



MERITOR®

an **ArvinMeritor** brand

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\$2.50

Automatic Slack Adjuster

Maintenance Manual 4B






Before You Begin

This manual provides maintenance and service procedures for Meritor's automatic slack adjuster. 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

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

Access Product and Service Information in the DriveTrain PlusTM by ArvinMeritor Tech Library on arvinmeritor.com

Go to arvinmeritor.com. Click Products & Services/ Truck & Trailer Products/Sales & Service/Tech Library icon. The screen will display an index of publications by type.

To Order Information by Phone

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

- *Automatic Slack Adjuster Installation and Maintenance* (Video 90234)
- *New Generation Automatic Slack Adjuster* (Video T-9443V)
- *Drivetrain PlusTM 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.

Meritor Brakes That Use Automatic Slack Adjusters

- Cam brakes, including Q PlusTM LX500 and MX500 and Cast PlusTM cam brakes
- Air disc brakes

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ASBESTOS FIBER WARNING

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

Hazard Summary

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

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

Recommended Work Practices

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

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

2. **Respiratory Protection.** Wear a respirator equipped with a high-efficiency (HEPA) filter approved by NIOSH or MSHA for use with asbestos at all times when servicing brakes, beginning with the removal of the wheels.
3. **Procedures for Servicing Brakes.**
 - a) Enclose the brake assembly within a negative pressure enclosure. The enclosure should be equipped with a HEPA vacuum and worker arm sleeves. With the enclosure in place, use the HEPA vacuum to loosen 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 Meritor.

Hazard Summary

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

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

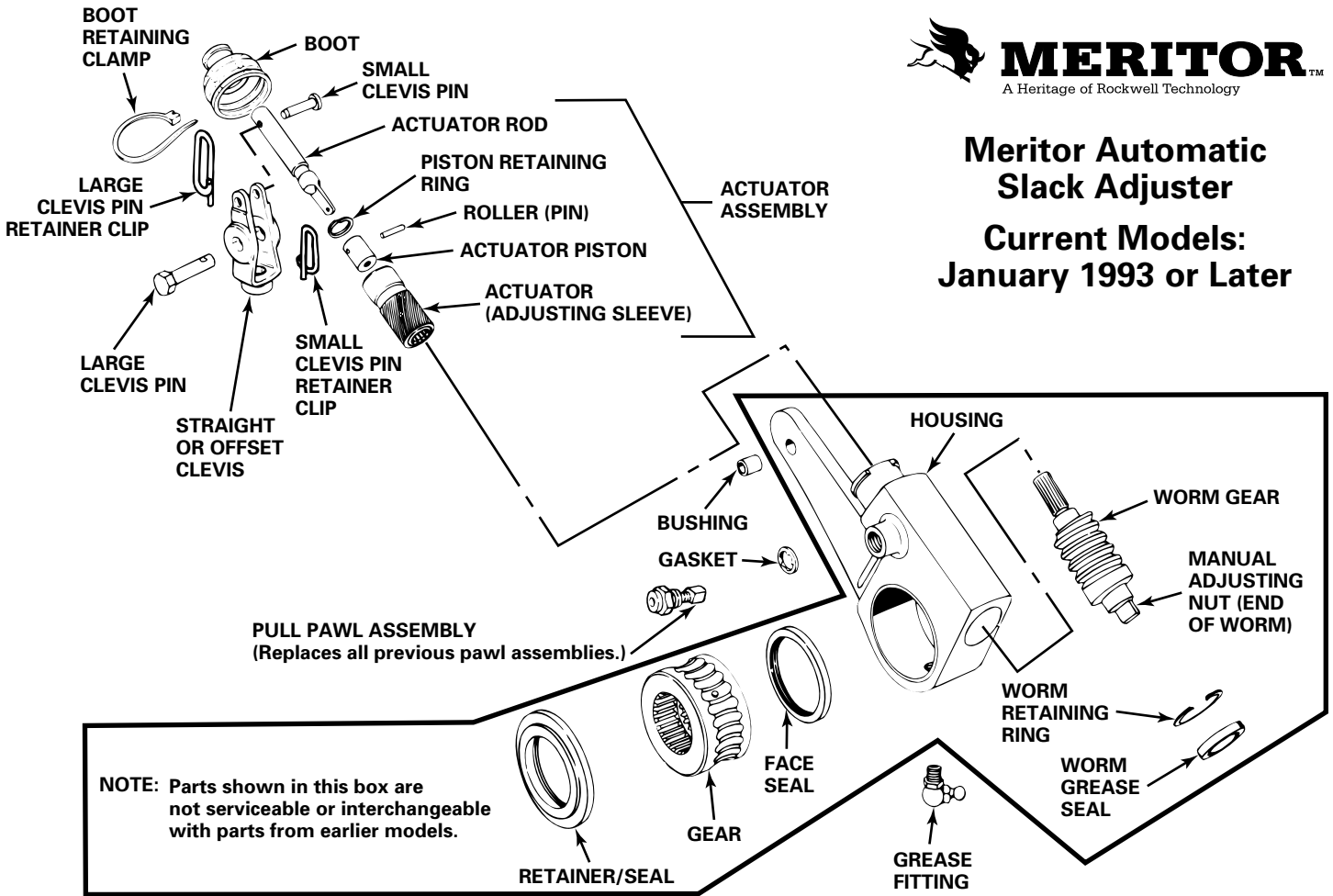
Recommended Work Practices

1. **Separate Work Areas.** Whenever feasible, service brakes in a separate area away from other operations to reduce risks to unprotected persons.
2. **Respiratory Protection.** OSHA has set a maximum allowable level of exposure for silica of 0.1 mg/m³ as an 8-hour time-weighted average. Some manufacturers of non-asbestos brake linings recommend that exposures to other ingredients found in non-asbestos brake linings be kept below 1.0 f/cc as an 8-hour time-weighted average. Scientists disagree, however, to what extent adherence to these maximum allowable exposure levels will eliminate the risk of disease that can result from inhaling non-asbestos dust. Therefore, wear respiratory protection at all times during brake servicing, beginning with the removal of the wheels. Wear a respirator equipped with a high-efficiency (HEPA) filter approved by NIOSH or MSHA, if the exposure levels may exceed OSHA or manufacturers' recommended maximum levels. Even when exposures are expected to be within the maximum allowable levels, wearing such a respirator at all times during brake servicing will help minimize exposure.
3. **Procedures for Servicing Brakes.**
 - 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.

