

2010 BRAKES

Disc Brakes - Equinox & Terrain

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Application	Specification	
	Metric	English
Brake Caliper Bracket Bolt - Front	190 N.m	140 lb ft
Brake Caliper Bracket Bolt - Rear	125 N.m	92 lb ft
Brake Caliper Guide Pin Bolt - Front and Rear	27 N.m	20 lb ft
Brake Hose Fitting Bolt - Front	40 N.m	30 lb ft
Brake Hose Fitting Bolt - Rear	52 N.m	38 lb ft
Brake Rotor Screw - Front	9 N.m	80 lb in
Brake Rotor Screw - Rear	10 N.m	89 lb in

DISC BRAKE COMPONENT SPECIFICATIONS

Application	Specification	
	Metric	English
Brake Pads - Front and Rear		
Minimum Thickness	2.0 mm	0.08 in
Front Disc Brake Rotor		
Diameter	321.00 mm	12.64 in
Discard Thickness*	27.00 mm	1.06 in
Maximum Allowable Lateral Runout	0.06 mm	0.002 in
Maximum Allowable Scoring	1.60 mm	0.06 in
Maximum Allowable Thickness Variation	0.025 mm	0.001 in
Rear Disc Brake Rotor		
Diameter	303.00 mm	11.93 in
Discard Thickness*	18.40 mm	0.72 in
Maximum Allowable Lateral Runout	0.06 mm	0.002 in
Maximum Allowable Scoring	1.60 mm	0.06 in
Maximum Allowable Thickness Variation	0.025 mm	0.001 in
*All disc brake rotors have a discard dimension cast into them. Replace any rotor that does not meet this specification. After refinishing the brake rotor, measure the brake rotor thickness. Replace any brake rotor which exceeds the discard specification.		

DIAGNOSTIC INFORMATION AND PROCEDURES

BRAKE ROTOR THICKNESS MEASUREMENT

WARNING: Refer to Brake Dust Warning .

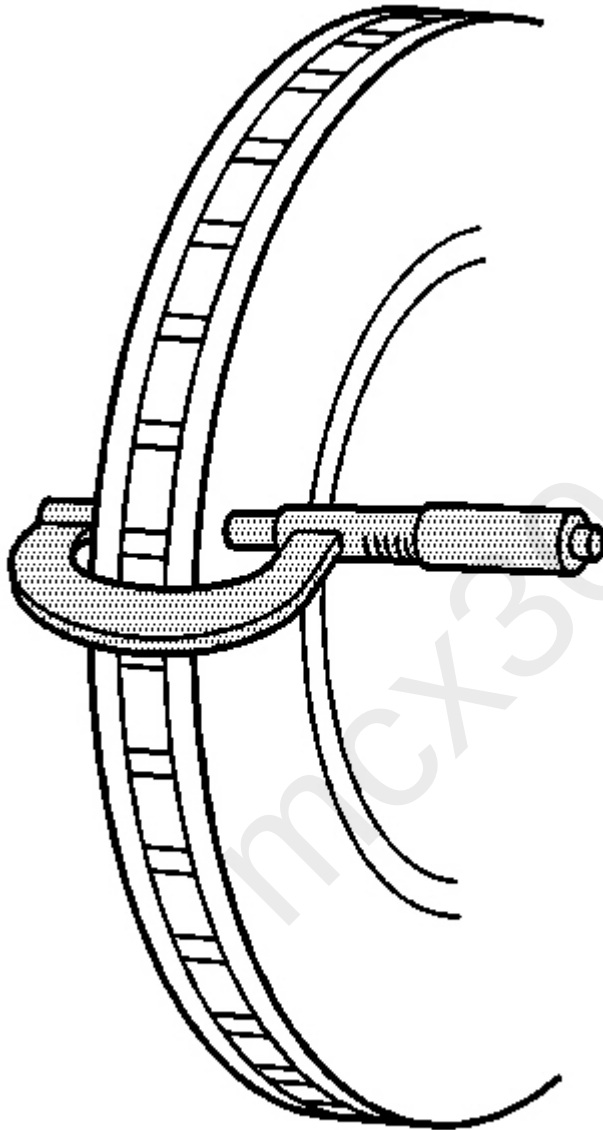


Fig. 1: Measuring Brake Rotor Thickness
Courtesy of GENERAL MOTORS CORP.

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. Using a micrometer 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 following specifications:

Specification - Front: Brake rotor discard thickness: 27.0 mm (1.063 in)

Specification - Rear: Brake rotor discard thickness: 18.4 mm (0.724 in)

5. If the lowest thickness measurement of the brake rotor is above the minimum allowable thickness after refinishing specification, the rotor may be able to be refinished, depending upon surface and wear conditions which may be present.
6. If the lowest thickness measurement of the brake rotor is at or below the minimum allowable thickness after refinishing specification, the rotor may not be refinished.
7. If the lowest thickness measurement of the brake rotor is at or below the discard thickness specification, the rotor requires replacement.

BRAKE ROTOR THICKNESS 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**.
2. Clean the friction surfaces of the brake rotor with denatured alcohol, or an equivalent approved brake cleaner.

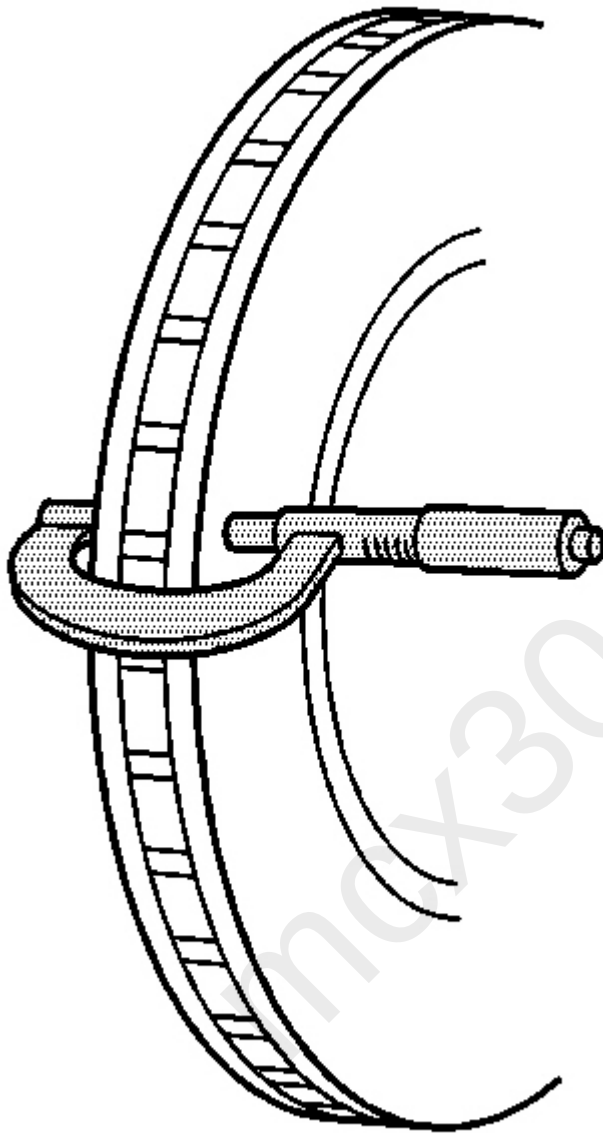


Fig. 2: Measuring Brake Rotor Thickness
Courtesy of GENERAL MOTORS CORP.

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.
5. Compare the thickness variation measurement to the following specification:

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

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

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

BRAKE ROTOR SURFACE AND WEAR INSPECTION

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

1. If the inboard friction surface of the brake rotor is not accessible, reposition and support the caliper with the brake pads. Refer to **Front Disc Brake Pads Replacement** 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.

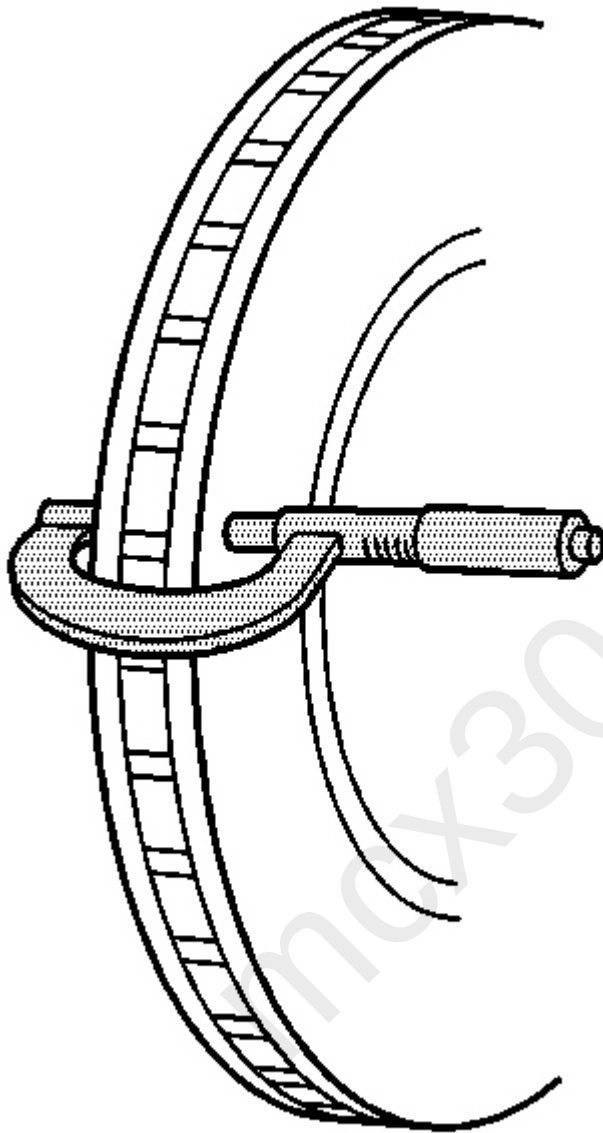


Fig. 3: Measuring Brake Rotor Thickness
Courtesy of GENERAL MOTORS CORP.

5. Using a micrometer 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: 1.60 mm (0.06 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-39544-KIT:** Complete Torque Socket Set - 10 PCS, or equivalent
- **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

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** 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.

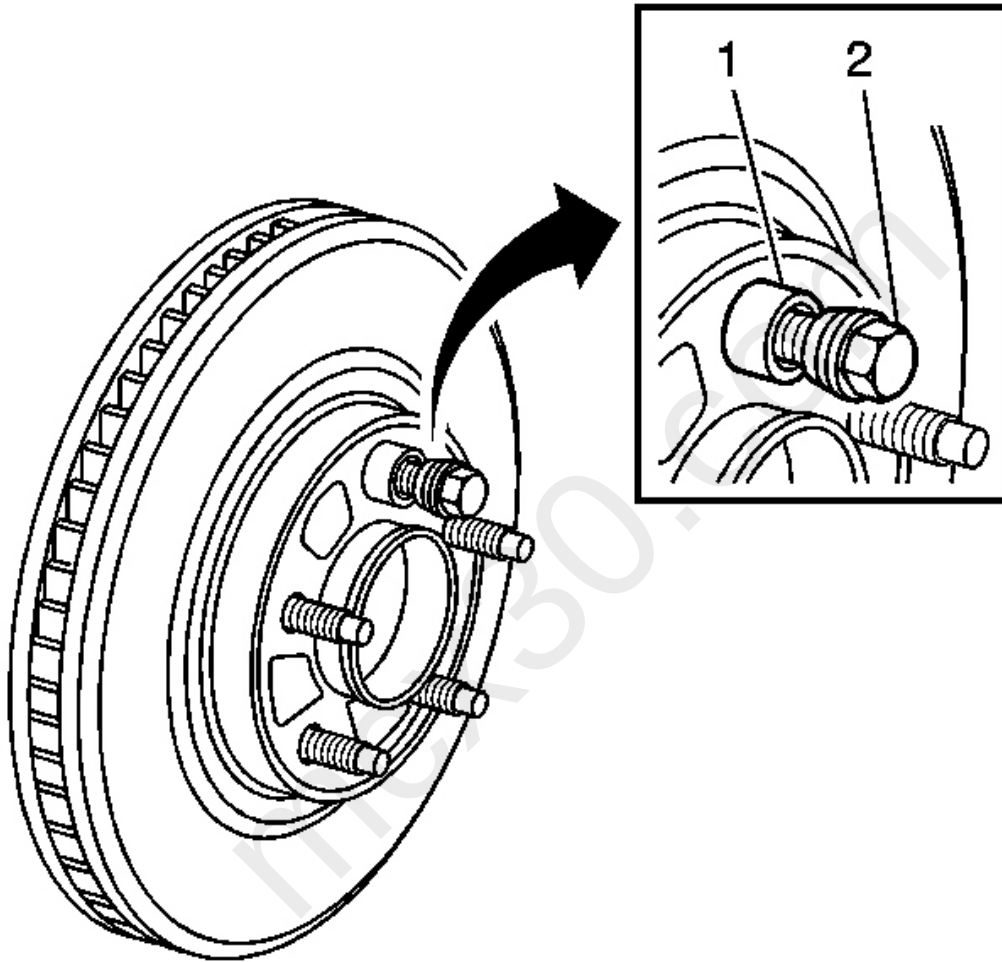


Fig. 4: Identifying J 45101-100 & Lug Nut
Courtesy of GENERAL MOTORS CORP.

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.

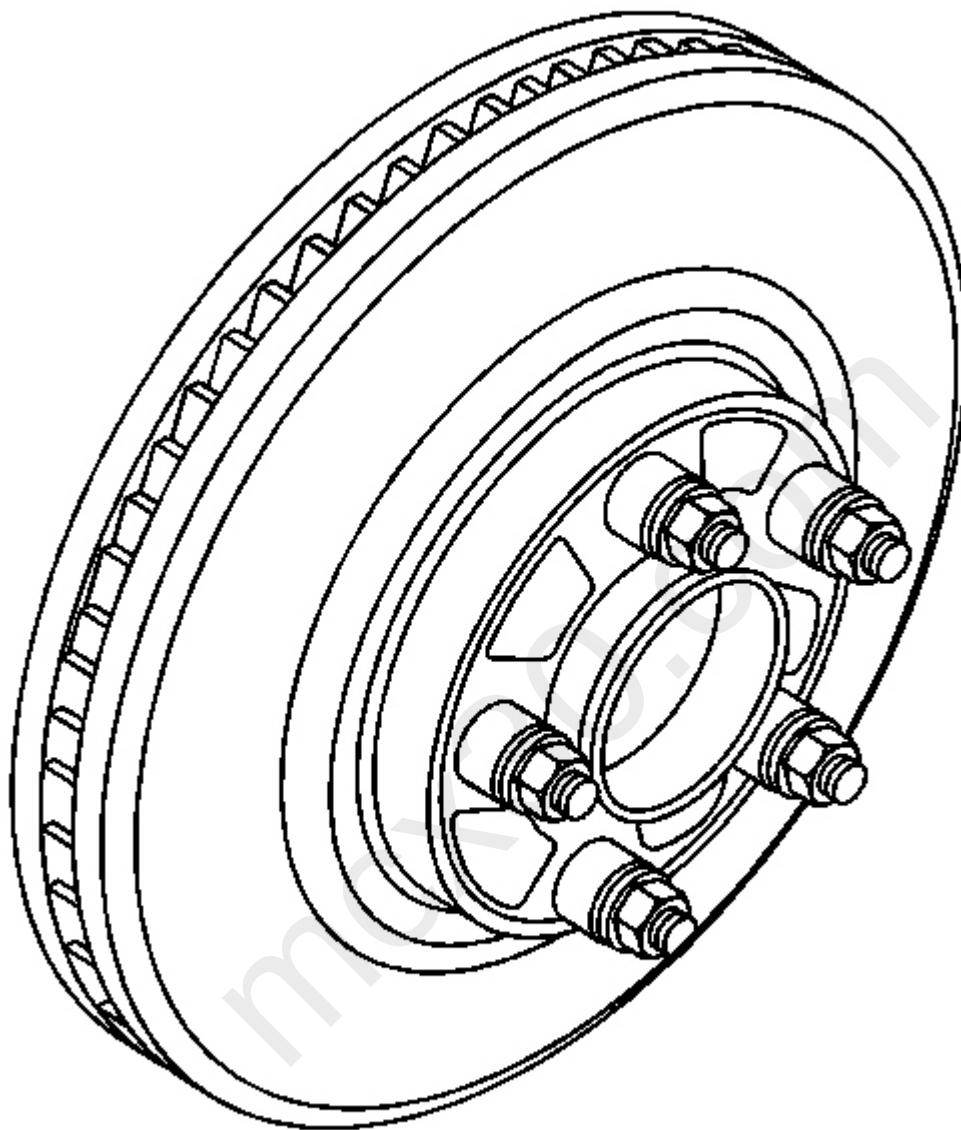


Fig. 5: Identifying All J 45101-100s & Lug Nuts
Courtesy of GENERAL MOTORS CORP.

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. Using the **CH-39544-KIT**: Complete Torque Socket Set - 10 PCS, or equivalent, 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. 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.

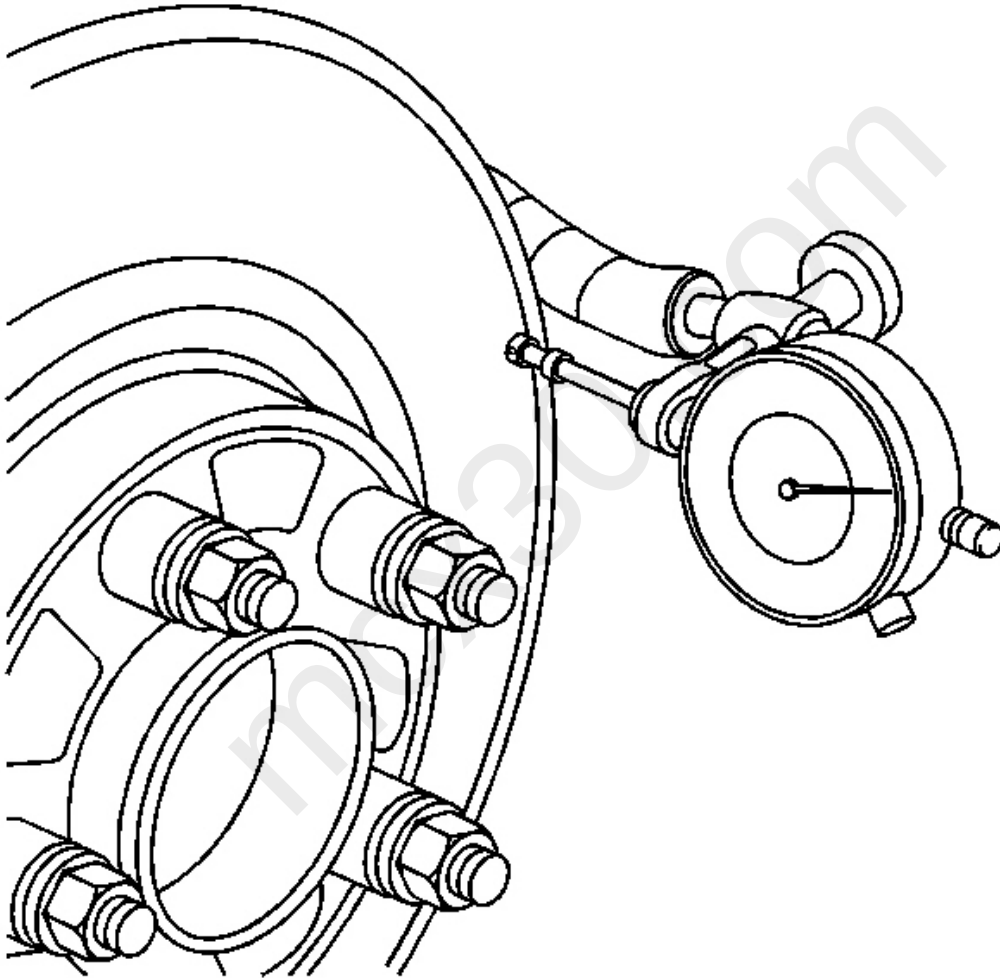


Fig. 6: Measuring Lateral Runout
Courtesy of GENERAL MOTORS CORP.

10. Mount a dial indicator, **CH-45101: Hub and Wheel Runout Gauge**, or equivalent, to the steering knuckle and position the indicator button so it contacts the brake rotor friction surface at a 90 degree angle, approximately 13 mm (0.5 in) from the outer edge of the rotor.

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

Specification:

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

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

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

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

Specification:

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

17. If the brake rotor assembled LRO measurement exceeds the specification, bring the LRO to within specifications. Refer to **Brake Rotor Assembled Lateral Runout Correction**.
18. If the brake rotor assembled LRO measurement is within specification, install the brake caliper and depress the brake pedal several times to secure the rotor in place before removing the **CH-45101-100**: Conical Brake Rotor Washers and the lug nuts.

BRAKE PAD INSPECTION

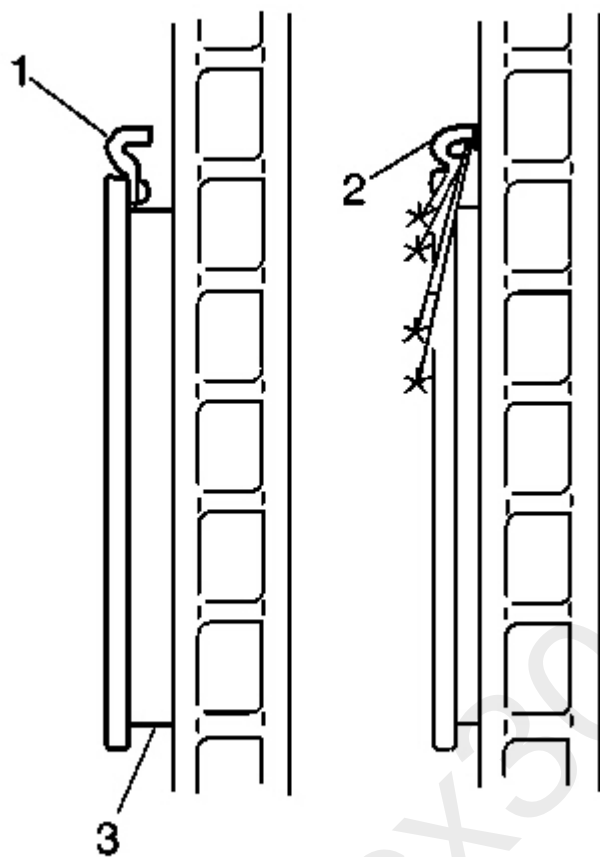


Fig. 7: Identifying Brake Pads & Audible Wear Sensors
Courtesy of GENERAL MOTORS CORP.

WARNING: Refer to Brake Dust Warning .

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

reaches the minimum allowable thickness, the wear sensor contacts the disc brake rotor (2). The wear indicator will then produce an audible, high-pitched warning noise during wheel rotation.

6. Replace the disc brake pads when the friction surface (3) is worn to within 0.76 mm (0.030 in) of the mounting plates.
7. Remove the brake calipers and inspect the friction surfaces of the inner and outer disc brake pads to ensure that they are level. Place the disc brake pad friction surfaces together and measure the gap between the surfaces. If more than 0.13 mm (0.005 in) gap exists midway between the length of the disc brake pads, replace the disc brake pads.
8. Verify that any disc brake pad shims that may be required are in place and not damaged or excessively corroded. Replace any missing or damaged shims in order to preserve proper disc brake performance.
9. Replace the disc brake pads if any have separated from the mounting plates.
10. Inspect the disc brake pads friction surfaces for cracks, fractures, or damage which may cause noise or otherwise impair disc brake performance.

BRAKE CALIPER INSPECTION

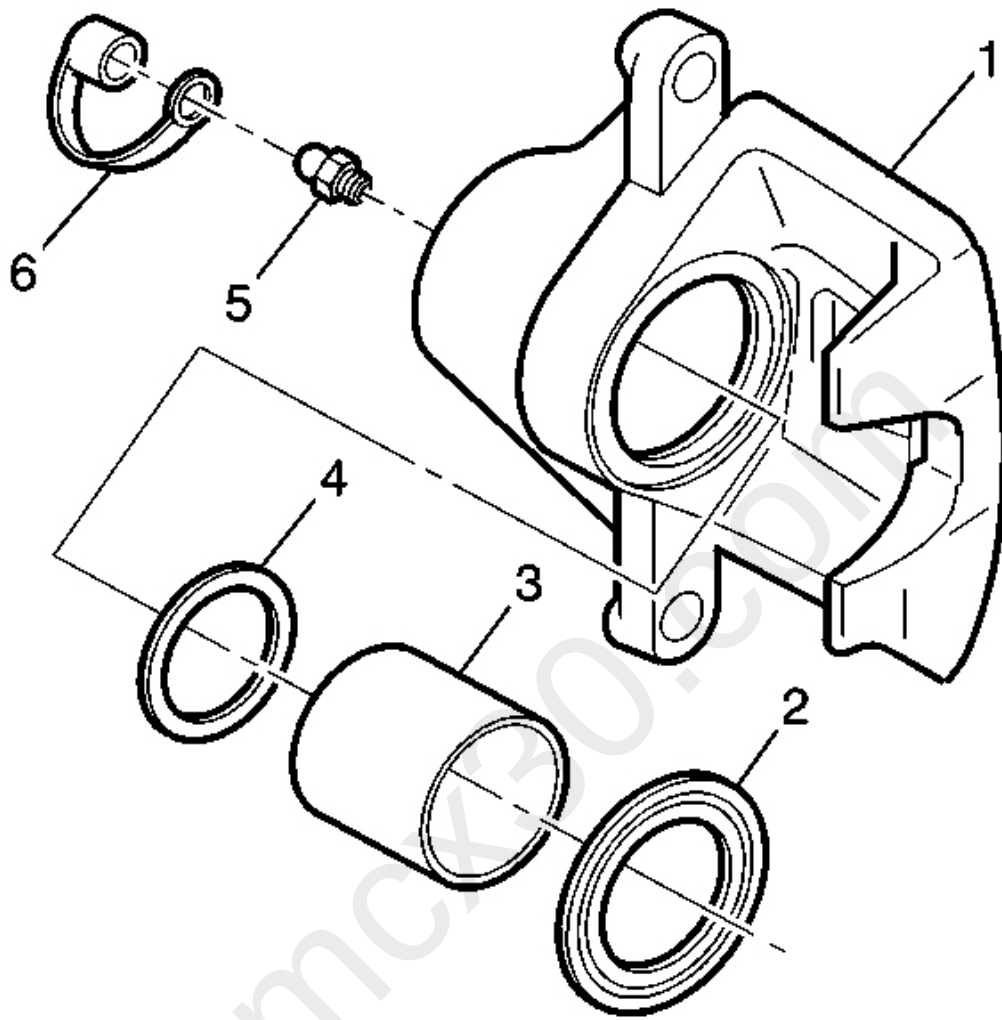


Fig. 8: Exploded View Of Brake Caliper
Courtesy of GENERAL MOTORS CORP.

WARNING: Refer to Brake Dust Warning .

1. Inspect the brake caliper housing (1) for cracks, excess wear, and/or damage. If any of these conditions are present, the brake caliper requires replacement.
2. Inspect the caliper piston dust boot seal (2) for cracks, tears, cuts, deterioration and/or improper seating in the caliper body. If any of these conditions are present, the brake caliper requires overhaul or replacement.

3. Inspect for brake fluid leakage around the caliper piston dust boot seal (2) and on the disc brake pads. If there is any evidence of brake fluid leakage, the brake caliper requires overhaul or replacement.

