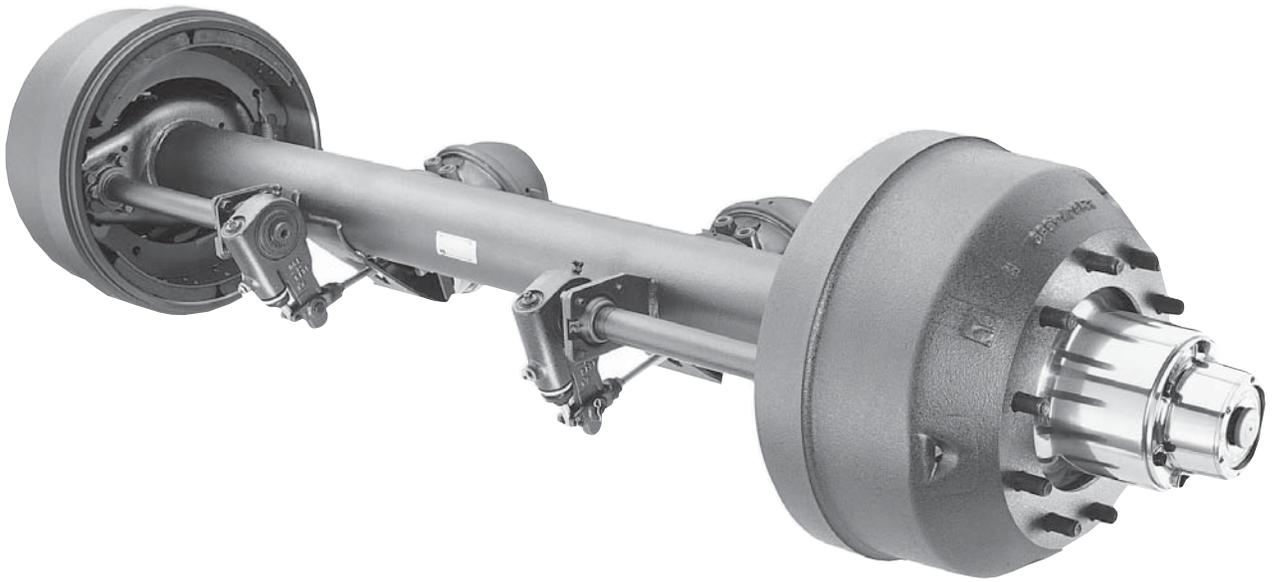


Maintenance Manual 14
Trailer Axles

Revised 11-13



Service Notes

About This Manual

This manual provides maintenance and service information for Meritor trailer axles.

Before You Begin

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

Hazard Alert Messages and Torque Symbols

WARNING

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

CAUTION

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

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

How to Obtain Additional Maintenance, Service and Product Information

Visit Literature on Demand at meritor.com to access and order additional information.

Contact the Meritor OnTrac™ Customer Call Center at 866-668-7221 (United States and Canada); 001-800-889-1834 (Mexico); or email OnTrac@meritor.com

If Tools and Supplies Specified in This Manual

Call Meritor's Commercial Vehicle Aftermarket at 888-725-9355.

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

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ASBESTOS FIBERS WARNING

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

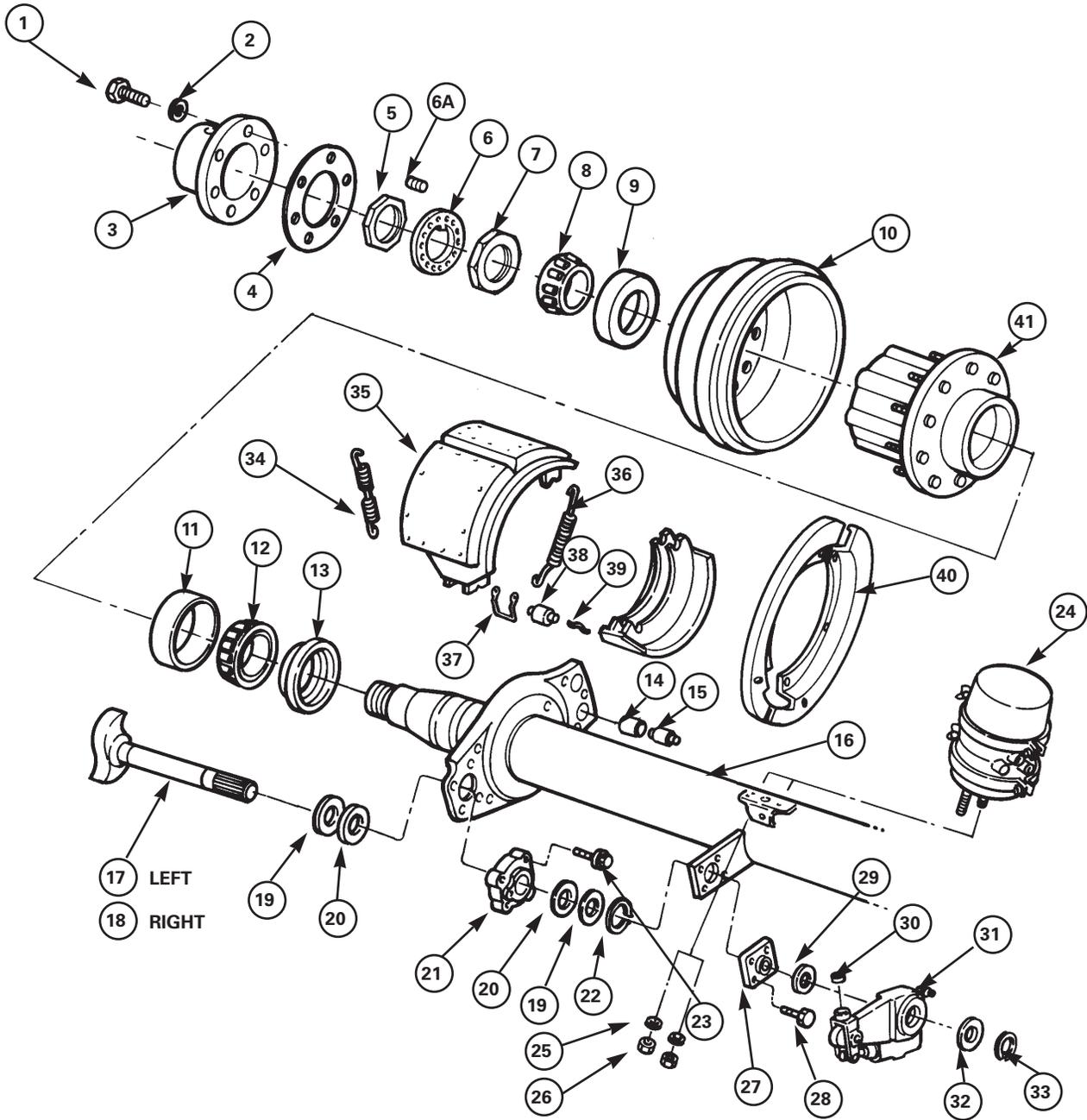
Therefore, wear respiratory protection at all times during brake servicing, beginning with the removal of the wheels. Wear a respirator equipped with a high-efficiency (HEPA) filter approved by NIOSH or MSHA, if the exposure levels may exceed OSHA or manufacturers' recommended maximum levels. Even when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

1 Exploded View

Typical 16.5" x 7" Q Series Brake Installation



4003153a

1 Exploded View

Item	Description
1	Capscrew
2	Lock Washer
3	Hubcap
4	Gasket
5	Wheel Bearing Jam Nut
6	Lock Washer
6A	Set Screw
7	Wheel Bearing Adjusting Nut
8	Outer Wheel Bearing Cone
9	Outer Bearing Cup
10	Brake Drum
11	Inner Bearing Cup
12	Inner Bearing Cone
13	Wheel Bearing Seal
14	Bushing Anchor Pin
15	Pin Anchor
16	Beam Axle
17	Left Camshaft
18	Right Camshaft
19	Washer
20	Seal
21	Bushing
22	Snap Ring
23	Capscrew
24	Air Chamber
25	Lock Washer
26	Locknut
27	Camshaft Bushing Assembly
28	Capscrew
29	Slack Adjuster Washer
30	Slack Adjuster Locknut
31	Automatic Slack Adjuster
32	Slack Adjuster Washer
33	Slack Adjuster Snap Ring
34	Brake Shoe Return Spring

Item	Description
35	Brake Shoe and Lining Assembly
36	Brake Shoe Retaining Spring
37	Brake Shoe Roller Retainer
38	Brake Shoe Roller
39	Shoe Return Spring Pin
40	Dust Shield
41	Hub

2 Introduction

Important Information

Meritor automatic slack adjusters (ASAs) should not need to be manually adjusted in service. ASAs should not have to be adjusted to correct excessive pushrod stroke. The excessive stroke may be an indication that a problem exists with the foundation brake, ASA, brake actuator or other system components.

Meritor recommends troubleshooting the problem, replacing suspect components and then confirming proper brake operation prior to returning the vehicle into service.

In the event that a manual adjustment must be made (although not a common practice), a service appointment and full foundation brake, ASA, and other system component inspection should be conducted as soon as possible to ensure integrity of the overall brake system.

For Meritor brake adjustment, refer to the brake adjustment tables in this manual. For non-Meritor brake adjusters, refer to the brake manufacturer's service procedures.

Description

Axle Models

The maintenance procedures detailed in this manual apply to the following Meritor trailer axles.

- Axles currently in production, such as TN, TP, TQ, TR, TQC, TQD and TRD models. These axle models are available either for installation on new trailers or as service replacement parts.
- Axles no longer in production, such as TK, TKN, RN and RQ models. These axle models are available only as service replacement parts.

About This Manual

The procedures for removal, disassembly, assembly and installation in this manual are for current production Meritor trailer axles equipped with the following components.

- Disc wheel-end equipment
- Q Series cam brakes
- Meritor automatic slack adjusters
- TN and TQ axle spindles with standard retention hardware
- Oil-lubricated wheel ends

Axle Designs

Meritor trailer axles are available in the following designs.

Beam Designs

- Straight beams, such as the TN, TP, TQ and TR models. Figure 2.1.

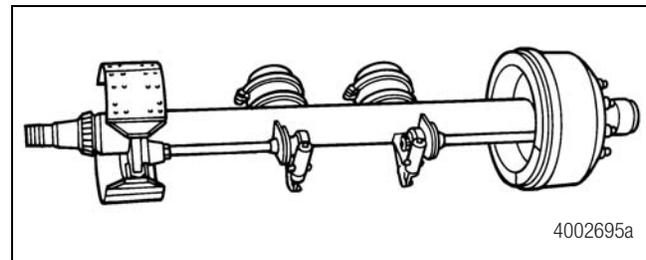


Figure 2.1

- Crank beams, such as the TQC model. Figure 2.2.

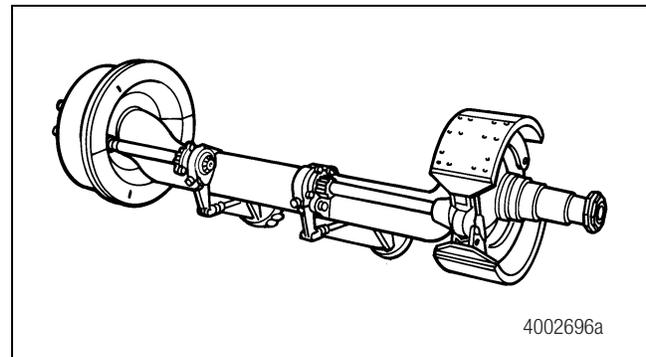


Figure 2.2

- Drop center beams, such as the TQD and TRD models. Figure 2.3.

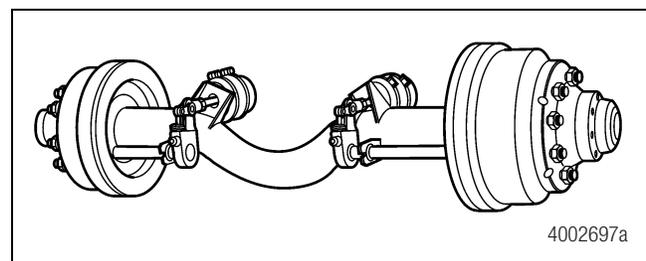


Figure 2.3

Beam Cross Sections

- Round
- Rectangular, available only as service replacement beams

Spindle Designs

- The TN/TQ Series axles use the most common wheel bearings in the trailer industry.
- The TR Series axles use wheel bearings compatible with drive axles.
- The TP Series axles use bearings compatible with Freuhauf axles.
- The TB Series axles use unitized bearings.

Brakes

- Cam — Meritor cam brakes
- Wedge — Meritor Stopmaster® brakes
- Air Disc — Meritor Dura-Master® brakes

Identification

All of the information necessary to identify a particular trailer axle is indicated on the trailer axle identification tag. Located at the center of the axle beam, this ID tag is stamped with the axle model number, serial number and date of manufacture. Figure 2.4.

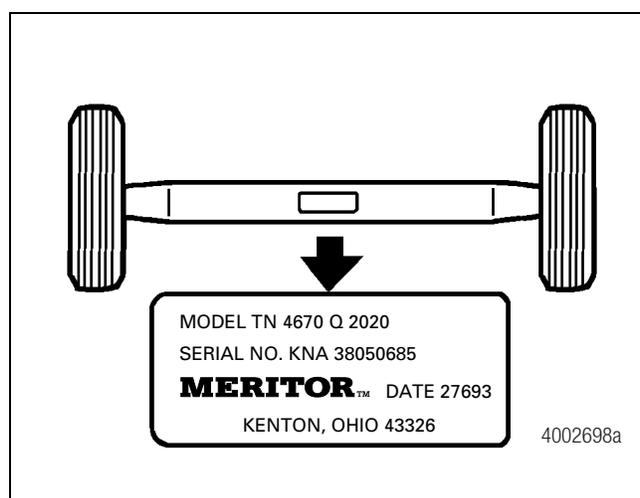


Figure 2.4

The model number is composed of letters and digits; for example, TN-4670-Q-2020. This number is used to identify the axle assembly when obtaining replacement parts.

The serial number is composed of letters and digits; for example, KNA-38050685. This number can be used to identify a particular trailer axle, and the material and components used to build the axle.

The date of manufacture is indicated by a Julian date; for example, 27693. The first three digits (276) indicate the 276th day of the year, or October 3. The last two digits (93) indicate the year, or 1993.

Model Nomenclature

Model numbers for Meritor trailer axles are composed of letters and digits; for example, TQD 4670 Q 52. These letters and digits indicate the weight capacity and type of components installed on the axle. For a more comprehensive list of Meritor current production trailer axle models, refer to TP-8301, Trailer Axle Specifications. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.

Meritor aftermarket model numbers differ from the current production model numbers detailed below. Refer to Parts Catalog PB-8857, Brake, Trailer Axle and Wheel Attaching Parts, for a chart detailing these numbers. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.

2 Introduction

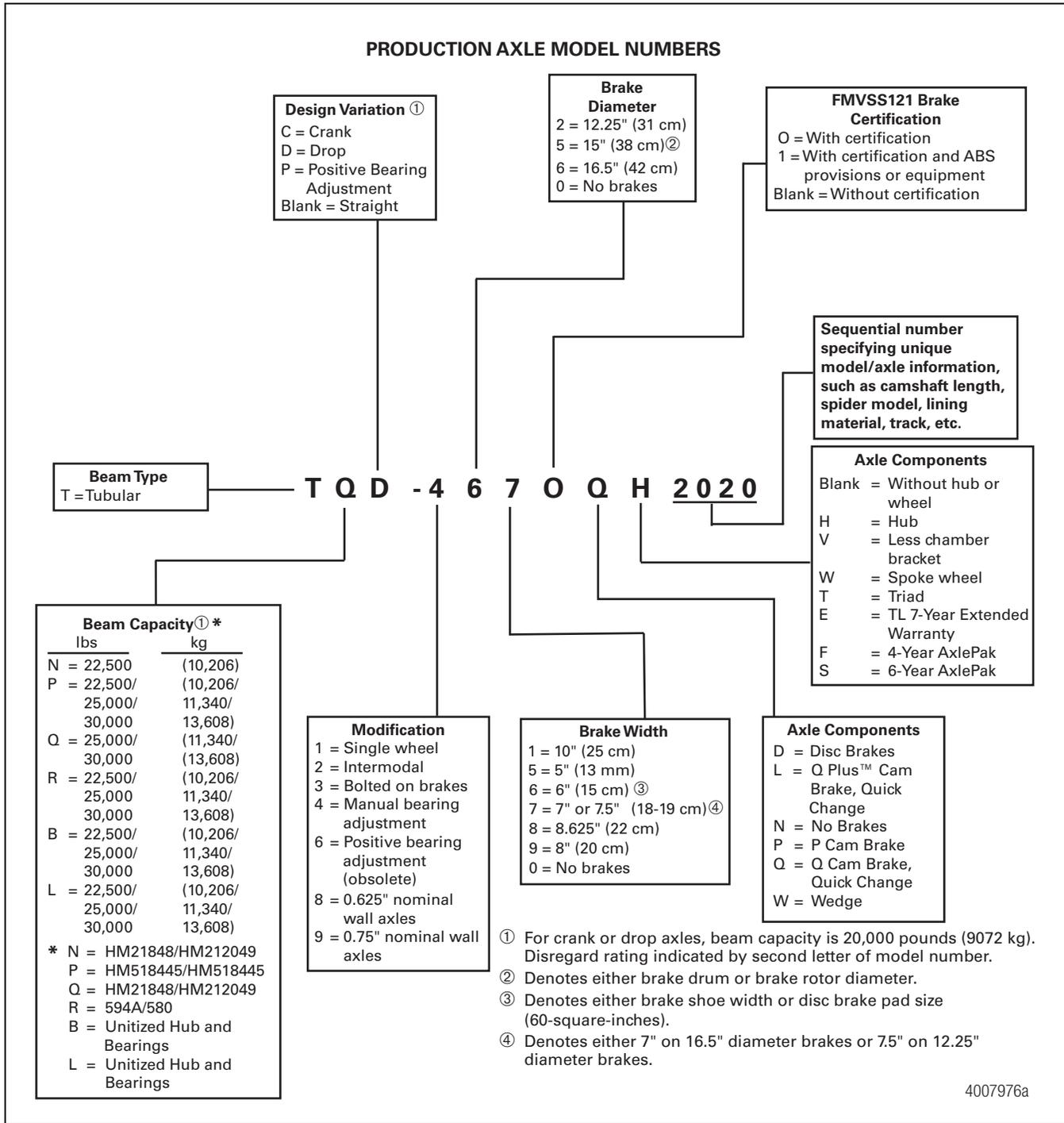


Figure 2.5

Important Information

Meritor automatic slack adjusters (ASAs) should not need to be manually adjusted in service. ASAs should not have to be adjusted to correct excessive pushrod stroke. The excessive stroke may be an indication that a problem exists with the foundation brake, ASA, brake actuator or other system components.

Meritor recommends troubleshooting the problem, replacing suspect components and then confirming proper brake operation prior to returning the vehicle into service.

In the event that a manual adjustment must be made (although not a common practice), a service appointment and full foundation brake, ASA, and other system component inspection should be conducted as soon as possible to ensure integrity of the overall brake system.

For Meritor brake adjustment, refer to the brake adjustment tables in this manual. For non-Meritor brake adjusters, refer to the brake manufacturer's service procedures.

Hazard Alert Messages

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

WARNING

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

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

Removal

Wheel Ends

1. Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving. Set the parking brake.
2. Raise the trailer until the tires are off the floor.
3. Place safety stands under the trailer frame or under each axle spring seat. Figure 3.1.

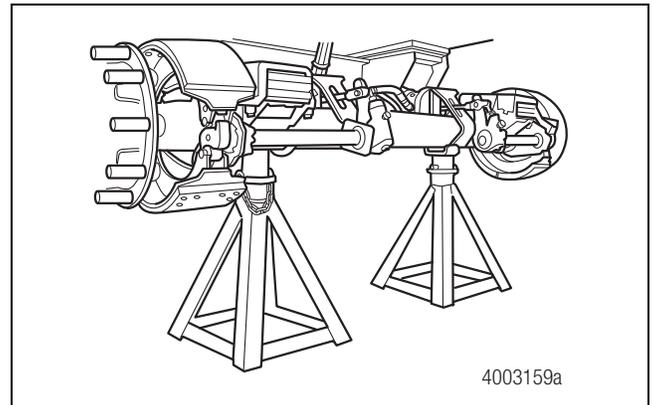


Figure 3.1

4. Remove the tire and wheel assembly, using procedures specified by the wheel manufacturer. Figure 3.2.

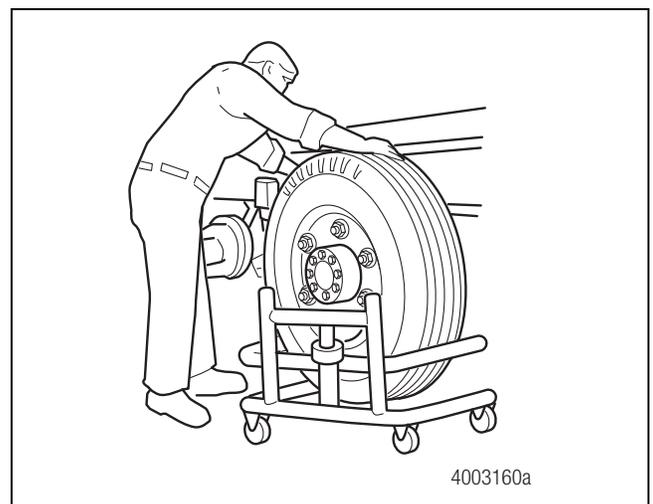


Figure 3.2

WARNING

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

5. If the axle is equipped with spring brake chambers, carefully compress and lock the springs so that they cannot actuate. Figure 3.3.

3 Removal and Disassembly

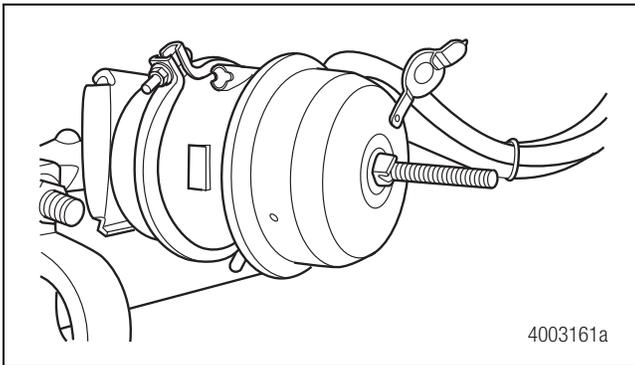


Figure 3.3

6. There are two automatic slack adjuster designs: handed and unhanded. For most applications, install a handed slack adjuster so that the pawl faces INBOARD on the vehicle. The pawl can be located on either side or on the FRONT of the slack adjuster. Figure 3.4.

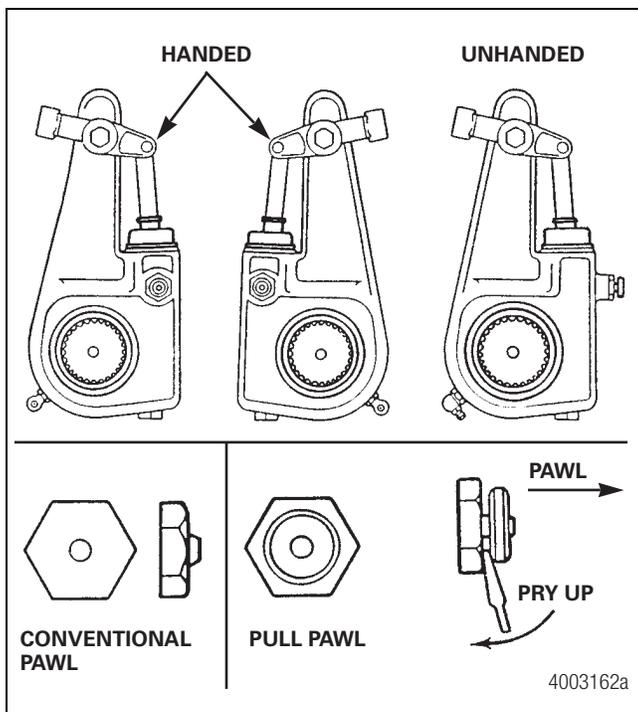


Figure 3.4

⚠ 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.

7. Rotate the manual adjusting nut **CLOCKWISE** until the linings clear the drums. Disengage the pawl.

- **For a conventional pawl:** Remove the pawl from the slack adjuster. Replace a conventional pawl with a pull pawl.
- **For a pull pawl:** Pry the pawl at least 1/32-inch (0.794 mm) to disengage the teeth. Figure 3.5.

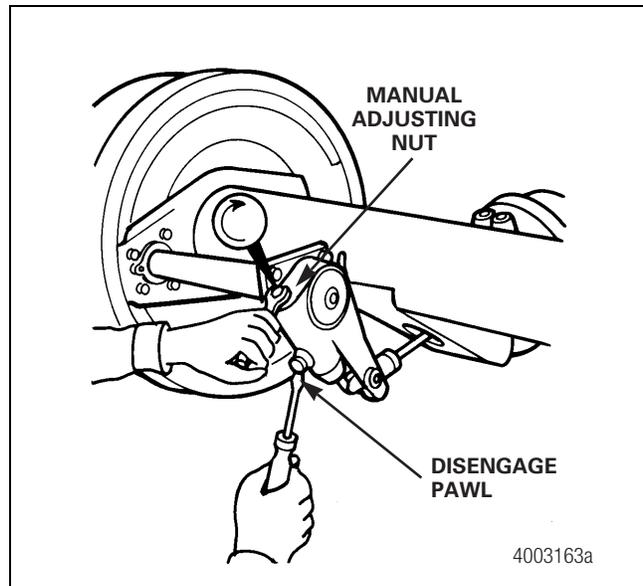


Figure 3.5

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

8. Place a container under the hubcap to receive the draining oil, then remove the hubcap and hubcap gasket. Figure 3.6.

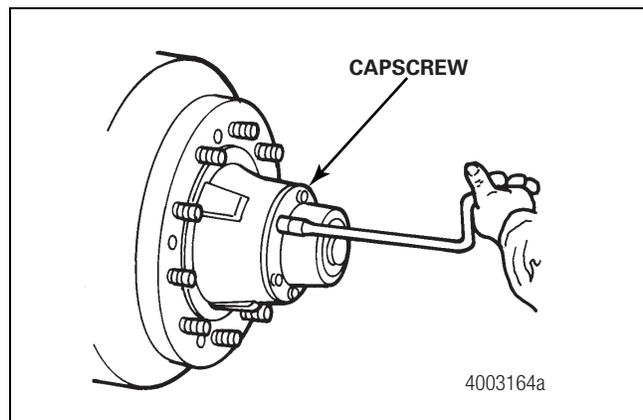


Figure 3.6

⚠ WARNING

Do not loosen the axle spindle nuts by either striking them directly with a hammer, or striking a drift or chisel placed against them. Damage to the parts will occur causing possible loss of axle wheel-end components and serious personal injury.

- Remove the set screw from the lock washer. Then remove the jam nut, lock washer and adjusting nut. Figure 3.7.

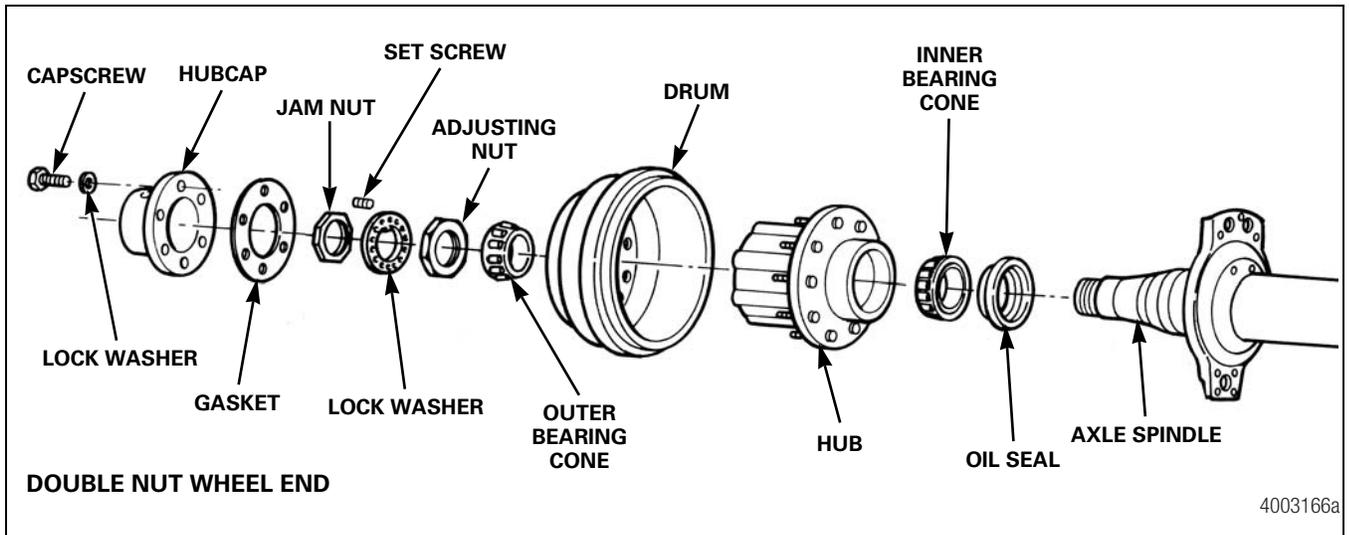


Figure 3.7

⚠ CAUTION

Be careful when you remove the hub and drum assembly that you do not damage the outer bearing by dropping it on the floor.

- Remove the outer bearing cone, then the hub and drum assembly from the axle spindle. Support the hub and drum assembly during the entire removal process, as failure to do so may result in damage to the axle spindle threads. Figure 3.8.

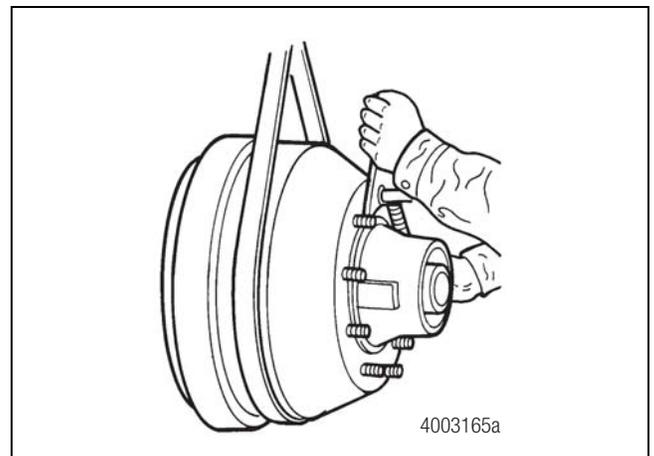


Figure 3.8

- Remove the inner bearing cone and seal from either the spindle or hub. Discard the seal. Figure 3.7.

3 Removal and Disassembly

⚠ CAUTION

Never remove a seal wiper with a hammer and chisel or other sharp tool. Damage to the axle oil seal collar will occur.

12. If the seal incorporates a separate wiper on the oil seal collar, loosen it by lightly striking with the round end of a ball-peen hammer, then remove it and discard. Figure 3.9.

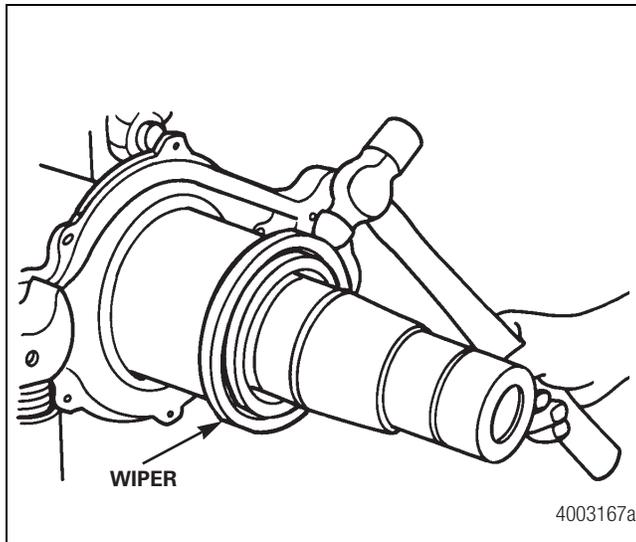


Figure 3.9

13. An alternate method is to use a slide hammer with a hook on the end of the tool. Figure 3.10.

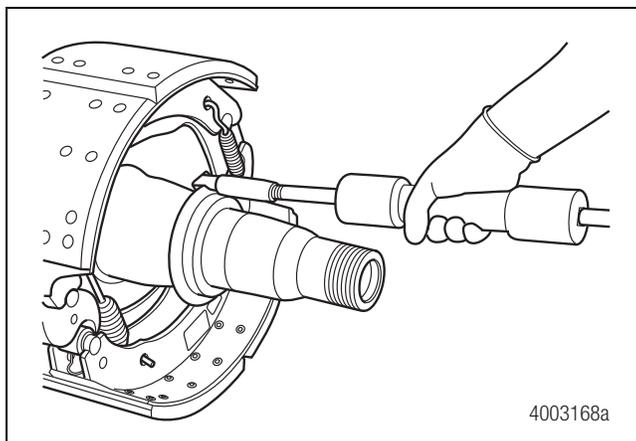


Figure 3.10

Brakes

⚠ 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.

1. Push down on the bottom brake shoe and pull on the roller retaining clip to remove the bottom cam roller. Figure 3.11.

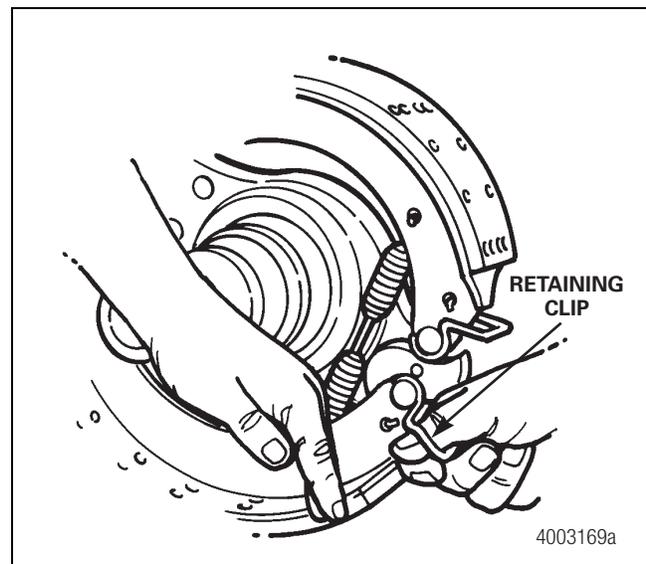


Figure 3.11

2. Lift the top brake shoe and pull on the roller retaining clip to remove the top cam roller.

NOTE: You can remove a standard return spring by hand, if one is installed. If a heavy-duty spring is installed, you will need a tool to remove the spring.

3. Lift the bottom shoe to release tension on the brake return spring. Remove the spring. Figure 3.12.

3 Removal and Disassembly

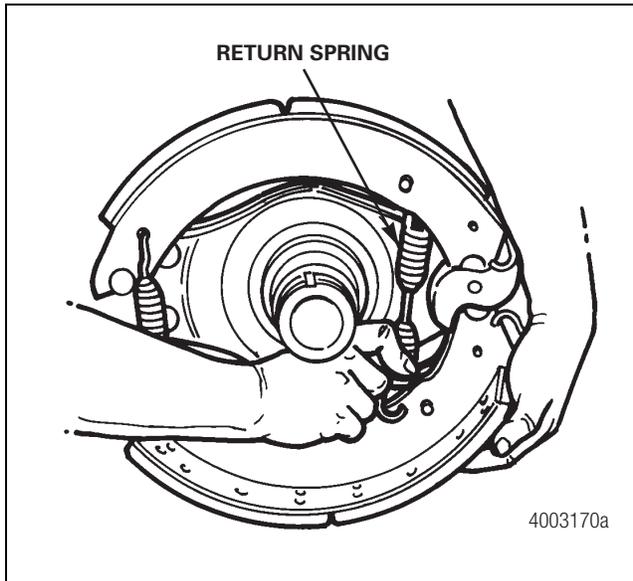


Figure 3.12

4. Rotate the bottom shoe to release tension on the two retaining springs. Remove the springs and brake shoes. Figure 3.13.

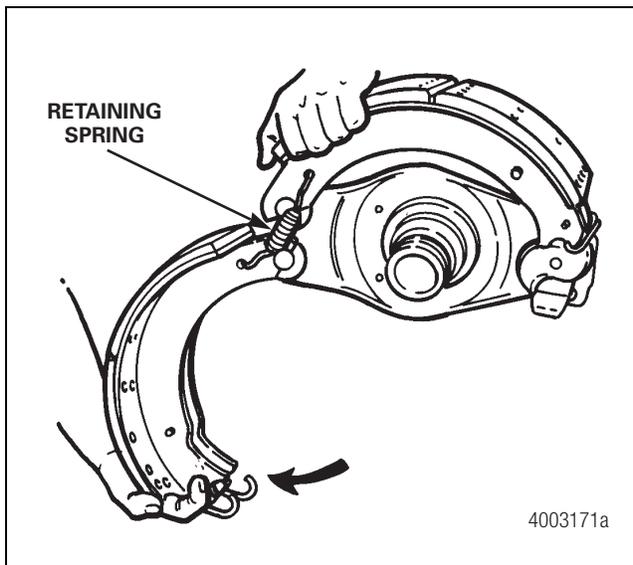


Figure 3.13

5. Disengage the slack adjuster from the air chamber push rod by removing the two slack adjuster clevis pins. Discard the two cotter pins that secure the clevis pins.

⚠ CAUTION

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

6. Remove a conventional pawl or pry a pull pawl at least 1/32-inch (0.794 mm) to disengage the teeth. Rotate the manual adjusting nut **CLOCKWISE** to move the slack adjuster away from the clevis. Figure 3.14.

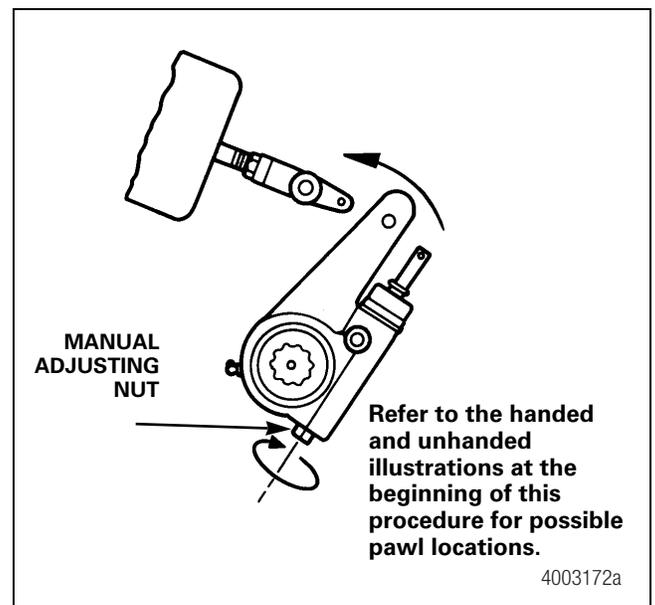


Figure 3.14

7. Remove the snap ring, slack adjuster and spacer washers from the camshaft spline. Figure 3.15.

3 Removal and Disassembly

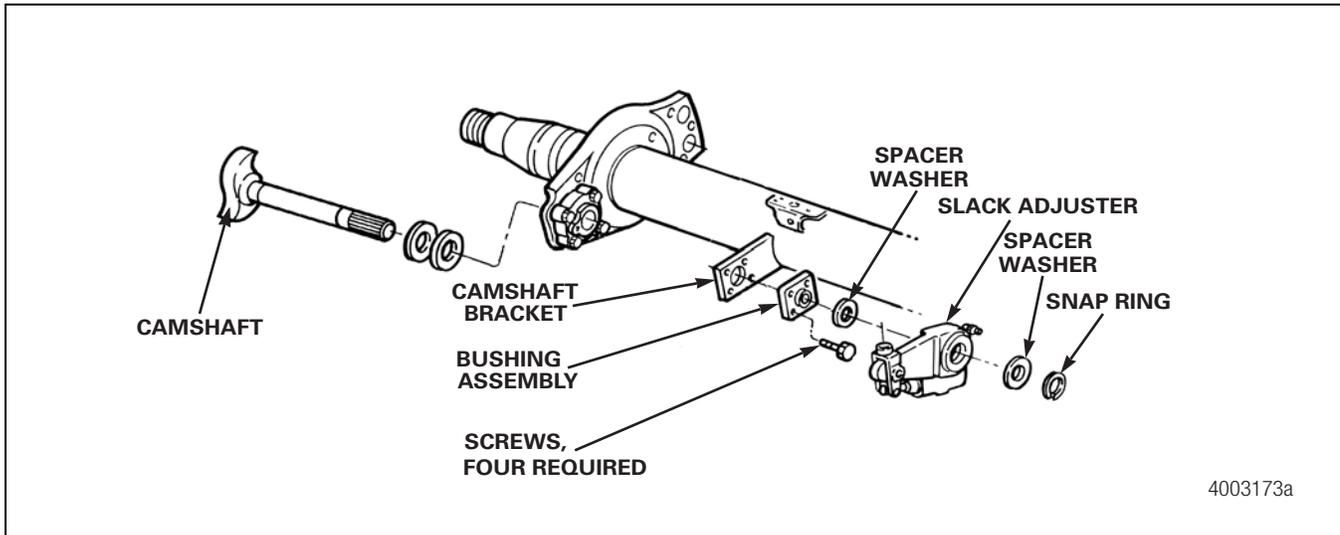


Figure 3.15

8. Remove the camshaft and camshaft bushings as detailed in Section 12.

Hazard Alert Messages

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

⚠ WARNING

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

Solvent cleaners can be flammable, poisonous and cause burns. Examples of solvent cleaners are carbon tetrachloride, and emulsion-type and petroleum-base cleaners. Read the manufacturer's instructions before using a solvent cleaner, then carefully follow the instructions. Also follow the procedures below.

- Wear safe eye protection.
- Wear clothing that protects your skin.
- Work in a well-ventilated area.
- Do not use gasoline or solvents that contain gasoline. Gasoline can explode.
- You must use hot solution tanks or alkaline solutions correctly. Read the manufacturer's instructions before using hot solution tanks and alkaline solutions. Then carefully follow the instructions.

Clean, Dry and Inspect Parts

Steam Clean the Axle Assembly

Steam clean a complete axle assembly to remove heavy dirt.

- **Before steam cleaning the assembly:** Cover all axle assembly openings, such as vents in the hubcaps and air chambers, to help keep water out of these openings during high-pressure steam cleaning.
- **After steam cleaning the assembly:** Grease camshaft bushings and automatic slack adjusters until new grease flows from these parts. The grease will help to remove water that may have entered the parts during steam cleaning.

Clean Smooth Parts

⚠ CAUTION

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

1. Use a solvent cleaner to clean machined parts and surfaces, such as axle spindles and camshaft journals. Do not use a hot solution tank with water, steam or alkaline solutions. This will cause corrosion. Figure 4.1.

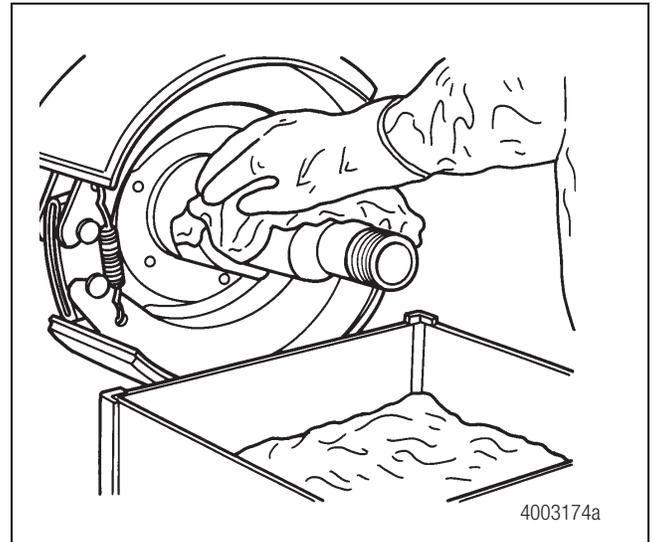


Figure 4.1

2. Remove gasket material from parts such as the hubcap gasket mounting face. Be careful not to damage machined surfaces.

Clean Rough Parts

1. Clean rough parts with either solvents or in hot solution tanks with a weak alkaline solution.
2. Leave parts in the tank until they are completely cleaned and heated. When the parts are clean, remove them from the tank and wash them with water until the hot solution is removed.

Dry Cleaned Parts

1. Dry parts immediately after cleaning using clean paper, rags or compressed air.
2. Do not use compressed air to dry bearings. This may cause small abrasive particles to contaminate the bearings and may result in reduced bearing life.

Prevent Corrosion

1. If parts are to be immediately assembled, apply lubricant to all machined surfaces.
2. If parts are to be stored, apply a coating that prevents corrosion to all machined surfaces.

4 Clean and Inspect Parts

Inspect Parts

It is important to inspect all axle components for damage or wear, and to repair or replace them as required before assembly. Performing these procedures now can help prevent future problems.

1. Inspect all machined surfaces of the axle assembly. Repair any scratches, nicks or mars with a crocus or emery cloth. Figure 4.2.

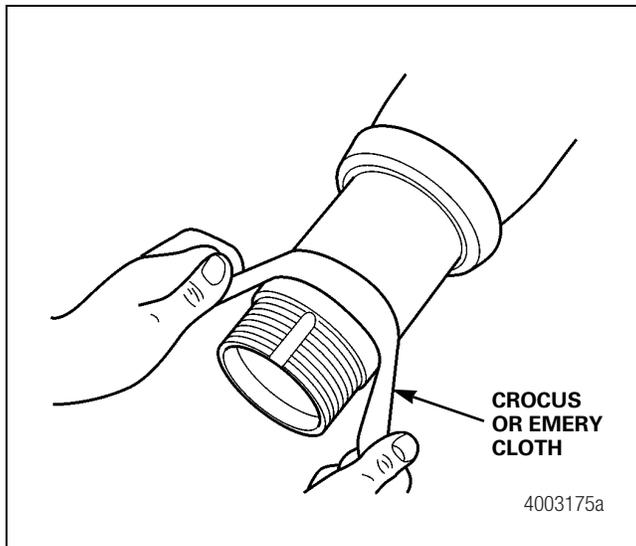


Figure 4.2

2. Inspect the axle spindle threads. Repair the damaged threads with a correct sized die.
3. Inspect the wheel-end retention hardware including nuts, washers and set screws. Replace them if any of this equipment is worn or damaged.
4. Inspect all fasteners and tapped holes. Replace damaged fasteners and repair damaged tapped hole threads with a correct sized die.
5. Inspect the entire axle assembly for cracks.
 - **If a crack is found in the axle tube, brake spider or axle spindle:** Replace the axle.
 - **If a crack is found in a weld attaching any component to the axle, and if this crack extends into the axle tube:** Replace the axle.
 - **If a crack is found in a weld that attaches a vendor-supplied component such as a spring seat to the axle, and if this crack is confined to the weld:** It may be repaired using the information in Section 7.
6. Periodic removal of the wheel-end equipment either for maintenance or repair presents the opportunity for axle spindle inspection.

