HEAVY-DUTY FRONT DRIVE STEER AXLES
MX-140 AND MX-160 SERIES
About This Manual

This manual provides maintenance and service information for the Meritor heavy-duty front drive steer axles equipped with Q Series or Q Plus™ cam brakes.

How to Obtain Additional Maintenance and Service Information

Visit Literature on Demand at meritor.com to access and order the following publication.

- Technical Publication TP-0445, Parts Failure Analysis

Additional information is also available at meritorbullpen.com.

Contact the Meritor OnTrac™ Customer Service Center at 866-668-7221 (US and Canada) between 7:30 AM and 10:00 PM ET Monday through Friday, and between 9:00 AM and 6:00 PM ET on Saturday; 001-800-889-1834 (Mexico); or visit our website: www.meritor.com/warranty.

If Parts, Tools, and Supplies are Specified in this Manual

Contact Meritor’s Commercial Vehicle Aftermarket at 888-725-9355.

For assistance with parts, you may also contact the Meritor Parts Center in Florence, KY at CustCareCntr.Florence@Meritor.com or 859-525-3500.
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Safety Information

Hazard Alert Messages

Read and observe all hazard alert messages in this publication.

**DANGER**

Indicates imminent danger. Failure to follow this instruction will result in death or serious injury.

**WARNING**

Indicates a possibly impending danger. Failure to follow this instruction can result in death or serious injury.

**CAUTION**

Indicates a hazardous situation or unsafe practice which, if not avoided, could result in injury or damage to components.

Safety Precautions

Before performing service and maintenance procedures, read and understand the following safety precautions. Failure to follow these instructions may result in death or injury. Additional hazard alert messages are included throughout this publication where applicable.

**DANGER**

- Before starting any work on the vehicle, carefully read and understand all instructions and hazard alert messages provided in this publication. Failure to follow procedures and alerts as directed can result in death, serious injury and damage to components.
- Procedures may only be performed by qualified professionals who are trained and certified in vehicle service. Death or serious personal injury and damage to components can result.
- Only perform work on a flat, level surface in a well-lighted, ventilated area. Death or serious personal injury and damage to components can result.
- Follow all safety instructions and service guidelines established at the service facility where work is being performed. Death or serious personal injury and damage to components can result.

**WARNING**

- Always wear proper eye protection and other appropriate personal protective equipment when performing procedures.
- Never wear loose clothing such as neck ties and jewelry such as necklaces, watches and rings when working on a vehicle. Always tie long hair back. Loose clothing, hair and jewelry can catch on parts, resulting in serious injury.
- Turn the engine Off and remove the ignition key before working on a vehicle. Contact with moving parts can result in serious injury.
- After operating a vehicle, allow the vehicle to cool down before performing service. Coming into contact with hot parts and fluids can cause burns and serious injury.
- Drain the air completely from the air system before working on any connected air lines or components.
- Never disconnect or connect an air line containing pressurized air. The air line can whip around or project debris, resulting in personal injury.
- Do not actuate a brake with the brake pads or shoe linings removed.
- Use only Meritor® brand replacement parts, components and kits. Use of unauthorized parts can result in damage or injury, and void the Meritor warranty.
- Use only wheels and valve stems approved by the vehicle manufacturer for use with Meritor air disc brakes. Use of unapproved wheels and valve stems can result in valve stem damage.
- Always ensure all components and systems are in correct operating condition before returning the vehicle to service.
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 any 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.
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.

   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.

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Exploded Views
MX-160 Series with Q Series Cam Brakes

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<th>Item</th>
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<td>1</td>
<td>Wheel Nut</td>
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<td>2</td>
<td>Brake Drum</td>
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<td>3</td>
<td>Grease Fitting</td>
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<td>4</td>
<td>Cover Plate Capscrews</td>
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<td>Ball Plug</td>
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## 2 Exploded Views

### Q Series Brake

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<td>Brake Shoe Anchor Pin</td>
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<td>Brake Shoe Retaining Spring</td>
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<td>Brake Shoe Roller</td>
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<td>13</td>
<td>Brake Shoe Roller Retainer</td>
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<td>14</td>
<td>Dust Shield Capscrew</td>
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<td>Dust Shield</td>
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<td>Dust Shield</td>
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![Diagram of Q Series Brake components](image-url)
Introduction

Description

Meritor produces a complete line of heavy-duty front drive steer axles with single axle capacities of 21,000-23,000 lbs (9,525-10,432 kg). Figure 3.1.

Some axle models are available with the following features:

- Right-hand or left-hand gearing
- Standard or wide tracks
- Driver-controlled main differential lock for increased traction

Basic Axle Models Covered in this Manual

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<th>MX-17-140</th>
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<tr>
<td>MX-21-140</td>
<td>MX-23-160R</td>
</tr>
<tr>
<td>MX-21-160</td>
<td></td>
</tr>
</tbody>
</table>
3 Introduction

Identification

Current Axle Models

Front drive steer axle models are identified by a letter and number system. The letters and numbers give important information about the specific axle model.

The first seven positions of the designations identify a basic axle model. The second group of letters and numbers identify particular specifications.

As an example, a 21,000 lb (9525 kg) front drive steer axle with a single-reduction 145 model carrier is identified by the following in Figure 3.2.

M X - 21 - 160 DA - N - L 123 - XXXX XXXX

Figure 3.2
**Inspection**

**Hazard Alert Messages**

Read and observe all hazard alert messages in this publication.

---

**WARNING**

To prevent eye injury, always wear eye protection when performing vehicle maintenance or service.

---

**Tie Rod End Wear**

You may not be able to detect loose or worn tie rod ends during operation. Under normal operating conditions, wear occurs over time. The preload bearings inside each tie rod end provide less resistance, which can affect steering control, front tire wear and other axle components.

Regularly-scheduled inspection and maintenance helps to minimize the effects of tie rod end wear on the vehicle. Refer to “Front Drive Axle Greasing Intervals and Specifications” on page 47. Figure 4.1.

Reference Maintenance Manual 1, Preventive Maintenance and Lubrication, for additional Tie Rod End service. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.

---

*Figure 4.1*
4 Inspection

Does Tie Rod End Wear Affect the Steering Linkage?

Unless tie rod end wear becomes excessive, a safe steering linkage is maintained. However, tie rod end wear can affect uniform steering control and, ultimately, wear to the front tires.

Can the Driver Detect Tie Rod End Wear During Vehicle Operation?

A driver may not always detect a loose tie rod end condition during vehicle travel conditions. This is why it is important to inspect tie rod ends for wear and allowable movement at regular intervals.

Tie Rod Assembly for Movement

For roadside inspection, refer to the procedure in this section.

Vehicle Raised and Supported with Safety Stands

To perform this inspection, the entire system must be unloaded. The front end of the vehicle must be raised and supported with stands.

NOTE: Do not grease the tie rod assembly before performing the inspection.

![DANGER]

Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving. Support the vehicle with safety stands. NEVER work under a vehicle supported only by jacks. Jacks can slip and fall over. Failure to use safety stands can result in death or serious personal injury and damage to components.

1. Park the vehicle on a level surface with the wheels STRAIGHT. Block the wheels to prevent the vehicle from moving. Set the parking brake. Figure 4.2.

2. Raise the vehicle so that the front wheels are off the ground. Support the vehicle with safety stands. Do not use a jack to support the vehicle.

3. With the engine off, turn the wheels from full left to full right. Return to the straight-ahead position. This step will require more force for vehicles with the power steering off.

4. Check the tie rod boot for cracks, tears or other damage. Also check the boot seals for damage. Replace the entire tie rod end if the boot is damaged or missing. Figure 4.3.

![Cracked or torn boot requires entire tie rod end replacement.]

Verify the nut is tightened to the correct torque specification, the cotter pin is installed through the nut and the legs are bent in opposite directions, wrapping the legs around the nut. Replace missing cotter pins and tighten loose nuts. A missing cotter pin or loose nut can cause loss of steering control. Death or serious personal injury and damage to components can result.
5. Verify the tie rod end nut is installed and secured with a cotter pin.

**If the cotter pin is missing:** Tighten the tie rod end nut to the correct specification. Install a new cotter pin. Always tighten the tie rod end nut to the specified torque when setting the cotter pin. Refer to “Torque Specifications” on page 48. Do not back-off the nut to insert the cotter pin. Figure 4.4.

![Figure 4.4](4018531a)

**Figure 4.4**

6. Verify the tie rod end is threaded correctly into the cross tube and installed deeper than the end of the cross tube slot. The tie rod end must be visible the entire length of the cross tube slot. Figure 4.5.

![Figure 4.5](4018532a)

**Figure 4.5**

7. Confirm the grease fittings are installed. Replace a damaged grease fitting.

**If the tie rod ends are non-greaseable:** Do not install a grease fitting. Figure 4.6.

![Figure 4.6](4018533a)

**Figure 4.6**

8. By hand or using a pipe wrench with jaw protectors to avoid gouging the cross tube, rotate the cross tube toward the FRONT of the vehicle and then toward the REAR. After rotating, center the cross tube between the stop positions.

**If the cross tube will not rotate in either direction:** Replace both tie rod ends.

9. Position yourself directly below the ball stud socket. Using both hands, grasp the assembly end as close to the socket as possible, no more than 6 inches (152.4 mm) from the end.

> **CAUTION**

Only use your hands to check for movement or looseness of the tie rod assembly. Do not use a crow bar, pickle fork or 2x4. Do not apply pressure or force to the tie rod assembly ends or joints. Do not rock the tires with the vehicle on the ground or with the wheels raised. Damage to components can result.
10. Apply hand pressure of approximately 100 pounds (45 kg) in a vertical PUSH-and-PULL motion several times. Check for any movement or looseness at both tie rod ends. Figure 4.7.

If there is any vertical movement in the tie rod assembly: Replace both tie rod ends.

![Figure 4.7](4018534a)

**CAUTION**
Replace bent or damaged tie rods with original equipment parts of the same length, diameter and threads. Do not attempt to straighten a bent tie rod. Damage to components can result.

