

BRAKES

Disc Brakes - Canyon, Colorado

SPECIFICATIONS

FASTENER SPECIFICATIONS

Application	Specification	
	Metric	English
Brake Caliper Bolt		
First Pass	80 N.m	59 lb ft
Second Pass	30-45 degrees	
Brake Caliper Bracket Bolt		
First Pass	100 N.m	74 lb ft
Second Pass	15-30 degrees	
Brake Caliper Guide Pin Bolt	34 N.m	25 lb ft
Brake Hose Fitting Bolt	34 N.m	25 lb ft
Brake Rotor Bolt	9 N.m	80 lb in

DISC BRAKE COMPONENT SPECIFICATIONS

Application	Specification	
	Metric	English
Front Brakes		
• Brake Rotor Diameter	310.0 mm	12.20 in
• Brake Rotor Discard Thickness*	25.0 mm	0.98 in
• Brake Rotor Maximum Allowable Assembled Lateral Runout	0.05 mm	0.002 in
• Brake Rotor Maximum Allowable Scoring	1.50 mm	0.059 in
• Brake Rotor Maximum Allowable Thickness Variation	0.006 mm	0.00024 in
• Brake Rotor Thickness New	27.0 mm	1.07 in

Application	Type of Material	Specification	GM Part Number
Application	Metric	English	
Rear Brakes			
• Brake Rotor Diameter	324.0 mm	12.76 in	
• Brake Rotor Discard Thickness*	16.5 mm	0.650 in	
• Brake Rotor Maximum Allowable Assembled Lateral Runout	0.05 mm	0.002 in	
• Brake Rotor Maximum Allowable Scoring	1.50 mm	0.059 in	
• Brake Rotor Maximum Allowable Thickness Variation	0.006 mm	0.00024 in	
• Brake Rotor Thickness- New	18.0 mm	0.709 in	
*All brake rotors have a discard dimension cast into them. Replace any rotor that does not meet this specification. After refinishing the rotor, replace any rotor that does not meet the discard thickness specification.			

ADHESIVES, FLUIDS, LUBRICANTS, AND SEALERS

Application	Type of Material	GM Part Number
Brake Caliper Bolt	Threadlocker	89021297 (Canada 10953488)
Front Disc Brake Pad	Anti-Seize and Lubricating Compound	19303310 (Canada 19303311)

DIAGNOSTIC INFORMATION AND PROCEDURES

BRAKE ROTOR THICKNESS MEASUREMENT

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](#), and/or [Rear Disc Brake Pads Replacement](#).
2. Clean the friction surfaces of the brake rotor with denatured alcohol, or an equivalent approved brake cleaner.

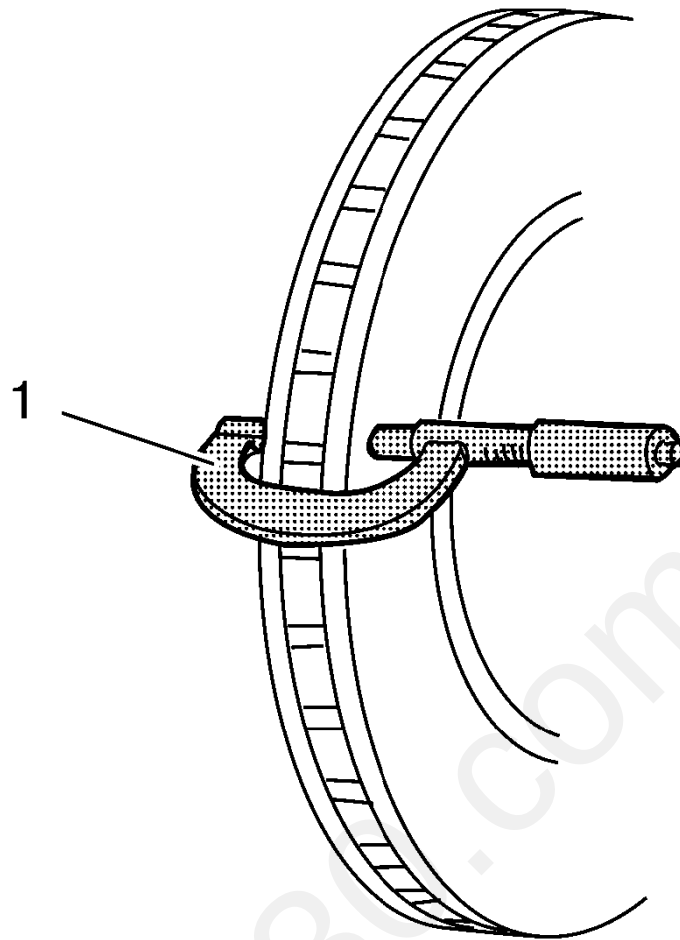


Fig. 1: Micrometer On Brake Rotor
Courtesy of GENERAL MOTORS COMPANY

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

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

4. Compare the lowest thickness measurement recorded to the brake rotor discard thickness specifications. Refer to [Disc Brake Component Specifications](#).
5. If the lowest thickness measurement of the brake rotor is above the discard thickness specification, the brake rotor may be refinished, depending upon surface and wear conditions which may be present.
6. If the lowest thickness measurement of the brake rotor is at or below the discard thickness specification, the rotor requires replacement. Refer to [Front Brake Rotor Replacement](#), and/or [Rear Brake Rotor Replacement](#).

BRAKE ROTOR THICKNESS VARIATION MEASUREMENT

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

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.

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

1. If the inboard friction surface of the brake rotor is not accessible, reposition and support the brake caliper bracket and/or brake caliper with the brake pads. Refer to [Front Brake Rotor Replacement](#), and/or [Rear Brake Rotor Replacement](#).
2. Clean the friction surfaces of the brake rotor with denatured alcohol, or an equivalent approved brake cleaner.

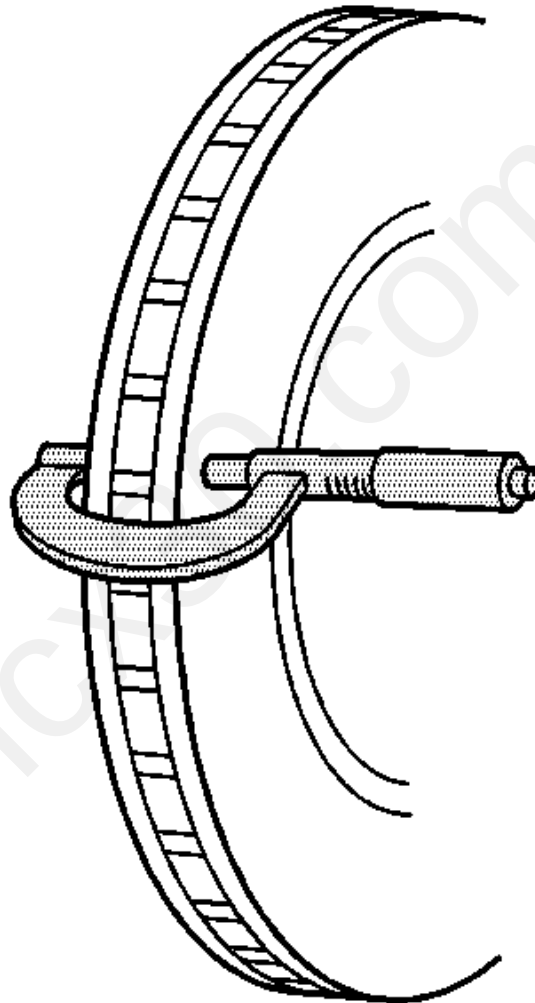


Fig. 2: Measuring Brake Rotor Thickness

Courtesy of GENERAL MOTORS COMPANY

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

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

4. Calculate the difference between the highest and lowest thickness measurements recorded to obtain the amount of thickness variation.

: the thickness variation measurement to the following specification:

Specification

Brake rotor maximum allowable thickness variation: 0.025 mm (0.001 in)

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

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

BRAKE ROTOR SURFACE AND WEAR INSPECTION

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

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

Light surface rust can be removed with an abrasive disc. Heavy surface rust and/or pitting must be removed by refinishing the rotor.
 - Cracks and/or heat spots
 - Excessive blueing discoloration
4. If the friction surfaces of the brake rotor exhibit one or more of the Braking Surface Conditions, the rotor requires refinishing or replacement.

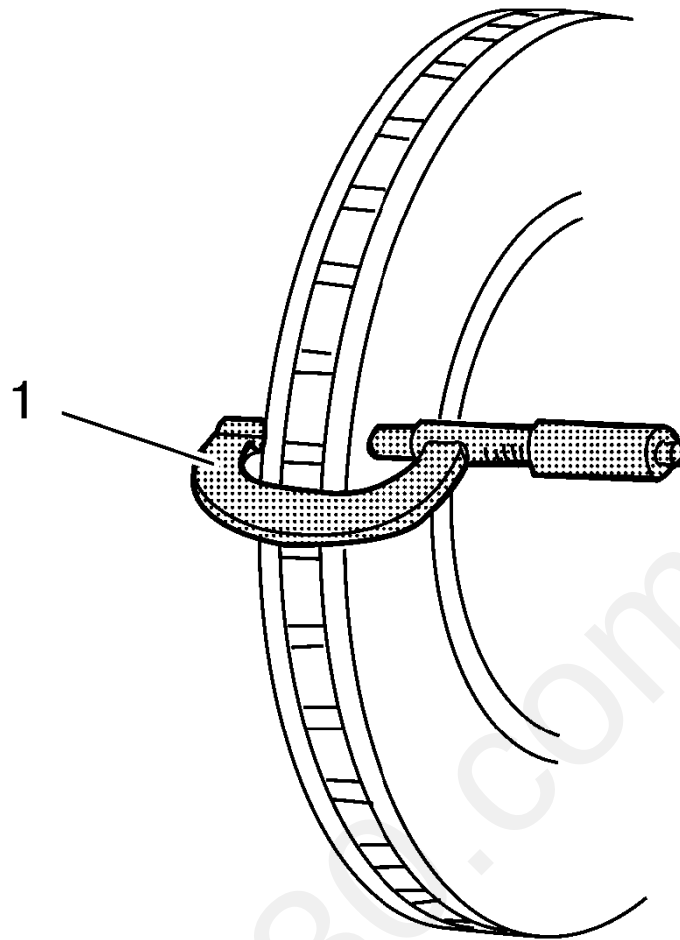


Fig. 3: Micrometer On Brake Rotor
Courtesy of GENERAL MOTORS COMPANY

5. Using a micrometer (1) calibrated in thousandths-of-a-millimeter, or ten-thousandths-of-an-inch, measure and record the scoring depth of any grooves present on the rotor friction surfaces.
6. Compare the groove scoring depth recorded to the following specification:

Specification

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

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

BRAKE ROTOR ASSEMBLED LATERAL RUNOUT MEASUREMENT

Special Tools

- **CH-41013** Rotor Resurfacing Kit
- **CH-42450-A** Wheel Hub Resurfacing Kit
- **CH-45101** Hub and Wheel Runout Gauge

11-100 Conical Brake Rotor Washers

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

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

NOTE:

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

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

NOTE:

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

2. Inspect the mating surface of the hub/axle flange and the brake rotor to ensure that there are no foreign particles, corrosion, rust, or debris remaining. If the wheel hub/axle flange and/or if the brake rotor mating surfaces exhibit these conditions, perform the following steps:
 1. Remove the brake rotor from the vehicle. Refer to [Front Brake Rotor Replacement](#), and/or [Rear Brake Rotor Replacement](#).
 2. Using the **CH-42450-A** wheel hub resurfacing kit, thoroughly clean any rust or corrosion from the mating surface of the hub/axle flange.
 3. Using the **CH-41013** rotor resurfacing kit, thoroughly clean any rust or corrosion from the mating surface of the brake rotor.
 4. Clean the friction surfaces of the brake rotor with denatured alcohol, or an equivalent approved brake cleaner.
3. Install the rotor to the hub/axle flange using the match-mark made prior to removal.

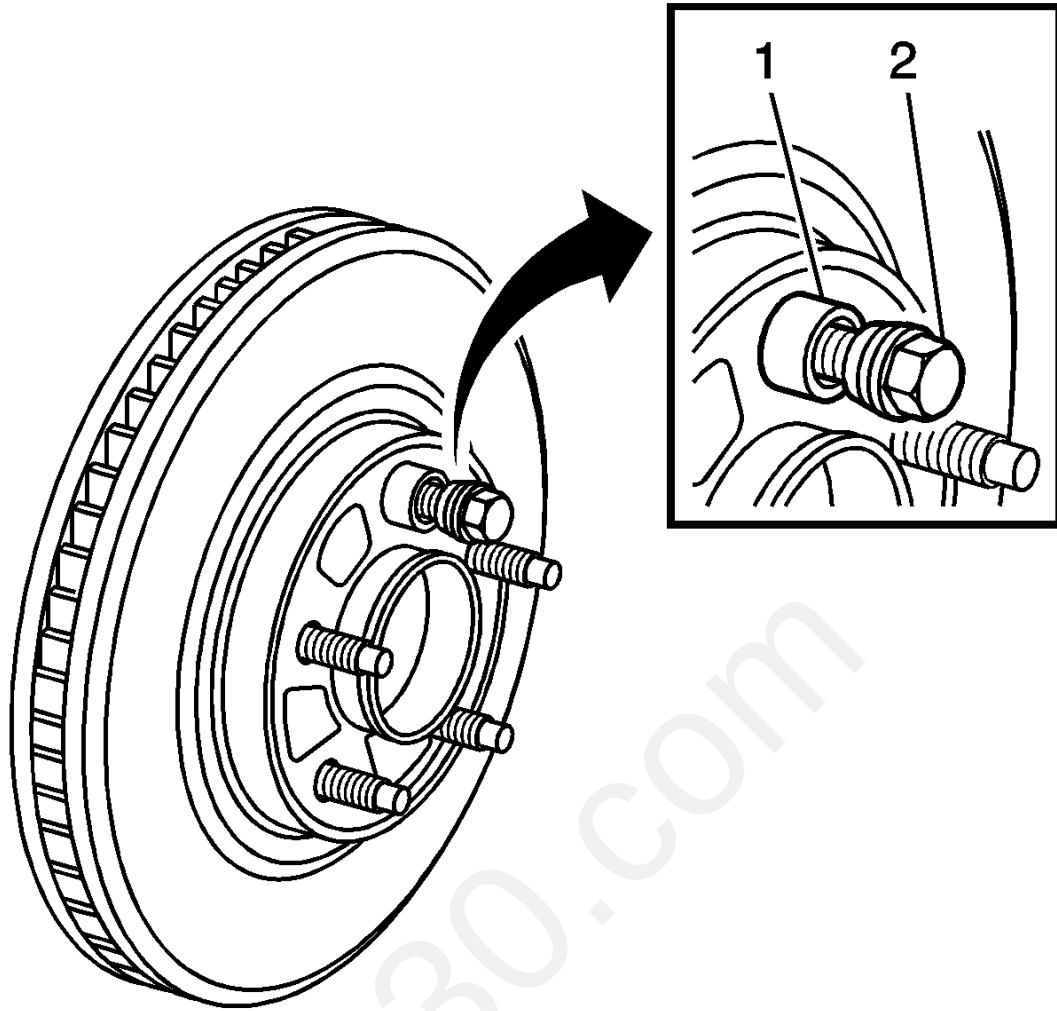


Fig. 4: Lug Nuts & Conical Washers

Courtesy of GENERAL MOTORS COMPANY

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

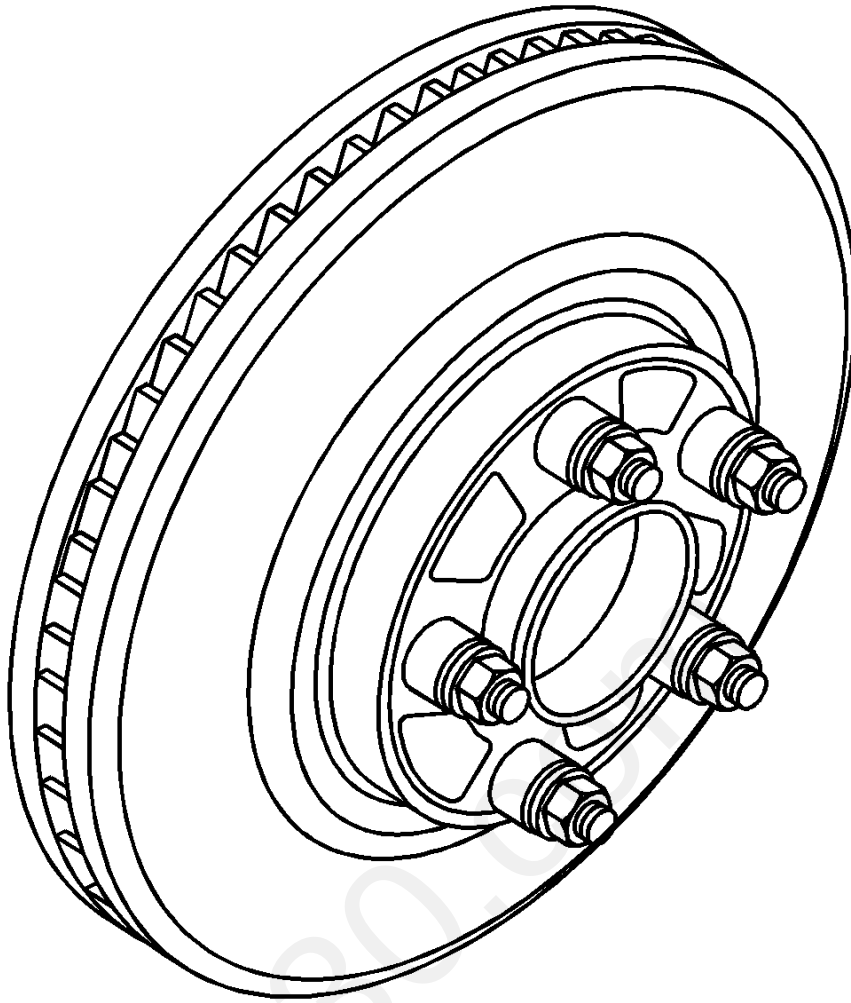


Fig. 5: Lug Nuts & Conical Washers

Courtesy of **GENERAL MOTORS COMPANY**

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

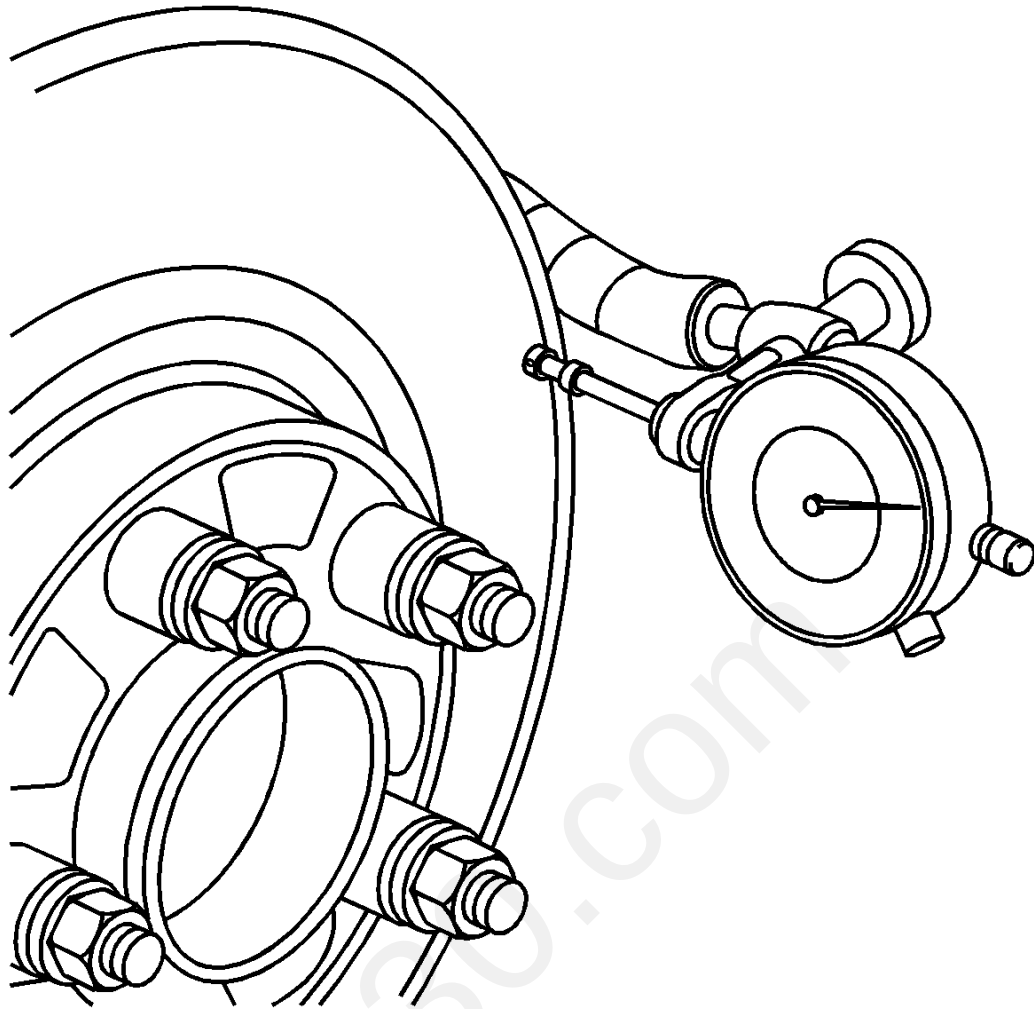


Fig. 6: Using Dial Indicator To Measure Lateral Runout
Courtesy of GENERAL MOTORS COMPANY

