



an **ArvinMeritor** brand

# Maintenance Manual 4M

## Air Disc Brakes

Revised 04-05



# Service Notes

## About This Manual

This manual provides instructions for Meritor air disc brakes.

## Before You Begin

1. Read and understand all instructions and procedures before you begin to service components.
2. 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.
4. 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.

### 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 the DriveTrain Plus™ by ArvinMeritor Tech Library at [arvinmeritor.com](http://arvinmeritor.com) to easily access product and service information. The Library also offers an interactive and printable Literature Order Form.

## ArvinMeritor's Customer Service Center

Call ArvinMeritor's Customer Service Center at 800-535-5560.

## Technical Electronic Library on CD

The DriveTrain Plus™ by ArvinMeritor Technical Electronic Library on CD contains product and service information for most Meritor and Meritor WABCO products. \$20. Specify TP-9853.

## 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.

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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 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 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, 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 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

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.

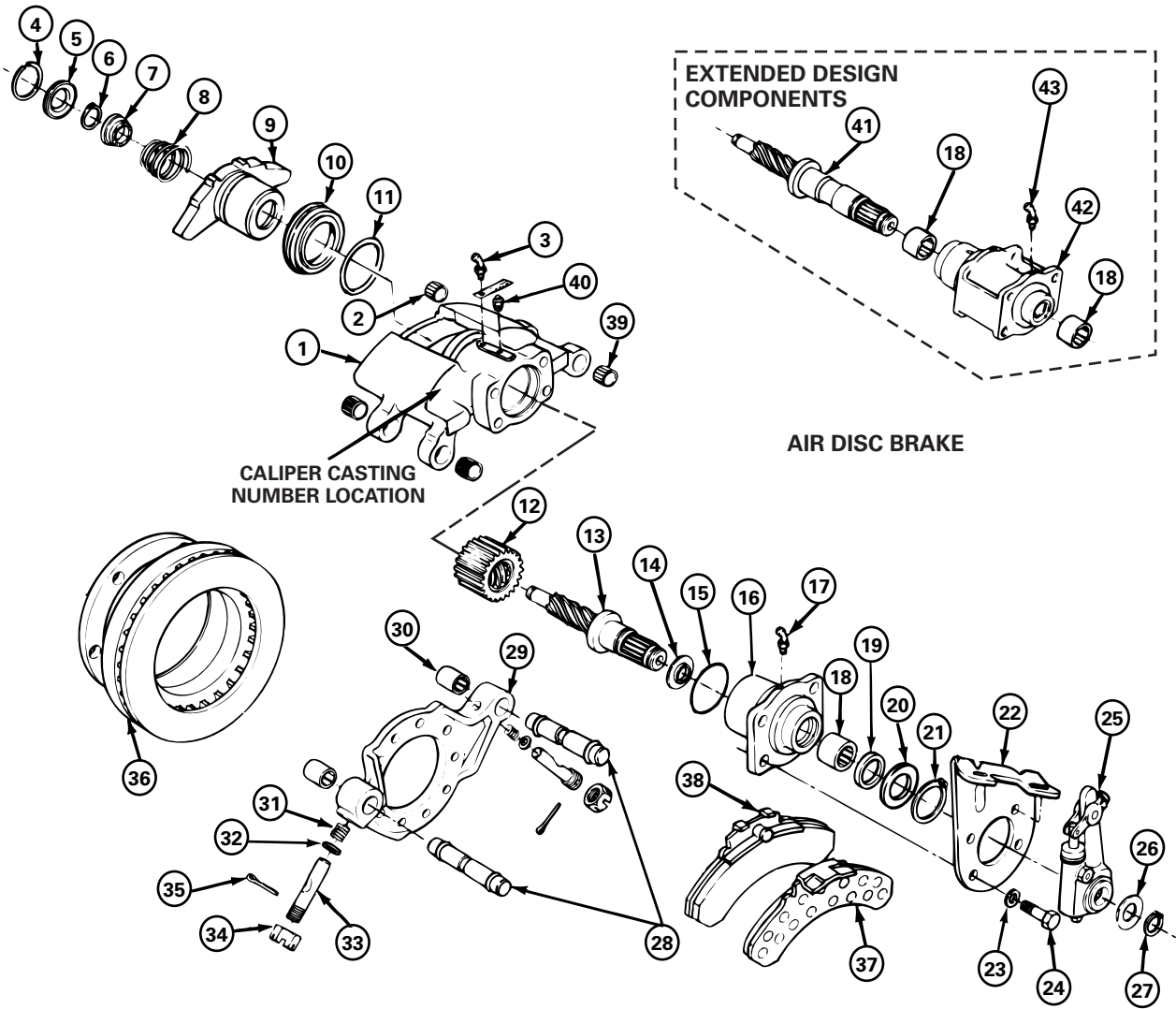
5. **Worker Clean-Up.** After servicing brakes, wash your hands before you eat, drink or smoke. Shower after work. Do not wear work clothes home. Use a vacuum equipped with a HEPA filter to vacuum work clothes after they are worn. Launder them separately. Do not shake or use compressed air to remove 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.

# 1 Exploded Views

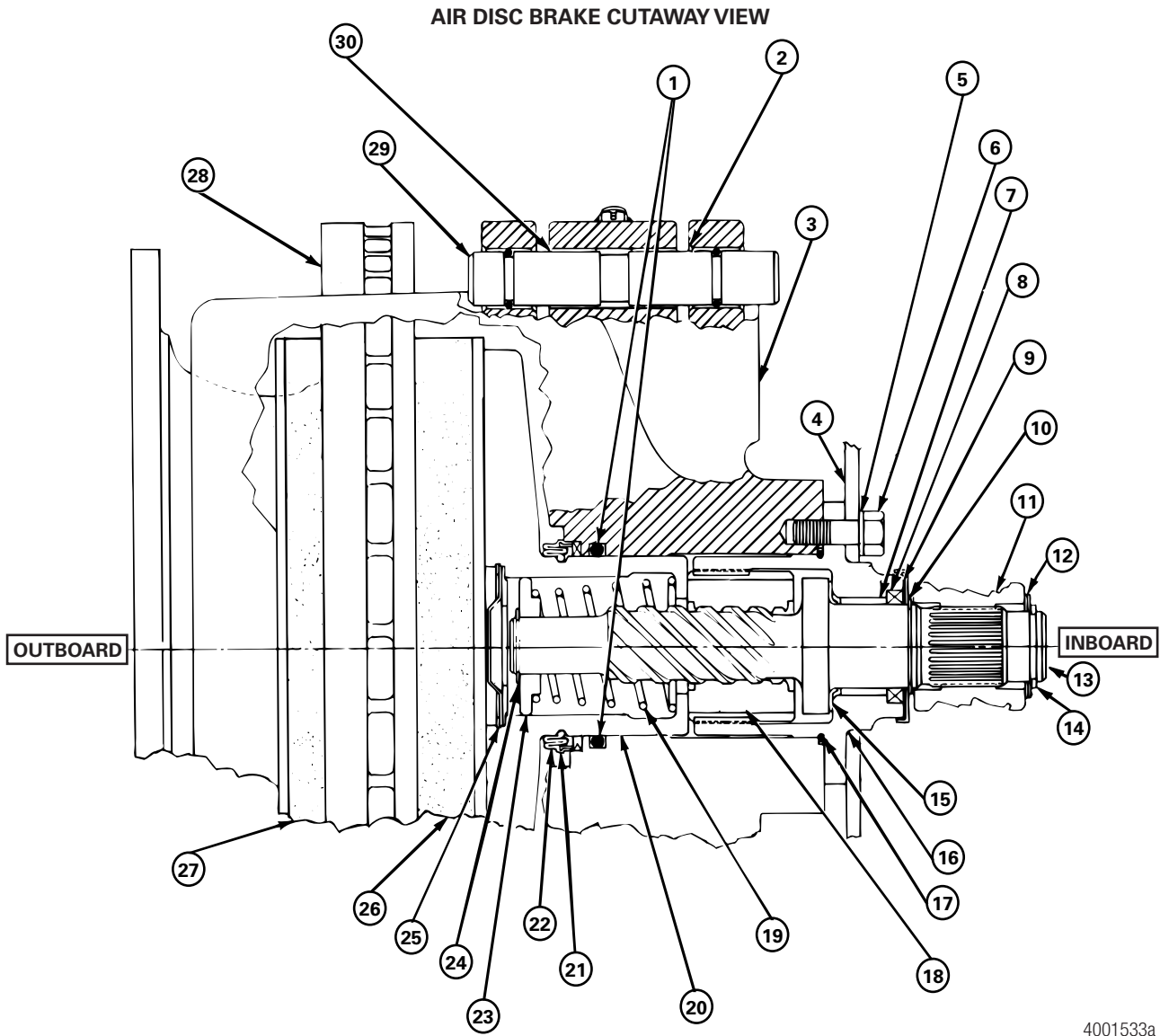


# 1 Exploded Views

<b>Item</b>	<b>Description</b>
1	Caliper
2	Bushing — Caliper Slide Pin, Outer
3	Fitting — Grease
4	Snap Ring — Seal Retaining
5	Seal Assembly — Brake Piston End
6	Snap Ring — Spring Retaining
7	Bushing — Camshaft Inner Pilot
8	Spring — Piston Return
9	Piston — Brake Shoe
10	Boot — Caliper/Piston
11	O-Ring — Brake Piston to Caliper
12	Nut — Actuator
13	Camshaft
14	Washer — Camshaft Thrust
15	O-Ring
16	Cap — Camshaft
17	Fitting — Grease
18	Bushing — Camshaft, Two Used with Extended Camshaft Cap
19	Seal — Camshaft Cap
20	Dust Cover — Camshaft Retaining
21	Snap Ring — Camshaft Retaining
22	Bracket — Air Chamber
23	Washer — Chamber Bracket Capscrew
24	Capscrew — Chamber Bracket
25	Automatic Slack Adjuster
26	Washer — Slack Adjuster
27	Snap Ring — Slack Adjuster
28	Slide Pin — Caliper
29	Torque Plate
30	Bushing — Torque Plate
31	Spring — Slide Pin Retainer
32	Washer — Slide Pin Retainer
33	Slide Pin Retainer
34	Nut — Slide Pin Retainer

<b>Item</b>	<b>Description</b>
35	Cotter Pin — Slide Pin Retainer
36	Disc, Rotor, Vented Type
37	Inner Shoe and Lining Assembly
38	Outer Shoe and Lining Assembly
39	Bushing — Caliper Slide Pin, Inner
40	Fitting — Pressure Relief
41	Extended Camshaft, Optional for Certain Applications
42	Extended Cap — Camshaft, Optional for Certain Applications
43	Fitting — Grease, Used with Extended Camshaft Cap

# 1 Exploded Views



4001533a



<b>Item</b>	<b>Description</b>
1	O-Ring, on Units Manufactured from Late 1991 to Present
2	Caliper Bushing
3	Caliper
4	Air Chamber Bracket
5	Washer
6	Capscrew
7	Outer Camshaft Cap Bushing
8	Camshaft Cap Seal
9	Camshaft Cap Dust Cover
10	Snap Ring, Camshaft Retaining
11	Automatic Slack Adjuster
12	Outer Slack Adjuster Washer
13	Camshaft
14	Snap Ring, Slack Adjuster Retaining
15	Camshaft/Cap Thrust Washer
16	Camshaft Cap
17	Camshaft Cap O-Ring
18	Camshaft Nut
19	Piston Return Spring
20	Brake Piston
21	Brake Piston/Caliper Seal, on Units Manufactured Before Late 1991
22	Brake Piston/Caliper Boot
23	Inner Spring Retainer/Camshaft Bushing
24	Snap Ring, Spring Retaining
25	Piston Seal and Snap Ring
26	Inboard Shoe and Lining Pad
27	Outboard Shoe and Lining Pad
28	Disc, Rotor — Vented Type
29	Slide Pin
30	Torque Plate Bushing

## 2 Introduction

### Overview

#### Model Code

The model codes and applications for Meritor air disc brakes are described in Figure 2.1. Air disc brake model ADB 1760 is available only on tandem drive axles with air suspensions.

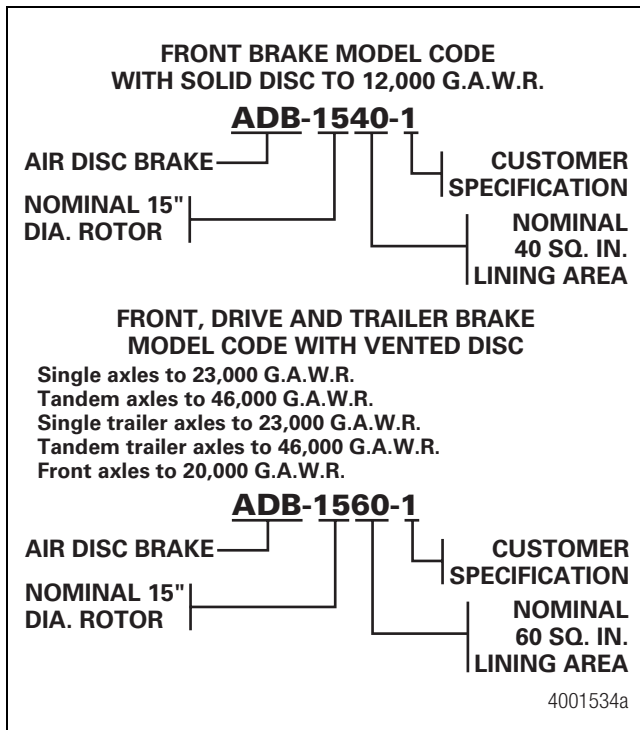


Figure 2.1

#### Description

Meritor air disc brakes have the following features.

- An easily visible indicator for lining wear
- A caliper that pivots away from the disc (rotor) for quick shoe and lining (pad) changes
- A Meritor automatic slack adjuster
- A caliper that is sealed and lubricated to protect the components that actuate the brake
- Standard service air chambers or air chambers with springs

#### How the Brake Functions

When the brakes are applied, the push rod of the air chamber pushes the automatic slack adjuster that is mounted to the camshaft of the brake. The movement of the slack adjuster rotates the camshaft, which causes the camshaft nut to slide out along the camshaft.

The nut pushes the piston and the inboard lining, pad, against the disc or rotor. The force of the inboard lining on the disc or rotor pulls the caliper in along the slide pins.

The movement of the caliper places the outboard pad into contact with the disc or rotor. The result is clamping force on both sides of the disc or rotor. Figure 2.2.

When the brakes are released, the piston return spring retracts the piston, which forces the nut back to its starting position. This action releases the clamping force on the disc or rotor.

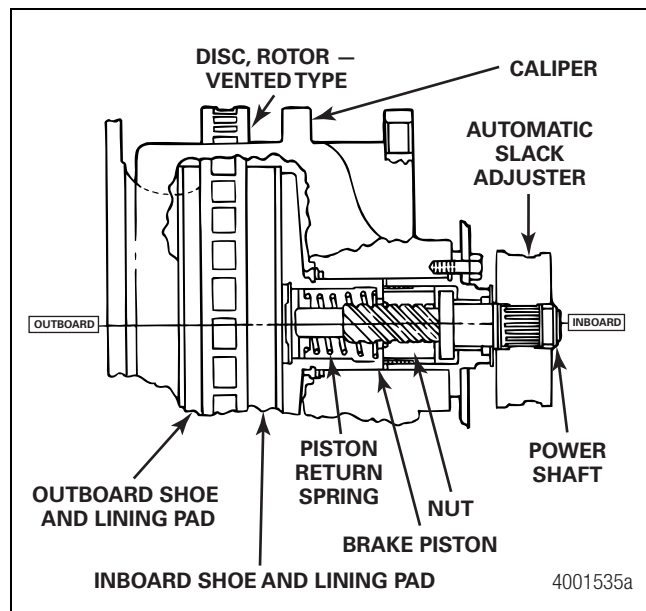


Figure 2.2

## 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.

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.

## Removal

### Caliper

1. Park the vehicle on a level surface and block the wheels.
2. Remove all the air from the air system.
3. Remove the air lines from the air chamber.

### **⚠ WARNING**

Before you service a spring chamber, carefully follow the manufacturer's instructions to compress and lock the spring to completely release the brake. Verify that no air pressure remains in the service chamber before you proceed. Sudden release of compressed air can cause serious personal injury and damage to components.

4. If the vehicle has spring brakes, manually compress and lock the springs to release the brakes. You must check to ensure that no air pressure remains in the service halves of the air chambers.
5. Remove the top slide pin. Temporarily raise the caliper into position over the disc (rotor). Figure 3.1.
6. Install the top slide pin through the outboard caliper boss and into the torque plate to support the caliper.

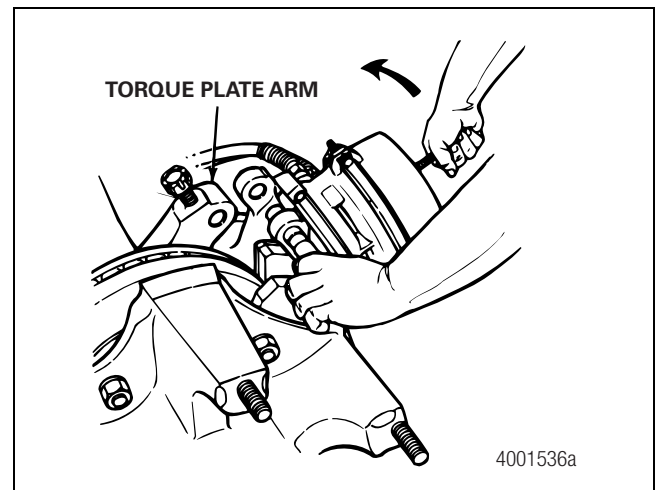


Figure 3.1

### **⚠ WARNING**

When you remove a clevis pin that has a spring on it, hold the spring with pliers. The spring can disengage from the clevis pin with enough force to cause serious personal injury.

7. Remove both clevis pins from the slack adjuster.
8. Remove the stud nuts that hold the air chamber to the bracket. Remove the air chamber. Figure 3.2.

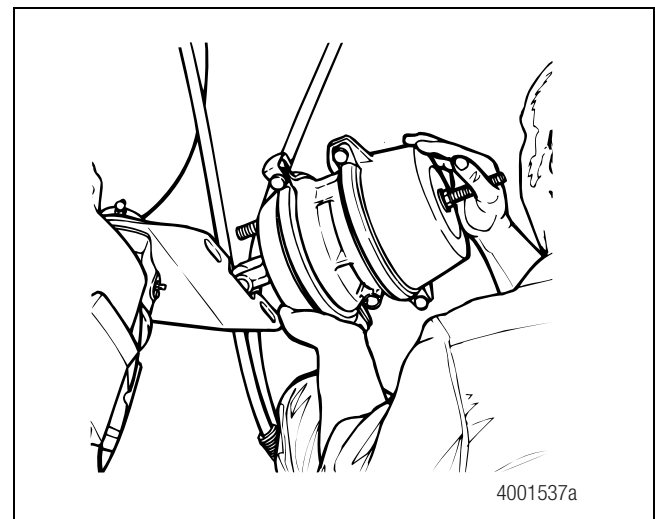


Figure 3.2

## 3 Caliper

9. Remove the cotter pin from the bottom slide pin retainer. Loosen the nut on the retainer. Figure 3.3.

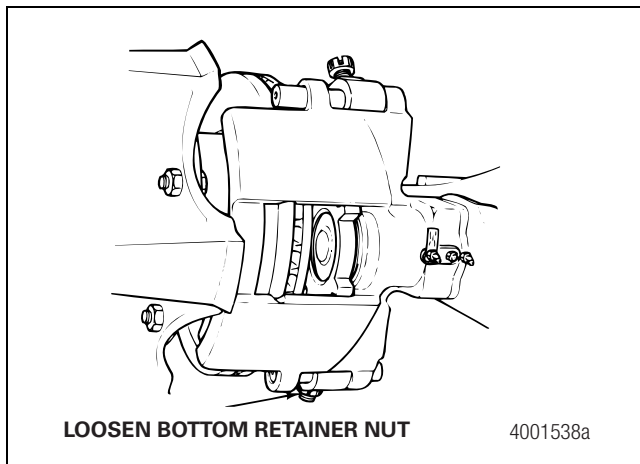


Figure 3.3

### ⚠ WARNING

Use a brass or synthetic mallet for assembly and disassembly procedures. Do not hit steel parts with a steel hammer. Pieces of a part can break off. Serious personal injury and damage to components can result.

10. Press the end of the retainer to release the slide pin. Pull the bottom slide pin out of the caliper and the torque plate. If you cannot press the retainer or remove the slide pin by hand, use the following procedures.
  - A. Apply penetrating oil to help loosen the retainer. Turn the nut until the end of the retainer is below the top of the nut. Hit the nut with a brass or leather mallet to loosen the retainer.
  - B. Install a slide hammer into the threaded hole in the end of the slide pin. If necessary, install an extension bar to the slide hammer for clearance.
  - C. Press the end of the retainer to release the slide pin. Use the knocker to loosen and remove the pin.
11. Pull the bottom of the caliper away from the disc (rotor) and support the caliper. Figure 3.4.
12. Remove the top slide pin using the same procedures you used to remove the bottom slide pin. Lift the caliper away from the disc (rotor).

## Installation

### Caliper

1. Remove dirt, paint or other material from the slide pins.
2. Support the caliper while you align the bores in the top of the caliper and the torque plate. Install the top slide pin through the caliper and into the torque plate from the outboard side. Install the pin so that its threaded hole is toward the outboard side. Figure 3.4.

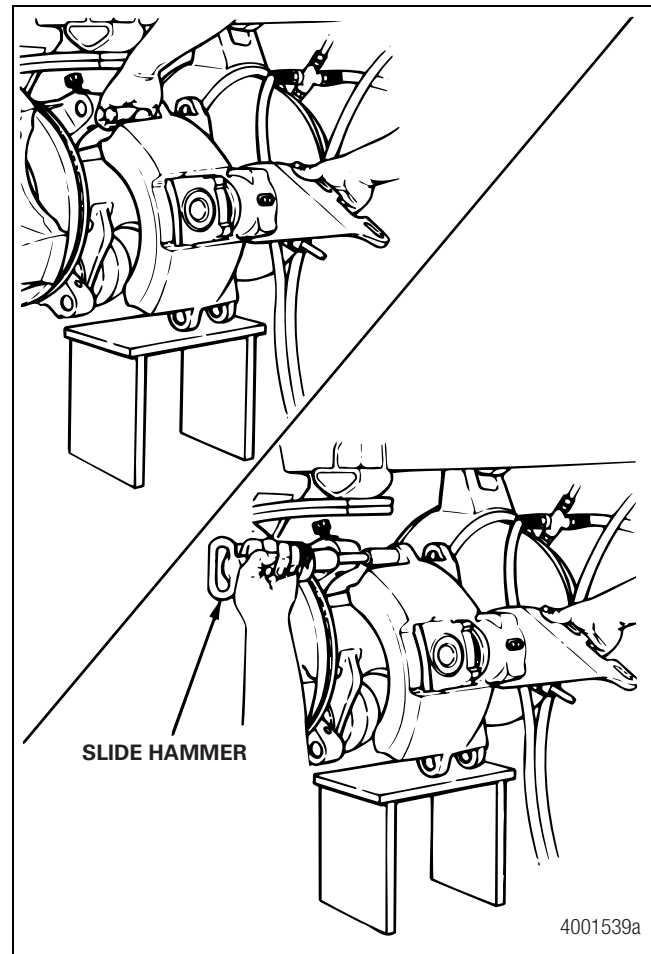
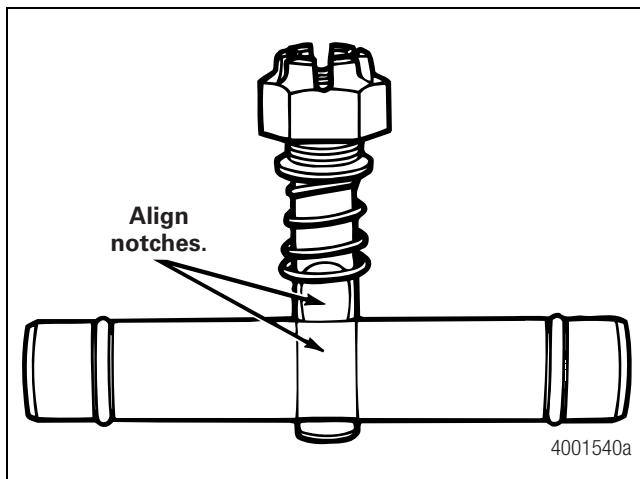


Figure 3.4

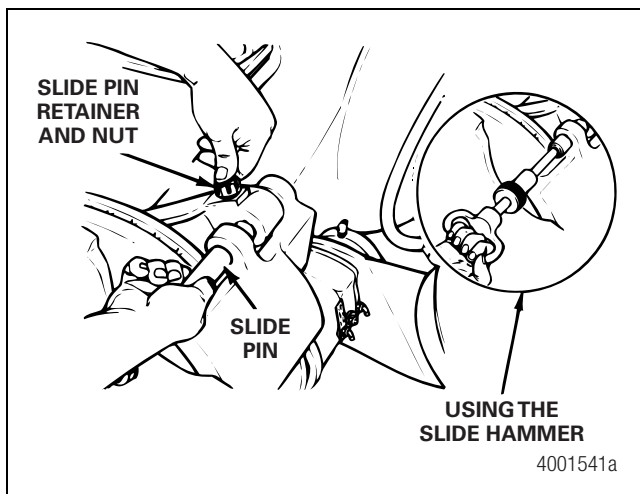
**NOTE:** The notch in the slide pin must be aligned with the slide pin retainer.

- The notch in the slide pin retainer must be toward the bore for the slide pin. The notches in the retainer and the slide pin must engage when you install the slide pin. Figure 3.5.



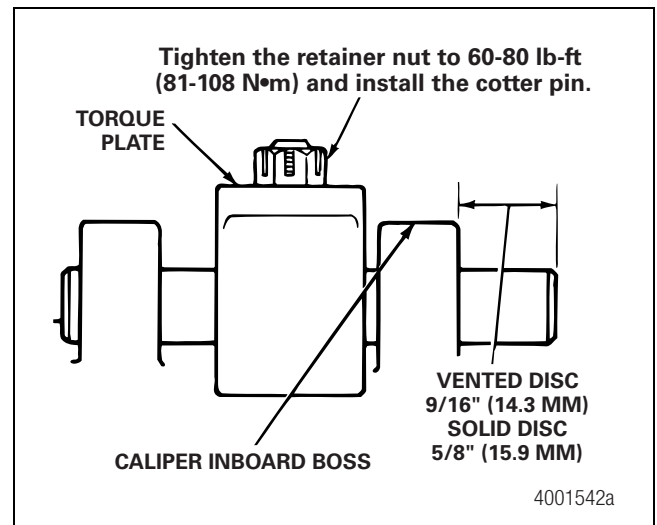
**Figure 3.5**

- Push down the retainer and push in the slide pin. Figure 3.6. The retainer will snap out when the notches engage.



