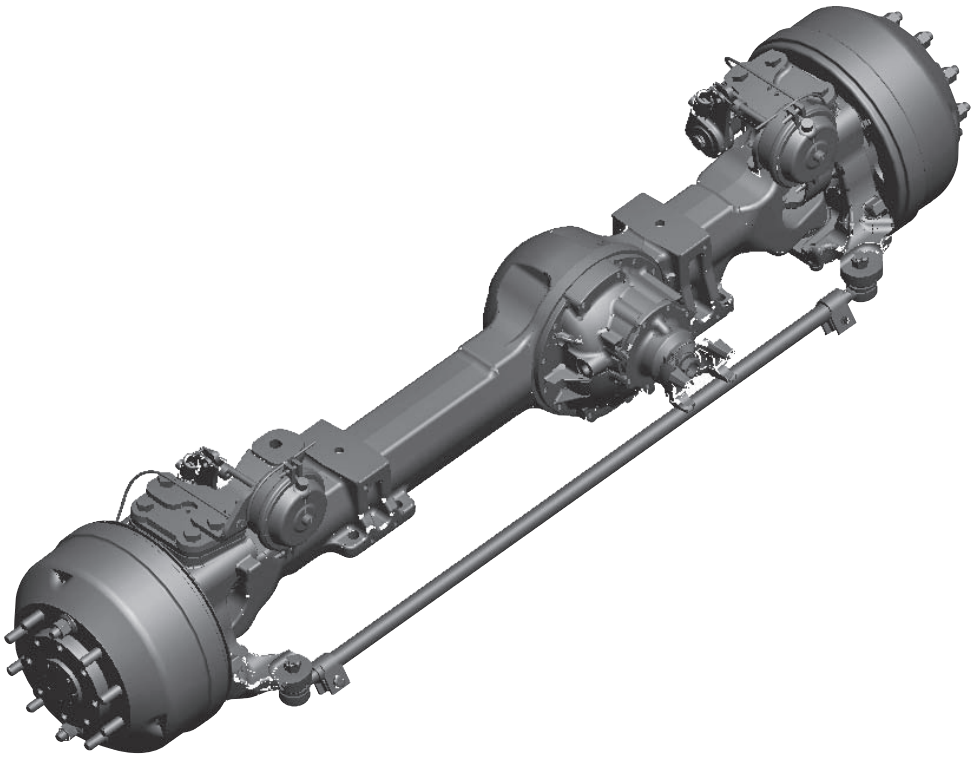
MERITOR
RUN WITH THE BULL

MEDIUM-DUTY FRONT DRIVE STEER AXLES

MX-120 AND MX-120-EVO SERIES

APPLIES TO STANDARD 120 AND 120-HR HIGH-RETARDATION CARRIERS



Revised 03-23

Service Notes

About this Manual

This manual provides maintenance and service information for the Meritor MX-120 and MX-120-EVO Series medium-duty front drive steer axles.

How to Obtain Additional Maintenance, Service and Product Information

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

- Maintenance Manual 1, Preventive Maintenance and Lubrication
- Maintenance Manual 4, Cam Brakes and Automatic Slack Adjusters
- Maintenance Manual 5A, Single Reduction Rear Differential Carriers
- Maintenance Manual 28, Anti-Lock Braking Systems (ABS) for Trucks, Tractors and Buses — C Version ECUs
- Maintenance Manual 30, Anti-Lock Braking Systems (ABS) for Trucks, Tractors and Buses — D Version ECUs
- Technical Publication TP-0445, Parts Failure Analysis

Additional information is also available at meritorbullpen.com.

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

If Tools and Supplies are Specified in This Manual

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

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

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Safety Information

Hazard Alert Messages

Read and observe all hazard alert messages in this publication.

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

Safety Precautions

Before performing service and maintenance procedures, read and understand the following safety precautions.

⚠ 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.
- 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

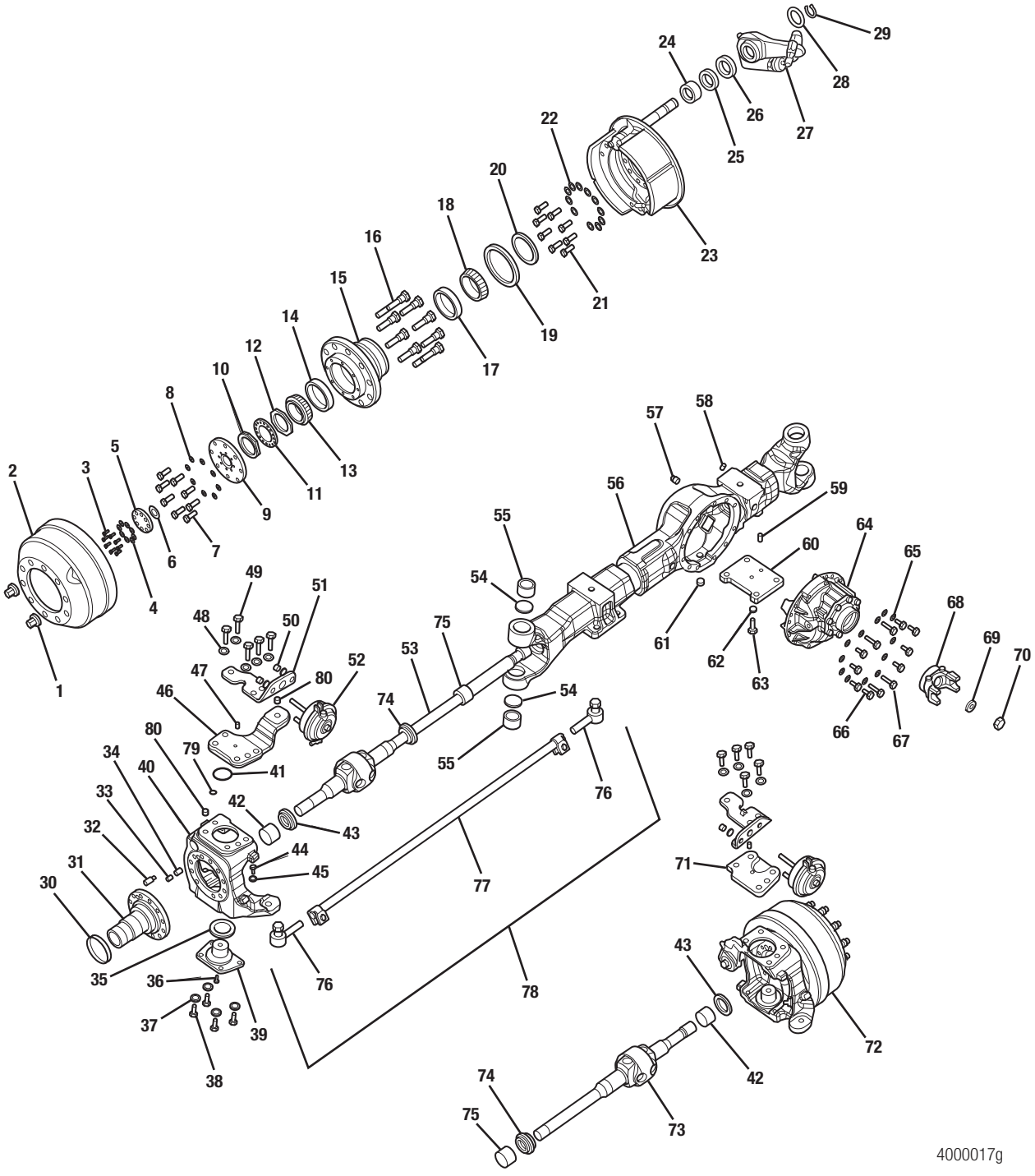
1. **Separate Work Areas.** Whenever feasible, service brakes in a separate area away from other operations to reduce risks to unprotected persons.
2. **Respiratory Protection.** OSHA has set a maximum allowable level of exposure for silica of 0.1 mg/m3 as an 8-hour time-weighted average. Some manufacturers 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

MX-120 and MX-120-HR Series

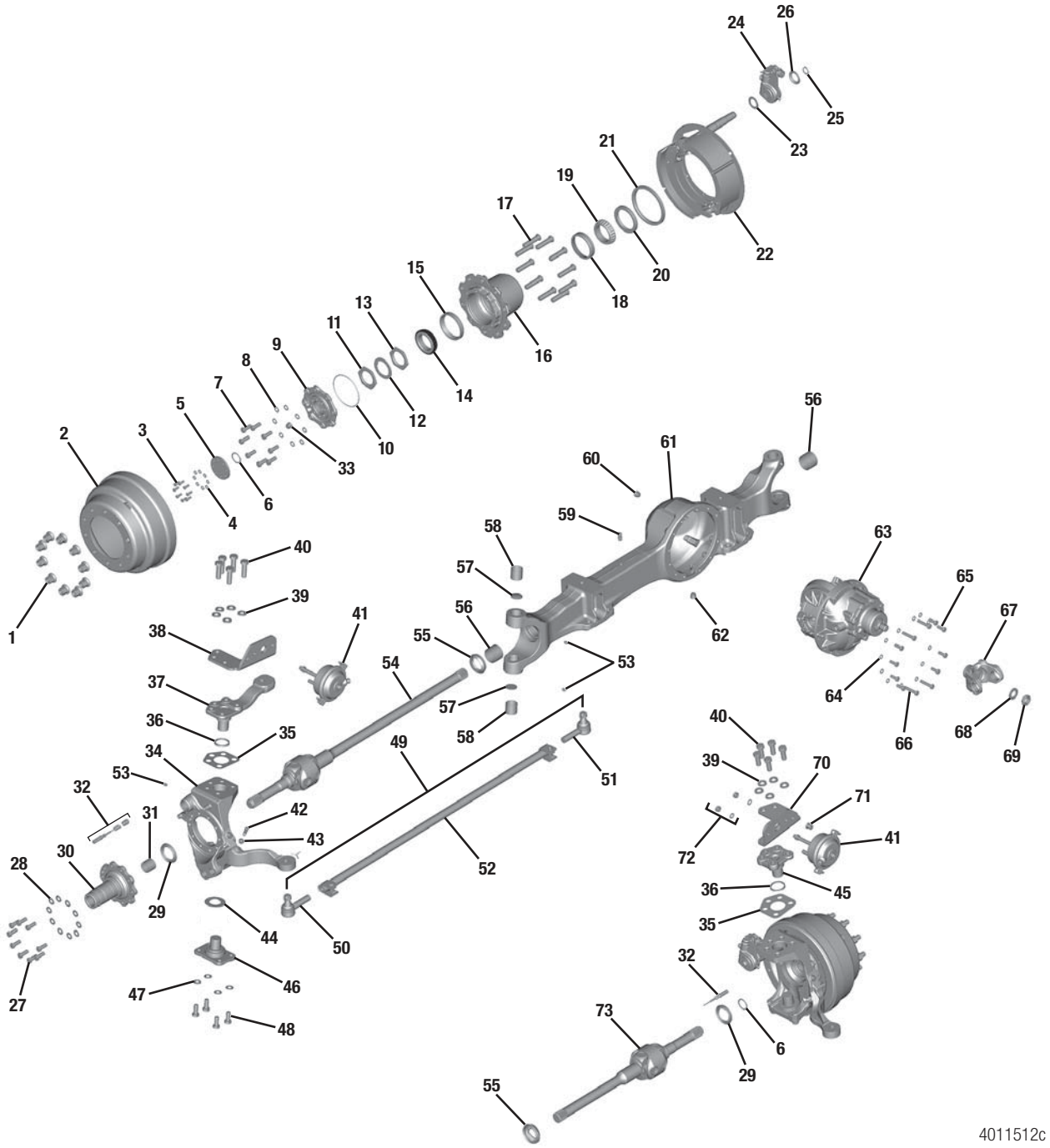


Item	Description
1	Wheel Stud Nuts
2	Brake Drum
3	Capscrews
4	Washers
5	Hubcap
6	Snap Ring
7	Capscrews
8	Washers
9	Drive Flange
10	Jam Nut
11	Lock Washer
12	Inner Adjusting Nut
13	Outer Bearing Cone
14	Outer Bearing Cup
15	Hub
16	Wheel Studs
17	Inner Bearing Cup
18	Inner Bearing Cone
19	Tone Ring
20	Grease Seal
21	Capscrews
22	Washers
23	Brake Assembly
24	Camshaft Bushing
25	Camshaft Seal
26	Spacing Washer, Outer
27	Automatic Slack Adjuster
28	Spacing Washer, Inner
29	Camshaft Snap Ring
30	Grease Seal Sleeve
31	Spindle
32	ABS Sensor Assembly
33	ABS Clip
34	ABS Bushing
35	Thrust Bearing
36	Grease Fitting
37	Lower Knuckle Cap Washer
38	Capscrew
39	Lower Knuckle Cap
40	Steering Knuckle
41	Grease Seal, Upper Cap / Steering Arm

Item	Description
42	Outer Axle Shaft Bushing
43	Grease Seal
44	Steering Stop Adjusting Screw
45	Steering Stop Adjusting Nut
46	Steering Arm
47	Grease Fitting
48	Washer
49	Capscrews
50	Nuts and Washers
51	Chamber Bracket
52	Air Brake Chamber
53	Universal Joint and Axle Shaft Assembly, Long
54	Welch Plug
55	Bushing
56	Axle Housing
57	Lube Fill Plug
58	Breather Assembly
59	Spring Plate Dowel
60	Spring Plate
61	Lube Drain Plug
62	Spring Plate Washer
63	Spring Plate Capscrew
64	Carrier Assembly
65	Carrier Housing Washer
66	Capscrew, Short
67	Capscrew, Long
68	Yoke
69	Yoke Washer
70	Yoke Nut
71	Upper Knuckle Cap
72	Steering Knuckle and Wheel Assembly
73	Universal Joint and Axle Shaft Assembly, Short
74	Oil Seal
75	Inner Axle Shaft Bushing
76	Tie Rod End
77	Cross Tube
78	Tie Rod Assembly
79	Shim
80	ABS Cable Grommet

2 Exploded Views

MX-120-EVO Series

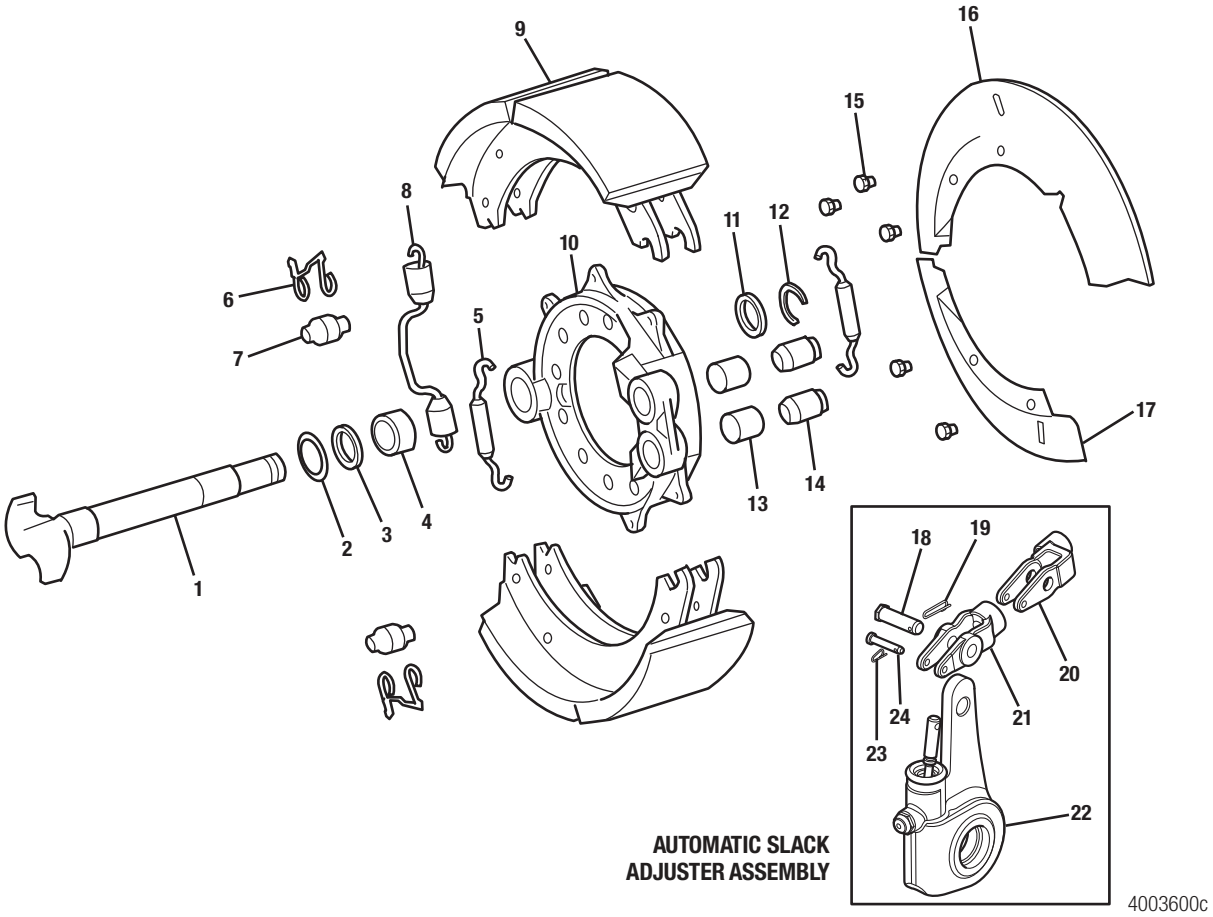


Item	Description
1	Wheel Stud Nut
2	Brake Drum
3	Capscrew
4	Washer
5	Hubcap
6	Snap Ring
7	Capscrew
8	Washer
9	Drive Flange
10	O-ring
11	Jam Nut
12	Lock Washer
13	Inner Adjusting Nut
14	Outer Bearing Cone
15	Outer Bearing Cup
16	Hub
17	Wheel Studs
18	Inner Bearing Cup
19	Inner Bearing Cone
20	Oil Seal
21	Tone Ring
22	Brake Assembly
23	Outer Flat Washer
24	Automatic Slack Adjuster
25	Snap Ring
26	Inner Spacing Washer
27	Capscrew
28	Washer
29	Grease Seal
30	Spindle
31	Outer Axle Shaft Bushing
32	ABS Sensor, Clip and Bushing
33	Oil Fill / Drain Plug
34	Steering Knuckle
35	Shim
36	Grease Seal, Upper Cap / Steering Arm
37	Steering Arm
38	Chamber Bracket, LH
39	Washer
40	Capscrew
41	Air Brake Chamber
42	Steering Stop Adjusting Screw

Item	Description
43	Steering Stop Adjusting Nut
44	Thrust Bearing
45	Pin Cap Steering Knuckle
46	Lower Knuckle Cap
47	Washer
48	Capscrew
49	Tie Rod Assembly
50	Tie Rod End, Left Hand
51	Tie Rod End, Right Hand
52	Cross Tube
53	Grease Fitting
54	Universal Joint and Axle Shaft Assembly, Long
55	Oil Seal
56	Inner Axle Shaft Bushing
57	Welch Plug
58	Bushing
59	Breather Assembly
60	Lube Fill Plug
61	Axle Housing
62	Lube Drain Plug
63	Carrier Assembly
64	Washer
65	Capscrew, Short
66	Capscrew, Long
67	Yoke
68	Yoke Washer
69	Yoke Nut
70	Chamber Bracket, Right Hand
71	ABS Cable Grommet
72	Brake Chamber Nuts and Washers
73	Universal Joint and Axle Shaft Assembly, Short

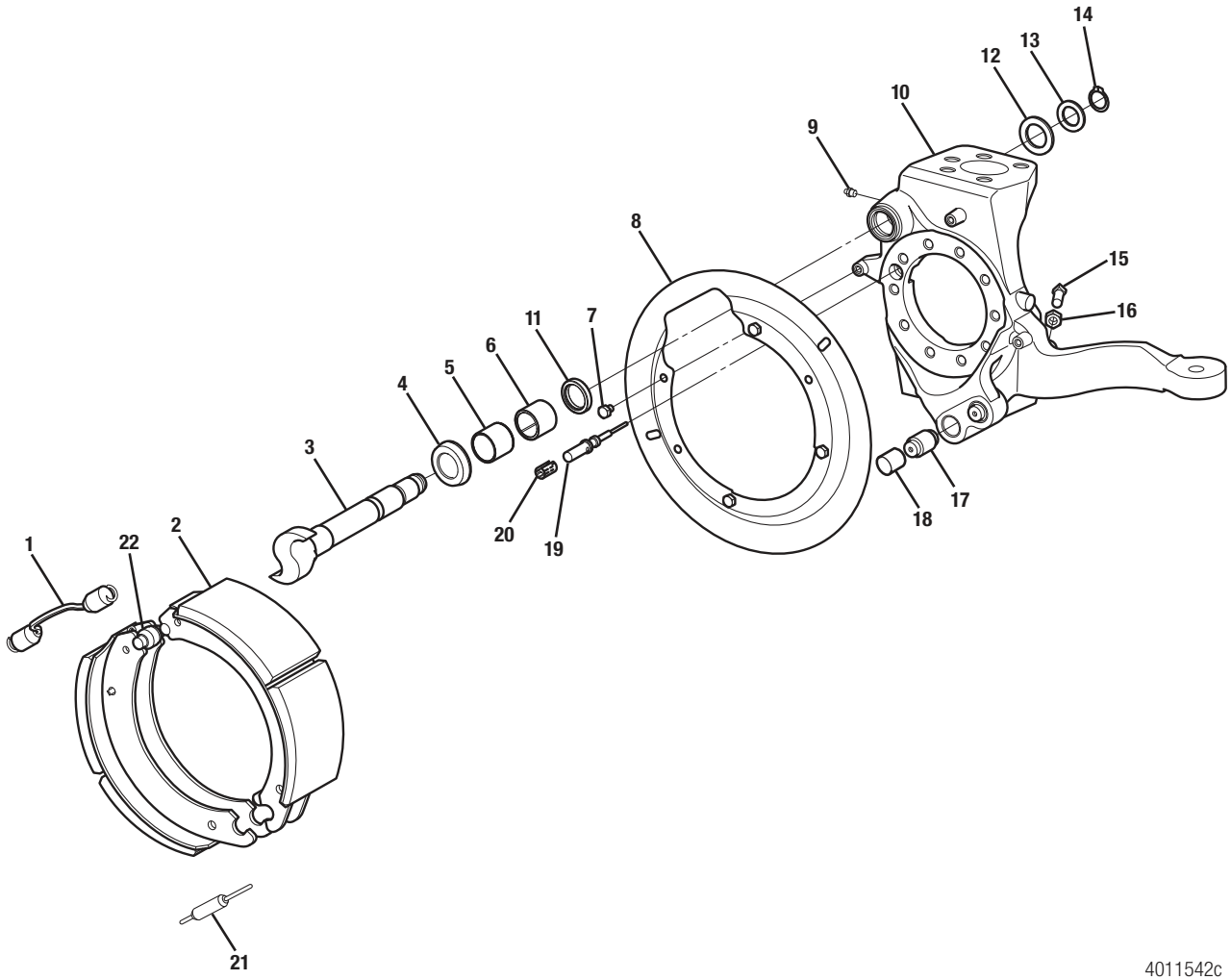
2 Exploded Views

Brake Assembly



Item	Description
1	Camshaft
2	Washer
3	Camshaft Seal
4	Camshaft Bushing
5	Brake Shoe Retaining Spring
6	Brake Shoe Roller Retainer
7	Brake Shoe Roller
8	Brake Shoe Return Spring
9	Brake Shoe and Lining Assembly
10	Brake Spider Assembly
11	Camshaft Seal
12	Snap Ring
13	Anchor Pin Bushing
14	Brake Shoe Anchor Pin
15	Dust Shield Capscrew
16	Dust Shield

Item	Description
17	Dust Shield
18	Large Clevis Pin
19	Large Clip
20	Offset Clevis
21	Standard Clevis
22	Automatic Slack Adjuster
23	Small Clip
24	Small Clevis Pin



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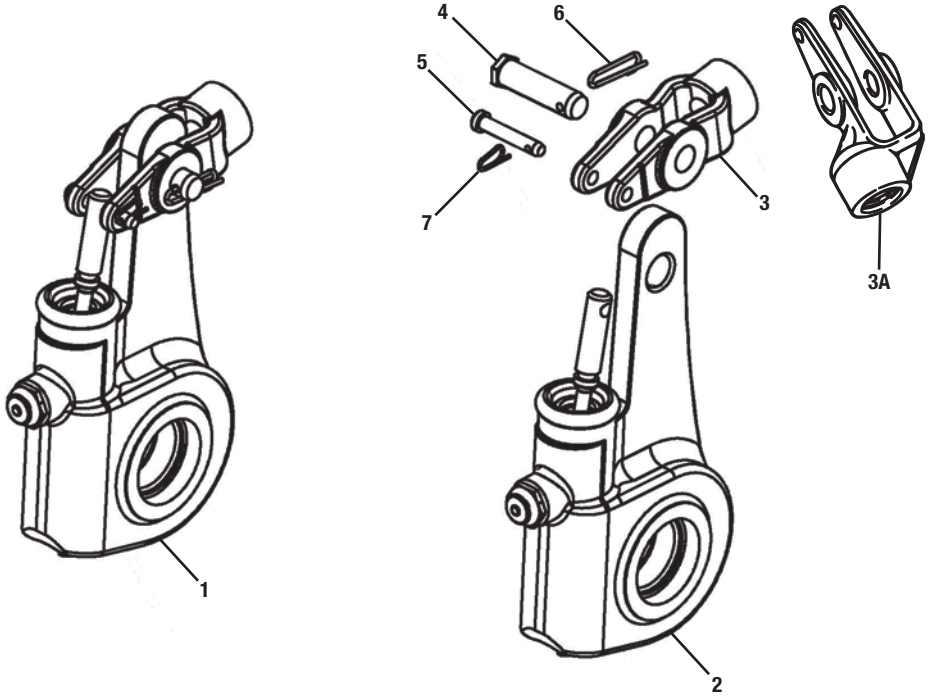
Item	Description
1	Spring Shoe Return
2	Brake Shoe and Lining Assembly
3	Camshaft
4	Outer Camshaft Seal
5	Inner Camshaft Bushing
6	Outer Camshaft Bushing
7	Capscrew
8	Dust Shield
9	Grease Fitting
10	Knuckle Steering Assembly
11	Inner Camshaft Seal
12	Flat Washer
13	Flat Washer

Item	Description
14	Snap Ring
15	Square Head Set Screw
16	Nut
17	Brake Shoe Anchor Pin
18	Anchor Pin Bushing
19	ABS Sensor
20	Sensor Sleeve
21	Spring
22	Brake Shoe Roller

2 Exploded Views

Automatic Slack Adjuster



4011543c

Item	Description
1	Slack Adjuster Assembly
2	Slack Adjuster
3	Clevis
3A	Offset Clevis
4	Large Clevis Pin
5	Small Clevis Pin
6	Large Clip
7	Small Clip

Introduction

Overview

MX Series Medium-Duty Front Drive Steer Axles

This publication provides maintenance and service information for Meritor MX-120, MX-120-HR and MX-120-EVO Series medium-duty front drive steer axles. Both the standard MX-120 and MX-120-HR carriers are available with these axles. The axles are designed specifically for use with the MTC-4210 and -4213 transfer cases as part of the Meritor medium-duty part-time 4x4 or 6x6 system.