10. Mount a dial indicator, **CH-45101** hub and wheel runout gauge, or equivalent, to the steering knuckle and position the indicator button so it contacts the brake rotor friction surface at a 90 degree angle, approximately 13 mm (0.5 in) from the outer edge of the rotor.
11. Measure and record the assembled LRO of the brake rotor.
 1. Rotate the rotor until the lowest reading is displayed on the indicator dial, then set the dial to zero.
 2. Rotate the rotor until the highest reading is displayed on the dial.
 3. Mark the location of the high spot relative to the nearest wheel stud, or studs.
 4. Measure and record the amount of LRO.
12. Compare the brake rotor assembled LRO to the following specification:

Specification

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

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

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

dial indicator, **CH-45101** hub and wheel runout gauge, or equivalent, to the steering knuckle and position the indicator button so it contacts the brake rotor friction surface at a 90 degree angle, approximately 13 mm (0.5 in) from the outer edge of the rotor.

15. Measure and record the assembled LRO of the brake rotor.

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

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

Specification

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

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

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

BRAKE PAD INSPECTION

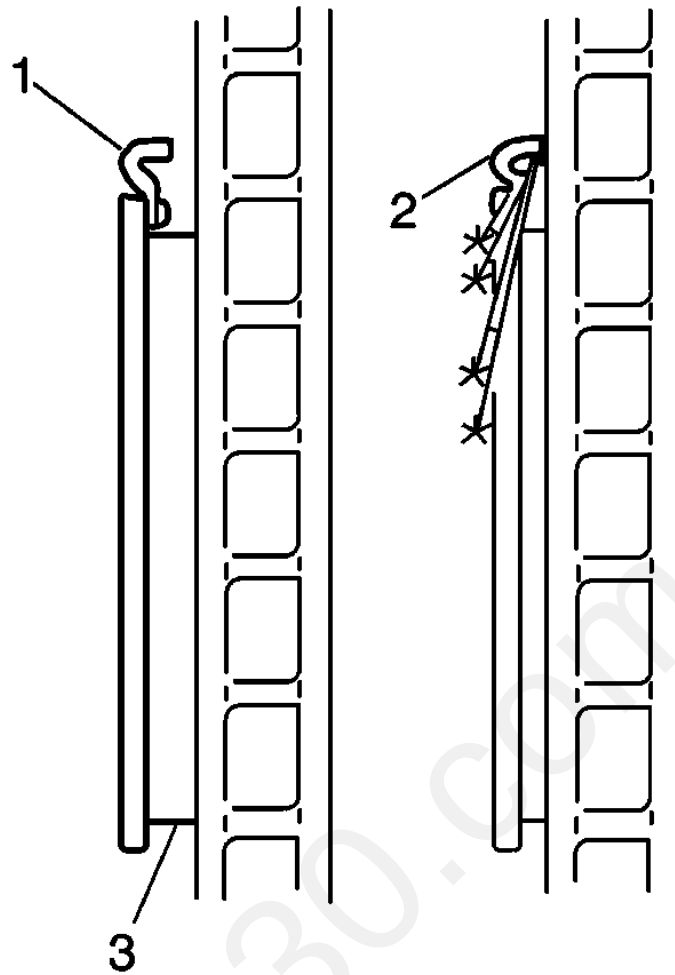


Fig. 7: View Of Brake Pads & Audible Wear Sensors
Courtesy of GENERAL MOTORS COMPANY

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

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

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

5. Both front and rear disc brake pads have integral, audible wear sensors (1). When the disc brake pad wear reaches the minimum allowable thickness, the wear sensor contacts the disc brake rotor (2). The wear indicator will then produce an audible, high-pitched warning noise during wheel rotation.

the disc brake pads when the friction surface (3) is worn to within 0.76 mm (0.030 in) of the mounting plates.

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

BRAKE CALIPER INSPECTION

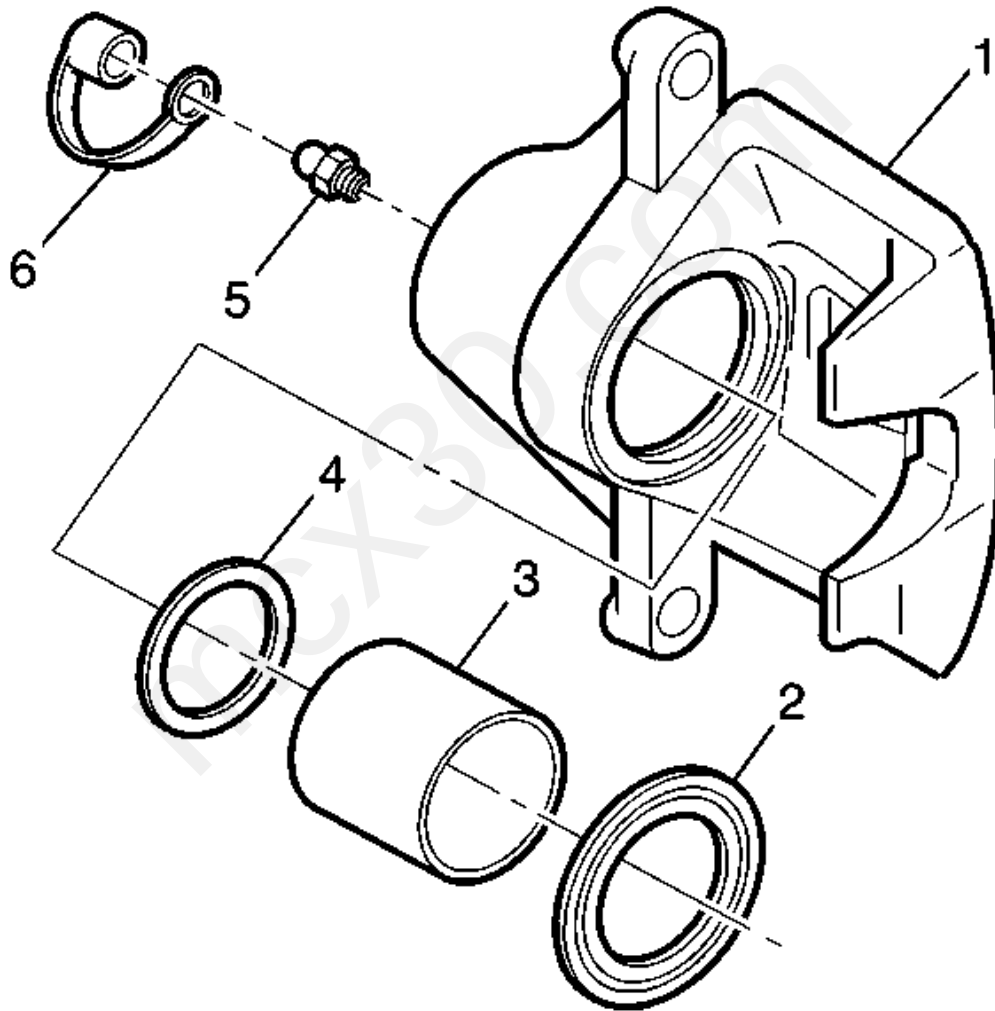


Fig. 8: Exploded View Of Brake Caliper

Courtesy of GENERAL MOTORS COMPANY

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

1. Inspect the brake caliper housing (1) for cracks, excess wear, and/or damage. If any of these conditions are present, the brake caliper requires replacement.

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

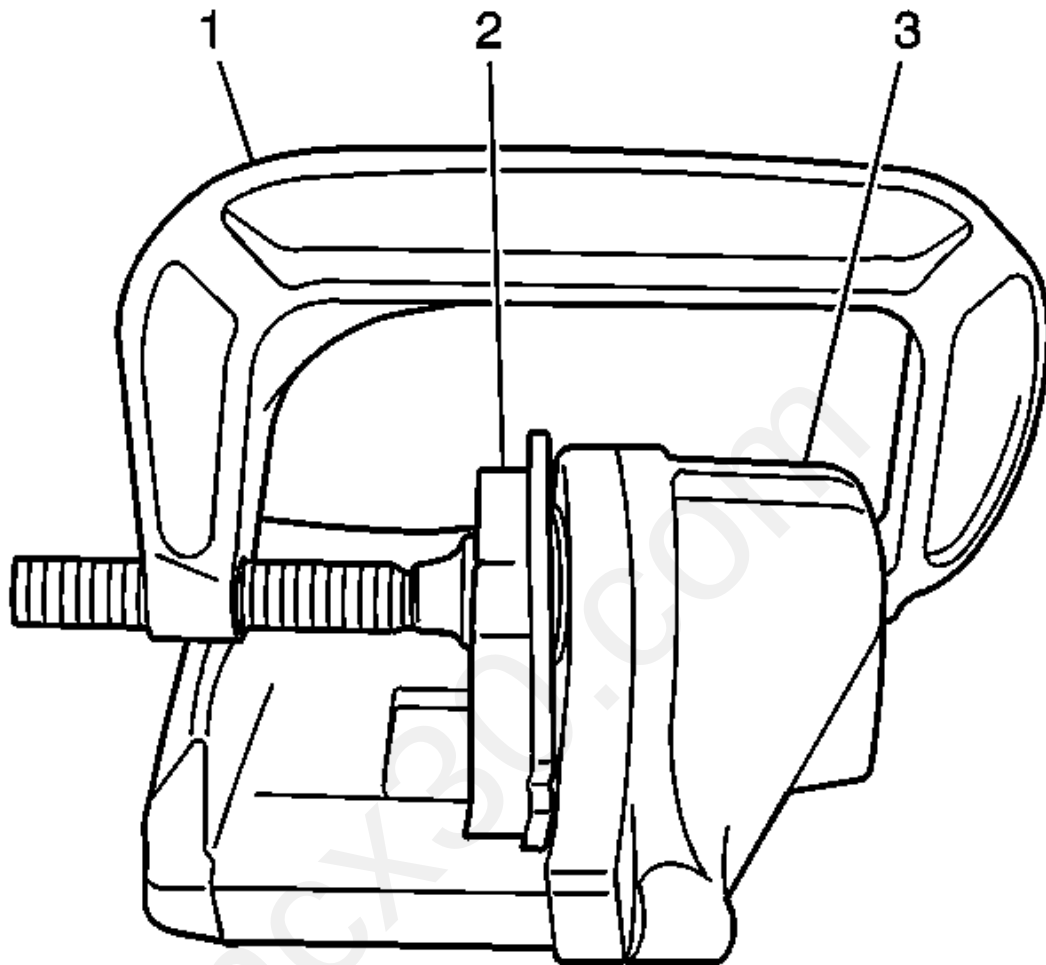


Fig. 9: Compressing Caliper Piston
Courtesy of GENERAL MOTORS COMPANY

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

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

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

FRONT DISC BRAKE MOUNTING AND HARDWARE INSPECTION

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

the fluid level in the brake master cylinder reservoir.

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

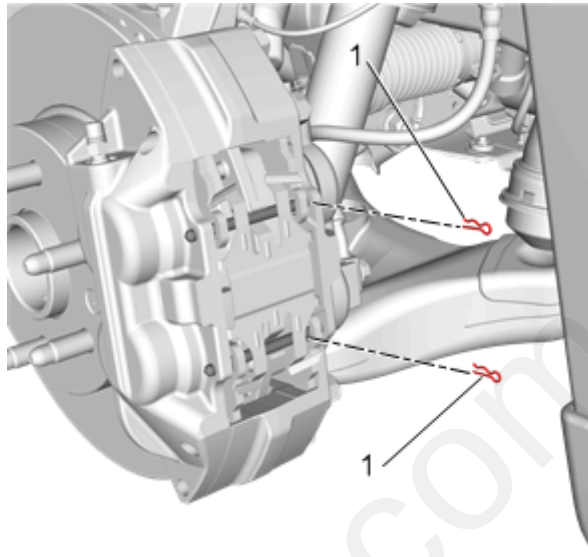
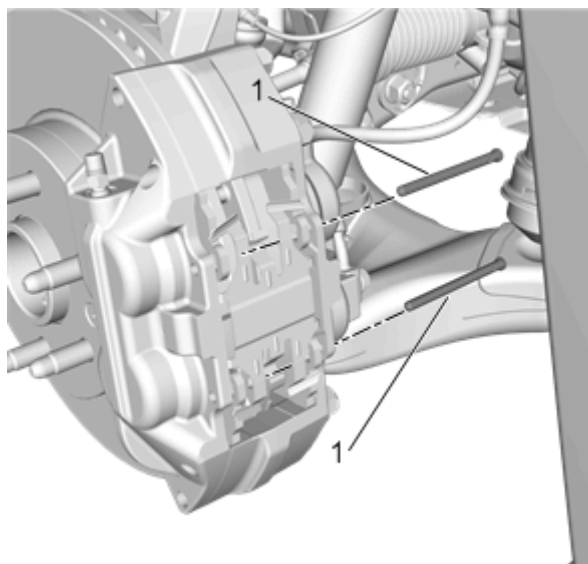


Fig. 10: Disc Brake Pad Pin Clips

Courtesy of GENERAL MOTORS COMPANY

6. Inspect the disc brake pad pin clips (1) for the following:
 - Missing pin clips
 - Excessive corrosion
 - Excessive looseness
 - Deformed pin clips
7. If any of the conditions listed are found, the disc brake pad pin clips require replacement.



Brake Caliper Pins

Courtesy of GENERAL MOTORS COMPANY

8. Carefully drive out the brake caliper pins (1) from the brake caliper and inspect the pins for the following:
 - Excessive corrosion
 - Excessive looseness
 - Deformed pins
9. If any of the conditions listed are found, the brake caliper pins require replacement.

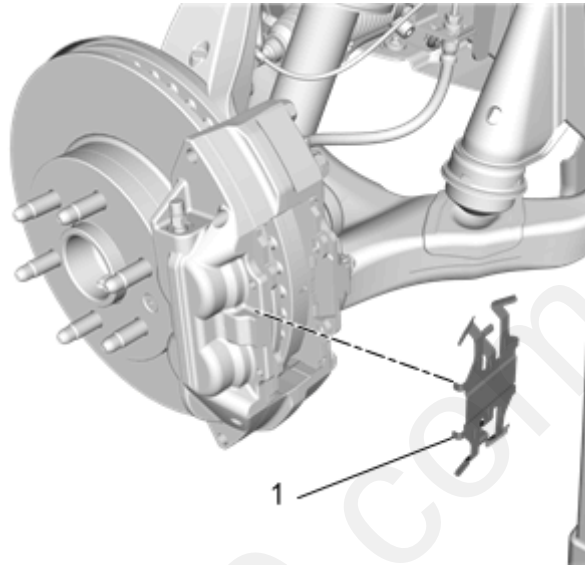


Fig. 12: Brake Pad Spring

Courtesy of GENERAL MOTORS COMPANY

10. Inspect the brake pad spring (1) for the following:
 - Missing
 - Broken
 - Excessive corrosion
 - Deformation
11. If any of the conditions listed are found, the brake pad spring requires replacement.
12. Install the disc brake pad mounting hardware. Refer to [Front Disc Brake Pads Replacement](#).
13. Ensure the disc brake pads are held firmly in place in the brake caliper, yet slide easily on the mounting hardware without binding.

REAR DISC BRAKE MOUNTING AND HARDWARE INSPECTION

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

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

WARNING: Do not use a service jack in locations other than those specified to lift this vehicle. Lifting the vehicle with a jack in those other locations could cause

the vehicle to slip off the jack and roll; this could cause injury or death.

4. Raise and support the vehicle. Refer [Lifting and Jacking the Vehicle](#) .
5. Remove the tire and wheel assembly. Refer to [Tire and Wheel Removal and Installation](#) .
6. Grasp the brake caliper housing and try to move the brake caliper housing up/down and forward/reverse in relation to the brake caliper mounting bracket. If excessive looseness is observed the brake caliper bracket bushings and/or the brake caliper mounting bolts may need to be replaced.
7. Compress the rear caliper piston.
 - Install a large C-clamp over the top of the caliper housing and against the back of the outboard pad.
 - Slowly tighten the C-clamp until the piston is pushed completely into the caliper bores.
 - Remove the C-clamp from the caliper.
8. With the piston compressed into the caliper bore, grasp the brake caliper housing and slide it back and forth on the brake caliper mounting bolts. Check for smooth operation. If the brake caliper housing slide force is high or the brake caliper housing does not slide smoothly, inspect the brake caliper mounting bolts and/or the brake caliper mounting bracket bushings for wear or damage. If wear or damage conditions are found, replacement of the brake caliper mounting bolts and/or the brake caliper mounting bracket bushings is necessary.
9. Remove the brake caliper mounting bolts from the brake caliper mounting bracket and support the brake caliper using heavy mechanics wire. Do not disconnect the hydraulic brake hose from the caliper. Refer to [Rear Brake Caliper Replacement](#).
10. Remove the disc brake pads from the brake caliper mounting bracket.
11. Inspect the disc brake pad mounting hardware for the following:
 - Missing mounting hardware
 - Excessive corrosion
 - Bent mounting tabs
 - Looseness at the brake caliper mounting bracket
 - Looseness at the disc brake pads
 - Excessive contaminants in the brake caliper mounting bracket surface and threads.
12. If any of the conditions listed are found, the disc brake pad mounting hardware requires replacement.
13. Ensure the disc brake pads are held firmly in place on the brake caliper mounting bracket, yet slide easily on the mounting hardware without binding.

