

2018 Brakes
Disc Brakes - Equinox & Terrain

SPECIFICATIONS

FASTENER SPECIFICATIONS

Single Use Non-Threaded Fasteners/Components

NOTE: <i>All fasteners/components listed in this table MUST BE DISCARDED and replaced with NEW after removal.</i>	
Application	
Brake Caliper Piston Dust Boot	
Brake Caliper Piston Seal	
Brake Hose Fitting Gasket	
Rear Parking Brake Actuator Lever Seal	

Reusable Threaded Fastener Tightening Specifications

NOTE: <i>All fasteners listed in this table can be reused after removal.</i>	
Application	Specification
	Metric (English)
Brake Caliper Guide Pin Bolt - Front and Rear	40 N.m (30 lb ft)
Brake Hose Fitting Bolt - Front and Rear	40 N.m (30 lb ft)
Front Brake Caliper Bracket Bolt	
• First Pass:	150 N.m (111 lb ft)
• Final Pass:	15-30 Degrees
Front Brake Rotor Bolt	9 N.m (80 lb in)
Parking Brake Actuator Bolt	12 N.m (106 lb in)
Rear Brake Caliper Bracket Bolt	
• First Pass:	100 N.m (74 lb ft)
• Final Pass:	15-30 Degrees
Rear Brake Rotor Bolt	9 N.m (80 lb in)

DISC BRAKE COMPONENT SPECIFICATIONS

Application	Specification	
	Metric	English
Front Brakes - J17		
• Brake Pad Friction Material Minimum Thickness	2.0 mm	0.078 in
• Rotor Diameter	321.0 mm	12.638 in
• Rotor Discard Thickness*	25.0 mm	0.984 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 Minimum Allowable Thickness After Refinish	25.2 mm	0.992 in
• Rotor Thickness New	28.0 mm	1.102 in
Front Brakes - J60		
• Brake Pad Friction Material Minimum Thickness	2.0 mm	0.078 in
• Rotor Diameter	300.0 mm	11.810 in
• Rotor Discard Thickness*	23.0 mm	0.905 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 Minimum Allowable Thickness After Refinish	23.2 mm	0.913 in
• Rotor Thickness New	26.0 mm	1.023 in
Rear Brakes - J17, J60		
• Brake Pad Friction Material Minimum Thickness	2.0 mm	0.078 in
• Rotor Diameter	288.0 mm	11.339 in
• Rotor Discard Thickness*	10.0 mm	0.393 in
• Rotor Maximum Allowable Assembled Lateral Runout	0.05 mm	0.002 in
• Rotor Maximum Allowable Thickness Variation	0.025 mm	0.001 in
• Rotor Maximum Allowable Scoring	1.50 mm	0.059 in

Application	Specification	
	Metric	English
Rotor Minimum Allowable Thickness After Refinish	10.2 mm	0.402 in
Rotor Thickness New	12.0 mm	0.472 in

* All brake rotors have a minimum thickness dimension cast into them. Replace any rotor that is worn or machined below this specification.

ADHESIVES, FLUIDS, LUBRICANTS, AND SEALERS

Application	Type of Material	GM Part Number	
		United States	Canada
Brake Caliper Bracket Bolt	Threadlocker	89021297	10953488
Hydraulic Brake System	DOT 3 Motor Vehicle Brake Fluid	19299818	19299819

DIAGNOSTIC INFORMATION AND PROCEDURES

BRAKE ROTOR THICKNESS MEASUREMENT

WARNING: Refer to Brake Dust Warning .

- 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 (J17)Front Disc Brake Pads Replacement (J60), and/or Rear Disc Brake Pads Replacement.
- Clean the friction surfaces of the brake rotor with denatured alcohol, or an equivalent approved brake cleaner.

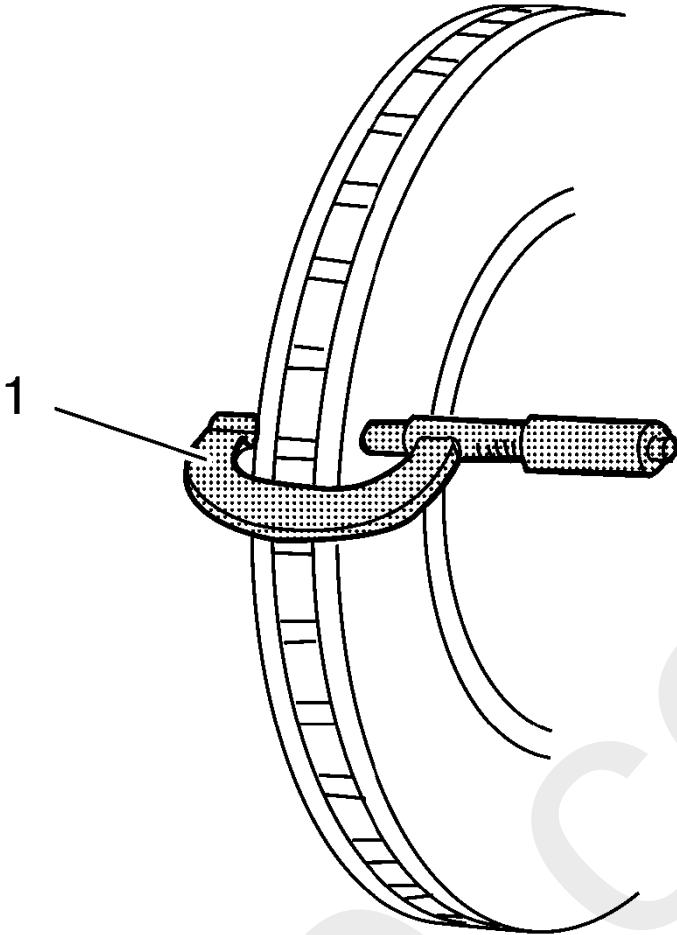


Fig. 1: Micrometer On Brake Rotor
Courtesy of GENERAL MOTORS COMPANY

- Using a micrometer (1) calibrated in thousandths-of-a-millimeter, or ten-thousandths-of-an-inch, measure and record the lowest thickness of the brake rotor at 4 or more points, equally 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 outside edge of the rotor, about 13 mm (1/2 in), for each measurement.
- Compare the lowest thickness measurement recorded to the brake rotor discard thickness specifications. Refer to Disc Brake Component Specifications.
- If the lowest thickness measurement of the brake rotor is above the discard thickness specification, the brake rotor may be refinished, depending upon surface and wear conditions which may be present.
- If the lowest thickness measurement of the brake rotor is at or below the discard thickness specification, the rotor requires replacement. Refer to Front Brake Rotor Replacement, and/or Rear Brake Rotor Replacement.

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.

- 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 (J17)Front Disc Brake Pads Replacement (J60), and/or Rear Disc Brake Pads Replacement.
- Clean the friction surfaces of the brake rotor with denatured alcohol, or an equivalent approved brake cleaner.

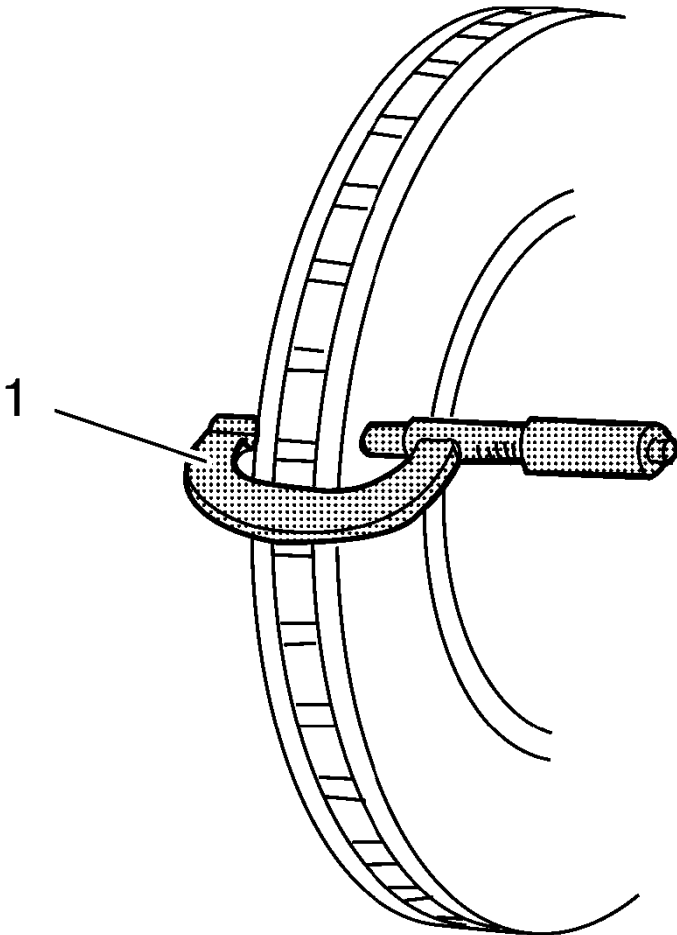


Fig. 2: Micrometer On Brake Rotor
Courtesy of GENERAL MOTORS COMPANY

- 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 \(J17\)](#)[Front Disc Brake Pads Replacement \(J60\)](#), and/or [Rear Disc Brake Pads Replacement](#).
2. Clean the friction surfaces of the brake rotor with denatured alcohol, or an equivalent approved brake cleaner.
3. Inspect the friction surfaces of the brake rotor for the following Braking Surface Conditions:

- Heavy rust and/or pitting

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

- Cracks and/or heat spots
- Excessive blueing discoloration

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

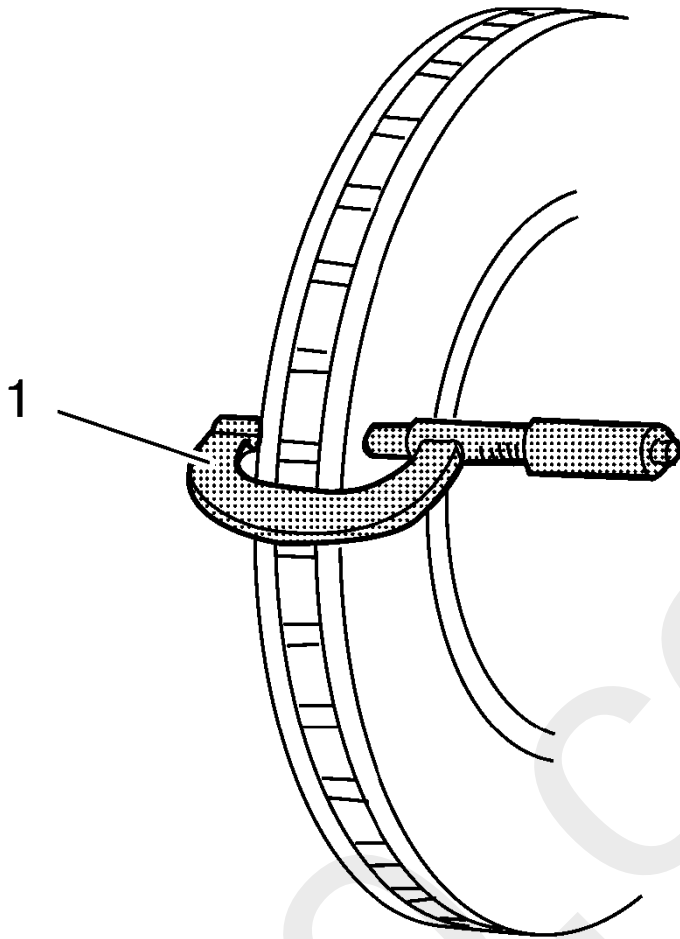


Fig. 3: Micrometer On Brake Rotor
Courtesy of GENERAL MOTORS COMPANY

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. Match-mark 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](#), and/or [Rear Brake Rotor Replacement](#).
 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 match-mark made prior to removal.

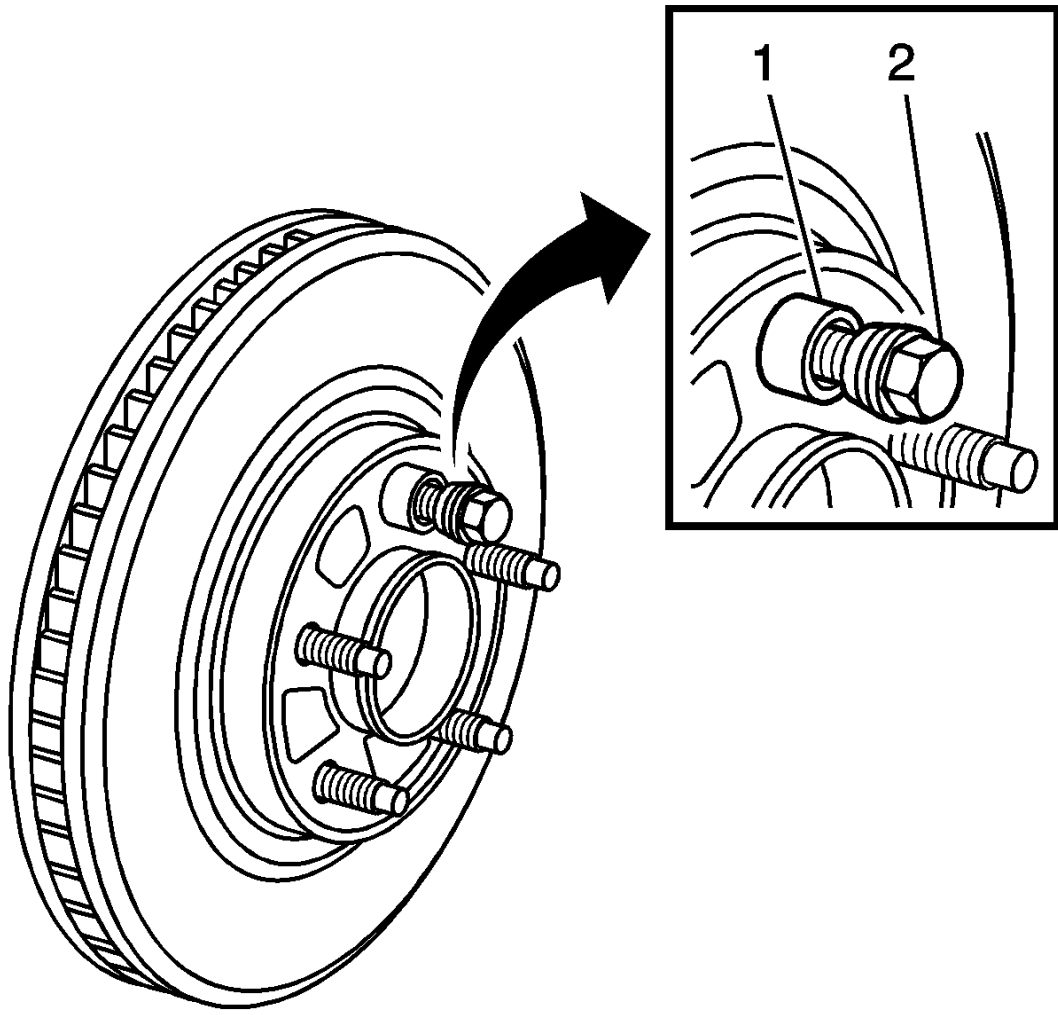


Fig. 4: Lug Nuts & Conical Washers
Courtesy of GENERAL MOTORS COMPANY

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.

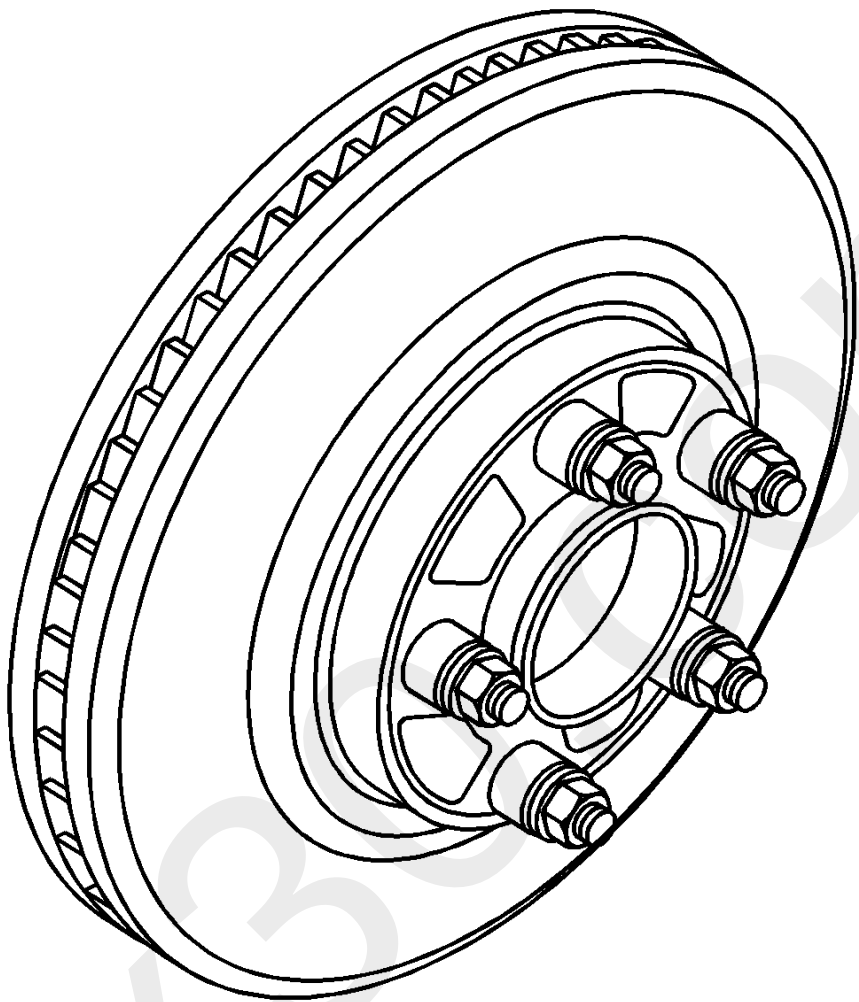


Fig. 5: Lug Nuts & Conical Washers
Courtesy of GENERAL MOTORS COMPANY

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.

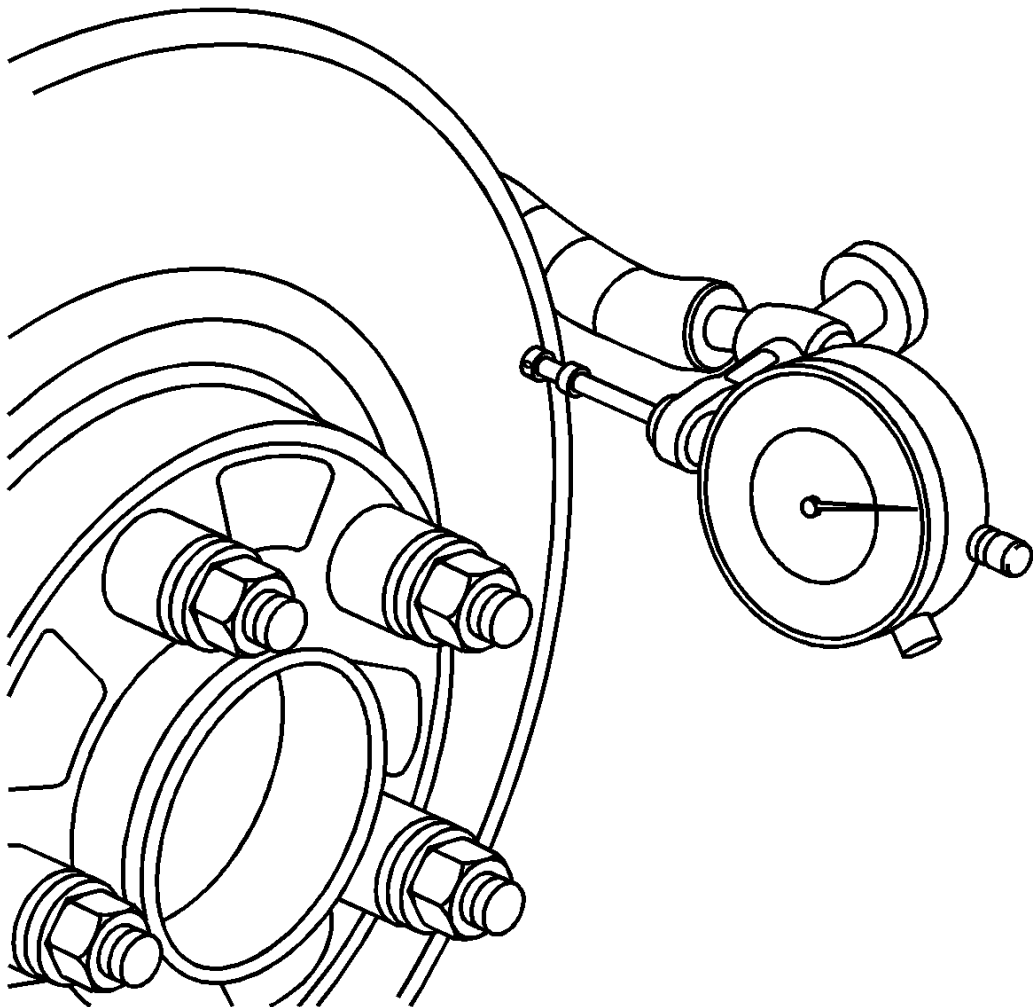


Fig. 6: Using Dial Indicator To Measure Lateral Runout
Courtesy of GENERAL MOTORS COMPANY

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

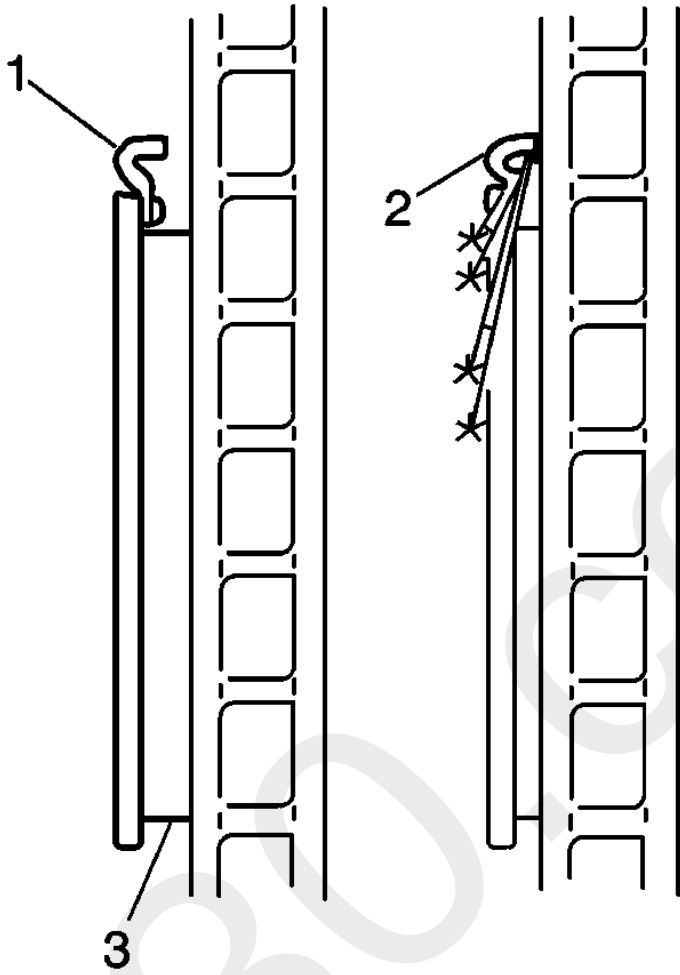


Fig. 7: View Of Brake Pads & Audible Wear Sensors
Courtesy of GENERAL MOTORS COMPANY

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.

NOTE: Some pads are designed to be bonded to the caliper for noise suppression. This bond should only be undone when pads are replaced.

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.

NOTE: When replacing the disc brake pads, maintain the same disc brake pad wear sensor orientation.

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 2.0 mm (0.080 in) of the mounting plates.
7. Replace the disc brake pads if any have separated from the mounting plates.
8. Inspect the disc brake pads friction surfaces for cracks, fractures, or damage which may cause noise or otherwise impair disc brake performance.

BRAKE CALIPER INSPECTION

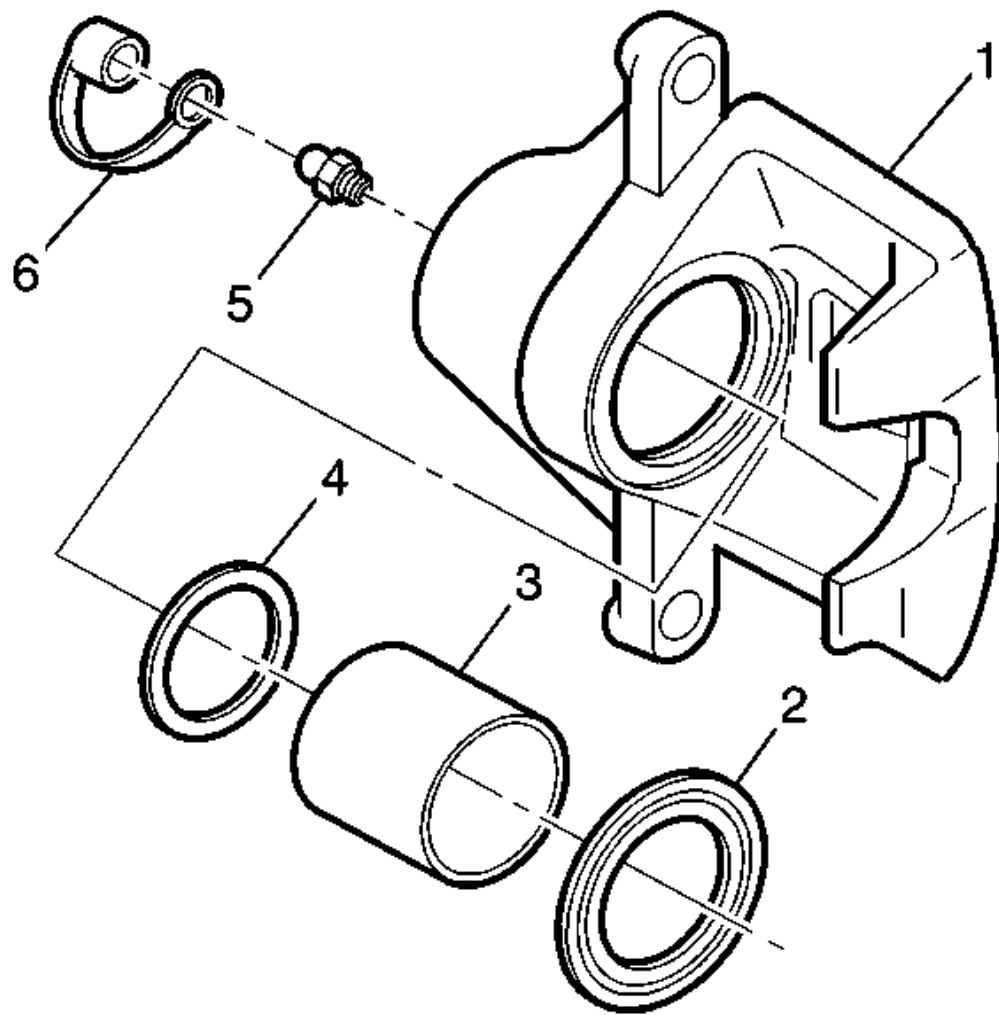


Fig. 8: Exploded View Of Brake Caliper
Courtesy of GENERAL MOTORS COMPANY

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.

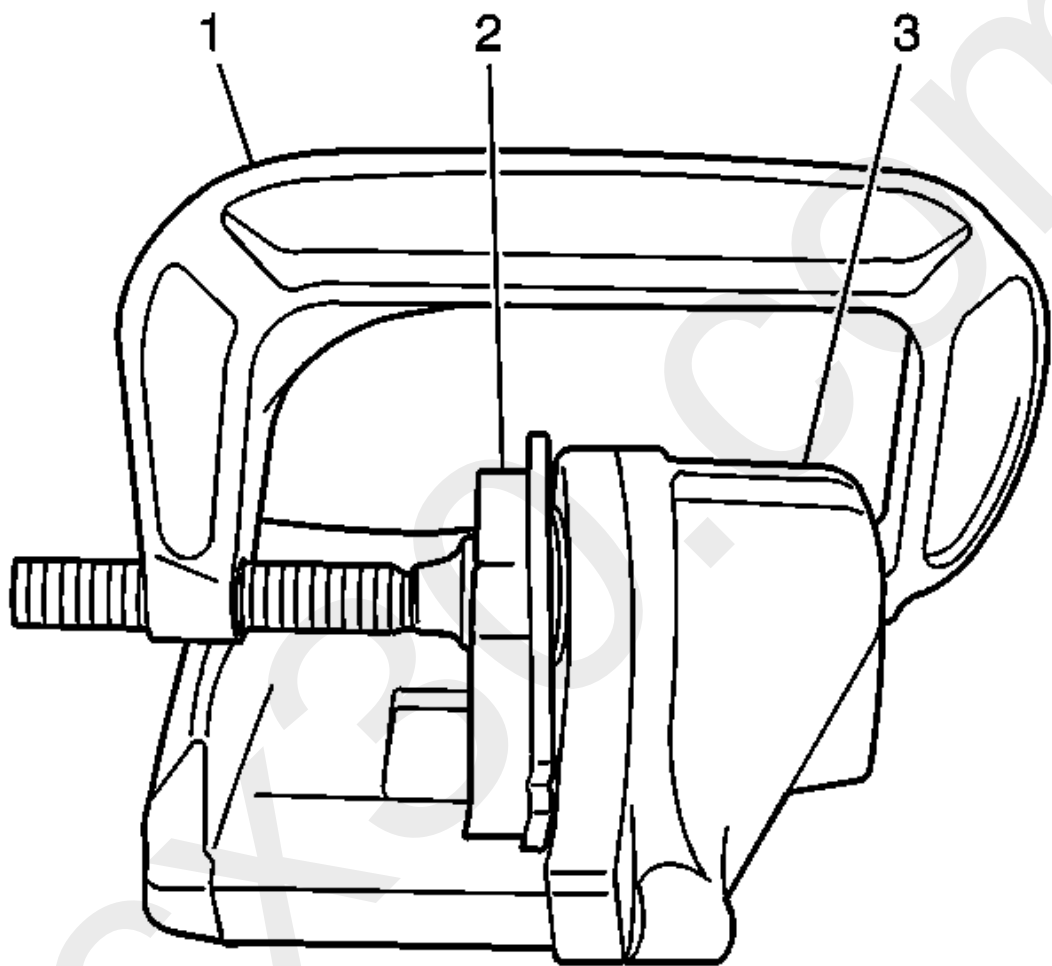


Fig. 9: Compressing Caliper Piston
Courtesy of GENERAL MOTORS COMPANY

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](#) .
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.
 1. Install a large C-clamp over the top of the caliper housing and against the back of the outboard pad.
 2. Slowly tighten the C-clamp until the pistons are pushed completely into the caliper bores.
 3. 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](#).

NOTE: When replacing the disc brake pads, maintain the same disc brake pad wear sensor orientation.

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.

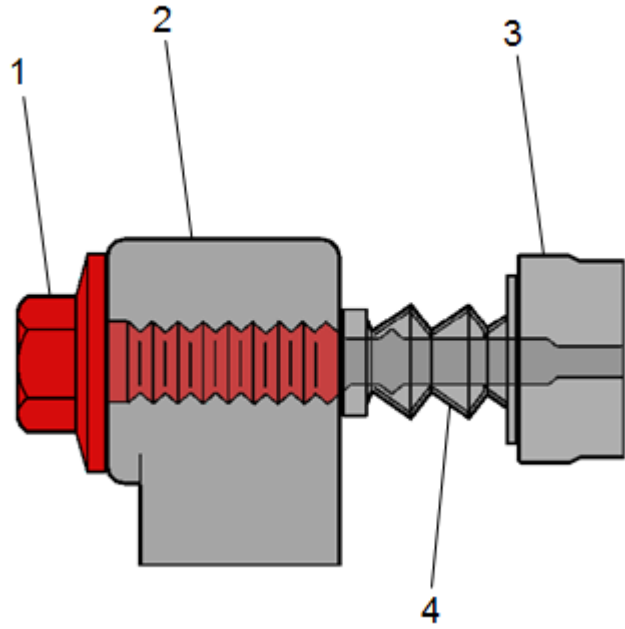


Fig. 10: View Of Caliper, Pin, Boots & Caliper Mounting Bracket
Courtesy of GENERAL MOTORS COMPANY

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](#).

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.
 1. Install a large C-clamp over the top of the caliper housing and against the back of the outboard pad.
 2. Slowly tighten the C-clamp until the pistons are pushed completely into the caliper bores.
 3. 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](#).
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.

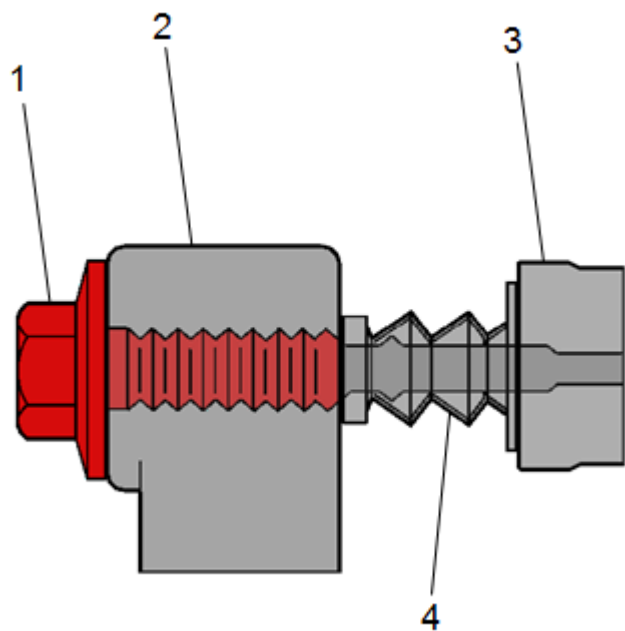


Fig. 11: View Of Caliper, Pin, Boots & Caliper Mounting Bracket
Courtesy of GENERAL MOTORS COMPANY

14. Inspect the caliper bolts (1) or guide pins for the following:
 - Binding
 - Seizing
 - Looseness in the brake caliper mounting bracket (3)
 - Bent or damaged brake caliper mounting bolts or guide pins
 - 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.



Fig. 12: Upper Guide Pin Seal And Guide Pin Seal
Courtesy of GENERAL MOTORS COMPANY

NOTE: Excess brake lubricant and trapped air must be expelled from the brake caliper guide pin bore to allow full caliper movement and prevent premature brake pad wear.

17. Gently pull the edge of the upper guide pin seal (1) away from the brake caliper guide pin (2) while simultaneously pushing the brake caliper guide pin into the brake caliper bracket to expel any trapped air and excess brake lubricant.
18. Repeat step 17 for the lower guide pin seal and brake caliper guide pin.
19. With a clean shop towel, clean any excess brake lubricant from the guide pin seal and brake caliper guide pin.
20. Install the disc brake caliper to the brake caliper mounting bracket. Refer to [Rear Brake Caliper Replacement](#).

REPAIR INSTRUCTIONS

FRONT DISC BRAKE PADS REPLACEMENT (J17)

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 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. [Lifting and Jacking the Vehicle](#)
5. Remove the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)
6. Place a large C-clamp over the brake caliper body and against the outer brake pad.
7. Using the C-clamp, carefully compress the brake caliper piston fully into the brake caliper bore.

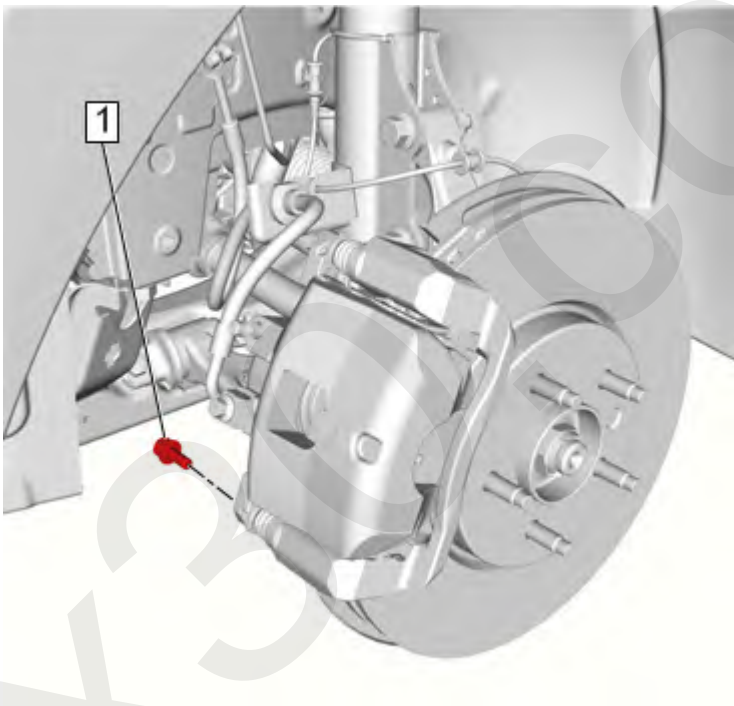


Fig. 13: Brake Caliper Guide Pin Bolt
Courtesy of GENERAL MOTORS COMPANY

- NOTE:**
- DO NOT use any air tools to remove or install the guide pin bolts. Use hand tools ONLY.
 - Install an open end wrench to hold the caliper guide pin in line with the brake caliper while removing or installing caliper guide pin bolt. DO NOT allow the open end wrench to come in contact with the brake caliper. Allowing the open end wrench to come in contact with the brake caliper will cause a pulsation when the brakes are applied.

8. Remove Brake Caliper Guide Pin Bolt (1).

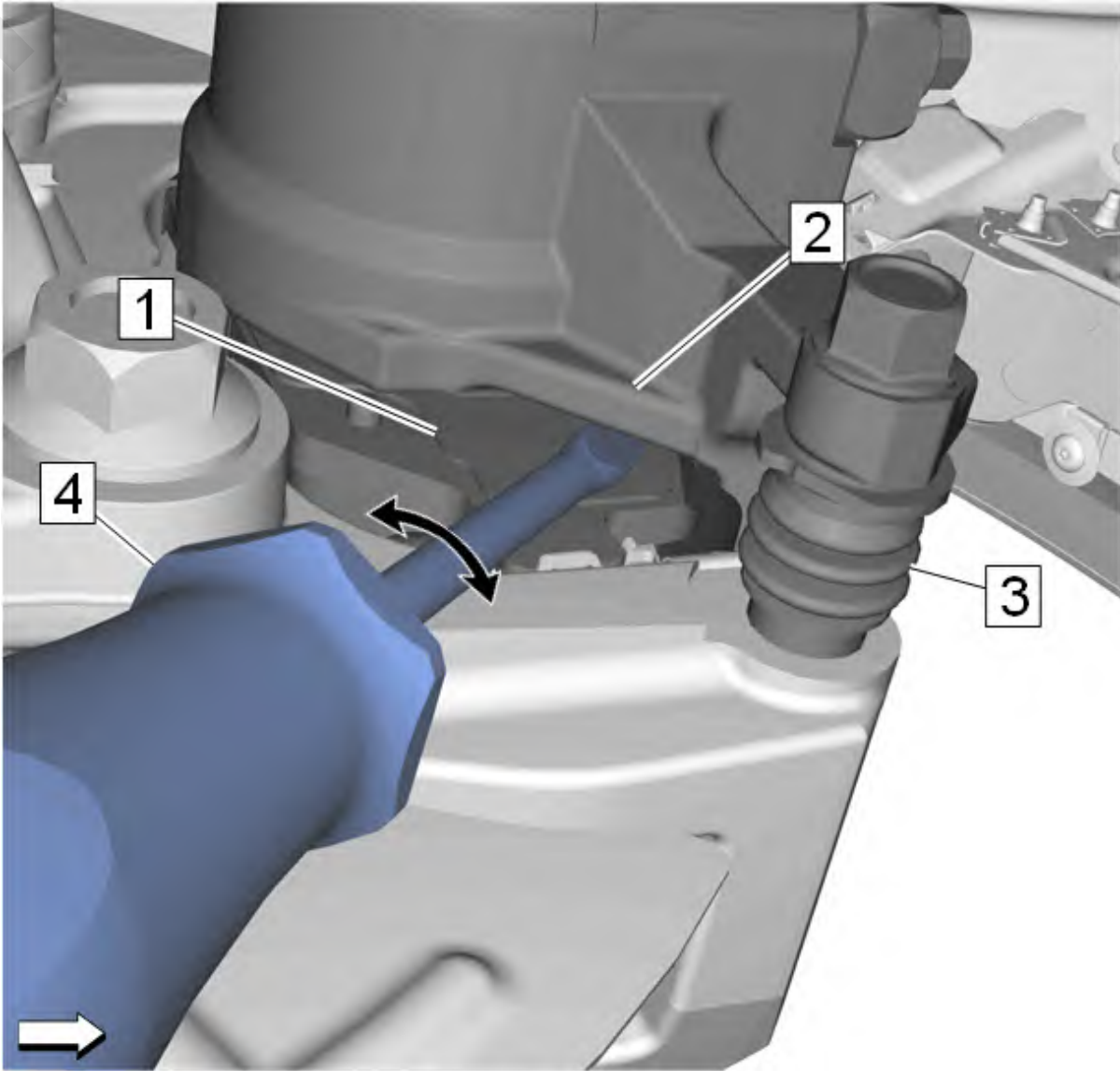


Fig. 14: Inner Brake Pad And Brake Caliper
Courtesy of GENERAL MOTORS COMPANY

WARNING: Disc brake pads are adhered to the caliper piston using an adhesive patch. The disc brake pads must be separated from the caliper piston. Do NOT insert the pry tool through bridge window to pry against the piston face. Prying at this location may damage the brake caliper piston. Failure to follow this warning may result in brake system failure and/or personal injury.

9. Loose the inner brake pad (1) by twisting a screwdriver (4) between inner brake pad (1) and brake caliper (2).

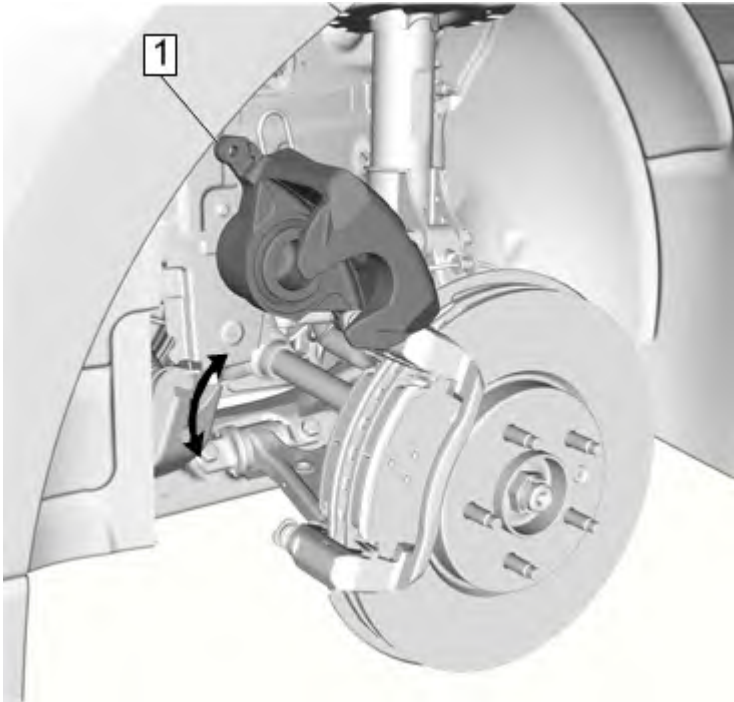


Fig. 15: Front Brake Caliper
Courtesy of GENERAL MOTORS COMPANY

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.

- 10. Remove Front Brake Caliper (1).
- 11. Pivot the brake caliper upward and secure with heavy mechanics wire, or equivalent.

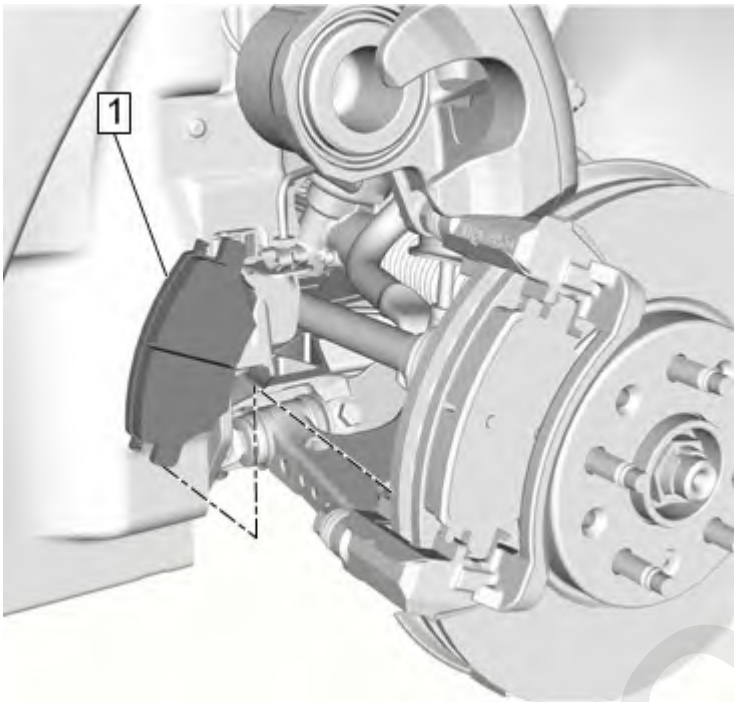


Fig. 16: Inner Disc Brake Pad
Courtesy of GENERAL MOTORS COMPANY

- 12. Remove Inner Disc Brake Pad (1).

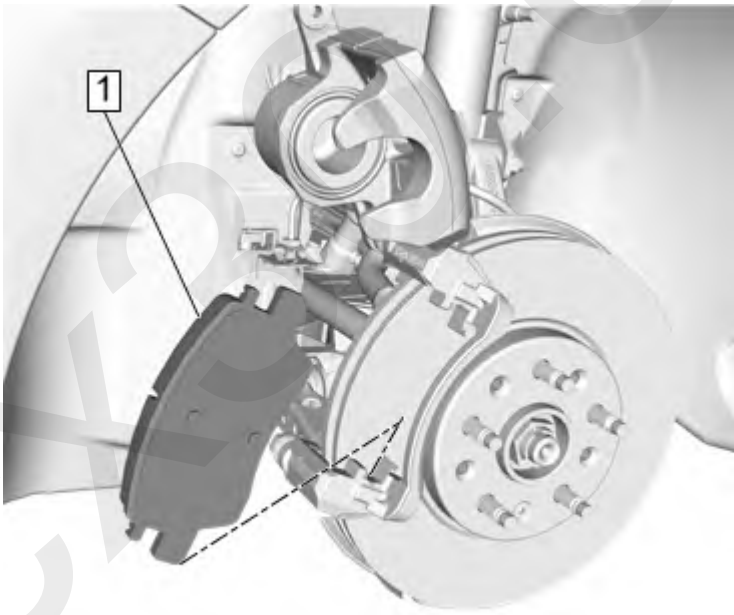


Fig. 17: Outer Disc Brake Pad
Courtesy of GENERAL MOTORS COMPANY

- 13. Remove Outer Disc Brake Pad (1)

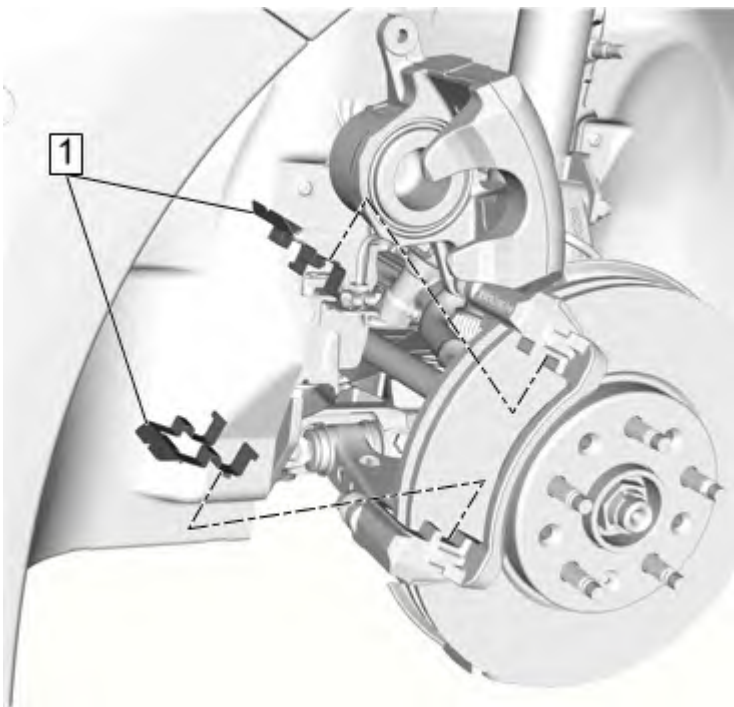


Fig. 18: Front Disc Brake Pad Retaining Springs
Courtesy of GENERAL MOTORS COMPANY

- 14. Remove Front Disc Brake Pad Retaining Spring (1)

Installation Procedure

- 1. Thoroughly clean the disc brake pad retaining spring contact area and surfaces of the brake caliper bracket of any corrosion and debris.



