MERITOR®

an ArvinMeritor brand

Revised 09-02

Cam Brakes

Maintenance Manual 4

16.5-Inch
Q Plus™ Brake
with a Stamped Spider

- Q Plus™
- Cast Plus™
- Q Series
- P Series
- T Series

Before You Begin

This manual describes the correct service and repair procedures for Meritor cam brakes. Before you begin procedures:

1. Read and understand all instructions and procedures before you begin to service components.
2. Read and observe all Caution and Warning safety alerts that precede instructions or procedures you will perform. These alerts help to avoid damage to components, serious personal injury, 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.

Safety Alerts, Torque Symbol and Notes

WARNING	A Warning alerts you to an instruction or procedure that you must follow exactly to avoid serious personal injury.
CAUTION	A Caution alerts you to an instruction or procedure that you must follow exactly to avoid damage to components.
	A torque symbol alerts you to tighten fasteners to a specified torque value.
NOTE	A Note provides information or suggestions that help you correctly service a component.

Access Product and Service Information on Our Website

Visit the DriveTrain Plus™ by ArvinMeritor Tech Library at arvinmeritor.com to access and order product and service information.

To Order Information by Phone

Call ArvinMeritor's Customer Service Center at 800-535-5560 to order the following publications.

- Automatic Slack Adjuster (Maintenance Manual 4B)
- Q Plus™ LX500 and MX500 Cam Brakes (Maintenance Manual MM-96173)
- Q and Q Plus™ Cam Brake Maintenance (Video T-90233V)
- Meritor Automatic Slack Adjuster Installation and Maintenance (Video T-90234V)
- New Generation Automatic Slack Adjuster (Video T-9443V)
- Drivetrain Plus™ by ArvinMeritor Technical Electronic Library on CD. Features product and service information on most Meritor, ZF Meritor and Meritor WABCO products. $20. Order TP-9853.

How to Order Tools, Supplies and Brake Conversion Kits

Call ArvinMeritor's Commercial Vehicle Aftermarket at 888-725-9355 to order tools and supplies specified in this manual. You also can order the following brake conversion kits.

- A kit to convert Q Series cam brake shoes (except models with cast shoes) to Q Series brakes with "quick change" shoes
- A kit to convert standard 16.5-inch Q Series cam brakes to Q Plus™ cam brakes

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Table of Contents

Table of Contents

MERITOR®

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Asbestos and Non-Asbestos Fibers

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.

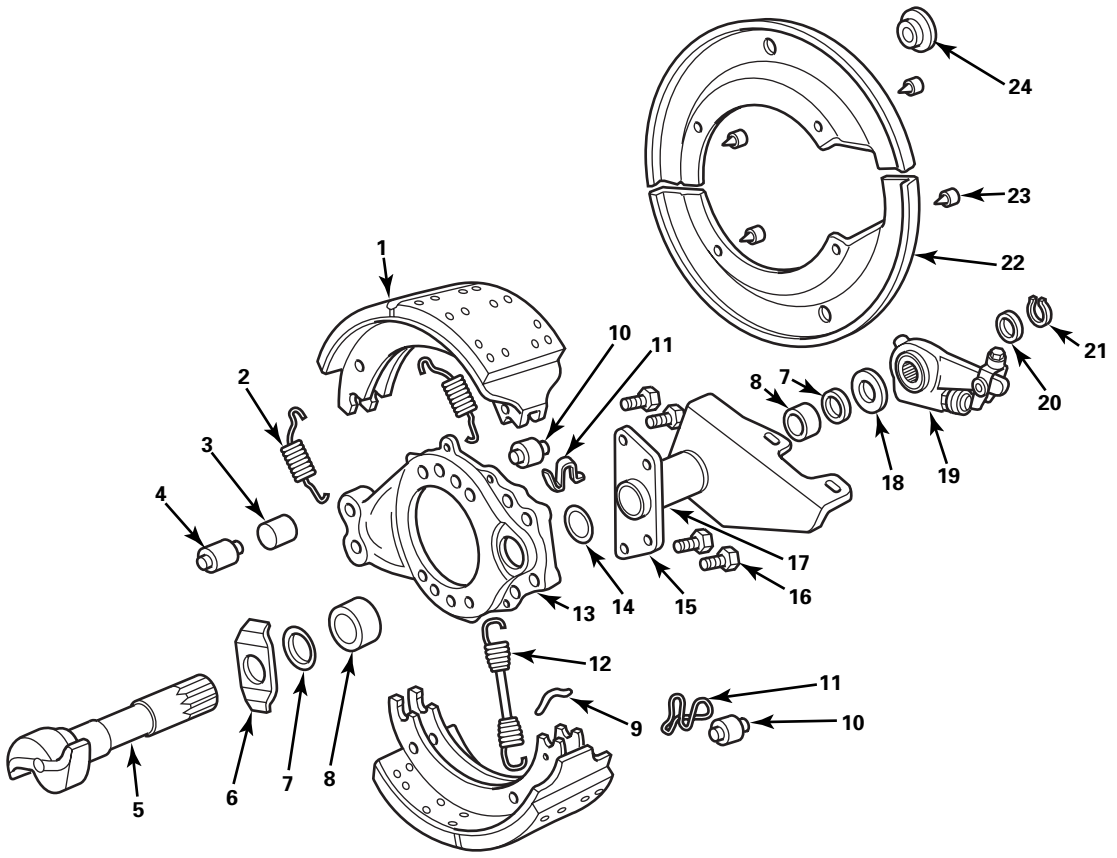
4. Cleaning Work Areas. Clean work areas with a vacuum equipped with a HEPA filter or by wet wiping. **NEVER** use compressed air or dry sweeping to clean work areas. When you empty vacuum cleaners and handle used rags, wear a respirator equipped with a HEPA filter approved by NIOSH or MSHA, to minimize 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

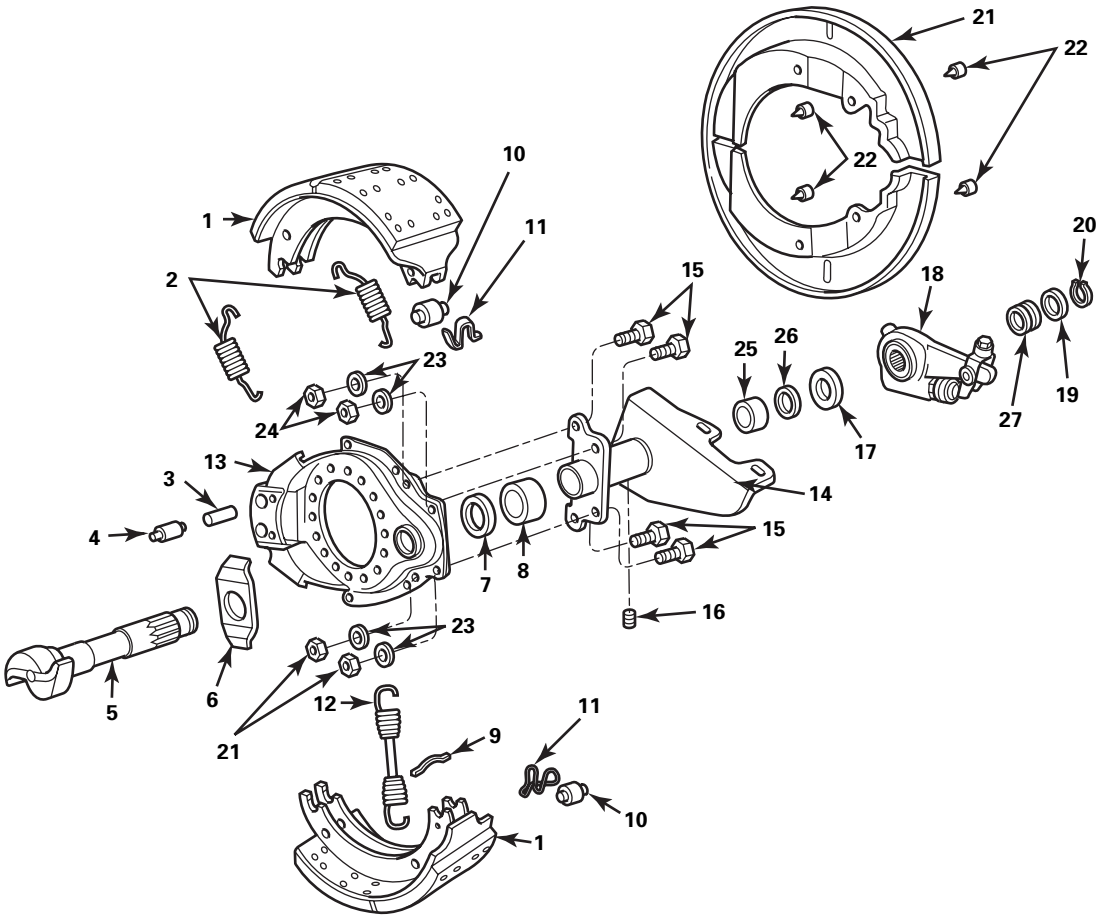
References to OSHA, NIOSH, MSHA, and EPA, which are regulatory agencies in the United States, are made to provide further guidance to employers and workers employed within the United States. Employers and workers employed outside of the United States should consult the regulations that apply to them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



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

Item	Description
1	Shoe and Lining Assembly
2	Spring — shoe retaining
3	Bushing — anchor pin
4	Anchor Pin — brake shoe
5	Camshaft — "S" head
6	Washer — camhead
7	Seal — camshaft (grease)
8	Bushing — camshaft
9	Pin — return spring
10	Roller — brake shoe
11	Retainer — shoe roller
12	Spring — brake shoe return