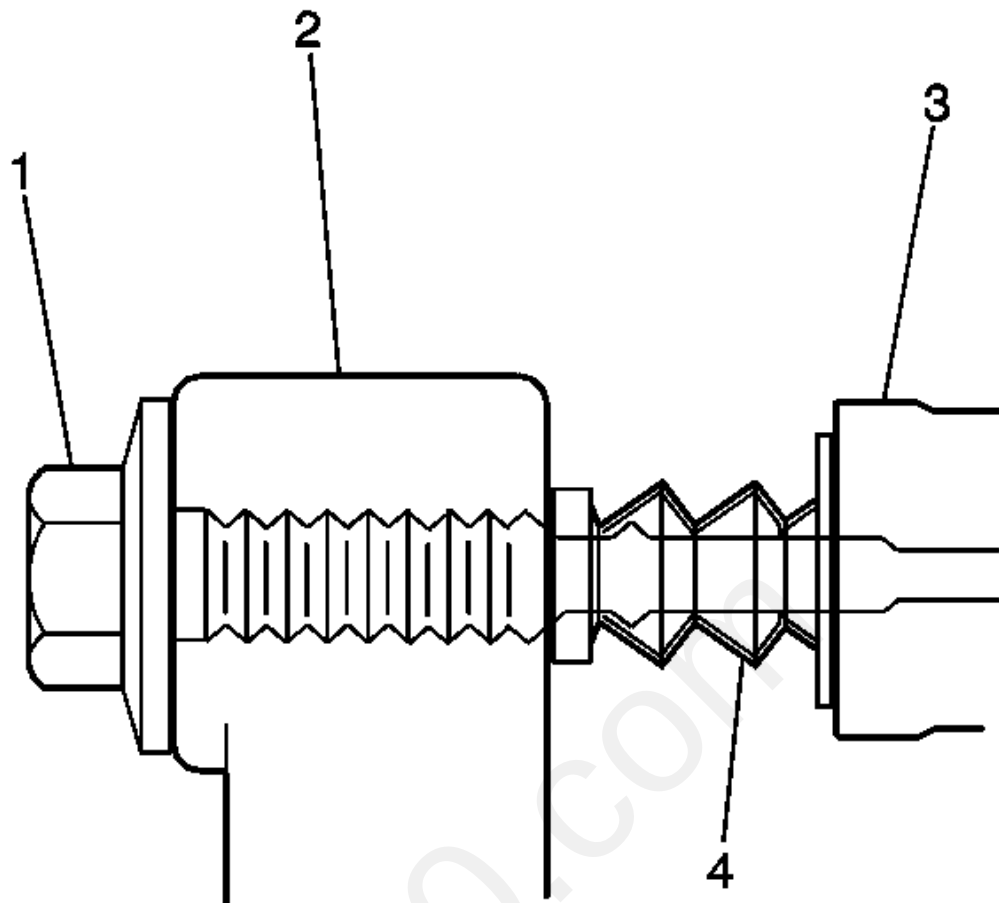


Fig. 13: View Of Caliper, Pin, Boots & Caliper Mounting Bracket
Courtesy of GENERAL MOTORS COMPANY

14. Inspect the caliper bolts (1) or guide pins for the following:

- Binding
- Seizing
- Looseness in the brake caliper mounting bracket (3)
- Bent or damaged brake caliper mounting bolts or guide pins
- Cracked or torn boots (4)
- Missing boots
- Bent or damaged brake caliper mounting bracket (3)

15. If any of the conditions listed are found then the brake caliper mounting hardware requires replacement.

16. Install the disc brake pads to the brake caliper mounting bracket.



Fig. 14: Upper Guide Pin Seal And Guide Pin Seal

Courtesy of GENERAL MOTORS COMPANY

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

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

REPAIR INSTRUCTIONS

FRONT DISC BRAKE PADS REPLACEMENT

Removal Procedure

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

NOTE: Always replace disc brake pads in axle sets.

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

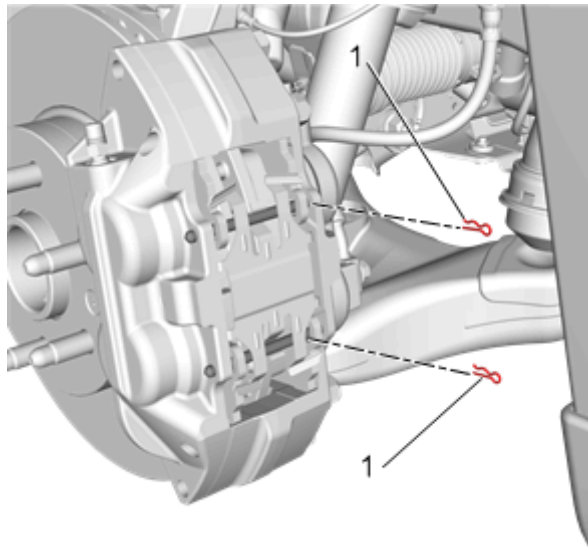


Fig. 15: Disc Brake Pad Pin Clips

Courtesy of GENERAL MOTORS COMPANY

6. Remove the disc brake pad pin clips (1).

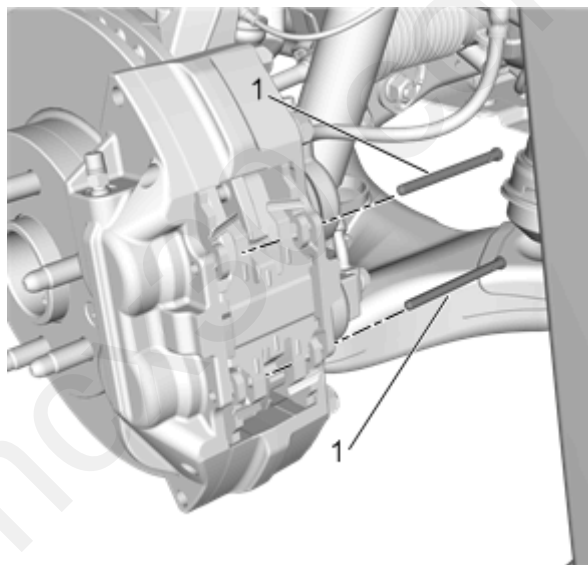


Fig. 16: Brake Caliper Pins

Courtesy of GENERAL MOTORS COMPANY

7. Carefully drive out the brake caliper pins (1) from the brake caliper.

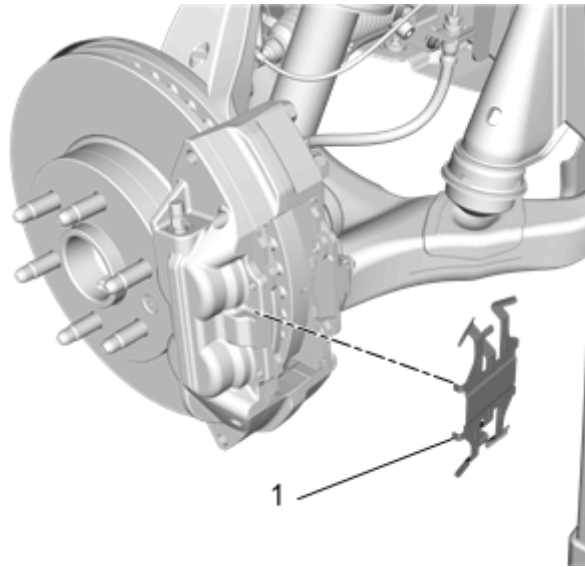


Fig. 17: Brake Pad Spring

Courtesy of GENERAL MOTORS COMPANY

NOTE: Maintain the brake pad spring orientation for proper installation.

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

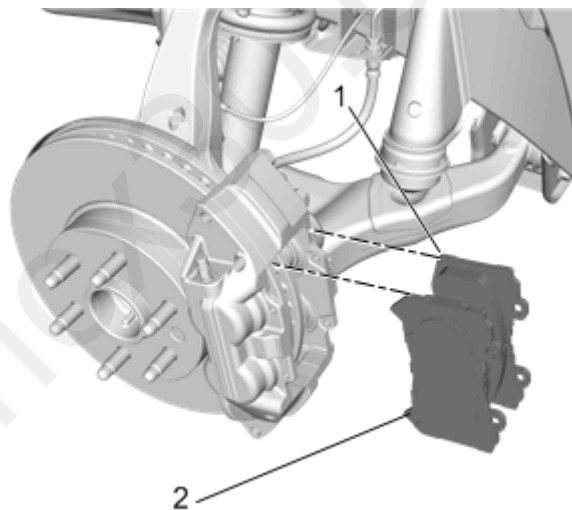


Fig. 18: Inner Brake Pad

Courtesy of GENERAL MOTORS COMPANY

10. Remove the inner brake pad (1).
11. Remove the outer brake pad (2), noting the location of the brake pad wear sensor.

Installation Procedure

1. Inspect the brake caliper pins, pin clips, and brake pad springs for damage or excessive corrosion and replace, if necessary.

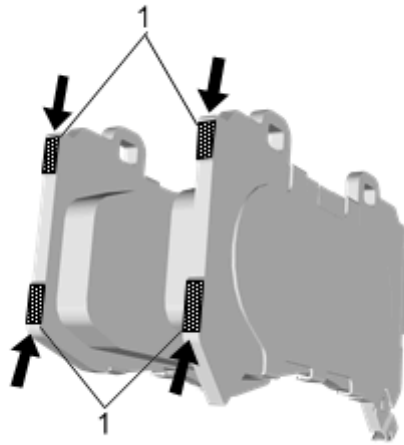


Fig. 19: Brake Pad Abutments

Courtesy of GENERAL MOTORS COMPANY

NOTE: Do not allow the anti-seize lubricant to contact the disc brake pad friction surfaces.

2. Apply a total of approximately 0.3-0.6 g (0.01-0.02 oz) of anti-seize lubricant to the brake pad abutments (1) which contact the brake caliper. Refer to [Adhesives, Fluids, Lubricants, and Sealers](#).

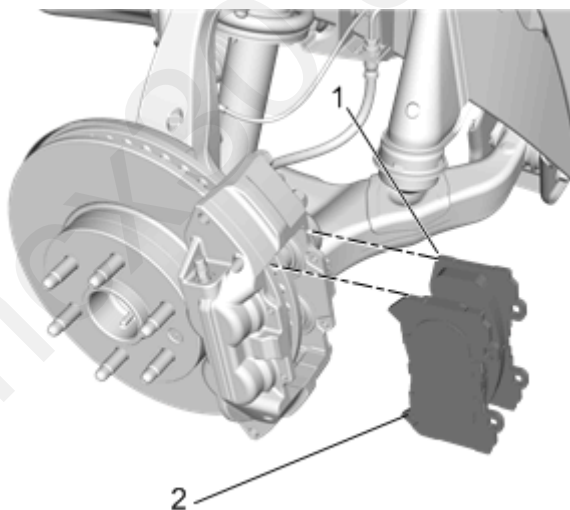


Fig. 20: Inner Brake Pad

Courtesy of GENERAL MOTORS COMPANY

3. Install the inner brake pad (1).

NOTE: The brake pad equipped with the wear sensor must be install in the outboard position.

4. Install the outer brake pad (2), noting the location of the brake pad wear sensor.

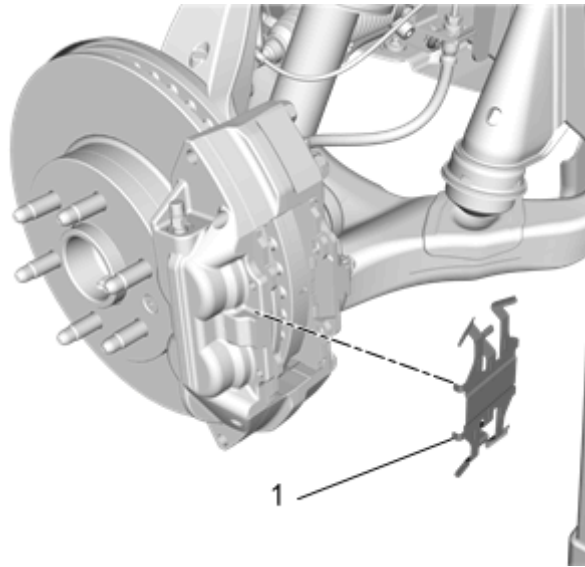


Fig. 21: Brake Pad Spring

Courtesy of GENERAL MOTORS COMPANY

NOTE: Maintain the brake pad spring orientation for proper installation.

5. Install the brake pad spring (1).

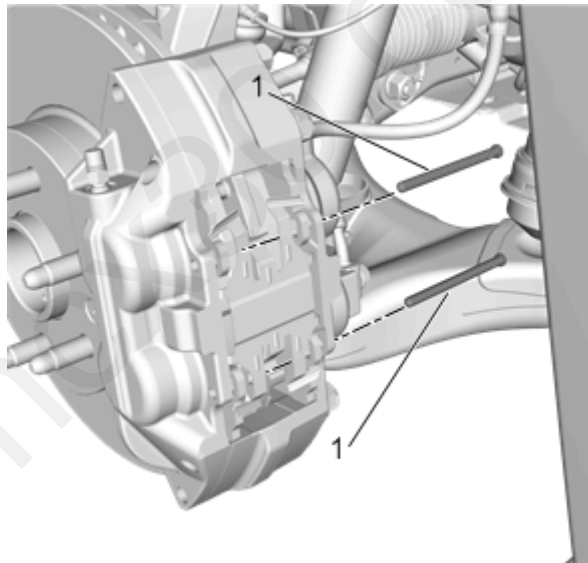


Fig. 22: Brake Caliper Pins

Courtesy of GENERAL MOTORS COMPANY

6. Carefully drive the brake caliper pins (1) into the brake caliper.
7. Ensure the brake caliper pins are fully seated in the brake caliper.

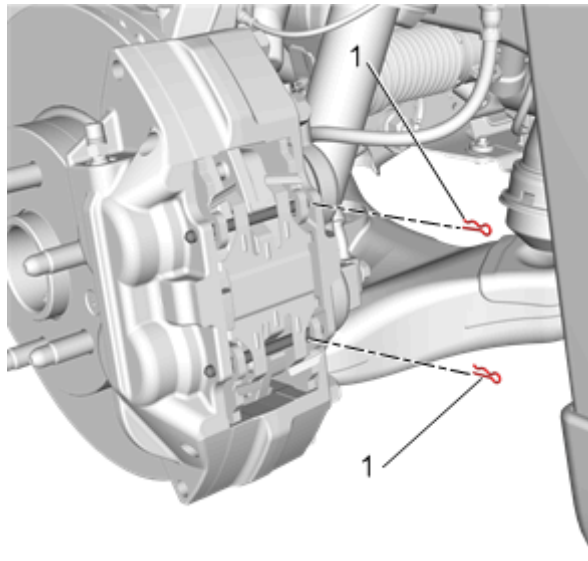


Fig. 23: Disc Brake Pad Pin Clips

Courtesy of GENERAL MOTORS COMPANY

8. Install the disc brake pad pin clips (1).
9. Install the tire and wheel assembly. Refer to [Tire and Wheel Removal and Installation](#) .
10. With the engine OFF, gradually apply the brake pedal to approximately 2/3 of its travel distance.
11. Slowly release the brake pedal.
12. Wait 15 seconds, then repeat steps 9 and 10 until a firm brake pedal apply is obtained. This will properly seat the brake caliper pistons and brake pads.
13. Fill the brake master cylinder reservoir to the proper level. Refer to [Master Cylinder Reservoir Filling](#) .
14. Burnish the brake pads and rotors. Refer to [Brake Pad and Rotor Burnishing](#).

REAR DISC BRAKE PADS REPLACEMENT

Removal Procedure

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

NOTE: Always replace disc brake pads in axle sets.

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

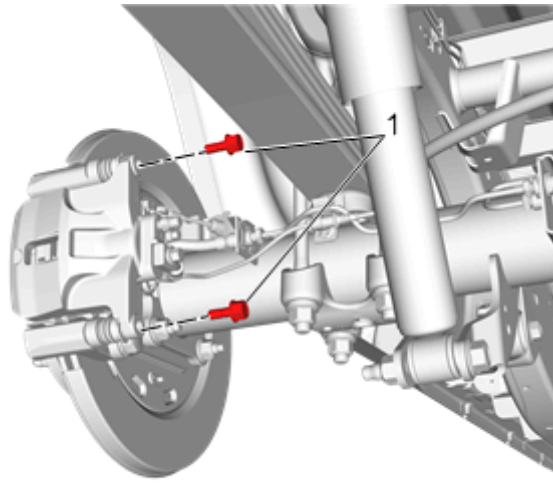


Fig. 24: Brake Caliper Guide Pin Bolts

Courtesy of GENERAL MOTORS COMPANY

6. Remove the brake caliper guide pin bolts (1).

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

7. Remove the brake caliper and support with heavy mechanics wire.

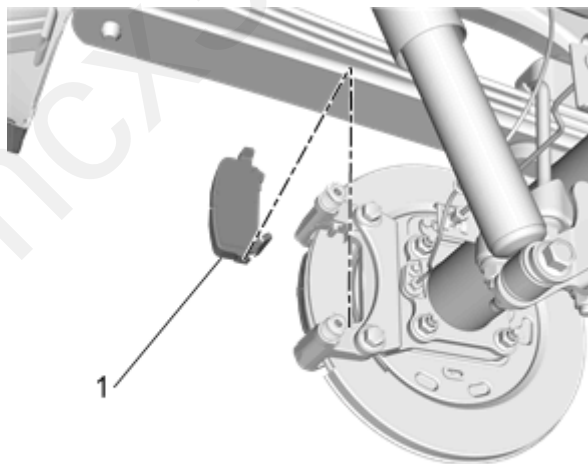


Fig. 25: Inner Brake Pad

Courtesy of GENERAL MOTORS COMPANY

NOTE: The inner brake pad is equipped with a wear sensor. Note the location of the wear sensor.

