

2017 BRAKES
Disc Brakes - Bolt EV

SPECIFICATIONS

FASTENER SPECIFICATIONS

Single Use Non-Threaded Fasteners/Components

Application
NOTE: <i>All fasteners/components listed in this table MUST BE DISCARDED and replaced with NEW after removal.</i>
Front Brake Caliper Piston Boot
Front Brake Caliper Piston Seal
Front Brake Hose Washer
Rear Brake Hose Washer

Single Use Threaded Fastener/Component Tightening Specifications

Application	Specification
	Metric (English)
NOTE: <i>All fasteners/components listed in this table MUST BE DISCARDED and replaced with NEW after removal.</i>	
A	
Front Brake Caliper Bracket Bolt	160 N.m (118 lb ft)
Rear Brake Caliper Bracket Bolt	100 N.m (74 lb ft)

Reusable Threaded Fastener Tightening Specifications

Application	Specification
	Metric (English)
NOTE: <i>All fasteners listed in this table can be reused after removal.</i>	
Front Brake Caliper Bleeder Valve	10 N.m (89 lb in)
Front Brake Caliper Guide Pin Bolt	40 N.m (30 lb ft)
Front Brake Hose Fitting Bolt	40 N.m (30 lb ft)
Front Brake Rotor Bolt	9 N.m (80 lb in)
Rear Brake Caliper Guide Pin Bolt	35 N.m (26 lb ft)
Rear Brake Hose Fitting Bolt	40 N.m (30 lb ft)
Rear Brake Rotor Bolt	9 N.m (80 lb in)

DISC BRAKE COMPONENT SPECIFICATIONS

Application	Specification	
	Metric	English
Front Brakes		
Brake Pad Lining Thickness - Minimum	3.0 mm	0.118 in
Brake Pad Lining Thickness - New	11.0 mm	0.433 in
Brake Rotor Diameter	276.0 mm	10.866 in
Brake Rotor Discard Thickness	23.0 mm	0.906 in
Brake Rotor Maximum Allowable Assembled Lateral Runout	0.04 mm	0.0016 in
Brake Rotor Maximum Allowable Scoring	1.5 mm	0.059 in
Brake Rotor Maximum Allowable Thickness Variation	0.02 mm	0.0008 in
Brake Rotor Minimum Allowable Thickness After Refinish	24.0 mm	0.945 in
Brake Rotor Thickness - New	26.0 mm	1.024 in
Rear Brakes		
Brake Pad Lining Thickness - Minimum	1.6 mm	0.063 in
Brake Pad Lining Thickness - New	10.0 mm	0.394 in
Brake Rotor Diameter	264.0 mm	10.394 in
Brake Rotor Discard Thickness	8.5 mm	0.335 in
Brake Rotor Maximum Allowable Assembled Lateral Runout	0.04 mm	0.0016 in
Brake Rotor Maximum Allowable Scoring	1.5 mm	0.059 in
Brake Rotor Maximum Allowable Thickness Variation	0.02 mm	0.0008 in
Brake Rotor Minimum Allowable Thickness After Refinish	8.8 mm	0.346 in
Brake Rotor Thickness - New	10.0 mm	0.394 in

DIAGNOSTIC INFORMATION AND PROCEDURES

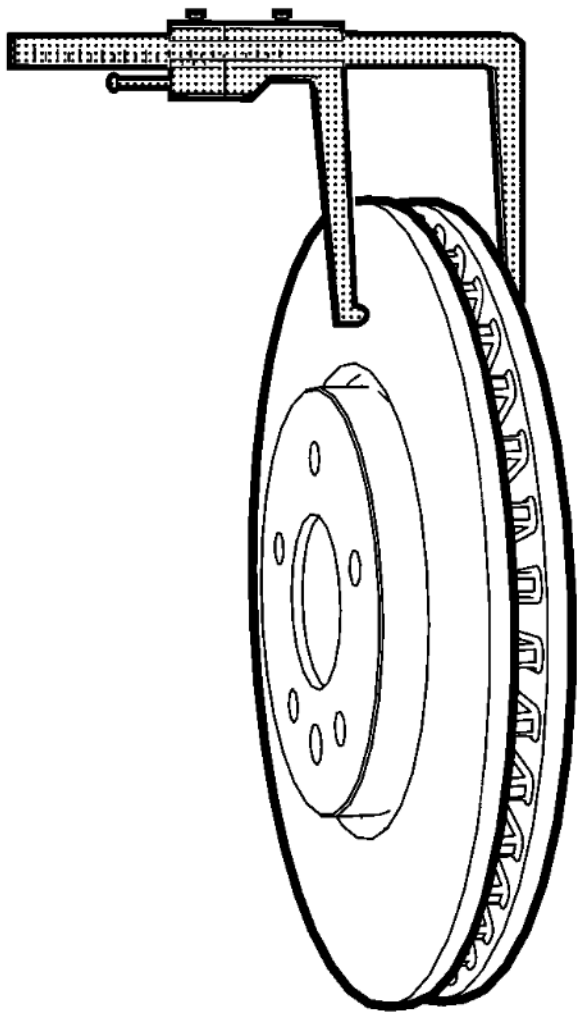
BRAKE ROTOR THICKNESS MEASUREMENT

Special Tools

CH-230-A Disc Gauge

Equivalent regional tools:[Special Tools](#)

WARNING: Refer to [Brake Dust Warning](#) .



[Fig. 1: Locating Disc Gauge](#)
Courtesy of GENERAL MOTORS COMPANY

1. If the inboard friction surface of the brake rotor is not accessible, remove the brake pads. Refer to [Front Disc Brake Pads Replacement](#), and/or [Rear Disc Brake Pads Replacement](#), if equipped.
2. Clean the friction surfaces of the brake rotor with denatured alcohol, or an equivalent approved brake cleaner.

NOTE: **Ensure the measurements are only taken within the friction surfaces.**

3. Install the **CH-230-A** gauge for lateral runout measurement.
 1. Measure and record the thickness of the brake rotor at 4 or more points from the brake rotor inside to outside.
 2. Compare the lowest thickness measurement to the disc brake component specifications. Refer to [Disc Brake Component Specifications](#).
4. If the lowest thickness measurement of the brake rotor is above the minimum allowable thickness after refinishing specification, the rotor may be able to be refinished, depending upon surface and wear conditions which may be present.
5. If the lowest thickness measurement of the brake rotor is at or below the minimum allowable thickness after refinishing specification, the rotor may not be refinished.
6. 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

Special Tools

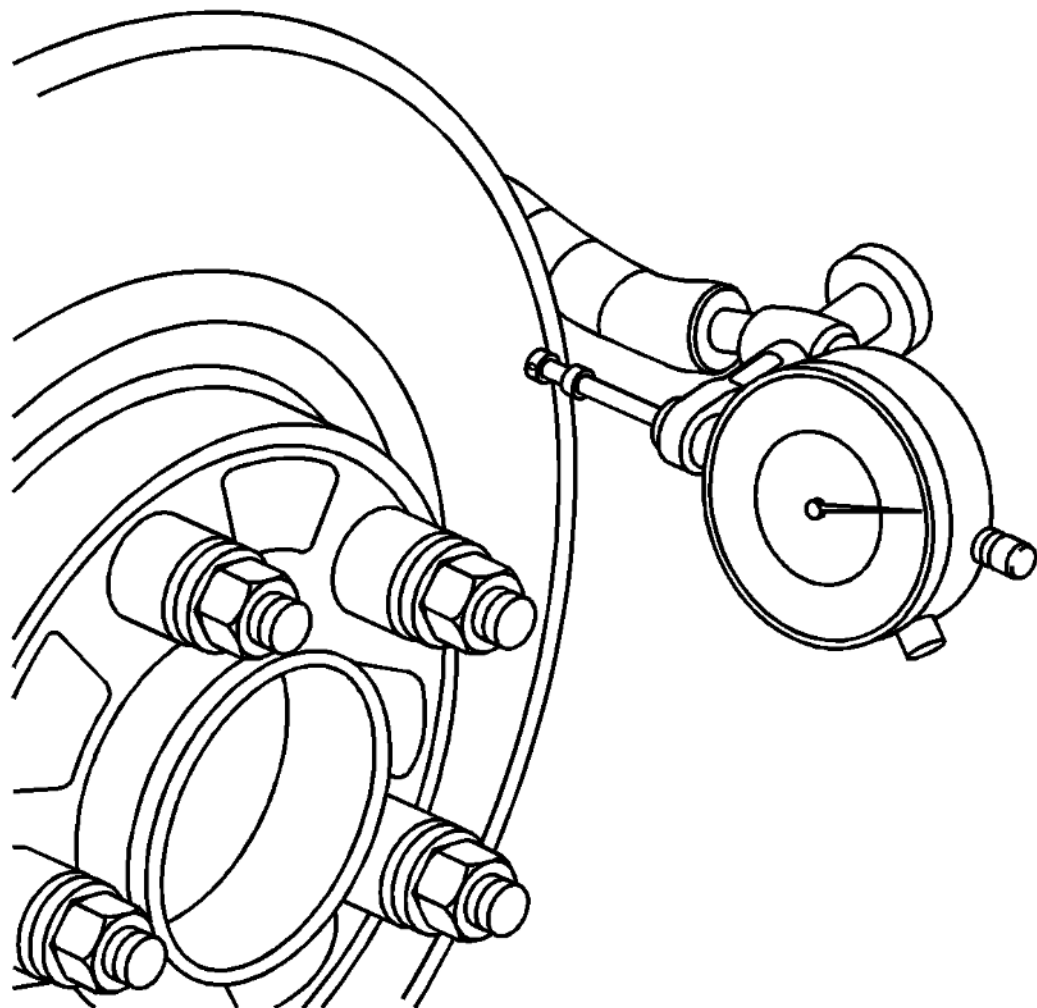
CH-45101 Hub and Wheel Runout Gauge

For equivalent regional tools, refer to [Special Tools](#).

WARNING: **Refer to [Brake Dust Warning](#) .**

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

1. If the inboard friction surface of the brake rotor is not accessible, remove the brake pads. Refer to [Front Disc Brake Pads Replacement](#), and/or [Rear Disc Brake Pads Replacement](#), if equipped.
2. Clean the friction surfaces of the brake rotor with denatured alcohol, or an equivalent approved brake cleaner.



[Fig. 2: Using Dial Indicator To Measure Lateral Runout](#)
Courtesy of GENERAL MOTORS COMPANY

NOTE: **Ensure the measurements are only taken within the friction surfaces.**

3. Install the **CH-45101** runout gauge for lateral runout measurement and compare with the correct specifications. Refer to [Disc Brake Component Specifications](#).

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.**

4. If the brake rotor lateral runout measurement exceeds the specification, the rotor requires refinishing or replacement. Refer to [Front Brake Rotor Replacement](#), [Rear Brake Rotor Replacement](#), or [Brake Rotor Refinishing](#).

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, remove the brake pads. Refer to [Front Disc Brake Pads Replacement](#), or/and [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. Refer to [Brake Rotor Refinishing](#).
 - Cracks and/or heat spots.
 - Excessive bluing 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. Refer to [Front Brake Rotor Replacement](#), [Rear Brake Rotor Replacement](#), or [Brake Rotor Refinishing](#).

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 tool, 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 4800 and 11300 km (3000 and 7000 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](#).**

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

1. 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** resurfacing kit, thoroughly clean any rust or corrosion from the mating surface of the hub/axle flange.
 3. Using the **CH-41013** 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.
- 2. Install the rotor to the hub/axle flange.

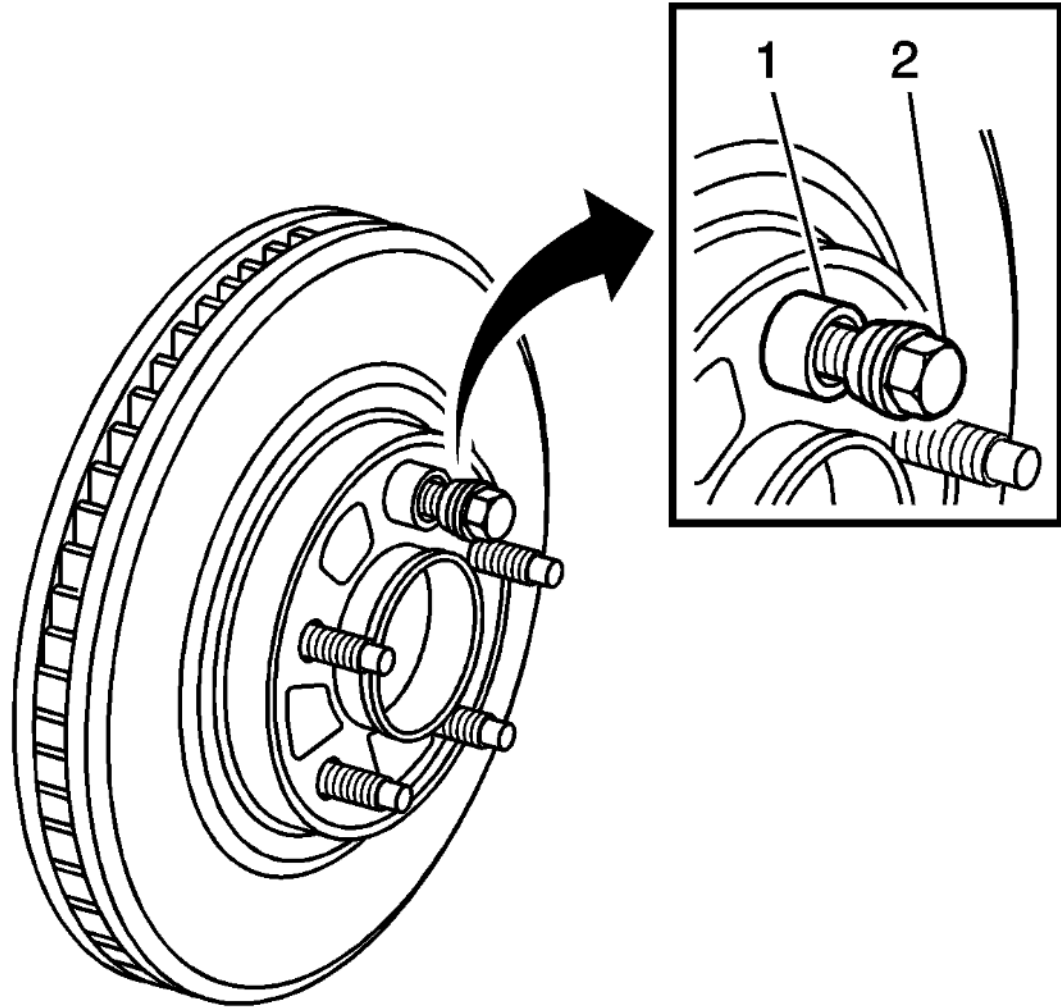


Fig. 3: Lug Nuts & Conical Washers
Courtesy of GENERAL MOTORS COMPANY

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

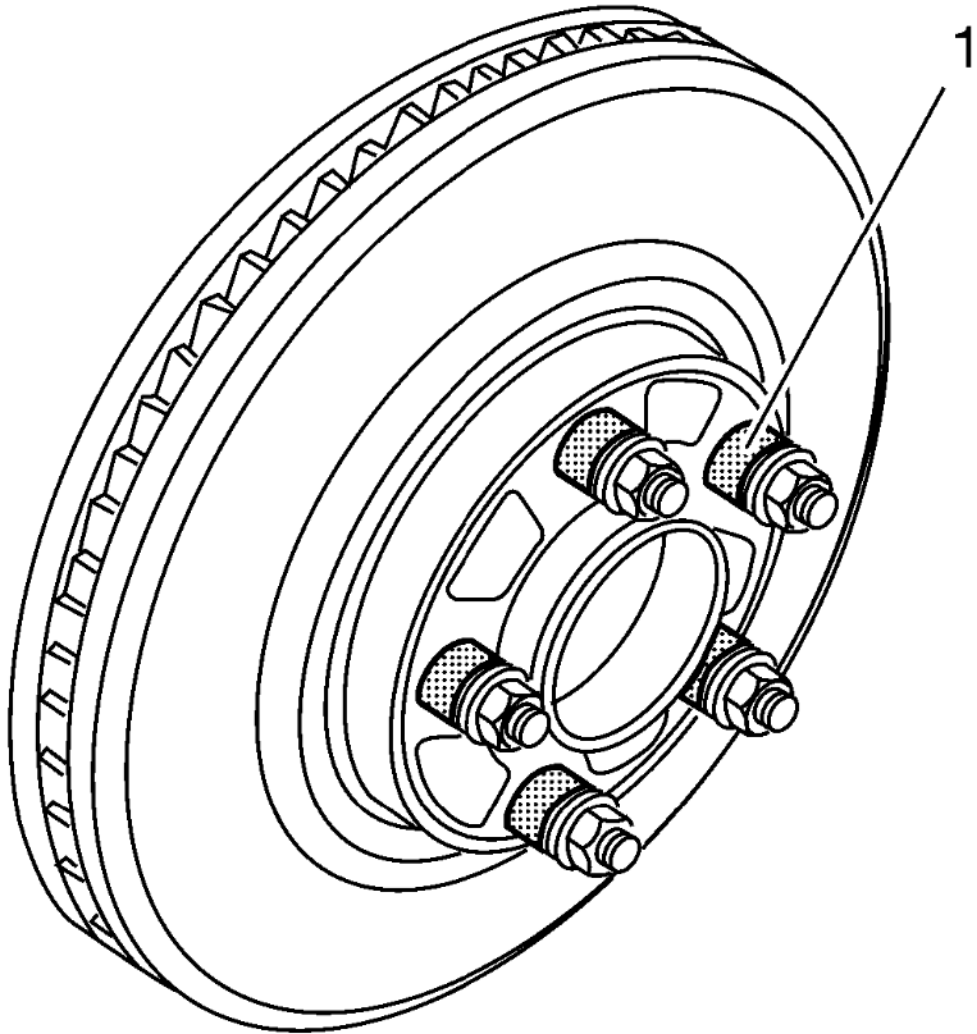


Fig. 4: Conical Washers & Lug Nuts
Courtesy of GENERAL MOTORS COMPANY

- 5. Install the remaining **CH-45101-100** washers (1) and lug nuts onto the wheel studs and tighten the nuts firmly by hand in a star-pattern.
- 6. Tighten the lug nuts in a star-pattern to specification, in order to properly secure the rotor. Refer to [Tire and Wheel Removal and Installation](#) .
- 7. If the brake rotor has been REFINISHED or REPLACED with a new rotor, proceed to step 13.
- 8. If the brake rotor meets the following criteria, proceed to step 9.
 - 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.

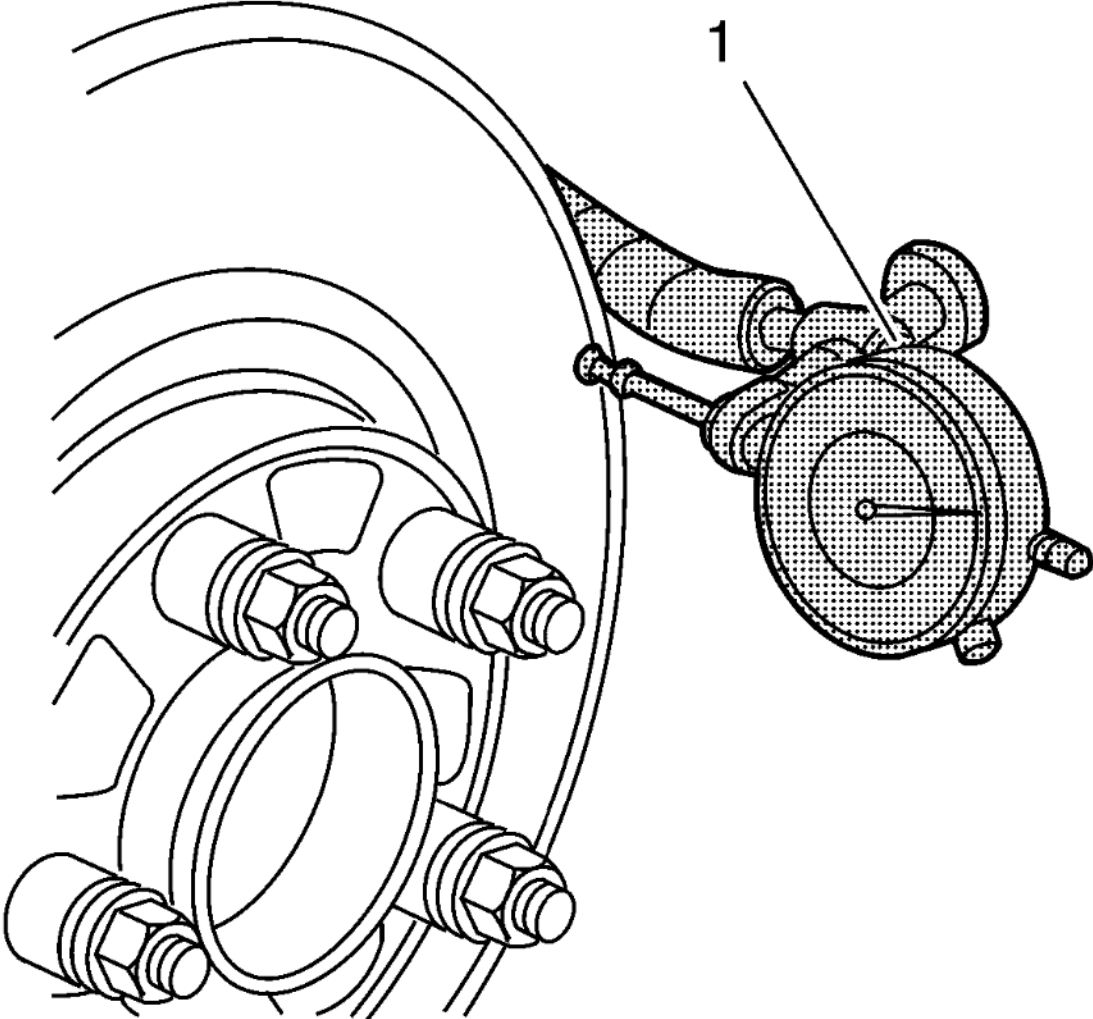


Fig. 5: Measuring Brake Rotor Lateral Runout
Courtesy of GENERAL MOTORS COMPANY

9. Mount the **CH-45101** gauge (1) or equivalent, to the strut 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.
10. 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.
11. Compare the brake rotor assembled LRO to the disc brake component specifications. Refer to [Disc Brake Component Specifications](#)
12. If the brake rotor assembled LRO is within specifications, proceed to step 17.

