

2013 Chevrolet Cruze

2013 BRAKES Disc Brakes - Cruze

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Disc Brakes - Cruze

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Brake Caliper Bleeder Valve	17 N.m	13 lb ft
Brake Hose and the Brake Hose-To-Caliper Bolt	40 Y	30 lb ft
Brake Pipe Fitting Bolt	18 N.m	13 lb ft
Front Brake Caliper Bracket Bolt	100 N.m + 60-75° (1)	74 lb ft + 60-75° (1)
Front Brake Caliper Guide Pin Bolt	28 N.m	21 lb ft
Rear Brake Caliper Bracket Bolt	100 N.m + 60°-- 75° (1)	74 lb ft + 60°-- 75° (1)
Rear Brake Caliper Guide Pin Bolt	28 N.m	21 lb ft
Vibration Dampener	9 N.m	80 lb in
Vibration Dampener Stud	28 N.m	21 lb ft
Wheel Bearing/Hub Mounting Bolts	50 N.m + 30° (1)	37 lb ft + 30° (1)
Wheel Speed Sensor Bolt	6 N.m	53 lb in
(1) = Use NEW Fastener		

DISC BRAKE COMPONENT SPECIFICATIONS

Disc Brake Component Specifications

Application	Specification	
	Metric	English
Front Brakes		
• Caliper Bore Diameter-Rear (15" Brake System)	40.0 mm	1.574 in
• Rotor Diameter (15" Brake System)	276.0 mm	10.866 in
• Rotor Thickness (15" Brake System)	26 mm	1.024 in
• Rotor Discard Thickness* (15" Brake System)	23 mm	0.905 in
• Rotor Maximum Allowable Assembled Lateral Runout (15" Brake System)	0.1 mm	0.004 in
• Rotor Maximum Allowable Scoring (15" Brake System)	0.4 mm	0.0157 in
• Rotor Minimum Allowable Thickness After Refinish (15" Brake System)	23.2 mm	0.913 in

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• Rotor Maximum Allowable Thickness Variation (15" Brake System)	0.006 mm	0.0002 in
• Rotor Thickness New	26.0 mm	1.023 in
• Brake Pad Thickness New without Pad Plate	12.0 mm	0.472 in
• Brake Pad Discard Thickness without Pad Plate	2.0 mm	0.078 in
Rear Brakes		
• Caliper Bore Diameter-Rear (15" Brake System)	38.0 mm	1.50 in
• Rotor Diameter (15" Brake System)	268.0 mm	10.551
• Rotor Thickness (15" Brake System)	12 mm	0.472 in
• Rotor Discard Thickness* (15" Brake System)	10 mm	0.393 in
• Rotor Maximum Allowable Assembled Lateral Runout (15" Brake System)	0.1 mm	0.004 in
• Rotor Maximum Allowable Scoring (15" Brake System)	0.4 mm	0.0157 in
• Rotor Minimum Allowable Thickness After Refinish (15" Brake System)	10.2 mm	0.402 in
• Rotor Maximum Allowable Thickness Variation (15" Brake System)	0.006 mm	0.0002 in
• Rotor Thickness New	12.0 mm	0.472 in
• Brake Pad Thickness New without Pad Plate	10.25 mm	0.403 in
• Brake Pad Discard Thickness without Pad Plate	2.0 mm	0.078 in

ADHESIVES, FLUIDS, LUBRICANTS, AND SEALERS

Adhesives, Fluids, Lubricants, and Sealers

Application	Type of Material	GM Part Number	
		United States	Canada
Hydraulic Brake System	DOT 3 Motor Vehicle Brake Fluid	88863461	88863462

DIAGNOSTIC INFORMATION AND PROCEDURES

BRAKE ROTOR THICKNESS MEASUREMENT

WARNING: Refer to Brake Dust Warning .

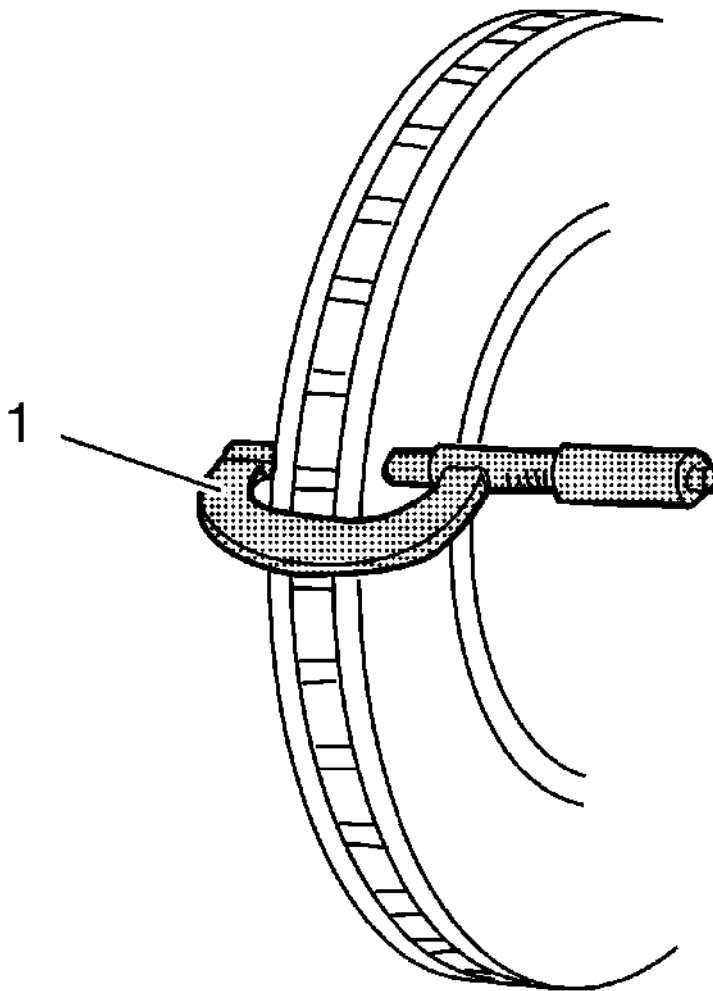


Fig. 1: Measuring Brake Rotor Thickness

Courtesy of GENERAL MOTORS COMPANY

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**, 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.
3. 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 (0.5 in), for each measurement.

4. Compare the lowest thickness measurement to the disc brake component specifications.
5. If the lowest thickness measurement of the brake rotor is above the minimum allowable thickness after

refinishing specification, the rotor may be able to be refinished, depending upon surface and wear conditions which may be present.

6. If the lowest thickness measurement of the brake rotor is at or below the minimum allowable thickness after refinishing specification, the rotor may not be refinished.
7. If the lowest thickness measurement of the brake rotor is at or below the discard thickness specification, the rotor requires replacement. Refer to **Front Brake Rotor Replacement (J60)**, **Front Brake Rotor Replacement (J67)**, 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.

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**, 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.

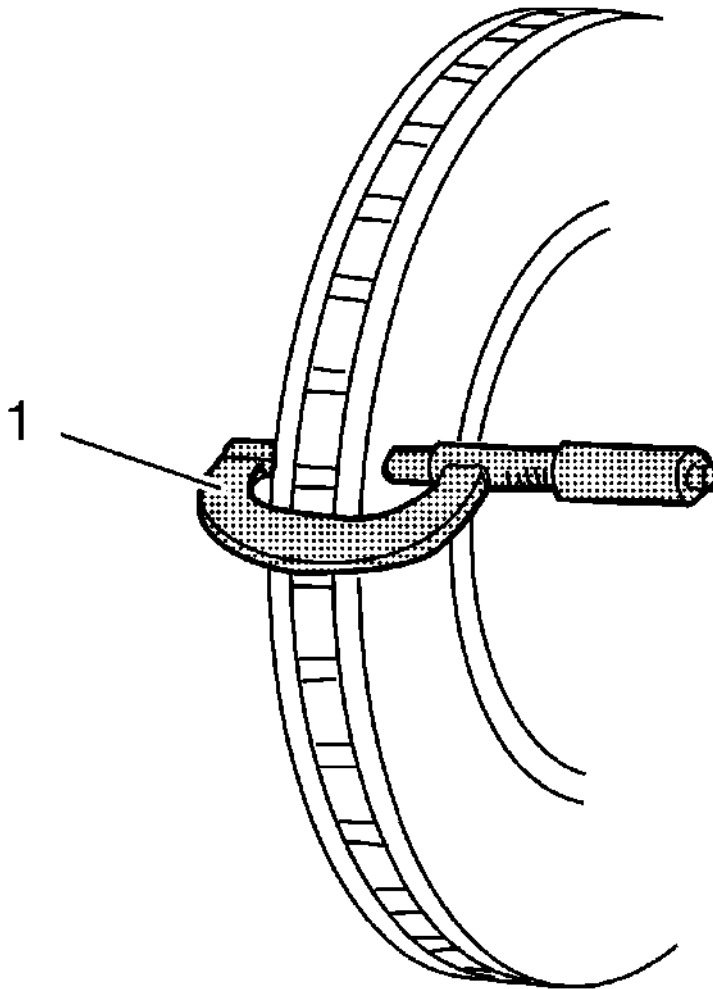


Fig. 2: Measuring Brake Rotor Thickness

Courtesy of GENERAL MOTORS COMPANY

3. Using a micrometer (1) calibrated in thousandths-of-a-millimeter, or ten-thousandths-of-an-inch, measure and record the thickness of the brake rotor at 4 or more points, evenly spaced around the rotor.

Ensure that the measurements are only taken within the friction surfaces and that the micrometer is positioned the same distance from the outer edge of the rotor, about 13 mm (0.5 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 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.

6. If the brake rotor thickness variation measurement exceeds the specification, the rotor requires refinishing or replacement. Refer to **Front Brake Rotor Replacement (J60)**, **Front Brake Rotor Replacement (J67)**, **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, reposition and support the caliper with 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 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. Refer to **Front Brake Rotor Replacement (J60)**, **Front Brake Rotor Replacement (J67)**, **Rear Brake Rotor Replacement**, or **Brake Rotor Refinishing**.

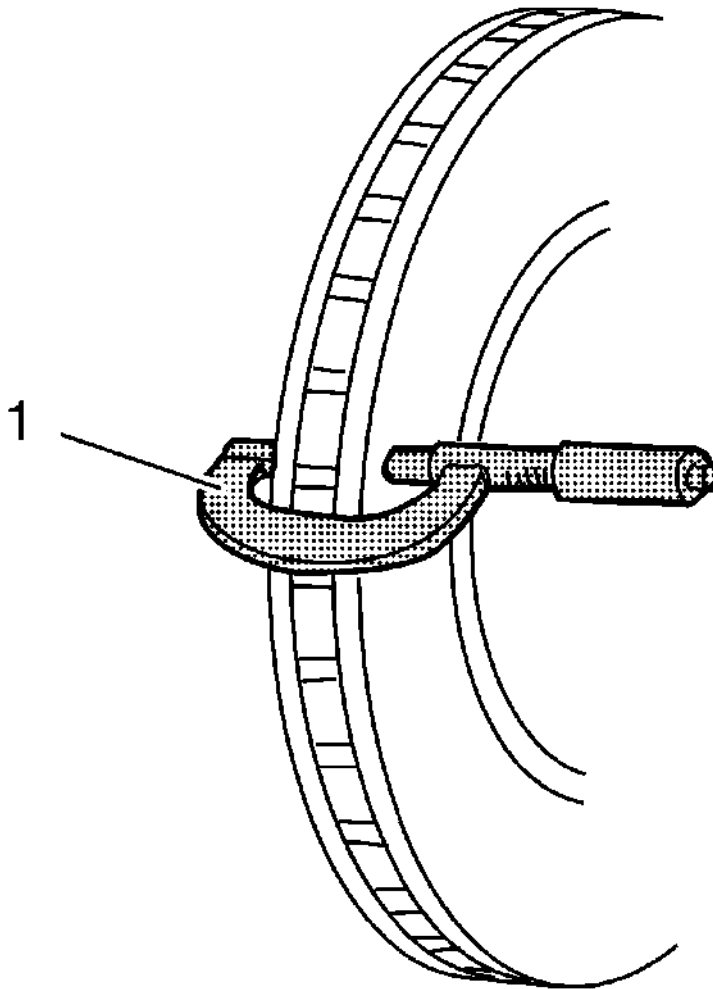


Fig. 3: Measuring Brake Rotor Thickness

Courtesy of GENERAL MOTORS COMPANY

5. Using an appropriate tool (1) for measurement, 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 disc brake component Specifications.
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. Refer to **Front Brake Rotor Replacement (J60)**, **Front Brake Rotor Replacement (J67)**, **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 tools, refer to **Special Tools**.

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

NOTE:

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

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

NOTE:

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

2. Inspect the mating surface of the hub/axle flange and the brake rotor to ensure that there are no foreign particles, corrosion, rust, or debris remaining. If the wheel hub/axle flange and/or if the brake rotor mating surfaces exhibit these conditions, perform the following steps:
 1. Remove the brake rotor from the vehicle. Refer to **Front Brake Rotor Replacement (J60)**, **Front Brake Rotor Replacement (J67)**, 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 matchmark made prior to removal.

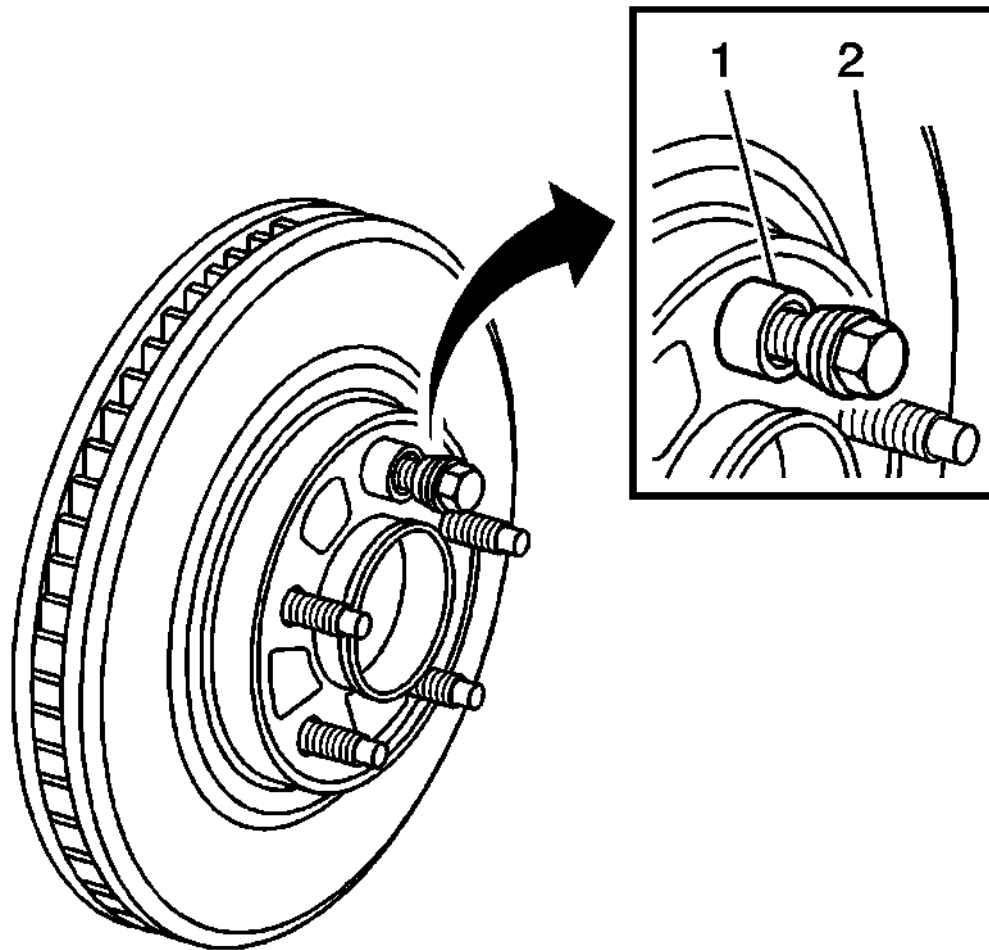


Fig. 4: Identifying Special Tool J 45101-100 & Lug Nut
Courtesy of GENERAL MOTORS COMPANY

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

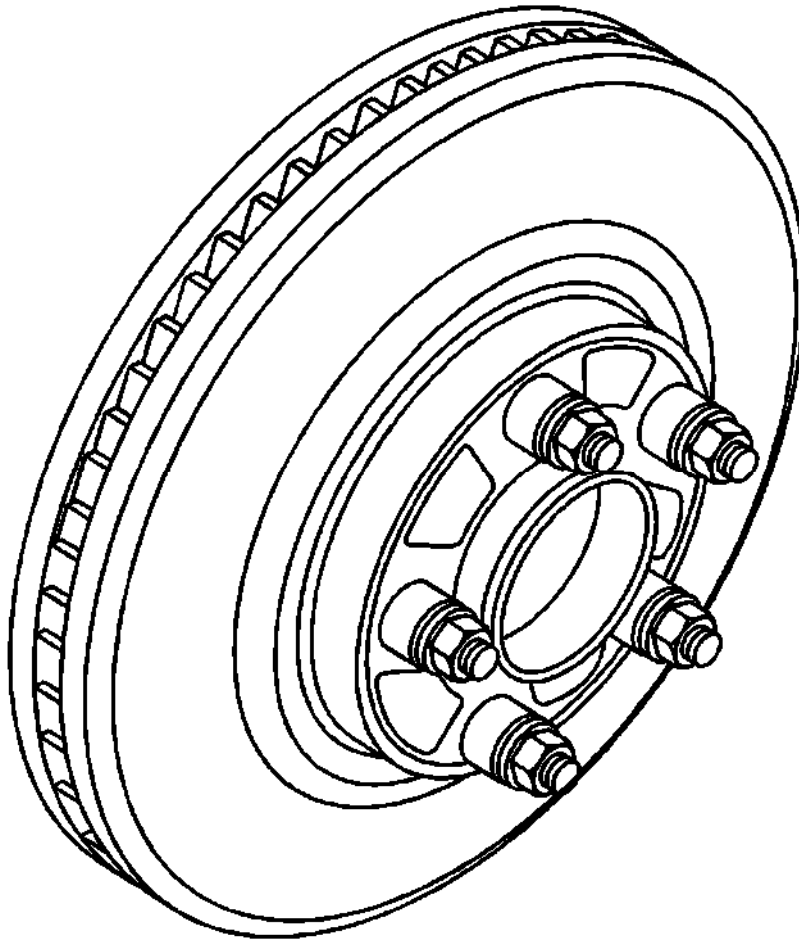


Fig. 5: Identifying All Special Tools J 45101-100s & Lug Nuts
Courtesy of GENERAL MOTORS COMPANY

6. Install the remaining **CH-45101-100** conical brake rotor washers and lug nuts onto the wheel studs and tighten the nuts firmly by hand in a star-pattern.
7. Tighten the lug nuts in a star-pattern to specification. Refer to **Tire and Wheel Removal and Installation**.
8. If the brake rotor has been REFINISHED or REPLACED with a new rotor, proceed to step 14.
9. If the brake rotor meets the following criteria, proceed to step 10.
 - The rotor is within specifications and is being REUSED.
 - The rotor has NOT been refinished.
 - The rotor does NOT exhibit thickness variation exceeding the maximum allowable level.

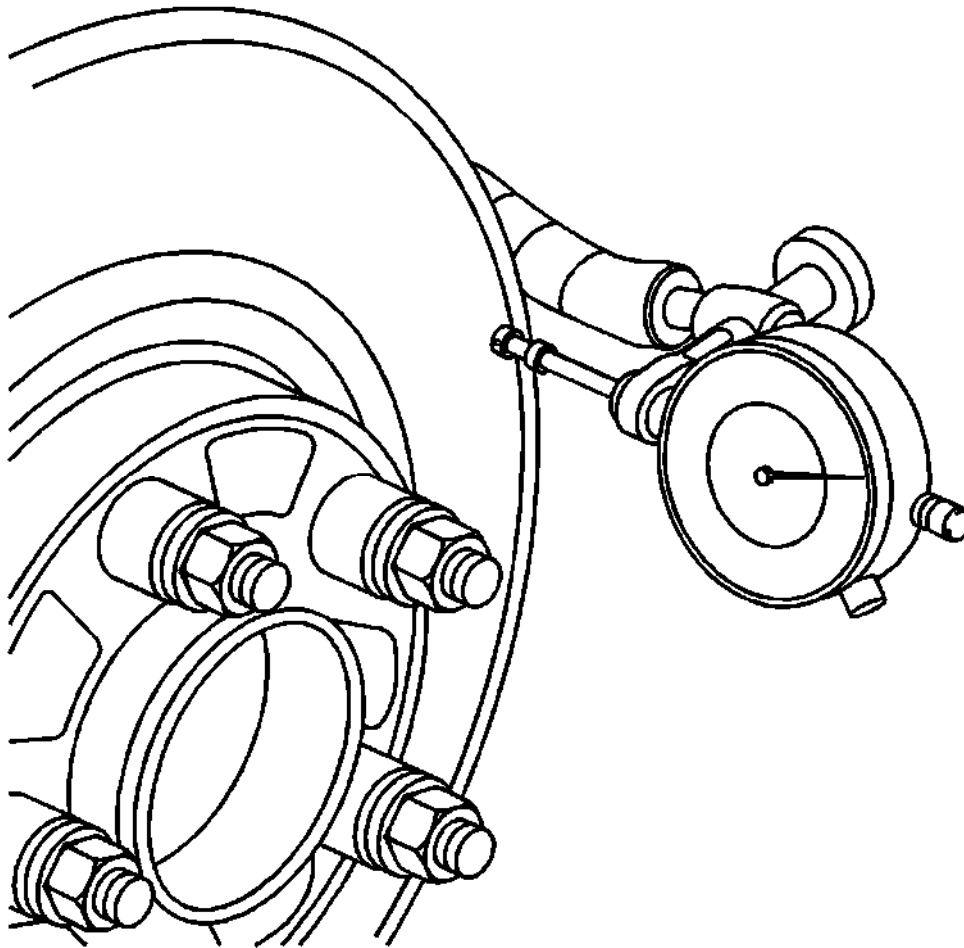


Fig. 6: Using Dial Indicator To Measure Lateral Runout
Courtesy of GENERAL MOTORS COMPANY

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

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**.

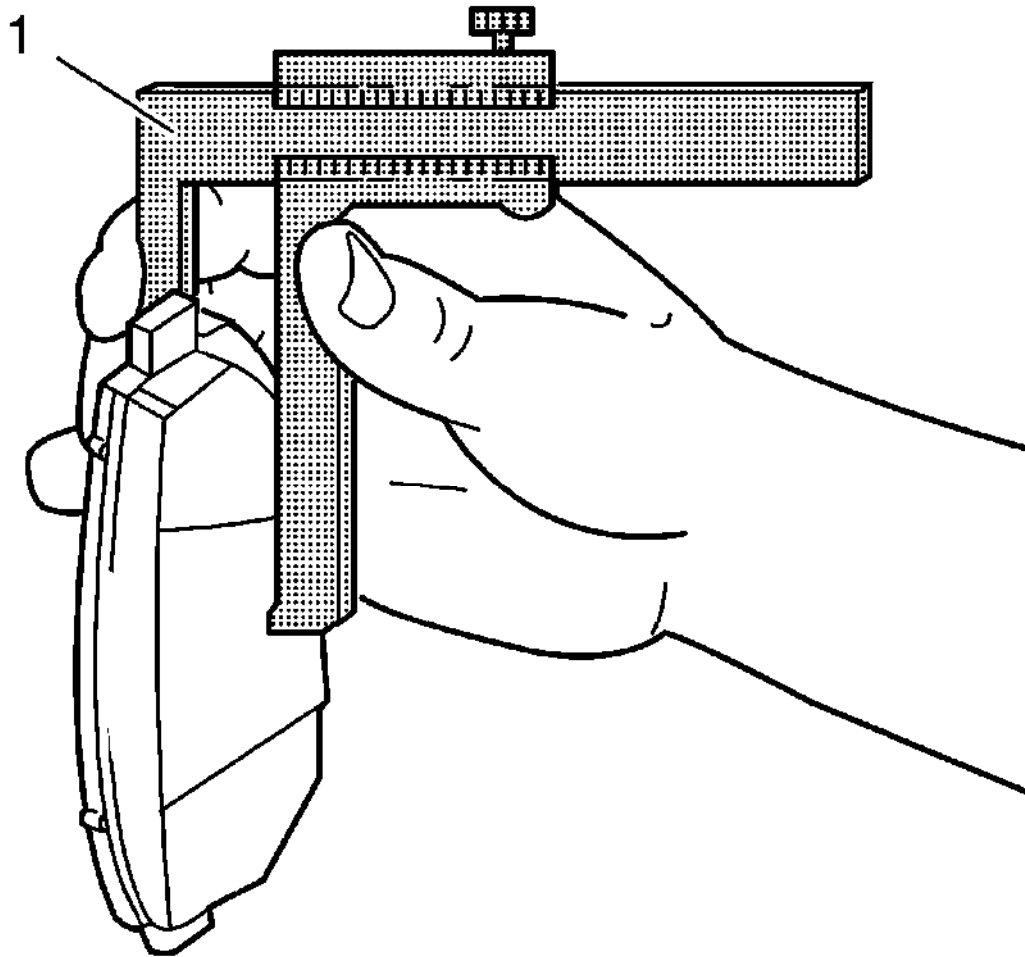


Fig. 7: Measuring Brake Pad Thickness

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

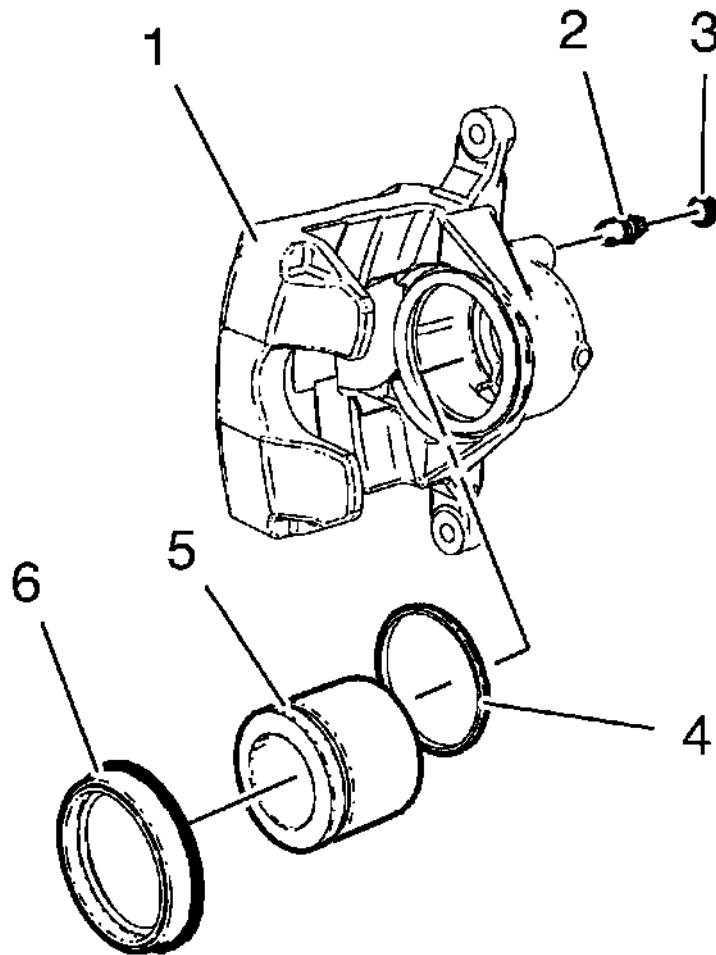


Fig. 8: Exploded View Of Brake Caliper
Courtesy of GENERAL MOTORS COMPANY

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 (6) 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. Renew brake caliper bleeder valve cap (3) if missing.
4. Check for blocked bleeder valve (2).

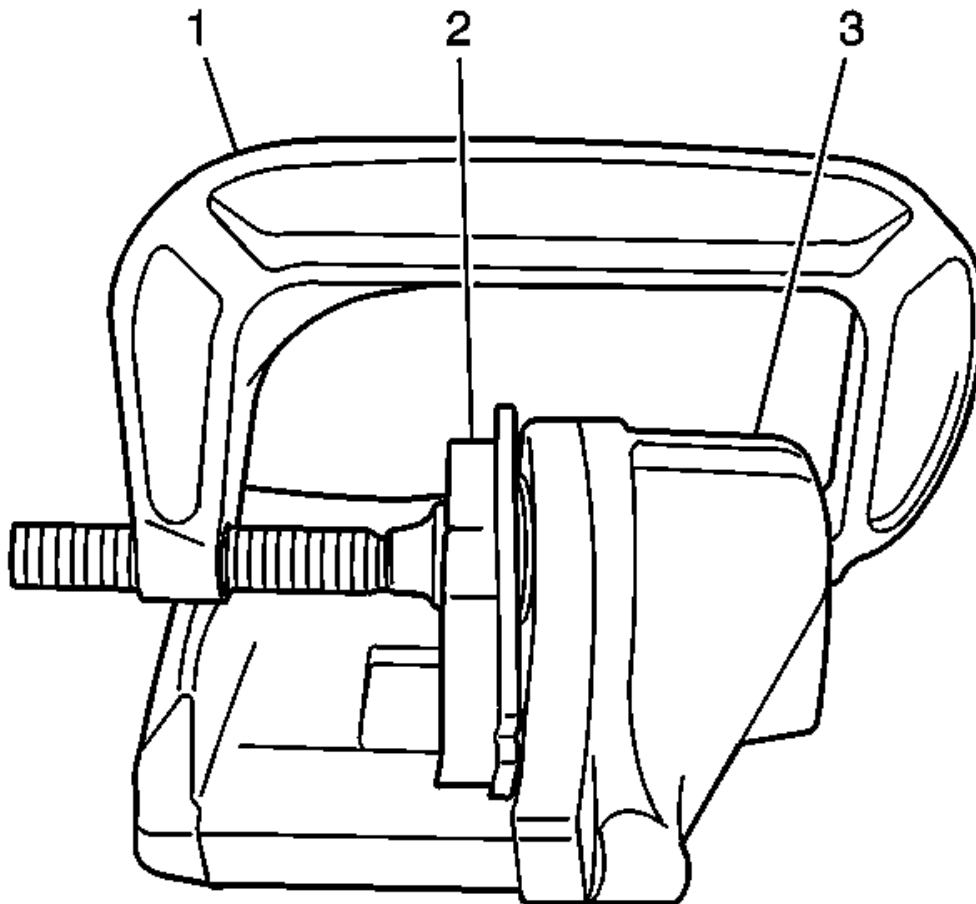


Fig. 9: Compressing Caliper Piston

Courtesy of GENERAL MOTORS COMPANY

5. 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.

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.

FRONT DISC BRAKE MOUNTING AND HARDWARE INSPECTION

WARNING: Refer to Brake Dust Warning .

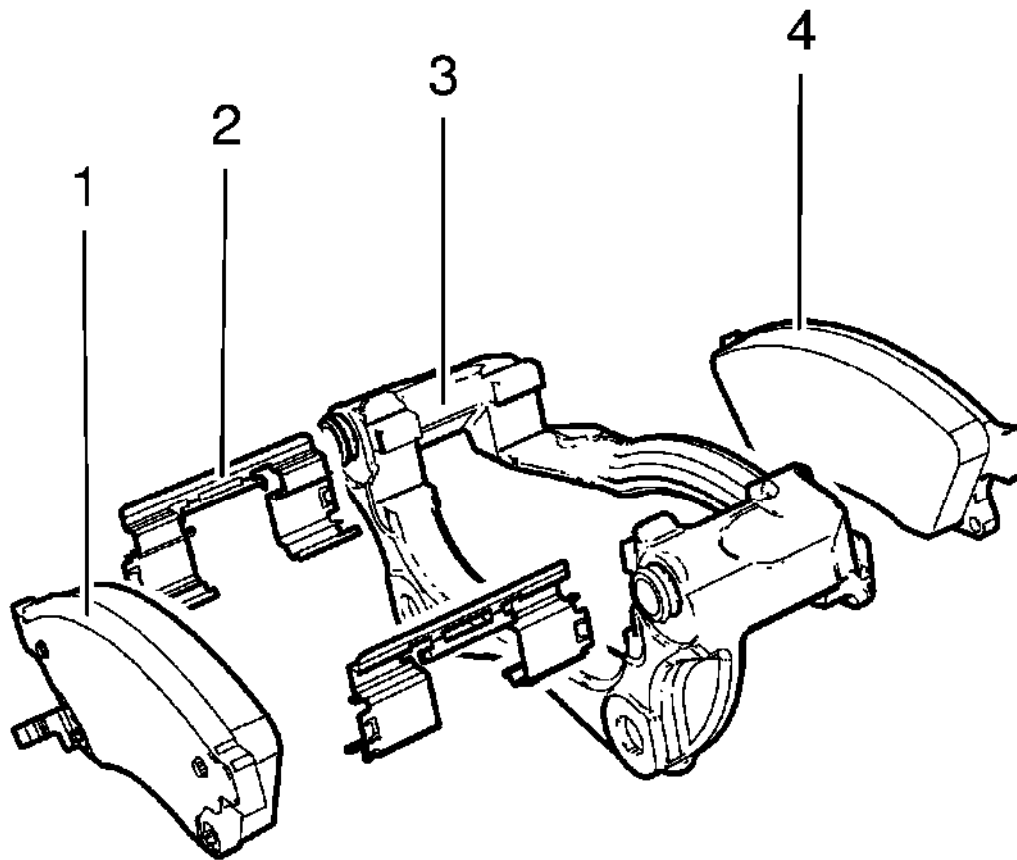


Fig. 10: Exploded View Of Brake Pads And Brake Caliper Mounting Bracket
Courtesy of GENERAL MOTORS COMPANY

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

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- (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.

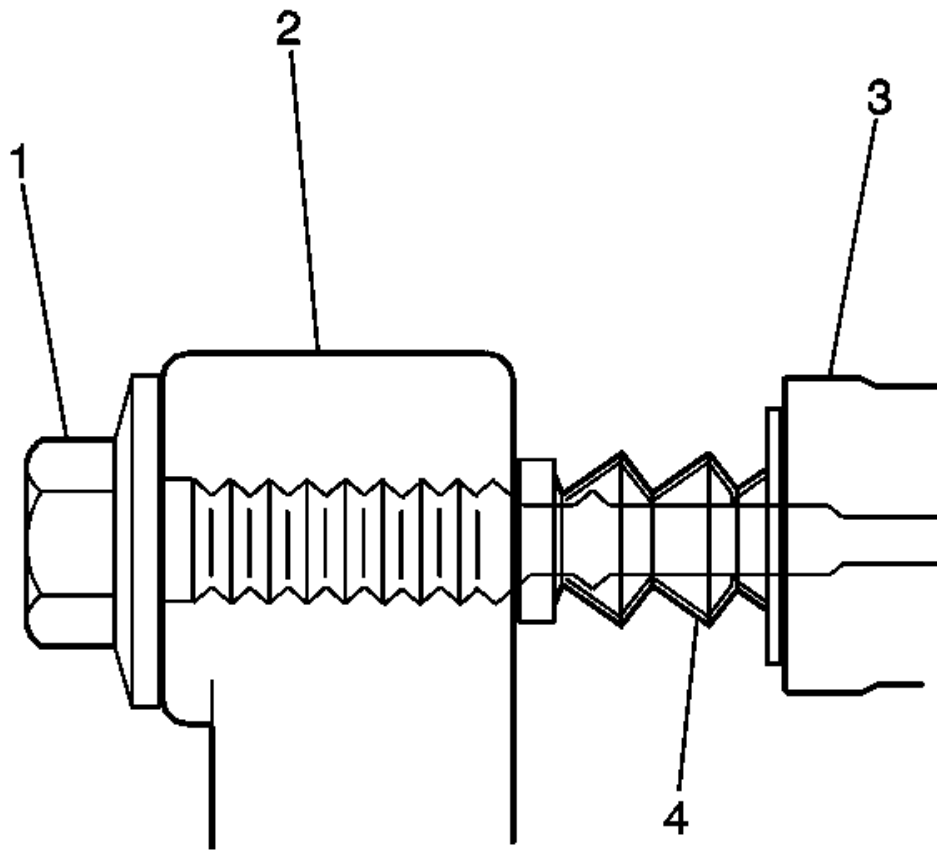


Fig. 11: View Of Caliper, Pin, Boots & Caliper Mounting Bracket
Courtesy of GENERAL MOTORS COMPANY

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: Refer to Brake Dust Warning .

1. Remove rear brake caliper bracket. Refer to Rear Brake Caliper Bracket Replacement.

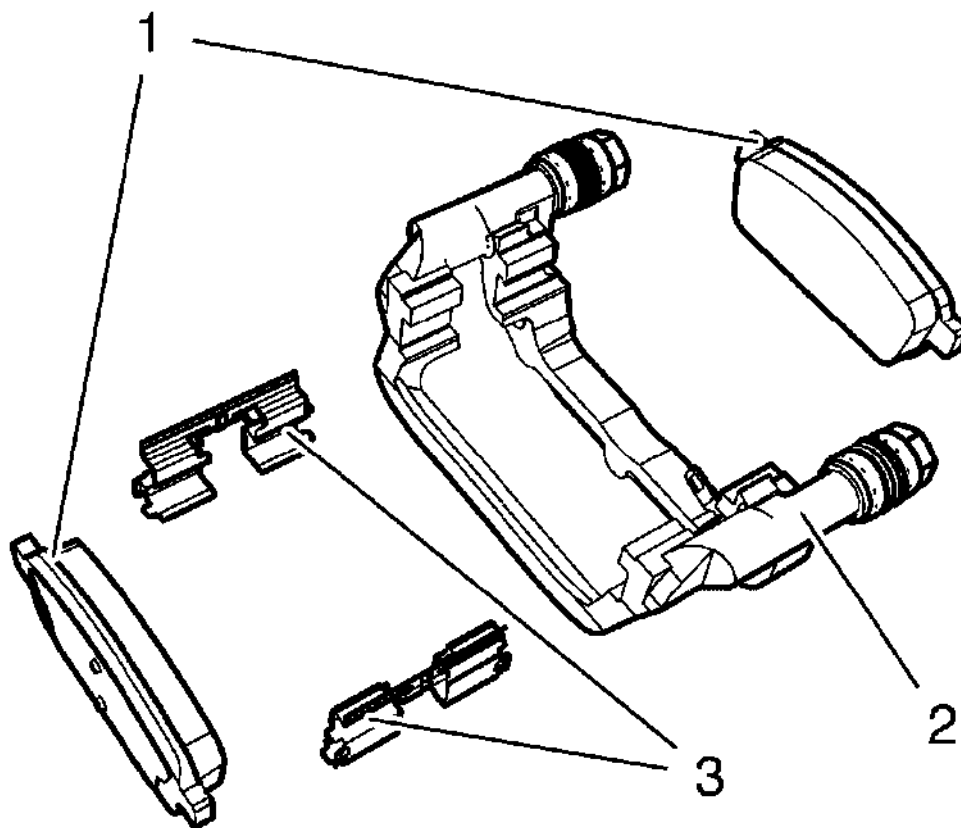


Fig. 12: Exploded View Of Brake Pads And Brake Caliper Mounting Bracket
Courtesy of GENERAL MOTORS COMPANY

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) for the following:
 - Missing mounting hardware.

- Excessive corrosion.
 - Bent pad retainer spring.
 - 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 in place on the caliper mounting bracket, yet slide easily on the mounting hardware without binding.
 7. Install the disc brake pads to the caliper mounting bracket.
 8. Install the disc brake caliper to the mounting bracket.
 9. Install rear brake caliper bracket. Refer to **Rear Brake Caliper Bracket Replacement**.

REPAIR INSTRUCTIONS

FRONT DISC BRAKE PADS REPLACEMENT

Removal Procedure

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

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

NOTE: Always replace disc brake pads in axle sets.

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

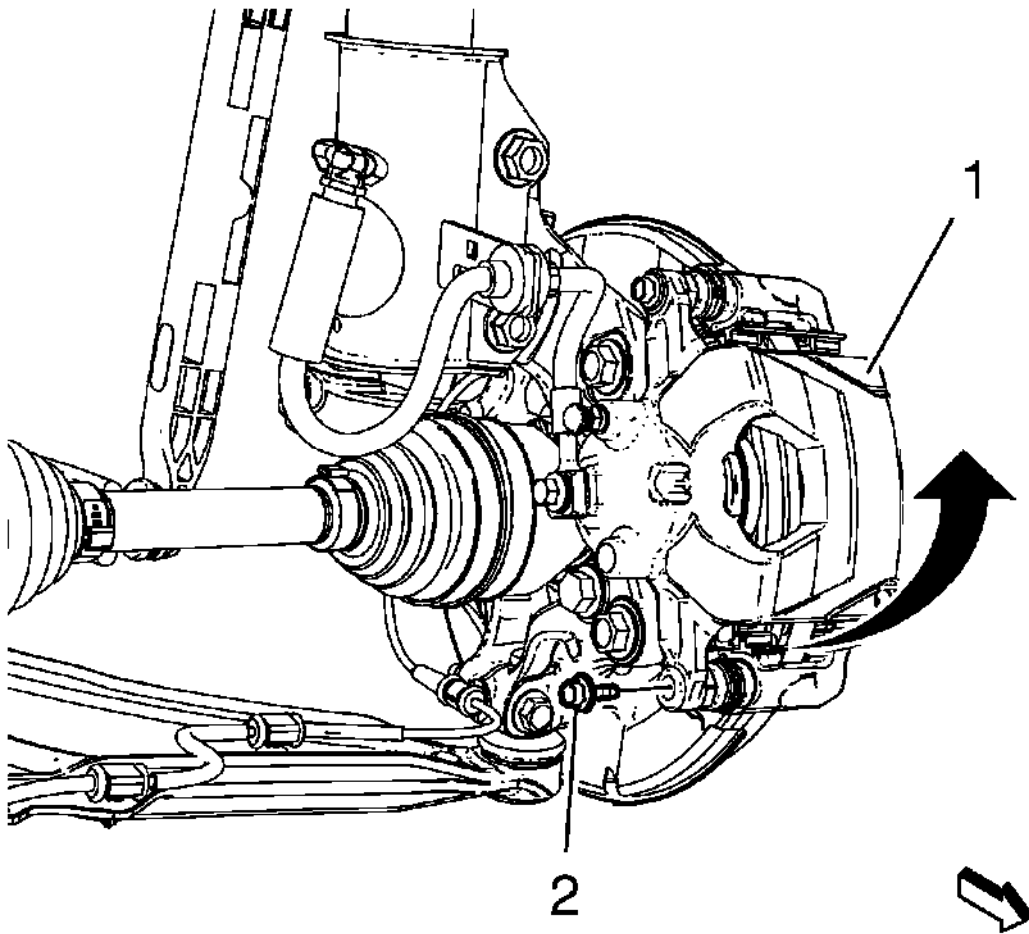


Fig. 13: View Of Brake Caliper And Brake Caliper Guide Pin Bolt
Courtesy of GENERAL MOTORS COMPANY

6. Remove the brake caliper lower guide pin bolt (2).
7. Without disconnecting the hydraulic brake flexible hose, pivot the caliper (1) upward and secure the caliper with heavy mechanics wire, or equivalent.