Visually inspect the spindle for cracks.

Surface rust, scratches, or slight pitting on the wheel spindle bearing or seal journals may be polished or sanded out with an emery or crocus cloth. Do not reduce the diameters of the journals beyond the axle manufacturer's specifications. Excessive pitting, scratches or fretting on the spindle bearing or seal journals covering more than 50 percent of the surface require axle replacement.

Spindle threads may be cleaned with a wire brush or chased with a die. Repair welding of the spindle threads is not permitted. Consult the trailer axle manufacturer if any wear is questionable.

 - **If any crack is found in the spindle:** Immediate axle replacement is necessary. Neither in-house repair, nor repair by an outside contractor specializing in spindle welding repairs, is allowed.
7. Inspect the hubs or spoke wheels. If damaged or worn, repair or replace as outlined in the appropriate component manufacturer's maintenance manual.
8. Measure the axle camber and toe as outlined in Section 8.
 - **If either of these parameters is out of specification:** Replace the axle.
9. Inspect the dust shields if installed. Repair or replace damaged shields as necessary.
10. Inspect the brake equipment. Repair or replace damaged components. Refer to the Service Notes page on the front inside cover of this manual for instructions on how to obtain the correct Meritor maintenance manual for the brake you are servicing. Follow the manufacturer's instructions for components that are not supplied by Meritor.
11. If the trailer axle is equipped with cam brakes perform the following.

4 Clean and Inspect Parts

- Check the up-and-down and side-to-side end play of the camshaft. If total movement is more than 0.030-inch (0.76 mm) in either direction, replace the bushings or camshaft as detailed in Section 12. Figure 4.3.

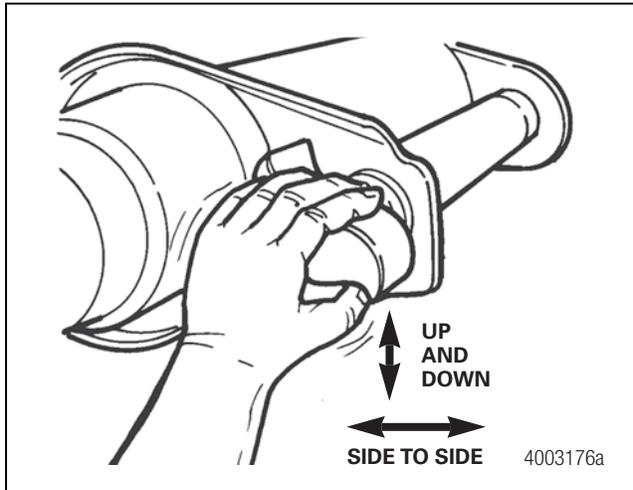


Figure 4.3

- Check the axial end play of the camshaft. If total movement is more than 0.060-inch (1.52 mm), replace the bushings, camshaft or both as specified in Section 12. Figure 4.4.

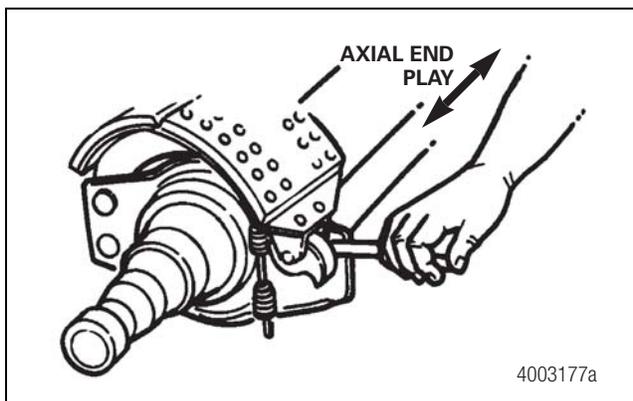


Figure 4.4

12. Inspect the bearings using the guidelines detailed below or literature published by the bearing manufacturer.

- **If any of the conditions shown exist:** Replace the bearings.
- **If there is a question as to whether any of these conditions exist:** It makes sense to replace bearings, since bearing costs are small compared to the potential cost of a breakdown.

- In many instances, the conditions shown are caused by problems such as debris or water contaminating the lubricant, incorrect bearing adjustment, or inadequate lubricant. If these problems are not corrected, the conditions will persist.

A. The roller ends are worn. Figure 4.5.



Figure 4.5

B. The rib is worn. Figure 4.6.

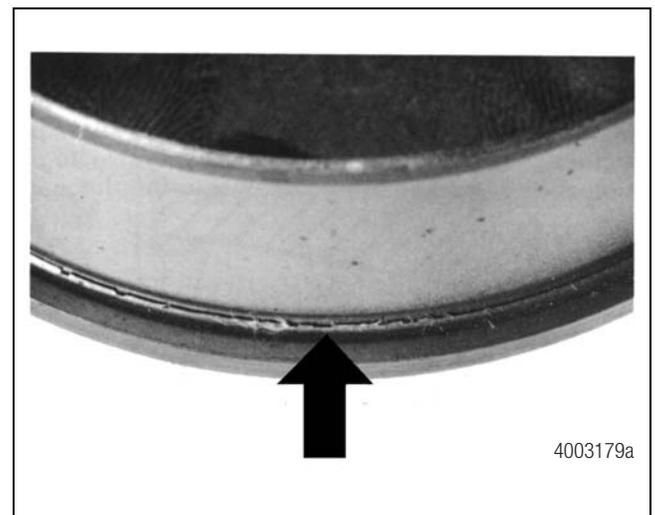


Figure 4.6

C. The roller cage is damaged. Figure 4.7 and Figure 4.8.

4 Clean and Inspect Parts

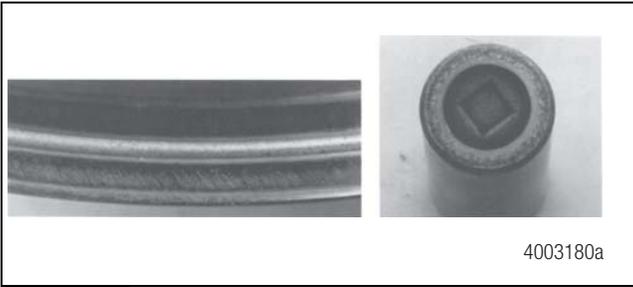


Figure 4.7

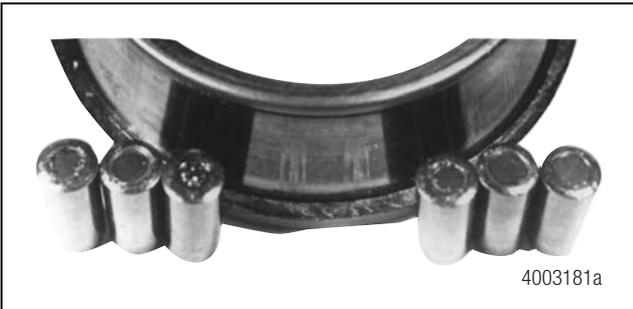


Figure 4.8

D. The roller ends and the ribs are scored. Figure 4.9 and Figure 4.10.



Figure 4.9



Figure 4.10

E. The bearing is discolored. Figure 4.11.



Figure 4.11

F. The cage, cup, cone or rollers are grooved. Figure 4.12.

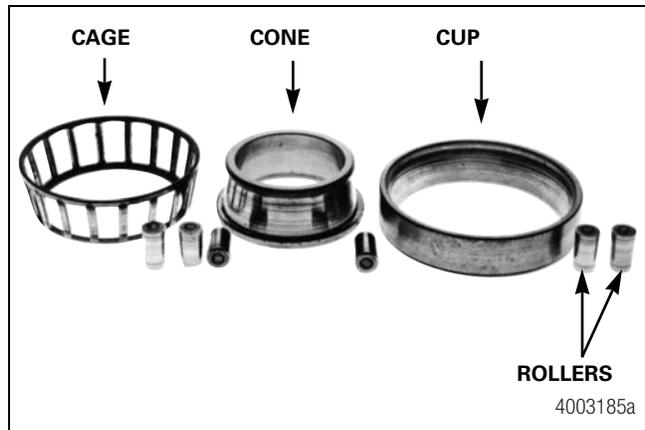


Figure 4.12

4 Clean and Inspect Parts

- G. The races or rollers are bruised with deep indentations. Figure 4.13.



Figure 4.13

- H. The races or rollers are etched. Figure 4.14.

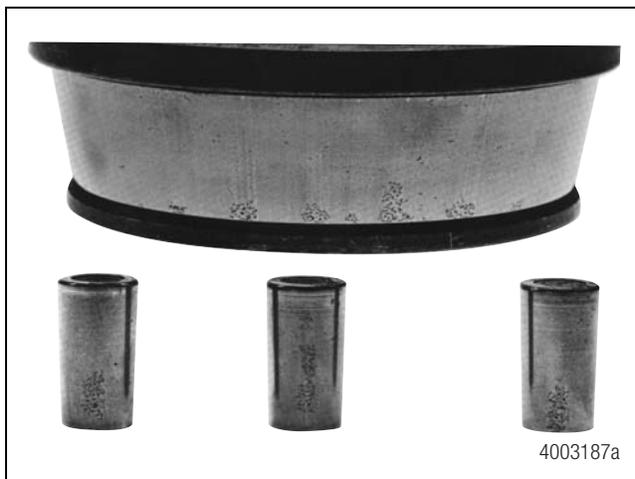


Figure 4.14

- I. The races or rollers are spalled. Figure 4.15 and Figure 4.16.



Figure 4.15



Figure 4.16

- J. The races or rollers are gouged or nicked. Figure 4.17 and Figure 4.18.



Figure 4.17

4 Clean and Inspect Parts



Figure 4.18

K. The races or rollers are brinelled. Figure 4.19.



Figure 4.19

L. The races or rollers are cracked. Figure 4.20.

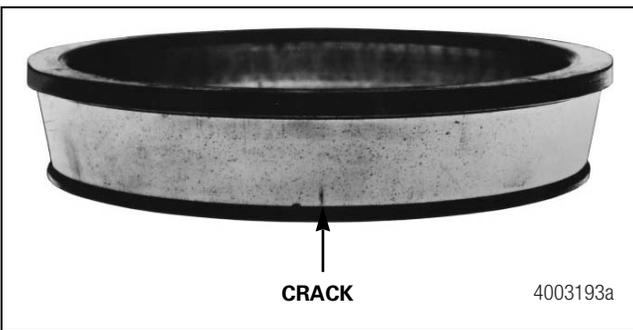


Figure 4.20

Important Information

Meritor automatic slack adjusters (ASAs) should not need to be manually adjusted in service. ASAs should not have to be adjusted to correct excessive pushrod stroke. The excessive stroke may be an indication that a problem exists with the foundation brake, ASA, brake actuator or other system components.

Meritor recommends troubleshooting the problem, replacing suspect components and then confirming proper brake operation prior to returning the vehicle into service.

In the event that a manual adjustment must be made (although not a common practice), a service appointment and full foundation brake, ASA, and other system component inspection should be conducted as soon as possible to ensure integrity of the overall brake system.

For Meritor brake adjustment, refer to the brake adjustment tables in this manual. For non-Meritor brake adjusters, refer to the brake manufacturer's service procedures.

Hazard Alert Messages

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

⚠ WARNING

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

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

⚠ ASBESTOS AND NON-ASBESTOS FIBERS WARNING

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

Installation

Brakes

Most Meritor trailer axles are equipped with Q Series cam brakes. This section details procedures for installing this brake. For information on lubricants specified, refer to Section 14.

1. Install the camshaft and camshaft bushings as detailed in Section 12.

NOTE: Only one washer is needed on each side of the slack adjuster.

2. Lubricate the camshaft and slack adjuster splines with anti-seize compound. Install the slack adjuster, washers and snap ring. Figure 5.1.

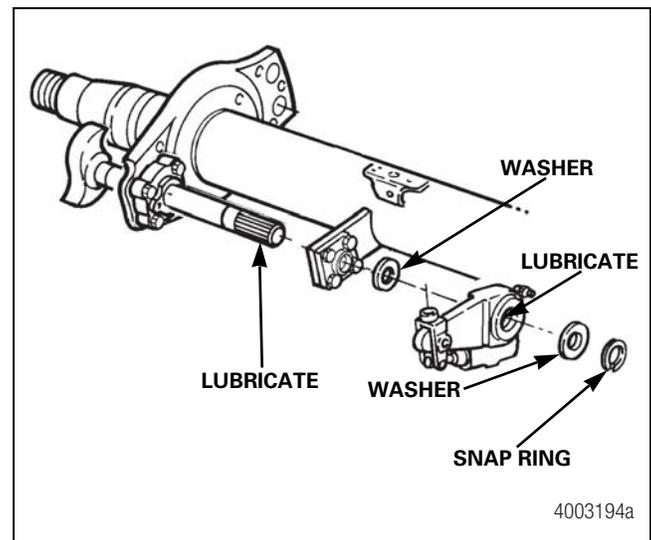


Figure 5.1

⚠ CAUTION

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

3. Rotate the slack adjuster manual adjusting nut CLOCKWISE to align the holes in the slack with the holes in the push rod clevis. Figure 5.2.

5 Assembly and Installation

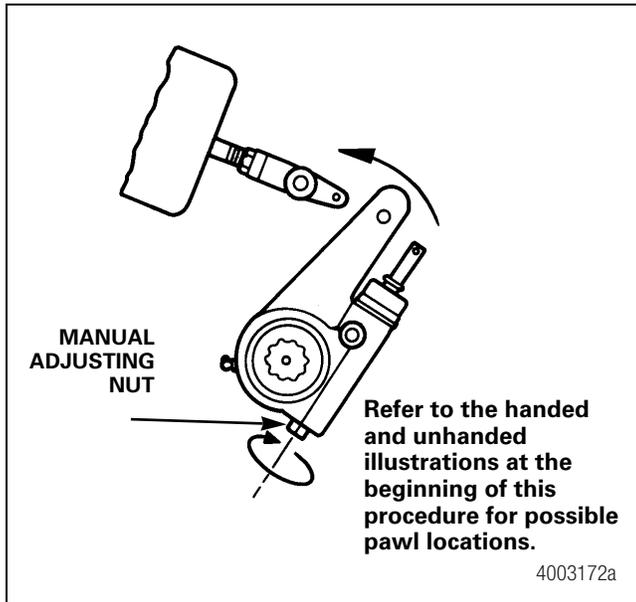


Figure 5.2

⚠ CAUTION

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

4. Lubricate both slack adjuster clevis pins with anti-seize compound, then install through the holes in the clevis and slack. Secure in place with clevis pin retainer clips. Replace used cotter pins with clevis pin retainer clips. Do not reuse cotter pins.
5. Lubricate anchor pins with Meritor specification 0-616-A grease where the brake shoes touch them. Place the upper shoe in position on the top anchor pin. Hold the lower brake shoe on the bottom anchor pin and install two new brake shoe retaining springs. Figure 5.3.

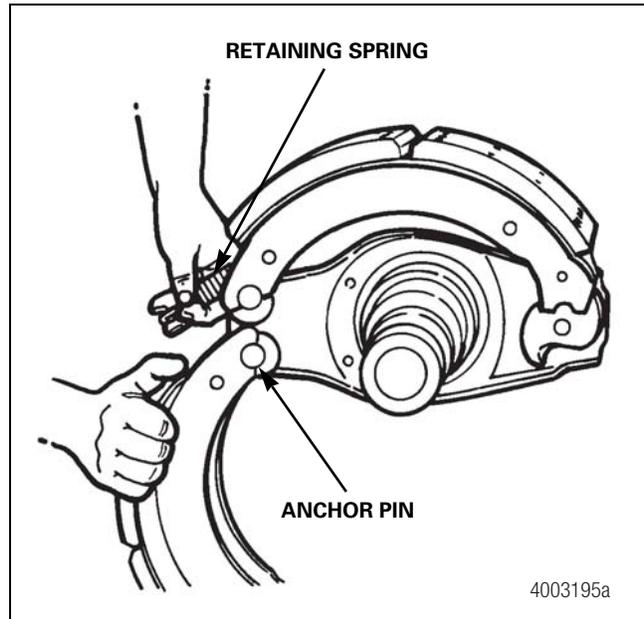


Figure 5.3

NOTE: You can remove a standard return spring by hand, if one is installed. If a heavy-duty spring is installed, you will need a tool to remove the spring.

6. Rotate the lower brake shoe FORWARD to place tension on the retaining springs and install a new return spring. Figure 5.4.

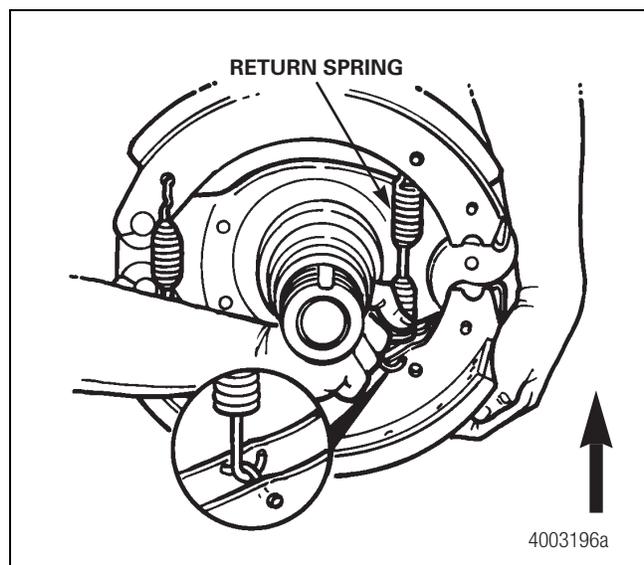


Figure 5.4

5 Assembly and Installation

7. Lubricate the cam rollers with grease where they touch the brake shoe webs, making sure not to get lubricant on the outer diameter of the roller that touches the camshaft head.
8. Pull each brake shoe away from the cam permitting enough space to install the cam rollers. Press the ears of the roller retainer clip together to fit the retainer between the brake shoe webs. Figure 5.5.

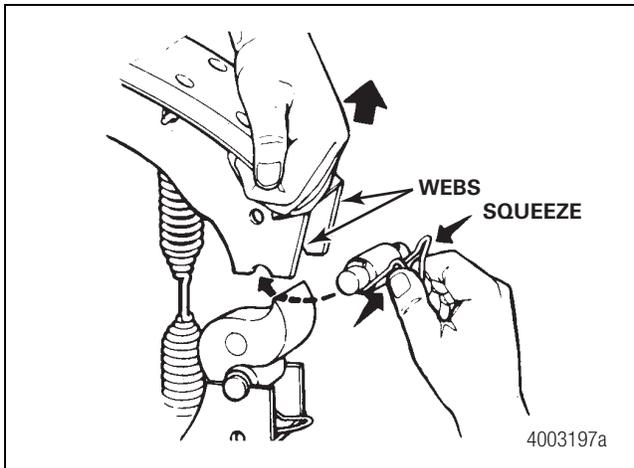


Figure 5.5

9. Push each roller retainer clip into the brake shoe until its ears lock in the holes in the shoe webs. Figure 5.6.

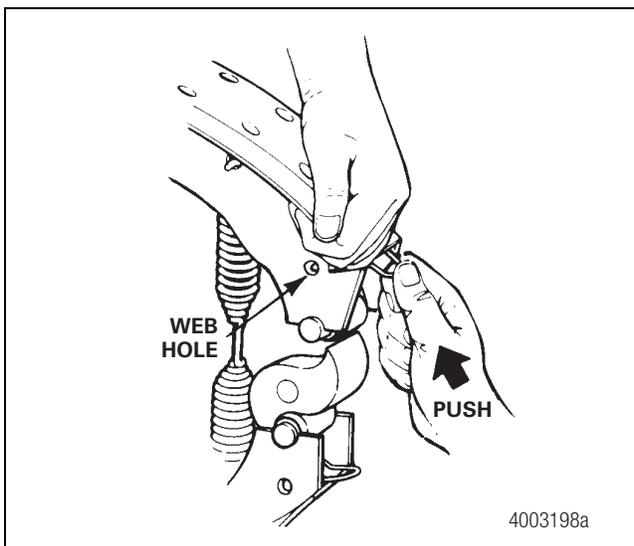


Figure 5.6

10. Lubricate the camshaft bushings and slack adjusters as follows.

- Wipe off the grease fittings to prevent contamination from being injected into the joints along with grease.
- Grease the camshaft bushings until new grease flows from the seals. If the cam bushing seals at the spider end of the cam are installed correctly, grease will flow out toward the slack adjuster.
- Grease the slack adjuster until new grease flows from around the inboard splines and from the pawl assembly.
- Wipe away excess grease that purges from the joints. This helps ensure that road dirt is not attracted to the lube point and that grease does not drop onto either the brake linings or road surface.

Wheel Ends

1. If the seal incorporates a separate wiper, apply a thin coat of sealant around the axle oil seal collar. Then using an installation tool, drive the wiper onto the oil seal collar until its edge is flush with the bearing shoulder. Figure 5.7.

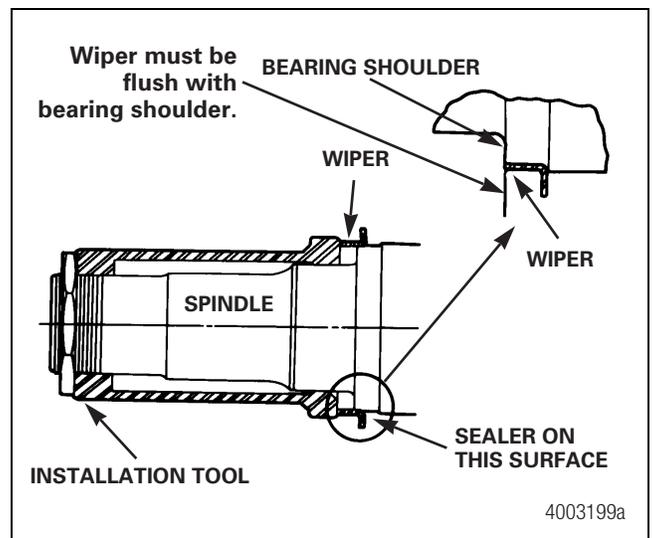


Figure 5.7

2. Coat the bearing cones with oil. Apply a light film of grease to the axle spindle bearing journals to help protect them from fretting corrosion. Do not use oil on the spindle bearing journals.

5 Assembly and Installation

⚠ WARNING

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

3. Install the seal and inner bearing cone. Follow the seal manufacturer's instructions to install the seal.
 - A. **For hub-mounted seals:** Install the inner bearing cone inside the hub. Lubricate the seal according to the seal manufacturer's recommendations, then place it onto the installation tool. Align the tool with the hub seal bore and drive the seal until it bottoms out in the hub seal bore. Rotate the tool and apply several light blows to ensure the seal is correctly seated. Check the bearing to verify it rotates freely. Figure 5.8.

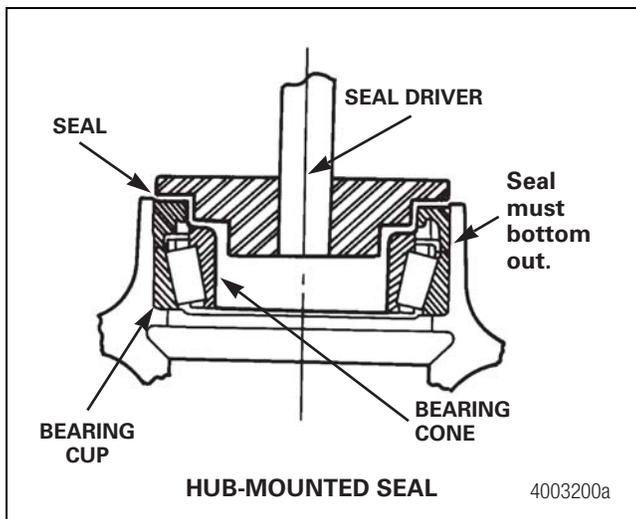


Figure 5.8

- B. **For spindle-mounted seals:** Lubricate the seal according to the seal manufacturer's recommendations, then place it onto the axle oil seal collar. Place the installation tool over the spindle and drive the seal until it is flush with the bearing shoulder. Rotate the tool and apply several light blows to ensure the seal is correctly seated. Figure 5.9.

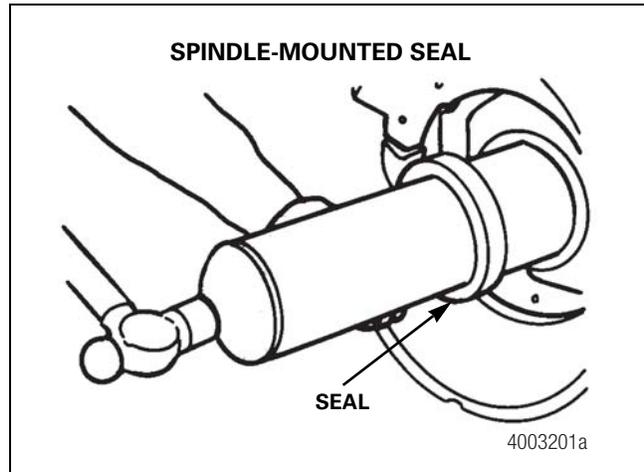


Figure 5.9

- C. Install the inner bearing cone onto the spindle. If it becomes misaligned, lightly tap the rough part of the axle tube with a hammer to create vibrations which will help realign it on the spindle and ease installation. Figure 5.10.

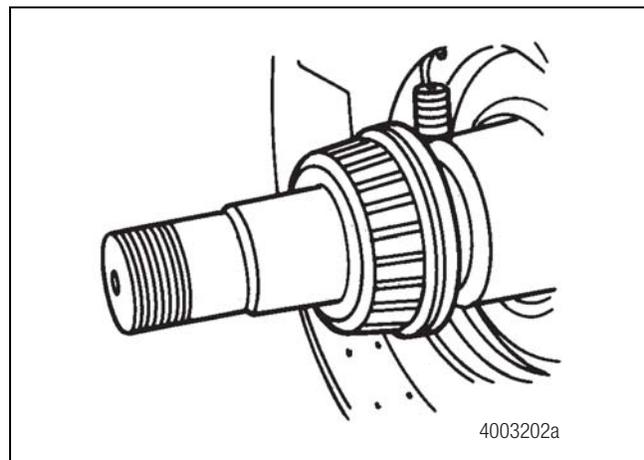


Figure 5.10

4. Support the hub and drum assembly using a sling or other appropriate method. Failure to do so may result in damage to the spindle threads or seal. Figure 5.11.

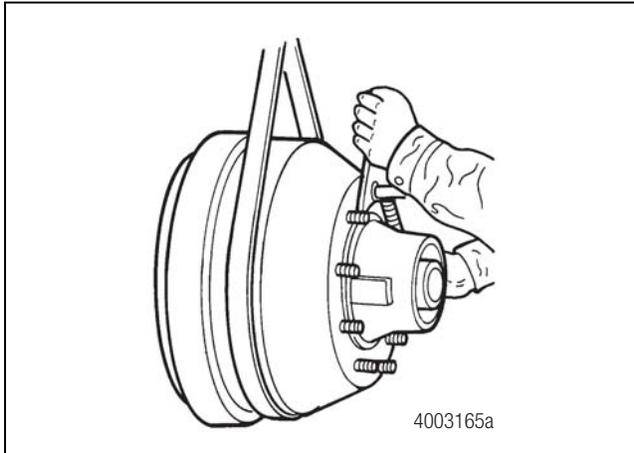


Figure 5.11

⚠ CAUTION

When you tighten the spindle nuts, the hub and drum assembly will seat to the correct position. Do not try to completely seat the hub and drum assembly by hand. Damage to components can result.

5. Install the hub and drum assembly as follows.
 - A. **For spindle-mounted seals:** Align the hub bore with the spindle and push the assembly into position until the bearing cone on the spindle fits into the bearing cup in the hub. The brake drum will help maintain alignment of the assembly during this operation.
 - B. **For hub-mounted seals:** Align the hub bore with the spindle and push the assembly into position until the bearing cone in the hub bottoms out against the oil seal collar. The bearing cone in the hub will help maintain alignment of the assembly during this operation.
6. Install the outer bearing cone, then tighten the adjusting nut until it is snug against the outer bearing cone. Remove the hub support so the hub rests on the bearings. Figure 5.12.

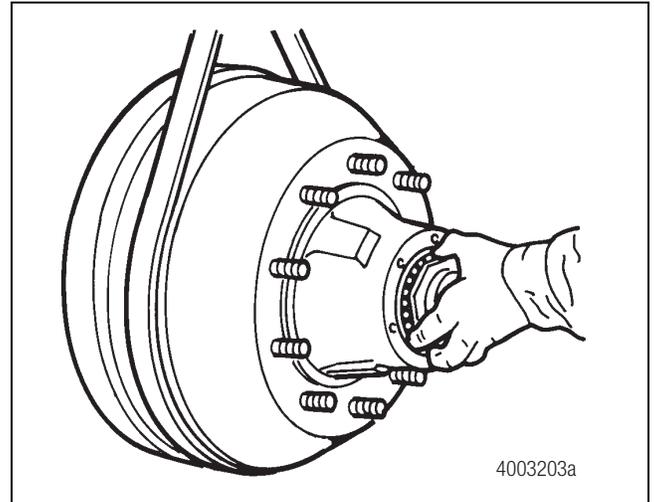


Figure 5.12

7. Adjust the bearings as specified in Section 10.
8. Install the hubcap by tightening the capscrews to 15-30 lb-ft (20-41N•m) in a criss-cross pattern. Use a new hubcap gasket. Figure 5.13. **ⓘ**

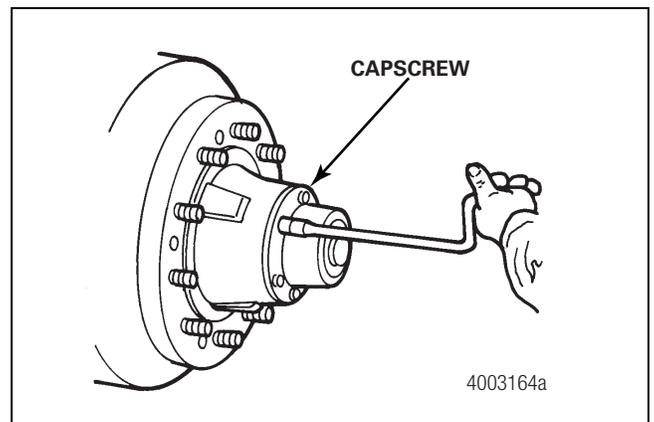


Figure 5.13

5 Assembly and Installation

⚠ CAUTION

Add wheel-end lubricant only to the hubcap fill line. Do not overfill the hubcap. Wipe off excess lubricant, which can contaminate brake linings and cause reduced brake performance. Damage to components can result.

9. Fill the wheel end with oil to the hubcap fill line. Note that the oil must be given sufficient time to settle prior to the final check of the oil level. This is especially important in cold conditions. Install the hubcap plug, verifying that the vent hole, if present, is not clogged with debris. Figure 5.14.

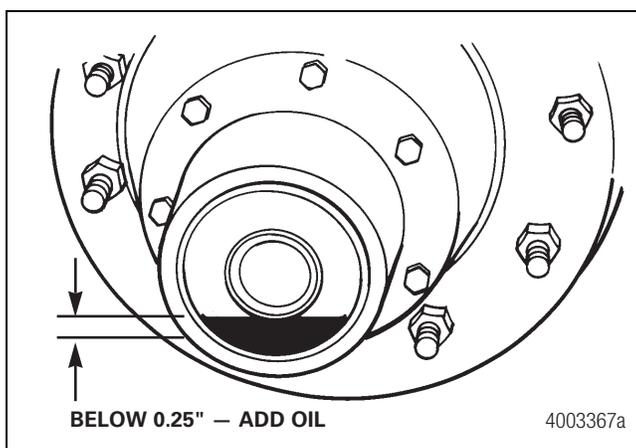


Figure 5.14

10. Install the tire and wheel assembly using the procedures specified by the wheel manufacturer.
11. Remove the safety stands and lower the vehicle.
12. Adjust the brakes using the procedures detailed in Maintenance Manual 4, Cam Brakes and Automatic Slack Adjusters. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.

⚠ 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.

13. If the axle is equipped with spring brake chambers, carefully release the springs.

Hazard Alert Messages

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

⚠ WARNING

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

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

Guidelines

Axle Installation

1. Refer to the procedures in this section to locate the top and front of the axle, as well as the allowable axle rotation. Using this information, position the suspension brackets onto the axle.
2. Verify that the brackets fit the axle correctly, then weld the brackets to the axle. Refer to Section 7.
3. Position the axle assembly under the vehicle, then tighten the suspension installation fasteners. Note that the final tightening must be done to the manufacturer's specifications with a calibrated torque wrench. Follow the recommended procedures protecting certain axle models from overtorquing.
4. Align the axle using the information in Section 8.
5. Inspect the assembly to ensure the following.
 - Suspension springs are correctly located on their wear pads.
 - Adequate clearances exist between the axle and vehicle components in both loaded and unloaded conditions.
 - All fasteners are tightened to the correct torque values.
6. After an initial break-in period and then at regular intervals, inspect all suspension fasteners to ensure that correct torque values are maintained according to the manufacturer's specifications.

Axle Positioning

⚠ CAUTION

Follow these instructions to correctly position an axle. An axle can crack from brake component welds that are in unauthorized locations, or because the axle was not positioned correctly. Excessive tire wear can result from incorrect axle camber or toe due to incorrect axle positioning. Damage to other components can also result.

The following provides detailed instructions on locating the top and bottom of the axle, locating the front and rear of the axle and determining the amount the axle can be rotated.

It is important to follow these instructions to help prevent the following conditions.

- Axle cracking due to incorrectly located brake component welds.
- Excessive tire wear due to incorrect axle camber or toe.

Follow the procedure below to correctly install most trailer axles. For additional assistance, contact the Meritor OnTrac™ Customer Call Center at 866-668-7221. Figure 6.1.

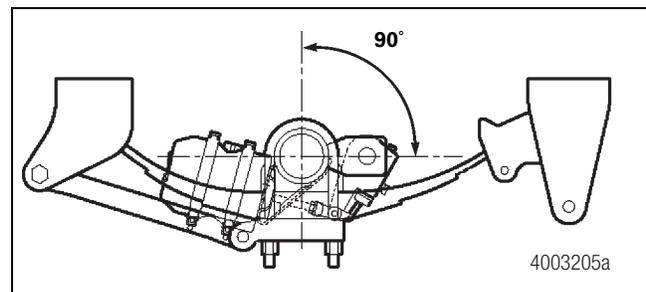


Figure 6.1

Axle Top and Bottom

1. Most Meritor trailer axles are built with a 0.31-inch (7.874 mm) diameter hole partially drilled through the axle tube. This hole identifies the top of the axle. Figure 6.2.

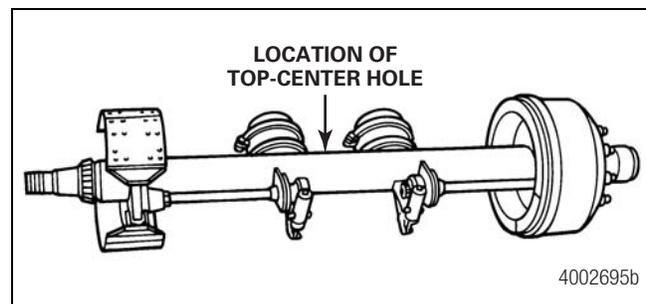


Figure 6.2

6 Additional Installation Information

2. On axles built without a top-center hole, the axle can be rotated 180 degrees. Therefore, the axle top and bottom are interchangeable. Figure 6.3.

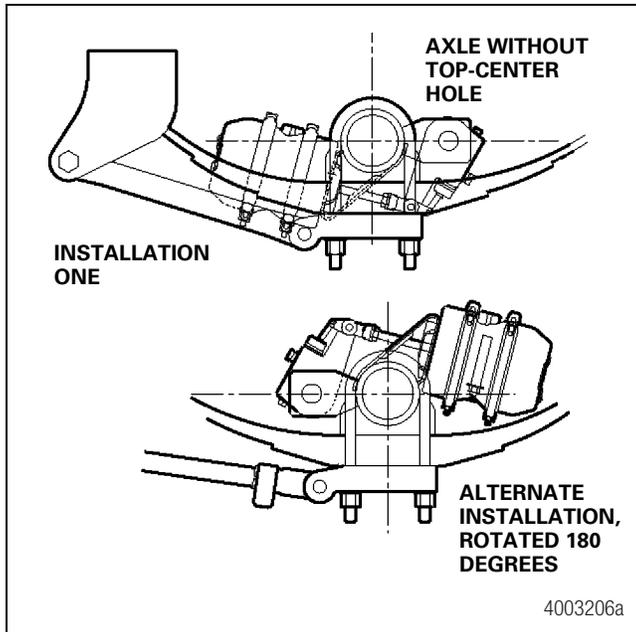


Figure 6.3

Axle Front and Rear

The front and rear of the axle can be identified using the location of the ID tag or embossing along with information regarding the correct brake equipment installation.

1. On axles built with a top-center hole, the ID tag or embossing is located toward the axle rear. Figure 6.4.

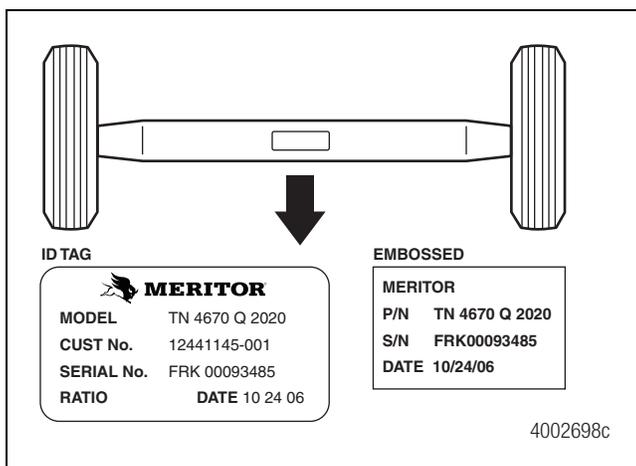


Figure 6.4

2. On axles built without a top-center hole, the axle can be rotated 180 degrees. Therefore, the axle front and rear are interchangeable. Figure 6.3. For these models, use the brake installation guidelines in this section.

Important Information

Meritor automatic brake adjusters (ABAs) should not need to be manually adjusted in service. ABAs should not have to be adjusted to correct excessive pushrod stroke. The excessive stroke may be an indication that a problem exists with the foundation brake, ABA, brake actuator or other system components.

Meritor recommends troubleshooting the problem, replacing suspect components and then confirming proper brake operation prior to returning the vehicle into service.

In the event that a manual adjustment must be made (although not a common practice), a service appointment and full foundation brake, ABA, and other system component inspection should be conducted as soon as possible to ensure integrity of the overall brake system.

For Meritor brake adjustment, refer to the brake adjustment information in this section. For non-Meritor brake adjusters, refer to the brake manufacturer's service procedures.

Brake Installation

- Trailer axles built with cam brakes should be installed so that the camshaft rotates in the same direction as the tires when the vehicle is moving forward. Figure 6.5.
- Trailer axles built with wedge brakes must be installed so that the tires rotate in the direction indicated on the brake shoe webs. Figure 6.6.

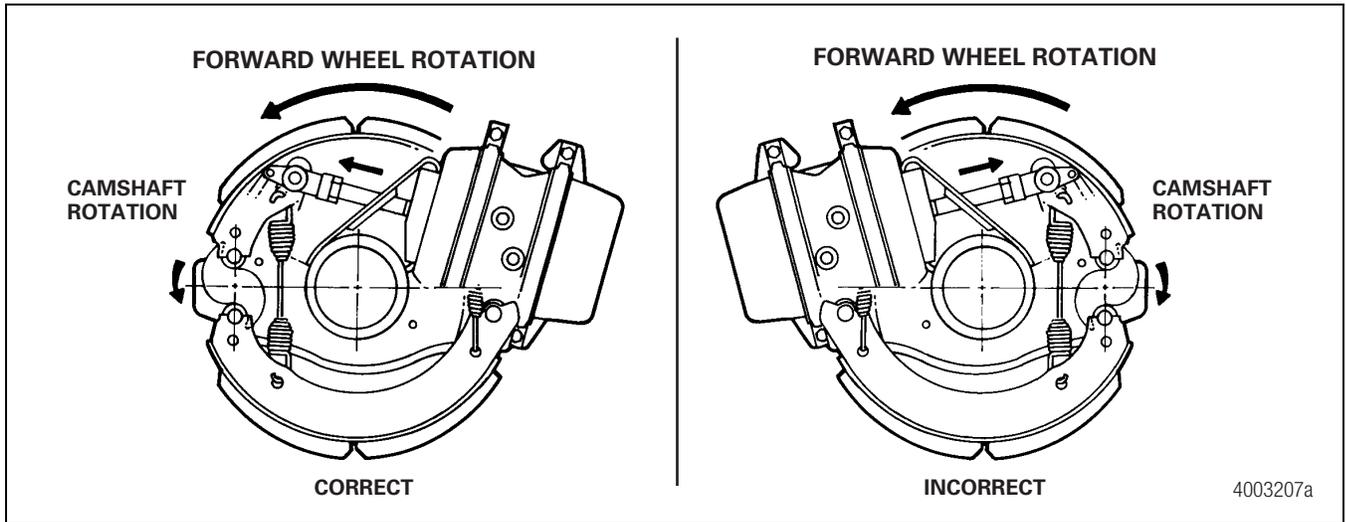


Figure 6.5

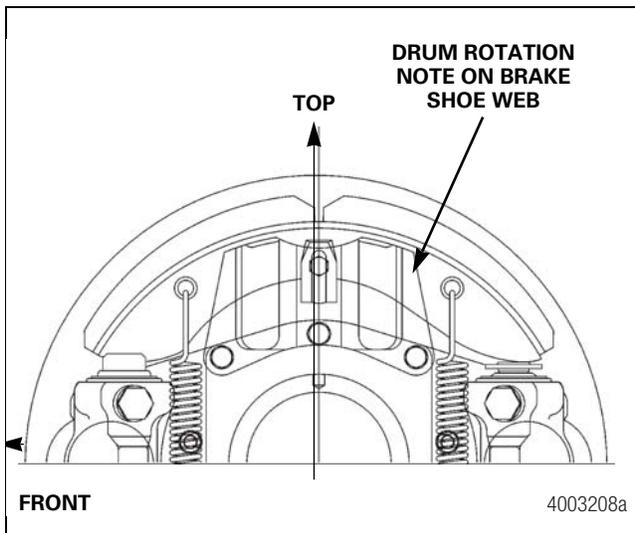


Figure 6.6

Axle Rotation

Trailer axles are available in both cambered and non-cambered models. Allowable axle rotation for these two models is different.

Refer to Figure 8.15 for the definition of camber. Note that a cambered axle cannot be identified by simple visual inspection. Rather, the Bill of Materials for a particular Engineering Axle Specification (EAS) must be checked to identify the axle as being either cambered or non-cambered.

All cambered axles are built with a top-center hole. These models must be installed so that this hole is located at the exact top position. Figure 6.7.

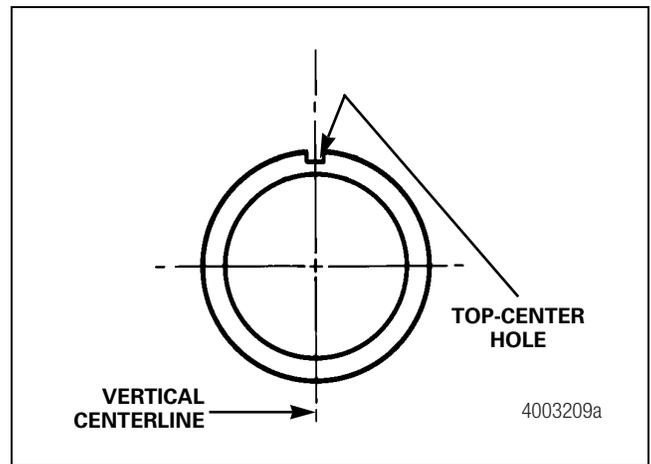


Figure 6.7

Non-cambered axles may be built either with or without a top-center hole. These models must be installed as follows:

- **On models with a top-center hole:** The top-center hole must be located within 20 degrees of vertical and the brake hardware must be located within 20 degrees of horizontal as described in this section.
- **On models without a top-center hole:** Brake hardware must be located within 20 degrees of horizontal as described in this section.

6 Additional Installation Information

⚠ WARNING

When you install an axle with a top-center hole, you must locate the top-center hole within 20 degrees of the axle vertical centerline. You must locate brake components within 20 degrees of the axle horizontal centerline. An installation that does not comply with these specifications will void the warranty. Axle fatigue, damage to components and serious personal injury can result.

On non-cambered axles, observe the following for correct positioning.

- **Top-center hole:** The top-center hole must be within 20 degrees of the axle vertical centerline. Figure 6.8.

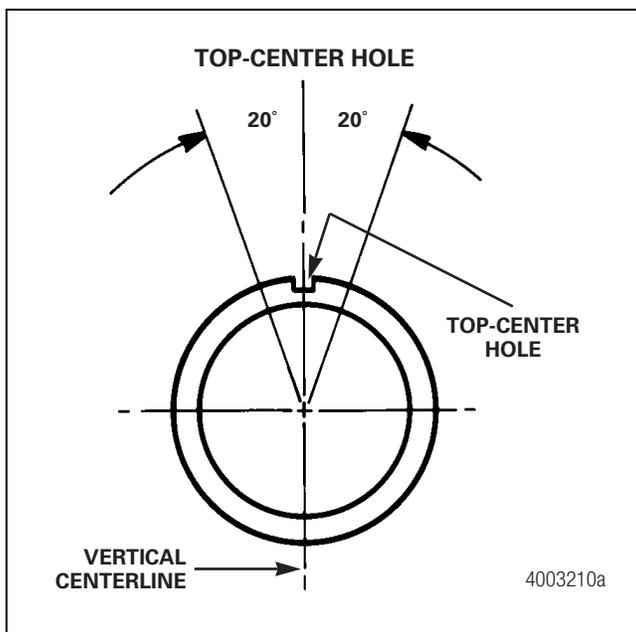


Figure 6.8

- **Cam brakes:** The centerline of the camshaft bracket must be located within 20 degrees of the axle horizontal centerline. Figure 6.9.

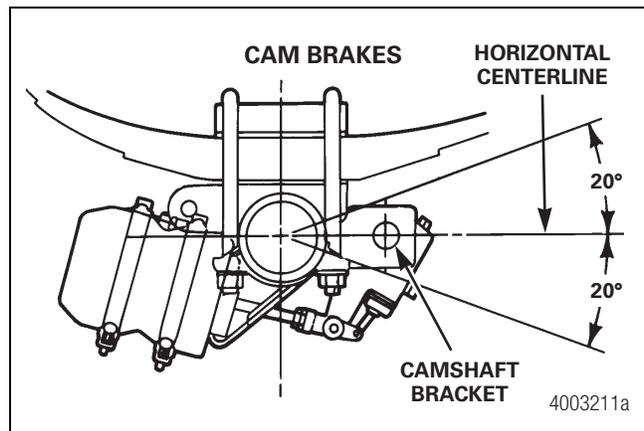


Figure 6.9

- **Disc brakes:** The centerline of the power screw must be located within 20 degrees of the axle horizontal centerline. Figure 6.10.