11. Inspect the cross tube and clamps for damage. Figure 4.8.

If the cross tube is bent or cracked: Replace it. Use original equipment parts of the same length, diameter and threads.

If the clamps are damaged: Replace them.

If either clamp has become welded to the cross tube: Replace the entire cross tube assembly. Use original equipment parts of the same length, diameter and threads.

![Figure 4.8](4018535a)

**Federal DOT Out of Service Roadside Inspection Criteria**

The following cross tube and tie rod end components may be checked during roadside inspections. Deficiencies may result in the vehicle being placed out-of-service by authorized personnel. (See www.fmcsa.dot.gov for additional information.)

1. Loose clamps or clamp bolts on the tie rods.
2. Any looseness in the threaded tie rod end and cross tube joint.
3. Loose or missing nuts on the tie rods or cross tube.
4. Any movement under the steering load of a tie rod arm ball stud nut.
5. Any motion, other than rotational, between any linkage member and its attachment point of more than 0.125-inch (3 mm), when measured with hand pressure.
6. Any obvious welded repairs.

**Replacement Criteria**

Any detectable movement of 0.125-inch (3 mm) or more requires that the vehicle is immediately taken out of service for replacement of the tie rod ends.

When the roadside check indicates tie rod end movement of less than 0.125-inch (3 mm), the vehicle does not need to be immediately removed from a service run. It is advisable to schedule a major out-of-service inspection and maintenance as soon as possible.

**Commercial Vehicle Safety Alliance (CVSA) Criteria**

The following are reprinted with permission from the CVSA (see https://www.cvsa.org/inspections/out-of-service-criteria). When any of these values are met or exceeded, vehicle shall be placed out-of-service.

g. Ball and Socket Joints:
(1) Any movement under steering load of a stud nut. [396.3(a)(1)]
(2) Any motion, other than rotational, between any linkage member and its attachment point of more than 1/8 inch (3mm) measured with hand pressure only. [396.3(a)(1)]
(3) Any obvious welded repair(s). [396.3(a)(1)]

h. Tie Rods and Drag Links:
(1) Loose clamp(s) or clamp bolt(s) on tie rods or drag links. [396.3(a)(1)]
(2) Any looseness in any threaded joint. [396.3(a)(1)]

i. Nuts:
Loose or missing on tie rods, pitman arm, drag link, steering arm, or tie rod arm. [393.209(d)]
Cam Brake Removal and Wheel End Disassembly

Hazard Alert Messages

Read and observe all hazard alert messages in this publication.

DANGER

Observe all hazard alerts provided by the press manufacturer. Death or serious personal injury and damage to components can result.

WARNING

To prevent eye injury, always wear eye protection when performing vehicle maintenance or service.

WARNING

Use a brass or synthetic mallet for assembly and disassembly procedures. NEVER hit steel parts with a steel hammer. Pieces of a part can break off. Serious personal injury and damage to components can result.

Disassembly of Front Drive Steer Axle Wheel Ends Equipped with Cam Brakes

NOTE: When servicing driveshaft, the steering knuckle may be removed as an assembly.

To remove the steering knuckle as an assembly:
- Refer to “Cam Brake and Spindle Disassembly” on page 15.
- After you remove the steering knuckle, proceed to the procedure in this section to service the driveshafts.

Wheel, Drum, and Hub Removal

DANGER

Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving. Support the vehicle with safety stands. NEVER work under a vehicle supported only by jacks. Jacks can slip and fall over. Failure to use safety stands can result in death or serious personal injury and damage to components.

1. Park the vehicle on a level surface. Block the wheels to keep the vehicle from moving.
2. Use a jack to raise the vehicle so that the wheels to be serviced are off the ground. Support the vehicle with safety stands.
3. Retract the brake linings so that the drums will clear the linings.
4. Remove the automatic slack adjuster. Refer to Maintenance Manual 4B, Automatic Slack Adjusters. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.
5. If the steering universal joint is to be removed from the housing, remove the oil drain plug and drain the lubricant from the axle.

NOTE: It is not necessary to remove the rim and tire at this time.

6. Remove the capscrews and washers that connect the drive flange to the wheel hub. The hubcap does not need to be removed from the drive flange unless it is damaged. Figure 5.1.

Figure 5.1
5 Cam Brake Removal and Wheel End Disassembly

7. If necessary, remove the hubcap. Use a puller to remove the drive flange. Figure 5.2.

![Figure 5.2](4018537b)

8. If necessary, remove the felt seal and retainer from the drive flange.

9. Remove the outer jam nut, lock washer and inner adjusting nut from the spindle. Use the correct size wrench socket to remove the nuts. Figure 5.3.

![Figure 5.3](4018538a)

10. Remove the hub, drum and wheel assembly, if still mounted, straight off the spindle. If necessary, hit the inside of the wheel with a mallet to loosen it. Prevent the outer bearing cone from falling when removing the hub.

Hub Bearing Cup and Seal Disassembly

1. Remove the wheel, rim and tire, from the hub if not previously removed.

2. If it is necessary to remove the wheel studs from the hub, place the hub in a press. Support the hub flange and press the studs through the hub. Figure 5.4.

   **If a press is not available:** Use a brass hammer or drift.

![Figure 5.4](4019240a)

3. If necessary, use a long screwdriver to remove the oil seal from the hub. Discard the oil seal. Figure 5.5.

![Figure 5.5](4018539a)

4. If necessary, on units equipped for ABS, use a suitable puller to remove the ABS tone ring from the hub.

5. Remove the inner bearing cone from the hub.

6. Use a press and sleeve or a bearing puller to remove the inner and outer bearing cups from the hub.

7. Tap and stretch the oil sleeve to remove it from the spindle. Do not reuse the sleeve.
Cam Brake and Spindle Disassembly

**WARNING**

ASBESTOS AND NON-ASBESTOS FIBERS - 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. Use caution when handling both asbestos and non-asbestos materials.

**NOTE:** It is possible to remove the brake as an assembly after removing the slack adjuster and the brake spider-to-knuckle attachment screws.

1. Remove the cam brake return springs and brake shoes from the brake spiders. Figure 5.6.

2. Remove the dust shield from the brake spider. Figure 5.7.

3. Remove the slack adjuster retaining ring at the adjuster end of the camshaft. Figure 5.8.

4. Remove the slack adjuster shims at the adjuster end of the camshaft. Figure 5.9.

5. Remove the pins that engage the push rod yoke and the slack adjuster. Remove the slack adjuster from the camshaft. Figure 5.10.
6. Remove the retaining ring from the camshaft at the back of the spider assembly. Figure 5.11.

7. Remove the camshaft. Figure 5.12.

---

**WARNING**

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

8. Drain the air tank.

9. Disconnect the air lines at the brake chamber.

10. Remove the air brake chambers and brackets. Figure 5.13

11. To disassemble the brake spider and spindle assembly from the steering knuckle, remove the attaching capscrews.

12. On units equipped for ABS, push the ABS sensor into the knuckle cavity.

13. Pull the spindle straight from the knuckle and driveshaft. Figure 5.14.

14. The seal wiper sleeve and thrust washer will remain inside the spindle. If necessary, use a screwdriver to disassemble these parts.

15. On units equipped for ABS, the steel sleeve and sensor clip for positioning the ABS sensor will remain on the spindle. If necessary, push out the sensor clip. Use a suitable driver to remove the sleeve.
16. Remove the screws and the bearing support bushing plate from the back side of steering knuckle. Figure 5.15.

Steering Knuckle Removal

The steering knuckle must be disassembled before the steering universal joint can be removed. The steering arm and cross tube assemblies can be serviced without removing the steering knuckle from the housing.

1. Remove the cotter pin and nut and disconnect the steering linkage from the steering arm on the knuckle. Discard the cotter pin.

2. Remove the cotter pin and nut and disconnect the tie rod assembly from the knuckle arm. Discard the cotter pin. Figure 5.16.

3. Push the stud for the tie rod end completely through the knuckle arm. If necessary, use a soft mallet to drive the stud through the knuckle arm. To assist this process, partially reinstall the nut with the castle side down until it is even with the top of the threaded shaft, and then strike the nut/ shaft with the mallet to loosen the stud.

4. On units equipped for ABS, remove the grommet for the ABS cable and the ABS sensor from the knuckle.

   **NOTE:** It is not necessary to disassemble both cross tube ends unless both knuckle assemblies are being serviced at the same time.

5. Remove the four capscrews and washers from the lower knuckle cap.

6. Disassemble the lower knuckle cap. Inspect the thrust bearing for wear and damage. Replace a worn or damaged thrust bearing at reassembly. Figure 5.17.

7. Remove the six capscrews from the upper knuckle cap or steering arm.

---

**CAUTION**

- Use care when removing the tie rod end to prevent damage. Protect the tie rod end threads, especially if using a mallet, or damage can occur. If the tie rod end is damaged, both tie rod ends must be replaced.

- Do not use a pickle fork tool to separate the tie rod end from the knuckle arm or damage can occur.
8. Lift the upper knuckle cap or steering arm from the bore. Keep the shims together for use at reassembly. Figure 5.18.

9. Inspect the steering arm oil seal on the upper knuckle cap for wear and damage. Replace a worn or damaged oil seal at reassembly. Figure 5.19.

10. After both the upper and lower knuckle cap and steering arm assemblies are removed, pull the steering knuckle from the housing.

11. The bushings will remain in the sockets of the housing. Inspect the upper and lower bushings while they are still in the sockets for wear and damage.

12. Pull the universal joint and driveshaft assembly straight from the carrier housing. Figure 5.20.

13. If the oil seal is leaking or loose, remove the oil seal from the outer driveshaft. Discard the seal.

14. If required, remove the inner driveshaft oil seal, thrust washer and bushing from the axle housing.

15. If necessary, remove the welch plugs from the upper and lower sockets in the housing. Use a solid shaft that is slightly smaller than the socket bore to drive the welch plug toward the outside of the housing. Figure 5.22 and Figure 5.22.

