield (1).

Installation Procedure

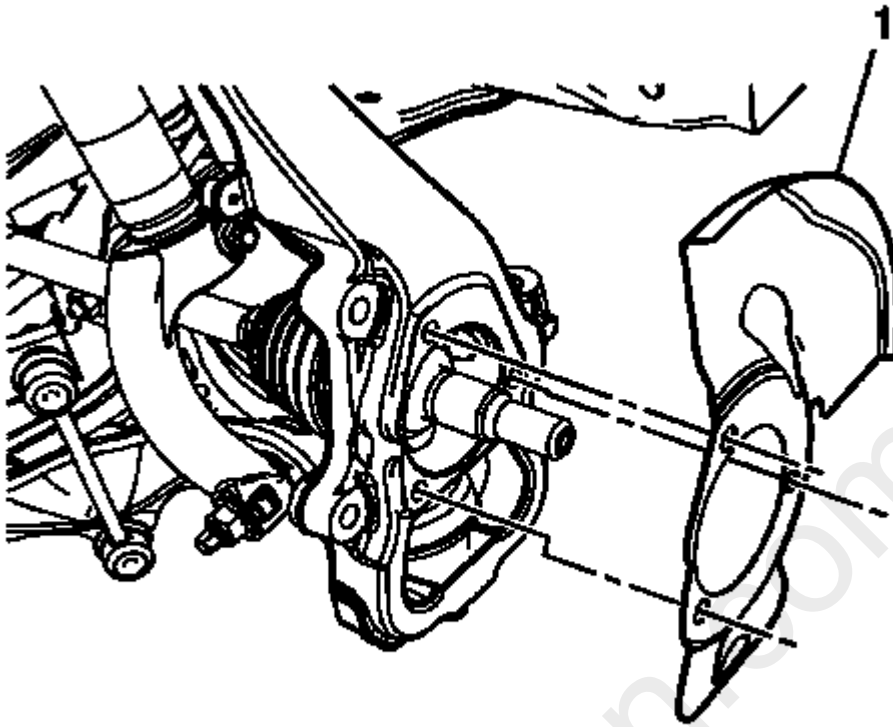


Fig. 204: View of Brake Shield

Courtesy of GENERAL MOTORS COMPANY

1. Install the front brake shield (1).
2. Install the front wheel bearing and hub assembly. Refer to **Front Wheel Bearing and Hub Replacement (AWD)** .
3. Install the wheel speed sensor. Refer to **Front Wheel Speed Sensor Replacement (AWD)** .
4. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .

BRAKE ROTOR ASSEMBLED LATERAL RUNOUT CORRECTION

NOTE:

- 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 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 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 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 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 CORRECTION - INDEXING

NOTE: This Procedure is not used in Europe

Special Tools

CH-45101-100 Conical Brake Rotor Washers

For equivalent regional tools, refer to **Special Tools**.