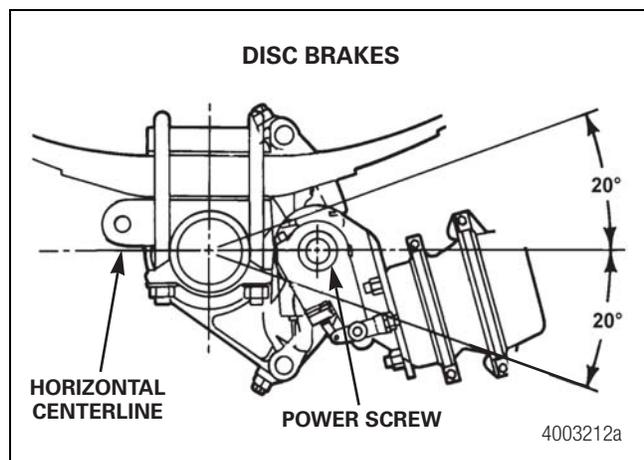


Figure 6.10

- **Wedge brakes with air chamber tube support brackets:** When wedge brakes are equipped with air chamber support brackets, the centerline of the brackets must be located within 20 degrees of the axle horizontal centerline. Figure 6.11 and Figure 6.12.

6 Additional Installation Information

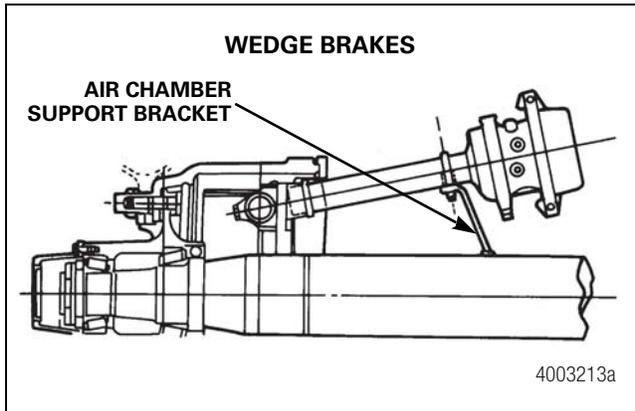


Figure 6.11

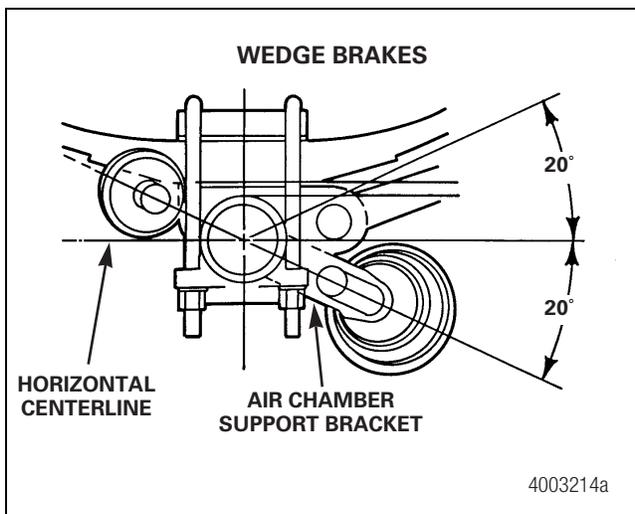


Figure 6.12

Suspension

⚠ CAUTION

You must tighten U-bolts to the manufacturer's specifications. U-bolts that are overtightened can damage the axle at the point the bolts contact the axle.

Special pressure plates may be required when installing rectangular axles on some suspensions.

On the mounting set-up shown in Figure 6.13, the spring seat and axle bracket isolate the top and bottom of the axle from the compression forces exerted by tightening the U-bolts. No pressure plates are required.

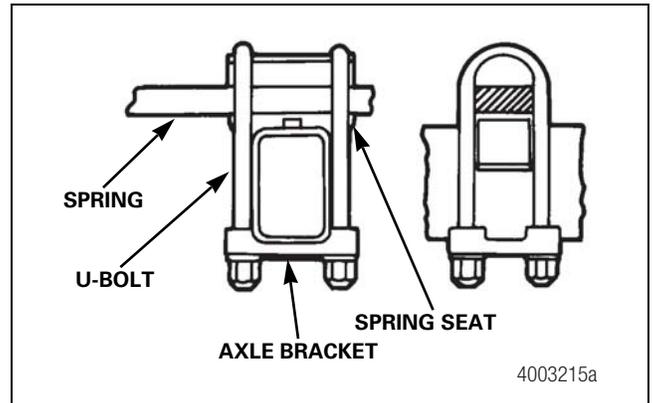


Figure 6.13

On the mounting set-up shown in Figure 6.14, a suspension bracket does not isolate the bottom of the axle from compression forces exerted by tightening the U-bolts. This isolation must be obtained by installing plates, at least 0.25-inch (6.3 mm) thick, between the axle and the U-bolts.

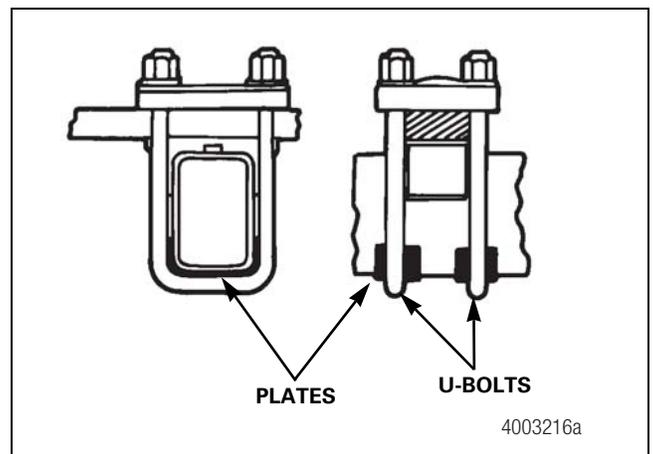


Figure 6.14

To correctly distribute axle loads on some suspension models, the chassis angle, or angle of the trailer relative to the ground, must be correct.

- **If the tractor fifth wheel height is correct:** The trailer chassis angle will be correct and the suspension load will be correctly distributed to the axles.
- **If the tractor fifth wheel height is incorrect:** The chassis angle will be incorrect and the suspension load will be incorrectly distributed to the axles.

6 Additional Installation Information

- On the suspension shown in Figure 6.15, the fifth wheel is too high, resulting in an overload of the rear axle. If the fifth wheel had been too low, the front axle would have been overloaded.
- Correct distribution of suspension loads can be achieved by either setting the tractor fifth wheel to the height recommended by the trailer manufacturer, or by adjusting the suspension by installing shims between the axle and the suspension springs.

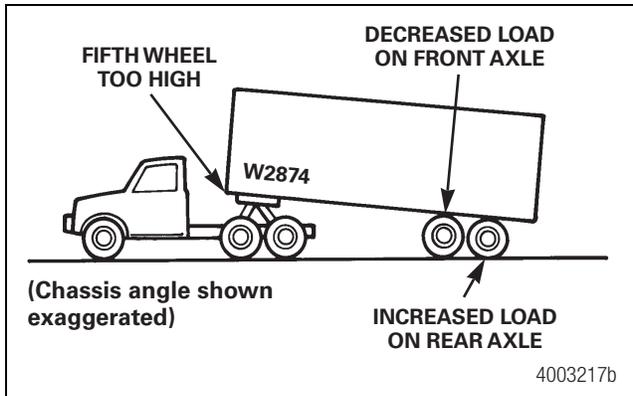


Figure 6.15

Dust Shields

NOTE: Refer to Section 12 for more information on forged and stamped spiders.

Dust shield installation kits for trailer axles equipped with cam brakes are available from Meritor's Aftermarket Service. To obtain this kit, refer to the Service Notes page on the front inside cover of this manual.

Dust shields are mounted to forged spiders with six fasteners. Figure 6.16.

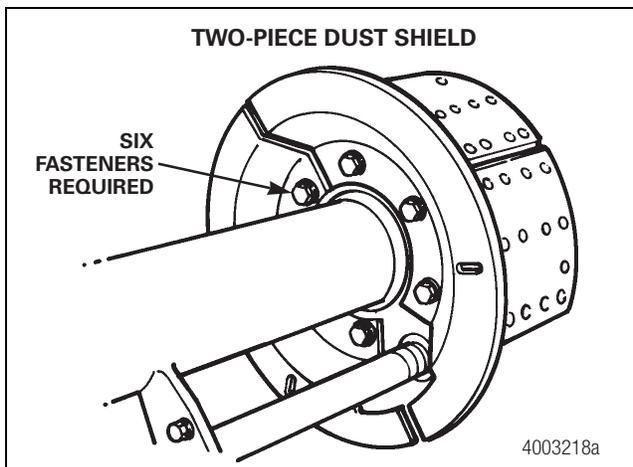


Figure 6.16

Two dust shield designs are available for use on forged spiders depending on whether 16.5 x 7-inch or 16.5 x 8-5/8-inch brakes are installed onto the axle. Both of these designs are mounted directly to the spider.

Dust shields are mounted to stamped spiders with four fasteners. Figure 6.17.

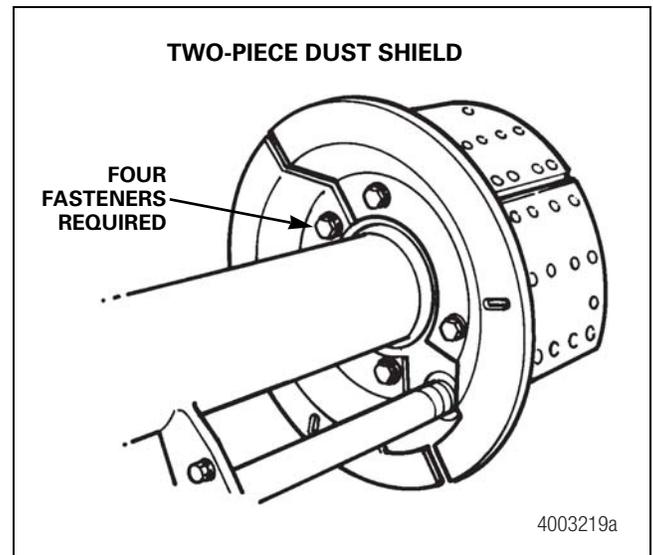


Figure 6.17

- One dust shield design is available for use on stamped spiders. On axles built with 16.5 x 7-inch brakes, the dust shield is fastened directly to the spider.
- On axles built with 16.5 x 8, 8.625-inch and 10-inch brakes, a spacer assembly is installed to space the dust shield to accommodate the wider brake equipment. Figure 6.18.

6 Additional Installation Information

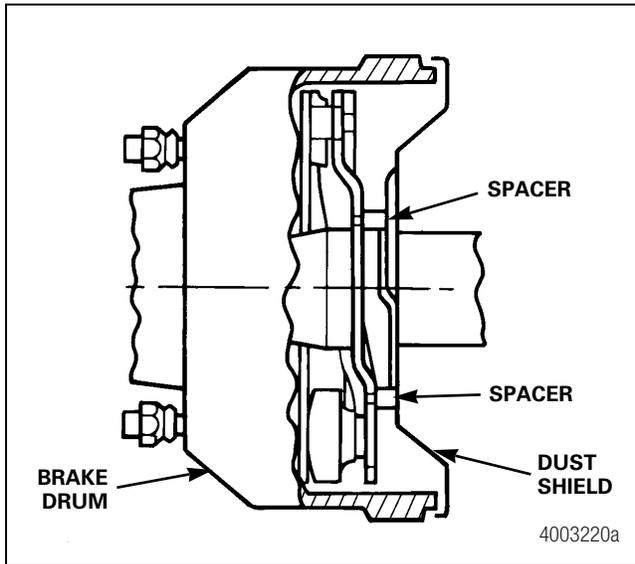


Figure 6.18

Dust shields are mounted to a separate welded-on bracket on axles built with 12-1/4 x 7-1/2-inch brakes. Refer to Figure 6.19 and Section 7 for detailed instructions on locating and welding this bracket to the trailer axle.

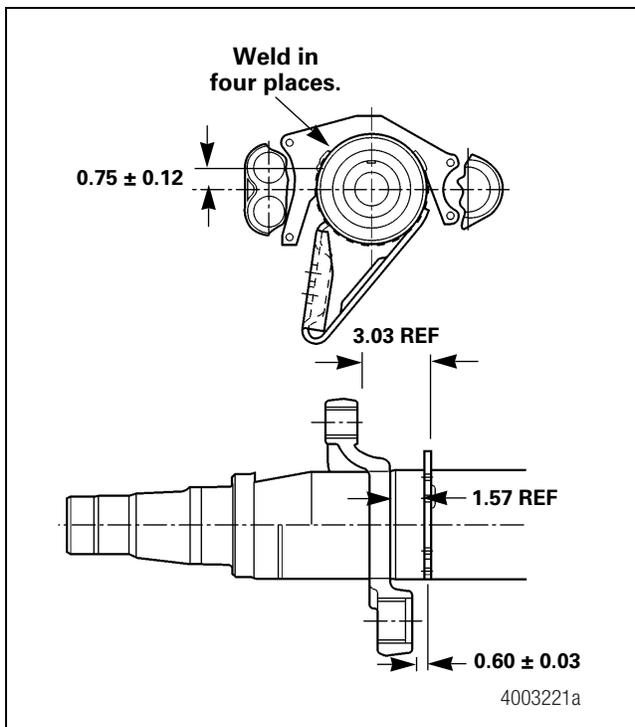


Figure 6.19

When installing a dust shield, tighten all dust shield attachment fasteners to 25-35 lb-ft (34-47 N•m). 

Dust shield kits include four loose spacers that can be used to fine tune the installation. For example, if the dust shield rubs on the brake drum after installation, remove the fasteners and install the washers to space the shields away from the drum.

Centrifuse drums are typically 0.25-inch (6.35 mm) wider than comparable cast drums. Therefore, these loose spacers must be installed between the dust shield and spider when centrifuse drums are used.

Spindle Protection

Two methods are used to protect trailer axle spindles from damage and corrosion during shipping, when axles are built without wheel-end equipment. A plastic sleeve or chemical protectant may be used.

Plastic Sleeve

The most common method is to fit a plastic sleeve over the spindle.

CAUTION

To remove a plastic sleeve from an axle spindle, pull the sleeve off the spindle to break the sleeve vacuum. Do not use a knife to cut a plastic sleeve. Damage to the axle spindle can result.

1. To remove the sleeve, pull on it and break the sleeve vacuum by either deflecting it slightly at the oil seal collar, Figure 6.20, or applying clean dry air into the slit on the end of the sleeve. Figure 6.21.

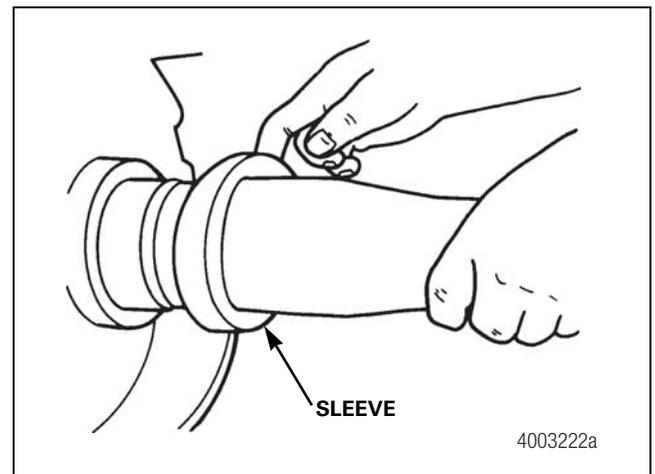


Figure 6.20

6 Additional Installation Information

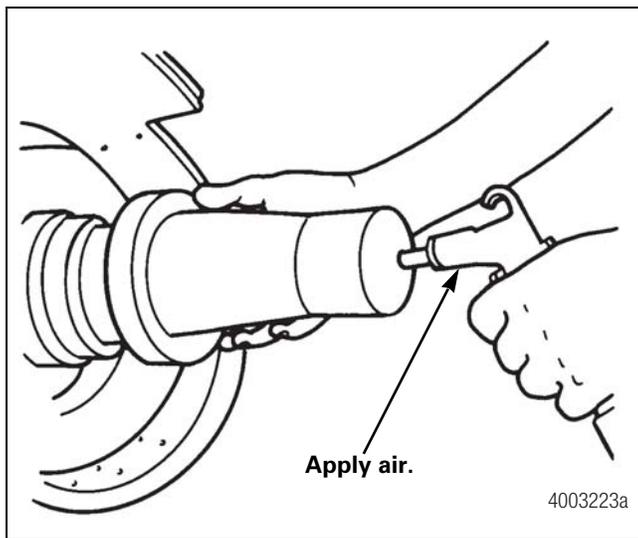


Figure 6.21

2. Remove moisture or contamination found on the spindle with a clean rag.
3. Coat the axle spindle with axle lubricant as specified in Section 5. The light coating of oil on the spindle does not have to be removed.
4. Sleeves are non-hazardous and recyclable. Sleeve color will vary, but this has no significance. Undamaged sleeves can be returned to the Meritor manufacturing plant in Kenton, Ohio, for credit. Call the Meritor OnTrac™ Customer Call Center at 866-668-7221 for instructions.

The plastic sleeves are not designed to protect spindles indefinitely. If axles are stored outside for extended periods of time, water can enter through the sleeve into the spindle cavity and cause some minor rusting. To remove this rust, use a crocus or emery cloth as detailed in Section 4. Lubricate the spindle prior to installing the wheel-end equipment.

Chemical Protectant

Another method of protecting spindles is to apply a chemical protectant directly to the axle spindle.

1. Use a clean rag and solvent to remove protectant prior to service.
2. After removing the solvent, coat the spindle with axle lubricant as detailed in Section 5.

Unit-Mounted Brakes

On some axle models, brake flanges are welded to the axle INBOARD of the spindle. Figure 6.22.

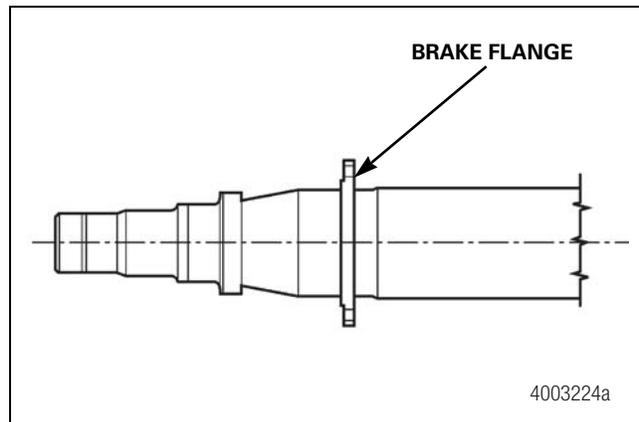


Figure 6.22

Unit-mounted brakes, standard on drive axles, are then mounted to the trailer axle by bolting the brake spider to this flange. Figure 6.23.

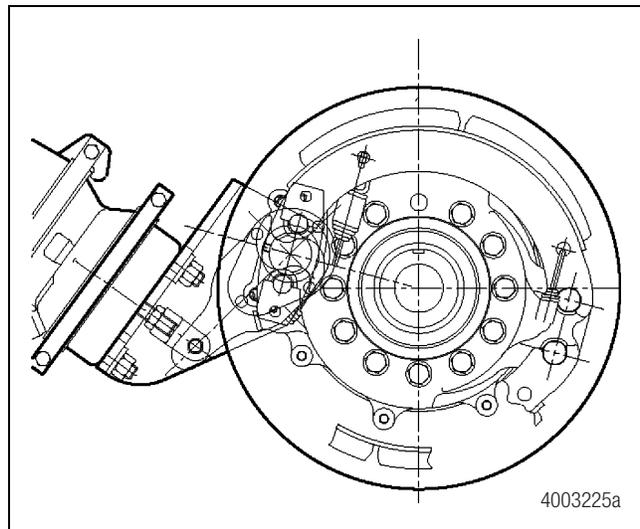


Figure 6.23

Three different flange designs are currently available. Each has one 0.8125-inch (20.638 mm) hole for the anti-lock braking system (ABS) sensor wire and additional holes for fastening the brakes.

- **For a nine-hole flange:** Fasten the brake by installing the correct 5/8-inch (15.875 mm) diameter fasteners through the eight 0.656-inch (17 mm) holes. Tighten the fasteners to 180-230 lb-ft (244-312 N•m). Figure 6.24. 

6 Additional Installation Information

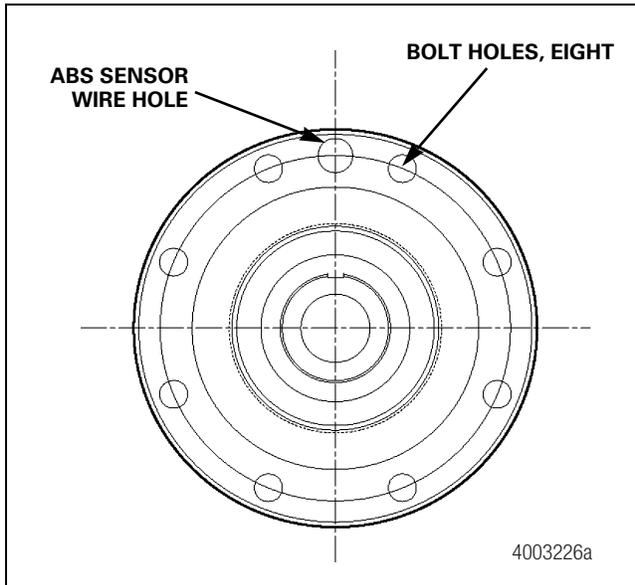


Figure 6.24

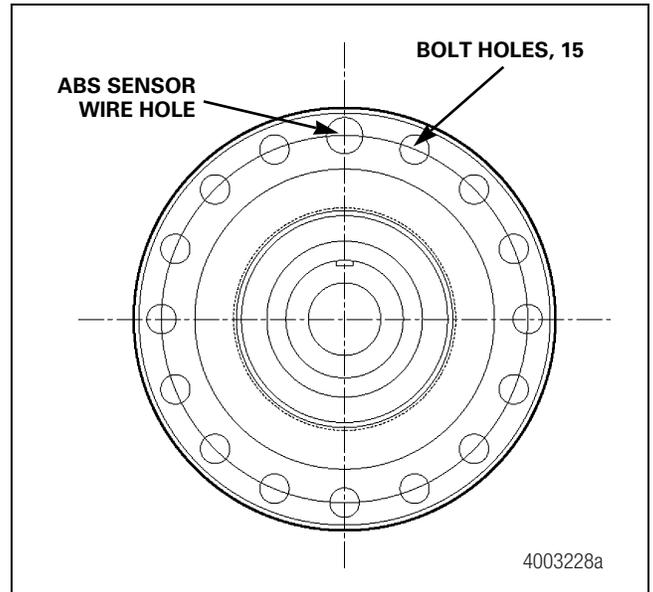


Figure 6.26

- **For a 12-hole flange:** Fasten the brake by installing the correct 9/16-inch (14.288 mm) diameter fasteners through the 11 0.594-inch (15 mm) holes. Tighten the fasteners to 130-165 lb-ft (176-224 N•m). Figure 6.25. 

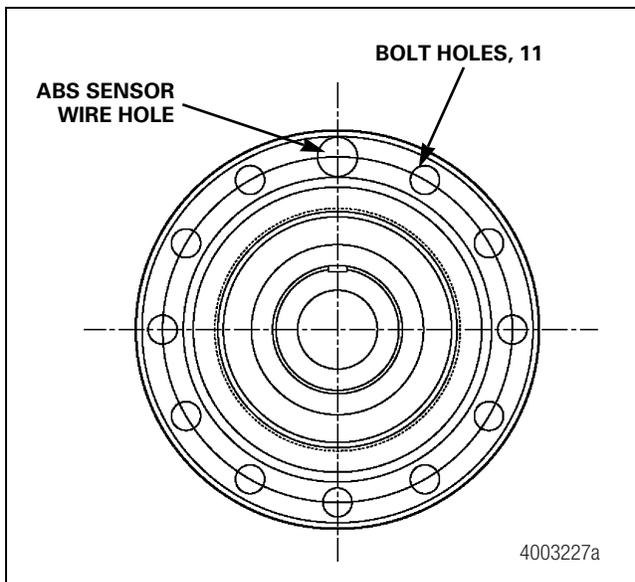


Figure 6.25

- **For a 16-hole flange:** Fasten the brake by installing the correct 5/8-inch (15.875 mm) diameter fasteners through the 15 0.656-inch (17 mm) holes. Tighten the fasteners to 180-230 lb-ft (244-312 N•m). Figure 6.26. 

7 Welding

Hazard Alert Messages

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

WARNING

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

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

Guidelines

For complete welding instructions, refer to technical bulletin TP-9421, Instructions for Welding Brackets on All Drive Axles. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.

Only Use Certified Welders

The American Welding Society's (AWS) Document D1.1 requires that you only use certified welders.

Methods

- Four methods can be used to weld hardware to trailer axles.
 - Shielded Metal Arc (Stick electrodes)
 - Gas Metal Arc (MIG — Solid Wire)
 - Gas Tungsten Arc (TIG)
 - Flux Cored Arc (Tubular Wire)
- Refer to the following table for the American Welding Society (AWS) classifications and specifications.

Method for Welding Carbon and Low Alloy Steels	AWS Electrode Classification	AWS Specification
Shielded Metal Arc	E70XX	A5.1
		A5.5
Gas Metal Arc	ER70S-X	A5.18
Gas Tungsten Arc	ER70S-X	A5.18
Flux Cored Arc	E70T-X	A5.20

- The AWS requires that weld tensile strength must be 70,000 psi (4826.33 bar). Weld tensile strengths that are either higher or lower than this rating are not acceptable.
- The best fusion and strength will be obtained using the voltage, current and shielding medium recommended by the electrode manufacturer.
- If the Shielded Metal Arc method is used, electrodes must be clean, dry and come from stock that has been stored according to AWS specifications.

Axle Preparation

- The area to be welded must be free of grease, dirt, slag and other contaminants that can affect weld quality.
- The axle tube and the hardware to be welded to the axle must be at a temperature of at least 60°F (15°C). Welds made with the axle components at the correct temperature will perform better, since there is less of a tendency to form an area of brittle material next to the weld.
- Never bring an axle into a factory or repair facility from the cold and immediately weld. Rather, the axle and brackets to be welded should be stored overnight in a correctly heated room.
- If temperature requirements are not met, pre-heat the weld area to a temperature of at least 200°F (93°C) using a "rosebud." Do not concentrate heat in one area. Rather, slowly heat a wide area around the joint to be welded. Verify the temperature with a temperature-sensitive crayon or other appropriate means.

Hardware Fit

- Hardware at the weld site should fit as close as possible to the axle. This will prevent the necessity for excessive welding. Figure 7.1.

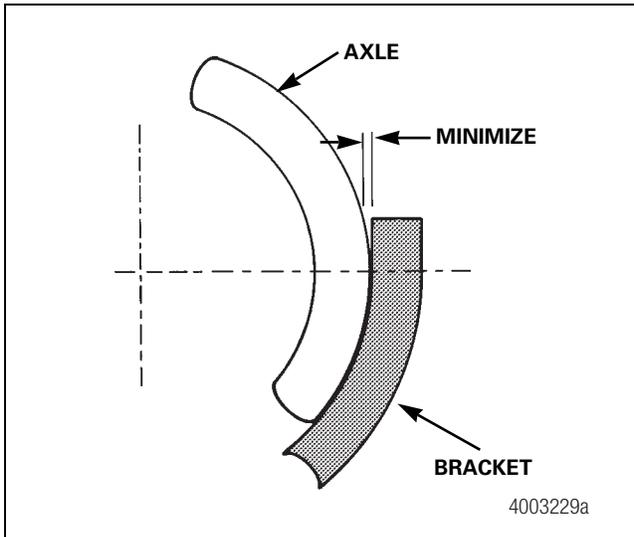


Figure 7.1

- Hardware, such as suspension spring seats and trailing arms, must be accurately positioned parallel to each other. Use the axle top-center hole, when available, for reference in locating this hardware, then C-clamp components in position prior to welding.
- Brackets that wrap around the axle should fit the axle so that the point of contact is at the base of the bracket as shown in View A. Here the fit is such that loads imposed on the bracket are transferred directly to the axle. A fit as shown in View B is such that both vehicle loads or loads imposed by tightening U-bolts are transferred through the weld. This may cause the weld to crack. Figure 7.2.

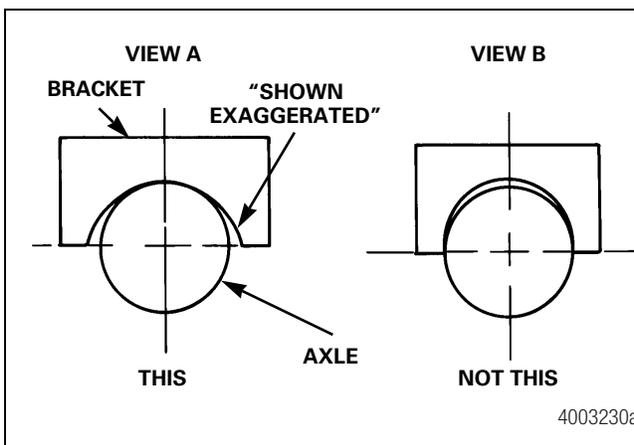


Figure 7.2

- Brackets on rectangular axles should fit the axle so that the point of contact is at the tangent point of the axle radius. Figure 7.3.

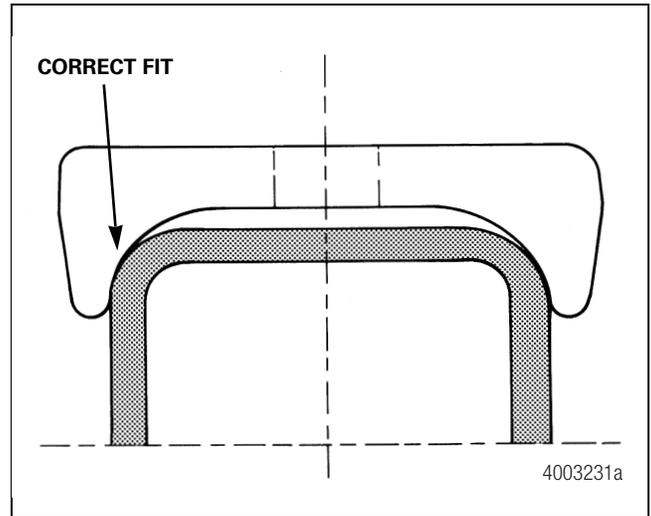


Figure 7.3

Welding Preparation

- Welding equipment should be grounded to the axle through a cable connection that is both clean and tight. The connection should be located at one of the parts welded to the axle such as the camshaft bracket, air chamber bracket or brake spider. It should not be located at a suspension spring, a U-bolt or a point that will place a wheel bearing between the ground connection and weld area. Figure 7.4.

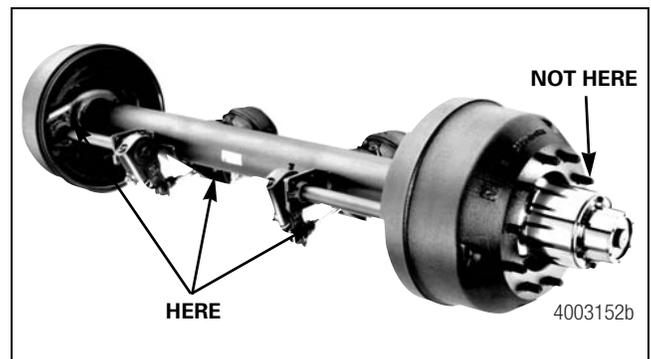


Figure 7.4

- A connection that places a wheel bearing between the ground cable connection and the weld area can damage the bearing by electric arcing as shown below. Figure 7.5.

7 Welding

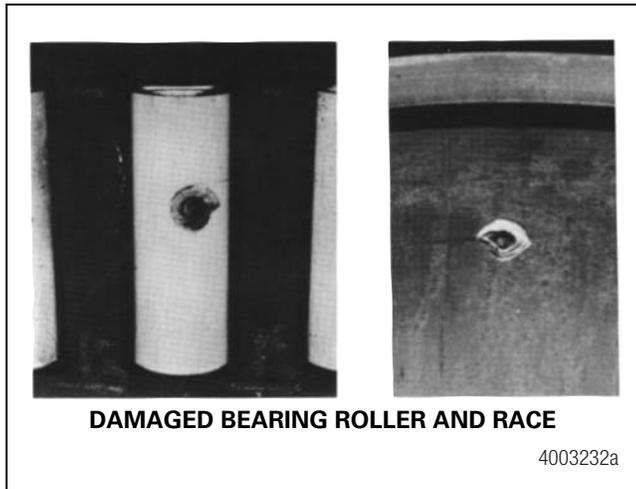


Figure 7.5

- Prior to applying final welds, hardware should be tack welded to the axle following recommendations provided by the component manufacturer. This will help minimize both axle distortion and residual stresses caused by final welds. After tack welding, clean up any weld slag, then fuse the tack welds into the final welds. Figure 7.6.

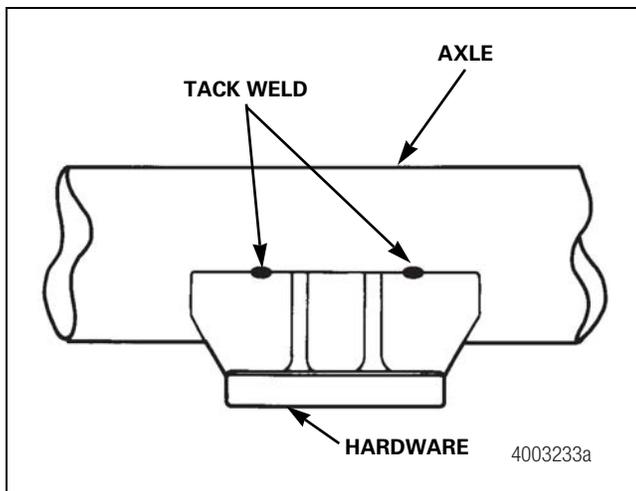


Figure 7.6

- Do not locate tack welds at the ends of the bracket. Rather, they should be located toward the center of the brackets. Figure 7.7.

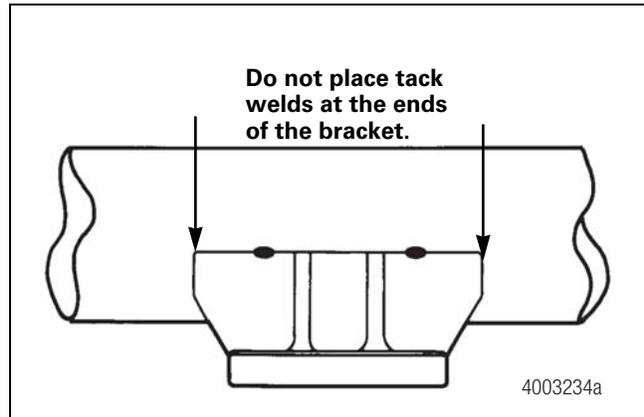


Figure 7.7

Location

Axles are more likely to crack at a weld location, since welds lower the strength of the axle material adjacent to the weld and set up a stress riser at the weld site. You must confine welding to areas of relatively low stress near the center or neutral axis of the beam. Figure 7.8.

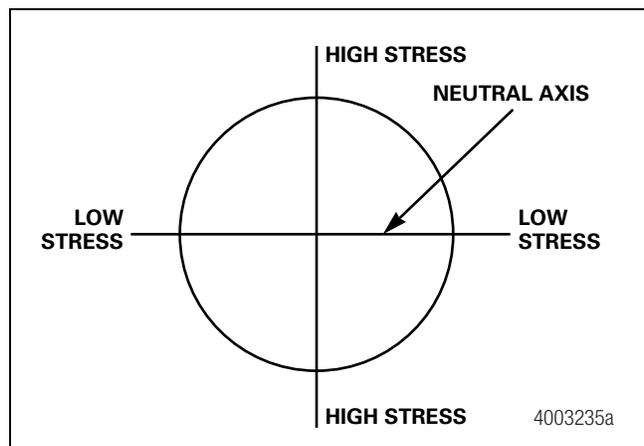


Figure 7.8

⚠ WARNING

An incorrect weld location will void the axle warranty and can result in reduced fatigue life of the trailer axle beam. Serious personal injury and damage to components can result.

The following guidelines are for welding locations on round axles.

- Welding is not allowed within 1.50-inches (38.1 mm) of the top-center of the axle. Figure 7.9.

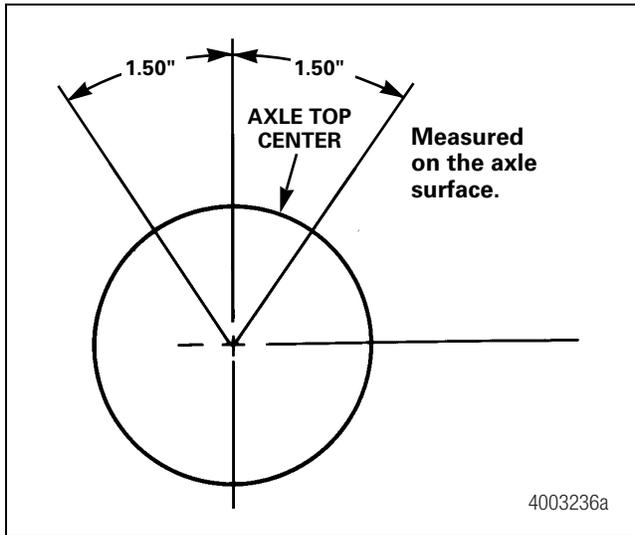


Figure 7.9

- Horizontal welding is not allowed more than 1.50-inches (38.1 mm) below the axle horizontal centerline. Figure 7.10.

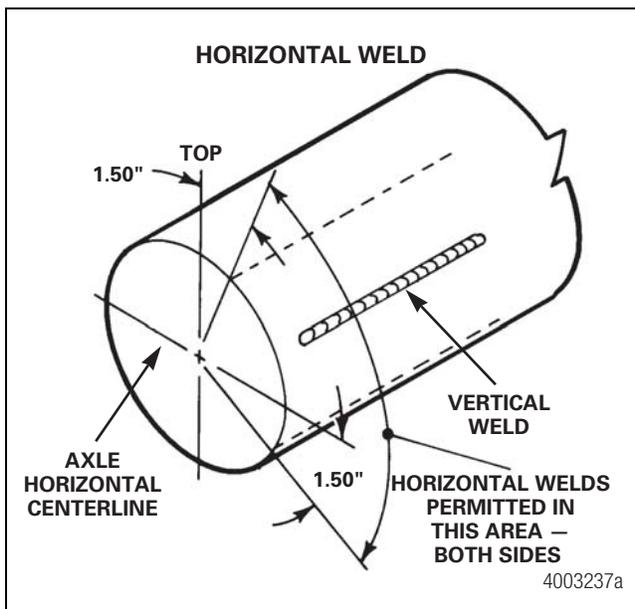


Figure 7.10

- Vertical welding is not allowed more than one-inch (25.4 mm) below the axle horizontal centerline. Figure 7.11.

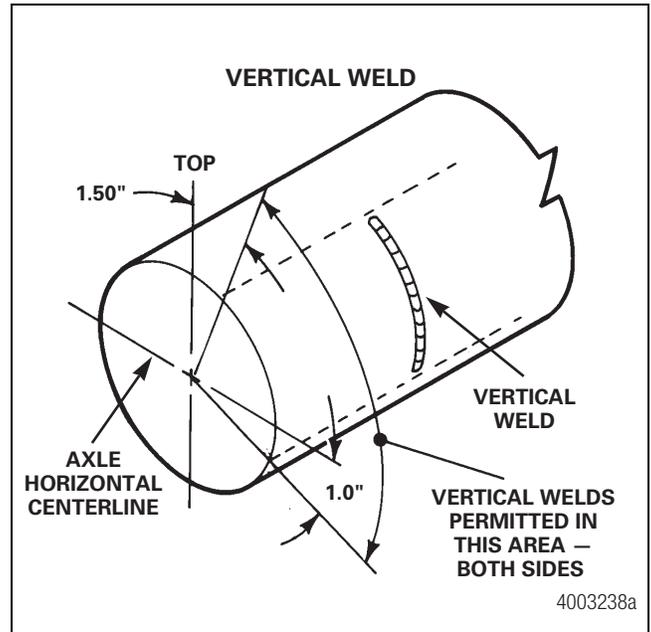


Figure 7.11

- The round axle welding locations are in reference to their position when installed onto the vehicle.

NOTE: Axles can be rotated up to 20 degrees. Do not install the brackets with the correct welds, then rotate them out of the correct positions.

The following procedures are for welding locations on rectangular axles.

- Welding is not allowed within one-inch (25.4 mm) of the top-center of the axle. Figure 7.12.

7 Welding

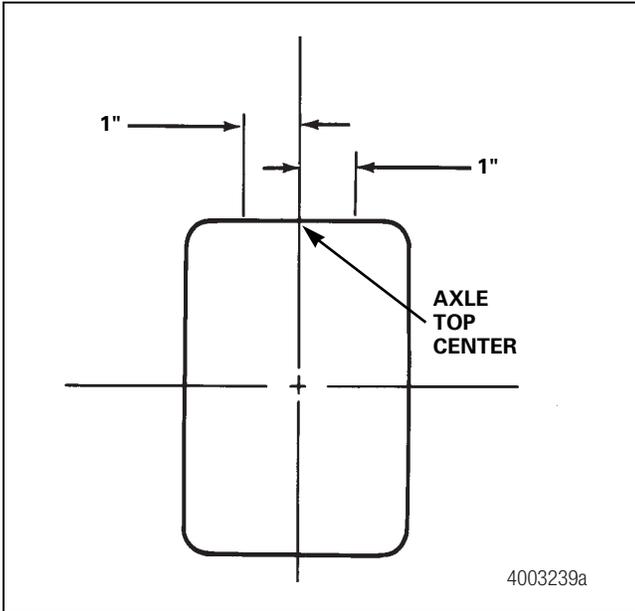


Figure 7.12

- Horizontal welding is not allowed more than 1.50-inches (38.1 mm) below the axle horizontal centerline. Figure 7.13.

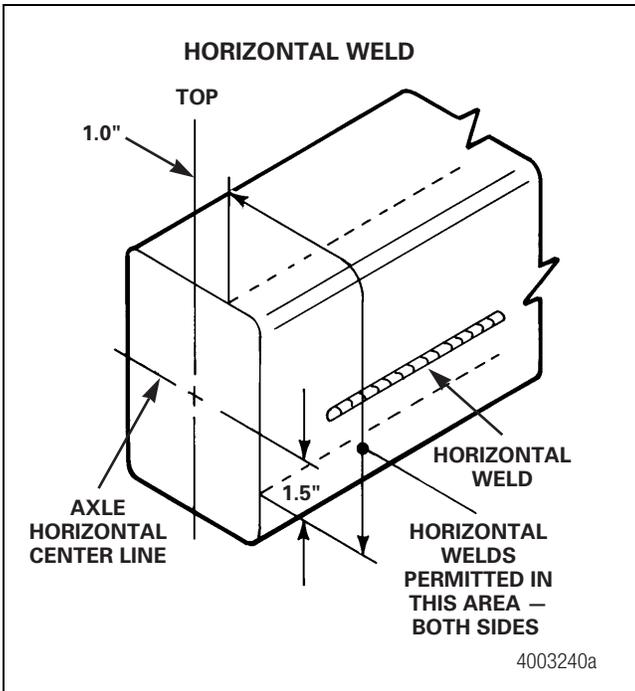


Figure 7.13

- Vertical welding is not allowed more than one-inch (25.4 mm) below the axle horizontal centerline. Figure 7.14.

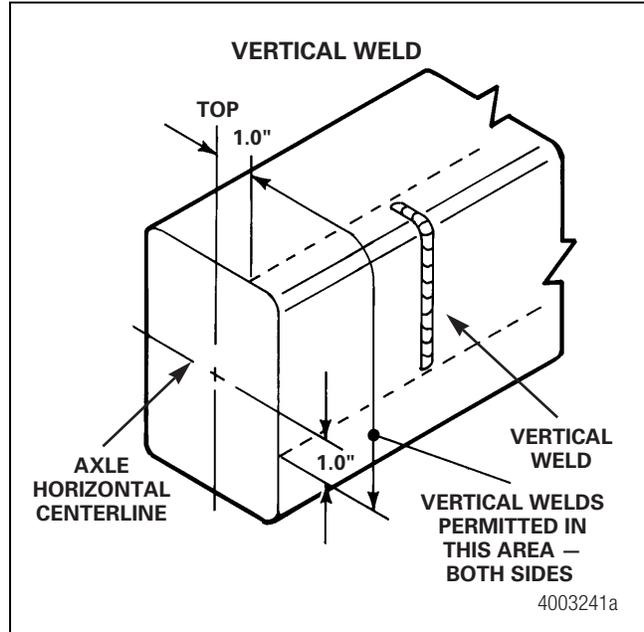


Figure 7.14

- Weld location requirements in this section apply to all welds. In some instances, axles have been found with bracket attachment welds in authorized locations, but with tack welds in unauthorized locations. Neither tack welds nor brackets attachment welds are allowed in unauthorized locations. This can cause a material change that can reduce axle fatigue life. Figure 7.15.

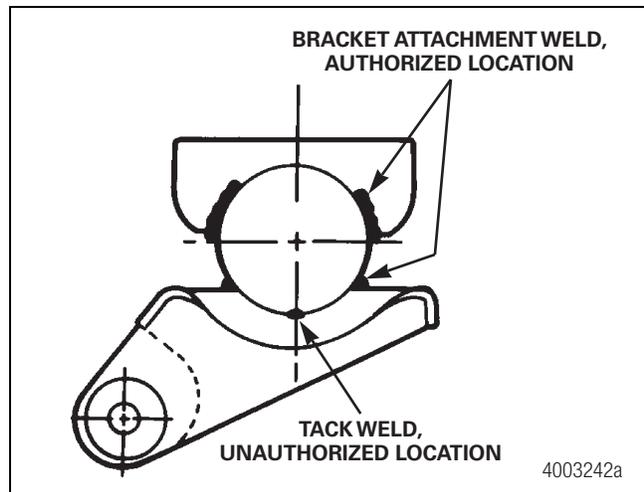


Figure 7.15

- Do not test the weld arc on the axle beam in unauthorized locations. This can cause a material change that can reduce axle fatigue life.

Welding Procedures

Observe the following when performing welding procedures.

- Axles are more likely to crack at the end of the bracket attachment welds. It is critical to avoid welding imperfections such as craters, undercuts and poor fusion at these locations. Some methods of avoiding these imperfections include using correct welding parameters, starting and stopping the arc a short distance away from the ends of the weld pass and maintaining correct arc position and length. Figure 7.16.