**NOTE:** Some housings use a pressed-in socket plug.
16. Clean all grease and dirt from the bores before reassembly.

17. Inspect for damage to housing.

18. Determine the correct welch plug orientation. Figure 5.23 and Figure 5.24.

19. Using an appropriate tool*, deform (flatten) the welch plug to seal the housing. Ensure the welch plug is convex toward the kingpin. If the welch plug is the wrong direction, grease from the fitting will not reach the kingpin bushing and thrust bearing resulting in future bearing failure. Figure 5.25 and Figure 5.26.

* The welch plug needs to be installed by a tool approximately 90% its diameter. If an appropriate tool is not available, one can be made by cutting off the rounded end of an old kingpin and attaching it to a handle or drift. Figure 5.27.
5 Cam Brake Removal and Wheel End Disassembly

Steering Universal Joint Disassembly

NOTES:

• Do not disassemble Permalube™ joints. Disassembly will void the Meritor warranty. The cross assemblies are Permalube™ design and are non-greaseable.

• Meritor front drive steer axles with cam brakes have a round bearing yoke joint design. Figure 5.28.

![Round Bearing Yoke](image)

Figure 5.28

1. Use snap ring pliers to remove the snap rings. Figure 5.29.

![Snap Ring](image)

Figure 5.29

2. If necessary, use a brass drift and lightly tap the center of the bushing to assist in snap ring removal. Figure 5.30.

![Drift](image)

Figure 5.30

3. Repeat the previous step on the other sides of the yoke.

4. Use a press, bridge and bearing cup bushing receiver as shown in Figure 5.31. The bridge and bearing cup bushing receiver are detailed in Figure 5.32.

![Press and Bushing](image)

Figure 5.31

![Bridge Details](image)

Figure 5.32
5. Press down until the first round bushing is loose. Figure 5.31.

6. Remove the round bushing. Figure 5.33.

![Figure 5.33](image)

7. Turn over the universal joint. Repeat the procedure for the opposite side of the universal joint. Figure 5.34.

![Figure 5.34](image)
6 Prepare Parts for Assembly

Prepare Parts for Assembly

Hazard Alert Messages

Read and observe all hazard alert messages in this publication.

⚠️ DANGER
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. Death or serious personal injury and damage to components can result. Follow the procedures below.

• Wear eye protection.
• Wear clothing that protects the skin.
• Work in a well-ventilated area.
• NEVER use gasoline or solvents containing gasoline. Gasoline can explode.
• Hot solution tanks or alkaline solutions must be used correctly. Read the manufacturer’s instructions before using hot solution tanks and alkaline solutions. Then carefully follow the instructions.

⚠️ WARNING
The use of compressed air for cleaning and drying parts is unlawful in some areas of Canada and should not be used where prohibited. Personal injury and damage to parts can result.

⚠️ WARNING
To prevent eye injury, always wear eye protection when performing vehicle maintenance or service.

Clean Parts

Ground and Polished Parts

⚠️ CAUTION
NEVER use hot solution tanks or water and alkaline solutions to clean ground or polished parts. Damage to parts can result.

• NEVER clean ground or polished parts in a hot solution tank, water, steam, or alkaline solution to avoid damaging the surfaces.
• Use a cleaning solvent to clean ground or polished parts or surfaces. NEVER USE GASOLINE.
• Use a knife, if required, to remove gasket material from parts. Be careful not to damage the ground or polished surfaces.

Clean Rough Parts

• Clean rough parts with the same method as cleaning ground and polished parts.
• Use a cleaning solvent or a hot solution tank with a weak alkaline solution to clean parts with a rough finish.
• Leave the parts in the hot solution tank until they are completely cleaned and heated. When the parts are clean, remove them from the tank.
• Wash the parts with water until the alkaline solution is completely removed.

Clean Axle Assemblies

⚠️ CAUTION
Close or cover all openings, including breather, oil drain, and speed sensor, before steam cleaning. Steam can cause component damage.

• Before steam cleaning the axle, close or put a cover over all openings in the case.
• Steam clean axle assembly on the outside to remove heavy amounts of dirt.
• Remove any remaining silicone sealant from the axle housing using a suitable scraper or wire wheel.

Dry Parts

⚠️ WARNING
Dry bearings with clean paper or rags. NEVER use compressed air, which can cause abrasive particles to contaminate the bearings. Damage to components and reduced lining life can result. Using compressed air can also cause the rollers to be forced out of their cage and propelled into the air, causing injury.

• Immediately after cleaning, use clean paper, cloth rags, or compressed air to dry the parts. Do not use compressed air to dry the bearings.

Prevent Corrosion

NOTE: Parts must be clean and dry before lubricating them.

• Apply a light oil to cleaned and dried parts that are not damaged and are to be immediately assembled. Do not apply oil to the brake linings or the brake drums.
• If the parts are being stored after cleaning, apply a corrosion-preventive material to all machined surfaces. Store the parts in a special paper or other material that prevents corrosion.
Oil Seals and O-rings

Discard all oil seals and o-rings. Replace with new parts.

Inspect Parts

It is very important to inspect all parts carefully and completely before the axle or carrier is assembled. Check all parts for wear and stress. Replace all damaged parts to avoid costly downtime at a future date. For more detailed information about inspections and analysis, refer to Technical Publication TP-0445, Parts Failure Analysis.

Tapered Roller Bearings

Inspect the tapered roller bearings. Inspect the cup, cone, rollers, and cage of all tapered roller bearings in the assembly. If any of the following conditions exist, the bearing must be replaced:

- The center of the large diameter end of the rollers is worn level with or below the outer surface.
- The radius at the large diameter end of the rollers is worn to a sharp edge.
- A visible roller groove is worn in the inner race surfaces of the cup or cone. The groove can be seen at the small or large diameter end of both parts.
- Deep cracks or breaks appear in the surfaces of the cup, cone, inner race, or rollers.

- Bright wear marks appear on the outer surface of the roller cage.
- The rollers and surfaces of the cup and cone inner race touching the rollers are damaged.
6 Prepare Parts for Assembly

- The cup and cone inner race surfaces touching the roller are damaged.

![Spalling and Flaking](image)

**Figure 6.5**

**Axle Housing**

**DANGER**

Replace damaged or out-of-specification axle components. NEVER bend, repair, or recondition axle components by welding or heat treating. A bent axle beam reduces axle strength, affects vehicle operation, and voids Meritor’s warranty. Death or serious personal injury and damage to components can result.

- Always replace a damaged drive axle housing. NEVER bend or straighten a damaged housing, which can misalign or weaken it, and void Meritor’s warranty.
- Remove dirt from the housing sleeves. Check for cracks, loose studs, and damage to machined surfaces. Repair or replace damaged parts.
- Check the king pin bushings for wear or damage. Replace worn or damaged parts.
- Inspect the needle roller thrust bearing for wear or damage. Replace worn or damaged parts.
- Inspect the knuckle or steering stops for wear or damage. Replace worn or damaged parts.
- Inspect the axle housing knuckle socket bushings for wear. Replace worn components.

**Axle Shafts**

- Inspect the axle shafts for wear, stress and cracks at the splines, shaft and yoke ears. Replace damaged components.

- For front drive steer axles, inspect the axle shaft oil seals in the housing and spindle for damage. Replace damaged seals.
- For front drive steer axles, inspect the INNER and OUTER axle shaft bushings in the housing and spindle for wear or damage. Replace worn or damaged bushings.

![Universal Joint Inspection](image)

**Figure 6.6**

**Universal Joint Inspection**

**DANGER**

Excessive looseness across the ends of the universal joint bearing cup assemblies can cause imbalance or vibration in the driveline assembly. Imbalance or vibration can cause component wear, which can result in separation of the driveline from the vehicle. Death or serious personal injury and damage to components can result.

Use the following procedure to check for looseness across the ends of the universal joint bearing cup assemblies and trunnions.

1. With the axle shaft removed, hold the INBOARD shaft with both hands. Secure the outboard shaft end in a vise. **Figure 6.7**

![Figure 6.7](image)
2. Try to move the yoke UP-AND-DOWN and SIDE-TO-SIDE by applying at least 50 lb-ft (68 Nm) of force to the shaft near the universal joints.

If movement is greater than 0.010” (0.254 mm): Replace the cardan shaft.

Tie Rod Ends

- Inspect tie rod ends for wear and damage. Replace worn or damaged tie rod ends. Do not repair them.
- Check seals for damage. No cuts in the sealing boot are allowed. Replace damaged seals. Verify the seals are fastened correctly on the socket.
- If tie rod ends have grease fittings, check fittings for wear and damage. Replace worn or damaged fittings. If a grease fitting is missing, install a new one. Never try to install a grease fitting on a tie rod end with a non-greaseable design.
- Tighten all grease fittings to the correct torque. Do not over-tighten, which can damage the threads. See “Torque Specifications” on page 48.

![GREASE FITTING](image)

Figure 6.8

- The threads must be in good condition and a new cotter pin used with the castle nut.
- Tie rod ends must be replaced in pairs.
- The surfaces called out below must be free from dirt and rust. Figure 6.9.

![MUST BE CLEAN AND FREE OF RUST](image)

Figure 6.9

---

**6 Prepare Parts for Assembly**

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**Repair or Replace Parts**

**DANGER**

Replace damaged or out-of-specification axle components. NEVER bend, repair, or recondition axle components by welding or heat treating. A bent axle beam reduces axle strength, affects vehicle operation, and voids Meritor’s warranty. Death or serious personal injury and damage to components can result.