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 13.
13. Mount the **CH-45101** gauge (1) or equivalent, to the strut 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.
14. 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.
15. Compare the brake rotor assembled LRO to the disc brake component specifications.
16. If the brake rotor assembled LRO measurement exceeds the specification, replace the brake rotors. Refer to [Front Brake Rotor Replacement](#), and/or [Rear Brake Rotor Replacement](#).
17. 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** washers.

BRAKE PAD INSPECTION

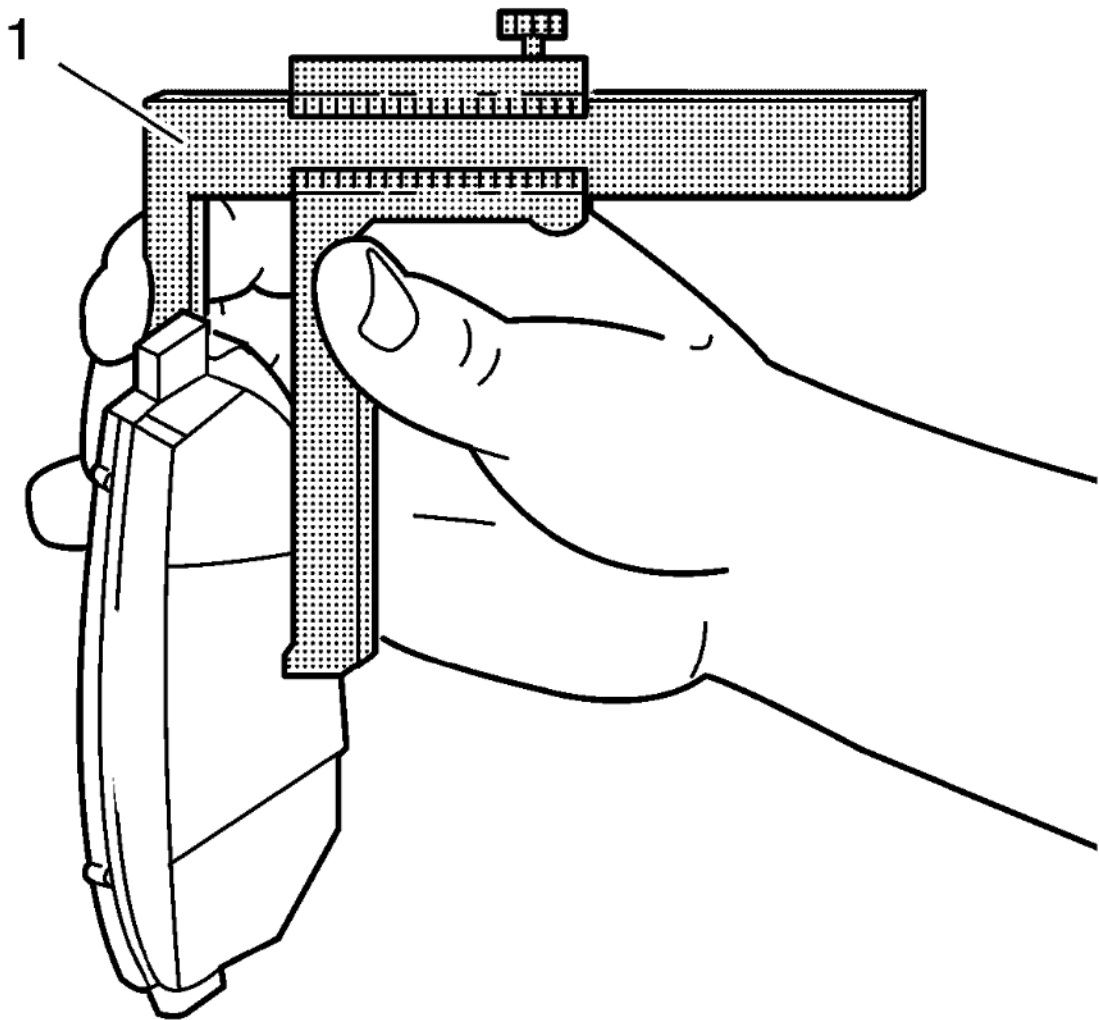
Special Tools

CH-230-A Disc Gauge

For equivalent regional tools, refer to [Special Tools](#).

WARNING: Refer to [Brake Dust Warning](#) .

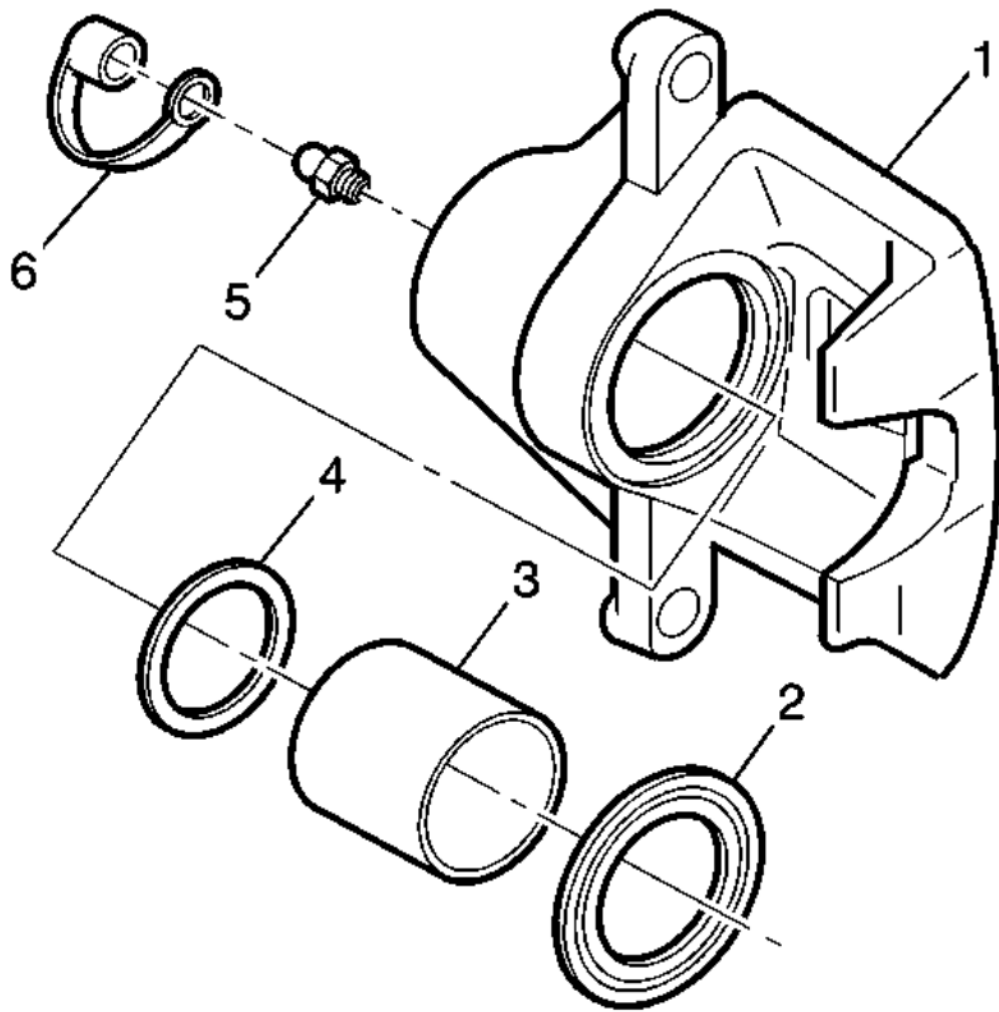
1. Remove brake pads. Refer to [Front Disc Brake Pads Replacement](#), and/or [Rear Disc Brake Pads Replacement](#).



[Fig. 6: Measuring Brake Pad Thickness](#)
Courtesy of GENERAL MOTORS COMPANY

2. Measure remaining brake pad thickness at several points, using the **CH-230-A** disc gauge (1).
3. Compare brake pad thickness to disc brake component specifications.

BRAKE CALIPER INSPECTION



[Fig. 7: 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.

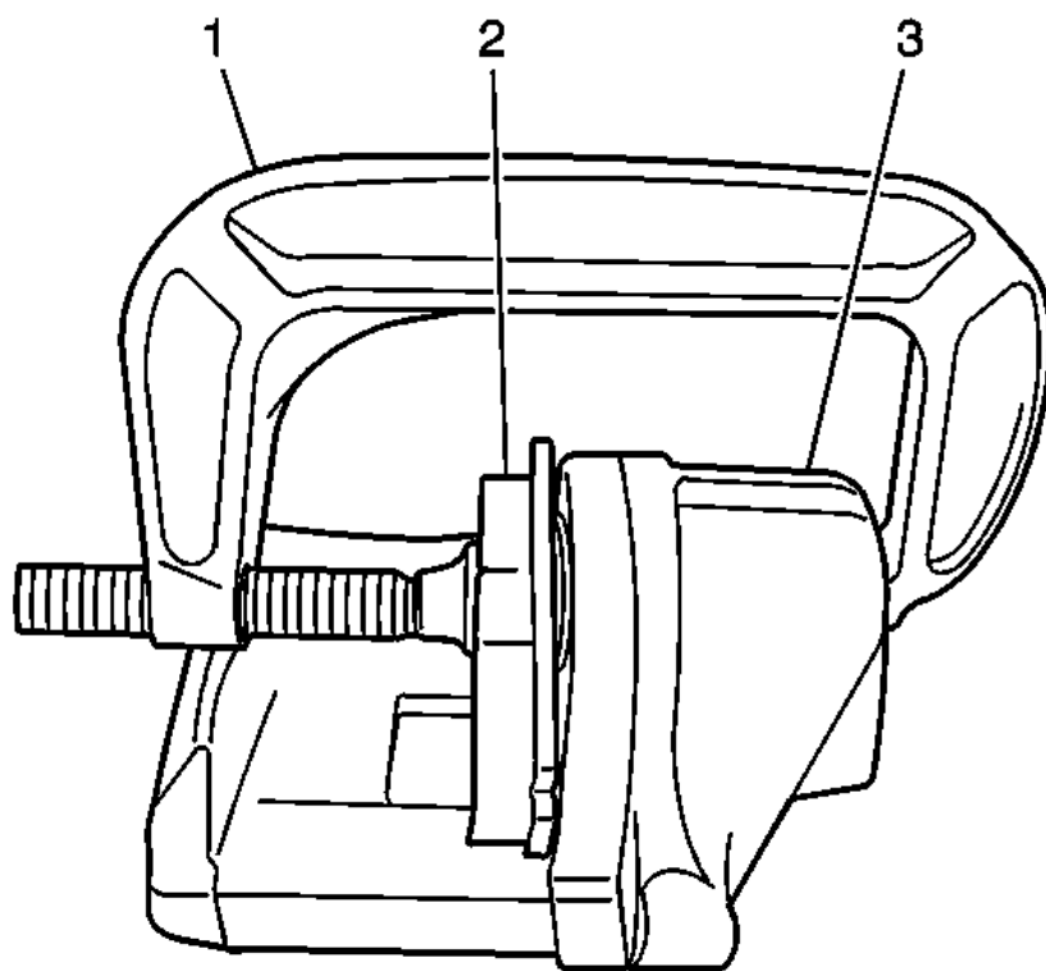


Fig. 8: Compressing Caliper Piston
Courtesy of GENERAL MOTORS COMPANY

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](#) .

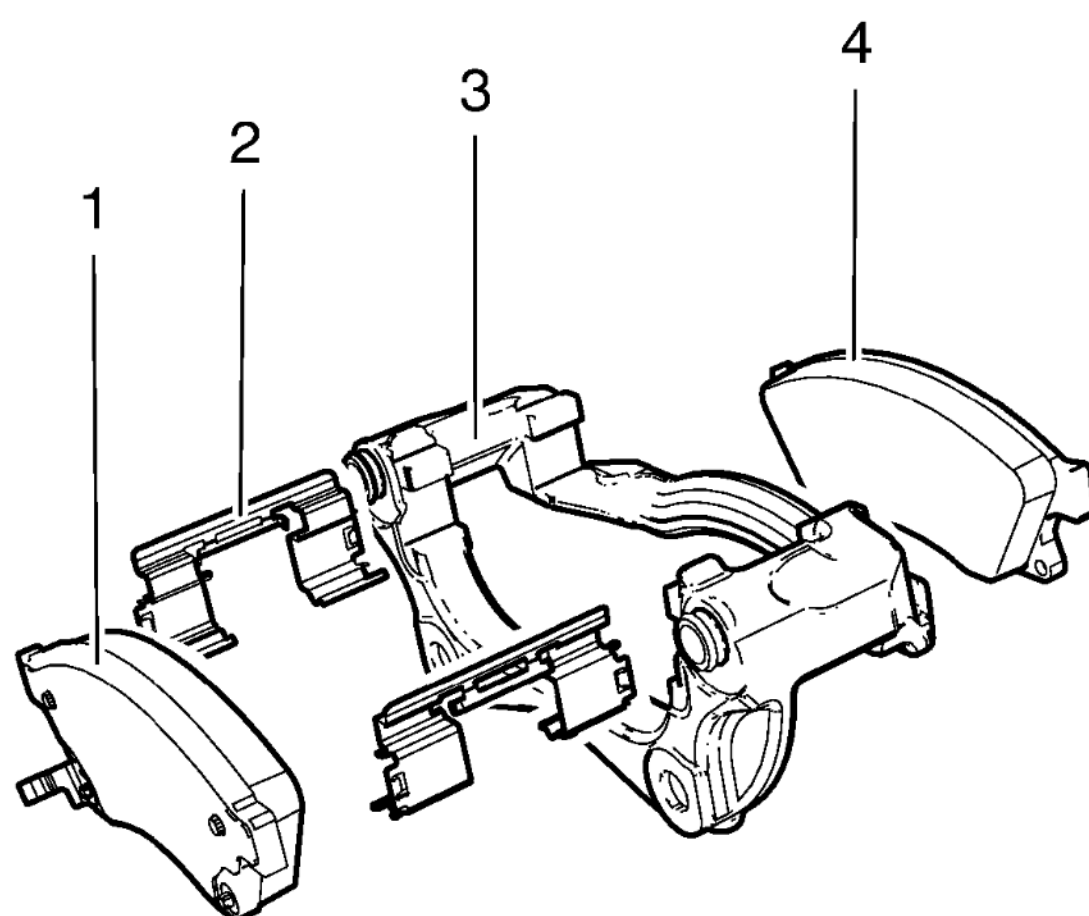


Fig. 9: Exploded View Of Brake Pads And Brake Caliper Mounting Bracket
Courtesy of GENERAL MOTORS COMPANY

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 to [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 (3). If excessive looseness is observed the brake caliper bracket bushings and/or the brake caliper mounting bolts may need to be replaced. Compress the front caliper pistons
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 (1).
 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](#).
10. Remove the disc brake pads (1, 2) from the brake caliper mounting bracket (3).
11. Inspect the disc brake pad mounting hardware for the following:
 - Missing mounting hardware.
 - Excessive corrosion.
 - Bent pad retainer spring (2).
 - Looseness at the brake caliper mounting bracket (3).
 - Looseness at the disc brake pads (1, 4).
 - Excessive contaminants in the brake caliper mounting bracket (3) 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.

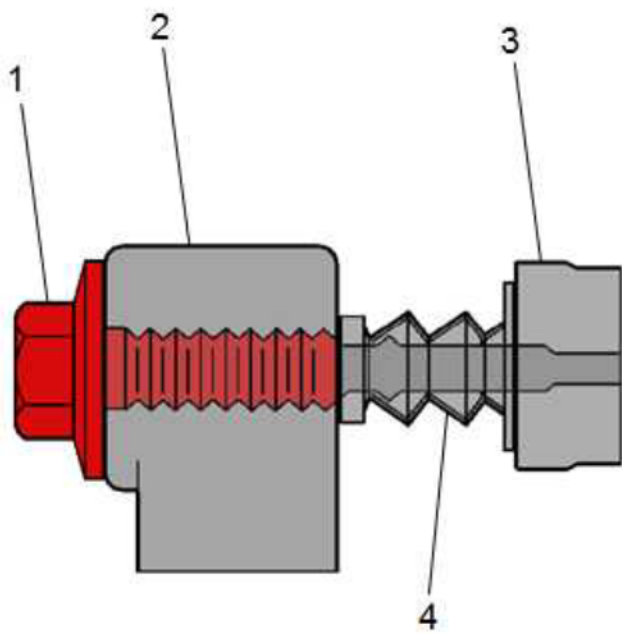


Fig. 10: View Of Caliper, Pin, Boots & Caliper Mounting Bracket
Courtesy of GENERAL MOTORS COMPANY

14. Inspect the brake caliper mounting hardware for the following:
- Binding
 - Seizing
 - Looseness in the brake caliper mounting bracket (3).
 - Bent or damaged brake caliper mounting bolts (1).
 - Cracked or torn boots (4).
 - Missing boots.
 - Bent or damaged brake caliper mounting bracket (3).
 - Cracked or damaged brake caliper (2).
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: [Brake Dust Warning](#)

1. Remove Rear Brake Caliper Bracket [Rear Brake Caliper Bracket Replacement](#)

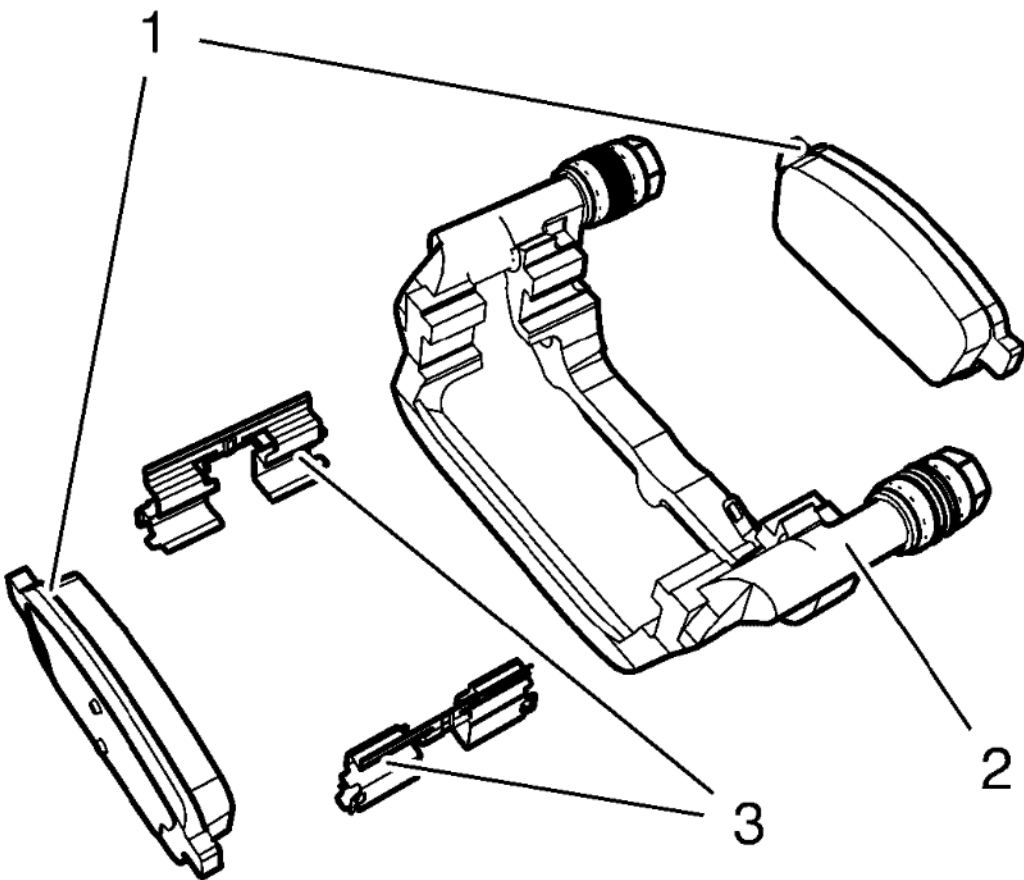


Fig. 11: Exploded View Of Brake Pads And Brake Caliper Mounting Bracket
Courtesy of GENERAL MOTORS COMPANY

2. Remove the disc brake caliper from the caliper mounting bracket (2).
3. Remove the disc brake pads (1) from the caliper mounting bracket (2).
4. Inspect the disc brake pad mounting hardware (3) (if installed) for the following:
- Missing mounting hardware.
 - Excessive corrosion.
 - Brake pad fastener spring is bent.
 - Looseness at the brake caliper mounting bracket.
 - Looseness at the disc brake pads.
 - Excessive contaminants in the brake caliper mounting bracket surface and threads.
5. If any of the conditions listed are found, the disc brake pad mounting hardware requires replacement.
6. Ensure the disc brake pads are held firmly on the brake caliper mounting bracket, yet slide easily on the mounting hardware without binding.