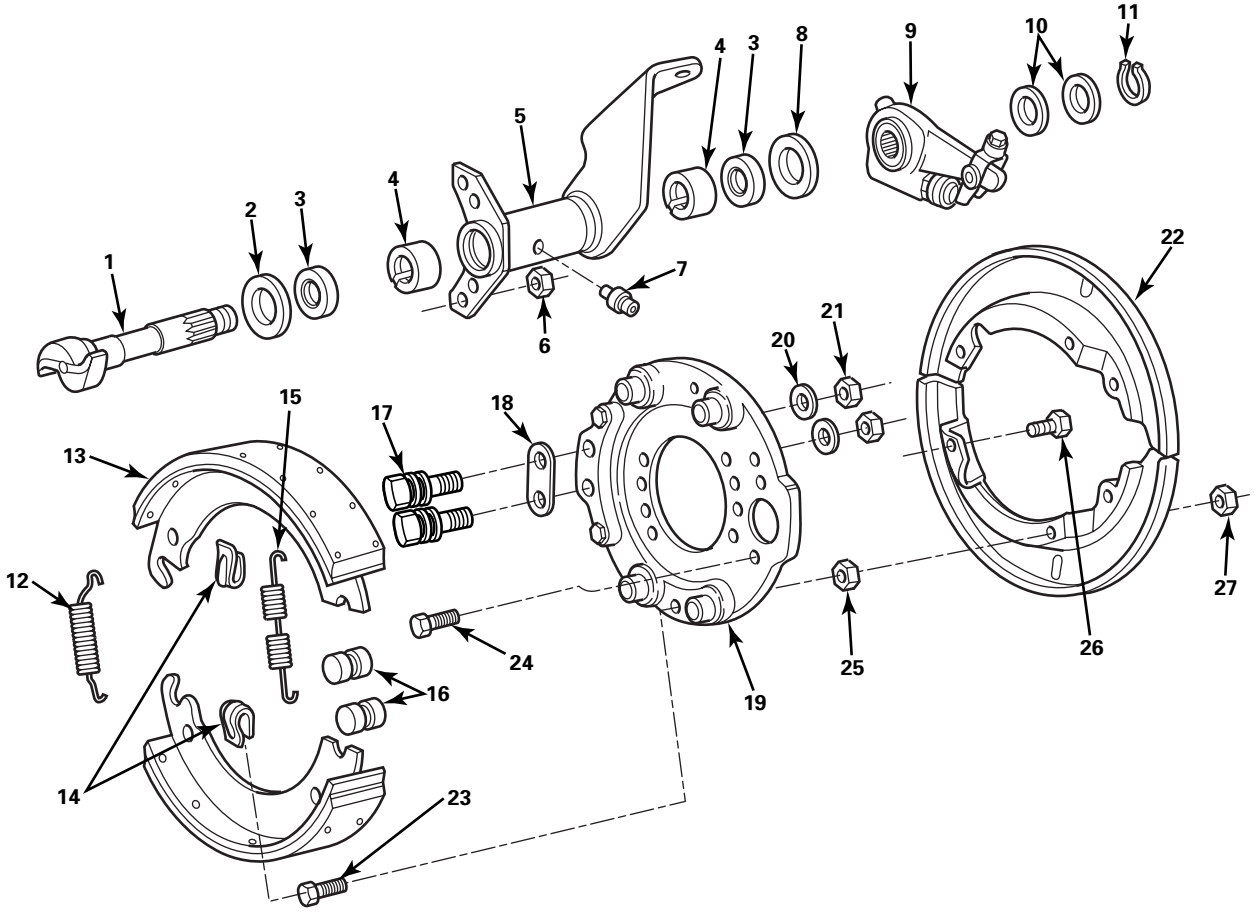
Item	Description
13	Cast spider — brake
14	Seal — chamber bracket
15	Bracket — camshaft and chamber
16	Capscrew — chamber bracket
17	Fitting — grease
18	Washer — camshaft (thick)
19	Slack Adjuster — automatic
20	Washer — spacing
21	Snap Ring — camshaft
22	Dust Shield
23	Capscrew — dust shield
24	Plug



16.5-Inch Q Plus™ Cam Brake with a Stamped Spider

Item	Description
1	Shoe and Lining Assembly
2	Spring — shoe retaining
3	Bushing — anchor pin
4	Anchor Pin — brake shoe
5	Camshaft — “S” head
6	Washer — camhead
7	Orange seal — camshaft
8	Bushing — camshaft
9	Pin — return spring
10	Roller — brake shoe
11	Retainer — shoe roller
12	Spring — brake shoe return
13	Stamped spider — brake
14	Bracket — camshaft and chamber

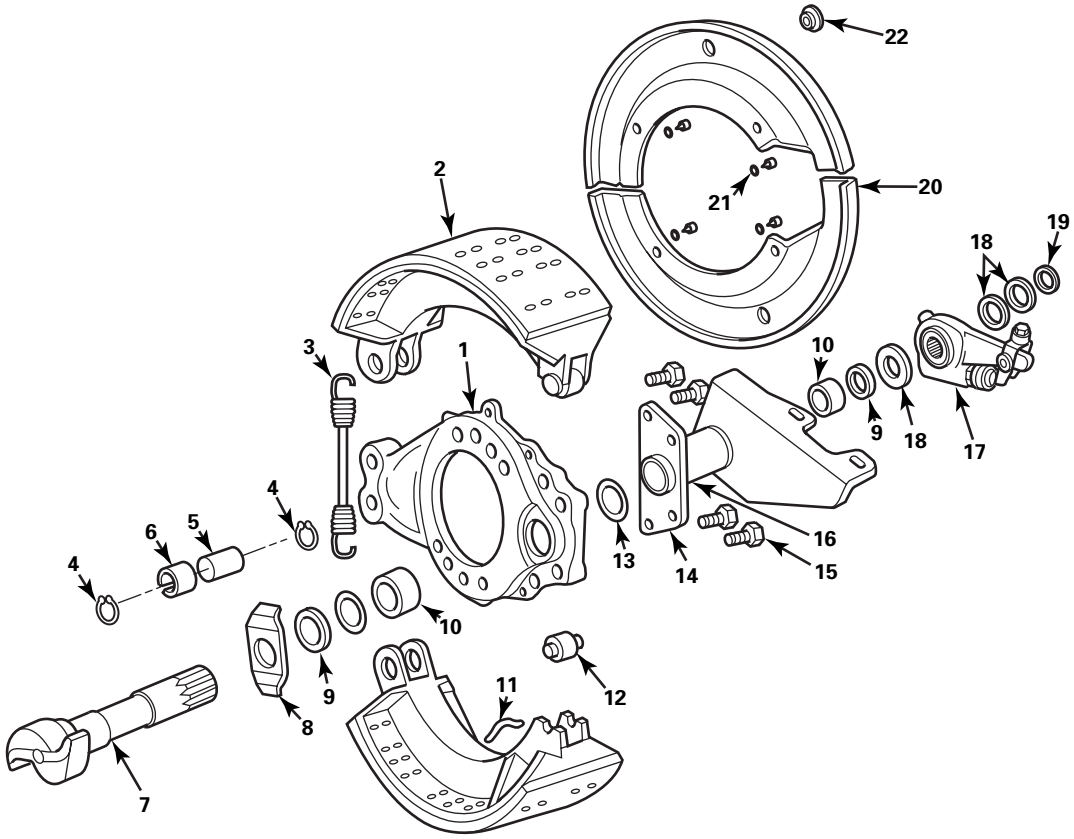
Item	Description
15	Capscrew — Grade 8
16	Plug — pipe
17	Washer — camshaft (thick)
18	Slack adjuster — automatic
19	Washer — spacing
20	Snap ring — camshaft
21	Dust shield
22	Capscrew — dust shield
23	Washer (4) — hard
24	Nut (4) — Grade 8
25	Bushing — camshaft
26	Seal — camshaft
27	Washer — spacing (thin)



15-Inch Q Series Cam Brakes

Item	Description
1	Camshaft
2	Washer — camhead
3	Seal — camshaft (grease)
4	Bushing — camshaft
5	Bracket — camshaft
6	Nut — camshaft bracket
7	Grease Fitting
8	Washer — spacing
9	Slack Adjuster — automatic
10	Spacers — camshaft
11	Snap Ring — camshaft
12	Spring — shoe retaining
13	Shoe and Lining Assembly
14	Clips — anti-rattle

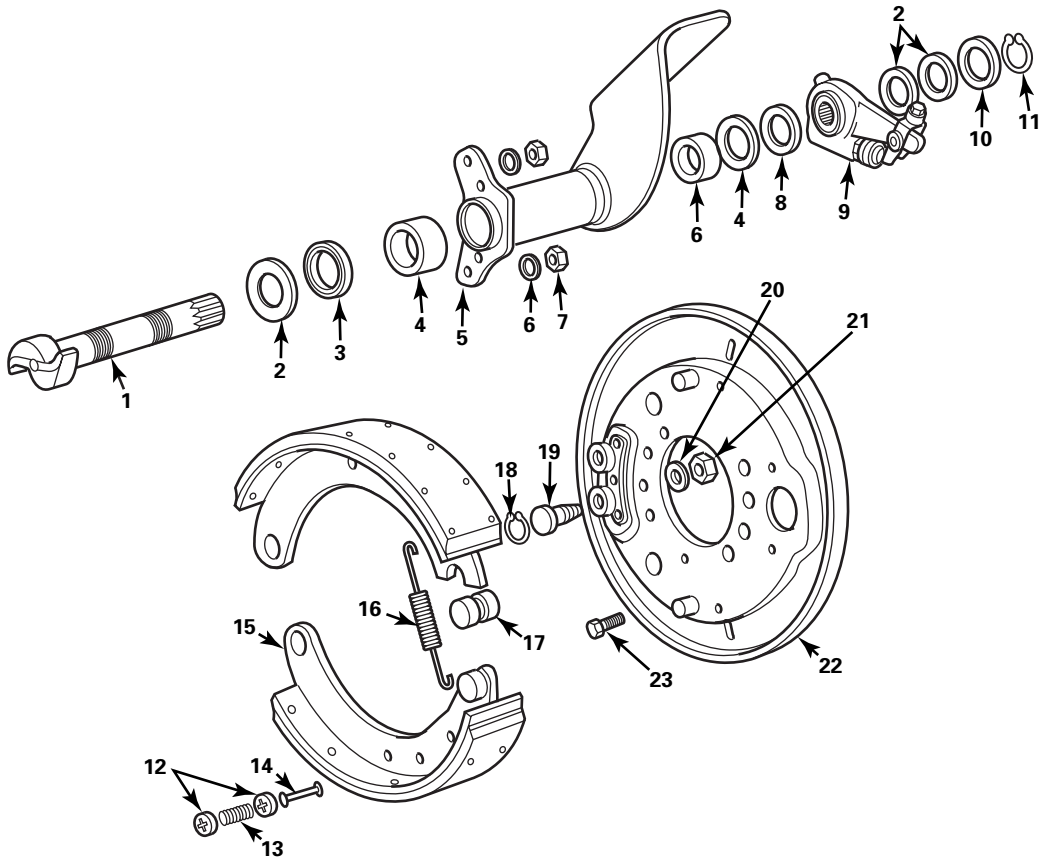
Item	Description
15	Spring — shoe return
16	Rollers — brake shoe
17	Anchor Pins — brake shoe
18	Plate — support
19	Backing Plate
20	Washer — anchor pin
21	Nut — anchor pin
22	Dust Shield
23	Bolt — shoe clip
24	Bolt — camshaft bracket
25	Nut — clip to backing plate
26	Capscrew — dust shield
27	Nut — dust shield



