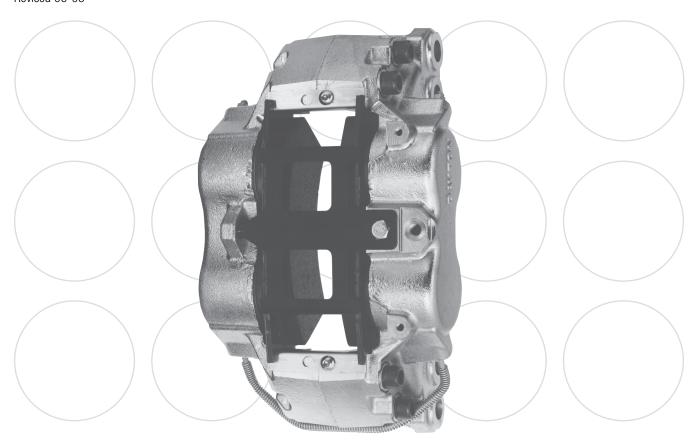


## Maintenance Manual MM-2075

# Four-Piston Quadraulic™ Disc Brake Caliper

Revised 06-08



#### **About This Manual**

This manual provides instructions for Meritor four-piston Quadraulic<sup>™</sup> disc brake calipers.

## **Before You Begin**

- 1. Read and understand all instructions and procedures before you begin to service components.
- Read and observe all Warning and Caution hazard alert messages in this publication. They provide information that can help prevent serious personal injury, damage to components, or both.
- 3. Follow your company's maintenance and service, installation, and diagnostics guidelines.
- Use special tools when required to help avoid serious personal injury and damage to components.

# Hazard Alert Messages and Torque Symbols

#### **WARNING**

A Warning alerts you to an instruction or procedure that you must follow exactly to avoid serious personal injury and damage to components.

#### **A** CAUTION

A Caution alerts you to an instruction or procedure that you must follow exactly to avoid damage to components.

This symbol alerts you to tighten fasteners to a specified torque value.

## How to Obtain Additional Maintenance and Service Information

#### On the Web

Visit Literature on Demand at arvinmeritor.com to access and order product, service, aftermarket, and warranty literature for ArvinMeritor's truck, trailer and specialty vehicle components.

#### Literature on Demand DVD (LODonDVD)

The LODonDVD contains product, service and warranty information for ArvinMeritor components. To order the DVD, visit Literature on Demand at arvinmeritor.com and specify TP-0742.

# How to Obtain Tools and Supplies Specified in This Manual

Call ArvinMeritor's Commercial Vehicle Aftermarket at 888-725-9355 to obtain Meritor tools and supplies.

Information contained in this publication was in effect at the time the publication was approved for printing and is subject to change without notice or liability. Meritor Heavy Vehicle Systems, LLC, reserves the right to revise the information presented or to discontinue the production of parts described at any time.

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#### 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 ArvinMeritor.

#### **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

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**

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.

- 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.
- 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 HÉPÁ vacuum to loosen and vacuum residue from the brake parts
- As an alternative procedure, use a catch basin with water and a biodegradable, nonphosphate, 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.
- 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
- 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.
- **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.
- 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.
- 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 ArvinMeritor.

#### **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

- Separate Work Areas. Whenever feasible, service brakes in a separate area away from other operations to reduce risks to unprotected persons.
- Respiratory Protection. OSHA has set a maximum allowable level of exposure for silica of 0.1 mg/m³ 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.

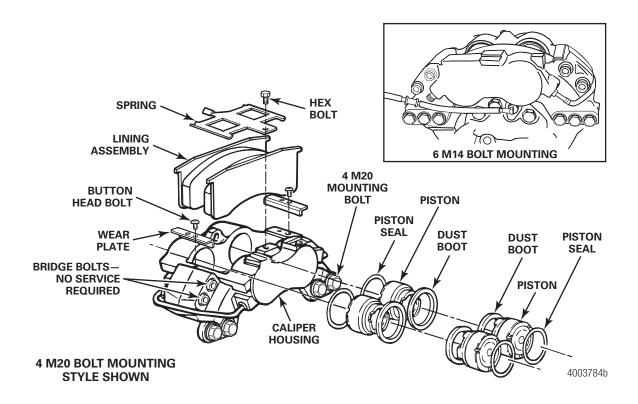
Therefore, wear respiratory protection at all times during brake servicing, beginning with the removal of the wheels. Wear a respirator equipped with a high-efficiency (HEPA) filter approved by NIOSH or MSHA, if the exposure levels may exceed OSHA or manufacturers recommended maximum levels. Even when 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.
- 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.
- 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.
- 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.
- 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.
- **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.
- 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.
- 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.
- 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