To obtain maintenance and service information on the MTC Series transfer cases, refer to the Service Notes page on the inside front cover of this manual.

MX-120 Series Axle Standard Features

- Single axle capacities of 10,000 lb (4,536 kg) to 18,000 lb (28,968 kg) GAWR
- 16.5 Q+™ cam brakes with outboard-mounted brake drums
- Meritor automatic slack adjusters
- Hub-piloted wheel mountings for 10 stud x 11.25-inch wheels
- Easy Steer™ king pin bushings
- ABS-ready wheel-ends with installed tooth wheel and sensor
- Standard MX-120 Series carrier with hypoid gearing with a wide range of ratio selections from 4.30 to 6.43
- MX-120 High Retardation (HR) Series carrier with hypoid gearing with ratio selections of 4.88, 5.57, 6.14 and 6.43

Typical Applications

- Utility vehicles
- Snow plows
- Block trucks
- Oil drillers

3 Introduction

Model Nomenclature

Front drive steer axle models are identified by a letter and number system. The letters and numbers give important information about the specific axle model. Figure 3.1.

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

MX-120-EVO Series axles will include an “EV” designation in the axle model nomenclature.

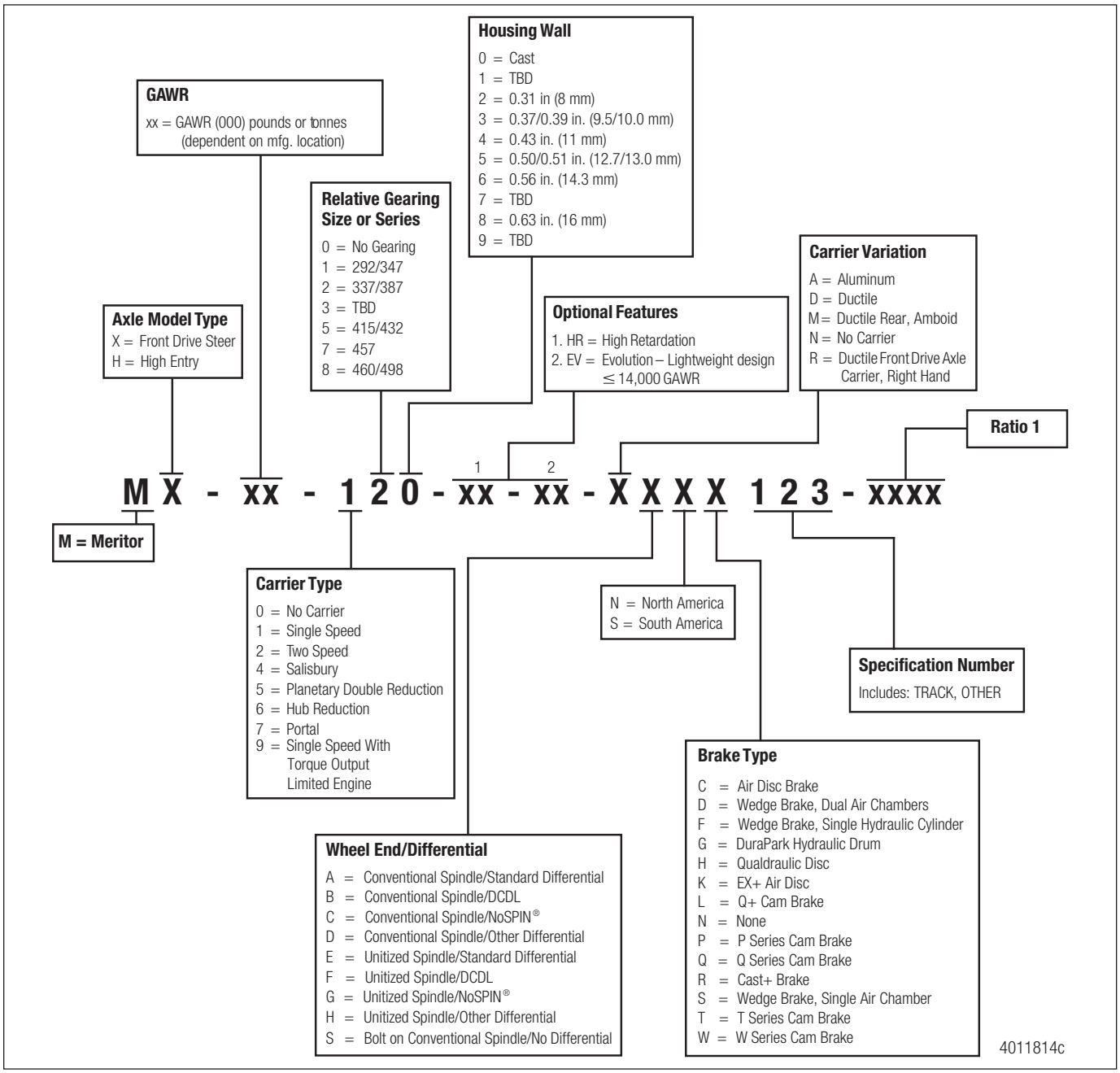


Figure 3.1

Removal and Disassembly – MX-120 and MX-120-HR Series

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.

Remove the Wheel and Drum Assembly

⚠ DANGER

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

1. Park the vehicle on a level surface. Place blocks under the wheels not being serviced to prevent the vehicle from moving.
2. Raise the vehicle so that the wheels to be serviced are off the ground. Support the vehicle with safety stands.
3. Retract the brake linings so that the drums will clear the linings.
4. If the steering universal joint is to be removed from the housing, remove the oil drain plug and drain the lubricant from the axle.
5. Remove the rim and tire.
6. Remove the wheel and drum assembly.

Disconnect the Tie Rod Assembly, Tie Rod End and Cross Tube

1. Remove the cotter pins and the nuts that fasten each tie rod end to the tie rod arms.

⚠ CAUTION

Do not use a pickle fork tool to separate the tie rod end from the tie rod arm or damage can occur.

2. Disconnect the cross tube assembly from the tie rod arms. Use a tie rod end puller, if available, to separate the tie rod end from the tie rod arm. Push the stud for the tie rod end completely through the tie rod arm. To assist this process, partially reinstall the nut with the castle side down until it is flush with the top of the threaded shaft, and then strike the nut/shaft with the mallet to loosen the stud. Use a soft mallet, if necessary, to drive the stud through the tie rod arm. Figure 4.1.

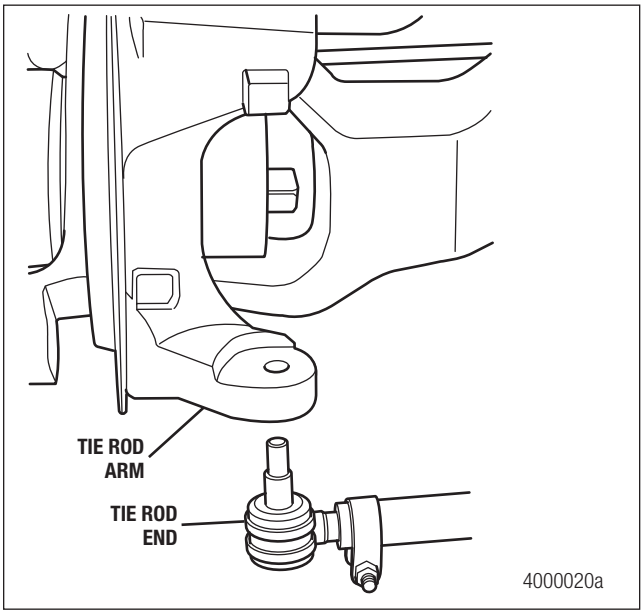


Figure 4.1

3. Position the tie rod end and cross tube out of the way.
4. If necessary, remove the tie rod ends from the cross tube using the following procedure.
   a. Mark the position that each tie rod end is installed into the cross tube. Count and record the number of threads that appear outside of the cross tube. Figure 4.2.

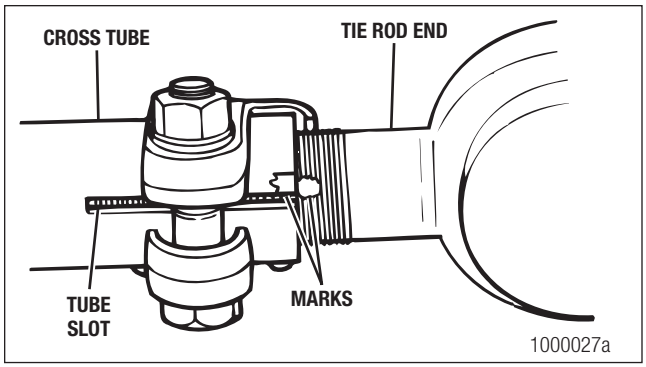


Figure 4.2

b. Remove the bolts and the nuts from the clamp on the cross tube. The rotating style clamp on the cross tubes can be rotated for easier accessibility when removing the clamp bolt and nut. Figure 4.3.

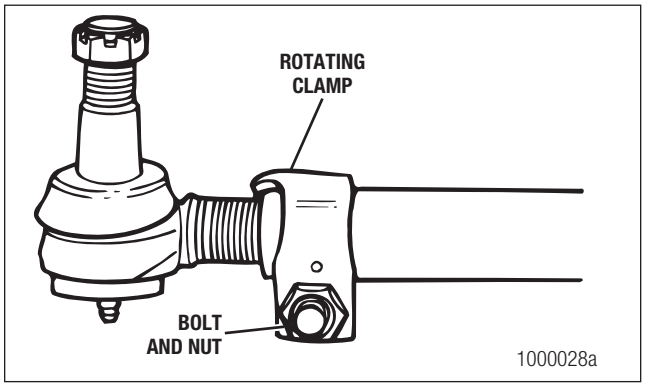


Figure 4.3

c. Remove the tie rod ends from the cross tube.

5. Inspect the parts. Refer to Section 6 Prepare Parts for Assembly on page 28.

NOTE: If one of the tie rod ends requires replacement, replace both tie rod ends as a set.

Remove the Hub from the Axle

1. Remove the capscrews and washers that connect the hubcap to the drive flange. Remove the hubcap. Figure 4.4.

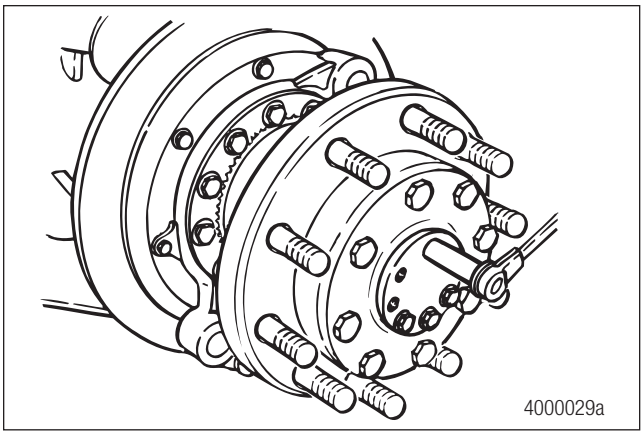


Figure 4.4

2. Remove the snap ring from the end of the axle shaft. Figure 4.5.

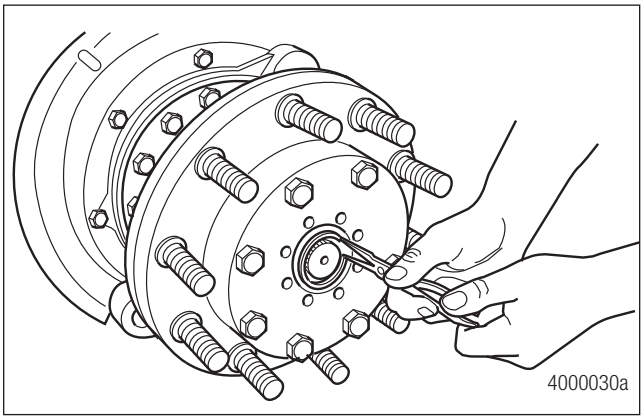


Figure 4.5

3. Remove the capscrews and washers that connect the drive flange to the wheel hub. Figure 4.6.

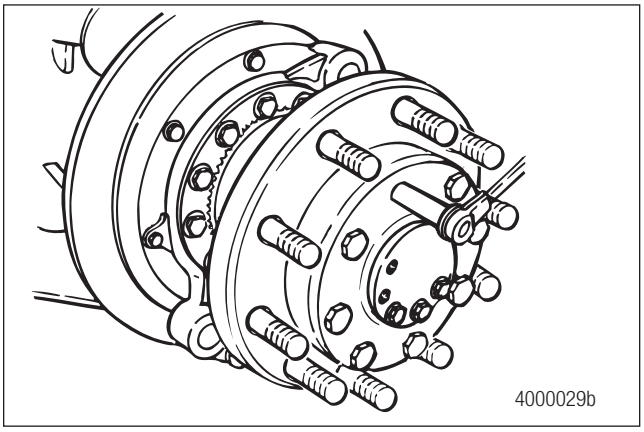


Figure 4.6

4. Remove the drive flange from the hub. If necessary, use a puller to remove the drive flange. Figure 4.7.

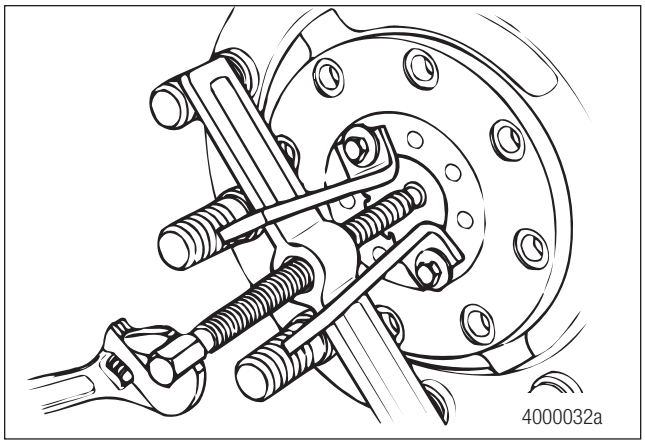


Figure 4.7

⚠ DANGER

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

5. Remove the jam nut, lock washer and the inner adjusting nut from the spindle. Figure 4.8. Use a 4-7/8-inch socket wrench to remove the adjusting nut. Figure 4.9.

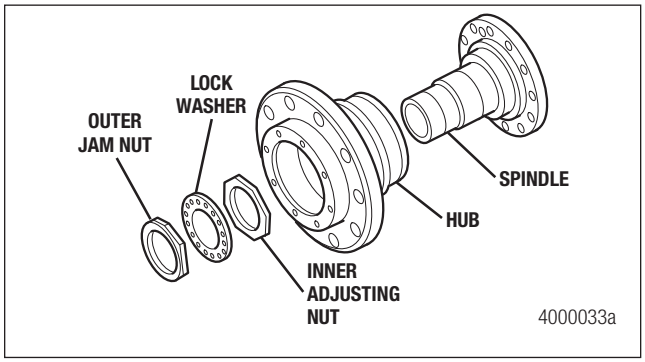


Figure 4.8

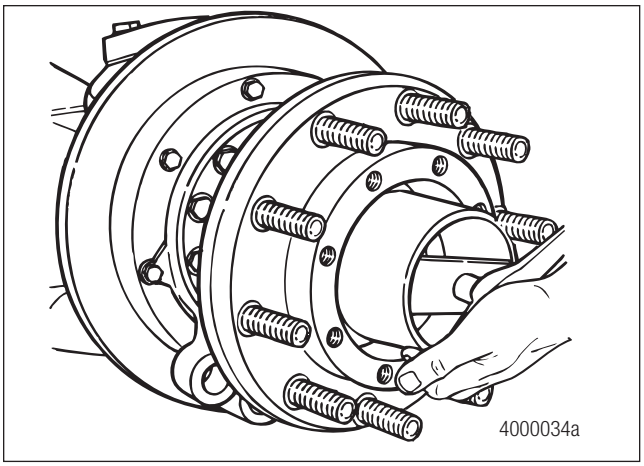


Figure 4.9

6. Remove the hub straight off the spindle. Prevent the outer bearing cone from falling when you remove the hub.

   If the hub is difficult to remove: Tap it with a plastic or leather mallet to loosen it.

7. Remove the outer bearing cone from the hub.

Disassemble the Bearing Cups and Grease Seal from the Hub

⚠ DANGER

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

NOTE: If a press is not available, use a brass hammer or drift.

1. If it is necessary to remove the wheel studs from the hub, place the hub into a press. Support the hub flange and press the studs through the hub. Figure 4.10.

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

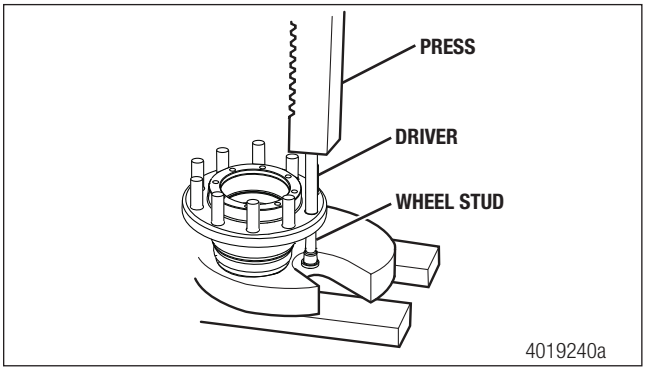


Figure 4.10

2. Use a suitable tool to remove the grease seal from the hub. Discard the grease seal. Figure 4.11 and Figure 4.12.

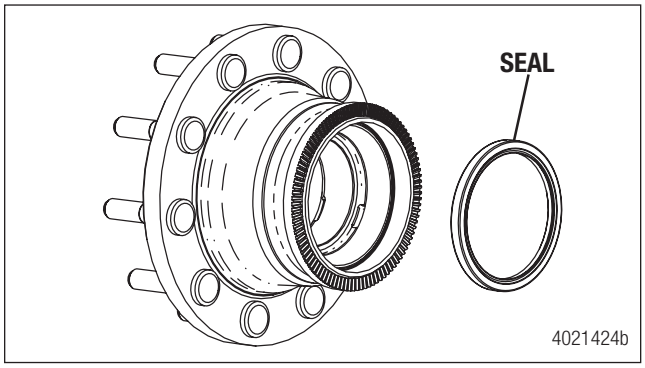


Figure 4.11

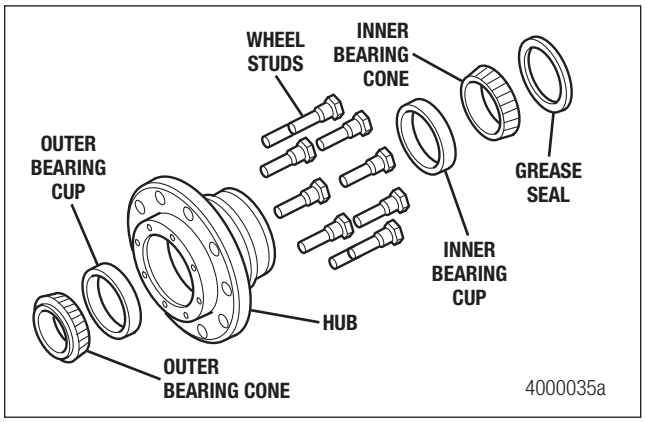


Figure 4.12

3. If necessary, on units equipped for ABS, remove the ABS tooth wheel from the hub with a suitable puller.

4. Remove the inner bearing cone from the hub. Figure 4.12.

5. Remove the inner and outer bearing cups from the hub with a press and sleeve or a bearing puller. Figure 4.12.

6. Use a suitable tool to remove the grease seal sleeve from the spindle. Discard the grease seal sleeve. Figure 4.13.

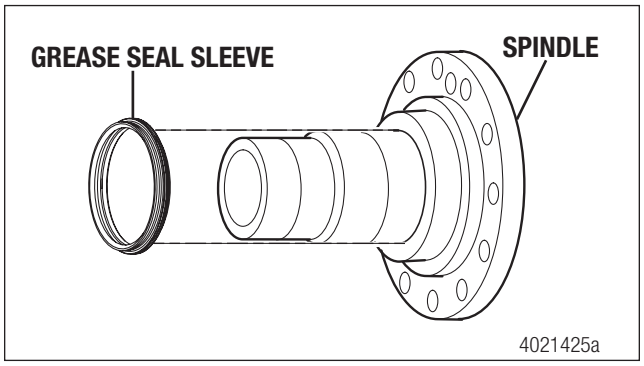


Figure 4.13

Remove the Automatic Slack Adjuster from the Steering Knuckle

1. Remove the slack adjuster retaining ring at the adjuster end of the camshaft. Figure 4.14.

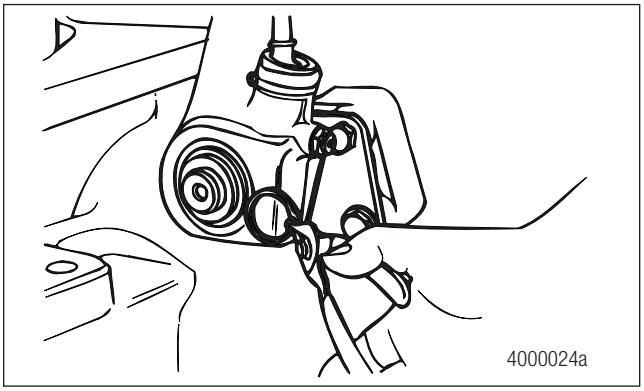


Figure 4.14

2. Remove the slack adjuster shims at the adjuster end of the camshaft. Figure 4.15.

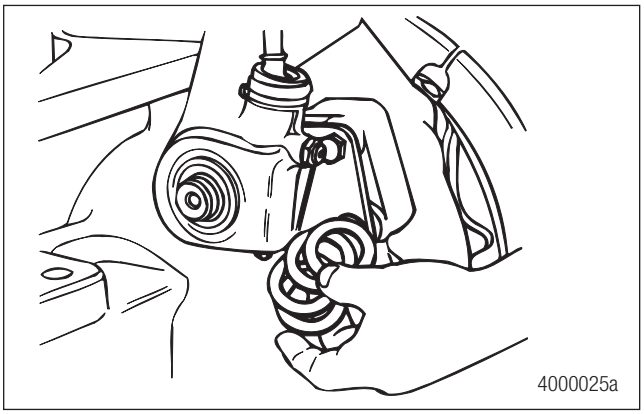


Figure 4.15

3. Remove the pins that engage the push rod yoke and the slack adjuster. Figure 4.16.

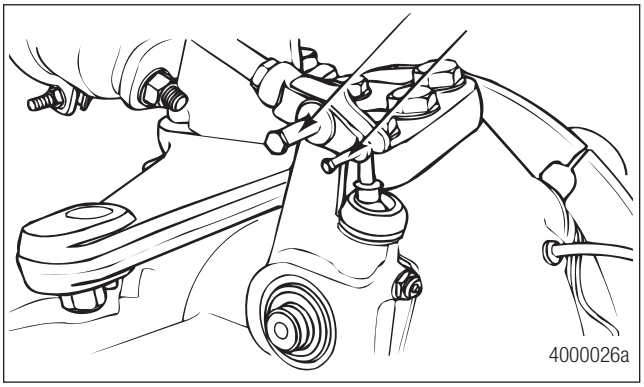


Figure 4.16

4. Adjust the slack forward by lifting on the pawl and rotating the hex nut.
5. Remove the slack adjuster and inner washer from the camshaft.
6. Drain the air tank.
7. Disconnect the air lines at the brake chamber.
8. Remove the air brake chamber and bracket. Figure 4.17.