**Figure 3.6**

- To correctly install the slide pin, the pin must extend past the inboard boss of the caliper, as shown in Figure 3.7.



**Figure 3.7**

- Check for grease on the slide pin retainer threads. Wipe clean, if necessary. Tighten the nut on the slide pin retainer to 60 lb-ft (81 N•m). Figure 3.7.
- Tighten the nut to the next slot and install a new cotter pin through the nut and retainer. DO NOT exceed 80 lb-ft (108 N•m).
- Repeat Steps 2-7 to install the bottom slide pin.

## Calipers with Helper Springs

- Support the caliper.
- Install one spring on each slide pin between the torque plate and the OUTBOARD caliper boss. Figure 3.8.
- Position the large end of the helper spring toward the torque plate.
- Install the slide pin with its threaded hole OUTBOARD.
- Install the pin through the caliper and helper spring into the torque plate.

### 3 Caliper

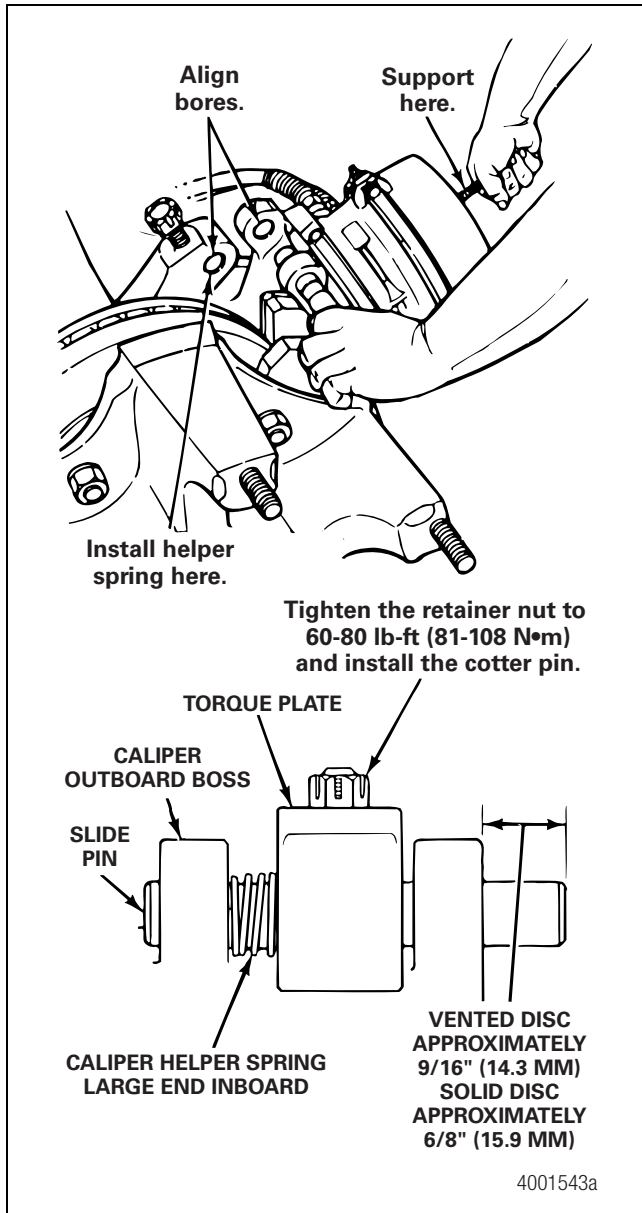


Figure 3.8

## 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.

## Inspection

### Caliper Bushings

#### ⚠️ CAUTION

When a caliper bushing is worn, you must replace all four bushings in the caliper with a new set of caliper bushings. Do not install new bushings with old bushings in the same caliper. Slide pin sticking and binding will occur that can result in premature lining wear.

#### When the Caliper Is Mounted onto the Vehicle

- Use a pin gauge (J-34064-54) to check for bushing wear. When the gauge fits between the slide pin and bushing, the slide pin or bushing is worn and must be replaced. Figure 4.1. To obtain the pin gauge, contact SPX Kent-Moore at 800-328-6657.

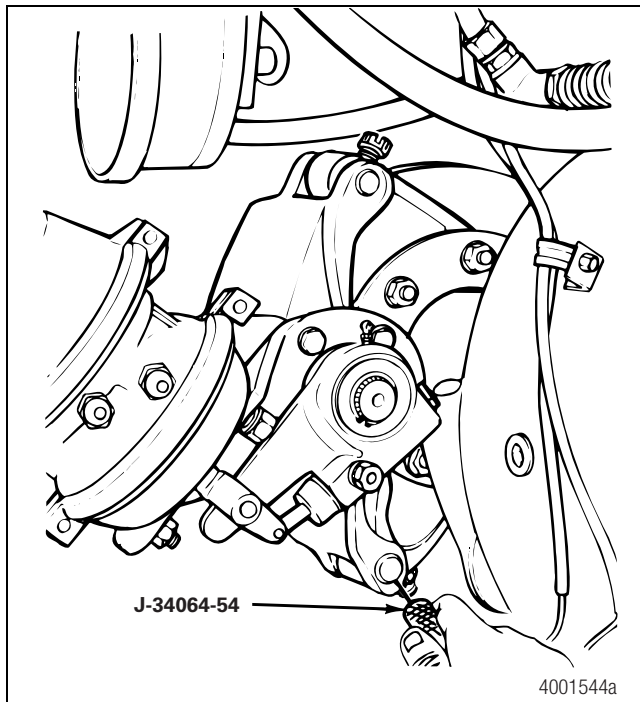


Figure 4.1

#### When the Caliper Is Removed from the Vehicle

- Clean and inspect the bushings for damage.

#### ⚠️ CAUTION

If a slide pin wears completely through a caliper bushing, remove the bushing and inspect the caliper bore for wear. If the caliper bore is worn, you must replace the caliper. A worn caliper bore can cause brake drag. Damage to components can result.

- Use a plug gauge (J-34064-53) to check for bushing wear. When the gauge fits into the bushing, the bushing is worn and must be replaced. Figure 4.2. Refer to the procedure in this section. To obtain the plug gauge, contact SPX Kent-Moore at 800-328-6657.

If you do not have a plug gauge, measure the inner diameter of all four caliper bushings at three locations. Figure 4.3. Replace all four bushings if the diameter of any bushing exceeds 1.052-inches (26.72 mm).

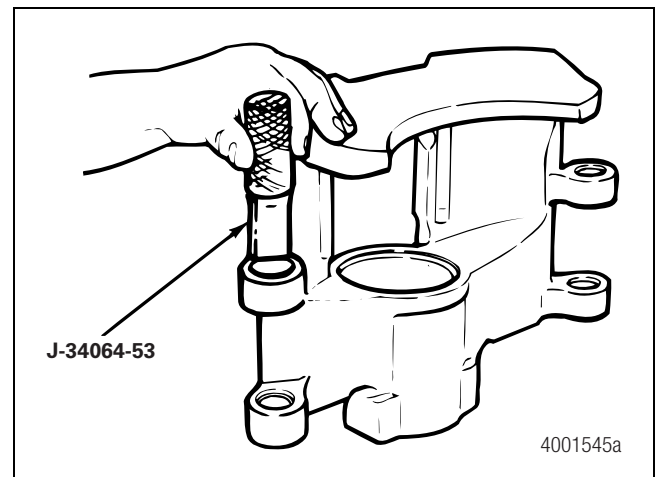


Figure 4.2

## 4 Caliper Bushings

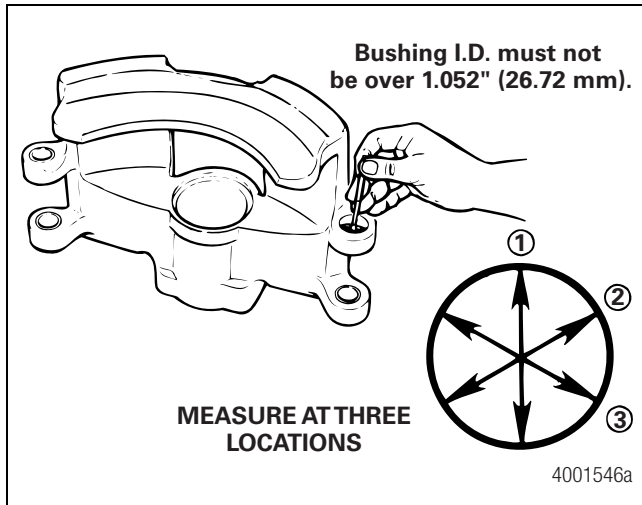


Figure 4.3

### Removal

#### Caliper Bushings

##### ⚠ WARNING

Use a brass or synthetic mallet for assembly and disassembly procedures. Do not hit steel parts with a steel hammer. Pieces of a part can break off. Serious personal injury and damage to components can result.

1. Remove the caliper from the vehicle. Refer to Section 3.

##### ⚠ CAUTION

Support the caliper boss when you remove the bushings. The force used to drive a bushing can break the boss when the boss is unsupported. Damage to the components can result.

2. Support the caliper boss.
3. Use a bushing driver and a press or mallet to remove the bushings. Figure 4.4.

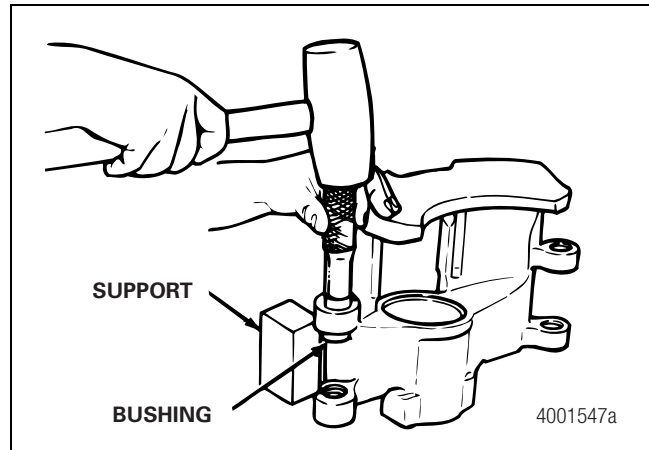


Figure 4.4

### Inspection

#### Caliper Bores

##### ⚠ WARNING

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.
1. Use solvent cleaners to clean the bore. Inspect the bore for wear or damage.
  2. Measure the diameter of the bore at three locations. The diameter must equal 1.118-1.120-inches (28.397-28.448 mm). When any of the bores exceed 1.120-inches (28.448 mm), you must replace the caliper. Figure 4.5.



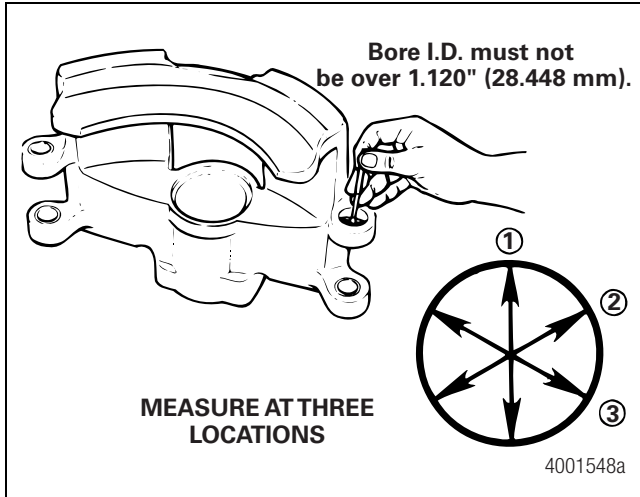


Figure 4.5

## Installation

### Caliper Bushing Kits and Special Tools

#### Caliper Bushing Kits

Two caliper bushing kits are available for Meritor air disc brakes. Each kit includes the four bushings required for each caliper. The bushings are serrated on the outside diameter and do not require burnishing, sizing, when correctly installed. Figure 4.6. To obtain a bushing kit, refer to the Service Notes page on the front inside cover of this manual.

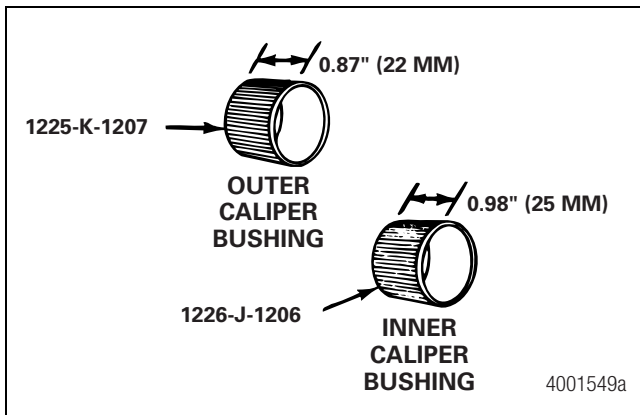


Figure 4.6

#### KIT 15010 for ADB 1560 and 1760 Calipers (Replaces KITS 15005 and 15008)

Description	Applications	Length Inch (mm)	Quantity
Outer Caliper Bushing	ADB 1560 and ADB 1760	0.87-7/8 (22)	2
Inner Caliper Bushing	ADB 1560 and ADB 1760	0.98-63/64 (25)	2

#### KIT 15011 for ADB 1540 Calipers (Replaces KIT 15004)

Description	Application	Length Inch (mm)	Quantity
Caliper Bushings	ADB 1540	0.87-7/8 (22)	4

#### Bushing Drivers

Inner and outer bushing drivers are required to correctly align new bushings during installation. You may make the drivers according to the specifications shown in Figure 4.7. To obtain the bushing drivers, refer to the Service Notes page on the front inside cover of this manual.

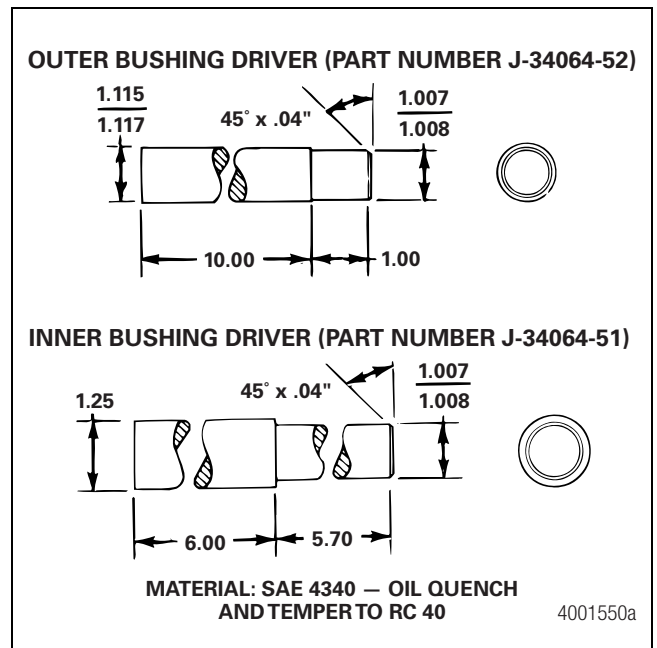


Figure 4.7

## 4 Caliper Bushings

### Prepare to Install the Bushings

1. Check that the caliper bores are clean and undamaged.
2. Measure and note the length of the inner and outer bosses to ensure you install the correct bushings into each boss.
  - **Model ADB 1540:** All bosses are 0.87-inch (22 mm) long.
  - **Models ADB 1560 and ADB 1760:** The inner boss length is approximately one-inch (25.4 mm). The outer boss length is approximately 0.87-inch (22 mm). Figure 4.8.

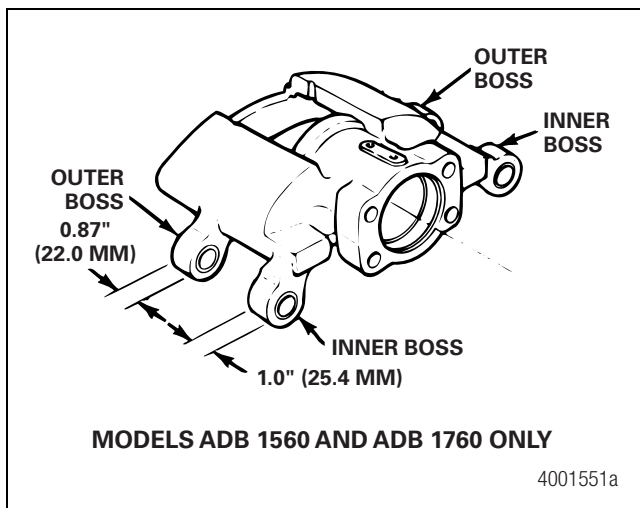


Figure 4.8

3. Install the outer bushings before installing the inner bushings. Refer to the procedure in this section.

### Install the Outer Bushings

#### ⚠ WARNING

When a caliper bushing is worn, you must replace all four bushings in the caliper with a new set of caliper bushings. Do not install new bushings with old bushings in the same caliper. Slide pin sticking and binding will occur and can result in premature lining wear.

#### ⚠ CAUTION

When you install the bushings, support the caliper bosses. The force used to drive a bushing can break a boss, if the boss is not supported.

1. Support the caliper bosses.

#### ⚠ WARNING

Use a brass or synthetic mallet for assembly and disassembly procedures. Do not hit steel parts with a steel hammer. Pieces of a part can break off. Serious personal injury and damage to components can result.

2. Use the outer bushing driver and a mallet or press to install the outer bushings. This will avoid damaging the inner diameters of the bushings. Figure 4.9.

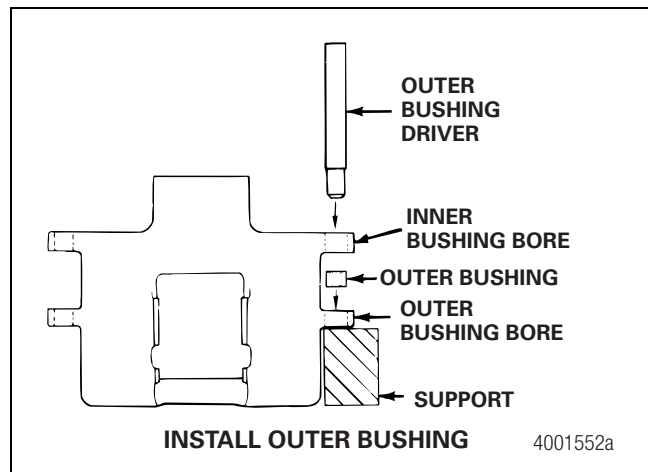


Figure 4.9

3. Set the caliper on a bench with the bushing bores on top.
4. Align the small diameter end of the outer bushing driver through the inner bushing bore and into the outer bushing. Figure 4.9.
5. Carefully tap or press-in the bushing driver until the outer bushing is centered in the bore. The bushing must not extend past either side of the caliper boss.
6. Install the inner bushings. Refer to the procedure in this section.

### Install the Inner Bushings

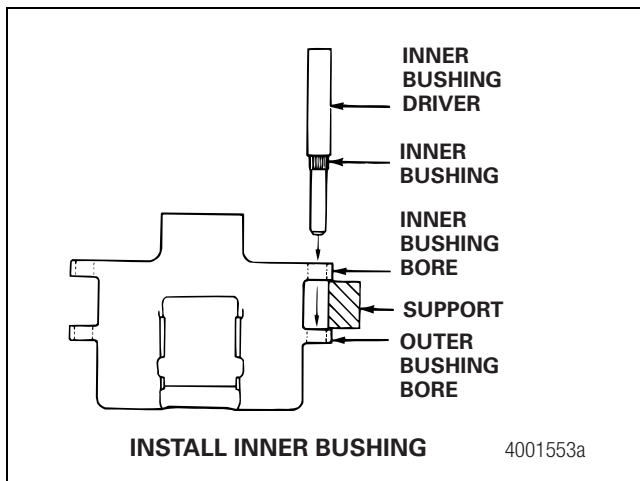
#### ⚠ CAUTION

When you install the bushings, support the caliper bosses. The force used to drive a bushing can break a boss, if the boss is not supported.

1. Support the caliper bosses.

**NOTE:** Avoid damaging the inner diameters of the bushings by using the inner bushing driver and a mallet or press to install the inner bushings.

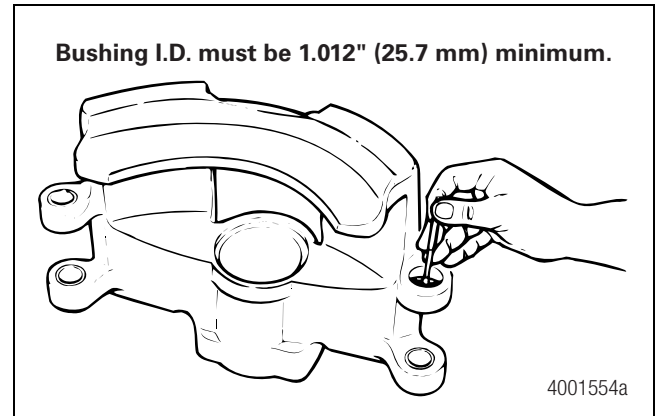
2. Use the inner bushing driver and a mallet or press to install the inner bushings. Figure 4.10.



**Figure 4.10**

3. Align the small diameter end of the inner bushing driver through the inner bushing, inner bushing bore and installed outer bushing. Figure 4.10.
4. Carefully tap or press-in the bushing driver until the inner bushing is centered in the bore. The bushing must not extend past either side of the caliper boss.
5. Remove the caliper boss support.
6. Measure the inner diameters of the outer and inner bushings to verify correct installation. Each bushing inner diameter must equal 1.012-inches (25.7 mm). Figure 4.11.

- **When a bushing inner diameter is smaller than specification:** Ream the bushing inner diameter to 1.012-inches (25.7 mm). To obtain a reamer, contact Meritor Aftermarket Services at 888-725-9355 or SPX Kent-Moore at 800-328-6657 and request part number J-38388.
- **When a bushing inner diameter is larger than specification:** Install a new bushing. Refer to the procedure in this section.



**Figure 4.11**

## 5 Caliper/Piston Boot and O-Ring

### 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.

### Removal

#### Caliper/Piston Boot and O-Ring

**NOTE:** The figures show removal of the boot and O-ring with the caliper on a bench. The same procedures can be used to remove the boot and O-ring while the caliper is mounted to the torque plate. The procedures can be more difficult to perform while the caliper is mounted to the torque plate.

1. Use a pointed tool to remove the snap ring from the piston bore. Figure 5.1.

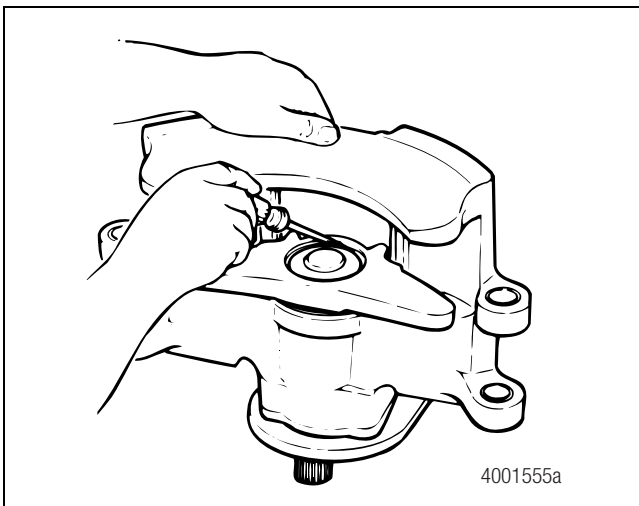


Figure 5.1

2. Remove the pressure relief valve from the caliper. Place a rag over the piston. Carefully apply air pressure through the relief valve hole to force the seal from the caliper. Figure 5.2.

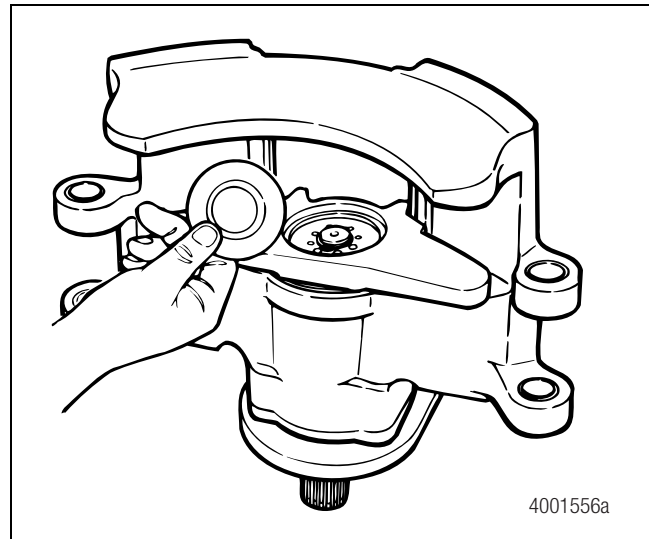


Figure 5.2

3. Discard the old seal. Install the pressure relief valve in the caliper.

**NOTE:** If you are working on a vented disc or rotor brake, install the spacer over the bearing and nut assembly.

4. Assemble the adaptor tool as shown in Figure 5.3. To obtain an adaptor tool, refer to the Service Notes page on the front inside cover of this manual.

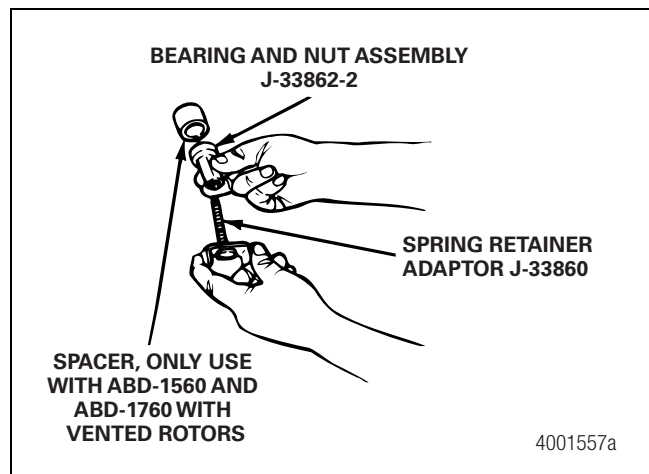
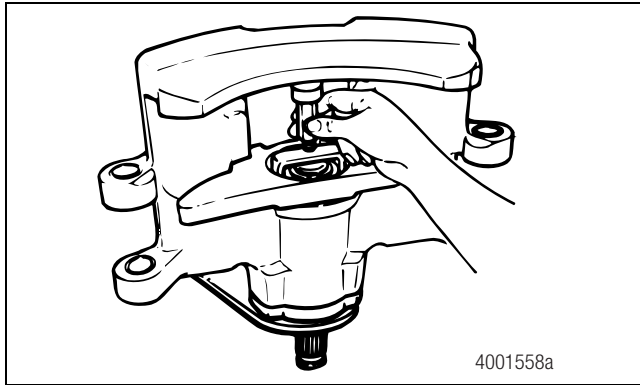


Figure 5.3

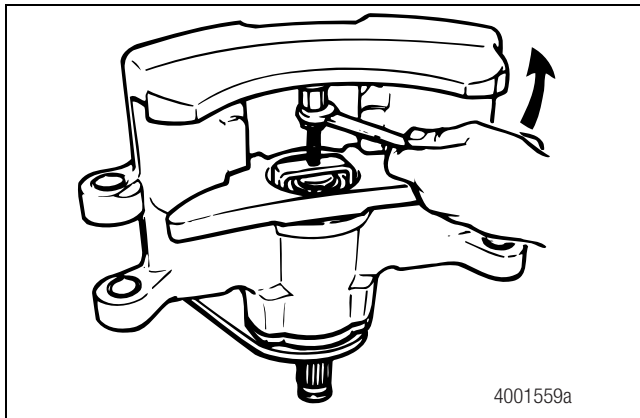
5. Use the adaptor tool to remove the spring retainer. Position the tool between the spring retainer and the caliper leg, and directly over the spring retainer. Figure 5.4.