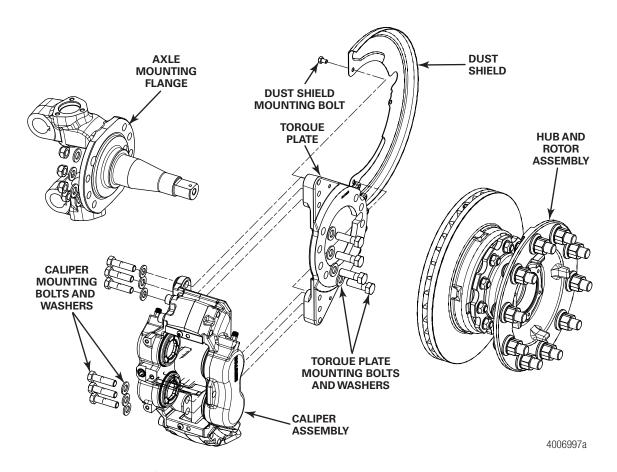
#### **Regulatory Guidance**

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

## 1 Exploded Views



## 1 Exploded Views



The general assembly sequence is as follows.

- 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.

#### **Features**

### Four-Piston Quadraulic™ Disc Brake Caliper

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

There are two caliper-to-torque plate mounting styles for both the 64 mm and 70 mm size calipers. One uses six M14 bolts and the other uses four M20 bolts.

#### **Caliper**

Meritor caliper assemblies 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

The calipers are available in two sizes based on piston diameter: 64 mm or 70 mm. They are visually identifiable by boot color (64 mm is red, 70 mm is black).

Check for an assembly number on the side of the caliper for specific handed part numbers.

## **Torque Plate**

The torque plate assembly 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 system 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 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 hydraulic caliper assembly consists of a caliper housing and four pistons. The housing is bolted directly to the torque plate. The torque plate is bolted to the axle flange or may be integrated with the axle.

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 2.1 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 Section 6.

During a 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.

## 2 Introduction

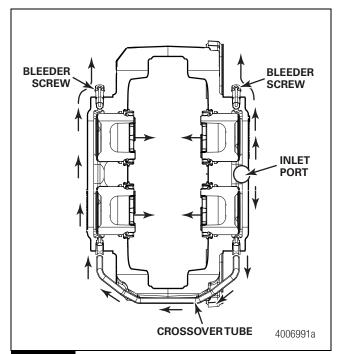


Figure 2.1

## **Hazard Alert Messages**

Read and observe all Warning and Caution hazard alert messages in this publication. They provide information that can help prevent serious personal injury, damage to components, or both.

#### **A** DANGER

Before you perform 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 you cannot reduce this pressure by switching off the ignition or removing the battery. To prevent death, serious personal injury or damage to components, you must carefully follow procedures for the hydraulic system you are servicing.

#### **WARNING**

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.

Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving. Support the vehicle with safety stands. Do not work under a vehicle supported only by jacks. Jacks can slip and fall over. Serious personal injury and damage to components can result.

## ASBESTOS AND NON-ASBESTOS FIBERS WARNING

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. You must use caution when you handle both asbestos and non-asbestos materials.

#### Removal

#### **Brake Pads**

Visually inspect all brake pads. Replace the pads when the remaining lining reaches 1/8-inch (3.175 mm) thickness.

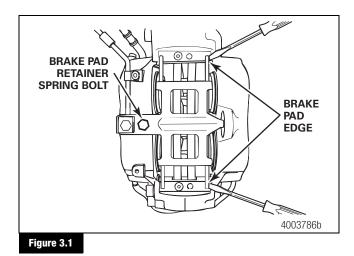
- If you replace the pads: Replace all the disc brake pads at the same time to maintain original brake balance.
- If a complete vehicle pad replacement is not necessary or desirable: Replace the pads on both wheel ends on the same axle.

#### Replace the Brake Pads

#### CAUTION

The brake pads must be installed when you apply 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.
- 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 3.1.