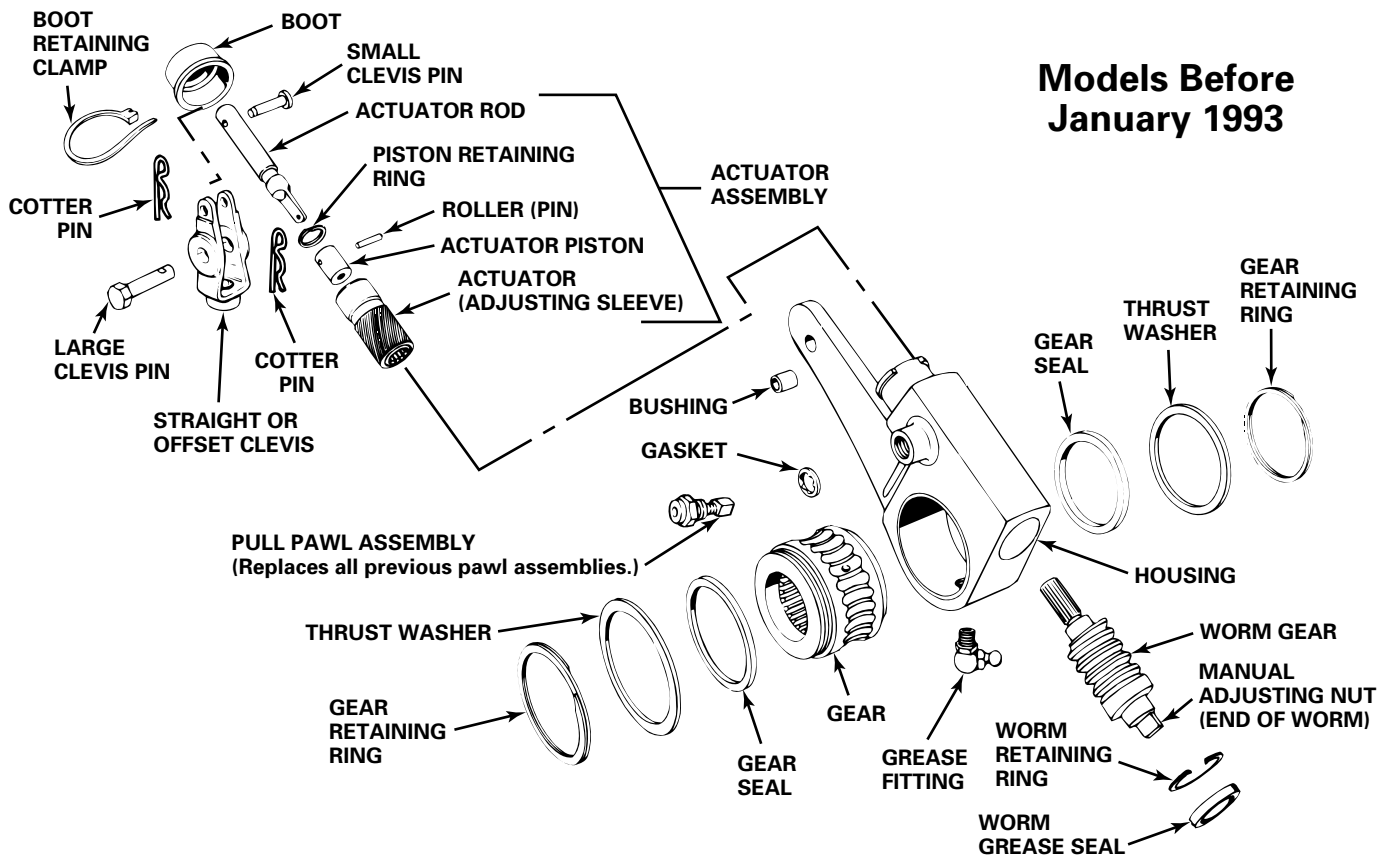
Regulatory Guidance

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.

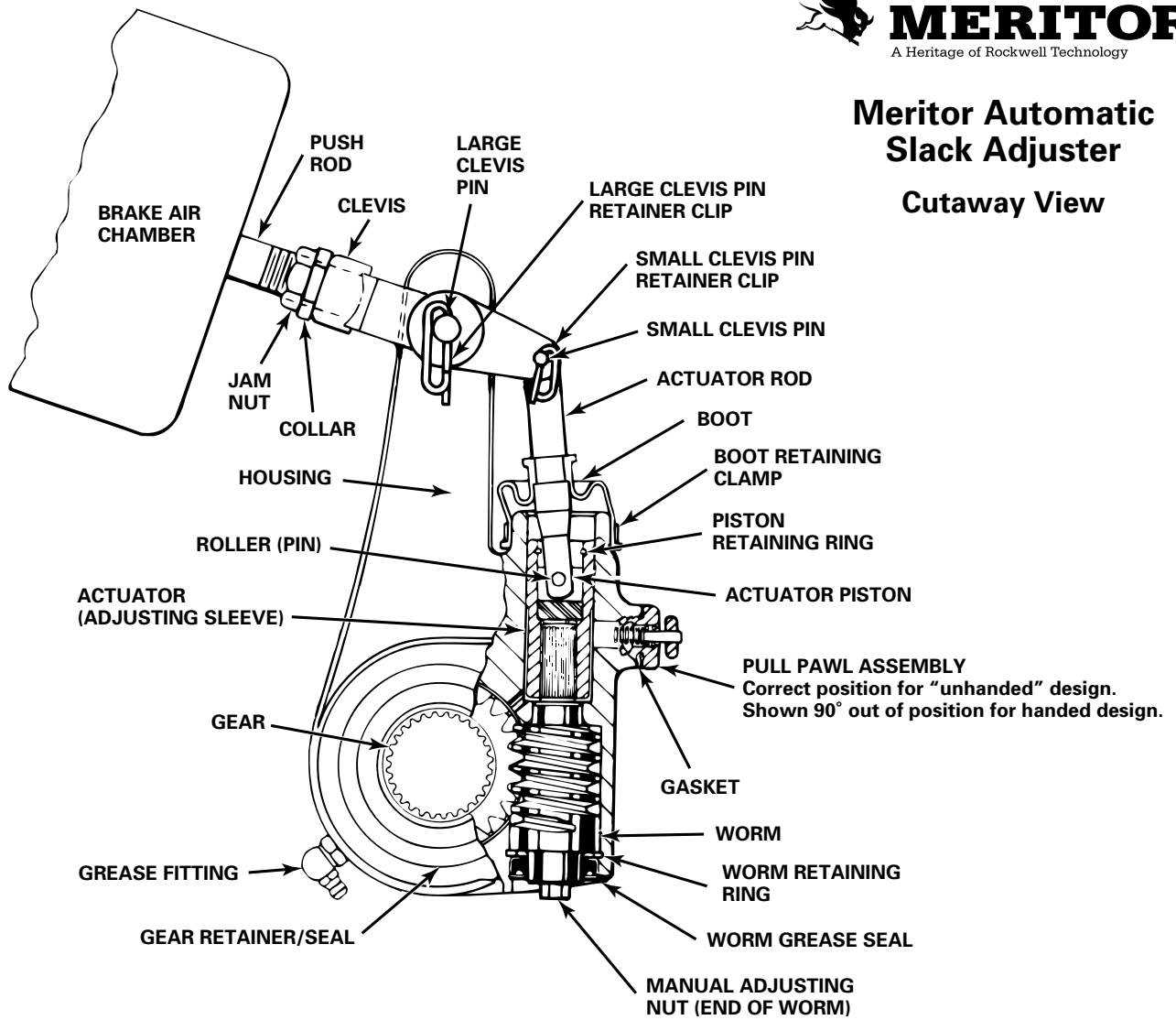
**Meritor Automatic
Slack Adjuster**
**Current Models:
January 1993 or Later**



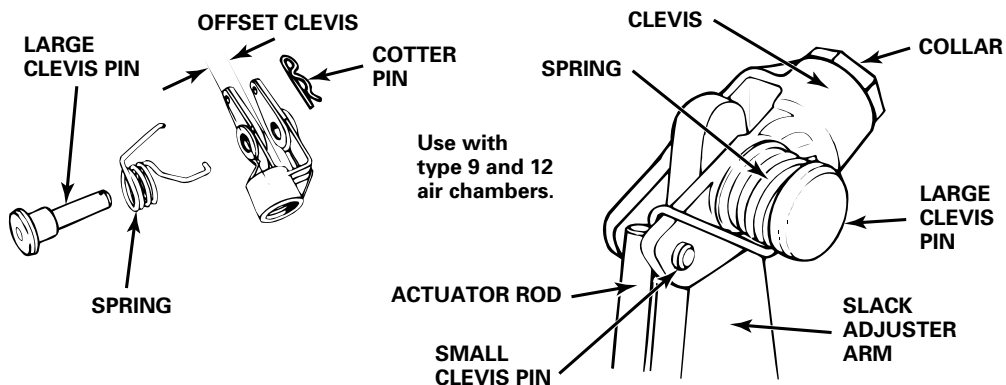
**Models Before
January 1993**



Meritor Automatic Slack Adjuster Cutaway View



Offset Clevis for Front Axle Slack Adjuster



Meritor's Automatic Slack Adjuster

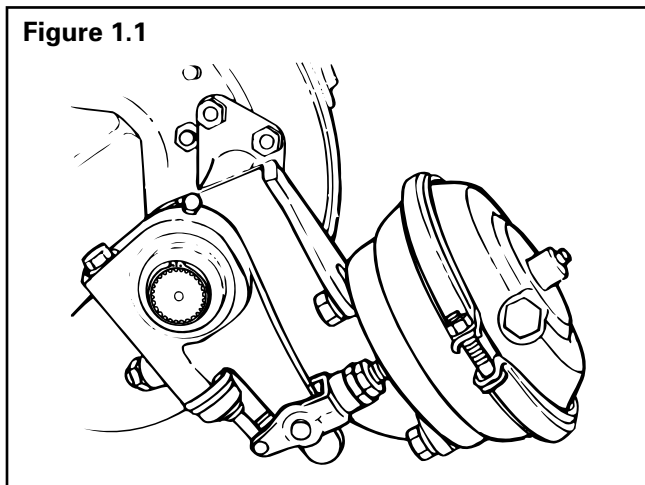
NOTE: As of January 1993 some parts of Meritor's automatic slack adjuster are no longer serviceable and are not interchangeable with parts from earlier models. Refer to Exploded View, pages 2 and 3, for more information.

How the Automatic Slack Adjuster Works

Meritor's automatic slack adjuster automatically adjusts the clearance between the brake lining and the brake drum (rotor). When linings wear, this clearance increases and causes the chamber push rod to move a greater distance to apply the brakes.

When you install an automatic slack adjuster, you set the brake chamber stroke measurement, which is the correct clearance between the linings and drum (rotor). **Figure 1.1.**

During operation, if the chamber stroke exceeds the design limit, the automatic slack adjuster will automatically adjust the push rod's return stroke to control clearance between the lining and drum (rotor) and reset the stroke to the correct length.



Pressed-In, Sealed Actuator Boot on Meritor Automatic Slack Adjusters Manufactured from July 1998

A pressed-in, sealed actuator boot is standard equipment on Meritor automatic slack adjusters manufactured from July 1998.

The boot features a metal retaining ring with additional material that extends beyond the base of the retainer and forms a seal once the boot is pressed into the slack adjuster body.