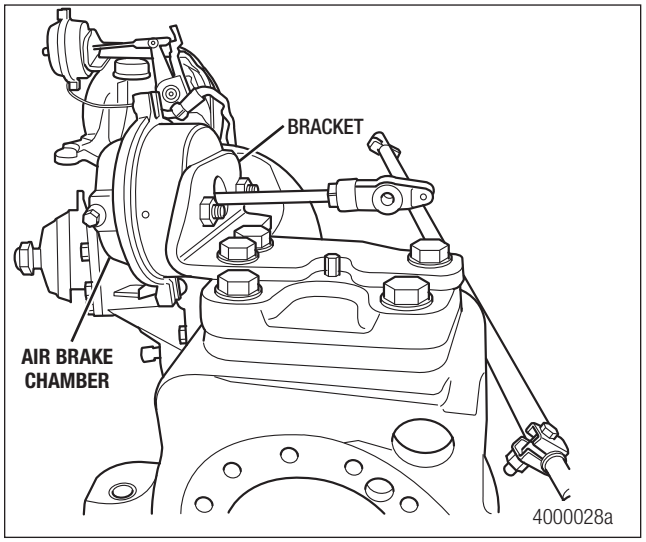


Figure 4.17

Remove the Brake Assembly and Spindle from the Knuckle

1. Remove the capscrews that secure the brake assembly and spindle to the steering knuckle. Figure 4.18.

   If the vehicle is equipped with ABS: Push the ABS sensor into the steering knuckle cavity. Figure 4.19.

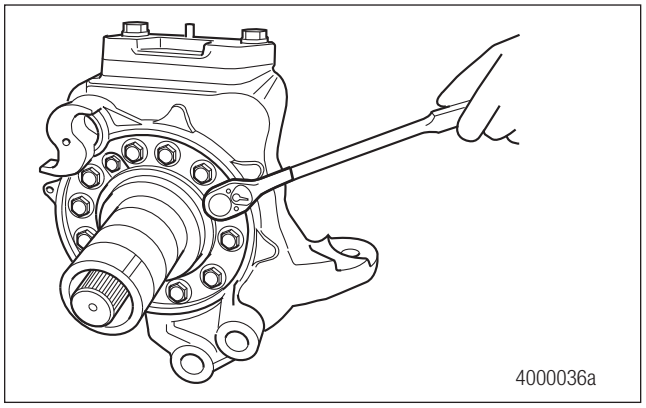


Figure 4.18

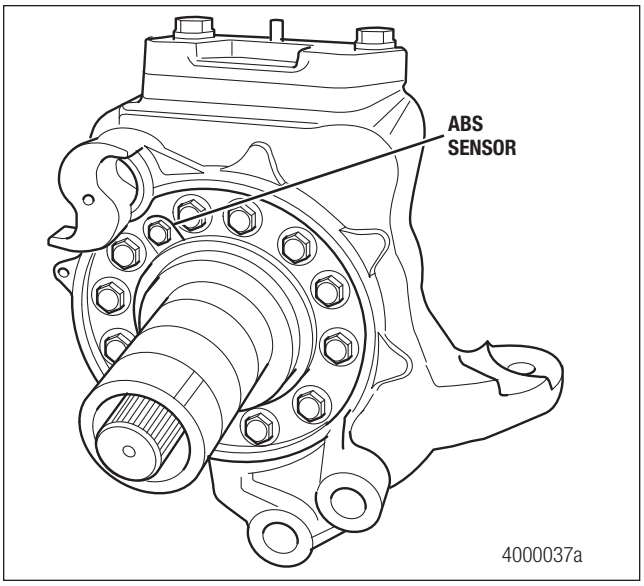


Figure 4.19

2. Pull the brake assembly off the spindle. Take care to prevent the spindle from falling.

   If the vehicle is equipped with ABS: The steel sleeve and sensor clip that position the ABS sensor will remain on the spindle. If necessary, push out the sensor clip to remove it. Use a suitable driver to remove the steel sleeve.

   NOTE: The stop screw maintains the vehicle manufacturer's maximum turning angle and does not have to be removed. If you do remove it, mark the installed depth for reassembly.

3. Pull the spindle straight from the knuckle and axle shaft. The grease seal and bushing will remain inside the spindle. If necessary, remove these parts with the appropriate tool. Figure 4.20 and Figure 4.21.

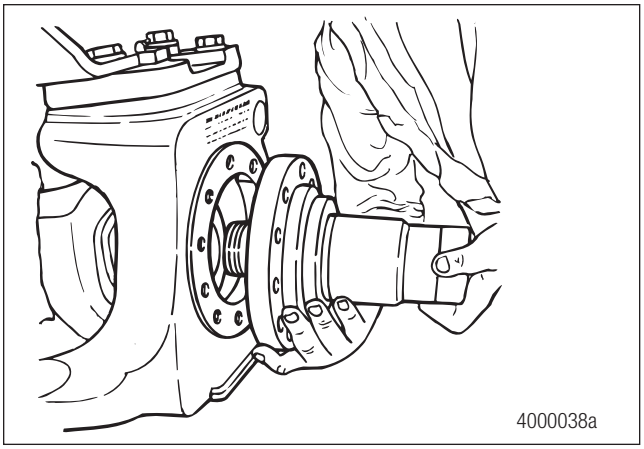


Figure 4.20

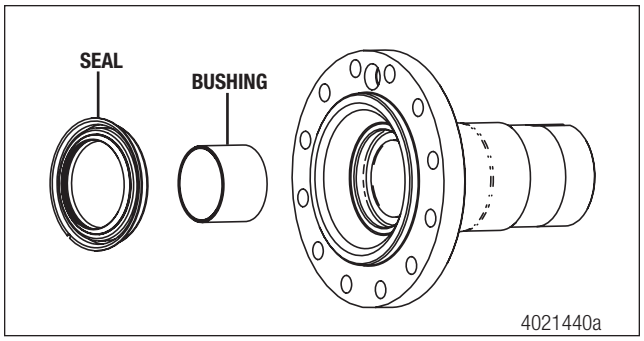


Figure 4.21

Remove the Steering Knuckle from the Axle Housing

NOTES:

- The axle shaft double-cardan joint assembly can be pulled through the steering knuckle opening. If only the axle shaft without the knuckle is being removed, go to Remove the Axle Shaft Without Removing the Steering Knuckle in this section.
- The steering arm and cross tube assemblies can be serviced without removing the steering knuckle from the housing.

1. Remove the four capscrews and washers from the lower knuckle cap. Figure 4.22.

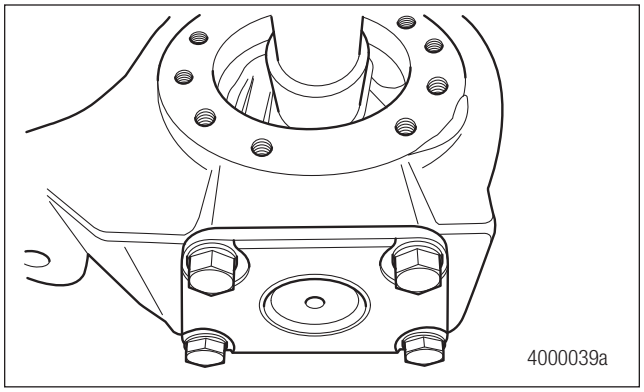


Figure 4.22

2. Remove the lower knuckle cap and inspect the thrust bearing for wear or damage. Replace a worn or damaged thrust bearing at reassembly. Figure 4.23.

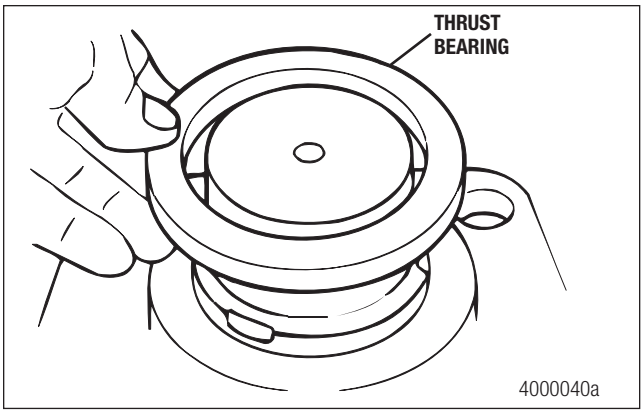


Figure 4.23

3. Remove the five capscrews from the upper knuckle cap.
4. Remove the air chamber mounting bracket. Remove the upper knuckle cap from the bore. Figure 4.24. Inspect the cap for wear and damage. Replace damaged or worn parts.

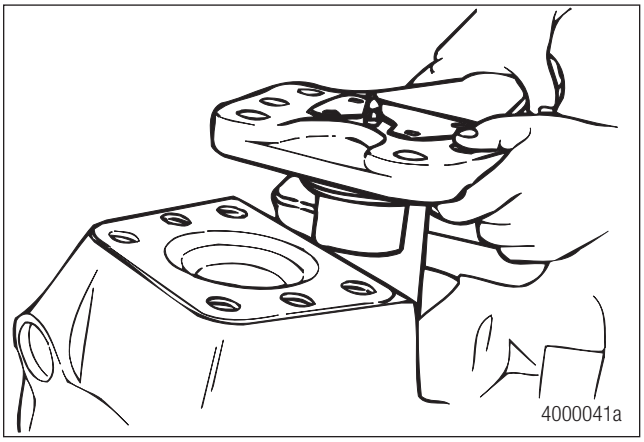


Figure 4.24

5. Remove the steering knuckle from the axle housing. The bushings will remain in the housing sockets.
6. Inspect the upper and lower bushings for wear or damage while they're still in the housing sockets. Figure 4.25. Use the following procedure to remove worn or damaged bushings.

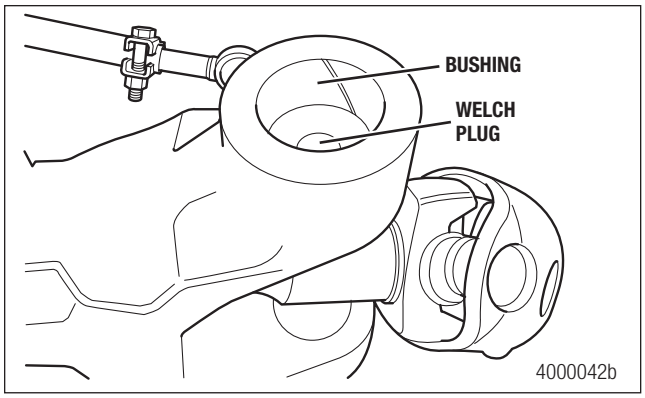


Figure 4.25

a. Drive the welch plug and bushing toward the outside of the socket. Use a sleeve that is slightly smaller than the socket bore. Figure 4.26.

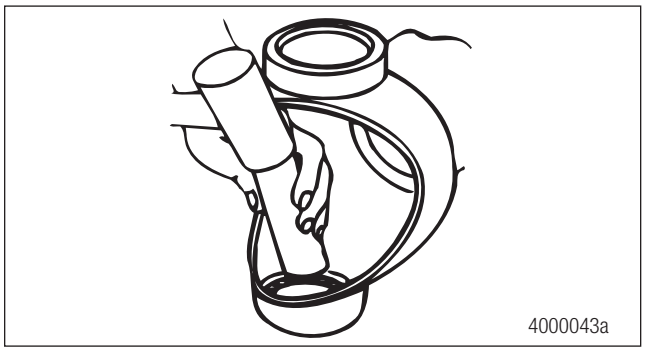


Figure 4.26

b. Clean grease and dirt from the bore before reassembly.

c. Inspect for damage to the housing.

Remove the Axle Shaft from the Axle Housing

⚠ CAUTION

The cross assembly is not greaseable. Do not disassemble it. Damage to components can result. If the cross assembly requires service, replace the assembly.

1. Remove the axle shaft double-cardan joint assembly from the carrier housing by pulling the assembly STRAIGHT out of the carrier housing. Do not disassemble the universal joints, which will void the Meritor warranty. Figure 4.27.

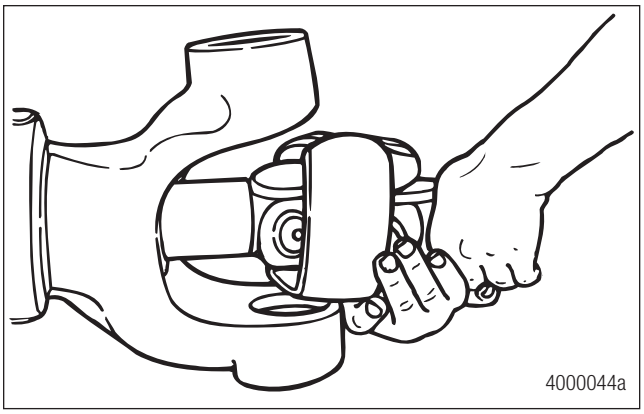


Figure 4.27

2. Inspect the oil seal and bushing in the axle housing for wear or damage and replace if necessary. If the bushing must be replaced, install a new oil seal at the same time. Figure 4.28.

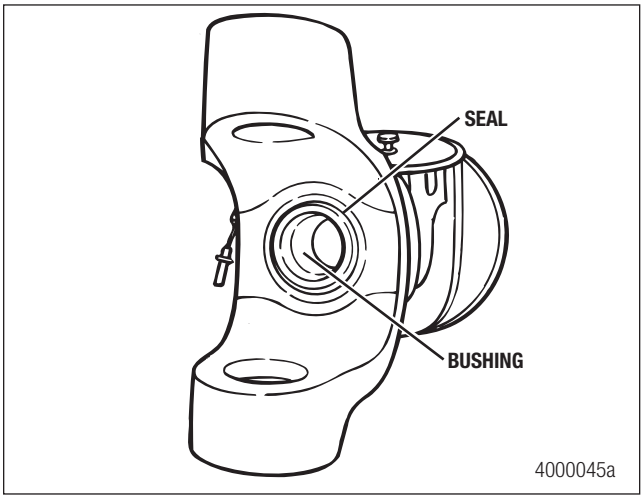


Figure 4.28

Remove the Axle Shaft Without Removing the Steering Knuckle

1. Remove the axle shaft double-cardan joint assembly from the carrier housing by pulling the assembly STRAIGHT out of the carrier housing.

2. Inspect the oil seal and bushing in the axle housing for wear or damage and replace if necessary. If the bushing must be replaced, install a new oil seal at the same time. Figure 4.28.

Remove the Axle Differential Carrier

Refer to Maintenance Manual 5A, Single Reduction Rear Differential Carriers for differential carrier maintenance and service information.

Removal and Disassembly – MX-120-EVO Series

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.

Remove the Wheel and Drum Assembly

⚠ DANGER

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

1. Park the vehicle on a level surface. Place blocks under the wheels not being serviced to prevent the vehicle from moving.
2. Raise the vehicle so that the wheels to be serviced are off the ground. Support the vehicle with safety stands.
3. Retract the brake linings so that the drums will clear the linings.
4. If the steering universal joint is to be removed from the housing, remove the oil drain plug and drain the lubricant from the axle.
5. Remove the rim and tire.
6. Remove the wheel and drum assembly.

Disconnect the Tie Rod Assembly, Tie Rod End and Cross Tube

1. Remove the cotter pins and the nuts that fasten each tie rod end to the tie rod arms.

⚠ CAUTION

Do not use a pickle fork tool to separate the tie rod end from the tie rod arm or damage can occur.

2. Disconnect the cross tube assembly from the tie rod arms. Use a tie rod end puller, if available, to separate the tie rod end from the tie rod arm. Push the stud for the tie rod end completely through the tie rod arm. To assist this process, partially reinstall the nut with the castle side down until it is flush with the top of the threaded shaft, and then strike the nut/shaft with the mallet to loosen the stud. Use a soft mallet, if necessary, to drive the stud through the tie rod arm. Figure 5.1.

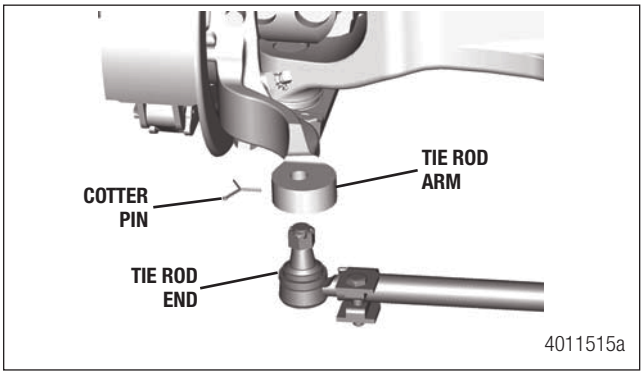


Figure 5.1

3. Position the tie rod end and cross tube out of the way.
4. If necessary, remove the tie rod ends from the cross tube using the following procedure.
   a. Mark the position that each tie rod end is installed into the cross tube. Count and record the number of threads that appear outside of the cross tube. Figure 5.2.

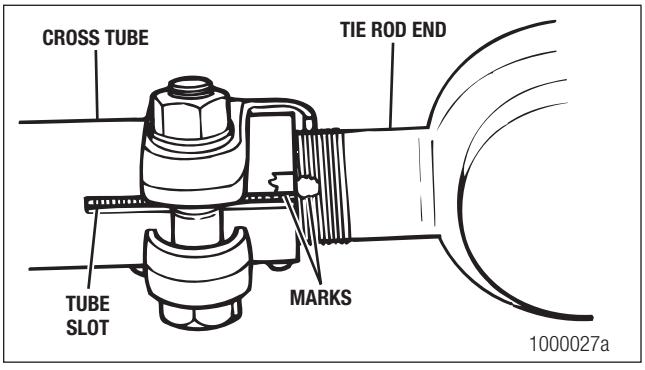


Figure 5.2

b. Remove the bolts and the nuts from the clamp on the cross tube. The rotating style clamp on the cross tubes can be rotated for easier accessibility when removing the clamp bolt and nut. Figure 5.3.

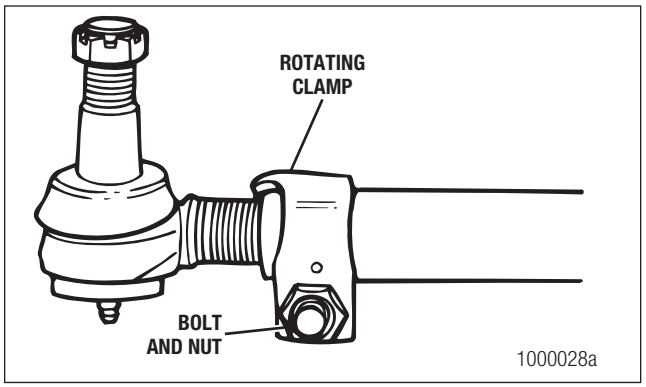


Figure 5.3

c. Remove the tie rod ends from the cross tube.

5. Inspect the parts. Refer to Section 6 Prepare Parts for Assembly on page 28.

NOTE: If one of the tie rod ends requires replacement, replace both tie rod ends as a set.

Remove the Hub from the Axle

1. Place a drain pan under the hub.

2. Rotate the hub so the oil fill/drain plug is at the 6 o'clock position. Remove the oil fill/drain plug and allow the oil to drain. Reinstall the plug. Figure 5.4.

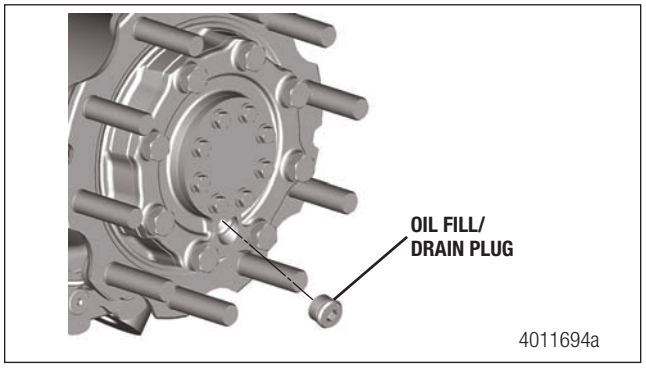


Figure 5.4

3. Remove the capscrews and washers that connect the hubcap to the drive flange. Remove the hubcap. Figure 5.5.

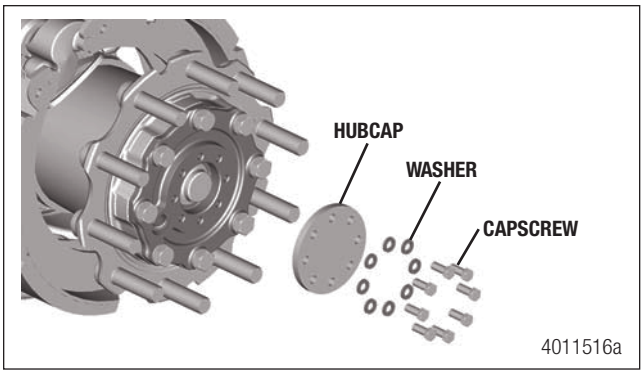


Figure 5.5

4. Remove the snap ring from the end of the axle shaft. Figure 5.6.

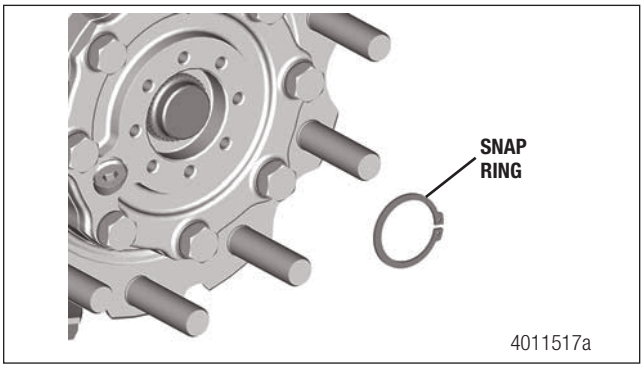


Figure 5.6

5. Remove the capscrews and washers that connect the drive flange to the wheel hub. Figure 5.7.

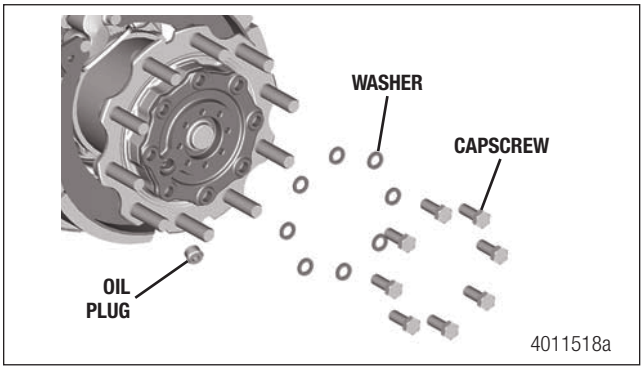


Figure 5.7

6. Remove the drive flange from the hub. If necessary, use a puller to remove the drive flange. Figure 5.8 and Figure 5.9.

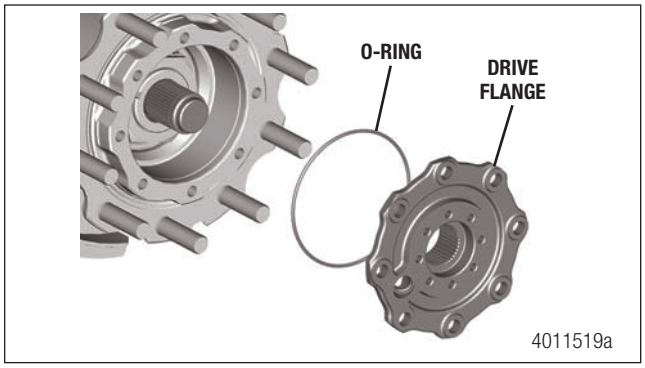


Figure 5.8

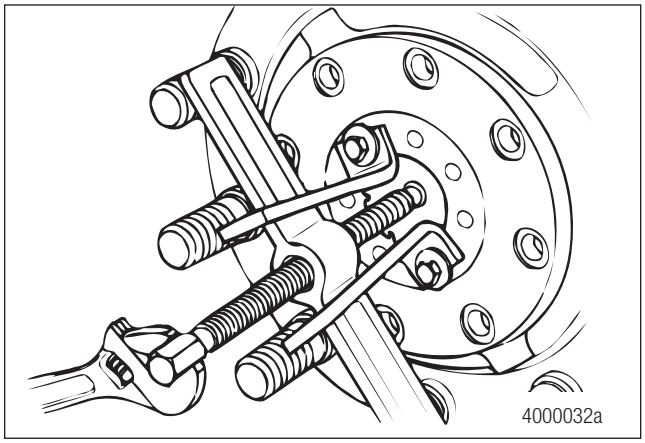


Figure 5.9

7. Remove the o-ring and discard it. The o-ring must be replaced with a new one at reassembly.

⚠ DANGER

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

8. Remove the jam nut, lock washer and the inner adjusting nut from the spindle. Figure 5.10. Use a 4-inch socket wrench to remove the adjusting nut. Figure 5.11.

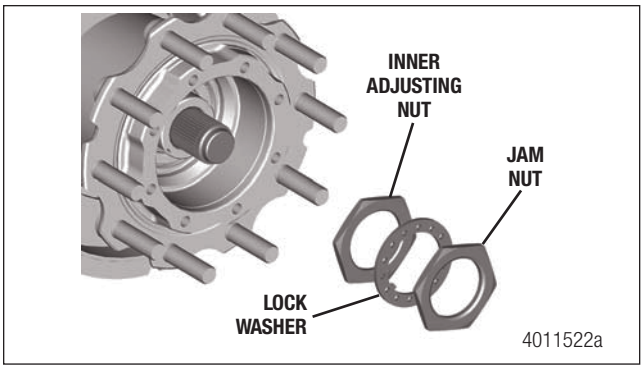


Figure 5.10

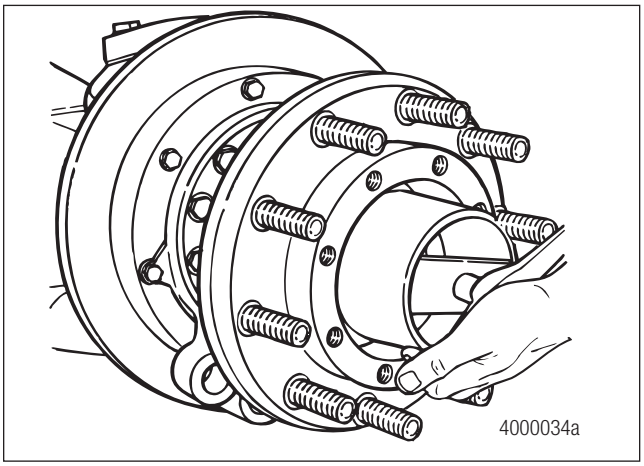


Figure 5.11

9. Remove the hub straight off the spindle. Prevent the outer bearing cone from falling when removing the hub. Figure 5.12.