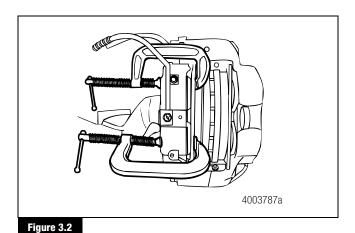


7. Insert flat screwdrivers under the brake pad edges. Work the pads out evenly to avoid binding. Figure 3.1.

#### **A** CAUTION

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

8. Compress the pistons on each side. Use a piece of plate steel stock over the pistons to uniformly distribute the load. Figure 3.2.



- 9. Inspect the rotor for scoring, warping, cracks, bluing, heat spots or other damage or defects and minimum thickness. Repair or replace if necessary.
- 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.

**NOTE:** The inboard and outboard brake pads are identical, except when they are equipped with a mechanical wear sensor.

12. Install the brake pads. Install pads equipped with a mechanical wear sensor on the inboard side of the caliper. Ensure that the friction surface is against the rotor. Install the pad retainer spring and tighten the bolt. Refer to Section 8. Figure 3.3. •

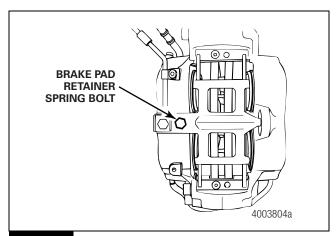


Figure 3.3

- 13. Fill the master cylinder reservoir with new, clean, high-performance DOT 3 brake fluid or equivalent. Make several brake applications to move the brake pistons and linings out into contact with the brake rotors.
- 14. Recheck the master cylinder reservoir and top off as necessary to the manufacturer's recommended level.
- 15. Install the tire and wheel assembly according to the manufacturer's instructions.
- 16. Lower the vehicle. Road test for correct operation.

## **Brake Caliper**

- 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 3.4.

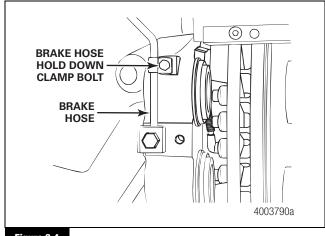


Figure 3.4

Remove the brake hose from the caliper. Figure 3.4.

#### **WARNING**

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

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 bolt procedure in Section 8. Figure 3.5.

Figure 3.5



**NOTE:** Refer to the vehicle manufacturer's rotor specifications for inspection and service requirements.

- Check the rotor while assembled to the hub or spoke wheel and mounted on the axle spindle. The lateral runout of the rotor friction 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.
  - If it is necessary to service the rotor, hub, hub seal or bearing: Remove the caliper according to the procedure in this section.
- 2. Remove the hub and rotor assembly according to the vehicle 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 3.6.

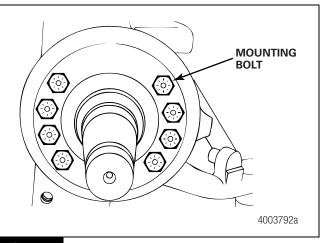


Figure 3.6

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## Disassembly

### **Brake Caliper**

- 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. 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 3.7.

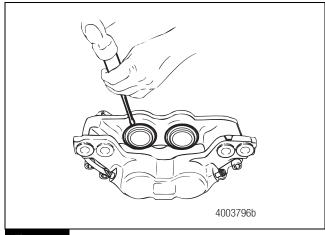


Figure 3.7

Remove the crossover tube.

#### WARNING

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

- 6. Install a plug screw in the inlet port on the inboard caliper half.
- 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 3.8.

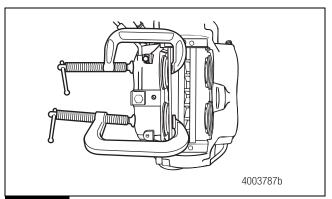
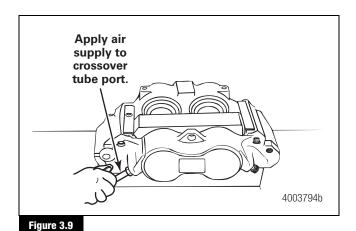


Figure 3.8

#### CAUTION

When you remove 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 low air pressure, no more than 25 psi (172 kPa), with a rubber nosed air fitting to the crossover tube port. Figure 3.9.



