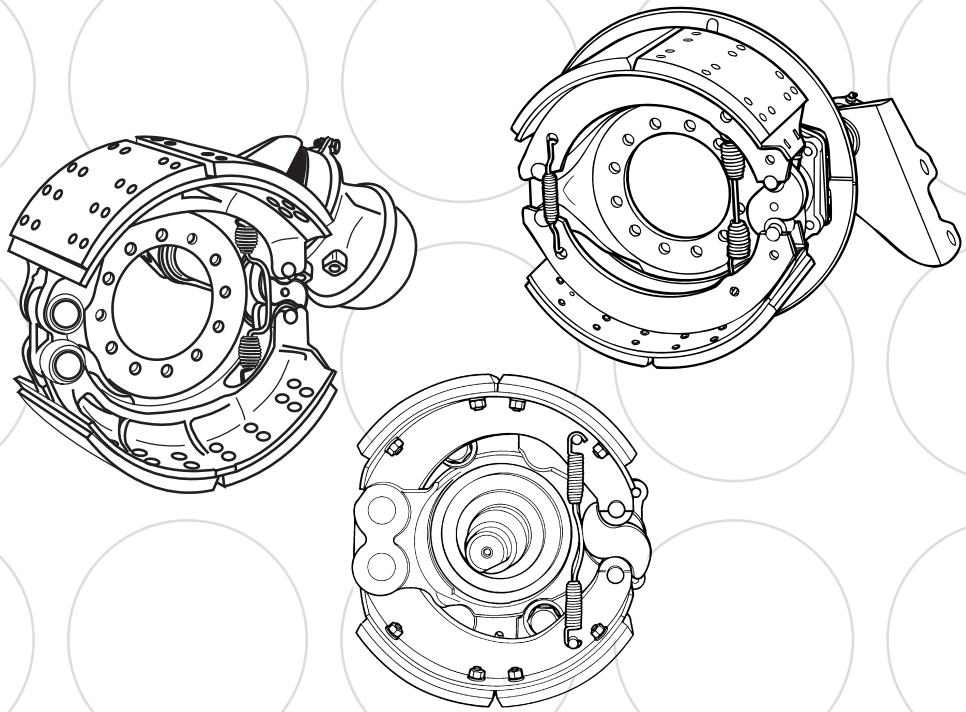
MERITOR®

an *ArvinMeritor* brand

Maintenance Manual 23B

Bus and Coach Cam Brakes

Revised 07-04



About This Manual

This manual provides maintenance and service information for the Meritor bus and coach Q Series, Q Plus™, Cast Plus™ and W Series cam 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 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, Supplies and Brake Conversion Kits Specified in This Manual

Call ArvinMeritor's Commercial Vehicle Aftermarket at 888-725-9355 to obtain Meritor tools and supplies. Lined shoe kits and brake hardware kits are available. You also can obtain the following conversion kit.

- A kit to convert standard 16.5-inch Q Series cam brakes to Q Plus™ cam brakes

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

Contents

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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^3 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.

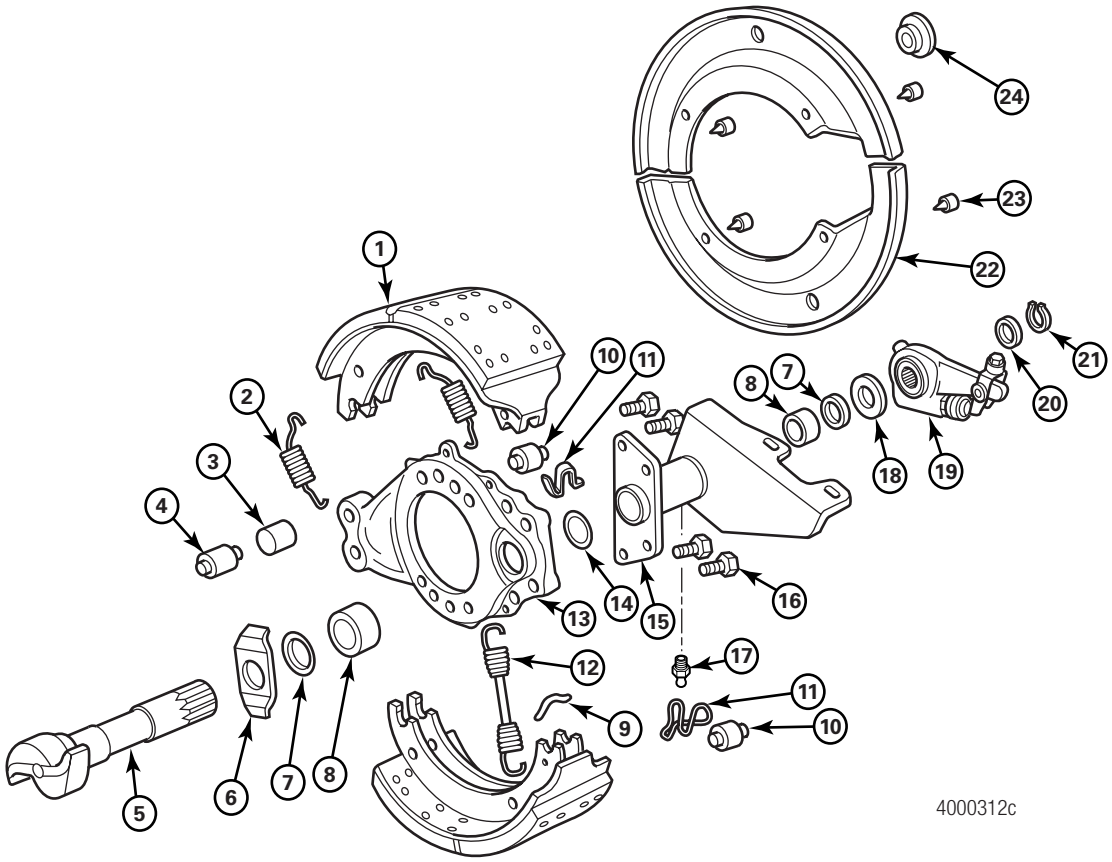
5. Worker Clean-Up. After servicing brakes, wash your hands before you eat, drink or smoke. Shower after work. Do not wear work clothes home. Use a vacuum equipped with a HEPA filter to vacuum work clothes after they are worn. Launder them separately. Do not shake or use compressed air to remove dust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

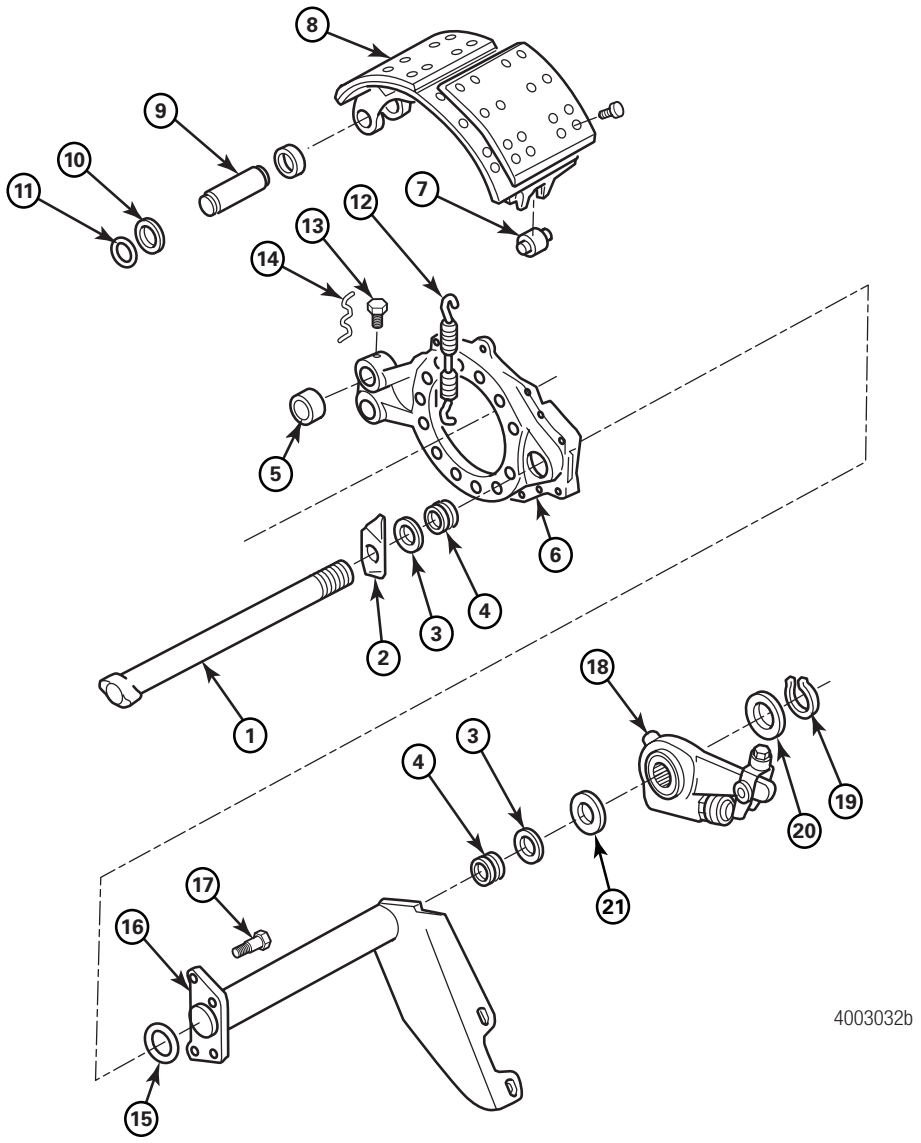
References to OSHA, NIOSH, MSHA, and EPA, which are regulatory agencies in the United States, are made to provide further guidance to employers and workers employed within the United States. Employers and workers employed outside of the United States should consult the regulations that apply to them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

15-Inch and 16.5-Inch Q Plus™ and Q Series Cam Brakes with Cast Spiders



Item	Description	Item	Description
1	Shoe and Lining Assembly	13	Cast Brake Spider
2	Shoe Retaining Spring	14	Chamber Bracket Seal
3	Anchor Pin Bushing	15	Chamber Bracket
4	Brake Shoe Anchor Pin	16	Chamber Bracket Capscrew
5	“S” Head Camshaft	17	Grease Fitting
6	Cam Head Washer	18	Thick Camshaft Washer
7	Camshaft Grease Seal	19	Automatic Slack Adjuster
8	Camshaft Bushing	20	Spacing Washer
9	Return Spring Pin	21	Camshaft Snap Ring
10	Brake Shoe Roller	22	Dust Shield
11	Shoe Roller Retainer	23	Dust Shield Capscrew
12	Brake Shoe Return Spring	24	Plug

16.5-Inch Cast Plus™ Cam Brake

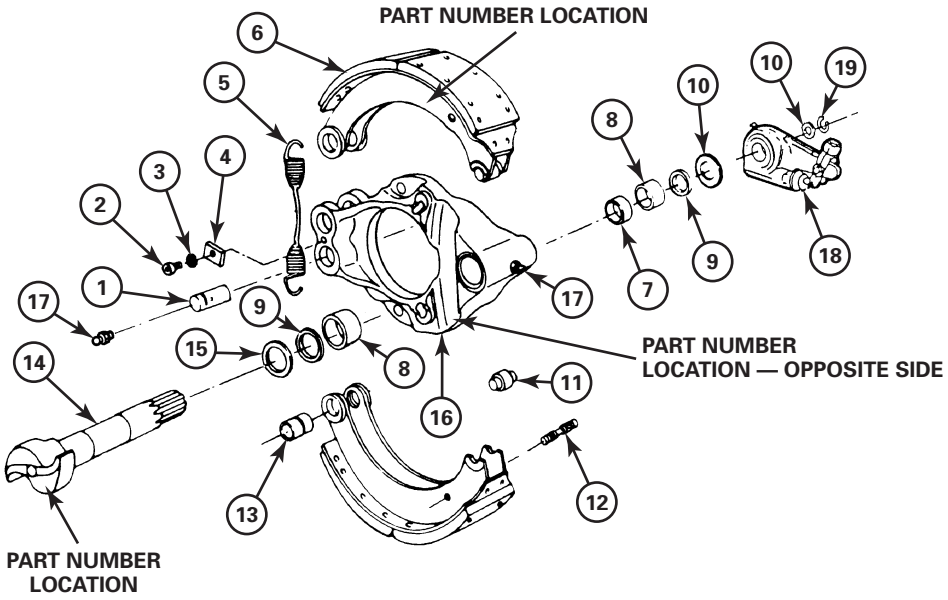


Item	Description
1	Camshaft
2	Cam Head Washer
3	Camshaft Seal
4	Camshaft Bushing
5	Anchor Pin Bushing
6	Brake Spider
7	Brake Shoe Roller
8	Brake Shoe and Lining Assembly
9	Anchor Pin
10	Anchor Pin Washer
11	Anchor Pin Snap Ring

Item	Description
12	Brake Shoe Return Spring
13	Anchor Pin Set Screw
14	Anchor Pin Set Screw Lock Wire
15	Chamber Bracket Seal
16	Chamber Bracket
17	Chamber Bracket Capscrew
18	Automatic Slack Adjuster
19	Snap Ring
20	Camshaft Spacing Washers
21	Thick Camshaft Washer

14.5-Inch W Series Brakes

14.5 x 5-Inch and 14.5 x 6-Inch



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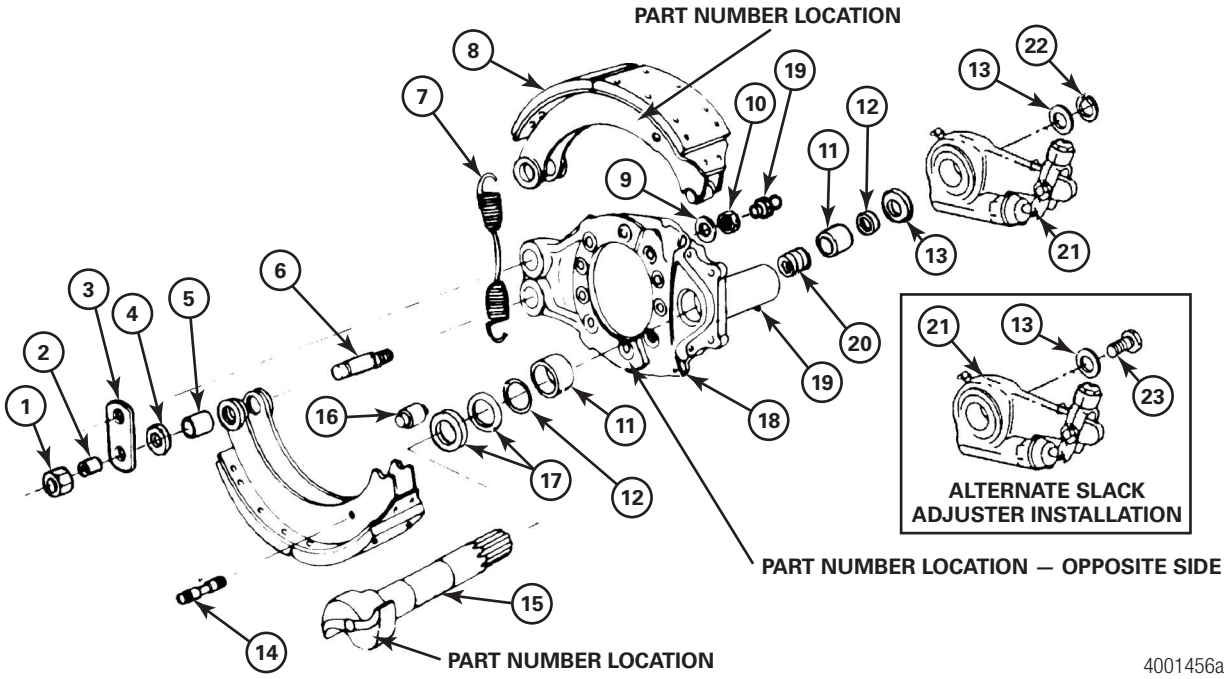
Item	Description
1	Brake Shoe Anchor Pin
2	Anchor Pin Lock Capscrew
3	Lock Washer
4	Strap
5	Brake Shoe Return Spring
6	Brake Shoe and Lining Assembly
7	Spider Bushing Spacer
8	Spider Camshaft Bushing
9	Camshaft Seal
10	Spacing Washer
11	Brake Shoe Roller
12	Brake Shoe Return Spring Pin
13	Brake Shoe Bushing
14	Camshaft
15	Cam Head Washer
16	Brake Spider
17	Grease Fitting
18	Automatic Slack Adjuster
19	Lock Ring

1 Exploded Views

14.5-Inch W Series Brakes

14.5 x 8-Inch and 14.5 x 10-Inch Type I, Tapered Seat Anchor Pin and Integral Cam Bracket

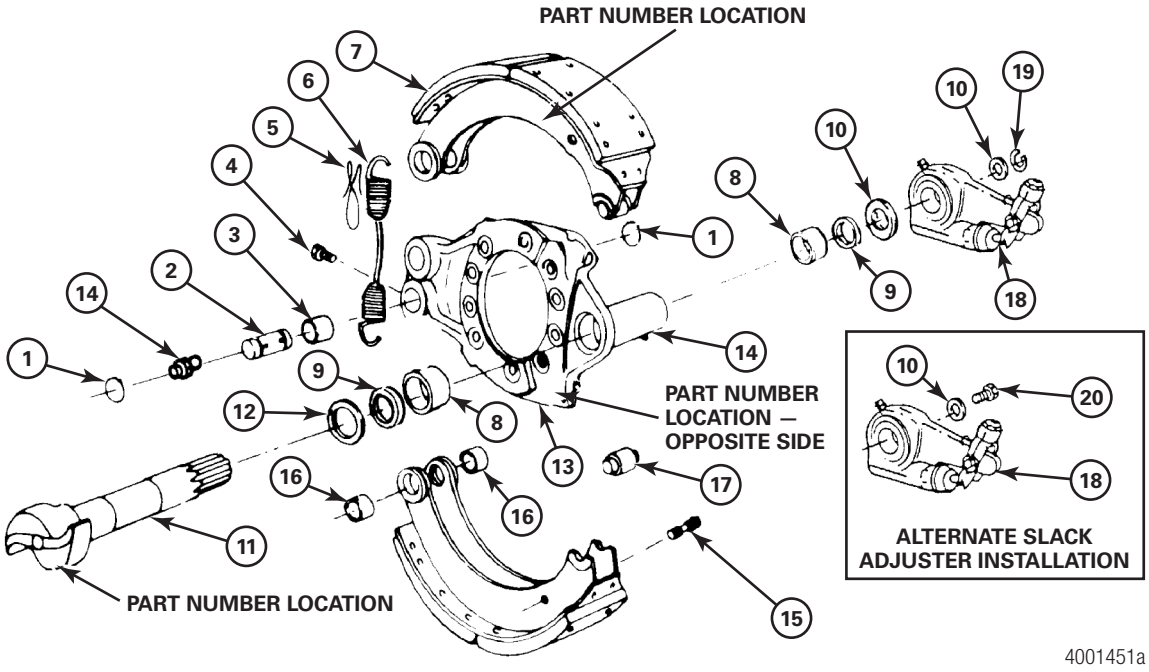


Item	Description
1	Shoe Retaining Nut
2	Dowel
3	Strap
4	Shim
5	Brake Shoe Bushing
6	Brake Shoe Anchor Pin
7	Brake Shoe Return Spring
8	Brake Shoe and Lining Assembly
9	Flat Washer
10	Anchor Pin Nut
11	Camshaft Spider Bushing
12	Camshaft Seal
13	Spacing Washer
14	Brake Shoe Return Spring Pin
15	Camshaft

Item	Description
16	Brake Shoe Roller
17	Spacing Washer
18	Brake Spider
19	Grease Fitting
20	Spider Bushing Spacer
21	Automatic Slack Adjuster
22	Lock Ring
23	Capscrew

14.5-Inch W Series Brakes

14.5 x 10-Inch Type II, Straight Anchor Pin and Integral Cam Bracket

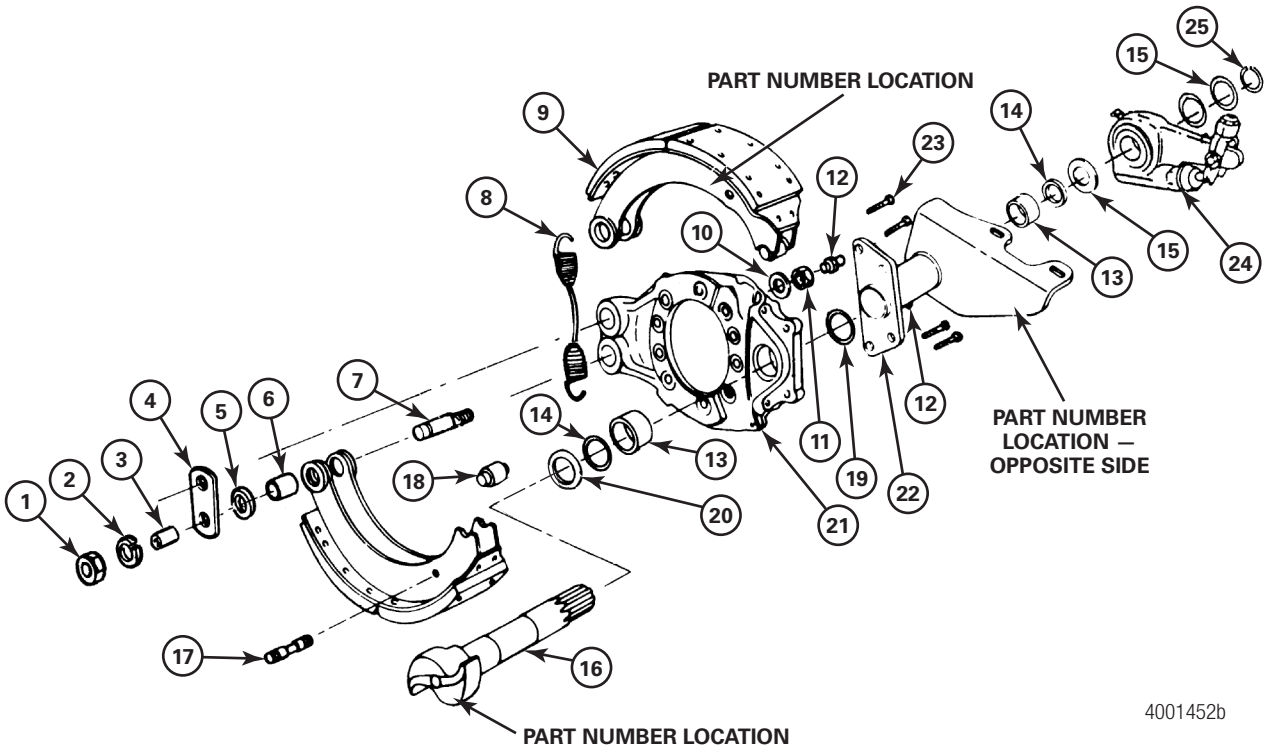


Item	Description
1	Anchor Pin Lock Ring
2	Brake Shoe Anchor Pin
3	Anchor Pin Bushing
4	Anchor Pin Set Screw
5	Anchor Pin Lock Wire
6	Brake Shoe Return Spring
7	Brake Shoe and Lining Assembly
8	Camshaft Spider Bushing
9	Camshaft Seal
10	Spacing Washer
11	Camshaft
12	Cam Head Washer
13	Brake Spider
14	Grease Fitting
15	Brake Shoe Return Spring Pin

Item	Description
16	Brake Shoe Bushing
17	Brake Shoe Roller
18	Automatic Slack Adjuster
19	Lock Ring
20	Capscrew

14.5-Inch W Series Brakes

14.5 x 10-Inch Type III, Tapered Seat Anchor Pin and Standard Cam and Chamber Bracket



Item	Description
1	Shoe Retaining Nut
2	Lock Washer
3	Dowel
4	Strap
5	Shim
6	Brake Shoe Bushing
7	Brake Shoe Anchor Pin
8	Brake Shoe Return Spring
9	Brake Shoe and Lining Assembly
10	Flat Washer
11	Anchor Pin Nut
12	Grease Fitting
13	Camshaft Bushing
14	Camshaft Seal

Item	Description
15	Spacing Washer
16	Camshaft
17	Brake Shoe Return Spring Pin
18	Brake Shoe Roller
19	Bracket O-Ring Seal
20	Flat Washer
21	Brake Spider
22	Chamber Bracket
23	Bracket Capscrew
24	Automatic Slack Adjuster
25	Lock Ring

Description

Cam Brakes

The Meritor cam brakes are air-actuated, cam-operated, double shoe brakes with each shoe mounted on a separate anchor pin. The brakes are available with automatic adjustment and can be assembled with auxiliary spring brakes.

There are three types of cam brakes for buses and coaches: Q Series and Q Plus™, Cast Plus™ and W Series.

Q Series and Q Plus™

The Q Series and Q Plus™ brake shoe has an open end on the anchor pin ends for "quick change" service. An anchor pin fastens each brake shoe to the spider. The linings are fastened to the brake shoes with rivets. Two retaining springs and one return spring hold the shoes together on the spider. Figure 2.1.

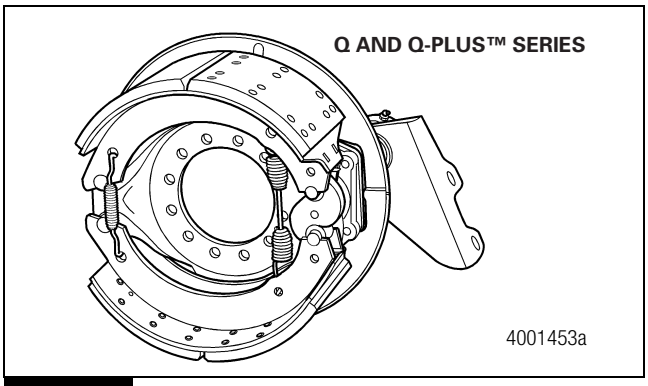


Figure 2.1

Q Series brakes are available in 16.5-inch diameter with a 10-inch width and 0.75-inch tapered brake lining.

Q Plus™ brakes are available in 15-inch and 16.5-inch (419 mm) diameter with 5-, 6-, 7- and 8.625-inch (127, 152, 178 and 219 mm) widths. The tapered brake linings are 0.73-inch (18.54 mm) thick on 15-inch brakes and 0.84-inch (21.34 mm) thick on 16.5-inch brakes.

Cast Plus™

The Cast Plus™ brake is designed for heavy-duty, off-highway and people-mover applications. A redesigned S-cam and heavy-duty shoe return spring allow additional shoe travel. An improved camshaft bushing contributes to longer service life. The Cast Plus™ brake uses Q Plus™ brake linings and the P Series brake shoe design. For more information on the P Series brake, refer to Maintenance Manual 4, Cam Brakes and Automatic Slack Adjuster. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual. The brake linings are fastened to the brake shoes with rivets or bolts. Figure 2.2.

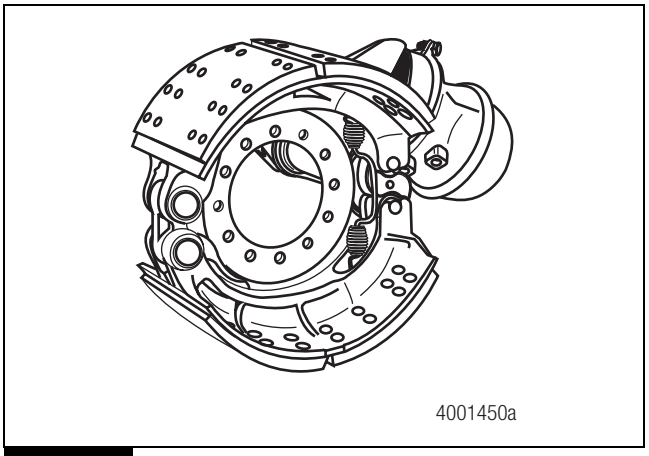


Figure 2.2

Cast Plus™ brakes are available in 16.5-inch (419 mm) diameter with 6- and 8.625-inch (152 and 219 mm) widths.

W Series

The W Series brake has anchor pins that fasten the brake shoe to the spider. The anchor pins can have a straight or tapered design. The spider can have an integral or separate cam bracket. The brake shoes are fastened to the linings with bolts. Figure 2.3.

W Series brakes are available in 14.5-inch (368 mm) diameter with 5-, 6-, 8- and 10-inch (127, 152, 203 and 254 mm) widths.