## 5 Caliper/Piston Boot and O-Ring



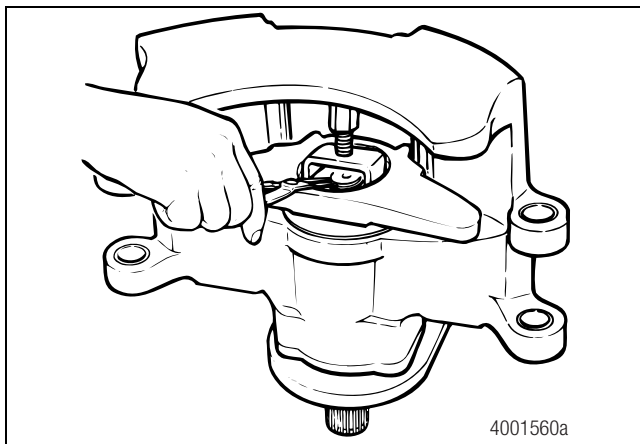
**Figure 5.4**

6. Turn the nut and force it against the spacer or the caliper to release the return spring pressure on the snap ring. Figure 5.5.



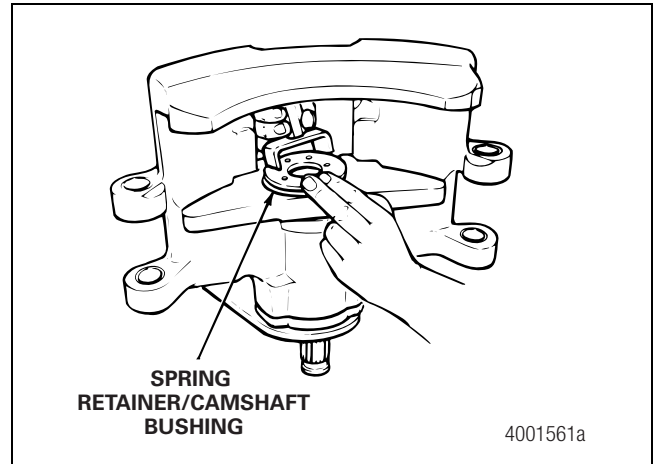
**Figure 5.5**

7. Use 45-degree snap ring pliers to remove the snap ring. Figure 5.6.



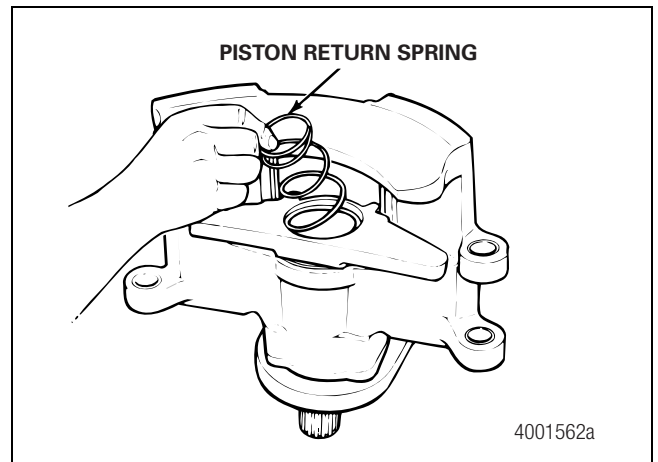
**Figure 5.6**

8. Turn the nut in the opposite direction to release the spring pressure. When the tool is completely retracted, hold the spring retainer with one hand and remove the adaptor tool. Figure 5.7.



**Figure 5.7**

9. Remove the spring retainer and the return spring. Figure 5.8.



**Figure 5.8**

10. Remove the piston from the caliper. While you remove the piston, remove the lip of the boot from the piston groove. The boot will remain in the caliper bore. Figure 5.9.

## 5 Caliper/Piston Boot and O-Ring

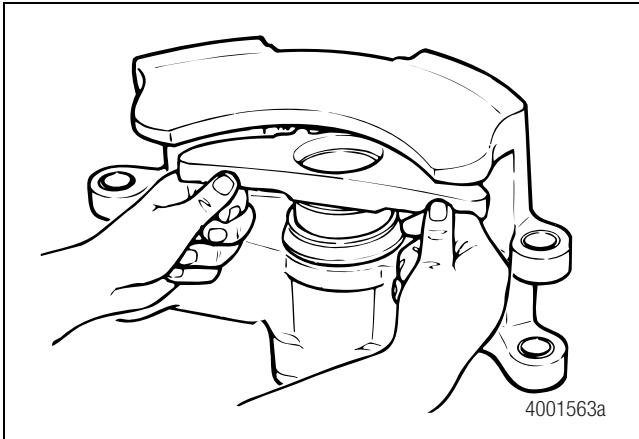


Figure 5.9

**NOTE:** On a brake with a solid disc (rotor), you must retract the camshaft before you can remove the piston. Loosen the capscrews holding the camshaft cap to the caliper. Pull the camshaft out of the caliper to provide enough clearance to remove the piston.

11. Use a tool with a thin blade to remove the boot. Discard the boot and use a new boot when you assemble the caliper. Figure 5.10.

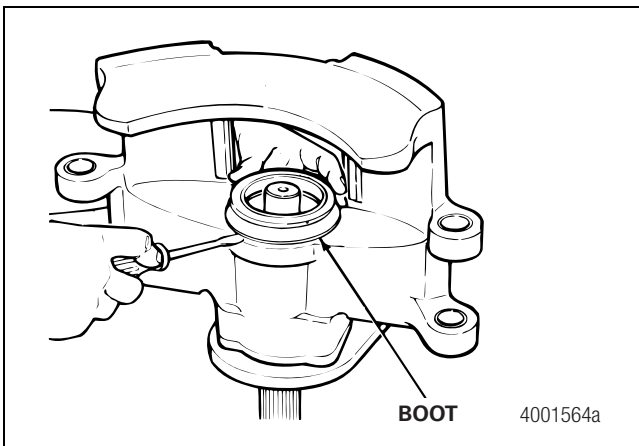


Figure 5.10

12. Use a tool with a thin blade to remove the O-ring from the bore of the caliper. Ensure you do not damage the bore. Discard the old O-ring and use a new O-ring when you assemble the caliper. Figure 5.11.

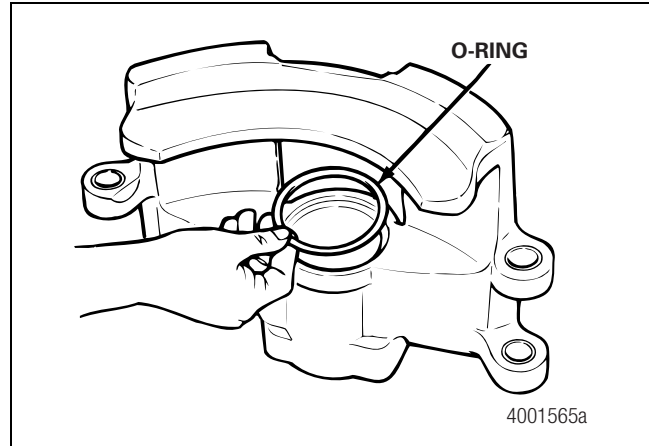


Figure 5.11

### Replace Boot and O-Ring

#### **⚠ WARNING**

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.

**NOTE:** Light polishing of the piston is normal. However, if the piston is damaged, discard the piston and overhaul the caliper. To obtain a caliper overhaul kit, contact Meritor Aftermarket Services at 888-725-9355.

1. Clean the piston with solvent.
2. Inspect the outside of the piston for scratches or other damage.

### ⚠ CAUTION

Do not use solvent to clean the O-ring groove. You will contaminate the lubricant and damage the seals in the caliper.

3. Use a clean, dry cloth to clean the O-ring groove in the bore.
4. Inspect the lubricant in the bore.
  - **If you find dirt, water or any other contaminant:** You must overhaul the caliper. To obtain a caliper overhaul kit, contact Meritor Aftermarket Services at 888-725-9355.
  - **If the lubricant and the piston are acceptable:** Install a new O-ring and boot. Assemble the caliper.

## Installation

### Caliper/Piston Boot and O-Ring

1. Install a new O-ring into the caliper bore. Figure 5.12.

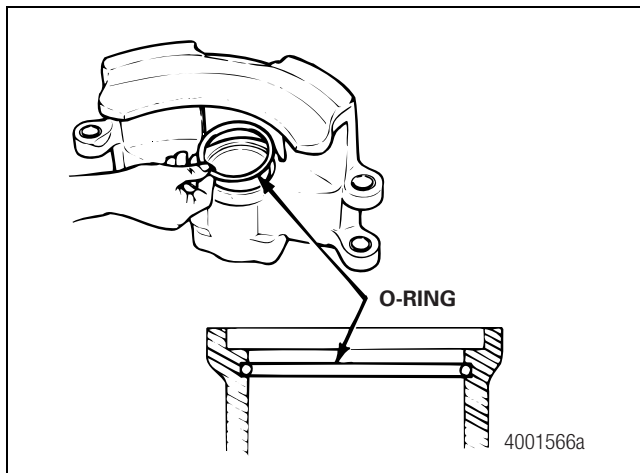


Figure 5.12

**NOTE:** If you are working on a vented disc or rotor brake, install the spacer over the bearing and nut assembly.

2. Install the bearing and nut assembly onto the threads of the boot adaptor threads. Figure 5.13.

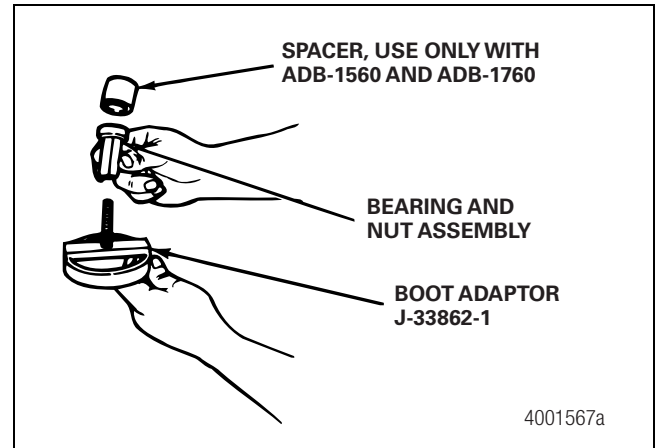


Figure 5.13

3. Position the boot straight into the adaptor. The boot seat must be away from the adaptor. Figure 5.14.

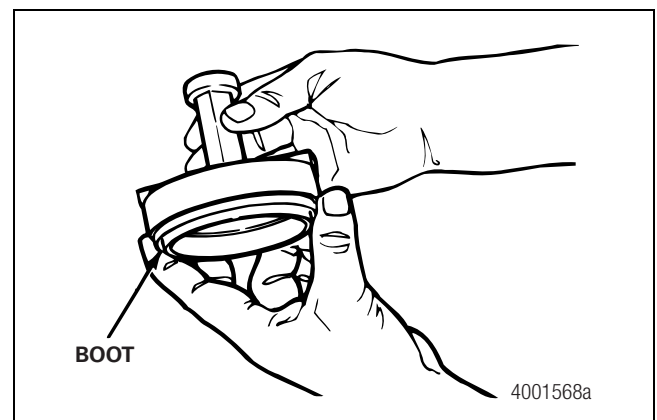


Figure 5.14

### ⚠ CAUTION

If the boot is not directly over the bore, you will damage the boot when you try to install it. When the boot seat touches the caliper, stop turning the nut or you will damage the boot.

4. Position the boot and tool between the caliper legs and directly over the bore. Carefully turn the nut in the direction shown in Figure 5.15. Force the nut against the spacer or the caliper leg until the boot is installed in the bore.

## 5 Caliper/Piston Boot and O-Ring

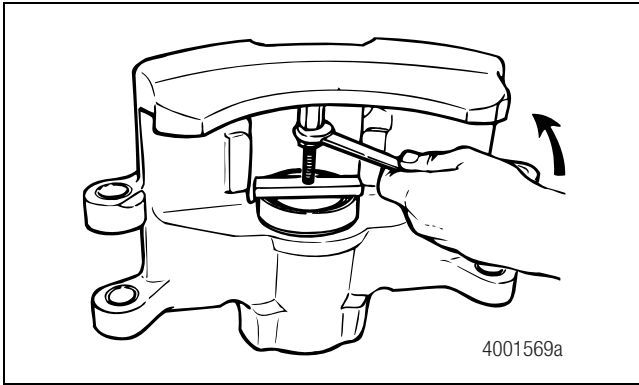


Figure 5.15

5. Turn the nut in the opposite direction to retract and remove the tool.
6. Apply grease to the outer diameter of the piston.
7. Carefully install the piston through the boot and into the caliper. Figure 5.16.

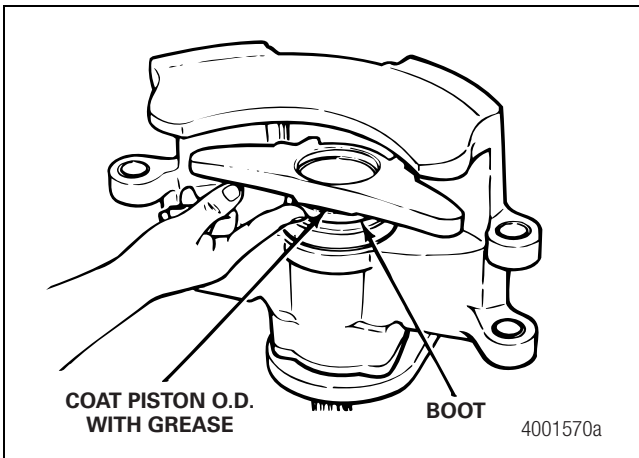



Figure 5.16

8. Slide the boot over the piston while you push the piston into the bore. You must fit the lip of the boot into the groove in the piston.
9. If you loosened them earlier, tighten the capscrews on the air chamber bracket to 135-170 lb-ft (183-230 N•m). 
10. Install the return spring into the piston by inserting the large end of the spring first. Figure 5.17.

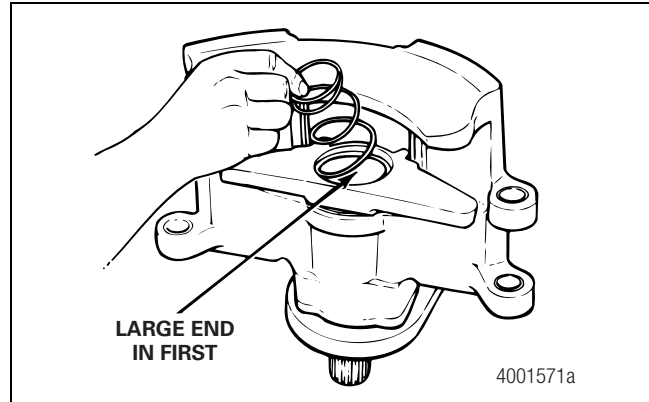


Figure 5.17

**NOTE:** If you are working on a vented disc or rotor brake, install the spacer over the bearing and nut assembly.

11. Install the bearing and nut assembly on the spring retainer adaptor threads. Figure 5.18.

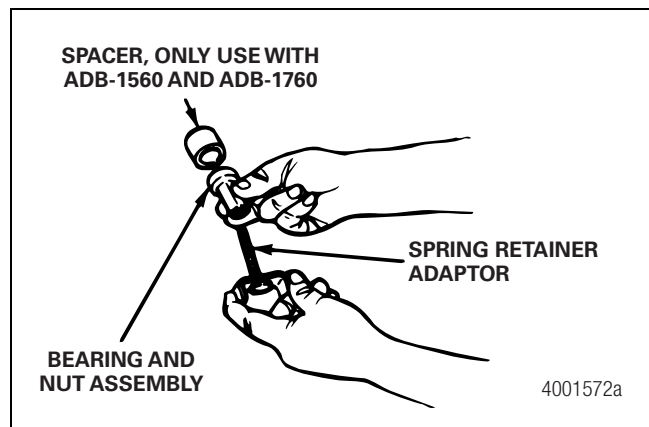


Figure 5.18

12. Hold the spring retainer and camshaft bushing assembly over the return spring. Install the tool between the caliper legs and directly over the retainer and bushing assembly. Figure 5.19.



## 5 Caliper/Piston Boot and O-Ring

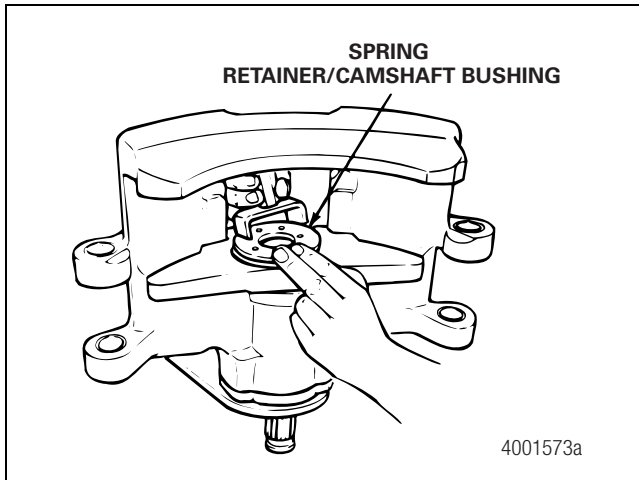


Figure 5.19

13. Turn the nut and force it against the spacer or the opposite side of the caliper. Figure 5.20.

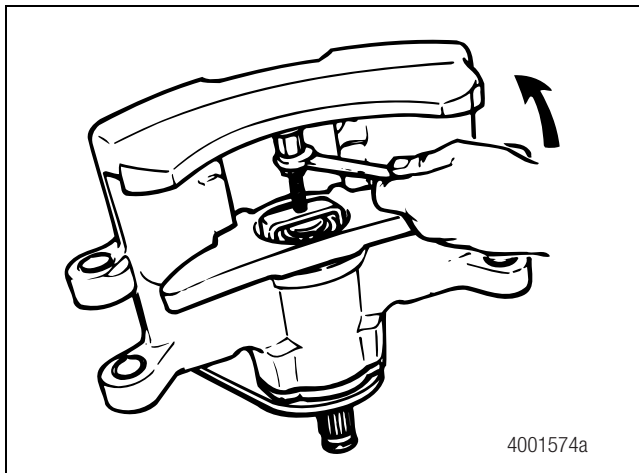


Figure 5.20

14. Compress the spring and push the retainer and bushing assembly below the snap ring groove in the camshaft.
15. Use 45-degree snap ring pliers to install the snap ring. Figure 5.21.

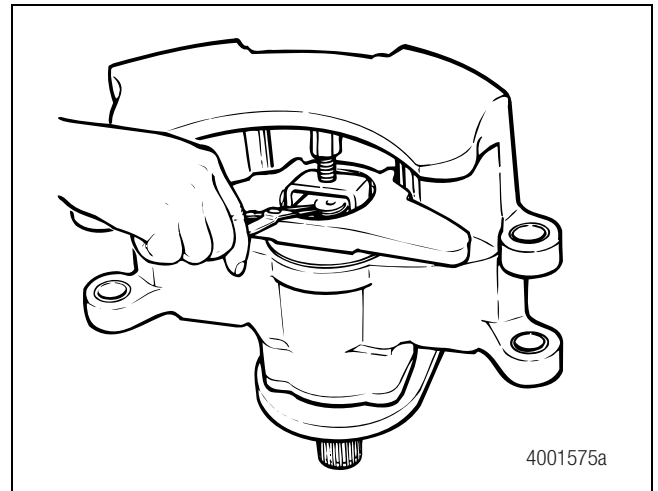


Figure 5.21

16. Turn the nut in the opposite direction to retract and remove the tool.

### ⚠ CAUTION

Always install a new seal when you assemble a caliper. Assembling a caliper with an old seal can cause lubrication leaks. Damage to components can result.

17. Position a new seal into the piston bore. Install the snap ring to hold the seal in place. Figure 5.22.

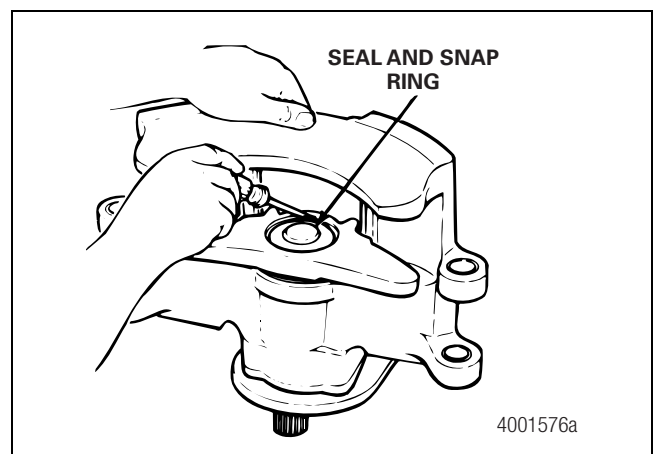


Figure 5.22

## 6 Automatic Slack Adjuster

### 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.

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.

### Removal

#### Automatic Slack Adjuster

##### Replace Conventional Pawls with Pull Pawls

When you service an automatic slack adjuster, replace a conventional pawl with a pull pawl. Install the slack adjuster so that you can remove the conventional pawl or disengage the pull pawl when you adjust the brake.

##### Pull Pawls

Pull pawls are spring loaded. Pry the pull pawl at least 1/32-inch (0.8 mm) to disengage the teeth. When you remove the pry bar, the pull pawl will re-engage automatically.

**NOTE:** If you are removing the automatic slack adjuster while the caliper is mounted on the vehicle, start with Step 1. If you are removing the slack adjuster after removing the caliper, start with Step 9.

1. Park the vehicle on a level surface and block the wheels.
2. Remove all the air from the air system.
3. Remove the air lines from the air chamber.

#### **⚠ WARNING**

Before you service a spring chamber, carefully follow the manufacturer's instructions to compress and lock the spring to completely release the brake. Verify that no air pressure remains in the service chamber before you proceed. Sudden release of compressed air can cause serious personal injury and damage to components.

4. If the vehicle has spring brakes, manually compress and lock the springs to release the brakes. You must check to ensure that no air pressure remains in the service halves of the air chambers.

#### **⚠ WARNING**

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 can result.

5. If necessary, raise the vehicle using a jack. Support the vehicle with safety stands.

#### **⚠ WARNING**

When you remove a clevis pin that has a spring, hold the spring with pliers. The spring can disengage from the clevis with enough force to cause serious personal injury.

6. Remove both clevis pins.
7. Remove a conventional pawl. Disengage a pull pawl. Use a screwdriver or equivalent tool to lift the button of a pull pawl assembly at least 1/32-inch (0.8 mm) from the actuator. Figure 6.1.

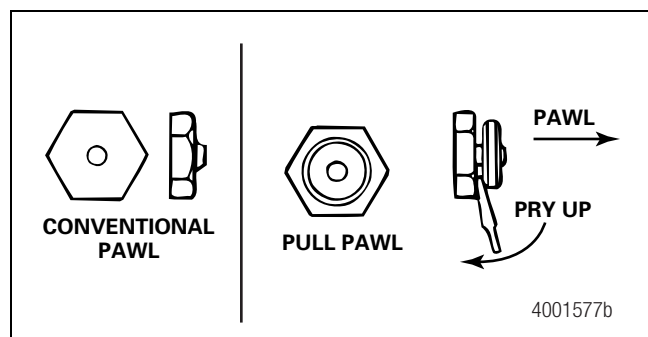
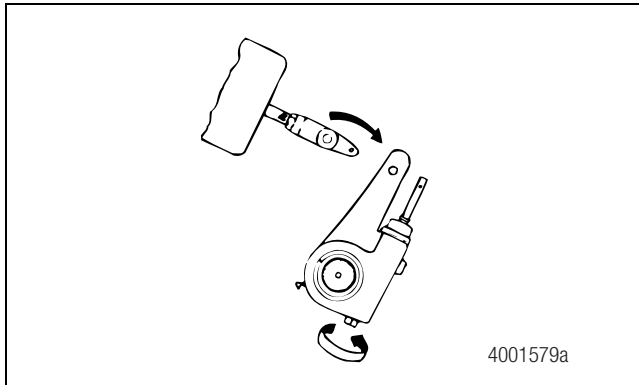


Figure 6.1

### **CAUTION**

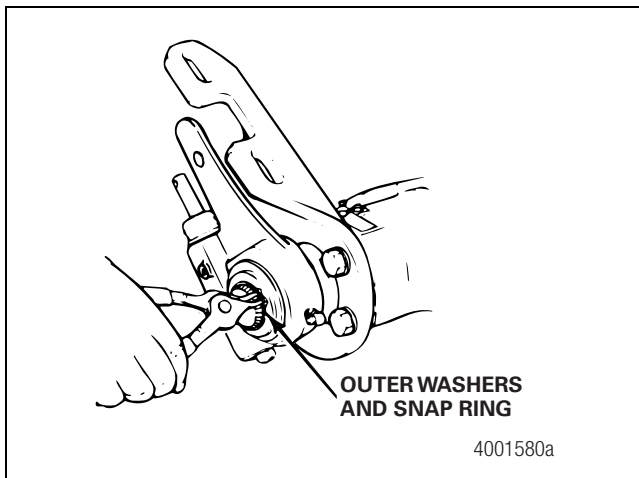
You must disengage a pull pawl or remove a conventional pawl before rotating the manual adjusting nut, or you will damage the pawl teeth. A damaged pawl will not allow the slack adjuster to automatically adjust brake clearance. Replace damaged pawls before putting the vehicle in service.

- Use a wrench to turn the manual adjusting nut in the direction shown in Figure 6.2. Move the slack adjuster away from the clevis.



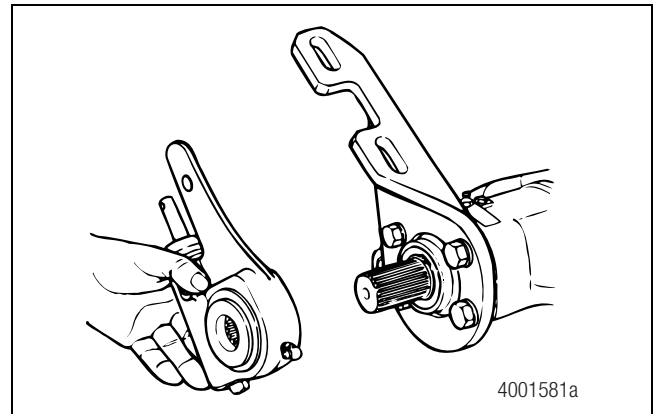
**Figure 6.2**

- Remove the snap ring and washers from the camshaft. Figure 6.3.