WARNING

Ensure the pistons are installed in the housing before you pressurize it to prevent serious personal injury and damage to components.

- Gradually open the C-clamp to allow the pistons to move out evenly until free.
- 10. Repeat the procedure for the other caliper half.

#### **A** 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.

- 11. 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.

#### **A** 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.

- 12. 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.
- 13. Inspect the caliper bore for scoring, nicks, corrosion, wear and damage.
  - If any of these conditions exist: Replace the caliper.

#### **A** CAUTION

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

- 14. Inspect the caliper bore for minor stains and corrosion.
  - If any of these conditions exist: Use a crocus cloth to remove stains or corrosion. Clean the caliper bore after using a crocus cloth. Do not use abrasives, including an emery cloth.
  - If you cannot remove stains and corrosion from the caliper bore: Replace the caliper.

## 4 Prepare Parts for Caliper Assembly

## **Hazard Alert Messages**

Read and observe all Warning and Caution hazard alert messages in this publication. They provide information that can help prevent serious personal injury, damage to components, or both.

#### **WARNING**

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.

Solvent cleaners can be flammable, poisonous and cause burns. 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 your skin.
- Work in a well-ventilated area.
- Do not use gasoline, or solvents that contain gasoline.
   Gasoline can explode.
- You must use hot solution tanks or alkaline solutions correctly. Read the manufacturer's instructions before using hot solution tanks and alkaline solutions. Then carefully follow the instructions.

## 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.

 Leave the rough parts in the tank until they are completely cleaned and heated.

- 2. Remove the rough parts from the tank.
- 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.
- Carefully inspect all parts for wear or damage before you assemble them.
- 3. Repair or replace worn or damaged parts.

#### **Apply Corrosion Protection**

- Apply a thin layer of brake fluid to cleaned, dried parts. Be careful that you do not apply the fluid to the linings or rotor.
- If you will store the parts, apply a rust inhibitor, that prevents corrosion and rust, to all surfaces. Store parts inside to prevent rust and corrosion.

## **Hazard Alert Messages**

Read and observe all Warning and Caution hazard alert messages in this publication. They provide information that can help prevent serious personal injury, damage to components, or both.

#### **WARNING**

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.

## **Assembly**

### **Brake Caliper**

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.

- 1. Assemble the crossover tube. Tighten the crossover tube nuts. Refer to Section 8. •
- 2. Ensure the parts are clean and free of debris. Use compressed air to clean out and dry the grooves and passages.
- Dip new piston seals in new, clean DOT 3 hydraulic brake fluid and install into the piston seal groove in the caliper piston bores. Verify that they are correctly seated.
- 4. Apply a thin film of silicon 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 5.1.



Figure 5.1

 Apply DOT 3 hydraulic brake fluid to the outside of the caliper pistons and install them in the caliper bores with the piston steel cap facing out, verifying that they are square to the bore. Figure 5.2.

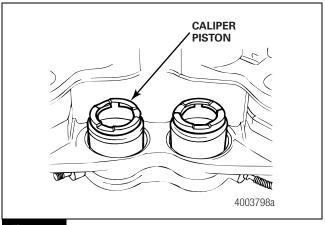


Figure 5.2

6. 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 5.3.

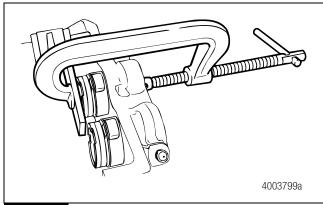
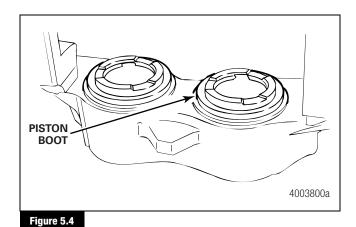


Figure 5.3

7. Install the piston boots over the projecting ends of the pistons and press the ring side of the boots into the boot bore with a seal driver or other method to evenly install the boot. An old bearing cup equal to the boot ring size helps install the boots. Verify that the piston boot bead is seated back against the shoulder of the projecting end of the piston. Boots for the 64 mm and 70 mm pistons are color-coded. The 64 mm boot is red and the 70 mm is black. Figure 5.4.