- Meritor part numbers will not change.
- All application information is printed on the slack adjuster's identification tag.
- A counterbore is machined into the slack body for easier installation of the press-in boot.

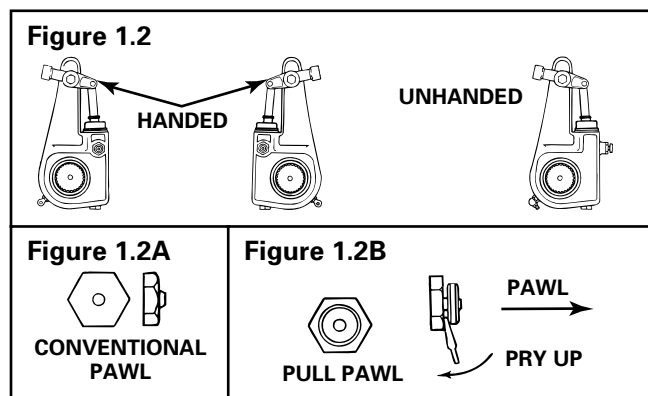
Factory-Installed Automatic Slack Adjusters on Q PlusTM LX500 and MX500 Cam Brake Packages

Q PlusTM LX500 and MX500 brake packages include factory-installed automatic slack adjusters that do not have grease fittings, and lubrication intervals differ from conventional slack adjusters. Refer to Maintenance Manual MM-96173, *Q PlusTM LX500 and MX500 Cam Brakes*, for complete information. Call Meritor's Customer Service Center at 800-535-5560 to order this publication.

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 1.2.**



Pull Pawls

Pull pawls are spring loaded. Pry the pull pawl at least 1/32-inch to disengage the teeth. **Figure 1.2B**. 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 1.2A** and **Figure 1.2B**. Install the slack adjuster so that you can remove the conventional pawl or disengage the pull pawl when you adjust the brake.

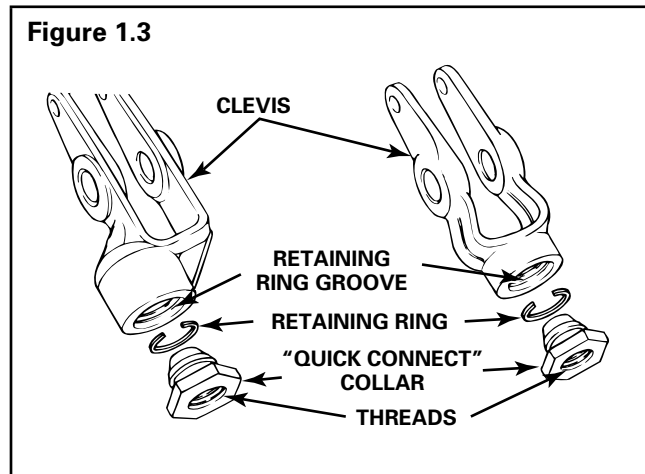
Clevis Types and Thread Sizes

NOTE: 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 brake system performance.

"Quick Connect" Clevis

Some models of Meritor's automatic slack adjuster have a "Quick Connect" clevis. **Figure 1.3**.

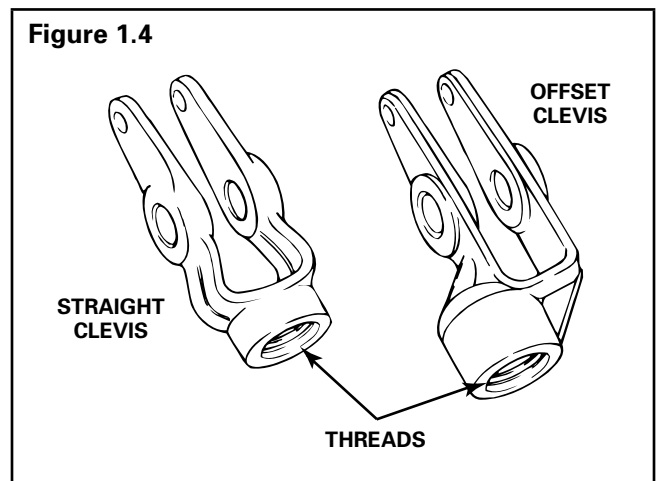
- A "Quick Connect" clevis is a three-piece assembly that cannot be separated after it is assembled.
- The collar has a threaded hole for the push rod.
- A "Quick Connect" clevis can be straight or offset. Use an offset clevis when more clearance is necessary between the air chamber and the tire on the front axle.



One-Piece Threaded Clevis

Most of Meritor's automatic slack adjusters, including the factory-installed slack adjusters on the new Q PlusTM LX500 and MX500 cam brakes, have a one-piece threaded clevis.

- The clevis has a threaded hole for the push rod. **Figure 1.4**.
- The one-piece threaded clevis can be straight or offset.
- All service replacement automatic slack adjusters have one-piece threaded clevises.



Thread Sizes

Straight and offset clevises are available in two thread sizes (including metric threads) to match push rod threads.

Table A: Thread Sizes

Chambers	Thread Sizes
9, 12, 16	1/2"-20 UNF
20, 24, 30, 36	5/8"-18 UNF

Section 2

Remove the Slack Adjuster from the Camshaft



Removal

WARNING

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

WARNING

When you work on a spring chamber, carefully follow the service instructions of the chamber manufacturer. Sudden release of a compressed spring can cause serious personal injury.

WARNING

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 can result.

1. 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.
2. 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.

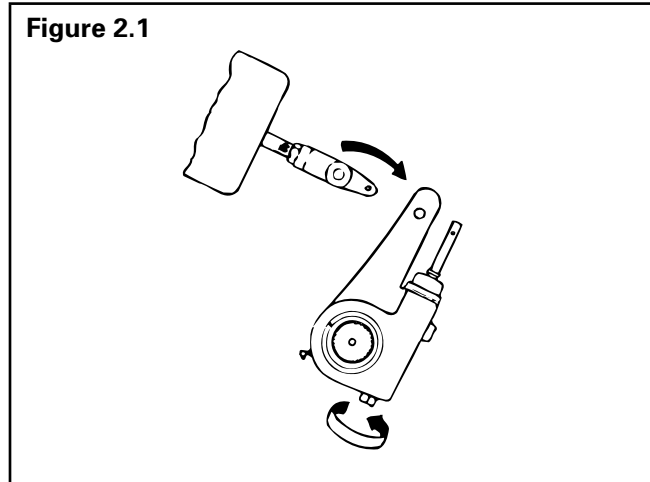
3. Remove both clevis pins.
4. **Remove a conventional pawl or disengage a pull pawl:** Use a screwdriver or equivalent tool to lift the button of a pull pawl assembly at least 1/32-inch from the actuator.

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.

5. Use a wrench to turn the manual adjusting nut in the direction shown in **Figure 2.1**. Move the slack adjuster away from the clevis.

Figure 2.1



6. Remove the snap ring and washers from the camshaft. Remove the slack adjuster from the camshaft.
7. Remove the clevis from the push rod if the gap between the clevis and the collar of a "Quick Connect" clevis exceeds 0.060-inch (1.52 mm). You do not have to remove the clevis if it is in good condition.

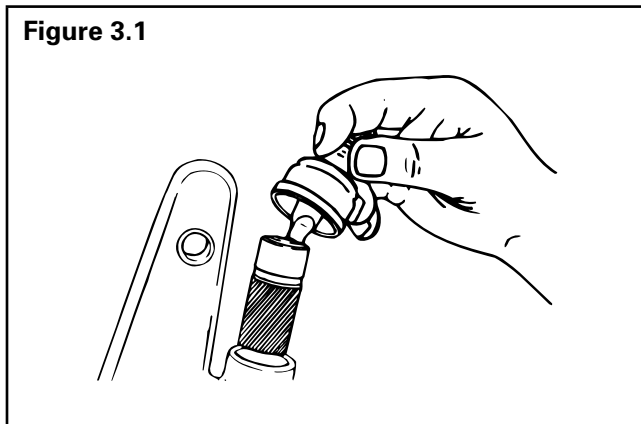
Disassembly

WARNING

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

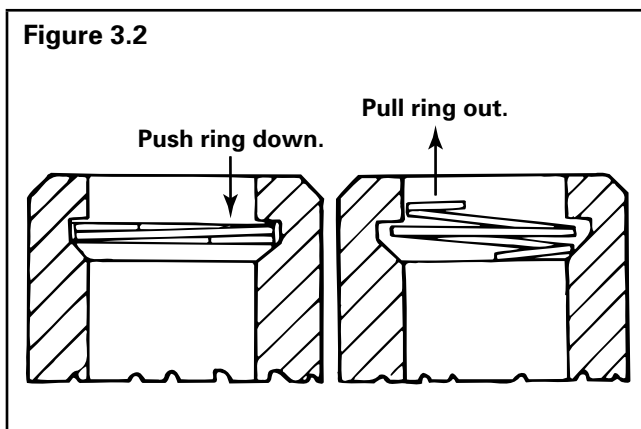
1. Cut the clamp and remove it from the boot. Use a new clamp and boot when you assemble the slack adjuster.
2. Remove the boot from the housing. Pull the actuator assembly from the housing. **Figure 3.1.**