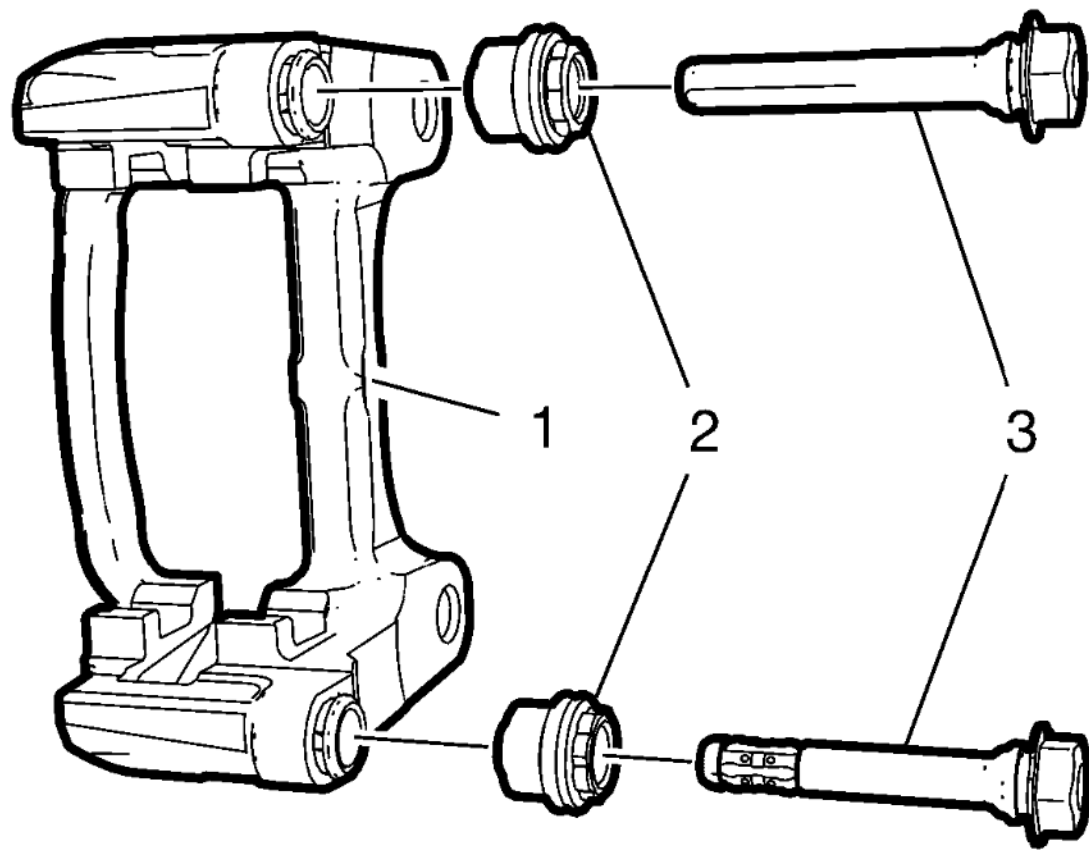


Fig. 12: Brake Caliper And Mounting Brackets
Courtesy of GENERAL MOTORS COMPANY

7. Inspect the brake caliper mounting hardware for the following:
- Binding
 - Seizing
 - Looseness in the brake caliper mounting bracket (1)
 - Bent or damaged brake caliper mounting bolts
 - Cracked or torn boots (4)
 - Missing boots
 - Bent or damaged brake caliper mounting bracket (3)
 - Cracked or damaged brake caliper (2)
8. If any of the conditions listed are found then the brake caliper mounting hardware requires replacement.
9. Install the disc brake pads to the caliper mounting bracket.
10. Install the disc brake caliper to the mounting bracket.
11. Install Rear Brake Caliper Bracket [Rear Brake Caliper Bracket Replacement](#)

REPAIR INSTRUCTIONS

FRONT DISC BRAKE PADS REPLACEMENT

Removal Procedure

- WARNING:** [Brake Dust Warning](#)
- WARNING:** [Brake Fluid Irritant Warning](#)
- CAUTION:** [Brake Fluid Effects on Paint and Electrical Components Caution](#)
- 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 front tire and wheel assembly. [Tire and Wheel Removal and Installation](#)



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

- NOTE:**
- Do NOT use any air tools to remove or install the brake caliper 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 the caliper guide pin bolt. Allowing the open end wrench to come in contact with the brake caliper will cause a pulsation when the brakes are applied.

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

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

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

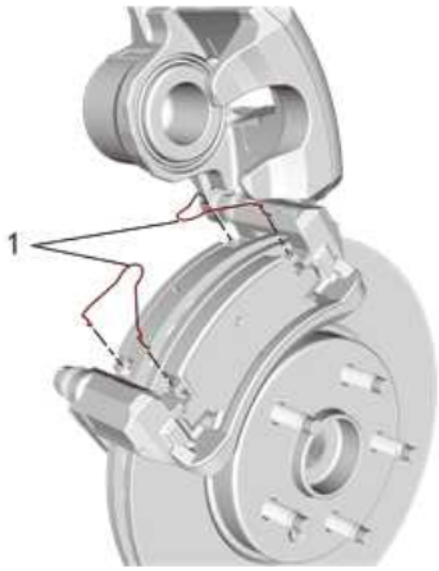


Fig. 14: Front Brake Caliper Spring
Courtesy of GENERAL MOTORS COMPANY

8. Remove Front Brake Caliper Spring (1) and DISCARD

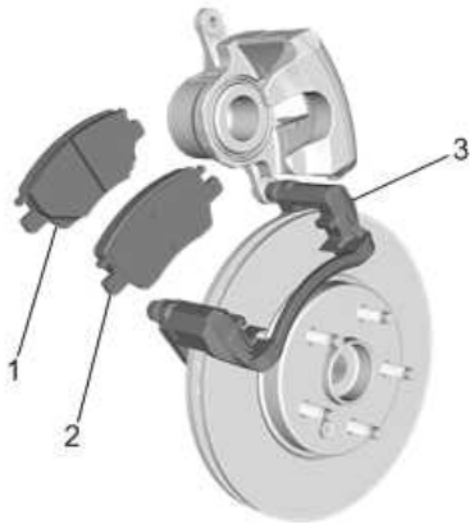


Fig. 15: Front Disc Brake Inner Pad
Courtesy of GENERAL MOTORS COMPANY

- 9. Remove Front Disc Brake Inner Pad (1) @Front Brake Caliper Bracket (3)
- 10. Remove Front Disc Brake Outer Pad (2) @Front Brake Caliper Bracket (3)

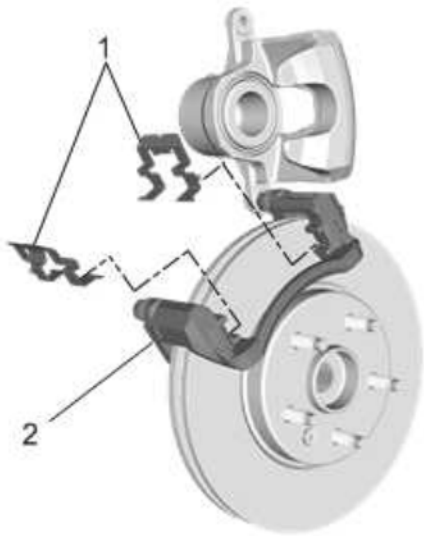


Fig. 16: Front Disc Brake Pad Retainer Spring
Courtesy of GENERAL MOTORS COMPANY

- 11. Remove Front Disc Brake Pad Retainer Spring (1) @Front Brake Caliper Bracket (2)
- 12. Inspect the front disc brake mounting and hardware. [Front Disc Brake Mounting and Hardware Inspection](#)

Installation Procedure

- 1. Using a commercial brake caliper piston retracting tool, carefully push back the brake caliper piston until it is compressed completely into the caliper bore.

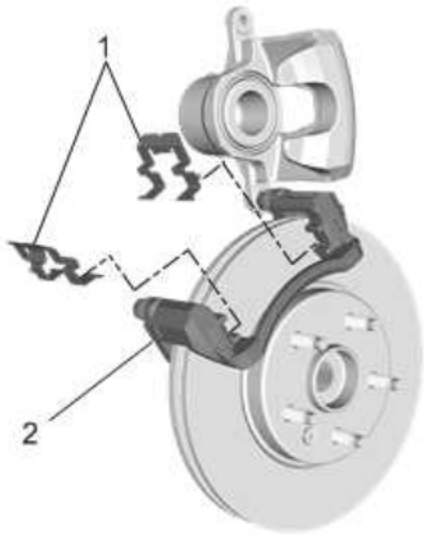


Fig. 17: Front Disc Brake Pad Retainer Spring
Courtesy of GENERAL MOTORS COMPANY

- 2. Install Front Disc Brake Pad Retainer Spring (1) @Front Brake Caliper Bracket (2)

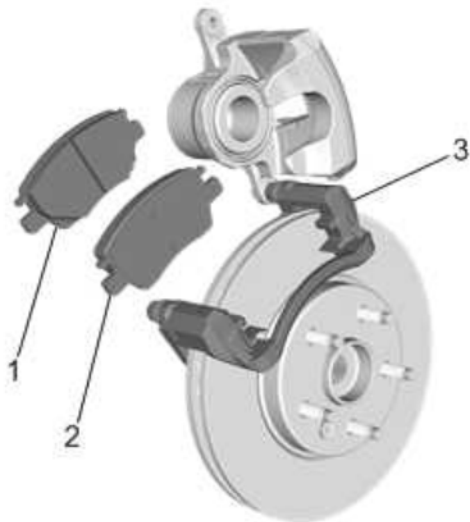


Fig. 18: Front Disc Brake Inner Pad
Courtesy of GENERAL MOTORS COMPANY

NOTE: The disc brake pad equipped with wear sensor has to be mounted in upper position on the inner side of the rotor.

- 3. Front Disc Brake Outer Pad (2) @Front Brake Caliper Bracket (3)
- 4. Front Disc Brake Inner Pad (1) @Front Brake Caliper Bracket (3)

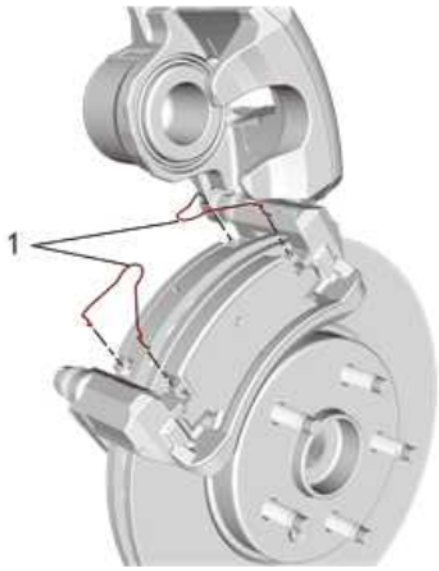


Fig. 19: Front Brake Caliper Spring
Courtesy of GENERAL MOTORS COMPANY

5. Install Front Brake Caliper Spring (1)



Fig. 20: Front Brake Caliper Guide Pin Bolt
Courtesy of GENERAL MOTORS COMPANY

6. Remove the support and rotate the front brake caliper into position over the disc brake pads and to the caliper mounting bracket.

CAUTION: [Fastener Caution](#)

NOTE: Install an open end wrench to hold the caliper guide pin in line with the brake caliper while removing or installing the caliper guide pin bolt.

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

REAR DISC BRAKE PADS REPLACEMENT

Removal Procedure

WARNING: [Brake Dust Warning](#)

WARNING: [Brake Fluid Irritant Warning](#)

CAUTION: [Brake Fluid Effects on Paint and Electrical Components Caution](#)

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

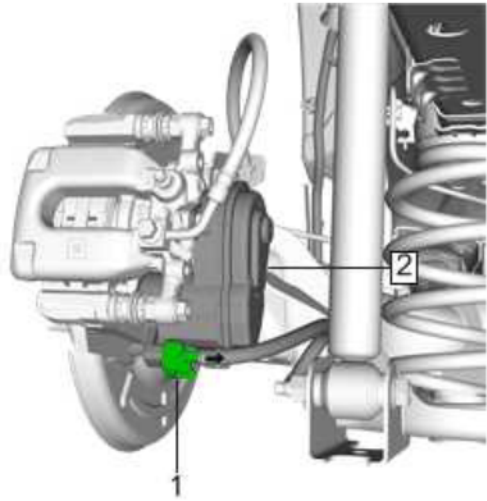


Fig. 21: Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

8. Disconnect Electrical Connector (1) @Rear Park Brake Actuator (2)

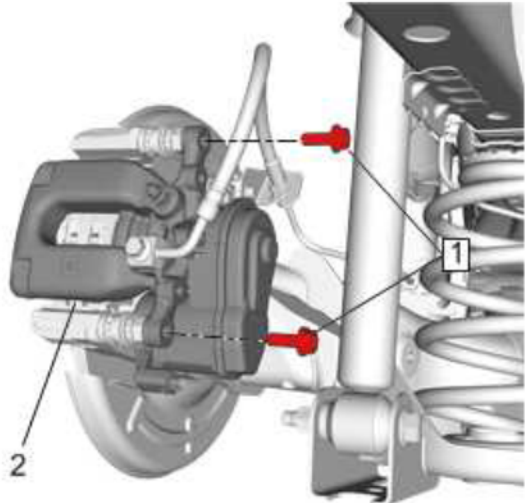


Fig. 22: Rear Brake Caliper Guide Pin Bolt
Courtesy of GENERAL MOTORS COMPANY

- NOTE:**
- Do NOT use any air tools to remove or install the brake caliper 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 the caliper guide pin bolt. Allowing the open end wrench to come in contact with the brake caliper will cause a pulsation when the brakes are applied.

9. Remove Rear Brake Caliper Guide Pin Bolt (1)

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

10. Remove the rear brake caliper (2) from the brake caliper bracket and support the rear brake caliper (2) with heavy mechanic's wire, or equivalent. Do NOT disconnect the hydraulic brake flexible hose from the caliper.

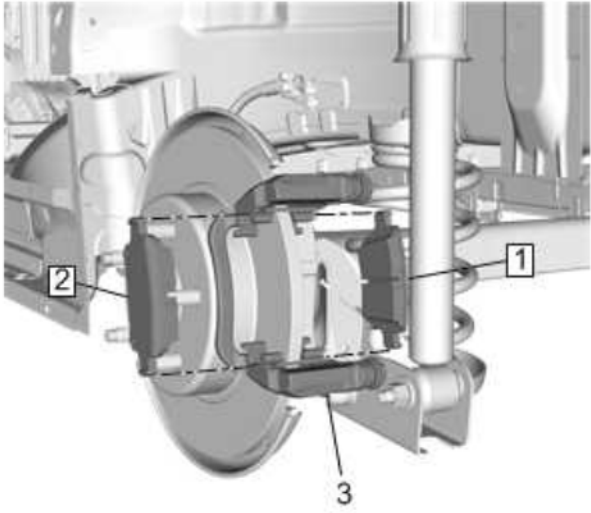


Fig. 23: Rear Disc Brake Inner Pad And Rear Brake Caliper Bracket
Courtesy of GENERAL MOTORS COMPANY

11. Remove Rear Disc Brake Inner Pad (1) @Rear Brake Caliper Bracket (3)
12. Remove Rear Disc Brake Outer Pad (2) @Rear Brake Caliper Bracket (3)

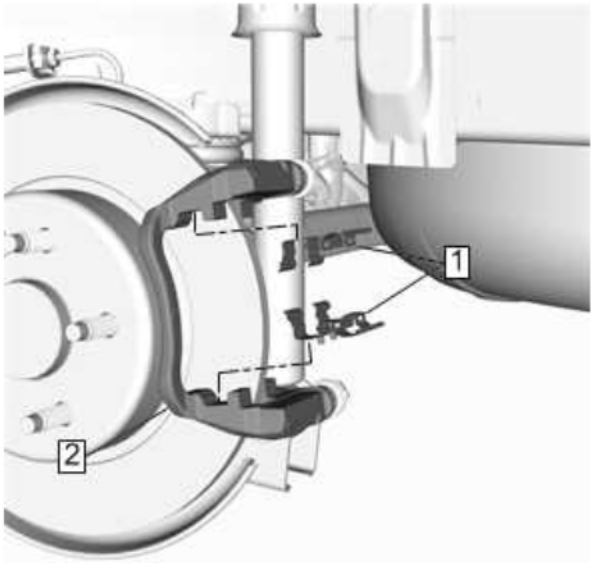


Fig. 24: Rear Disc Brake Pad Retainer Spring
Courtesy of GENERAL MOTORS COMPANY

13. Remove Rear Disc Brake Pad Retainer Spring (1) @Rear Brake Caliper Bracket (2)
14. Inspect the rear disc brake mounting and hardware. [Rear Disc Brake Mounting and Hardware Inspection](#)

Installation Procedure

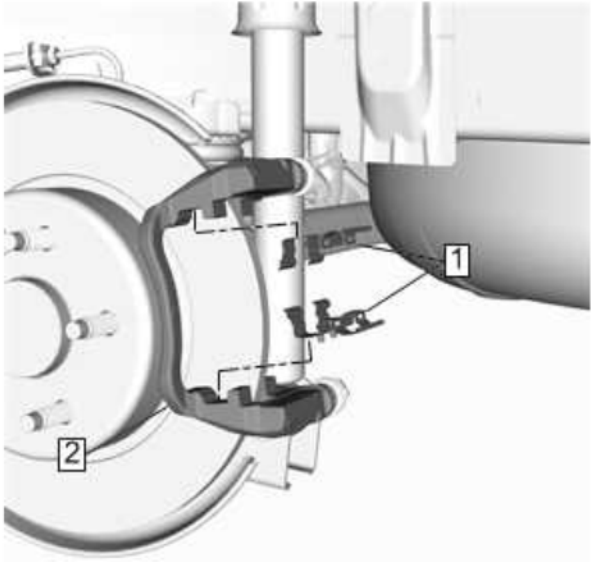


Fig. 25: Rear Disc Brake Pad Retainer Spring
Courtesy of GENERAL MOTORS COMPANY

1. Install Rear Disc Brake Pad Retainer Spring (1) @Rear Brake Caliper Bracket (2)

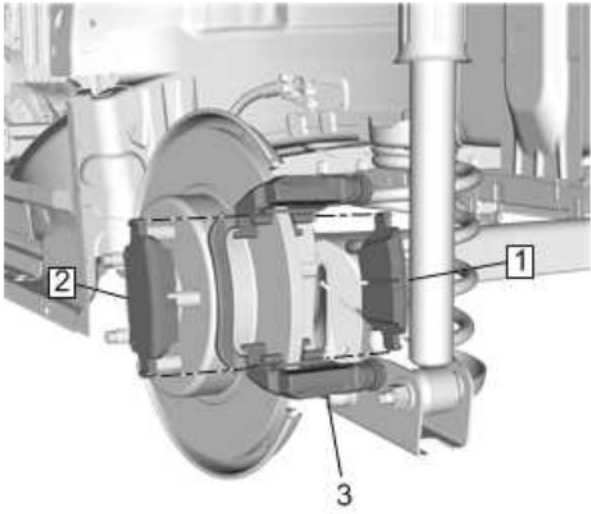


Fig. 26: Rear Disc Brake Inner Pad And Rear Brake Caliper Bracket
Courtesy of GENERAL MOTORS COMPANY

NOTE: The disc brake pad equipped with wear sensor has to be mounted in lower position on the inner side of the rotor.

2. Install Rear Disc Brake Outer Pad (2) @Rear Brake Caliper Bracket (3)
3. Install Rear Disc Brake Inner Pad (1) @Rear Brake Caliper Bracket (3)

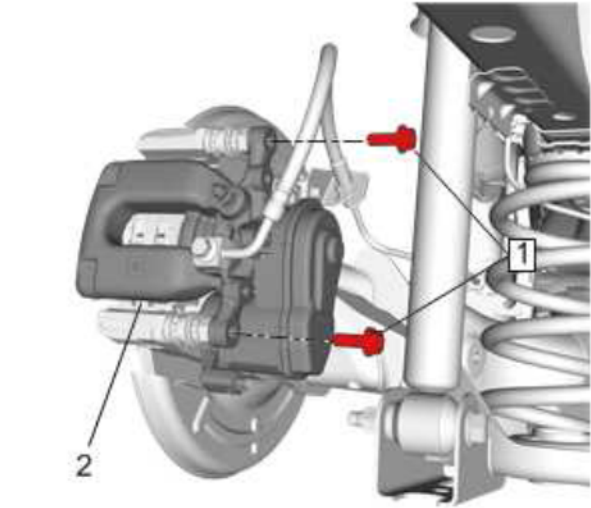


Fig. 27: Rear Brake Caliper Guide Pin Bolt
Courtesy of GENERAL MOTORS COMPANY

4. Remove the support and reposition the rear brake caliper (2) over the brake pads and to the rear brake caliper bracket.

CAUTION: [Fastener Caution](#)

NOTE: Install an open end wrench to hold the caliper guide pin in line with the brake caliper while removing or installing the caliper guide pin bolt.

5. Install Rear Brake Caliper Guide Pin Bolt (1) and tighten 35 N.m (26 lb ft)

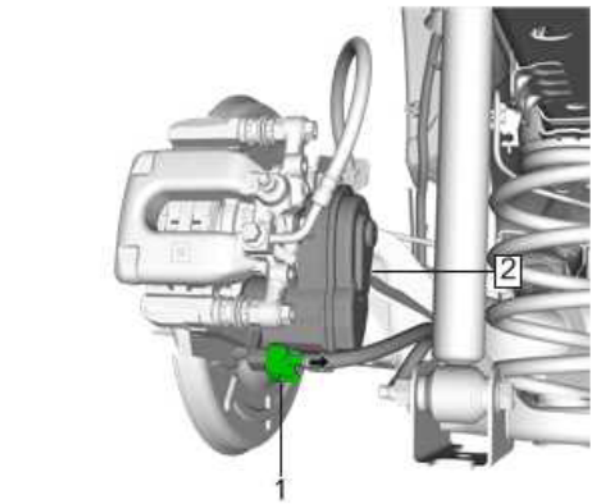


Fig. 28: Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

- 6. Connect Electrical Connector (1) @Rear Park Brake Actuator (2)
- 7. Install the rear tire and wheel assembly. [Tire and Wheel Removal and Installation](#)
- 8. Lower the vehicle.
- 9. With the vehicle OFF, gradually apply the brake pedal approximately 2/3 of its travel distance.
- 10. Slowly release the brake pedal.
- 11. Wait 15 seconds, then gradually apply the brake pedal approximately 2/3 of its travel distance again until a firm brake pedal apply is obtained. This will properly seat the brake caliper pistons and brake pads.
- 12. Inspect the fluid level in the brake master cylinder reservoir.
- 13. Fill the brake master cylinder reservoir to the maximum-full level with GM approved brake fluid from a clean, sealed brake fluid container: [Master Cylinder Reservoir Filling](#)
- 14. Calibrate the park brake. [Park Brake Calibration](#)
- 15. 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](#)

CAUTION: [Brake Fluid Effects on Paint and Electrical Components Caution](#)

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

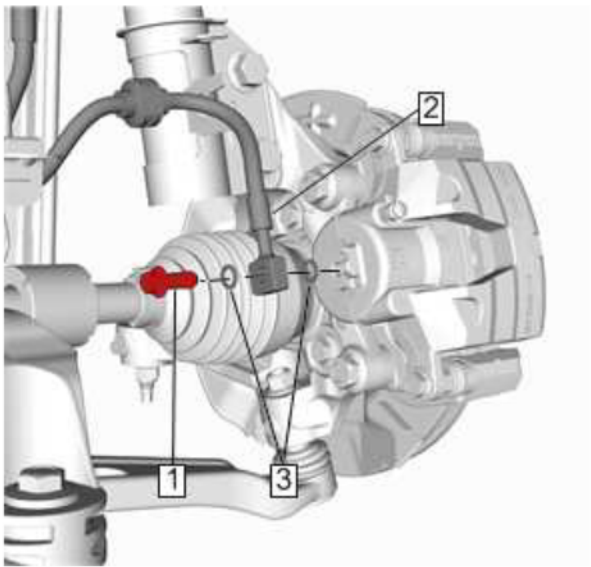


Fig. 29: Front Brake Hose, Fitting Bolt And Washer
Courtesy of GENERAL MOTORS COMPANY

- 3. Remove Front Brake Hose Fitting Bolt (1) @Front Brake Caliper
- 4. Remove Front Brake Hose (2) @Front Brake Caliper
- 5. Remove Front Brake Hose Washer (3) and DISCARD

NOTE: These washers may be stuck to the brake caliper and/or the brake hose end.