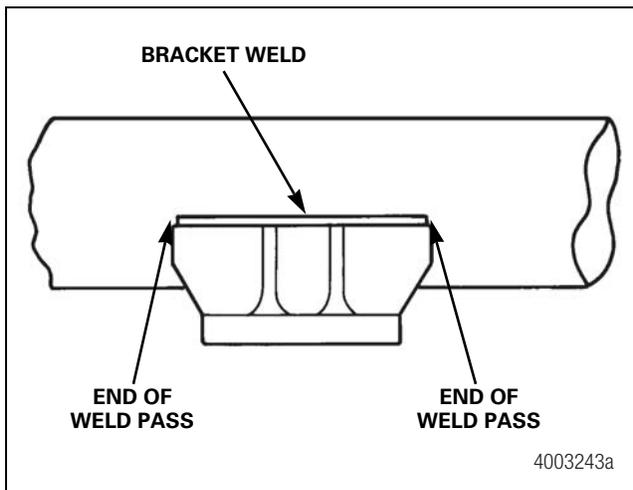


Figure 7.16

- Some brackets are attached to trailer axles with multiple welds. For example, at each of the weld locations shown in Figure 7.17, roadside front, curbside rear, etc., three weld passes are applied. Axle distortion can be minimized in this situation by sequencing the welds. This involves alternating weld passes from the front to the rear of an individual bracket and between the brackets located on the axle roadside and curbside. This is in contrast to applying all the welds at one bracket location prior to applying the welds at other locations.

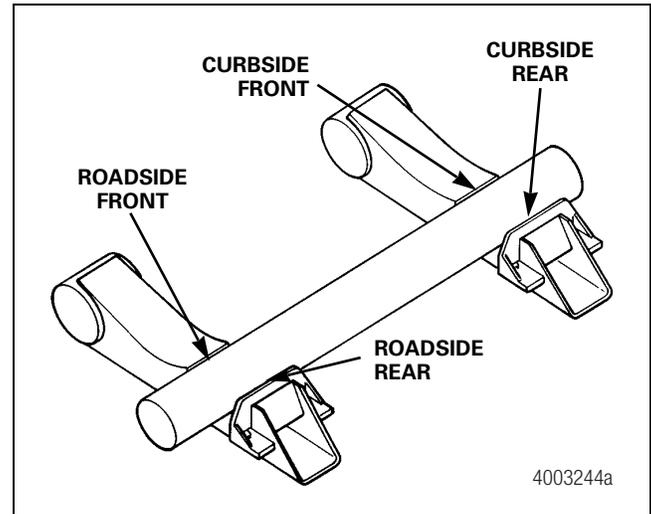


Figure 7.17

- When attaching a bracket, the first weld pass should be made on the front side of the bracket. This will result in any distortion causing the more desirable toe-in rather than the less desirable toe-out condition.
- It is good manufacturing practice to specify a welding procedure that prevents excessive distortion and to periodically check this procedure to ensure that it is understood and is being followed.

Bead Size

- The maximum weld bead size allowed, regardless of whether the weld is achieved with a single or multiple passes, is 3/8-inch (9.5 mm) on rectangular axles and 1/2-inch (12.7 mm) on round axles.

8 Alignment

Hazard Alert Messages

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

⚠ WARNING

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

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

Alignment

Alignment is a function of three parameters:

- Axle orientation
- Axle camber
- Axle toe

Alignment should be checked whenever major axle or suspension components are replaced or if vehicle tracking or excessive tire wear problems exist. Note, however, that these problems can also be caused by other factors such as:

- An axle that is installed with its centerline located more than 0.25-inch (6.3 mm) from the trailer centerline. Figure 8.1.

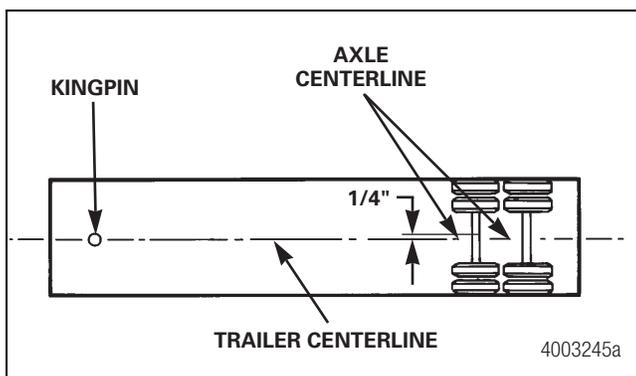


Figure 8.1

- Incorrect tire inflation pressure.
- The rolling radii of a set of dual tires on a wheel end not matching within 0.125-inch (3.1 mm). Figure 8.2.

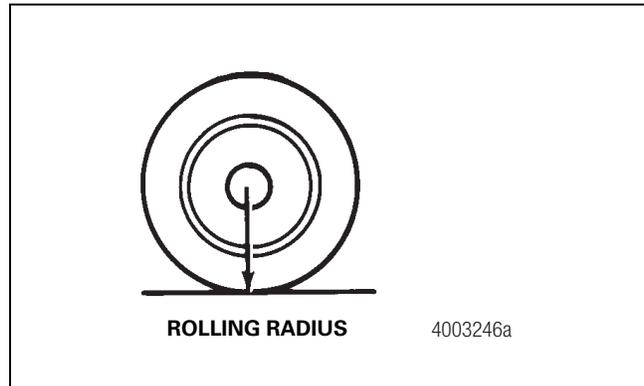


Figure 8.2

- Damaged or worn suspension components or incorrectly tightened suspension fasteners.
- Incorrect chassis angle. Refer to Section 6 for additional information on obtaining a correct chassis angle.

Before performing an alignment, replace damaged or worn components with the parts that match the manufacturer specifications and tighten the fasteners to specifications.

Alignment should be performed with the vehicle empty and the brakes released.

Axle Orientation

Axle orientation is defined as the positioning of the axle assembly relative to the vehicle on which it is installed.

Correctly oriented axles must be positioned as follows. Figure 8.3.

- On a single-axle vehicle, the axle is positioned relative to the vehicle.
- On a multiple-axle vehicle, the front axle is positioned relative to the vehicle, then the remaining axles are positioned so they are parallel to this axle.

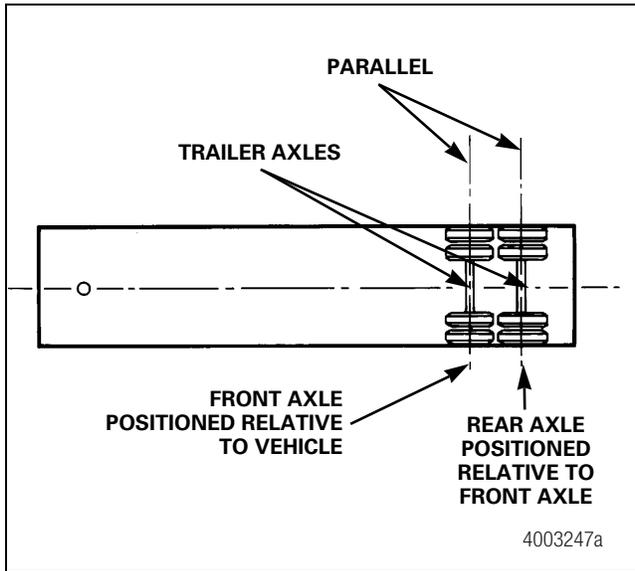


Figure 8.3

Before performing an axle orientation, the vehicle suspension must be in its “as run” condition. This is accomplished by positioning the vehicle on a level floor and moving it forward and backward several times in a straight line. Verify that the last movement is forward.

On a slider suspension, the suspension should be placed in its “as run” condition by applying the trailer brakes and pulling the trailer forward, causing the tires to slide. This step is designed to stabilize the slider subframe by forcing the slider locking pins to the rear within their retention holes.

On a slider suspension, the lower subframe is designed to move within the confines of the trailer longitudinal body rails. Therefore, lateral clearances must be present between these members. On some slider suspensions, this clearance may be excessive and it may be necessary to center the system before orienting the axles by installing temporary shims between these members at all four corners.

Spindle extenders are designed to ease axle orientation by eliminating the requirement for removing the outer wheel when orienting the front trailer axle. Figure 8.4. Made from tubular stock approximately 12 to 15-inches long, the devices are designed to be attached to the spindle end. Once in place, the devices position the axle reference points far enough outside the trailer to allow the measuring tape to clear the tires when measuring the dimensions from the kingpin to the axle ends.

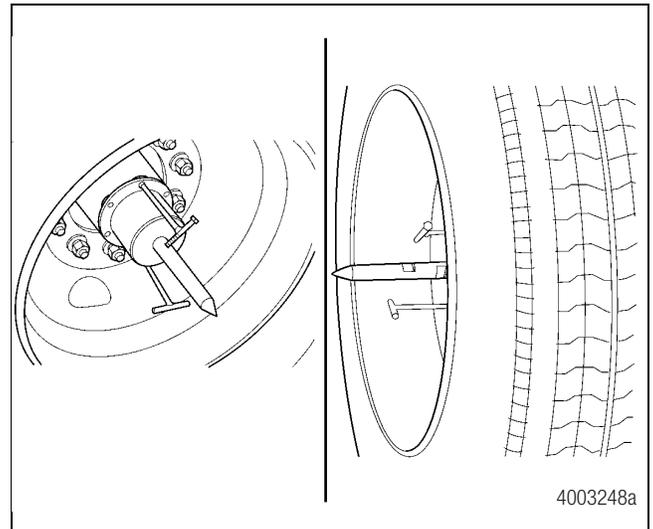


Figure 8.4

Kingpin extenders are designed to ease axle orientation by allowing the measuring device used to orient the front trailer axle to clear obstructions under the trailer. Made from tubular steel, the device provides a vertically oriented adjustable length rod below the kingpin. Bubble-type level gauges should be attached to allow the vertical position to be checked. Once in place, the device provides a location far enough below the kingpin to allow the measuring device to clear under trailer obstructions when measuring the dimensions from the kingpin to the axle ends. Figure 8.5.

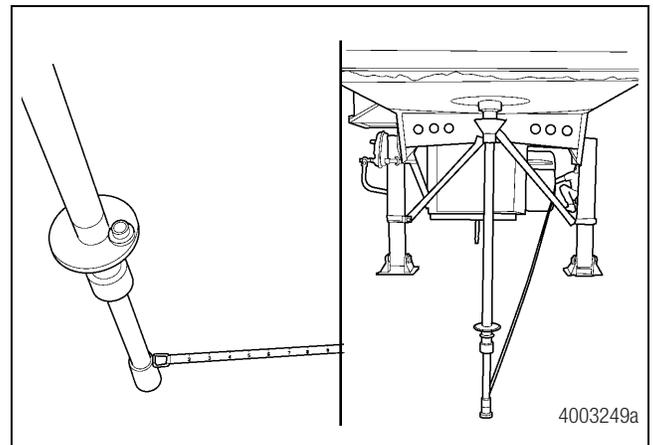


Figure 8.5

To facilitate alignment, a commercially available alignment gauge, generally found in automotive maintenance shops can be used. Otherwise, a trammel bar can be readily fabricated from a drill rod. The pointers of the gauge must be straight and true, as well as aligned with each other. Figure 8.6.

8 Alignment

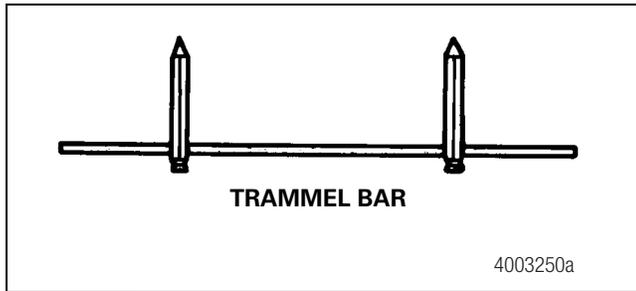


Figure 8.6

Single-Axle Trailers

1. Prepare the suspension by positioning the trailer on a level floor and moving it forward and backward several times in a straight line. Verify that the last movement is forward.
2. Uncouple the tractor and use the support legs to raise or lower the front of the trailer to position the kingpin in its “as used” or design fifth wheel height.
3. Remove the outer tires and any other parts from under the chassis that obstruct the measuring distances between the kingpin and the axle ends. If using commercially available kingpin and axle spindle extenders or the edge of the wheel rim as detailed in this section, you will not need to remove this equipment.

NOTE: An acceptable gauge point for measuring “A” and “B” is the edge of the wheel rim. This measurement should be made at the height of the axle spindles. Verify that the rim is not damaged, the same tires and rims are mounted on each side of the vehicle and the tires are correctly inflated. Figure 8.7.

4. Attach a steel measuring tape to a hook. Attach the hook to the kingpin and measure distance “A” on the roadside and “B” on the curbside of the trailer. Figure 8.8. The difference between these dimensions must not exceed ± 0.0625 inch (± 1.59 mm). Adjust the axle, if necessary, to bring this difference within specification.

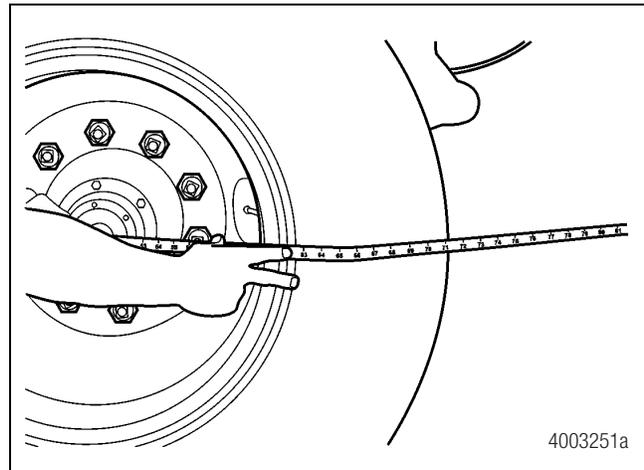


Figure 8.7

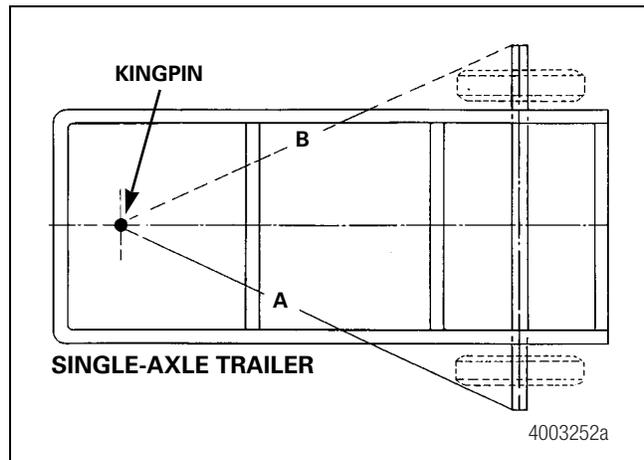


Figure 8.8

Multiple-Axle Trailers

1. Orient the front axle as detailed in the single-axle trailer procedure in this section.
2. Measure “C” and “D”, the distances between the front and rear axles on the trailer roadside and curbside. The difference between these dimensions must not exceed ± 0.03125 -inch (± 0.79 mm). Adjust the rear axle, if necessary, to bring this difference within specification. Figure 8.9.

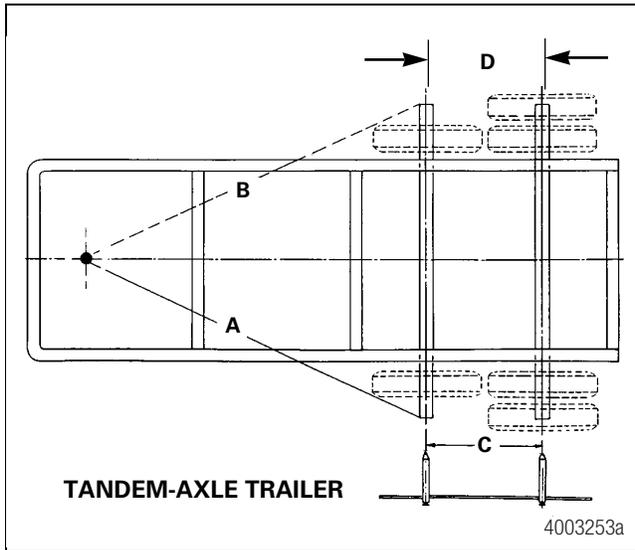


Figure 8.9

3. An acceptable gauge point for measuring “C” and “D” is the dimple in the spindle end plug located on most trailer axles. To reach this plug, remove the rubber hubcap oil filler plugs. Other acceptable gauge points are the edges of the wheel rims as noted earlier. Figure 8.10.

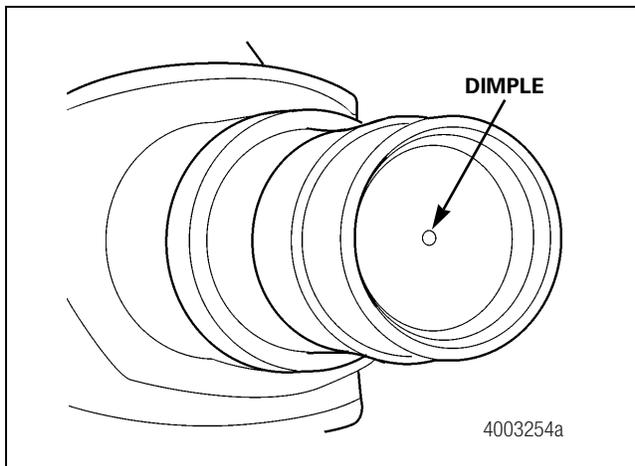


Figure 8.10

4. On trailers equipped with more than two axles, measure and adjust each additional axle. To ensure that these additional axles are accurately adjusted, measurements should be made from the front axle to each additional axle.

Double or Triple Trailers

In most cases, the previous two procedures can be used to orient axles on double or triple trailers. However, if these procedures are used and problems with tire wear or tracking persist, use the following procedure to orient axles to the pull line of the trailer.

1. Prepare the suspension by positioning the trailer on a level floor and moving it forward and backward several times in a straight line. Verify that the last movement is forward.
2. Measure the radius of the tires from the center of the axle to the floor.
3. Uncouple the tractor and use the support legs to raise or lower the front of the trailer to position the kingpin in its “as used” or design fifth wheel height.
4. Raise the rear of the trailer and remove the wheel-end equipment. Place supports under the axle at the spring seat or trailing arm locations so that when the trailer is lowered, the axle spindle centers will be positioned at the height of the radius of the tires, measured in Step 2.
5. Lower the trailer onto the supports.
6. Hang plumb lines from the exact centers of the kingpin and pintle hook. Establish the trailer pull line by marking these points on the floor and snapping a chalk line through them. Figure 8.11 and Figure 8.12.

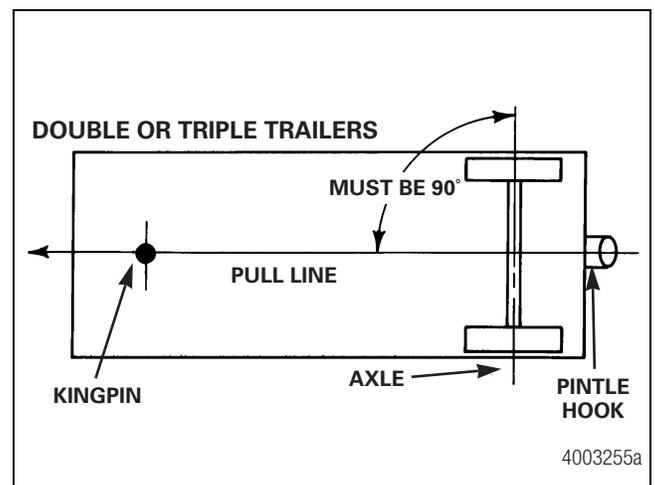


Figure 8.11

8 Alignment

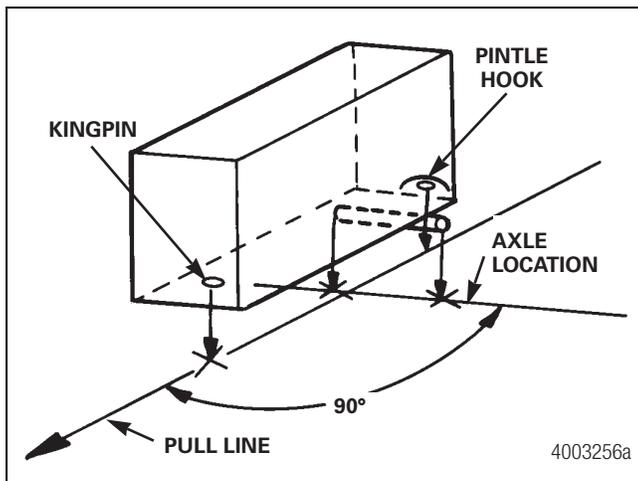


Figure 8.12

7. Hang plumb lines from the exact centers of the roadside and curbside front axle spindles. Establish the axle location by marking these points on the floor and snapping a chalk line through them.
8. Use a large carpenter's square to measure the angle where the chalk lines cross. Adjust the axle, if necessary, until this angle is 90 degrees.
9. If the trailer is equipped with additional axles, measure and adjust them relative to the front axle, as outlined in the multiple-axle trailers procedure in this section.

Converter Dollies

1. Prepare the suspension by positioning the dolly on a level floor and moving it forward and backward several times in a straight line. Verify that the last movement is forward.
2. Measure the radius of the tires from the center of the axle to the floor.
3. Support the front of the dolly to position the lunette eye in its "as used" height.
4. Raise the rear of the dolly and remove the wheel-end equipment. Place supports under the axle at the spring seat or trailing arm locations so that when the dolly is lowered, the axle spindle centers will be positioned at the height of the radius of the tires, measured in Step 2.
5. Lower the dolly onto the supports.

6. Hang plumb lines from the exact centers of the lunette eye and fifth wheel where it holds the trailer kingpin. Establish the pull line by marking these points on the floor and snapping a chalk line through them. Figure 8.13 and Figure 8.14.

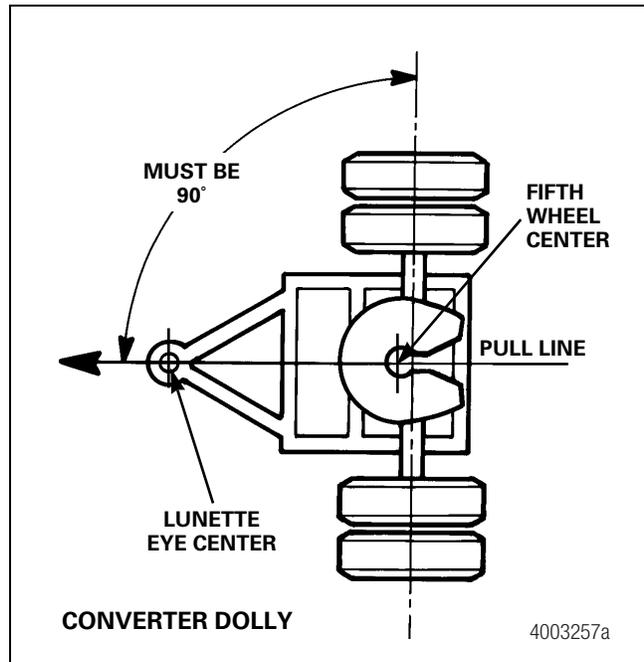


Figure 8.13

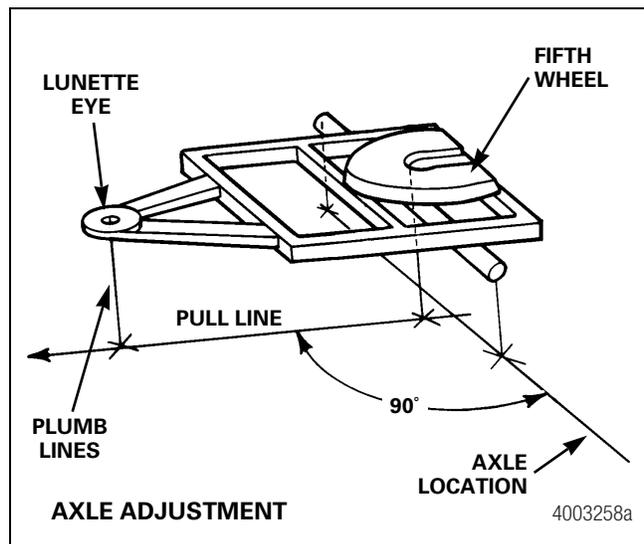


Figure 8.14

7. Hang plumb lines from the exact centers of the roadside and curbside front axle spindles. Establish the axle location by marking these points on the floor and snapping a chalk line through them. Figure 8.14.
8. Use a large carpenter's square to measure the angle where the chalk lines cross. Adjust the axle, if necessary, until this angle is 90 degrees. Figure 8.14.
9. If the dolly is equipped with an additional axle, measure and adjust it relative to the front axle as outlined in the multiple-axle trailers procedure in this section.

Axle Camber

WARNING

Axle camber angle is not adjustable. Do not change the axle camber angle or bend the axle beam. Bending the axle beam to change camber angle can damage the axle and reduce axle strength, and will void Meritor's warranty. A bent axle beam can also cause a vehicle accident and serious personal injury.

- Axle camber is defined as the inward or outward angle of the tires with respect to vertical. With positive camber, the top of the tires are farther apart than the bottom. Negative camber is the opposite. Figure 8.15.

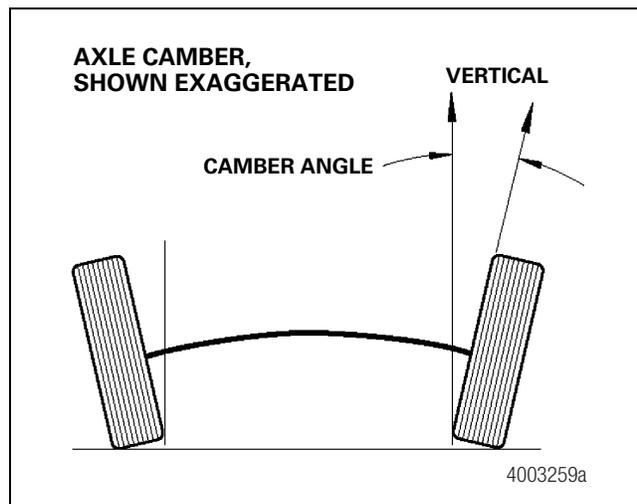


Figure 8.15

- Meritor builds both cambered and non-cambered trailer axles.
 - Camber is currently available on crank axles and straight axles with round cross sections.

— Camber is not currently available on drop axles or straight axles with rectangular cross sections.

- A cambered axle cannot be identified by simply inspecting the axle. Instead, the Meritor Bill of Materials for a particular Engineering Axle Specification (EAS) must be accessed to determine whether the axle is built either with or without camber.
- Trailer axle camber specifications are detailed in Table A. This data is for the following:
 - The camber built into the axle at the manufacturing plant
 - With an unloaded axle
 - The camber measured in minutes of angle (Note that 60 minutes equals one degree of angle.)

Table A: Camber Specifications

<u>Axle Model</u>	<u>Top-Center Hole</u>	<u>Camber (Minutes)</u>
Cambered	with	+20/+40
Non-Cambered	with	-2.5/+10
Non-Cambered	without	-5/+5

- Camber specifications detailed in Table A are for axles prior to welding on suspension brackets. Note the following in regard to bracket welding:
 - The heat generated during bracket welding has been found to induce up to four minutes of additional positive or negative axle camber. This will cause an expansion of the camber range for all the axles listed in Table A. For example, the range for non-cambered axles without a top-center hole will expand from -5/+5 to -9/+9.
 - This information is provided for reference only since Meritor cannot determine the effect on camber of every bracket weld pattern.
 - Refer to Section 7 for guidance on minimizing welding distortion.
- When a commercial alignment machine is used to measure the camber of a trailer axle assembly installed onto a vehicle, the measurement obtained is vehicle camber. Vehicle camber includes the camber of the bare axle beam, as well as the effect on camber of the following.
 - Hub and bearing runouts
 - Wheel-end equipment end play
 - Wheel and rim runouts
 - Tire concentricity, as well as other factors

8 Alignment

Meritor does not design, manufacture or sell all of these components, and therefore, cannot provide vehicle camber specifications. Contact the vehicle manufacturer for this information.

Axle Camber Measurement

1. Remove the axle assembly from the trailer. Remove the wheel-end equipment. Clean the beam and spindle area.
2. Cut four pieces of 0.5-inch (12.7 mm) diameter rod to a length of three-inches (76.2 mm). Grind a 0.1875-inch (4.8 mm) flat side on the rods so they do not roll.
3. Place a set of V-blocks on a stationary surface. Set the rods in the V-blocks with the flat side down.
4. Apply several drops of machine oil to the inner bearing journals of the axle ends. Set the axle down so that its inner bearing journals touch the rods.
5. Rotate the axle several turns. Adjust the rods until a single line is marked on the inner bearing journals. Continue to rotate the axle until the top of the axle is positioned exactly on top.
6. At the top of the axle, measure exactly five-inches (127 mm) from the line on the inner bearing journal to the outer bearing journal. Mount a dial indicator so that the stem measures vertical run out. Figure 8.16.

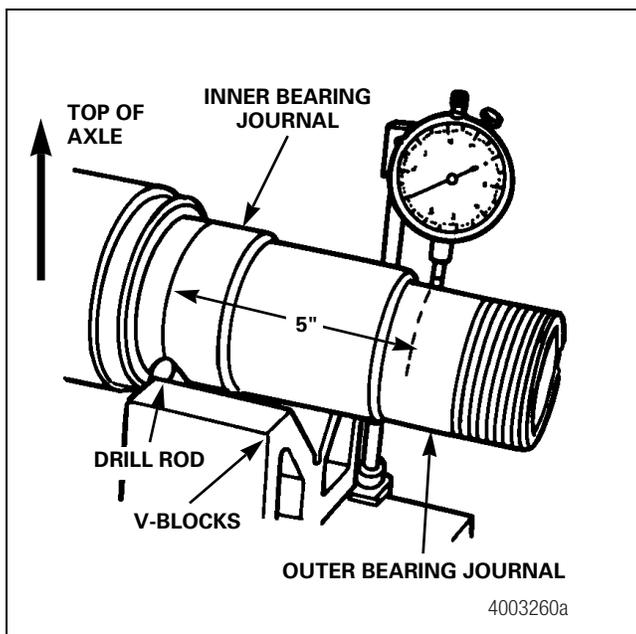


Figure 8.16

7. Set the dial indicator to ZERO. Rotate the axle 180 degrees until the top of the axle is toward the bottom.

NOTE: Table B is based on an accurate measurement of five-inches (127 mm) between points on the inner and outer bearing journals. If this measurement is not exactly five-inches (127 mm), the axle camber read from the chart will be incorrect.

8. Read the dial indicator and use Table B to convert this reading into axle camber. For example, a dial indicator reading of 0.0727-inch converts to 25 minutes of axle camber.
 - **If the stem of the dial indicator rises after rotation:** The axle camber is positive.
 - **If the stem of the dial indicator lowers after rotation:** The axle camber is negative.
 - **If the dial indicator reading does not change after rotation:** The axle camber is ZERO.

Table B: Axle Camber

Dial Indicator Reading (Inches)	Axle Camber (Minutes)
0.0000	0
0.0145	5
0.0291	10
0.0436	15
0.0582	20
0.0727	25
0.0873	30
0.1018	35
0.1163	40
0.1309	45
0.1454	50
0.1600	55
0.1745	60

9. Check the camber on the opposite end of the axle using the same procedure.

Axle Toe

⚠ WARNING

Axle camber angle is not adjustable. Do not change the axle camber angle or bend the axle beam. Bending the axle beam to change camber angle can damage the axle and reduce axle strength, and will void Meritor's warranty. A bent axle beam can also cause a vehicle accident and serious personal injury.

- Axle toe is defined as the inward and outward angle of the tires with respect to horizontal. With toe-in, the front of the tires are closer together than the rear. Toe-out is the opposite. Figure 8.17.

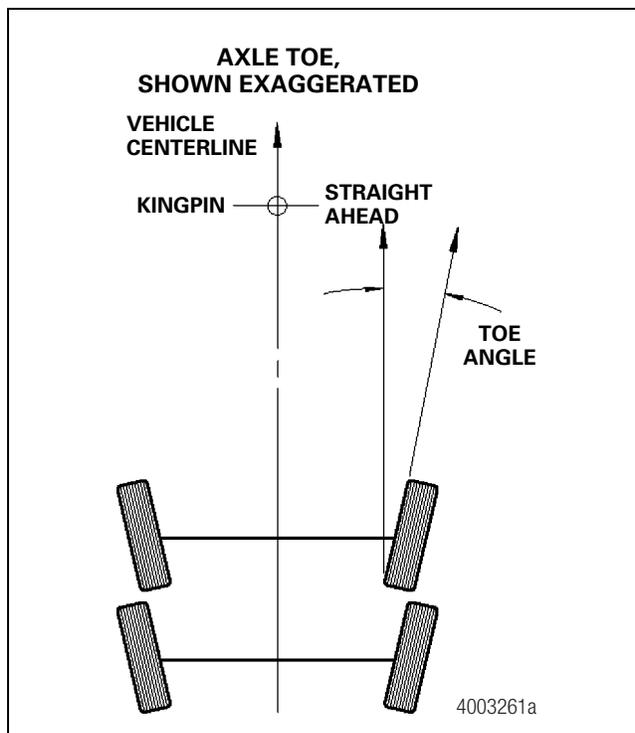


Figure 8.17

- Trailer axle toe specifications are detailed in Table C. This data is for the following.
 - The toe built into the axle at the manufacturing plant
 - With an unloaded axle
 - The toe measured in minutes of angle (Note that 60 minutes equals one degree of angle.)

Table C: Toe Specifications

Top-Center Hole	Toe-In (minutes)	Toe-Out (minutes)
With	6.5	2.5
Without	5.0	5.0

- Toe specifications detailed in Table C are for axles prior to welding on suspension brackets. Note the following in regard to bracket welding.
 - The heat generated during bracket welding has been found to induce up to three minutes of additional toe-in and toe-out. This will cause an expansion of the toe range for all the axles listed in Table C. For example, the range for axles without a top-center hole will expand from five minutes toe-in and toe-out to eight minutes toe-in and toe-out.
 - This information is provided for reference only since Meritor cannot determine the effect on toe of every bracket weld pattern.
 - Refer to Section 7 for guidance on minimizing welding distortion.
- Note the following with respect to axles built with and without a top-center hole.
 - Axles built with a top-center hole are manufactured with a bias toward toe-in. This bias orients the tires in the optimum position for achieving maximum tire life.
 - Axles built without a top-center hole are manufactured with a toe tolerance centered around zero toe. On the positive side, this tolerance allows the axle to be rotated 180 degrees during installation. On the negative side, this tolerance can compromise the position of the tires with respect to achieving maximum tire life.
 - Note that it is especially important to ensure that axles built without a top-center hole are oriented correctly, since tires installed onto these axles will be more susceptible to tire wear due to axle misalignment.
- When a commercial alignment machine is used to measure the toe of a trailer axle assembly installed onto a vehicle, the measurement obtained is vehicle toe. Vehicle toe includes the toe of the bare axle beam, as well as the effect on toe of the following.
 - Hub and bearing runouts
 - Wheel-end equipment end play

8 Alignment

- Wheel and rim runouts
- Tire concentricity, as well as other factors

Meritor does not design, manufacture, or sell all of these components, and therefore, cannot provide vehicle toe specifications. Contact the vehicle manufacturer for this information.

- Excessive axle toe is generally due to a spindle bent from a tire impact. The wheel position shown to sustain the most impacts is the curbside front. Since tire impacts are an individual incident generally occurring at only one wheel position at a time, excessive axle toe is often isolated to a single wheel position.
- Axles bent beyond the recommended axle toe limits should be replaced since any attempt to reshape them by bending could cause fractures.
- A trailer in which the curbside front spindle has been bent into an excessive toe-out condition is shown in Figure 8.18. If this bent axle is oriented so the "A" and "B" dimensions are equal:
 - The excessive curbside toe will be equalized between both sides of the trailer. Tire wear due to toe will then be equalized between both sides of the trailer.
 - The axle track line will be directed away from the centerline of the trailer, causing a "dog tracking" condition.

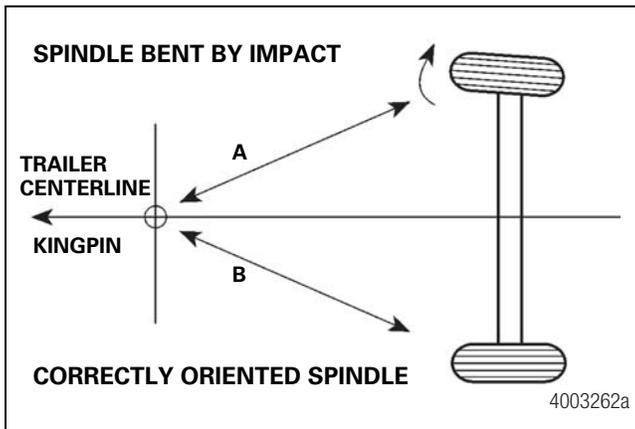


Figure 8.18

Axle Toe Measurement

1. Prepare the axle as outlined in Step 1 through Step 5 of the axle camber measurement procedure in this section.

2. At the front of the axle, measure exactly five-inches (127 mm) from the line on the inner bearing journal to the outer bearing journal. Mount a dial indicator so that the stem measures horizontal runout. Figure 8.19.

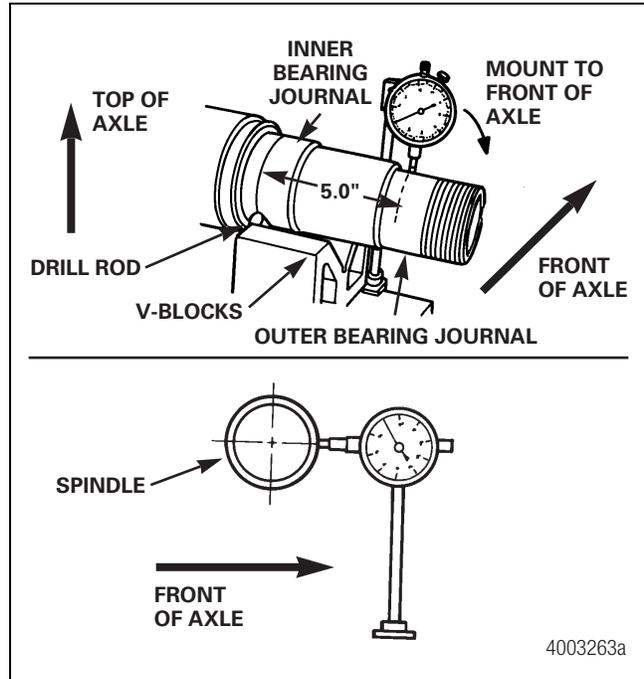


Figure 8.19

3. Set the dial indicator to ZERO. Rotate the axle 180 degrees until the front of the axle is toward the rear.

NOTE: Table D is based on an accurate measurement of five-inches (127 mm) between points on the inner and outer bearing journals. If this measurement is not exactly five-inches (127 mm), the axle toe read from the chart will be incorrect.

4. Read the dial indicator and use Table D to convert this reading into axle toe. For example, a dial indicator reading of 0.0175-inch converts to six minutes of axle toe.
 - **If the stem of the dial indicator moves BACKWARD after rotation:** The axle is toed-in.
 - **If the stem of the dial indicator moves FORWARD after rotation:** The axle is toed-out.
 - **If the dial indicator does not change after rotation:** Axle toe is ZERO.

Table D: Axle Toe

Dial Indicator Reading (Inches)	Axle Toe (Minutes)
0.0000	0
0.0058	2
0.0116	4
0.0175	6
0.0233	8
0.0291	10
0.0349	12
0.0407	14
0.0465	16
0.0524	18
0.0582	20
0.0640	22
0.0698	24
0.0756	26
0.0815	28
0.0873	30

5. Check toe on the opposite end of the axle using the same procedure.

9 Conventional Wheel-End Equipment

Hazard Alert Messages

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

⚠ WARNING

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

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

Guidelines

Trailer axles may be built either with conventional or unitized wheel ends.

- With conventional wheel ends, the hub, seal, lubricant and bearings are installed as separate components. Figure 9.1.
- With unitized wheel ends, these components are installed as an assembly. Figure 9.2.

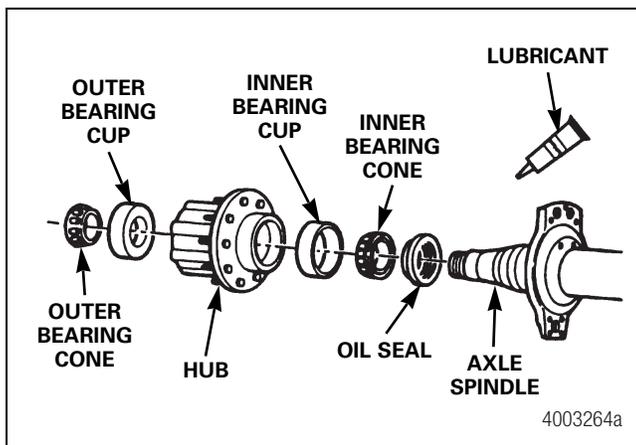


Figure 9.1

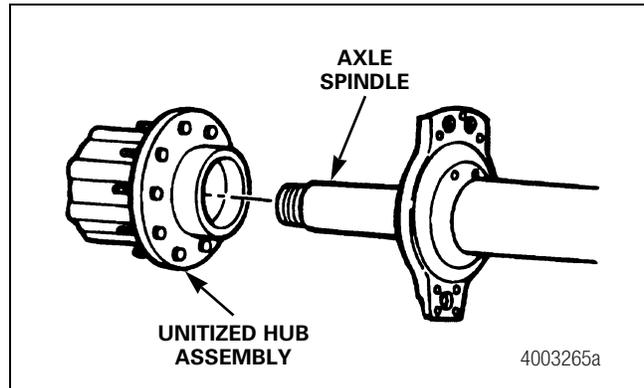


Figure 9.2

⚠ WARNING

There are two basic wheel bearing adjustment procedures for Meritor axles: The POSITIVE adjustment procedure and the MANUAL adjustment procedure. You must use the correct wheel bearing adjustment procedures for the type of axle that you are servicing. Loss of wheel-end components, serious personal injury and damage to components can occur if you use the incorrect adjustment procedure on an axle.

For more information on the unitized hub assembly, refer to technical bulletin TP-96175, Servicing Meritor's TB Series Trailer Axles with Unitized Hub Assemblies. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.

Bearing Adjustment

Two different wheel bearing adjustment methods are available on conventional trailer axle equipment. Most axles use the manual wheel bearing adjustment method. Axles are available, however, that use the positive wheel bearing adjustment method. The procedures for these two wheel bearing adjustments are different, as detailed in Section 10 and Section 11. Therefore, the technician must be able to identify which method to use on the equipment to be serviced.

The information presented in this section provides the following.

- A listing of the conventional equipment used for both bearing adjustment methods so the technician can identify the correct adjustment method to be used on a particular axle.
- General information on the wheel-end equipment used on trailer axles built with conventional wheel-end equipment.

9 Conventional Wheel-End Equipment

Meritor Axles

To determine whether a particular axle uses the manual or positive bearing adjustment method, refer to the Model Numbers chart in Section 2 as well as the following guidance.

- Manual bearing adjustment is used on axles where the first number in the model number is a “4” as in TN-4670.
- Positive bearing adjustment is used on axles where the first number in the model number is a “6” as in TN-6670.

Positive and manual bearing adjustment axles can also be identified as follows.

- On positive adjust axles, a shoulder is machined into the spindle. Figure 9.3.

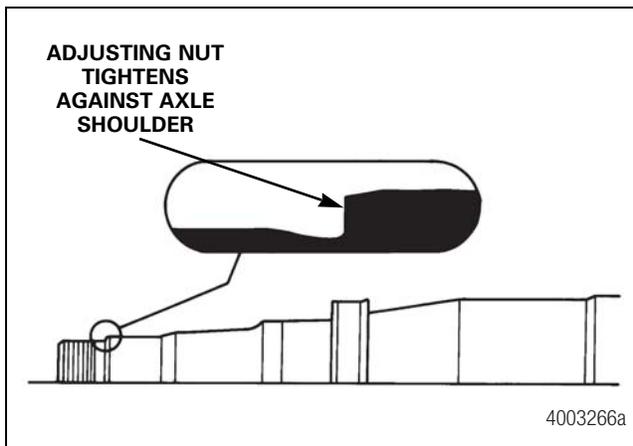


Figure 9.3

- On manual adjust axles, no shoulder is present. Figure 9.4.

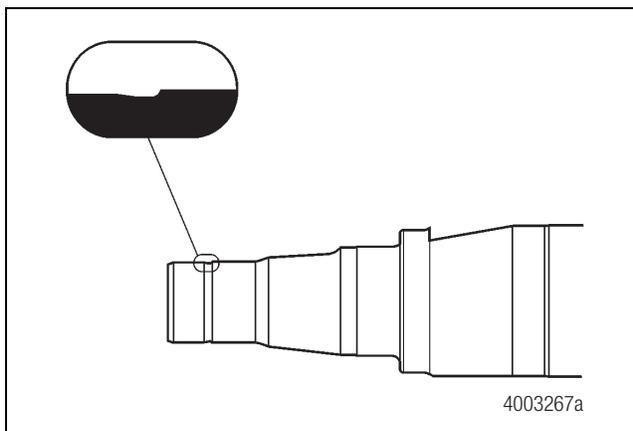


Figure 9.4

- On positive adjust axles, the inner nut of the wheel retention hardware does not have an alignment pin and is marked as shown. Figure 9.5.

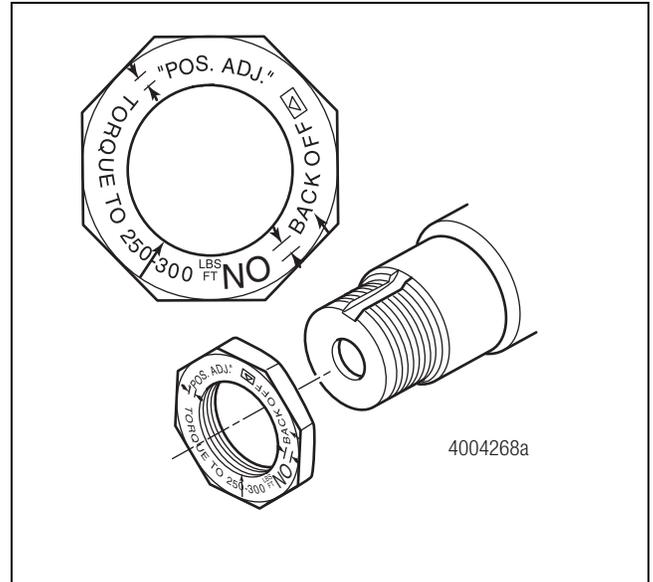


Figure 9.5

- On manual adjust axles, the inner nut of the wheel retention hardware has an alignment pin. Figure 9.6.

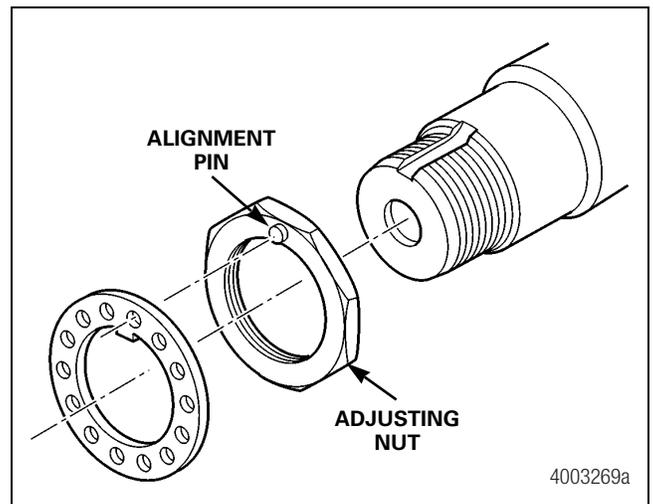


Figure 9.6

- On all positive adjust axle models, except the TP, the spindle threads are smaller than the manual adjust threads. Figure 9.7.