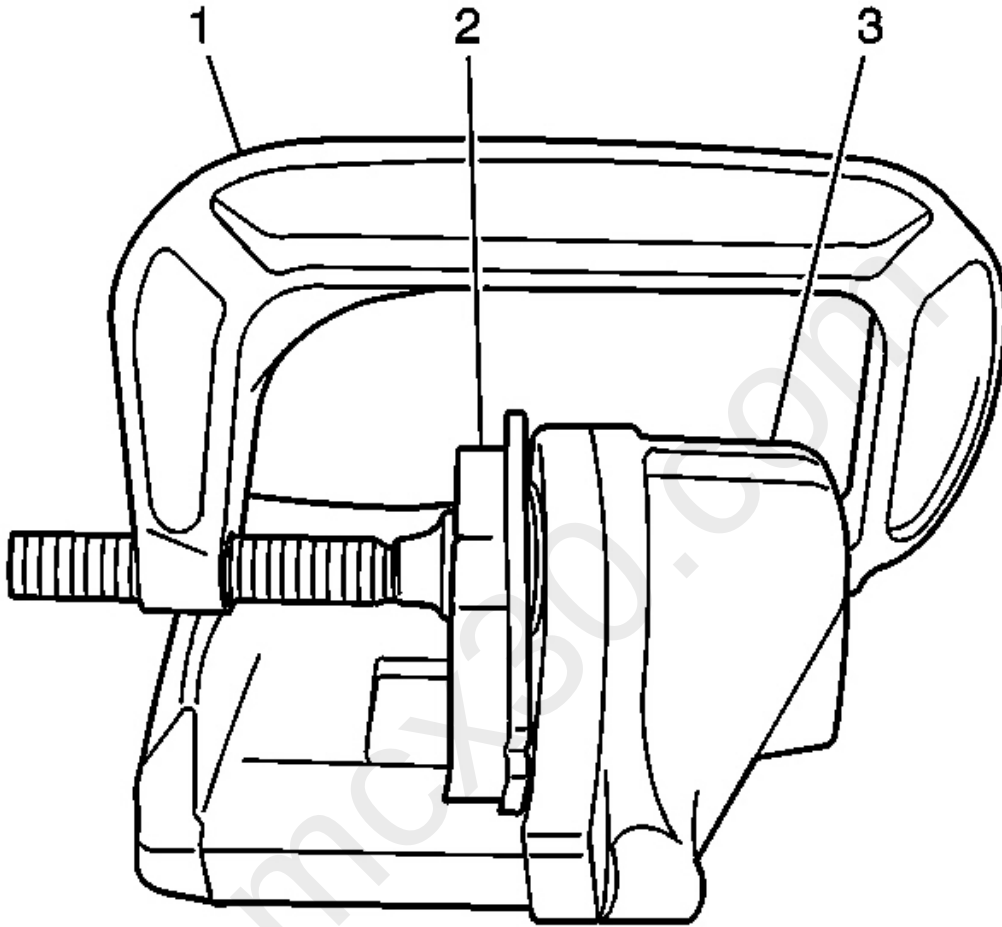


Fig. 9: Compressing Caliper Piston
Courtesy of GENERAL MOTORS CORP.

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

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

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

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

FRONT DISC BRAKE MOUNTING AND HARDWARE INSPECTION

WARNING: Refer to Brake Dust Warning .

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

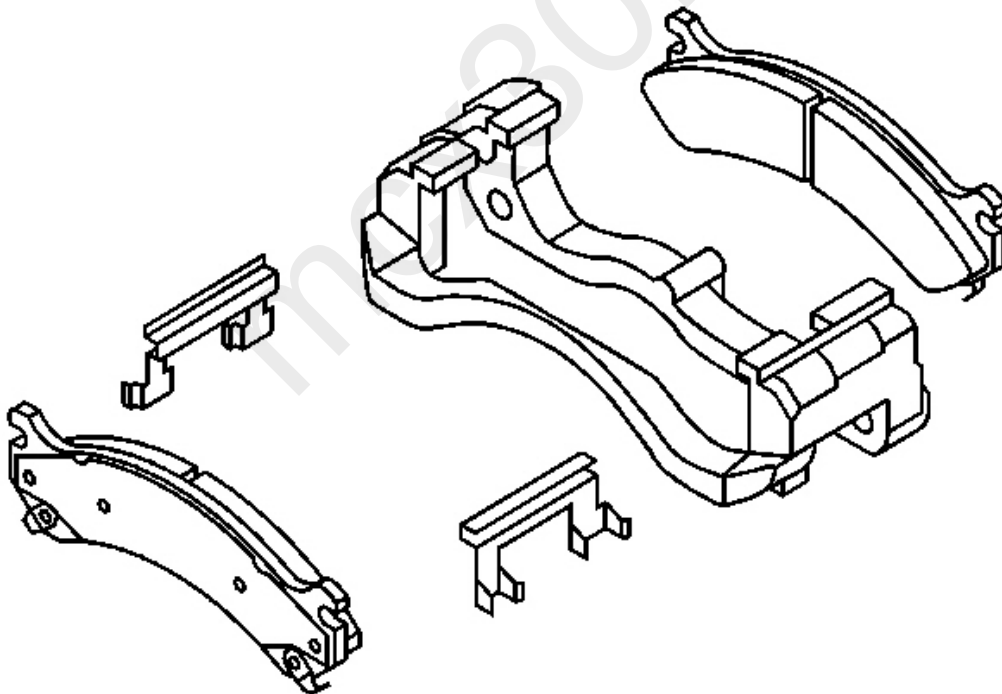


Fig. 10: View Of Disc Brake Pads & Brake Caliper Mounting Bracket
Courtesy of GENERAL MOTORS CORP.

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

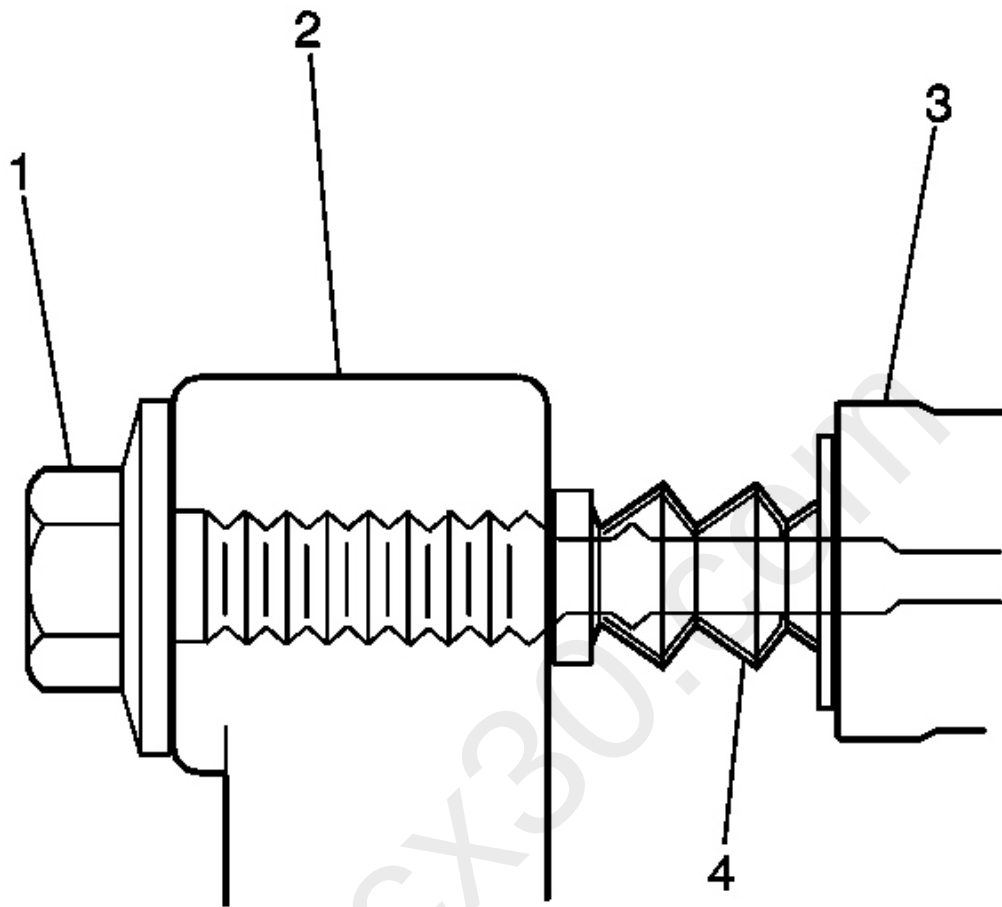


Fig. 11: View Of Caliper, Pin, Boots & Caliper Mounting Bracket
Courtesy of GENERAL MOTORS CORP.

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

17. Install the disc brake caliper to the brake caliper mounting bracket. Refer to **Front Brake Caliper Replacement**.

REAR DISC BRAKE MOUNTING AND HARDWARE INSPECTION

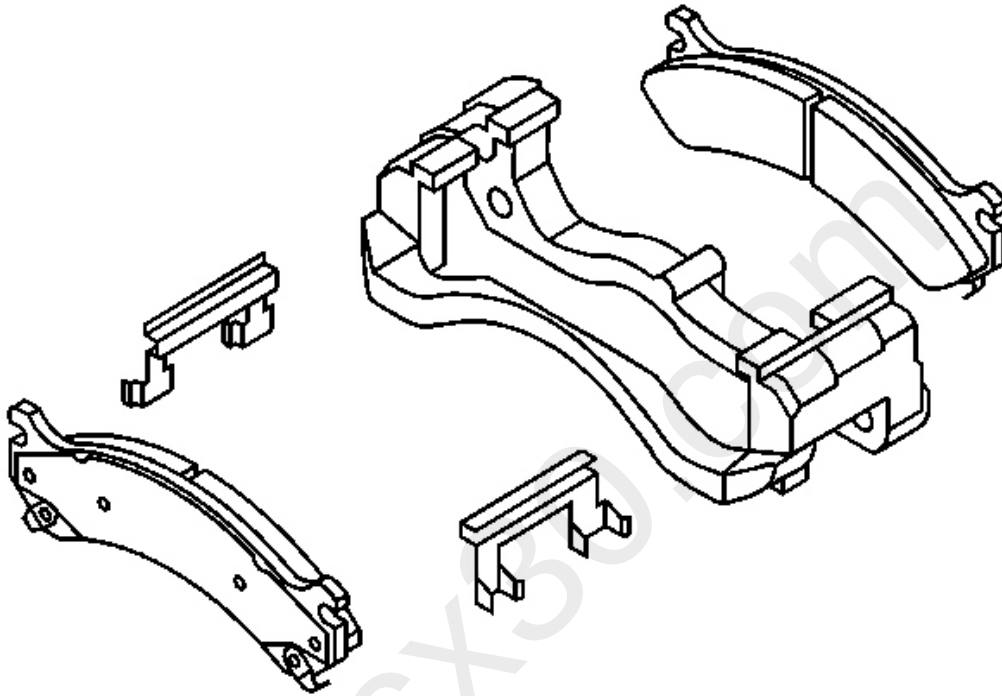


Fig. 12: View Of Disc Brake Pads & Brake Caliper Mounting Bracket
Courtesy of GENERAL MOTORS CORP.

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

1. Remove the disc brake caliper from the caliper mounting bracket.
2. Remove the disc brake pads from the caliper mounting bracket.
3. Inspect the disc brake pad mounting hardware for the following:
 - Missing mounting hardware
 - Excessive corrosion
 - Bent mounting tabs
 - Looseness at the caliper mounting bracket

- Looseness at the disc brake pads
- 4. If any of the conditions listed are found, the disc brake pad mounting hardware requires replacement.
- 5. Ensure the disc brake pads are held firmly in place on the caliper mounting bracket, yet slide easily on the mounting hardware without binding.
- 6. Install the disc brake pads to the caliper mounting bracket.
- 7. Install the disc brake caliper to the mounting bracket.

REPAIR INSTRUCTIONS

FRONT DISC BRAKE PADS 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 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. Place a large C-clamp over the brake caliper body and against the outer brake pad.
7. Using the C-clamp, compress the brake caliper piston fully into the brake caliper bore.

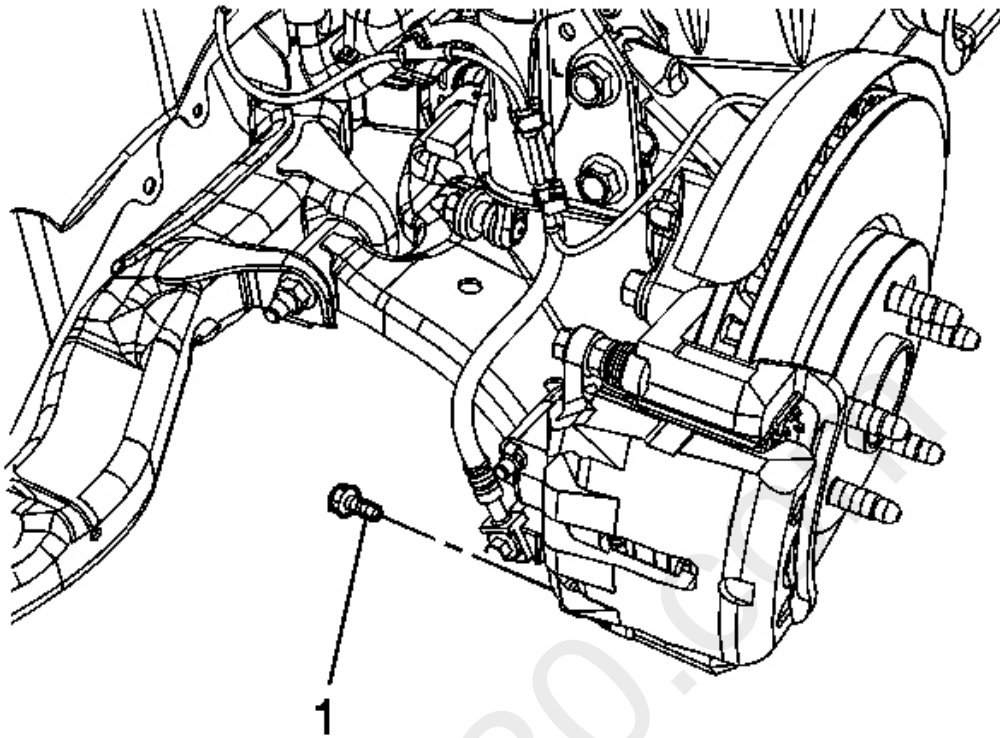


Fig. 13: Lower Brake Caliper Guide Pin Bolt
Courtesy of GENERAL MOTORS CORP.

NOTE:

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

8. Using a backup wrench to hold the brake caliper guide pin stationary, remove the lower brake caliper guide pin bolt (1).
9. Pivot the brake caliper upward.

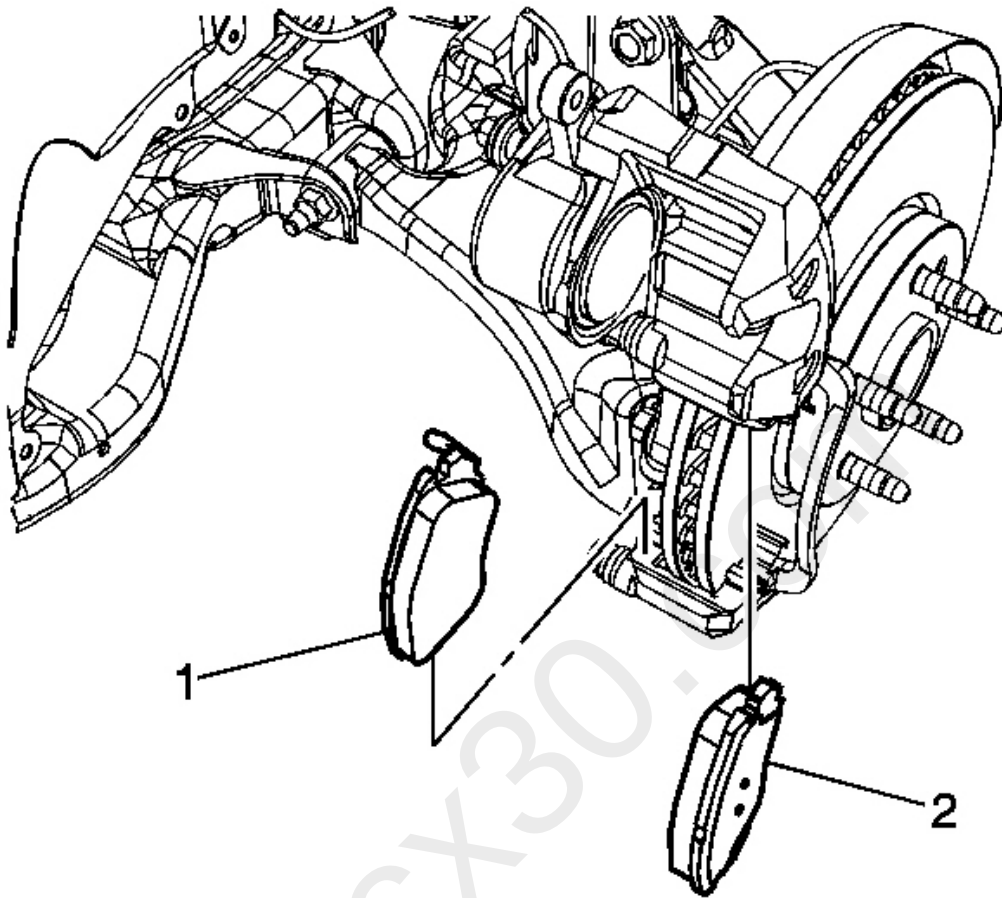


Fig. 14: Inner & Outer Brake Pads
Courtesy of GENERAL MOTORS CORP.

NOTE: Note the location of the brake pad wear sensor for correct installation.

10. Remove the inner brake pad (1) and the outer brake pad (2).

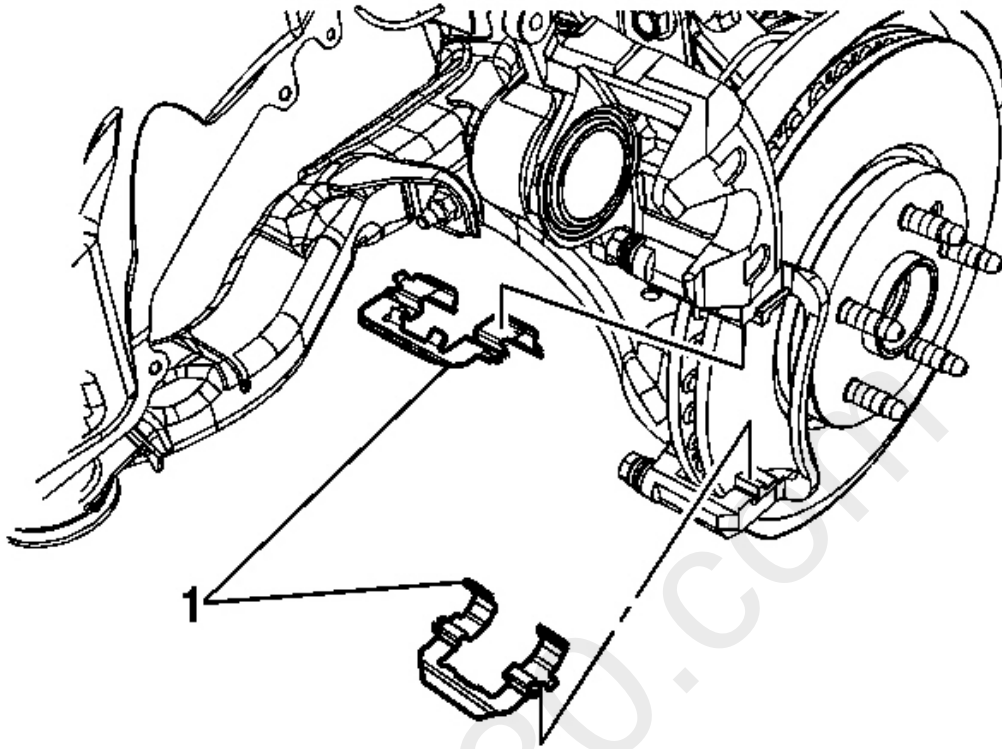


Fig. 15: Upper & Lower Brake Pad Springs
Courtesy of GENERAL MOTORS CORP.

11. Remove the upper and lower brake pad springs (1).
12. If installing new brake pads, discard the springs.

Installation Procedure

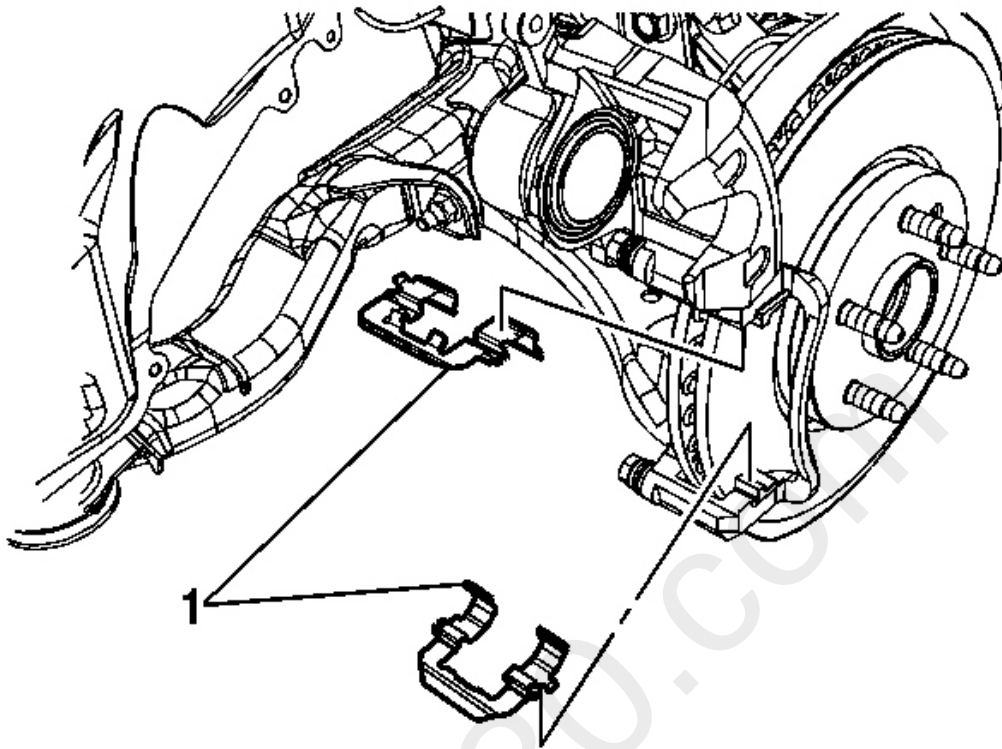


Fig. 16: Upper & Lower Brake Pad Springs
Courtesy of GENERAL MOTORS CORP.

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

1. Install the upper and lower brake pad springs (1).

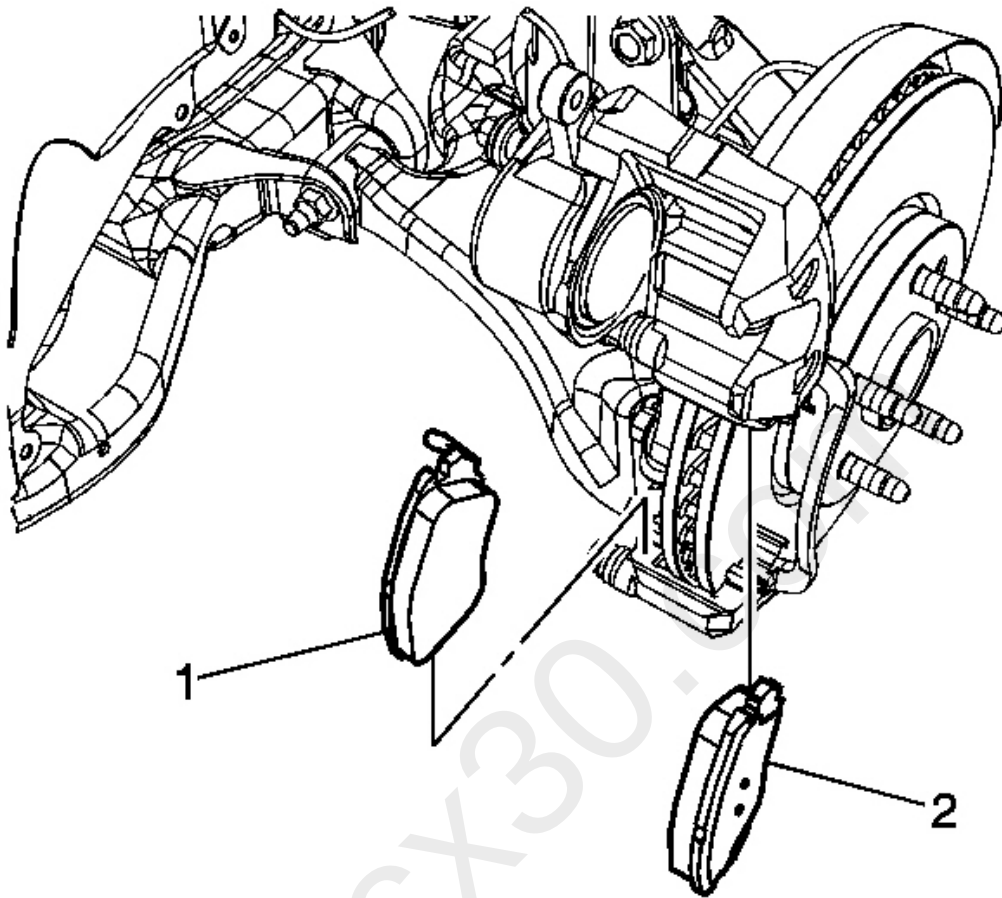


Fig. 17: Inner & Outer Brake Pads
Courtesy of GENERAL MOTORS CORP.

NOTE: **Note the location of the brake pad wear sensor for correct installation.**

2. Install the inner brake pad (1) and the outer brake pad (2).
3. Pivot the brake caliper to the installed position.

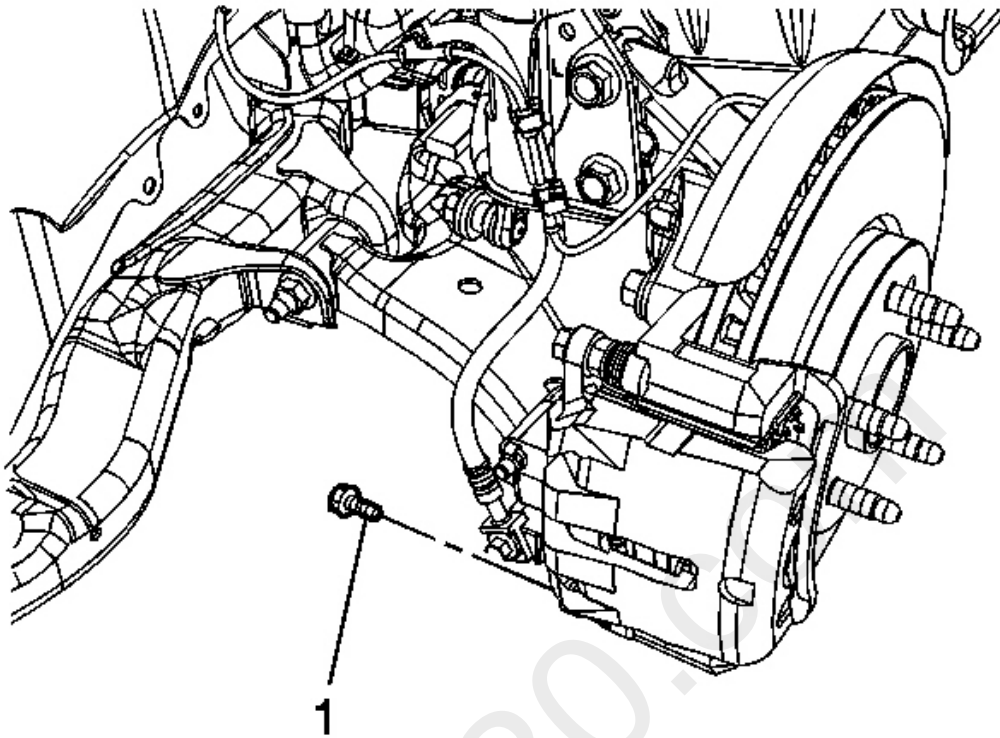


Fig. 18: Lower Brake Caliper Guide Pin Bolt
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to Fastener Caution .

4. Using a backup wrench to hold the brake caliper guide pin stationary, install the lower brake caliper guide pin bolt (1) and tighten to 27 N.m (20 lb ft).
5. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
6. With the engine OFF, gradually apply the brake pedal to approximately 2/3 of its travel distance.
7. Slowly release the brake pedal.
8. Wait 15 seconds, then repeat steps 6-7 until a firm brake pedal is obtained. This will properly seat the brake caliper piston and brake pads.
9. Fill the master cylinder reservoir. Refer to **Master Cylinder Reservoir Filling** .
10. 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 .

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 .