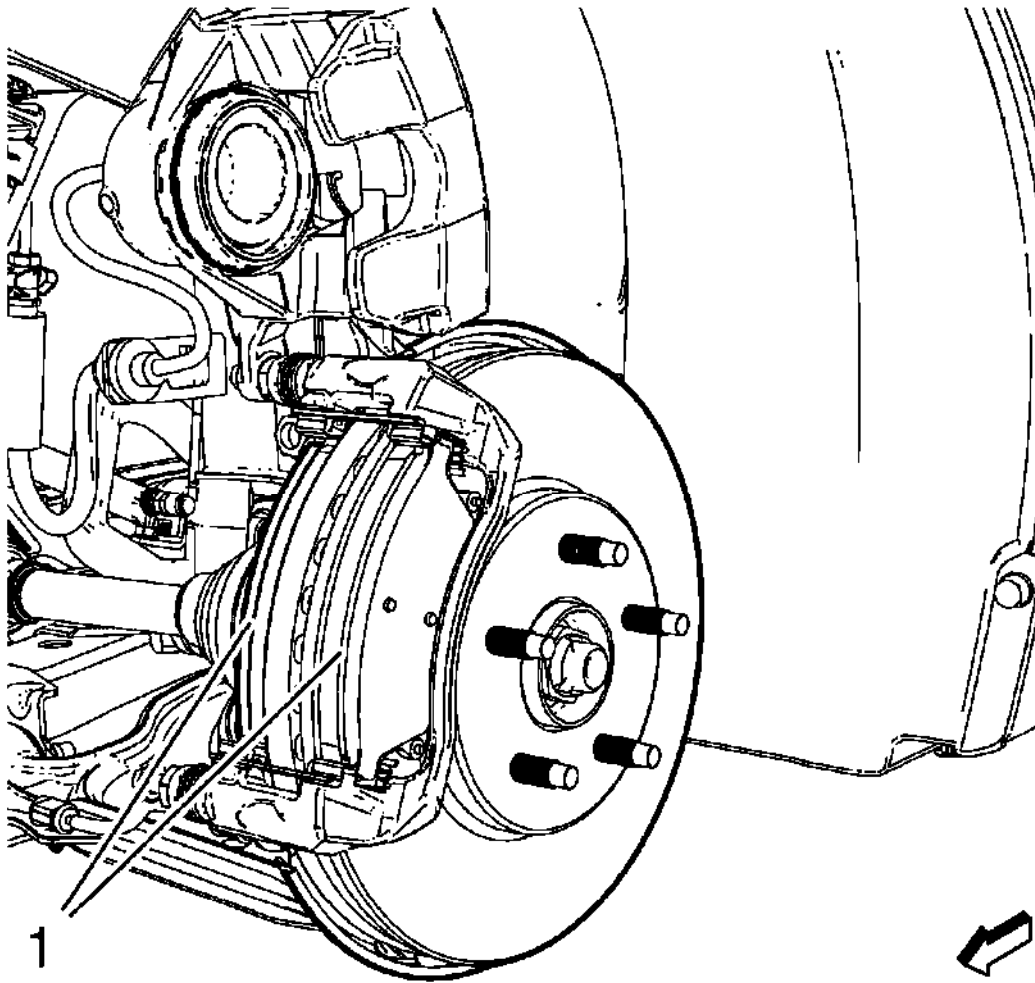


Fig. 14: View of Installed Brake Pads
Courtesy of GENERAL MOTORS COMPANY

8. Remove the brake pads (1) from the caliper mounting bracket.

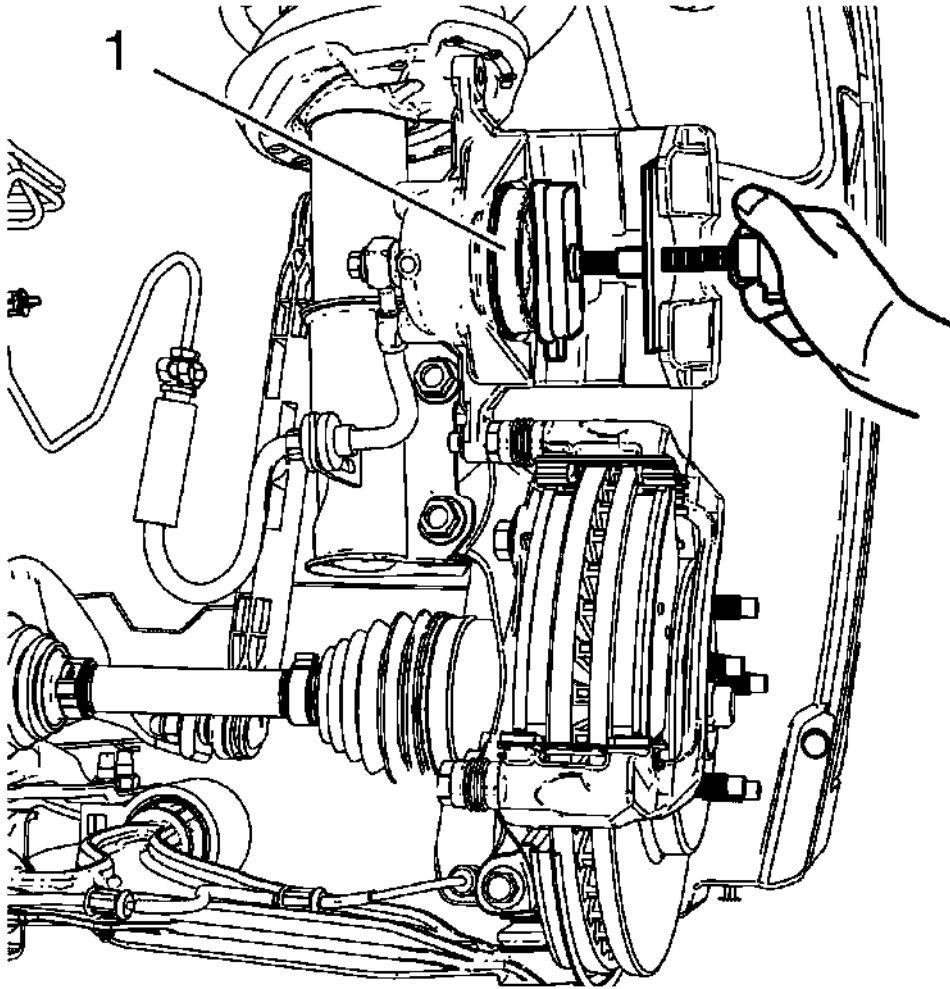


Fig. 15: Pushing Disc Brake Caliper Piston Inward
Courtesy of GENERAL MOTORS COMPANY

9. Push the disc brake caliper piston (1) into the caliper bore using a disc brake piston installation tool.

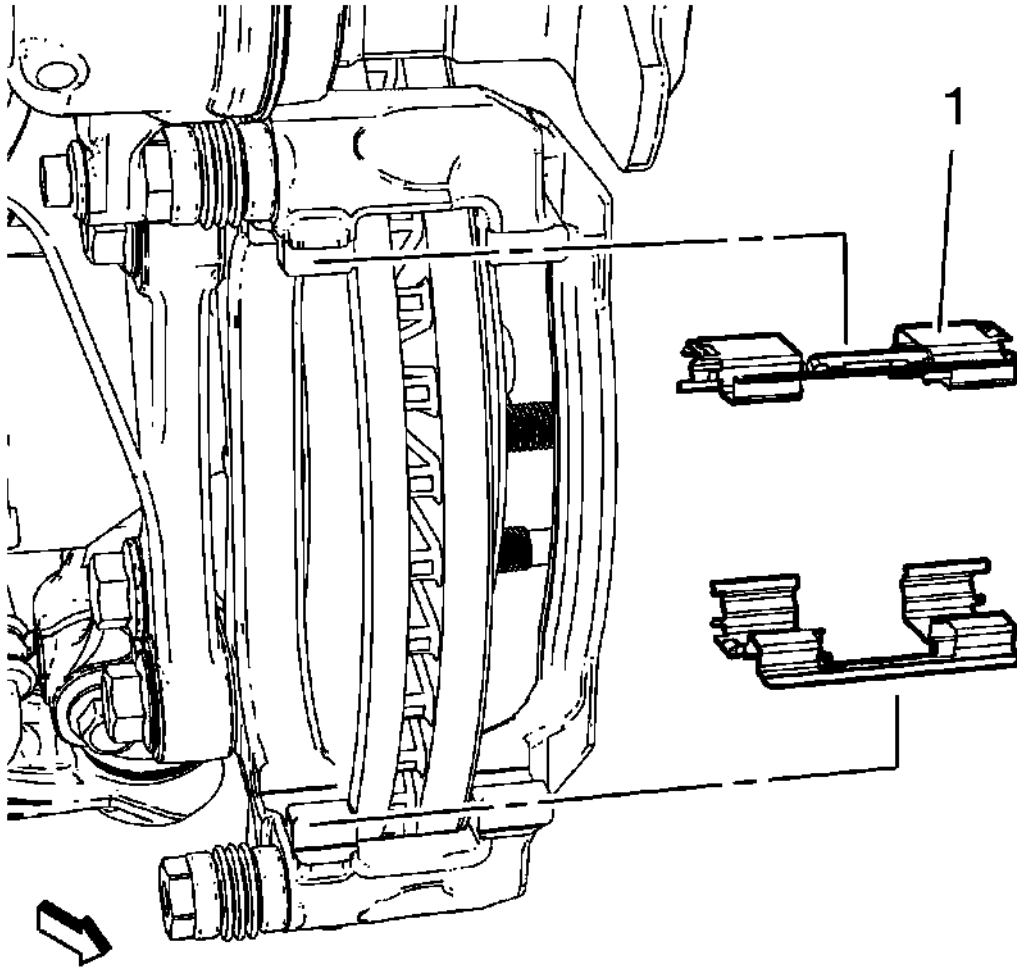


Fig. 16: View Of Brake Pad Retainer Springs
Courtesy of GENERAL MOTORS COMPANY

10. Remove the brake pad retainer springs (1) from the caliper bracket.
11. Thoroughly clean the brake pad hardware mating surfaces of the caliper bracket of any debris and corrosion.
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.

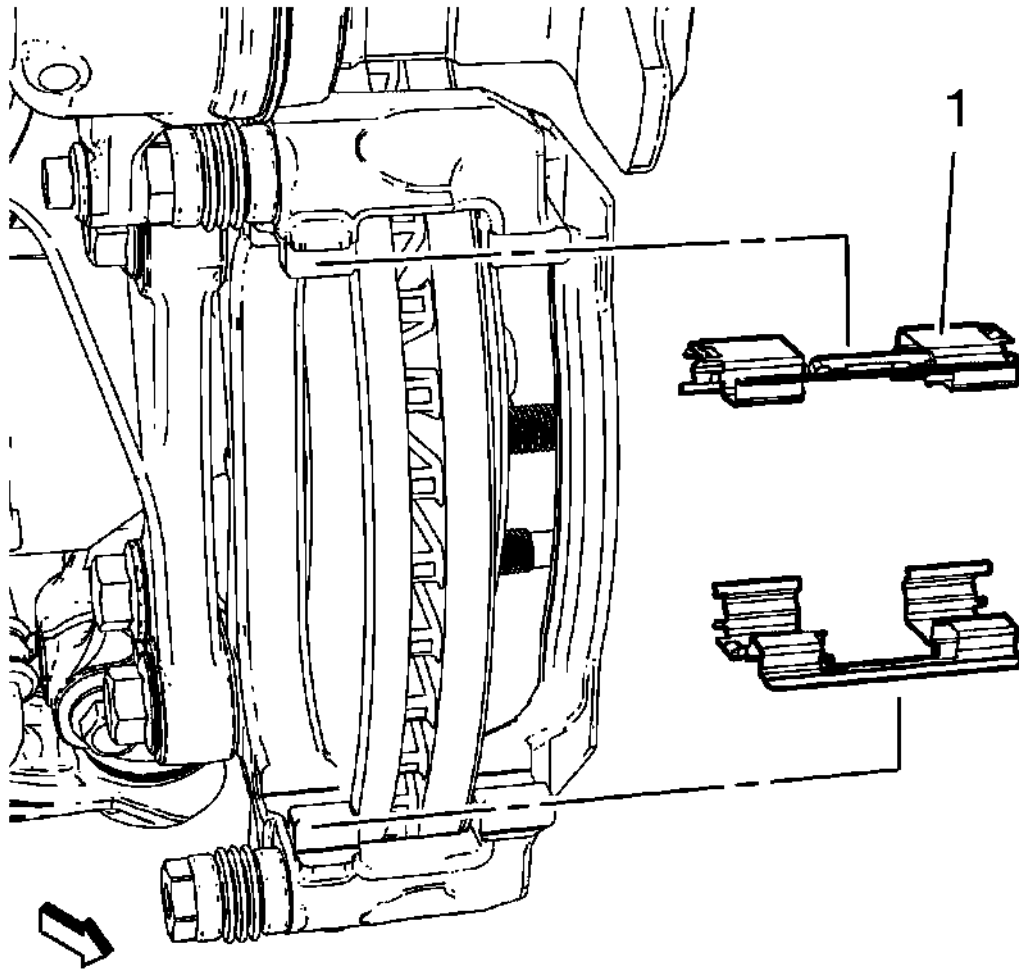


Fig. 17: View Of Brake Pad Retainer Springs
Courtesy of GENERAL MOTORS COMPANY

1. Ensure the brake pad hardware mating surfaces are clean.
2. Install the brake pad retainer springs (1) to the brake caliper bracket.

Apply a thin coat of high temperature silicone lube to the brake pad retainers.

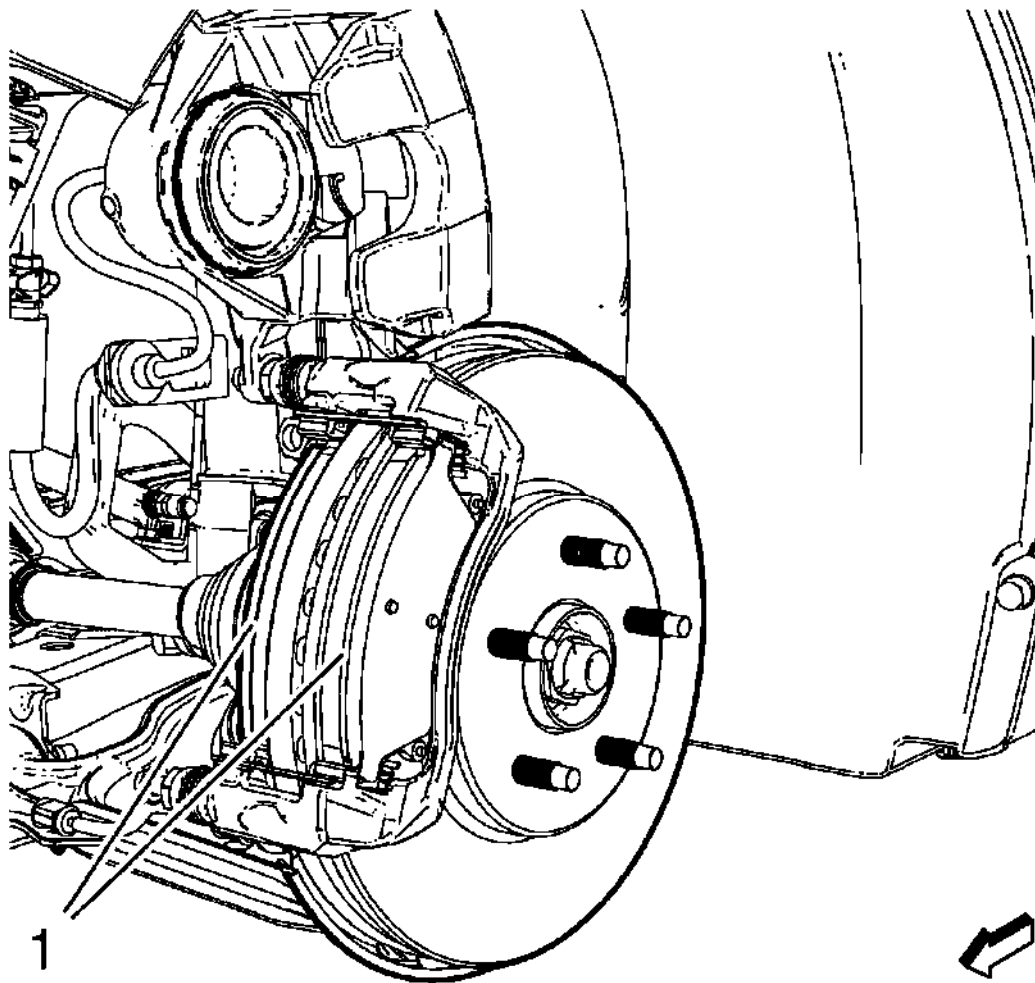


Fig. 18: View of Installed Brake Pads
Courtesy of GENERAL MOTORS COMPANY

NOTE: The wear sensor equipped disc brake pad must be mounted inboard of the rotor with the leading edge of the sensor facing the brake rotor during forward wheel rotation, or at the top of the pad when installed in vehicle position.

3. Install the brake pads (1) to the caliper bracket.
4. Remove the support, and rotate the brake caliper into position over the disc brake pads and to the caliper mounting bracket.

CAUTION: Refer to Fastener Caution .

5. Install the lower brake caliper guide pin bolt and tighten to 28 N.m (21 lb ft).

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6. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
7. Lower the vehicle.
8. With the engine OFF, gradually apply the brake pedal approximately 2/3 of its travel distance.
9. Slowly release the brake pedal.
10. 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.
11. Fill the master cylinder auxiliary reservoir to the proper level. Refer to **Master Cylinder Reservoir Filling** .
12. Burnish the brake pads and the brake rotor. Refer to **Brake Pad and Rotor Burnishing**.

REAR DISC BRAKE PADS REPLACEMENT

Removal Procedure

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

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

NOTE: Always replace disc brake pads in axle sets.

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

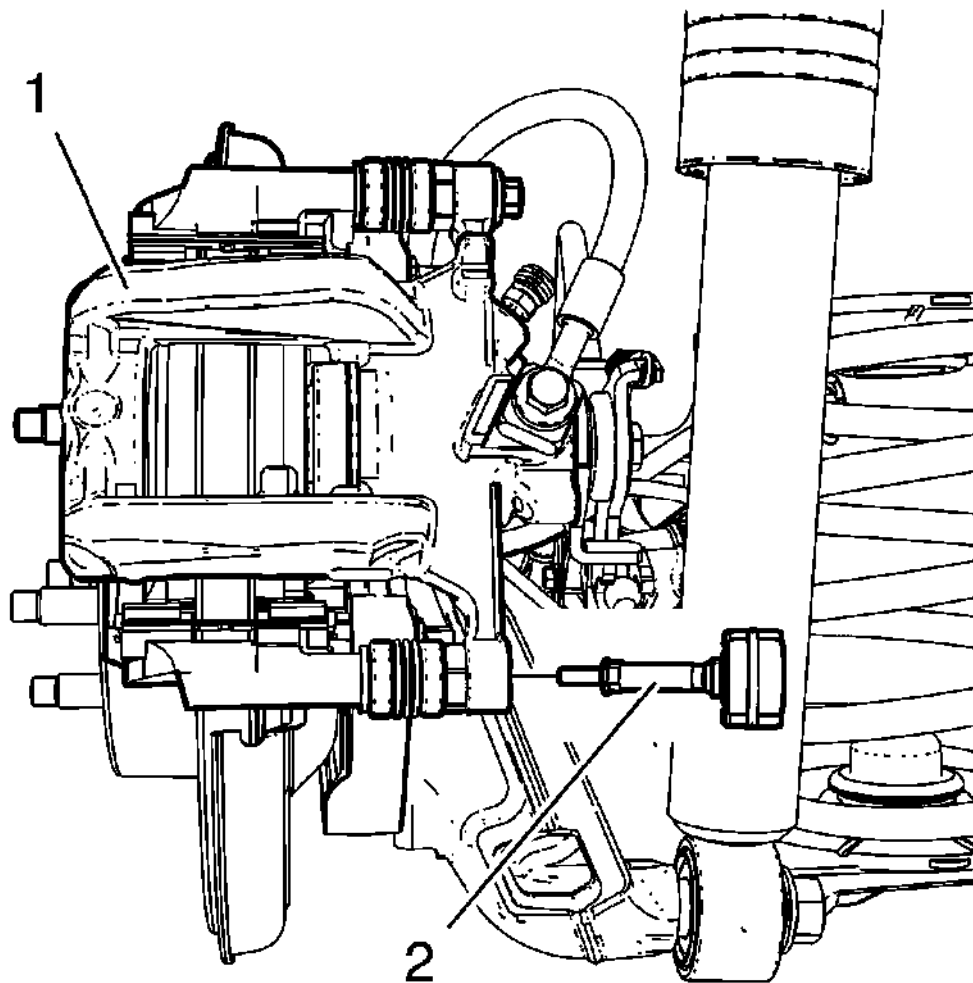


Fig. 19: Brake Caliper Mass Dampener
Courtesy of GENERAL MOTORS COMPANY

6. Remove the brake caliper mass dampener (2).

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

7. Without disconnecting the hydraulic brake flexible hose, pivot the caliper (1) upward and secure the caliper with heavy mechanics wire, or equivalent.

Mark the brake caliper piston position to the brake caliper (1).

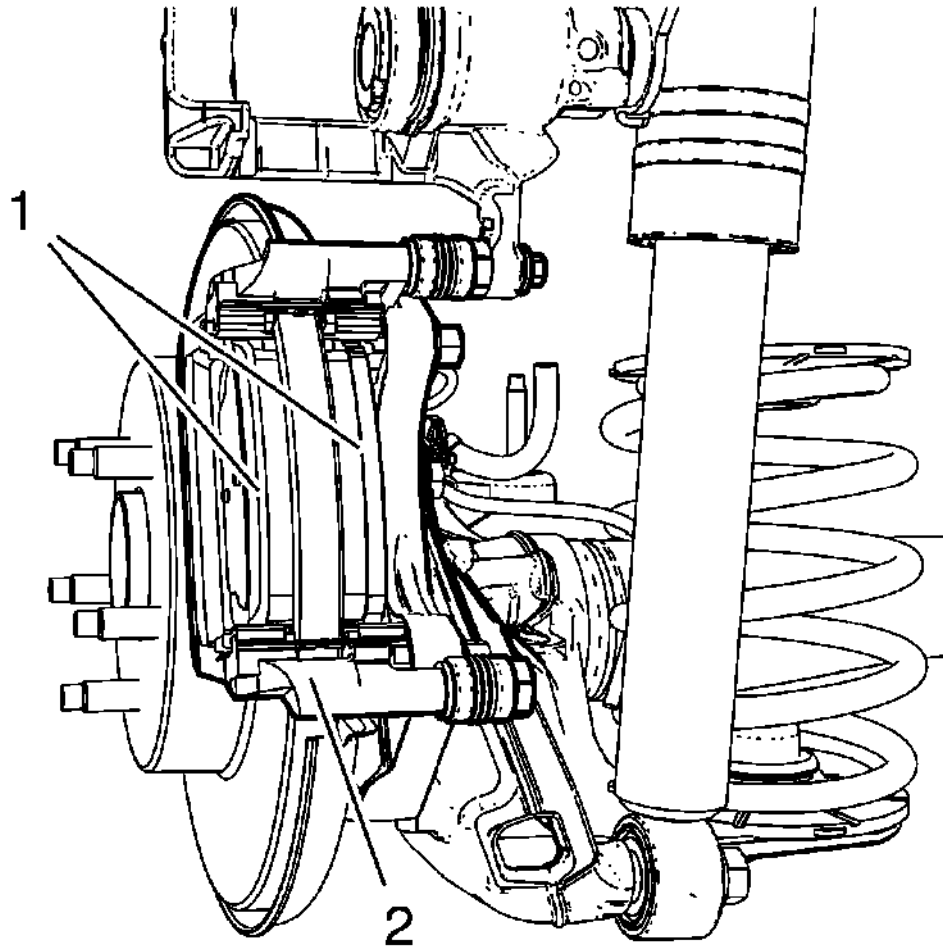


Fig. 20: View Of Installed Brake Pads

Courtesy of GENERAL MOTORS COMPANY

8. Remove the brake pads (1) from the caliper mounting bracket (2).

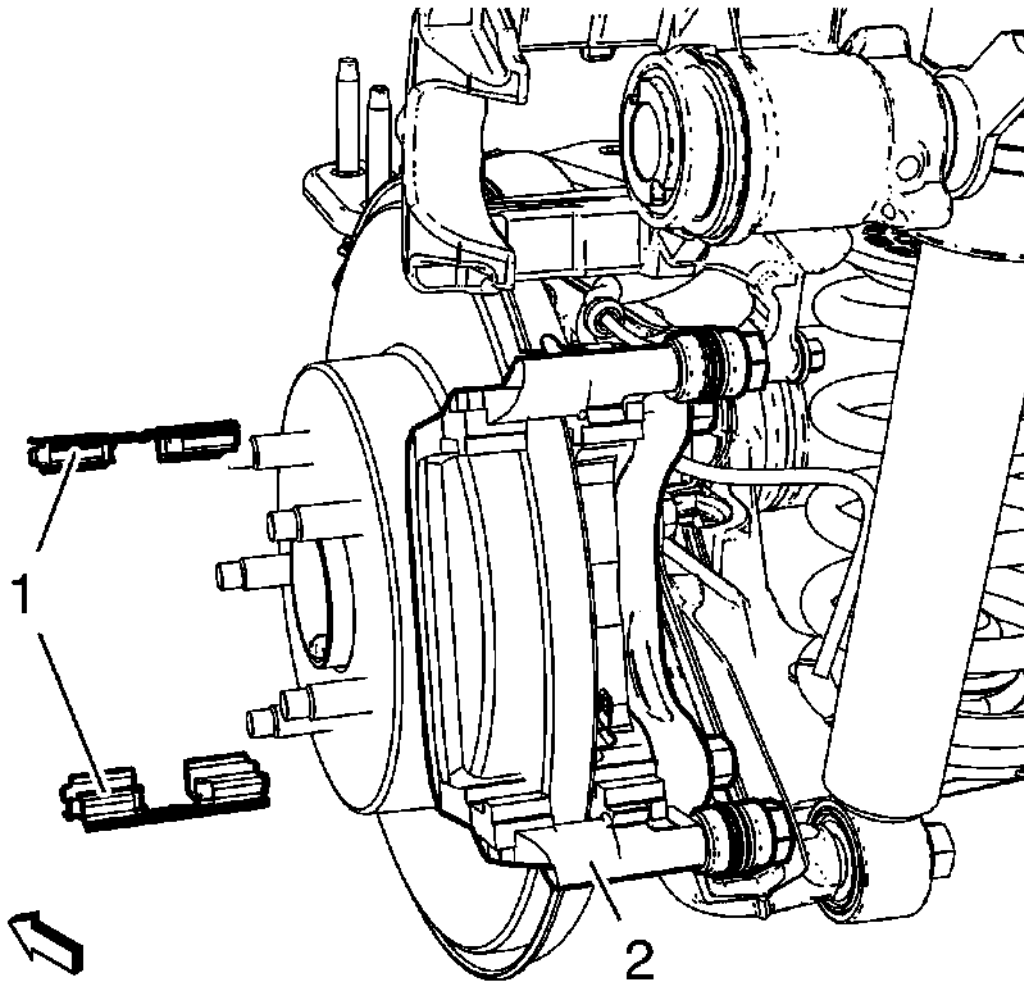


Fig. 21: View Of Brake Pad Retainer Springs
Courtesy of GENERAL MOTORS COMPANY

9. Remove the brake pad retainer springs (1) from the caliper bracket (2).
10. Thoroughly clean the brake pad hardware mating surfaces of the caliper bracket, of any debris and corrosion.
11. 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.
12. If any of the conditions listed are found, the brake caliper guide pins and/or boots require replacement.

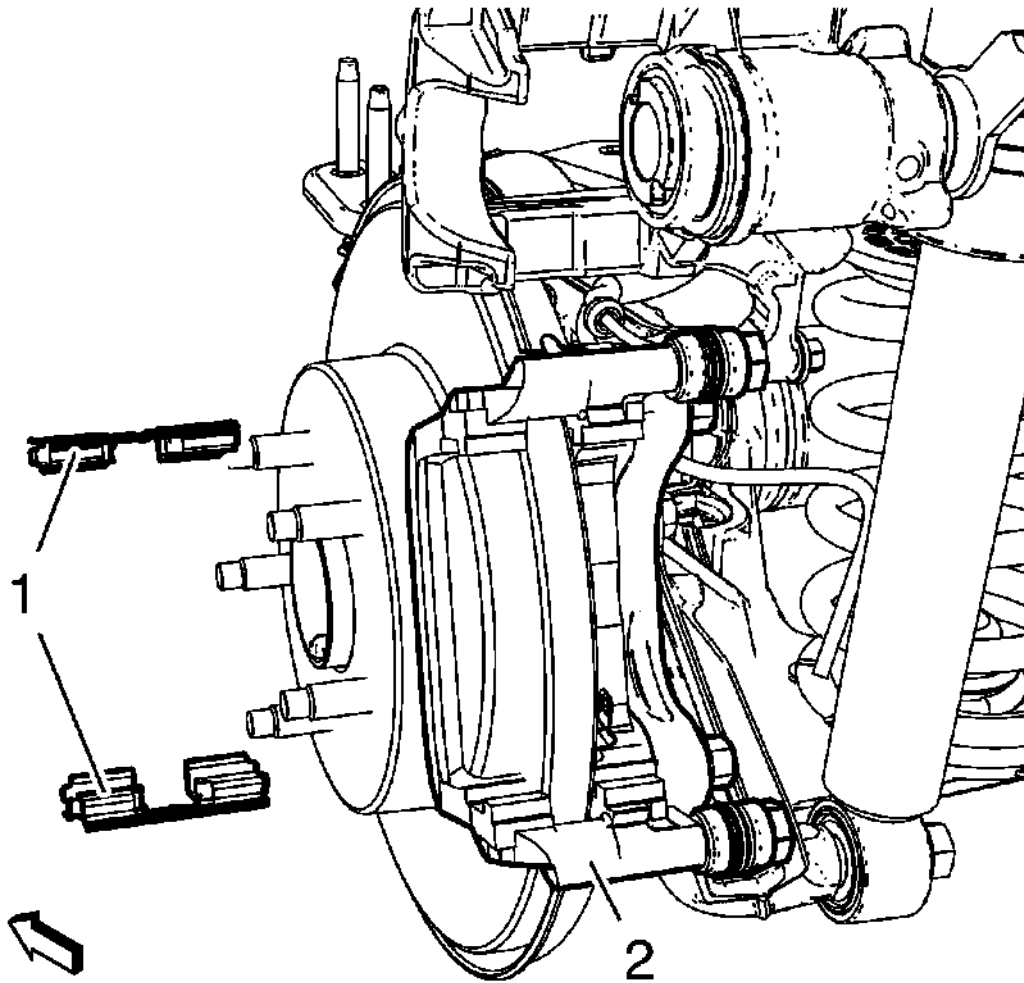


Fig. 22: View Of Brake Pad Retainer Springs
Courtesy of GENERAL MOTORS COMPANY

1. Ensure the brake pad hardware mating surfaces are clean.
2. Install the brake pad retainers springs (1) to the brake caliper bracket (2) and apply a thin coat of high temperature silicone lube to the brake pad retainers.

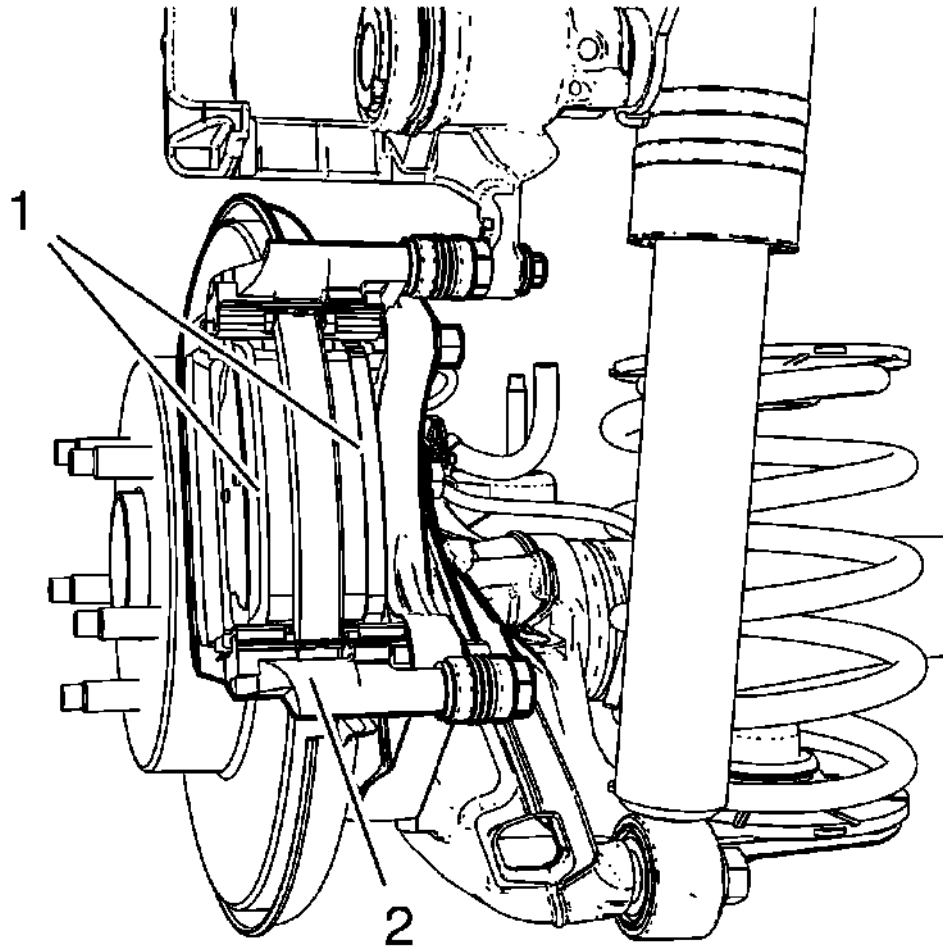


Fig. 23: View Of Installed Brake Pads
Courtesy of GENERAL MOTORS COMPANY

NOTE: The wear sensor equipped disc brake pad must be mounted inboard of the rotor with the leading edge of the sensor facing the brake rotor during forward wheel rotation, or at the top of the pad when installed in vehicle position.

3. Install the brake pads (1) to the caliper bracket (2).

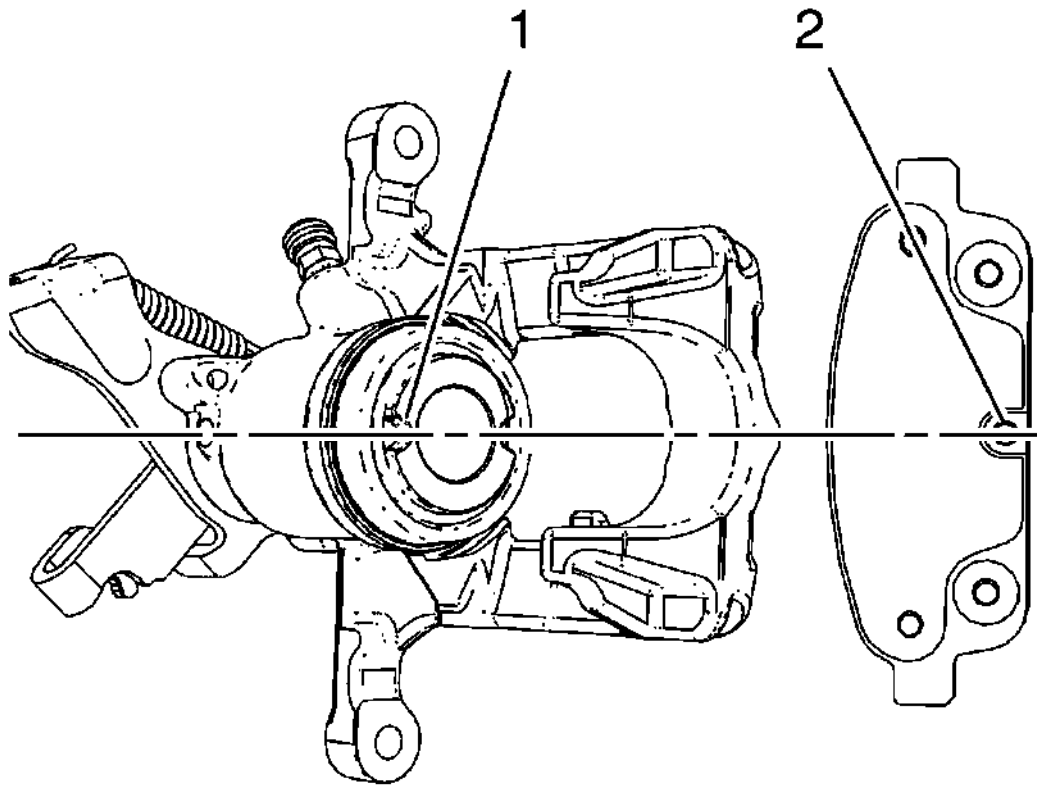


Fig. 24: Brake Caliper Piston And Pin Notch
Courtesy of GENERAL MOTORS COMPANY

4. Rotate the brake caliper piston (1) into the brake caliper bore.
5. Align the notch on the brake caliper piston with the pin (2) on the disc brake pad.

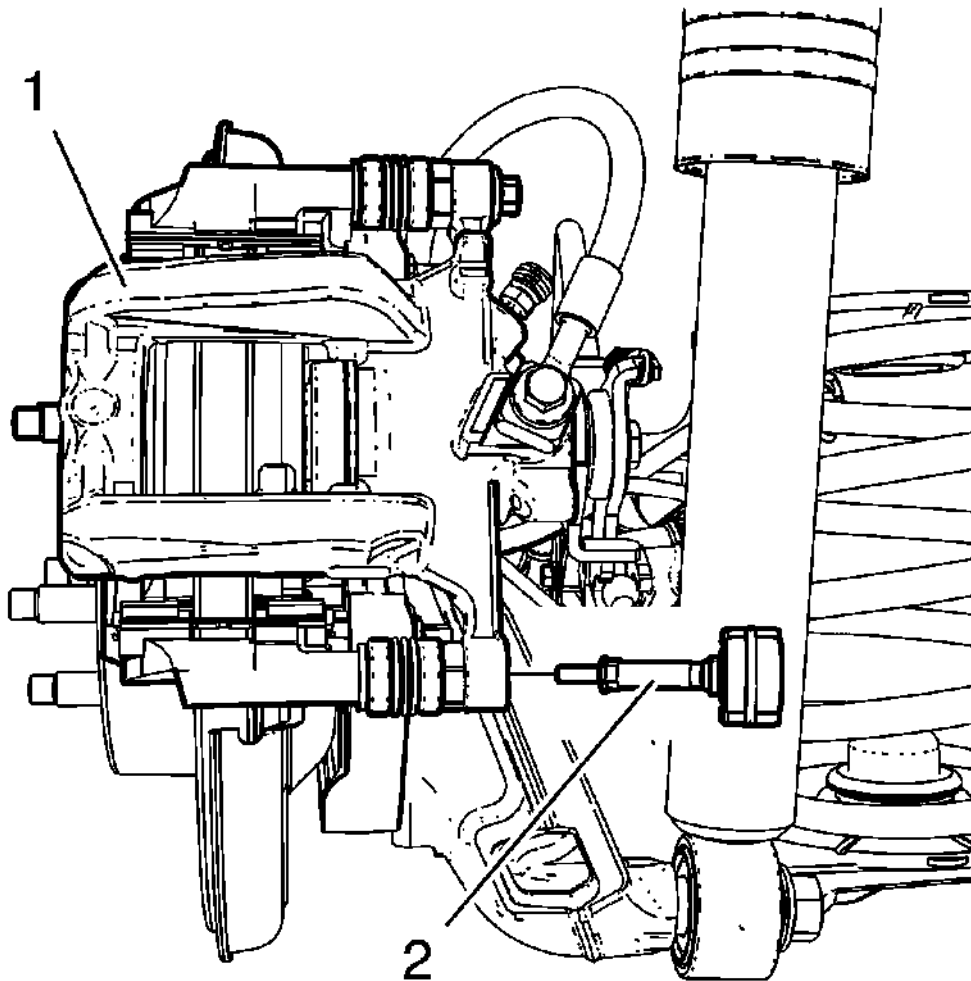


Fig. 25: Brake Caliper Mass Dampener
Courtesy of GENERAL MOTORS COMPANY

6. Remove the support, and rotate the brake caliper (1) into position over the disc brake pads and to the caliper mounting bracket.

CAUTION: Refer to Fastener Caution .

7. Install the lower brake caliper mass dampener (2) and tighten to 28 N.m (21 lb ft).
8. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
9. Lower the vehicle.
10. With the engine 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. Fill the master cylinder reservoir to the proper level. Refer to **Master Cylinder Reservoir Filling** .

14. Burnish the brake pads and the brake rotor. Refer to **Brake Pad and Rotor Burnishing**

BRAKE PAD AND ROTOR BURNISHING

WARNING: Road test a vehicle under safe conditions and while obeying all traffic laws. Do not attempt any maneuvers that could jeopardize vehicle control. Failure to adhere to these precautions could lead to serious personal injury and vehicle damage.

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

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

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

NOTE: Use care to avoid overheating the brakes while performing this step.

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

FRONT BRAKE CALIPER REPLACEMENT

Removal Procedure

WARNING: Use of eye goggles is necessary to prevent personal injury.

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

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

1. Inspect the fluid level in the brake master cylinder reservoir.
2. If the brake fluid level is midway between the maximum-full point and the minimum allowable level, no brake fluid needs to be removed from the reservoir before proceeding.

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

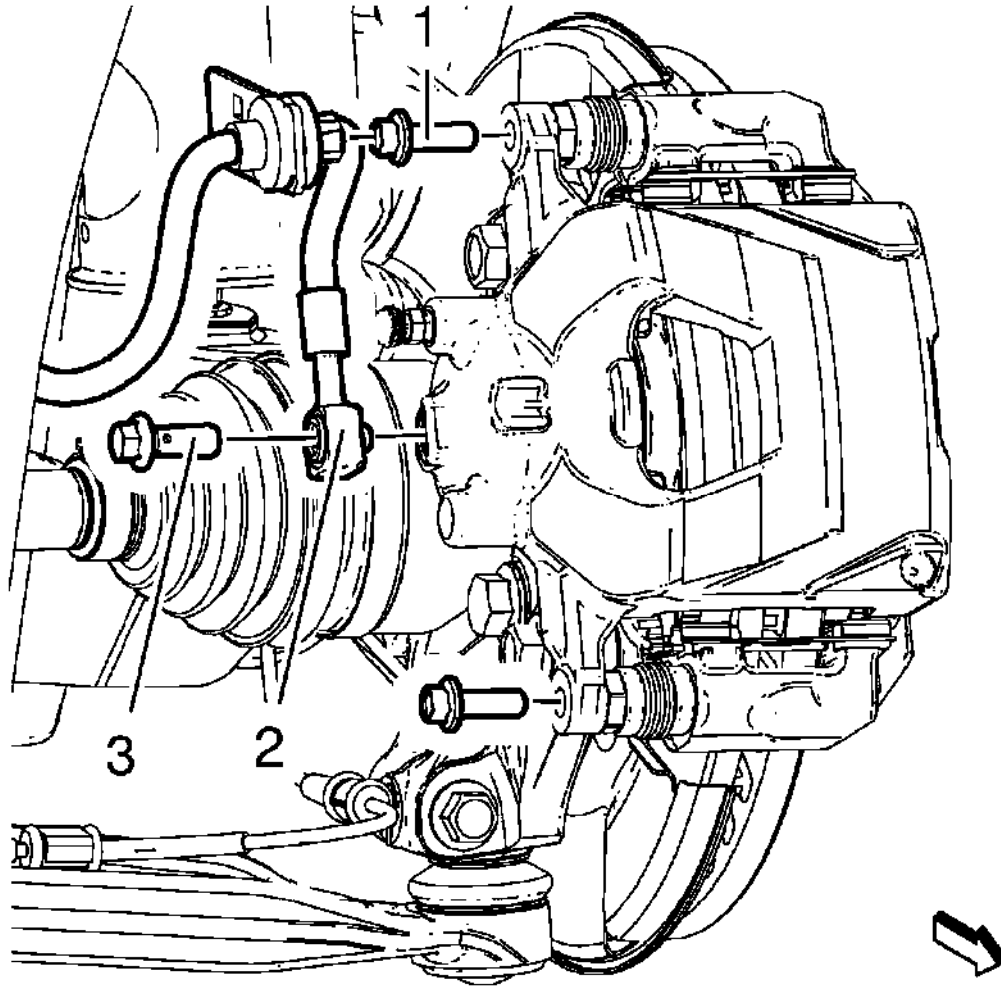


Fig. 26: Caliper Brake Hose And Brake Hose-To-Caliper Bolt
 Courtesy of GENERAL MOTORS COMPANY

6. Remove the brake hose-to-caliper bolt (3) from the brake caliper.
7. Remove the brake hose (2) from the brake caliper.