9 Conventional Wheel-End Equipment

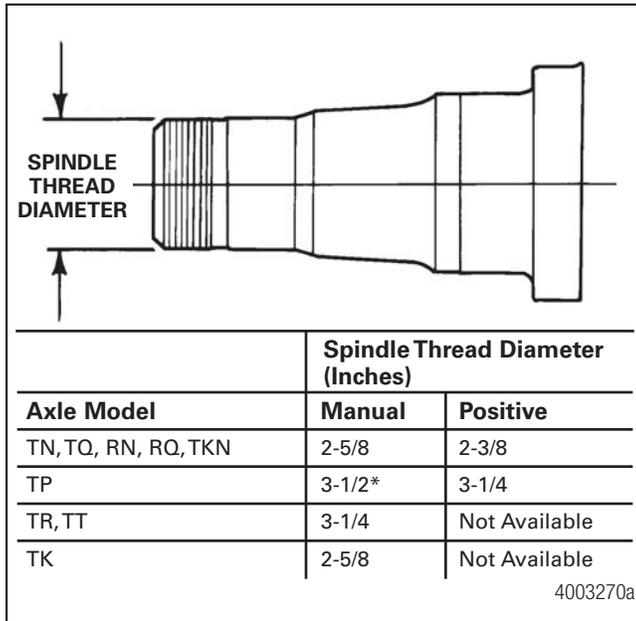


Figure 9.7

Axle Model	Spindle Thread Diameter (Inches)	
	Manual	Positive
TN, TQ, RN, RQ, TKN	2 5/8	2 3/8
TP	3 1/2 ¹	3 1/4
TR, TT	3 1/4	Not available
TK	2 5/8	Not available

¹ One exception to the smaller thread size is the manual adjust TP axle model which was built for a short time with 3.25-inch threads. Therefore, for TP model axles, use one of the other methods for identifying the adjustment method.

WP Axles

Meritor builds, on a contract basis, a trailer axle for Wabash National, a trailer component equipment manufacturer. This model can be recognized by:

- The model number, “WP 4670” or “WP 8670.”
- The spindle, consisting of a “TP” style axle drilled with three adjustment holes. Figure 9.8.

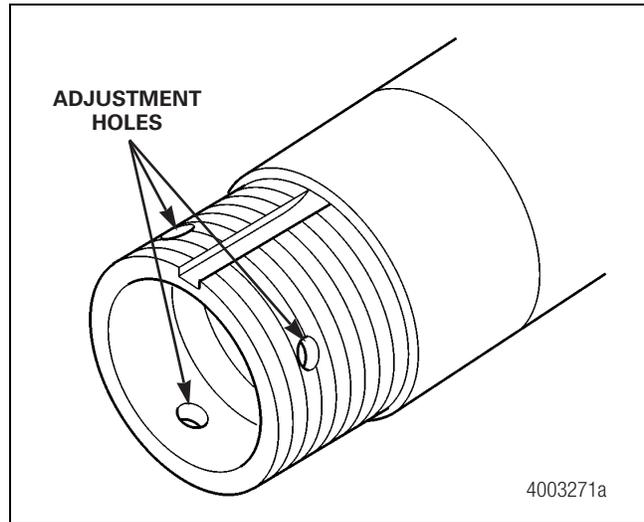


Figure 9.8

Note that the wheel-end configuration for this model was designed, tested and assembled by Wabash National. Therefore, bearing adjustment procedures for this model are not provided in this manual. Contact Wabash National for this information.

Bearings

The correct bearings to use on various trailer axle models are tabulated below in either Anti-friction Bearing Manufacturers Association (AFBMA) or Meritor part numbers.

⚠ WARNING

There are two basic wheel bearing adjustment procedures for Meritor axles: The POSITIVE adjustment procedure and the MANUAL adjustment procedure. You must use the correct wheel bearing adjustment procedures for the type of axle that you are servicing. Loss of wheel-end components, serious personal injury and damage to components can occur if you use the incorrect adjustment procedure on an axle.

Positive adjust axles must use special close tolerance bearings. These bearings can be identified by first noting the model number stamped into the part and then referring to Table E.

9 Conventional Wheel-End Equipment

Table E: Trailer Axle Bearings

Axle Series	Adjustment Method	Inner		Outer	
		Cup	Cone	Cup	Cone
TN/TQ/TKN	Manual	HM218210	HM218248	HM212011	HM212049
TN/TQ/TKN	Positive	1228-P-406	1228-Q-407	1228-M-403	1228-N-404
RN/RQ	Manual	HM218210	HM218248	HM212011	HM212049
RN/RQ	Positive	1228-P-406	1228-Q-407	1228-M-403	1228-N-404
TP	Manual	HM518410	HM518445	HM518410	HM518445
TP	Positive	1228-J-634	1228-H-623	1228-J-634	1228-H-623
TR	Manual	592A	594A	572	580
TK	Manual	653	663	HM212011	HM212049

Do not use a bearing in positive adjust service if a question exists regarding whether bearing is appropriate for this service.

Discard the bearing cup or cone if the number stamped into these parts cannot be read. Figure 9.9.

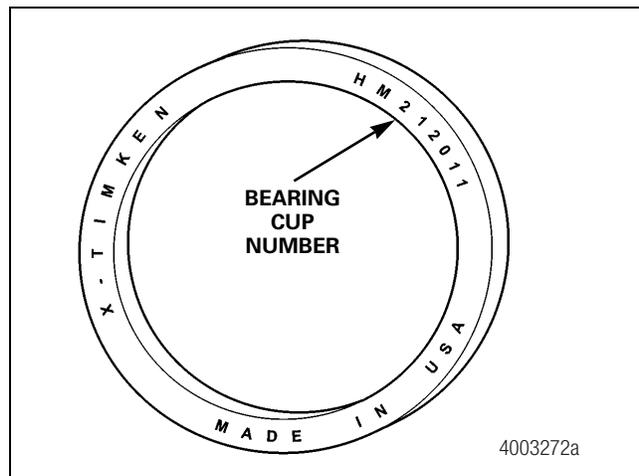


Figure 9.9

Replace the cups and cones as an assembly. For example, if a cone must be replaced, also replace the matching cup.

Do not mix the bearing cups and cones from different manufacturers.

Hubs and Spoke Wheels

Manual bearing adjustment is available on trailer axles fitted with either spoke or disc wheel-end equipment. Figure 9.10 and Figure 9.11.

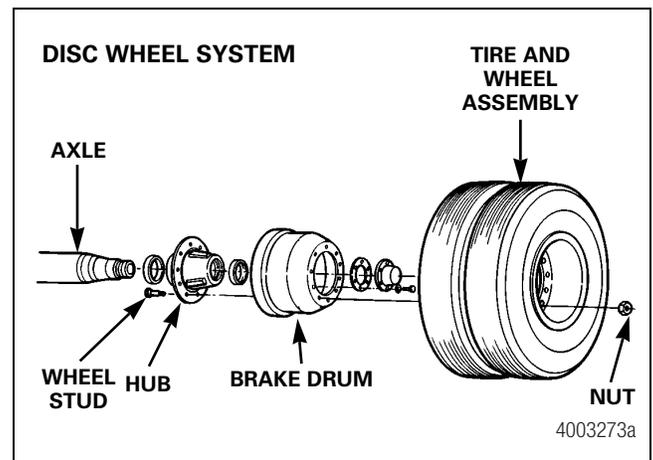


Figure 9.10

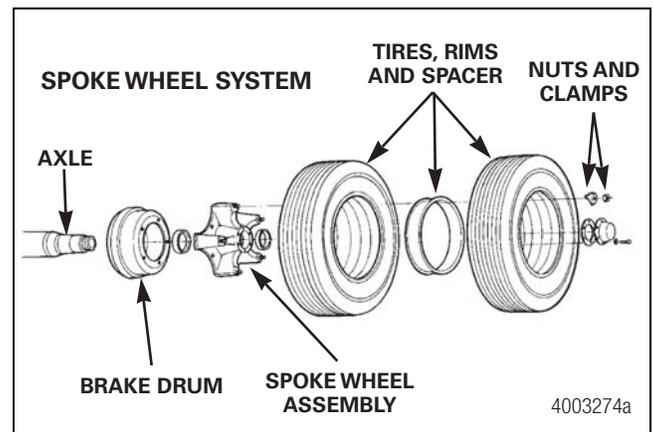


Figure 9.11

Positive bearing adjustment is only available on trailer axles fitted with disc wheel-end equipment. Figure 9.10.

9 Conventional Wheel-End Equipment

⚠ WARNING

There are two basic wheel bearing adjustment procedures for Meritor axles: The **POSITIVE** adjustment procedure and the **MANUAL** adjustment procedure. You must use the correct wheel bearing adjustment procedures for the type of axle that you are servicing. Loss of wheel-end components, serious personal injury and damage to components can occur if you use the incorrect adjustment procedure on an axle.

Positive adjust axles must use special close tolerance hubs.

Positive adjust hubs can be identified by first noting the model number stamped into the part, then contacting the hub supplier for clarification. Do not use a hub in positive adjust service if a question exists regarding whether the hub is appropriate for this service.

Disc Wheel Equipment

Disc wheel equipment incorporates a hub that is mounted onto the axle spindle. Brake drums and tire-wheel assemblies or brake rotors and tire-wheel assemblies are then fastened to this hub.

Figure 9.12.

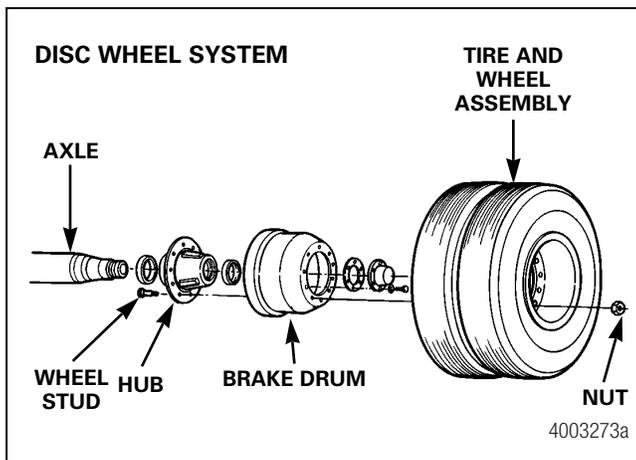


Figure 9.12

Brake drums used on disc wheel equipment may be mounted either inboard or outboard of the hub flange.

- **On inboard-mounted drums:** With this configuration, the brake drum is mounted inboard of the hub flange. Therefore, the hub must be removed prior to removing the brake drum. The main disadvantage of this design is that wheel-end bearings, seals and lubricant must be disturbed during brake maintenance. Figure 9.13.

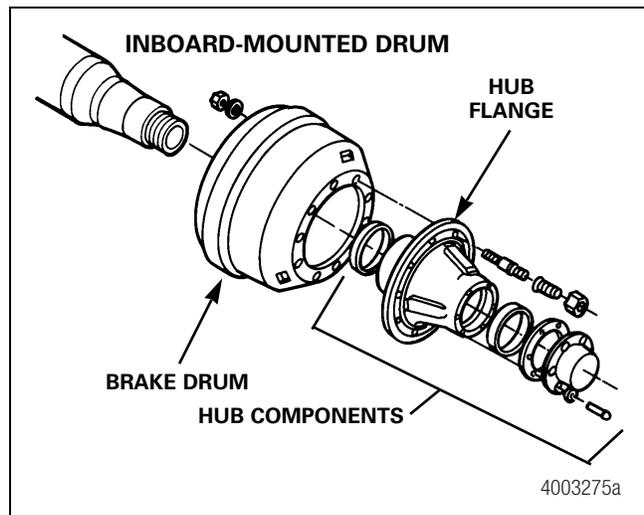


Figure 9.13

- **On outboard-mounted drums:** With this configuration, the brake drum is mounted outboard of the hub flange. Therefore, the hub can remain in place when removing the brake drum. The main advantage of this design is that wheel-end bearings, seals and lubricant can remain in place during brake maintenance. Figure 9.14.

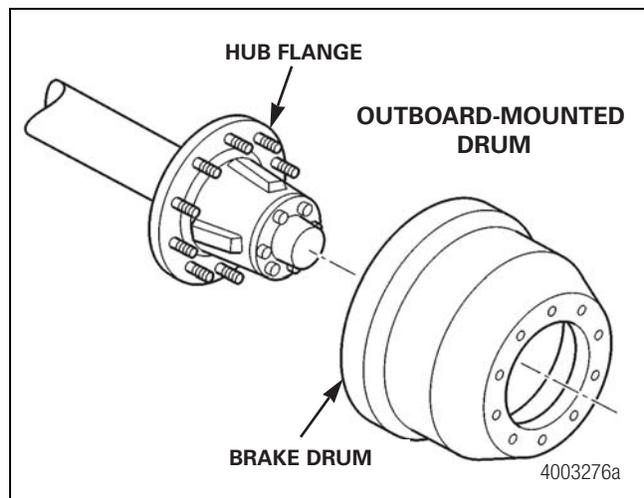


Figure 9.14

- Brake rotors are always mounted inboard of the hub. Therefore, the hub must be removed prior to removing the brake rotor, thus disturbing bearings, seals and lubricant. Figure 9.15. Note, however, that the Meritor Dura-Master® air disc brake design allows brake linings to be replaced without removing the hub. For more information, refer to Maintenance Manual 4M, Air Disc Brakes. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.

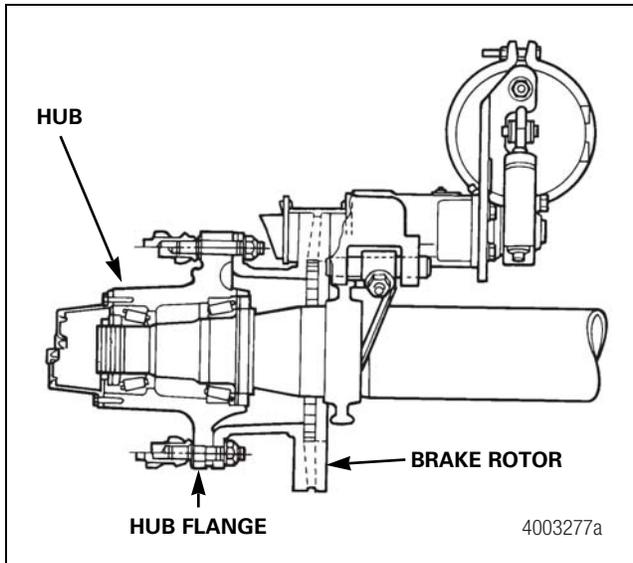


Figure 9.15

- **Do not mix hub-piloted and stud-piloted wheel-end equipment. Mixing this equipment can result in damage to the wheel end and serious personal injury.**

Two mounting methods are available for installing tire-wheel assemblies onto the disc wheel equipment. Hardware for these two mounting systems should never be mixed.

Stud Pilot

With this method, the tire-wheel assembly is centered on hub by piloting the spherical radii built into the mounting nuts into a matching spherical radii machined into the wheel. A separate nut is required for each wheel at each stud location. Thus, single wheels require a single nut at each stud and dual wheels require two nuts at each stud. This method incorporates ball seat nuts, designed to use right- and left-hand threads on opposite sides of the vehicle. Figure 9.16.

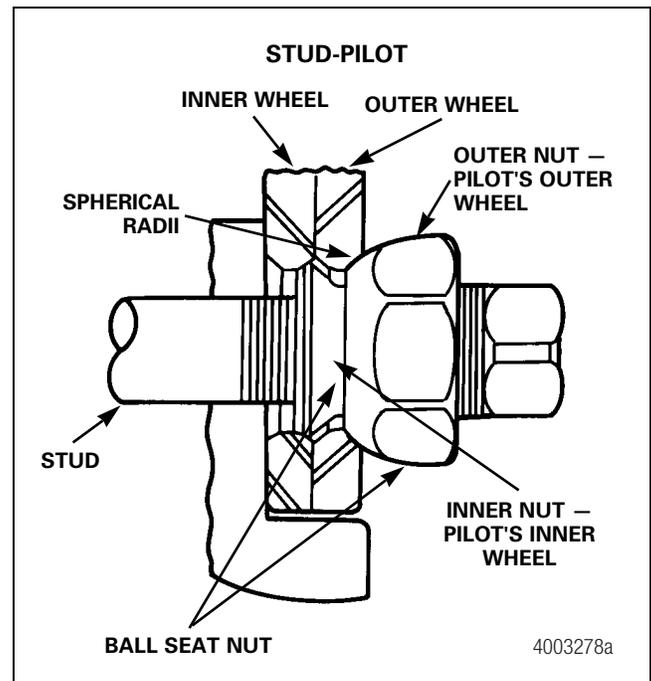


Figure 9.16

Hub Pilot

With this method, the tire-wheel assembly is centered on the hub by piloting the wheel over a pilot diameter machined into the hub. Only a single nut is required at each stud location regardless of whether single or dual wheels are used. This method incorporates flange nuts which are designed to use only metric right hand threads on both side of the vehicle. Figure 9.17.

9 Conventional Wheel-End Equipment

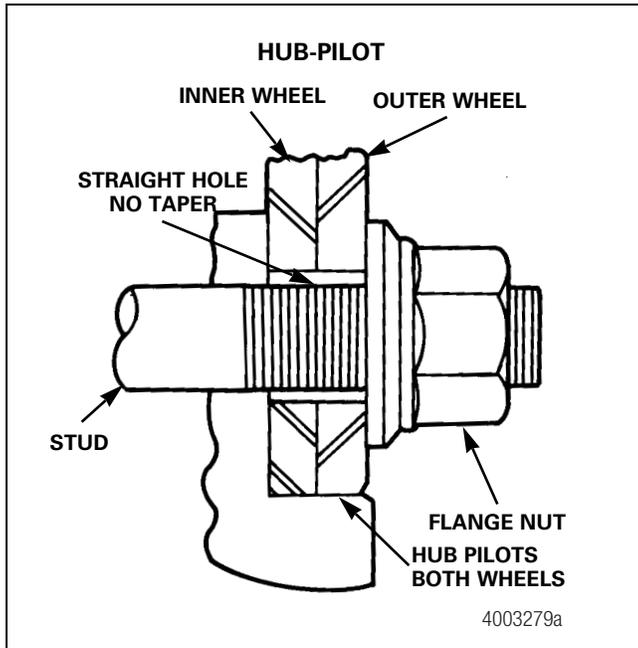


Figure 9.17

Spoke Wheel Equipment

Spoke wheel equipment incorporates a cast wheel built with either three, five or six spokes that mounts onto the spindle. Brake drums or rotors are bolted to the wheel, and tire-rim assemblies are mounted to the wheel using rim spacers, clamps and nuts. Figure 9.18.

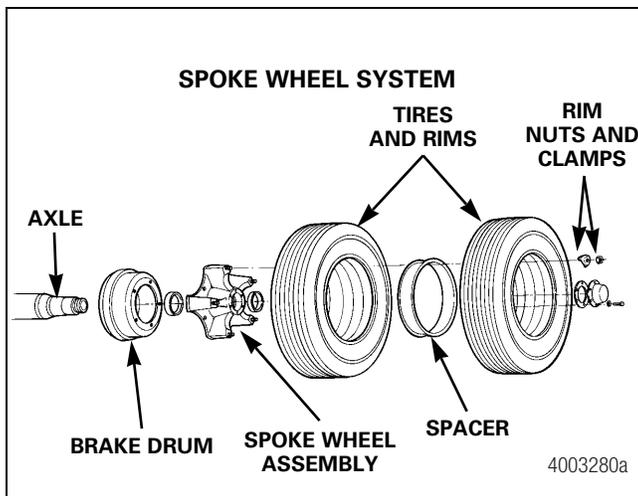


Figure 9.18

Brake drums or rotors are always mounted on the inboard side of the wheel. To remove this equipment, the wheel must be removed, thus disturbing the bearings and seals. Note, however, that the design of Meritor Dura-Master® air disc brakes allows brake linings to be replaced without removing the wheel. Figure 9.19.

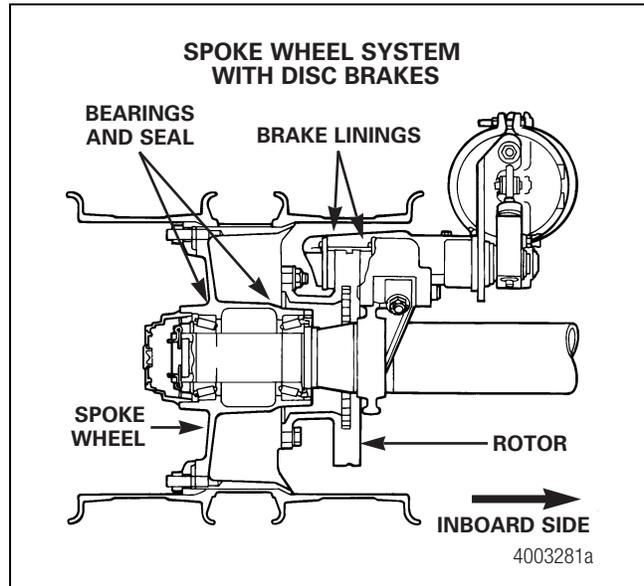


Figure 9.19

Hazard Alert Messages

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

⚠ WARNING

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

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

Adjustment

Manual Bearing Adjustment

- Manual bearing adjustment is the current production standard. The goal of this procedure is to obtain a wheel bearing end play of 0.001-0.005-inch (0.025-0.127 mm). This is achieved by first tightening the adjusting nut against the bearing cone, then backing it off a prescribed amount. Figure 10.1.

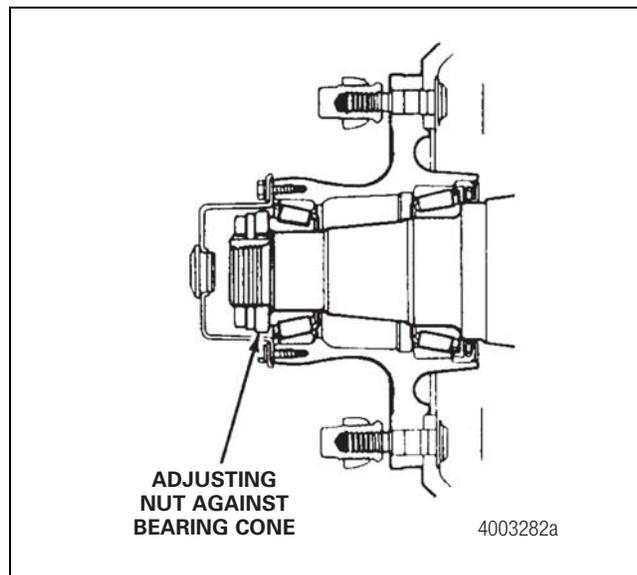


Figure 10.1

- To help ensure that a correct bearing adjustment can be achieved, be sure to do the following prior to performing this adjustment:

- Release the brakes.
 - Inspect the wheel-end equipment, especially the axle and wheel retention hardware threads.
 - Repair or replace any damaged parts as detailed in Section 4.
- Wheel-end components can wear, causing correctly adjusted bearings to loosen. Wheel bearing end play should therefore be periodically checked and re-adjusted if necessary.
 - The procedures detailed in this section apply to both grease and oil lubricated wheel ends.
 - When installing spoke wheels onto Meritor trailer axles, Meritor requires that the wheel rim clamps be tightened prior to adjusting wheel bearings. This helps eliminate excessive bearing and spindle stresses resulting from wheel clamping pressures. Figure 10.2.

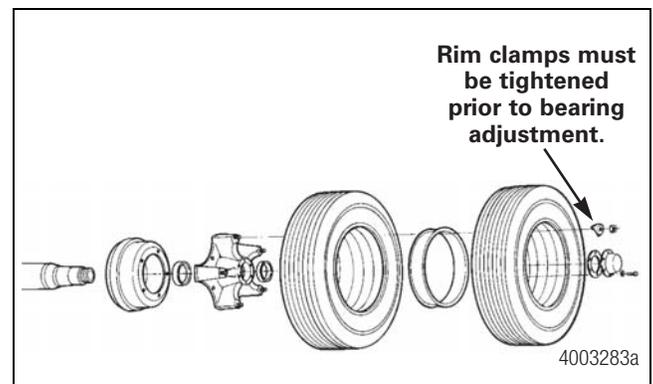


Figure 10.2

Note that this only applies when the entire wheel end is disassembled. If only the rim clamps are removed as is necessary when replacing a flat tire, a new bearing adjustment is not necessary if rim clamp fasteners are retightened in the correct sequence and with the correct torque.

- Meritor TP-89159 details wheel bearing adjustment procedures. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.
- Use the correct size socket to remove or install the spindle nuts. Figure 10.3.

10 Manual Bearing Adjustment

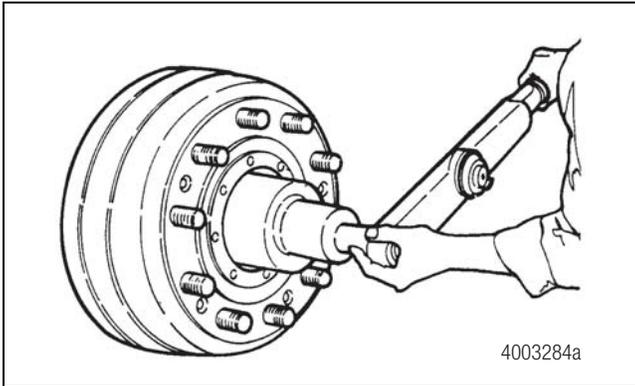


Figure 10.3

⚠ WARNING

Use the correct sockets when you remove and install axle spindle nuts. Do not try to remove the spindle nuts by striking them with a hammer or by striking a chisel or other tool that has been placed against the spindle nuts to loosen them. Loss of wheel-end components, serious personal injury and damage to components can result.

Double Nut Adjustment Procedure

The most common version of the double nut design consists of an adjusting nut, lock washer, jam nut and set screw. Figure 10.4.

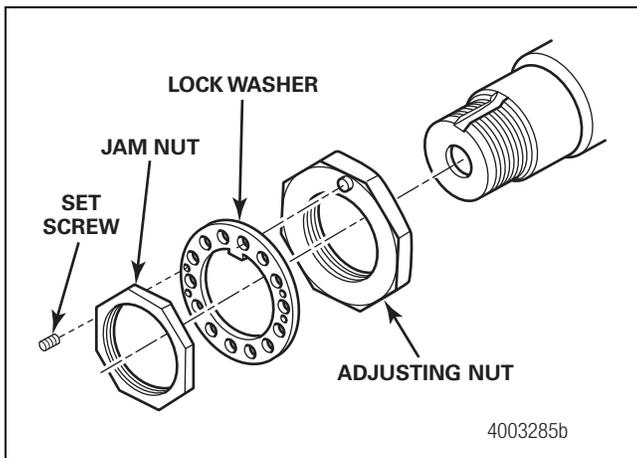


Figure 10.4

Other versions of the double nut design are either currently available or were available in the past.

- A washer was installed before the adjusting nut on an earlier version of the manual adjust TP axle model.

- A set screw was not used on an earlier manual adjust TP axle model.
- A bendable tab lock washer, rather than a set screw, is used on the current production TR axle model.

Use the following procedure to adjust the wheel bearings.

1. Install the adjusting nut so that the pin on the nut faces away from the wheel-end equipment. Tighten the nut to 200 lb-ft (271 N•m) while rotating the wheel end in both directions. Figure 10.5. 

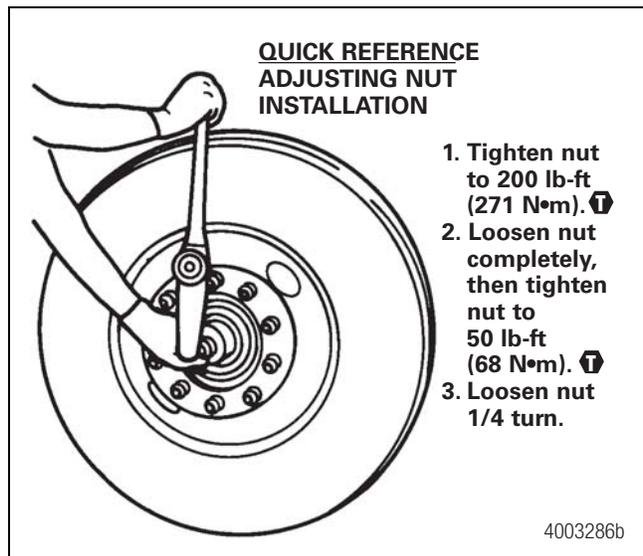


Figure 10.5

1. Tighten nut to 200 lb-ft (271 N•m). 
2. Loosen nut completely, then tighten nut to 50 lb-ft (68 N•m). 
3. Loosen nut 1/4 turn.
2. Completely loosen the nut, then tighten it to 50 lb-ft (68 N•m) while rotating the wheel end. 
3. Loosen the nut 1/4 turn. Do not include socket backlash in the 1/4 turn.
4. Install the lock washer. If the hole in the washer is not aligned with the adjusting nut pin, remove the washer, turn it around and reinstall. The pin and hole should now be aligned. If not, slightly adjust the parts to align them. Figure 10.6.

10 Manual Bearing Adjustment

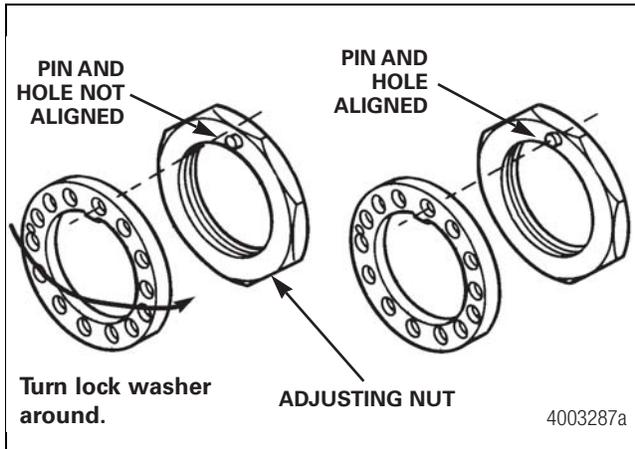


Figure 10.6

5. Install the jam nut and tighten the nut to 300-400 lb-ft (408-544 N•m). 

CAUTION

Too loose an adjustment will reduce bearing life, increase spindle wear and cause seal leaks. Too tight an adjustment will reduce bearing life and increase spindle wear. Extremely tight adjustments can cause complete bearing failure and possible loss of wheel-end equipment.

6. Check the wheel bearing end play as follows.
 - A. Attach the magnetic base of a dial indicator to the spindle. Touch the dial indicator stem to the hubcap gasket face. Figure 10.7.

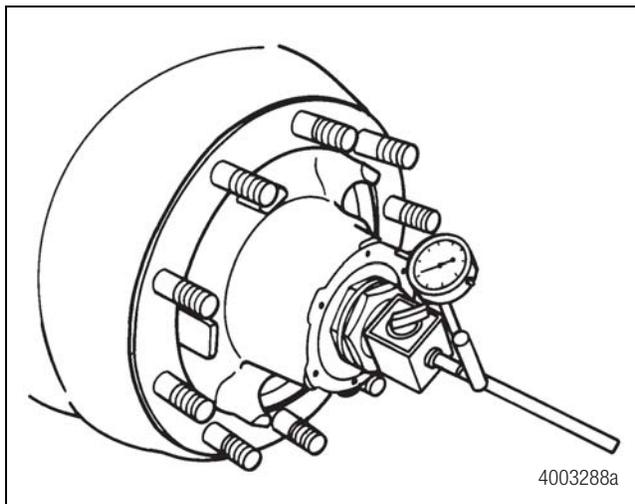


Figure 10.7

- B. Slightly rotate the wheel end in both directions while pushing inward until the dial indicator does not change. Set the dial indicator to ZERO. Figure 10.8.

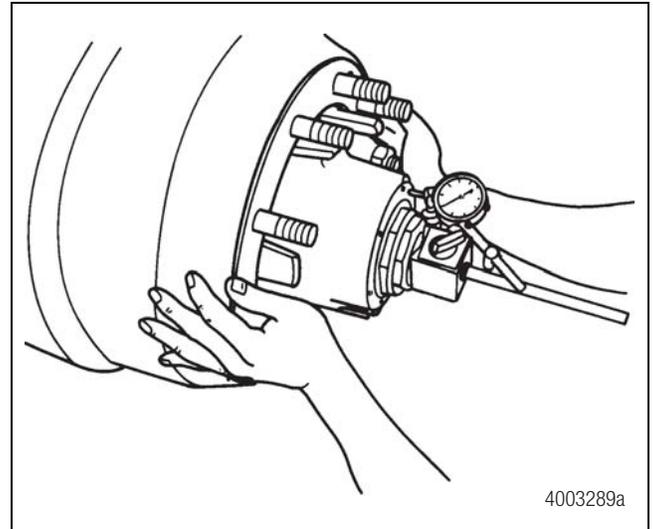


Figure 10.8

- C. Slightly rotate the wheel end in both directions while pulling outward until the dial indicator does not change. Figure 10.9.

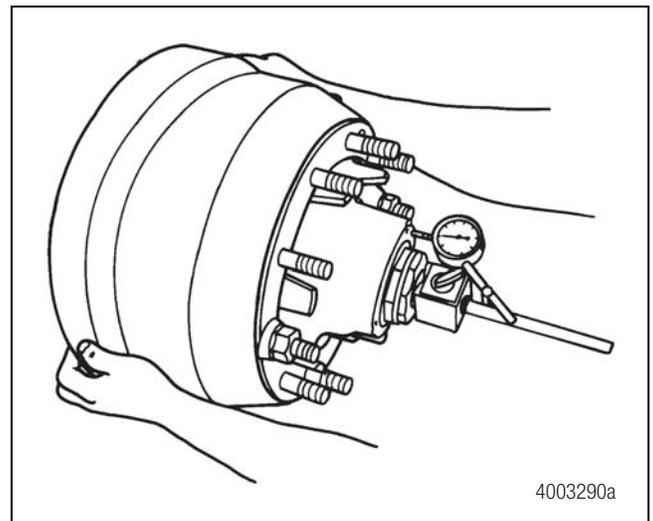


Figure 10.9

- D. End play is the difference between the two readings.

10 Manual Bearing Adjustment

⚠ WARNING

You must adjust wheel bearing end play to within 0.001-0.005-inch (0.025-0.127 mm). An adjustment that is too loose will reduce wheel-end bearing life, increase spindle wear and cause seal leakage. An adjustment that is too tight can affect wheel-end bearing performance. Loss of wheel-end components, serious personal injury and damage to components can result.

7. If end play falls within 0.001-0.005-inch (0.025-0.127 mm), go to Step 8.

If end play does not meet this requirement:

- A. Remove the jam nut and lock washer.
 - B. Tighten or loosen the adjusting nut as required to achieve the correct end play.
 - C. Install the lock washer.
 - D. Tighten the jam nut to 300-400 lb-ft (408-544 N•m). **ⓘ**
 - E. Check end play.
 - F. Continue to adjust until end play meets specifications. Then go to Step 8.
8. Using an Allen wrench, tighten the set screw into the lock washer until it is seated. Figure 10.10. If the axle is fitted with the bendable tab lock washer, bend two tabs over opposite flats of the jam nut. Figure 10.11.

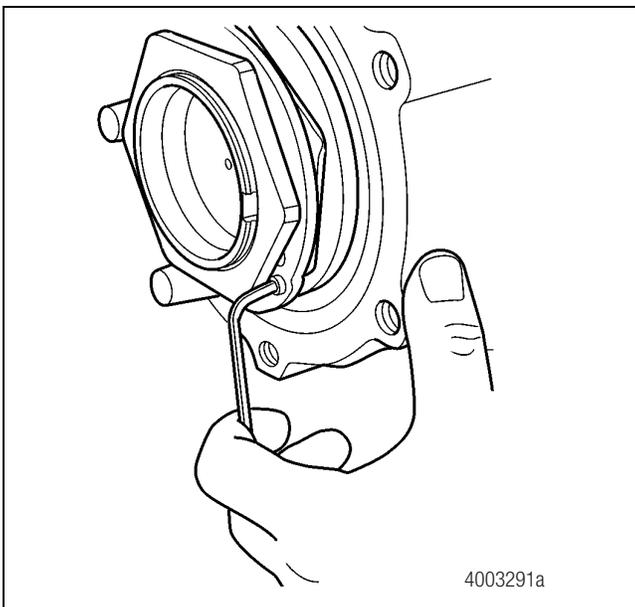


Figure 10.10

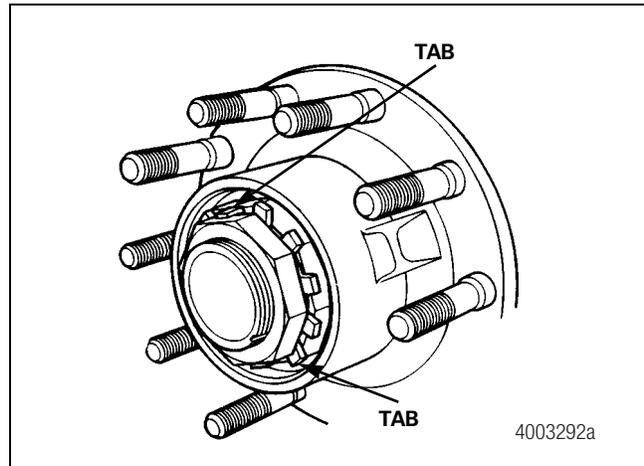


Figure 10.11

Single Nut Adjustment Procedure

The Meritor single nut model consisting of a washer, castellated nut and cotter pin is no longer in production. It was available on manual adjust TP model axles. Figure 10.12.

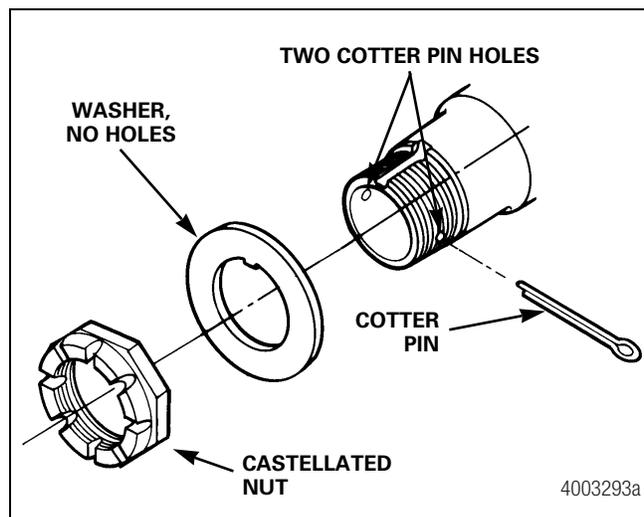


Figure 10.12

Use the following procedure to adjust the wheel bearings.

1. Install the washer and castellated nut. Tighten the nut to 200 lb-ft (271 N•m) while rotating the wheel end in both directions. Figure 10.13. **ⓘ**

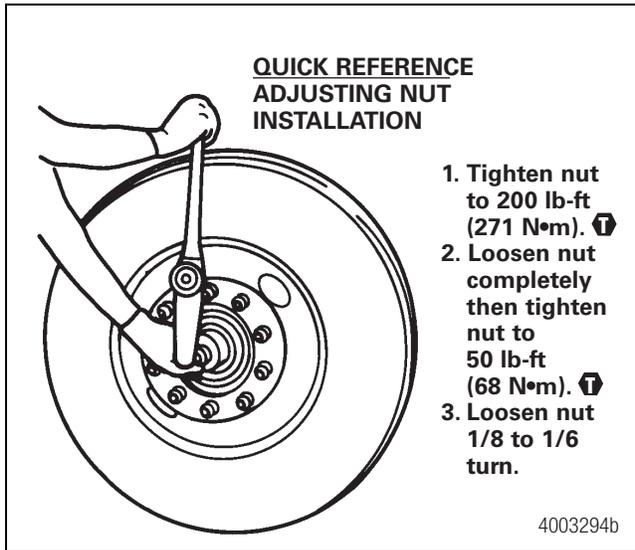


Figure 10.13

2. Completely loosen the nut, then tighten it to 50 lb-ft (68 N•m) while rotating the wheel end in both directions.
3. Loosen the nut 1/8 to 1/6 turn. Do not include socket backlash in the 1/8 to 1/6 turn.

CAUTION

Always replace used cotter pins with new ones when servicing the axle spindle. Do not reuse cotter pins after removing them. Discard used cotter pins. When removed for maintenance or service, cotter pins can be bent or “gapped apart” and can lose retention. Damage to components can result.

4. Install a new cotter pin into the axle spindle hole, but do not bend.

WARNING

You must adjust wheel bearing end play to within 0.001-0.005-inch (0.025-0.127 mm). An adjustment that is too loose will reduce wheel-end bearing life, increase spindle wear and cause seal leakage. An adjustment that is too tight can affect wheel-end bearing performance. Loss of wheel-end components, serious personal injury and damage to components can result.

5. Check the end play using procedure detailed in this section. If end play falls within 0.001-0.005-inch (0.025-0.127 mm), go to Step 6.

If end play does not meet this requirement:

- A. Remove the cotter pin.
- B. Tighten or loosen the castellated nut as required to achieve the correct end play.
- C. Install the cotter pin.
- D. Check end play.
- E. Continue to adjust until the end play meets specifications. Then go to Step 6.

CAUTION

When you install a new cotter pin into the axle spindle hole, only bend one leg of the pin 90 degrees. If you bend both cotter pin legs in the same direction, the cotter pin can fall out of the spindle. Damage to components can result.

6. Bend one leg of the cotter pin 90 degrees. Do not bend both legs. If both legs are bent in the same direction, the cotter pin could fall out.

Single-to-Double Nut Conversion

The single nut design can be converted to the double nut by simply removing the single nut equipment and replacing with the correct double nut equipment. Conversions in the other direction are not recommended since the axle will not have a hole for the cotter pin.

11 Positive Bearing Adjustment

Hazard Alert Messages

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

⚠ WARNING

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

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

Positive Bearing Adjustment

⚠ WARNING

Use the correct sockets when you remove and install axle spindle nuts. Do not try to remove the spindle nuts by striking them with a hammer or by striking a chisel or other tool that has been placed against the spindle nuts to loosen them. Loss of wheel-end components, serious personal injury and damage to components can result.

1. Positive bearing adjustment is available as an option on most trailer axles. With this method, wheel bearing end play of 0.005-0.007-inch (0.127-0.178 mm) is automatically obtained by tightening the adjusting nut against a shoulder machined into the axle spindle. Figure 11.1.

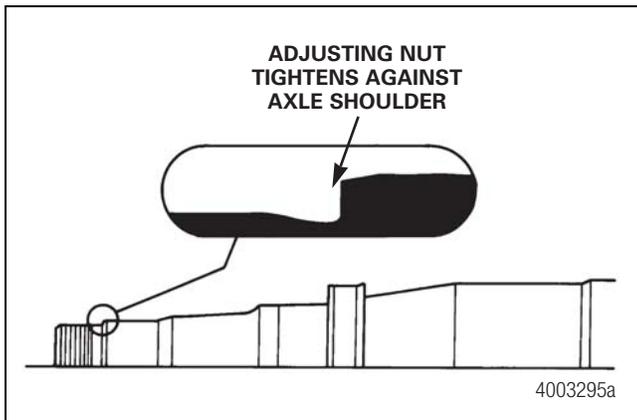


Figure 11.1

2. If the correct end play is not achieved after following this procedure, the axle must either be converted to a manual adjust system or new close tolerance hubs and bearings must be installed.
3. To ensure that the correct bearing adjustment can be achieved, be sure to do the following before performing the adjustment:
 - A. Release the brakes.
 - B. Inspect the wheel-end equipment, especially the threads of the axle and wheel-retention hardware.
 - C. Repair or replace any damaged parts as detailed in Section 4.
4. Wheel-end components can wear, causing correctly adjusted bearings to loosen. Wheel bearing end play should therefore be periodically checked and re-adjusted if necessary.
5. The procedures detailed in this section apply to both grease and oil-lubricated wheel ends.

Adjustment

The most common version of the double nut design consists of an adjusting nut, lock washer, jam nut and set screw. Figure 11.2.

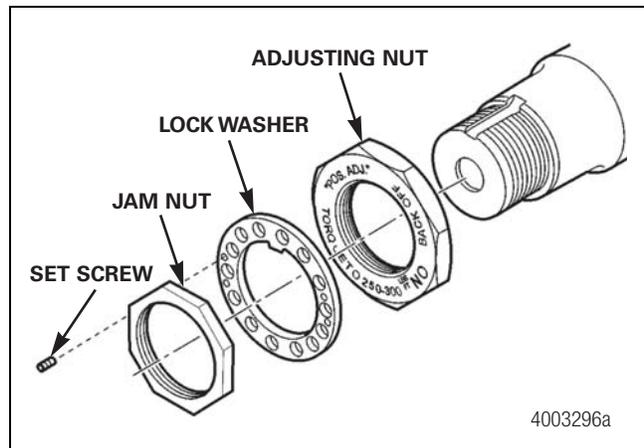


Figure 11.2

Another version of the double nut design is used on the TP positive adjust model where a washer is installed before the adjusting nut.

Use the following procedure to adjust the wheel bearings.

1. Install the adjusting nut and tighten it to 250-300 lb-ft (340-408 N•m) while rotating the hub in both directions. Figure 11.3. **ⓘ**

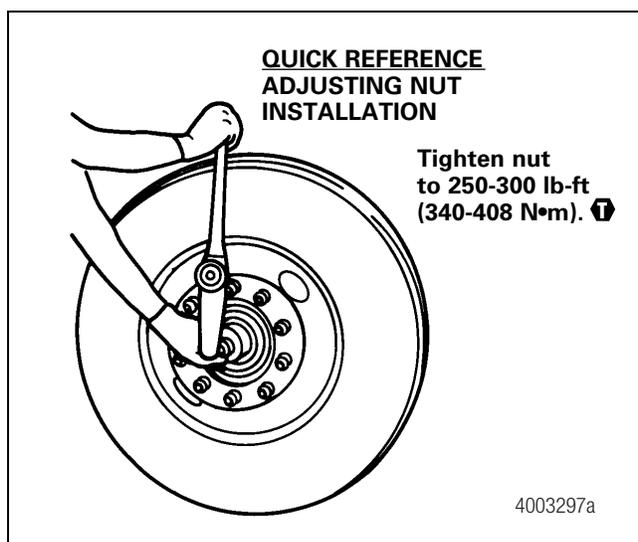


Figure 11.3

2. Install the lock washer. Figure 11.4. ⚠

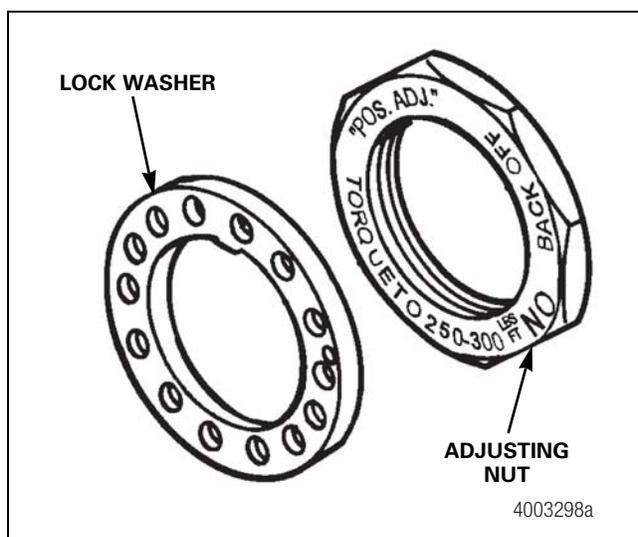


Figure 11.4

3. Install the jam nut and tighten to 250-300 lb-ft (340-408 N•m). ⚠

⚠ WARNING

You must adjust wheel bearing end play to within a 0.001-0.005 inch (0.025-0.127 mm) specification. An adjustment that is too loose will reduce wheel-end bearing life, increase spindle wear and cause seal leakage. An adjustment that is too tight can affect wheel-end bearing performance. Loss of wheel-end components, serious personal injury and damage to components can result.