Fig. 19: Disc Brake Pad Spring
Courtesy of GENERAL MOTORS COMPANY

2. Install the disc brake pad retaining spring with the tab in the leading edge of the brake caliper bracket.

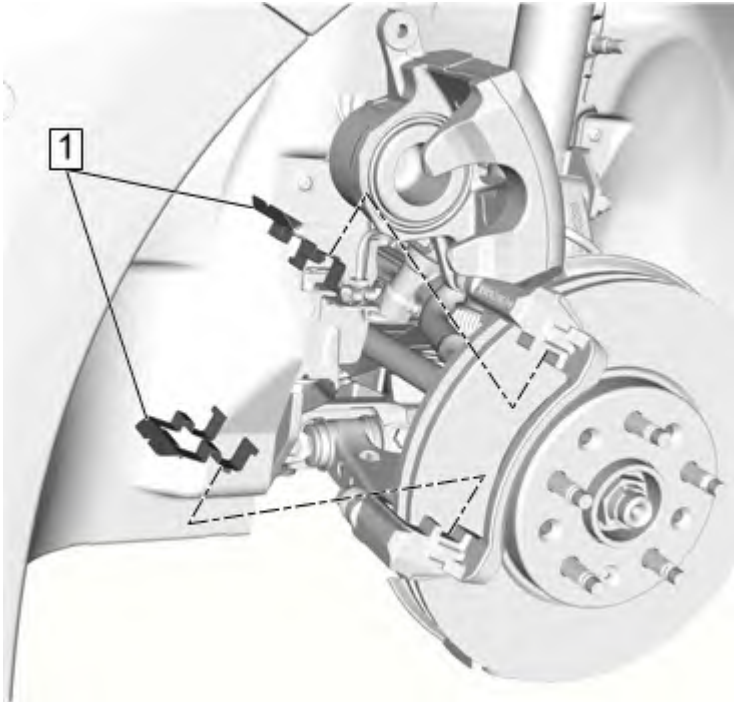


Fig. 20: Front Disc Brake Pad Retaining Springs
Courtesy of GENERAL MOTORS COMPANY

3. Install Front Disc Brake Pad Retaining Spring (1)

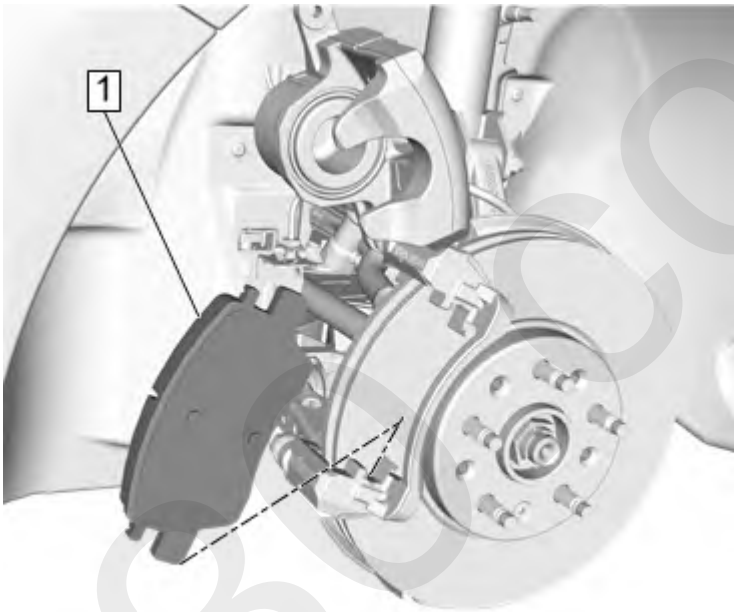


Fig. 21: Outer Disc Brake Pad
Courtesy of GENERAL MOTORS COMPANY

4. Install Outer Disc Brake Pad (1)

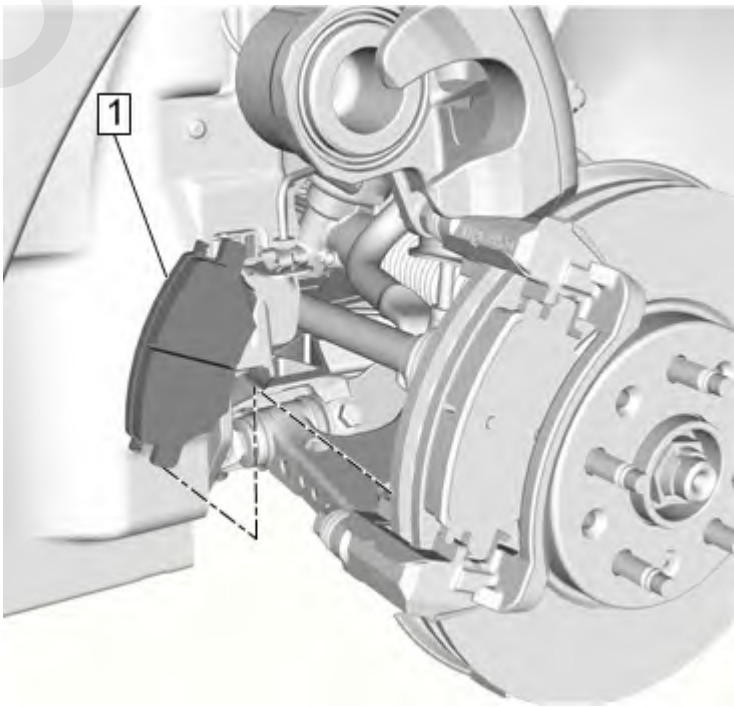


Fig. 22: Inner Disc Brake Pad
Courtesy of GENERAL MOTORS COMPANY

NOTE: The inner disc brake pad must be positioned with the wear sensor at the disc brake pad leading edge.

5. Install Inner Disc Brake Pad (1)

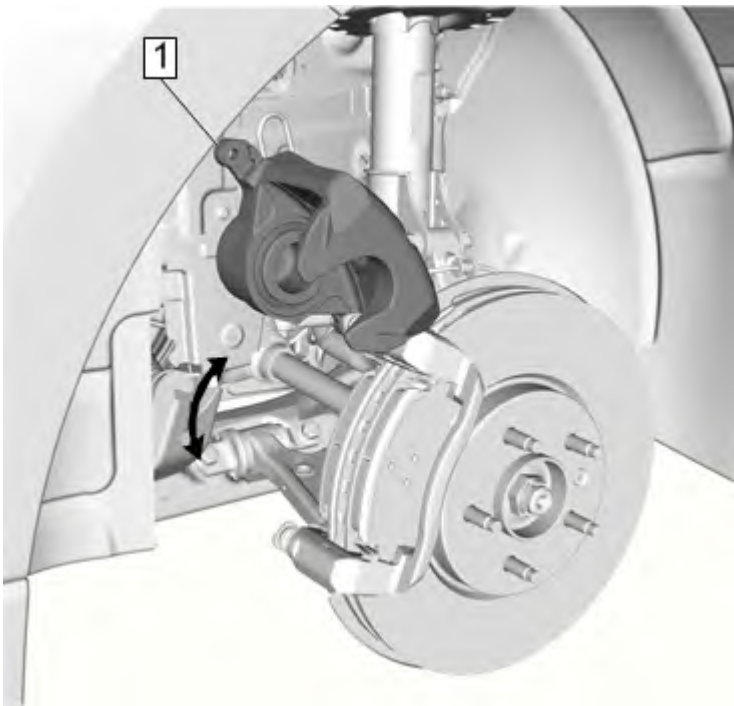


Fig. 23: Front Brake Caliper
Courtesy of GENERAL MOTORS COMPANY

CAUTION: The phenolic brake caliper piston can be damaged if it contacts the edges of the brake pads upon installation. To avoid phenolic brake caliper piston damage, carefully hold the brake pads against the rotor and do NOT allow the caliper piston to contact the edges of the brake pads while installing the caliper. If the brake caliper piston sustains any damage, the entire caliper will need to be replaced.

6. Install Front Brake Caliper (1)

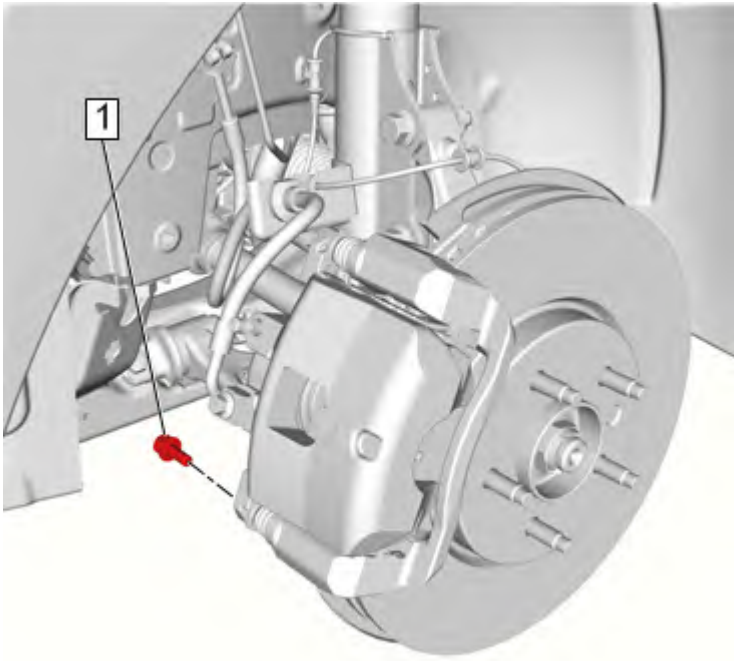


Fig. 24: Brake Caliper Guide Pin Bolt
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to [Fastener Caution](#) .

7. Install Brake Caliper Guide Pin Bolt (1) and tighten 40 N.m (30 lb ft)
8. Install the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)
9. With the engine OFF, gradually apply the brake pedal to approximately 2/3 of its travel distance.
10. Slowly release the brake pedal.
11. Wait 15 seconds, then repeat steps 9-10 until a firm brake pedal is obtained. This will properly seat the brake caliper pistons and brake pads.
12. Fill the brake master cylinder reservoir to the maximum-full level with GM approved brake fluid from a clean, sealed brake fluid container. [Brake Master Cylinder Reservoir Filling](#)
13. Burnish the brake pads and rotors. [Brake Pad and Rotor Burnishing](#)

FRONT DISC BRAKE PADS REPLACEMENT (J60)

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 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. [Lifting and Jacking the Vehicle](#)
5. Remove the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)
6. Place a large C-clamp over the brake caliper body and against the outer brake pad.
7. Using the C-clamp, carefully compress the brake caliper piston fully into the brake caliper bore.

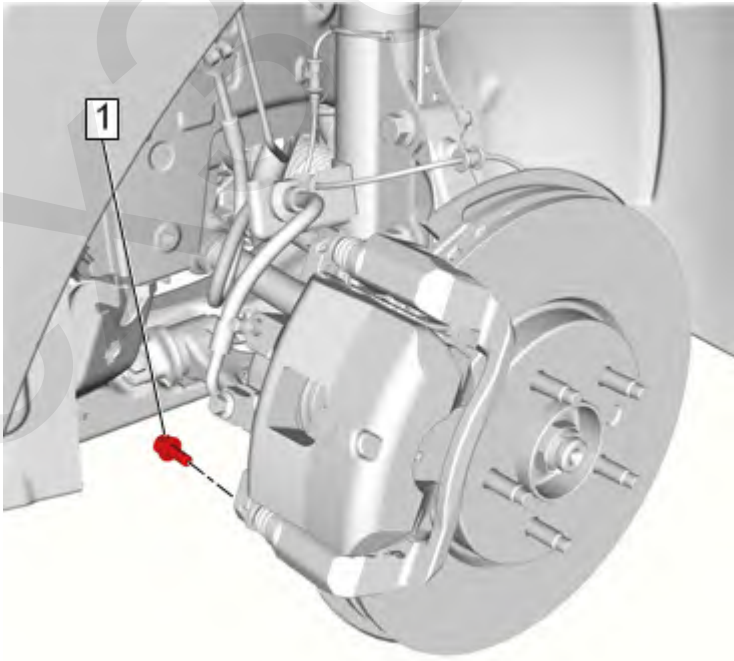


Fig. 25: Brake Caliper Guide Pin Bolt
Courtesy of GENERAL MOTORS COMPANY

- NOTE:**
- DO NOT use any air tools to remove or install the guide pin bolts. Use hand tools ONLY.
 - Install an open end wrench to hold the caliper guide pin in line with the brake caliper while removing or installing caliper guide pin bolt. DO NOT allow the open end wrench to come in contact with the brake caliper. Allowing the open end wrench to come in contact with the brake caliper will cause a pulsation when the brakes are applied.

8. Remove Brake Caliper Guide Pin Bolt (1)

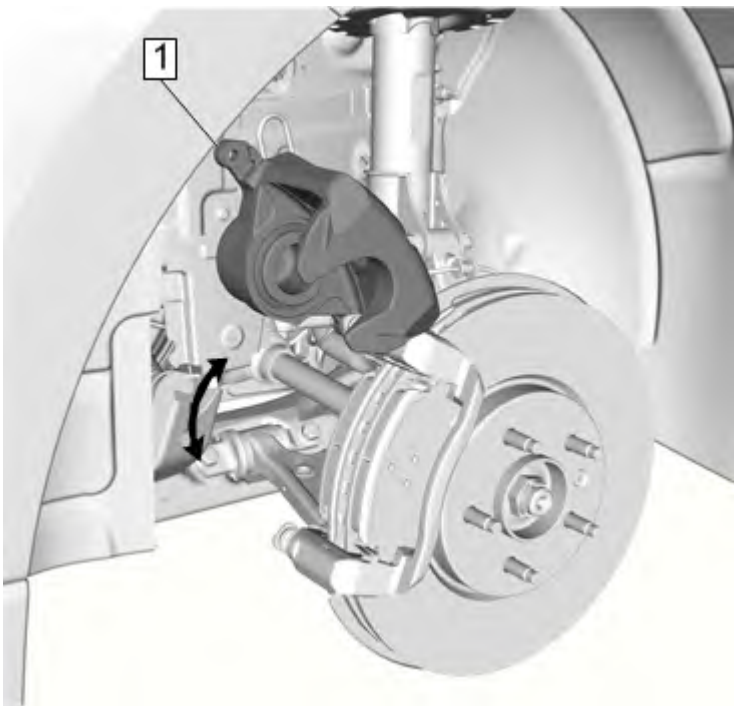


Fig. 26: Front Brake Caliper
Courtesy of GENERAL MOTORS COMPANY

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.

9. Remove Front Brake Caliper (1).

10. Pivot the brake caliper upward and secure with heavy mechanics wire, or equivalent.

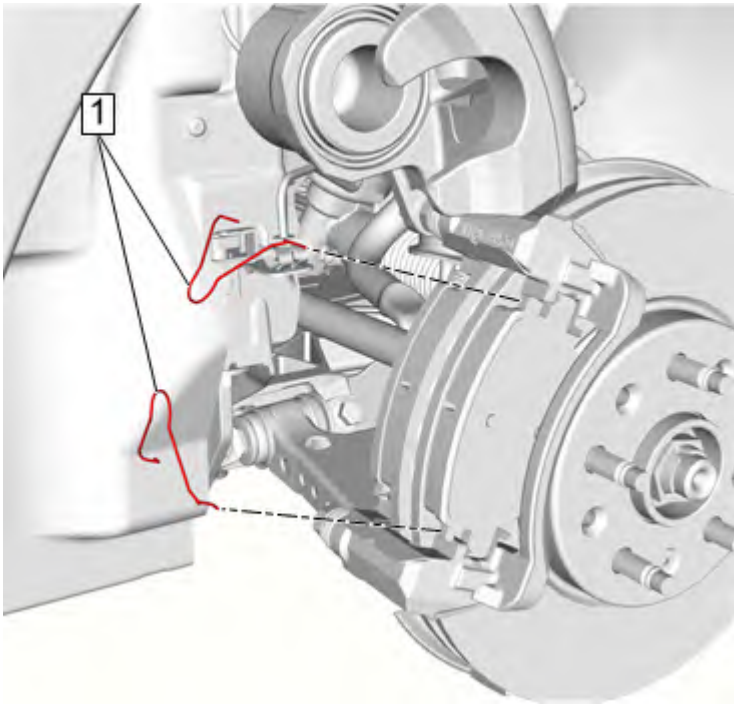


Fig. 27: Front Brake Caliper Springs
Courtesy of GENERAL MOTORS COMPANY

11. Remove Front Brake Caliper Spring (1)

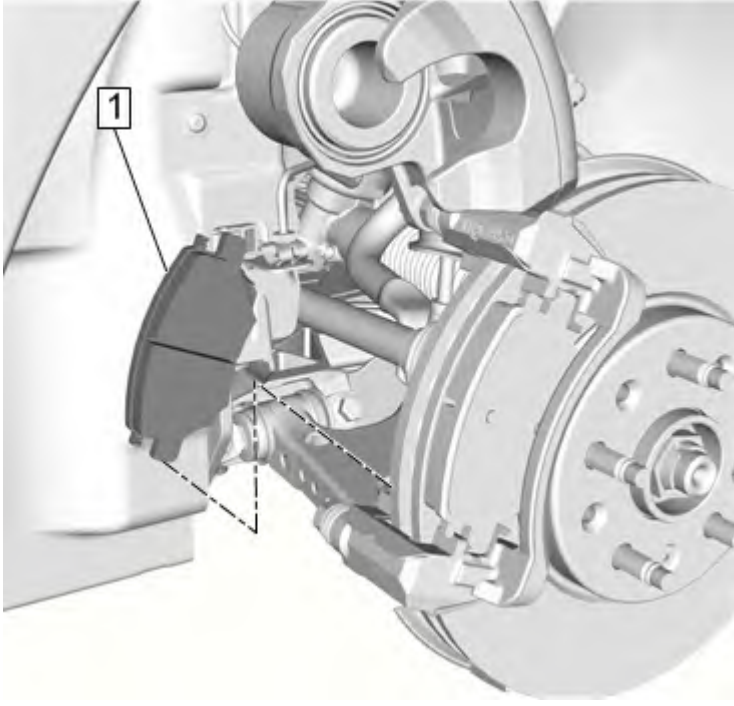


Fig. 28: Inner Disc Brake Pad
Courtesy of GENERAL MOTORS COMPANY

12. Remove Inner Disc Brake Pad (1)

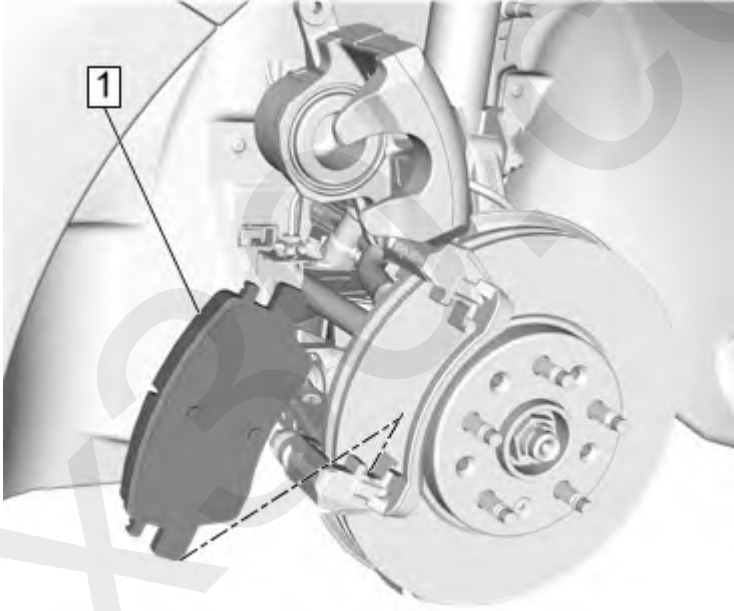


Fig. 29: Outer Disc Brake Pad
Courtesy of GENERAL MOTORS COMPANY

13. Remove Outer Disc Brake Pad (1)

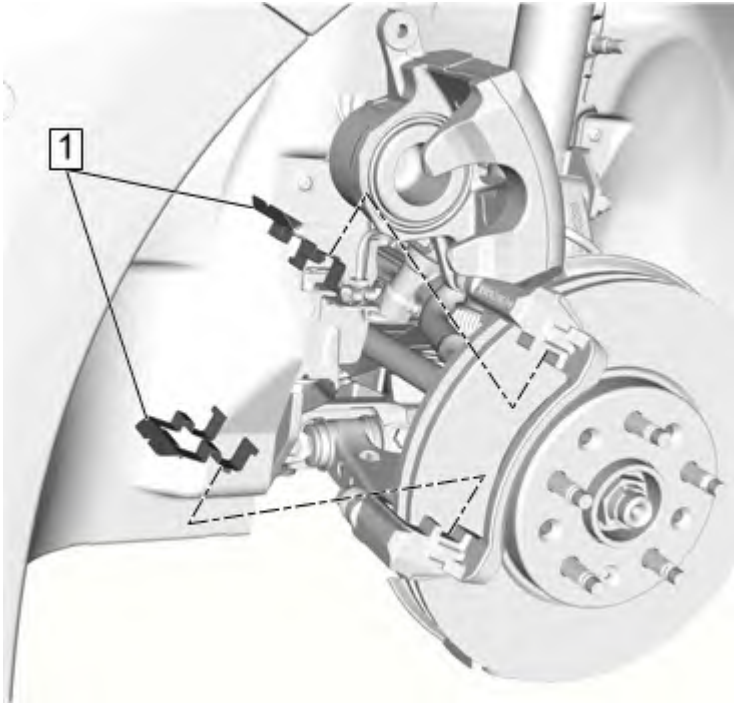


Fig. 30: Front Disc Brake Pad Retaining Springs
Courtesy of GENERAL MOTORS COMPANY

14. Remove Front Disc Brake Pad Retaining Spring (1)

Installation Procedure

1. Thoroughly clean the disc brake pad retaining spring contact area and surfaces of the brake caliper bracket of any corrosion and debris.

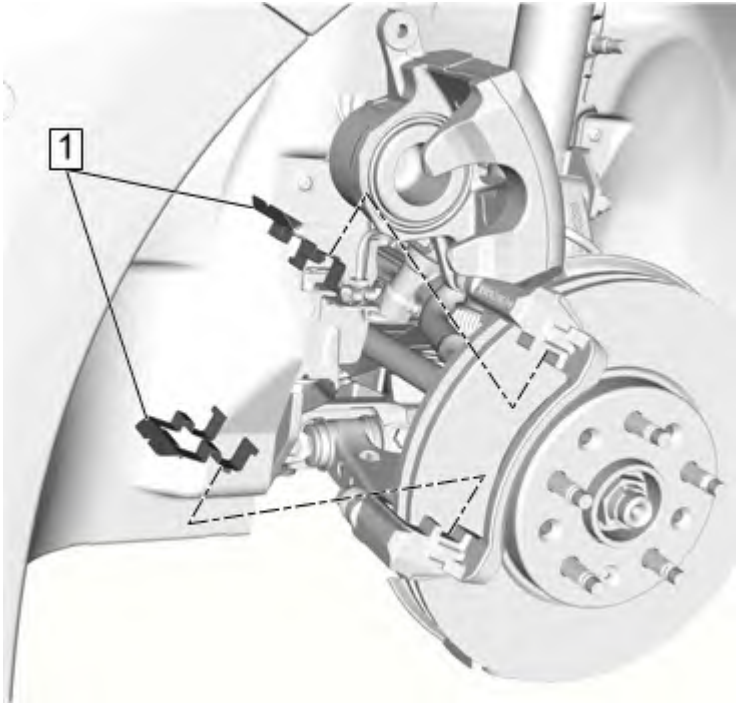


Fig. 31: Front Disc Brake Pad Retaining Springs
Courtesy of GENERAL MOTORS COMPANY

2. Install Front Disc Brake Pad Retaining Spring (1)

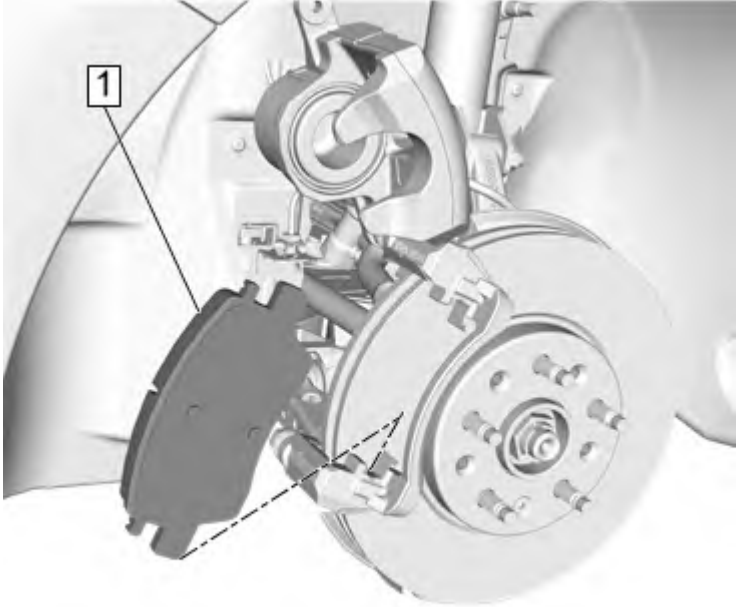


Fig. 32: Outer Disc Brake Pad
Courtesy of GENERAL MOTORS COMPANY

3. Install Outer Disc Brake Pad (1)

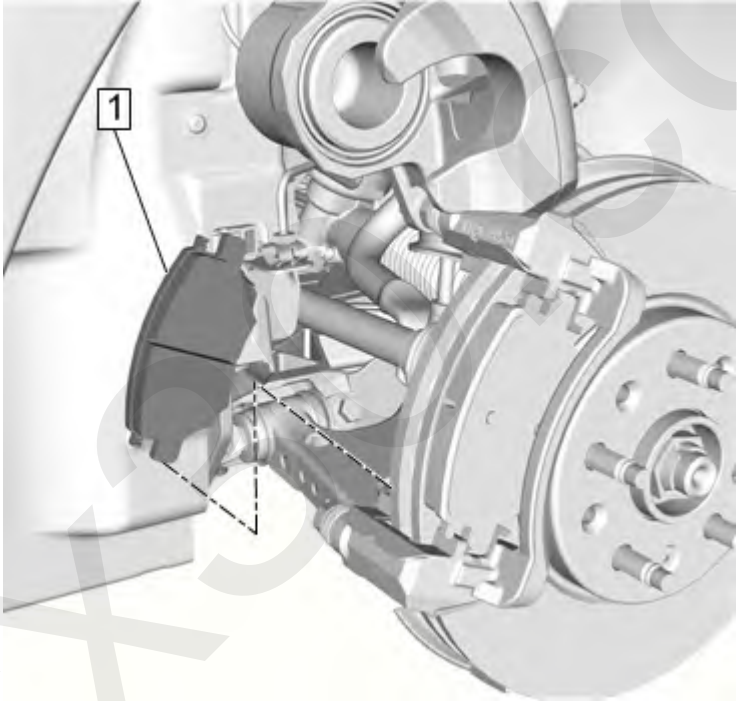


Fig. 33: Inner Disc Brake Pad
Courtesy of GENERAL MOTORS COMPANY

NOTE: The inner disc brake pad must be positioned with the wear sensor at the disc brake pad leading edge.

4. Install Inner Disc Brake Pad (1)

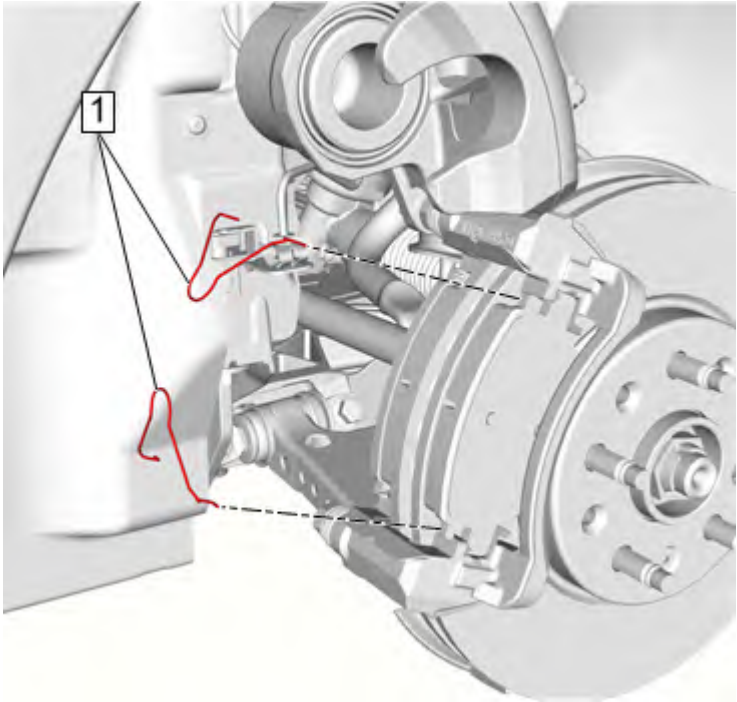


Fig. 34: Front Brake Caliper Springs
Courtesy of GENERAL MOTORS COMPANY

5. Install Front Brake Caliper Spring (1)

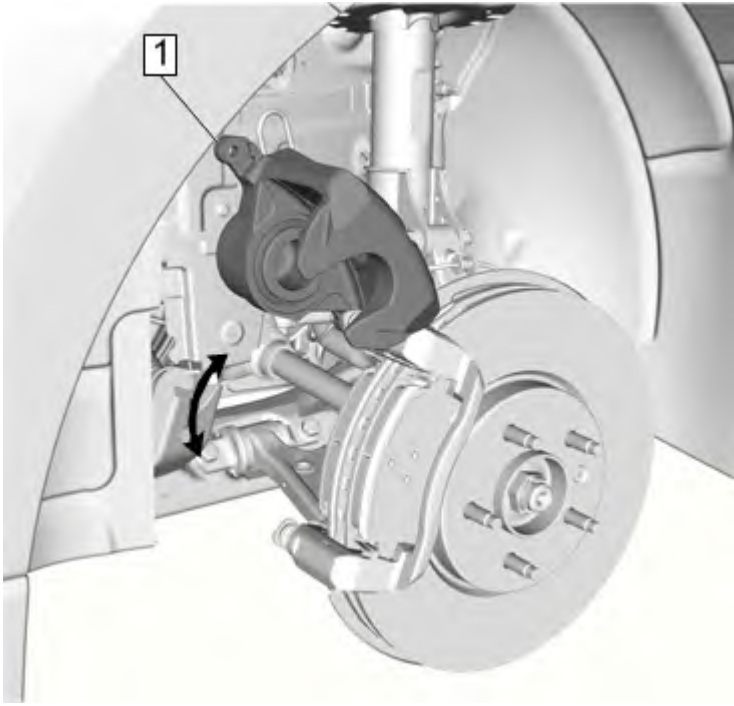


Fig. 35: Front Brake Caliper
Courtesy of GENERAL MOTORS COMPANY

CAUTION: The phenolic brake caliper piston can be damaged if it contacts the edges of the brake pads upon installation. To avoid phenolic brake caliper piston damage, carefully hold the brake pads against the rotor and do NOT allow the caliper piston to contact the edges of the brake pads while installing the caliper. If the brake caliper piston sustains any damage, the entire caliper will need to be replaced.

6. Install Front Brake Caliper (1)

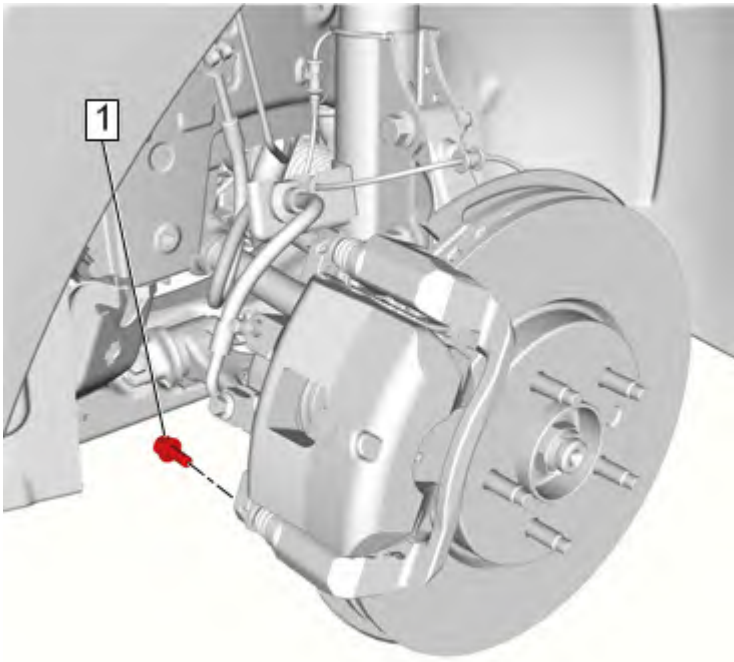


Fig. 36: Brake Caliper Guide Pin Bolt
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to [Fastener Caution](#) .

- 7. Install Brake Caliper Guide Pin Bolt and tighten 40 N.m (30 lb ft)
- 8. Install the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)
- 9. With the engine OFF, gradually apply the brake pedal to approximately 2/3 of its travel distance.
- 10. Slowly release the brake pedal.
- 11. Wait 15 seconds, then repeat steps 9-10 until a firm brake pedal is obtained. This will properly seat the brake caliper pistons and brake pads.
- 12. Fill the brake master cylinder reservoir to the maximum-full level with GM approved brake fluid from a clean, sealed brake fluid container. [Brake Master Cylinder Reservoir Filling](#)
- 13. Burnish the brake pads and rotors. [Brake Pad and Rotor Burnishing](#)

REAR DISC BRAKE PADS REPLACEMENT

Removal Procedure

WARNING: [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 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. Set the parking brake in Service Mode. [Rear Parking Brake Service Mode Selection](#)
- 5. Raise and support the vehicle. [Lifting and Jacking the Vehicle](#)
- 6. Remove the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)

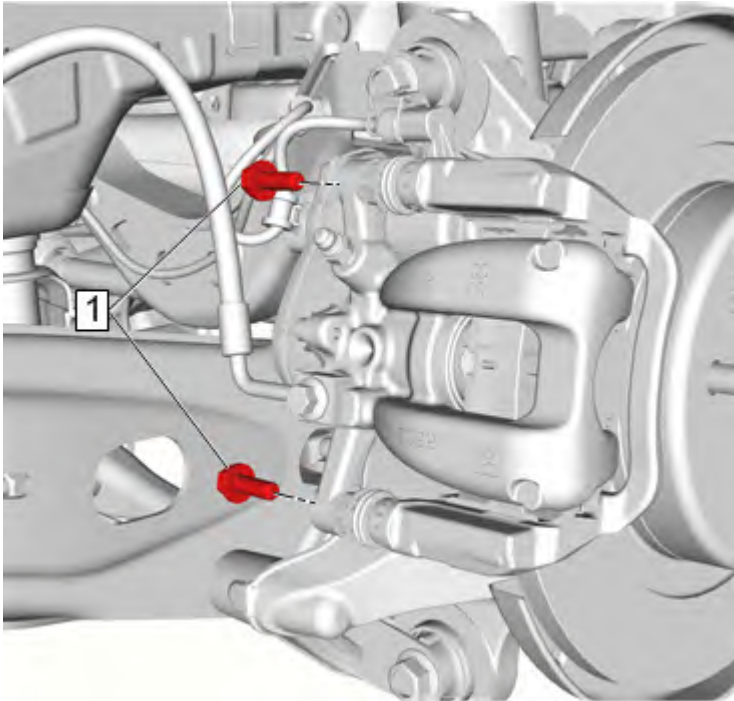


Fig. 37: Brake Caliper Guide Pin Bolt
Courtesy of GENERAL MOTORS COMPANY

NOTE:

- DO NOT use any air tools to remove or install the guide pin bolts. Use hand tools ONLY.
- Install an open end wrench to hold the caliper guide pin in line with the brake caliper while removing or installing caliper guide pin bolt. DO NOT allow the open end wrench to come in contact with the brake caliper. Allowing the open end wrench to come in contact with the brake caliper will cause a pulsation when the brakes are applied.

7. Remove Brake Caliper Guide Pin Bolt (1)

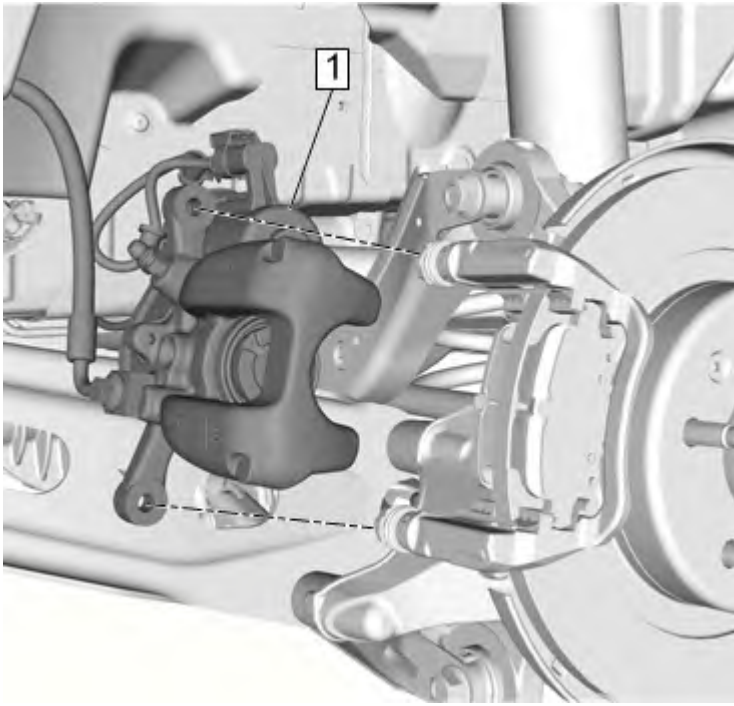


Fig. 38: Rear Brake Caliper
Courtesy of GENERAL MOTORS COMPANY

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 Rear Brake Caliper (1)
- 9. Support the brake caliper with heavy mechanics wire.

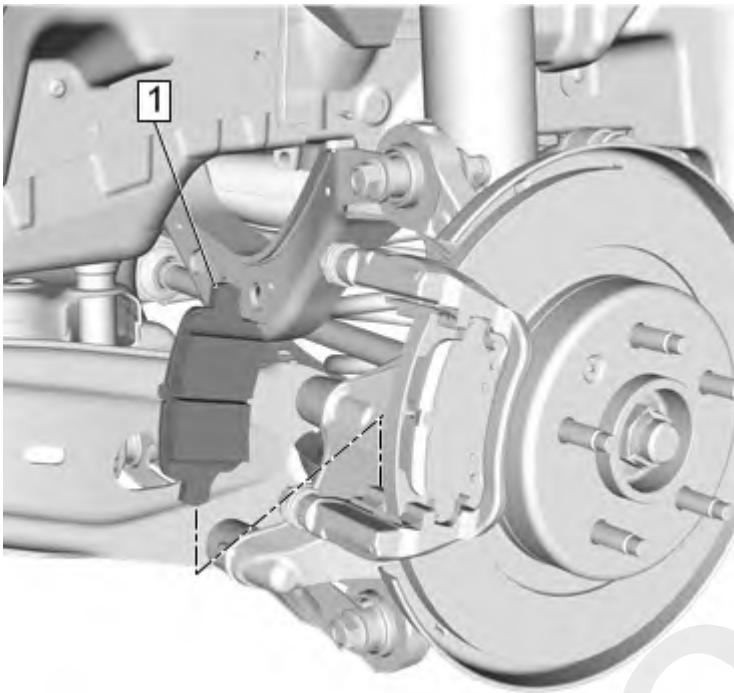


Fig. 39: Inner Disc Brake Pad
Courtesy of GENERAL MOTORS COMPANY

- 10. Remove Inner Disc Brake Pad (1)

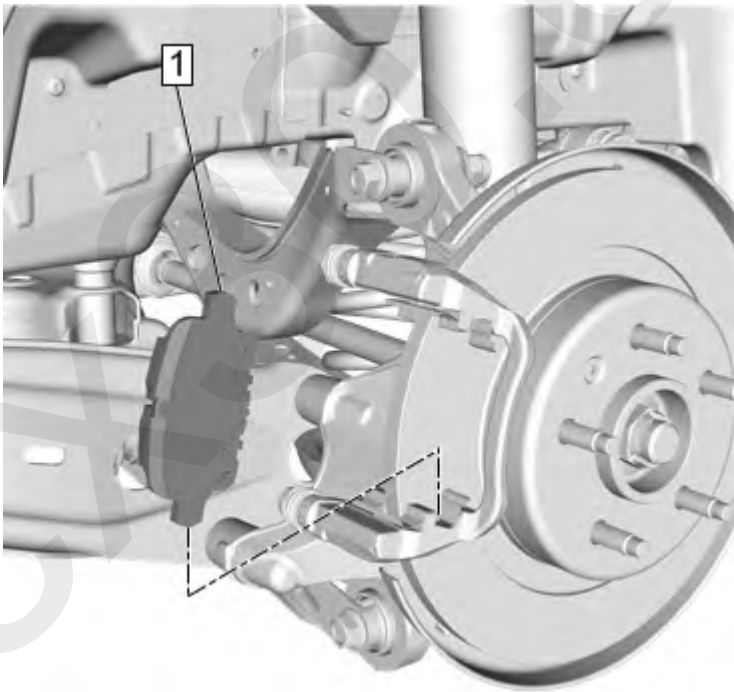


Fig. 40: Outer Disc Brake Pad
Courtesy of GENERAL MOTORS COMPANY

- 11. Remove Outer Disc Brake Pad (1)

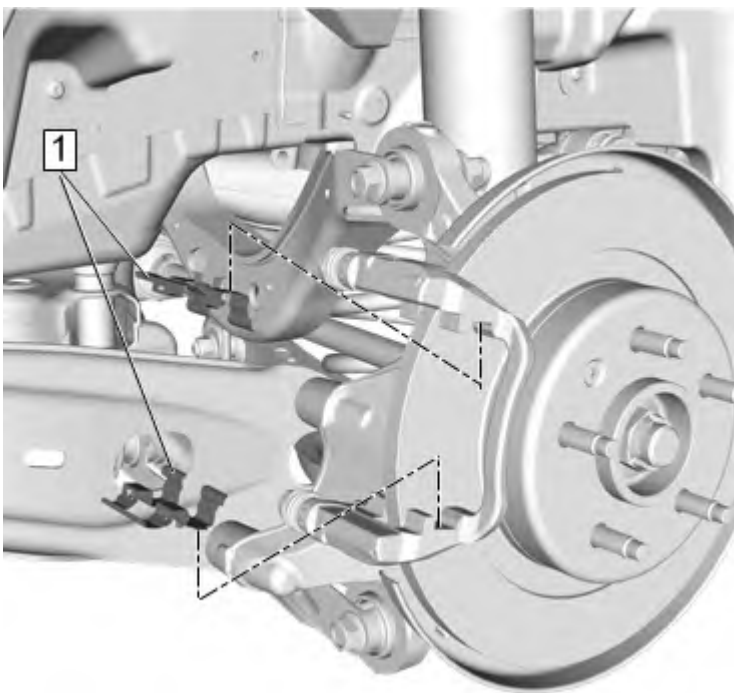


Fig. 41: Rear Disc Brake Pad Retaining Spring
Courtesy of GENERAL MOTORS COMPANY

- 12. Remove Rear Disc Brake Pad Retaining Spring (1)

Installation Procedure

- 1. Thoroughly clean the contact surfaces of the brake caliper bracket and the disc brake pad retaining springs of any corrosion and debris.

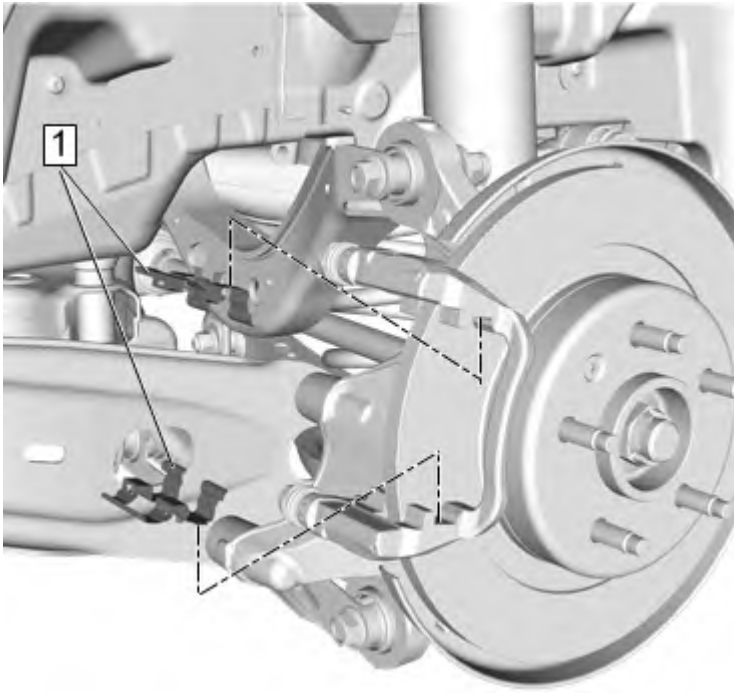


Fig. 42: Rear Disc Brake Pad Retaining Spring
Courtesy of GENERAL MOTORS COMPANY

2. Install Rear Disc Brake Pad Retaining Spring (1)

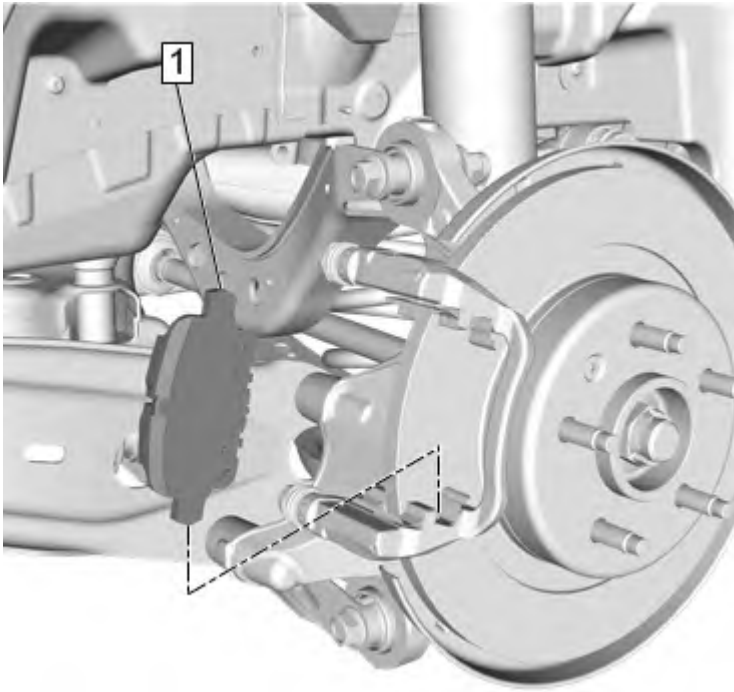


Fig. 43: Outer Disc Brake Pad
Courtesy of GENERAL MOTORS COMPANY

3. Install Outer Disc Brake Pad (1)

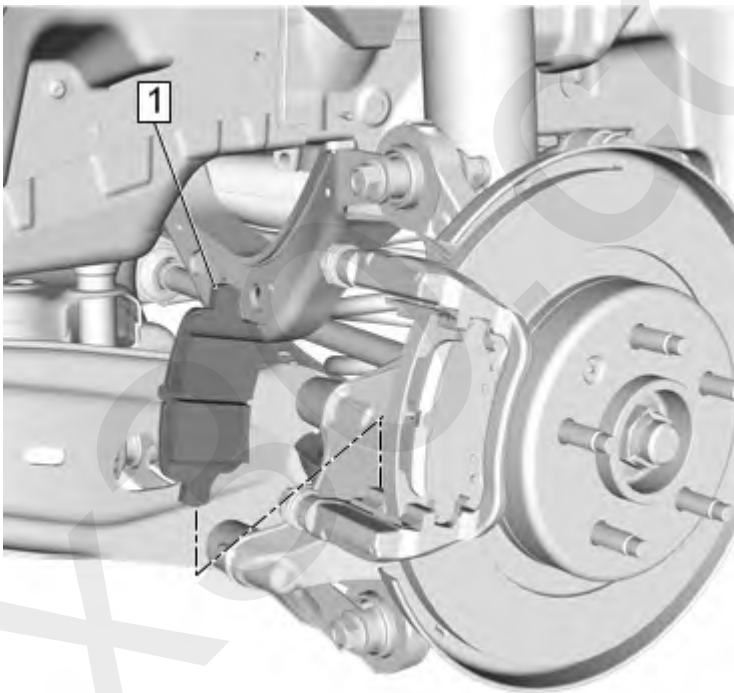


Fig. 44: Inner Disc Brake Pad
Courtesy of GENERAL MOTORS COMPANY

4. Install Inner Disc Brake Pad (1)

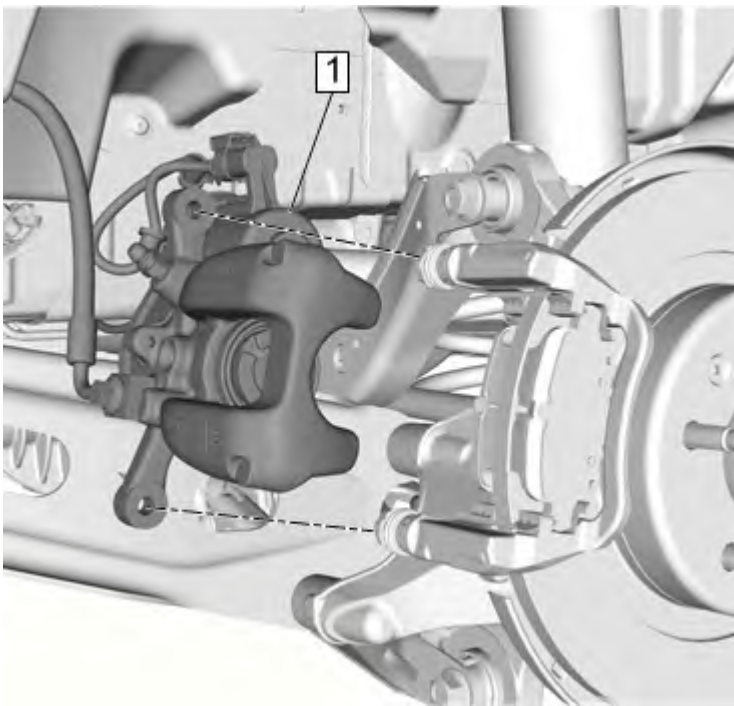


Fig. 45: Rear Brake Caliper
Courtesy of GENERAL MOTORS COMPANY

NOTE: Do NOT rotate the brake caliper piston.