## 5 Assembly and Installation

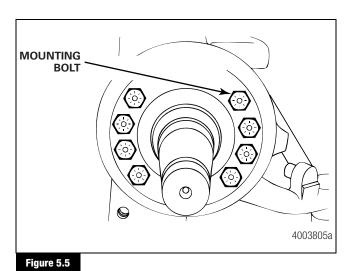


8. If required, replace the two stainless steel wear rails by removing the button head bolts.

#### Installation

#### **Torque Plate**

1. Install the torque plate mounting bolts. Tighten the bolts to the specified torque. Refer to Section 8. Figure 5.5.



- 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**

- 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.
- Check the rotor while assembled to the hub or spoke wheel and mounted on the axle spindle. The lateral runout of the rotor friction 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

Inspect the caliper before you reinstall 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 5.6.

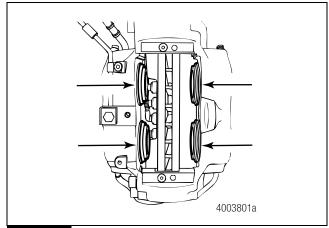
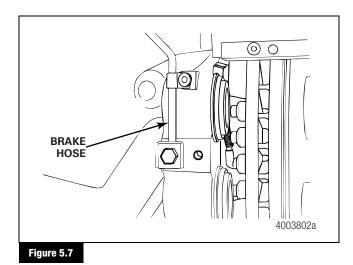


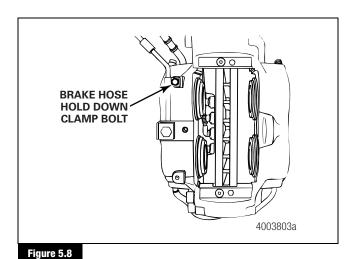
Figure 5.6

- 2. Install the caliper over the rotor. Install the washers and start the caliper-to-torque plate mounting bolts by hand.
- Depending on the caliper configuration, tighten the four M20 mounting bolts or the six M14 mounting bolts. Refer to Section 8.
- 4. Install the brake hose. Figure 5.7.

## **5** Assembly and Installation



5. Secure the brake hose hold-down clamp with the bolt. Figure 5.8.



## Brake Pads

- Inspect the rotor for scoring, warping, cracks, bluing, heat spots or other damage or defects and minimum thickness. Repair or replace if necessary.
- Inspect the disc brake calipers for leakage, damage or defects to piston boots, seals or pistons. Replace or repair the parts as required.
- 3. Clean and inspect the lining wear plates. Replace damaged or worn wear plates.

**NOTE:** The inboard and outboard brake pads are identical, except when they are equipped with a mechanical wear sensor.

4. Install the brake pads. Install pads equipped with a mechanical wear sensor on the inboard side of the caliper. Ensure that the friction surface is against the rotor. Install the pad retainer spring and tighten the bolt. Refer to Section 8. Figure 5.9.

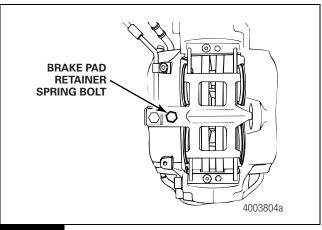


Figure 5.9

- Fill the master cylinder reservoir with new, clean, high-performance DOT 3 brake fluid or equivalent. Make several brake applications to move the brake pistons and linings out into contact with the brake rotors.
- 6. Recheck the master cylinder reservoir and top off as necessary to the manufacturer's recommended level.

### **A** CAUTION

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

- Bleed the brake system according to the vehicle manufacturer's procedure. Bleed the caliper according to the procedure specified in Section 6 of this manual.
- 8. Install the tire and wheel assembly according to the manufacturer's instructions.
- 9. Lower the vehicle. Road test for correct operation.

## Inspection

## **Hazard Alert Messages**

Read and observe all Warning and Caution hazard alert messages in this publication. They provide information that can help prevent serious personal injury, damage to components, or both.

#### WARNING

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.

## **Inspect Parts**

#### **Caliper**

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

#### **Torque Plate**

- Inspect the caliper mounting area of the torque plate for rust or corrosion. Replace a damaged or worn torque plate.
- Use a wire brush to clean the caliper mounting area.
- Inspect the torque plate for cracks or elongated bolt holes.
  - If these conditions exist: Replace the torque plate.

## **Brake Caliper Bleeding Procedure**

## DANGER

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

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

Check the master cylinder reservoir and fill, if necessary, with DOT 3 or DOT 4 brake fluid.