**Figure 6.3**

- Remove the slack adjuster from the camshaft. Figure 6.4.

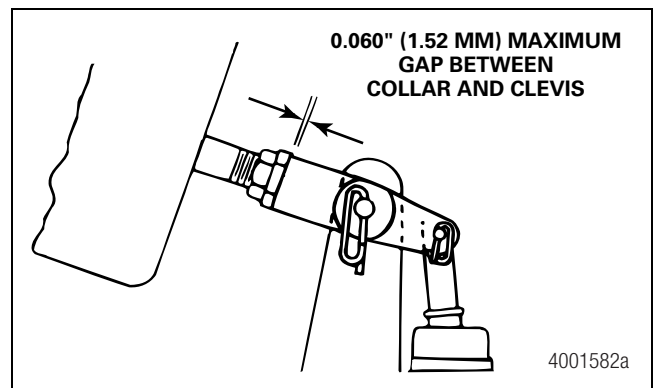


**Figure 6.4**

- Inspect the splines on the camshaft. If the splines are worn or damaged, replace the camshaft. Refer to Section 7.

**NOTE:** Do not remove the clevis from the push rod unless it is necessary.

- Remove the clevis from the push rod if the gap between the clevis and the collar of a Quick Connect clevis exceeds 0.060-inch (1.52 mm). Do not remove the clevis if it is in good condition. Figure 6.5.



**Figure 6.5**

## Installation

### Automatic Slack Adjuster

- Check the camshaft and bushings and seals for wear and corrosion.
- Turn the camshaft by hand to check for smooth operation.
- Repair or replace parts as required.

## 6 Automatic Slack Adjuster

4. Apply the service brake and spring brake several times. Check that the chamber return spring retracts the push rod quickly and completely. If necessary, replace the return spring or the air chamber.
5. The new automatic slack adjuster must be the same length as the one you are replacing. The table below shows the length of slack adjuster that is used with each brake chamber size.

**Table A: Chamber and Automatic Slack Adjuster Sizes**

<b>Length of Slack Adjuster (Inches)</b>	<b>Size of Chamber (Square Inches)</b>
5	9*, 12*, 16, 20, 24, 30
5-1/2	9*, 12*, 16, 20, 24, 30, 36
6	24, 30, 36
6-1/2	30, 36

\* Use an auxiliary spring on the slack adjusters used with these size chambers. A size 9 or 12 chamber return spring cannot supply enough spring tension to completely retract the slack adjuster.

### **CAUTION**

**Most Meritor automatic slack adjusters manufactured after January 1990 have lubrication holes in the gear splines. Do not operate the actuator before you install the slack adjuster. Lubricant can pump through the holes and onto the splines. Damage to components can result.**

6. If the automatic slack adjuster gear has a 10-tooth spline, apply anti-seize compound to the slack adjuster and cam splines. Use Meritor specification O-637, Southwest SA 8249496 or equivalent lubricants.

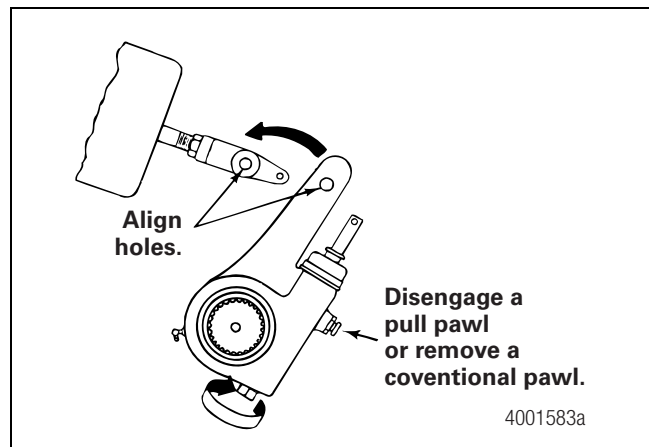
**NOTE:** Install the slack adjuster so that you can remove a conventional pawl or disengage a pull pawl when you adjust the brake.

7. Install the slack adjuster onto the camshaft. Position the slack adjuster so that you can remove the pawl when you adjust the brake.
8. If necessary, install spacing washers and the snap ring at a maximum clearance of 0.062-inch (1.57 mm).
9. Install the clevis onto the push rod. Do not tighten the jam nut against the clevis.

### **CAUTION**

**You must disengage a pull pawl or remove a conventional pawl before rotating the manual adjusting nut, or you will damage the pawl teeth. A damaged pawl will not allow the slack adjuster to automatically adjust brake clearance. Replace damaged pawls before putting the vehicle in service.**

10. Disengage or remove the pawl. Turn the manual adjusting nut to align the holes in the slack adjuster arm and the clevis. Figure 6.6.



**Figure 6.6**

11. For a slack adjuster with a welded clevis, apply anti-seize compound to the two clevis pins. Install the clevis pins through the clevis and the slack adjuster.

### **CAUTION**

**Always replace used clevis pin retainer clips with new ones when you service an automatic slack adjuster or chamber. Do not reuse retainer clips. Discard used clips. When you remove a retainer clip, it can bend or "gap apart" and lose retention. Damage to components can result.**

12. Install new cotter pins or clevis pin retainer clips to hold the clevis pins in place. Figure 6.7.

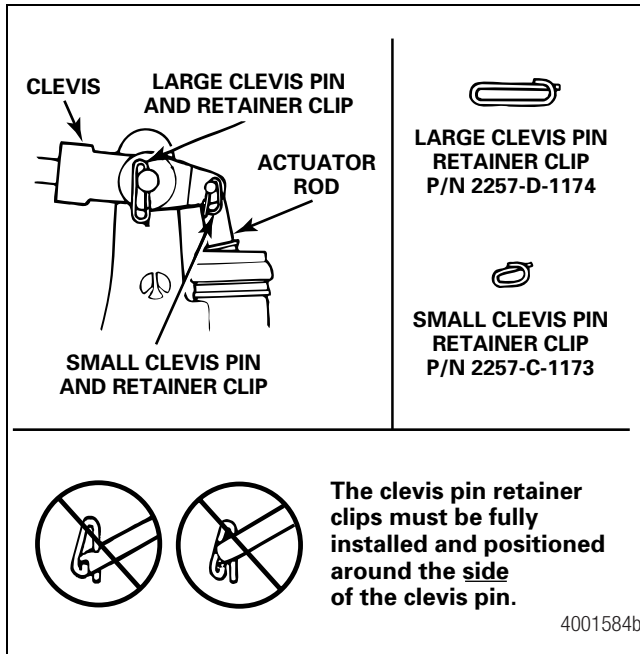


Figure 6.7

- 13. For a slack adjuster with a threaded clevis, refer to Section 11.
- 14. Adjust the brake. Refer to Section 11.

## 7 Camshaft

### 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.

### Removal

#### Camshaft

#### **⚠ CAUTION**

If you disassemble more than one caliper at the same time, keep the components of each caliper separate. Install brake parts only on the same caliper from which you removed them.

1. Remove the caliper from the vehicle. Refer to Section 3.
2. Remove the slack adjuster from the camshaft. Refer to Section 6.
3. Perform Steps 1-9 of the caliper/piston boot and O-ring removal procedure. Refer to Section 5.
4. Remove the capscrews and washers that hold the camshaft cap and the air chamber bracket to the caliper. Remove the bracket. Figure 7.1.

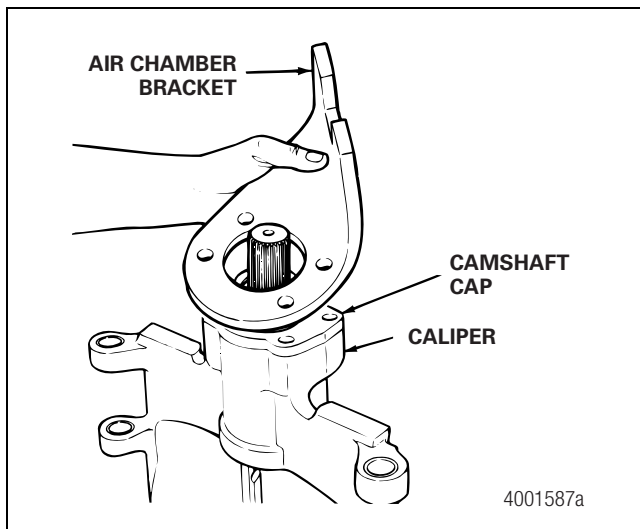


Figure 7.1

**NOTE:** Do not turn the shaft or the nut will fall from the end of the shaft.

5. Lift the camshaft, cap and nut assembly out of the caliper. Figure 7.2.

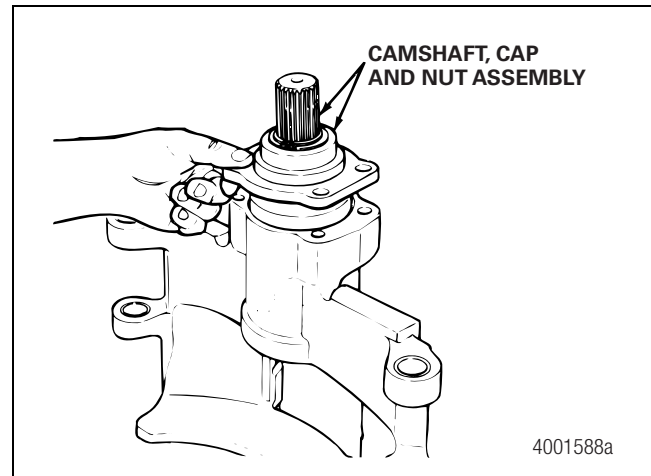


Figure 7.2

6. Use snap ring pliers to remove the snap ring from the camshaft. Figure 7.3.

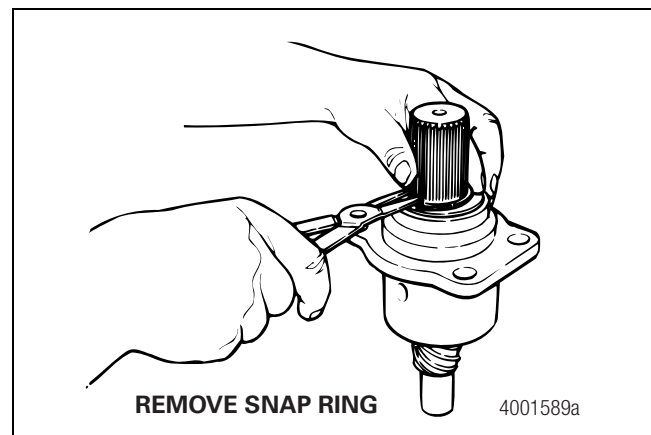
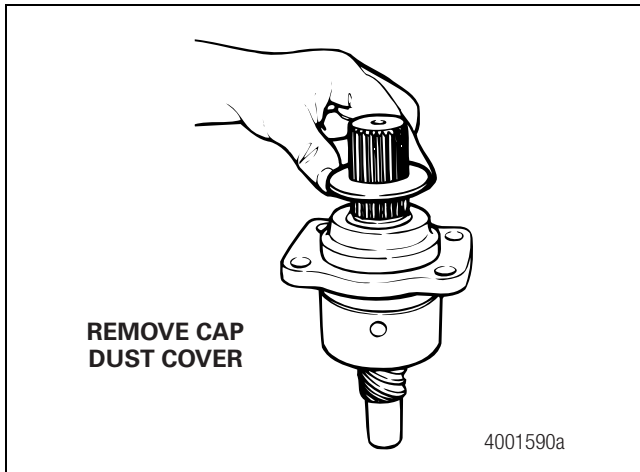


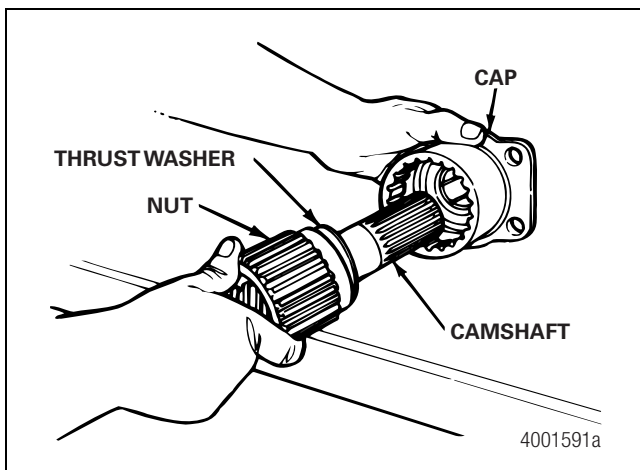
Figure 7.3

7. Remove the dust cover from the camshaft. Figure 7.4.



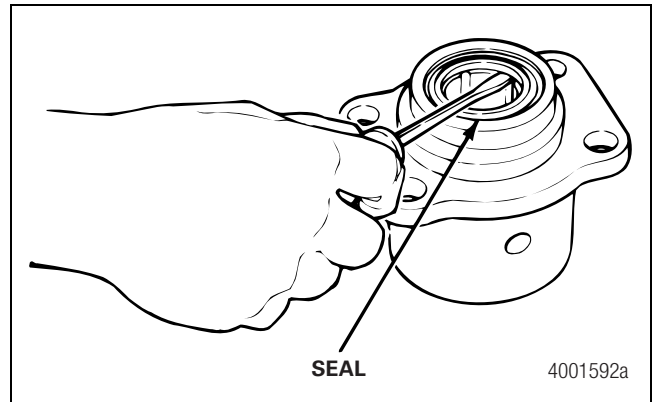
**Figure 7.4**

8. Separate the cap from the camshaft. Figure 7.5.



**Figure 7.5**

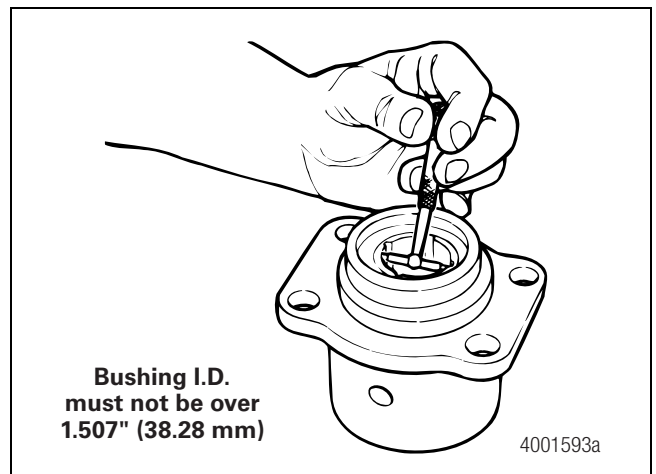
9. Remove the nut and thrust washer. Discard the thrust washer. Use a new thrust washer when you assemble the caliper.
10. Remove the O-ring from the groove in the outer diameter of the camshaft cap. Discard the O-ring. Use a new O-ring when you assemble the caliper.
11. Use a tool with a flat blade to remove the seal from the bore in the camshaft cap. You must not damage the bushing inside the cap. Discard the seal and use a new seal when you assemble the caliper. Figure 7.6.



**Figure 7.6**

**NOTE:** Some brake models have a long camshaft cap with bushings at each end. Measure both bushings.

12. Measure the inner diameter of the bushing in the camshaft cap. The inner diameter must not exceed 1.507-inches (38.28 mm). If the inner diameter exceeds specification, discard the camshaft cap and bushing assembly. Use a new assembly when you assemble the caliper. Figure 7.7.



**Figure 7.7**

# 7 Camshaft

## Installation

### Camshaft

#### ⚠ WARNING

Observe all warnings and cautions provided by the press manufacturer to avoid damage to components and serious personal injury.

1. Position a new seal over the bore at the end of the camshaft cap that has a flange. The seal lips must be away from the camshaft cap. Use a press and a steel plate to press the seal into the bore. Press the seal unit until it is even with the end of the bore. Figure 7.8.

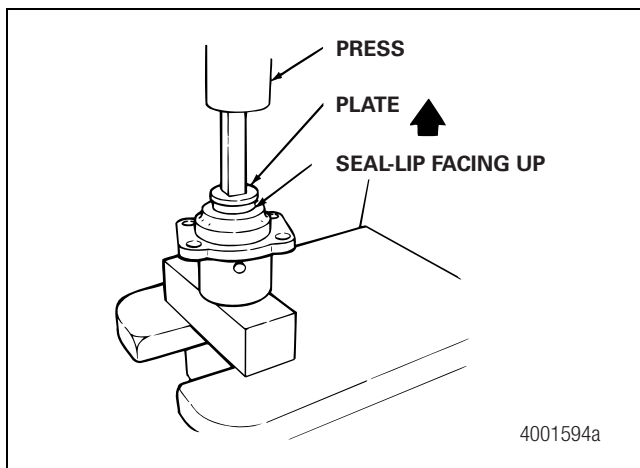


Figure 7.8

2. Install a new O-ring in the groove in the outer diameter of the camshaft cap.
3. Apply grease to the following components.
  - Camshaft threads
  - Camshaft nut splines
  - Thrust washer surfaces
  - Bushing(s) and splines inside the camshaft cap
4. Install the nut on the threads of the camshaft. Figure 7.9.

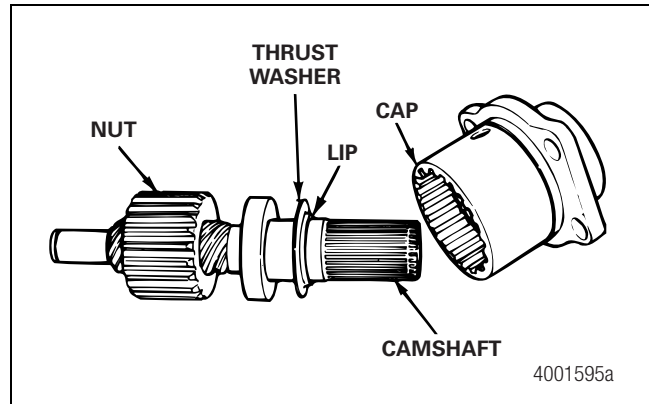


Figure 7.9

5. Install the thrust washer with its lip toward the splines.
6. Install the camshaft and nut assembly into the camshaft cap.
7. Install the camshaft dust cover onto the shaft. Install the snap ring to hold the camshaft and nut inside the cap. Figure 7.10.

- **If you are working on a brake with a solid disc (rotor) and removed the piston:** You must install the piston now. Perform Steps 1-8 of Installation, Caliper/Piston Boot and O-Ring in Section 5, then proceed to Step 8.

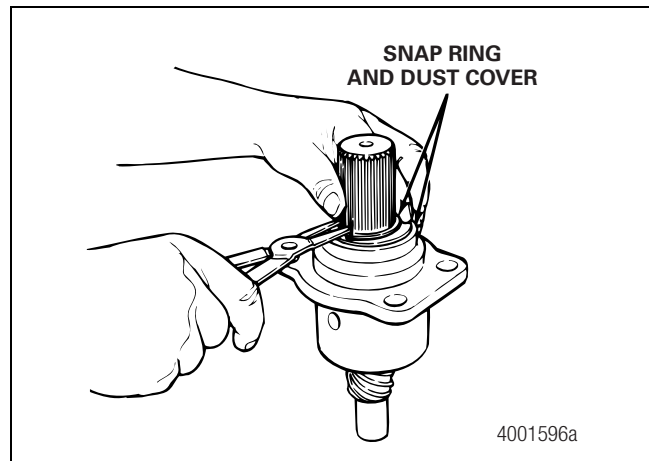


Figure 7.10

8. Insert the camshaft, nut and cap assembly into the caliper. Position the grease fitting in the cap OUTBOARD to allow you to install the bracket in Step 9 and reach the fitting for service. Figure 7.11.



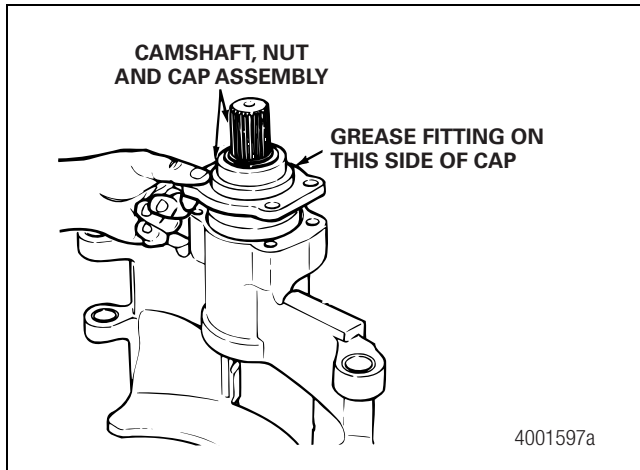


Figure 7.11

9. Install the air chamber bracket over the cap. Figure 7.12.

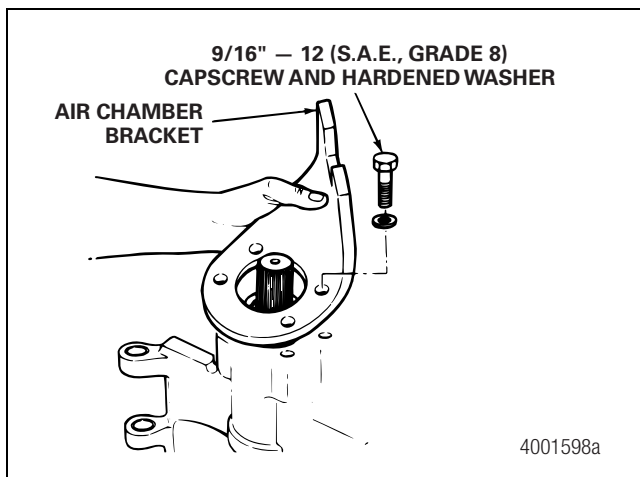



Figure 7.12

10. Install the capscrews and washers and tighten the capscrews to 135-170 lb-ft (183-230 N•m). 
11. Finish installing the caliper/piston boot and O-ring. You must lubricate the outside of the piston. Refer to Section 5.

### WARNING

The piston must move out of its bore when you turn the camshaft. If the piston does not move out of its bore, then the brake does not work correctly. You must disassemble the brake and correct the cause of the malfunction.

12. Hand turn the camshaft in the direction it will turn when the caliper is installed on the vehicle and the brakes are applied. Check that the piston moves out from its bore when you turn the camshaft. If the piston does not move, the brake does not work correctly. Disassemble the caliper and correct the cause of the malfunction.
13. Install the slack adjuster on the camshaft. Refer to Section 6.

### Caliper

1. Install the caliper onto the vehicle. Refer to Section 3.
2. Install the pads. Refer to Section 10.
3. Lubricate the caliper. Refer to Section 13.
4. Adjust the brake. Refer to Section 11.

## 8 Disc (Rotor)

### 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.

### Inspection

#### Disc or Rotor

#### **⚠ CAUTION**

You must always replace a damaged disc or rotor.

When you inspect the brakes, inspect both sides and the outer diameter of the disc or rotor for the following conditions.

- Cracks
- Heat checking
- Grooves or score
- Blue marks or bands

When you reline the brakes, you must measure the thickness of the disc or rotor.

#### Cracks

A crack can extend through a disc or rotor section and can cause the two sides of the crack to separate. Figure 8.1. If you find any cracks, always replace the disc or rotor.

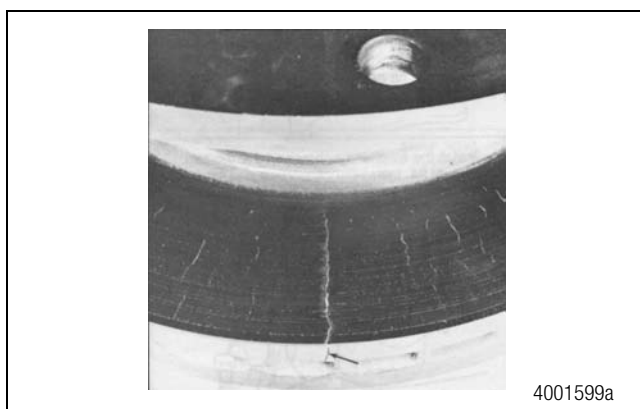


Figure 8.1

#### Heat Checking

Heat checking are cracks in the surface of the disc or rotor caused by heat. Heat checking can be light or heavy.

- **Light Heat Checking**

Light heat checking are very fine, tight, small cracks. Light heat checking is normal. You can continue to use a disc or rotor with light heat checking.

- **Heavy Heat Checking**

Heavy heat checking are surface cracks with width and depth. Figure 8.2. If you find heavy heat checking, always replace the disc or rotor.

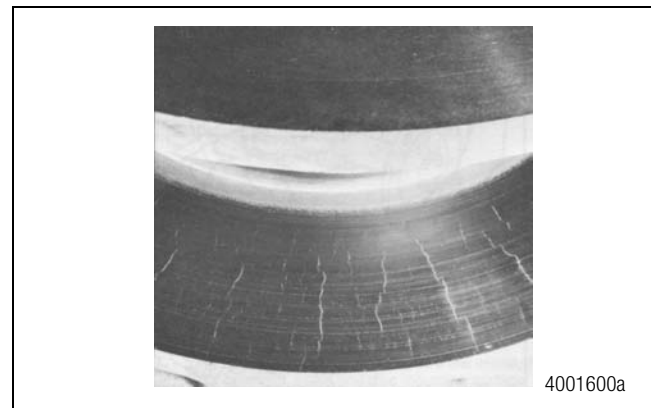


Figure 8.2

#### Grooves or Scores

Check both sides of the disc or rotor for deep grooves or scores. If the grooves or scores are deep, replace the disc or rotor. If the grooves or scores are not too deep, you can continue to use the disc or rotor. Figure 8.3.

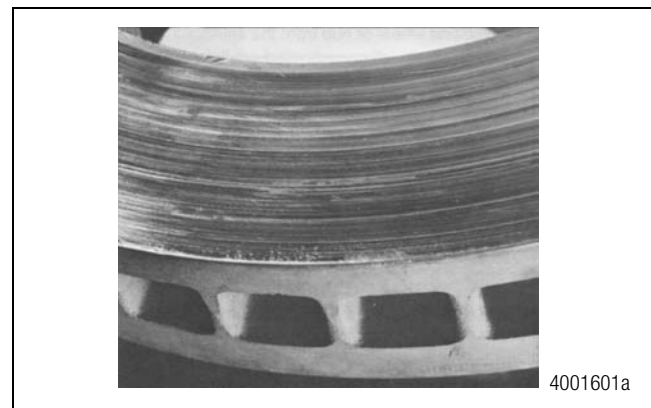


Figure 8.3

### Blue Marks or Bands

Blue marks or bands indicate that the disc or rotor was very hot. If blue marks or bands are present, refer to Section 14 to find and correct the cause of the problem. Figure 8.4.