5. Install Rear Brake Caliper (1)

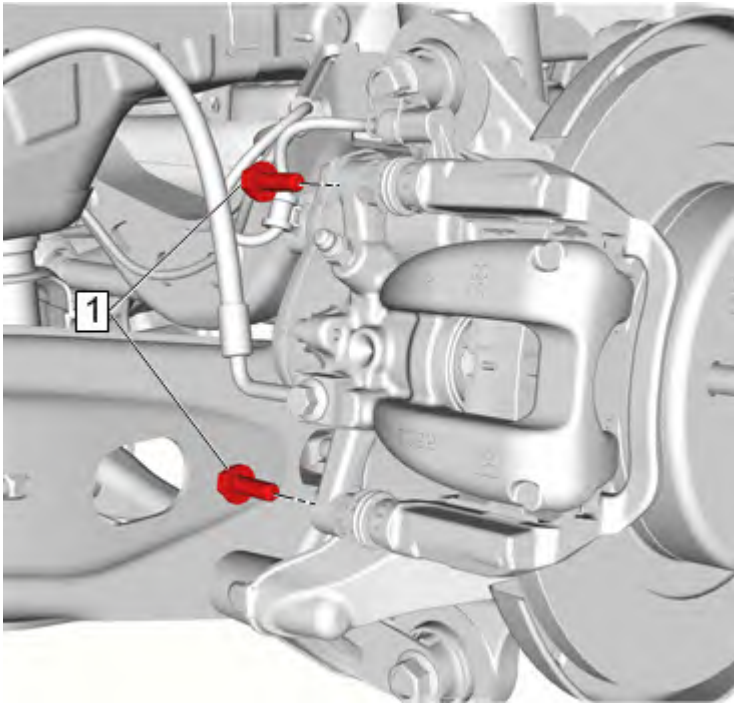


Fig. 46: Brake Caliper Guide Pin Bolt
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Fastener Caution

- 6. Install Brake Caliper Guide Pin Bolt (1) and tighten 40 N.m (30 lb ft)
- 7. Install the tire and wheel assembly. 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 8-9 until a firm brake pedal is obtained. This will properly seat the brake caliper pistons and brake pads.
- 11. Fill the brake master cylinder reservoir to the maximum-full level with GM approved brake fluid from a clean, sealed brake fluid container. Brake Master Cylinder Reservoir Filling
- 12. Calibrate the park brake. Park Brake Calibration
- 13. Burnish the brake pads and rotors. 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

Removal Procedure

WARNING: Brake Dust Warning

WARNING: Brake Fluid Irritant Warning

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

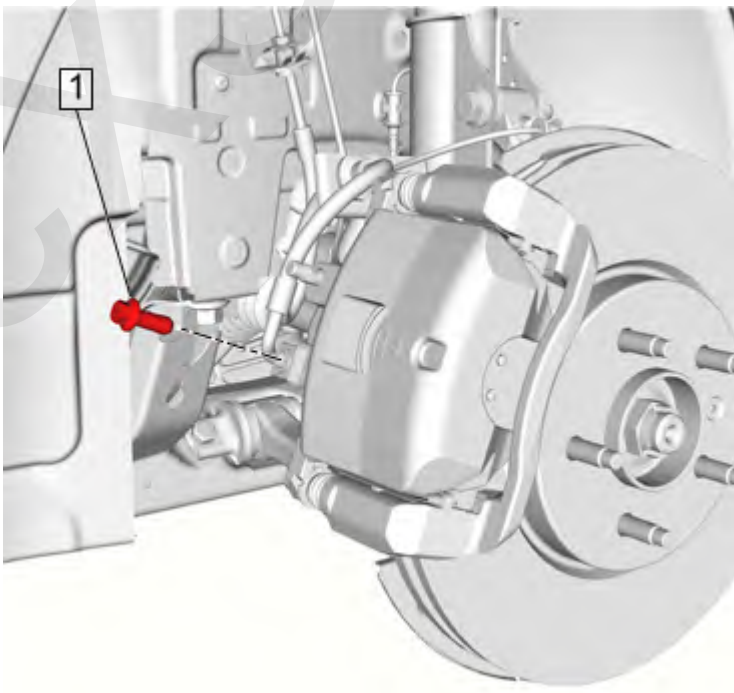


Fig. 47: Brake Hose Fitting Bolt
Courtesy of GENERAL MOTORS COMPANY

- 3. Remove Brake Hose Fitting Bolt (1)

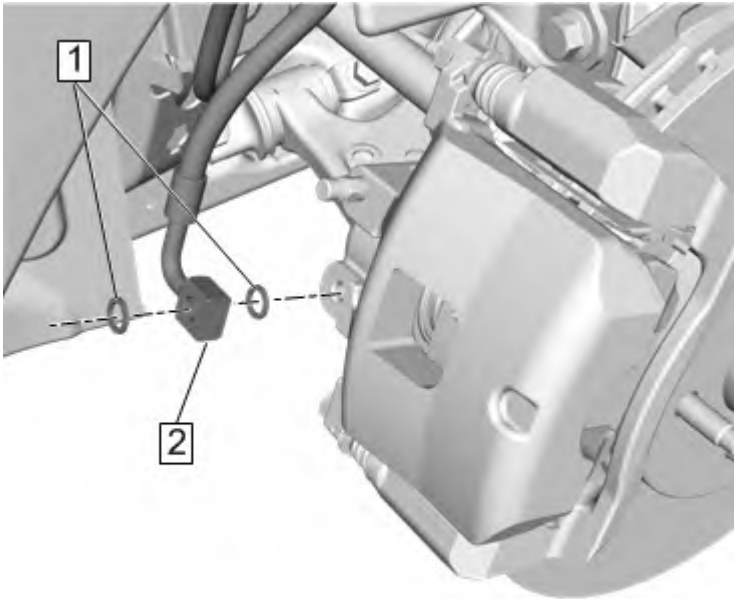


Fig. 48: Brake Hose Fitting And Gasket
Courtesy of GENERAL MOTORS COMPANY

NOTE: **Do NOT reuse the brake hose fitting gaskets.**

- 4. Remove Brake Hose Fitting Gasket (1) @Brake Hose Fitting (2) and DISCARD
- 5. Cap the brake hose fitting to prevent brake fluid loss and contamination.

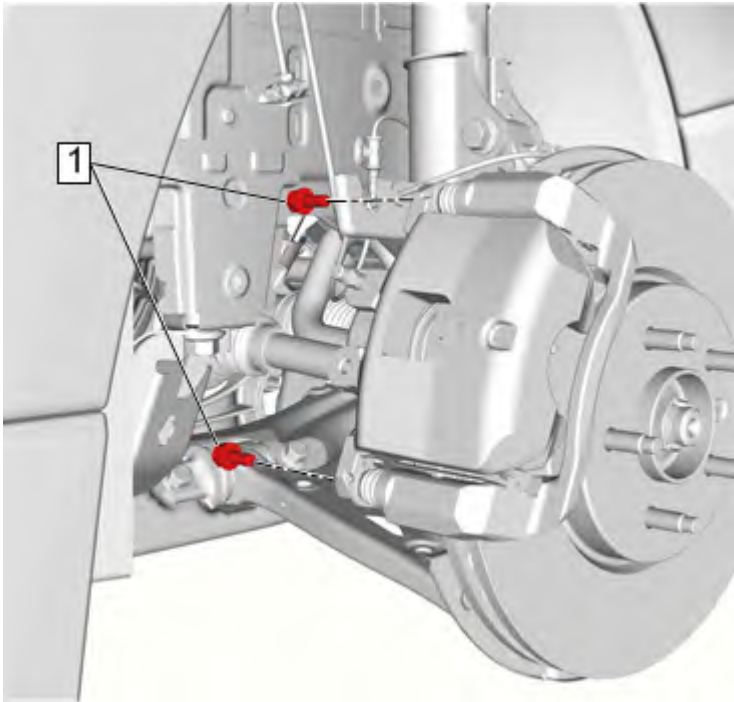


Fig. 49: Brake Caliper Guide Pin Bolt
Courtesy of GENERAL MOTORS COMPANY

6. Remove Brake Caliper Guide Pin Bolt (1)

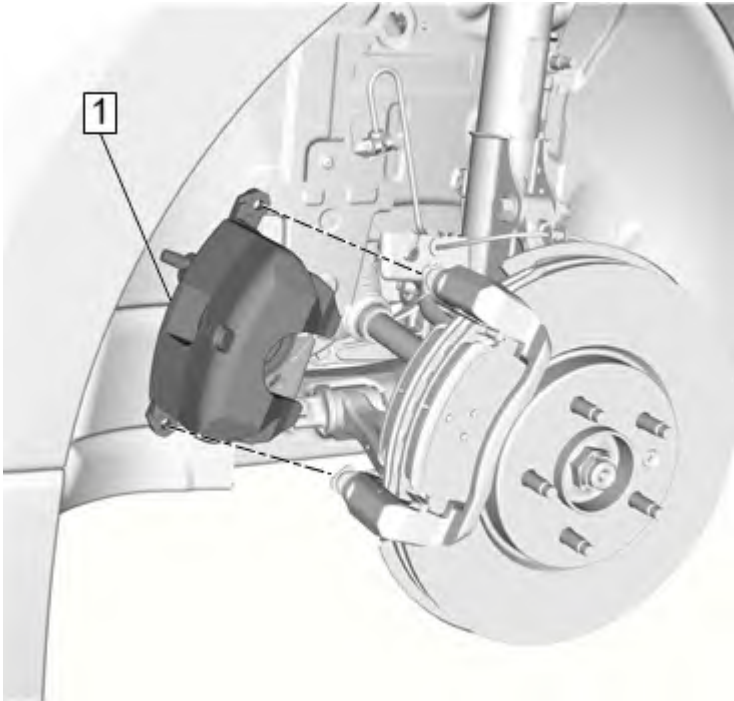


Fig. 50: Brake Caliper
Courtesy of GENERAL MOTORS COMPANY

7. Remove Brake Caliper (1)

Installation Procedure

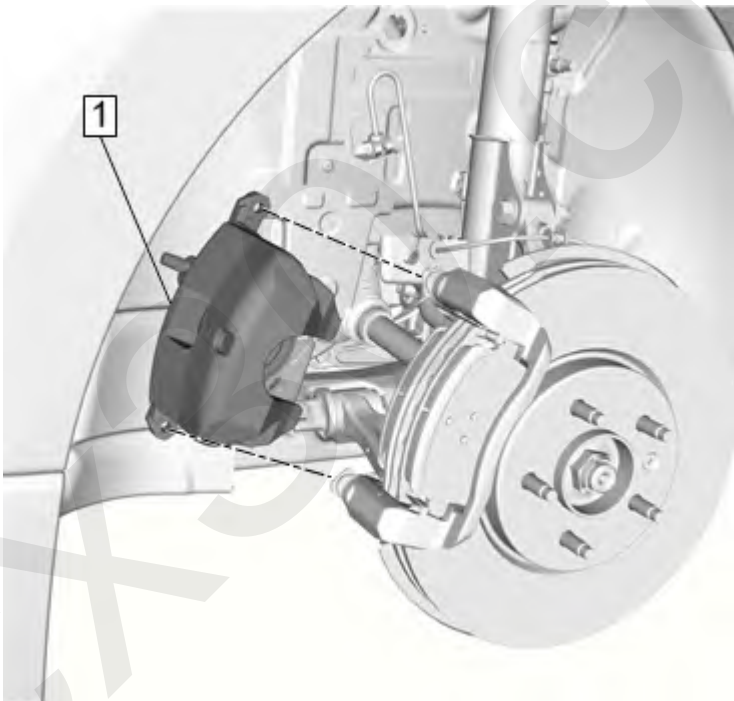


Fig. 51: Brake Caliper
Courtesy of GENERAL MOTORS COMPANY

CAUTION: The phenolic brake caliper piston can be damaged if it contacts the edges of the brake pads upon installation. To avoid phenolic brake caliper piston damage, carefully hold the brake pads against the rotor and do NOT allow the caliper piston to contact the edges of the brake pads while installing the caliper. If the brake caliper piston sustains any damage, the entire caliper will need to be replaced.

1. Install Brake Caliper (1)

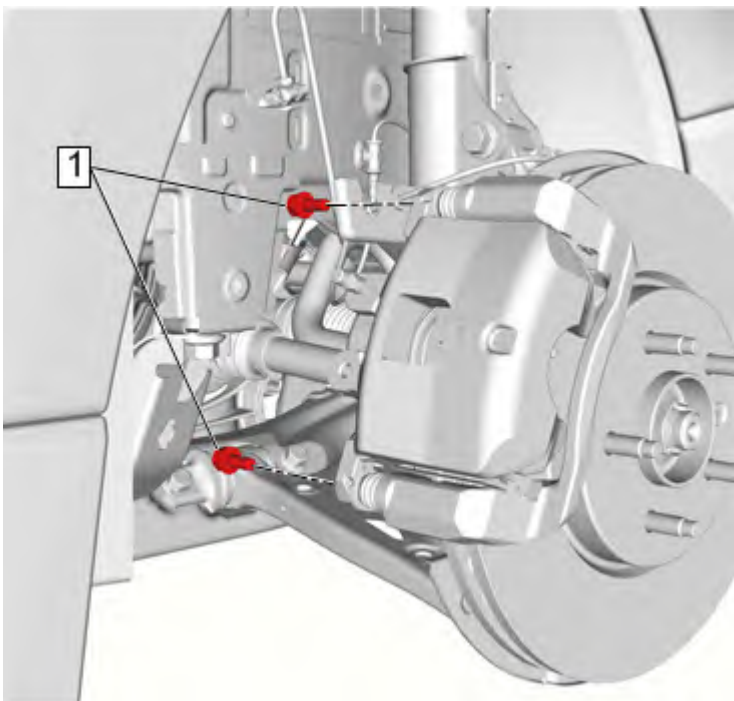


Fig. 52: Brake Caliper Guide Pin Bolt
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Fastener Caution

2. Install Brake Caliper Guide Pin Bolt (1) and tighten 40 N.m (30 lb ft)

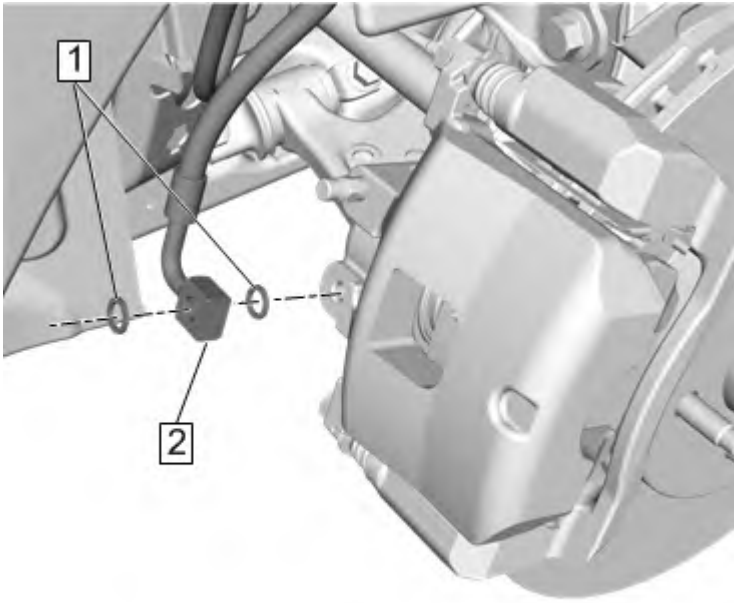


Fig. 53: Brake Hose Fitting And Gasket
Courtesy of GENERAL MOTORS COMPANY

NOTE: Install NEW brake hose fitting gaskets.

3. Install Brake Hose Fitting Gasket (1) @Brake Hose Fitting (2)

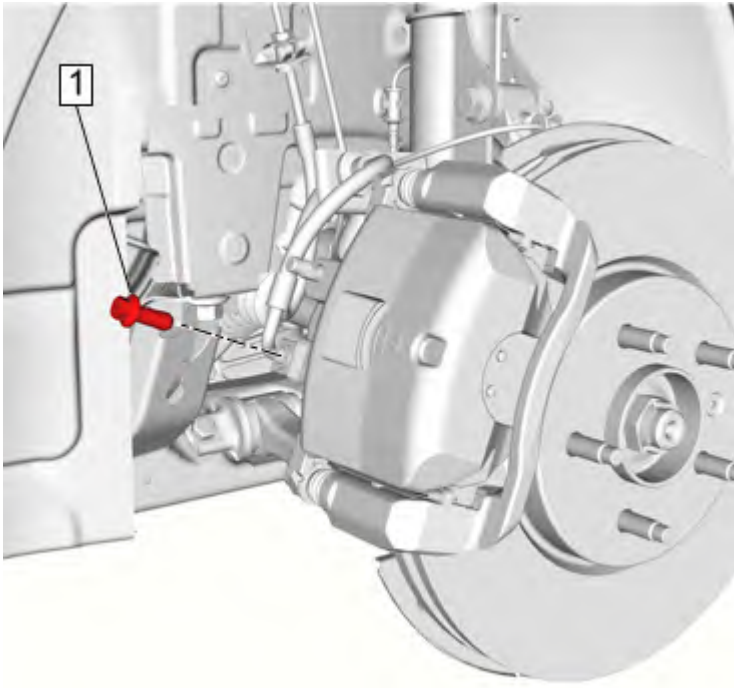


Fig. 54: Brake Hose Fitting Bolt
Courtesy of GENERAL MOTORS COMPANY

4. Install Brake Hose Fitting Bolt (1) and tighten 40 N.m (30 lb ft)
5. Bleed the brake system. [Hydraulic Brake System Bleeding \(Manual\)](#) [Hydraulic Brake System Bleeding \(Pressure\)](#)
6. Install the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)

FRONT BRAKE CALIPER GUIDE PIN REPLACEMENT

Removal Procedure

WARNING: [Brake Dust Warning](#)

1. Raise and support the vehicle. [Lifting and Jacking the Vehicle](#)
2. Remove the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)

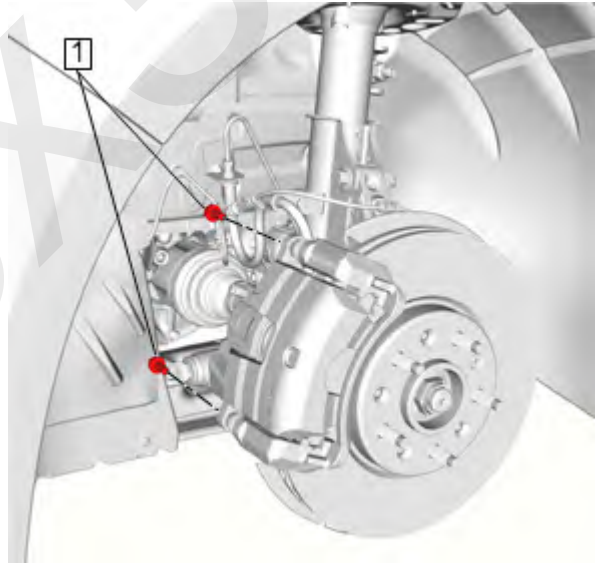


Fig. 55: Brake Caliper Guide Pin Bolt
Courtesy of GENERAL MOTORS COMPANY

NOTE:

- DO NOT use any air tools to remove or install the guide pin bolts. Use hand tools ONLY.
- Install an open end wrench to hold the caliper guide pin in line with the brake caliper while removing or installing caliper guide pin bolt. DO NOT allow the open end wrench to come in contact with the brake caliper. Allowing the open end wrench to come in contact with the brake caliper will cause a pulsation when the brakes are applied.

3. Remove Brake Caliper Guide Pin Bolt (1)

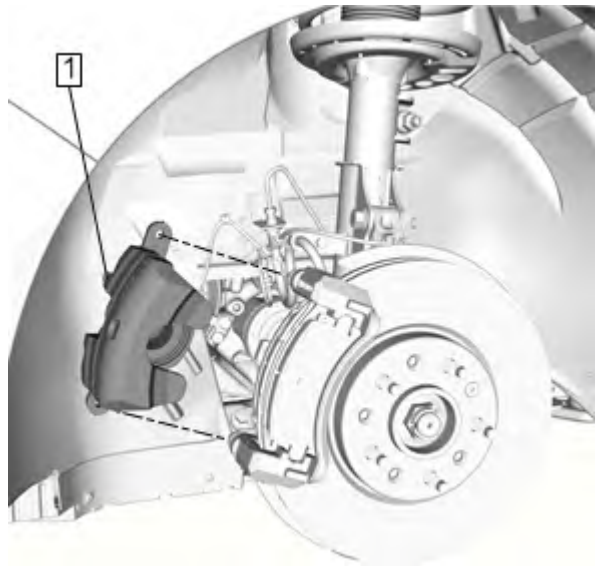


Fig. 56: Front Brake Caliper
Courtesy of GENERAL MOTORS COMPANY

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.

4. Remove Front Brake Caliper (1)
5. Support the brake caliper with heavy mechanics wire.

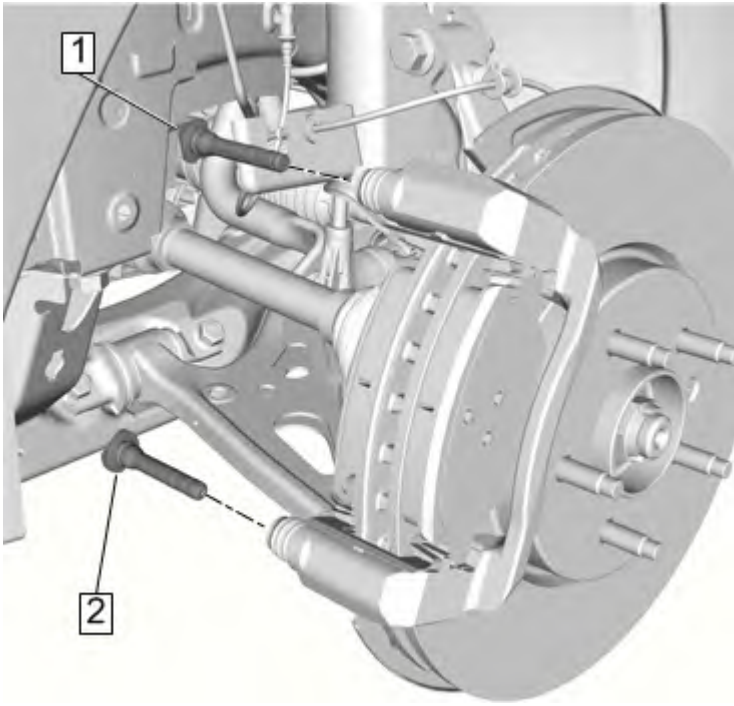


Fig. 57: Front Brake Caliper Guide Pin
Courtesy of GENERAL MOTORS COMPANY

6. Remove Front Brake Caliper Guide Pin (2)

NOTE: The lower front brake caliper guide pin is equipped with a bushing and **MUST** be installed in the same location.

7. Remove Front Brake Caliper Guide Pin (1)

Installation Procedure

- 1. Thoroughly clean the brake caliper bracket guide pin bores with denatured alcohol and allow to dry.
- 2. Apply a light coat of high temperature silicone brake lubricant to the caliper guide pins.

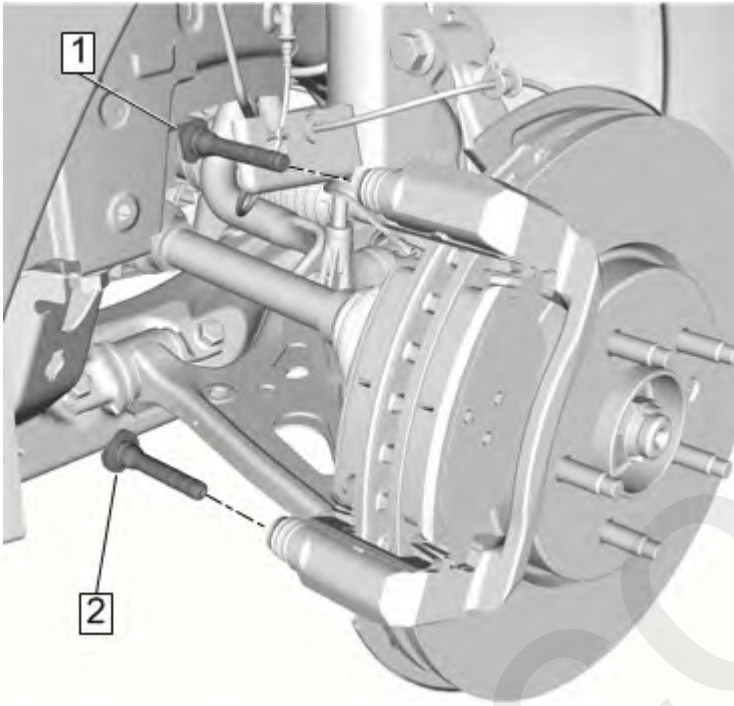


Fig. 58: Front Brake Caliper Guide Pin
Courtesy of GENERAL MOTORS COMPANY

- 3. Install Front Brake Caliper Guide Pin (1)
- 4. Ensure the guide pin seal is fully seated in the groove of the caliper guide pin.
- 5. Gently lift the edge of the guide pin seal while pushing the guide pin into the caliper bracket bore to expel any trapped air.

NOTE: The lower front brake caliper guide pin is equipped with a bushing and **MUST** be installed in the same location.

- 6. Install Front Brake Caliper Guide Pin (1)
- 7. Ensure the guide pin seal is fully seated in the groove of the caliper guide pin.
- 8. Gently lift the edge of the guide pin seal while pushing the guide pin into the caliper bracket bore to expel any trapped air.

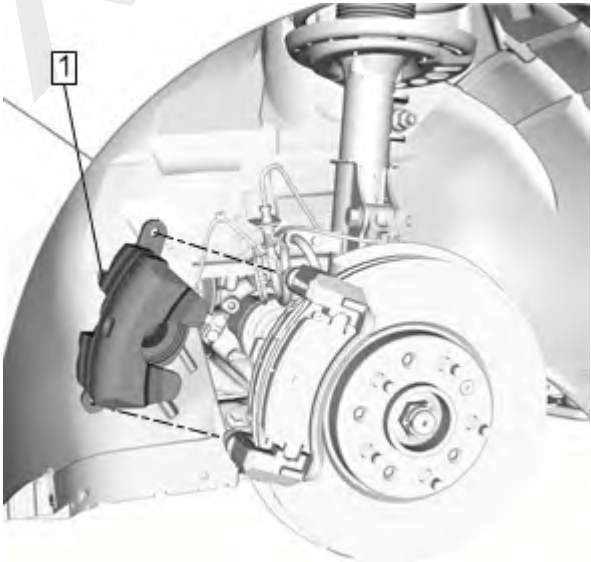


Fig. 59: Front Brake Caliper
Courtesy of GENERAL MOTORS COMPANY

CAUTION: The phenolic brake caliper piston can be damaged if it contacts the edges of the brake pads upon installation. To avoid phenolic brake caliper piston damage, carefully hold the brake pads against the rotor and do **NOT** allow the caliper piston to contact the edges of the brake pads while installing the caliper. If the brake caliper piston sustains any damage, the entire caliper will need to be replaced.

9. Install Front Brake Caliper (1)

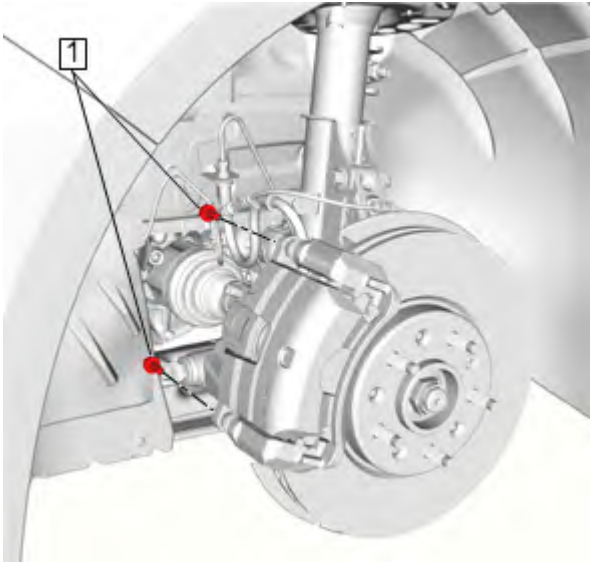


Fig. 60: Brake Caliper Guide Pin Bolt
Courtesy of GENERAL MOTORS COMPANY

CAUTION: **Fastener Caution**

- 10. Install Brake Caliper Guide Pin Bolt (1) and tighten 40 N.m (30 lb ft)
- 11. Install the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)

FRONT BRAKE CALIPER GUIDE PIN SEAL REPLACEMENT

WARNING: **Brake Dust Warning**

1. Raise and support the vehicle. [Lifting and Jacking the Vehicle](#)
2. Remove the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)

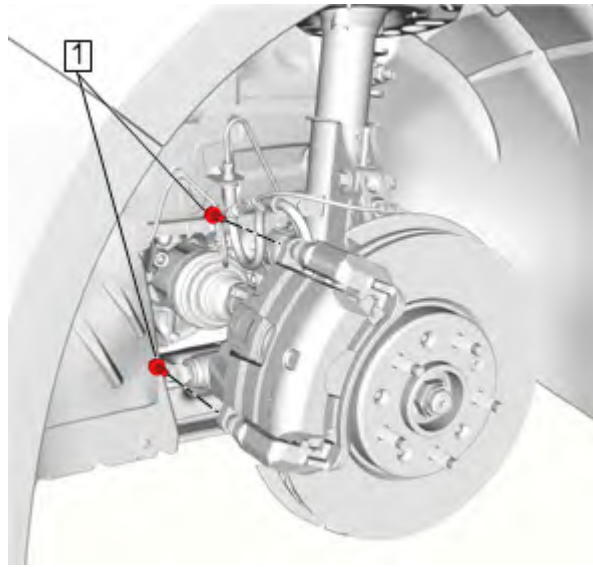


Fig. 61: Brake Caliper Guide Pin Bolt
Courtesy of GENERAL MOTORS COMPANY

- NOTE:**
- DO NOT use any air tools to remove or install the guide pin bolts. Use hand tools ONLY.
 - Install an open end wrench to hold the caliper guide pin in line with the brake caliper while removing or installing caliper guide pin bolt. DO NOT allow the open end wrench to come in contact with the brake caliper. Allowing the open end wrench to come in contact with the brake caliper will cause a pulsation when the brakes are applied.
3. Remove Brake Caliper Guide Pin Bolt (1)

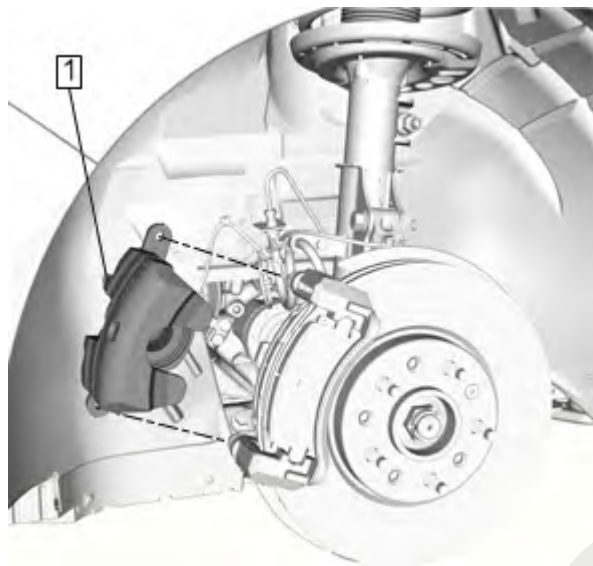


Fig. 62: Front Brake Caliper
Courtesy of GENERAL MOTORS COMPANY

- 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.
4. Remove Front Brake Caliper (1)
 5. Support the brake caliper with heavy mechanics wire.

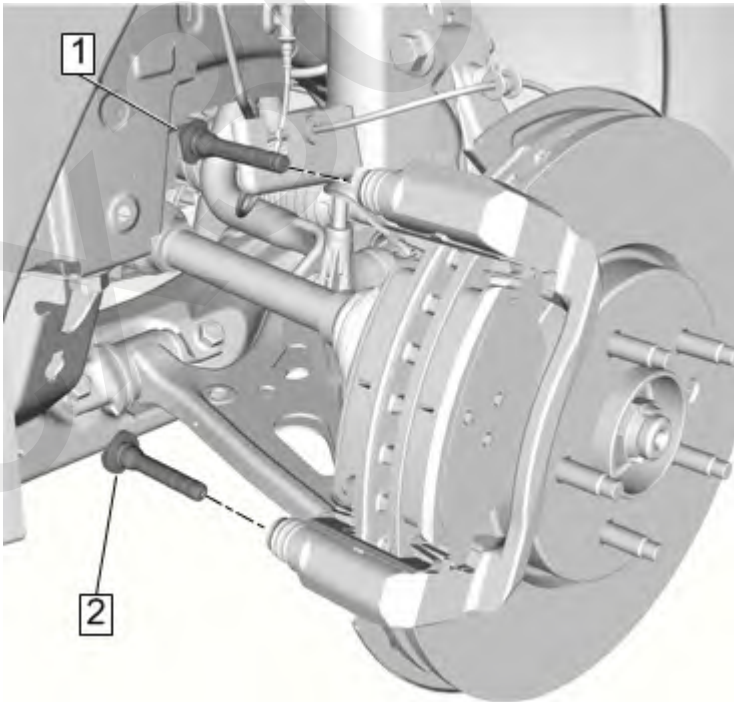


Fig. 63: Front Brake Caliper Guide Pin
Courtesy of GENERAL MOTORS COMPANY

6. Remove Front Brake Caliper Guide Pin (1)
- NOTE:** The lower front brake caliper guide pin is equipped with a bushing and MUST be installed in the same location.
7. Remove Front Brake Caliper Guide Pin (1)

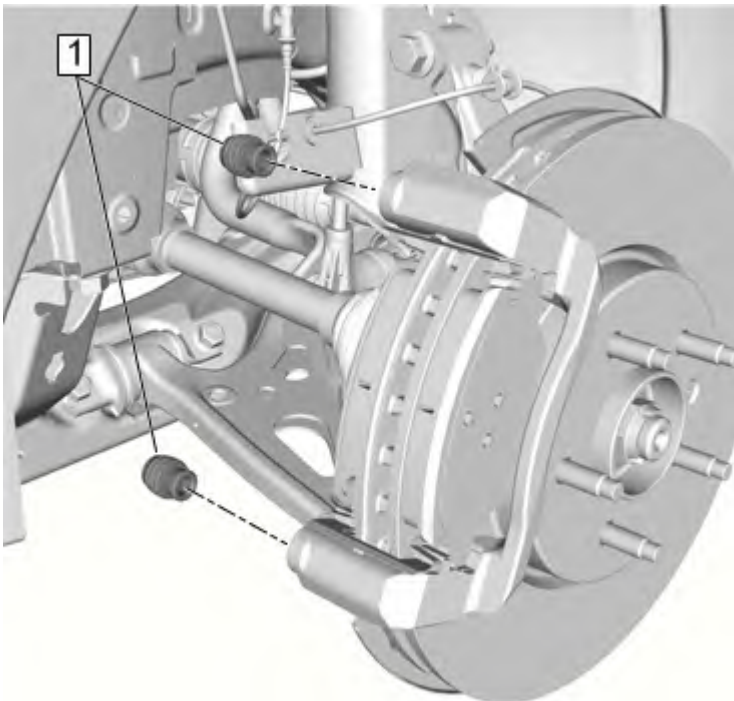


Fig. 64: Front Brake Caliper Guide Pin Seal
Courtesy of GENERAL MOTORS COMPANY

8. Remove Front Brake Caliper Guide Pin Seal (1)

Installation Procedure

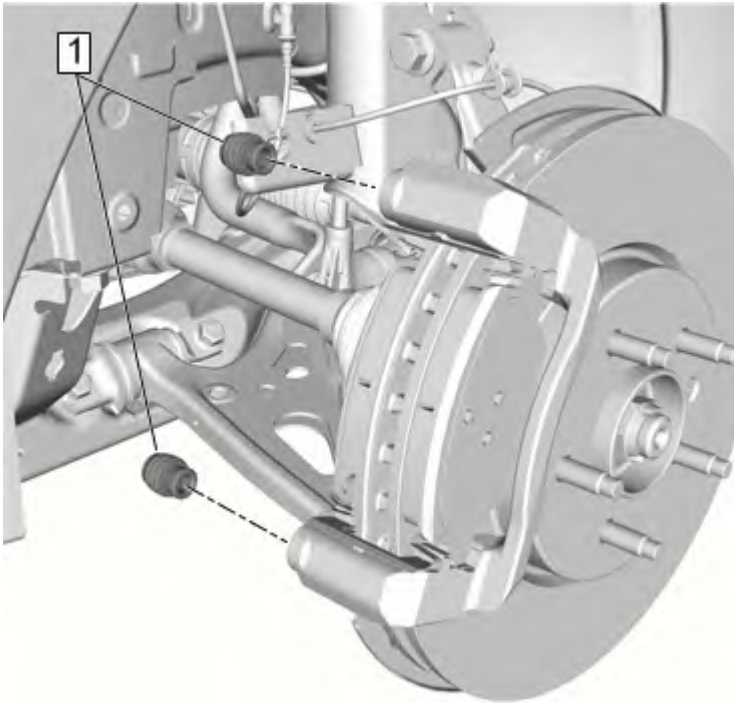


Fig. 65: Front Brake Caliper Guide Pin Seal
Courtesy of GENERAL MOTORS COMPANY

- 1. Install Front Brake Caliper Guide Pin Seal (1)
- 2. Apply a thin coat of high-temperature silicone brake lubricant to the caliper guide pins.

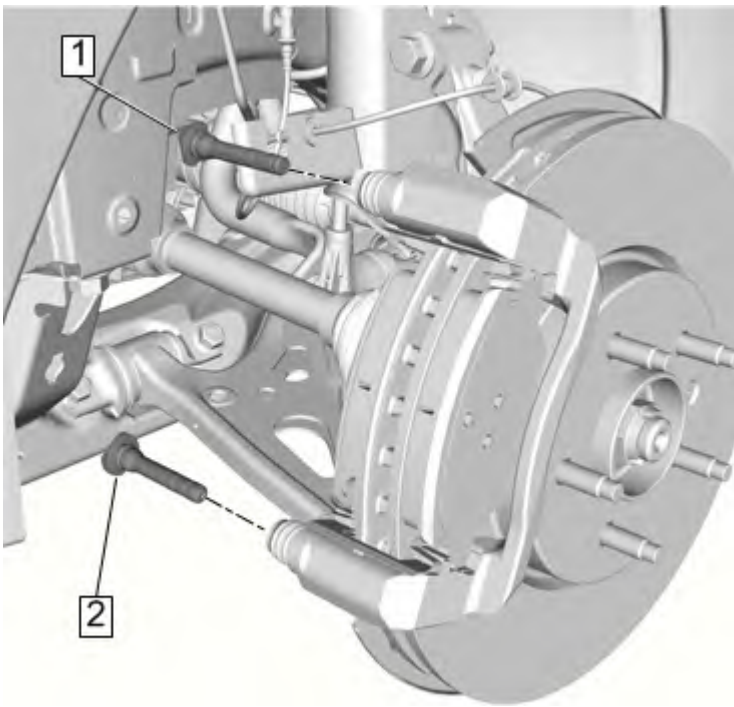


Fig. 66: Front Brake Caliper Guide Pin
Courtesy of GENERAL MOTORS COMPANY

- 3. Install Front Brake Caliper Guide Pin (1)
- 4. Ensure the guide pin seal is fully seated in the groove of the caliper guide pin.
- 5. Gently lift the edge of the guide pin seal while pushing the guide pin into the caliper bracket bore to expel any trapped air.

NOTE: The lower front brake caliper guide pin is equipped with a bushing and **MUST** be installed in the same location.

- 6. Install Front Brake Caliper Guide Pin (1)
- 7. Ensure the guide pin seal is fully seated in the groove of the caliper guide pin.
- 8. Gently lift the edge of the guide pin seal while pushing the guide pin into the caliper bracket bore to expel any trapped air.

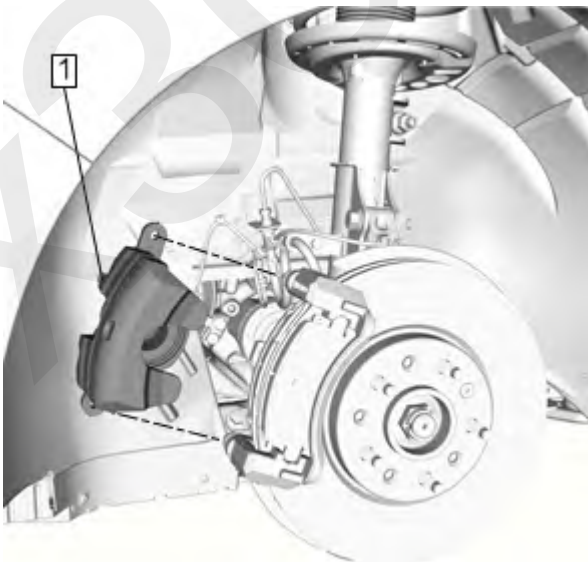


Fig. 67: Front Brake Caliper
Courtesy of GENERAL MOTORS COMPANY

CAUTION: The phenolic brake caliper piston can be damaged if it contacts the edges of the brake pads upon installation. To avoid phenolic brake caliper piston damage, carefully hold the brake pads against the rotor and do NOT allow the caliper piston to contact the edges of the brake pads while installing the caliper. If the brake caliper piston sustains any damage, the entire caliper will need to be replaced.

- 9. Install Front Brake Caliper (1)

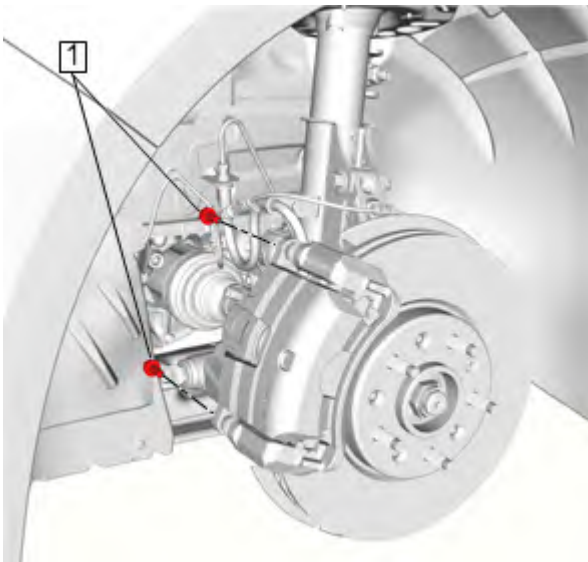


Fig. 68: Brake Caliper Guide Pin Bolt
Courtesy of GENERAL MOTORS COMPANY

CAUTION: **Fastener Caution**

- 10. Install Brake Caliper Guide Pin Bolt (1) and tighten 40 N.m (30 lb ft)
- 11. Install the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)

REAR BRAKE CALIPER REPLACEMENT

Removal Procedure

WARNING: **Brake Dust Warning**

WARNING: **Brake Fluid Irritant Warning**

- 1. Set the parking brake in Service Mode. [Rear Parking Brake Service Mode Selection](#)

- 10/28/2019
2. Raise and support the vehicle. [Lifting and Jacking the Vehicle](#)
 3. Remove the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)

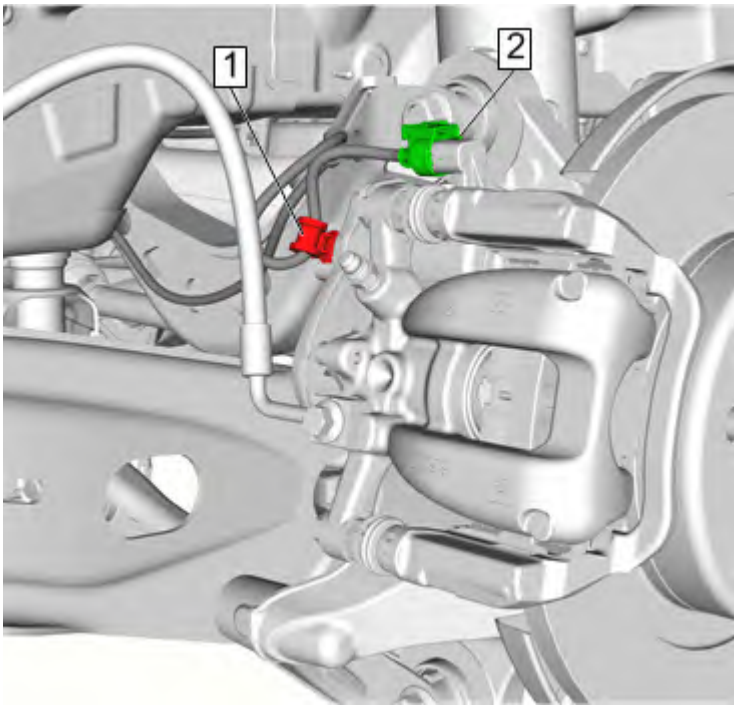


Fig. 69: Park Brake Actuator Electrical Harness Retainer And Connector
Courtesy of GENERAL MOTORS COMPANY

4. Release Park Brake Actuator Electrical Harness Retainer (1)
5. Disconnect Park Brake Actuator Electrical Harness Connector (2)

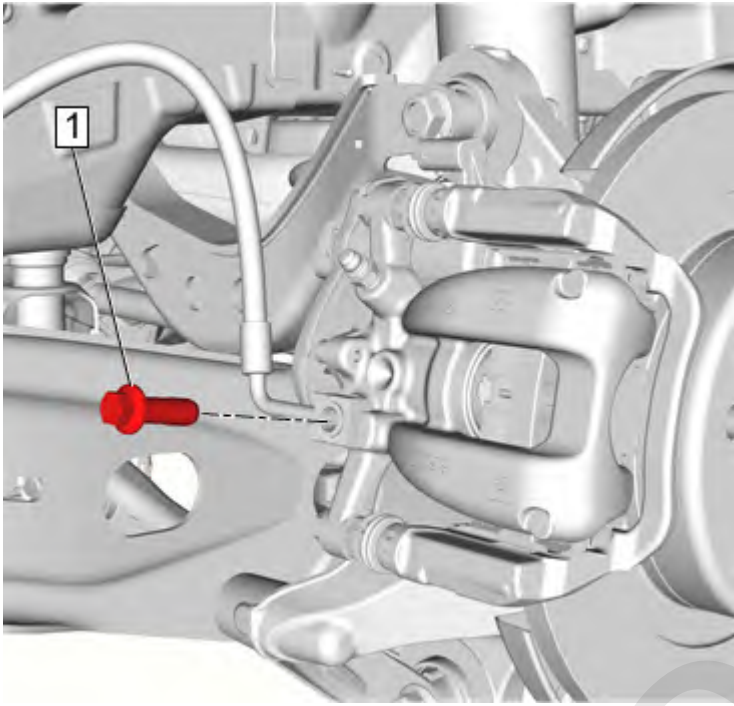


Fig. 70: Brake Hose Fitting Bolt
Courtesy of GENERAL MOTORS COMPANY

6. Remove Brake Hose Fitting Bolt (1)

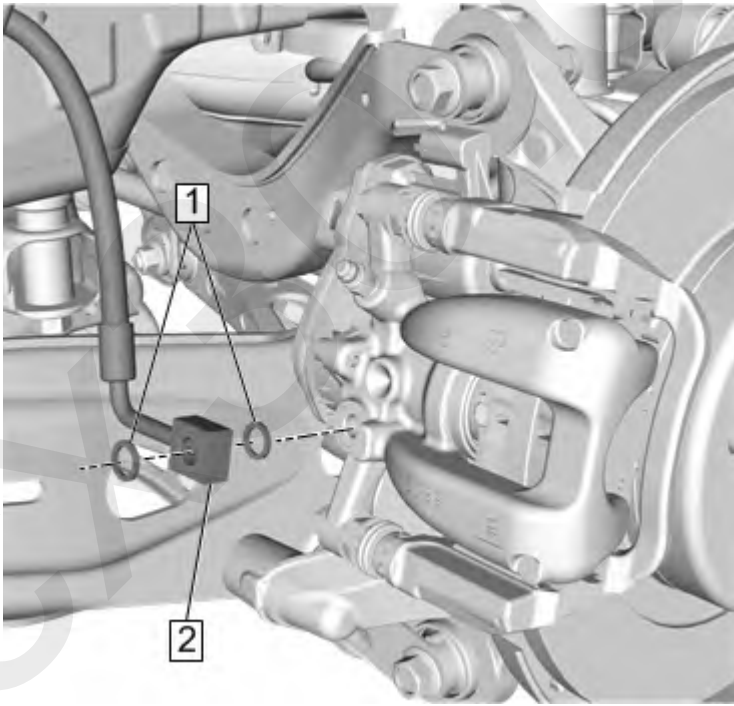


Fig. 71: Brake Hose Fitting And Gasket
Courtesy of GENERAL MOTORS COMPANY

NOTE: Do NOT reuse the brake hose fitting gaskets.