Remove and discard the copper brake hose washers. These washers may be stuck to the brake caliper and/or the brake hose end.

8. Cap or plug the opening in the brake caliper and the brake hose to prevent fluid loss and contamination.
9. Remove the brake caliper guide pin bolts (1).

10. Remove the brake caliper from the caliper bracket.
11. 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
12. If any of the conditions listed are found, the brake caliper guide pins and/or boots require replacement.

Installation Procedure

1. Install the brake caliper to the brake caliper bracket.

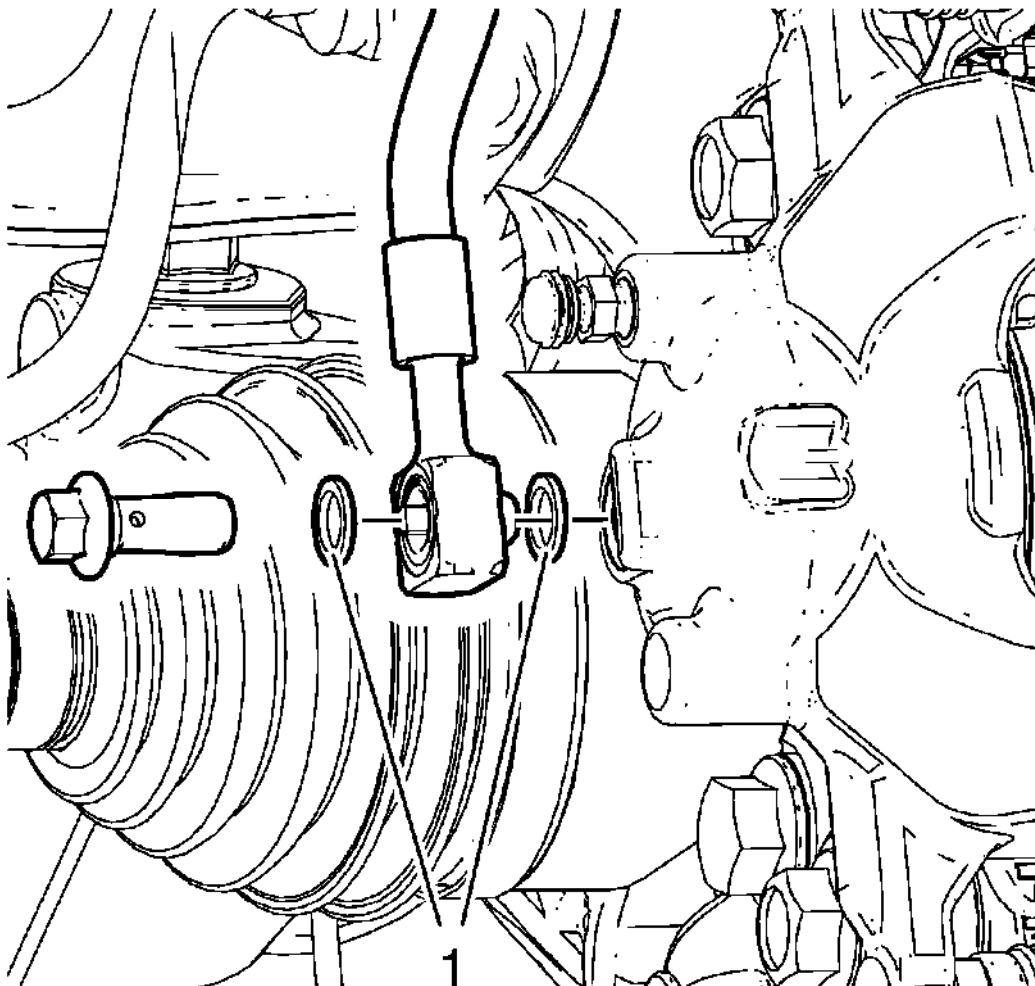


Fig. 27: Caliper Brake Hose And Brake Hose-To-Caliper Bolt
Courtesy of GENERAL MOTORS COMPANY

NOTE: Do not reuse the brake hose washers.

2. Install NEW copper brake hose washers (1) to the brake hose-to-caliper bolt and to the brake hose.

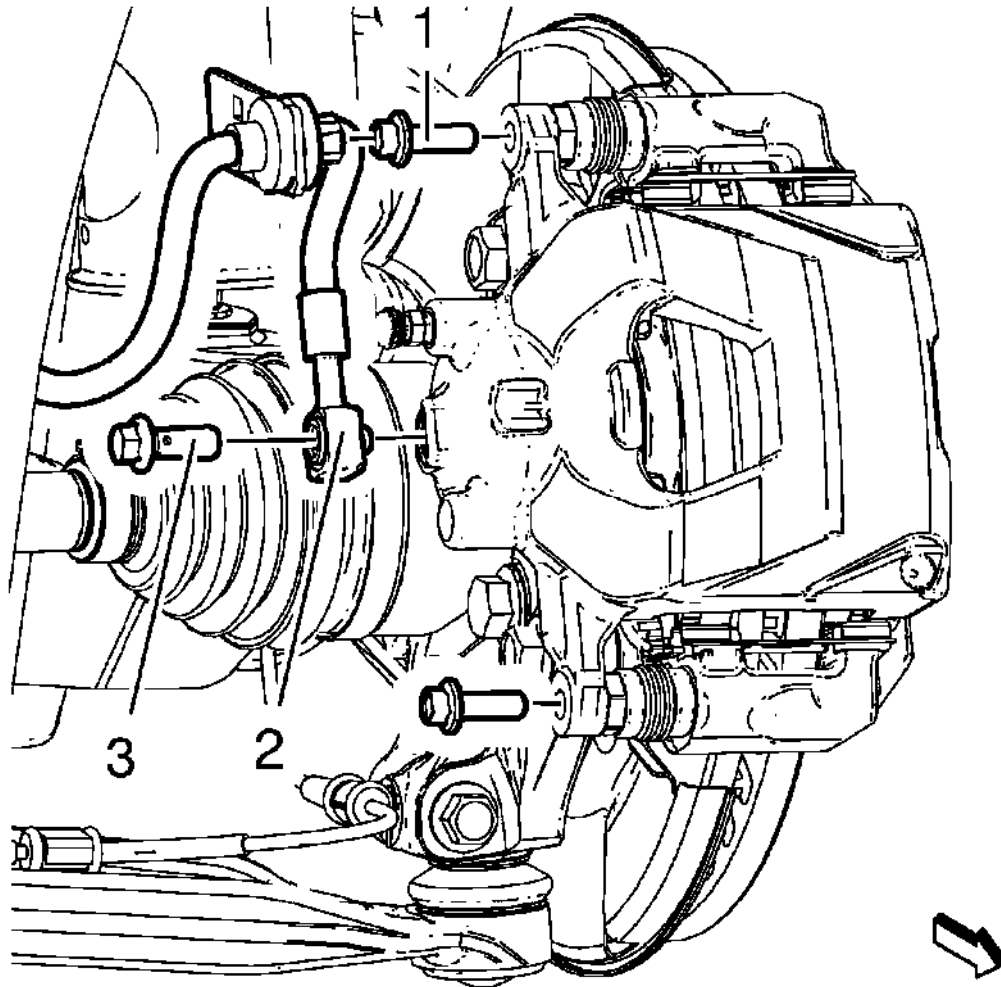


Fig. 28: Caliper Brake Hose And Brake Hose-To-Caliper Bolt
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution

3. Install the brake caliper guide pin bolts (1) and tighten to 28 N.m (21 lb ft).
4. Remove the caps or plugs from the brake caliper opening and the brake hose.
5. Install the brake hose (2) to the caliper.
6. Install brake hose-to-caliper bolt (3) to the caliper and tighten to 40 N.m (30 lb ft).
7. Bleed the hydraulic brake system. Refer to Hydraulic Brake System Bleeding (Manual Bleeding) ,

Hydraulic Brake System Bleeding (Pressure Bleeding) .

8. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
9. Lower the vehicle.
10. With the engine OFF, gradually apply the brake pedal to approximately 2/3 of its travel distance.
11. Slowly release the brake pedal.
12. Wait 15 seconds, then repeat steps 10 and 11 until a firm brake pedal is obtained. This will properly seat the brake caliper piston and brake pads.

REAR BRAKE CALIPER REPLACEMENT

Removal Procedure

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

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

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

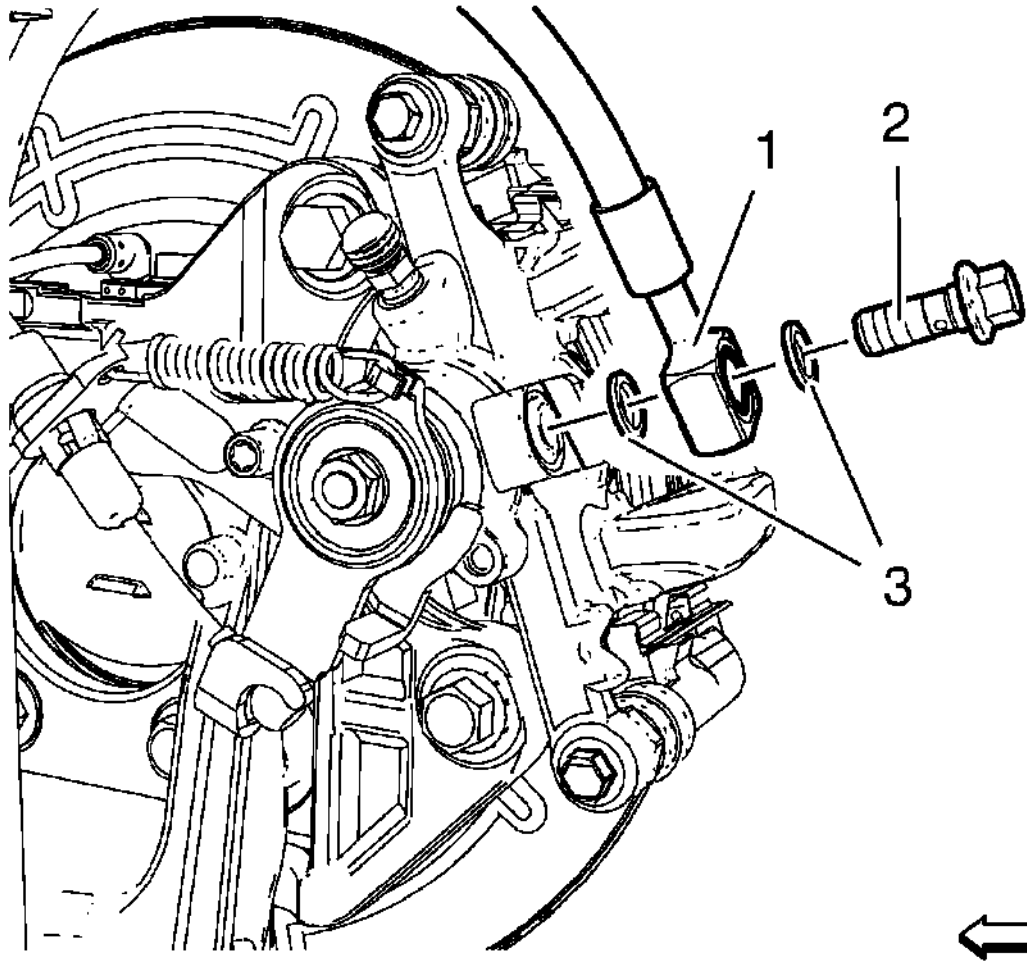


Fig. 29: Brake Hose And Brake Hose-To-Caliper Bolt
Courtesy of GENERAL MOTORS COMPANY

6. Remove the brake hose to caliper bolt (2) from the brake caliper.
7. Remove the brake hose (1) from the brake caliper.
8. Remove and discard the 2 copper brake hose gaskets (3). These gaskets may be stuck to the brake caliper and/or the brake hose end.

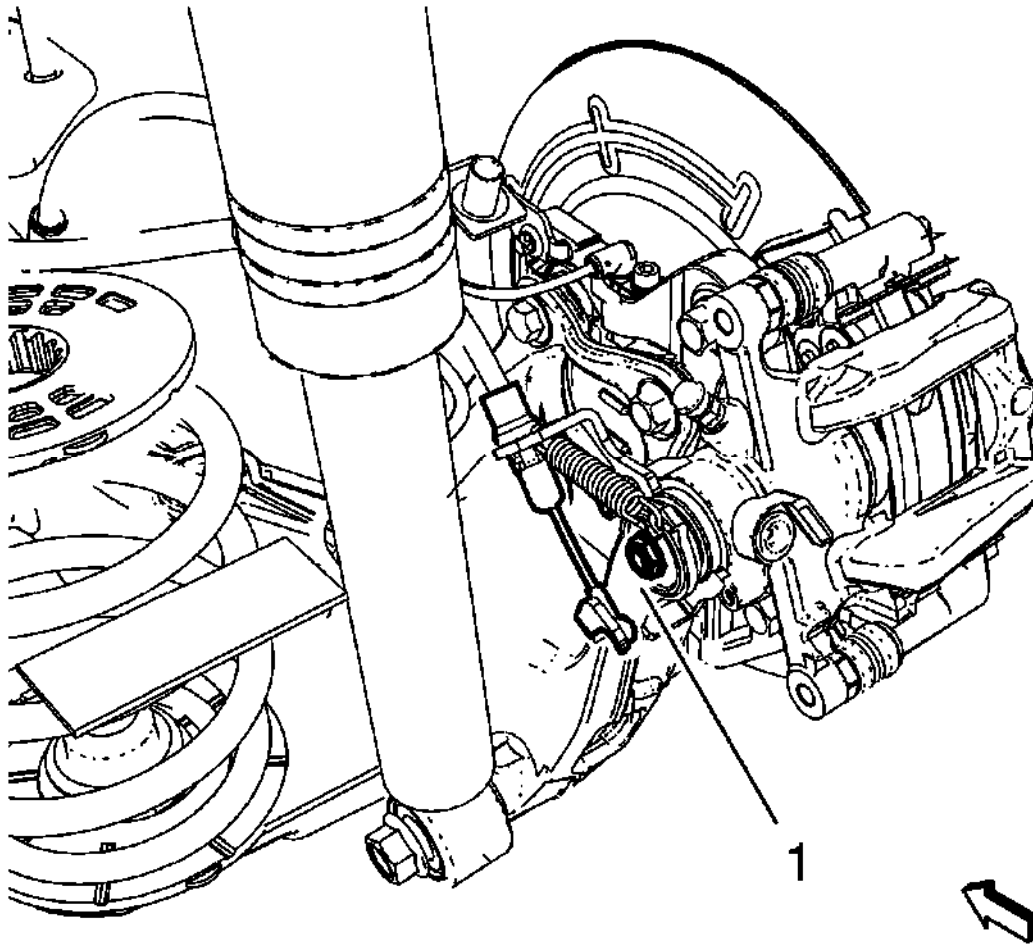


Fig. 30: Rear Parking Brake Lever

Courtesy of GENERAL MOTORS COMPANY

9. Remove the park brake cable from the rear parking brake lever (1).
10. Cap or plug the opening in the brake caliper and the brake hose to prevent fluid loss and contamination.

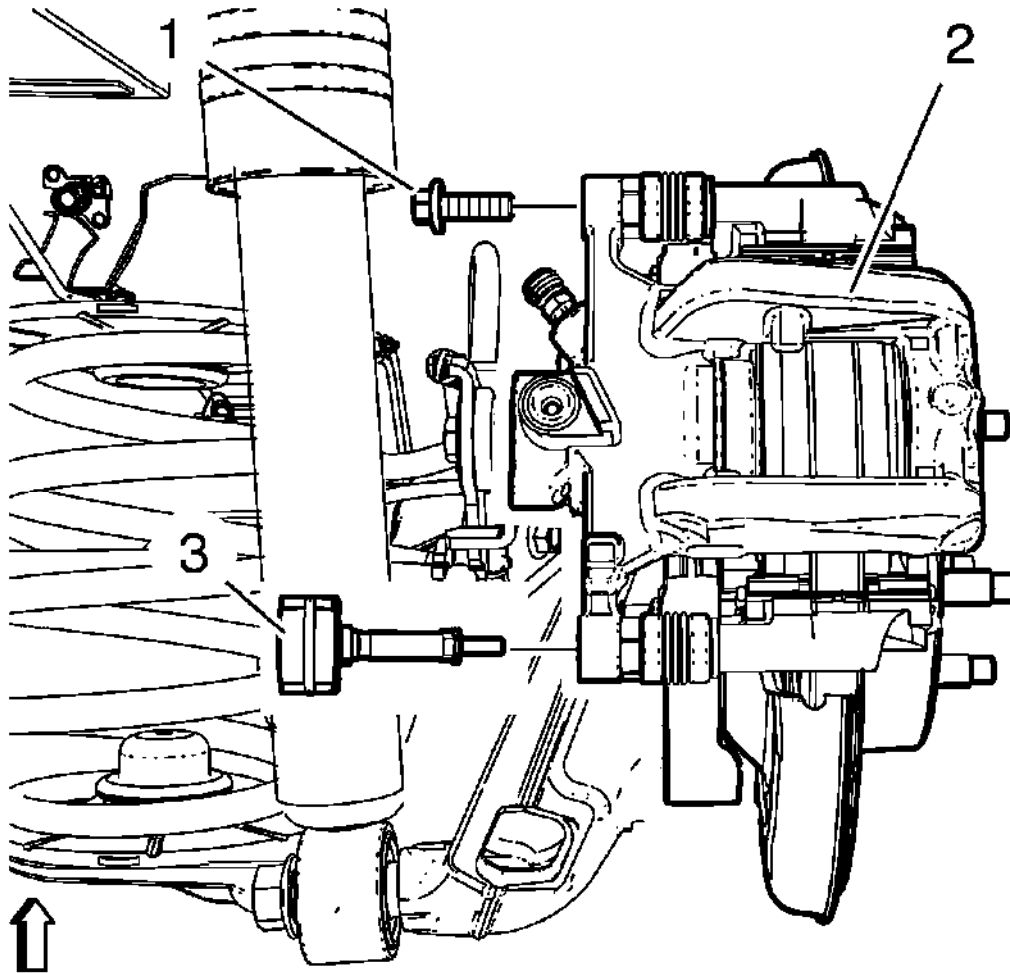


Fig. 31: Brake Caliper Pin Bolt And Brake Caliper Vibration Dampener
Courtesy of GENERAL MOTORS COMPANY

11. Remove the upper brake caliper pin bolt (1).
12. Remove the brake caliper vibration dampener (3).

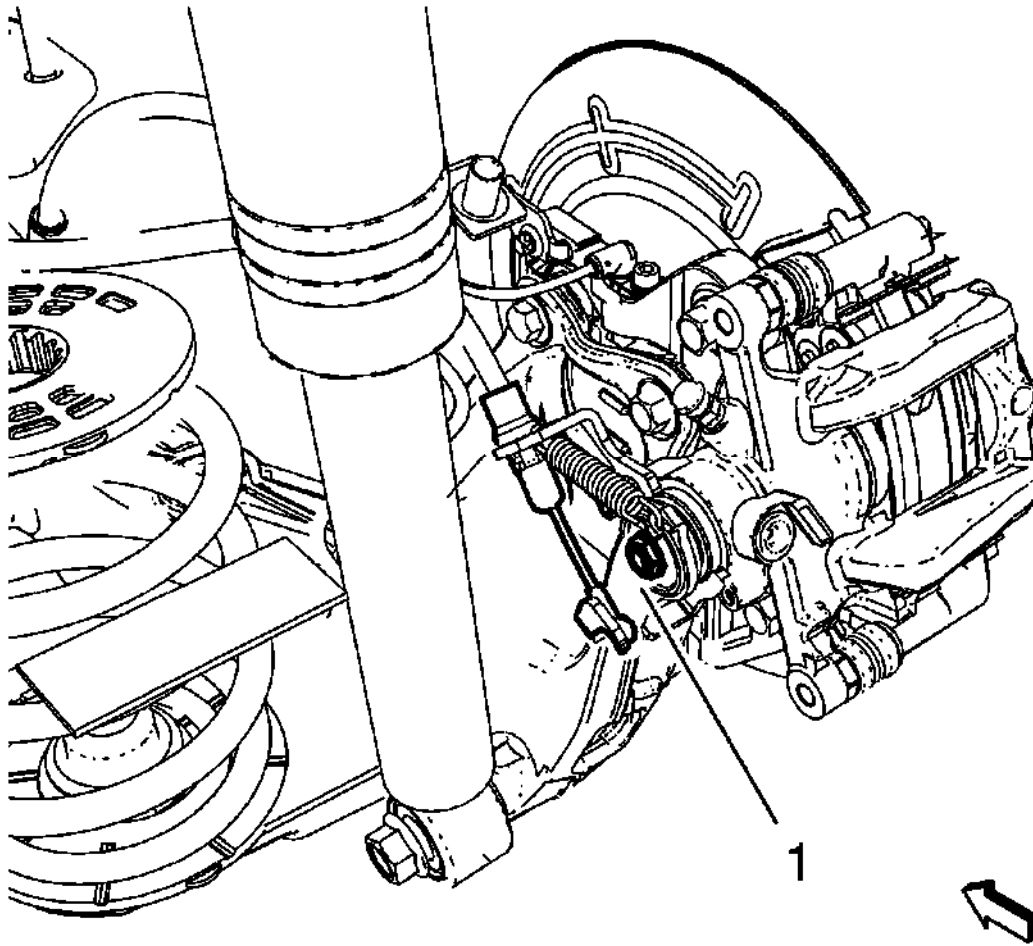


Fig. 32: Rear Parking Brake Lever
Courtesy of GENERAL MOTORS COMPANY

13. Remove the park brake cable from the rear parking brake lever (1).
14. Remove the brake caliper from the brake caliper bracket.

Installation Procedure

1. Inspect the caliper slide boots for cuts, tears, or deterioration. If damaged, replace the slides and boots. Refer to **Rear Brake Caliper Hardware Replacement**.

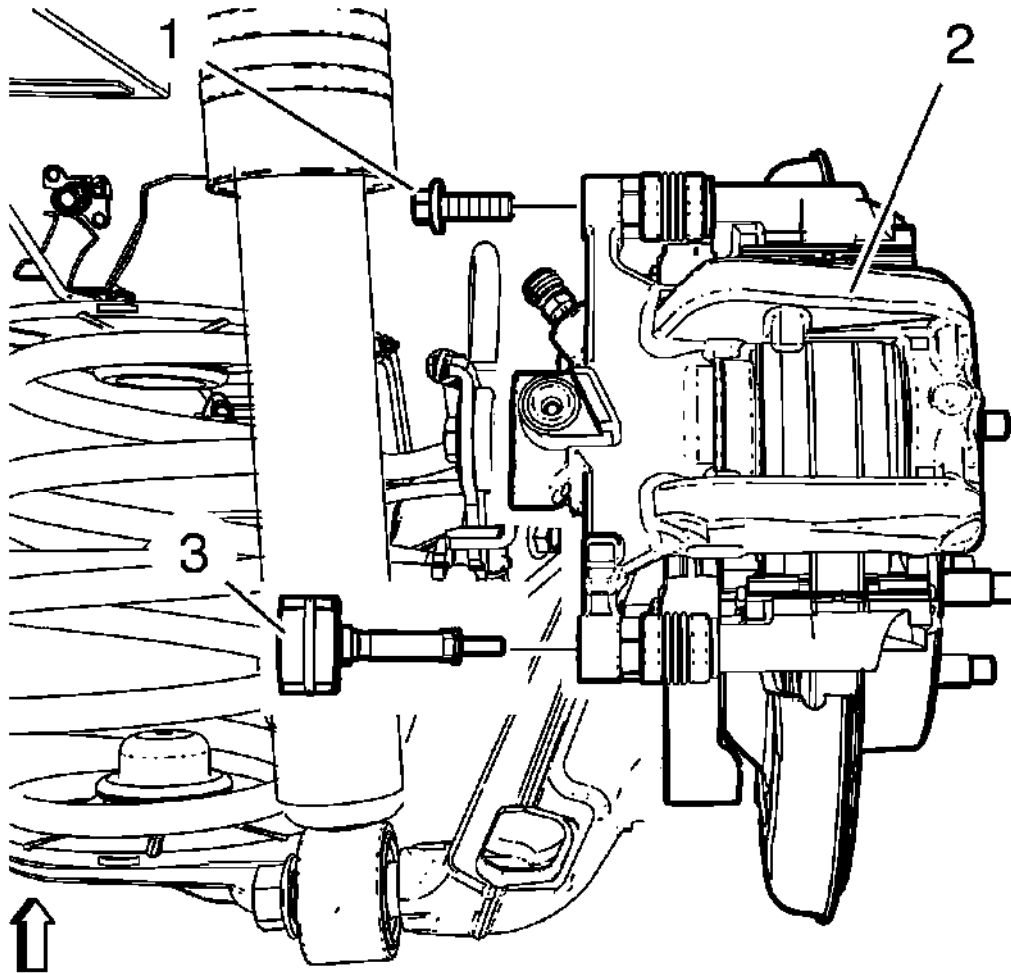


Fig. 33: Brake Caliper Pin Bolt And Brake Caliper Vibration Dampener
Courtesy of GENERAL MOTORS COMPANY

2. Install the brake caliper to the brake caliper bracket.

CAUTION: Refer to Fastener Caution .

3. Install the lower brake caliper pin bolt (1) and tighten to 28 N.m (20 lb ft).
4. Install the brake caliper vibration dampener (3) and tighten to 28 N.m (20 lb ft).

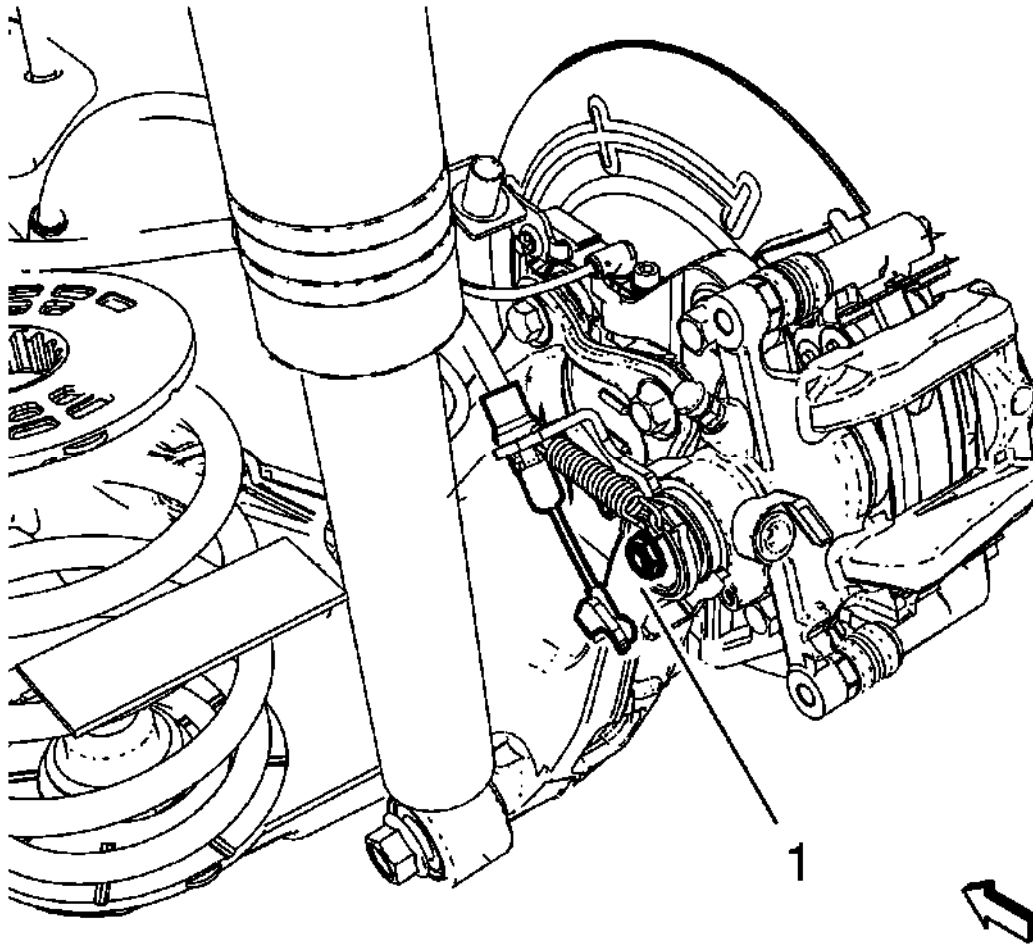


Fig. 34: Rear Parking Brake Lever

Courtesy of GENERAL MOTORS COMPANY

5. Install the park brake cable to the rear parking brake lever (1).

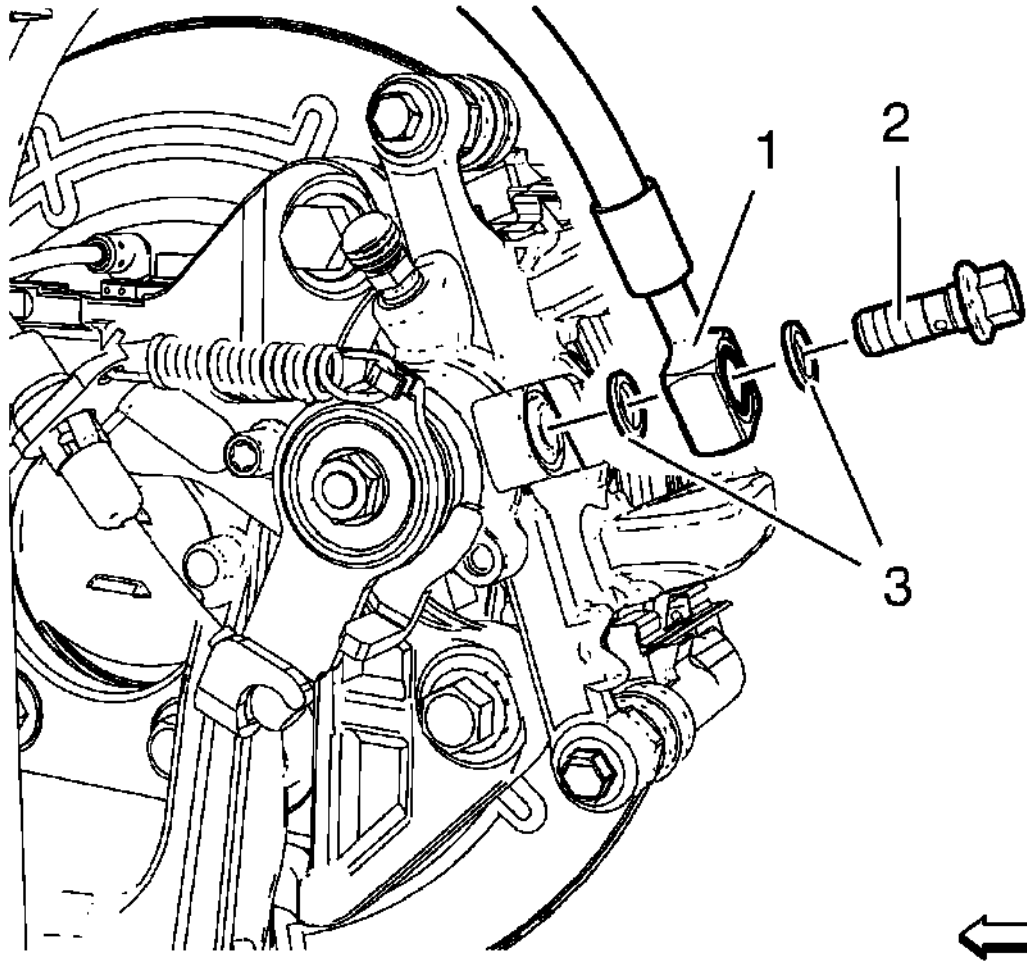


Fig. 35: Brake Hose And Brake Hose-To-Caliper Bolt
Courtesy of GENERAL MOTORS COMPANY

6. Remove the caps or plugs from the brake caliper opening and the brake hose.

NOTE: **DO NOT reuse the copper brake hose gaskets.**

7. Install NEW copper brake hose gaskets (3) to the brake hose-to-caliper bolt (2) and to the brake hose.
8. Install the brake hose and the brake hose-to-caliper bolt to the brake caliper and tighten the bolt to 40 N.m (30 lb ft).
9. Bleed the hydraulic brake system. Refer to **Hydraulic Brake System Bleeding (Manual Bleeding)** , **Hydraulic Brake System Bleeding (Pressure Bleeding)** .
10. With the engine OFF, gradually apply the brake pedal to approximately 2/3 of its travel distance.
11. Slowly release the brake pedal.
12. Wait 15 seconds, then repeat steps 9 and 10 until a firm brake pedal is obtained. This will properly seat the brake caliper pistons and brake pads.

2013 Chevrolet Cruze

2013 BRAKES Disc Brakes - Cruze

13. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
14. Lower the vehicle.
15. Apply and release the park brake lever 4 times.

FRONT BRAKE CALIPER OVERHAUL

Disassembly Procedure

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

WARNING: Refer to **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 the brake caliper from the vehicle. Refer to **Front Brake Caliper Replacement**.

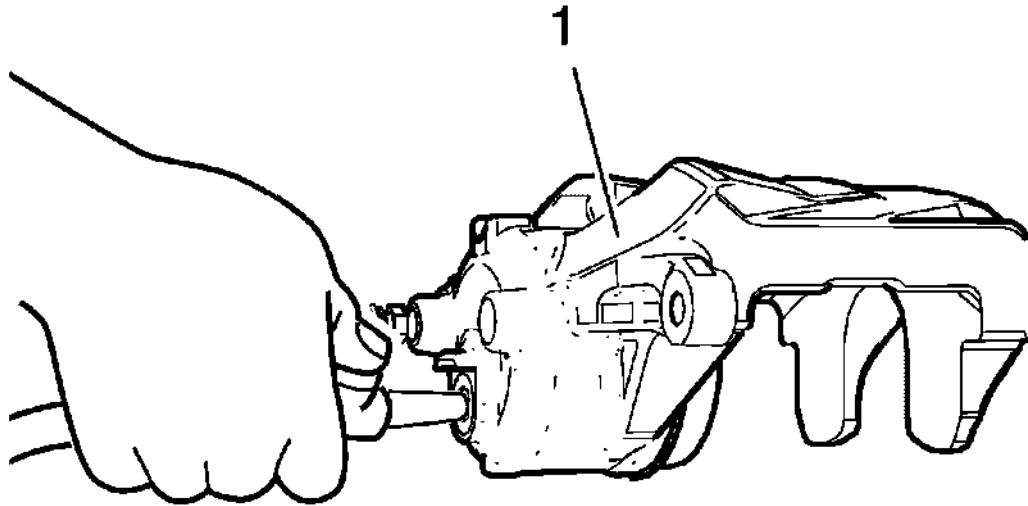


Fig. 36: Using Low Pressure Compressed Air To Remove Brake Caliper Piston
Courtesy of GENERAL MOTORS COMPANY

2. Remove the brake caliper piston from the caliper bore by directing low pressure compressed air into the caliper (1) through the fluid inlet hole.

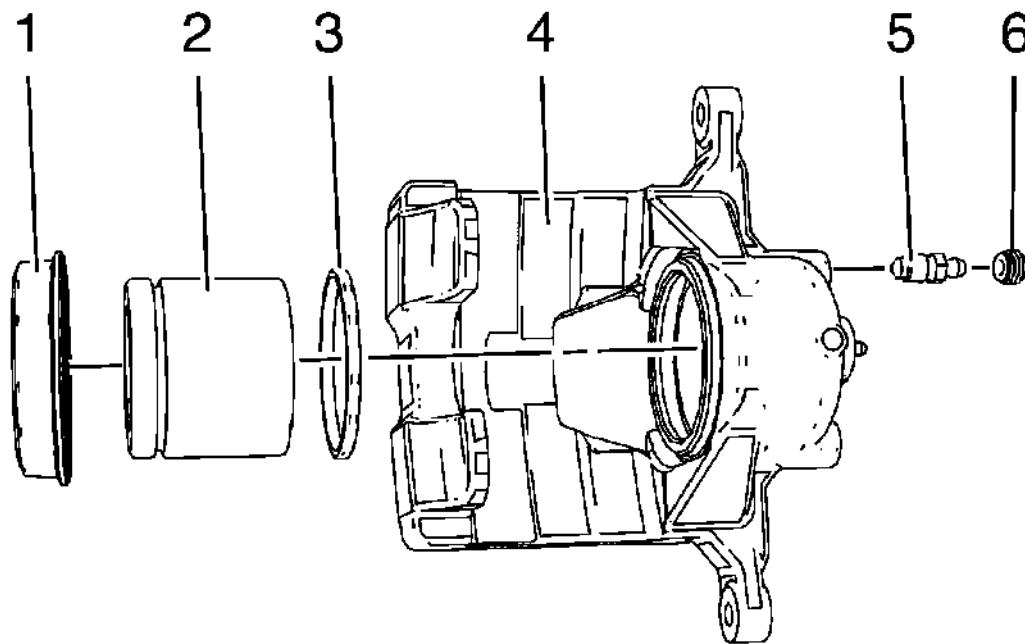


Fig. 37: Exploded View Of Brake Caliper
Courtesy of GENERAL MOTORS COMPANY

3. Remove the piston dust boot seal (1) from the seal counterbore in the caliper (4). Discard the boot seal.
4. Using a small wooden or plastic tool, remove the piston seal (3) from the caliper bore. Discard the piston seal.
5. Remove the bleeder valve cap (6).
6. Remove the bleeder valve (5).

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

7. If cracks, scoring, pitting, excessive rust, and/or excessive corrosion are present in the caliper bore, replace the caliper assembly.
8. 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.
9. Clean the brake caliper piston bore and seal counterbore, and the caliper piston with denatured alcohol, or

equivalent.

10. Dry the caliper piston bore and counterbore, and the piston with non-lubricated, filtered, compressed air.
11. Inspect the caliper piston for cracks, scoring, and/or damage to the plating. Replace the caliper piston if any of these conditions exist.
12. 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

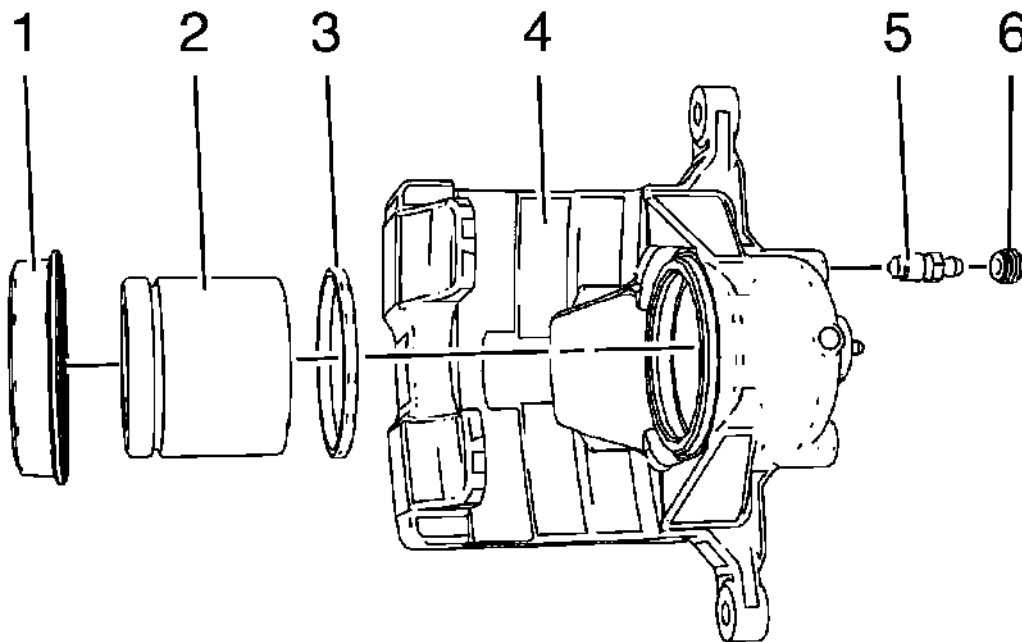


Fig. 38: Exploded View Of Brake Caliper
Courtesy of GENERAL MOTORS COMPANY

1. Lubricate the new piston seal (3) with brake fluid from a clean, sealed brake fluid container. Refer to **Adhesives, Fluids, Lubricants, and Sealers** for the recommended brake fluid.
2. Install the lubricated, new piston seal (3) into the caliper bore.
3. Apply a thin coat of brake fluid from a clean, sealed brake fluid container. Refer to **Adhesives, Fluids,**

Lubricants, and Sealers for the recommended brake fluid.

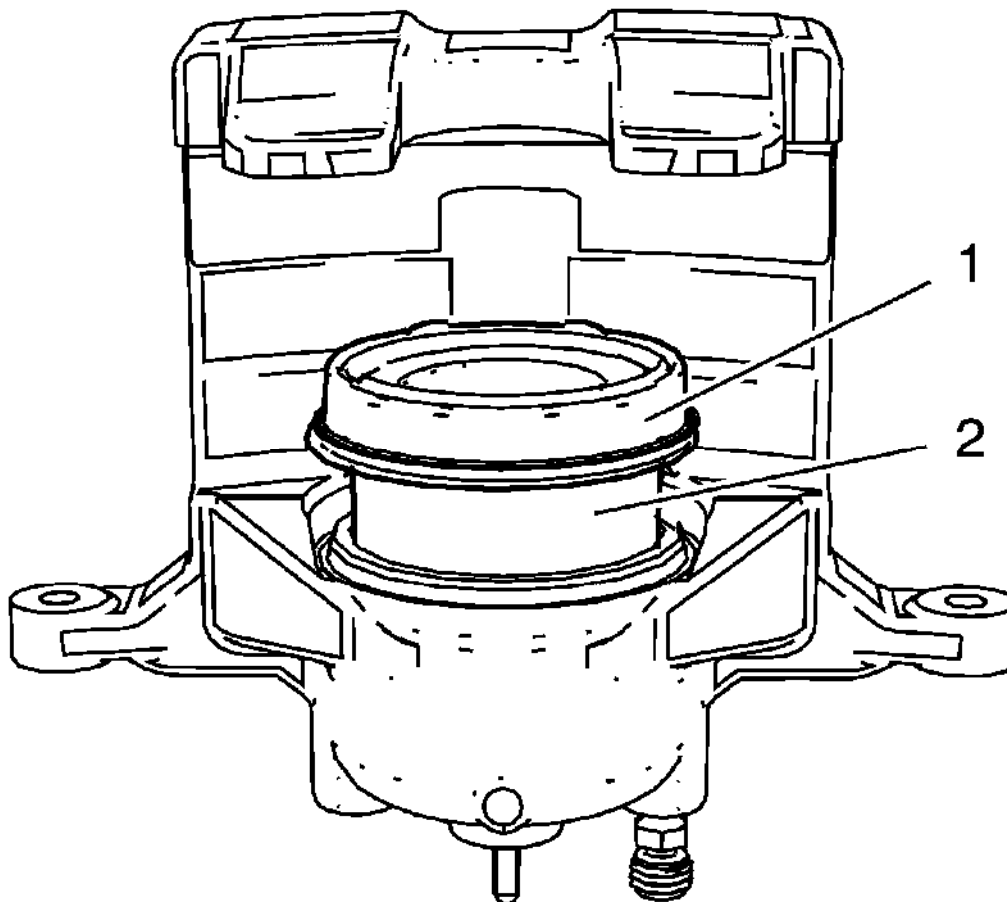


Fig. 39: View Of Caliper Piston And Caliper Piston Dust Boot Seal
Courtesy of GENERAL MOTORS COMPANY

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

CAUTION: Refer to Fastener Caution .