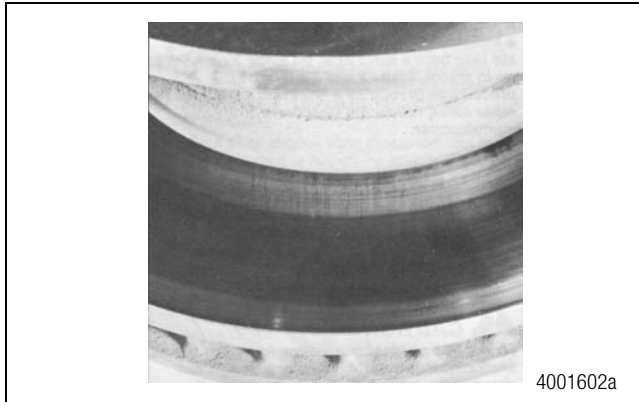


Figure 8.4

### Measuring the Thickness of the Disc or Rotor

Measure the thickness of the disc or rotor when you reline the brakes. A solid disc or rotor must be at least 0.779-inch (19.8 mm) thick. Discs (rotors) with vents must be at least 1.626-inches (41.3 mm) thick. If the thickness of the disc or rotor is less than specification, always replace the disc or rotor. Figure 8.5.

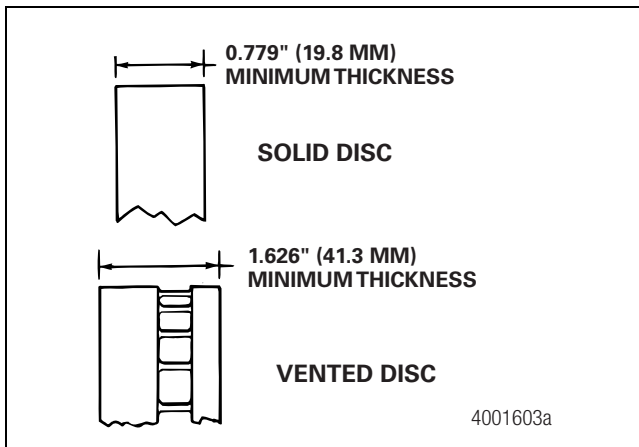


Figure 8.5

## Removal

### Disc or Rotor

#### ⚠ WARNING

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service, or when you use an air hammer. Power tools and components can loosen and break.

**NOTE:** This section addresses disc or rotor removal for Meritor axles only. For axles made by other manufacturers, refer to the manufacturer's disc or rotor removal instructions.

### Front Non-Drive Steering Axles and Trailer Axles

**NOTE:** Do not reuse either the hubcap gasket or the oil.

1. Place a container under the hubcap to receive the draining oil, then remove the hubcap and hubcap gasket. Figure 8.6.

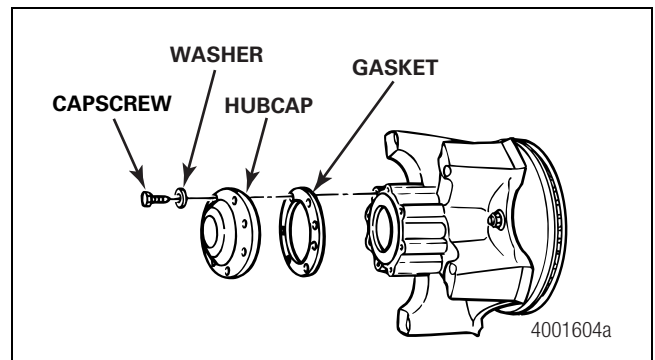


Figure 8.6

2. Use a strap or other lifting device to support the disc and wheel or hub. Figure 8.7.

## 8 Disc (Rotor)

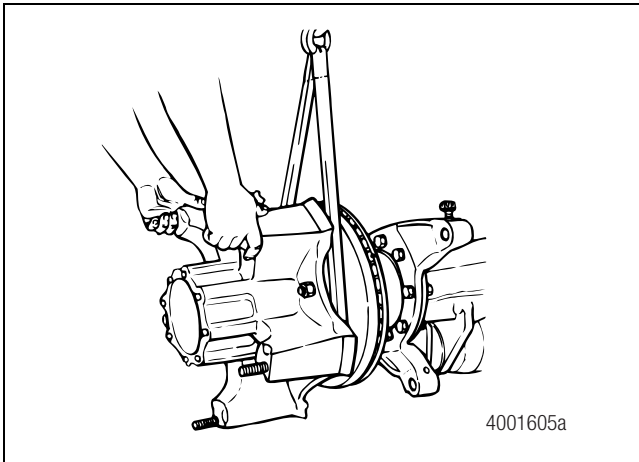


Figure 8.7

3. Remove the disc and wheel or hub from the spindle.
4. Remove any nuts, bolts and washers. Separate the disc from the wheel or hub. Figure 8.8.

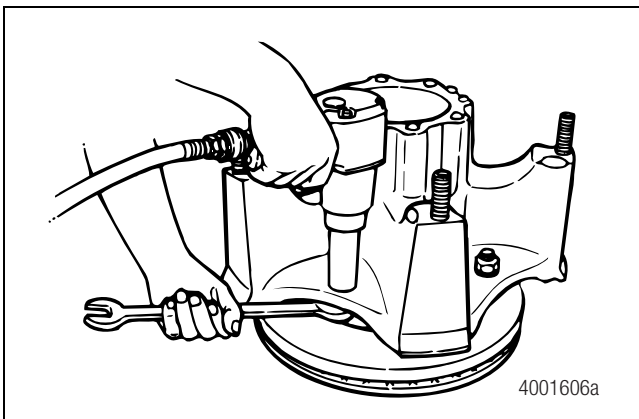


Figure 8.8

## Drive Axles

### ⚠ WARNING

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service, or when you use an air hammer. Power tools and components can loosen and break.

Do not hit the round driving lugs on axle shaft flanges. Lugs can break and cause serious personal injury.

### ⚠ CAUTION

Do not use a chisel or wedge to loosen the axle shafts or dowels. A chisel or wedge can damage the axle shaft, hub and oil seals.

**NOTE:** This section addresses disc or rotor removal for Meritor axles only. For axles made by other manufacturers, refer to the manufacturer's disc or rotor removal instructions.

1. If the axle hub is lubricated with oil, drain the oil.
2. For axles with driver controlled main differential lock, shift and hold the differential lock into the locked, engaged, position.
3. Follow the Brass Drift Method or the Air Hammer Method to loosen the axle shaft and tapered dowels. Figure 8.9 and Figure 8.10.

**NOTE:** You can use a 1.5-inch (38.1 mm) diameter brass hammer in place of a drift.

- A. Hold a 1.5-inch (38.1 mm) diameter brass drift against the center of the axle shaft inside the round driving lugs.
- B. Hit the end of the drift with a large five- to six-pound (2-3 kg) hammer to loosen the axle shaft and tapered dowels.

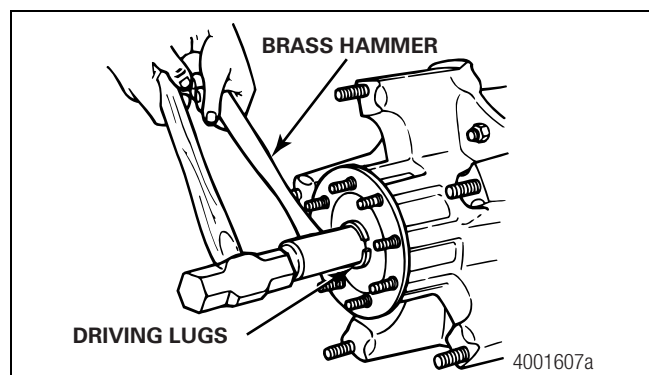
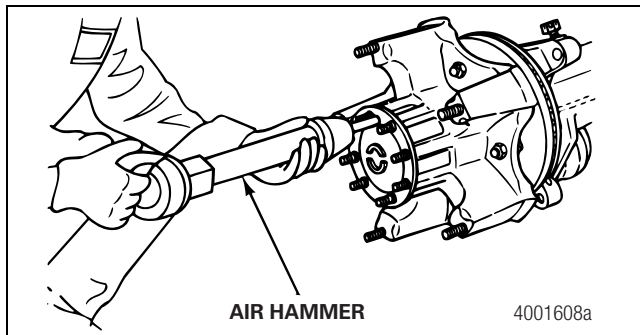


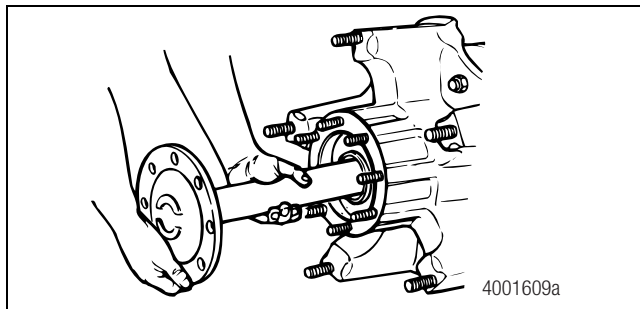
Figure 8.9

- A. Use an air hammer, such as Chicago Pneumatic CP-4181-PULER or equivalent, with a round hammer bit to loosen the axle shaft.
- B. Place the round hammer bit between the studs. Operate the air hammer and loosen the axle shaft and tapered dowels.



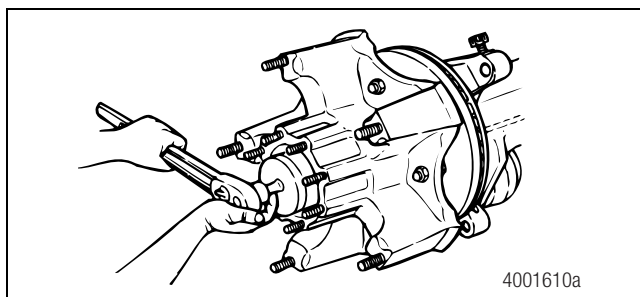
**Figure 8.10**

- 4. If used, loosen the tapered dowels in the flanges of both axle shafts.
- 5. Pull the axle shaft out of the housing. Figure 8.11.



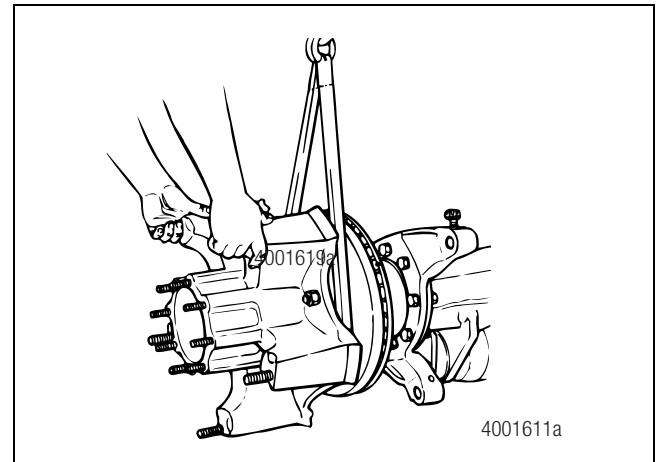
**Figure 8.11**

- 6. Remove the jam nut, washer and adjusting nut from the spindle. Figure 8.12.



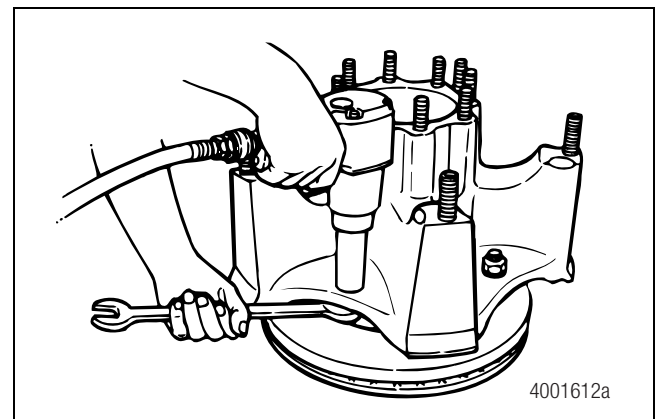
**Figure 8.12**

- 7. Use a strap or other lifting device to support the disc and wheel or hub. Figure 8.13.



**Figure 8.13**

- 8. Remove the disc and wheel or hub from the spindle.
- 9. Remove any nuts, bolts and washers. Separate the disc from the wheel or hub. Figure 8.14.



**Figure 8.14**

## 8 Disc (Rotor)

### Installation

#### Advisory Label TP-0503

ArvinMeritor has issued advisory label TP-0503 that specifies the correct torque for metric wheel nuts used with double-sided wheel studs on Meritor's ADB 1560 air disc brake. If the vehicle is equipped with this brake, you can obtain a free copy of the advisory label, which should be applied to the side of the vehicle. Also available is Maintenance Manual MM-99100, Wheel Equipment.

Refer to How to Obtain Additional Maintenance and Service Information on the Service Notes page at the front inside cover of this manual for instructions to order these publications.

#### Disc or Rotor

##### **⚠ WARNING**

The hub and rotor assembly uses double-sided wheel studs with a two-piece metric wheel nut. You must tighten the metric wheel nuts to 390-450 lb-ft (530-612 N•m). Follow the manufacturer's instructions to install and tighten the metric wheel nuts to this specification. Do not over-tighten the metric wheel nuts, which can damage them and cause the wheels to separate from the vehicle. Serious personal injury and damage to components can result. Check the torque value again after 50-100 service miles (80-161 km) to verify that it is within specification.

##### **⚠ CAUTION**

When installing a hub or wheel, the outer bearing must be ready to install and within reach before mounting the hub on the axle. If you rest the hub on the end of the spindle before installing the outer bearing, you can damage the oil seal.

1. Clean, inspect and repair or replace the wheel, hub, bearings, seals and disc or rotor mounting surface as necessary.

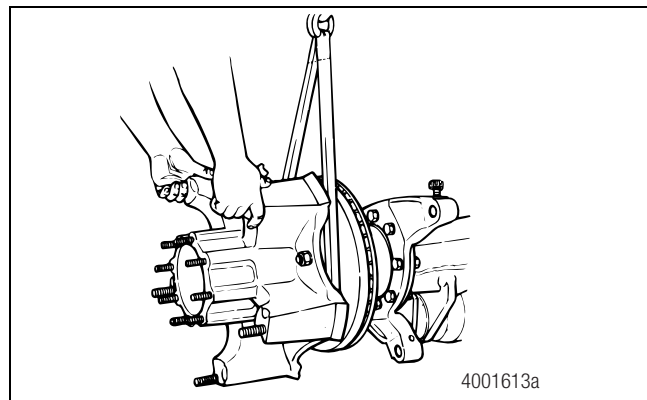
2. Mount the disc or rotor.

##### **Cast Wheel with Spokes**


- A. Use five or six 3/4"-16 S.A.E. Grade 8 bolts and locknuts as needed. Use two hardened washers with each bolt and nut.
- B. Install a washer onto each bolt.
- C. Install the bolts through the disc or rotor and wheel from the inboard side.
- D. Install a washer and locknut onto each bolt.
- E. Use a crisscross pattern to tighten the nuts to 275-325 lb-ft (373-441 N•m). **ⓘ**

##### **Hub**

- A. Use 10 3/4"-16 S.A.E. Grade 8 locknuts and 10 hardened washers.
  - B. Install the disc (rotor) onto the studs in the hub. Use a crisscross pattern to tighten the inner stud nuts to 100 lb-ft (136 N•m). **ⓘ**
3. Verify that clearance exists between the fasteners and caliper. If there is no clearance between the fasteners and the caliper, check that you are using the correct parts.
  4. Apply the correct lubricant to the spindle and the inside of the wheel or hub. If the wheel bearings are lubricated with grease, force the grease between the rollers. If you are using Meritor hubs, refer to Maintenance Manual 1, Preventive Maintenance and Lubrication, for complete lubrication information. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.
  5. Use a strap or other lifting device to install the disc or rotor and wheel or hub onto the spindle. Figure 8.15.



**Figure 8.15**

6. Adjust the wheel bearings.
  - **For wheel bearings on a front axle or rear drive axle:**  
Refer to the manufacturer's instructions for the correct procedures.
  - **For wheel bearings on a trailer axle:** Refer to Maintenance Manual 14, Trailer Axles. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.
7. If you are working on a drive axle, install the axle shaft into the housing. Install stud nuts and washers or capscrews and washers to fasten the axle shaft. Tighten the fasteners in a crisscross pattern according to the torque specifications in Table B. 
8. If the axle hub is lubricated with oil, fill the hub with the correct amount and type of oil. Refer to Maintenance Manual 1, Preventive Maintenance and Lubrication. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.

**Table B: Axle Shaft Torque Specifications**

Fastener	Thread Size	Torque Value lb-ft (N•m)	
		Plain Nut	Locknut
Capscrew — Axle Shaft	0.31-24 0.50-13	18-24 (24-33) 85-115 (115-156)	
Nut — Axle Shaft Stud	0.44-20	50-75	40-65
	0.50-20	(68-102)	(54-88)
	0.56-18	75-115	65-100
	0.62-18	(102-156)	(88-136)
		110-165	100-145
	(149-224)	(136-197)	
	150-230	130-190	
	(203-312)	(176-258)	

## 9 Torque Plate and Bushings

### 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.

### Inspection

#### Torque Plate

Clean and inspect the torque plate for cracks. If you find any cracks, always replace the torque plate.

#### **⚠ CAUTION**

Torque plates are welded to some trailer axles. If the torque plate or the weld has a crack, replace the complete beam and torque plate assembly. Do not weld the crack to repair it. Welding can damage heat-treated beams and torque plates.

#### Torque Plate Bushings

Clean and inspect the torque plate for cracks. If you find any cracks, always replace the torque plate.

#### **⚠ CAUTION**

Torque plates are welded to some trailer axles. If the torque plate or the weld has a crack, replace the complete beam and torque plate assembly. Do not weld the crack to repair it. Welding can damage heat-treated beams and torque plates.

1. Clean and inspect the bushings for wear or other damage.
2. Measure the inner diameter of the bushings at three locations. The inner diameter must not exceed 1.003-inches (25.47 mm). Figure 9.1.

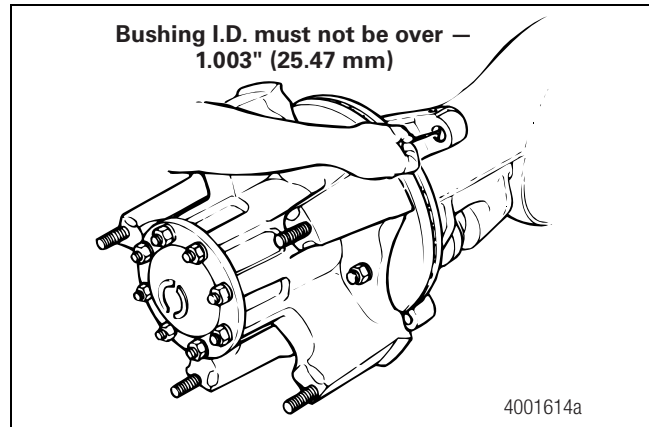


Figure 9.1

3. Measure the bushings. The bushings must not be out-of-round more than 0.003-inch (0.08 mm).
4. Replace the bushing if its dimensions exceed specifications.

### Removal

#### Torque Plate Bushings

#### **⚠ WARNING**

Use a brass or synthetic mallet for assembly and disassembly procedures. Do not hit steel parts with a steel hammer. Pieces of a part can break off. Serious personal injury and damage to components can result.

Use a bushing driver and a mallet to remove the bushing. Figure 9.2. Do not replace the torque plate bushings unless they are damaged or worn out of specification.

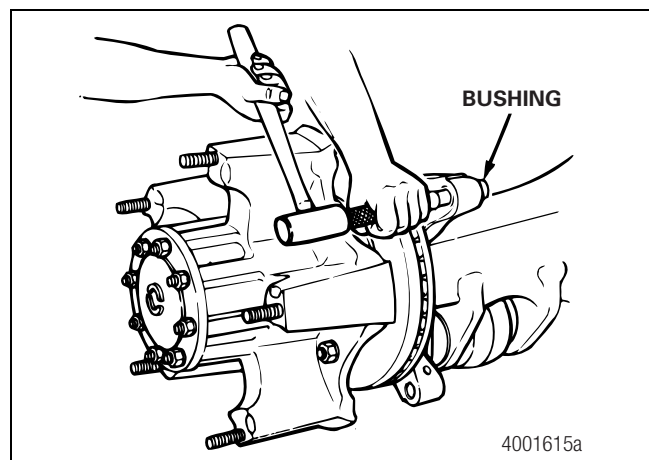


Figure 9.2



### Torque Plate

1. Remove the disc (rotor) and wheel or hub.
2. Remove the nuts, bolts and washers that hold the torque plate to the axle and remove the torque plate. Figure 9.3.

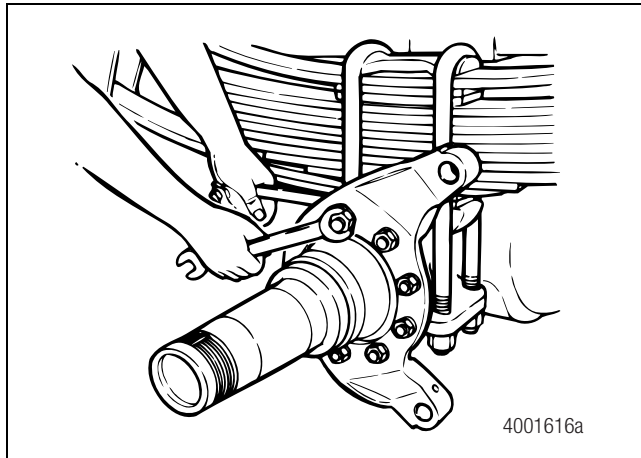


Figure 9.3


### Installation

#### Torque Plate

1. Verify that the torque plate and axle surfaces that will be joined are clean and undamaged.
2. Position the torque plate on the axle. The arms of the torque plate must be inboard.

#### Tighten the Torque Plate

**NOTE:** Use S.A.E. Grade 8 nuts, bolts and washers when you install the torque plate.

1. Install a washer onto each bolt.
2. Install the bolts through the axle flange and the torque plate from the inboard side.
3. Install a washer and nut onto each bolt.
4. Use a crisscross pattern to tighten the nuts. Tighten the nuts to the specifications listed below. Figure 9.4. 

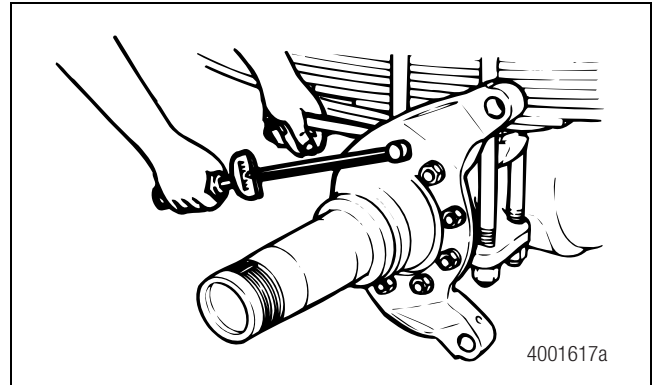


Figure 9.4

Table C: Torque Plate Fastener Specifications

Component	Torque
Torque Plate to Axle or Knuckle Flange Nut and Bolt:	
1/2" - 20 (S.A.E. Grade 8)	85-115 lb-ft (115-156 N•m)
9/16" - 18 (S.A.E. Grade 8)	130-165 lb-ft (176-224 N•m)
5/8" - 18 (S.A.E. Grade 8)	180-240 lb-ft (244-325 N•m)

**NOTE:** Assemble the bolt and one washer from the axle or knuckle flange side and nut with one washer from the torque plate side. Tighten in a crisscross pattern.

#### Torque Plate Bushings

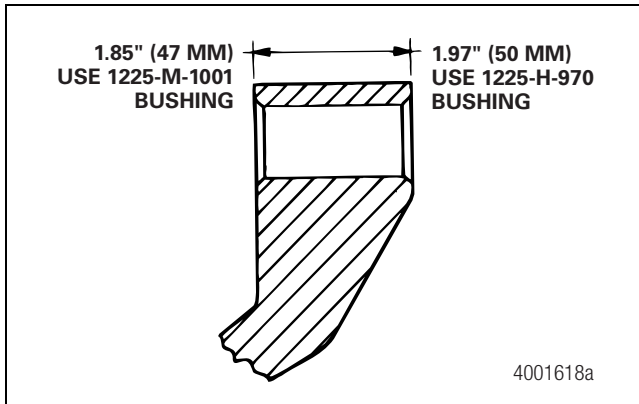
##### WARNING

Use a brass or synthetic mallet for assembly and disassembly procedures. Do not hit steel parts with a steel hammer. Pieces of a part can break off. Serious personal injury and damage to components can result.

**NOTE:** Some torque plates have arms that are 1.97-inches (50 mm) wide. Other models have arms that are 1.85-inches (47 mm) wide.

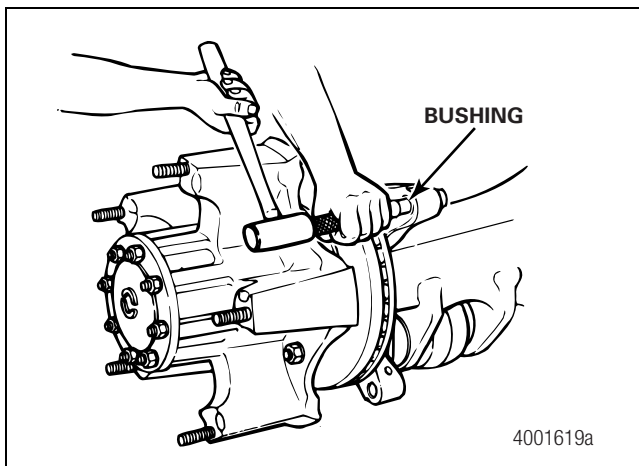
1. Select the correct bushing for the torque plate. Use part number 1225-H-970 for 1.97-inch (50 mm) wide arms. Use part number 1225-M-1001 for 1.85-inch (47 mm) wide arms. Figure 9.5.

## 9 Torque Plate and Bushings



**Figure 9.5**

2. Position the bushing and the driver over the center of the bore.
3. Align the slot in the bushing with the slide pin retainer hole in the torque plate arm.
4. Drive the bushing into the center of the bore. The bushing must be the same distance from each end of the bore. Figure 9.6. The bushing should not extend past the end of the bore.



**Figure 9.6**

## 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.

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.

## Check

### Lining Wear

Refer to Section 13 for lining wear inspection procedures.

## Removal

### Shoes and Linings or Pads

### ⚠️ CAUTION

Replace the pads on both brakes of a single axle or all four brakes of a tandem axle at the same time. If you do not replace all the pads at the same time, poor brake performance will occur.

1. Park the vehicle on a level surface and block the wheels.
2. Remove all the air from the air system.
3. Remove the air lines from the air chamber.

### ⚠️ WARNING

Before you service a spring chamber, carefully follow the manufacturer's instructions to compress and lock the spring to completely release the brake. Verify that no air pressure remains in the service chamber before you proceed. Sudden release of compressed air can cause serious personal injury and damage to components.

