

**2018 BRAKES****Disc Brakes - Traverse****SPECIFICATIONS****FASTENER SPECIFICATIONS****Single Use Non-Threaded Fasteners/Components**

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

**Reusable Threaded Fastener Tightening Specifications**

| <b>NOTE:</b><br><i>All fasteners listed in this table can be reused after removal.</i> |                     |
|----------------------------------------------------------------------------------------|---------------------|
| Application                                                                            | Specification       |
|                                                                                        | Metric (English)    |
| Front Brake Caliper Bleeder Valve                                                      | 11 N.m (97 lb in)   |
| Front Brake Caliper Bracket Bolt                                                       |                     |
| • First Pass:                                                                          | 150 N.m (111 lb ft) |
| • Final Pass:                                                                          | 15-30 Degrees       |
| Front Brake Caliper Guide Pin Bolt                                                     | 72 N.m (53 lb ft)   |
| Front Brake Rotor Bolt                                                                 | 9 N.m (80 lb in)    |
| Rear Brake Bleeder Valve                                                               | 10 N.m (89 lb in)   |
| Rear Brake Caliper Bracket Bolt                                                        |                     |
| • First Pass:                                                                          | 100 N.m (74 lb ft)  |
| • Final Pass:                                                                          | 15-30 Degrees       |
| Rear Brake Caliper Guide Pin Bolt                                                      | 40 N.m (30 lb ft)   |
| Rear Brake Rotor Bolt                                                                  | 9 N.m (80 lb in)    |

**DISC BRAKE COMPONENT SPECIFICATIONS**

| Application                         | Specification |           |
|-------------------------------------|---------------|-----------|
|                                     | Metric        | English   |
| Disc Brake Pads - Front and Rear    |               |           |
| Maximum Allowable Taper             | 0.15 mm       | 0.0059 in |
| Minimum Friction Material Thickness | 2.0 mm        | 0.078 in  |
| Front Brake Rotor                   |               |           |
| Diameter                            | 345.0 mm      | 13.583 in |

| Application                                                                                                                                                                                                                | Specification |           |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------|
|                                                                                                                                                                                                                            | Metric        | English   |
| Discard Thickness*                                                                                                                                                                                                         | 27.0 mm       | 1.063 in  |
| Maximum Allowable Assembled Lateral Runout                                                                                                                                                                                 | 0.05 mm       | 0.002 in  |
| Maximum Allowable Scoring                                                                                                                                                                                                  | 1.50 mm       | 0.59 in   |
| Maximum Allowable Thickness Variation                                                                                                                                                                                      | .025 mm       | 0.001 in  |
| Minimum Allowable Thickness After Refinish                                                                                                                                                                                 | 28.0 mm       | 1.102 in  |
| Thickness - New                                                                                                                                                                                                            | 30.0 mm       | 1.181 in  |
| Rear Brake Rotor                                                                                                                                                                                                           |               |           |
| Diameter                                                                                                                                                                                                                   | 315.0 mm      | 12.402 in |
| Discard Thickness*                                                                                                                                                                                                         | 21.0 mm       | 0.827 in  |
| Maximum Allowable Assembled Lateral Runout                                                                                                                                                                                 | 0.05 mm       | 0.002 in  |
| Maximum Allowable Scoring                                                                                                                                                                                                  | 1.50 mm       | 0.59 in   |
| Maximum Allowable Thickness Variation                                                                                                                                                                                      | .025 mm       | 0.002 in  |
| Minimum Allowable Thickness After Refinish                                                                                                                                                                                 | 22.0 mm       | 0.866 in  |
| Thickness - New                                                                                                                                                                                                            | 23.0 mm       | 0.906 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 |          |
|-----------------------------|---------------------------------|----------------|----------|
|                             |                                 | United States  | Canada   |
| Brake Caliper Bracket Bolts | Threadlocker                    | 89021297       | 10953488 |
| Hydraulic Brake System      | DOT 3 Motor Vehicle Brake Fluid | 19299818       | 19299819 |
| Front Disc Brake Pad Shims  | Molykote® M-77 Lubricant Paste  | 19356408       | 19356409 |

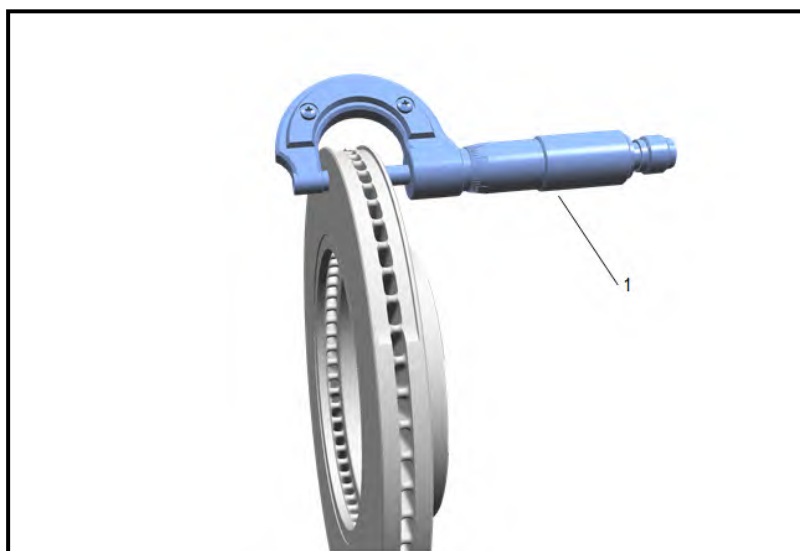
## DIAGNOSTIC INFORMATION AND PROCEDURES

### 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. [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 (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.

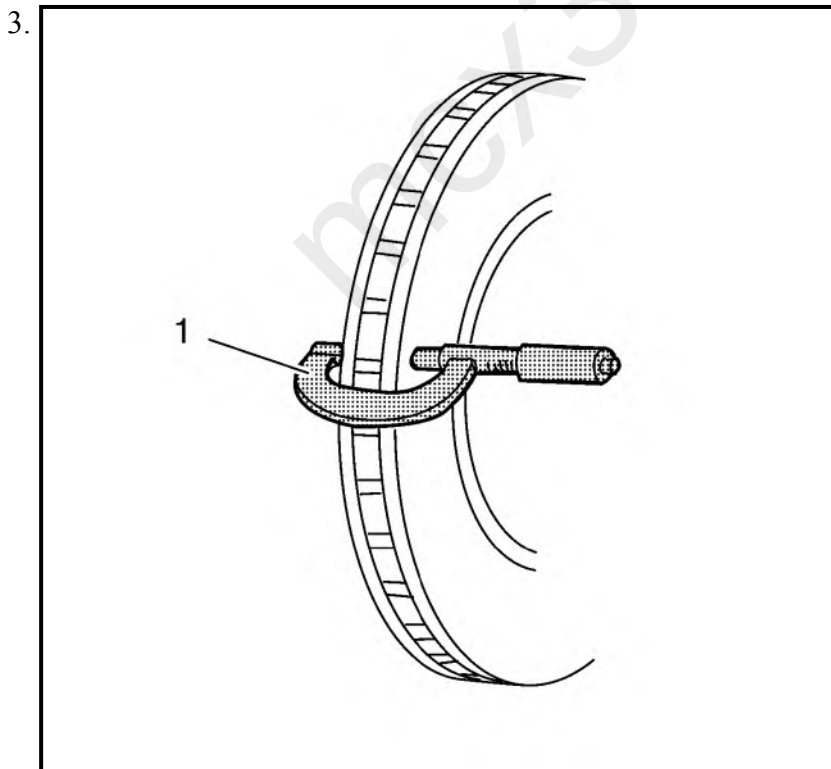
4. Compare the lowest thickness measurement recorded to the brake rotor discard thickness specifications. [Disc Brake Component Specifications](#)
5. If the lowest thickness measurement of the brake rotor is above the discard thickness specification, the brake rotor may be refinished, depending upon 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. [Front Brake Rotor Replacement](#), and/or [Rear Brake Rotor Replacement](#)

## BRAKE ROTOR THICKNESS VARIATION MEASUREMENT

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

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

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.



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

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

4. Calculate the difference between the highest and lowest thickness measurements recorded to obtain the amount of thickness variation.
5. Compare the thickness variation measurement to the following specification:

### Specification

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

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

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

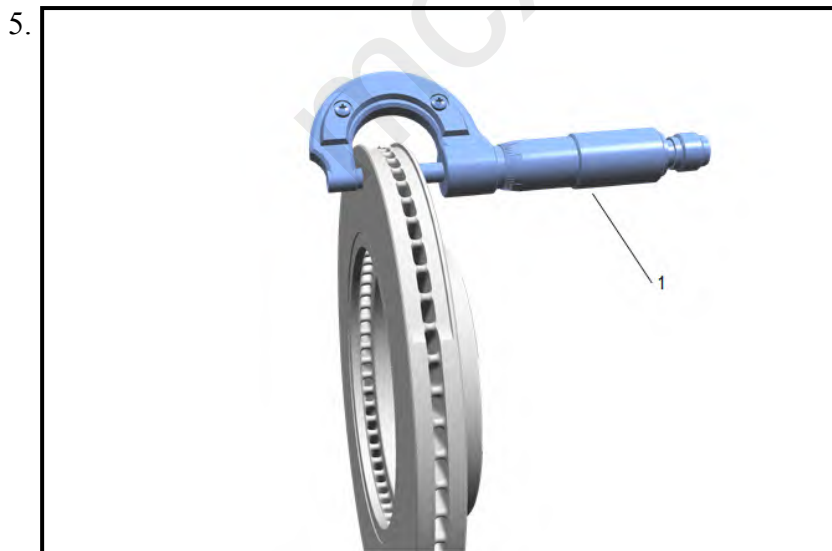
## BRAKE ROTOR SURFACE AND WEAR INSPECTION

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

1. If the inboard friction surface of the brake rotor is not accessible, reposition and support the caliper with the brake pads. [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 any of the following:
  - 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 bluing discoloration
4. If the friction surfaces of the brake rotor exhibit one or more of the above conditions, the rotor requires refinishing or replacement.



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: 1.5 mm (0.059 in)

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

## **BRAKE ROTOR ASSEMBLED LATERAL RUNOUT MEASUREMENT**

### **Special Tools**

- **CH-41013** Rotor Resurfacing Kit
- **CH-42450-A** Wheel Hub Resurfacing Kit
- **CH-45101** Hub and Wheel Runout Gauge
- **CH-45101-100** Conical Brake Rotor Washers

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

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

### **NOTE:**

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

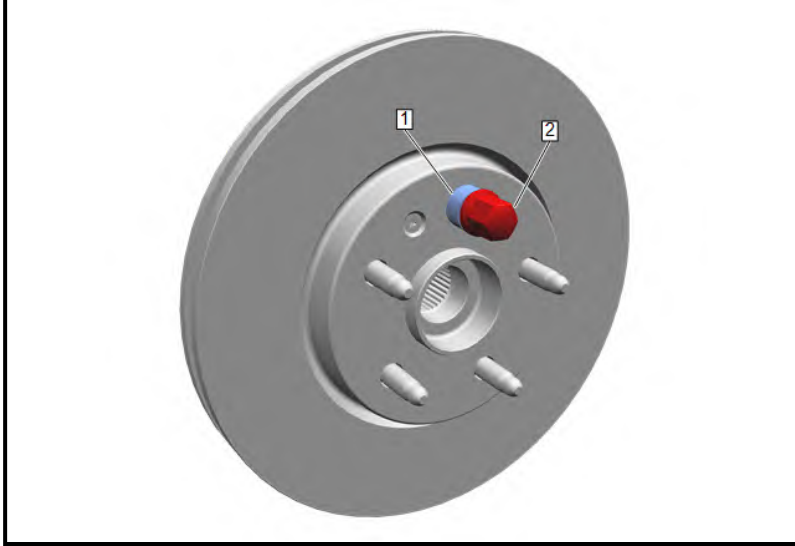
1. Match-mark the position of the brake rotor to the wheel studs if this has not been done already.

**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. [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.

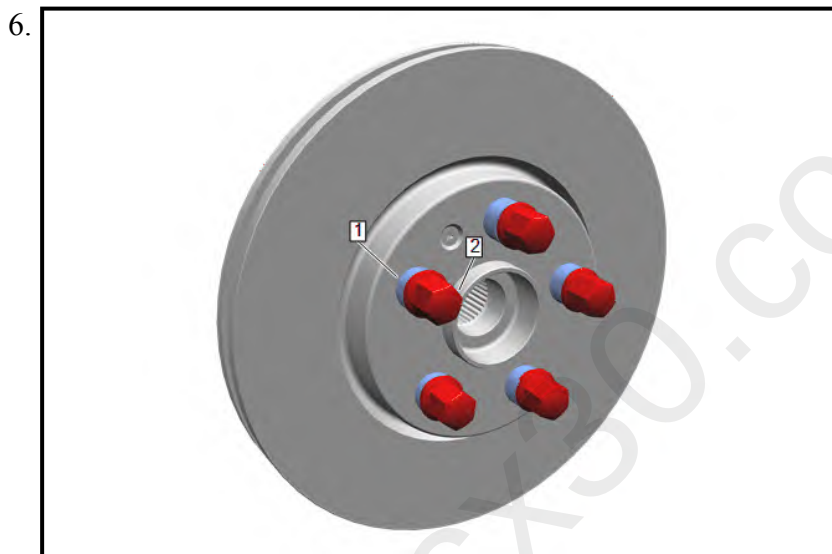
4.





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.



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.

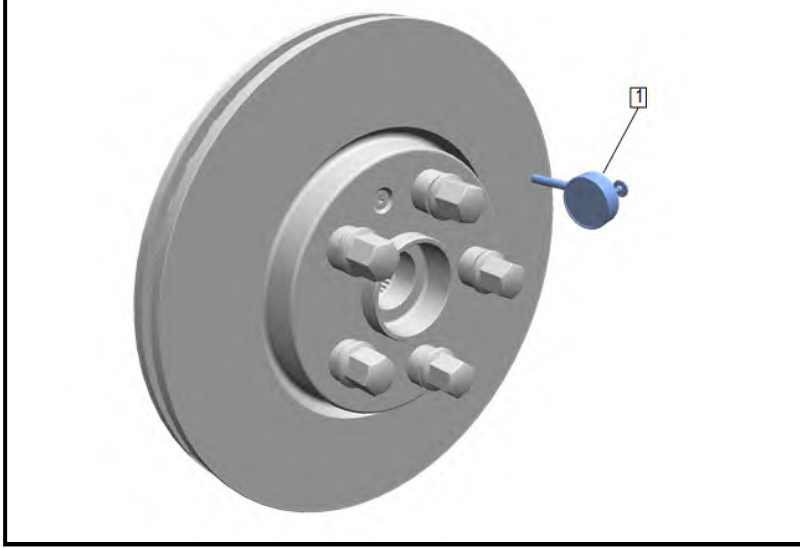
7. Tighten the lug nuts in a star-pattern to specification. [Tire and Wheel Removal and Installation](#)

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.





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. **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:

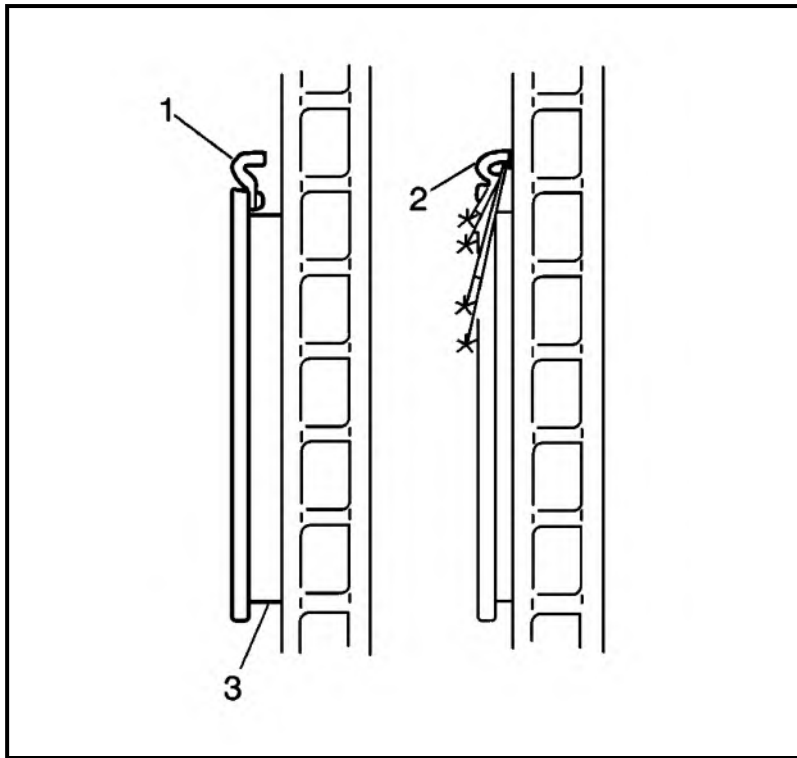
#### **Specification**

- 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. **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

1.



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

Inspect the disc brake pads at regular intervals, or whenever the tire and wheel assemblies are removed from the vehicle.

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

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

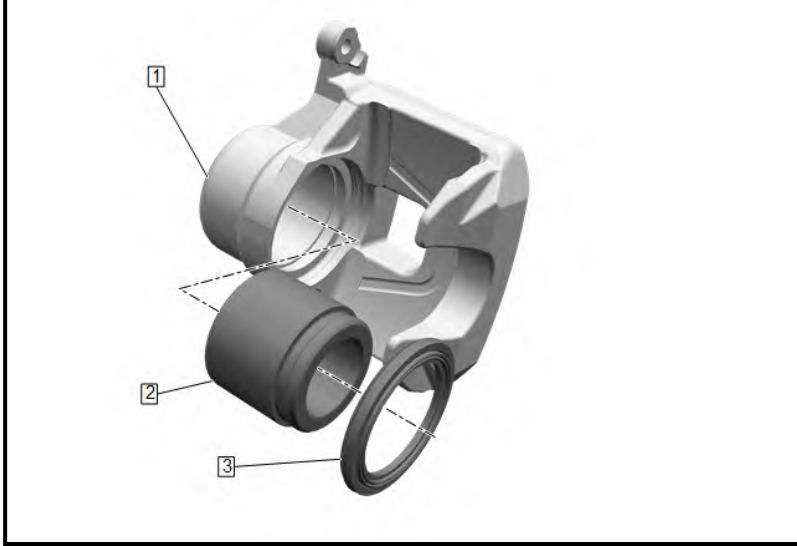
**NOTE:** When replacing the disc brake pads, maintain the same disc brake pad wear sensor orientation.

5. Both front and rear disc brake pads have integral, audible wear sensors (1). When the disc brake pad wear reaches the minimum allowable thickness, the wear sensor contacts the disc brake rotor (2). The wear indicator will then produce an audible, high-pitched warning noise during wheel rotation.
6. Replace the disc brake pads when the friction surface (3) is worn to within 2.0 mm (0.080 in) of the mounting plates.
7. Replace the disc brake pads if any have separated from the mounting plates.
8. Inspect the disc brake pads friction surfaces for cracks, fractures, or damage which may cause noise or otherwise impair disc brake performance.

## BRAKE CALIPER INSPECTION

1.





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

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 (3) 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 (3) and on the disc brake pads. If there is any evidence of brake fluid leakage, the brake caliper requires overhaul or replacement.
4. Inspect for smooth and complete travel of the caliper piston (2) into the caliper bores. The movement of the caliper piston (2) into the caliper bores should be smooth and even. If the caliper piston (2) is frozen or difficult to bottom, the caliper requires overhaul or replacement.

## 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.

**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.

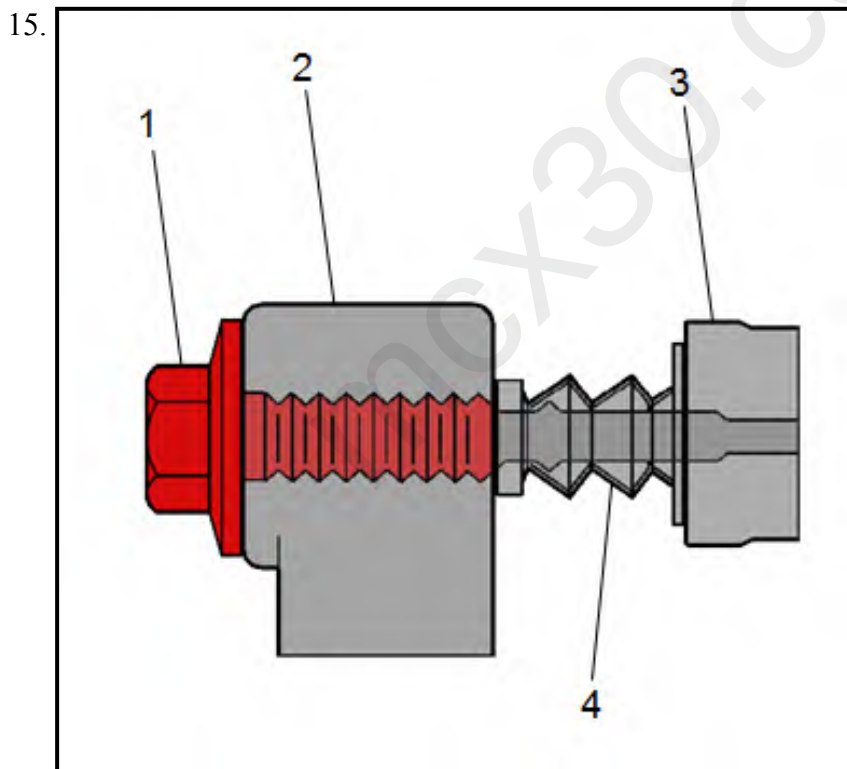
- 4.
5. Raise and support the vehicle. [Lifting and Jacking the Vehicle](#)
6. Remove the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)
7. Grasp the brake caliper housing and try to move the brake caliper housing up/down and forward/reverse in relation to the brake caliper mounting bracket. If excessive looseness is observed the brake caliper bracket bushings and/or the brake caliper mounting bolts may need to be replaced.
8. Compress the front caliper pistons.
  1. Install a large C-clamp over the top of the caliper housing and against the back of the outboard pad.
  2. Slowly tighten the C-clamp until the pistons are pushed completely into the caliper bores.
  3. Remove the C-clamp from the caliper.

9. 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.
10. 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.

### Front Brake Caliper Replacement

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

11. Remove the disc brake pads from the brake caliper mounting bracket.
12. 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.
13. If any of the conditions listed are found, the disc brake pad mounting hardware requires replacement.
14. 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.



Inspect the brake caliper guide pin bolt (1), brake caliper (2), caliper bracket (3), and the guide pin seal (4) for the following:

- Binding
- Seizing
- Looseness in the brake caliper mounting bracket
- Bent or damaged brake caliper mounting bolts
- Cracked or torn boots
- Missing boots
- Bent or damaged brake caliper mounting bracket

16. If any of the conditions listed are found then the brake caliper mounting hardware requires replacement.
17. Install the disc brake pads to the brake caliper mounting bracket.
18. Install the disc brake caliper to the brake caliper mounting bracket. [Front Brake Caliper Replacement](#)

## REAR DISC BRAKE MOUNTING AND HARDWARE INSPECTION

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

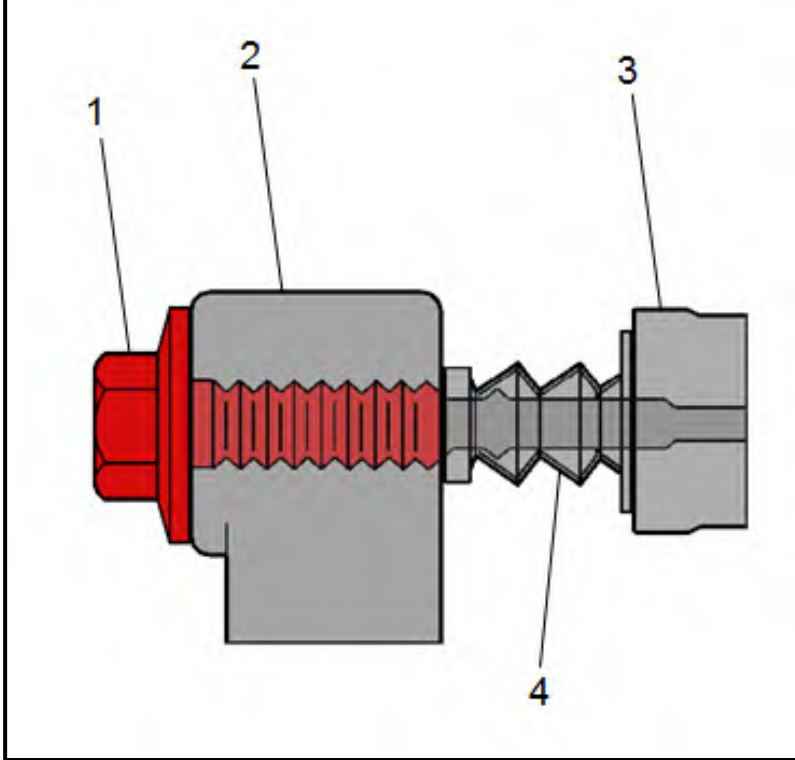
1. Inspect the fluid level in the brake master cylinder reservoir.
2. If the brake fluid level is midway between the maximum - full point and the minimum allowable level then no brake fluid needs to be removed from the reservoir before proceeding.
3. If the brake fluid level is higher than midway between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

**WARNING:** Do not use a service jack in locations other than those specified to lift this vehicle. Lifting the vehicle with a jack in those other locations could cause the vehicle to slip off the jack and roll; this could cause injury or death.

4. Raise and support the vehicle. [Lifting and Jacking the Vehicle](#)
5. Remove the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)
6. Grasp the brake caliper housing and try to move the brake caliper housing up/down and forward/reverse in relation to the brake caliper mounting bracket. If excessive looseness is observed the brake caliper bracket bushings and/or the brake caliper mounting bolts may need to be replaced.
7. Compress the rear caliper piston.
  1. Install a large C-clamp over the top of the caliper housing and against the back of the outboard pad.
  2. Slowly tighten the C-clamp until the pistons are pushed completely into the caliper bores.
  3. Remove the C-clamp from the caliper.
8. With the piston compressed into the caliper bore, grasp the brake caliper housing and slide it back and forth on the brake caliper mounting bolts. Check for smooth operation. If the brake caliper housing slide force is high or the brake caliper housing does not slide smoothly, inspect the brake caliper mounting bolts and/or the brake caliper mounting bracket bushings for wear or damage. If wear or damage conditions are found, replacement of the brake caliper mounting bolts and/or the brake caliper mounting bracket bushings is necessary.
9. Remove the brake caliper mounting bolts from the brake caliper mounting bracket and support the brake caliper using heavy mechanics wire. Do not disconnect the hydraulic brake hose from the caliper. [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.

14.





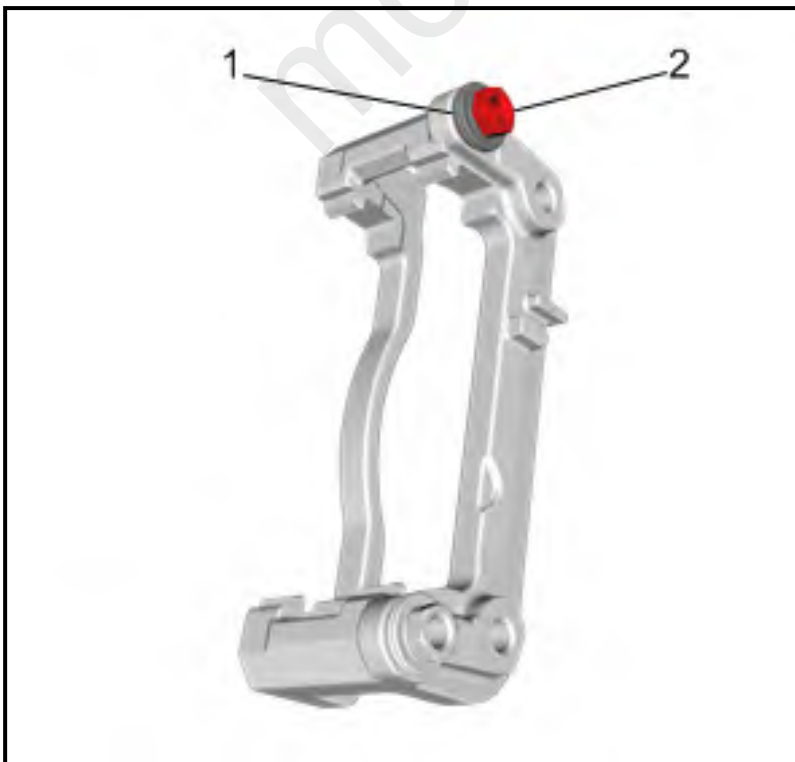
Inspect the caliper bolts (1) or guide pins for the following:

- 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.

17.



**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.

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. [Rear Brake Caliper Replacement](#)

## REPAIR INSTRUCTIONS

### FRONT DISC BRAKE PADS REPLACEMENT

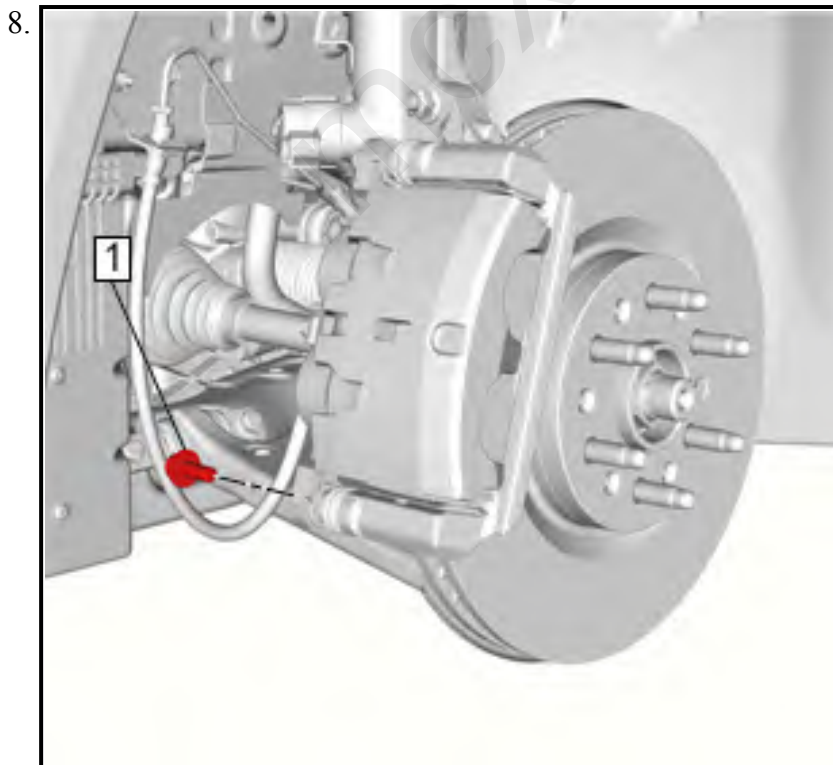
#### Removal Procedure

**WARNING:** [Brake Dust Warning](#)

**WARNING:** [Brake Fluid Irritant Warning](#)

**NOTE:** Always replace disc brake pads in axle sets.

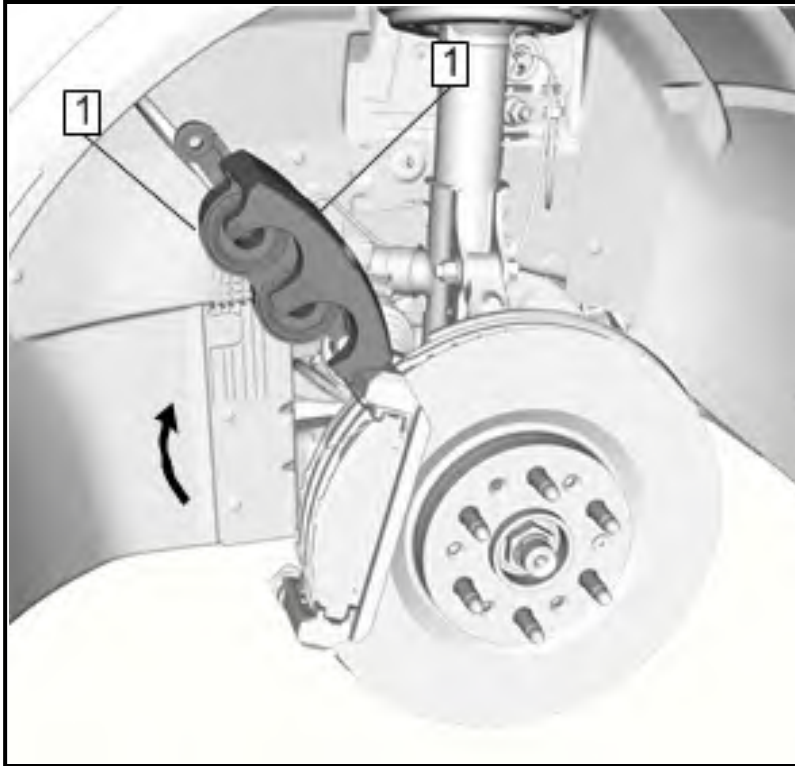
1. Inspect the fluid level in the brake master cylinder reservoir.
2. If the brake fluid level is midway between the maximum-full point and the minimum allowable level, no brake fluid needs to be removed before proceeding.
3. If the brake fluid level is higher than midway between the maximum-full point and the minimum allowable level, remove brake fluid to the midway point before proceeding.
4. Raise and support the vehicle. [Lifting and Jacking the Vehicle](#)
5. Remove the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)
6. Place a large C-clamp over the brake caliper body and against the outer brake pad.
7. Using the C-clamp, compress the brake caliper piston fully into the brake caliper bore.



**NOTE:** Do NOT use any air tools to remove or install the guide pin bolts. Use hand tools ONLY.

Front Brake Caliper Guide Pin Bolt (1) - Remove

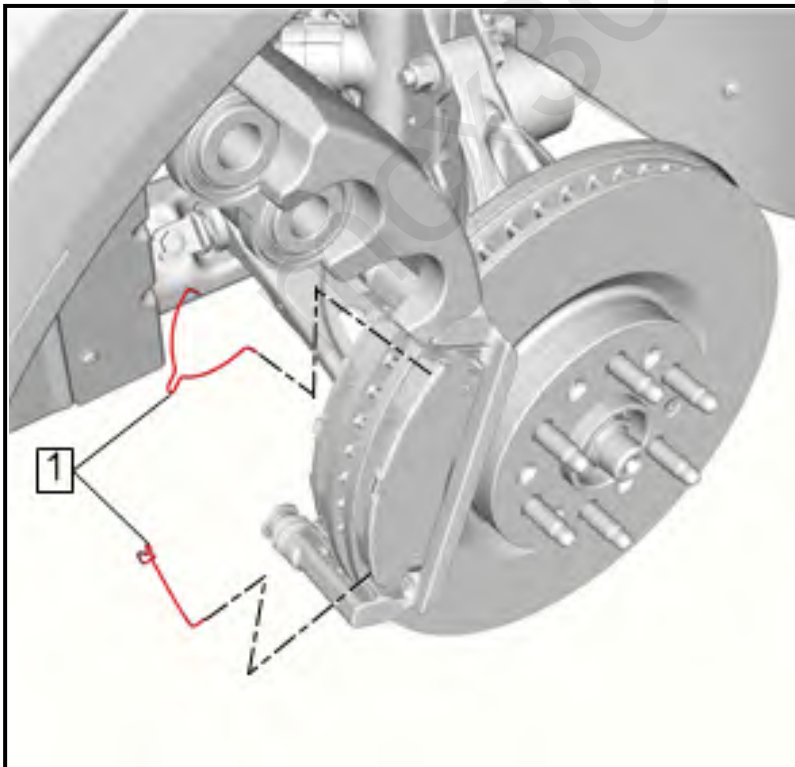
9.



**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.

Rotate the front brake caliper (1) upward and support with heavy mechanics wire.

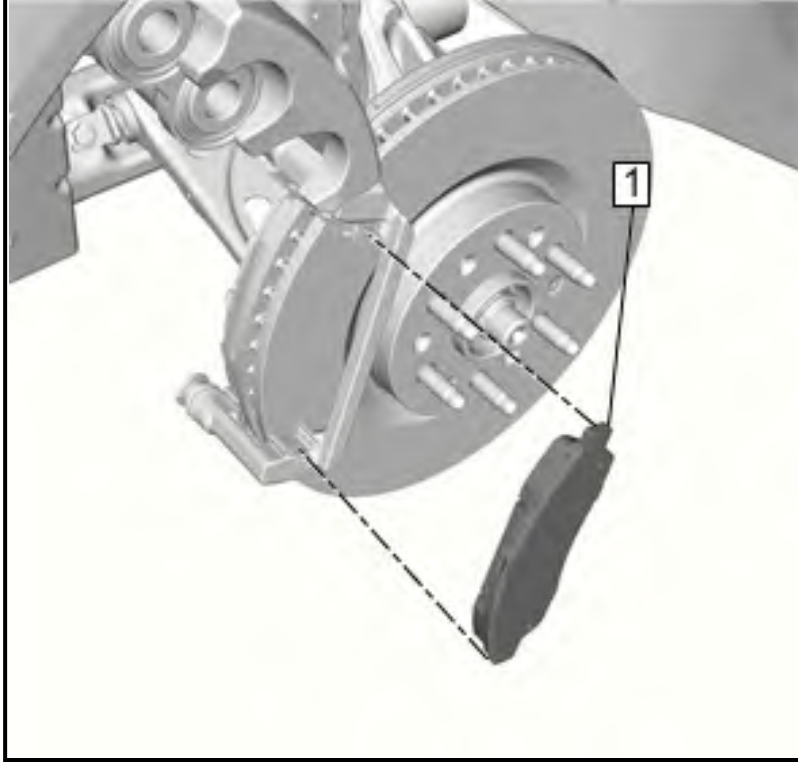
10.



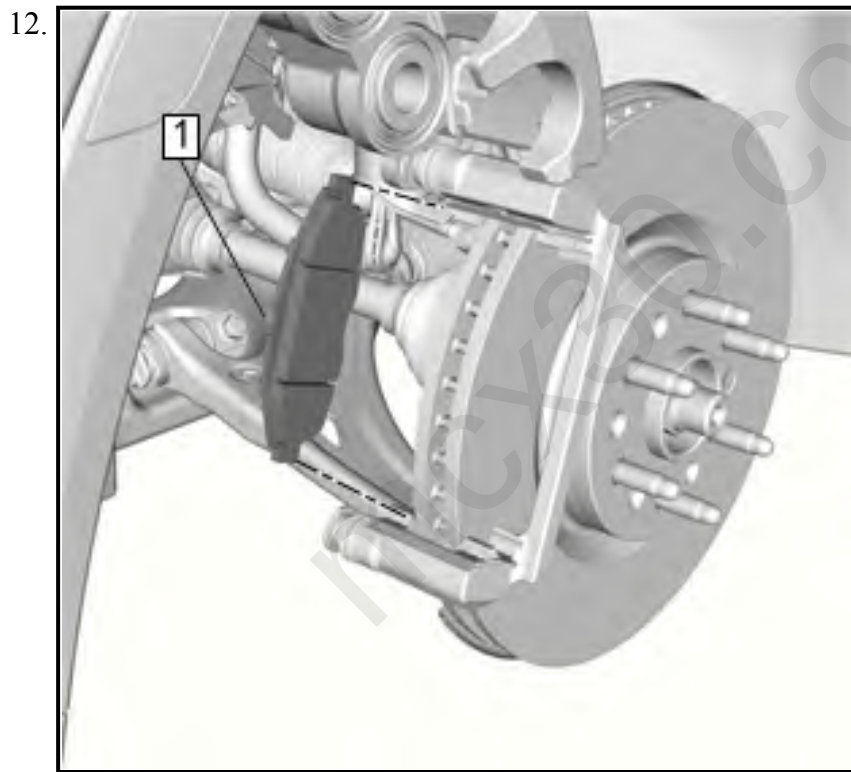
Disc Brake Pad Spring (1) - Remove [2x]

11.