Bleed the brakes in the following order: right rear, left rear, right front and left front.

#### **A** CAUTION

When you bleed a four-piston caliper, monitor the brake fluid level to ensure you do not drain the system. Add brake fluid to the reservoir as needed to prevent damage to components during operation.

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.

- 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.
- Repeat the procedure for the outboard bleed screw.
- Repeat the procedure for the inboard bleed screw.
- 7. Tighten the bleed screws to specification. Refer to Section 8.
- Test the brakes prior to returning the vehicle to service.

## **Hazard Alert Messages**

Read and observe all Warning and Caution hazard alert messages in this publication. They provide information that can help prevent serious personal injury, damage to components, or both.

## **WARNING**

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.

## **Brakes**

Conditions	Possible Causes	Correction
Excessive Pedal Effort	Pads worn below minimum thickness	Install new pads.
	Faded, overheated condition, glazed pads, blued or heat-checked rotors	Replace the rotor and reface pads if sufficient lining remains.
	Grease, oil or brake fluid on linings	Install new pads in the axle sets.
	Seized or frozen pistons	Disassemble the calipers and free pistons, or replace the caliper.
	Incorrect pad friction material	Install the manufacturer recommended material.
	Incorrectly installed brake pads, backing plate facing the rotor	Inspect for damage and install the pads with the friction material toward the rotor.
Pedal Pulsation (Brake Roughness or Chatter)	Excessive lateral runout of brake rotor	Check with a dial indicator. Install a new rotor if the runout exceeds the maximum specified.
	Excessive out-of-parallelism of brake rotor	Check the parallelism or rotor thickness variation with a micrometer. Resurface the rotor or install a new rotor if the parallelism exceeds the maximum allowed.
	Loose or worn steering or suspension parts	Replace the parts and realign.
	Excessive front bearing clearance	Readjust the bearing to specifications.
Vehicle Pulls to One Side	Brake fluid, oil or grease on linings	Install new pads in the axle sets.
	Unmatched linings, uneven lining wear, distorted pads	Install new pads in the axle sets.
	Rough rotor surfaces on one rotor	Resurface or replace the rotor in the axle sets.
	Seized or frozen pistons	Disassemble the caliper and repair or replace.
	Loose caliper mounting bolts	Tighten to specifications.
	Uneven tire pressure, tread wear or size, right to left	Equalize to the recommended pressures. Install the correct size tires with good tread.
	Excessive rotor parallelism or runout	Resurface or replace the rotor.
	Restricted hose or line	Examine the hoses and lines, and replace as necessary.
	Front end out of alignment	Reset the alignment.

## 7 Troubleshooting

Conditions	Possible Causes	Correction
Leaky Caliper	Wheel seal damaged. A damaged wheel seal can make the wheel end and caliper appear as the problem.	Pressurize the caliper to determine the source of the leak. If necessary, replace the wheel seal.
	Crossover tube damaged	Repair or replace the components or housing as necessary.
	Bleeder screw damaged	Repair or replace the components or housing as necessary.
	Inlet port damaged	Repair or replace the components or housing as necessary.
	Cylinder bore surface scored or corroded	Disassemble the calipers, clean the bore and replace the seals and boots.
	Caliper piston seal damaged or worn	Disassemble the calipers and install new seals and boots.
	Caliper piston damaged	Replace the piston.
No Braking Effect or Excessive Pedal Travel	Reservoir fluid level low	Check for causes of fluid leak, repair as required and refill the reservoir. Bleed the system as needed.
	Air in the caliper	Bleed the caliper as needed. Refer to the brake caliper bleed procedure.
	Air in the hydraulic application system	Refer to the hydraulic application system manual for the correct bleeding procedure.
	Malfunction of the hydraulic application system	Refer to the hydraulic application system manual for the diagnostic procedures.
	Caliper piston seal damaged	Disassemble the caliper and replace the piston seals. Replace the piston if it is damaged.
	Excessive rotor runout or bent rotor	Check the rotor with a dial indicator. Install a new rotor if the runout exceeds the maximum specified.
	Worn or excessively loose wheel bearings	Adjust or replace the bearings as needed.
	Low quality brake fluid	Drain and clean the system. Replace with the recommended brake fluid.
	Weak brake hose that expands under pressure	Replace the hoses.
Brake Noise (Chatter)	Excessive lateral runout of rotor	Check the runout with a dial indicator. Install a new rotor if the runout exceeds the maximum specified.
	Lack of rotor parallelism	Check the parallelism with a micrometer.  Resurface or install a new rotor as required.
	Loose wheel bearing	Readjust the bearing to the specified torque.
	Incorrect pad friction material	Install the manufacturer recommended material.
	Incorrectly installed brake pads, backing plate facing the rotor	Inspect for damage and install the pads with the friction material toward the rotor.

