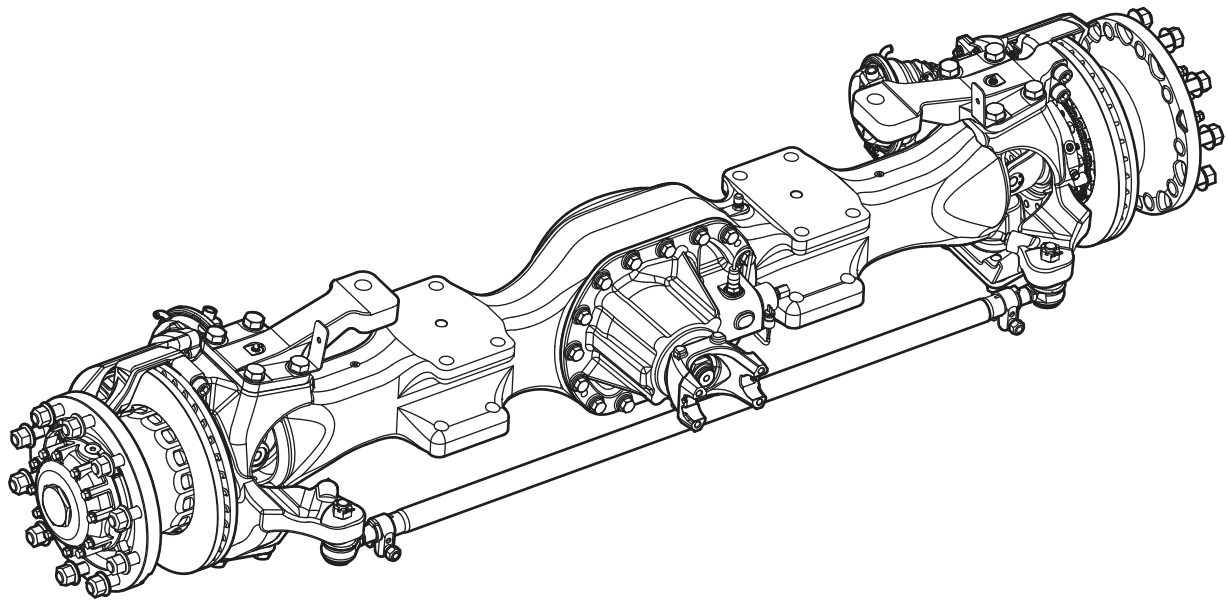
MERITOR
RUN WITH THE BULL

MX-810 SERIES FRONT DRIVE STEER AXLE



Revised 06-23

Service Notes

About this Manual

This manual provides service and repair procedures for Meritor MX-810 Series front drive steer axles.

How to Obtain Additional Maintenance, Service and Product Information

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

Maintenance Manual MM-0467, EX+™ Air Disc Brake

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 Tools and Supplies are Specified in This Manual

Contact Meritor's Commercial Vehicle Aftermarket at 888-725-9355. For additional assistance with parts, contact the Meritor Parts Center in Florence, KY at 859-525-3500 or CustCareCntr.Florence@Meritor.com.

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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.

⚠ 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.
- Only perform work on a flat, level surface in a well-lighted, ventilated area.
- Follow all safety instructions and service guidelines established at the service facility where work is being performed.

⚠ DANGER

- Use only the recommended tools for service. Follow all safety guidelines and instructions provided by the tool manufacturer. Failure to do so can result in serious injury and damage to components.
- Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving. Support the vehicle with safety stands. NEVER work under a vehicle supported only by jacks. Jacks can slip and fall over. Failure to use a jack stand can result in serious personal injury and damage to components.

⚠ 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.

1 Safety Information

⚠ ASBESTOS FIBERS WARNING

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

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

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

Recommended Work Practices

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

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

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

⚠ NON-ASBESTOS FIBERS WARNING

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

Hazard Summary

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

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

Recommended Work Practices

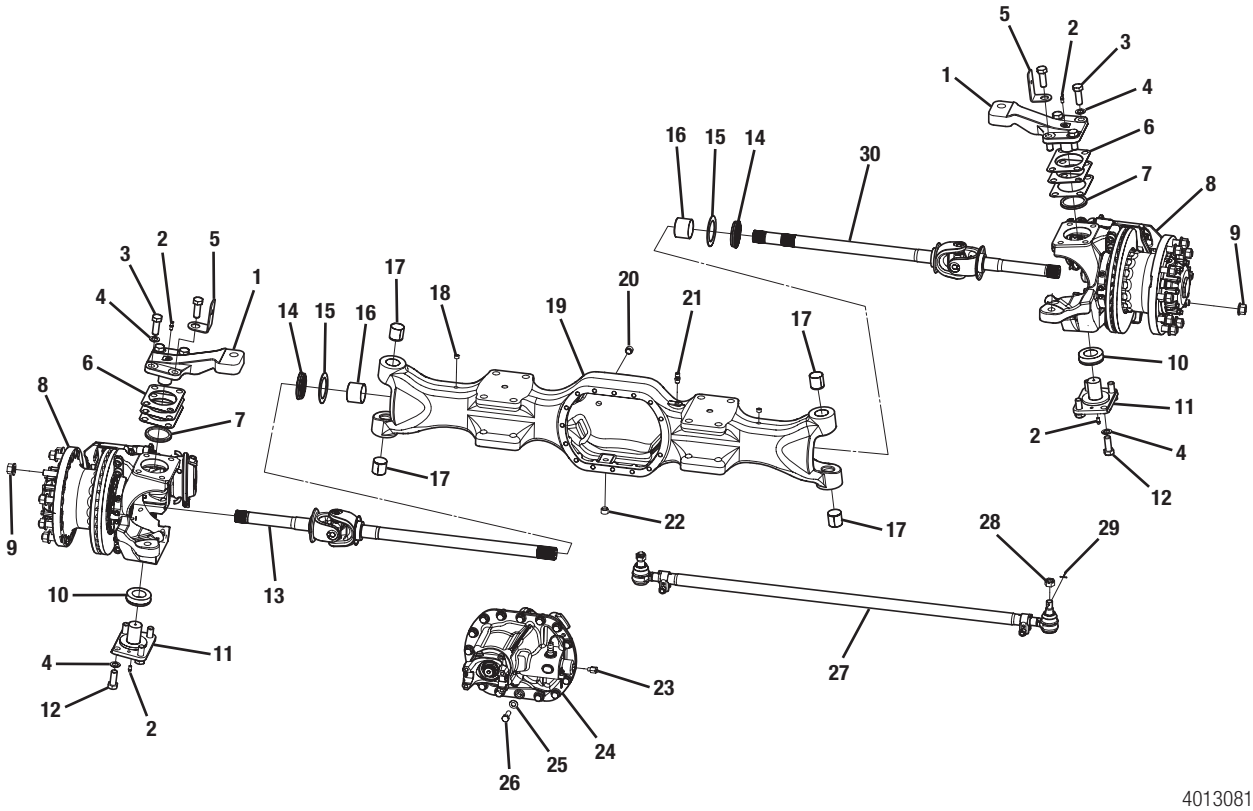
1. **Separate Work Areas.** Whenever feasible, service brakes in a separate area away from other operations to reduce risks to unprotected persons.
2. **Respiratory Protection.** OSHA has set a maximum allowable level of exposure for silica of 0.1 mg/m3 as an 8-hour time-weighted average. Some manufacturers of non-asbestos brake linings recommend that exposures to other ingredients found in non-asbestos brake linings be kept below 1.0 f/cc as an 8-hour time-weighted average. Scientists disagree, however, to what extent adherence to these maximum allowable exposure levels will eliminate the risk of disease that can result from inhaling non-asbestos dust. Therefore, wear respiratory protection at all times during brake servicing, beginning with the removal of the wheels. Wear a respirator equipped with a high-efficiency (HEPA) filter approved by NIOSH or MSHA, if the exposure levels may exceed OSHA or manufacturers' recommended maximum levels. Even when exposures are expected to be within the maximum allowable levels, wearing such a respirator at all times during brake servicing will help minimize exposure.
3. **Procedures for Servicing Brakes.**
   a. Enclose the brake assembly within a negative pressure enclosure. The enclosure should be equipped with a HEPA vacuum and worker arm sleeves. With the enclosure in place, use the HEPA vacuum to loosen and vacuum residue from the brake parts.
   b. As an alternative procedure, use a catch basin with water and a biodegradable, non-phosphate, water-based detergent to wash the brake drum or rotor and other brake parts. The solution should be applied with low pressure to prevent dust from becoming airborne. Allow the solution to flow between the brake drum and the brake support or the brake rotor and caliper. The wheel hub and brake assembly components should be thoroughly wetted to suppress dust before the brake shoes or brake pads are removed. Wipe the brake parts clean with a cloth.
   c. If an enclosed vacuum system or brake washing equipment is not available, carefully clean the brake parts in the open air. Wet the parts with a solution applied with a pump-spray bottle that creates a fine mist. Use a solution containing water, and, if available, a biodegradable, non-phosphate, water-based detergent. The wheel hub and brake assembly components should be thoroughly wetted to suppress dust before the brake shoes or brake pads are removed. Wipe the brake parts clean with a cloth.
   d. Wear a respirator equipped with a HEPA filter approved by NIOSH or MSHA when grinding or machining brake linings. In addition, do such work in an area with a local exhaust ventilation system equipped with a HEPA filter.
   e. NEVER use compressed air by itself, dry brushing, or a vacuum not equipped with a HEPA filter when cleaning brake parts or assemblies. NEVER use carcinogenic solvents, flammable solvents, or solvents that can damage brake components as wetting agents.
4. **Cleaning Work Areas.** Clean work areas with a vacuum equipped with a HEPA filter or by wet wiping. NEVER use compressed air or dry sweeping to clean work areas. When you empty vacuum cleaners and handle used rags, wear a respirator equipped with a HEPA filter approved by NIOSH or MSHA, to minimize exposure. When you replace a HEPA filter, wet the filter with a fine mist of water and dispose of the used filter with care.
5. **Worker Clean-Up.** After servicing brakes, wash your hands before you eat, drink or smoke. Shower after work. Do not wear work clothes home. Use a vacuum equipped with a HEPA filter to vacuum work clothes after they are worn. Launder them separately. Do not shake or use compressed air to remove dust from work clothes.
6. **Waste Disposal.** Dispose of discarded linings, used rags, cloths and HEPA filters with care, such as in sealed plastic bags. Consult applicable EPA, state and local regulations on waste disposal.

Regulatory Guidance

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

Exploded Views

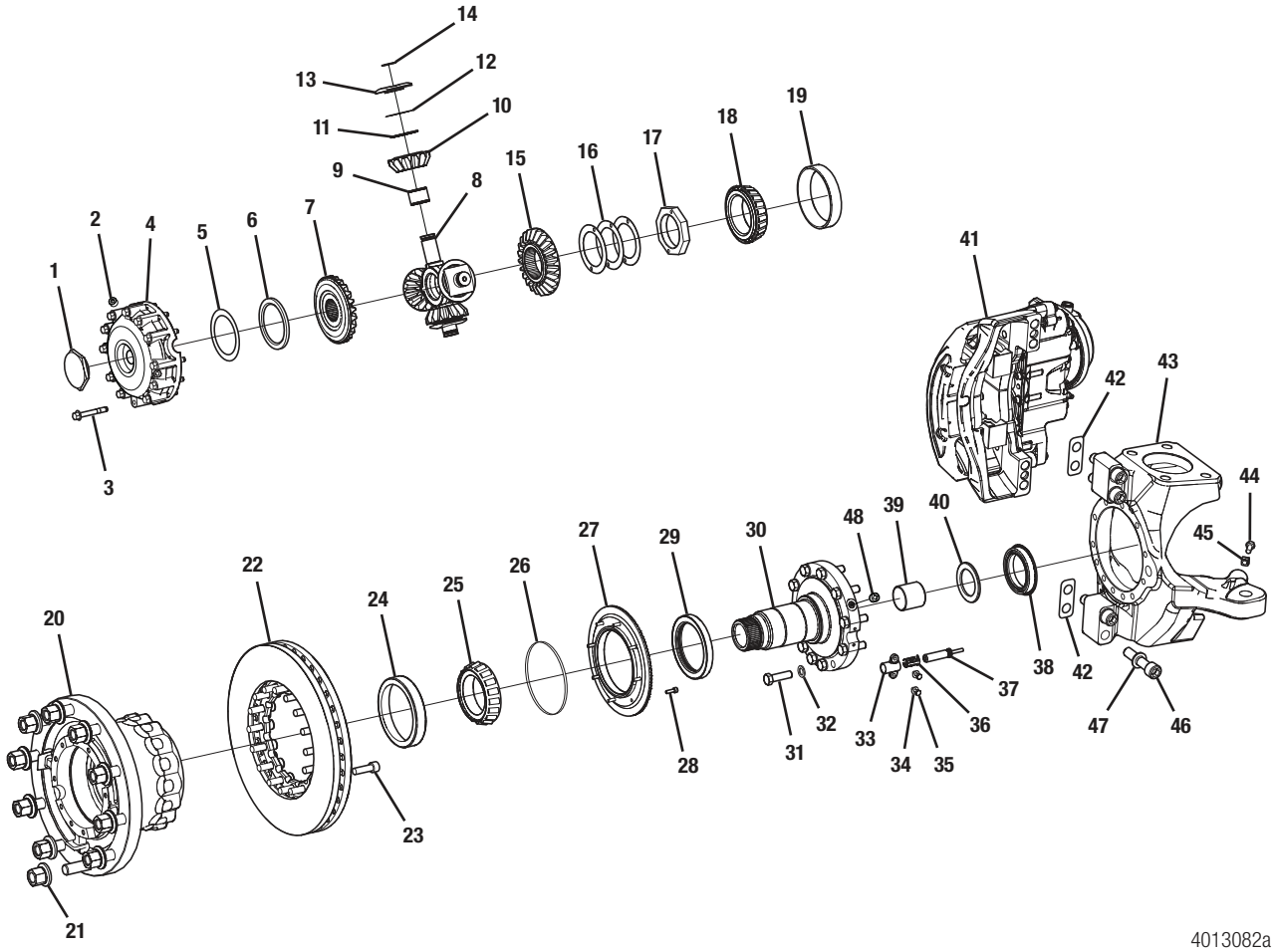
Front Drive Steer Axle



Item	Description
1	Steering Arm
2	Grease Fitting
3	Capscrew
4	Hardened Washer
5	L-bracket
6	Shims
7	Grease Seal
8	Wheel End Assembly
9	Wheel Stud Nut
10	Thrust Bearing
11	Lower King Pin Cap
12	Capscrew
13	Axle Shaft Assembly, Left-Hand
14	Oil Seal
15	Thrust Washer

Item	Description
16	Bushing
17	King Pin Trunnion Bushing
18	Shipping Plug
19	Axle Housing Assembly
20	Magnetic Fill Plug
21	Breather Assembly
22	Magnetic Drain Plug
23	Adapter
24	Carrier Assembly
25	Hardened Washer
26	Capscrew
27	Tie Rod Assembly
28	Nut
29	Cotter Pin
30	Axle Shaft Assembly, Right-Hand

Wheel End Assembly



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Item	Description
1	Cover Plug
2	Plug
3	Capscrew
4	Bevel Gear Hub Cover
5	Thrust Washer
6	Thrust Bearing
7	Outer Bevel Gear
8	Spider
9	Bearing
10	Bevel Pinion
11	Thrust Bearing
12	Thrust Washer
13	Thrust Washer
14	O-ring

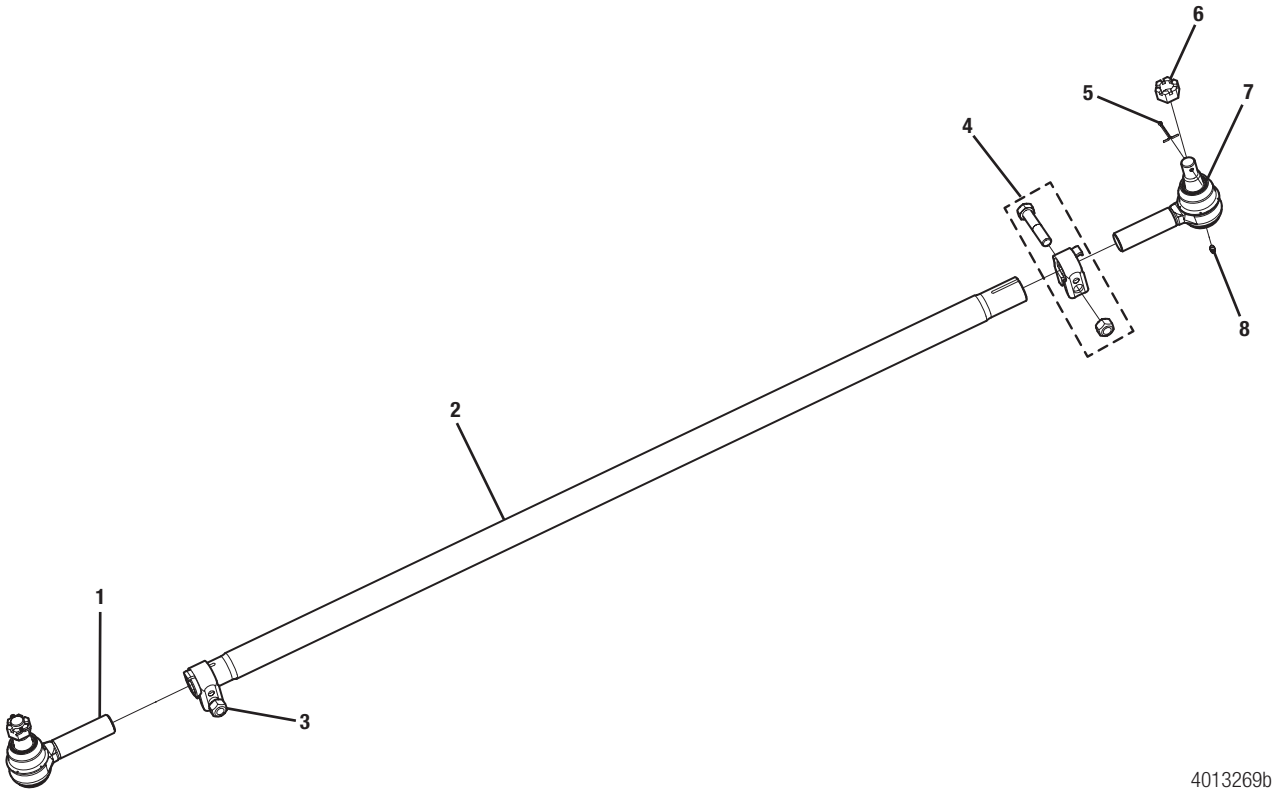
Item	Description
15	Inner Bevel Gear
16	Shims
17	Wheel Bearing Lock Nut
18	Outer Bearing Cone
19	Bearing Cup
20	Wheel End Hub Assembly
21	Wheel Stud Nut
22	Rotor
23	Rotor Mounting Capscrew
24	Bearing Cup
25	Bearing Cone
26	O-ring
27	Tone Ring
28	Tone Ring Mounting Bolt

2 Exploded Views

Item	Description
29	Hub Oil Seal
30	Spindle Assembly
31	Bolt
32	Washer
33	ABS Sensor Bracket
34	Flat Washer
35	Bracket Bolt
36	ABS Sensor Retainer Clip
37	ABS Sensor
38	Axle Shaft Seal
39	Bushing
40	Thrust Washer
41	Caliper Assembly
42	Spacer*
43	Steering Knuckle Assembly
44	Steer Stop Bolt
45	Steer Stop Bolt Lock Nut
46	Caliper Mounting Bolt
47	Flat Washer
48	Plug

* Required for axles with serial numbers lower than LRS00962355.

Tie Rod Assembly



Item	Description
1	Tie Rod End, Left-Hand
2	Tie Rod Cross Tube
3	Clamp Fastener
4	Clamp Assembly
5	Cotter Pin
6	Tie Rod End Castle Nut
7	Tie Rod End, Right-Hand
8	Grease Fitting

Introduction

This manual covers the Meritor MX-810 Series front drive steer axles equipped with 2:1 wheel end reduction bevel gearing and capable of up to a 43-degree turn angle.

Refer to Maintenance Manual MM-0467, EX+™ Air Disc Brake for all other brake service, maintenance and troubleshooting procedures.

Model Nomenclature

Identification tags are riveted on the axle housing and the differential carrier. Use the model number and ratio number marked on the identification tag and the number on the carrier and/or axle housing to obtain replacement parts. Figure 3.1.

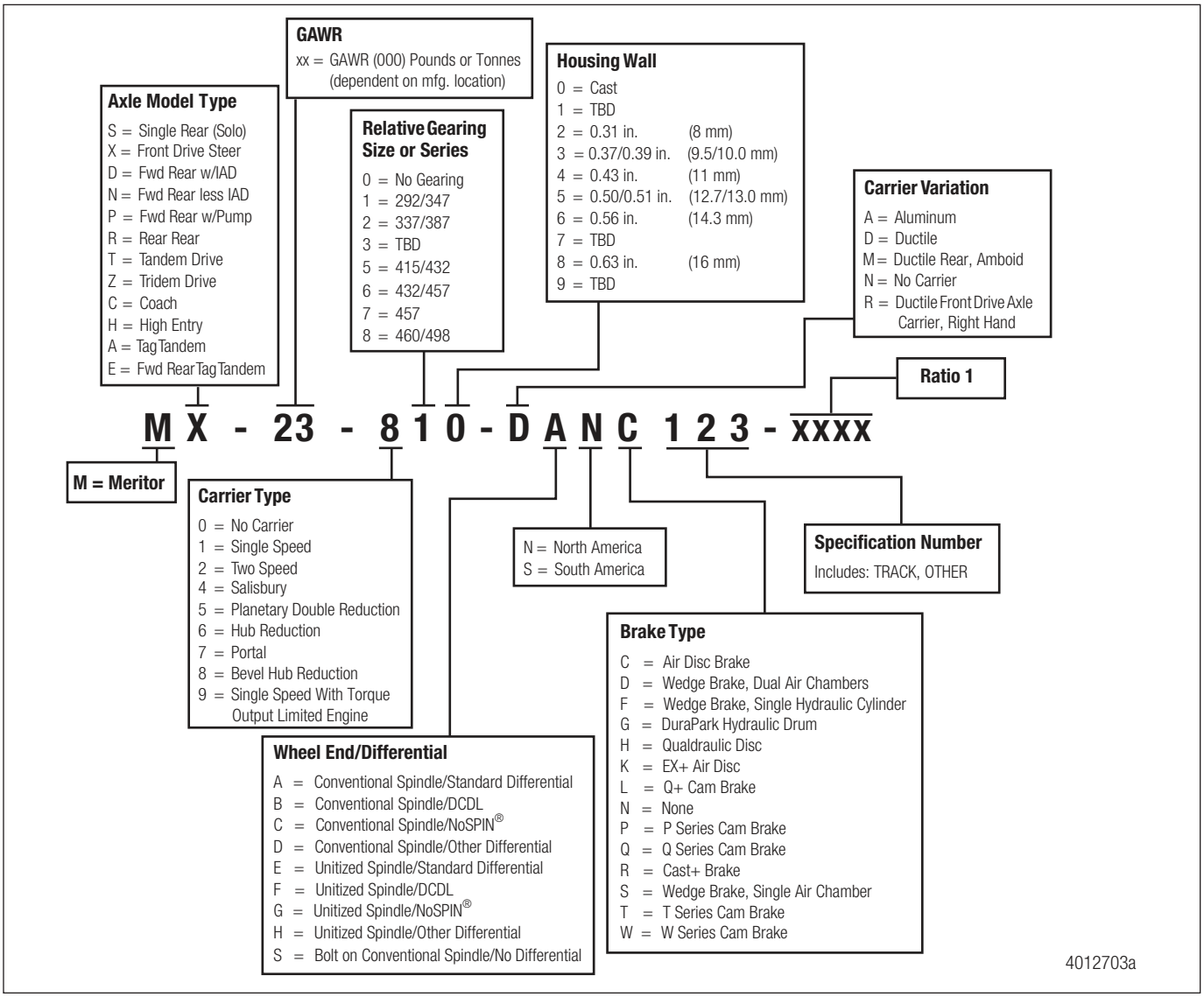


Figure 3.1

Specifications

Model	MX-23-810	MX-24-810
Location	Front	Front
Nominal Rating*	23,000 lb (10 432 kg)	24,000 lb (10 886 kg)
Brakes	EX+™	EX+™
Hub	13.189" (335 mm) bolt circle	13.189" (335 mm) bolt circle
Track	82.70" (2100.6 mm)	84.52" (2146.8 mm)
Ratios, Overall Axle	4.88, 5.28, 5.38, 5.58, 6.14, 6.84, 7.16, 7.80	6.14
KPI	68.16" (1731.38 mm)	67.26" (1708.5mm)
Wheel End Ratio	2:1	2:1
Road Clearance	14.3" (363.2 mm) with 21.3" (541.0 mm) radius tires	13.0" (330.7 mm) with SLR 21.3" tires
Housing Size	5.28 x 4.61" (134 x 117 mm)	5.28 x 4.61" (134 x 117 mm)
Weight — Axle Complete with Bracket as Shown (without DCDL)	1745 lb (791 kg)	1801 lb (817 kg)
Axle Complete with Bracket and DCDL	1750 lb (794 kg)	1806 lb (819 kg)

*Permitted use of axles and components, including capacity ratings where stated vary with application and service. The Meritor Specialty Engineering Department must approve installation. Approved ratings may be higher or lower than indicated above, dependent upon engineering review.

Inspection

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.

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 4.1

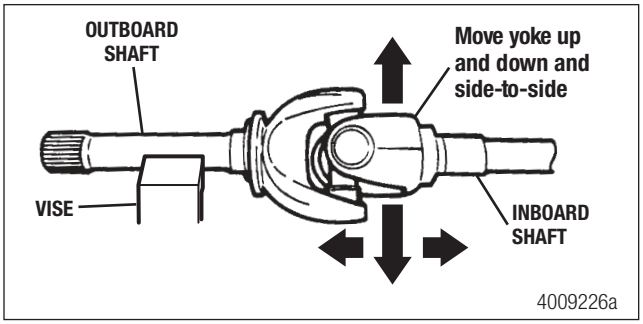


Figure 4.1

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 universal joint.

Greaseable Universal Joints

1. Verify all grease fittings are installed. Replace missing or damaged fittings and tighten to 10 lb-ft (14 Nm).
2. Check for loose grease fittings. Tighten to 10 lb-ft (14 Nm).

Axle Bushing Inspection

Inspect the two inner (axle housing) and two outer (spindle) bushings for damage if the axle seals are leaking. Replace, as necessary.

King Pin Bushing Inspection

Inspect the two upper and two lower king pin bushings for damage and replace, if required. See Inspect the Knuckle Bushings for Play on page 61.

Oil and Magnetic Fill/Drain Plug Inspection

Whenever the oil is drained from the carrier or wheel end, check the magnetic oil fill and drain plugs for contamination using the following guidelines and inspection procedures.

Analyzing Contaminants on Magnetic Plugs

Metal Particles on the Magnetic Fill/Drain Plug
During maintenance procedures it is normal to find fine metal particles adhering to the magnetic oil fill and drain plugs. These particles are generated under normal operating conditions, and the magnets attract the particles and prevent them from passing through the gear mesh or bearings.

However, larger metal particles adhering to the oil fill and drain plugs, such as gear teeth, bearing fragments, thrust washer fragments and metal shavings, are not a normal condition.

It is important to be able to identify the differences between fine and large metal particles to determine how they occurred and what repairs may be required to prevent component damage. Refer to Section 10 Prepare Parts for Assembly on page 33 for further information on inspections.

Remove and Inspect the Oil Fill and Drain Plugs

Remove the magnetic oil fill and drain plugs. Inspect the metal particles adhering to the plug. Use the Guidelines in this section to determine if the metal particles are fine (a normal condition) or larger (a condition that is not normal).

Guidelines

Fine Metal Particles

The fine metal particles attached to the magnetic plug in the following figure are normal. Internal components can shed fine metal wear particles at a steady rate, especially during the break-in period. In addition to the magnetic plugs, the carriers and wheel end have internal magnets in the housing to capture debris generated during extended maintenance intervals used today. Figure 4.2.

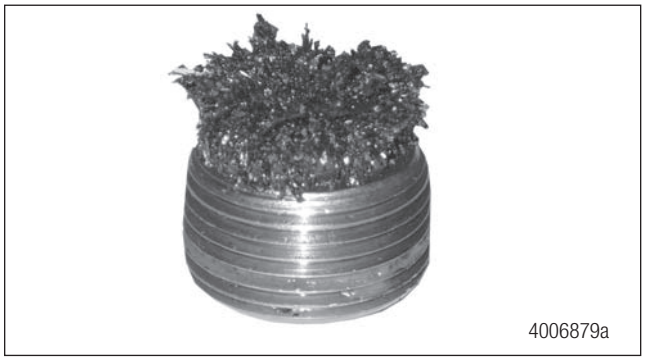


Figure 4.2

Metal Shavings

The following figure shows metal shavings which are remnants from the machining process. Metal shavings adhere to the magnets and are not detrimental to the operation of the drivetrain component. It is not necessary to perform further inspections or remove the component for cleaning. Figure 4.3.

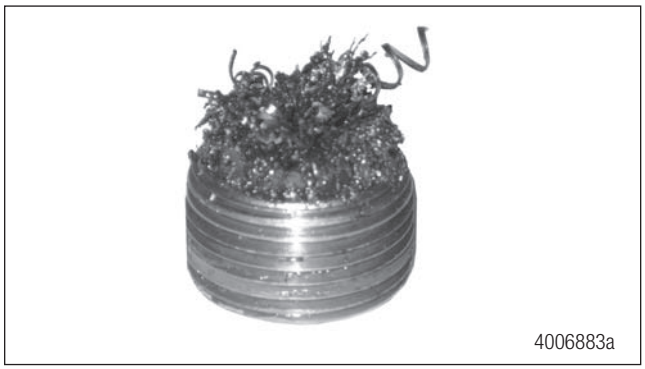


Figure 4.3

Bearing and Gear Teeth Fragments

The following two figures show bearing and gear tooth fragments. Both indicate a significant issue that can result in component damage. Immediately remove the component, inspect it, and perform required repairs. Figure 4.4 and Figure 4.5.

Figure 4.4

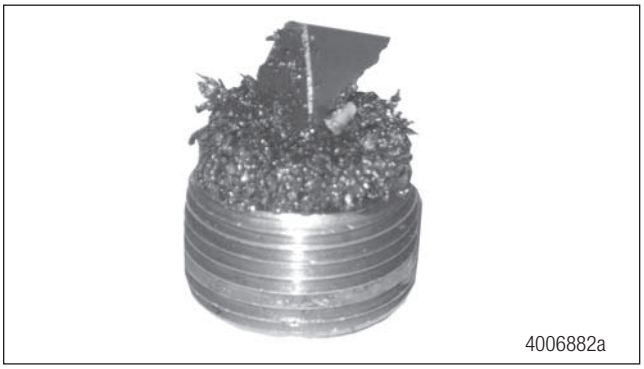


Figure 4.5

Verify the Lubricant Level

Verify the lubricant is even with the bottom of the oil fill plug hole and not below the fill plug hole. If necessary, add the specified lubricant, until it is even with the bottom of the fill plug hole. Refer to Figure 4.17 on page 15 for detailed check and fill procedures. Figure 4.6.

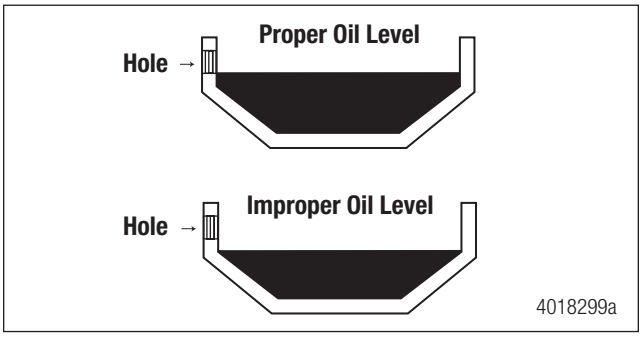


Figure 4.6

Check the Condition of the Oil

Most drive axle oils are either golden brown or deep red in color. If the oil looks “milky brown” or has a “copper” color, the oil is contaminated. The oil samples in the following figure show how the lubricant may appear during inspection. Refer to the following Oil Conditions section for guidelines. Figure 4.7.