8. Install the bleeder valve to the caliper and tighten the valve to 17 N.m (13 lb ft).
9. Install the bleeder valve cap.

10. Install the brake caliper to the vehicle. Refer to **Front Brake Caliper Replacement**.

REAR BRAKE CALIPER VIBRATION DAMPENER REPLACEMENT

Removal Procedure

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

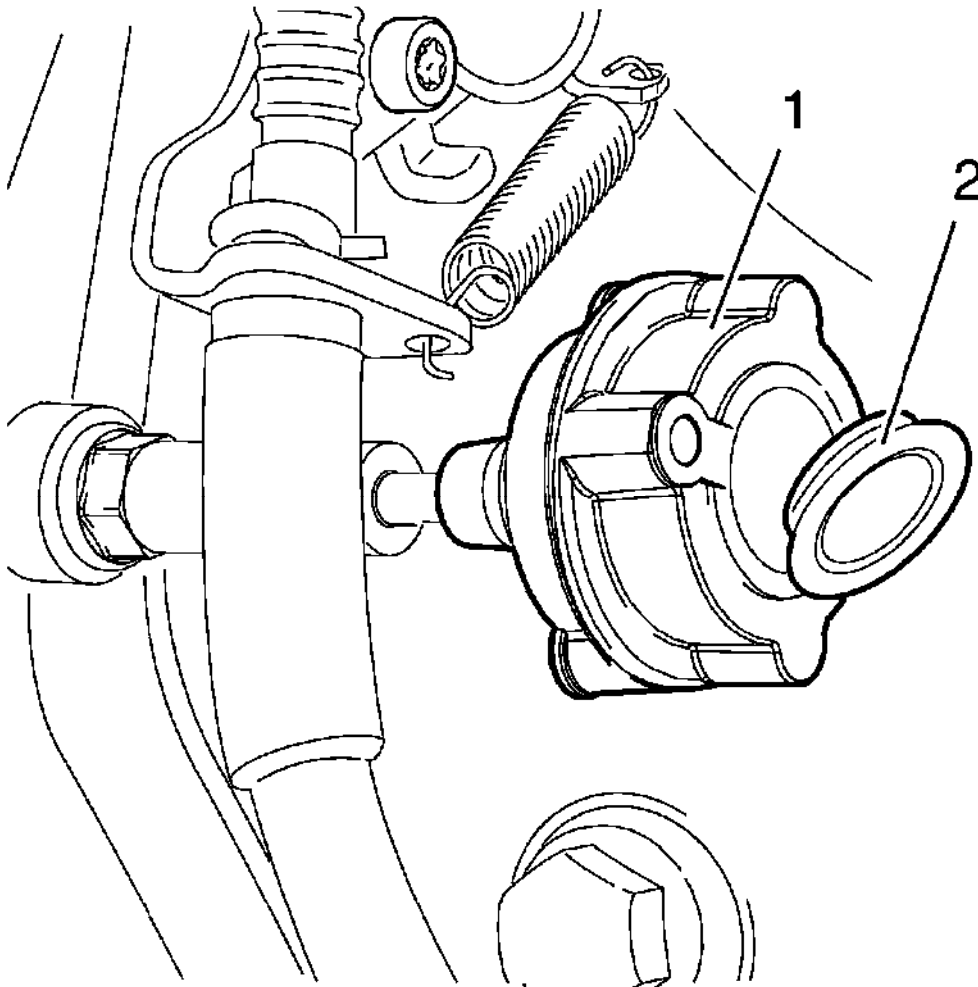


Fig. 40: Brake Caliper Vibration Damper
Courtesy of GENERAL MOTORS COMPANY

2. Open the cap (2) of the brake caliper vibration damper (1), to gain access to the internal torx.

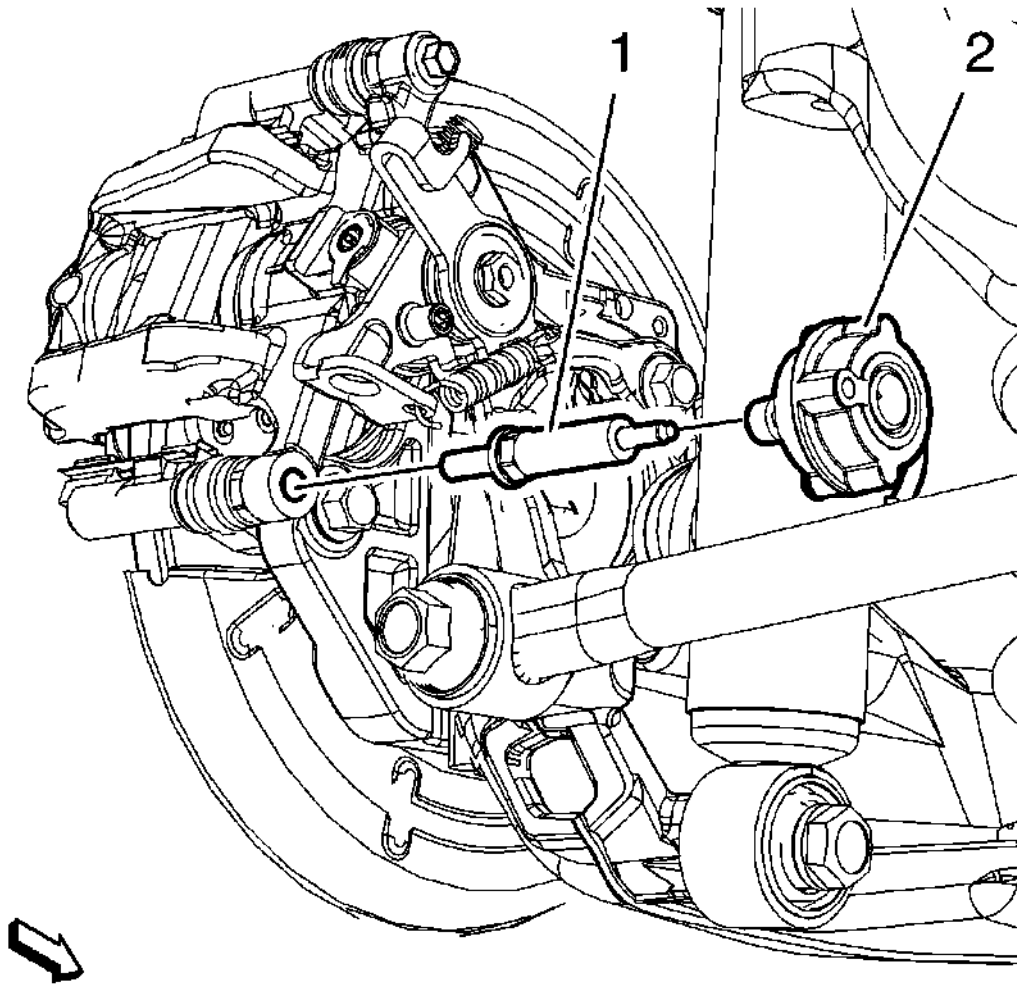


Fig. 41: Brake Caliper Vibration Damper And Brake Caliper Vibration Damper Stud
Courtesy of GENERAL MOTORS COMPANY

3. Remove the brake caliper vibration damper (2) from the brake caliper vibration damper stud (1).
Hold against internal torx of damper stud (1).
4. Remove the damper stud (1) from the rear brake.

Installation Procedure

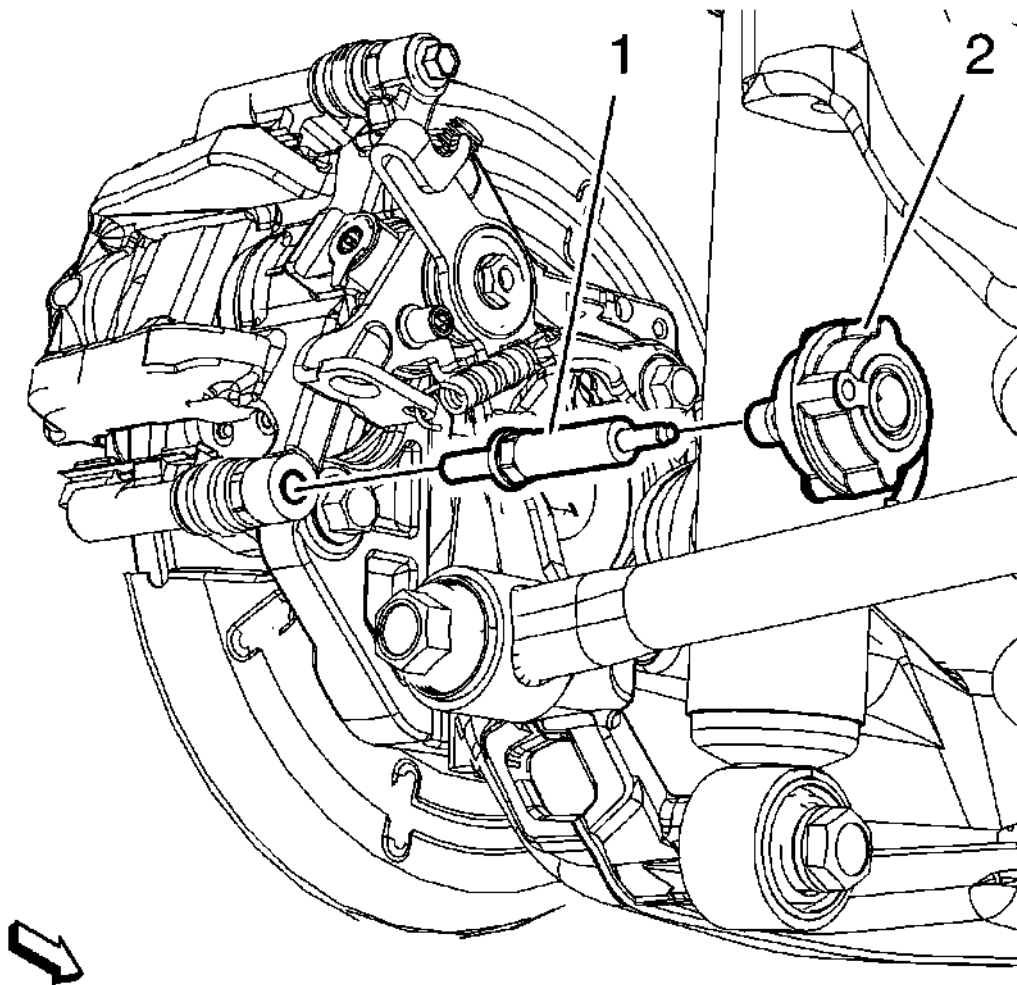


Fig. 42: Brake Caliper Vibration Damper And Brake Caliper Vibration Damper Stud
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

1. Install the damper stud (1) to the rear brake and tighten to 28 N.m (21 lb ft).
2. Attach the brake caliper vibration damper (2) to the stud (1) by turn in 2 threads ONLY.
3. Tighten the brake caliper vibration damper (2) to 9 N.m (80 lb in) with a suitable tool.

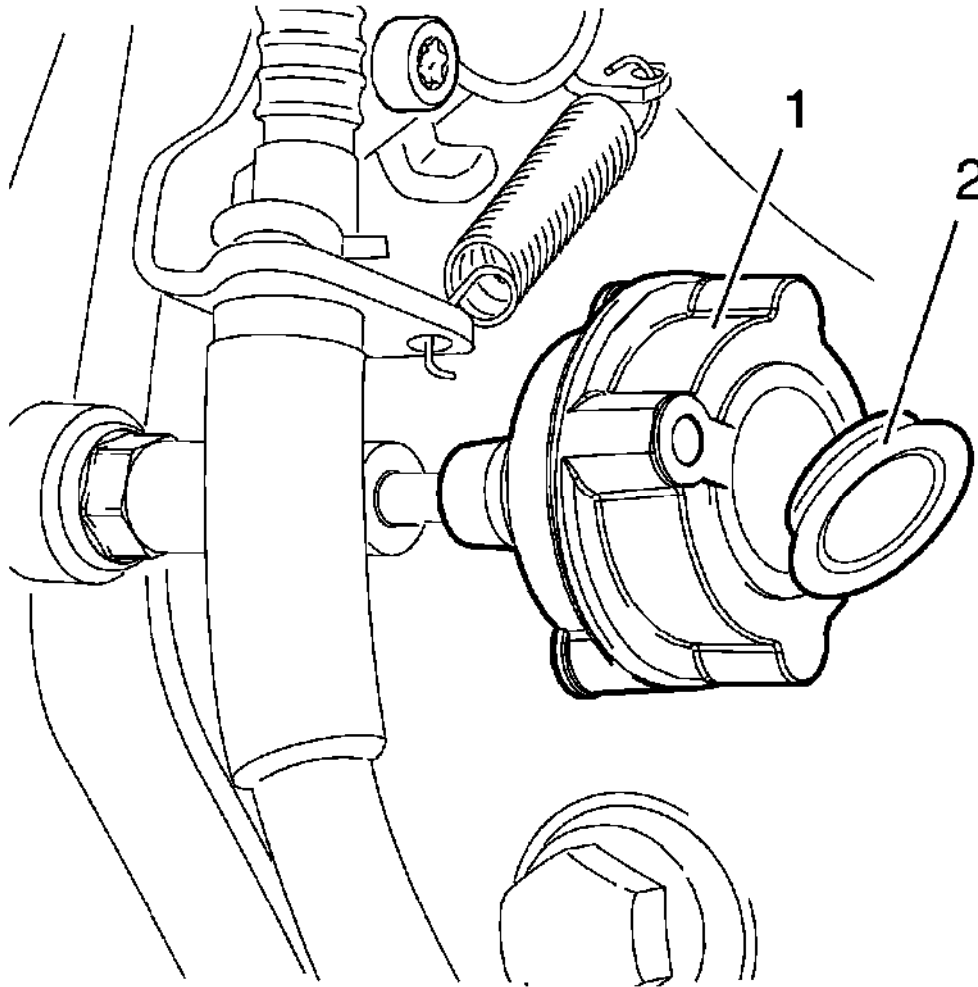


Fig. 43: Brake Caliper Vibration Damper
Courtesy of GENERAL MOTORS COMPANY

4. Close the cap (2) of the brake caliper vibration damper (1).
5. Lower the vehicle.

FRONT BRAKE CALIPER HARDWARE REPLACEMENT

Removal Procedure

WARNING: Refer to Brake Dust Warning .

1. Inspect the fluid level in the brake master cylinder reservoir.
2. If the brake fluid level is midway between the maximum-full point and the minimum allowable level, no brake fluid needs to be removed from the reservoir before proceeding.

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

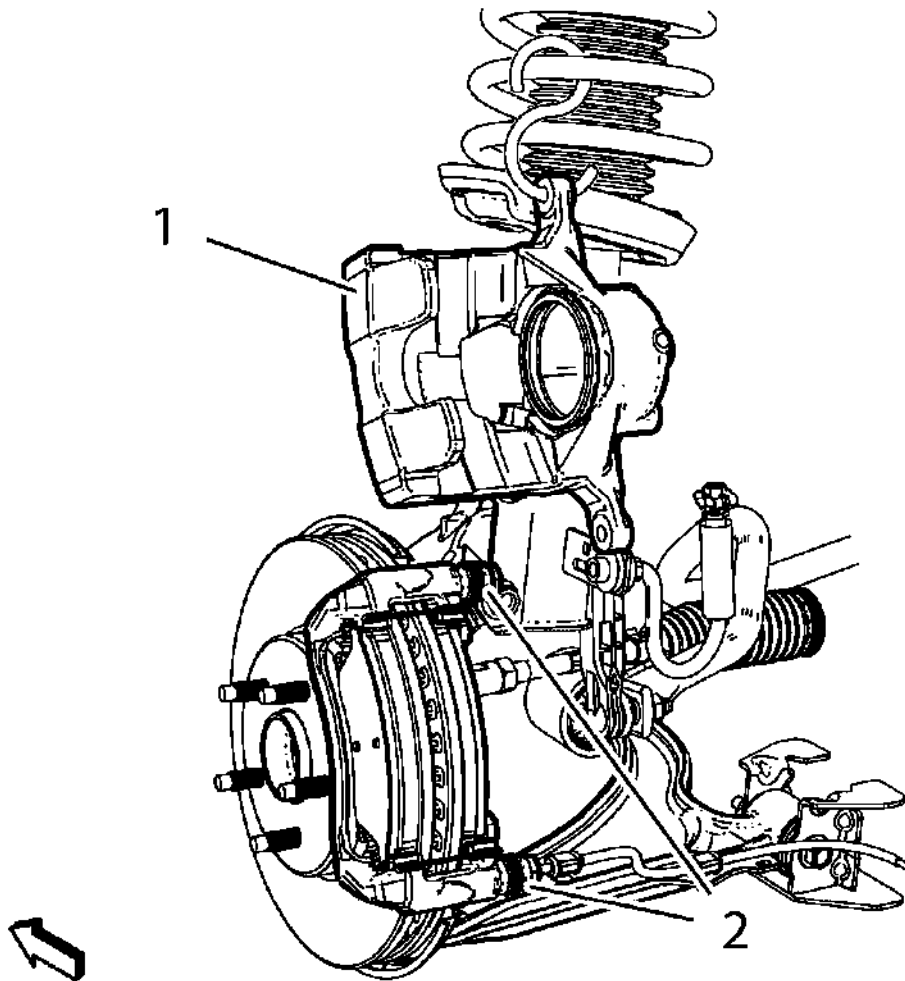


Fig. 44: Brake Caliper Supported With Wire
Courtesy of GENERAL MOTORS COMPANY

6. Remove the brake caliper lower guide pin bolt (2).

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

7. Without disconnecting the hydraulic brake flexible hose, pivot the caliper (1) upward and secure the caliper with heavy mechanics wire, or equivalent.

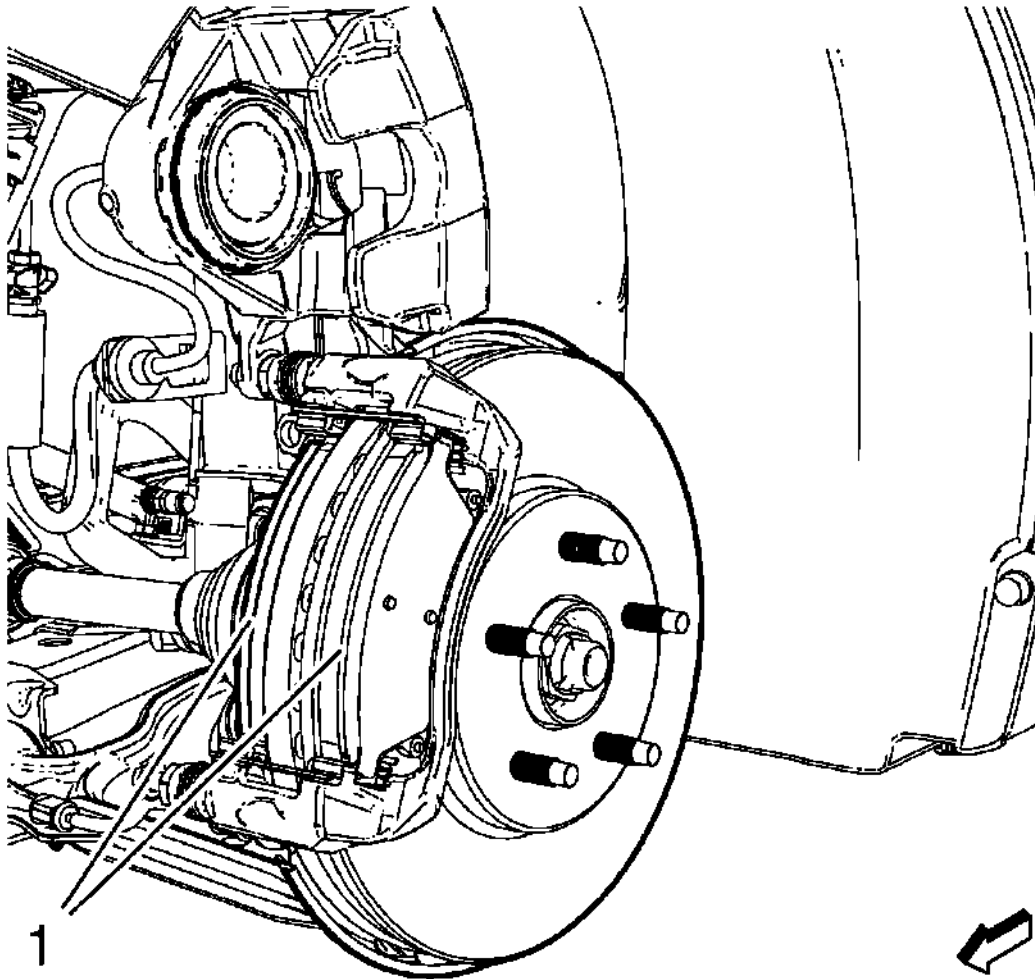


Fig. 45: View of Installed Brake Pads
Courtesy of GENERAL MOTORS COMPANY

8. Remove the brake pads (1) from the caliper mounting bracket

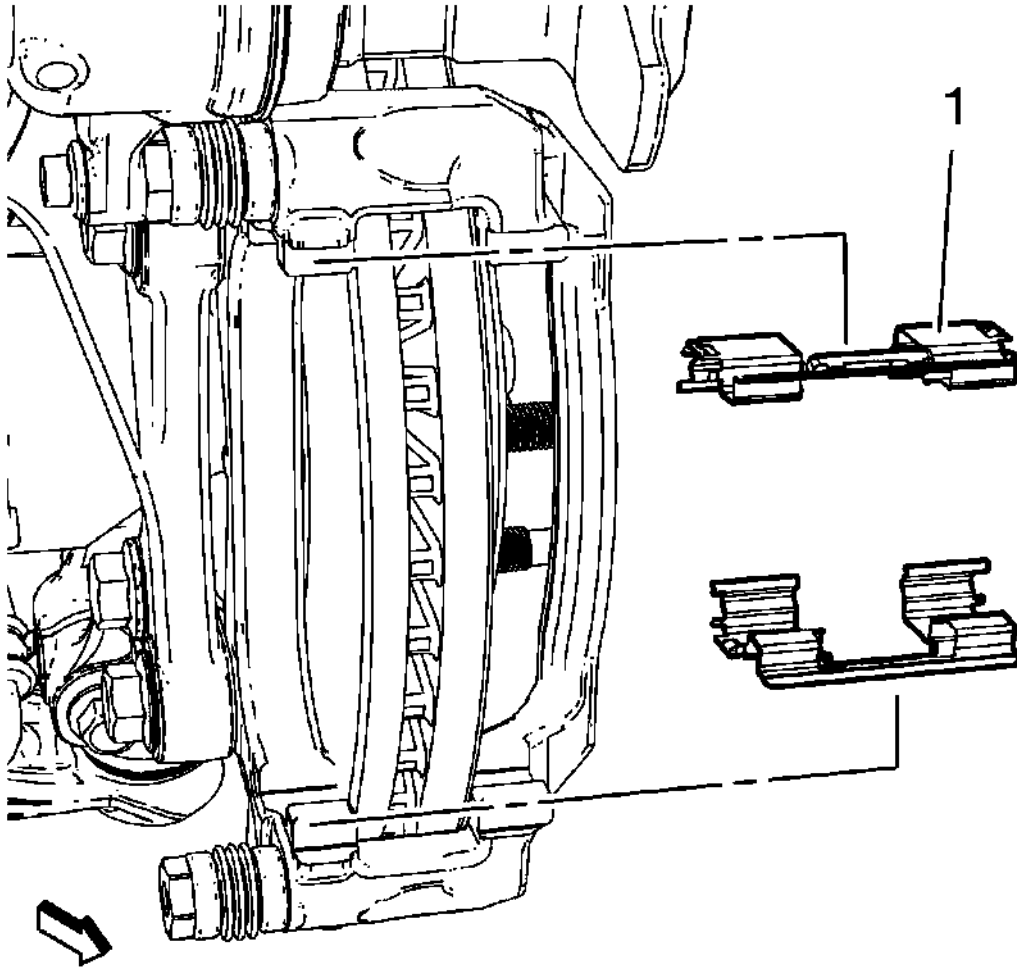


Fig. 46: View Of Brake Pad Retainer Springs
Courtesy of GENERAL MOTORS COMPANY

9. Remove the brake pad retainer springs (1) from the caliper bracket.

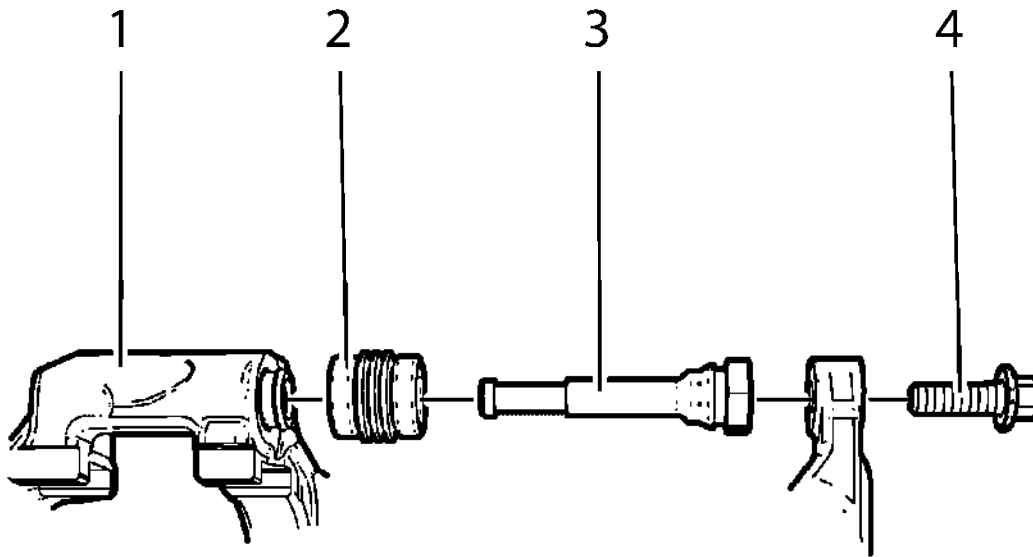


Fig. 47: Brake Caliper Guide Pin, Brake Caliper Pin Boot And Brake Caliper Mounting Bracket
Courtesy of GENERAL MOTORS COMPANY

10. Remove the brake caliper guide pins (3) from the brake caliper mounting bracket (1).
11. Remove the brake caliper pin boots (2) from the brake caliper mounting bracket (1).

Installation Procedure

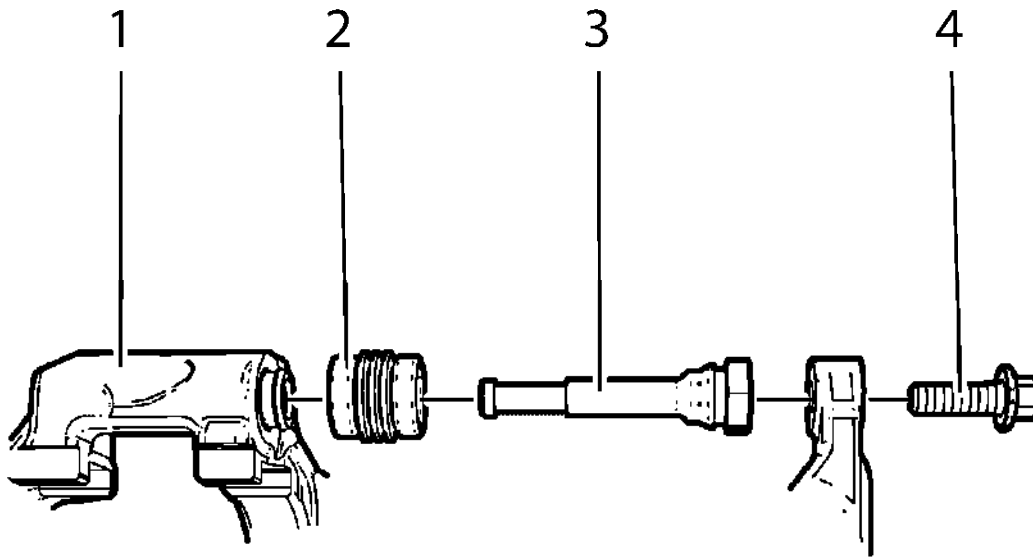


Fig. 48: Brake Caliper Guide Pin, Brake Caliper Pin Boot And Brake Caliper Mounting Bracket
Courtesy of GENERAL MOTORS COMPANY

1. Apply a thin coat of high temperature silicone lube to the brake caliper guide pin boots.
2. Install the brake caliper pin boots (2) into the brake caliper mounting bracket (1). Do not hammer the caliper pin boots into the bracket. Ensure that the caliper pin boots are fully seated in the bracket.
3. Apply a thin coat of high temperature silicone lube to the brake caliper guide pins.
4. Install the brake caliper guide pins (3) to the brake caliper mounting bracket (1).

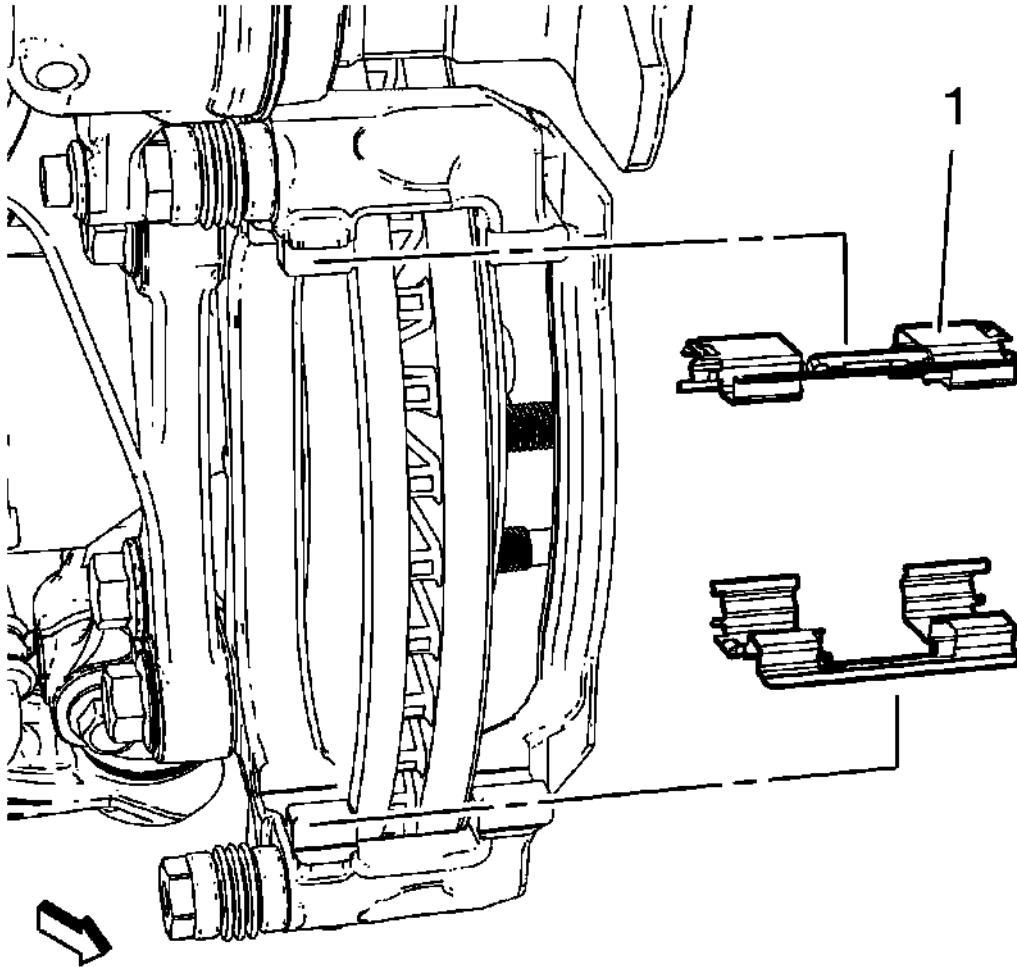


Fig. 49: View Of Brake Pad Retainer Springs
Courtesy of GENERAL MOTORS COMPANY

5. Ensure the brake pad hardware mating surfaces are clean.
6. Install the brake pad retainers (1) to the brake caliper bracket.

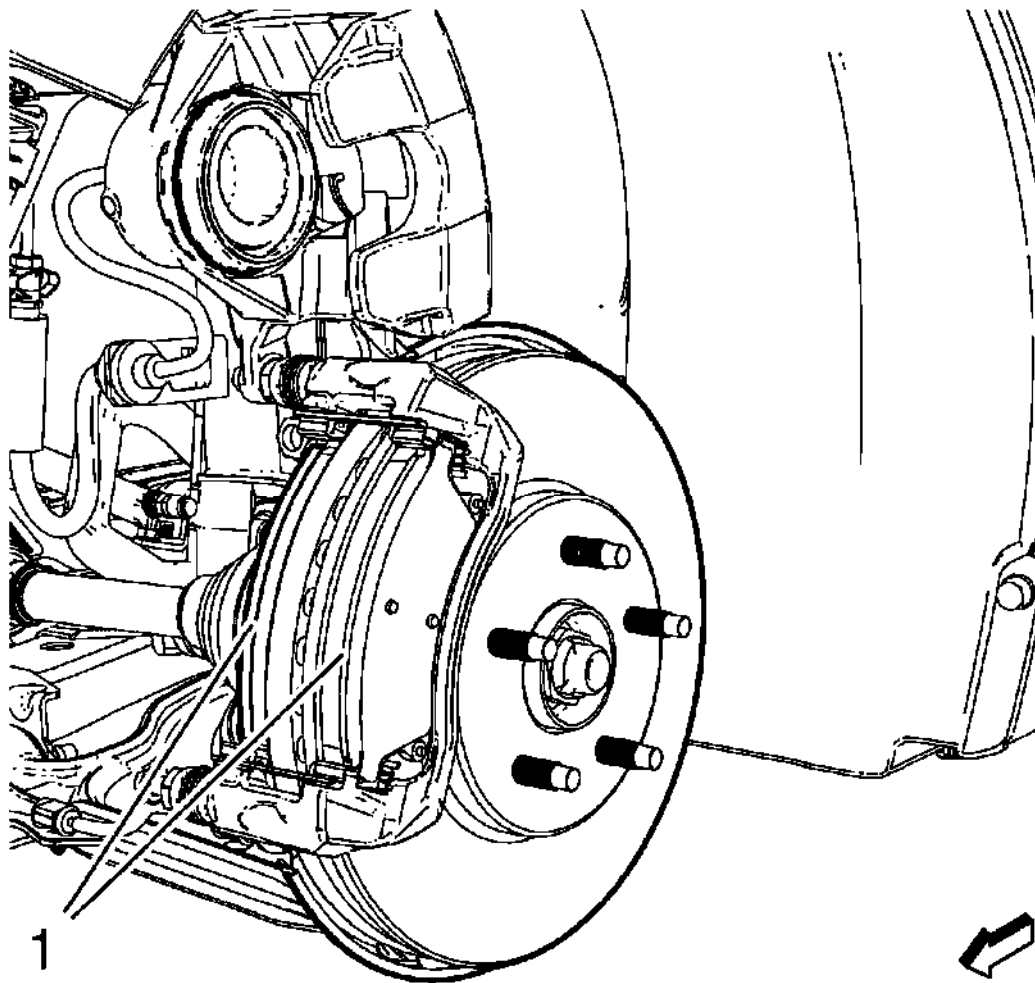


Fig. 50: View of Installed Brake Pads
Courtesy of GENERAL MOTORS COMPANY

NOTE: The wear sensor equipped disc brake pad must be mounted inboard of the rotor with the leading edge of the sensor facing the brake rotor during forward wheel rotation, or at the top of the pad when installed in vehicle position.

7. Install the brake pads (1) to the caliper bracket.

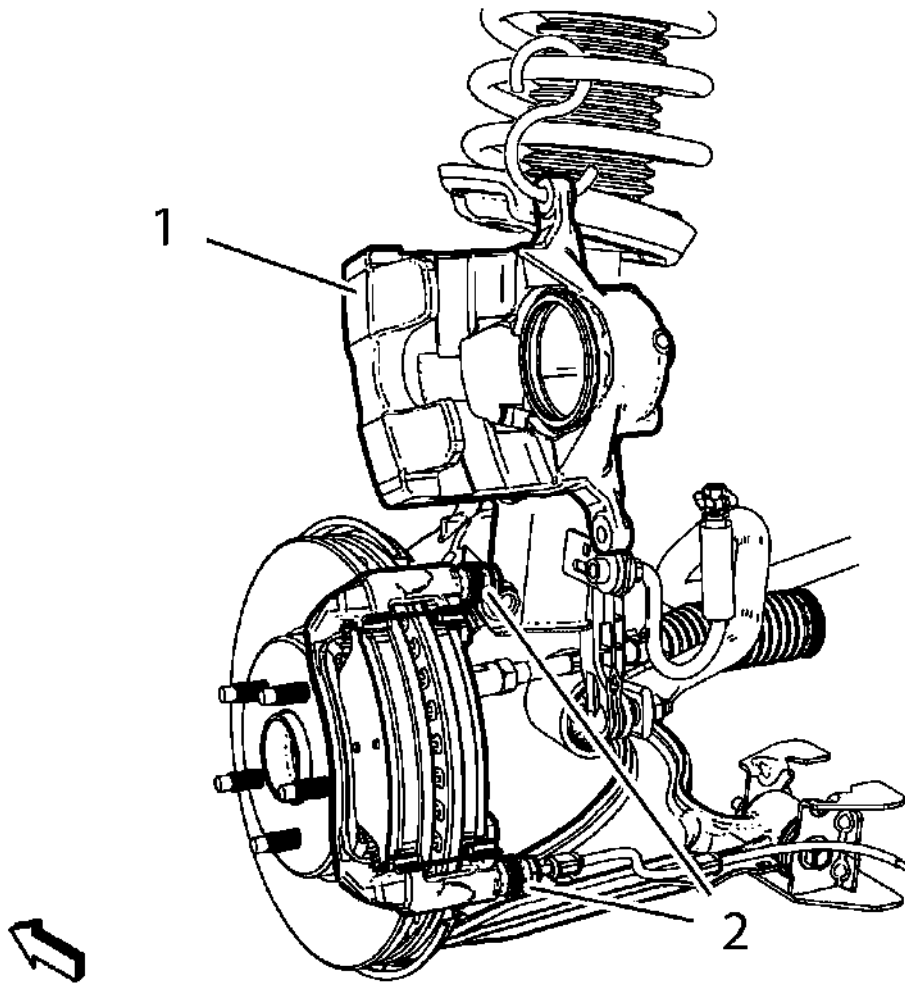


Fig. 51: Brake Caliper Supported With Wire
Courtesy of GENERAL MOTORS COMPANY

8. Remove the support, and rotate the brake caliper (1) into position over the disc brake pads and to the caliper mounting bracket.

CAUTION: Refer to Fastener Caution .

9. Install the lower brake caliper guide pin bolts (2) and tighten to 28 N.m (21 lb ft).
10. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
11. Lower the vehicle.
12. With the engine 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. Fill the master cylinder auxiliary reservoir to the proper level. Refer to **Master Cylinder Reservoir Filling** .

REAR BRAKE CALIPER HARDWARE REPLACEMENT

Removal Procedure

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

1. Inspect the fluid level in the brake master cylinder reservoir.
2. If the brake fluid level is midway between the maximum-full point and the minimum allowable level, no brake fluid needs to be removed from the reservoir before proceeding.
3. If the brake fluid level is higher than midway between the maximum-full point and the minimum allowable level, remove brake fluid to the midway point before proceeding.
4. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
5. Remove the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
6. Without disconnecting the hydraulic brake system, remove the rear brake caliper. Refer to **Rear Brake Caliper Replacement**.