7. Remove Brake Hose Fitting Gasket (1) @Brake Hose Fitting (2) and DISCARD
8. Cap the brake hose fitting to prevent brake fluid loss and contamination.

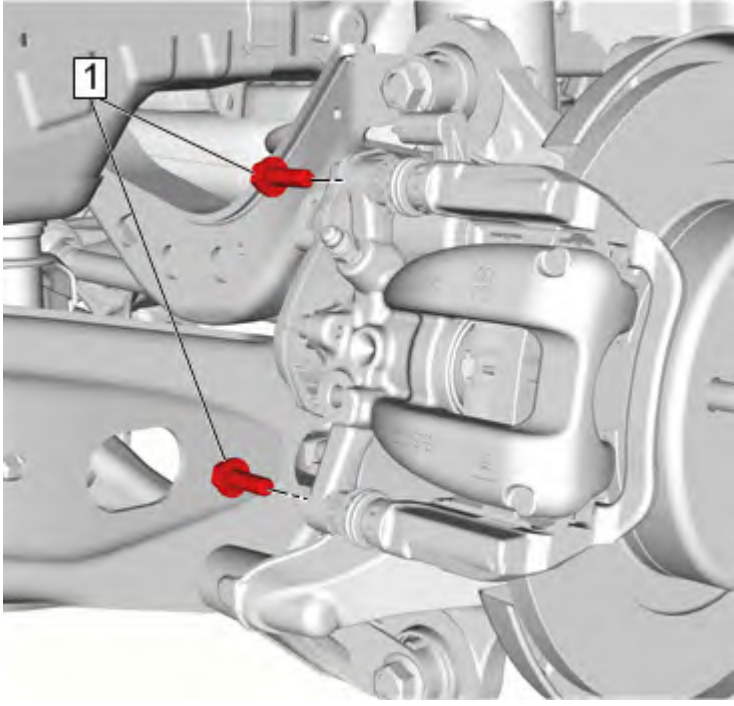


Fig. 72: Brake Caliper Guide Pin Bolt
Courtesy of GENERAL MOTORS COMPANY

9. Remove Brake Caliper Guide Pin Bolt (1)

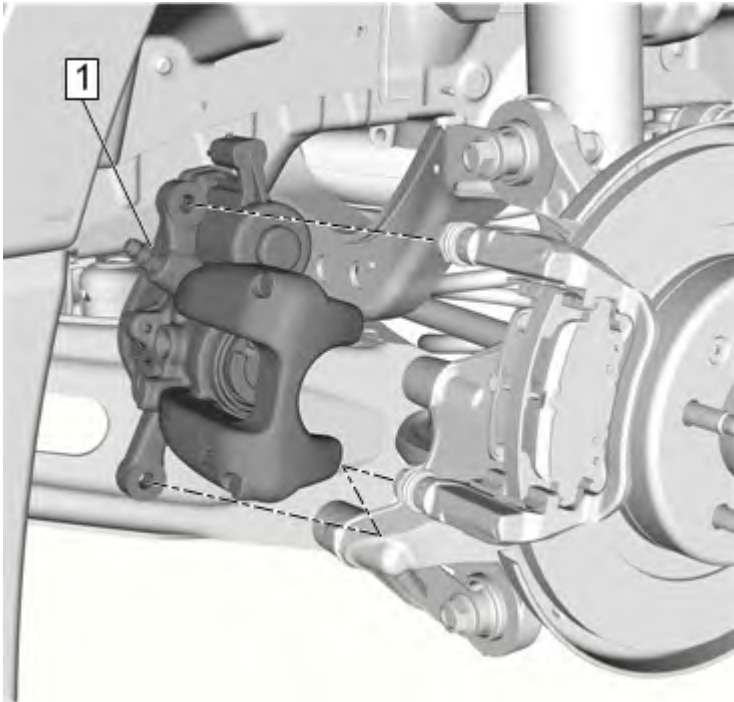


Fig. 73: Brake Caliper
Courtesy of GENERAL MOTORS COMPANY

10. Remove Brake Caliper (1)

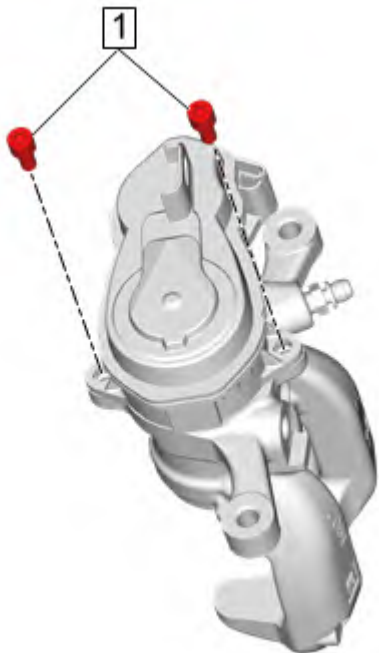


Fig. 74: Parking Brake Actuator Bolt
Courtesy of GENERAL MOTORS COMPANY

11. Remove Parking Brake Actuator Bolt (1)

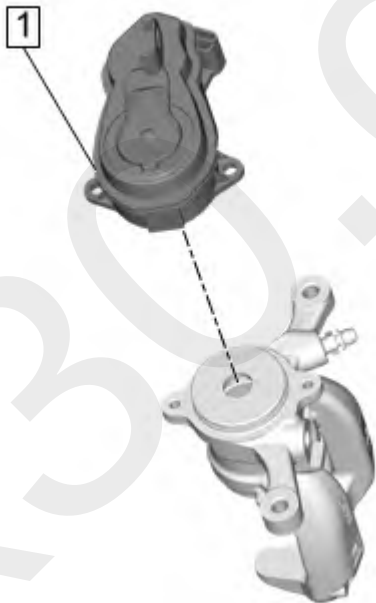


Fig. 75: Rear Parking Brake Actuator
Courtesy of GENERAL MOTORS COMPANY

12. Remove Rear Parking Brake Actuator (1)

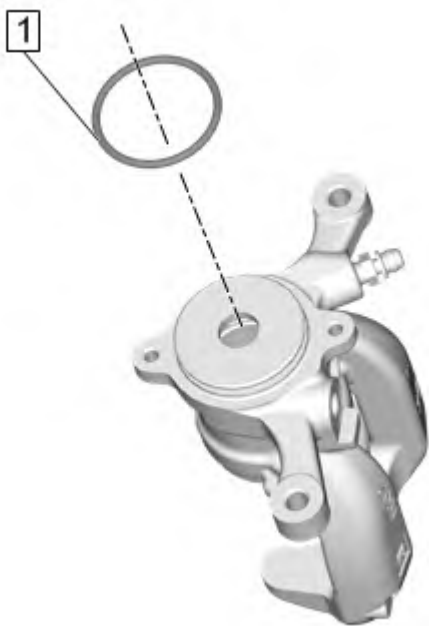


Fig. 76: Rear Parking Brake Actuator Lever Seal
Courtesy of GENERAL MOTORS COMPANY

13. Remove Rear Parking Brake Actuator Lever Seal (1) and DISCARD

Installation Procedure

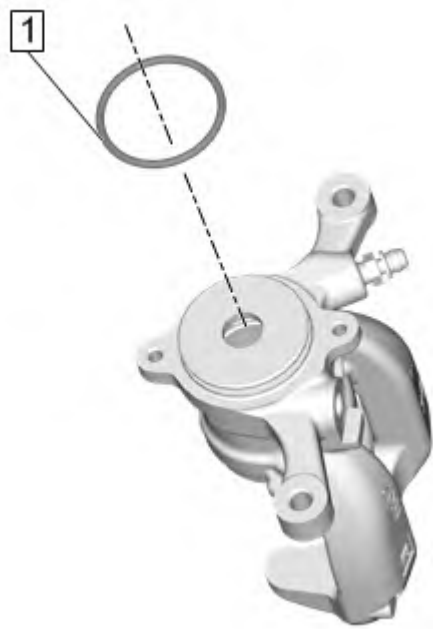


Fig. 77: Rear Parking Brake Actuator Lever Seal
Courtesy of GENERAL MOTORS COMPANY

1. Install NEW Rear Parking Brake Actuator Lever Seal (1)

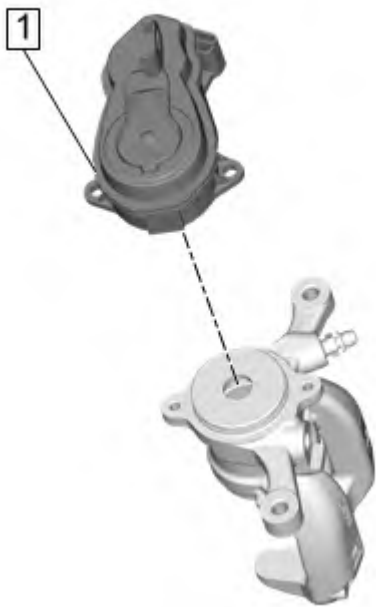


Fig. 78: Rear Parking Brake Actuator
Courtesy of GENERAL MOTORS COMPANY

2. Install Rear Parking Brake Actuator (1)

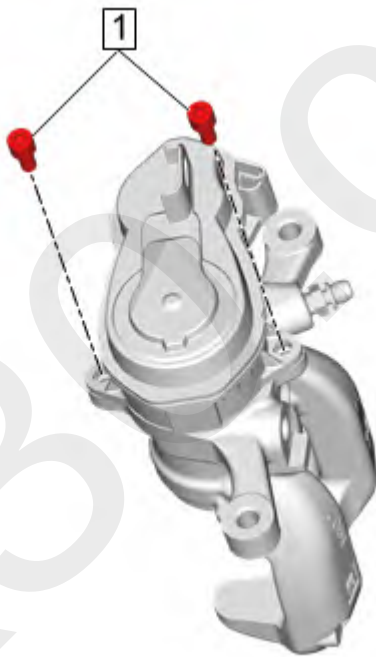


Fig. 79: Parking Brake Actuator Bolt
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Fastener Caution

3. Install Parking Brake Actuator Bolt (1) and tighten 12 N.m (106 lb in)

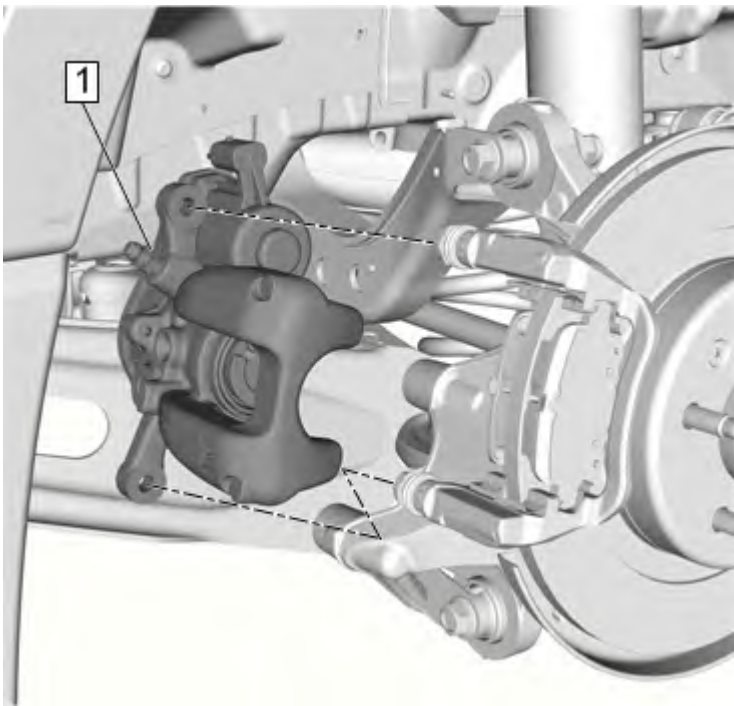


Fig. 80: Brake Caliper
Courtesy of GENERAL MOTORS COMPANY

4. Install Brake Caliper (1)

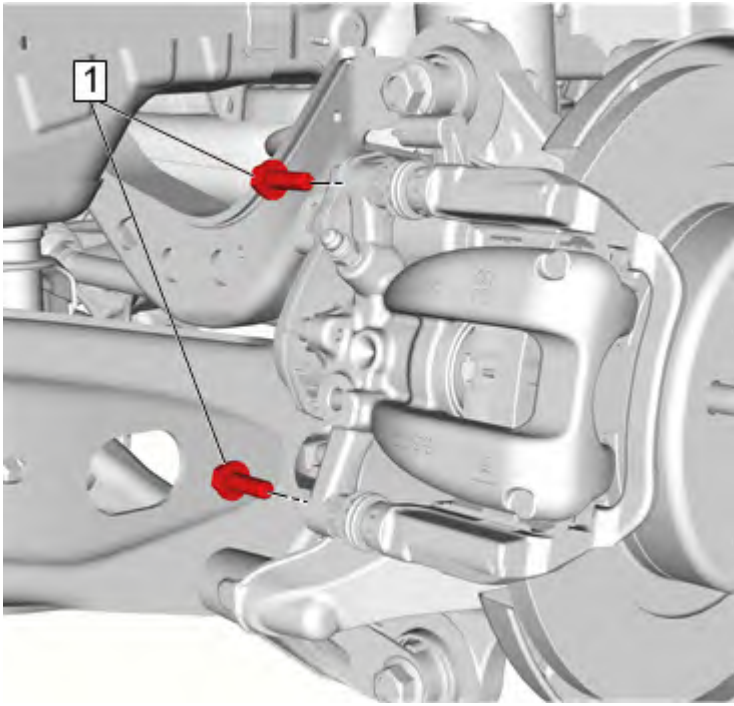


Fig. 81: Brake Caliper Guide Pin Bolt
Courtesy of GENERAL MOTORS COMPANY

5. Install Brake Caliper Guide Pin Bolt (1) and tighten 40 N.m (30 lb ft)

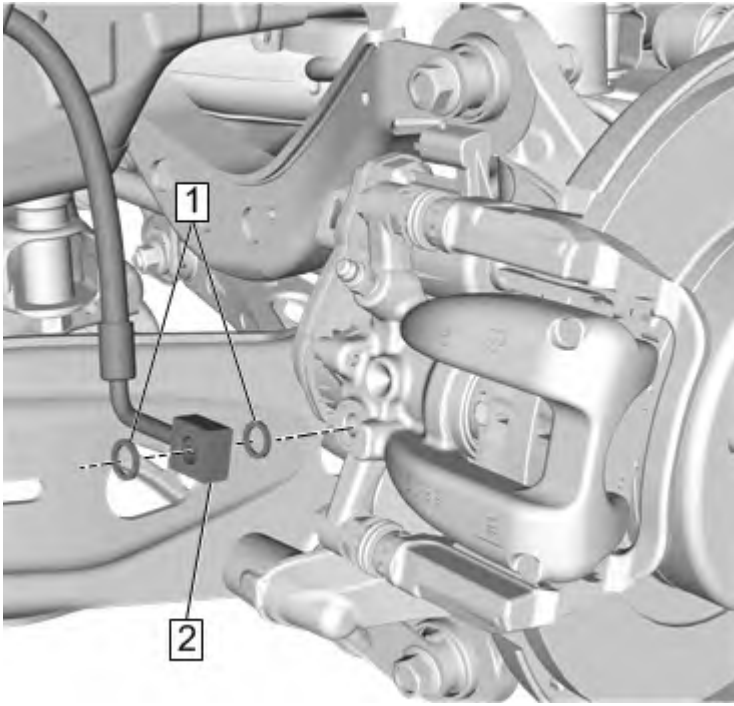


Fig. 82: Brake Hose Fitting And Gasket
Courtesy of GENERAL MOTORS COMPANY

NOTE: Install NEW brake hose fitting gaskets.

6. Install Brake Hose Fitting Gasket (1) @Brake Hose Fitting (2)

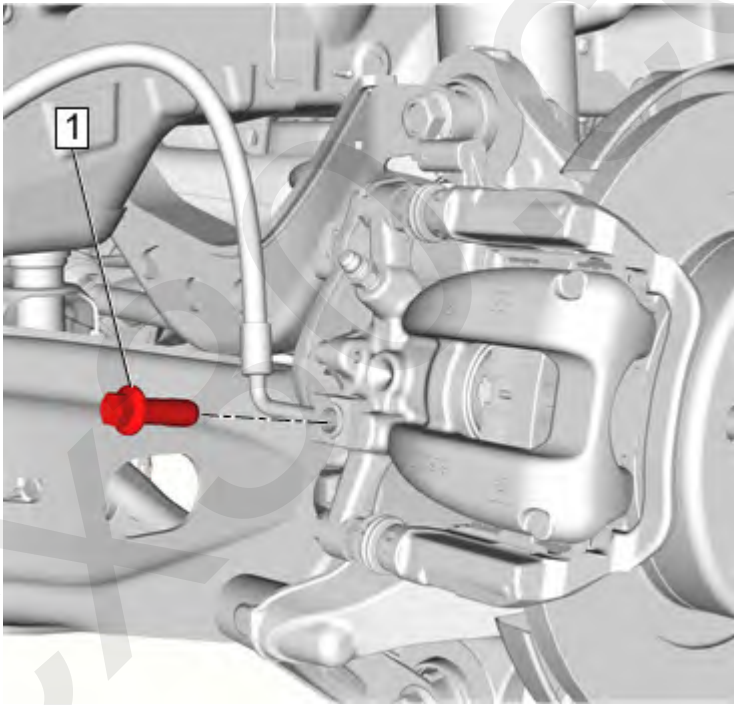


Fig. 83: Brake Hose Fitting Bolt
Courtesy of GENERAL MOTORS COMPANY

7. Install Brake Hose Fitting Bolt (1) and tighten 40 N.m (30 lb ft)

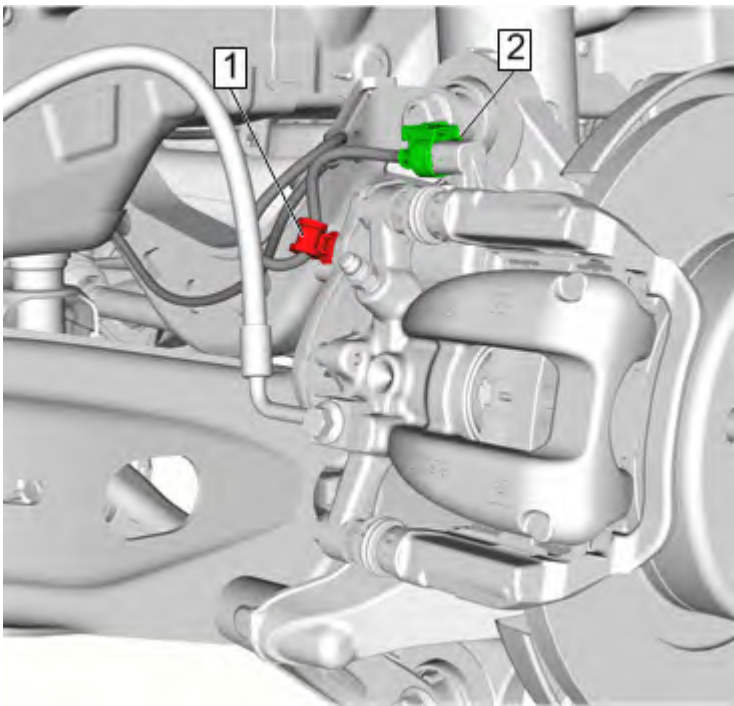


Fig. 84: Park Brake Actuator Electrical Harness Retainer And Connector
Courtesy of GENERAL MOTORS COMPANY

8. Secure Park Brake Actuator Electrical Harness Retainer (1)
9. Connect Park Brake Actuator Electrical Harness Connector (2)
10. Bleed the brake system. [Hydraulic Brake System Bleeding \(Manual\)](#) [Hydraulic Brake System Bleeding \(Pressure\)](#)
11. Calibrate the park brake. [Park Brake Calibration](#)
12. Install the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)

REAR BRAKE CALIPER GUIDE PIN REPLACEMENT

Removal Procedure

WARNING: [Brake Dust Warning](#)

1. Set the parking brake in Service Mode. [Rear Parking Brake Service Mode Selection](#)
2. Raise and support the vehicle. [Lifting and Jacking the Vehicle](#)
3. Remove the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)

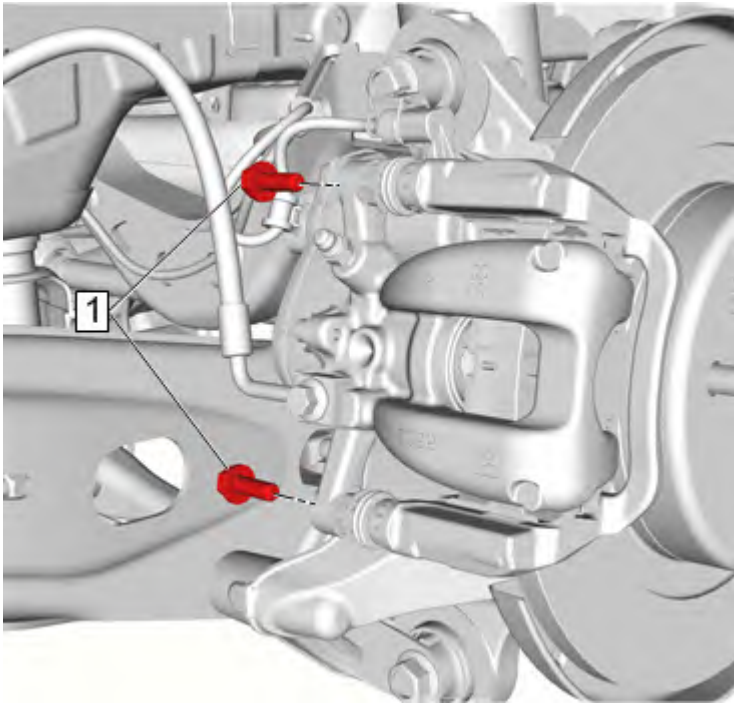


Fig. 85: Brake Caliper Guide Pin Bolt
Courtesy of GENERAL MOTORS COMPANY

- NOTE:**
- **DO NOT** use any air tools to remove or install the guide pin bolts. Use hand tools **ONLY**.
 - Install an open end wrench to hold the caliper guide pin in line with the brake caliper while removing or installing caliper guide pin bolt. **DO NOT** allow the open end wrench to come in contact with the brake caliper. Allowing the open end wrench to come in contact with the brake caliper will cause a pulsation when the brakes are applied.

4. Remove Brake Caliper Guide Pin Bolt (1)

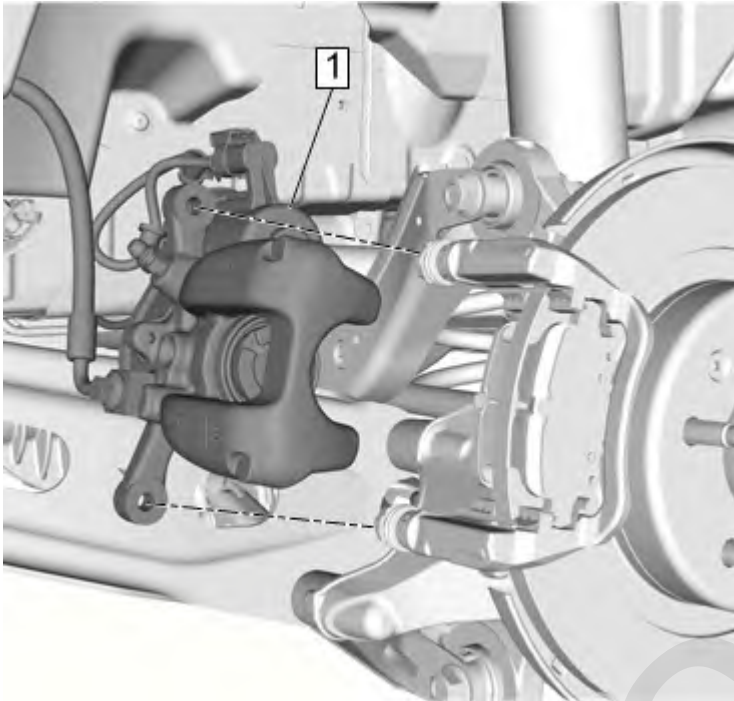


Fig. 86: Rear Brake Caliper
Courtesy of GENERAL MOTORS COMPANY

- 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.

5. Remove Rear Brake Caliper (1)
6. Support the brake caliper with heavy mechanics wire.

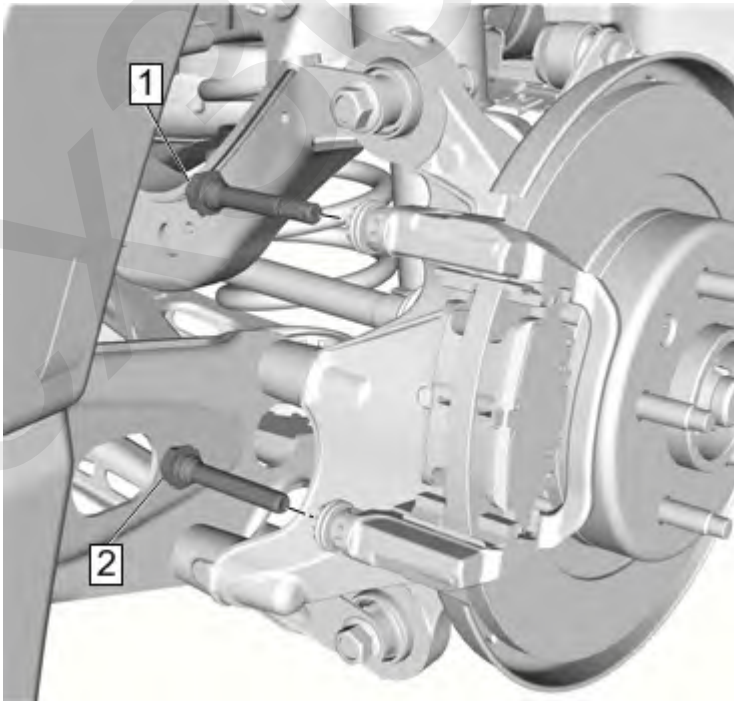


Fig. 87: Upper And Lower Rear Brake Caliper Guide Pin
Courtesy of GENERAL MOTORS COMPANY

- NOTE:** The upper rear brake caliper guide pin is equipped with a bushing and **MUST** be installed in the same location.

7. Remove Upper Rear Brake Caliper Guide Pin (1)
8. Remove Lower Rear Brake Caliper Guide Pin (2)

Installation Procedure

1. Thoroughly clean the brake caliper bracket guide pin bores with denatured alcohol and allow to dry.
2. Apply a light coat of high temperature silicone brake lubricant to the caliper guide pins.

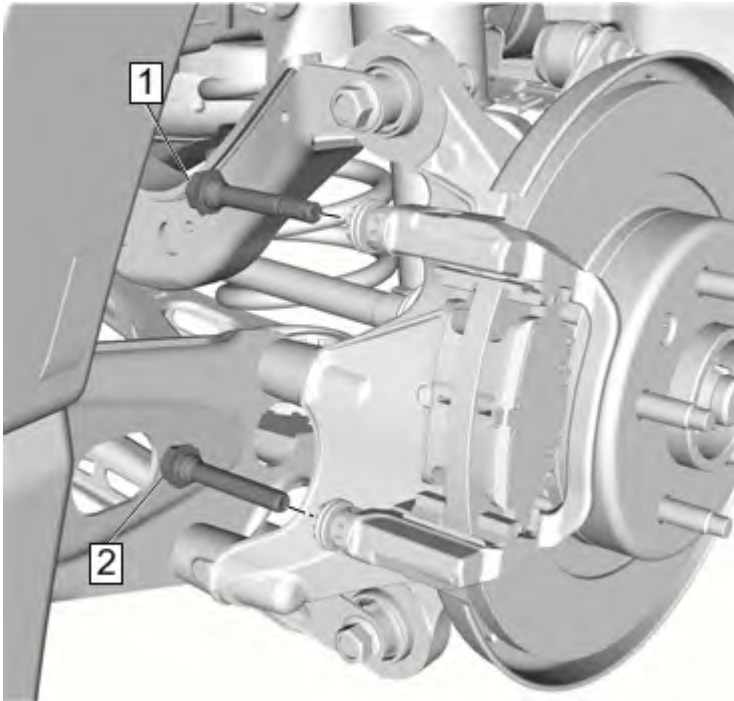


Fig. 88: Upper And Lower Rear Brake Caliper Guide Pin
Courtesy of GENERAL MOTORS COMPANY

- NOTE:** The upper rear brake caliper guide pin is equipped with a bushing and **MUST** be installed in the same location.

- 3. Install Upper Rear Brake Caliper Guide Pin (1)
- 4. Ensure the guide pin seal is fully seated in the groove of the caliper guide pin.
- 5. Gently lift the edge of the guide pin seal while pushing the guide pin into the caliper bracket bore to expel any trapped air.
- 6. Install Lower Rear Brake Caliper Guide Pin (1)
- 7. Ensure the guide pin seal is fully seated in the groove of the caliper guide pin.
- 8. Gently lift the edge of the guide pin seal while pushing the guide pin into the caliper bracket bore to expel any trapped air.

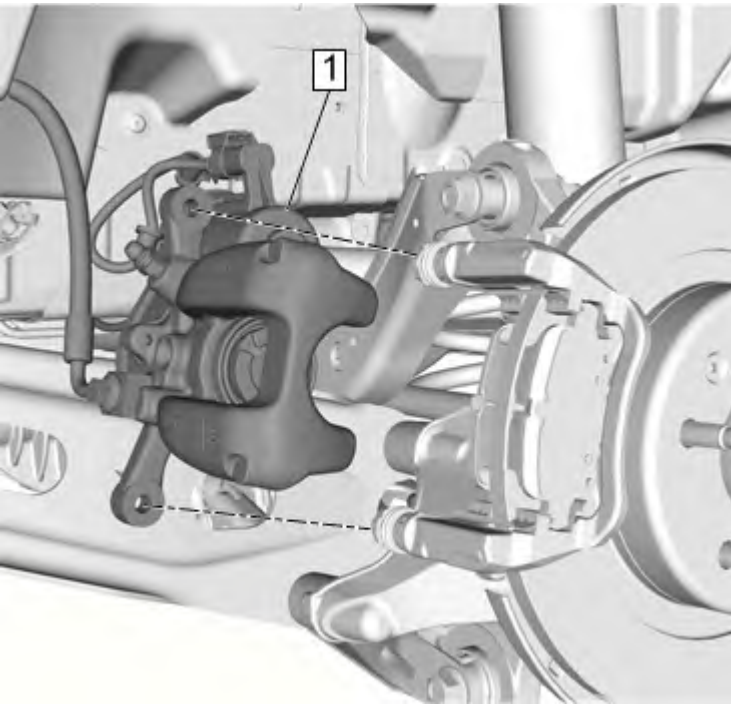


Fig. 89: Rear Brake Caliper
Courtesy of GENERAL MOTORS COMPANY

- 9. Install Rear Brake Caliper (1)

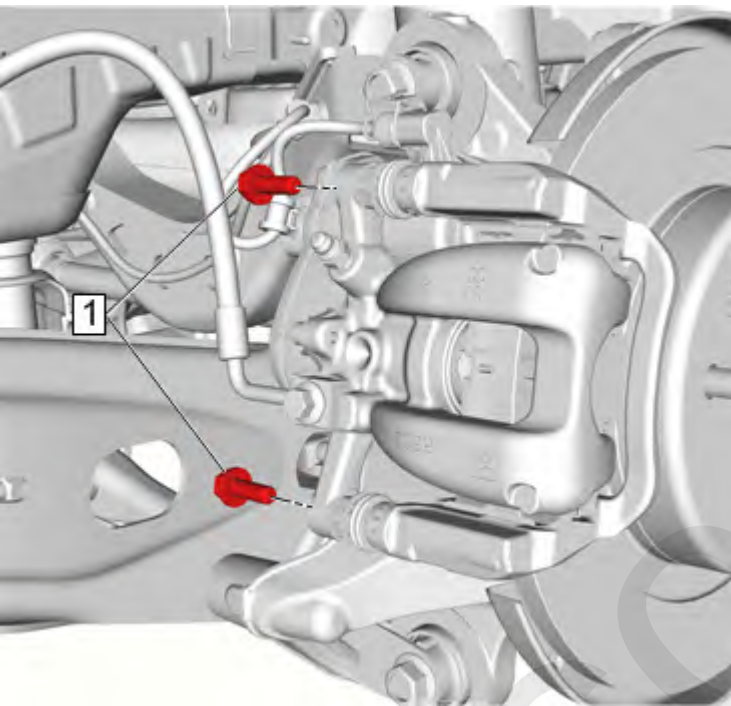


Fig. 90: Brake Caliper Guide Pin Bolt
Courtesy of GENERAL MOTORS COMPANY

CAUTION: [Fastener Caution](#)

- 10. Install Brake Caliper Guide Pin Bolt (1) and tighten 40 N.m (30 lb ft)
- 11. Install the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)
- 12. Calibrate the park brake. [Park Brake Calibration](#)

REAR BRAKE CALIPER GUIDE PIN SEAL REPLACEMENT

Removal Procedure

WARNING: [Brake Dust Warning](#)

- 1. Set the parking brake in Service Mode. [Rear Parking Brake Service Mode Selection](#)
- 2. Raise and support the vehicle. [Lifting and Jacking the Vehicle](#)
- 3. Remove the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)

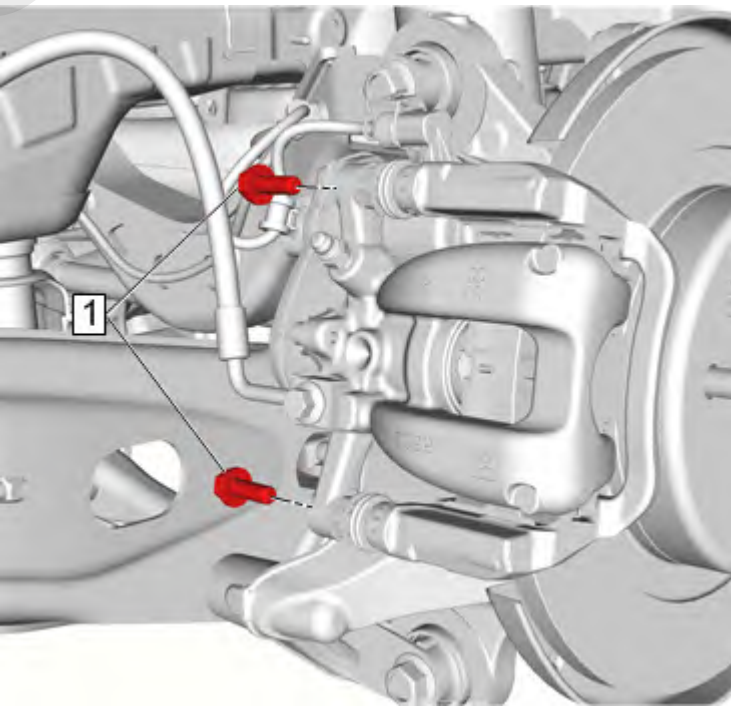


Fig. 91: Brake Caliper Guide Pin Bolt
Courtesy of GENERAL MOTORS COMPANY

- NOTE:**
- DO NOT use any air tools to remove or install the guide pin bolts. Use hand tools ONLY.
 - Install an open end wrench to hold the caliper guide pin in line with the brake caliper while removing or installing caliper guide pin bolt. DO NOT allow the open end wrench to come in contact with the brake caliper. Allowing the open end wrench to come in contact with the brake caliper will cause a pulsation when the brakes are applied.

- 4. Remove Brake Caliper Guide Pin Bolt (1)

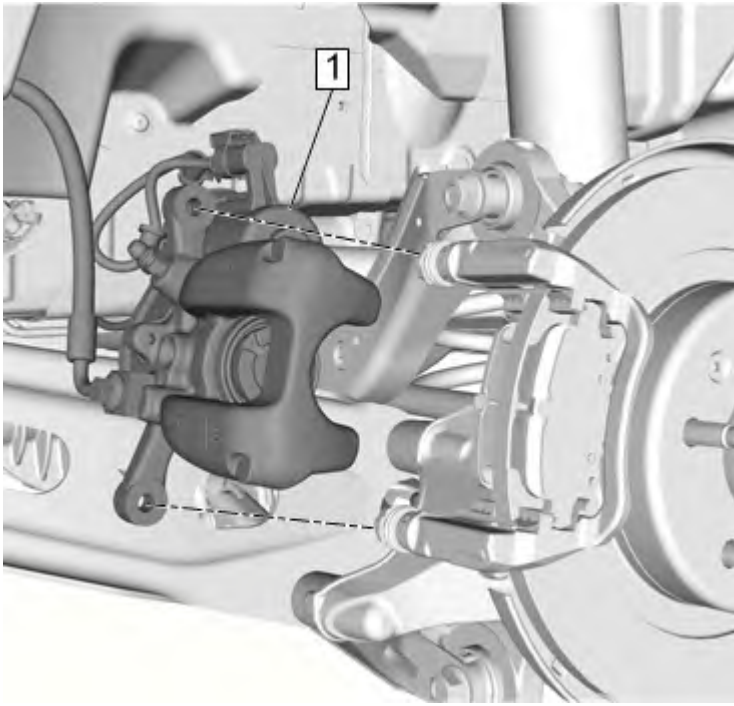


Fig. 92: Rear Brake Caliper
Courtesy of GENERAL MOTORS COMPANY

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.

- 5. Remove Rear Brake Caliper (1)
- 6. Support the brake caliper with heavy mechanics wire.

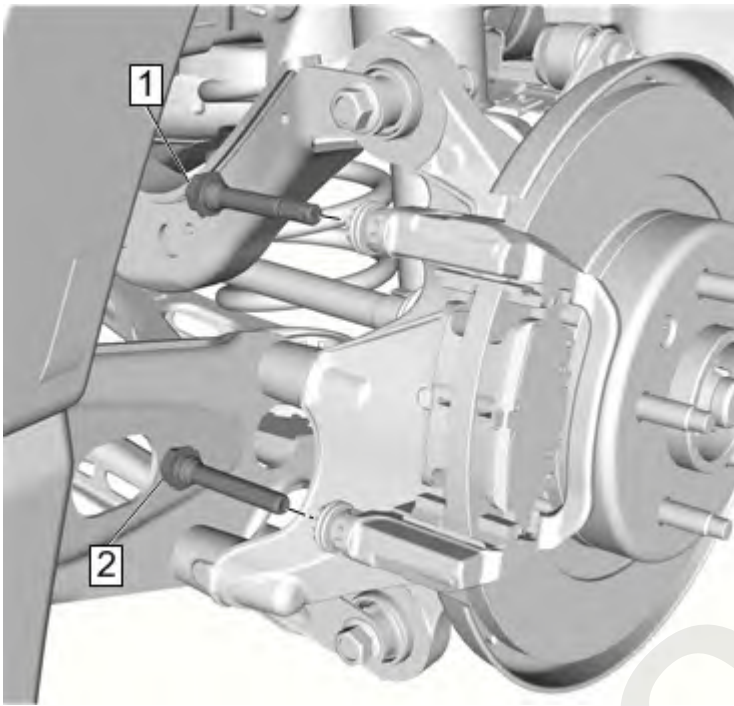


Fig. 93: Upper And Lower Rear Brake Caliper Guide Pin
Courtesy of GENERAL MOTORS COMPANY

NOTE: The upper rear brake caliper guide pin is equipped with a bushing and **MUST** be installed in the same location.

- 7. Remove Upper Rear Brake Caliper Guide Pin (1)
- 8. Remove Lower Rear Brake Caliper Guide Pin (2)

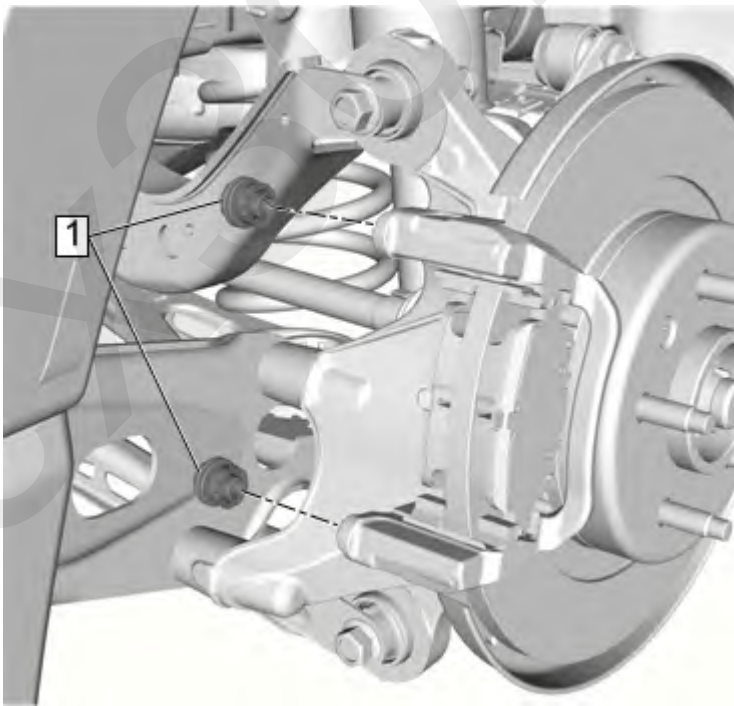


Fig. 94: Rear Brake Caliper Guide Pin Seal
Courtesy of GENERAL MOTORS COMPANY

- 9. Remove Rear Brake Caliper Guide Pin Seal (1)

Installation Procedure

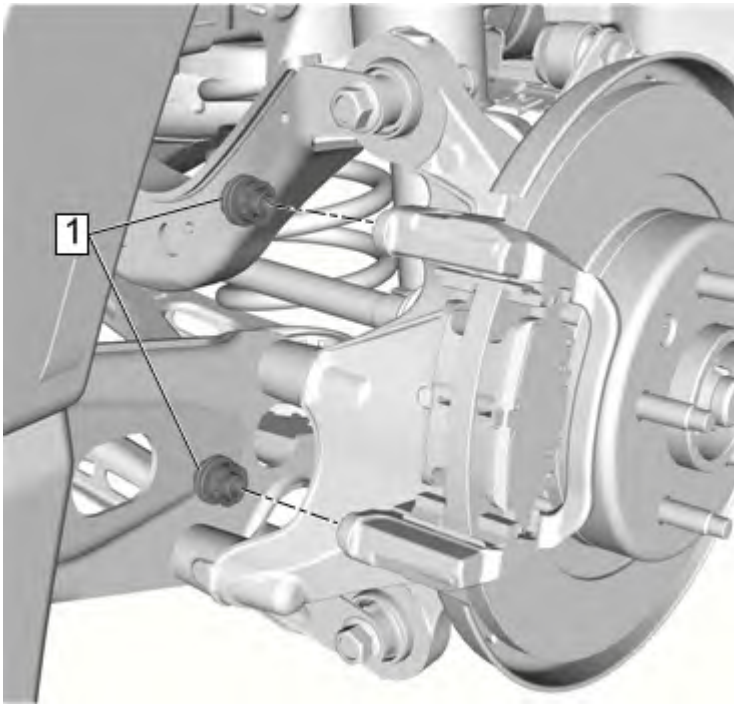


Fig. 95: Rear Brake Caliper Guide Pin Seal
Courtesy of GENERAL MOTORS COMPANY

- 1. Install Rear Brake Caliper Guide Pin Seal (1)
- 2. Apply a thin coat of high-temperature silicone brake lubricant to the caliper guide pins.

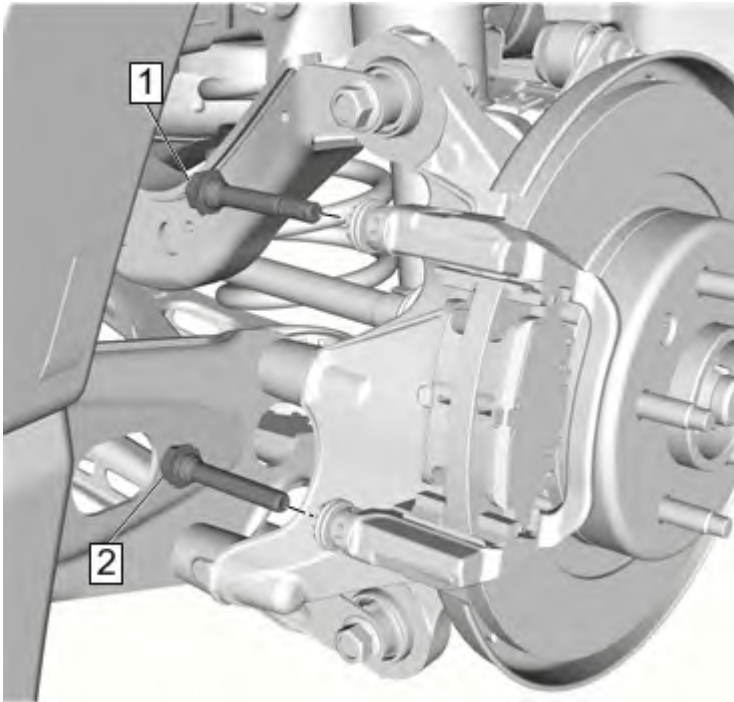


Fig. 96: Upper And Lower Rear Brake Caliper Guide Pin
Courtesy of GENERAL MOTORS COMPANY

NOTE: The lower front brake caliper guide pin is equipped with a bushing and **MUST** be installed in the same location.

- 3. Install Upper Rear Brake Caliper Guide Pin (1)
- 4. Ensure the guide pin seal is fully seated in the groove of the caliper guide pin.
- 5. Gently lift the edge of the guide pin seal while pushing the guide pin into the caliper bracket bore to expel any trapped air.
- 6. Install Lower Rear Brake Caliper Guide Pin (1)
- 7. Ensure the guide pin seal is fully seated in the groove of the caliper guide pin.
- 8. Gently lift the edge of the guide pin seal while pushing the guide pin into the caliper bracket bore to expel any trapped air.