6. Cap the opening in the brake caliper and the brake hose to prevent fluid loss and contamination.

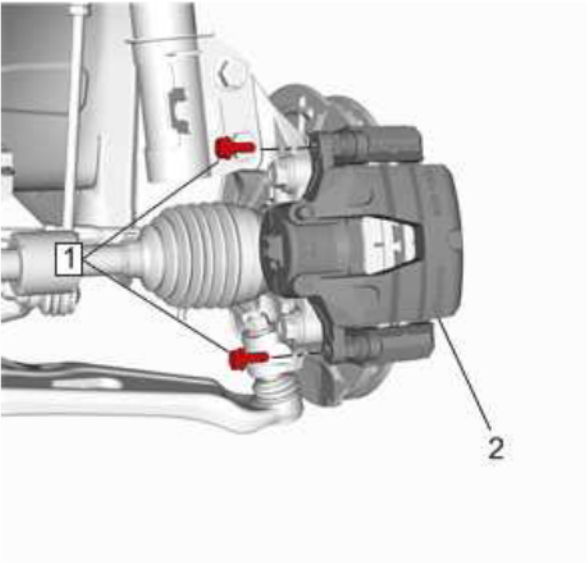


Fig. 30: Front Brake Caliper Guide Pin Bolt
Courtesy of GENERAL MOTORS COMPANY

- NOTE:**
- Do NOT use any air tools to remove or install the brake caliper 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 the caliper guide pin bolt. Allowing the open end wrench to come in contact with the brake caliper will cause a pulsation when the brakes are applied.

7. Remove Front Brake Caliper Guide Pin Bolt (1)
8. Remove Front Brake Caliper (2) @Front Brake Caliper Bracket
9. Inspect the brake caliper guide pins for freedom of movement, and inspect the condition of the guide pin boots. Move the guide pins inboard and outboard within the bracket bores, without disengaging the slides from the boots, and observe for the following:
 - Restricted caliper guide pin movement
 - Looseness in the brake caliper mounting bracket
 - Seized or binding caliper guide pins
 - Split or torn boots
10. If any of the conditions listed are found, the brake caliper guide pins and/or boots require replacement.

Installation Procedure

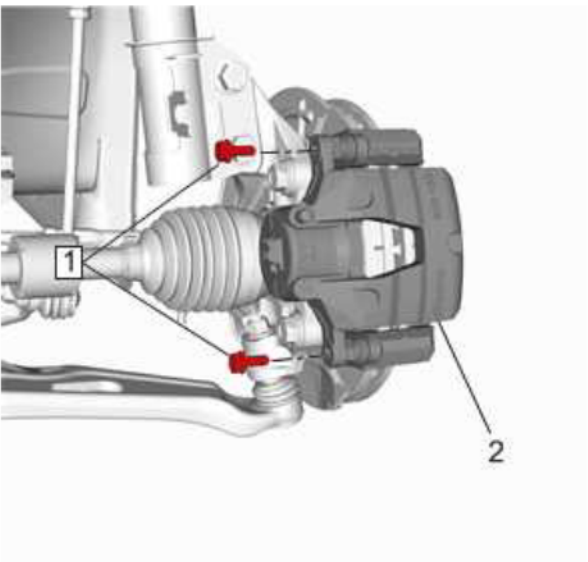


Fig. 31: Front Brake Caliper Guide Pin Bolt
Courtesy of GENERAL MOTORS COMPANY

1. Install Front Brake Caliper (1) @Front Brake Caliper Bracket

CAUTION: [Fastener Caution](#)

NOTE: Install an open end wrench to hold the caliper guide pin in line with the brake caliper while removing or installing the caliper guide pin bolt.

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

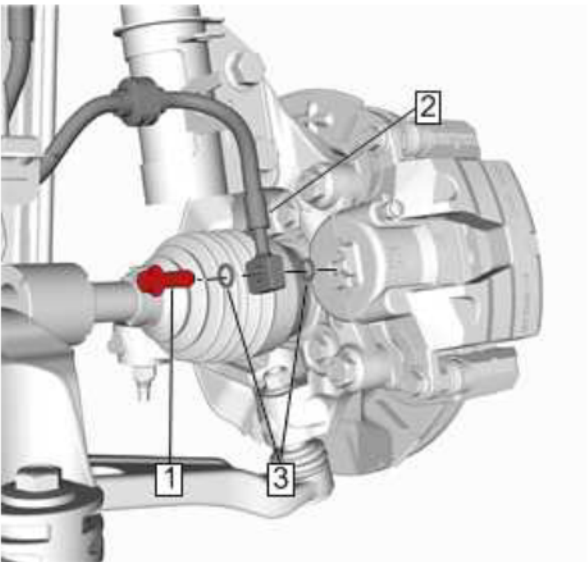


Fig. 32: Front Brake Hose, Fitting Bolt And Washer
Courtesy of GENERAL MOTORS COMPANY

3. Remove the caps from the brake caliper and the brake hose.

NOTE: Do not reuse the copper brake hose washers.

4. Install Front Brake Hose Washer (3)
5. Install Front Brake Hose (2) @Front Brake Caliper
6. Install Front Brake Hose Fitting Bolt (1) @Front Brake Caliper and tighten 40 N.m (30 lb ft)
7. Bleed the brake system. [Hydraulic Brake System Bleeding](#)
8. Install the front tire and wheel assembly. [Tire and Wheel Removal and Installation](#)
9. Lower the vehicle.
10. With the vehicle OFF, gradually apply the brake pedal to approximately 2/3 of its travel distance.
11. Slowly release the brake pedal.
12. Wait 15 seconds, then gradually apply the brake pedal approximately 2/3 of its travel distance again until a firm brake pedal apply is obtained. This will properly seat the brake caliper pistons and brake pads.

REAR BRAKE CALIPER REPLACEMENT

Removal Procedure

WARNING: [Brake Dust Warning](#)

WARNING: [Brake Fluid Irritant Warning](#)

CAUTION: [Brake Fluid Effects on Paint and Electrical Components Caution](#)

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

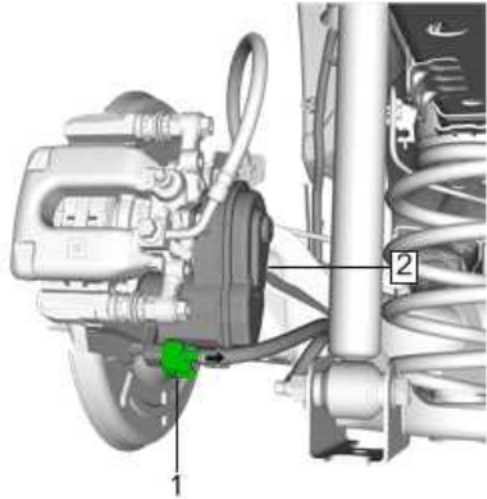


Fig. 33: Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

5. Disconnect Electrical Connector (1) @Rear Park Brake Actuator (2)

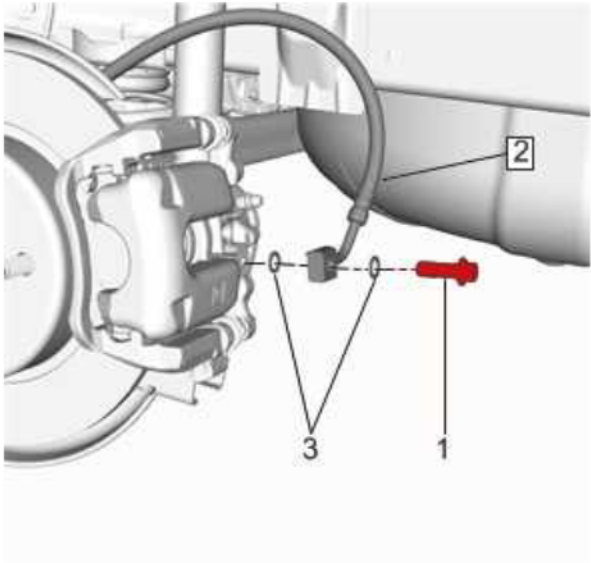


Fig. 34: Rear Brake Hose, Fitting Bolt And Washer
Courtesy of GENERAL MOTORS COMPANY

- 6. Remove Rear Brake Hose Fitting Bolt (1) @Rear Brake Caliper
- 7. Remove Rear Brake Hose (2) @Rear Brake Caliper
- 8. Remove Rear Brake Hose Washer (3) and DISCARD

NOTE: These washers may be stuck to the brake caliper and/or the brake hose end.

9. Cap the opening in the brake caliper and the brake hose to prevent fluid loss and contamination.

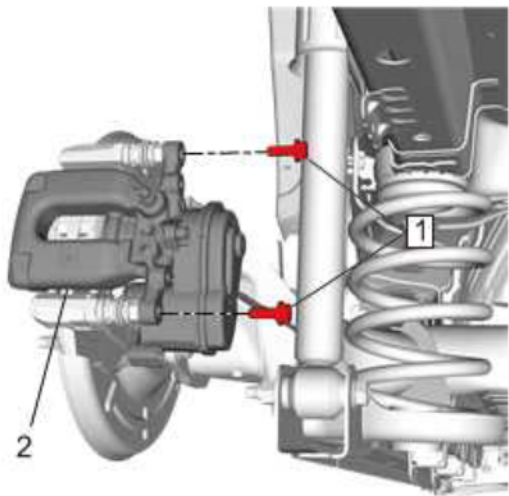


Fig. 35: Rear Brake Caliper Guide Pin Bolt
Courtesy of GENERAL MOTORS COMPANY

- NOTE:**
- Do NOT use any air tools to remove or install the brake caliper 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 the caliper guide pin bolt. Allowing the open end wrench to come in contact with the brake caliper will cause a pulsation when the brakes are applied.

- 10. Remove Rear Brake Caliper Guide Pin Bolt (1)
- 11. Remove Rear Brake Caliper (2) @Rear Brake Caliper Bracket
- 12. Inspect the brake caliper guide pins for freedom of movement, and inspect the condition of the guide pin boots. Move the guide pins inboard and outboard within the bracket bores, without disengaging the slides from the boots, and observe for the following:
 - Restricted caliper guide pin movement
 - Looseness in the brake caliper mounting bracket
 - Seized or binding caliper guide pins
 - Split or torn boots
- 13. If any of the conditions listed are found, the brake caliper guide pins and/or boots require replacement.
- 14. Remove Rear Parking Brake Actuator@Rear Brake Caliper [Rear Parking Brake Actuator Replacement](#)

Installation Procedure

- 1. Install Rear Parking Brake Actuator@Rear Brake Caliper [Rear Parking Brake Actuator Replacement](#)

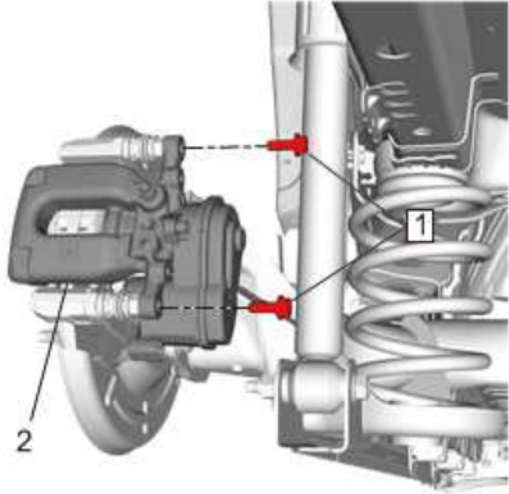


Fig. 36: Rear Brake Caliper Guide Pin Bolt
Courtesy of GENERAL MOTORS COMPANY

2. Install Rear Brake Caliper (2) @Rear Brake Caliper Bracket

CAUTION: [Fastener Caution](#)

NOTE: Install an open end wrench to hold the caliper guide pin in line with the brake caliper while removing or installing the caliper guide pin bolt.

3. Install Rear Brake Caliper Guide Pin Bolt (1) and tighten 35 N.m (26 lb ft)

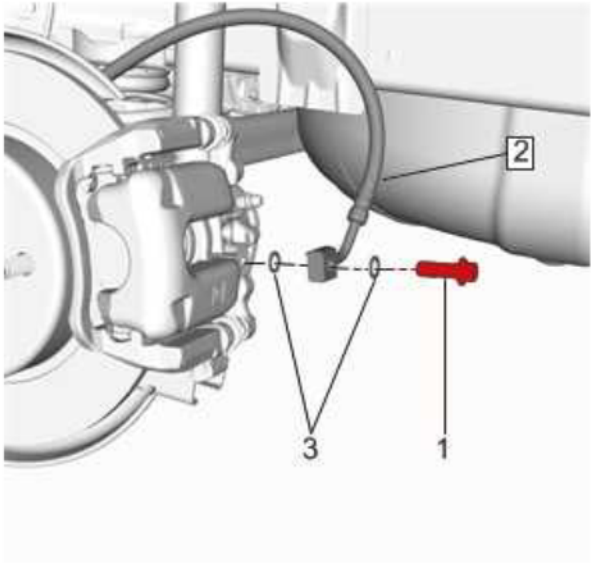


Fig. 37: Rear Brake Hose, Fitting Bolt And Washer
Courtesy of GENERAL MOTORS COMPANY

4. Remove the caps from the brake caliper and the brake hose.

NOTE: Do not reuse the copper brake hose washers.

- 5. Install Rear Brake Hose Washer (3)
- 6. Install Rear Brake Hose (2) @Rear Brake Caliper
- 7. Install Rear Brake Hose Fitting Bolt (1) @Rear Brake Caliper and tighten 40 N.m (30 lb ft)

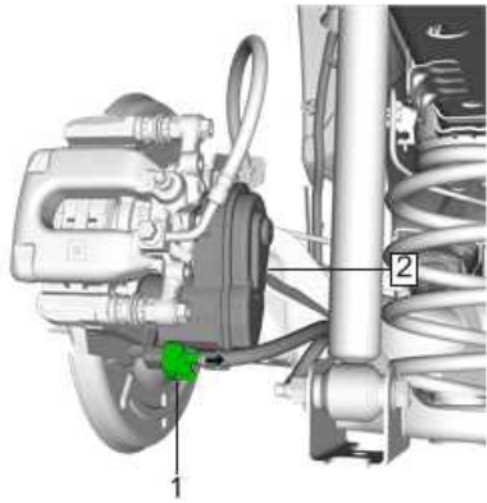


Fig. 38: Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

- 8. Connect Electrical Connector (1) @Rear Park Brake Actuator (2)
- 9. Bleed the brake system. [Hydraulic Brake System Bleeding](#)
- 10. Install the rear tire and wheel assembly. [Tire and Wheel Removal and Installation](#)
- 11. Lower the vehicle.
- 12. With the vehicle OFF, gradually apply the brake pedal approximately 2/3 of its travel distance.
- 13. Slowly release the brake pedal.
- 14. Wait 15 seconds, then gradually apply the brake pedal approximately 2/3 of its travel distance again until a firm brake pedal apply is obtained. This will properly seat the brake caliper pistons and brake pads.
- 15. Calibrate the park brake. [Park Brake Calibration](#)

FRONT BRAKE CALIPER OVERHAUL

WARNING: Refer to [Brake Fluid Irritant Warning](#) .

WARNING: Refer to [Brake Dust Warning](#) .

CAUTION: Refer to [Brake Fluid Effects on Paint and Electrical Components Caution](#) .

Disassembly Procedure

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

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

- 1. Remove the brake caliper from the vehicle. [Front Brake Caliper Replacement](#)
- 2. Drain the brake fluid from the brake caliper.

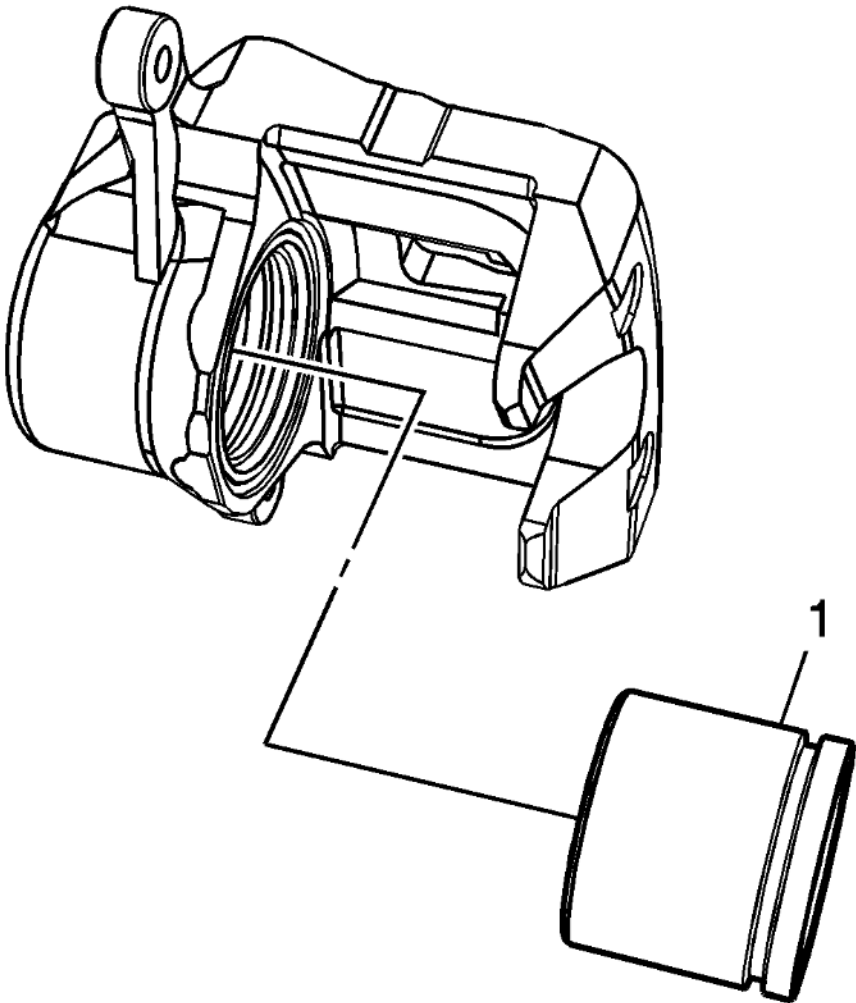


Fig. 39: Brake Caliper Piston
Courtesy of GENERAL MOTORS COMPANY

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

- 3. Place a 25 mm (1 in) block of wood between the caliper housing and the piston.
- 4. Place clean shop cloths between the caliper piston and the block of wood.
- 5. Carefully remove the brake caliper piston (1) by directing low pressure compressed air into the brake caliper inlet hole.
- 6. Remove the shop cloths and the block of wood from the caliper.

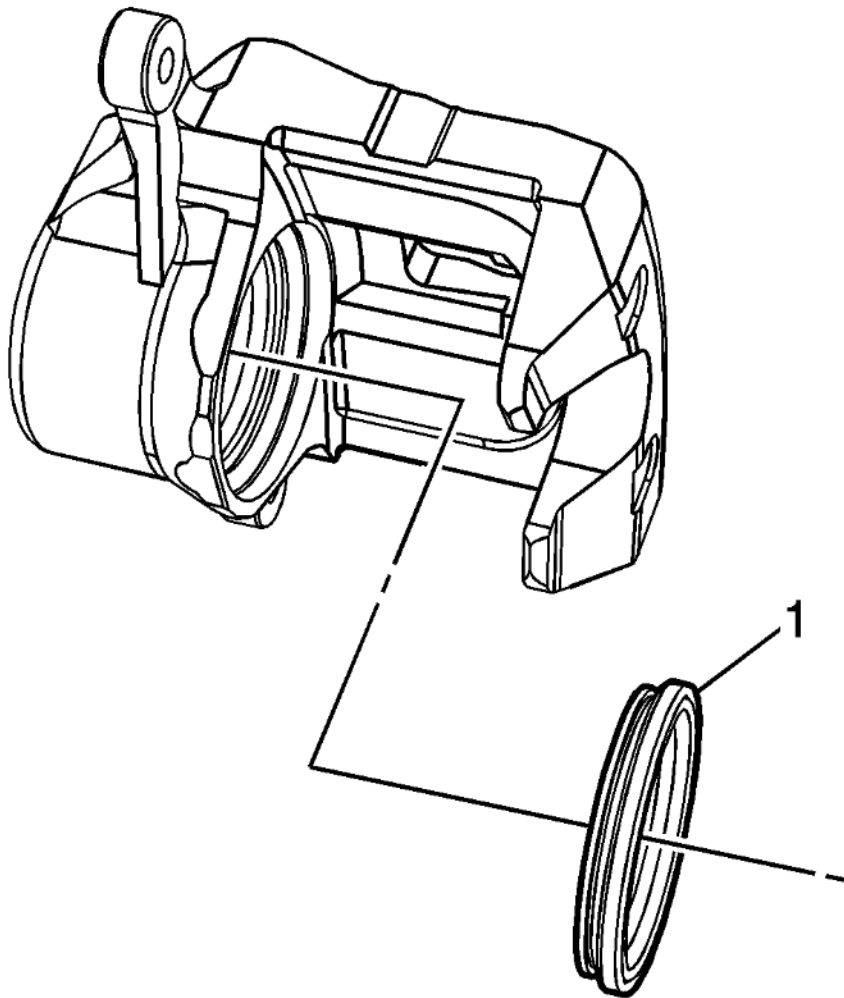


Fig. 40: Piston Dust Boot Seal
Courtesy of GENERAL MOTORS COMPANY

- 7. Remove the piston dust boot seal (1) from the seal counterbore in the brake caliper and discard the dust boot seal.