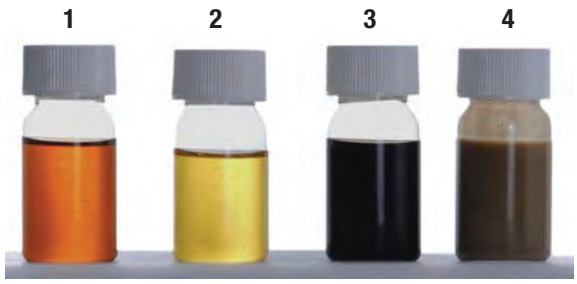


Figure 4.7

Oil Conditions

Sample 1: Red and Sample 2: Golden Brown
Both the red and golden brown samples show the typical appearance of new GL5 EP oils that meet the SAE J2360 specification. They usually are golden brown, but also can be red in color.

Sample 3: Black
This black sample is used-oil with significant time and mileage. The color change from red or golden brown to black is the result of a normal chemical process that occurs as the additive package in the oil degrades. The black color does not necessarily indicate the oil’s useful life has been exhausted. Perform a lubrication analysis to verify the oil can still be used.

Sample 4: “Milky” Brown
This “milky” brown sample indicates the oil is contaminated with significant moisture well above the allowable change specification of >0.3%. Change the oil immediately. Locate the source of the moisture.

Table A: Used-Oil Analyses (ppm = parts per million)

Water (H^2O)	If the level is greater than 0.3%, drain and replace the oil.
Phosphorus (P)	If the level is less than 900 ppm, it is possible the oil is not a GL-5 gear oil. Contact the lubricant manufacturer or Meritor Materials Engineering to determine the expected phosphorus level of a new oil sample. Only GL-5 type gear oils are approved for use in Meritor differentials.

⚠ 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.

EX™+ Air Disc Brake Inspection

NOTE: Refer to Maintenance Manual MM-0467, EX+™ Air Disc Brake for complete service and maintenance procedures. Information in this manual is specific to this configuration and over rides information in MM-0467.

Inspect the brake pads and rotors for wear. Repair or replace components as necessary.

⚠ 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.

Rotor Inspection

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 the wheels to be serviced are off the ground. Support the vehicle with safety stands.
3. With the pads removed, rotate the wheel and inspect the hub and rotor assembly for damage.
4. Inspect both sides of the rotor for cracks and heat checks. Refer to the rotor inspection criteria in the following section. Replace the hub, rotor, or entire assembly, if necessary.
5. Check the hub and rotor assembly for damaged, loose, or missing fasteners.

Rotor Inspection Criteria

⚠ WARNING

The recommendations outlined in this inspection must be followed. If not, severe damage to the wheel end assembly can result due to heat damage from the metal pad back plate contacting the rotor. Failure to follow these recommendations will also void any warranty claim.

Do not allow the pad back plate to wear down to a thickness where it is possible to be trapped between carrier abutments and rotor. If this occurs, the wheel can lock and the pad back plates can come out of the brake assembly.

⚠ CAUTION

Always replace the rotor on both wheels of an axle. Only use rotors approved by the vehicle manufacturer.

Dimension Detail

- New Rotor Thickness - A = 45 mm
- Minimum Resurfacing Thickness = 39 mm
- Minimum Fully Worn Thickness B = 37 mm
- Pad Back Plate Thickness = 9.5 mm
- Carrier Rotor Gap - C = 50 mm
- Minimum Friction Material Thickness = 3 mm
- Clearance New Rotor - E = 2.5 mm

New Rotor Condition

The rotor nominal maximum thickness, in new condition, is A.

The rotor gap between the carrier abutments of the brake assembly is C nominally.

Therefore, if the rotor is centered between the carrier abutments, an equal clearance of E nominally is achieved either side of the rotor.

However, due to tolerances, the rotor is not always centered within the carrier abutment gap. This may result in the rotor requiring replacement before being worn to the minimum thickness. Figure 4.8.

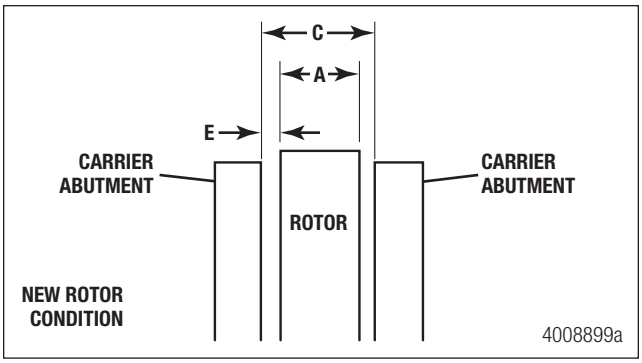


Figure 4.8

Maximum Permissible Rotor Wear

The rotor is permitted to wear to a minimum thickness of B provided that there is maximum wear of no more than 3 mm off any one rotor face. When equal wear is achieved on both sides of the rotor, the rotor maintains a central position in the carrier abutments. The rotor to carrier clearance F must not exceed 5.5 mm. Figure 4.9.

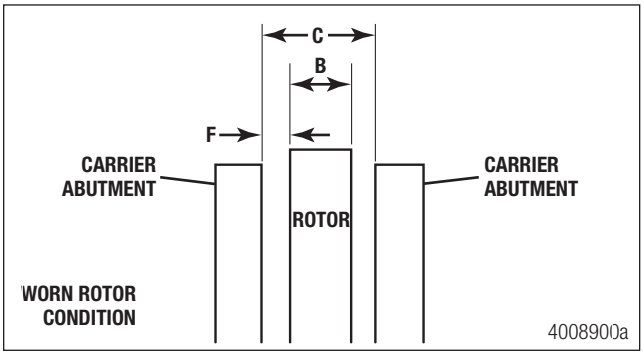


Figure 4.9

Uneven Rotor Wear

In many cases where uneven wear D takes place, the rotor must be replaced before wearing down to the minimum thickness B. In the case of uneven rotor wear, it is important the gap between the rotor and carrier abutment F does not exceed 5.5 mm. Figure 4.10.

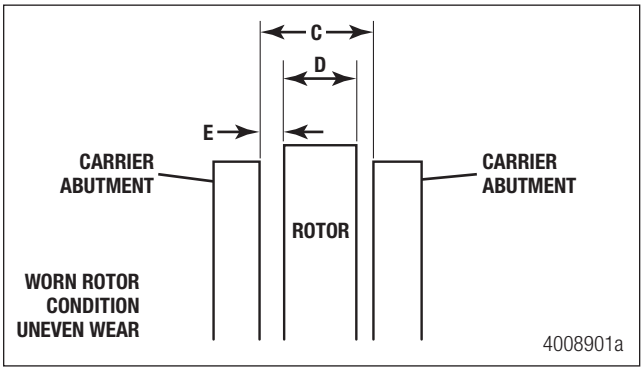


Figure 4.10

4 Inspection

Brake Pad, Caliper Guide Pin and Piston Boot Inspection

1. Use a 17 mm wrench to remove the pad retainer bolt. Remove the pad retainer. Figure 4.11.

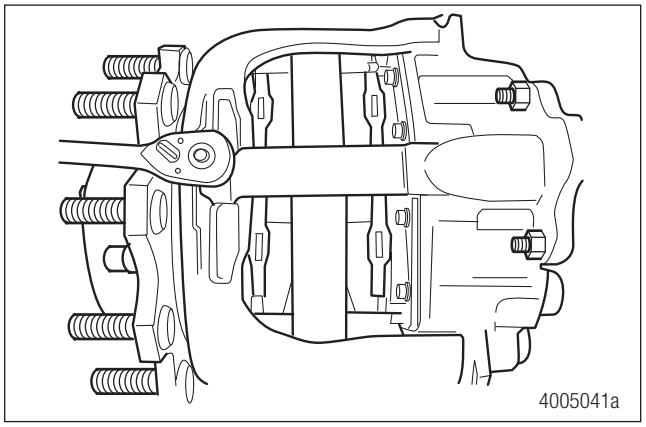


Figure 4.11

2. Visually inspect the pad retainer.

   If the pad retainer is bent or damaged: Replace the pad retainer.

3. Remove the pad springs.

4. Remove the outboard brake pad from the caliper assembly and mark the brake pad “outboard”. Figure 4.12.

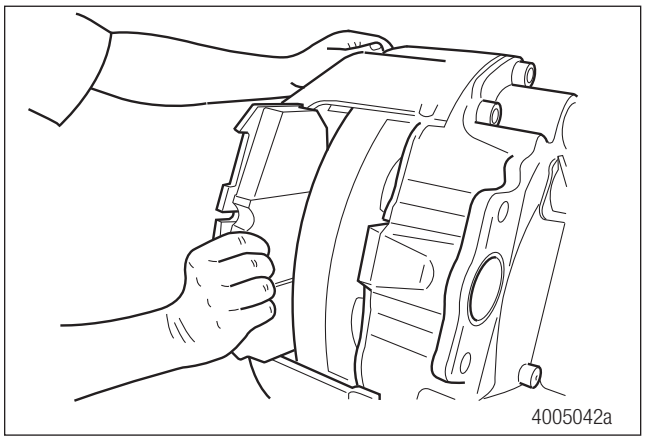


Figure 4.12

5. Remove the inboard brake pad from the caliper assembly and mark the brake pad “inboard”.

6. Use a vacuum brush or damp cloth to remove the dirt and dust from the carrier brake pad contact surfaces.

7. Inspect the carrier for signs of damage or wear. Pay particular attention to the pad abutments. Figure 4.13.

   If there is excessive wear or damage to the abutments: It may be necessary to replace the caliper assembly.

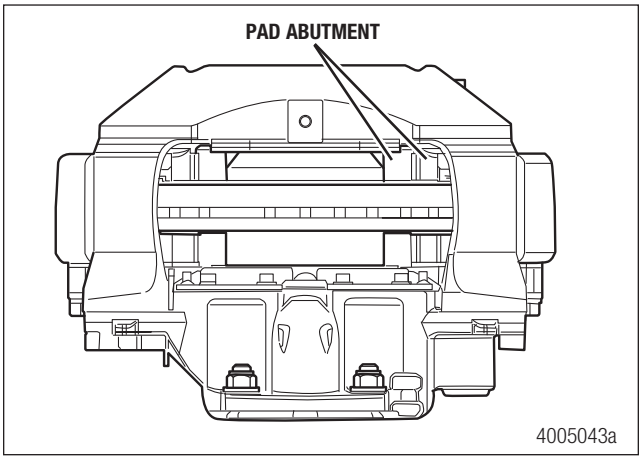


Figure 4.13

> **⚠ CAUTION**
>
> Replace the pads on both brakes of a single axle or all four brakes of a tandem axle at the same time. If all the pads are not replaced at the same time, poor brake performance will occur.

8. Inspect the brake pads for excessive grooving or cracked friction material. Check if the friction material is loose or detached from the backing plate. If necessary, replace all the brake pad assemblies.

9. Measure the friction material thickness from the center of the brake pad. Replace brake pad assemblies before the lining thickness reaches 0.12” (3 mm). Figure 4.14.

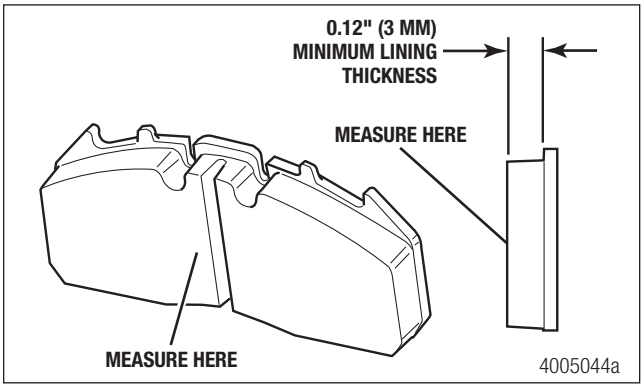


Figure 4.14

10. Inspect the pad springs. Replace bent, cracked or broken pad springs.

11. Verify the caliper slides freely, by hand, on the slide pins. Take care not to trap your fingers while checking the sliding action of the brake.

    If the caliper does not slide: Check the slide pin boots for damage and verify they are seated correctly.

12. With the pads removed, visually inspect the caliper slide pin boots and piston boots. All slide pin and piston boots should be free from damage and should be correctly seated. Figure 4.15, Figure 4.16, and Figure 4.17.

    If any of the piston boots or the slide pin boots are damaged or unseated: Replace the boots.

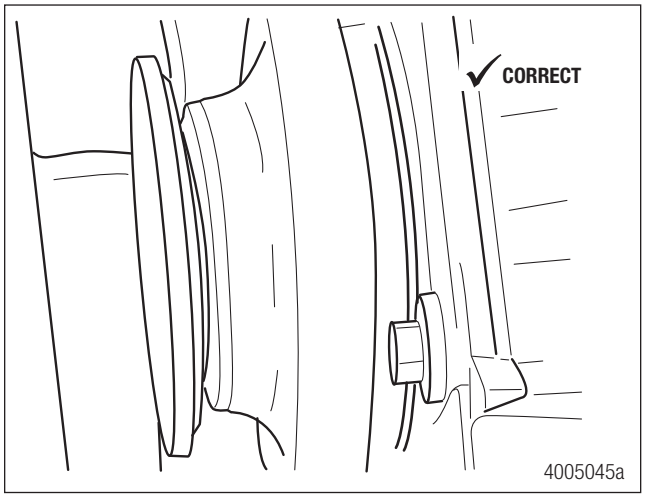


Figure 4.15

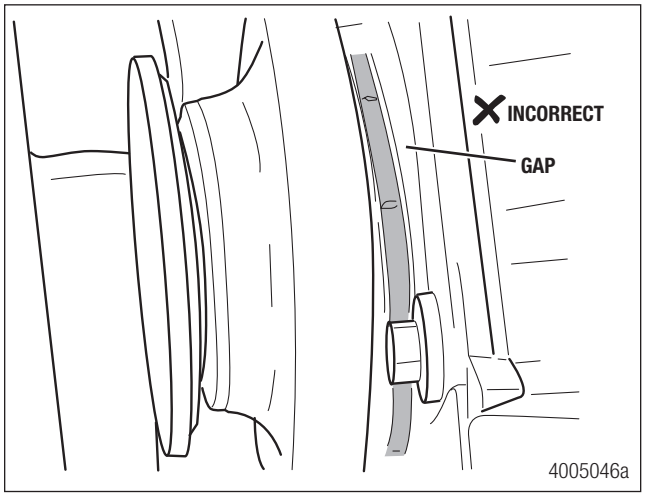


Figure 4.16

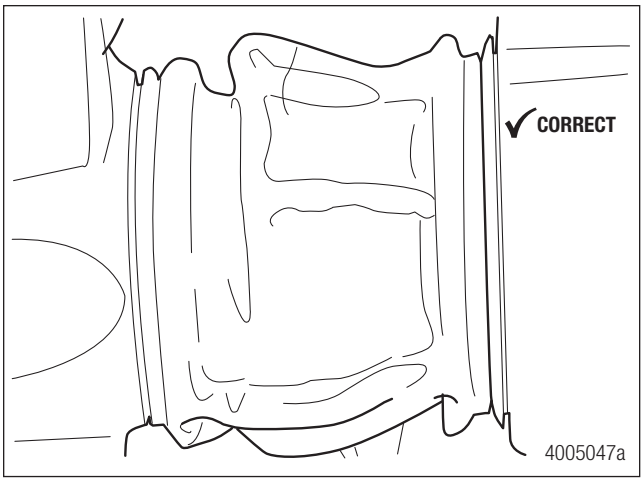


Figure 4.17

ABS Warning Signal

If ABS diagnostics indicates excessive sensor gap, inspect the wheel end for smooth rotation, movement, and bearing end play.

ABS Tone Ring Removal (Bolt-on Style)

Inspect the ABS tone ring mounting face and teeth for corrosion, road debris, or damage, as well as, the mating face of the rotor.

If the ABS tone ring has damage or corrosion an ABS sensor fault can occur: Remove it and install a new one using the steps in ABS Tone Ring Removal (Bolt-on Style) on page 21 and ABS Tone Ring Installation (Bolt-on Style) on page 44.

ABS Tone Ring (Press-Fit Style)

Inspect the ABS tone ring for corrosion, road debris, or damage that may have occurred during operation or hub removal.

If the ABS tone ring is damaged: Replace the tone ring. Refer to removal on page 21 and installation on page 44.

Wheel End and Axle Shaft Removal

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

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.

Wheel End Removal

Four axle shaft seals and bushings are used in the MX-810 front drive steer axle. Two of each are located on each axle shaft. The inner axle shaft seal and bushing are located in the housing socket. They are called the inner seal and bushing because they are inside of the axle shaft universal joint. The outer axle shaft seal and bushing are located in the wheel spindle. The seals will require service if either of the seals is leaking oil or the axle shaft requires removal. Bushings are serviceable, refer to Axle Bushing Inspection on page 10 for replacement criteria.

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 the front wheels are off the ground. Support the vehicle with safety stands.
3. Remove the tire and wheel assembly.
4. Remove the brake caliper. Refer to Remove the Caliper Assembly on page 29.
5. Before removing the axle shafts from the axle, cage the driver-controlled differential lock (DCDL) if equipped. Refer to the DCDL lockout instructions on page 24 and page 25 for correct procedures.
6. Disconnect the drag link at the steering arms.
7. Disconnect and label the two brake lines.
8. Disconnect the wheel end vent line.

⚠ DANGER

Follow all safety guidelines and instructions provided by the lifting device manufacturer. Inspect lifting straps to ensure they are not damaged. NEVER subject lifting straps to shocks or drop-loading. Death or serious personal injury and damage to components can result.

9. Use an appropriate lifting device to support the wheel end, and for wheel end removal later.
10. With the wheel end appropriately secured, remove the four capscrews. Remove the steering arm or upper king pin cap. Set the steering arm or upper king pin cap shims aside for re-installation. Figure 5.1.

    NOTE: If necessary use the two jack screw threaded holes to aid in removal using a 1/2-13 UNC bolt.

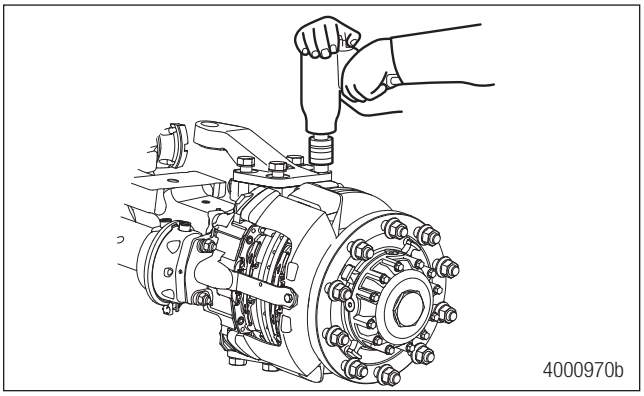


Figure 5.1

11. Remove the four capscrews attaching the lower king pin cap.
12. Disconnect the tie rod connection at the knuckle. Use a tie rod end puller, if available, to separate the tie rod end. To help loosen the stud, use a mallet or 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 until the stud is loose. Figure 5.2.

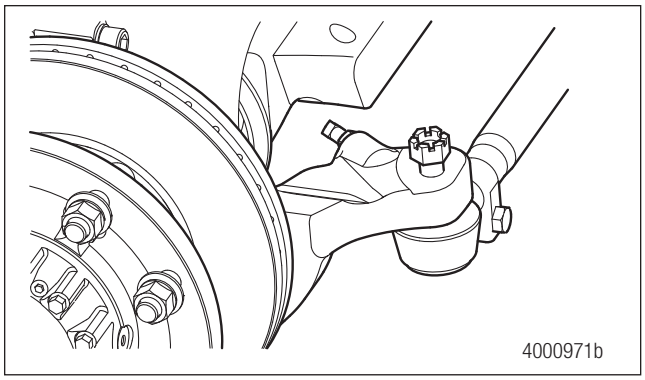


Figure 5.2

13. Remove the wheel end plug cover. Install the axle shaft removal tool (part number 3256-B-1016). See Axle Shaft Removal Tool (3256-B-1016) on page 74. Figure 5.3.

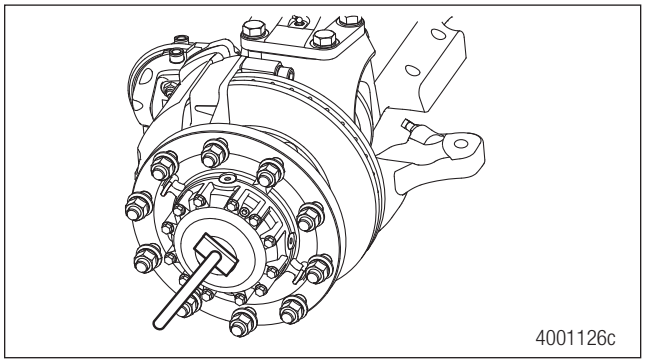


Figure 5.3

Axle Shaft Removal

1. Secure the wheel end and knuckle to a suitable lifting device. Remove the wheel end, knuckle and front axle shaft together from the axle housing. Figure 5.4.

   NOTE: If the carrier is equipped with DCDL, the DCDL must be caged prior to removing the passenger side axle shaft to prevent the clutch collar from dropping off the DCDL shift fork. Refer to the DCDL lockout instructions on page 24 and page 25 for correct procedures.

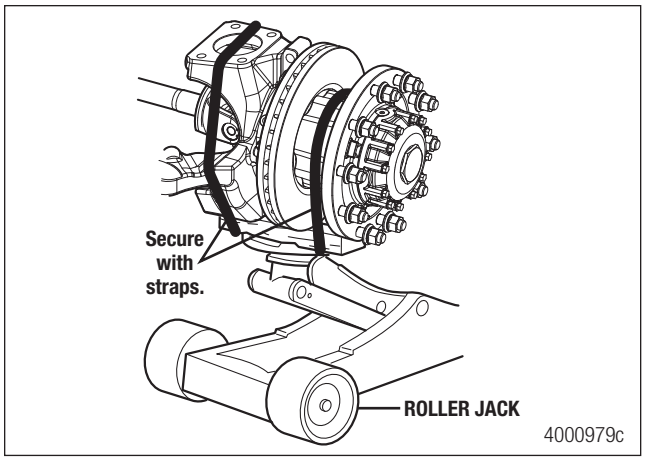


Figure 5.4

2. The axle shaft seals will come apart when the axle shaft is removed from the axle housing. The seal sleeve will be attached to the axle shaft and the seal casing will remain in the axle housing. Remove the seal sleeve from the shaft by prying against the metal shaft slinger. Be careful not to damage or bend the slinger. Figure 5.5 and Figure 5.6.

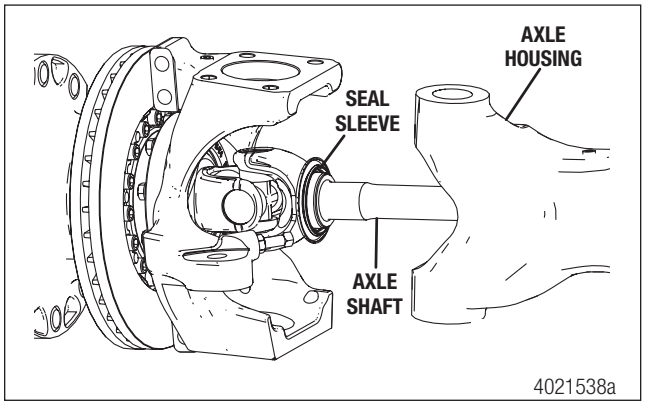


Figure 5.5

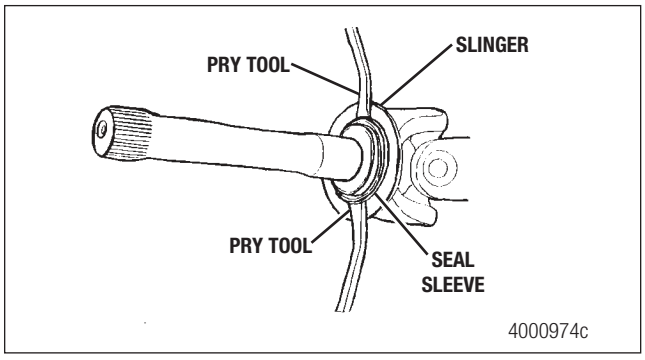


Figure 5.6

Alternate Method: Use a blunt soft chisel to score softly every 120-degrees around the seal journal to release the seal journal from the shoulder of the axle shaft. Figure 5.7.

5 Wheel End and Axle Shaft Removal

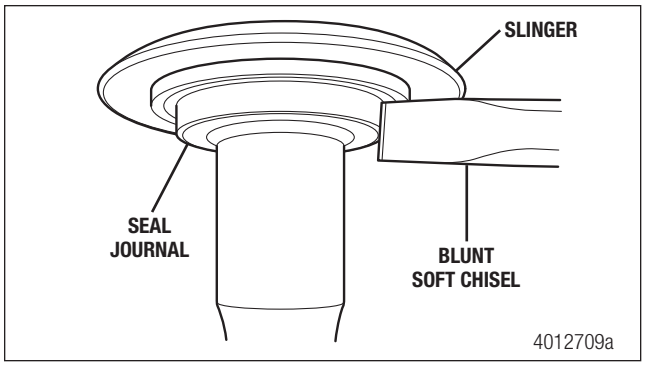


Figure 5.7

3. If necessary, use the procedures in Section 6 Wheel End Disassembly on page 19 to disassemble the wheel end.

Wheel End Disassembly

NOTE: Wheel end disassembly can be performed with the wheel end assembly removed from the axle assembly or installed.

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

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.

Hub and Rotor Assembly Removal

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 the front wheels are off the ground. Support the vehicle with safety stands.
3. Remove the tire and wheel assembly.
4. De-adjust the brake and remove the brake caliper assembly. Refer to Remove the Caliper Assembly on page 29.
5. Place a drain pan under the wheel end. Remove the oil drain plug. Drain the lubricant from the wheel ends.
6. Remove the hub cover plug.
7. Remove the hubcap capscrews. Figure 6.1.

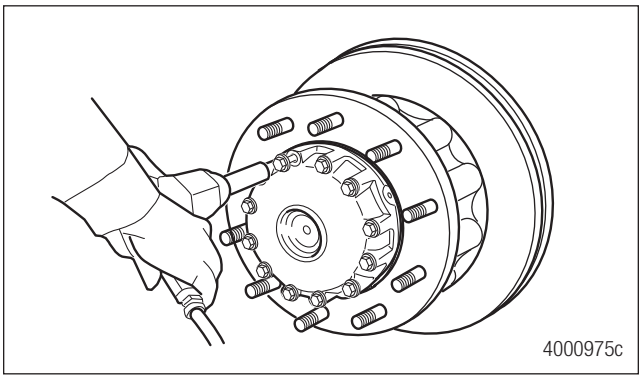


Figure 6.1

8. Pry the hubcap off the wheel end. Figure 6.2.

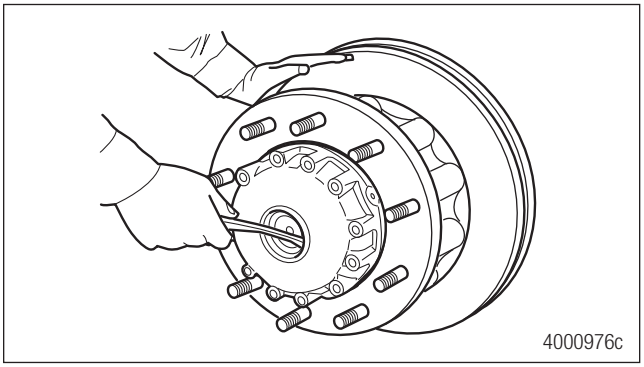


Figure 6.2

9. Remove the wheel end spider and pinion assembly. Figure 6.3.

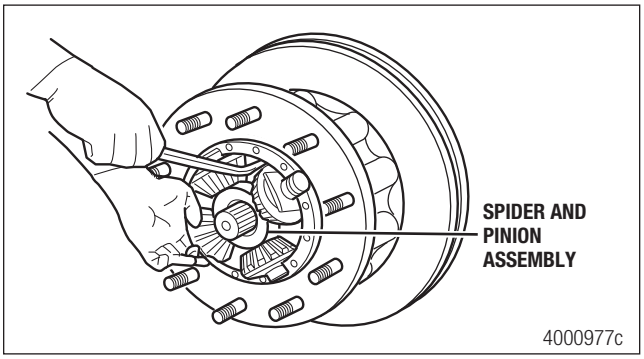


Figure 6.3

10. Remove the inner side gear and shims. Figure 6.4.

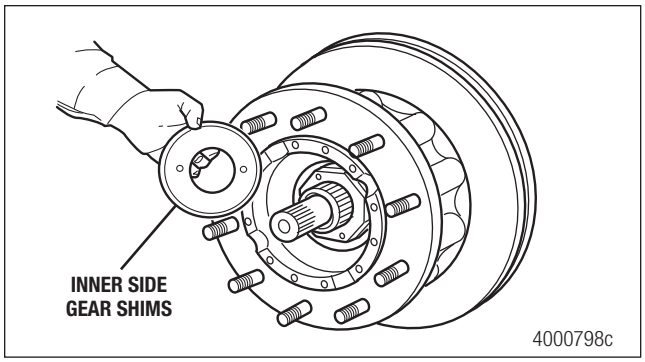


Figure 6.4

⚠ WARNING

The rear output shaft assembly is heavy. Support the assembly to prevent it from dropping during the pressing operation. Serious personal injury and damage to components can result.

11. Using a suitable lifting device to support the wheel end, remove the wheel bearing adjusting nut. Use the correct size wrench socket to prevent damage to the adjusting nut. Refer to Wheel End Lock Nut Socket on page 72 for socket information. Figure 6.5.

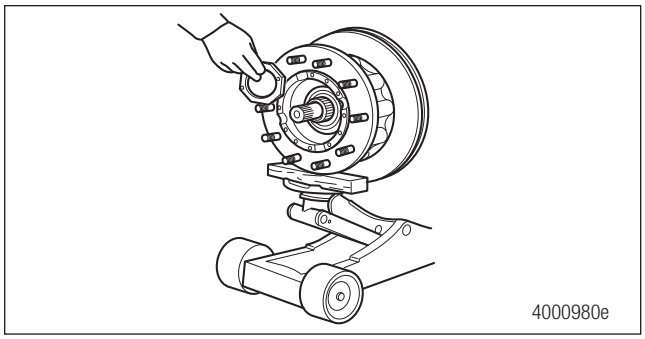


Figure 6.5

12. Remove the outer wheel bearing. Figure 6.6.

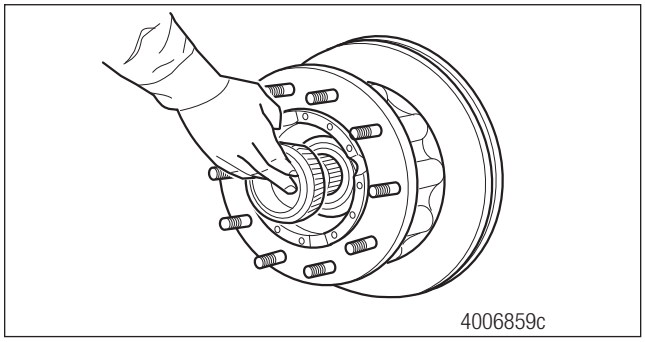


Figure 6.6

13. For models with CTIS, install the nose cone tool (part number 3256-C-1303) to facilitate hub removal and protect the spindle and CTIS seals. Refer to Nose Cone (3256-C-1303) on page 73. Figure 6.7.

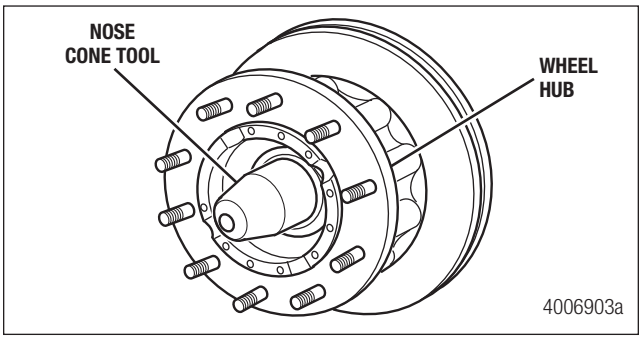


Figure 6.7

14. Remove the hub and rotor assembly from the spindle/knuckle assembly. If necessary, hit the inside of the wheel end with a mallet to loosen it.