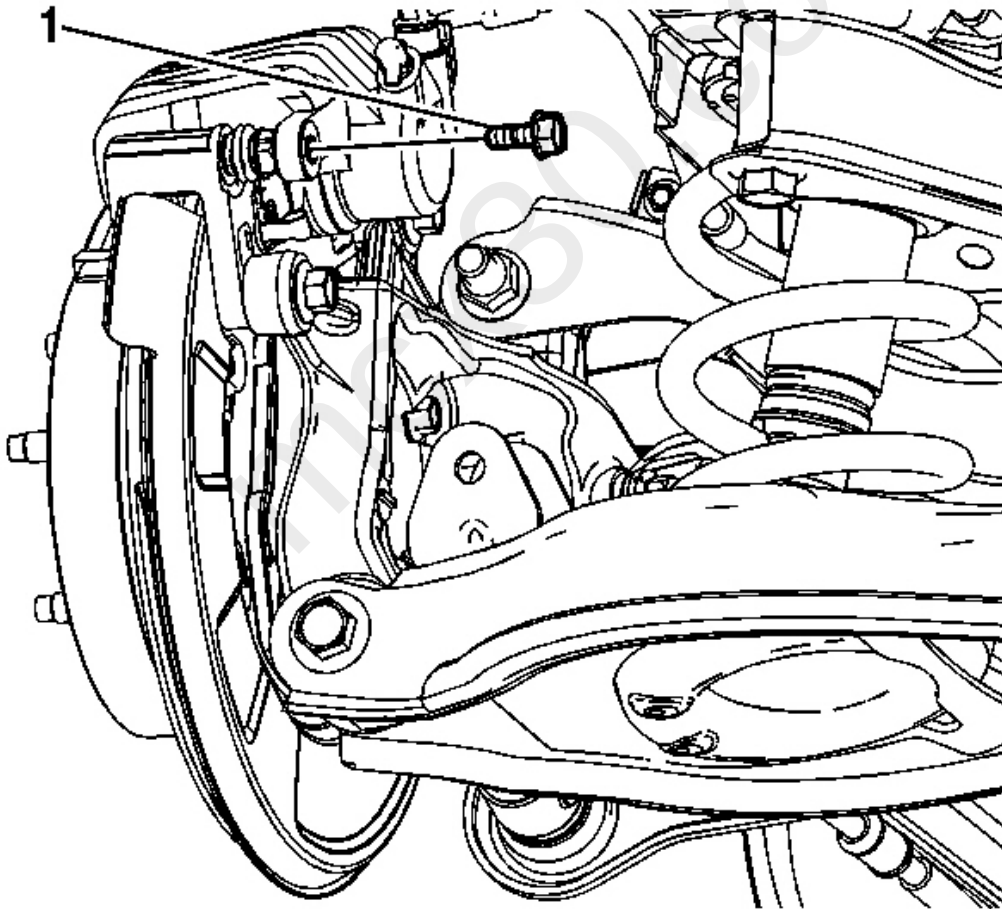


Fig. 19: Lower Brake Caliper Guide Pin Bolt
Courtesy of GENERAL MOTORS CORP.

NOTE:

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

6. Hold the brake caliper guide pin stationary and remove the lower brake caliper guide pin bolt (1).

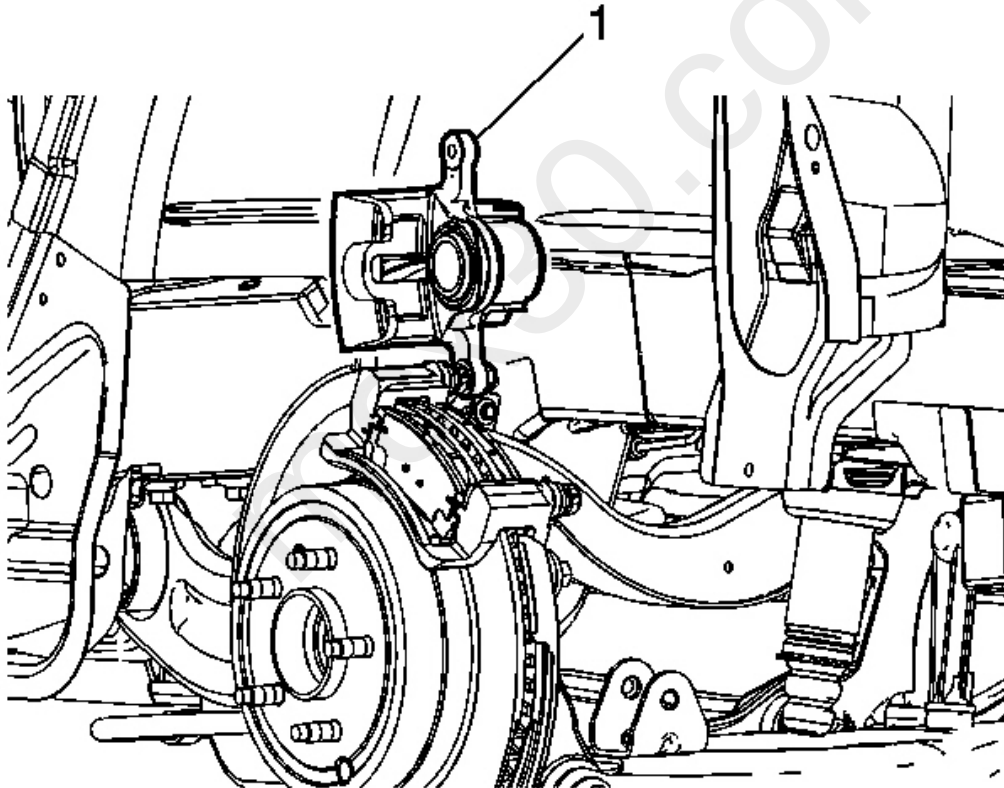


Fig. 20: Brake Caliper
Courtesy of GENERAL MOTORS CORP.

7. Pivot the brake caliper (1) upward.

8. Place a block of wood or an old brake pad against the brake caliper pistons.
9. Using a brake pad spreader tool or equivalent, fully seat the caliper piston in the caliper bore.

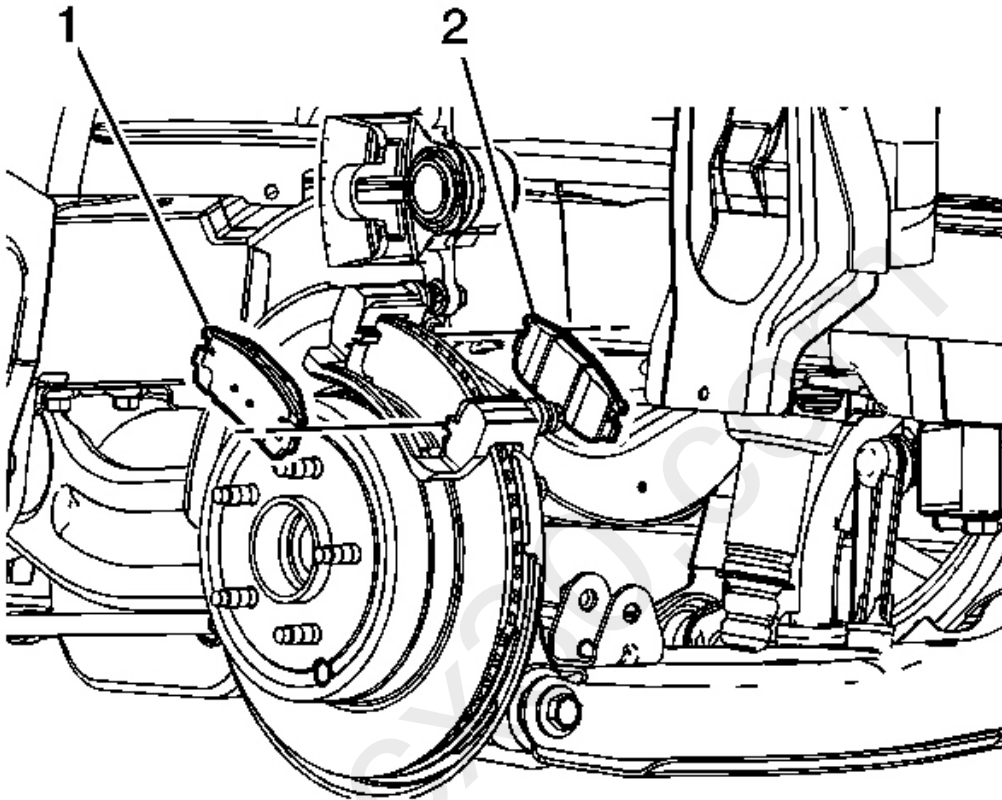


Fig. 21: Brake Pads

Courtesy of GENERAL MOTORS CORP.

NOTE: Note the location of the brake pad wear sensor for correct installation.

10. Remove the outer brake pad (1) and the inner brake pad (2).

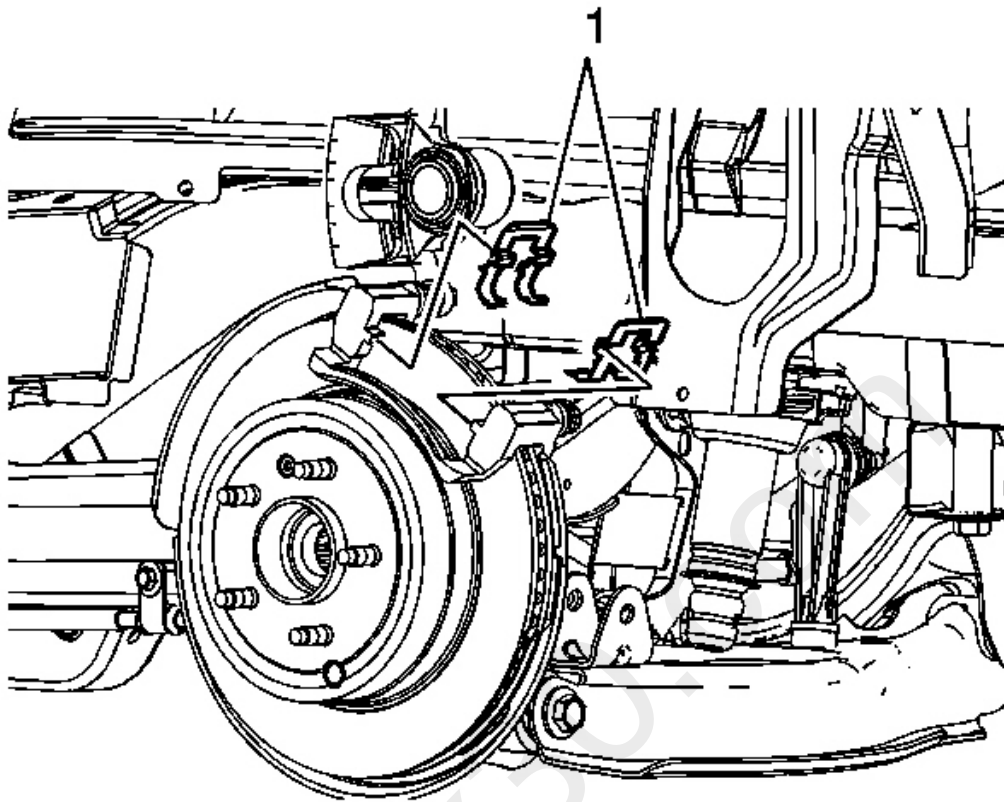


Fig. 22: Upper And Lower Brake Pad Shims
Courtesy of GENERAL MOTORS CORP.

11. Remove the upper and lower brake pad springs (1).
12. If installing new brake pads, discard the springs.

Installation Procedure

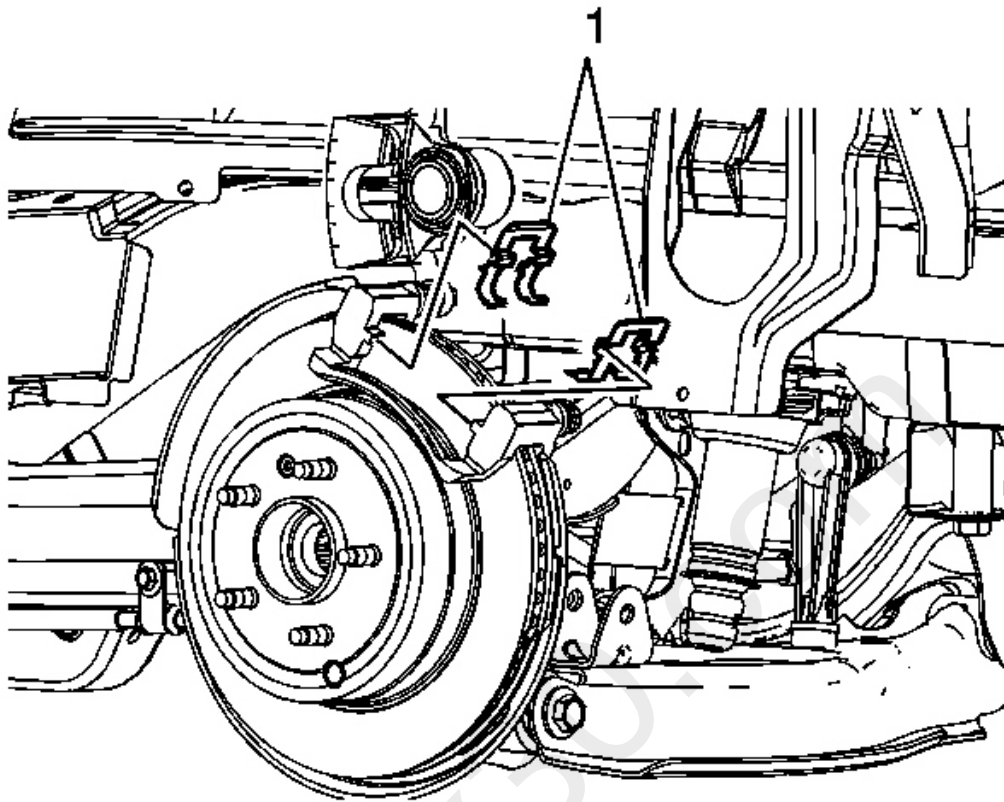


Fig. 23: Upper And Lower Brake Pad Shims
Courtesy of GENERAL MOTORS CORP.

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

1. Install the upper and lower brake pad springs (1).

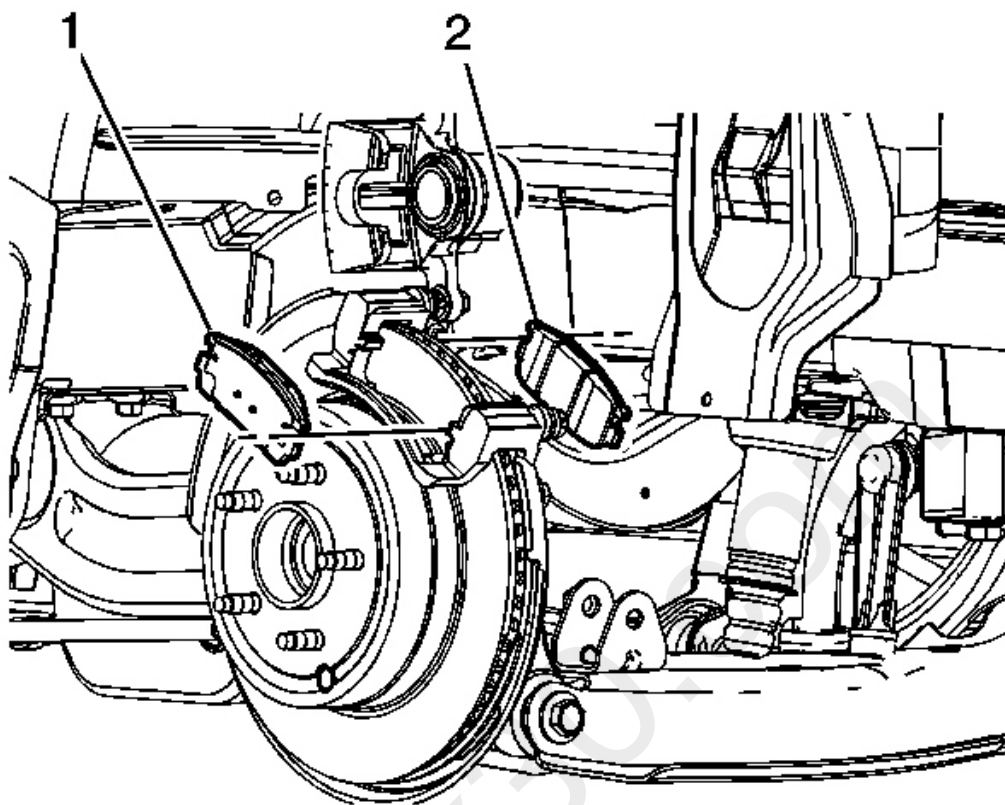


Fig. 24: Brake Pads

Courtesy of GENERAL MOTORS CORP.

NOTE: **Note the location of the brake pad wear sensor for correct installation.**

2. Install the outer brake pad (1) and the inner brake pad (2).
3. Pivot the brake caliper to the installed position.

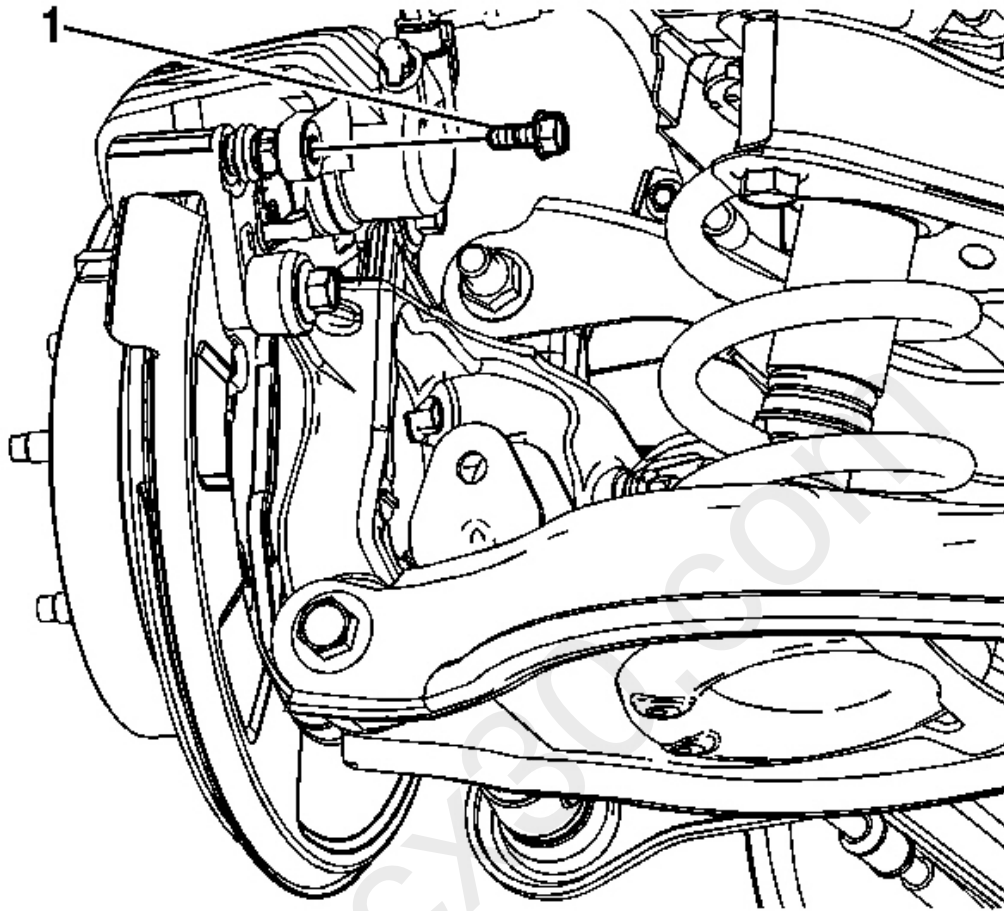


Fig. 25: Lower Brake Caliper Guide Pin Bolt
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to Fastener Caution .

4. Using a backup wrench to hold the brake caliper guide pin stationary, install the lower brake caliper guide pin bolt (1) and tighten to 27 N.m (20 lb ft).
5. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
6. With the engine OFF, gradually apply the brake pedal to approximately 2/3 of its travel distance.
7. Slowly release the brake pedal.
8. Wait 15 seconds, then repeat steps 6-7 until a firm brake pedal is obtained. This will properly seat the brake caliper pistons and brake pads.

9. Fill the master cylinder reservoir. Refer to Master Cylinder Reservoir Filling .
10. 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 Dust Warning .

WARNING: Refer to Brake Fluid Irritant 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 .

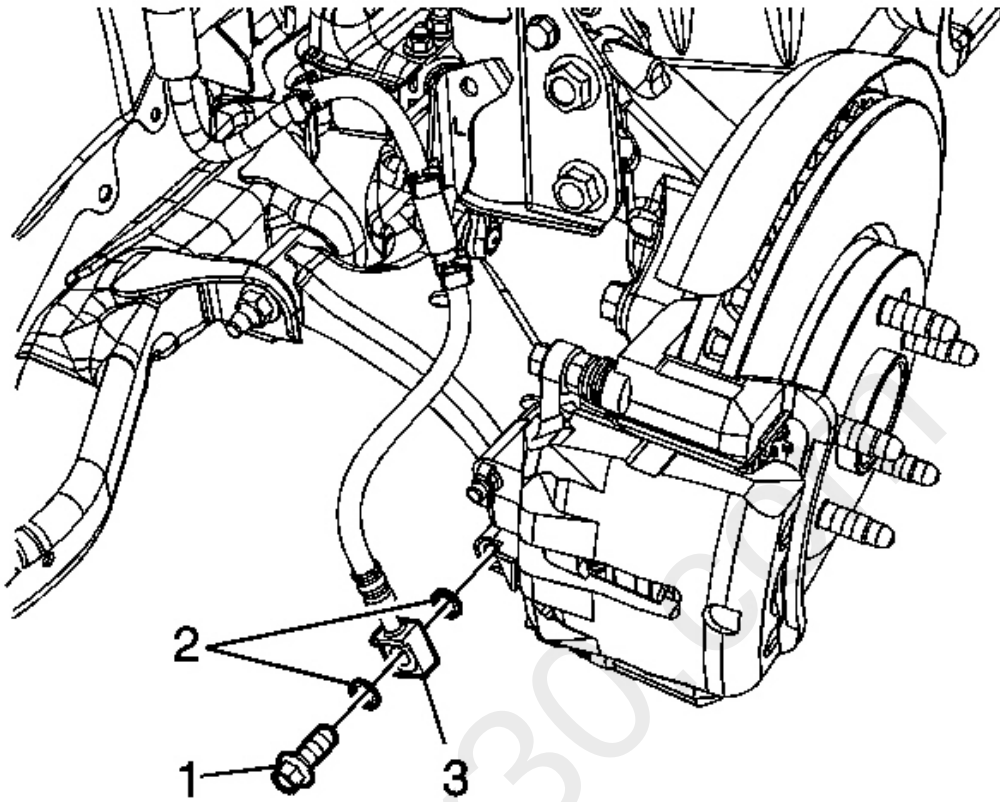


Fig. 26: Brake Hose Fitting, Bolt & Gaskets
Courtesy of GENERAL MOTORS CORP.

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

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

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

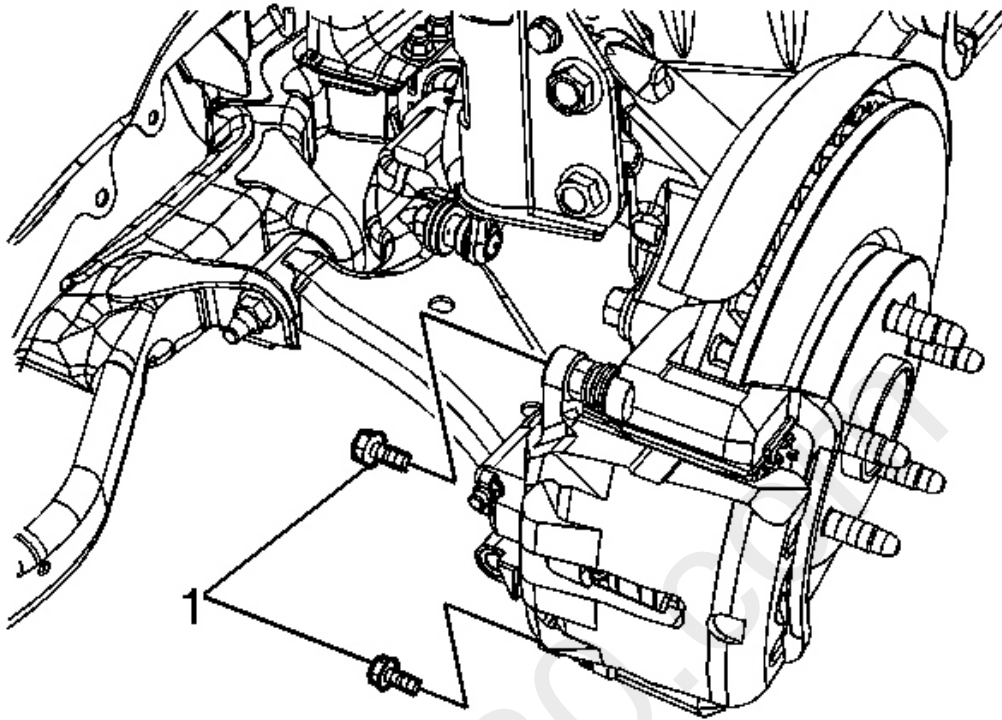


Fig. 27: Brake Caliper Guide Pin Bolts
Courtesy of GENERAL MOTORS CORP.

NOTE:

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

6. Using a backup wrench to hold the brake caliper guide pin stationary, remove the brake caliper guide pin bolts (1).
7. Remove the brake caliper.

Installation Procedure

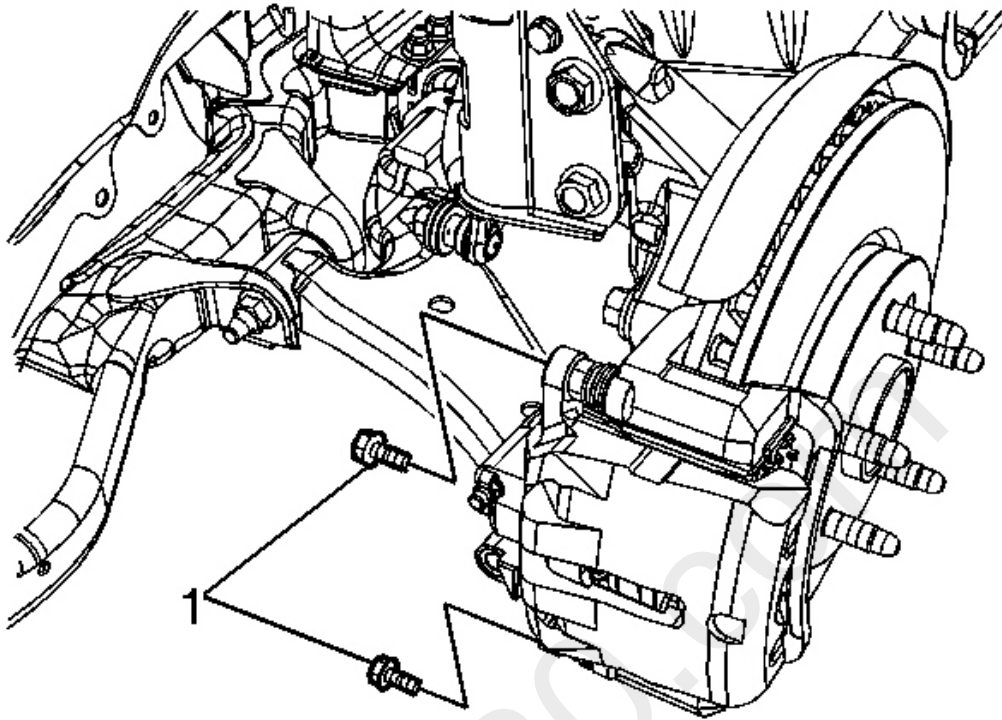


Fig. 28: Brake Caliper Guide Pin Bolts
Courtesy of GENERAL MOTORS CORP.

1. Install the brake caliper.

CAUTION: Refer to Fastener Caution .

2. Hold the brake caliper guide pin stationary and install the brake caliper guide pin bolts (1) and tighten to 27 N.m (20 lb ft).