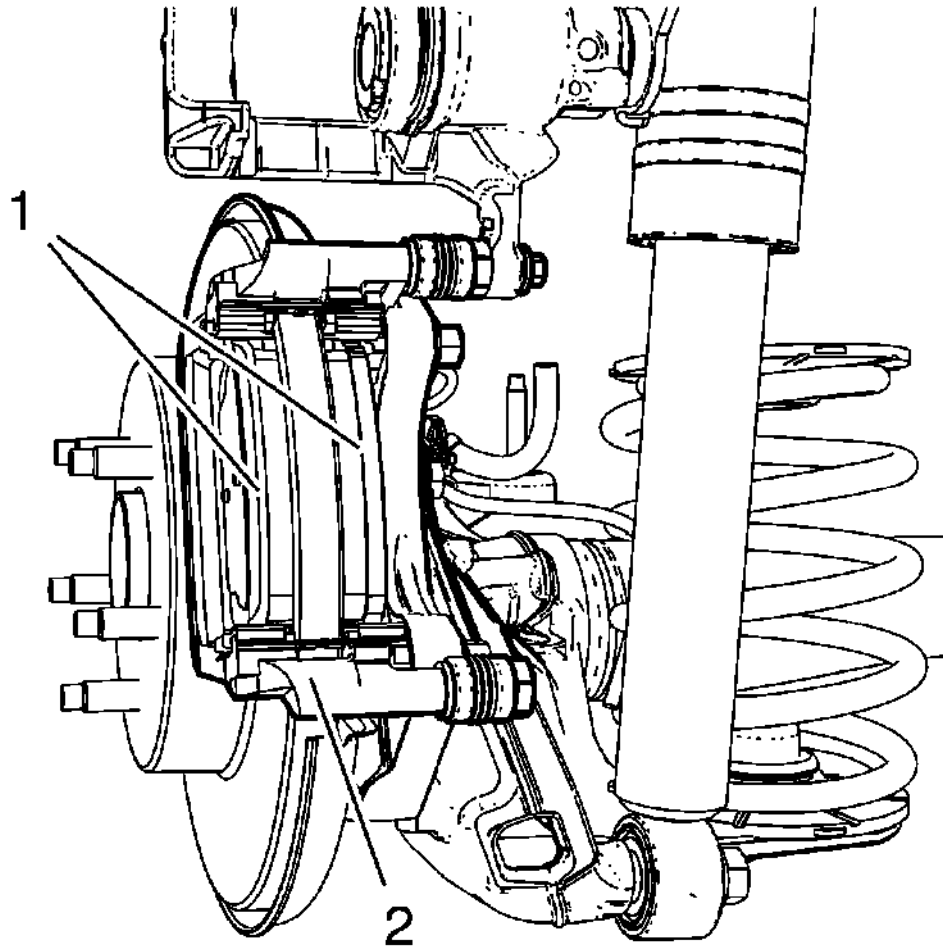


Fig. 52: View Of Installed Brake Pads

Courtesy of GENERAL MOTORS COMPANY

7. Remove the brake pads (1) from the caliper mounting bracket (2).

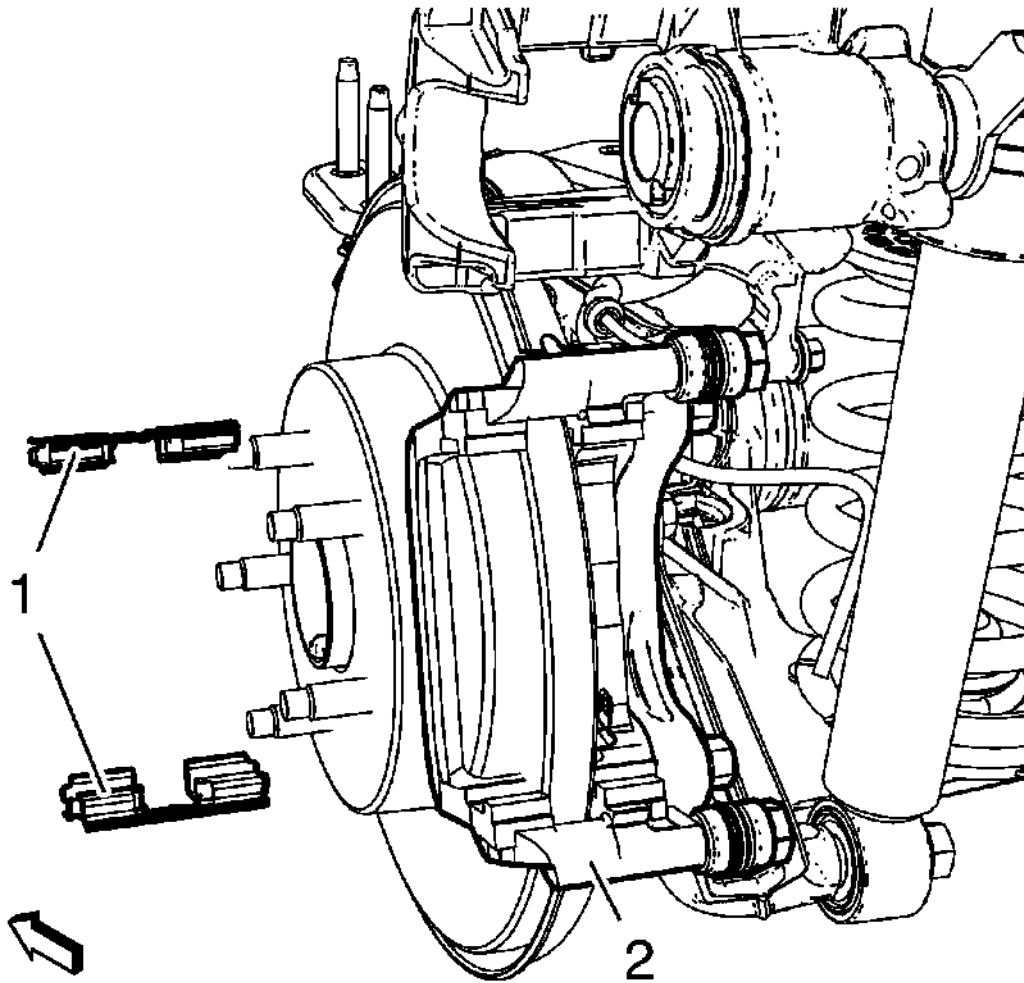


Fig. 53: View Of Brake Pad Retainer Springs
Courtesy of GENERAL MOTORS COMPANY

8. Remove the brake pad retainer springs (1) from the caliper bracket (2).

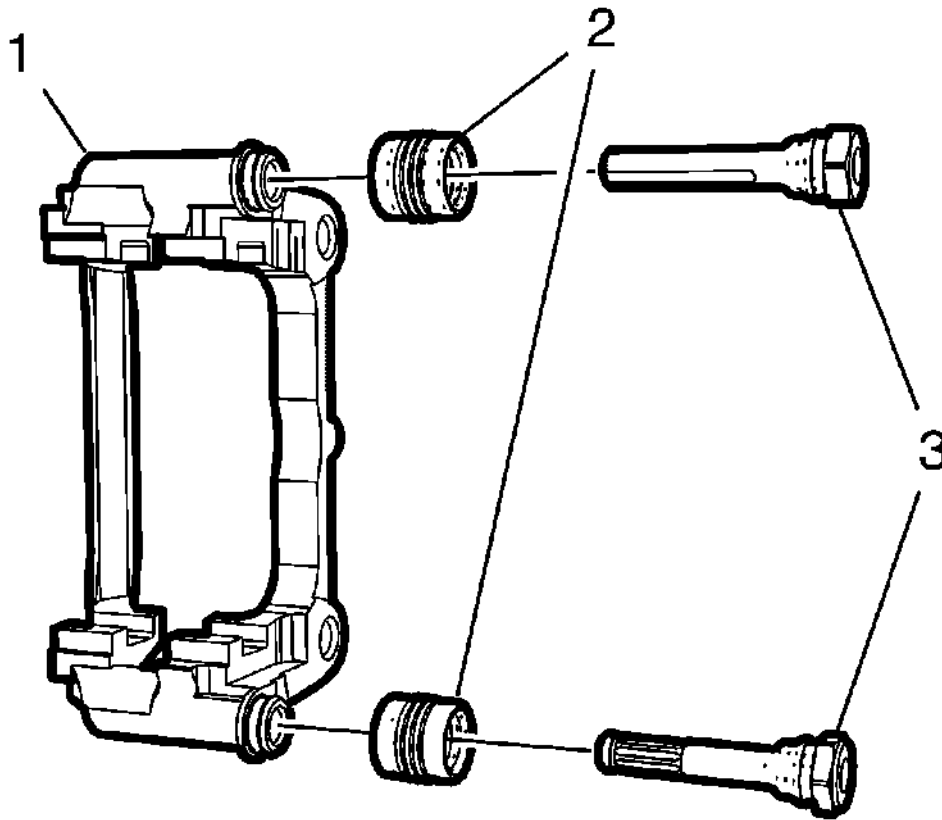


Fig. 54: Brake Caliper Mounting Bracket, Guide Pins And Boots
Courtesy of GENERAL MOTORS COMPANY

9. Remove the brake caliper guide pins (3) from the brake caliper mounting bracket (1).
10. Remove the brake caliper pin boots (2) from the brake caliper mounting bracket (1).

Installation Procedure

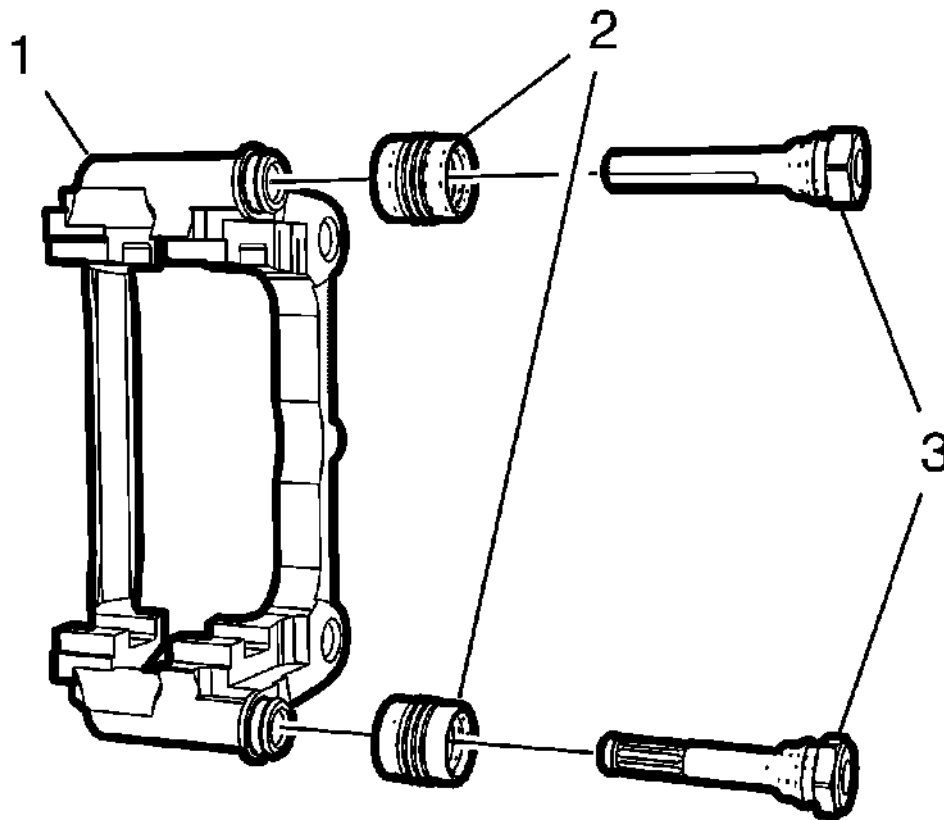


Fig. 55: Brake Caliper Mounting Bracket, Guide Pins And Boots

Courtesy of GENERAL MOTORS COMPANY

1. Apply a thin coat of high temperature silicone lube to the brake caliper guide pin boots.
2. Install the brake caliper pin boots (2) into the brake caliper mounting bracket (1). Do not hammer the caliper pin boots into the bracket. Ensure that the caliper pin boots are fully seated in the bracket.
3. Apply a thin coat of high temperature silicone lube to the brake caliper guide pins.

NOTE: **The lower brake caliper guide pin is equipped with a ribbed insert.**

4. Install the brake caliper guide pins (3) to the brake caliper mounting bracket (1).

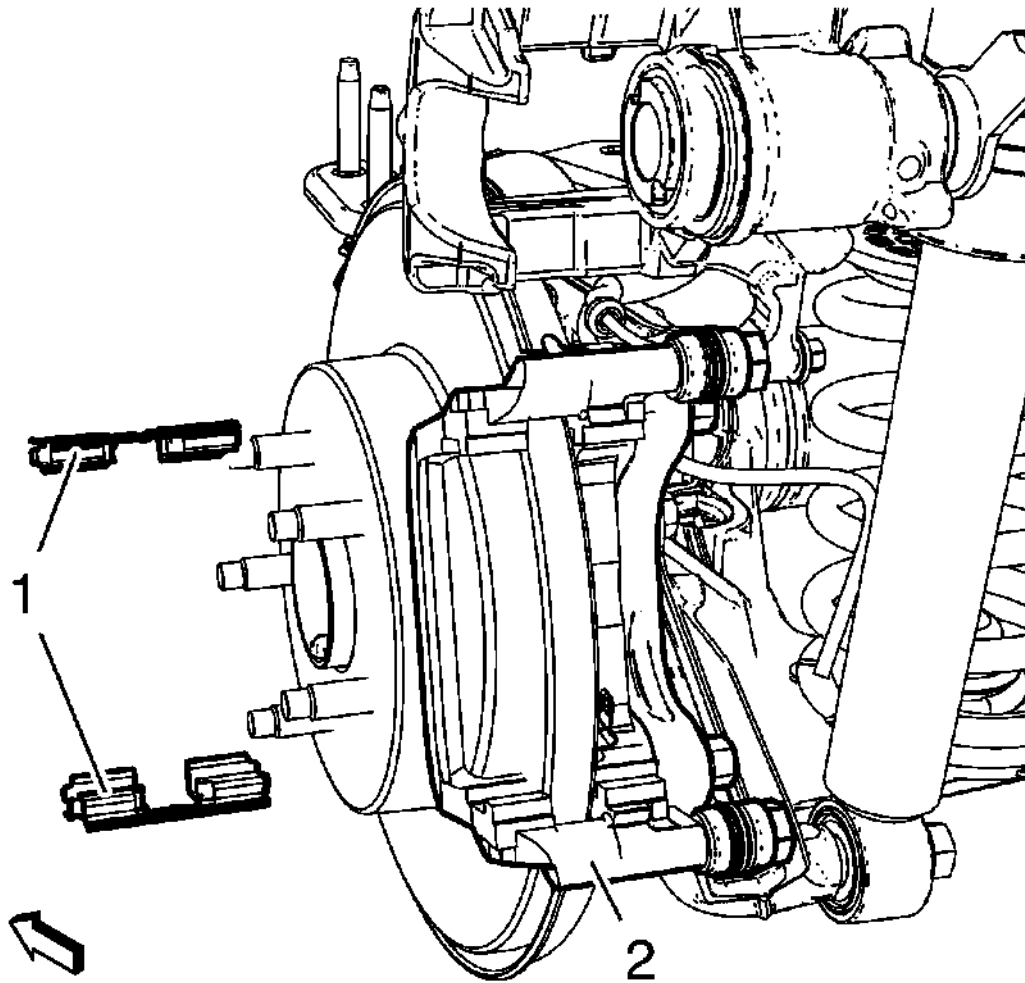


Fig. 56: View Of Brake Pad Retainer Springs
Courtesy of GENERAL MOTORS COMPANY

5. Ensure the brake pad hardware mating surfaces are clean.
6. Install the brake pad retainers (1) to the brake caliper bracket and apply a thin coat of high temperature silicone lube to the brake pad retainers.

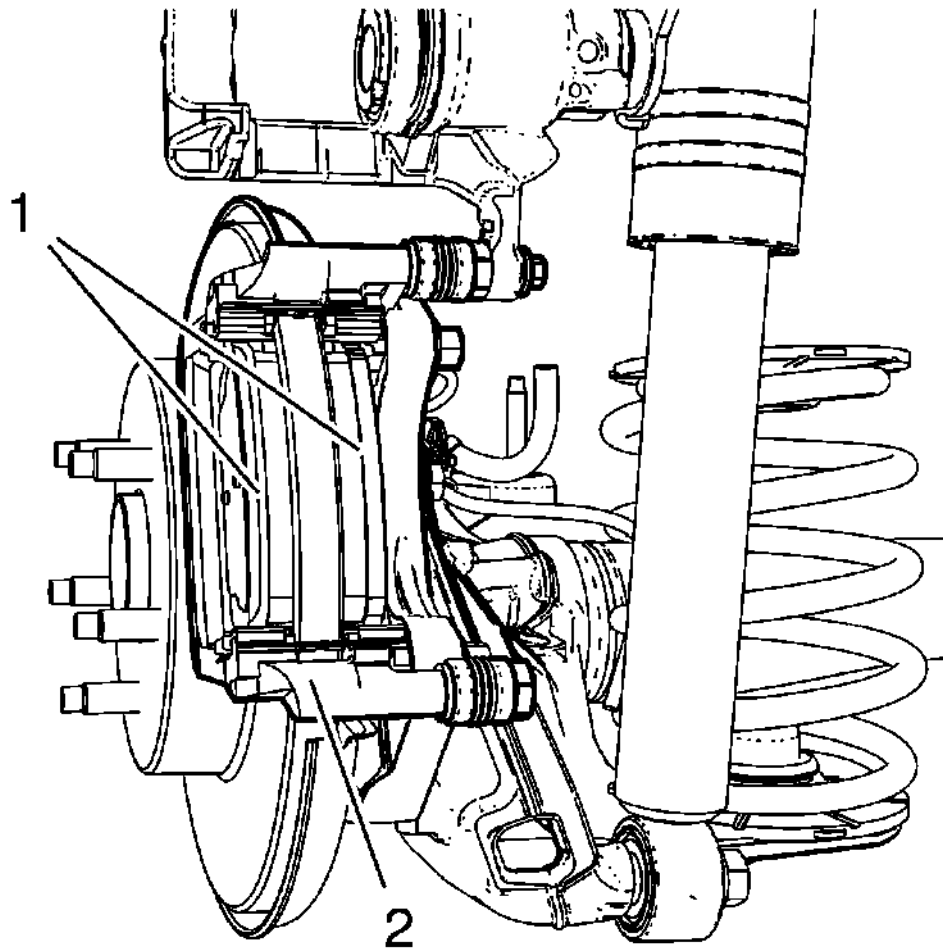


Fig. 57: View Of Installed Brake Pads
Courtesy of GENERAL MOTORS COMPANY

NOTE: The wear sensor equipped disc brake pad must be mounted inboard of the rotor with the leading edge of the sensor facing the brake rotor during forward wheel rotation, or at the top of the pad when installed in vehicle position.

7. Install the brake pads (1) to the caliper bracket.
8. Install the rear brake caliper. Refer to **Rear Brake Caliper Replacement**.
9. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation**.
10. Lower the vehicle.
11. With the engine OFF, gradually apply the brake pedal approximately 2/3 of its travel distance.
12. Slowly release the brake pedal.
13. 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.

14. Fill the master cylinder auxiliary reservoir to the proper level. Refer to **Master Cylinder Reservoir Filling** .

FRONT BRAKE CALIPER BRACKET REPLACEMENT

Removal Procedure

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

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

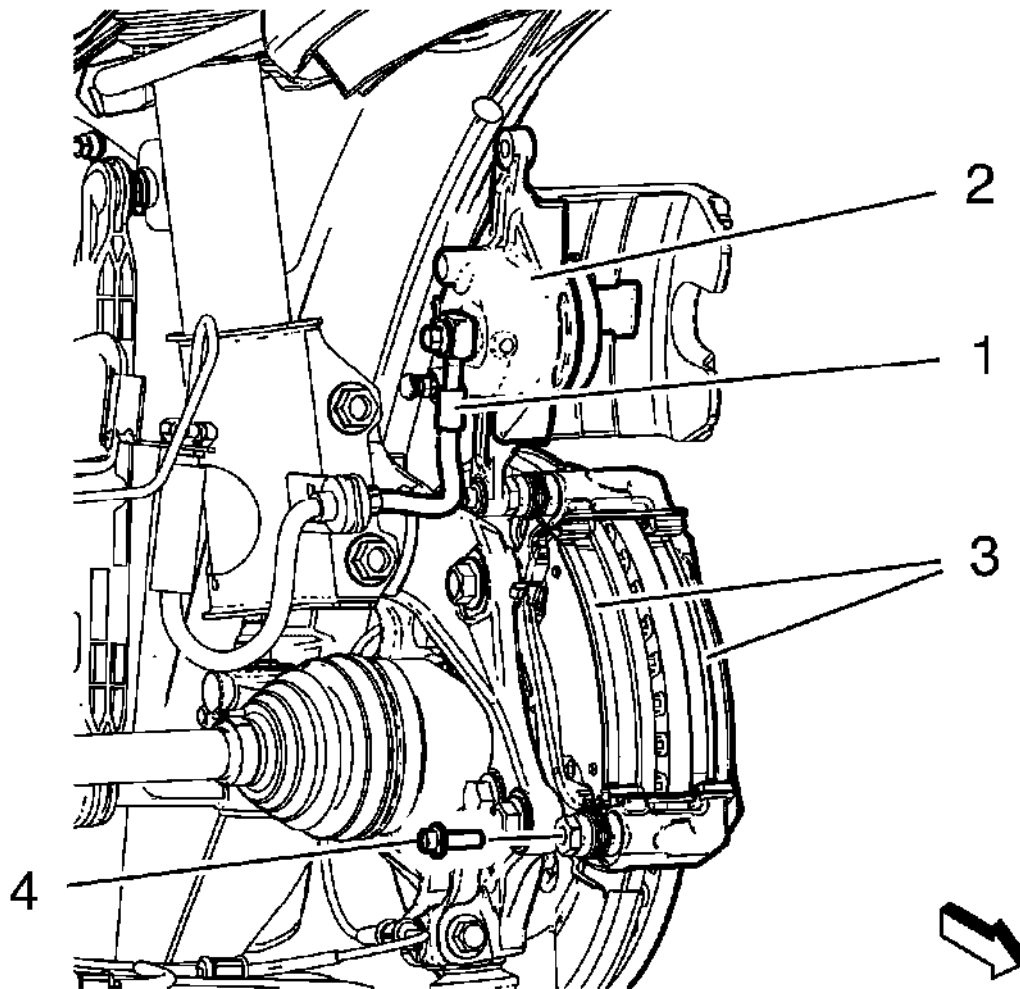


Fig. 58: Brake Caliper, Flex Hose, Brake Pads And Guide Pin Bolt
 Courtesy of GENERAL MOTORS COMPANY

6. Remove the lower brake caliper guide pin bolt (4). Do NOT disconnect the hydraulic brake flexible hose (1) from the caliper (2).

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

7. Without disconnecting the hydraulic brake flexible hose (1), pivot the caliper (2) upward and separate from caliper bracket in direction of arrow.
8. Remove the brake pads (3).

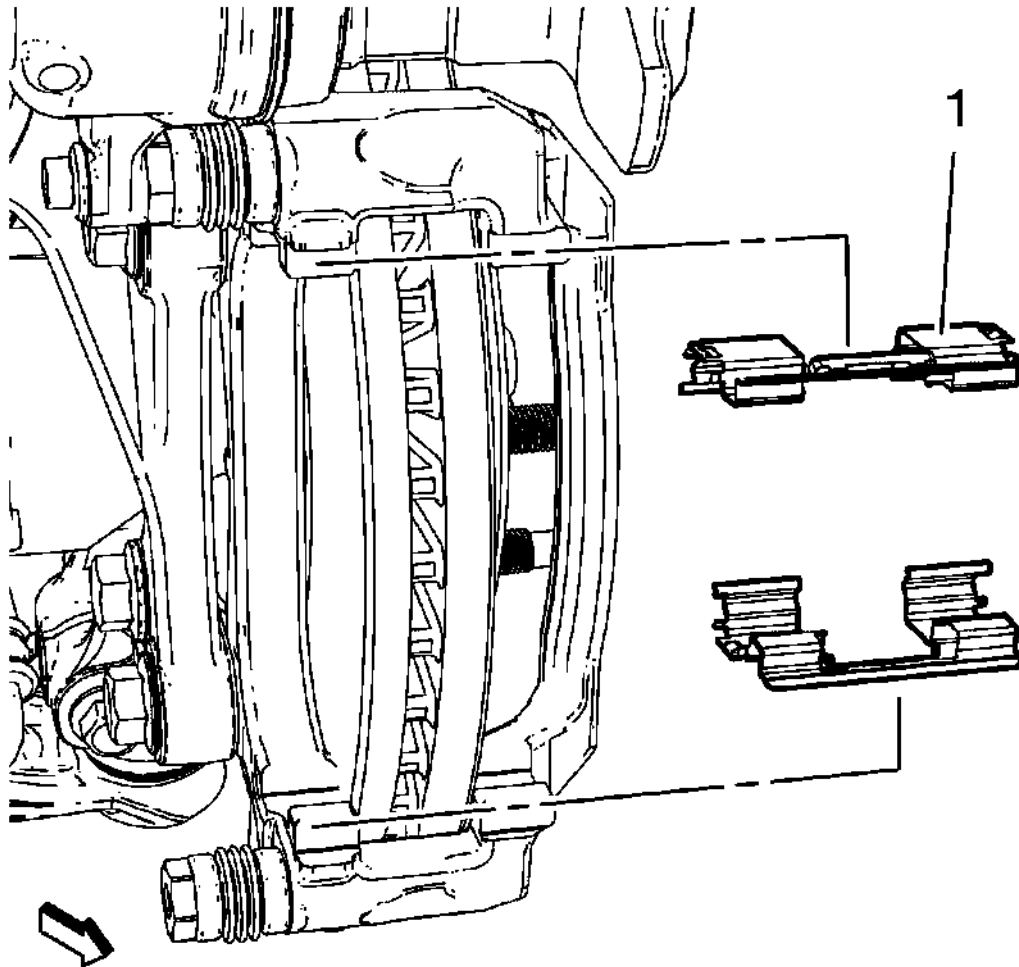


Fig. 59: View Of Brake Pad Retainer Springs
Courtesy of GENERAL MOTORS COMPANY

9. Remove the brake pad retainer springs (1).
10. If reusing the bracket, thoroughly clean the pad hardware mating surfaces of the caliper bracket, of any debris and corrosion.
11. Inspect the brake pad retainer springs (1) for the following:
 - Bent mounting tabs
 - Excessive corrosion
 - Looseness at the brake caliper mounting bracket
 - Looseness at the disc brake pads
12. If any of the conditions listed are found, the disc brake pad retainers require replacement.

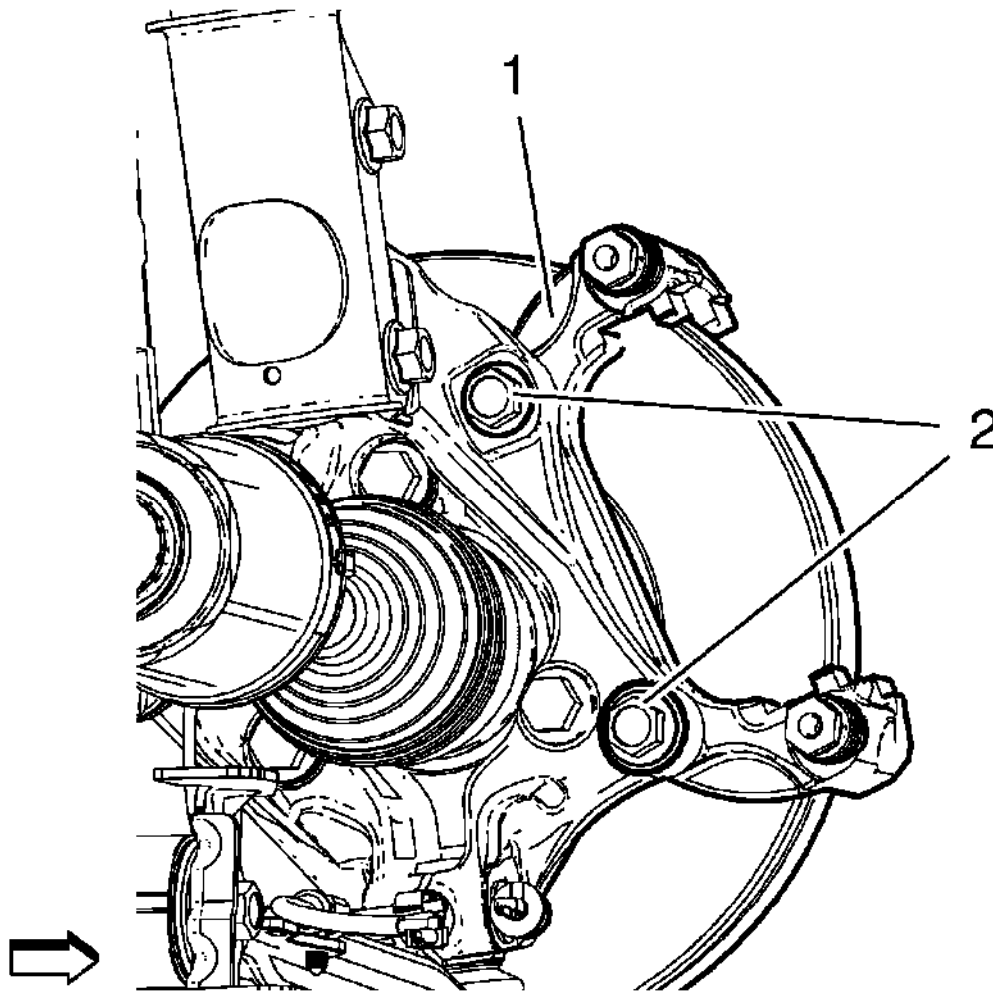


Fig. 60: Brake Caliper Bracket Mounting Bolts
Courtesy of GENERAL MOTORS COMPANY

13. Remove and DISCARD caliper bracket bolts (2).
14. Remove brake caliper bracket (1) from steering knuckle.

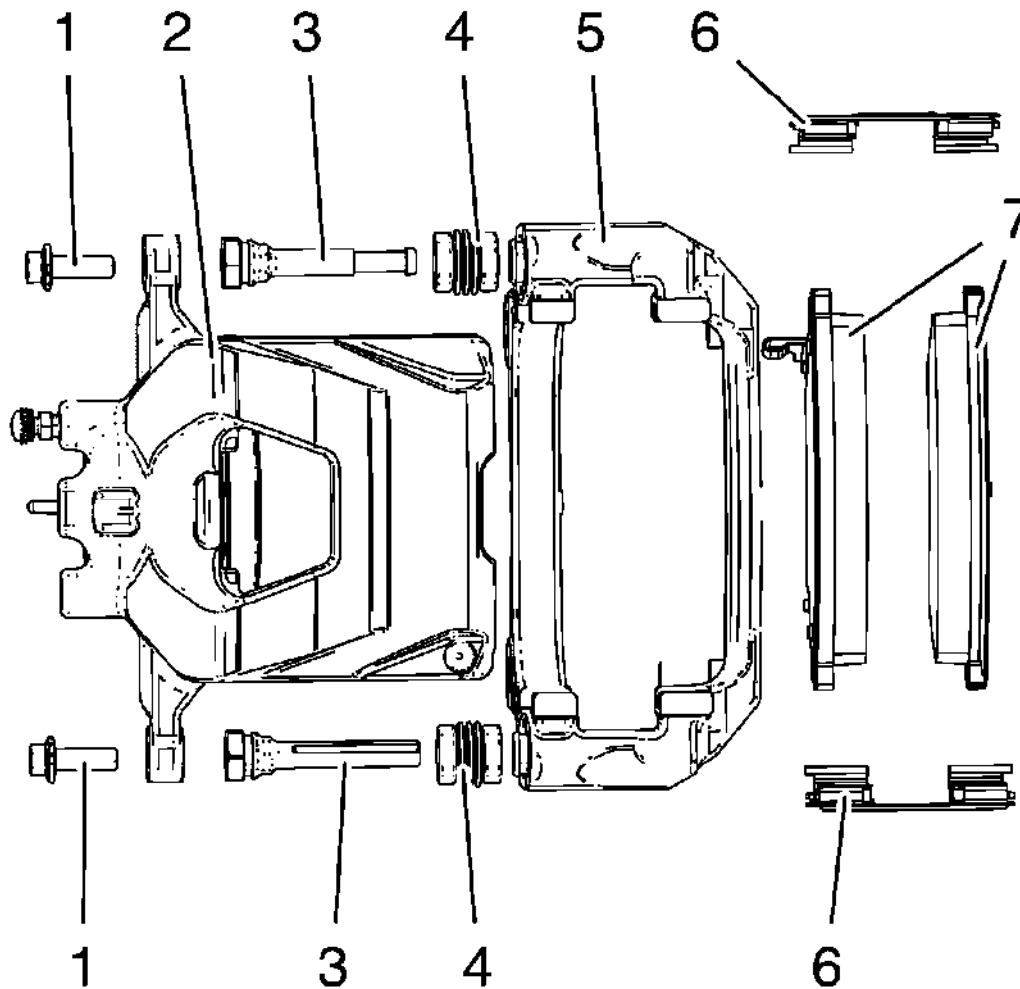


Fig. 61: Brake Caliper And Mounting Hardware

Courtesy of GENERAL MOTORS COMPANY

15. Inspect the caliper bracket (5). If the brake caliper bracket (5) is bent, cracked, or damaged, it requires replacement.
16. Inspect the brake caliper guide pins (3) for freedom of movement, and inspect the condition of the guide pin boots (4). Move the brake caliper guide pins (3) inboard and outboard within the brake caliper bracket (5), without disengaging the slides from the boots (4), 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
17. If any of the conditions listed are found, the brake caliper guide pins (3) and/or boots (4) require replacement.

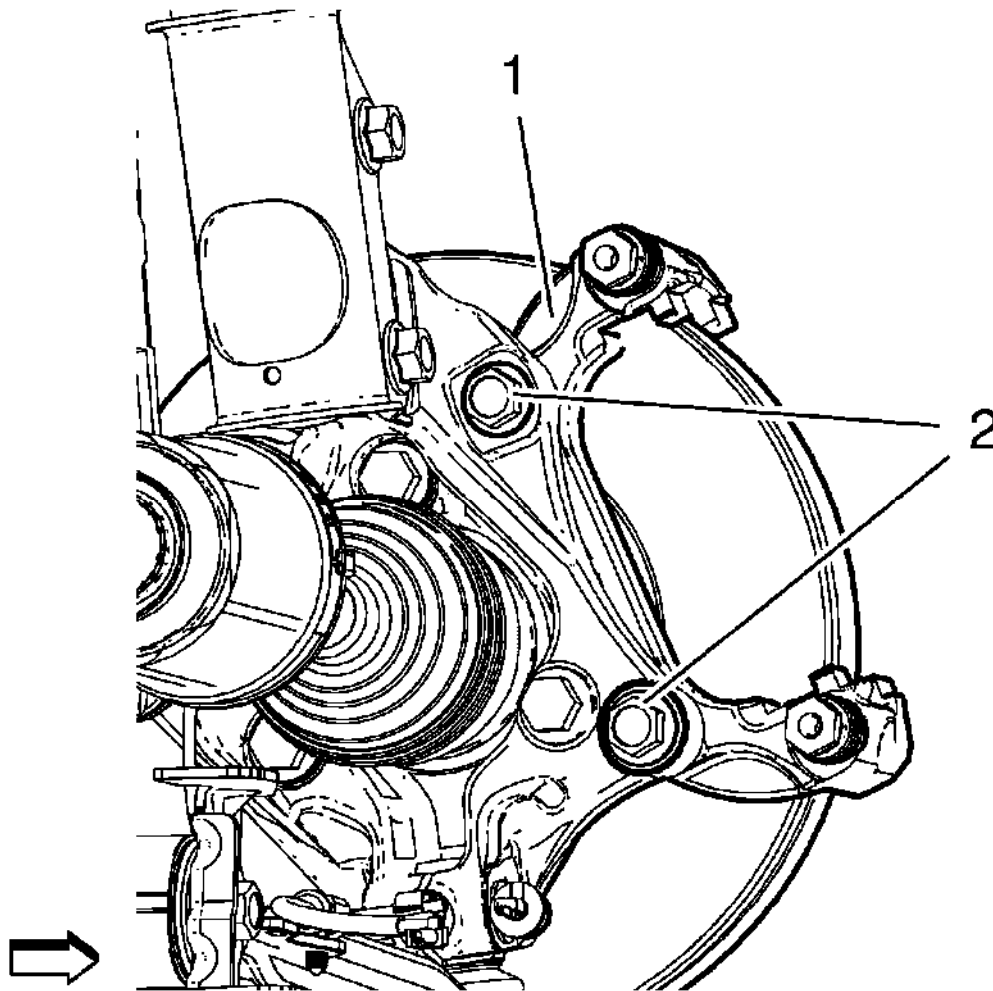


Fig. 62: Brake Caliper Bracket Mounting Bolts
Courtesy of GENERAL MOTORS COMPANY

1. Install the brake caliper bracket (1) to the steering knuckle.

WARNING: Refer to Torque-to-Yield Fastener Warning .

CAUTION: Refer to Fastener Caution .

2. Install the NEW brake caliper bracket bolts (2) and tighten to 100 N.m (74 lb ft) + 60° - 75°

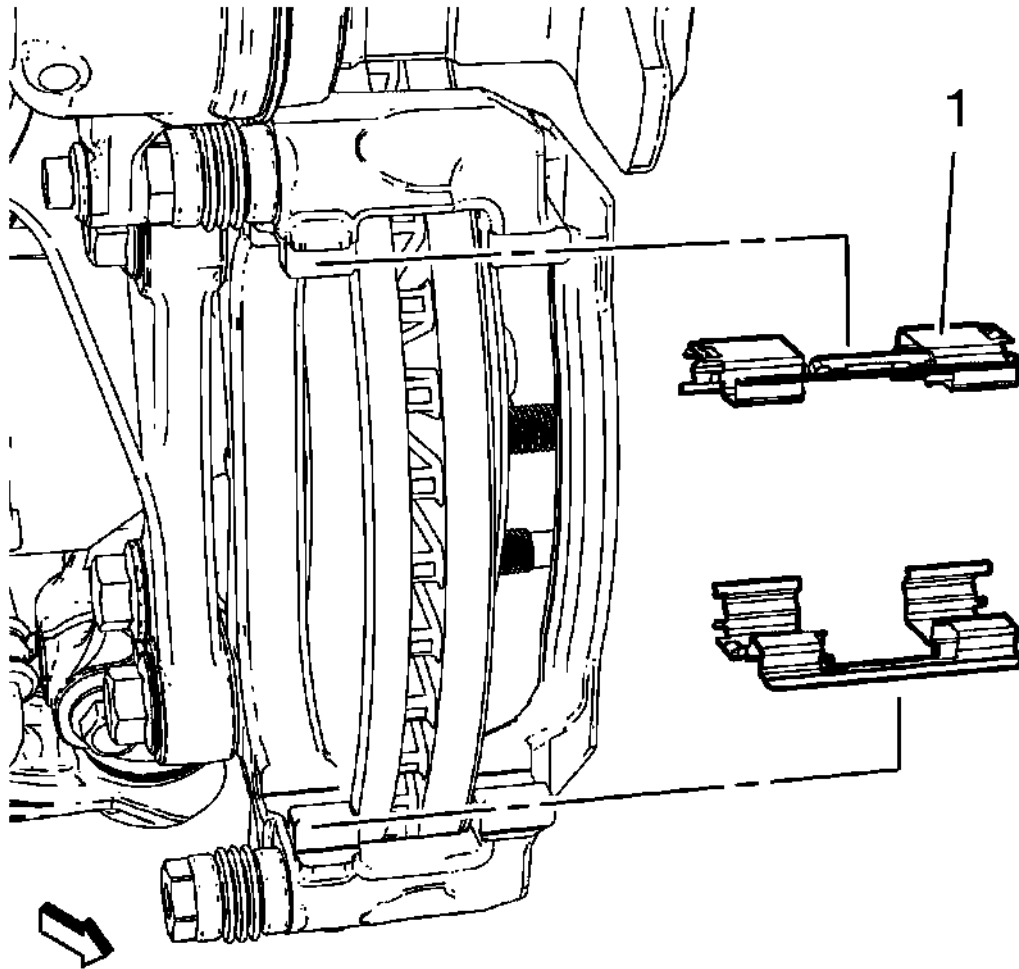


Fig. 63: View Of Brake Pad Retainer Springs
Courtesy of GENERAL MOTORS COMPANY

3. Apply a very thin coating of high temperature silicone brake lubricant to the pad hardware mating surfaces of the caliper bracket only.
4. Install the brake pad retainer springs (1).

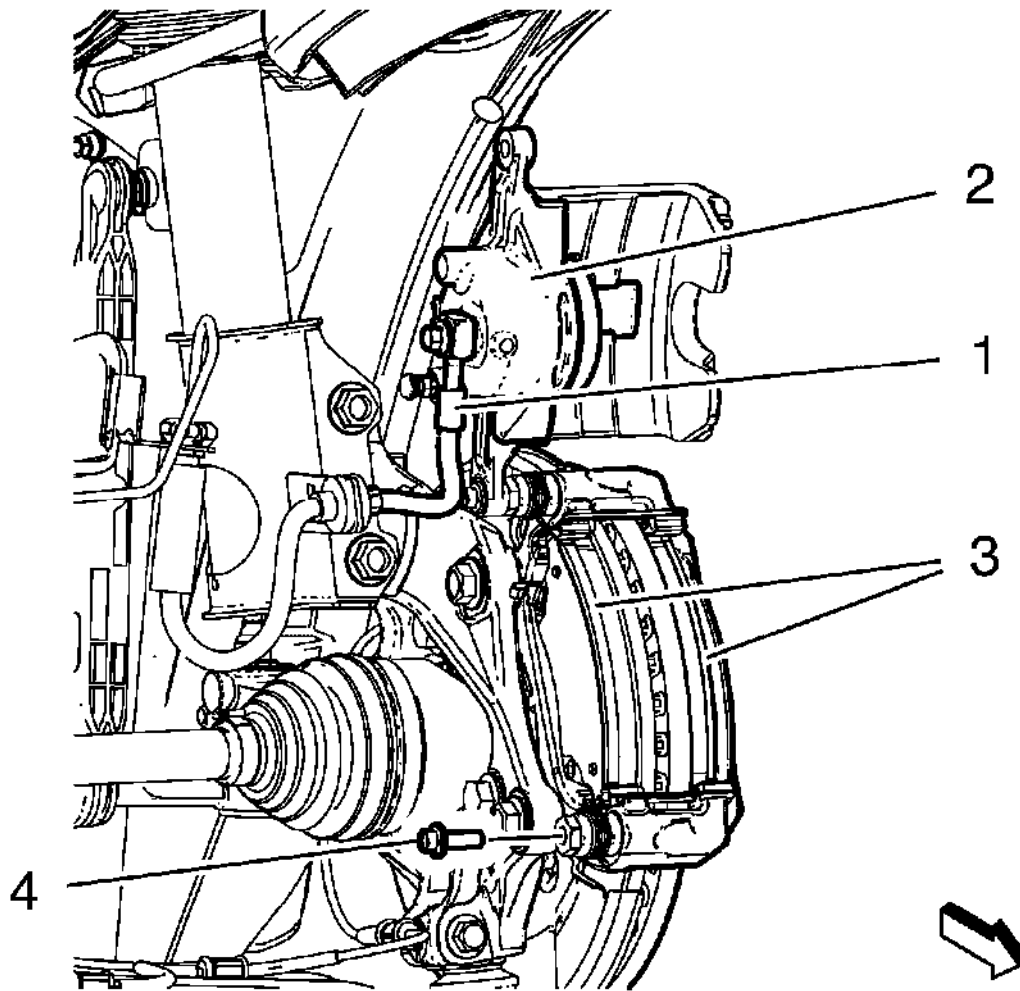


Fig. 64: Brake Caliper, Flex Hose, Brake Pads And Guide Pin Bolt
 Courtesy of GENERAL MOTORS COMPANY

NOTE: The wear sensor equipped disc brake pad must be mounted inboard of the rotor with the leading edge of the sensor facing the brake rotor during forward wheel rotation, or at the top of the pad when installed in vehicle position.

5. Install the brake pads (3) to the brake caliper bracket.
6. Remove the support and reposition the brake caliper (2) over the brake pads and to the caliper bracket. Assure that guide pin bolts boots apply firmly.
7. Install guide pin bolts and tighten to 28 N.m (21 lb ft).
8. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
9. Lower the vehicle.
10. With the engine OFF, gradually apply the brake pedal approximately 2/3 of its travel distance.

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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. Fill the master cylinder auxiliary reservoir to the proper level. Refer to **Master Cylinder Reservoir Filling** .

REAR BRAKE CALIPER BRACKET REPLACEMENT

Special Tools

EN-45059 Angle Meter

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

Removal Procedure

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

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

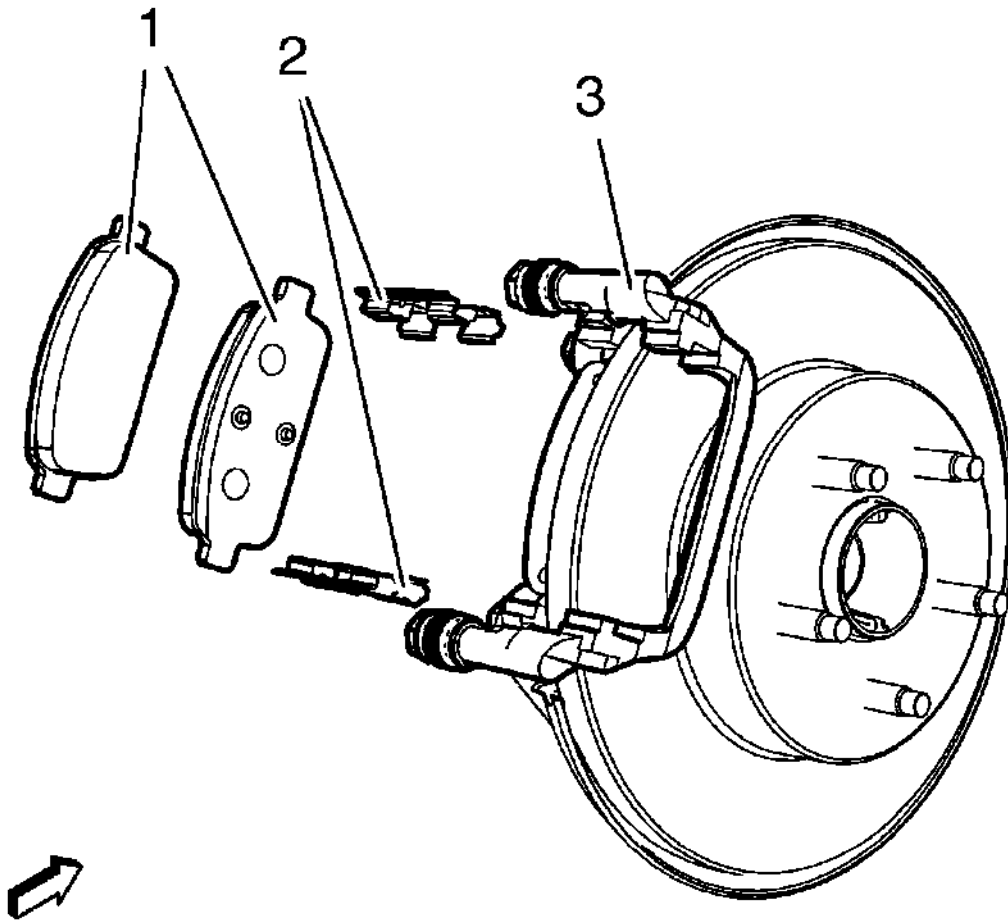


Fig. 65: Brake Caliper Mounting Bracket And Brake Pads

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.