⚠ CAUTION

Do not bend or damage the tone ring when removing the hub seal or the tone ring will need to be replaced.

15. Remove the hub seal from the tone ring and discard the used hub seal.

Remove the Rotor

1. Remove the caliper assembly. Refer to Remove the Caliper Assembly on page 29.
2. Remove the hub and rotor assembly. Refer to Hub and Rotor Assembly Removal on page 19.
3. Remove the tone ring. Refer to ABS Tone Ring Removal (Bolt-on Style) on page 21 or ABS Tone Ring Removal (Press-Fit Style) on page 21.
4. Use the correct size wrench to remove the hub-to-rotor bolts and washers. Remove the rotor from the hub. Figure 6.8.

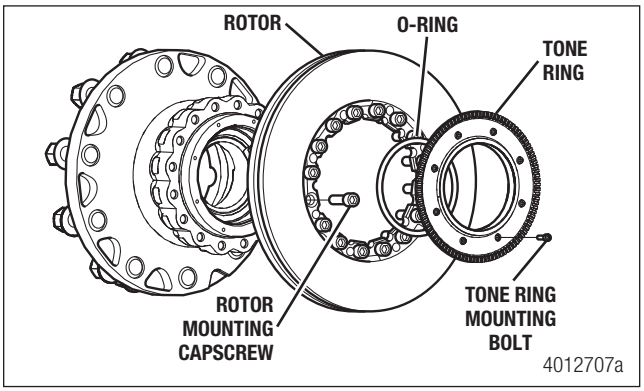


Figure 6.8

5. Verify the hub and rotor mating surfaces are clean and free of debris or burrs. Verify the hub rotor pilots are correctly engaged to the rotor.

ABS Tone Ring Removal (Bolt-on Style)

1. Remove the tone ring mounting bolts and remove the tone ring. Figure 6.9.

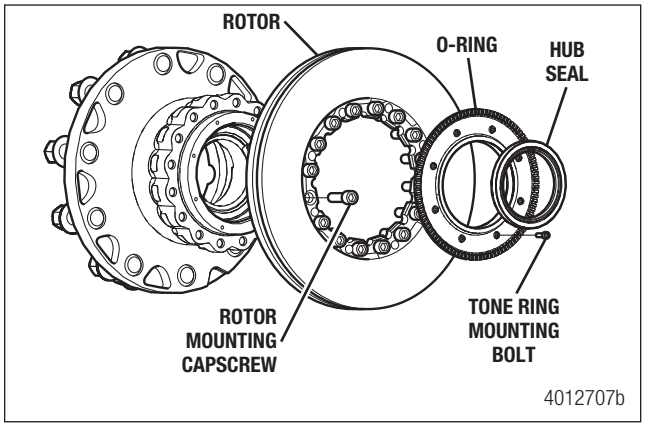


Figure 6.9

2. If not previously completed, remove the hub seal from the tone ring and discard the hub seal.

3. Thoroughly clean and degrease the ABS tone ring seat on the rotor using a non-flammable solvent.

4. Inspect the ABS tone ring seat on the rotor for damage or fretting from tone ring rotation.

   If the ABS tone ring seat on the rotor is damaged:
   Replace the rotor.

ABS Tone Ring Removal (Press-Fit Style)

NOTE: Hubs manufactured after July 2017 have Loctite® 620 retaining compound applied during tone ring mounting. Removal of the tone ring will require much higher force which may result in damage to the hub. A new hub with a tone ring already installed may be required to complete the repair.

1. Use a small pry bar or hammer and chisel to remove the ABS tone ring from the hub. Use care with the tool to avoid bending and damaging both components. Use a circular pattern around the wheel to remove it from the hub. Figure 6.10.

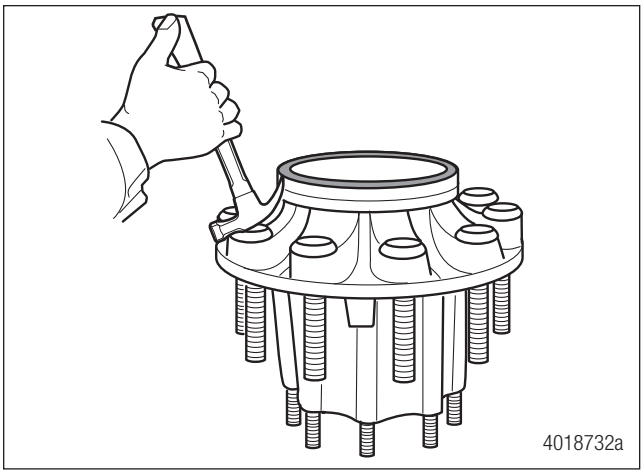


Figure 6.10

2. Thoroughly clean and degrease the ABS tone ring seat on the hub using a non-flammable solvent.

3. Inspect the ABS tone ring seat on the hub for damage or fretting from tone ring rotation.

   If the ABS tone ring seat on the hub is damaged:
   Replace the hub.

4. Remove all debris and clean the outside diameter of the hub where the ABS tone ring seats using a Scotch-Brite™ pad or 3M brand cleaning pad. Make sure it is clear of all grime or contaminants. If necessary, use a mild-abrasive wire wheel to remove any surface rust. Figure 6.11 and Figure 6.12.

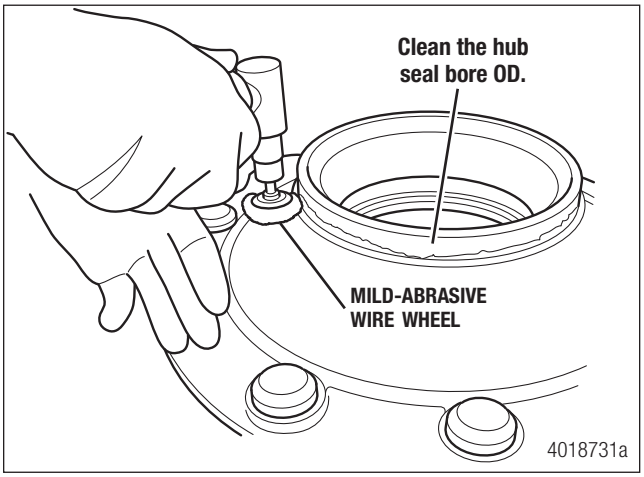


Figure 6.11

Figure 6.12

Wheel Hub Stud Removal

1. Remove the hub and rotor assembly. Refer to Hub and Rotor Assembly Removal on page 19.
2. Remove the rotor. Refer to Remove the Rotor on page 20.

⚠ DANGER

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

3. Use an appropriate press or brass mallet to remove the studs from the wheel end assembly.

Spindle Removal and Disassembly

1. Remove the hub and rotor assembly. Refer to Hub and Rotor Assembly Removal on page 19.

   NOTE: Refer to Wheel End Removal on page 16. Refer to Axle Shaft Removal on page 17 for axle shaft seal and bushing removal.

2. Remove the capscrews securing the spindle to the steering knuckle. Figure 6.13.

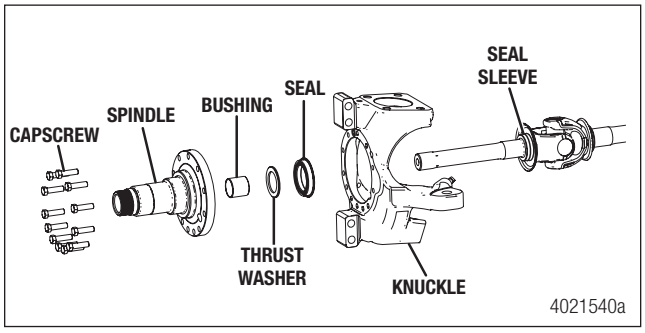


Figure 6.13

3. Separate and remove the spindle from the knuckle.
4. Remove the seal sleeve from the axle shaft. Figure 6.13.
5. Remove the axle shaft seal inside the spindle. Figure 6.14

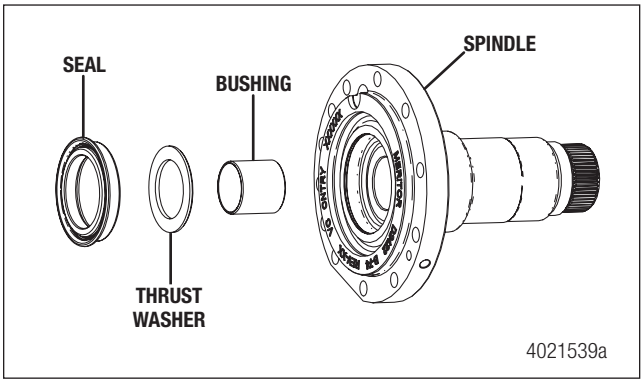


Figure 6.14

6. Check the fit of the thrust washer and axle shaft bushing in the spindle. If either part is loose in the spindle, replace the spindle.
7. Inspect the thrust washer in the spindle for wear or damage and replace it if necessary.

⚠ CAUTION

Use care when removing the thrust washer and axle shaft bushing to prevent damage to the spindle.

8. Inspect the axle shaft bushing in the spindle for wear or damage and replace it if necessary. Use a slide hammer to remove the bushing. Figure 6.15.

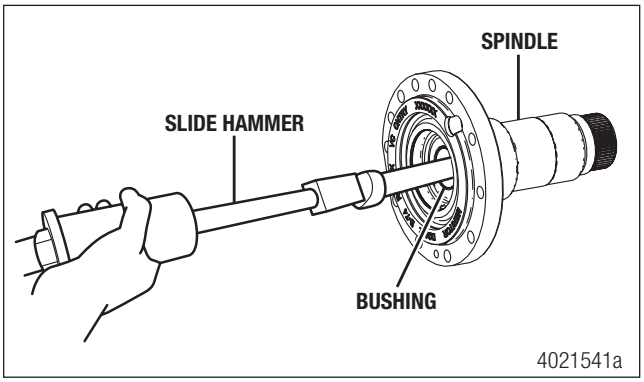


Figure 6.15

Carrier Removal

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

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.

NOTE: Prior to carrier removal, the axle shafts must be removed and the DCDL must be caged, if equipped.

1. Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving.
2. Place a drain pan under the rear axle and remove the drain plug from the bottom of the housing to drain the lubricant.
3. Use a jack to raise the left-hand wheel of the drive axle.
4. Place a jack stand under the left-hand spring seat to hold the vehicle in the raised position.
5. Disconnect the driveline universal joint from the pinion input yoke or flange on the carrier. Figure 7.1.

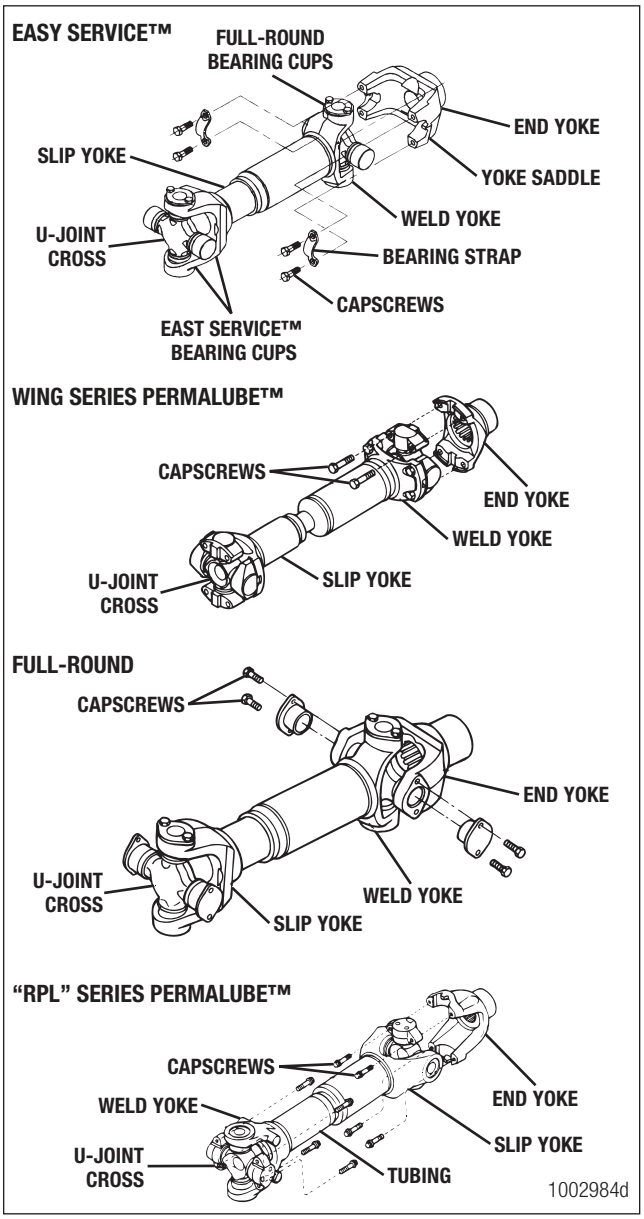


Figure 7.1

6. **If DCDL equipped:** Follow the Manual Method to disengage on page 24 OR the Auxiliary Air Supply Method on page 25.

   If not DCDL equipped: Follow Steps 7-14 in DCDL Engagement or Lockout, If Equipped – Auxiliary Air Supply Method on page 25.

DCDL Engagement or Lockout, If Equipped – Manual Method

⚠ DANGER

During DCDL disassembly, when the DCDL is in the locked (engaged) position and any of the vehicle's drive tires are in contact with the floor, NEVER start the engine and engage the transmission. The vehicle can move resulting in death or serious personal injury and damage to components.

⚠ 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.

Use the following manual engaging method to shift the DCDL into the locked position.

If an auxiliary air supply is not available or if the differential carrier is to be stored for later, use this manual engaging method for the DCDL.

1. Disconnect the wiring harness from the DCDL switch.
2. Disconnect the vehicle air line from the inter-axle differential and main differential lock actuator assemblies.
3. Remove the caging bolt from the side of the housing. Figure 7.2.

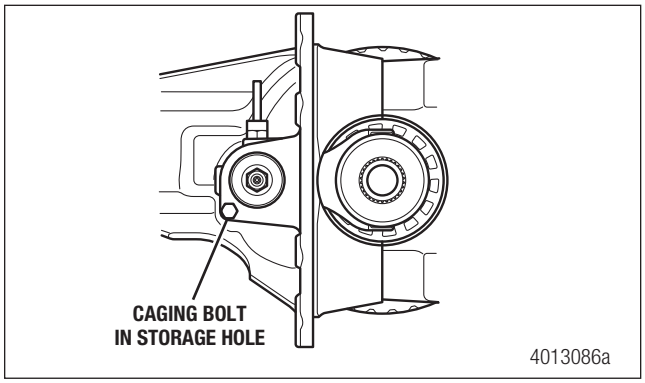


Figure 7.2

4. Install the caging bolt into the threaded hole in the center of the DCDL cover. Figure 7.3.

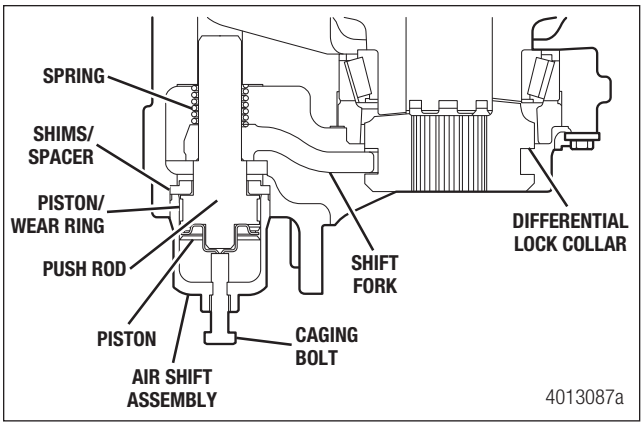


Figure 7.3

⚠ CAUTION

There will be a small amount of spring resistance felt when turning the caging bolt. If a high resistance is felt before reaching the locked or engaged position, stop turning the caging bolt to prevent damage to the cover, fork, and bolt threads.

5. Turn the caging bolt to the right until the head is approximately 0.25-0.50" (6-13 mm) from the cylinder cover. Do not turn the caging bolt beyond its normal stop. Figure 7.3. A high resistance on the caging bolt indicates the splines of the shift collar and the differential case half are not aligned or engaged. To align the splines, use the following procedure:
   - Rotate the left-hand wheel to align the splines of the shift collar and case half while you turn in the caging bolt.
   - When the normal amount of spring resistance is again felt on the caging bolt, the splines are engaged. Continue to turn in the caging bolt until the head is approximately 0.25-0.50" (6-13 mm) from the cylinder cover. The caging bolt is now in the service position and the main differential lock is completely engaged.
6. Remove the carrier from the axle housing following Steps 7-14 in DCDL Engagement or Lockout, If Equipped – Auxiliary Air Supply Method on page 25.
7. Release the differential lock by removing the caging bolt from the hole in the center of the DCDL cover.
8. Reinstall the caging bolt with the washer into its original position on the cover. Tighten the caging bolt to 7-11 lb-ft (10-15 Nm).
9. Reconnect the vehicle air line from the inter-axle differential and main differential lock actuator assemblies.
10. Reconnect the wiring harness from the DCDL switch.

DCDL Engagement or Lockout, If Equipped – Auxiliary Air Supply Method

⚠ DANGER

During DCDL disassembly, when the DCDL is in the locked (engaged) position and any of the vehicle's drive tires are in contact with the floor, NEVER start the engine and engage the transmission. The vehicle can move resulting in death or serious personal injury and damage to components.

⚠ 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. Disconnect the wiring harness from the DCDL switch.
2. Disconnect the vehicle air line from the inter-axle differential and main differential lock actuator assemblies.
3. Install a suitable air line coupling into the main differential actuator assembly.
4. Install the air line into the coupling.

⚠ CAUTION

When using an auxiliary air supply to engage the DCDL, air must be supplied to the DCDL until the carrier is removed. NEVER disconnect the air line or reduce air pressure to the DCDL before removing the carrier from the housing. Damage to components can result.

5. Supply 85 psi (586 kPa) regulated air pressure through the air line.
6. Verify the DCDL is engaged. Figure 7.4.

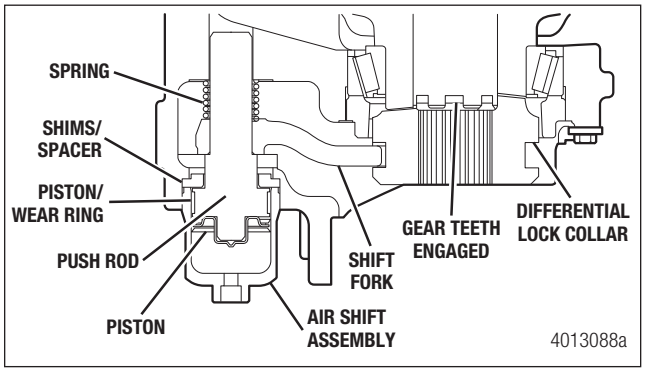


Figure 7.4

7. Prior to carrier removal, remove the wheel ends and axle shafts if not already removed. Refer to Section 5 Wheel End and Axle Shaft Removal on page 16.

⚠ DANGER

Follow all safety guidelines and instructions provided by the lifting device manufacturer. Check that the lift capacity marked on the lifting device, straps and chains is correct for the weight being lifted. If they are not marked with the lift capacity, do not use them. Inspect lifting straps to ensure they are not damaged. NEVER subject lifting straps to shocks or drop-loading. Failure to follow these directives can result in death or serious personal injury and damage to components.

⚠ DANGER

Ensure the carrier is properly supported on the lifting device. A carrier not supported correctly can fall. Death or serious personal injury and damage to components can result.

8. Place a lift table, transmission jack or other suitable lifting device under the differential carrier to support the assembly. Secure the carrier with straps. Figure 7.5.

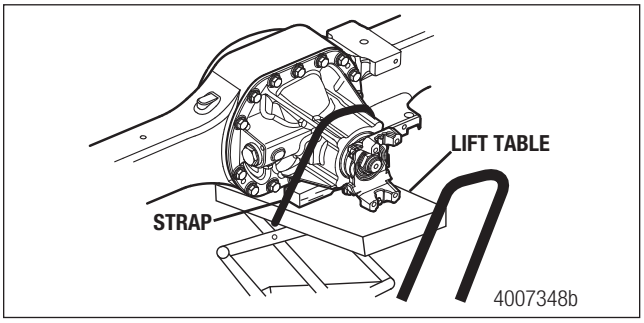


Figure 7.5

9. Remove all but the top two carrier-to-housing capscrews and washers.
10. Loosen, but do not remove, the top two carrier-to-housing fasteners. The fasteners will hold the carrier in the housing.
11. Loosen the differential carrier in the axle housing. Use a dead blow or non-metallic mallet to hit the mounting flange of the carrier at several points.
12. After the carrier is loosened, remove the top two capscrews and washers securing the assembly in the axle housing.

⚠ CAUTION

When using a pry bar, be careful not to damage the carrier or housing flange. Damage to these surfaces will cause oil leaks.

7 Carrier Removal

13. Move the lifting device to remove the carrier from the axle housing. Use a pry bar with a round end to help remove the carrier from the housing.
14. Using a hoist, remove the differential carrier and install it into a carrier repair stand. Do not lift by hand. See Carrier Repair Stand on page 80 for a tool drawing.
15. Shut off the air supply to the DCDL.
16. Disconnect the air line from the main differential actuator assembly coupling.
17. Remove the air line coupling from the main differential actuator assembly.
18. Reconnect the vehicle air line from the inter-axle differential and main differential lock actuator assemblies.
19. Reconnect the wiring harness from the DCDL switch.

Axle Housing Disassembly

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.

⚠ 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.

Disassemble the Axle Housing

1. Remove the wheel end assembly. Refer to Section 5 Wheel End and Axle Shaft Removal on page 16.
2. Remove the carrier assembly. Refer to Section 7 Carrier Removal on page 23.
3. If required, remove the breather from the axle housing. Figure 8.1.

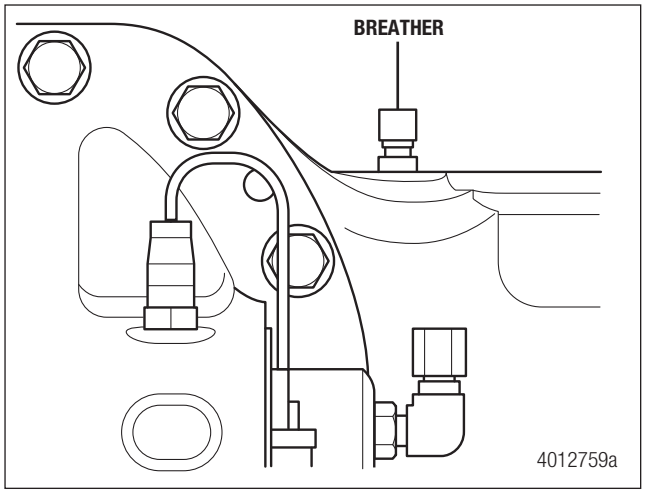


Figure 8.1

4. If required, remove the upper and lower king pin bushings. To facilitate removal, locate the king pin bushing seam and fold it over. Pull the edge with an appropriate tool. Figure 8.2.

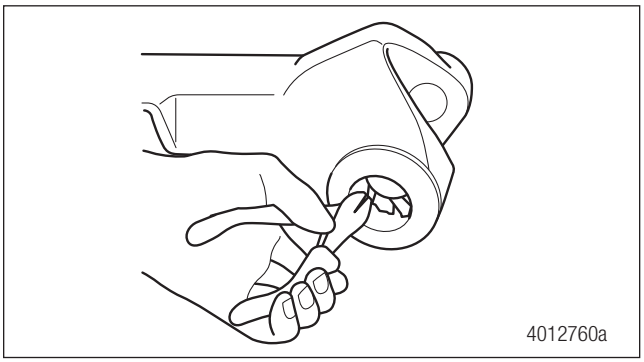


Figure 8.2

5. Remove and discard the inner axle shaft seal in the axle housing. The axle shaft seal should be replaced whenever the axle shaft is removed from the housing or if the seal is leaking oil. Figure 8.3.

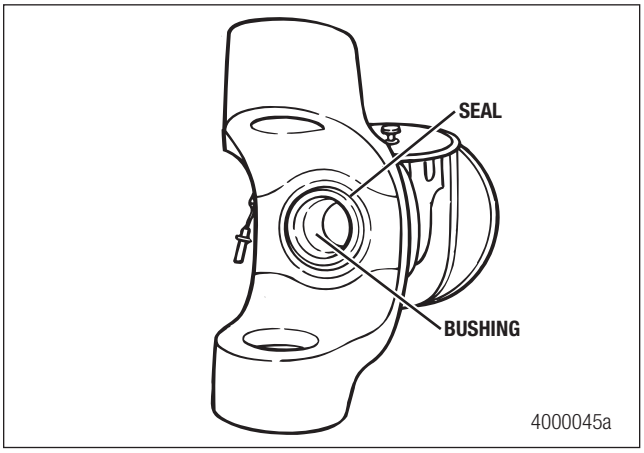


Figure 8.3

6. Inspect the thrust washer in the axle housing for wear or damage and replace if necessary. Figure 8.4.

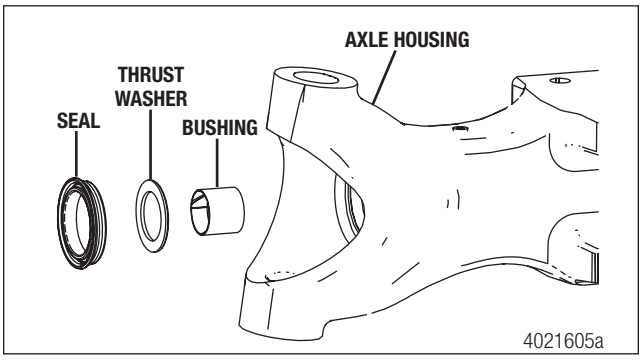


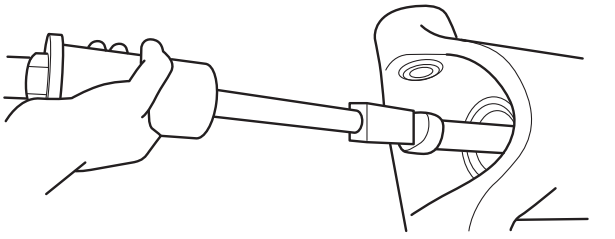
Figure 8.4

8 Axle Housing Disassembly

⚠ CAUTION

Use care when removing the thrust washer and axle shaft bushing to prevent damage to the housing.

7. Inspect the bushing in the axle housing for wear or damage and replace if necessary. If the bushing requires replacement, first remove the axle shaft seal and thrust washer. Then, use a slide hammer to remove the bushing. Discard the seal, thrust washer and bushing, and replace with new during reassembly. Figure 8.4 and Figure 8.5.



4012761a

Figure 8.5

Brakes

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

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.

⚠ 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.

Procedures for EX+™ Brakes on MX-810 Series Axles

The EX+ brakes on MX-810 Series axles are equipped with side-mounted calipers instead of axial-mounted calipers found on the standard brake. This section provides only the service instructions related to the EX+™ brake. Refer to Maintenance Manual MM-0467, EX+™ Air Disc Brake for all other brake service, maintenance and troubleshooting procedures.

Remove the Caliper Assembly

NOTE: These chambers have vent lines (snorkels) that look similar to service and parking brake air lines. Ensure the hoses are correctly marked before removal to ensure correct reassembly.

1. Remove the service chambers. Mark the air hoses for reference during reassembly. Carefully remove the air hoses from the air chamber. Use the correct wrench to remove the air chamber nuts and washers. Figure 9.1.

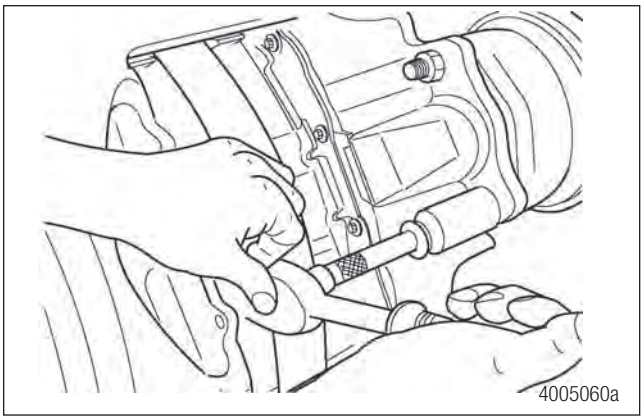


Figure 9.1

2. Cover the exposed air chamber mounting aperture with tape to prevent debris from entering the caliper housing assembly. Figure 9.2.

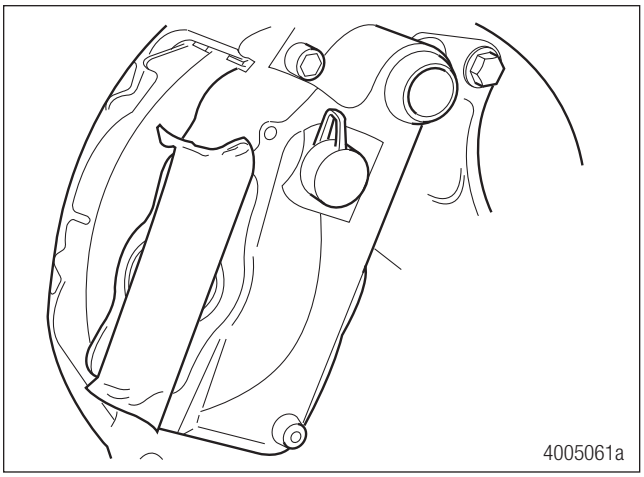


Figure 9.2

3. De-adjust the caliper and remove the brake pads. Refer to Maintenance Manual MM-0467, EX+™ Air Disc Brake.

⚠ WARNING

Caliper mounting bolts should not be reused. Proper torque can not be retained on used bolts. Install new bolts to prevent serious personal injury and damage to components.

4. Use an Allen-head socket wrench to remove the caliper bolts and washers. Use an appropriate lifting device to carefully remove the caliper assembly from the axle. Figure 9.3.

   NOTE: Axles with serial numbers lower than LRS00962355 are equipped with spacers between the caliper and knuckle. Keep these spacers for reassembly.

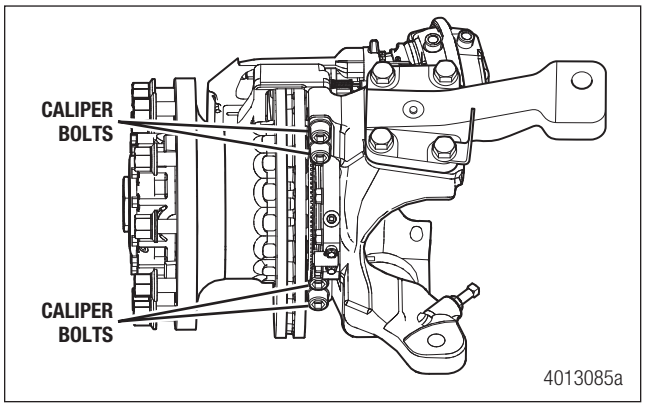


Figure 9.3

ABS Sensor Replacement

NOTE: Some axle models have the ABS sensor mount through the knuckle. Other models have a sensor mounting bracket attached to the spindle with fasteners.

For Sensor Mounting Brackets Attached to the Spindle:

1. Disconnect the sensor wire cable from the chassis harness.
2. Remove the sensor from the inboard side of the knuckle using a twisting motion. Figure 9.4.