Figure 3.1



3. Use a small screwdriver to push down on one side of the piston retaining ring to force the ring out of the groove. **Figure 3.2.**
4. Extend the coils of the ring.
5. Use pliers to unwind the ring and pull it out of the groove. **Figure 3.2.**

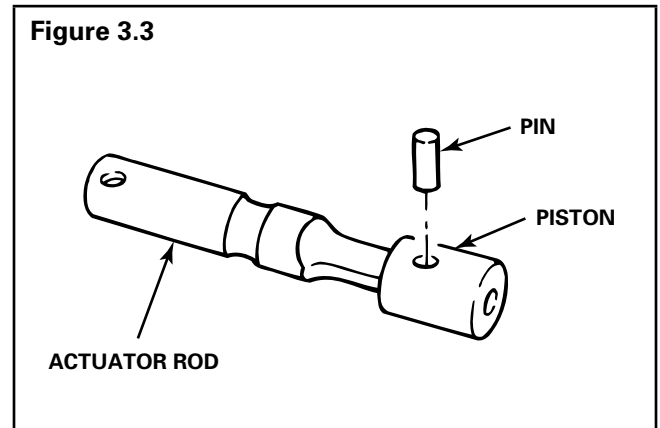
Figure 3.2



6. Use a new ring when you assemble the slack adjuster.
7. Pull the actuator rod, piston and pin from the actuator.

8. Remove the pin from the rod and piston, if necessary. **Figure 3.3.**

Figure 3.3



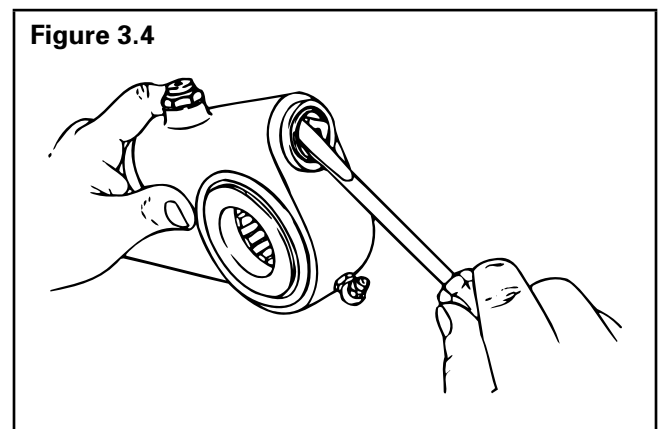
NOTE: You do not have to remove the slack adjuster arm bushing unless it is worn or "egg-shaped."

9. Inspect the condition and fit of the slack adjuster arm bushing.
10. If necessary, install a new bushing onto the clevis pin. Use the clevis pin and mallet to drive out the old bushing while you drive in the new bushing.

NOTE: Steps 11 through 21 apply only to automatic slack adjusters manufactured **BEFORE** January 1993. The gear set and seals are not serviceable on automatic slack adjusters manufactured **AFTER** January 1993. Refer to the exploded views on pages 2 and 3 of this manual for more information.

11. Use a small screwdriver to remove the grease seal from around the worm bore. **Figure 3.4.** Discard the seal. Use a new seal when you assemble the slack adjuster.

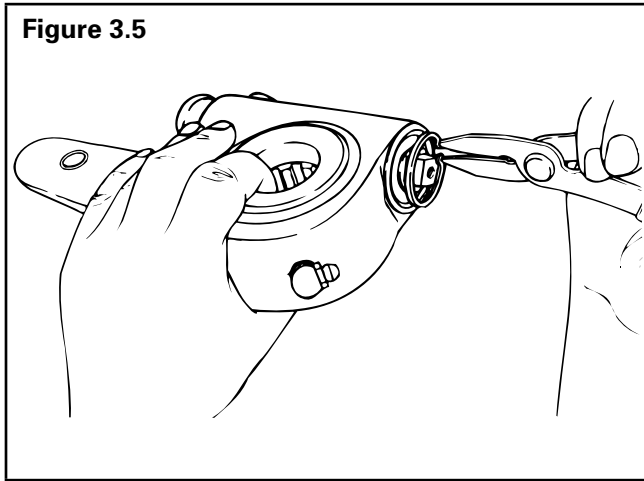
Figure 3.4



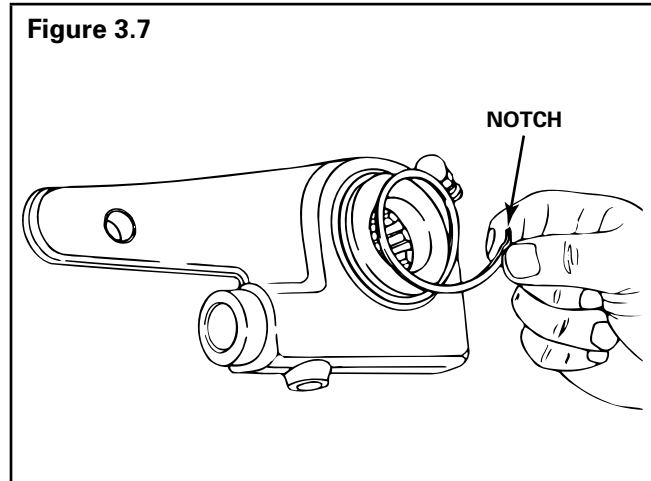
Section 3 Disassembly



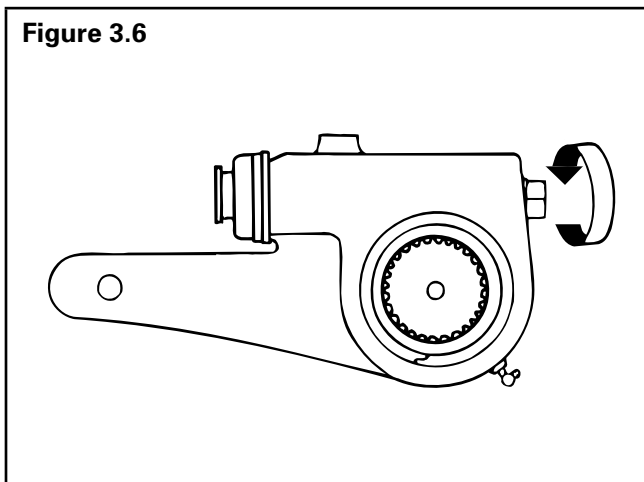
12. Use snap ring pliers to remove the retaining ring from the worm bore. **Figure 3.5.**



17. Unwind the ring by hand and pull it out of the groove. **Figure 3.7.**



13. Use a wrench to turn the manual adjusting nut and wind the worm out of the bore. **Figure 3.6.**



18. Remove the thrust washer.

CAUTION

Push one seal out of one side of the slack adjuster housing and the other seal out of the other side of the housing to avoid damaging the seals.

19. Push the gear out of the housing only far enough to enable you to remove one gear seal.
20. Push the gear out of the opposite side of the housing and remove the other seal.
21. Inspect the seals. Discard damaged seals.

14. Remove the retaining rings and thrust washers from both sides of the gear.
15. Fit a small screwdriver into the notch at the end of the retaining ring.
16. Remove the end of the retaining ring from the groove.

Prepare Parts for Assembly

 **WARNING**

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

 **WARNING**

Solvent cleaners can be flammable, poisonous and cause burns. Examples of solvent cleaners are carbon tetrachloride, emulsion-type cleaners and petroleum-based cleaners. To avoid serious personal injury when you use solvent cleaners, you must carefully follow the manufacturer's product instructions and these procedures:

- *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. Follow the manufacturer's instructions carefully.*

 **CAUTION**

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

 **CAUTION**

Only use solvent cleaners on metal parts. Damage to parts will result.

Clean Parts

1. Use solvent cleaners to clean all automatic slack adjuster parts that have ground or polished surfaces; for example, the gear, the worm and the inner bores of the housing.
2. Use soap and water to clean non-metal parts.
3. Use soft paper or cloth that is free from dirt, oil or abrasives to dry the parts completely.

Dry Parts After Cleaning

Dry the parts immediately after cleaning. Dry parts with clean paper or rags, or compressed air.

Inspect Parts

1. You must carefully inspect all slack adjuster parts, including pawl teeth, for wear and damage before you assemble the slack adjuster.
2. Replace any part that is worn or damaged.

Corrosion Protection

NOTE: Parts must be clean and dry before you lubricate them.

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.

Automatic Slack Adjusters

 **CAUTION**

Always replace used clevis pin retainer clips with new ones when servicing the automatic slack adjuster or chamber. Do not reuse clevis pin retainer clips after removing them. Discard used clips. When removed for maintenance or service, clevis pin retainer clips can be bent or "gapped apart" and can lose retention. Damage to components can result.