8. Remove the inner brake pad (1).

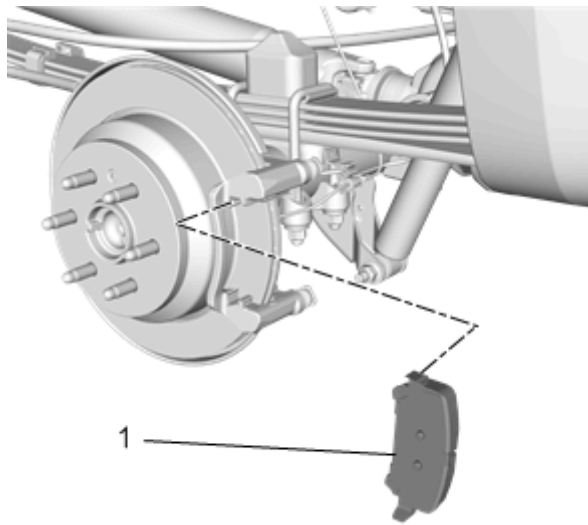


Fig. 26: Outer Brake Pad

Courtesy of GENERAL MOTORS COMPANY

9. Remove the outer brake pad (1).

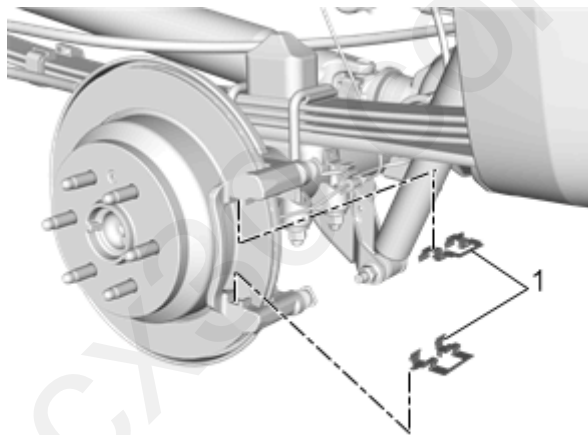


Fig. 27: Upper And Lower Brake Pad Springs

Courtesy of GENERAL MOTORS COMPANY

NOTE: The upper and lower brake pad springs are not identical.

10. Remove the upper and lower brake pad springs (1), noting the location.

Installation Procedure

1. Thoroughly clean the contact surfaces of the brake caliper bracket of any corrosion or debris.

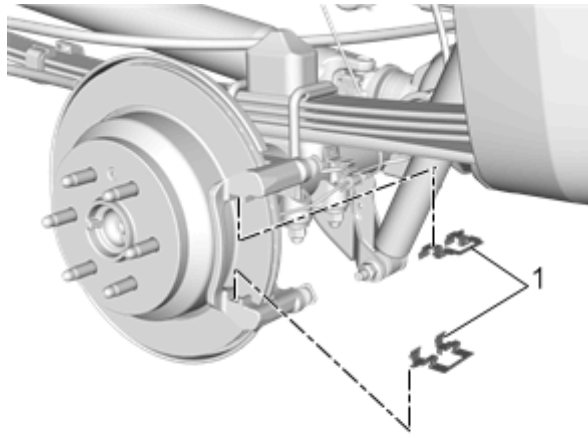


Fig. 28: Upper And Lower Brake Pad Springs
Courtesy of GENERAL MOTORS COMPANY

NOTE: If installing new brake pads, install new brake pad springs.

2. Install the upper and lower brake pad springs (1) in the locations noted during removal.

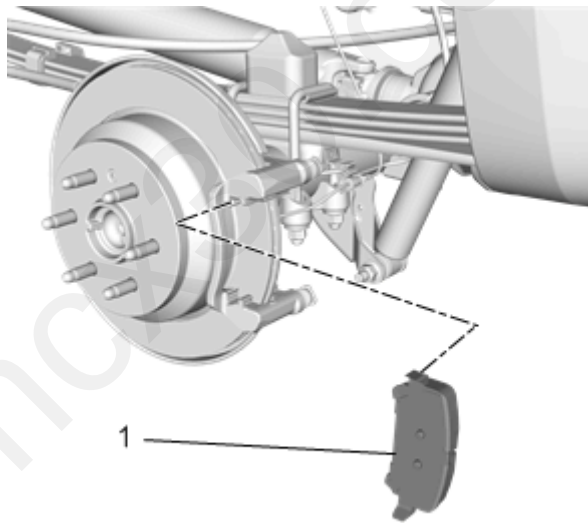


Fig. 29: Outer Brake Pad
Courtesy of GENERAL MOTORS COMPANY

3. Install the outer brake pad (1).

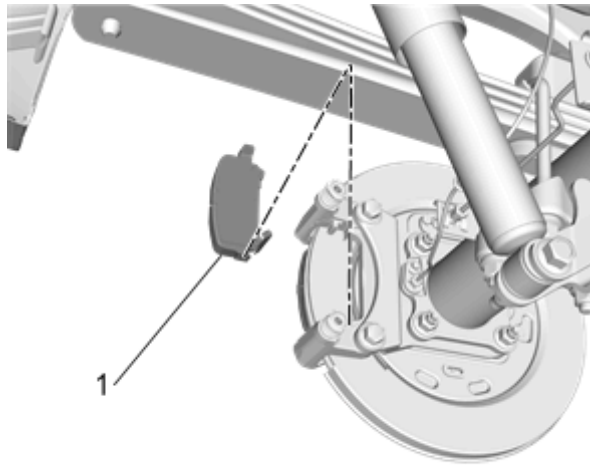


Fig. 30: Inner Brake Pad

Courtesy of GENERAL MOTORS COMPANY

NOTE: The inner brake pad is equipped with the wear sensor. Position the brake pad with the wear sensor in the same location as noted during removal.

4. Install the inner brake pad (1).
5. Position a discarded brake pad against the caliper piston.
6. Install a large C-clamp over the brake caliper housing and against the discarded brake pad.
7. Using the C-clamp, slowly compress the caliper piston fully into the caliper bore.
8. Remove the C-clamp and the brake pad.
9. Position the brake caliper over the brake pads and to the caliper bracket.

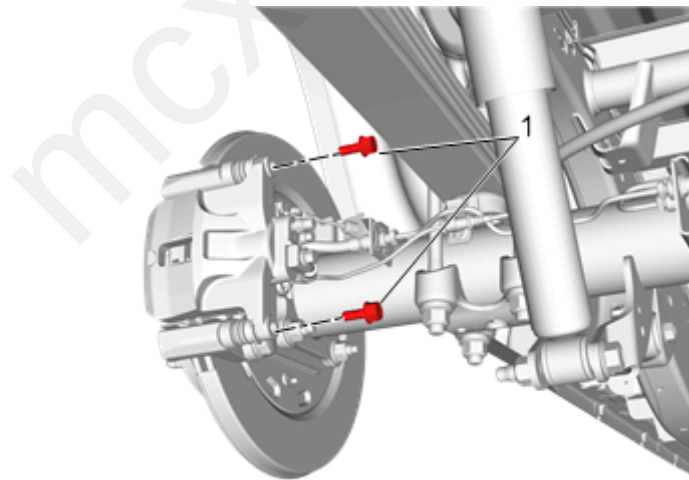


Fig. 31: Brake Caliper Guide Pin Bolts

Courtesy of GENERAL MOTORS COMPANY

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

10. Install the brake caliper guide pin bolts (1) and tighten to 34 N.m (25 lb ft).

e tire and wheel assembly. Refer to [Tire and Wheel Removal and Installation](#) .

12. With the engine OFF, gradually apply the brake pedal to approximately 2/3 of its travel distance.

13. Slowly release the brake pedal.

14. Wait 15 seconds, then repeat steps 12-13 until a firm brake pedal is obtained. This will properly seat the brake caliper piston and brake pads.

15. Fill the master cylinder reservoir. Refer to [Master Cylinder Reservoir Filling](#) .

16. Burnish the brake pads and rotors. Refer to [Brake Pad and Rotor Burnishing](#).

BRAKE PAD AND ROTOR BURNISHING

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

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

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

1. Select a smooth road with little or no traffic.

2. Accelerate the vehicle to 48 km/h (30 mph).

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

3. Using moderate to firm pressure, apply the brakes to bring the vehicle to a stop. Do not allow the brakes to lock.

4. Repeat steps 2 and 3 until approximately 20 stops have been completed. Allow sufficient cooling periods between stops in order to properly burnish the brake pads and rotors.

FRONT BRAKE CALIPER REPLACEMENT

Removal Procedure

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

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

1. Remove the front disc brake pads. Refer to [Front Disc Brake Pads Replacement](#).

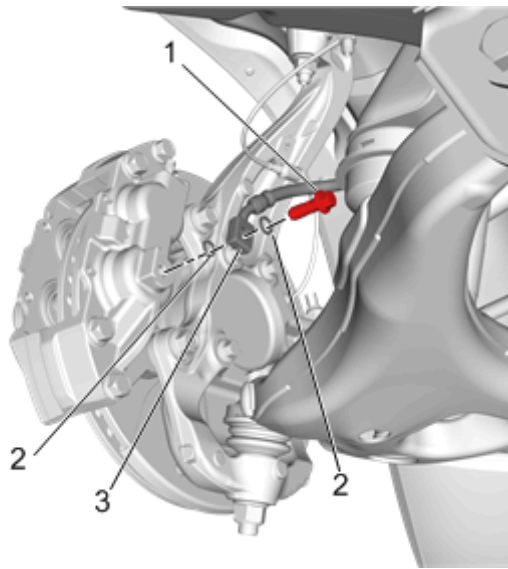


Fig. 32: Front Brake Hose Fitting Bolt

Courtesy of GENERAL MOTORS COMPANY

2. Remove the brake hose fitting bolt (1).
3. Plug the brake caliper inlet port to prevent brake fluid loss and contamination.

NOTE: Do not reuse the brake hose fitting gaskets.

4. Remove and discard the brake hose fitting gaskets (2) from the brake hose (3).
5. Cap the brake hose fitting to prevent brake fluid loss and contamination.

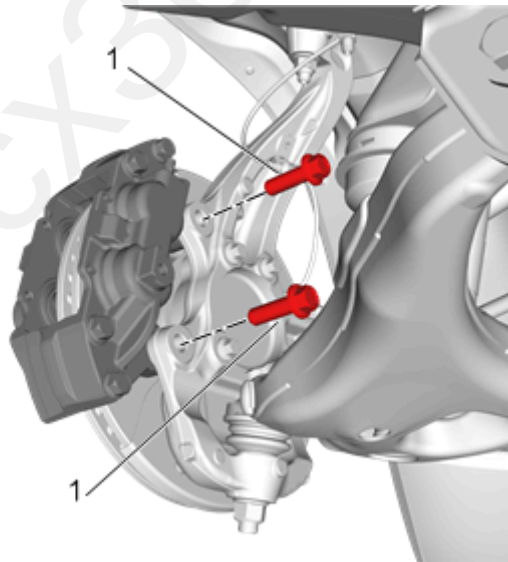


Fig. 33: Brake Caliper Bolts

Courtesy of GENERAL MOTORS COMPANY

NOTE: Do not loosen or remove the 4 bolts securing the brake caliper halves. The components are not serviceable.

6. Remove the brake caliper bolts (1).

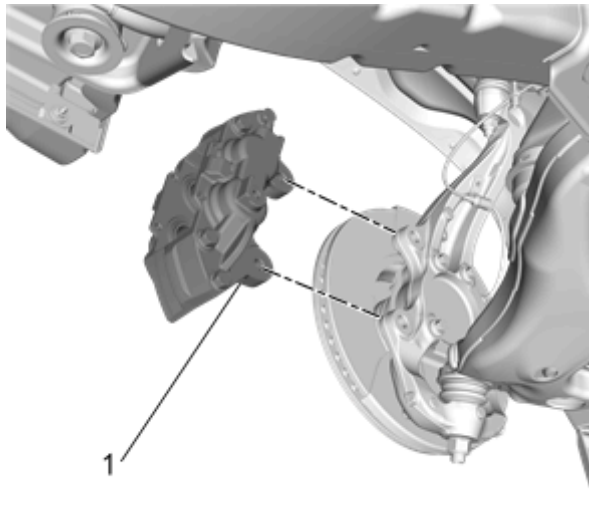


Fig. 34: Brake Caliper

Courtesy of GENERAL MOTORS COMPANY

7. Remove the brake caliper (1).

Installation Procedure

1. Prepare the brake caliper bolts and caliper threaded holes for assembly:

- Thoroughly clean the residue from the bolt threads with denatured alcohol or equivalent and allow to dry.
- Thoroughly clean the residue from the threaded holes with denatured alcohol or equivalent and allow to dry.
- Apply threadlocker to 2/3 of the threaded length of the bolts. Refer to [Adhesives, Fluids, Lubricants, and Sealers](#).

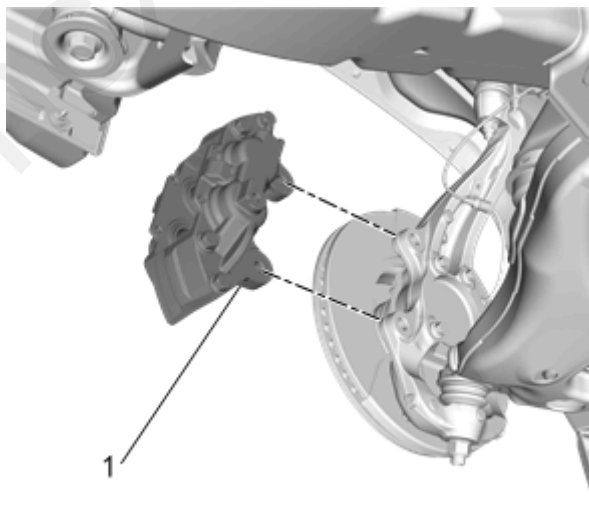


Fig. 35: Brake Caliper

Courtesy of GENERAL MOTORS COMPANY

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

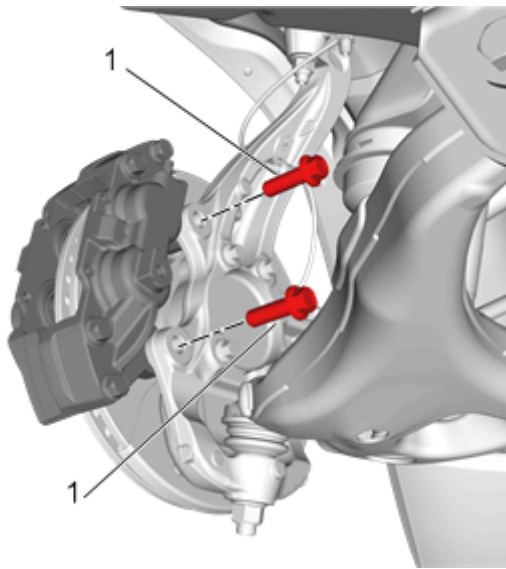


Fig. 36: Brake Caliper Bolts

Courtesy of GENERAL MOTORS COMPANY

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

3. Install the brake caliper bolts (1) and tighten to 80 N.m (59 lb ft) + 30-45 degrees.

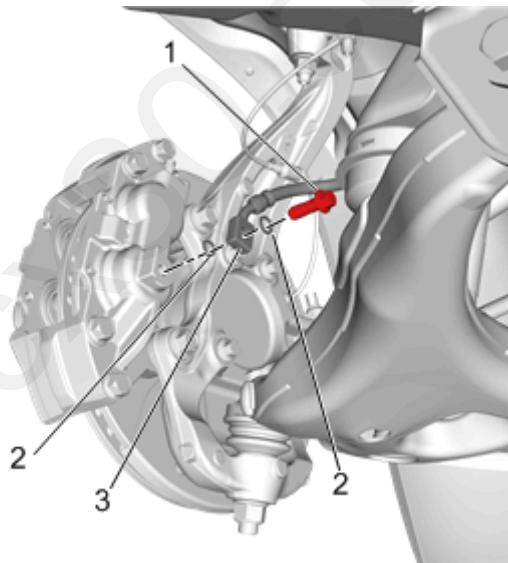


Fig. 37: Front Brake Hose Fitting Bolt

Courtesy of GENERAL MOTORS COMPANY

NOTE: Install new brake hose fitting gaskets.

4. Assemble the brake hose fitting bolt (1) and the 2 new brake hose fitting gaskets (2) to the brake hose (3).
5. Install the brake hose assembly to the brake caliper and tighten the brake hose fitting bolt to 34 N.m (25 lb ft).
6. Install the disc brake pads. Refer to [Front Disc Brake Pads Replacement](#).
7. Bleed the hydraulic brake system. Refer to [Hydraulic Brake System Bleeding \(Manual\) Hydraulic Brake System Bleeding \(Pressure\)](#) .

FRONT BRAKE CALIPER GUIDE PIN REPLACEMENT

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

NOTE: Always replace disc brake pads in axle sets.

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](#) .

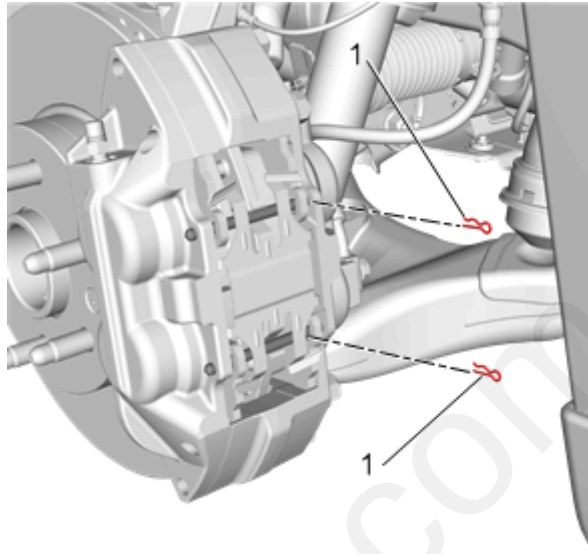


Fig. 38: Disc Brake Pad Pin Clips

Courtesy of GENERAL MOTORS COMPANY

3. Remove the disc brake pad pin clips (1).

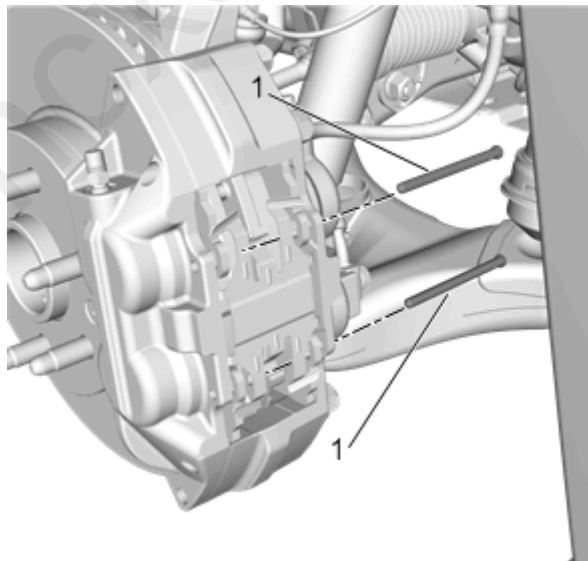


Fig. 39: Brake Caliper Pins

Courtesy of GENERAL MOTORS COMPANY

4. Carefully drive out the brake caliper pins (1) from the brake caliper.

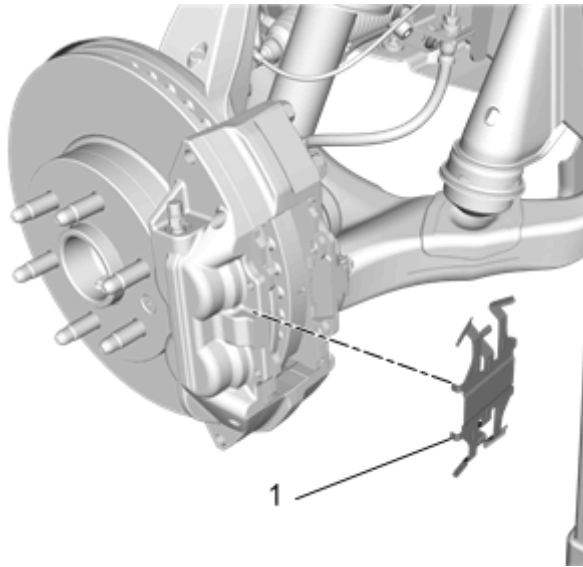


Fig. 40: Brake Pad Spring

Courtesy of GENERAL MOTORS COMPANY

5. Remove the brake pad spring (1).

Installation Procedure

1. Inspect the brake caliper pins, pin clips, and brake pad springs for damage or excessive corrosion and replace, if necessary.