Replace worn or damaged parts of an axle assembly. The following are some conditions to check:

- Replace the fasteners if the corners of the head are worn.
- Replace damaged washers.
- Replace the gaskets, oil seals, grease seals or felt seals at the time of axle or carrier repair.
- Clean the parts. Apply new silicone gasket material, where required, when the axle or carrier is assembled.
- Use a fine file, emery cloth or crocus cloth to remove rough edges from parts that have machined or ground surfaces.
- Clean and repair fastener threads and holes. Use a die or tap of the correct size or a fine file.
- Verify the threads are clean and not damaged, so the correct torque specifications for fasteners can be obtained.
- Tighten all fasteners to the correct torque specifications. See “Torque Specifications” on page 48.
Applying Adhesive and Silicone Gasket Material

**DANGER**
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. Death or serious personal injury and damage to components can result. Follow the procedures below.
- Wear eye protection.
- Wear clothing that protects the skin.
- Work in a well-ventilated area.
- NEVER use gasoline or solvents containing gasoline. Gasoline can explode.
- Hot solution tanks or alkaline solutions must be used correctly. Read the manufacturer’s instructions before using hot solution tanks and alkaline solutions. Then carefully follow the instructions.

**WARNING**
To prevent eye injury, always wear eye protection when performing vehicle maintenance or service.

**WARNING**
Take care when using Loctite® adhesive to avoid serious personal injury. Read the manufacturer’s instructions before using this product. Follow the instructions carefully to prevent irritation to the eyes and skin. If Loctite® adhesive material gets into the eyes, follow the manufacturer’s emergency procedures and get checked by a physician as soon as possible.

**WARNING**
When applying some silicone gasket materials, a small amount of acid vapor is present. To prevent serious personal injury, ensure the work area is well-ventilated. Read the manufacturer’s instructions before using a silicone gasket material, then carefully follow the instructions. If a silicone gasket material gets into the eyes, follow the manufacturer’s emergency procedures and get checked by a physician as soon as possible.

The silicone gasket products listed in the table below or their equivalent can be used on Mentor components.

### Table A: Silicone Gasket Products

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loctite® 5699 Ultra Grey</td>
<td>Adhesive/Sealant</td>
</tr>
<tr>
<td>Permatex® 82194 Ultra Grey</td>
<td>Silicone Sealant</td>
</tr>
<tr>
<td>Three Bond 1216</td>
<td>Silicone Sealant</td>
</tr>
<tr>
<td>Three Bond 1216E</td>
<td>Silicone Sealant</td>
</tr>
</tbody>
</table>

1. Remove all old gasket material from both surfaces.
2. Clean the surfaces where you’ll apply the silicone gasket material. Remove all oil, grease, dirt and moisture. Dry both surfaces.

**CAUTION**
Apply silicone gasket material in a continuous 0.125" (3 mm) bead. If more than this amount is used, the gasket material can break off and plug lubrication passages. Damage to components can result.

3. Apply a 0.125" (3 mm) diameter continuous bead of silicone gasket material around one surface. Also apply the gasket material around the edge of all the fastener holes on that surface. Figure 6.10.

**WARNING**
When applying some silicone gasket materials, a small amount of acid vapor is present. To prevent serious personal injury, ensure the work area is well-ventilated. Read the manufacturer’s instructions before using a silicone gasket material, then carefully follow the instructions. If a silicone gasket material gets into the eyes, follow the manufacturer’s emergency procedures and get checked by a physician as soon as possible.

4. Assemble the components immediately to permit the gasket material to compress evenly between the parts.
5. Tighten the fasteners to the required torque specification for that size fastener. See “Torque Specifications” on page 48.
6. Wait 20 minutes before filling the assembly with lubricant.
6 Prepare Parts for Assembly

Fasteners

Removing Fasteners Secured with Adhesive

If it is difficult to remove fasteners secured with Dri-Loc®, Meritor adhesive, or Loctite® 277 adhesive, use the following procedure.

**CAUTION**

Use a heat gun to slowly heat fasteners for removal. NEVER use a flame to heat fasteners. Do not use excessive heat or heat fasteners quickly. Do not use an impact wrench or hit fasteners with a hammer. Damage to the fastener and components can result.

1. Using a heat gun, slowly heat the fastener three to five seconds at a time to 350°F (177°C). NEVER exceed this temperature or heat the fastener quickly. Try to loosen the fastener with a wrench. NEVER use an impact wrench or hit the fastener with a hammer.
2. Repeat Step 1 until the fastener can be removed.

New Fasteners with Pre-Applied Adhesive

1. Use a wire brush to clean the oil and dirt from the threaded holes.
2. Install new fasteners with pre-applied adhesive to assemble parts. NEVER apply adhesives or sealants to fasteners with pre-applied adhesive, or to fastener holes.
3. Tighten the fasteners to the required torque value for that size fastener. No drying time is required for fasteners with pre-applied adhesive.

Original or Used Fasteners

1. Use a wire brush to clean the oil, dirt, and old adhesive from all threads and threaded holes.
2. Apply liquid adhesive to the bolt threads or bore threads, as required, for the specific component.
3. Tighten the fasteners to the torque specified in "Torque Specifications" on page 48.

Yoke Cleaning and Inspection

All current Meritor axles feature a helix angle on the splines of the shaft at the yoke interface. This feature provides a tight fit between the yoke and the mating male spline of the input shaft, output shaft and pinion shaft which prevents loosening of the yoke nut over the service life of the axle.

Check for Yoke Wear

**DANGER**

Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving. Support the vehicle with safety stands. NEVER work under a vehicle supported only by jacks. Jacks can slip and fall over. Failure to use safety stands can result in death or serious personal injury and damage to components.

**CAUTION**

NEVER install a press-on shaft excluder or POSE™ seal after installing a unitized pinion seal. The use of a POSE seal will prevent the correct seating of the unitized pinion seal on the yoke and will result in lubricant leakage at the seal. POSE seal installation is recommended only for triple-lip and other previous seal designs.

**CAUTION**

NEVER use thin metal wear sleeves to refresh the yoke surface. Wear sleeves pressed onto the yoke will prevent the correct seating of the pinion seal and damage the pinion seal assembly. Wear sleeve usage will cause the seal to leak.

1. Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving.
2. Use a jack to raise the vehicle so that the wheels to be serviced are off the ground. Support the vehicle with safety stands.
3. Remove the driveline.
4. Remove the input, output or pinion shaft nut.
5. Clean the ground and polished surface of the yoke journal using a clean shop towel and a safe cleaning solvent. NEVER use abrasive cleaners, towels, or scrubbers to clean the yoke or flange surface. NEVER use gasoline.
6. Attempt to remove the yoke by hand.

**If the yoke can be removed by hand:** The yoke is worn. Replace the yoke.
6  Prepare Parts for Assembly

7. Use a correct yoke puller tool to remove the yoke.

NOTE: The unitized seal features a rubber inner sleeve designed to seal and rotate with the yoke. This feature allows the yoke to be reused with minor grooves.

8. Inspect the yoke seal surface for grooves.

   If grooves are found on yoke hubs used with single or triple-lip seals: Replace the yokes.

   If grooves are found on the yoke: Use calipers to measure the groove diameters. If any groove diameter measures less than the dimensions shown in the figure below, replace the yoke. Figure 6.11.

<table>
<thead>
<tr>
<th>UNITIZED PINION SEAL (UPS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yoke Seal Diameter</td>
</tr>
<tr>
<td>3.000/3.005&quot;</td>
</tr>
<tr>
<td>3.250/3.255&quot;</td>
</tr>
</tbody>
</table>

   Figure 6.11

   Check for a Tight-Fit Condition

   Check for a tight-fit condition when installing any serviceable yoke.

   1. Attempt to install the yoke by hand.

      If the yoke slip fits on the pinion spline and bottoms out against the bearing: Replace the yoke.

   2. Use a correct yoke installation tool to install the yoke.

   3. As the yoke is installed, there should be resistance between the yoke and shaft which is caused from the helical splines.

      If there is no resistance between the yoke and shaft: Replace the yoke.

   4. Install and tighten the input, output, or pinion shaft nut to the correct torque. Refer to "Torque Specifications" on page 48.

   5. Install the driveline.

   6. Remove the safety stands.

   7. Lower the vehicle.

   Carrier-to-Housing Joint Cleaning Procedure

   1. Remove the carrier from the housing. Refer to Maintenance Manual 5A, Single-Reduction Differential Carriers, for procedures. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.

   2. Remove all debris from inside the housing.

   ![CAUTION]

   Use a rotary tool with a 3M™ brand Roloc™ green bristle disc to clean the sealant from the housing and carrier face. Use of other types of discs may damage the mating surfaces.

   ![CAUTION]

   When cleaning, take care not to remove the base housing flange material. Removal of flange material, especially near the 6:00 position, may make the axle more susceptible to leaks. Without sufficient lubricant, damage to components can occur.

   ![CAUTION]

   When cleaning, take care not to remove milling marks on the carrier and housing mating surfaces. Removal of these milling marks may affect the adhesion of the sealant to the mating surface and the bond strength of the adhesive, making the axle more susceptible to leaks. Removal of these milling marks may also affect flatness of the interface surfaces which can affect the seal between the housing and carrier, making the axle more susceptible to leaks. Without sufficient lubricant, damage to components can occur.

   ![Figure 6.12]
3. Use a rotary tool with a 3M™ brand Roloc™ green bristle disc to clean all sealant residue from the housing and carrier faces. Use of other types of discs may damage the mating surfaces. After cleaning, surfaces must be clean, dry and free of foreign matter. The surfaces must not be oily to the touch. Figure 6.13, Figure 6.14, and Figure 6.15.

NOTES:

• Do not remove the milling marks on the carrier and housing mating surfaces. The milling marks provide a textured surface necessary for the sealant to adhere to the parts. Removal of the milling marks may also affect the flatness of the mating surfaces. Figure 6.12.

• The use of other types of discs with a rotary tool is not recommended for cleaning. Other types of discs may remove component material and may reduce flatness on the mating surfaces which can make the axle more susceptible to leaks.

4. Check the flatness of the carrier and axle housing mating surfaces as follows. Place a good machined straight edge against the carrier or housing mating surface and try to insert a feeler gauge to check for a gap of 0.003" (0.076 mm) or greater. Figure 6.16.

