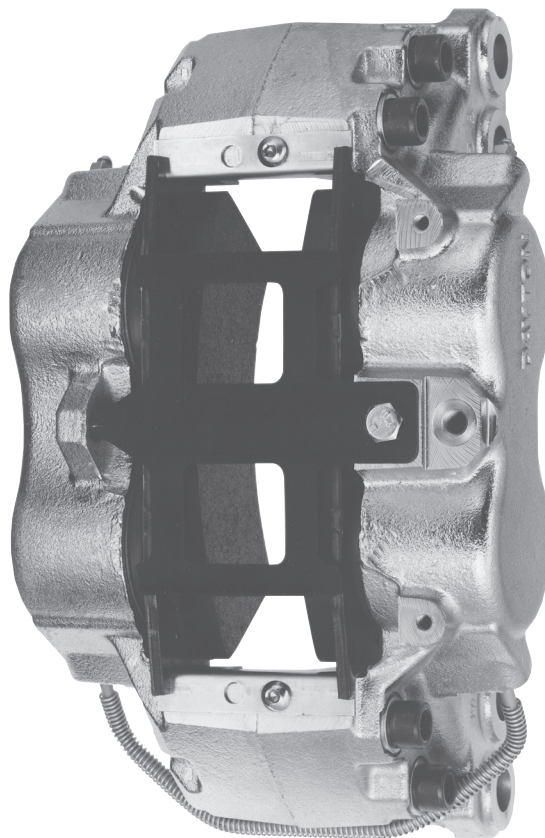


Air Disc Brakes

# FOUR-PISTON QUADRAULIC™ DISC BRAKE CALIPER MAINTENANCE MANUAL



# Service Notes

## About this Manual

This manual provides instruction for all Meritor four-piston Quadraulic™ disc brake calipers:

- 70 mm diameter piston
- 64 mm diameter piston
- 64 mm diameter piston Quadraulic-Lite.

## How to Obtain Additional Maintenance, Service and Product Information

Visit [Literature on Demand on meritor.com](https://www.meritor.com/literature-on-demand) to access and order additional information.

Contact the Meritor OnTrac™ Customer Service Center at 866-668-7221 (US and Canada) between 7:30 AM and 10:00 PM ET Monday through Friday, and between 9:00 AM and 6:00 PM ET on Saturday; 001-800-889-1834 (Mexico); or visit our website: [www.meritor.com/warranty](https://www.meritor.com/warranty).

## How to Obtain Parts, Tools and Supplies Specified in this Manual

Contact Meritor's Commercial Vehicle Aftermarket 888-725-9355.

For additional assistance with parts, contact the Meritor Parts Center in Florence, KY at [CustCareCntr.Florence@Meritor.com](mailto:CustCareCntr.Florence@Meritor.com) or 859-525-3500.

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## Safety Information

### Hazard Alert Messages

Read and observe all hazard alert messages in this publication.

#### **DANGER**

Indicates imminent danger. Failure to follow this instruction will result in death or serious injury.

#### **WARNING**

Indicates a possibly impending danger. Failure to follow this instruction can result in death or serious injury.

#### **CAUTION**

Indicates a hazardous situation or unsafe practice which, if not avoided, could result in injury or damage to components.

### Safety Precautions

Before performing service and maintenance procedures, read and understand the following safety precautions. Failure to follow these instructions may result in death or injury. Additional hazard alert messages are included throughout this publication where applicable.

#### **DANGER**

- Before starting any work on the vehicle, carefully read and understand all instructions and hazard alert messages provided in this publication. Failure to follow procedures and alerts as directed can result in death, serious injury and damage to components.
- Procedures may only be performed by qualified professionals who are trained and certified in vehicle service.
- Only perform work on a flat, level surface in a well-lighted, ventilated area.
- Follow all safety instructions and service guidelines established at the service facility where work is being performed.
- Use only the recommended tools for service. Follow all safety guidelines and instructions provided by the tool manufacturer. Failure to do so can result in serious injury and damage to components.

#### **DANGER**

- Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving. Support the vehicle with safety stands. NEVER work under a vehicle supported only by jacks. Jacks can slip and fall over. Failure to use a jack stand can result in serious personal injury and damage to components.

#### **WARNING**

- Always wear proper eye protection and other appropriate personal protective equipment when performing procedures.
- Never wear loose clothing and jewelry when working on a vehicle. Always tie long hair back. Loose clothing, hair and jewelry can catch on parts, resulting in serious injury.
- Turn the engine Off and remove the ignition key before working on a vehicle. Contact with moving parts can result in serious injury.
- After operating a vehicle, allow the vehicle to cool down before performing service. Coming into contact with hot parts and fluids can cause burns and serious injury.
- Drain the air completely from the air system before working on any connected air lines or components.
- Never disconnect or connect an air line containing pressurized air. The air line can whip around or project debris, resulting in personal injury.
- Do not actuate a brake with the brake pads or shoe linings removed. Personal injury and damage to components can result.
- Use only wheels and valve stems approved by the vehicle manufacturer for use with Meritor air disc brakes. Use of unapproved wheels and valve stems can result in valve stem damage.
- Use only Meritor® brand replacement parts, components and kits. Use of unauthorized parts can result in damage or injury, and void the Meritor warranty.
- Always ensure all components and systems are in correct operating condition before returning the vehicle to service.

# 1 Safety Information

## ASBESTOS FIBERS WARNING

The following procedures for servicing brakes are recommended to reduce exposure to asbestos fiber dust, a cancer and lung disease hazard. Material Safety Data Sheets are available from Meritor.

### Hazard Summary

Because some brake linings contain asbestos, workers who service brakes must understand the potential hazards of asbestos and precautions for reducing risks. Exposure to airborne asbestos dust can cause serious and possibly fatal diseases, including asbestosis (a chronic lung disease) and cancer, principally lung cancer and mesothelioma (a cancer of the lining of the chest or abdominal cavities). Some studies show that the risk of lung cancer among persons who smoke and who are exposed to asbestos is much greater than the risk for non-smokers. Symptoms of these diseases may not become apparent for 15, 20 or more years after the first exposure to asbestos.

Accordingly, workers must use caution to avoid creating and breathing dust when servicing brakes. Specific recommended work practices for reducing exposure to asbestos dust follow. Consult your employer for more details.

### Recommended Work Practices

1. **Separate Work Areas.** Whenever feasible, service brakes in a separate area away from other operations to reduce risks to unprotected persons. OSHA has set a maximum allowable level of exposure for asbestos of 0.1 f/cc as an 8-hour time-weighted average and 1.0 f/cc averaged over a 30-minute period. Scientists disagree, however, to what extent adherence to the maximum allowable exposure levels will eliminate the risk of disease that can result from inhaling asbestos dust. OSHA requires that the following sign be posted at the entrance to areas where exposures exceed either of the maximum allowable levels:

**DANGER: ASBESTOS CANCER AND LUNG DISEASE HAZARD  
AUTHORIZED PERSONNEL ONLY  
RESPIRATORS AND PROTECTIVE CLOTHING ARE  
REQUIRED IN THIS AREA.**

2. **Respiratory Protection.** Wear a respirator equipped with a high-efficiency (HEPA) filter approved by NIOSH or MSHA for use with asbestos at all times when servicing brakes, beginning with the removal of the wheels.
3. **Procedures for Servicing Brakes.**
  - a. Enclose the brake assembly within a negative pressure enclosure. The enclosure should be equipped with a HEPA vacuum and worker arm sleeves. With the enclosure in place, use the HEPA vacuum to loosen any residue from the brake parts.
  - b. As an alternative procedure, use a catch basin with water and a biodegradable, non-phosphate, water-based detergent to wash

the brake drum or rotor and other brake parts. The solution should be applied with low pressure to prevent dust from becoming airborne. Allow the solution to flow between the brake drum and the brake support or the brake rotor and caliper. The wheel hub and brake assembly components should be thoroughly wetted to suppress dust before the brake shoes or brake pads are removed. Wipe the brake parts clean with a cloth.

- c. If an enclosed vacuum system or brake washing equipment is not available, employers may adopt their own written procedures for servicing brakes, provided that the exposure levels associated with the employer's procedures do not exceed the levels associated with the enclosed vacuum system or brake washing equipment. Consult OSHA regulations for more details.
  - d. Wear a respirator equipped with a HEPA filter approved by NIOSH or MSHA for use with asbestos when grinding or machining brake linings. In addition, do such work in an area with a local exhaust ventilation system equipped with a HEPA filter.
  - e. NEVER use compressed air by itself, dry brushing, or a vacuum not equipped with a HEPA filter when cleaning brake parts or assemblies. NEVER use carcinogenic solvents, flammable solvents, or solvents that can damage brake components as wetting agents.
4. **Cleaning Work Areas.** Clean work areas with a vacuum equipped with a HEPA filter or by wet wiping. NEVER use compressed air or dry sweeping to clean work areas. When you empty vacuum cleaners and handle used rags, wear a respirator equipped with a HEPA filter approved by NIOSH or MSHA for use with asbestos. When you replace a HEPA filter, wet the filter with a fine mist of water and dispose of the used filter with care.
5. **Worker Clean-Up.** After servicing brakes, wash your hands before you eat, drink or smoke. Shower after work. Do not wear work clothes home. Use a vacuum equipped with a HEPA filter to vacuum work clothes after they are worn. Launder them separately. Do not shake or use compressed air to remove dust from work clothes.
6. **Waste Disposal.** Dispose of discarded linings, used rags, cloths and HEPA filters with care, such as in sealed plastic bags. Consult applicable EPA, state and local regulations on waste disposal.

### Regulatory Guidance

References to OSHA, NIOSH, MSHA, and EPA, which are regulatory agencies in the United States, are made to provide further guidance to employers and workers employed within the United States. Employers and workers employed outside of the United States should consult the regulations that apply to them for further guidance.

## NON-ASBESTOS FIBERS WARNING

The following procedures for servicing brakes are recommended to reduce exposure to non-asbestos fiber dust, a cancer and lung disease hazard. Material Safety Data Sheets are available from Meritor.

### Hazard Summary

Most recently manufactured brake linings do not contain asbestos fibers. These brake linings may contain one or more of a variety of ingredients, including glass fibers, mineral wool, aramid fibers, ceramic fibers and silica that can present health risks if inhaled. Scientists disagree on the extent of the risks from exposure to these substances. Nonetheless, exposure to silica dust can cause silicosis, a non-cancerous lung disease. Silicosis gradually reduces lung capacity and efficiency and can result in serious breathing difficulty. Some scientists believe other types of non-asbestos fibers, when inhaled, can cause similar diseases of the lung. In addition, silica dust and ceramic fiber dust are known to the State of California to cause lung cancer. U.S. and international agencies have also determined that dust from mineral wool, ceramic fibers and silica are potential causes of cancer.

Accordingly, workers must use caution to avoid creating and breathing dust when servicing brakes. Specific recommended work practices for reducing exposure to non-asbestos dust follow. Consult your employer for more details.

### Recommended Work Practices

1. **Separate Work Areas.** Whenever feasible, service brakes in a separate area away from other operations to reduce risks to unprotected persons.
2. **Respiratory Protection.** OSHA has set a maximum allowable level of exposure for silica of 0.1 mg/m<sup>3</sup> as an 8-hour time-weighted average. Some manufacturers of non-asbestos brake linings recommend that exposures to other ingredients found in non-asbestos brake linings be kept below 1.0 f/cc as an 8-hour time-weighted average. Scientists disagree, however, to what extent adherence to these maximum allowable exposure levels will eliminate the risk of disease that can result from inhaling non-asbestos dust. Therefore, wear respiratory protection at all times during brake servicing, beginning with the removal of the wheels. Wear a respirator equipped with a high-efficiency (HEPA) filter approved by NIOSH or MSHA, if the exposure levels may exceed OSHA or manufacturers' recommended maximum levels. Even when exposures are expected to be within the maximum allowable levels, wearing such a respirator at all times during brake servicing will help minimize exposure.
3. **Procedures for Servicing Brakes.**
  - a. Enclose the brake assembly within a negative pressure enclosure. The enclosure should be equipped with a HEPA vacuum and worker arm sleeves. With the enclosure in place, use the HEPA vacuum to loosen and vacuum residue from the brake parts.