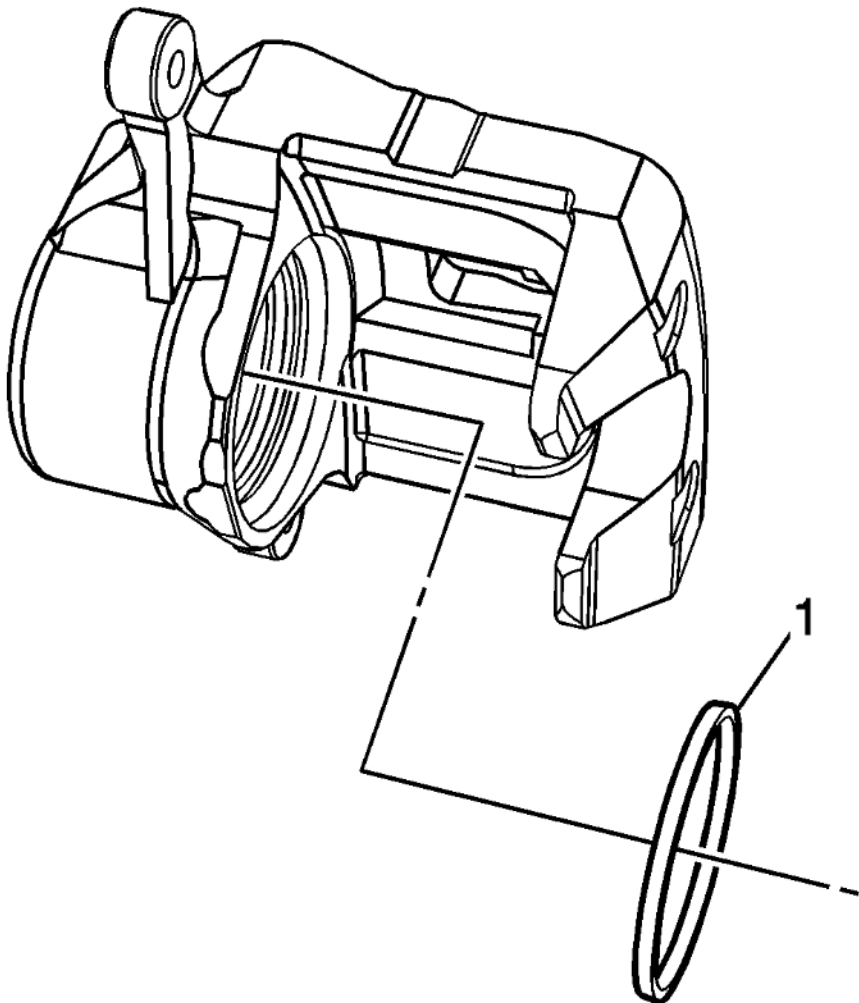


Fig. 41: Piston Seal
Courtesy of GENERAL MOTORS COMPANY

- 8. Using a small wooden or plastic tool, remove the piston seal (1) from the brake caliper bore and discard the piston seal.

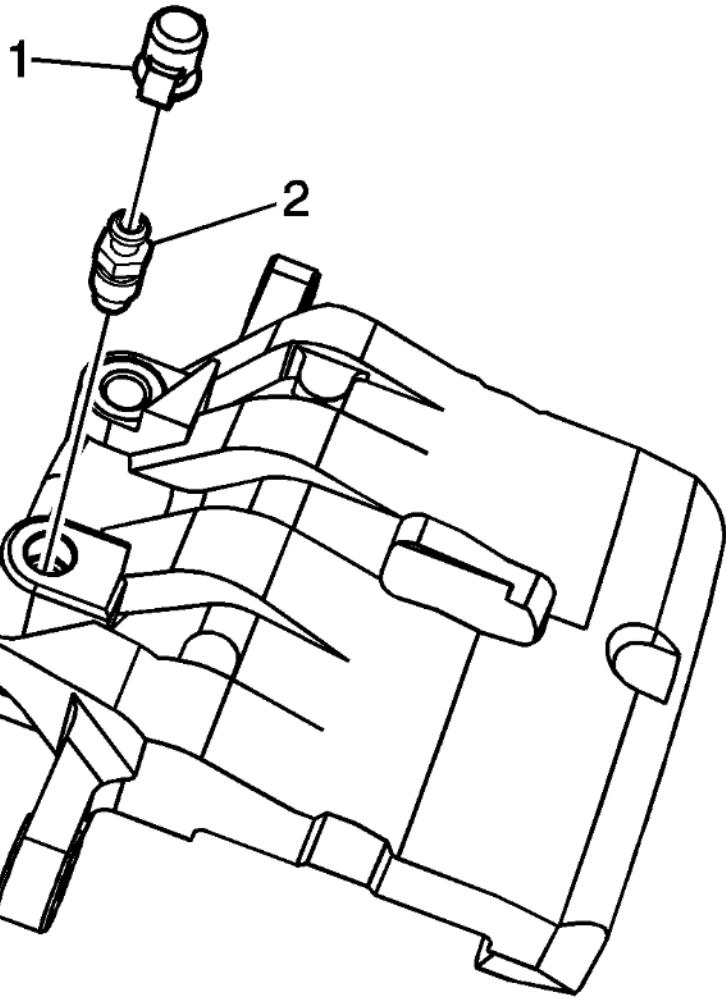


Fig. 42: Brake Caliper Bleeder Valve & Cap
Courtesy of GENERAL MOTORS COMPANY

- 9. Remove the brake caliper bleeder valve cap (1) and bleeder valve (2).

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

- 10. Inspect the brake caliper mounting bracket guide surfaces for corrosion and wear. Remove and replace the brake caliper mounting bracket if damaged or worn.
- 11. Clean the brake caliper piston bores and seal counterbore with denatured alcohol, or equivalent.
- 12. Clean the brake caliper piston with denatured alcohol, or equivalent.
- 13. Dry the caliper piston bore and counterbore with non-lubricated, filtered air.

- 14. Dry the brake caliper piston with non-lubricated, filtered air.
- 15. Inspect the caliper bore for cracks, scoring, pitting, excessive corrosion.
- 16. If light corrosion is 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.
- 17. If cracks, scoring, pitting, and excessive corrosion are present in the caliper bore, replace the caliper assembly.
- 18. Inspect the caliper piston for cracks, scoring, and/or damage. Replace the caliper piston if any of these conditions exist.

Assembly Procedure

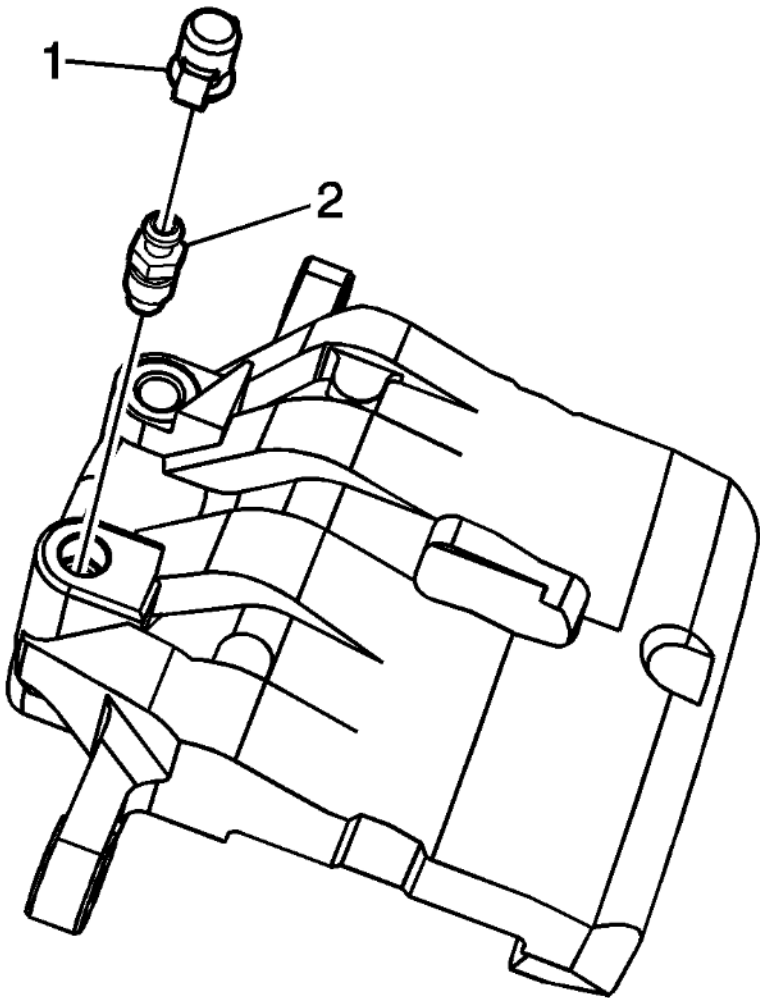


Fig. 43: Brake Caliper Bleeder Valve & Cap
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

- 1. Install the brake caliper bleeder valve (2) and tighten to 10 N.m (89 lb in).
- 2. Install the brake caliper bleeder valve cap (1).

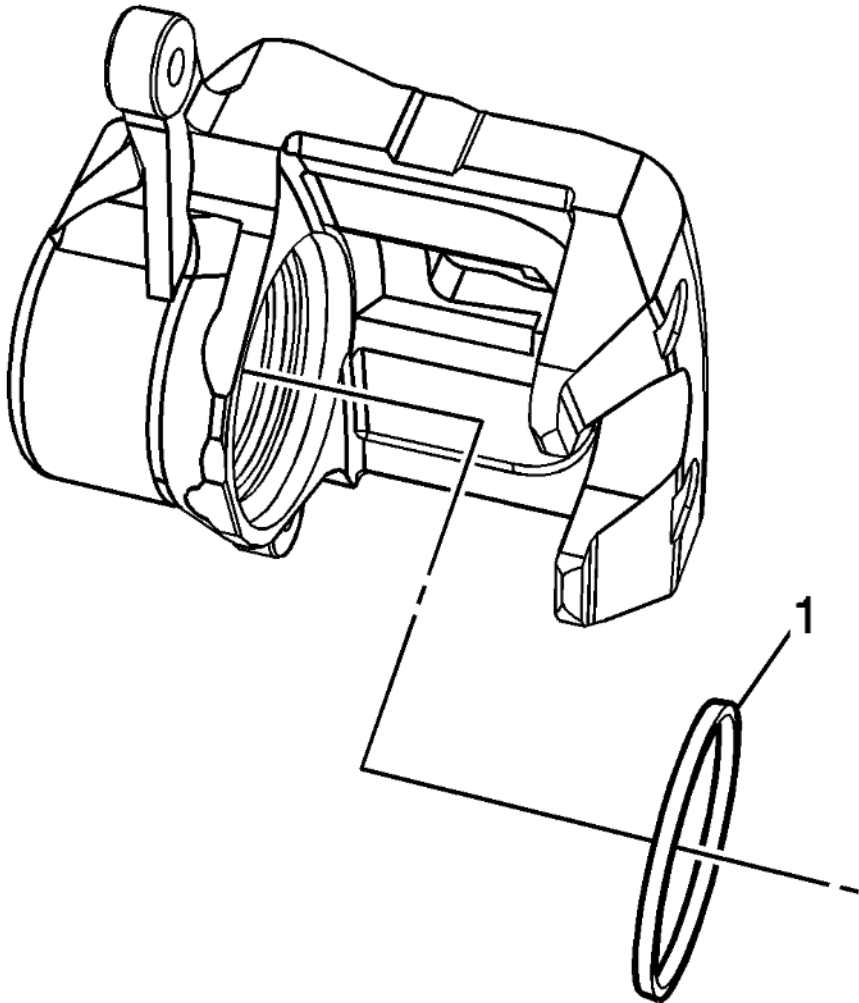


Fig. 44: Piston Seal
Courtesy of GENERAL MOTORS COMPANY

- 3. Lubricate the new piston seal (1) with GM approved brake fluid from a clean, sealed brake fluid container.
- 4. Install lubricated piston seal into the brake caliper bore seal groove.

Ensure the seal is not twisted.

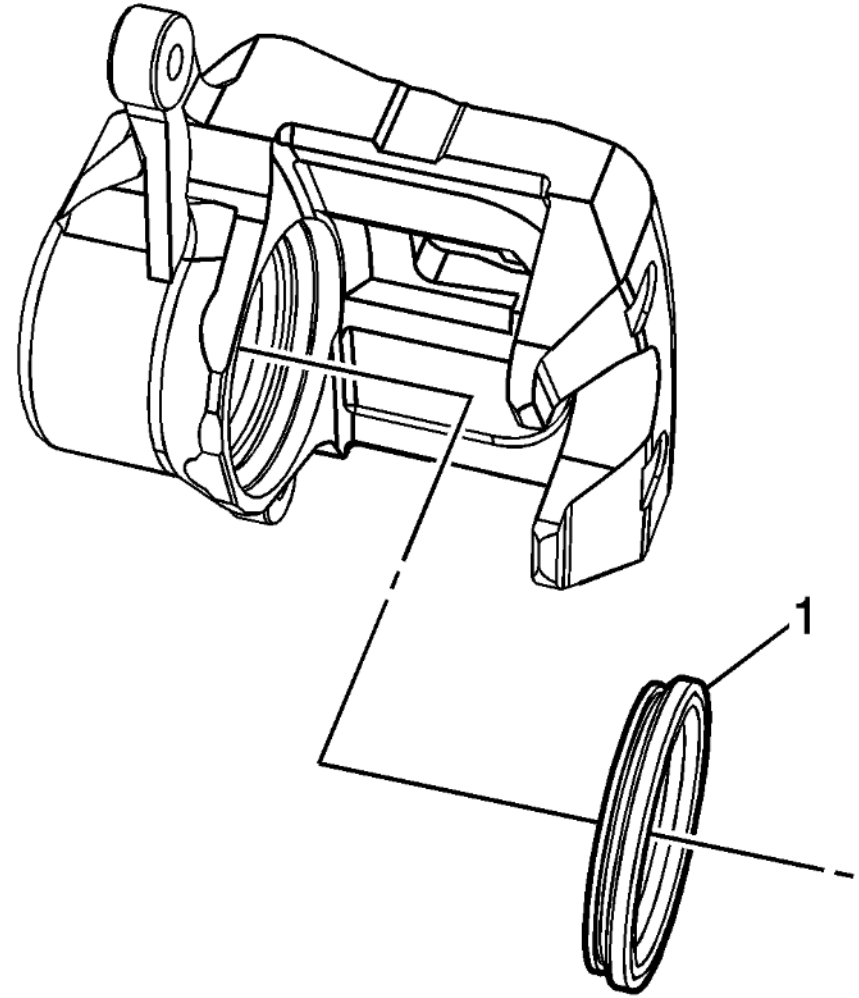


Fig. 45: Piston Dust Boot Seal
Courtesy of GENERAL MOTORS COMPANY

5. Install the piston dust boot seal (1) to the caliper.

Ensure the seal is seated evenly and completely into the groove in the caliper housing.

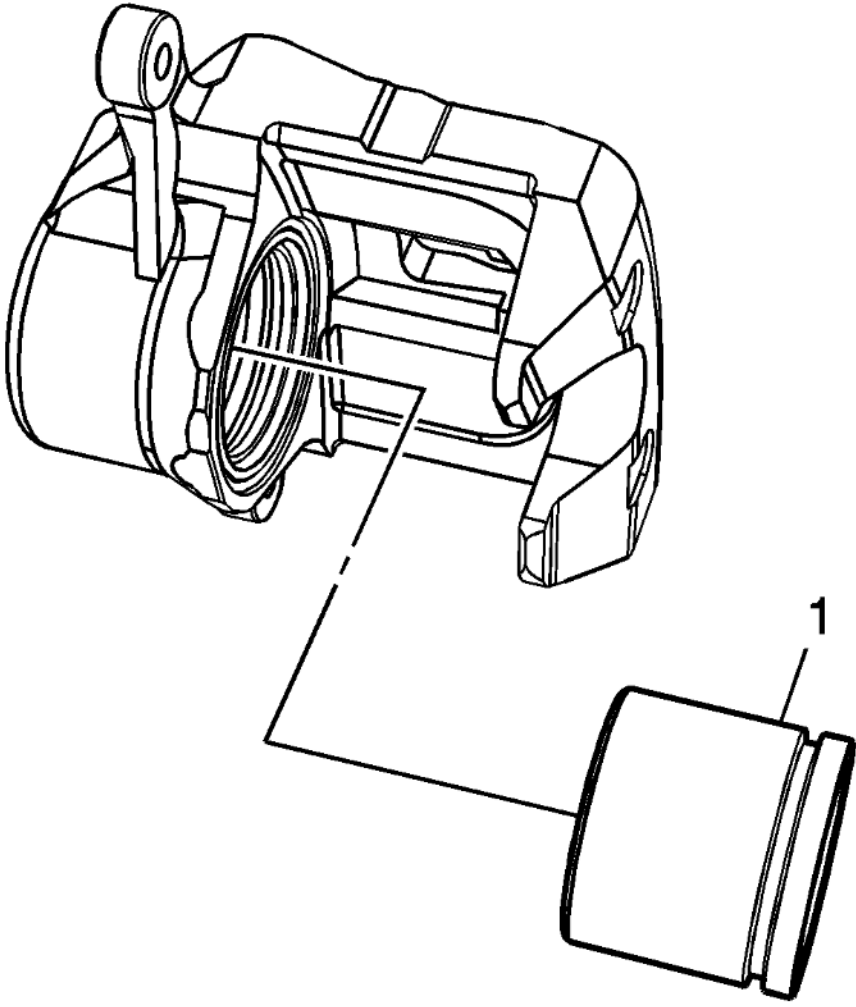


Fig. 46: Brake Caliper Piston
Courtesy of GENERAL MOTORS COMPANY

- 6. Place the caliper piston into the caliper housing by carefully lifting the edge of the dust boot seal.
- 7. Carefully push the piston (1) squarely into the brake caliper bore.
- 8. Ensure the caliper dust boot is properly seated into the piston groove and into the groove in the brake caliper bore.
- 9. Install the brake caliper to the vehicle. [Front Brake Caliper Replacement](#)

FRONT BRAKE CALIPER BRACKET REPLACEMENT

Removal Procedure

WARNING: Refer to [Brake Dust Warning](#) .

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

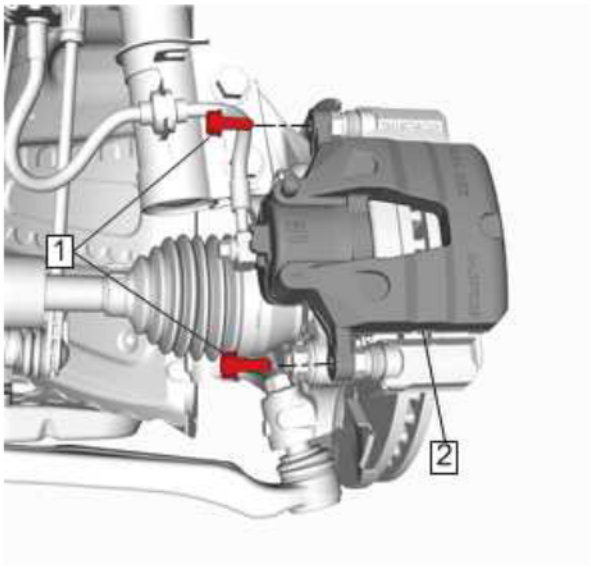


Fig. 47: Front Brake Caliper Guide Pin Bolt
Courtesy of GENERAL MOTORS COMPANY

NOTE:

- Do NOT use any air tools to remove or install the brake caliper 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 the caliper guide pin bolt. Allowing the open end wrench to come in contact with the brake caliper will cause a pulsation when the brakes are applied.

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

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

4. Remove the front brake caliper (2) from the front brake caliper bracket and support the front brake caliper (2) with heavy mechanic's wire, or equivalent. Do NOT disconnect the hydraulic brake flexible hose from the caliper.

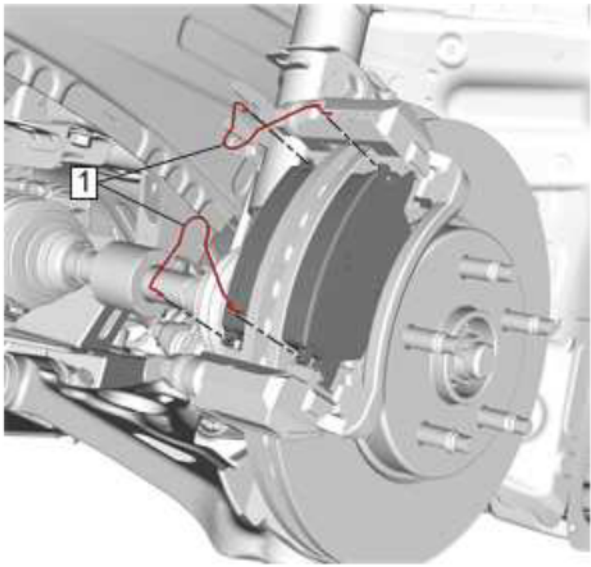


Fig. 48: Front Brake Caliper Spring
Courtesy of GENERAL MOTORS COMPANY

5. Remove Front Brake Caliper Spring (1)

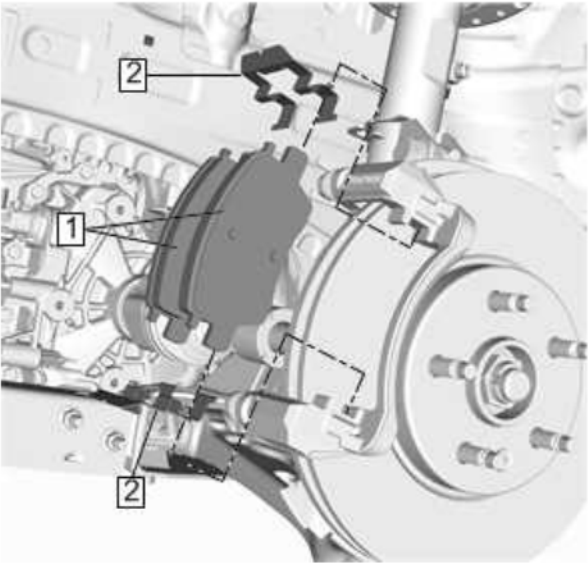


Fig. 49: Front Disc Brake Pad And Front Disc Brake Pad Retainer Spring
Courtesy of GENERAL MOTORS COMPANY

- 6. Remove Front Disc Brake Pad (1) @Front Brake Caliper Bracket
- 7. Remove Front Disc Brake Pad Retainer Spring (2) @Front Brake Caliper Bracket

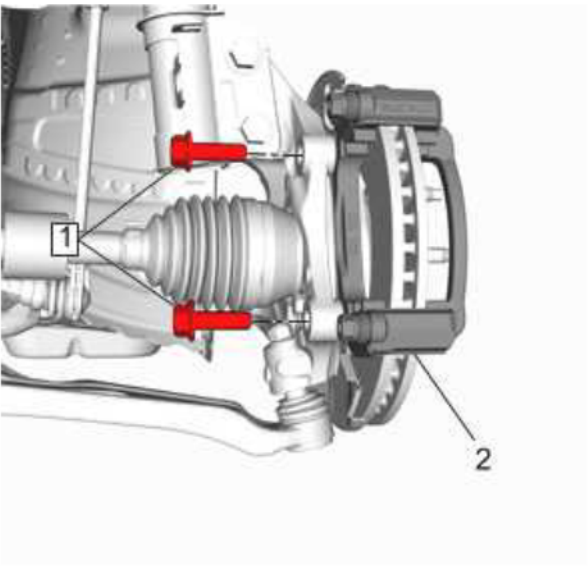


Fig. 50: Front Brake Caliper Bracket And Bolt
Courtesy of GENERAL MOTORS COMPANY

NOTE: The brake caliper mounting bracket bolts must not be used. Replace the bolts with new bolts whenever the bolts are removed or become loose.