NOTE: Remove and discard the brake caliper pin bolts.

3. Remove the brake caliper from the brake caliper bracket (3) and support the brake caliper with heavy mechanic's wire, or equivalent. Do NOT disconnect the hydraulic brake flexible hose from the caliper. Refer to **Rear Brake Caliper Replacement**.
4. Remove the brake pads from the brake caliper bracket (3).

5. Remove the brake pad retainers from the brake caliper bracket.

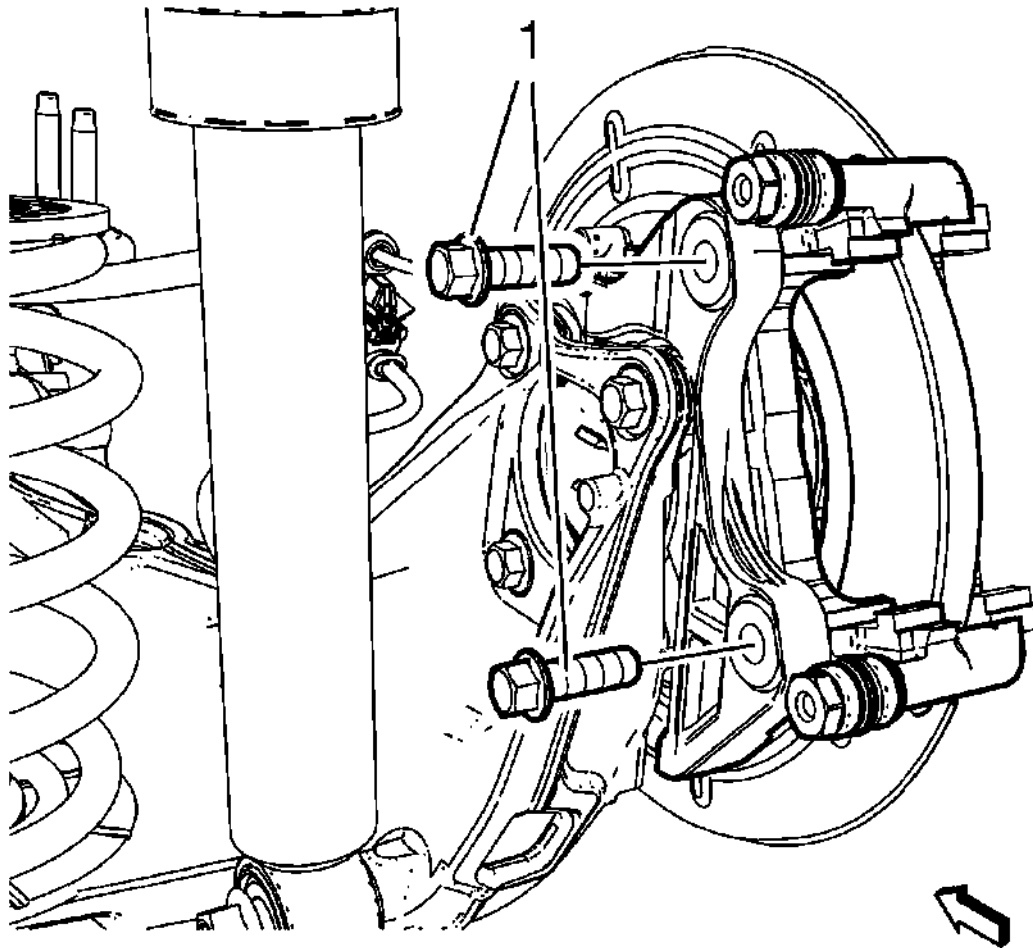


Fig. 66: Brake Caliper Bracket Bolts
Courtesy of GENERAL MOTORS COMPANY

6. Remove and DISCARD the brake caliper bracket bolts (1).
7. Remove the rear brake caliper bracket.
8. Inspect the brake mounting and hardware. Refer to **Rear Brake Caliper Hardware Replacement**.
9. Inspect the brake caliper bracket.
10. Replace the brake caliper bracket if cracked or damaged.

Installation Procedure

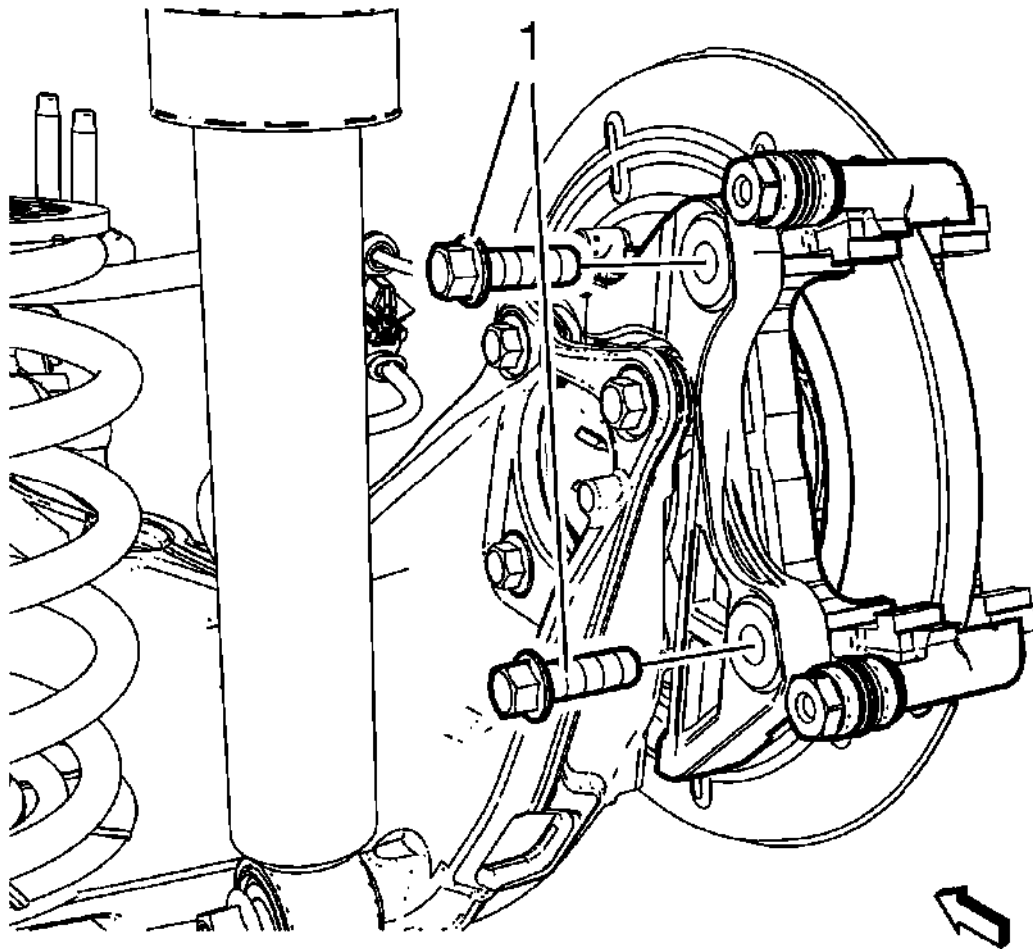


Fig. 67: Brake Caliper Bracket Bolts
Courtesy of GENERAL MOTORS COMPANY

1. Install the brake caliper bracket.

CAUTION: This is a self-retaining fastener joint that does not require thread locking compounds. Do not attempt to clean the threads with a standard tap. If a standard tap is used, damage to the joint threads will occur.

CAUTION: Refer to Fastener Caution .

2. Install the NEW brake caliper mounting bracket bolts (1) and tighten a first pass to 100 N.m (74 lb ft).

WARNING: Refer to Torque-to-Yield Fastener Warning .

3. Tighten the NEW brake caliper mounting bracket bolts (1) a final pass to an additional 60 - 75 degrees, using the **EN-45059** meter.

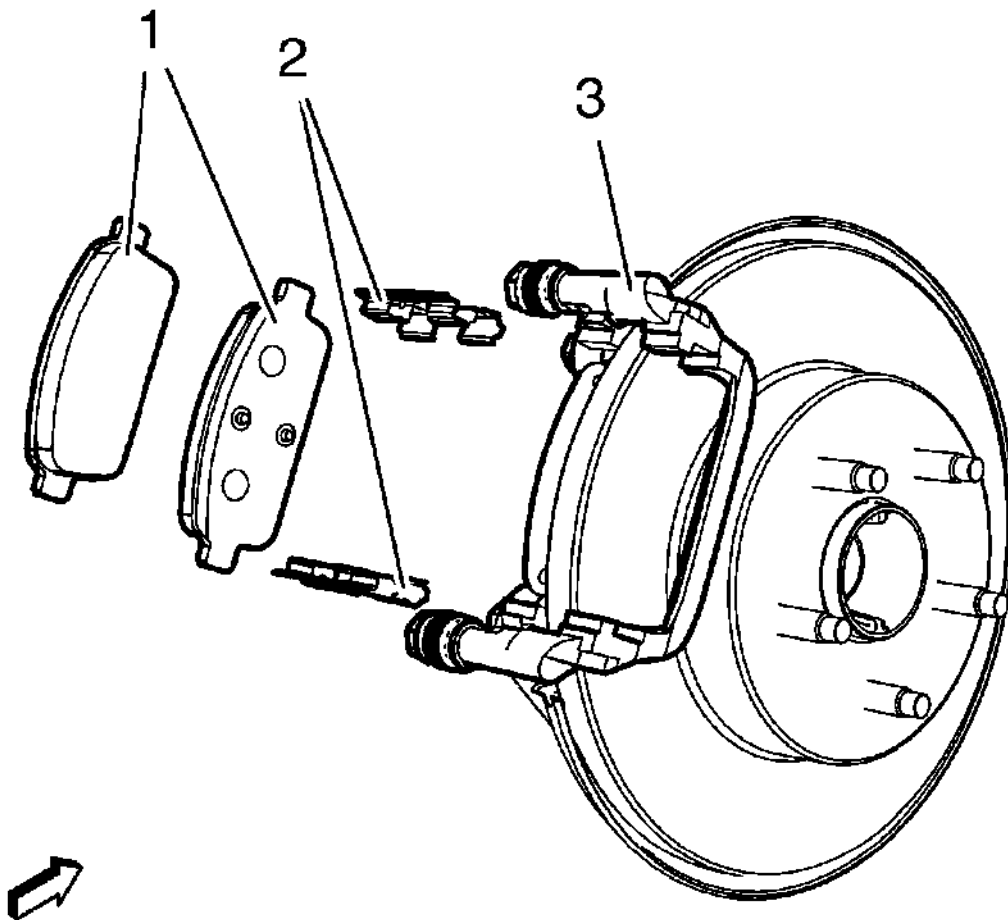


Fig. 68: Brake Caliper Mounting Bracket And Brake Pads
Courtesy of GENERAL MOTORS COMPANY

4. Install the brake pad retainers (2) to the brake caliper bracket (3).
5. Install the brake pads (1) to the brake caliper bracket.
6. Install the brake caliper. Refer to **Rear Brake Caliper Replacement**.
7. Install the rear tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation**.
8. Lower the vehicle.
9. Pump the brake pedal 2-3 times in order to seat the rear disc brake pads to the rotor.

Special Tools

- CH-41013 Rotor Resurfacing Kit
- CH-42450-A Wheel Hub Resurfacing Kit
- EN-45059 Angle Meter

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

Removal Procedure

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

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

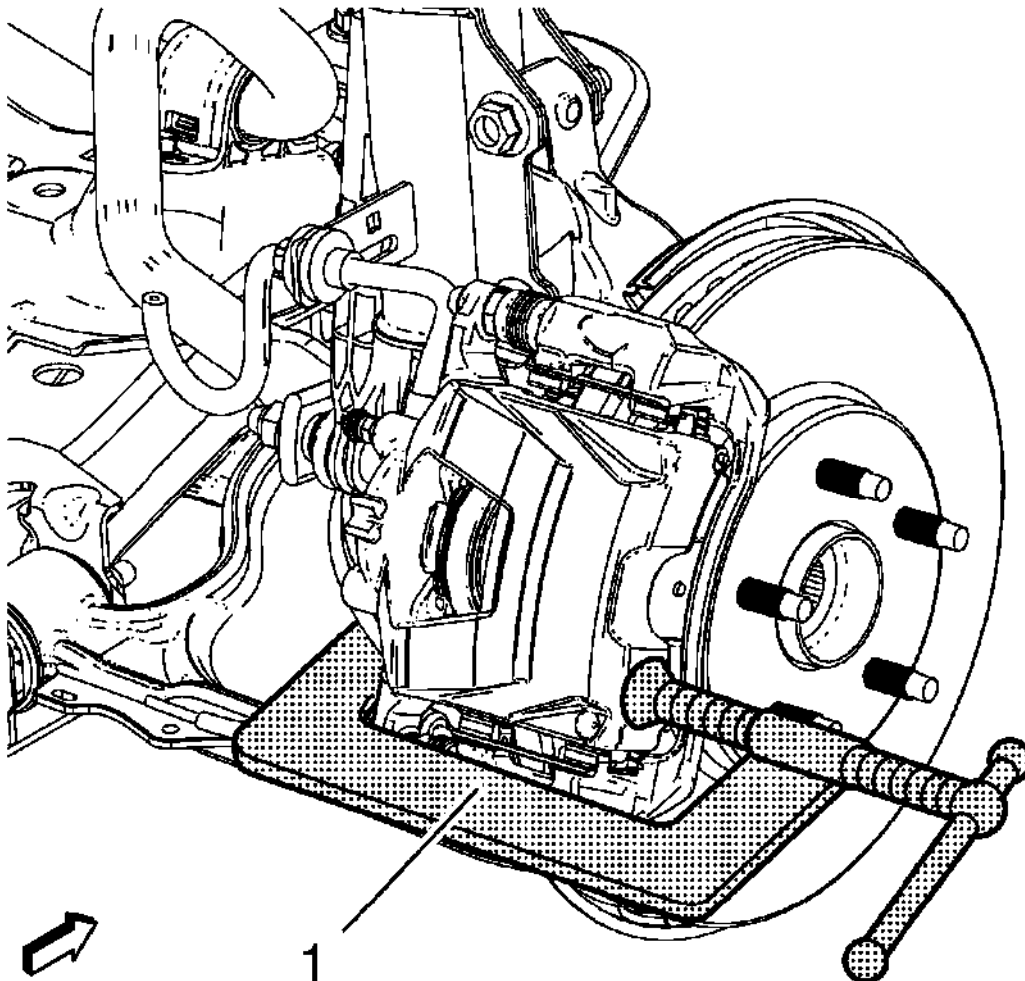


Fig. 69: Compressing Caliper Piston Into Caliper Bore

Courtesy of GENERAL MOTORS COMPANY

3. Install a C-clamp (1) over the body of the brake caliper, with the C-clamp ends against the rear of the caliper body and the outboard disc brake pad.
4. Tighten the C-clamp (1) until the caliper piston is compressed into the caliper piston bore enough, to allow the caliper to slide past the brake rotor.
5. Remove the C-clamp (1).

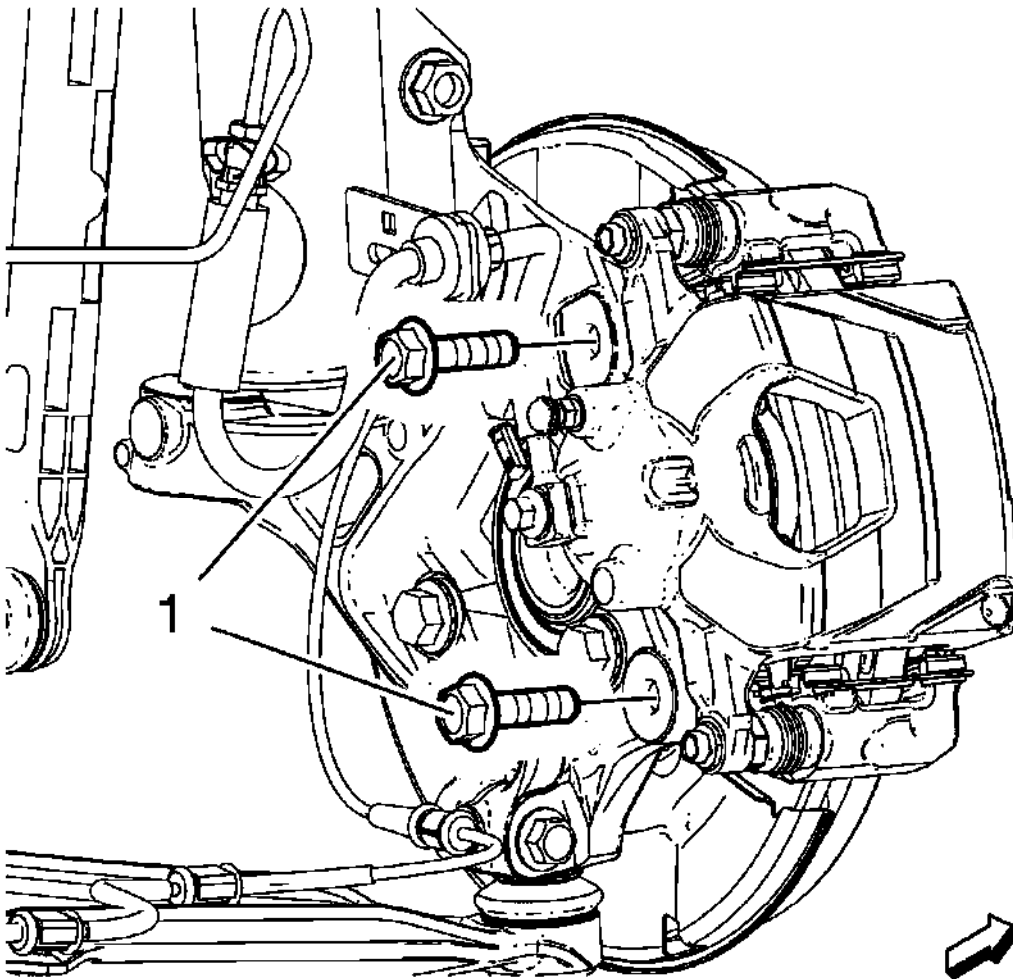


Fig. 70: Brake Caliper Bracket Bolts

Courtesy of GENERAL MOTORS COMPANY

6. Remove and DISCARD the brake caliper bracket bolts (1).

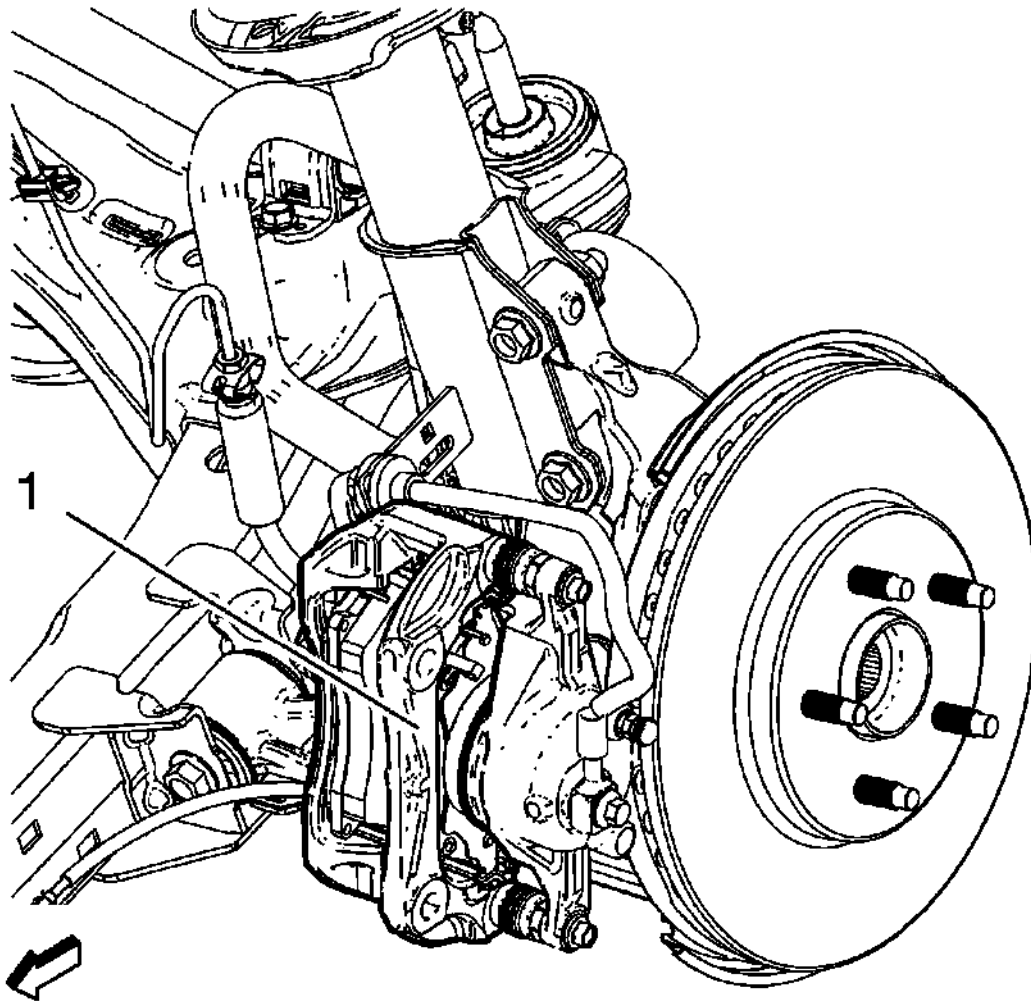


Fig. 71: Brake Caliper And Caliper Mounting Bracket Assembly

Courtesy of GENERAL MOTORS COMPANY

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

NOTE: Do NOT disconnect the hydraulic brake flexible hose from the caliper.

7. Remove the brake caliper and the caliper mounting bracket as an assembly (1) from the steering knuckle and support the assembly with heavy mechanics wire, or equivalent. Ensure that there is no tension on the hydraulic brake flexible hose.

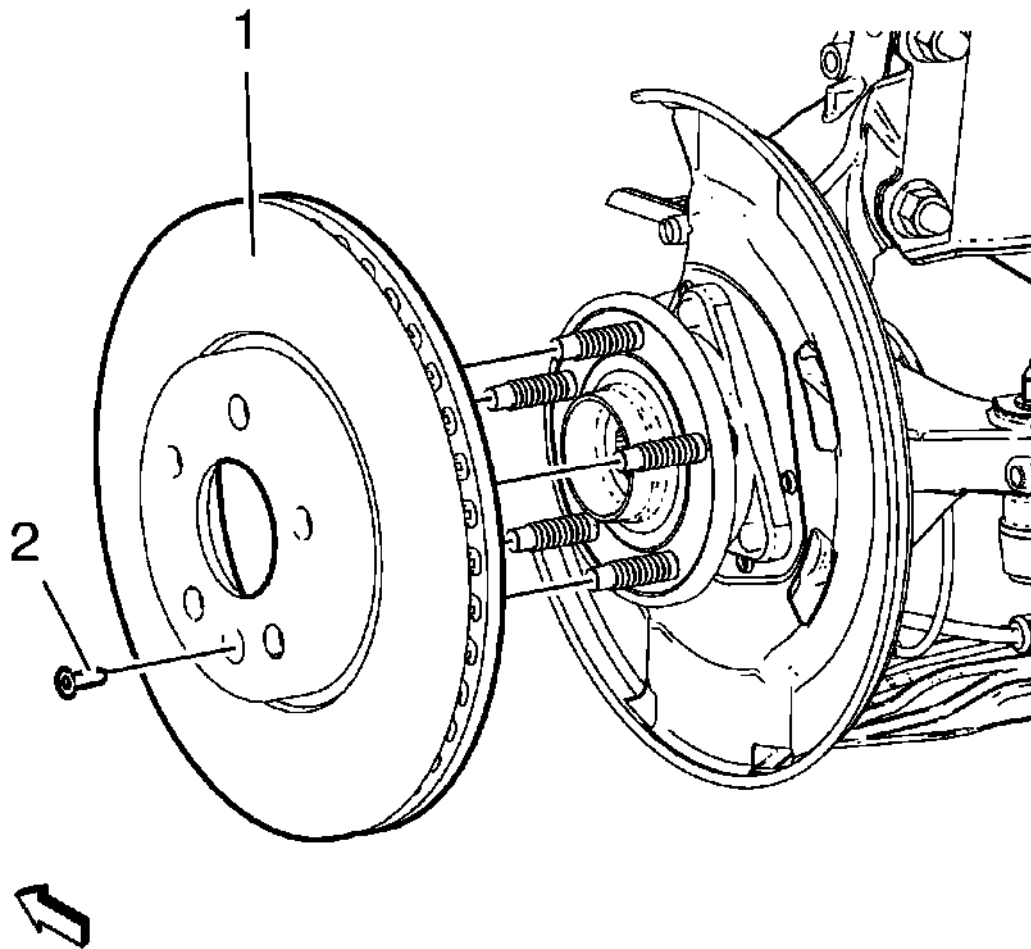


Fig. 72: Brake Rotor And Brake Rotor Retaining Screw
Courtesy of GENERAL MOTORS COMPANY

8. Remove the brake rotor bolt (2).
9. Remove the brake rotor (1) from the wheel hub.

Installation Procedure

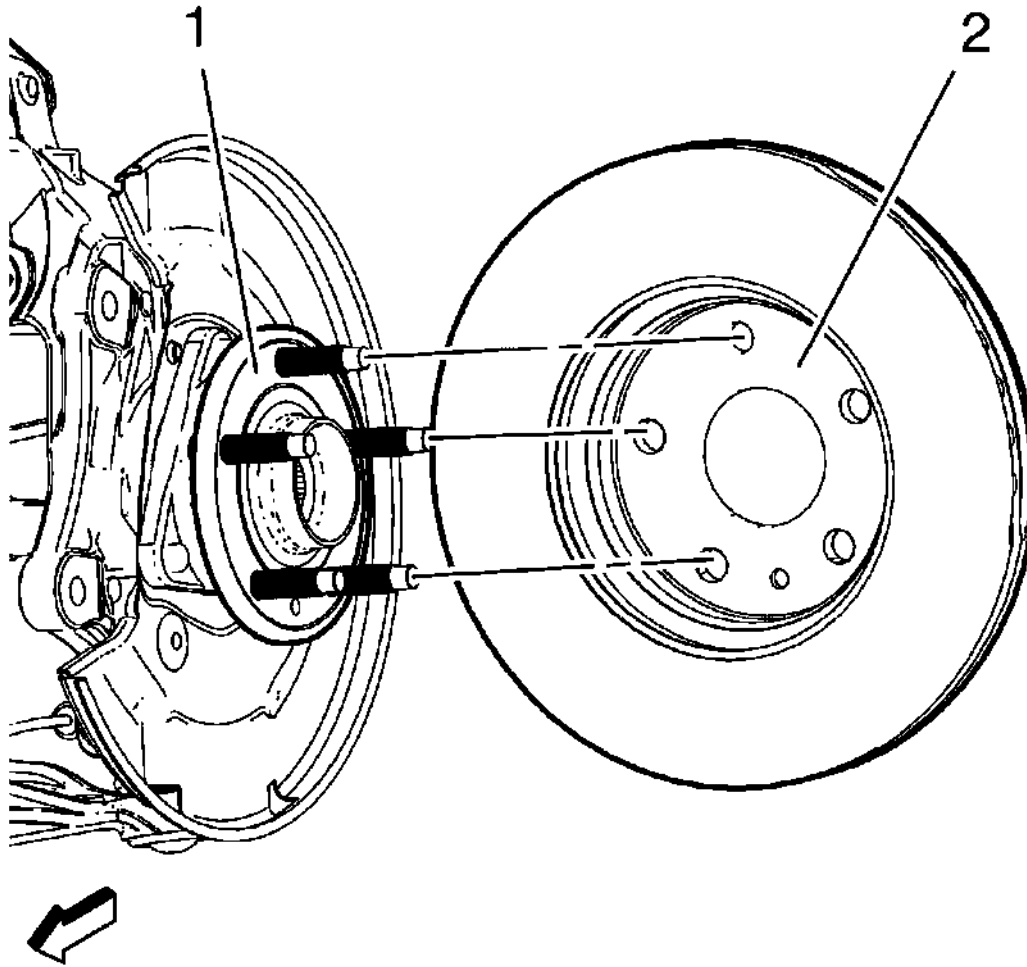


Fig. 73: Inspecting Hub/Axle Flange And Brake Rotor Mounting Surfaces

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** resurfacer, thoroughly clean any rust or corrosion from the mating surface of the hub/axle flange (1).
2. Using the **CH-41013** resurfacer, thoroughly clean any rust or corrosion from the mating surface and the mounting surface of the brake 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.

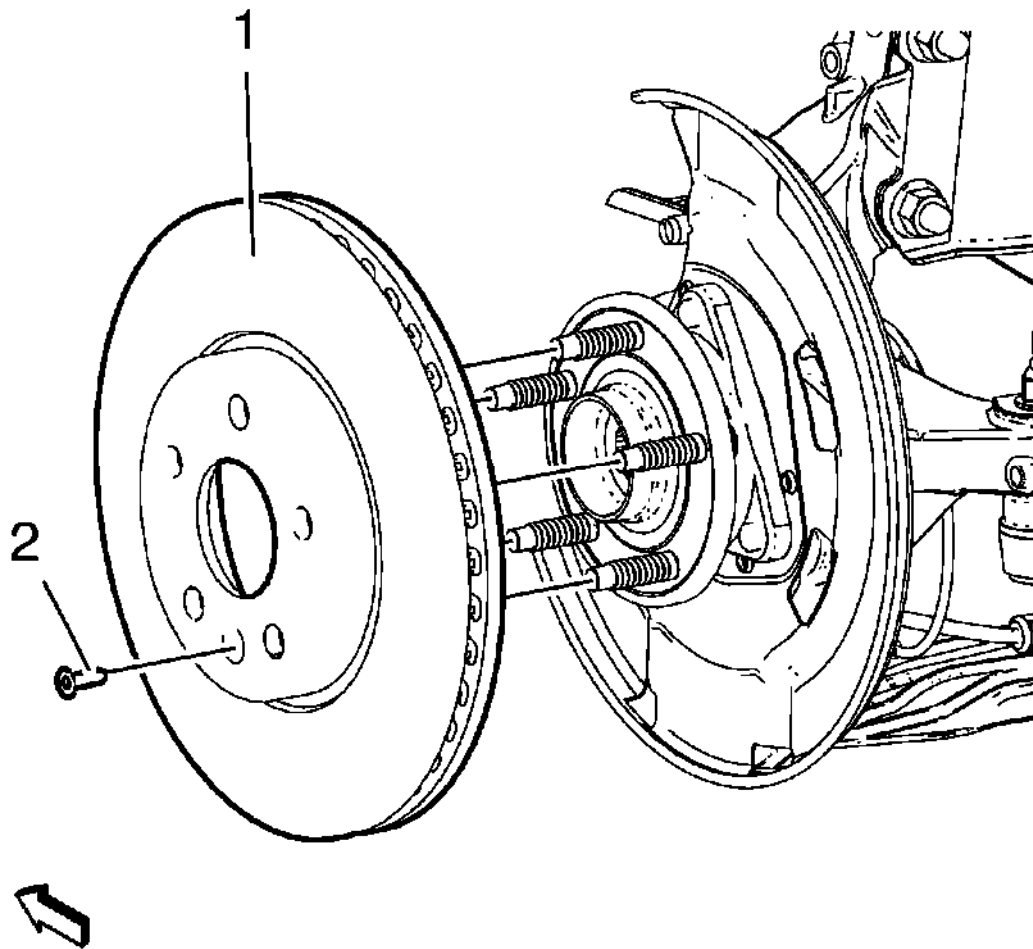


Fig. 74: Brake Rotor And Brake Rotor Retaining Screw
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

4. Install the brake rotor (1) to the hub/axle flange and tighten bolt (2) to 9 N.m (80 lb in).
5. If the brake rotor was removed and installed as a part of a brake system repair, measure the assembled lateral runout of the brake rotor to ensure optimum performance of the disc brake. Refer to **Brake Rotor Assembled Lateral Runout Measurement**.
6. If the brake rotor assembled lateral runout measurement exceeds the specification, bring the lateral runout to within specifications. Refer to **Brake Rotor Assembled Lateral Runout Correction**.
7. Remove the support and install the brake caliper and the brake caliper bracket as an assembly to the steering knuckle.

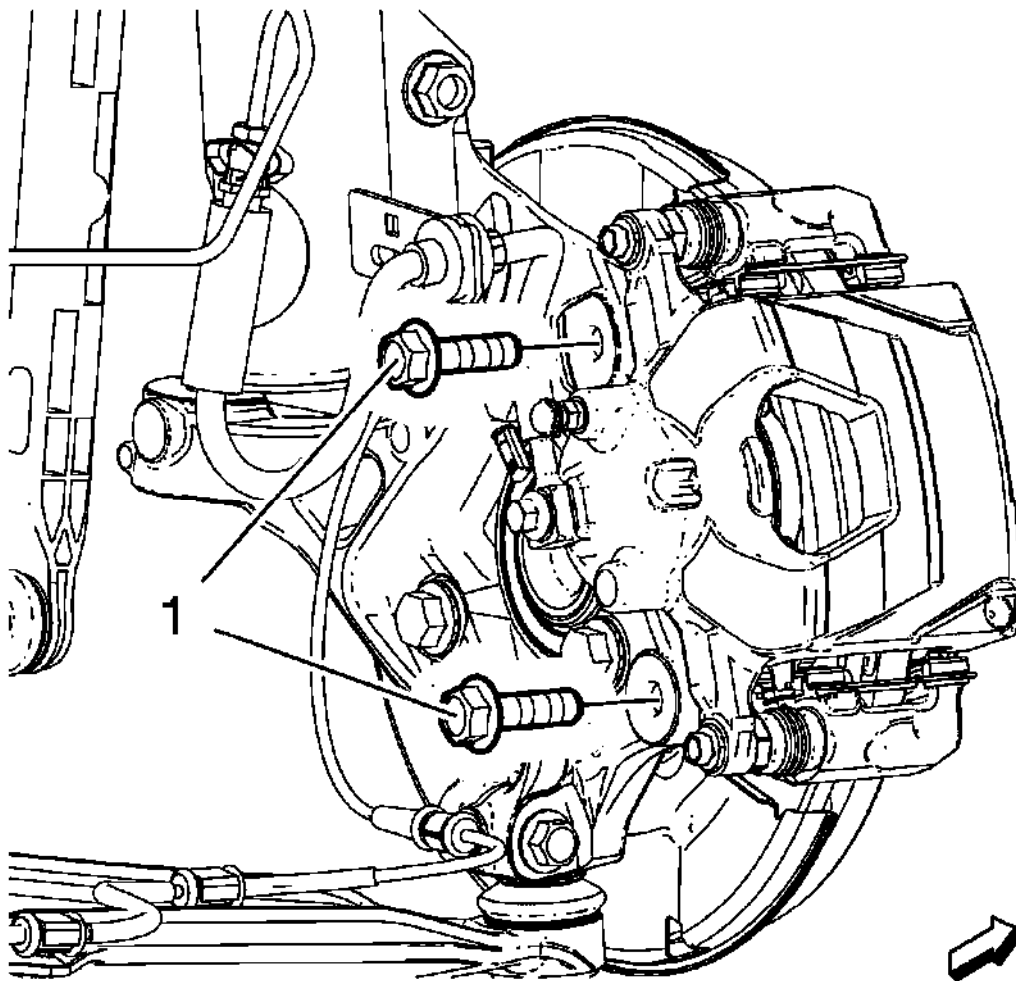


Fig. 75: Brake Caliper Bracket Bolts
Courtesy of GENERAL MOTORS COMPANY

WARNING: Refer to Torque-to-Yield Fastener Warning .

8. Install NEW brake caliper bracket bolts (1) and tighten first pass to 150 N.m (111 lb ft).
9. Tighten the NEW brake caliper bracket bolts in a final pass to an additional 45 to 60 degrees using the EN-45059 meter.
10. Install the tire and wheel assembly. Refer to Tire and Wheel Removal and Installation .

FRONT BRAKE ROTOR REPLACEMENT (J67)

Special Tools

- CH-41013 Rotor Resurfacing Kit

- CH-42450-A Wheel Hub Resurfacing Kit
- EN-45059 Angle Meter

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

Removal Procedure

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

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

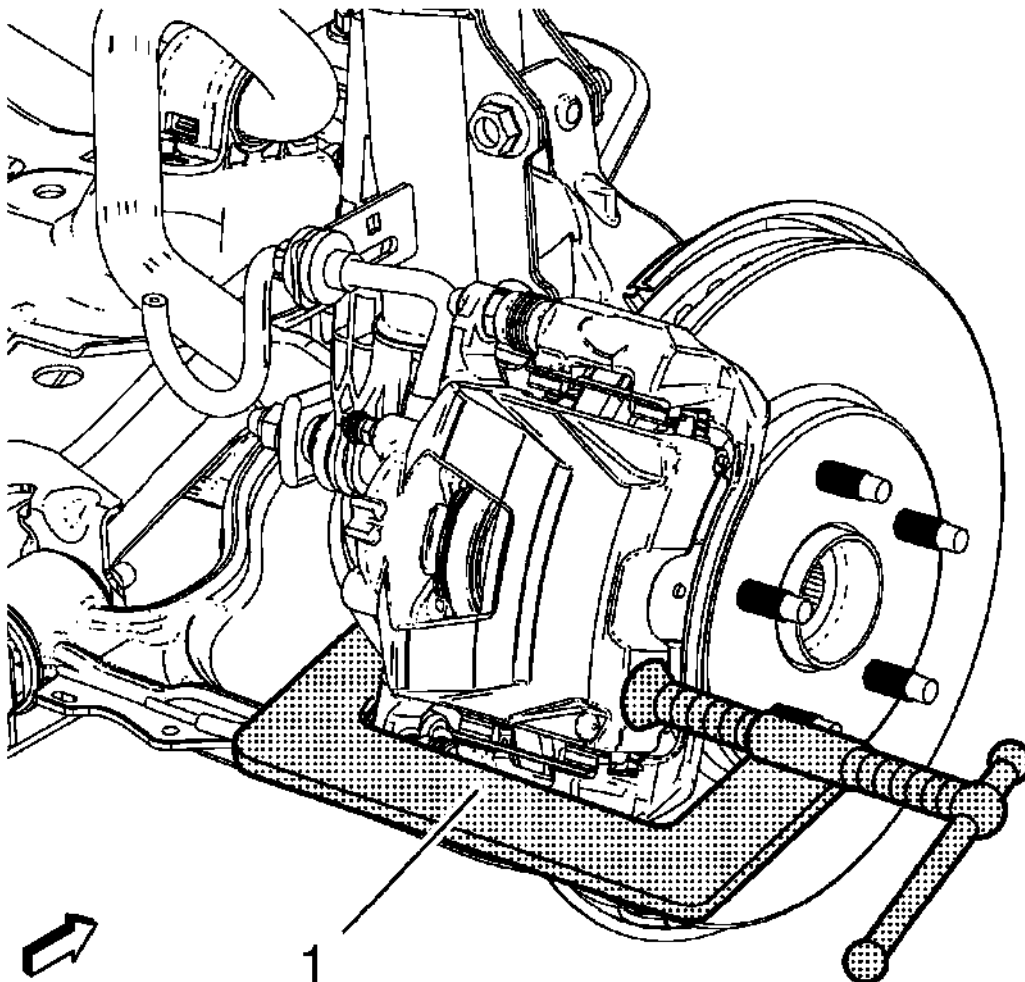


Fig. 76: Compressing Caliper Piston Into Caliper Bore
Courtesy of GENERAL MOTORS COMPANY

3. Install a C-clamp (1) over the body of the brake caliper, with the C-clamp ends against the rear of the caliper body and the outboard disc brake pad.
4. Tighten the C-clamp (1) until the caliper piston is compressed into the caliper bore enough to allow the caliper to slide past the brake rotor.
5. Remove the C-clamp (1).

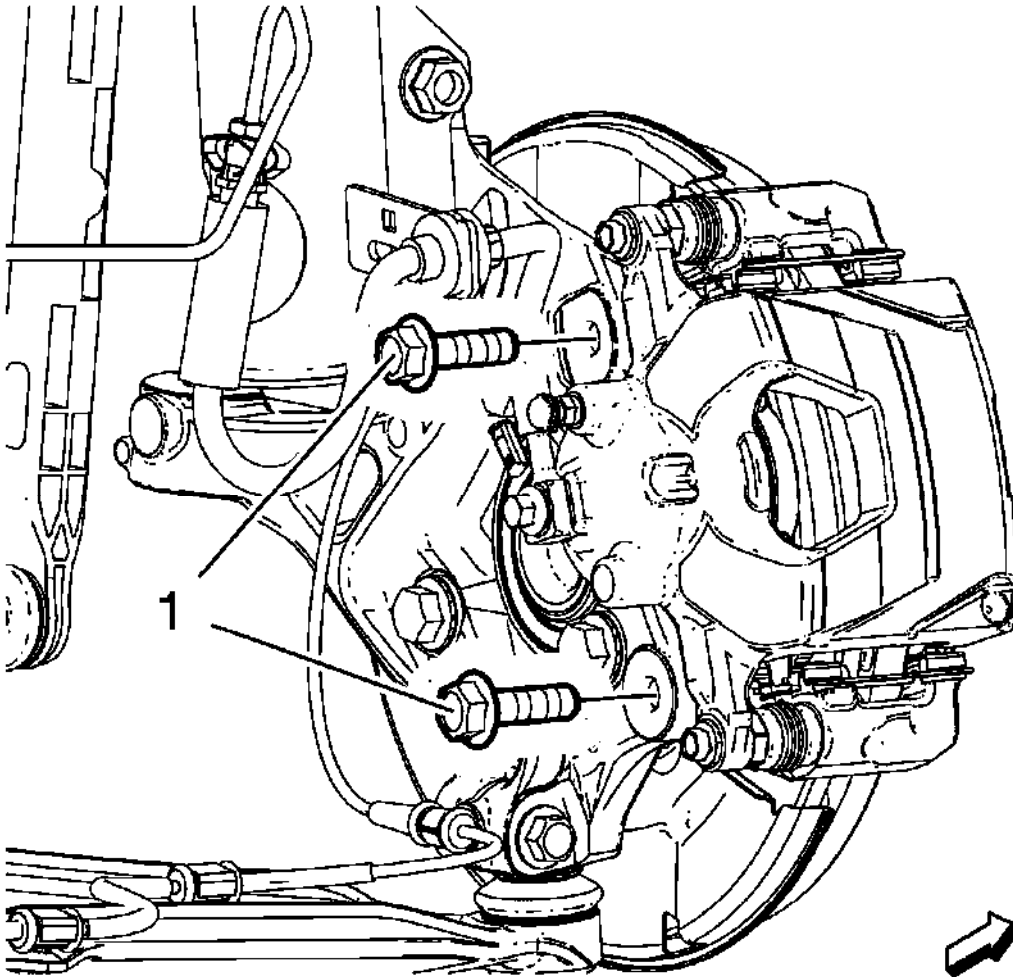


Fig. 77: Brake Caliper Bracket Bolts
Courtesy of GENERAL MOTORS COMPANY

6. Remove and DISCARD the brake caliper bracket bolts (1).

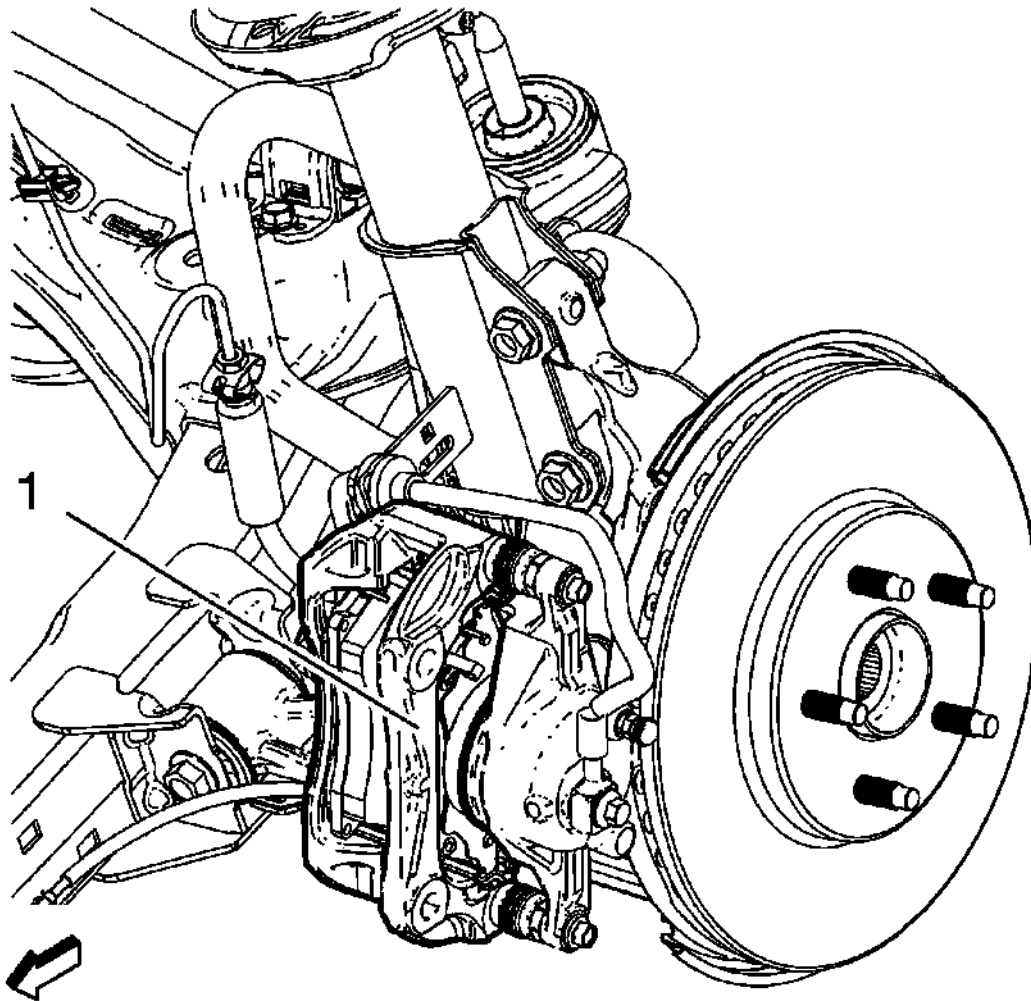


Fig. 78: Brake Caliper And Caliper Mounting Bracket Assembly
Courtesy of GENERAL MOTORS COMPANY

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

NOTE: Do NOT disconnect the hydraulic brake flexible hose from the caliper.