Check the clevis pins and the bushing in the arm of the slack adjuster. Replace the pins if they are worn. Replace the bushing if its diameter exceeds 0.531-inch (13.5 mm).

Section 5 Assembly



Assembly

WARNING

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

NOTE: Steps 3 through 11 apply only to automatic slack adjusters manufactured **BEFORE** January 1993. The gear set and seals are not serviceable on automatic slack adjusters manufactured **AFTER** January 1993. If you are working on a current model, skip to Step 10.

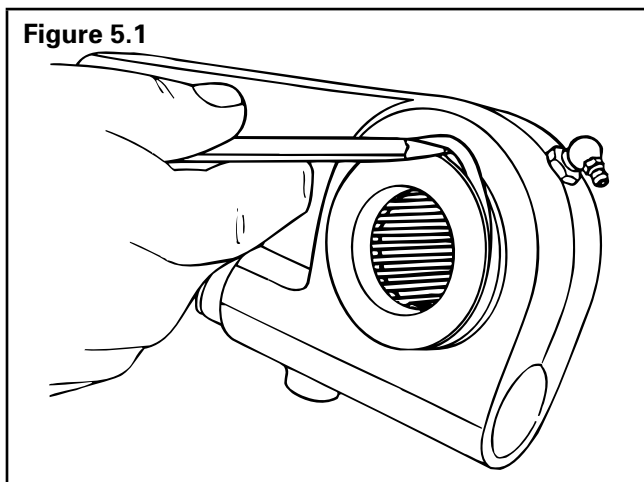
Refer to exploded view in the front of this manual for more information.

1. Remove any corrosion-preventive material that may have been applied to the parts you will assemble.
2. Use grease to lubricate the gear bore in the housing.

CAUTION

Follow Steps 3, 4 and 5 exactly when you install the seals so that the sharp edges of the worm bore will not damage the seals.

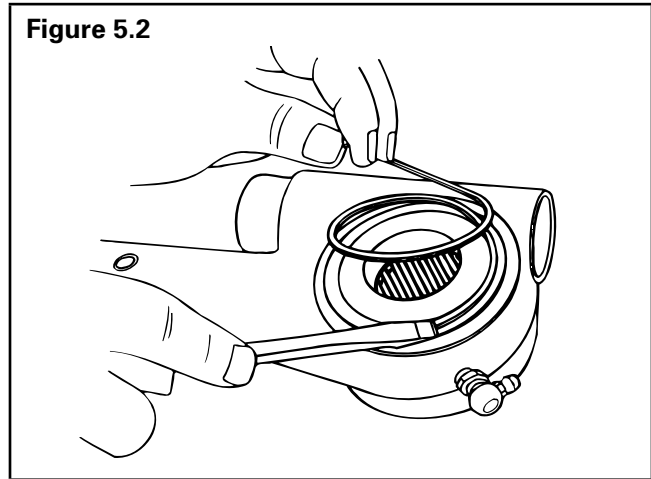
3. Install the gear straight into the bore in the housing without the seals, keeping one seal groove outside of the housing.
4. Install a seal into the groove. **Figure 5.1.**



5. Lubricate the seal with grease that meets Meritor's specifications. Compress the seal in its groove. Push the gear into the housing.

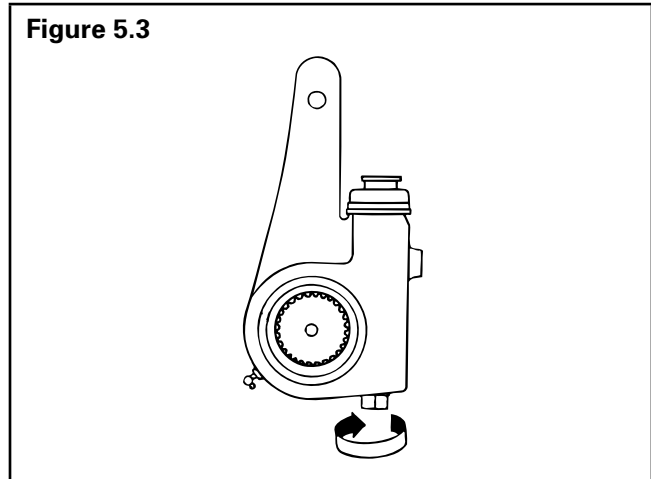
6. Push the gear out of the opposite side of the housing only until the other seal groove is visible. Repeat Steps 4 and 5 to install the second seal.
7. Lubricate a thrust washer with grease that meets Meritor's specifications. Refer to Section 10. Install the washer around the gear.
8. Expand the retaining ring coil. Install one end of the coil into the groove in the outer diameter of the gear. Work around the gear and press the coil into the groove. **Figure 5.2.**

Figure 5.2



9. Repeat Steps 7 and 8 for the opposite side of the gear.
10. Install the worm into the bore. Turn the adjusting nut to wind the worm completely into the bore. **Figure 5.3.**

Figure 5.3



- Use snap ring pliers to install the retaining ring into the worm bore.

CAUTION

*Install the seal with the lips **OUTSIDE** of the bore and the metal retainer **INSIDE** of the bore to prevent contamination from entering the slack adjuster housing. Damage to components can result. Figure 5.4.*

CAUTION

Do not hit the seal after it reaches the bottom of the bore. Damage to seal will result.

- Place the seal directly over the worm bore. Use a hammer and 1-3/16-inch (30.2 mm) diameter seal driver to install the seal straight into the bore. Figure 5.5.

Figure 5.4

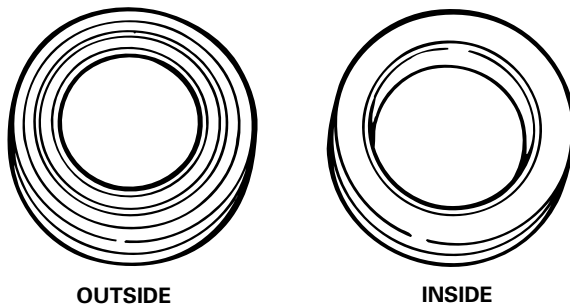
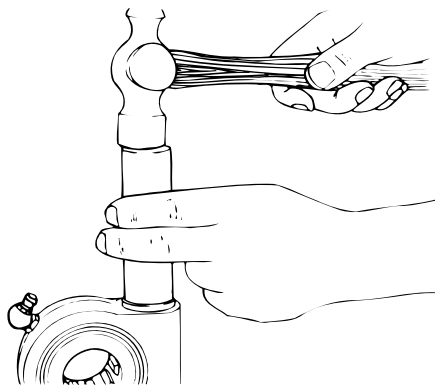
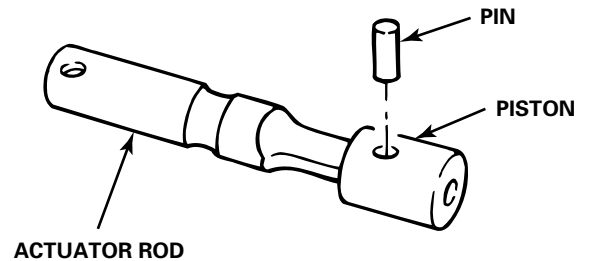


Figure 5.5



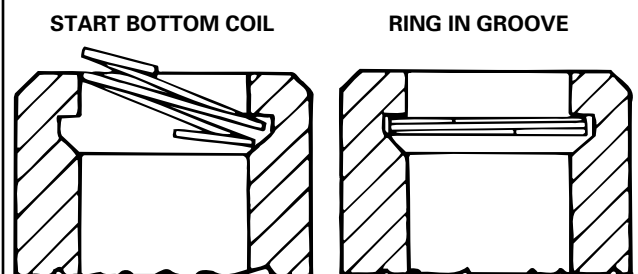
- If you removed the pin, install it into the rod and piston. Figure 5.6.

Figure 5.6



- Install the actuator rod and piston assembly into the actuator (adjusting sleeve).
- Slide the piston retaining ring over the rod.
- Extend the coils of the ring.
- Use a small screwdriver to press one end of the ring into the groove. Figure 5.7.

Figure 5.7




- Keep the coil extended. Press on the ring and work around the groove until the ring is in the groove completely.
- Check to ensure that the ring is installed correctly in the groove. You cannot pull the piston out of the actuator if the retaining ring is installed correctly.

Section 5 Assembly



20. Install the actuator assembly into the housing so that the actuator slides along the worm splines.
21. Slip the boot over the actuator rod.

NOTE: Do not seal the boot to the tapered part of the actuator rod.