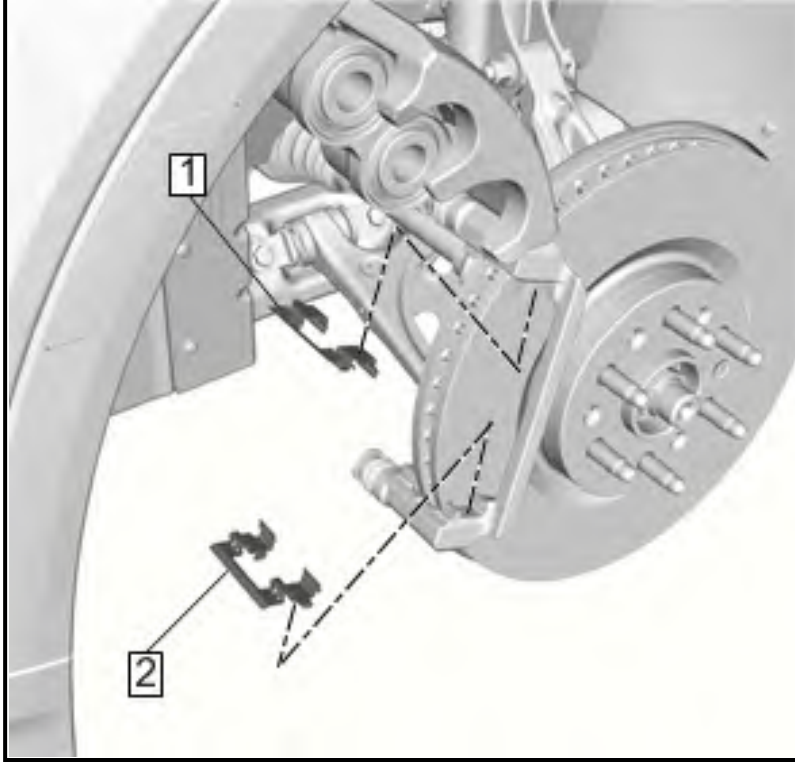


Outer Disc Brake Pad (1) - Remove



Inner Disc Brake Pad (1) - Remove

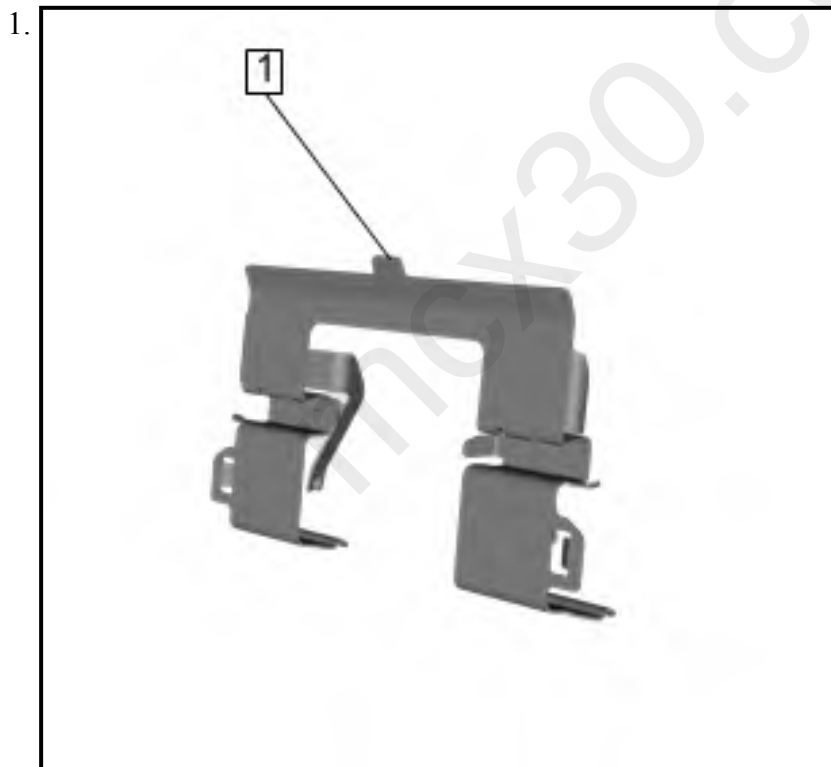




Leading Disc Brake Pad Clip (1) - Remove

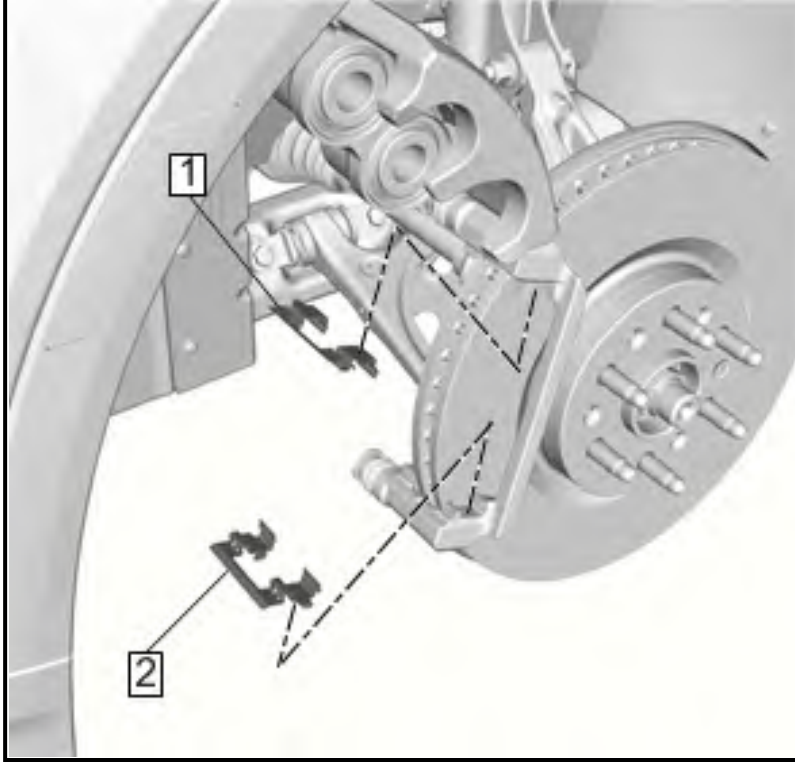
14. Trailing Disc Brake Pad Clip (2) - Remove

#### Installation Procedure



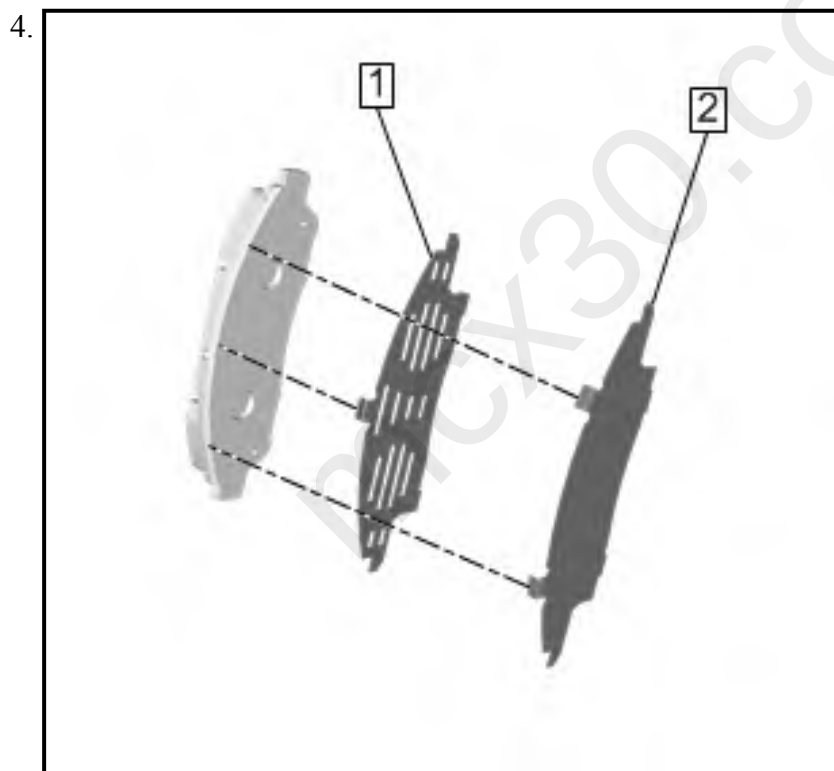
The disc brake pad clip with the tab (1) must be installed in the leading edge of the brake caliper bracket.





Leading Disc Brake Pad Clip (1) - Install

3. Trailing Disc Brake Pad Clip (2) - Install



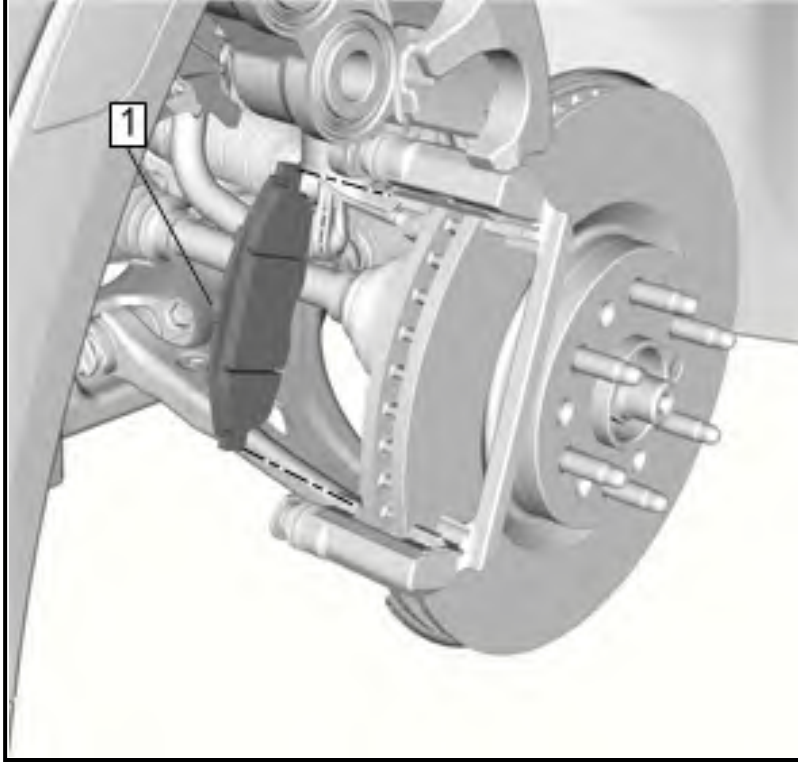
**NOTE:** The inner disc brake pad shim is perforated.

Inner Disc Brake Pad Shim (1) - Install

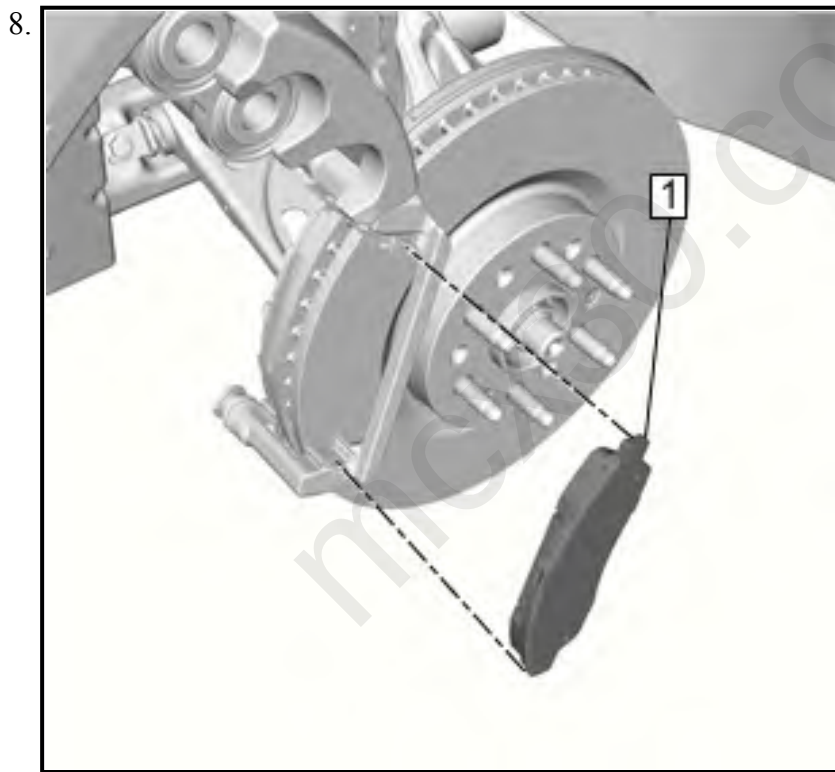
5. Apply 2 g (0.07 oz) lubricant paste between the disc brake pad shims. [Adhesives, Fluids, Lubricants, and Sealers](#)

6. Outer Disc Brake Pad Shim (2) - Install



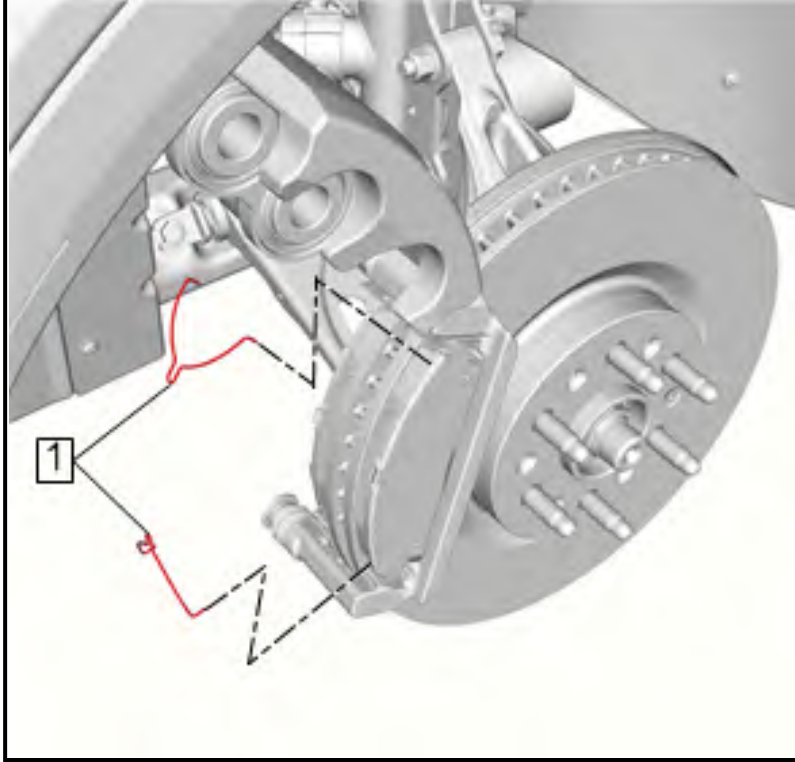


Inner Disc Brake Pad (1) - Install



Outer Disc Brake Pad (1) - Install

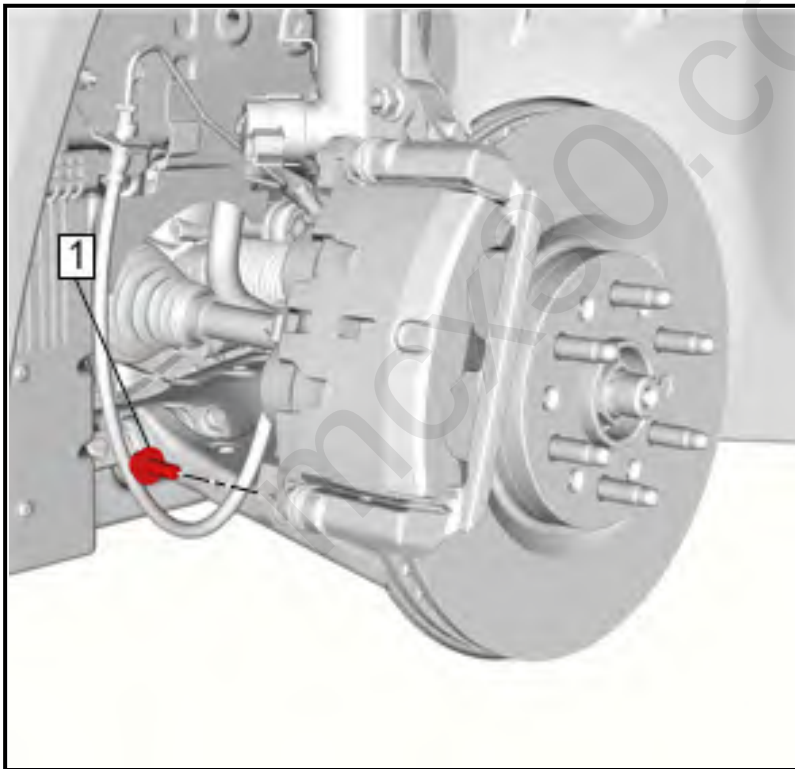




Disc Brake Pad Spring (1) - Install [2x]

10. Position the brake caliper to the caliper bracket.

11.



Front Brake Caliper Guide Pin Bolt (1) - Install - [Front Brake Caliper Replacement](#)

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

13. Remove the supports and lower the vehicle.

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

15. Slowly release the brake pedal.

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

17. Fill the brake master cylinder reservoir to the maximum-full level with GM approved brake fluid from a clean, sealed brake fluid container. [Brake Master Cylinder Reservoir Filling](#)

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

# REAR DISC BRAKE PADS REPLACEMENT

## Removal Procedure

**WARNING:** Brake Dust Warning

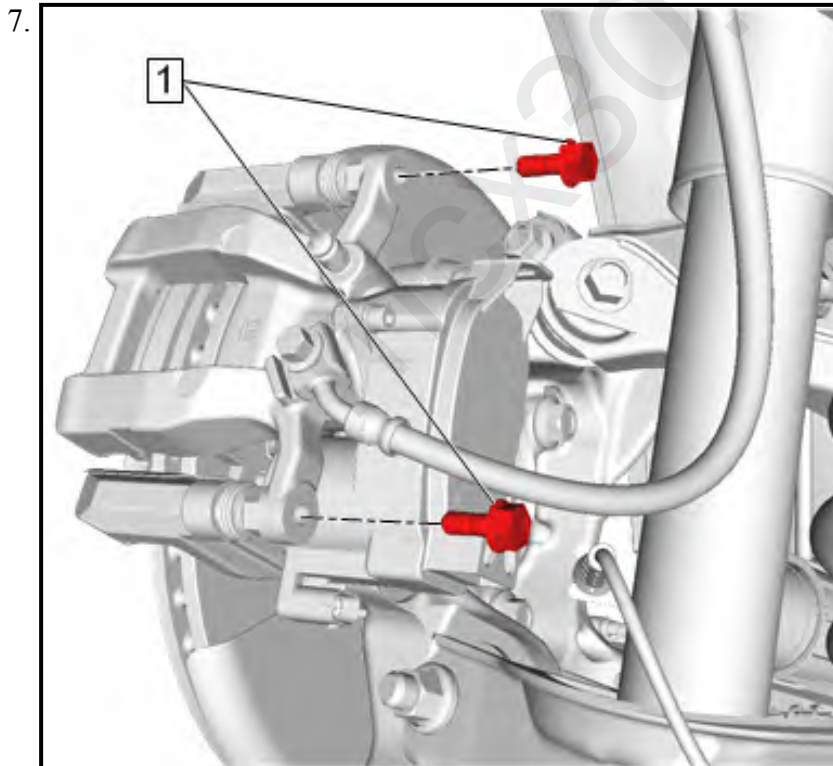
**WARNING:** Brake Fluid Irritant Warning

**NOTE:** Always replace disc brake pads in axle sets.

1. Set the parking brake in Service Mode.
  1. Install a scan tool.
  2. Turn the ignition ON with the engine OFF.
  3. Select Electronic Brake Control Module.
  4. Select Control Functions.

**NOTE:** Do NOT apply any brake pressure during this step.

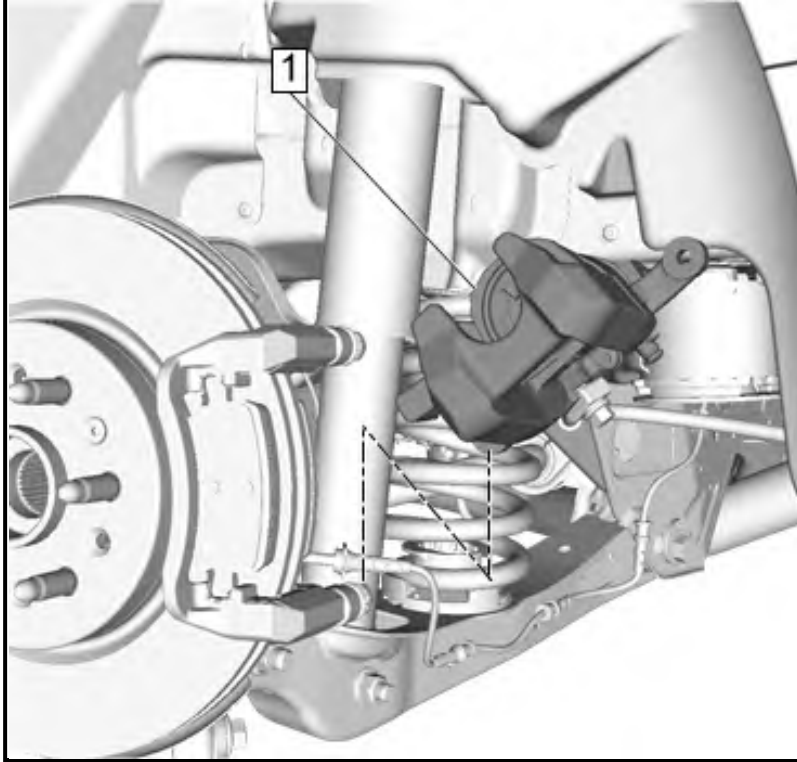
5. Select Rear Brake Caliper Piston Retract.
2. Inspect the fluid level in the brake master cylinder reservoir.
3. If the brake fluid level is midway between the maximum-full point and the minimum allowable level, no brake fluid needs to be removed before proceeding.
4. If the brake fluid level is higher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



**NOTE:** Do NOT use any air tools to remove or install the rear brake caliper guide pin bolts. Use hand tools ONLY.

Rear Brake Caliper Guide Pin Bolt (1) - Remove [2x]

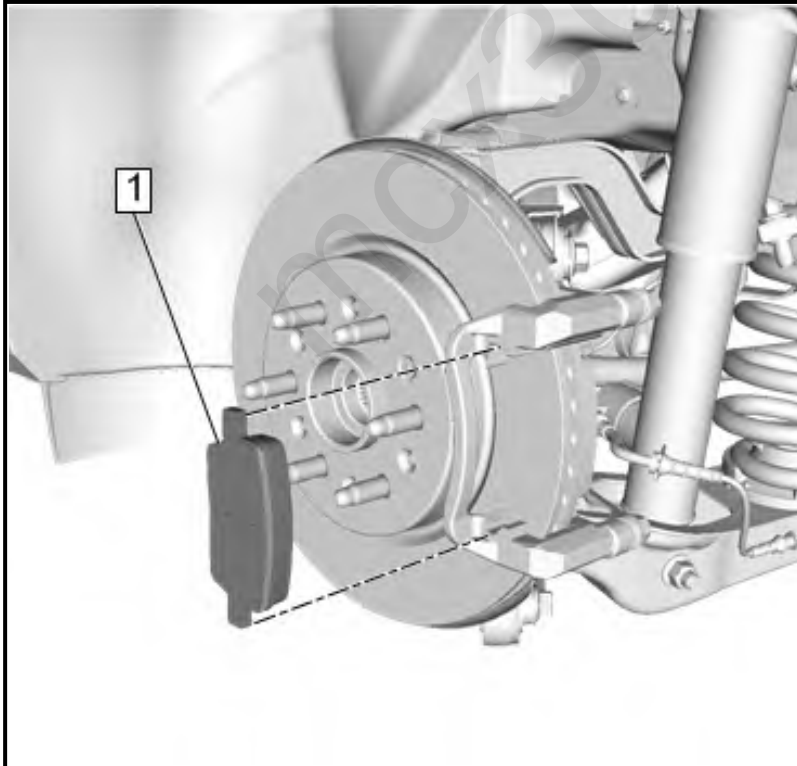




**CAUTION:** Support the brake caliper with heavy mechanic wire, or equivalent, whenever it is separated from its mount and the hydraulic flexible brake hose is still connected. Failure to support the caliper in this manner will cause the flexible brake hose to bear the weight of the caliper, which may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

Remove the rear brake caliper (1) and support with heavy mechanics wire.

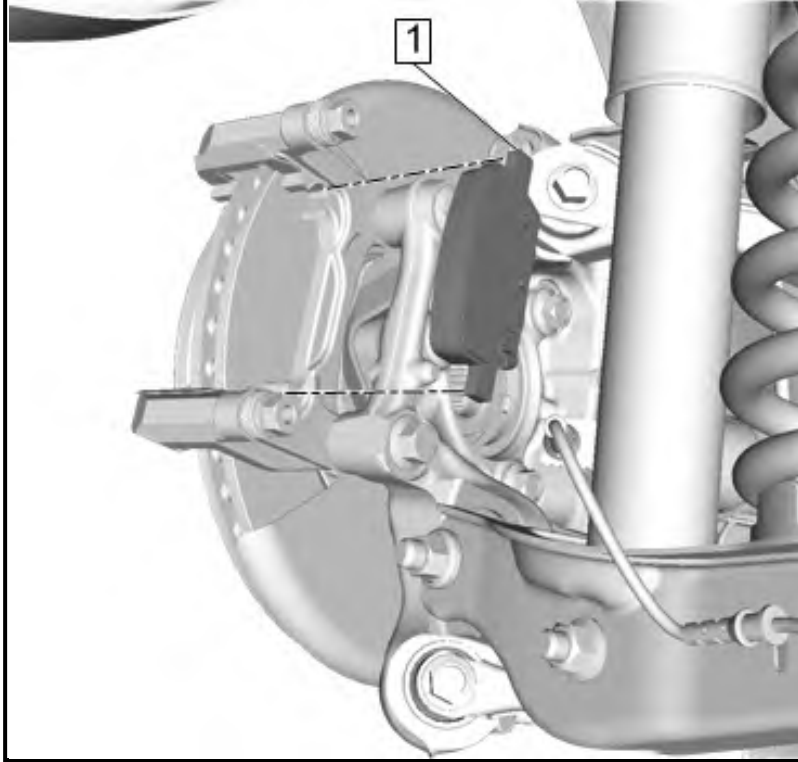
9.



Outer Disc Brake Pad (1) - Remove

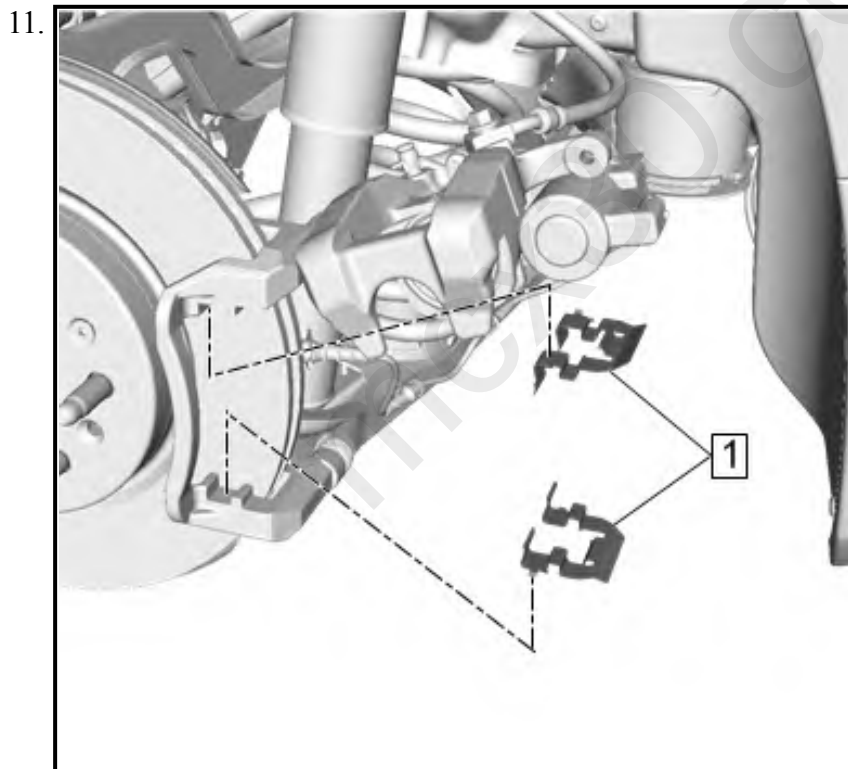
10.





**NOTE:** The inner disc brake pad is equipped with a wear sensor on the leading edge of the disc brake pad.

Inner Disc Brake Pad (1) - Remove

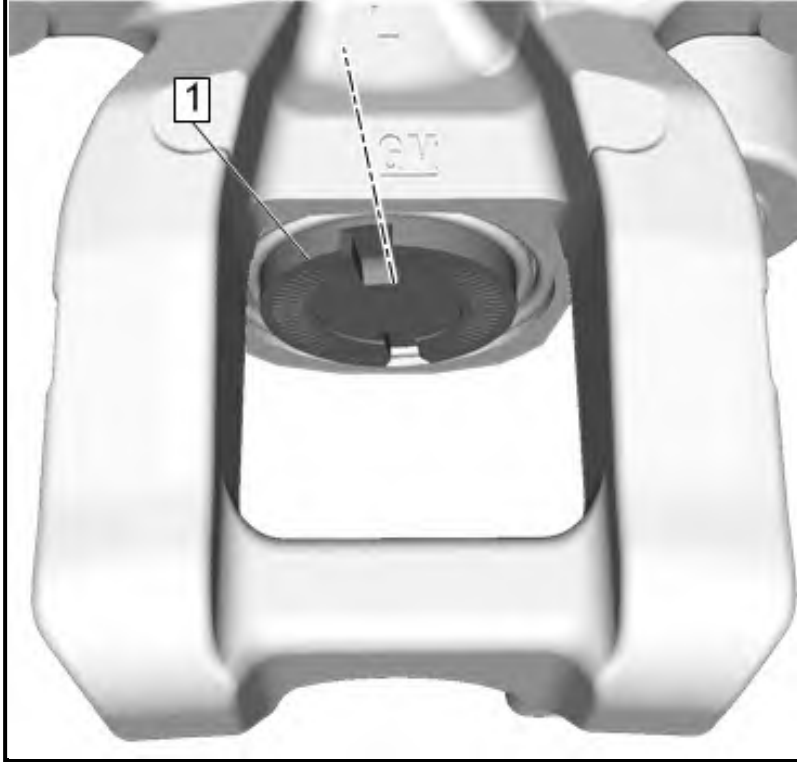


Disc Brake Pad Spring (1) - Remove [2x]

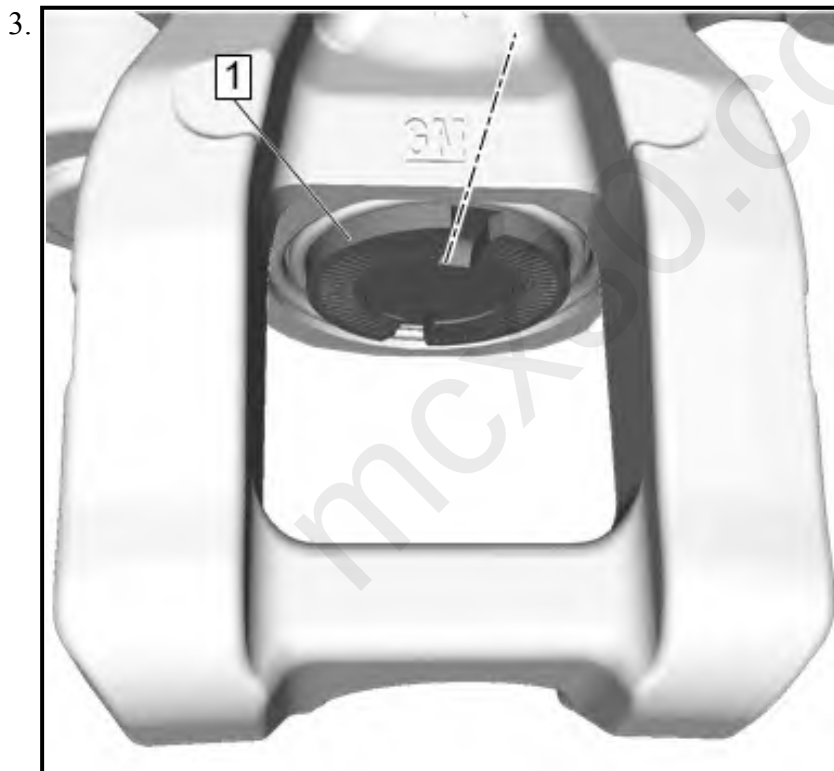
### Installation Procedure

1. Using an appropriate brake caliper piston spanner tool, slowly rotate the brake caliper piston clockwise while applying inward pressure to the brake caliper piston until the piston is fully seated in the brake caliper housing.



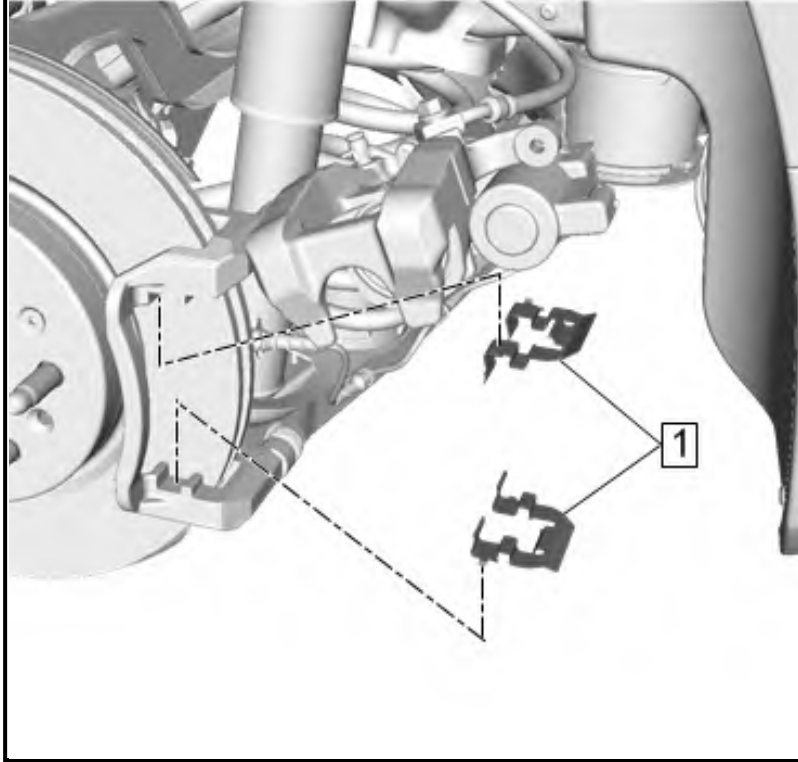


Align the right edge in the upper notch of the left rear brake caliper piston (1) with the left edge of the caliper logo as shown.

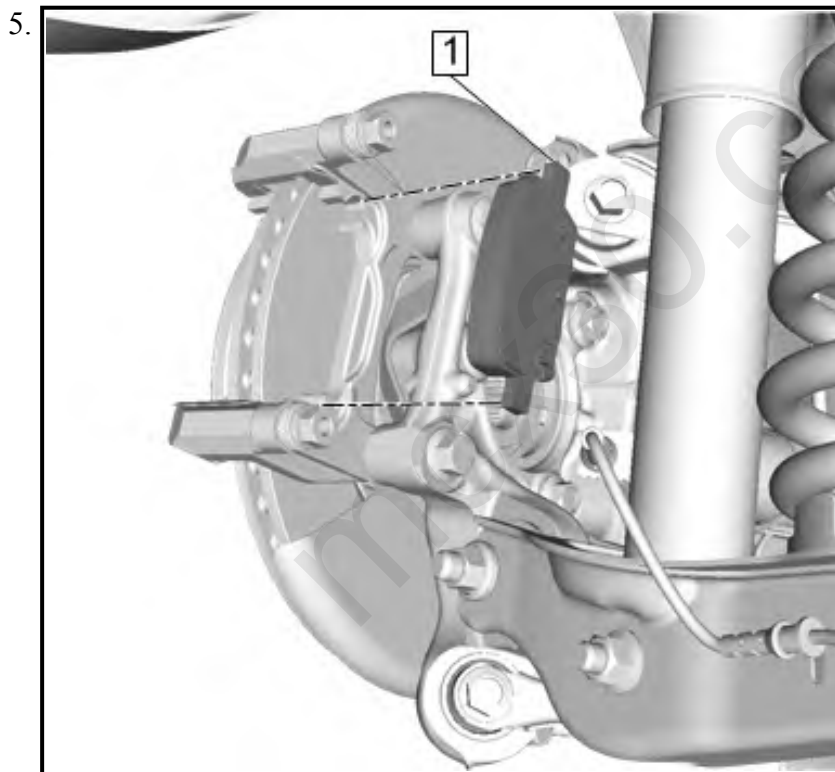


Align the left edge in the upper notch of the right rear brake caliper piston (1) with the right edge of the caliper logo as shown.





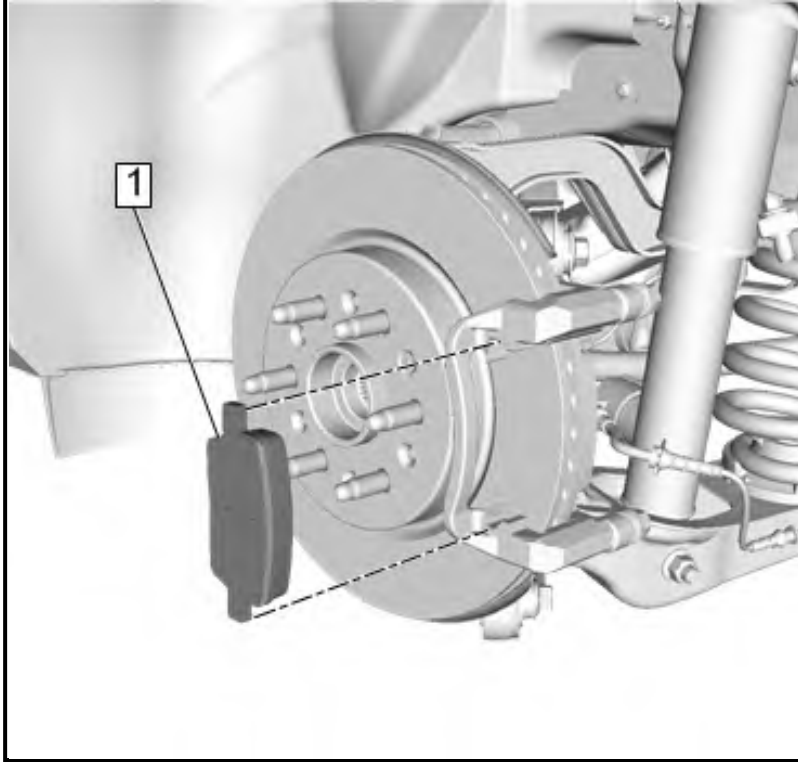
Disc Brake Pad Spring (1) - Install [2x]



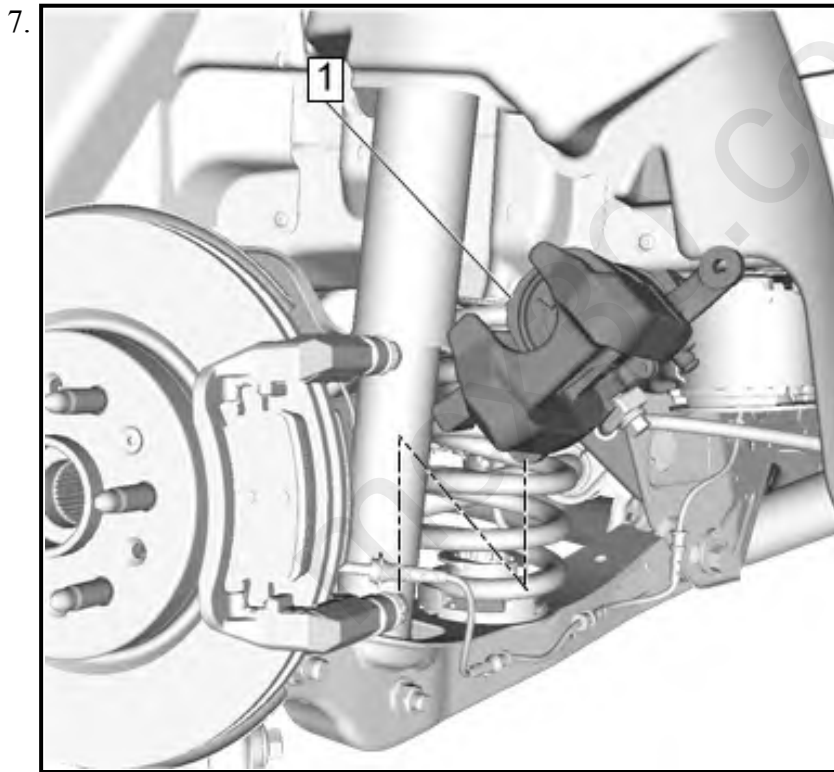
**NOTE:** The inner disc brake pad is equipped with a wear sensor on the leading edge of the disc brake pad.

Inner Disc Brake Pad (1) - Install



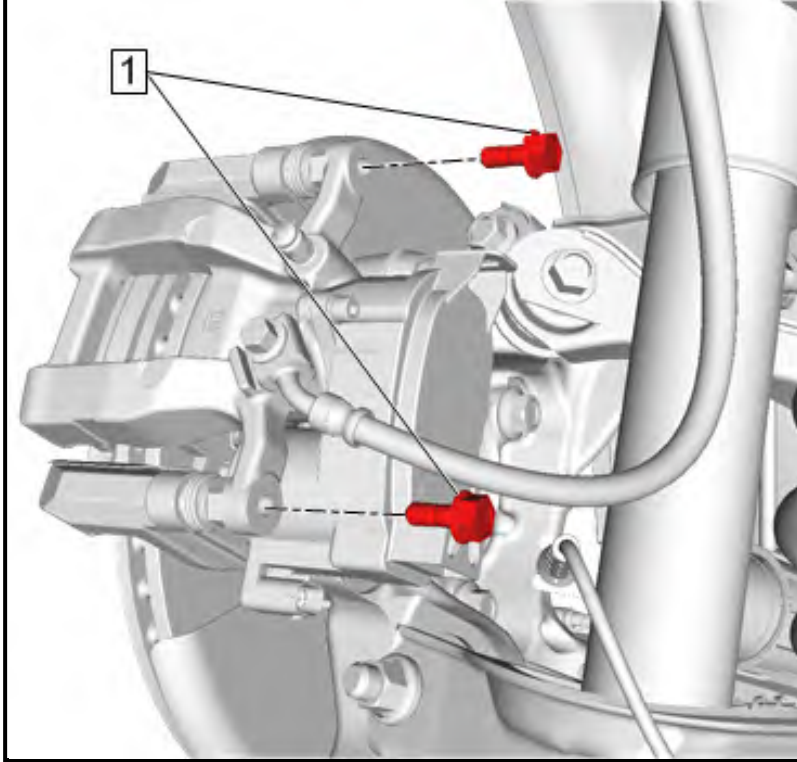


Outer Disc Brake Pad (1) - Install



Position the rear brake caliper (1) to the rear brake caliper bracket.