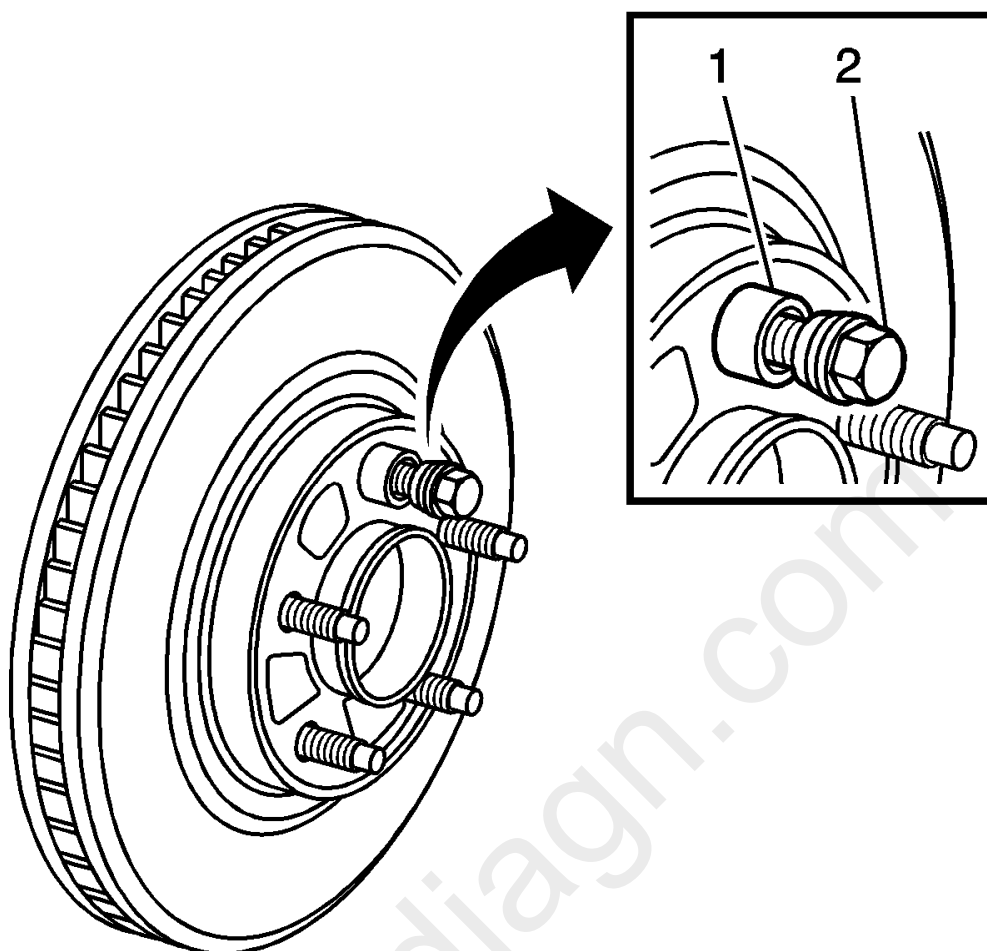


Fig. 205: Identifying Conical Brake Rotor Washers & Lug Nut
Courtesy of GENERAL MOTORS COMPANY

WARNING: Refer to Brake Dust Warning .

NOTE:

- 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 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 Measurement.

1. Remove the **CH-45101-100** Conical Brake Rotor Washers and the lug nuts that were installed during the assembled LRO measurement procedure.

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 **CH-45101-100** Conical Brake Rotor Washers (1) and one lug nut (2) onto the upper-most wheel stud.
5. Continue to hold the rotor secure and tighten the lug nut firmly by hand.

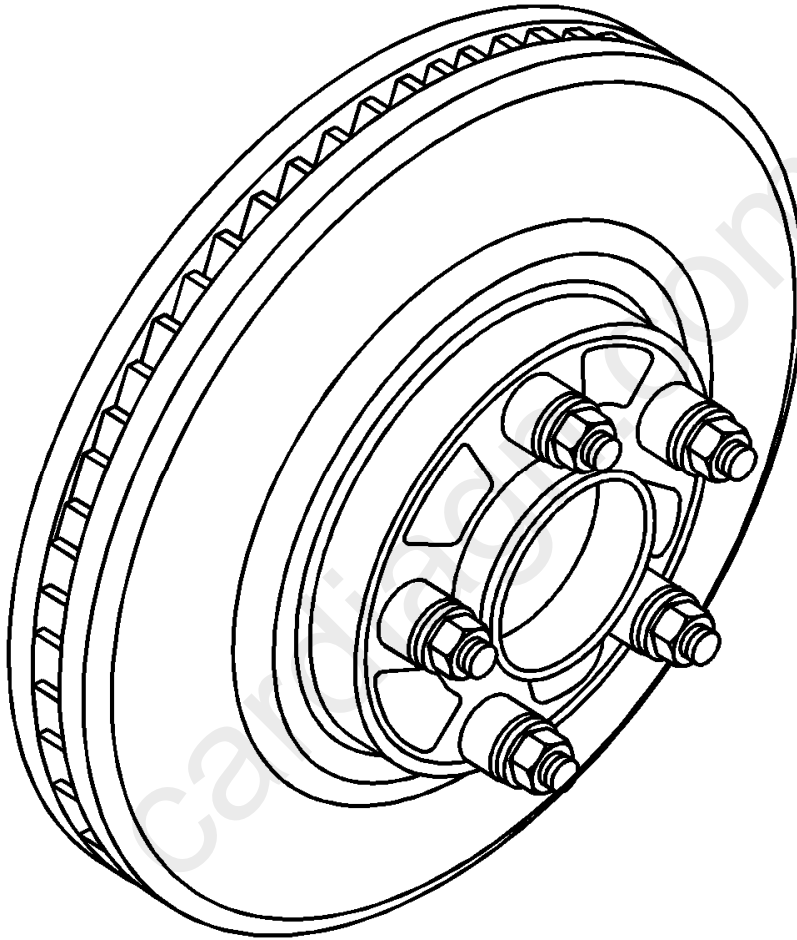


Fig. 206: Identifying Conical Brake Rotor Washers & Lug Nuts
Courtesy of GENERAL MOTORS COMPANY

6. Install the remaining **CH-45101-100** Conical Brake Rotor Washers and lug nuts onto the wheel studs and tighten the nuts firmly by hand in a star-pattern.
7. Tighten the lug nuts in a star-pattern to specification, in order to properly secure the rotor. Refer to **Tire and Wheel Removal and Installation** .
8. Measure the assembled LRO of the brake rotor. Refer to **Brake Rotor Assembled Lateral Runout 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 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 **CH-45101-100** Conical Brake Rotor Washers and the lug nuts.