5. Remove metal filings from the magnets inside the housing.

6. Use Loctite® ODC Free cleaner or brake cleaner to clean the carrier faces. Also, spray brake cleaner on the lower internal carrier casting area at the 6:00 position near the carrier flange and clean this area in order to prevent an oil drip from leaking down/across the carrier flange during assembly. An oil drip at this position may prevent correct adhesion of sealant and may result in a leak.

7. Dry the housing and carrier faces.

8. Use a M12 x 1.75 bottoming tap to clean all old Dri-Loc from the threaded holes in the axle housing.
6 Prepare Parts for Assembly

Carrier Sealing

NOTE: The following silicone gasket products or equivalent can be used for Meritor components.

- Loctite® Ultra Grey Adhesive/Sealant number 18581
- Meritor part number 2297-H-7054 gasket material. To obtain this gasket material, refer to the Service Notes page on the front inside cover of this manual.

CAUTION

Apply silicone gasket material in a continuous 0.25” (6 mm) bead. If more than this amount is used, the gasket material can break off and plug lubrication passages. Damage to components can result.

1. Apply a 0.25-inch (6 mm) diameter continuous bead of the silicone gasket material around one surface. Also apply the gasket material around the edge of all fastener holes on that surface. Figure 6.17.

2. Assemble the short and long carrier capscrews with washers immediately following the previously made match marks to permit the silicone gasket material to compress evenly between the parts.

3. Tighten fasteners to the required torque value for that size fastener.

Table B: Carrier Bolt Torque Chart

<table>
<thead>
<tr>
<th>Thread Size</th>
<th>Torque lb-ft (Nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.625-11</td>
<td>185-235 (251-319)</td>
</tr>
<tr>
<td>0.625-18</td>
<td>210-270 (285-366)</td>
</tr>
</tbody>
</table>

4. Wait 20 minutes before filling the assembly with the correct lubricant. See “Lubrication” on page 44.
Cam Brake Installation and Wheel End Assembly

Hazard Alert Messages

Read and observe all hazard alert messages in this publication.

**DANGER**

Observe all hazard alerts provided by the press manufacturer. Death or serious personal injury and damage to components can result.

**WARNING**

To prevent eye injury, always wear eye protection when performing vehicle maintenance or service.

**WARNING**

Use a brass or synthetic mallet for assembly and disassembly procedures. NEVER hit steel parts with a steel hammer. Pieces of a part can break off. Serious personal injury and damage to components can result.

Axle Shaft Universal Joint Assembly

1. Slide the first bushing onto the trunnion. Figure 7.1.

2. Press the first round bushing into the yoke slightly past the snap ring groove. Check that the bushing is aligned with the universal joint trunnion. Figure 7.2.

3. Use snap ring pliers to install the snap ring into the snap ring groove. You must fully seat the snap ring into the snap ring groove to avoid damage to the driveshaft. Figure 7.3.
4. Use a snap ring installation gauge to check that the snap ring is fully seated in the snap ring groove. Figure 7.4.

5. Repeat the previous four steps to install the remaining bushings into the yoke.

6. Lubricate the universal joint when the joint includes a grease fitting.

   If the universal joint does not move freely: Strike the yoke ear with a brass or copper hammer. Figure 7.5.

---

**Steering Knuckle and Axle Shaft Assembly**

1. Install a new seal onto the outer driveshaft. Figure 7.6.

2. Inspect the bushing for wear and damage. The bushing diameter must be 2.630-2.634-inches (66.8-66.9 mm).

   If the bushing diameter is not within the specification: Use a correct size sleeve or driver to install a new inner driveshaft bushing, thrust washer and oil seal into the housing or housing socket adapter. Apply a layer of non-hardening sealing compound to the seal retainers before the seals are installed.

   **CAUTION**
   Do not force or hit the seal after it is correctly installed into its seat. Damage to the seal retainer can result.

3. If the socket plugs were removed from the housing, position the socket plugs in the housings up against the counter bore. If tack welds were used previously, carefully tack weld each plug in position with four welds.

4. Use the correct size sleeve or driver to drive new bushings into the socket bores so that the bushings are level with the outside of the socket.

   If a press is available: Press-in the domed socket plugs or tack weld them into position. To avoid distortion to the bushing and bushing bore diameter, do not apply too much heat to the socket during tack welding of socket plugs.
5. Inspect the axle shaft journals for wear and damage. The seal journal diameter on the axle shaft should be 3.248-3.250-inches (82.50-82.55 mm).

**If the seal journal diameter is not within the specification:**
Replace the seal.

6. Inspect the housing seal and thrust washer to verify they are correctly installed. Install the universal joint into the housing. Align the inner shaft splines with the splines of the differential side gear.

7. Pack the thrust washer rollers with grease before assembly.

8. Install the thrust bearing against the journal on the lower cap.

9. Place the knuckle into its correct position over the end of the housing. Align the knuckle bores with the housing socket bores.

10. Install the lower cap assembly through the bottom bores of the knuckle and housing until the cap is against the knuckle.

11. Install the capscrews and tighten to the correct torque. Refer to “Torque Specifications” on page 48.

12. Install the shims and oil seal against the base of the upper cap. Use the same thickness shim pack that was removed during disassembly. The shim pack must contain a minimum of three shims.

13. Install the cap assembly through the upper bores of the knuckle and housing until the cap is against the knuckle.


15. Check the steering knuckle “vertical” end play (up and down movement).

   a. Place a magnetic base dial indicator on the axle housing, with the dial indicator tip on the upper steer arm. Figure 7.7.

   **NOTE:** If necessary, remove the grease fitting from the lower knuckle cap to prevent damage.

   b. Use a jack to place pressure onto the lower knuckle cap. Set the dial indicator to ZERO.

   c. Fully release the jack pressure and read the end play on the dial indicator. Correct end play is 0.005-0.015-inch (0.127-0.381 mm). Remove or add shims from between the upper knuckle cap and steering knuckle to obtain the correct end play.

16. Check the knuckle bearing preload.

   a. Fasten a soft wire or cord to the tie rod arm. Attach a pound scale to the opposite end of the wire or cord. Hold the outer shaft of the universal joint away from the knuckle opening and pull on the pound scale to rotate the knuckle. Read the pounds on the scale. Read the pull necessary to rotate the knuckle, not the pull necessary to start the movement. Figure 6.8.

   b. The pounds shown on the scale must be 10-30 lbs (4.5-13.5 kg). The correct rotating torque is 8-25 lb-ft (20.8-33.9 Nm). Figure 7.8.

   c. If within specification, grease according to “Lubrication” on page 44.
Cam Brake Installation and Wheel End Assembly

Spindle and Brake to the Steering Knuckle Assembly

1. On units equipped for ABS, if the steel sleeve for holding the ABS sensor clip and ABS sensor has been disassembled, install the sleeve with a suitable driver. Install the sleeve into the spindle until it is 0.9375-inch (23.8 mm) below the inner bearing shoulder. Install the ABS sensor clip into the sleeve. Figure 7.9.

![Figure 7.9](image1)

2. If disassembled, install the thrust washer and seal wiper sleeve into the spindle. Figure 7.10.

![Figure 7.10](image2)

**NOTE:** On larger model axles, spindle installation will be easier if you install two temporary pilot studs into opposite sides of the knuckle. Tighten the studs finger-tight. Figure 7.11.

![Figure 7.11](image3)

3. If the brake was removed as an assembly, install it at this time.

4. Install the spider assembly against the knuckle with the keyway slot for the wheel bearing adjusting nut system toward the top for ABS spindles.

5. Install the brake spider onto the spindle. Fasten all parts to the knuckle with 12 capscrews and washers. Tighten to the correct torque. Refer to "Torque Specifications" on page 48. Figure 7.12.

![Figure 7.12](image4)

6. Check the axle shaft end play.

   a. Place a magnetic base dial indicator into position on the housing with the pointer on the shaft. Set the dial indicator to ZERO.

   b. Push DOWN on the axle shaft and read the end play on the dial indicator.

   **If the end play is greater than 0.118-inch (3 mm):**
   Remove the wheel end and inspect for wear. The thrust washer thickness must be at least 0.120-inch (3.05 mm). Replace the thrust washer if necessary. Inspect the thrust surfaces on the spindle, housing and axle shaft for wear. Replace parts as necessary.
7. On units equipped for ABS, install the ABS cable and grommet into the knuckle. Install the ABS sensor into the ABS bushing in the spindle. Figure 7.12.

8. Install the camshaft bushing retainer plate and two bolts to the back side of the steering knuckle. Tighten the capscrews to the correct torque. Refer to “Torque Specifications” on page 48. Figure 7.13.

9. If the camshaft bushing was disassembled, attach it to the retainer plate with four self-tapping screws. Tighten the screws to the correct torque. Refer to “Torque Specifications” on page 48.

10. Install the air brake chambers and brackets. Tighten the bracket mounting capscrews to the correct torque. Refer to “Torque Specifications” on page 48. Figure 7.14.

11. Install the camshaft. Figure 7.15.

12. Install the retaining ring onto the camshaft at the back of the spider assembly. Figure 7.16.

13. Install the slack adjuster onto the camshaft. Figure 7.17.

14. Install slack adjuster shims at the adjuster end of the camshaft. Figure 7.18.
15. Install the slack adjuster retaining ring at the adjuster end of the camshaft. Figure 7.19.

16. If disassembled, install the nut and push rod yoke onto the air chamber push rod.

17. Install the pin and retainer that engages the push rod yoke and the slack adjuster plunger rod. Figure 7.20.

18. The distance from the back of the brake air chamber to the center of the clevis pin is the brake slack adjuster position (BSAP). Adjust the slack adjuster position to obtain the correct specification in Table C.