Brake Caliper Guide Pin Bolt (1) - Install [2x] - [Rear Brake Caliper Replacement](#)

9. Install the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)
10. Remove the supports and lower the vehicle.
11. With the engine OFF, gradually apply the brake pedal to approximately 2/3 of its travel distance.
12. Slowly release the brake pedal.
13. Wait 15 seconds, then repeat steps 10 - 11 until a firm brake pedal is obtained. This will properly seat the brake caliper pistons and brake pads.
14. Fill the brake master cylinder reservoir to the maximum-full level with GM approved brake fluid from a clean, sealed brake fluid container. [Brake Master Cylinder Reservoir Filling](#)
15. Calibrate the park brake. [Park Brake Calibration](#)
16. Burnish the brake pads and rotors. [Brake Pad and Rotor Burnishing](#)

## **BRAKE PAD AND ROTOR BURNISHING**

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

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

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

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

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

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

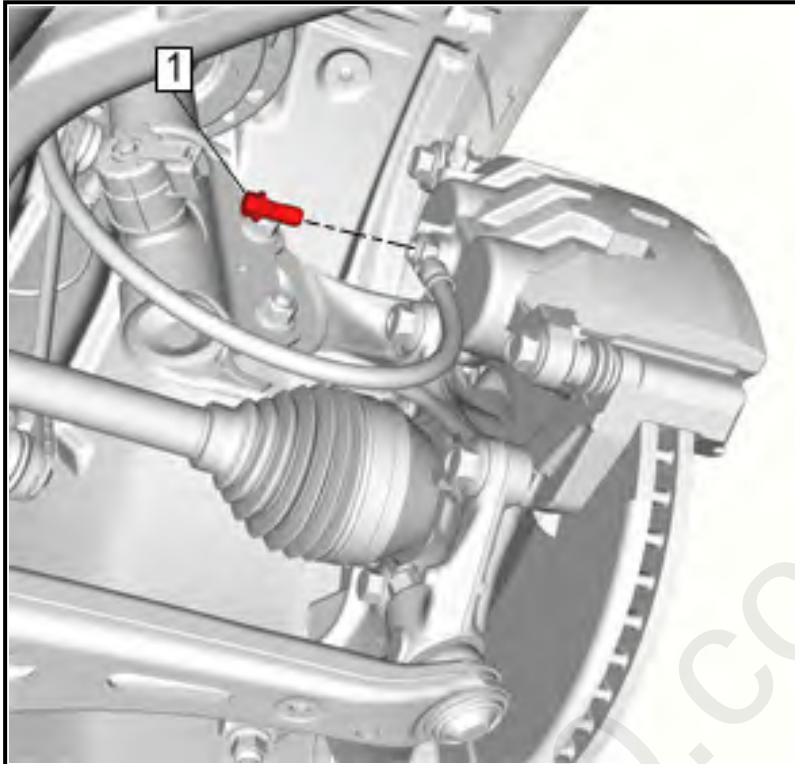
## **FRONT BRAKE CALIPER REPLACEMENT**

**WARNING:** Brake Dust Warning

**WARNING:** Brake Fluid Irritant Warning

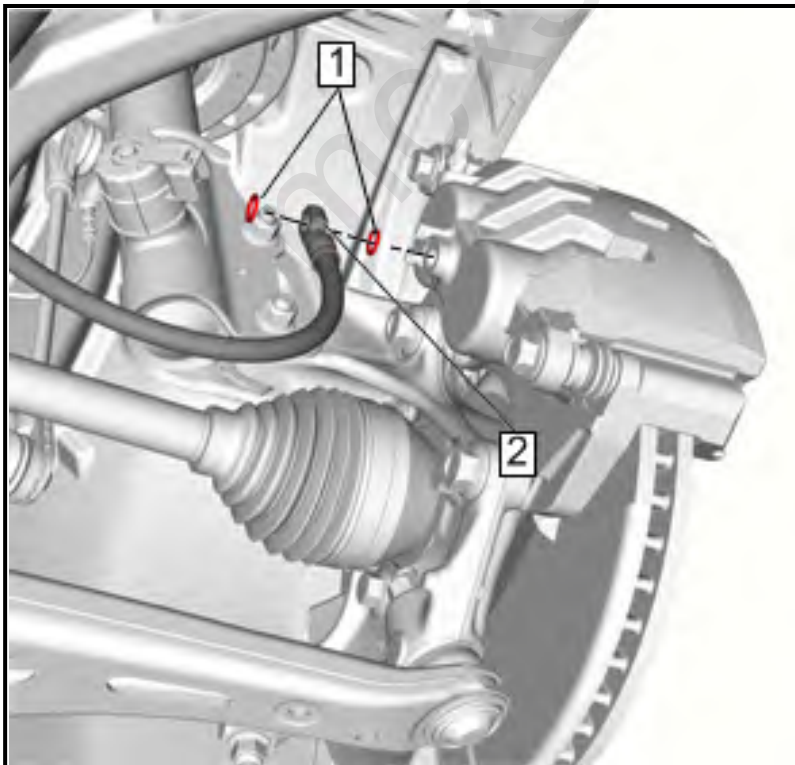
1. Raise and support the vehicle. Lifting and Jacking the Vehicle
2. Remove the tire and wheel assembly. Tire and Wheel Removal and Installation

3.



Front Brake Hose Bolt (1) - Remove

4.

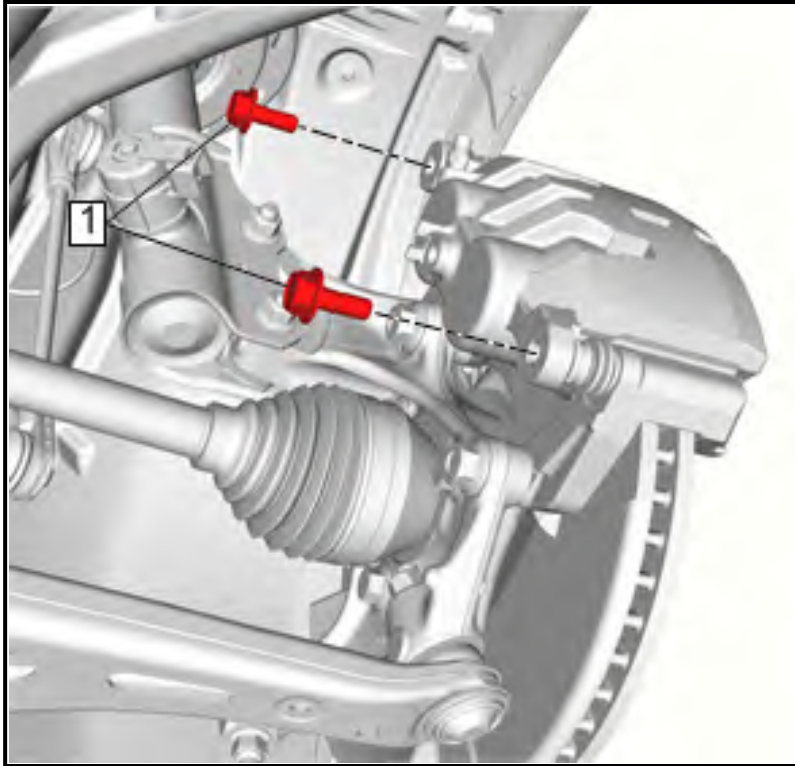


**NOTE:** Do NOT reuse the brake hose fitting gaskets.

Brake Hose Fitting Gasket (1) @ Brake Hose Fitting (2) - Remove and DISCARD [2x]

5. Cap the brake hose fitting to prevent brake fluid loss and contamination.

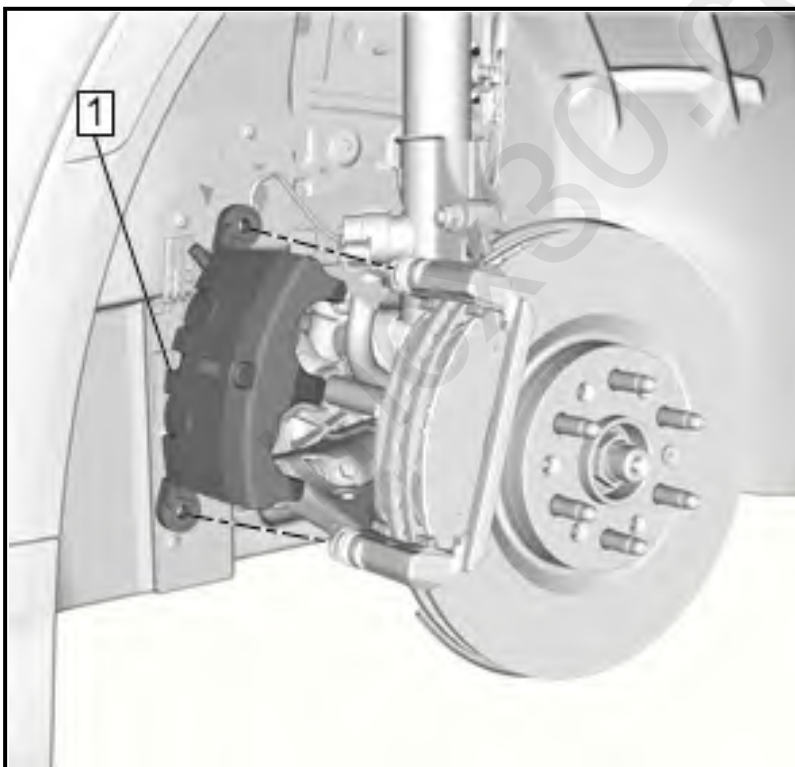
6.



**NOTE:** Do NOT use any air tools to remove or install the guide pin bolts. Use hand tools ONLY.

Brake Caliper Guide Pin Bolt (1) - Remove [2x]

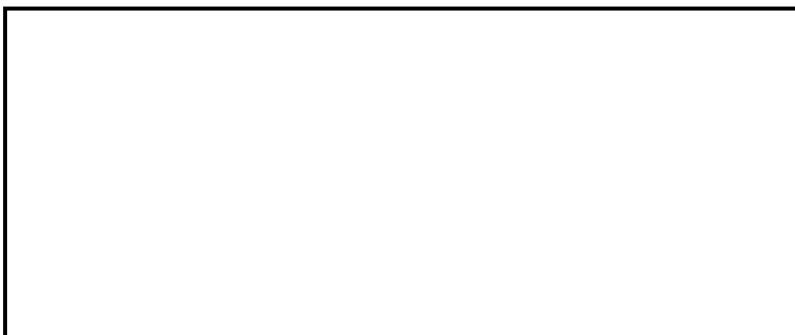
7.

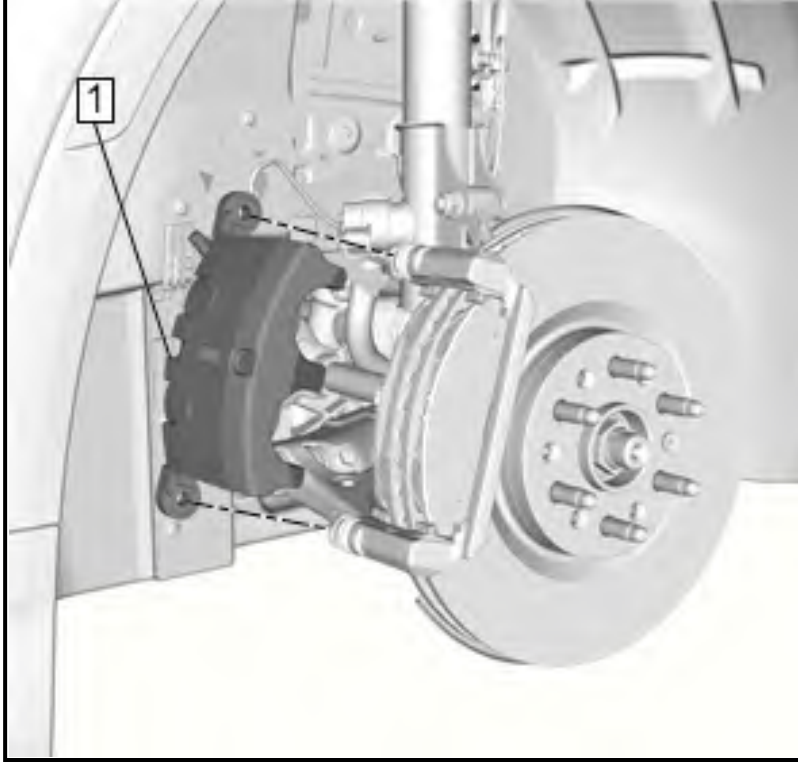


Brake Caliper (1) - Remove

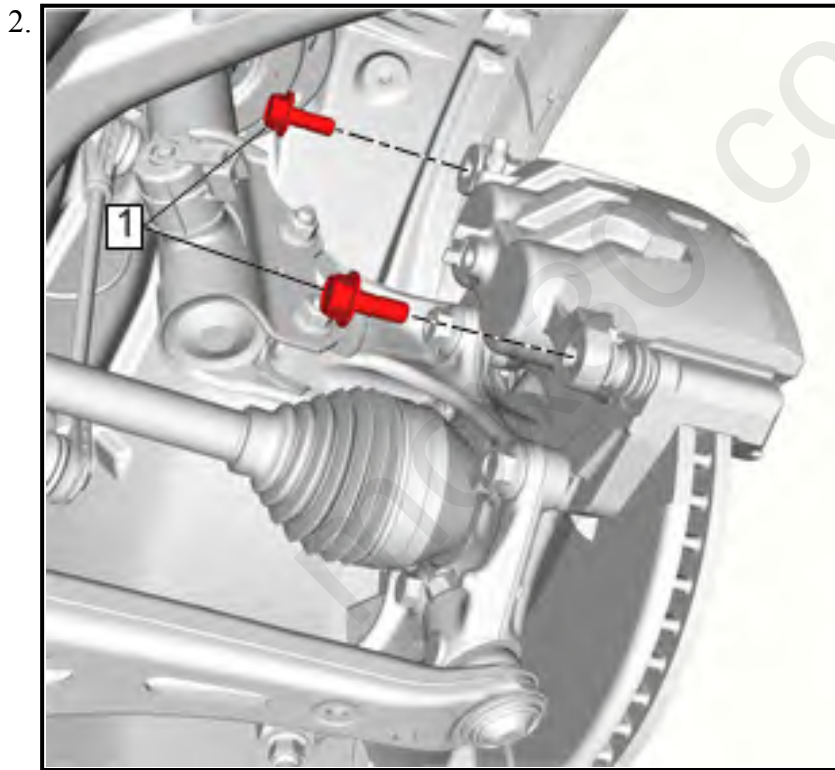
### Installation Procedure

1.



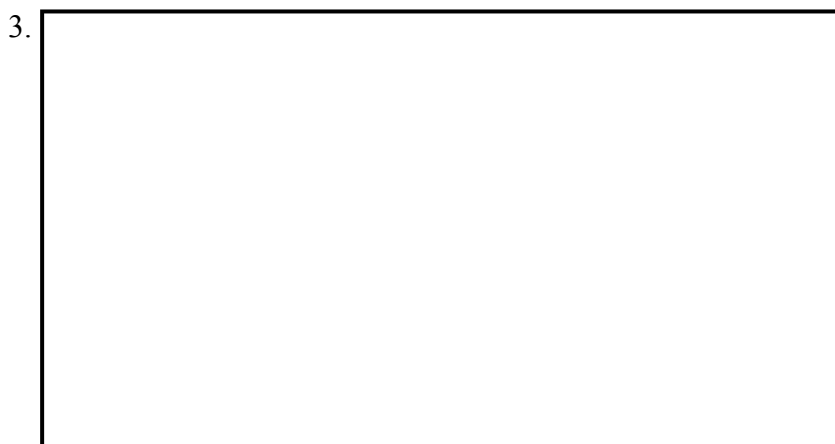


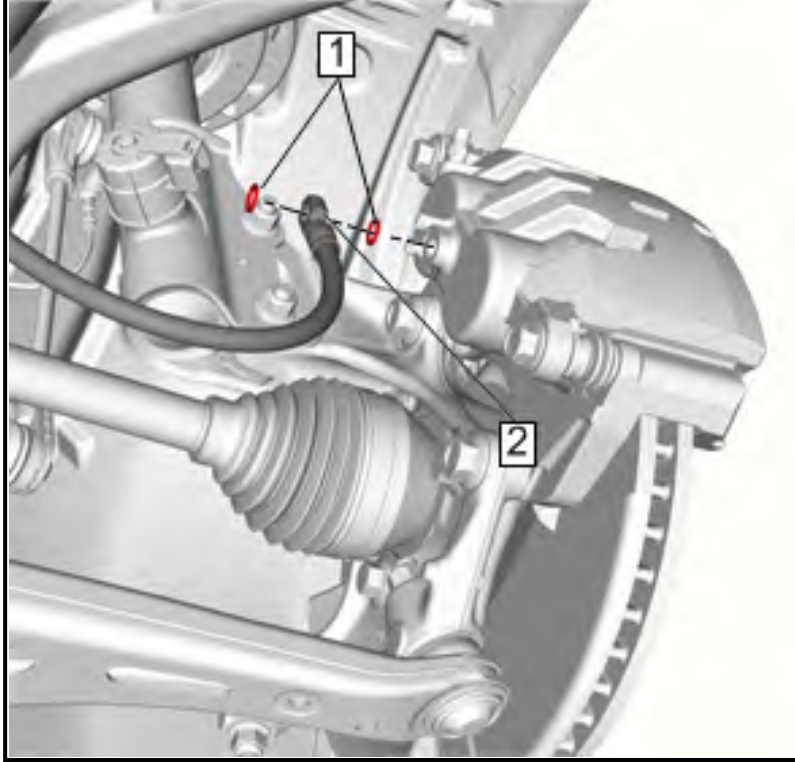
Brake Caliper (1) - Install



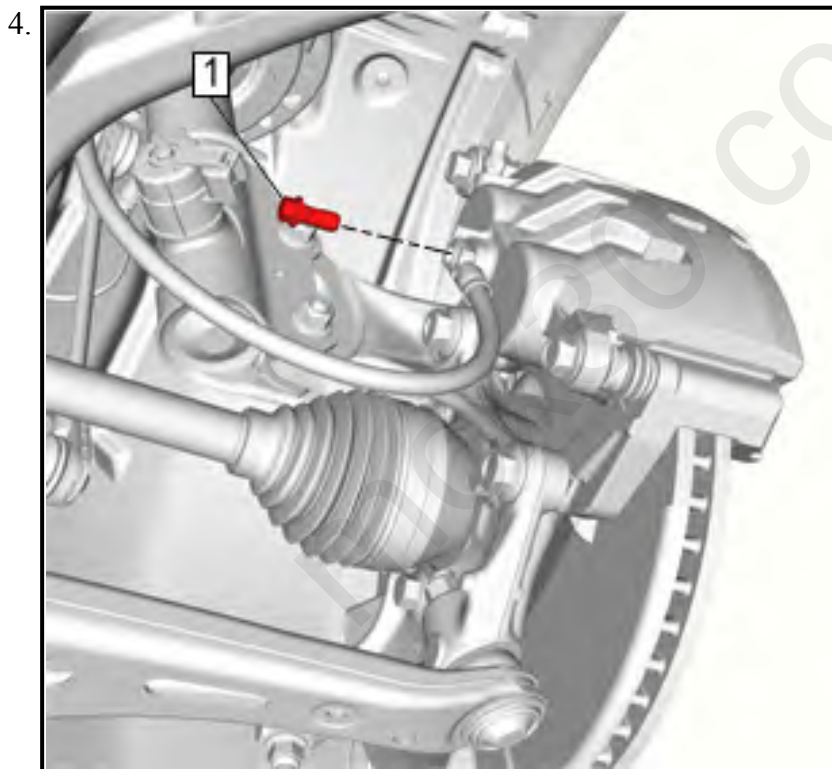
**CAUTION:** Fastener Caution

Brake Caliper Guide Pin Bolt (1) - Install and tighten [2x] 72 N.m (53 lb ft)





Brake Hose Fitting Gasket (1) @ Brake Hose Fitting (2) - Install NEW [2x]



Front Brake Hose Bolt (1) - Install - [Front Brake Hose Replacement](#)

5. Bleed the brake system. [Hydraulic Brake System Bleeding \(Manual\)](#) [Hydraulic Brake System Bleeding \(Pressure\)](#)
6. Install the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)
7. Remove the supports and lower the vehicle.

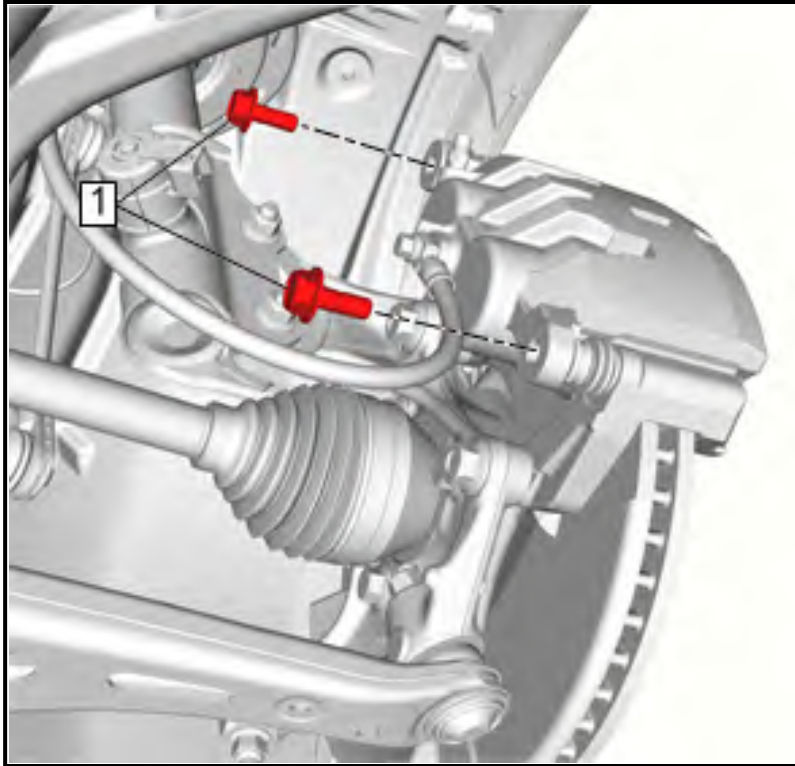
## FRONT BRAKE CALIPER GUIDE PIN REPLACEMENT

### Removal Procedure

**WARNING:** [Brake Dust Warning](#)

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

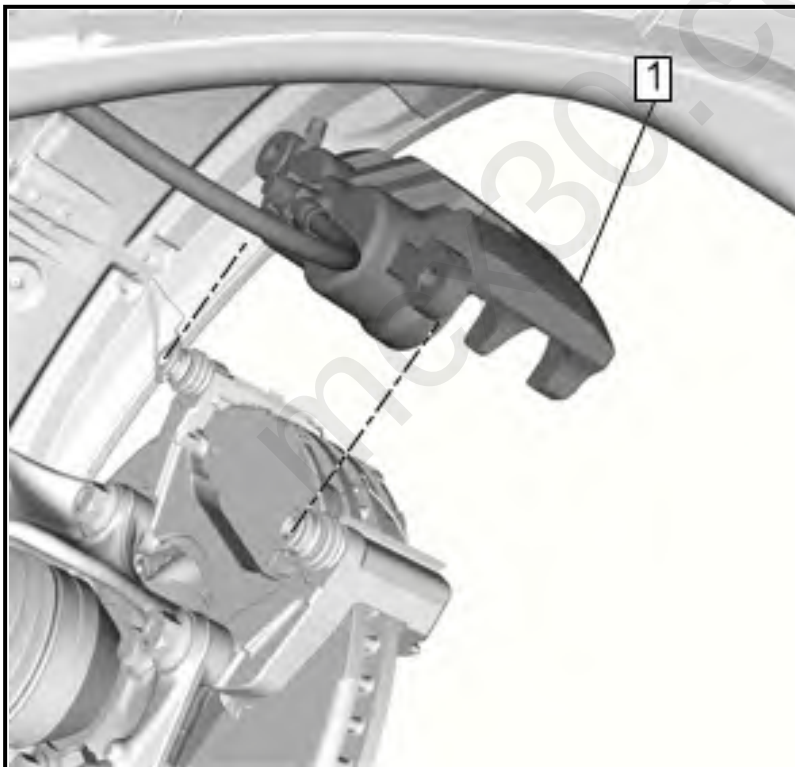
3.



**NOTE:** Do NOT use any air tools to remove or install the guide pin bolts. Use hand tools ONLY.

Front Brake Caliper Guide Pin Bolt (1) - Remove [2x]

4.

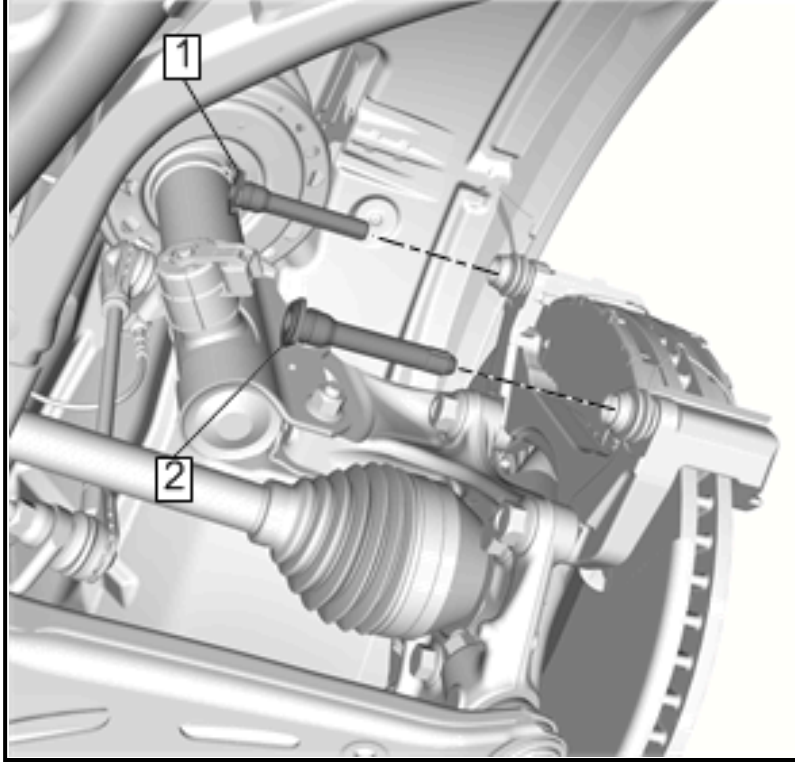


**CAUTION:** Support the brake caliper with heavy mechanic wire, or equivalent, whenever it is separated from its mount and the hydraulic flexible brake hose is still connected. Failure to support the caliper in this manner will cause the flexible brake hose to bear the weight of the caliper, which may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

Remove the front brake caliper (1) and support with heavy mechanics wire.

5.



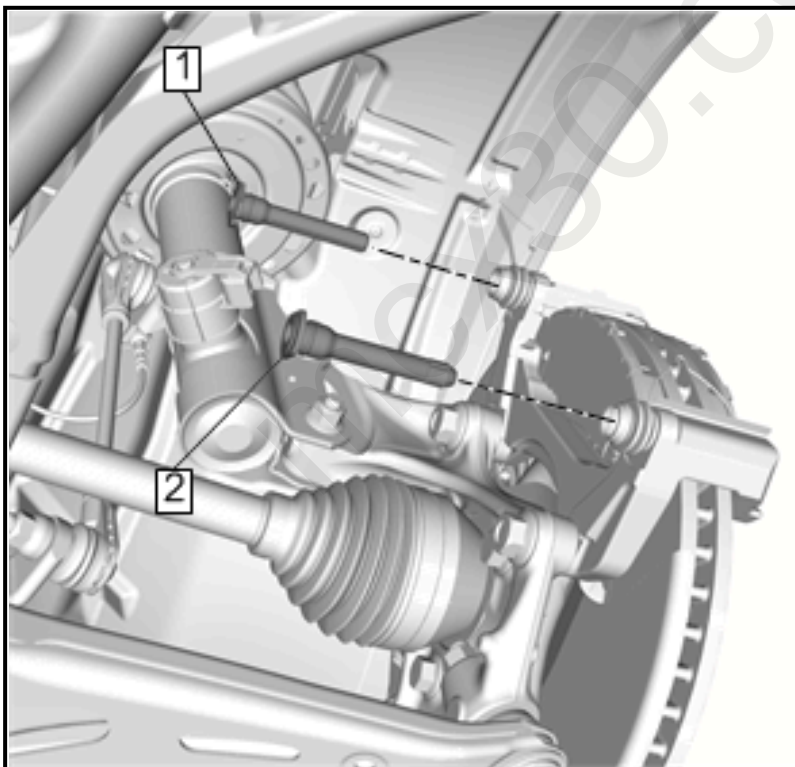


Upper Brake Caliper Guide Pin (1) - Remove

6. Lower Brake Caliper Guide Pin (2) - Remove

#### Installation Procedure

1.



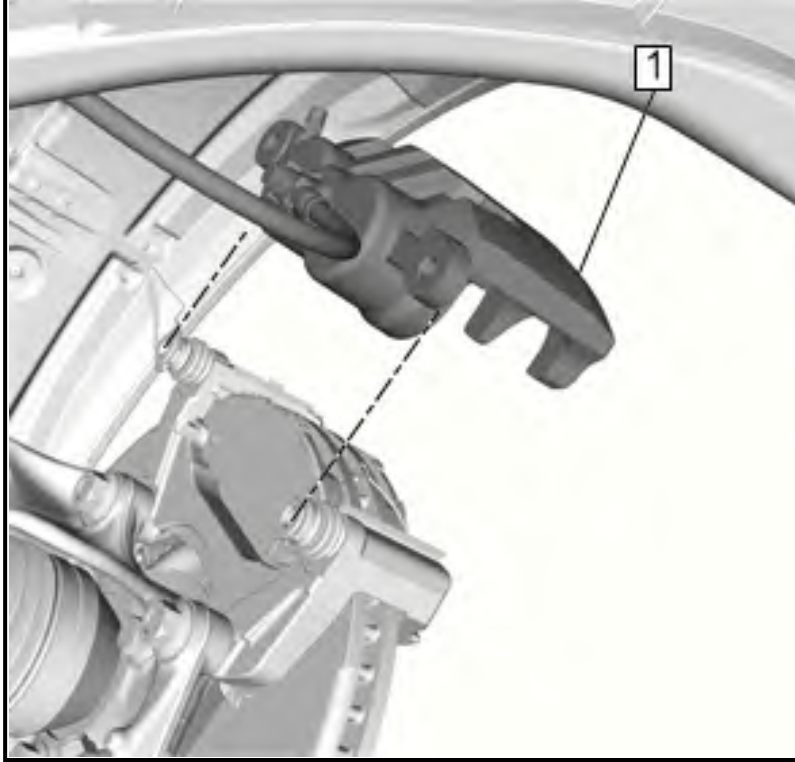
Upper Brake Caliper Guide Pin (1) - Install

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

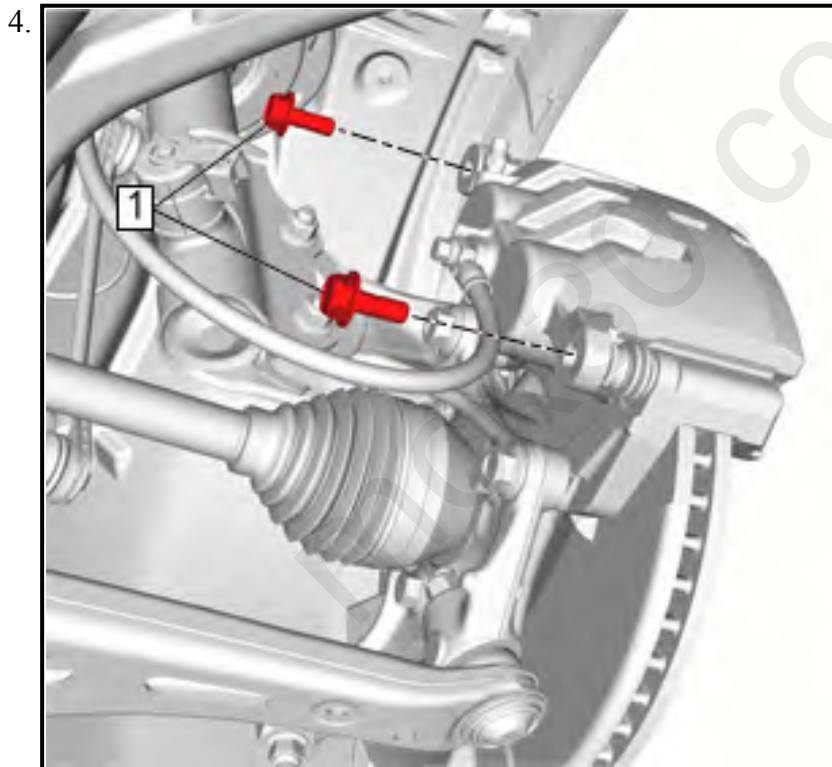
2. Lower Brake Caliper Guide Pin (2) - Install

3.





Front Brake Caliper (1) - Install



Front Brake Caliper Guide Pin Bolt (1) - Install [2x] - [Front Brake Caliper Replacement](#)

5. Install the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)
6. Remove the supports and lower the vehicle.

## REAR BRAKE CALIPER REPLACEMENT

### Removal Procedure

**WARNING:** [Brake Dust Warning](#)

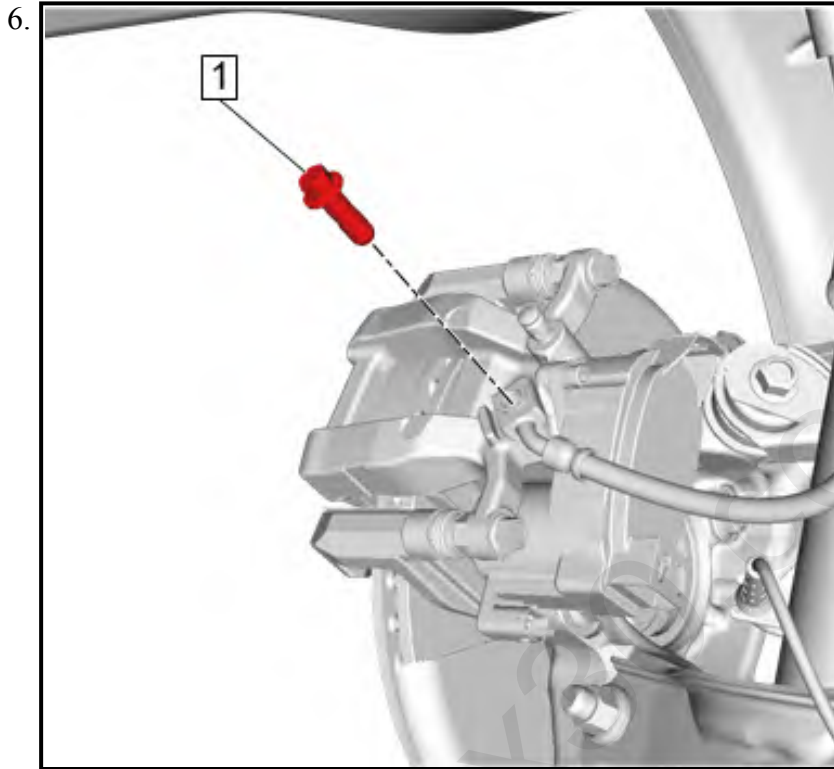
**WARNING:** [Brake Fluid Irritant Warning](#)

1. Set the parking brake in Service Mode.
  1. Install a scan tool.

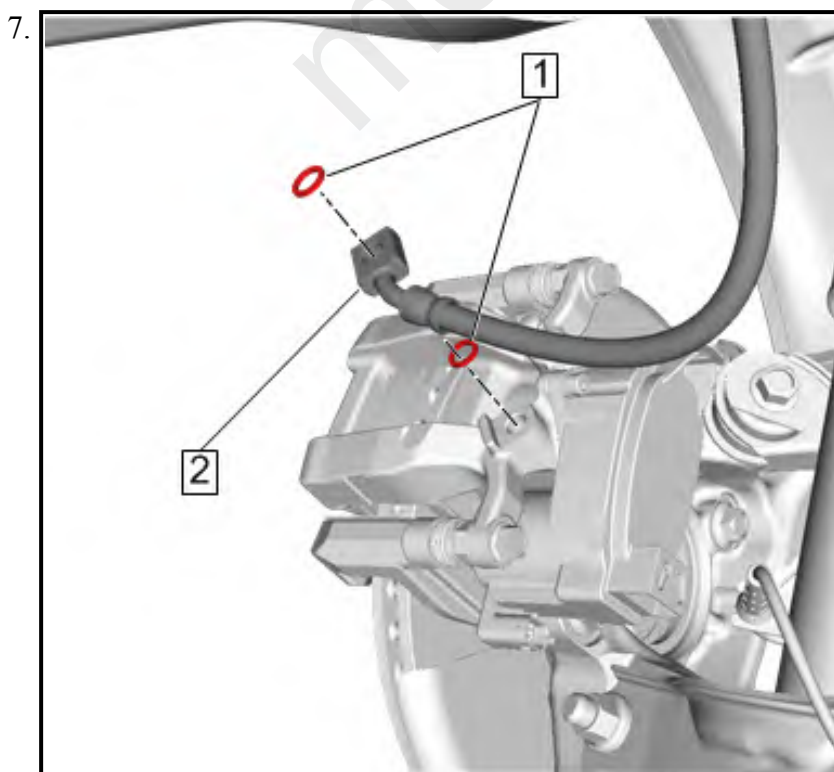
2. Turn the ignition ON with the engine OFF.
3. Select Electronic Brake Control Module.
4. Select Control Functions.

**NOTE:** Do NOT apply any brake pressure during this step.

5. Select Rear Brake Caliper Piston Retract.
2. Raise and support the vehicle. [Lifting and Jacking the Vehicle](#)
3. Remove the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)
4. Disconnect the parking brake actuator electrical connector.
5. Release the wiring harness from the parking brake actuator and position aside.