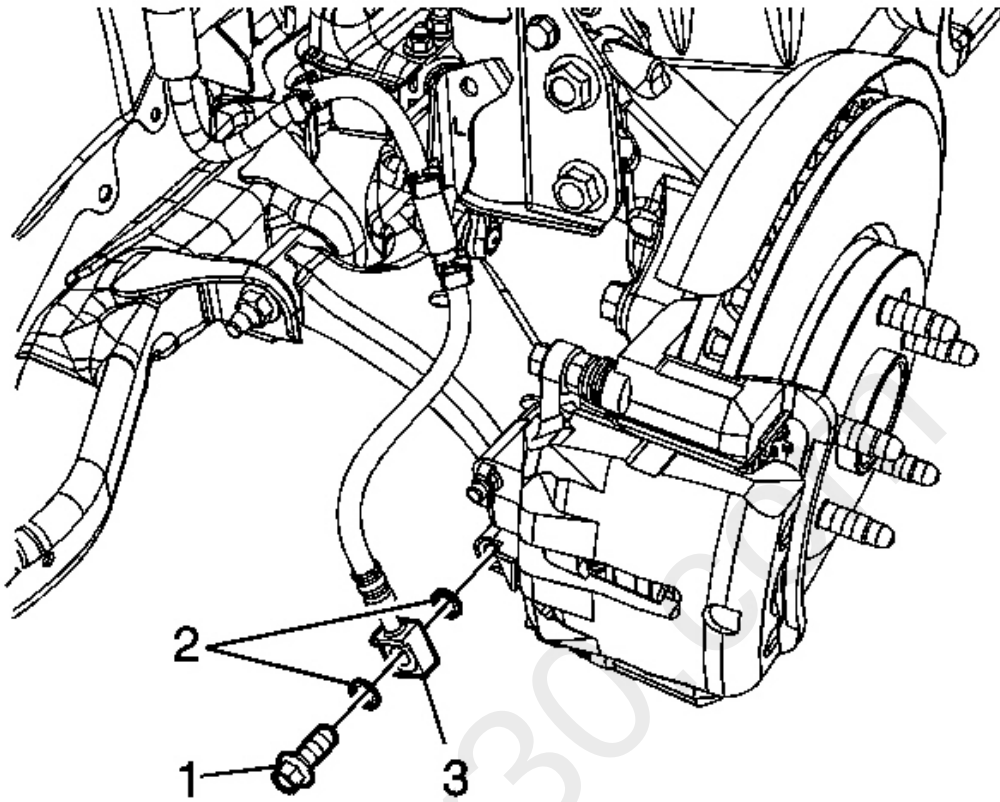


Fig. 29: Brake Hose Fitting, Bolt & Gaskets
Courtesy of GENERAL MOTORS CORP.

NOTE: **Install new brake hose fitting gaskets.**

3. Assemble the brake hose fitting bolt (1) and the 2 new brake hose fitting gaskets (2) to the front brake hose fitting (3).
4. Install the brake hose assembly and tighten the brake hose fitting bolt to 40 N.m (30 lb ft).
5. Bleed the hydraulic brake system. Refer to **Hydraulic Brake System Bleeding (Manual)** or **Hydraulic Brake System Bleeding (Pressure)** .
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 .
2. Remove the tire and wheel assembly. Refer to Tire and Wheel Removal and Installation .

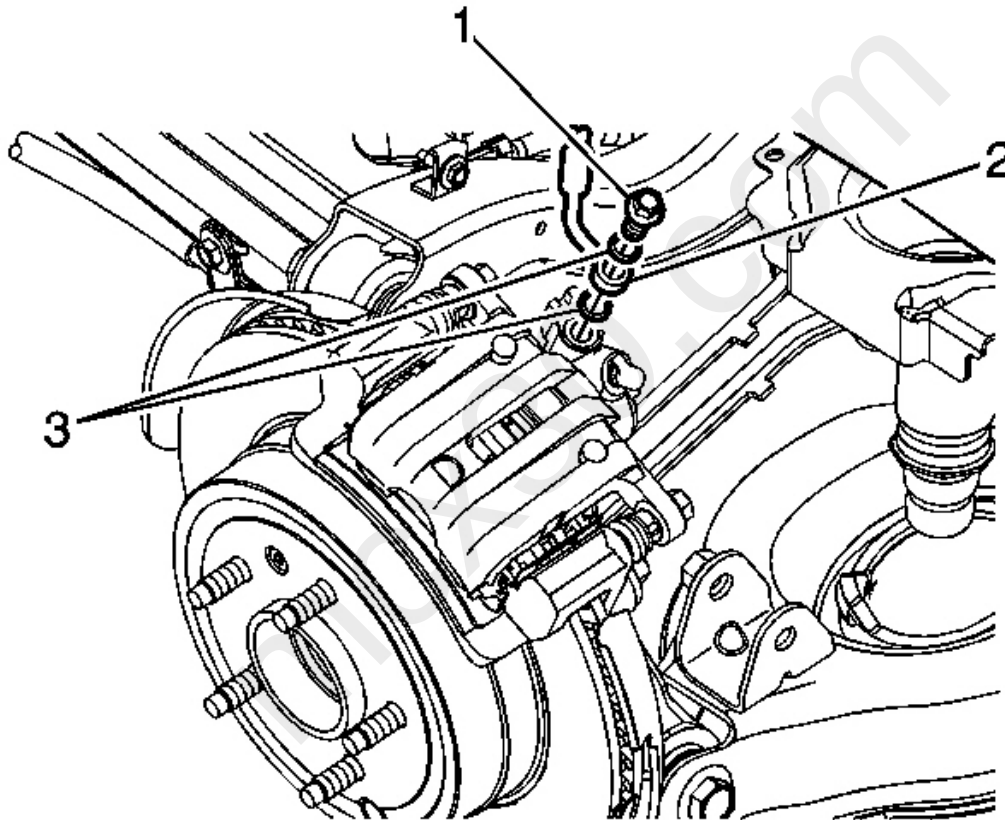


Fig. 30: Brake Hose Fitting, Bolt & Gaskets
Courtesy of GENERAL MOTORS CORP.

3. Remove the brake hose fitting bolt (1).
4. Remove the brake hose fitting (2) from the brake caliper.

NOTE: Do not reuse the brake hose fitting gaskets.

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

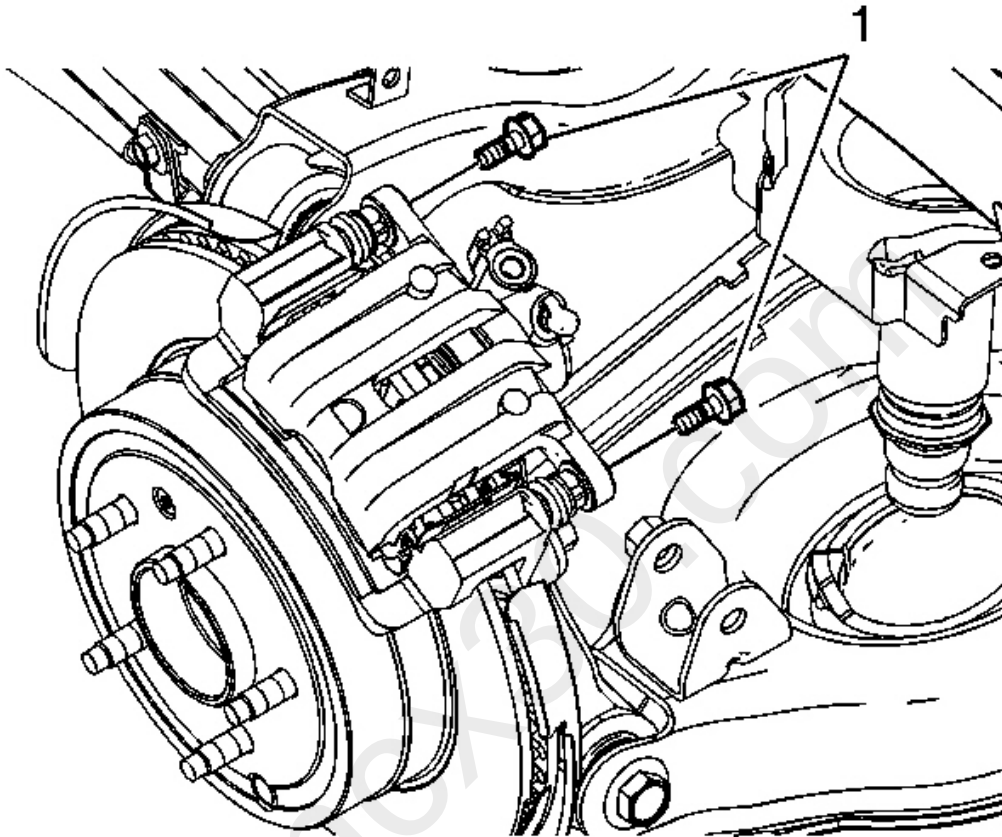


Fig. 31: Brake Caliper Guide Pin Bolts
Courtesy of GENERAL MOTORS CORP.

NOTE:

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

7. Hold the brake caliper guide pin stationary and remove the brake caliper guide pin bolts (1).

8. Remove the brake caliper.

Installation Procedure

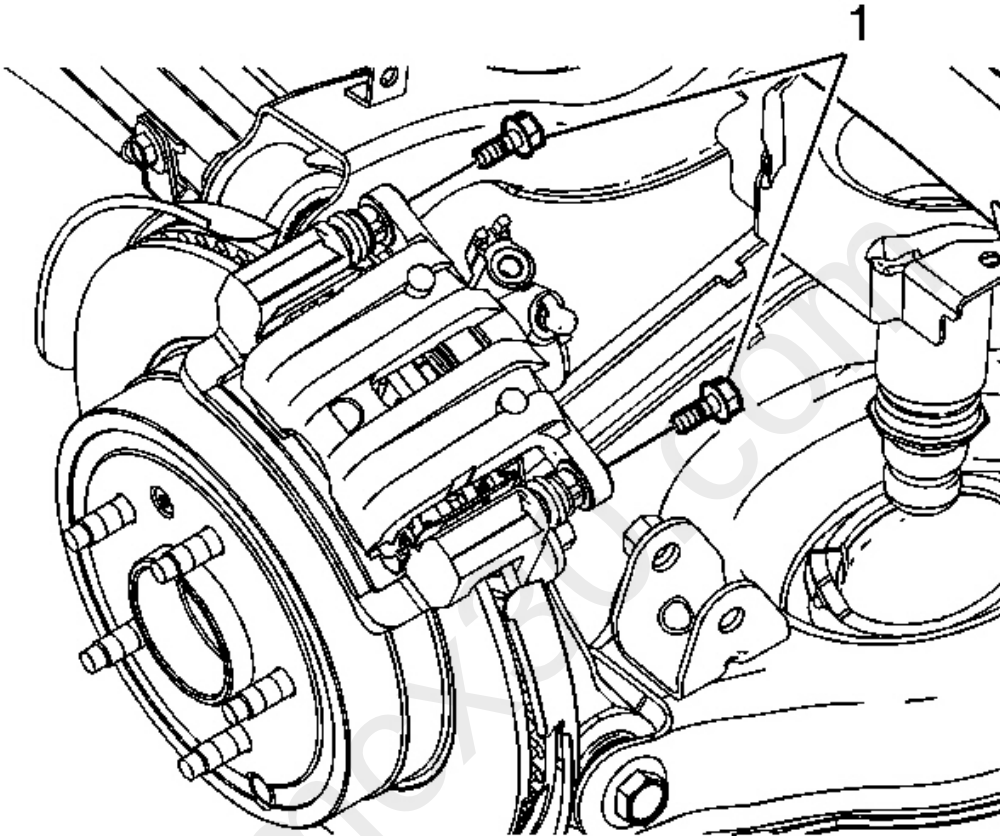


Fig. 32: Brake Caliper Guide Pin Bolts
Courtesy of GENERAL MOTORS CORP.

1. Install the brake caliper.

CAUTION: Refer to Fastener Caution .

2. Hold the brake caliper guide pin stationary and install the brake caliper guide pin bolts (1) and tighten to 27 N.m (20 lb ft).

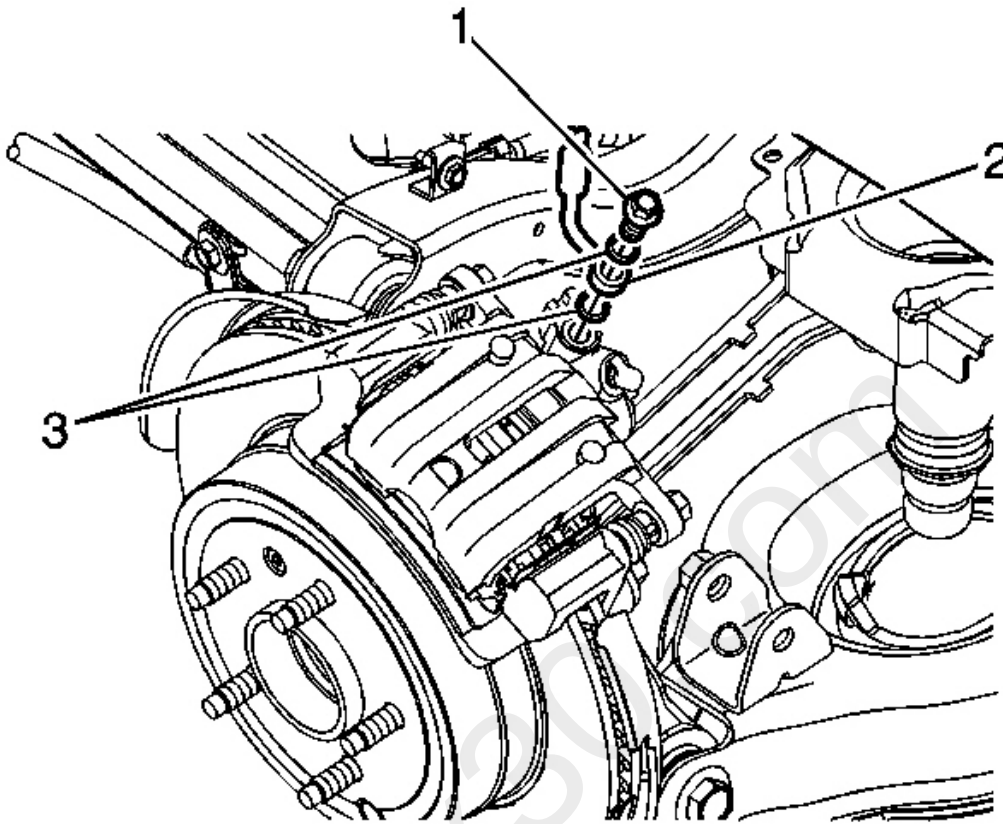


Fig. 33: Brake Hose Fitting, Bolt & Gaskets
Courtesy of GENERAL MOTORS CORP.

NOTE: Install new brake hose fitting gaskets.

3. Assemble the brake hose fitting bolt (1) to the brake hose fitting (2) with 2 new brake hose fitting gaskets (3).
4. Install the brake hose assembly to the brake caliper and tighten the brake hose fitting bolt to 52 N.m (38 lb ft).
5. Bleed the hydraulic brake system. Refer to **Hydraulic Brake System Bleeding (Manual)** or **Hydraulic Brake System Bleeding (Pressure)** .
6. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .

FRONT BRAKE CALIPER HARDWARE 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 .

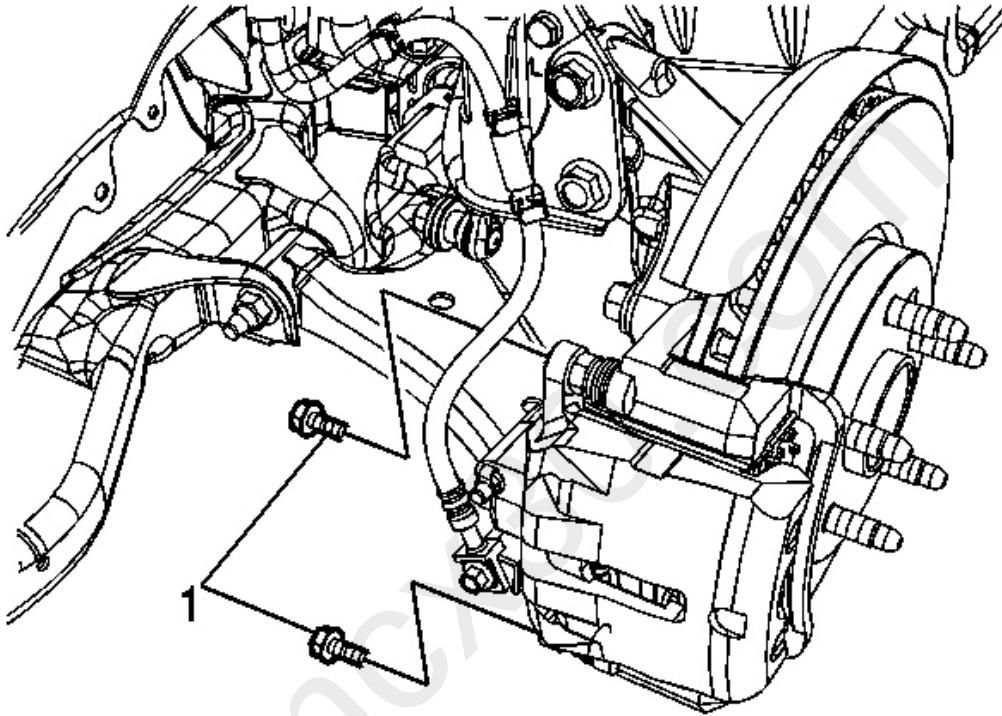


Fig. 34: Brake Caliper Guide Pin Bolts
Courtesy of GENERAL MOTORS CORP.

NOTE:

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

3. Hold the brake caliper guide pin stationary and remove the brake caliper guide pin bolts (1).

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

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

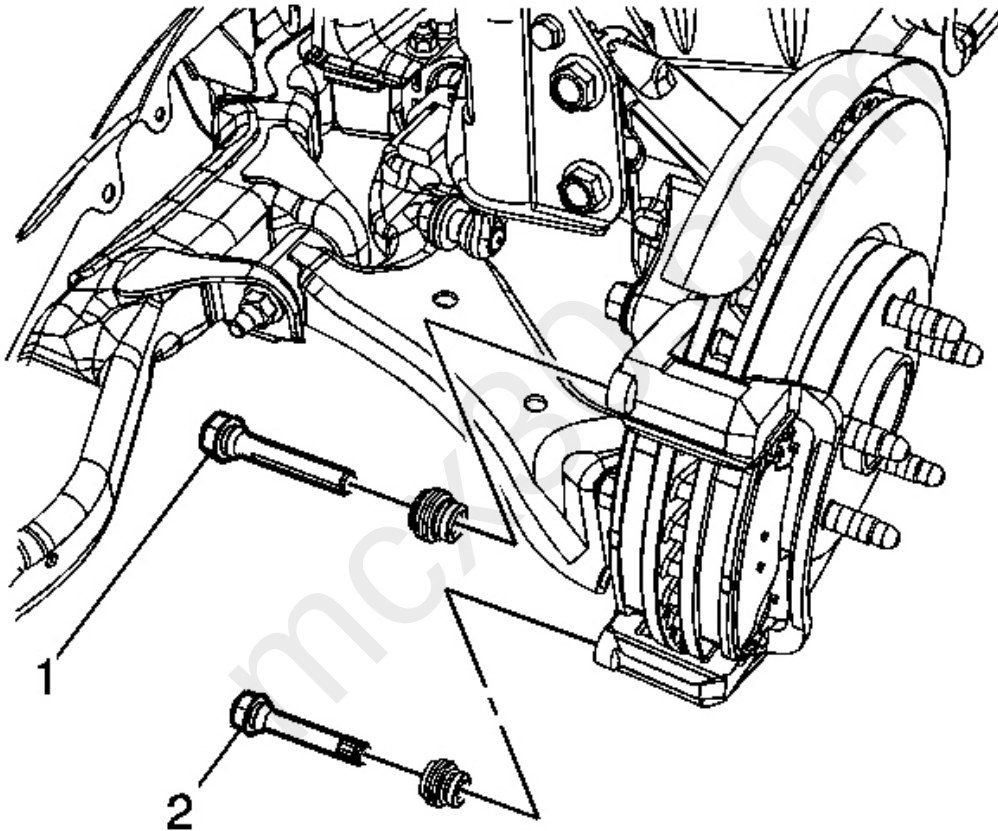


Fig. 35: Upper & Lower Guide Pins
Courtesy of GENERAL MOTORS CORP.

5. Remove the upper guide pin (1) and seal.

NOTE: The lower brake caliper guide pin is equipped with a bushing and is not interchangeable with the upper guide pin.

6. Remove the lower guide pin (2) and seal.

Installation Procedure

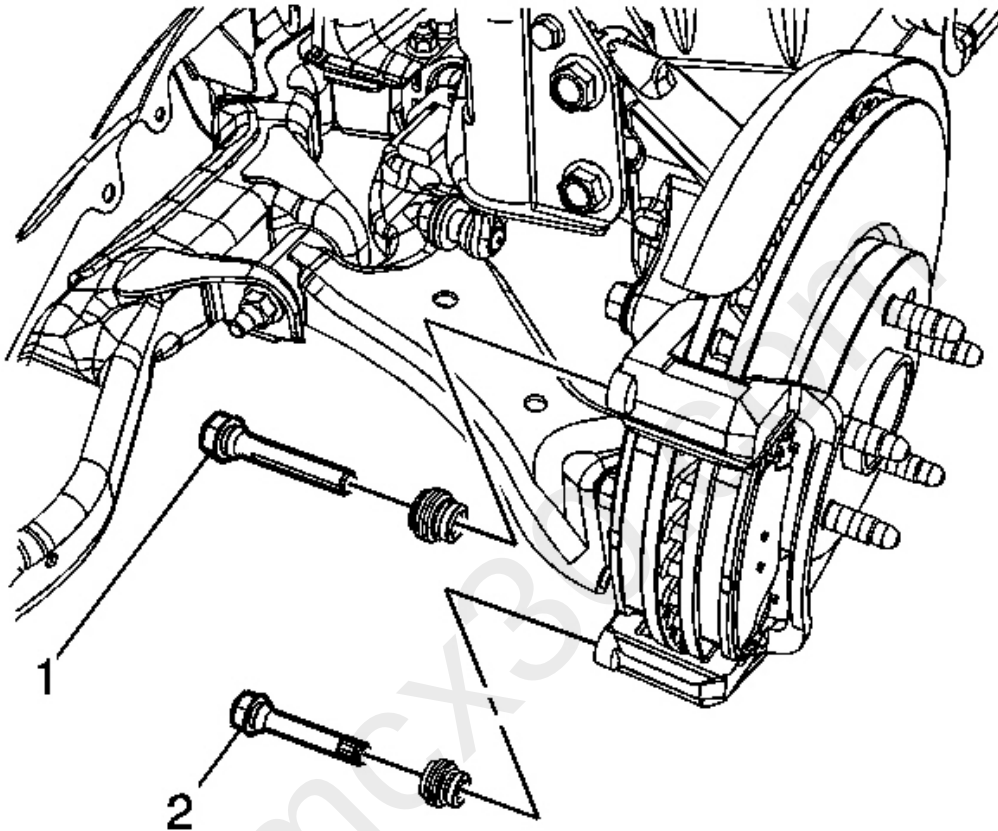


Fig. 36: Upper & Lower Guide Pins
Courtesy of GENERAL MOTORS CORP.

NOTE: The guide pins are not interchangeable. Note the location of the guide pins.

1. Apply a light coat of high temperature silicone brake lubricant to the brake caliper guide pins.
2. Install the upper guide pin (1) and seal.
3. Ensure the lip of the seal is fully seated in the groove of the brake caliper guide pin and the brake caliper bracket.
4. Install the lower guide pin (2) and seal.
5. Ensure the lip of the seal is fully seated in the groove of the brake caliper guide pin and the brake caliper

bracket.

6. Position the brake caliper to the bracket.

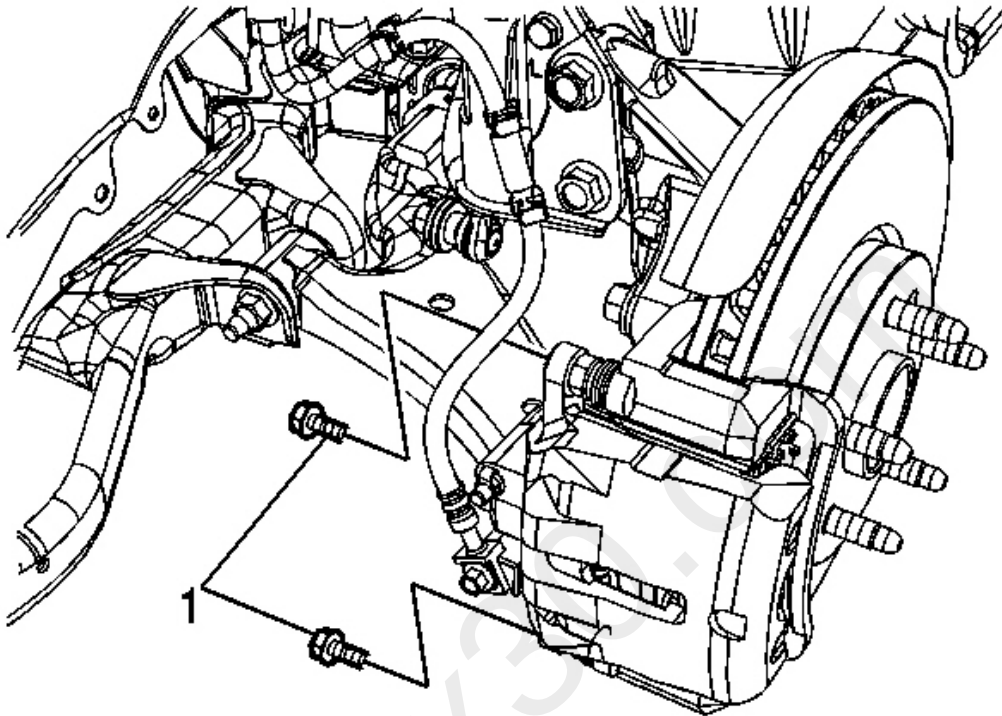


Fig. 37: Brake Caliper Guide Pin Bolts
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to Fastener Caution .

7. Hold the brake caliper guide pin stationary and tighten the brake caliper guide pin bolts (1) to 27 N.m(20 lb ft).
8. Install the tire and wheel assembly. Refer to Tire and Wheel Removal and Installation .

REAR BRAKE CALIPER HARDWARE 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 .

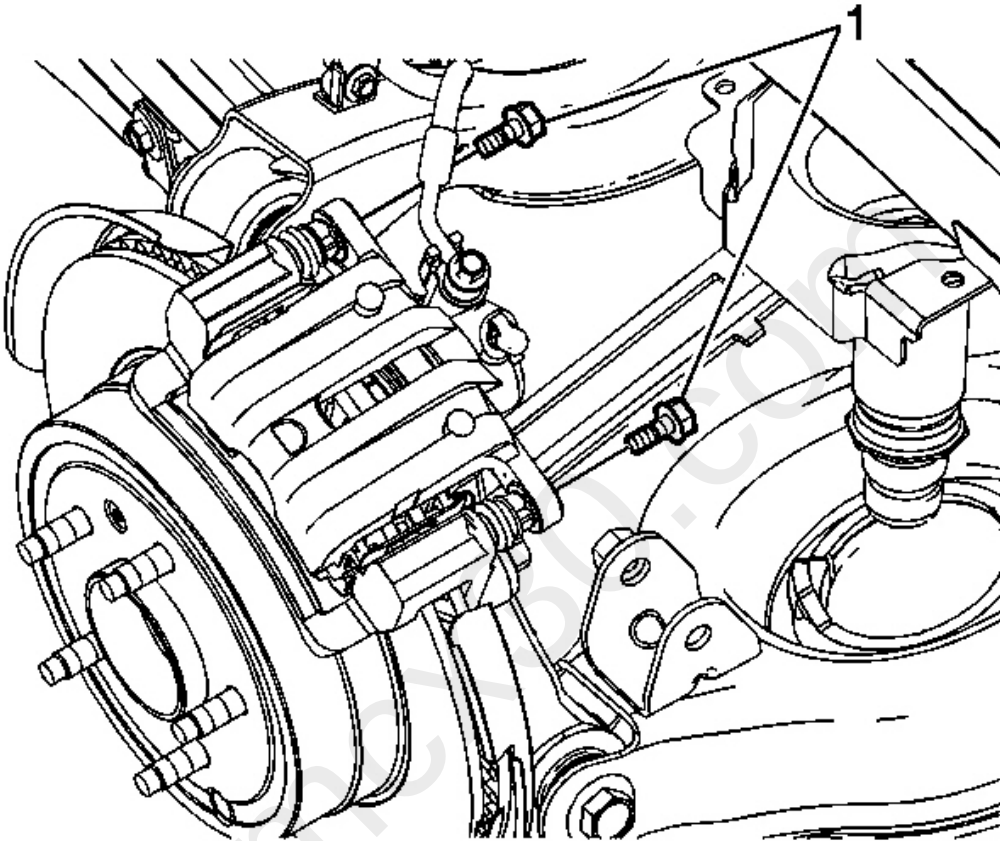


Fig. 38: Brake Caliper Guide Pin Bolts
Courtesy of GENERAL MOTORS CORP.