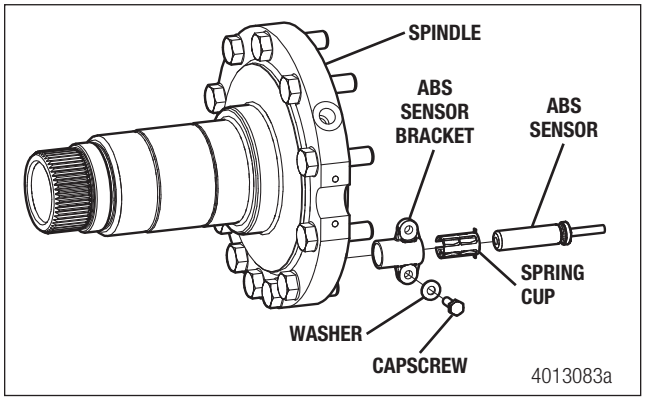


Figure 9.4

3. Connect the new ABS sensor wire cable to the chassis harness.
4. Remove the capscrews, washers and ABS sensor bracket from the outboard side of the knuckle/spindle assembly.
5. Remove the spring clip from the ABS sensor bracket.
6. Apply a light coat of anti-corrosion lubricant to the spring clip.
7. Install the sensor spring clip into the ABS sensor bracket until it stops. The spring clip tabs must be on the inboard side of the bracket.
8. Install the ABS sensor bracket using capscrews with washers onto the knuckle/spindle assembly. Tighten to the torque listed in Section 17 Torque Specifications on page 63. Figure 9.4.
9. Apply a light coat of anti-corrosion lubricant to the ABS sensor.
10. Install the sensor through the inside of the knuckle/spindle completely into the sensor spring clip until it contacts the tone ring.

For Sensor Mounting Directly Through the Knuckle:

1. Disconnect the sensor wire cable from the chassis harness.
2. Remove the ABS sensor wire clamp bolt. Figure 9.5.

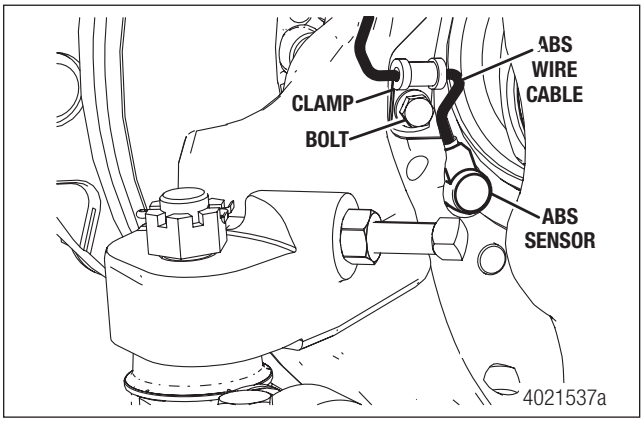


Figure 9.5

3. Remove the wire clamp from the old sensor wire.
4. Remove the sensor from the inboard side of the knuckle using a twisting motion.
5. Remove the old sensor spring clip from the knuckle.
6. Connect the new ABS sensor wire cable to the chassis harness.
7. Apply a light coat of anti-corrosion lubricant to the spring clip.

8. Install the sensor spring clip into the knuckle until it stops. The spring clip tabs must be on the inboard side the knuckle.

9. Apply a light coat of anti-corrosion lubricant to the ABS sensor.

10. Install the sensor through the inside of the knuckle/spindle completely into the sensor spring clip until it contacts the tone ring.

11. Remount the ABS sensor wire clamp, if necessary, and reinstall the bolt. Tighten to specification. Refer to Section 17 Torque Specifications on page 63.

Install the Caliper Assembly

⚠ DANGER

Follow all safety guidelines and instructions provided by the lifting device manufacturer. Inspect lifting straps to ensure they are not damaged. NEVER subject lifting straps to shocks or drop-loading. Death or serious personal injury and damage to components can result.

1. Use an appropriate lifting device to place the caliper assembly over the rotor.

2. Align the caliper bolt holes. Assemble the caliper to the knuckle using the caliper carrier bolts and washers. For axles with serial numbers lower than LRS00962355, spacers must also be installed between the caliper and knuckle. Tighten to specification. Refer to Section 17 Torque Specifications on page 63.

3. Check the caliper assembly to verify it slides by hand.

4. Install the brake pads, if applicable.

5. Before installing the air chamber onto the caliper assembly, ensure the perforated transit plug is removed from the caliper chamber seal by pulling the tab. Figure 9.6 and Figure 9.7.

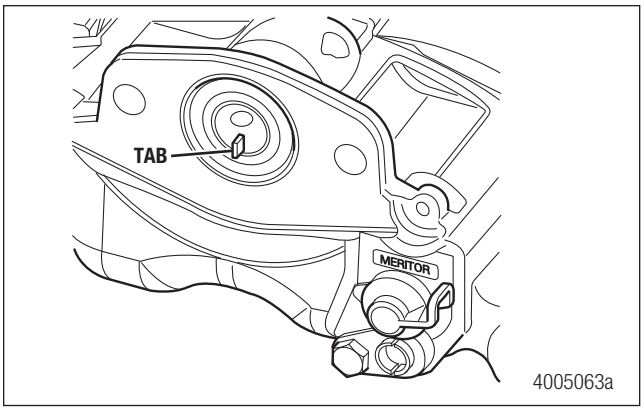


Figure 9.6

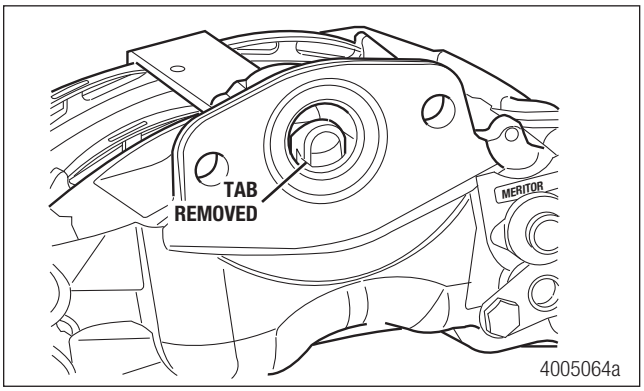


Figure 9.7

6. Install the air chamber onto the caliper assembly. Refer to the manufacturer's instructions.

7. Inspect the rotors, install the pads and set the initial brake pad-to-rotor clearance. Refer to Maintenance Manual MM-0467, EX+™ Air Disc Brake.

Measure the Rotor Thickness

⚠ CAUTION

Replace the rotor if it reaches the minimum allowable rotor thickness as marked on the rotor to prevent damage to components.

1. Use a micrometer to measure the rotor thickness. When replacing the brake pads, the rotor should be replaced if the rotor thickness is less than 1.46” (37 mm). Figure 9.8.

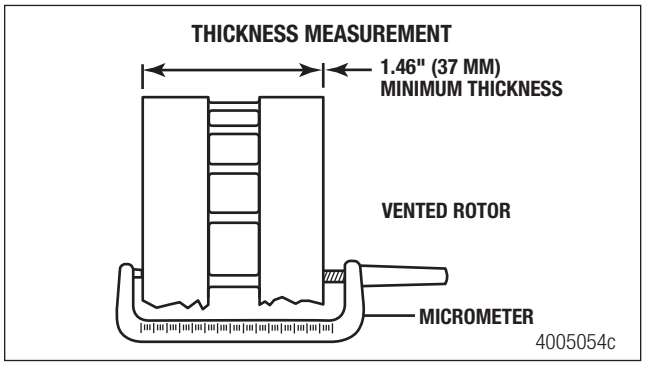


Figure 9.8

2. Check for uneven rotor wear. Using the pad retainer as a gauge, place it between the rotor surface and carrier pad abutment. Check both the inboard and outboard sides of the rotor. Figure 9.9 and Figure 9.10.

   If the pad retainer fits into the gap on either side:
   Replace the rotor.

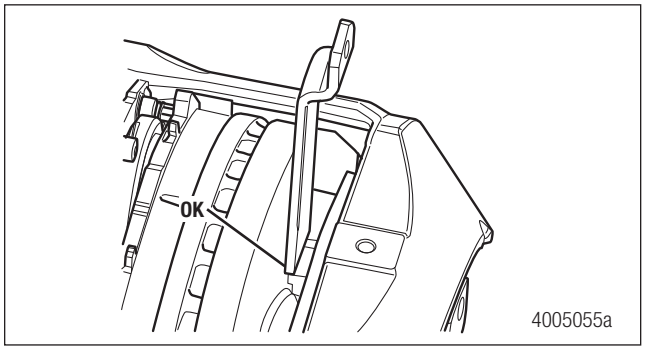


Figure 9.9

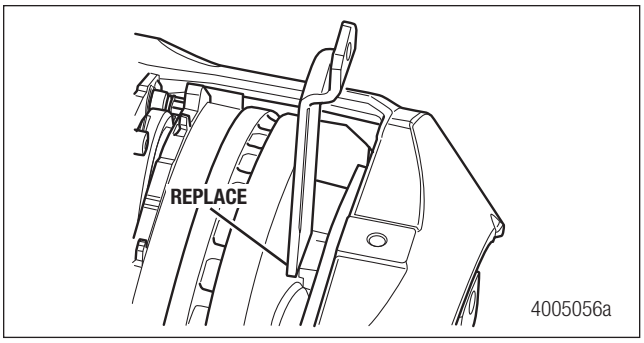


Figure 9.10

Prepare Parts for Assembly

Hazard Alert Messages

Read and observe all hazard alert messages in this publication.

⚠ DANGER

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

- Wear 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 cleaning the axle, close or put a cover over all openings in the case.
- Clean the outside of the axle assembly 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 the 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 bearings.

10 Prepare Parts for Assembly

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.

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.

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.

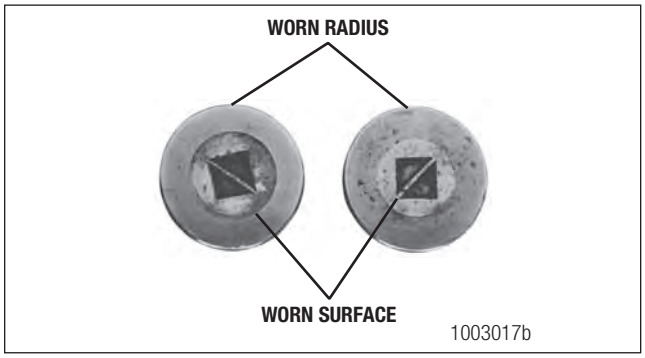


Figure 10.1

- 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.

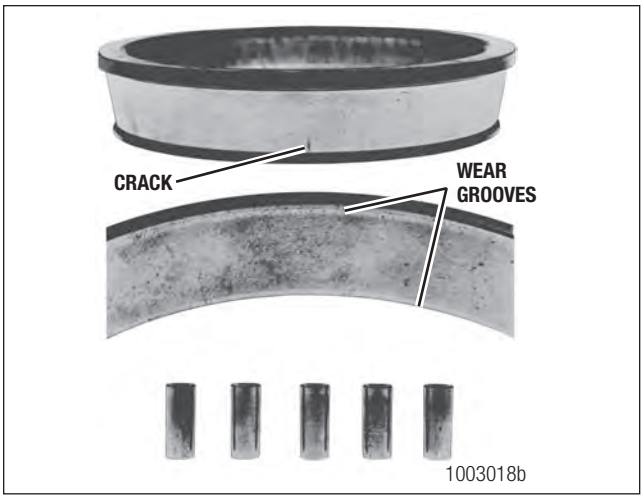


Figure 10.2

- Bright wear marks appear on the outer surface of the roller cage.

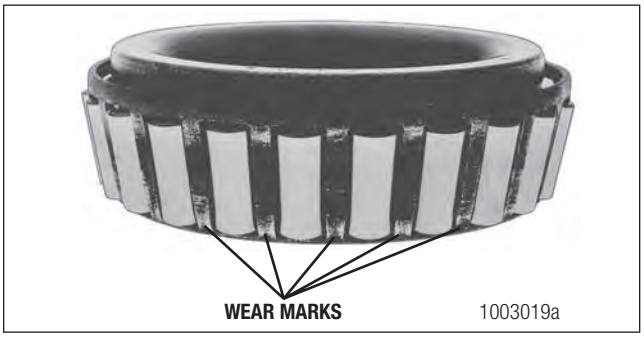


Figure 10.3

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

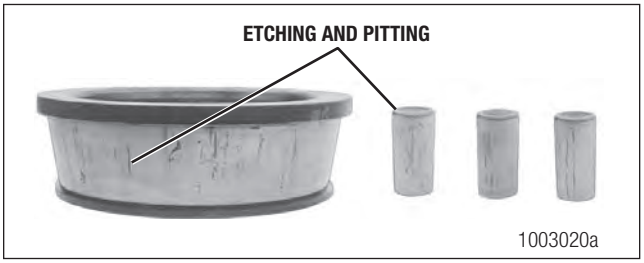


Figure 10.4

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

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 bushing 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.
- Replace the inner and outer axle shaft seals with new seals during reassembly.
- Inspect the inner and outer axle shaft bushings and thrust washers in the housing and spindle for wear or damage. Replace worn or damaged bushings and thrust washers.

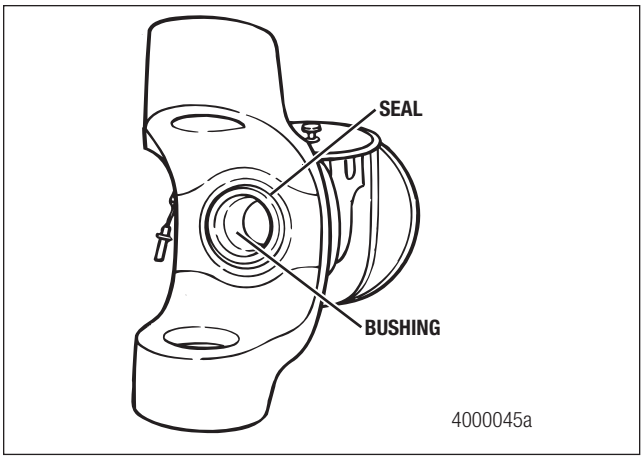


Figure 10.5

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. Replace damaged seals. Verify that 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. Refer to Section 17 Torque Specifications on page 63.

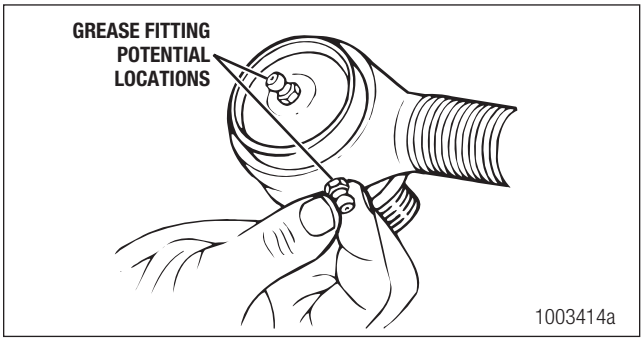


Figure 10.6

10 Prepare Parts for Assembly

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. Refer to Section 17 Torque Specifications on page 63.

Axle Housing Assembly

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.

⚠ 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.

King Pin Bushing Installation

1. Use the king pin bushing driver tool (part number 3256-Y-1299) to drive the new upper and lower king pin bushings into the socket bore until the bushings are level with the outside of the socket. Refer to King Pin Bushing Driver (3256-Y-1299) on page 76. Figure 11.1, Figure 11.2, and Figure 11.3.

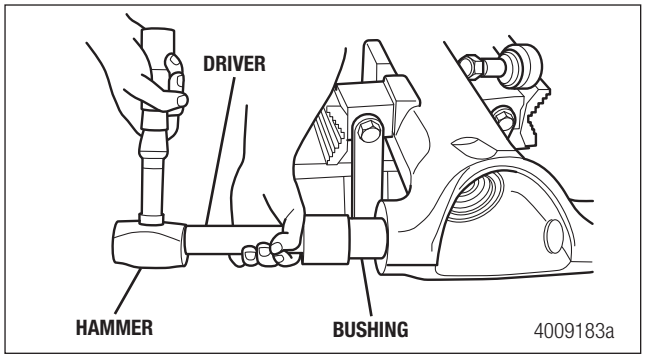


Figure 11.1

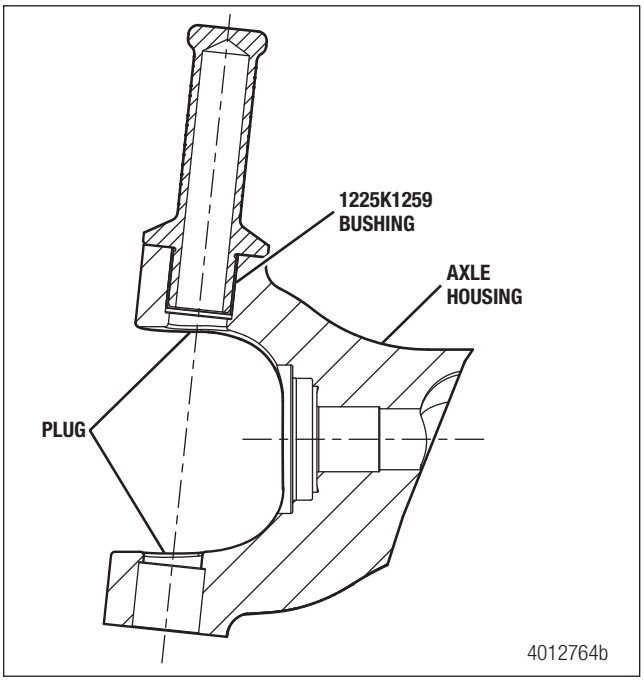


Figure 11.2

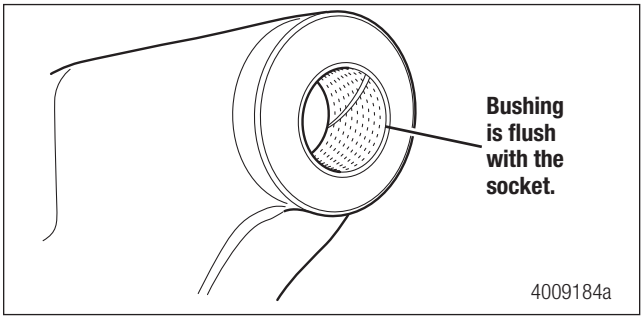


Figure 11.3

2. Apply a light coating of grease to the bushings before assembling the knuckle to the axle.

Axle Shaft Bushing and Seal Installation

1. If disassembled, assemble the wheel end components. Refer to Section 13 Wheel End Assembly on page 41.

2. If the inner axle bushing was removed from the axle housing, apply a layer of Loctite® 680 sealant or equivalent on the outside diameter of the new bushing and install it into the axle housing. Figure 11.4.

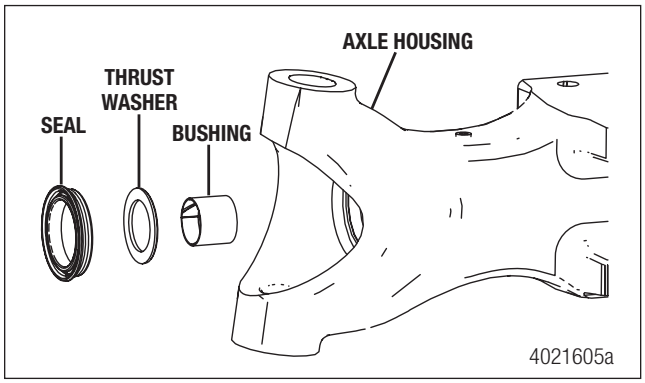


Figure 11.4

3. Using the appropriate bushing driver, install a new bushing and thrust washer into the axle housing. See Section 20 Special Tools on page 69 for the appropriate driver. Figure 11.5.

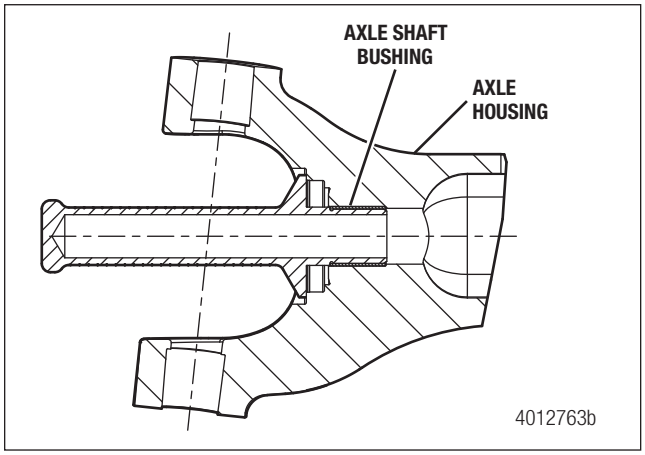


Figure 11.5

4. Install the thrust washers until fully seated in the bore.

5. Use the axle seal installation tool (part number 3256-J-1050) to install the seals into the housing. See Axle Shaft Seal Driver (3256-J-1050) on page 70. Figure 11.6.

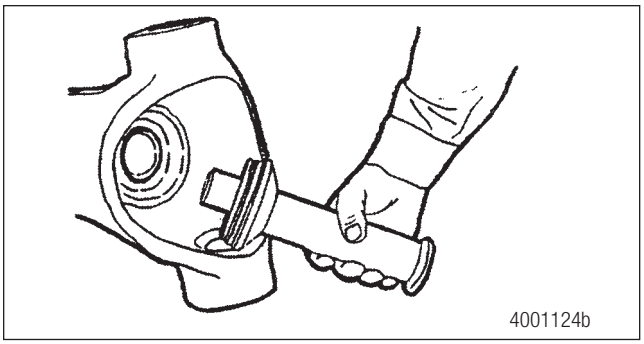


Figure 11.6

6. Apply a liberal amount of oil or grease to the shaft bushing. Figure 11.7.

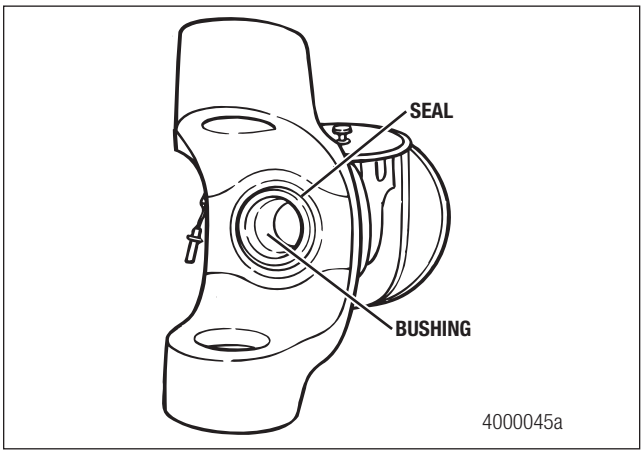


Figure 11.7

Carrier Installation

Hazard Alert Messages

Read and observe all hazard alert messages in this publication.

⚠ DANGER

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

- Wear 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

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.

⚠ 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.

Install the Differential Carrier

1. Clean the inside of the axle housing and the mounting surface where the carrier fastens. Remove the old gasket material. Use a cleaning solvent and rags to remove dirt. Allow the cleaned areas to dry. See Section 10 Prepare Parts for Assembly on page 33.

2. Inspect the axle housing for damage. Repair or replace the axle housing. See Prepare Parts for Assembly on page 33.

3. Ensure the driver-controlled differential lock (DCDL) is in the engaged or locked position. See DCDL Engagement or Lockout, If Equipped – Manual Method on page 24 or DCDL Engagement or Lockout, If Equipped – Auxiliary Air Supply Method on page 25 for lockout instructions.

⚠ 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.

4. Apply a continuous bead of Loctite® 5699 gasket material to the mounting surface of the housing where the carrier fastens. Figure 12.1.

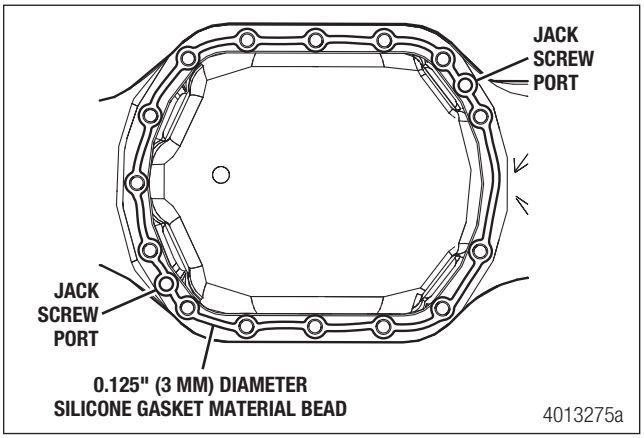


Figure 12.1

12 Carrier Installation

⚠ DANGER

Follow all safety guidelines and instructions provided by the lifting device manufacturer. Check that the lift capacity marked on the lifting device, straps and chains is correct for the weight being lifted. If they are not marked with the lift capacity, do not use them. Inspect lifting straps to ensure they are not damaged. NEVER subject lifting straps to shocks or drop-loading. Failure to follow these directives can result in death or serious personal injury and damage to components.

⚠ DANGER

Ensure the carrier is properly supported on the lifting device. A carrier not supported correctly can fall. Death or serious personal injury and damage to components can result.

⚠ CAUTION

Use caution when lowering the carrier to avoid damaging the ring gear on the housing flange.

5. Use a hoist to remove the carrier from the repair stand and place it on a lift table, transmission jack or other suitable lifting device. Secure the carrier with straps.

6. Immediately install the carrier into the axle housing. To help seat the carrier, try to keep the flanges of the axle and carrier parallel during installation.

⚠ CAUTION

NEVER use a hammer or mallet to install the carrier. A hammer or mallet will damage the mounting flange of the carrier and cause oil leaks.

7. Install the washers and carrier capscrews. Hand-tighten the carrier capscrews.

8. Tighten the two directly opposing capscrews to seat the carrier. Once the carrier is seated, tighten all of the capscrews to specification. Refer to Section 17 Front Drive Steer Axle on page 63. Figure 12.2.

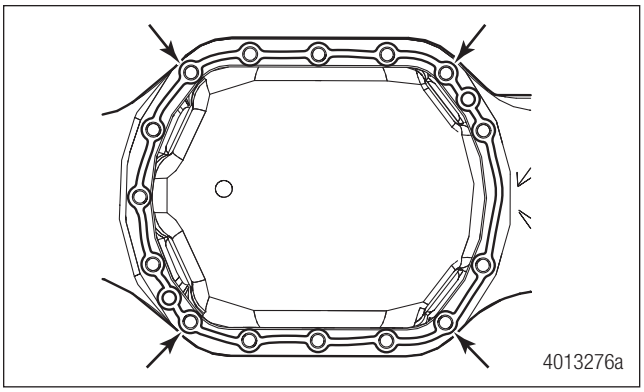


Figure 12.2

9. Allow the Loctite® 5699 gasket material to cure for 60 minutes prior to refilling lube.

10. Connect the driveline universal joint to the input yoke on the carrier.

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.

⚠ 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.

Spindle End Assembly Installation

⚠ 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.

1. If a new bushing is required, apply a layer of Loctite® 680 sealant or equivalent on the outside diameter of the bushing. Figure 13.1.

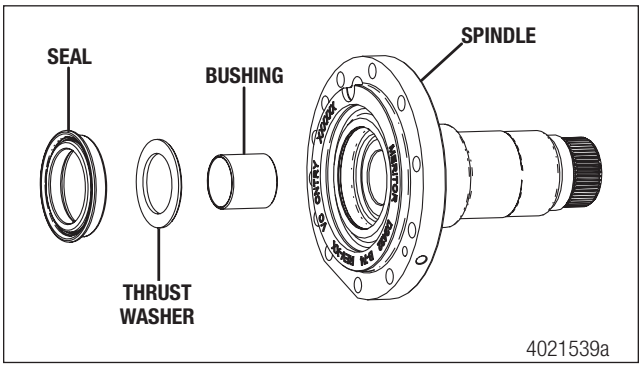


Figure 13.1

2. Use the axle shaft bushing installation tool (part number 3256-J-1050) to install the bushing into the spindle until it is fully seated. See Axle Shaft Seal Driver (3256-J-1050) on page 70. Figure 13.2.

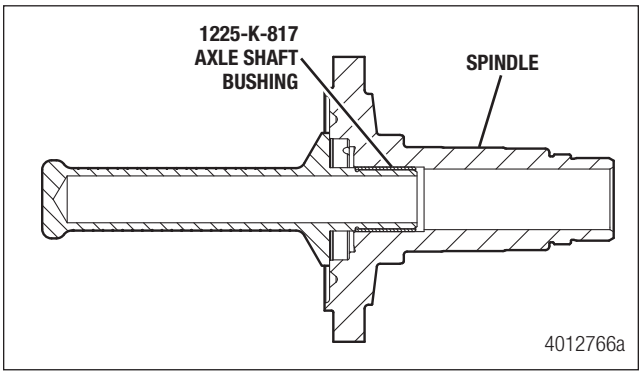


Figure 13.2

3. Install the thrust washer into the spindle.

4. Use the axle shaft seal installation tool (part number 3256-J-1050) to install the seal into the wheel end spindle. See Axle Shaft Seal Driver (3256-J-1050) on page 70.

5. Align the spindle end assembly with the bolt holes and ABS sensor bracket hole. Place the spindle end assembly in position on the steering knuckle. Figure 13.3.

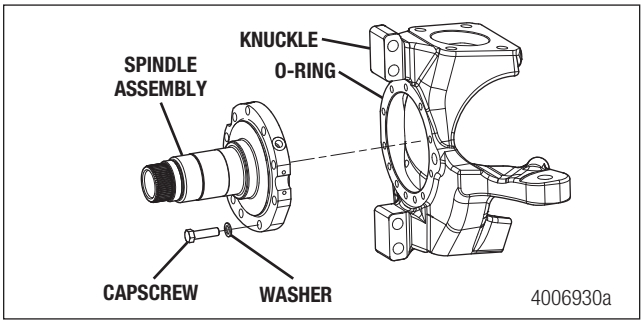


Figure 13.3

6. Install and tighten the capscrews in a crisscross pattern to the specified torque. See Section 17 Torque Specifications on page 63.

Wheel Studs Installation

⚠ DANGER

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

1. If the wheel studs were removed from the hub, place the hub into a press with the disc side at the bottom.
2. Align the grooves on the studs with the grooves in the hub stud holes. Press the studs in until fully seated. Figure 13.4.

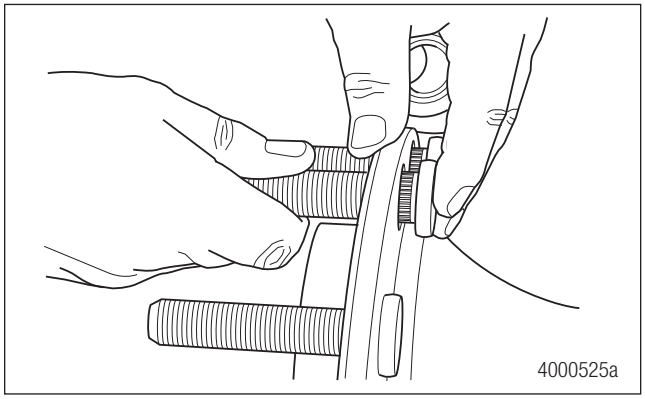


Figure 13.4

Hub and Rotor Assembly

⚠ DANGER

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

⚠ 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.

1. Use a press and appropriate driver to install the inner and outer bearing cups into the hub. Use driver part number 3256-A-1301 for the outer bearing cup and driver part number 3256-B-1302 for the inner bearing cup. See Hub Outer Bearing Cup Driver (3256-A-1301) on page 69 and Hub Inner Bearing Cup Driver (3256-B-1302) on page 69 for tool information. Figure 13.5.

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

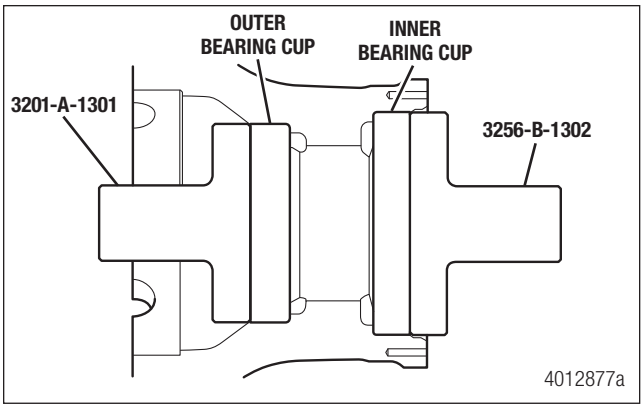


Figure 13.5

2. If equipped with CTIS, fill the inner bearing cone and the bearing cup race with grease. See Table H: Hub Bearing Grease Specifications (CTIS Greased Hub Bearings) on page 59.
3. If removed, install the rotor. Refer to Install the Rotor on page 43.

ABS Tone Ring Installation (Press-Fit Style)

If the tone ring was removed, use the following procedure to install a new one.

⚠ 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.

1. Apply Loctite® 620 adhesive sealant or equivalent to the ABS tone ring hub seat in a continuous band 0.125" wide (3 mm) 360 degrees around the hub.