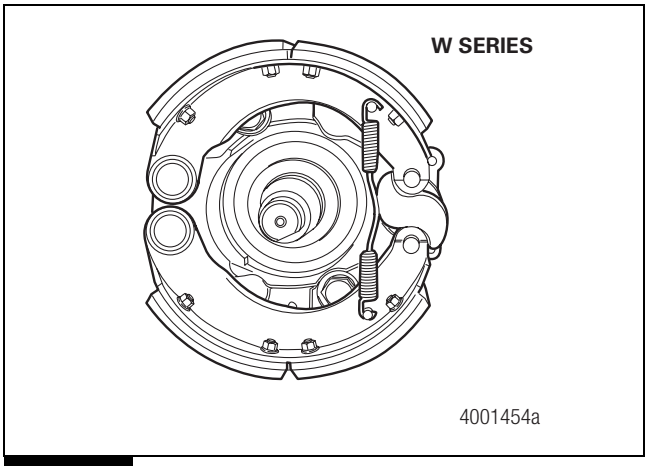


Figure 2.3

Identification

An identification tag is located on the axle housing or the differential carrier. Use the model number and the ratio number marked on the tag to order replacement parts. Figure 2.4.

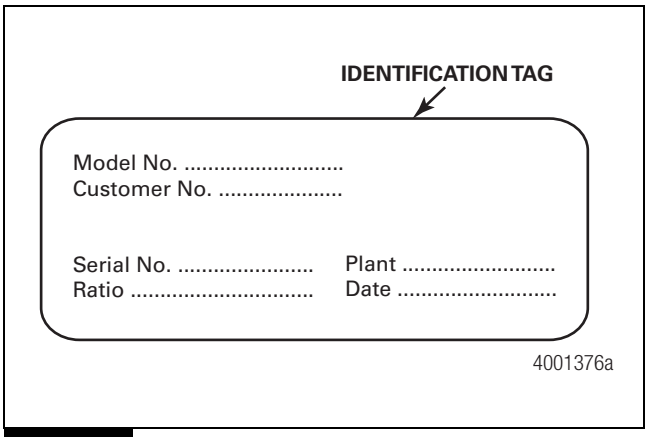


Figure 2.4

The model number designation for the 59000, 61000 and 71000 Series axles are identified in Figure 2.5 and Figure 2.6.

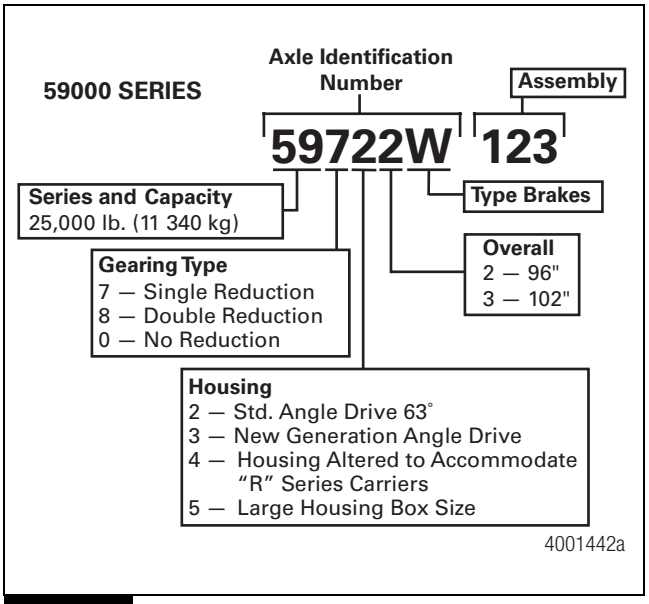


Figure 2.5

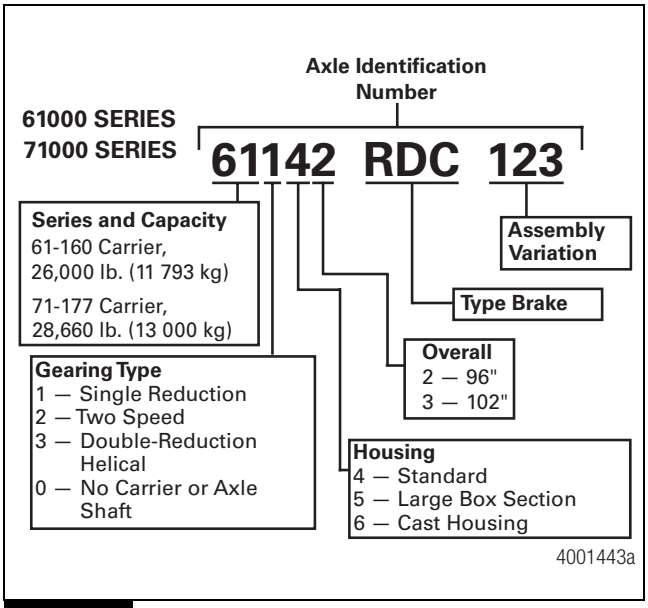


Figure 2.6

The RC-23-160 coach rear axle is identified by a letter and number system that provides information about the specific axle model. The first seven positions of the designation identify a basic axle model. The second group of letters and numbers identify complete axle specifications. Figure 2.7.

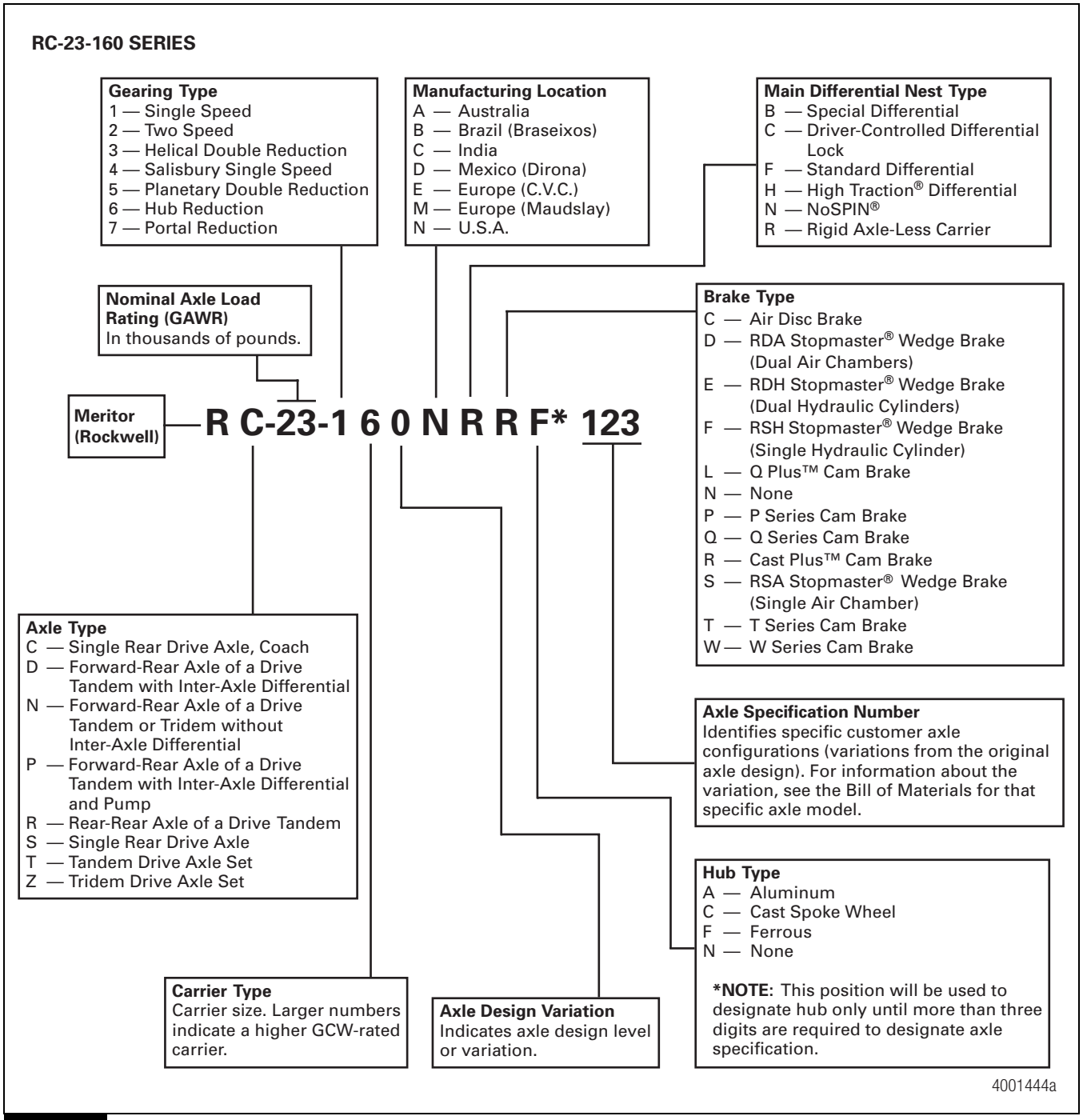
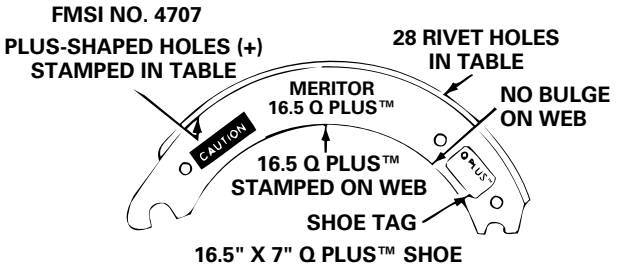
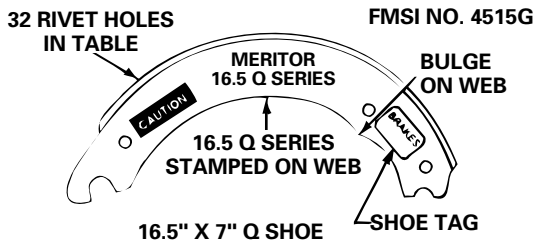
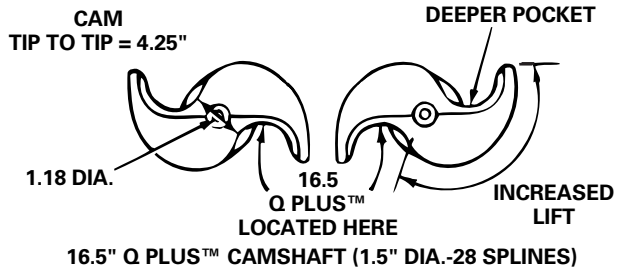
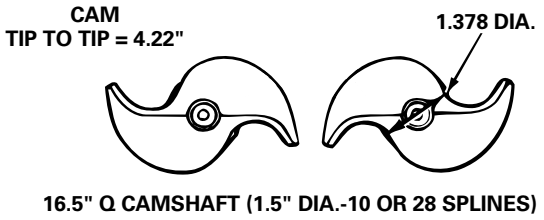


Figure 2.7

When parts are replaced, the correct parts must be used. Part numbers are found on the camshaft, on the brake spider, on the brake shoes and on the air chamber bracket.

Description

Differences Between Q Plus™ and Q Series Cam Brakes

Q Plus™ Components	Q Series Components
 4000323a	 4000324a
 4000325a	 4000326a

Camshafts	Shoes	Return Springs
Q Plus™	Q Plus™	Heavy-duty (blue)
Q Plus™	Q Series	Standard
Q Series	Q Series	Standard

Removal

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 and service.

⚠ ASBESTOS AND NON-ASBESTOS FIBERS WARNING

Some brake linings contain asbestos fibers, a cancer and lung disease hazard. Some brake linings contain non-asbestos fibers, whose long-term effects to health are unknown. You must use caution when you handle both asbestos and non-asbestos materials.

Wheel Components

⚠ 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 or fall over. Serious personal injury and damage to components can result.

1. Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving.
2. Use a jack to raise the vehicle so that the wheels to be serviced are off the ground. Support the vehicle with safety stands.
3. Remove the wheel nuts, and tire and rim assemblies.

⚠ 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 brake has spring chambers, carefully cage and lock the spring, so that the spring cannot actuate during assembly.
5. Release the automatic slack adjuster to retract the shoes so the drum can clear the lining. Refer to Section 7 for Meritor automatic slack adjusters. For non-Meritor automatic slack adjusters, refer to the slack adjuster manufacturer's instructions.

Brake Drums

1. If equipped, remove the screws that secure the brake drum to the hub.

⚠ WARNING

To avoid serious personal injury and damage to components, take care when using lifting devices during service and maintenance procedures. Inspect a lifting strap to ensure that it is not damaged. Do not subject lifting straps to shocks or drop loading. The lifting bolt threads must be fully engaged.

2. Use a lifting device to remove the brake drum.
   - **If the drum is difficult to remove and is equipped with push holes:** Install the bolts into the push holes. Tighten the bolts sequentially until the drum separates from the hub.

Brake Shoes

1. Push DOWN on the bottom brake shoe. Pull on the brake shoe roller retainer clip to remove the bottom roller. Figure 3.1.

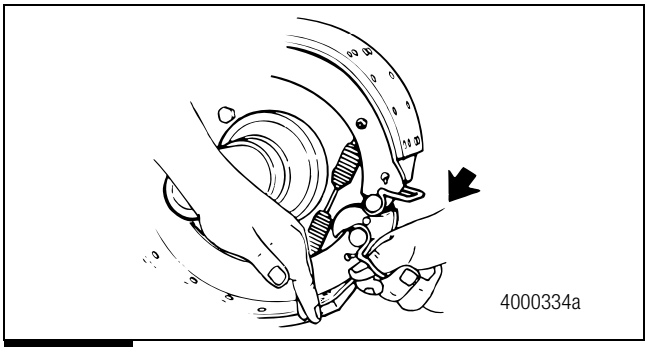


Figure 3.1

2. Lift the top brake shoe and pull on the brake shoe roller retainer clip to remove the top roller.
3. Lift the bottom shoe to release the tension on the brake shoe return spring. Figure 3.2.

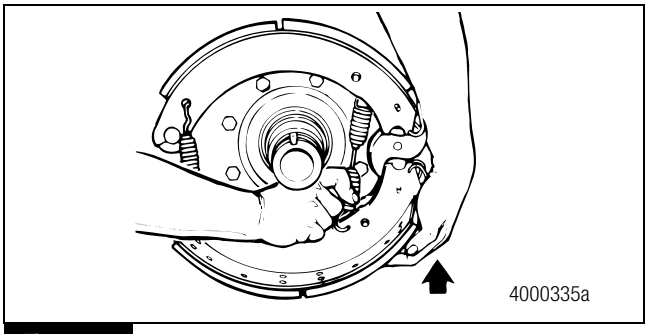


Figure 3.2

4. Rotate the bottom shoe to release the tension on the brake shoe retainer springs. Figure 3.3.

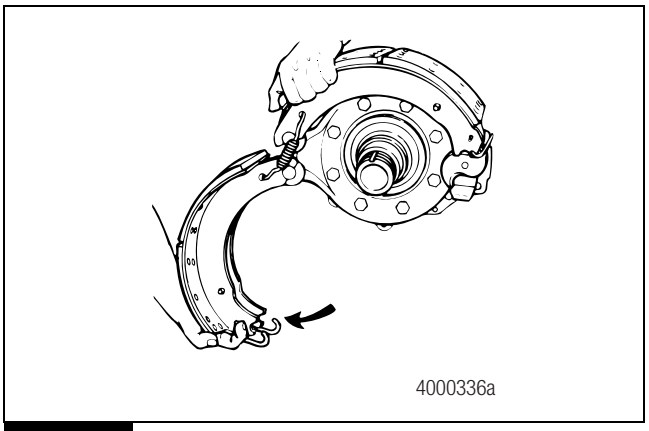


Figure 3.3

5. Remove the shoe retainer springs and the brake shoes.

Check Cam-to-Bushing Radial Free Play

Meritor recommends that you replace the camshaft bushings if the S-cam is replaced, if the radial movement exceeds 0.030-inch (0.762 mm), and at every brake shoe reline. Always replace the S-cam seals when you replace the S-cam bushings.

Before you remove the automatic slack adjuster and camshaft, move the camshaft as shown in Figure 3.4. Use a dial indicator to verify that the cam-to-bushing radial free play is within specification.

- **If radial free play movement exceeds 0.030-inch (0.76 mm):** Replace the bushings and seals.

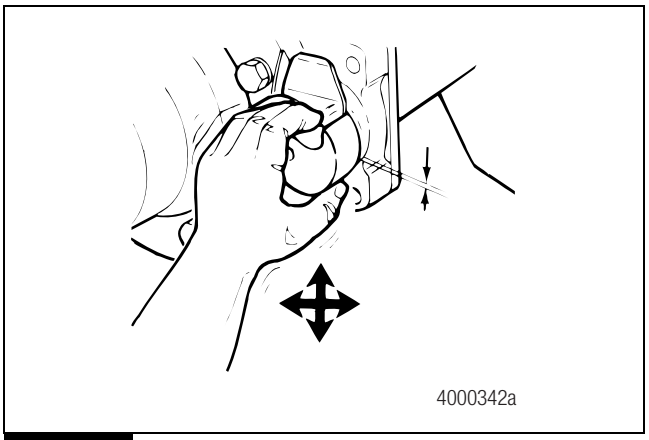


Figure 3.4

Automatic Slack Adjuster and Camshaft

For complete maintenance and service information on Meritor's automatic slack adjuster, refer to Section 7 and Maintenance Manual 4, Cam Brakes and Automatic Slack Adjuster. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.

If the slack adjuster is not a Meritor automatic slack adjuster, refer to the manufacturer's literature for the correct service procedures.

1. Remove the automatic slack adjuster from the camshaft.
2. If equipped, remove the spacer washers from the camshaft on the inboard side of the spider.
3. If necessary, remove the hub from the axle. Refer to the appropriate axle maintenance manual for hub removal procedures.
4. Remove the camshaft from the spider and bracket.
5. Use the correct size driver to remove the bushings and seals from the spider and bracket. On some brakes, a spacer is installed between the camshaft bushings.
6. Remove the capscrews that fasten the bracket to the spider. Remove the bracket and the seal.
7. If the spider must be removed, mark the position of the spider on the axle flange. Remove the capscrews that fasten the spider to the flange. Remove the spider. Inspect the axle flange for damage.

Prepare Parts for Assembly

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.

⚠ ASBESTOS AND NON-ASBESTOS FIBERS WARNING

Some brake linings contain asbestos fibers, a cancer and lung disease hazard. Some brake linings contain non-asbestos fibers, whose long-term effects to health are unknown. You must use caution when you handle both asbestos and non-asbestos materials.

Clean and Dry Parts

⚠ 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.**

⚠ CAUTION

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

Use soap and water to clean non-metal parts. Dry parts immediately after cleaning with soft, clean paper or cloth, or compressed air.

Corrosion Protection

1. If you assemble parts immediately after you clean them, lubricate parts with grease to prevent corrosion. Parts must be clean and dry before you lubricate them. Do not apply grease to the brake linings or the brake drums.
2. If you store parts after you clean them, apply a corrosion-preventive material. Do not apply the material to the brake linings or the brake drums. Store parts in a special paper or other material that prevents corrosion.

Inspect Parts

Meritor recommends that you replace the following parts at each reline.

- Brake Shoe Springs
- Clevis Pin Clips
- Rollers
- Camshaft Seals and Bushings
- Anchor Pins

1. Check the inside diameter of the anchor pin bushings. Figure 3.5. The inside diameter of the bushing must not exceed 1.259-inches (31.98 mm). Replace worn bushings.

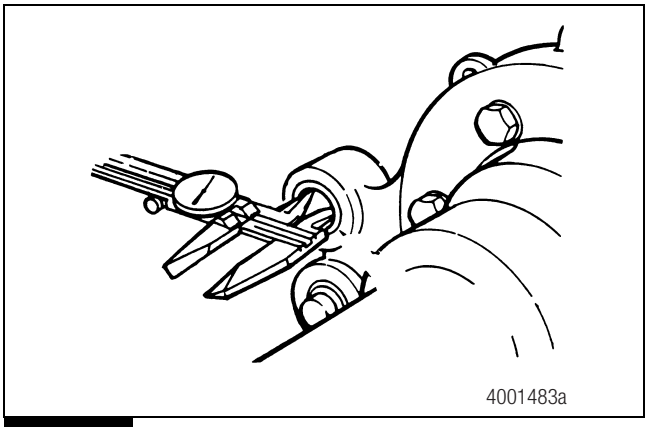


Figure 3.5

2. Check the spider for worn anchor pin holes or cracks. Replace damaged spiders. Tighten the spider mounting bolts to the vehicle manufacturer's specifications.
3. Check the camshaft bracket for broken welds, cracks and correct alignment. Replace damaged brackets.
4. Check the anchor pins for corrosion and wear. Replace worn or damaged anchor pins.
   - The anchor pin body diameter should be 1.244-1.248-inches (31.598-31.699 mm).
   - The anchor pin journal diameter should be 0.9985 ± 0.0015-inches (25.3619 ± 0.0381 mm).
5. Check the brake shoe lining thickness. Reline the brake when the lining thickness is 0.25-inch (6.3 mm) at the thinnest point, usually at the crown.
6. Check the brake shoes for worn anchor pin slots, rust, expanded rivet holes, broken welds and correct alignment. The rivet holes must not exceed 0.257-0.263-inch (6.52-6.68 mm). Replace brake shoes as necessary.
7. For 16.5-inch brake shoes, the anchor pin slots must not exceed 1.009-inches (25.63 mm) in diameter. Replace any brake shoes that do not meet measurement specifications.

8. With the roller and anchor pin installed, measure the distance from the center of the anchor pin slot to the center of the roller slot. Figure 3.6. The distance must not exceed 12.75-inches (323.85 mm). Replace any brake shoes that do not meet measurement specifications.

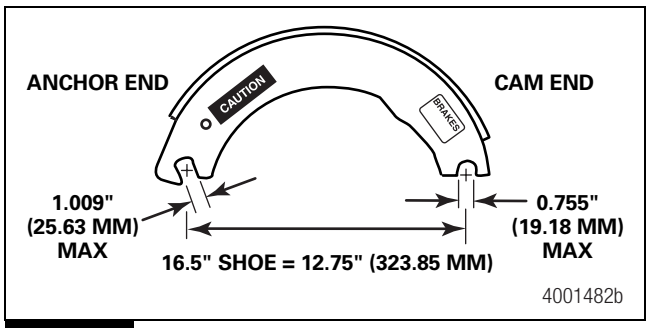


Figure 3.6

9. Measure the distance between the webs on the brake shoes at both ends. The web spacing should be 1.490-1.550-inches (37.85-39.37 mm) measured 1.0-inch (25.4 mm) from the edge of the slots. Replace the shoe if the web spacing is not within specification. Figure 3.7.

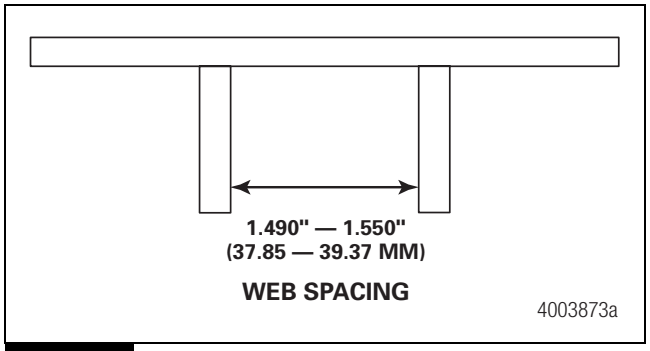


Figure 3.7

10. Check the camshaft for cracks, wear and corrosion. Check the cam head, bearing journals and splines. Replace worn or damaged camshafts.

⚠ 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.

11. If you remove cotter pins from a slack adjuster during maintenance and service procedures, Meritor recommends that you install new clevis pin retainer clips at assembly. Always replace used clevis pin retainer clips with new ones. Do not reuse clevis pin retainer clips. Discard used clips.
12. Inspect the large and small clevis pins for wear or damage. Replace worn or damaged parts.

⚠ WARNING

Do not operate the vehicle with the brake drum worn or machined beyond the discard dimension indicated on the drum. The brake system may not operate correctly. Damage to components and serious personal injury can result.

⚠ CAUTION

Replace the brake drum if it is out-of-round. Do not turn or rebore a brake drum, which decreases the strength and capacity of the drum. Damage to components can result.

13. Use the following procedure to inspect the brake drums.
    A. Check the brake drums for cracks, severe heat checking, heat spotting, scoring, pitting and distortion. Replace drums as required. Do not turn or rebore brake drums, which decreases the strength and heat capacity of the drum.
    B. Measure the inside diameter of the drum in several locations with a drum caliper or internal micrometer. Figure 3.8.
       - **If the diameter exceeds the specifications supplied by the drum manufacturer or is close enough that the drum will wear past the specification before the next inspection:** Replace the drum.

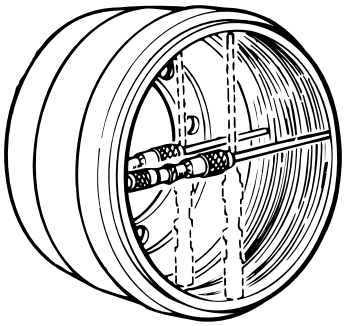


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Figure 3.8

14. Check the dust shields for wear and damage. Repair or replace worn or damaged parts as necessary.

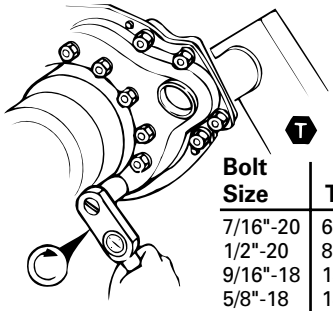
15. Check the automatic slack adjuster. For complete maintenance and service information on Meritor's automatic slack adjuster, refer to Section 7 in this manual and Maintenance Manual 4, Cam Brakes and Automatic Slack Adjuster. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.

    - **If the slack adjuster is not a Meritor automatic slack adjuster:** Refer to the manufacturer's literature for the correct service procedures.

Camshaft

Meritor recommends that you replace the brake shoe springs, rollers, anchor pins, cam bushings and seals at each reline.

1. Tighten all spider bolts to the correct torque. Figure 3.9. ❶



Bolt Size	Torque	
7/16"-20	60-75 lb-ft	81-102 N•m
1/2"-20	85-115 lb-ft	115-156 N•m
9/16"-18	130-165 lb-ft	176-224 N•m
5/8"-18	180-230 lb-ft	244-312 N•m
7/8"-9	440-580 lb-ft	598-789 N•m

4000345a

Figure 3.9

2. Use a seal driver to install new camshaft bushings and new seals into the cast spider and camshaft bracket. Figure 3.10. The lips of the seals must face the slack adjuster. Figure 3.11.

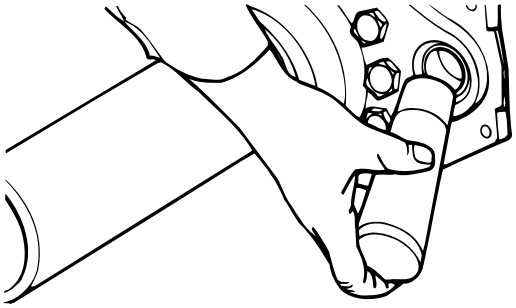


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Figure 3.10

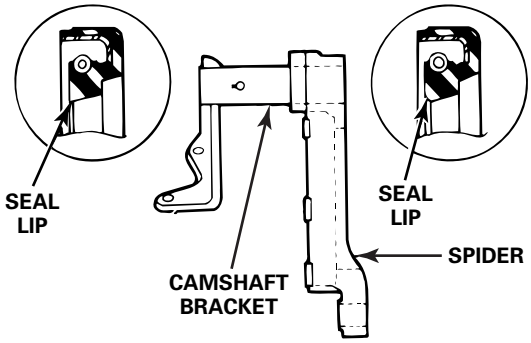

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Figure 3.11

3. If the camshaft bracket has been removed, install the chamber bracket seal and bracket onto the spider. Tighten the capscrews to the correct torque. Figure 3.9. ❶

Installation

⚠ WARNING

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

⚠ ASBESTOS AND NON-ASBESTOS FIBERS WARNING

Some brake linings contain asbestos fibers, a cancer and lung disease hazard. Some brake linings contain non-asbestos fibers, whose long-term effects to health are unknown. You must use caution when you handle both asbestos and non-asbestos materials.

⚠ CAUTION

Only install a Q Plus™ camshaft in a Q Plus™ brake. A Q Series hammerclaw camshaft will not provide enough clearance between the brake shoe and the brake drum. Brake drag and damage to components can result.

To install a new brake drum so that it fits correctly over a Q Plus™ brake shoe, you must install a Q Plus™ camshaft to prevent damage to components.

Camshaft

1. Install the cam head thrust washer onto the camshaft. Apply Meritor specification 0-617-A or 0-617-B grease to the camshaft bushings and journals.
2. Install the camshaft through the spider and bracket so that the camshaft turns freely by hand. Figure 3.12.