NOTE:

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

3. Hold the brake caliper guide pins stationaly and remove the brake caliper guide pin bolts (1).

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

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

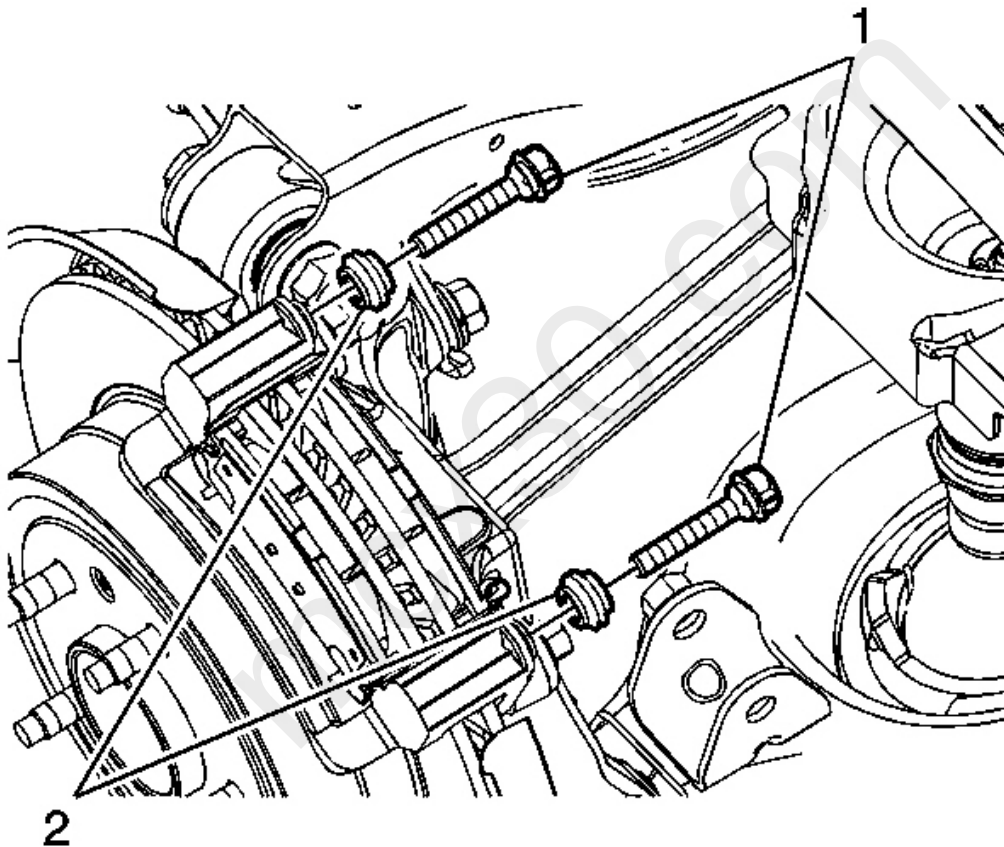


Fig. 39: Brake Caliper Guide Pins & Seals
Courtesy of GENERAL MOTORS CORP.

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

Installation Procedure

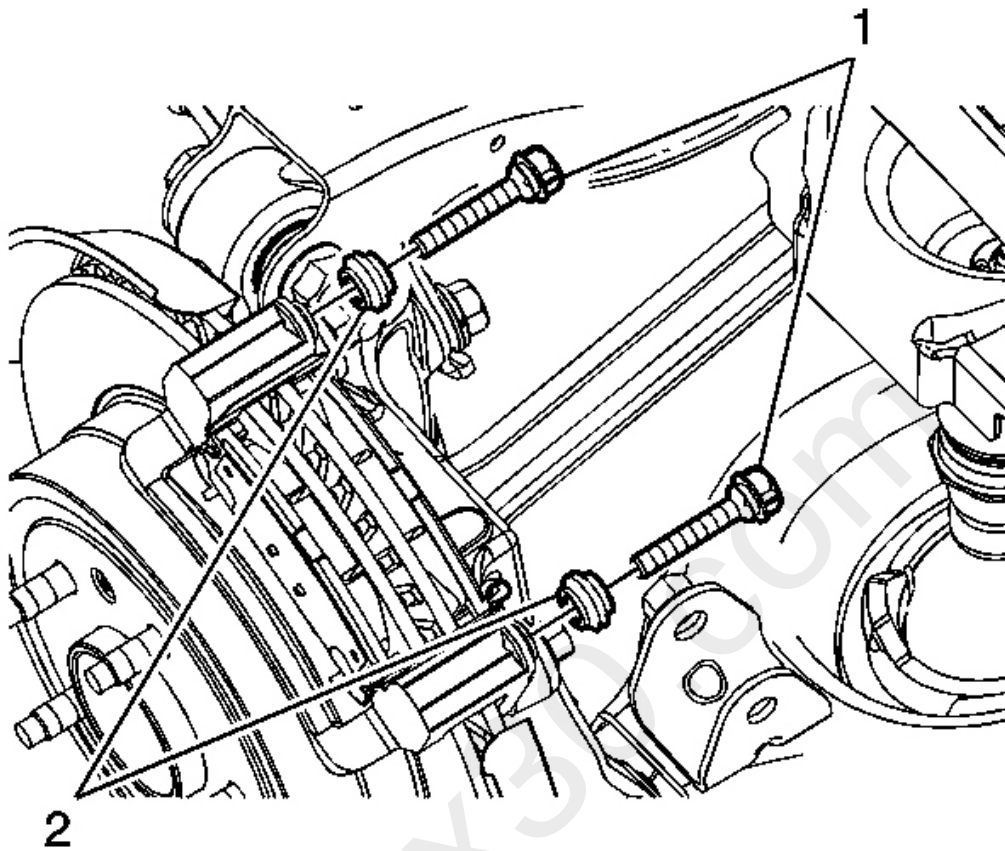


Fig. 40: Brake Caliper Guide Pins & Seals
Courtesy of GENERAL MOTORS CORP.

1. Apply a light coat of high temperature silicone brake lubricant to the brake caliper guide pins.
2. Assemble the brake caliper guide pins (1) to the guide pin seals (2).
3. Ensure the lip of the seal is fully seated in the groove of the brake caliper guide pin.
4. Install the upper and lower guide pins and seals to the brake caliper bracket.
5. Ensure the lip of the seal is fully seated in the groove of the brake caliper bracket.
6. Position the brake caliper to the bracket.

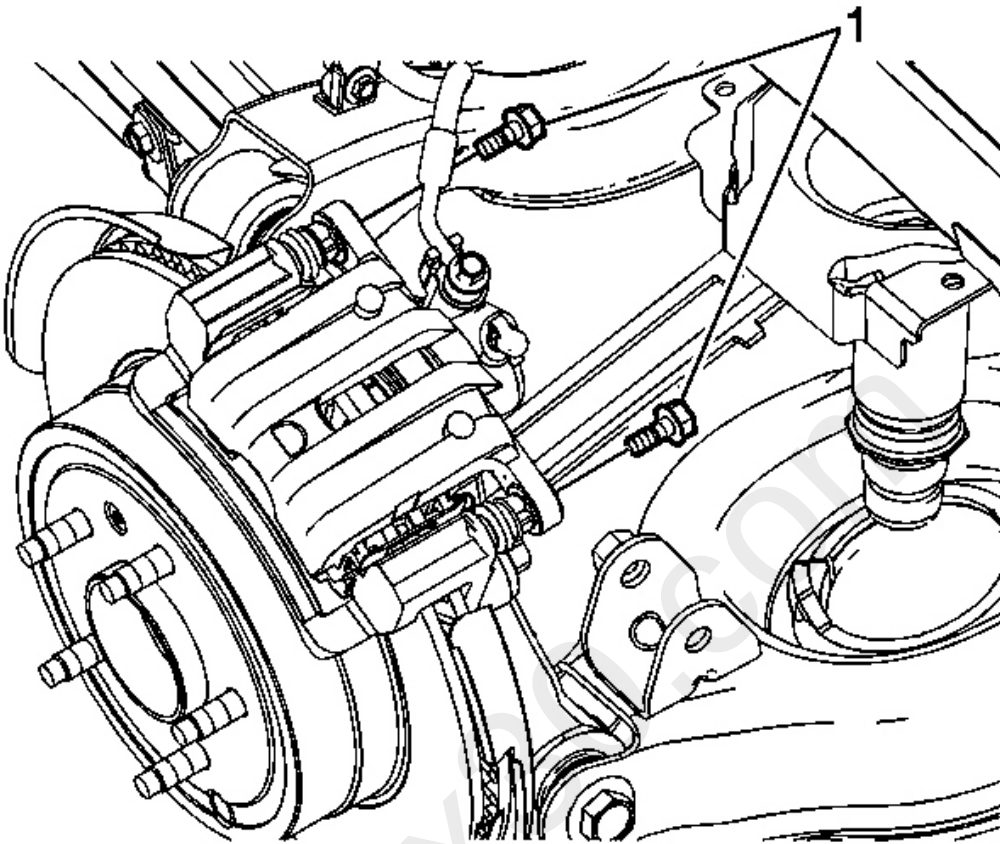


Fig. 41: Brake Caliper Guide Pin Bolts
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to Fastener Caution .

7. Hold the brake caliper guide pins stationary and tighten the brake caliper guide pin bolts (1) to 27 N.m (20 lb ft).
8. Install the tire and wheel assembly. Refer to Tire and Wheel Removal and Installation .

FRONT BRAKE CALIPER BRACKET REPLACEMENT

Removal Procedure

WARNING: Refer to Brake Dust Warning .

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

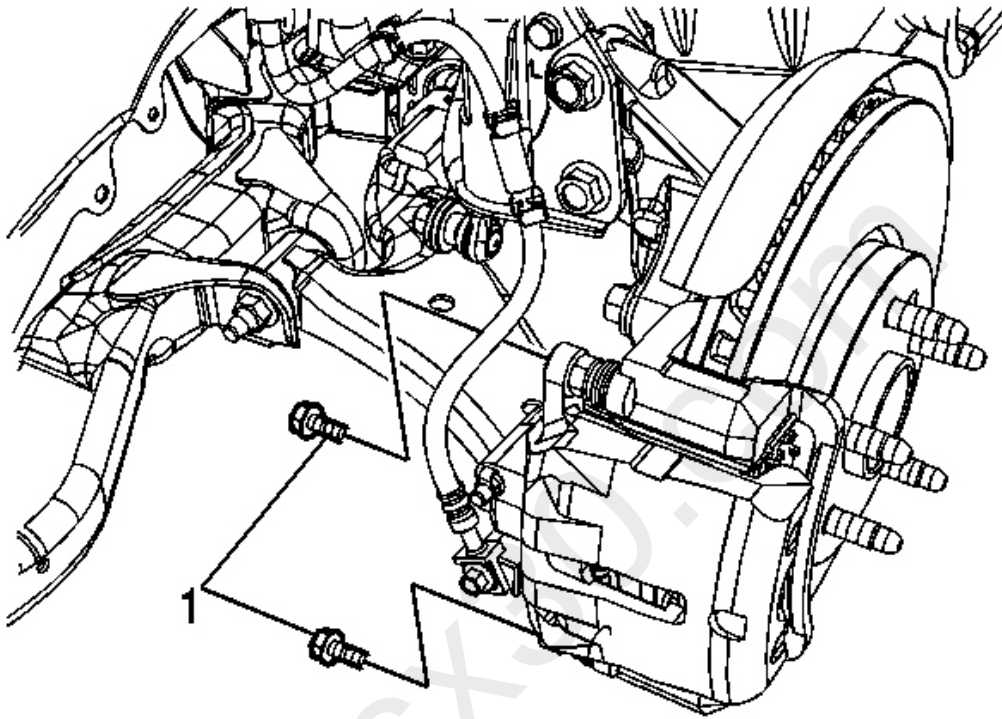


Fig. 42: Brake Caliper Guide Pin Bolts
Courtesy of GENERAL MOTORS CORP.

NOTE:

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

3. Hold the brake caliper guide pin stationary and remove the brake caliper guide pin bolts (1).

CAUTION: Support the brake caliper with heavy mechanic wire, or equivalent, whenever it is separated from its mount and the hydraulic flexible

brake hose is still connected. Failure to support the caliper in this manner will cause the flexible brake hose to bear the weight of the caliper, which may cause damage to the brake hose and in turn may cause a brake fluid leak.

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

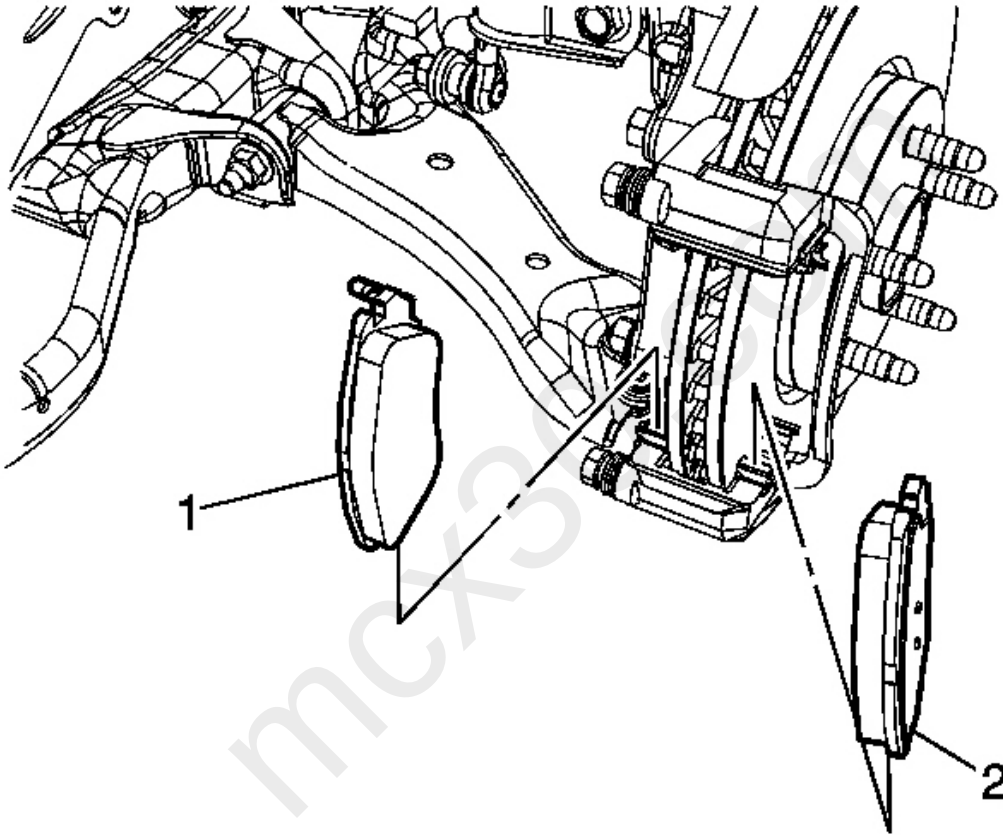


Fig. 43: Inner & Outer Brake Pads
Courtesy of GENERAL MOTORS CORP.

NOTE: Note the location of the wear sensor for correct installation.

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

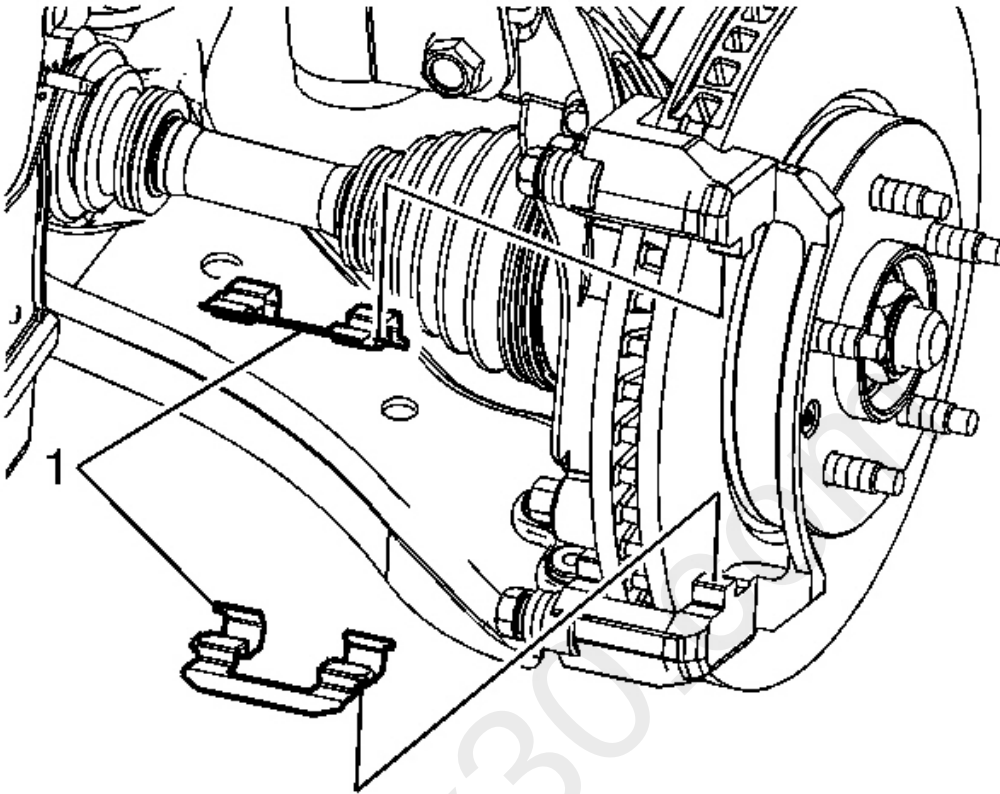


Fig. 44: Brake Pad Springs
Courtesy of GENERAL MOTORS CORP.

7. Remove the brake pad springs (1).

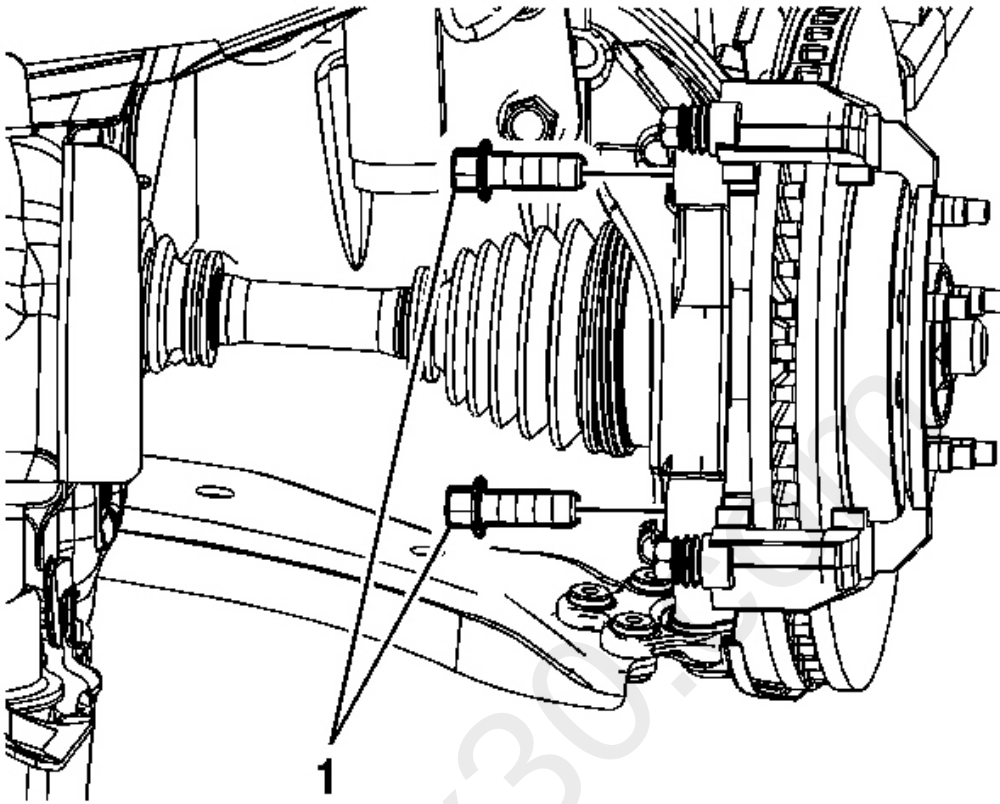


Fig. 45: Brake Caliper Bracket Bolts
Courtesy of GENERAL MOTORS CORP.

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

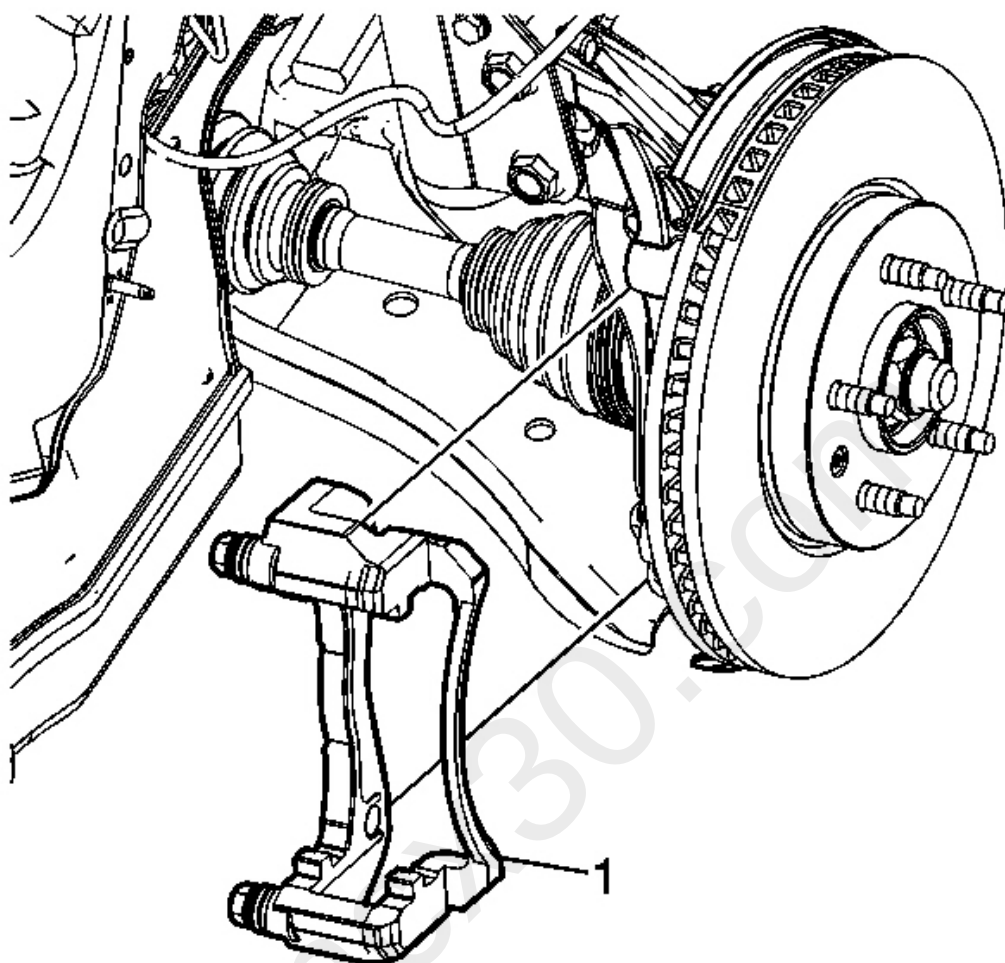


Fig. 46: Brake Caliper Bracket
Courtesy of GENERAL MOTORS CORP.

9. Remove the brake caliper bracket (1).

Installation Procedure

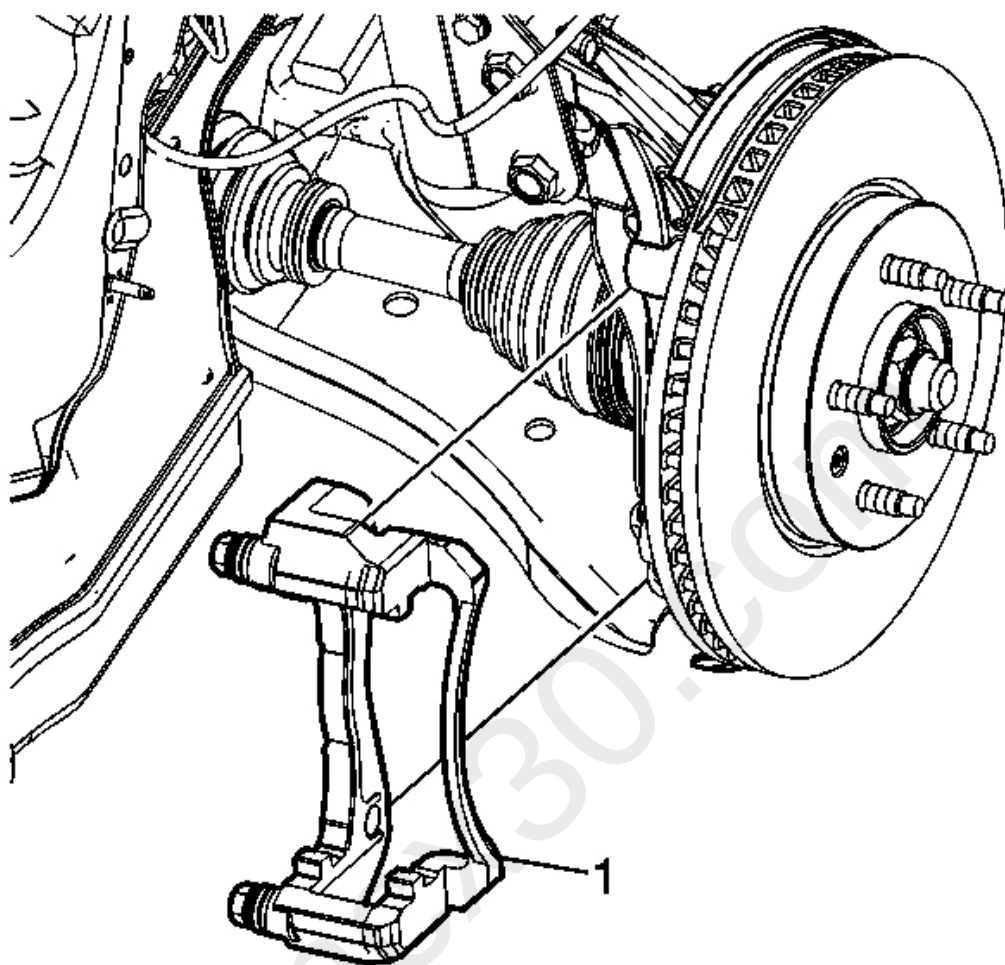


Fig. 47: Brake Caliper Bracket
Courtesy of GENERAL MOTORS CORP.