   If the hub is difficult to remove: Tap it with a plastic or leather mallet to loosen it.

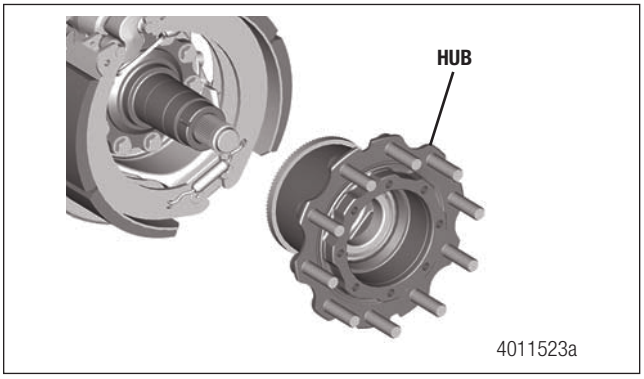


Figure 5.12

10. Remove the outer bearing cone from the hub.

Disassemble the Bearing Cups and Oil Seal from the Hub

⚠ DANGER

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

NOTE: If a press is not available, use a brass hammer or drift.

1. If it is necessary to remove the wheel studs from the hub, place the hub into a press. Support the hub flange and press the studs through the hub. Figure 5.13 and Figure 5.14.

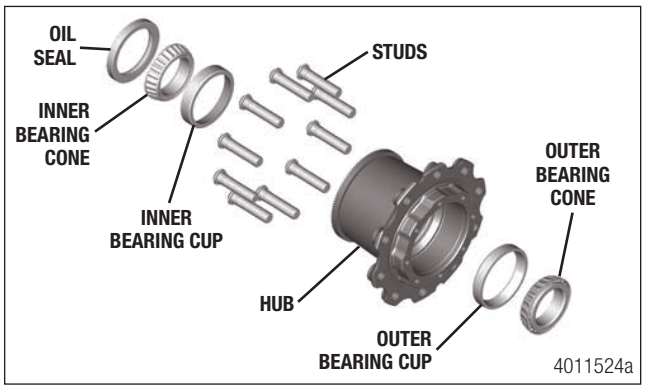


Figure 5.13

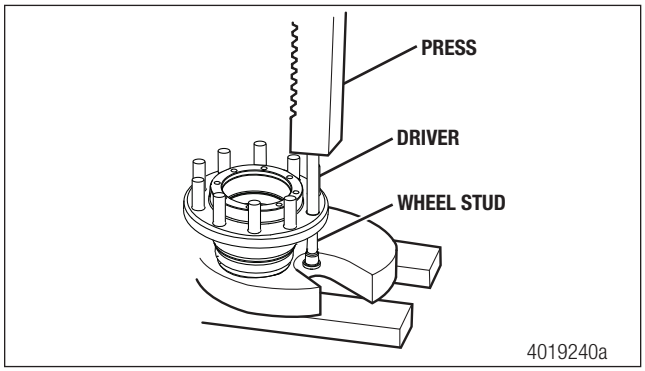


Figure 5.14

2. Remove the oil seal from the hub with a suitable tool. Discard the oil seal. Figure 5.15.

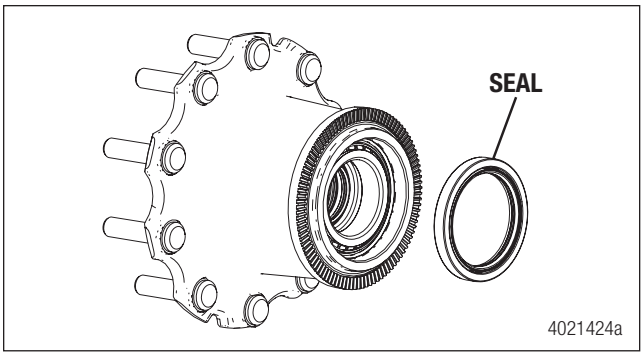


Figure 5.15

3. If necessary, on units equipped for ABS, remove the ABS tone ring from the hub with a suitable puller.

4. Remove the inner bearing cone from the hub. Figure 5.13.

5. Remove the inner and outer bearing cups from the hub with a press and sleeve or a bearing puller. Figure 5.13.

Remove the Automatic Slack Adjuster from the Steering Knuckle

1. Remove the slack adjuster retaining ring at the adjuster end of the camshaft. Figure 5.16.

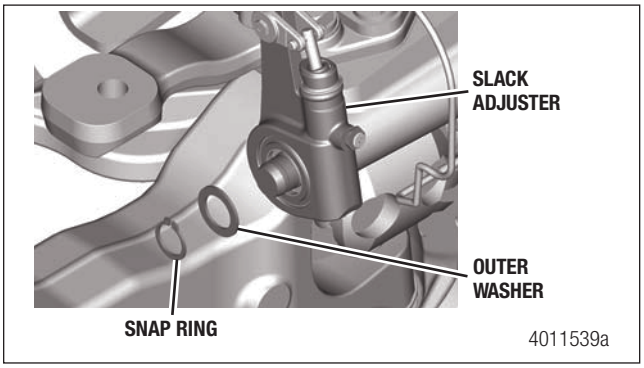


Figure 5.16

2. Remove the pins that engage the push rod yoke and the slack adjuster. Figure 5.17.

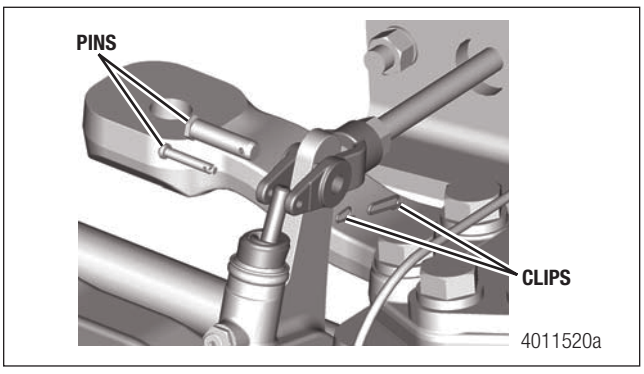


Figure 5.17

3. Adjust the slack forward by lifting on the pawl and rotating the hex nut.

4. Remove the slack adjuster and inner washer from the camshaft. Figure 5.18.

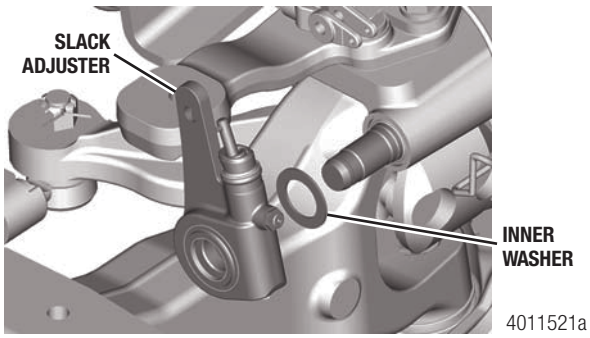


Figure 5.18

5. Drain the air tank.

6. Disconnect the air lines at the brake chamber.

7. Remove the air brake chamber and bracket. Figure 5.19.

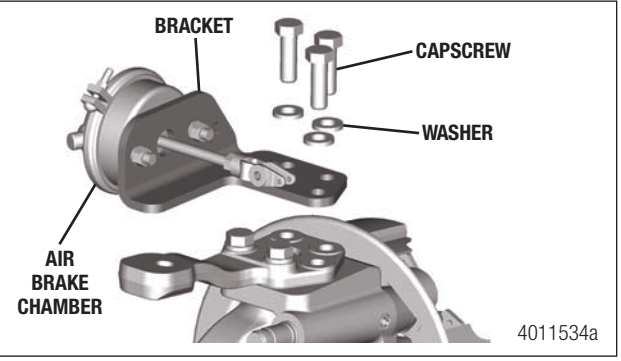


Figure 5.19

Remove the Brake Assembly and Spindle from the Knuckle

1. Remove the return springs and retainer springs from the brake shoes. Remove the brake shoes. Figure 5.20.

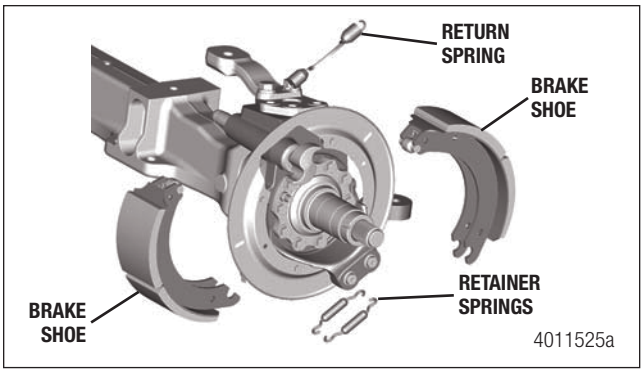


Figure 5.20

2. Remove the brake dust shield mounting screws and remove the brake dust shield. Figure 5.21.

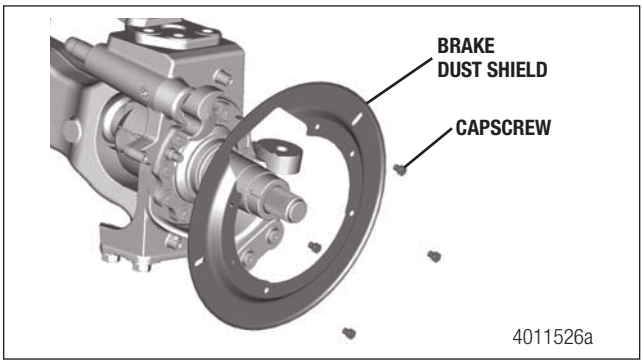


Figure 5.21

3. Remove the brake camshaft seals, bushings and the brake camshaft from the steering knuckle. Figure 5.22.

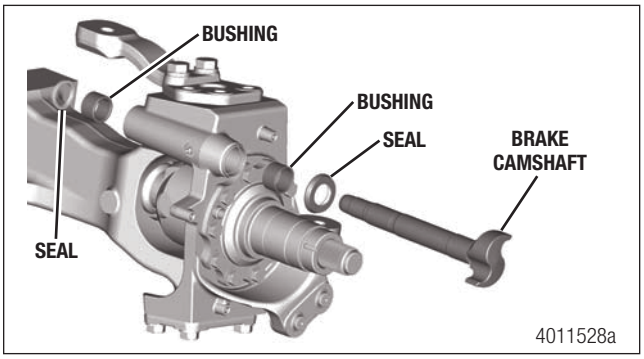


Figure 5.22

4. Remove the capscrews that secure the spindle to the steering knuckle. Figure 5.23.

   If the vehicle is equipped with ABS: Push the ABS sensor into the steering knuckle cavity. Figure 5.24.

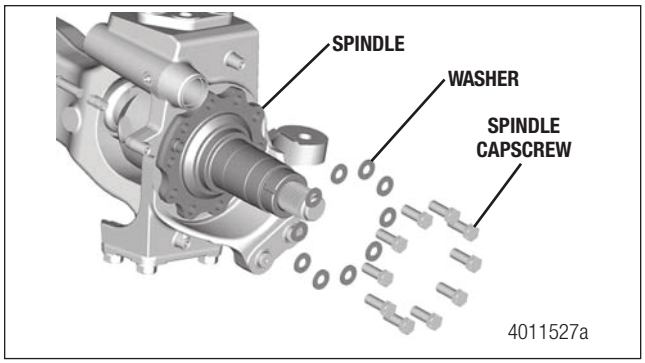


Figure 5.23

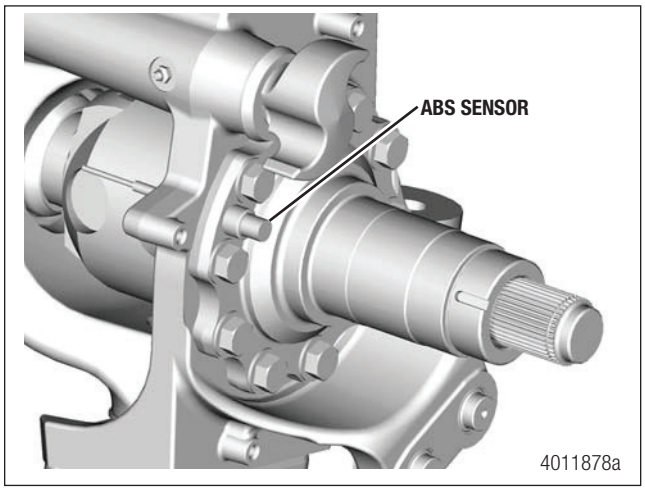


Figure 5.24

5. Support the spindle to prevent it from falling.

   If the vehicle is equipped with ABS: The steel sleeve and sensor clip that position the ABS sensor will remain on the spindle. If necessary, push out the sensor clip to remove it. Use a suitable driver to remove the steel sleeve.

   NOTE: The stop screw maintains the vehicle manufacturer's maximum turning angle and does not have to be removed. If you do remove it, mark the installed depth for reassembly.

6. Pull the spindle straight from the knuckle and axle shaft. The grease seal and bushing will remain inside the spindle. Remove these parts with the appropriate tool and discard them. Figure 5.25 and Figure 5.26.

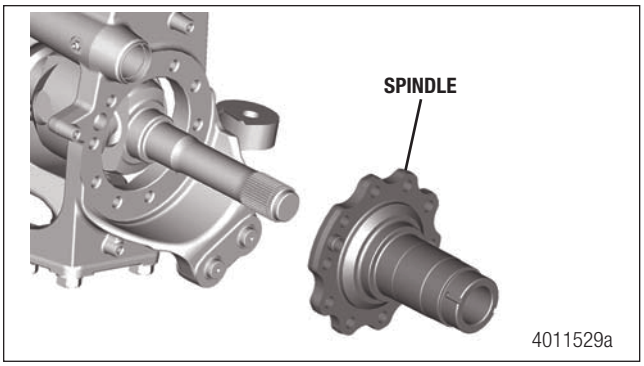


Figure 5.25

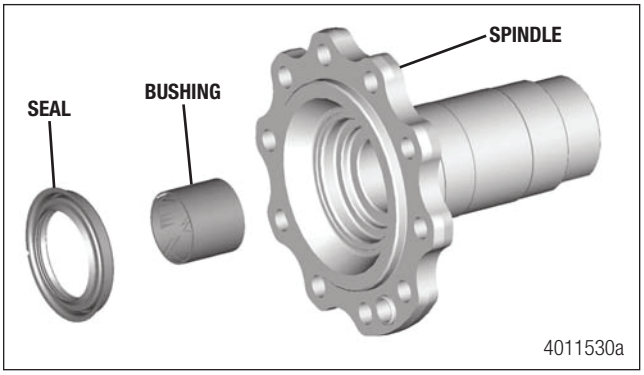


Figure 5.26

Remove the Steering Knuckle from the Axle Housing

NOTE: You can service the steering arm and cross tube assemblies without removing the steering knuckle from the housing.

1. Remove the four capscrews and washers from the lower knuckle cap. Figure 5.27.

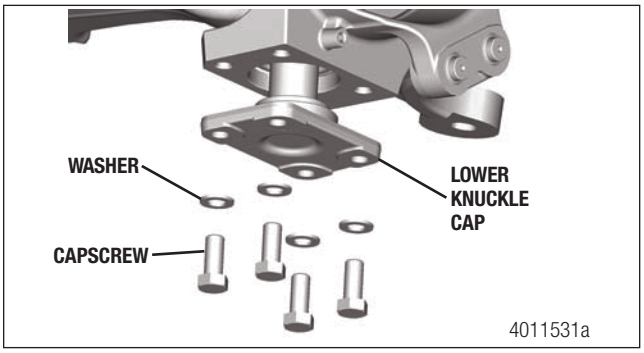


Figure 5.27

2. Remove the lower knuckle cap and inspect the thrust bearing for wear or damage. Replace a worn or damaged thrust bearing at reassembly. Figure 5.28.

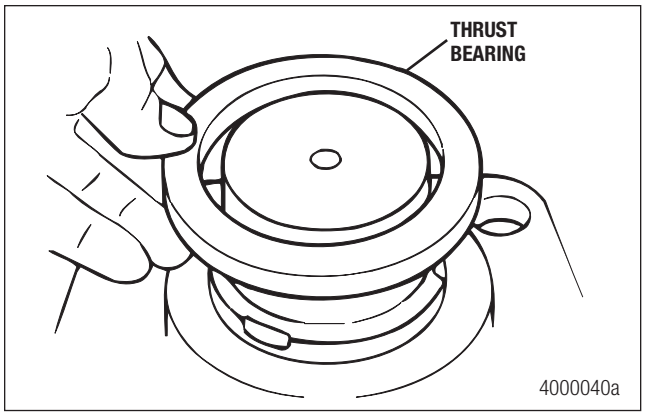


Figure 5.28

3. Remove the five capscrews from the upper knuckle cap.

4. Remove the air chamber mounting bracket. Figure 5.29. Remove the upper knuckle cap from the bore. Figure 5.30. Inspect the cap for wear and damage. Replace damaged or worn parts.

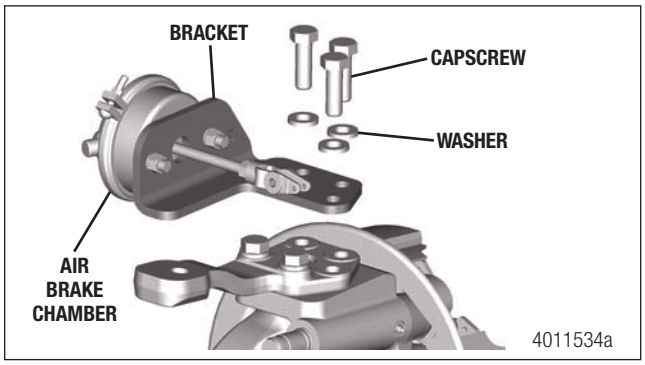


Figure 5.29

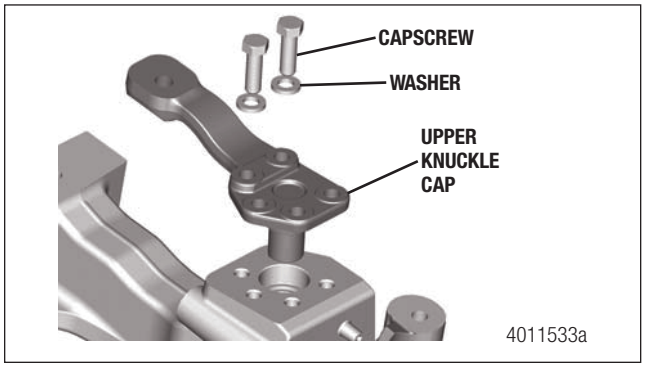


Figure 5.30

5. Remove the steering knuckle from the axle housing. The bushings will remain in the housing sockets.

6. Inspect the upper and lower bushings for wear or damage while they're still in the housing sockets. Figure 5.31. Use the following procedure to remove worn or damaged bushings.

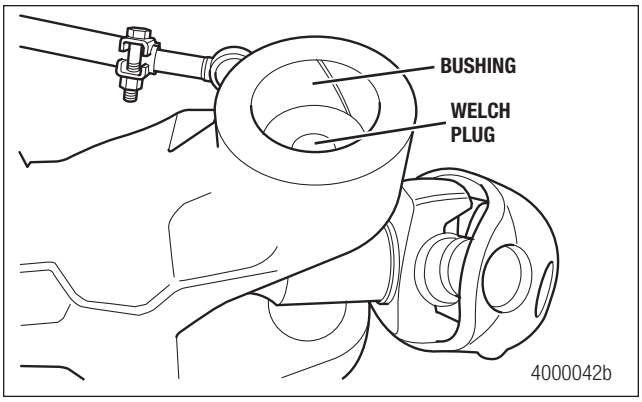


Figure 5.31

a. Drive the welch plug and bushing toward the outside of the socket. Use a sleeve that is slightly smaller than the socket bore. Figure 5.32.

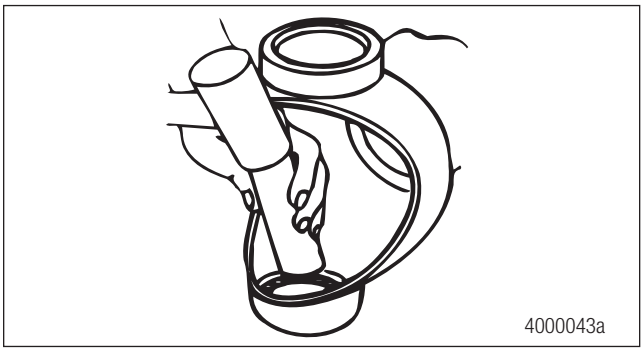


Figure 5.32

b. Clean grease and dirt from the bore before reassembly.

c. Inspect for damage to the housing.

Remove the Axle Shaft from the Axle Housing

⚠ CAUTION

The cross assembly is not greaseable. Do not disassemble it. Damage to components can result. If the cross assembly requires service, replace the assembly.

1. Remove the axle shaft double-cardan joint assembly from the carrier housing by pulling the assembly STRAIGHT out of the carrier housing. Do not disassemble the joints, which will void the Meritor warranty. Figure 5.33.

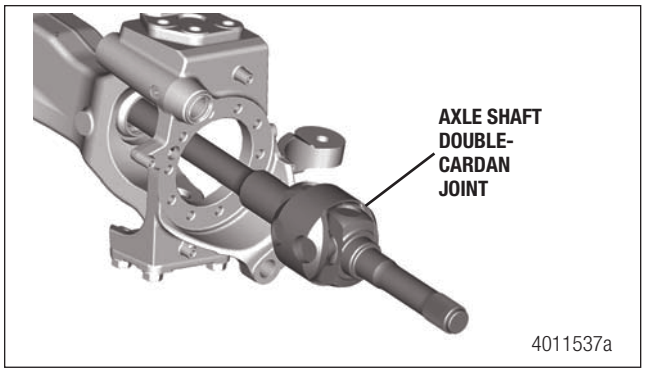


Figure 5.33

2. Inspect the oil seal and bushing in the axle housing for wear or damage and replace if necessary. If the bushing must be replaced, install a new oil seal at the same time. Figure 5.34.

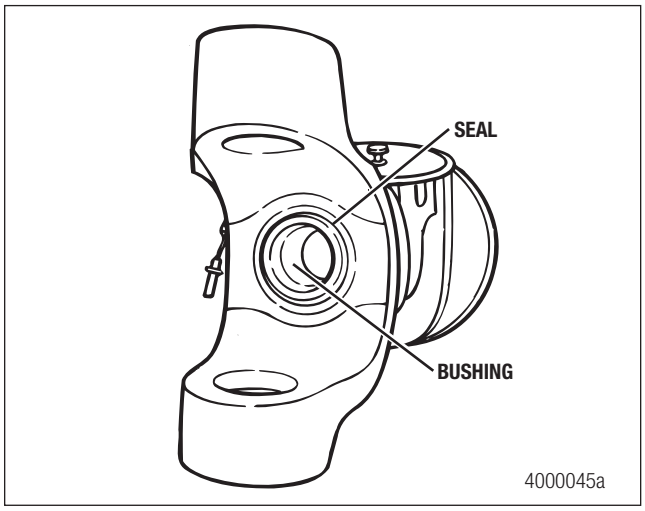


Figure 5.34

Remove the Axle Shaft Without Removing the Steering Knuckle

1. Remove the axle shaft double-cardan joint assembly from the carrier housing by pulling the assembly STRAIGHT out of the carrier housing.

2. Inspect the oil seal and bushing in the axle housing for wear or damage and replace if necessary. If the bushing must be replaced, install a new oil seal at the same time. Figure 5.34.

Remove the Axle Differential Carrier

Refer to Maintenance Manual 5A, Single Reduction Rear Differential Carriers for differential carrier maintenance and service information.

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 steam cleaning the axle, close or put a cover over all openings in the case.
- Steam 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.

Prevent Corrosion

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

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

Oil Seals and O-rings

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

Inspect Parts

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

Tapered Roller Bearings

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

- The center of the large diameter end of the rollers is worn level with or below the outer surface. Figure 6.1.
- The radius at the large diameter end of the rollers is worn to a sharp edge.

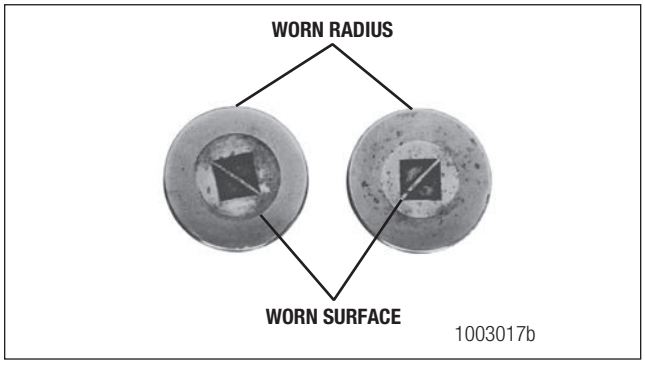


Figure 6.1

- 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 6.2.