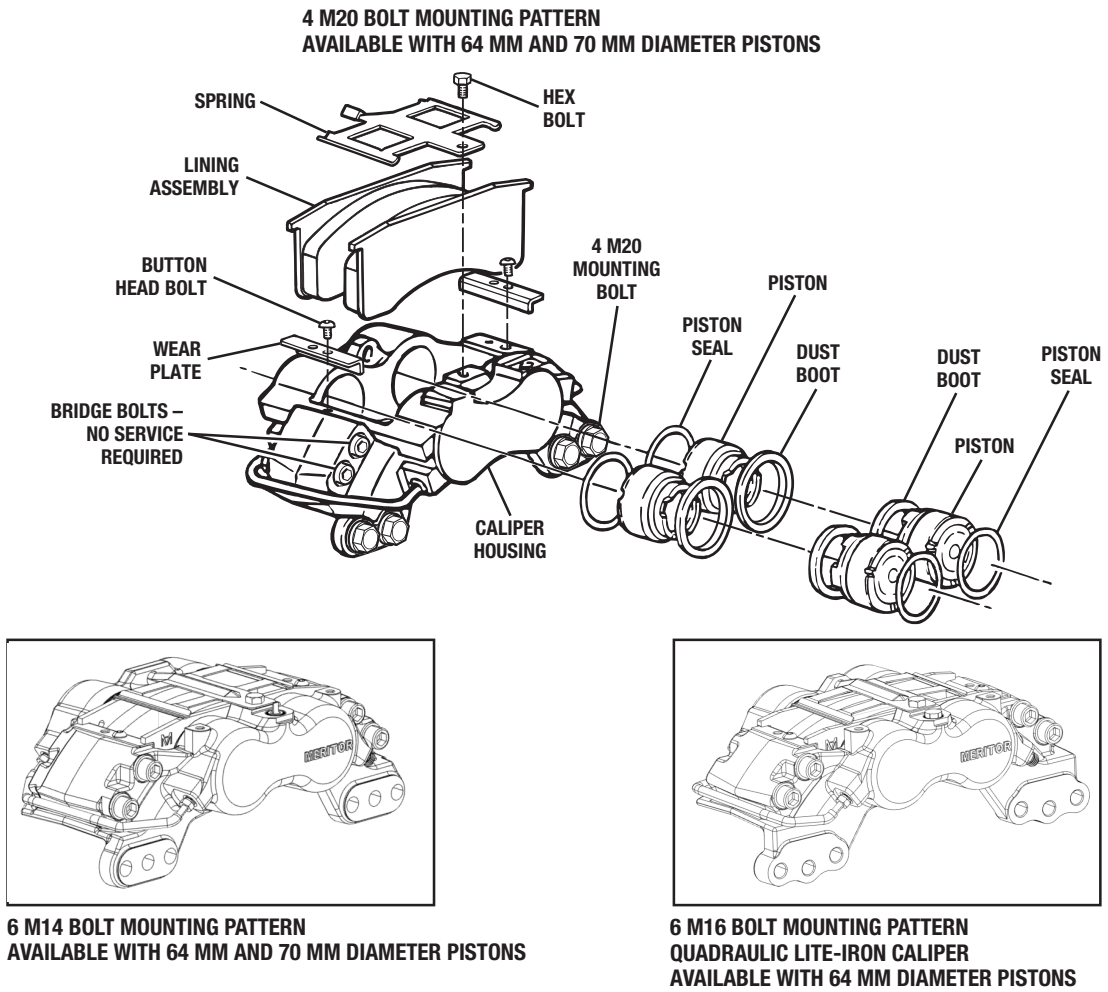
- b. As an alternative procedure, use a catch basin with water and a biodegradable, non-phosphate, water-based detergent to wash the brake drum or rotor and other brake parts. The solution should be applied with low pressure to prevent dust from becoming airborne. Allow the solution to flow between the brake drum and the brake support or the brake rotor and caliper. The wheel hub and brake assembly components should be thoroughly wetted to suppress dust before the brake shoes or brake pads are removed. Wipe the brake parts clean with a cloth.
  - c. If an enclosed vacuum system or brake washing equipment is not available, carefully clean the brake parts in the open air. Wet the parts with a solution applied with a pump-spray bottle that creates a fine mist. Use a solution containing water, and, if available, a biodegradable, non-phosphate, water-based detergent. The wheel hub and brake assembly components should be thoroughly wetted to suppress dust before the brake shoes or brake pads are removed. Wipe the brake parts clean with a cloth.
  - d. Wear a respirator equipped with a HEPA filter approved by NIOSH or MSHA when grinding or machining brake linings. In addition, do such work in an area with a local exhaust ventilation system equipped with a HEPA filter.
  - e. NEVER use compressed air by itself, dry brushing, or a vacuum not equipped with a HEPA filter when cleaning brake parts or assemblies. NEVER use carcinogenic solvents, flammable solvents, or solvents that can damage brake components as wetting agents.
4. **Cleaning Work Areas.** Clean work areas with a vacuum equipped with a HEPA filter or by wet wiping. NEVER use compressed air or dry sweeping to clean work areas. When you empty vacuum cleaners and handle used rags, wear a respirator equipped with a HEPA filter approved by NIOSH or MSHA, to minimize exposure. When you replace a HEPA filter, wet the filter with a fine mist of water and dispose of the used filter with care.
  5. **Worker Clean-Up.** After servicing brakes, wash your hands before you eat, drink or smoke. Shower after work. Do not wear work clothes home. Use a vacuum equipped with a HEPA filter to vacuum work clothes after they are worn. Launder them separately. Do not shake or use compressed air to remove dust from work clothes.
  6. **Waste Disposal.** Dispose of discarded linings, used rags, cloths and HEPA filters with care, such as in sealed plastic bags. Consult applicable EPA, state and local regulations on waste disposal.

### Regulatory Guidance

References to OSHA, NIOSH, MSHA, and EPA, which are regulatory agencies in the United States, are made to provide further guidance to employers and workers employed within the United States. Employers and workers employed outside of the United States should consult the regulations that apply to them for further guidance.

## 2 Exploded Views

### Exploded Views

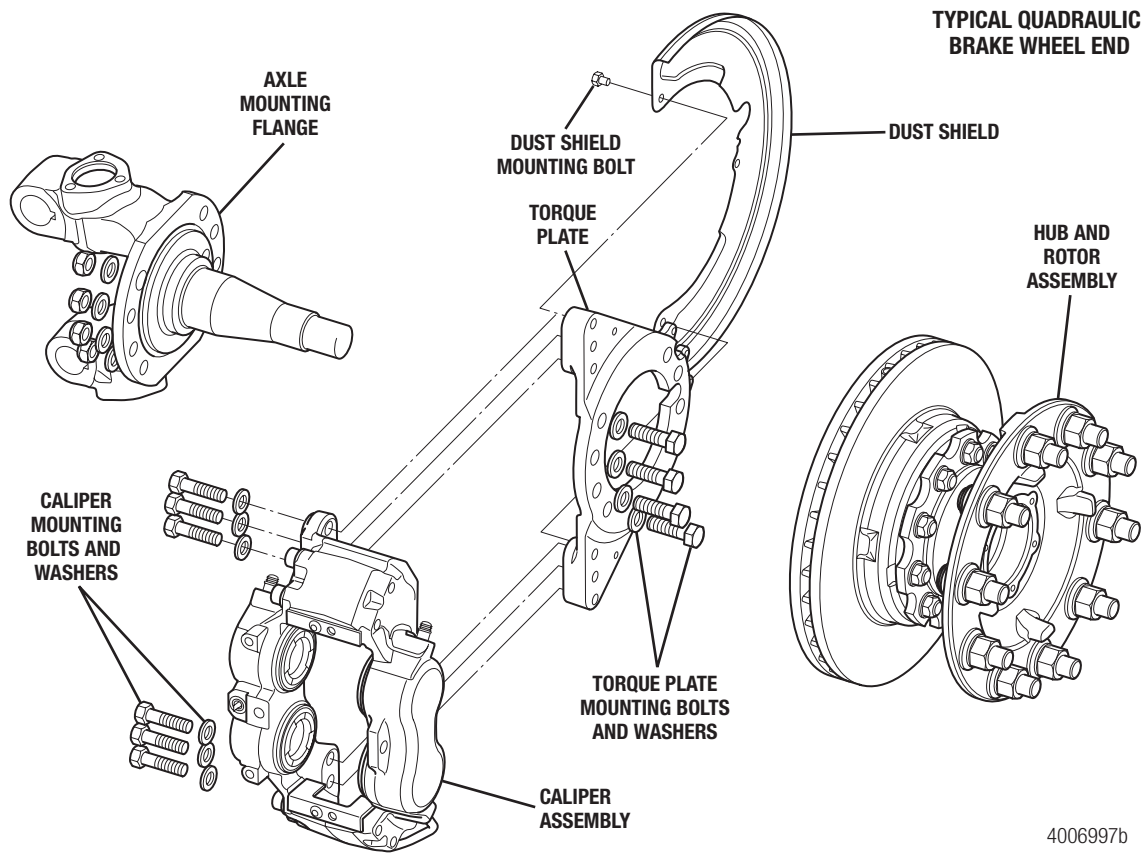


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Figure 2.1



## 2 Exploded Views



**Figure 2.2**

The general assembly sequence is as follows.

1. Assemble the dust shield to the torque plate. The dust shield option varies by model.
2. Assemble the torque plate to the axle flange.
3. Assemble the hub and rotor assembly.
4. Assemble the caliper over the rotor and bolt it to the torque plate.

## 3 Introduction

# Introduction

## Features

### Four-Piston Quadraulic™ Disc Brake Caliper

Meritor Quadraulic™ disc brakes have a four-piston, fixed-mount caliper design for use on both front and rear drive axles. An installation includes the following major components — the caliper assembly, torque plate assembly, optional dust shield, hub or rotor assembly and attaching hardware.

There are three caliper types and they are referenced by the piston diameter: 70 mm, 64 mm and 64 mm Lite.

**NOTE:** The 64 mm Lite version is not a replacement equivalent for the base 64 mm caliper.

The operation and service instructions in this maintenance manual apply to all three Quadraulic caliper models.

### Caliper

Meritor caliper assemblies (Figure 2.1) are designed as follows.

- The caliper assembly consists of two halves assembled with four bolts and washers.
- It includes four hydraulic piston bores, two brake pads, two stainless steel lining wear plates installed with button head bolts, a pad retainer spring and bolt, bleed screw and crossover tube.
- The piston bores contain the pistons, piston seals and piston boots.
- The crossover tubes connect the two halves of the caliper piston to supply brake fluid to the outboard pistons.

### How to Identify the Caliper

Check for an assembly number on the side of the caliper (Figure 2.1) for specific handed part numbers.

If a part number is not visible, the calipers can also be identified by piston diameter size. The two sizes available are: 64 mm or 70 mm. They are visually identifiable by boot color (64 mm is red, 70 mm is black).

The 64 mm Lite caliper also has a red boot and is distinguishable from the base 64 mm caliper by the six M16 size mounting bolts.

Assembly check - The caliper bleed screws should be higher than the crossover tube when assembled to the torque plate to allow effective brake bleed.

### Torque Plate

The torque plate assembly (Figure 2.2) may have a provision for an anti-lock braking system (ABS) sensor using either a bolt-on bracket, press-in bushing, clearance hole or slot. It also has provisions to mount an optional dust shield to protect the rotor and brake assembly from road contamination. When the ABS is not used or the sensor is mounted through the axle flange, the supports are not equipped with the sensor bracket.

### Hub and Rotor

Meritor hub and rotor assemblies (Figure 2.2) incorporate the following design features.

- The hub and rotor assemblies consist of a hub and rotor, fitted with bearing cups and wheel attachment studs.
- There are two types of rotors used — a U-shaped rotor and a hat-shaped rotor.
- Some rotors are equipped with a cast-in ABS speed sensor tooth wheel, typically with 100 slots. Some rotors have separate ABS speed sensor tooth wheels attached to the rotor with bolts.
- Front hub and rotor assemblies can have various ABS speed sensor tooth wheels such as a separate ring mounted to the inboard end of the hub, ABS teeth integral to the rotor, or a separate ABS ring attached to the rotor by bolts.
- There are various hub configurations offered to accept the 19.5-inch (495.3 mm) eight-hole wheels, as well as 22.5-inch (571.5 mm) 10-hole wheels with the hub-piloted or stud-piloted system.