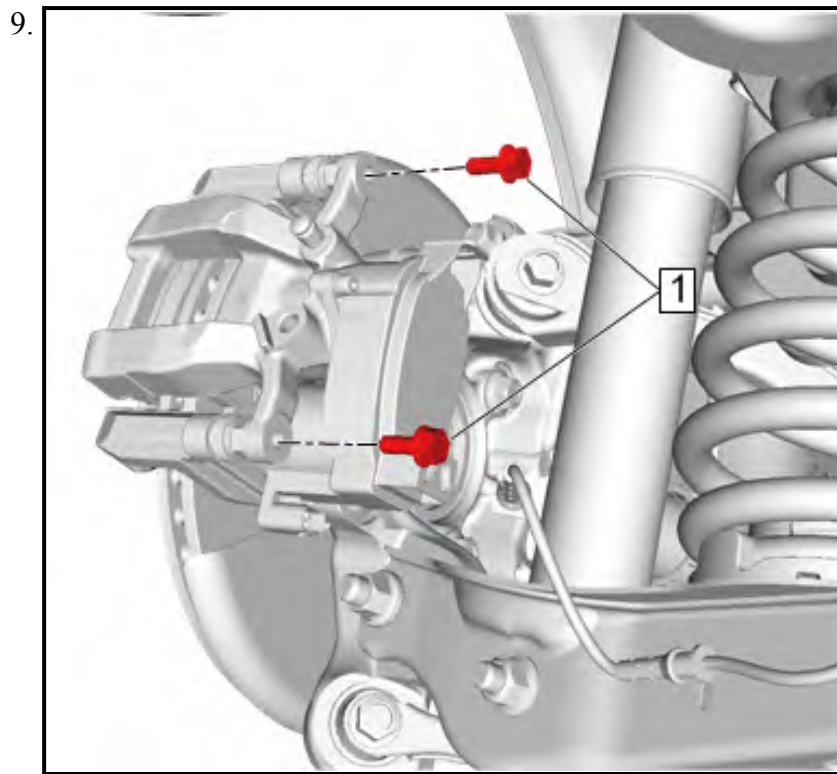


Brake Hose Fitting Bolt (1) - Remove



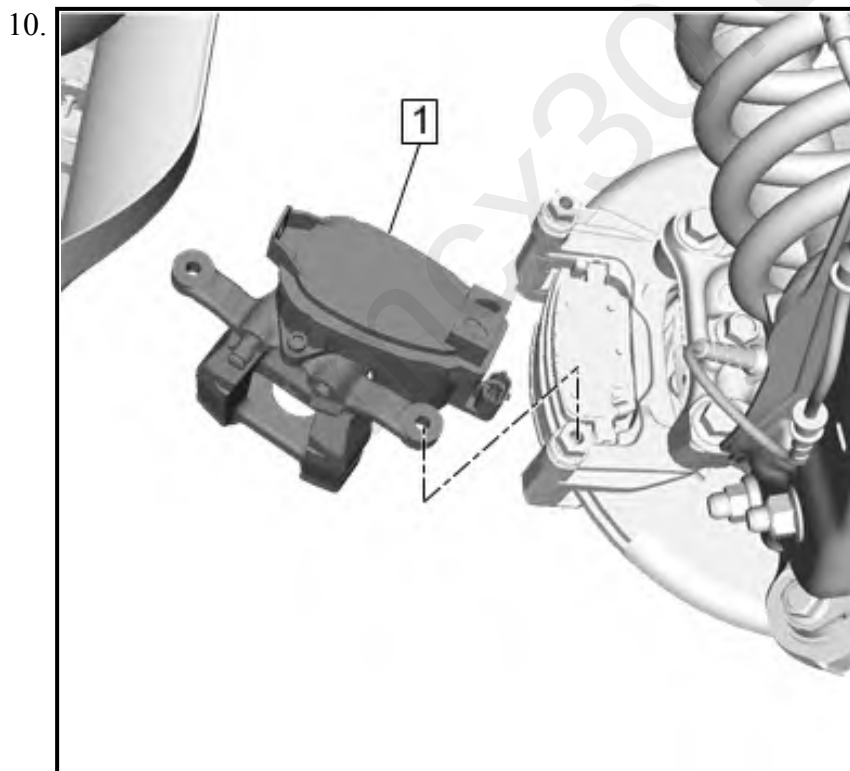
Brake Hose Fitting Gasket (1) @ Brake Hose Fitting (2) - Remove and DISCARD [2x]

8. Cap the brake hose fitting to prevent brake fluid loss and contamination.



**NOTE:** Do NOT use any air tools to remove or install the rear brake caliper guide pin bolts. Use hand tools ONLY.

Rear Brake Caliper Guide Pin Bolt (1) - Remove [2x]

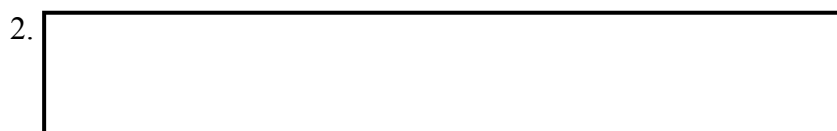


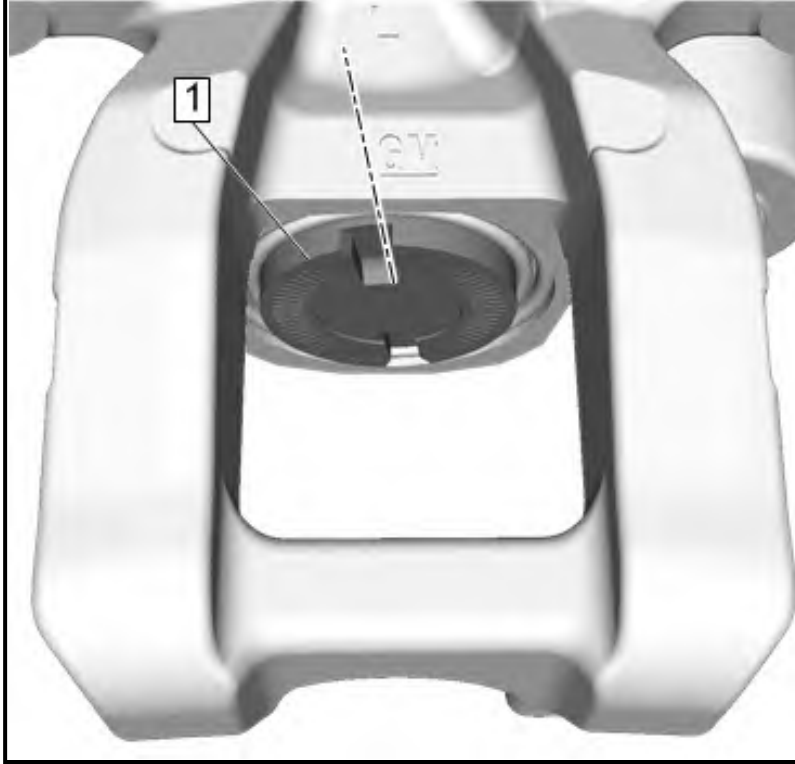
Rear Brake Caliper (1) - Remove

11. Parking Brake Actuator - Remove - [Parking Brake Actuator Replacement](#)

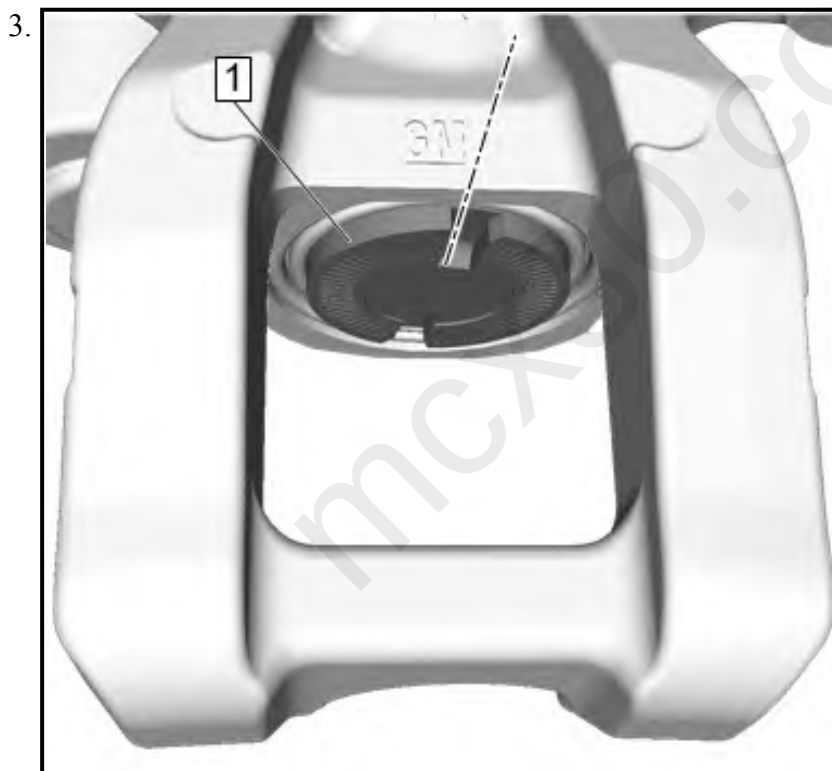
#### Installation Procedure

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



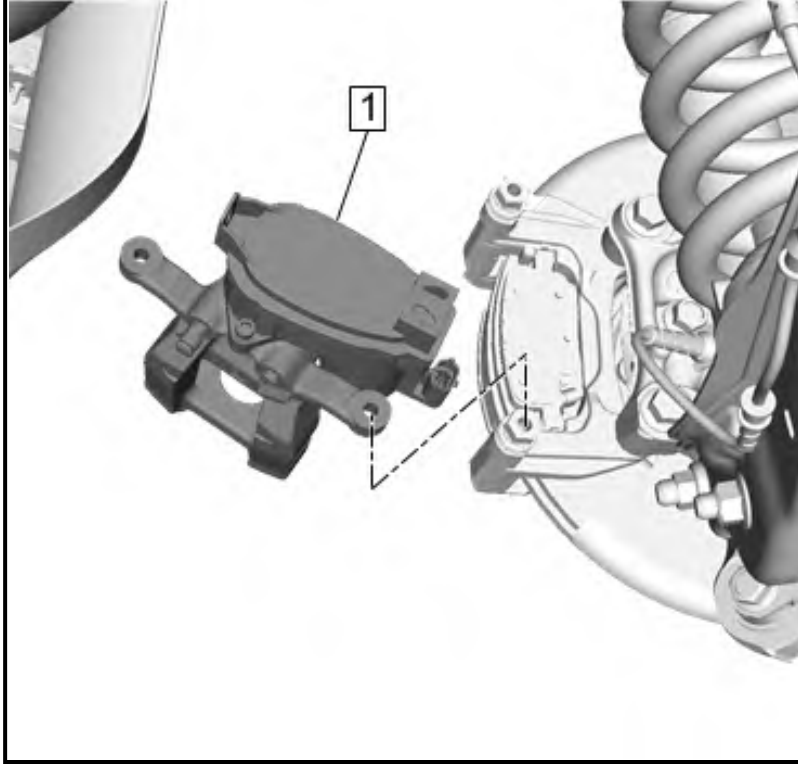


Align the right edge in the upper notch of the left rear brake caliper piston (1) with the left edge of the caliper logo as shown.

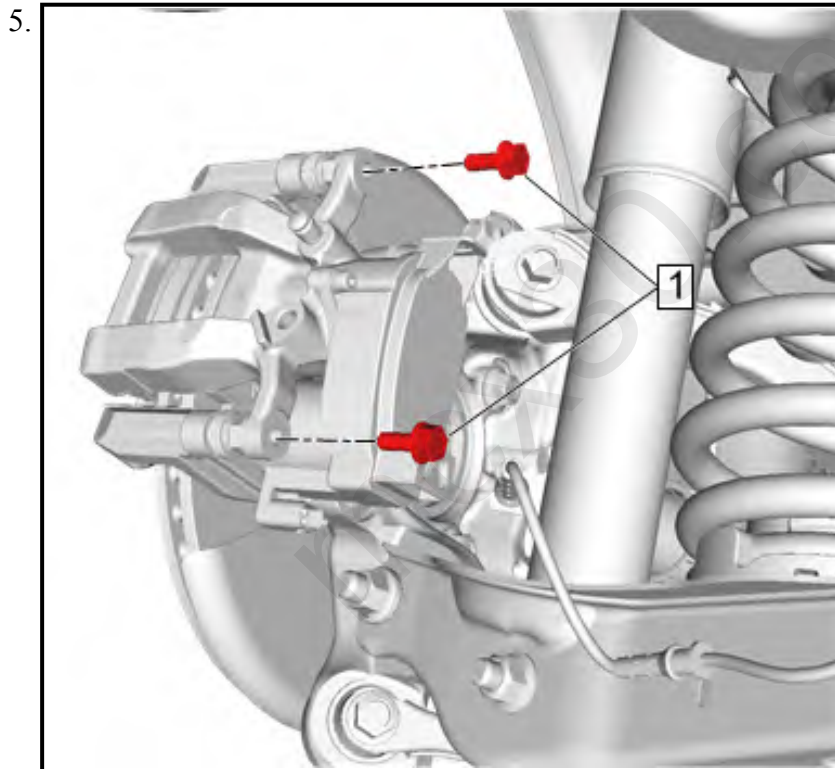


Align the left edge in the upper notch of the right rear brake caliper piston (1) with the right edge of the caliper logo as shown.



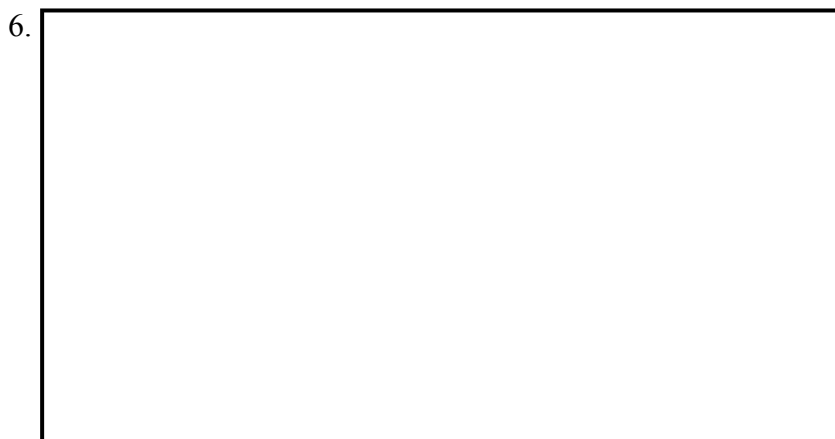


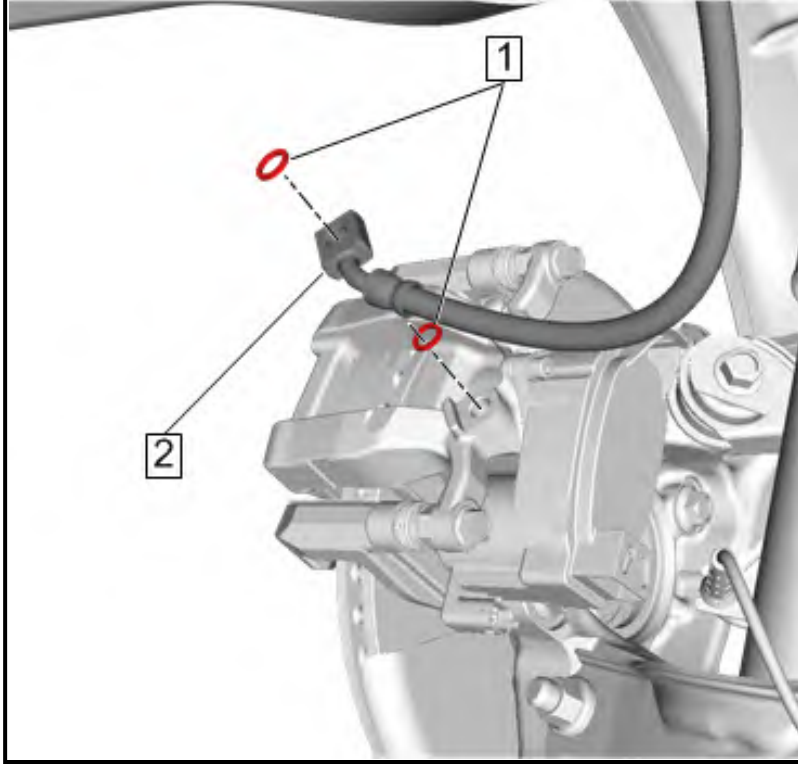
Rear Brake Caliper (1) - Install



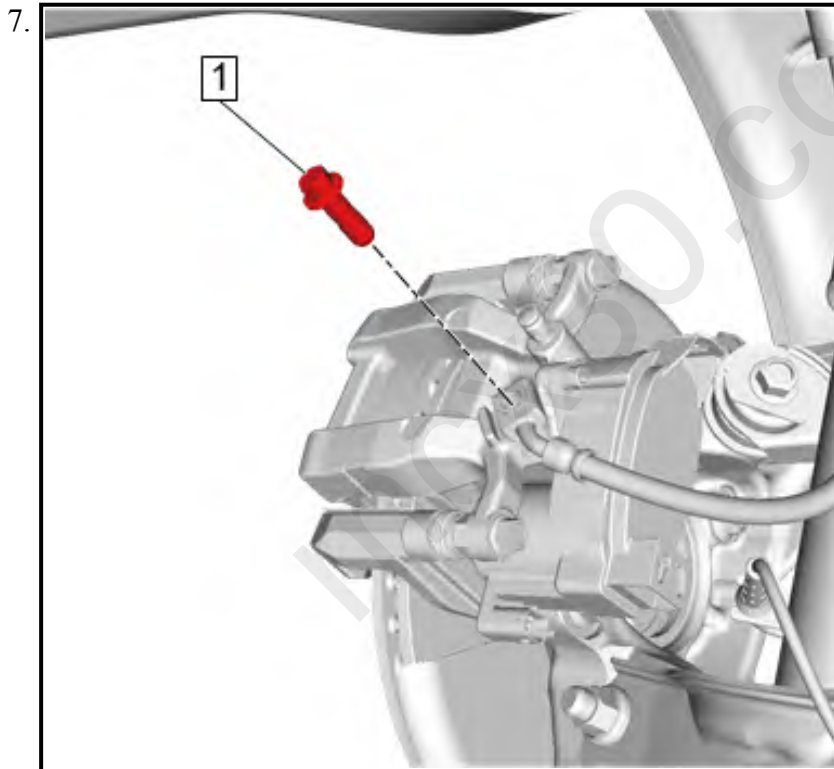
**CAUTION:** Fastener Caution

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





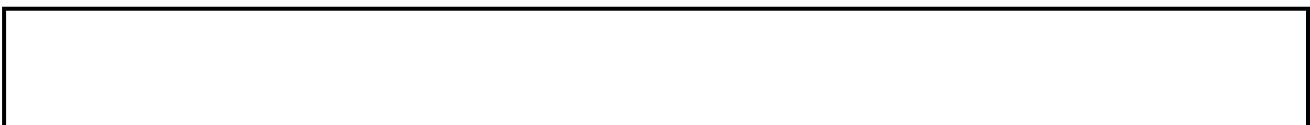
Brake Hose Fitting Gasket (1) @ Brake Hose Fitting (2) - Install NEW [2x]

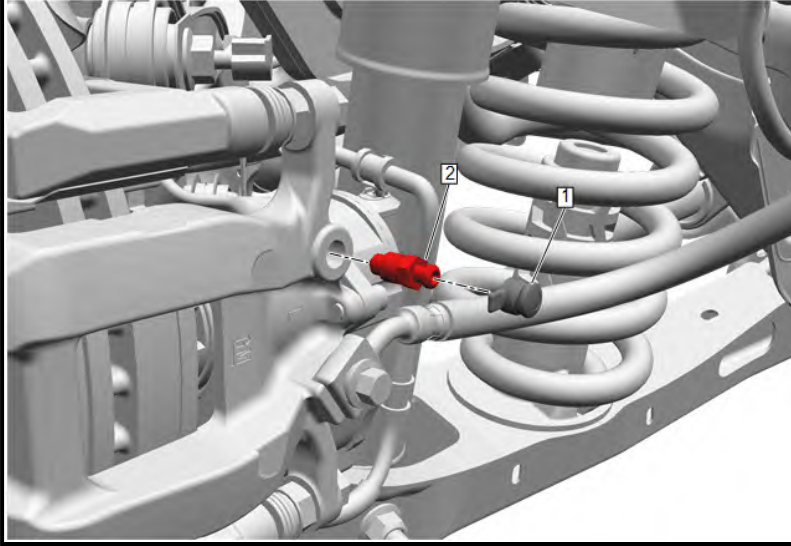


Rear Brake Hose Bolt (1) - Install - [Rear Brake Hose Replacement](#)

8. Connect the parking brake actuator electrical connector.
9. Using an appropriate tie strap, secure the parking brake actuator electrical harness to the harness bracket.
10. Bleed the brake system. [Hydraulic Brake System Bleeding \(Manual\)](#) [Hydraulic Brake System Bleeding \(Pressure\)](#)
11. Install the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)
12. Remove the supports and lower the vehicle.

## REAR BRAKE BLEEDER VALVE REPLACEMENT





| Callout                                                                                                         | Component Name                                                                                                                                                                                                                                        |
|-----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>WARNING:</b><br><u>Brake Dust Warning</u>                                                                    |                                                                                                                                                                                                                                                       |
| <b>WARNING:</b><br><u>Brake Fluid Irritant Warning</u>                                                          |                                                                                                                                                                                                                                                       |
| <b>CAUTION:</b><br><u>Brake Fluid Effects on Paint and Electrical Components Caution</u>                        |                                                                                                                                                                                                                                                       |
| <b>Preliminary Procedure</b> Remove the tire and wheel assembly. <u>Tire and Wheel Removal and Installation</u> |                                                                                                                                                                                                                                                       |
| 1                                                                                                               | Rear Brake Bleeder Valve Cap                                                                                                                                                                                                                          |
| 2                                                                                                               | Rear Brake Bleeder Valve<br><br><b>CAUTION:</b><br><u>Component Fastener Tightening Caution</u><br><br><b>Tighten</b><br>17 N.m (13 lb ft)<br><b>Procedure</b><br>Install the tire and wheel assembly. <u>Tire and Wheel Removal and Installation</u> |

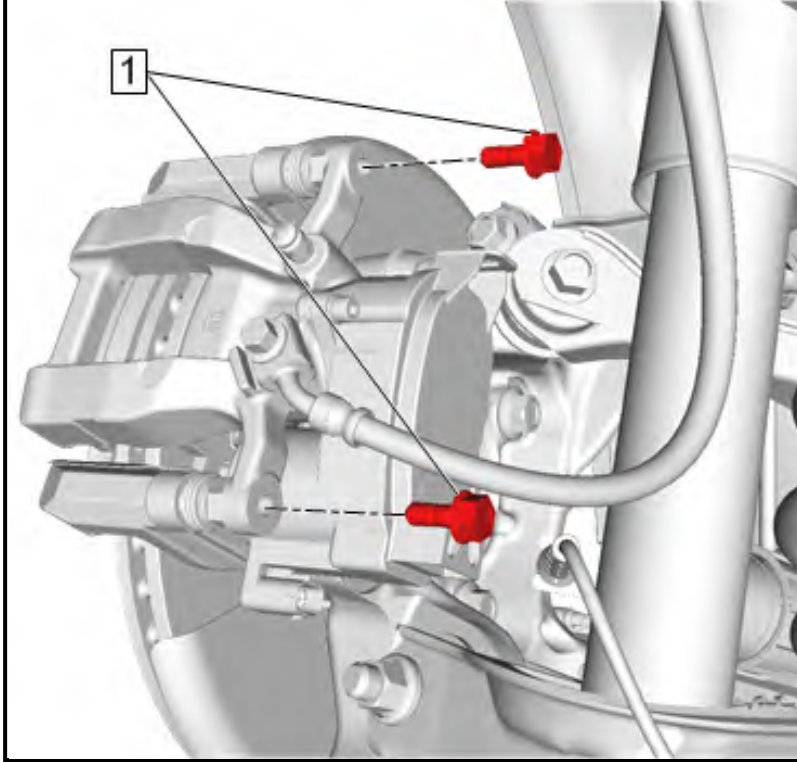
## REAR BRAKE CALIPER GUIDE PIN REPLACEMENT

### Removal Procedure

**WARNING:** Brake Dust Warning

1. Release the electronic parking brake.
2. Raise and support the vehicle. Lifting and Jacking the Vehicle
3. Remove the tire and wheel assembly. Tire and Wheel Removal and Installation
- 4.

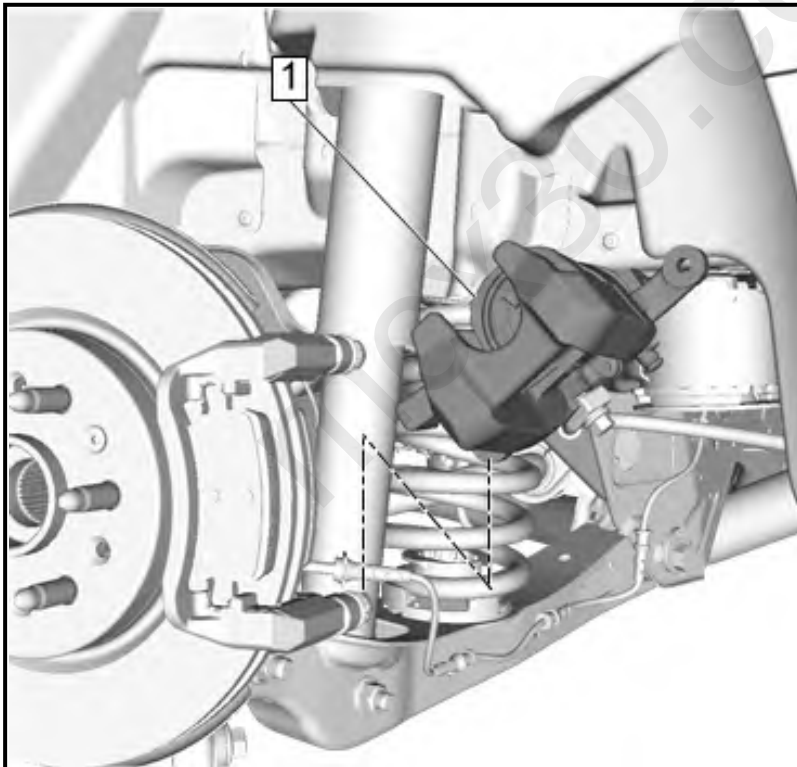




**NOTE:** Do NOT use any air tools to remove or install the guide pin bolts. Use hand tools ONLY.

Rear Brake Caliper Guide Pin Bolt (1) - Remove [2x]

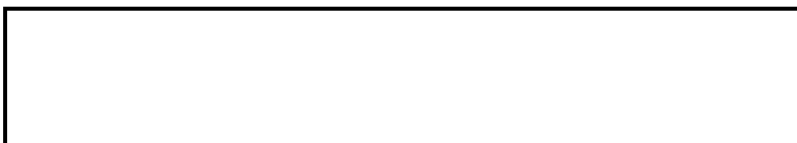
5.

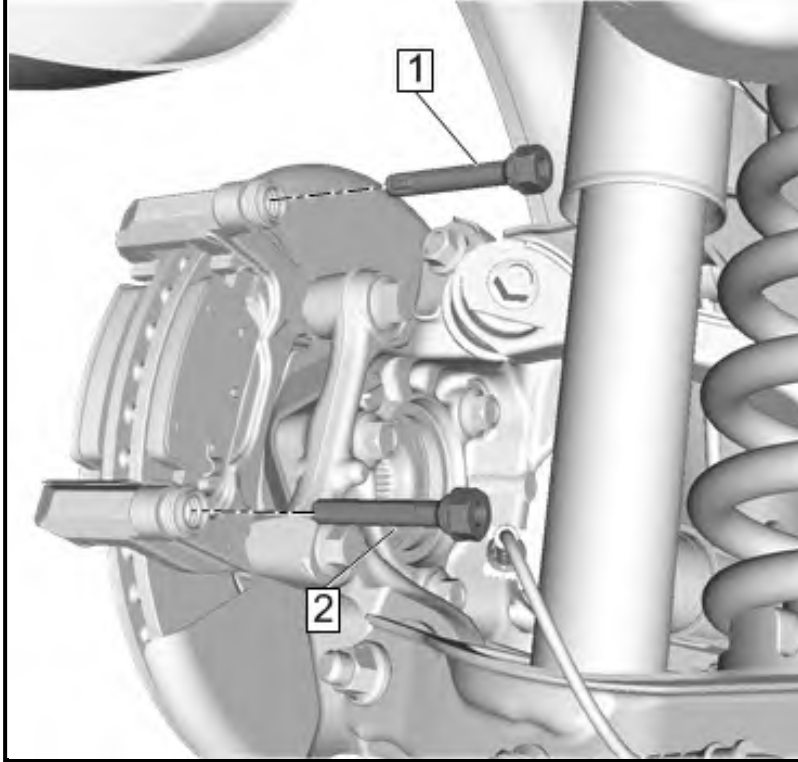


**CAUTION:** Support the brake caliper with heavy mechanic wire, or equivalent, whenever it is separated from its mount and the hydraulic flexible brake hose is still connected. Failure to support the caliper in this manner will cause the flexible brake hose to bear the weight of the caliper, which may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

Remove the rear brake caliper (1) and support with heavy mechanics wire.

6.



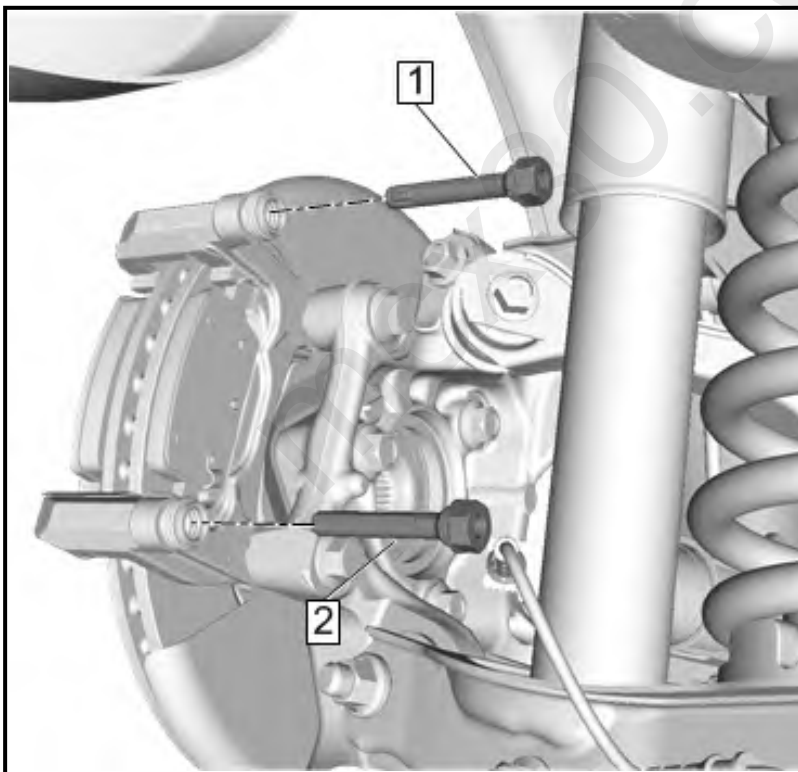


Upper Brake Caliper Guide Pin (1) - Remove

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

#### Installation Procedure

1.



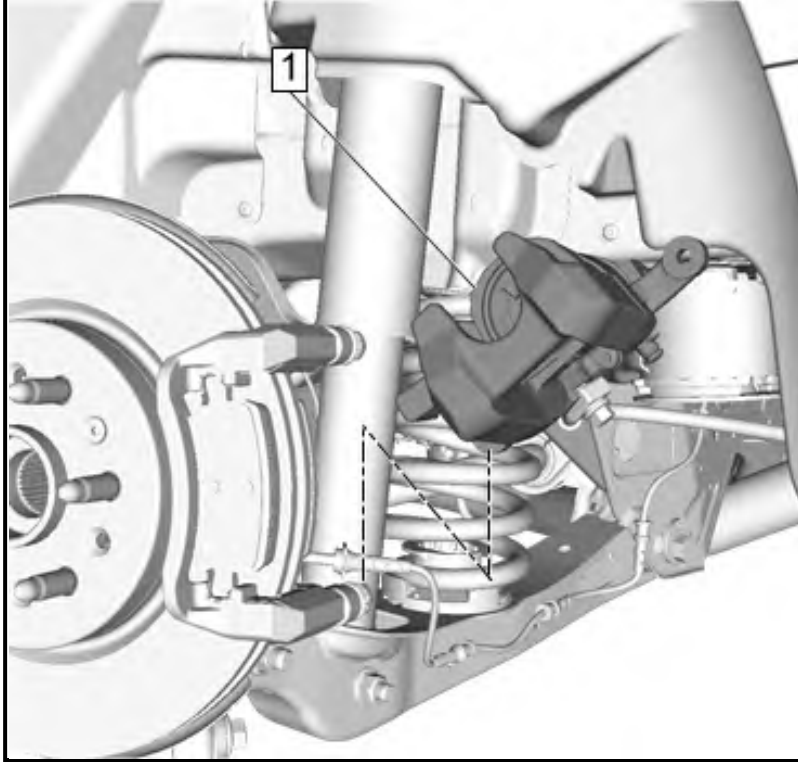
**NOTE:** The upper brake caliper guide pin is equipped with a bushing and must be installed in the same position.

Upper Brake Caliper Guide Pin (1) - Install

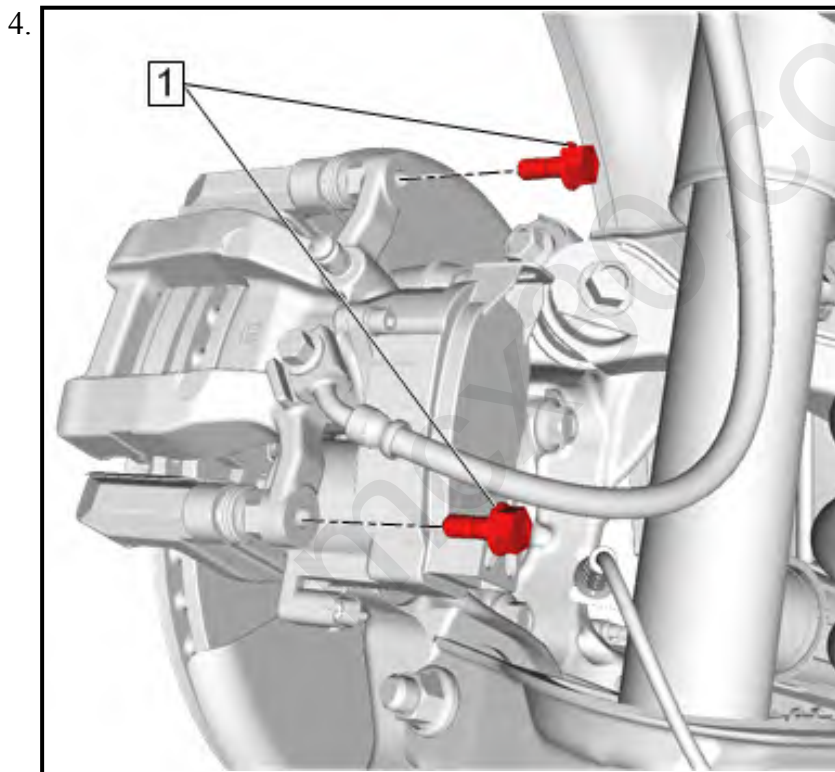
2. Lower Brake Caliper Guide Pin (2) - Install

3.





Rear Brake Caliper (1) - Install



Brake Caliper Guide Pin Bolt (1) - Install [2x] - [Rear Brake Caliper Replacement](#)

5. Install the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)
6. Remove the supports and lower the vehicle.

## FRONT BRAKE CALIPER OVERHAUL

**WARNING:** [Brake Dust Warning](#)

**WARNING:** [Brake Fluid Irritant Warning](#)

### Disassembly Procedure

#### NOTE:

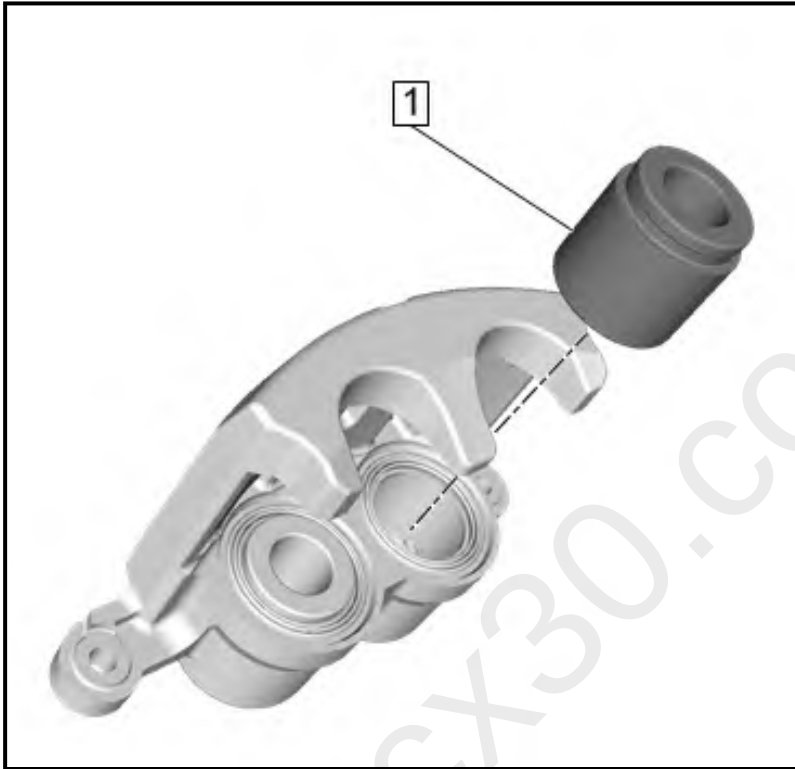
- Replace all the components included in the repair kits used to service

this brake caliper.

- Lubricate the rubber parts with GM approved brake fluid from a clean, sealed brake fluid container to make assembly easier. [Adhesives, Fluids, Lubricants, and Sealers](#)
- If any hydraulic component is removed or disconnected, it may be necessary to bleed all or part of the brake system.
- The torque values specified are for dry, non-lubricated fasteners.
- Perform the service operations on a clean bench, free from all mineral oil materials.

1. Remove the front brake caliper. [Front Brake Caliper Replacement](#)
2. Drain and properly dispose of the brake fluid from the brake caliper.

3.



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

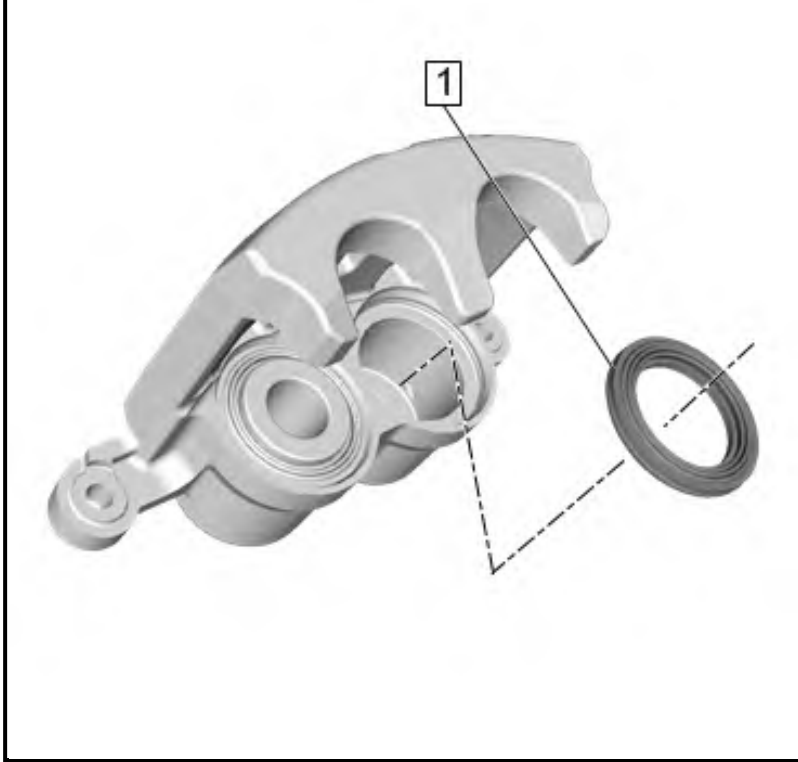
**CAUTION:** Use clean cloths to pad interior of caliper housing during piston removal. Use just enough air to ease the pistons out of the bores. If the pistons are blown out, even with the padding provided, it may be damaged.

Place a 25 mm (1 in) block of wood between the caliper housing and one of the caliper pistons.

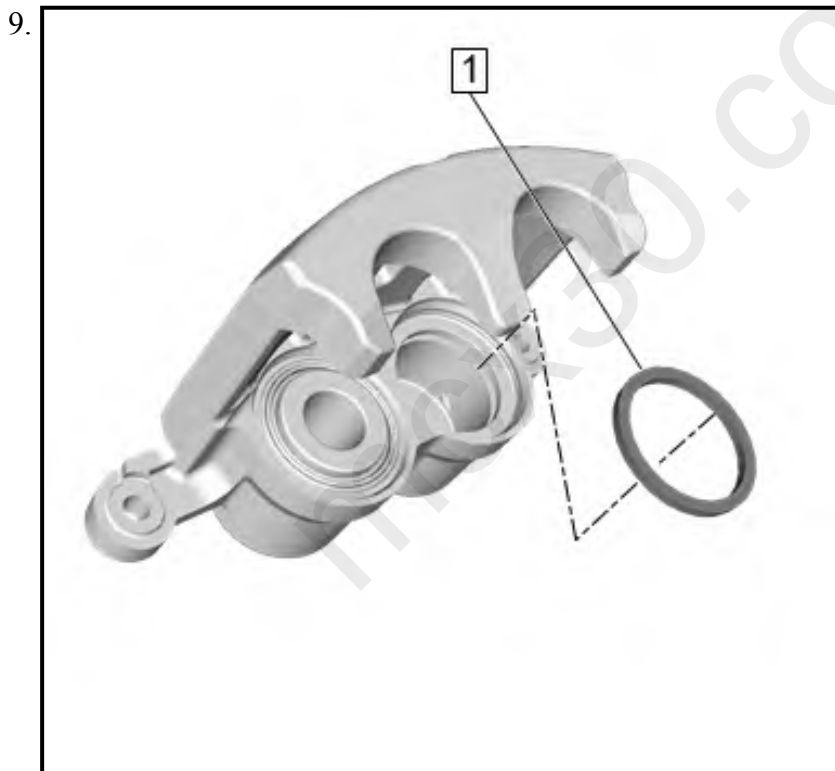
4. Install a large C-clamp over the body of the brake caliper with the C-clamp ends against the rear of the caliper body and against the block of wood.
5. Carefully remove the brake caliper piston (1) by directing low pressure compressed air into the brake caliper inlet.
6. Remove the C-clamp from the caliper.
7. Remove the block of wood from the caliper.

8.



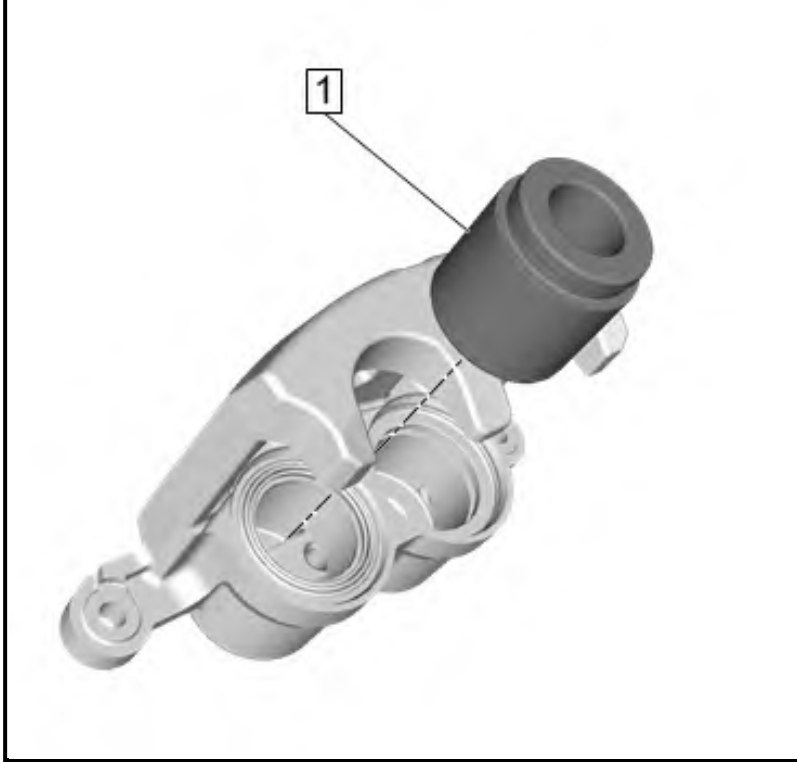


Remove the caliper piston boot (1) from the seal counterbore in the brake caliper and discard the caliper piston boot.



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

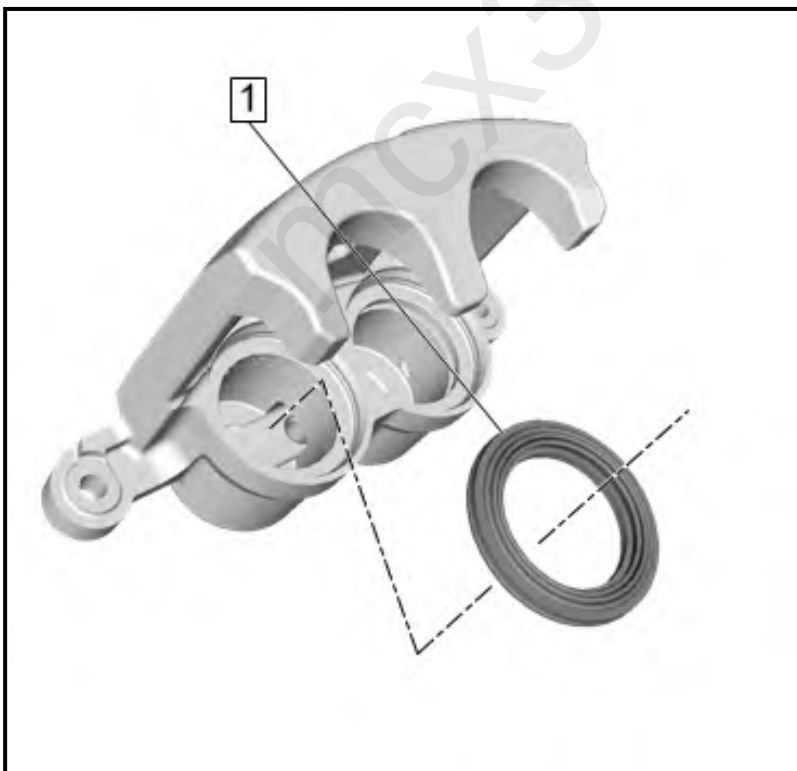




Place a 25 mm (1 in) block of wood between the caliper housing and the opposite caliper piston bore.