16.5-Inch P Series Cam Brakes

Item	Description
1	Spider — brake
2	Shoe and Lining Assembly
3	Spring — brake shoe return
4	Snap Ring — anchor pin
5	Anchor Pin — brake shoe
6	Bushing — anchor pin
7	Camshaft — “S” head
8	Washer — camhead
9	Seal — camshaft (grease)
10	Bushing — camshaft
11	Pin — return spring

Item	Description
12	Roller — cam
13	Seal — camshaft bracket
14	Bracket — camshaft and chamber
15	Capscrew — camshaft bracket
16	Fitting — grease
17	Slack Adjuster — automatic
18	Washer — spacing
19	Snap Ring — camshaft
20	Dust Shield
21	Capscrew — dust shield
22	Plug



15-Inch T Series Cam Brakes

Item	Description
1	Camshaft
2	Washer — camhead
3	Seal — camshaft (grease)
4	Bushing
5	Bracket — camshaft and chamber
6	Lockwasher — bracket
7	Nut — bracket
8	Washer — spacing
9	Slack Adjuster — automatic
10	Washer — spacer
11	Snap Ring — camshaft
12	Retainer — anti-rattle spring

Item	Description
13	Spring — anti-rattle
14	Rod — anti-rattle
15	Shoe and Lining Assembly
16	Spring — shoe return
17	Roller — brake shoe
18	Snap Ring — anchor pin
19	Anchor Pin — brake shoe
20	Washer — anchor pin
21	Nut — anchor pin
22	Backing Plate
23	Capscrew — dust shield

Cam Brakes

Q Plus™

Figure 2.1

- More lining thickness increases service life and mileage between relines.
- A redesigned S-cam and heavy-duty shoe return spring allow additional shoe travel.
- An improved camshaft bushing contributes to longer service life.
- The trailer axle version of the 16.5 x 7.0-inch Q Plus brake uses a heavy-duty, bolt-on camshaft bushing.

Figure 2.1

Q Plus LX500 and Q Plus MX500

Figure 2.2

For complete maintenance and service information on Meritor's Q Plus LX500 and MX500 cam brakes, refer to Maintenance Manual MM-96173, Q Plus™ LX500 and MX500 Cam Brakes. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.

- The Q Plus LX500 cam brake and the Q Plus MX500 cam brake both include an Extended Lube Feature and Meritor factory-installed automatic slack adjusters.
- The Q Plus MX500 cam brake also includes all features found in the Q Plus LX500 brake plus special long life brake shoes and linings.

Figure 2.2

Cast Plus™

Figure 2.3

- The Cast Plus brake is spec'd for heavy-duty, off-highway and people-mover applications.
- Uses Meritor's Q Plus cam brake linings, that provide increased service life and mileage between relines.
- A redesigned S-cam and heavy-duty shoe return spring allow additional shoe travel.
- An improved camshaft bushing contributes to longer service life.
- The brake uses Meritor's cast P Series brake shoe design.

Figure 2.3

Q Series Brakes

Figure 2.4

- Open anchor pins for “Quick Change” service.
- Single web shoe (15-inch only).
- Two shoe retainer springs in addition to the shoe return springs.
- Available in 16.5-inch diameter with 5, 6, 7, 8.625 and 10-inch widths with 0.75-inch tapered brake lining.
- Available in 15.0-inch diameter for front non-drive axle applications.

Figure 2.4

P Series

Figure 2.5

- 16.5-inch and 18-inch diameters with 7-inch wide cast shoes.
- 0.75-inch tapered brake lining.

Figure 2.5

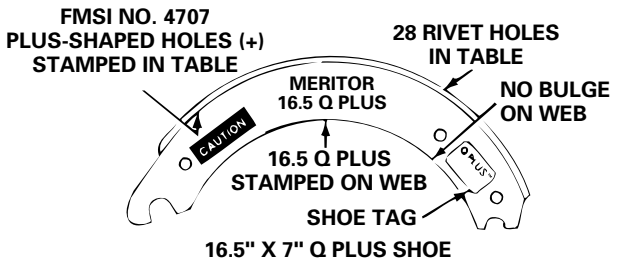
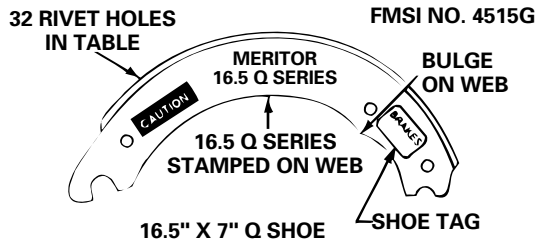
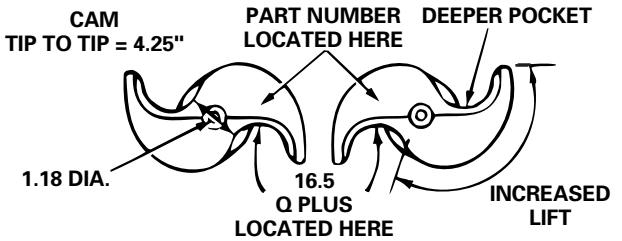
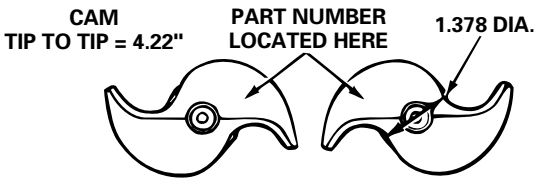
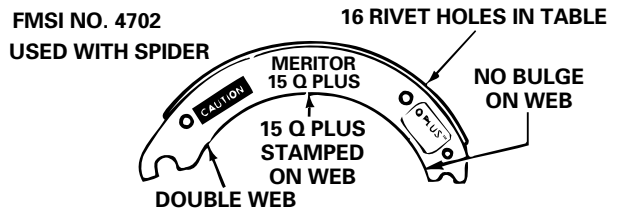
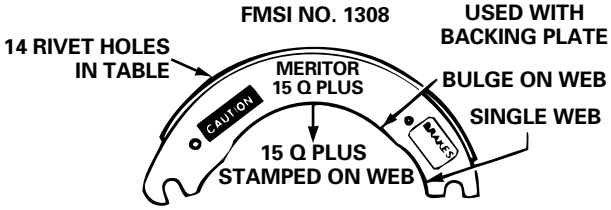
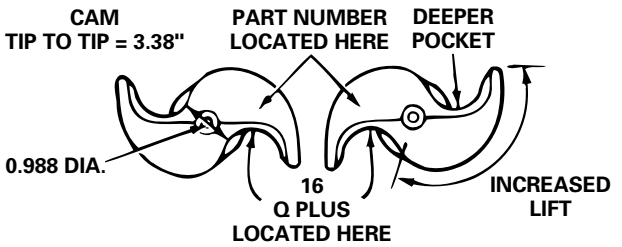
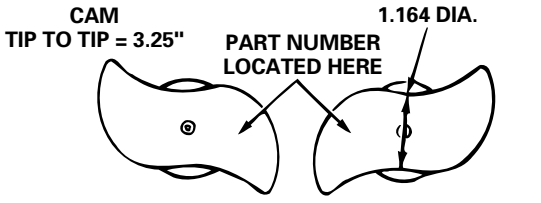
T Series

Figure 2.6

- 15-inch diameter with 3.5-inch and 4-inch widths for smaller capacity axles.
- 0.438-inch thick lining.

Figure 2.6

Differences Between Q Plus and Q Series Cam Brakes

Q Plus Components	Q Series Components
 16.5" X 7" Q PLUS SHOE	 16.5" X 7" Q SHOE
 16.5" Q PLUS CAMSHAFT (1.5" DIA.-28 SPLINES)	 16.5" Q CAMSHAFT (1.5" DIA.-10 OR 28 SPLINES)
 15" X 4" Q PLUS SHOE	 15" X 4" Q SHOE
 15" Q PLUS CAMSHAFT (1.5" DIA.-28 SPLINES)	 15" Q CAMSHAFT (1.25" DIA.-10 OR 24 SPLINES)

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

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. Refer to Page 1 in this manual for hazard summaries and recommended work practices.

WARNING

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

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

Removal

Wheel Components

1. Park the vehicle on a level surface.
2. Block the wheels to prevent the vehicle from moving.
3. Raise the vehicle, so that the area you will service is off of the ground. Support the vehicle with safety stands.

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.

Automatic Slack Adjuster

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

CAUTION

You must disengage a pull pawl or remove a conventional pawl before you rotate the manual adjusting nut, or you'll damage pawl teeth. A damaged pawl will not allow the slack adjuster to automatically adjust brake clearance. Damage to components can result. Replace a damaged pawl before returning the vehicle to service.

1. Disengage the pull pawl. Use a screwdriver or equivalent tool to pry the pull pawl at least 1/32-inch to disengage the teeth. **Figure 3.1**.
   - **If the slack adjuster has a conventional pawl:** Remove the pawl. **Figure 3.1**.
2. Use a wrench to turn the manual adjusting nut COUNTERCLOCKWISE until the brake shoes are fully retracted, and the lining clears the drum. **Figure 3.2**.

Figure 3.1

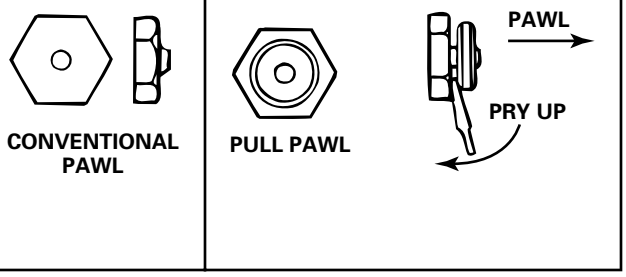


Figure 3.2

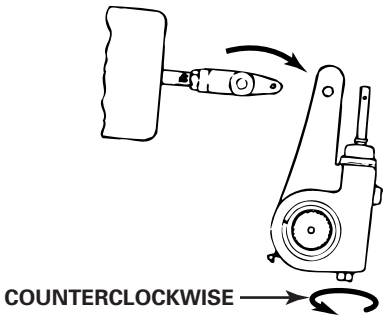
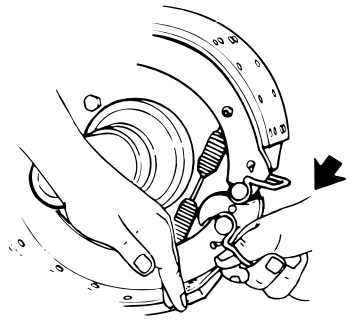


Figure 3.3



⚠ 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.

3. Remove both clevis pins, and retainer clips or cotter pins. Move the slack adjuster away from the clevis.
4. Follow the manufacturer's instructions to remove the wheel and drum from the axle.