⚠ CAUTION

Only use an appropriate oven to heat the tone ring; do not use a torch or flame. Using a torch or flame can warp the tone ring or damage the tone ring coating.
When heating the tone ring, do not allow the tone ring to exceed a temperature of 400°F (204°C) or damage to the tone ring coating can occur.

2. Heat the ABS tone ring in an appropriate oven approximately 20 minutes until the ring reaches a temperature of 350°F (177°C). Do not use a torch or flame to heat the tone ring. Do not allow the tone ring to exceed a temperature of 400°F (204°C).

⚠ WARNING

Wear heat-resistant gloves and appropriate protective clothing when working with heating equipment and heated parts. Coming into contact with hot surfaces and parts can result in serious personal injury.

3. Using heat resistant gloves, drop the ABS tone ring onto the hub journal and press down with hand force. The tone ring must seat against the mounting seat shoulder of the hub. A brass drift can be used to ensure it is fully seated. Figure 13.6.

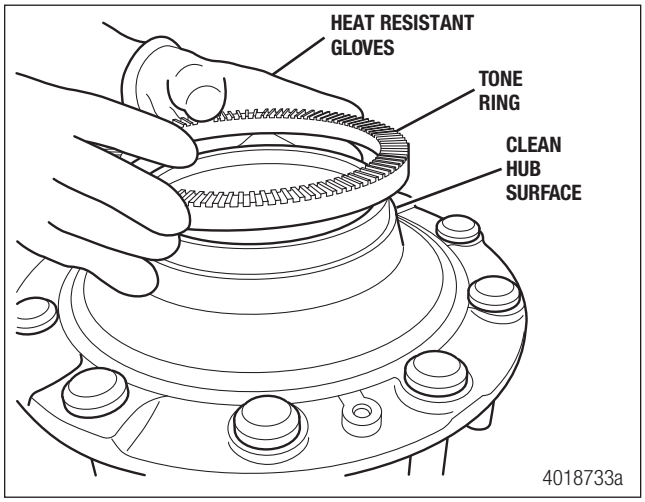


Figure 13.6

⚠ WARNING

The tone ring will remain hot for a period of time after installation. Allow the tone ring to cool before continuing assembly. Contact with heated parts can result in serious personal injury.

4. Allow the tone ring and hub to cool before continuing to service the hub.

5. Check the hub for any gaps between the ABS tone ring and the hub seat.

⚠ CAUTION

Use care to ensure the ABS tone ring is not damaged. If the tone ring is damaged, replace it with a new tone ring.

6. Use a 0.003” (0.076 mm) feeler gauge at four places 90 degrees apart to ensure the tone ring is fully seated and is not cocked on the hub. Figure 13.7 and Figure 13.8.

If a gap between the tone ring and the hub seat shoulder greater than 0.003" (0.076 mm) is found: Use the appropriate driver to seat the ABS tone ring against the hub seat shoulder.

If the ABS tone ring will not seat with less than 0.003" (0.076 mm) gap: Remove the tone ring and install a new one.

Figure 13.7

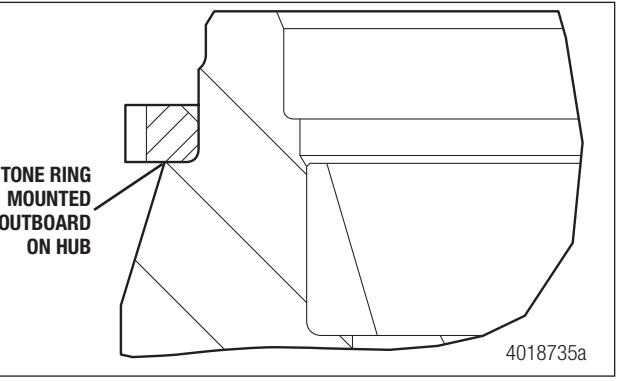


Figure 13.8

7. Continue to hub assembly and installation.

Install the Rotor

⚠ WARNING

Use the correct fasteners. Incorrect fasteners may result in an insufficient clamping load or damage to the caliper or wheel. Serious personal injury and damage to components can result.

1. Always use new bolts to attach the new rotor to the hub.

⚠ 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.

2. Apply a 0.63" (16 mm) bead Loctite® 620 adhesive sealant or equivalent to the hub-to-rotor bolts. Figure 13.9.

   NOTE: Loctite® 620 adhesive sealant takes 24 hours to completely cure.

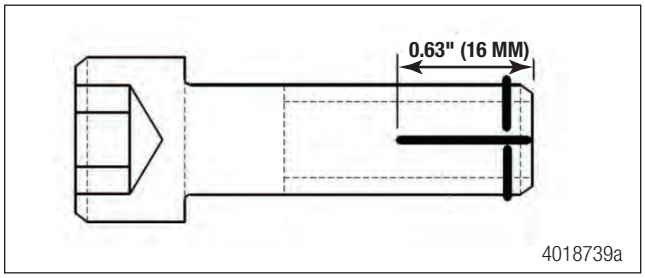


Figure 13.9

3. Tighten the hub-to-rotor bolts in a crisscross pattern to specification. Refer to Section 17 Torque Specifications on page 63.

4. After the end of the tightening sequence, go back to the first bolt and check/re-tighten as needed. Figure 13.10.

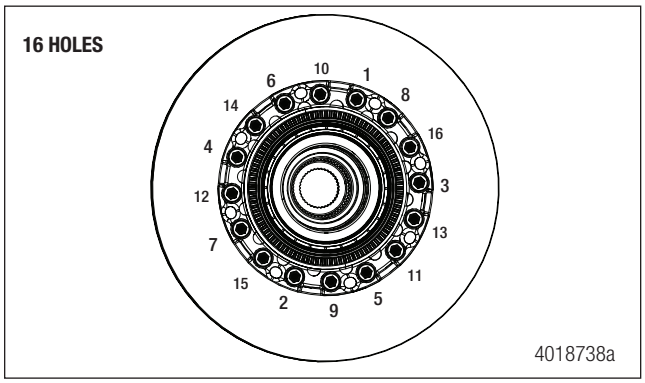


Figure 13.10

ABS Tone Ring Installation (Bolt-on Style)

1. Prior to installing the tone ring to the hub, install a new o-ring into the groove on the back face of the tone ring. Figure 13.11.

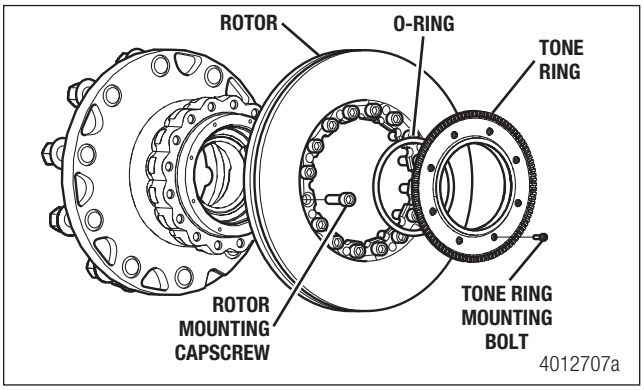


Figure 13.11

2. Place the tone ring in position on the hub and align the mounting bolt holes.

3. Apply Loctite® 680 threadlocker to the tone ring mounting bolts. Install and hand-tighten the tone ring mounting bolts.

4. Tighten the tone ring mounting bolts in a crisscross pattern to the torque specified in Section 17 Torque Specifications on page 63.

5. After the end of the tightening sequence, go back to the first bolt and check/re-tighten as needed. Figure 13.12.

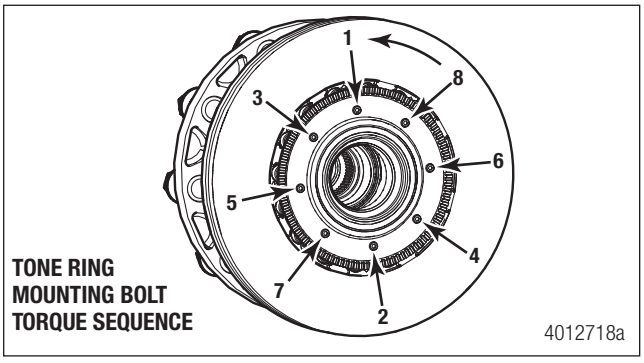


Figure 13.12

6. If equipped with CTIS, pack the inner bearing cone and the bearing cup race cavity with grease. See Table H: Hub Bearing Grease Specifications (CTIS Greased Hub Bearings) on page 59.

   NOTES:

   - Ensure the inner bearing cone cavity is fully packed.
   - Avoid getting grease onto the CTIS seals.

7. Install a new hub seal using the appropriate driver and ensure the seal is fully seated. See Section 20 Special Tools on page 69. Figure 13.13.

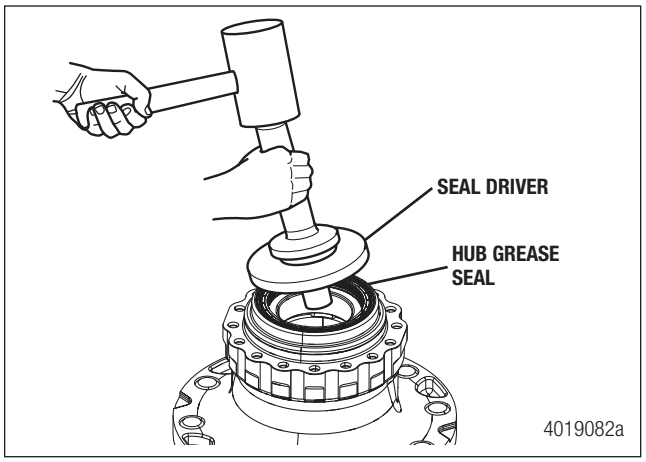


Figure 13.13

8. Install the nose cone tool (part number 3256-C-1303) onto the spindle to facilitate hub installation and protect the hub oil seal. See Nose Cone (3256-C-1303) on page 73.

⚠ DANGER

Follow all safety guidelines and instructions provided by the lifting device manufacturer. Inspect lifting straps to ensure they are not damaged. NEVER subject lifting straps to shocks or drop-loading. Death or serious personal injury and damage to components can result.

9. Install the hub assembly onto the spindle using an appropriate lifting device. Remove the nose cone tool. Verify the inner bearing is flat against the face of the spindle. Figure 13.14.

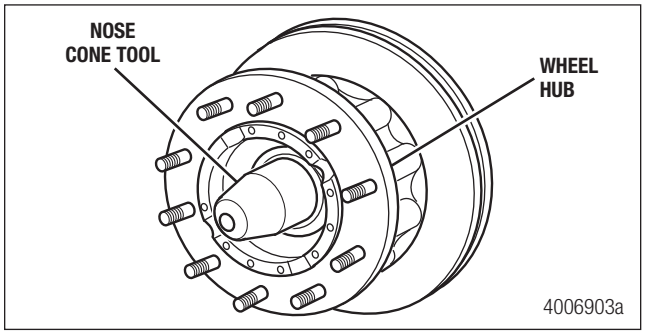


Figure 13.14

10. Install the outer bearing cone onto the spindle and press it into its cup inside the hub. Figure 13.15.

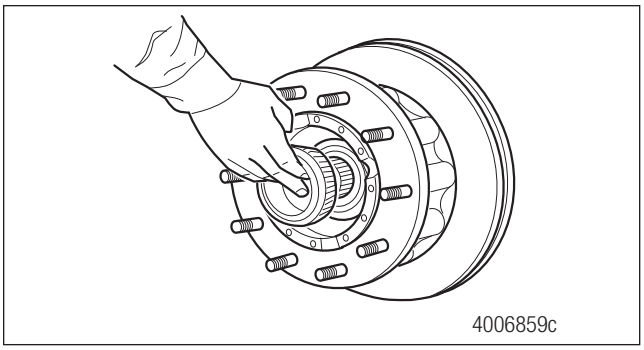


Figure 13.15

Adjust the Wheel Bearings

1. Install the inner wheel bearing adjusting nut onto the spindle against the outer bearing. Tighten the adjusting nut while rotating the hub in both directions to seat the bearings. See Section 17 Torque Specifications on page 64. Figure 13.16.

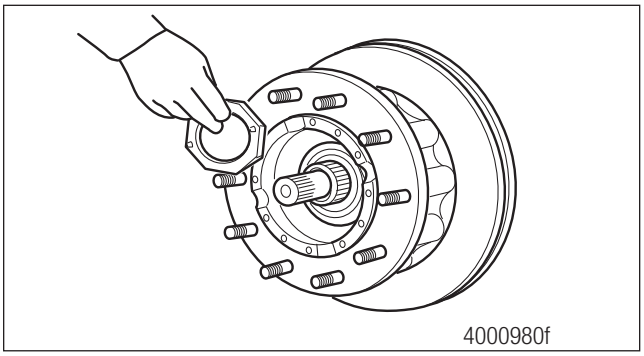


Figure 13.16

⚠ CAUTION

Do not loosen the nut more than one spline tooth from the initial torque setting in the Specifications section. Damage to components can result.

2. Back off the adjusting nut a quarter turn, 90-degrees, and tighten using the wheel end lock nut socket tool. See Wheel End Lock Nut Socket on page 72. See Section 17 Torque Specifications on page 64. Do not over tighten.

3. Install the inner side gear. The holes on the side gear back face must engage with the adjusting nut pins. Figure 13.17. To align the adjusting nut pins with the side gear holes, use the following procedure:

   a. Mark the internal spline that locates one hole on the back of the side gear.

   b. Mark the external spline on the spindle that locates one pin position on the adjusting nut.

   c. Match the two marks when assembling to align the pins with the holes on the side gear.

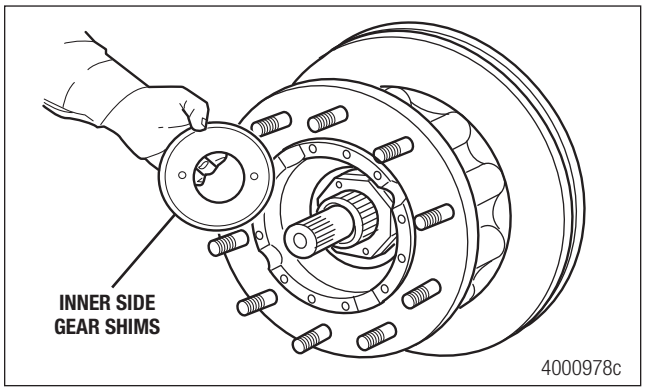


Figure 13.17

4. Measure the bearing end play as follows:

   a. Place a dial indicator on the wheel end with the magnetic base mounted on the hub assembly flange/ shoulder and the tip placed at a 90-degree angle on the edge of the spindle.

   NOTE: A dial indicator with an extension may be required to clear the axle shaft. Figure 13.18 and Figure 13.19.

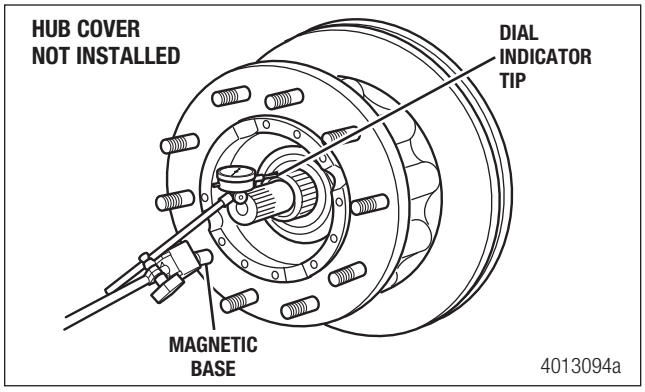


Figure 13.18

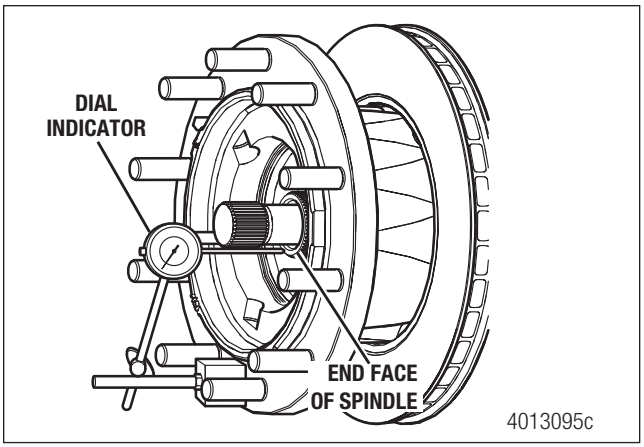


Figure 13.19

   b. Rotate the hub while using hand force to push the hub toward the knuckle.

   c. Zero the dial indicator.

   d. Use hand force at the 3 o'clock and 9 o'clock positions to pull the hub outward. The total movement observed is the end play reading. The end play must be 0.001-0.005" (0.025-0.127 mm).

   If end play is 0.001-0.005" (0.025-0.127 mm): The bearings do not need adjustment.

   If end play is not 0.001-0.005" (0.025-0.127 mm): Loosen the adjusting nut, repeat the alignment procedure, and recheck until the correct end play is achieved.

5. Remove the inner side gear.

6. Install the appropriate shims to achieve the 2.168-2.173" (55.066-55.194 mm) dimension from the shim pack to the face of the hub. Place a straight edge across the hub and measure using a depth gauge micrometer. The depth measurement reading should be reduced by the thickness of the straight edge. Figure 13.20, Figure 13.21 and Figure 13.22.

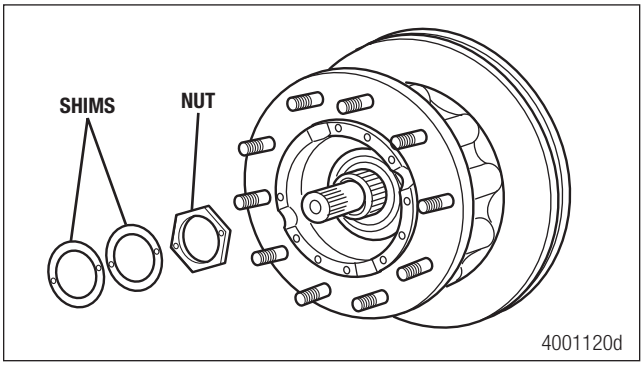


Figure 13.20

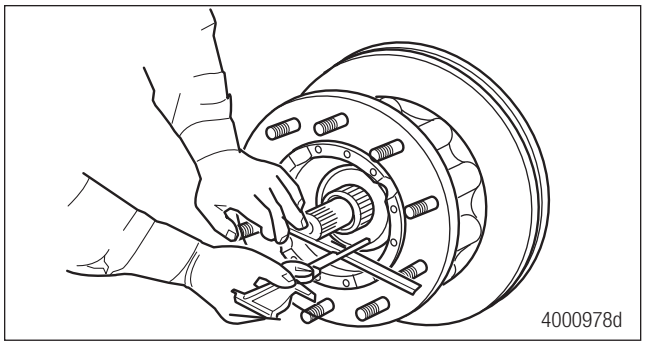


Figure 13.21

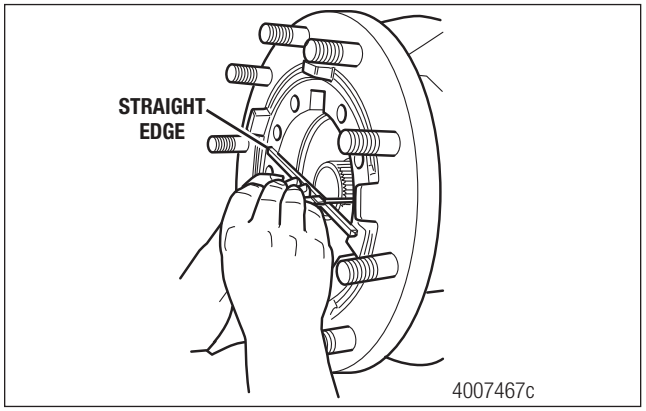


Figure 13.22

7. Apply a light amount of oil to the shims to hold them together and in correct position when installed on the nut. Install the shims so the holes in the shims align with pins of the wheel bearing retaining nut.

8. Install the inner side gear.

Wheel End Components

1. Apply grease to the thrust washer and thrust bearing. Use only enough grease to aid in assembly. See Table H: Hub Bearing Grease Specifications (CTIS Greased Hub Bearings) on page 59.

2. Install the side gear thrust washer and side gear thrust bearing into the hub cover. Figure 13.23.

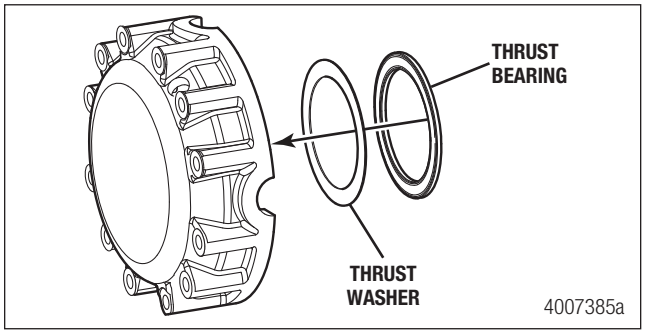


Figure 13.23

3. Apply a thin film of oil and install the four radial pinion bearings, bevel pinions, thrust bearings, round thrust washers, and square thrust washers onto the spider. Install the four o-rings onto the spider without oil. Figure 13.24.

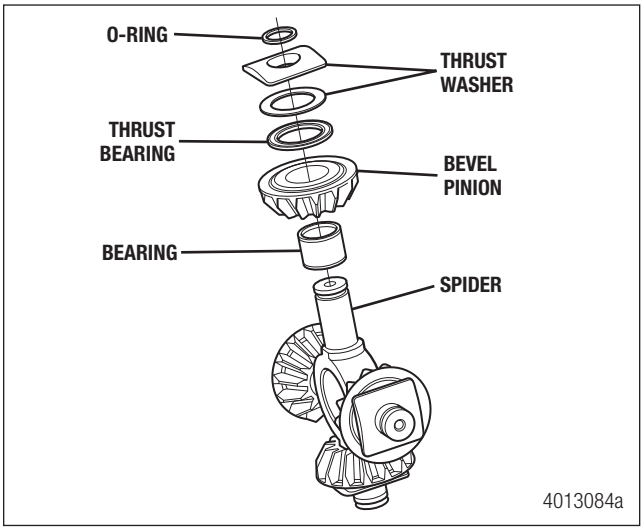


Figure 13.24

4. Install the spider and pinion assembly into the hub. Figure 13.25.

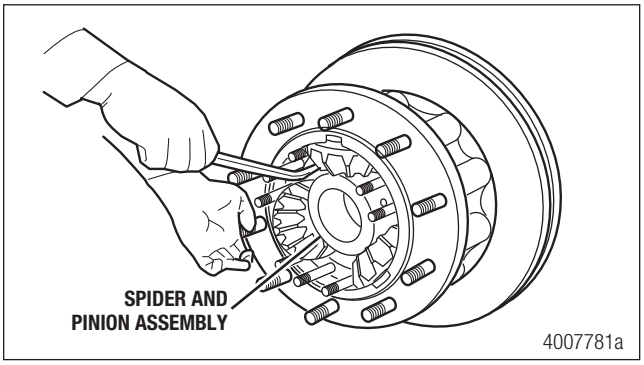


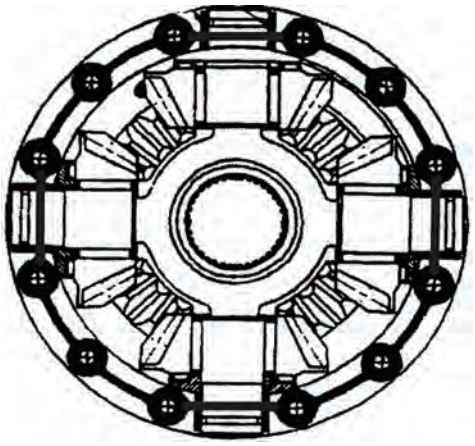
Figure 13.25

5. Install the outer side gear into the hub.

⚠ 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.

6. Apply Loctite® 5699 adhesive sealant to the hub cover along both spider chamfers and around the holes. Figure 13.26.

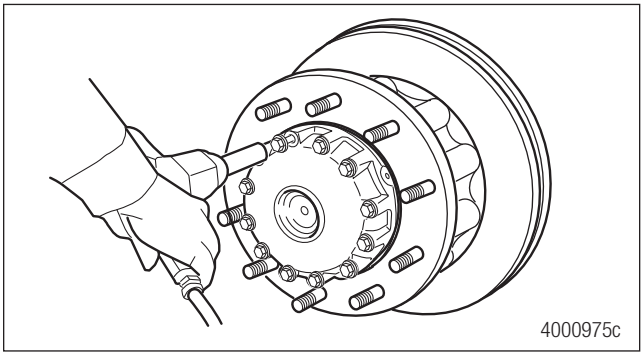


WHEEL END HUB AND COVER SEALANT PLACEMENT 4001122b

Figure 13.26

7. Apply Loctite® 242 threadlocker to the 12 hub cover capscrews.

8. Install the hub cover onto the wheel end assembly. Install and tighten the capscrews. See Section 17 Torque Specifications on page 64. Figure 13.27.



4000975c

Figure 13.27

9. Ensure the rotor braking surfaces are free of oil, grease, and other contaminants.

Tire and Wheel Assembly Lug Nut Tightening

⚠ WARNING

The wheel end must be at ambient air temperature or cooler when tightening the lug nuts. Do NOT tighten the lug nuts when the wheel end is above ambient air temperature or the lug nut studs can become damaged. Serious personal injury or damage to components can result.

Refer to the OEM instructions and torque values when installing the tire and wheel assembly.

Wheel End and Axle Shaft Installation

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.

⚠ 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.

⚠ 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.

Axle Shaft and Wheel End Installation

1. If the axle shaft was removed from the wheel end, the axle seal must be replaced prior to reinstalling the axle shaft into the wheel end.

⚠ CAUTION

Do not retract the shaft after it is fully seated or damage to the seal will occur.

2. Insert the shaft into the wheel end first. The shaft must fully seat against the seal. The shaft will bottom out solidly when the seal is fully seated. Do not retract the shaft after it is fully seated or the axle shaft seal will need to be replaced. Figure 14.1.

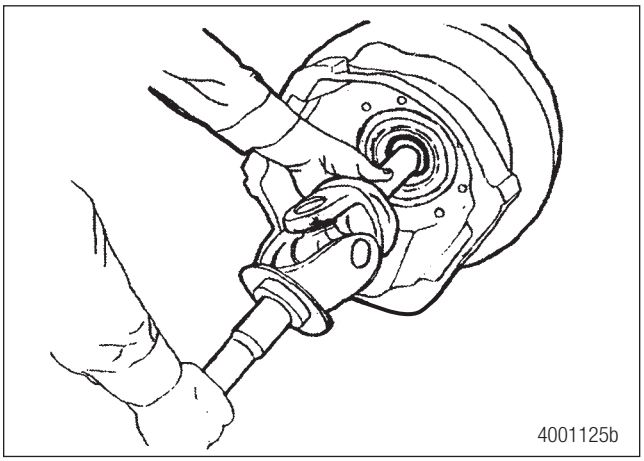


Figure 14.1

3. Attach the axle shaft tool (part number 3256-B-1016) to the outer portion of the axle shaft. See Axle Shaft Removal Tool (3256-B-1016) on page 74 for tool information. Figure 14.2.

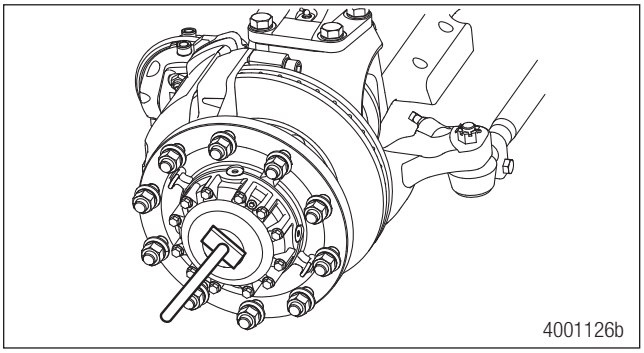


Figure 14.2

4. Using a hoist, position the wheel end and shaft assembly at the correct height for assembly into the housing. Figure 14.3.

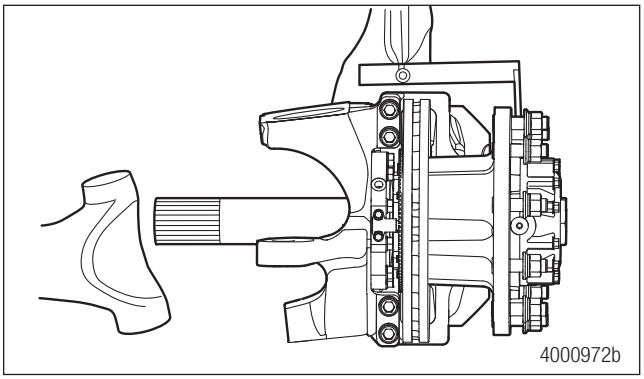


Figure 14.3

5. The axle shaft seal in the housing must be replaced prior to reinstalling the shaft into the housing. See Axle Shaft Bushing and Seal Installation on page 38.

6. Insert the wheel end and shaft into the housing. The seal must be fully seated on the shaft. Do not retract the shaft after it is fully seated.

7. Install the steering arm and king pin caps according to the procedure in the following section.

8. Install the brake caliper assembly. See Install the Caliper Assembly on page 31.

Steering Arm and King Pin Installation

1. Prior to installation, pack the thrust bearing with grease. See Table K: Front Axle Grease Specifications on page 62.

2. Using Meritor-approved grease, lubricate the surfaces of the lower king pin and king pin bushing inside the axle housing. Figure 14.4 and Figure 14.5.

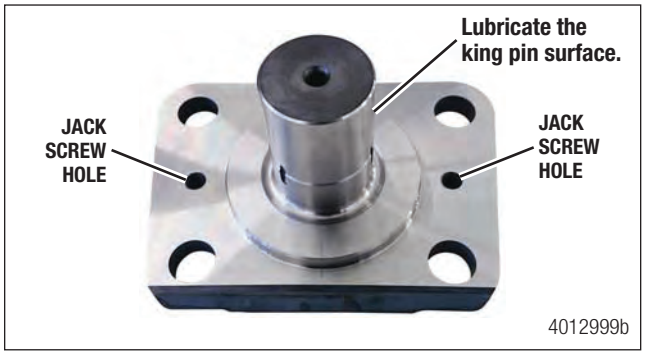


Figure 14.4

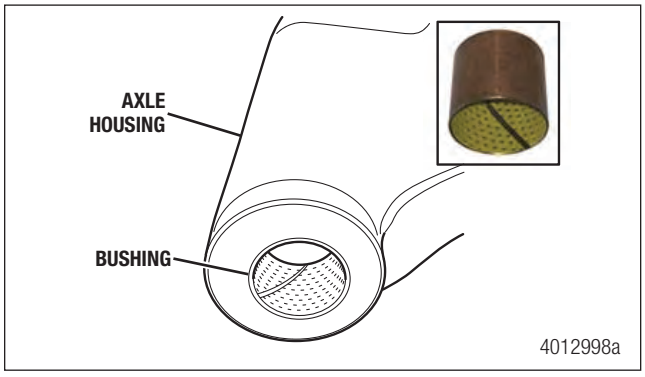


Figure 14.5

3. Install the thrust bearing over the lower king pin. The seal side of the thrust bearing must be seated against the lower king pin. Figure 14.6.

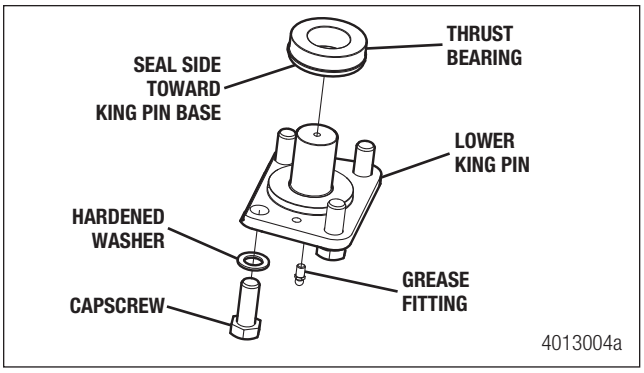


Figure 14.6

4. Install the lower king pin into the bore on the knuckle.

   NOTE: Do not force the lower king pin into position with a mallet or prying tool. If the king pin and knuckle do not align correctly, check to determine the source of the problem and correct the alignment.