11. Install a large C-clamp over the body of the brake caliper with the C-clamp ends against the rear of the caliper body and against the block of wood.
12. Carefully remove the brake caliper piston (1) by directing low pressure compressed air into the brake caliper inlet.
13. Remove the C-clamp from the caliper.
14. Remove the block of wood from the caliper.

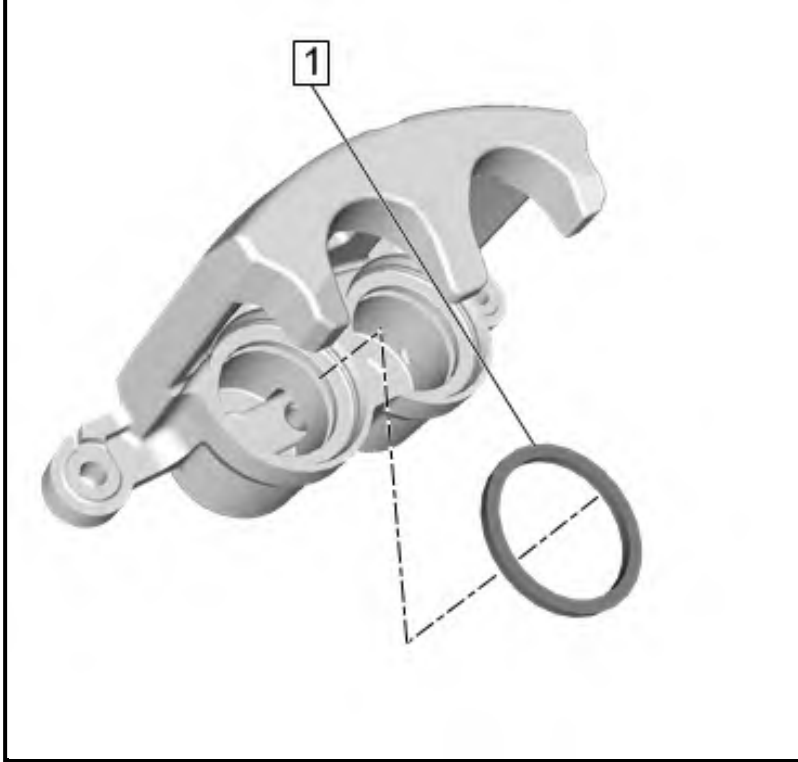
15.



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

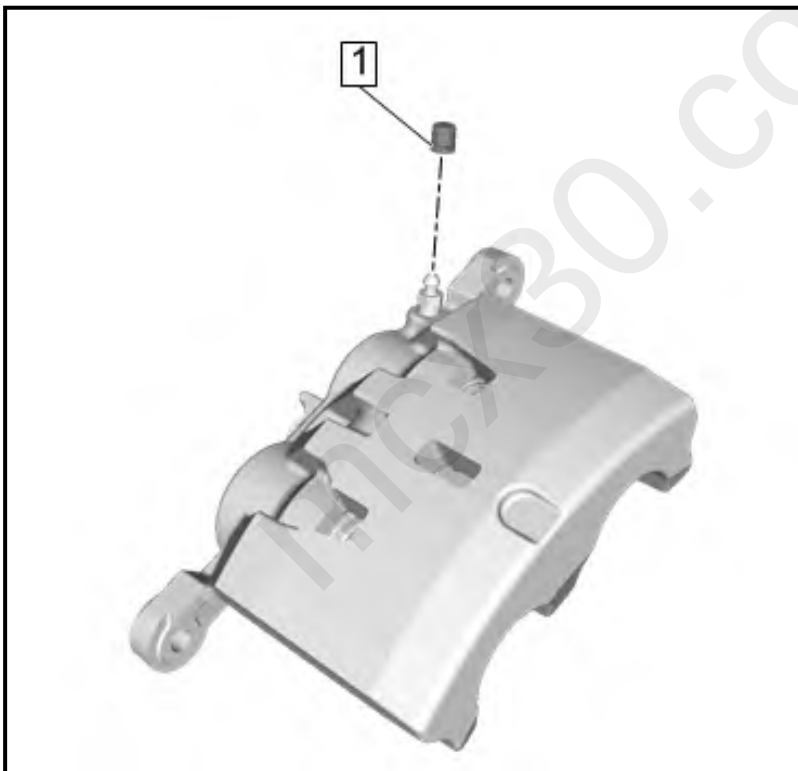
16.





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

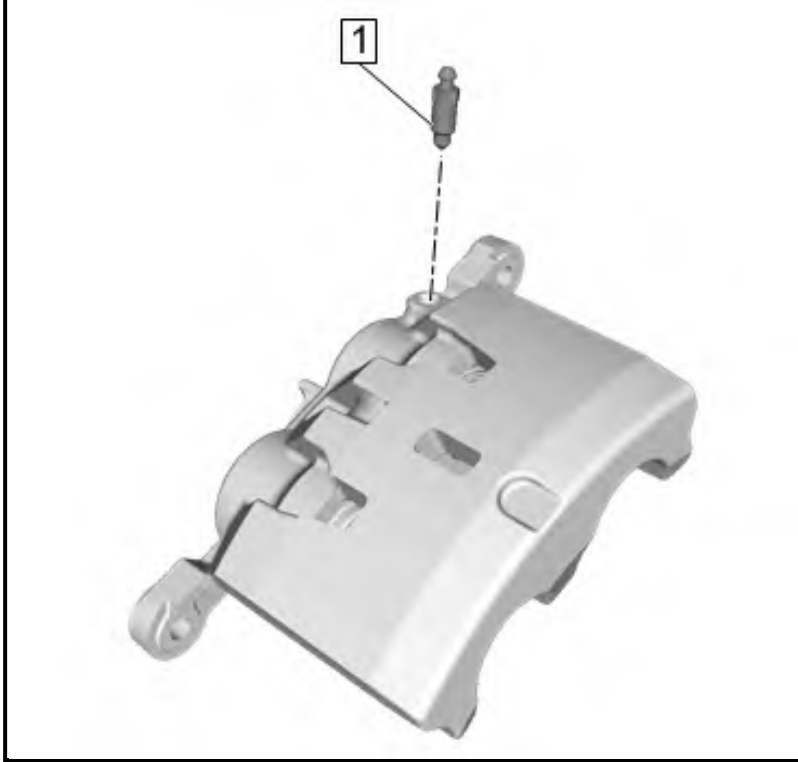
17.



Remove the brake caliper bleeder valve cap (1).

18.





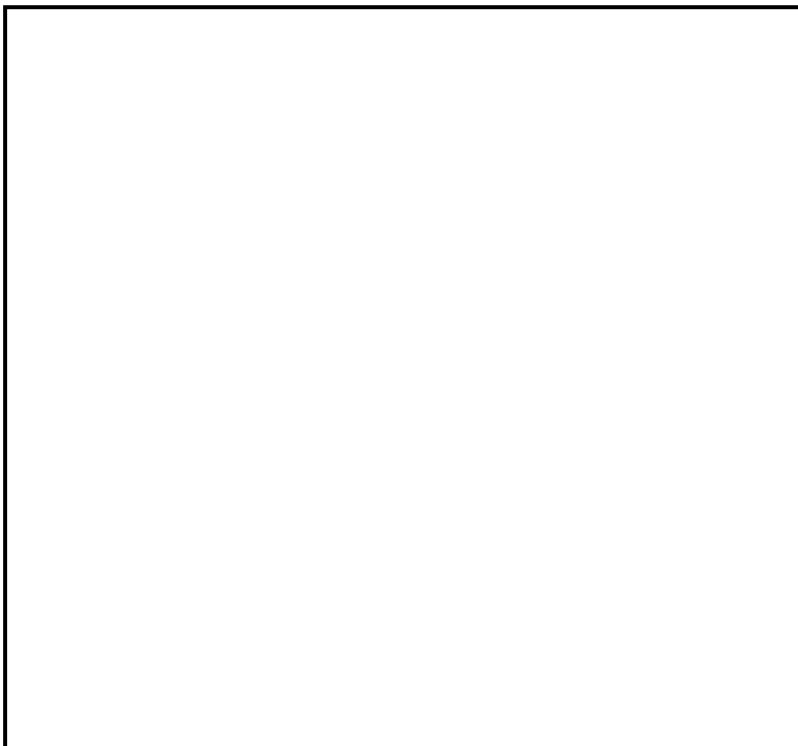
Remove the brake caliper bleeder valve (1).

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

19. Clean the brake caliper piston bores and seal counterbores with denatured alcohol, or equivalent.
20. Clean the brake caliper pistons with denatured alcohol, or equivalent.
21. Dry the caliper piston bores and counterbores with non-lubricated, filtered air.
22. Dry the brake caliper pistons with non-lubricated, filtered air.
23. Inspect the caliper bores for cracks, scoring, pitting, excessive corrosion.
24. If light corrosion is present in the caliper bores, attempt to remove the imperfection with a fine emery paper. If the imperfection cannot be removed, replace the caliper assembly.
25. If cracks, scoring, pitting, and excessive corrosion are present in the caliper bores, replace the caliper assembly.
26. Inspect the caliper pistons for cracks, scoring, and/or damage. Replace the caliper pistons if any of these conditions exist.

#### Assembly Procedure

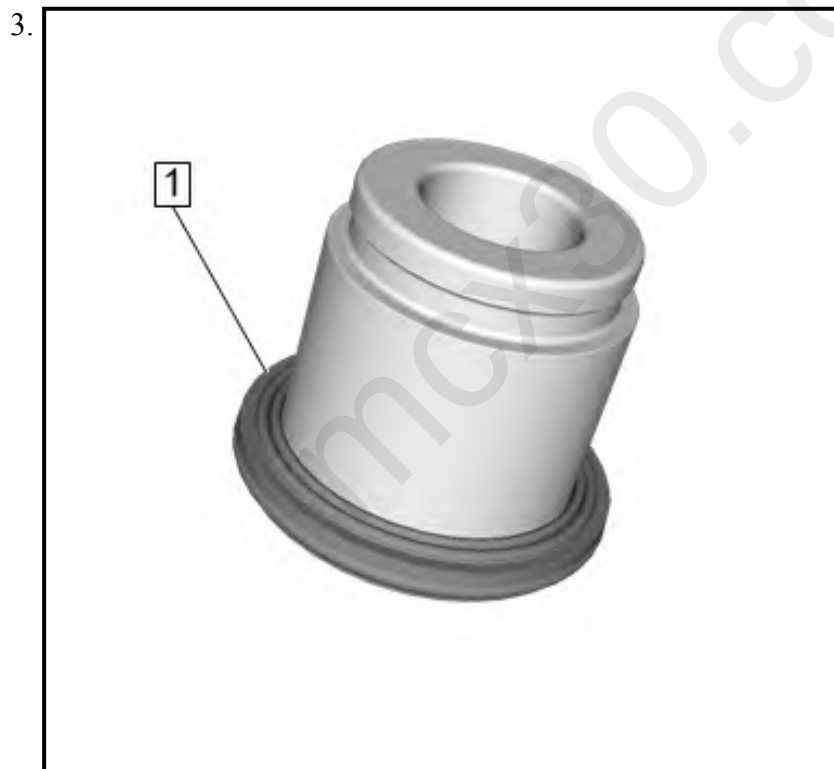
1.





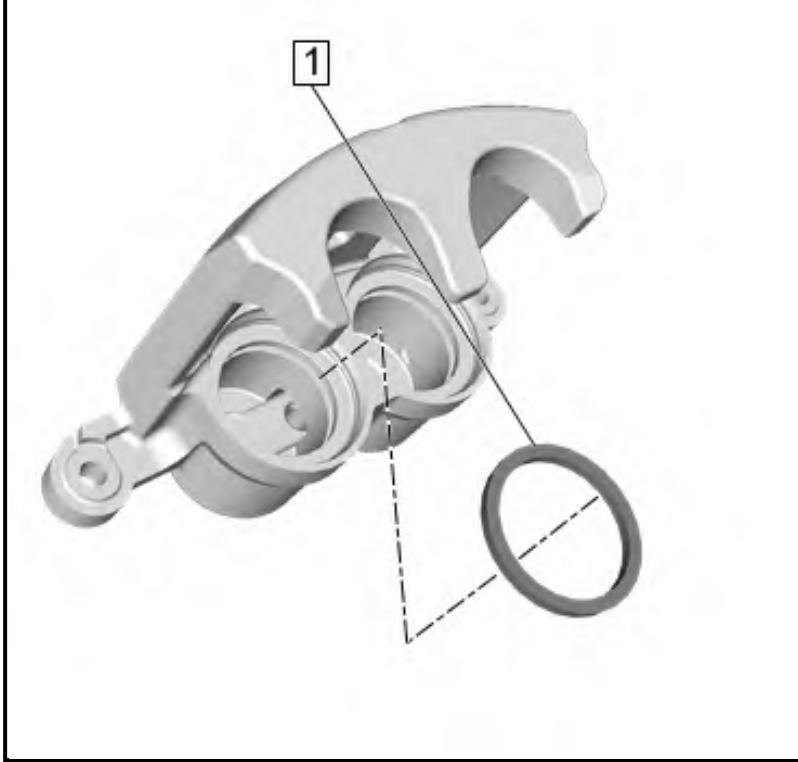
Lubricate the outer surface of the caliper pistons with GM approved brake fluid from a clean, sealed brake fluid container. [Adhesives, Fluids, Lubricants, and Sealers](#)

2. Install the caliper piston boots (1) to the caliper pistons.



Position the caliper piston boots (1) at the bottom of the caliper pistons.

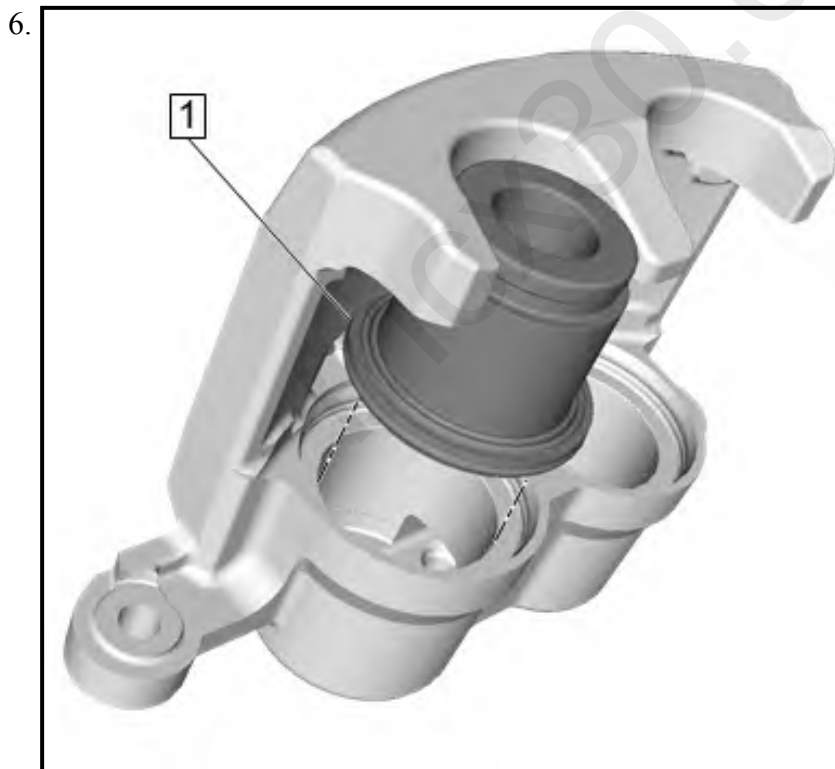




Lubricate the new caliper piston seal (1) with GM approved brake fluid from a clean, sealed brake fluid container. [Adhesives, Fluids, Lubricants, and Sealers](#)

**NOTE:** Ensure the seal is not twisted.

5. Install the lubricated caliper piston seal into the brake caliper bore seal groove.

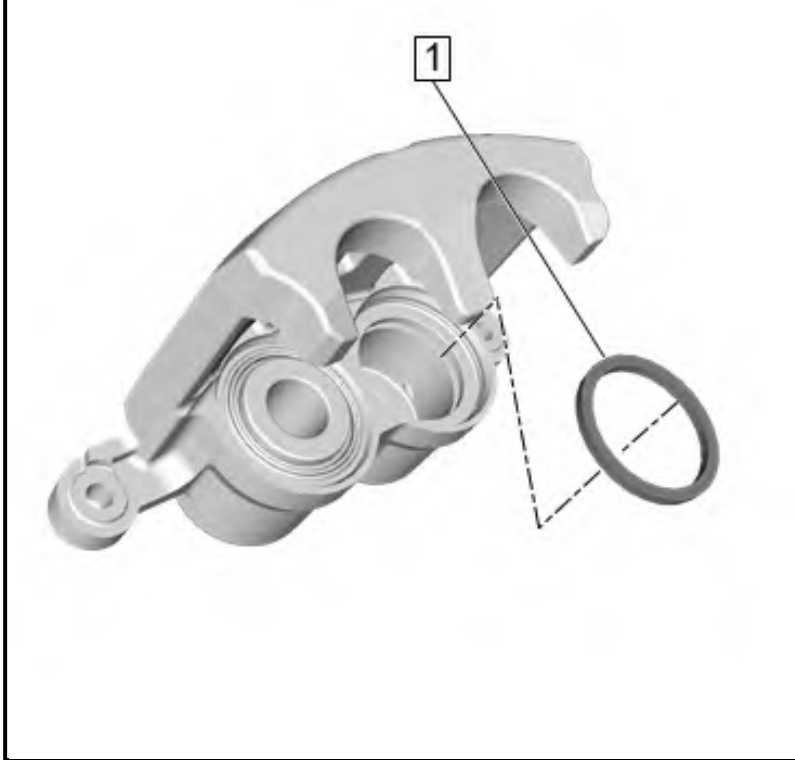


Install the caliper piston and boot assembly (1) into the caliper.

7. Seat the caliper piston boot evenly and completely into the groove in the caliper housing.

8. Carefully push the piston squarely into the brake caliper housing bore.

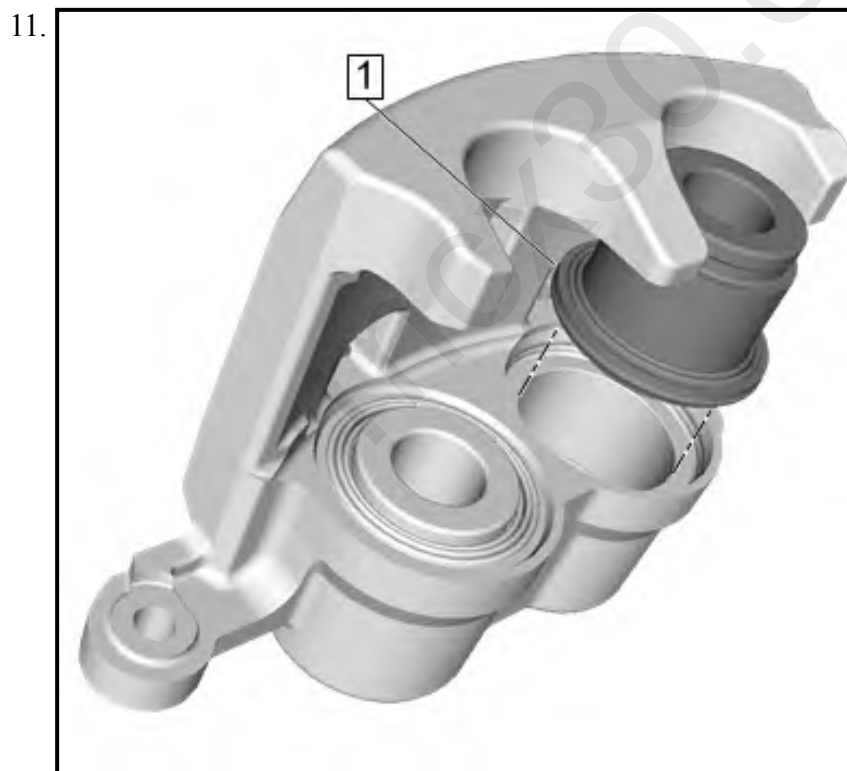




Lubricate the opposite new caliper piston seal (1) with GM approved brake fluid from a clean, sealed brake fluid container. [Adhesives, Fluids, Lubricants, and Sealers](#)

**NOTE:** Ensure the seal is not twisted.

10. Install the lubricated caliper piston seal into the brake caliper bore seal groove.

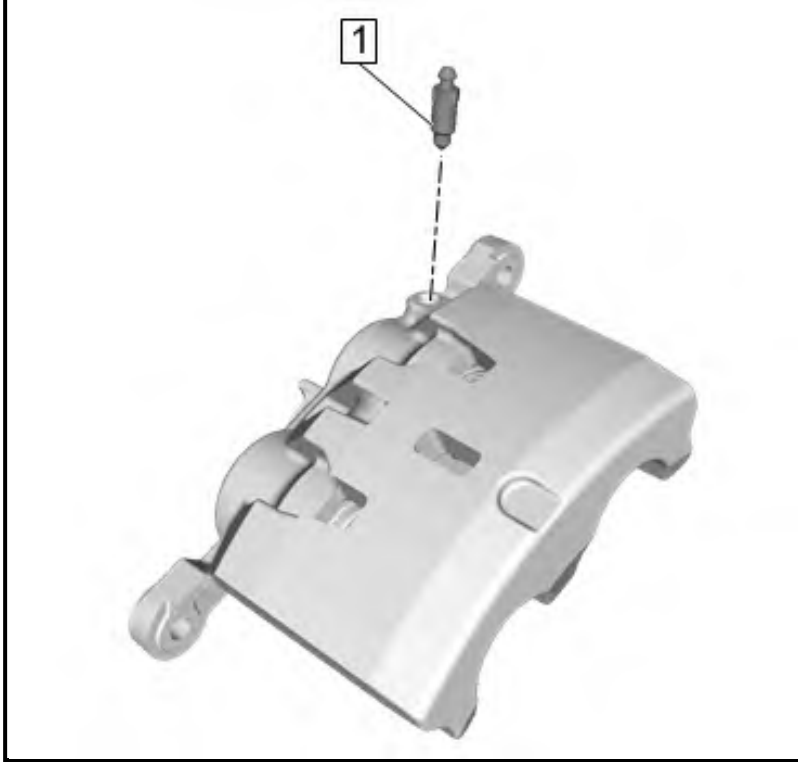


Install the opposite caliper piston and boot assembly (1) into the caliper.

12. Seat the caliper piston boot evenly and completely into the groove in the caliper housing.

13. Carefully push the piston squarely into the brake caliper housing bore.

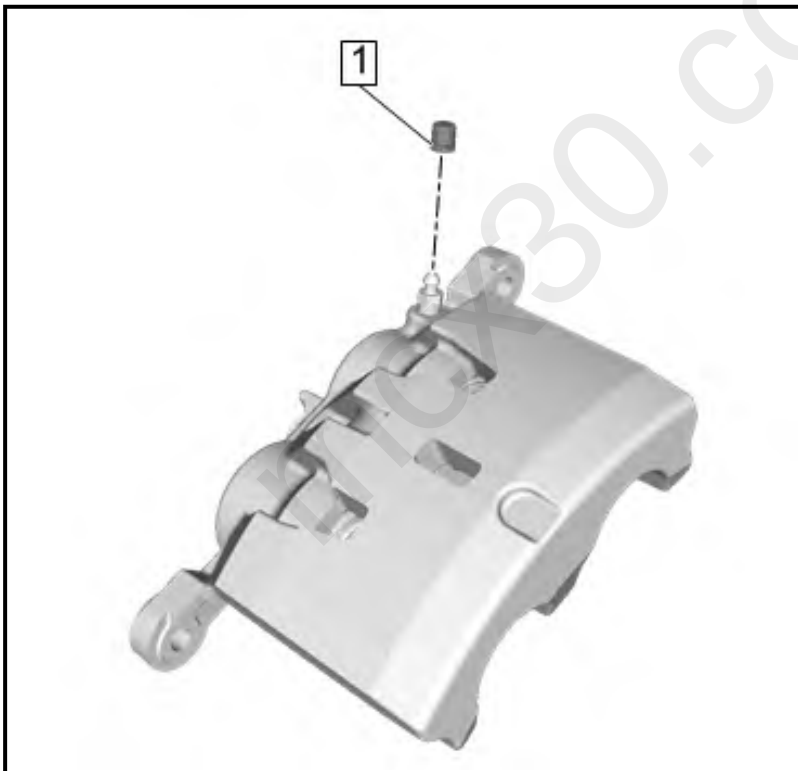




**CAUTION:** Component Fastener Tightening Caution

Install the brake caliper bleeder valve (1) and tighten to 11 N.m (97 lb in).

15.



Install the brake caliper bleeder valve cap (1).

16. Install the front brake caliper. Front Brake Caliper Replacement

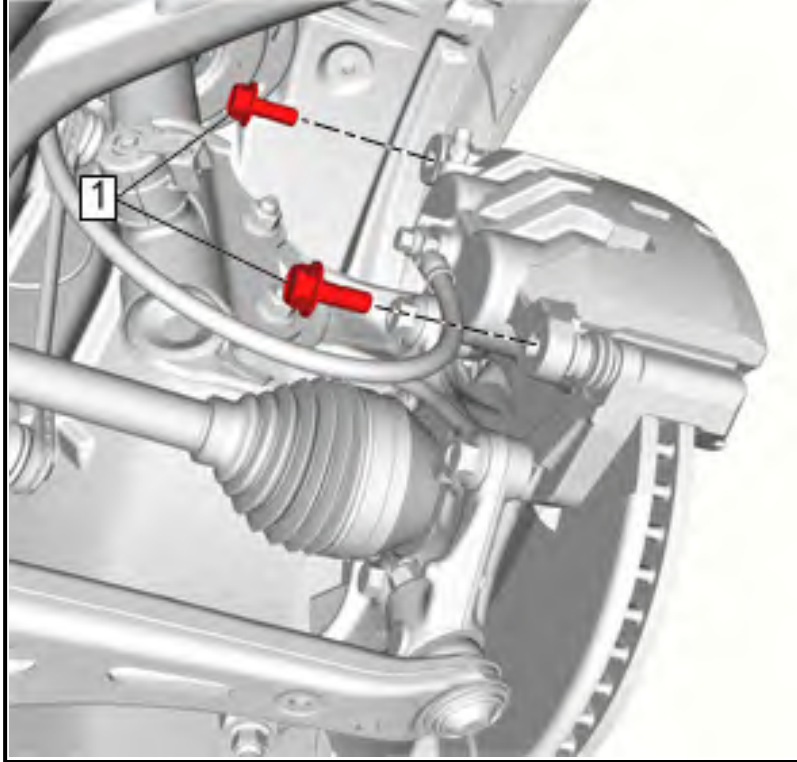
**FRONT BRAKE CALIPER BRACKET REPLACEMENT**

**Removal Procedure**

**WARNING:** Brake Dust Warning

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

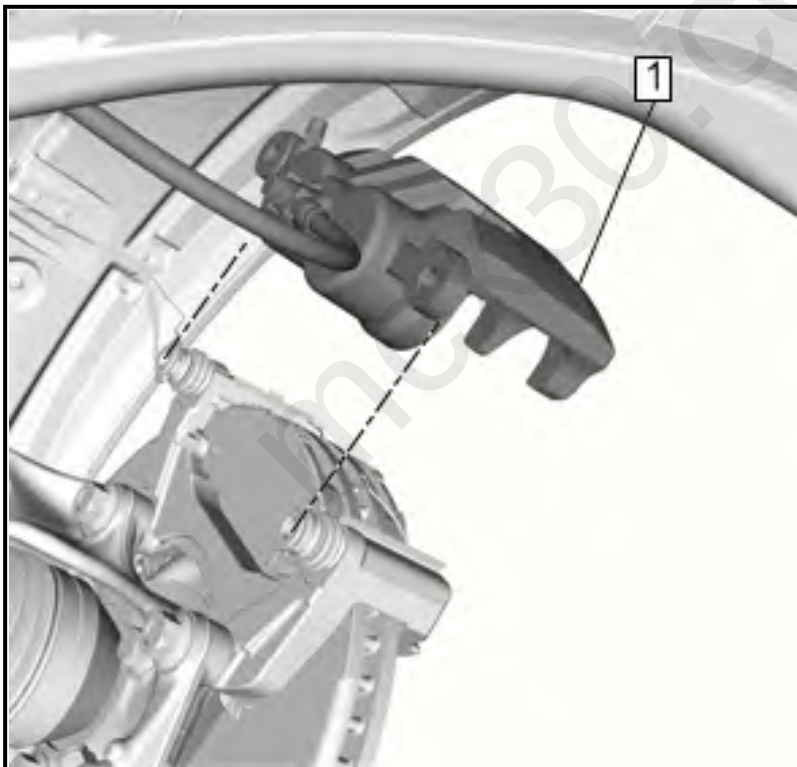
3.



**NOTE:** Do NOT use any air tools to remove or install the guide pin bolts. Use hand tools ONLY.

Front Brake Caliper Guide Pin Bolt (1) - Remove [2x]

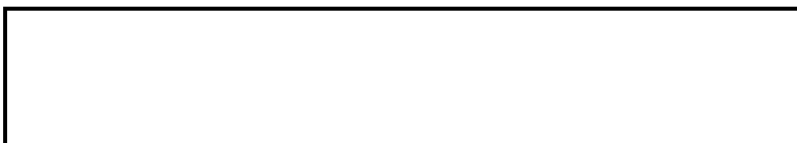
4.

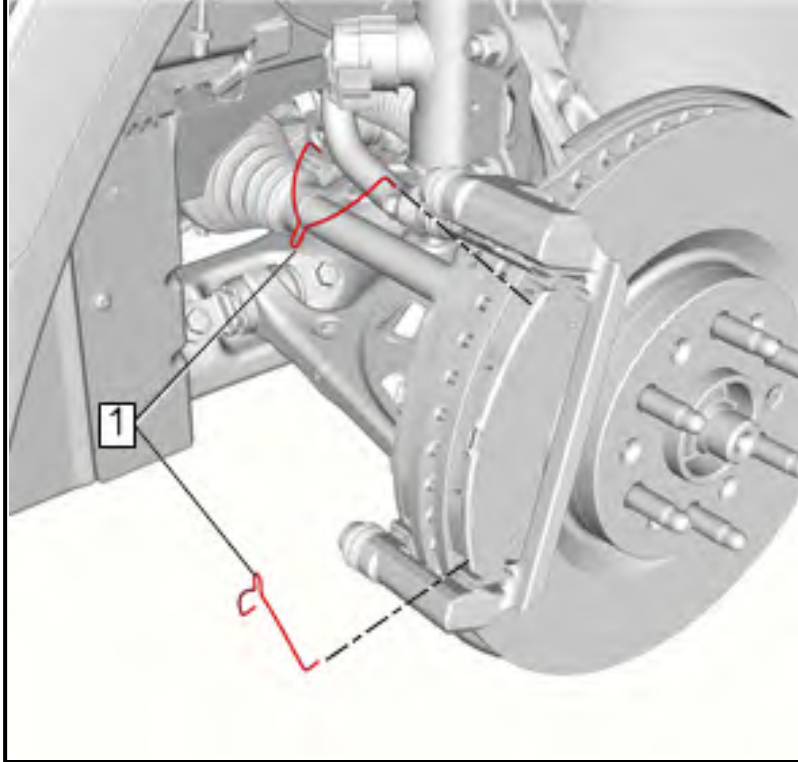


**CAUTION:** Support the brake caliper with heavy mechanic wire, or equivalent, whenever it is separated from its mount and the hydraulic flexible brake hose is still connected. Failure to support the caliper in this manner will cause the flexible brake hose to bear the weight of the caliper, which may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

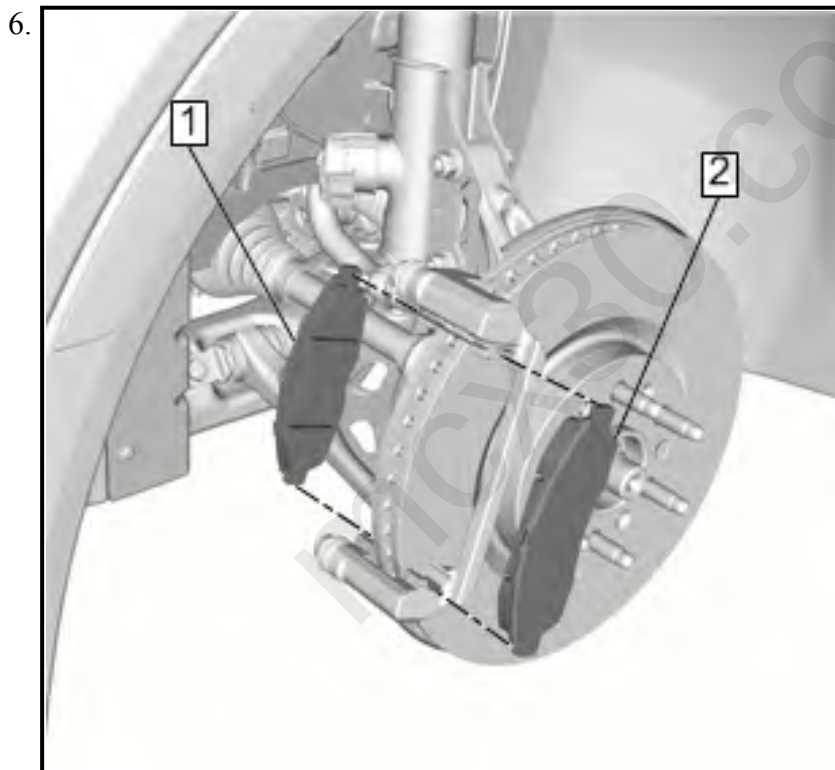
Remove the brake caliper (1) and support with heavy mechanics wire.

5.





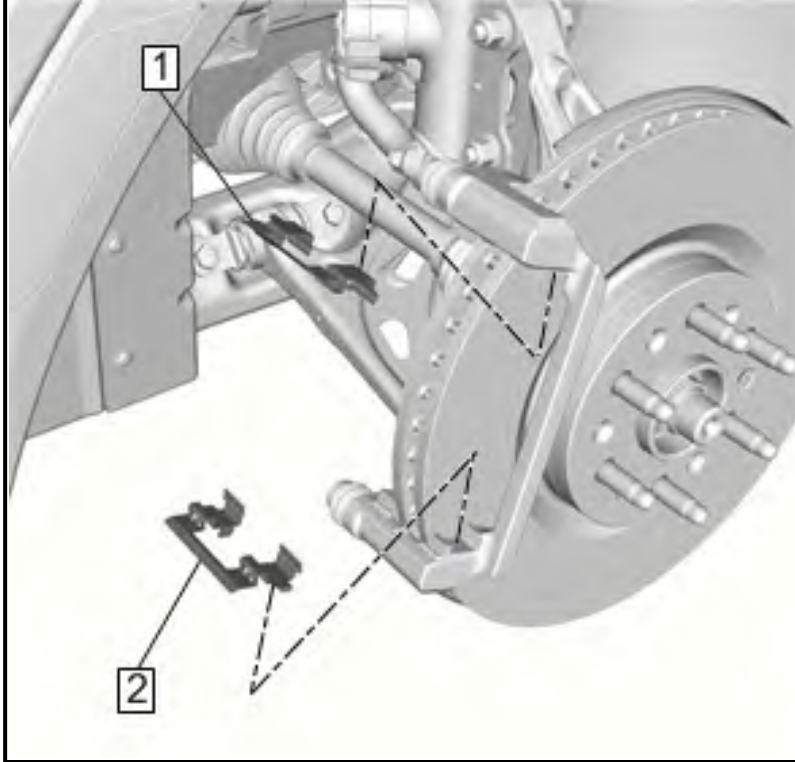
Disc Brake Pad Spring (1) - Remove [2x]



Inner Disc Brake Pad (1) - Remove

7. Outer Disc Brake Pad (2) - Remove

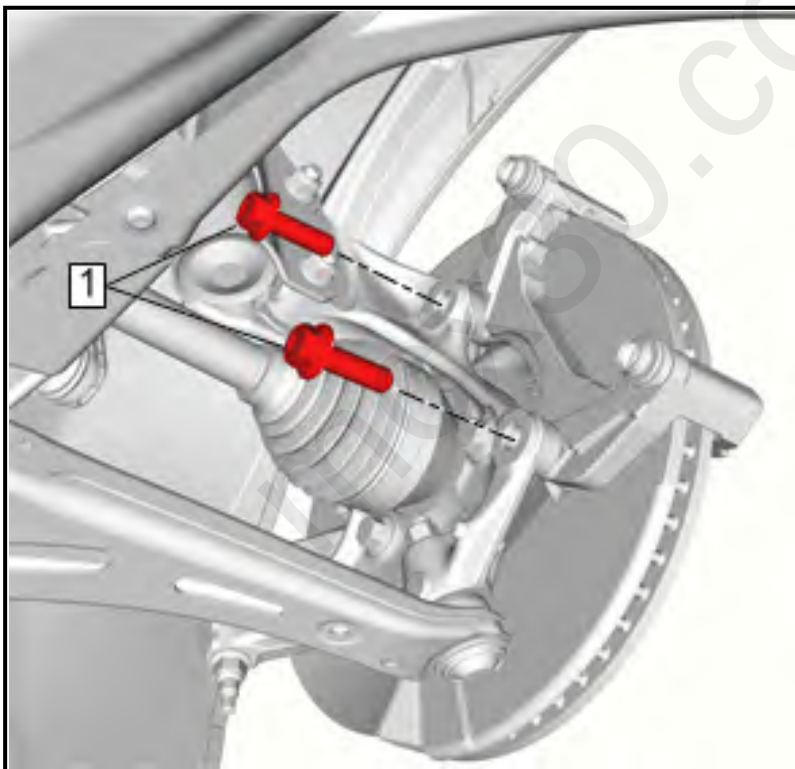




Leading Disc Brake Pad Clip (1) - Remove

9. Trailing Disc Brake Pad Clip (2) - Remove

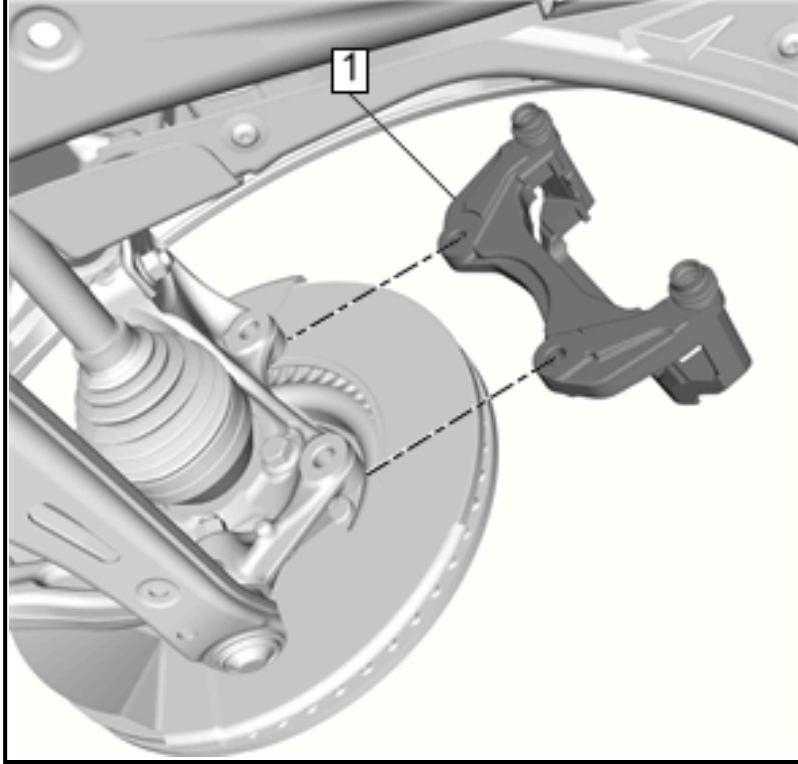
10.



Front Brake Caliper Bracket Bolt (1) - Remove [2x]

11.