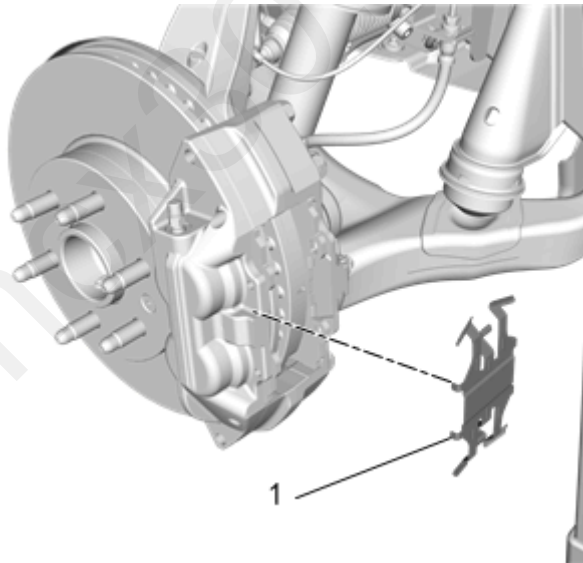


Fig. 41: Brake Pad Spring

Courtesy of GENERAL MOTORS COMPANY

2. Install the brake pad spring (1).

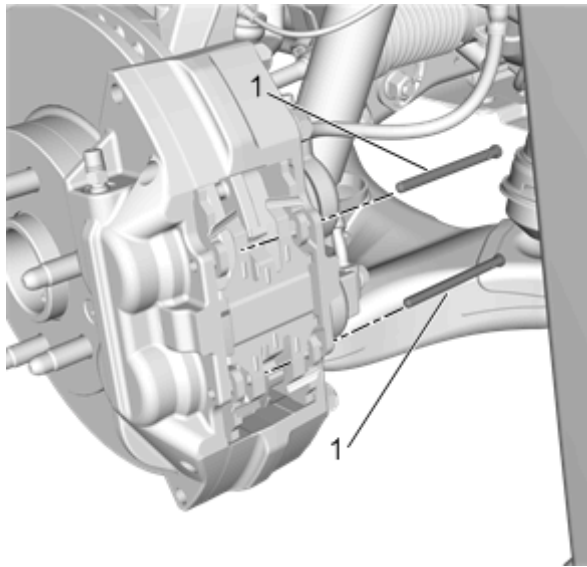


Fig. 42: Brake Caliper Pins

Courtesy of GENERAL MOTORS COMPANY

3. Carefully drive the brake caliper pins (1) into the brake caliper.
4. Ensure the brake caliper pins are fully seated in the brake caliper.

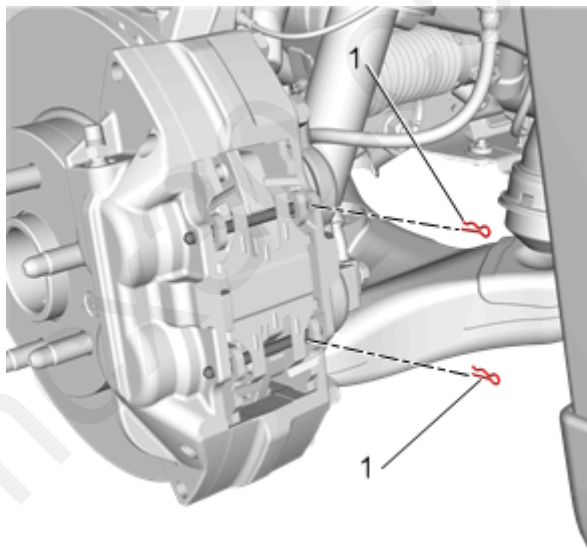


Fig. 43: Disc Brake Pad Pin Clips

Courtesy of GENERAL MOTORS COMPANY

5. Install the disc brake pad pin clips (1).
6. Install the tire and wheel assembly. Refer to [Tire and Wheel Removal and Installation](#) .

REAR BRAKE CALIPER REPLACEMENT

Removal Procedure

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

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

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#) .

the tire and wheel assembly. Refer to [Tire and Wheel Removal and Installation](#) .

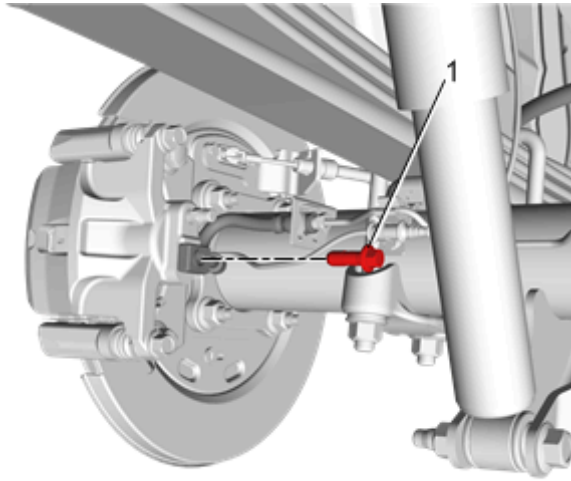


Fig. 44: Rear Brake Caliper Hose Fitting Bolt
Courtesy of GENERAL MOTORS COMPANY

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

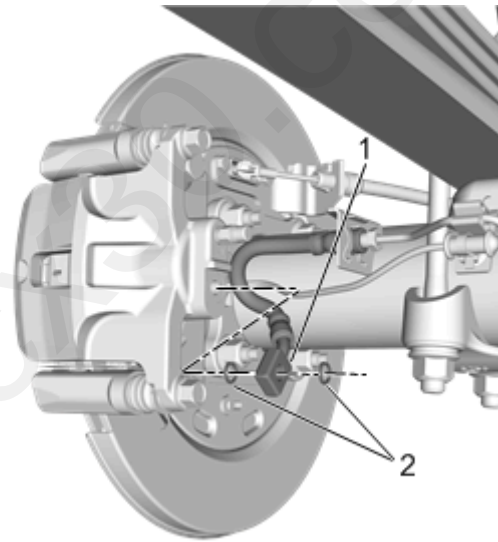


Fig. 45: Rear Brake Caliper Hose Fitting
Courtesy of GENERAL MOTORS COMPANY

4. Remove the brake hose fitting (1) from the brake caliper.

NOTE: Do not reuse the brake hose fitting gaskets.

5. Remove and discard the brake hose fitting gaskets (2).
6. Cap the brake hose fitting to prevent brake fluid loss and contamination.

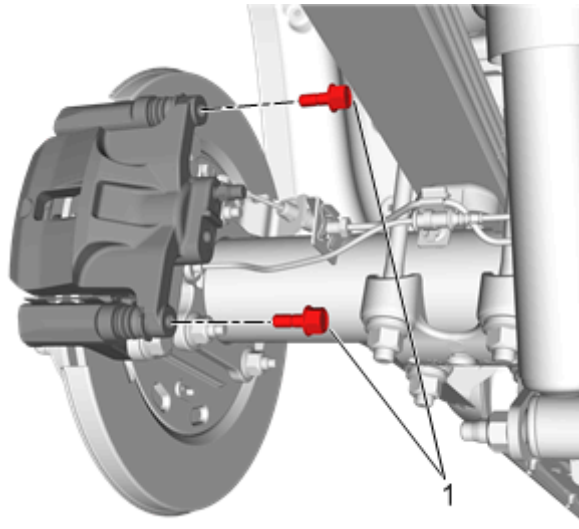


Fig. 46: Brake Caliper Guide Pin Bolts

Courtesy of GENERAL MOTORS COMPANY

7. Remove the brake caliper guide pin bolts (1).

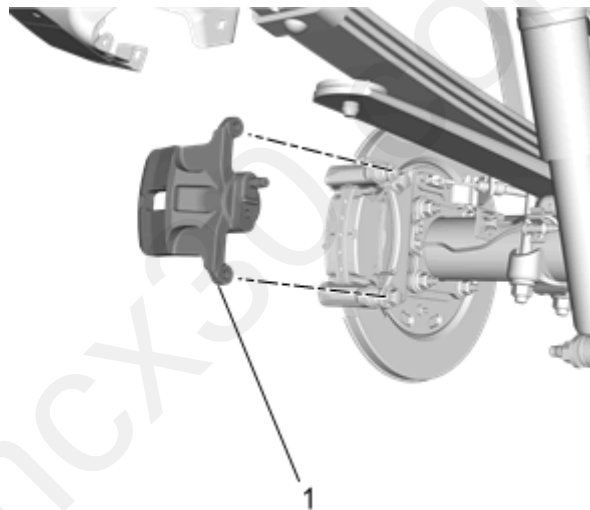


Fig. 47: Brake Caliper

Courtesy of GENERAL MOTORS COMPANY

8. Remove the brake caliper (1).

Installation Procedure

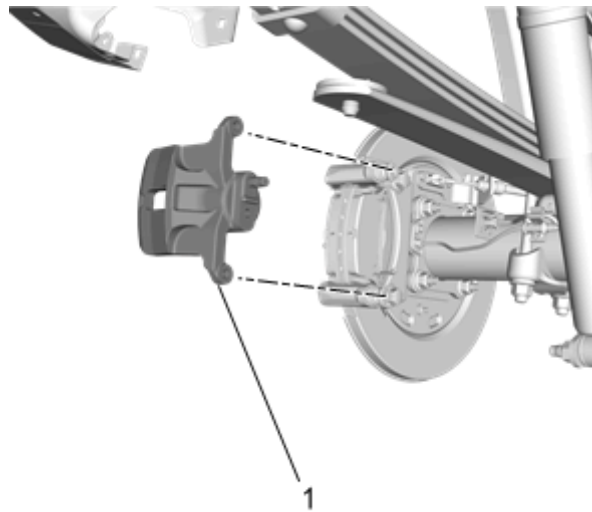


Fig. 48: Brake Caliper

Courtesy of GENERAL MOTORS COMPANY

1. Position the brake caliper (1) over the brake pads and to the caliper bracket.

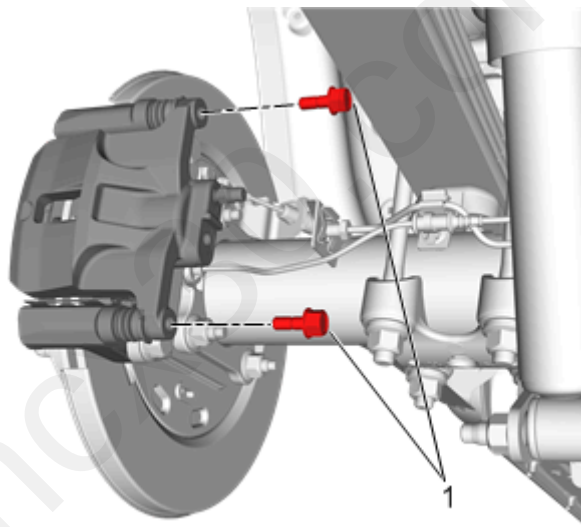


Fig. 49: Brake Caliper Guide Pin Bolts

Courtesy of GENERAL MOTORS COMPANY

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

2. Install the brake caliper guide pin bolts (1) and tighten to 34 N.m (25 lb ft).

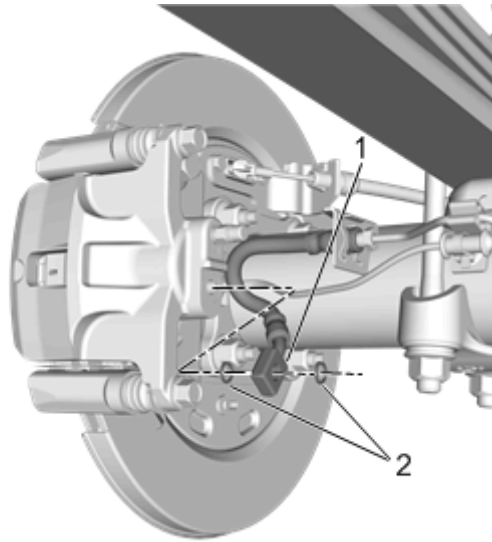


Fig. 50: Rear Brake Caliper Hose Fitting

Courtesy of GENERAL MOTORS COMPANY

NOTE: Install new brake hose fitting gaskets.

3. Position the brake hose fitting (1) with 2 new brake hose fitting gaskets (2) to the brake caliper.

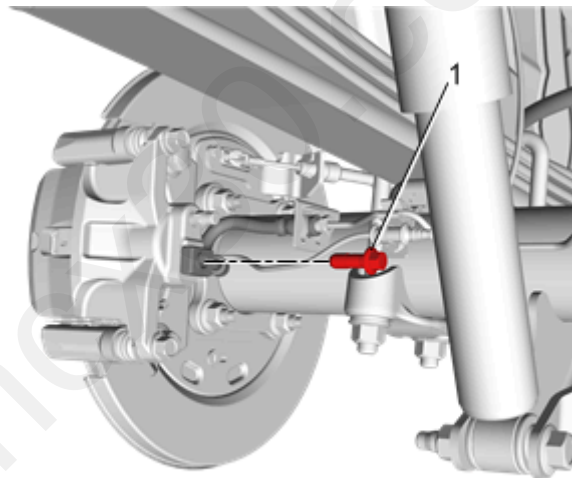


Fig. 51: Rear Brake Caliper Hose Fitting Bolt

Courtesy of GENERAL MOTORS COMPANY

4. Install the brake hose fitting bolt (1) and tighten to 34 N.m (25 lb ft).
5. Bleed the hydraulic brake system. Refer to [Hydraulic Brake System Bleeding \(Manual\)](#) [Hydraulic Brake System Bleeding \(Pressure\)](#) .
6. Install the tire and wheel assembly. Refer to [Tire and Wheel Removal and Installation](#) .

REAR BRAKE CALIPER GUIDE PIN REPLACEMENT

Removal Procedure

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

- 1 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](#) .

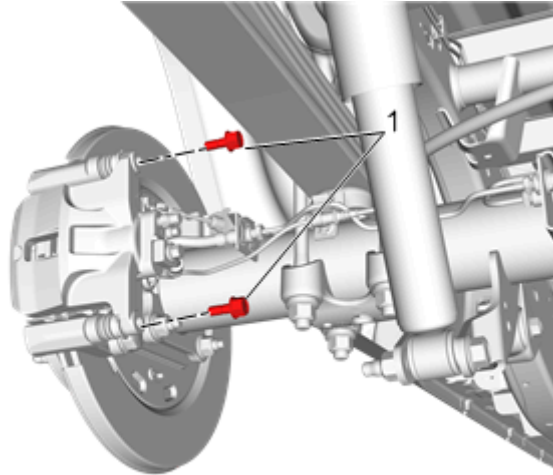


Fig. 52: Brake Caliper Guide Pin Bolts

Courtesy of GENERAL MOTORS COMPANY

3. Remove the brake caliper guide pin bolts (1).

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

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

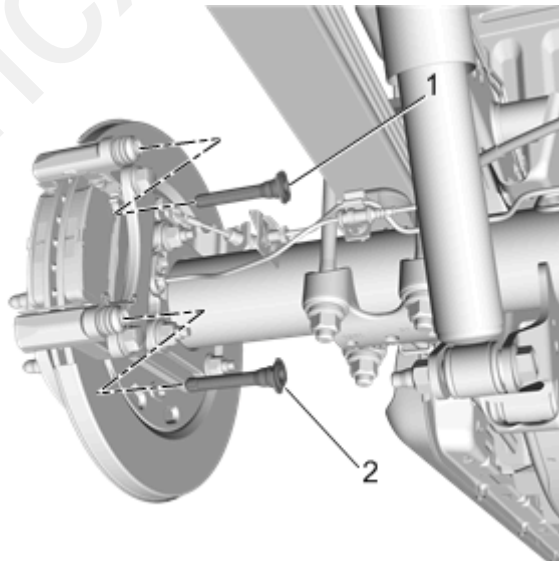


Fig. 53: Upper Brake Caliper Guide Pin

Courtesy of GENERAL MOTORS COMPANY

5. Remove the upper brake caliper guide pin (1).

The lower brake caliper guide pin is equipped with a bushing and must be

The lower brake caliper guide pin is equipped with a bushing and must be installed in the same location.