Brake Shoes

All Q Plus and Q Series 15-Inch and 16.5-Inch Brakes

1. Push down on the bottom brake shoe. Pull on the cam roller retainer clip to remove the bottom cam roller. **Figure 3.3**.
2. Lift the top brake shoe and pull on the cam roller retainer clip to remove the top cam roller.
3. Lift the bottom shoe to release the tension on the brake shoe return spring. **Figure 3.4**.
4. Rotate the bottom shoe to release the tension on the brake shoe retainer springs. **Figure 3.5**.
5. Remove the shoe retainer springs and the brake shoes.

Figure 3.4

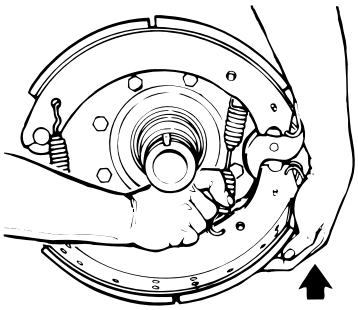
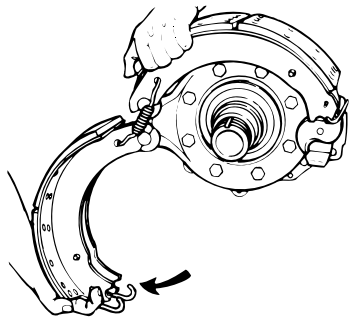


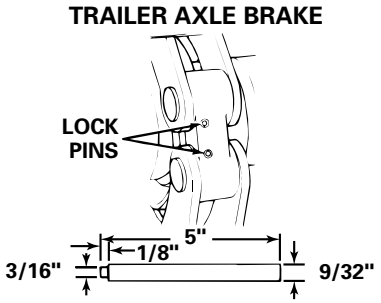
Figure 3.5



P Series and Cast Plus Brakes

Some trailer axle P Series brakes have anchor pins that are secured with lock pins. You can use a steel rod to make a tool to drive out the lock pins. **Figure 3.6**.

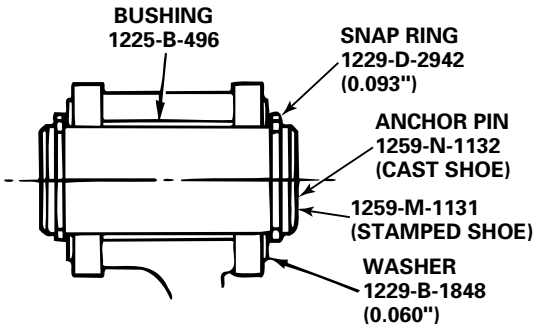
Figure 3.6



NOTE: The current anchor pin arrangement is shown in **Figure 3.7**. Older P Series brakes can include additional parts.

1. Remove the anchor pin snap ring, washer, retainer, felts, seals or capscrews as required.

Figure 3.7



⚠ WARNING

Use a brass or leather mallet for assembly and disassembly procedures. Do not hit steel parts with a steel hammer. Pieces of a part can break off and cause serious personal injury.

2. Remove the top anchor pin with a brass drift. **Figure 3.8**.
3. Rotate the top shoe to release the tension on the brake shoe return spring. Remove the shoe. **Figure 3.9**.
4. Remove the bottom anchor pin. Refer to Step 2. Remove the bottom shoe. If necessary, remove the cam rollers. **Figure 3.10**.

Figure 3.8

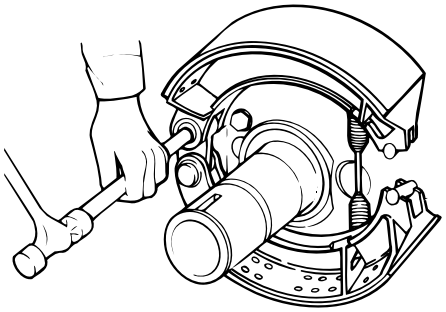


Figure 3.9

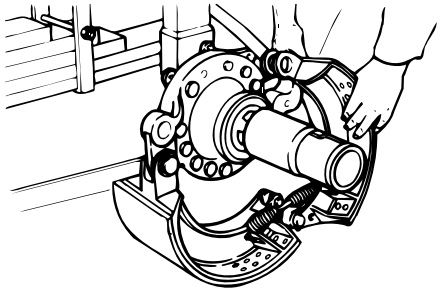
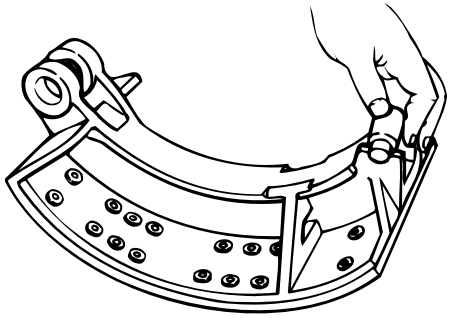


Figure 3.10



T Series Cam Brakes

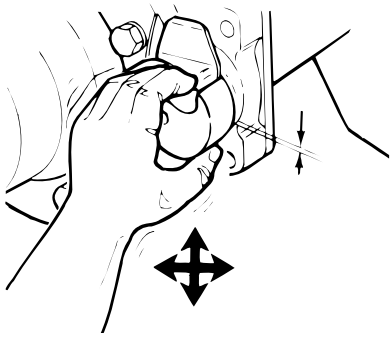
1. Remove the anti-rattle spring retainer and spring from the anti-rattle rod.
2. Push down on the bottom brake shoe to provide enough clearance to remove the bottom cam roller. Remove the roller.
3. Lift the top brake shoe. Remove the top cam roller. Remove the anchor pin snap ring and the anchor pin.
4. Rotate the bottom shoe to release the tension on the brake shoe retainer springs. Remove the shoe retainer springs and the brake shoes.

Check Cam-to-Bushing Radial Free Play and Axial End Play

Before you remove the automatic slack adjuster and camshaft, move the camshaft as shown in **Figure 3.11**. Use a feeler gauge to verify that the cam-to-bushing radial free play and axial end play are within specification.

- **If radial free play movement is less than 0.030-inch (0.76 mm):** Do not replace the bushings and seals.
- **If radial free play movement exceeds 0.030-inch (0.76 mm):** Replace the bushings and seals.
- **If axial end play movement exceeds 0.060-inch (1.52 mm):** Remove the snap ring. Add an appropriate number of spacing washers between the slack adjuster and snap ring to achieve the correct specification of 0.005-0.060-inch (0.127-1.52 mm).

Figure 3.11



Remove the Automatic Slack Adjuster and Camshaft

1. Remove the snap ring, washers and spacers from the camshaft.
2. Remove the automatic slack adjuster from the camshaft.
   - **If the slack adjuster has a "quick connect" clevis, and the gap between the clevis and clevis collar exceeds 0.060-inch (1.52 mm):** Remove the clevis from the push rod.
3. Remove the camshaft from the spider. Use the correct size driver to remove the camshaft bushings from the spider and spider bracket.

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. Refer to page 1 in this manual for hazard summaries and recommended work practices.

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.

Clean and Dry Parts

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.
2. **If you store parts after you clean them:** Apply a corrosion-preventive material. Store parts in a special paper or other material that prevents corrosion.

Inspect Parts

1. Check the spider for expanded anchor pin holes and for cracks. Replace damaged spiders and anchor pin bushings.
2. Check the camshaft bracket for broken welds, cracks and correct alignment. Replace damaged brackets.
3. Check anchor pins for corrosion and wear. Replace worn or damaged anchor pins.
4. Check brake shoes for rust, expanded rivet holes, broken welds and correct alignment. Replace a shoe with any of the above conditions.

16.5-Inch Brake Shoes Only

Anchor pin holes must not exceed 1.009-inches (25.63 mm) in diameter. The distance from the center of the anchor pin hole to the center of the roller hole must not exceed 12.779-inches (32.46 cm). Replace brake shoes with measurements that do not meet specifications.

1. Check the camshaft for cracks, wear and corrosion. Check the cam head, bearing journals and splines. Replace worn or damaged camshafts.
2. Inspect the large and small clevis pins for wear or damage. Replace worn or damaged parts.

⚠ 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.

NOTE: If you remove cotter pins from a slack adjuster during maintenance and service procedures, Meritor recommends that you install clevis pin retainer clips at assembly.

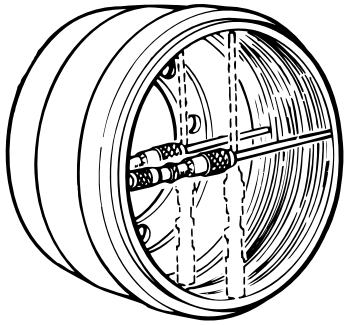
3. Inspect clevis pin retainer clips or cotter pins for wear or damage. Replace worn or damaged retainer clips or cotter pins. Do not reuse clevis pin retainer clips. Always replace used retainer clips with new ones. Discard used clips.

⚠ 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 and damage to components and serious personal injury can result.

4. 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 4.1.** Replace the drum if the diameter exceeds the specifications supplied by the drum manufacturer.
5. Check dust shields for wear and damage. Repair or replace worn or damaged parts as necessary.

Figure 4.1



Automatic Slack Adjuster

1. If the slack adjuster has a "quick connect" clevis, check the gap between the clevis and the collar.
   - **If the gap exceeds 0.060-inch (1.52 mm):** Replace the clevis with a one-piece threaded clevis.
2. Check the clevis pins, clips and bushing in the slack adjuster arm for wear and damage. Replace worn or damaged parts. Check the bushing's diameter to ensure it does not exceed 0.531-inch (13.5 mm).
   - **If the bushing diameter exceeds 0.531-inch (13.5 mm)**: Replace the bushing.

⚠ CAUTION

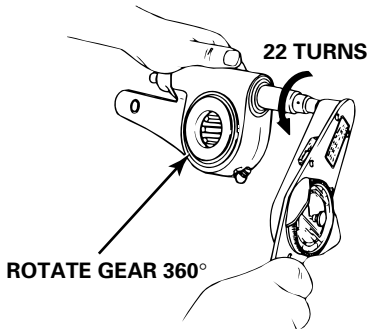
You must disengage a pull pawl or remove a conventional pawl before rotating the manual adjusting nut, or you will damage the pawl teeth. A damaged pawl will not allow the slack adjuster to automatically adjust brake clearance. Replace damaged pawls before putting the vehicle in service.

NOTE: When you service an automatic slack adjuster with a conventional pawl, replace the conventional pawl with a pull pawl.

3. Disengage the pull pawl. Use a screwdriver or equivalent tool to pry the pull pawl at least 1/32-inch to disengage the teeth. **Figure 4.2.**
   - **If the slack adjuster has a conventional pawl:** Remove the pawl. **Figure 4.2.**

Figure 4.2

Figure 4.3



CAUTION

Only turn the adjusting nut counterclockwise when you check gear torque on an automatic slack adjuster. If you turn the adjusting nut incorrectly, you will damage the pawl teeth. A damaged pawl will prevent the slack adjuster from automatically adjusting clearance between the linings and drum. Damage to components can result.