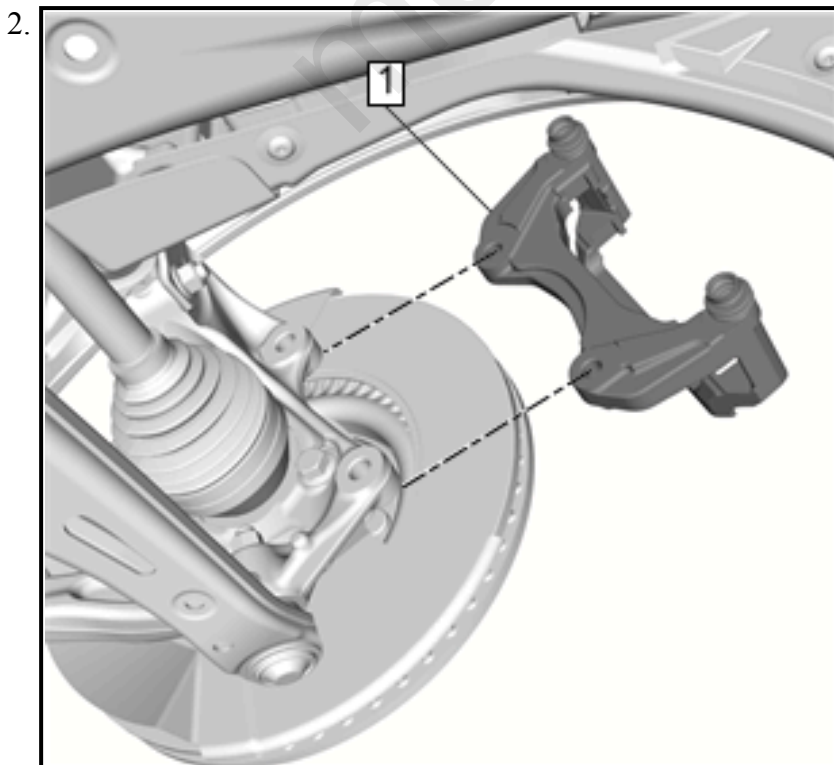


Front Brake Caliper Bracket (1) - Remove

12. Front Brake Caliper Bracket - Inspect for damage
13. Transfer components as necessary.

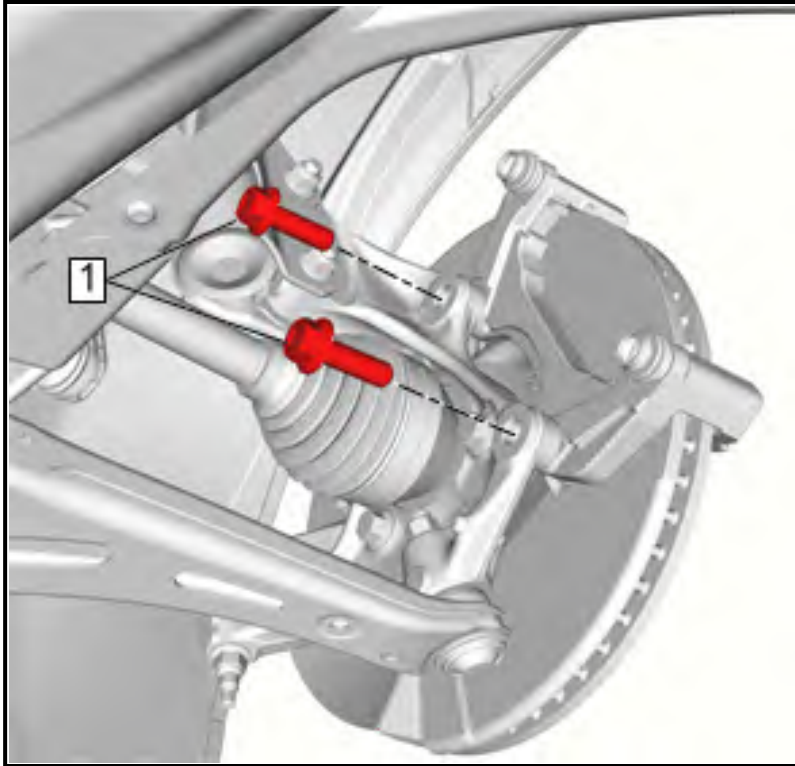
#### Installation Procedure

1. Prepare the brake caliper bracket bolts and the bracket threaded holes for assembly:
  - Thoroughly clean the residue from the bolt threads with denatured alcohol 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. Adhesives, Fluids, Lubricants, and Sealers



Front Brake Caliper Bracket (1) - Install

3.

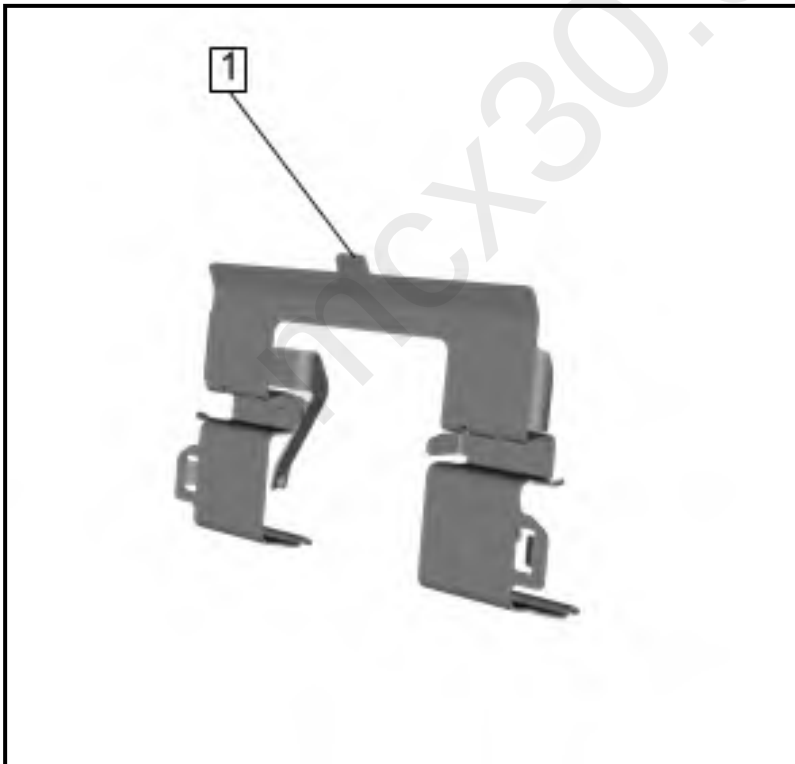


**CAUTION:** Fastener Caution

Front Brake Caliper Bracket Bolt (1) - Install and tighten [2x]

- First Pass: 150 N.m (111 lb ft)
- Final Pass: **15-30 degrees**

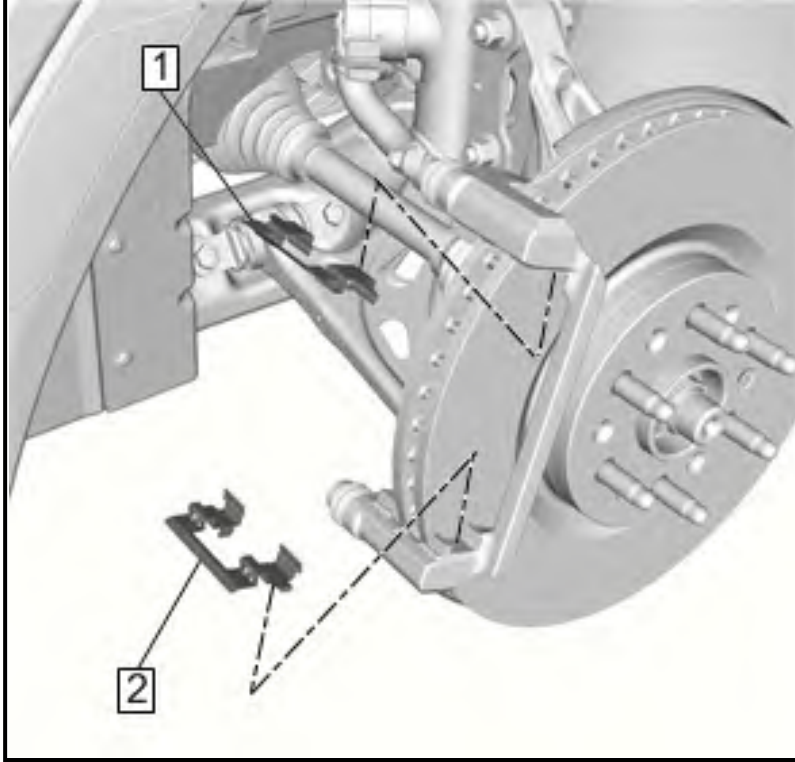
4.



The disc brake pad clip with the tab (1) must be installed in the leading edge of the brake caliper bracket.

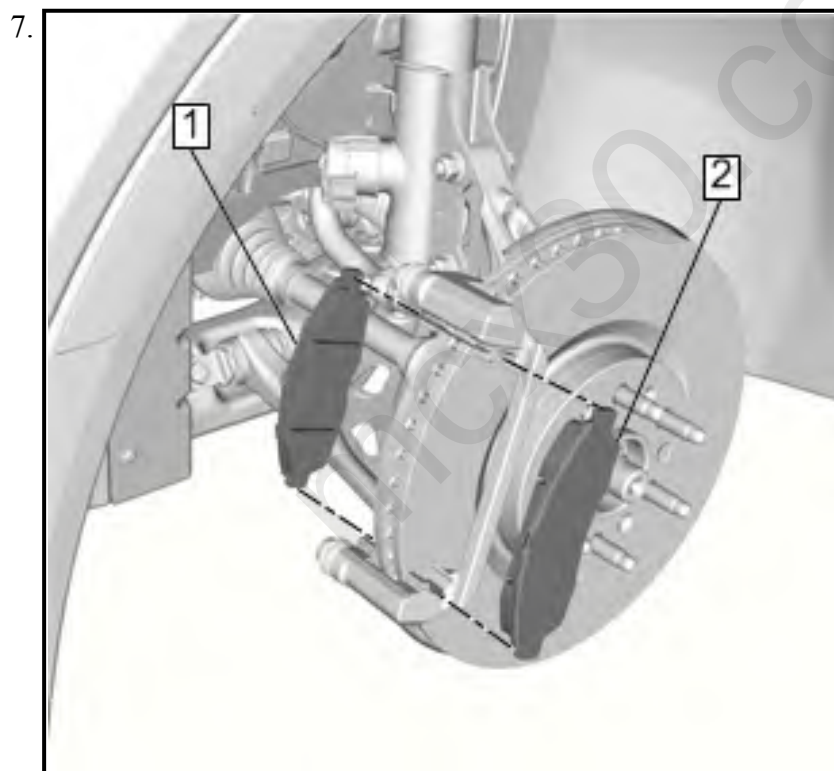
5.





Leading Disc Brake Pad Clip (1) - Install

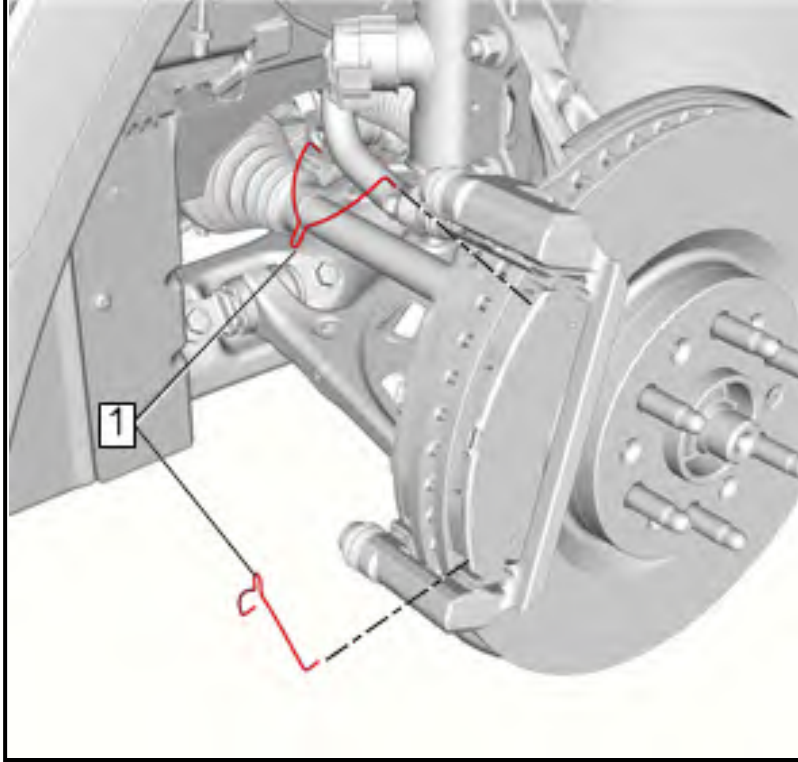
6. Trailing Disc Brake Pad Clip (2) - Install



Inner Disc Brake Pad (1) - Install

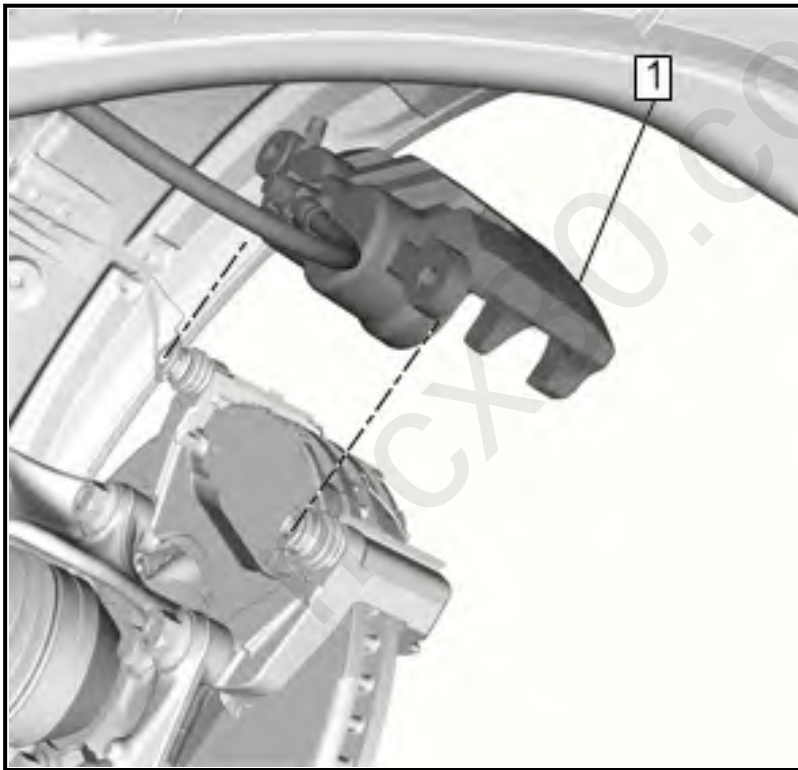
8. Outer Disc Brake Pad (2) - Install





Disc Brake Pad Spring (1) - Install [2x]

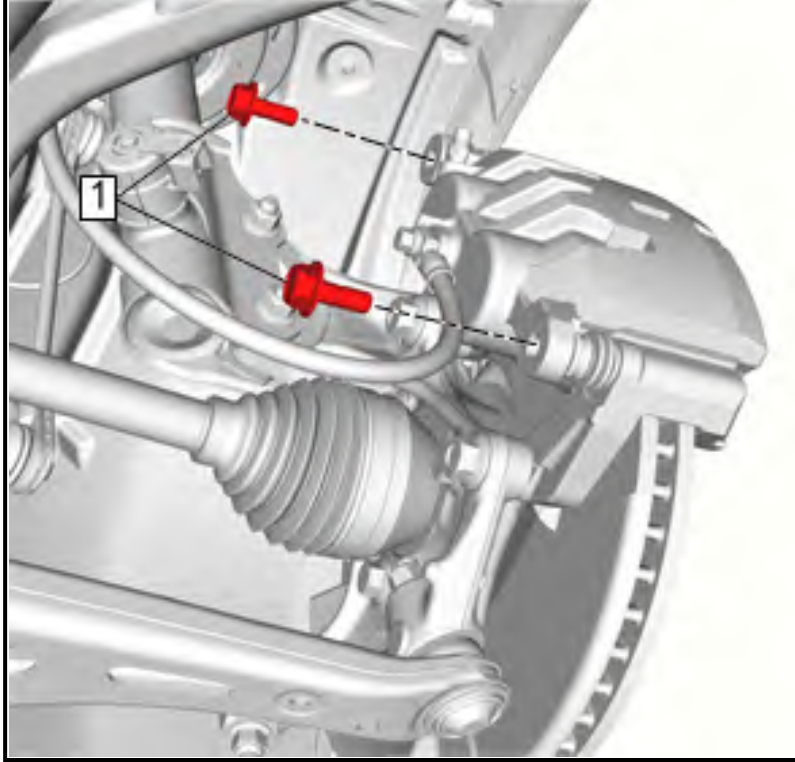
10.



Brake Caliper (1) - Install

11.





Front Brake Caliper Guide Pin Bolt (1) - Install [2x] - [Front Brake Caliper Replacement](#)

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

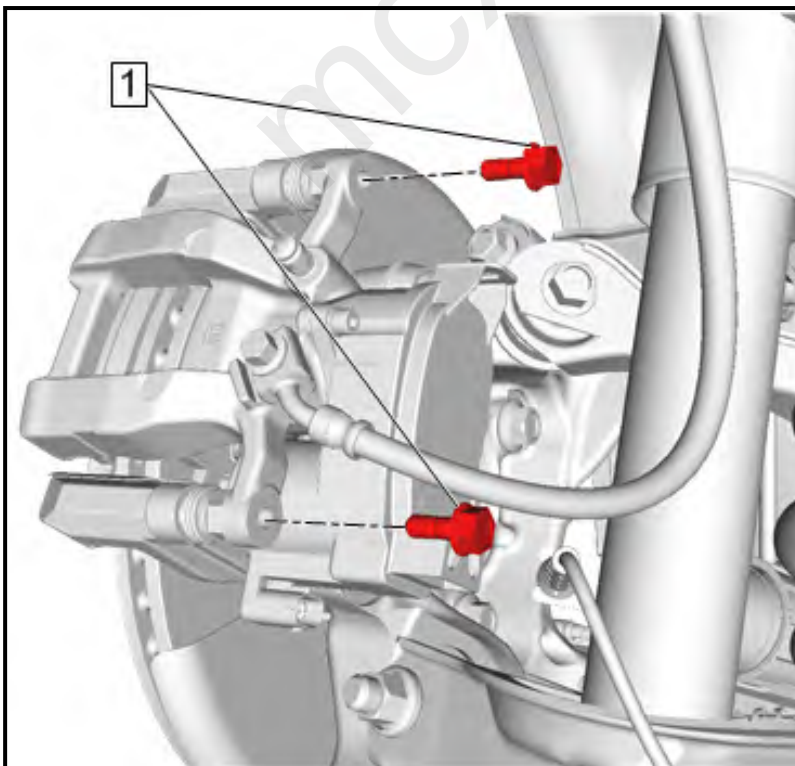
## REAR BRAKE CALIPER BRACKET REPLACEMENT

### Removal Procedure

#### **WARNING:** [Brake Dust Warning](#)

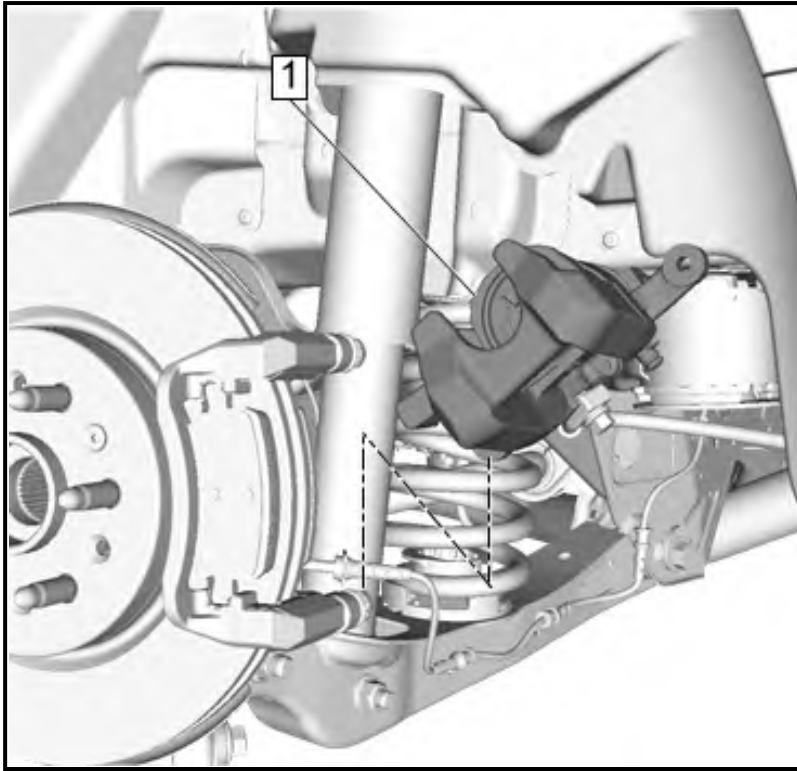
1. Release the electronic parking brake.
2. Raise and support the vehicle. [Lifting and Jacking the Vehicle](#)
3. Remove the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)

4.



**NOTE:** Do NOT use any air tools to remove or install the rear brake caliper guide pin bolts. Use hand tools ONLY.

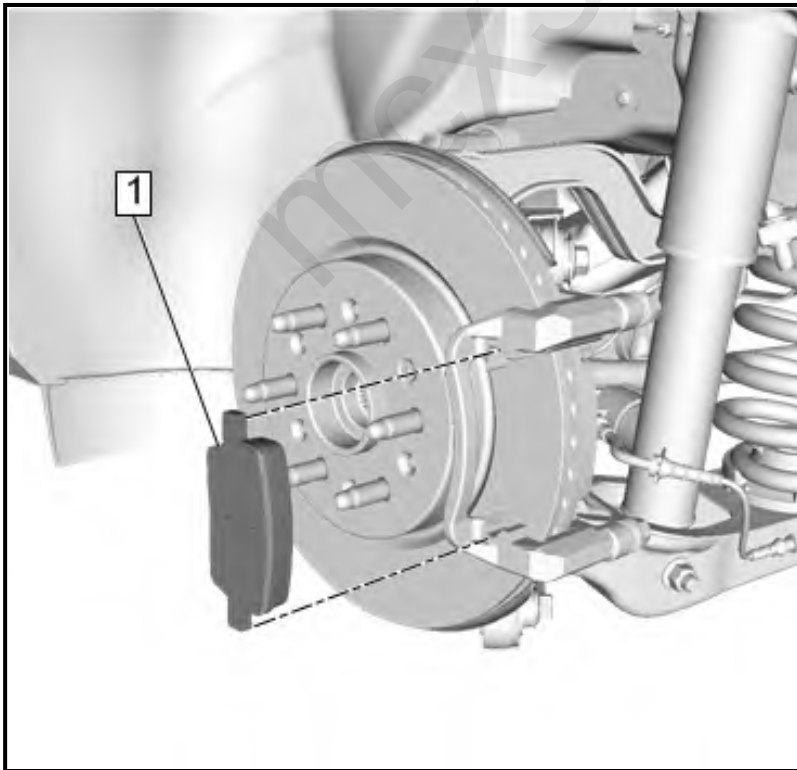
5.



**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.

Remove the rear brake caliper (1) and support with heavy mechanics wire.

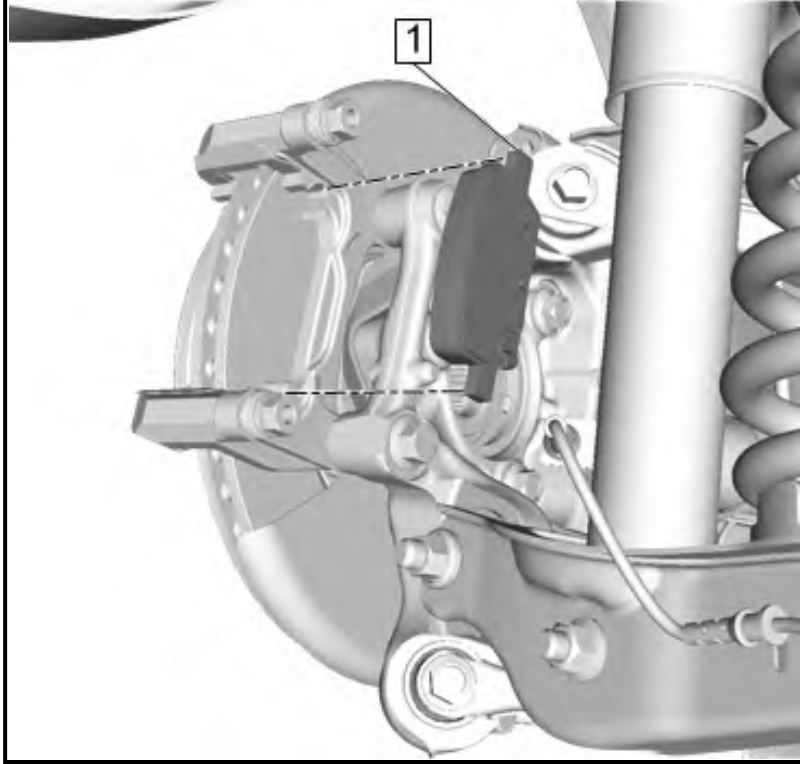
6.



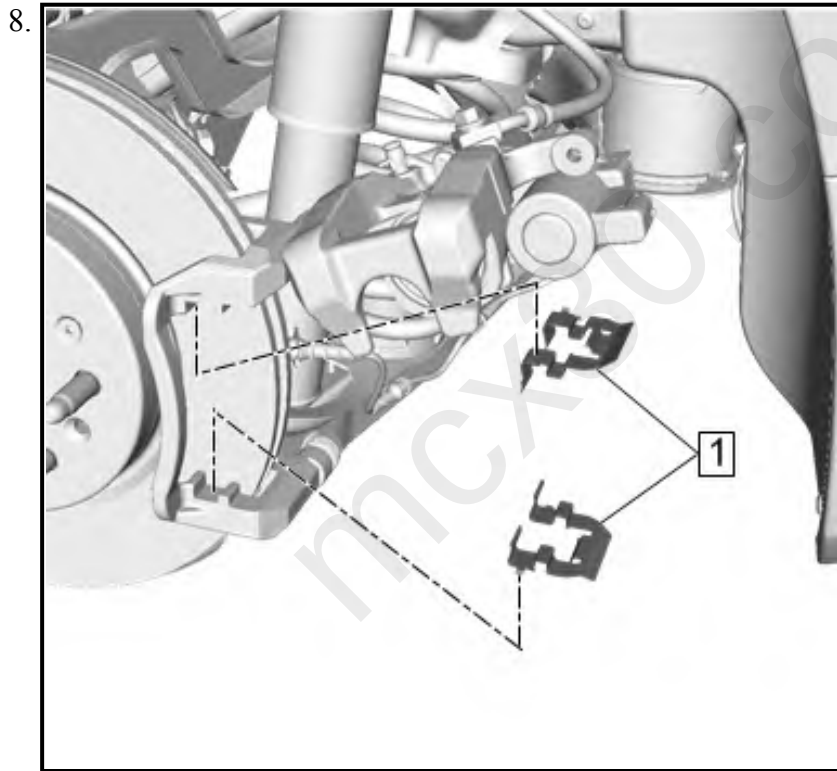
Outer Disc Brake Pad (1) - Remove

7.



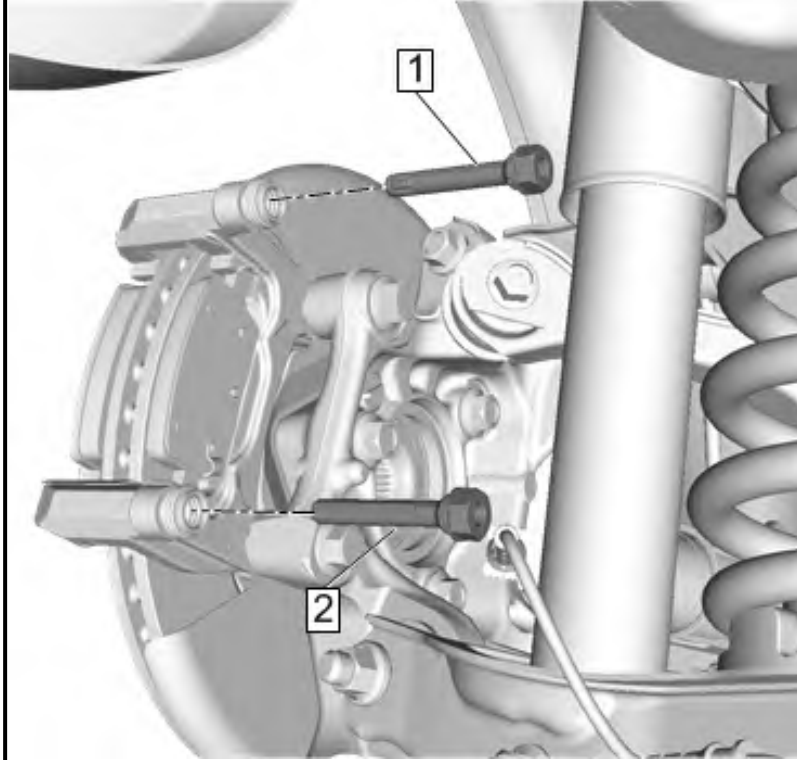


Inner Disc Brake Pad (1) - Remove



Disc Brake Pad Spring (1) - Remove [2x]

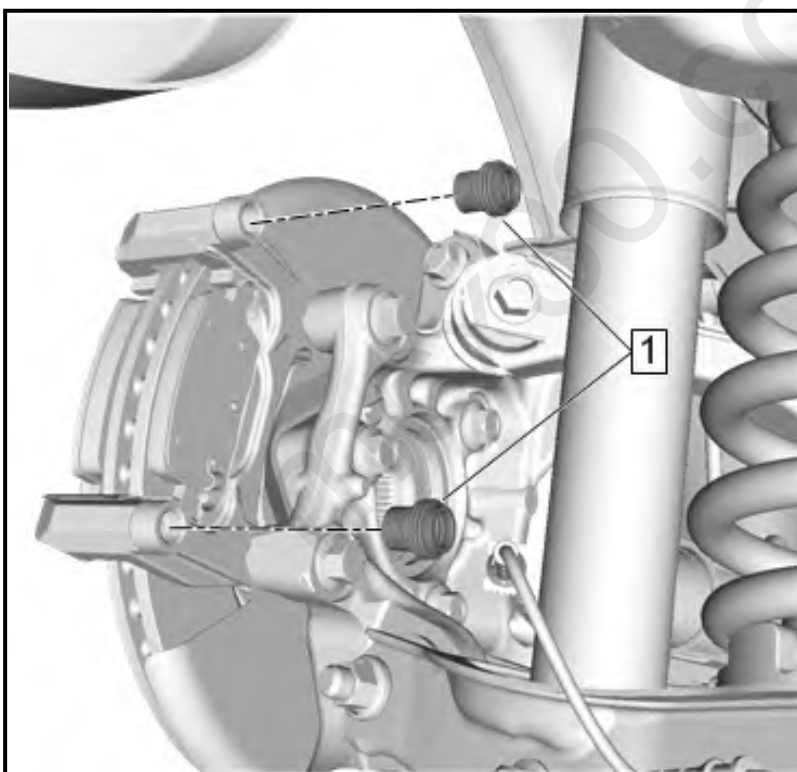




Upper Brake Caliper Guide Pin (1) - Remove

10. Lower Brake Caliper Guide Pin (2) - Remove

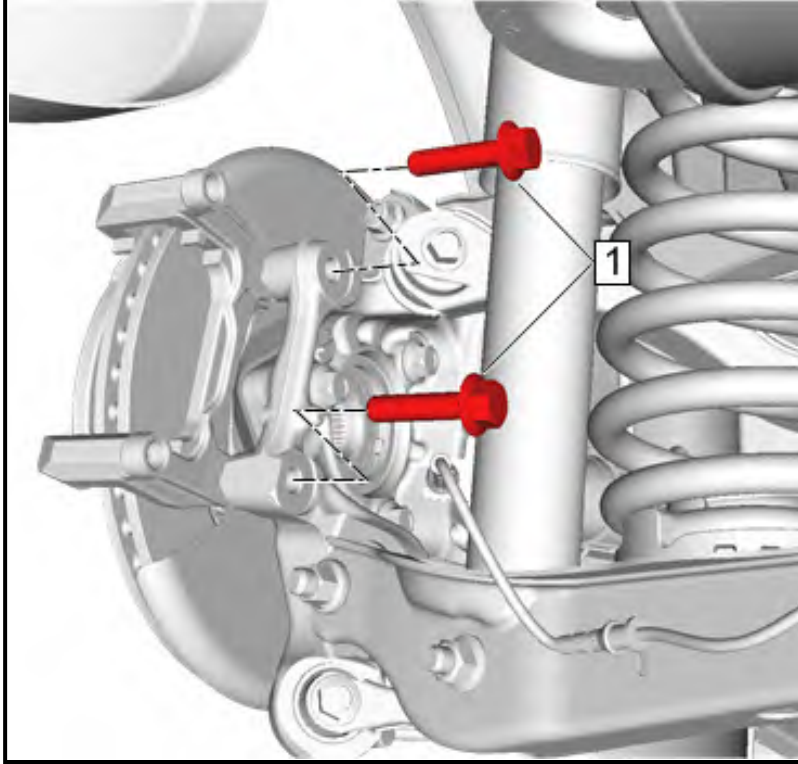
11.



Brake Caliper Guide Pin Seal (1) - Remove [2x]

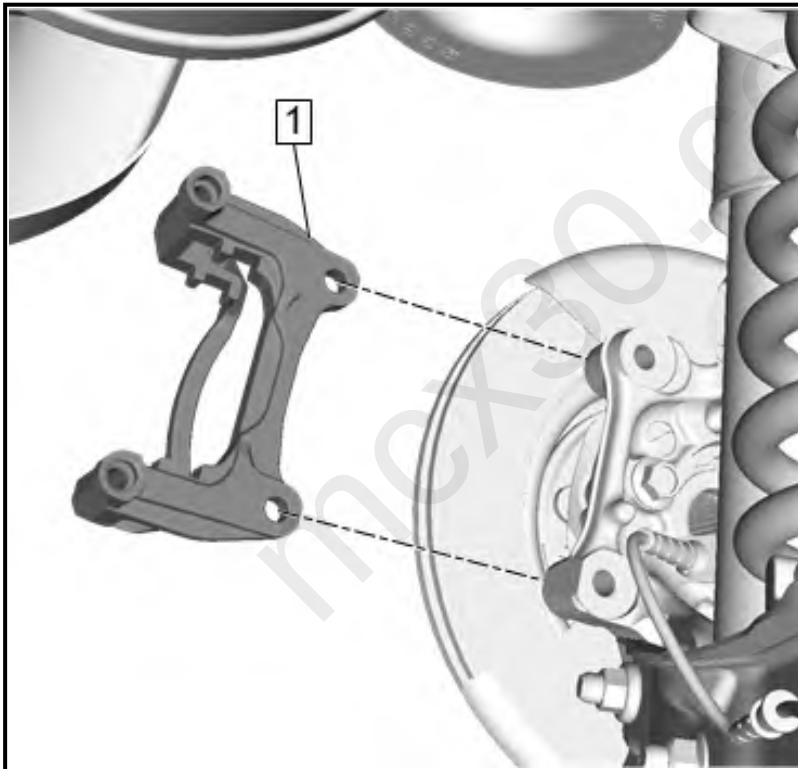
12.





Brake Caliper Bracket Bolt (1) - Remove [2x]

13.



Rear Brake Caliper Bracket (1) - Remove

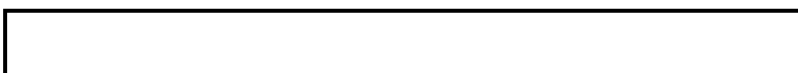
14. Rear Brake Caliper Bracket - Inspect for damage

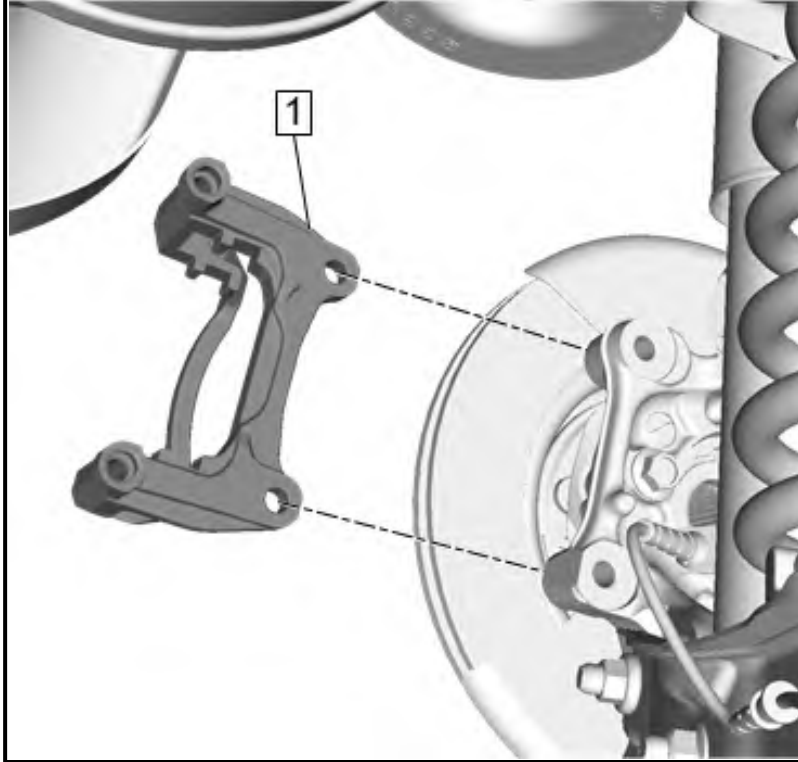
#### Installation Procedure

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

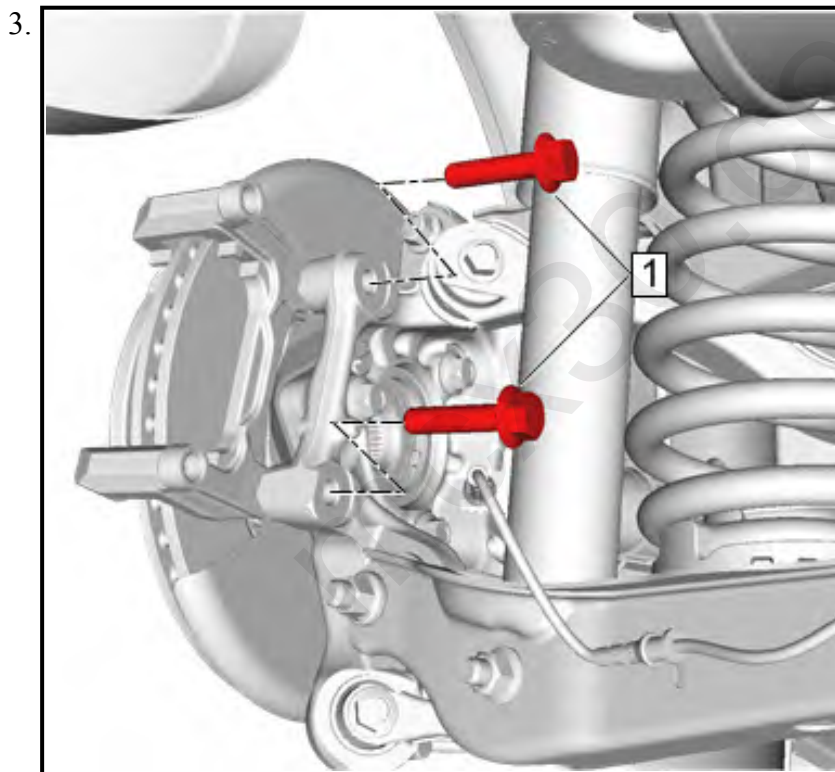
- Thoroughly clean the residue from the bolt threads with denatured alcohol or equivalent and allow to dry.
- Thoroughly clean the residue from the threaded holes with denatured alcohol or equivalent and allow to dry.
- Apply threadlocker to 2/3 of the threaded length of the bolts. Adhesives, Fluids,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

2.