## Operation

The Quadraulic brake is a fixed mount caliper - the only part that moves during a brake application is the piston and related brake pad.

The caliper receives hydraulic fluid pressure by way of the centrally located inlet port. The inlet port can accept either a banjo bolt connection or an inverted flare-type connection.

The arrows in Figure 3.1 show the fluid handling from the inlet port to each of the pistons. Also shown is the fluid handling for bleeding air from the caliper. Because there are two bleed screws, a special bleeding sequence is required to remove all air from the system. This procedure is detailed in Brake Caliper Bleeding Procedure on page 19.

### 3 Introduction

During brake application, the hydraulic pressure is uniformly applied to the rear of all pistons. The pistons extend out of the bores and push the brake pads into contact with the rotor. The hydraulic force creates a clamp force resulting in braking. After the brake is released, the pressure is released and the pistons retract.

#### **⚠ CAUTION**

Do not actuate a brake with the brake pads or shoe linings removed, or damage to parts can result.

The piston seals provide sealing but also act as a spring to retract the pistons after the brake is released.

As the linings wear, the pistons extend out further. The void is backfilled with brake fluid available in the brake reservoir.

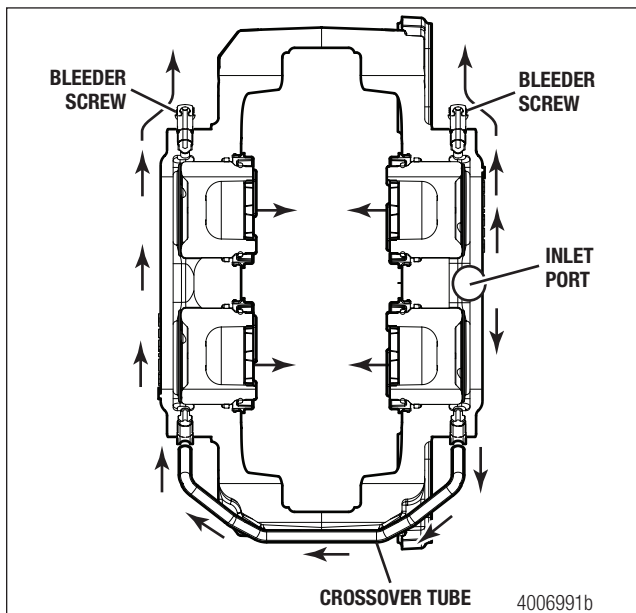


Figure 3.1

## 4 Removal and Disassembly

### Removal and Disassembly

#### Hazard Alert Messages

Read and observe all hazard alert messages in this publication.

#### **⚠ DANGER**

Before performing any brake service, identify the vehicle's hydraulic system and refer to the service manual for procedures. Some brake application systems are fully-pressurized, and this pressure cannot be reduced by switching off the ignition or removing the battery. To prevent death, serious personal injury or damage to components, carefully follow the procedures for the hydraulic system being serviced.

#### **⚠ DANGER**

Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving. Support the vehicle with safety stands. NEVER work under a vehicle supported only by jacks. Jacks can slip and fall over. Failure to use safety stands can result in death or serious personal injury and damage to components.

#### **⚠ DANGER**

**ASBESTOS AND NON-ASBESTOS FIBERS** - Some brake linings contain asbestos fibers, a cancer and lung disease hazard. Some brake linings contain non-asbestos fibers, whose long-term effects to health are unknown. Use caution when handling both asbestos and non-asbestos materials. Refer to Section 2 for asbestos and non-asbestos safety information and recommended work practices.

#### **⚠ WARNING**

To prevent eye injury, always wear eye protection when performing vehicle maintenance or service.

### Removal

#### Brake Pads

Measure the brake pad thickness. The brake pad thickness is the distance from the friction material surface to the brake pad backing plate interface. Figure 4.1.

**If any brake pad is 1/16" (1.6 mm) or less:** Replace all brake pads on the axle being inspected.

**If the brake pad thickness is greater than 1/16" (1.6 mm) and the user would like to continue using the current brake pads:** Evaluate if the remaining lining is sufficient to reach the next scheduled service.

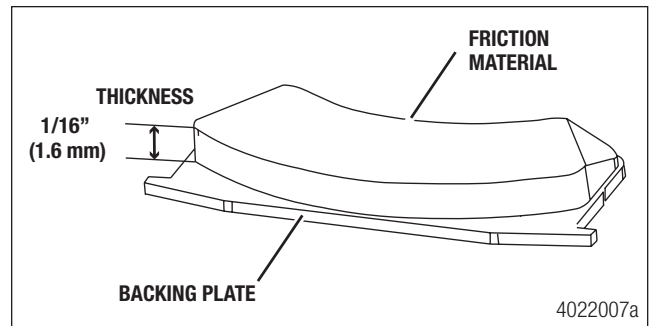


Figure 4.1

- Brake pads should wear evenly, but some level of uneven wear and/or taper wear may occur due to operating environment and rotor condition.
- If the wear is believed excessive, then the caliper should be inspected to validate operation. Refer to Caliper on page 19.

**If you replace the pads:** Replace all of the disc brakes pads at the same time to maintain original brake balance.

**If a complete vehicle pad replacement is not necessary or desirable:** Replace the pads on both wheel ends on the same axle.

#### Replace the Brake Pads

#### **⚠ CAUTION**

The brake pads must be installed when applying the brakes. If brake pads are not installed, damage to the pistons can result.

1. Wear safe eye protection.
2. Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving.
3. Use a jack to raise the vehicle so that the wheels to be serviced are off the ground. Support the vehicle with safety stands.
4. Remove the wheel and tire assembly according to the manufacturer's recommendation.
5. Remove the master cylinder reservoir filler cap. Check the brake fluid level in the reservoir. If necessary, remove fluid to keep the reservoir from overflowing when compressing the pistons into the caliper.
6. Remove the pad retainer spring bolt. Figure 4.2.

**NOTE:** The brake linings and the brake rotor wear in service. The rotor will develop a wear edge that will affect removing the brake pads. The brake pistons must be seated to allow the brake pads to be removed.

## 4 Removal and Disassembly

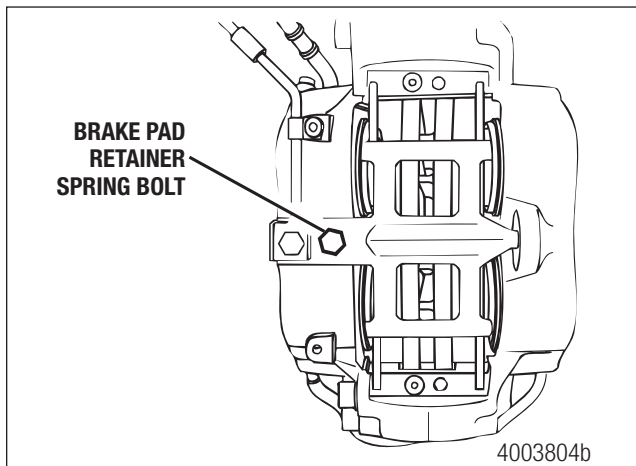


Figure 4.2

7. Install a screw driver into the veins of the rotor. Using the screw driver as a fulcrum, use a pry bar to apply force to the brake pad backing plate to help seat the pistons. Figure 4.3.

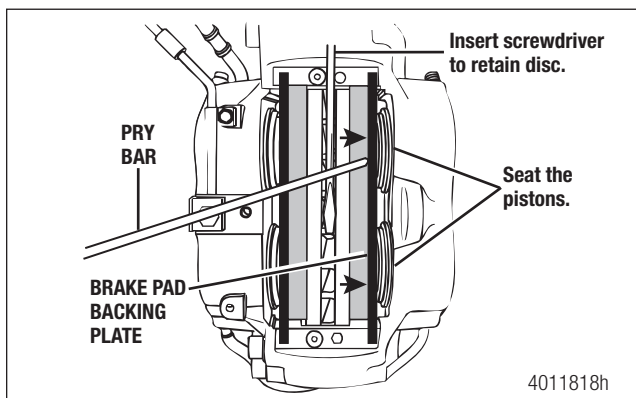


Figure 4.3

### **CAUTION**

Avoid placing direct pressure on a piston or damage to components can result.

8. Remove the brake pads from the caliper and brake pad wear plates. Figure 4.3.
9. Inspect the rotor as part of brake pad service. Refer to Rotor on page 16.
10. Inspect the disc brake calipers for leakage, damage or defects to piston boots, seals or pistons. Replace or repair the parts as required.
11. Clean and inspect the lining wear plates. Replace damaged or worn wear plates. Install wear plates and tighten to specification. Figure 4.4.

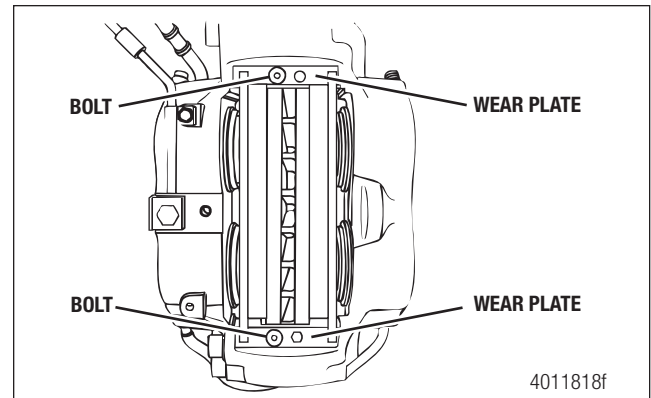


Figure 4.4

**NOTE:** New brake pads are identical and there are no specific inboard or outboard brake pads. If the old pads are reinstalled, they should be installed in the same position from which they were removed. Reinstalling old pads in the wrong position will result in accelerated and/or uneven lining wear.

12. Install the brake pads with the friction material surface toward the rotor face. The brake pads should drop into the caliper and move freely. Investigate any condition were the pads do not move freely. Failure to determine and correct the root cause can result in accelerated and/or uneven lining wear. Install the pad retainer spring and tighten the bolt. Refer to Section 8. Figure 4.5.

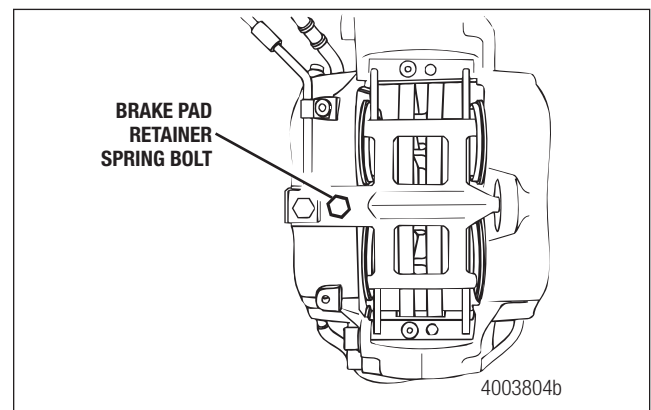


Figure 4.5

13. Repeat the process on the other wheel end of the axle being serviced.
14. Check the brake reservoir fluid level. Add OEM-approved fluid as needed. Tighten the reservoir cap.
15. Apply the brakes a few times to adjust the pistons from the seated position required to install the new brake pads.
16. Recheck the brake reservoir fluid level and add OEM-approved fluid as needed.

## 4 Removal and Disassembly

17. Install the tire and wheel assembly according to the OEM instructions.
18. Lower the vehicle and perform a road test to verify operation.

### Brake Caliper Removal

1. Use a jack to raise the vehicle so that the wheels to be serviced are off the ground. Support the vehicle with safety stands.
2. Remove the tire and wheel assembly according to the manufacturer's instructions.
3. Remove the brake hose hold down clamp bolt, if equipped. Figure 4.6.

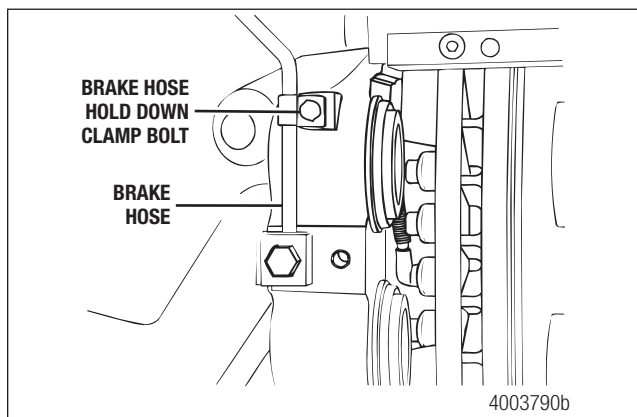


Figure 4.6

4. Remove the brake hose from the caliper. Figure 4.6.

### **⚠ WARNING**

Do not remove the bridge bolts to perform service procedures. If the bridge bolts are removed, reinstall them correctly to prevent serious personal injury and damage to components.