<table>
<thead>
<tr>
<th>Chamber Size</th>
<th>Chamber Push Rod Length (CPRL)</th>
<th>Slack Length</th>
<th>Stroke</th>
<th>Brake Slack Adjuster Position (BSAP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td></td>
<td>6.00</td>
<td>2.25</td>
<td>6.30</td>
</tr>
<tr>
<td>24</td>
<td>4.95</td>
<td>5.50</td>
<td></td>
<td>6.30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6.00</td>
<td></td>
<td>6.43</td>
</tr>
<tr>
<td>30</td>
<td></td>
<td>5.50</td>
<td>2.50</td>
<td>6.30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6.00</td>
<td></td>
<td>6.43</td>
</tr>
<tr>
<td>SPECIAL</td>
<td></td>
<td>5.50</td>
<td>3.00</td>
<td>5.80</td>
</tr>
<tr>
<td></td>
<td>4.45</td>
<td></td>
<td>2.50</td>
<td>6.88</td>
</tr>
<tr>
<td></td>
<td>5.63</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

19. Tighten the nut on the push rod to the clevis pin to the correct torque. Refer to “Torque Specifications” on page 48.
20. Install the dust shields to the brake spider. Tighten the mounting screws to the correct torque. Refer to “Torque Specifications” on page 48, Figure 7.21.

![Figure 7.21](4018555a)

21. Remove the cam brake return springs and brake shoes from the brake spiders. Figure 7.22.

![Figure 7.22](4018553a)

22. Connect the air lines to the brake chambers.

Wheel Bearings to Hub Installation

1. If the wheel studs were removed from the hub, place the hub into a press with the drum side at the bottom. Align the grooves on the studs with the grooves in the stud holes in the hub. Press the studs into position. If a press is not available, use a brass hammer. Figure 7.23.

![Figure 7.23](4020900a)

2. Install the inner and outer bearing cups into the hub. Use a press and sleeve.

3. Pack the bearing cones and fill the hub cavity with the recommended grease until it is level with the inside diameter of the bearing cones. Refer to “Lubrication” on page 44.

4. Install the inner bearing cone into its cup inside the hub.

5. Install a new inner oil seal. Refer to “Tools” on page 49. Apply a layer of non-hardening sealing compound to the outside of the seal. Install the seal into its correct position against the bore. Do not force or hit the seal after it has touched the bottom of the bore. The seal can be damaged.

6. On units equipped for ABS, use a suitable driver to install the ABS tooth wheel onto the hub. Damage to the teeth on the ABS tooth ring can create an error signal during testing and operation of the ABS system.

7. Install the oil sleeve onto the spindle with a driver.

8. Install the hub assembly onto the spindle. Be careful the oil seal is not damaged during installation. Press the hub until the inner bearing is flat against the face of the spindle.

9. Install the outer bearing cone onto the spindle and push it into its cup inside the hub.

10. Check the axle lubricant level and fill if required. Refer to “Lubrication” on page 44.
Wheel Bearing Adjustment

**DANGER**

When adjusting wheel bearings, always use the correct socket wrench to loosen the adjusting nut. Use a torque wrench to tighten it to the correct specification. Do not attempt to tighten or loosen an adjusting nut by striking it with a hammer. Do not place a chisel or drift next to the adjusting nut and strike the chisel with a hammer. Damage to the adjusting nut can result, which can prevent obtaining the correct wheel bearing adjustment. An incorrect adjustment can cause a wheel to separate from the vehicle during operation. Death or serious personal injury and damage to components can result.

1. Use a torque wrench to tighten the inner adjusting nut to 100 lb-ft (136 Nm). Figure 7.24.

   ![Figure 7.24](4018577a)

   **Figure 7.24**

2. Rotate the hub three full turns to ensure all the bearings and seal surfaces are in contact.

3. Back off the inner adjusting nut 1/4 turn, 2-1/2 studs of the drum bolt circle. Do not rotate the hub assembly after backing off the adjusting nut or the bearing adjustment could change.

4. Assemble the lock ring and jam nut. Tighten the jam nut to 250-400 lb-ft (339-542 Nm). If the lock ring does not line up with the adjusting nut, rotate the adjusting nut clockwise, tightening, to the closest lock ring hole. To make the smallest turn possible, flip the lock ring over if necessary.

5. Check the resulting end play with a dial indicator and perform the following actions.

<table>
<thead>
<tr>
<th>End Play (in)</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 0.0005</td>
<td>Return to Step 1 and repeat the procedure.</td>
</tr>
<tr>
<td>0.0005-0.0025</td>
<td>No action required.</td>
</tr>
<tr>
<td>&gt;0.0025-0.005</td>
<td>Remove the jam nut and lock ring. Tighten the adjusting nut 1/32 turn by flipping the lock ring over and turning the adjusting nut to align with the next hole.</td>
</tr>
<tr>
<td>&gt;0.005-0.008</td>
<td>Remove the jam nut and lock ring. Tighten the adjusting nut 1/16 turn by turning the adjusting nut to align with the next hole. Do not flip the lock ring.</td>
</tr>
<tr>
<td>&gt;0.008-0.011</td>
<td>Remove the jam nut and lock ring. Tighten the adjusting nut 3/32 turn by flipping the lock ring over and turning the adjusting nut to align with the second hole from the current position.</td>
</tr>
<tr>
<td>&gt;0.011</td>
<td>Return to Step 1 and repeat the procedure.</td>
</tr>
</tbody>
</table>

Brake Adjustment

**DANGER**

Brakes must be manually adjusted after performing maintenance or service. Do not depend on the automatic adjusters to remove the excessive clearance created when backing off the brake during service. The automatic adjusters are designed to compensate for normal lining wear. Death or serious personal injury and damage to components can result.

Refer to Maintenance Manual 4, Cam Brakes, for complete brake adjustment procedures. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.
ABS Sensor Adjustment

1. On units equipped for ABS, push the ABS sensor completely into the sensor bearing until it contacts the tone ring on the hub. Figure 7.25.

2. With the sensor in place, feed any excess cable back through the grommet on the knuckle. Do not affect the position of the sensor or allow excess cable to contact the driveshaft.

3. For service instructions for ABS braking systems, refer to:

   To obtain these publications, refer to the Service Notes page on the front inside cover of this manual.

Drum and Drive Flange Assembly

![Drum and Drive Flange Assembly](image)

**WARNING**

When applying some silicone gasket materials, a small amount of acid vapor is present. To prevent serious personal injury, ensure the work area is well-ventilated. Read the manufacturer’s instructions before using a silicone gasket material, then carefully follow the instructions. If a silicone gasket material gets into the eyes, follow the manufacturer’s emergency procedures and get checked by a physician as soon as possible.

1. Install the drum over the hub pilot. If a flat-head cap screw is used for retention, fasten the drum to the hub with the flat-head cap screws. Tighten the cap screws to the correct torque. Refer to “Torque Specifications” on page 48.

2. Install a felt seal and retainer onto the drive flange.

3. Apply a layer of silicone gasket material to the hub mounting surface of the drive flange only. Refer to “Prepare Parts for Assembly” on page 22.

4. Apply Meritor specification number O-617-A or O-617-B wheel bearing grease to the inside splines of the drive flange and the splines of the driveshaft.

5. Install the drive flange on the hub and fasten with washers and cap screws. Tighten the cap screws to the correct torque. Refer to “Torque Specifications” on page 48.

6. If previously removed, install the hubcap, if used, to the drive flange. Apply a 0.125-inch (3.18 mm) continuous bead of silicone gasket material around either the mounting surface of the hubcap or the drive flange. Refer to “Prepare Parts for Assembly” on page 22. Tighten the cap screws to the correct torque. Refer to “Torque Specifications” on page 48.
7 Cam Brake Installation and Wheel End Assembly

Cross Tube to the Knuckle Assembly

1. Assemble the tie rod ends to the tie rod cross tube, if they were removed during the disassembly process. Tighten the lock nuts to the correct torque. Refer to “Torque Specifications” on page 48.

WARNING

The tapered pin and seat must be clean and free of rust. Assemble dry and do not lubricate or use anti-seize compound on mating surfaces.

2. Push the stud of the tie rod end through the bottom of the bore in the knuckle arm tapered hole. Tighten the cross tube nut to the correct torque. Refer to “Torque Specifications” on page 48.

3. Install the castle nut and a new cotter pin to the assembly.
   a. Tighten the nut to the initial torque specified.
   b. Advance the nut, do not back it off, to align the cotter pin.
   c. Final installed torque must not exceed the maximum specified.

   If the final torque exceeds the maximum: Remove the nut and reinstall it to the correct specification.

   If the minimum torque is not met: Check if the stud taper is showing. If necessary, shim with a 0.125-inch (3.18 mm) washer.

4. Install the cotter pin.

5. Assemble the wheel, tire and rim, to the drum. Tighten the wheel nuts to the manufacturer’s specifications.

Steering Stop Setting Adjustment

All Meritor front drive steer axles are shipped with the steering stop screws preset at the factory according to the manufacturer’s specifications. Additional adjustments can be made by the vehicle manufacturer or end user to accommodate a specific chassis design or tire size as long as the maximum angle does not exceed the u-joint capability.

NOTE: Check the adjustments of both axle steering stops and power steering units every time part of the steering system is disassembled.

Maximum Turn Angle Setting Adjustment

NOTE: Do not adjust the turn angle beyond the specifications set by the vehicle manufacturer.

The maximum turn angle of the u-joint is 35 degrees.

Manual Steering Adjustment

Adjust both the right- and left-hand knuckle steering stops to touch the housing when the maximum turning angle specified by the vehicle manufacturer is reached. Lock the steering stop in position with the jam nut tightened to the correct torque. Refer to “Torque Specifications” on page 48. Figure 7.26.

Power Steering Adjustment

CAUTION

Meritor does not permit any power steering system that does not have a pressure relief or positive mechanical stop to be set before the maximum turn angle is reached. The power units must be stopped before the axle stop touches the housing to prevent unnecessary stressing to the axle components. Damage to components can result.