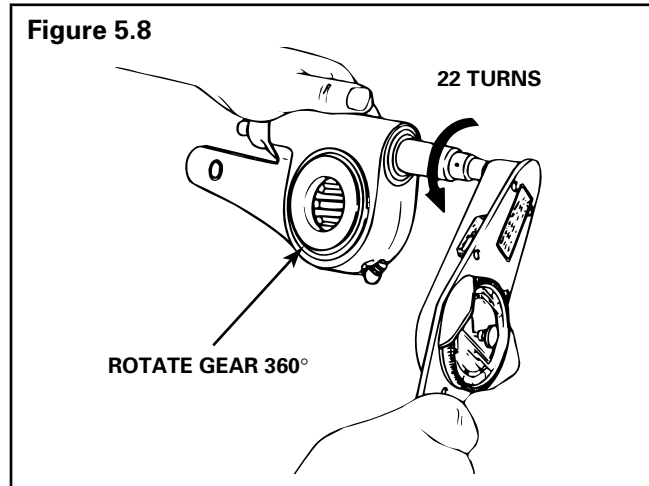
- **If the rod has a groove:** The top of the boot must fit into the groove.
 - **If the rod does not have a groove:** Use silicone sealant to seal the top of the boot to the round part of the rod.
22. Fasten the bottom of the boot to the housing with a retaining clamp.
 23. **Conventional Pawl:** Install the pawl assembly into the housing. Tighten the capscrew to a torque of 15-20 lb-ft (20-27 N•m). 
 24. **Pull Pawl:** Remove the screwdriver or equivalent tool. The pull pawl will re-engage automatically.
 25. Use a grease gun to lubricate the slack adjuster through the grease fitting. If necessary, install a camshaft into the slack adjuster gear to minimize grease flow through the gear holes.
 26. Apply lubrication that meets Meritor's specifications until new grease purges from around the camshaft splines and from the pawl assembly. Refer to Section 10.


CAUTION

In Step 28 turn the adjusting nut only in the direction shown in Figure 5.8. If you turn the adjusting nut in the opposite direction while the pawl is installed, you will damage pawl teeth. Damaged teeth prevent automatic adjustment. Replace damaged pawls before putting the vehicle in service.

27. Use a torque wrench that measures lb-in.

28. As you turn the adjusting nut in the direction shown in **Figure 5.8**, read the torque scale and rotate the gear 360 degrees (22 turns of the wrench).



29. The torque value must remain less than 25 lb-in (2.83 N•m) during the complete 360-degree rotation of the gear. 
30. **If the torque value remains less than 25 lb-in (2.8 N•m):** The slack adjuster is working correctly.
31. **If the torque value exceeds 25 lb-in (2.8 N•m):** The slack adjuster is not working correctly. Disassemble the slack adjuster.
 - Check that the slack adjuster is assembled correctly.
 - Check that parts are aligned correctly.

Installing the Slack Adjuster Onto the Camshaft

 **WARNING**

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

 **WARNING**

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 can result.

1. Check the camshaft and bushings and seals for wear and corrosion.
2. Turn the camshaft by hand to check for smooth operation.
3. Repair or replace parts as required.
4. Apply the service brake and spring brake several times. Check that the chamber return spring retracts the push rod quickly and completely. If necessary, replace the return spring or the air chamber.
5. The new automatic slack adjuster must be the same length as the one you are replacing. **Table B** below shows the length of slack adjuster that is used with each brake chamber size.
6. Place blocks in front of and behind the vehicle's wheels to prevent it from moving.

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
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**

When you work on a spring chamber, carefully follow the service instructions of the chamber manufacturer. Sudden release of a compressed spring can cause serious personal injury.

7. If the brake has a spring brake, compress and lock the spring to completely release the brake. No air pressure must remain in the service half of the air chamber.

 **CAUTION**

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

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

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

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

Section 6

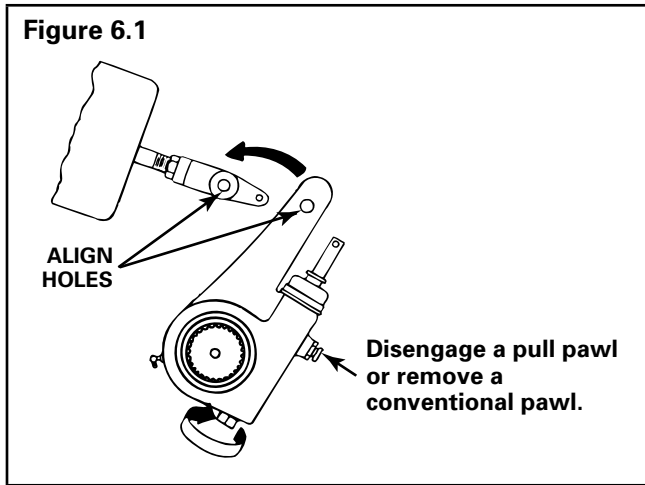
Install the Slack Adjuster Onto the Camshaft



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.

- 12. Disengage the pawl. Turn the manual adjusting nut to align the holes in the slack adjuster arm and the clevis. **Figure 6.1.**




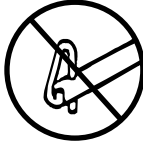



- 13. **If the slack adjuster has a welded clevis:** Apply anti-seize compound to the two clevis pins. Install the clevis pins through the clevis and the slack adjuster.
- 14. **If the slack adjuster has a threaded clevis:** Refer to Section 7.

CAUTION

Always replace used clevis pin retainer clips with new ones when servicing the automatic slack adjuster or chamber. Do not reuse clevis pin retainer clips after removing them. Discard used clips. When removed for maintenance or service, clevis pin retainer clips can be bent or "gapped apart" and can lose retention. Damage to components can result.

- 15. Install new clevis pin retainer clips to hold the clevis in place. **Figure 6.2.**

Figure 6.2	
	 LARGE CLEVIS PIN RETAINER CLIP P/N 2257-D-1174
	 SMALL CLEVIS PIN RETAINER CLIP P/N 2257-C-1173
	
The clevis pin retainer clips must be fully installed and positioned around the SIDE of clevis pin.	

Check Brake Chamber Push Rod Stroke and Adjust the Clevis Position

⚠ WARNING

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

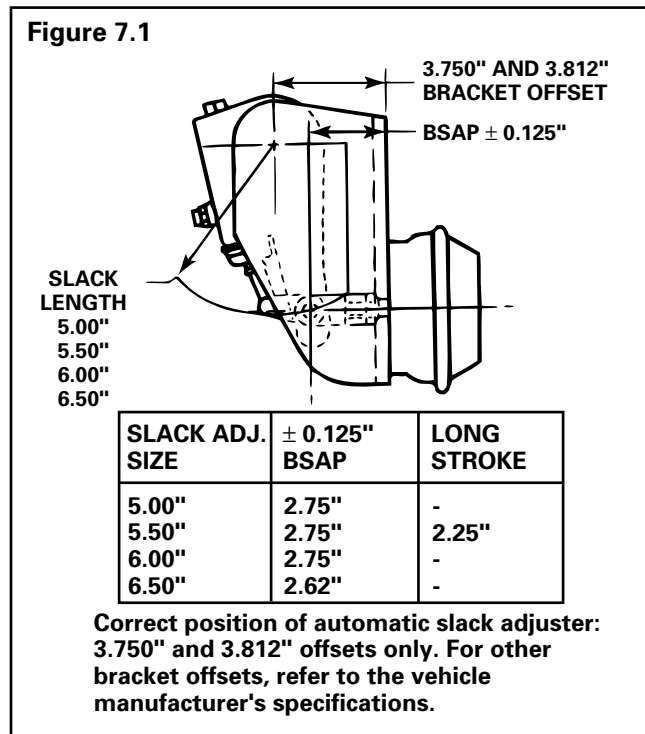
NOTE: You cannot adjust the clevis position on a chamber push rod that is equipped with a welded clevis.

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.
- Meritor's automatic slack adjuster template method for **standard stroke chambers only**.

Brake Slack Adjuster Position (BSAP) Method

When installing the automatic slack adjuster, verify that the BSAP dimension of the chamber matches the table in **Figure 7.1**.



Automatic Slack Adjuster Templates

Order the correct automatic slack adjuster template from Meritor's Customer Service Center at 800-535-5560.

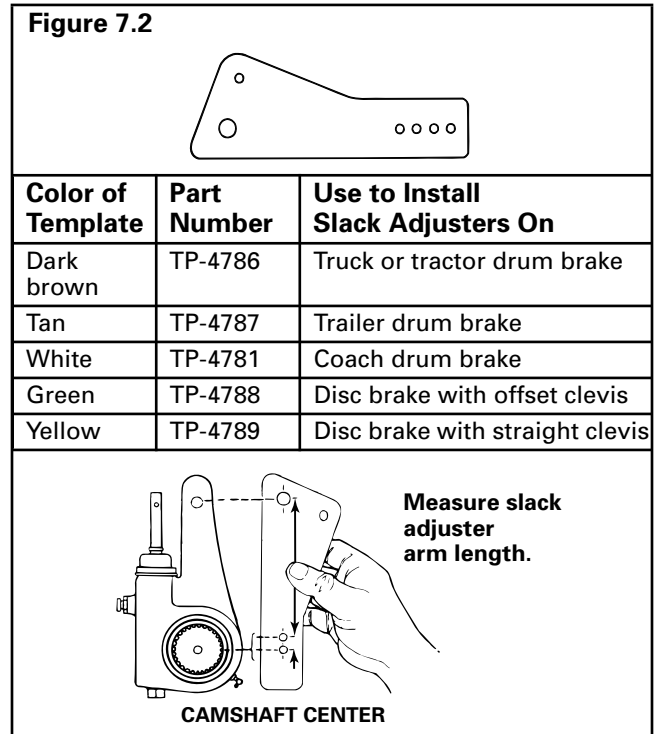
⚠ CAUTION

There are five different installation templates for Meritor automatic slack adjusters (Figure 7.2). 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.