5. Remove the caliper-to-torque plate assembly bolts. Do not disassemble the bridge bolts joining the two halves of the caliper. Refer to the Bridge Bolts on page 27. Figure 4.7.

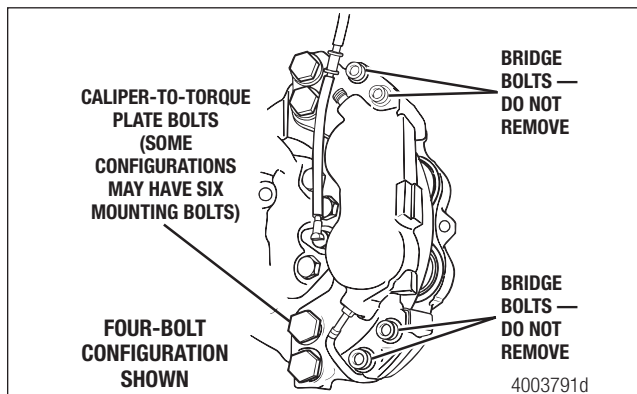


Figure 4.7

### Rotor

1. Check the rotor condition while assembled to the axle. See Rotor on page 16.
2. Remove the hub and rotor assembly according to manufacturer's recommendation.

### Torque Plate

1. Remove the caliper from the vehicle. Refer to the procedure in this section.
2. Remove the dust shield, if installed, from the torque plate.
3. Remove the hub and rotor assembly according to the vehicle manufacturer's recommended service procedure.
4. Remove the ABS sensor, if equipped.
5. Remove the torque plate-to-axle mounting bolts. Figure 4.8.

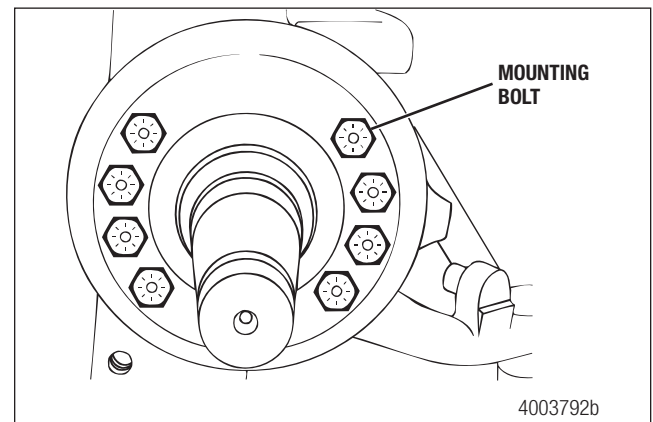


Figure 4.8

## Disassembly

### Brake Caliper

### **⚠ WARNING**

Do not remove the bridge bolts to perform service procedures. If the bridge bolts are removed, reinstall them correctly to prevent serious personal injury and damage to components.

**NOTE:** It is not necessary to remove the bridge bolts to service the brake caliper. Figure 4.7.

1. Remove the brake caliper and brake pads. Refer to the procedures in this section.
2. Drain all fluid from the caliper.
3. Push all four pistons to the bottom of their bores.

## 4 Removal and Disassembly

- Remove the piston boots by prying the metal ring portion of the boot out of the bore with a screwdriver. Use care to avoid damage to the piston or bore. Discard the boots. Figure 4.9.

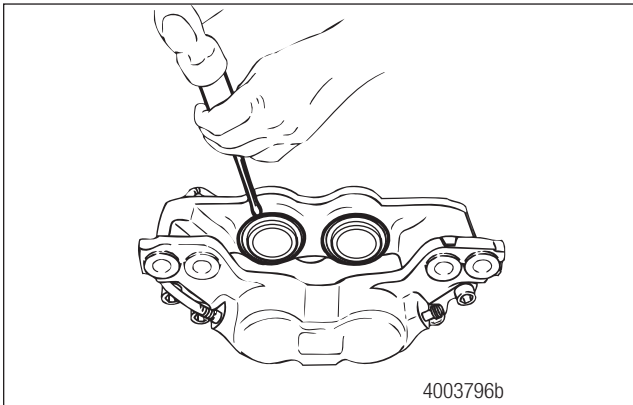


Figure 4.9

- Removing the crossover tube allows the service of the pistons to be performed one half at a time.

### **⚠ WARNING**

When using compressed air to remove the pistons from the caliper bore, do not place hands or fingers near the bore to catch or protect the pistons. Serious personal injury can result.

- Starting with the inboard caliper, utilize the outboard caliper half bleed screw to seal the crossover tube port.
- Place a section of plate stock across the pistons to be removed. Use a C-clamp to hold the plate against the pistons on one side of the caliper where the pistons are to be removed. Figure 4.10.

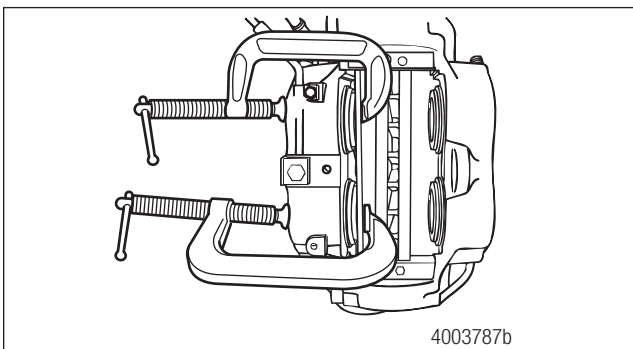


Figure 4.10

### **⚠ CAUTION**

When removing the pistons from the caliper bore, only direct enough compressed air into the caliper brake fluid inlet to ease the pistons out of the bore. Do not exceed 25 psi (172 kPa). Damage to components will result.

- Apply compressed air through the caliper inlet port using a rubber-nosed air fitting. Pressure should not exceed 25 psi (172 kPa).
- Gradually open the C-clamp to allow the pistons to move out evenly until free.
- Repeat the procedure for the outboard caliper half.
- Seal one of the open hydraulic ports with a bleed screw.
- Place a section of plate stock across the outboard pistons to be removed.
- Use a c-clamp to hold the plate against the pistons to be removed.
- Apply compressed air through the caliper inlet port using a rubber-nosed air fitting. Pressure should not exceed 25 psi (172 kPa).
- Gradually open the c-clamp to allow the pistons to move out evenly until free.

### **⚠ CAUTION**

Install a new caliper if the caliper bores are excessively scored or corroded. Do not hone the caliper bores, which can affect piston fit and operation. Damage to components can result.

- Remove the piston seals with a non-metallic device. Discard the seals. Do not nick, scratch or scar the piston bores or seal grooves. Do not hone the caliper bores.

**If the caliper bores are excessively scored or corroded:**  
Install a new caliper.

### **⚠ CAUTION**

The outside diameter of the piston is the caliper's primary sealing surface and is manufactured to very close tolerances. Replace a piston if the outside diameter is damaged. Do not refinish or use abrasives, including an emery cloth, on the piston. Damage to components can result.

- Inspect the outside diameter of the pistons for scoring, nicks, corrosion, wear and damage.

**If any of these conditions exist:** Replace the pistons. Do not refinish or use abrasives.

### **⚠ CAUTION**

Use a crocus cloth to remove minor stains and corrosion from the caliper bore. Do not use abrasives, including an emery cloth. If minor stains and corrosion cannot be removed, replace the caliper bore to avoid damage to components.

## 5 Prepare Parts for Caliper Assembly

### Prepare Parts for Caliper Assembly

#### Hazard Alert Messages

Read and observe all hazard alert messages in this publication.

#### **DANGER**

Solvent cleaners can be flammable and poisonous, and cause serious personal injury or death. Examples of solvent cleaners are carbon tetrachloride, and emulsion-type and petroleum-base cleaners. Read the manufacturer's instructions before using a solvent cleaner, then carefully follow the instructions. Also follow the procedures below.

- Wear safe eye protection.
- Wear clothing that protects the skin.
- Work in a well-ventilated area.
- NEVER use gasoline or solvents containing gasoline. Gasoline can explode.
- Hot solution tanks or alkaline solutions must be used correctly. Read the manufacturer's instructions before using hot solution tanks and alkaline solutions. Then carefully follow the instructions.

#### **WARNING**

To prevent eye injury, always wear eye protection when performing vehicle maintenance or service.

### Clean, Dry and Inspect Parts

#### Clean Parts

##### For Ground or Polished Metal Parts

#### **CAUTION**

Do not use hot solution tanks or water and alkaline solutions to clean ground or polished parts. Damage to parts can result.

Use a cleaning solvent or kerosene or diesel fuel to clean ground or polished metal parts or surfaces.

##### For Rough Metal Parts

Use a cleaning solvent or a weak alkaline solution in a hot solution tank to clean rough metal parts. If you use a hot solution tank, follow the instructions below.

1. Leave the rough parts in the tank until they are completely cleaned and heated.
2. Remove the rough parts from the tank.
3. Wash the parts with water until you remove the alkaline solution.

#### Dry and Inspect Parts

1. Use soft, clean paper or cloth rags or compressed air to completely dry parts immediately after you clean them.
2. Carefully inspect all parts for wear or damage before you assemble them.
3. Repair or replace worn or damaged parts.



# Assembly and Installation

## Hazard Alert Messages

Read and observe all hazard alert messages in this publication.

### **⚠ WARNING**

To prevent eye injury, always wear eye protection when performing vehicle maintenance or service.

### **⚠ CAUTION**

When using compressed air, use air lines that are completely free of oil and moisture. All brake parts must be clean and completely dried of cleaning fluid. Use only Meritor replacement parts to ensure correct caliper performance.

## Assembly

### Brake Caliper

1. Ensure the parts are clean and free of debris. Use compressed air to clean out and dry the grooves and passages.
2. Inspect the crossover tube, the tube nut and the tube flares for damage prior to installation. Replace the crossover tube if any component appears damaged.
3. Assemble the crossover tube. Tighten the crossover tube nuts. Refer to Section 11 Specifications on page 26.
4. Dip new piston seals in new, clean OEM-approved brake fluid and install into the piston seal groove in the caliper piston bores. Verify that they are correctly seated.
5. Apply a thin film of silicone grease or brake fluid to the caliper bore seal land between the piston boot and seal groove. Apply the grease or brake fluid around the entire circumference of the caliper bore. Figure 6.1.

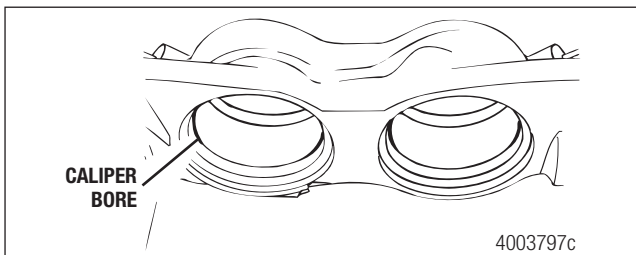


Figure 6.1

6. Apply OEM-approved brake fluid to the piston bore, seal and piston OD to aid in piston installation.
7. Install a new seal into the seal groove.

8. Align the piston to the bore for installation. The piston is a tight clearance fit and must be square to the bore during this operation to avoid binding. Figure 6.2.

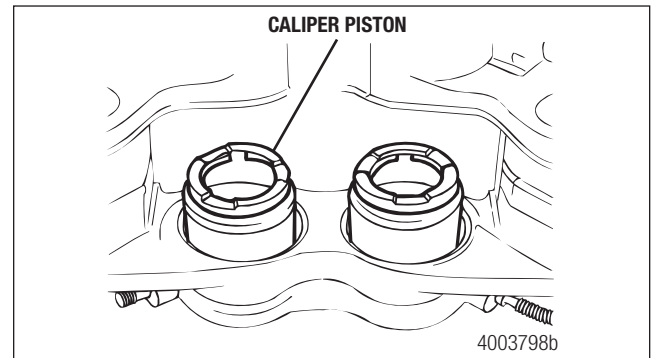


Figure 6.2

9. Press the pistons into the bores one at a time. Use a block and c-clamp to press the piston into the housing until lightly seated. Repeat this procedure for the other pistons. Figure 6.3.