- 8. Remove Front Brake Caliper Bracket Bolt (1) and DISCARD
- 9. Remove Front Brake Caliper Bracket (2) @Steering Knuckle

Installation Procedure

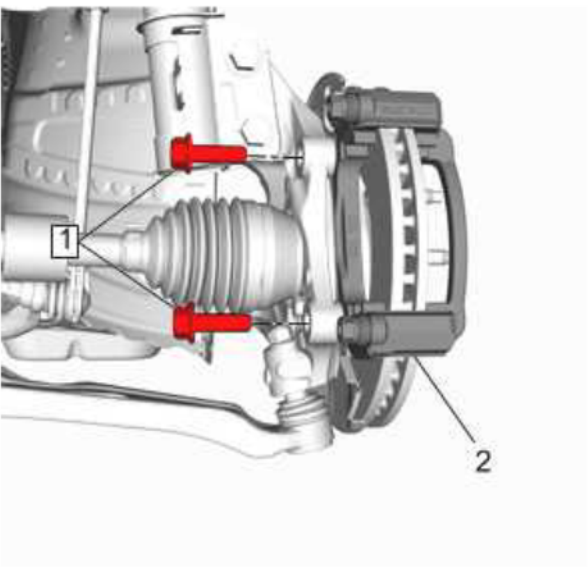


Fig. 51: Front Brake Caliper Bracket And Bolt
Courtesy of GENERAL MOTORS COMPANY

- 1. Install Front Brake Caliper Bracket (2) @Steering Knuckle
- CAUTION:** Refer to **Fastener Caution** .
- 2. Install Front Brake Caliper Bracket Bolt (1) and tighten 160 N.m (118 lb ft)
- Install NEW bolts. Do NOT reuse old bolts.

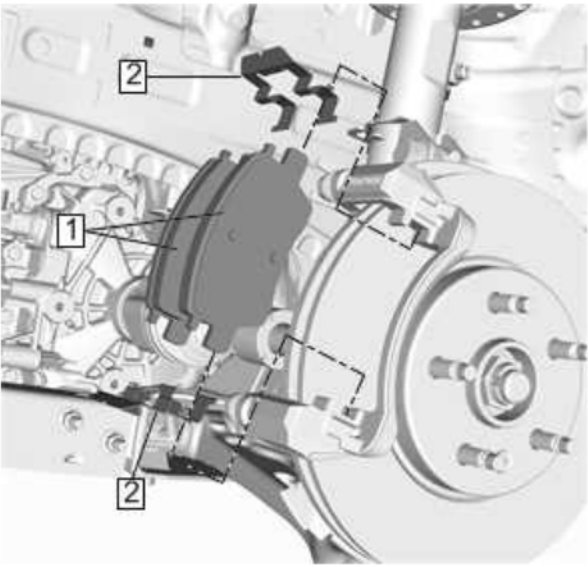


Fig. 52: Front Disc Brake Pad And Front Disc Brake Pad Retainer Spring
Courtesy of GENERAL MOTORS COMPANY

- 3. Install Front Disc Brake Pad Retainer Spring (2) @Front Brake Caliper Bracket

NOTE: The disc brake pad equipped with wear sensor has to be mounted in upper position on the inner side of the rotor.

- 4. Install Front Disc Brake Pad (1) @Front Brake Caliper Bracket

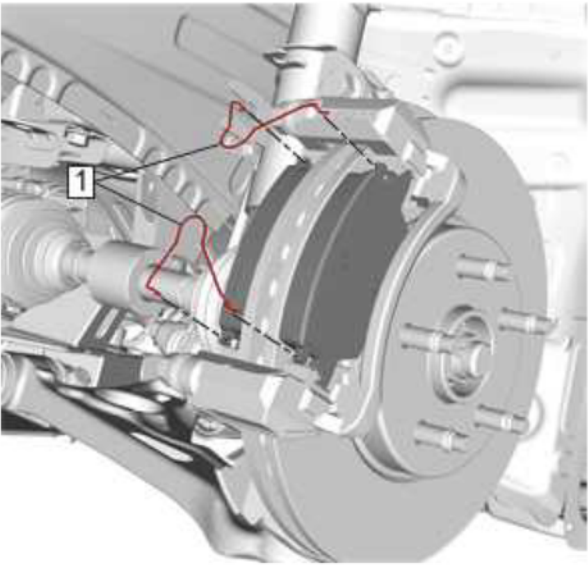


Fig. 53: Front Brake Caliper Spring
Courtesy of GENERAL MOTORS COMPANY

5. Install Front Brake Caliper Spring (1)

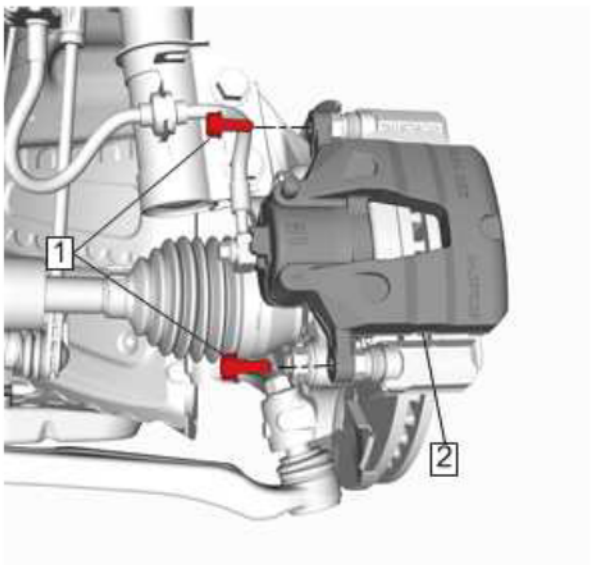


Fig. 54: Front Brake Caliper Guide Pin Bolt
Courtesy of GENERAL MOTORS COMPANY

6. Remove the support and reposition the front brake caliper (2) over the brake pads and to the front brake caliper bracket.

NOTE: Install an open end wrench to hold the caliper guide pin in line with the brake caliper while removing or installing the caliper guide pin bolt.

- 7. Install Front Brake Caliper Guide Pin Bolt (1) and tighten 40 N.m (30 lb ft)
- 8. Install the front tire and wheel assembly. [Tire and Wheel Removal and Installation](#)
- 9. Lower the vehicle.

REAR BRAKE CALIPER BRACKET REPLACEMENT

Removal Procedure

WARNING: Refer to [Brake Dust Warning](#) .

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

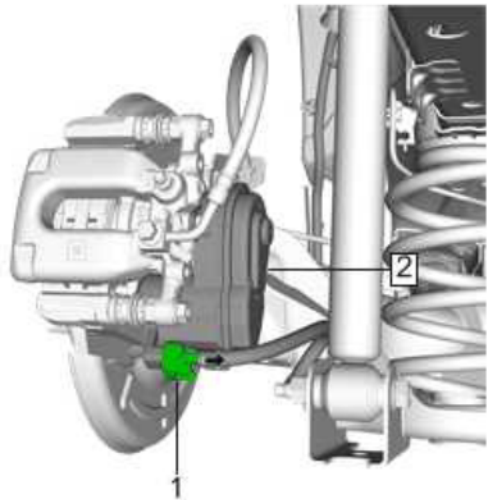


Fig. 55: Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

5. Disconnect Electrical Connector (1) @Rear Park Brake Actuator (2)

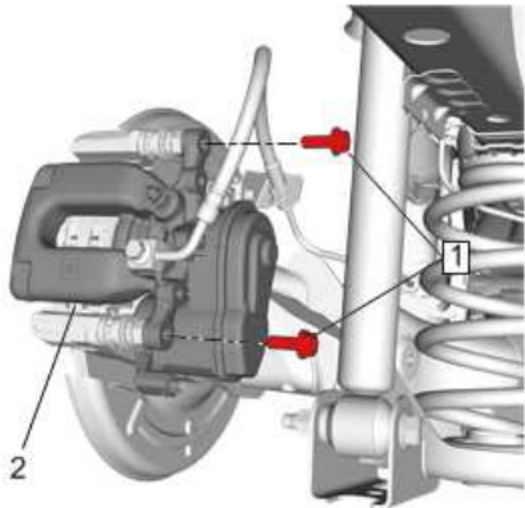


Fig. 56: Rear Brake Caliper Guide Pin Bolt
Courtesy of GENERAL MOTORS COMPANY

NOTE:

- Do NOT use any air tools to remove or install the brake caliper 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 the caliper guide pin bolt. Allowing the open end wrench to come in contact with the brake caliper will cause a pulsation when the brakes are applied.

6. Remove Rear Brake Caliper Guide Pin Bolt (1)

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

7. Remove the rear brake caliper (2) from the brake caliper bracket and support the rear brake caliper (2) with heavy mechanic's wire, or equivalent. Do NOT disconnect the hydraulic brake flexible hose from the caliper.

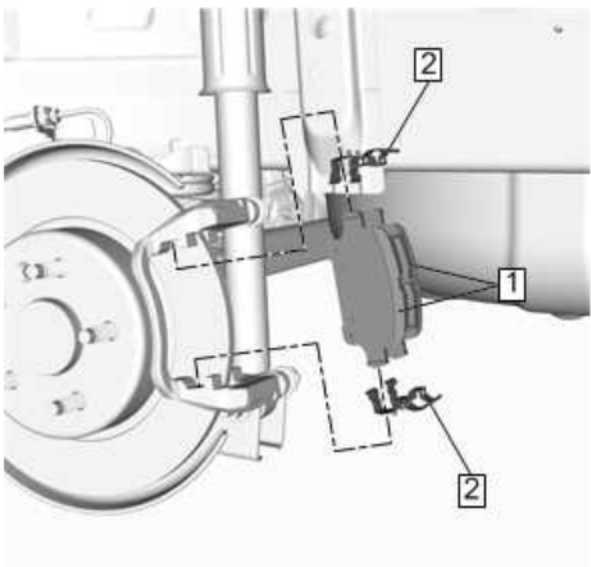


Fig. 57: Rear Disc Brake Pad
Courtesy of GENERAL MOTORS COMPANY

- 8. Remove Rear Disc Brake Pad (1) @Rear Brake Caliper Bracket
- 9. Remove Rear Disc Brake Pad Retainer Spring (2) @Rear Brake Caliper Bracket

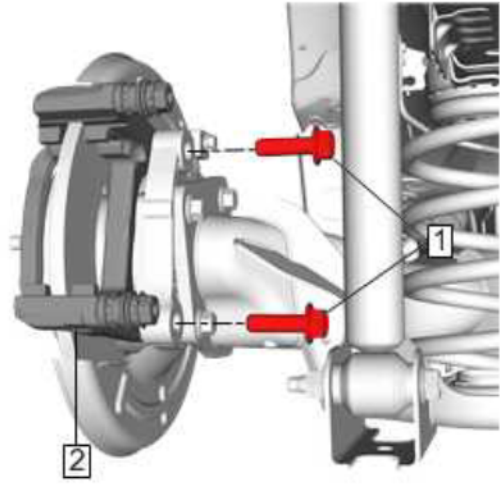


Fig. 58: Brake Caliper Bracket And Bolt
Courtesy of GENERAL MOTORS COMPANY

NOTE: The brake caliper mounting bracket bolts must not be used. Replace the bolts with new bolts whenever the bolts are removed or become loose.

- 10. Remove Rear Brake Caliper Bracket Bolt (1) and DISCARD
- 11. Remove Rear Brake Caliper Bracket (2) @Vehicle

Installation Procedure

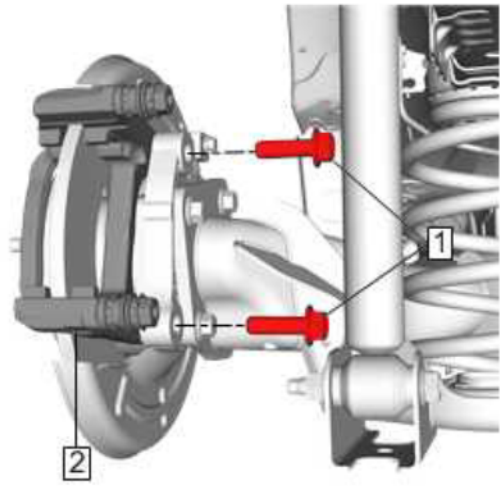


Fig. 59: Brake Caliper Bracket And Bolt
Courtesy of GENERAL MOTORS COMPANY

- 1. Install Rear Brake Caliper Bracket (2)@Vehicle

CAUTION: Refer to **Fastener Caution** .

- 2. Install Rear Brake Caliper Bracket Bolt (1) and tighten 100 N.m (74 lb ft)
Install NEW bolts. Do NOT reuse old bolts.

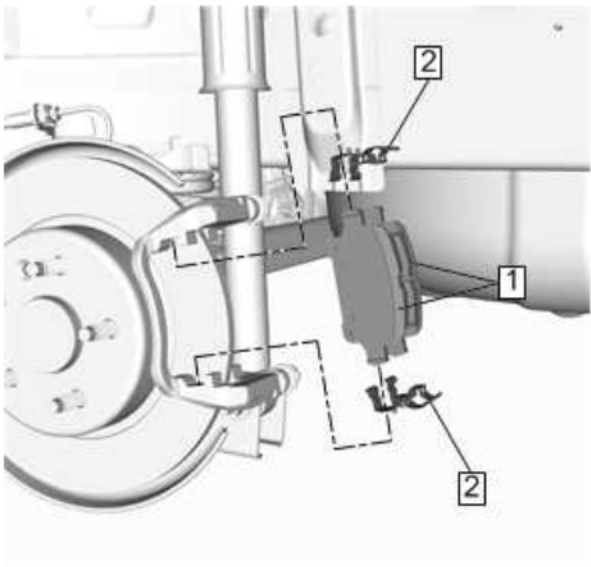


Fig. 60: Rear Disc Brake Pad
Courtesy of GENERAL MOTORS COMPANY

- 3. Install Rear Disc Brake Pad Retainer Spring (2) @Rear Brake Caliper Bracket

NOTE: The disc brake pad equipped with wear sensor has to be mounted in lower position on the inner side of the rotor.

- 4. Install Rear Disc Brake Pad (1) @Rear Brake Caliper Bracket

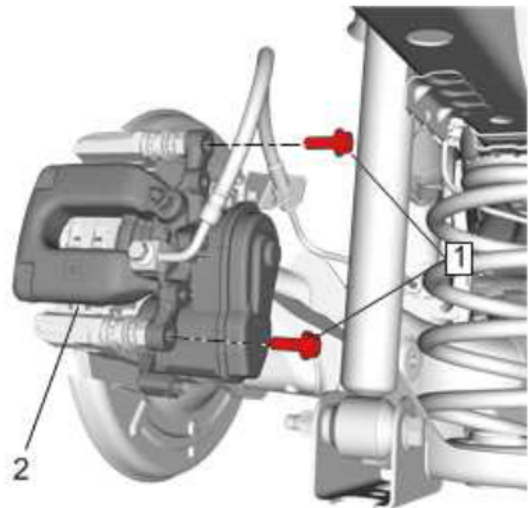
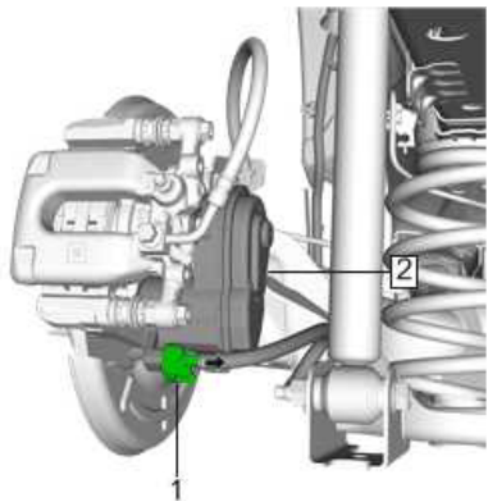


Fig. 61: Rear Brake Caliper Guide Pin Bolt
Courtesy of GENERAL MOTORS COMPANY

- 5. Remove the support and reposition the rear brake caliper (2) over the brake pads and to the rear brake caliper bracket.

NOTE: Install an open end wrench to hold the caliper guide pin in line with the brake caliper while removing or installing the caliper guide pin bolt.

- 6. Install Rear Brake Caliper Guide Pin Bolt (1) and tighten 35 N.m (26 lb ft)



[Fig. 62: Electrical Connector](#)
Courtesy of GENERAL MOTORS COMPANY

- 7. Connect Electrical Connector (1) @Rear Park Brake Actuator (2)
- 8. Install the rear tire and wheel assembly. [Tire and Wheel Removal and Installation](#)
- 9. Lower the vehicle.
- 10. With the vehicle OFF, gradually apply the brake pedal approximately 2/3 of its travel distance.
- 11. Slowly release the brake pedal.
- 12. Wait 15 seconds, then gradually apply the brake pedal approximately 2/3 of its travel distance again until a firm brake pedal apply is obtained. This will properly seat the brake caliper pistons and brake pads.
- 13. Calibrate the park brake. [Park Brake Calibration](#)

FRONT BRAKE ROTOR REPLACEMENT

Special Tools

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

For equivalent regional tools, refer to [Special Tools](#).

Removal Procedure

WARNING: Refer to [Brake Dust Warning](#) .

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

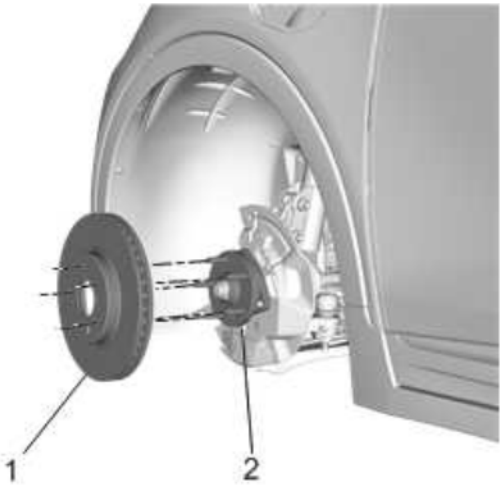
CAUTION: Support the brake caliper with heavy mechanic wire, or equivalent, whenever it is separated from its mount and the hydraulic flexible brake hose is still connected. Failure to support the caliper in this manner will cause the flexible brake hose to bear the weight of the caliper, which may cause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

- 3. Remove the front brake caliper from the front brake caliper bracket and support the front brake caliper with heavy mechanic's wire, or equivalent. Do NOT disconnect the hydraulic brake flexible hose from the caliper. [Front Brake Caliper Replacement](#)
- 4. Remove Front Brake Caliper Bracket@Steering Knuckle [Front Brake Caliper Bracket Replacement](#)



[Fig. 63: Front Brake Rotor Bolt](#)
Courtesy of GENERAL MOTORS COMPANY

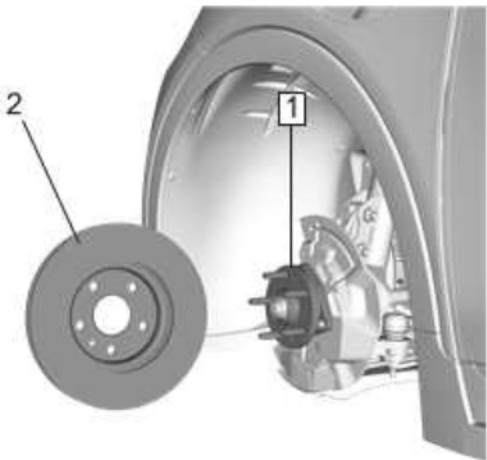
- 5. Remove Front Brake Rotor Bolt (1)



[Fig. 64: Front Brake Rotor And Front Wheel Hub](#)
Courtesy of GENERAL MOTORS COMPANY

- 6. Remove Front Brake Rotor (1) @Front Wheel Hub (2)

Installation Procedure



[Fig. 65: NO CONTENT](#)
Courtesy of GENERAL MOTORS COMPANY

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

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

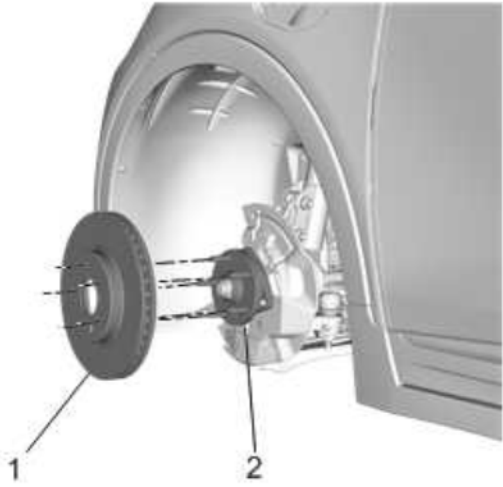


Fig. 66: Front Brake Rotor And Front Wheel Hub
Courtesy of GENERAL MOTORS COMPANY

4. Install Front Brake Rotor (1) @Front Wheel Hub (2)



Fig. 67: Front Brake Rotor Bolt
Courtesy of GENERAL MOTORS COMPANY

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

- 5. Install Front Brake Rotor Bolt (1) and tighten 9 N.m (80 lb in)
- 6. Install Front Brake Caliper Bracket@Steering Knuckle [Front Brake Caliper Bracket Replacement](#)
- 7. Remove the support and install the front brake caliper to the front brake caliper bracket. [Front Brake Caliper Replacement](#)
- 8. Install the front tire and wheel assembly. [Tire and Wheel Removal and Installation](#)
- 9. Lower the vehicle.
- 10. If the brake rotor was refinished or replaced, or if new brake pads were installed, burnish the pads and rotors. [Brake Pad and Rotor Burnishing](#)

REAR BRAKE ROTOR REPLACEMENT

Special Tools

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

For equivalent regional tools, refer to [Special Tools](#).