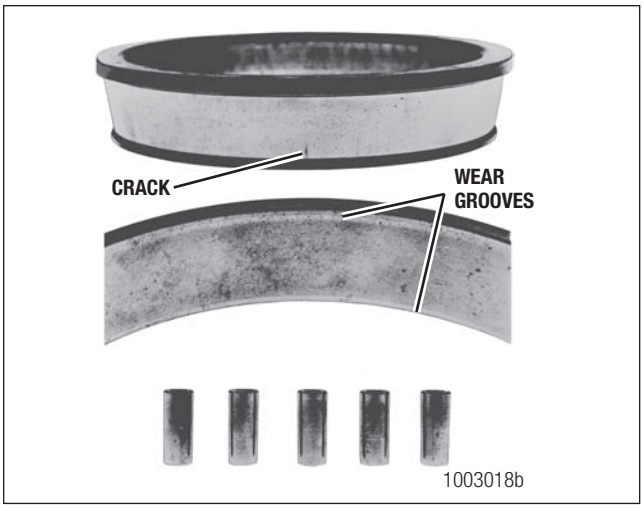


Figure 6.2

- Bright wear marks appear on the outer surface of the roller cage. Figure 6.3.

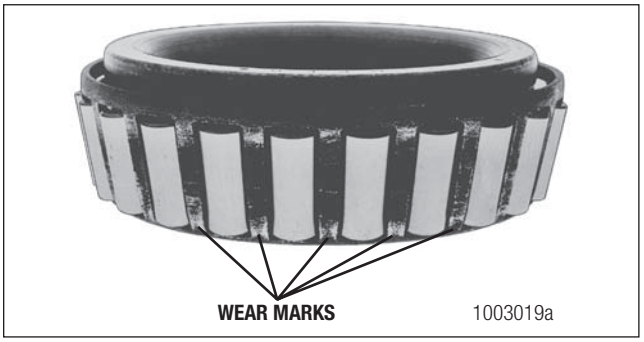


Figure 6.3

- The rollers and surfaces of the cup and cone inner race touching the rollers are damaged. Figure 6.4.

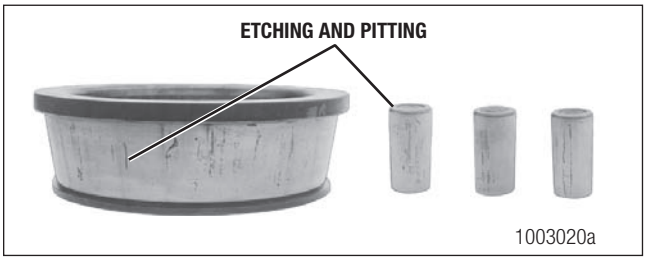


Figure 6.4

- The cup and cone inner race surfaces touching the roller are damaged. Figure 6.5.

6 Prepare Parts for Assembly

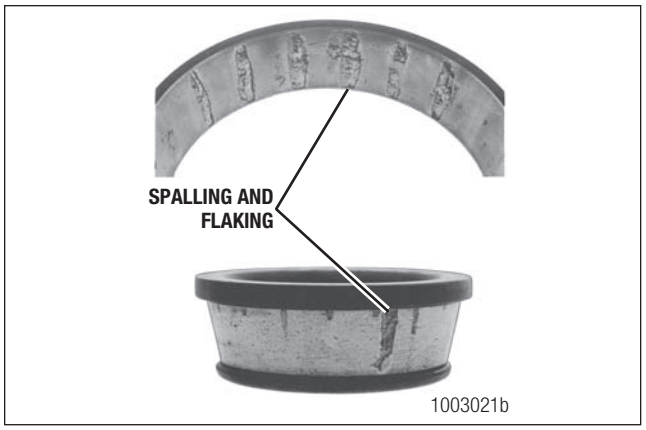


Figure 6.5

Axle Housing

⚠ DANGER

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

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

Axle Shafts

- Inspect the axle shafts for wear, stress and cracks at the splines, shaft and yoke ears. Replace damaged components.
- Inspect the axle shaft seals in the housing and spindle for damage. Replace damaged seals.
- Inspect the axle shaft bushings in the housing and spindle for wear or damage. Replace worn or damaged bushings.

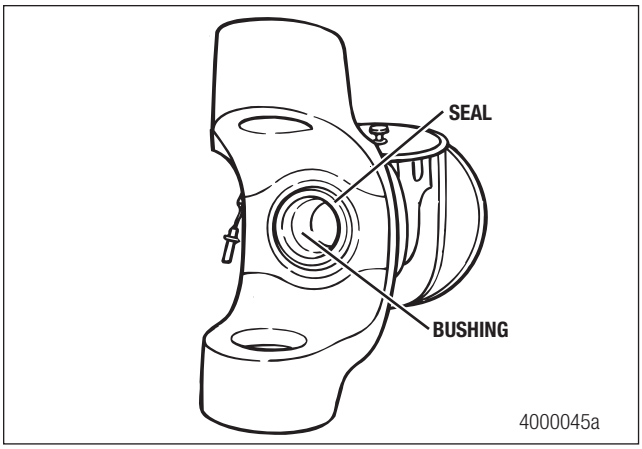


Figure 6.6

Universal Joint Inspection

⚠ DANGER

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

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

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

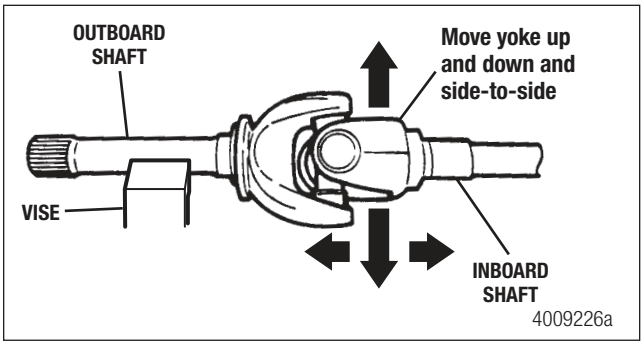


Figure 6.7

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

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

Tie Rod Ends

- Inspect tie rod ends for wear and damage. Replace worn or damaged tie rod ends. Do not repair them.
- Check seals for damage. 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 12 Specifications on page 77.

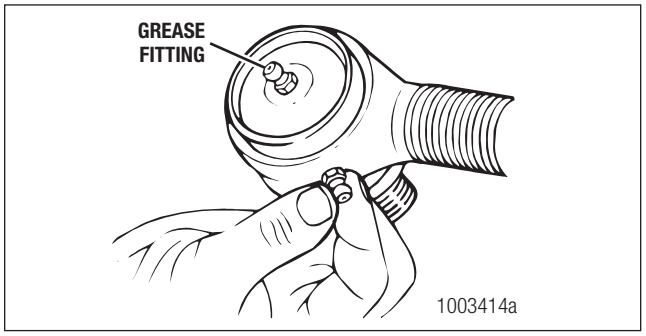


Figure 6.8

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

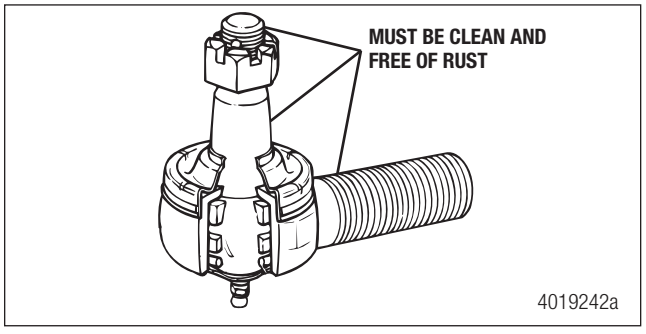


Figure 6.9

Camshaft Bushings

Inspect the camshaft bushings for wear and damage. Replace worn or damaged parts.

Steering Arm and Ball Joint

Inspect the steering arm and ball joint for wear and damage. Replace worn or damaged parts.

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 12 Specifications on page 77.

Applying Adhesive and Silicone Gasket Material

⚠ 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 Prepare Parts for Assembly

⚠ WARNING

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

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

Table A: Silicone Gasket Products

Product	Description
Loctite® 5699 Ultra Grey	Adhesive/Sealant
Permatex® 82194 Ultra Grey	Silicone Sealant
Three Bond 1216	Silicone Sealant
Three Bond 1216E	Silicone Sealant

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

⚠ CAUTION

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

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

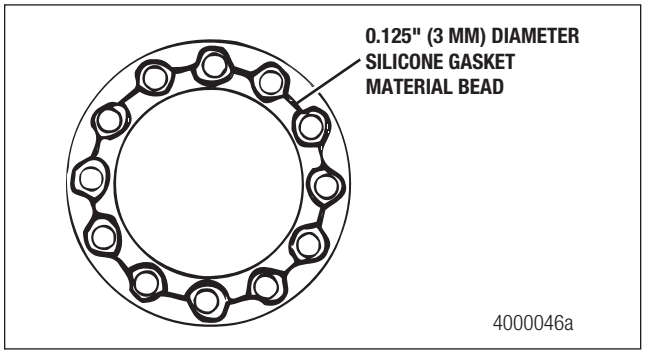


Figure 6.10

4. Assemble the components immediately to permit the gasket material to compress evenly between the parts.
5. Tighten the fasteners to the required torque specification for that size fastener. Refer to Section 12 Specifications on page 77.
6. Wait 20 minutes before filling the assembly with lubricant.

Fasteners

Removing Fasteners Secured with Adhesive

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

⚠ CAUTION

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

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

New Fasteners with Pre-Applied Adhesive

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

Original or Used Fasteners

1. Use a wire brush to clean the oil, dirt, and old adhesive from all threads and threaded holes.
2. Apply liquid adhesive to the bolt threads or bore threads, as required, for the specific component.
3. Tighten the fasteners to the torque specified in Section 12.

Yoke Cleaning and Inspection

All current Meritor axles feature helical splines at the yoke interface. This feature provides a tight fit between the yoke and input shaft, output shaft and pinion shaft. For the axle to operate correctly, the input shaft, output shaft and pinion shaft must fit tightly to the corresponding yoke.

Check for Yoke Wear

⚠ DANGER

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

⚠ CAUTION

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

⚠ CAUTION

Do not use a thin metal wear sleeve to refresh the yoke surface. Wear sleeves pressed onto the yoke will prevent the correct seating of the pinion seal and damage the pinion seal assembly. Wear sleeve usage will cause the seal to leak.

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

   If the yoke can be removed by hand: The yoke is worn. Replace the yoke.

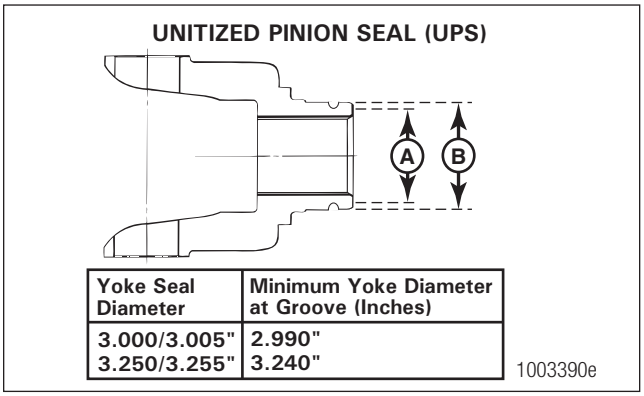
7. Use a correct yoke puller tool to remove the yoke.

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

8. Inspect the yoke seal surface for grooves.

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

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



Yoke Seal Diameter	Minimum Yoke Diameter at Groove (Inches)
3.000/3.005"	2.990"
3.250/3.255"	3.240"

Figure 6.11

Check for a Tight-Fit Condition

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

1. Attempt to install the yoke by hand.

   If the yoke bottoms out against the adjacent bearing: Replace the yoke.

2. Use a correct yoke installation tool to install the yoke.
3. As the yoke is installed, there should be resistance between the yoke and shaft.

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

4. Install and tighten the input, output, or pinion shaft nut to the correct torque. Refer to Section 12 Specifications on page 77.
5. Install the driveline.
6. Remove the safety stands.
7. Lower the vehicle.

6 Prepare Parts for Assembly

Carrier-to-Housing Joint Cleaning Procedure

1. Remove the carrier from the housing. Refer to Maintenance Manual 5A, Single Reduction Rear Differential Carriers for differential carrier maintenance and service information

2. Remove all debris from inside the housing.

⚠ CAUTION

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

⚠ CAUTION

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

⚠ CAUTION

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

Figure 6.12

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

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

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

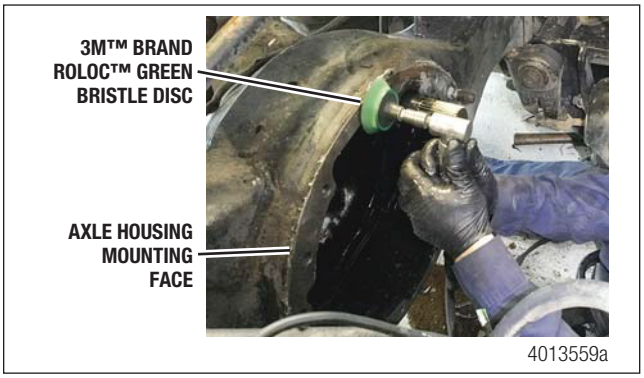


Figure 6.13

Figure 6.14

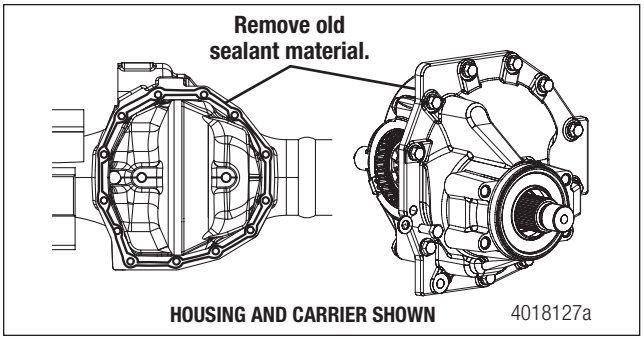


Figure 6.15

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

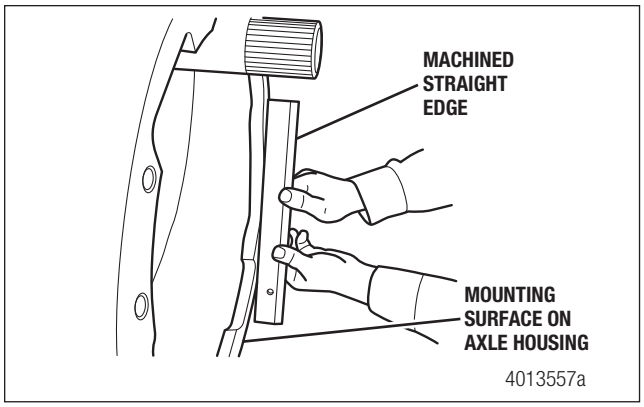


Figure 6.16

5. Remove metal filings from the magnets inside the housing.
6. Use Loctite® ODC Free cleaner or brake cleaner to clean the carrier faces. Also, spray brake cleaner on the lower internal carrier casting area at the 6 o'clock position near the carrier flange and clean this area in order to prevent an oil drip from leaking down/across the carrier flange during assembly. An oil drip at this position may prevent correct adhesion of sealant and may result in a leak.
7. Dry the housing and carrier faces.
8. Use a M12 x 1.75 bottoming tap to clean all old Dri-Loc® from the threaded holes in the axle housing.

Assembly and Installation – MX-120 and MX-120-HR Series

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.

Install the Bushings and Seals in the Housing

1. If required, install a new bushing into the axle housing.

⚠ WARNING

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

2. If required, install a new oil seal into the axle housing. The seal must be installed with the notch at the top. Figure 7.1. Use a correct size sleeve or driver. Refer to Section 13 Special Tools on page 81 for seal driver tool specifications.

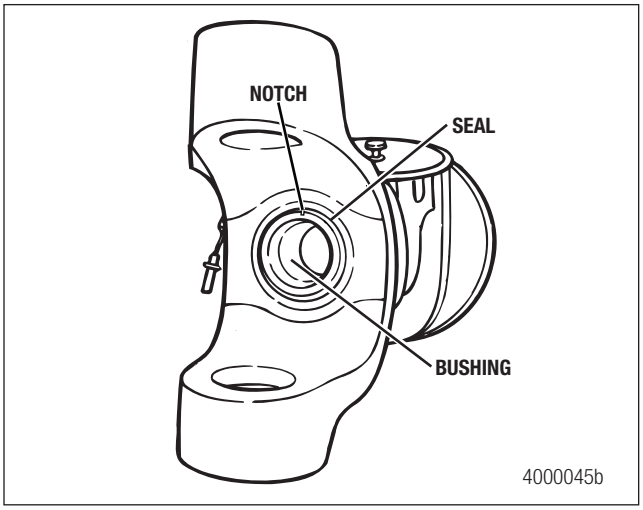


Figure 7.1

⚠ 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. Apply a layer of Loctite® 680 sealant on the outside diameter of the bushing.

⚠ CAUTION

Make sure the welch plug is installed so the convex side will be toward the king pin. If the welch plug is installed facing the wrong direction, grease from the fitting will not reach the king pin bushing and thrust bearing, resulting in bearing failure.

4. Place the welch plug in the socket bore so the convex side will be toward the king pin. If the welch plug is facing the wrong direction, grease from the fitting will not reach the king pin bushing and thrust bearing. Figure 7.2 and Figure 7.3.

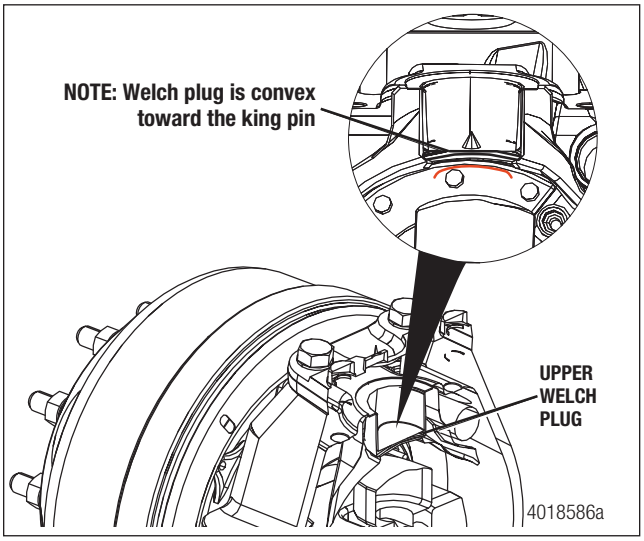


Figure 7.2

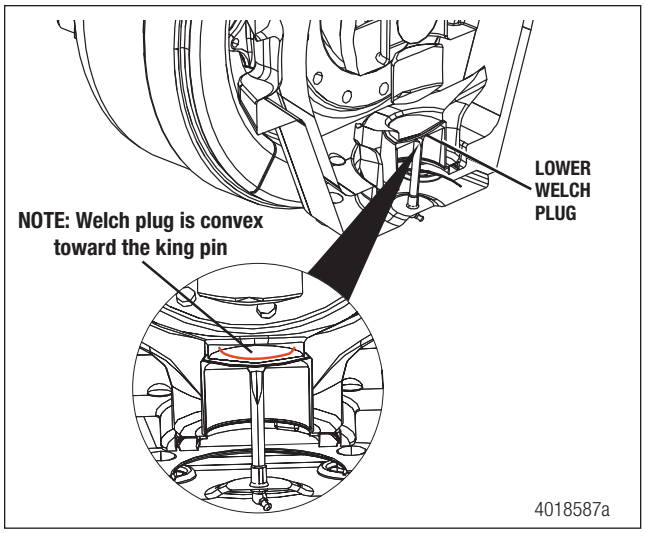


Figure 7.3

5. Using an appropriate tool (see note below), deform (flatten) the welch plug to seal the housing. Ensure the welch plug is convex (bowed) toward the king pin. Figure 7.4 and Figure 7.5.

   NOTE: The welch plug needs to be installed by a tool approximately 90% its diameter. If an appropriate tool is not available, one can be made by cutting off the rounded end of an old king pin and attaching it to a handle or drift. Figure 7.6.

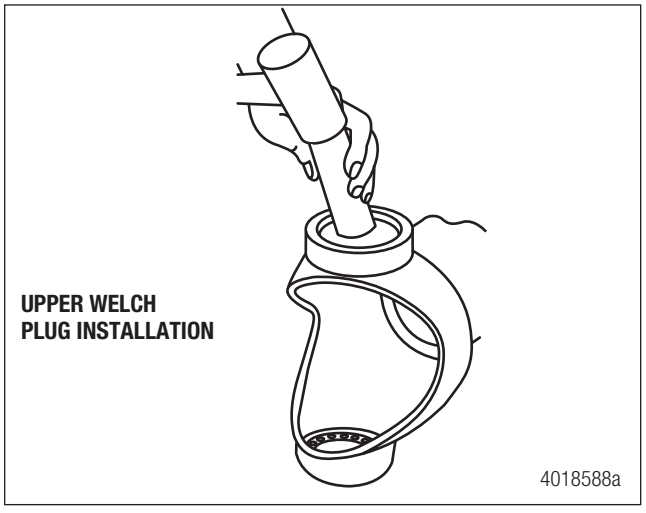


Figure 7.4

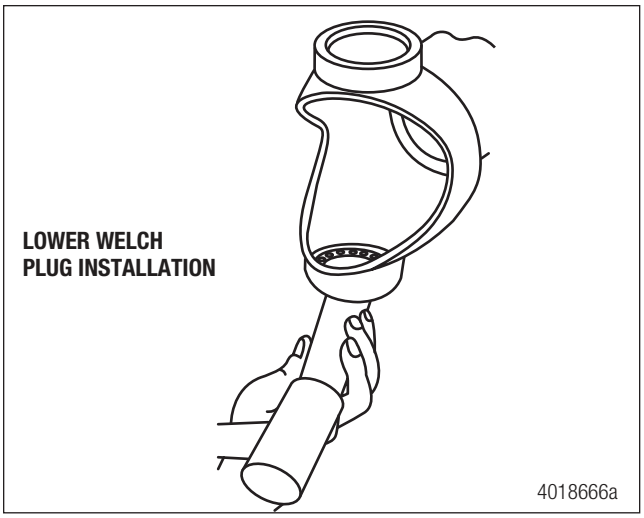


Figure 7.5

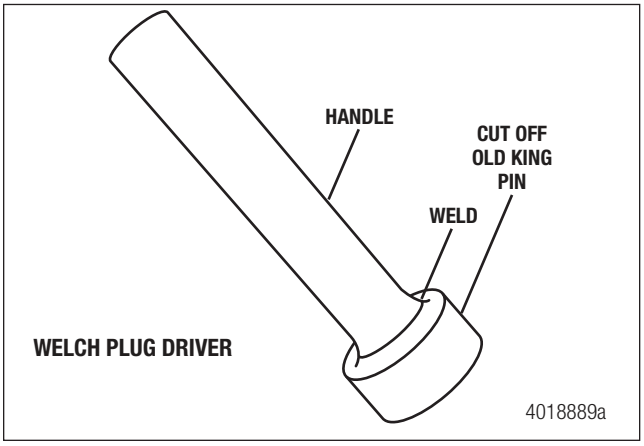


Figure 7.6

6. Drive the new bushings into the socket bores so that the bushings are level with the outside of the socket. Use the correct size sleeve or driver. Refer to Special Tools on page 81 for tool specifications.

7. Pack the bushings with grease before assembly.

Install the Axle Shaft and Assemble the Steering Knuckle

NOTE: If the axle shaft was removed without removing the steering knuckle, refer to Install the Axle Shaft Through the Steering Knuckle in this section.

1. Inspect the housing seal to verify it is correctly installed.

2. Install the axle shaft double-cardan joint assembly into the housing. Carefully align the inner shaft splines with the splines of the differential side gear. Figure 7.7.

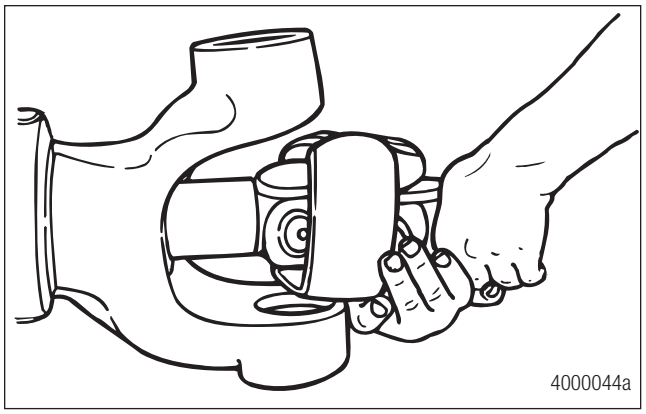


Figure 7.7

3. Place the knuckle in its correct position over the end of the housing. Align the knuckle bores with the housing socket bores.

4. Position the cap assembly through the upper bores of the knuckle and housing until the cap is against the knuckle.

5. Install two capscrews and loosely tighten them to hold the upper knuckle cap in place. Figure 7.8.

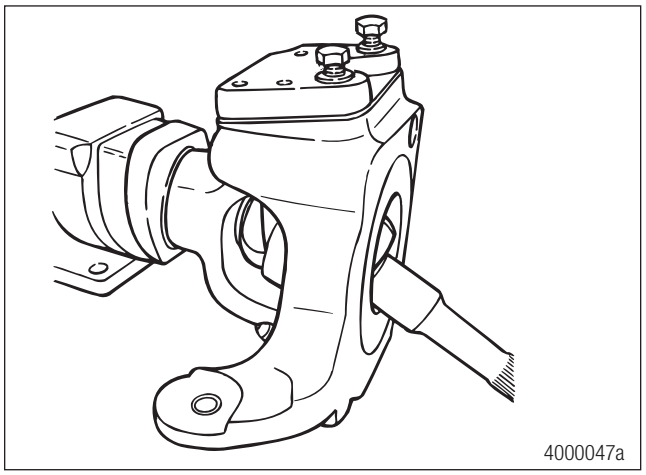


Figure 7.8

6. Install the thrust bearing against the journal on the lower cap. Figure 7.9.

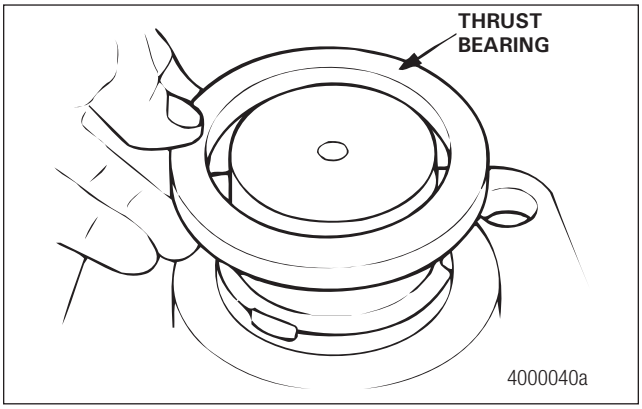


Figure 7.9

7. Position the lower cap assembly through the bottom bores of the knuckle and housing until the cap is against the knuckle. Figure 7.10.