BRAKE ROTOR ASSEMBLED LATERAL RUNOUT CORRECTION - CORRECTION PLATES

NOTE: **This procedure not used in Europe**

Special Tools

CH-45101-100 Conical Brake Rotor Washers

For equivalent regional tools, refer to **Special Tools**.

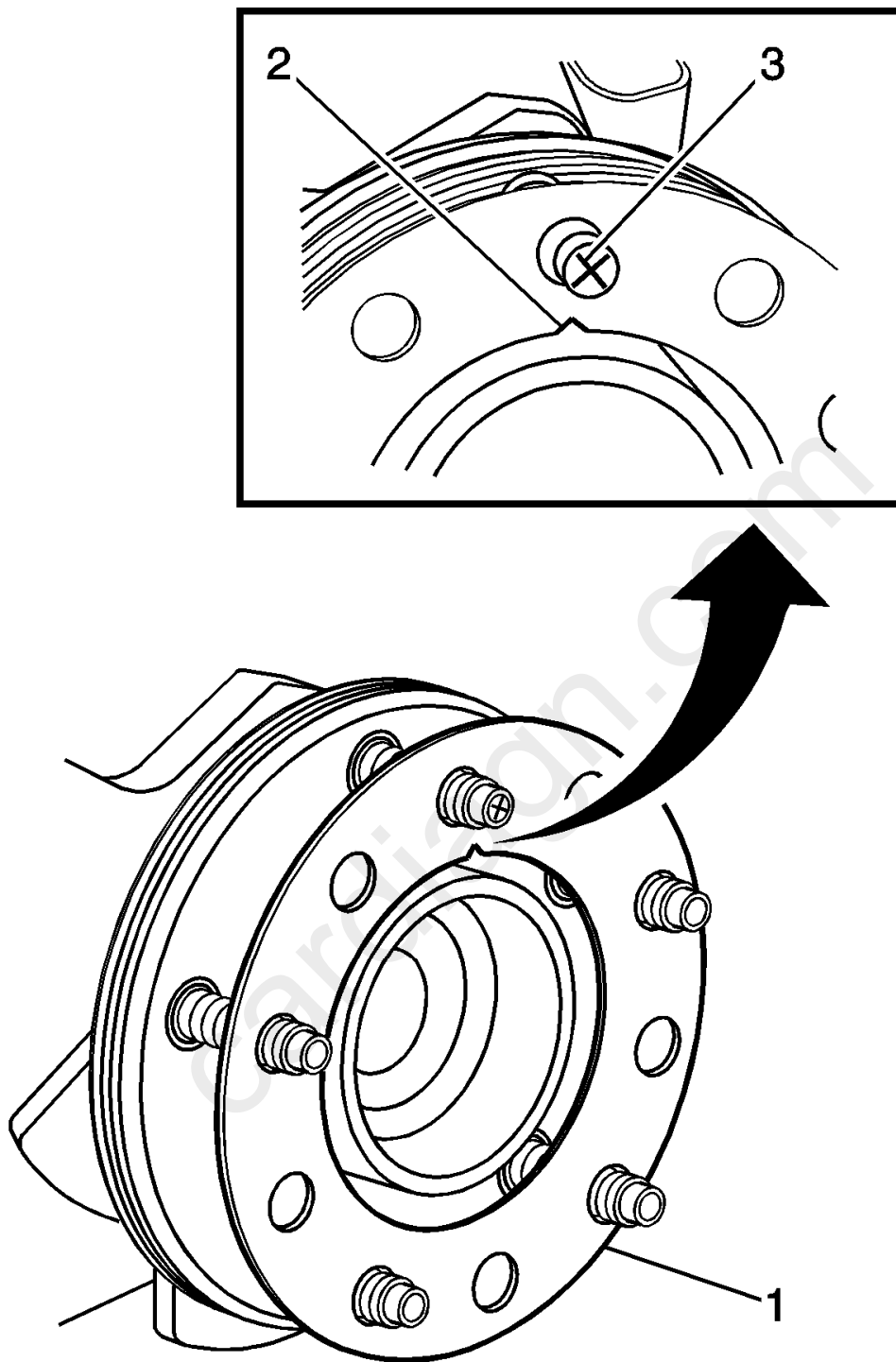


Fig. 207: Identifying Correction Plate, High Spot Mark & V-Shaped Notch
Courtesy of GENERAL MOTORS COMPANY

WARNING: Refer to Brake Dust Warning .

NOTE:

- 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 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 Measurement.

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 **CH-45101-100** Conical Brake Rotor Washers and the lug nuts that were installed during the assembled LRO measurement procedure and/or the indexing correction procedure.
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.

NOTE:

- Do **NOT** install used correction plates in an attempt to correct brake rotor assembled 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.