Rear Brake Caliper Bracket (1) - Install

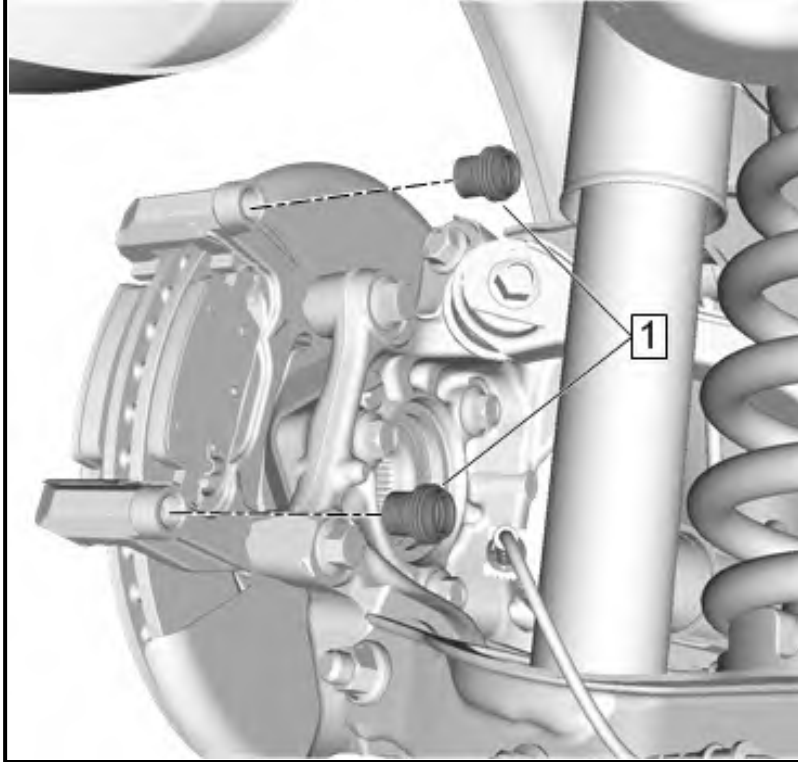


**CAUTION:** Fastener Caution

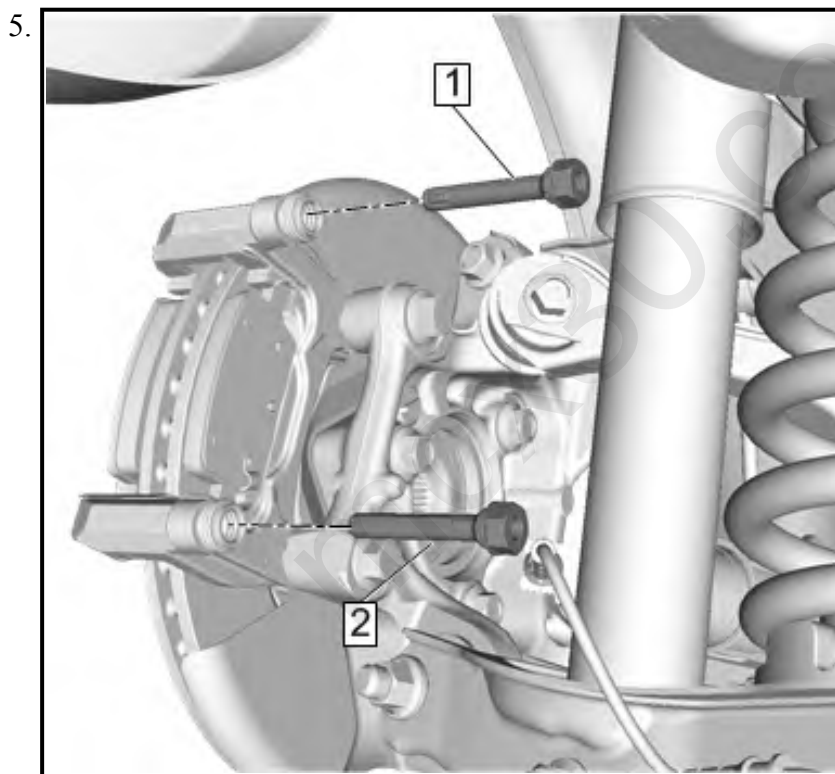
Brake Caliper Bracket Bolt (1) - Install and tighten [2x]

- First Pass: 100 N.m (74 lb ft)
- Final Pass: **15-30 degrees**





Brake Caliper Guide Pin Seal (1) - Install [2x]

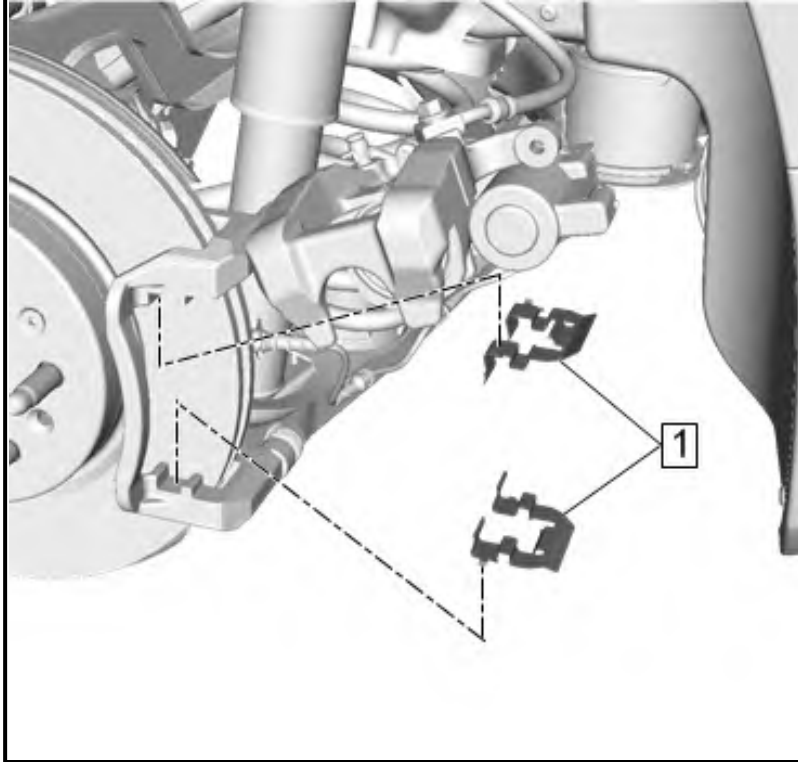


**NOTE:** The upper brake caliper guide pin is equipped with a bushing and must be installed in the same position.

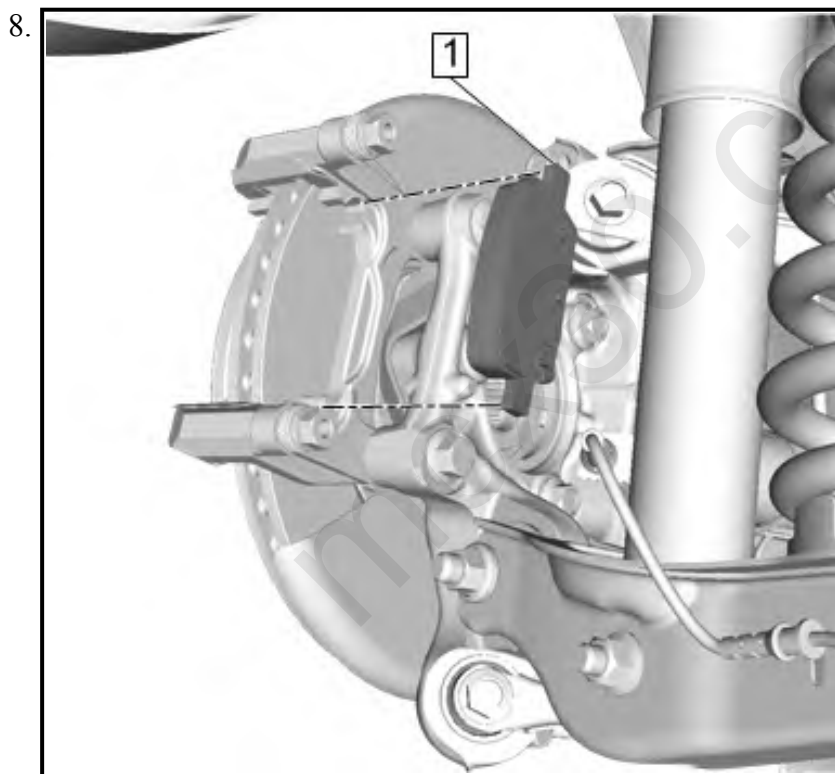
Upper Brake Caliper Guide Pin (1) - Install

6. Lower Brake Caliper Guide Pin (2) - Install





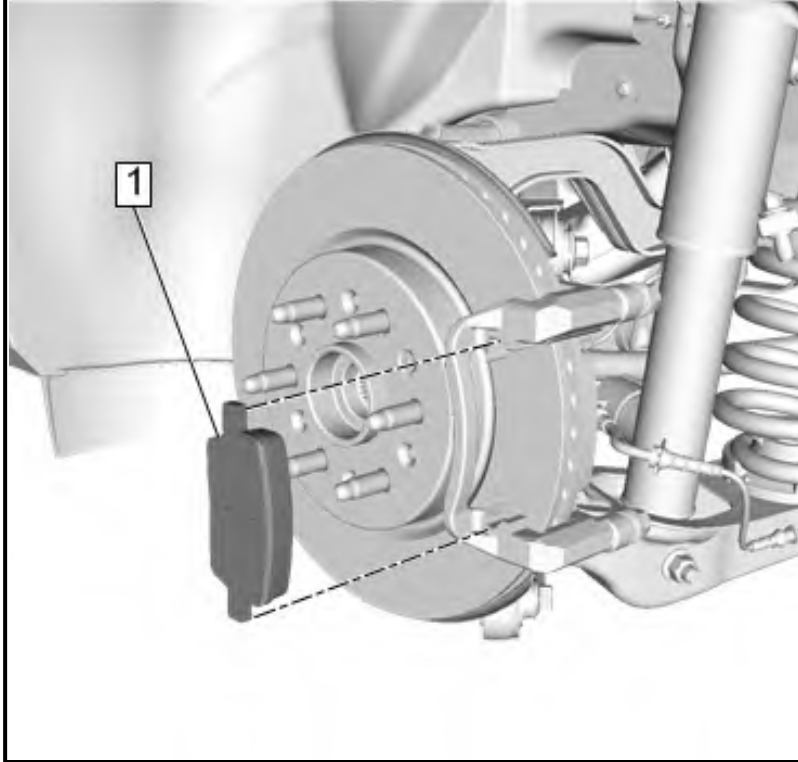
Disc Brake Pad Spring (1) - Install [2x]



**NOTE:** The inner disc brake pad is equipped with a wear sensor on the leading edge of the disc brake pad.

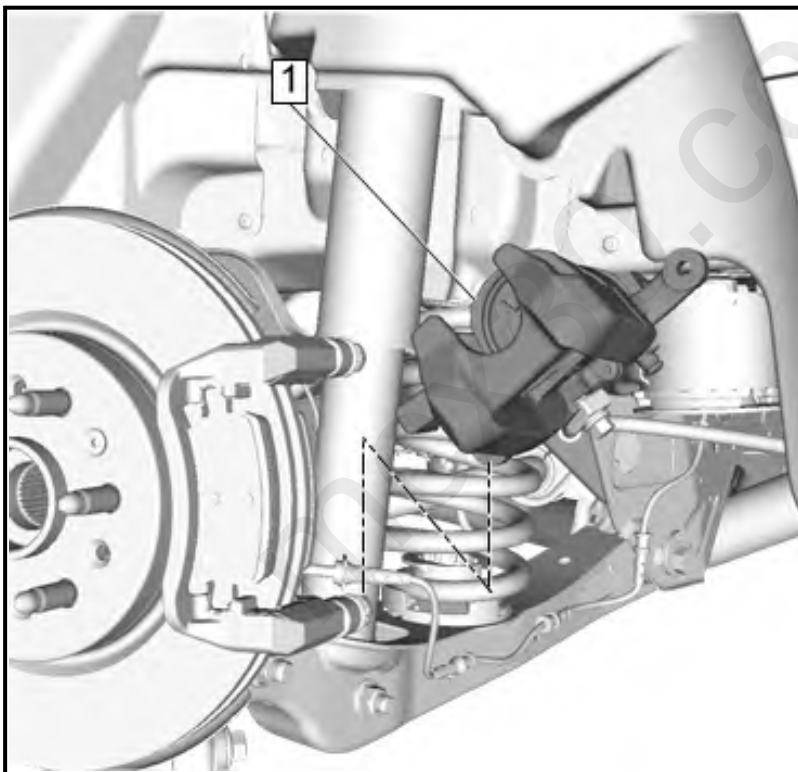
Inner Disc Brake Pad (1) - Install





Outer Disc Brake Pad (1) - Install

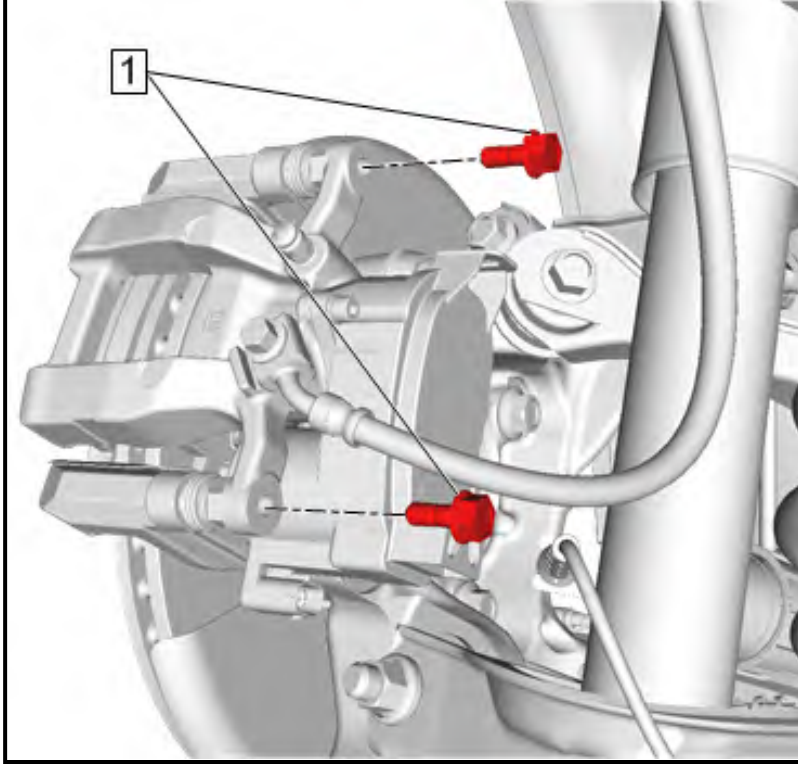
10.



Rear Brake Caliper (1) - Install

11.





Rear Brake Caliper Guide Pin Bolt (1) - Install [2x] - [Rear Brake Caliper Replacement](#)

12. Install the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)
13. Remove the supports and lower the vehicle.

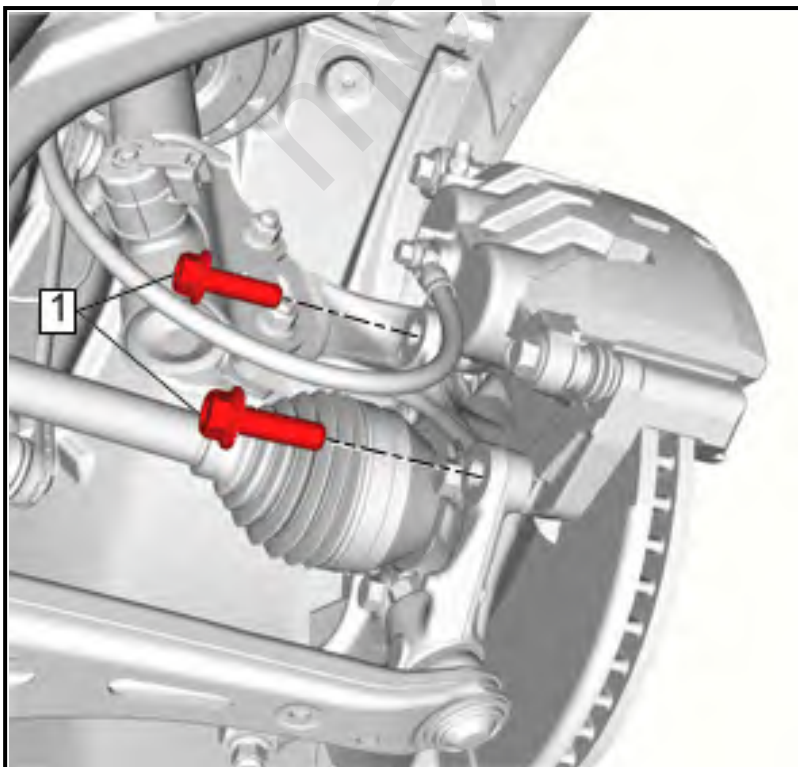
## FRONT BRAKE ROTOR REPLACEMENT

### Removal Procedure

#### **WARNING:** [Brake Dust Warning](#)

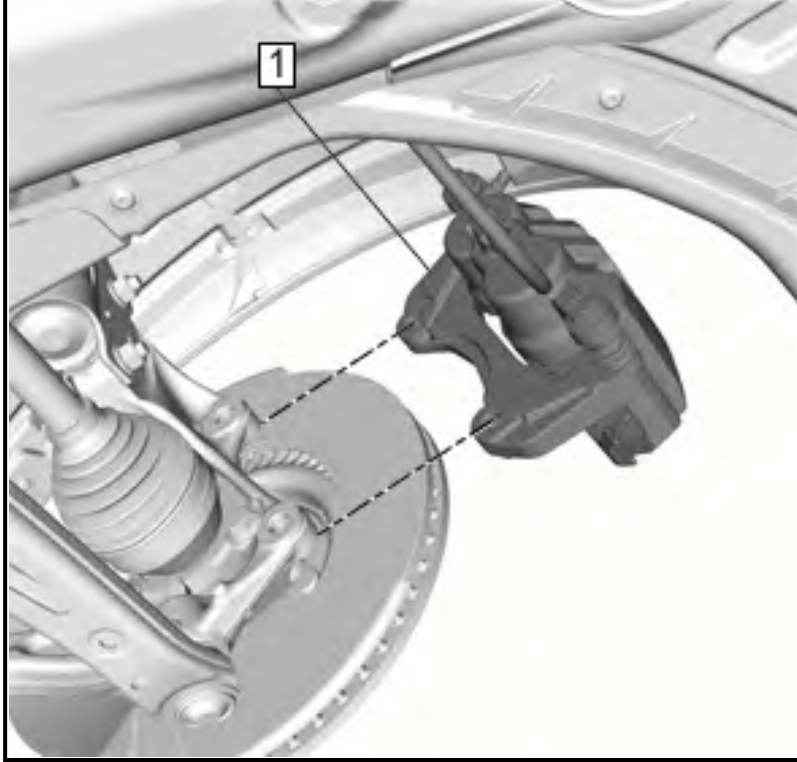
1. Raise and support the vehicle. [Lifting and Jacking the Vehicle](#)
2. Remove the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)

3.



Front Brake Caliper Bracket Bolt (1) - Remove [2x]

4.

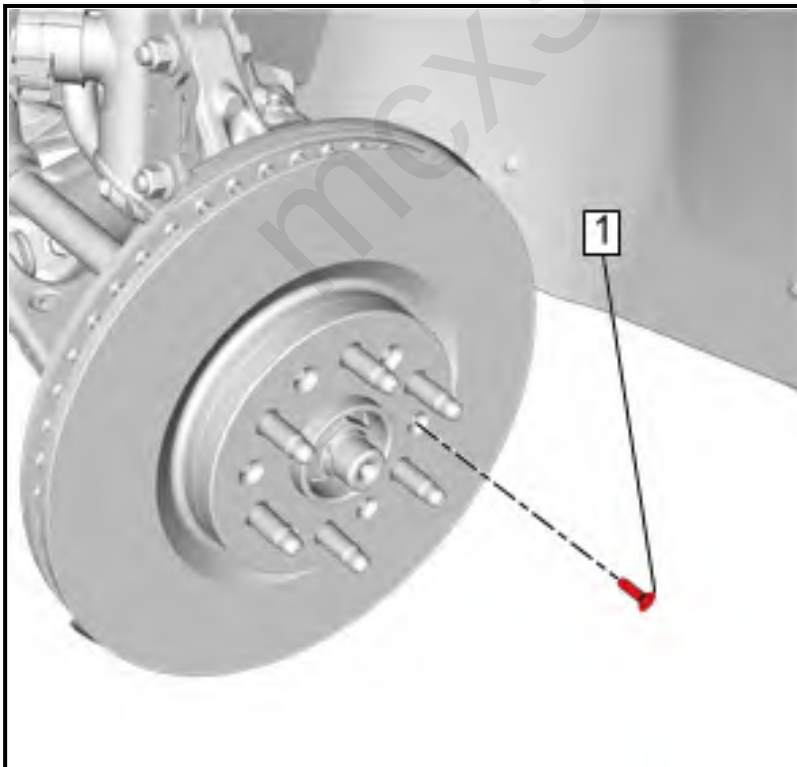


Brake Caliper and Bracket Assembly (1) - Remove

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

5. Support the brake caliper and bracket assembly with heavy mechanics wire.

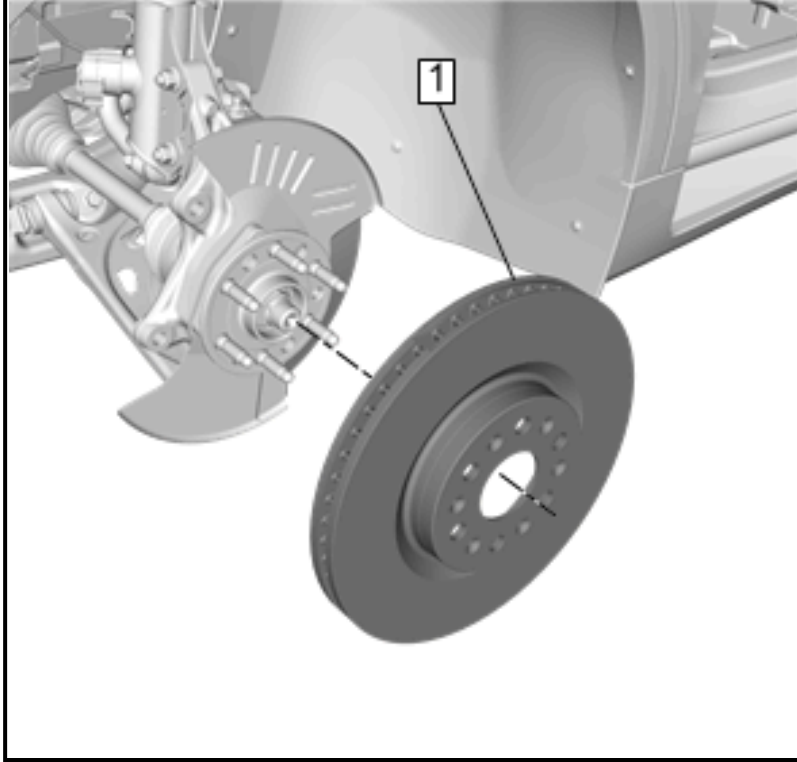
6.



Front Brake Rotor Bolt (1) - Remove

7.





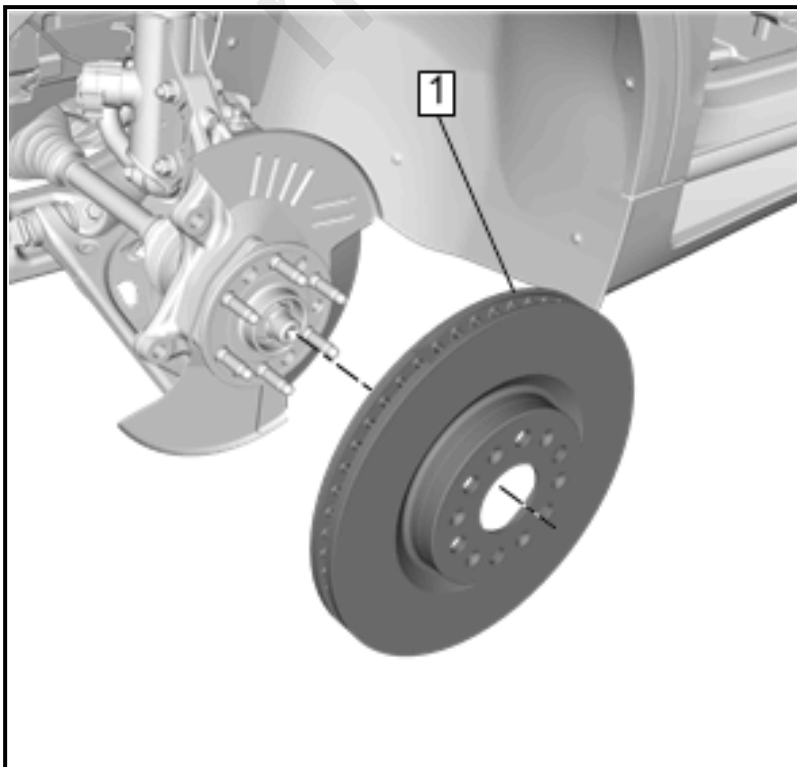
Front Brake Rotor (1) - Remove

### Installation Procedure

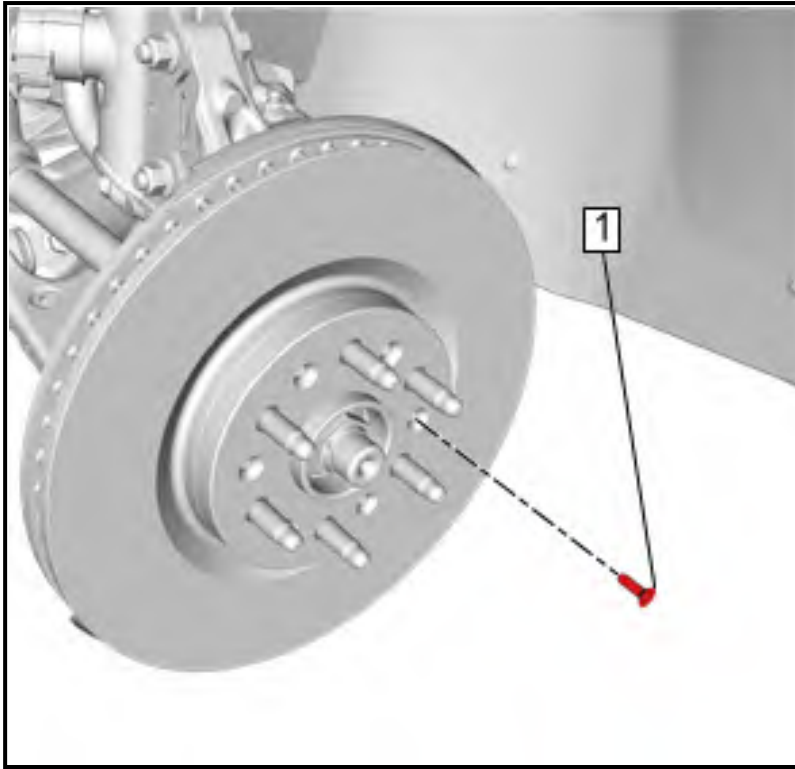
**NOTE:** Whenever the brake rotor has been separated from the hub/axle flange, any rust or contaminants should be cleaned from the hub/axle flange and the brake rotor mating surfaces. Failure to do this may result in excessive assembled lateral runout (LRO) of the brake rotor, which could lead to brake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

1. Using a stiff brush, thoroughly clean any rust or corrosion from the mating surface of the hub/axle flange.
2. Using a stiff brush, thoroughly clean any rust or corrosion from the mating surface and mounting surface of the brake rotor.
3. Inspect the mating surfaces of the hub/axle flange and the rotor to ensure there are no foreign particles or debris remaining.

4.



5.



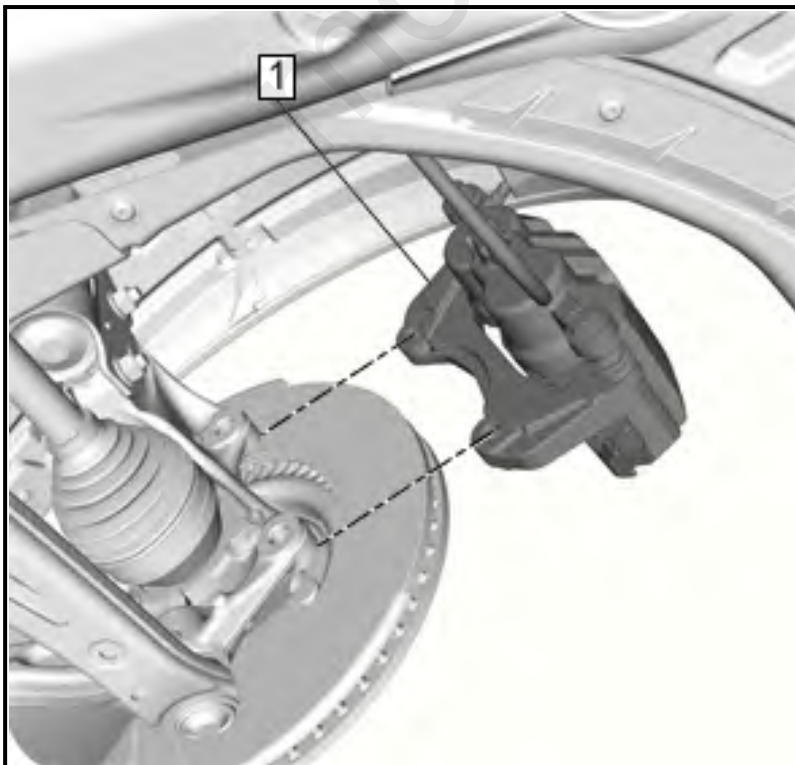
**CAUTION:** Fastener Caution

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

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

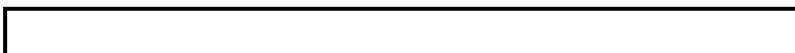
- Thoroughly clean the residue from the bolt threads with denatured alcohol or equivalent and allow to dry.
- Thoroughly clean the residue from the threaded holes with denatured alcohol or equivalent and allow to dry.
- Apply threadlocker to 2/3 of the threaded length of the bolts. Adhesives, Fluids,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

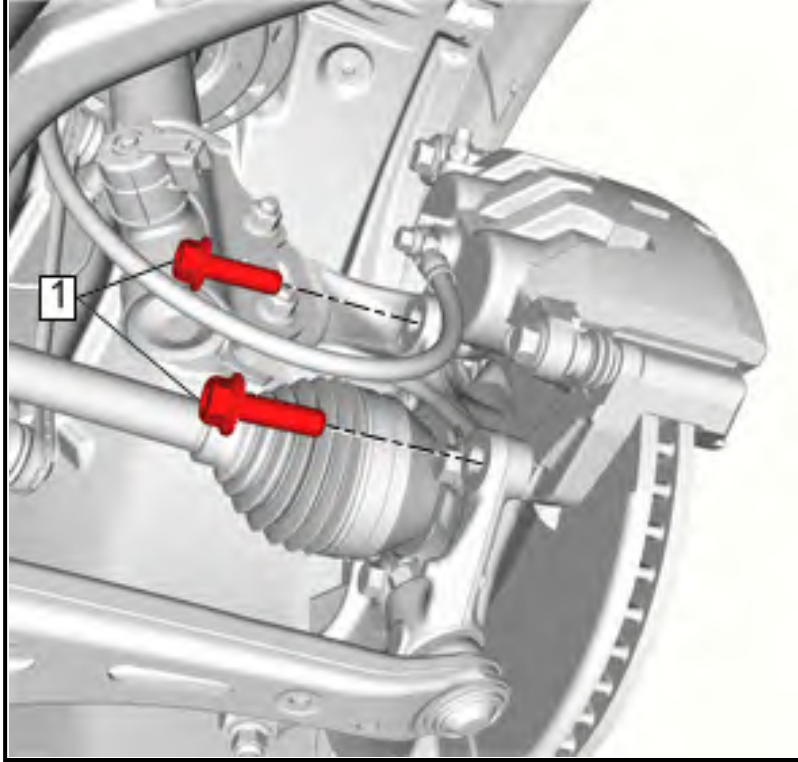
7.



Brake Caliper and Bracket Assembly (1) - Install

8.





Front Brake Caliper Bracket Bolt (1) - Install [2x] - [Front Brake Caliper Bracket Replacement](#)

9. Install the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)
10. Remove the supports and lower the vehicle.
11. Burnish the brake pads and rotors. [Brake Pad and Rotor Burnishing](#).

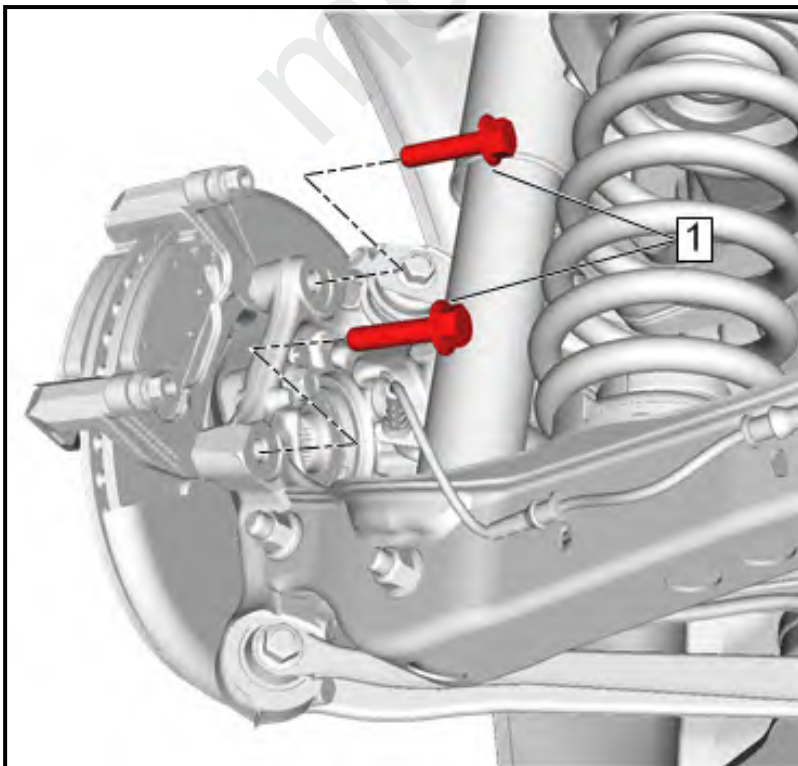
## REAR BRAKE ROTOR REPLACEMENT

### Removal Procedure

**WARNING:** [Brake Dust Warning](#)

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

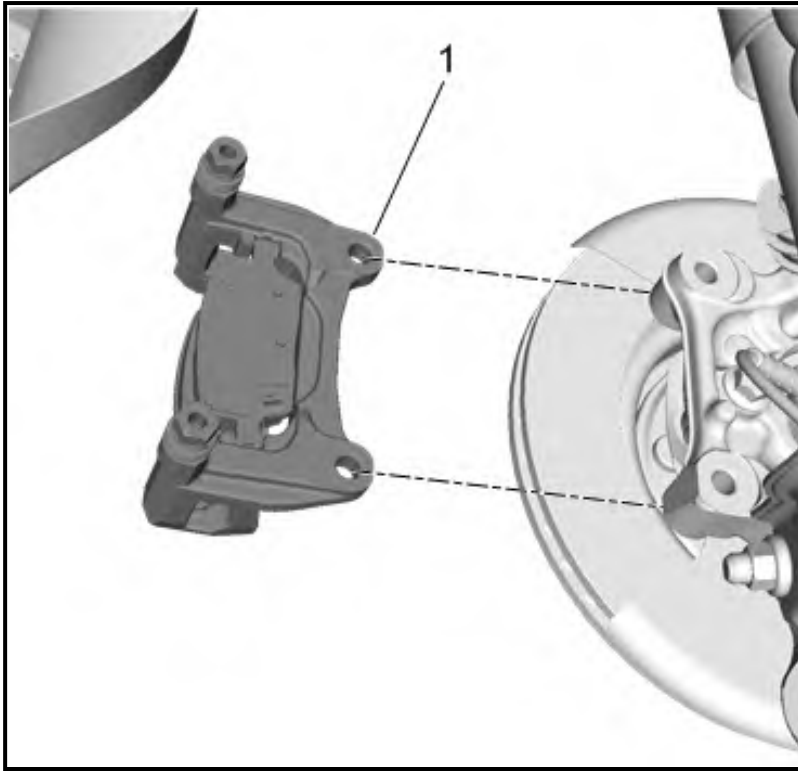
3.



**NOTE:** Caliper assembly not shown for clarity.

Rear Brake Caliper Bracket Bolt (1) - Remove [2x]

4.



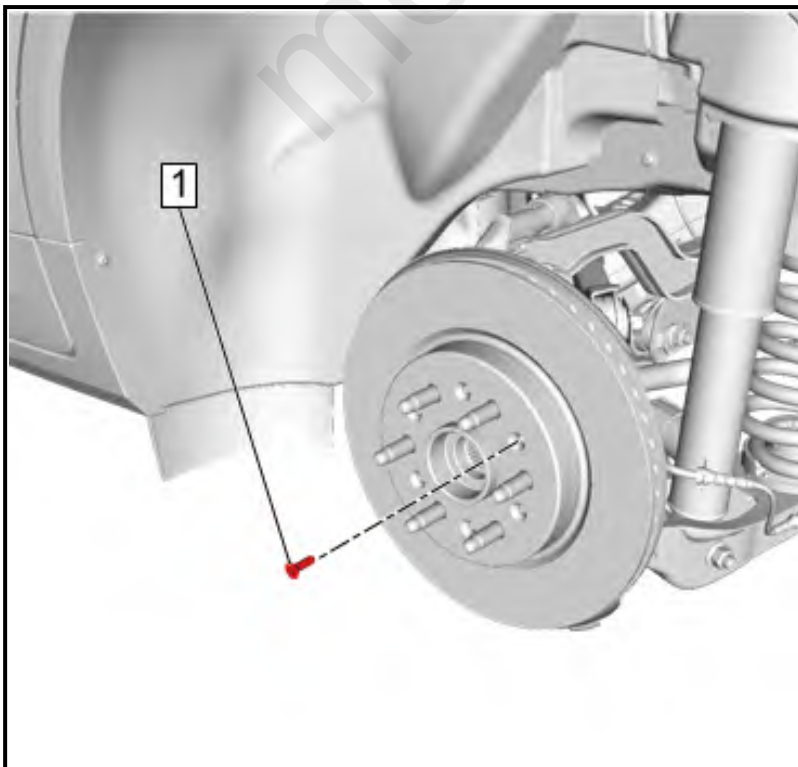
**NOTE:** Caliper assembly not shown for clarity.

Brake Caliper and Bracket Assembly (1) - Remove

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

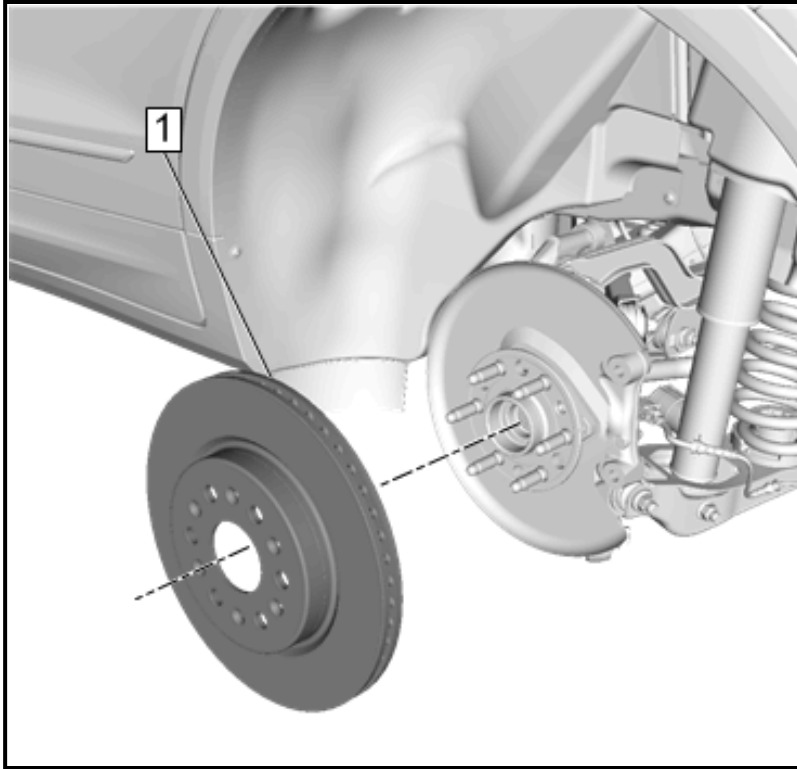
5. Support the brake caliper and bracket assembly with heavy mechanics wire.

6.



Rear Brake Rotor Bolt (1) - Remove

7.



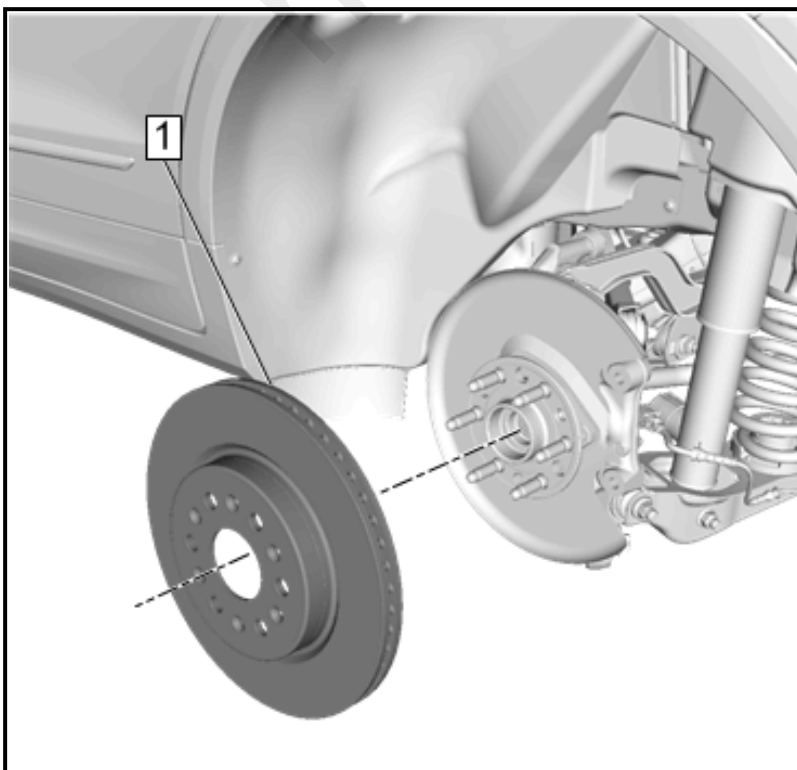
Rear Brake Rotor (1) - Remove

### Installation Procedure

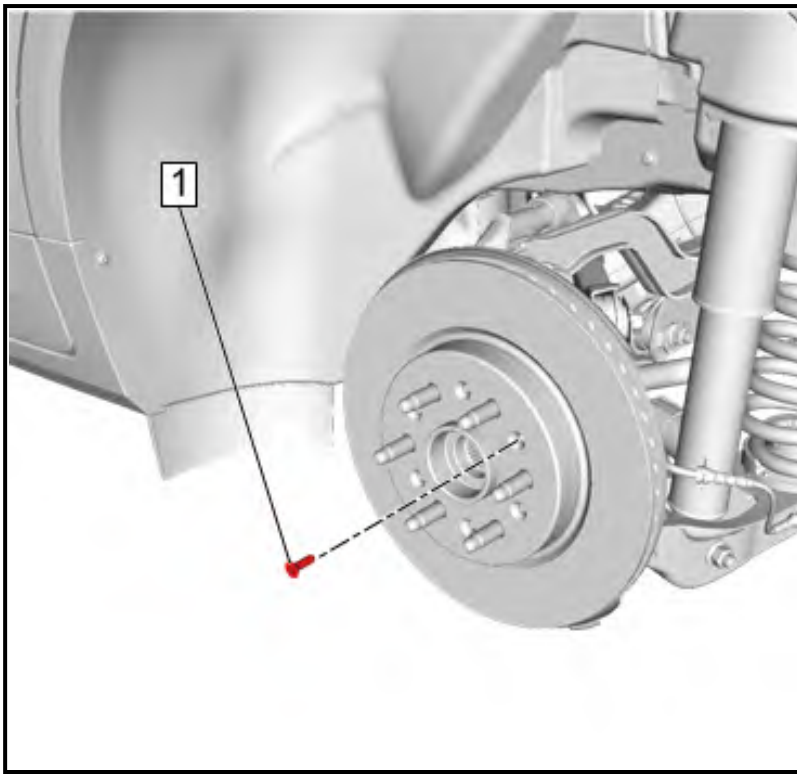
**NOTE:** Whenever the brake rotor has been separated from the hub/axle flange, any rust or contaminants should be cleaned from the hub/axle flange and the brake rotor mating surfaces. Failure to do this may result in excessive assembled lateral runout (LRO) of the brake rotor, which could lead to brake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

1. Using a stiff brush, thoroughly clean any rust or corrosion from the mating surface of the hub/axle flange.
2. Using a stiff brush, thoroughly clean any rust or corrosion from the mating surface and mounting surface of the brake rotor.
3. Inspect the mating surfaces of the hub/axle flange and the rotor to ensure there are no foreign particles or debris remaining.

4.



5.