7. Remove the brake caliper and the caliper mounting bracket as an assembly (1) from the steering knuckle and support the assembly with heavy mechanic's wire, or equivalent. Ensure that there is no tension on the hydraulic brake flexible hose.

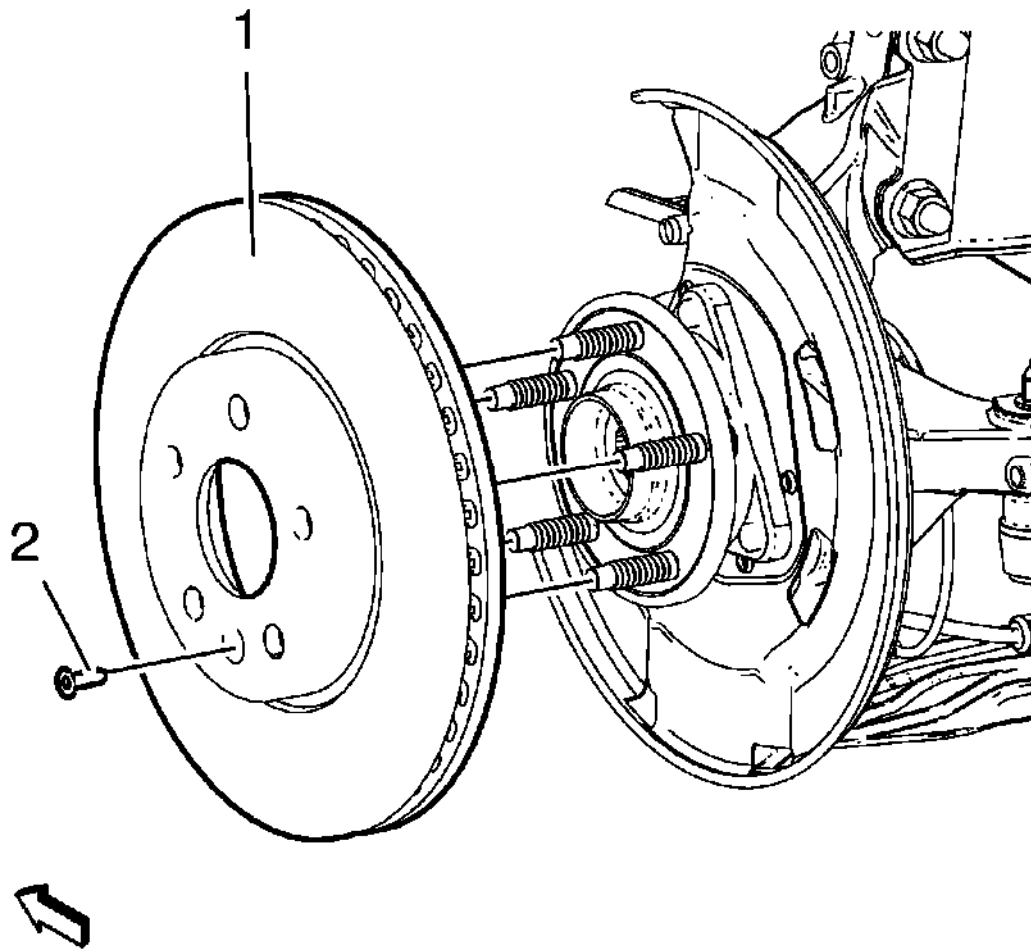


Fig. 79: Brake Rotor And Brake Rotor Retaining Screw
Courtesy of GENERAL MOTORS COMPANY

8. Remove the brake rotor screw (2).
9. Remove the brake rotor (1) from the wheel hub.

Installation Procedure

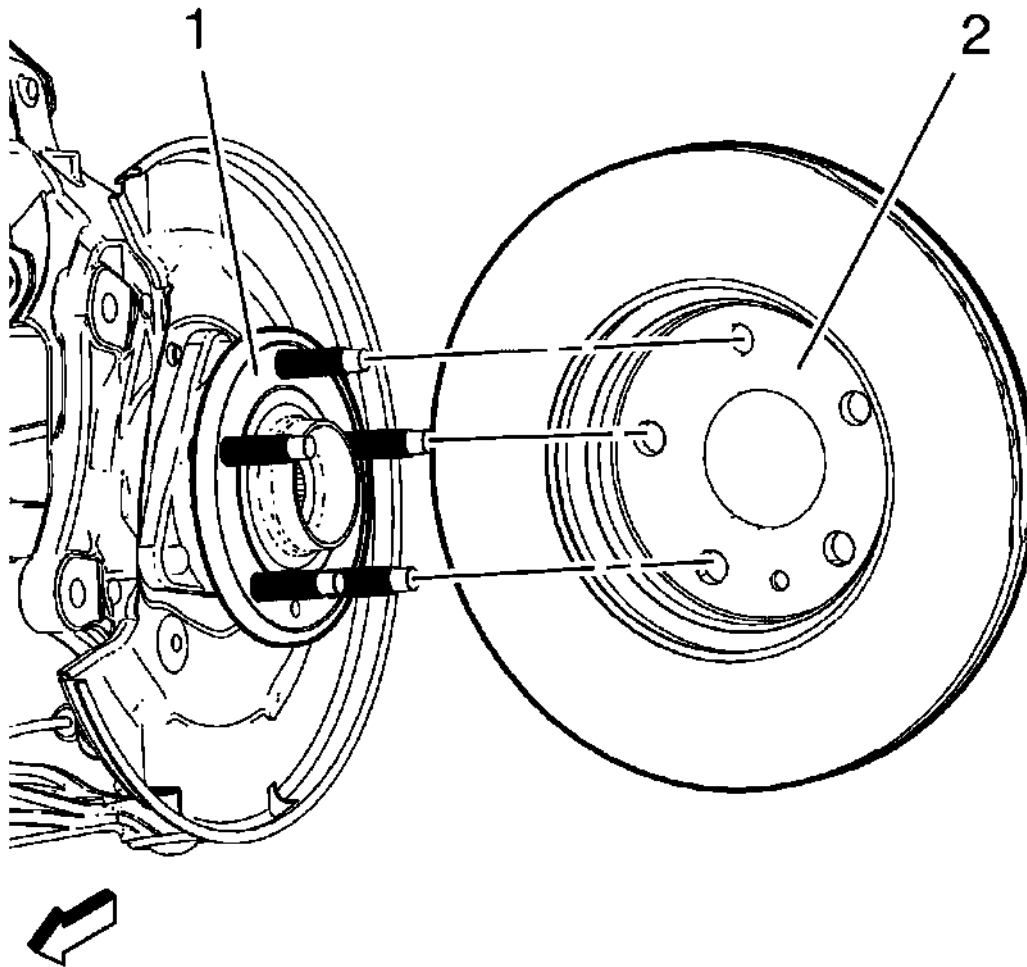


Fig. 80: Inspecting Hub/Axle Flange And Brake Rotor Mounting Surfaces

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** resurfacer, thoroughly clean any rust or corrosion from the mating surface of the hub/axle flange (1).
2. Using the **CH-41013** resurfacer, thoroughly clean any rust or corrosion from the mating surface and mounting surface of the brake 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.
4. Install the brake rotor to the hub/axle flange. Use the mark made prior to removal to ensure proper

orientation to the flange.

CAUTION: Refer to Fastener Caution .

5. Install the brake rotor screw and tighten to 9 N.m (80 lb in).
6. If the brake rotor was removed and installed as part of a brake system repair, measure the assembled LRO of the brake rotor to ensure optimum performance of the disc brakes. Refer to **Brake Rotor Assembled Lateral Runout Measurement**.
7. Remove the support, and install the brake caliper and the brake caliper bracket as an assembly to the steering knuckle.

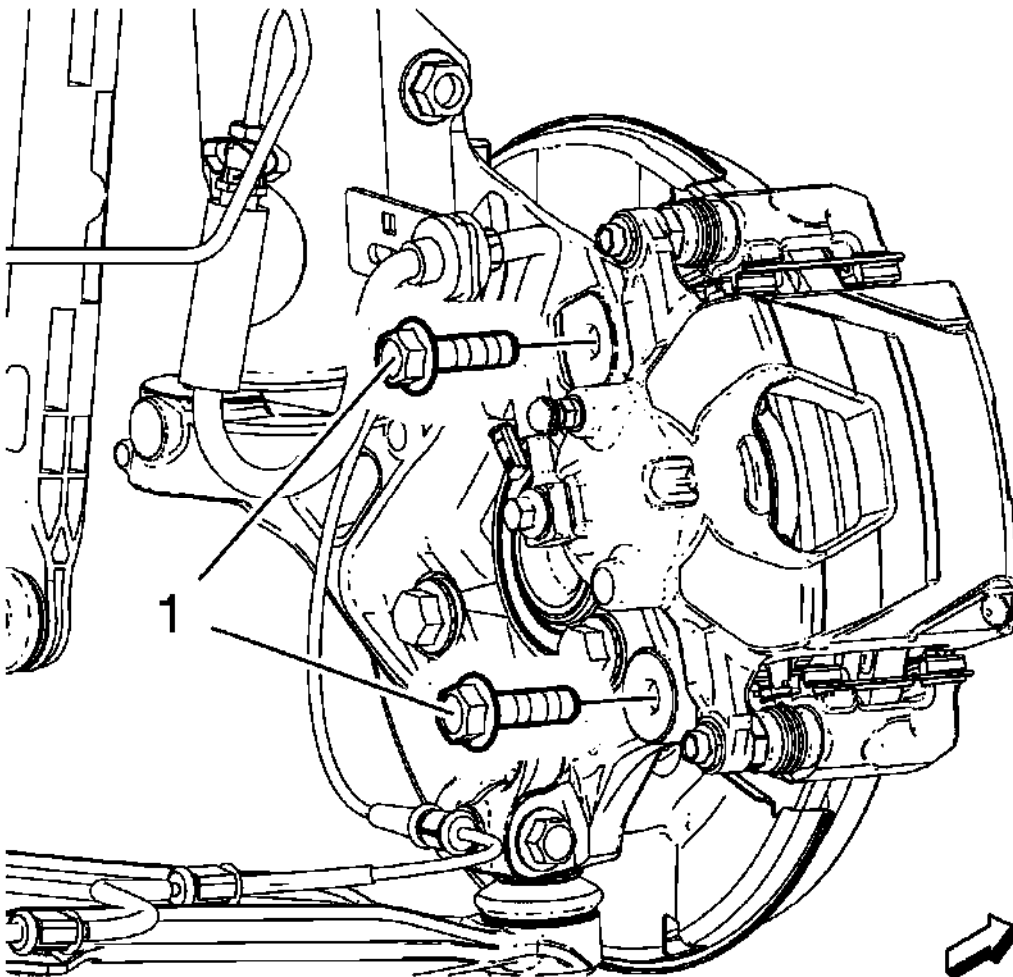


Fig. 81: Brake Caliper Bracket Bolts
Courtesy of GENERAL MOTORS COMPANY

8. Install NEW brake caliper bracket bolts (1) and tighten a first pass to 100 N.m (74 lb ft).

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WARNING: Refer to Torque-to-Yield Fastener Warning .

9. Tighten the NEW brake caliper bracket bolts a final pass to an additional 60 - 75 degrees, using the **EN-45059** meter.
10. Install the tire and wheel assembly. Refer to Tire and Wheel Removal and Installation .
11. Lower the vehicle.

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

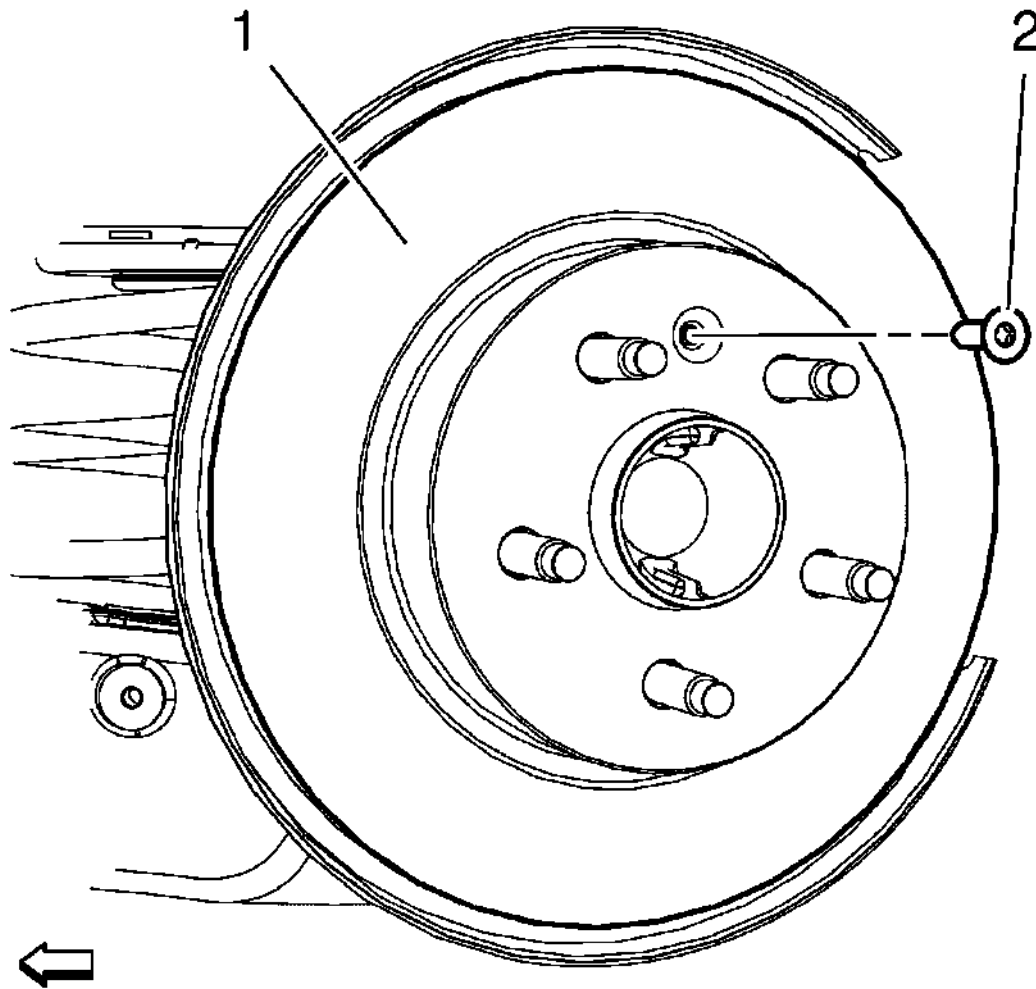


Fig. 82: Brake Rotor And Brake Rotor Retaining Bolt
Courtesy of GENERAL MOTORS COMPANY

WARNING: Refer to Brake Dust Warning .

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.

1. Remove the brake caliper and the caliper mounting bracket as an assembly from the steering knuckle. Refer to Rear Brake Caliper Bracket Replacement.
2. Matchmark the position of the brake rotor to the wheel studs.

3. Remove the rear brake rotor bolt (2).
4. Remove rear brake rotor (1) from the wheel hub.

Installation Procedure

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

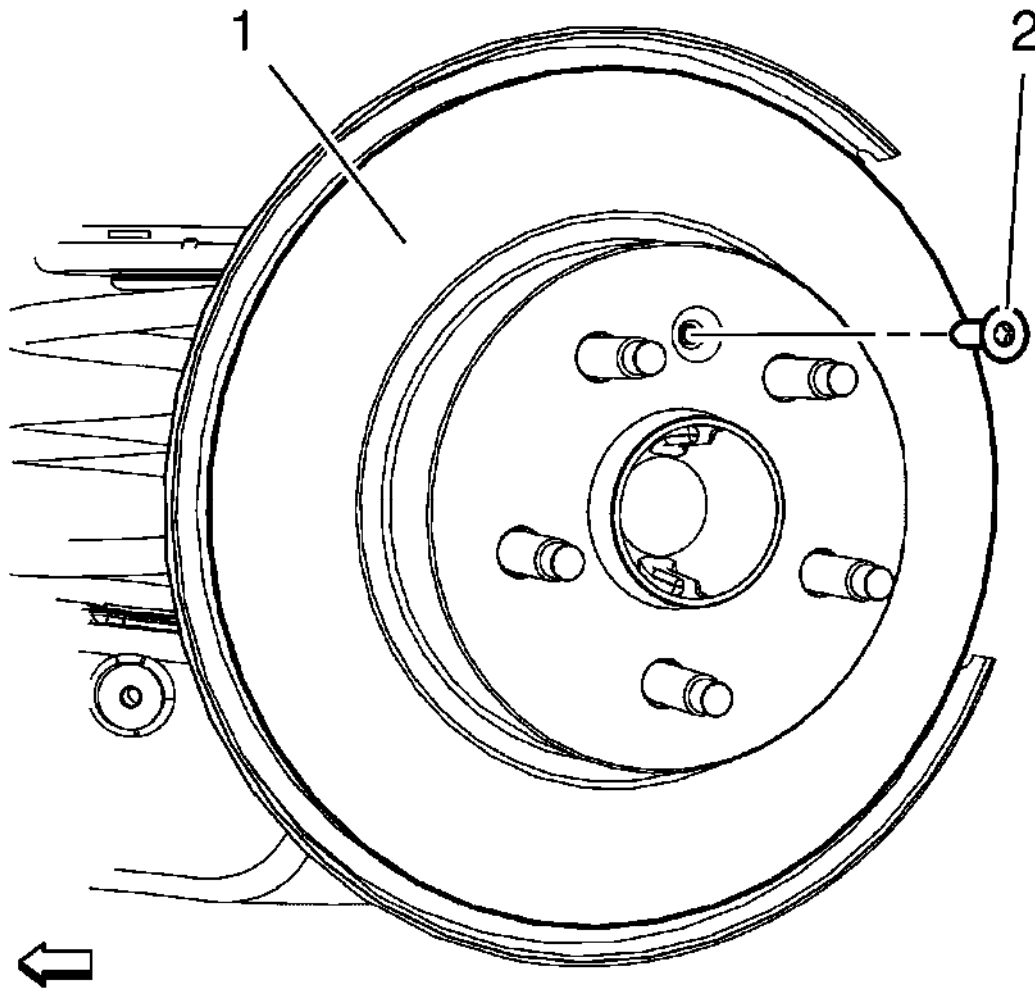


Fig. 83: Brake Rotor And Brake Rotor Retaining Bolt
Courtesy of GENERAL MOTORS COMPANY

4. Install the brake rotor (1) to the hub/axle flange. Use the matchmark made prior to removal for proper

orientation to the flange.

CAUTION: Refer to Fastener Caution .

5. Install rear brake rotor bolt (2) and tighten to 9 N.m (80 lb in).
6. Install the brake caliper and the caliper mounting bracket assembly to the steering knuckle. Refer to **Rear Brake Caliper Bracket Replacement**.
7. If the brake rotor was removed and installed as part of a brake system repair, measure the assembled lateral run out (LRO) of the brake rotor to ensure optimum performance of the disc brakes. Refer to **Brake Rotor Assembled Lateral Runout Measurement**.
8. If the brake rotor assembled LRO measurement exceeds the specification, bring the LRO to within specifications. Refer to **Brake Rotor Assembled Lateral Runout Correction**.

FRONT BRAKE SHIELD REPLACEMENT

Special Tools

EN-45059 Angle Meter

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

Removal Procedure

1. Raise and suitably support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Remove the brake rotor. Refer to **Front Brake Rotor Replacement (J60)**, **Front Brake Rotor Replacement (J67)**.

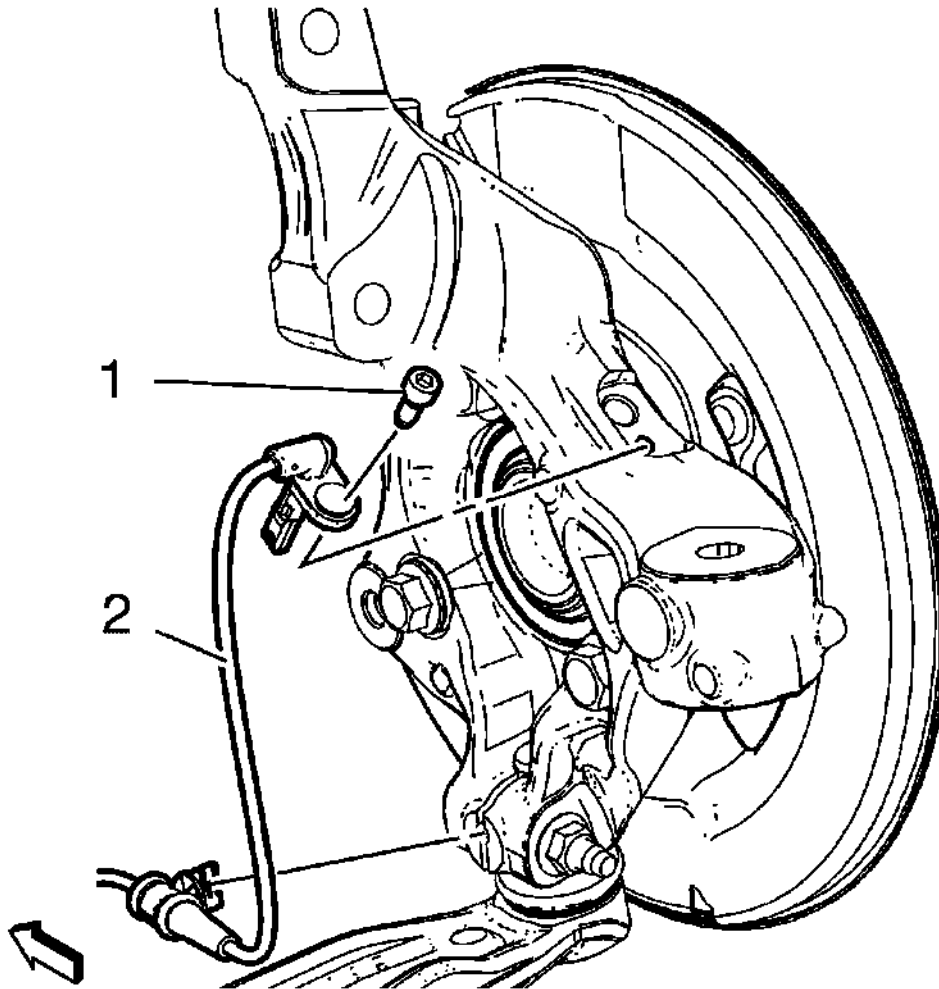


Fig. 84: Wheel Speed Sensor And Wheel Speed Sensor Mounting Bolt
Courtesy of GENERAL MOTORS COMPANY

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

3. Remove the wheel speed sensor bolt (1).
4. Remove the wheel speed sensor (2).
5. Remove the wheel speed sensor wiring harness from the steering knuckle.
6. Remove and DISCARD the wheel drive shaft from the wheel bearing/hub. Refer to **Front Wheel Drive Shaft Replacement - Right Side** , or **Front Wheel Drive Shaft Replacement - Left Side** .

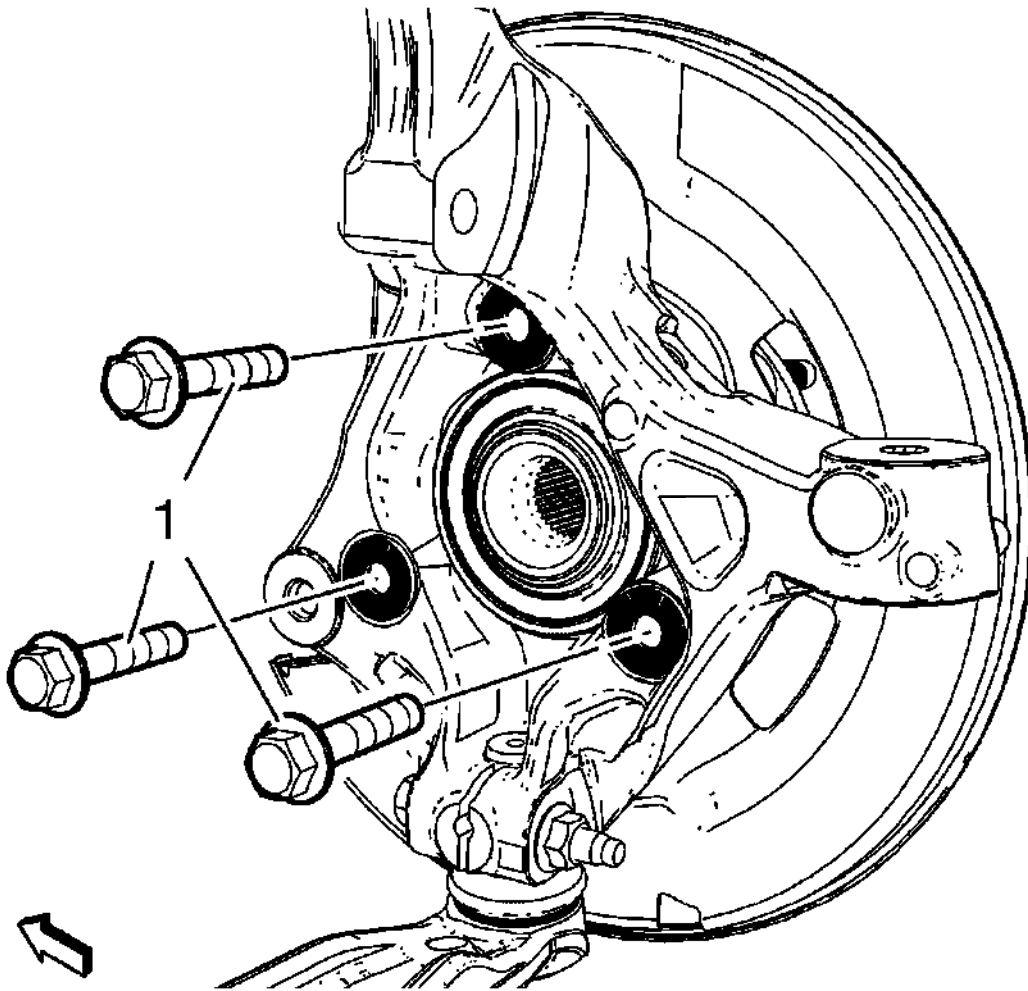


Fig. 85: Wheel Bearing/Hub Mounting Bolts
Courtesy of GENERAL MOTORS COMPANY

7. Remove and DISCARD the wheel bearing/hub mounting bolts (1).

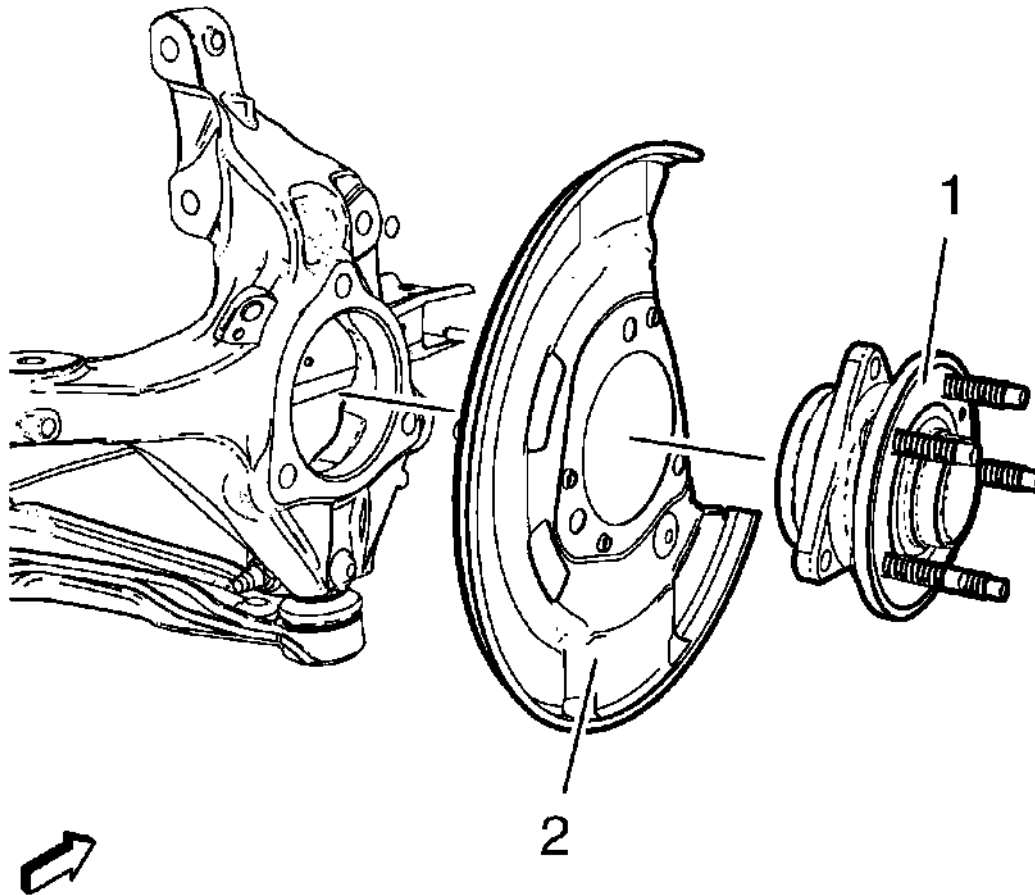


Fig. 86: Wheel Bearing/Hub, Front Brake Shield And Steering Knuckle
Courtesy of GENERAL MOTORS COMPANY

8. Remove the wheel bearing/hub (1) and front brake shield (2) from the steering knuckle.

Installation Procedure

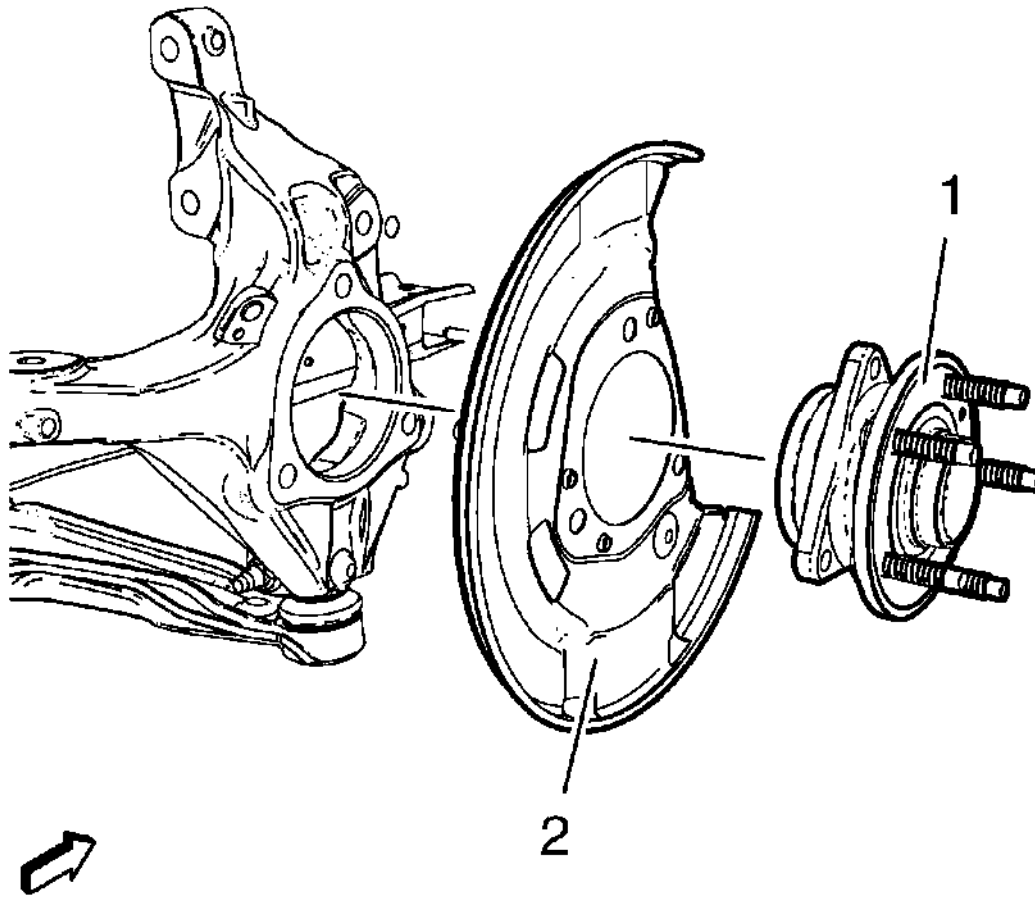


Fig. 87: Wheel Bearing/Hub, Front Brake Shield And Steering Knuckle
Courtesy of GENERAL MOTORS COMPANY

1. Position the front brake shield (2) and wheel bearing/hub assembly (1) in the steering knuckle.

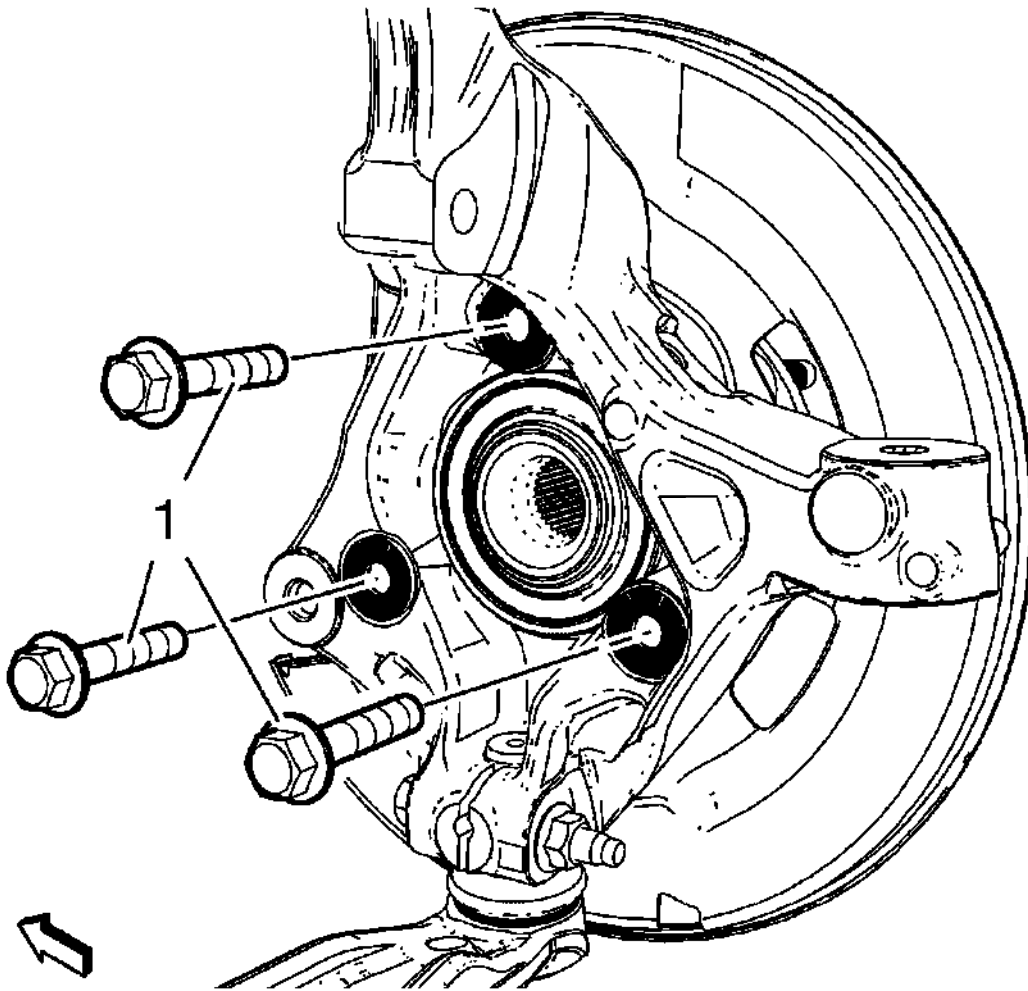


Fig. 88: Wheel Bearing/Hub Mounting Bolts
Courtesy of GENERAL MOTORS COMPANY

CAUTION: This is a self-retaining fastener joint that does not require thread locking compounds. Do not attempt to clean the threads with a standard tap. If a standard tap is used, damage to the joint threads will occur.

CAUTION: Refer to Fastener Caution .

2. Tighten the bearing/hub bolts (1) a first pass to 90 N.m (66 lb ft).

WARNING: Refer to Torque-to-Yield Fastener Warning .

3. Tighten the NEW bearing/hub bolts (1) a final pass to an additional 60 - 75 degrees, using the **EN-45059** meter.

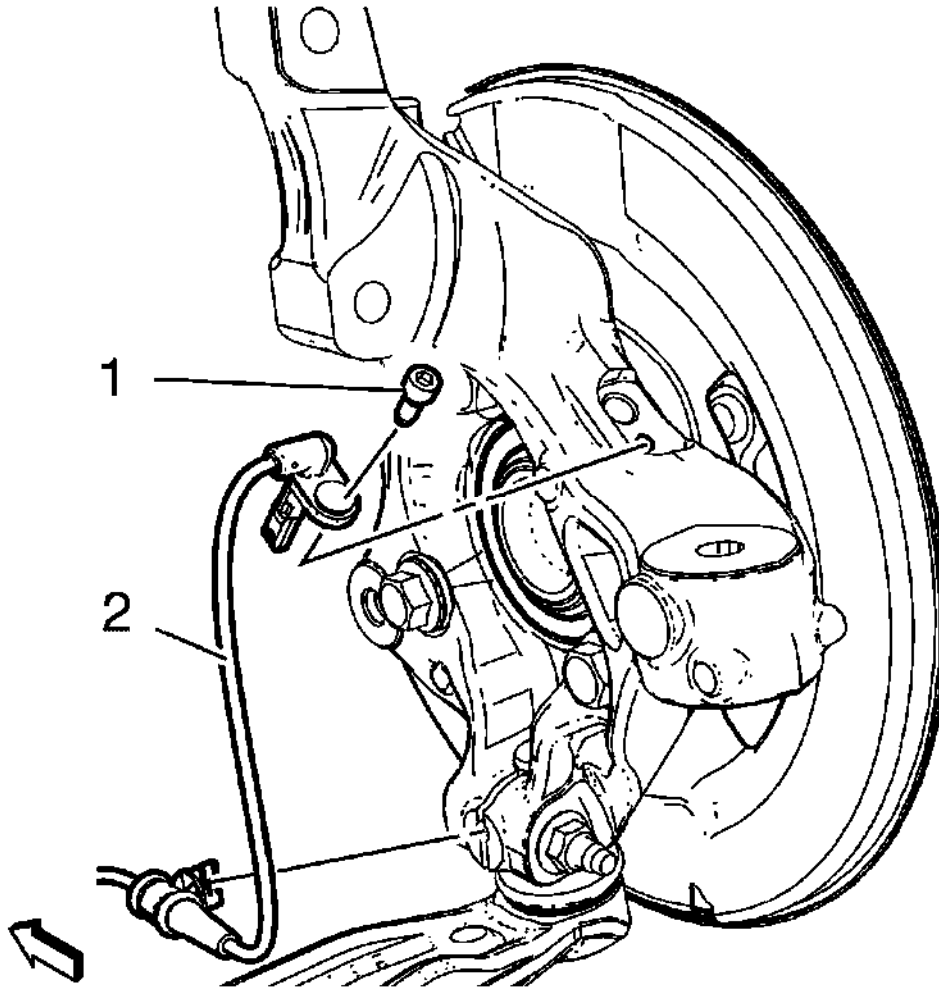


Fig. 89: Wheel Speed Sensor And Wheel Speed Sensor Mounting Bolt
 Courtesy of GENERAL MOTORS COMPANY

4. Install the wheel speed sensor wiring harness to the steering knuckle.
5. Install the wheel speed sensor (2).
6. Install the wheel speed sensor bolt (1) and tighten to 6 N.m (53 lb in).
7. Install the brake rotor. Refer to **Front Brake Rotor Replacement (J60)**, **Front Brake Rotor Replacement (J67)**.
8. Install the NEW wheel drive shaft retaining nut and washer. Refer to **Front Wheel Drive Shaft Replacement - Right Side** , or **Front Wheel Drive Shaft Replacement - Left Side** .
9. Remove the support and lower the vehicle.

REAR BRAKE SHIELD REPLACEMENT

Special Tools**EN-45059** Angle Meter**Removal Procedure**

1. Raise and suitably support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Remove the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
3. Remove the brake rotor. Refer to **Rear Brake Rotor Replacement**.