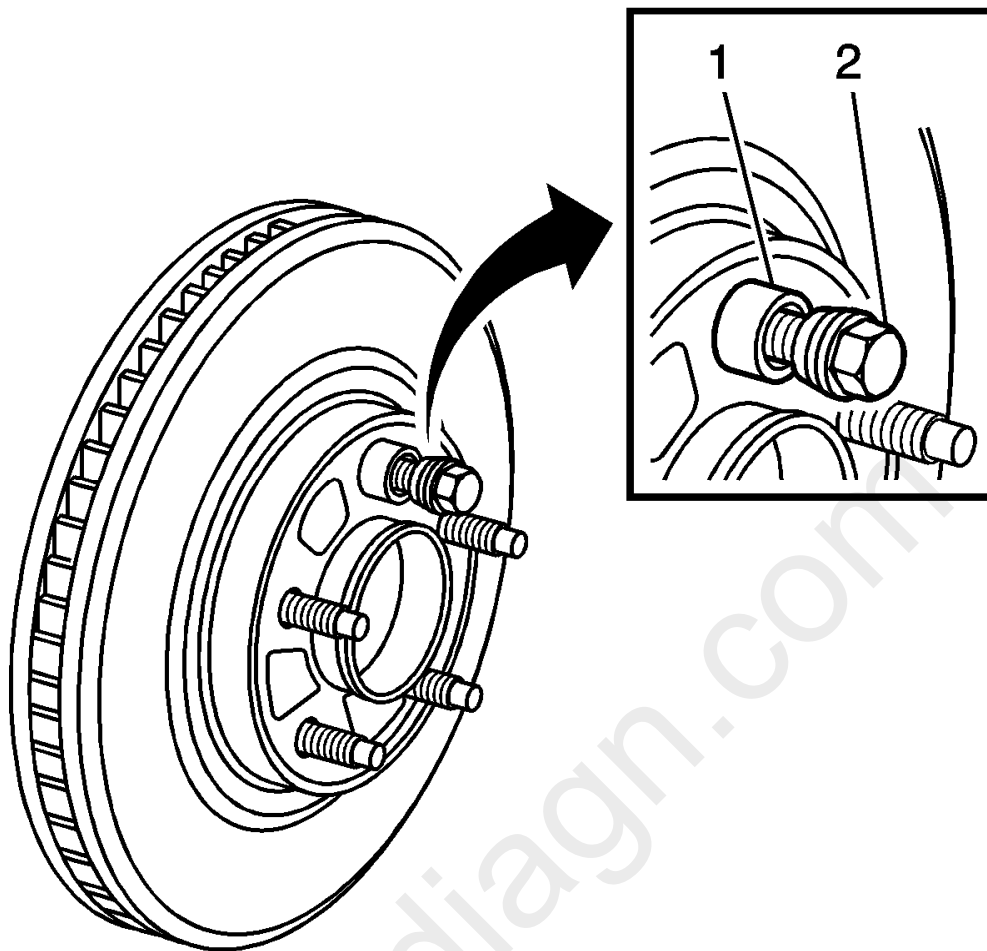


Fig. 208: Identifying Conical Brake Rotor Washers & Lug Nut
Courtesy of GENERAL MOTORS COMPANY

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 **CH-45101-100** Conical Brake Rotor Washers (1) and one lug nut (2) onto the upper-most wheel stud.
9. Continue to hold the rotor secure and tighten the lug nut firmly by hand.