5. Once the lower king pin is in position, install four new capscrews with hardened washers and hand-tighten only. Do not completely tighten at this time.

6. Lubricate the surfaces of the upper king pin and king pin bushing inside the axle housing. See Table K: Front Axle Grease Specifications on page 62.

7. Install the grease seal onto the steering arm/upper king pin with the seal lip facing DOWN. Lightly coat the seal lip with grease. See Table K: Front Axle Grease Specifications on page 62. Figure 14.7.

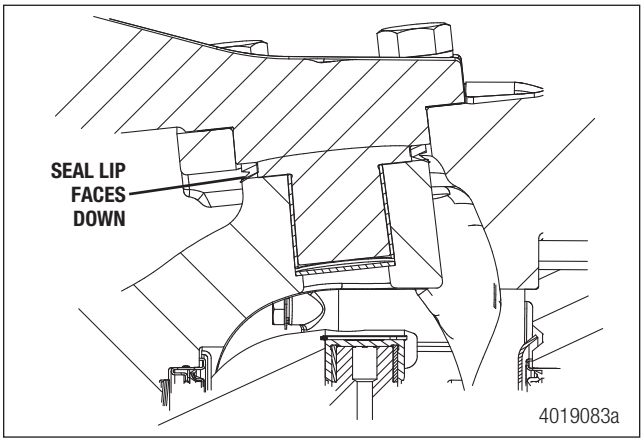


Figure 14.7

8. Install the correct shims (use at least three shims to start) onto the steering arm/upper king pin and install the steering arm/upper king pin into the knuckle.

   NOTE: Do not force the steering arm/upper king pin into position with a mallet or prying tool. If the king pin and knuckle do not align correctly, check to determine the source of the problem and correct the alignment.

9. Once the steering arm/upper king pin is in position, install four new capscrews with hardened washers and/or L-bracket and hand-tighten only. No washer is required on the L-bracket. Do not completely tighten at this time.

10. Now that both the lower and upper king pins are attached, tighten the capscrews on all king pins. See Section 17 Torque Specifications on page 63. Figure 14.8.

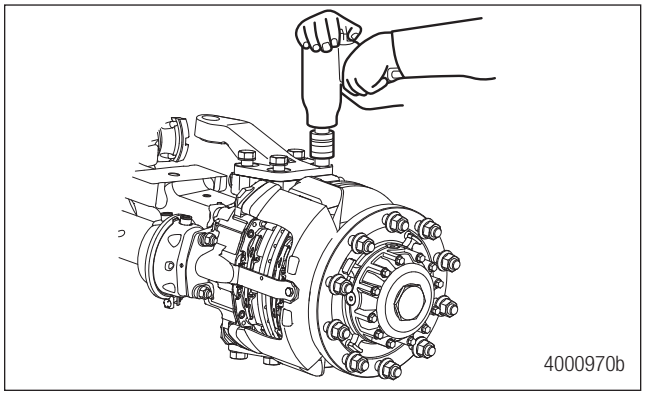


Figure 14.8

11. Install the grease fittings, if applicable, and tighten. See Section 17 Torque Specifications on page 63.

12. Check the vertical knuckle end play using the following procedure.

Knuckle End Play Check

1. Place the axle in the horizontal position with the steering arm on top.

2. Install a dial indicator on each end of the axle housing with one indicator point on the steering arm and one indicator point on the king pin cap. Zero both indicators. Figure 14.9.

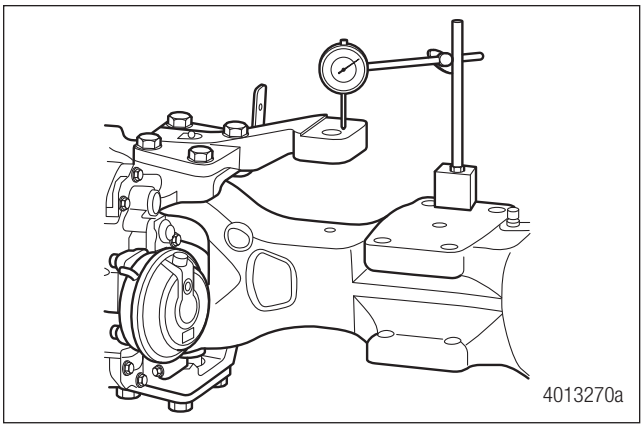


Figure 14.9

3. Place a pry bar between the housing and the knuckle and pry the knuckle upward on both ends. Read the dial indicators to determine the end play.

4. Add or remove the shims under the steering arm and king pin cap to achieve an end play of 0.010 ± 0.005" (0.254 ± 0.127 mm) on both sides.

5. After the correct end play is achieved, tighten the upper and lower king pin capscrews. See Section 17 Torque Specifications on page 63.

6. Perform a final knuckle end play check using the steps outlined in this procedure.

   NOTE: If the capscrews are removed, use new capscrews for final assembly.

7. Remove the axle shaft tool.

8. Apply a continuous bead of Loctite® 5699 gasket material to the hub cover plug prior to installation. Figure 14.10.

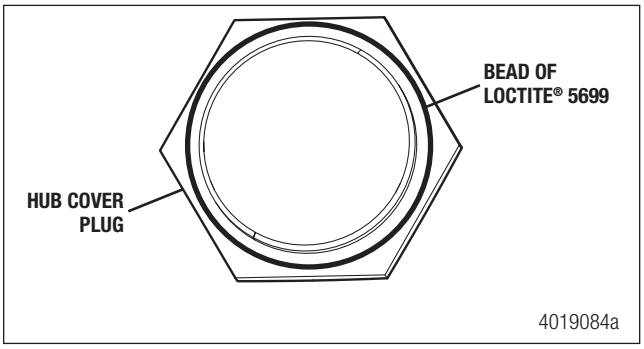


Figure 14.10

9. Install the hub cover plug and tighten. See Section 17 Torque Specifications on page 63

10. Install and adjust the ABS sensor by pressing the sensor in until it contacts the tone ring.

11. Install the caliper assembly. Refer to Install the Caliper Assembly on page 31.

12. Refer to Maintenance Manual MM-0467, EX+™ Air Disc Brake to install the brake pads and adjust the brake pad-to-rotor clearance along with other required procedures.

13. Fill the wheel end with the correct level and type of oil. See Check and Adjust the Hub Oil Level on page 58.

Cross Tube Assembly Installation

1. Assemble the cross tube ends and clamps if disassembled. Tighten the clamp nuts. See Section 17 Torque Specifications on page 63. Figure 14.11.

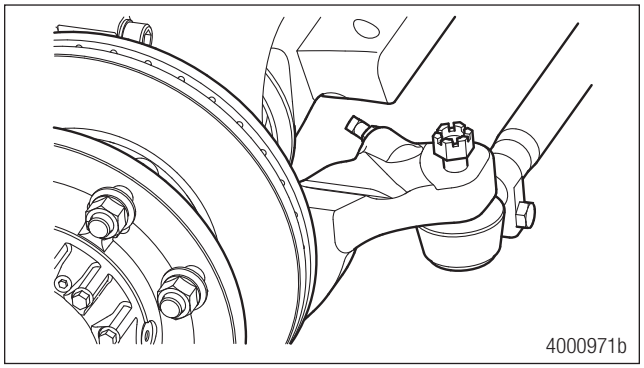


Figure 14.11

2. Push the cross tube assembly through the bottom of the bore in the knuckle. Install and tighten the cross tube nuts. See Section 17 Torque Specifications on page 63.

3. Install the cotter pin. Figure 14.12.

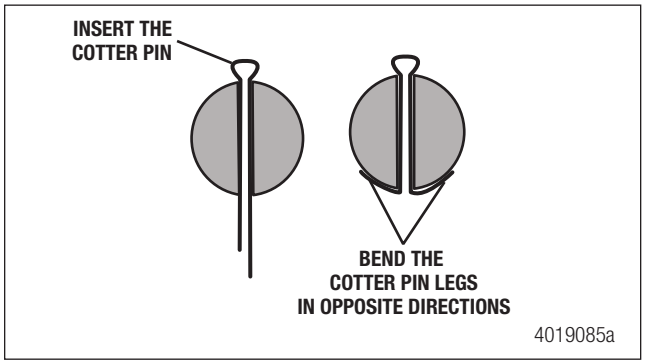


Figure 14.12

4. Install the wheel and tire assembly. Refer to the OEM information for recommended procedures.

Adjustments

Steering Stop 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 universal joint capability.

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

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

Manual Steering Adjustment

1. 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.

2. Lock the steering stop in position with the jam nut tightened to the correct torque. Figure 15.1.

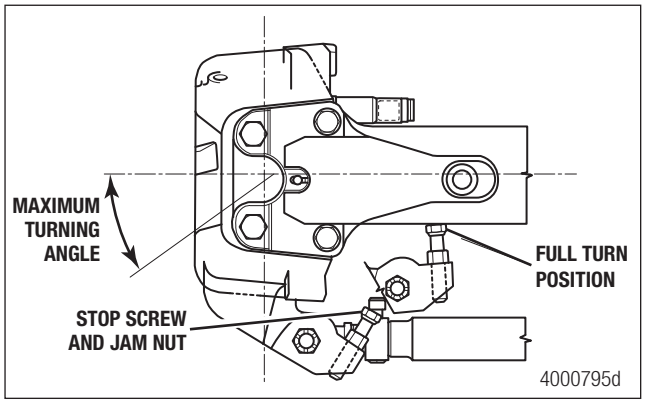


Figure 15.1

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 Pressure 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" (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 15.2.

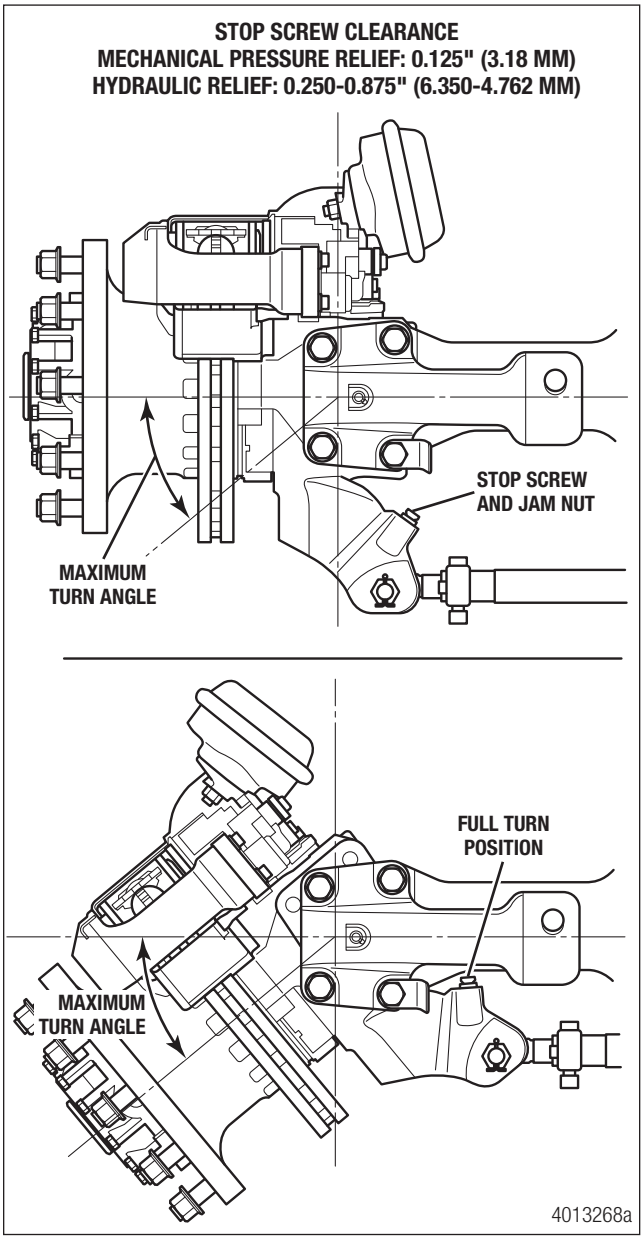


Figure 15.2

Hydraulic Relief

Hydraulic steering gears or cylinders with poppet valves must be adjusted while a 0.250-0.1875" (6.35-4.76 mm) spacer is held between the housing and stop screw.

Adjust the poppet valves 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 15.2.

Wheel Toe-In Adjustment

⚠ 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.

Check and adjust toe-in on all front drive axles after the axle is installed in the vehicle. Figure 15.3.

Measure toe-in with the weight of the vehicle on the axle and the axle on a level floor using the following procedure.

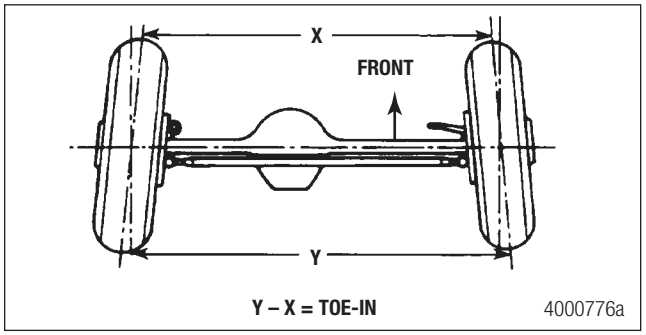


Figure 15.3

1. Use a jack to raise the front axle. Support the axle with safety stands.
2. Use a piece of chalk to mark the center area of both front tires around the complete circumference.
3. Place a scribe or pointed instrument against the center of the whitened part of each tire and rotate the tires. The scribe must be held in place so a single straight line is marked all around the tire.
4. 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 and then forward for the same distance.
5. Set the slide scale end of a trammel bar to ZERO and lock the scale in place.
6. 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 15.4.

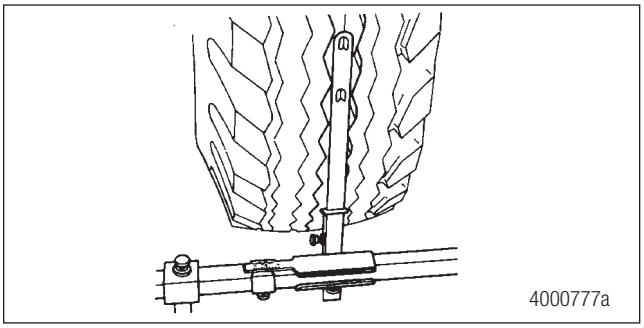


Figure 15.4

7. Place the trammel bar at the front of the tires. Adjust the pointer to line up with the scribe lines. Figure 15.5.

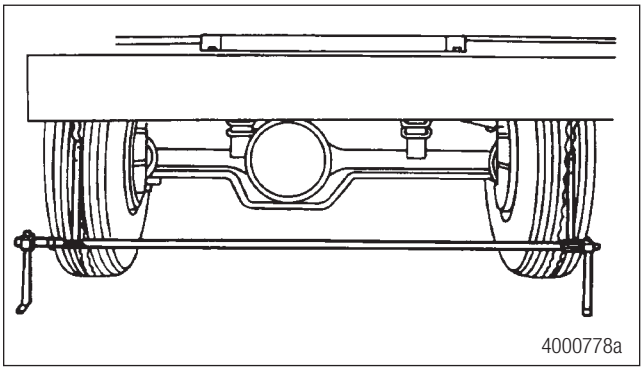


Figure 15.5

8. Read the toe-in or toe-out from the scale. Toe-in must be set to manufacturer's specifications.

   If toe-in adjustment is necessary: Adjust the tie rod assembly.

Tie Rod Adjustment

1. Loosen the cross tube clamps and rotate the tube or adjusting sleeve as required.
2. Tighten the clamps to the values specified in Section 17 Torque Specifications on page 63.
3. Check the toe-in measurement again to verify it is within the correct limits.

Maintenance and 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.

Drive Axles

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.

Magnetic Fill and Drain Plugs

Meritor front drive axles are equipped with magnetic plugs.

Inspect the magnetic plugs for metal particles each time the oil is changed.

The oil drain and fill plugs can be reused after cleaning.

If recplacement is necessary, use the correct part.

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.

Temperature

⚠ 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.

Check and Adjust the Carrier Oil

1. Park the vehicle on a level surface.

   NOTE: Allow the oil to settle and cool to a safe temperature before removing the oil fill plug.

2. Remove the oil fill plug from the axle.

3. Verify the oil level is even with the bottom of the oil fill plug hole.

   If oil flows from the hole when the plug is loosened: The oil level is high. Allow the oil to drain until the level is even with the bottom of the oil fill plug hole. Dispose of all fluids according to local environmental requirements.

   If the oil level is below the oil fill plug hole: Add the specified oil until it is even with the bottom of the oil fill plug hole.

4. Clean, apply Loctite® 592 sealant or equivalent to the oil fill plug threads, install, and tighten. See Section 17 Torque Specifications on page 63.

Table B: Axle Oil Change Intervals*

Description	Interval
Initial Oil Change	Not Required
Check Oil Level	Every 6,000 miles (9656 km), once a month, or the fleet maintenance interval, whichever comes first
Petroleum Oil Change	Every 24,000 miles (38 000 km) or annually, whichever comes first
Synthetic Oil Change	Every 48,000 miles (77 249 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 C: Axle Oil Specifications*

		Outside Temperature			
		°F		°C	
Meritor Specification	Oil Type	Min.	Max.	Min.	Max.
0-94	85W140	10	None	-12	None
	80W90 80W140	-15	None	-26	None
	75W75 75W90 75W140	-40	None	-40	None
	75W	-40	35	-40	2

* These lubricants are gear oil, GL-5, SAE J2360, military specification MIL-L-2105-D. Approved gear oils are listed in the latest SAE J2360 Qualified Products List, https://p-r-i.org/pri-qpl/lubricant-review-institute/.

Table D: Axle Oil Capacity

	Sump Oil Capacity	
Axle Model	Pints	Liters
Front Drive Steer for Offset Bowls	22*	10.4

* Approximately.

Drain and Replace the Carrier Oil

1. Park the vehicle on a level surface. Place a large container under the axle.
2. Remove the drain plug from the bottom of the axle and drain the oil. Figure 16.1.

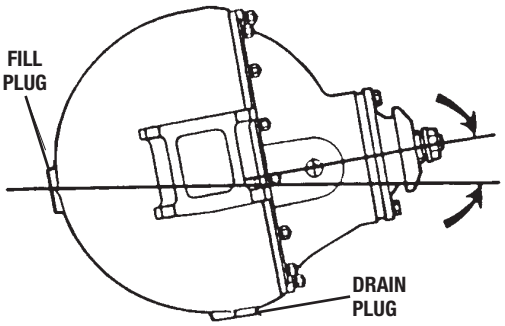


Figure 16.1

3. Dispose of all fluids according to local environmental requirements.
4. Clean, apply Loctite® 592 sealant or equivalent to the oil drain plug threads, install, and tighten. See Section 17 Torque Specifications on page 63.
5. Remove the oil fill plug from the axle.
6. Fill the axle to the bottom of the oil fill plug hole with the specified oil. Allow enough time for oil to circulate through the axle assembly.
7. Clean, apply Loctite® 592 sealant or equivalent to the oil fill plug threads, install, and tighten. See Section 17 Torque Specifications on page 63.

Inspection Intervals

Component	Inspection and Maintenance	Interval
Axle	Inspect the axle for oil, grease leaks. If leaks are found, repair the axle.	Daily
Breather	Inspect for damage and correct operation. Clean as necessary.	Weekly
Cross Tube Tie Rod Ends	Inspect the seals and boots for damage and wear. Grease the ball joints.	Every 6,000 miles (9 656 km) or 400 hours of operation, whichever comes first
Knuckle Bushings	Grease the upper and lower knuckle bushings.	Every 6,000 miles (9 656 km) or 400 hours of operation, whichever comes first
Housing Axle Shaft Bushing (Inner and Outer)	Inspect for damage and wear. Oil the bushing and seal.	Every 100,000 miles (160 000 km) or every two years, whichever comes first

Wheel Ends

Front Axle Wheel Ends

The front axle wheel ends do not share the same oil sump with the housing. However, due to possible air pressure build-up in the front wheel end, some oil will likely move out of the wheel end and into the wheel end vent line. Therefore, during wheel end oil level inspection, the level may appear to be low.

The amount of oil remaining in the wheel end system is sufficient lubrication for the wheel end, until the vehicle reaches the mileage intervals listed in Table E: Wheel End Oil Lubrication Intervals on page 59.

Magnetic Drain Plugs

Meritor wheel ends are equipped with magnetic drain plugs.

Inspect the magnetic plugs for metal particles each time the oil is changed.

The magnetic drain plugs can be reused after cleaning.

If replacement is required, use the correct part.

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 can damage components.

Temperature

⚠ 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.

Check and Adjust the Hub Oil Level

⚠ 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.

NOTE: The vehicle must be stationary for at least 15 minutes before checking or adjusting oil levels.

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 the wheels to be serviced are off the ground. Support the vehicle with safety stands.
3. Rotate the wheel end so the hub trunnion cross is at the 12 o'clock position and the fill hole is at the 4 o'clock position. Figure 16.2.

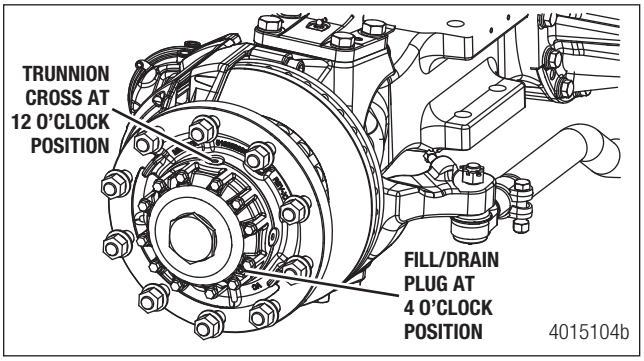


Figure 16.2

4. The plug in the hub cover is both the oil fill and oil drain plug. Clean the area around the plug and remove the plug.
5. Verify the wheel end oil level is even with the bottom of the plug hole.

   If oil flows from the hole when the plug is loosened: The oil level is high. Allow the oil to drain until the level is even with the bottom of the oil fill plug hole. Dispose of all fluids according to local environmental requirements.

   If the oil level is below the oil fill plug hole: Add the specified oil until it is even with the bottom of the oil fill plug hole.

⚠ 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.

6. Apply Loctite® 592 pipe sealant or equivalent to the plug threads. Install and tighten. See Section 17 Torque Specifications on page 63.

Table E: Wheel End Oil Lubrication Intervals

Description	Interval
Initial Oil Change	Not required
Check Oil Level	Every 6,000 miles (9656 km)
Petroleum Oil Change	Every 12,000 miles (19 312 km) or annually, whichever comes first
Synthetic Oil Change	Every 24,000 miles (38 624 km) or annually, whichever comes first

Table F: Oil Specifications*

		Outside Temperature			
		°F		°C	
Meritor Specification	Oil Type	Min.	Max.	Min.	Max.
O-94	85W140	10	None	-12	None
	80W90 80W140	-15	None	-26	None
	75W75 75W90 75W140	-40	None	-40	None
	75W	-40	35	-40	2

* These lubricants are gear oil, GL-5, SAE J2360, military specification MIL-L-2105-D. Approved gear oils are listed in the latest SAE J2360 Qualified Products List, https://p-r-i.org/pri-qpl/lubricant-review-institute/.

Table G: Wheel End Oil Capacity

	Oil Capacity	
	Pints	Milliliters
Wheel End (each)	0.8	380

Table H: Hub Bearing Grease Specifications (CTIS Greased Hub Bearings)

Meritor Specification	Grease	NLGI Grade	Grease Description	Typical Application	Outside Temperature	Greasing Interval
O-618, preferred, or O-617-A/B, acceptable Military applications use O-618 MIL-PRF-10924 or equivalent	Multi-Purpose Grease	1 or 2	Lithium 12-Hydroxy Stearate or Lithium Complex	Wheel Bearings Hubs Spindle	Refer to the grease manufacturer's specifications for temperature service limits.	Whichever comes first: Replacing seals Relining brakes 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

Drain and Replace the Hub Oil

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 the wheels to be serviced are off the ground. Support the vehicle with safety stands.
3. Place a suitable sized drain pan under the wheel ends.
4. Rotate the wheels so the wheel end cover drain plug is toward the ground (6 o'clock position). Figure 16.3.

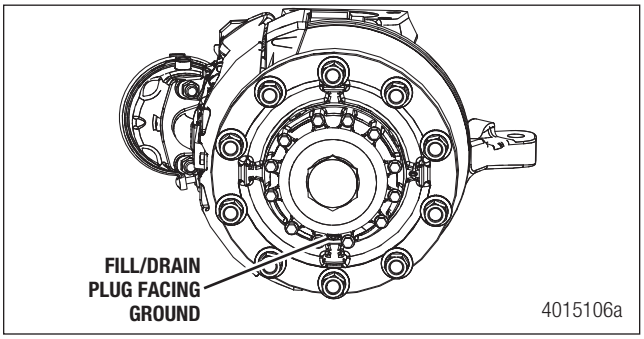


Figure 16.3

5. The plug in the wheel end hub cover is both the fill and drain plug. Clean the area around the plugs. Remove the plugs from the wheel end hub covers, drain, and clean the plug magnets.

6. Dispose of all fluids according to local environmental requirements.

7. Rotate the wheels so the trunnion cross is at the 12 o'clock position and the oil fill hole is at the 4 o'clock position. Figure 16.4.

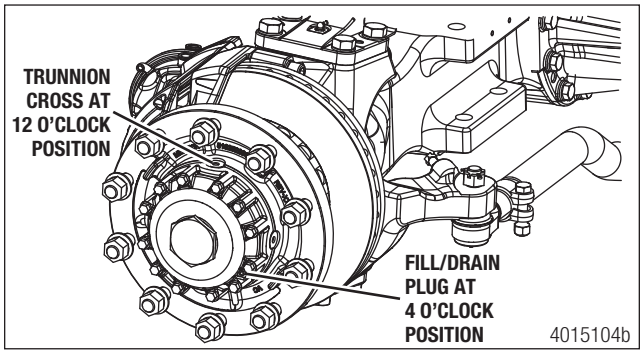


Figure 16.4

8. Add the specified oil until the oil level is even with the bottom of the hole.

⚠ 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.

9. Apply Loctite® 592 pipe sealant or equivalent to the plug threads. Install and tighten. See Section 17 Torque Specifications on page 63.

Table I: Wheel End Inspection Intervals

Component	Inspection and Maintenance	Interval
Wheel End	Inspection for oil leaks	Daily
	Inspect for correct oil level (front axle wheel ends only) - 0.8 pint (0.3 liter); add as needed	Every 6,000 miles (9 656 km), or 6 months, whichever comes first
	Change oil	Every 12,000 miles (19 312 km) or annually, whichever comes first
	Inspect for correct end play - Wheel off/pads removed (disc brakes) - 0.005" (0.127 mm) max.	Every 6,000 miles (9 656 km), or 6 months, whichever comes first
Hub Seal	Inspect - check for leaks/damage/signs of rotation	Every 6,000 miles (9 656 km) - Replace as needed or whenever hub is removed
Axle Shaft Seal	Inspect - check for leaks/damage	Every 6,000 miles (9 656 km) - Replace as needed or whenever axle shaft is removed
CTI Seals (if equipped)	Replace	Every 12,000 miles (19 312 km) or annually or whenever hub is removed, whichever comes first
Inner Wheel Bearing	Inspect/Grease/Replace as needed	Every 12,000 miles (19 312 km) or annually, whichever comes first for NORMAL DUTY OR Every 6,000 miles (9 656 km) or twice a year, whichever comes first for SEVERE DUTY OR When replacing the wheel end seals, brakes or rotors, or whenever the hub is removed, whichever comes first

Front Axle

Grease the Universal Joint

1. Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving.
2. Check the universal joint for looseness. If loose, service as necessary.
3. Apply the specified grease to the universal joint grease fitting until new grease purges from all the seals.

   If new grease does not purge at every seal: Move the driveline while applying grease at the fitting until new grease purges at every seal.

   If new grease still does not purge: Disassemble the universal joint, inspect the grease fitting and the components. Service as necessary.

Grease the Tie Rod End Assembly

1. Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving.
2. Check the tie rod for looseness. If loose, service as necessary. Figure 16.5.

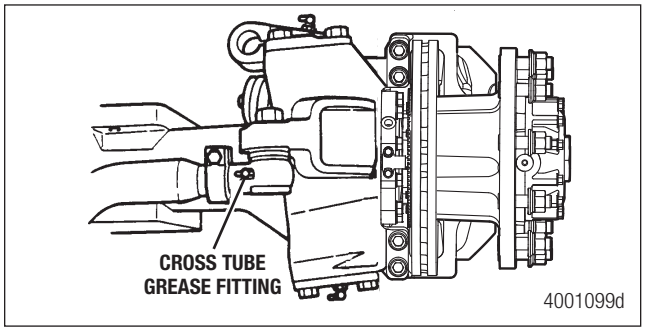


Figure 16.5

3. Apply the specified grease to the cross tube grease fitting until new grease purges from all the seals.

   If new grease does not purge at the seals: Move the cross tube while applying grease at the fitting until new grease purges from all the seals.

   If new grease still does not purge: Disassemble the cross tube, inspect the grease fitting and the components. Service as necessary.

Inspect the Knuckle Bushings for Play

1. Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving.
2. Inspect the knuckle for excess looseness in the king pin by performing the following procedure with the wheel off:
   a. Mount a dial indicator on the axle housing with the tip on the knuckle to measure the in and out movement.
   b. Push inward on the top of the knuckle and zero the dial indicator.
   c. Pull outward and record the total indicated movement.
   d. Repeat the procedure on the bottom of the knuckle.
   e. Mount a dial indicator on the axle housing with the tip on the knuckle to measure fore and aft movement.
   f. Push on the knuckle in either a forward or rear direction and zero the dial indicator.
   g. Pull the knuckle in the opposite direction and record the total indicated movement.
3. If the observed total indicated movement in any direction of either the top or bottom of the knuckle is greater than 0.050” (1.27 mm), service both top and bottom king pin bushings.

Grease the Knuckle Bushing

NOTE: The vehicle weight must be on the axle to properly grease the knuckle bushings. If the axle is on jack stands, follow all safety precautions, reinstall the wheels and put the axle back on the ground.

1. Clean all the grease fittings prior to lubrication.
2. Verify the vehicle weight is on the wheel end. Do not raise the vehicle.

3. Apply the specified grease through the knuckle grease fittings located on the upper steering arms and the lower king pin caps until new grease purges from all the seals and thrust bearings. Figure 16.6.

   If new grease does not purge at the seals: Move the knuckle while applying grease at the fitting until new grease purges at the seals.