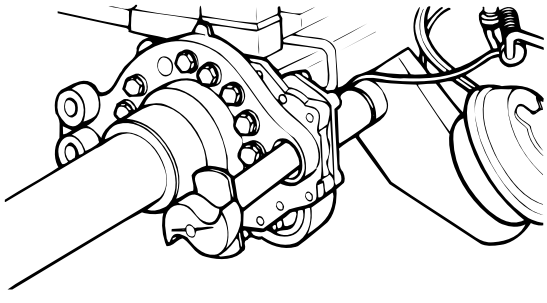

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Figure 3.12

Replace a Hammerclaw Camshaft with a Standard Q Plus™ Camshaft

For front axles only, a standard Q Plus™ camshaft and shoe return spring with an offset center bar replaces the hammerclaw Q Series camshaft and shoe return spring with a straight center bar on the 16.5 x 5-inch and 6-inch Q Series cam brake. Figure 3.13 and Figure 3.14.

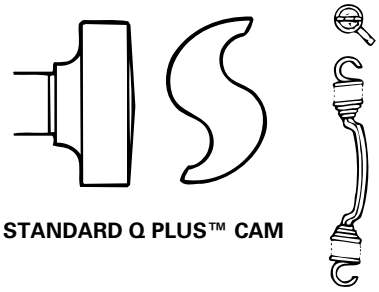

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Figure 3.13

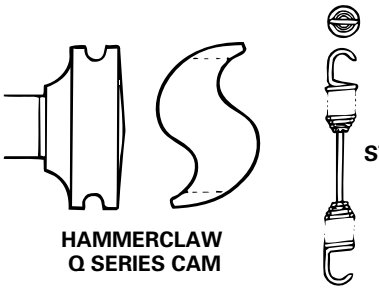

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Figure 3.14

A Q Plus™ camshaft has deeper roller pockets than a Q Series camshaft and has “Q Plus” forged into one of the pockets. You may notice a larger gap between the brake lining and the drum after you assemble the brake shoe and shoe return spring with an offset center bar. Figure 3.15. The excess gap will be eliminated when you correctly adjust the brake.

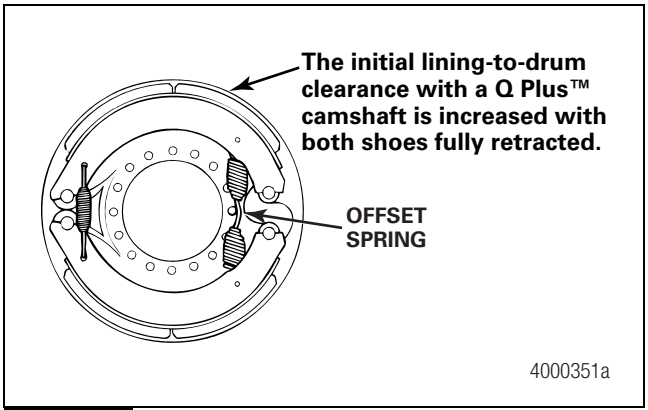


Figure 3.15

Follow the procedure in this section to replace a Q Series hammerclaw camshaft with a standard Q Plus™ camshaft.

Offset Shoe Return Spring

Install the new offset shoe return spring with the open end of the spring hooks TOWARD the camshaft. Figure 3.16.

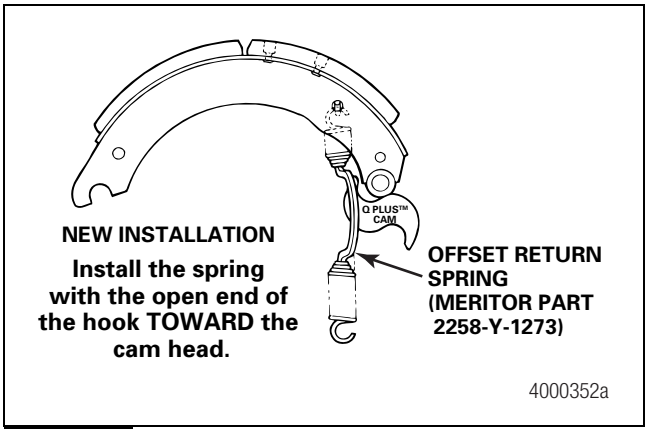


Figure 3.16

Brake Shoes, Rollers and Anchor Pins

Meritor recommends that you replace the brake shoe springs, rollers, anchor pins, cam bushings and seals, and clevis pin retainers at each reline.

When the brake is disassembled, or when necessary, lubricate the anchor pins and rollers where these parts touch the brake shoes.

Do not allow grease to contact the area of the camshaft roller that touches the camshaft head.

1. Use Meritor specification 0-617-A or 0-617-B grease to lubricate the brake shoe roller and anchor pin. Figure 3.17.

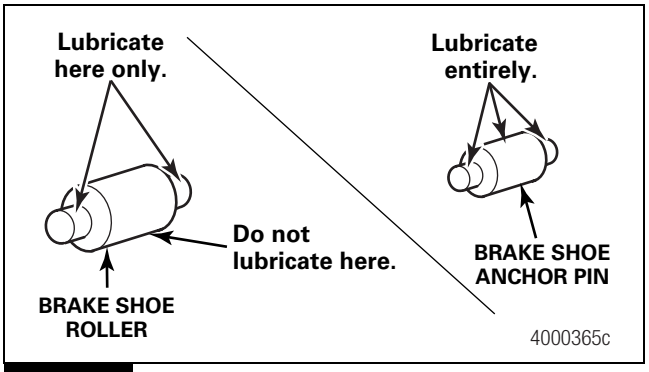


Figure 3.17

2. Install the lubricated anchor pins.
3. Place the upper brake shoe into position on the top anchor pin. Hold the lower brake shoe on the bottom anchor pin. Install two new brake shoe retaining springs. Figure 3.18.

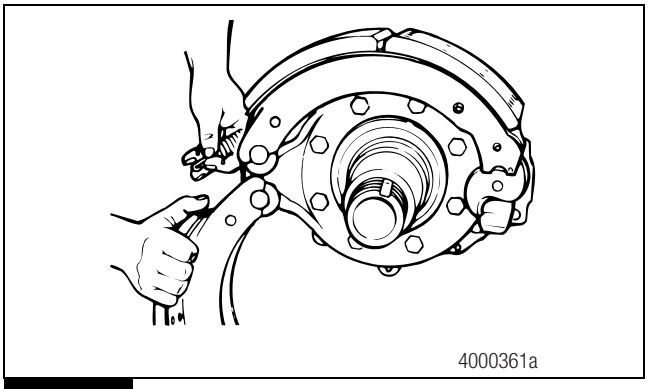


Figure 3.18

4. Rotate the lower brake shoe forward. Install a new brake shoe return spring with the open end of the spring hooks toward the camshaft. Figure 3.19.

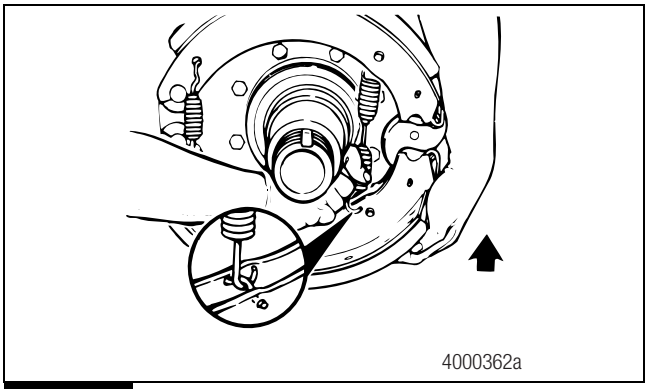


Figure 3.19

5. Pull each brake shoe away from the camshaft to enable you to install the brake shoe roller and roller retainer. Press the retainer ears to fit into the retainer between the brake shoe webs. Figure 3.20.

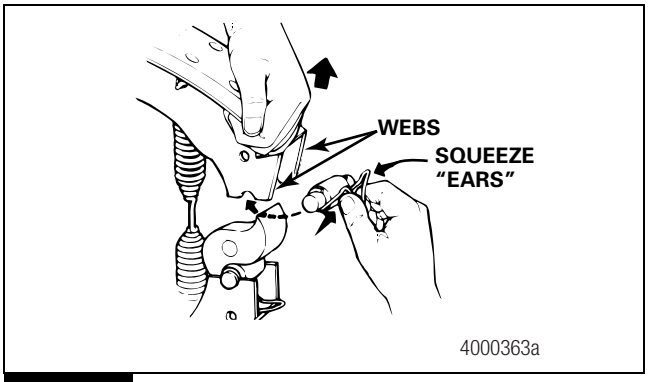


Figure 3.20

6. Push the brake shoe roller retainer into the brake shoe until the ears lock into the shoe web holes. Figure 3.21.

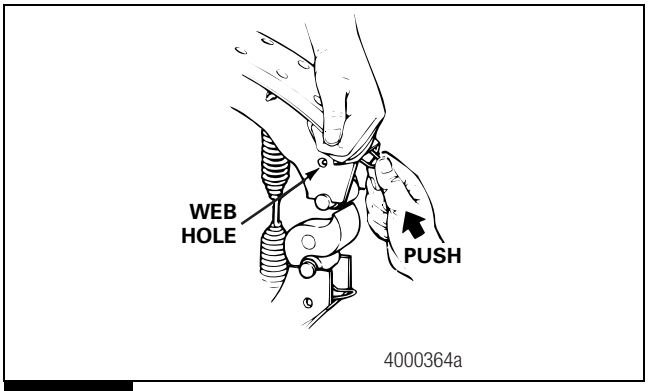


Figure 3.21

7. Use a lifting device to install the brake drum.
8. Connect the slack adjuster to the air chamber push rod. For complete instructions on the Meritor automatic slack adjuster, refer to Section 7 in this manual and Maintenance Manual 4, Cam Brakes and Automatic Slack Adjuster. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.
   - **If the slack adjuster is not a Meritor automatic slack adjuster:** Refer to the manufacturer's literature for the correct service procedures.

Burnish the Brakes

1. Adjust the brake manually. Refer to Section 7.
2. While driving the vehicle at 20 mph (32 km/h), apply the brakes to reduce speed, approximately 10 feet (3.05 m) per second, to five mph (8 km/h). Perform this operation 10 times at regular intervals of 500 feet or 0.1 mile (150 m or 0.16 km) without stopping the vehicle.
3. After 10 brake applications, make one complete stop from 20 to 0 mph (32 to 0 km/h).
4. Check the drum temperatures immediately after burnishing. Any drums that are cooler, approximately 50°F (10°C) side-to-side, 100°F (38°C) front-to-rear, than the others indicate a possible lack of braking effort on those wheels.

   A temperature difference greater than stated above is a possible indication of brake imbalance. Check for correct brake assembly and automatic slack adjuster setup. Refer to the appropriate section of this manual. In addition, check the vehicle manufacturer's specifications for correct air system setup. After the imbalance is repaired, reburnish the brakes.
5. Allow the brakes to cool to the ambient temperature. Readjust all the brakes manually.

Q Series and Q Plus™ Cam Brake Conversion Kits

Convert standard 16.5-inch Q Series brakes to Q Plus™ brakes. A kit includes all the hardware.

To obtain the brake conversion kit, refer to the Service Notes page on the front inside cover of this manual.

Removal

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 and service.

⚠ ASBESTOS AND NON-ASBESTOS FIBERS WARNING

Some brake linings contain asbestos fibers, a cancer and lung disease hazard. Some brake linings contain non-asbestos fibers, whose long-term effects to health are unknown. You must use caution when you handle both asbestos and non-asbestos materials.

Wheel Components

⚠ 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 or fall over. Serious personal injury and damage to components can result.

1. Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving.
2. Use a jack to raise the vehicle so that the wheels to be serviced are off the ground. Support the vehicle with safety stands.
3. Remove the wheel nuts, and tire and rim assemblies.

⚠ 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 brake has spring chambers, carefully cage and lock the spring, so that the spring cannot actuate during assembly.
5. Release the automatic slack adjuster to retract the shoes so the drum can clear the lining. Refer to Section 7 for Meritor automatic slack adjusters. For non-Meritor automatic slack adjusters, refer to the slack adjuster manufacturer's instructions.

Brake Shoes

⚠ CAUTION

Do not overstress and deform the brake return spring when removing the brake shoes.

1. Use an appropriate tool to remove the brake shoe return spring. Insert the tool through the opening in the shoe. Figure 4.1.
   - You can use a return spring remover and assembler tool or a thin plate with a 0.25-inch (6.35 mm) slot to remove the brake shoe return spring. Refer to Section 14, Figure 14.3, for a tool production drawing.

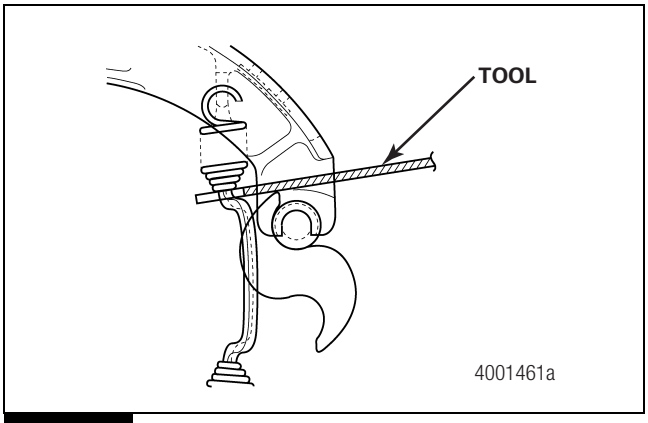


Figure 4.1

2. Remove the anchor pin snap rings, washers, set screws and lock wire. Figure 4.2.

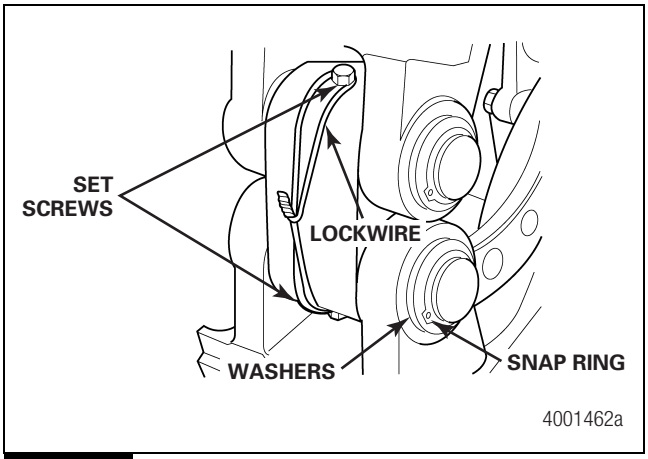


Figure 4.2

⚠ 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.

3. Use a brass drift to remove the anchor pins. Figure 4.3.

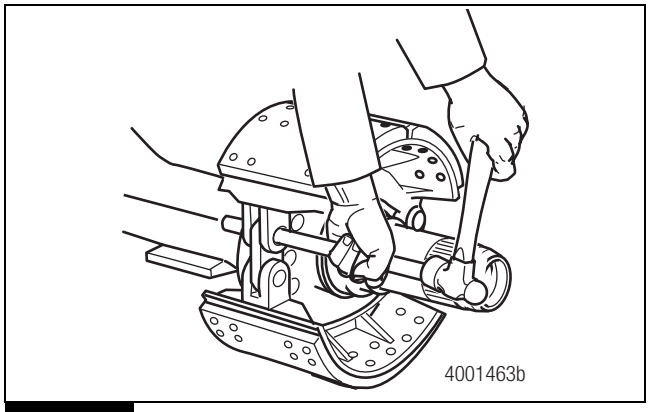


Figure 4.3

4. Remove the brake shoes. Figure 4.4. If necessary, remove the rollers. Figure 4.5.

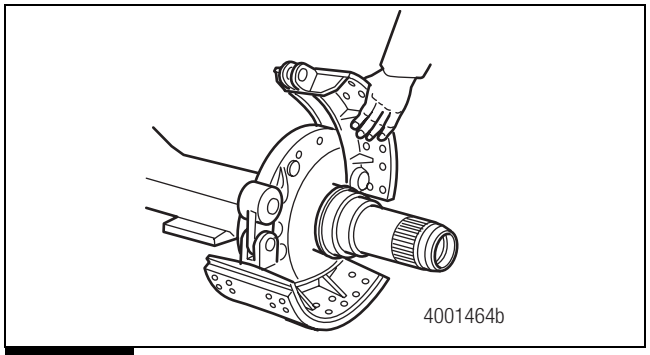


Figure 4.4

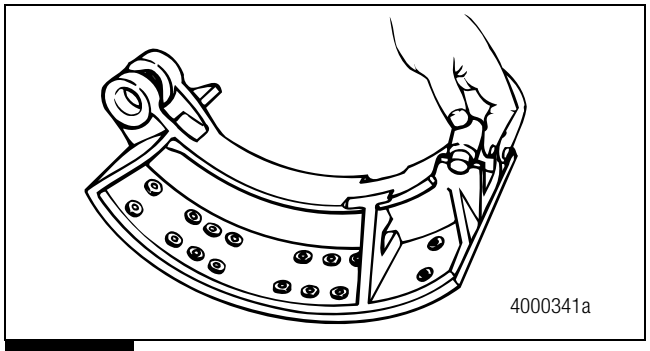


Figure 4.5

Automatic Slack Adjuster and Camshaft

If the slack adjuster is not a Meritor automatic slack adjuster, refer to the manufacturer's literature for the correct service procedures.

For complete maintenance and service information on Meritor's automatic slack adjuster, refer to Section 7 in this manual and Maintenance Manual 4, Cam Brakes and Automatic Slack Adjuster. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.

To remove axle wheel-end components to access the camshaft for removal, refer to the appropriate maintenance manual. To obtain these publications, refer to the Service Notes page on the front inside cover of this manual.

- Maintenance Manual 23, Bus and Coach Front Axles
- Maintenance Manual 23A, Bus and Coach Rear Axles
- Maintenance Manual 23D, Bus and Coach Inverted Portal Drive Axle
- Maintenance Manual 23E, Bus and Coach Planetary Drive Axle

Meritor recommends that you replace the camshaft bushings if the S-cam is replaced, if the radial movement exceeds 0.030-inch (0.762 mm), and at every brake shoe reline. Always replace the S-cam seals when you replace the S-cam bushings.

1. Move the camshaft as shown in Figure 4.6. Use a dial indicator to verify that the cam-to-bushing radial free play is within specification.
   - **If the radial free play movement exceeds 0.030-inch (0.76 mm):** Replace the bushings and seals.

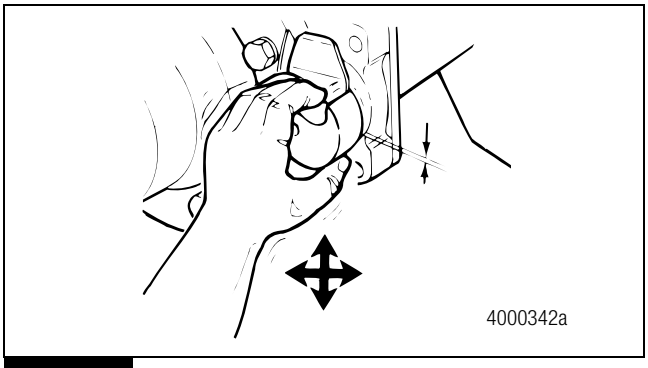


Figure 4.6

2. Remove the snap rings, washers and spacers from the camshaft.
3. Remove the two clevis pins from the clevis on the air chamber push rod. Remove the slack adjuster from the camshaft.

4. Remove the camshaft from the spider and bracket.
5. Use the correct size driver to remove the bushings from the spider and bracket.

Prepare Parts for Assembly

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.

⚠ ASBESTOS AND NON-ASBESTOS FIBERS WARNING

Some brake linings contain asbestos fibers, a cancer and lung disease hazard. Some brake linings contain non-asbestos fibers, whose long-term effects to health are unknown. You must use caution when you handle both asbestos and non-asbestos materials.

Clean and Dry Parts

⚠ 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.**

⚠ CAUTION

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

Use soap and water to clean non-metal parts. Dry parts immediately after cleaning with soft, clean paper or cloth, or compressed air.

Corrosion Protection

1. If you assemble the parts immediately after you clean them, lubricate the parts with grease to prevent corrosion. Parts must be clean and dry before you lubricate them. Do not apply grease to the brake linings or the brake drums.
2. If you store the parts after you clean them, apply a corrosion-preventive material. Do not apply the material to the brake linings or the brake drums. Store the parts in a special paper or other material that prevents corrosion.

Inspect Parts

Meritor recommends that you replace the following parts at each reline.

- Brake Shoe Springs
- Clevis Pin Clips
- Rollers
- Camshaft Seals and Bushings
- Anchor Pins

1. Check the inside diameter of the anchor pin bushings. Figure 4.7. The inside diameter of the bushing must not exceed 1.259-inches (31.98 mm). Replace worn bushings.

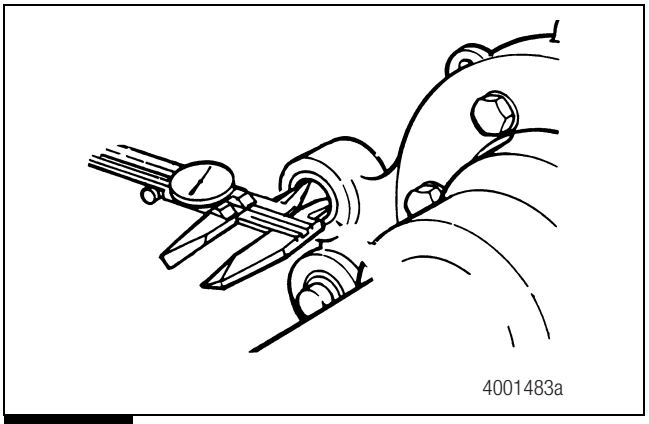


Figure 4.7

2. Check the spider for expanded anchor pin holes and for cracks. Replace damaged spiders. Tighten the spider mounting bolts to the vehicle manufacturer's specifications.
3. Check the camshaft bracket for broken welds, cracks and correct alignment. Replace damaged brackets.

4. Check the anchor pins for corrosion and wear. Replace worn or damaged anchor pins.
   - The anchor pin body diameter should be 1.246-1.252-inches (31.65-31.8 mm).
5. Check the brake shoe lining thickness at the thinnest spot. The minimum allowable lining thickness is 0.25-inch (6.35 mm). Discard and replace lining worn below this thickness.
6. Check the brake shoes for worn anchor pin holes, rust, expanded rivet holes, broken welds and correct alignment. The rivet holes must not exceed 0.257-0.263-inch (6.52-6.68 mm). Replace brake shoes as necessary.
7. The anchor pin holes must not exceed 1.009-inches (25.63 mm) in diameter. Replace any brake shoes that do not meet measurement specifications.
8. With the roller and anchor pin installed, measure the distance from the center of the anchor pin hole to the center of the roller slot. Figure 4.8. The distance must not exceed 12.75-inches (323.85 mm). Replace any brake shoes that do not meet measurement specifications.

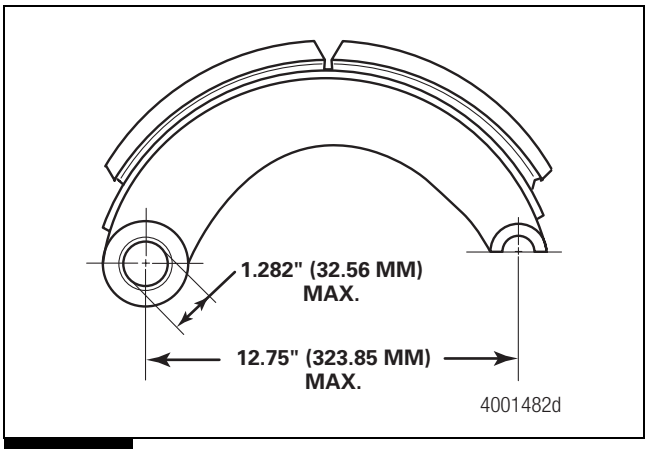


Figure 4.8

9. Check the camshaft for cracks, wear and corrosion. Check the cam head, bearing journals and splines. Replace worn or damaged camshafts.
10. Check the slack adjuster. Follow the vehicle manufacturer's recommendations. For Meritor slack adjusters, refer to Section 7 of this manual and Maintenance Manual 4, Cam Brakes and Automatic Slack Adjuster. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.

⚠ 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.

11. If you remove cotter pins from a slack adjuster during maintenance and service procedures, Meritor recommends that you install new clevis pin retainer clips at assembly. Always replace used clevis pin retainer clips with new ones. Do not reuse clevis pin retainer clips. Discard used clips.
12. Inspect the large and small clevis pins for wear or damage. Replace worn or damaged parts.

⚠ WARNING

Do not operate the vehicle with the brake drum worn or machined beyond the discard dimension indicated on the drum. The brake system may not operate correctly. Damage to components and serious personal injury can result.

⚠ CAUTION

Replace the brake drum if it is out-of-round. Do not turn or rebore a brake drum, which decreases the strength and capacity of the drum. Damage to components can result.

13. Drums and shoes for Cast Plus™ brakes are also available in X, XX and XXX sizes. Refer to Technical Bulletin TP-0351, Lining Profile Change for Production Cast Plus™ Brake Service Kits, for information on servicing these drums and shoes. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.

    Use the following procedure to inspect the drum.

    A. Check the brake drum for cracks, severe heat checking, heat spotting, scoring, pitting and distortion. Replace the drum as required.

    B. Measure the inside diameter of the drum in several locations with a drum caliper or internal micrometer. Figure 4.9.
       - **If the diameter exceeds the specifications supplied by the drum manufacturer or is close enough that the drum will wear past the specification before the next inspection:** Replace the drum.

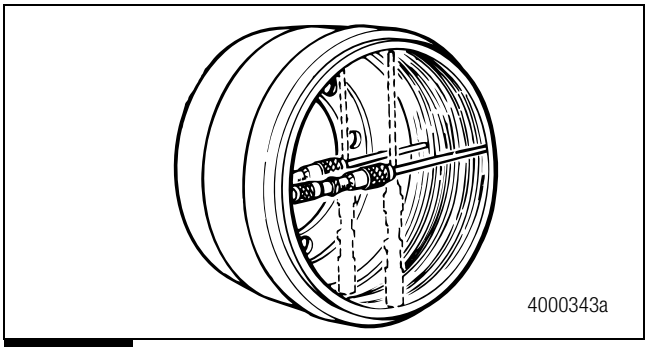


Figure 4.9

Installation

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.

⚠ ASBESTOS AND NON-ASBESTOS FIBERS WARNING

Some brake linings contain asbestos fibers, a cancer and lung disease hazard. Some brake linings contain non-asbestos fibers, whose long-term effects to health are unknown. You must use caution when you handle both asbestos and non-asbestos materials.

Camshaft

Meritor recommends that you replace the brake shoe springs, rollers, anchor pins, cam bushings and seals, and clevis pin clips at each reline.

1. Tighten all the spider bolts to the correct torque. Figure 4.10. ❶

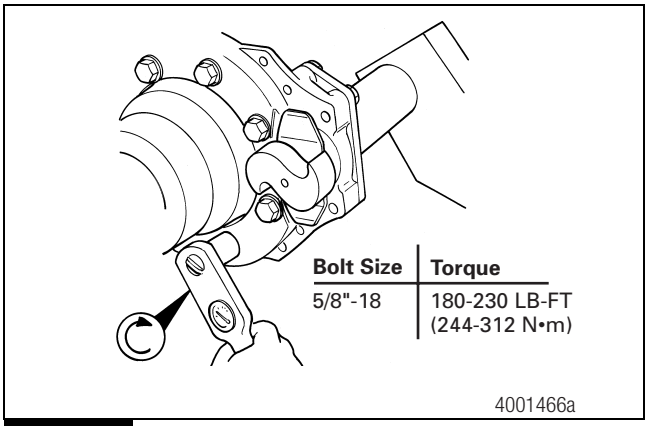


Figure 4.10

2. If removed, use a seal driver to install the new camshaft seals and new bushings into the spider and camshaft bracket. Figure 4.11.