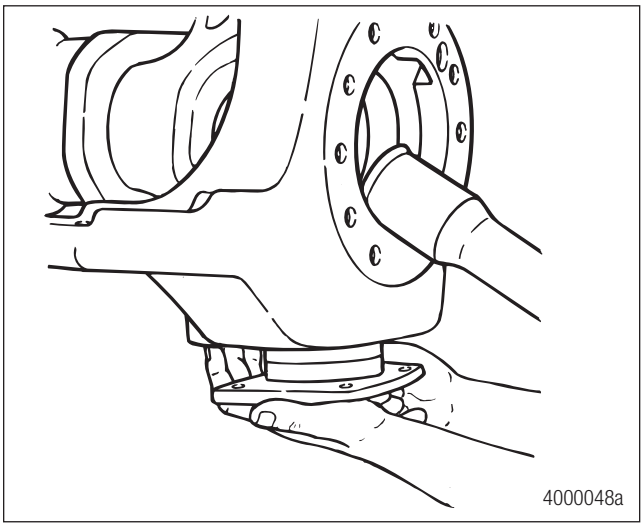


Figure 7.10

8. Install the bolts for the lower and upper knuckle caps.

   a. Tighten the lower knuckle cap bolt to 310-400 lb-ft (420-542 Nm).

   b. Tighten the upper knuckle cap bolt to 500-600 lb-ft (678-881 Nm).

9. Turn the knuckle back and forth to verify that it travels freely.

10. Check the steering knuckle end play.

    a. Support the vehicle with safety stands under the axle housing.

    b. Place a magnetic base dial indicator into position on the housing. Figure 7.11.

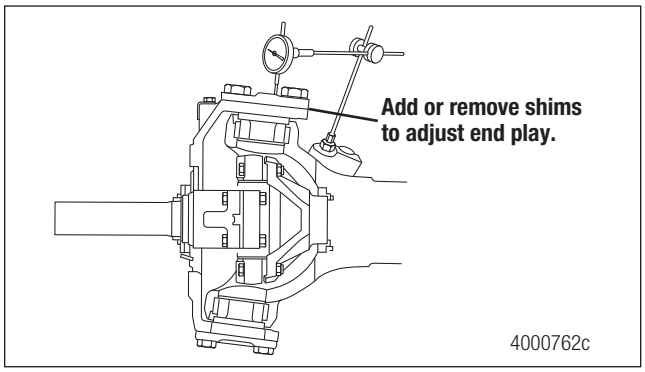


Figure 7.11

    c. Use a jack to place pressure onto the lower knuckle cap. Set the dial indicator to ZERO. If necessary, remove the grease fitting from the lower knuckle cap to prevent damage.

    d. Fully release the jack pressure and read the end play on the dial indicator. Correct end play is 0.005-0.015-inch (0.127-0.381 mm). Remove or add shims from between the upper knuckle cap/steering arm and the axle housing to obtain the correct end play. Figure 7.12.

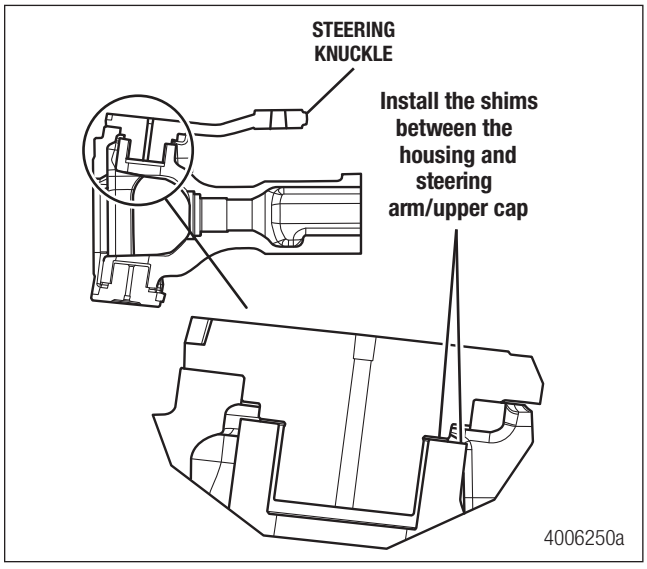


Figure 7.12

Check Steering Knuckle Rotational Torque

1. Fasten a soft wire or cord to the tie rod arm. Attach a pound scale to the opposite end of the wire or cord.

2. Hold the outer shaft of the universal joint away from the knuckle opening. Pull on the pound scale to rotate the knuckle.

   NOTE: Read the scale after the start of movement. The correct rotational torque is 8-25 lb-ft (20.8-33.9 Nm).

3. Read the pounds on the scale. Read the pull necessary to rotate the knuckle. The scale must read 10-30 lb (4.5-13.5 kg). Figure 7.13.

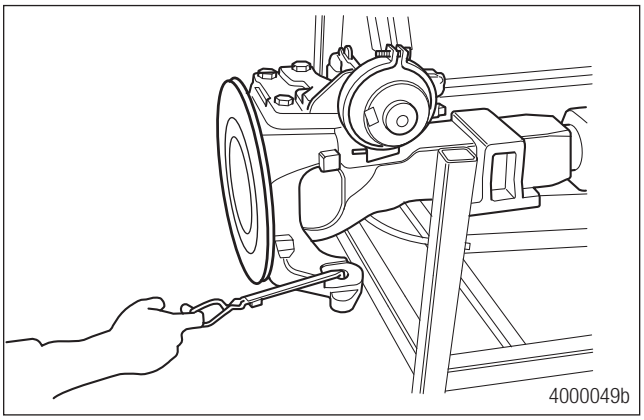


Figure 7.13

4. Verify the rotational torque is within specification. If it is not, follow the instructions below.

   a. Turn the knuckle back and forth. Check the torque again.

   b. Check the trunnion for damage.

   c. Check the knuckle assembly end play.

Install the Axle Shaft Through the Steering Knuckle

NOTE: Use this procedure to install the axle shafts if they were removed without removing the steering knuckle.

It can be difficult to correctly support and align the inner shaft when installing the longer axle shaft and universal joint assembly through the steering knuckle. The following procedure has been developed to aid in the installation process.

1. Obtain a strong, smooth piece of wood, like an ax handle or sledge hammer handle.
2. Place one end of the piece of wood between the steering knuckle and the axle housing.
3. Install the inner axle shaft through the steering knuckle and into the axle housing. Use the piece of wood as a lever to support the axle shaft. Figure 7.14.

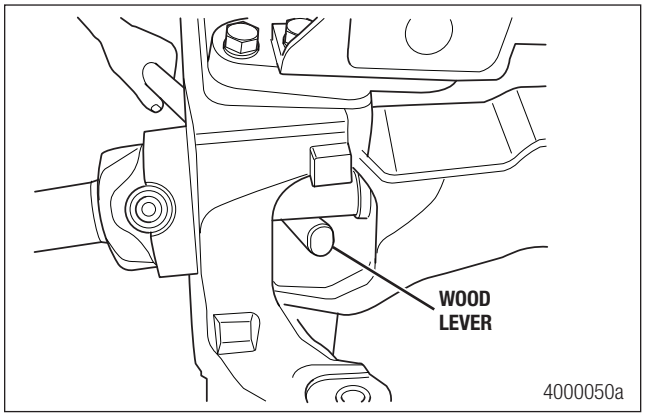


Figure 7.14

⚠ CAUTION

Be careful to avoid damaging the oil seal when installing the axle shaft.

4. Carefully align the inner shaft splines with the splines of the differential side gear.
5. Install the axle shaft and universal joint assembly through the steering knuckle. Figure 7.15.

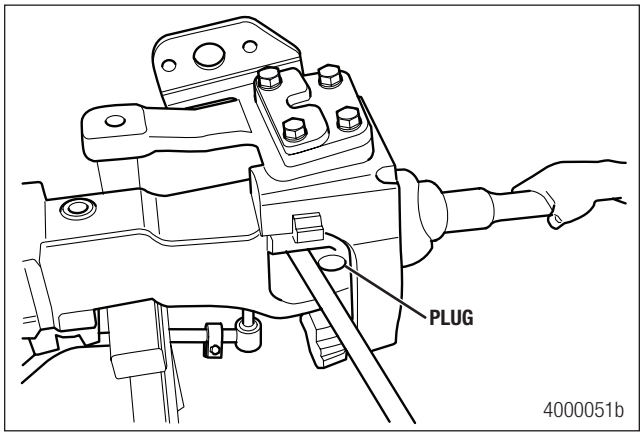


Figure 7.15

Assemble the Spindle, Brake Assembly and Dust Shield on the Steering Knuckle

Prepare the Spindle

1. On units equipped for ABS, if the steel sleeve for holding the ABS sensor clip and ABS sensor has been disassembled, install the sleeve with a suitable driver.
2. Install the ABS sensor clip into the sleeve. Figure 7.16.

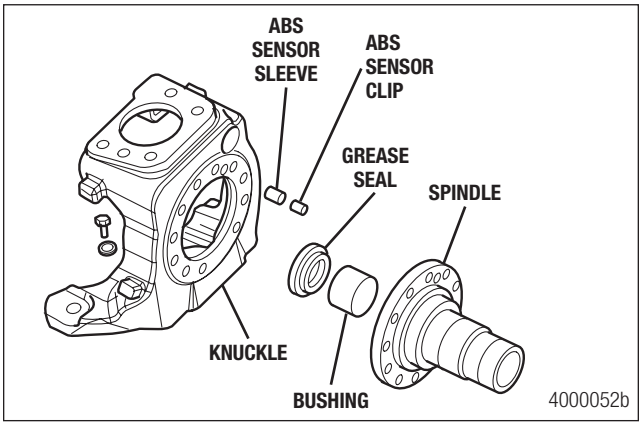


Figure 7.16

3. If disassembled, use the correct size drivers to install the bushing and grease seal into the spindle. Refer to Section 13 Special Tools on page 81 for tool specifications.
4. Pack the spindle bushing and seal with grease.
5. Install the spindle against the knuckle with the keyway slot for the wheel bearing adjusting nut system toward the TOP for ABS spindles. Figure 7.17.

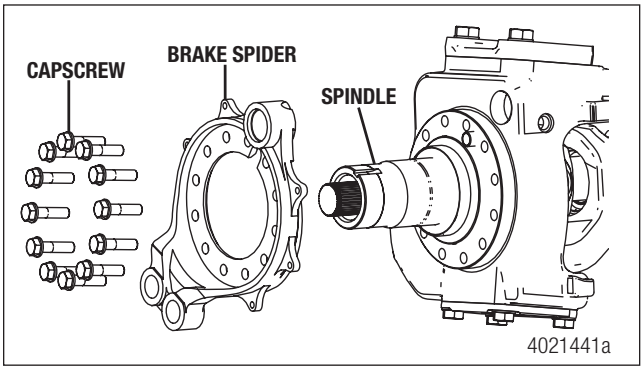


Figure 7.17

6. Install the brake spider onto the spindle. Fasten all parts to the knuckle with 12 capscrews and washers. Tighten to specification. Refer to Section 12 Specifications on page 77. Figure 7.17 and Figure 7.18.

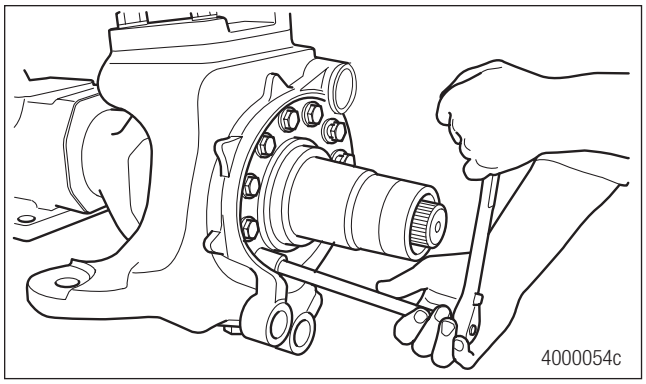


Figure 7.18

7. Install the brake dust shield with the mounting capscrews and tighten to specification. Refer to Section 12 Specifications on page 77. Figure 7.19.

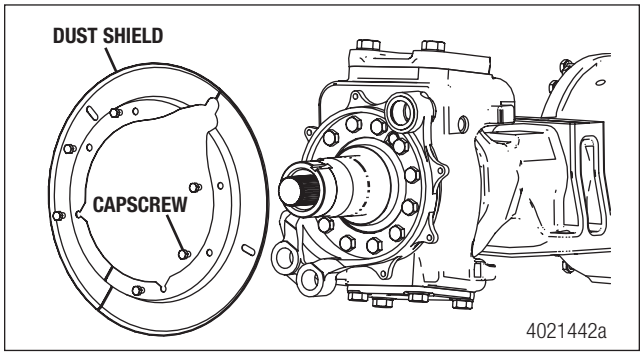


Figure 7.19

8. Install the brake camshaft, washer, seals and bushings. Figure 7.20.

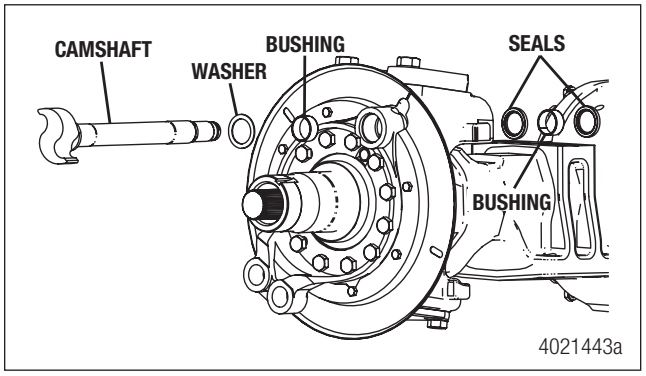


Figure 7.20

9. Install the brake shoes on the brake spider. Install the return springs and retainer springs. Lift the ends of the brake shoes and install the brake rollers. Figure 7.21.

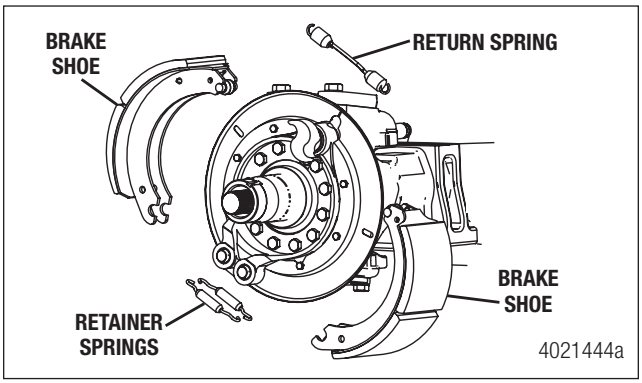


Figure 7.21

10. On units equipped for ABS, install the ABS cable into the knuckle. Install the ABS sensor into the ABS sleeve and clip in the spindle.

11. If removed, install the stop screw to the depth marked during removal.

Install the Wheel Bearings into the Hub

⚠ 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, put the hub in a press with the drum side at the BOTTOM.

   a. Align the grooves on the studs with the grooves in the stud holes in the hub.

   b. Press the studs into position.

⚠ 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.

2. Use a press and sleeve to install the inner and outer bearing cups into the hub. The bearing cup must be pressed tight against the shoulder in the hub.

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

3. Inspect the wheel bearings for wear or damage. Refer to Section 6 for instructions.

4. Use a pressure packer to force the specified grease from the large end of the cones into the cavities between the rollers and cage.

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

5. Fill the hub cavity between the bearing cups with the specified grease until it is level with the smallest diameter of the cups.

6. Install the inner bearing cone into the cup inside the hub.

7. On units equipped with ABS, install the ABS tooth wheel onto the hub with a suitable driver.

8. Install the grease seal into the correct position against the hub bore. Refer to Section 13 Special Tools on page 81 for seal driver tool specification. Do not force or hit the seal after it has reached the bottom of the bore, which can damage the seal.

Install the Hub onto the Axle

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

2. Install the outer bearing cone onto the spindle and push it into its cup inside the hub. Figure 7.22.

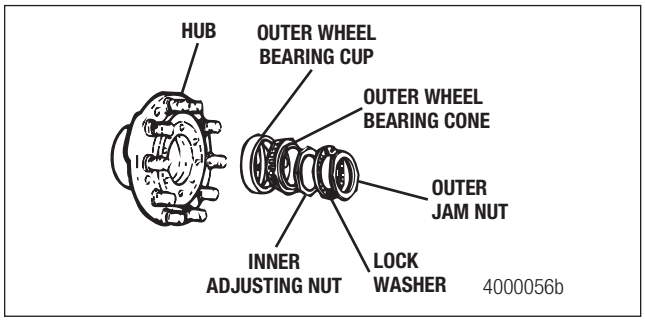


Figure 7.22

Adjust the Wheel Bearings

⚠ DANGER

Use a torque wrench to tighten or loosen the adjusting nuts. Do not use a hammer to directly hit the adjusting nuts, or to hit a chisel or drift placed against them. Damaged adjusting nuts can prevent you from obtaining correct wheel bearing end play, which can affect vehicle operation and cause the wheels to separate from the vehicle. Death or serious personal injury and damage to components will result.

1. Install the adjusting nut. Use a torque wrench to tighten the adjusting nut to 100 lb-ft (136 Nm). Figure 7.23.

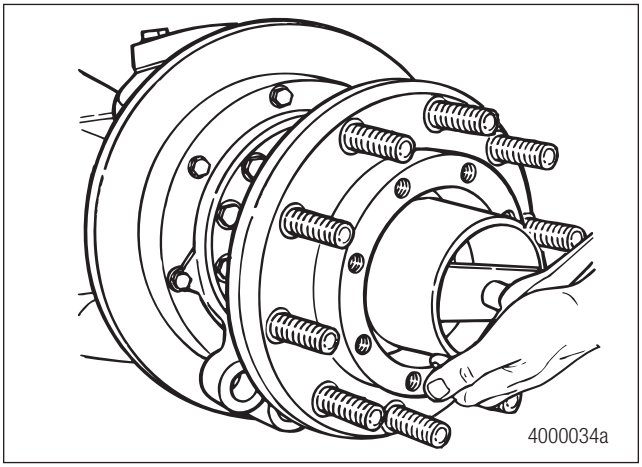


Figure 7.23

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

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

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

5. Check the end play with a dial indicator. Refer to Check and Adjust Wheel Bearings on page 58. Perform one of the following actions based on the end play result.

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

Adjust the Wheel Speed Sensors on Units Equipped with ABS

For complete maintenance and service procedures for Meritor anti-lock braking systems, refer to Maintenance Manual 28, Anti-Lock Braking Systems (ABS) for Trucks, Tractors and Buses — C Version ECUs and Maintenance Manual 30, Anti-Lock Braking Systems (ABS) for Trucks, Tractors and Buses — D Version ECUs.

Push the wheel speed sensor IN until it contacts the tooth wheel. Do not use sharp objects to pry or push sensors. Sensors will self-adjust during wheel rotation. Figure 7.24.

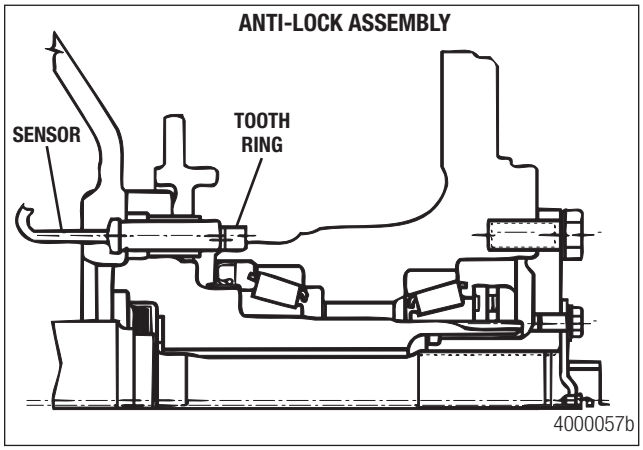


Figure 7.24

Install the Drive Flange and Hubcap

⚠ WARNING

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

1. Apply a layer of silicone gasket material to the hub mounting surface of the drive flange only. Refer to Section 6 Prepare Parts for Assembly on page 28.
2. Apply Meritor specification O-617-A or O-617-B wheel bearing grease to the inside splines of the drive flange and the splines of the driveshaft. Refer to Section 11 Lubrication and Maintenance on page 65.
3. Install the drive flange onto the hub and fasten with washers and capscrews. Figure 7.25. Tighten to specification. Refer to Section 12 Specifications on page 77.

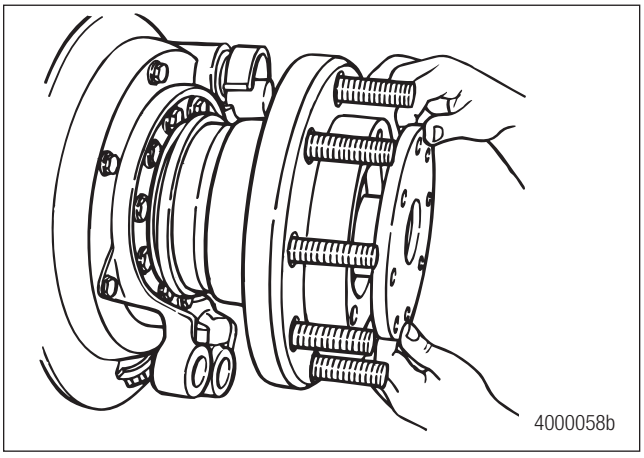


Figure 7.25

4. Install the snap ring onto the end of the axle shaft. Figure 7.26. Ensure the snap ring is positioned in the groove at the end of the axle shaft.

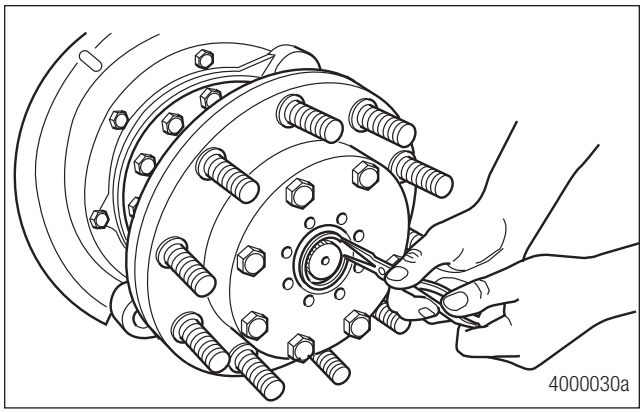


Figure 7.26

5. Apply a 0.125-inch continuous bead of silicone gasket material around either the mounting surface of the hubcap or the drive flange. Refer to Section 6 Prepare Parts for Assembly on page 28.

6. Install the hubcap and tighten the capscrews to specification. Refer to Section 12 Specifications on page 77. Figure 7.27.

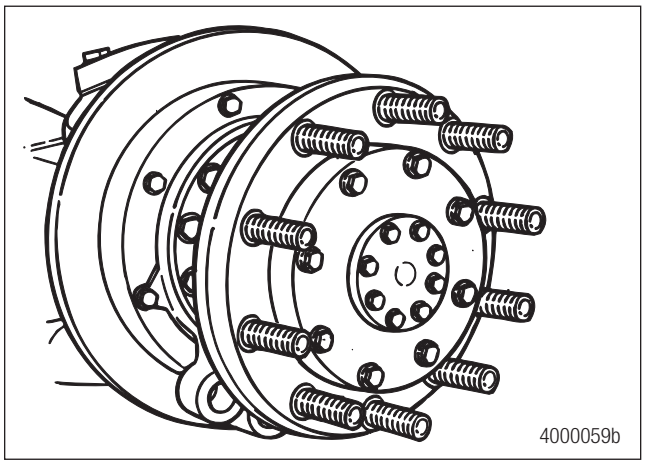


Figure 7.27

Assemble the Slack Adjuster

For complete maintenance and service procedures for Meritor's automatic slack adjusters, refer to Maintenance Manual 4, Cam Brakes and Automatic Slack Adjusters.

⚠ WARNING

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

1. Install the air brake chamber and bracket. Tighten the bracket mounting capscrews to specification. Refer to Section 12 Specifications on page 77. Figure 7.28.