4. Use a lb-in torque wrench and turn the adjusting nut COUNTERCLOCKWISE (**Figure 4.3**) to rotate the gear 360 degrees (22 turns of the wrench) as you read the torque scale on the wrench. The value should remain at less than 25 lb-in (2.83 N•m) as you rotate the gear.
   - **If the torque value remains less than 25 lb-in (2.8 N•m) as you rotate the gear:** The slack adjuster is operating correctly.
   - **If the torque value exceeds 25 lb-in (2.8 N•m) as you rotate the gear:** The slack adjuster is not operating correctly. Disassemble the slack adjuster. Check that it's assembled correctly. Check that parts are aligned correctly.
5. Re-engage the pull pawl. Remove 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). T

NOTE: If necessary, install a camshaft into the slack adjuster gear to minimize grease flow through the gear holes.

6. Use a grease gun to apply Meritor lubricant specification O-616-A, O-692 or O-645 to the slack adjuster grease fitting, until grease flows from around the camshaft splines and pawl assembly. Refer to Section 8 for more lubricant information.

Camshafts

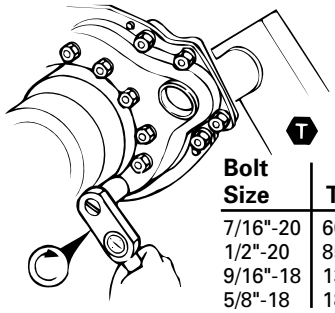
NOTE: Install new camshaft bushings and seals whenever you install a new camshaft.

1. Tighten all spider bolts to the correct torque. **Figure 4.4**. T
2. Use a seal driver to install new camshaft seals and new bushings into the cast spider and camshaft bracket.
   - **If the brake has a stamped spider:** Install both bushings into the bracket. Install the seals with the seal lips toward the slack adjuster. **Figure 4.5**.

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 4.4**. T

Figure 4.4



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

Figure 4.5

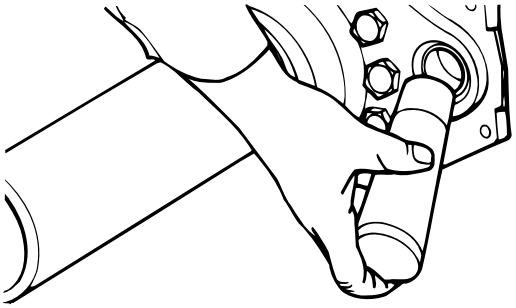
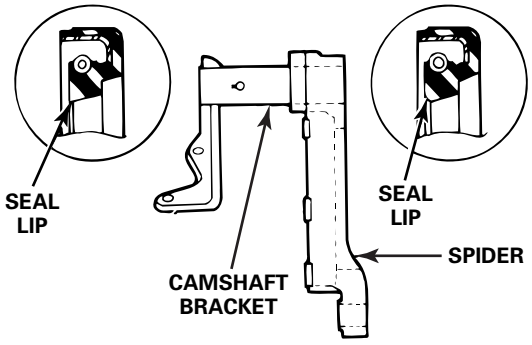


Figure 4.6



WARNING

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

Do not use the straight-center bar shoe return spring with the Q Plus camshaft. The shoe spring can interfere with the camshaft and affect braking performance. Serious personal injury and damage to components can result.

ASBESTOS AND NON-ASBESTOS FIBERS WARNING

Some brake linings contain asbestos fibers, a cancer and lung disease hazard. Some brake linings contain non-asbestos fibers, whose long-term effects to health are unknown. You must use caution when you handle both asbestos and non-asbestos materials. Refer to page 1 in this manual for hazard summaries and recommended work practices.

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.

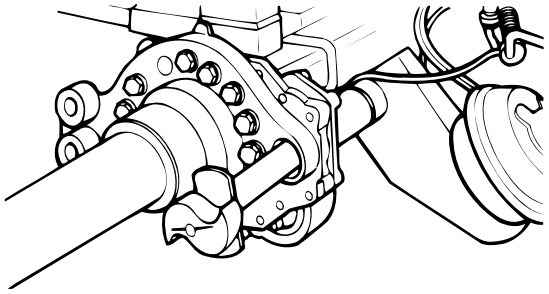
To install a new brake drum so that it fits correctly over a Q Plus brake shoe, you must install a Q Plus camshaft to prevent damage to components.

Installation

Camshaft

1. Install the cam head thrust washer onto the camshaft. Apply Meritor specification O-617-A or O-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 5.1**.

Figure 5.1



Replace a Q Series Camshaft with a Q Plus Camshaft

All Front and Drive Axle 16.5-Inch Q Series Brakes

When you replace a Q Series camshaft with a Q Plus camshaft, continue to follow maintenance and service procedures for a Q Series brake and a Q Plus camshaft.

Replace a Hammerclaw Camshaft with a Standard Q Plus Camshaft

Front Axles Only

A standard Q Plus camshaft and a shoe return spring with an offset center bar replaces the hammerclaw Q Series camshaft and shoe return spring with a straight center bar on 16.5 x 5-inch and 6-inch Q Series cam brake. **Figures 5.2 and 5.3**.

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 5.4**. The excess gap will be eliminated when you correctly adjust the brake.

1. Follow Steps 1 and 2 under Q Plus and Q Series 16.5-Inch Brakes in this section to replace a Q Series hammerclaw camshaft with a standard Q Plus camshaft.
2. Continue to follow service and maintenance procedures for a Q Plus camshaft and Q Series brake.

Figure 5.2

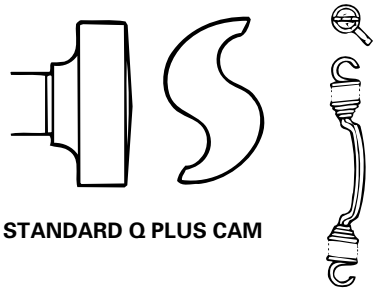


Figure 5.3

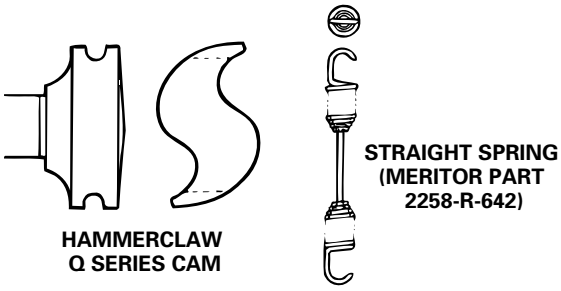
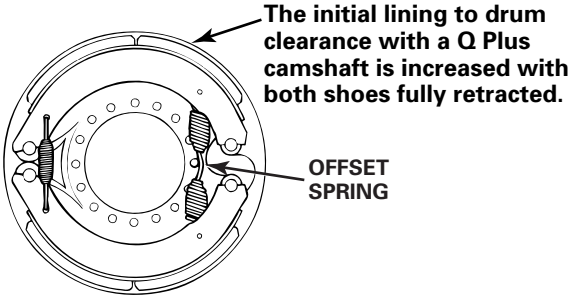


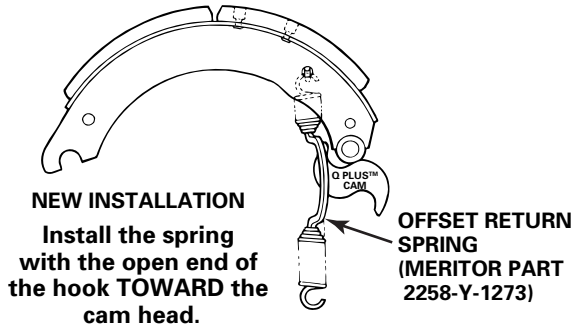
Figure 5.4



Shoe Return Spring

Install the new offset shoe return spring with the open end of the spring hooks toward the camshaft. **Figure 5.5**.

Figure 5.5



Automatic Slack Adjuster onto the Camshaft

1. Check the camshaft and bushings and seals for wear and corrosion. Turn the camshaft by hand to check for smooth operation. Repair or replace parts as required.
2. 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.
3. Verify that the new automatic slack adjuster is the same length as the one you are replacing. Refer to Table A.

Table A: Chamber and Automatic Slack Adjuster Sizes

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

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

WARNING

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

4. If the vehicle has spring brakes, follow the chamber manufacturer's instructions to compress and lock 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.

5. If the automatic slack adjuster gear has a 10-tooth spline, apply Meritor specification O-637 (part number 2297-U-4571) anti-seize compound, or equivalent. This specification is a corrosion-control grease. Do not mix this grease with other greases.

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

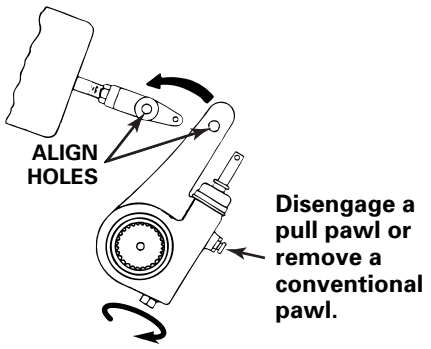
6. Install the slack adjuster onto the camshaft. Position the slack adjuster so that you can access the pawl when you adjust the brake.
7. Verify that camshaft axial end play is 0.005-0.060-inch (0.127-1.52 mm).
   - **If axial end play exceeds 0.060-inch (1.52 mm):** Remove the snap ring. Add an appropriate number of spacing washers to achieve the correct specification.
8. Install the clevis onto the push rod.

CAUTION

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

9. 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 5.6**.

Figure 5.6



Welded Clevis

1. Check the clevis position. Apply Meritor specification O-637 (part number 2297-U-4571) anti-seize compound or equivalent to the large and small clevis pins. This specification is a corrosion-control grease. Do not mix this grease with other greases.

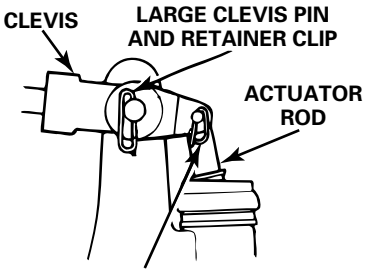
⚠ CAUTION

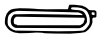
Always replace used clevis pin retainer clips with new ones when you service an automatic slack adjuster or chamber. Do not reuse retainer clips. Discard used clips. When you remove a retainer clip, it can bend or "gap apart" and lose retention. Damage to components can result.

NOTE: Meritor recommends that you replace cotter pins with clevis retainer clips at assembly.

2. Install new clevis pin retainer clips or cotter pins to secure the clevis pins. Retainer clips must be fully installed and positioned around the side of the clevis pin. **Figure 5.7**.