1. Install the brake caliper bracket (1).

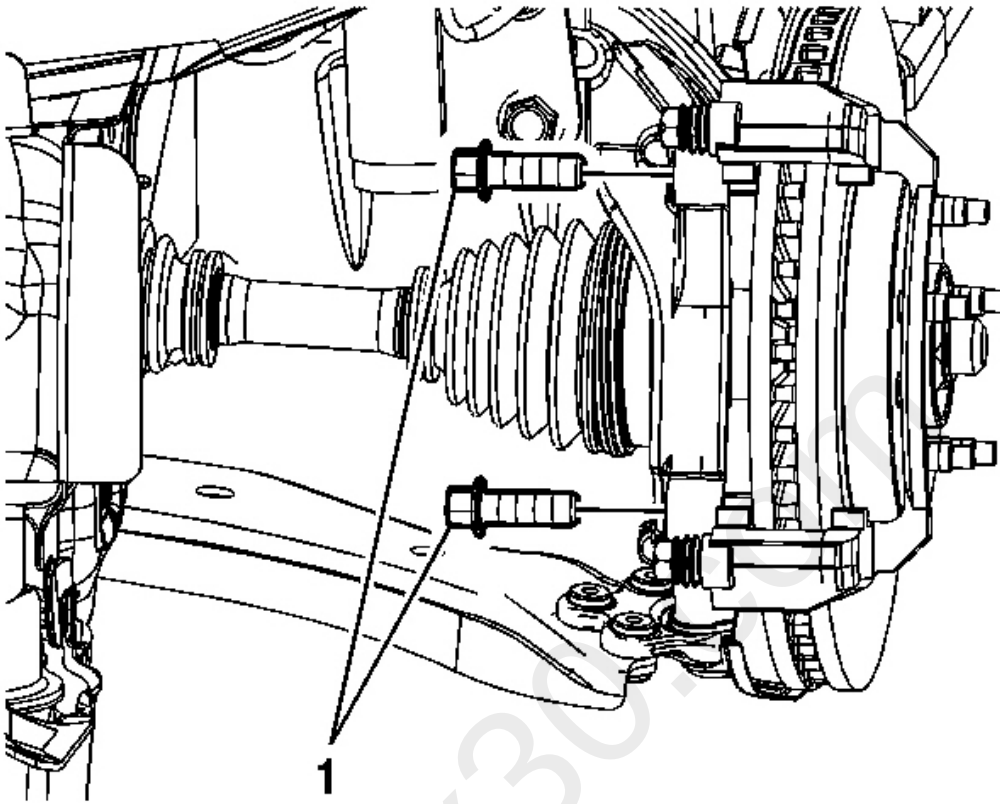


Fig. 48: Brake Caliper Bracket Bolts
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to Fastener Caution .

2. Install the brake caliper bracket bolts (1) and tighten to 190 N.m (140 lb ft).

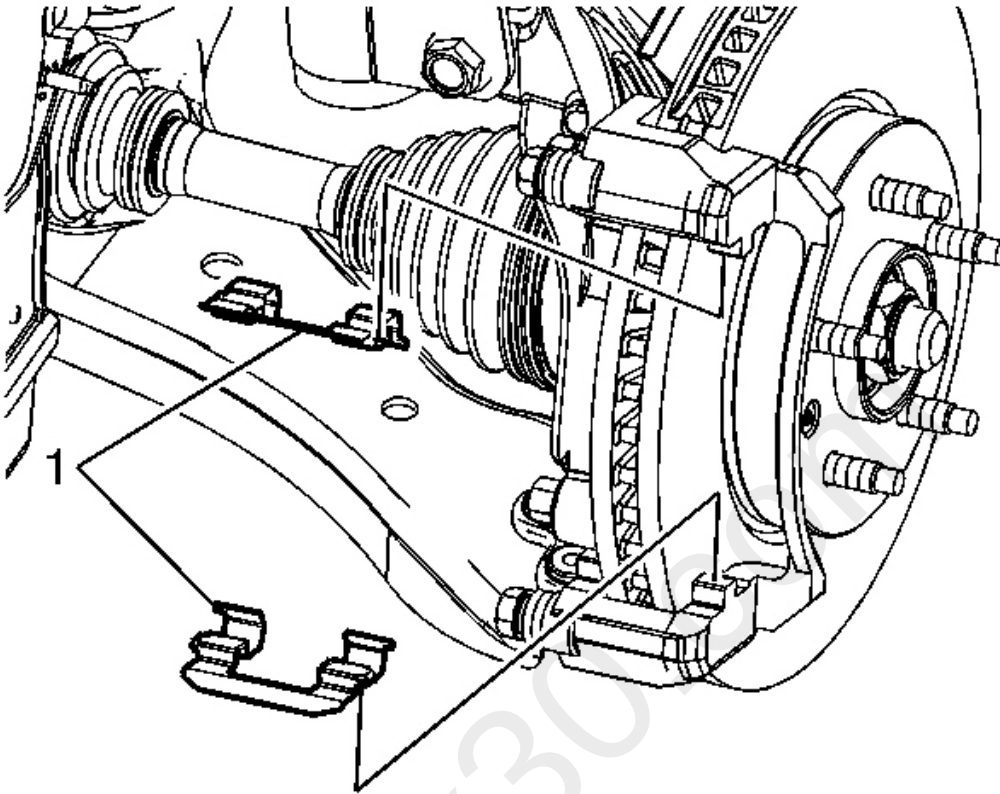


Fig. 49: Brake Pad Springs
Courtesy of GENERAL MOTORS CORP.

3. Install the brake pad springs (1).

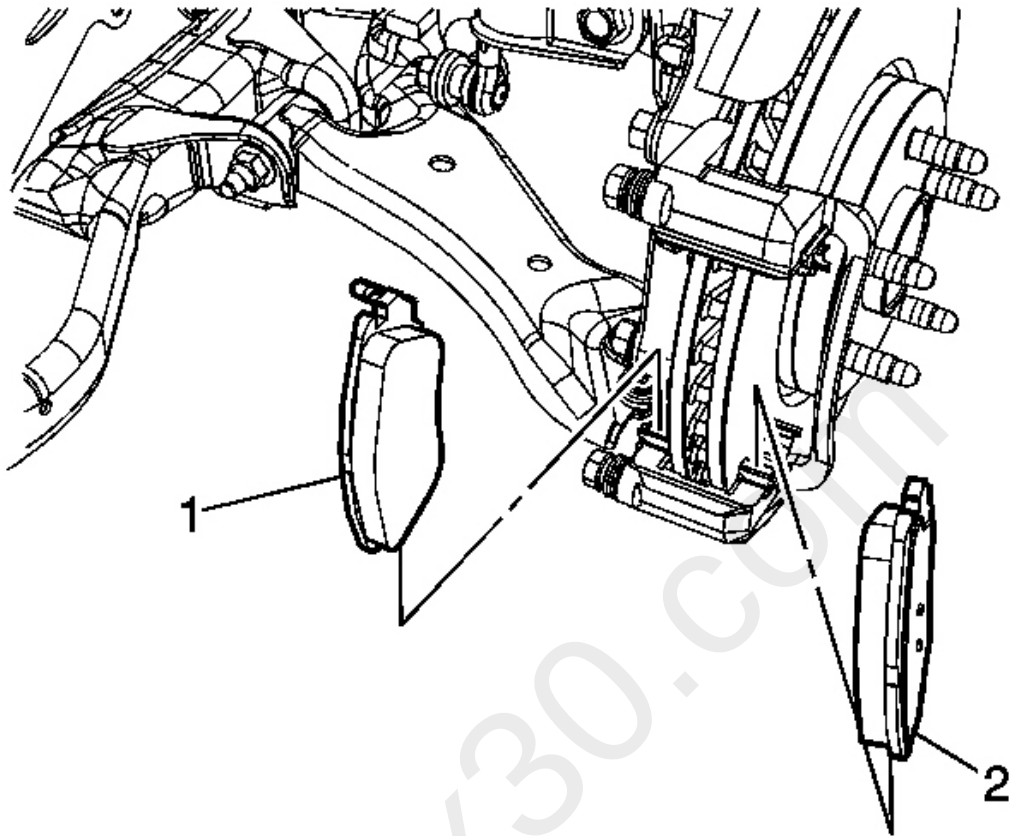


Fig. 50: Inner & Outer Brake Pads
Courtesy of GENERAL MOTORS CORP.

NOTE: Note the location of the wear sensor for correct installation.

4. Install the inner brake pad (1).
5. Install the outer brake pad (2).
6. Position the brake caliper to the bracket.

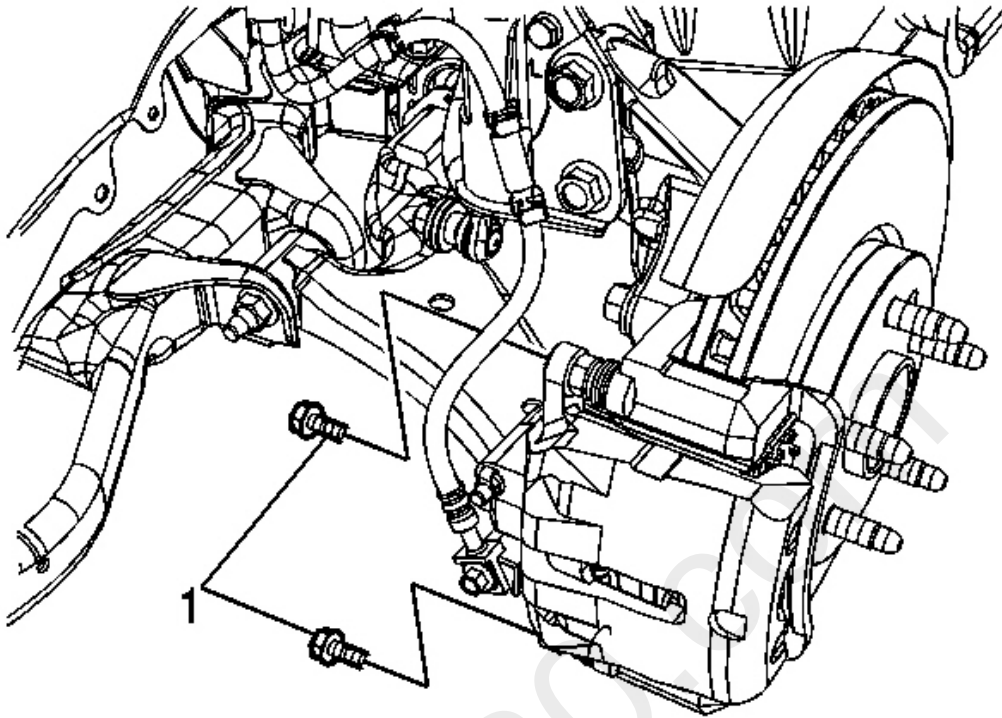


Fig. 51: Brake Caliper Guide Pin Bolts
Courtesy of GENERAL MOTORS CORP.

7. Hold the brake caliper guide pins stationary and tighten the brake caliper guide pin bolts (1) to 27 N.m (20 lb ft).
8. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .

REAR BRAKE CALIPER BRACKET REPLACEMENT

Removal Procedure

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

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

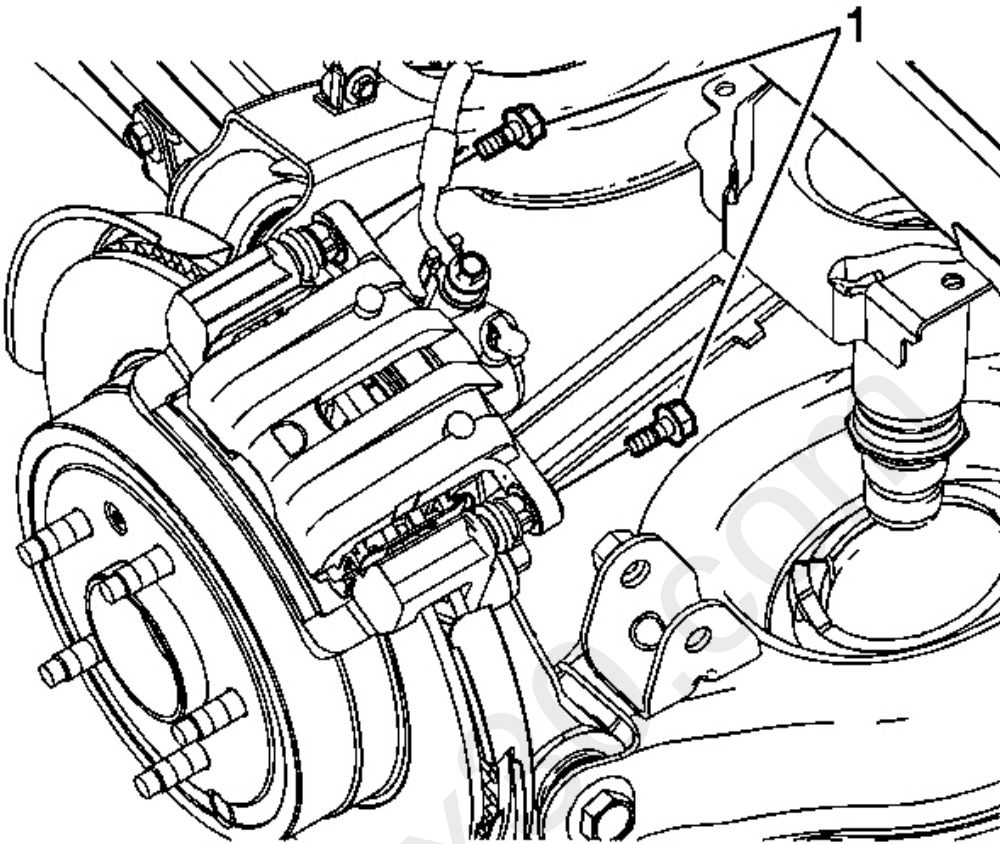


Fig. 52: Brake Caliper Guide Pin Bolts
Courtesy of GENERAL MOTORS CORP.

NOTE:

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

3. Hold the brake caliper guide pins stationary and remove the brake caliper guide pin bolts (1).

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

manner will cause the flexible brake hose to bear the weight of the caliper, which may cause damage to the brake hose and in turn may cause a brake fluid leak.

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

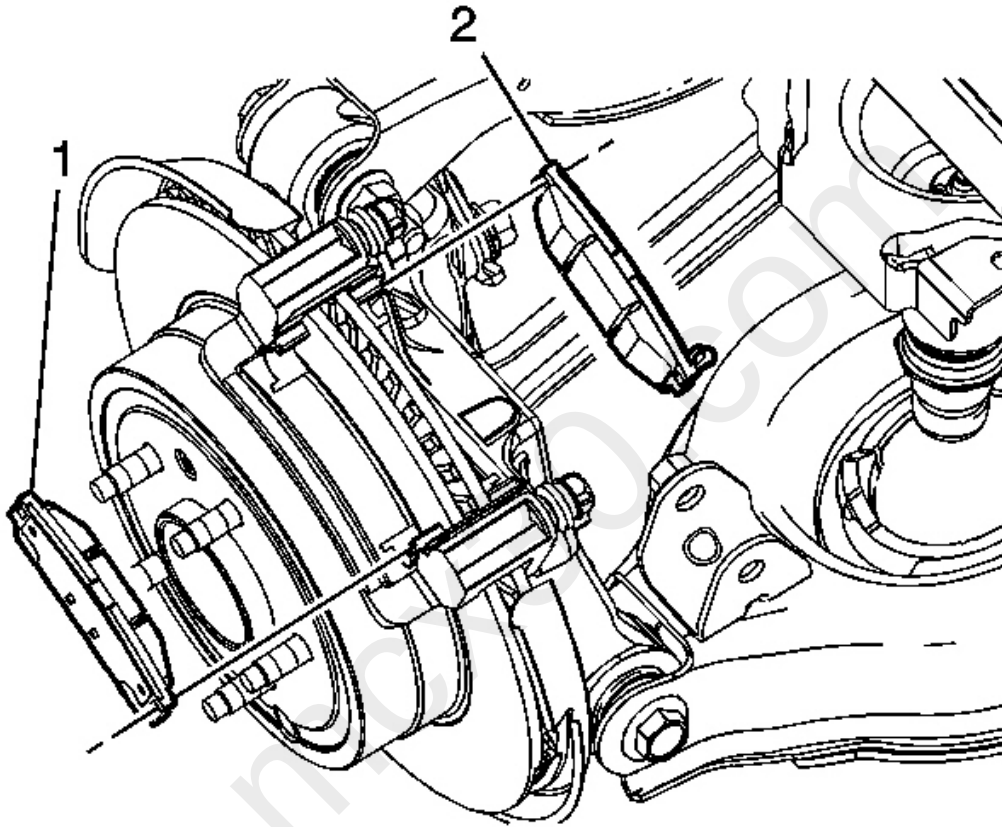


Fig. 53: Inner & Outer Brake Pads
Courtesy of GENERAL MOTORS CORP.

NOTE: **Note the location of the wear sensor for correct installation.**

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

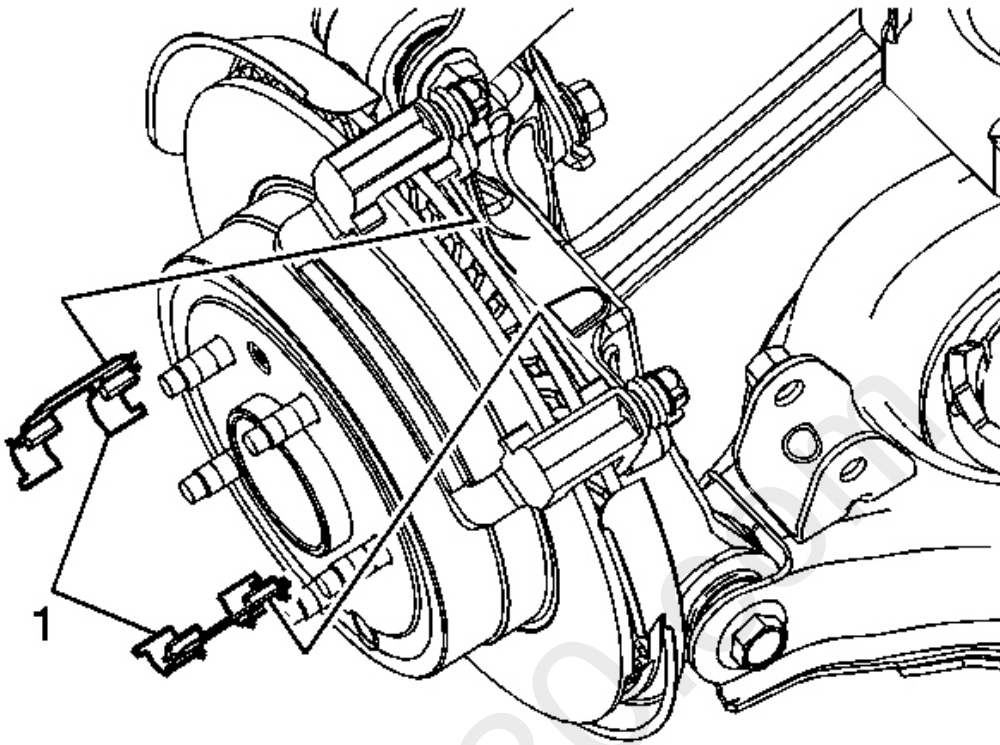


Fig. 54: Brake Pad Springs
Courtesy of GENERAL MOTORS CORP.

7. Remove the brake pad springs (1).

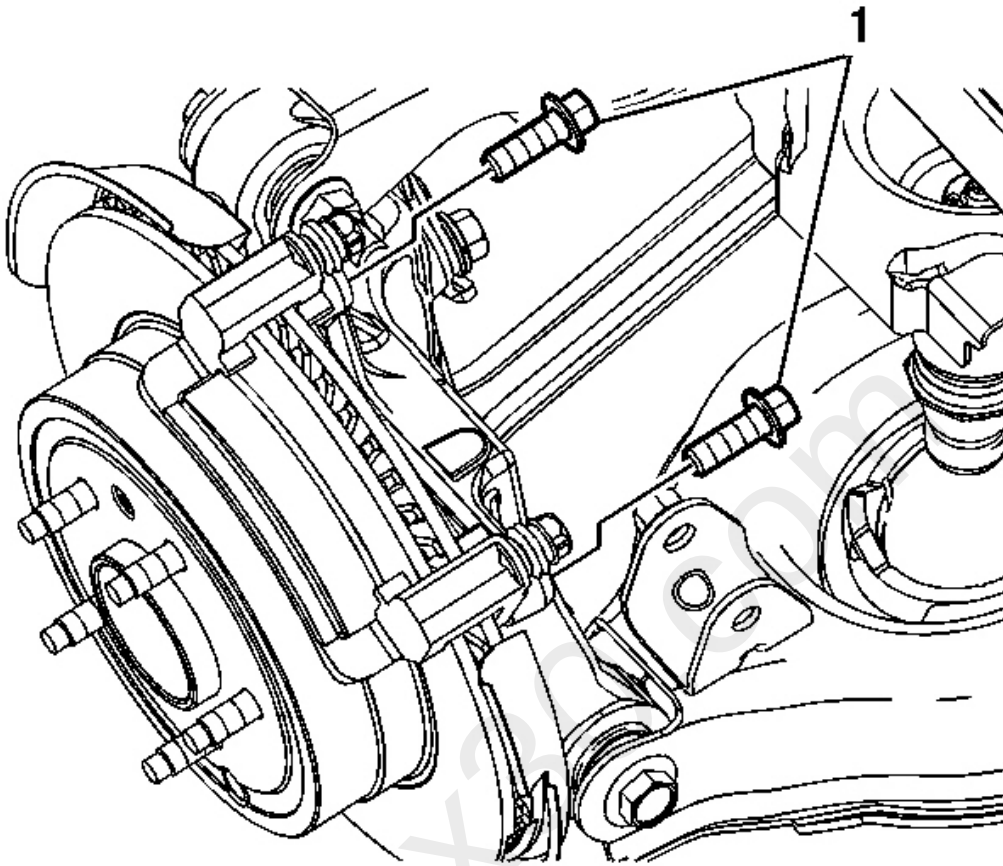


Fig. 55: Brake Caliper Bracket Bolts
Courtesy of GENERAL MOTORS CORP.

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

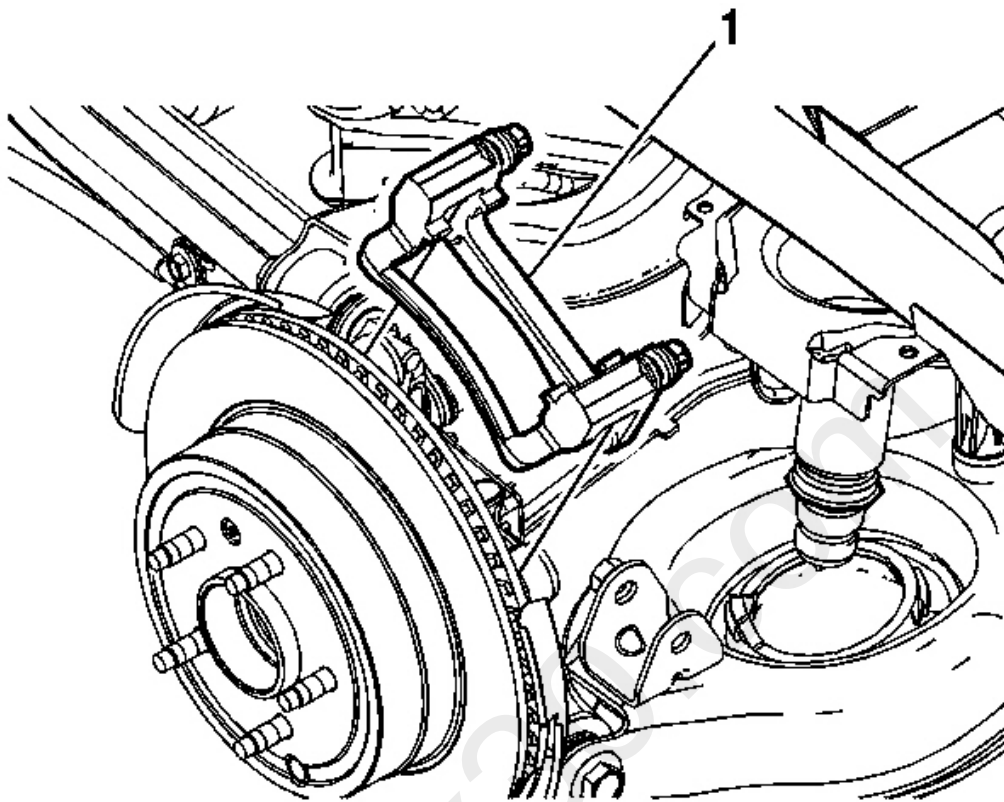


Fig. 56: Brake Caliper Bracket
Courtesy of GENERAL MOTORS CORP.

9. Remove the brake caliper bracket (1).

Installation Procedure

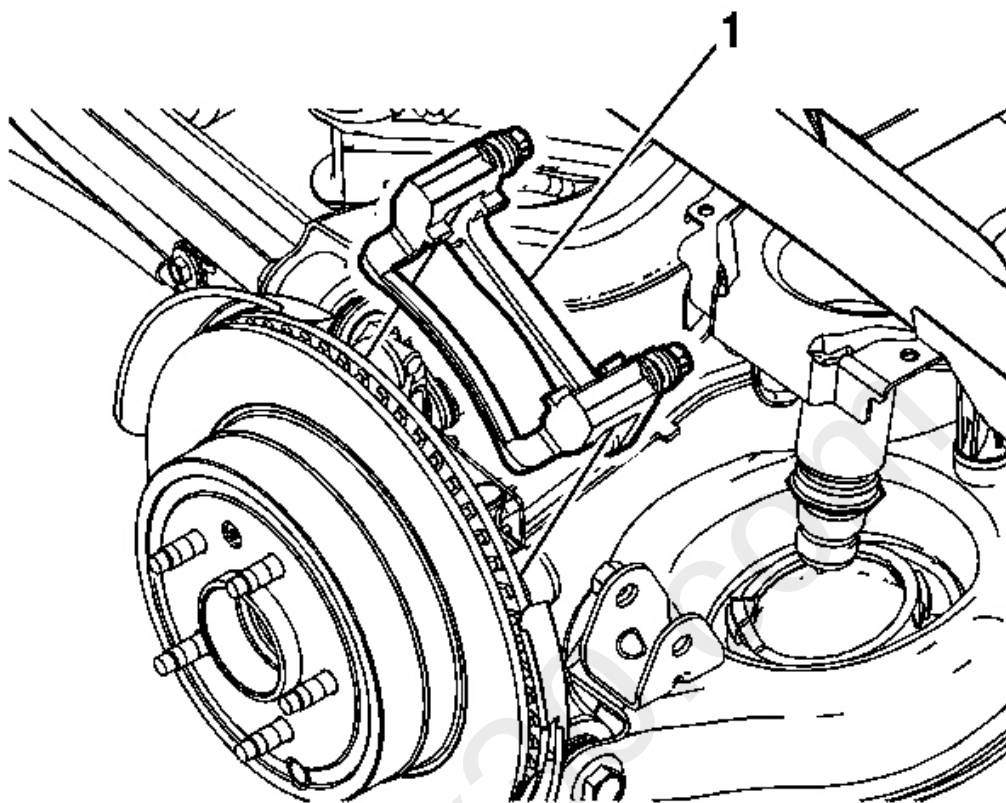


Fig. 57: Brake Caliper Bracket
Courtesy of GENERAL MOTORS CORP.