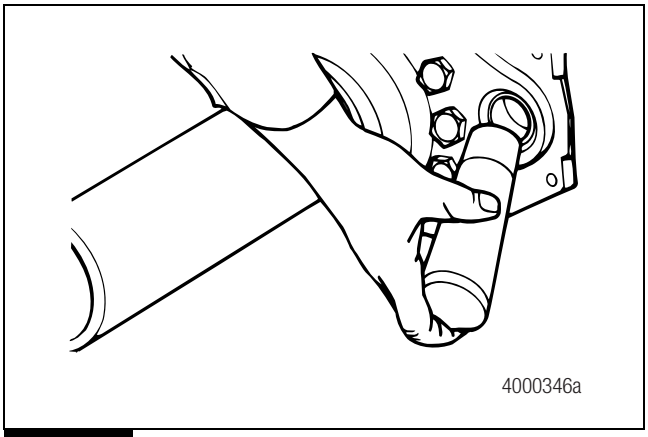


Figure 4.11

3. Install the seals with their lips toward the slack adjuster. Figure 4.12.

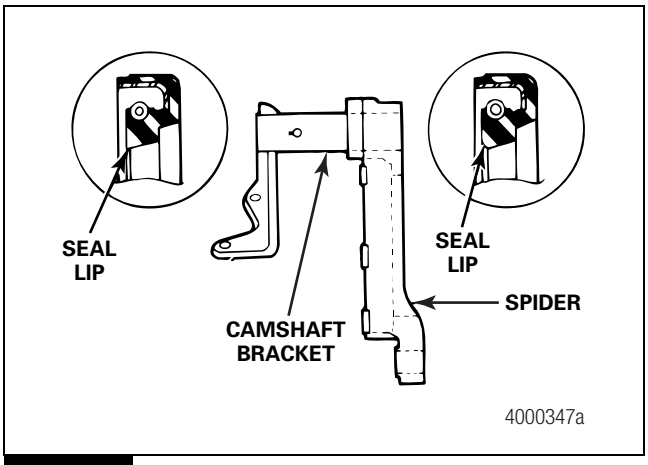


Figure 4.12

4. If the camshaft bracket was removed, install the gasket and bracket onto the spider. Tighten the capscrews to 44-55 lb-ft (60-75 N•m). ❶

5. Place the cam head washer onto the camshaft. Apply Meritor specification O-617-A or O-617-B chassis grease to the camshaft bushings and journals. Install the camshaft through the spider and bracket. The camshaft should turn freely by hand. Figure 4.13.

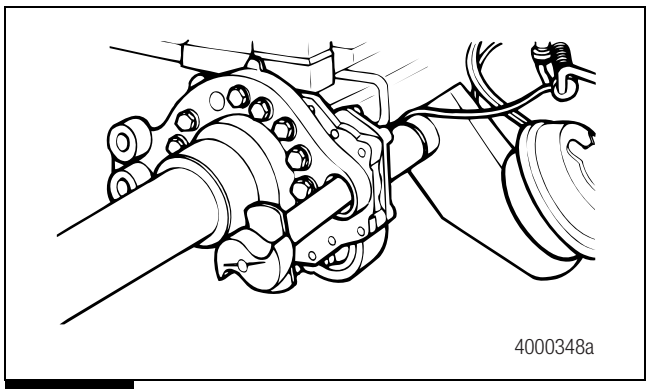


Figure 4.13

Brake Shoes, Rollers and Anchor Pins

Meritor recommends that you replace the brake shoe springs, rollers, anchor pins, cam bushings and seals, and clevis pin clips at each reline.

When the brake is disassembled, or when necessary, lubricate the anchor pins and rollers. Figure 4.14 and Figure 4.15.

Do not allow grease to contact the area of the camshaft roller that touches the camshaft head.

Use Meritor specification O-617-A or O-617-B grease to lubricate the brake shoe rollers and Meritor specification O-637 anti-seize compound to lubricate the anchor pin. Figure 4.14.

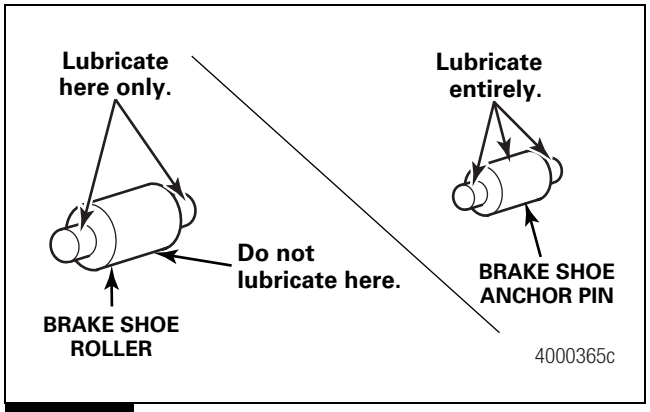


Figure 4.14

1. Install the anchor pin bushings. Align the holes in the bushings with the set screw holes in the spider.
2. Install the new brake shoe rollers. Place the brake shoes into position on the spider. Figure 4.15.

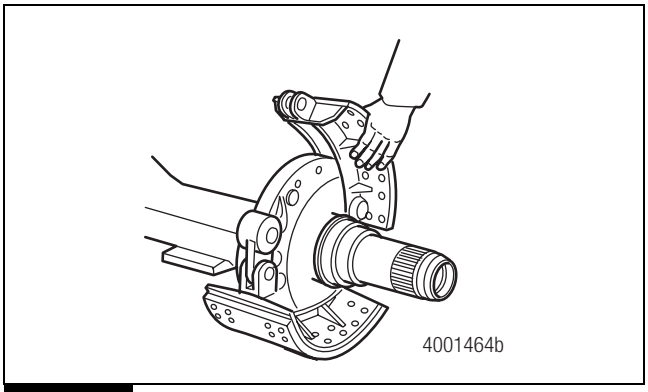


Figure 4.15

⚠ 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.

3. Use a brass drift to install the anchor pins. Align the flat or groove on the pin with the holes in the spider and bushing.
4. Install the anchor pin washers, seals and snap rings.
5. Install the anchor pin set screws. Tighten the screws to 10-15 lb-ft (13.6-20.3 N•m). ❶
6. Install a lock wire through both anchor pin set screws.

⚠ CAUTION

Do not overstress and deform the brake return spring when installing the brake shoes.

7. Use a brake spring tool to install the shoe return spring on the brake shoes. Figure 4.16.

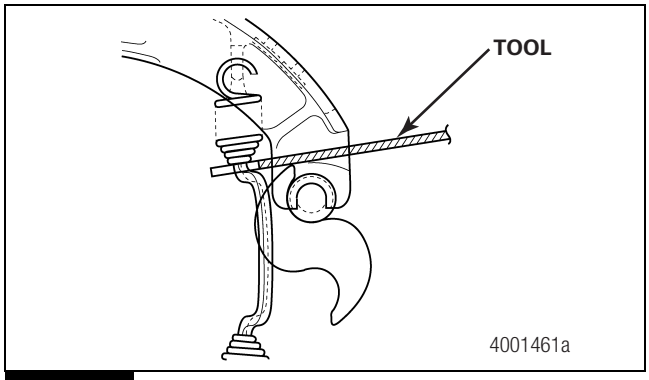


Figure 4.16

8. Use a lifting device to install the brake drum.

Automatic Slack Adjuster

If the slack adjuster is not a Meritor automatic slack adjuster, refer to the manufacturer's literature for the correct service procedures.

For complete instructions on the Meritor automatic slack adjuster, refer to Section 7 in this manual and Maintenance Manual 4, Cam Brakes and Automatic Slack Adjuster. To obtain this publication, refer to the Service Notes page on the inside front cover of this manual.

Burnish the Brakes

1. Adjust the brake manually. Refer to Section 7.
2. While driving the vehicle at 20 mph (32 km/h), apply the brakes to reduce speed, approximately 10 feet (3.05 m) per second, to five mph (8 km/h). Perform this operation 10 times at regular intervals of 500 feet or 0.1 mile (150 m or 0.16 km) without stopping the vehicle.
3. After 10 brake applications, make one complete stop from 20 to 0 mph (32 to 0 km/h).
4. Check the drum temperatures immediately after burnishing. Any drums that are cooler, approximately 50°F (10°C) side-to-side, 100°F (38°C) front-to-rear, than the others indicate a possible lack of braking effort on those wheels.

   A temperature difference greater than stated above is a possible indication of brake imbalance. Check for correct brake assembly and automatic slack adjuster setup. Refer to the appropriate section of this manual. In addition, check the vehicle manufacturer's specifications for correct air system setup. After the imbalance is repaired, reburnish the brakes.
5. Allow the brakes to cool to the ambient temperature. Readjust all the brakes manually.

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 and service.

⚠ ASBESTOS AND NON-ASBESTOS FIBERS WARNING

Some brake linings contain asbestos fibers, a cancer and lung disease hazard. Some brake linings contain non-asbestos fibers, whose long-term effects to health are unknown. You must use caution when you handle both asbestos and non-asbestos materials.

Removal

Wheel Components

⚠ 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 or fall over. Serious personal injury and damage to components can result.

1. Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving.
2. Use a jack to raise the vehicle so that the wheels to be serviced are off the ground. Support the vehicle with safety stands.
3. Remove the wheel nuts, and tire and rim assemblies.

⚠ 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 brake has spring chambers, carefully cage and lock the spring, so that the spring cannot actuate during assembly.
5. Release the automatic slack adjuster to retract the shoes so the drum can clear the lining. Refer to Section 7 for Meritor automatic slack adjusters. For non-Meritor automatic slack adjusters, refer to the slack adjuster manufacturer's instructions.

Automatic Slack Adjuster

If the slack adjuster is not a Meritor automatic slack adjuster, refer to the manufacturer's literature for the correct service procedures.

For complete maintenance and service information on Meritor's automatic slack adjuster, refer to Section 7 in this manual and Maintenance Manual 4, Cam Brakes and Automatic Slack Adjuster. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.

Brake Shoes

1. Place a pry bar between the bottom brake shoe and the cam. Push the shoe away from the cam and remove the brake shoe roller from the bottom shoe. Figure 5.1.

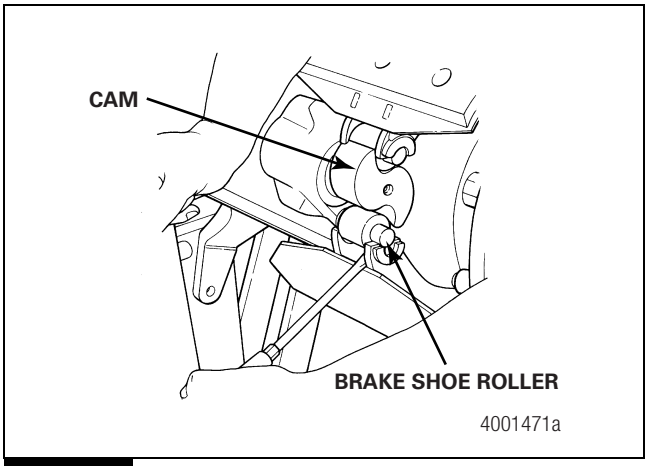


Figure 5.1

2. Place a pry bar between the top brake shoe and the cam. Push the shoe away from the cam and remove the brake shoe roller from the top shoe. Figure 5.1.
3. Mark each brake shoe so that the shoes can be installed in the same position if the same parts are used.

4. Remove the fasteners on the anchor pin. Use one of the following procedures that corresponds to the type of anchor pin and fastener used on the brake.

   A. **For a straight anchor pin with a strap**, remove the capscrew and washer that fasten the strap to the spider.

   B. Remove the strap. Figure 5.2.

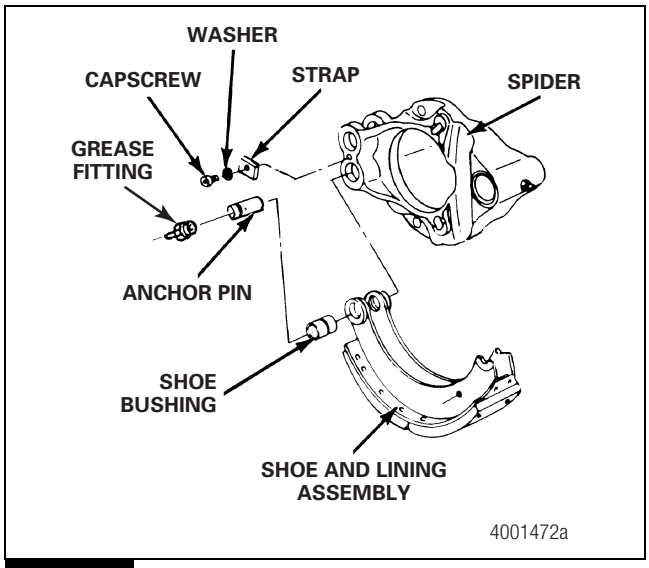


Figure 5.2

   A. **For a straight anchor pin with a lock ring and set screw**, remove the lock ring from the top of the anchor pin. Figure 5.3.

   B. Remove the set screw for the anchor pin from the side of the spider. Figure 5.3.

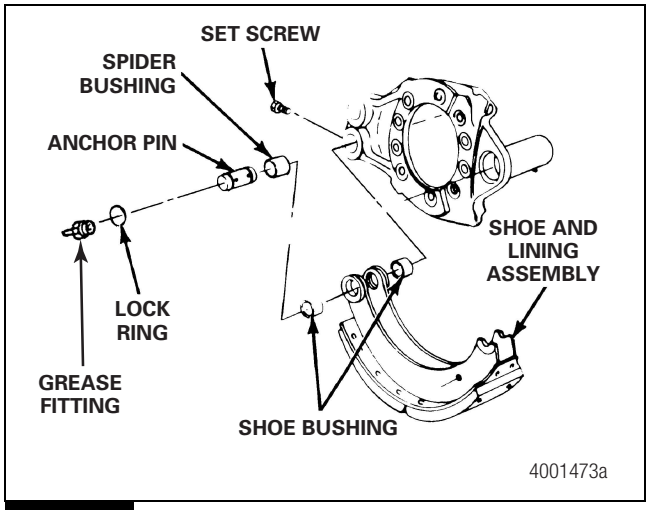


Figure 5.3

   A. **For a straight anchor pin with threads**, remove the grease fitting from the end of the anchor pin.

   B. From the inboard side of the spider, remove the nut and washer that hold the anchor pin in the spider. Figure 5.4.

   C. From the shoe side of the spider, remove the lock ring from the end of each anchor pin. Figure 5.4.

   D. Remove the strap from the anchor pins. Figure 5.4.

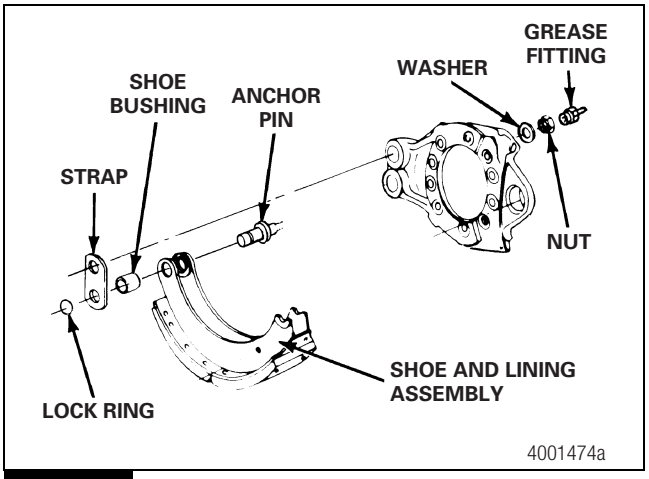


Figure 5.4

   A. **For a tapered anchor pin**, from the inboard side of the spider, remove the nut and washer that hold the anchor pin in the spider.

   B. From the shoe side of the spider, remove the nuts, lock washers if equipped, and dowels from the anchor pins. Figure 5.5.

   C. Remove the strap and washers, if equipped, from the anchor pins.

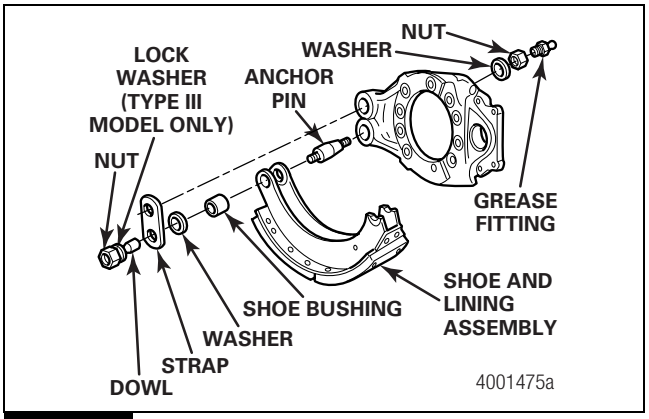


Figure 5.5

⚠ 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.

5. From the inboard side of the spider, use a hammer and a brass drift to remove the anchor pin from the spider and the shoes. Figure 5.6.

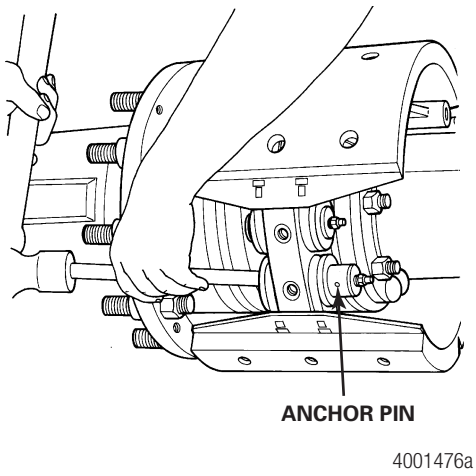


Figure 5.6

6. Remove the bushings from the anchor pins or the shoes.
7. Remove the brake shoe assemblies from the spider. Disconnect the spring from the shoes.

Slack Adjuster, Camshaft and Spider

For complete maintenance instructions on the Meritor automatic slack adjuster, refer to Section 7 in this manual and Maintenance Manual 4, Cam Brakes and Automatic Slack Adjuster. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.

If the slack adjuster is not a Meritor automatic slack adjuster, refer to the manufacturer's literature for the correct service procedures.

Meritor recommends that you replace the camshaft bushings if the S-cam is replaced, if the radial movement exceeds 0.030-inch (0.762 mm) and at every brake shoe reline. Always replace the S-cam seals when you replace the S-cam bushings.

1. Move the camshaft as shown in Figure 5.7. Use a dial indicator to verify that the cam-to-bushing radial free play is within specification.
   - **If the radial free play movement exceeds 0.030-inch (0.762 mm):** Replace the bushings and seals.

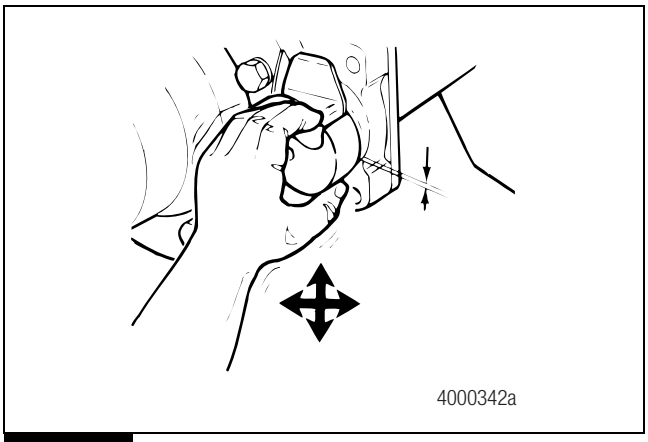


Figure 5.7

2. Disassemble the air chamber from the slack adjuster. Remove the slack adjuster from the camshaft.
3. Remove the lock ring or the capscrew and washer from the end of the camshaft.
4. Remove the spacer washers from the camshaft on the inboard side of the spider.
5. Remove the camshaft from the spider and bracket. Figure 5.8.

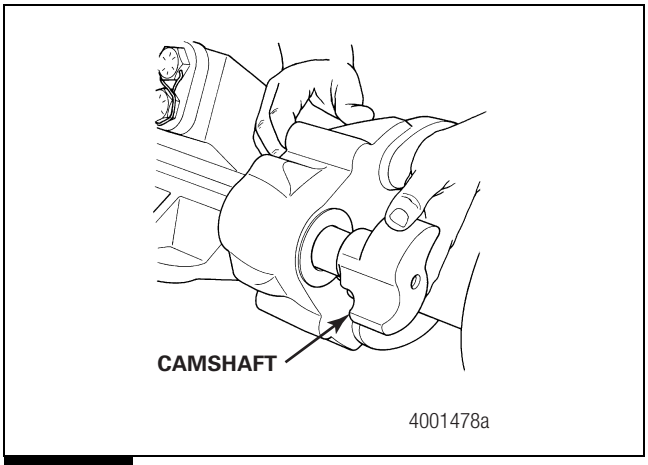


Figure 5.8

6. Remove the seals and the bushings. Use a mallet and the correct size driver to remove the bushings and seals from the spider and the bracket. On some brakes, a spacer is installed between the camshaft bushings. Meritor recommends that you replace the camshaft bushings and seals at each reline.
7. Remove the capscrews that fasten the bracket to the spider. Remove the bracket and the seal.
8. If the spider must be removed, mark the position of the spider on the axle flange. Remove the capscrews that fasten the spider to the axle flange. Remove the spider. Inspect the flange for damage.

Prepare Parts for Assembly

Clean and Dry Parts

⚠ 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.**

⚠ CAUTION

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

Use soap and water to clean non-metal parts. Dry parts immediately after cleaning with soft, clean paper or cloth, or compressed air.

Corrosion Protection

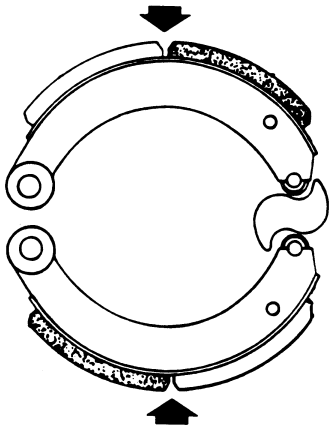
1. If you assemble parts immediately after you clean them, lubricate parts with grease to prevent corrosion. Parts must be clean and dry before you lubricate them. Do not apply grease to the brake linings or the brake drums.
2. If you store parts after you clean them, apply a corrosion-preventive material. Do not apply the material to the brake linings or the brake drums. Store parts in a special paper or other material that prevents corrosion.

Inspect Parts

Meritor recommends that you replace the following parts at each reline.

- Brake Shoe Springs
- Clevis Pin Clips
- Rollers
- Camshaft Seals and Bushings
- Anchor Pins

1. Check the brake lining. Figure 5.9. Brake lining thickness must be the same on both brake shoes and on both axle brakes.
   - **If the linings are worn to less than 0.3125-inch (7.9 mm) thick at the thinnest point:** Replace the lining on both brake shoes and both axle brakes. Refer to the vehicle manufacturer's recommendations for replacement linings.



Lining thickness must not be less than 0.3125" (7.9 mm).

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Figure 5.9

2. Check the brake shoes for excessive rust, expanded rivet holes, broken welds and correct alignment. The rivet holes must not exceed 0.39-0.40-inch (9.90-10.16 mm). Replace brake shoes as necessary.

3. The anchor pin holes must not exceed 1.282-inches (32.56 mm) in diameter. Figure 5.10.
4. With the roller and anchor pin installed, measure the distance from the center of the anchor pin hole to the center of the roller slot. Figure 5.10. The distance must not exceed 10.25-inches (260.35 mm). Replace any brake shoes that do not meet measurement specifications.
5. The distance between the webs of the shoe and the distance between the outside of the spacers at the anchor pin end must not exceed the specified dimension. Refer to Figure 5.11 and Table A for the specified distance on each end of the shoe. Replace shoes that exceed the distance.

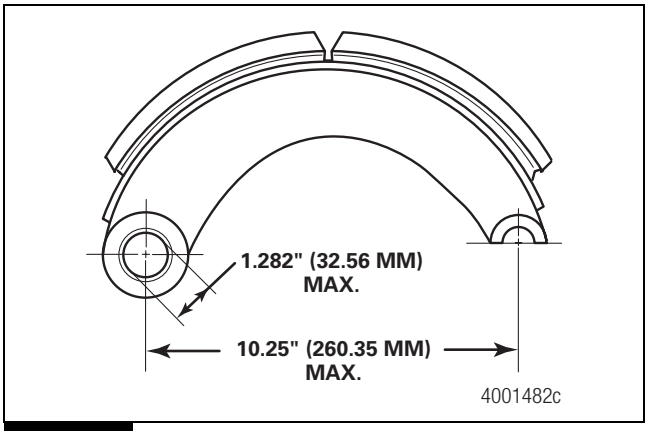


Figure 5.10

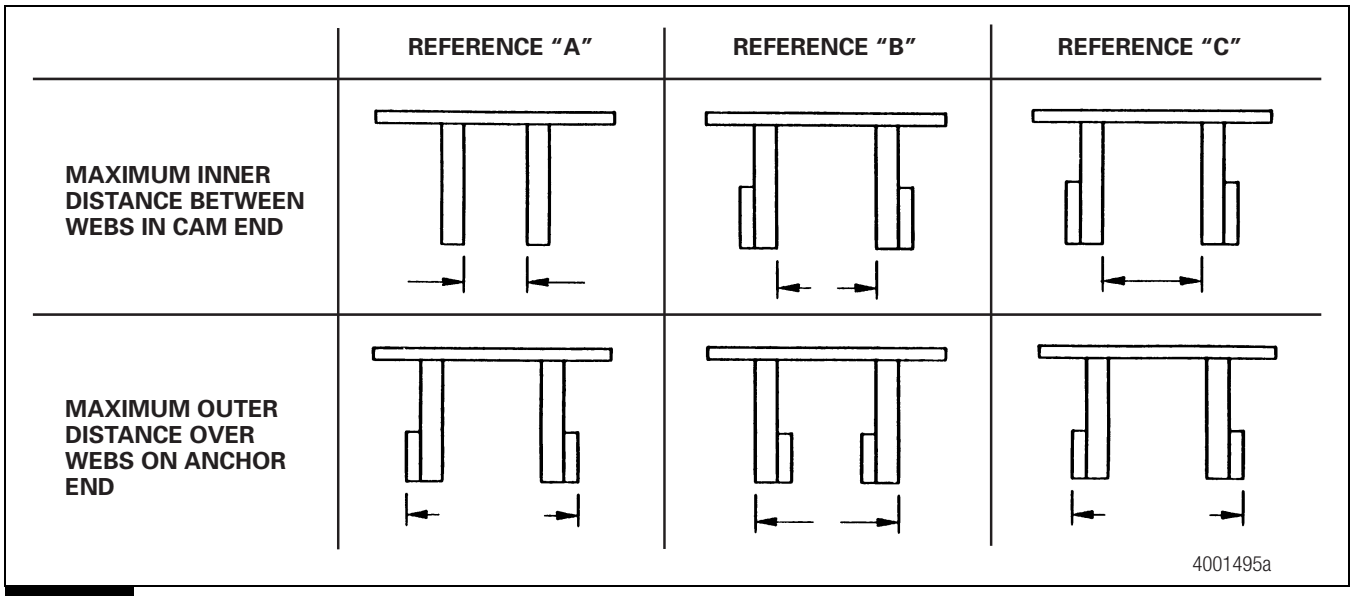


Figure 5.11

Table A: Maximum Inner and Outer Dimensions

Brake Size, Inch (mm)	Ref.	Maximum Inner Distance Between Webs on Cam End, Inch (mm)	Maximum Outer Distance Over Webs on Anchor End, Inch (mm)
14.5 x 4 (368 x 102)	A	0.855 (21.7)	1.970 (50)
14.5 x 5 (368 x 127)	A	0.855 (21.7)	1.970 (50)
14.5 x 6 (368 x 152)	A	0.855 (21.7)	1.970 (50)
14.5 x 8 (368 x 203)	B	1.355 (34.4)	1.994 (50.6)
14.5 x 10 (368 x 254) — Type I	B	1.395 (35.4)	2.167 (55)
14.5 x 10 (368 x 254) — Type III	B	1.395 (35.4)	2.167 (55)
14.5 x 10 (368 x 254) — Type II	C	1.520 (38.6)	2.914 (74)

6. The anchor pin diameter must be greater than 1.245-inches (31.62 mm).
7. Check the camshaft bracket for broken welds, cracks and correct alignment. Replace damaged brackets.
8. Check the camshaft for cracks, wear and corrosion. Check the cam head, bearing journal and splines. Replace damaged camshafts.
9. Determine if the camshaft bushings need replacement by using a dial indicator to check the radial movement of the camshaft. Figure 5.12.
   - **If the radial movement is more than 0.030-inch (0.76 mm):** Remove the camshaft. Replace the bushings and seals after the camshaft is removed.