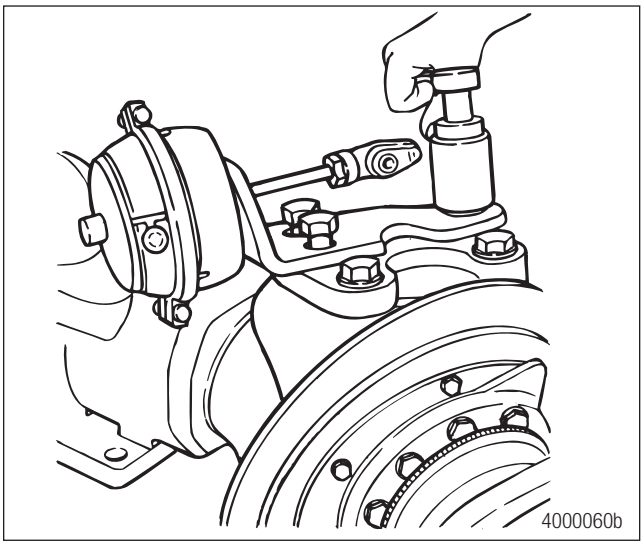


Figure 7.28

2. Install the inner washer onto the camshaft, then install the slack adjuster onto the camshaft. Figure 7.29.

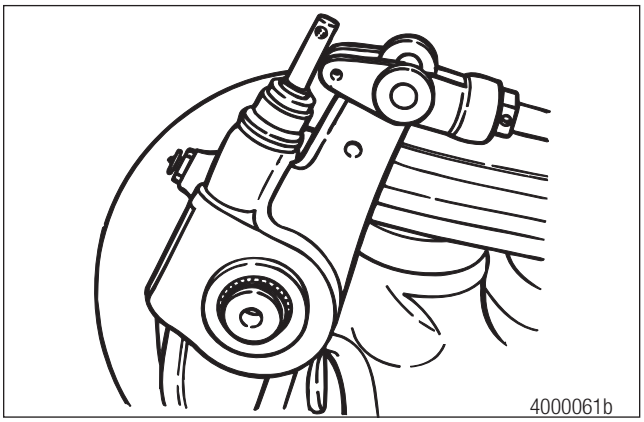


Figure 7.29

3. Install the slack adjuster washers at the adjuster end of the camshaft. Figure 7.30. Use as many washers as required to keep slack end play at 0.060-inch (1.5 mm) maximum.

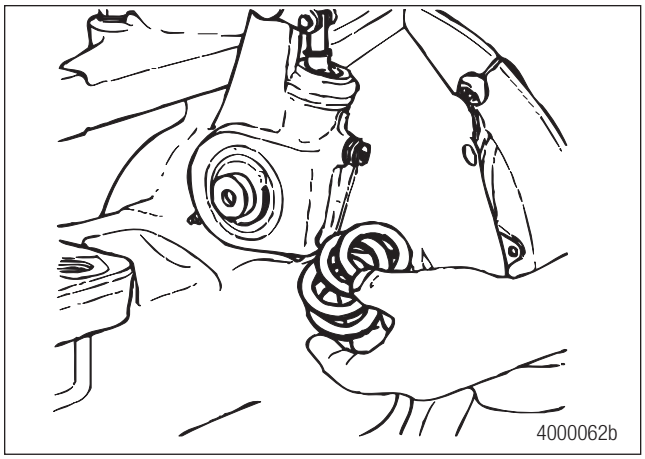


Figure 7.30

4. Install the slack adjuster retaining ring at the adjuster end of the camshaft. Figure 7.31.

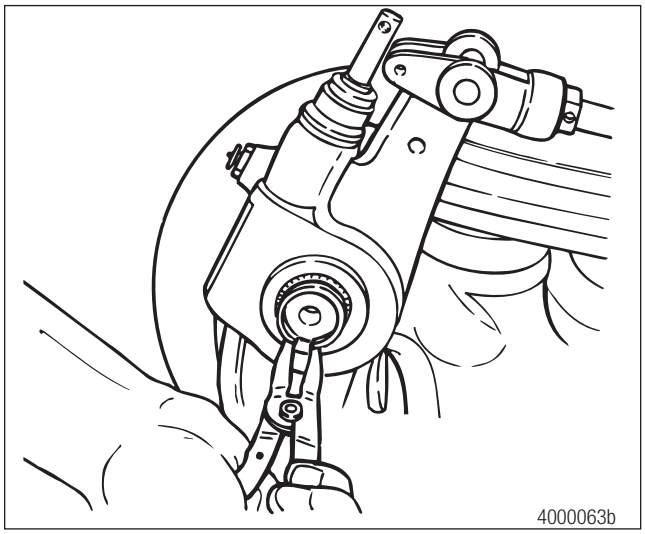


Figure 7.31

5. Install the pin and retainer that engages the push rod yoke and the slack adjuster plunger rod. Figure 7.32.

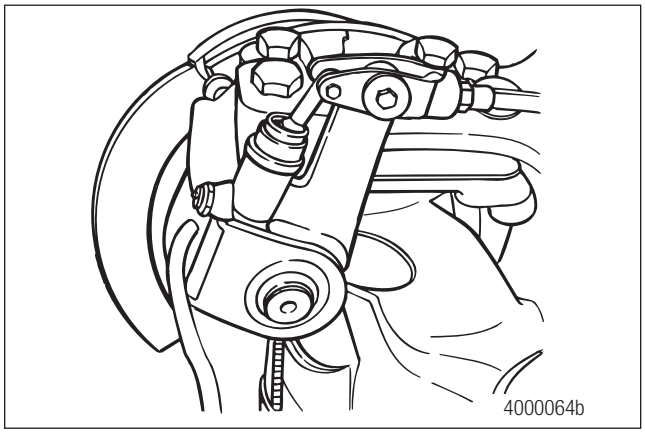


Figure 7.32

6. Adjust the slack adjuster position to obtain the following BSAP dimension from the back of the brake air chamber to the center of the clevis pin.

Clevis Type	SL (Slack Adjuster Length)	BSAP (Brake Slack Adjuster Position)
Standard	5.5" (139.7 mm)	7.4" (188 mm)
Offset	5.5" (139.7 mm)	7.75" (196.85 mm)

7. Tighten the nut on the push rod to the clevis pin to specification. Refer to Section 12 Specifications on page 77.

8. Connect the air lines to the brake chambers.

9. Install the brake drum. Figure 7.33.

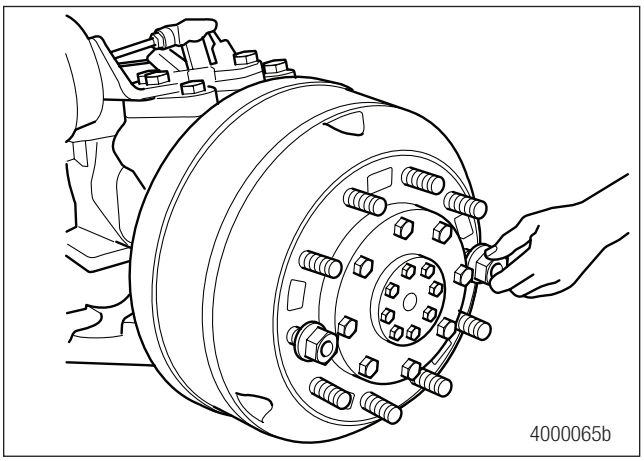


Figure 7.33

10. Check the lubricant level in the axle housing. Fill if required. Refer to Maintenance Manual 1, Preventative Maintenance and Lubrication for lubricant specifications.

Adjust the Brakes

Refer to Maintenance Manual 4, Cam Brakes and Automatic Slack Adjusters for complete brake adjustment procedures.

Assembly and Installation – MX-120-EVO Series

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.

Install the Bushings and Seals in the Housing

1. If required, install a new bushing into the axle housing.

⚠ WARNING

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

2. If required, install a new oil seal into the axle housing. The seal must be installed with the notch at the top. Figure 8.1. Use a correct size sleeve or driver. Refer to Section 13 Special Tools on page 81 for a tool drawing.

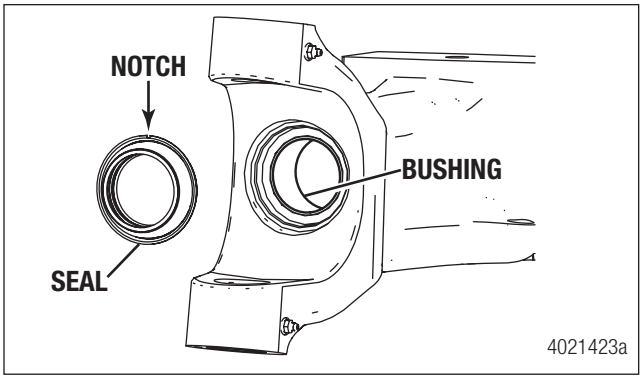


Figure 8.1

⚠ 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. Apply a layer of Loctite® 680 sealant on the outside diameter of the bushing.

⚠ CAUTION

Make sure the welch plug is installed so the convex side will be toward the king pin. If the welch plug is installed facing the wrong direction, grease from the fitting will not reach the king pin bushing and thrust bearing, resulting in bearing failure.

4. Place the welch plug in the socket bore so the convex side will be toward the king pin. If the welch plug is facing the wrong direction, grease from the fitting will not reach the king pin bushing and thrust bearing. Figure 8.2 and Figure 8.3.

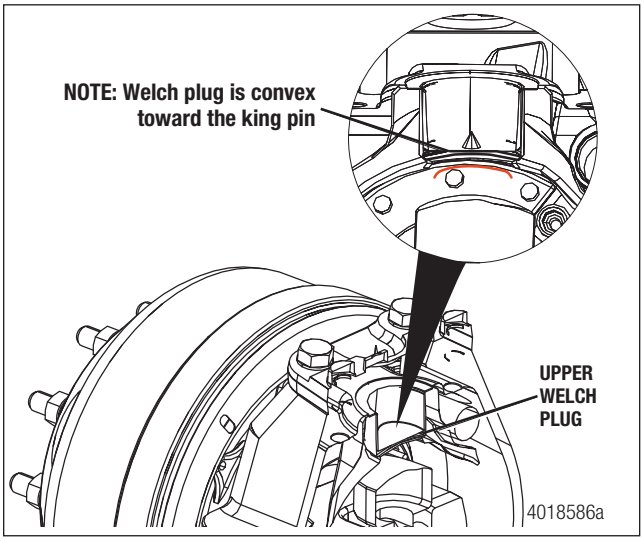


Figure 8.2

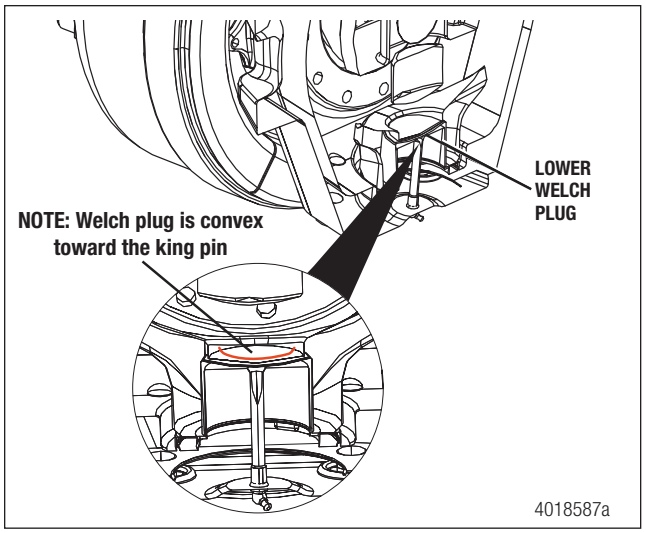


Figure 8.3

5. Using an appropriate tool (see note below), deform (flatten) the welch plug to seal the housing. Ensure the welch plug is convex (bowed) toward the king pin. Figure 8.4 and Figure 8.5.

   NOTE: The welch plug needs to be installed by a tool approximately 90% its diameter. If an appropriate tool is not available, one can be made by cutting off the rounded end of an old king pin and attaching it to a handle or drift. Figure 8.6.

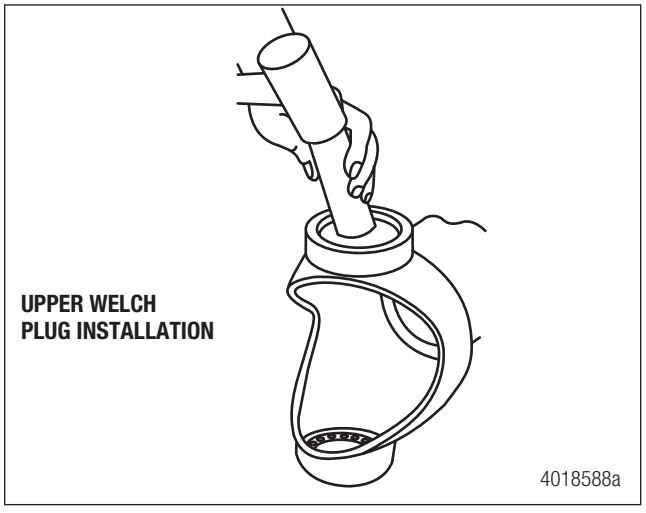


Figure 8.4

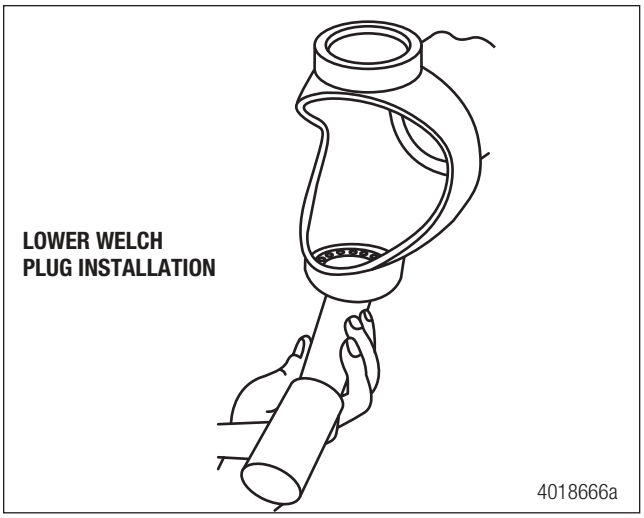


Figure 8.5

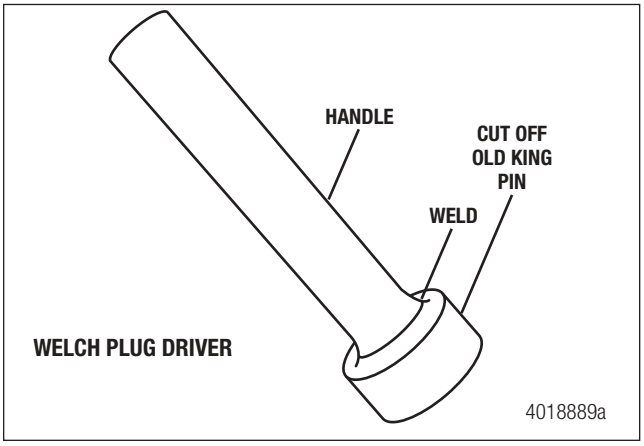


Figure 8.6

6. Drive the new bushings into the socket bores so that the bushings are level with the outside of the socket. Use the correct size sleeve or driver. Refer to Special Tools on page 81 for tool specifications.

7. Pack the bushings with grease before assembly.

Install the Axle Shaft and Assemble the Steering Knuckle

NOTE: If the axle shaft was removed without removing the steering knuckle, refer to Install the Axle Shaft Through the Steering Knuckle in this section.

1. Inspect the housing seal to verify it is correctly installed.

2. Install the axle shaft double-cardan joint assembly into the housing. Carefully align the inner shaft splines with the splines of the differential side gear. Figure 8.7.

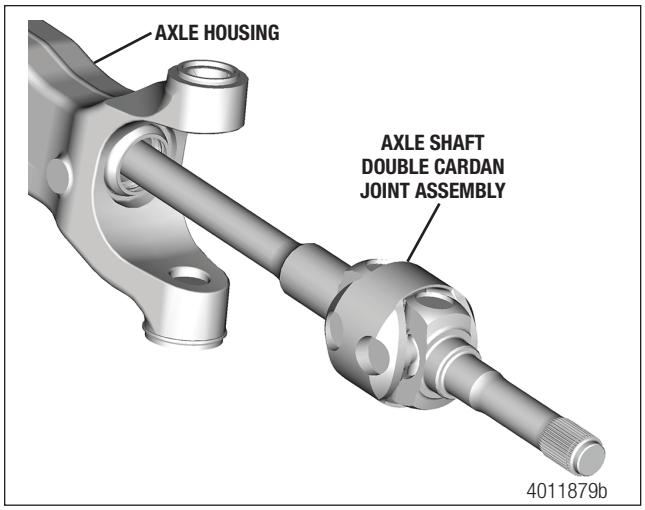


Figure 8.7

3. Place the knuckle in its correct position over the end of the housing. Align the knuckle bores with the housing socket bores.

4. Position the cap assembly through the upper bores of the knuckle and housing until the cap is against the knuckle.

5. Install two capscrews and loosely tighten them to hold the upper knuckle cap in place. Figure 8.8.

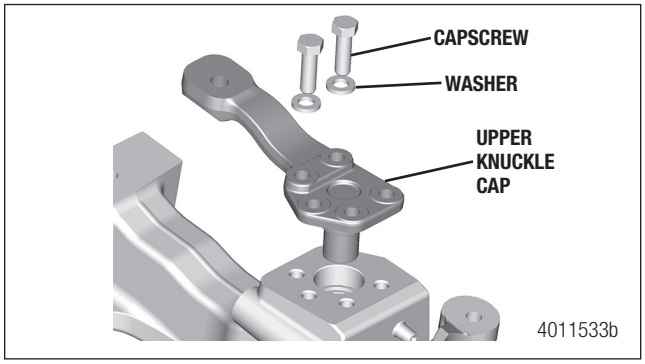


Figure 8.8

6. Install the thrust bearing on the lower cap. Figure 8.9.

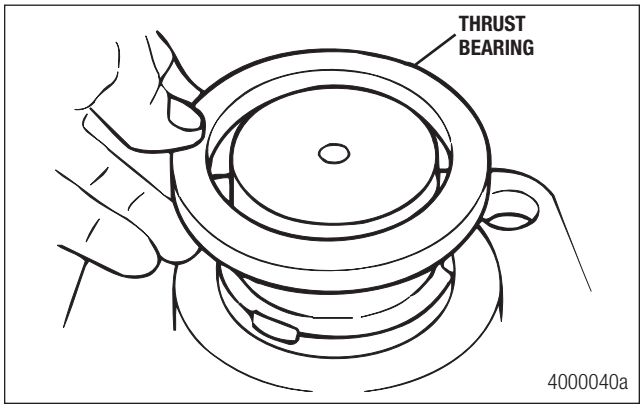


Figure 8.9

7. Position the lower cap assembly through the bottom bores of the knuckle and housing until the cap is against the knuckle. Figure 8.10.

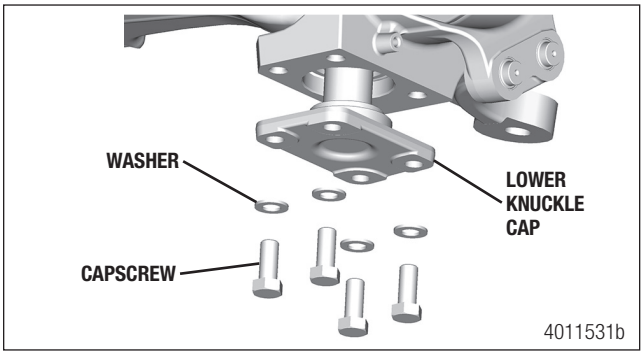


Figure 8.10

8. Install the bolts for the lower and upper knuckle caps. Tighten to specifications. Refer to Section 12 Specifications on page 77.

9. Turn the knuckle back and forth to verify that it travels freely.

10. Check the steering knuckle end play.

    a. Support the vehicle with safety stands under the axle housing.

    b. Place a magnetic base dial indicator into position on the housing. Figure 8.11.

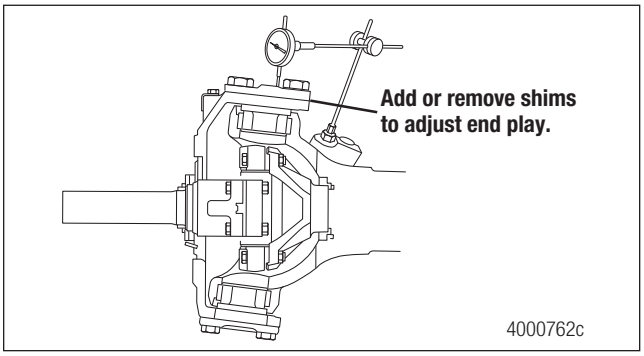


Figure 8.11

    c. Use a jack to place pressure onto the lower knuckle cap. Set the dial indicator to ZERO. If necessary, remove the grease fitting from the lower knuckle cap to prevent damage.

    d. Fully release the jack pressure and read the end play on the dial indicator. Correct end play is 0.005-0.015-inch (0.127-0.381 mm). Remove or add shims from between the upper knuckle cap/steering arm and the axle housing to obtain the correct end play. Figure 8.12.

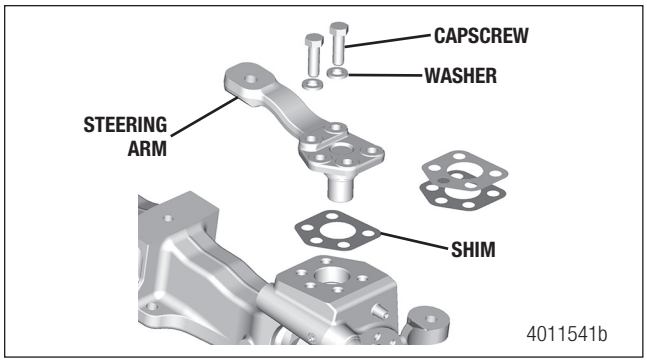


Figure 8.12

Check Steering Knuckle Rotational Torque

1. Fasten a soft wire or cord to the tie rod arm. Attach a pound scale to the opposite end of the wire or cord.
2. Hold the outer shaft of the universal joint away from the knuckle opening. Pull on the pound scale to rotate the knuckle.

   NOTE: Read the scale after the start of movement. The correct rotational torque is 8-25 lb-ft (20.8-33.9 Nm).
3. Read the pounds on the scale. Read the pull necessary to rotate the knuckle. The scale must read 10-30 lb (4.5-13.5 kg). Figure 8.13.

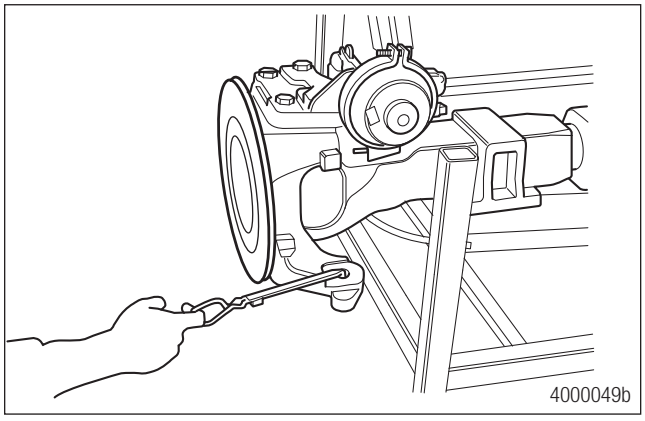


Figure 8.13

4. Verify the rotational torque is within specification. If it is not, follow the instructions below.
   a. Turn the knuckle back and forth. Check the torque again.
   b. Check the trunnion for damage.
   c. Check the knuckle assembly end play.

Install the Axle Shaft through the Steering Knuckle

NOTE: Use this procedure to install the axle shafts if they were removed without removing the steering knuckle.

It can be difficult to correctly support and align the inner shaft when installing the longer axle shaft and universal joint assembly through the steering knuckle. The following procedure has been developed to aid in the installation process.

1. Obtain a strong, smooth piece of wood, like an ax handle or sledge hammer handle.
2. Place one end of the piece of wood between the steering knuckle and the axle housing.
3. Install the inner axle shaft through the steering knuckle and into the axle housing. Use the piece of wood as a lever to support the axle shaft. Figure 8.14.

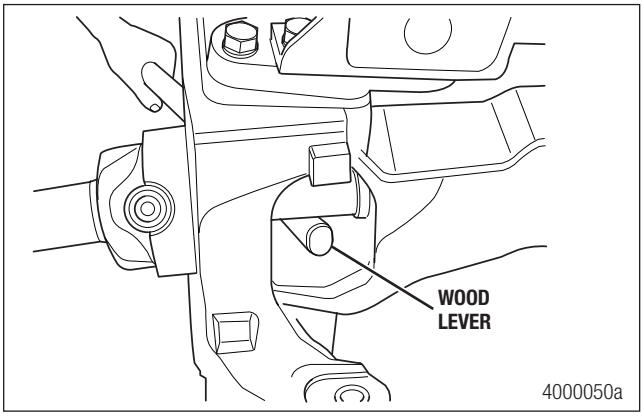


Figure 8.14

⚠ CAUTION

Be careful to avoid damaging the oil seal when installing the axle shaft.

4. Carefully align the inner shaft splines with the splines of the differential side gear.
5. Install the axle shaft and universal joint assembly through the steering knuckle. Figure 8.15.

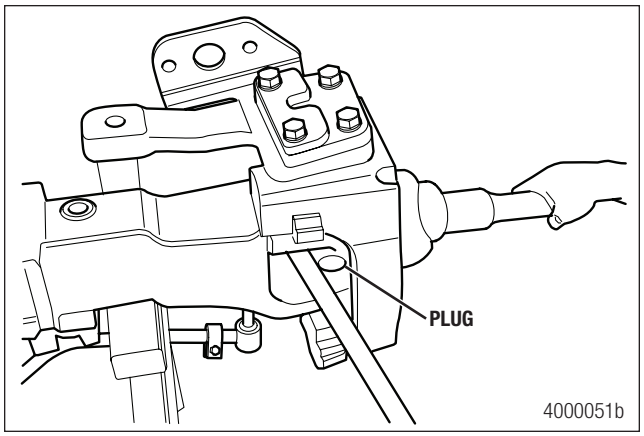


Figure 8.15

Assemble the Spindle, Brake Assembly and Dust Shield to the Steering Knuckle

Prepare the Spindle

1. On units equipped for ABS, if the steel sleeve for holding the ABS sensor clip and ABS sensor has been removed, use a suitable driver to install the sleeve into the back side of the spindle until it is flush with the surface. Figure 8.16.