Measure the Slack Adjuster

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

1. 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 7.2**.



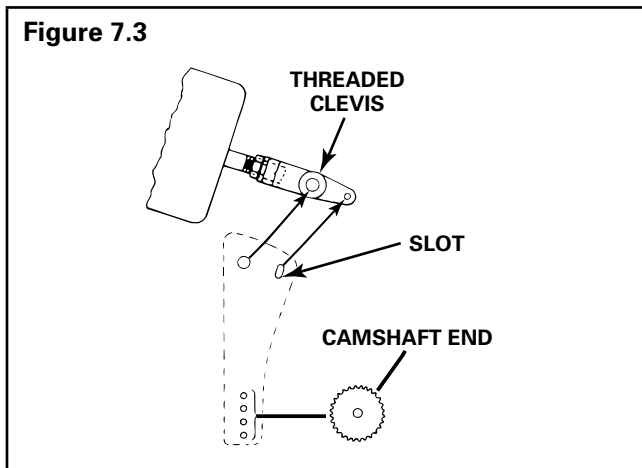
Section 7

Adjust the Brakes



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. If necessary, adjust the position of the clevis until the small hole in the clevis is completely visible through the template slot. **Figure 7.3.**



4. Check for these specifications:
 - Thread engagement between the clevis and the push rod must be at least 1/2-inch (12.7 mm). **Figure 7.4.**
 - The push rod must not extend through the clevis more than 1/8-inch (3.18 mm). If necessary, cut the push rod, or install a new push rod with a new air chamber.
5. Tighten the jam nut against the clevis to torque specifications in **Table C.**

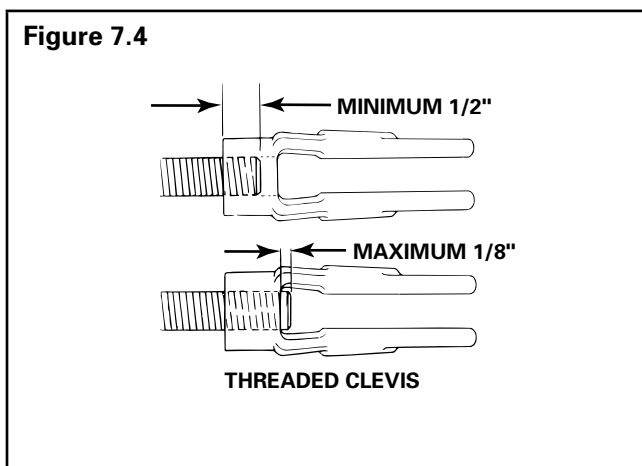


Table C: Jam Nut Torque Specifications

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

Free Stroke Measurement

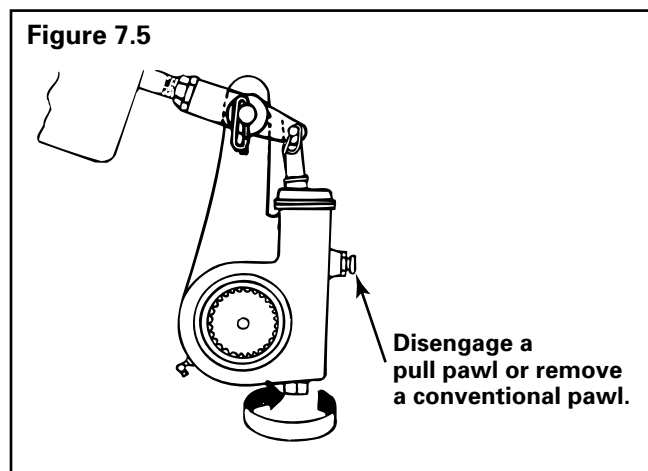


CAUTION
You must disengage a pull pawl or remove a conventional pawl before rotating the manual adjusting nut, or you will damage the pawl teeth. A damaged pawl will not allow the slack adjuster to automatically adjust brake clearance. Replace damaged pawls before putting the vehicle in service.

NOTE: During preventive maintenance on an in-service brake, check both the free stroke as described below and the adjusted chamber stroke as described in Section 9.

On some applications, you may find the in-service free stroke to be slightly longer than specified in Step 5. However, this is not necessarily a concern, as long as the adjusted chamber stroke is within the limits shown in the Commercial Vehicle Safety Alliance (CVSA) charts on page 20.

1. Disengage a pull pawl or remove a conventional pawl.
2. Turn the adjusting nut in the direction shown in **Figure 7.5** until the linings touch the drum, and then turn the adjusting nut in the opposite direction:
 - 1/2 turn for drum brakes
 - 3/4 turn for disc brakes

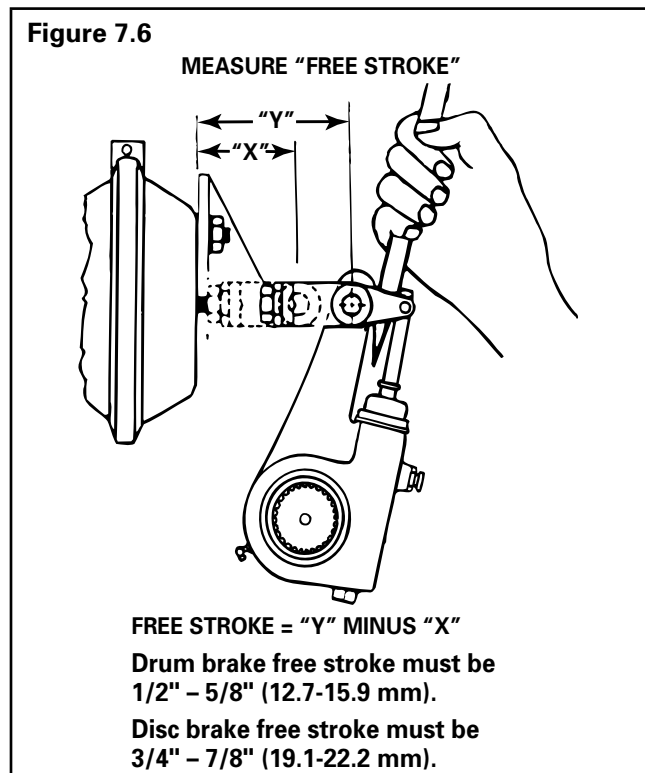


3. Measure the distance from the center of the large clevis pin to the bottom of the air chamber while the brake is released. Refer to "X" in Figure 7.6.
4. Use a pry bar to move the slack adjuster so that the linings are against the drum (applying the brakes). Measure the same distance again while the brakes are applied. Refer to "Y" in Figure 7.6.

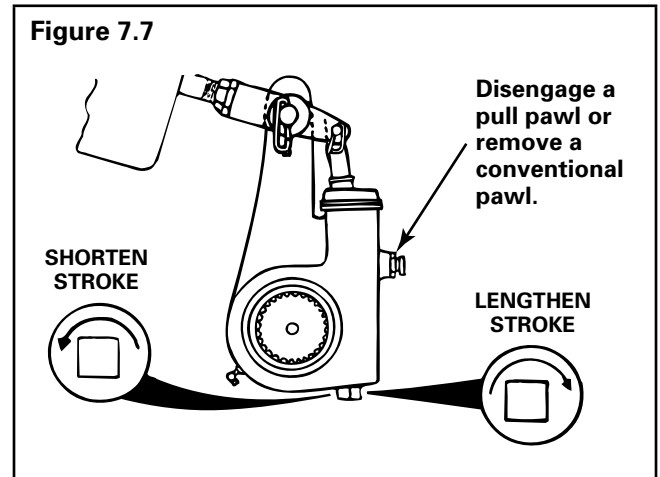
CAUTION

Do not set free stroke shorter than specifications. If free stroke is too short, linings can drag and damage the brake.

5. The difference between measurement "X" and measurement "Y" is the free stroke, which sets the clearance between the linings and drum. Free stroke must be within the following specifications. Figure 7.6.
 - Drum Brakes:
1/2-inch – 5/8-inch (12.7-15.9 mm)
 - Disc Brakes:
3/4-inch – 7/8-inch (19.1-22.2 mm)



6. If it is necessary to adjust the stroke, turn the adjusting nut 1/8 turn in the direction shown in Figure 7.7 and check the stroke again. Continue to measure and adjust the stroke until it is adjusted correctly.
7. Release a pull pawl or install a conventional pawl.