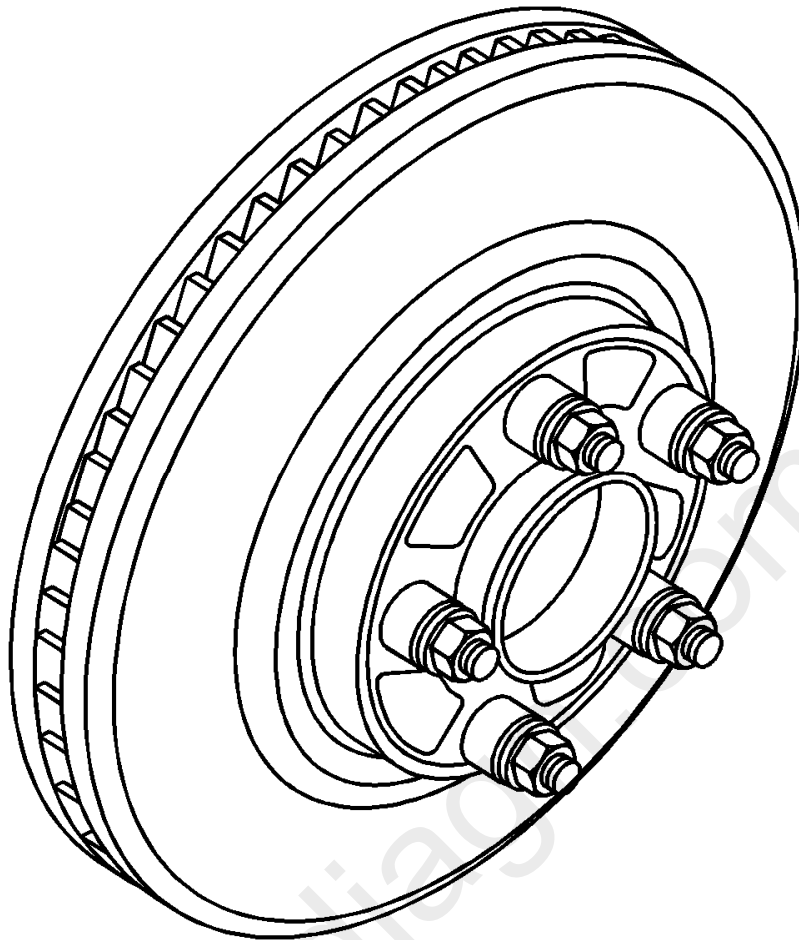


Fig. 209: Identifying Conical Brake Rotor Washers & Lug Nuts
Courtesy of GENERAL MOTORS COMPANY

10. Install the remaining **CH-45101-100** Conical Brake Rotor Washers and lug nuts onto the wheel studs and tighten the nuts firmly by hand in a star-pattern.
11. Tighten the lug nuts in a star-pattern to specification, in order to properly secure the rotor. Refer to **Tire and Wheel Removal and Installation** .
12. Measure the assembled LRO of the brake rotor. Refer to **Brake Rotor Assembled Lateral Runout Measurement**.
13. If the brake rotor assembled LRO measurement still exceeds the maximum allowable specification, refer to **Brake Rotor Assembled Lateral Runout 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 **CH-45101-100** Conical Brake Rotor Washers and the lug nuts.

BRAKE ROTOR ASSEMBLED LATERAL RUNOUT CORRECTION - ON VEHICLE LATHE

NOTE: This procedure is not used in Europe.

Special Tools

CH-45101-100 Conical Brake Rotor Washers

For equivalent regional tools, refer to Special Tools.

WARNING: Refer to Brake Dust Warning .

NOTE:

- 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 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 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 **CH-45101-100** Conical Brake Rotor Washers and the lug nuts that were installed during the assembled LRO measurement procedure and/or the indexing correction procedure.
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 (JE5, J55 Front and Rear, J56 Rear), Brake Rotor Thickness Measurement (J56 Front).
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 Measurement**.
11. If the brake rotor assembled LRO measurement still exceeds the maximum allowable specification, refer to **Brake Rotor Assembled Lateral Runout 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 **CH-45101-100** Conical Brake Rotor Washers and the lug nuts.

BRAKE ROTOR REFINISHING

Special Tools

- **CH-41013** Rotor Resurfacing Kit
- **CH-42450-A** Wheel Hub Resurfacing Kit

For equivalent regional tools, refer to **Special Tools**.

WARNING: Refer to **Brake Dust Warning** .

NOTE:

- 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 (JE5, J55 Front and Rear, J56 Rear)**, **Brake Rotor Thickness Measurement (J56 Front)**.

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.

NOTE: If the vehicle is equipped with cross-drilled rotors, use a lathe with positive rake tooling. This setup requires less cutting pressure, which will result in less vibration, and a better surface finish. Also, use a vibration dampener when cutting. Otherwise, refinish according to the following instructions.

NOTE: 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 **CH-42450-A** Wheel Hub Resurfacing Kit , thoroughly clean any rust or corrosion from the mating surface of the hub/axle flange.
2. Using the **CH-41013** Rotor Resurfacing Kit , thoroughly clean any rust or corrosion from the mating surface and mounting surface of the brake rotor.
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 (JE5, J55 Front and Rear, J56 Rear), Brake Rotor Thickness Measurement (J56 Front)**.
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.

NOTE: Thoroughly cleaning the brake rotor will prevent the possible transfer of finite metal dust left as a by-product of machining to the brake pad material during the burnishing process, thereby reducing the possibility for brake squeal or other brake noises to occur.

3. After applying a non-directional finish, clean each friction surface of the brake rotor with a solution of mild dish washing detergent and water, or a GM approved brake cleaner and a clean shop towel to remove metal particles remaining from machining. Repeat the cleaning process if necessary to remove all metal particles.
13. Remove the brake rotor from the brake lathe.
14. Measure the assembled LRO of the brake rotor to ensure optimum performance of the disc brakes. Refer to **Brake Rotor Assembled Lateral Runout 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 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 (CTS)

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 (CTS)

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.