4. If the vehicle has spring brakes, manually compress and lock the springs to release the brakes. You must check to ensure that no air pressure remains in the service halves of the air chambers.

### ⚠️ WARNING

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 can result.

5. Raise the vehicle to provide enough clearance for wheel and tire removal and to lower the caliper when you remove the pads. Support the vehicle with safety stands.
6. Remove the wheel and tire.
7. Remove the pressure relief fitting from the caliper. Figure 10.1.

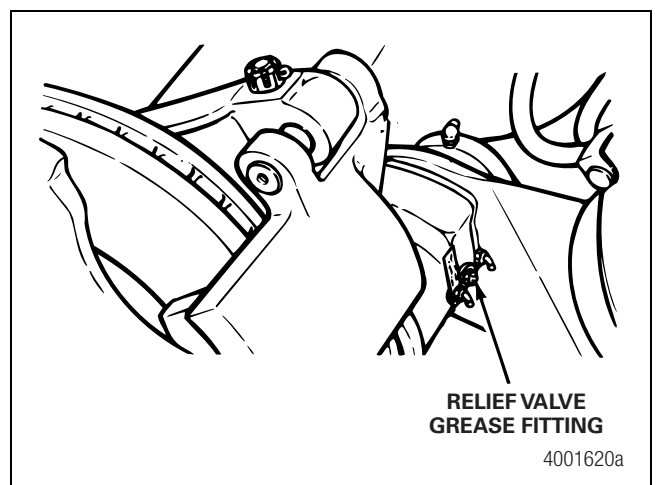


Figure 10.1

8. Remove or disengage the pawl assembly from the slack adjuster. Figure 10.2.

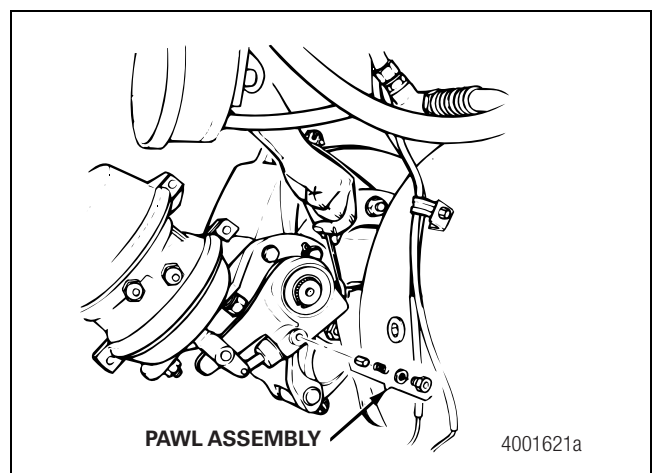


Figure 10.2

## 10 Reline the Brakes

### ⚠ CAUTION

You must disengage a pull pawl or remove a conventional pawl before rotating the manual adjusting nut, or you will damage the pawl teeth. A damaged pawl will not allow the slack adjuster to automatically adjust brake clearance. Replace damaged pawls before putting the vehicle in service.

9. Use a wrench to turn the manual adjusting nut on the slack adjuster until the brake piston is completely retracted. Figure 10.3.

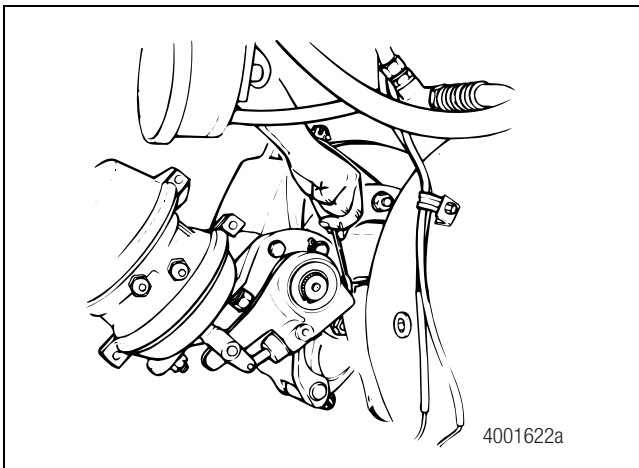


Figure 10.3

10. Remove the cotter pin from the slide pin retainer in the upper arm of the torque plate. Loosen the nut on the slide pin retainer. Figure 10.4.

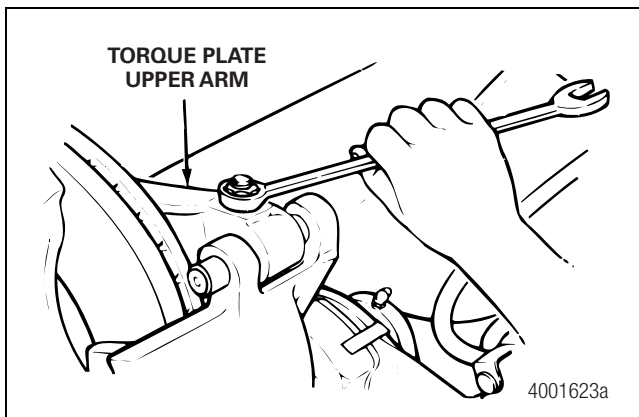


Figure 10.4

### ⚠ CAUTION

If the air lines are not long enough to move the caliper completely down, then disconnect the air lines. Do not support the caliper and the air chamber with the air lines. Damage to components can result.

11. Support the caliper at the air chamber while you remove the slide pin. Press the end of the retainer to release the slide pin and remove the slide pin. Figure 10.5.

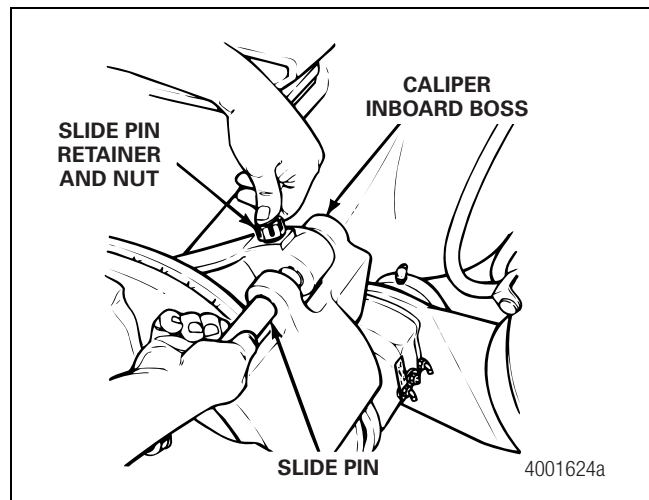


Figure 10.5

12. Hold the air chamber and lower the caliper. Figure 10.6.

**If you cannot press the retainer or remove the slide pin by hand:**

- A. Apply penetrating oil to help loosen the retainer. Turn the nut until the end of the retainer is below the top of the nut. Wear safe eye protection. Hit the nut with a brass or leather mallet to loosen the retainer. Figure 10.7.
- B. Install a slide hammer into the threaded hole in the end of the slide pin. If necessary, install an extension bar to give clearance.
- C. Support the caliper at the air chamber while you remove the slide pin.
- D. Press the end of the retainer to release the slide pin. Use the knocker to loosen and remove the pin. Figure 10.8.
- E. Hold the air chamber and lower the caliper. Figure 10.9.

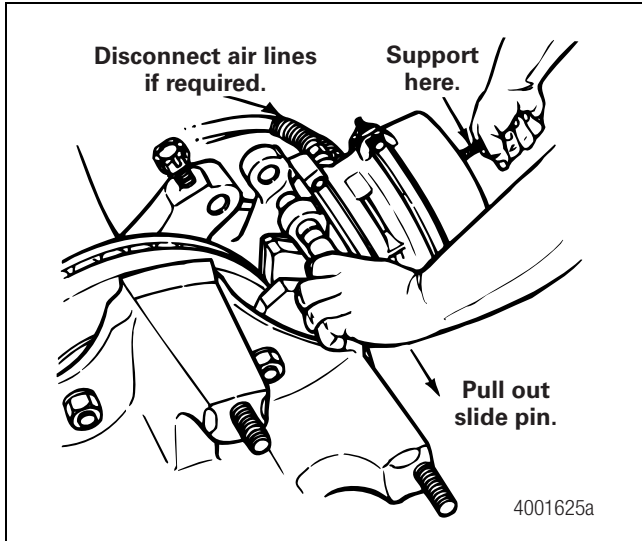


Figure 10.6

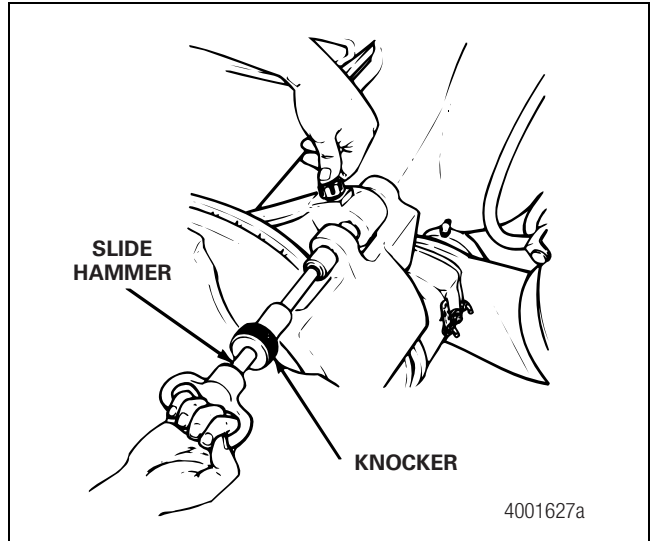


Figure 10.8

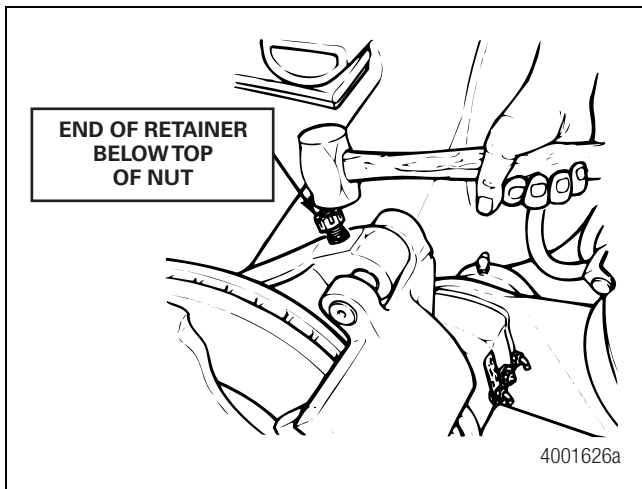


Figure 10.7

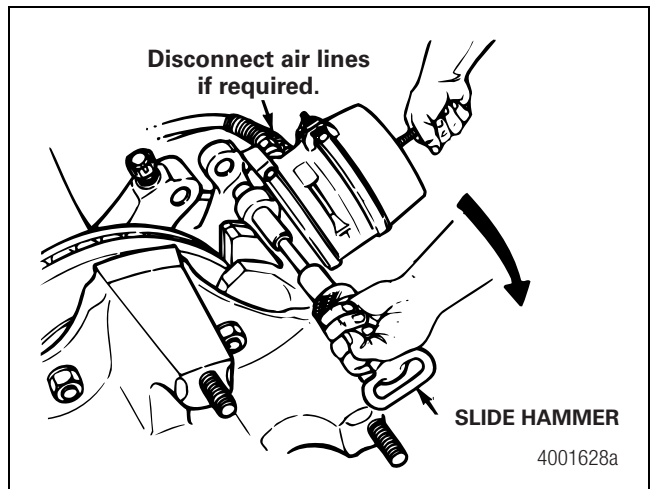


Figure 10.9

## 10 Reline the Brakes

13. Remove the outer pad first. Press down on the edge of the pad to compress the clip. Slide the pad over to the notches. Lift the pad out of the caliper. Repeat this step to remove the inner pad. Figure 10.10.

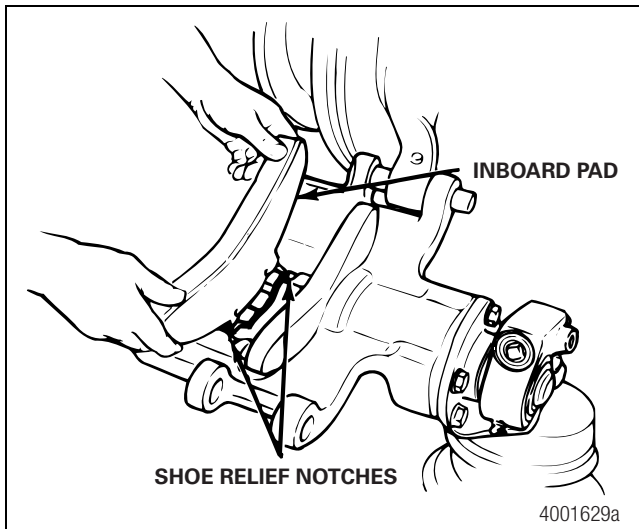


Figure 10.10

14. Check for grooves worn in the caliper by the brake shoe tabs. Figure 10.11. A worn caliper will not hold the pad assemblies in position. Replace a caliper that is worn more than 0.015-inch (0.38 mm) on either side.

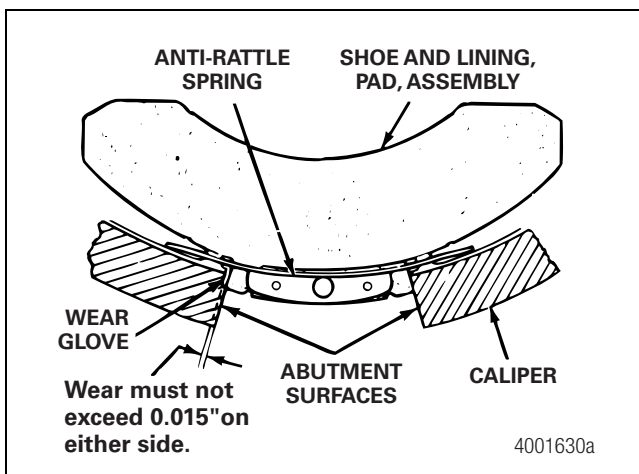


Figure 10.11

15. Turn the manual adjusting nut on the slack adjuster to extend the piston and boot approximately one-inch (25 mm). Figure 10.12.

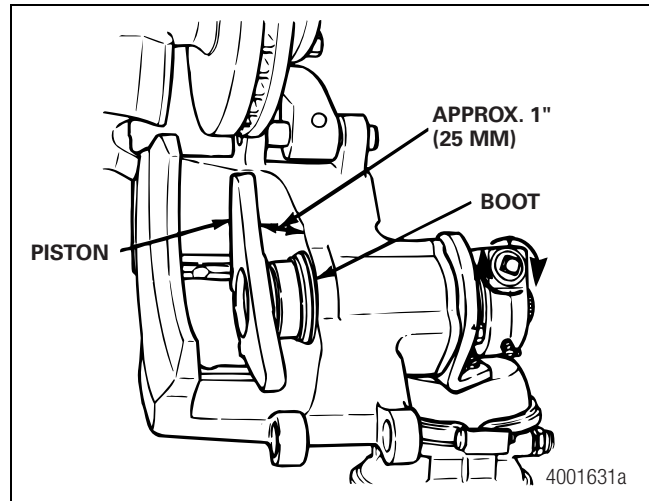


Figure 10.12

16. Use a clean rag to remove any dirt or grease from the boot.
17. Inspect the boot for cuts, tears or cracks. Use a flashlight to check for damage. Be sure to raise the caliper and inspect the other side of the boot.
- **When the boot is damaged:** Install a new boot and seal. Refer to Section 5. Go to Step 18 after you install the new boot and seal.
  - **When the boot is undamaged:** Go to Step 18.
18. Clean, inspect and measure the slide pins and bushings. Refer to Section 12 for information about cleaning the brake components.
- A. Clean the slide pin. Remove any paint or other material from the pin. Replace the pin when you find burrs, nicks, corrosion, or other damage. Lubricate the slide pins lightly with WD-40, Spray CRC or a similar product.
  - B. Measure the diameter of the pin with a micrometer. Replace the pin if the diameter is less than 0.987-inch (25.07 mm).
  - C. Clean, inspect and measure the bushings in the caliper. Refer to Section 4.
  - D. Repeat these procedures for the lower slide pin and bushings after you install the new linings and install the caliper.

19. Inspect the disc (rotor) for damage and measure the disc thickness. Replace the disc when it is damaged or when its dimensions are outside specification. Refer to Section 8. Resurface the disc when necessary. Do not exceed the minimum thickness specifications listed in Section 8.
20. Inspect the automatic slack adjuster. Refer to Section 6. For complete disassembly and repair information, refer to Maintenance Manual 4B, Automatic Slack Adjuster. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.
21. Remove the pawl. Inspect the grease inside the slack adjuster.
  - **If the grease is in good condition:** Finish relining the brakes.
  - **If the grease is dry or contaminated or if the pawl or actuator is dry or worn:** Then remove, disassemble and repair the slack adjuster.

## Installation

### Shoes and Linings (Pads)

**NOTE:** You must perform all brake and automatic slack adjuster maintenance procedures when you reline the brakes. Refer to Steps 1-13 of the shoes and linings (pads) removal procedure in this section and Section 13.

#### **CAUTION**

For the brake to work correctly, the back of the inboard pad must fit flat against the piston, and the pad must slide in the caliper. The back of the outboard pad must fit flat against the outer leg of the caliper. If the pads do not slide or fit correctly, repair any burrs, nicks or other damage on the shoes or the caliper.

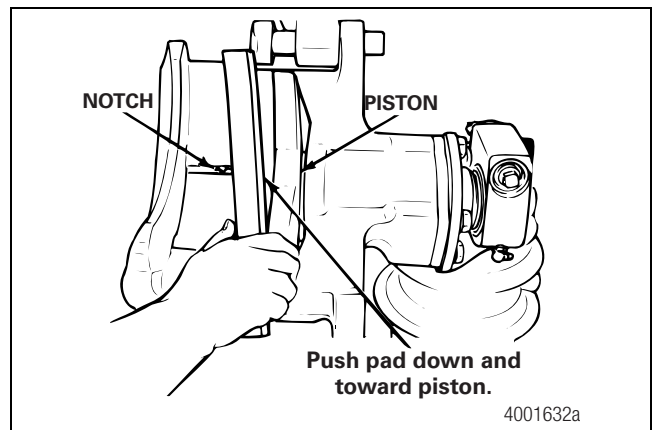
**NOTE:** On brakes with vented discs or rotors, the inboard pad is thicker than the outboard pad. On brakes with solid discs or rotors, the inboard and outboard pads are the same thickness. You must install the pads in the correct positions with the linings toward the disc or rotor.

1. Remove the pressure relief fitting from the caliper and retract the brake piston. If necessary, push the piston completely into the caliper.

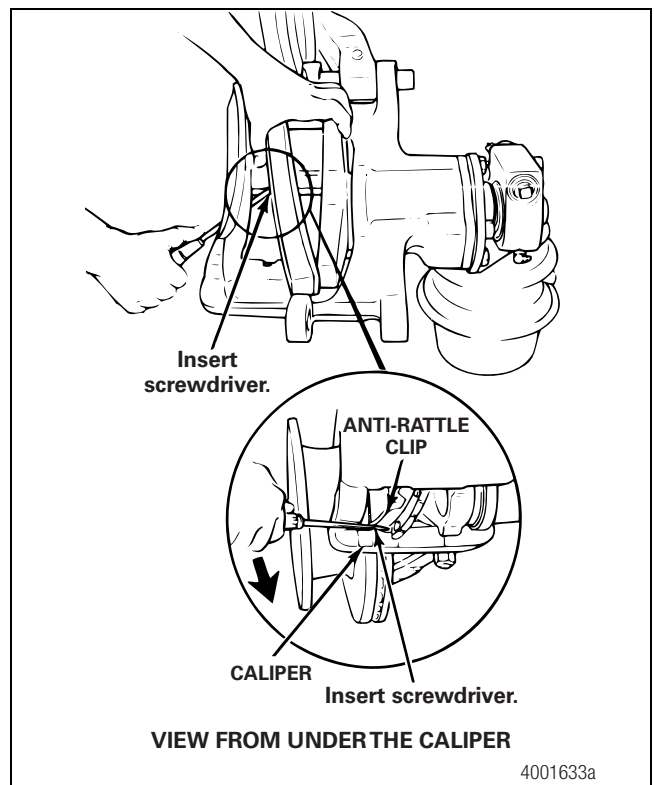
#### **CAUTION**

**Do not hit the pads with a hammer to force them into place. You can damage the pads.**

2. Install the inboard pad first. Fit the shoe tab into the notches in the caliper. Push DOWN on the edge of the pad to compress the clip and slide the pad against the piston. Figure 10.13. If necessary, use a screwdriver to compress the clip while you slide the pad against the piston. Figure 10.14.



**Figure 10.13**



**Figure 10.14**

## 10 Reline the Brakes

3. Repeat Step 2 to install the outboard pad. Slide the outboard pad against the outer leg of the caliper.
4. Remove dirt, paint or other material from the slide pin. Apply silastic seal in the inboard end retainer hole to prevent corrosion and ease removal of the lower slide pin. Figure 10.15.

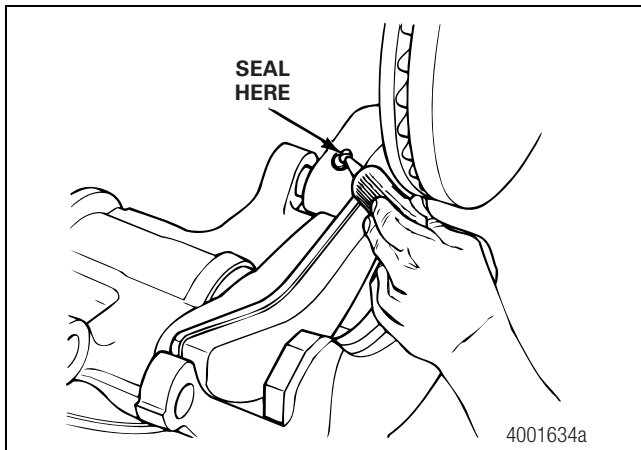


Figure 10.15

5. Raise the caliper and align the caliper bores with the torque plate bores. Figure 10.16. Install the slide pin through the caliper and into the torque plate. Install the pin so that its threaded hole is toward the outboard side.

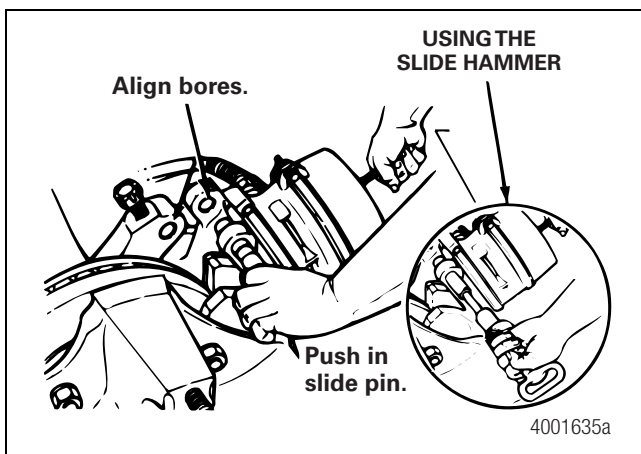


Figure 10.16

6. Apply anti-seize compound to the slide pin retainer. DO NOT apply anti-seize compound to the threads of the retainer or to the slide pin.

**NOTE:** The notch in the slide pin must be aligned with the slide pin retainer.

7. The notch in the slide pin retainers must be toward the bore for the slide pin. The notches in the retainer and the slide pin must engage when you install the slide pin. Figure 10.17.

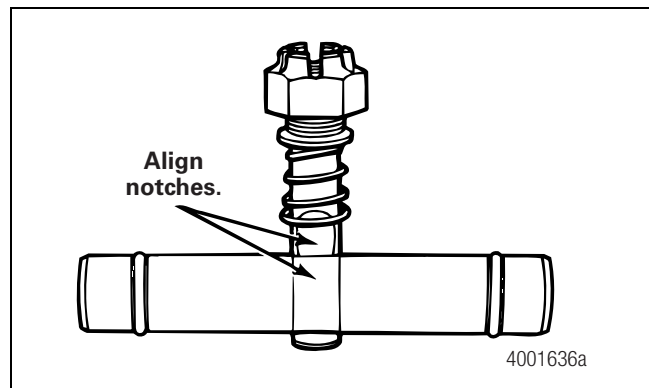


Figure 10.17

8. Push down the retainer and push in the slide pin. Figure 10.18. The retainer will snap out when the notches engage.

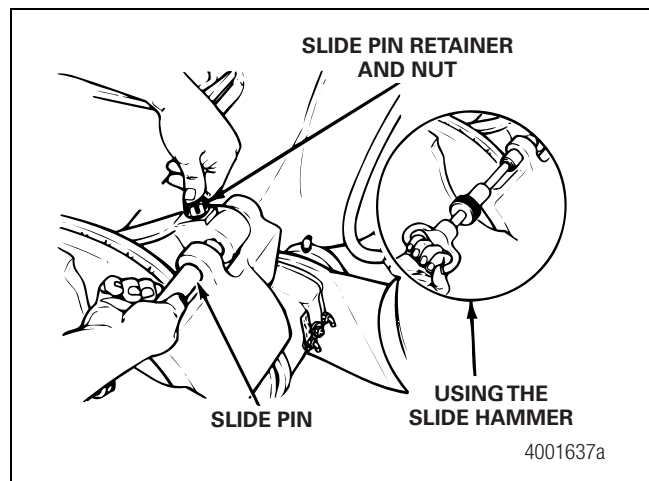



Figure 10.18

9. To correctly install the slide pin, the pin must extend past the inboard boss of the caliper as shown in Figure 10.19.
10. Check for grease on the slide pin retainer threads. Wipe the threads clean, if necessary.
11. Tighten the nut on the slide pin retainer to 60 lb-ft (81 N•m). Figure 10.19. 



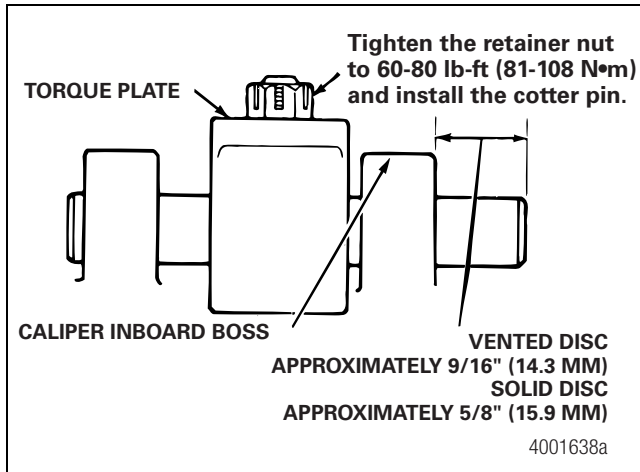


Figure 10.19

12. Tighten the nut to the next slot and install a new cotter pin through the nut and retainer. DO NOT exceed 80 lb-ft (108 N•m).
13. Remove, clean, measure and install the bottom slide pin, bushings and retainer using the same procedures you used with the top pin.
14. If necessary, connect the air lines to the air chamber.
15. Install the pressure relief valve into the caliper. Tighten the valve to 10 lb-ft (13.5 N•m).
16. Install the slack adjuster if you removed it earlier. Refer to Section 6.