WARNING




When you work on a spring chamber, carefully follow the service instructions of the chamber manufacturer. Sudden release of a compressed spring can cause serious personal injury.

8. If the brake has spring chambers, carefully release the spring.
9. Test the vehicle to ensure that the brake system is operating correctly before you return the vehicle to service.

Section 8

Diagnostics



Symptoms	Possible Causes	Corrective Actions
Adjusted stroke is too long. No adjustment.	The slack adjuster part number is incorrect.	Check with WD or OEM.
	The clevis angle is incorrect.	Use correct template or BSAP setting to install clevis correctly.
	Excessive wear exists between the clevis and collar (more than 0.060" [1.52 mm]).	Replace with threaded clevis.
	The jam nut at the clevis is loose.	Tighten to specification. 
	There is a worn clevis pin bushing in slack arm (ID larger than 0.53" [13.46 mm]).	Replace bushing.
	There is a weak or damaged air chamber spring. Spring force must be at least 32 lb (142.4 N) at first push rod movement.	Replace return spring or air chamber.
	The spring brake does not retract fully.	Repair or replace spring brake.
	There are worn or damaged teeth on the pawl or actuator.	Replace pawl or actuator.
	High torque is required to rotate worm when slack is removed from vehicle. In service slack maximum worm torque: 45 lb-in (5.09 N•m)  New or rebuilt slack maximum worm torque: 25 lb-in (2.83 N•m) 	Rebuild or replace slack adjuster.
	Excessive looseness exists between the splines of the camshaft and the slack adjuster gear.	Replace powershaft, gear or automatic slack adjuster as needed.
A cam brake has worn components (cam bushing, for example).	Replace components.	
Adjusted stroke is too short. Linings drag.	OEM replacement linings are not installed. Linings exhibit excessive swell or growth.	Use Meritor-approved linings.
	The slack adjuster part number is incorrect.	Check with WD or OEM.
	The clevis angle is incorrect.	Use correct template to install clevis correctly.
	The jam nut at the clevis is loose.	Tighten to specification.
	The spring brake does not retract fully.	Repair or replace spring brake.
	The manual adjustment is incorrect.	Adjust brake. Refer to Section 7.
	Poor contact exists between the linings and the drum. The drum is out-of-round.	Repair or replace drums or linings.
	Brake temperature is not even.	Correct brake balance.

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

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

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

WARNING

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

WARNING

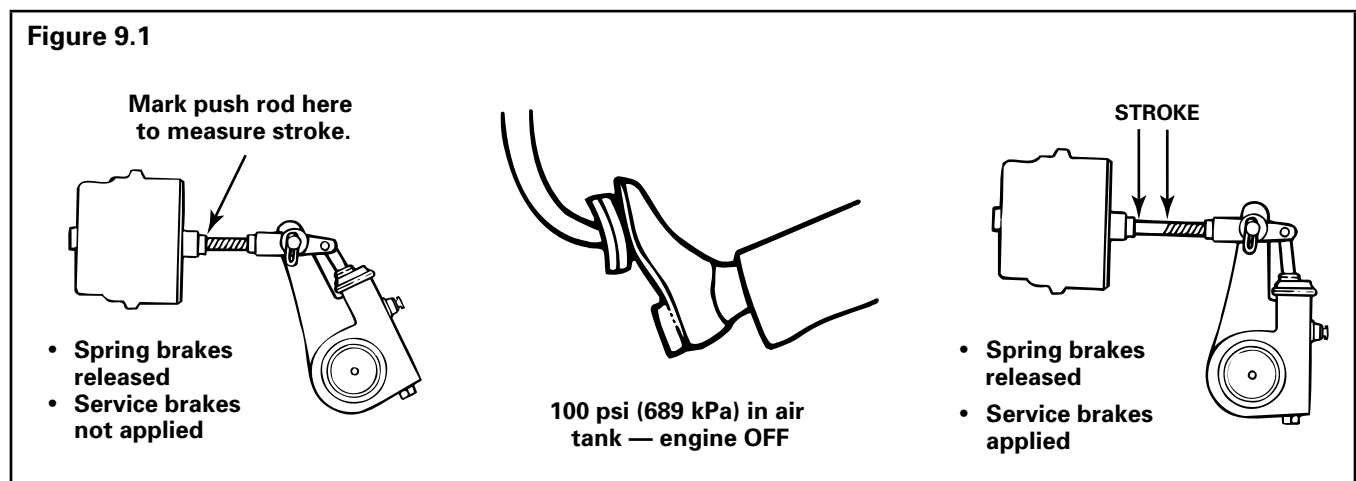
When you work on a spring chamber, carefully follow the service instructions of the chamber manufacturer. Sudden release of a compressed spring can cause serious personal injury.

1. The engine must be **OFF**. If the brake has spring chambers, carefully release the spring.
2. Check the gauges in the cab to ensure that air pressure in the tanks is 100 psi (689 kPa).
3. Determine the size and type of brake chamber you are inspecting.

4. With the brakes released, mark the push rod where it exits the chamber. **Figure 9.1**. Measure and record the distance.
5. Have another person apply and hold the brakes one full application. **Figure 9.1**.
6. Measure push rod travel distance (adjusted chamber stroke) from where the push rod exits the brake chamber to your mark on the push rod. Measure and record the distance. **Figure 9.1**.
7. **To determine push rod travel (adjusted chamber stroke):** Subtract the measurement you obtained in Step 4 from the measurement you obtained in Step 6. The difference is the push rod travel (adjusted chamber stroke).
 - Push rod travel (adjusted chamber stroke) must not be greater than the stroke length shown in the CVSA reference charts for the size and type of air chamber you are inspecting.
 - If push rod travel (adjusted chamber stroke) is greater than the maximum stroke shown in the CVSA reference charts, inspect the slack adjuster and replace it if necessary.

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

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



Section 9

Inspection



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

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

**Table 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	

* For 3" maximum stroke type 24 chambers

**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*	7-7/32	2.5	
30	8-3/32	2.5	

Lubricants

Table F: Conventional 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	

Anti-Seize Compound

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

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

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

Q PlusTM LX500 and MX500 cam brake packages include factory-installed automatic slack adjusters that do not have grease fittings, and lubrication intervals differ from conventional slack adjusters.

Refer to Maintenance Manual No. MM-96173, *Q PlusTM LX500 and MX500 Cam Brakes*, for complete information. Order this publication by calling Meritor's Customer Service Center at 800-535-5560.

Maintenance

Inspections and Lubrication

Inspect and lubricate the slack adjuster according to one of the following schedules. Use the schedule that gives the most frequent inspection and lubrication. Also inspect and lubricate the slack adjuster whenever you reline the brakes.

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

Section 10

Lubrication and Maintenance



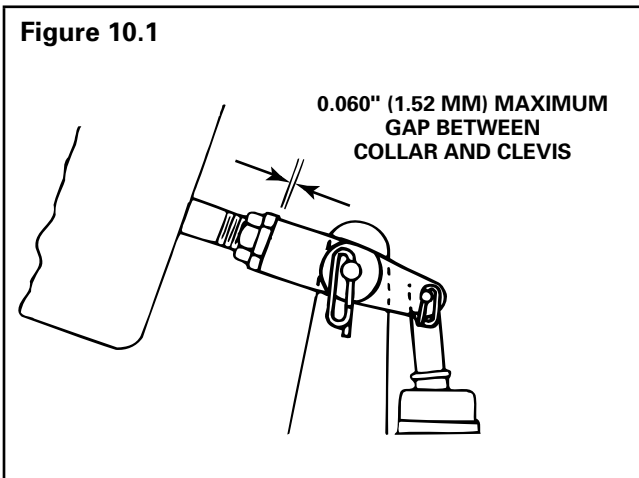
At Brake Reline

1. Before you perform brake maintenance, check the free stroke and the adjusted chamber stroke as described in Section 7.
2. If the free stroke is not correct, refer to the Diagnostics table on page 18 to correct the stroke before you adjust the chamber stroke.
3. Inspect the boot for cuts or other damage. If the boot is cut or damaged, remove the pawl and inspect the grease.
4. If the grease is in good condition, replace the damaged boot with a new boot.
5. Use a grease gun to lubricate the slack adjuster through the grease fitting. If necessary, install a camshaft into the slack adjuster gear to minimize grease flow through the gear holes.
6. Lubricate until new grease purges from around the inboard camshaft splines and from the pawl assembly.
7. Measure the gap between the clevis and the collar on a "Quick Connect" clevis. Replace the clevis if the gap exceeds 0.060-inch (1.52 mm). **Figure 10.1.**

Slack Adjusters Manufactured Before 1993

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

Figure 10.1



ArvinMeritorTM
Commercial Vehicle Systems

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Troy, MI 48084 USA
800-535-5560
arvinmeritor.com



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