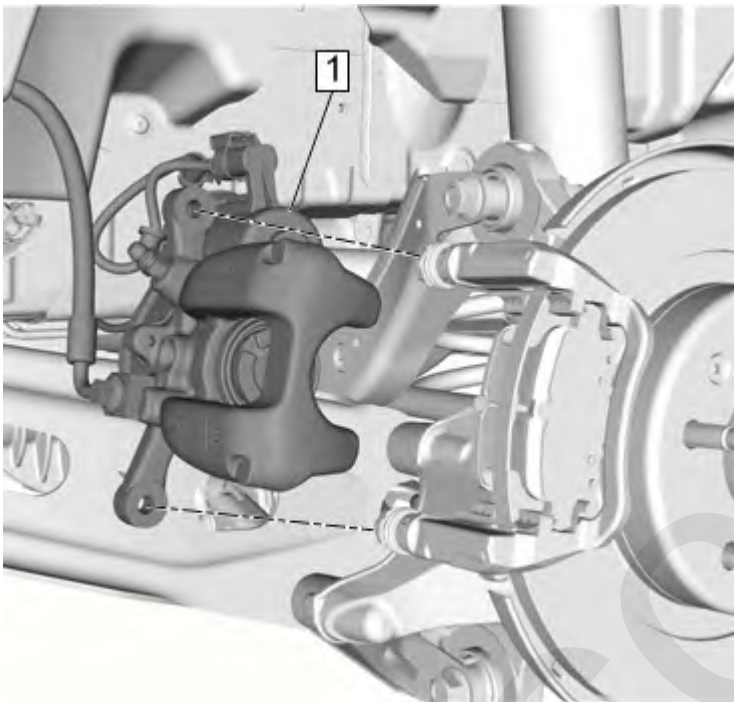


Fig. 97: Rear Brake Caliper
Courtesy of GENERAL MOTORS COMPANY

- 9. Install Rear Brake Caliper (1)

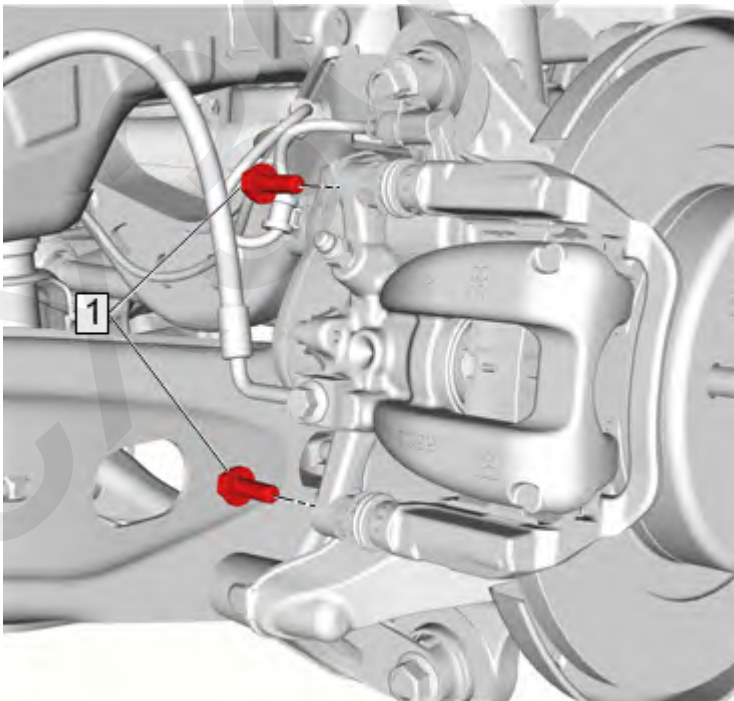


Fig. 98: Brake Caliper Guide Pin Bolt
Courtesy of GENERAL MOTORS COMPANY

CAUTION: **Fastener Caution**

- 10. Install Brake Caliper Guide Pin Bolt (1) and tighten 40 N.m (30 lb ft)
- 11. Install the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)
- 12. Calibrate the park brake. [Park Brake Calibration](#)

FRONT BRAKE CALIPER OVERHAUL

Disassembly Procedure

WARNING: **Brake Dust Warning**

WARNING: **Brake Fluid Irritant Warning**

- 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.

- 1. Remove Front Brake Caliper -[Front Brake Caliper Replacement](#)



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

- 2. Remove Bleeder Valve (1) and Cap (2)

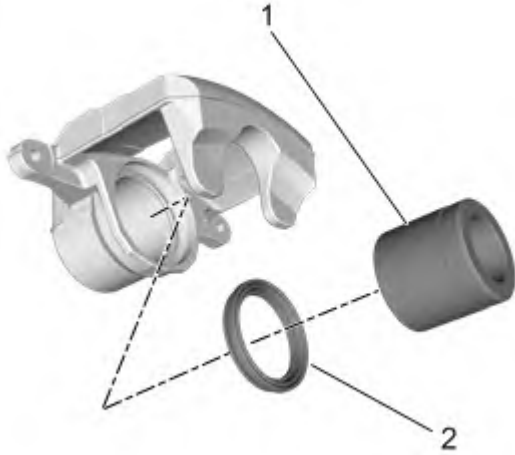


Fig. 100: Brake Caliper Piston
Courtesy of GENERAL MOTORS COMPANY

NOTE: Direct low-pressure, compressed air through the brake caliper fluid inlet.

- 3. Remove Brake Caliper Piston (1)
- 4. Remove Brake Caliper Piston Dust Boot (2) and DISCARD

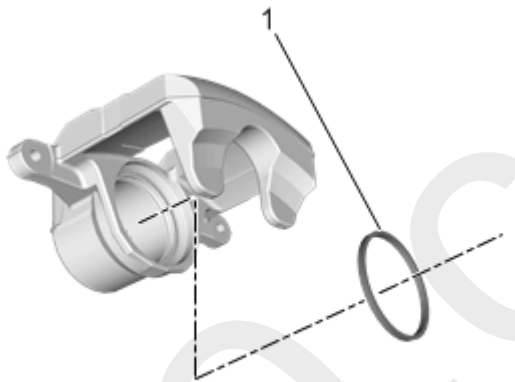


Fig. 101: Caliper Piston Seal
Courtesy of GENERAL MOTORS COMPANY

NOTE: Use a wooden or plastic tool to remove the seal.

- 5. Remove Brake Caliper Piston Seal (1) and DISCARD
- 6. If cracks, scoring, pitting, excessive rust, and/or excessive corrosion are present in the caliper bore, replace the caliper assembly.
- 7. If light rust or light corrosion are present in the caliper bore, attempt to remove the imperfection with a fine emery paper. If the imperfection cannot be removed, replace the caliper assembly.
- 8. Clean the brake caliper piston bore and seal counterbore, and the caliper piston with denatured alcohol, or equivalent.
- 9. Dry the caliper piston bore and counterbore, and the piston with non-lubricated, filtered, compressed air.

NOTE: Do NOT use abrasives to clean the brake caliper piston.

- 10. Inspect the caliper piston for cracks, scoring, and/or damage to the plating. Replace the caliper piston if any of these conditions exist.
- 11. Inspect the caliper mounting holes for cracks, scoring, pitting, rust and/or excessive corrosion. Replace the caliper assembly if any of these conditions exist.

Assembly Procedure

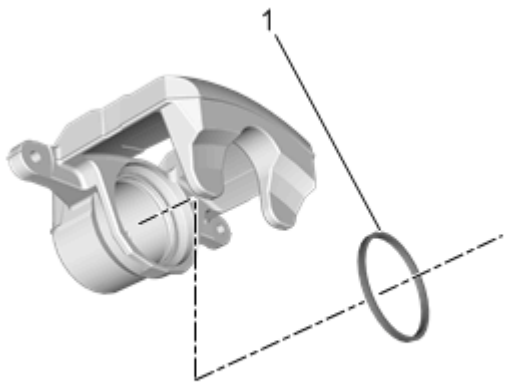


Fig. 102: Caliper Piston Seal
Courtesy of GENERAL MOTORS COMPANY

- 1. Lubricate the NEW caliper piston seal with brake fluid from a clean, sealed brake fluid container. **Adhesives, Fluids, Lubricants, and Sealers**
- 2. Install Brake Caliper Piston Seal (1)
- 3. Apply a thin coat of brake fluid from a clean, sealed brake fluid container to the brake caliper bore. **Adhesives, Fluids, Lubricants, and Sealers**

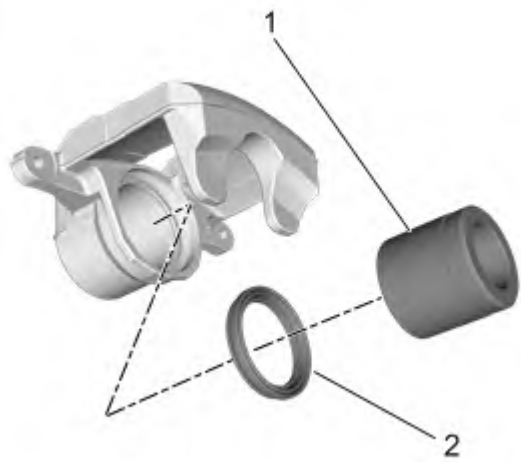


Fig. 103: Brake Caliper Piston
Courtesy of GENERAL MOTORS COMPANY

NOTE: **Seat the NEW caliper piston dust boot in the groove of the brake caliper piston.**

- 4. Install Brake Caliper Piston (1) @ Brake Caliper Piston Dust Boot (2)
- 5. Compress the caliper piston to the bottom of the caliper bore.
- 6. Fully seat the piston dust boot seal into caliper counterbore.



Fig. 104: Brake Caliper Bleeder Valve
Courtesy of GENERAL MOTORS COMPANY

CAUTION: **Fastener Caution**

- 7. Install Bleeder Valve (1) 10 N.m (89 lb in)
- 8. Install Cap (2)
- 9. Install Front Brake Caliper - **Front Brake Caliper Replacement**

FRONT BRAKE CALIPER BRACKET REPLACEMENT (J17)

Removal Procedure

WARNING: **Brake Dust Warning**

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

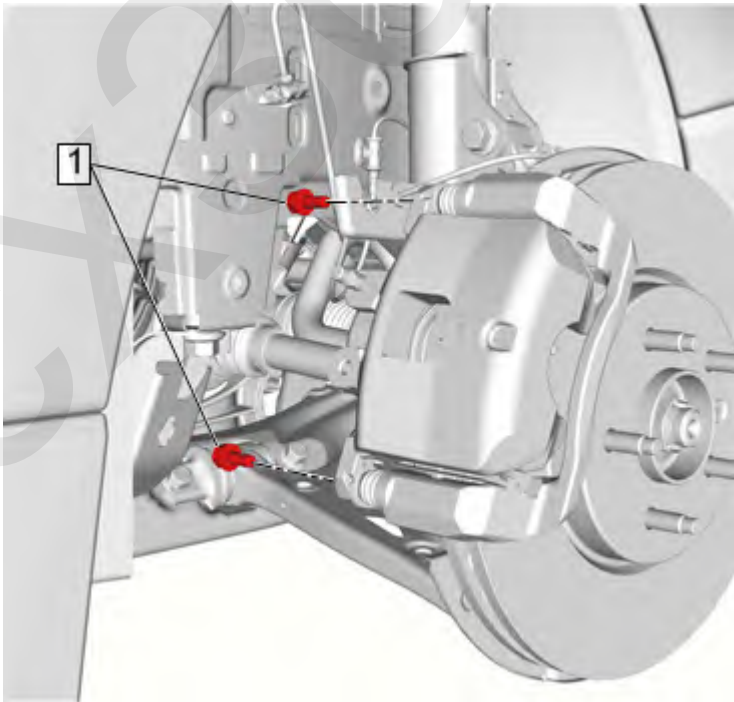


Fig. 105: Brake Caliper Guide Pin Bolt
Courtesy of GENERAL MOTORS COMPANY

- NOTE:**
- **DO NOT** use any air tools to remove or install the guide pin bolts. Use hand tools **ONLY**.
 - Install an open end wrench to hold the caliper guide pin in line with the brake caliper while removing or installing caliper guide pin bolt. **DO NOT** allow the open end wrench to come in contact with the brake caliper. Allowing the open end wrench to come in contact with the brake caliper will cause a pulsation when the brakes are applied.

- 3. Remove Brake Caliper Guide Pin Bolt (1)

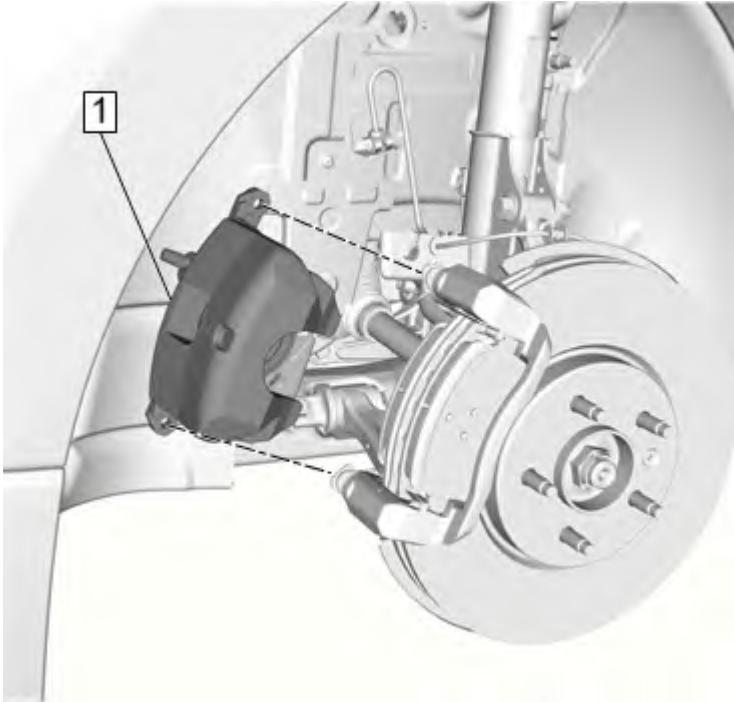


Fig. 106: Brake Caliper
Courtesy of GENERAL MOTORS COMPANY

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.**

- 4. Remove Front Brake Caliper (1)

5. Support the brake caliper with heavy mechanics wire.

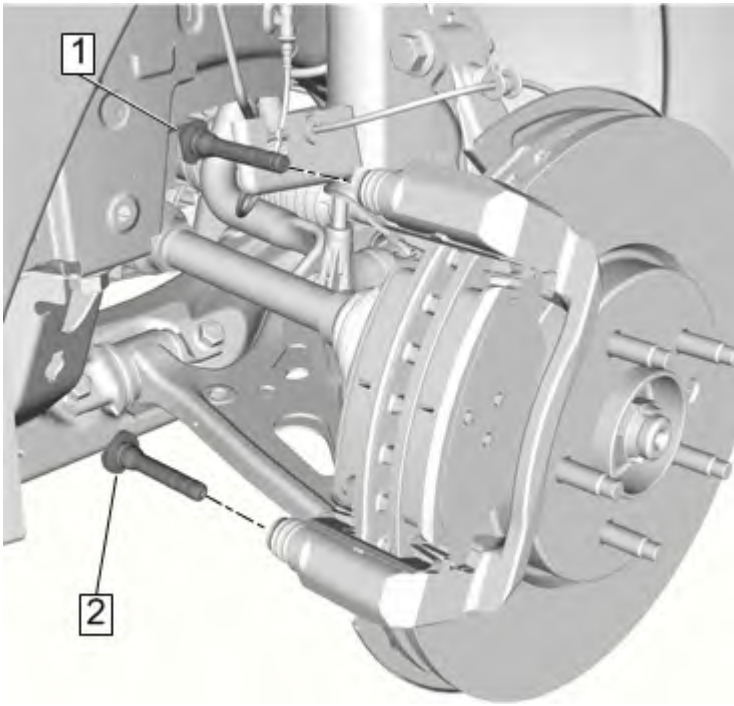


Fig. 107: Front Brake Caliper Guide Pin
Courtesy of GENERAL MOTORS COMPANY

6. Remove Upper Front Brake Caliper Guide Pin (1)

NOTE: The lower front brake caliper guide pin is equipped with a bushing and **MUST** be installed in the same location.

7. Remove Lower Front Brake Caliper Guide Pin (2)

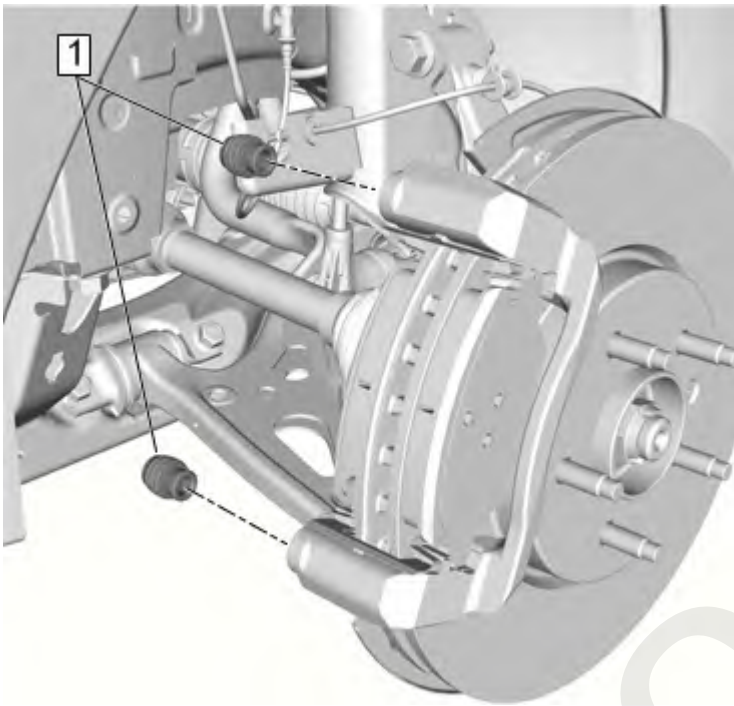


Fig. 108: Front Brake Caliper Guide Pin Seal
Courtesy of GENERAL MOTORS COMPANY

8. Remove Front Brake Caliper Guide Pin Seal (2)

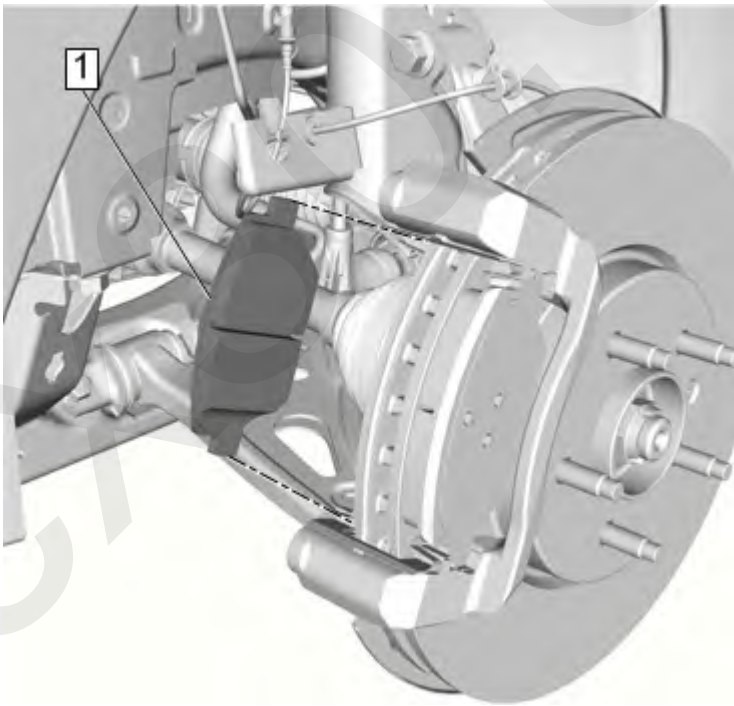


Fig. 109: Inner Disc Brake Pad
Courtesy of GENERAL MOTORS COMPANY

9. Remove Inner Disc Brake Pad (1)

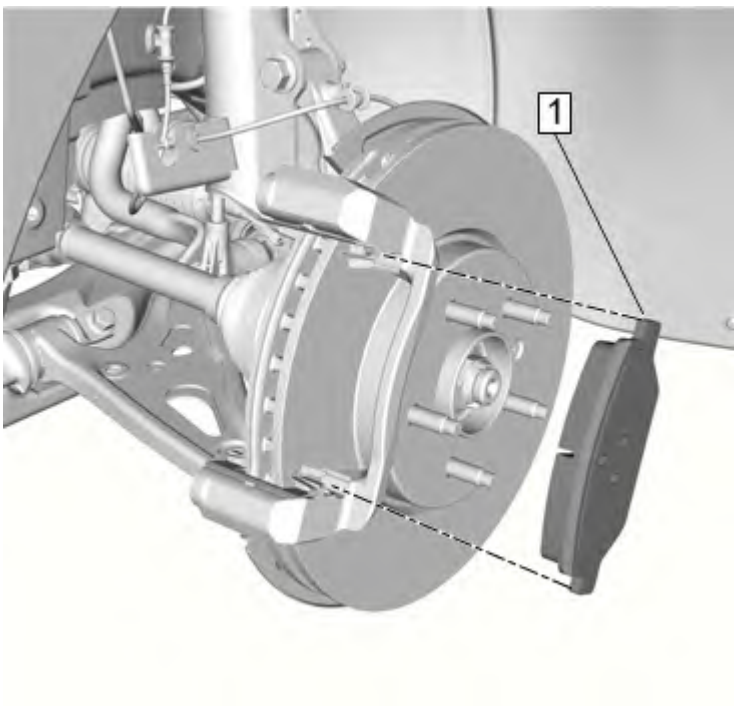


Fig. 110: Outer Disc Brake Pad
Courtesy of GENERAL MOTORS COMPANY

10. Remove Outer Disc Brake Pad (1)

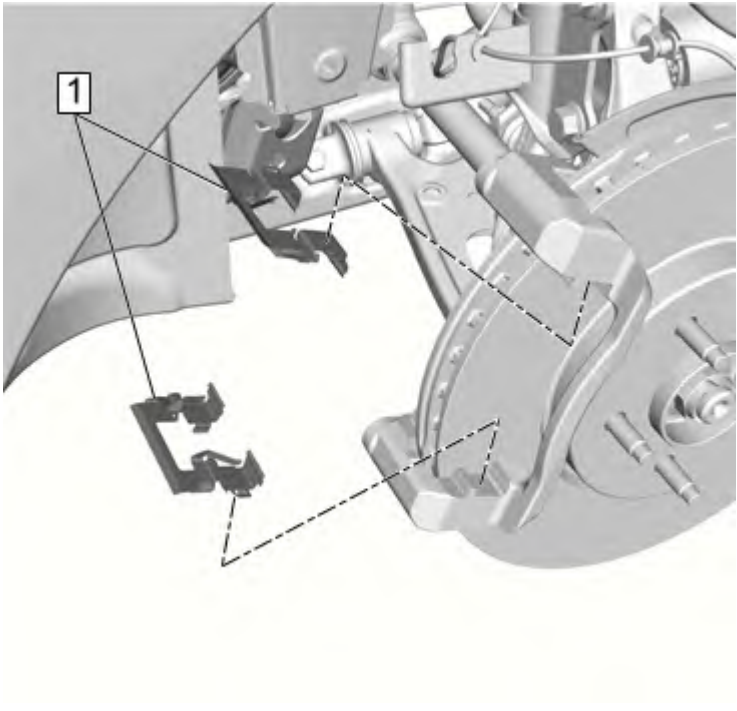


Fig. 111: Front Disc Brake Pad Retaining Spring
Courtesy of GENERAL MOTORS COMPANY

11. Remove Front Disc Brake Pad Retaining Spring (1)

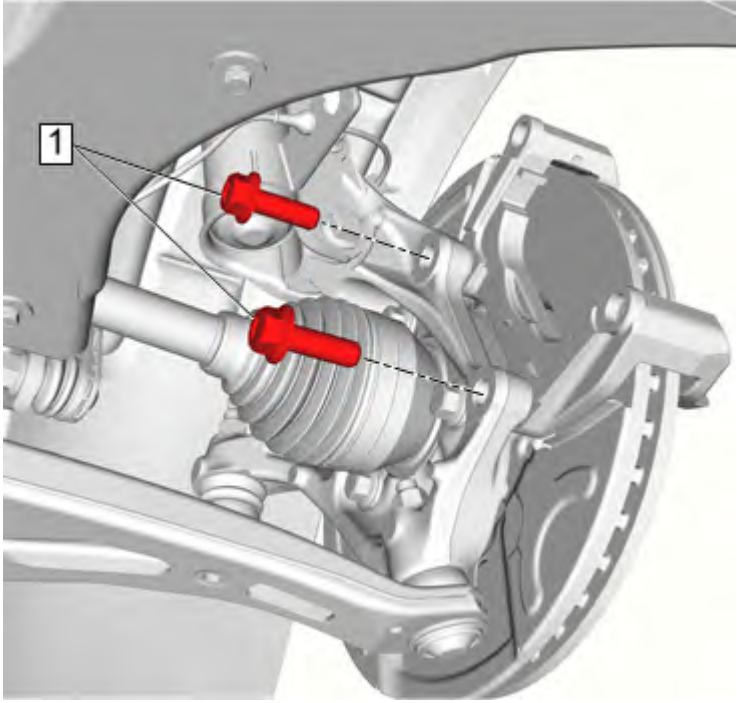


Fig. 112: Front Brake Caliper Bracket Bolt
Courtesy of GENERAL MOTORS COMPANY

12. Remove Front Brake Caliper Bracket Bolt (1)

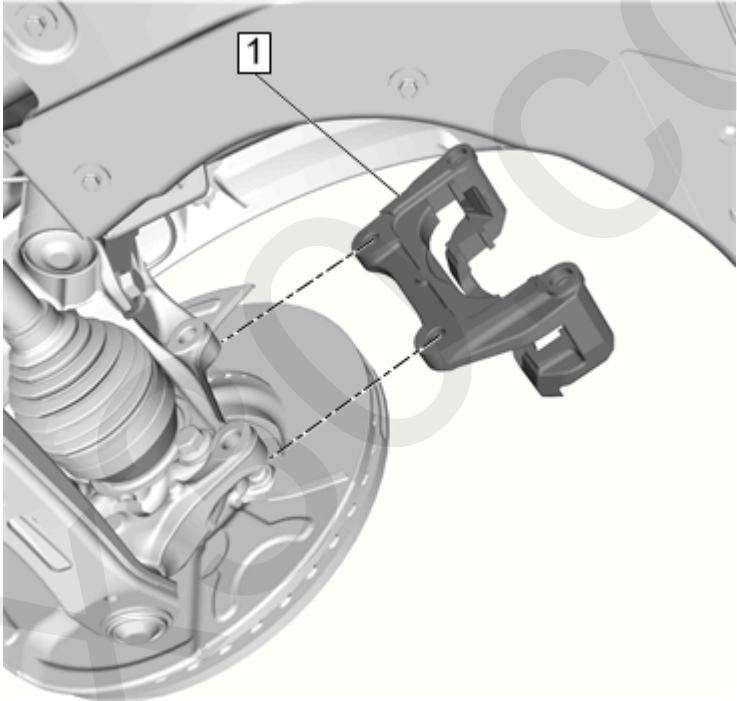


Fig. 113: Front Brake Caliper Bracket
Courtesy of GENERAL MOTORS COMPANY

13. Remove Front Brake Caliper Bracket (1)

Installation Procedure

1. Prepare the brake caliper bracket bolts and the bracket threaded holes for assembly:
 - Thoroughly clean the residue from the bolt threads with denatured alcohol and allow to dry.
 - Thoroughly clean the residue from the threaded holes with denatured alcohol and allow to dry.
 - Apply threadlocker to 2/3 of the threaded length of the bolts. **Adhesives, Fluids, Lubricants, and Sealers**

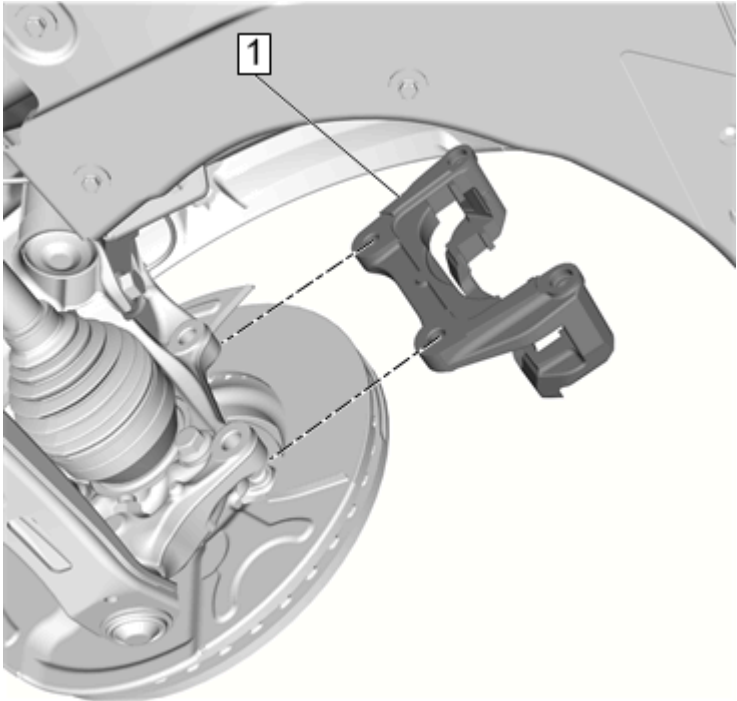


Fig. 114: Front Brake Caliper Bracket
Courtesy of GENERAL MOTORS COMPANY

2. Install Front Brake Caliper Bracket (1)

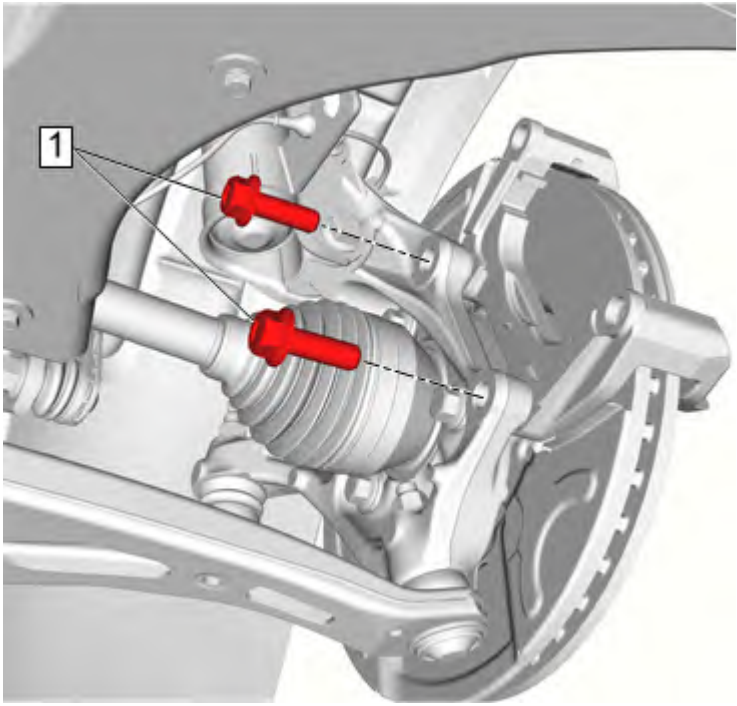


Fig. 115: Front Brake Caliper Bracket Bolt
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Fastener Caution

3. Install Front Brake Caliper Bracket Bolt (1) and tighten
- First Pass:150 N.m (111 lb ft)
 - Final Pass:15-30 degrees



Fig. 116: Disc Brake Pad Spring
Courtesy of GENERAL MOTORS COMPANY

4. Install the disc brake pad retaining spring with the tab (1) in the leading edge of the brake caliper bracket.

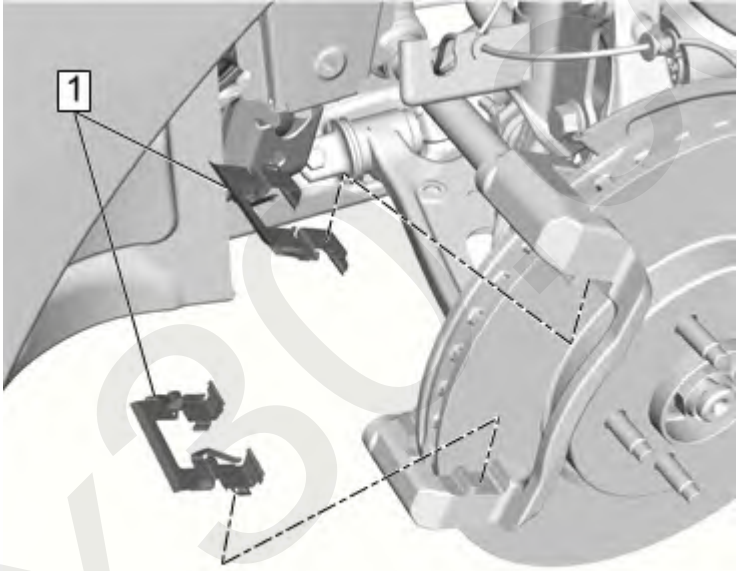


Fig. 117: Front Disc Brake Pad Retaining Spring
Courtesy of GENERAL MOTORS COMPANY

5. Install Front Disc Brake Pad Retaining Spring (1)

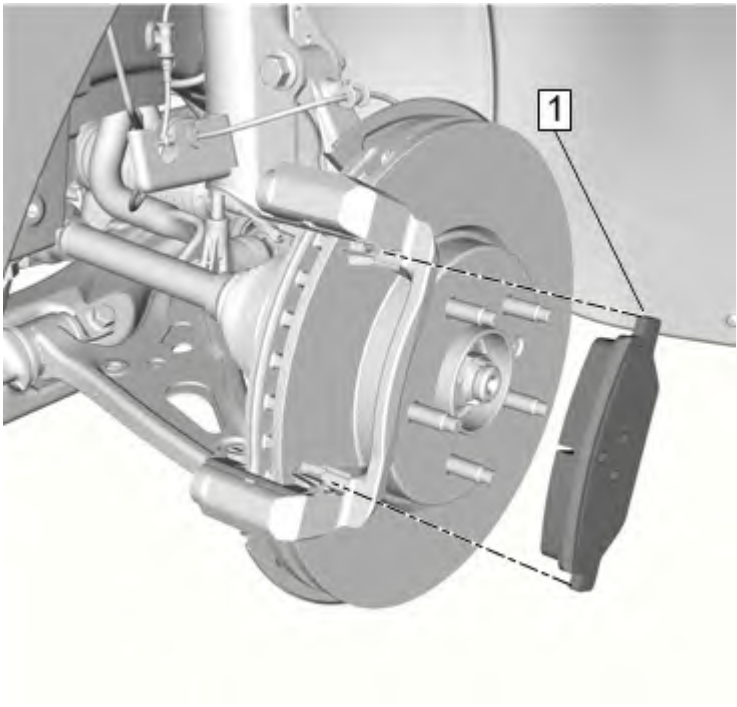


Fig. 118: Outer Disc Brake Pad
Courtesy of GENERAL MOTORS COMPANY

6. Install Outer Disc Brake Pad (1)

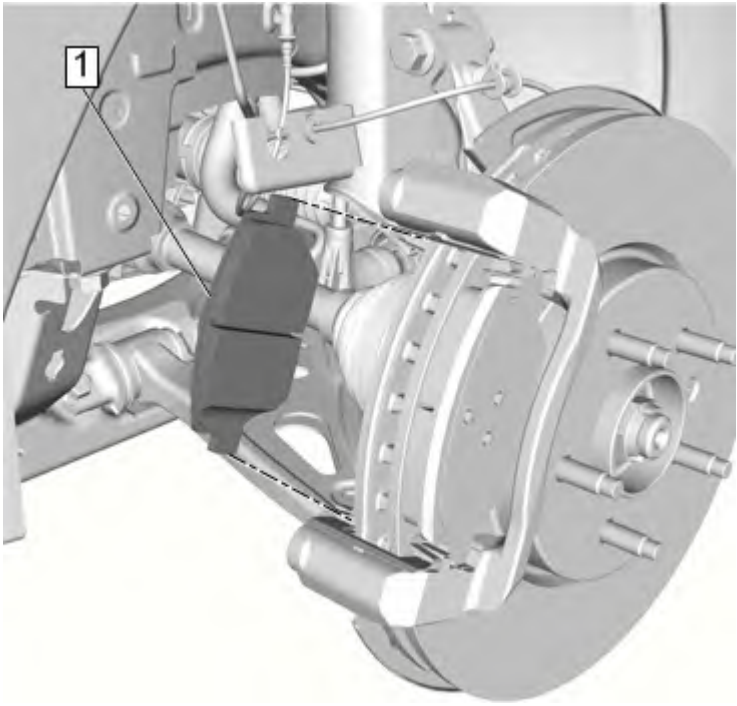


Fig. 119: Inner Disc Brake Pad
Courtesy of GENERAL MOTORS COMPANY

- 7. Install Inner Disc Brake Pad (1)
- 8. Apply a thin coat of high-temperature silicone brake lubricant to the caliper guide pins.

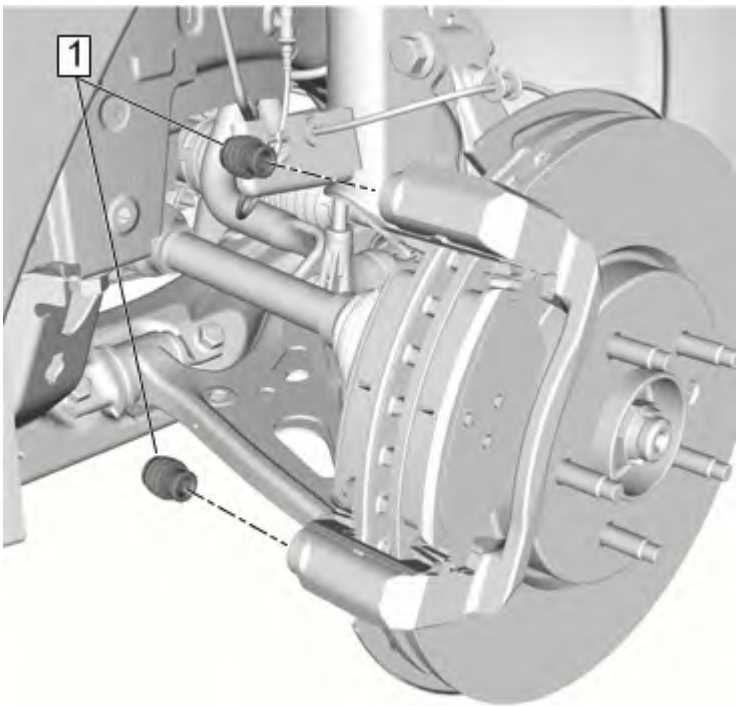


Fig. 120: Front Brake Caliper Guide Pin Seal
Courtesy of GENERAL MOTORS COMPANY

- 9. Install Front Brake Caliper Guide Pin Seal (1)

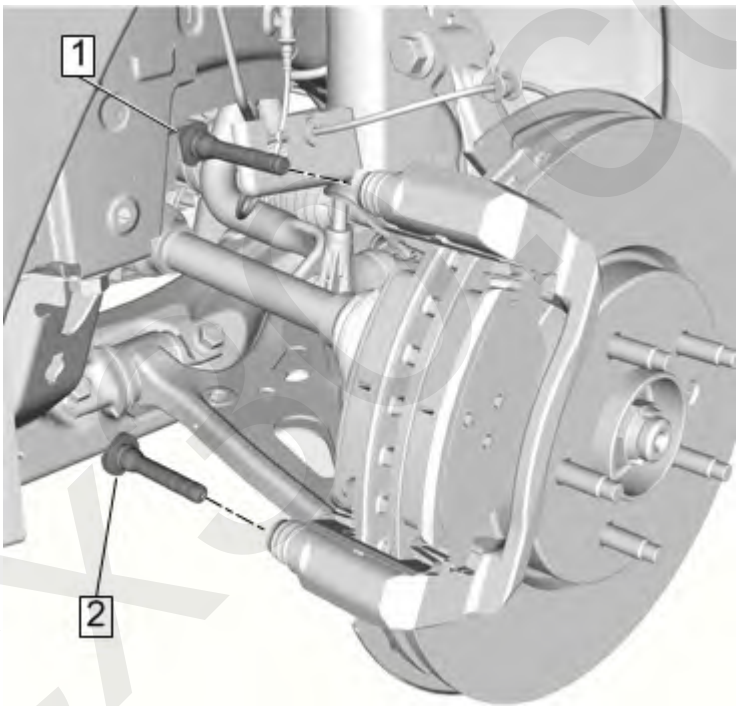


Fig. 121: Front Brake Caliper Guide Pin
Courtesy of GENERAL MOTORS COMPANY

- 10. Install Upper Front Brake Caliper Guide Pin (1)
- 11. Ensure the guide pin seal is fully seated in the groove of the caliper guide pin.
- 12. Gently lift the edge of the guide pin seal while pushing the guide pin into the caliper bracket bore to expel any trapped air.

NOTE: The lower front brake caliper guide pin is equipped with a bushing and **MUST** be installed in the same location.

- 13. Install Lower Front Brake Caliper Guide Pin (2)
- 14. Ensure the guide pin seal is fully seated in the groove of the caliper guide pin.
- 15. Gently lift the edge of the guide pin seal while pushing the guide pin into the caliper bracket bore to expel any trapped air.

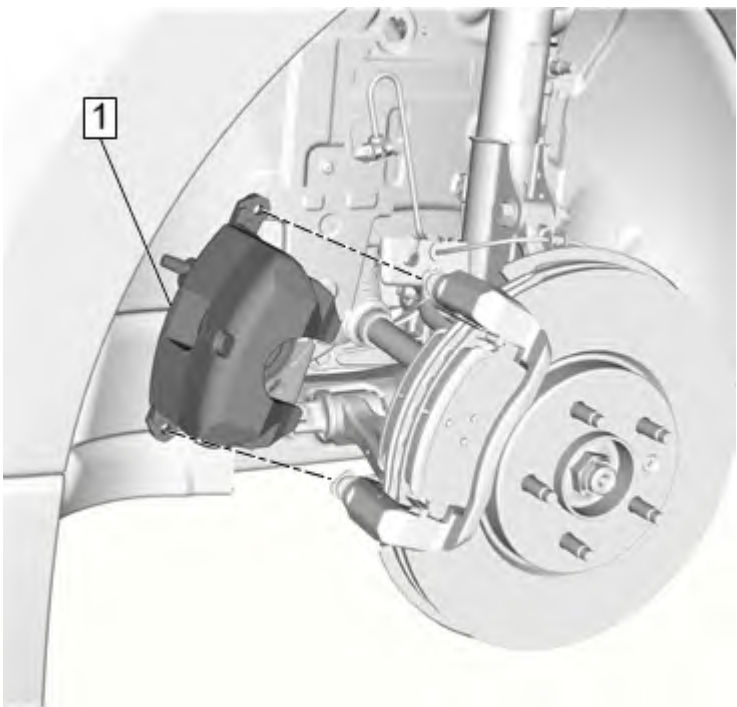


Fig. 122: Brake Caliper
Courtesy of GENERAL MOTORS COMPANY

- 16. Install Front Brake Caliper (1)

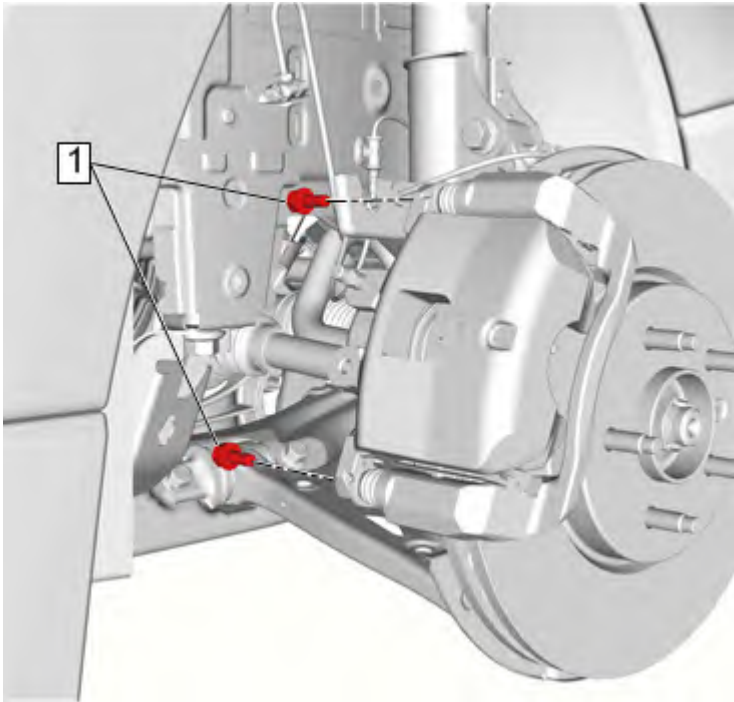


Fig. 123: Brake Caliper Guide Pin Bolt
Courtesy of GENERAL MOTORS COMPANY

- 17. Install Brake Caliper Guide Pin Bolt (1) and tighten 40 N.m (30 lb ft)
- 18. Install the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)

FRONT BRAKE CALIPER BRACKET REPLACEMENT (J60)

Removal Procedure

WARNING: [Brake Dust Warning](#)

- 1. Raise and support the vehicle. [Lifting and Jacking the Vehicle](#)
- 2. Remove the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)

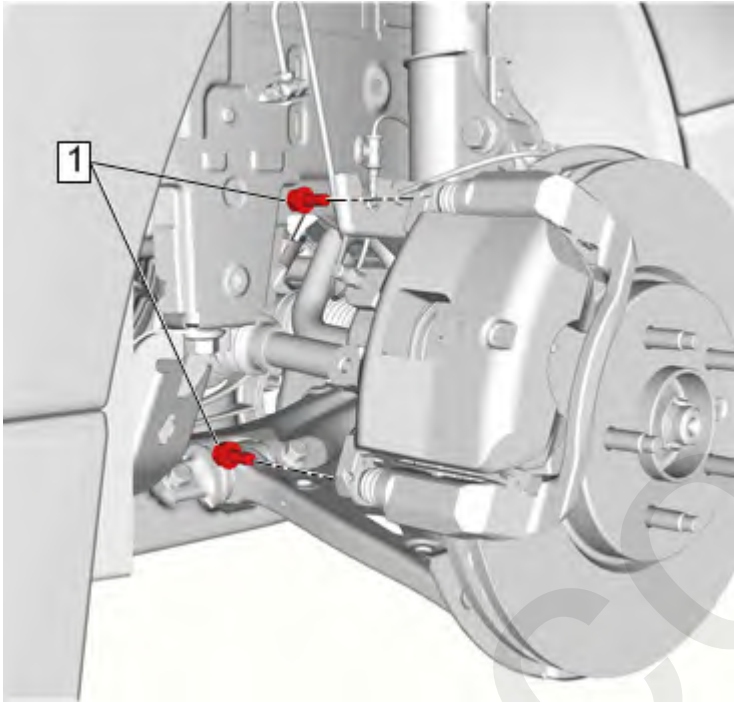


Fig. 124: Brake Caliper Guide Pin Bolt
Courtesy of GENERAL MOTORS COMPANY

- NOTE:**
- DO NOT use any air tools to remove or install the guide pin bolts. Use hand tools ONLY.
 - Install an open end wrench to hold the caliper guide pin in line with the brake caliper while removing or installing caliper guide pin bolt. DO NOT allow the open end wrench to come in contact with the brake caliper. Allowing the open end wrench to come in contact with the brake caliper will cause a pulsation when the brakes are applied.

- 3. Remove Brake Caliper Guide Pin Bolt (1)

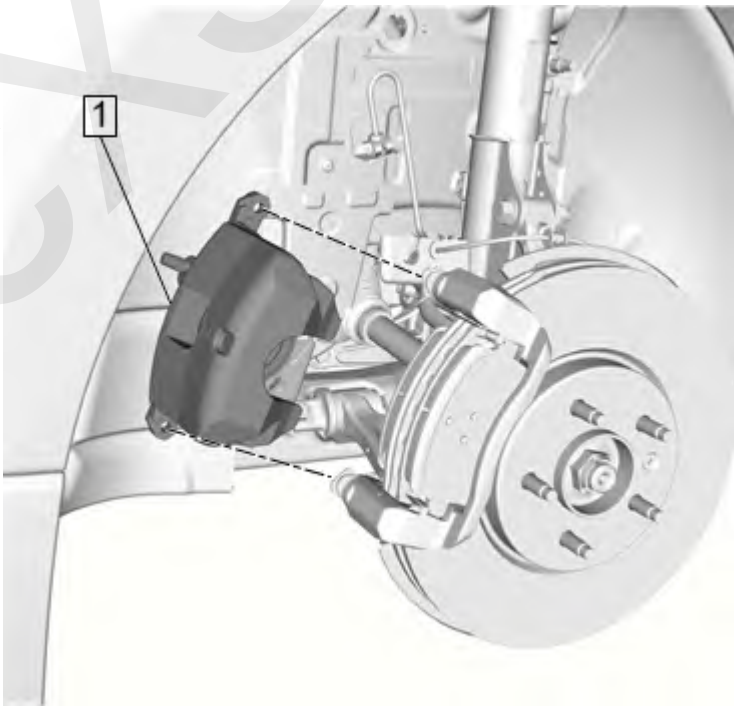


Fig. 125: Brake Caliper
Courtesy of GENERAL MOTORS COMPANY

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.

- 4. Remove Front Brake Caliper (1)
- 5. Support the brake caliper with heavy mechanics wire.