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

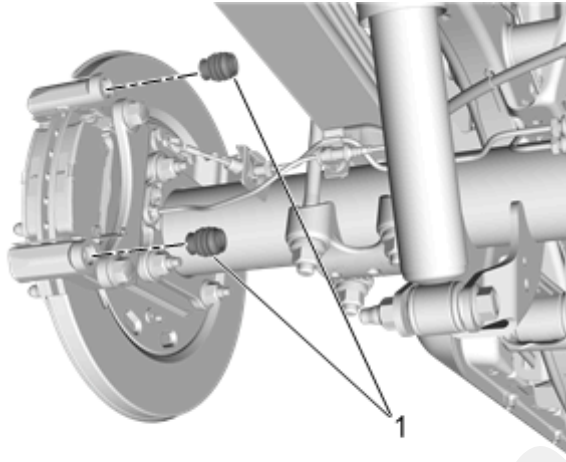


Fig. 54: Brake Caliper Guide Pin Seals

Courtesy of GENERAL MOTORS COMPANY

7. Remove the brake caliper guide pin seals (1).

Installation Procedure

1. Inspect the brake caliper guide pins and seals for damage or corrosion and replace, if necessary.

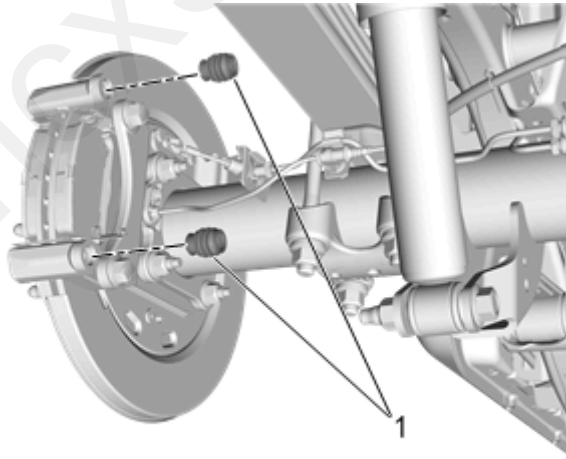


Fig. 55: Brake Caliper Guide Pin Seals

Courtesy of GENERAL MOTORS COMPANY

2. Install the brake caliper guide pin seals (1).

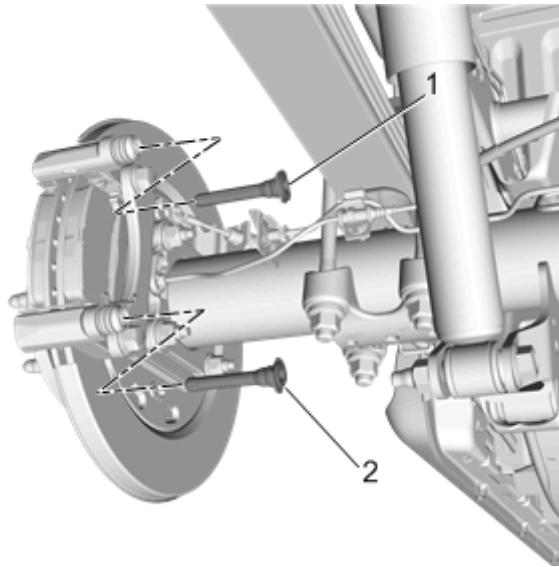


Fig. 56: Upper Brake Caliper Guide Pin

Courtesy of GENERAL MOTORS COMPANY

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

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

4. Install the lower brake caliper guide pin (2).
5. Position the brake caliper over the brake pads and to the caliper bracket.

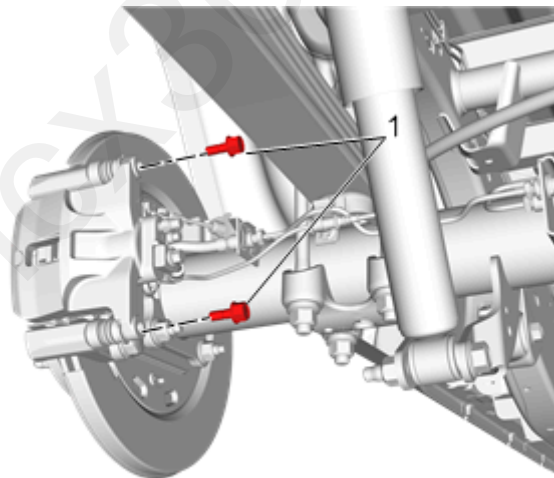


Fig. 57: Brake Caliper Guide Pin Bolts

Courtesy of GENERAL MOTORS COMPANY

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

6. Install the brake caliper guide pin bolts (1) and tighten to 34 N.m (25 lb ft).
7. Install the tire and wheel assembly. Refer to [Tire and Wheel Removal and Installation](#) .

REAR BRAKE CALIPER BRACKET REPLACEMENT

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](#) .
3. Remove the rear disc brake pads. Refer to [Rear Disc Brake Pads Replacement](#).

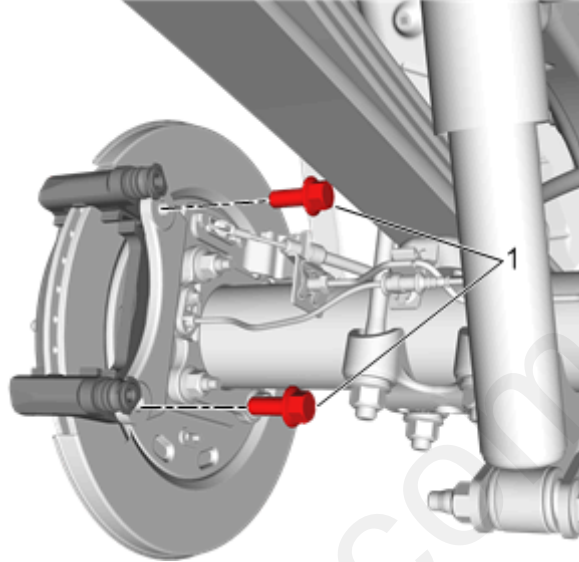


Fig. 58: Brake Caliper Bracket Bolts

Courtesy of GENERAL MOTORS COMPANY

NOTE: Do not reuse the brake caliper bracket bolts.

4. Remove and discard the brake caliper bracket bolts (1).

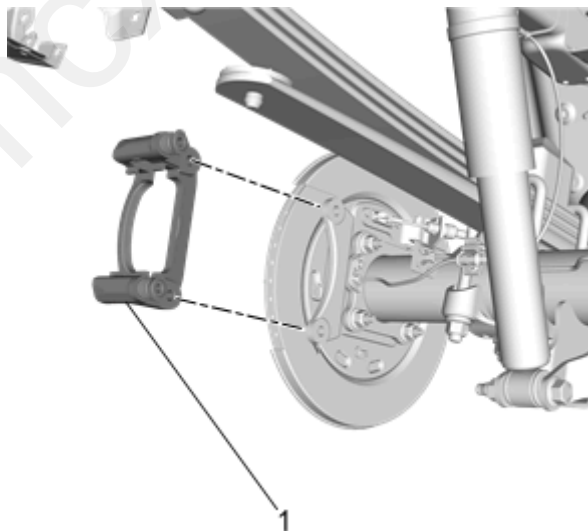


Fig. 59: Rear Brake Caliper Bracket

Courtesy of GENERAL MOTORS COMPANY

5. Remove the rear brake caliper bracket (1).

Installation Procedure

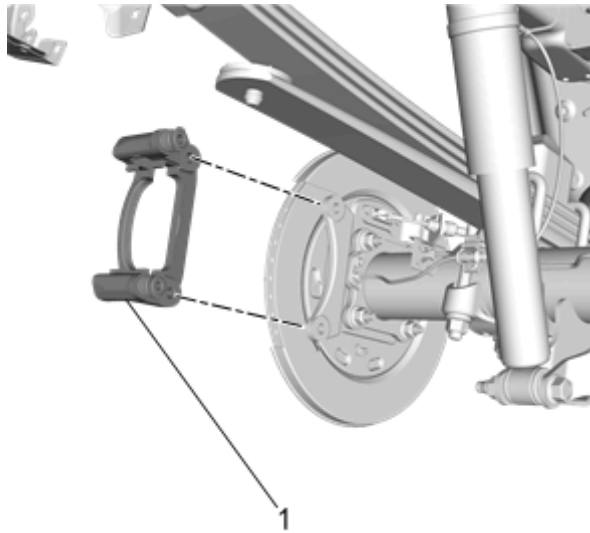


Fig. 60: Rear Brake Caliper Bracket

Courtesy of GENERAL MOTORS COMPANY

1. Install the rear brake caliper bracket (1).

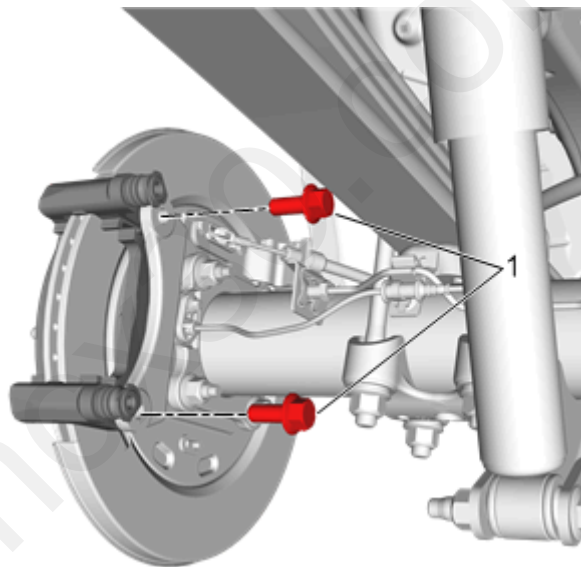


Fig. 61: Brake Caliper Bracket Bolts

Courtesy of GENERAL MOTORS COMPANY

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

2. Install new brake caliper bracket bolts (1) and tighten to 100 N.m (74 lb ft) + 15-30 degrees.
3. Install the rear disc brake pads. Refer to [Rear Disc Brake Pads Replacement](#).
4. Install the tire and wheel assembly. Refer to [Tire and Wheel Removal and Installation](#) .

FRONT BRAKE ROTOR REPLACEMENT

Special Tools

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

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](#) .

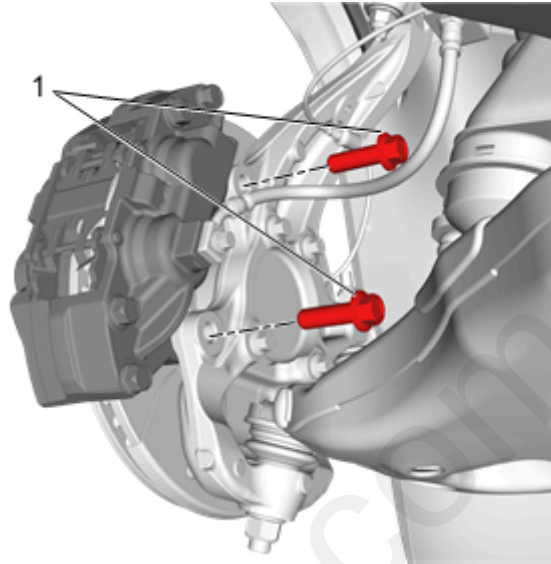


Fig. 62: Brake Caliper Bolts

Courtesy of GENERAL MOTORS COMPANY

NOTE: Do not loosen or remove the 4 bolts securing the brake caliper halves. The components are not serviceable.

3. Remove the brake caliper bolts (1).

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

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

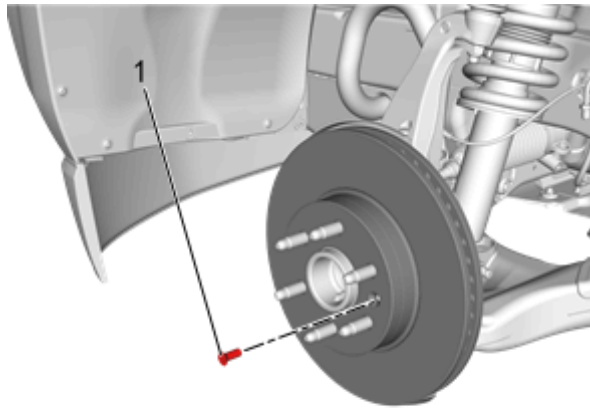


Fig. 63: Brake Rotor Bolt

Courtesy of GENERAL MOTORS COMPANY

5. Remove the brake rotor bolt (1).

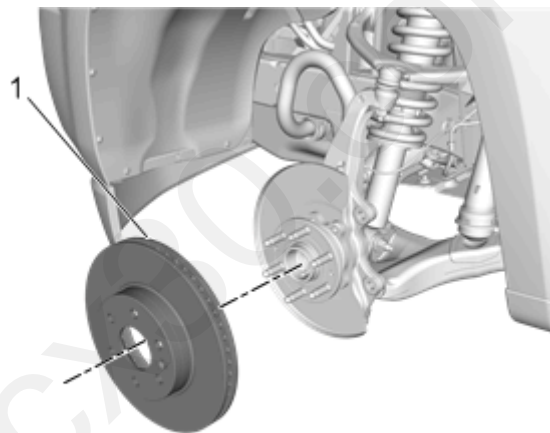


Fig. 64: Brake Rotor

Courtesy of GENERAL MOTORS COMPANY

6. Remove the brake rotor (1).

Installation Procedure

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

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

» **CH-41013** Rotor Resurfacing Kit, thoroughly clean any rust or corrosion from the mating surface and mounting surface of the brake rotor.

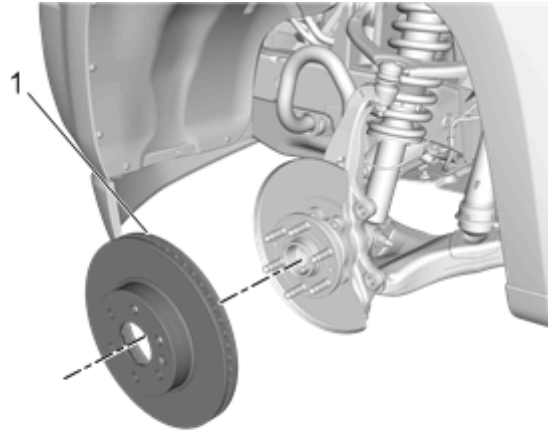


Fig. 65: Brake Rotor

Courtesy of GENERAL MOTORS COMPANY

3. Install the brake rotor (1).

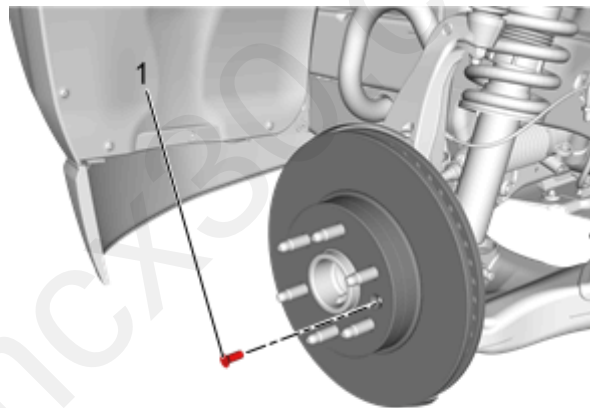


Fig. 66: Brake Rotor Bolt

Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to **Fastener Caution** .

4. Install the brake rotor bolt (1) and tighten to 9 N.m (80 lb in).

5. Prepare the brake caliper bolts and caliper threaded holes for assembly:

- Thoroughly clean the residue from the bolt threads with denatured alcohol or equivalent and allow to dry.
- Thoroughly clean the residue from the threaded holes with denatured alcohol or equivalent and allow to dry.

Apply threadlocker to 2/3 of the threaded length of the bolts. Refer to [Adhesives, Fluids, Lubricants, and Sealers](#).

6. Position the brake caliper assembly to the steering knuckle.

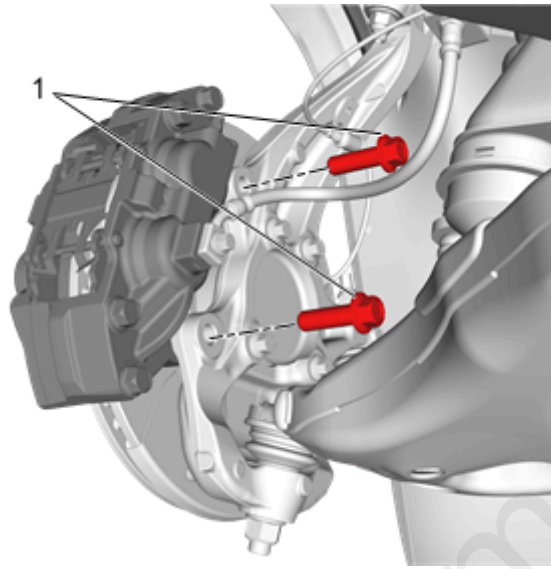


Fig. 67: Brake Caliper Bolts

Courtesy of GENERAL MOTORS COMPANY

7. Install the brake caliper bolts (1) and tighten to 80 N.m (59 lb ft) + 30-45 degrees.

8. Install the tire and wheel assembly. Refer to [Tire and Wheel Removal and Installation](#).

9. If the brake rotor was refinished or replaced, or if new brake pads were installed, burnish the brake pads and rotors. Refer to [Brake Pad and Rotor Burnishing](#).

REAR BRAKE ROTOR REPLACEMENT

Special Tools

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

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

Removal Procedure

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

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

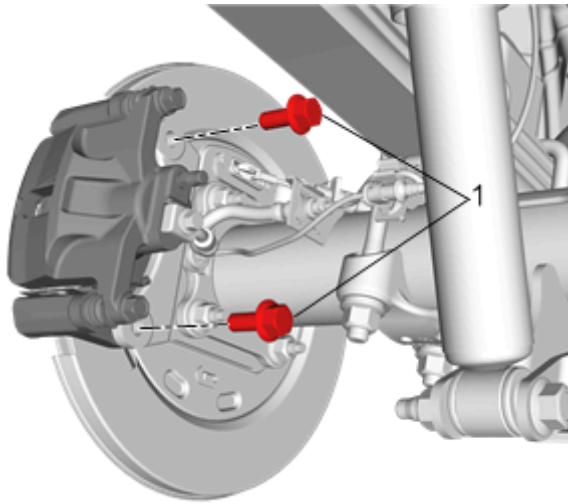


Fig. 68: Brake Caliper Bracket Bolts

Courtesy of GENERAL MOTORS COMPANY

NOTE: Do not reuse the brake caliper bracket bolts.

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

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

4. Remove the brake caliper and bracket as an assembly and support with heavy mechanics wire.

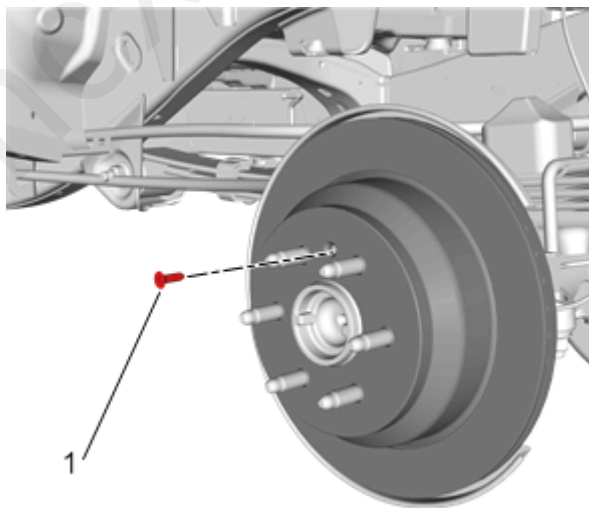


Fig. 69: Brake Rotor Bolt

Courtesy of GENERAL MOTORS COMPANY

5. Remove the brake rotor bolt (1).

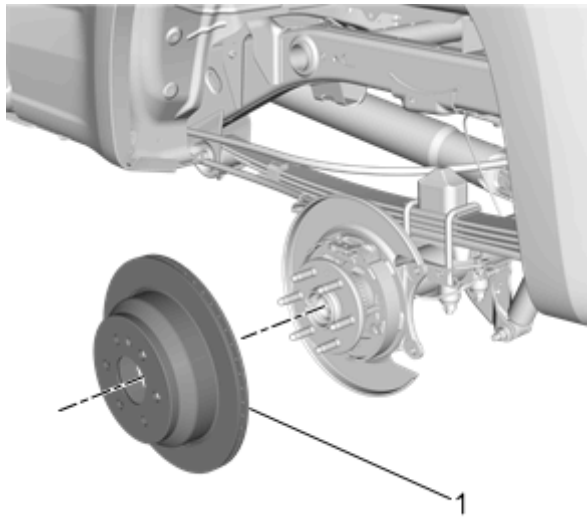


Fig. 70: Brake Rotor

Courtesy of GENERAL MOTORS COMPANY

6. Remove the brake rotor (1).

Installation Procedure

1. If installing a new brake rotor, clean the friction surfaces of the brake rotor with denatured alcohol.
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 rotor to the hub/axle flange.