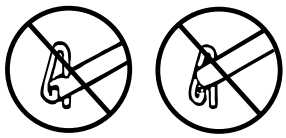
Figure 5.7





LARGE CLEVIS PIN RETAINER CLIP MERITOR PART 2257-D-1174

SMALL CLEVIS PIN RETAINER CLIP MERITOR PART 2257-C-1173



The clevis pin retainer clips must be fully installed and positioned around the side of clevis pin.

Threaded Clevis

Adjust the Clevis Position on the Chamber Push Rod

Automatic Slack Adjuster Template Method for Standard Stroke Chambers Only

⚠ WARNING

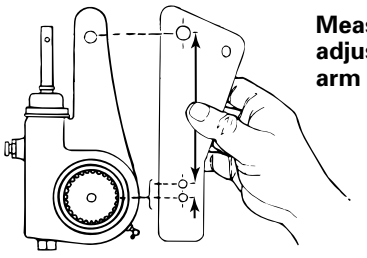
Meritor provides a slack adjuster template for truck and tractor, trailer, and coach drum brakes. *These templates are not interchangeable*. You must use the correct template when you install the clevis.

If you use the wrong template, the automatic slack adjuster will not adjust the brakes correctly. Under-adjustment can increase stopping distances. Over-adjustment can cause the linings to drag. Serious personal injury and damage to components can result.

1. Install the large clevis pin through the large clevis pin hole in the correct slack adjuster template for the drum brake you're servicing. **Figure 5.8**.

Figure 5.8

Color of Template	Part Number	Applications
Dark brown	TP-4786	Truck or tractor drum brake
Tan	TP-4787	Trailer drum brake
White	TP-4781	Coach drum brake

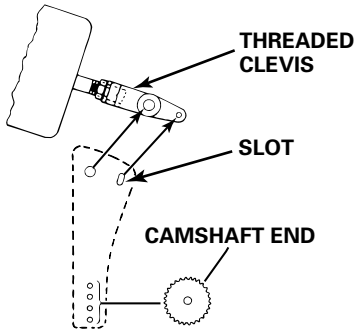


Measure slack adjuster arm length.

CAMSHAFT CENTER

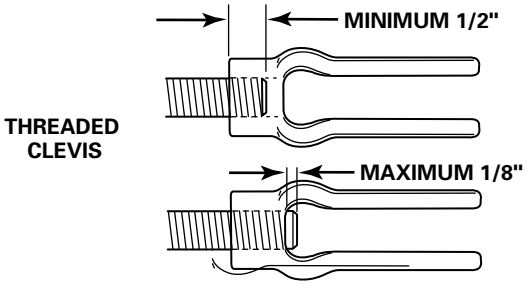
2. Select the hole at the small end of the template that matches the slack adjuster arm length. Position and hold the hole on the center of the camshaft.
3. Look through the small clevis pin slot on the template to see if the small clevis hole completely aligns within the slot.
   - **If the small clevis hole doesn't align within the slot:** Adjust the clevis until you can see the small clevis pin hole within the slot. **Figure 5.9**.

Figure 5.9



4. Verify that thread engagement between the clevis and push rod is 1/2-5/8-inch (12.7-15.9 mm). **Figure 5.10**.

Figure 5.10



5. Verify that the push rod does not extend through the clevis more than 1/8-inch (12.7 mm).
   - **If the push rod extends through the clevis more than 1/8-inch (12.7 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 B. (T)

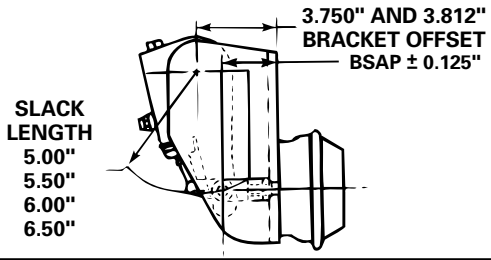
Table B: Jam Nut Torque Specifications

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

Brake Slack Adjuster Position (BSAP) Method for Standard Stroke and Long Stroke Chambers

When you install the slack adjuster, verify that the BSAP chamber dimension matches the table in **Figure 5.11**.

Figure 5.11



Slack Adjuster Size	Standard Stroke Chamber Clevis (1.38") 1.38"	Long Stroke Chamber Clevis (1.30") 1.30"
5.00"	2.75"	2.25"
5.50"	2.75"	2.25"
6.00"	2.75"	2.25"
6.50"	2.62"	2.25"

±0.125" Tolerance. You must use the correct clevis with the correct chamber type.

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

Brake Shoes

NOTE: Meritor recommends that you replace springs, rollers, anchor pins and cam bushings at each reline.

Q Plus and Q Series 16.5-Inch Brakes

1. 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 5.12**.
2. 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 5.13**.
3. Pull each brake shoe away from the camshaft to enable you to install the camshaft roller and roller retainer. Press the retainer "ears" to fit into the retainer between the brake shoe webs. **Figure 5.14**.

Figure 5.12

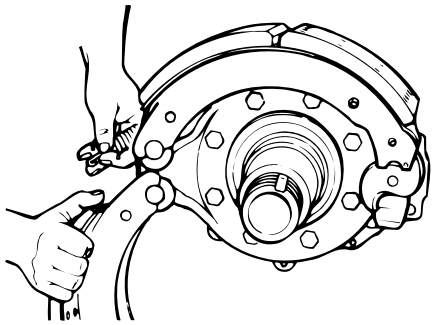


Figure 5.13

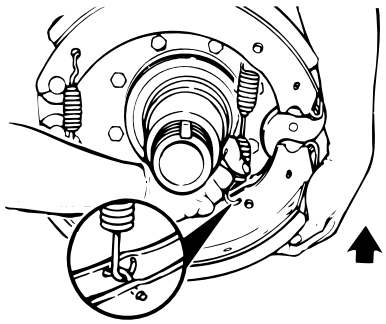
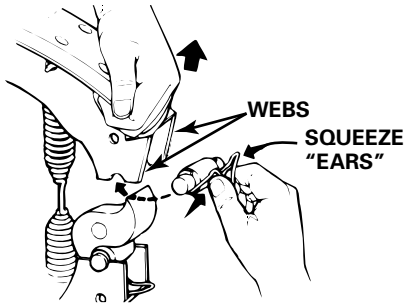


Figure 5.14



4. Push the camshaft roller retainer into the brake shoe until the "ears" lock into the shoe web holes. **Figure 5.15**.
5. Use Meritor specification grease O-617-A or O-617-B to lubricate the camshaft roller pin and anchor pin. **Figure 5.16**.

Figure 5.15

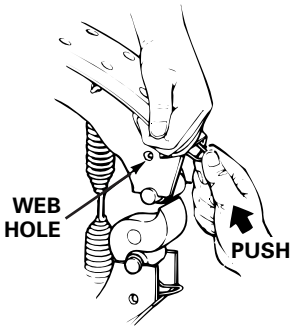
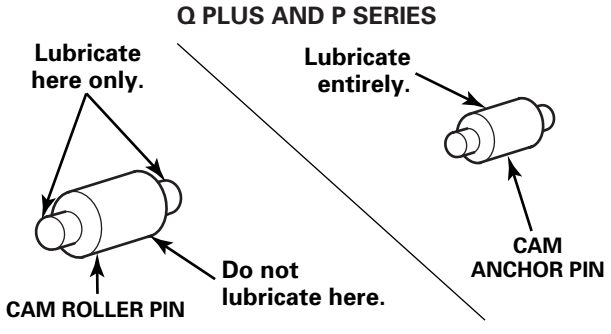


Figure 5.16



Q Series 15-Inch Cam Brake

1. Install the anchor pins, washers and nuts to the spider if these parts were removed previously. Tighten the anchor pin nuts to 325-375 lb-ft (441-509 N•m). T
2. Install a new brake shoe return spring with the open end of the spring hooks toward the camshaft. Install the brake shoes onto the anchor pins. **Figure 5.17**.
3. Hold the bottom brake shoe in position. Install the shoe return spring. Pull the brake shoe away from the camshaft to enable you to install the camshaft roller and roller retainer.
4. Use Meritor specification grease O-617-A or O-617-B to lubricate the camshaft roller pin and anchor pin. **Figure 5.18**.

Figure 5.17

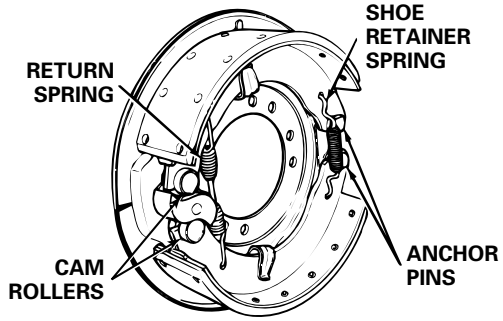
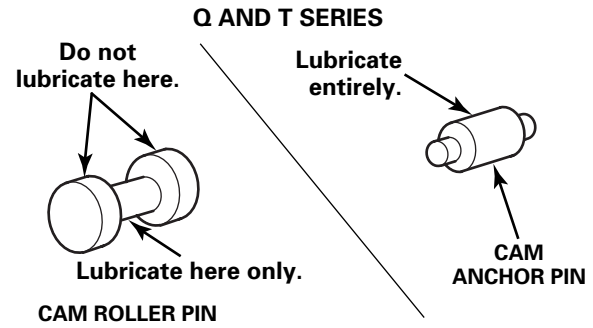


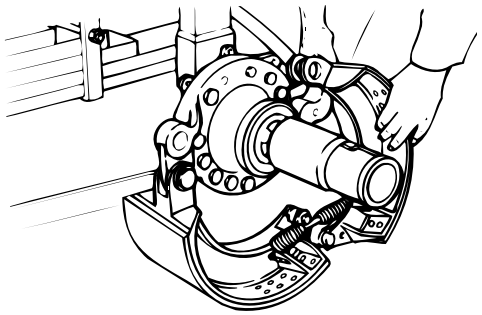
Figure 5.18



P Series and Cast Plus Cam Brakes

1. Install the anchor pin bushings. If necessary, align the holes in the bushings with the holes in the spider.
2. Install a new cam roller and cam roller retainers.
3. Install the lower brake shoe in position on the spider.
4. Use a hammer and brass drift to install the anchor pin. If necessary, align the groove on the anchor pin with the holes in the spider and bushing.
5. Install the anchor pin washers, felts, seals, retainers and snap rings, if required. Install lock pins or lock screws, if required. Tighten the screws to 10-15 lb-ft (13.6-20.3 N•m). T
6. Install a new shoe return spring onto the brake shoe. **Figure 5.19**. Place the upper brake shoe into position over the spider. Repeat Steps 4 and 5.
7. Lubricate the camshaft roller pin and anchor pin with Meritor specification O-617-A or O-617-B grease. **Figure 5.16**.