**WARNING**

You must adjust the brakes when you reline or overhaul the brakes. Do not return the vehicle into service before you adjust the brakes. Serious personal injury can result.

17. Adjust the brakes. Refer to Section 11.

# 11 Adjust the Brakes

## 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.

You must adjust the brakes when you reline or overhaul the brakes. Do not return the vehicle into service before you adjust the brakes. Serious personal injury may result.

## Check and Adjust

### Brake Chamber Push Rod Stroke and Adjust the Clevis Position

**NOTE:** You cannot adjust the clevis position on a chamber push rod equipped with a welded clevis.

There are two methods you can use to adjust the clevis position on a chamber push rod equipped with a threaded clevis:

- The Brake Slack Adjuster Position (BSAP) method for standard and long stroke chambers
- The Meritor automatic slack adjuster template method for standard stroke chambers only

### Brake Slack Adjuster Position (BSAP) Method

When installing the automatic slack adjuster, verify that the BSAP dimension of the chamber matches the table in Figure 11.1.

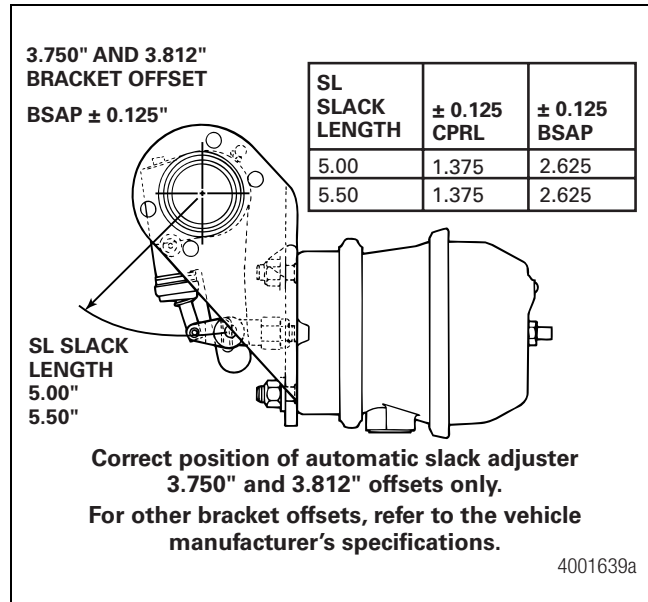


Figure 11.1

## Automatic Slack Adjuster Templates

### Measure the Slack Adjuster

### **⚠ CAUTION**

There are five different installation templates for Meritor automatic slack adjusters. The templates are not interchangeable. You must use the correct template and you must adjust the clevis position as described below. If you use the wrong template and install the clevis in the wrong position, the slack adjuster will not adjust the brake correctly. If the slack adjuster under-adjusts, then stopping distances are increased. If the slack adjuster over-adjusts, then the linings may drag and damage the brake.

**NOTE:** For long stroke chambers, use the BSAP method to measure the automatic slack adjuster.

Use the correct Meritor automatic slack adjuster template to measure the length of the slack adjuster. The marks by the holes in the small end of the template indicate the length of the slack adjuster. Figure 11.2. To obtain the correct automatic slack adjuster template, call the Meritor Customer Service Center at 800-535-5560.

If the clevis is:	Use this template:	Distance A will be:
Offset	TP-4788 Green	3.34-inches (84.8 mm)
Straight	TP-4789 Yellow	2.62-inches (66.5 mm)

\* Offset clevises are used in units built before December 1989. Straight clevises are used in units built from December 1989 to present.

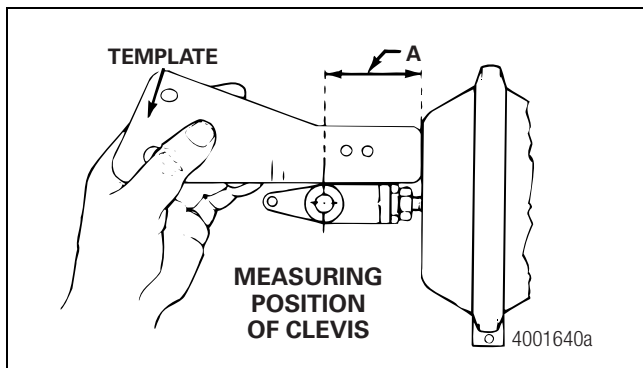


Figure 11.2

## Install a Threaded Clevis

1. Install a large clevis pin through the large holes into the template and the clevis.
2. Select the hole in the template that matches the length of the slack adjuster. Hold that hole on the center of the camshaft.
3. Look through the slot in the template. If necessary, adjust the position of the clevis until the small hole in the clevis is completely visible through the template slot. Figure 11.3.

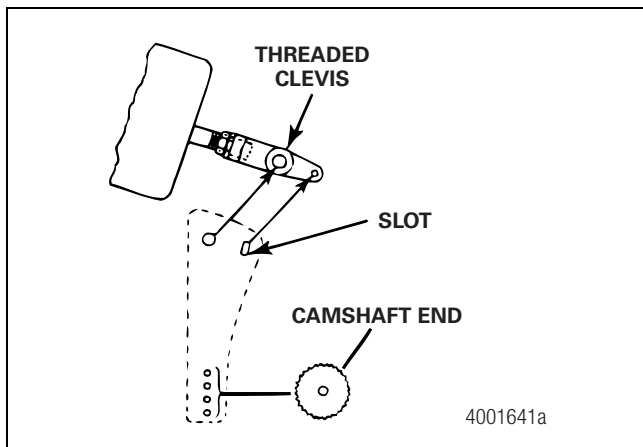


Figure 11.3

4. Check for the following specifications.

- Thread engagement between the clevis and the push rod must be at least 1/2-inch (12.7 mm). Figure 11.4.
- The push rod must not extend through the clevis more than 1/8-inch (3.18 mm). If necessary, cut the push rod or install a new push rod with a new air chamber.

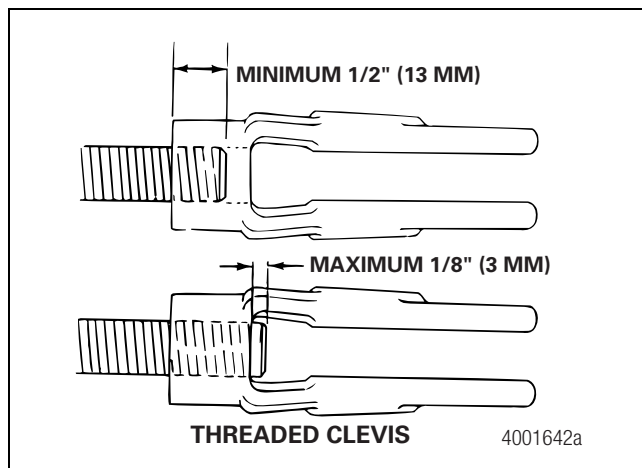


Figure 11.4

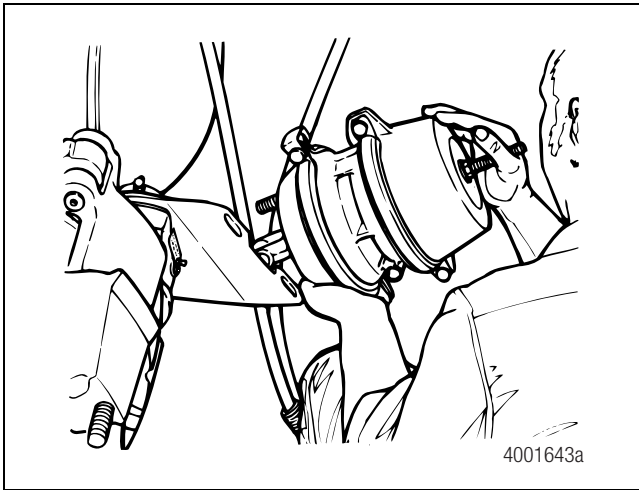
5. Tighten the jam nut against the clevis to torque specifications listed in the following table.

Table D: Jam Nut Torque Specifications

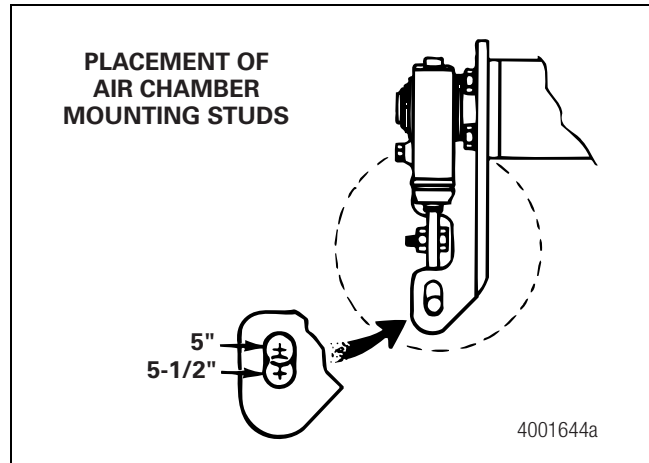
Threads	Torque
1/2-20	20-30 lb-ft (27-41 N•m)
5/8-18	35-50 lb-ft (48-68 N•m)

# 11 Adjust the Brakes

- If removed, install the air chamber. Figure 11.5. The position of the studs in the slots in the bracket depends on the length of the slack adjuster. Refer to Figure 11.6 to correctly position the studs.



**Figure 11.5**



**Figure 11.6**

## Air Chamber Stud Nut Torque Values Lb-Ft (N•m) ⓘ

	Chamber Size						Spring Chamber	
	9	12	16	20	24	30		36
Bendix	20-30 lb-ft (27-41 N•m)		30-45 lb-ft (41-61 N•m)			45-65 lb-ft (61-88 N•m)		65-85 lb-ft (88-115 N•m)
Midland	35-50 lb-ft (48-68 N•m)		70-100 lb-ft (95-136 N•m)					
MGM	35-40 lb-ft (48-54 N•m)		100-115 lb-ft (136-156 N•m)					
Anchor-Lok	110-115 lb-ft with hex nut and washer (149-203 N•m)							
	85-95 lb-ft with locknut and washer (115-129 N•m)							

## Measuring and Adjusting the Chamber Stroke

**NOTE:** There are two free stroke settings. Use the free stroke setting listed below appropriate to the type of brake service you are performing on the vehicle.

- Use the initial free stroke setting when you reline the brakes. If you are adjusting the brake after lubricating the caliper, relining the brake or overhauling the caliper, start with Step 1.
- Use the in-service free stroke setting after the vehicle is operated in its normal duty cycle and the brakes have been applied approximately 50 times. If you are checking the in-service free stroke as part of preventive maintenance, start with Step 3.

### **⚠ WARNING**

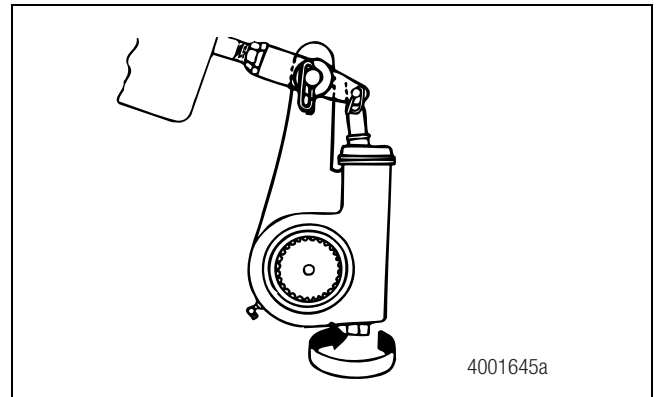
**Before you service a spring chamber, carefully follow the manufacturer's instructions to compress and lock the spring to completely release the brake. Verify that no air pressure remains in the service chamber before you proceed. Sudden release of compressed air can cause serious personal injury and damage to components.**

1. If the vehicle has spring brakes, manually compress and lock the springs to release the brakes. You must check to ensure that no air pressure remains in the service halves of the air chambers.

### **⚠ CAUTION**

**You must disengage a pawl or remove a conventional pawl before rotating the manual adjusting nut, or you will damage the pawl teeth. A damaged pawl will not allow the slack adjuster to automatically adjust brake clearance. Replace damaged pawls before putting the vehicle in service.**

2. Remove or disengage the slack adjuster pawl.
3. Set the stroke to its approximate length. Set the approximate clearance between the linings and rotor as follows.
  - A. Turn the manual adjusting nut on the slack adjuster in the direction shown in Figure 11.7 until the inboard lining touches the disc or rotor.
  - B. Turn the adjusting nut  $3/4$  turn in the opposite direction.



**Figure 11.7**

## Measuring the Initial and In-Service Free Stroke Without a Template

1. Measure the distance from the bottom of the air chamber to the center of the large clevis pin.
2. Use a pry bar to move the slack adjuster so that the linings are against the disc or rotor. Measure from the air chamber to the center of the large clevis pin while the linings are against the disc or rotor.

### **⚠ CAUTION**

**Do not set free stroke shorter than the specified minimum. Free stroke set too short can cause the linings to drag on the disc or rotor. Damage to the brake can result.**

3. Free stroke is the difference between measurements taken in Step 1 and Step 2. Figure 11.8.
  - The initial free stroke must be  $7/8$ - $1-1/8$ -inch (22.2-28.6 mm).
  - The in-service free stroke must be  $3/4$ - $7/8$ -inch (19.1-22.2 mm). If the in-service free stroke is outside specification, refer to the tables in Section 14 to correct the problem before adjusting the stroke.

# 11 Adjust the Brakes

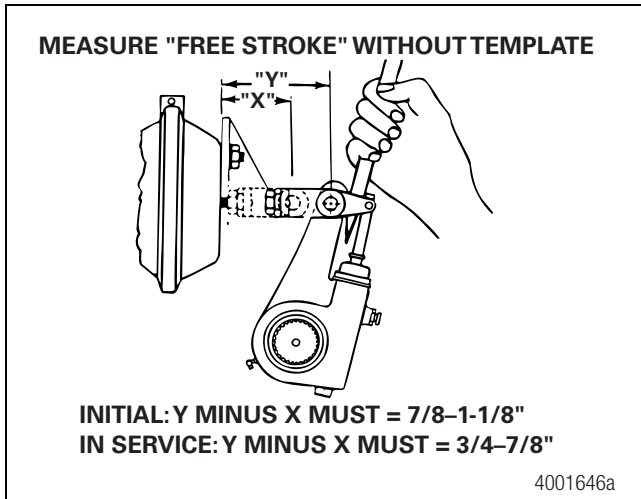


Figure 11.8

4. Adjust the stroke. Refer to the procedure in this section.

## Measuring the In-Service Free Stroke with a Template

1. Position the narrow end of the template against the bottom of the air chamber. The center of the large clevis pin must be at the mark on the template indicated "CL of large clevis pin." Figure 11.9.

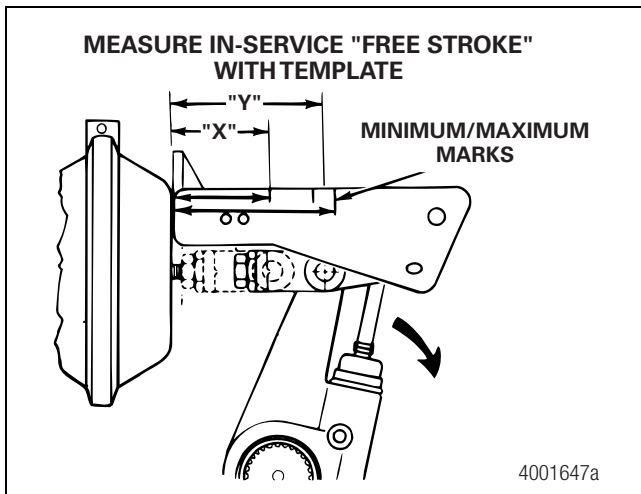


Figure 11.9

2. If the clevis is not at the mark, check to verify that the clevis is installed in the correct position.

3. Use a pry bar to move the slack adjuster so that the linings are against the disc or rotor. The center of the large clevis pin must be between the "MIN" and "MAX" marks on the template.
4. If the free stroke is not between the marks, refer to Section 14 to correct the problem before adjusting the stroke.
5. Adjust the stroke. Refer to Adjusting the Stroke in this section.

## Adjusting the Stroke

1. To adjust the stroke, turn the adjusting nut 1/8 turn in the direction shown in Figure 11.10. Check the stroke again. Continue to measure and adjust the stroke until it is adjusted correctly.

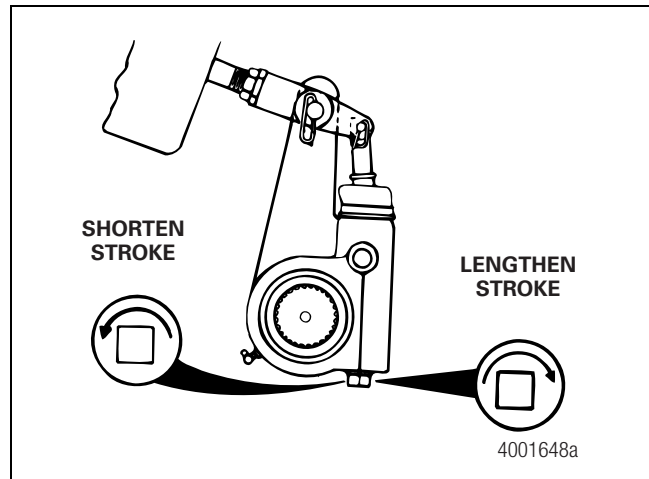


Figure 11.10

2. Release a pull pawl or re-install a conventional pawl.

### ⚠ WARNING

Before you service a spring chamber, carefully follow the manufacturer's instructions to compress and lock the spring to completely release the brake. Verify that no air pressure remains in the service chamber before you proceed. Sudden release of compressed air can cause serious personal injury and damage to components.

3. If the brake has spring chambers, carefully release the spring.
4. Test the vehicle to ensure that the brake system operates correctly before you return the vehicle to service.

## Hazard Alert Messages

### Commercial Vehicle Safety Alliance (CVSA) Guidelines to Measure Push Rod Travel (Adjusted Chamber Stroke)

Use the following procedures to check in-service push rod travel, adjusted chamber stroke, on truck or tractor air brakes with automatic slack adjusters.

Hold the ruler parallel to the push rod and measure as carefully as possible. An error in measurement can affect CVSA re-adjustment limits, which state that “any brake 1/4-inch or more past the re-adjustment limit, or any two brakes less than 1/4-inch beyond the re-adjustment limit will be cause for rejection.”

#### WARNING

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

Before you service a spring chamber, carefully follow the manufacturer’s instructions to compress and lock the spring to completely release the brake. Verify that no air pressure remains in the service chamber before you proceed. Sudden release of compressed air can cause serious personal injury and damage to components.

1. The engine must be OFF. If the brake has spring chambers, carefully release the spring.
2. Check the gauges in the cab to ensure that air pressure in the tanks is 100 psi (689 kPa).

3. Determine the size and type of brake chamber you are inspecting.
4. With the brakes released, mark the push rod where it exits the chamber. Figure 11.11. Measure and record the distance.
5. Have another person apply and hold the brakes one full application.
6. Measure push rod travel distance, adjusted chamber stroke, from where the push rod exits the brake chamber to your mark on the push rod. Measure and record the distance.
7. Subtract the measurement you obtained in Step 4 from the measurement you obtained in Step 6. The difference is the push rod travel, adjusted chamber stroke. Push rod travel, adjusted chamber stroke, must not be greater than the stroke length shown in the Table E and Table F for the size and type of air chamber you are inspecting.

- If push rod travel, adjusted chamber stroke, is greater than the maximum stroke shown in the Table E and Table F: Inspect the slack adjuster and replace it if necessary.

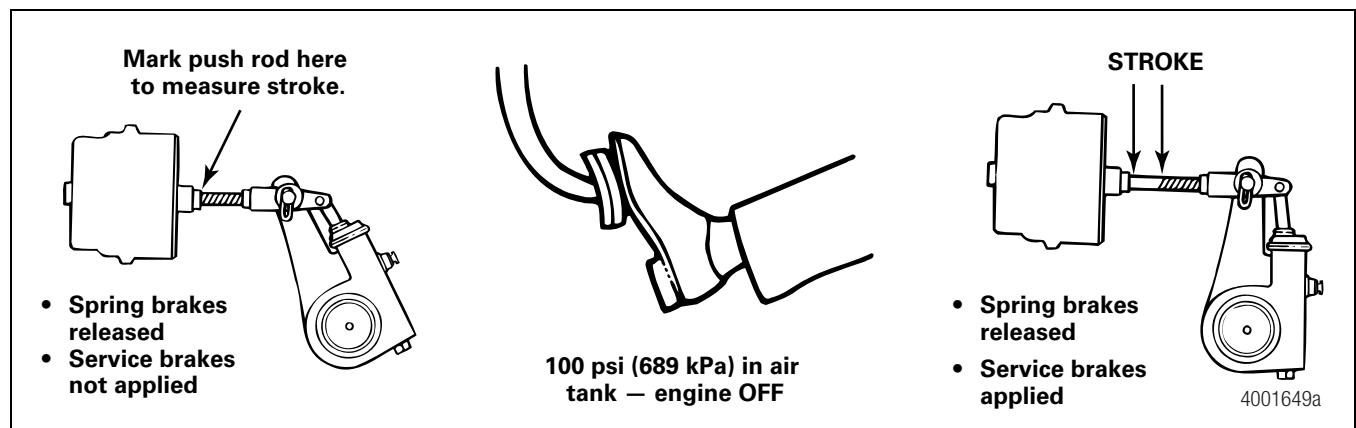


Figure 11.11

# 11 Adjust the Brakes

## Alternate Method for Determining Push Rod Travel (Adjusted Chamber Stroke)

Use the above procedure, except in Step 4 and Step 6, measure the distance from the bottom of the air chamber to the center of the large clevis pin on each of the brakes.

## Commercial Vehicle Safety Alliance (CVSA) North American Out-of-Service Criteria Reference Charts

**NOTE:** A brake found at the adjustment limit is not a violation.

**Table E: "Standard Stroke" Clamp-Type Brake Chamber Data**

Type	Outside Diameter (inches)	Brake Adjustment Limit (inches)
16	6-3/8	1-3/4
20	6-25/32	1-3/4
24	7-7/32	1-3/4
30	8-3/32	2
36	9	2-1/4

**Table F: "Long Stroke" Clamp-Type Brake Chamber Data**

Type	Outside Diameter (inches)	Brake Adjustment Limit (inches)
16	6-3/8	2.0
20	6-25/32	2.0
24	7-7/32	2.0
24*	7-7/32	2.5
30	8-3/32	2.5

\* For 3" maximum stroke type 24 chambers



### 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.

#### **WARNING**

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

#### 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 to clean metal parts and surfaces that are ground or polished. Kerosene or diesel fuel can be used as cleaning solvents.

#### Rough Metal Parts

Clean rough metal parts with cleaning solvents or with a weak alkaline solution in a hot solution tank. If you use a hot solution tank, leave the rough parts in the hot solution tank until they are completely cleaned and heated. Remove the rough parts from the hot solution tank and wash them with water until the alkaline solution is removed.

#### Rubber or Plastic Parts

#### **CAUTION**

Do not use cleaning solvents or alkaline solutions on rubber or plastic parts or you will damage the parts.

### Dry and Inspect the Parts

#### **CAUTION**

Do not use compressed air to dry bearings or you will damage them.

- Dry the brake parts.

Use soft, clean paper or cloth rags, or compressed air to completely dry all parts immediately after you clean them.

- Inspect the brake parts.

It is very important that you carefully inspect all parts before you assemble them. Inspect the parts for any signs of wear or damage. Repair or replace any worn or damaged parts. You must replace worn or damaged parts. Poor brake performance or a brake failure can result.

- Apply corrosion protection to the brake parts.

To prevent corrosion, apply a thin layer of brake grease to parts you cleaned, dried, inspected and will assemble.

If the parts will be stored, apply a special material that prevents corrosion and rust to all surfaces. Store the parts inside special paper or other material that prevents corrosion and rust.

**NOTE:** Do not apply brake grease to the brake linings or the disc (rotor).

## 13 Lubrication and Maintenance

### 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.

### Lubrication

#### Automatic Slack Adjuster

Use a grease gun to lubricate the automatic slack adjuster through the grease fitting until new grease flows from the pressure relief seal under the pawl assembly. Refer to Maintenance Manual 1, Preventive Maintenance and Lubrication, for the approved lithium-based greases for automatic slack adjusters. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.

#### Anti-Seize Compound

Meritor lubricant specification O-637, part number 2297-U-4571, is a corrosion control grease. Do not mix this grease with other greases. This compound is also available from the Southwest Petro-Chemical Division of Witco Chemical Corporation, 1400 South Harrison, Olathe, KS 66061, as "Corrosion Control", part number SA 8249496.

- Use anti-seize compound on the clevis pins of all slack adjusters.
- Also use anti-seize compound on the automatic slack adjuster and cam splines if the slack adjuster gear has no grease groove and holes around its inner diameter.

### Caliper

#### **⚠ CAUTION**

Only use Meritor specification O-616-A or O-645 grease inside the disc brake caliper. Do not use lithium-base grease, which can melt from high temperatures inside the caliper. Damage to components can result.

Meritor air disc brakes have been manufactured in three different designs. Note that the location of the caliper grease fitting and pressure relief valve is different in brakes manufactured before 1985, from 1985 to 1991, and after 1992. Figure 13.1, Figure 13.2 and Figure 13.3.