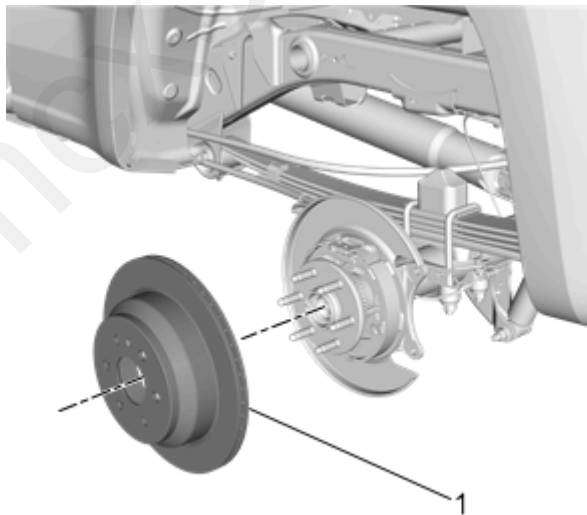


Fig. 71: Brake Rotor

Courtesy of GENERAL MOTORS COMPANY

4. Install the brake rotor (1).

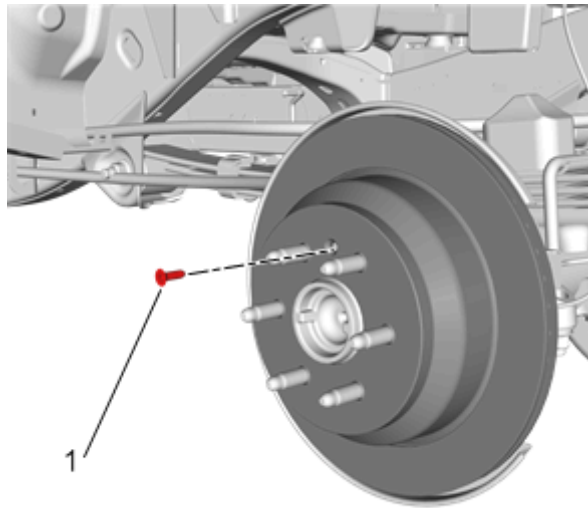


Fig. 72: Brake Rotor Bolt

Courtesy of GENERAL MOTORS COMPANY

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

5. Install the brake rotor bolt (1) and tighten to 9 N.m (80 lb in).
6. Position the brake caliper and bracket assembly over the brake rotor and to the suspension knuckle.

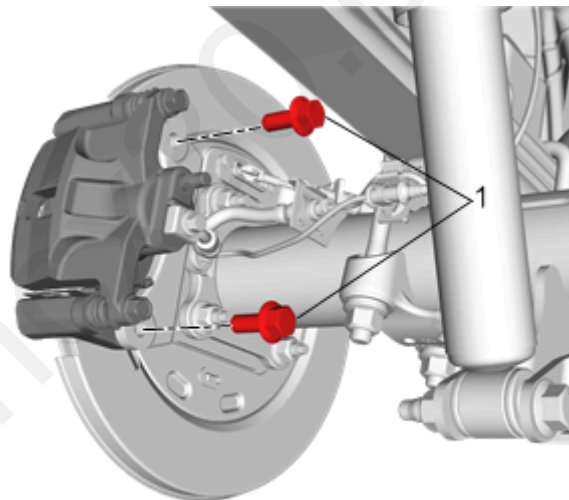


Fig. 73: Brake Caliper Bracket Bolts

Courtesy of GENERAL MOTORS COMPANY

7. Install new brake caliper bracket bolts (1) and tighten to 100 N.m (74 lb ft) + 15-30 degrees.
8. Install the tire and wheel assembly. Refer to [Tire and Wheel Removal and Installation](#) .
9. Burnish the brake pads and rotors. Refer to [Brake Pad and Rotor Burnishing](#).

FRONT BRAKE SHIELD REPLACEMENT

Removal Procedure

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

- 1 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](#) .

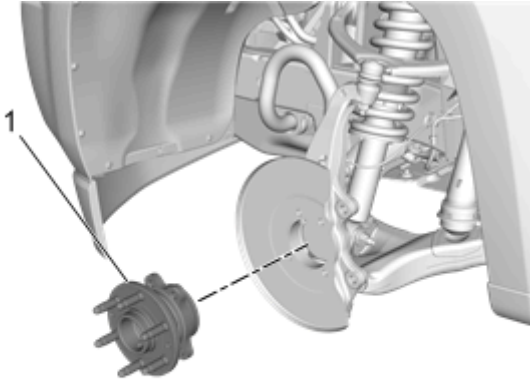


Fig. 74: Front Wheel Bearing And Hub Assembly
Courtesy of GENERAL MOTORS COMPANY

3. Remove the front wheel bearing and hub assembly (1). Refer to [Front Wheel Bearing and Hub Replacement \(4WD\)](#) [Front Wheel Bearing and Hub Replacement \(2WD\)](#) .

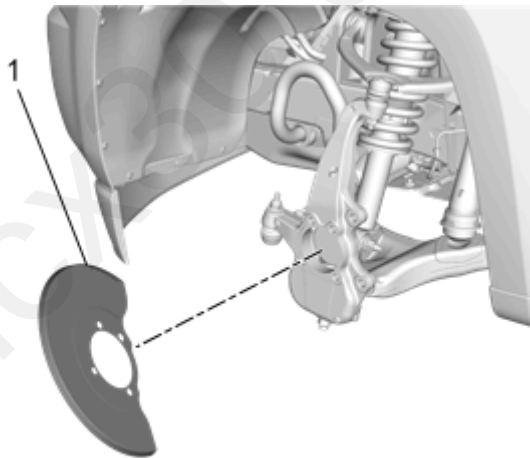


Fig. 75: Front Brake Shield
Courtesy of GENERAL MOTORS COMPANY

4. Remove the front brake shield (1).

Installation Procedure

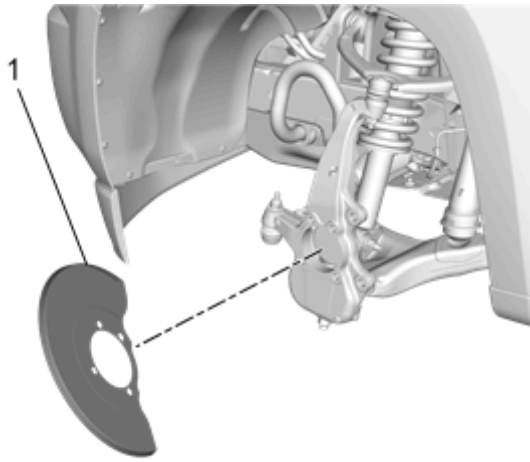


Fig. 76: Front Brake Shield

Courtesy of GENERAL MOTORS COMPANY

1. Install the front brake shield (1).

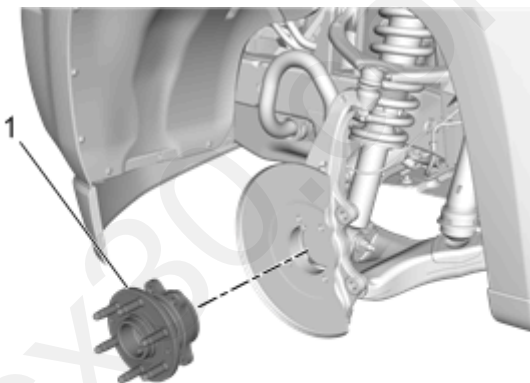


Fig. 77: Front Wheel Bearing And Hub Assembly

Courtesy of GENERAL MOTORS COMPANY

2. Install the front wheel bearing and hub assembly (1). Refer to [Front Wheel Bearing and Hub Replacement \(4WD\)](#) [Front Wheel Bearing and Hub Replacement \(2WD\)](#) .
3. Install the tire and wheel assembly. Refer to [Tire and Wheel Removal and Installation](#) .

FRONT BRAKE BEARING SHIELD REPLACEMENT

Removal Procedure

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

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

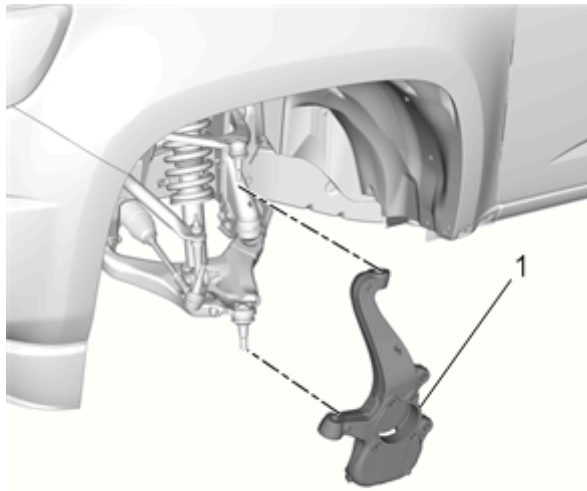


Fig. 78: Steering Knuckle

Courtesy of GENERAL MOTORS COMPANY

3. Remove the steering knuckle (1). Refer to [Steering Knuckle Replacement \(4WD\)](#) [Steering Knuckle Replacement \(2WD\)](#) .

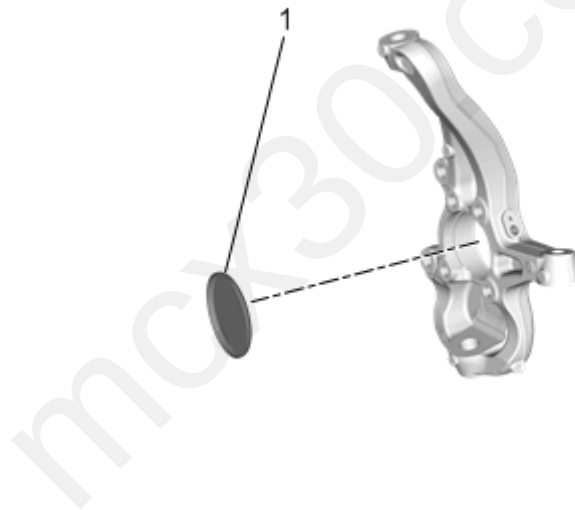


Fig. 79: Front Brake Bearing Shield

Courtesy of GENERAL MOTORS COMPANY

4. Using a hydraulic press, remove the front brake bearing shield (1).

Installation Procedure

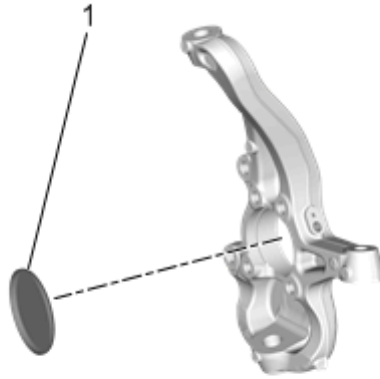


Fig. 80: Front Brake Bearing Shield

Courtesy of GENERAL MOTORS COMPANY

NOTE: Ensure the front brake bearing shield is fully seated against the ridge in the steering knuckle.

1. Using a hydraulic press, install the front brake bearing shield (1).

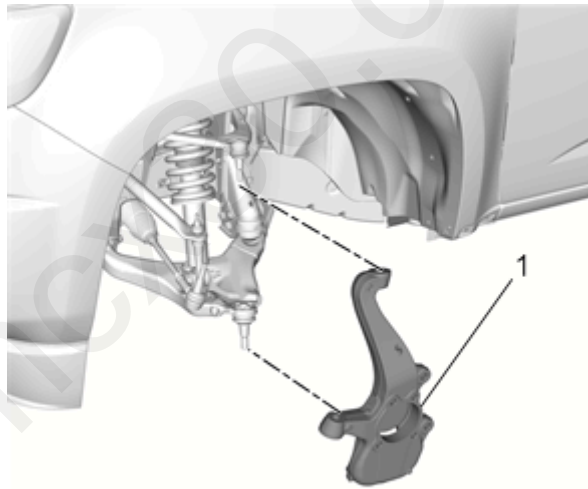


Fig. 81: Steering Knuckle

Courtesy of GENERAL MOTORS COMPANY

2. Install the steering knuckle (1). Refer to [Steering Knuckle Replacement \(4WD\)](#) [Steering Knuckle Replacement \(2WD\)](#) .
3. Install the tire and wheel assembly. Refer to [Tire and Wheel Removal and Installation](#) .

BRAKE ROTOR ASSEMBLED LATERAL RUNOUT CORRECTION

NOTE:

- Brake rotor thickness variation **MUST** be checked **BEFORE** checking for assembled lateral runout (LRO). Thickness variation exceeding the maximum

acceptable level can cause brake pulsation. Refer to [Brake Rotor Thickness Variation Measurement](#).

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

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

- The indexing method of correcting assembled LRO is most effective when the LRO specification is only exceeded by a relatively small amount: 0.025-0.127 mm (0.001-0.005 in). Indexing is used to achieve the best possible match of high spots to low spots between related components. Refer to [Brake Rotor Assembled Lateral Runout Correction - Indexing](#).
- The on-vehicle brake lathe method is used to bring the LRO to within specifications through compensating for LRO while refinishing the brake rotor. Refer to [Brake Rotor Assembled Lateral Runout Correction - On Vehicle Lathe](#).

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

BRAKE ROTOR ASSEMBLED LATERAL RUNOUT CORRECTION - INDEXING

NOTE: This Procedure is not used in Europe

Special Tools

CH-45101-100 Conical Brake Rotor Washers

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

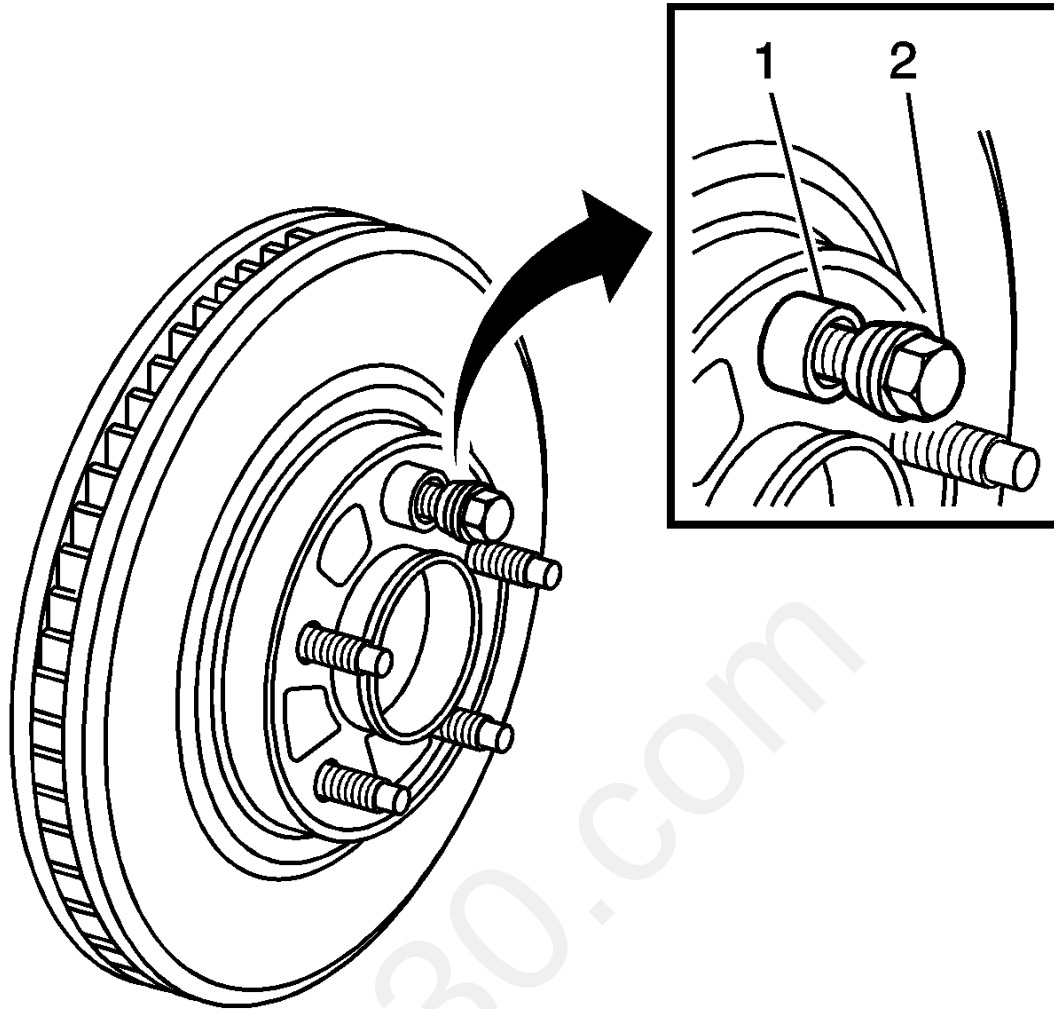


Fig. 82: Lug Nuts & Conical Washers

Courtesy of GENERAL MOTORS COMPANY

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

NOTE:

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

1. Remove the **CH-45101-100** Conical Brake Rotor Washers and the lug nuts that were installed during the assembled LRO measurement procedure.
2. Inspect the mating surface of the hub/axle flange and the brake rotor to ensure that there are no foreign particles or debris remaining.
3. Index the brake rotor in a different orientation to the hub/axle flange.
4. Hold the rotor firmly in place against the hub/axle flange and install one of the **CH-45101-100** Conical Brake Rotor Washers (1) and one lug nut (2) onto the upper-most wheel stud.

to hold the rotor secure and tighten the lug nut firmly by hand.