Figure 5.19



T Series Cam Brake

1. Install the anchor pins, washers and nuts onto the backing plate if these parts were previously removed. Tighten the anchor pin nuts to 185-350 lb-ft (251-475 N•m). T
2. Install the anti-rattle rod. Install the brake shoe onto the anchor pins and anti-rattle rod.
3. Install the anchor pin snap rings, anti-rattle spring and anti-rattle retainer spring onto the anti-rattle rod.
4. Pull the brake shoe away from the camshaft to enable you to install the brake shoe roller. Install a new brake shoe return spring onto the brake shoe.
5. Lubricate the camshaft roller pin and anchor pin with Meritor specification grease O-617-A or O-617-B. **Figure 5.18**.

Drum and Wheel

Follow the manufacturer's instructions to install the drum and wheel onto the axle.

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. Refer to page 1 in this manual for hazard summaries and recommended work practices.

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.

Adjust the Brakes

When you perform preventive maintenance procedures on an in-service brake, check both the free stroke and adjusted chamber stroke. Refer to Commercial Vehicle Safety Alliance (CVSA) Guidelines to Measure Push Rod Travel (Adjusted Chamber Stroke) in this section.

Free stroke sets the clearance between the linings and drum. The in-service free stroke may be slightly longer than 1/2-5.8-inch (12.7-15.9 mm) specified in this procedure. This is not a concern if the adjusted chamber stroke is within the limits shown in Table C and Table D in this section.

Measure 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.

1. Disengage a pull pawl. Use a screwdriver or equivalent tool to pry the pull pawl at least 1/32-inch 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 shoes are fully retracted, and the lining clears the drum. **Figure 6.1**. Then back-off the adjusting nut one-half turn in the opposite direction.
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 6.2**.
4. Use a pry bar to move the slack adjuster and position the linings against the drum (brakes applied). Measure the same distance again while the brakes are applied. The measurement you obtain is "Y" in **Figure 6.2**.

CAUTION

Do not set free stroke shorter than 1/2-5/8-inch (12.7-15.9 mm) for drum brakes. If the measurement is too short, linings can drag. Damage to components can result.

5. Subtract "X" from "Y" to obtain the in-service free stroke. The measurement must be 1/2-5/8-inch (12.7-15.9 mm) for drum brakes. **Figure 6.2**.
   - **If the free stroke measurement is not within specification:** Turn the adjusting nut COUNTERCLOCKWISE 1/8 turn to adjust free stroke. **Figure 6.2**. Follow the steps above to check free stroke again, until the measurement is within specification.

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

Figure 6.1

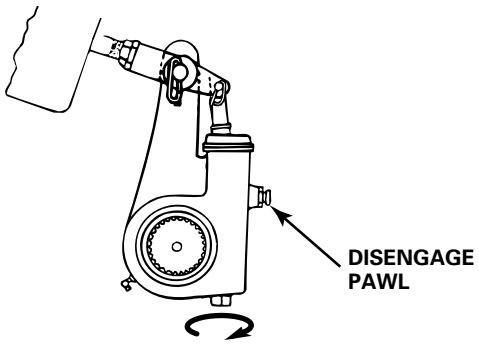


Figure 6.2

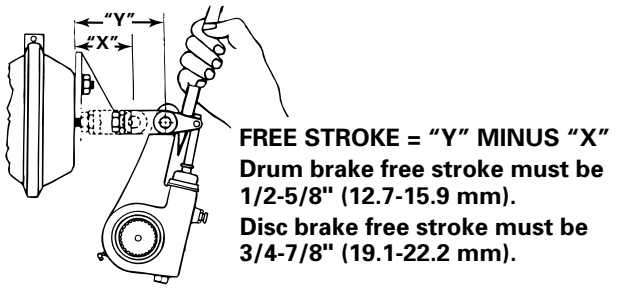
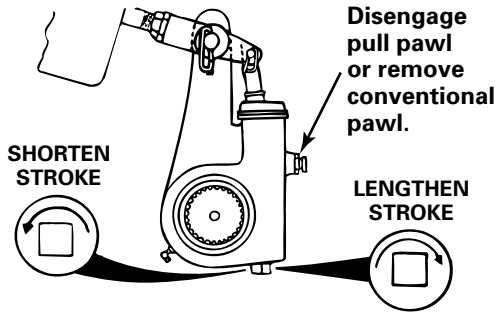


Figure 6.3



Commercial Vehicle Safety Alliance (CVSA) Guidelines

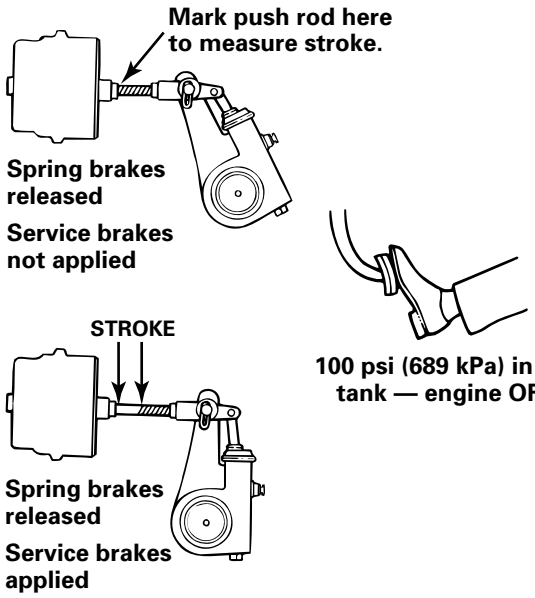
Measure Push Rod Travel (Adjusted Chamber Stroke)

Use the following procedure to check in-service push rod travel (adjusted chamber stroke) on truck and tractor brakes.

NOTE: 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."

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 pressure is 100 psi (689 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 6.4**.
4. Measure push rod travel (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 6.4**.
5. Subtract the measurement you recorded in Step 3 from the measurement you recorded in Step 4. The difference is push rod travel (adjusted chamber stroke).
6. Refer to Table C or Table D to verify that the stroke length is correct for the size and type of air chambers on the vehicle.
   - **If push rod travel (adjusted chamber stroke) is greater than the maximum stroke shown in Table C or Table D:** Inspect the slack adjuster and replace it, if necessary.

Figure 6.4



Alternate Method to Measure Push Rod Travel (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

Information contained in the following tables is for reference only. Consult the CVSA's Out-of-Service Criteria Handbook for North American Standards, Appendix A. Visit their website at http://64.35.82.7/ to order the handbook.

Table C: "Standard Stroke" Clamp-Type Brake Chamber Data

Type	Outside Diameter (inches)	Brake Adjustment Limit (inches)	
6	4-1/2	1-1/4	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 D: "Long Stroke" Clamp-Type Brake Chamber Data

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

* For 3" maximum stroke type 24 chambers.

⚠ 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. Refer to page 1 in this manual for hazard summaries and recommended work practices.

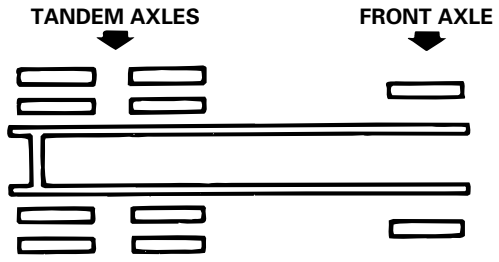
Important Information on Linings and Primary Shoe Locations

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 7.1**.

Figure 7.1



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

Single Axles

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

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

Combination Friction Linings

⚠ CAUTION

When you install combination friction linings, you must install the *primary* lining on the *primary* brake shoe. If you install combination friction linings incorrectly, damage to components will result. Carefully follow instructions included with the replacement linings.

You can combine brake linings, which means that the linings you install on the primary shoe will have a different friction rating than the linings you install on the secondary shoe.

However, you must install the primary lining on the primary shoe. Carefully follow the instructions included with the replacement combination linings.

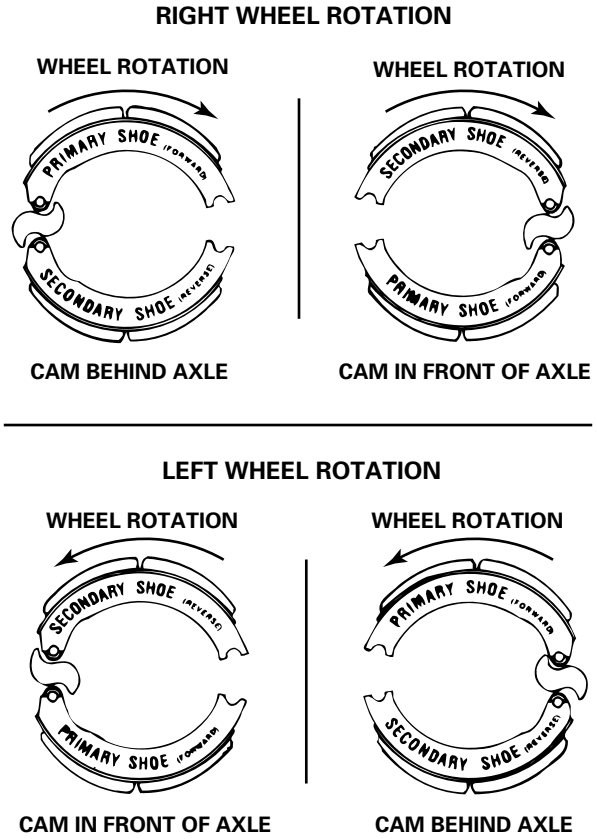
Primary Shoe Locations

The first shoe past the camshaft in the direction of wheel rotation is the primary shoe. **Figure 7.2**. The primary shoe can be either at the top or bottom position, depending on the location of the camshaft.

If the camshaft is behind the axle, the top shoe is the primary shoe.

If the cam is in front of the axle, the top shoe is the primary shoe.

Figure 7.2



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⚠ WARNING

During lubrication procedures, if grease flows from the seal near the camshaft head, replace the seal. Remove all grease or oil from the camshaft head, rollers and brake linings. Always replace linings contaminated with grease or oil, which can increase stopping distances. Serious personal injury and damage to components can result.

Lubrication and Maintenance

NOTE: Refer to Table E in this section for grease specifications.

Camshaft Bushings

Meritor recommends that you install new camshaft bushings whenever you install a new camshaft.

Lubricate through the fitting on the bracket or spider until new grease flows from the inboard seal.

Rollers and Anchor Pins

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. **Figures 8.1 and 8.2**.