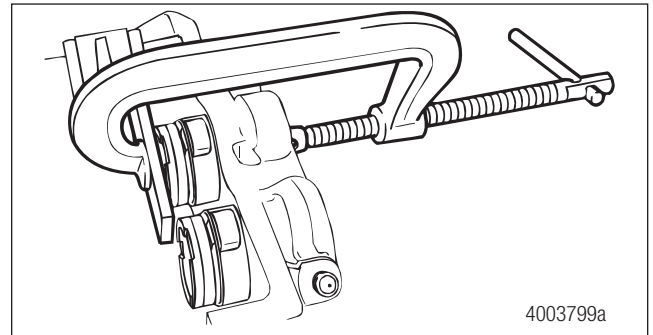


Figure 6.3

10. Install the piston boot over the projecting end of the piston. Figure 6.4.

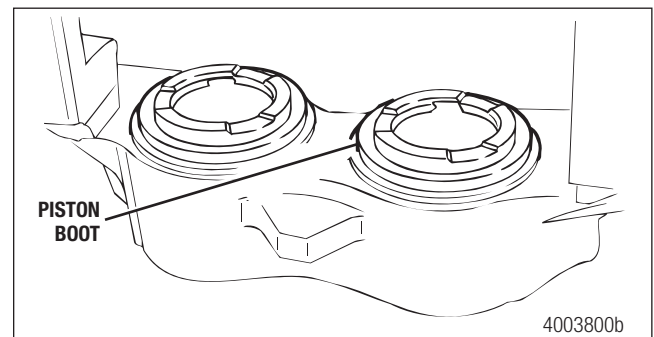


Figure 6.4

11. Apply force to the steel case of the piston boot. A bearing cup that fits the diameter of the steel is suitable installation tool. Figure 6.5.

## 6 Assembly and Installation

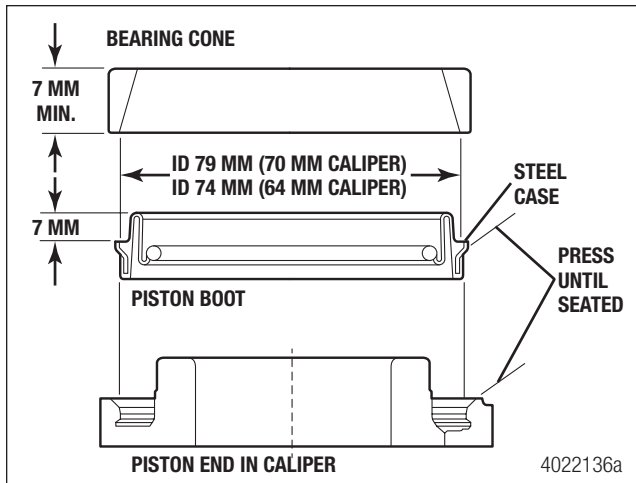


Figure 6.5

12. Make sure the tool used clears the boot. Figure 6.5.
13. Apply uniform force with a c-clamp until the case is seated to the caliper housing as shown in Figure 6.5.
14. Check piston boot after installation to verify the boot was not damaged during installation

## Installation

### Torque Plate

1. Install the torque plate mounting bolts. Tighten the bolts to the specified torque. Refer to Section 11 Specifications on page 26. Figure 6.6.

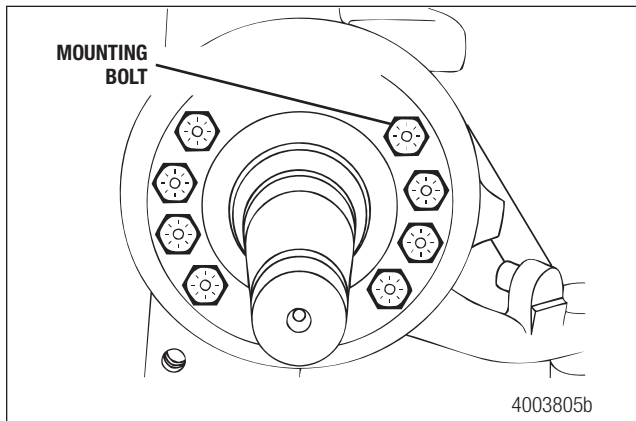


Figure 6.6

2. If equipped, install the ABS sensor according to the vehicle manufacturer's recommended service procedure.
3. Install the hub and rotor assembly according to the vehicle manufacturer's recommended service procedure.
4. Install the dust shield, if equipped.

5. Install the caliper. Refer to the procedure in this section.

### Rotor

1. Install the hub and rotor assembly according to the manufacturer's recommended service procedures. Verify that the mating surfaces of the hub or spoke wheel and rotor are clean and free of rust build-up.
2. Check the rotor while assembled to the hub or spoke wheel and mounted on the axle spindle. The lateral runout of the rotor friction material surfaces should not exceed 0.015-inch (0.381 mm) total indicator reading (TIR). The thickness variation of the rotor should not exceed 0.0012-inch (0.0300 mm).

**If the lateral runout or the thickness variation exceeds the above values:** Resurface or replace the rotor.

### Caliper

1. Inspect the caliper before reinstalling it onto the torque plate. The pistons should be fully retracted into the caliper. Check to ensure the piston boots are not loose or damaged. Verify the piston boots are fully seated into the housing. If any leakage, damage or defect is found, it may be necessary to disassemble or replace the caliper. Figure 6.7.

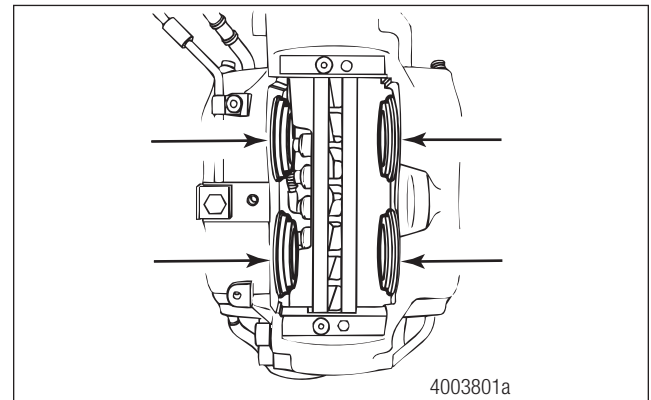


Figure 6.7

2. Install the caliper over the rotor. Install the washers and start the caliper-to-torque plate mounting bolts by hand.
3. Depending on the caliper configuration, tighten the four M20 mounting bolts or the six M14 mounting bolts. Refer to Section 11 Specifications on page 26.
4. Install the brake hose. Figure 6.8.

**NOTE:** The banjo bolt connection should always use new crush washers.

## 6 Assembly and Installation

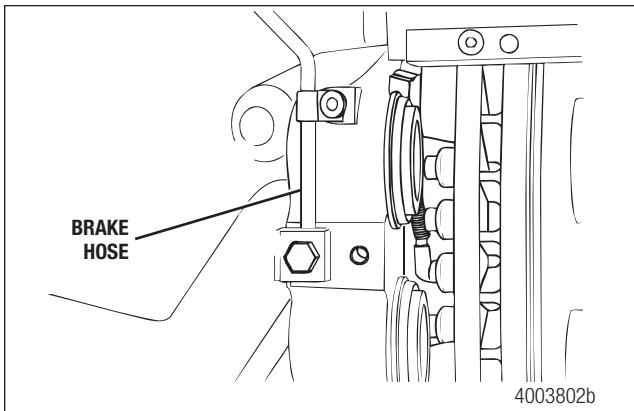


Figure 6.8

5. Secure the brake hose hold-down clamp with the bolt. Figure 6.9.

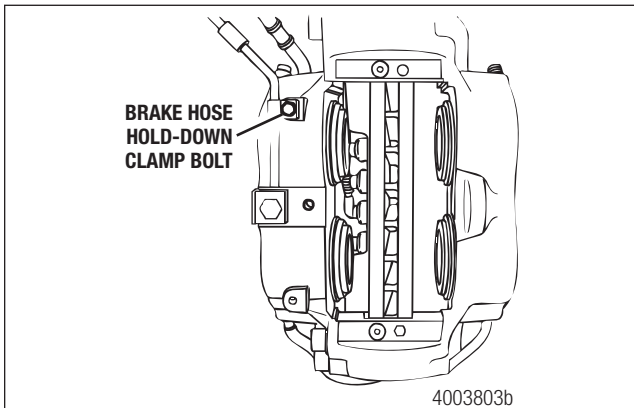


Figure 6.9

### Brake Pads

#### **⚠ WARNING**

Install the brake pads with the friction material facing the rotor surface as shown in the figure. Installing the brake pad with the back plate facing the rotor surface can affect brake performance and damage the rotor face.

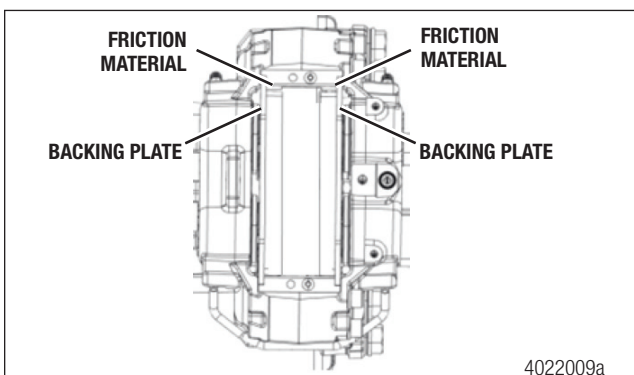


Figure 6.10

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**NOTE:** New brake pads are identical and there are no specific inboard or outboard brake pads. If the old pads are reinstalled, they should be installed in the same position from which they were removed. Reinstalling old pads in the wrong position will result in accelerated and/or uneven lining wear.

1. Install the brake pads and pad retainer. Tighten the pad retainer bolt. Refer to Section 11 Specifications on page 26. Figure 6.11.

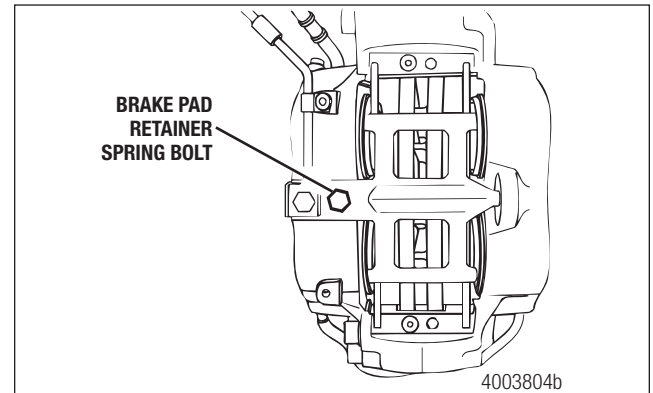


Figure 6.11

2. Fill the brake reservoir with new OEM-recommended brake fluid.
3. Apply the brakes a few time to adjust the piston and check for leaks. If no leaks are detected, then proceed to bleeding the brake system.

#### **⚠ CAUTION**

To remove air from the caliper, the two bleed screws must be used in a specific sequence to correctly bleed the brakes. Otherwise air can enter the system and affect brake performance. Damage to components can result.

4. Bleed the brake system according to the vehicle manufacturer's procedure. Bleed the caliper according to the Brake Caliper Bleeding Procedure on page 19.
5. Install the tire and wheel assembly according to the manufacturer's instructions.
6. Lower the vehicle. Road test for correct operation.

## 7 Rotor

### Rotor

#### Hazard Alert Messages

Read and observe all hazard alert messages in this publication.

#### **⚠ DANGER**

Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving. Support the vehicle with safety stands. NEVER work under a vehicle supported only by jacks. Jacks can slip and fall over. Failure to use a jack stand can result in serious personal injury and damage to components.

#### **⚠ WARNING**

To prevent eye injury, always wear eye protection when performing vehicle maintenance or service.