4. Install the set screw into the lock washer and tighten it until it seats against the nut.
5. Check end play as detailed in the procedure for manual bearing adjustment. End play must be less than 0.005-inch (0.127 mm). If end play exceeds this standard, either replace the bearings or hub with new close-tolerance equipment or keep the same equipment if undamaged and convert the axle to a manual adjust system as detailed in the procedure below.

Positive-to-Manual Conversion

1. Conversions from positive-to-manual adjustment must be made if the wheel bearing end play exceeds 0.010-inch (0.25 mm) or if the manual adjust bearings or hubs are to be installed onto a positive adjust axle.
2. Conversions from positive-to-manual adjust are made by replacing the innermost component of the wheel-retention hardware with parts built with a recess designed to clear the shoulder machined into the positive adjust axle spindle.
3. On TN, TQ, RN, RQ and TKN axle models where the innermost component is a nut, replace with part number A-1227-S-877. Be sure the recess in the nut faces toward the wheel-end equipment. Figure 11.5.

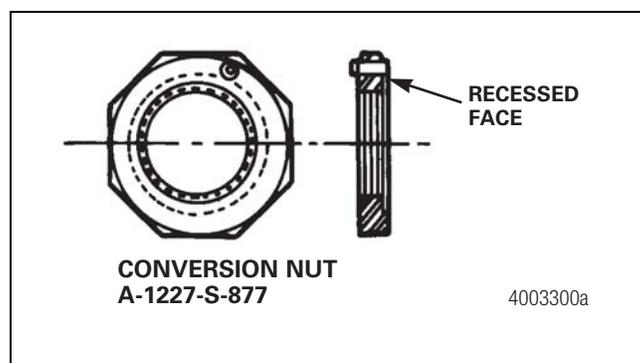


Figure 11.5

11 Positive Bearing Adjustment

4. On TP axle model where the innermost component is a washer, replace with part number 1229-B-3122 and the adjusting nut with part number 1227-W-517. Figure 11.6.

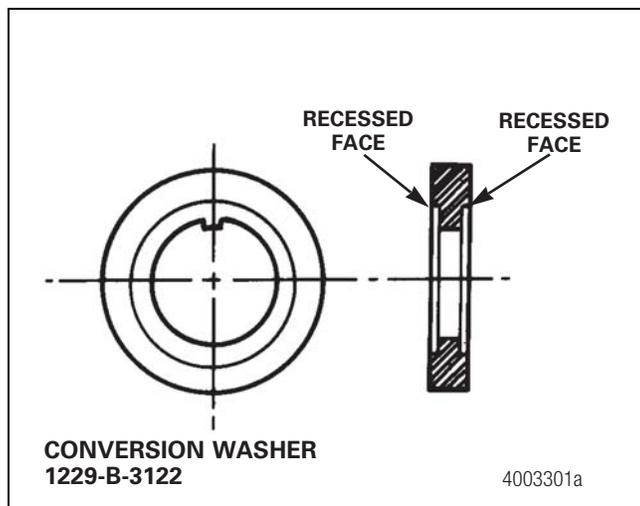


Figure 11.6

5. After changing this equipment, adjust the bearings using the manual adjustment method detailed in the procedure for manual bearing adjustment.

Important Information

Meritor automatic slack adjusters (ASAs) should not need to be manually adjusted in service. ASAs should not have to be adjusted to correct excessive pushrod stroke. The excessive stroke may be an indication that a problem exists with the foundation brake, ASA, brake actuator or other system components.

Meritor recommends troubleshooting the problem, replacing suspect components and then confirming proper brake operation prior to returning the vehicle into service.

In the event that a manual adjustment must be made (although not a common practice), a service appointment and full foundation brake, ASA, and other system component inspection should be conducted as soon as possible to ensure integrity of the overall brake system.

For Meritor brake adjustment, refer to the brake adjustment tables in this manual. For non-Meritor brake adjusters, refer to the brake manufacturer's service procedures.

Hazard Alert Messages

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⚠ WARNING

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

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

⚠ ASBESTOS AND NON-ASBESTOS FIBERS WARNING

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

Cam Brakes

Repair kits are available from Meritor Aftermarket Services and can be found in Meritor's Parts Book PB-8857, Brake, Trailer and Wheel Attaching Parts. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual. To obtain kits, call the Meritor OnTrac™ Customer Call Center at 866-668-7221.

Components

Trailer Axles with Cam Brakes

A trailer axle equipped with cam brakes is shown in Figure 12.1. Reference will be made in this section to the highlighted components.

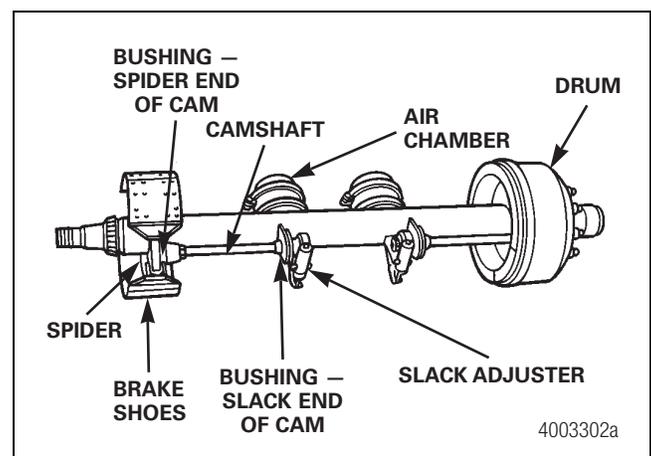


Figure 12.1

Spiders

Brake spiders are welded to the axle just inboard of the spindle. Three models may be encountered.

A forged spider model is currently used when a brake rating must exceed 23,000 pounds (8585 kg). Figure 12.2.

12 Cam Brakes

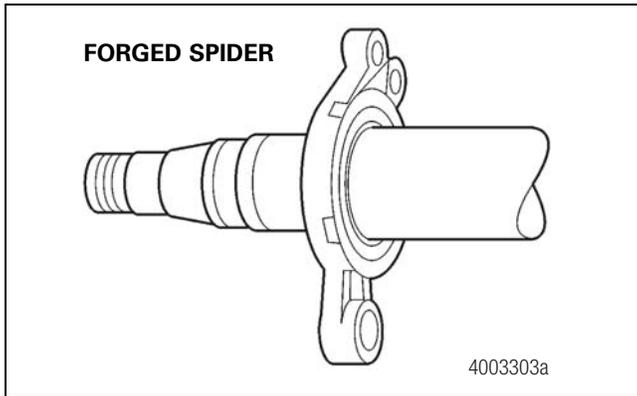


Figure 12.2

A stamped spider with four holes is the current production standard. Figure 12.3.

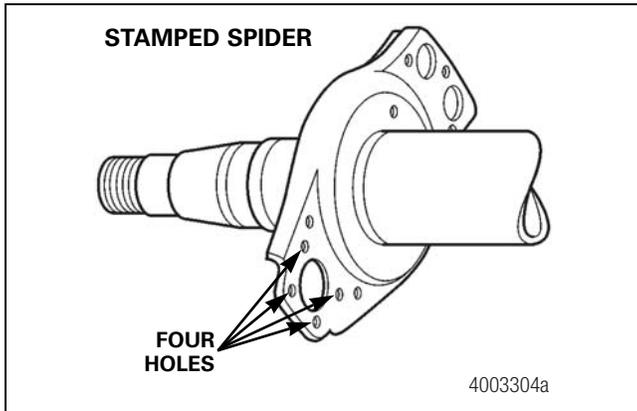


Figure 12.3

A stamped spider without holes is no longer in production. This model was replaced by the model with four holes. Figure 12.4.

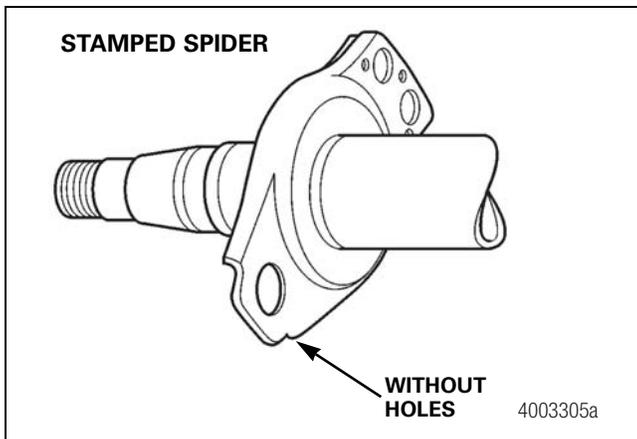


Figure 12.4

On some stamped spider models, a retainer is pressed into a hole in the spider and then welded in place. This retainer is designed to hold the cam bushings. The stamped spider models without holes and with four holes use different retainers. Figure 12.5.

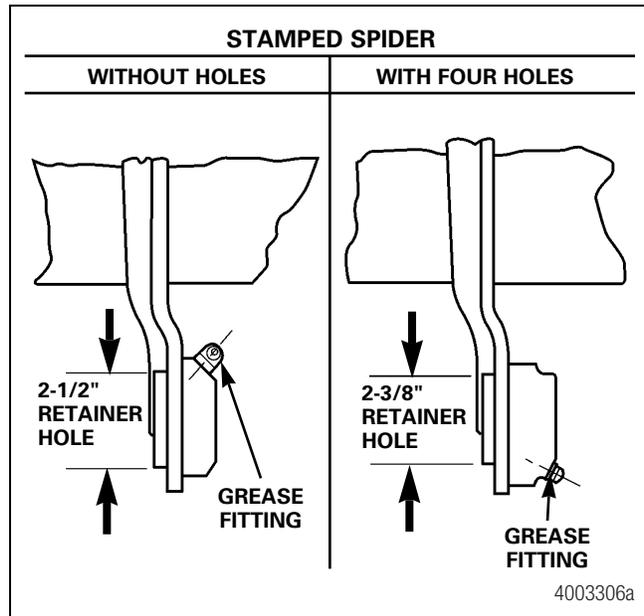


Figure 12.5

Cam Bushings

Cam bushings are installed at the spider and slack adjuster ends of the cam.

Three bushings may be encountered at the spider.

- A plastic sleeve bushing can be installed onto all three spider models. Note that a steel sleeve is pressed into the spider before this bushing is installed. Figure 12.6.

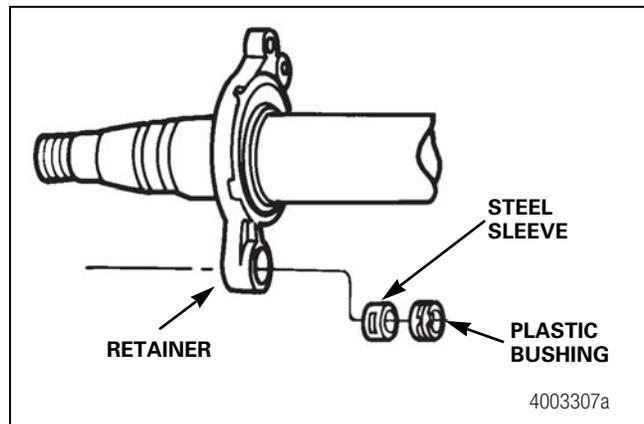


Figure 12.6

- A metal sleeve bushing can be installed onto all three spider models. Figure 12.7.

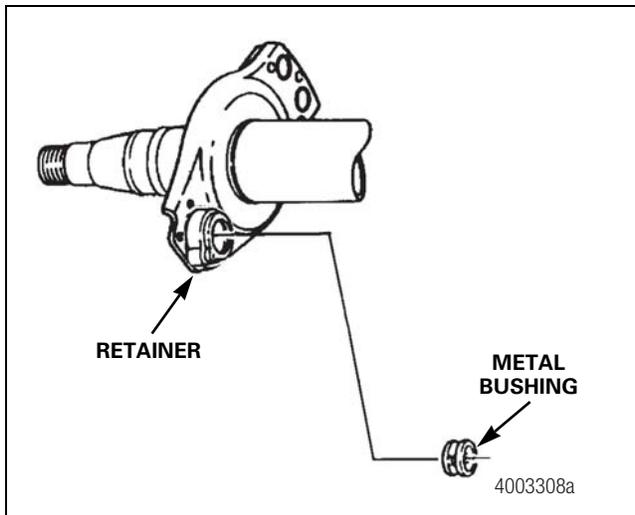


Figure 12.7

- A bolt-on bushing can only be installed onto the stamped spider with four holes. Figure 12.8.

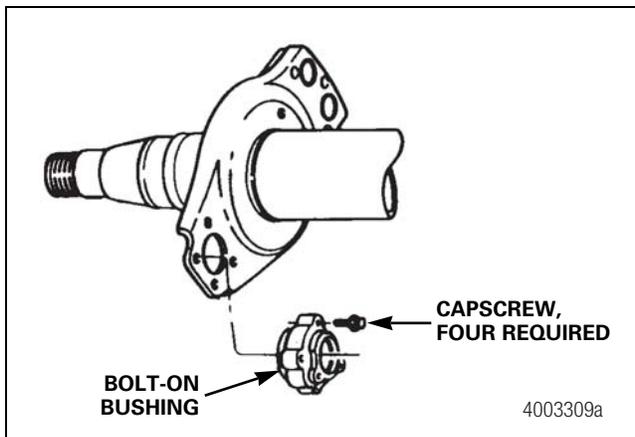


Figure 12.8

Two bushing models may be encountered at the slack.

- The current production arrangement consists of a bushing with a straight grease fitting installed onto a camshaft bracket with a slotted hole. When assembled, the grease fitting is oriented away from the slack adjuster. Figure 12.9.

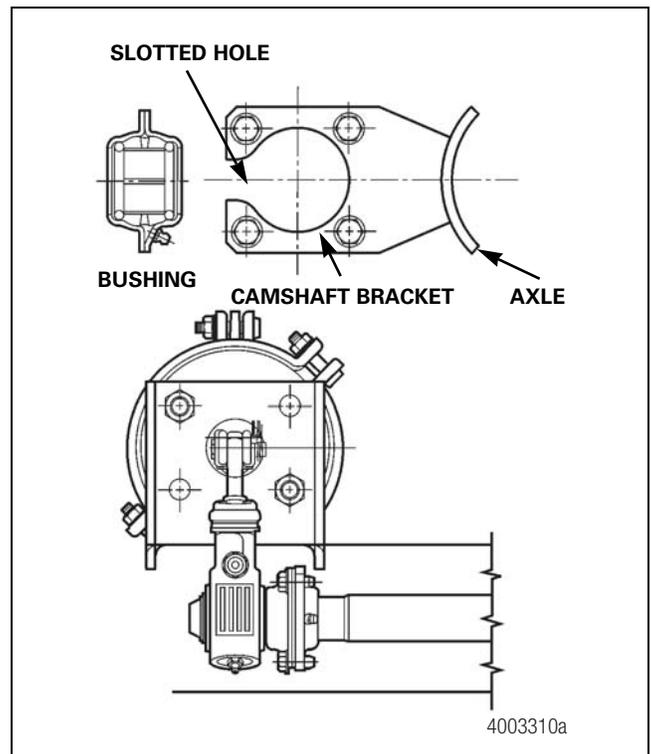


Figure 12.9

- An arrangement used in the past consists of a bushing with a 90-degree grease fitting installed onto a camshaft bracket with a round hole. When assembled, the grease fitting is oriented toward the slack adjuster. Figure 12.10.

12 Cam Brakes

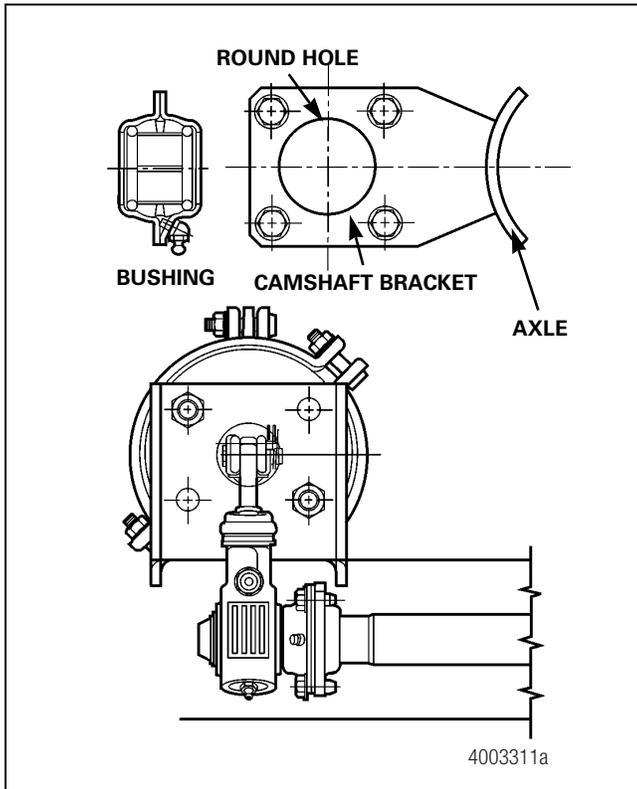


Figure 12.10

NOTE: The bushing with the 90-degree grease fitting will fit either of the camshaft bracket designs. The bushing with the straight grease fitting will not fit the camshaft bracket with the round hole.

Camshafts

Meritor camshafts are available with both heat-treated and non-heat-treated journals. These two models can be identified by the length of the journal. Figure 12.11.

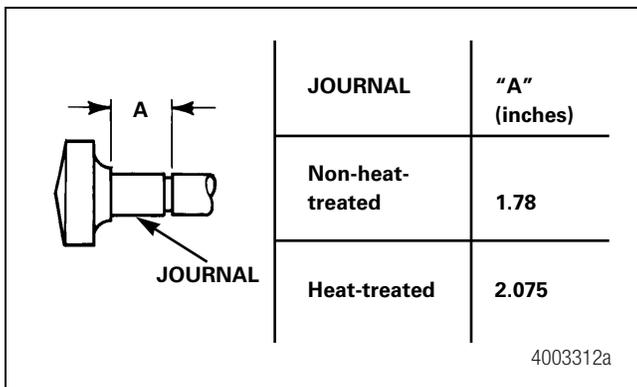


Figure 12.11

The correct cam and bushing match-ups are as follows:

- Cams with non-heat-treated journals are used with plastic sleeve bushings. Figure 12.12.

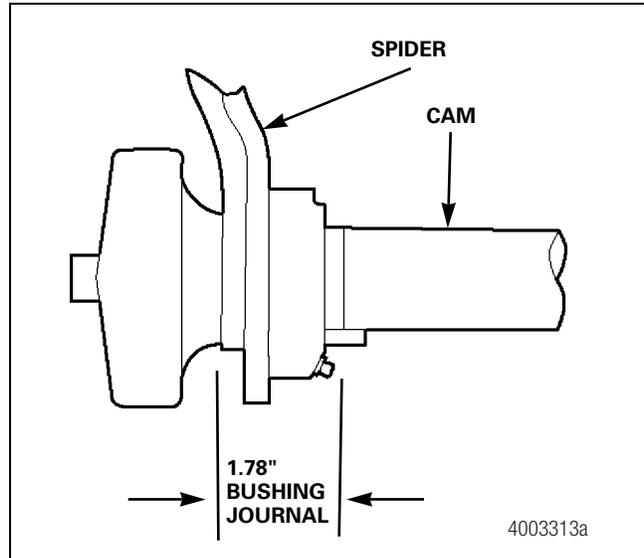


Figure 12.12

- Cams with heat-treated journals are used with metal sleeve bushings. A spacer washer is used to make up the difference in width between the cam bushing and journal. Figure 12.13.

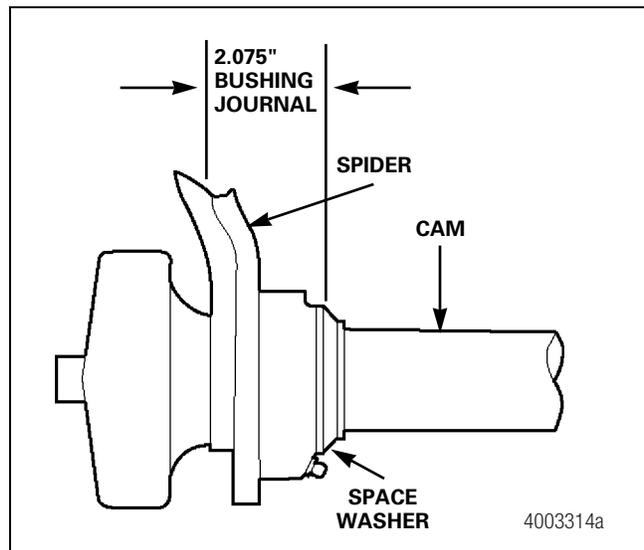


Figure 12.13

- Cams with heat-treated journals are used with bolt-on bushings. Figure 12.14.

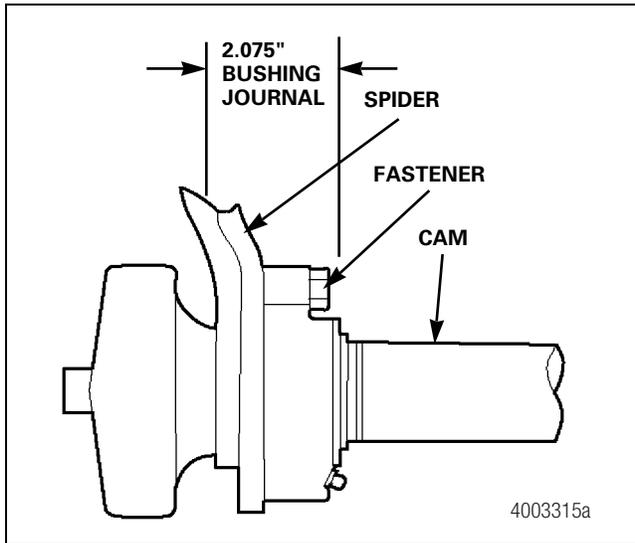


Figure 12.14

Air Chamber Brackets

Trailer axles are available with a variety of air chamber brackets. Information on the two most popular models is provided below. For information on other models, contact the Meritor OnTrac™ Customer Call Center at 866-668-7221.

The most widely used bracket is the “V-Type.” Figure 12.15.

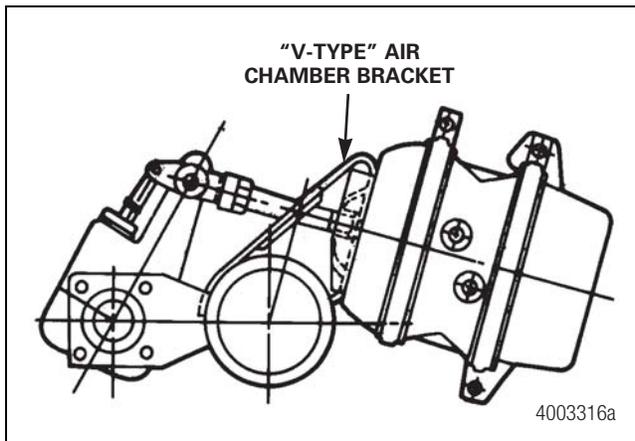


Figure 12.15

There are old and new versions of the “V-Type” bracket. Both make provisions for the use of three different slack lengths as stamped into the bracket. The new version was made standard in 1985. Figure 12.16.

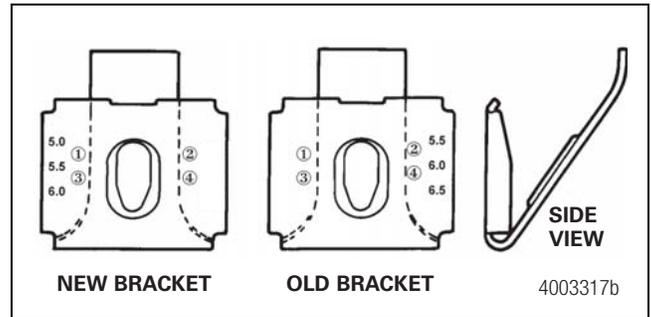


Figure 12.16

The three different slack lengths are obtained by installing the air chamber mounting studs through the different hole combinations. Refer to Table F.

Table F: Mounting Hole Combinations

Air Chamber Mounting Position	Slack Adjuster Length (inches)	
	New Bracket	Old Bracket
Holes 1 and 2	5.0	5.5
Holes 1 and 4 or 2 and 3	5.5	6.0
Holes 3 and 4	6.0	6.5

Another popular bracket is the “Channel-Type.” This bracket is only set up for one slack adjuster length. Figure 12.17.

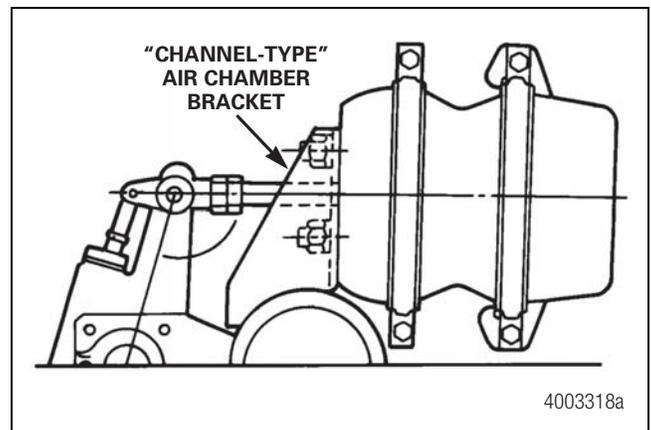


Figure 12.17

12 Cam Brakes

Important Information

Meritor automatic slack adjusters (ASAs) should not need to be manually adjusted in service. ASAs should not have to be adjusted to correct excessive pushrod stroke. The excessive stroke may be an indication that a problem exists with the foundation brake, ASA, brake actuator or other system components.

Meritor recommends troubleshooting the problem, replacing suspect components and then confirming proper brake operation prior to returning the vehicle into service.

In the event that a manual adjustment must be made (although not a common practice), a service appointment and full foundation brake, ASA, and other system component inspection should be conducted as soon as possible to ensure integrity of the overall brake system.

For Meritor brake adjustment, refer to the brake adjustment tables in this manual. For non-Meritor brake adjusters, refer to the brake manufacturer's service procedures.

Air Chambers and Slack Adjusters

When Meritor automatic slacks and cam brakes are installed onto a trailer axle, there must be a 105-degree angle between the air chamber push rod and the slack adjuster. Figure 12.18.

NOTE: This angle is with the service and spring brakes in the fully released or "Brakes Off" position.

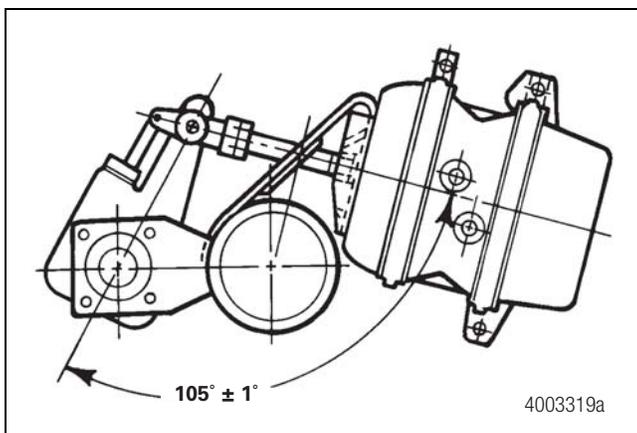


Figure 12.18

⚠ CAUTION

Five different installation templates are available from Meritor. These templates are designed to be used with specific model brakes and are not interchangeable. If the correct template is not used when adjusting the brakes, the slack adjuster will not be correctly set-up and brake performance will be affected.

To set up the required 105-degree angle between the air chamber push rod and the slack adjuster, use the tan-colored Meritor slack adjuster template, Meritor part number TP-4787. Figure 12.19.

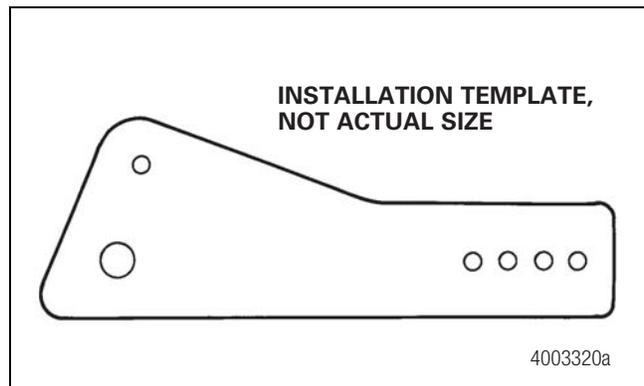


Figure 12.19

To use the template, insert the two slack adjuster clevis pins into the matching template holes. Adjust the slack until the bottom hole aligns with the cam centerline. Figure 12.20. Detailed instructions are in Maintenance Manual 4, Cam Brakes and Automatic Slack Adjusters. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.

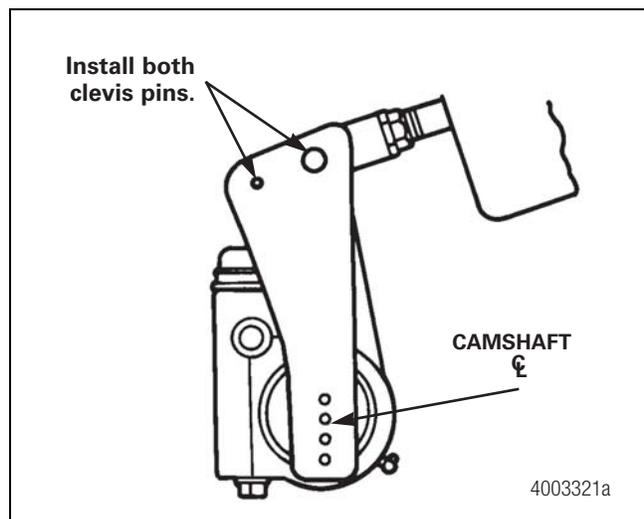


Figure 12.20

To achieve the required 105-degree angle, the air chamber push rod length must be correct. Table G details the correct length for various combinations of axles, cam brakes and air chamber brackets. Figure 12.21.

NOTE: These lengths are with the service and spring brakes in the fully released or “Brakes Off” position.

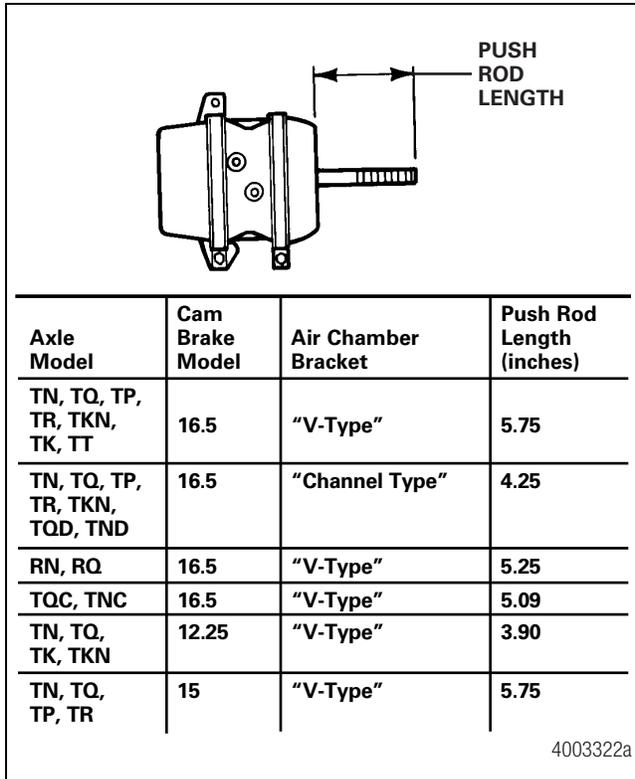


Figure 12.21

Table G: Push Rod Length

Axle Model	Cam Brake Model	Air Chamber Bracket	Push Rod Length (Inches)
TN, TQ, TP, TR, TKN, TK, TT	16.5	“V Type”	5.75
TN, TQ, TP, TR, TKN, TQD, TND	16.5	“Channel Type”	4.25
RN, RQ	16.5	“V Type”	5.25
TQC, TNC	16.5	“V Type”	5.09
TN, TQ, TK, TKN	12.25	“V Type”	3.90
TN, TQ, TP, TR	15	“V Type”	5.75

It is acceptable to cut an air chamber push rod to length. Most aftermarket air chambers have extra-long threaded push rods so this can be done. Figure 12.22.

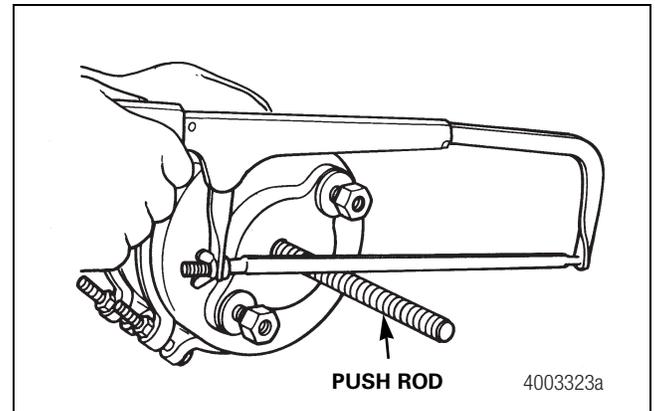


Figure 12.22

The air chamber clevis must be assembled to the push rod as follows.

- There must be at least 0.5-inch (12.7 mm) of thread engagement between the clevis and push rod.
- The push rod must not extend through the clevis more than 0.125-inch (3.18 mm). Figure 12.23.

12 Cam Brakes

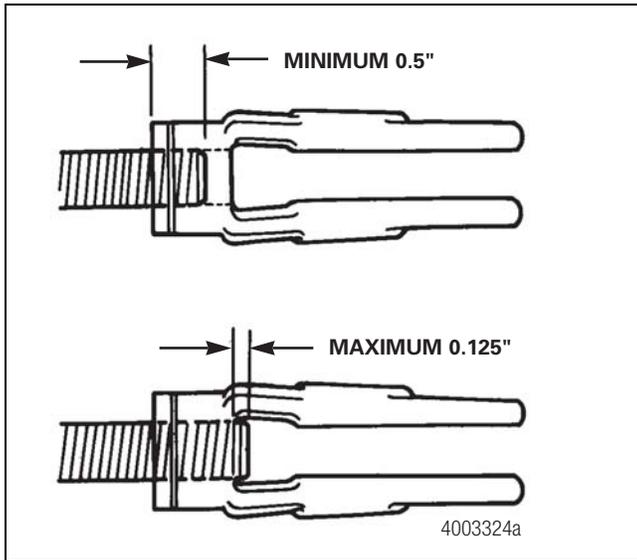


Figure 12.23

Q Series and Q Plus™ Brakes

Meritor trailer axles may be installed with either Q Series or Q Plus™ cam brakes.

Q Plus™ brakes are designed to reduce maintenance costs by providing thicker linings when compared to Q Series brakes. Figure 12.24.

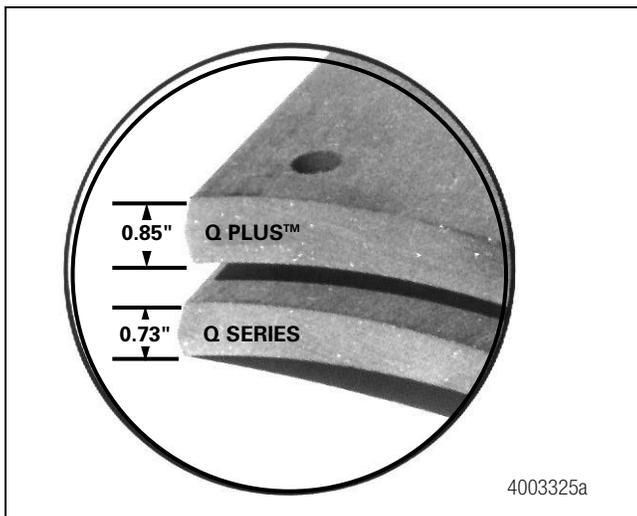


Figure 12.24

The equipment required for Q Series and Q Plus™ brakes is detailed below and shown in Table H.

- Camshafts — Q Series brakes can use either Q Series or Q Plus™ camshafts. Q Plus™ brakes must use Q Plus™ camshafts in order to accommodate the greater shoe travel as the thicker linings wear.
- Return Springs — Q Series brakes may use either standard or heavy-duty return springs. Q Plus™ brakes must use heavy-duty return springs in order to accommodate the greater shoe travel as the thicker linings wear.
- Brake Drums — Both Q and Q Plus™ brakes use standard brake drums.

Table H: Brake Equipment

Brake Component	Q Series	Q Plus™
Shoes	Q Series	Q Plus™ or Q Series
Cam	Q Series or Q Plus™	Q Plus™
Return Springs	Standard or Heavy-Duty	Heavy-Duty
Drums	Standard	Standard

Q Series and Q Plus™ brake equipment can be identified as follows. Figure 12.25.

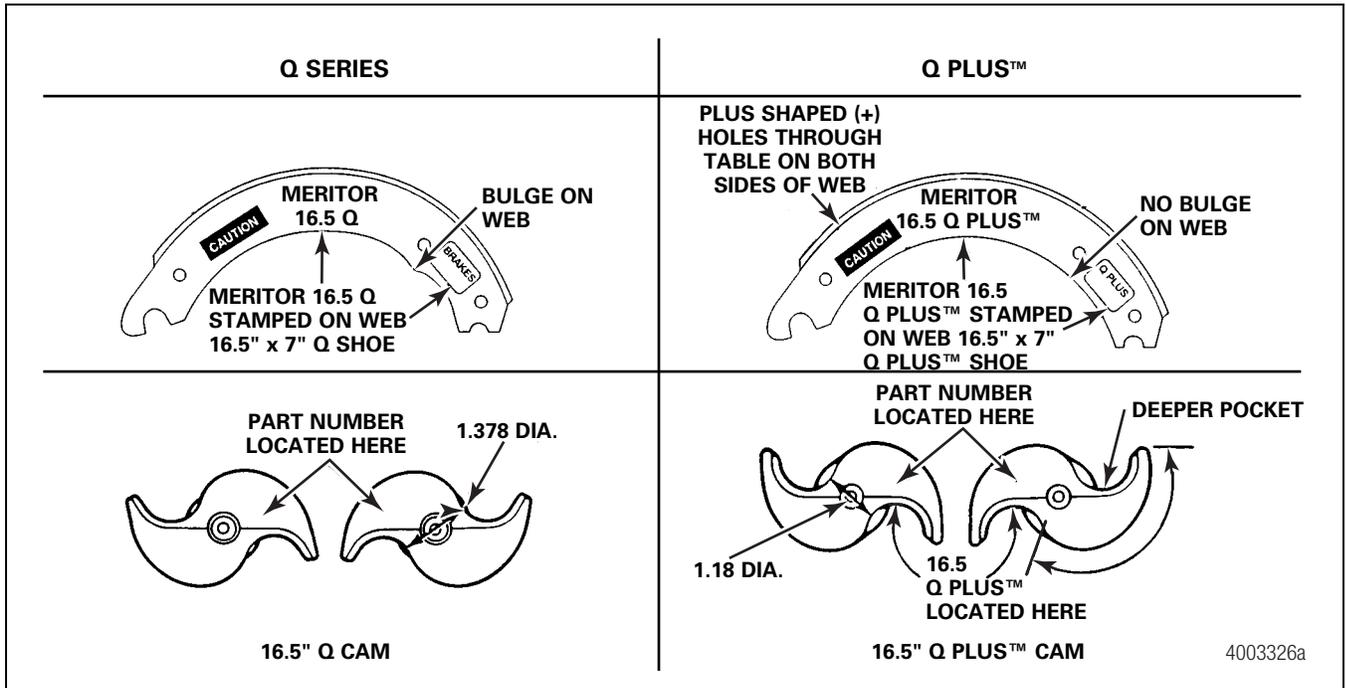


Figure 12.25

Since March 1995, Q Plus™ camshafts have been standard on all trailer axles built with 16.5 inch Q Series and Q Plus™ brakes and 28-tooth spline cams. This has reduced part numbers and eliminated the need to replace cams during a Q Series-to-Q Plus™ brake retrofit.

To retrofit from Q Series-to-Q Plus™ brakes, refer to the procedure in this section and then install the appropriate equipment. To obtain maximum benefit from this retrofit, Meritor recommends that plastic sleeve bushings be replaced with bolt-on bushings.

Cam Bushings

Refer to Section 4 for information regarding when to replace the cam bushings.

Cam Bushings at the Slack End

To replace the bushing at the slack end of the cam, remove and replace the four fasteners, making sure to tighten them to 25-35 lb-ft (34-48 N•m). Figure 12.26. **1**

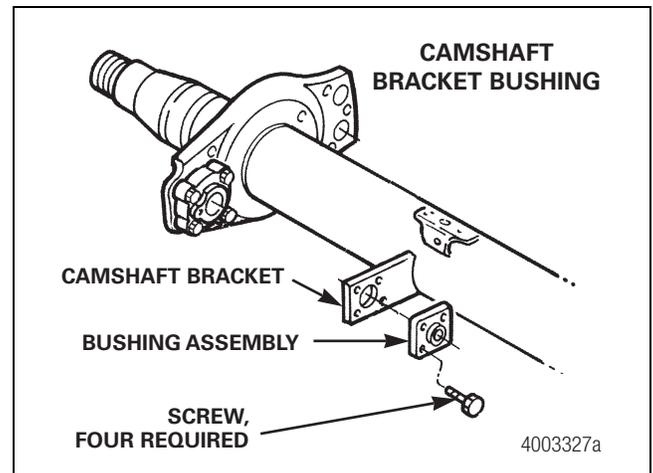


Figure 12.26

Cam Sleeve Bushings at the Spider End

1. Remove the snap ring, then pull the camshaft from the axle.
2. Remove all loose parts from the camshaft and retainer bore including the grease seals and washers. Figure 12.27.

12 Cam Brakes

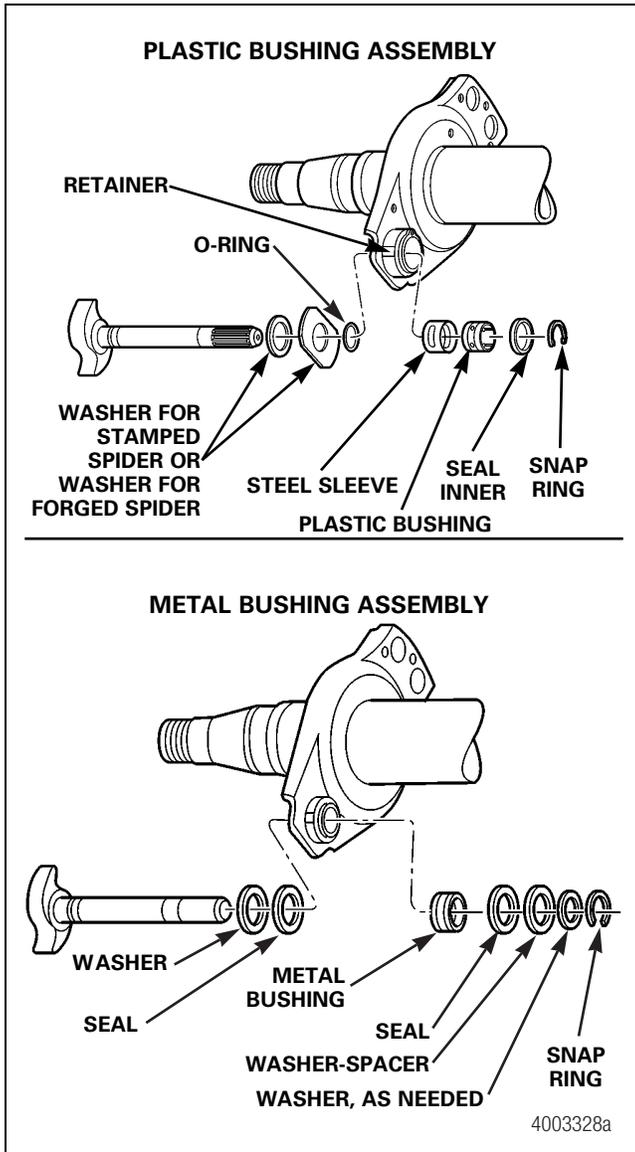


Figure 12.27

3. Drive the following components out of the retainer bore. Verify that the correct size driver is used and care is taken to ensure the bore is not damaged. Figure 12.28.
 - A. For plastic bushings, drive the steel sleeve out of the retainer bore.
 - B. For metal bushings, drive the metal bushing out of the retainer bore.

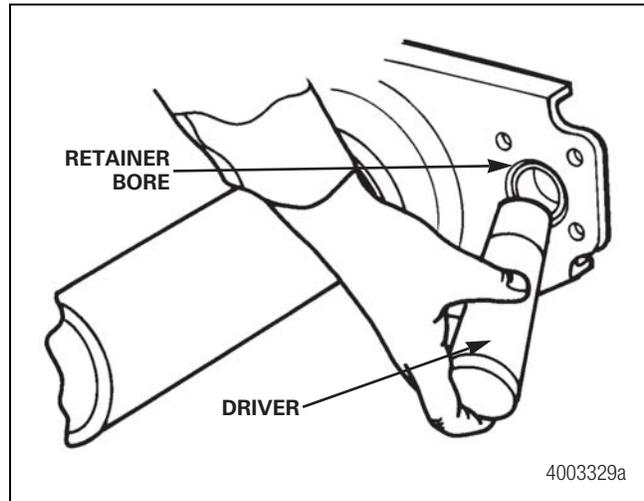


Figure 12.28

4. Install the following components into the retainer.
 - A. For plastic bushings, drive a steel sleeve into the retainer bore until it is flush with the outboard edge, tire side, of the retainer. Verify that the slot in the steel sleeve lines up with the grease fitting delivery hole. Then install the plastic bushing. Figure 12.29.