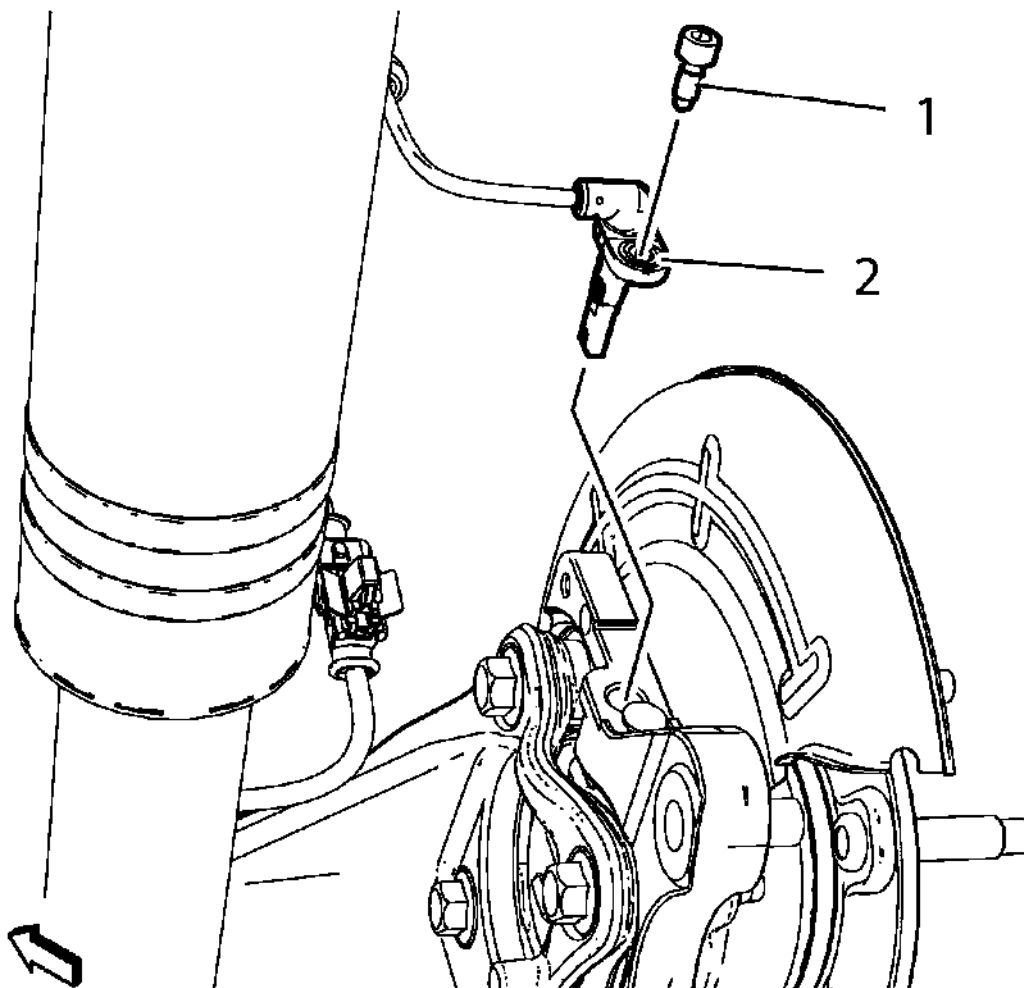


Fig. 90: Wheel Speed Sensor And Wheel Speed Sensor Mounting Bolt
Courtesy of GENERAL MOTORS COMPANY

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

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

4. Remove the wheel speed sensor bolt (1).
5. Remove the wheel speed sensor (2).

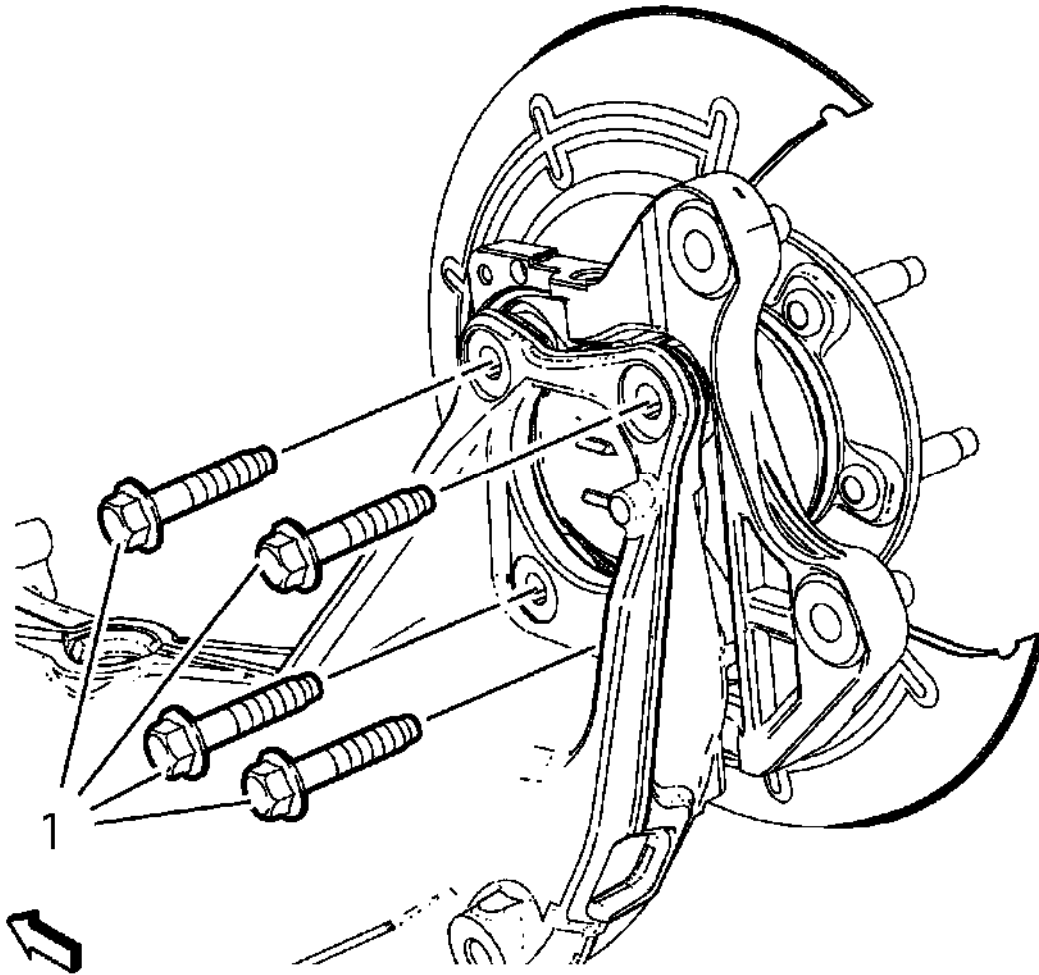


Fig. 91: Wheel Bearing/Hub Mounting Bolts
Courtesy of GENERAL MOTORS COMPANY

6. Remove and DISCARD the wheel bearing/hub mounting bolts (1).

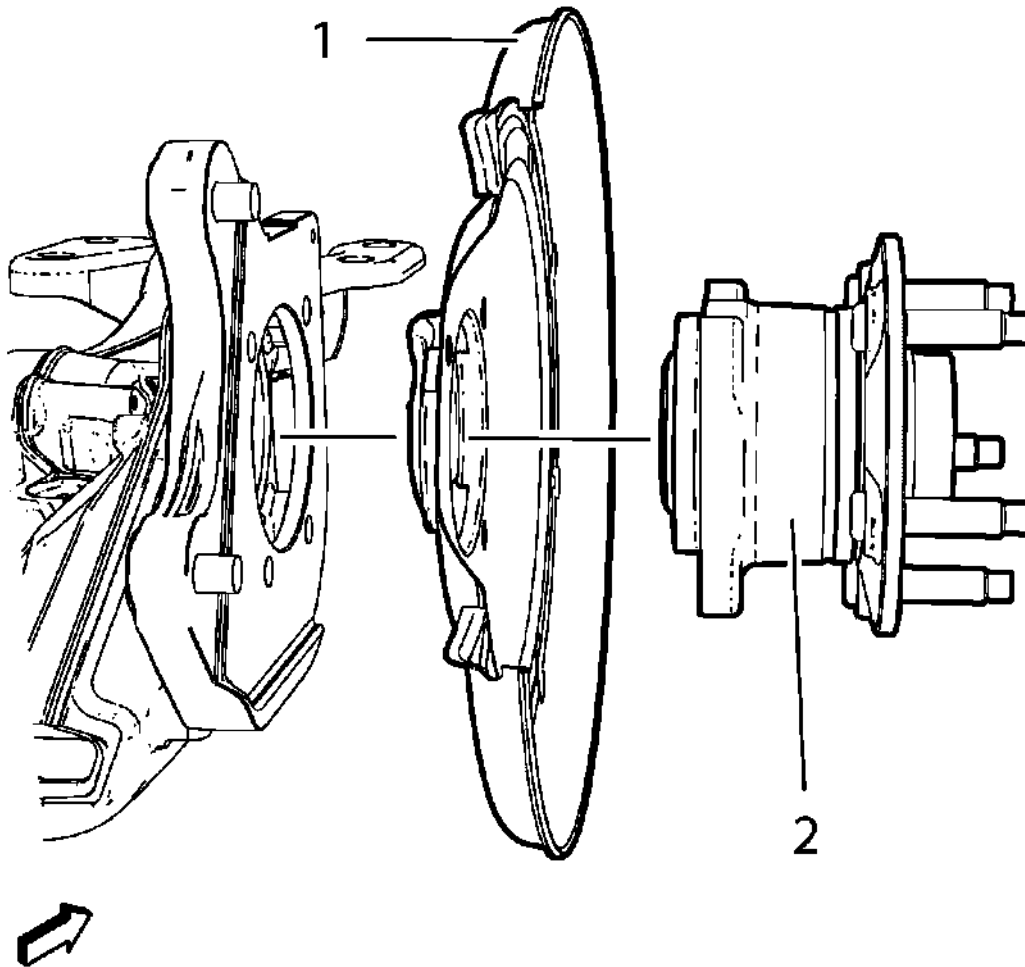


Fig. 92: Wheel Bearing/Hub, Rear Brake Shield And Steering Knuckle
Courtesy of GENERAL MOTORS COMPANY

7. Remove the wheel bearing/hub assembly (2) and rear brake shield (1) from the rear axle assembly.

Installation Procedure

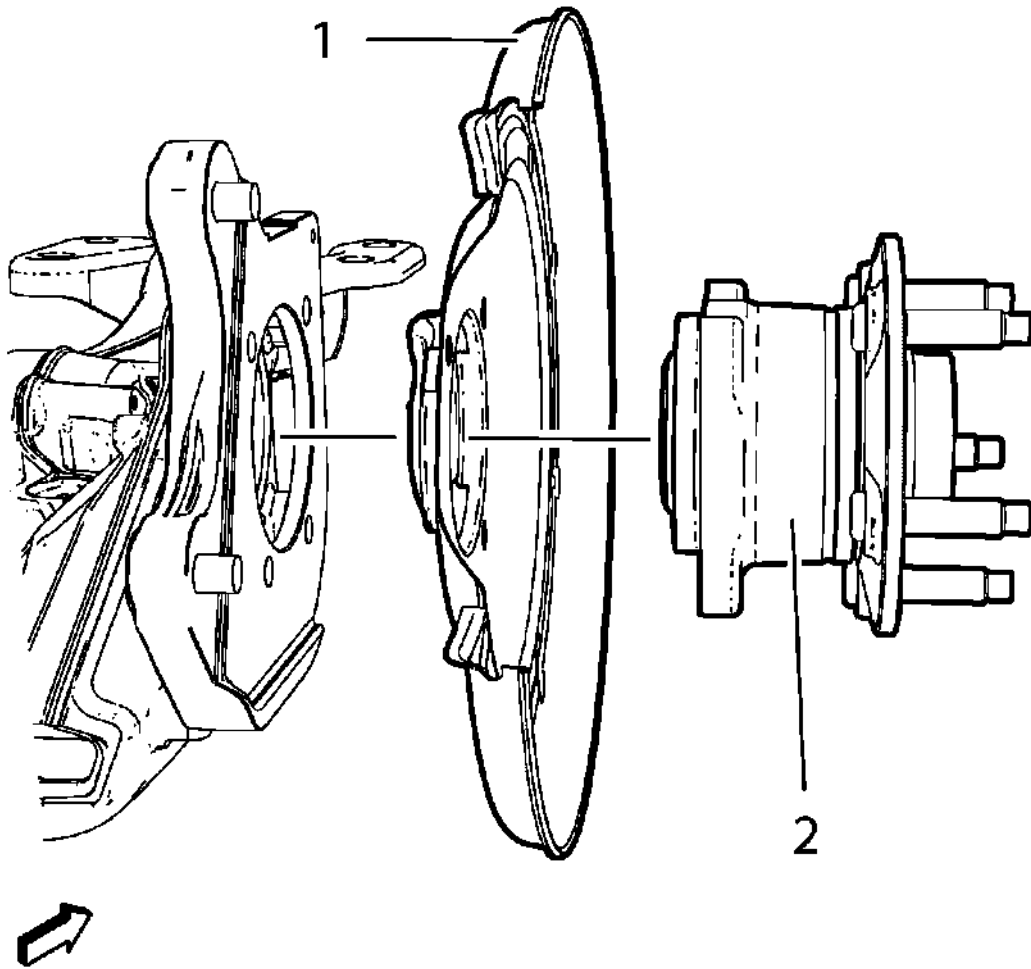


Fig. 93: Wheel Bearing/Hub, Rear Brake Shield And Steering Knuckle
Courtesy of GENERAL MOTORS COMPANY

1. Position the rear brake shield (1) and wheel bearing/hub assembly (2) onto the rear axle assembly.

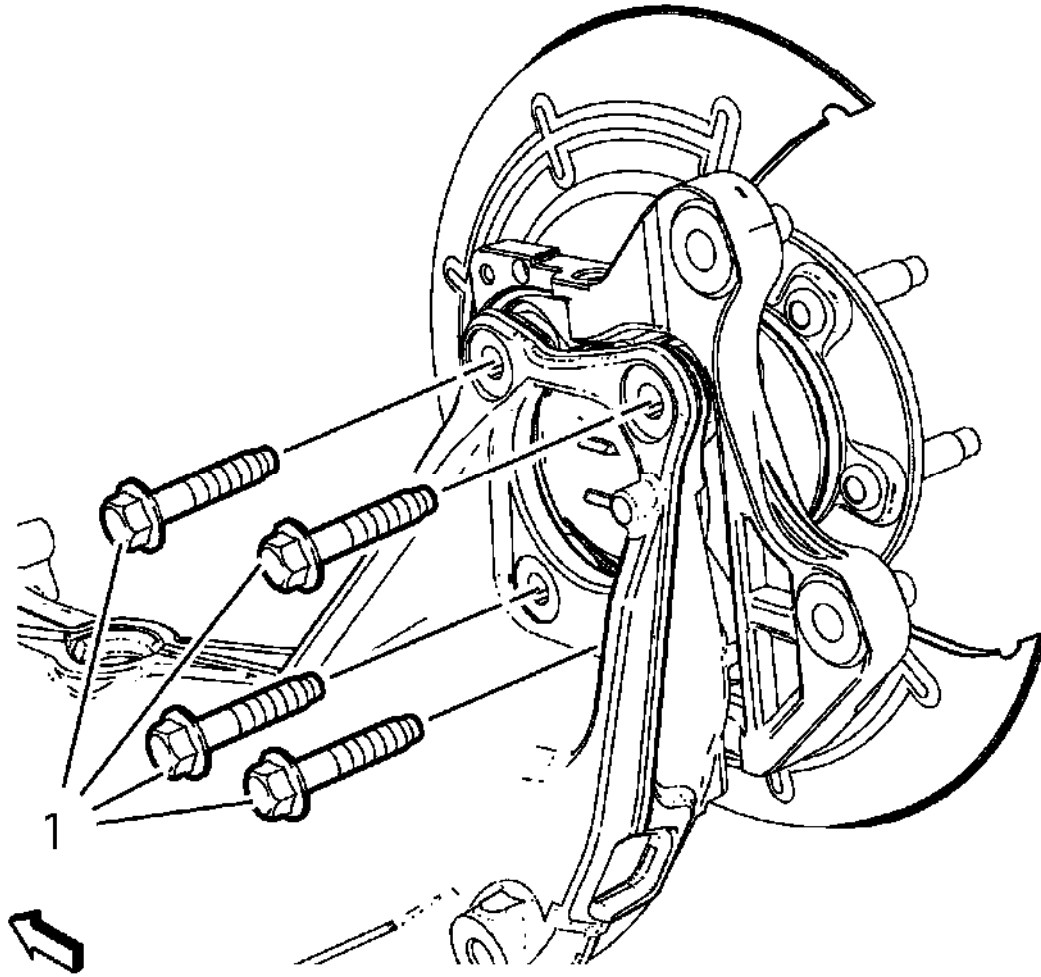


Fig. 94: Wheel Bearing/Hub Mounting Bolts
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

2. Install NEW wheel bearing/hub mounting bolts (1) and tighten a first pass to 50 N.m (37 lb ft).

WARNING: Refer to Torque-to-Yield Fastener Warning .

3. Tighten the NEW wheel bearing/hub mounting bolts (1) a final pass to an additional 30 - 45 degrees, using the EN-45059 meter.

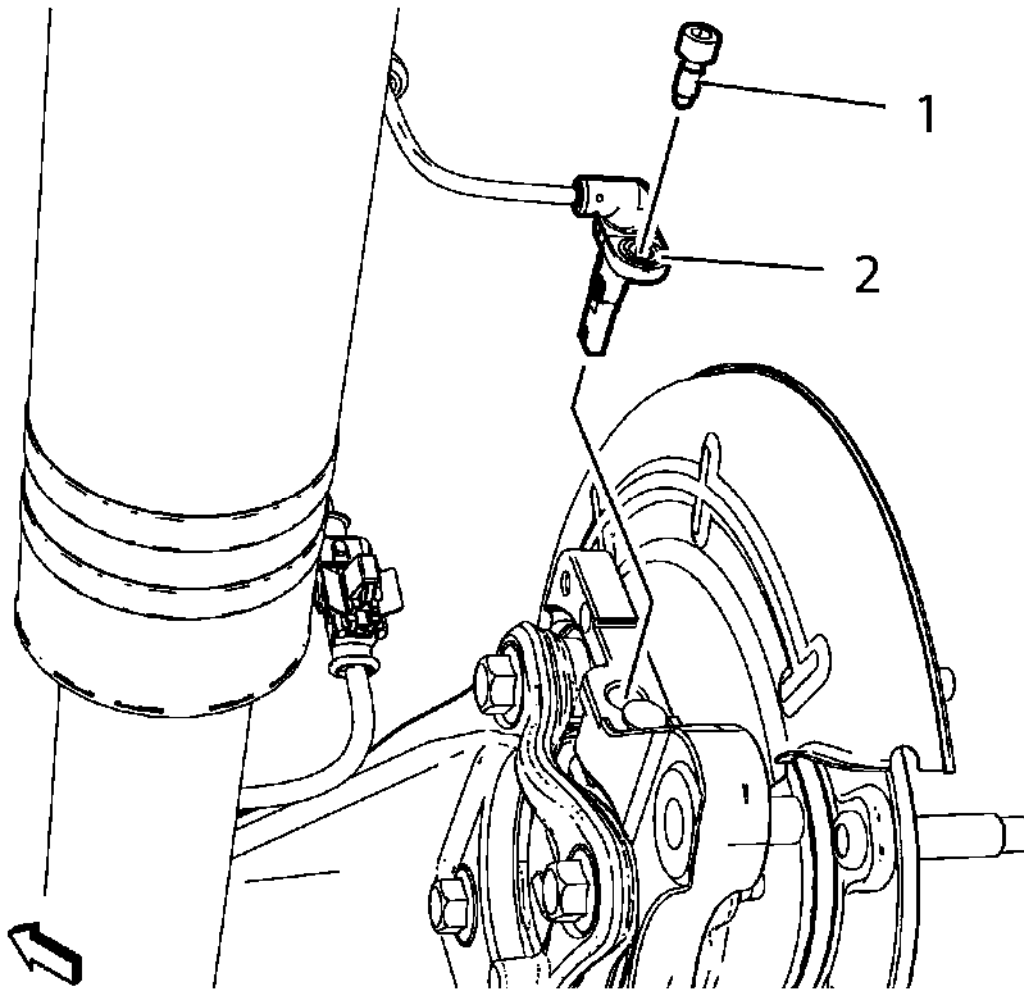


Fig. 95: Wheel Speed Sensor And Wheel Speed Sensor Mounting Bolt
Courtesy of GENERAL MOTORS COMPANY

4. Install the wheel speed sensor (2).
5. Install the wheel speed sensor bolt (1) and tighten to 6 N.m (54 lb in).
6. Install the brake rotor. Refer to **Rear Brake Rotor Replacement**.
7. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation**.
8. 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. Refer to **Brake Rotor Thickness Variation Measurement**.

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

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

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

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

BRAKE ROTOR ASSEMBLED LATERAL RUNOUT CORRECTION - INDEXING

Special Tools

CH-45101-100 Conical Brake Rotor Washers

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

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

NOTE:

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

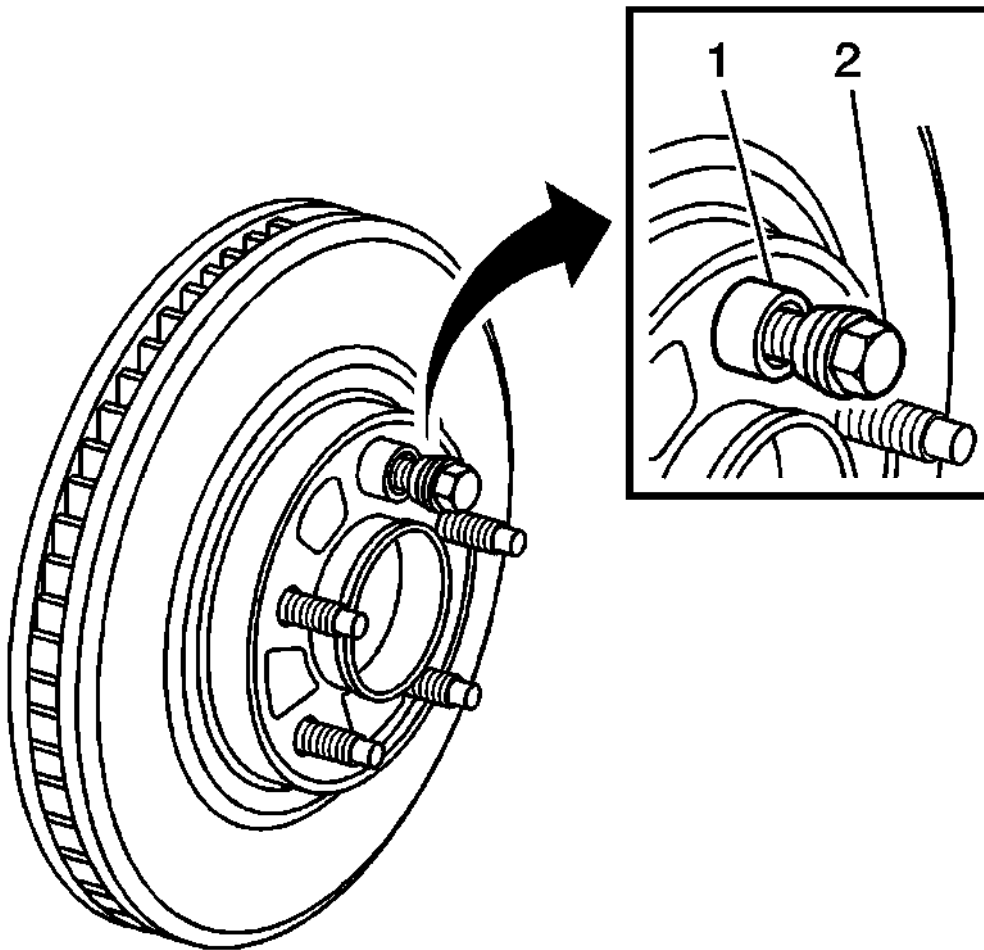


Fig. 96: Identifying Special Tool J 45101-100 & Lug Nut
Courtesy of GENERAL MOTORS COMPANY

1. Remove the **CH-45101-100** 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** 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.

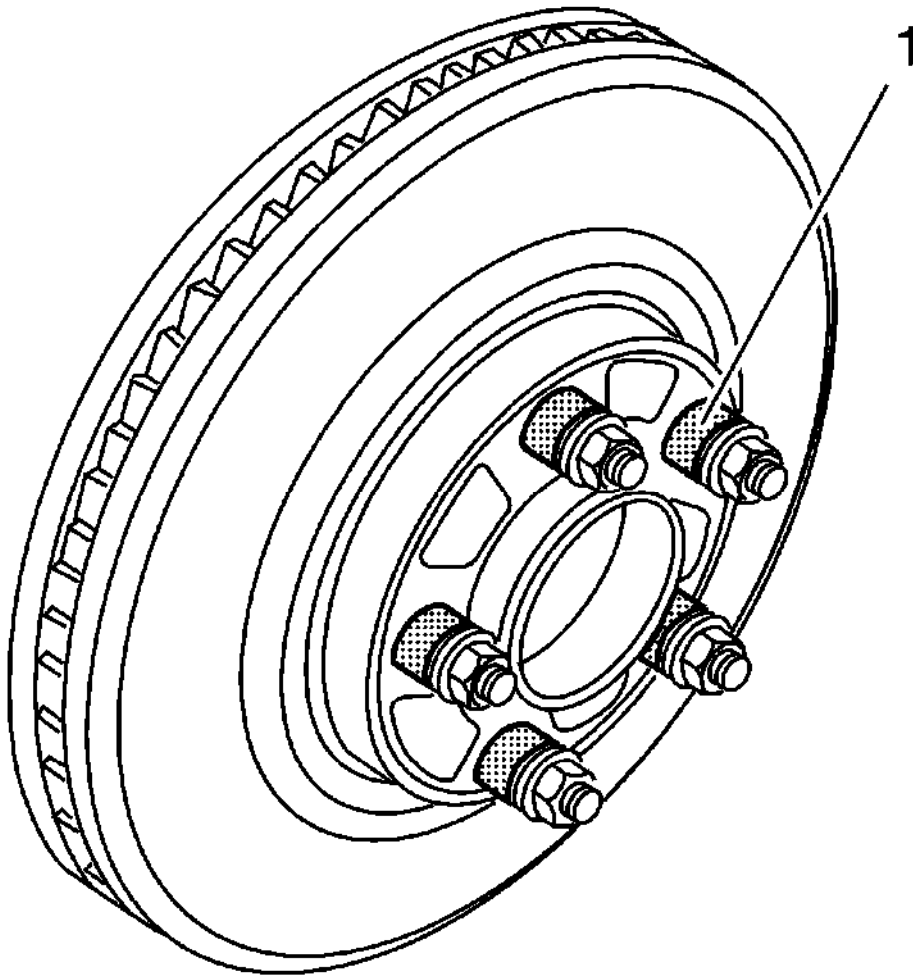


Fig. 97: Tightening Lug Nuts In A Star-Pattern To Secure Rotor
Courtesy of GENERAL MOTORS COMPANY

6. 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.
7. Tighten the lug nuts in a star-pattern to specification, in order to properly secure the rotor. Refer to **Tire and Wheel Removal and Installation** .
8. Measure the assembled LRO of the brake rotor. Refer to **Brake Rotor Assembled Lateral Runout Measurement**.
9. Compare the amount of change between this measurement and the original measurement.
10. If this measurement is within specifications, proceed to step 14.
11. If this measurement still exceeds specifications, repeat steps 1-9 until the best assembled LRO measurement is obtained.
12. Matchmark the final location of the rotor to the wheel studs if the orientation is different than it was originally.
13. If the brake rotor assembled LRO measurement still exceeds the maximum allowable specification, refer

to **Brake Rotor Assembled Lateral Runout Correction**.

14. If the brake rotor assembled LRO is within specification, install the brake caliper and depress the brake pedal several times to secure the rotor in place before removing the **CH-45101-100** washers and the lug nuts.

BRAKE ROTOR ASSEMBLED LATERAL RUNOUT CORRECTION - CORRECTION PLATES

Special Tools

CH-45101-100 Conical Brake Rotor Washers

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

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

NOTE:

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

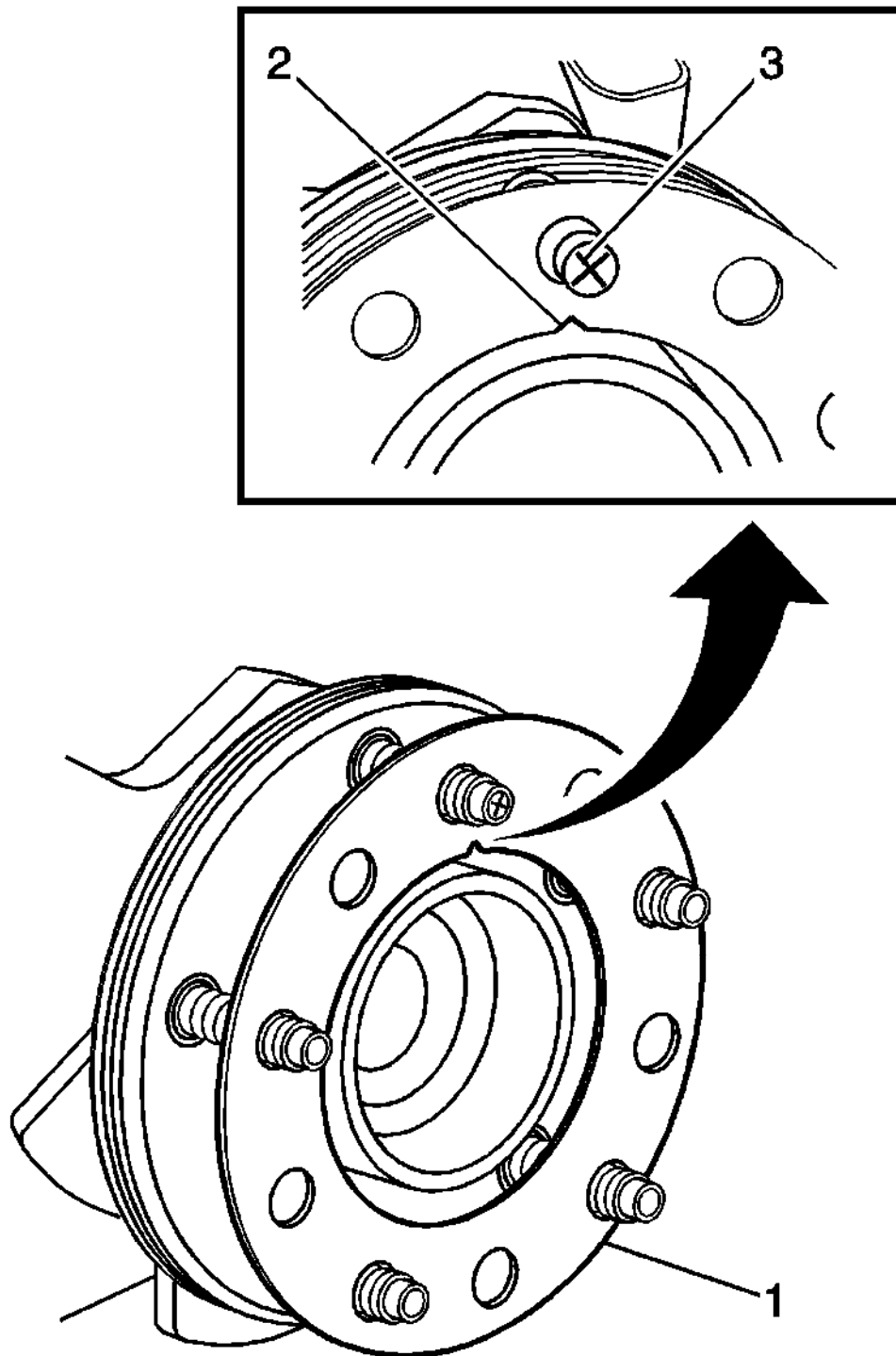


Fig. 98: Identifying Correction Plate, High Spot Mark & V-Shaped Notch
Courtesy of GENERAL MOTORS COMPANY

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** 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 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.

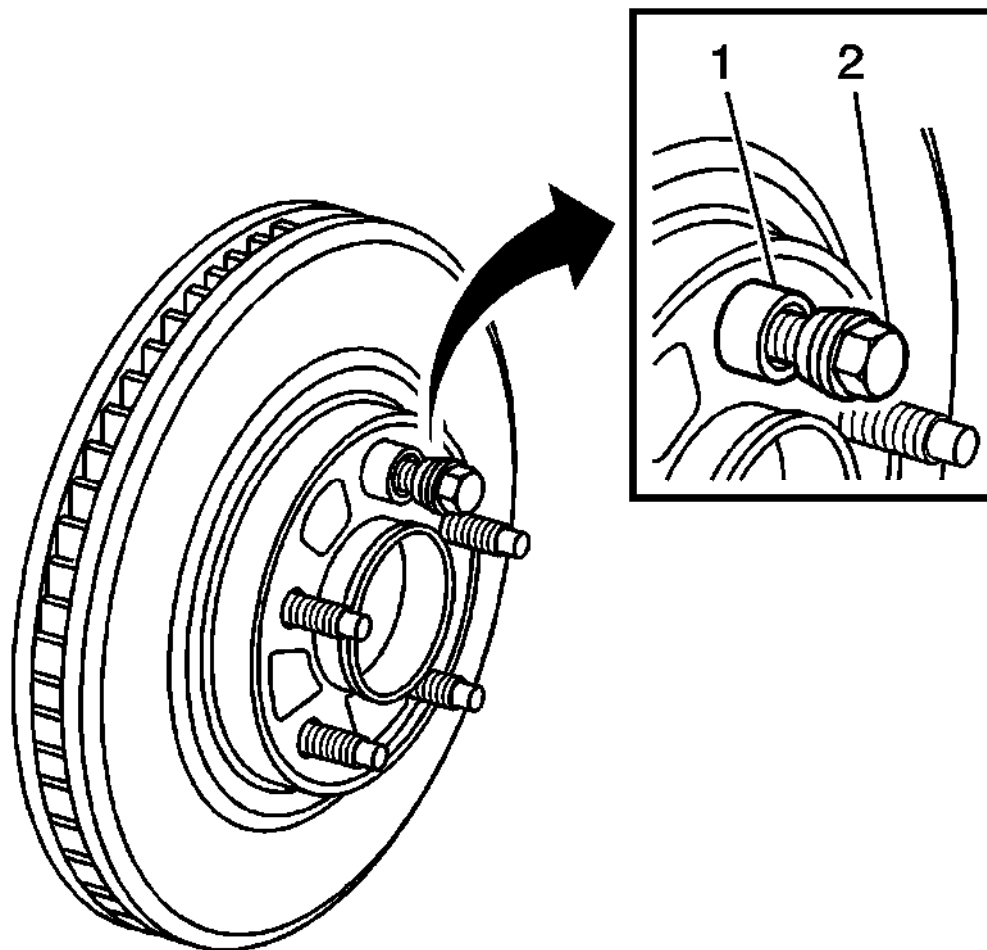


Fig. 99: Identifying Special Tool J 45101-100 & Lug Nut
Courtesy of GENERAL MOTORS COMPANY

7. Install the brake rotor to the hub/axle flange. Use the matchmark made prior to removal for proper orientation to the flange.
8. Hold the rotor firmly in place against the hub/axle flange and install one of the **CH-45101-100** 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.

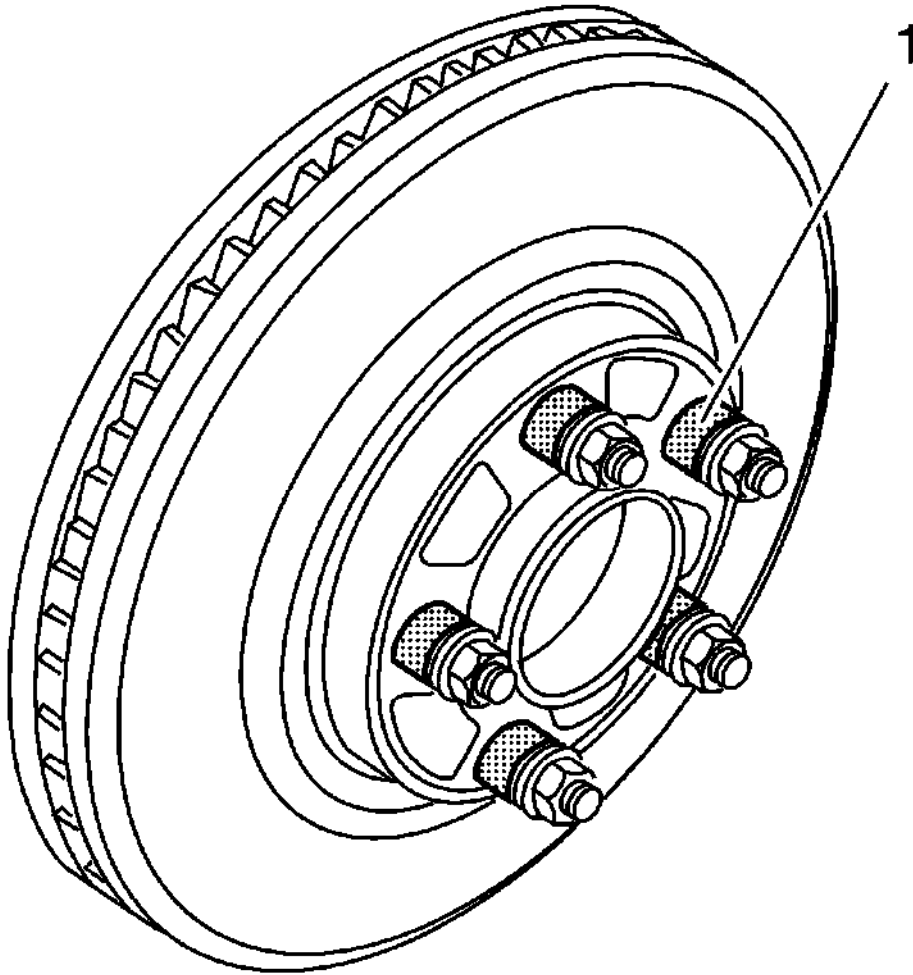


Fig. 100: Tightening Lug Nuts In A Star-Pattern To Secure Rotor
Courtesy of GENERAL MOTORS COMPANY

10. 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.
11. Tighten the lug nuts in a star-pattern to specification, in order to properly secure the rotor. Refer to **Tire and Wheel Removal and Installation** .
12. Measure the assembled LRO of the brake rotor. Refer to **Brake Rotor Assembled Lateral Runout Measurement**.
13. If the brake rotor assembled LRO measurement still exceeds the maximum allowable specification, refer to **Brake Rotor Assembled Lateral Runout Correction**.
14. If the brake rotor assembled LRO 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 and the lug nuts.

BRAKE ROTOR ASSEMBLED LATERAL RUNOUT CORRECTION - ON VEHICLE LATHE

Special Tools

CH-45101-100 Conical Brake Rotor Washers

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

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

NOTE:

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

1. Ensure that the caliper and caliper bracket that are already being supported, are clear from contacting any rotating components, such as the brake rotor.
2. Remove the **CH-45101-100** 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 instructions.
5. Refinish the brake rotor, following the brake lathe manufacturer instructions. Refer to **Brake Rotor Refinishing**.
6. After each successive cut, inspect the brake rotor thickness. Refer to **Brake Rotor Thickness Measurement**.
7. If at any time the brake rotor exceeds the minimum allowable thickness after refinish specification, the brake rotor must be replaced. After replacing the rotor, proceed to step 10.
8. After refinishing the brake rotor, use the following procedure in order to obtain the desired non-directional finish:
 1. Follow the brake lathe manufacturer recommended speed setting for applying a non-directional finish.
 2. Using moderate pressure, apply the non-directional finish:
 - If the lathe is equipped with a non-directional finishing tool, apply the finish with 120-grit aluminum oxide sandpaper.
 - If the lathe is not equipped with a non-directional finishing tool, apply the finish with a sanding block and 150-grit aluminum oxide sandpaper.
 3. After applying a non-directional finish, clean each friction surface of the brake rotor with denatured alcohol, or an equivalent approved brake cleaner.
9. Remove the lathe from the vehicle.

10. Measure the assembled LRO of the brake rotor. Refer to **Brake Rotor Assembled Lateral Runout Measurement**.
11. If the brake rotor assembled LRO measurement still exceeds the maximum allowable specification, refer to **Brake Rotor Assembled Lateral Runout Correction**.
12. If the brake rotor assembled LRO is within specification, install the brake caliper and depress the brake pedal several times to secure the rotor in place before removing the **CH-45101-100** washers and the lug nuts.

BRAKE ROTOR REFINISHING

Special Tools

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

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

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

NOTE:

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

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

- Brake system noise - squeal, growl, groan
- Uneven and/or premature disc brake pad wear
- Superficial or cosmetic corrosion/rust of the disc brake rotor friction surface
- Scoring of the disc brake rotor friction surface less than the maximum allowable specification
- Before refinishing a brake rotor, the rotor **MUST** first be checked for adequate thickness to allow the rotor to be refinished and remain above the minimum allowable thickness after refinish specification. Refer to **Brake Rotor Thickness Measurement**.

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

- Thickness variation in excess of the maximum allowable specification
- Excessive corrosion/rust and/or pitting

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

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

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

1. Using the **CH-42450-A** Wheel Hub Resurfacing Kit, thoroughly clean any rust or corrosion from the mating surface of the hub/axle flange.
2. Using the **CH-41013** Rotor Resurfacing Kit, thoroughly clean any rust or corrosion from the mating surface and mounting surface of the brake rotor.
3. Inspect the mating surfaces of the hub/axle flange and the rotor to ensure that there are no foreign particles or debris remaining.
4. Mount the brake rotor to the brake lathe according to the lathe manufacturer's instructions, ensuring that all mounting attachments and adapters are clean and free of debris.
5. Ensure that any vibration dampening attachments are securely in place.
6. With the brake lathe running, slowly bring in the cutting tools until they just contact the brake rotor friction surfaces.
7. Observe the witness mark on the brake rotor. If the witness mark extends approximately three-quarters or more of the way around the brake rotor friction surface on each side, the brake rotor is properly mounted to the lathe.
8. If the witness mark does not extend three-quarters or more of the way around the brake rotor, re-mount the rotor to the lathe.
9. Following the brake lathe manufacturer's instructions, refinish the brake rotor.
10. After each successive cut, inspect the brake rotor thickness. Refer to **Brake Rotor Thickness Measurement**.
11. If at any time the brake rotor exceeds the minimum allowable thickness after refinish specification, the brake rotor must be replaced.
12. After refinishing the brake rotor, use the following procedure in order to obtain the desired non-directional finish:

1. Follow the brake lathe manufacturer's recommended speed setting for applying a non-directional finish.
2. Using moderate pressure, apply the non-directional finish:
 - If the lathe is equipped with a non-directional finishing tool, apply the finish with 120-grit aluminum oxide sandpaper.
 - If the lathe is not equipped with a non-directional finishing tool, apply the finish with a sanding block and 150-grit aluminum oxide sandpaper.

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

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

DESCRIPTION AND OPERATION

DISC BRAKE SYSTEM DESCRIPTION AND OPERATION

System Component Description

The disc brake system consists of the following components:

Disc Brake Pads: Applies mechanical output force from the hydraulic brake calipers to friction surfaces of brake rotors.

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

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

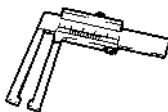
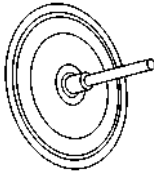
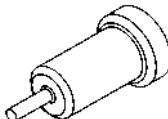
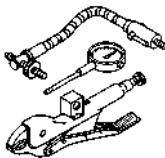
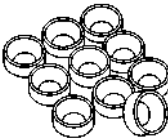
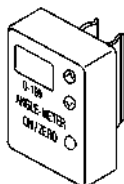
Disc Brake Caliper Hardware: Provides mounting for hydraulic brake caliper and secures the caliper firmly in proper relationship to caliper bracket. Enables a sliding motion of the brake caliper to the brake pads when mechanical output force is applied.

System Operation

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

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

Illustration	Tool Number/ Description
	CH-230-A MKM-230-A J-21177-A Disc Gauge
	CH-41013 J-41013 Rotor Resurfacing Kit
	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
	EN-45059 J 45059 Angle Meter