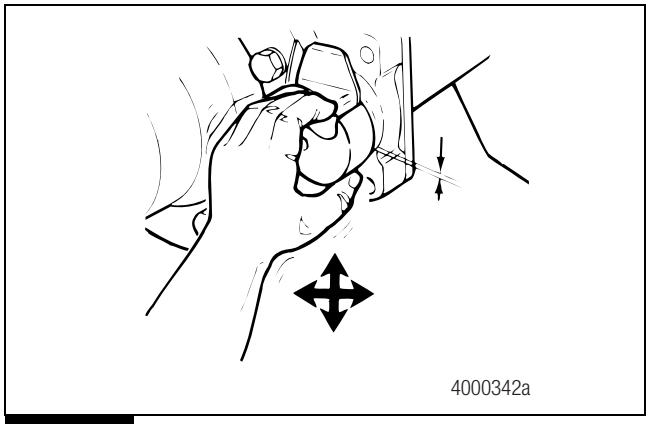


Figure 5.12

10. Check the camshaft seals for leakage. Replace damaged seals.
11. Check the spider for an expanded anchor pin hole and for cracks.
    A. Check the inside diameter of the anchor pin holes or the anchor pin bushings, if used.
       - On brake models without bushings, the diameter of the anchor pin holes must not exceed 1.252-inches (31.8 mm).
       - On brakes with anchor pin bushings, the inside diameter of the bushing must not exceed 1.023-inches (26 mm). Figure 5.13.

    B. Replace damaged or worn spiders, anchor pin bushings and anchor pins. Tighten the spider mounting bolts to the vehicle manufacturer's specifications.

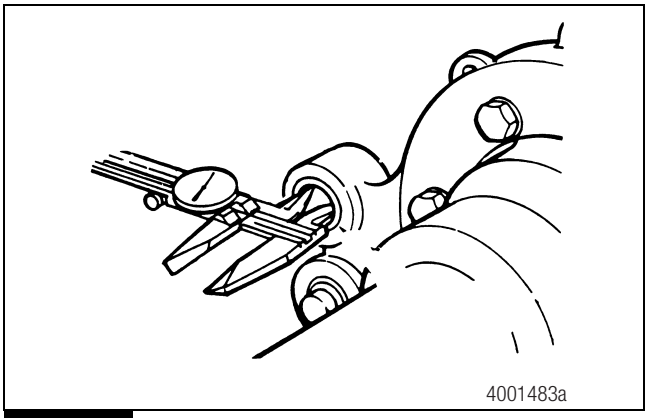


Figure 5.13

12. Check the slack adjuster. Follow the vehicle manufacturer's recommendations. For Meritor slack adjusters, refer to Section 7 in this manual and Maintenance Manual 4, Cam Brakes and Automatic Slack Adjuster. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.

⚠ WARNING

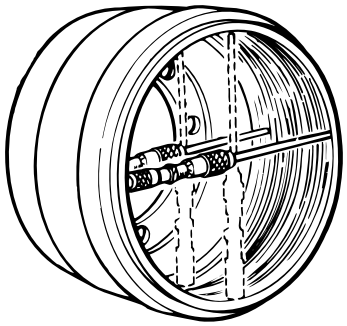
Do not operate the vehicle with the brake drum worn or machined beyond the discard dimension indicated on the drum. The brake system may not operate correctly. Damage to components and serious personal injury can result.

13. Drums and shoes for W Series brakes are also available in X, XX and XXX sizes. Refer to Parts Book PB-8857, Brake, Trailer Axle and Wheel Attaching Parts, for information on servicing these drums and shoes. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.

    Check the brake drums.

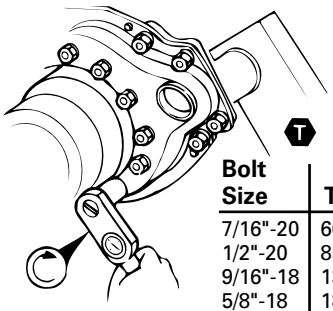
    A. Check the drums for cracks, severe heat checking, heat spotting, scoring, pitting or distortion. Replace damaged drums.

    B. Measure the inside diameter of the drum in several locations with a drum caliper or inside micrometer. Figure 5.14.
       - **If the drum is out-of-round due to wear:** You can turn the drum if the diameter does not exceed the specifications.
       - **If the diameter exceeds the specifications supplied by the drum manufacturer or is close enough that the drum will wear past the specification before the next inspection:** Replace the drum.



4000343a

Figure 5.14



Bolt Size	Torque	
7/16"-20	60-75 lb-ft	81-102 N•m
1/2"-20	85-115 lb-ft	115-156 N•m
9/16"-18	130-165 lb-ft	176-224 N•m
5/8"-18	180-230 lb-ft	244-312 N•m
7/8"-9	440-580 lb-ft	598-789 N•m

4000345a

Figure 5.15

14. Check the dust shields, if used, for rust and distortion. Repair or replace damaged shields as necessary.

Installation

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.

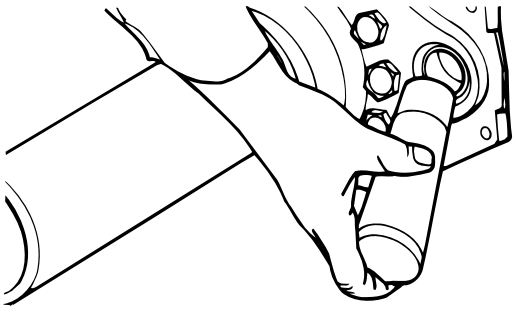
⚠ ASBESTOS AND NON-ASBESTOS FIBERS WARNING

Some brake linings contain asbestos fibers, a cancer and lung disease hazard. Some brake linings contain non-asbestos fibers, whose long-term effects to health are unknown. You must use caution when you handle both asbestos and non-asbestos materials.

Camshaft Assembly

Some W Series brakes do not use a chamber bracket.

1. If removed, install the spider onto the axle housing flange. Align the marks you made on the spider and flange during removal. Install the spider-to-flange capscrews. Tighten the capscrews to the torque specified in Figure 5.15. T
2. If removed, install the seal and bracket onto the spider. Install the bracket fastener. Tighten the fastener to the torque specified in Figure 5.15. T
3. If the spider was not removed, check the torque of the spider-to-flange capscrews. Tighten the spider capscrews to the torque specified in Figure 5.15. T
4. If removed, install new bushings and seals into the spider and bracket.
   A. Lubricate the outside of the bushings and seals with Meritor specification O-617-A or O-617-B grease, or equivalent.
   B. Lubricate the bores in the spider and bracket with Meritor specification O-617-A or O-617-B grease, or equivalent.
   C. If used, install the bushing spacer into the bore.
   D. Place a bushing into the bore of the spider and bracket. Use the correct size driver to install the bushings into the bore. The bushings are correctly installed when the bottom of the bushing is even with the bottom of the seal bore. The bushing must not extend into the seal bore. Figure 5.16.



4000346a

Figure 5.16

E. Place a seal into the bore of the spider and bracket. The lips of the seal must face the slack adjuster. Use the correct size driver to install the seals into the bore. The seal is correctly installed when the bottom of the seal touches the bottom of the bore. Figure 5.17.

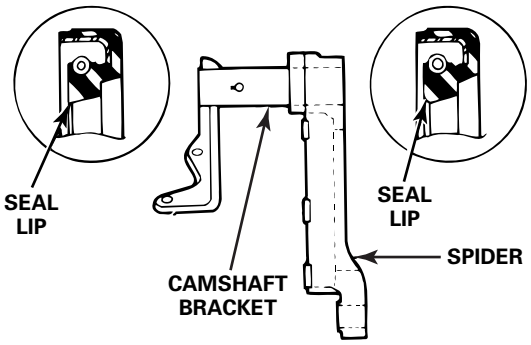


Figure 5.17

5. Place the cam head thrust washer onto the camshaft. Apply Meritor specification O-617-A or O-617-B grease to the camshaft bushings, camshaft journals and camshaft seal lips. Install the camshaft assembly through the spider and bracket. The camshaft should turn freely by hand. Figure 5.18.

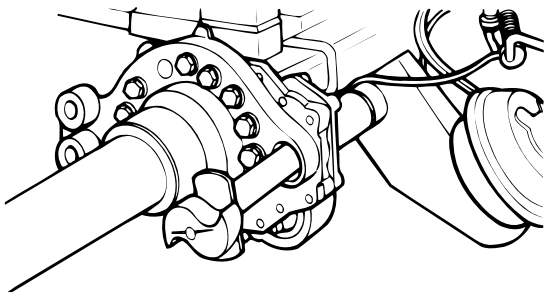


Figure 5.18

Lining with Bolts

1. Verify that the lining and shoe contact faces are clean.
2. Align the bolt holes in the lining with the bolt holes in the shoe.
3. Install the 0.375-inch diameter brass bolts into the bolt holes. The bolts must be the correct body diameter, head size and shape, and length and material. Follow the sequence shown in Figure 5.19 for 10-inch width brakes and Figure 5.20 for all other brake widths.
   - The maximum acceptable lining-to-shoe gap along the sides and ends of the assembly is 0.010-inch (0.25 mm). The maximum acceptable lining-to-shoe gap between webs is 0.025-inch (0.64 mm). Figure 5.21.
   - Use new lock washers.
   - Tighten the nuts to 18-23 lb-ft (24.8-31.6 N•m).

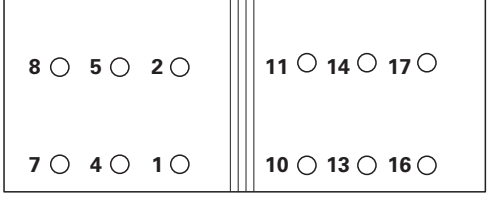


Figure 5.19

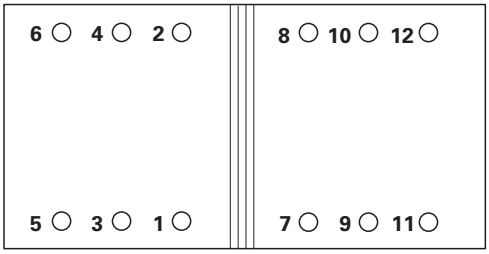


Figure 5.20

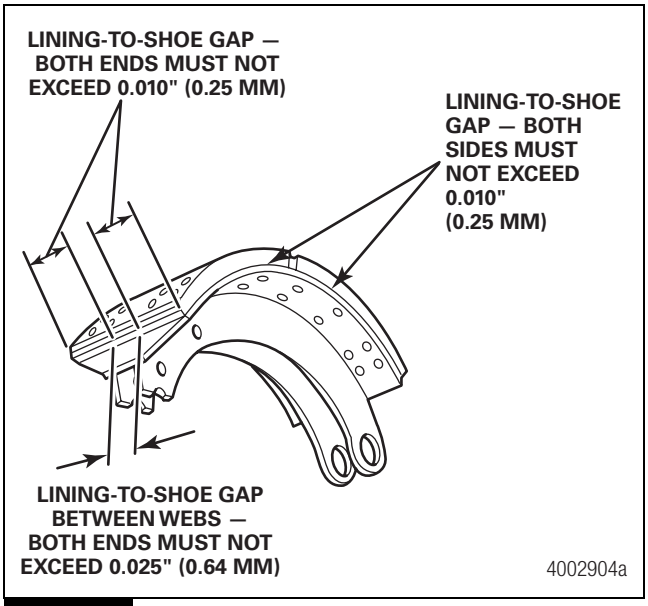


Figure 5.21

Brake Shoes

1. If removed, use a driver to install a new bushing into the brake shoe. The brake shoe may use a single or double bushing. When correctly installed, the top of the bushing is even with the outer surface of the shoe.
2. Connect the return spring to the brake shoes. Install the brake shoes onto the spider in the same position from which the shoes were removed. Figure 5.22.

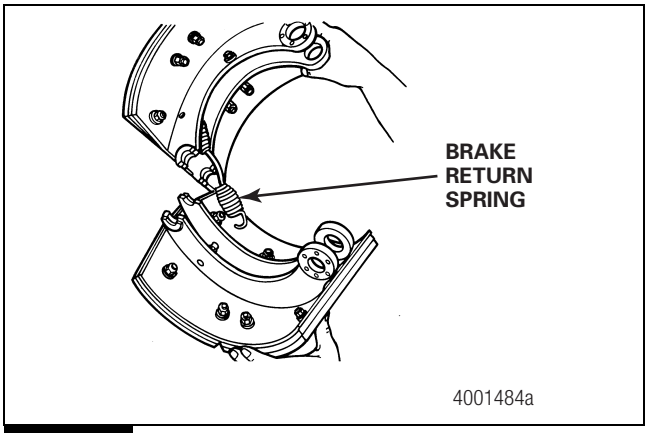


Figure 5.22

3. Lubricate the anchor pin and bushings with Meritor specification 0-617-A or 0-617-B grease, or equivalent.
4. Install the anchor pins through the brake shoes. Use one of the following procedures.
   A. **For a straight anchor pin with a strap**, place the anchor pin through the shoes and into the shoe side of the spider. The slot in the pin must be toward the bore for the strap fastener in the spider. Figure 5.23.

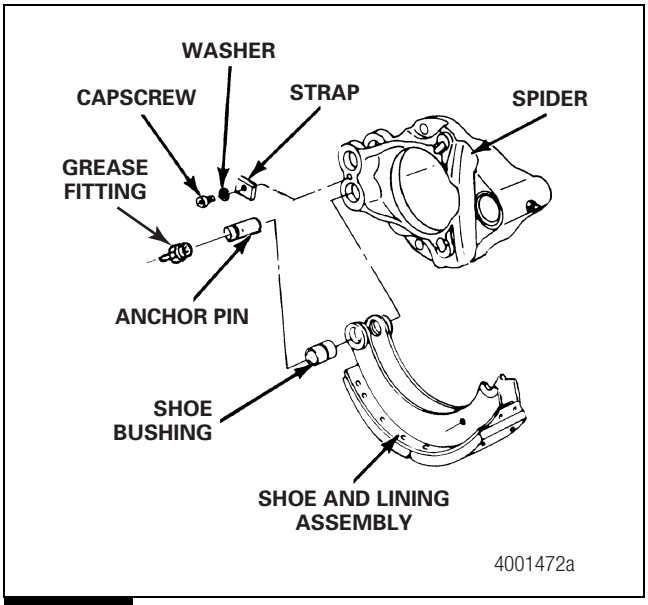


Figure 5.23

   B. Use a hammer and brass drift to install the anchor pin into the spider. The anchor pin is correctly installed when the bottom of the anchor pin is even with the end of the bore on the slack adjuster side of the spider.
   C. Install the strap into the slot on the anchor pin. Align the hole in the strap with the hole in the spider.
   D. Install the capscrew and washer that secure the strap to the spider. Tighten the capscrew to 15-20 lb-ft (20-27 N•m) for Grade 5, 22-28 lb-ft (30-38 N•m) for Grade 8. ❶
   E. Install the grease fitting onto the outboard side of the anchor pin.

A. **For a straight anchor pin with a lock ring and set screw**, place the anchor pin through the shoes and into the shoe side of the spider. Align the hole in the pin with the set screw hole in the spider. Figure 5.24.

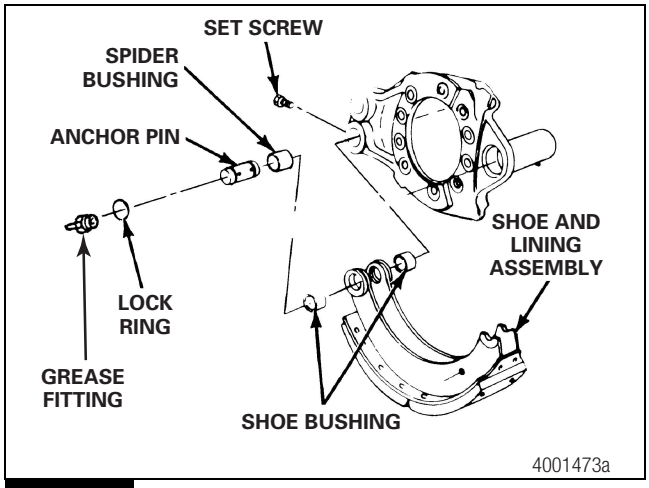


Figure 5.24

B. Install the anchor pin into the spider. Align the set screw hole in the spider with the anchor pin bore.

C. Install the set screw. Tighten the set screw to 10 lb-ft (14 N•m).

D. Install the lock ring onto each end of the anchor pin.

E. Install the grease fitting onto the outboard side of the anchor pin.

A. **For a straight anchor pin with threads**, place the anchor pin through the shoes and into the shoe side of the spider. The threads on the pin must be toward the slack adjuster. Figure 5.25.

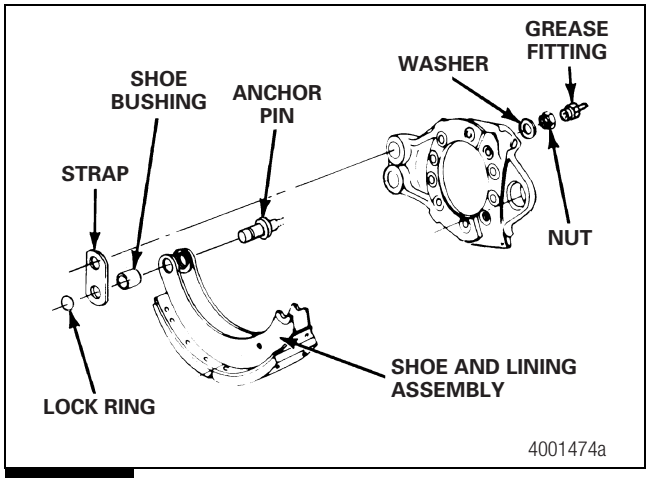


Figure 5.25

B. Use a hammer and brass drift to install the anchor pin into the spider. The anchor pin is correctly installed when the bottom of the anchor pin is even with the outer surface on the slack adjuster side of the spider.

C. Install the strap over both anchor pins.

D. Install the lock rings onto the anchor pins.

E. Install the grease fitting onto the slack adjuster side of the anchor pin.

A. **For a tapered anchor pin**, place the anchor pin through the shoes and into the shoe side of the spider. The tapered side of the pin must be toward the spider. Figure 5.26.

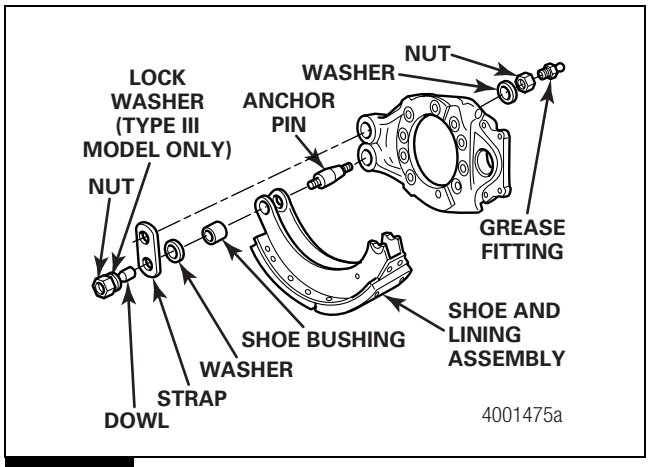


Figure 5.26

B. Use a hammer and brass drift to install the anchor pin into the spider. The taper on the pin must touch the bore.

C. Install one washer from shim pack S-1229-C-1563 onto each anchor pin. The required gap between the brake shoes and the strap is 0.030-0.060-inch (0.762-1.524 mm).

D. Install the strap over both pins on the shoe side of the spider.

E. Install the dowel over the pin threads on the shoe side of the spider.

F. Install the lock washer onto the pin.

G. Install the nut onto the pin. Tighten the nut to 210-270 lb-ft (286-367 N•m).

H. Check the gap between the brake shoes and strap. Figure 5.27.

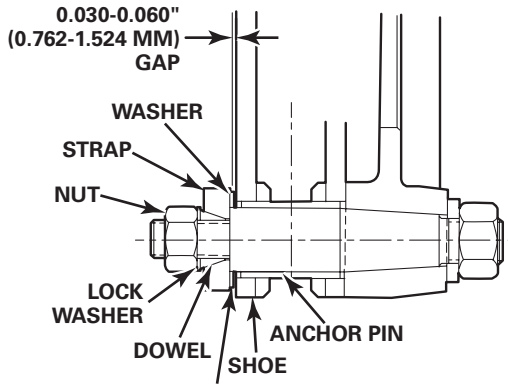


Figure 5.27

- **If the gap is not within 0.030-0.060-inch (0.762-1.524 mm):** Remove the nut, lock washer, dowel, strap and washer. Install a different size washer from shim pack S-1229-C-1563 to achieve the correct specification.

I. Install the washer and nut onto the anchor pin threads on the slack adjuster side of the spider. Tighten the nut to 150-180 lb-ft (203-244 N•m). ❶

J. Install the grease fitting onto the slack adjuster side of the anchor pin.

5. Lubricate the shoe rollers with Meritor specification O-617-A or O-617-B grease, or equivalent. Lubricate the rollers where the parts touch the brake shoes. Do not allow grease to contact the area of the shoe roller that touches the camshaft head.

6. Place a pry bar between the shoe and the cam. Lift up the shoe. Install the shoe rollers onto the camshaft end of the shoes. The rollers must touch the ends of the shoes and camshaft. Figure 5.28.

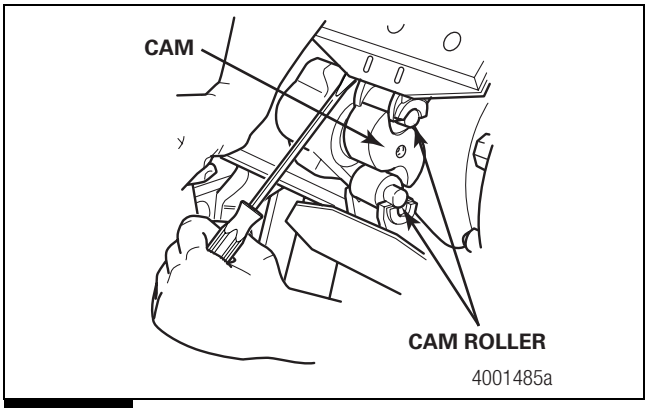


Figure 5.28

Slack Adjusters

If the slack adjuster is not a Meritor automatic slack adjuster, refer to the manufacturer's literature for the correct service procedures.

For complete maintenance and service information on Meritor's automatic slack adjuster, refer to Section 7 in this manual and Maintenance Manual 4, Cam Brakes and Automatic Slack Adjuster. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.

Burnish the Brakes

1. Adjust the brake manually. Refer to Section 7.
2. While driving the vehicle at 20 mph (32 km/h), apply the brakes to reduce speed, approximately 10 feet (3.05 m) per second, to five mph (8 km/h). Perform this operation 10 times at regular intervals of 500 feet or 0.1 mile (150 m or 0.16 km) without stopping the vehicle.
3. After 10 brake applications, make one complete stop from 20 to 0 mph (32 to 0 km/h).
4. Check the drum temperatures immediately after burnishing. Any drums that are cooler, approximately 50°F (10°C) side-to-side, 100°F (38°C) front-to-rear, than the others indicate a possible lack of braking effort on those wheels. Repeat the burnishing.

   A temperature difference greater than stated above is a possible indication of brake imbalance. Check for correct brake assembly and automatic slack adjuster setup. Refer to the appropriate section of this manual. In addition, check the vehicle manufacturer's specifications for correct air system setup. After the imbalance is repaired, reburnish the brakes.
5. Allow the brakes to cool to the ambient temperature. Readjust all the brakes manually.

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.

⚠ ASBESTOS AND NON-ASBESTOS FIBERS WARNING

Some brake linings contain asbestos fibers, a cancer and lung disease hazard. Some brake linings contain non-asbestos fibers, whose long-term effects to health are unknown. You must use caution when you handle both asbestos and non-asbestos materials.

Installation

Combination Friction Linings

Combination friction linings with different friction ratings on the primary and secondary shoes are frequently used. When you use combination friction linings, you must install the lining blocks to the correct locations on the brake shoes.

Always reline both wheels of a single axle and all four wheels of a tandem axle at the same time. Always install the same linings and drums onto both wheels of a single axle and all four wheels of a tandem axle. It is not necessary that the front and rear axles have the same linings and drums.

Determine the Location of the Primary and Secondary Brake Shoes

If the orientation of the brake shown does not match the brake you are servicing, rotate the figure to the correct orientation and wheel rotation.

The first brake shoe past the cam in the direction of the wheel rotation is the primary shoe. Figure 6.1. The primary shoe can be either at the TOP or BOTTOM position, depending on the location of the cam.

- **If the cam is BEHIND the axle:** The TOP shoe is the primary shoe.
- **If the cam is in FRONT of the axle:** The BOTTOM shoe is the primary shoe.

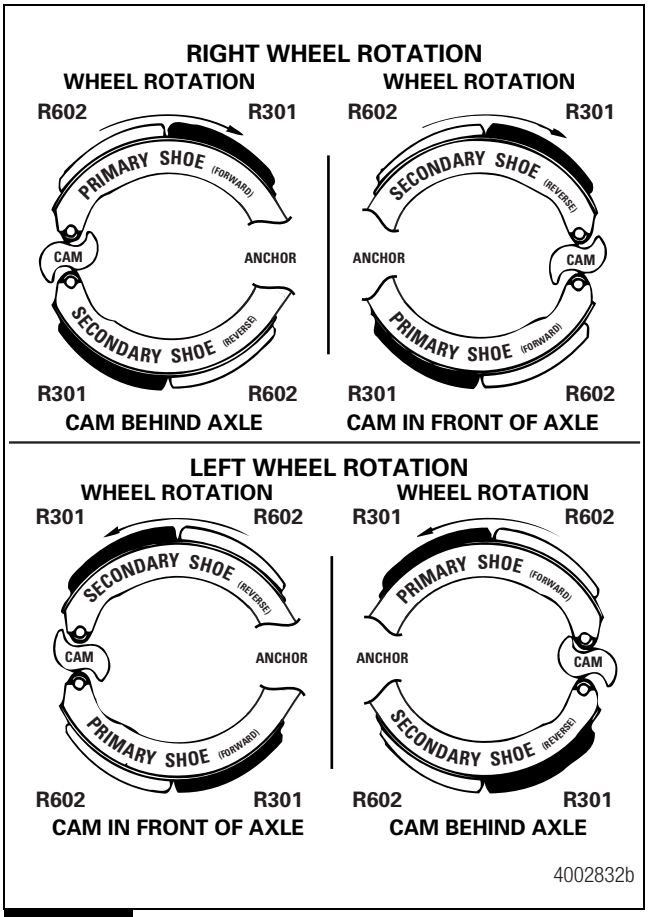


Figure 6.1

Install the Linings, Mount the Brake Shoes onto the Vehicle and Adjust the Brakes

To maintain uniform lining wear at each wheel end, Meritor recommends that you install matching lining sets onto both wheels of a single axle and all four wheels of a tandem axle.

1. Install the R301 linings onto the primary and secondary brake shoes.
2. Install the R602 linings onto the primary and secondary brake shoes.
3. Mount the brake shoes onto the vehicle.
4. Adjust the brakes. Refer to Section 7.

Hazard Alert Messages

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Overview

As of January 1993, some parts of the Meritor automatic slack adjuster are no longer serviceable and are not interchangeable with parts from earlier models.

Handed and Unhanded Slack Adjusters

There are two automatic slack adjuster designs: handed and unhanded. For most applications, install a handed automatic slack adjuster so that the pawl faces inboard on the vehicle.

The pawl can be on either side or on the front of the slack adjuster housing. Figure 7.1.

Pull Pawls

Pull pawls are spring-loaded. Pry the pull pawl at least 0.03-inch (0.78 mm) to disengage the teeth. Figure 7.1. When you remove the pry bar, the pull pawl will re-engage automatically.

Replace Conventional Pawls with Pull Pawls

When you service an automatic slack adjuster, replace a conventional pawl with a pull pawl. Figure 7.1. Install the slack adjuster so that you can remove the conventional pawl or disengage the pull pawl when you adjust the brake.

Clevis Types and Thread Sizes

Meritor's automatic slack adjusters and clevises are designed to be used as a system. Always replace original components with genuine Meritor replacement parts. Although parts from other manufacturers can look the same, significant differences can exist that can affect the brake system performance.