Mechanical Relief

Vehicles with mechanical Pitman arm stops or cylinder stops must be adjusted to end the travel of the Pitman arm or cylinder 0.125-inch (3.18 mm) before the steering stop screw touches the housing. Maximum turn angle is then controlled by the arm or cylinder stop, not the axle stop. Make the adjustments for both full-right and full-left turns. Figure 7.27.
Hydraulic Relief

Hydraulic steering gears or cylinders with poppet valves must be adjusted while a 0.250-0.1875-inch (6.35-4.76 mm) spacer is held between the housing and stop screw. The poppet valves must be adjusted to permit pressure bypass at this position with the spacer in place for full-right and full-left turns. During this setting the steering gear pressure must be at a maximum 600 psi (41.4 bar). Figure 7.28.

Wheel Toe-In Adjustment

Toe-in must be checked and adjusted on all front drive axles after the axle is installed in the vehicle. Figure 7.29.

Prior to Checking Toe

Before checking the toe setting, make sure the vehicle meets the following conditions.

Wheels and Tires

1. Verify that the tires are inflated to the specified pressure.
2. Verify that the front tires are the same size and type.
3. Verify that the lug nuts are tightened to the specified torque.
4. Verify that the wheels are balanced.
5. Check for bent or damaged wheels.

Front Suspension

1. Verify that all fasteners are tightened to the specified torque.
2. Inspect the leaf springs for wear and damage.
3. Inspect the shock absorbers for wear and damage.

Rear Axle and Rear Suspension

Front tire wear can be caused by the rear axle. If the outer edge of one front tire is worn and the inner edge of the other front tire is worn, check the following.

1. All fasteners are tightened to the specified torque.
2. The leaf springs are not worn or damaged.
3. The bushings in the leaf springs are not worn or damaged.
4. The torque rods, if used, are correctly adjusted.
5. The frame is not bent.
6. The rear axle, especially a tandem axle, is correctly aligned. Refer to the vehicle or the suspension manufacturer's procedure.
7 Cam Brake Installation and Wheel End Assembly

7. Refer to any additional rear axle and suspension recommendations and specifications from the vehicle manufacturer.

Toe Adjustment Procedure

**NOTE:** Toe-in must be measured with the weight of the vehicle on the axle and the axle on a level floor. Use the following procedure.

1. Position the vehicle on a smooth, level surface. Drive the vehicle in a straight line into the work area and park it. Block the rear wheels to keep the vehicle from moving.

2. Use a jack to raise the front axle one inch off the ground.

3. Use white spray paint or a piece of white chalk to mark a line around the circumference of the tire. Choose an area of the tire near the center which is smooth and away from the tread grooves. Figure 7.30.

4. Place a tire scribe against the center of the whitened part of each tire and rotate the tires. The scribe must be held in place so that a single straight line is marked all around the tire. Figure 7.31.

5. Place a full-floating turning radius gauge plate under each wheel. Lower the vehicle and remove the lock pins from the gauge plates.

**If full-floating gauge plates are not available:** Lower the vehicle to the floor and move the vehicle backward approximately six feet (1.8 m) and then forward for the same distance to allow the tire camber to normalize after lowering the vehicle to the floor.

6. Set the slide scale end of a trammel bar to ZERO and lock the scale in place.

7. Place the trammel bar at the rear of the tires. Adjust the pointer to line up with the scribe lines on the tires. Lock the pointers in place. The sliding scale still must be set on ZERO. Figure 7.32.

8. Place the trammel bar at the front of the tires. Adjust the pointer to line up with the scribe lines. Figure 7.33.
9. Read the toe-in or toe-out from the scale. Toe-in must be one of the following specifications.

<table>
<thead>
<tr>
<th>Front Drive Axle Use</th>
<th>Toe Recommendation (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unloaded</td>
</tr>
<tr>
<td>Frequent (&gt;75%)</td>
<td>+0 ± 1/32</td>
</tr>
<tr>
<td>Normal (25-75%)</td>
<td>+1/32 ± 1/32</td>
</tr>
<tr>
<td>Infrequent (&lt;25%)</td>
<td>+1/16 ± 1/32</td>
</tr>
</tbody>
</table>

10. If toe-in adjustment is necessary, use the following procedure.

**Axles with Sleeve Adjustable Cross Tubes**

1. Loosen the tie rod clamp located on the sleeve side of the tie rod. Figure 7.34.

2. Rotate the sleeve to set toe-in or toe-out.

3. Tighten the clamp to the correct torque. Refer to “Torque Specifications” on page 48. Figure 7.35.

4. Verify the cross tube drop center does not interfere with the carrier or other vehicle components. Larger axles should have the drop center inclined at 5-10 degrees to vertical for optimum clearance at maximum turn conditions.

5. Check the toe-in measurement again to verify it is within the correct limits.
Lubrication

Hazard Alert Messages

Read and observe all hazard alert messages in this publication.

**DANGER**

Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving. Support the vehicle with safety stands. NEVER work under a vehicle supported only by jacks. Jacks can slip and fall over. Failure to use safety stands can result in death or serious personal injury and damage to components.

**WARNING**

To prevent eye injury, always wear eye protection when performing vehicle maintenance or service.

**WARNING**

Dispose of all lubricants in accordance with state and local laws. Failure to do so can result in harm to the environment.

Overview

Drive axles generate small metal wear particles at a fairly steady rate, especially during the break-in period. If these fine, but hard particles are allowed to circulate in the lubricant, along with external moisture and dirt, internal components will wear at a much faster rate than normal.

Magnets and Magnetic Drain Plugs

Front drive axles are equipped with magnetic drain plugs that have a minimum pick-up capacity of 1.5 pounds (0.7 kilograms) of low carbon steel.

The magnetic drain plug can be reused if, after cleaning, the plug has a minimum pick-up capacity of 1.5 pounds (0.7 kilograms) of low carbon steel.

Inspect the magnetic drain plug each time the oil is changed. Use the correct part. Pipe plugs will leak if used as a drain plug.

Breather

**CAUTION**

Close or cover all openings, including breather, oil drain, and speed sensor, before steam cleaning. Steam can cause component damage.

Baffle-type breathers help keep axles free from external moisture and dirt which can cause premature oil and component failure.

Refer to “Torque Specifications” on page 48 for breather torque.

Seals

**CAUTION**

Always use the correct tools and procedures when replacing seals to prevent incorrect installation and help prevent seals from leaking. Seals keep lubricant in and dirt out of a component. When they are worn or damaged, seals leak and produce low lubricant levels, which may damage components.

Seals keep lubricant in and dirt out of a component. When they are worn or damaged, seals leak and produce low lubricant levels which may damage components.

Durable triple-lip seals, standard in Meritor axles, protect the quality and levels of the lubricant and provide superior performance.

Temperature Indicators

**CAUTION**

Meritor axles can operate above 190°F (88°C) without damage. However, if the oil temperature reaches 250°F (121°C), stop the vehicle immediately and check for the cause of overheating. Damage to components can result.

Many Meritor axles have a tapped hole in the housing for the installation of a lubricant temperature indicator that will help reduce the failure of axle parts from overheated oil.

Check and Adjust the Oil Level

**WARNING**

Check the oil level when the axle is at room temperature. When hot, the oil temperature may be 190°F (88°C) or more and can cause burns. Also, checking the oil level when the axle is warm or hot can produce an inaccurate level reading. Damage to components can result.

**NOTE:** For axles equipped with MLMS, the vehicle must be stopped at least 5 minutes before checking the oil level. In colder operating climates, wait 10 minutes before checking the oil level.

1. Park the vehicle on a level surface. Place blocks under the front wheels to prevent the vehicle from moving. The axle must be cold or near room temperature. Wait 5-10 minutes before checking the oil level.
2. Remove the fill plug from the axle. Clean the area around the fill plug. Remove the fill plug from the differential carrier or the axle housing bowl, depending on the axle. Do not remove the temperature indicator plug. Figure 8.1.

3. Check the oil level. The level must be even with the bottom of the fill plug hole as shown in Figure 8.1. The oil level must be even with the bottom of the fill plug hole.

   **If oil flows from the hole when the plug is loosened:** The oil level is high. Let the oil drain to the correct level.

   **If the oil level is below the bottom of the fill plug hole:** Add the specified oil.

4. Install the fill plug. Tighten the plug to 35-50 lb-ft (48-67 Nm).

**Drain and Replace the Oil**

**NOTE:** Drain the oil when it is warm. Remove and replace the oil filters each time the oil is drained.

1. Park the vehicle on a level surface. Place blocks under the front wheels to prevent the vehicle from moving. Place a large container under the axle.

2. Remove the drain plug. Allow the oil to drain completely then reinstall the drain plug.

3. Clean the area around the fill plug. Remove the fill plug from the differential carrier or the axle housing bowl, depending on the axle.

4. Add the specified oil until the oil is even with the bottom of the fill plug hole as shown in Figure 8.1. Wait to allow the oil to flow through the axle.

5. Check the oil level again. If necessary, continue to add oil until it is even with the bottom of the fill plug hole.

6. Install the fill plug. Tighten the plug to 35-50 lb-ft (48-67 Nm).

**Knuckle King Pins**

With the vehicle weight on the wheel end, pump grease through the grease fittings located on the upper cap or steering arm and lower cap assemblies. Grease should purge through the seals and thrust bearing. Also pump grease until it comes out fresh and clean. Remove excess grease and dispose of it correctly.

**Camshaft Retainer Bushing and Cam Bushing**

Pump grease until it purges through the seals. Remove excess grease and dispose of it correctly.

**Drive Axle Shaft Universal Joint**

1. Permanently-lubricated Permalube™ driveshaft joints do not have a grease fitting provided. Periodic greasing is not required for these parts. For serviceable universal joints with grease fittings, follow Step 2 through Step 3.

2. Clean all grease fittings prior to lubrication.

3. Apply the specified grease at the grease fitting on the universal joint. Apply grease until new grease purges from all the seals. Remove excess grease and dispose of it correctly.

   **If new grease does not purge at every seal:** Move the driveshaft while applying grease at the fittings until new grease purges at every seal.

   **If new grease still does not purge:** Disassemble the universal joint. Inspect the grease and the components. Service as necessary.