Removal Procedure

WARNING: Refer to [Brake Dust Warning](#) .

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

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 the rear brake caliper from the brake caliper bracket and support the rear brake caliper with heavy mechanic's wire, or equivalent. Do NOT disconnect the hydraulic brake flexible hose from the caliper. [Rear Brake Caliper Replacement](#)
- 6. Remove Rear Brake Caliper Bracket@Vehicle [Rear Brake Caliper Bracket Replacement](#)

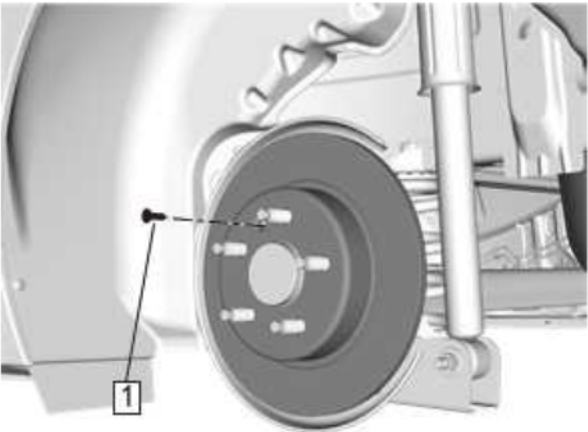


Fig. 68: Rear Brake Rotor Bolt
Courtesy of GENERAL MOTORS COMPANY

7. Remove Rear Brake Rotor Bolt (1)

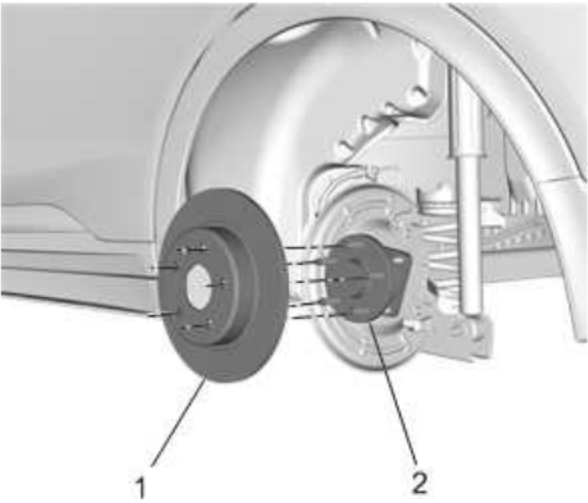


Fig. 69: Rear Brake Rotor And Rear Wheel Hub
Courtesy of GENERAL MOTORS COMPANY

8. Remove Rear Brake Rotor (1) Rear Wheel Hub (2)

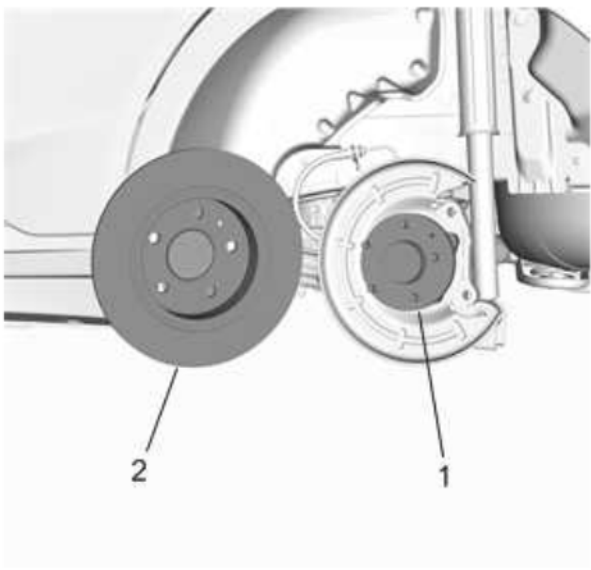


Fig. 70: Hub Flange And Rotor
Courtesy of GENERAL MOTORS COMPANY

- NOTE:** Whenever the brake rotor has been separated from the hub/axle flange, any rust or contaminants should be cleaned from the hub/axle flange and the brake rotor mating surfaces. Failure to do this may result in excessive assembled lateral runout (LRO) of the brake rotor, which could lead to brake pulsation.
1. Using the **CH-42450-A** Wheel Hub Resurfacing Kit, thoroughly clean any rust or corrosion from the mating surface of the hub flange (1).
 2. Using the **CH-41013** Rotor Resurfacing Kit, thoroughly clean any rust or corrosion from the mating surface of the rotor (2).
 3. Inspect the mating surfaces of the hub/axle flange and the rotor to ensure that there are no foreign particles or debris remaining.

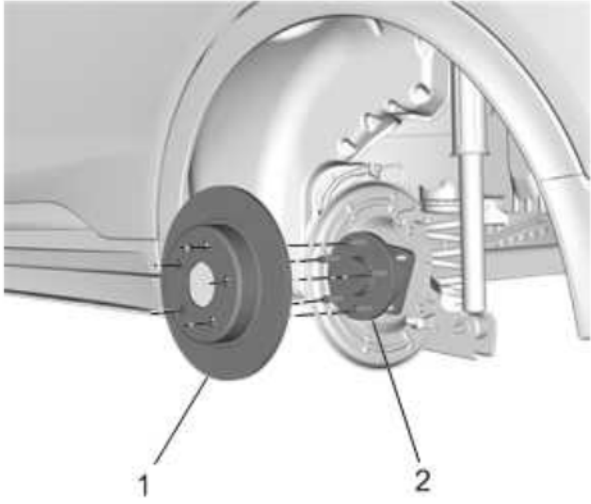


Fig. 71: Rear Brake Rotor And Rear Wheel Hub
Courtesy of GENERAL MOTORS COMPANY

4. Install Rear Brake Rotor (1) @Rear Wheel Hub (2)

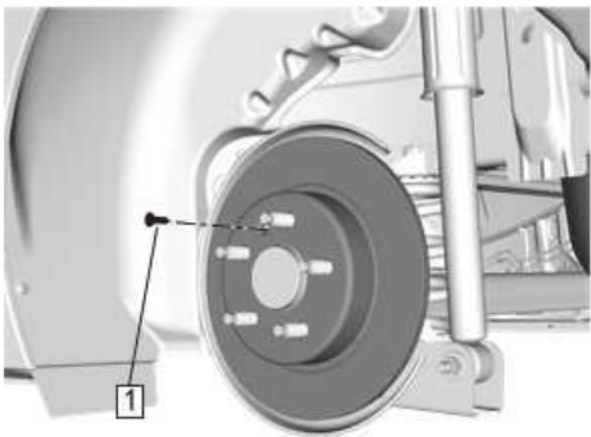


Fig. 72: Rear Brake Rotor Bolt
Courtesy of GENERAL MOTORS COMPANY

- CAUTION:** Refer to **Fastener Caution** .
5. Install Rear Brake Rotor Bolt (1) and tighten 9 N.m (80 lb in)
 6. Install Rear Brake Caliper Bracket@Vehicle **Rear Brake Caliper Bracket Replacement**
 7. Remove the support and install the rear brake caliper to the rear brake caliper bracket. **Rear Brake Caliper Replacement**
 8. Install the rear tire and wheel assembly. **Tire and Wheel Removal and Installation**
 9. Lower the vehicle.
 10. Calibrate the park brake. **Park Brake Calibration**
 11. If the brake rotor was refinished or replaced, or if new brake pads were installed, burnish the pads and rotors. **Brake Pad and Rotor Burnishing**

FRONT BRAKE SHIELD REPLACEMENT

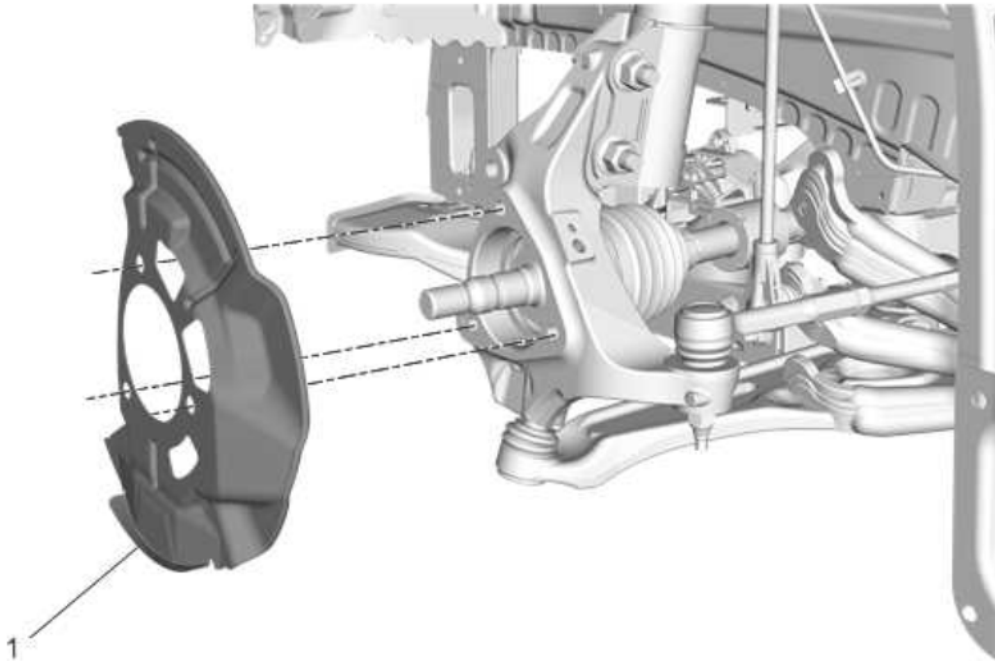


Fig. 73: Front Brake Shield
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name

Callout	Component Name
WARNING: Refer to Brake Dust Warning .	
Preliminary Procedures 1. Raise and support the vehicle. Lifting and Jacking the Vehicle 2. Remove the front tire and wheel assembly. Tire and Wheel Removal and Installation 3. Front Wheel Bearing and Hub Replacement	
1	Front Brake Shield Procedure 1. Install the front tire and wheel assembly. Tire and Wheel Removal and Installation 2. Lower the vehicle.

REAR BRAKE SHIELD REPLACEMENT

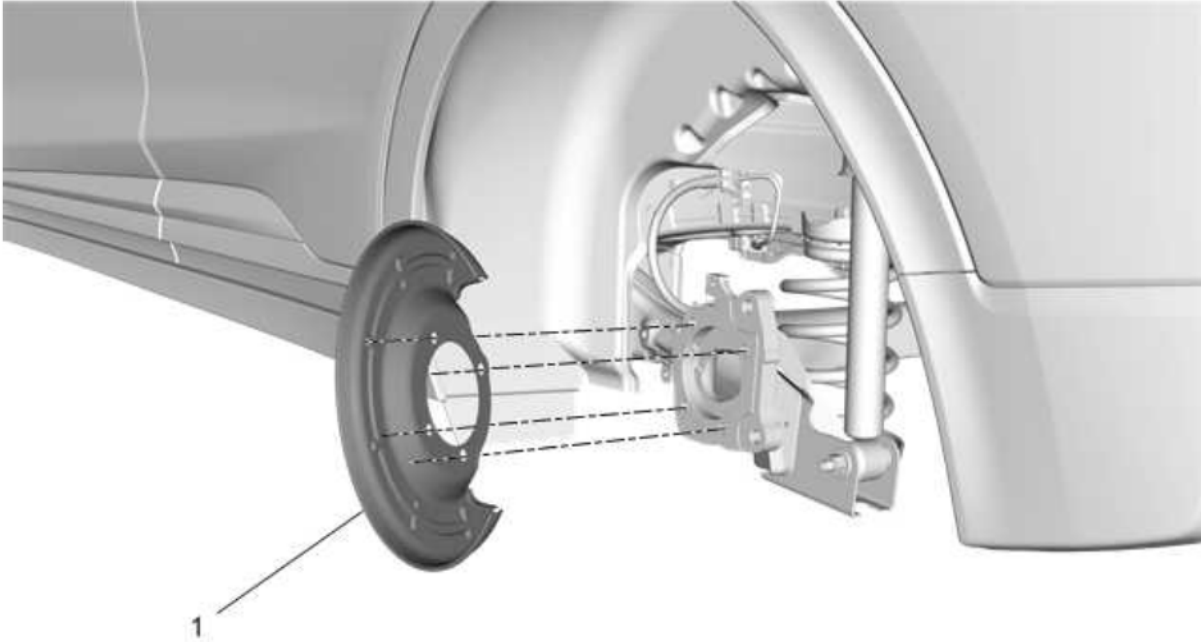


Fig. 74: Rear Brake Shield
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
WARNING: Refer to Brake Dust Warning .	
Preliminary Procedures 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 3. Rear Wheel Bearing and Hub Replacement	
1	Rear Brake Shield Procedure 1. Install the rear tire and wheel assembly. Tire and Wheel Removal and Installation 2. Lower the vehicle.

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](#).

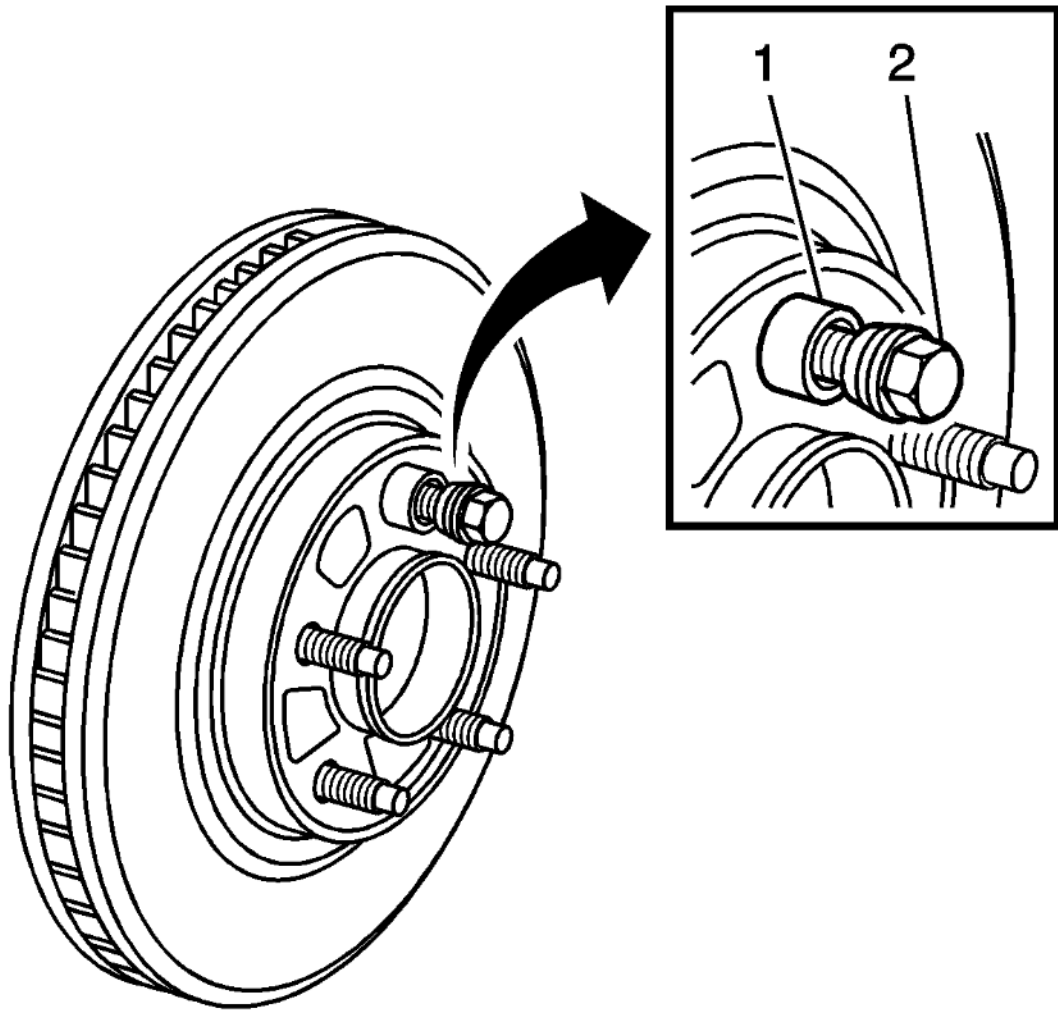


Fig. 75: Lug Nuts & Conical Washers
Courtesy of GENERAL MOTORS COMPANY

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.

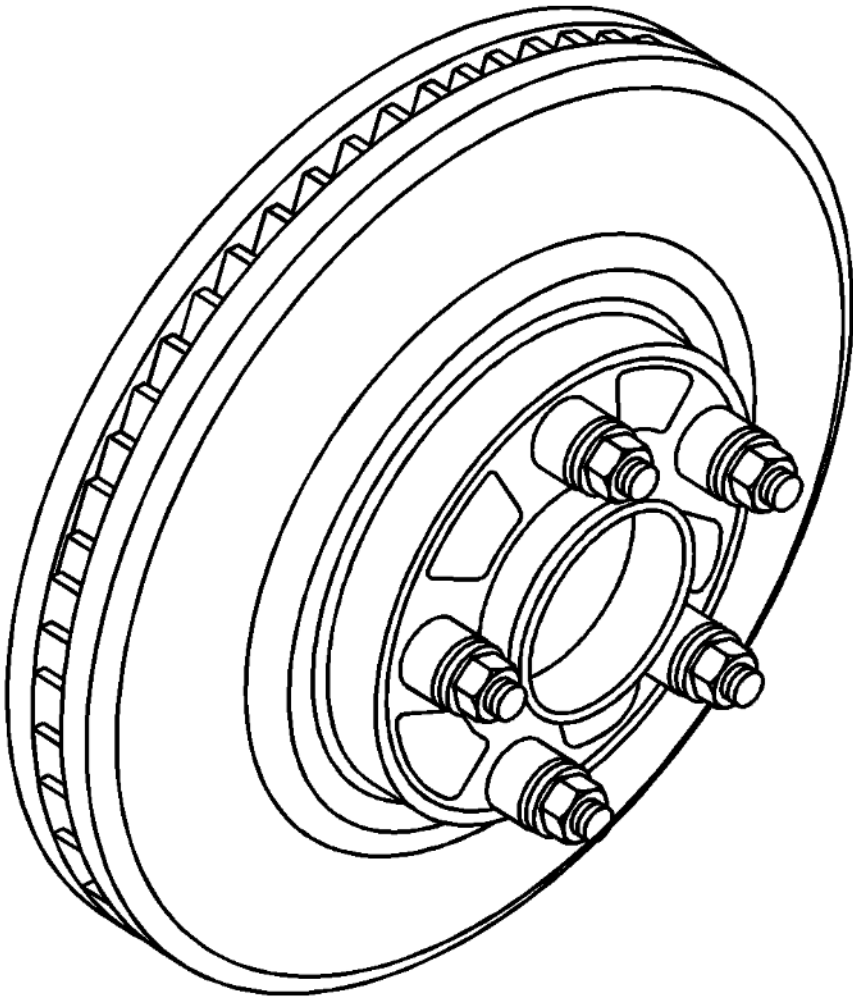


Fig. 76: Lug Nuts & Conical Washers
Courtesy of GENERAL MOTORS COMPANY

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](#).

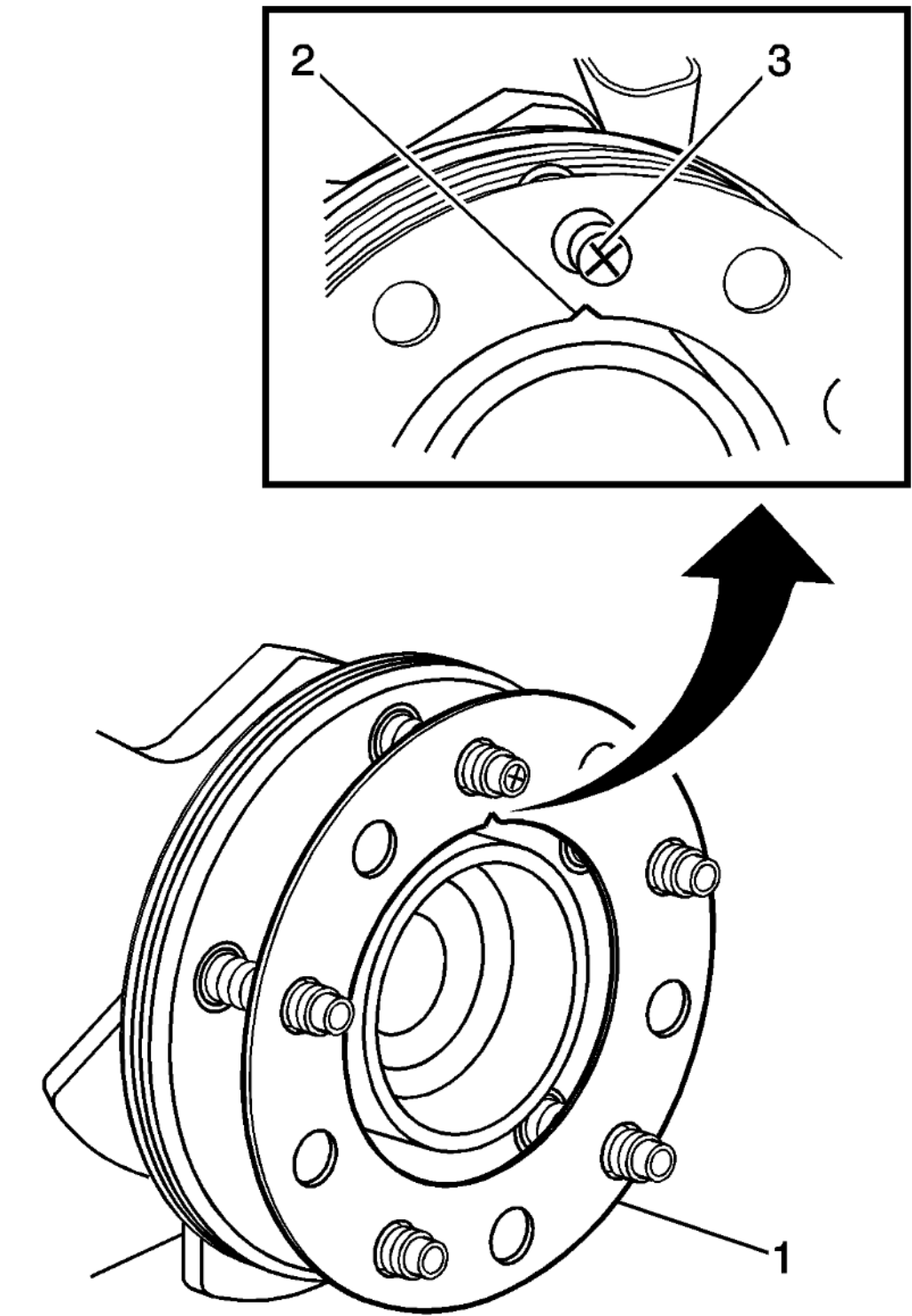


Fig. 77: Identifying Correction Plate, High Spot Mark & V-Shaped Notch
Courtesy of GENERAL MOTORS COMPANY

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.