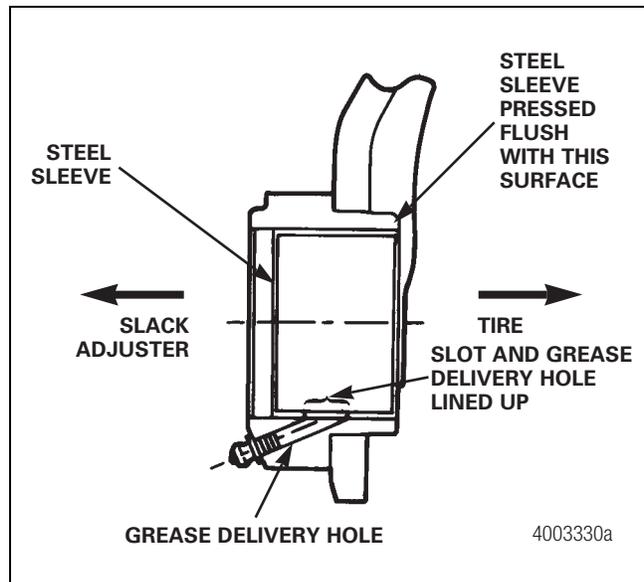


Figure 12.29

- B. For metal bushings, drive a metal bushing into the retainer bore until it is centered in the retainer as detailed below. Figure 12.30.

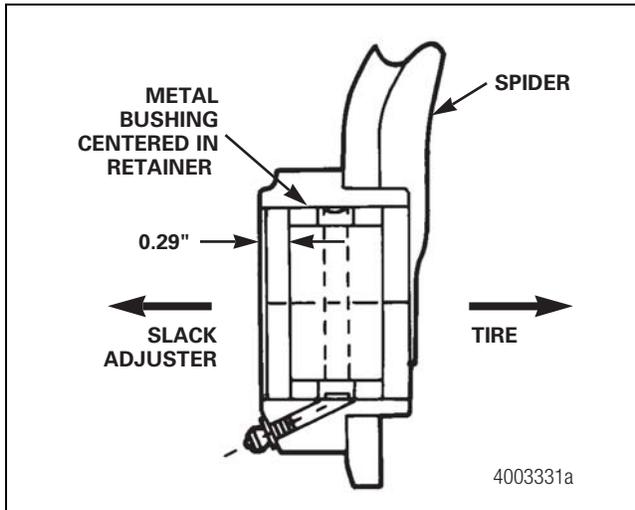


Figure 12.30

5. Install the grease seals. Be careful not to crimp or damage the metal flange of the seals.

- A. For plastic bushings, install one grease seal. Verify that the seal lip faces toward the slack adjuster and that the seal body is pressed against the steel sleeve.

Figure 12.31.

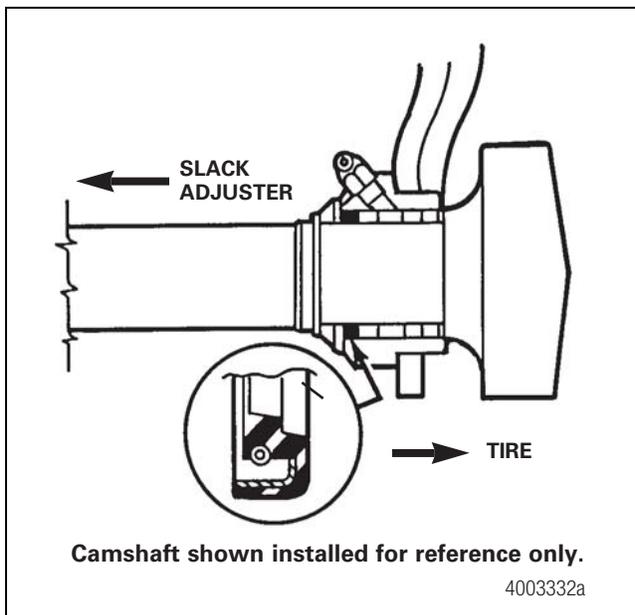


Figure 12.31

- B. For metal bushings, install two grease seals. Verify that the seal lips face toward the slack adjuster and that the seal bodies press against the metal bushing.
- Figure 12.32.

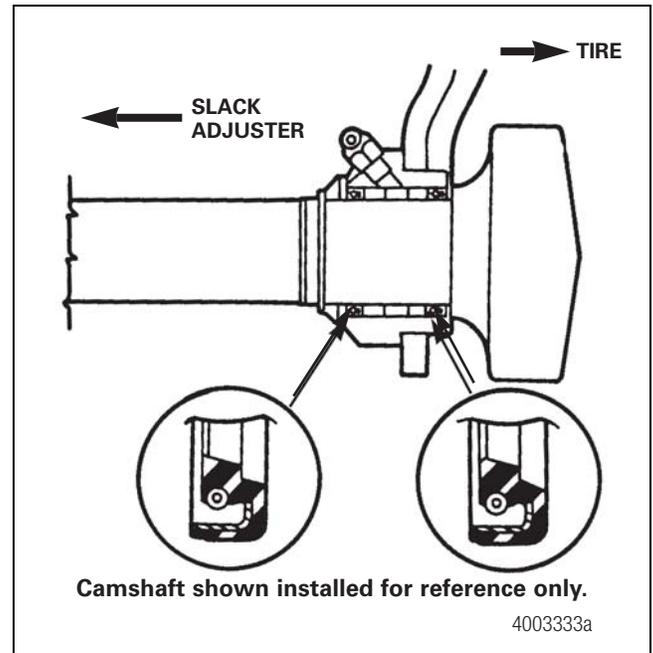


Figure 12.32

NOTE: Cleaning the cam before installation will ensure that bushings are not contaminated as the cam is pushed through them.

6. Clean the entire camshaft, then grease the cam bushings and journals.
7. Install the following equipment onto camshaft, then install the camshaft through the spider bushing.
 - A. For plastic bushings, install the cam head washer and O-ring onto the camshaft.
 - B. For metal bushings, install the cam head washer onto the camshaft.

NOTE: The metal bushing replacement kit includes an optional washer. If there is excessive axial end play, install the washer during Step 8.

8. Install the following equipment onto the camshaft and then install the camshaft through the second bushing.
 - A. For plastic bushings, install the washer onto the camshaft.

12 Cam Brakes

- B. For metal bushings, install the washer and spacer onto the camshaft.
9. Install the snap ring. When the camshaft is correctly installed, you should be able to turn it by hand.
10. Grease the cam bushings as detailed in the procedure in this section.

Bolt-On Bushing Replacement

1. Remove the snap ring, camshaft, washers and seals. Figure 12.33.

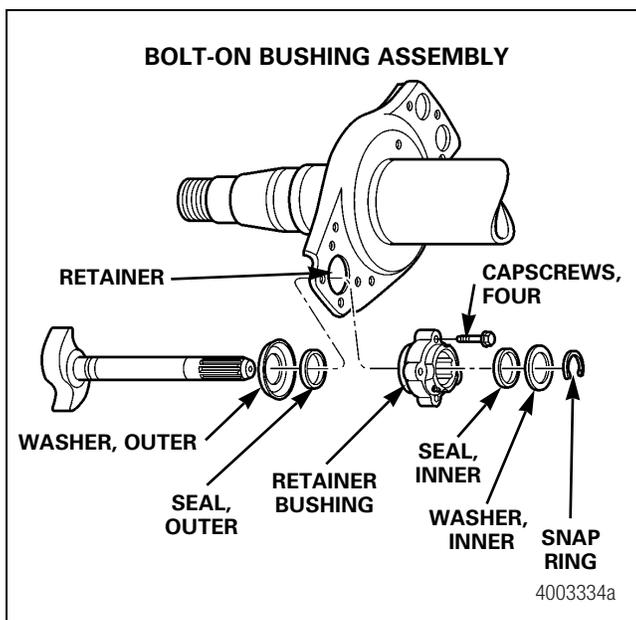


Figure 12.33

2. Remove the four fasteners attaching the bolt-on bushing, then pry the bushing from the spider. Figure 12.33.
3. Position a new bushing onto the spider making sure the four bushing holes line up with the four matching spider holes, then press a new bushing into the spider with a C-clamp until it is completely seated. Figure 12.34.

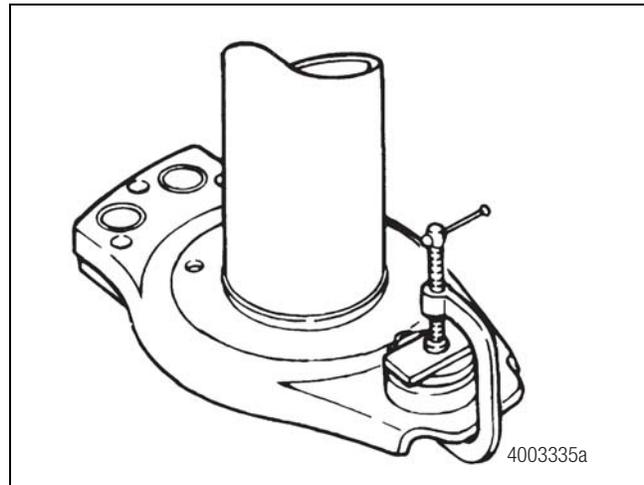


Figure 12.34

4. Tighten the four capscrews to 25-35 lb-ft (34-48 N•m). Figure 12.35. 

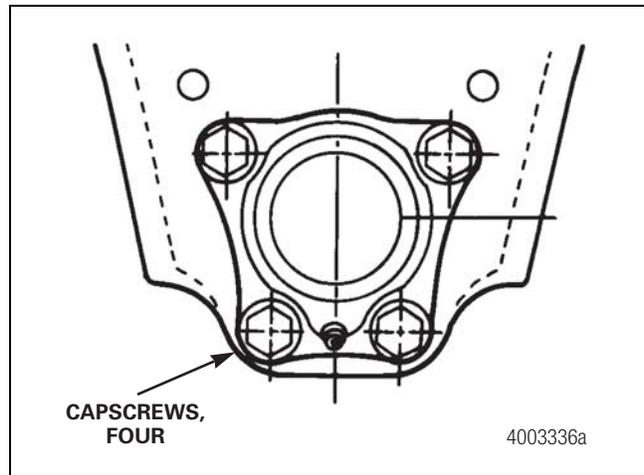


Figure 12.35

5. Replace all camshaft assembly parts as shown in Figure 12.33. Verify that the seals align in the correct direction. Figure 12.36.

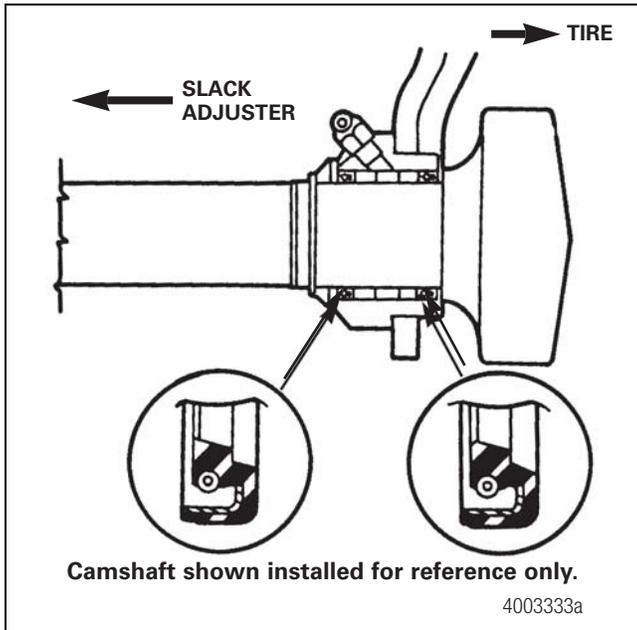


Figure 12.36

Replacing the Cam Without Removing the Hub

On most trailer axles equipped with outboard-mounted brake drums and bolt-on bushings, the camshaft and bolt-on bushing can be removed without removing the hub. This allows service to be performed on these components without disturbing the wheel-end lubricant, bearings and seals.

Proceed as follows, using the assembly and disassembly procedures as reference.

1. Remove the brake drum, slack adjuster and brake shoes. Figure 12.37.

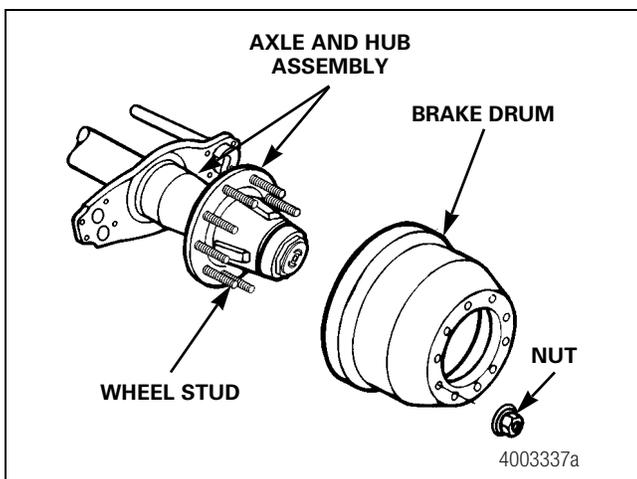


Figure 12.37

2. Remove the snap ring at the inboard side of the bushing and the four capscrews from the bushing. Figure 12.38.

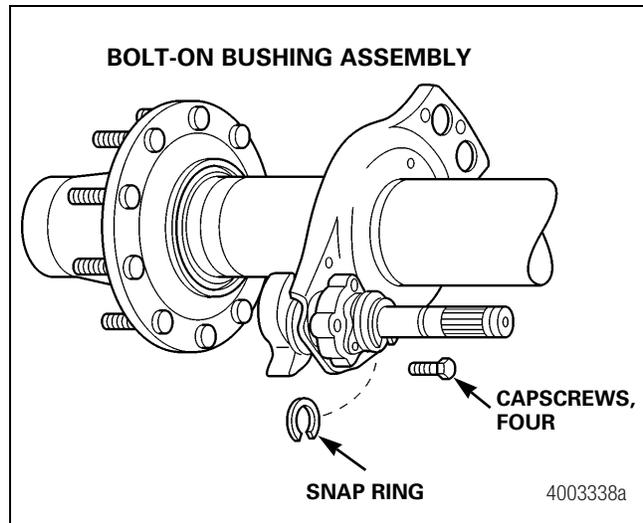


Figure 12.38

3. Pry the bushing out of the spider retainer hole. Figure 12.39.

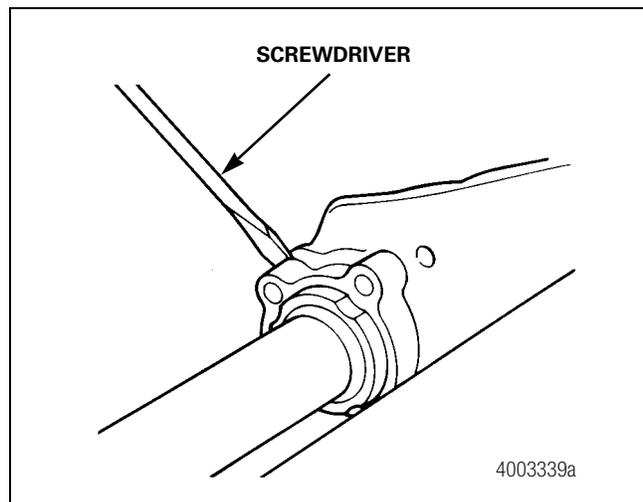


Figure 12.39

4. Move the camshaft head away from the centerline of the axle so it clears the hub flange, then pull the camshaft from the bushings. Figure 12.40.

12 Cam Brakes

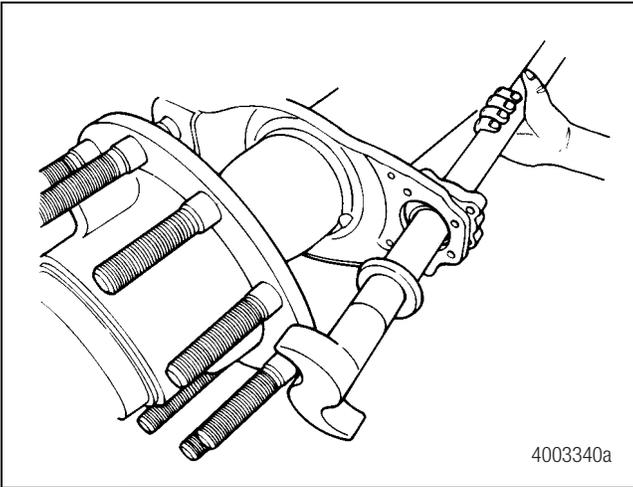


Figure 12.40

5. Install the new bolt-on bushing and cam by reversing the procedure.
6. Tighten the four bolts to draw the bolt-on bushing into its seated position. Figure 12.41.

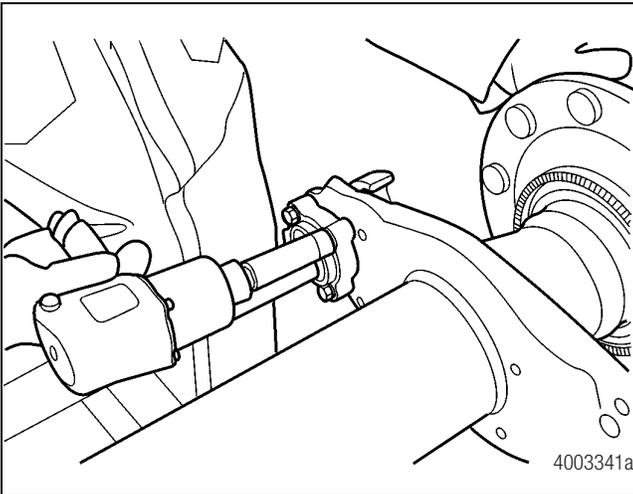


Figure 12.41

7. Install the remaining components.

Replacing the Weld-On Retainer

If the weld-on retainer used on the stamped spiders is either damaged or worn, it can be replaced. Figure 12.42.

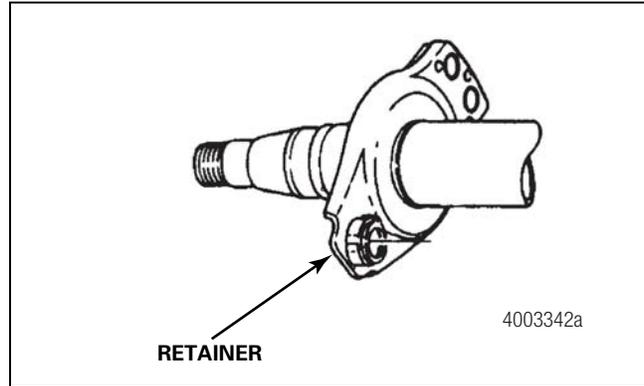


Figure 12.42

Although the two stamped spider designs use different weld-on retainers, the replacement procedure is the same for both.

1. Remove the camshaft assembly parts as detailed in this section.
2. Grind the welds that attach the retainer to the spider. Grind only to the base metal of the spider. Position the grinding toward the retainer, since this item will be scrapped. Figure 12.43.

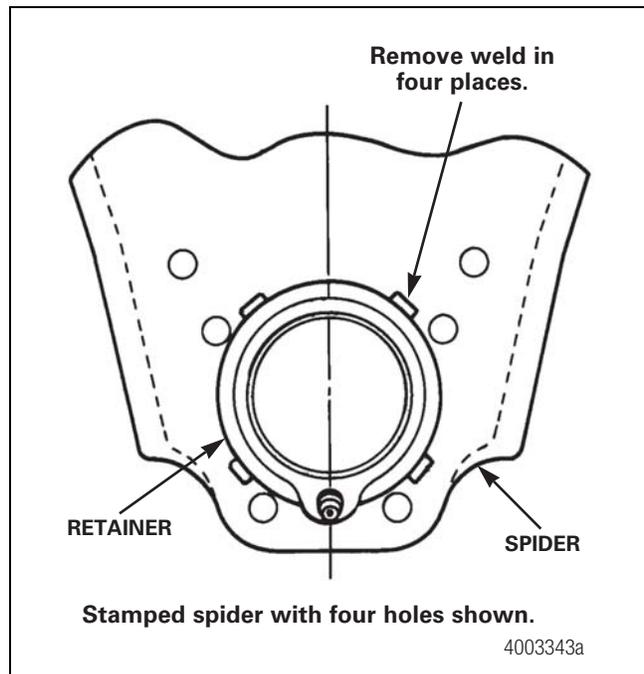


Figure 12.43

3. Press the old retainer out of the spider with a C-clamp.

4. Press a new retainer into the spider with a C-clamp. Figure 12.44. Verify that the grease fitting is positioned correctly. Figure 12.45.

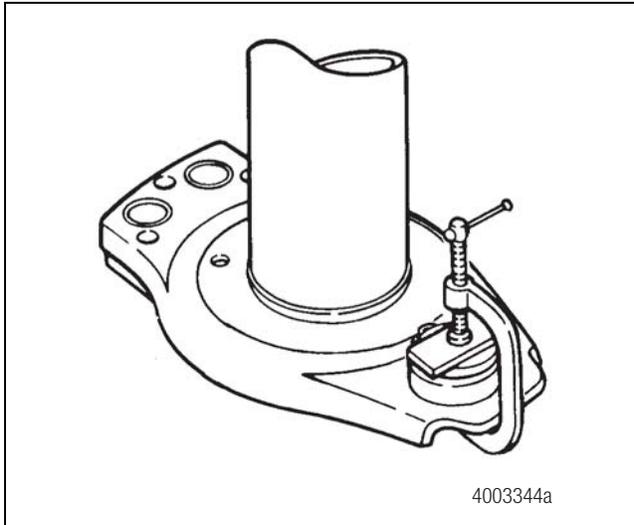


Figure 12.44

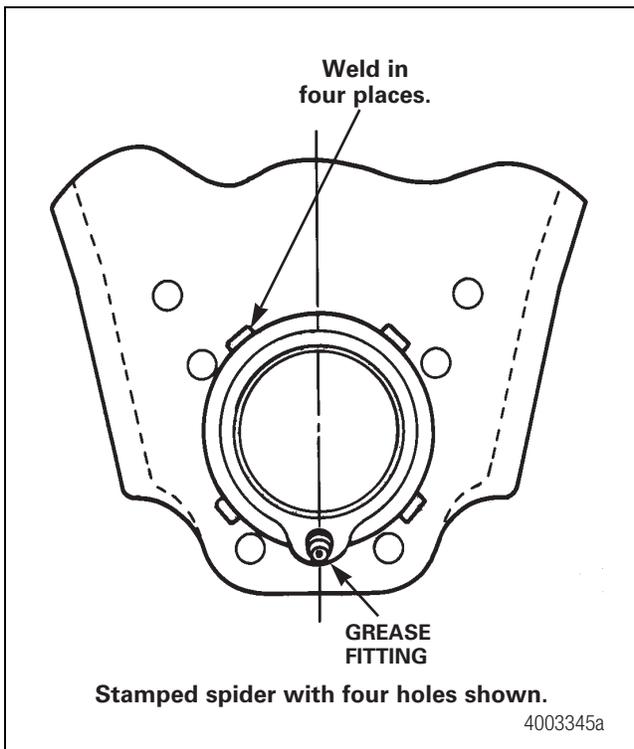


Figure 12.45

5. Weld the retainer in four places using AWS E70S3 or E70S6 electrodes. Each weld should have a 0.1875-inch (4.76 mm) fillet and be 0.375-inch (9.52 mm) long. Figure 12.45.
6. Replace the camshaft assembly parts using the procedures in this section.

Upgrading the Bushing on the Spider End of the Cam

If plastic sleeve bushings are installed at the spider end of the camshaft, service life can be increased by replacing them with metal bushings.

The equipment changes allowed depend on the spider model installed onto the axle.

- **For forged spiders:** Remove the plastic sleeve bushing and replace with the metal sleeve bushing.
- **For stamped spiders without holes:** Remove the plastic sleeve bushing and replace with a metal sleeve bushing.
- **For stamped spiders with four holes:** Use one of the following two methods. Remove the plastic sleeve bushing and replace it with a metal sleeve bushing. As an alternative method, remove the plastic sleeve bushing and weld-on retainer and replace it with a bolt-on bushing.

Use the maintenance procedures detailed in this section to perform these operations.

Whenever plastic sleeve bushings are replaced with a metal sleeve bushing, Meritor recommends that the non-heat-treated cam be replaced with a heat-treated cam. This will ensure that wear occurs to the bushing, not the cam.

Whenever plastic bushings are replaced with a bolt-on bushing, the non-heat-treated cam must be replaced with a heat-treated cam, since the non-heat-treated cam will not fit the bolt-on bushing.

13 Anti-Lock Braking System

Hazard Alert Messages

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

⚠ WARNING

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

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

Installation

Anti-Lock Braking System (ABS) Components

For complete information on Meritor WABCO anti-lock braking system (ABS) components, refer to the Service Notes page on the front inside cover of this manual.

Equipment

An ABS-equipped trailer axle will be installed with the wheel speed monitoring components located at the axle spindle. Figure 13.1.

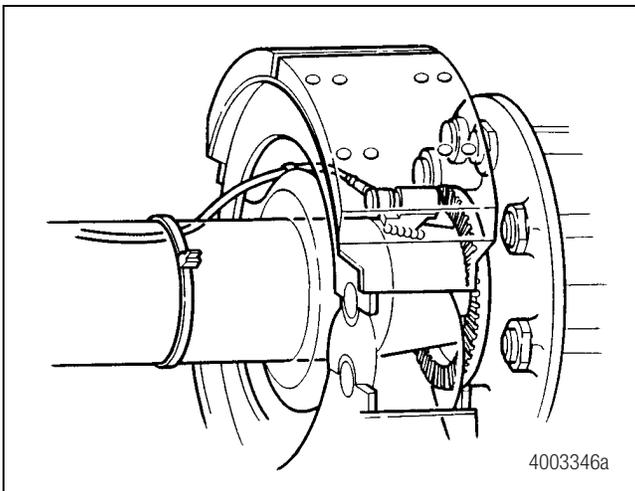


Figure 13.1

This wheel speed monitoring equipment consists of the following components.

- **Tooth Wheel** — A 100 tooth wheel mounted to the hub or spoke wheel. Working with the sensor, it provides an AC voltage that represents wheel speed. Figure 13.2.

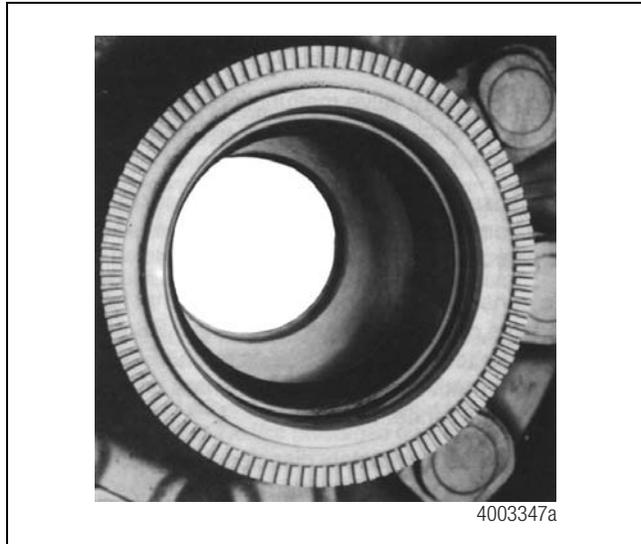


Figure 13.2

- **Sensor** — An electro-mechanical device mounted to the axle. Working with the tooth wheel, it provides an AC voltage that represents wheel speed. Figure 13.3.



Figure 13.3

- **Sensor Block** — Welded to the axle between the spider and oil seal collar, the sensor block holds the sensor in correct position relative to the tooth wheel. Figure 13.4.

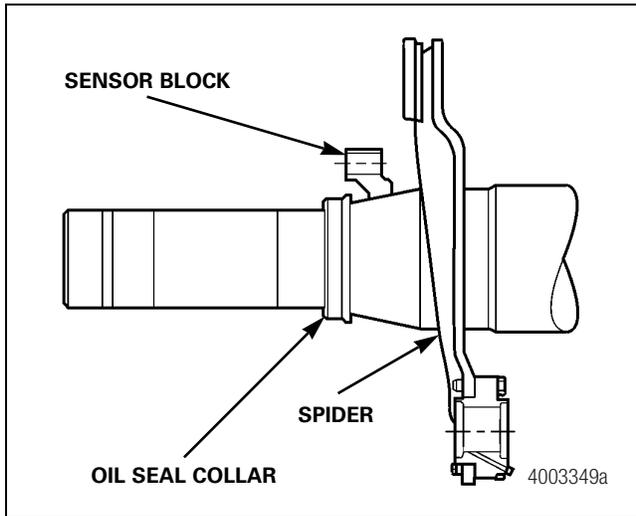


Figure 13.4

- Sensor Spring Clip — Retains the sensor in the sensor block. Figure 13.5.

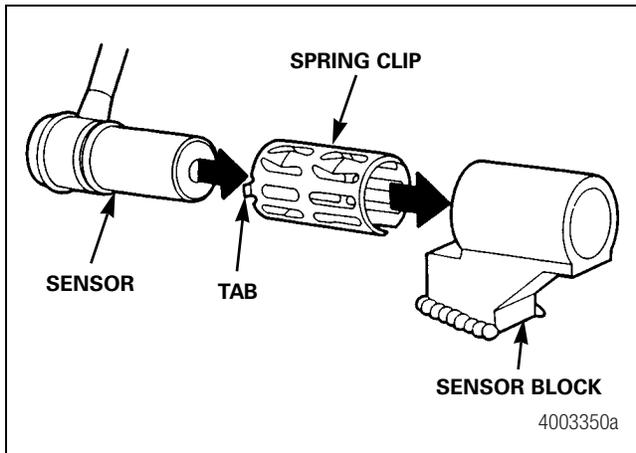


Figure 13.5

Sensor Block Location

Sensor blocks can be located at the three, six, nine or 12 o'clock positions. Any of these positions will provide acceptable sensor performance.

Sensor block locations at either three or nine o'clock are the most common positions. Figure 13.6.

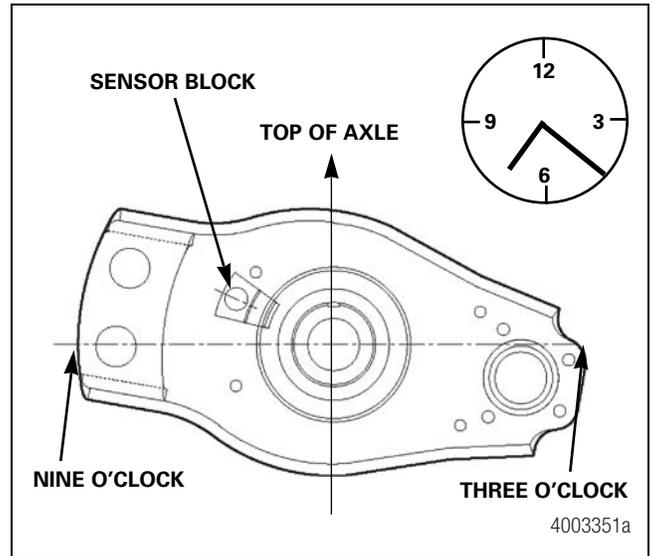


Figure 13.6

Less common is the 12 o'clock position. Some blocks are located in this position to provide access to the sensor for service. Figure 13.7.

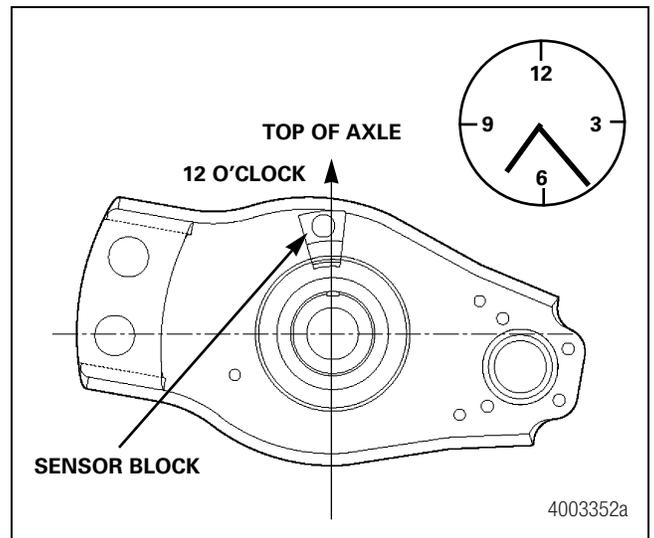


Figure 13.7

The least common position is near six o'clock. A sensor can end up in this area when an ABS-equipped axle is rotated 180 degrees prior to installation. Refer to the axle rotation information in Section 6. Figure 13.8.

13 Anti-Lock Braking System

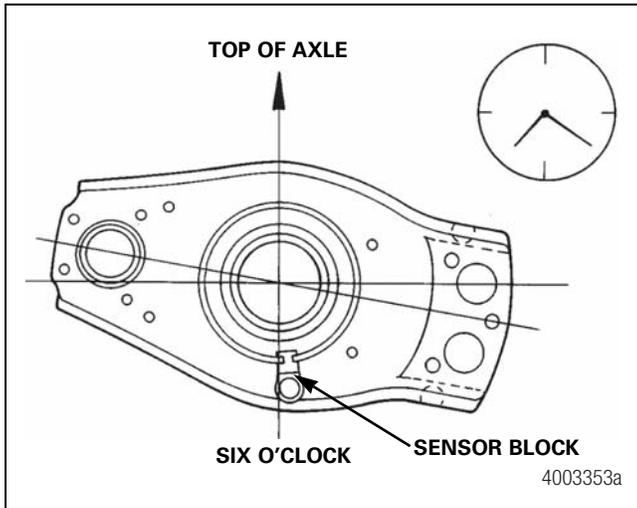


Figure 13.8

Sensor Gap

The sensor should contact the tooth wheel at the initial installation. A gap may develop during trailer operations. If this gap exceeds 0.040-inch (1 mm), the system may not function correctly. To readjust, push the sensor through the sensor block until it contacts the tooth wheel. Figure 13.9.

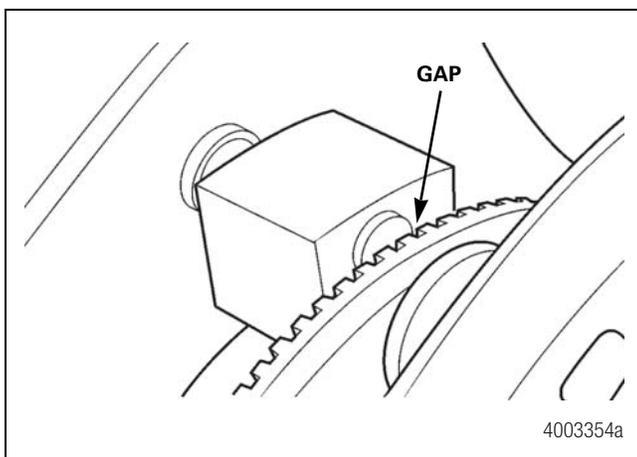


Figure 13.9

You can make a special tool to reach the back of the sensor through the brake equipment. Be careful not to damage the sensor when pushing on it. Figure 13.10.

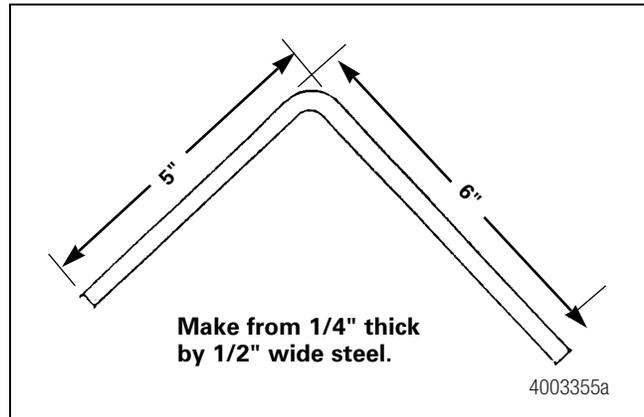


Figure 13.10

Wire Routing

This section details the correct methods for routing wiring within the brake cavity so that the correct clearance between the ABS wiring and brake equipment is provided.

Note the following in regard to this information.

- If the sensor is to be located at the bottom of an axle, first route the sensor wire to the top of the axle within the brake cavity. Then route it through the brake equipment. Figure 13.11.
 - Refer to the appropriate ABS maintenance manuals for information on routing wires beyond the areas shown here.
 - Information shown is for typical applications. Alternate routing may be used if either improved clearances can be obtained or if optional equipment is installed which requires different routing.
 - In order to route ABS wiring on trailer axles equipped with 12.25 x 7.5 inch cam brakes, modifications must be made to the brake structural components. Therefore, this installation must be performed at the Meritor manufacturing plant.
1. Current production cam brakes are built with a hole in the spider for routing the ABS wire. Figure 13.11.

13 Anti-Lock Braking System

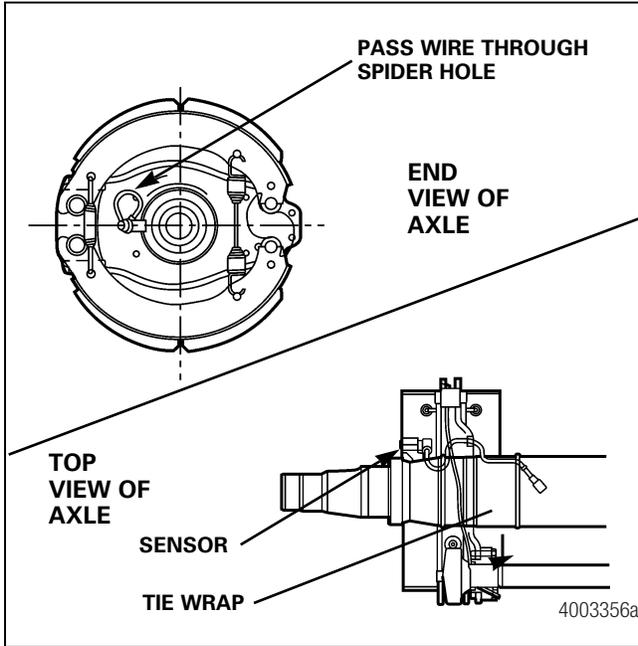


Figure 13.11

2. Route the ABS wires on TN and TQ model axles equipped with cam brakes without an ABS spider hole as follows. Figure 13.12.

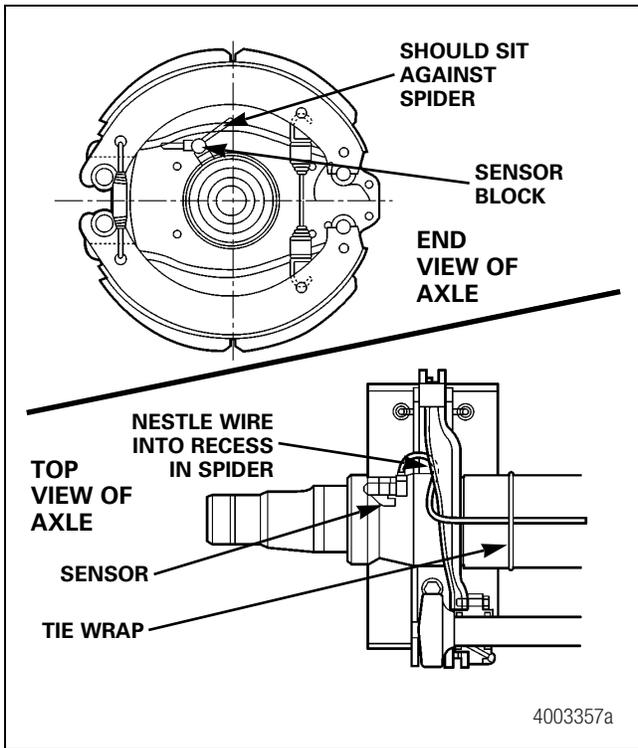


Figure 13.12

3. Route the ABS wires on TP and TR model axles equipped with cam brakes without an ABS spider hole as follows. Figure 13.13.

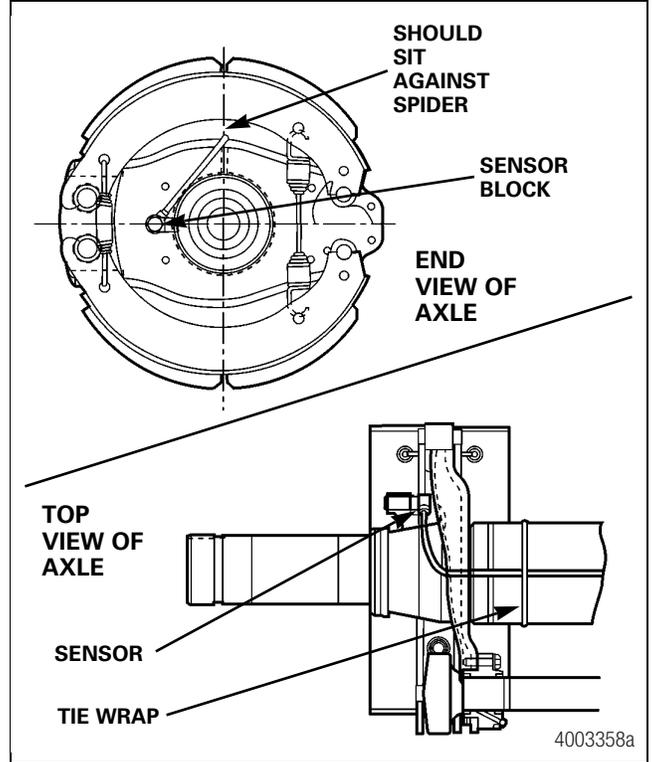


Figure 13.13

4. Route the ABS wires on axles equipped with disc brakes as follows. The sensor must be completely clear of the spinning disc brake rotor, otherwise it will be damaged. Figure 13.14.

13 Anti-Lock Braking System

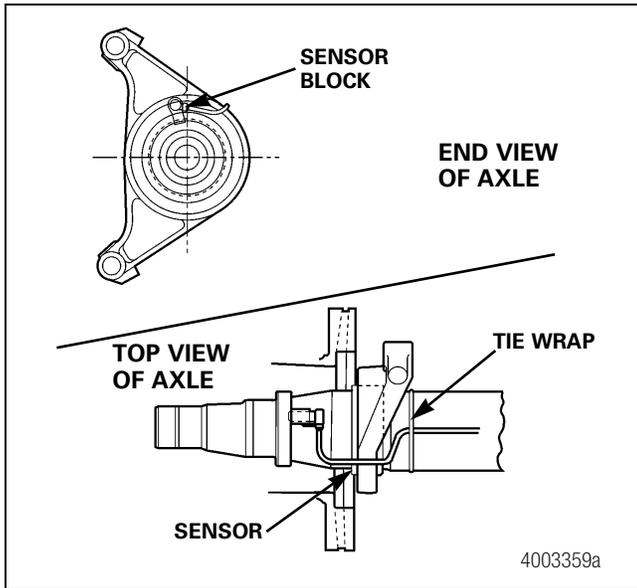


Figure 13.14

5. Route the ABS wires on axles equipped with wedge brakes as follows. Figure 13.15.

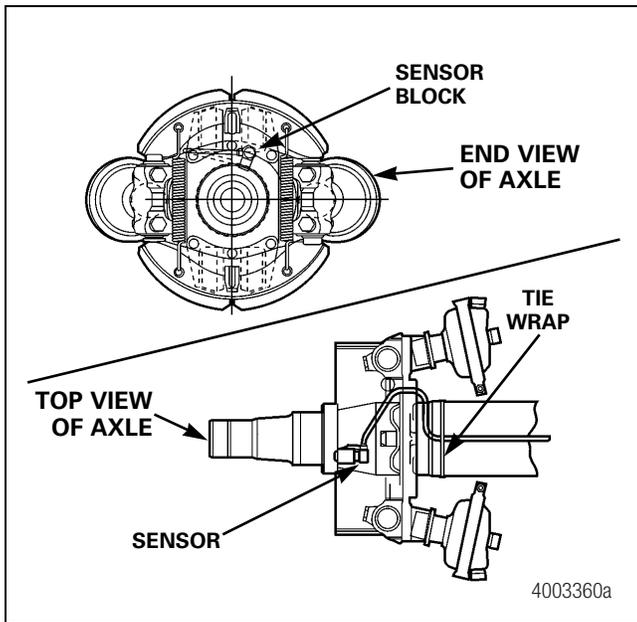


Figure 13.15

6. Meritor current production two-piece dust shields are designed to be used either with or without ABS equipment. Each dust shield section contains a hole for passing an ABS wire.

- On ABS-equipped axles, insert a grommet for wire protection into the hole in which the wire will be passed and a plug into the remaining hole.
- On axles not equipped with ABS, insert plugs into both holes. Figure 13.16.

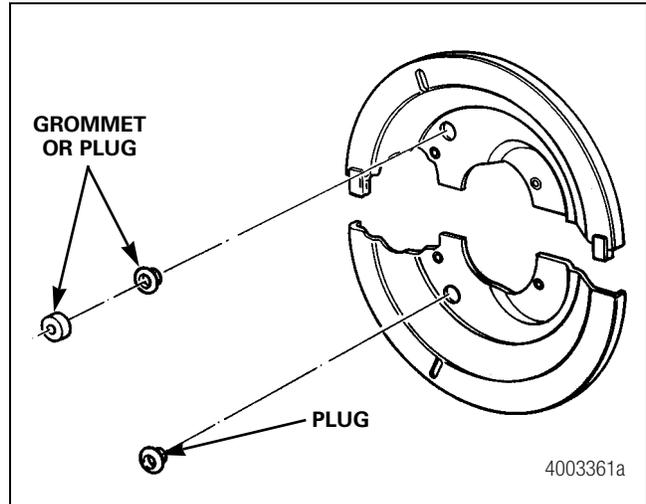


Figure 13.16

7. On some axle models, unit-mounted brakes, standard on drive axles, are fastened to the trailer axle by bolting the spider to a brake flange. Figure 13.17.

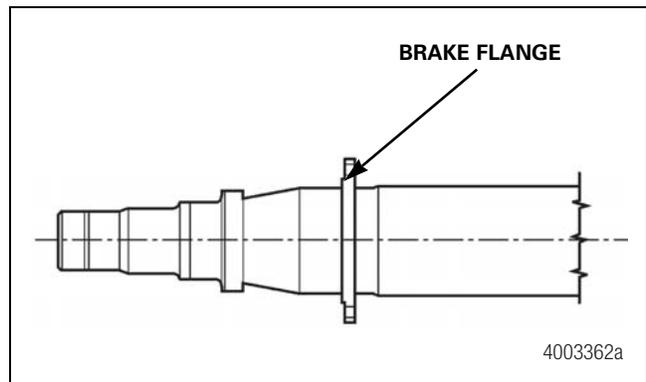


Figure 13.17

8. Currently brake flanges are available with nine, 12 and 16 hole patterns. For all three designs, the ABS wire should pass through the 0.8125-inch diameter hole and the remaining holes should be used for fastening the brake spider as detailed in Section 6. Figure 13.18.