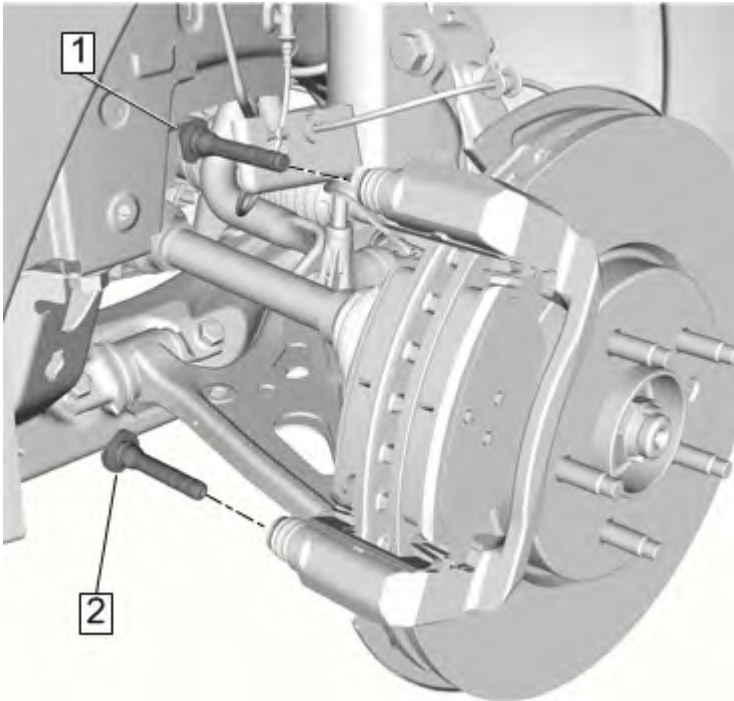


Fig. 126: Front Brake Caliper Guide Pin
Courtesy of GENERAL MOTORS COMPANY

- 6. Remove Upper Front Brake Caliper Guide Pin (1)

NOTE: The lower front brake caliper guide pin is equipped with a bushing and **MUST** be installed in the same location.

7. Remove Lower Front Brake Caliper Guide Pin (2)

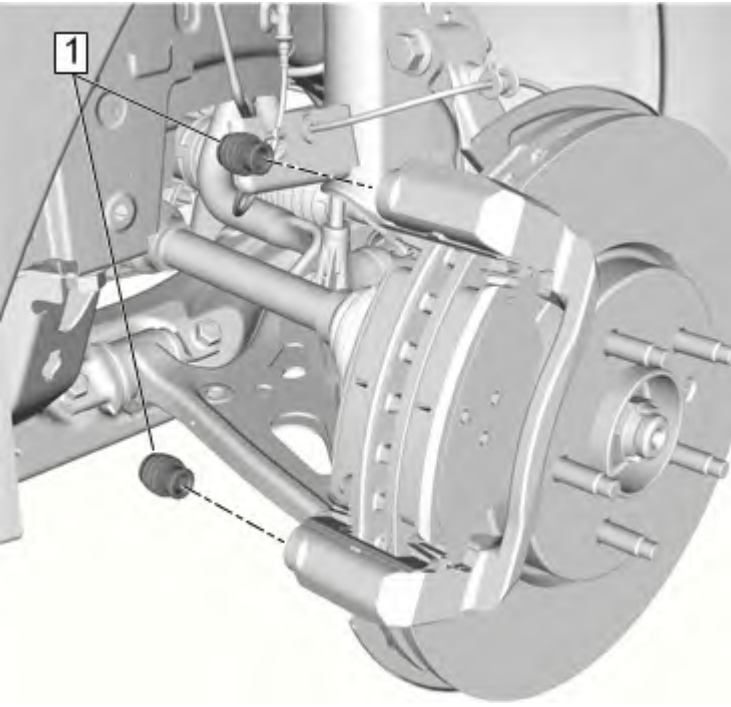


Fig. 127: Front Brake Caliper Guide Pin Seal
Courtesy of GENERAL MOTORS COMPANY

8. Remove Front Brake Caliper Guide Pin Seal (1)

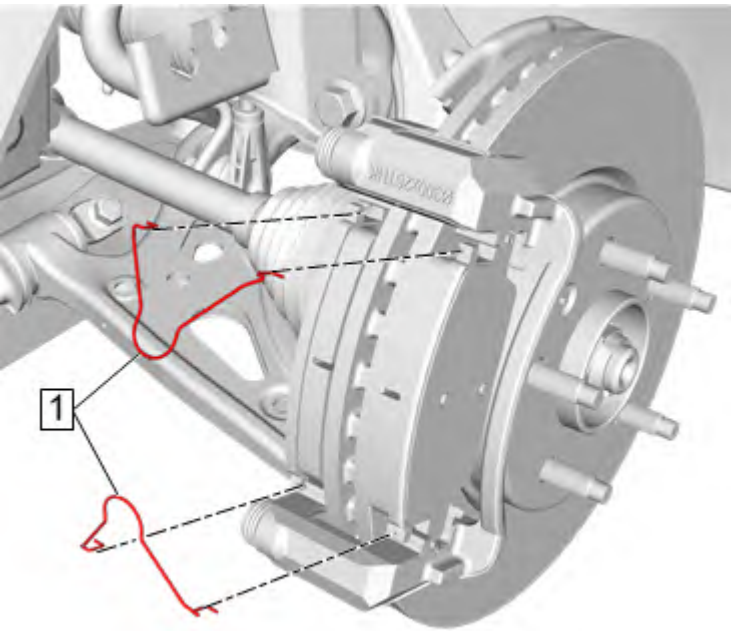


Fig. 128: Front Brake Caliper Spring
Courtesy of GENERAL MOTORS COMPANY

9. Remove Front Brake Caliper Spring (1)

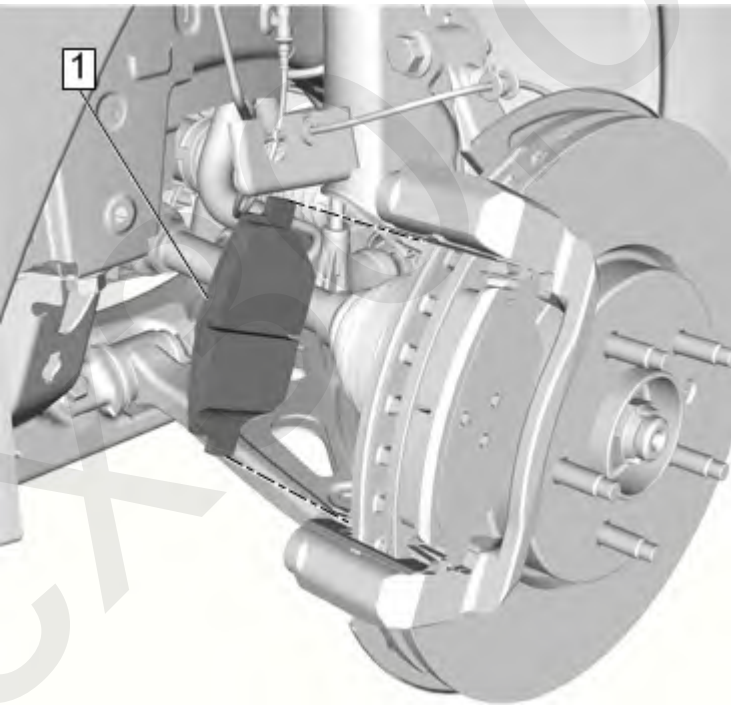


Fig. 129: Inner Disc Brake Pad
Courtesy of GENERAL MOTORS COMPANY

10. Remove Inner Disc Brake Pad (1)

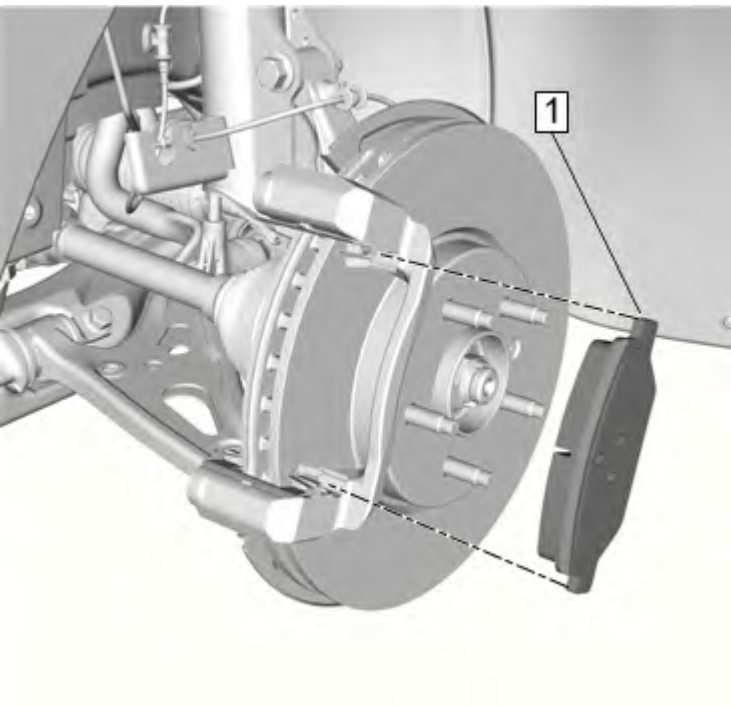


Fig. 130: Outer Disc Brake Pad
Courtesy of GENERAL MOTORS COMPANY

11. Remove Outer Disc Brake Pad (1)

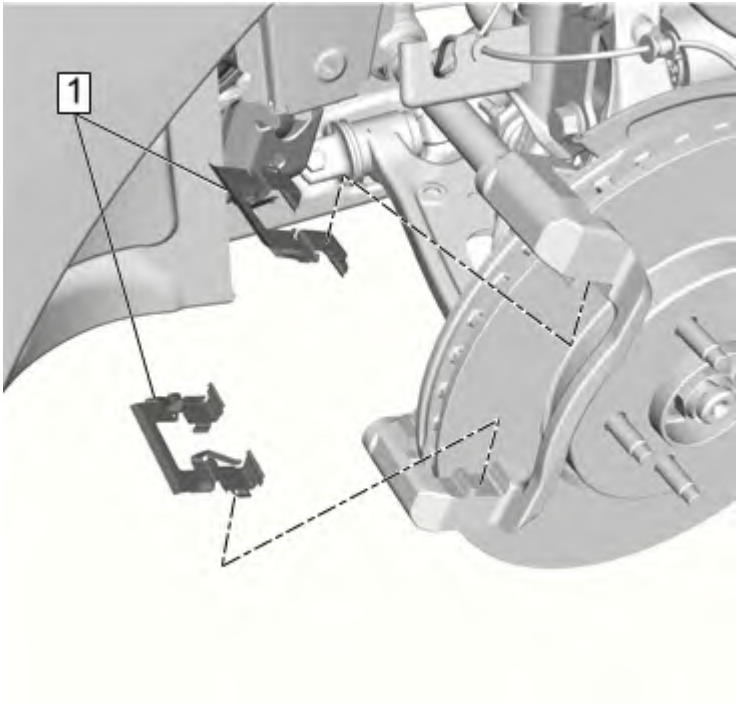


Fig. 131: Front Disc Brake Pad Retaining Spring
Courtesy of GENERAL MOTORS COMPANY

12. Remove Front Disc Brake Pad Retaining Spring (1)

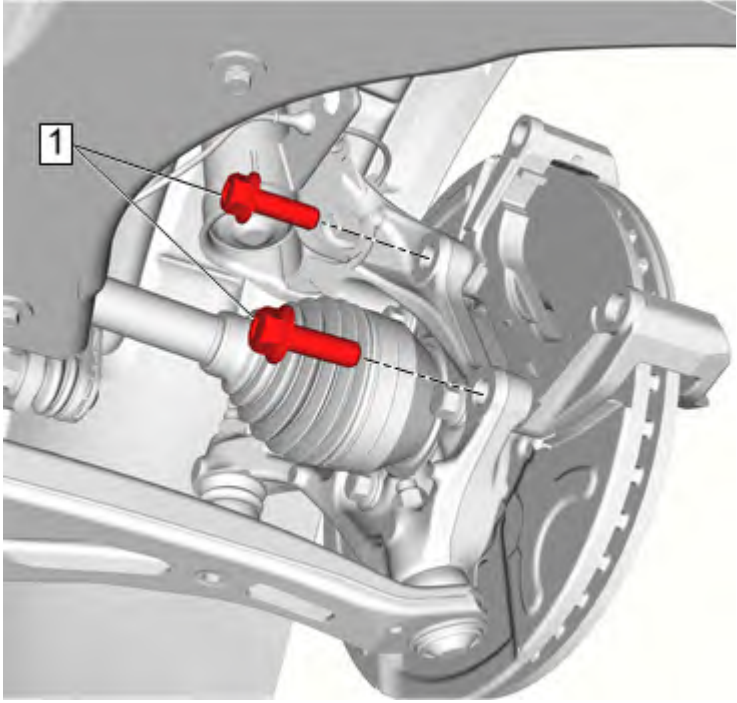


Fig. 132: Front Brake Caliper Bracket Bolt
Courtesy of GENERAL MOTORS COMPANY

13. Remove Front Brake Caliper Bracket Bolt (1)

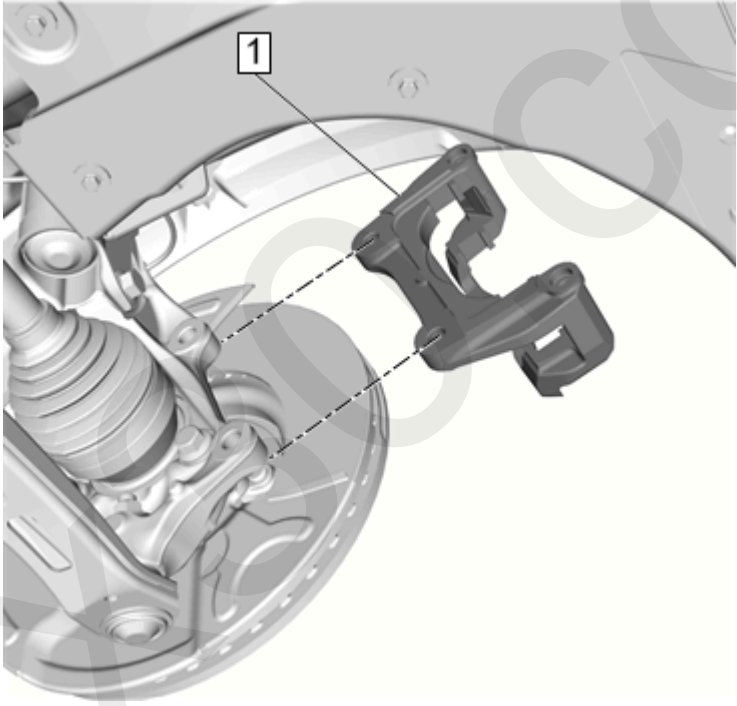


Fig. 133: Front Brake Caliper Bracket
Courtesy of GENERAL MOTORS COMPANY

14. Remove Front Brake Caliper Bracket (1)

Installation Procedure

1. Prepare the brake caliper bracket bolts and the bracket threaded holes for assembly:
 - Thoroughly clean the residue from the bolt threads with denatured alcohol and allow to dry.
 - Thoroughly clean the residue from the threaded holes with denatured alcohol and allow to dry.
 - Apply threadlocker to 2/3 of the threaded length of the bolts. **Adhesives, Fluids, Lubricants, and Sealers**

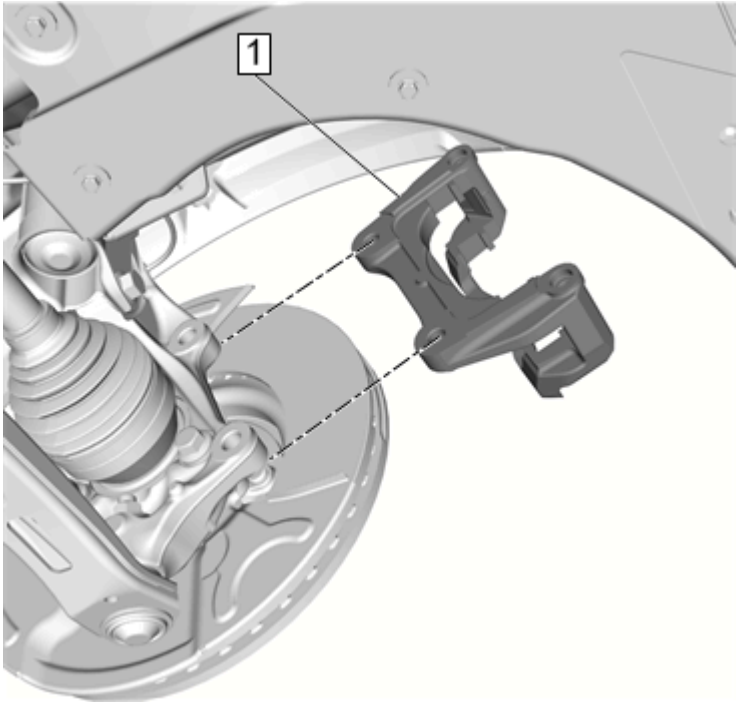


Fig. 134: Front Brake Caliper Bracket
Courtesy of GENERAL MOTORS COMPANY

2. Install Front Brake Caliper Bracket (1)

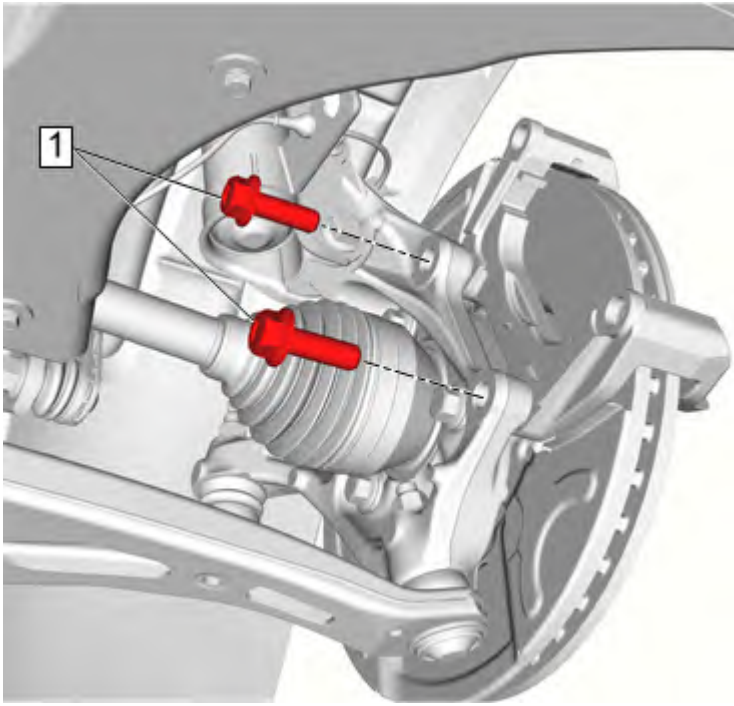


Fig. 135: Front Brake Caliper Bracket Bolt
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Fastener Caution

3. Install Front Brake Caliper Bracket Bolt (1) and tighten
- First Pass: 150 N.m (111 lb ft)
 - Final Pass: 15-30 degrees

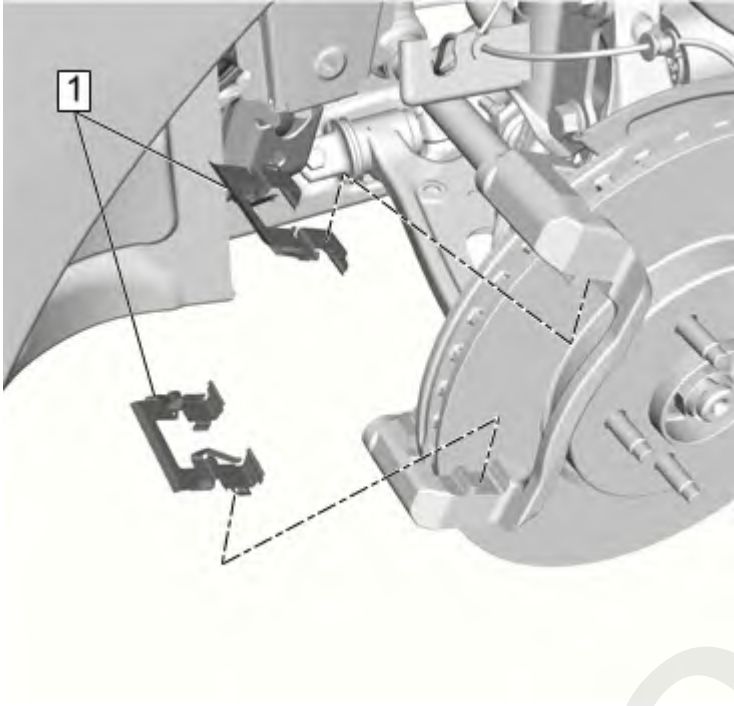


Fig. 136: Front Disc Brake Pad Retaining Spring
Courtesy of GENERAL MOTORS COMPANY

4. Install Front Disc Brake Pad Retaining Spring (1)

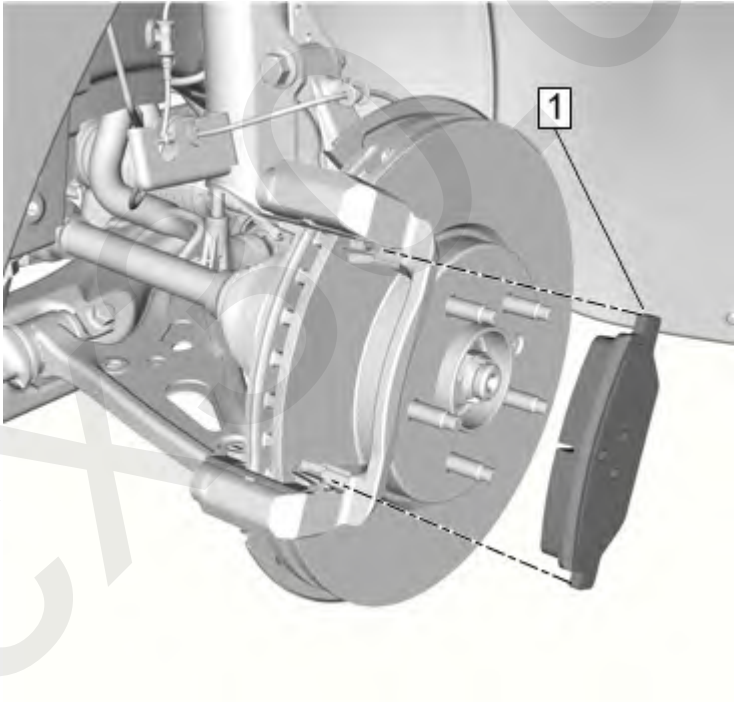


Fig. 137: Outer Disc Brake Pad
Courtesy of GENERAL MOTORS COMPANY

5. Install Outer Disc Brake Pad (1)

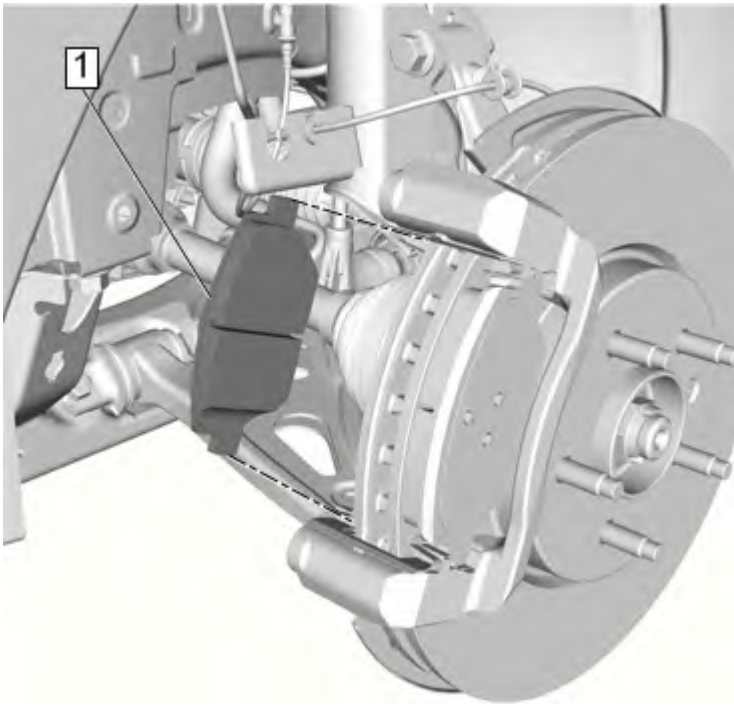


Fig. 138: Inner Disc Brake Pad
Courtesy of GENERAL MOTORS COMPANY

6. Install Inner Disc Brake Pad (1)

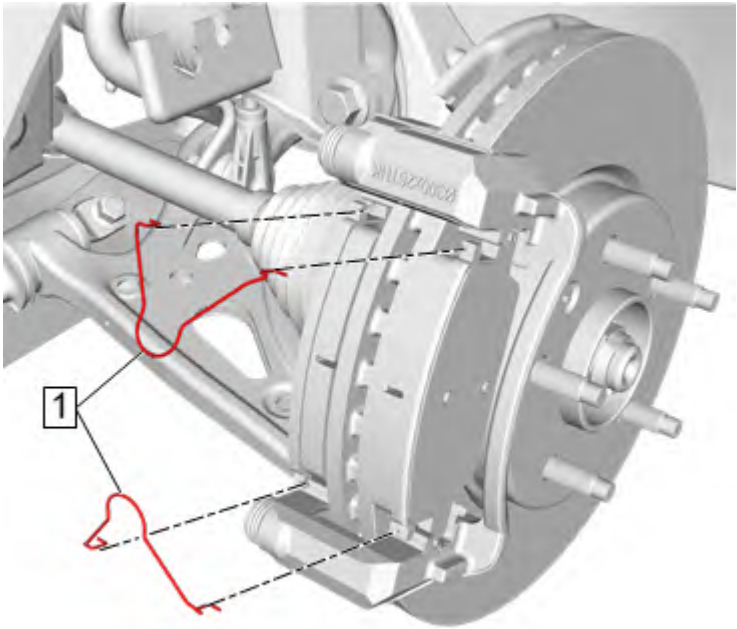


Fig. 139: Front Brake Caliper Spring
Courtesy of GENERAL MOTORS COMPANY

7. Install Front Brake Caliper Spring (1)

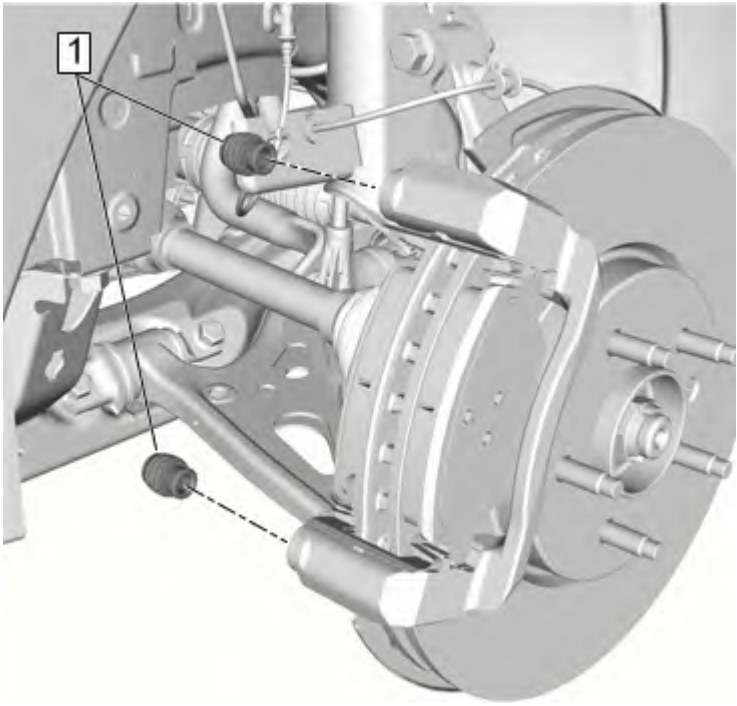


Fig. 140: Front Brake Caliper Guide Pin Seal
Courtesy of GENERAL MOTORS COMPANY

- 8. Install Front Brake Caliper Guide Pin Seal (1)
- 9. Apply a thin coat of high-temperature silicone brake lubricant to the caliper guide pins.

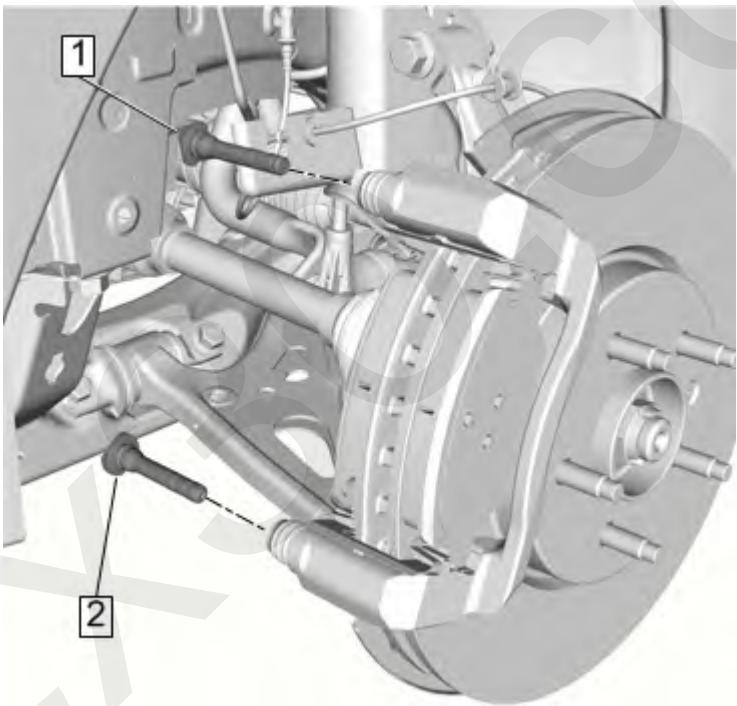


Fig. 141: Front Brake Caliper Guide Pin
Courtesy of GENERAL MOTORS COMPANY

- 10. Install Upper Front Brake Caliper Guide Pin (1)
- 11. Ensure the guide pin seal is fully seated in the groove of the caliper guide pin.
- 12. Gently lift the edge of the guide pin seal while pushing the guide pin into the caliper bracket bore to expel any trapped air.

NOTE: The lower front brake caliper guide pin is equipped with a bushing and **MUST** be installed in the same location.

- 13. Install Lower Front Brake Caliper Guide Pin (2)
- 14. Ensure the guide pin seal is fully seated in the groove of the caliper guide pin.
- 15. Gently lift the edge of the guide pin seal while pushing the guide pin into the caliper bracket bore to expel any trapped air.

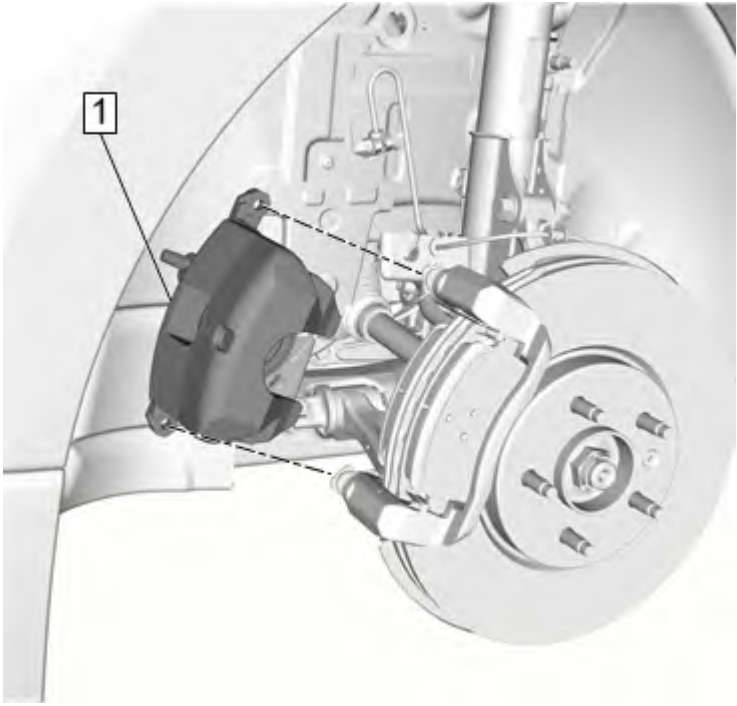


Fig. 142: Brake Caliper
Courtesy of GENERAL MOTORS COMPANY

16. Install Front Brake Caliper (1)

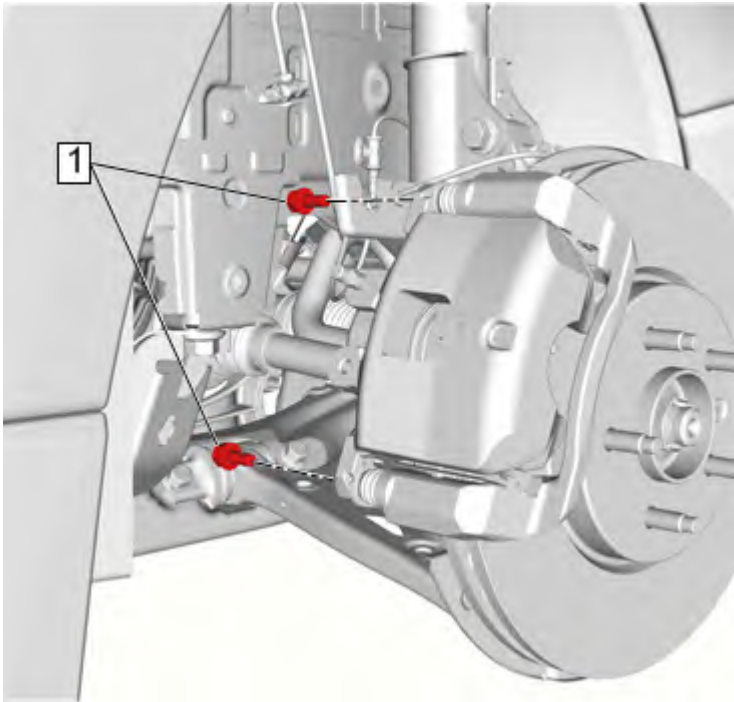


Fig. 143: Brake Caliper Guide Pin Bolt
Courtesy of GENERAL MOTORS COMPANY

- 17. Install Brake Caliper Guide Pin Bolt (1) and tighten 40 N.m (30 lb ft)
- 18. Install the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)

REAR BRAKE CALIPER BRACKET REPLACEMENT

Removal Procedure

WARNING: [Brake Dust Warning](#)

- 1. Set the parking brake in Service Mode. [Rear Parking Brake Service Mode Selection](#)
- 2. Raise and support the vehicle. [Lifting and Jacking the Vehicle](#)
- 3. Remove the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)

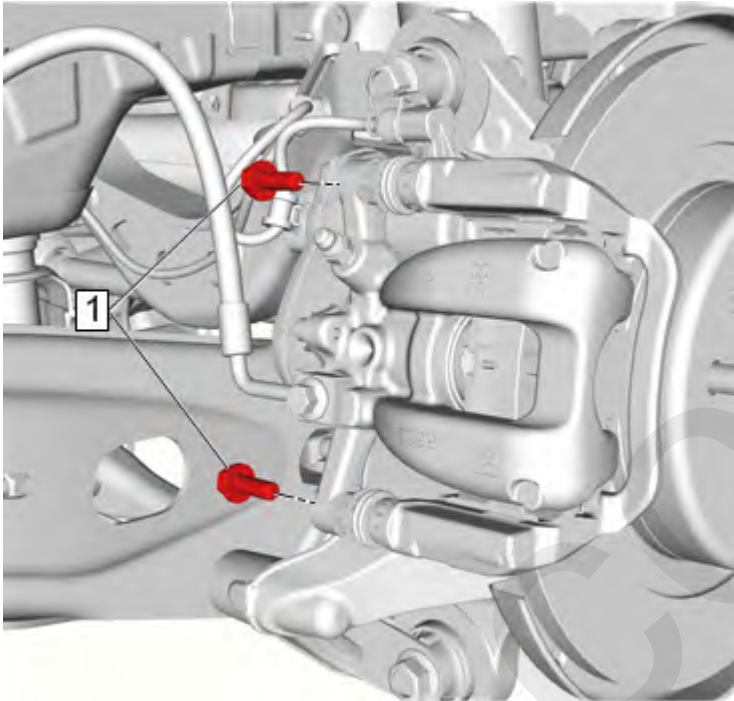


Fig. 144: Brake Caliper Guide Pin Bolt
Courtesy of GENERAL MOTORS COMPANY

- NOTE:**
- DO NOT use any air tools to remove or install the guide pin bolts. Use hand tools ONLY.
 - Install an open end wrench to hold the caliper guide pin in line with the brake caliper while removing or installing caliper guide pin bolt. DO NOT allow the open end wrench to come in contact with the brake caliper. Allowing the open end wrench to come in contact with the brake caliper will cause a pulsation when the brakes are applied.

- 4. Remove Brake Caliper Guide Pin Bolt (1)

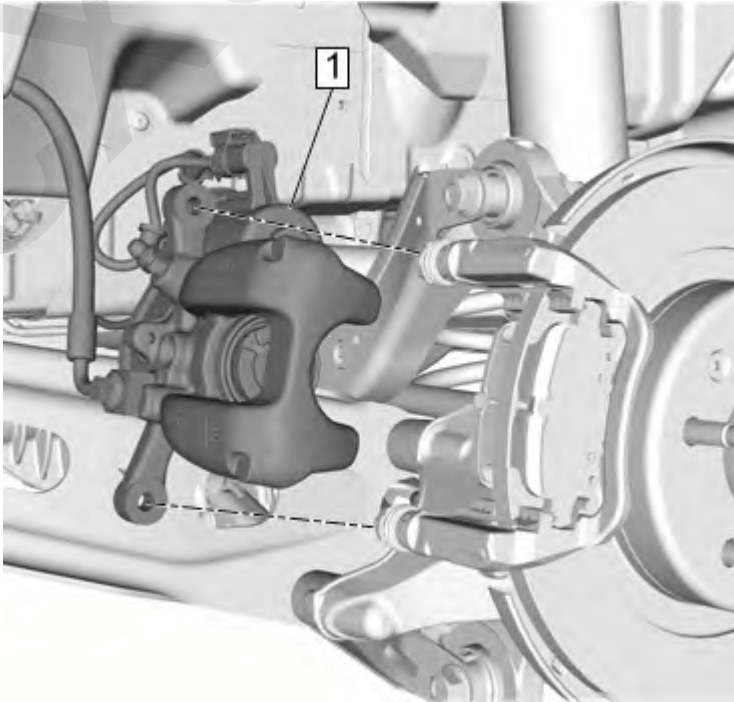


Fig. 145: Rear Brake Caliper
Courtesy of GENERAL MOTORS COMPANY

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.

- 5. Remove Rear Brake Caliper (1)
- 6. Support the brake calipers with heavy mechanics wire.

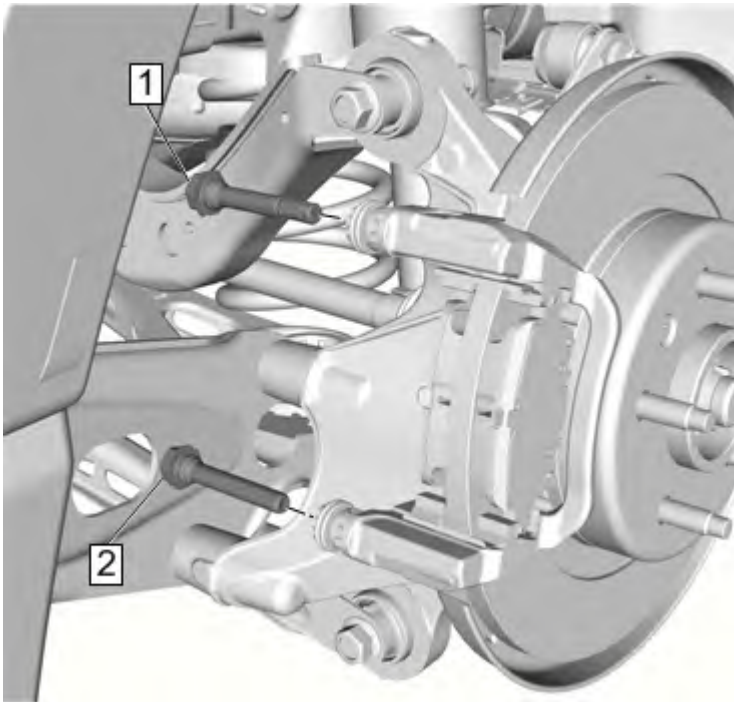


Fig. 146: Upper And Lower Rear Brake Caliper Guide Pin
Courtesy of GENERAL MOTORS COMPANY

NOTE: The upper rear brake caliper guide pin is equipped with a bushing and **MUST** be installed in the same location.

- 7. Remove Upper Rear Brake Caliper Guide Pin (1)
- 8. Remove Lower Rear Brake Caliper Guide Pin (2)

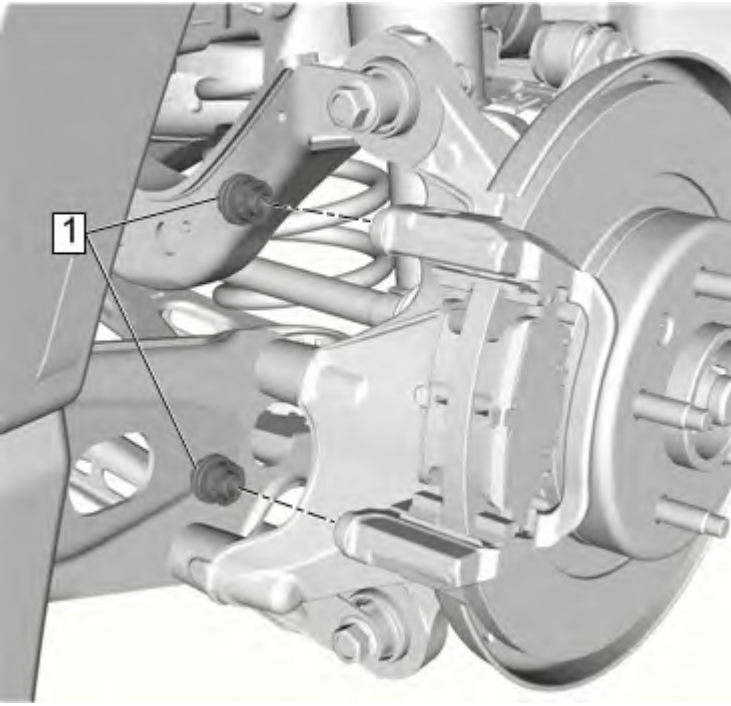


Fig. 147: Rear Brake Caliper Guide Pin Seal
Courtesy of GENERAL MOTORS COMPANY

- 9. Remove Rear Brake Caliper Guide Pin Seal (1)

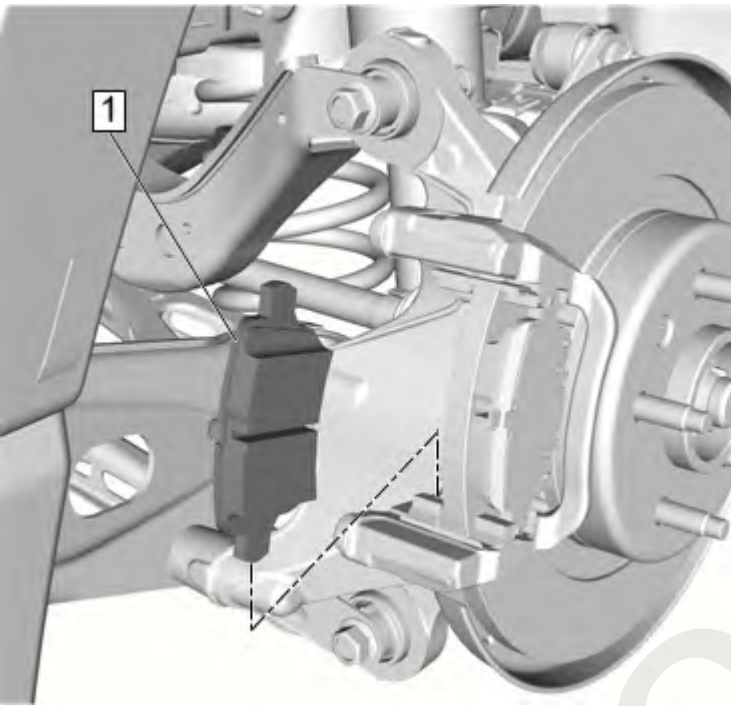


Fig. 148: Inner Disc Brake Pad
Courtesy of GENERAL MOTORS COMPANY

- 10. Remove Inner Disc Brake Pad (1)

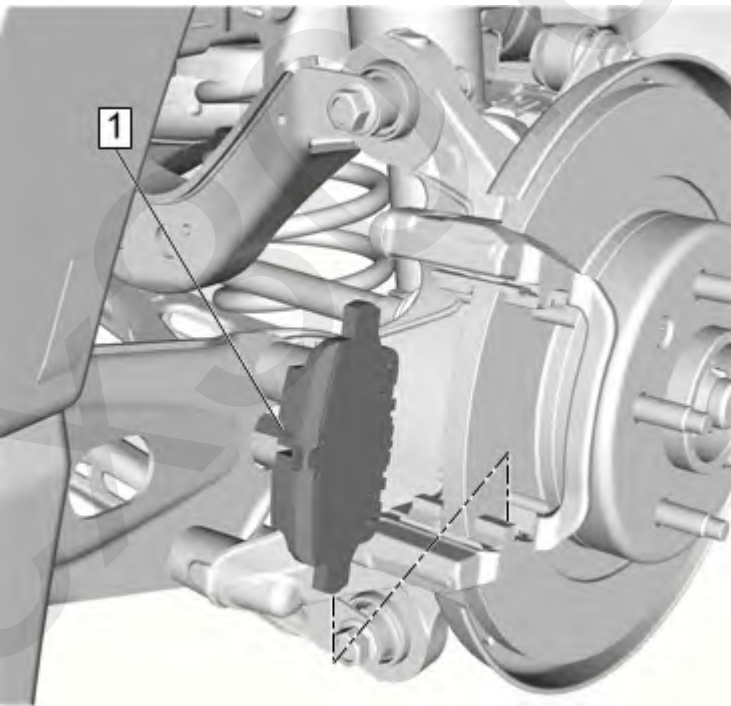


Fig. 149: Outer Disc Brake Pad
Courtesy of GENERAL MOTORS COMPANY

- 11. Remove Outer Disc Brake Pad (1)

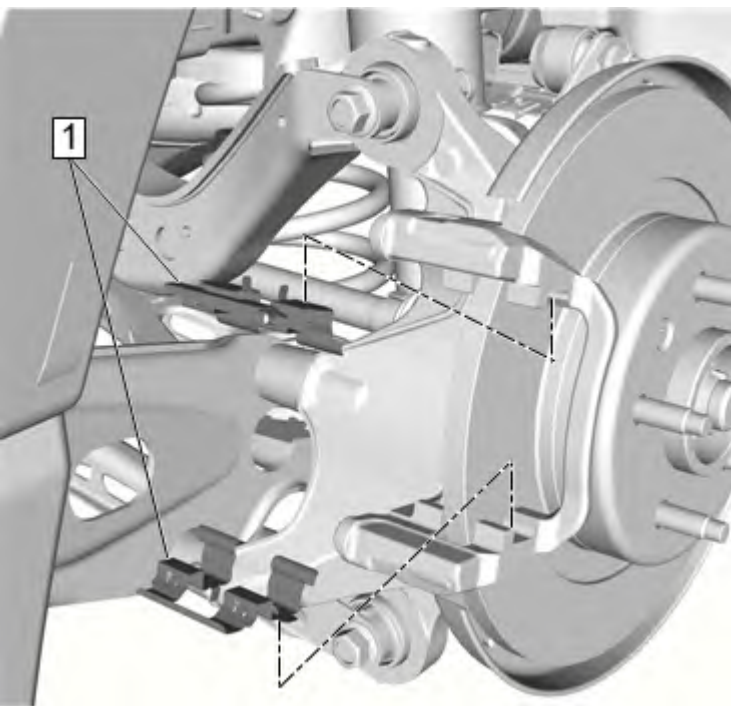


Fig. 150: Rear Disc Brake Pad Retaining Spring
Courtesy of GENERAL MOTORS COMPANY

- 12. Remove Rear Disc Brake Pad Retaining Spring (1)