Conditions	Possible Causes	Correction
Brake Noise (Scraping)	Rust or mud build-up on edges of rotor and on caliper housing	Clean or replace as necessary.
	Worn pad or pad installed backward	Replace the pads in the axle sets only with the friction surface against the rotor.
	Incorrect caliper alignment permitting rotor to scrape on housing	Correct the alignment.
	Incorrect pad friction material	Install the manufacturer recommended material.
	Incorrectly installed brake pads, backing plate facing the rotor	Inspect for damage and install the pads with the friction material toward the rotor.
Brake Noise (Groan)	Pressure on the brake pedal too light	Slightly increase the pedal effort to eliminate the noise.
	Incorrect pad friction material	Install the manufacturer recommended material.
	Incorrectly installed brake pads, backing plate facing the rotor	Inspect for damage and install the pads with the friction material toward the rotor.
Brake Noise (Rattle)	Excessive clearance between the shoe and caliper	Install new pads.
	Pad retainer plate missing or not correctly positioned	Install a new pad retainer spring or position it correctly.
	Incorrect pad friction material	Install the manufacturer recommended material.
	Incorrectly installed brake pads, backing plate facing the rotor	Inspect for damage and install the pads with the friction material toward the rotor.
Brake Noise (Squeal)	Glazed pads	Resurface or replace the pads in the axle sets only.
	Weak pad retainer spring	Install a new pad retainer spring.
	Foreign material embedded in linings	Replace the pads in the axle sets only.
	Incorrect pad friction material	Install the manufacturer recommended material.
	Incorrectly installed brake pads, backing plate facing the rotor	Inspect for damage and install the pads with the friction material toward the rotor.

## **Torque Specifications**

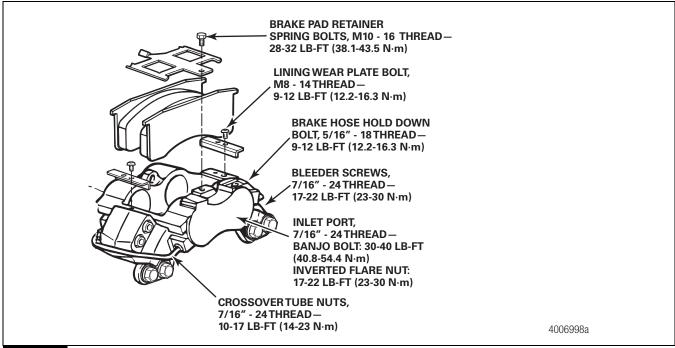


Figure 8.1

Figure 8.2

#### **Bridge Bolts**

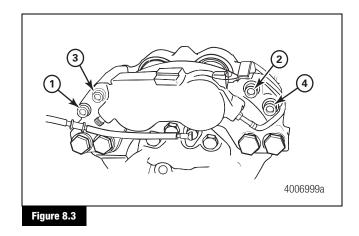
#### **WARNING**

Do not remove the bridge bolts to perform service procedures. If the bridge bolts are removed, they must be reinstalled correctly or serious personal injury, brake loss or damage to components can result.

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 ArvinMeritor'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.
  - Tighten the bolts to an initial torque of 50 lb-ft (68 N•m) in the sequence 1, 2, 3, 4. Figure 8.3. **1**
  - B. Use torque angle equipment to turn the bolts 70 + 3/-2 degrees in the sequence 1, 2, 3, 4.



(19)

## 8 Specifications

## Four-Piston Quadraulic™ Disc Brake Components

Description	Specification
Brake Pad — Thickness Above Metal (New) Minimum	0.73" (18.5 mm)
Thickness Above Metal (Discard)	0.125" (3.2 mm)
Brake Fluid — High-Performance Brake Fluid (Per Manufacturer's Recommendation)	DOT 3 or DOT 4