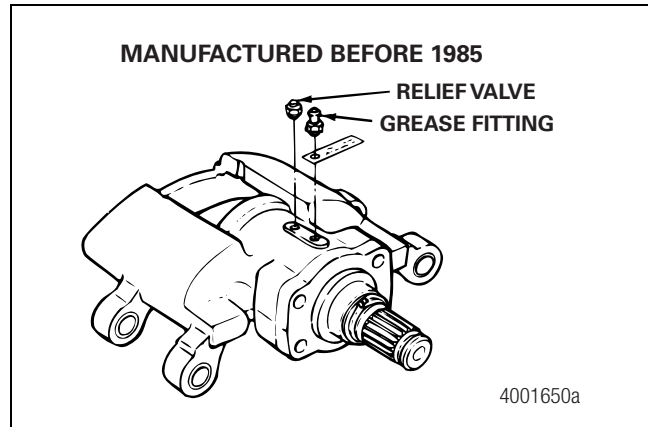


Figure 13.1

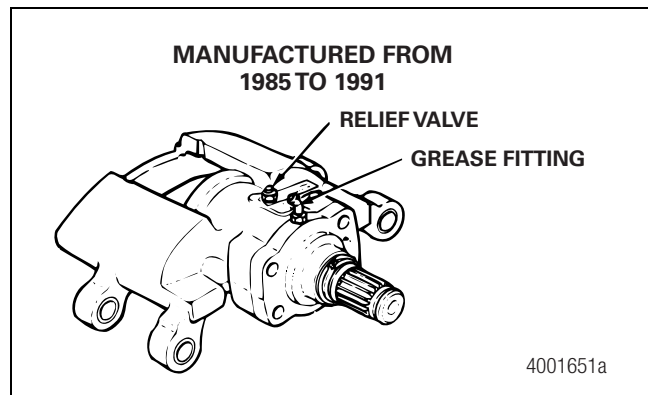


Figure 13.2

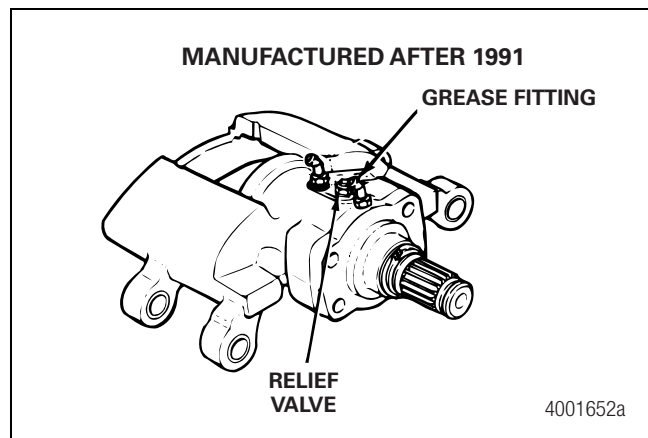
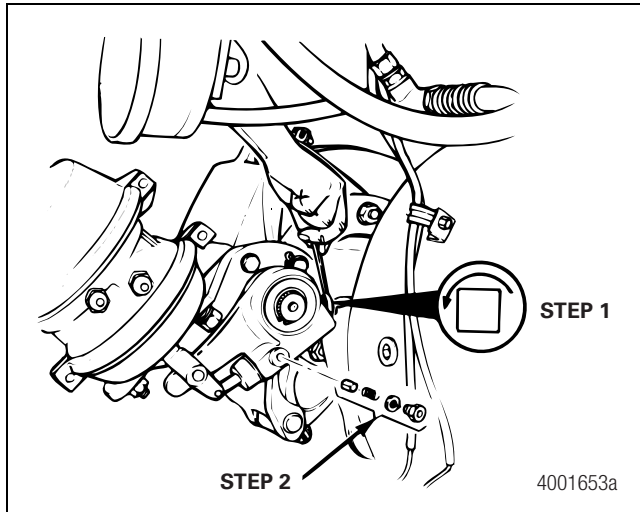


Figure 13.3

**NOTE:** Lubricate brake-actuating components inside the caliper two to four times during the life of the lining, or every six months.

1. Turn the adjusting nut on the automatic slack adjuster to move the inboard lining against the rotor. Figure 13.4.



**Figure 13.4**

2. Plug the pressure relief valve by holding a finger over the poppet.

**NOTE:** For calipers with grease fittings in the caliper and the camshaft cap, first apply grease to the caliper fitting, then apply grease to the camshaft cap fitting.

3. Apply grease through the grease fitting in the caliper until grease flows out of the seal at the camshaft cap.

### **CAUTION**

**You must force excess grease from the caliper. Brakes can drag due to excessive grease in the caliper, which will reduce brake lining life.**

4. Remove the pressure relief valve from the caliper. Turn the slack adjuster adjusting nut in the opposite direction to fully retract the caliper piston and force excess grease through the pressure relief hole.
5. Clean the excess grease from the outside of the caliper with a rag.
6. Install the pressure relief valve.
7. Adjust the brake. Refer to Section 11.

## Maintenance

The maintenance schedules shown in this manual are for normal operating conditions. Refer below for other operating conditions.

- Operation under severe conditions can require shorter periods between maintenance.
- Operation over long distances with few stops can permit longer periods between maintenance.

A maintenance schedule for each vehicle can be set after the brakes are inspected several times.

## Minor Inspections

Inspect and lubricate the brake and automatic slack adjuster according to one of the following schedules. Use the schedule that provides the most frequent inspection and lubrication.

- The chassis lubrication schedule used by your fleet.
- The chassis lubrication schedule recommended by the chassis manufacturer.
- A minimum of four times during the life of the linings.

## Air System

- A vehicle equipped with a combination of air disc and drum brakes requires special attention to obtain maximum brake performance.
- Replace air system valves with valves of identical performance characteristics.
- A correctly maintained air system and correct air pressure to each brake can help to ensure maximum brake performance and reduced lining wear.

# 13 Lubrication and Maintenance

## Automatic Slack Adjuster

**NOTE:** For complete maintenance instructions on the Meritor automatic slack adjuster, consult Maintenance Manual 4B, Automatic Slack Adjuster. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.

### **⚠ WARNING**

**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.**

1. Place blocks in front and behind the wheels to prevent the vehicle from moving.

### **⚠ WARNING**

**Before you service a spring chamber, carefully follow the manufacturer's instructions to compress and lock the spring to completely release the brake. Verify that no air pressure remains in the service chamber before you proceed. Sudden release of compressed air can cause serious personal injury and damage to components.**

2. If the vehicle has spring brakes, manually compress and lock the springs to release the brakes. You must check to ensure that no air pressure remains in the service halves of the air chambers.

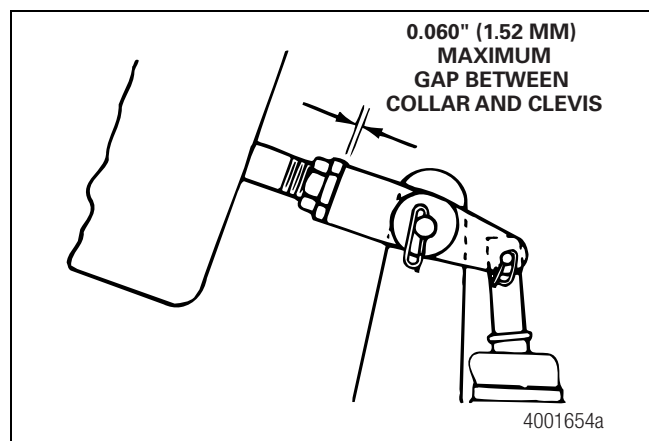
## Slack Adjusters Manufactured Before 1993

1. Remove the slack adjuster when these conditions are apparent.
  - The grease is dry or contaminated.
  - The pawl or actuator is worn.
2. Disassemble the slack adjuster.
3. Replace any worn or damaged parts.
4. Use new seals and a new boot when you assemble the unit.

## Slack Adjusters Manufactured in 1993 and Later

1. Use the correct slack adjuster template to ensure that the clevis is installed in the correct position. Refer to Section 11.
2. Before you perform brake maintenance, check the free stroke and the adjusted chamber stroke as described in Section 11.

3. If the free stroke is not correct, refer to the tables in Section 14 to correct the stroke before you adjust the chamber stroke.
4. Inspect the boot for cuts or other damage. If the boot is cut or damaged, remove the pawl and inspect the grease.
5. If the grease is in good condition, replace the damaged boot with a new boot.
6. Use a grease gun to lubricate the slack adjuster through the grease fitting. If necessary, install a camshaft into the slack adjuster gear to minimize grease flow through the gear holes.
7. Lubricate until new grease purges from around the inboard camshaft splines and from the pawl assembly.
8. Measure the gap between the clevis and the collar on a "Quick Connect" clevis. Replace the clevis if the gap exceeds 0.060-inch (1.52 mm). Figure 13.5.



**Figure 13.5**

## Slide Pins and Bushings

1. Check for contamination on the slide pins. If necessary, remove and clean the slide pins and caliper bushings. Refer to Section 4.
2. Use a pin gauge, J-34064-54, to check the slide pin bushings for wear. If you can fit the gauge between the slide pin and the bushing, the bushing or slide pin is worn. Replace worn bushings and slide pins. Refer to Section 4. To obtain the pin gauge, contact SPX Kent-Moore at 800-328-6657.

## Rotors

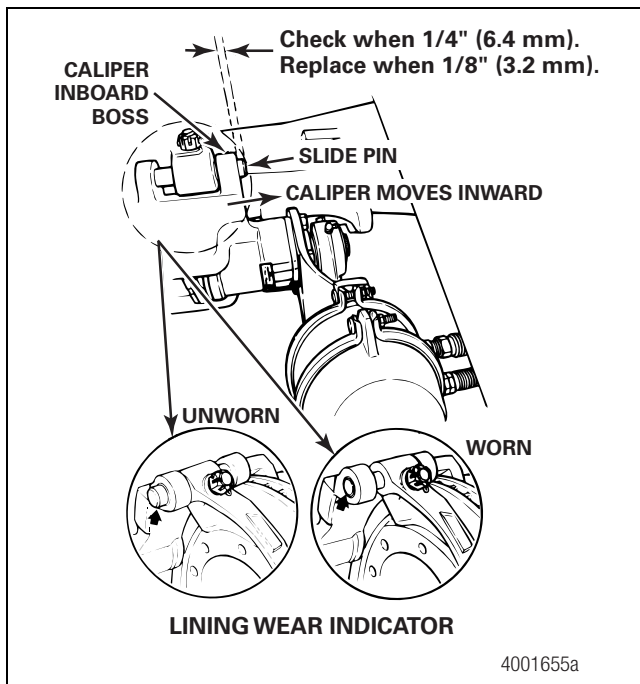
Inspect the rotor for cracks, deep scores or other damage. Replace the rotor when necessary. Refer to Section 8.

## Air Chamber

Move the air chamber from side-to-side to check that the caliper moves freely on the slide pins. When the caliper does not move freely, inspect the slide pins, slide pin bushings and slide pin retainers for wear or damage. Replace components when necessary. Refer to Section 10 and Section 4.

## Linings

When the linings wear, the caliper slides in along the slide pins. To check for lining wear, check the position of the caliper inboard bosses on the slide pins. Figure 13.6. If the bosses are within 1/4-inch (6.4 mm) of the ends of the pins, remove the wheels and tires and inspect the linings. If the bosses are within 1/8-inch (3.2 mm) of the ends of the pins, replace the linings. Refer to Section 10.



**Figure 13.6**

## Major Inspections

When you reline the brakes, or at least one time a year, perform the following inspection.

1. Inspect the automatic slack adjuster and brakes as previously described in the minor inspection guidelines in this section. Perform minor inspections before you do any other maintenance or reline procedures.
2. Perform all the procedures, inspections and measurements described in Section 10.
3. Lubricate the automatic slack adjuster and the caliper.
4. Adjust the brakes as described in Section 11.

## 13 Lubrication and Maintenance

**Table G: Air Disk Brake (1540, 1560, 1760) Grease Specifications**

<b>Component</b>	<b>Meritor Specification</b>	<b>NLGI Grade</b>	<b>Grease Description</b>	<b>Outside Temperature</b>
Caliper <sup>1</sup>	0-616-A	1	Clay Base	Down to -40°F (-40°C)
	0-645	2	Synthetic Oil, Clay Base	Down to -65°F (-54°C)
Slide Pin Retainers	0-637 <sup>2</sup>	1-1/2	Calcium Base	Refer to the grease manufacturer's specifications for the temperature service limits.
	0-641	—	Anti-Seize	
Camshaft Splines	Any of Above	See Above	See Above	See Above

<sup>1</sup> The grease used inside the caliper must be non-melting and also allow correct brake function at cold temperatures listed.

<sup>2</sup> Do not mix 0-637 calcium-base, corrosion-control grease with other greases.

**Table H: Conventional Automatic Slack Adjuster Grease Specifications**

<b>Component</b>	<b>Meritor Specification</b>	<b>NLGI Grade</b>	<b>Grease Type</b>	<b>Outside Temperature</b>
Automatic Slack Adjuster	0-616-A	1	Clay Base	Down to -40°F (-40°C)
	0-692	1 and 2	Lithium Base	Down to -40°F (-40°C)
	0-645	2	Synthetic Oil, Clay Base	Down to -65°F (-54°C)
Clevis Pins	Any of Above	See Above	See Above	See Above
	0-637	1-1/2	Calcium Base	Refer to the grease manufacturer's specifications for the temperature service limits.
	0-641	—	Anti-Seize	

**Table I: Automatic Slack Adjuster**

### Operating Temperature

#### Down to -40°F (-40°C)

Clay-Base Greases

Meritor Spec 0-616-A (Part Number A-1779-W-283)

Shell Darina Number 1

Texaco Thermatex EP-1

Texaco Hytherm EP-1

Aralub 3837

#### Down to -65°F (-54°C)

Synthetic Greases

Meritor Spec 0-645 (Part Number 2297-X-4574)

Mobilgrease 28 (Military)

Mobiltemp SHC 32 (Industrial)

Tribolube-12 Grade 1

## Troubleshooting

Table J: Air Disc Brake

Conditions	Possible Causes	Check For	Corrections
<b>Poor stopping power</b>	Incorrect air chamber or slack adjuster size	Check with vehicle manufacturer or Meritor for correct chamber and slack adjuster size.	Replace equipment with the recommended size.
<ul style="list-style-type: none"> <li>• Long stopping distances</li> <li>• Poor driver feel</li> <li>• High brake pressures</li> </ul>	Vehicle air system malfunction	Correct air pressure at the chamber inlet	Have the air system evaluated by a qualified brake system specialist.
	Brakes out-of-adjustment	Stroke Installation with auto slack template Jam nut torque Clevis wear Pawl wear	Repair, replace parts as required. Adjust to the recommended stroke. Correct the set-up and check with the template. Tighten as required.
	Vehicle overload	Overloading — Refer to GAWR limitations on vehicle I.D. plate.	Observe the vehicle manufacturer's load recommendations.
	Contamination on the linings	Grease, oil, etc., on the linings	Replace the linings.
	Companion vehicle brakes not working correctly	Inspect the companion vehicle brakes and air system.	Adjust or repair as required.
<b>Poor grade holding ability</b>	Refer to Poor stopping power	—	As required. Refer to Poor stopping power.
<ul style="list-style-type: none"> <li>• Vehicle does not hold on typical grade</li> </ul>	Incorrect spring brake chamber size	Check with original equipment manufacturer or Meritor for the correct size.	Replace with the correct chamber as required.
	Spring brake power spring in the caged position	—	Uncage the power spring.
<b>Brake not functioning</b>	Refer to Poor stopping power	—	As required. Refer to Poor stopping power.
<ul style="list-style-type: none"> <li>• Lack of normal response</li> </ul>	Internal caliper failure	Movement of the load plate piston when actuating the automatic slack adjuster	Disassemble and overhaul the caliper.
<b>Vehicle pulls to one side when stopping</b>	Refer to Poor stopping power, Poor grade holding ability and Brake not functioning	—	Refer to Poor stopping power, Poor grade holding ability and Brake not functioning.

# 14 Diagnostics

Table J: Air Disc Brake

Conditions	Possible Causes	Check For	Corrections
<b>Brake drag</b> <ul style="list-style-type: none"> <li>• Evidence of severe heat</li> <li>• Rapid lining wear</li> <li>• Heavy blueing or discoloration of disc or rotor braking surface</li> <li>• Torn or charred piston or caliper boot seal</li> </ul>	Incorrect manual adjustment	Automatic slack adjuster set-up Correct running clearance pad-to-disc or rotor	Correct the set-up. Adjust to the recommended stroke and running clearance. Check with the template.
	Vehicle air system malfunction	Correct operation of the quick release valve and relay valve	Repair or replace parts as required.
	Spring brake not releasing	Vehicle air system leakage	Find the source of the leak and repair as required.
		Spring brake chamber malfunction	Repair or replace spring brake chamber as required.
		Slow build-up of trailer emergency air pressure	Wait for full build-up before driving.
		Incorrect air pressure range at compressor or governor	Set the compressor or governor to the correct pressure range.
		Excessive grease pressure in the caliper	Incorrect lubrication procedures
<b>Short outboard lining life</b> <ul style="list-style-type: none"> <li>• Brake drag</li> </ul>	Internal corrosion of caliper assembly	Piston boot and caliper seals	Replace the seals as required. Inspect and overhaul the caliper assembly as required.
	Caliper seized on slide pins	Excessive paint or other foreign build-up on the caliper slide pins or bushings	Remove both pins. Clean, inspect and replace the pins and bushings as required.
	Misalignment of slide pins	Caliper should move back and forth with hand effort, 20-30 lb-ft (27-41 N•m)	Remove the pads. Clean, inspect and replace the slide pins and bushings as necessary. Install the caliper and slide pins without the pads. Tighten the retainer nuts. Check that the caliper slides freely on the slide pins. If the problem continues, check the axle mounting flange for nicks, burrs or gouges. Repair as necessary. Install the torque plate and caliper and check again for free movement. If the flange is acceptable but the problem continues, contact your Meritor representative for information.



Table J: Air Disc Brake

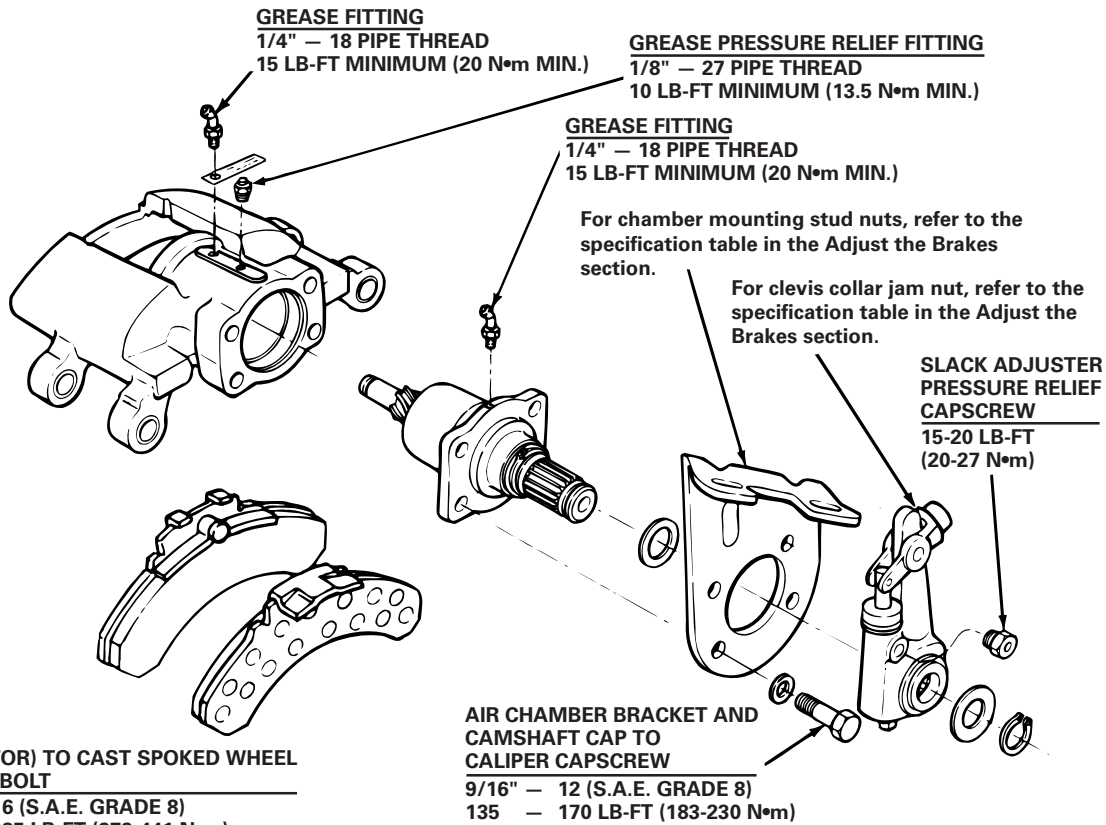
Conditions	Possible Causes	Check For	Corrections
<b>Short lining life</b>	Refer to Brake drag and Short outboard lining life	—	Refer to Brake drag and Short outboard lining life.
	Abusive use of brake system	Driver technique	Train the drivers.
	Vehicle overload	Overloading. Refer to gross axle weight ratings (GAWR) limitations on vehicle identification plate.	Observe the vehicle manufacturer's load recommendations.
<b>Pad backing plate tab wear</b>	Companion vehicle brakes do not work correctly	Inspect companion vehicle brakes and air system.	Adjust or repair as required.
	Brinnelling of pad tab area	Signs of brinnelling and back-and-forth movement of the pad in the caliper	Remove and replace the pads. Check the anti-rattle clip. If wear is excessive, replace the caliper assembly.
<b>Fractured disc or rotor</b>	Refer to Brake drag, Short outboard lining life and Short lining life	—	Replace the disc or rotor, shoes and linings as required. Review the correct maintenance procedures with personnel.
	• <b>Cracked or broken</b> Failure to perform routine checks on lining wear and caliper position on slide pins	Disc or rotor for minimum thickness	
<b>Slide pin or retainer pin assemblies hard to remove</b>	Highly corrosive environment	Signs of corrosion	Inspect the slide pins and retainer pin assemblies. Replace as required. Apply an anti-seize compound to the retainer, but not to the threads.  Seal the inner end of the lower slide pin retainer hole in the torque plate.
<b>Brake smoking</b>	Leaking hub or wheel seal	Condition of seals	Replace as required. Clean the disc or rotor as required. Inspect the pads and replace if oil-soaked.
	Leaking caliper sealing components	Condition of piston boot, piston cap seal and piston or caliper seal	Replace as required.
	Piston boot popped out of piston seating groove	Excessive lubrication of caliper. Inspect piston boot position.	Follow the lubrication recommendation. Replace the piston boot if required.
	Paint on slide pins or brake	All painted surfaces	Clean the slide pins and brake as required.
	High brake temperature	Refer to Poor stopping power, Brake drag, Short outboard lining life and Short lining life	Refer to Poor stopping power, Brake drag, Short outboard lining life and Short lining life

## 14 Diagnostics

Table K: Automatic Slack Adjuster

Conditions	Possible Causes	Corrections	
<b>Adjusted stroke is too long</b>	Incorrect slack adjuster part number	Check with the warehouse distributor or original equipment manufacturer.	
	<b>No adjustment</b>	Clevis installed at the incorrect angle	Use the correct template or BSAP setting to install the clevis correctly.
		Excessive wear between the clevis and collar, more than 0.060-inch (1.52 mm)	Replace with a threaded clevis.
		Loose jam nut at clevis	Tighten to specification.
		Worn clevis pin bushing in slack arm, inside diameter larger than 0.53-inch (13.46 mm)	Replace the bushing.
		Weak or broken return spring in air chamber, spring force must be at least 32 lb (142.4 N) at first push rod movement	Replace the return spring or air chamber.
		Spring brake does not retract fully	Repair or replace the spring brake.
		Worn or stripped teeth on pawl or actuator	Replace the pawl or actuator.
		High torque is required to rotate the worm when slack is removed from vehicle	Rebuild or replace the slack adjuster.
		<ul style="list-style-type: none"> <li>• In service slack, maximum worm torque: 45 lb-in (5.09 N•m)</li> <li>• New or rebuilt slack, maximum worm torque: 25 lb-in (2.83 N•m)</li> </ul>	
Excessive looseness between camshaft splines and automatic slack adjuster gear	Replace the camshaft, gear or automatic slack adjuster as needed.		
Worn components, cam bushing, for example, in the foundation brake	Replace the components.		
<b>Adjusted stroke is too short</b>	Non-original equipment manufacturer replacement linings with excessive swell or growth	Use Meritor-approved linings.	
	<b>Linings drag</b>	Incorrect slack adjuster part number	Check with the warehouse distributor or original equipment manufacturer.
Clevis installed at incorrect angle		Use the correct template to install the clevis correctly.	
Loose jam nut at clevis		Tighten to specification.	
Spring brake does not retract fully		Repair or replace the spring brake.	
Wrong manual adjustment		Adjust the brake.	
Poor contact between linings and drum, or drum is out-of-round		Repair or replace the drums or linings.	
Brake temperature imbalance		Correct the brake balance.	

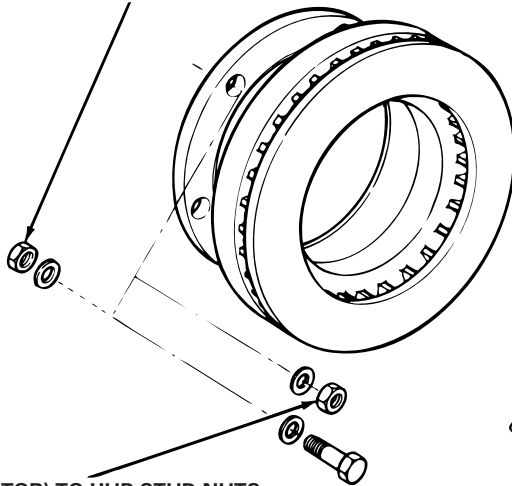
# Torque Specifications



**DISC (ROTOR) TO CAST SPOKED WHEEL NUT AND BOLT**

3/4" — 16 (S.A.E. GRADE 8)  
275 — 325 LB-FT (373-441 N•m)

NOTE: Assemble bolt and one washer from disc side and nut with one washer from wheel side. Tighten in a crisscross pattern.



**DISC (ROTOR) TO HUB STUD NUTS**

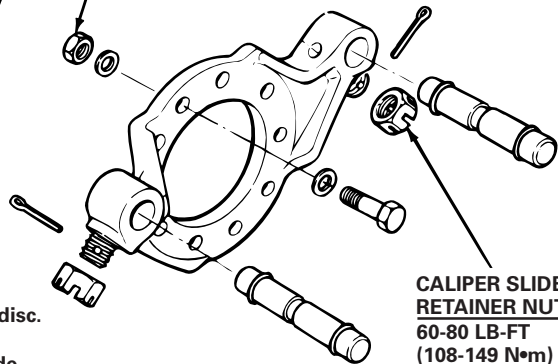
3/4" — 16 (S.A.E. GRADE 8)  
100 LB-FT (136 N•m) To seat the inner stud nuts against the disc. Refer to the Disc (Rotor) section for more information.

NOTE: Assemble nut and one washer onto stud from disc side. Tighten in a crisscross pattern.

**TORQUE PLATE TO AXLE OR KNUCKLE FLANGE NUT AND BOLT**

1/2" — 20 (S.A.E. GRADE 8) 85-115 LB-FT (115-156 N•m)  
9/16" — 18 (S.A.E. GRADE 8) 130-165 LB-FT (176-224 N•m)  
5/8" — 18 (S.A.E. GRADE 8) 180-240 LB-FT (244-325 N•m)

NOTE: Assemble bolt and one washer from axle or knuckle flange side and nut with one washer from torque plate side. Tighten in a crisscross pattern.



**CALIPER SLIDE PIN RETAINER NUT**

60-80 LB-FT (108-149 N•m)

4003819b



**Meritor Heavy Vehicle Systems, LLC**

2135 West Maple Road  
Troy, MI 48084 USA  
800-535-5560  
arvinmeritor.com

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