#### Inspection

1. Wear safe eye protection. Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving.
2. Use a jack to raise the vehicle so that the wheels to be serviced are off the ground. Support the vehicle with safety stands.
3. With the pads removed, rotate the wheel and inspect the hub and rotor assembly for damage.
4. Inspect both sides of the rotor for cracks and heat checks. Replace the hub, rotor or entire assembly, if necessary.
5. Check the hub and rotor assembly for damaged, loose or missing fasteners. For the correct torque, refer to Section 11 Specifications on page 26.

#### Cracks

#### **⚠ WARNING**

Always replace a cracked rotor to avoid serious personal injury and damage to components.

When the crack extends through a section of the rotor, replace the rotor. Figure 7.1.

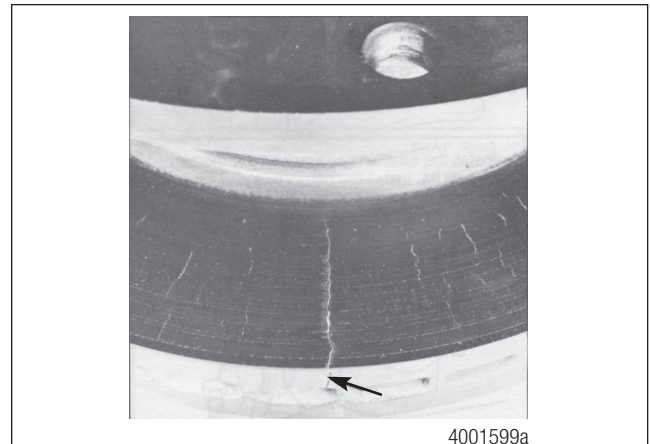


Figure 7.1

#### Heat Checking

Heat checks are short, thin, sometimes numerous, radial interruptions of the rotor braking surfaces. They are the result of disc brake operation. They are caused by the heating and cooling that occurs as the brakes are applied time after time. Heat checks will frequently wear away and reform, or they may become braking surface cracks, depending on such factors as the lining and rotor wear rate, brake balance, and how hard the brakes are used. There are two kinds of heat checking: light and heavy. Figure 7.2.

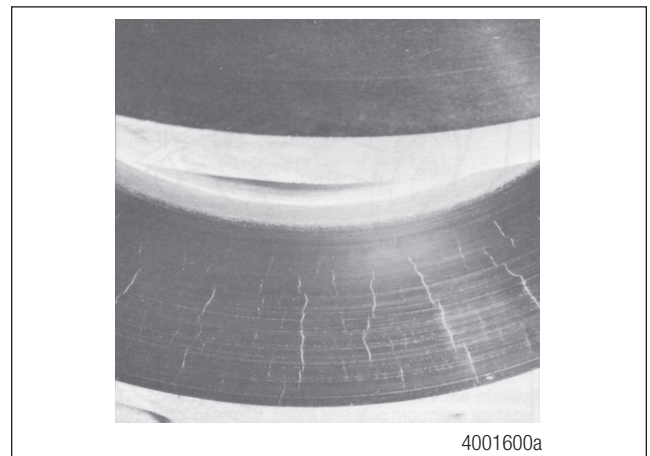


Figure 7.2

#### Light Heat Checking

Cracks on the surface of the rotor that result from light heat checking are small and fine and do not require rotor replacement. Figure 7.2 and Figure 7.3.

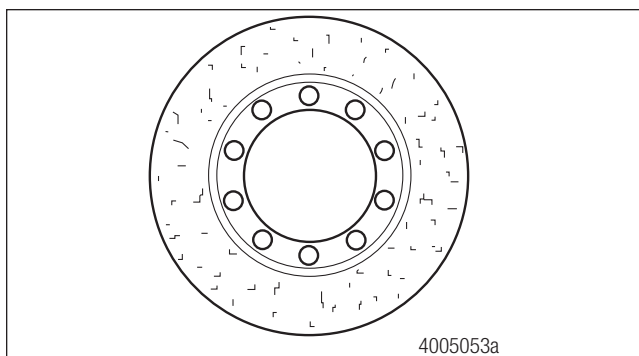


Figure 7.3

### Heavy Heat Checking

Heavy heat checking is surface cracks that have width and depth. Replace the rotor if the heat checks have a width greater than 0.02-inch (0.5 mm), depth greater than 0.04-inch (1 mm) and extend across the surface more than 75% in the radial direction. Figure 7.4.

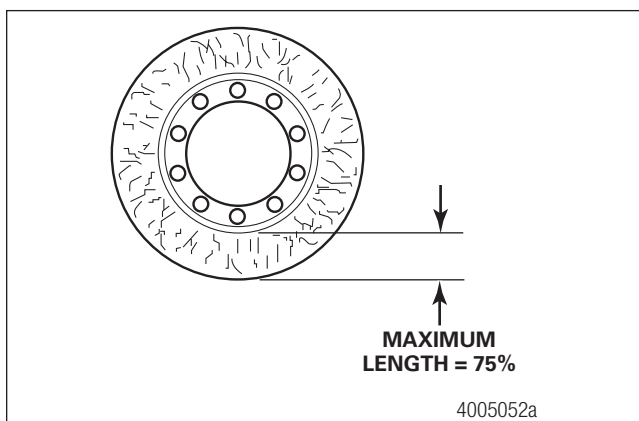


Figure 7.4

### Deep Grooves or Scores

Inspect both sides of the rotor. If you find grooves or scores of a depth less than 0.02-inch (0.5 mm), continue to use the rotor. If the grooves are greater than 0.02-inch (0.5 mm), you may choose to resurface the rotor. If the rotor thickness measured across any groove is less than the minimum discard thickness found on the rotor casting, discard and replace the rotor. Figure 7.5.

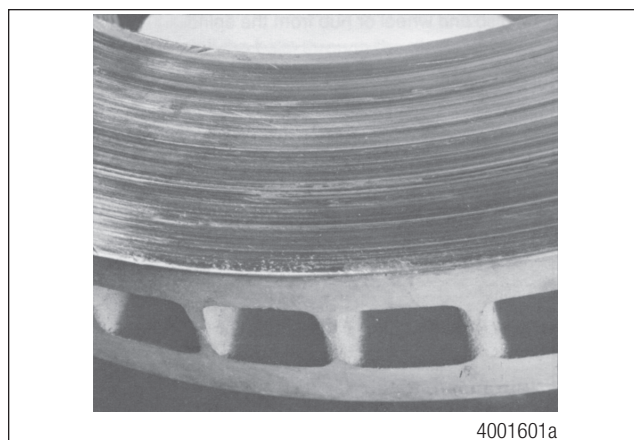


Figure 7.5

### Blue Marks or Bands

Blue marks or bands indicate that the rotor was very hot. Determine the cause and correct the conditions. Figure 7.6.

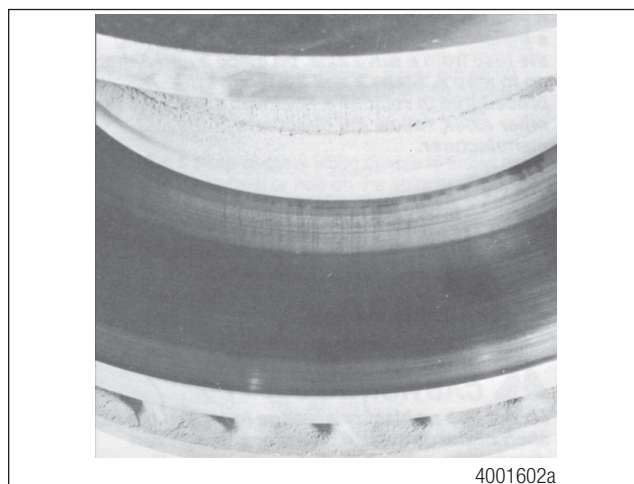


Figure 7.6

# 7 Rotor

## Measure the Rotor Thickness

### **CAUTION**

Replace the rotor if it reaches the minimum allowable rotor thickness found on the rotor casting. Damage to components can result.

1. Use a micrometer to measure rotor thickness. Figure 7.7.

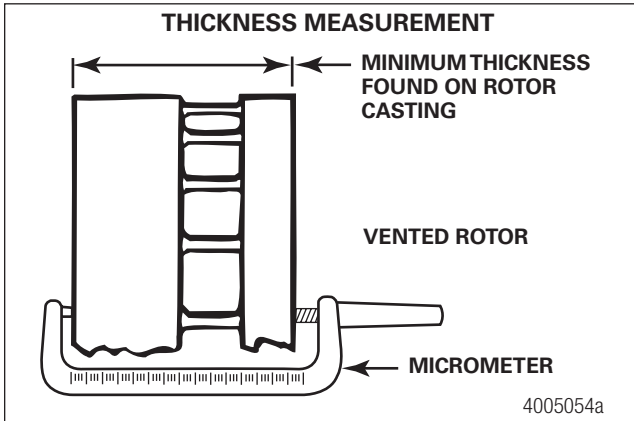


Figure 7.7

2. If the rotor thickness is equal to or less than the rotor discard dimension, then the rotor should be replaced.

### **Rotor discard dimension**

- 70 mm Quadraulic: New rotor thickness 39 mm  
Minimum allowable thickness 36.05 mm

- 64 mm Quadraulic: New rotor thickness 39 mm  
Minimum allowable thickness 36.05 mm

- 64 mm Quadraulic lite: New rotor thickness 36 mm  
Minimum allowable thickness 32.90 mm

3. If the brake rotor thickness is greater than the minimum allowable thickness and the user would like to continue using the current rotor, then the user should evaluate if the remaining rotor thickness is sufficient to reach the next scheduled service.

## Measure the Rotor Runout

1. Attach a dial indicator to the caliper or axle frame.
2. Check the rotor while assembled to the hub or spoke wheel and mounted on the axle spindle. The lateral runout of the rotor friction surface should not exceed 0.015-inch (0.381 mm) total indicator reading (TIR). The thickness variation of the rotor should not exceed 0.0012-inch (0.0300 mm).

**If the lateral runout or the thickness variation exceeds the above values:** Resurface or replace the rotor.

**If it is necessary to service the rotor, hub, hub seal or bearing:** Remove the caliper according to the procedure in this section.

3. Remove the hub and rotor assembly according to the vehicle manufacturer's recommendations.

## Inspection

### Hazard Alert Messages

Read and observe all hazard alert messages in this publication.

#### WARNING

To prevent eye injury, always wear eye protection when performing vehicle maintenance or service.

### Intervals

Periodically inspect the brakes. Check the caliper, torque plate, pads and rotor for signs of wear and damage. Also check for any loose or missing screws. Use the schedule below that gives the most frequent inspections. For additional roadside inspection information, contact the Meritor OnTrac™ Customer Call Center at 866-OnTrac1 (688-7221).

- Fleet chassis lubrication schedule
- Chassis manufacturer lubrication schedule
- At least four times during lining life
- At tire replacement

### Inspect Parts

#### Caliper

1. Clean the area around the brake hose. Use brake parts cleaner.
2. Inspect the piston and boots for wear and damage. Replace worn or damaged parts.
3. Inspect the caliper lining wear plates for wear and damage. Replace worn or damaged wear plates.
4. Inspect the housing for cracks or damage. Replace a cracked or damaged housing.

#### Torque Plate

1. Inspect the caliper mounting area of the torque plate for rust or corrosion. Replace a damaged or worn torque plate.
2. Use a wire brush to clean the caliper mounting area.
3. Inspect the torque plate for cracks or elongated bolt holes.

**If these conditions exist:** Replace the torque plate.

#### Rotor

Visually inspect the rotor. Refer to Cracks on page 16.

### Brake Caliper Bleeding Procedure

#### DANGER

This bleed sequence refers to bleeding the caliper and does not consider the hydraulic application system requirements. Identify the vehicle hydraulic application system type and refer to that service manual before performing any brake service. Adhere to the hydraulic application system bleeding procedures to prevent death or serious personal injury and damage to components.

Refer to the manufacturer's service information for ABS bleeding instructions.

1. Check the master cylinder reservoir and fill, if necessary, with OEM approved brake fluid.
2. Bleed the brakes in the following order: right rear, left rear, right front and left front.

#### DANGER

When bleeding a four-piston caliper, monitor the brake fluid level to ensure the system does not become drained. Add brake fluid to the reservoir as needed to prevent death or serious personal injury and damage to components.

#### CAUTION

Always install new brake fluid into the caliper. Discard old brake fluid. Do not reuse it. Damage to components can result.

**NOTE:** Each four-piston caliper is equipped with two bleed screws. To ensure air is removed from a caliper, the bleed sequence is inboard, outboard, and repeat inboard.