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

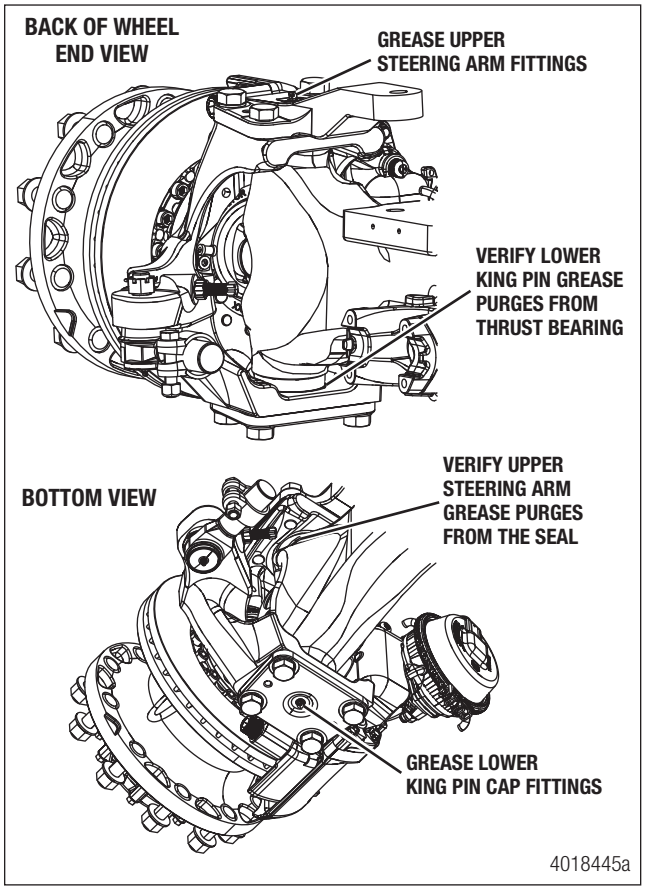


Figure 16.6

Table J: Front Axle Grease Interval

Whichever Comes First:
Replacing Seals or King Pin Bushing
Replacing Brake Pads
12,000 Miles (19 000 km) — Normal Duty
3,000 Miles (4 800 km) — Severe Duty

Table K: Front Axle Grease Specifications

Meritor Spec.	NLGI Grade	Grease Classification	Outside Temperature
O-618 (preferred) or O-617-A/B (acceptable) Military applications use O-618 MIL-PRF-10924 or equivalent	1 or 2	Lithium 12-Hydroxy Stearate or Lithium Complex	Refer to the manufacturer's specifications for the temperature service limits

Torque Specifications

Front Drive Steer Axle

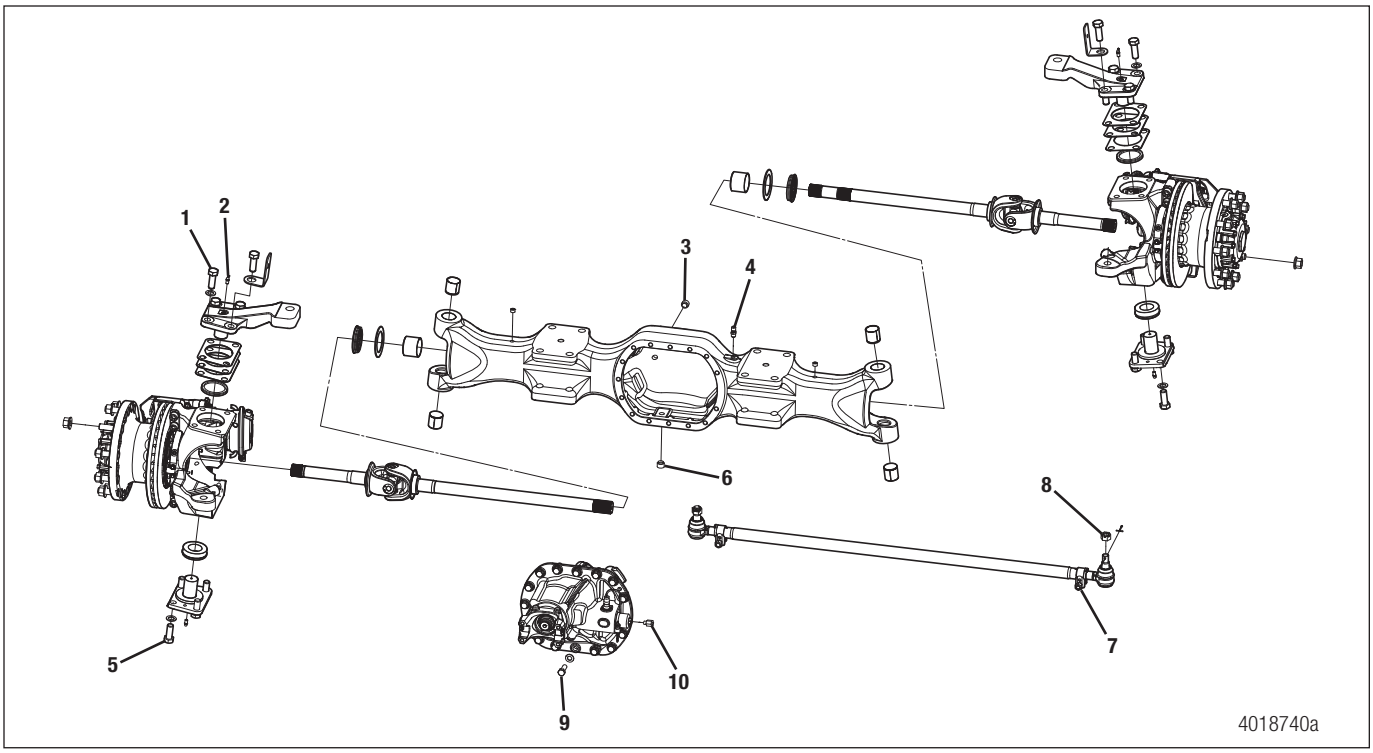


Figure 17.1

			Torque*	
Item	Description	Thread Size	lb-ft	Nm
1	Steer Arm Capscrew	7/8”-9 UNC	440-580	597-786
2	Grease Fitting	1/8” PTF	10	14
3	Fill Plug	3/4”-14	35-50	47-68
4	Breather Assembly	3/8”-18 NPT	15-25	20-34
5	King Pin Capscrew	7/8”-9 UNC	440-580	597-786
6	Magnetic Drain Plug	3/4”-14 NPT	35-50	47-68
7	Strap Clamp Nut - Straight Cross Tube Version - Drop Cross Tube Version		 50-60 110-130	 68-81 136-176
8	Castle Nut		120-170	163-230
9	Carrier-to-Housing Capscrew	M16X2	200-258	271-350
10	Air Fitting		15-25	20-34

*It is recommended to target the nominal to upper limit of the torque ranges listed.

17 Specifications

Wheel End and Brake Assembly

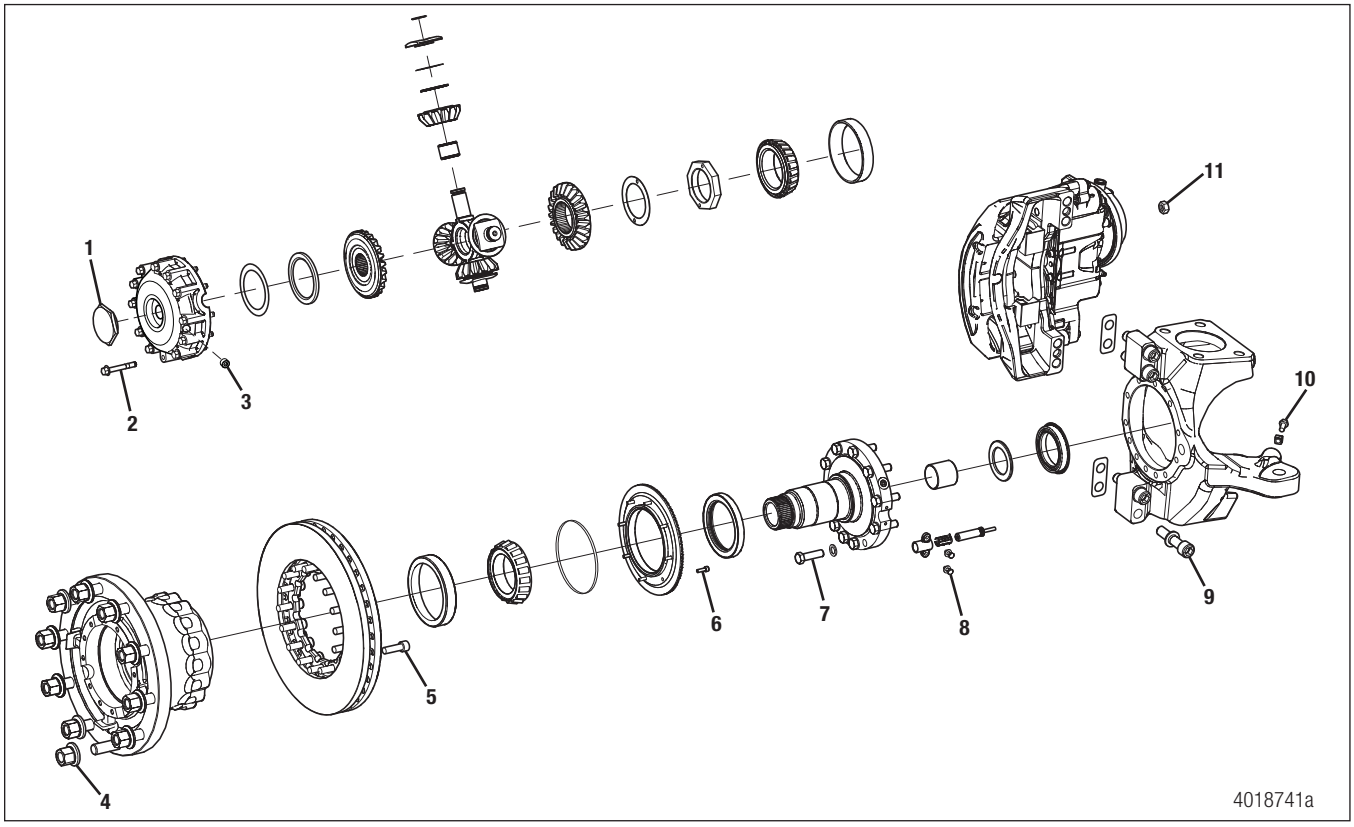


Figure 17.2

			Torque[1]	
Item	**Description**	**Thread Size**	**lb-ft**	**Nm**
1	Hub Cover Plug	7/8-9	60-100	81-136
2	Flange-Head Capscrew, Hub Cover	3/8-16	35-50	47-68
3	Hub Drain/Fill Plug	3/8 NPT	15-25	20-34
4	Wheel Nut	M22X1.5	See OEM Recommendation	
5	Hub-to-Rotor Bolt	M14X2 12mm Hex	115-140	156-190
6	Tone Ring Mounting Bolts	M6X20 5mm Hex	85-105 (lb-in)	9.6-11.9
7	Spindle-to-Knuckle Bolts	9/16-12 UNC	130-165	176-224
8	ABS Sensor Bracket Bolts	1/4-20 UNC	10-13	14-18
9	Allen-Head Capscrew, Caliper Mount Bolts	M20X1.5	350-450	475-610
10	Steering Stop Jam Nut	9/16-12 UNC	65-85	88-115
11	Brake Chamber	M16X1.5	135-155	183-210
12	ABS Sensor Clamp[2]	5/16-18	20-30	27-40

Refer to Maintenance Manual MM-0467, EX+™ Air Disc Brake for additional torque specifications.

[1] It is recommended to target the nominal to upper limit of the torque ranges listed.

[2] Not shown in illustration

Towing

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.

Vehicle Towing

When towing, any rear drive axle remaining on the ground must be disconnected to prevent damage to the axles and driveline components.

If the vehicle is being towed with the front drive steer axle on the ground, disconnect the driveline from the front drive steer axle.

Troubleshooting

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.

Hub Seal Leaks

1. Measure the seal bore:

   For hub seals mounted in the tone ring: The bore should be 5.3745 - 5.3775" (136.512-136.588 mm).

   For hub seals mounted into the hub: The bore should be 6.2991-6.3016" (160.000-160.063 mm).

   If the seal bore is outside this dimension: Replace the tone ring or hub. Refer to Section 6 Wheel End Disassembly on page 19 for removal and Section 13 Wheel End Assembly on page 41 for installation.

2. Always replace the hub seal when the wheel end is removed from the vehicle.

⚠ 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.

3. Prior to installing the new hub seal, apply a bead of Loctite® 638 adhesive sealant around the OD and seal flange.
4. Use the correct seal driver to install the seal.
5. Wipe away any excess Loctite adhesive sealant.

Noisy and/or Overheated Wheel Ends

Possible causes of noisy and overheated wheel ends are incorrect end play settings, incorrect shim pack dimension, or long pins on the adjusting nut. Perform the following to determine the cause and correct the issue:

1. Remove the tire and wheel assembly.
2. Drain the oil from the wheel end. See Drain and Replace the Hub Oil on page 59.
3. Remove the bevel gear hub cover and gear assembly, including the inner and outer bevel gears, pinions and spider.
4. Measure the bearing end play with a dial indicator either off of the rear back edge of the rotor to the knuckle or on the front side edge of the rotor to the spindle. The end play must be 0.001-0.005" (0.025-0.127 mm). Figure 19.1 and Figure 19.2.

   If end play is not within 0.001-0.005" (0.025-0.127 mm): Adjust the wheel end play. See Drain and Replace the Hub Oil on page 59.

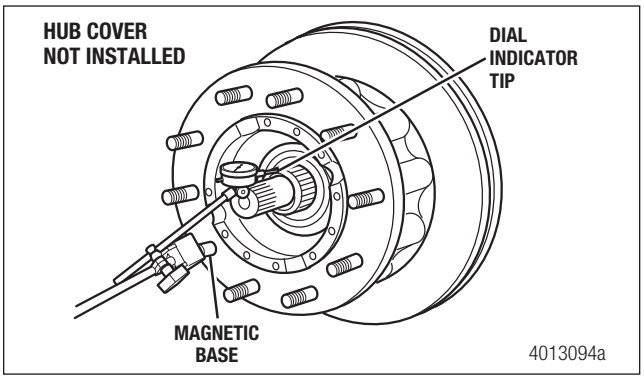


Figure 19.1

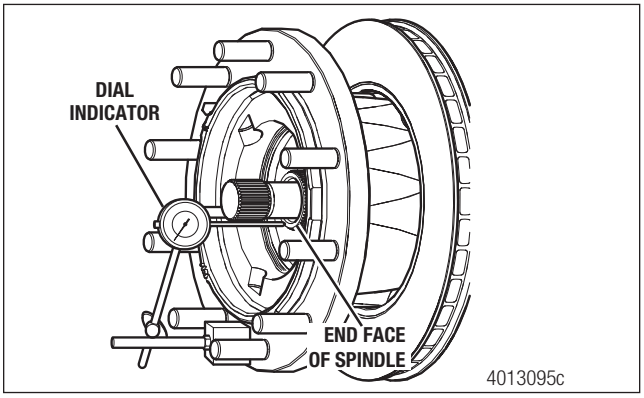


Figure 19.2

5. Verify the shim pack dimension. The shim pack dimension should be 2.168-2.173" (55.066-55.194 mm). See Adjust the Wheel Bearings on page 45.

   If the shim pack dimension is not 2.168-2.173" (55.066-55.194 mm): Adjust the shims as necessary to achieve the correct shim pack dimension. See Adjust the Wheel Bearings on page 45.

6. Measure the pin standout on the adjusting nut. The pin standout should be 0.241 ± 0.022" (6.121 ± 0.559 mm)

   If the pin stand out exceeds 0.241 ± 0.022" (6.121 ± 0.559 mm): Replace the adjusting nut. See Adjust the Wheel Bearings on page 45.

Table L: Troubleshooting

Condition	Cause	Correction
Tires wear out quickly or have uneven tire tread wear	Tires have incorrect air pressure	Place specified air pressure in the tires
	Tires out-of-balance	Balance or replace the tires
	Incorrect tandem axle alignment	Align the tandem axles
	Incorrect toe-in setting	Adjust the toe-in specified setting
	Incorrect steering arm geometry	Service the steering system as necessary
	Excessive wheel end play	Readjust the wheel bearings
Vehicle is hard to steer	Power steering system pressure low	Repair the power steering system
	Steering gear linkage not assembled correctly	Assemble the steering gear correctly
	Steering linkage needs lubrication	Lubricate the steering linkage
	King pins binding	Replace the king pins
	Incorrect steering arm geometry	Service the steering system as necessary
	Caster out-of-adjustment	Adjust the caster as necessary
	Tie rod ends hard to move	Replace the tie rod ends
	Worn thrust bearing	Replace the thrust bearing
Tie rod ends are worn and require replacement	Tie rod ends require lubrication	Lubricate the ends of cross tube; Verify the lubrication schedule is followed
	Severe operating conditions	Increase the frequency of inspection and lubrication intervals
	Damaged boot on tie rod end	Replace the boot
Bent or broken cross tube, tie rod end ball stud, steering arm, or tie rod end	Too much pressure in the power steering system; pressure exceeds vehicle manufacturer's specification	Replace any damaged components and adjust the power steering system to the specified pressure
	Power steering system cut-off pressure out of adjustment	Replace any damaged components and adjust the power steering system to the specified pressure
	Vehicle operated under severe conditions	Replace any damaged components and verify the vehicle is operating correctly
	Add-on type of power steering system not installed correctly	Replace any damaged components and correctly install the add-on power steering system
	Steering gear over-travel poppets incorrectly set or malfunctioning	Replace any damaged components, adjust the over-travel of poppets to vehicle manufacturer's specifications, and check for correct operation
	Axle stops incorrectly set	Replace any damaged components and set the axle stops to the vehicle manufacturer's specification
Worn or broken steering ball stud	Drag link fasteners tightened higher than OEM specification	Replace any damaged components and tighten the drag link fasteners to the specified torque
	Lack of lubrication or incorrect lubricant	Replace any damaged components and lubricate the linkage with the specified lubricant
	Power steering stops out-of-adjustment	Replace any damaged components and adjust the stops to the specified dimension

19 Troubleshooting

Condition	Cause	Correction
Worn king pins and king pin bushings	Worn or missing seals and gaskets	Replace any damaged components and replace the seals and gaskets
	Incorrect lubricant	Replace any damaged components and lubricate the axle with the specified lubricant
	Axle not lubricated at scheduled frequency	Replace any damaged components and lubricate the axle at the scheduled frequency
	Incorrect lubrication procedures	Replace any damaged components and use the correct lubrication procedures
	Lubrication schedule does not match operating conditions	Replace any damaged components and change the lubrication schedule to match the operating conditions
Vibration or shimmy of front axle during operation	Caster out-of-adjustment	Adjust the caster
	Wheels or tires out-of-balance	Balance or replace the wheels and tires
	Worn shock absorbers	Replace the shock absorbers

Special Tools

Hub Outer Bearing Cup Driver (3256-A-1301)

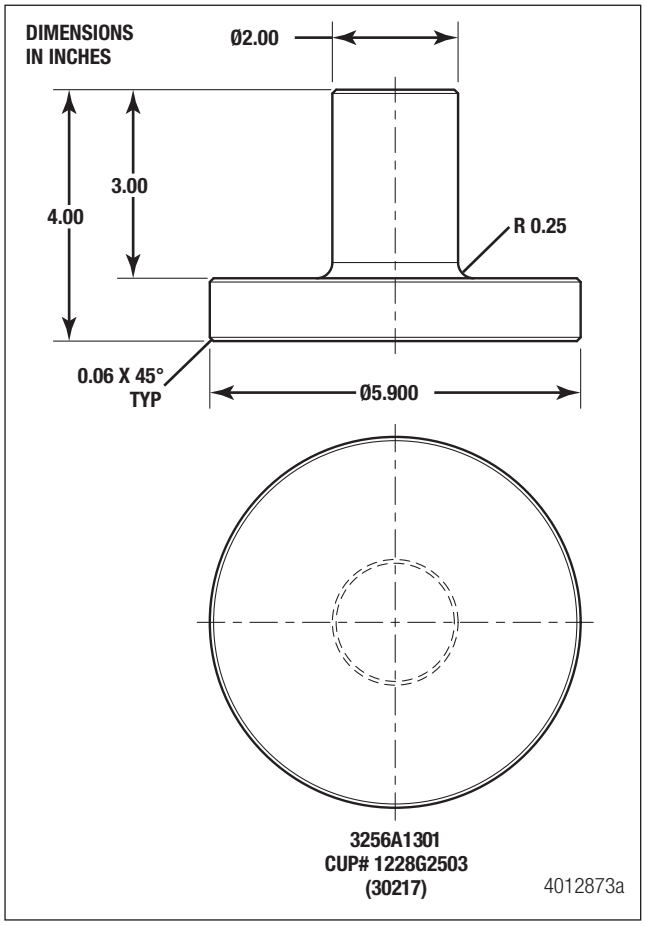


Figure 20.1

Hub Inner Bearing Cup Driver (3256-B-1302)

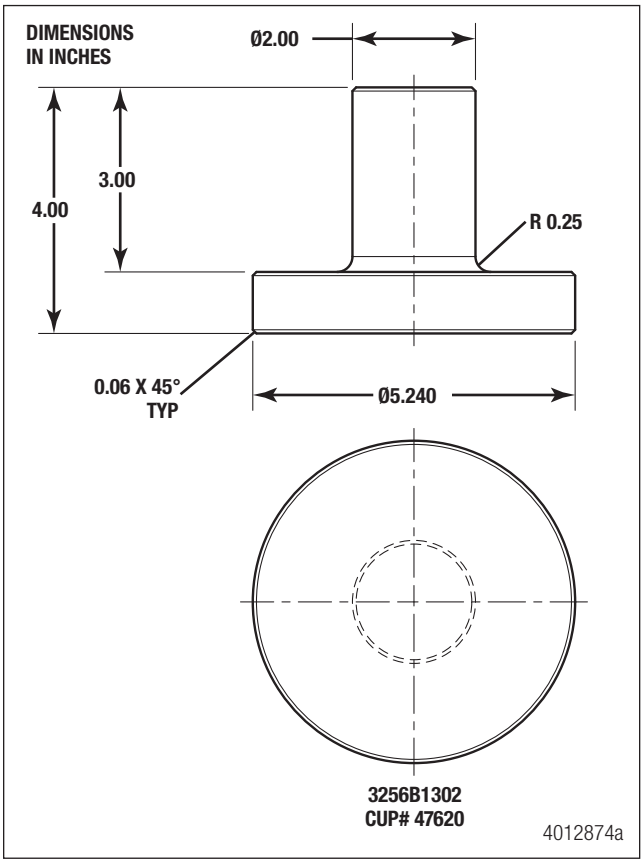


Figure 20.2

Axle Shaft Seal Driver (3256-J-1050)

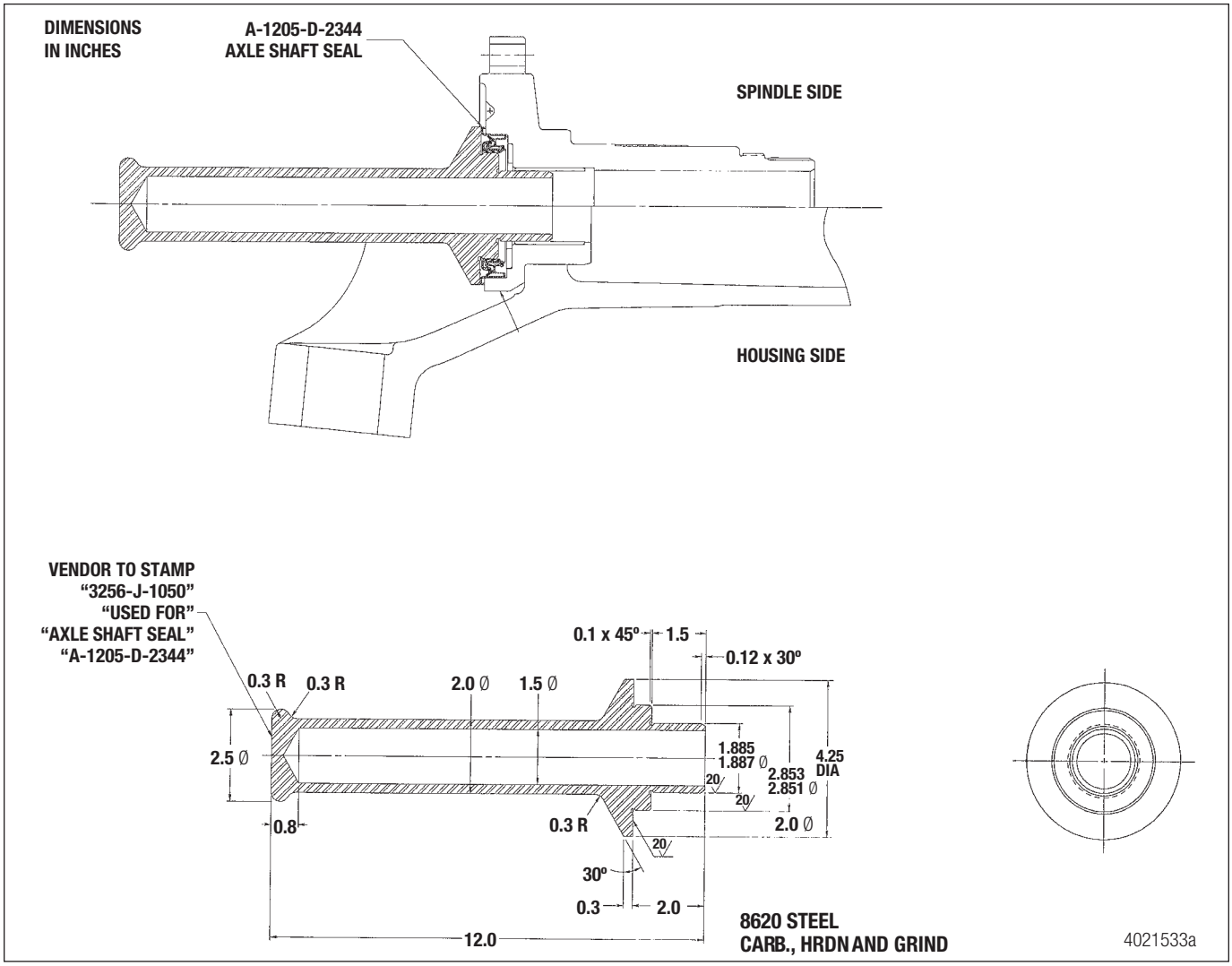


Figure 20.3

Hub Seal Driver (3256-Z-1300)

NOTE: Use with seal A1205-N-1392.

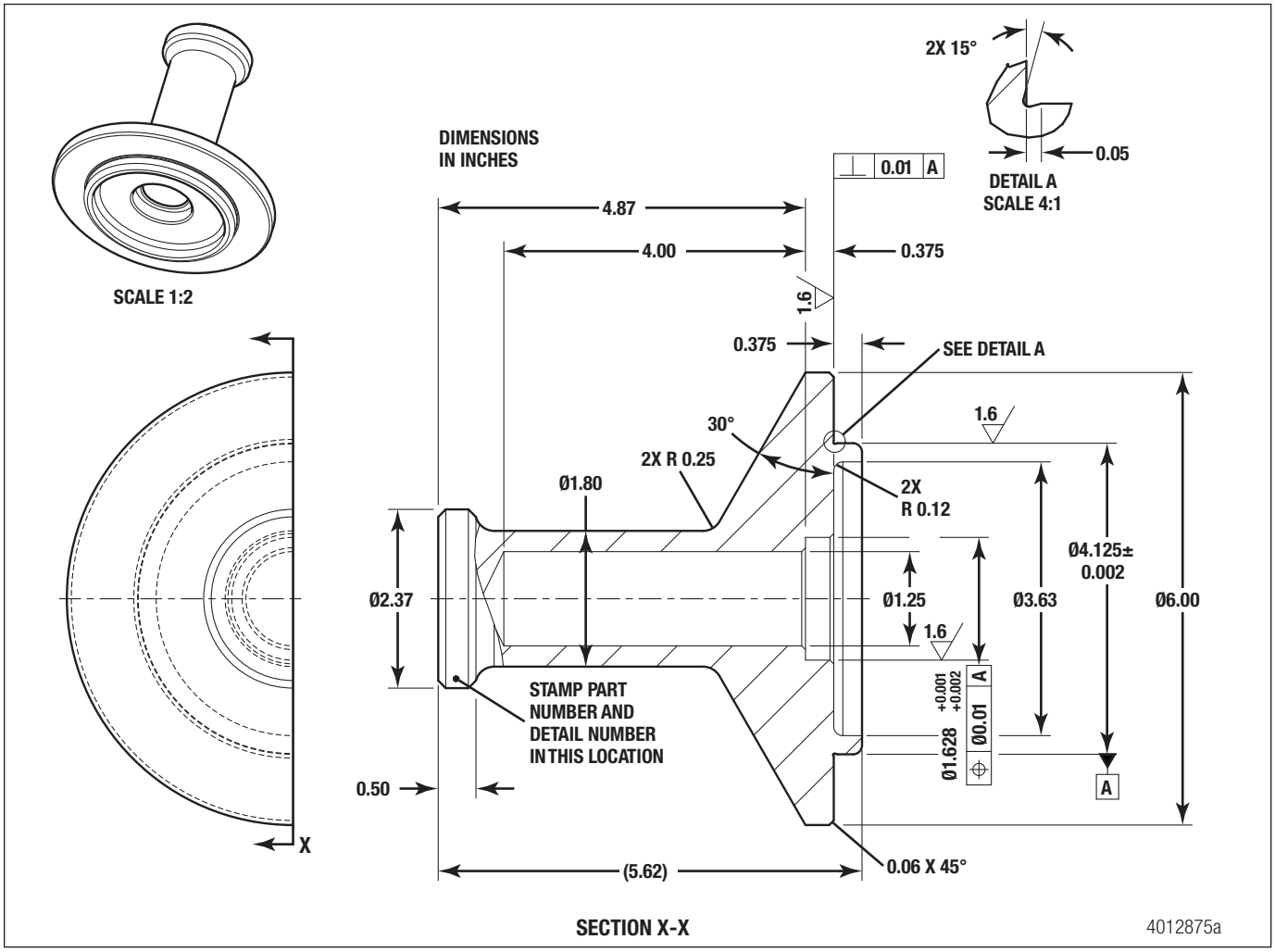


Figure 20.4

Wheel End Lock Nut Socket

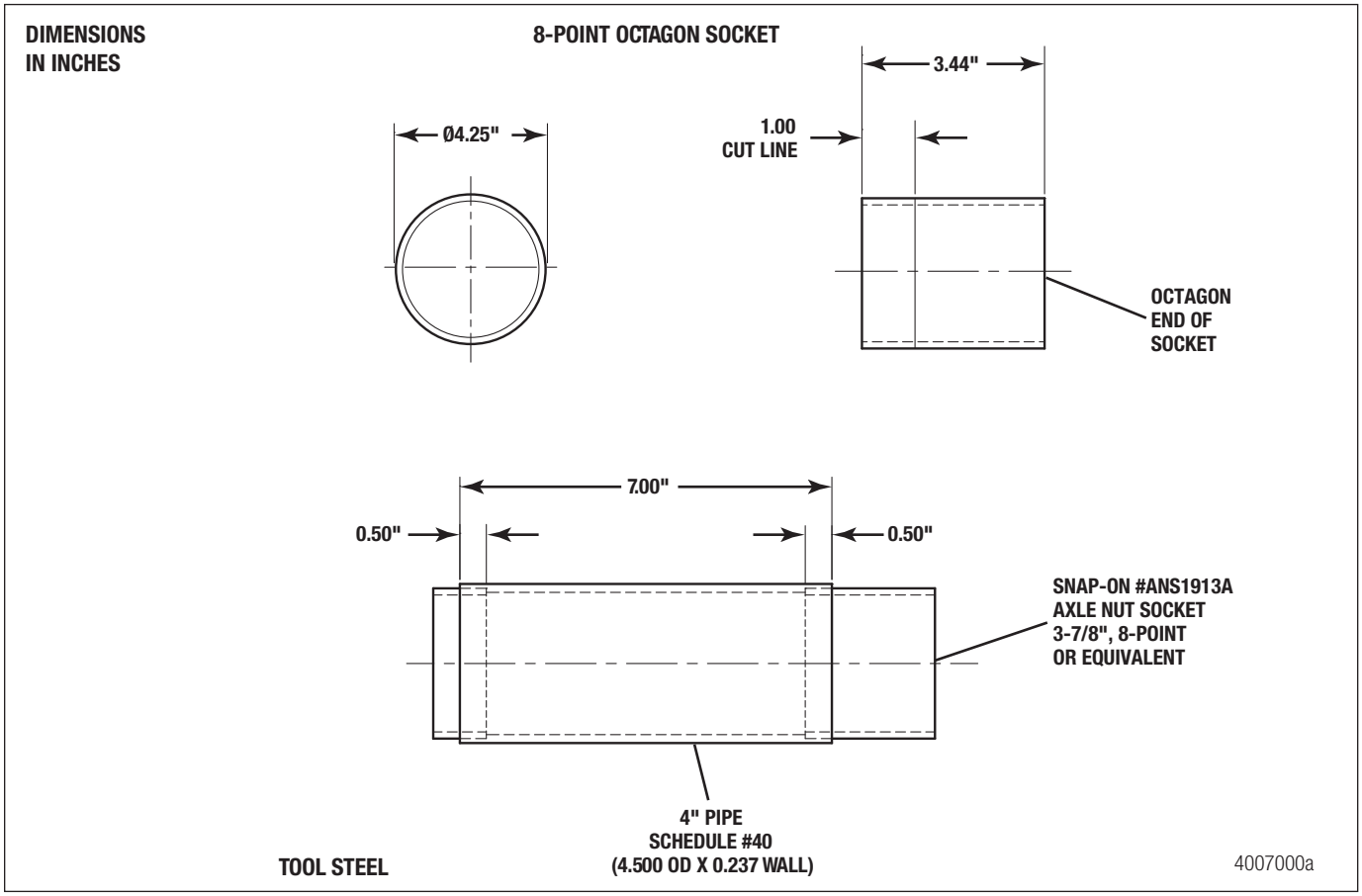


Figure 20.5

Nose Cone (3256-C-1303)