1. Install the brake caliper bracket (1).

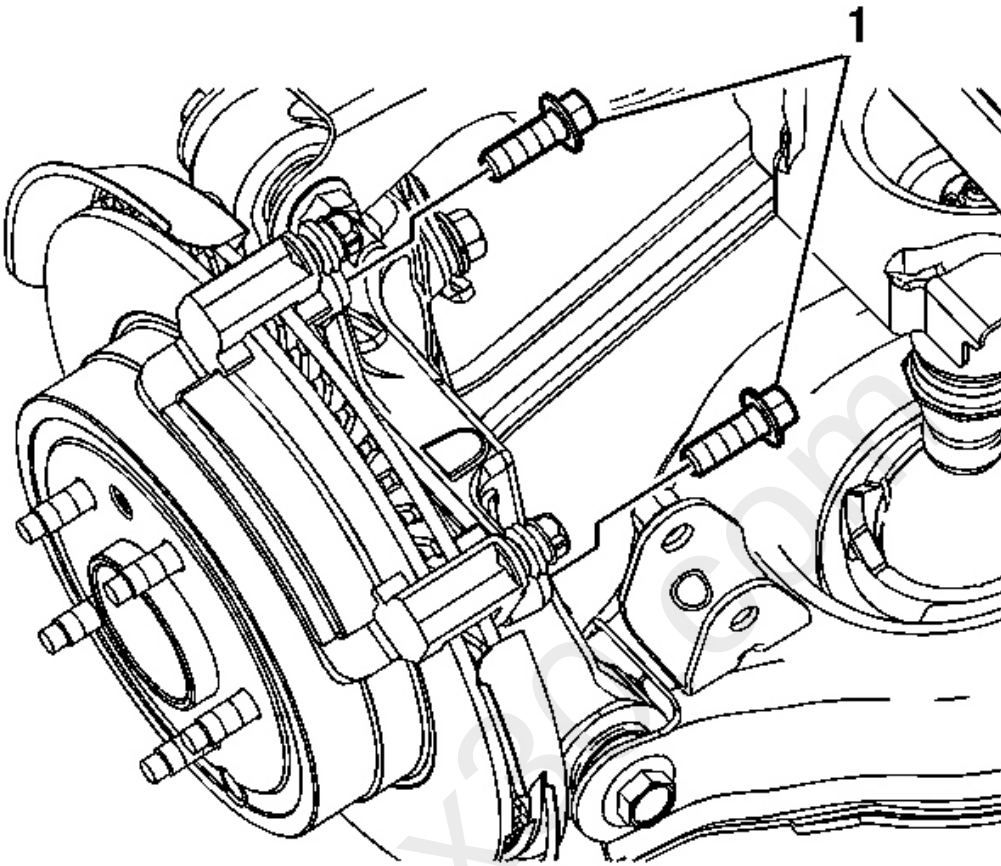


Fig. 58: Brake Caliper Bracket Bolts
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to Fastener Caution .

2. Install the brake caliper bracket bolts (1) and tighten to 125 N.m (92 lb ft).

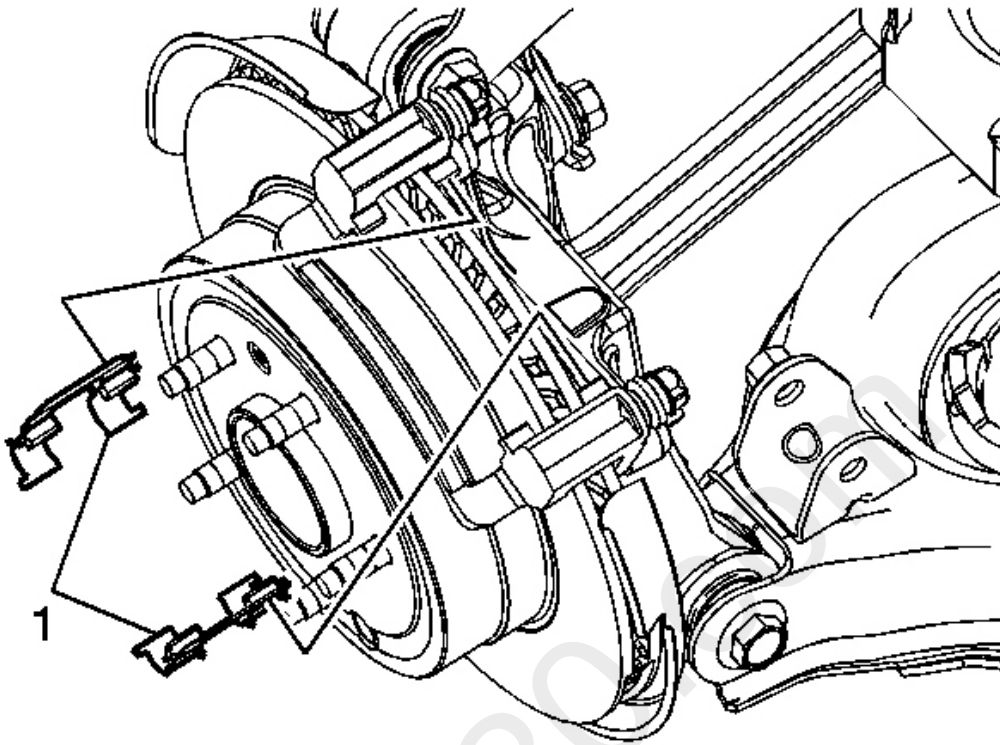


Fig. 59: Brake Pad Springs
Courtesy of GENERAL MOTORS CORP.

3. Install the brake pad springs (1).

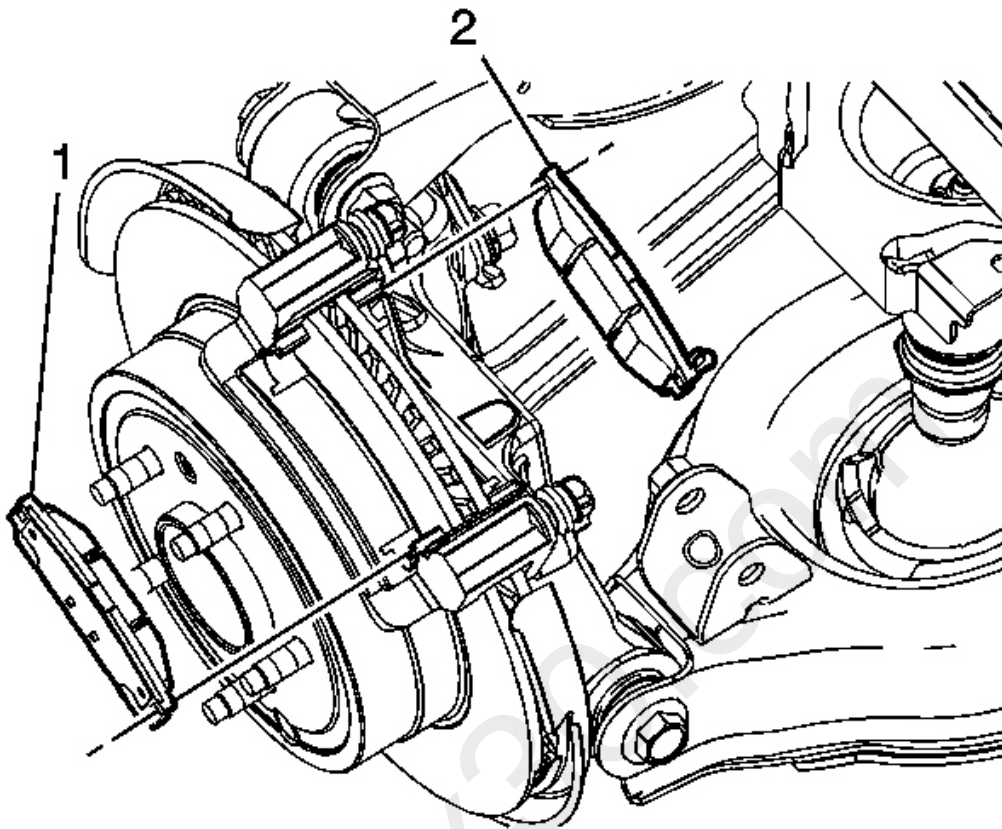


Fig. 60: Inner & Outer Brake Pads
Courtesy of GENERAL MOTORS CORP.

NOTE: **Note the location of the wear sensor for correct installation.**

4. Install the outer brake pad (1).
5. Install the inner brake pad (2).
6. Position the brake caliper to the bracket.

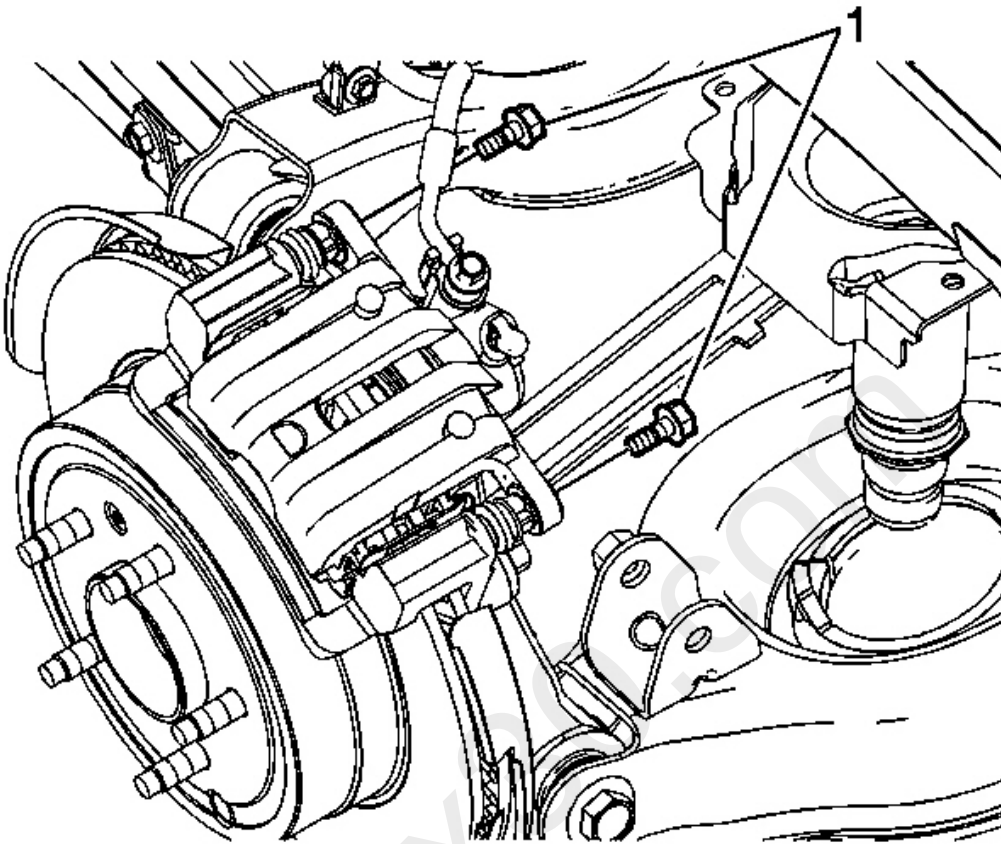


Fig. 61: Brake Caliper Guide Pin Bolts
Courtesy of GENERAL MOTORS CORP.

7. Hold the brake caliper guide pins stationary and tighten the brake caliper guide pin bolts (1) to 27 N.m (20 lb ft).
8. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .

FRONT BRAKE ROTOR REPLACEMENT

Special Tools

- **J-41013:** Rotor Resurfacing Kit
- **J-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 .

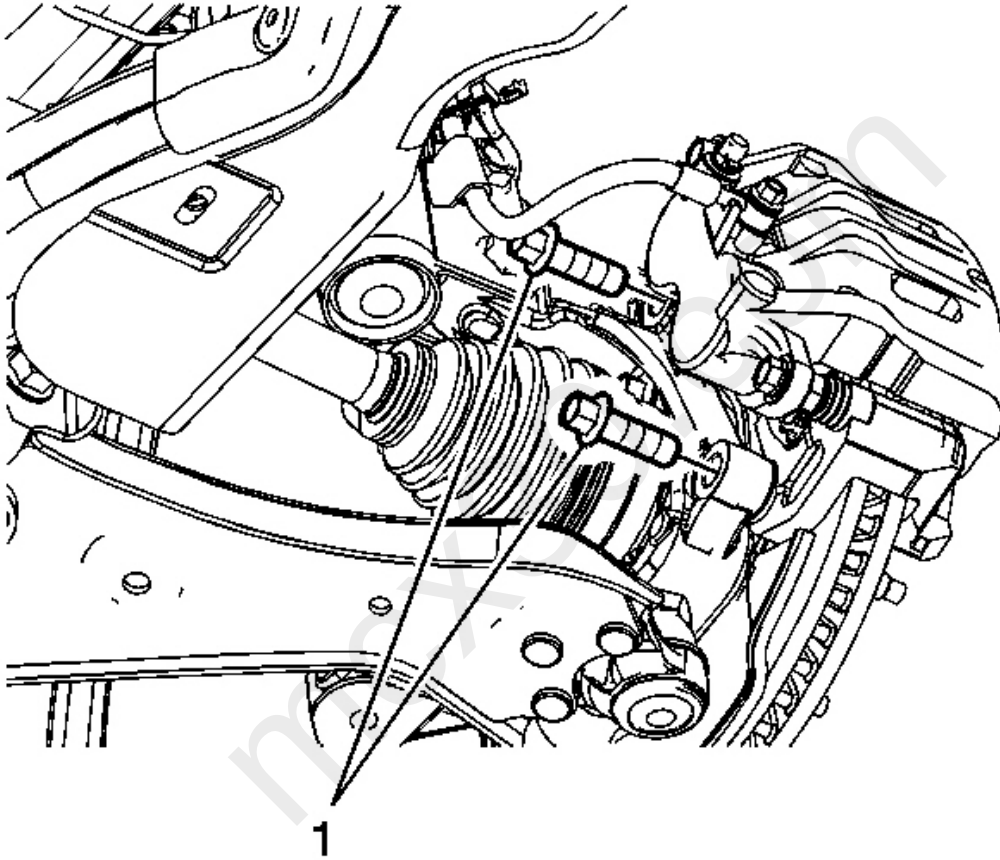


Fig. 62: Brake Caliper Bracket Bolts
Courtesy of GENERAL MOTORS CORP.

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

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

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

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

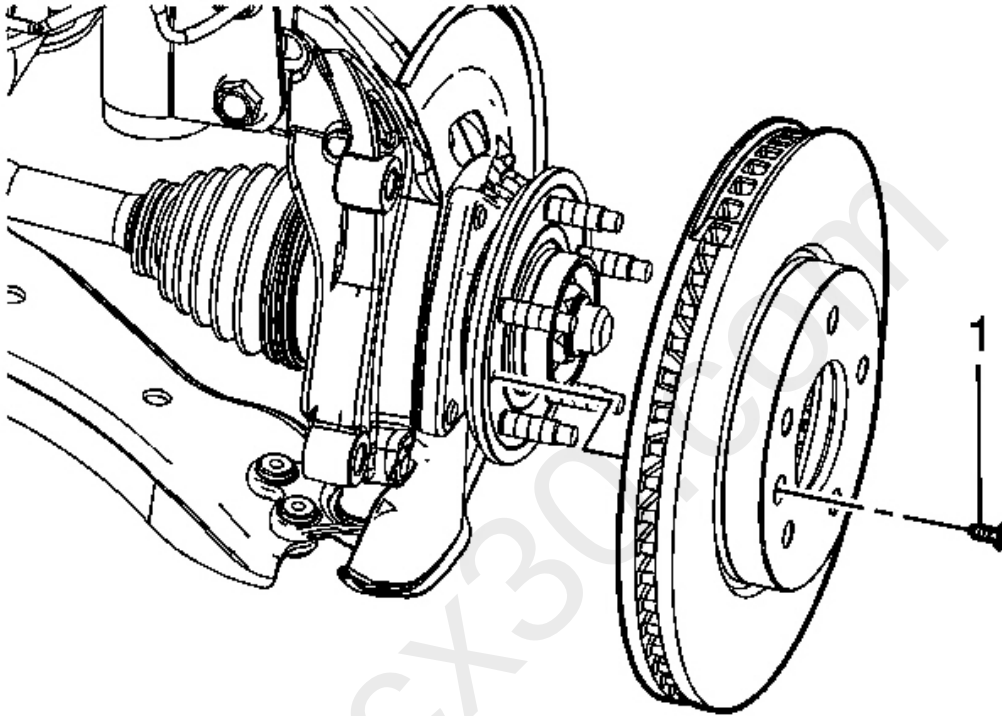


Fig. 63: Brake Rotor Bolt
Courtesy of GENERAL MOTORS CORP.

5. Remove the brake rotor bolt (1) and the brake rotor.

Installation Procedure

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

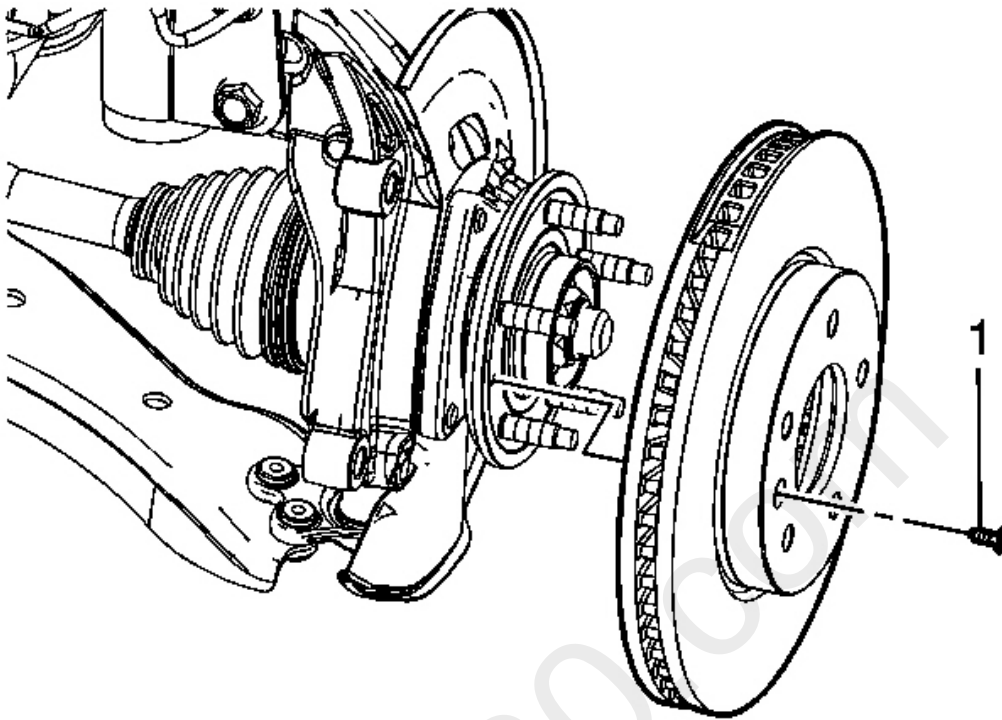


Fig. 64: Brake Rotor Bolt
Courtesy of GENERAL MOTORS CORP.

3. Install the brake rotor.

CAUTION: Refer to Fastener Caution .

4. Install the brake rotor bolt (1) and tighten to 9 N.m (80 lb in).
5. Position the brake caliper and bracket assembly to the vehicle.

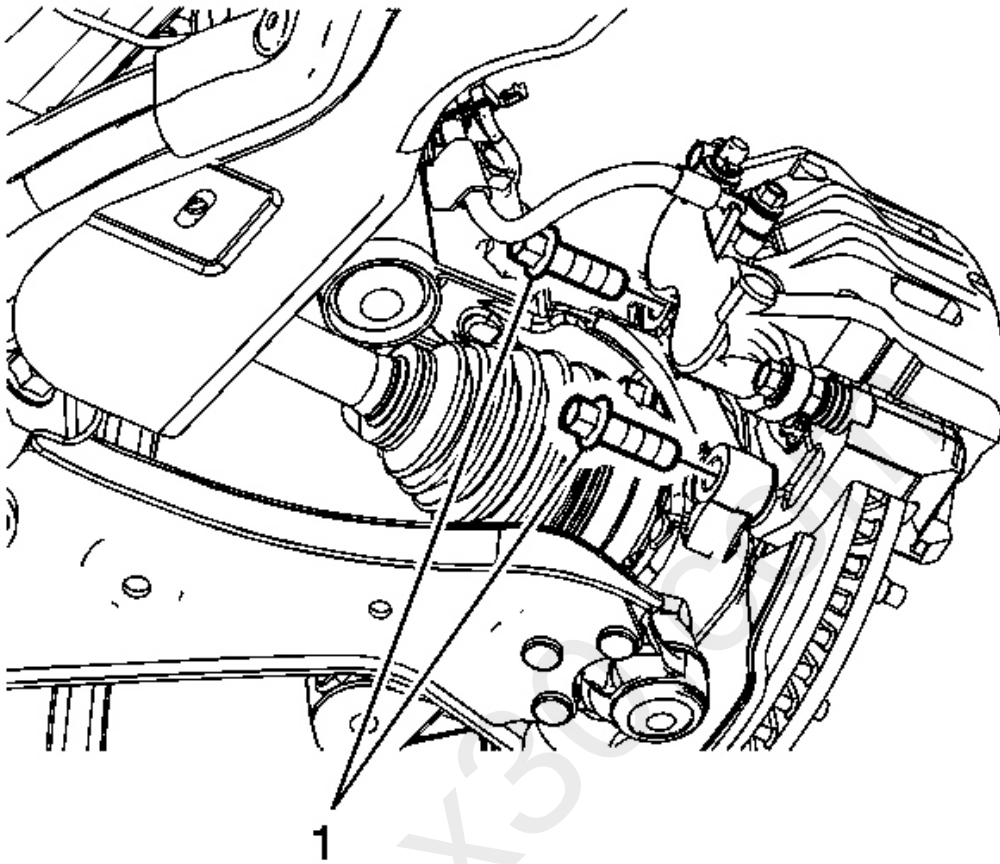


Fig. 65: Brake Caliper Bracket Bolts
Courtesy of GENERAL MOTORS CORP.

6. Install the brake caliper bracket bolts (1) and tighten to 190 N.m (140 lb ft).
7. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
8. Burnish the brake pads and rotors. Refer to **Brake Pad and Rotor Burnishing**.

REAR BRAKE ROTOR REPLACEMENT

Special Tools

- **J-41013:** Rotor Resurfacing Kit
- **J-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 .

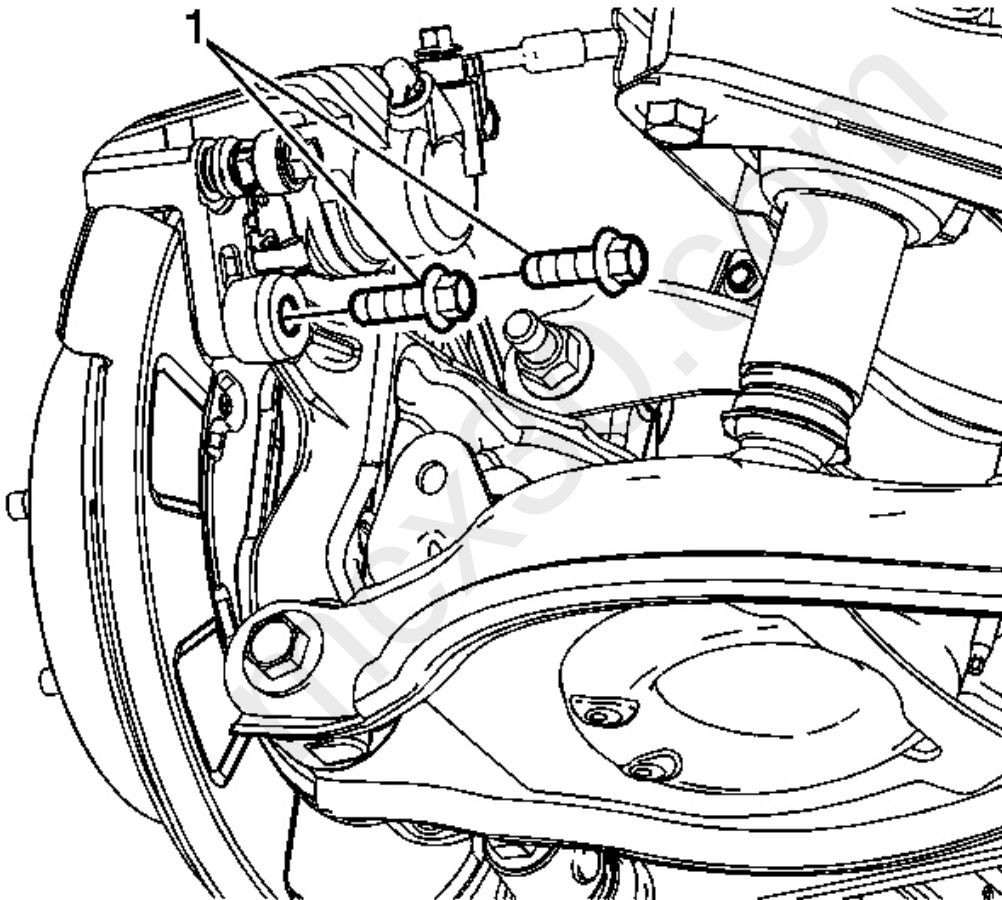


Fig. 66: Brake Caliper Bracket Bolts
Courtesy of GENERAL MOTORS CORP.

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

CAUTION: Support the brake caliper with heavy mechanic wire, or equivalent,

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

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

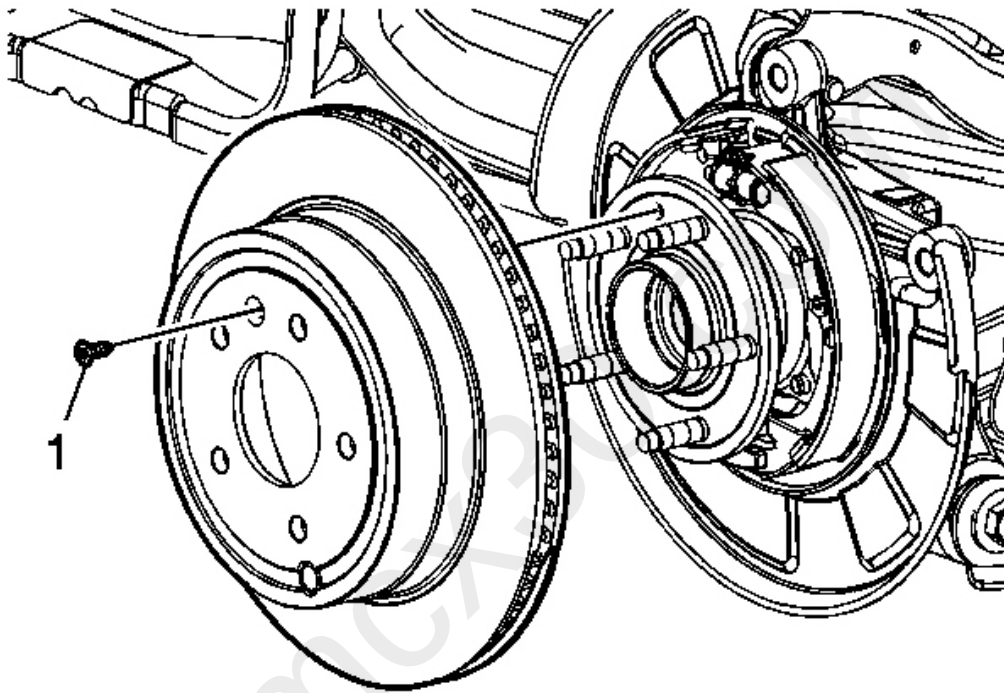


Fig. 67: Brake Rotor Bolt
Courtesy of GENERAL MOTORS CORP.

5. Remove the brake rotor bolt (1) and the brake rotor.
6. If the brake rotor is difficult to remove, remove the park brake shoe adjuster access plug on the face of the brake rotor to gain access to the park brake adjuster and loosen the park brake shoe adjuster.

Installation Procedure

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

3. Install the brake rotor.

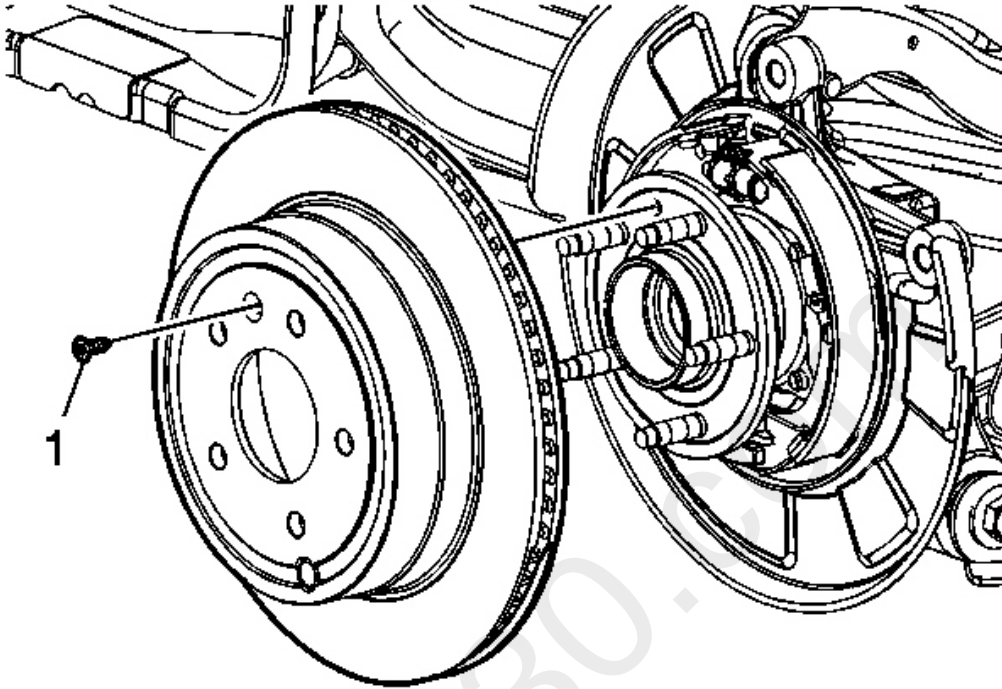


Fig. 68: Brake Rotor Bolt
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to Fastener Caution .