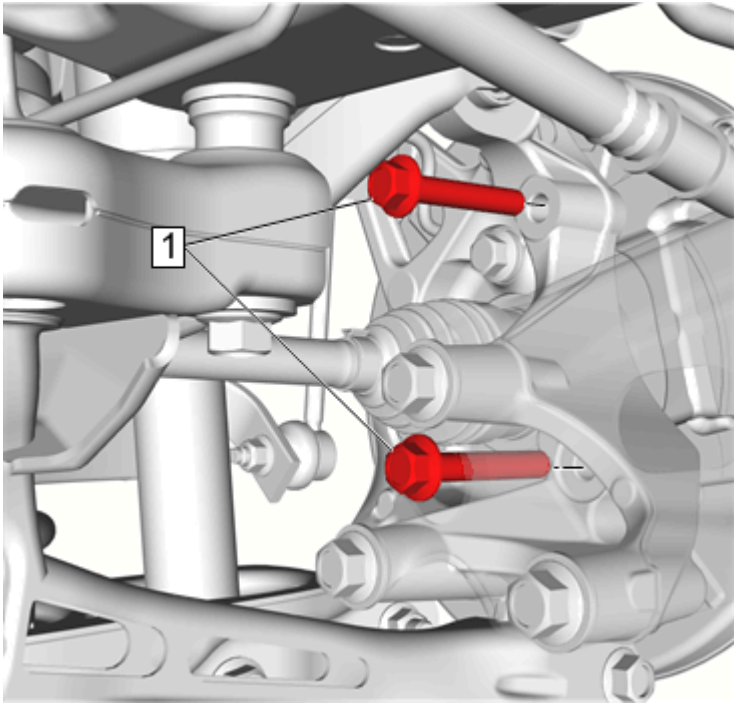


Fig. 151: Rear Brake Caliper Bracket Bolt
Courtesy of GENERAL MOTORS COMPANY

13. Remove Rear Brake Caliper Bracket Bolt (1)

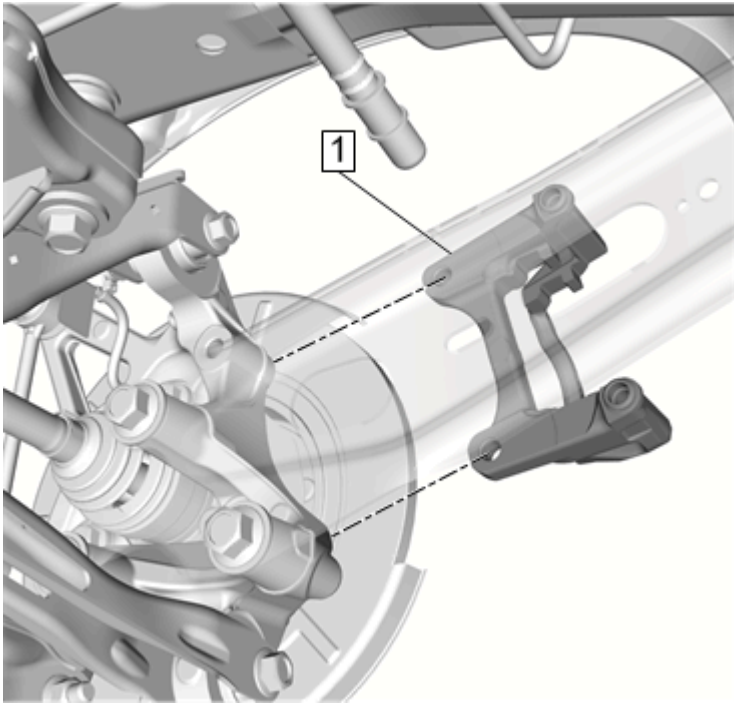


Fig. 152: Rear Brake Caliper Bracket
Courtesy of GENERAL MOTORS COMPANY

14. Remove Rear Brake Caliper Bracket (1)

Installation Procedure

1. Prepare the brake caliper bracket bolts and the bracket threaded holes for assembly:
 - Thoroughly clean the residue from the bolt threads with denatured alcohol and allow to dry.
 - Thoroughly clean the residue from the threaded holes with denatured alcohol and allow to dry.
 - Apply threadlocker to 2/3 of the threaded length of the bolts. **Adhesives, Fluids, Lubricants, and Sealers**

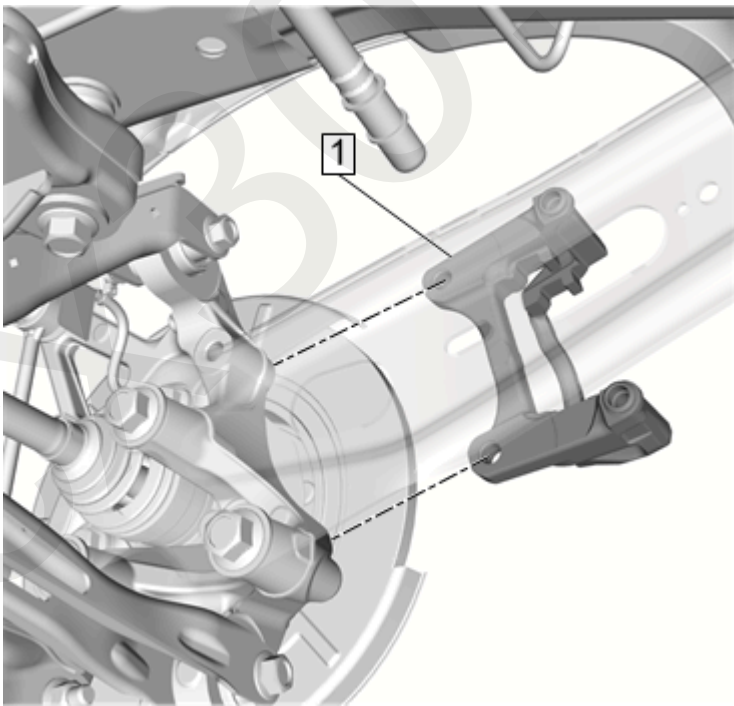


Fig. 153: Rear Brake Caliper Bracket
Courtesy of GENERAL MOTORS COMPANY

2. Install Rear Brake Caliper Bracket (1)

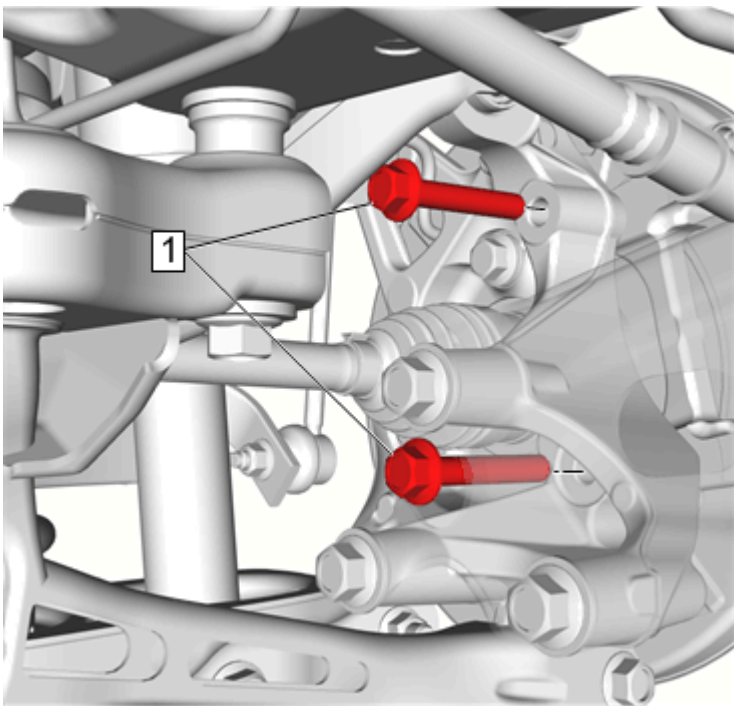


Fig. 154: Rear Brake Caliper Bracket Bolt
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Fastener Caution

3. Install Rear Brake Caliper Bracket Bolt (1) and tighten
 - First Pass:100 N.m (74 lb ft)
 - Final Pass:**15-30 degrees**

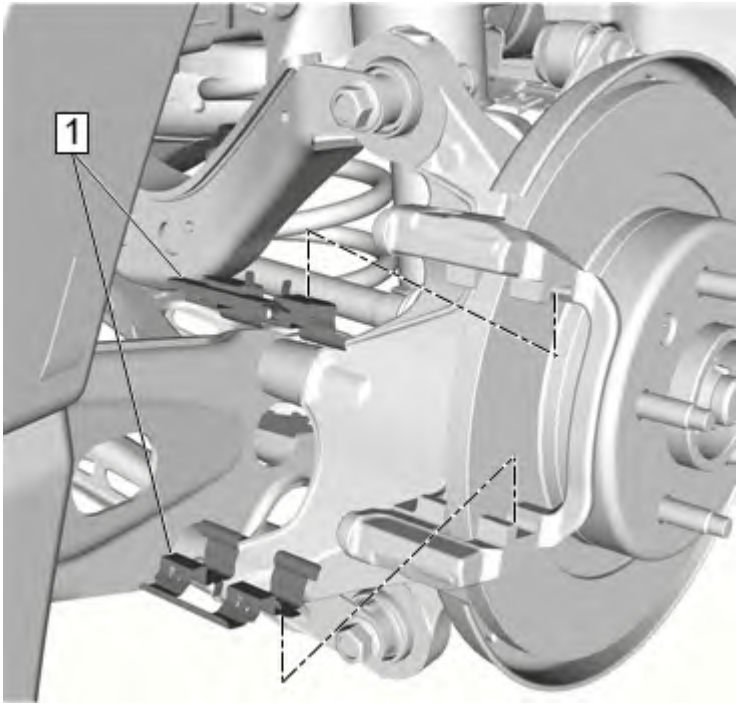


Fig. 155: Rear Disc Brake Pad Retaining Spring
Courtesy of GENERAL MOTORS COMPANY

4. Install Rear Disc Brake Pad Retaining Spring (1)

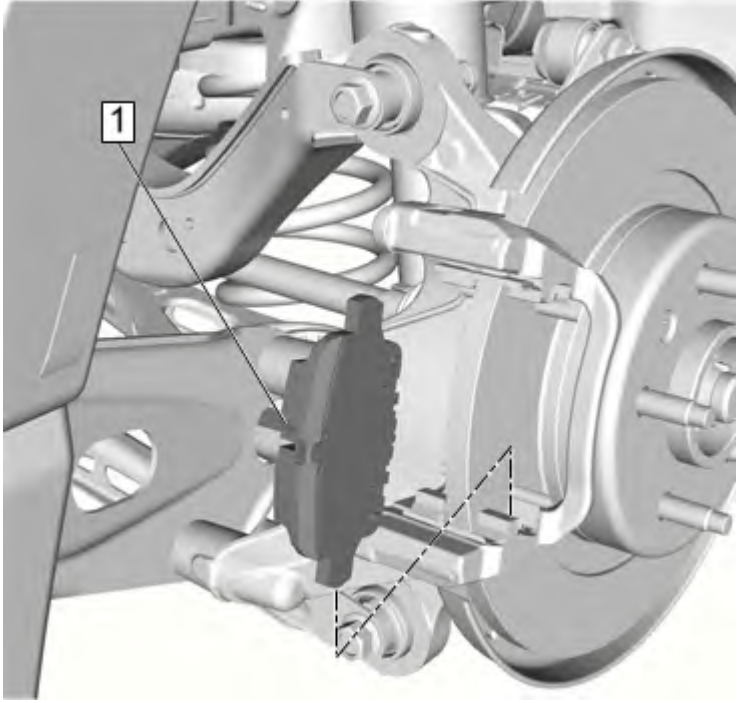


Fig. 156: Outer Disc Brake Pad
Courtesy of GENERAL MOTORS COMPANY

5. Install Outer Disc Brake Pad (1)

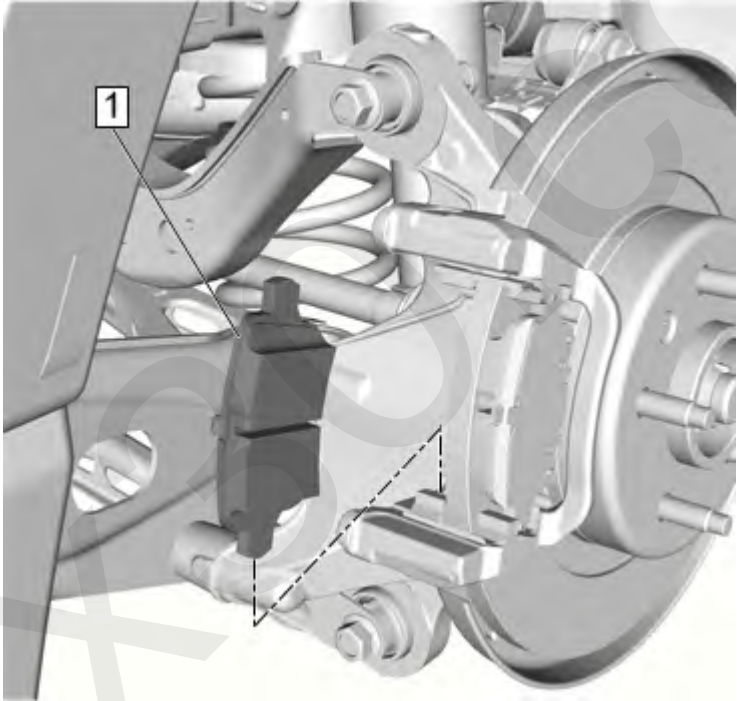


Fig. 157: Inner Disc Brake Pad
Courtesy of GENERAL MOTORS COMPANY

6. Install Inner Disc Brake Pad (1)

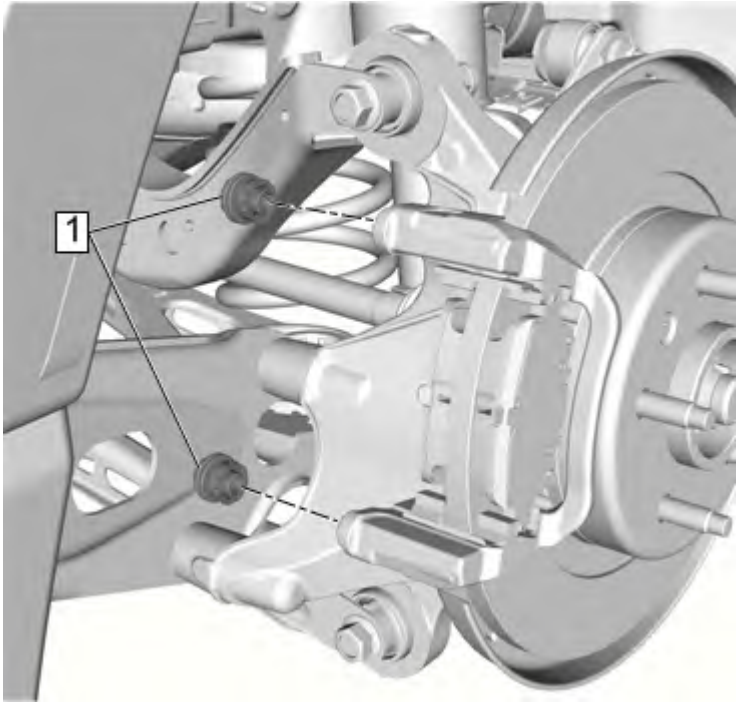


Fig. 158: Rear Brake Caliper Guide Pin Seal
Courtesy of GENERAL MOTORS COMPANY

7. Install Rear Brake Caliper Guide Pin Seal (1)

8. Apply a thin coat of high-temperature silicone brake lubricant to the caliper guide pins.

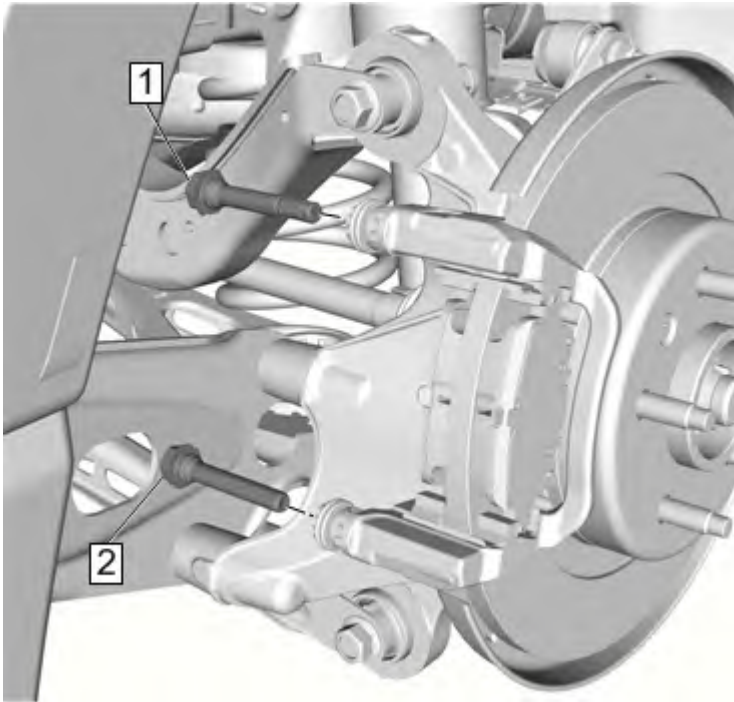


Fig. 159: Upper And Lower Rear Brake Caliper Guide Pin
Courtesy of GENERAL MOTORS COMPANY

NOTE: The upper rear brake caliper guide pin is equipped with a bushing and **MUST** be installed in the same location.

- 9. Install Upper Rear Brake Caliper Guide Pin (1)
- 10. Ensure the guide pin seal is fully seated in the groove of the caliper guide pin.
- 11. Gently lift the edge of the guide pin seal while pushing the guide pin into the caliper bracket bore to expel any trapped air.
- 12. Install Lower Rear Brake Caliper Guide Pin (2)
- 13. Ensure the guide pin seal is fully seated in the groove of the caliper guide pin.
- 14. Gently lift the edge of the guide pin seal while pushing the guide pin into the caliper bracket bore to expel any trapped air.

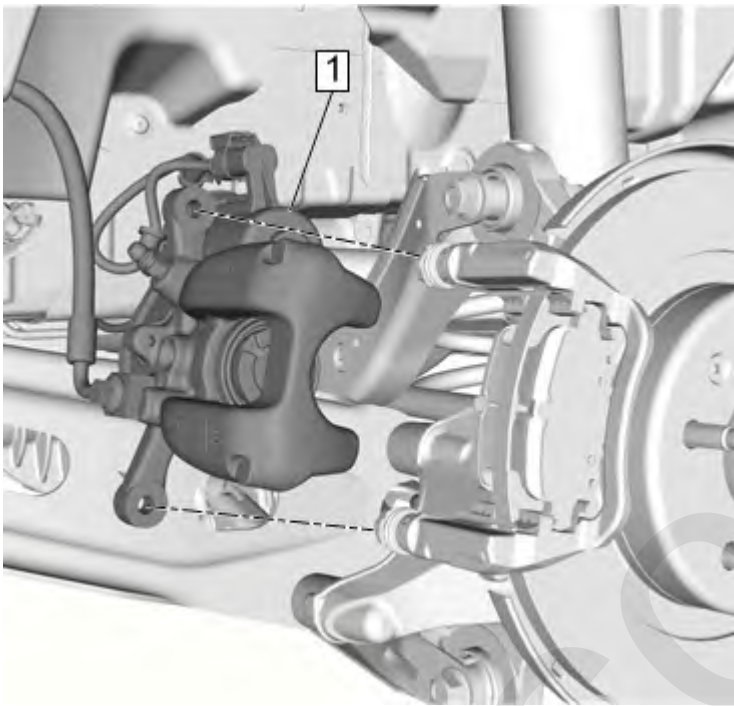


Fig. 160: Rear Brake Caliper
Courtesy of GENERAL MOTORS COMPANY

- 15. Install Rear Brake Caliper (1)

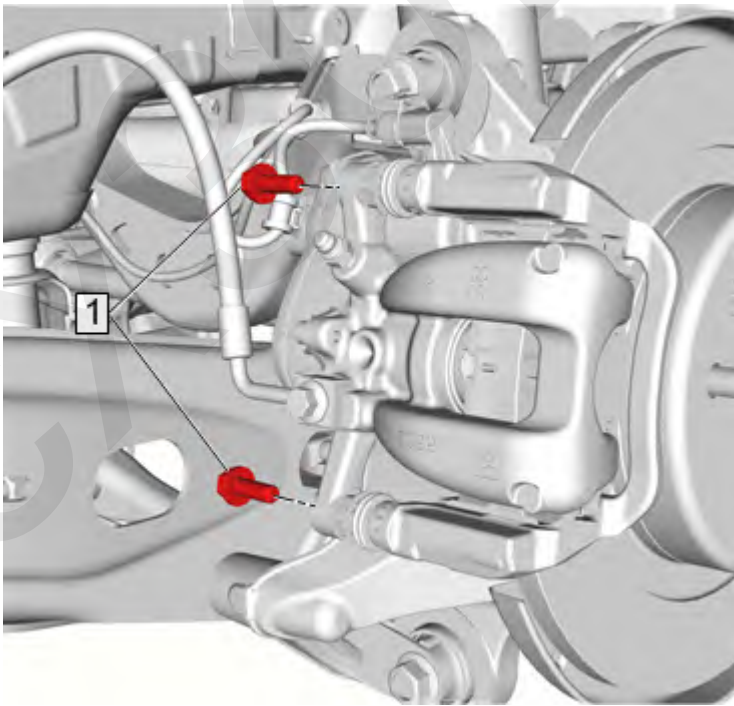


Fig. 161: Brake Caliper Guide Pin Bolt
Courtesy of GENERAL MOTORS COMPANY

- 16. Install Brake Caliper Guide Pin Bolt (1) and tighten 40 N.m (30 lb ft)
- 17. Install the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)
- 18. Calibrate the park brake. [Park Brake Calibration](#)

FRONT BRAKE ROTOR REPLACEMENT

Removal Procedure

WARNING: [Brake Dust Warning](#)

- 1. Raise and support the vehicle. [Lifting and Jacking the Vehicle](#)
- 2. Remove the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)

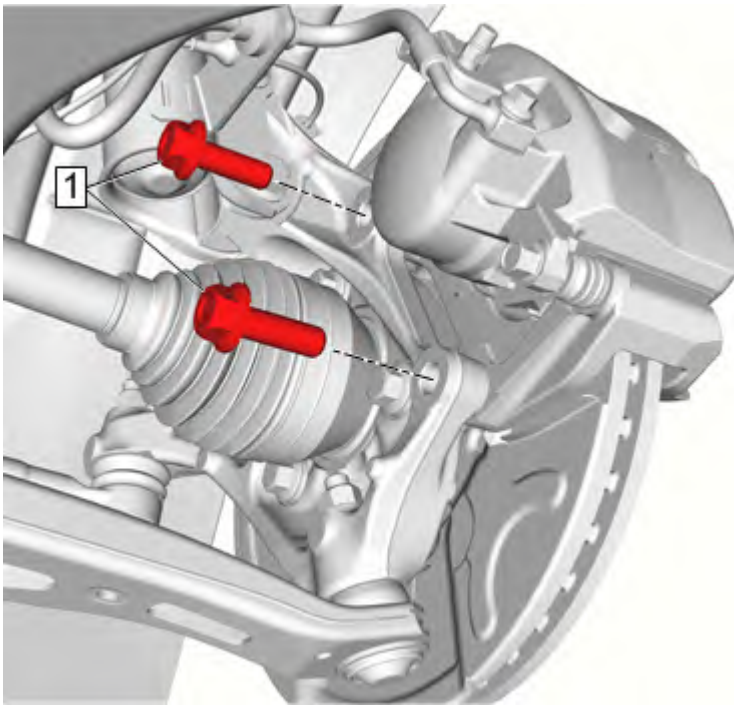


Fig. 162: Front Brake Caliper Bracket Bolt
Courtesy of GENERAL MOTORS COMPANY

- 3. Remove Front Brake Caliper Bracket Bolt (1)

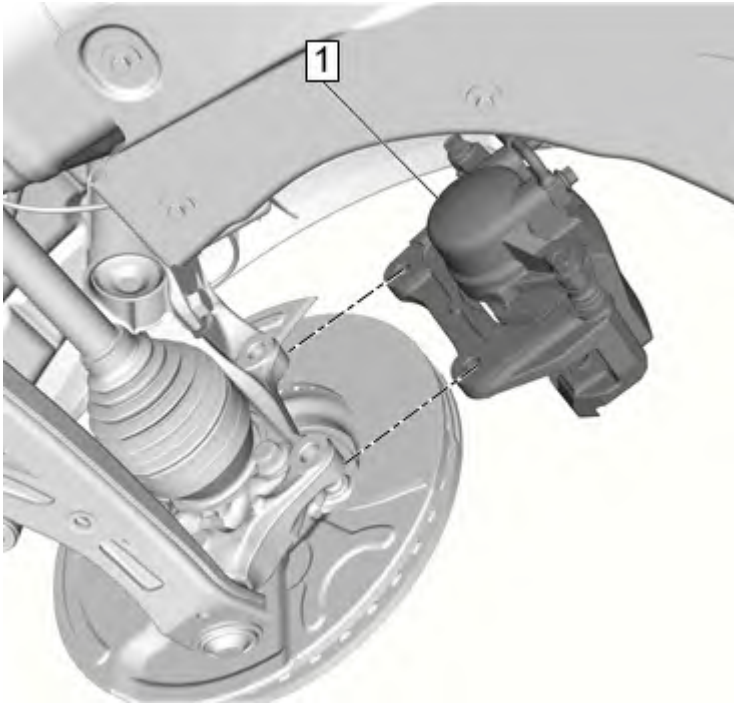


Fig. 163: Front Brake Caliper and Bracket
Courtesy of GENERAL MOTORS COMPANY

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.

- 4. Remove Front Brake Caliper and Bracket (1)
- 5. Support the caliper and bracket assembly with heavy mechanics wire.

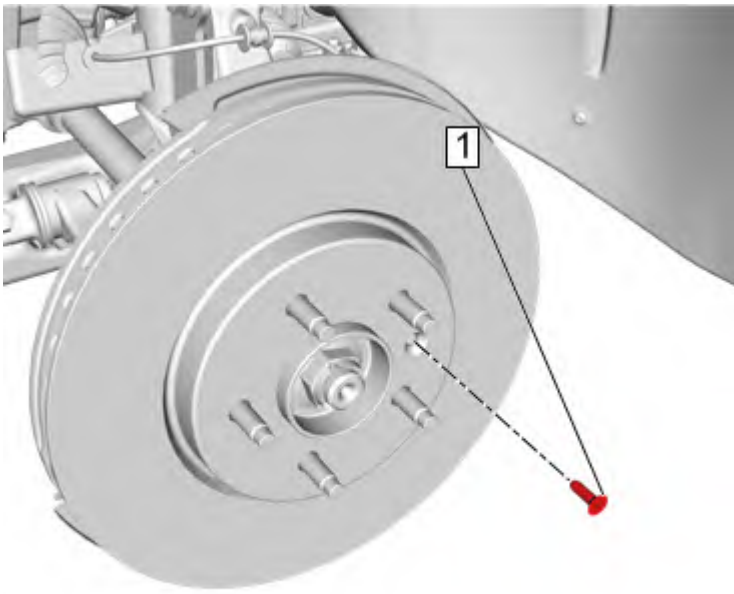


Fig. 164: Front Brake Rotor Bolt
Courtesy of GENERAL MOTORS COMPANY

- 6. Remove Front Brake Rotor Bolt (1)

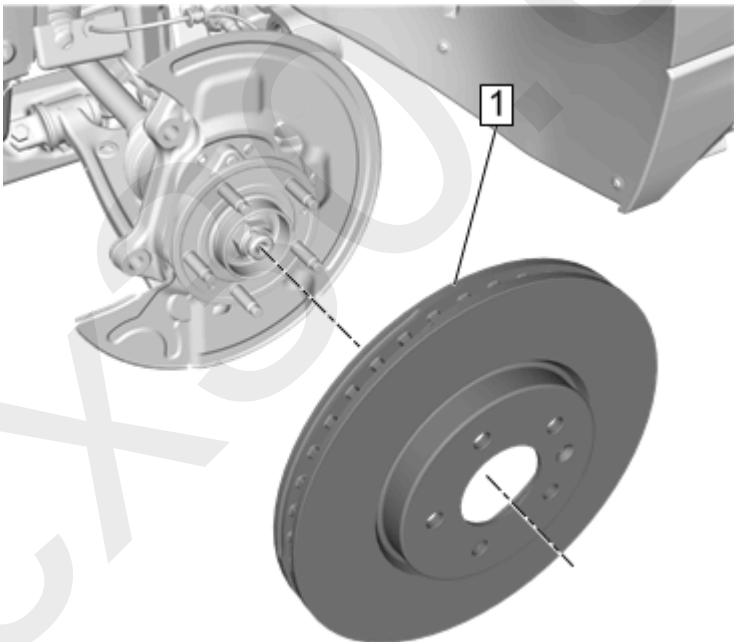


Fig. 165: Front Brake Rotor
Courtesy of GENERAL MOTORS COMPANY

- 7. Remove Front Brake Rotor (1)

Installation Procedure

NOTE: Whenever the brake rotor has been separated from the hub/axle flange, any rust or contaminates 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. Thoroughly clean any rust or corrosion from the mating surface of the hub/axle flange.
- 2. 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 there are no foreign particles or debris remaining.

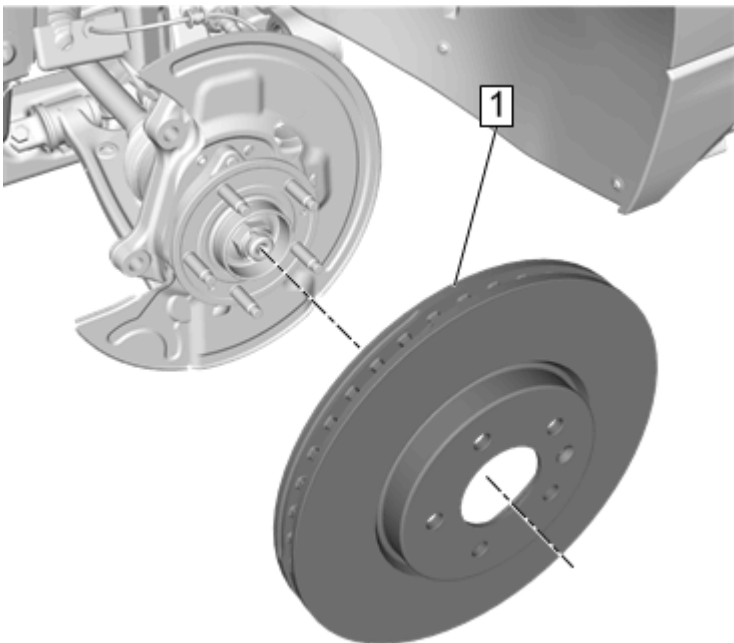


Fig. 166: Front Brake Rotor
Courtesy of GENERAL MOTORS COMPANY

- 4. Install Front Brake Rotor (1)

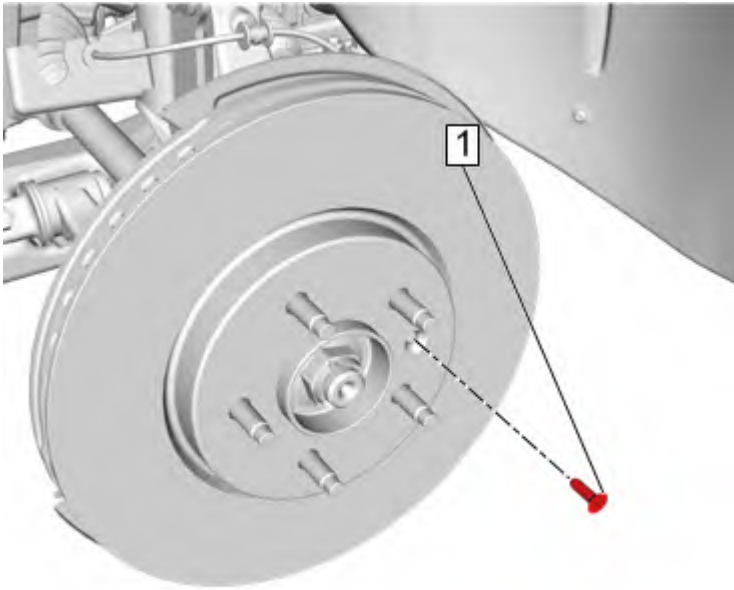


Fig. 167: Front Brake Rotor Bolt
Courtesy of GENERAL MOTORS COMPANY

CAUTION: [Fastener Caution](#)

5. Install Front Brake Rotor Bolt (1) and tighten 9 N.m (80 lb in)

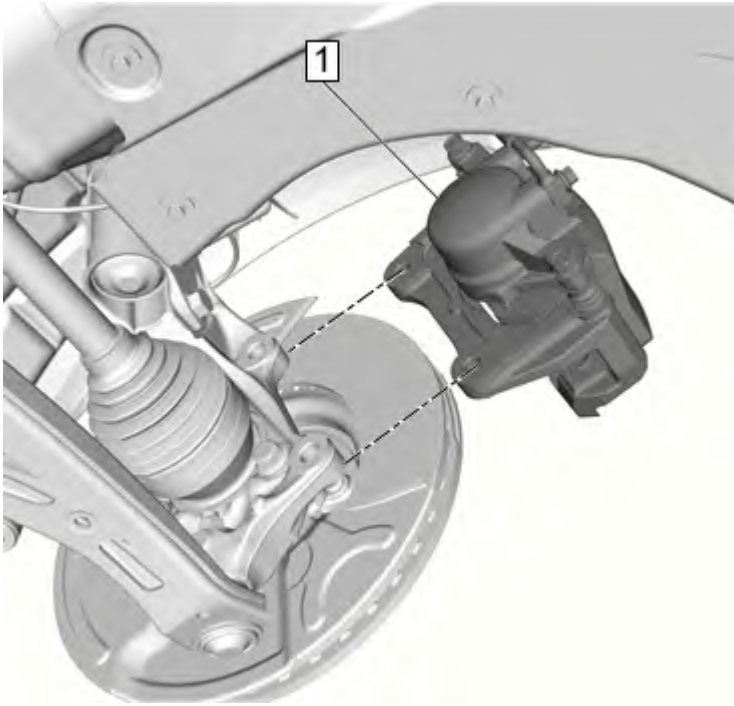


Fig. 168: Front Brake Caliper and Bracket
Courtesy of GENERAL MOTORS COMPANY

6. Install Front Brake Caliper and Bracket (1)
7. Prepare the brake caliper bracket bolts and the bracket threaded holes for assembly:
- Thoroughly clean the residue from the bolt threads with denatured alcohol and allow to dry.
 - Thoroughly clean the residue from the threaded holes with denatured alcohol and allow to dry.
 - Apply threadlocker to 2/3 of the threaded length of the bolts. [Adhesives, Fluids, Lubricants, and Sealers](#)

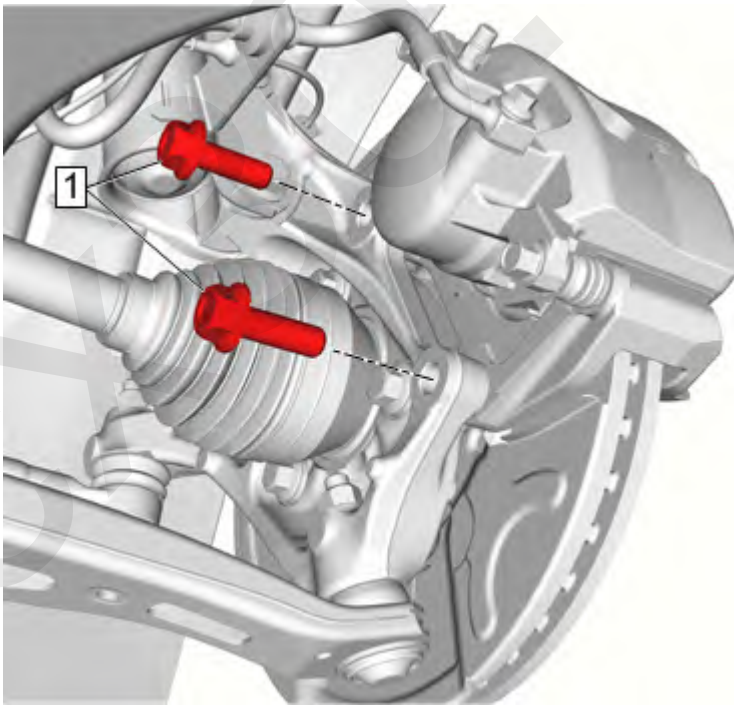


Fig. 169: Front Brake Caliper Bracket Bolt
Courtesy of GENERAL MOTORS COMPANY

8. Install Front Brake Caliper Bracket Bolt (1) and tighten
- First Pass: 150 N.m (111 lb ft)
 - Final Pass: **15-30 degrees**
9. Install the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)
10. Burnish the brake pads and rotors. [Brake Pad and Rotor Burnishing](#)

REAR BRAKE ROTOR REPLACEMENT

Removal Procedure

WARNING: [Brake Dust Warning](#)

1. Set the parking brake in Service Mode. [Rear Parking Brake Service Mode Selection](#)
2. Raise and support the vehicle. [Lifting and Jacking the Vehicle](#)
3. Remove the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)

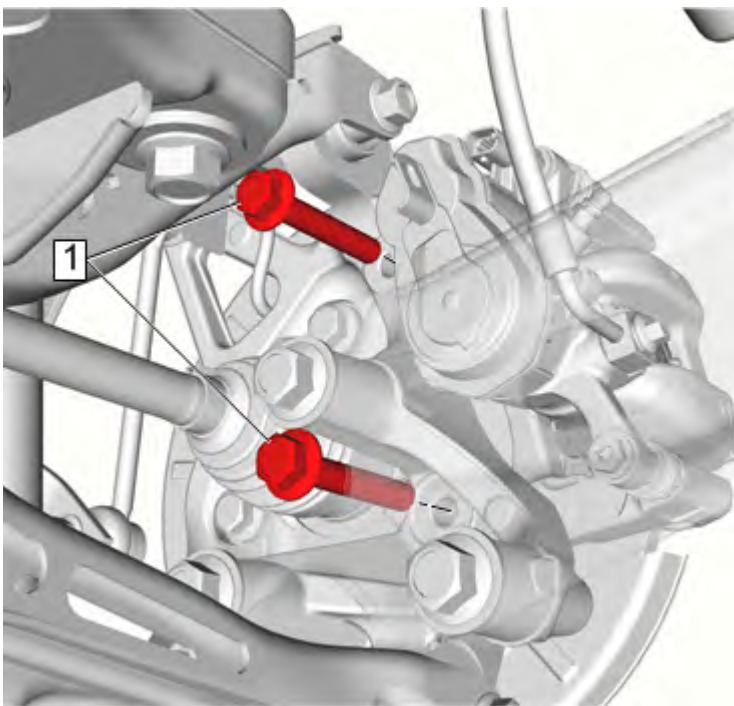


Fig. 170: Brake Caliper Bracket Bolt
Courtesy of GENERAL MOTORS COMPANY

4. Remove Rear Brake Caliper Bracket Bolt (1)

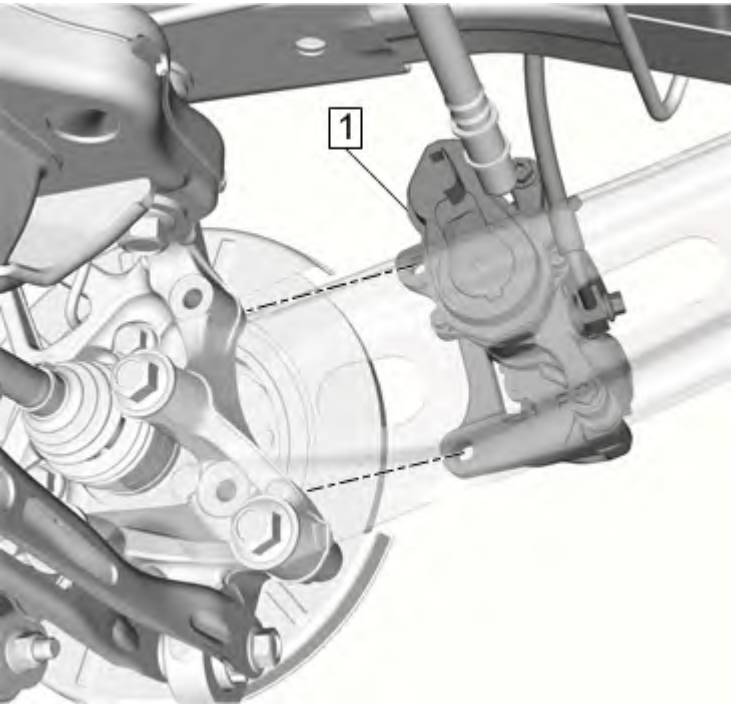


Fig. 171: Rear Brake Caliper And Bracket
Courtesy of GENERAL MOTORS COMPANY

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.

- 5. Remove Rear Brake Caliper and Bracket (1)
- 6. Support the caliper and bracket assembly with heavy mechanics wire.

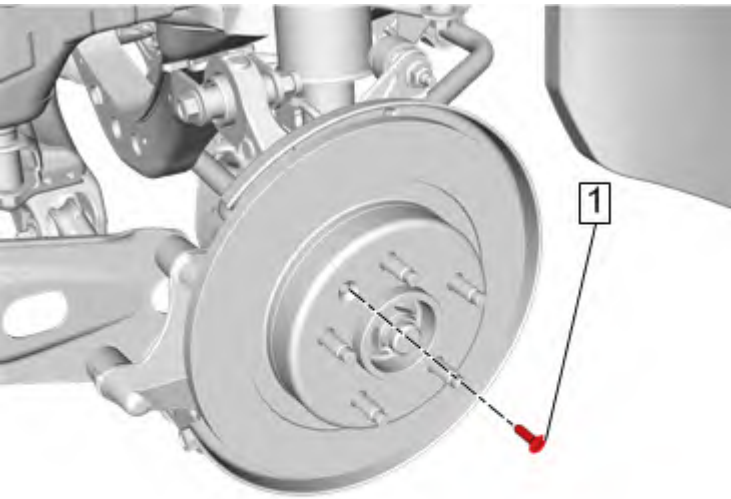


Fig. 172: Rear Brake Rotor Bolt
Courtesy of GENERAL MOTORS COMPANY

7. Remove Rear Brake Rotor Bolt (1)

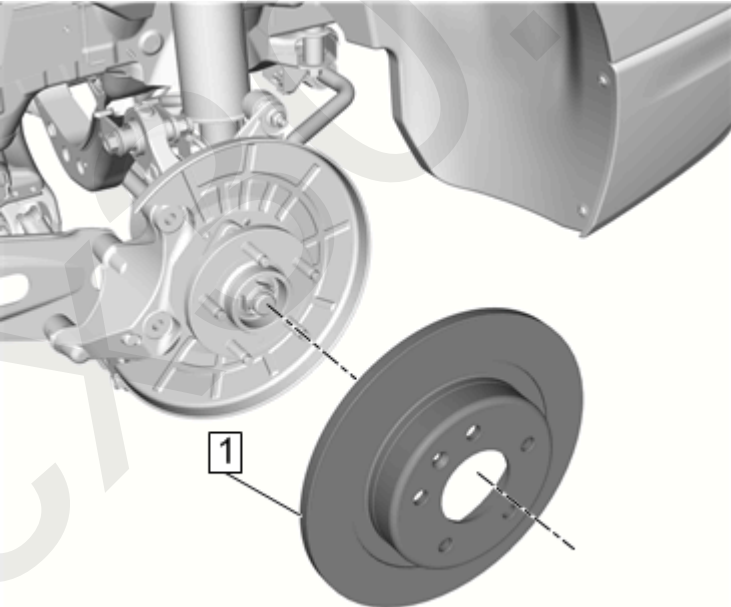


Fig. 173: Rear Brake Rotor
Courtesy of GENERAL MOTORS COMPANY

8. Remove Rear Brake Rotor (1)

Installation Procedure

NOTE: Whenever the brake rotor has been separated from the hub/axle flange, any rust or contaminates 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. Thoroughly clean any rust or corrosion from the mating surface of the hub/axle flange.
- 2. 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 there are no foreign particles or debris remaining.