Figure 8.1

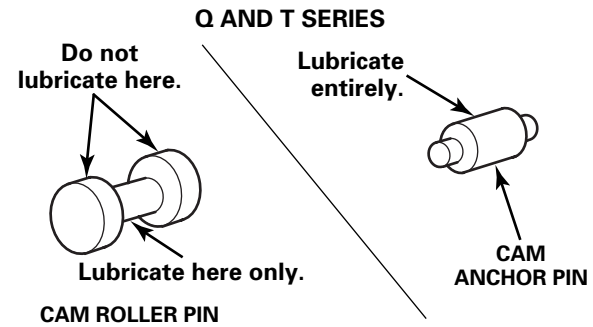
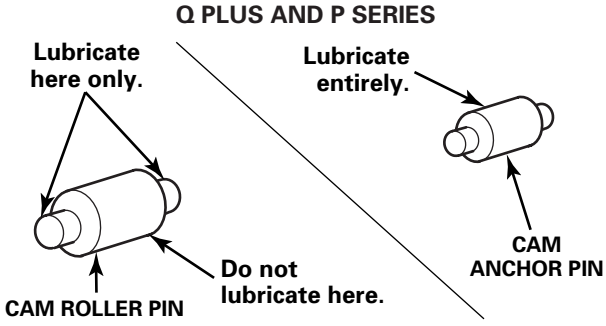


Figure 8.2



Automatic Slack Adjuster

Inspect and lubricate the automatic slack adjuster according to one of the schedules below. Use the schedule that requires the most frequent inspection and lubrication, and whenever you reline the brakes. Refer to Table F in this section for grease specifications.

- Vehicle manufacturer's schedule
- Fleet's schedule
- Every six months
- A minimum of four times during the life of the linings

Anti-Seize Compound

Use anti-seize compound on the clevis pins of all automatic slack adjusters.

For a conventional automatic slack adjuster, use anti-seize compound on the slack adjuster and camshaft splines, if the slack adjuster gear does not have a grease groove and holes around its inner diameter.

Factory-Installed Automatic Slack Adjusters on Q Plus LX500 and MX500 Cam Brake Packages

Q Plus LX500 and MX500 cam brake packages include factory-installed automatic slack adjusters that do not have grease fittings. Also, lubrication intervals are different than intervals for conventional slack adjusters.

For complete maintenance and service information for Meritor's LX500 and MX500 cam brakes, refer to Maintenance Manual MM-96173. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.

Table E: Cam Brake Grease Specifications

Components	Meritor Specification	NLGI Grade	Grease Type	Outside Temperature
• Retainer Clips • Anchor Pins • Rollers (Journals Only) • Camshaft Bushings	O-616-A	1	Clay Base	Down to –40°F (–40°C)
	O-617-A or O-617-B	1 2	Lithium 12-Hydroxy Stearate or Lithium Complex	Refer to the grease manufacturer's specifications for the temperature service limits.
	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)
Camshaft Splines	Any of Above	See Above	See Above	See Above
	O-637*	1-1/2	Calcium Base	Refer to the grease manufacturer's specifications for the temperature service limits.
	O-641	—	Anti-Seize	

Table F: Automatic Slack Adjuster Grease Specifications

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

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

Maintenance Intervals

On-Highway Linehaul Applications

Q Plus, Cast Plus and Q Series Brakes

Every 100,000 miles (160 000 km) or every six months, whichever comes first.

P Series Brakes

Every 50,000 miles (80 000 km) or every six months, whichever comes first.

Off-Highway Linehaul Applications

At least every four months when you replace the seals and reline the brakes.

Every two weeks during the first four-month period, inspect for hardened or contaminated grease and for the absence of grease to help determine lubrication intervals.

Lubricate more often for severe-duty applications.

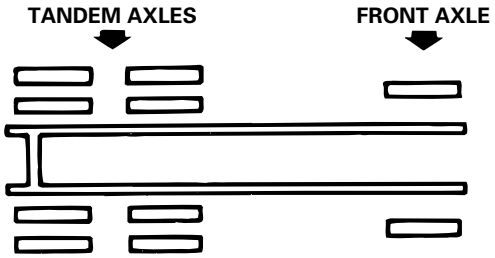
WARNING

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

Before You Return the Vehicle to Service

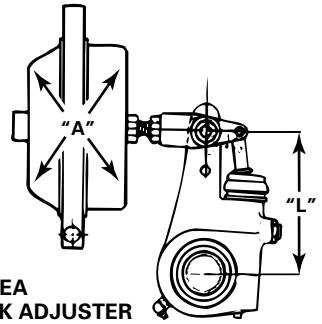
1. Check the complete air system for worn hoses and connectors. With air pressure at 100 psi (689 kPa), brakes released and engine off, loss of tractor air pressure must not exceed two psi a minute. Total tractor and trailer loss must not exceed three psi per minute.
2. Check to see that the air compressor drive belt is tight. Air system pressure must rise to approximately 100 psi (689 kPa) in two minutes.
3. The governor must be checked and set to the specifications supplied by the vehicle manufacturer.
4. Both the tractor and trailer air systems must match the specifications supplied by the vehicle manufacturer.
5. 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 driving axle brakes. **Figure 9.1**.
6. 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 and these requirements can change from vehicle to vehicle.
7. 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.
8. 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 9.2**.

Figure 9.1



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

Figure 9.2



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

Recommended Periodic Service

Adjust the Brakes

NOTE: Adjust the wheel bearings before you adjust the brakes.

Clean, inspect and adjust the brakes every time you remove a wheel hub.

Adjust the brakes when the chamber stroke exceeds CVSA limits in Table C and Table D in Section 6.

Adjust the brake as frequently as necessary for correct operation.

Check for correct lining-to-drum clearance, push rod travel and brake balance.

Lubrication

Refer to Table E and Table F in Section 8 to lubricate the brakes and automatic slack adjuster.

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 will result.

Meritor recommends that you replace springs, rollers, camshaft bushings and anchor pins at each reline.

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

Replace shoe retainer springs, check the drum, and perform a major inspection when you reline the brakes.

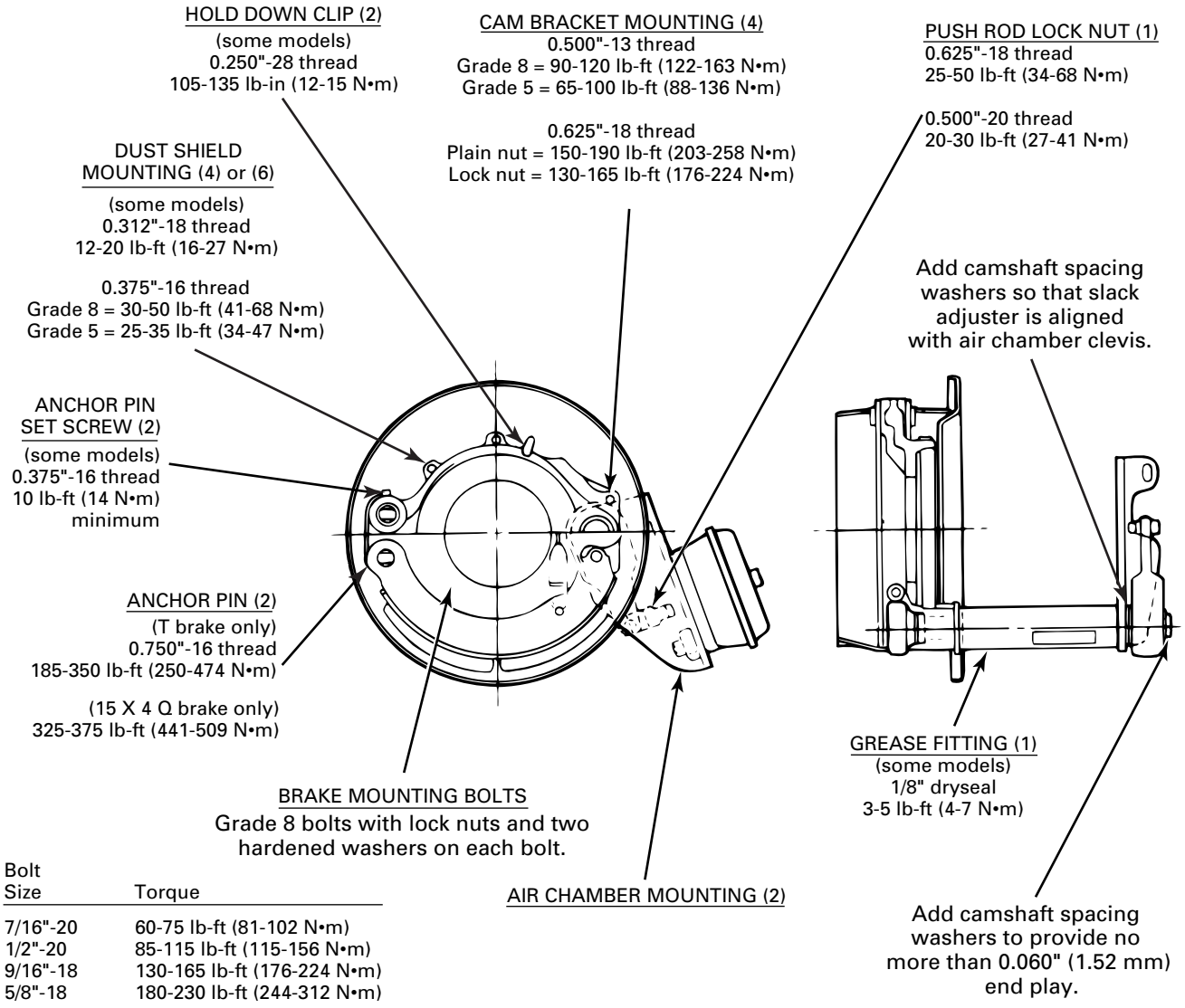
Inspection

Refer to Section 8 for inspection guidelines.

Major Overhaul

Perform a major overhaul at every second reline, or as necessary. Replace shoe return springs. Replace damaged or worn parts with genuine Meritor parts. Check components for the following conditions.

- Spiders for distortion and loose bolts
- Anchor pins for wear and correct alignment
- Brake shoes for wear at anchor pin holes or roller slots
- Camshafts and camshaft bushings for wear
- Brake linings for grease on the lining, wear and loose rivets or bolts
- Drums for cracks, deep scratches or other damage



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)

Grade 8 Nuts and Hard Flat Washers								
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)				

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 OEM 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.

Cam Rollers

To avoid flat spots, lubricate a cam 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 effect the brake system.

Hardware

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

Linings

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

Replacement Parts

Always use OEM quality standard 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.

Trailer Cam Brakes

Long-life bushings require correct lubrication for maximum performance and bushing life. Although you do not have to replace spider cam bushings on trailer axles as frequently, Meritor recommends that you lubricate the bushings at least four times during the life of your brake lining.

Automatic Slack Adjusters

"Automatic" doesn't mean maintenance-free. Properly 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.

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