3. Install a section of clear, flexible tubing with a 1/4-inch inner diameter over the inboard bleeder. Insert the other end of the tubing into a container to collect the purged brake fluid. Discard the brake fluid. Do not reuse old brake fluid.
4. If a pressurized bleeding system is not required by the vehicle manufacturer's service procedures, apply and hold the brakes to pressurize the system.
5. Repeat the procedure for the outboard bleed screw.
6. Repeat the procedure for the inboard bleed screw.
7. Tighten the bleed screws to specification. Refer to Section 11 Specifications on page 26.
8. Test the brakes prior to returning the vehicle to service.

## 9 Troubleshooting

### Troubleshooting

#### Hazard Alert Messages

Read and observe all hazard alert messages in this publication.

**⚠ WARNING**

To prevent eye injury, always wear eye protection when performing vehicle maintenance or service.

#### Brakes

Condition	Possible Causes	Check for	Correction
Brake Noise	Incorrect brake pads	Verify that OEM brake pads are being used	Replace with OEM brake pads.
	Brake pad installed incorrectly	Friction material facing rotor surface	Correct the pad installation. Replace the pads and rotor if necessary.
	Worn brake pads	Lining thickness	Replace the pads and rotor if necessary.
	Debris/contaminates on pad braking surface	Debris/contaminates on brake surface	Replace with OEM brake pads.
	Brake pads do not move freely in the caliper	Corrosion or debris on brake pads or pad abutment face	Clean brake pad edge and abutment. Replace brake pads and abutment if necessary.
	Brake component attachments are not installed to specification	Loose connections and fasteners	Tighten the connections and fasteners to the specified torque.
	Rotor surface condition	Excessive rotor cracking, heat checking or runout	Replace rotor.
	Pad retainer spring damaged, loose or missing	Inspect pad retainer for damage, fit and function	Correct the pad retainer installation or replace pad retainer spring.
	Caliper seized/drag		Check if system is holding pressure. Open bleed screw and see if brake releases.
Verify all pistons move - Seat pistons and then check piston movement when brake applied.			Piston move freely. Investigate other system issue.
Verify brake pads move freely in caliper			Replace brake pads and wear plates.



## 9 Troubleshooting

Condition	Possible Causes	Check for	Correction
Fluid leak:  Thoroughly clean area of concern to clearly determine leak point.	Inlet fitting - Banjo connection	Fitting not torqued to specification	Torque to OEM specification.
		Check banjo bolt, banjo bolt block and crush washers for damage or missing washers	Replace damage fittings.
	Inlet fitting - Inverted flare fitting	Fitting not torqued to specification	Torque to OEM specification.
		Check inverted flare nut and tube flare for damage	Replace damage fittings.
		Check tube seat in caliper inlet port for damage	Replace caliper.
	Crossover tube assembly	Fitting not torqued to specification	Torque to Meritor specification.
		Check inverted flare nut and tube flare for damage	Replace crossover tube.
		Crossover tube damaged	Replace crossover tube.
	Piston seal or piston damaged	Check tube seat in caliper inlet port for damage	Replace caliper if damaged.
		Remove the brake pads to allow access to the piston boots. Apply light hand pressure to each piston boot to detect if any fluid is present in the piston boot. If fluid emits from the boot, then further inspection is required to determine the source is piston or piston seal.	Service piston and seal or replace caliper.
Wheel seal - not a caliper leak	Determine if fluid is brake fluid or oil	Service wheel seal.	
Axle seal- not a caliper leak	Determine if fluid is brake fluid or oil	Service axle seal.	
Soft pedal	Leak in system	Check brake system for signs of leakage	Replace hardware as needed. Fill and bleed brake system per OEM requirements.
	Brake fluid degradation and excessive moisture in the system can form a steam pocket under heavy braking	Brake fluid discoloration indicating presence of foreign material  Check brake fluid with brake fluid test strip to verify fluid quality	Replace brake fluid with OEM-approved brake fluid.
	Air in hydraulic system	Recent brake system service - incomplete brake bleed	Bleed system.
		Deteriorated brake fluid condition - fluid boil	Drain system and replace with approved fluid.
	Weak brake hose that expands under pressure	Any visual hose damage	Replace defective hose.
	Master cylinder leaking or unable to apply pressure due to seal damage	Check master cylinder pressure output	Replace master cylinder.
	Incorrect brake pads	Verify that OEM brake pads are being used	Replace with OEM brake pads.
Hard pedal	Brake booster is not operating properly	Check for system for leaks or on stuck check valve	Replace brake booster.
	Vacuum hose leak	Inspect vacuum hose for damage or cracks	Replace vacuum hose.

## 9 Troubleshooting

Condition	Possible Causes	Check for	Correction
Brake pedal pulsation	Excessive rotor runout or thickness variation	Check braking surfaces with dial indicators	Replace rotor.
	Worn or damaged wheel bearing	Wheel end play	Replace wheel bearing.
	Rotor condition	Corrosion on braking surface	Replace rotor.
Steering wheel vibration during braking	Excessive rotor runout or thickness variation	Check braking surfaces with dial indicators	Replace rotor.
	Worn or damaged wheel bearing	Wheel end play	Replace wheel bearing.
	Tire damage	Inspect tire for bumps, blemishes and balance	Replace as needed.
	Steering/suspension related condition	Steering linkages, king pin, steering gear	Replace as needed.
Steering wheel pulls during braking	Uneven tire pressure	Check tire pressure	Add air as needed.
	Mismatched tire size	Tires are the same size	Replace tire with appropriate size.
	One caliper not operating properly	Verify caliper applies and release	See Caliper on page 19.
		Verify caliper not damaged	Replace as needed.
		Verify interference condition obstructing operation	Correct interference condition.
	Verify fluid delivery to caliper - no obstructions	Inspect hydraulic system.	
	Mismatched brake friction	Verify both calipers have the same friction	Replace brake pads as needed with OEM brake pads.
	Brake lining contaminates	Check brake pads and rotor surfaces	Clean rotor. Replace axle set of pads with new brake pads. Do not attempt to clean brake pads.
	Wheel bearings worn on not adjusted correctly	Check wheel end play	Replace as needed.
	Worn suspension components	Check suspension components	Replace as needed.
Incorrect alignment	Check alignment	Correct alignment.	
Steering pulls when driving	Uneven tire pressure	Check tire pressure	Add air as needed.
	Mismatched tire size	Tires are the same size	Replace tire with appropriate size.
	Brake caliper is not releasing	Fluid not releasing from caliper	Possible collapsed brake line.
		Check if caliper is holding pressure	Review brake system operation.
		Verify caliper not damage	Replace as needed.
		Verify interference condition obstructing operation	Correct interference condition.
	Wheel bearings worn on not adjusted correctly	Check wheel end play	Replace as needed.
	Worn suspension components	Check suspension components	Replace as needed.
Incorrect alignment	Check alignment	Correct alignment.	

## 9 Troubleshooting

Condition	Possible Causes	Check for	Correction
Long stopping distance	Incorrect brake friction for vocation	Verify brake friction is OEM approved	Replace brake pads as needed with OEM brake pads.
	Brake lining wear	Check for pad wear condition	Replace brake pads as needed with OEM brake pads.
	Brake lining contamination	Check brake pads for grease, oil, contaminates	Replace brake pads as needed with OEM brake pads.
	Brake pressure restriction	Check brake system for obstruction	Replace as needed.
	Insufficient hydraulic pressure	Verify system pressure at caliper	Investigate system delivery issue.
<b>Brake Drag - One wheel end</b>  Brake Drag Described - a wheel end does not rotate freely when brake not applied.  Free rotation is subjective and should be compared to a wheel end not experiencing the issue being investigated.  Drive axle wheel ends will have some level of system friction to consider when checking due to drive train.	Residual pressure in caliper or delay in fluid pressure relief from the caliper after the brake is applied	Caliper crossover tube damaged restricting fluid to outboard caliper	Replace crossover tube.
		Jounce hose collapsed/damaged	Replace jounce hose.
		Damage/restriction to brake fluid supply line	Replace damaged hose, bleed brakes and verify issue resolved.
		Debris/contaminates in brake fluid creating restriction in brake line	Bleed brake and verify brake releases properly.
	Brake pad binding in caliper	Dirt, debris and corrosion on brake pad abutment plate	Clean abutment plate and verify brake pads move freely in caliper.
		Damaged/deformed abutment plate limiting brake pad movement	Replace abutment plates and verify brake pads move freely in caliper.
		Brake pad backing corrosion/damage	Replace brake pads and verify brake pads move freely in caliper.
		Pad retainer spring deformed or damaged	Replace pad retainer spring.
	Brake not releasing - piston seized	Check if piston can be seated into piston bore. If the piston can be moved, then there is another issue. *Piston OD to caliper bore is tightly controlled dimension. Over extended pistons require attention when seating to avoid alignment induced binding.	Seized piston Service seized piston or replace caliper.
			Piston moves Not a piston issue. Further investigation required.
Incorrect brake pads - excessive swell and growth	Verify using OEM brake pads	Replace with OEM brake pads.	
Loose or worn wheel bearing	Check wheel end play	Adjust or replace wheel bearing.	

## 9 Troubleshooting

Condition	Possible Causes	Check for	Correction
<b>Brake Drag</b> a. Both calipers on the same axle b. All calipers - all wheel ends	Brake caliper seized/drag	Refer to above Brake Drag - One wheel end	Refer to above Brake Drag - One wheel end.
	Incorrect master cylinder push rod length	Check master cylinder push rod length	Adjust per OEM instruction.
	Incorrect brake booster push rod length	Check brake booster push rod length	Adjust per OEM instruction.
	Primary or secondary piston in master cylinder not returning	Check if primary or secondary piston chamber of master cylinder is holding pressure	Master cylinder piston seized - replace master cylinder.
	Brake pedal binding.	Verify brake pedal fully releases	Adjust pedal set-up. Remove obstructions affecting release.
	Reservoir cap not venting	Pressure build up in brake fluid reservoir. Remove reservoir cap - any air press release when cap is removed indicated cap is not venting and can cause brake drag	Replace reservoir cap.
Brake drag - drive axle brakes	Park brake not releasing	Check park brake and verify releasing	Service per OEM instruction.
Lining wear difference in the same caliper - inboard pad vs outboard pad	Brake not releasing	Verify caliper not holding pressure. Open bleed screw and check if brake releases.	Hydraulic system issue - refer to vehicle manufacturer instruction.
		Inspect piston boots for damage and contaminate ingress that may be affecting piston movement	Replace caliper or service damage hardware.
		Inspect crossover tube for damage that could restricted fluid flow	Replace crossover tube.
		Verify the brake pads move freely when the pad retainer spring is removed	Clean or replace abutment plates as needed.
		Verify the piston is not over extended - brake pad worn beyond service life	Service piston or replace caliper.
	Rotor finish	Inspect inboard and outboard braking surfaces for cracks, heat checking or wear grooves	Replace rotor.
	Contaminates on inboard or outboard brake pad or brake surface	Check braking surfaces for contaminate - grease, oil, brake fluid	Clean and replace parts as needed. Replace brake pads that have been contaminated. Replace brake pads as an axle set.
	Operating environment	Inspect parts for difference in environmental exposure	Review vehicle cleaning schedule frequency and metrics to address wheel end debris conditions.