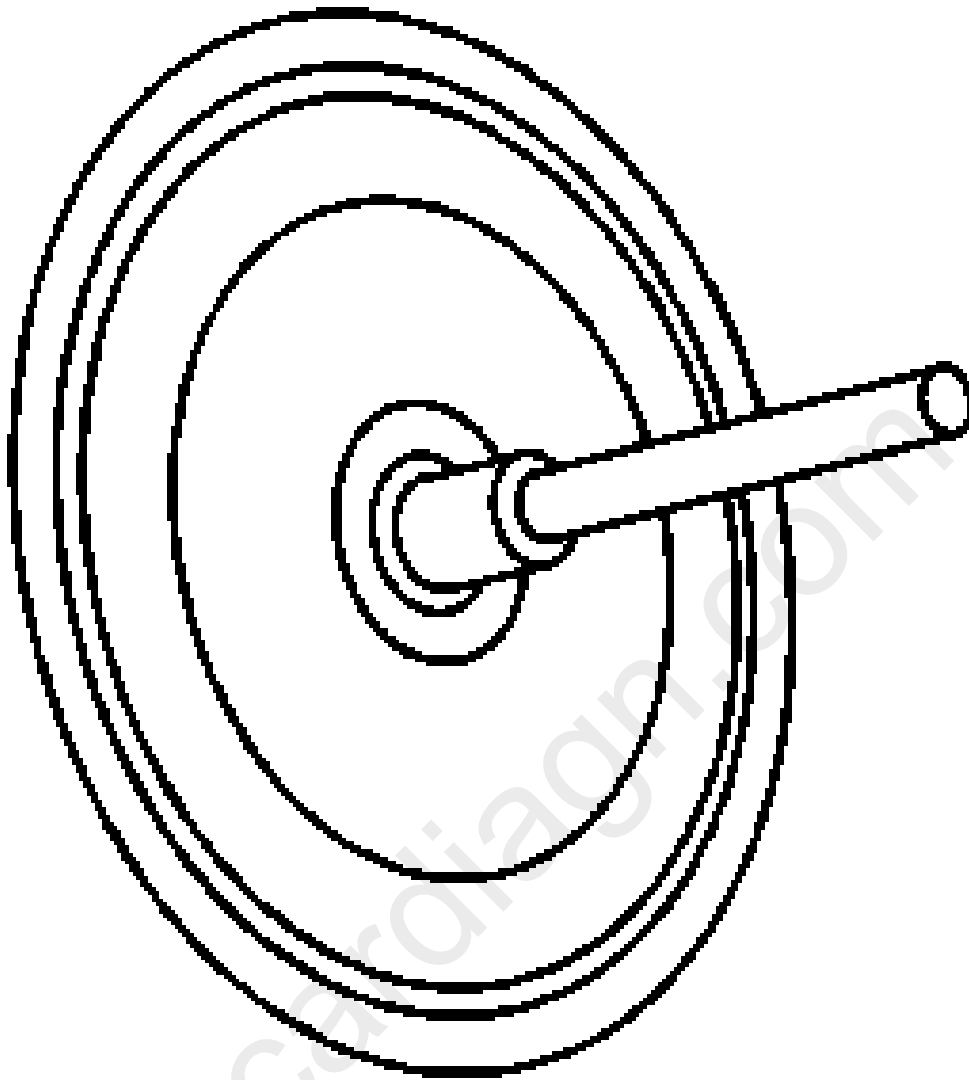
System Operation (CTS-V)

Mechanical output force is applied from the hydraulic brake caliper inboard and outboard pistons to the inner and outer brake pads. The brake calipers are a fixed, opposed-piston design, allowing the output force to be equally distributed through the distribution of the pressurized brake fluid within the caliper. 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 the brake pad hardware and of the brake caliper inboard and outboard pistons is essential for even distribution of braking force.