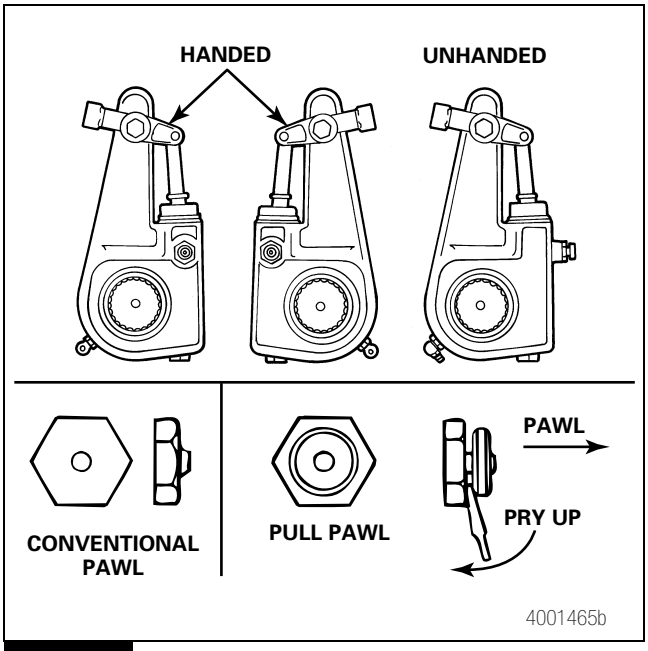


Figure 7.1

Removal

Automatic Slack Adjuster from the Camshaft

⚠ 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.

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. Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving.
2. If the brake has a spring brake, compress and lock the spring, so that the brake is released completely. Check that no air pressure remains in the service half of the air chamber.
3. If it is necessary to raise the vehicle, use a jack and 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.

4. Remove both clevis pins.
5. Remove a conventional pawl or disengage a pull pawl. Use a screwdriver or equivalent tool to lift the button of a pull pawl assembly at least 0.03125-inch (0.79375 mm) from the actuator.

⚠ 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.

6. Use a wrench to turn the manual adjusting nut in the direction shown in Figure 7.2. Move the slack adjuster away from the clevis.

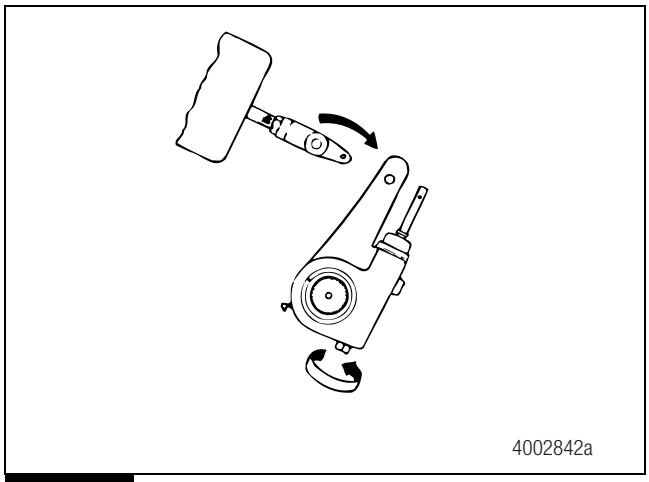


Figure 7.2

7. Remove the snap ring and washers from the camshaft. Remove the slack adjuster from the camshaft.

Installation

Automatic Slack Adjuster onto the Camshaft

⚠ 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. Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving.
2. Check the camshaft, bushings and seals for wear and corrosion. Turn the camshaft by hand to check for smooth operation. Repair or replace parts as required.
3. 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.
4. Verify that the new automatic slack adjuster is the same length as the one you are replacing. Refer to Table B.

Table B: Chamber and Automatic Slack Adjuster Sizes

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

[1] Use an auxiliary spring on slack adjusters used with size 9 and 12 chambers. A size 9 or 12 chamber return spring cannot supply enough spring tension to completely retract the slack adjuster.

⚠ 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.

5. If the vehicle has spring brakes, follow the chamber manufacturer's instructions to compress and lock the springs to completely release the brakes. Verify that no air pressure remains in the service chambers.

⚠ CAUTION

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

6. Apply Meritor specification O-637, part number 2297-U-4571, anti-seize compound, or equivalent, to the slack adjuster and cam splines.
7. Install the slack adjuster onto the camshaft. Position the slack adjuster so that you can remove a conventional pawl or disengage a pull pawl when you adjust the brake.
8. Verify that the camshaft axial end play is 0.005-0.060-inch (0.127-1.52 mm).
   - **If the axial end play exceeds 0.060-inch (1.52 mm):** Remove the snap ring. Add an appropriate number of spacing washers to achieve the correct specification.
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 the pull pawl or remove a conventional pawl. Turn the manual adjusting nut to align the holes in the slack adjuster arm and clevis. Figure 7.3.
    - **If the slack adjuster has a welded clevis:** Apply anti-seize compound to the two clevis pins. Install the clevis pins through the clevis and the slack adjuster.
    - **If the slack adjuster has a threaded clevis:** Refer to the threaded clevis installation procedure in this section.

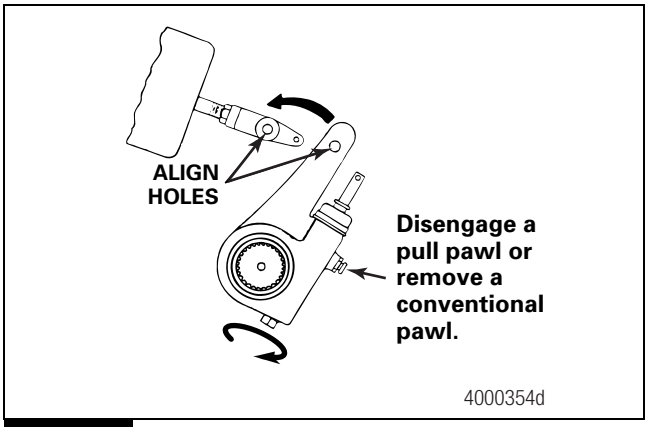


Figure 7.3

⚠ 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.

11. Install new clevis pin retainer clips to secure the clevis pins. Figure 7.4.

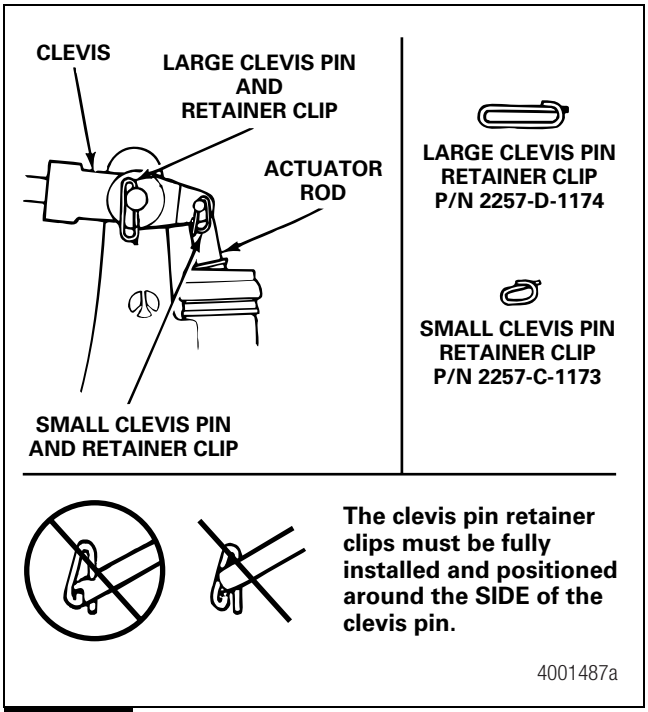


Figure 7.4

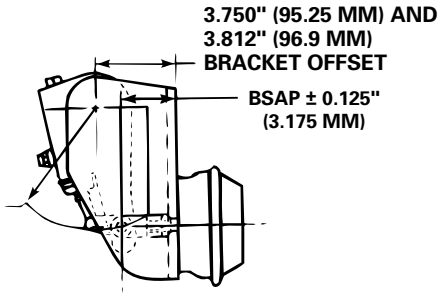
Check the Brake Chamber Push Rod Stroke and Adjust the Clevis Position

There are two methods you can use to adjust the clevis position on a chamber push rod that is 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 you install the slack adjuster, verify that the BSAP chamber dimension matches the table in Figure 7.5.



Slack Length	BSAP
5.00" (127.0 mm)	2.75" (69.85 mm)
5.50" (139.7 mm)	2.75" (69.85 mm)
6.00" (152.4 mm)	2.75" (69.85 mm)
6.50" (165.1 mm)	2.62" (66.55 mm)

Correct positions of the slack adjuster are 3.750-inch (95.25 mm) and 3.812-inch (96.82 mm) offsets only. For other bracket offsets, refer to the vehicle manufacturer's specifications.

4000360c

Figure 7.5

Automatic Slack Adjuster Templates

⚠ 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.

To obtain the correct automatic slack adjuster template, refer to the Service Notes page on the front inside cover of this manual. Figure 7.6.

Color of Template	Part Number	Use to Install Slack Adjusters On
Dark brown	TP-4786	Truck or tractor drum brake
Tan	TP-4787	Trailer drum brake
White	TP-4781	Coach drum brake
Green	TP-4788	Disc brake with offset clevis
Yellow	TP-4789	Disc brake with straight clevis

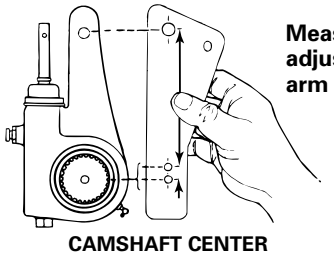


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Figure 7.6

Measure the Slack Adjuster

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 7.6.

Install a Threaded Clevis

1. Install the large clevis pin through the large holes in 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 to see if the small clevis hole completely aligns within the slot.
   - **If the small clevis hole doesn't align within the slot:** Adjust the clevis until you can see the small clevis pin hole within the slot. Figure 7.7.

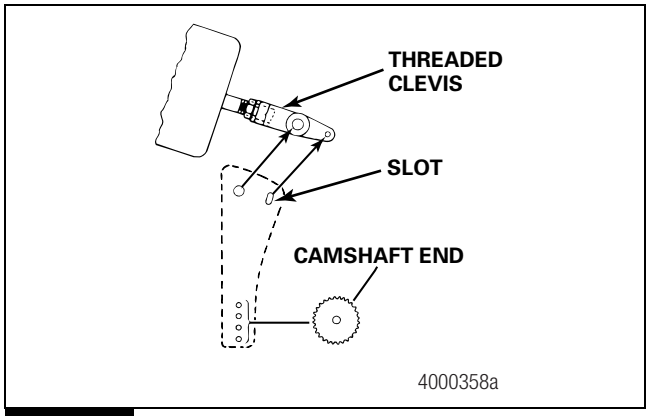

Figure 7.7

4. Verify that the thread engagement between the clevis and push rod is 0.5-0.625-inch (12.7-15.9 mm). Figure 7.8.

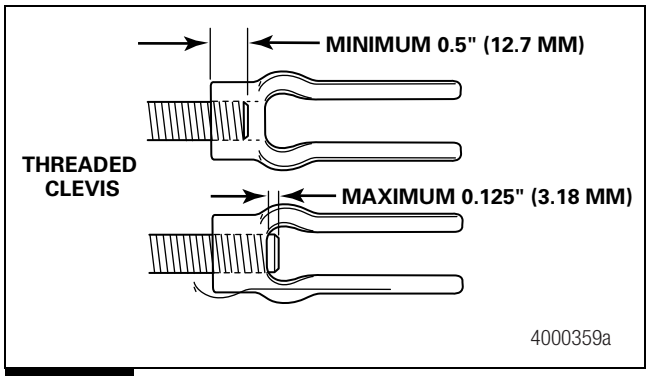

Figure 7.8

5. Verify that the push rod does not extend through the clevis more than 0.125-inch (3.18 mm).
   - **If the push rod extends through the clevis more than 0.125-inch (3.18 mm):** Cut the push rod or install a new air chamber and push rod.
6. Tighten the jam nut against the clevis to the torque specification in Table C.

Table C: 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)

Measure the Free Stroke

⚠ 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.

During preventive maintenance on an in-service brake, check both the free stroke as described below and the adjusted chamber stroke. Refer to the procedure in this section.

On some applications, you may find the in-service free stroke to be slightly longer than specified below. This is acceptable if the adjusted chamber stroke is within the limits shown in the Commercial Vehicle Safety Alliance (CVSA) table in this section.

1. Disengage a pull pawl. Use a screwdriver or equivalent tool to pry the pull pawl at least 1/32-inch (0.8 mm) to disengage the teeth.
   - **If the slack adjuster has a conventional pawl:** Remove the pawl.
2. Use a wrench to turn the manual adjusting nut COUNTERCLOCKWISE until the brake linings contact the drum. Figure 7.9. Then back-off the adjusting nut 1/2 turn in the opposite direction.

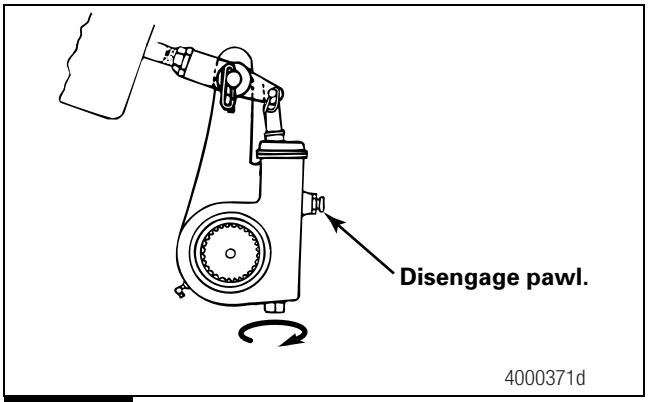

Figure 7.9

3. Measure the distance from the center of the large clevis pin to the bottom of the air chamber while the brake is released. The measurement you obtain is X in Figure 7.10.

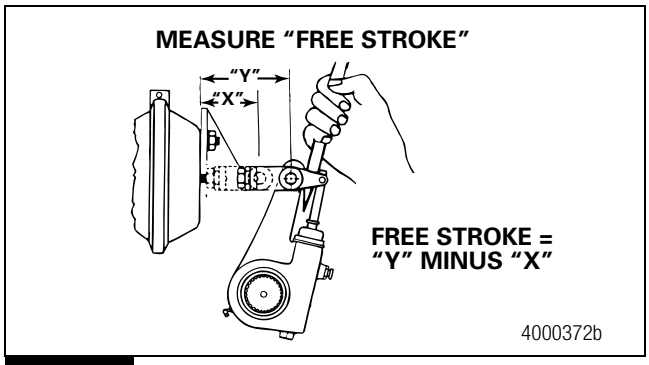

Figure 7.10

4. Use a pry bar to move the slack adjuster and position the linings against the drum with the brakes applied. Measure the same distance again while the brakes are applied. The measurement you obtain is Y in Figure 7.10.

⚠ CAUTION

Do not set the free stroke shorter than the specification. If the measurement is too short, the linings can drag. Damage to components can result.

5. Subtract X from Y to obtain the in-service free stroke. The measurement must be 0.5-0.625-inch (12.7-15.9 mm). Figure 7.10.

   - **If the free stroke measurement is not within specification:** Turn the adjusting nut COUNTERCLOCKWISE 1/8 turn to adjust the free stroke. Figure 7.11. Follow the steps above to check the free stroke again, until the measurement is within specification.

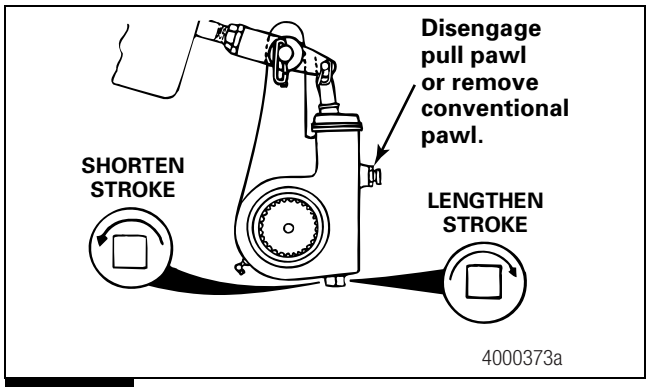

Figure 7.11

6. Re-engage the pull pawl by removing the screwdriver or equivalent tool. The pull pawl will re-engage automatically.

   - **If the slack adjuster has a conventional pawl:** Install the pawl assembly into the housing. Tighten the capscrew to 12-17 lb-ft (16-23 N•m).

⚠ 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.

7. If the brakes have spring chambers, carefully release the springs. Test the vehicle before you return it to service.

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

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

Hold the ruler parallel to the push rod and measure as carefully as possible. A measurement error can affect CVSA re-adjustment limits. CVSA states 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

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 a spring chamber, follow the manufacturer's instructions to release the spring. Verify that no air pressure remains in the service section of the chamber.
2. Verify that the pressure is between 90 and 100 psi (620-690 kPa) in the air tanks. Determine the size and type of brake chambers on the vehicle.

3. With the brakes released, mark the push rod where it exits the chamber. Measure and record the distance. Have another person apply and hold the brakes on full application. Figure 7.12.

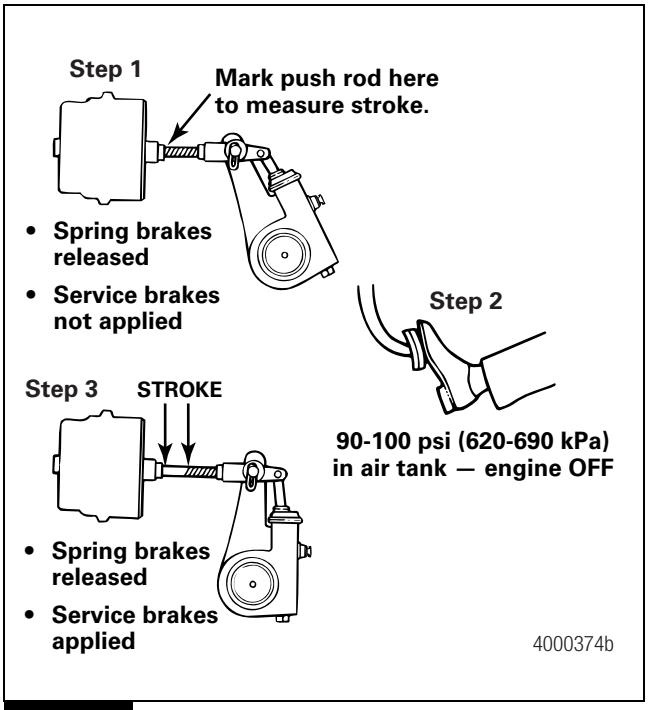

Figure 7.12

4. Measure the push rod travel or adjusted chamber stroke from where the push rod exits the brake chamber to your mark on the push rod. Measure and record the distance. Figure 7.12.
5. Subtract the measurement you recorded in Step 3 from the measurement you recorded in Step 4. The difference is the push rod travel or adjusted chamber stroke.
6. Refer to Table D or Table E to verify that the stroke length is correct for the size and type of air chambers on the vehicle.
   - **If the push rod travel or adjusted chamber stroke is greater than the maximum stroke shown in Table D or Table E:** Inspect the slack adjuster and replace it, if necessary.

Table D: Standard Stroke Clamp-Type Brake Chamber Data

Type	Outside Diameter (inches)	Brake Adjustment Limit (inches)	
6	4-1/2	1-1/4	Should be as short as possible without lining-to-drum contact
9	5-1/4	1-3/8	
12	5-4/16	1-3/8	
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 E: Long Stroke Clamp-Type Brake Chamber Data

Type	Outside Diameter (inches)	Brake Adjustment Limit (inches)	
16	6-3/8	2.0	Should be as short as possible without lining-to-drum contact
20	6-25/32	2.0	
24	7-7/32	2.0	
24[1]	7-7/32	2.5	
30	8-3/32	2.5	

[1] For 3-inch maximum stroke, Type 24 chambers.

Alternate Method to Measure the Push Rod Travel or Adjusted Chamber Stroke

Use the CVSA procedure, except in Steps 3 and 4, measure the distance from the bottom of the air chamber to the center of the large clevis pin on each of the brakes.

CVSA North American Out-of-Service Criteria Reference Tables

A brake which is at the adjustment limit is not a violation.

Information contained in Table D and Table E is for reference only. Consult the CVSA's Out-of-Service Criteria Handbook for North American Standards, Appendix A. Visit their website to obtain the handbook.

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 maintenance or service.

⚠ ASBESTOS AND NON-ASBESTOS FIBERS WARNING

Some brake linings contain asbestos fibers, a cancer and lung disease hazard. Some brake linings contain non-asbestos fibers, whose long-term affects to health are unknown. You must use caution when you handle both asbestos and non-asbestos materials.

Inspection

Before riveting the linings, you must inspect the rivet machine components as detailed in this section. You must also verify that the gaps between the brake linings and shoes are correct before you rivet the linings onto Meritor Cast Plus™, Q Series and Q Plus™ cam brake shoes. Refer to the Meritor standards for inspecting rivets in this section.

Rivet Machine Components

Inspect the rivet machine components. Figure 8.1. You must adjust, repair or replace the rivet machine components when necessary to ensure that the machine presses the rivets into the correct position. For additional rivet machine service information, consult the manufacturer's instructions.

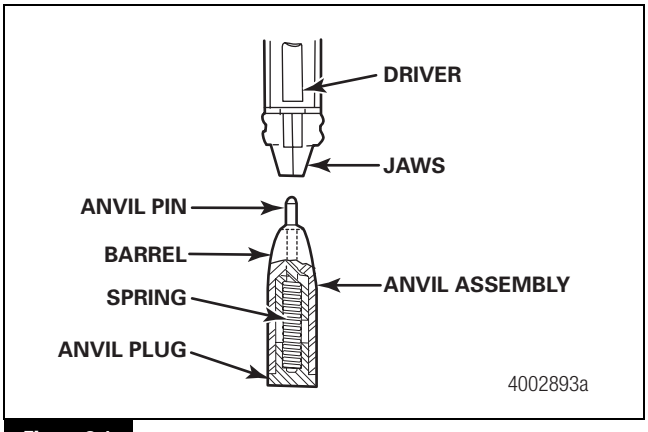

Figure 8.1

Rivet Machine Jaws

1. Remove the jaws from the rivet machine. Refer to the manufacturer's instructions.
2. Check the condition of the jaws. Carefully inspect the inner and outer surfaces for damage. Replace the damaged jaws.

Driver and Anvil Pin Alignment

The driver must align with the anvil pin. Use the following steps to check the driver and anvil pin alignment. Figure 8.2.

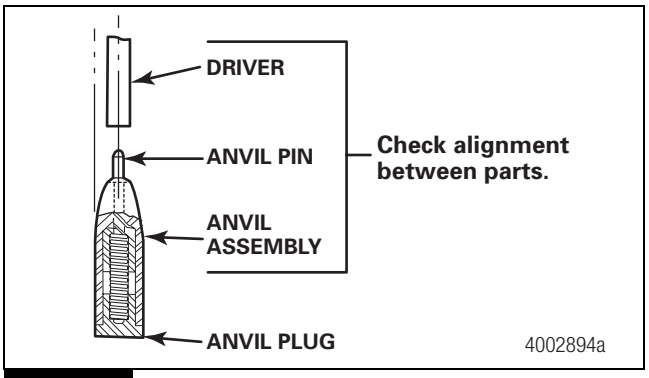

Figure 8.2

1. Use your hand to align the center of the driver with the anvil pin.
2. Adjust the alignment, if necessary.
3. If you cannot obtain the correct driver and anvil pin alignment, repair or replace the driver, anvil pin or anvil assembly. Refer to the manufacturer's instructions.

Anvil Pin Condition

1. Inspect the edge of the anvil pin. The corner must be sharp, not radial. Figure 8.3.

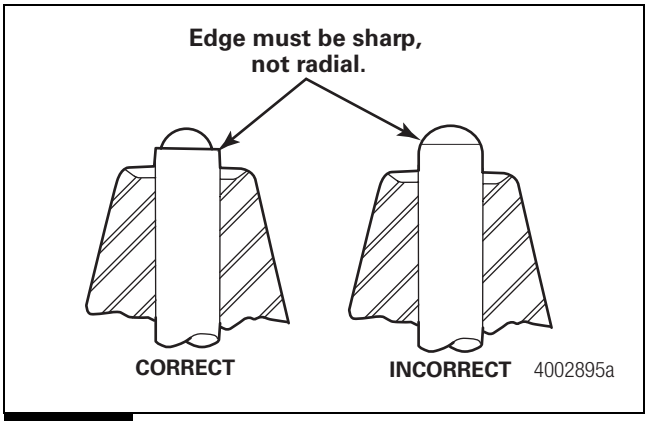

Figure 8.3

2. If the corner is not sharp, repair or replace the anvil pin. Refer to the manufacturer's instructions.
3. Use a micrometer to measure the diameter, Dimension A, of the anvil pin. Figure 8.4. Record the dimension.

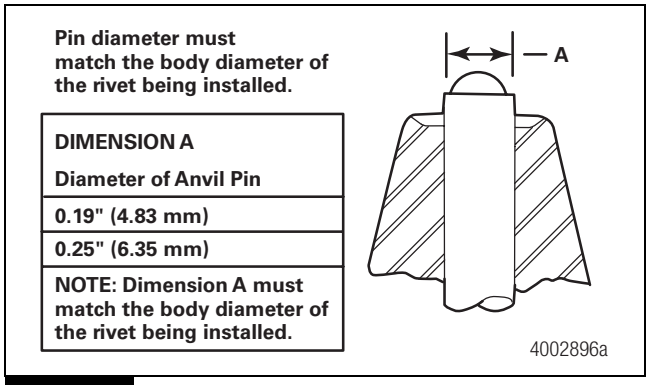

Figure 8.4

4. Push the anvil pin into the barrel of the anvil assembly until the base of the anvil pin contacts the top of the anvil assembly plug. Hold the anvil pin in this position.
5. Measure Dimension B from the sharp edge of the anvil pin to the bottom surface in the head of the barrel. Figure 8.5.
   - **If Dimension B exceeds the specification in Figure 8.5:** Use the following procedure to shorten the anvil pin.
     A. Remove the anvil pin from the barrel.
     B. Grind the bottom of the anvil pin as needed. Figure 8.6.
     C. Assemble the anvil assembly.
     D. Repeat Step 4 and Step 5.
     E. Install the jaws onto the rivet machine.

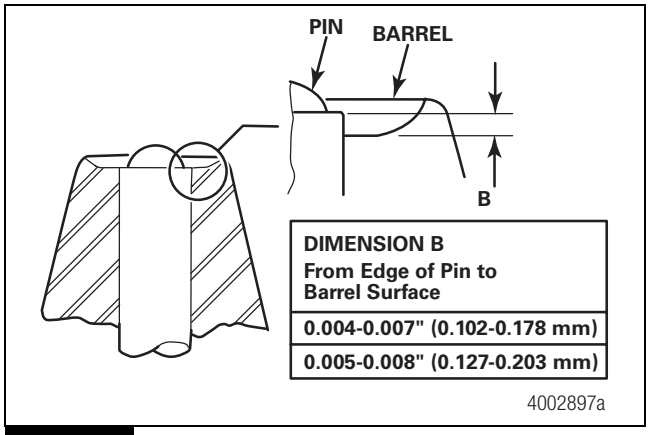

Figure 8.5

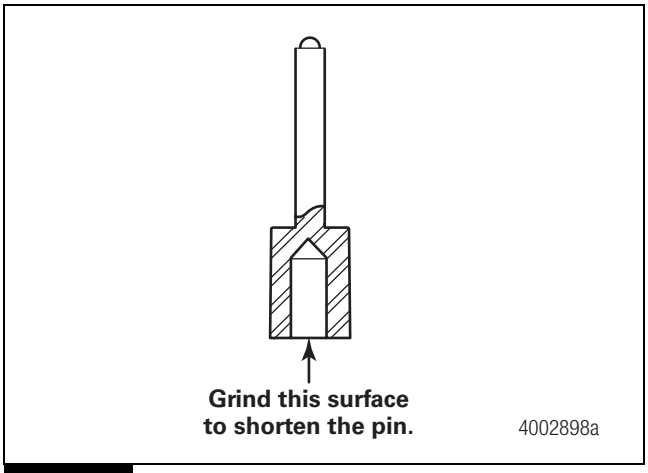

Figure 8.6

- **If Dimension B is less than the specification in Figure 8.5:** Use the following procedure to shorten the barrel.

A. Remove the plug, spring and anvil from the barrel.
B. Grind the bottom of the barrel as needed. Figure 8.7.
C. Assemble the anvil assembly.
D. Repeat Step 4 and Step 5.
E. Install the jaws onto the rivet machine.