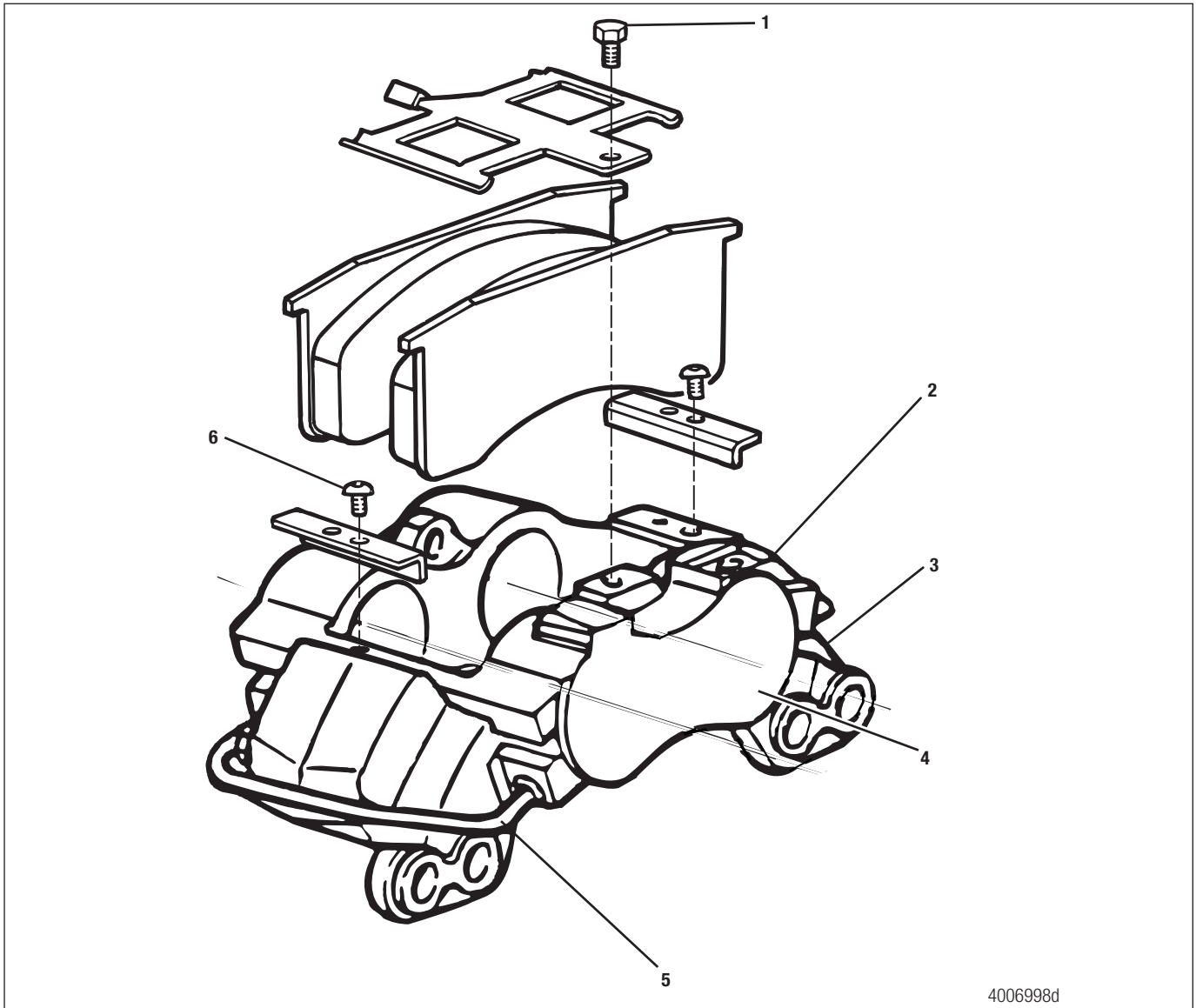
## 9 Troubleshooting

Condition	Possible Causes	Check for	Correction	
Lining wear difference on the same axle - left vs right	Brake not releasing	Verify caliper not holding pressure. Open bleed screw and check if brake releases.	Hydraulic system issue - refer to vehicle manufacturer instruction.	
	Incorrect caliper size	Verify calipers on the same axle are the same size	Correct caliper size per OEM caliper requirements.	
	Companion brake does not work properly	Inspect companion brake function (a/b rotor temp check)	Service caliper as needed.	
	Operating environment - side to side	Inspect companion brake pads and rotor for contaminates affecting performance	Review vehicle cleaning schedule frequency and metrics to address wheel end debris condition.	
Lining wear per axle - front vs rear	Brake not releasing	Verify calipers not holding pressure. Open bleed screw and check if brake releases.	Hydraulic system issue - refer to vehicle manufacturer instruction.	
	Axle overload (front vs rear)	Refer to the weight limitations on the vehicle identification plate	Observe the vehicle manufactures load recommendations.	
	Operating environment	Debris exposure - compare exposure per axle	Review vehicle cleaning frequency and process to address wheel end debris conditions.	
<p>Lining life and lining wear patterns.</p> <ul style="list-style-type: none"> <li>Lining life will vary by vehicle vocation, operating environment, loading, rotor finish and driving habit.</li> <li>Linings should wear evenly, but some level of taper or uneven wear can occur due to the conditions noted above.</li> <li>Accelerated, tapered or uneven lining wear that is considered excessive does not in itself prove a caliper is not operating properly. The wear condition requires further inspection to determine the root cause.</li> </ul>				
Smoking brakes	Brake applied	System issue applying pressure to brake	Inspect application system.	
	Brake system holding pressure	Open bleed screw and see if brake releases	Inspect actuation system.	
	Contamination on the rotor or brake lining	Grease, oil, undercoat, paint, etc. on the lining and/or rotor braking surfaces	Repair source of leak. Replace brake pads and clean rotor braking surface.	
	Vehicle overloaded	Verify loading is within weight rating defined on VIN plate	Adhere to VIN plate loading.	
	Driving habit - excessive braking		Aggressive driving.	Adjust driving habit.
			Not releasing brake for extended periods – example, holding brake to modulate speed on mountain descent	Mountain descent – do not continuously hold brake during a mountain decent to control speed. Intermittently release the brakes too. This intermittent braking allows the brake to cool when brakes are not applied.
		Aggressive driving. Not releasing brake for long periods (drag)	Braking for speed control (descending a grade) requires the brakes to be intermittently released to cool - this is referred to as brake snubs.	
	System control issue	Check for any dash warning signals	Correct system issue as required.	

## 10 Specifications

### Specifications

#### Torque Specifications



4006998d

Figure 9.1

Item	Description	Torque	
		lb-ft	Nm
1	Retainer Bolt	28-32	38-43
2	Brake Hose Hold Down	9-12	13-16
3	Bleeder Screw	17-22	23-30
4	Inlet Port, Inverted Flare Nut	17-22	23-30
	Inlet Port, Banjo Block Bolt	30-40	41-54
5	Crossover Tube Nut	10-17	14-23
6	Lining Wear Plate Bolt	9-12	13-16

## Bridge Bolts

### WARNING

Do not remove the bridge bolts to perform service procedures. If the bridge bolts are removed, reinstall them correctly to prevent serious personal injury and damage to components.

If the bridge bolts were removed, install new bridge bolts and tighten them in the correct sequence according to the following procedure. To obtain bolt hardware kits, call Meritor's Commercial Vehicle Aftermarket at 888-725-9355. Do not rebuild the calipers with used caliper parts.

1. Verify the two caliper halves are seated. If necessary, lightly press the halves together until correctly seated.
2. Loosely assembly all bridge bolts.
3. Perform the following two-step bolt tightening procedure.
  - a. Tighten the bolts to an initial torque of 50 lb-ft (68 Nm) in the sequence 1, 2, 3, 4. Figure 9.2.
  - b. Use torque angle equipment to turn the bolts 70 +3/-2 degrees in the sequence 1, 2, 3, 4.

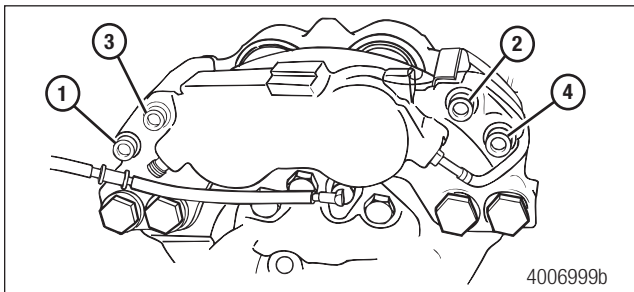
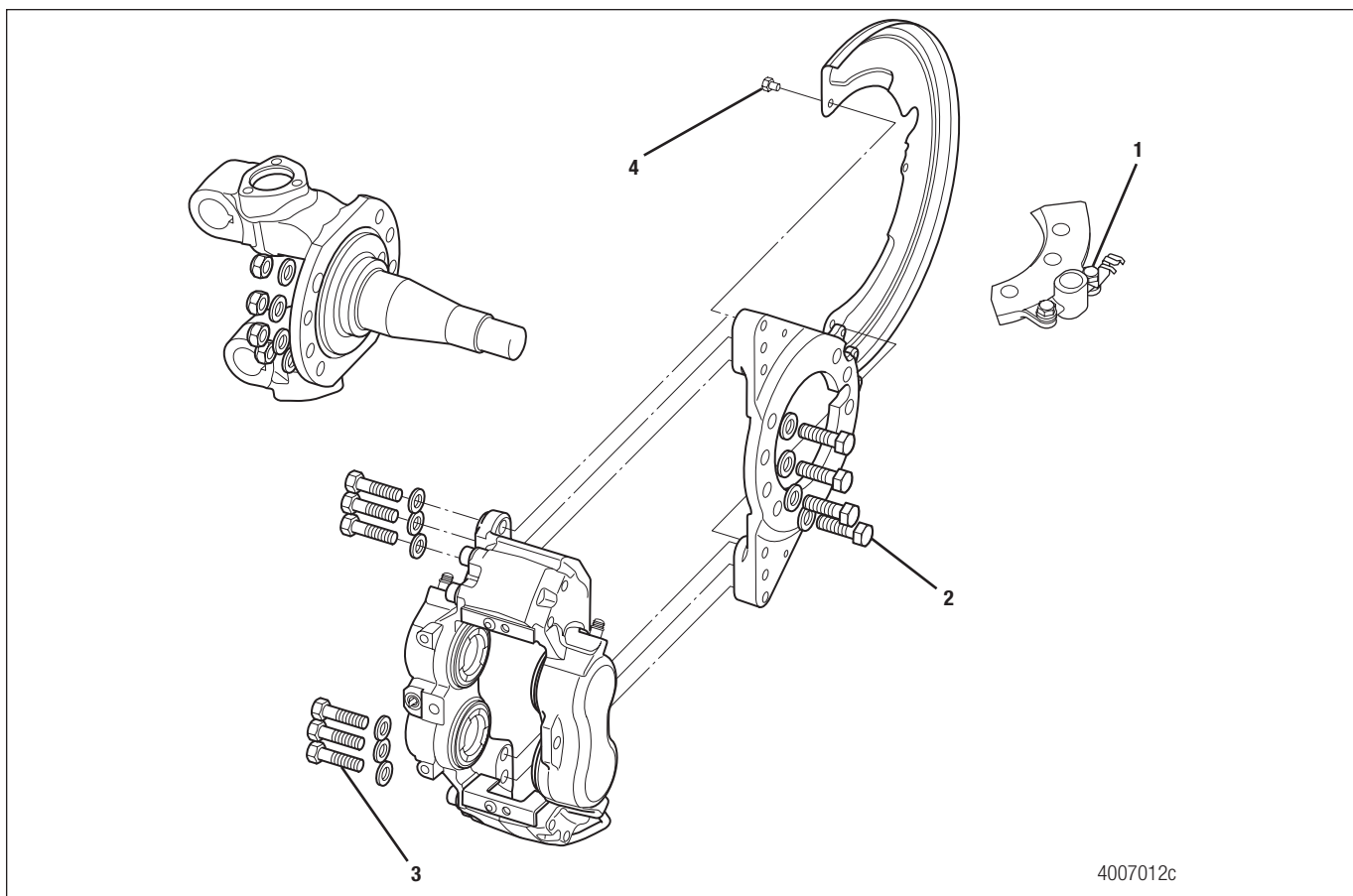


Figure 9.2

Table A: Four-Piston Quadraulic™ Disc Brake Components

Description	Specification
Brake Pad	0.73" (18.5 mm) — Thickness Above Metal (New) Minimum
	0.125" (3.2 mm) — Thickness Above Metal (Discard)
Brake Fluid — High-Performance Brake Fluid (Per Manufacturer's Recommendation)	Caliper approved for use with DOT 3, DOT 4 and DOT 5.1.

## 10 Specifications



4007012c

Figure 9.3

Item	Description	Torque	
		lb-ft	Nm
1	ABS Bracket Bolt	12-18	17-24
	Dust Shield Clip Bolt	12-18	17-24
2	Torque Plate-to-Flange Bolt*	-	-
3	Caliper-to-Torque Plate Bolt		
	M14*	-	-
	M16	199-258	270-360
	M20	320-360	433-488
4	Dust Shield Bolt	9-12	13-16

\*Refer to the vehicle manufacturer's torque specifications.



## 10 Specifications



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