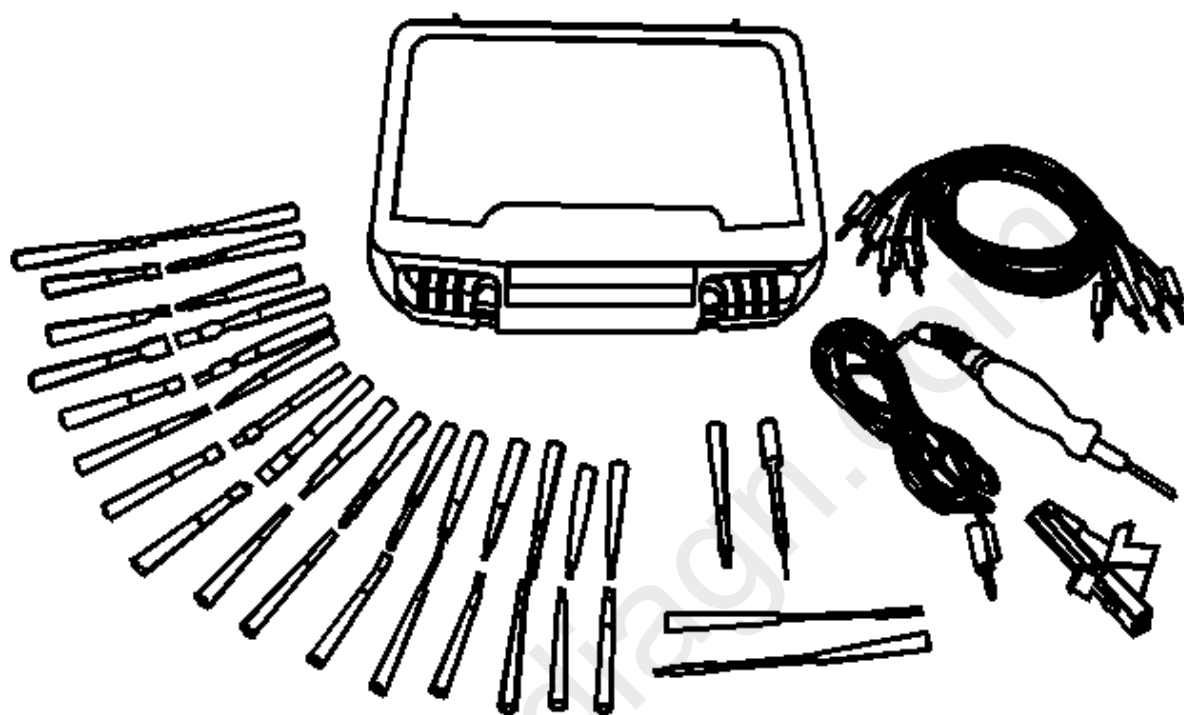
SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