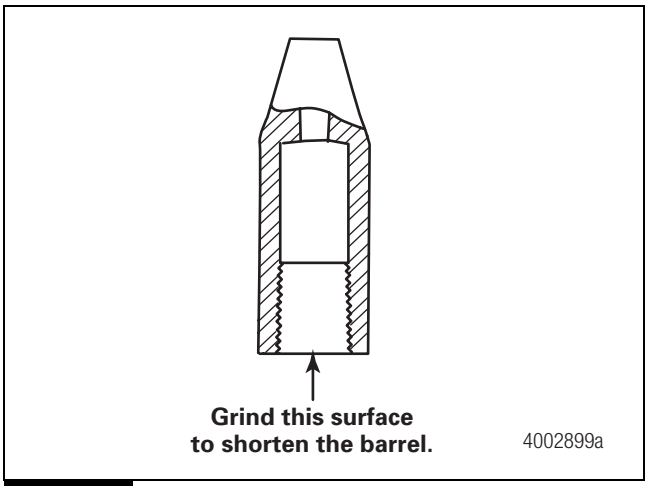

Figure 8.7

Meritor Standards for Inspecting Rivets

Refer to the following Meritor standards to inspect Meritor rivets and verify that the gaps between the Meritor linings and shoes are correct.

A rivet must fill the holes in the lining and shoe table. Figure 8.8.

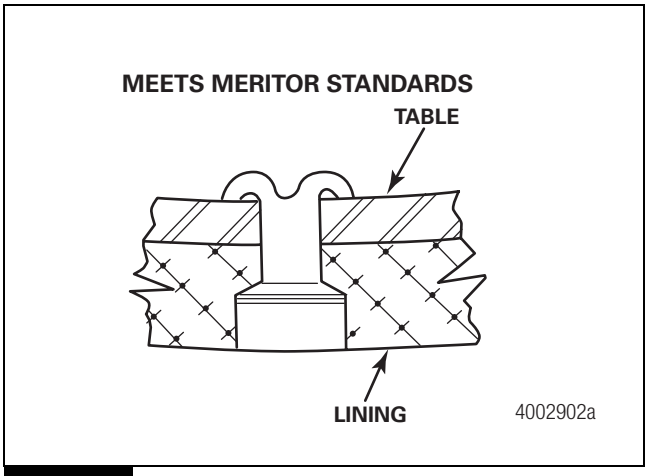

Figure 8.8

A rivet that does not fill the holes in the lining and shoe table does not meet Meritor standards. Figure 8.9.

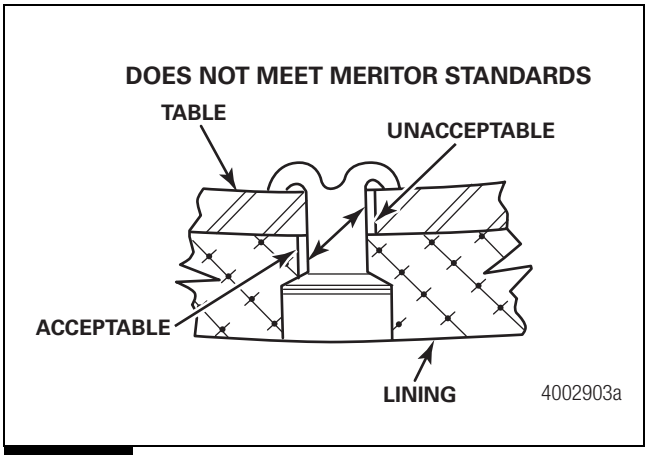

Figure 8.9

A rivet curl must completely contact the shoe table so that there's not a gap between the rivet curl and shoe. Figure 8.8. You must replace the rivet to correct the gap. Figure 8.10.

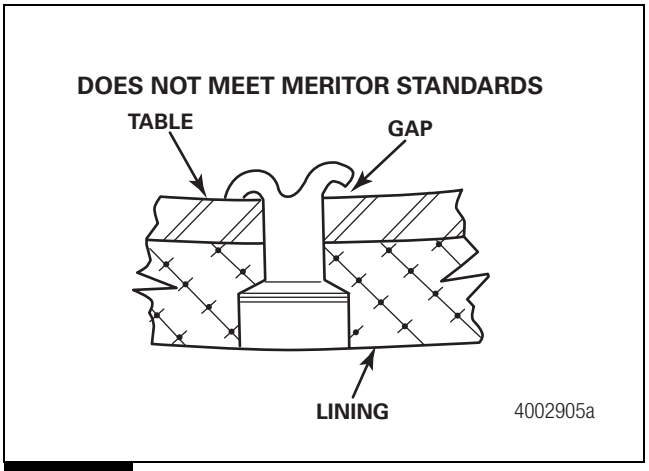

Figure 8.10

Meritor standards do not permit rivet movement. Use the following procedure to check for loose-rivet movement. Figure 8.11.

1. Use your hand to check for side-to-side and up-and-down rivet movement.
2. Place a punch on the driver side of the rivet. Gently tap the punch with a ball peen hammer. Check the roll side of the rivet with a 0.001-inch feeler gauge to ensure that the roll has not been lifted off the surface of the shoe.
   - **If rivet movement occurs during Step 1 or Step 2:** Remove the rivet and install another one.

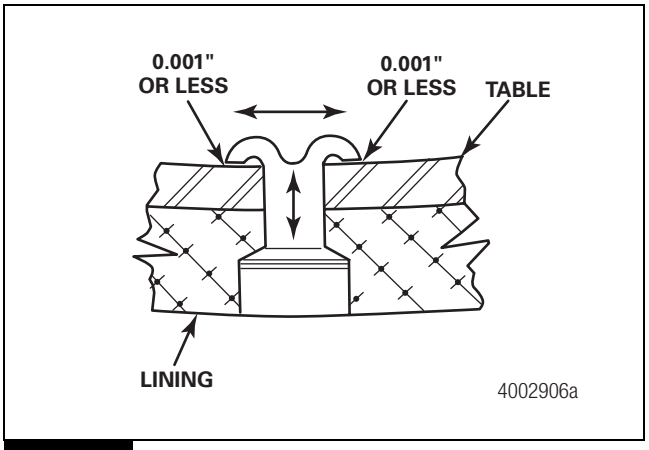

Figure 8.11

A rivet curl with more than one crack does not meet Meritor standards. Figure 8.12.

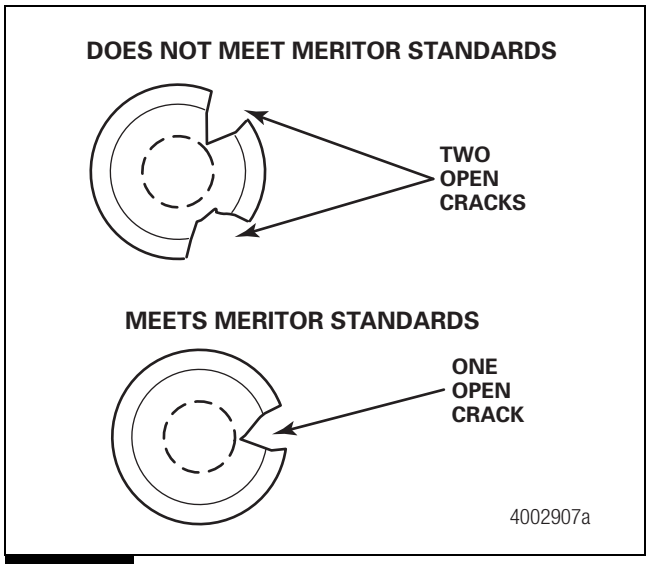

Figure 8.12

The maximum acceptable lining-to-shoe gap along the sides and ends of the assembly is 0.010-inch (0.25 mm). The maximum acceptable lining-to-shoe gap between webs is 0.025-inch (0.64 mm). Figure 8.13.

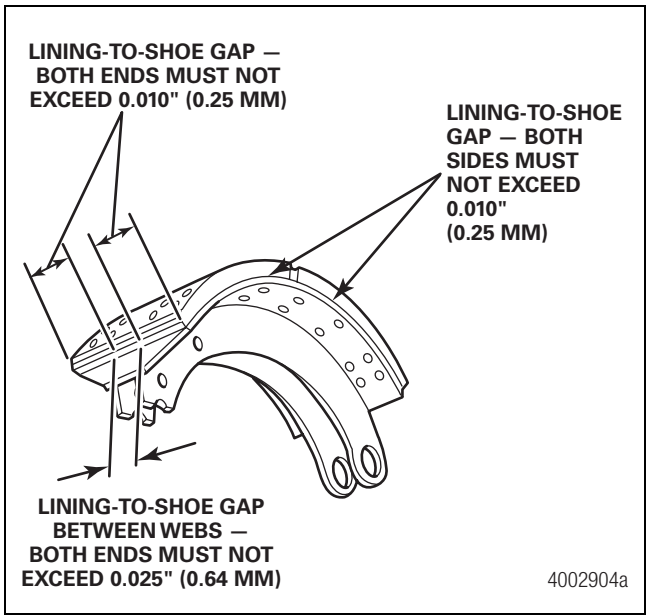

Figure 8.13

Installation

Lining with Rivets

1. Before riveting the linings, you must inspect the rivet machine components as detailed in the procedure in this section.
2. Verify that the gaps between the brake linings and shoes are correct before you rivet the linings onto Meritor Q Series, Q Plus™ and Cast Plus™ cam brake shoes. Refer to the procedure in this section.
3. Before you install the linings onto a shoe, check the compressed height of a rivet.
   A. Press a rivet into the machine.
   B. Measure distance A, which must be 0.460-0.475-inch (11.684-12.065 mm). Figure 8.14.

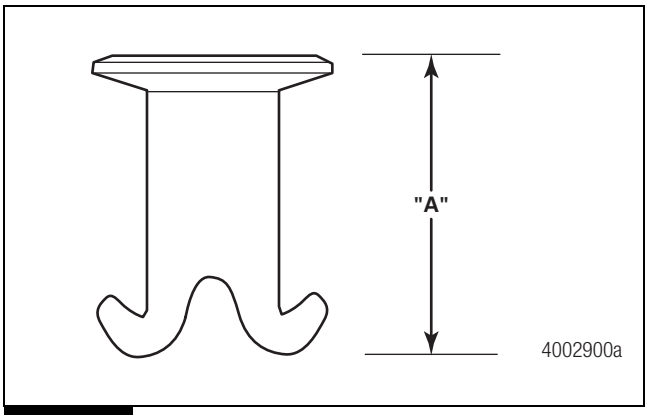

Figure 8.14

4. Verify that the lining and shoe contact faces are clean.
5. Align the rivet holes in the lining with the rivet holes in the shoe.
6. Before you cycle the rivet machine to fasten the linings to the brake shoe, check that the anvil pin extends through the table and lining assembly to ensure correct driver and anvil pin alignment. Figure 8.15.

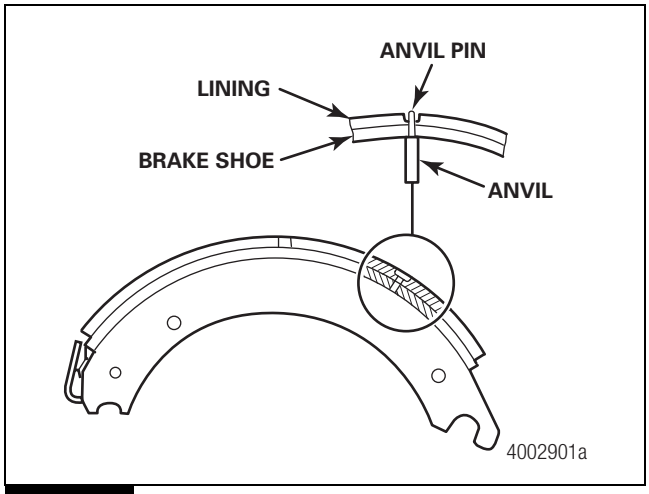

Figure 8.15

7. Install the rivets into the rivet holes following the sequence shown in Figure 8.16. For shoes with fewer rivet holes, start at the middle of the shoe and work toward the end. The rivets must be the correct body diameter, head size and shape, and length and material.

   A 0.010-inch (0.25 mm) maximum gap is acceptable between the shoe and linings along the sides and ends of the assembly, except between the double web. Between the webs, a 0.025-inch (0.64 mm) gap is acceptable.

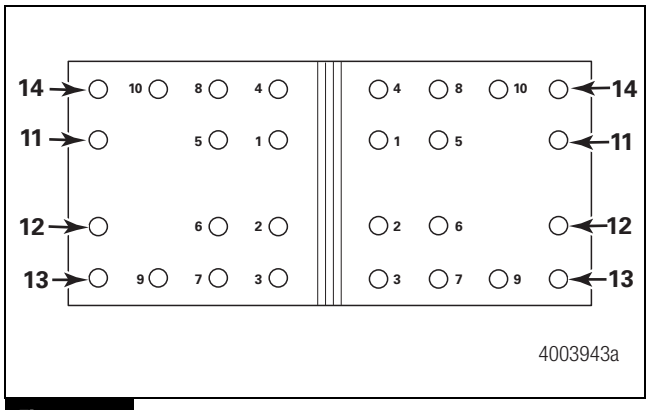

Figure 8.16

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.

⚠ ASBESTOS AND NON-ASBESTOS FIBERS WARNING

Some brake linings contain asbestos fibers, a cancer and lung disease hazard. Some brake linings contain non-asbestos fibers, whose long-term effects to health are unknown. You must use caution when you handle both asbestos and non-asbestos materials.

Before You Install the Brake Drum

The internal machined brake drum pilot on Meritor 17000, 59000, 61000, 71000 and RC-26-700 Series bus and coach steer, center and drive axles fits over the machined flange of the hub. Figure 9.1. A correct drum-to-hub installation is essential to maintain the integrity of the wheel-end assembly.

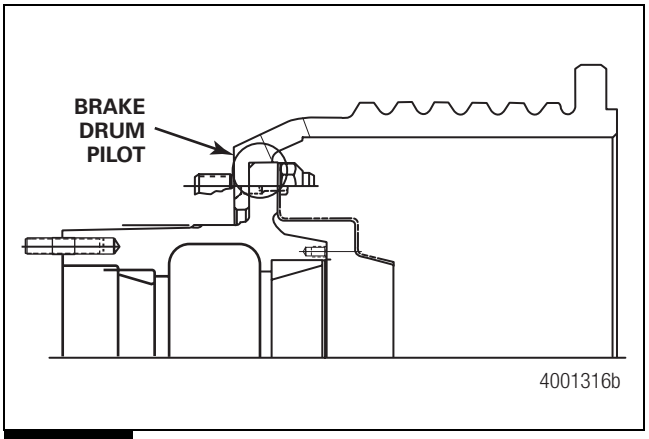

Figure 9.1

Replacing wheel studs can affect the fit of the drum onto the hub. If new wheel studs have been installed in the hub, there may be some localized swelling on the hub flange. The amount of swelling is usually small and localized. Figure 9.2.

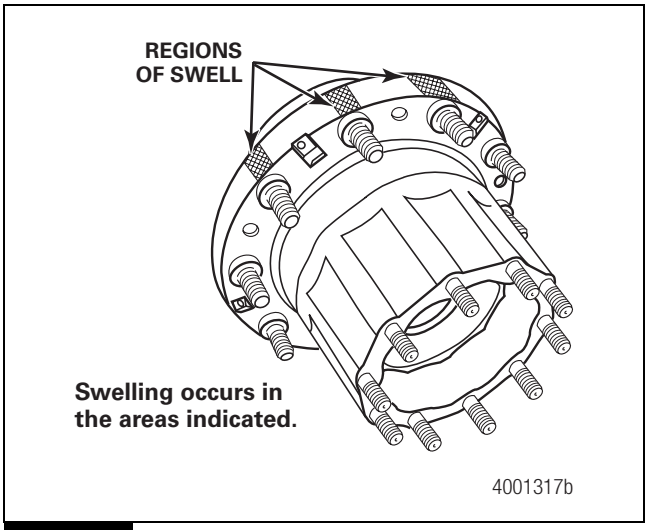

Figure 9.2

In a correct installation, the brake drum pilot should install easily over the machined flange of the hub. If it does not, perform the following procedures.

Installation

Brake Drum Procedure

⚠ 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.

You must carefully follow installation procedures when you install a brake drum onto a hub. An incorrect installation can cause the drum to fracture, which will affect braking performance. Loss of vehicle control, serious personal injury and damage to components can result.

⚠ CAUTION

When you install a brake drum and there's swelling on the hub flange, use a hand grinder to remove a small amount of material over each stud. Do not remove material from the flange area between the studs, which will weaken the drum mounting area. Damage to components can result.

1. Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving. Set the parking brake.

2. Use a ring gauge measuring 12.7510-12.7520-inches (323.875-323.900 mm) to check the flange diameter.
   - **If the ring gauge fits over the flange:** Proceed to Step 3.
   - **If the ring gauge does not fit over the hub flange because of swelling:** Use one of the following methods to remove the swelling on the hub flange. Remove only enough material to allow for an easy ring gauge or drum fit. Do not remove material from the flange area between the studs, which will weaken the drum mounting area.

   A. Use a hand grinder to remove a small amount of material over each stud. Check the ring gauge or drum fit frequently to ensure that you're not removing too much material.

   B. Use a lathe to machine the hub flange and remove any swells. Locate the lathe on the bearing cups. Check the ring gauge or drum fit frequently to ensure that you're not removing too much material.
3. Use a wire brush to remove any rust, burrs and debris on both mating surfaces. Use a cloth dampened with water or a water-base solution to clean the brake drum pilot on both the brake drum and hub flange.

Check the Brake Drum Surface Total Indicator Runout (TIR)

A Hub Mounted on the Axle

1. Install the drum onto the hub. Carefully slide the drum onto the hub flange. Do not force the brake drum over the flange.
   - **If the brake drum does not install easily over the hub flange:** Use the procedure above to remove swelling on the hub flange.
2. Install the wheel nuts and suitable spacers to fasten the drum to the hub.
3. Attach the magnetic base of a dial indicator to the axle housing. Measure brake drum total indicator runout (TIR) approximately one-inch (25 mm) from the open end of the drum. The runout should not exceed 0.015-inch (0.381 mm).
   - **If runout exceeds specifications:** Remove the drum from the hub. Rotate the drum and install it. Verify that runout does not exceed 0.015-inch (0.381 mm).
   - **If you are unable to rotate the drum to provide the correct runout:** Remove and turn the drum. The maximum diameter should be at least 0.1-inch (2.5 mm) less than the maximum dimension marked on the outer edge of the drum to maintain correct drum wear allowance. Install the drum. Verify that runout does not exceed 0.015-inch (0.381 mm).
   - **If turning the drum does not provide correct runout:** Replace the drum.

A Hub Not Mounted on the Axle

1. Assemble the hub, drum and wheel. Do not force the brake drum over the flange.
   - **If a brake drum does not install easily over the hub flange:** Use the procedure above to remove swelling on the hub flange.
2. Mount the hub, drum and wheel assembly onto a suitable spindle with the wheel bearings correctly adjusted.
3. Attach the magnetic base of a dial indicator to the spindle base. Measure brake drum total indicator runout (TIR) approximately one-inch (25 mm) from the open end of the drum. The runout should not exceed 0.015-inch (0.381 mm).
   - **If runout exceeds specifications:** Remove the drum from the hub. Rotate the drum and install it. Verify that runout does not exceed 0.015-inch (0.381 mm).
   - **If you are unable to rotate the drum to provide the correct amount of runout:** Remove and turn the drum. The maximum diameter should be at least 0.1-inch (2.5 mm) less than the maximum dimension marked on the outer edge of the drum to maintain correct drum wear allowance. Install the drum. Verify that runout does not exceed 0.015-inch (0.381 mm).
   - **If turning the drum does not provide the correct amount of runout:** Replace the drum.
4. Mount the hub assembly onto the axle. Refer to the hub installation instructions in Maintenance Manual 23, Bus and Coach Front Axles; and Maintenance Manual 23A, Bus and Coach Rear Axles. To obtain these publications, refer to the Service Notes page on the front inside cover of this manual.

10 W Series Brake Retention Screws in Hub and Drum Assemblies

Hazard Alert Messages

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Retention Screws

Meritor bus and coach steer, center and drive axles — 17000, 59000, 61000, 71000 and RC-26-700 Series — will be shipped without retention screws in the hub and drum assembly.

Purpose of Retention Screws in the Hub and Drum Assembly

On Meritor bus and coach axles, either three or five flat-head straight-slot or Phillips-head slot retention screws secure the drum to the hub. Retention screws make it easier to handle an axle during shipping and installation. Figure 10.1.

Retention screws do not provide integrity to the hub and drum assembly.

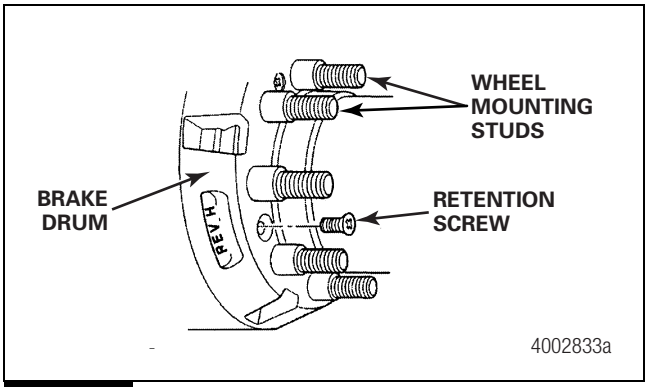

Figure 10.1

Retention Screws Can Loosen

⚠ WARNING

Retention screws can loosen, protrude beyond the brake drum and contact the inner back face. When you remove the wheels from a bus or coach, you must either tighten the retention screws to within the drum face or remove the retention screws from the hub and drum assembly.

Retention screws that are not recessed within the drum face or removed from the hub and drum assembly can prevent the wheel from seating when you mount it.

If this condition is not detected during vehicle inspection, wheel stud damage and wheel mounting nut loosening can cause the wheel to separate from the vehicle. Serious personal injury and damage to components can result.

Retention screws are recessed in the brake drum, which prevents screw heads from contacting the wheel. During normal vehicle operation, retention screws can loosen and unthread to the inner back face. You cannot detect this condition until you remove a wheel for maintenance or service.

Maintenance

Check Retention Screws During Maintenance or Whenever a Wheel is Removed from the Vehicle

During wheel assembly maintenance or service, or whenever you remove a wheel from the vehicle, you must complete one of the following procedures.

1. Tighten the retention screws to 15-30 lb-ft (20.3-41.0 N•m). The retention screws must be recessed within the drum face and the drum must be fully seated against its hub. Use the procedures and torque value recommended by the original equipment manufacturer to mount the wheels and tighten the wheel mounting nuts. ❶
2. Remove all flat-head retention screws from the hub and drum assembly. Use the procedures and torque value recommended by the original equipment manufacturer to mount the wheels and tighten the wheel mounting nuts.

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

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⚠ ASBESTOS AND NON-ASBESTOS FIBERS WARNING

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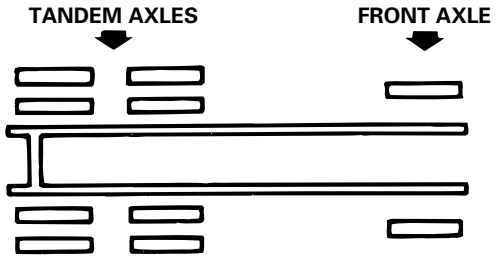
Inspection

Brake System Visual Inspection

For safer operating conditions and longer component life, make these visual inspections before the vehicle is placed into service.

1. Check the complete air system for worn hoses and connectors. With the air pressure at 100 psi (689 kPa), the brakes released and the engine off, air pressure loss must not exceed two psi (13.8 kPa) per minute. Total loss must not exceed three psi (20.7 kPa) per minute.
2. Verify that the air compressor drive belt is tight. Air system pressure must rise to approximately 85-100 psi (620-690 kPa) in two minutes at full RPM.
3. The governor must be checked and set to the specifications supplied by the vehicle manufacturer.
4. Both wheel ends of each axle must have the same linings and drums. All four wheel ends of tandem axles also must have the same linings and drums. It is not necessary for the front axle brakes to be the same as the rear drive axle brakes. Figure 11.1.

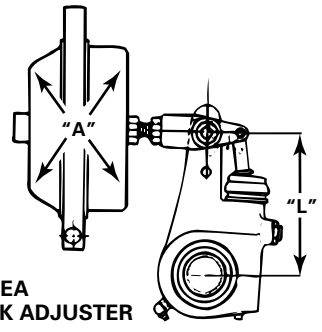


Both wheel ends of each axle must have identical drums and lining.

4000376a

Figure 11.1

5. Always follow the specifications supplied by the vehicle manufacturer for the correct lining to be used. Vehicle brake systems must have the correct friction material. These requirements can change from vehicle to vehicle.
6. The return springs must retract the shoes completely when the brakes are released. Replace the return springs each time the brakes are relined. The spring brakes must retract completely when they are released.
7. The air chamber area multiplied by the length of the automatic slack adjuster is called the AL factor. This number must be equal for both ends of a single axle and all four ends of a tandem axle. Figure 11.2. The push rod stroke length of all the brakes must be equal.



AL FACTOR = A x L
A = AIR CHAMBER AREA
L = LENGTH OF SLACK ADJUSTER

4000377a

Figure 11.2

Intervals

Reline the Brakes

⚠ CAUTION

Reline the brakes when the lining thickness is 0.25-inch (6.3 mm) at the thinnest point. The rivets or bolts must not touch the drum. Damage to components can result.

Meritor recommends that you replace the brake shoe springs, rollers, camshaft bushings and seals, anchor pins, and clevis pin clips at each reline.

Meritor recommends that you replace the camshaft bushings if the S-cam is replaced, if the radial movement exceeds 0.030-inch (0.762 mm) and at every brake shoe reline. Always replace the S-cam seals when you replace the S-cam bushings.

Reline the brake when the lining thickness is 0.25-inch (6.3 mm) at the thinnest point.

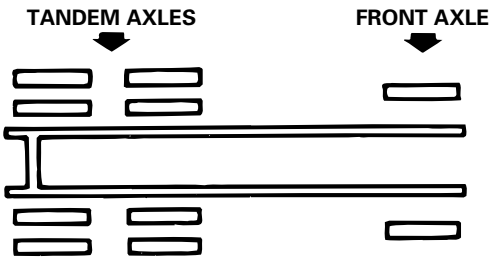
Check the drum and perform a major inspection when you reline the brakes.

Important Information on Linings and Primary Shoe Locations

Use the Correct Lining Material

Use the lining material specified by the vehicle manufacturer. This will help to ensure that the brakes perform correctly and meet Department of Transportation (DOT) performance regulations.

Also note that the drums and linings on a front axle can be different than drums and linings on a rear axle. Figure 11.3.



Both wheel ends of each axle must have identical drums and lining.

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Figure 11.3

Single Axles

Always reline both wheels of a single axle at the same time.

Always install the same linings and drums onto both wheels of a single axle.

Tandem Axles

Always reline all four wheels of a tandem axle at the same time.

Always install the same linings and drums onto all four wheels of a tandem axle.

Overview

Cam Brake Tips

Air Chambers

To ensure correct brake balance, all brake chambers on the same axle must be the same size and type to help ensure a balanced brake system for maximum lining wear and drum life.

Brake Kits

Meritor brake shoes, rollers, camshafts and shoe return springs are designed to perform as a system. Always install the vehicle manufacturer's spec-level components during maintenance or when you upgrade from standard to long-life brakes to help ensure correct brake performance and maximum lining life.

Cam Heads

Cam heads can look the same, but that doesn't mean they will perform the same in your brake system. Two cam head profiles can appear to be identical, but very small differences in cams from different manufacturers can be significant enough to affect the performance of your brakes. To ensure a balanced brake system and optimum lining and drum life, always install the correct replacement cam.

Brake Shoe Rollers

To avoid flat spots, lubricate a brake shoe roller directly in the web roller pocket and not at the cam-to-roller contact area. Flat spots can affect brake adjustment and result in premature brake wear or reduced braking performance.

Drums

To help ensure balanced braking, even lining and drum wear, and correct function of the automatic slack adjuster, do not install a cast drum and a centrifuse drum on the same axle.

A cast drum and a centrifuse drum each absorbs and dissipates heat differently. When drum types and weights are mixed, different rates of heat absorption and dissipation occur that can affect the brake system.

Hardware

When you service cam brakes, replace all the brake shoe springs, anchor pins, bushings and seals, clevis pin clips and rollers — not just the shoe return springs — to help ensure maximum braking performance.

Linings

Insist on the same brand of quality vehicle manufacturer friction lining material to help ensure fewer relines and compatibility with your present system.

Replacement Parts

Always use the vehicle manufacturer's quality standard for replacement parts. Meritor brakes work as a system, and when you replace original parts with "will-fit" parts, you can compromise the performance of the entire system.

Return Springs

Replace cam brake return springs at every cam brake reline. The return spring is critical to alignment, accurate return of the brake away from the drum and correct automatic slack adjustment.

Automatic Slack Adjusters

Automatic doesn't mean maintenance-free. Correctly installed and lubricated automatic slack adjusters help to ensure maximum brake system performance.