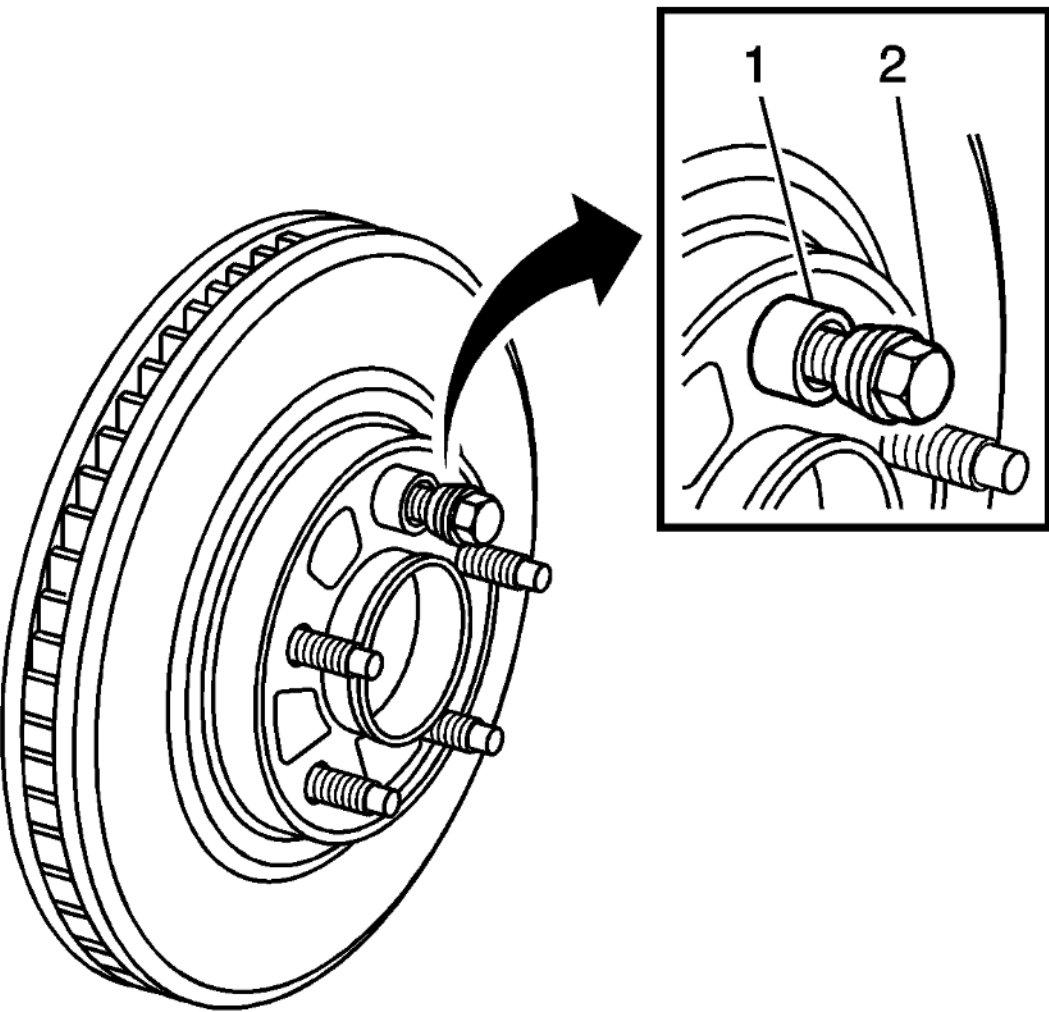


Fig. 78: Lug Nuts & Conical Washers
Courtesy of GENERAL MOTORS COMPANY

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.

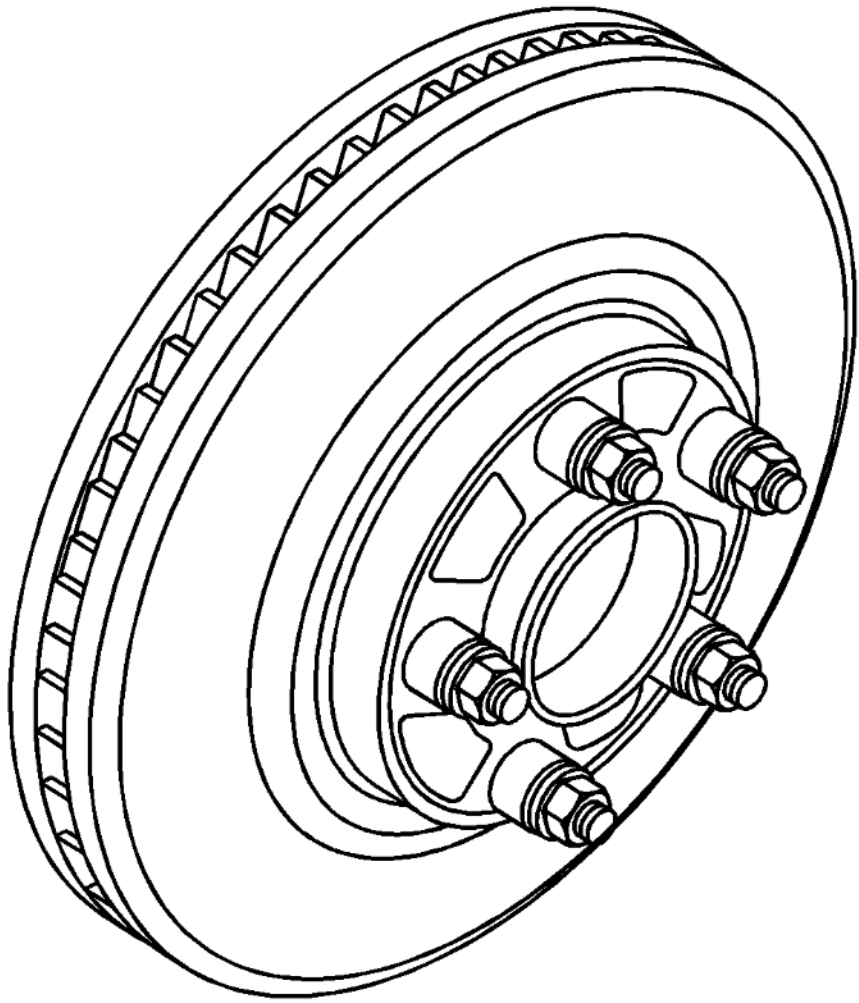


Fig. 79: Lug Nuts & Conical Washers
Courtesy of GENERAL MOTORS COMPANY

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

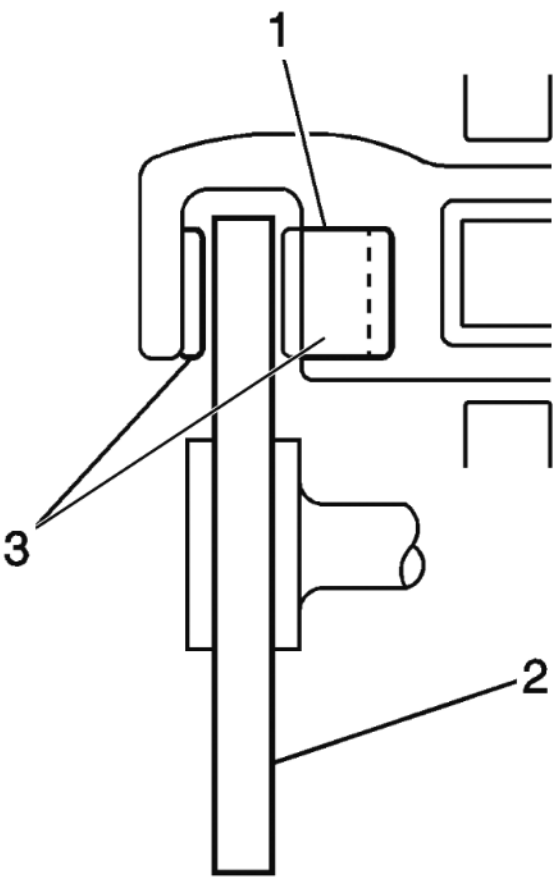


Fig. 80: Brake Caliper Piston, Rotor And Brake Pads
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to **Brake Caliper Caution** .

The brake caliper is single piston type; and is installed on knuckle by two mounting bolts. Brake caliper transforms hydraulic pressure generated by depressing brake pedal into braking force. The braking force evenly acts on the piston (1) and the bottom of brake caliper cylinder bore, and then move the piston outward and slide brake caliper inward so that there generates a clamping effect on brake rotor (2). The clamping effect forces brake pad (3) to attach to brake rotor, and the resulting friction will make vehicles stop.

When maintaining the brake caliper, replace all parts included in repair sets.

- Lubricate the rubber parts with clean brake fluid to make assembly easier.
- Do not apply compressed air to brake parts with workshop with lubricant, otherwise the rubber parts may be damaged.
- If any hydraulic component is removed or disconnected, it may be necessary to bleed all or part of the brake system.
- Replace whole brake pad (3) according to service parts in the maintenance package.
- The torque values are specified for dry, nonlubricated fasteners.
- Perform the service operations on a clean bench, free from all mineral oil materials.

Gap Calibration

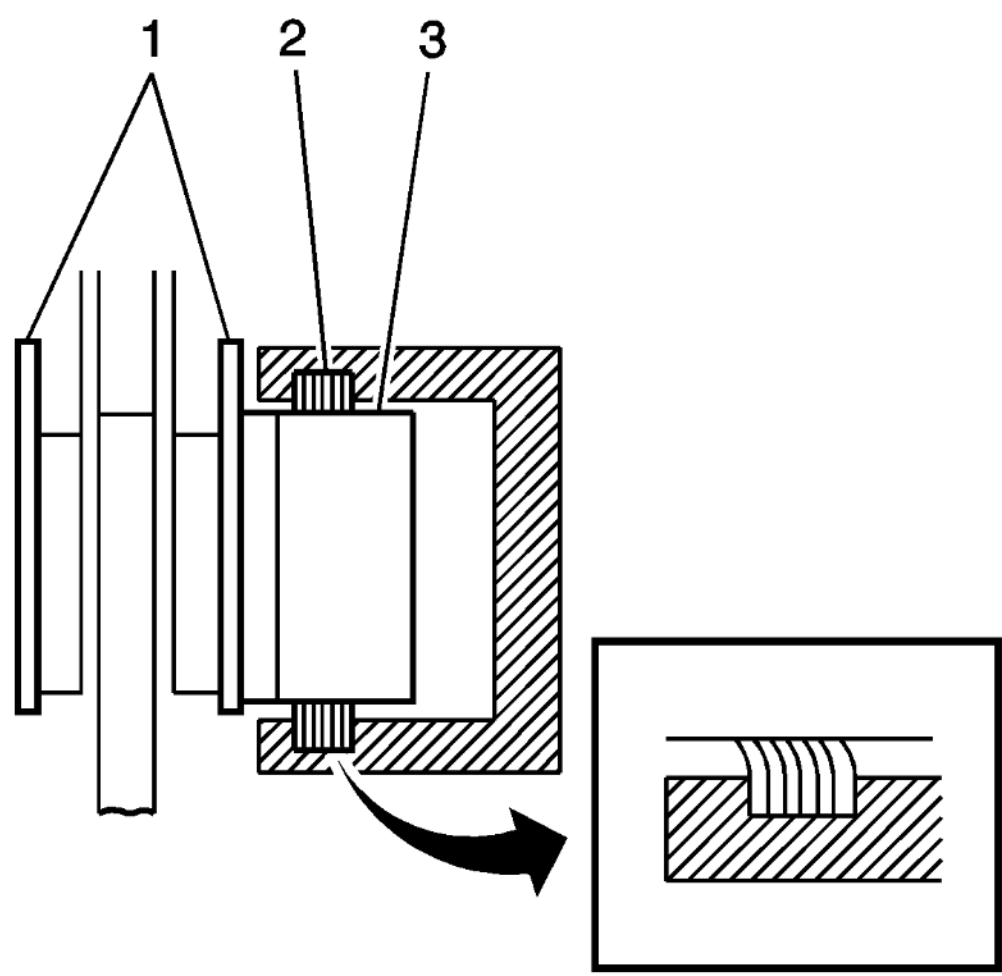


Fig. 81: Sectional View of Pads, Piston Seal, and Piston
Courtesy of GENERAL MOTORS COMPANY

When the hydraulic pressure acts on the piston (3), the piston moves left. The piston seals (2) exert pressure on the piston and move together with the cylinder. However, parts of the piston seals are fixed in the grooves of the cylinder. As shown, the shape of seals deforms toward the direction of piston.

When the pressure on the brake pedal is removed and the hydraulic pressure on the piston is released, there generates recovery elasticity on the seals. The force pushes the piston to the right side and return to its original position.

When the brake pad (1) exhibits wear, and the gap between the brake rotor and brake pad gets much larger, the piston moves farther.

Seals may further deform. Because the end of seals is fixed in the groove of the cylinder, the deformation is limited in the above-mentioned scope. Pistons further move to fill the gap. When the piston returns to the same position, the rubber seals resume original shape, and the gap between brake rotor and brake pad keeps the original level.

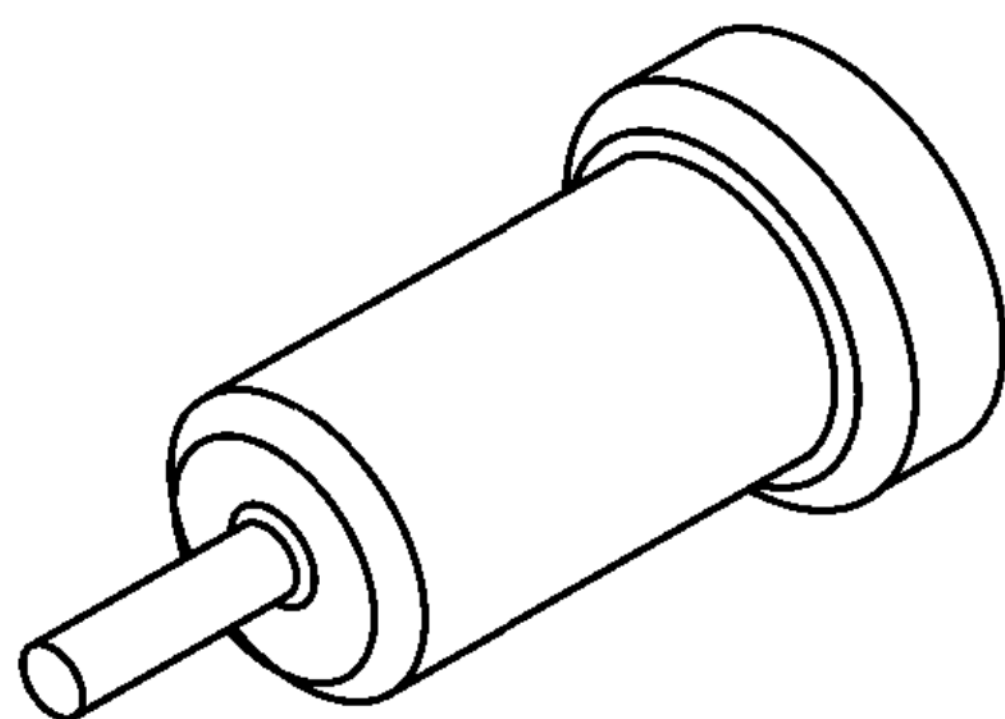
SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

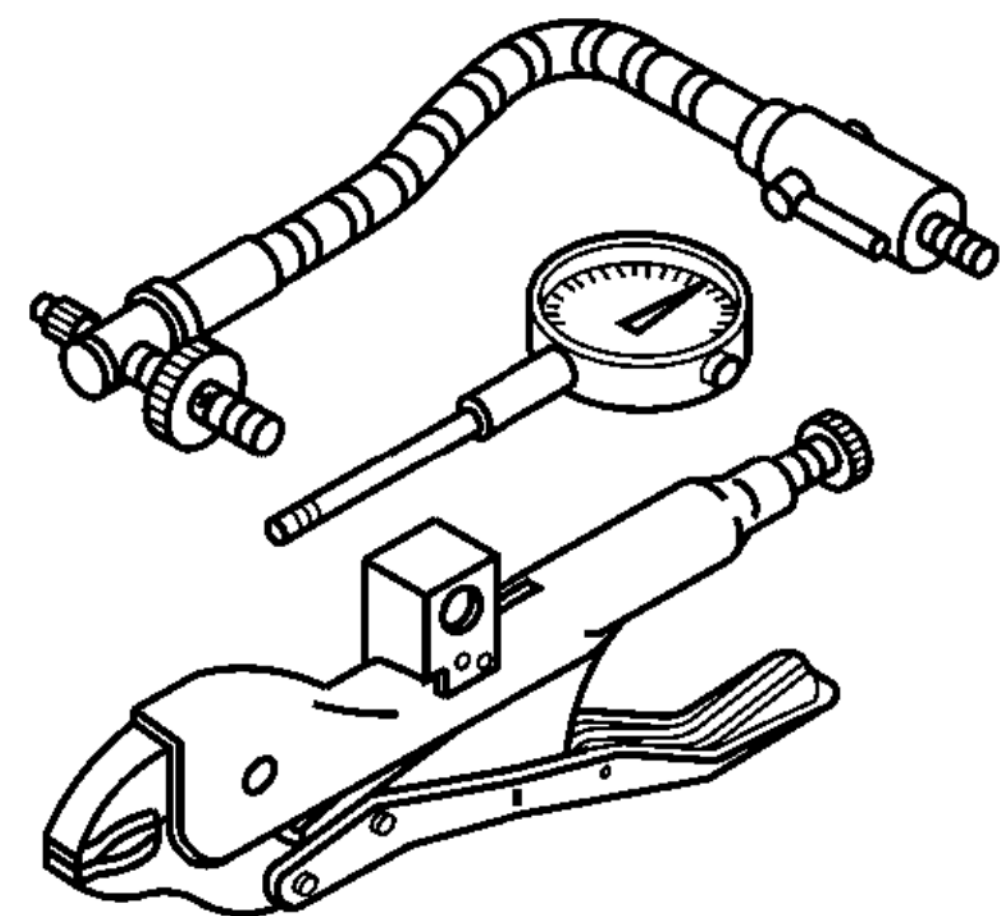
Illustration	Tool Number/Description
	CH-230-A MKM-230-A J-21177-A Disc Gauge
	CH-41013 J 41013 Rotor Resurfacing Kit

Illustration

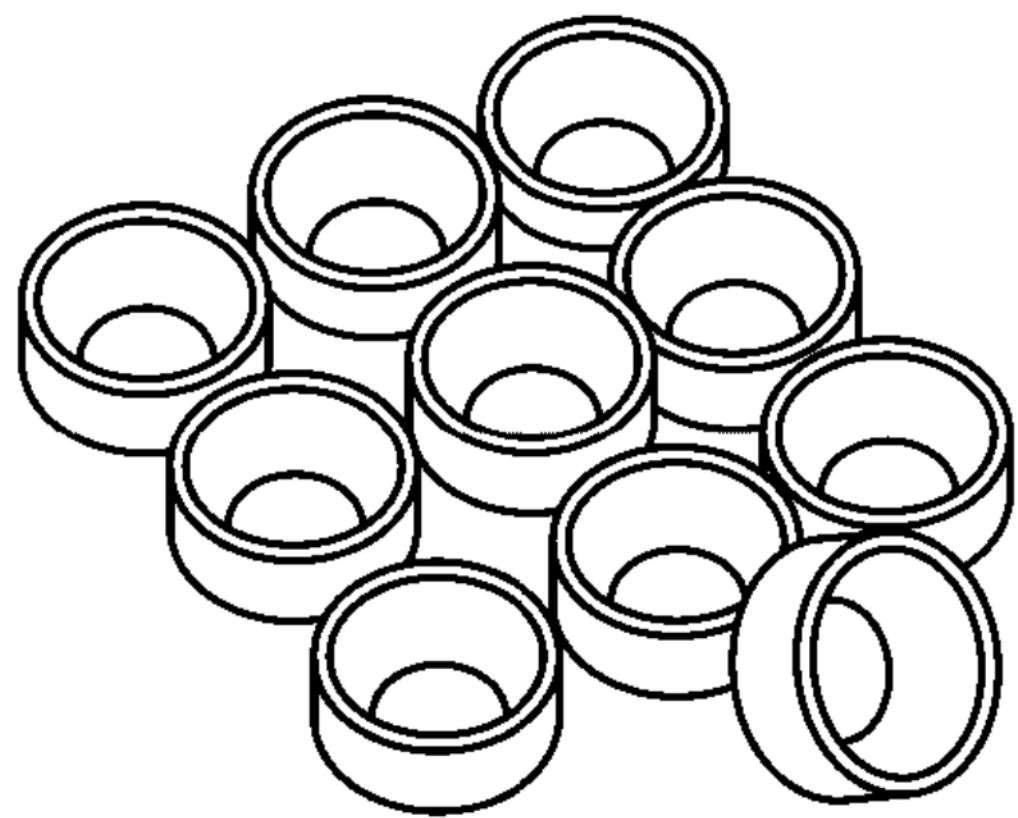
Tool Number/Description



CH-42450-A
J 42450-A
Wheel Hub Resurfacing Kit



CH-45101
J 45101
Hub and Wheel Runout Gauge



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