**Axle Shaft Spline and Thrust Washer**

On axles with greaseable drive flanges, pump grease through the grease fitting until it purges at the axle shaft seal. Remove excess grease and dispose of it correctly. Figure 8.2.
8 Lubrication

Cross Tube End Assembly

1. Apply hand pressure of approximately 100 pounds (45 kg) in a vertical PUSH-and-PULL motion several times. Check for any movement or looseness at both tie rod ends. Figure 8.3.

   If there is any vertical movement in the tie rod assembly: Replace both tie rod ends.

2. Clean all grease fittings prior to lubrication.

3. Apply the specified grease at the grease fitting on the knuckle until new grease purges from all the seals. Grease the lower pin cap with the vehicle weight on the wheel end to ensure that the thrust bearing is completely greased.

   If new grease does not purge at the seals: Move the knuckle while applying grease at the fittings until new grease purges at the seals. Also try rotating the knuckle to another position and raising the vehicle so the weight is off the axle.

   If new grease still does not purge: Disassemble the knuckle. Inspect the grease and the components. Service as necessary.

Greasing Wheel Bearings

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

2. Use a jack to raise the vehicle so that the wheels to be serviced are off the ground. Support the vehicle with safety stands.

3. Remove the tire and wheel assembly. Remove and disassemble the hub.

4. Before installing the wheel bearings, lubricate the bearing journals on the spindle with the grease that is used for the bearings.

5. Use a pressure packer to force the specified grease from the large end of the cones into the cavities between the rollers and cage. Pack the hub between the bearing cups with grease to the level of the smallest diameter of the cups.

   If a pressure packer is not available: Grease the bearings by hand.

6. Install the inner and outer bearing cones into the cups in the hubs. The bearing cups must be pressed tight against the shoulder in the hubs.

7. Install new wheel seals into the hubs.

8. Install the hub and the wheel and tire assembly. Install the adjusting nut.

9. Adjust the wheel bearings. Refer to “Wheel Bearing Adjustment” on page 38.
Front Drive Axle Oil Change Intervals and Specifications*

- **Initial Oil Change**: No longer required as of January 1, 1993
- **Check Oil Level**: Every 5,000 miles (8000 km), once a month, or the fleet maintenance interval, whichever comes first
- **Petroleum Oil Change**: Every 25,000 miles (40 000 km) or annually, whichever comes first
- **Synthetic Oil Change**: Every 50,000 miles (80 000 km) or annually, whichever comes first

*For continuous heavy-duty operation, check the oil level every 1,000 miles (1600 km). Add the correct type and amount of oil as required.

<table>
<thead>
<tr>
<th>Meritor Specifications</th>
<th>Military Specification Approval</th>
<th>Oil Description</th>
<th>Outside Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>O-76-A, Gear Oil</td>
<td></td>
<td>GL-5, SAE 85W/140</td>
<td>Minimum: 10, Maximum: None, C° Minimum: -12, Maximum: None</td>
</tr>
<tr>
<td>O-76-D, Gear Oil</td>
<td></td>
<td>GL-5, SAE 80W/90</td>
<td>Minimum: -15, Maximum: None, C° Minimum: -26, Maximum: None</td>
</tr>
<tr>
<td>O-76-E, Gear Oil</td>
<td>MIL-PRF-2105-E and SAE J2360</td>
<td>GL-5, SAE 75W/90</td>
<td>Minimum: -40, Maximum: None, C° Minimum: -40, Maximum: None</td>
</tr>
<tr>
<td>O-76-L, Gear Oil</td>
<td></td>
<td>GL-5, SAE 75W/140</td>
<td>Minimum: -40, Maximum: None, C° Minimum: -40, Maximum: None</td>
</tr>
<tr>
<td>O-76-M, Full-Synthetic Oil</td>
<td></td>
<td>GL-5, SAE 75W/140</td>
<td>Minimum: -40, Maximum: None, C° Minimum: -40, Maximum: None</td>
</tr>
<tr>
<td>O-76-N, Full-Synthetic Oil</td>
<td></td>
<td>GL-5, SAE 75W/90</td>
<td>Minimum: -40, Maximum: None, C° Minimum: -40, Maximum: None</td>
</tr>
</tbody>
</table>

*If the front drive axle is the only axle on the vehicle, change the oil every 15,000 miles (24 000 km) or 1,000 hours of operation, whichever comes first.

Front Drive Axle Greasing Intervals and Specifications

<table>
<thead>
<tr>
<th>Component</th>
<th>Knuckle King Pins</th>
<th>Brake Camshaft Bushings and Seals</th>
<th>Cross Tube End Assembly</th>
<th>Wheel Bearings</th>
<th>Spindle Axle Shaft Bushing</th>
<th>Wheel End</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greasing Intervals</td>
<td>Every 3,000 miles (4800 km) or 200 hours of operation, whichever comes first.</td>
<td>On-Highway: 30,000 miles (48 000 km) or once a year, whichever comes first.</td>
<td>Every 100,000 miles (160 000 km) or 2 years, whichever comes first.</td>
<td>On-Highway: 30,000 miles (48 000 km)/ Once a year - On/Off Highway and Off-Highway: 15,000 miles (24 140 km)/ Twice a year</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Grease/Oil

- **Grease/Oil Multi-Purpose Grease**
- **Meritor Specification**: O-617-A (preferred) or O-617-B (acceptable)
- **NLGI Grade**: 1 or 2
- **Grease Classification**: Lithium 12-Hydroxy Stearate or Lithium Complex
- **Outside Temperature**: Refer to the grease manufacturer’s specifications for the temperature service limits.
## Torque Specifications

### CAM BRAKE ONLY

- **Upper Knuckle Cap**
  - Thread Size: 3/4-10
  - 310-400 lb-ft (420-542 Nm)

- **Lower Knuckle Cap**
  - Thread Size: 1-8
  - 775-1000 lb-ft (1052-1355 Nm)

- **Wheel Nut**
  - Thread Size: 1-1/8-16
  - See Mfr Specifications
  - Thread Size: 1-3/16-12
  - See Mfr Specifications

- **Drive Flange**
  - Thread Size: 5/8-11
  - 180-230 lb-ft (244-312 Nm)

- **Hubcap**
  - Thread Size: 3/8-16
  - 35-50 lb-ft (47-68 Nm)

- **Brake Spider to Spindle Capscrew**
  - Thread Size: 5/8-11
  - 180-230 lb-ft (244-312 Nm)

- **Steering Arm Ball Nut**
  - Thread Size: 7/8-14
  - Initial: 160-215 lb-ft (217-292 Nm)
  - After Assembly: 300 lb-ft (407 Nm)

- **Tie Rod Clamp Sleeve Adjuster Lock Nut**
  - Thread Size: 5/8-11
  - 80-90 lb-ft (108-122 Nm)

- **Steering Stop Adjusting Screw**
  - Thread Size: 3/4-10
  - 180-230 lb-ft (244-312 Nm)

- **Brake Chamber**
  - Thread Size: 5/8-11
  - 100-115 lb-ft (136-156 Nm)
  - 180-230 lb-ft (244-312 Nm)

- **Camshaft Retainer Self-Tapping Screw**
  - Thread Size: 3/8-16
  - 35-50 lb-ft (47-68 Nm)

- **Camshaft Retainer Bracket Capscrew**
  - Thread Size: 1/2-13
  - 90-120 lb-ft (122-163 Nm)

- **Oil Drain Plug**
  - Thread Size: 3/4-14
  - 35-50 lb-ft min. (48-67 Nm)

- **Oil Fill Plug**
  - Thread Size: 3/4-14
  - 35-50 lb-ft min. (48-67 Nm)

- **Brake Chamber Attachment Nut**
  - Thread Size: 5/8-11

- **Temperature Indicator**
  - Thread Size: 3/4-14
  - 25 lb-ft min. (34 Nm)

- **Grease Fittings**
  - 12.5 lb-ft (17 Nm)

- **Breather Assembly**
  - Thread Size: 3/8-18
  - 20 lb-ft min. (27 Nm)

- **Carrier Bolts**
  - Thread Size: 5/8-11
  - 185-235 lb-ft (251-319 Nm)
  - Thread Size: 5/8-18
  - 210-270 lb-ft (285-366 Nm)

- **Adjusting Nuts & Lock Washer:**
  - Inner - 100 lb-ft (136), rotate hub 3X, and back off nut 1/4 turn
  - Lock Washer
  - Outer - 250-400 lb-ft (339-542 Nm)

- **Self-Tapping Screw**
  - Thread Size: 3/8-16
  - 35-50 lb-ft (47-68 Nm)

- **Oil Drain Plug**
  - Thread Size: 3/4-14
  - 35-50 lb-ft min. (48-67 Nm)

- **Oil Fill Plug**
  - Thread Size: 3/4-14
  - 35-50 lb-ft min. (48-67 Nm)

- **Brake Chamber**
  - Thread Size: 5/8-11
  - 100-115 lb-ft (136-156 Nm)
  - 180-230 lb-ft (244-312 Nm)
Hub Seal Driver

Use for seal, Part Number A-1205-P-2434

Section X-X
Seal driver tool 3256-M-1287

Diagram showing dimensions and details of the seal driver tool.

Dimensions:
- Ø2.37" (60.2 MM)
- Ø1.80" (45.72 MM)
- Ø1.25" ± 0.002" (31.75 MM ±0.0508 MM)
- Ø4.85" (123.19 MM)
- Ø0.01 Ø1.628" +0.001 +0.002 (41.35 MM ±0.0508)
- Ø6.75" (171.45 MM)
- Ø0.625" ± 0.002" (16.00 MM ±0.0508)
- 0.06" X 45°

Details:
- 0.375" (9.525 MM)
- 0.375" (9.525 MM)
- 2 x R0.25" (0.254 MM)
- 2 x R0.12° (1.27 MM)
- 2 x 15°
- 2 x 0.01" (0.254 MM)
- Scale 4:1

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