Never mix automatic slack adjusters on the same axle. When you replace automatic slack adjusters, always use replacement parts that were originally designed for the brake system to help ensure even brake wear, balanced braking and maximum brake performance.

Lubrication

Cam Brakes

⚠ CAUTION

Do not permit grease to contact the brake drum or linings. Grease on the linings can cause poor brake performance. Contaminated linings must be replaced.

For lubrication information, refer to Table F, Table G and Figure 11.4, Figure 11.5 or Figure 11.6.

Table F: Grease Specifications

Meritor Specification	NLGI Grade	Grease Type	Outside Temperature
O-616-A	1	Clay Base	Down to –40°F (–40°C)
O-617-A	1	Lithium 12-Hydroxy Stearate or Lithium Complex	Refer to the grease manufacturer's specifications for the temperature service limits.
O-617-B	2		
O-645	2	Synthetic Oil, Clay Base	Down to –65°F (–54°C)
O-692	1 and 2	Lithium Base	Down to –40°F (–40°C)
O-637[1]	1-1/2	Calcium Base	Refer to the grease manufacturer's specifications for the temperature service limits.

[1] Do not mix Meritor specification O-637 grease, part number 2297-U-4571, a calcium-base, rust-preventive grease, with other greases.

Table G: Grease Applications

Brake Component	Specification	Schedule	Procedure
Camshaft Bushings	Multi-Purpose Chassis Grease, 6% 12-hydroxy lithium stearate grease, NLGI Grade 1, Meritor specification O-617-A, or equivalent Multi-Purpose Chassis Grease, 8% 12-hydroxy lithium stearate grease, NLGI Grade 2, Meritor specification O-617-B, or equivalent	At each brake reline when the brake is disassembled. Every 100,000 miles (160,000 km). For severe duty, lubricate more often. Frequency is determined by monitoring the condition of the grease.	Through the fitting on the bracket or spider until new grease flows from the inboard seal.
Camshaft Splines	Metallic-base, temperature-resistant anti-seize compound, Meritor specification O-637, or equivalent	When necessary or when the brake is disassembled.	To all areas.
Anchor Pins	Anchor pin grease, non-melting grease with Bentone thickeners, NLGI Grade 1, Meritor specification O-616-A, O-617-B, or equivalent	When necessary or when the brake is disassembled.	Through the fittings and/or the entire surface of the anchor pin.
	Metallic-base, temperature-resistant anti-seize compound, Meritor specification O-637, or equivalent	Prior to assembly.	Coat exterior surface.
Brake Shoe Rollers	Multi-Purpose Chassis Grease, 6% 12-hydroxy lithium stearate grease, NLGI Grade 1, Meritor specification O-617-A, or equivalent Multi-Purpose Chassis Grease, 8% 12-hydroxy lithium stearate grease, NLGI Grade 2, Meritor specification O-617-B, or equivalent	When necessary or when the brake is disassembled.	To brake shoe rollers at areas where the rollers touch the brake shoes. Do not put lubricant on the part of the roller that touches the cam head.
ArvinMeritor Automatic Slack Adjuster[1]	Clay-base, non-melting grease with Bentone thickeners, NLGI Grade 1, Meritor specification O-616-A or equivalent Lithium-base, NLGI Grade 1 or 2, Meritor specification O-692 or equivalent synthetic oil, clay-base, NLGI Grade 2, Meritor specification O-645 or equivalent	Whichever of the following is the most frequent • Every 6 months • Four times during the life of the linings Always inspect and lubricate the automatic slack adjuster when the brakes are relined.	Through the fitting until new grease purges from around the inboard camshaft splines and from the pawl assembly.
Slack Adjuster Clevis Pins	Metallic-base, temperature-resistant anti-seize compound, Meritor specification O-637, or equivalent	Prior to assembly.	Coat pin surface.

[1] For non-Meritor automatic slack adjusters, refer to the vehicle manufacturer's instructions for maintenance intervals and specifications.

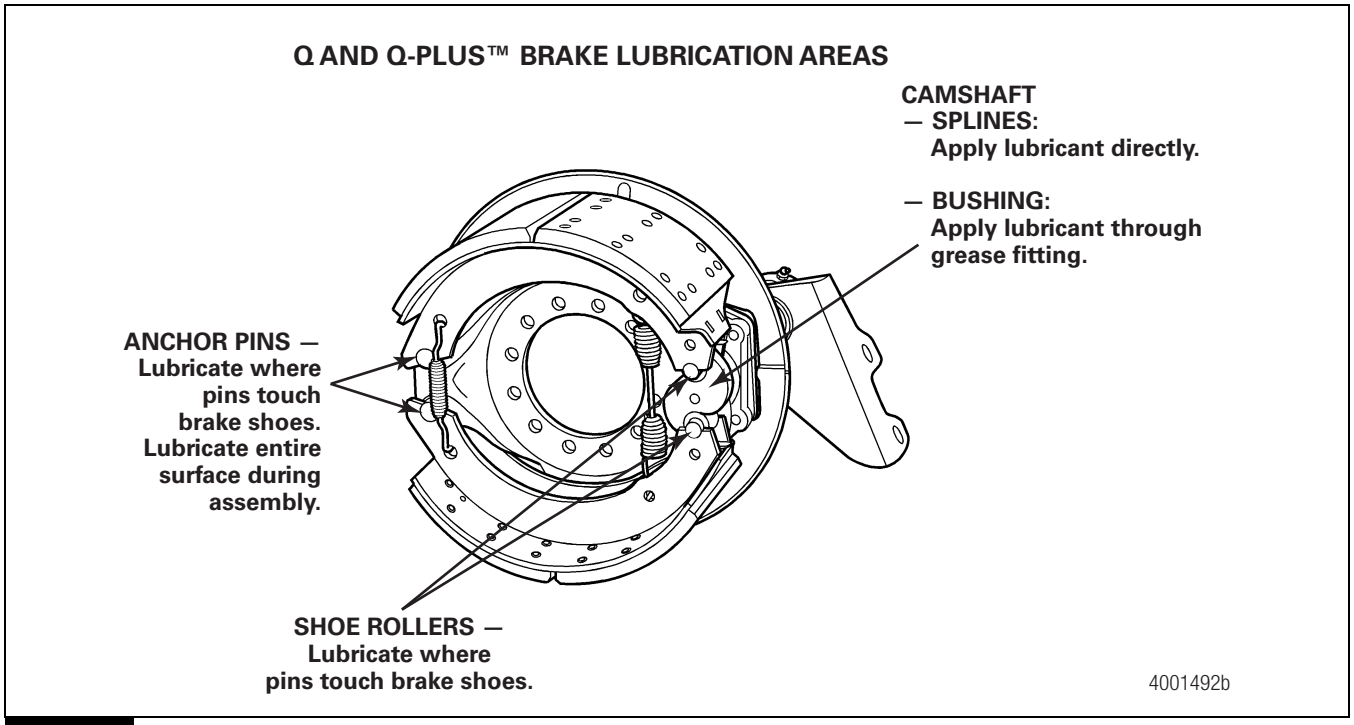

Figure 11.4

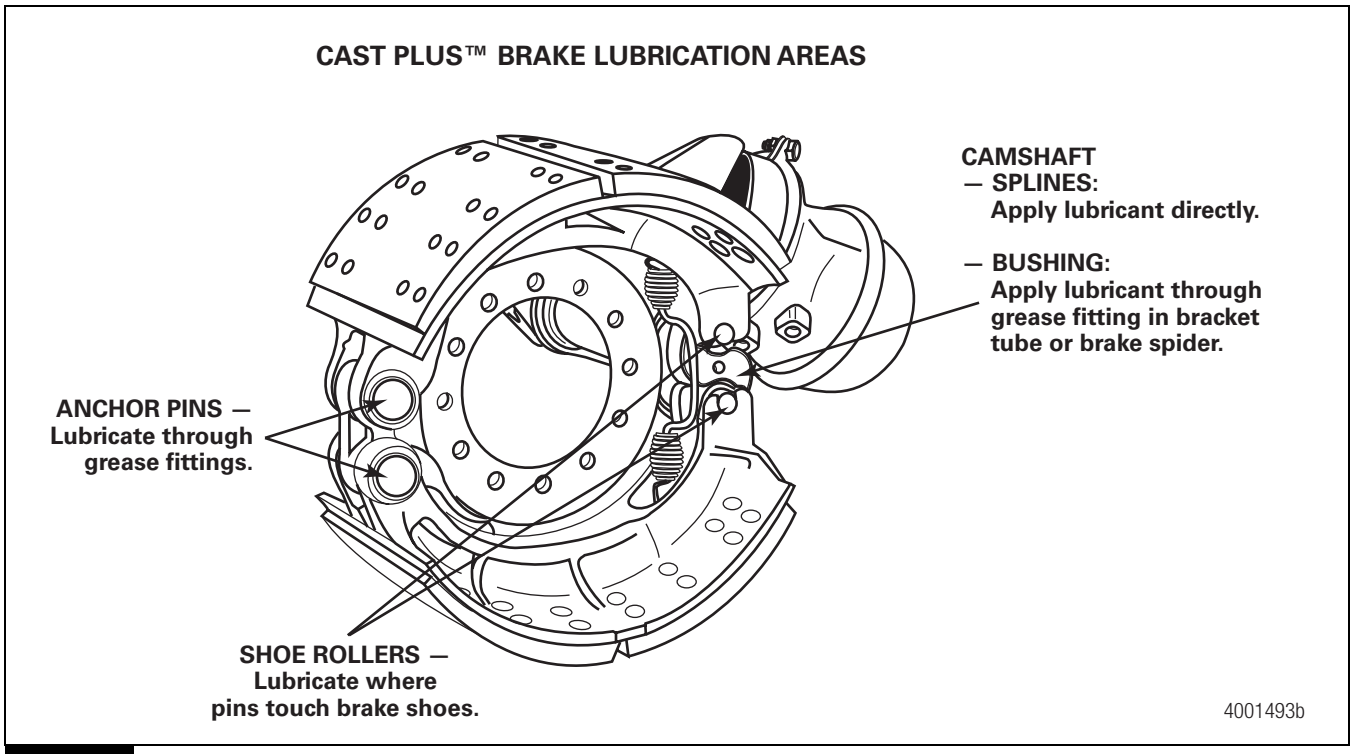

Figure 11.5

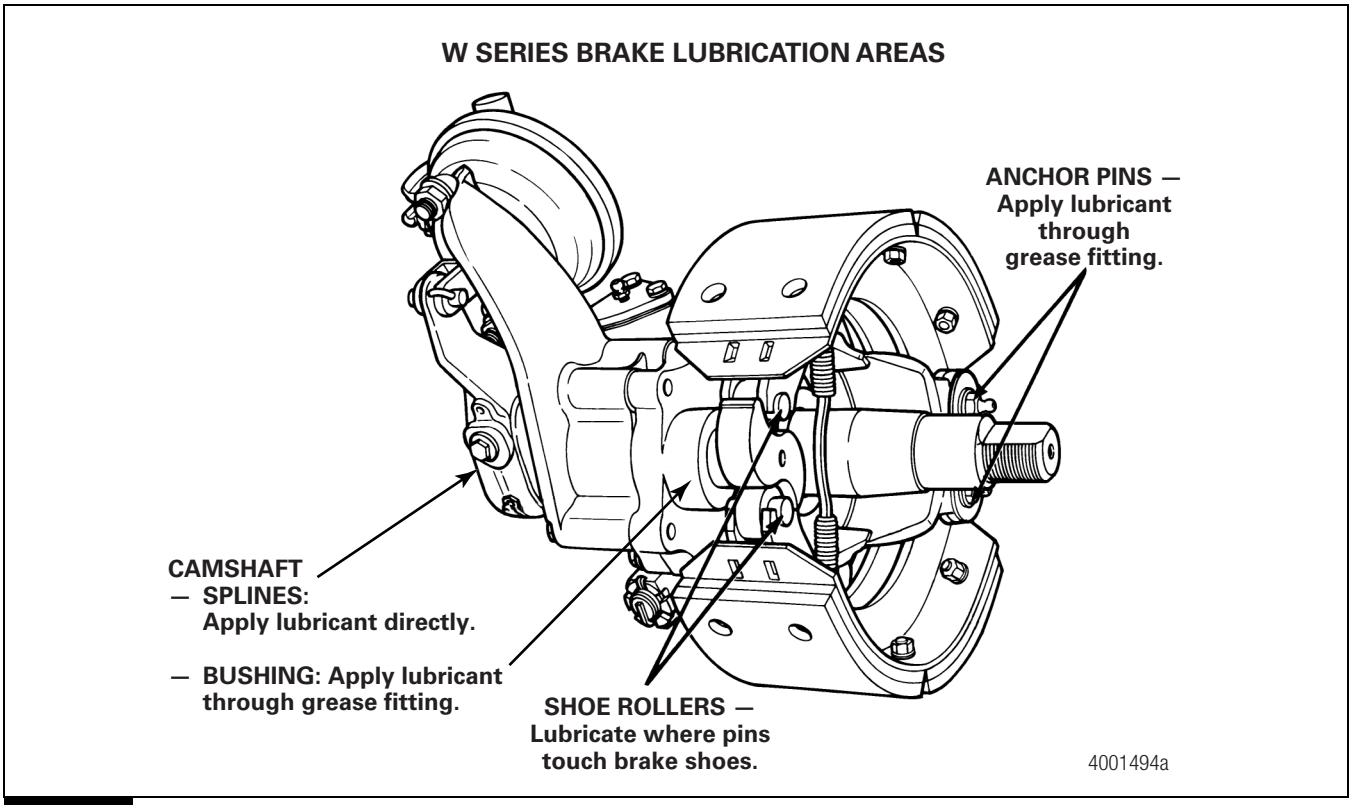
W SERIES BRAKE LUBRICATION AREAS
ANCHOR PINS — Apply lubricant through grease fitting.
CAMSHAFT
— SPLINES: Apply lubricant directly.
— BUSHING: Apply lubricant through grease fitting.
SHOE ROLLERS — Lubricate where pins touch brake shoes.
4001494a

Figure 11.6

Symptoms

Cam Brakes

Condition	Cause	Correction
Brakes do not apply or not enough braking force.	Worn or damaged camshaft.	Remove and replace the camshaft.
	Air chamber installed incorrectly.	Install correctly.
	Leak or restriction in air lines or valves.	Repair the air lines or valves.
	Air chamber air diaphragm damaged.	Repair or replace the air chamber.
	Brakes not adjusted correctly.	Adjust the brakes.
	Grease or other contamination on brake linings.	Replace the linings.
	Linings worn, damaged or missing.	Replace the linings.
Braking force not equal or lining wear not even.	Air chamber diaphragm damaged.	Repair or replace the air chamber.
	Damaged or worn camshaft.	Remove and replace the camshaft.
	Broken return springs.	Replace the return springs.
	Brakes not adjusted correctly.	Adjust the brakes.
	Grease or other contamination on brake linings.	Replace the linings.
	Brake linings installed backward.	Install the brake shoes correctly.
	Brake linings installed in wrong positions on shoes.	Install the linings in the correct positions.
	Drum has runout of more than 0.010-inch (0.25 mm).	Repair or replace the drum.
	Wheel bearings not adjusted correctly.	Adjust the wheel bearings.
	Incorrect linings are installed.	Replace with the specified linings.
Parking brake does not apply when air pressure is released.	Power spring in air chamber not fully released (spring is caged).	Release the power spring in the air chamber (uncage spring).
	Air pressure that holds springs in the compressed position is not fully released.	Repair the air system.
	Brakes not adjusted correctly.	Adjust the brakes.
	Power springs in air chamber weak or broken.	Replace the air chamber.
	Grease or other contamination on brake linings.	Replace the linings.
Brakes dragging.	Not enough air pressure to hold spring.	Repair the air system.
	Air lines connected to wrong ports.	Connect the lines to the correct ports.
	Leaks in air lines.	Repair or replace the air lines.
	Leaks in spring brake assembly.	Repair or replace the spring brake.
	Wheel bearings not adjusted correctly.	Adjust the wheel bearings.
	Drum has runout of more than 0.010-inch (0.25 mm).	Repair or replace the drums.
	Shoe return springs are weak, damaged or missing.	Replace the shoe return springs.
	Valve does not permit complete release of system pressure when brake is released.	Repair or replace the valves.
	Damaged camshaft.	Remove and replace the camshaft.
	Damaged rollers.	Remove and replace the rollers.

Torque Specifications

Cam Brakes

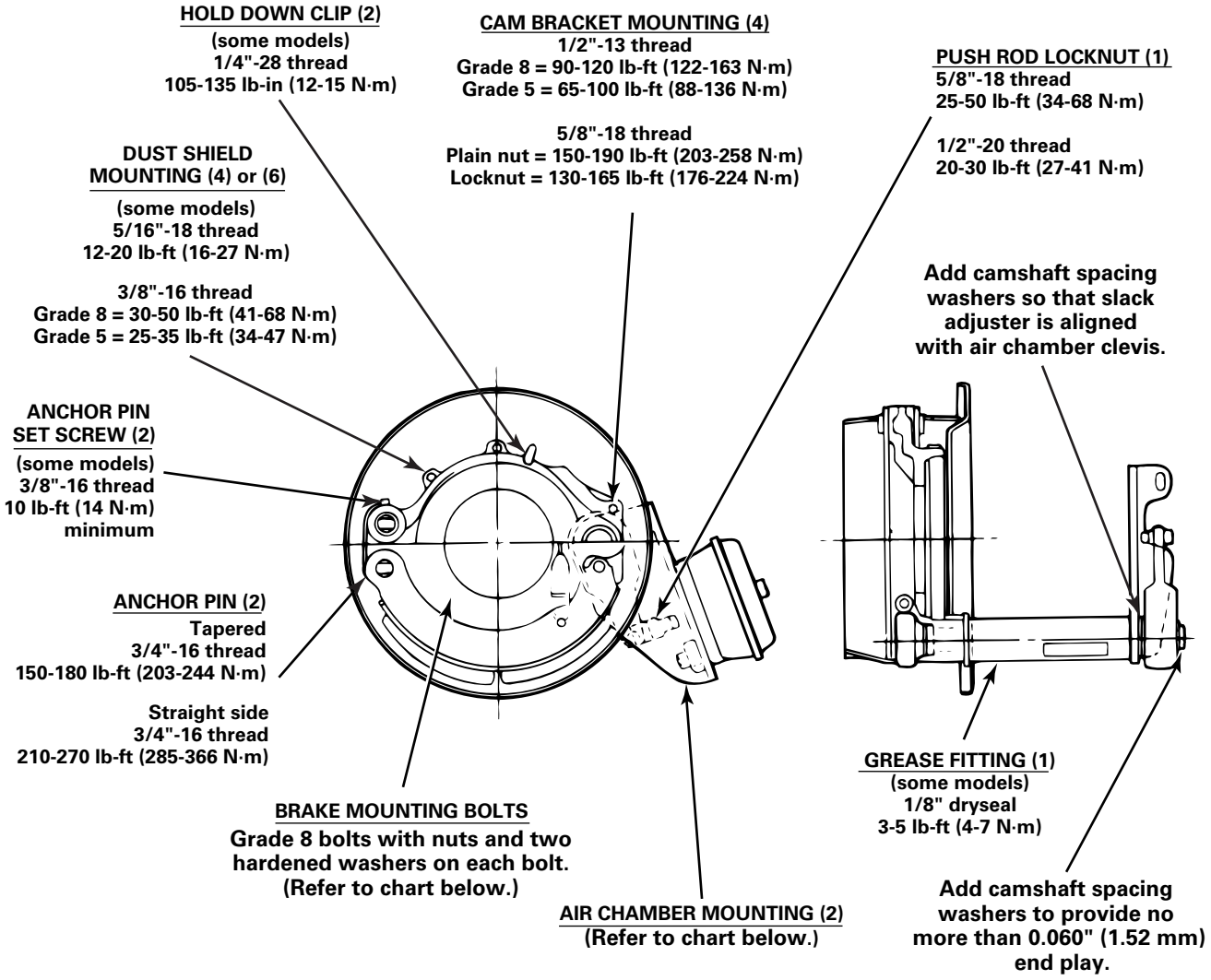

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Table H: Brake Mounting Bolts

Bolt Size	Torque, lb-ft (N•m)
7/16″-20	60-75 (81-102)
1/2″-20	85-115 (115-156)
9/16″-18	130-165 (176-224)
5/8″-18	180-230 (244-312)
3/4″-16	350-450 (474-610)
3/4″-10	270-350 (366-474)

Table I: Air Chamber Mounting Bolts

Chamber Size	9	12	16	20	24	30	36	Spring Chamber
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)
Haldex	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)			133-155 lb-ft (180-210 N•m)				
Anchorlok/Haldex	—			130-150 lb-ft (177-203 N•m)				

Tool Drawings

The following pages outline the machining and construction techniques for producing tools necessary to aid in servicing bus and coach cam brakes. Figure 14.1, Figure 14.2 and Figure 14.3.

All tools are within the capability of a reasonably equipped machine shop.

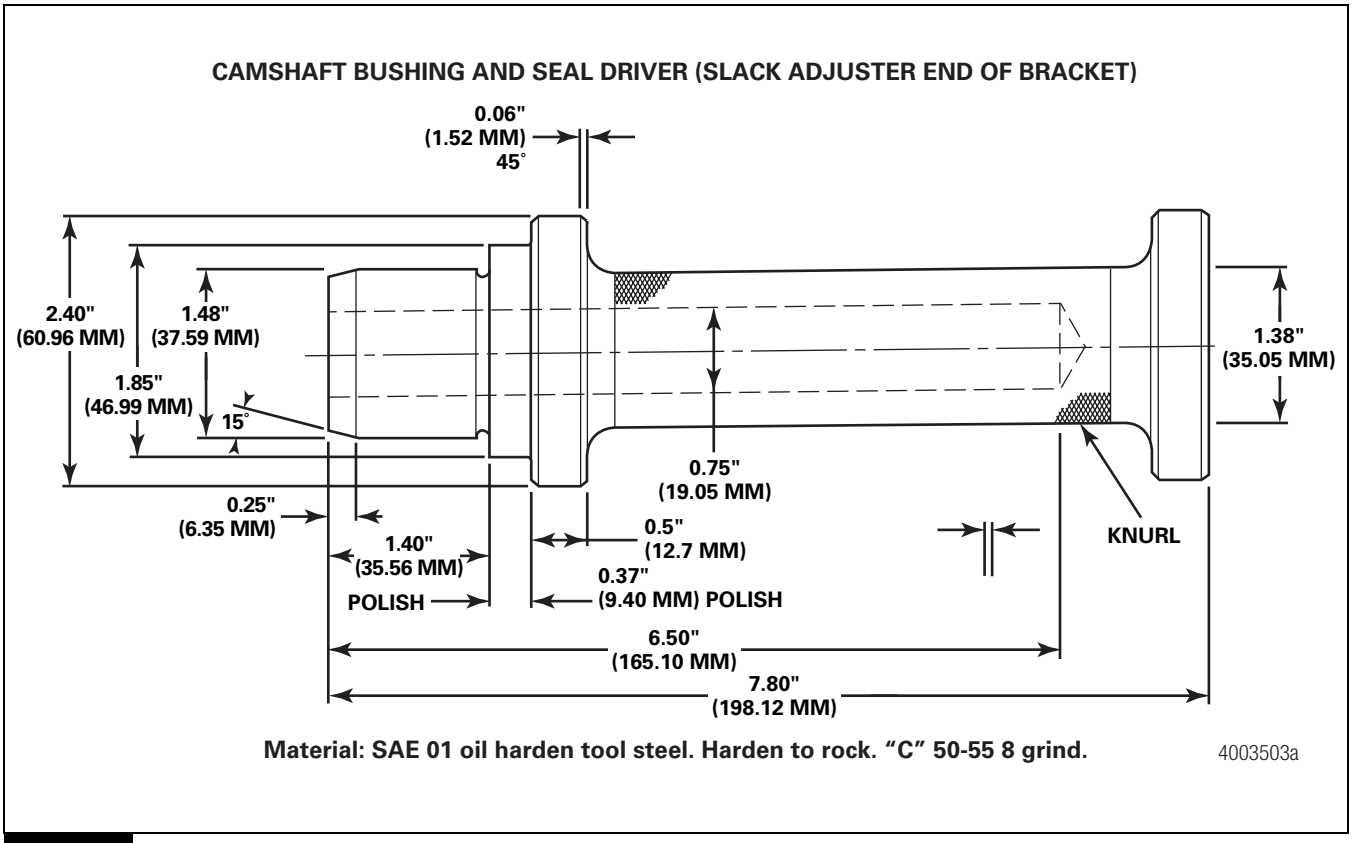
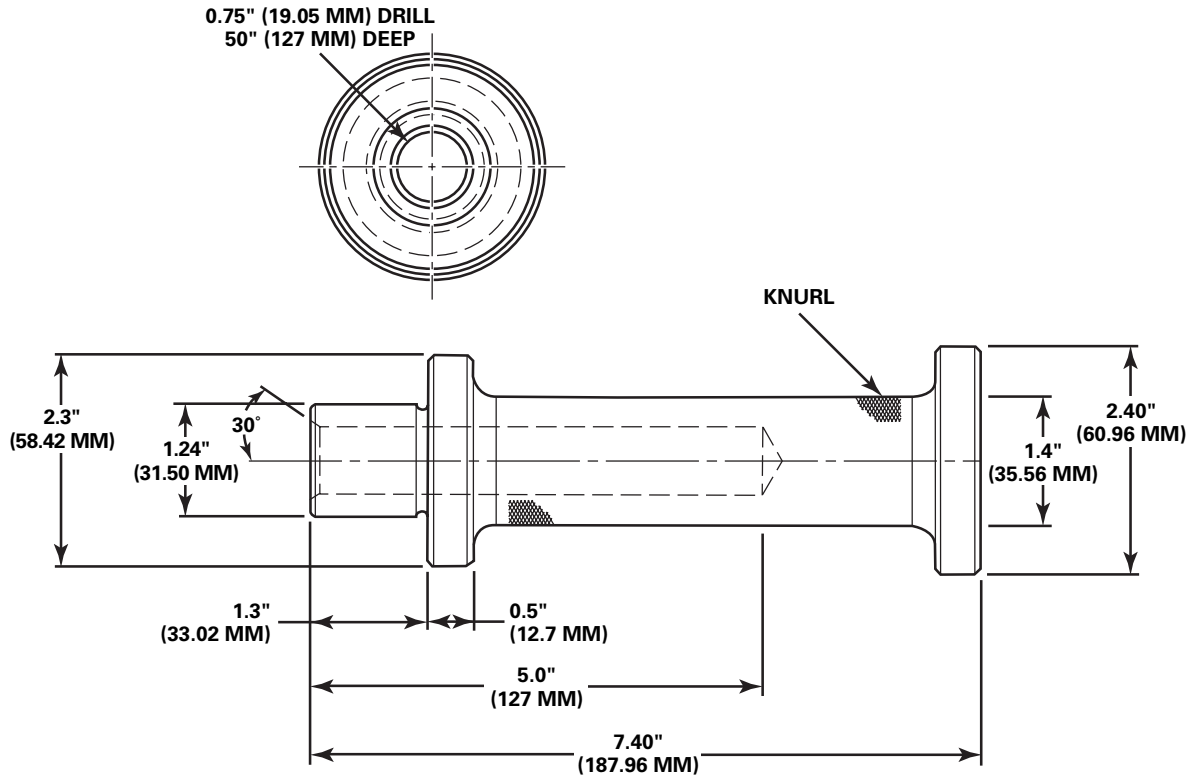


Figure 14.1

ANCHOR PIN REMOVER (IN BRAKE SPIDER)



Material: SAE 01 oil harden tool steel. Harden to rock. "C" 50-55 8 grind.

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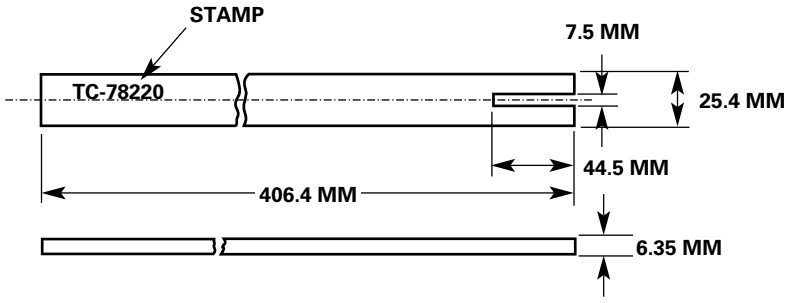
Figure 14.2

BRAKE SPRING TOOL,
RETURN SPRING REMOVER/ASSEMBLER SLOTTED PLATE
(MILLIMETERS)



MATERIAL: SAE 4140
HEAT TREAT: NONE

4003150a

Figure 14.3

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