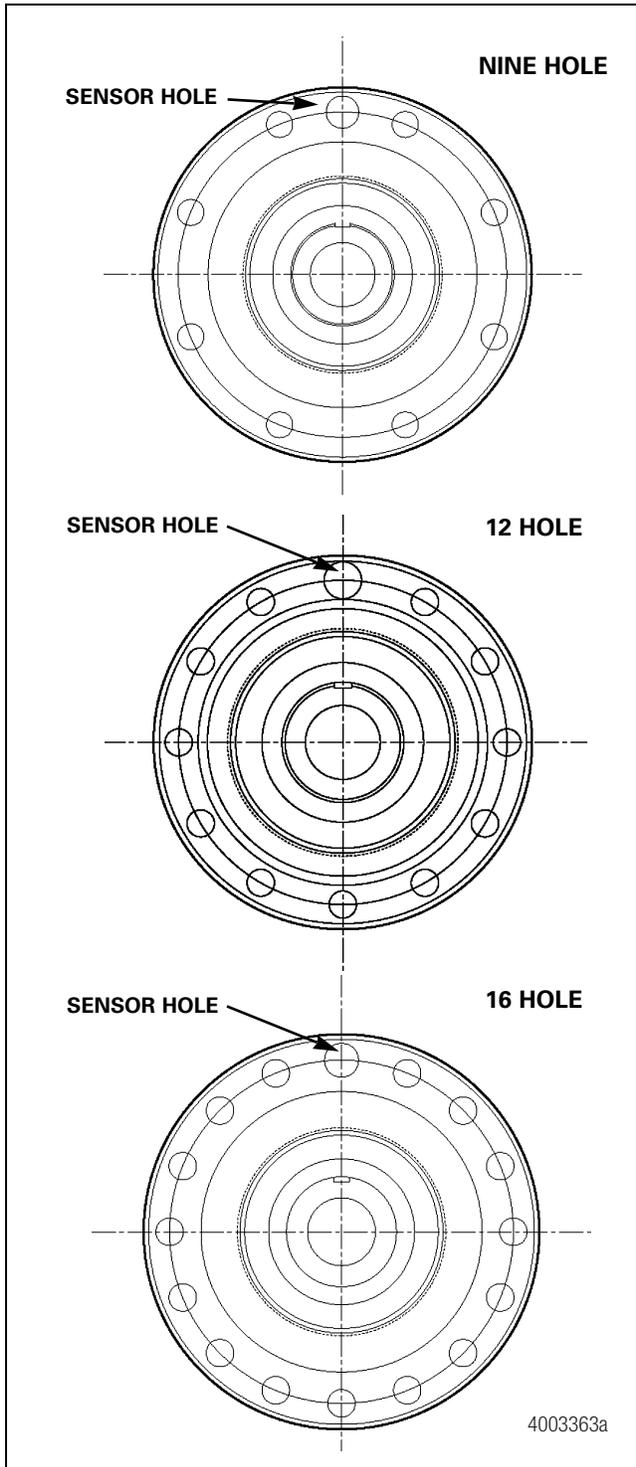


Figure 13.18

14 Lubrication

Hazard Alert Messages

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

WARNING

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

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

Lubrication

Lubricants increase the efficiency and extend the life of mechanical components by providing a lubricating film which:

- Reduces friction and wear
- Removes heat
- Inhibits corrosion
- Flushes contaminants away from moving parts

Many service problems can be traced to incorrect lubrication procedures; therefore, it is essential that trailer axle and brake components be filled:

- To the correct capacity
- With the specified lubricants
- At the required maintenance intervals

Refer to Maintenance Manual 1, Preventive Maintenance and Lubrication, for additional information on lubricants specified for Meritor trailer axles and brakes. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.

Seals protect components by keeping lubricants in and contaminants out. Seals should be periodically inspected for wear, damage or leaks. Note that many lubricants are colorless or semi-transparent and are difficult to see.

The use of synthetic lubricants is approved, provided they meet Meritor specification requirements. Note that these lubricants must either be compatible with standard commercial seals or special seals must be used.

Cam Brakes

The following provides information on lubricating Meritor cam brake components installed onto trailer axles.

Specified lubrication intervals are for standard-duty on-highway service. Lubricate more frequently for heavy-duty on-highway, off-highway and combined on/off-highway service.

Lubricants to be used are specified in the tables in this section.

CAUTION

Grease or oil on the brake rotors, drums or linings can cause poor brake performance. If lubricant contaminates brake components, be sure to clean the brake rotors or brake drums and replace contaminated linings.

Cam Bushings and Meritor Slack Adjusters

Before you perform lubrication procedures, release the brakes to ensure the camshaft bushings and automatic slack adjusters will be sufficiently lubricated. 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.

Lubricate the camshaft bushings and Meritor automatic slack adjusters as specified in Section 5.

Three possible lubrication schedules are shown below. Use the one that gives the most frequent interval.

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

Camshaft Splines

Lubricate the entire area of the spline in contact with the slack adjuster.

Lubricate when the brake is disassembled or as necessary.

Anchor Pins

Lubricate the anchor pins where they touch the brake shoes.

Lubricate when the brake is disassembled or as necessary.

Shoe Rollers

Lubricate the rollers where they touch the brake shoes. Do not get grease on the outer diameter of the roller that touches the cam head.

Lubricate when the brake is disassembled or as necessary.

Slack Adjuster Clevis Pins

Lubricate the entire pin.

Lubricate when the brake is disassembled or as necessary.

Camshaft Bushings

Apply the specified grease at the grease fitting on the spider. Apply grease until new grease purges from all the seals. Figure 14.1 and Table J.

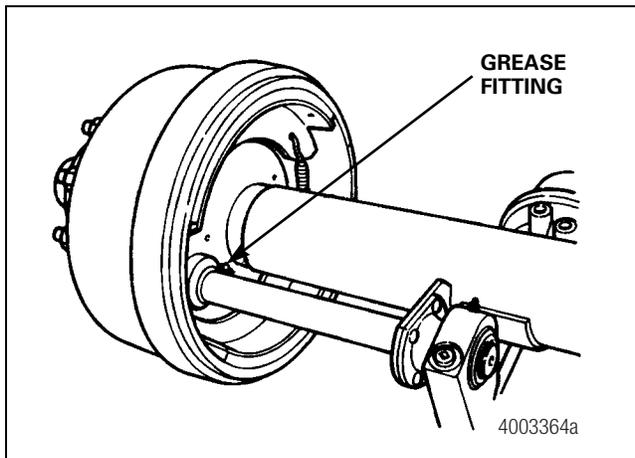


Figure 14.1

Approved Lubricants, Intervals and Specifications

Table I: Approved Lubricants

Lubricant Specification	Recommendation
0-616-A	Shell Darina Grease 1 Texaco Thermatex EP-1 Texaco Hytherm EP-1 Aralub 3837
0-617-A	Multipurpose Chassis Grease
0-617-B	
0-637	Witco Chemical Corp. SA-824946
0-641	Never-Seez Anti-Seize
0-645	Mobilgrease 28 (Military) Mobiltemp SHC 32 (Industrial) Aerospace Lubricants Inc. Tribolube 12 — Grade 1
0-692	Amoco Super Permalube, 2 Citgo Premium Lithium EP-2, 2 Exxon Ronex MP-2, 2 Kendall L-427 Super Blu, 2 Mobilith AW-1, 1 Sohio Factran EP-2, 2

14 Lubrication

WARNING

If grease flows from the seal near the cam head, replace the seal. Remove any grease or oil from the cam head, rollers and linings. Always replace contaminated linings. Grease on the linings can increase stopping distances. Serious personal injury and damage to components can result.

Table J: Cam Brake Grease Specifications

Components	Meritor Specification	NLGI Grade	Grease Type	Outside Temperature
Retainer Clips Anchor Pins Roller, Journals Only, Camshaft Bushings	0-616-A	1	Clay Base	Down to –40°F (–40°C)
When the brake is disassembled, or when necessary, lubricate the anchor pins and rollers where they touch the brake shoes.	0-617-A or	1	Lithium 12-Hydroxy Stearate or Lithium Complex	Refer to the grease manufacturer's specifications for the temperature service limits.
	0-617-B	2		
Do not allow grease to come in contact with the part of the cam roller that touches the cam head. Refer to the WARNING above.	0-645	2	Synthetic Oil, Clay Base	Down to –65°F (–54°C)
Camshaft Splines	Any of Above	Refer to Above	Refer to Above	Refer to Above
	0-637*	1-1/2	Calcium Base	Refer to the grease manufacturer's specifications for the temperature service limits.
	0-641	—	Anti-Seize	

*Do not mix 0-637 calcium-base, corrosion-control grease with other greases.

Table K: Conventional Automatic Slack Adjuster Grease Specifications

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

*Do not mix 0-637 calcium-base, corrosion-control grease with other greases.

Wheel-End Maintenance

This section provides information on lubricating Meritor trailer axle wheel ends with either grease or oil. Figure 14.2.

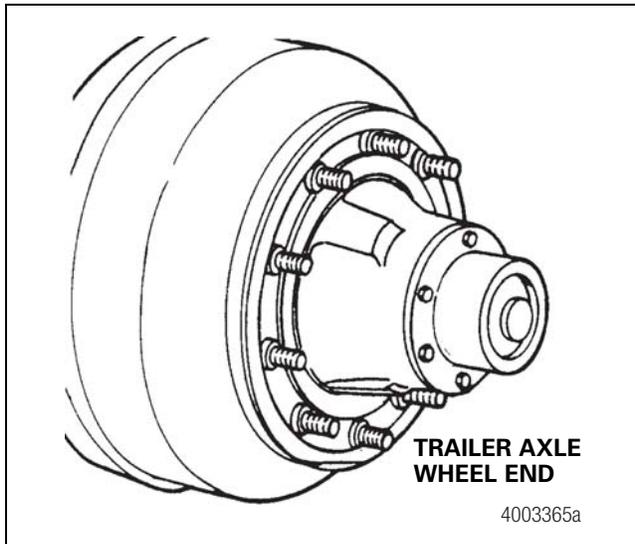


Figure 14.2

Oil-Lubricated Wheel Ends

The most common oils used in Meritor trailer axle wheel ends have a designation of API-GL-5 (American Petroleum Institute — Gear Lubricant 5). This oil is also approved under military specification MIL-2105D. Refer to Table L.

In addition to the GL-5 oils listed, oils with API grades GL-1, GL-2, GL-3 and GL-4 can also be used in trailer axle wheel ends. These oils cannot be used in drive axles, or any application which employs hypoid, amboid, spiral, bevel or planetary gearing.

Oil viscosity should be suitable for the climate in which the axle will be operated. Do not use thinning agents such as kerosene, gasoline or other solvents that lower the viscosity of lubricants.

- Low viscosity single grade gear oils, such as SAE 75W (Society of Automotive Engineers), should only be used in cold climates. Oil seals must be in excellent condition when using low viscosity oils to ensure against loss of these thin fluids.
- Multigrade oils, such as 80W/90, should be used where vehicles operate in both warm and cold climates.

Guidelines

Service environment, mileage, speed and axle load are some factors that determine how often you should change wheel-end lubricant. For example, a heavy-service application, such as an off-highway dump trailer, stresses the lubricant, and requires you to perform wheel-end maintenance more frequently.

Refer to the following table for guidelines.

Linehaul and General Service	Change the lubricant at every 100,000 miles (160 934 km) or 12 months, whichever comes first.
Heavy Service	Change the lubricant every 30,000 miles (48 280 km) or six months, whichever comes first.
Conditions That Require a Lubricant Change	The lubricant is contaminated. The spoke wheel or hub has been removed, which disrupts the lubricant.

Lubricate the Wheel End

Also refer to Table L, Conventional Trailer Axle Wheel-End Oil Change Intervals and Specifications; and Section 5, Assembly and Installation, for procedures to install seals, bearings, hubcaps and hubs.

1. Coat the bearing cones with oil.
2. Apply a light film of NLGI 1 or 2 grease, not oil, to the axle spindle bearing journals to help protect them from fretting corrosion. Figure 14.3.

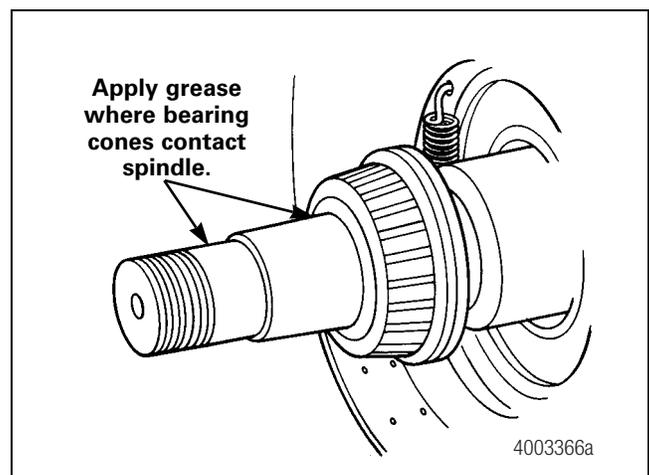


Figure 14.3

14 Lubrication

⚠ CAUTION

It is important not to overfill the wheel-end cavity with lubricant. Wheel-end oil level should never exceed the middle of the hubcap. Also, verify that any excess oil is wiped away since it can contaminate the brake linings and cause poor brake performance.

3. Fill the wheel end with an approved gear oil to the hubcap fill line. The oil must be given sufficient time to settle prior to a final check of the oil level. This is especially important in cold conditions. Figure 14.4.

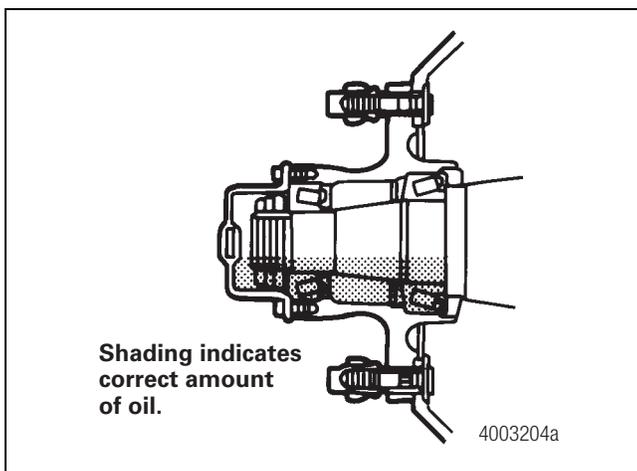


Figure 14.4

4. Inspect the wheel-end oil level at least every 1,000 miles (1600 km). To check, verify that the vehicle is on level ground, then clean the hubcap window and observe the oil level. Add lubricant if the oil level is down more than 0.25-inch (6.3 mm) from the full line. Figure 14.5.

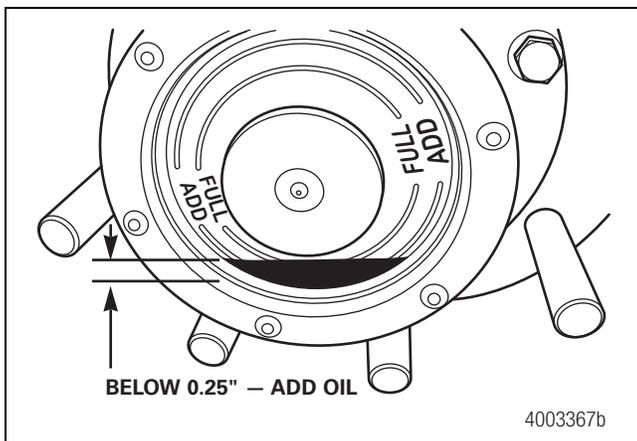


Figure 14.5

Grease-Lubricated Wheel Ends

The most common greases used in Meritor trailer axle wheel ends have a designation of NLGI (National Lubricating Grease Institute) grade 1 or 2. Refer to Table M.

Refer to the grease manufacturer specifications for temperature service limits.

Grease recommendations are based on commercial products that have given satisfactory results under normal conditions. There are, however, many proprietary grease products on the market that will perform satisfactorily and may be preferable because of supply problems or common usage with other vehicle components. Where such products are recommended by reputable suppliers for the specific lubrication of our components, Meritor has no objections, provided that these substitute products are equal to or better than the Meritor recommendations in regard to lubrication properties, water resistance, corrosion protection, high and low temperature characteristics, oxidation stability, shear stability, etc. All substitute products are subject to Meritor approval.

Guidelines

Service environment, mileage, speed and axle load are some factors that determine how often you should change wheel-end lubricant. For example, a heavy-service application, such as an off-highway dump trailer, stresses the lubricant, and requires you to perform wheel-end maintenance more frequently.

Refer to the following table for guidelines.

Linehaul and General Service	Change the lubricant at every 100,000 miles (160 934 km) or 12 months, whichever comes first.
Heavy Service	Change the lubricant every 30,000 miles (48 280 km) or six months, whichever comes first.
Conditions That Require a Lubricant Change	The lubricant is contaminated. The spoke wheel or hub has been removed, which disrupts the lubricant.

⚠ WARNING

Do not use gasoline to clean parts. Gasoline can explode or burn and cause serious personal injury.

To remove grease from a wheel end, use a stiff fiber brush, not steel, and kerosene or diesel fuel oil, not gasoline. Allow clean parts to dry, then wipe them with a clean, absorbent cloth. Any solvent residue must be completely wiped dry since it may either dilute the grease or prevent it from correctly adhering to the wheel-end components.

Lubricate a Wheel End with Approved NLGI 1 or 2 Grease

Refer to Table M for lubrication specifications and intervals for conventional trailer axles. Refer to Section 5 for information to install components such as seals, bearings and hubs.

1. Use a pressure packer to pack the bearing cones with grease by forcing grease into the cavities between the rollers and cage from the large end of the cone. If a pressure packer is not available, pack the bearings by hand.
2. Apply a light coat of grease to the spindle bearing journals.

⚠ CAUTION

When you lubricate the wheel-end cavity with approved grease, pack the area of the hub between the two bearings with grease only up to the smallest diameter of the bearing cups. Do not install too much grease in the wheel-end cavity. Remove excess grease, which can contaminate the brakes and affect bearing life and braking performance. Damage to components can result.

3. Pack the area of the hub between the two bearings with grease up to the smallest diameter of the bearing cups. Remove excess grease. Figure 14.6.

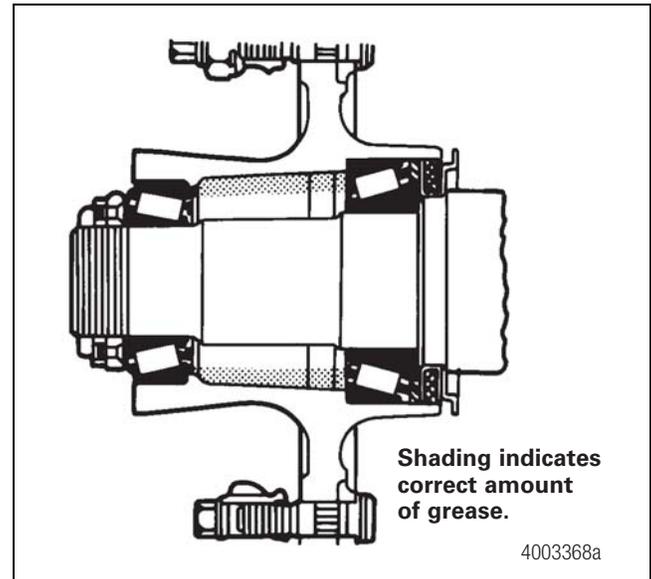


Figure 14.6

4. Install and tighten the hub retention hardware. Apply a light coat of approved NLGI 1 or 2 grease to the hubcap interior and across the face of the outer locknut. This will indicate that NLGI 1 or 2 grease was used, as well as help prevent corrosion of these parts.

Lubricating a Wheel End with Approved NLGI 00 Grease

To lubricate a wheel end with approved NLGI 00 grease, Table M, refer to the following.

Detailed information for installing components such as seals, bearings and hubs is located in Section 5.

1. Pack the bearing cones with grease by forcing grease into the cavities between the rollers and cage from the large end of the cone. The use of a pressure packer is recommended; otherwise, pack the bearings by hand.
2. Apply a light coat of synthetic grease to the spindle bearing journals. Refer to "A" in Figure 14.7.

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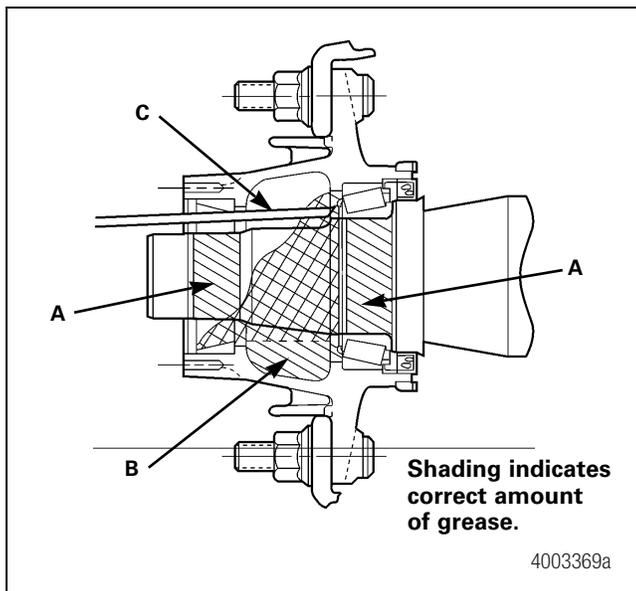


Figure 14.7

7. Install and tighten the hub retention hardware. Apply a light coat of approved NLGI 00 grease across the face of the outer locknut. This will indicate that NLGI 00 grease was used, as well as help prevent corrosion of these parts. Do not install grease in the hubcap.

3. Install the hub onto the spindle without the outer bearing cone in place.

⚠ CAUTION

When you lubricate the wheel-end cavity with approved grease, fill the hub cavity with grease to the outer cup's smallest diameter. Do not install too much grease in the wheel-end cavity or add grease to the hubcap, which can plug the vent hole, prevent the hubcap from venting correctly, and affect bearing life and braking performance. Damage to components can result.

4. Fill the hub cavity with the approved grease to the outer cup's smallest diameter. Refer to "B" in Figure 14.7.
5. At the top of the spindle and as far back as possible, pump additional synthetic grease until it appears that the grease will run out. Install the outer bearing cone quickly. Refer to "C" in Figure 14.7.
6. The hub cavity will be filled approximately 1/3 full with grease, from the four to the eight o'clock positions. This will involve installation of approximately 1.5 pounds of grease. However, different hub designs may require that either more or less grease be installed. Figure 14.7.

Conventional Trailer Axle Wheel-End Lubrication Intervals and Specifications

Table L: Conventional Trailer Axle Wheel-End Oil Change Intervals and Specifications

Check Oil Level	Oil Change*	Meritor Specification	Specification Approval	Oil Description	Outside Temperature			
					°F		°C	
					Min.	Max.	Min.	Max.
1,000 miles (1600 km)	<p>Linehaul and General Service: For 100,000 miles (160 000 km) or more a year, change the oil every 100,000 miles (160 000 km). For less than 100,000 miles (160 000 km) a year, change the oil once a year.</p> <p>Heavy Service: For 60,000 miles (96 000 km) or more a year, change the oil every 30,000 miles (48 000 km). For less than 60,000 miles (96 000 km) a year, change the oil every six months.</p> <p>Conditions That Require an Oil Change: Change the oil if the wheel end is disturbed during wheel or hub removal or if the oil is contaminated.</p>	O-76-A Gear Oil	MIL-PRF-210 5-E and SAE J2360	GL-5 SAE 85W/140	-10	None	-12	None
		O-76-D Gear Oil		GL-5 SAE 80W/90	-15	None	-26	None
		O-76-E Gear Oil		GL-5 SAE 75W/90	-40	None	-40	None
		O-76-J Gear Oil		GL-5 SAE 75W	-40	35	-40	2
		O-76-L Gear Oil		GL-5 SAE 75W/140	-40	None	-40	None
		O-76-M Full-Synthetic Gear Oil		GL-5 SAE 75W/140	-40	None	-40	None
		O-76-N Full-Synthetic Gear Oil		GL-5 SAE 75W/90	-40	None	-40	None
		O-81 Full-Synthetic Oil		SAE 50	-40	None	-40	None

*The recommended oil change interval is based on operating conditions, mileage, speeds and loads. Limited service applications may allow the recommended interval to be increased. Severe or heavy service applications may require the recommended interval to be reduced. For more information, contact the Meritor OnTrac™ Customer Call Center at 866-668-7221.

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Table M: Conventional Trailer Axle Greasing Intervals and Specifications

Greasing Interval*	Grease	Meritor Specification	NLGI Grade	Grease Description	Outside Temperature
Linehaul and General Service: For 100,000 miles (160 000 km) or more a year, grease the bearings every 100,000 miles (160 000 km). For less than 100,000 miles (160 000 km) a year, grease the bearings once a year.	Multi-Purpose Grease	0-617-A or 0-617-B	1 or 2	Lithium 12-Hydroxy Stearate or Lithium Complex	Refer to the grease manufacturer's specifications for the temperature service limits.
Heavy Service: For 60,000 miles (96 000 km) or more a year, grease the bearings every 30,000 miles (48 000 km). For less than 60,000 miles (96 000 km) a year, grease the bearings every six months.	Trailer Axle Bearing	0-647	00	Lithium Complex	

Conditions That Require a Grease Change:

Grease the bearings if the wheel end is disturbed during wheel or hub removal or if the grease is contaminated.

*The recommended greasing interval is based on operating conditions, mileage, speeds and loads. Limited service applications may allow the recommended interval to be increased. Severe or heavy service applications may require the recommended interval to be reduced. For more information, contact the Meritor OnTrac™ Customer Call Center at 866-668-7221.

Table N: TP and TN Series Trailer Axles Equipped with Conventional Hub Assemblies or PreSet® by Meritor*Hub Assemblies

Trailer Axle Series, Hub Assembly Type, and Hub Part Number ¹	Lubricant Volume per Wheel End		
	API-GL5 Oil	NLGI 00 Semi-Fluid Grease ²	NLGI 1 or 2 Grease ²
TP Series PreSet® hub assembly Hub part number 16040	Hubcap Fill Line Approx. 24.55 fl. oz. (44.31 cu. in.)	35.00 fl. oz. (63.16 cu. in.)	NOT RECOMMENDED
TP Series Conventional hub assembly Hub part number 15968	Hubcap Fill Line Approx. 24.55 fl. oz. (44.31 cu. in.)	33.47 fl. oz. (60.41 cu. in.)	23.37 fl. oz. (42.17 cu. in.)
TN Series PreSet® hub assembly Hub part number 16048	Hubcap Fill Line Approx. 15.17 fl. oz. (27.37 cu. in.)	31.00 fl. oz. (55.95 cu. in.)	NOT RECOMMENDED
TN Series Conventional hub assembly Hub part number 15984	Hubcap Fill Line Approx. 15.17 fl. oz. (27.37 cu. in.)	25.57 fl. oz. (46.15 cu. in.)	21.22 fl. oz. (38.29 cu. in.)

*The PreSet® by Meritor hub assembly is equipped with pre-installed bearings, cups and cones, and oil seals and studs. A precision tubular spacer between the bearings eliminates manual bearing adjustments. The hub subassembly also includes an integral tooth wheel for vehicles equipped with an anti-lock braking system (ABS).

¹ The hub part number is cast into the inboard side of the wheel mounting flange.

² Volume includes the lubricant volume of the bearing cones. PreSet® bearings are not greased prior to installation.

Torque Specifications

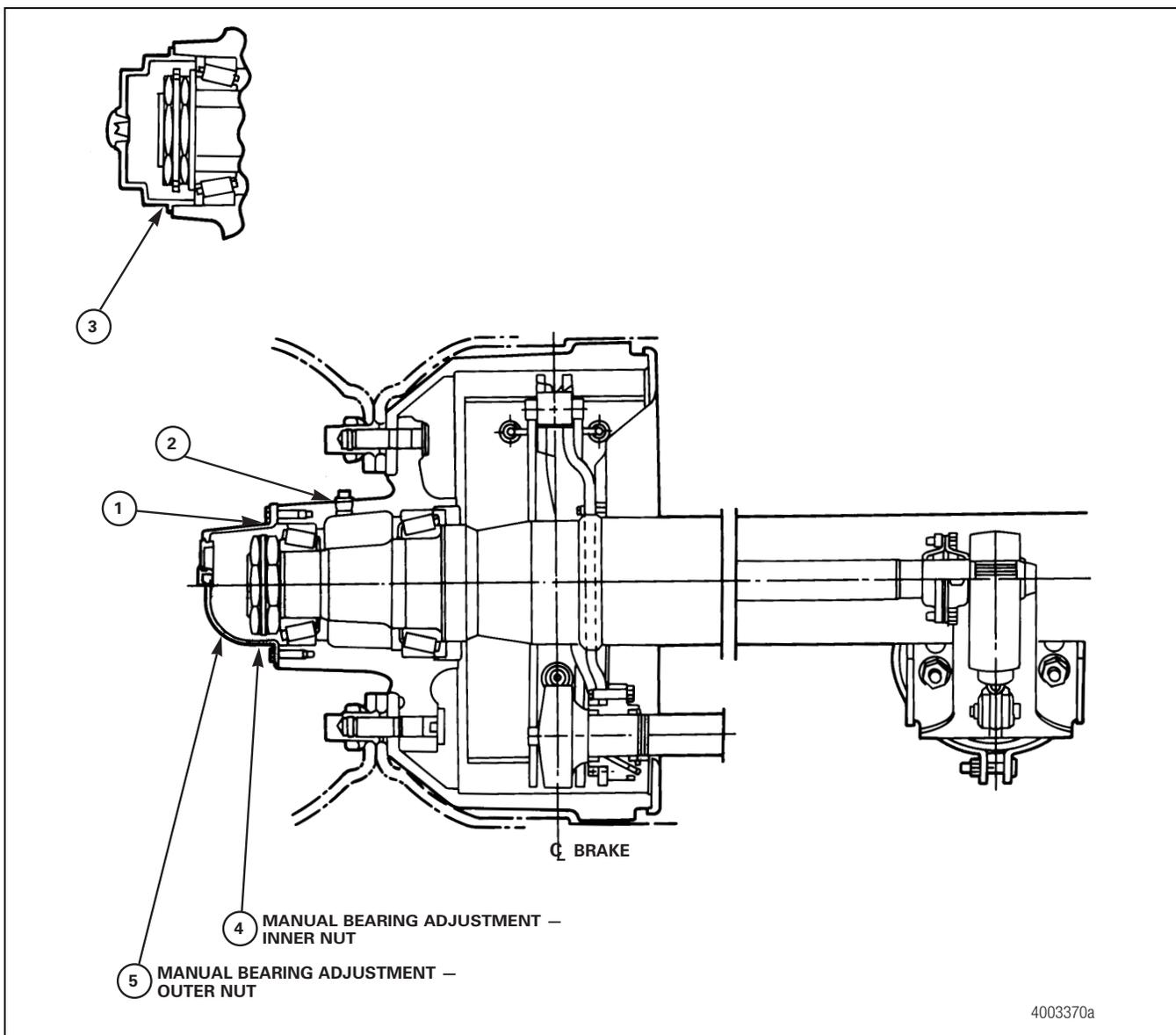


Table O: Axle Torque Values

Description	Torque Range		Fastener Size
	Lb-Ft	N•m	
1. Hubcap bolts	15-30	20-41	0.31-18
2. Hub fill plug	15-20	20-27	0.62-11 (TR Model)
3. Hubcap, screw-type	50-75	68-102	0.38-18 PTF
4. Adjustment nut, manual bearing adjustment, double nut	Tighten to 200, loosen, tighten to 50, loosen 1/4 turn.	271, 68	Size depends on axle model and adjustment method.
5. Jam nut, manual bearing adjustment	300-400	408-544	

15 Specifications

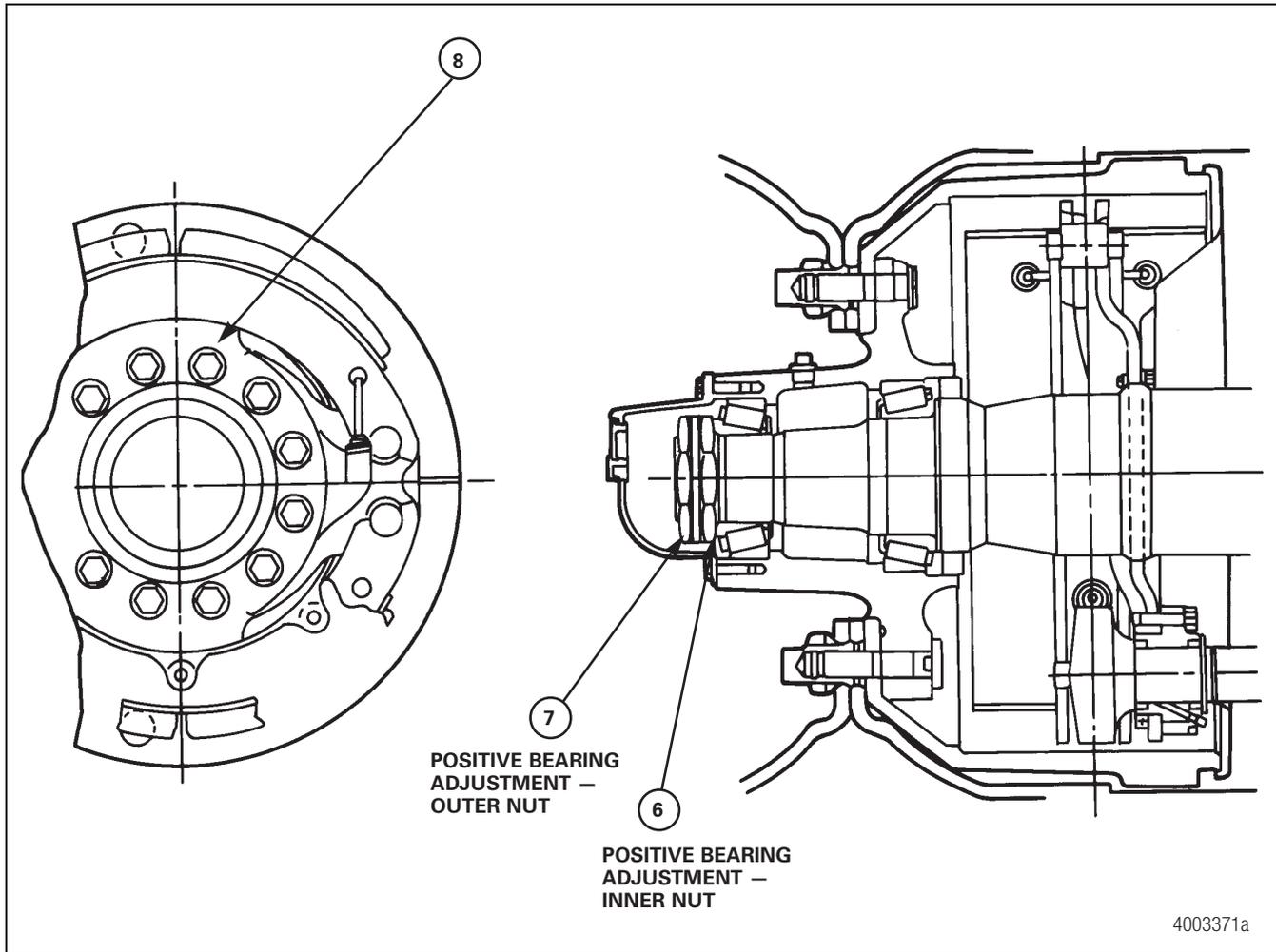
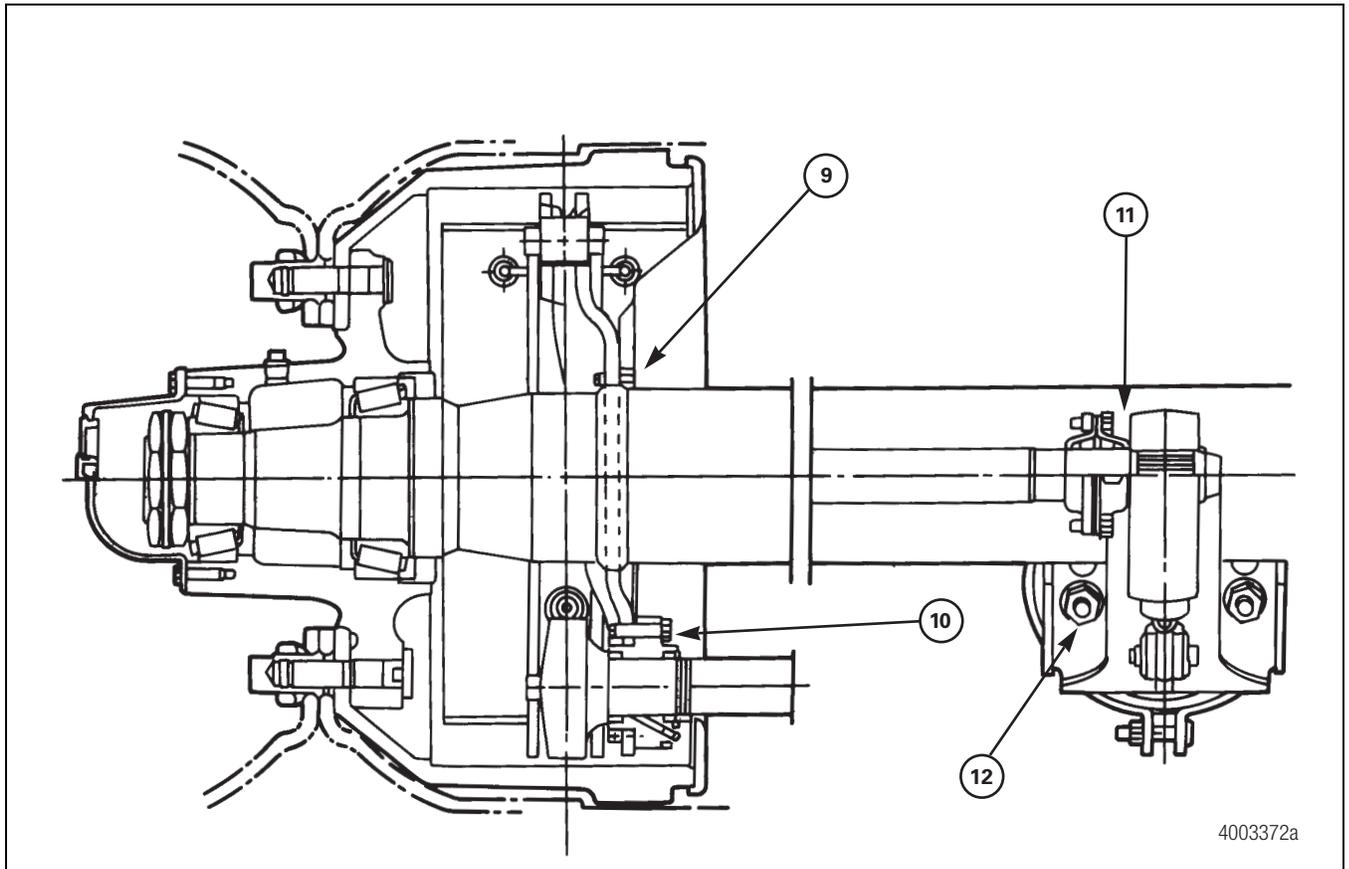


Table P: Axle Torque Values

Description	Torque Range		Fastener Size
	Lb-Ft	N•m	
6. Adjusting nut, positive bearing adjustment	250-300	340-408	Size depends on axle model and adjustment method.
7. Jam nut, positive bearing adjustment	250-300	340-408	
8. Brake mounting bolt	130-165	177-224	9/16
	180-230	245-313	5/8

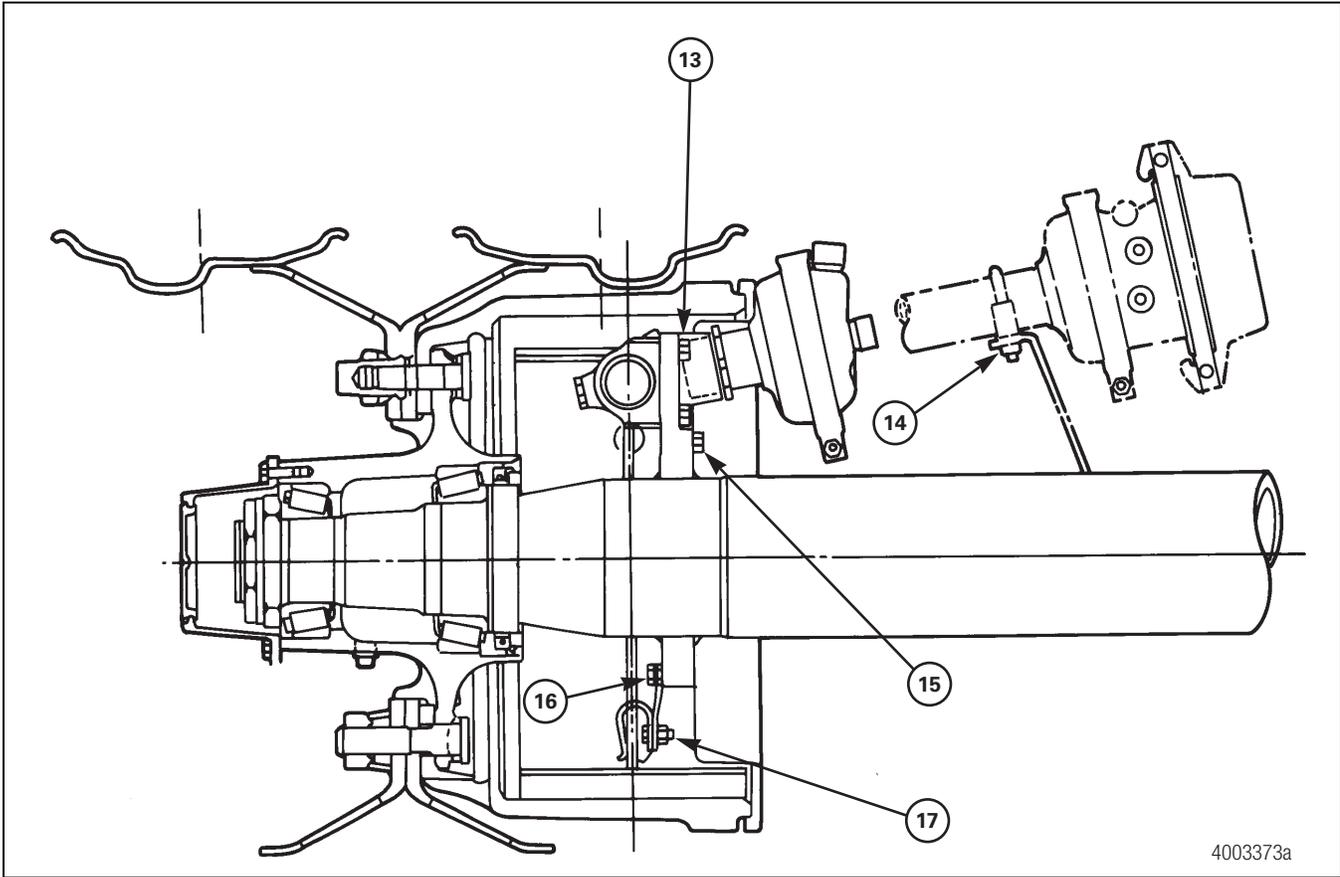


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Table Q: Cam Brake Torque Values

Description	Torque Range		Fastener Size
	Lb-Ft	N·m	
9. Two-piece dust shield bolts, shown	25-35	34-48	0.38-16
10. Bolt-on bushing bolts	25-35	34-48	0.38-16
11. Cam bushing bolts	25-35	34-48	0.38-16
12. Air chamber nuts	80-125	109-170	0.62-11

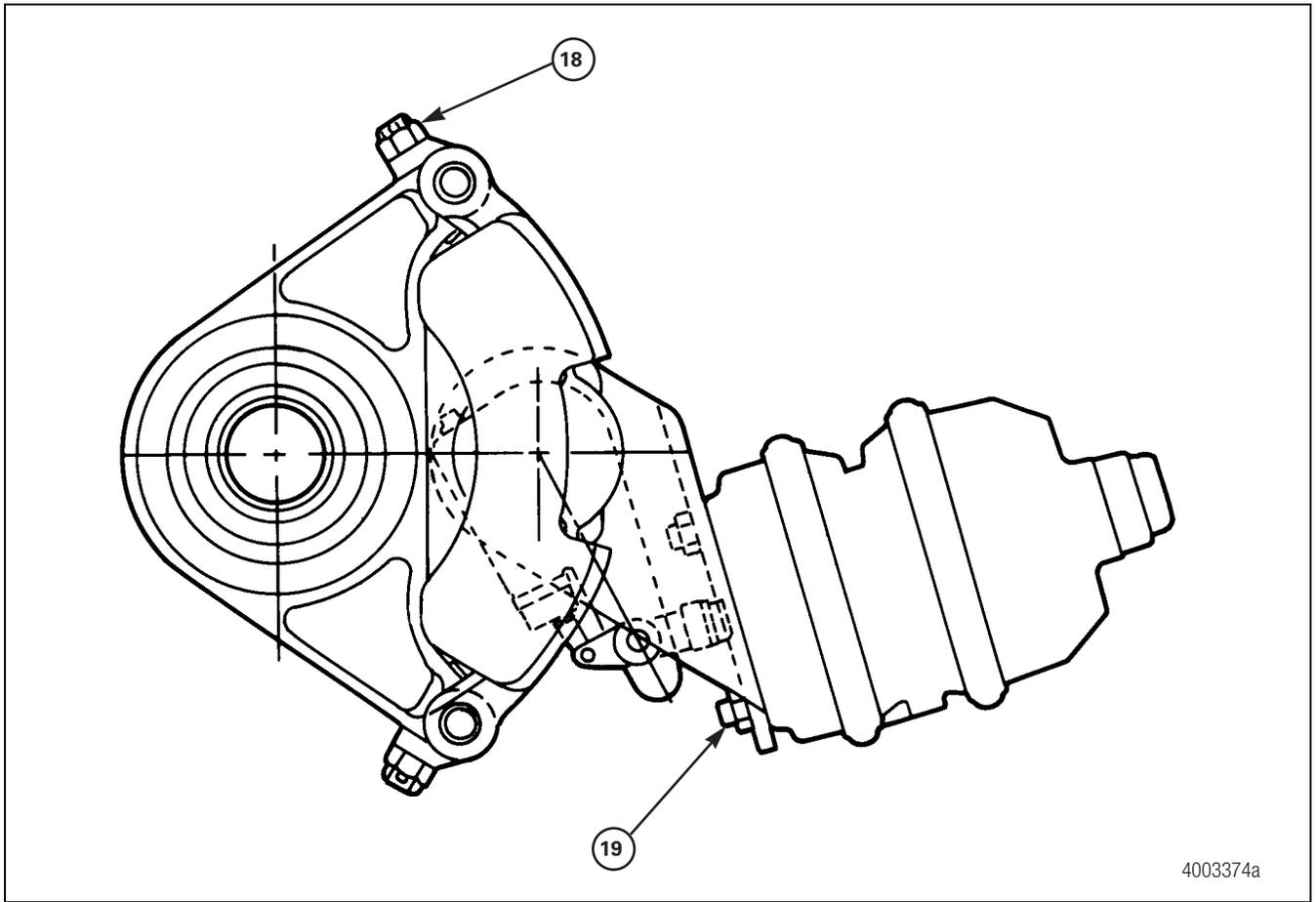
15 Specifications



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Table R: Wedge Brake Torque Values

Description	Torque Range		Fastener Size
	Lb-Ft	N•m	
13. Actuator bolts	30-40	41-54	0.38-16
14. Support locknuts	10-15	13-20	0.31-16
15. Dust shield bolts	15-20	13-20	0.38-24
16. Support bolts	30-40	41-54	0.38-24
17. Clip bolt	15-20	20-27	0.31-18



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Table S: Disc Brake Torque Values

Description	Torque Range		Fastener Size
	Lb-Ft	N•m	
18. Slide pin retainer nut	60-80	82-109	0.75-16
19. Air chamber nut	80-125	109-170	0.62-11

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