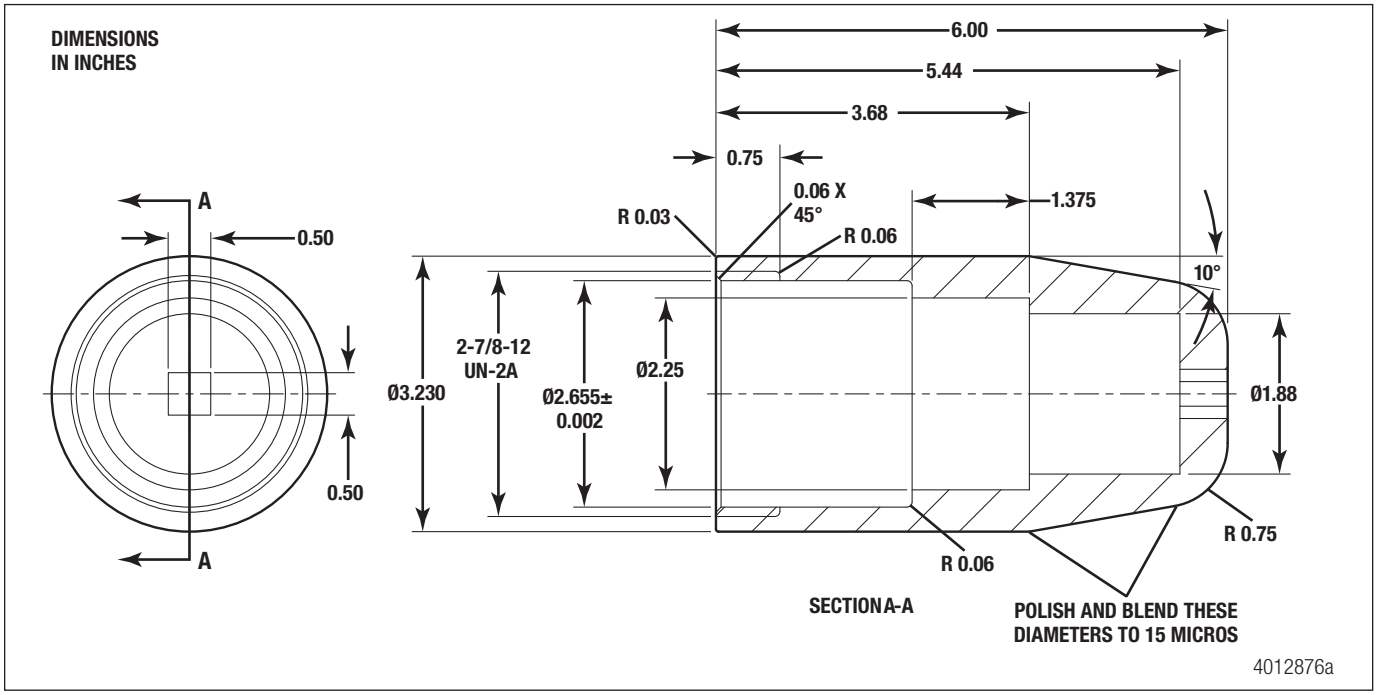


Figure 20.6

Axle Shaft Removal Tool (3256-B-1016)

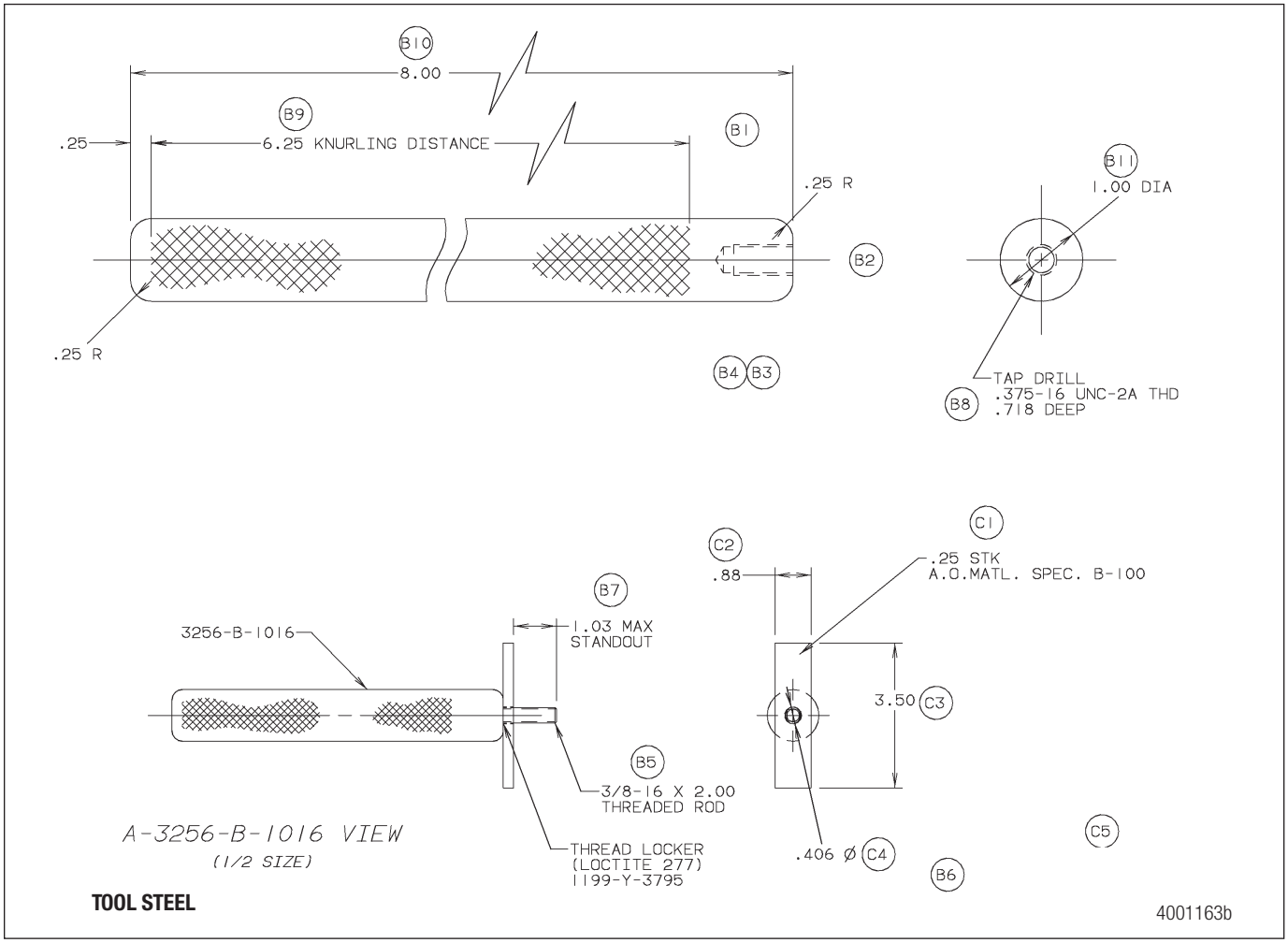


Figure 20.7

Axle Shaft Bushing Driver (3256-X-1298)

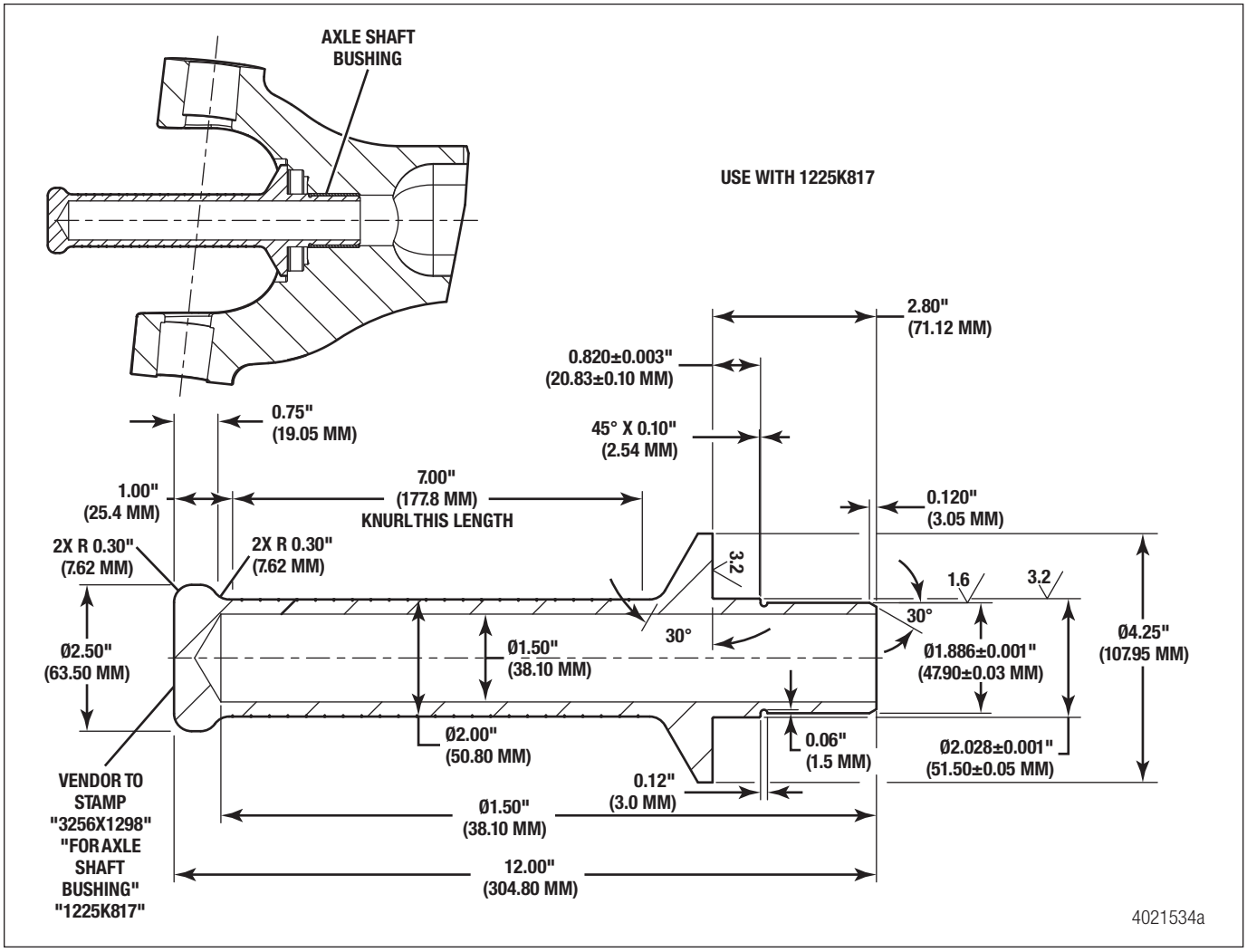


Figure 20.8

King Pin Bushing Driver (3256-Y-1299)

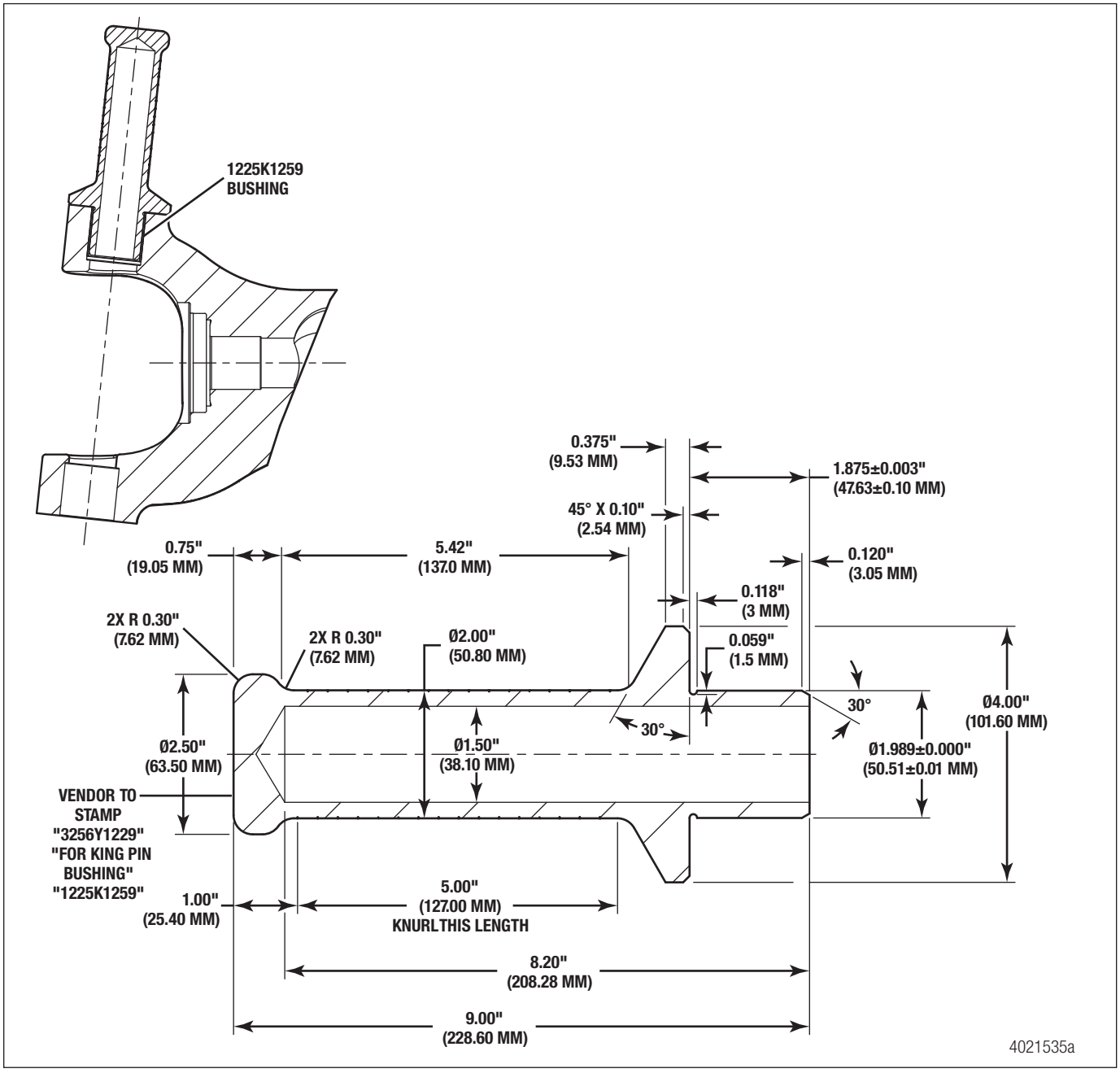


Figure 20.9

Axle Housing Driver (3256-F-1384A)

NOTE: Use with 1225-G-1593 and 1229-T-4570.

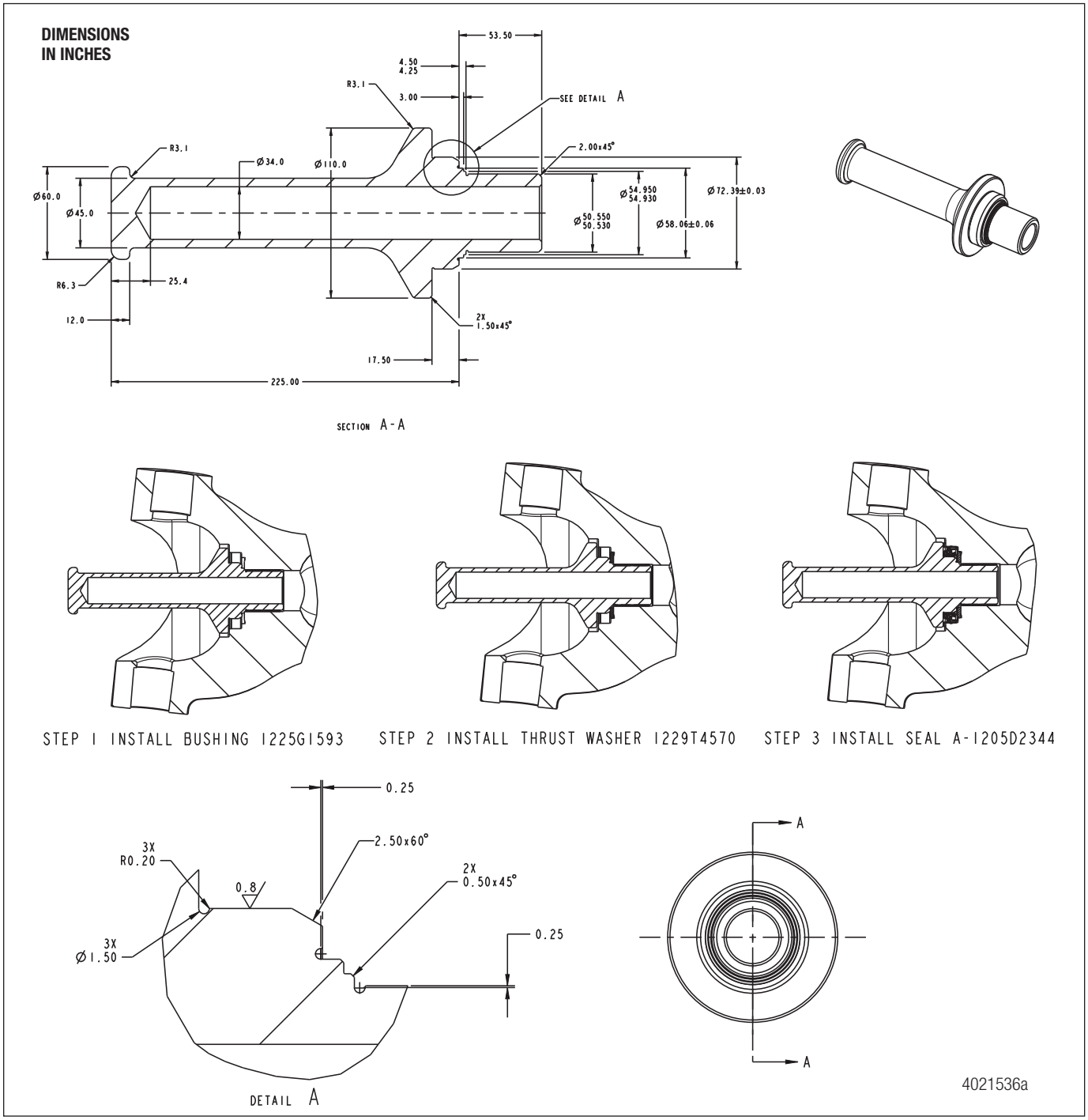


Figure 20.10

20 Special Tools

Hub Seal Driver

NOTE: Use with seal A1205-B-2940.

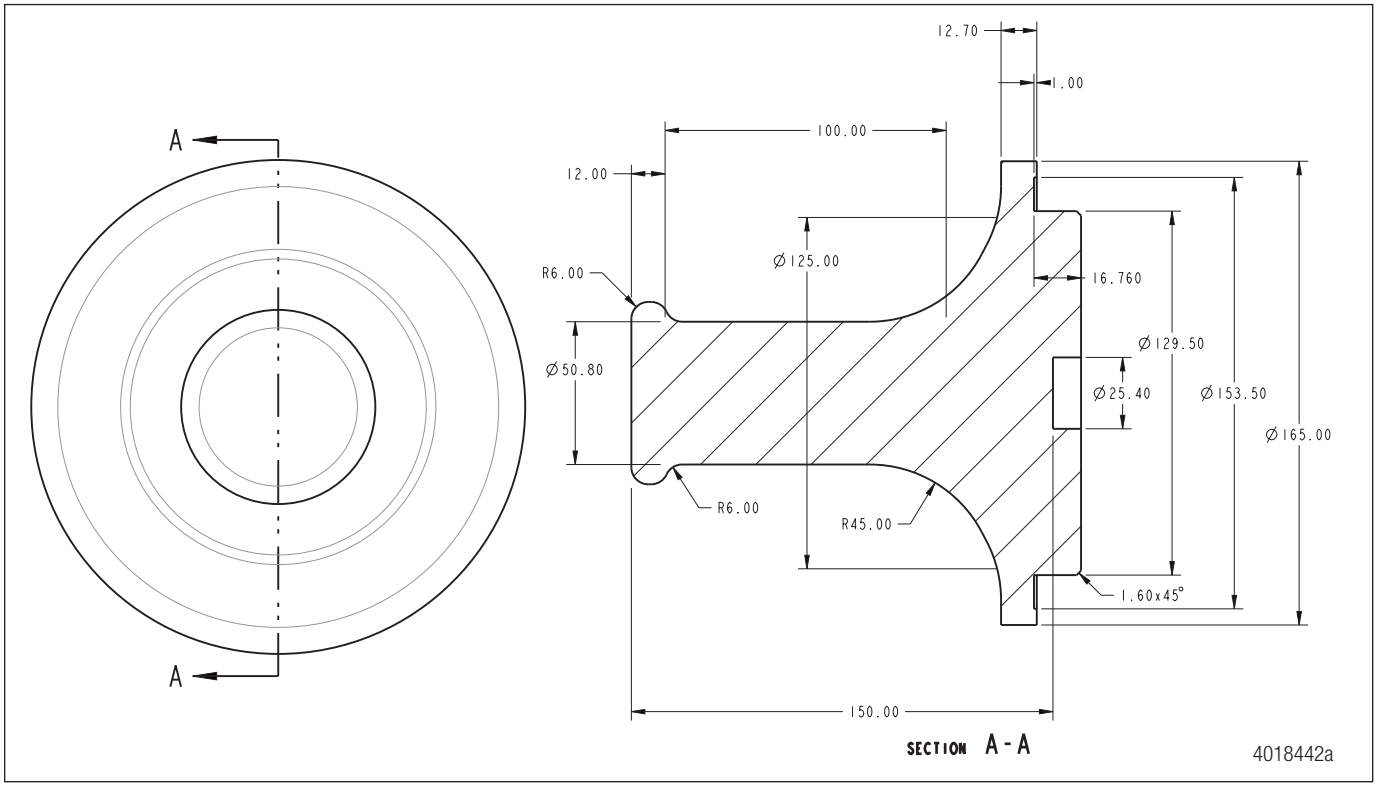


Figure 20.11

Gauge Block (1199A4265)

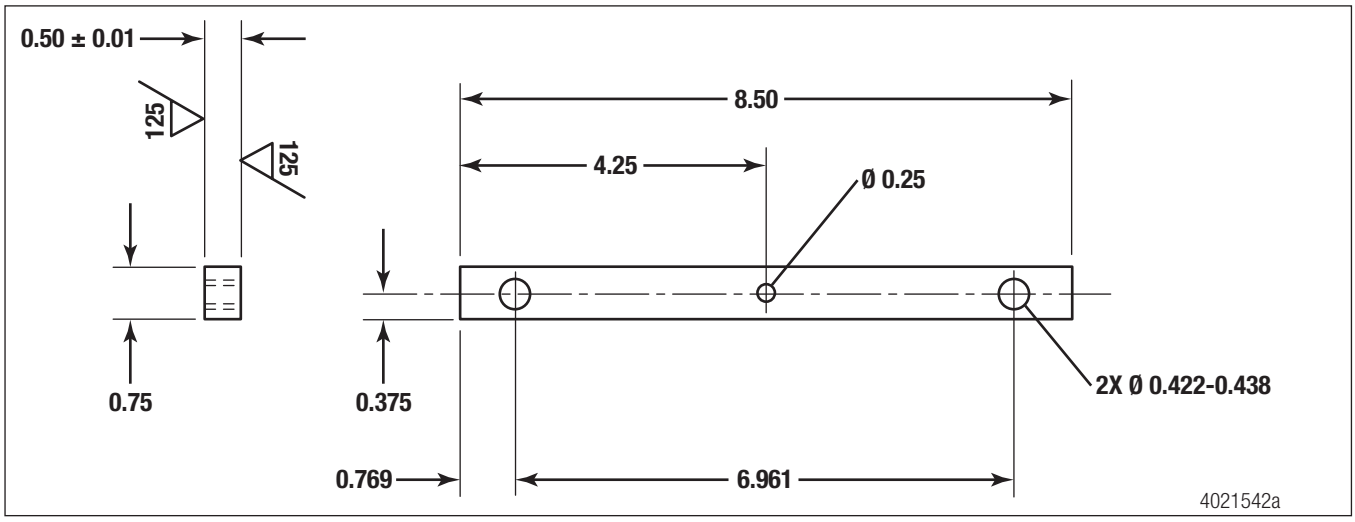


Figure 20.12

Hub Hanger (A-3305H5494)

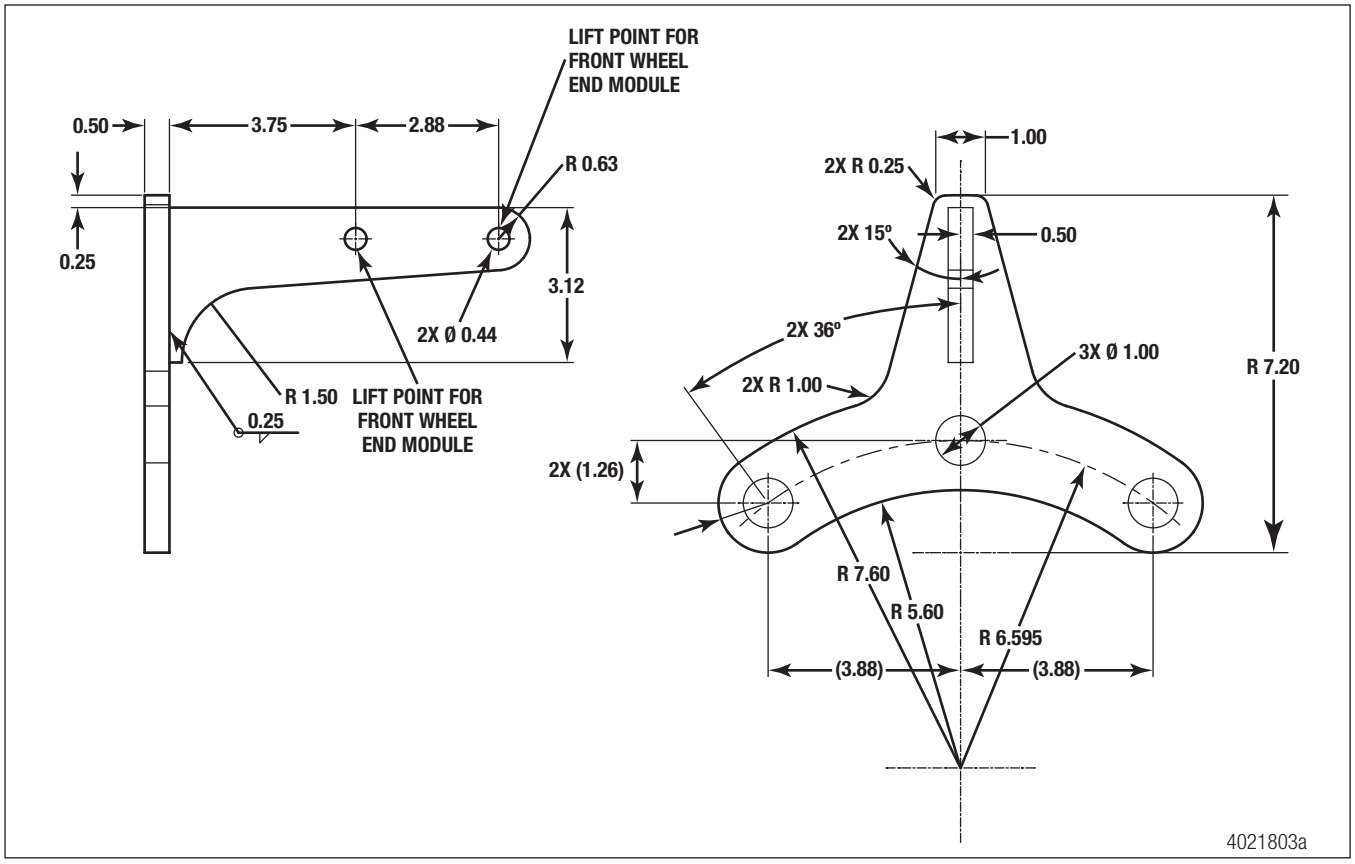


Figure 20.13

20 Special Tools

Carrier Repair Stand

To obtain a repair stand, refer to the Service Notes page on the inside front cover of this manual.

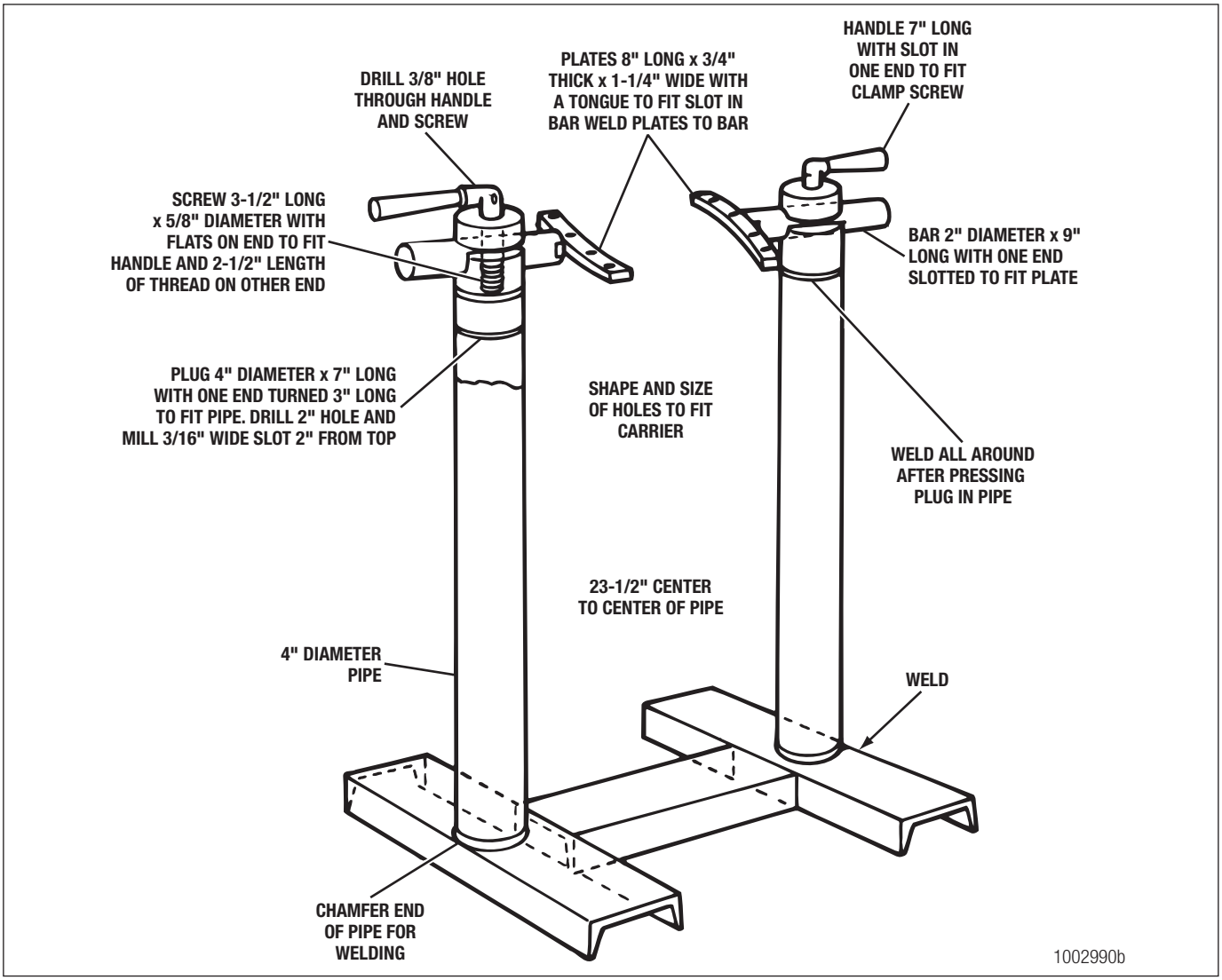


Figure 20.14

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