4. Install the brake rotor bolt (1) and tighten to 10 N.m (89 lb in).

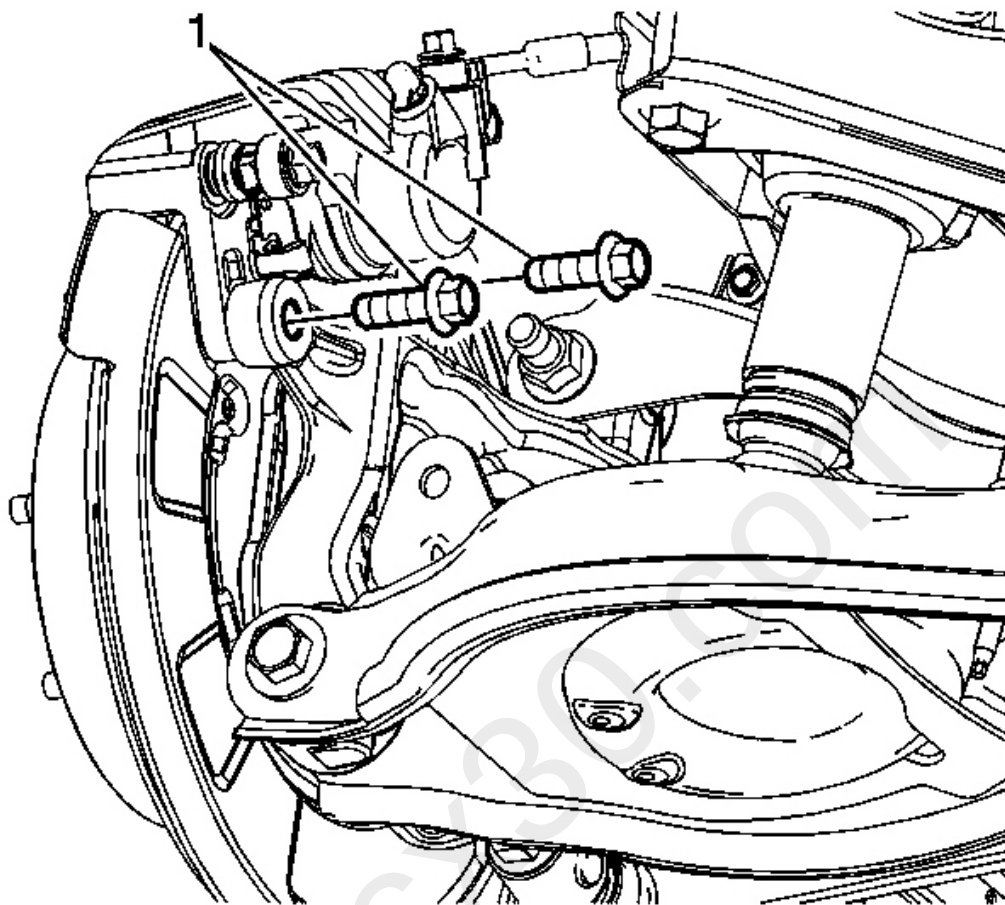


Fig. 69: Brake Caliper Bracket Bolts
Courtesy of GENERAL MOTORS CORP.

5. Position the brake caliper and bracket assembly to the vehicle.
6. Install the brake caliper bracket bolts (1) and tighten to 125 N.m (92 lb ft).
7. If necessary, adjust the park brake. Refer to **Parking Brake Adjustment** .
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. 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 front brake rotor. Refer to **Front Brake Rotor Replacement**.
4. Remove the front wheel bearing and hub assembly. Refer to **Front Wheel Bearing and Hub Replacement** .

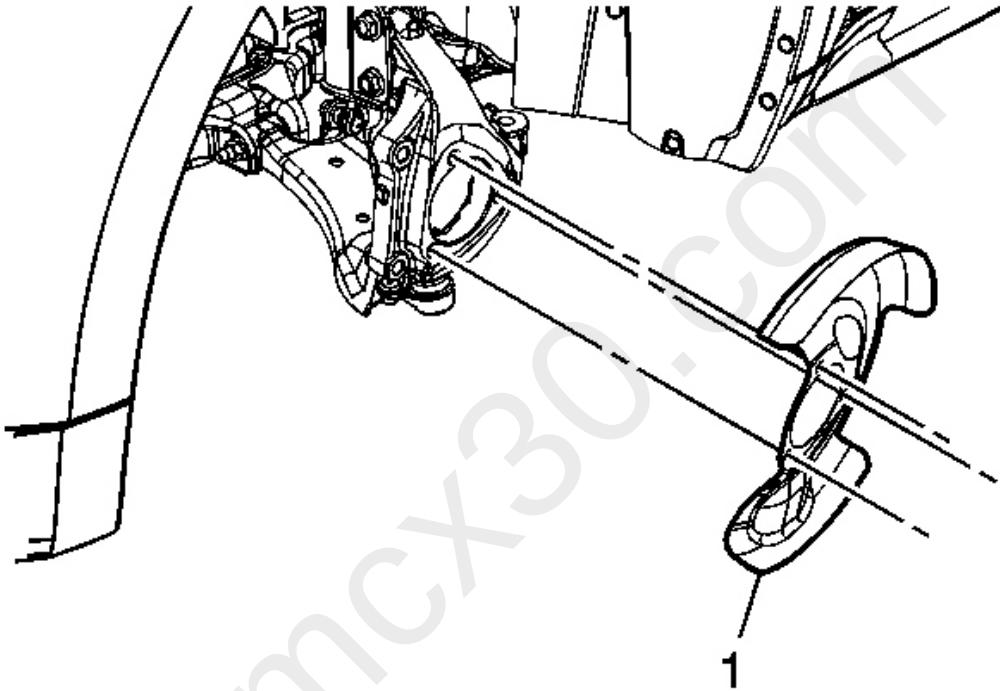


Fig. 70: Front Brake Shield
Courtesy of GENERAL MOTORS CORP.

5. Remove the front brake shield (1).

Installation Procedure

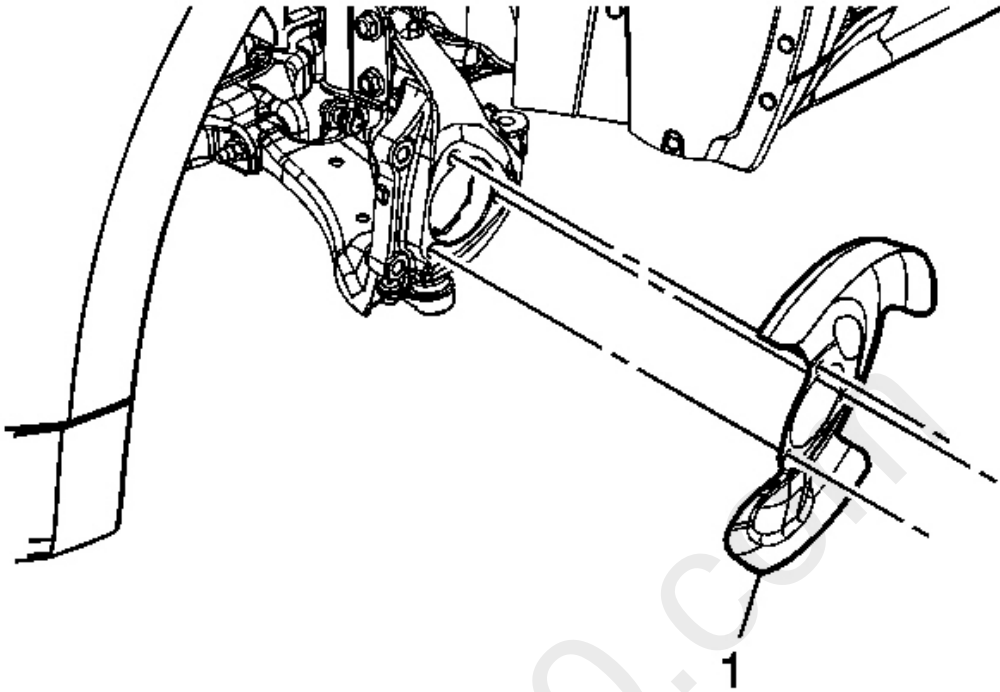


Fig. 71: Front Brake Shield
Courtesy of GENERAL MOTORS CORP.

1. Install the front brake shield (1).
2. Install the front wheel bearing and hub assembly. Refer to **Front Wheel Bearing and Hub Replacement** .
3. Install the front brake rotor. Refer to **Front Brake Rotor Replacement**.
4. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .

REAR BRAKE SHIELD REPLACEMENT

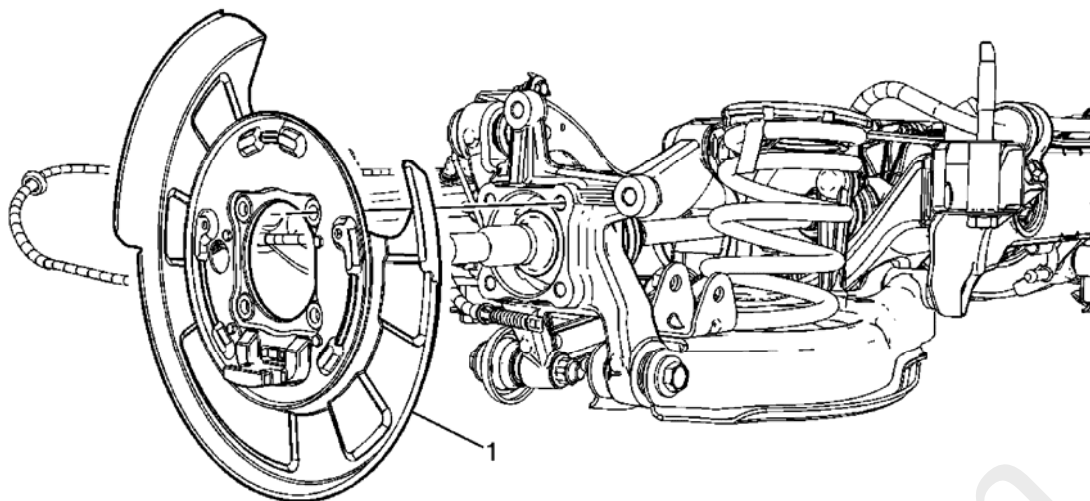


Fig. 72: Rear Brake Shield
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
WARNING: Refer to <u>Brake Dust Warning</u> .	
Preliminary Procedures	
1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 2. Remove the tire and wheel assembly. Refer to <u>Tire and Wheel Removal and Installation</u> . 3. Remove the park brake shoes. Refer to <u>Parking Brake Shoe Replacement</u> . 4. Remove the wheel speed sensor. Refer to <u>Rear Wheel Speed Sensor Replacement</u> . 5. Disconnect the park brake cable from the actuator and mounting bracket. Refer to <u>Parking Brake Rear Cable Replacement (Left)</u> or <u>Parking Brake Rear Cable Replacement (Right)</u> . 6. Remove the wheel bearing/hub assembly. Refer to <u>Rear Wheel Bearing and Hub Replacement</u> .	
1	Rear Brake Shield

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 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 - CORRECTION PLATES

Special Tools

- **CH-39544-KIT:** Complete Torque Socket Set - 10 PCS, or equivalent
- **CH-45101-100:** Conical Brake Rotor Washers

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

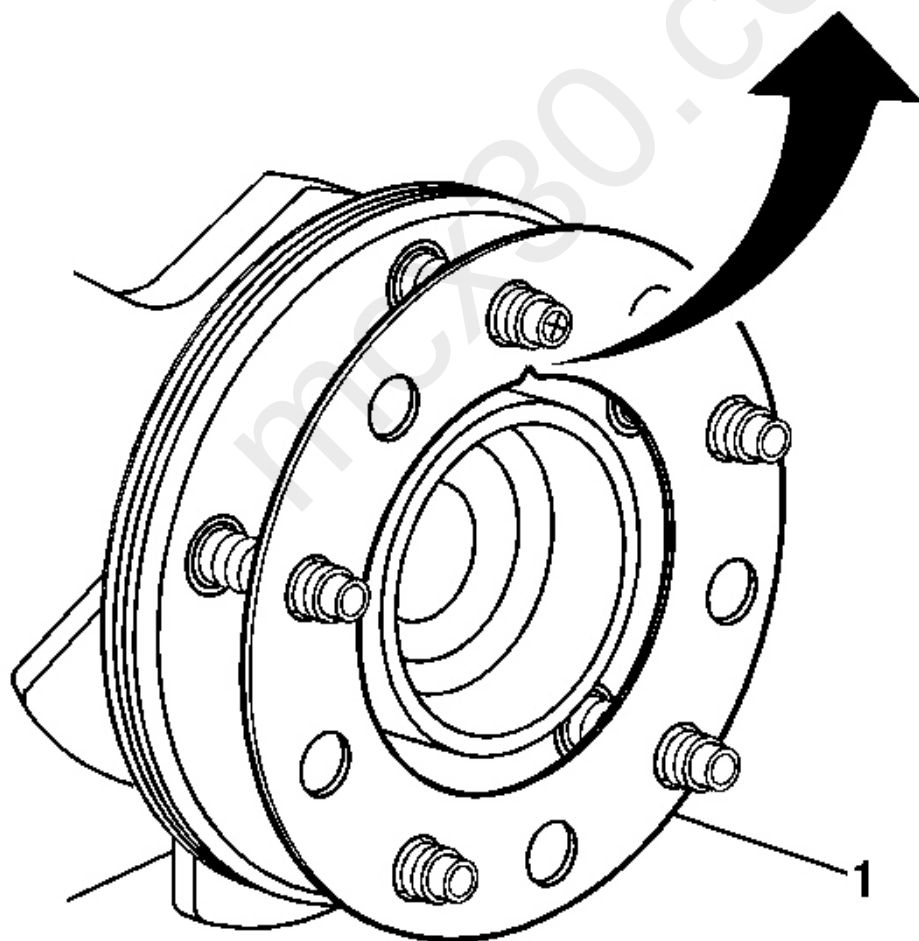
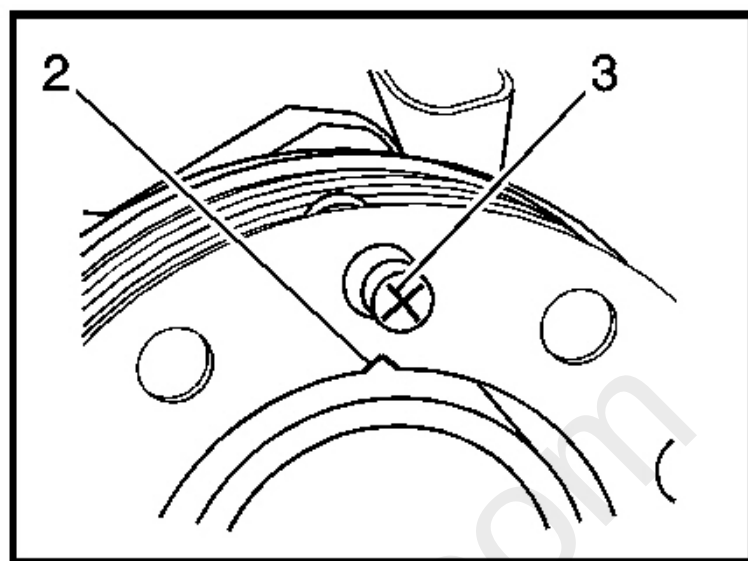


Fig. 73: Identifying Correction Plate, High Spot Mark & V-Shaped Notch
Courtesy of GENERAL MOTORS CORP.

WARNING: Refer to Brake Dust Warning .

NOTE:

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

1. Rotate the brake rotor to position the high spot, identified and marked during the brake rotor assembled LRO measurement procedure, to face upward.
2. Remove the **CH-45101-100**: Conical Brake Rotor Washers and the lug nuts that were installed during the assembled LRO measurement procedure and/or the indexing correction procedure.
3. Inspect the mounting surface of the hub/axle flange and the brake rotor to ensure that there are no foreign particles or debris remaining.
4. Select the correction plate, following the manufacturer's instructions, which has a specification closest to the assembled LRO measurement.

For example: If the assembled LRO measurement was 0.076 mm (0.003 in), the 0.076 mm (0.003 in) correction plate would be used. If the measurement was 0.127 mm (0.005 in), the 0.152 mm (0.006 in) correction plate would be used.

5. Determine the positioning for the correction plate (1) using the high spot mark (3) made during the brake rotor assembled LRO measurement procedure.

NOTE:

- **Do NOT install used correction plates in an attempt to correct brake rotor assembled LRO.**
- **Do NOT stack up, or install more than one correction plate onto one hub/axle flange location, in an attempt to correct brake rotor assembled LRO.**

6. Install the correction plate (1) onto the hub/axle flange, with the V-shaped notch (2) orientated to align with the high spot mark (3), that was positioned to face upward.

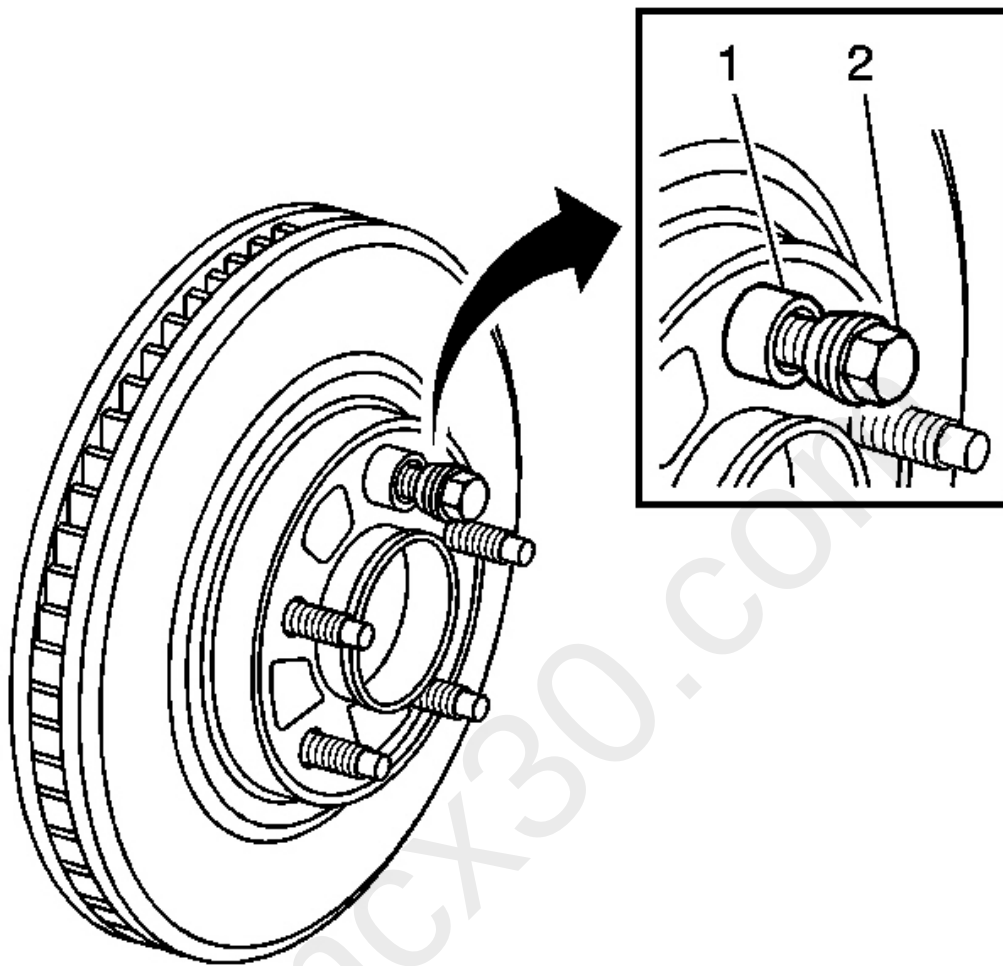


Fig. 74: Identifying J 45101-100 & Lug Nut
Courtesy of GENERAL MOTORS CORP.

7. Install the brake rotor to the hub/axle flange. Use the matchmark made prior to removal for proper orientation to the flange.
8. Hold the rotor firmly in place against the hub/axle flange and install one of the **CH-45101-100: Conical Brake Rotor Washers (1)** and one lug nut (2) onto the upper-most wheel stud.
9. Continue to hold the rotor secure and tighten the lug nut firmly by hand.

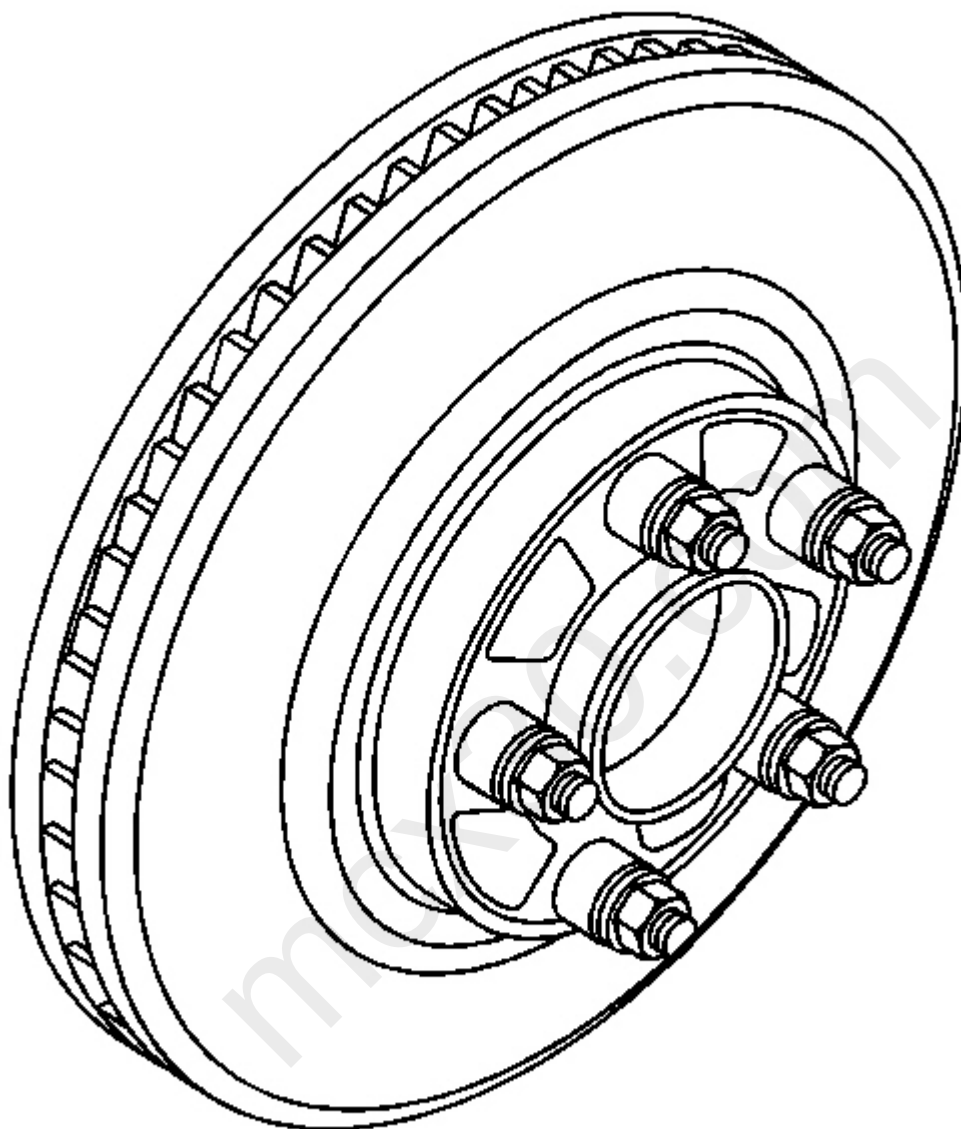


Fig. 75: Identifying All J 45101-100s & Lug Nuts
Courtesy of GENERAL MOTORS CORP.

10. Install the remaining **CH-45101-100**: Conical Brake Rotor Washers and lug nuts onto the wheel studs and tighten the nuts firmly by hand in a star-pattern.
11. Using the **CH-39544-KIT**: Complete Torque Socket Set - 10 PCS, or equivalent, tighten the lug nuts in a star-pattern to specification, in order to properly secure the rotor. Refer to **Tire and Wheel Removal and Installation** .

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

BRAKE ROTOR ASSEMBLED LATERAL RUNOUT CORRECTION - ON VEHICLE LATHE

Special Tools

CH-45101-100: Conical Brake Rotor Washers

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

Lateral Runout Correction

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

BRAKE ROTOR REFINISHING

Special Tools

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

NOTE: **Do NOT refinish the brake rotors in order to correct any of the following complaints:**

- **Growl or squeal brake noise**
- **Premature brake lining wear**
- **Cosmetic or superficial corrosion of the rotor braking surface**
- **Rotor discoloration**

Refinish the brake rotors ONLY when 1 or more of the following conditions exist:

- **Groove depth in excess of specification**
- **Severe scoring of the rotor braking surface**
- **Brake pulsation caused by the following:**
 - **Lateral runout in excess of specification**
 - **Brake rotor thickness variation in excess of specification**

- **Corrosion or pitting that is deeper than the rotor braking surface**

1. Use the **J-42450-A: Wheel Hub Resurfacing Kit** in order to clean the wheel bearing/hub.
2. Use a micrometer in order to measure the thinnest point of the brake rotor. If the thinnest point of the brake rotor exceeds the brake rotor minimum thickness, do NOT refinish the brake rotor. Replace the brake rotor.
3. Use the **J-41013: Rotor Resurfacing Kit** in order to THOROUGHLY clean the rust from the brake rotor flange.
4. Refinish the brake rotor. Refer to the brake lathe manufacturer's operating instructions.

NOTE: **Failure to obtain the best possible braking surface finish may cause the vehicle to stop with difficulty.**

5. After machining the rotor, use 120 grit aluminum oxide sandpaper and a non-directional rotor finisher, if available, in order to create a non-directional braking surface.
6. Clean the braking surfaces with GM P/N 12377981 (Canadian P/N 10953463) or equivalent, brake parts cleaner.

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)

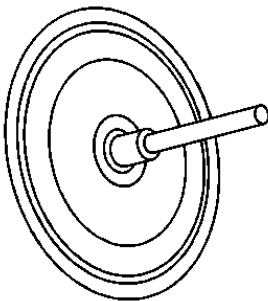
Mechanical output force is applied from the hydraulic brake caliper pistons to the inner brake pads. As the pistons press the inner brake pads outward, the caliper housings draw the outer brake pads inward. This allows the output force to be equally distributed. The brake pads apply the output force 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.

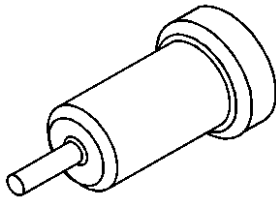
System Operation (Fixed Caliper)

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.

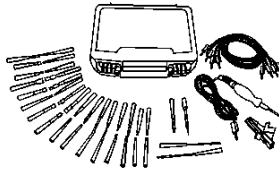
SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

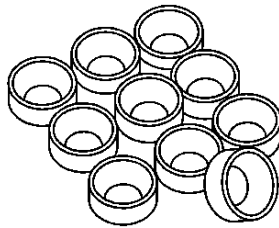
Illustration	Tool Number/ Description
	J 39544-KIT Complete Torque Socket Set - 10 Pieces
	J 41013 Rotor Resurfacing Kit



J 42450-A
Wheel Hub Resurfacing Kit



J 45101
Hub and Wheel Runout Gauge



J 45101-100
Conical Brake Rotor Washers