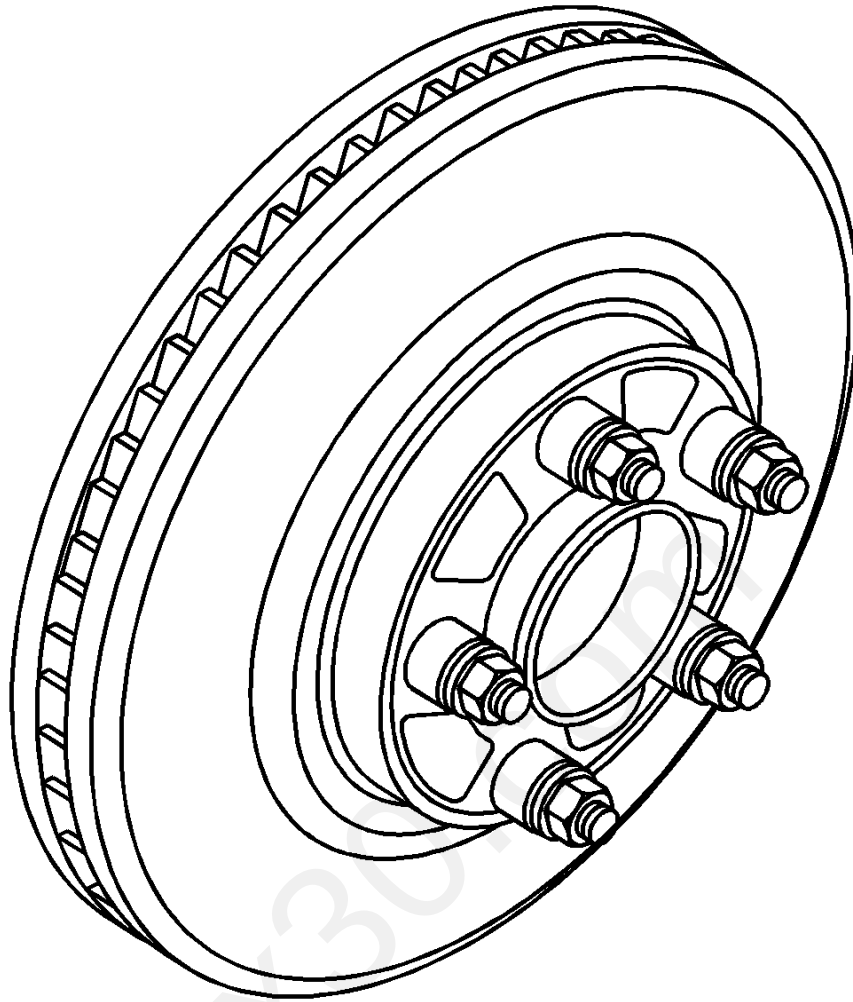


Fig. 83: Lug Nuts & Conical Washers

Courtesy of GENERAL MOTORS COMPANY

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

and the lug nuts.

BRAKE ROTOR ASSEMBLED LATERAL RUNOUT CORRECTION - ON VEHICLE LATHE

NOTE: This procedure is not used in Europe.

Special Tools

CH-45101-100 Conical Brake Rotor Washers

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

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

NOTE:

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

1. Ensure that the caliper and caliper bracket that are already being supported, are clear from contacting any rotating components, such as the brake rotor.
2. Remove the **CH-45101-100** Conical Brake Rotor Washers and the lug nuts that were installed during the assembled LRO measurement procedure and/or the indexing correction procedure.
3. Inspect the mounting surface of the hub/axle flange and the brake rotor to ensure that there are no foreign particles or debris remaining.
4. Set up the lathe, following the manufacturer's instructions.
5. Refinish the brake rotor, following the brake lathe manufacturer's instructions.
6. After each successive cut, inspect the brake rotor thickness. Refer to [Brake Rotor Thickness Measurement](#).
7. If at any time the brake rotor exceeds the minimum allowable thickness after refinish specification, the brake rotor must be replaced. After replacing the rotor, proceed to step 10.
8. After refinishing the brake rotor, use the following procedure in order to obtain the desired non-directional finish:
 1. Follow the brake lathe manufacturer's recommended speed setting for applying a non-directional finish.
 2. Using moderate pressure, apply the non-directional finish:
 - If the lathe is equipped with a non-directional finishing tool, apply the finish with 120-grit aluminum oxide sandpaper.
 - If the lathe is not equipped with a non-directional finishing tool, apply the finish with a sanding block and 150-grit aluminum oxide sandpaper.
 3. After applying a non-directional finish, clean each friction surface of the brake rotor with denatured alcohol, or an equivalent approved brake cleaner.
9. Remove the lathe from the vehicle.
10. Measure the assembled LRO of the brake rotor. Refer to [Brake Rotor Assembled Lateral Runout Measurement](#).

ke rotor assembled LRO measurement still exceeds the maximum allowable specification, refer to [Brake Rotor Assembled Lateral Runout Correction](#).

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

BRAKE ROTOR REFINISHING

Special Tools

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

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

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

NOTE:

- The disc brake rotors do not require refinishing as part of routine brake system service. New disc brake rotors do not require refinishing.
- Do not refinish disc brake rotors in an attempt to correct the following conditions:
- Brake system noise - squeal, growl, groan
 - Uneven and/or premature disc brake pad wear
 - Superficial or cosmetic corrosion/rust of the disc brake rotor friction surface
 - Scoring of the disc brake rotor friction surface less than the maximum allowable specification
- Before refinishing a brake rotor, the rotor **MUST** first be checked for adequate thickness to allow the rotor to be refinished and remain above the minimum allowable thickness after refinish specification. Refer to [Brake Rotor Thickness Measurement](#).

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.

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 (Floating Caliper)

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

System Operation (Floating Caliper)

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

System Operation (Fixed Caliper)

Mechanical output force is applied from the hydraulic brake caliper inboard and outboard pistons to the inner and outer brake pads. The brake calipers are a fixed, opposed-piston design, allowing the output force to be equally distributed through the distribution of the pressurized brake fluid within the caliper. The brake pads apply the output force to the friction surfaces on both sides of the brake rotors, which slows the rotation of the tire and wheel assemblies. The correct function of the brake pad hardware and of the brake caliper inboard and outboard pistons is essential for even distribution of braking force.

System Characteristics

Brake Noise

Brake noise can occur and to a degree, some brake noise is normal. Variations in driving conditions such as the weather, environment, driving patterns, differences in vehicle loading, and type or style of driving, can affect brake

of these variations can cause brake noise to become apparent. Inspect and verify that all metal-to-metal contact areas of the brake pads, brake pad guides or springs, brake caliper housing, caliper bracket and/or suspension knuckle, as applicable, are clean and free of corrosion and scale.

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

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

Squeak/Squeal Noise

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

Grinding Noise

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

Groan Noise

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

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

Illustration	Tool Number/ Description

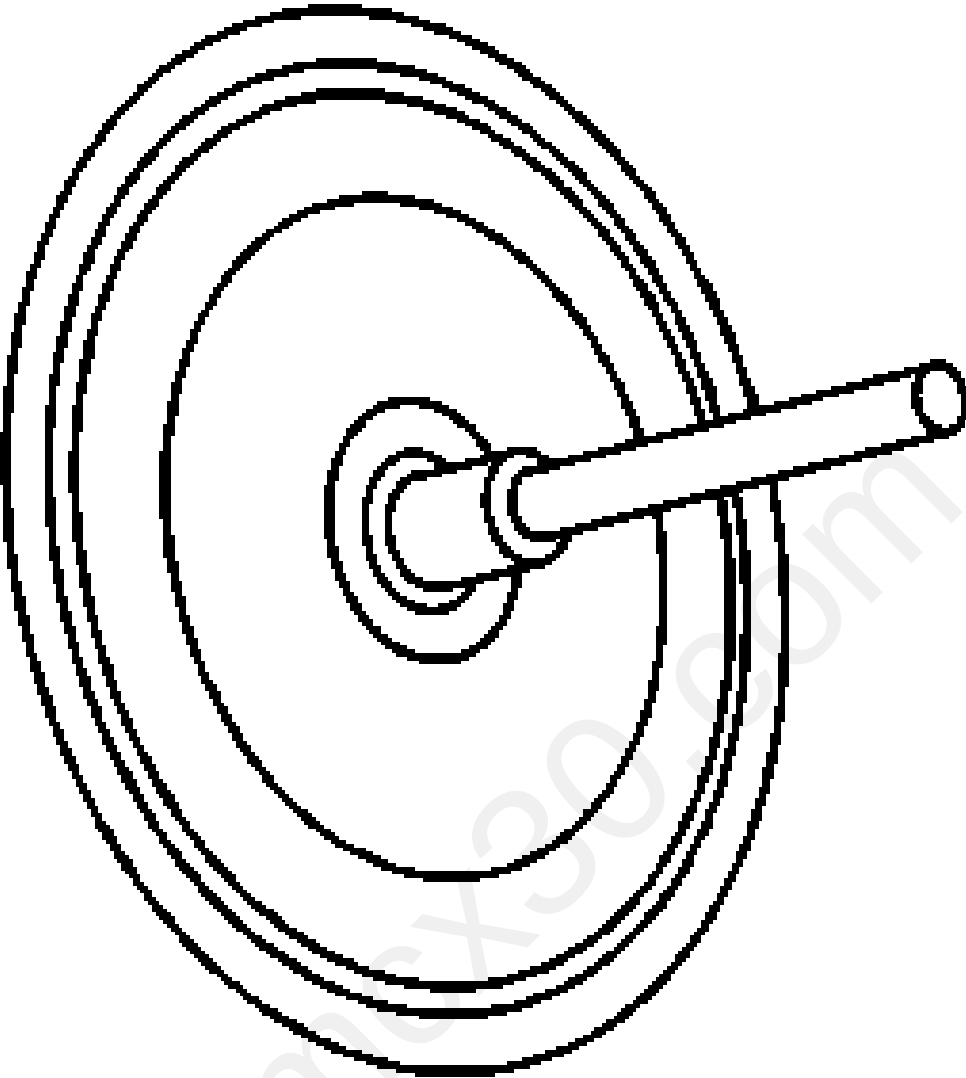
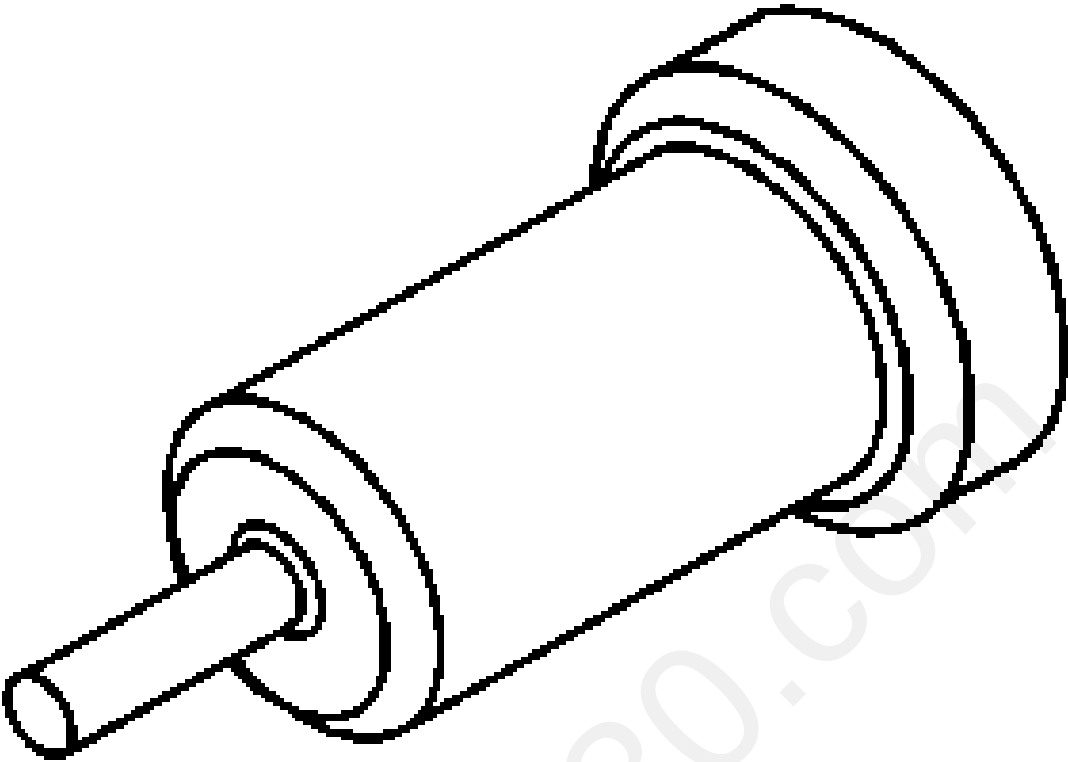
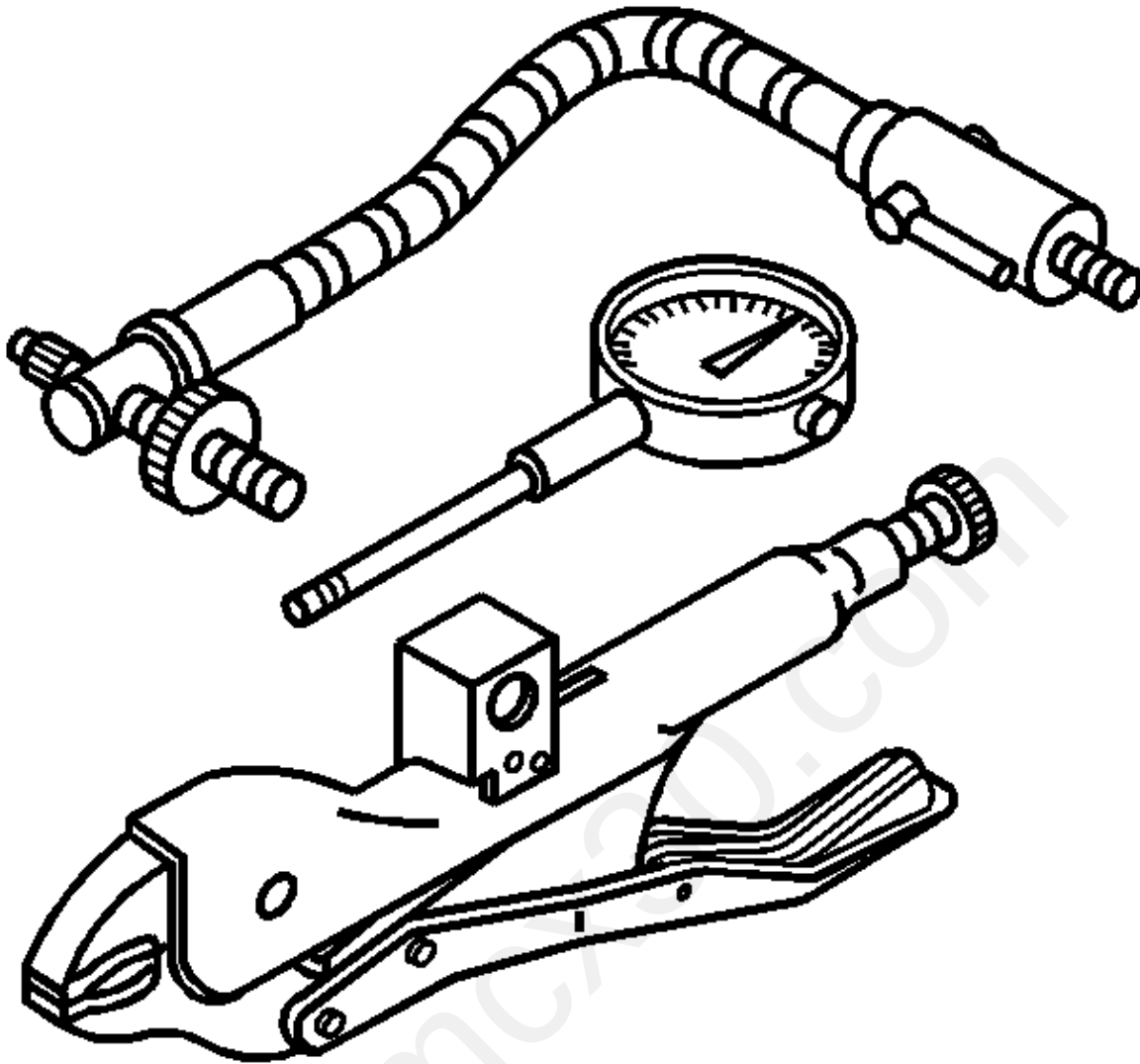
Illustration	Tool Number/ Description
	CH 41013 J 41013 Rotor Resurfacing Kit

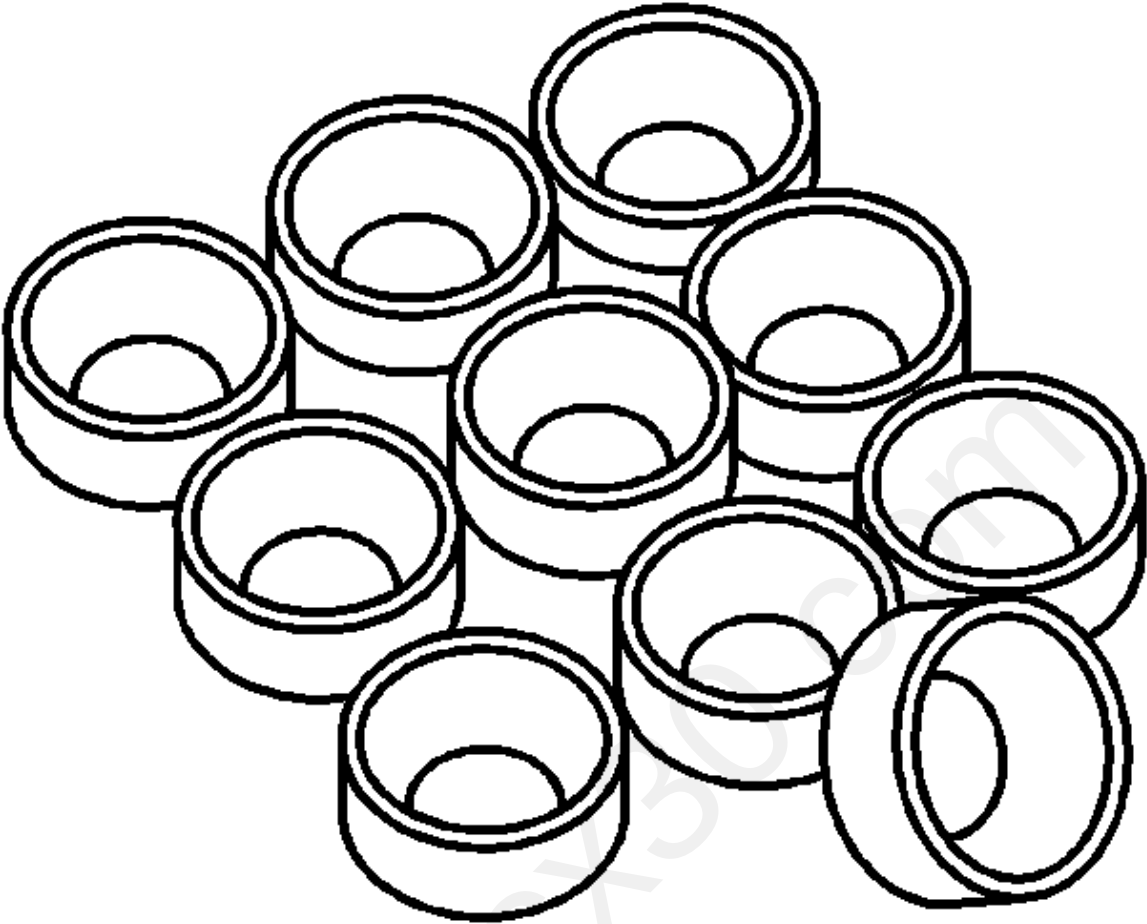
Illustration	Tool Number/ Description
	CH 42450-A J 42450-A Wheel Hub Resurfacing Kit

Illustration

Tool
Number/
Description



CH 45101
J 45101
Hub and
Wheel Runout
Gauge

Illustration	Tool Number/ Description
	CH 45101-100 J 45101-100 Conical Brake Rotor Washers