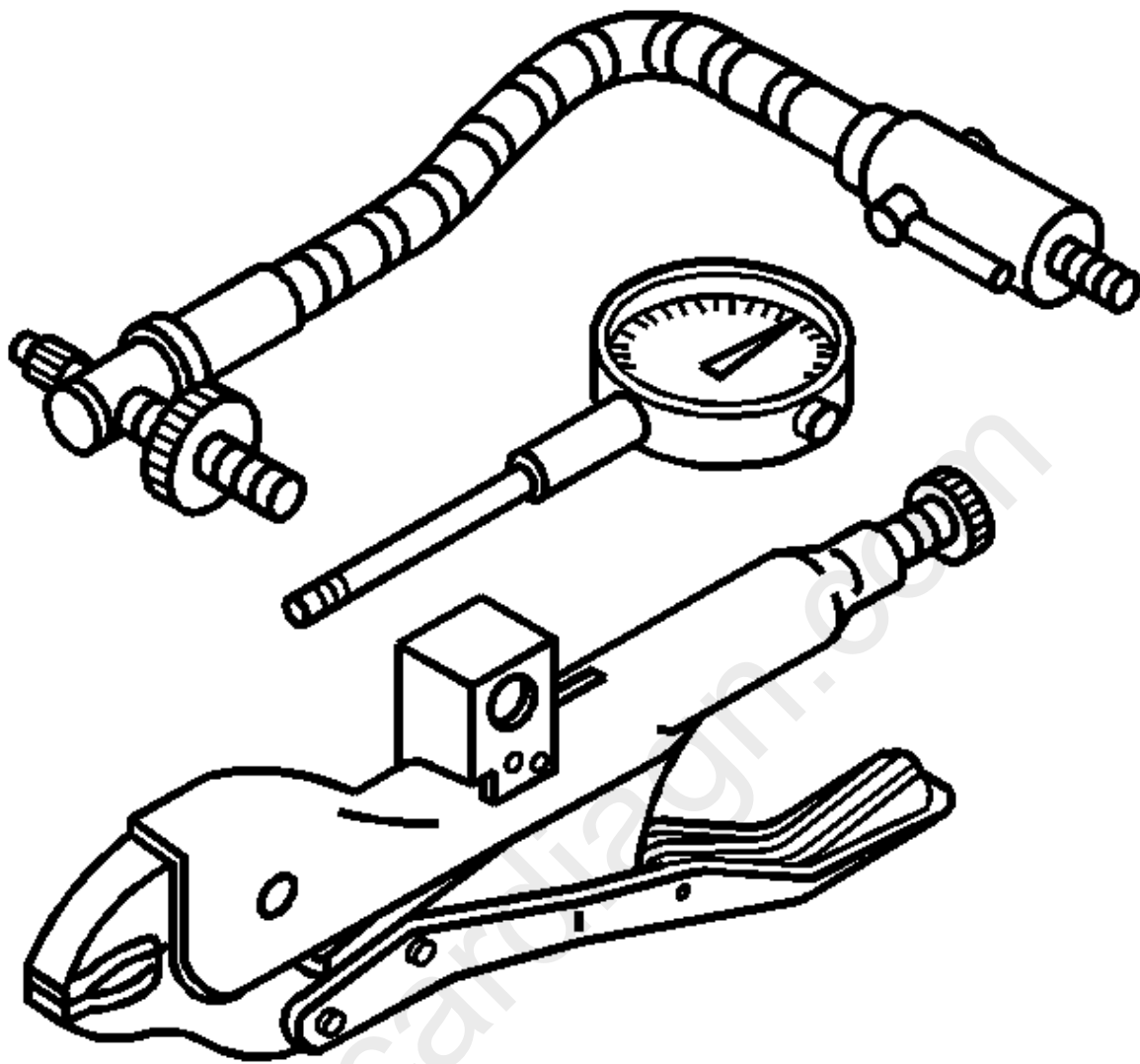
Illustration	Tool Number/ Description



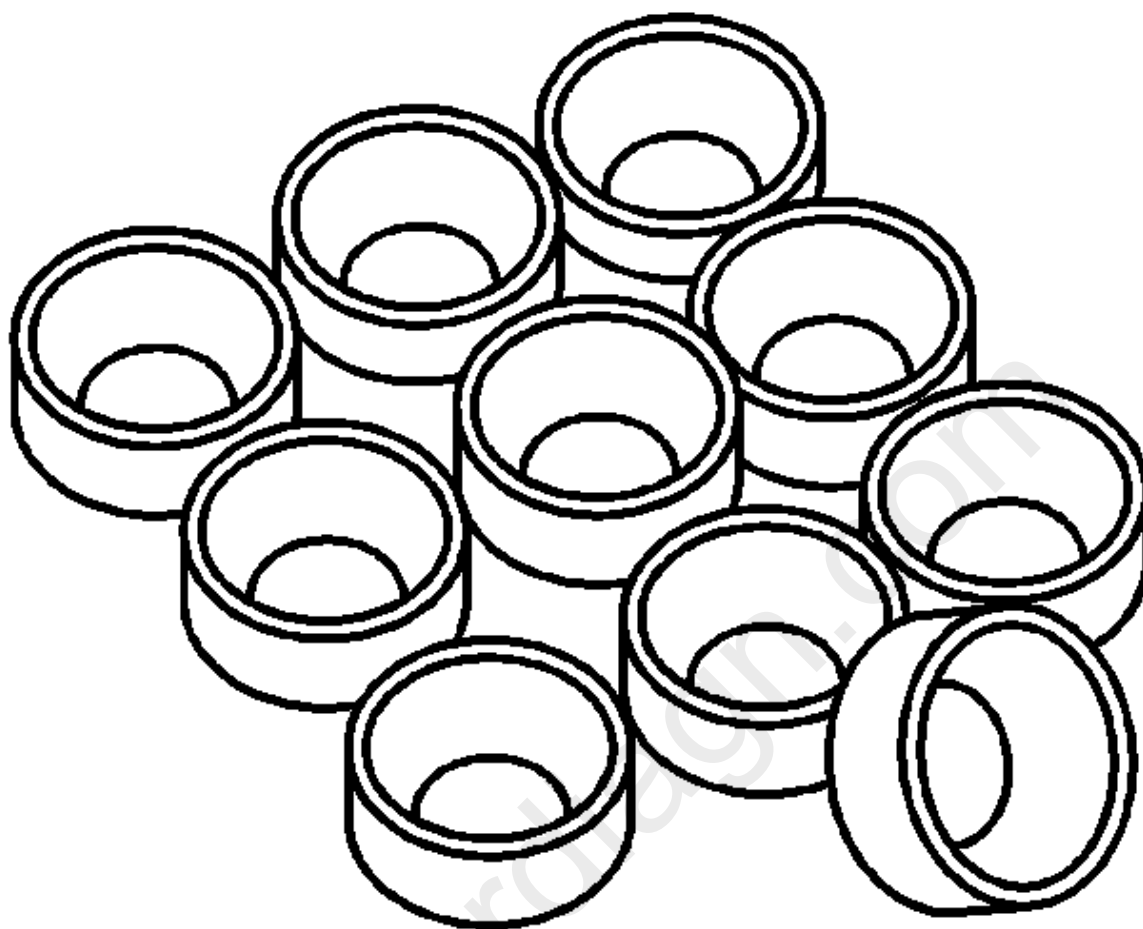
J 41013
Rotor
Resurfacing
Kit



J 42450-A
Wheel Hub
Resurfacing
Kit



J 45101
Hub and
Wheel
Runout
Gauge



J 45101-
100
Conical
Brake Rotor
Washers