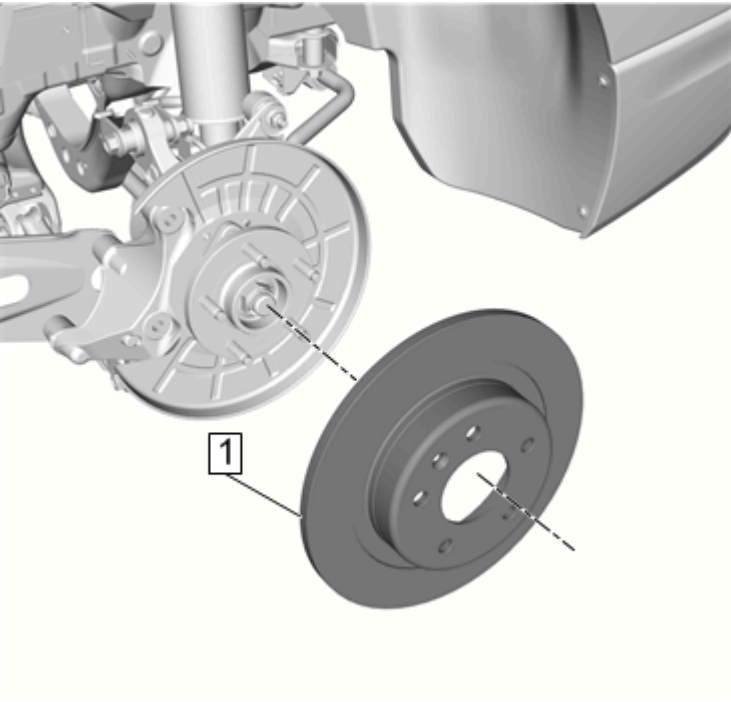


Fig. 174: Rear Brake Rotor
Courtesy of GENERAL MOTORS COMPANY

4. Install Rear Brake Rotor (1)

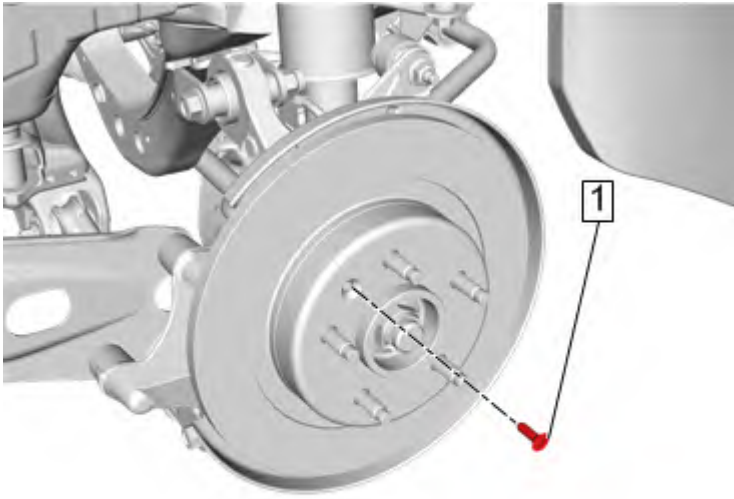


Fig. 175: Rear Brake Rotor Bolt
Courtesy of GENERAL MOTORS COMPANY

CAUTION: [Fastener Caution](#)

5. Install Rear Brake Rotor Bolt (1) and tighten 9 N.m (80 lb in)

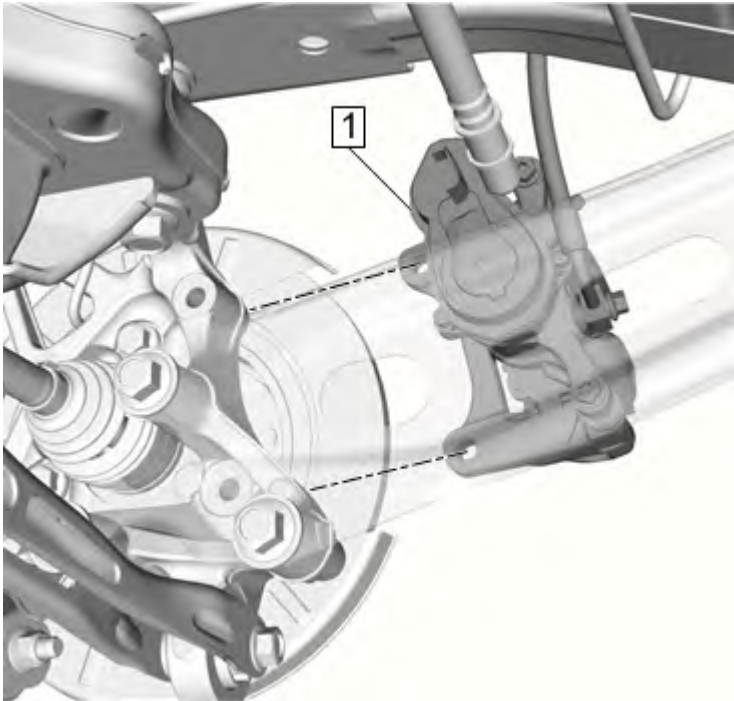


Fig. 176: Rear Brake Caliper And Bracket
Courtesy of GENERAL MOTORS COMPANY

6. Install Rear Brake Caliper and Bracket (1)
7. Prepare the brake caliper bracket bolts and the bracket threaded holes for assembly:
- Thoroughly clean the residue from the bolt threads with denatured alcohol and allow to dry.
 - Thoroughly clean the residue from the threaded holes with denatured alcohol and allow to dry.
 - Apply threadlocker to 2/3 of the threaded length of the bolts. [Adhesives, Fluids, Lubricants, and Sealers](#)

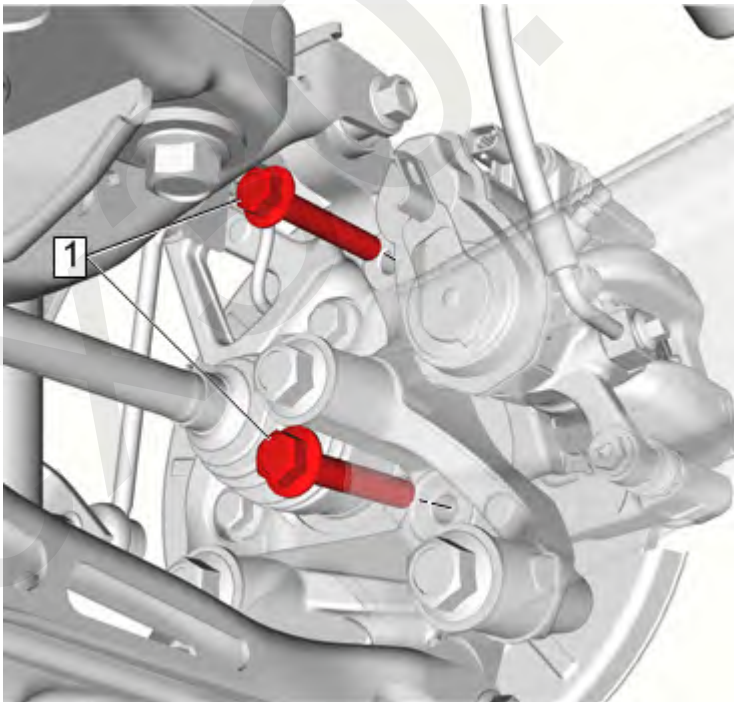


Fig. 177: Brake Caliper Bracket Bolt
Courtesy of GENERAL MOTORS COMPANY

8. Install Rear Brake Caliper Bracket Bolt (1) and tighten
- First Pass: 100 N.m (74 lb ft)
 - Final Pass: **15-30 degrees**
9. Install the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)
10. Calibrate the park brake. [Park Brake Calibration](#)
11. Burnish the brake pads and rotors. [Brake Pad and Rotor Burnishing](#)

FRONT BRAKE SHIELD REPLACEMENT

Removal Procedure

WARNING: [Brake Dust Warning](#)

1. Raise and support the vehicle. [Lifting and Jacking the Vehicle](#)
2. Remove the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)

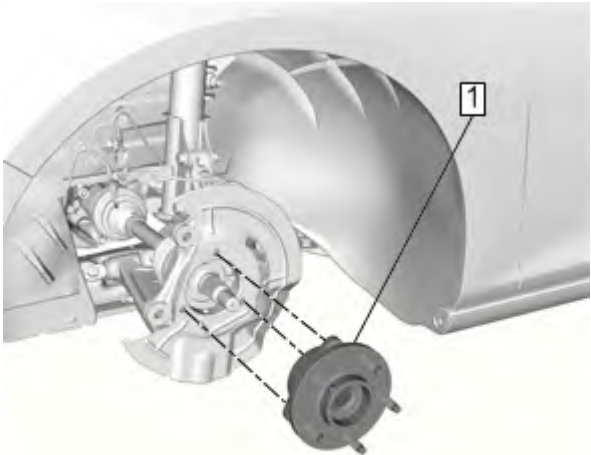


Fig. 178: Front Wheel Bearing And Hub Assembly
Courtesy of GENERAL MOTORS COMPANY

3. Remove Front Wheel Bearing and Hub Assembly (1)[Front Wheel Bearing and Hub Replacement \(Equinox\)](#) [Front Wheel Bearing and Hub Replacement \(Terrain\)](#)

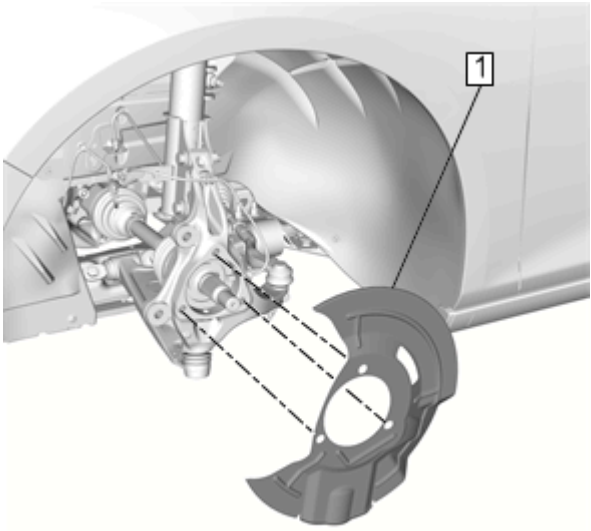


Fig. 179: Front Brake Shield
Courtesy of GENERAL MOTORS COMPANY

- 4. Remove Front Brake Shield (1)

Installation Procedure

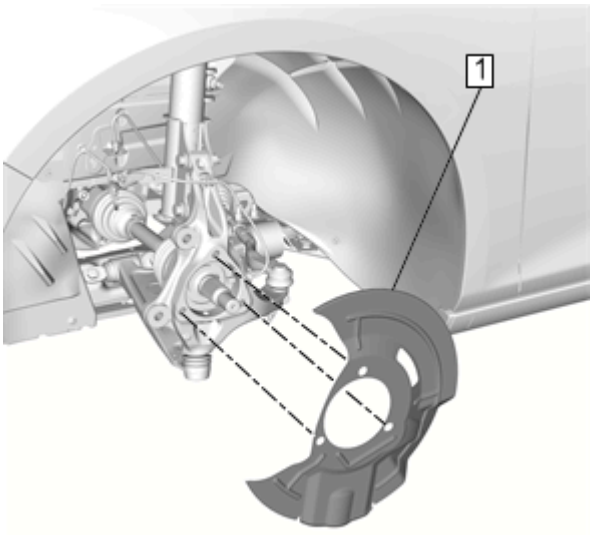


Fig. 180: Front Brake Shield
Courtesy of GENERAL MOTORS COMPANY

- 1. Install Front Brake Shield (1)

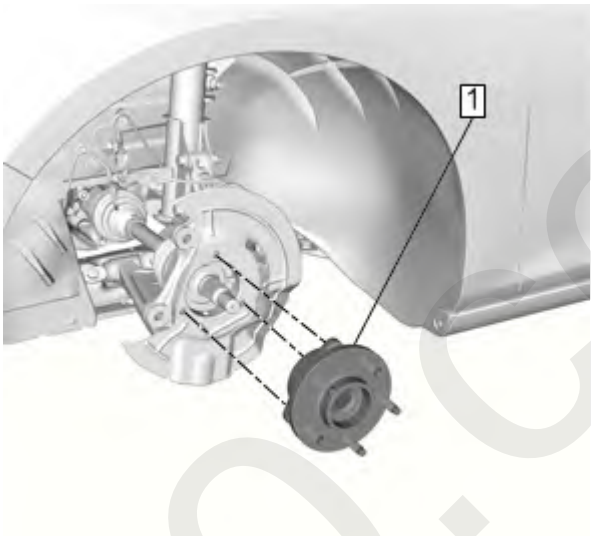


Fig. 181: Front Wheel Bearing And Hub Assembly
Courtesy of GENERAL MOTORS COMPANY

- 2. Install Front Wheel Bearing and Hub Assembly (1)**Front Wheel Bearing and Hub Replacement (Equinox) Front Wheel Bearing and Hub Replacement (Terrain)**
- 3. Install the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)

REAR BRAKE SHIELD REPLACEMENT

Removal Procedure

WARNING: [Brake Dust Warning](#)

- 1. Raise and support the vehicle. [Lifting and Jacking the Vehicle](#)
- 2. Remove the rear tire and wheel assembly. [Tire and Wheel Removal and Installation](#)

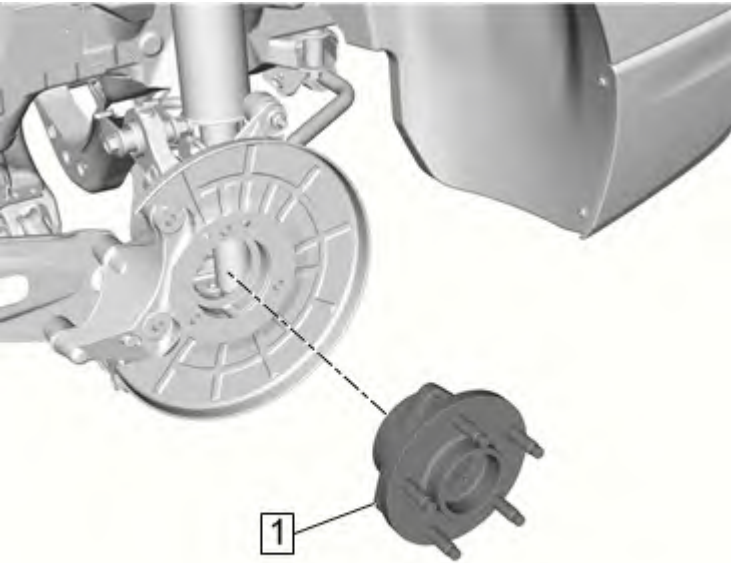
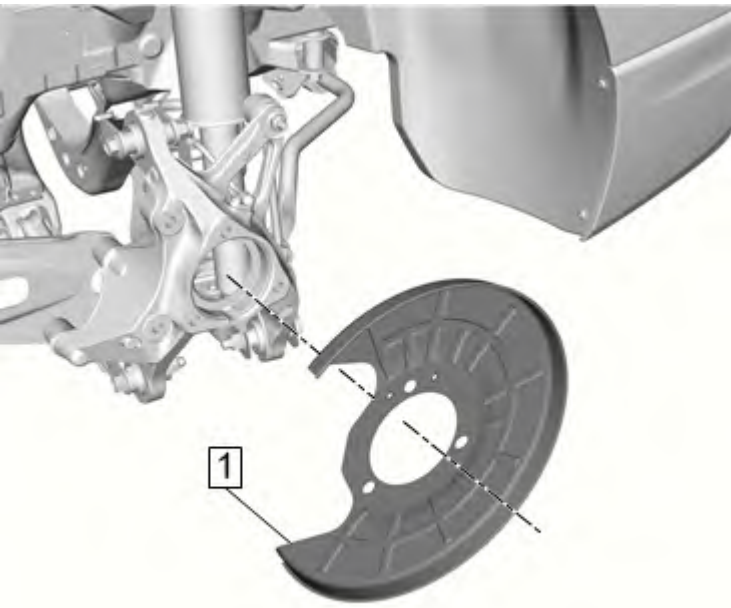


Fig. 182: Rear Wheel Bearing And Hub Assembly
Courtesy of GENERAL MOTORS COMPANY

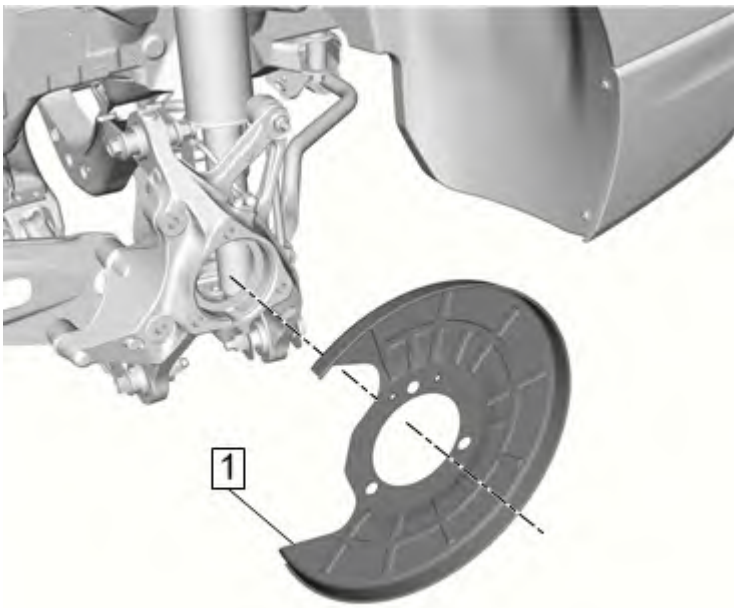
- 3. Remove Rear Wheel Bearing and Hub Assembly (1)**Rear Wheel Bearing and Hub Replacement (AWD) Rear Wheel Bearing and Hub Replacement (FWD)**



[Fig. 183: Rear Brake Shield](#)
Courtesy of GENERAL MOTORS COMPANY

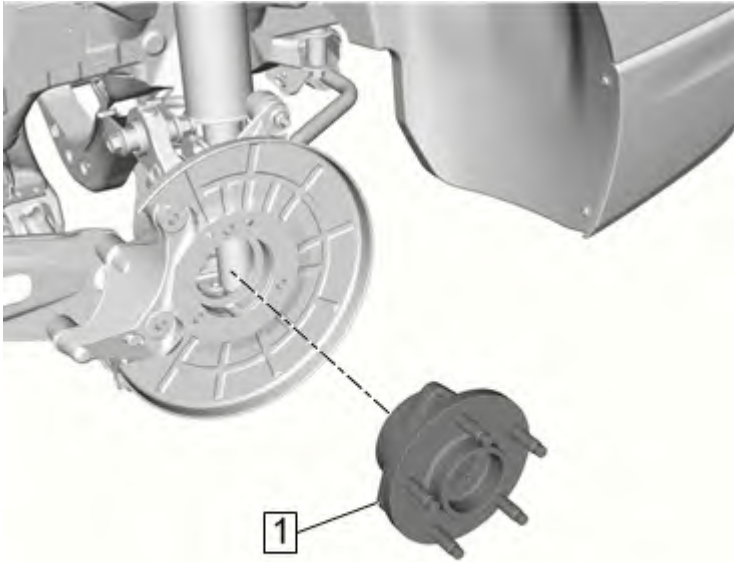
4. Remove Rear Brake Shield (1)

Installation Procedure



[Fig. 184: Rear Brake Shield](#)
Courtesy of GENERAL MOTORS COMPANY

1. Install Rear Brake Shield (1)



[Fig. 185: Rear Wheel Bearing And Hub Assembly](#)
Courtesy of GENERAL MOTORS COMPANY

2. Install Rear Wheel Bearing and Hub Assembly (1)[Rear Wheel Bearing and Hub Replacement \(AWD\)](#) [Rear Wheel Bearing and Hub Replacement \(FWD\)](#)
3. Install the rear tire and wheel assembly. [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. [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). [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. [Brake Rotor Assembled Lateral Runout Correction - Indexing](#)
- The on-vehicle brake lathe method is used to bring the LRO to within specifications through compensating for LRO while refinishing the brake rotor. [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

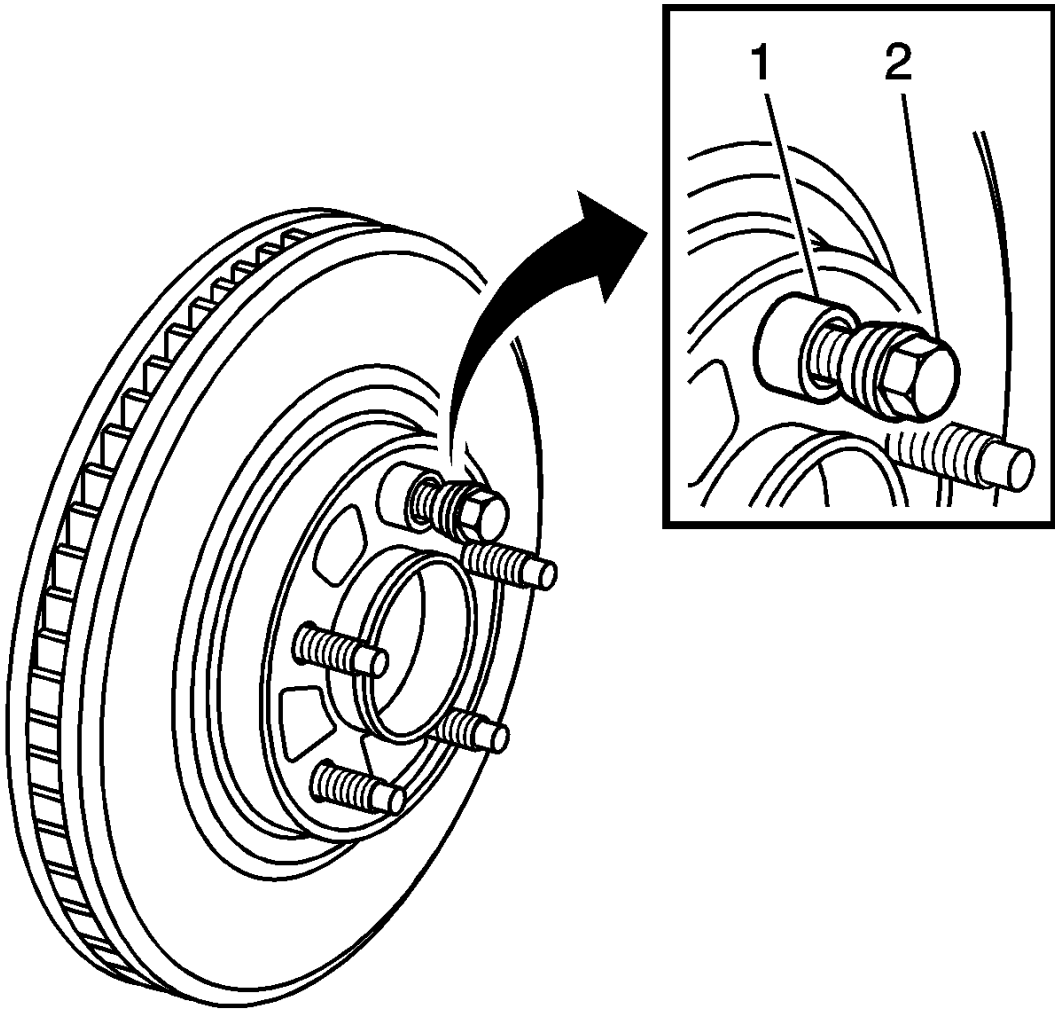
NOTE:

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. 186: Lug Nuts & Conical Washers](#)
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. [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). [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.

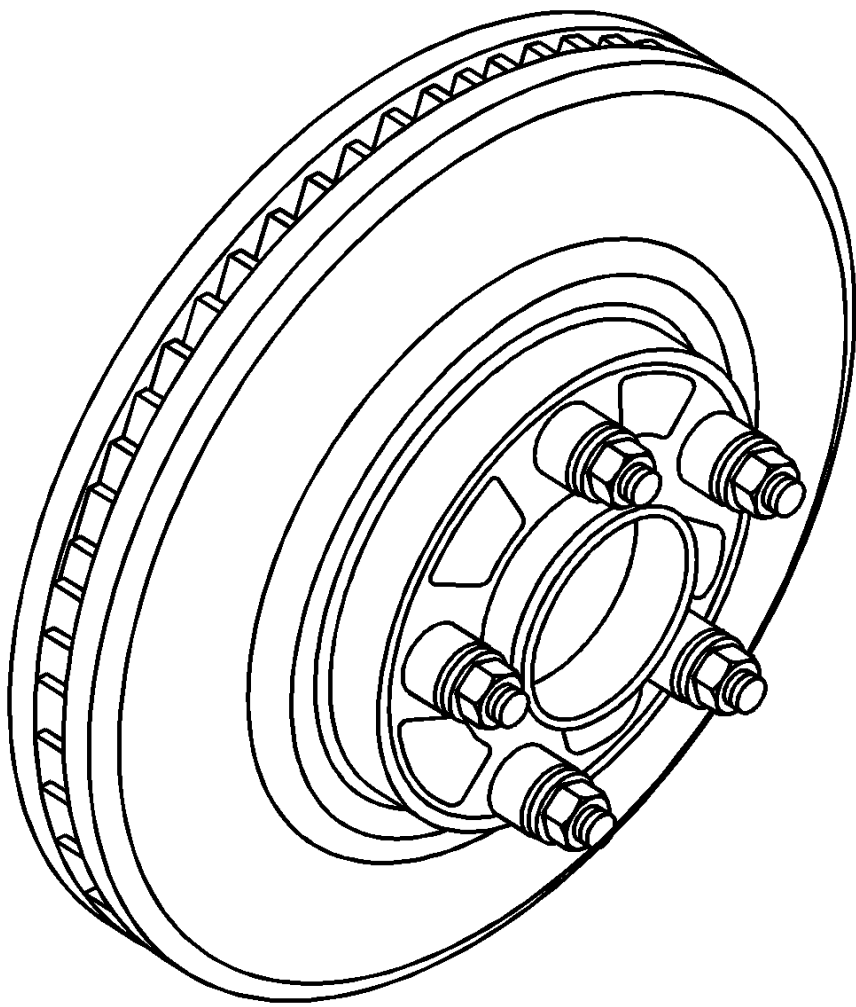


Fig. 187: Lug Nuts & Conical Washers
Courtesy of GENERAL MOTORS COMPANY

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. [Tire and Wheel Removal and Installation](#)
8. Measure the assembled LRO of the brake rotor. [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](#).

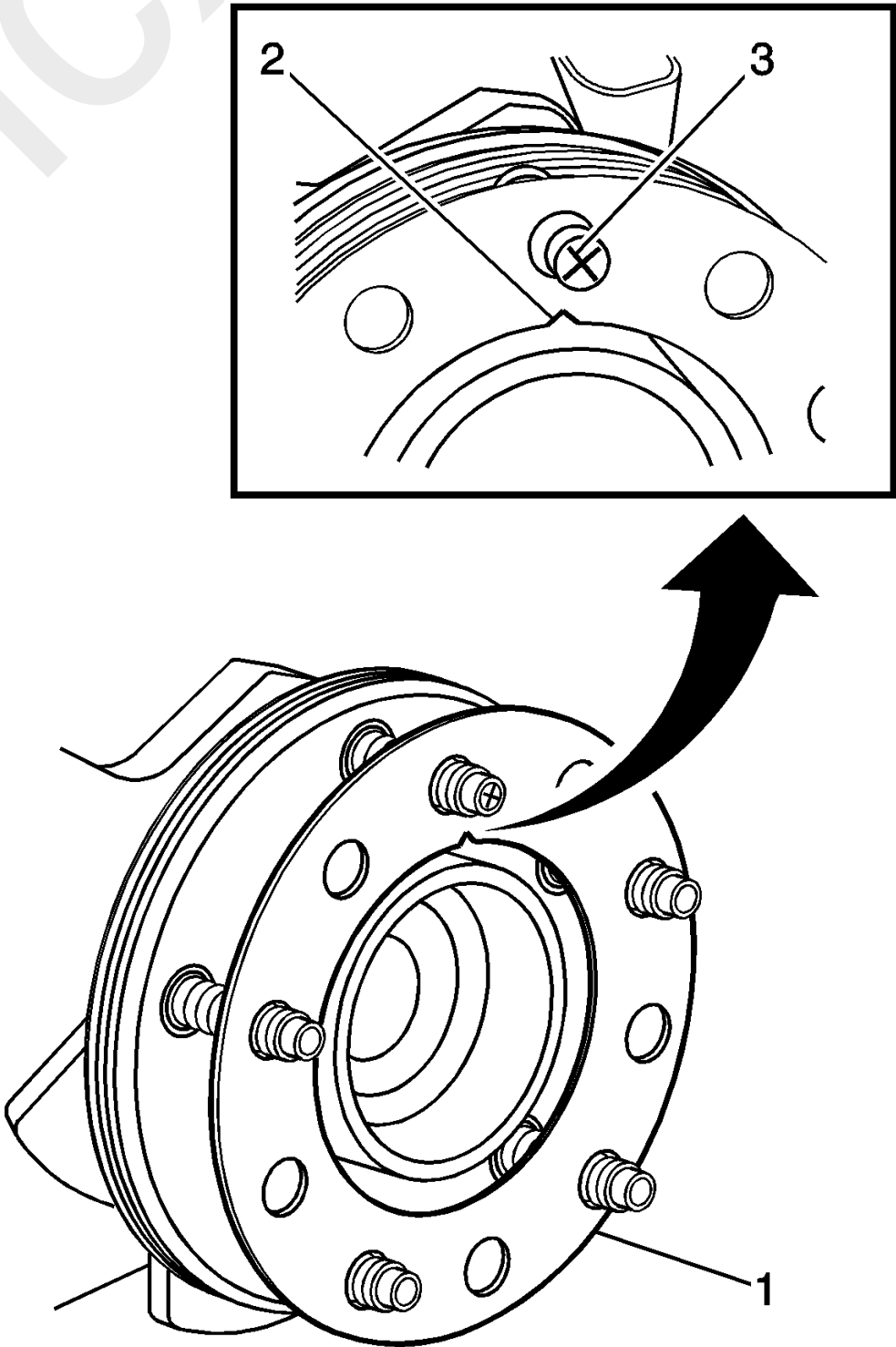


Fig. 188: Identifying Correction Plate, High Spot Mark & V-Shaped Notch
Courtesy of GENERAL MOTORS COMPANY

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. **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). **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.

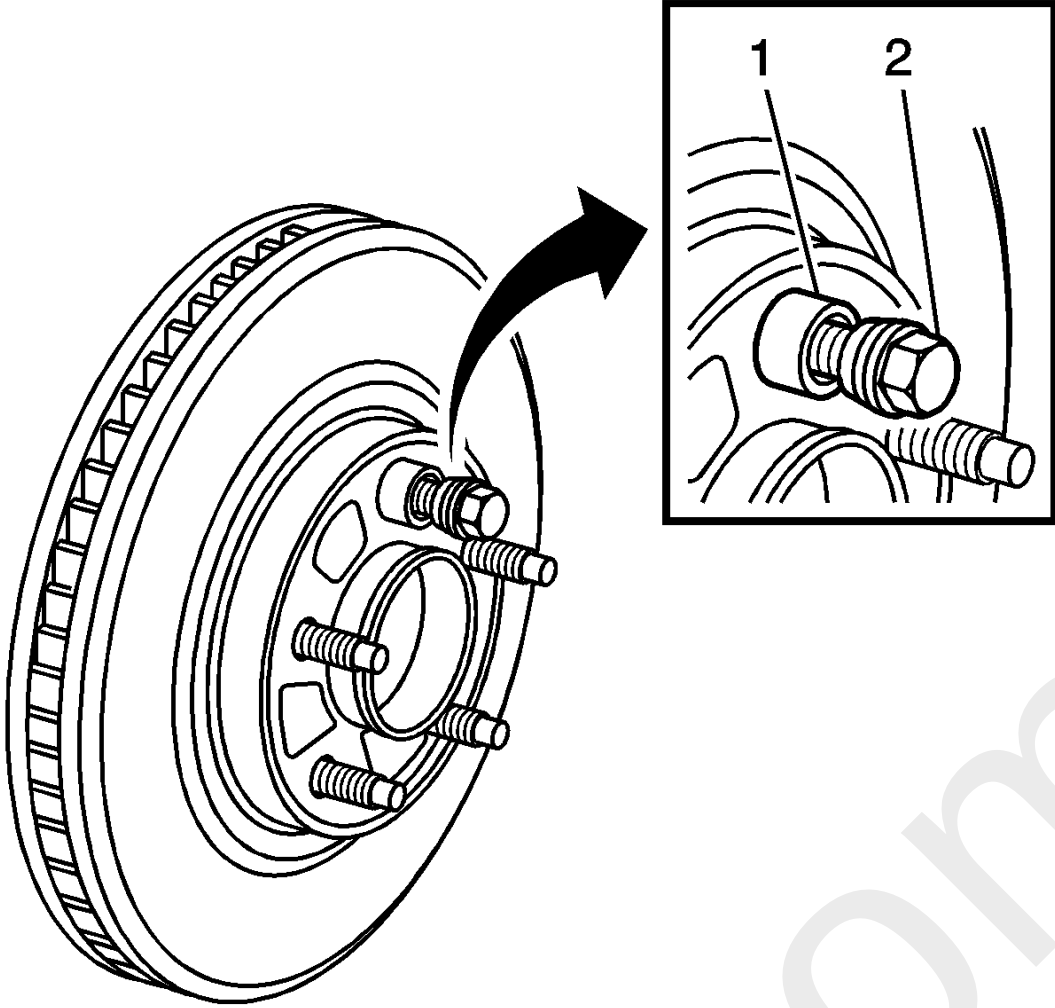


Fig. 189: Lug Nuts & Conical Washers
Courtesy of GENERAL MOTORS COMPANY

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.

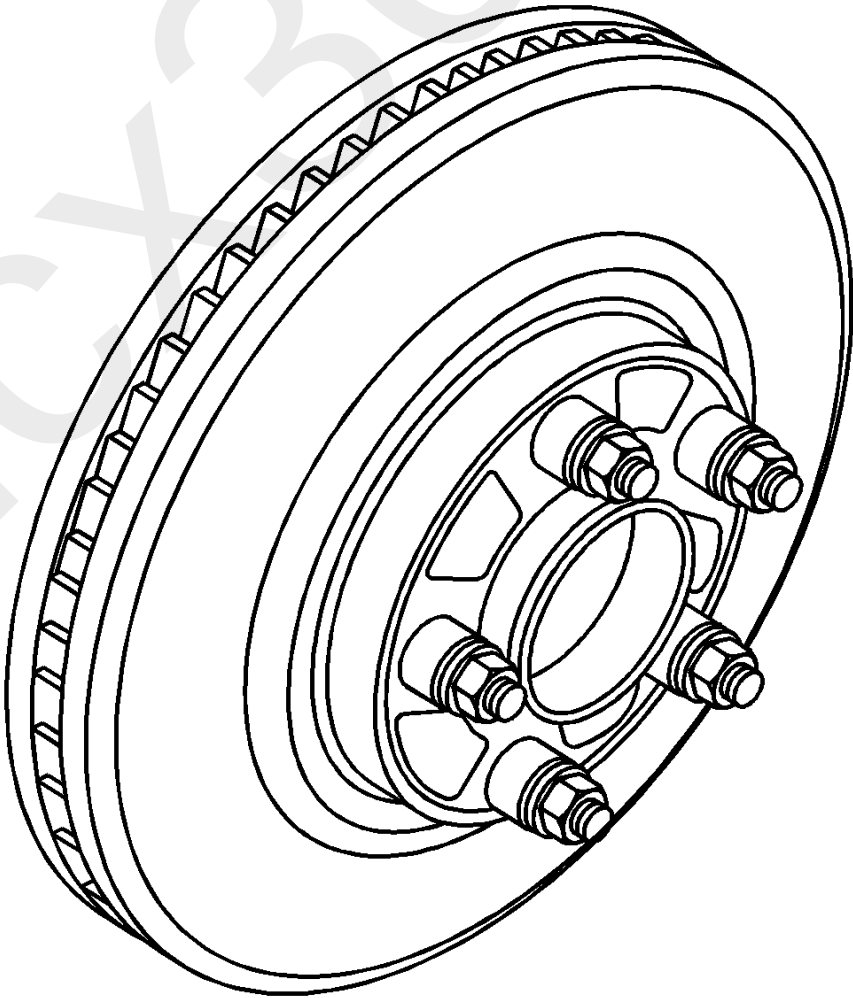


Fig. 190: Lug Nuts & Conical Washers
Courtesy of GENERAL MOTORS COMPANY

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. **Tire and Wheel Removal and Installation**
12. Measure the assembled LRO of the brake rotor. **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. **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). **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. **Brake Rotor Thickness Measurement**
7. If at any time the brake rotor exceeds the minimum allowable thickness after refinish specification, the brake rotor must be replaced. After replacing the rotor, proceed to step 10.
8. After refinishing the brake rotor, use the following procedure in order to obtain the desired non-directional finish:
 1. Follow the brake lathe manufacturer's recommended speed setting for applying a non-directional finish.
 2. Using moderate pressure, apply the non-directional finish:
 - If the lathe is equipped with a non-directional finishing tool, apply the finish with 120-grit aluminum oxide sandpaper.
 - If the lathe is not equipped with a non-directional finishing tool, apply the finish with a sanding block and 150-grit aluminum oxide sandpaper.
 3. After applying a non-directional finish, clean each friction surface of the brake rotor with denatured alcohol, or an equivalent approved brake cleaner.
9. Remove the lathe from the vehicle.
10. Measure the assembled LRO of the brake rotor. **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. [Brake Rotor Thickness Measurement](#)**

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

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

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. **Brake Rotor Thickness Measurement**
11. If at any time the brake rotor exceeds the minimum allowable thickness after refinish specification, the brake rotor must be replaced.
12. After refinishing the brake rotor, use the following procedure in order to obtain the desired non-directional finish:
 1. Follow the brake lathe manufacturer's recommended speed setting for applying a non-directional finish.
 2. Using moderate pressure, apply the non-directional finish:
 - If the lathe is equipped with a non-directional finishing tool, apply the finish with 120-grit aluminum oxide sandpaper.
 - If the lathe is not equipped with a non-directional finishing tool, apply the finish with a sanding block and 150-grit aluminum oxide sandpaper.

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. **Brake Rotor Assembled Lateral Runout Measurement**
15. If the brake rotor assembled LRO measurement exceeds the specification, bring the LRO to within specifications. **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 (Floating Caliper)

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 (Floating Caliper)

10/28/2019

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 (Fixed Caliper)

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.

System Characteristics

Brake Noise

Brake noise can occur and to a degree, some brake noise is normal. Variations in driving conditions such as the weather, environment, driving patterns, differences in vehicle loading, and type or style of driving, can affect brake wear. Any one of these variations can cause brake noise to become apparent. Inspect and verify that all metal-to-metal contact areas of the brake pads, brake pad guides or springs, brake caliper housing, caliper bracket and/or suspension knuckle, as applicable, are clean and free of corrosion and scale.

Brake noise is a "slip-stick" vibration of disc brake components and, if it occurs intermittently, can be considered normal. Most brake noise may be eliminated or temporarily reduced by performing 3 or 4 aggressive brake applications. If the brake noise persists or consistently recurs, application of a damping compound to the brake pad mounting plate where it contacts the caliper can lessen the vibration as the components move relative to each other. Refer to Adhesives, Fluids, Lubricants, and Sealers in this section for recommended compounds.

The following brake noises are characteristic of all brake systems. These noises cannot be avoided, and may not indicate improper operation of the brake system.

Squeak/Squeal Noise

A squeak or squeal noise can occur on vehicles with front semi-mettalic brake pads during light to medium brake pedal application at low to moderate vehicle speeds. Occasionally this noise may appear from the front or rear brakes after a period of non-use such as overnight, or cold brakes and/or in high humidity conditions.

Grinding Noise

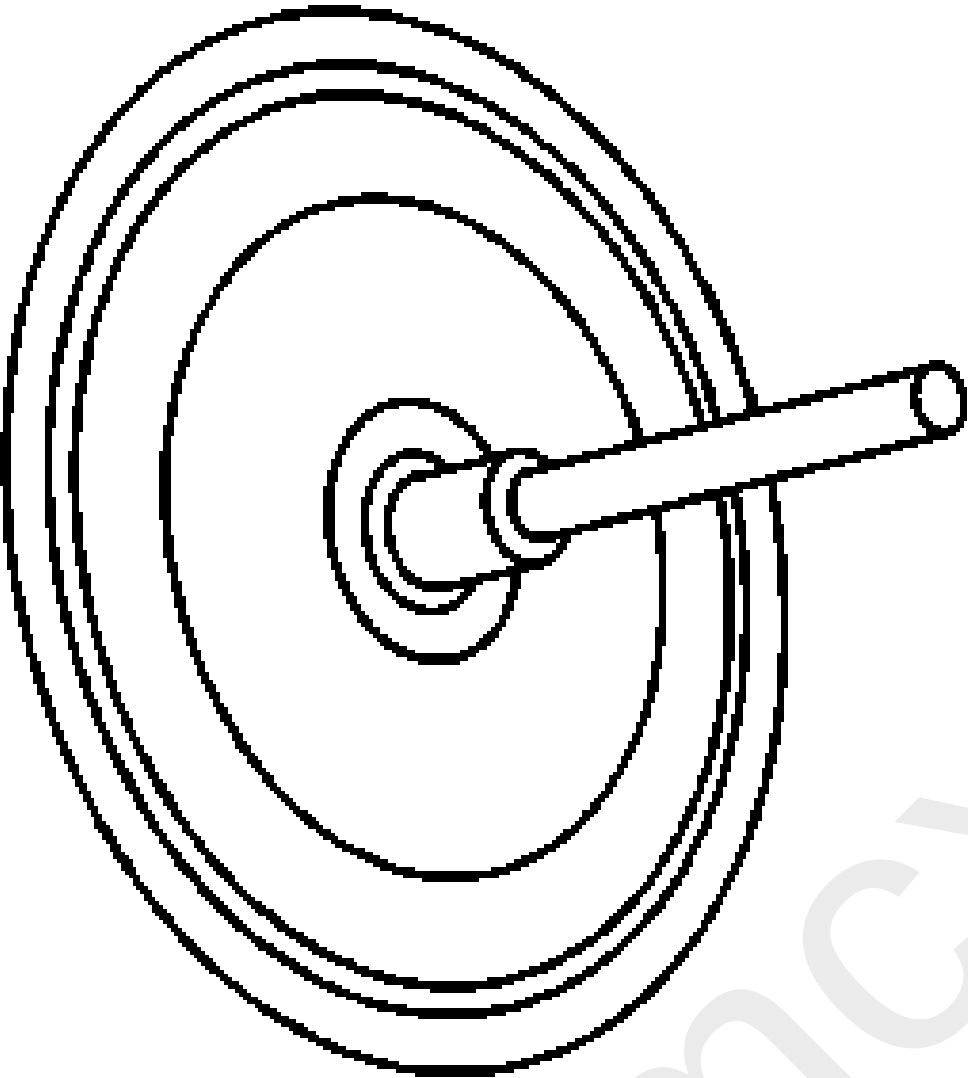
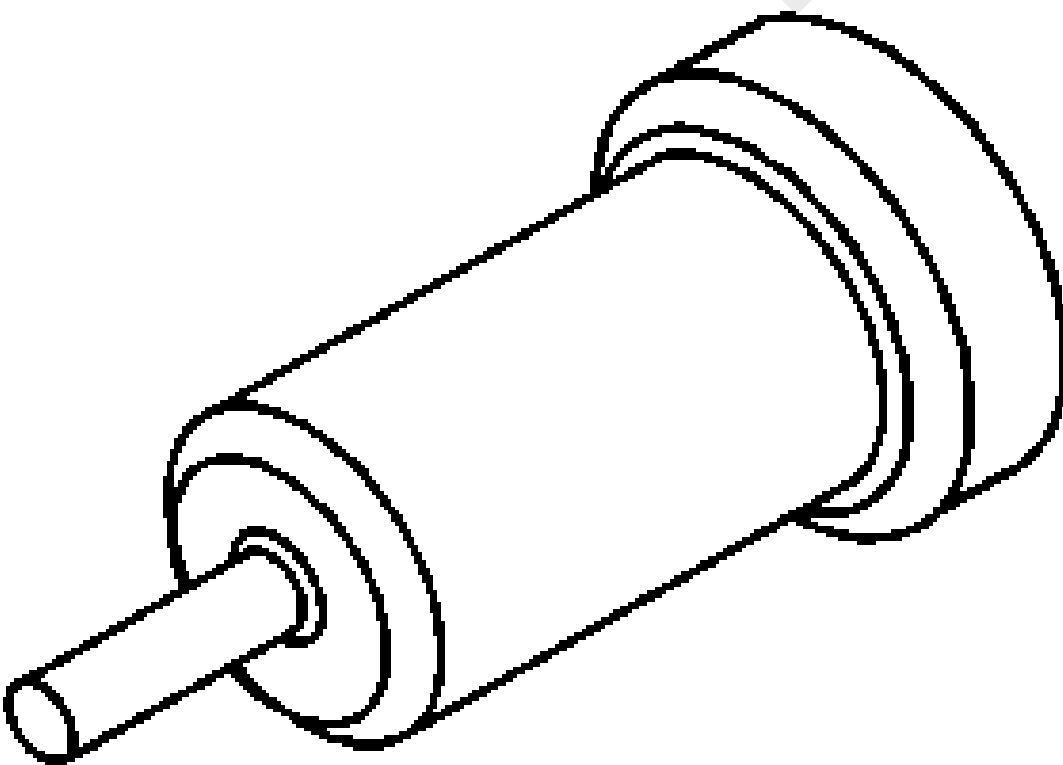
Common occurrence for rear brakes and some front disc brakes during initial brake applications after the vehicle has been parked overnight. Caused by light corrosion forming on the metal brake component friction surfaces during vehicle non-use. Typically disappears after the first few brake applications.

Groan Noise

A groan type noise may be heard during a quick stop, or when slowly moving forward from a complete stop. On vehicles equipped with antilock brake systems (ABS), a groan or moan noise may occur during heavy brake application or on road surfaces with compromised traction such as loose gravel, or on wet or icy roads. This is a normal function of ABS activation.

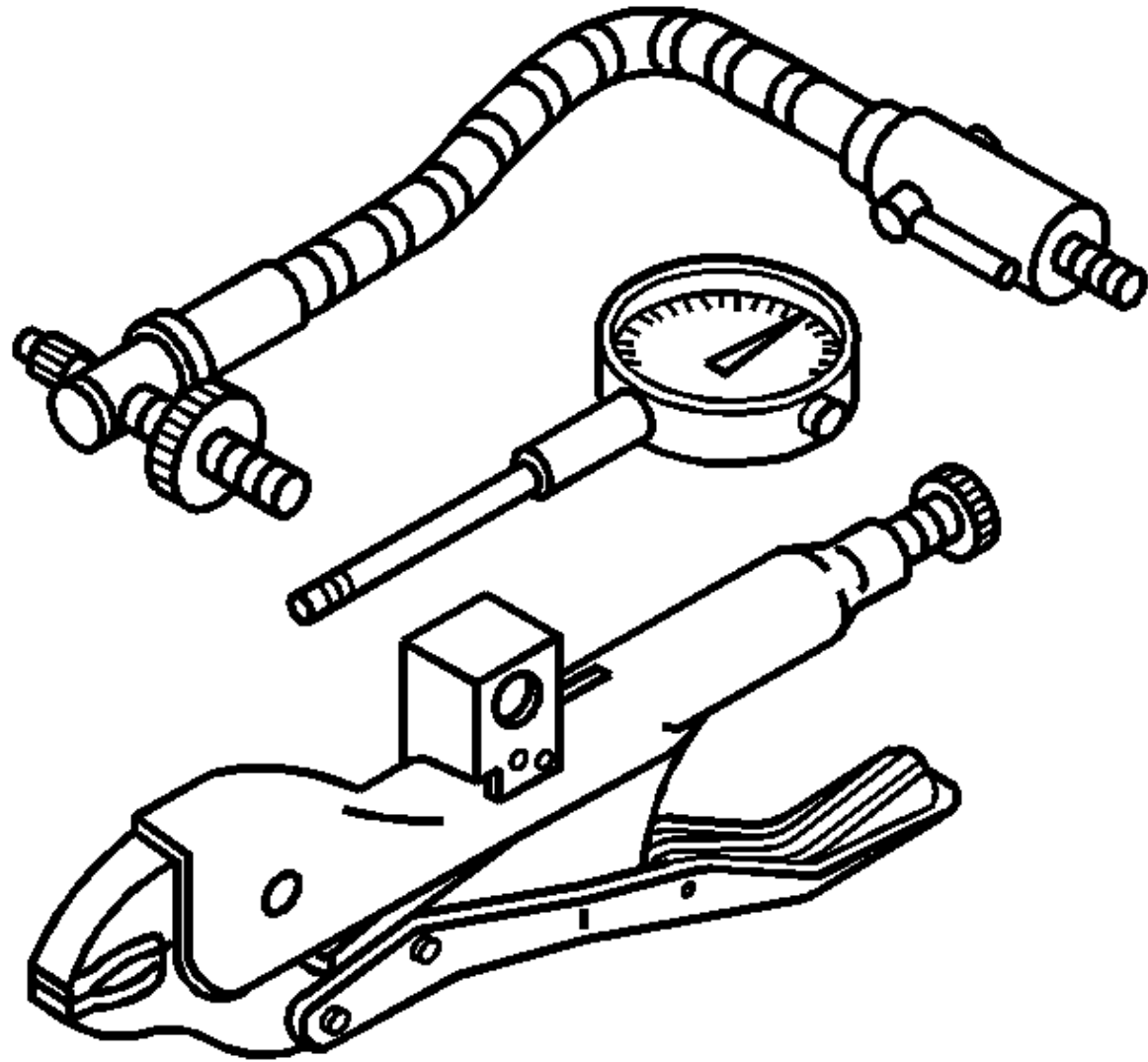
SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

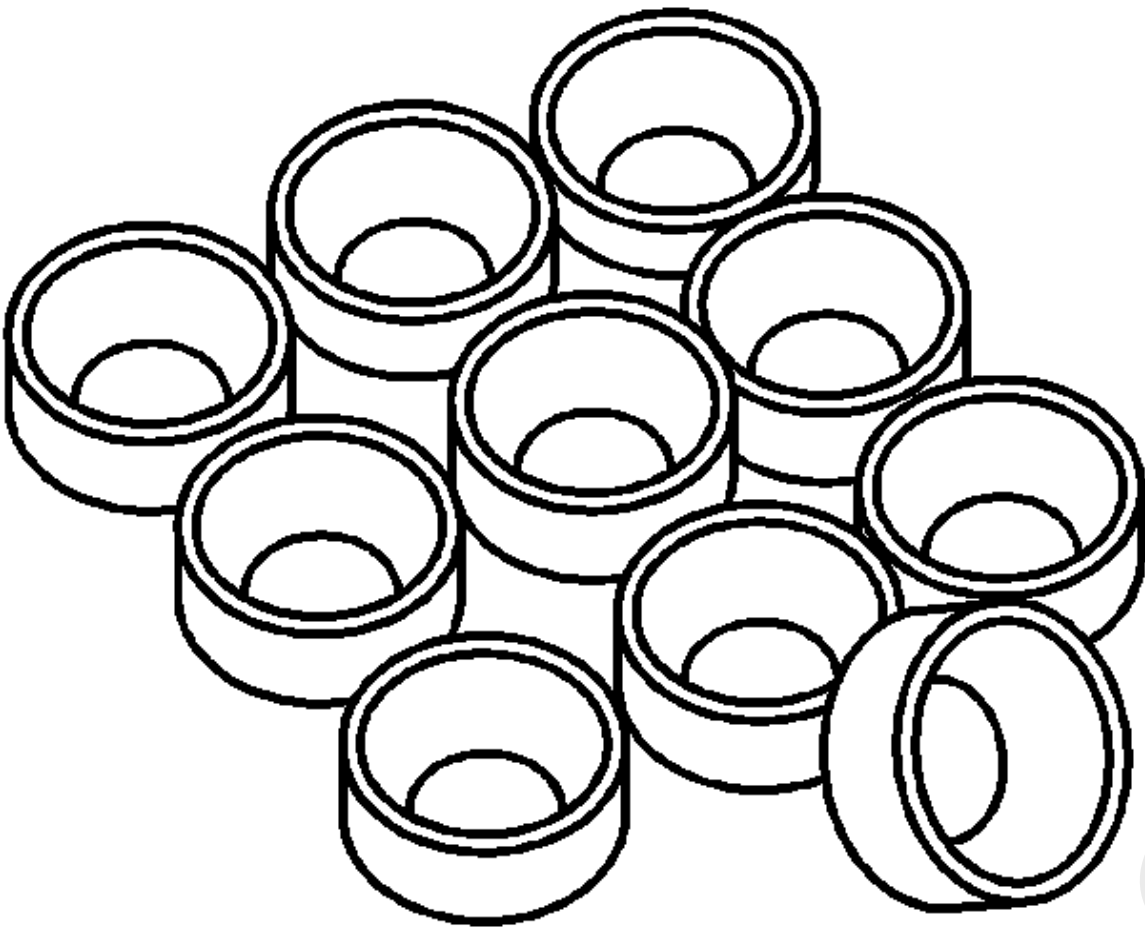
Illustration	Tool Number/ Description
	CH 41013 J 41013 Rotor Resurfacing Kit
	CH 42450-A J 42450-A Wheel Hub Resurfacing Kit

Illustration

Tool Number/ Description



CH 45101
J 45101
Hub and Wheel Runout Gauge



CH 45101-100
J 45101-100
Conical Brake Rotor Washers