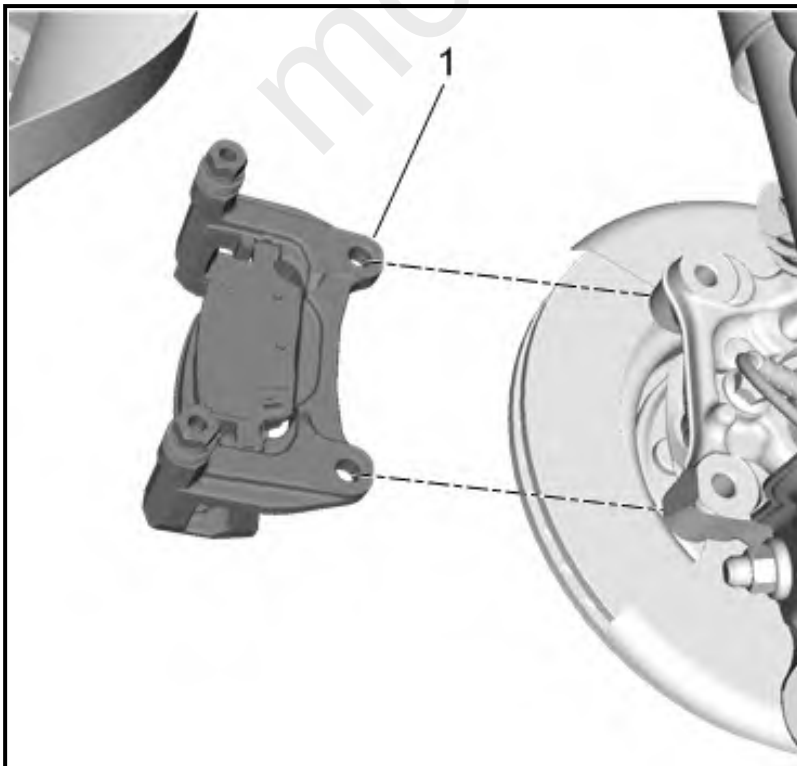
**CAUTION:** Fastener Caution

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

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

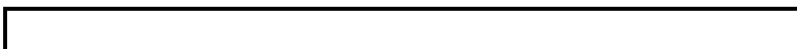
- Thoroughly clean the residue from the bolt threads with denatured alcohol or equivalent and allow to dry.
- Thoroughly clean the residue from the threaded holes with denatured alcohol or equivalent and allow to dry.
- Apply threadlocker to 2/3 of the threaded length of the bolts. Adhesives, Fluids,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

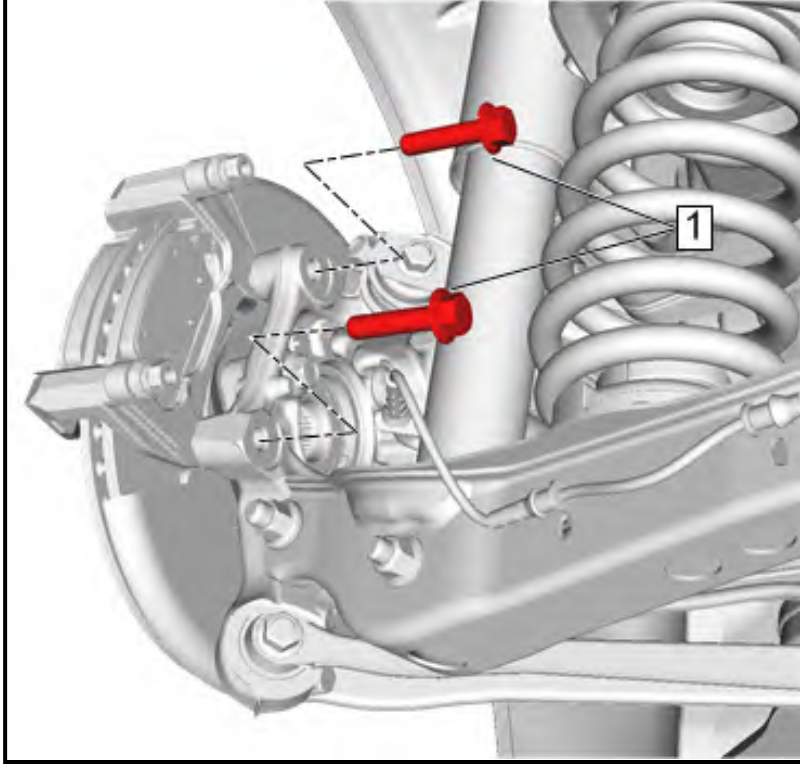
7.



Brake Caliper and Bracket Assembly (1) - Install

8.





Rear Brake Caliper Bracket Bolt (1) - Install [2x] - [Rear Brake Caliper Bracket Replacement](#)

9. Install the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)
10. Burnish the brake pads and rotors. [Brake Pad and Rotor Burnishing](#).

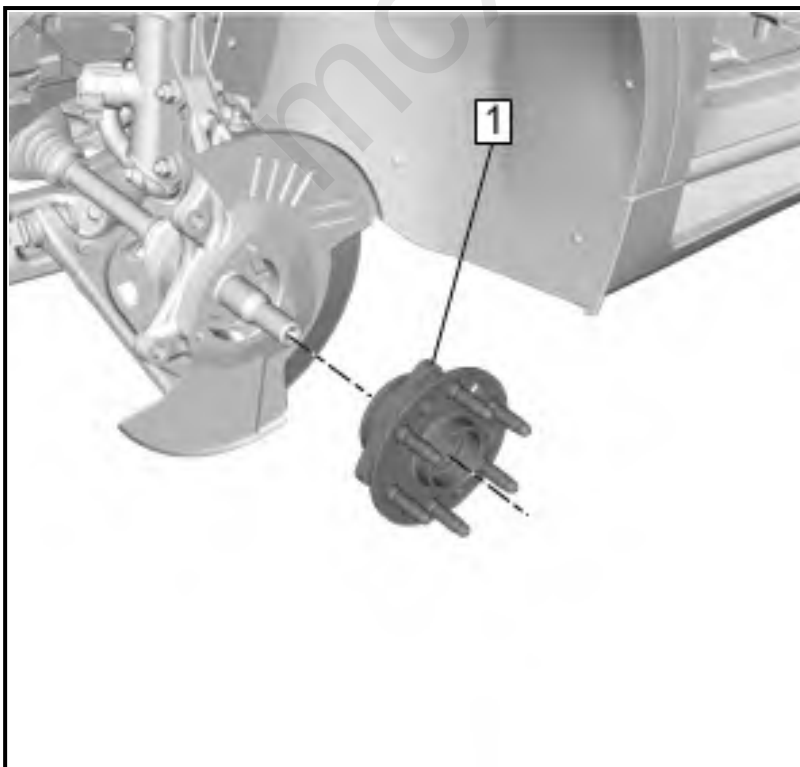
## FRONT BRAKE SHIELD REPLACEMENT

### Removal Procedure

#### **WARNING:** [Brake Dust Warning](#)

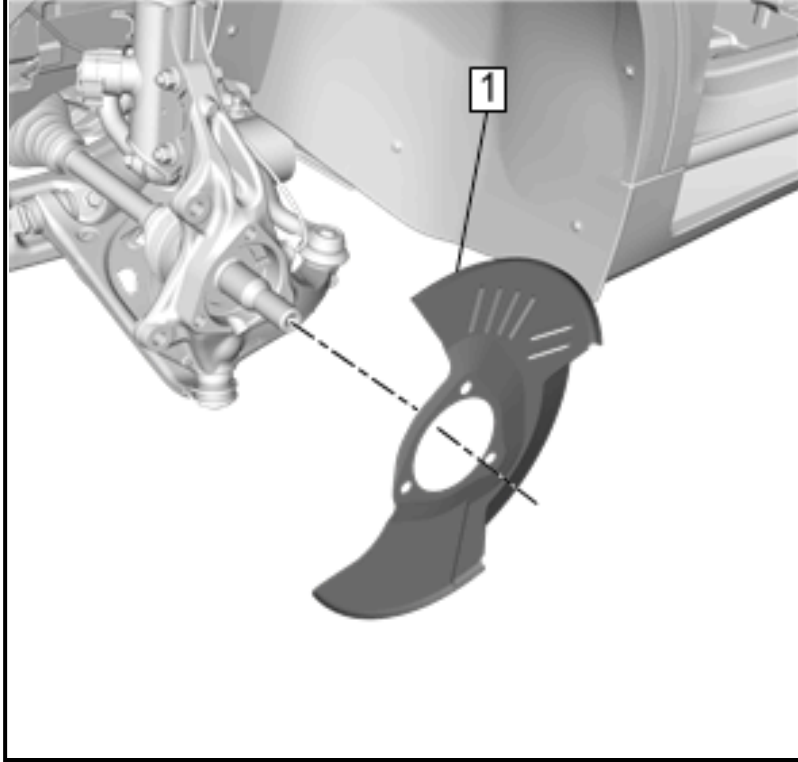
1. Raise and support the vehicle. [Lifting and Jacking the Vehicle](#)
2. Remove the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)

3.



Front Wheel Bearing and Hub Assembly (1) - Remove - [Front Wheel Bearing and Hub Replacement](#)

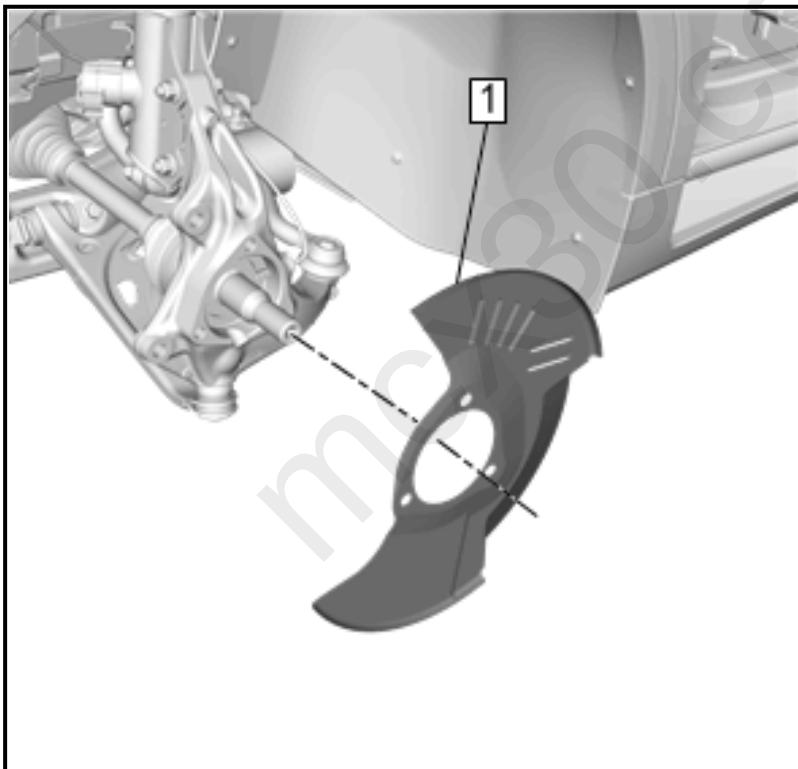
4.



Front Brake Shield (1) - Remove

### Installation Procedure

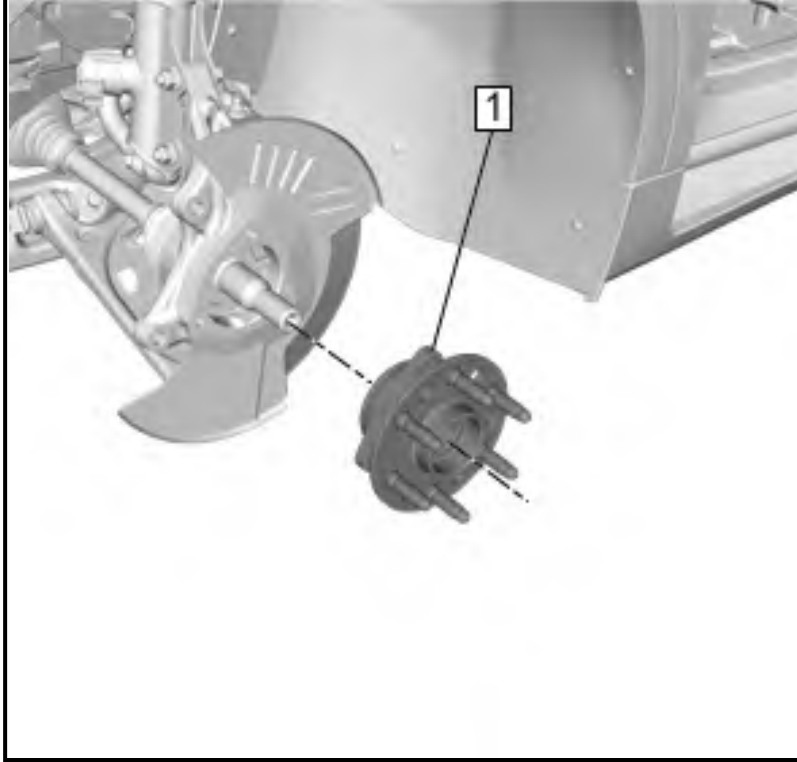
1.



Front Brake Shield (1) - Install

2.





Front Wheel Bearing and Hub Assembly (1) - Install - [Front Wheel Bearing and Hub Replacement](#)

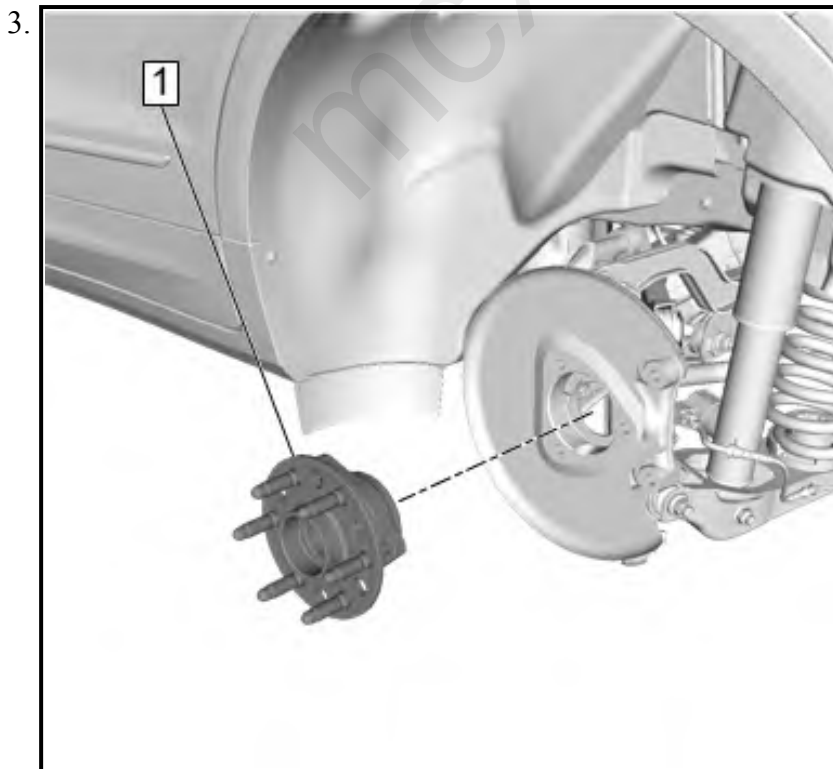
3. Install the tire and wheel assembly. [Tire and Wheel Removal and Installation](#)

## REAR BRAKE SHIELD REPLACEMENT

### Removal Procedure

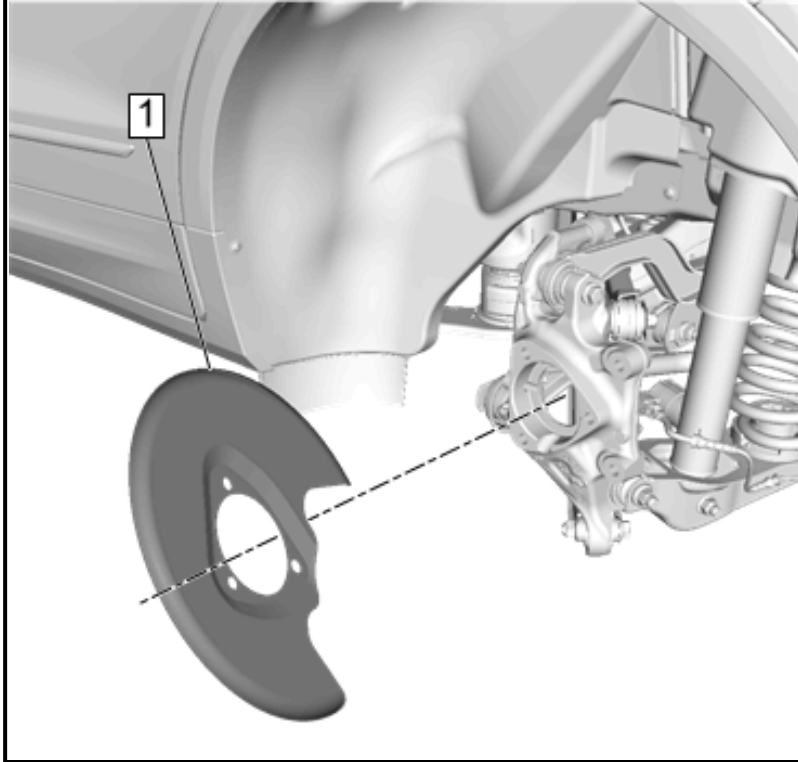
**WARNING:** Refer to [Brake Dust Warning](#) .

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



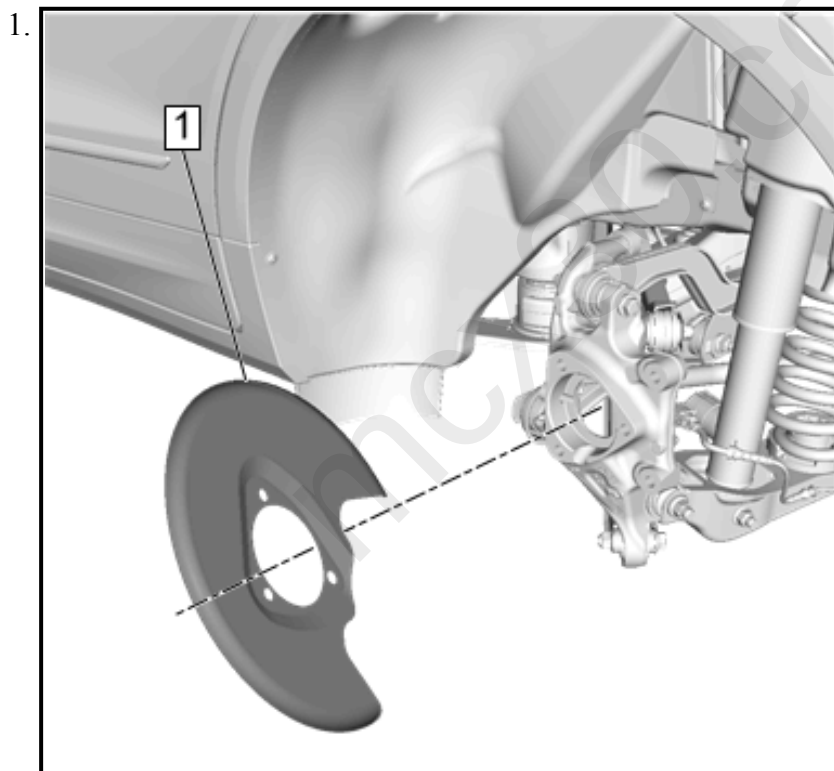
Rear Wheel Bearing and Hub Assembly (1) - Remove - [Rear Wheel Bearing and Hub Replacement \(AWD\)](#) [Rear Wheel Bearing and Hub Replacement \(FWD\)](#).

- 4.



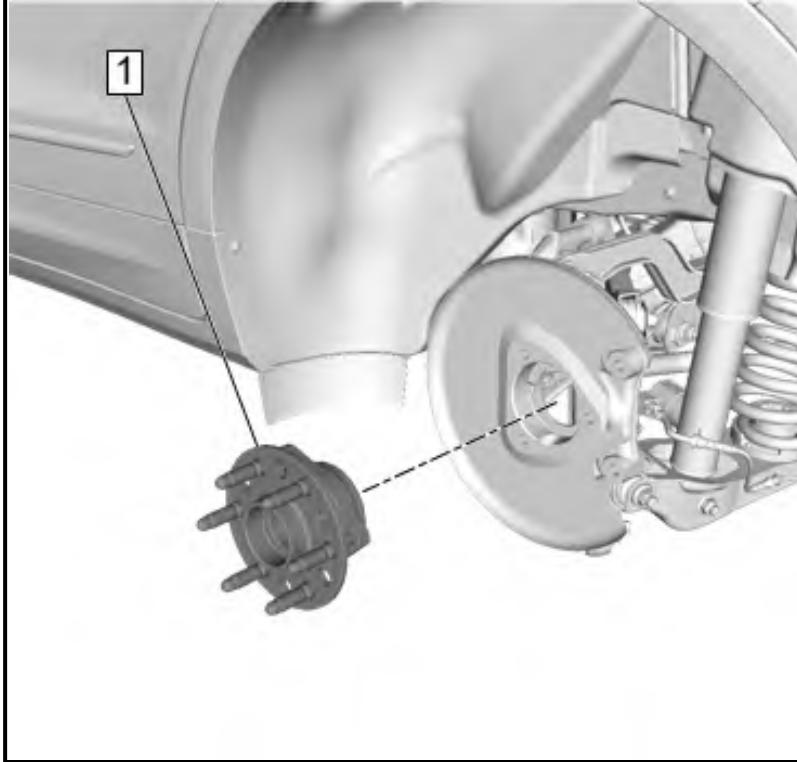
Rear Brake Shield (1) - Remove

### Installation Procedure



Rear Brake Shield (1) - Install





Rear Wheel Bearing and Hub Assembly (1) - Install - [Rear Wheel Bearing and Hub Replacement \(AWD\)](#), [Rear Wheel Bearing and Hub Replacement \(FWD\)](#).

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

## **BRAKE ROTOR ASSEMBLED LATERAL RUNOUT CORRECTION**

### **NOTE:**

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

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

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

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

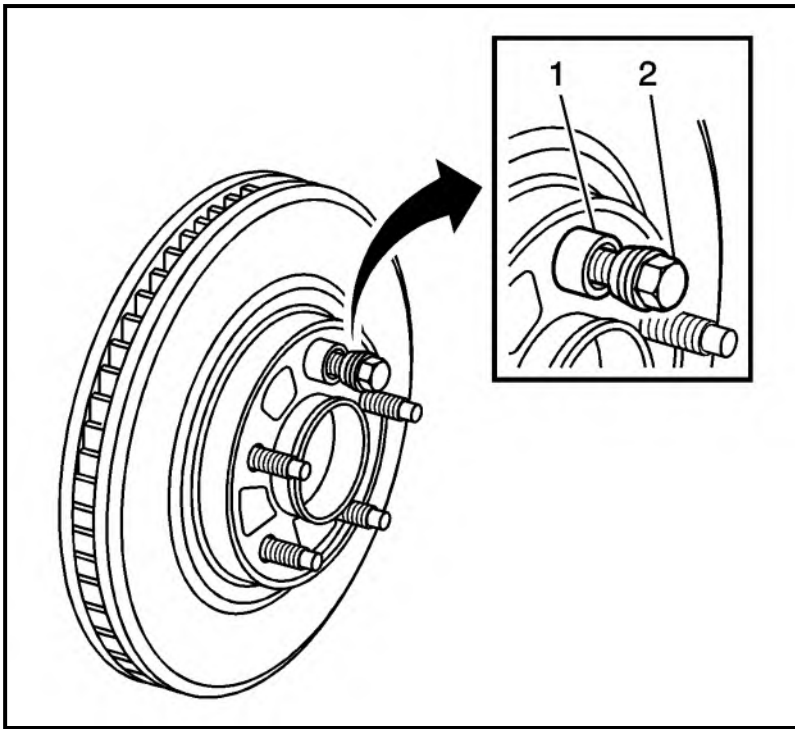
## **BRAKE ROTOR ASSEMBLED LATERAL RUNOUT CORRECTION - INDEXING**

**NOTE:** This Procedure is not used in Europe

### **Special Tools**

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

1.



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

**NOTE:**

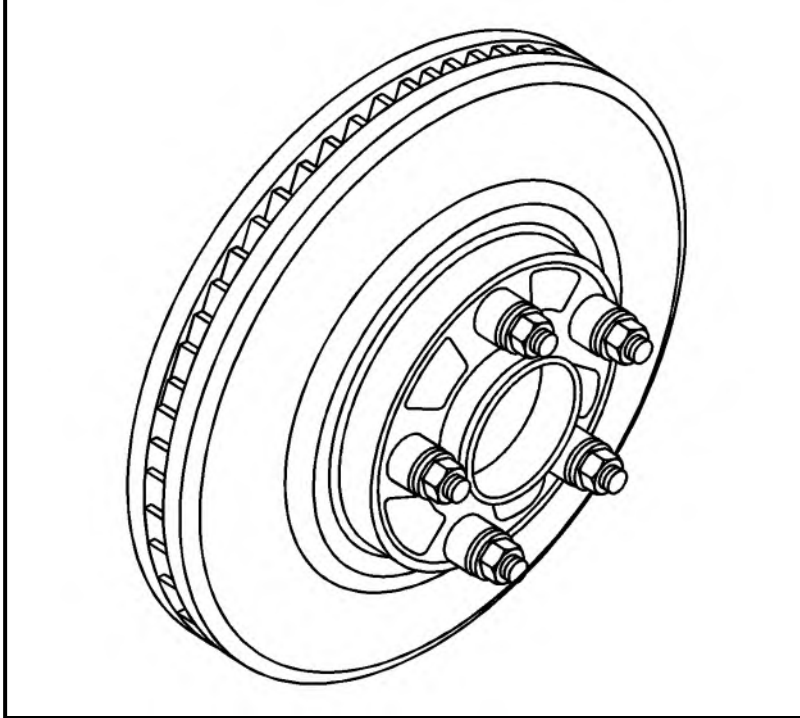
- Brake rotor thickness variation **MUST** be checked **BEFORE** checking for assembled lateral runout (LRO). Thickness variation exceeding the maximum acceptable level can cause brake pulsation. [Brake Rotor Thickness Variation Measurement](#)
- Brake rotor assembled LRO exceeding the maximum allowable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

Remove the **CH-45101-100** Conical Brake Rotor Washers and the lug nuts that were installed during the assembled LRO measurement procedure.

2. Inspect the mating surface of the hub/axle flange and the brake rotor to ensure that there are no foreign particles or debris remaining.
3. Index the brake rotor in a different orientation to the hub/axle flange.
4. Hold the rotor firmly in place against the hub/axle flange and install one of the **CH-45101-100** Conical Brake Rotor Washers (1) and one lug nut (2) onto the upper-most wheel stud.
5. Continue to hold the rotor secure and tighten the lug nut firmly by hand.

6.





Install the remaining **CH-45101-100** Conical Brake Rotor Washers and lug nuts onto the wheel studs and tighten the nuts firmly by hand in a star-pattern.

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

## **BRAKE ROTOR ASSEMBLED LATERAL RUNOUT CORRECTION - ON VEHICLE LATHE**

**NOTE:** This procedure is not used in Europe.

### **Special Tools**

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

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

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

### **NOTE:**

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

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

## **BRAKE ROTOR REFINISHING**

### **Special Tools**

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

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

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

### **NOTE:**

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

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

- **Brake system noise - squeal, growl, groan**
- **Uneven and/or premature disc brake pad wear**
- **Superficial or cosmetic corrosion/rust of the disc brake rotor friction surface**

- Scoring of the disc brake rotor surface in excess of the maximum allowable specification
- Before refinishing a brake rotor, the rotor **MUST** first be checked for adequate thickness to allow the rotor to be refinished and remain above the minimum allowable thickness after refinish specification.  
**Brake Rotor Thickness Measurement**

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

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

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

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

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

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

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

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

## DESCRIPTION AND OPERATION

### DISC BRAKE SYSTEM DESCRIPTION AND OPERATION

#### System Component Description

The disc brake system consists of the following components:

#### Disc Brake Pads

Applies mechanical output force from the hydraulic brake calipers to friction surfaces of brake rotors.

#### Disc Brake Rotors

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

#### Disc Brake Pad Hardware

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

#### Disc Brake Caliper Hardware (Floating Caliper)

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

#### System Operation (Floating Caliper)

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

## System Operation (Fixed Caliper)

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

## System Characteristics

### Brake Noise

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

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

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

### Squeak/Squeal Noise

A squeak or squeal noise can occur on vehicles with front semi-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.

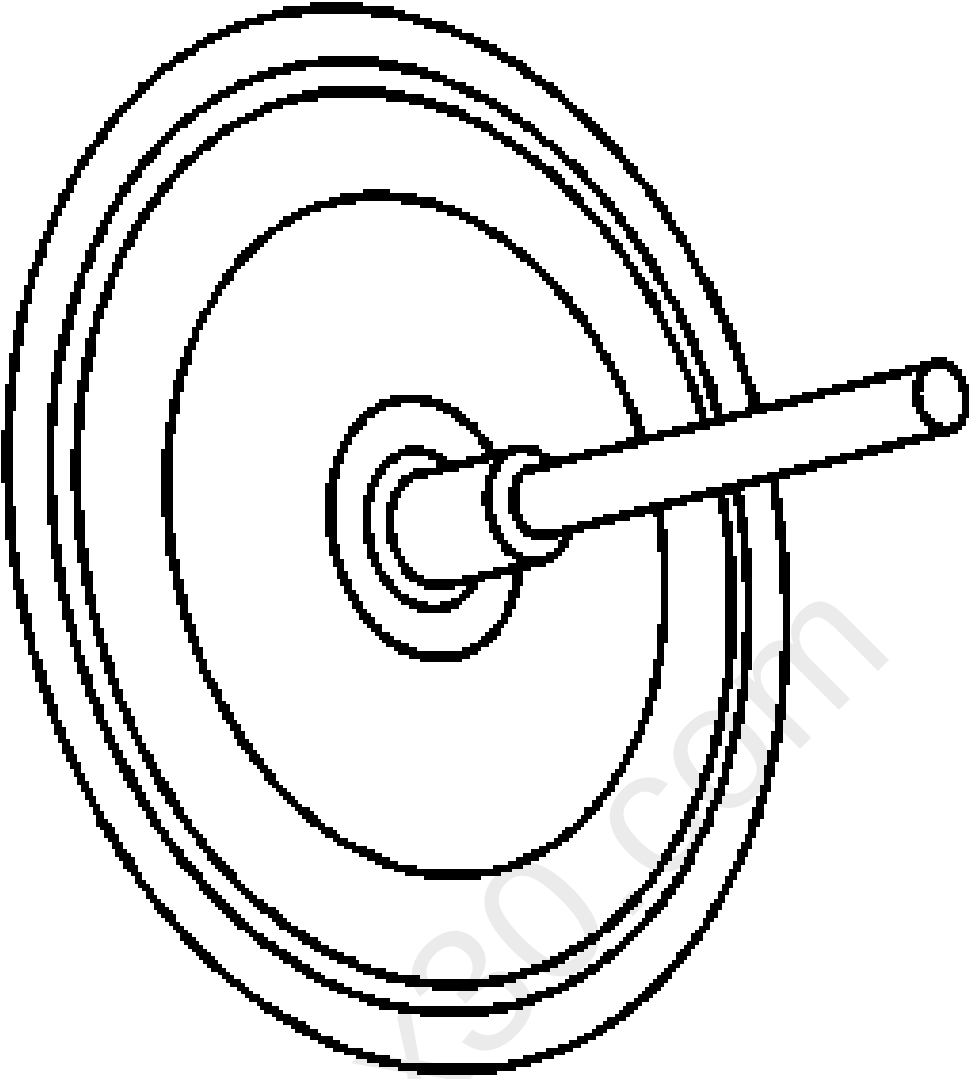
### Groan Noise

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.

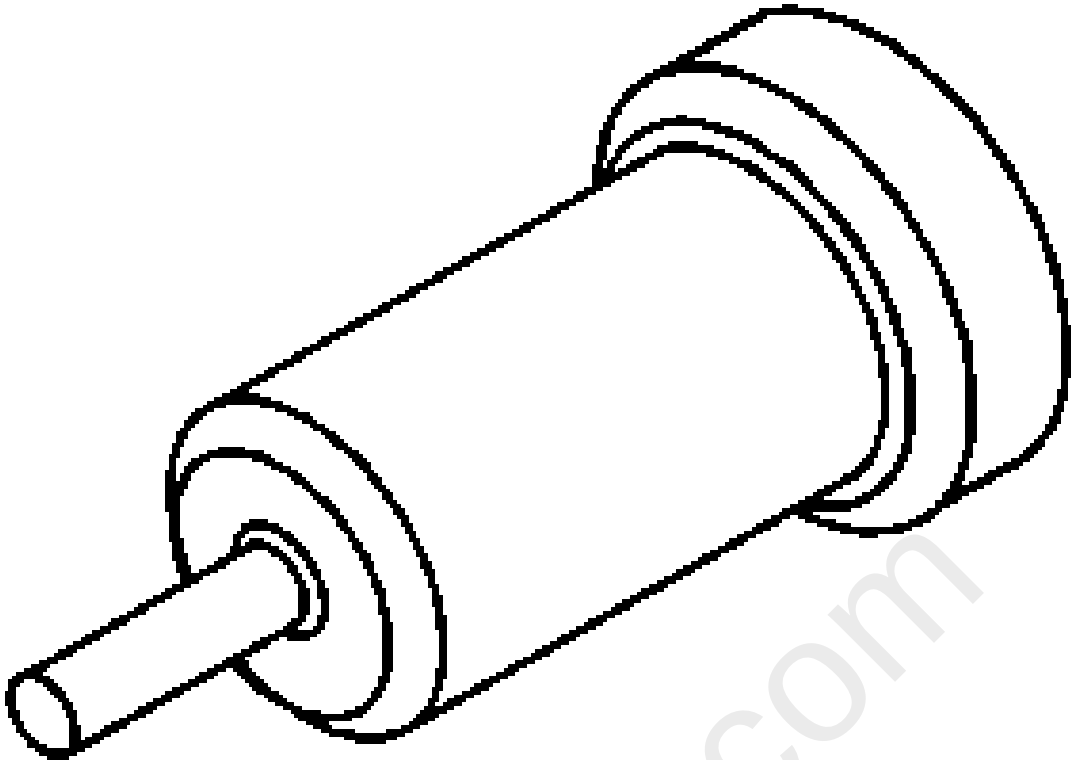
## SPECIAL TOOLS AND EQUIPMENT

### SPECIAL TOOLS

| Illustration | Tool Number/<br>Description |
|--------------|-----------------------------|
|              |                             |

| Illustration                                                                        | Tool Number/<br>Description                        |
|-------------------------------------------------------------------------------------|----------------------------------------------------|
|  | CH 41013<br>J 41013<br>Rotor<br>Resurfacing<br>Kit |

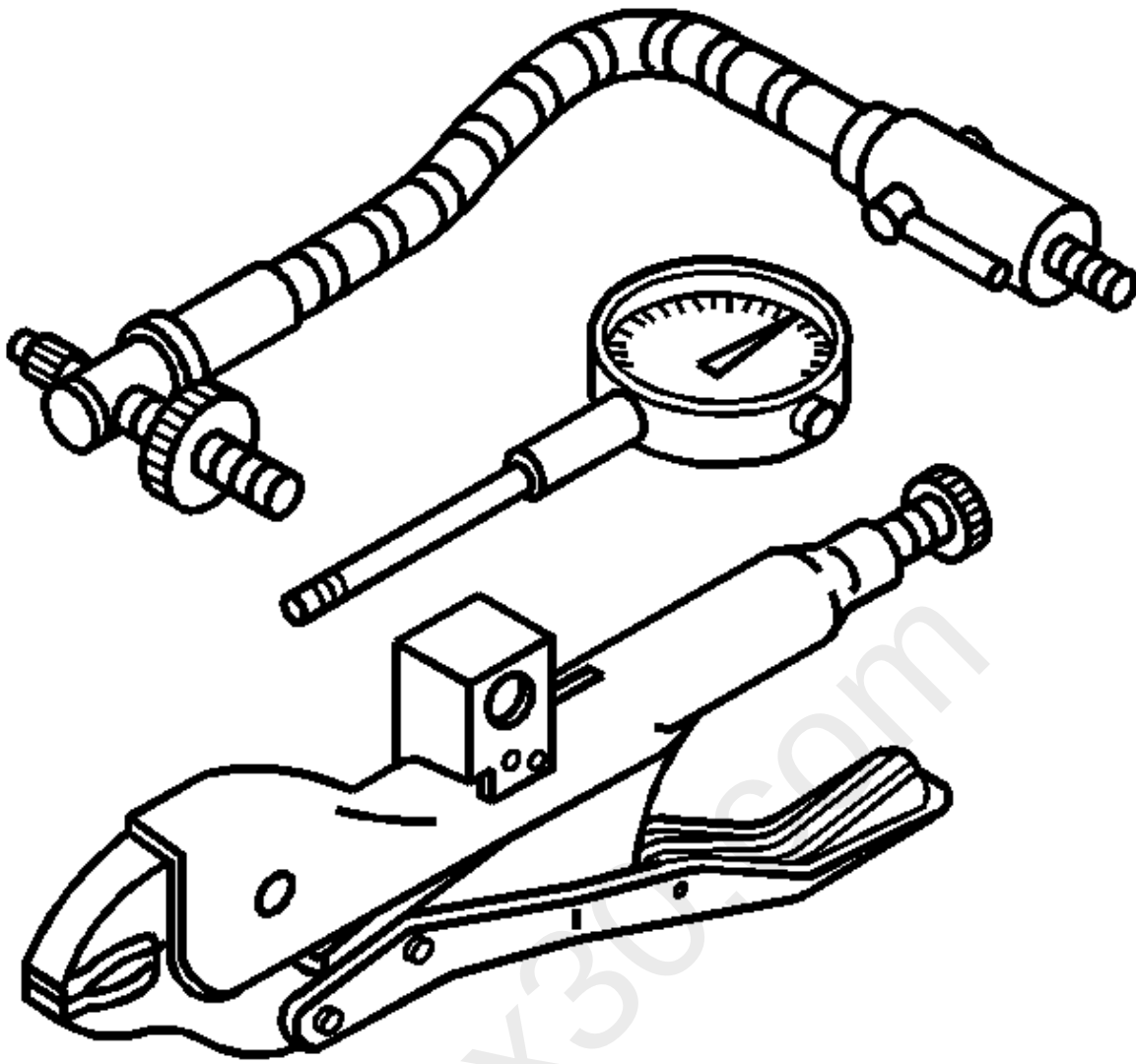
mc129.com

| Illustration                                                                        | Tool Number/<br>Description                                |
|-------------------------------------------------------------------------------------|------------------------------------------------------------|
|  | CH 42450-A<br>J 42450-A<br>Wheel Hub<br>Resurfacing<br>Kit |

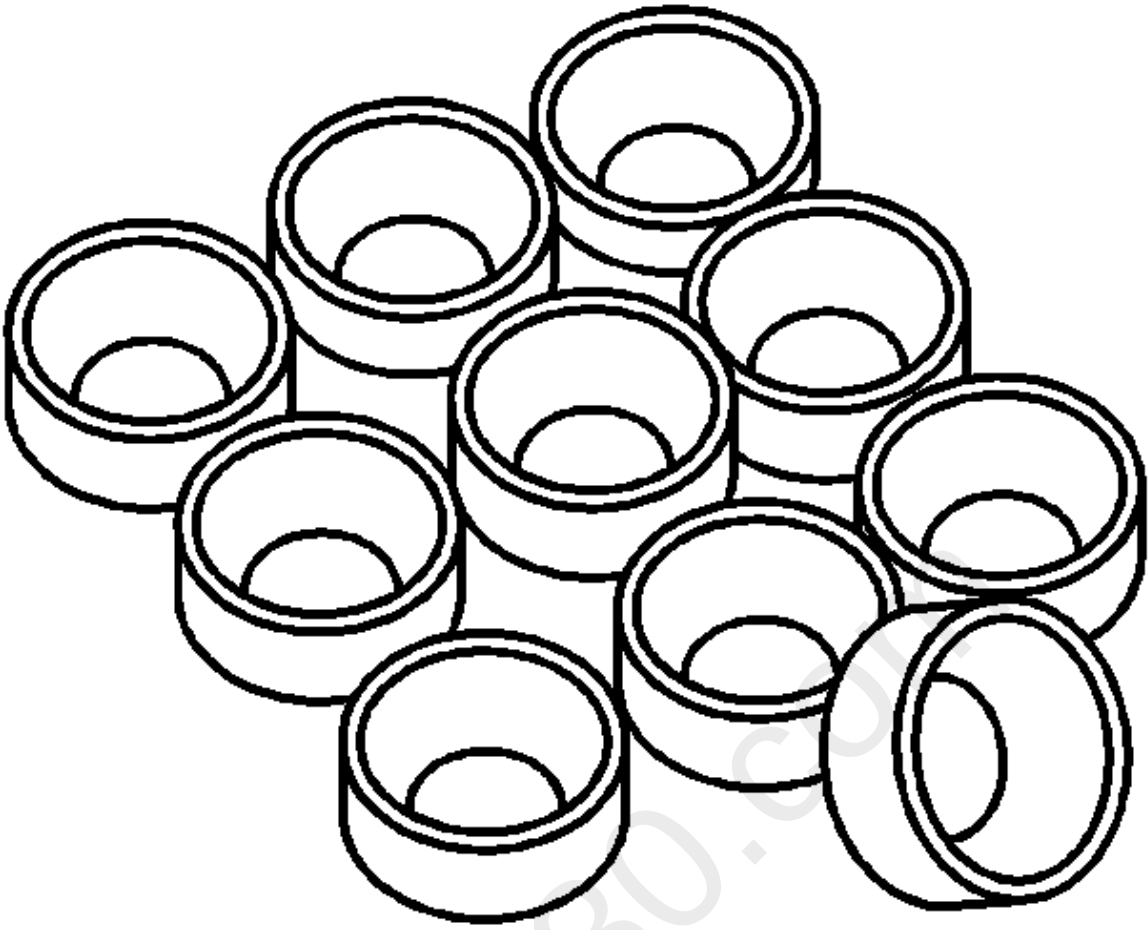
|  |
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|--|

Illustration

Tool  
Number/  
Description



CH 45101  
J 45101  
Hub and  
Wheel  
Runout  
Gauge

| Illustration                                                                        | Tool Number/<br>Description                                      |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------|
|  | CH 45101-100<br>J 45101-100<br>Conical<br>Brake Rotor<br>Washers |