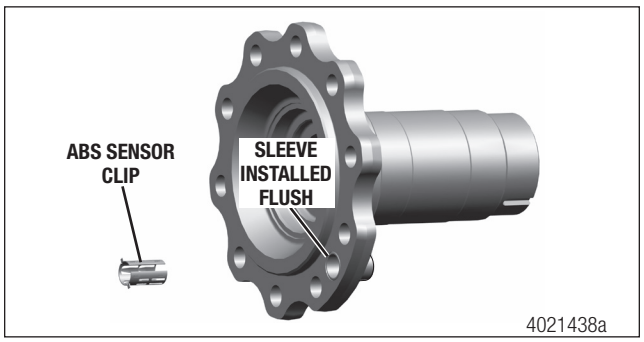


Figure 8.16

2. Install the ABS sensor clip into the sleeve. Figure 8.16.

3. If removed, use the correct size drivers to install the bushing and grease seal into the spindle. Refer to Section 13 Special Tools on page 81 for tool specifications. Figure 8.17.

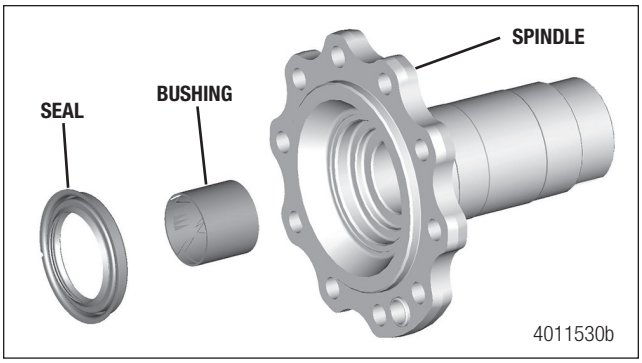


Figure 8.17

4. Apply a light coat of oil to the spindle bushing.

5. Install the spindle against the knuckle with the ABS sleeve aligned to the ABS through hole in the knuckle. Figure 8.18.

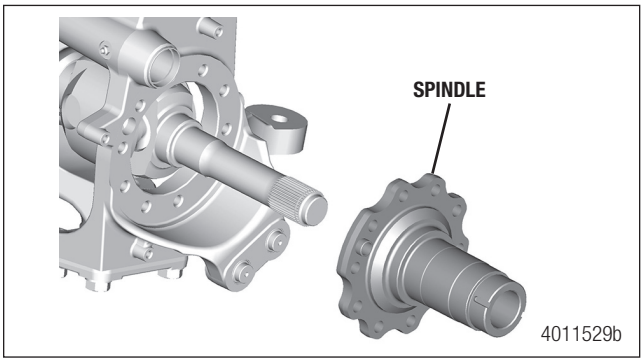


Figure 8.18

6. Install the 10 capscrews and washers and tighten to specification. Refer to Section 12 Specifications on page 77. Figure 8.19.

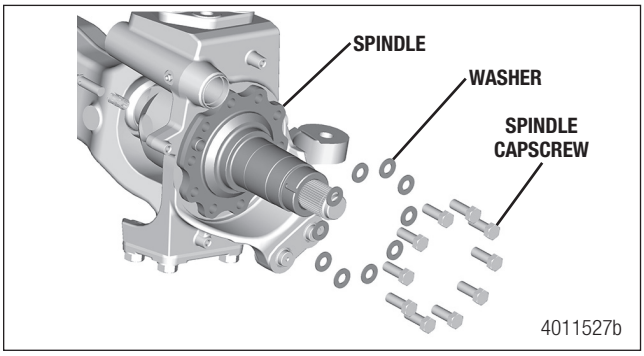


Figure 8.19

7. On units equipped for ABS, route the ABS cable to the back side of the knuckle. Install the ABS sensor into the clip in the spindle Figure 8.20.

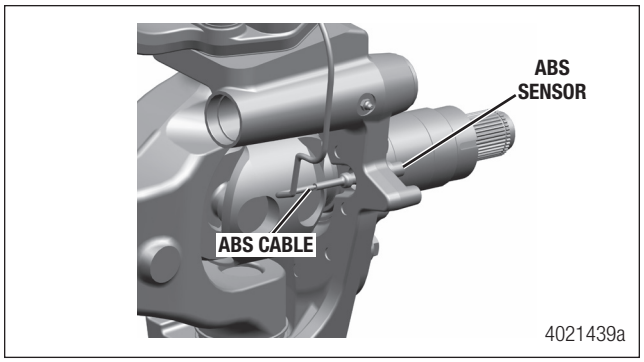


Figure 8.20

8. If removed, install the stop screw to the depth marked during removal.

9. If removed, install new camshaft bushings and grease seals into the knuckle. Figure 8.21.

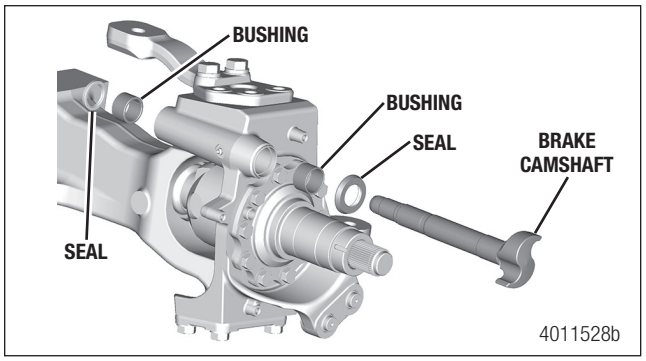


Figure 8.21

10. Install the brake camshaft through the knuckle.

11. Place the brake dust shield into position on the spindle and install the four mounting capscrews. Tighten to specification. Refer to Section 12 Specifications on page 77. Figure 8.22.

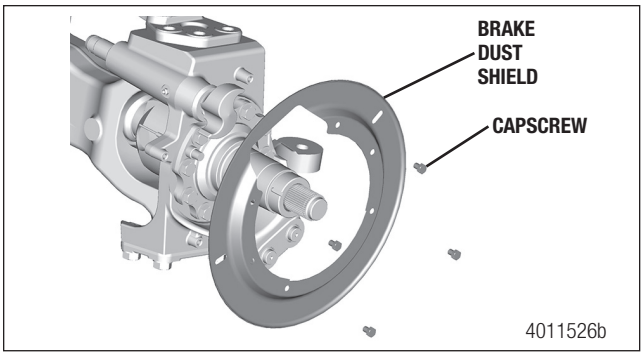


Figure 8.22

12. Install the brake shoes on the brake spider. Install the return springs and retainer springs. Lift the ends of the brake shoes and install the brake rollers. Figure 8.23.

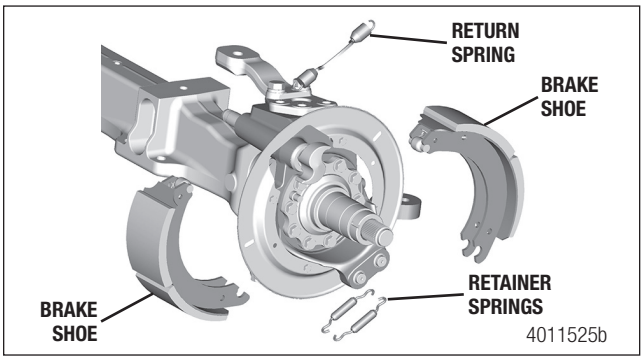


Figure 8.23

Install the Wheel Bearings into the Hub

⚠ 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, put the hub in a press with the drum side at the BOTTOM. Figure 8.24.

   a. Align the grooves on the studs with the grooves in the stud holes in the hub.

   b. Press the studs into position.

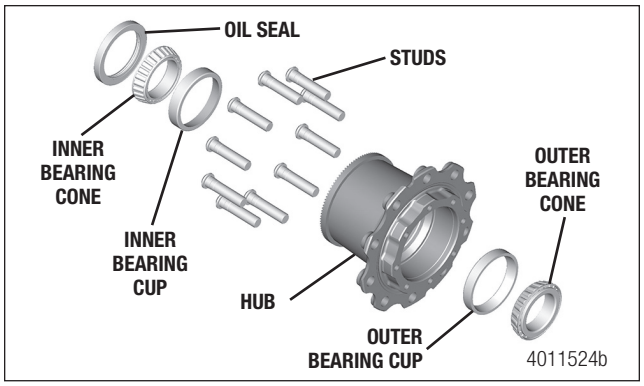


Figure 8.24

⚠ 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: If a wheel bearing cup or wheel bearing was found to be damaged during disassembly, both the cup and bearing must be replaced as a set.

2. Use a press and sleeve to install the inner and outer bearing cups into the hub. The bearing cup must be pressed tight against the shoulder in the hub.

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

⚠ CAUTION

Do not assemble dry. Damage to wheel end components may result.

3. Lubricate both the inner and outer wheel bearings. Dip the wheel bearings into the same lubricant as used in the differential carrier housing. Refer to Section 11 Lubrication and Maintenance on page 65.

4. Insert the inner wheel bearing into the hub bore.

Install the Hub onto the Axle

⚠ CAUTION

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

1. Install the oil seal into its correct position flush with the outer surface of the hub. Refer to Section 13 Special Tools on page 81 for seal driver tool specifications.

2. On units equipped for ABS, install the ABS tooth wheel onto the hub with a suitable driver.

3. Install the hub assembly onto the spindle. Be careful the oil seal is not damaged during installation. Press the hub until the inner bearing is flat against the face of the spindle. Figure 8.25.

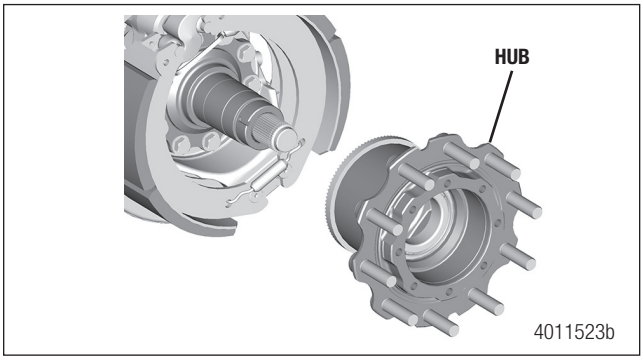


Figure 8.25

4. Install the outer bearing cup onto the spindle and push it into its cup inside the hub. Figure 8.24.

5. Install the inner adjusting nut, lock washer and outer jam nut. Figure 8.26.

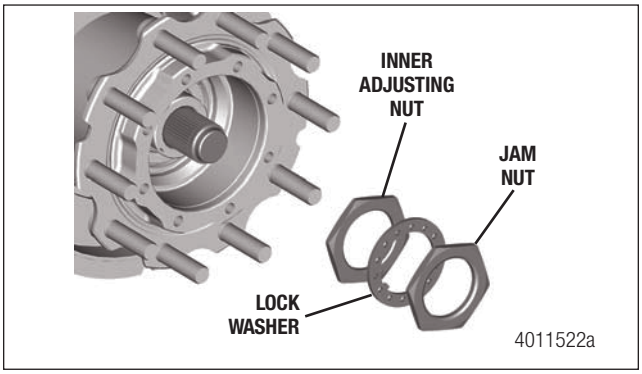


Figure 8.26

Adjust the Wheel Bearings

⚠ DANGER

Use a torque wrench to tighten or loosen the adjusting nuts. Do not use a hammer to directly hit the adjusting nuts, or to hit a chisel or drift placed against them. Damaged adjusting nuts can prevent you from obtaining correct wheel bearing end play, which can affect vehicle operation and cause the wheels to separate from the vehicle. Death or serious personal injury and damage to components will result.

1. Install the adjusting nut. Use a torque wrench to tighten the adjusting nut to 100 lb-ft (136 Nm). Figure 8.27.

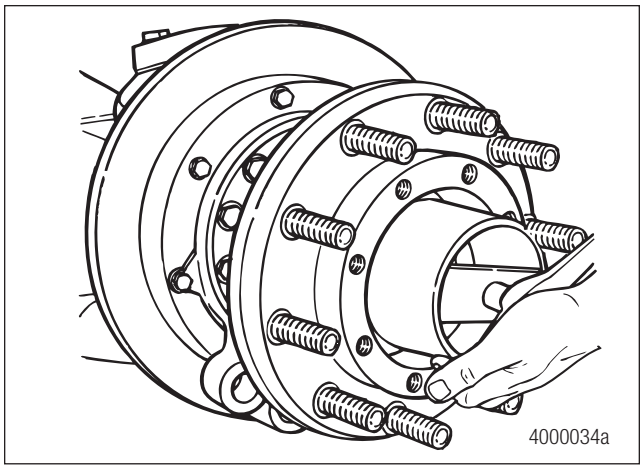


Figure 8.27

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

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

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

5. Check the end play with a dial indicator. Refer to Check and Adjust Wheel Bearings on page 58. Perform one of the following actions based on the end play result.

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

Adjust the Wheel Speed Sensors on Units Equipped with ABS

For complete maintenance and service procedures for Meritor anti-lock braking systems, refer to Maintenance Manual 28, Anti-Lock Braking Systems (ABS) for Trucks, Tractors and Buses — C Version ECUs and Maintenance Manual 30, Anti-Lock Braking Systems (ABS) for Trucks, Tractors and Buses — D Version ECUs.

Push the wheel speed sensor IN until it contacts the tooth wheel. Do not use sharp objects to pry or push sensors. Sensors will self-adjust during wheel rotation. Figure 8.28.

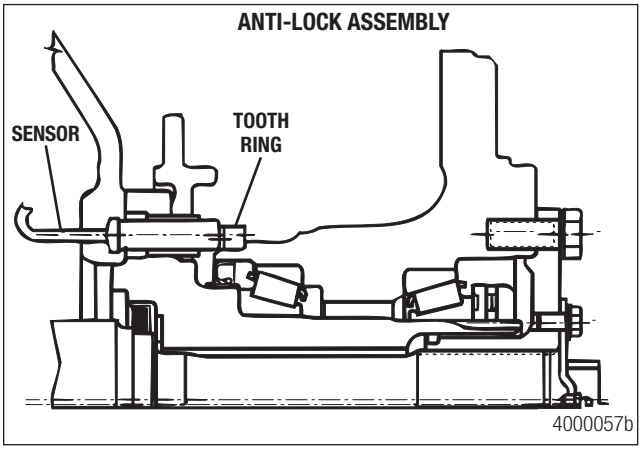


Figure 8.28

Install the Drive Flange and Hubcap

⚠ WARNING

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

1. Install a new O-ring on the drive flange. Figure 8.29.

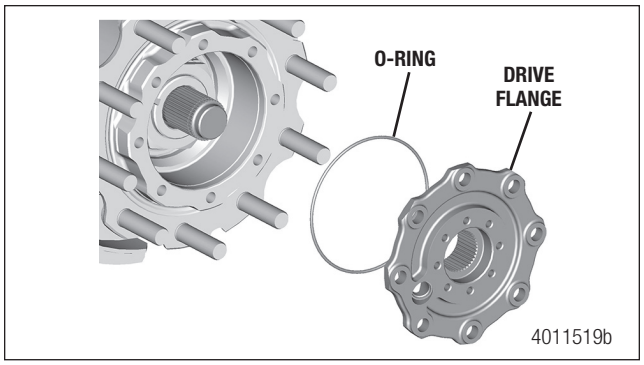


Figure 8.29

2. Apply Meritor specification O-617-A or O-617-B wheel bearing grease to the inside splines of the drive flange and the splines of the driveshaft. Refer to Section 11.

3. Install the drive flange onto the hub and fasten with washers and capscrews. Tighten the capscrews to specification. Refer to Section 12 Specifications on page 77. Figure 8.30.

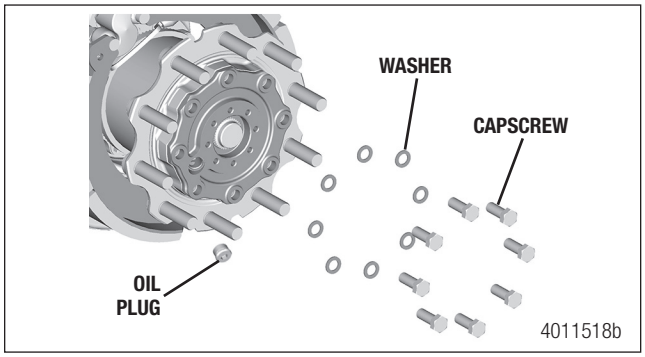


Figure 8.30

4. Install the snap ring onto the end of the axle shaft. Figure 8.31. Ensure the snap ring is positioned in the groove at the end of the axle shaft.

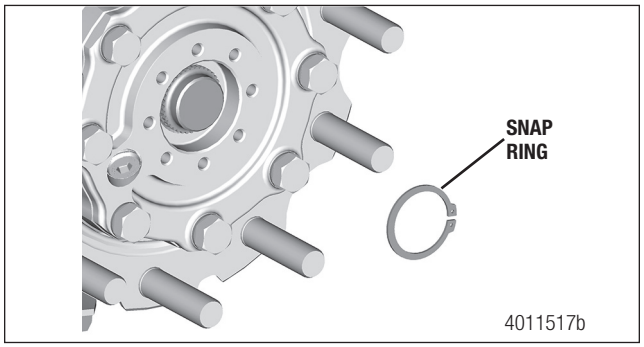


Figure 8.31

5. Apply a 0.125-inch continuous bead of silicone gasket material around either the mounting surface of the hubcap or the drive flange. Refer to Section 6 Prepare Parts for Assembly on page 28.

6. Install the hubcap and tighten the capscrews to specification. Refer to Section 12 Specifications on page 77. Figure 8.32.

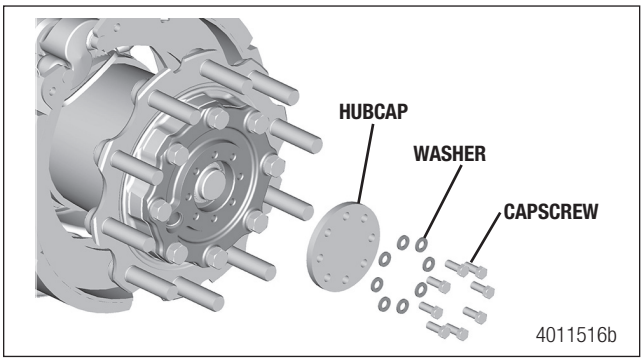


Figure 8.32

⚠ CAUTION

If the wheel end hubs are not filled with the specified lubricant, the bearings can become damaged.

7. Add oil to the hub per the Hub Fill Procedure in Wheel Hub Oil Fill on page 66.

Assemble the Slack Adjuster

For complete maintenance and service procedures for Meritor's automatic slack adjusters, refer to Maintenance Manual 4, Cam Brakes and Automatic Slack Adjusters.

⚠ WARNING

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

1. Install the air brake chamber and bracket. Tighten the bracket mounting capscrews to specification. Refer to Section 12 Specifications on page 77. Figure 8.33.

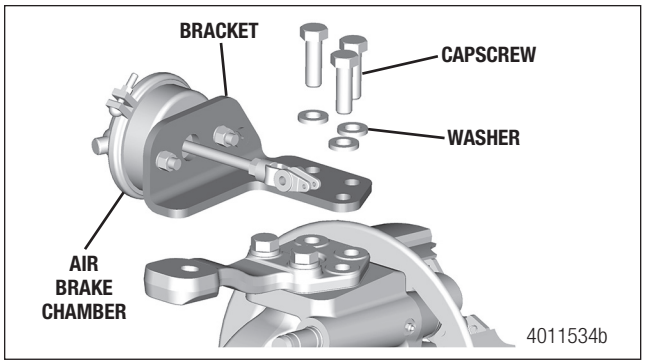


Figure 8.33

2. Install the inner washer onto the camshaft, then install the slack adjuster onto the camshaft. Figure 8.34.

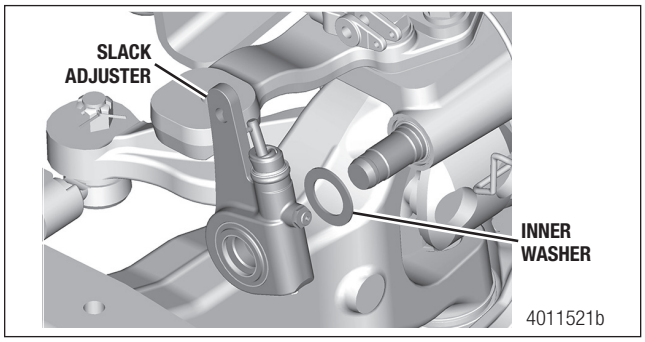


Figure 8.34

3. Install the slack adjuster washers at the adjuster end of the camshaft. Figure 8.35 and Figure 8.36. Use as many washers as required to keep slack end play at 0.060-inch (1.5 mm) maximum.

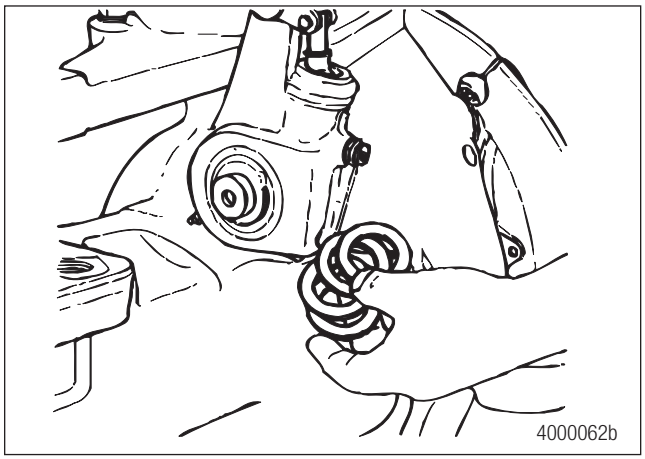


Figure 8.35

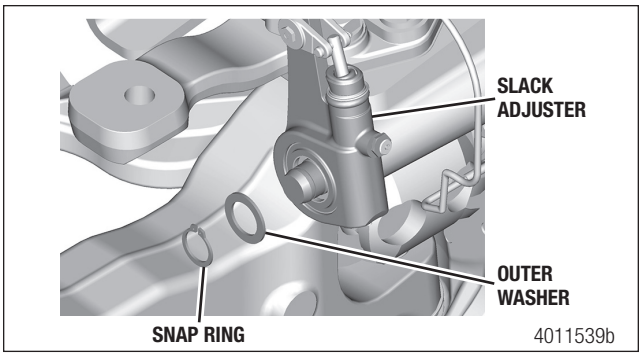


Figure 8.36

4. Install the slack adjuster retaining ring at the adjuster end of the camshaft.

5. Install the pin and retainer that engages the push rod yoke and the slack adjuster plunger rod. Figure 8.37.

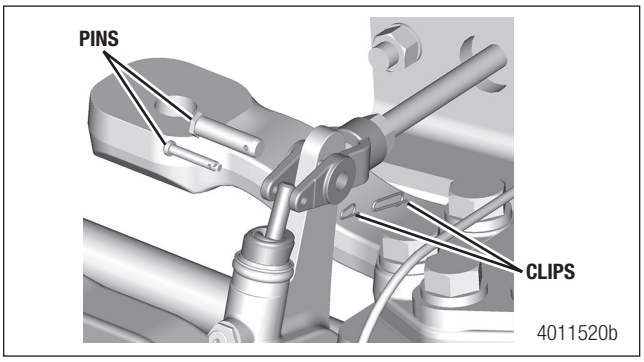


Figure 8.37

6. Adjust the slack adjuster position to obtain the following BSAP dimension from the back of the brake air chamber to the center of the clevis pin.

Clevis Type	SL (Slack Adjuster Length)	BSAP (Brake Slack Adjuster Position)
Standard	5.5" (139.7 mm)	7.4" (188 mm)
Offset	5.5" (139.7 mm)	7.75" (196.85 mm)

7. Tighten the nut on the push rod to the clevis pin to specification. Refer to Section 12 Specifications on page 77.

8. Connect the air lines to the brake chambers.

9. Install the brake drum. Figure 8.38.

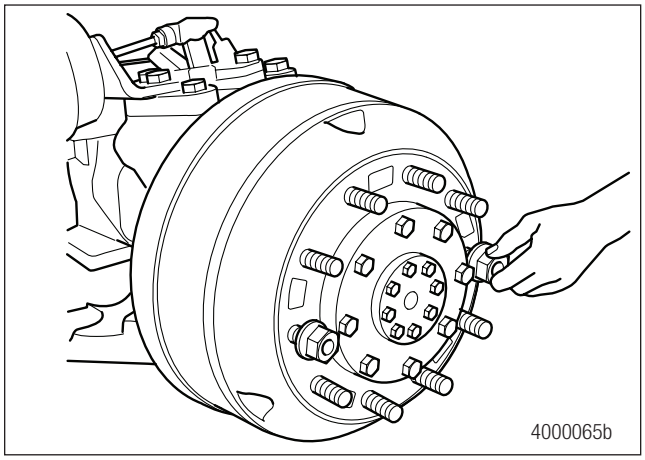


Figure 8.38

10. Check the lubricant level in the axle housing. Fill if required. Refer to Maintenance Manual 1, Preventive Maintenance and Lubrication for lubricant specifications.

Adjust the Brakes

Refer to Maintenance Manual 4, Cam Brakes and Automatic Slack Adjusters for complete brake adjustment procedures.

Adjustment

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.

Inspection

Before Alignment

Check the following before doing a front wheel alignment.

Inspection

Refer to Section 11 Lubrication and Maintenance on page 65.

Wheels and Tires

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

Front Suspension

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

Rear Axle and Rear Suspension

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

1. Verify that all fasteners are tightened to the specified torque.
2. Verify that the leaf springs are not worn or damaged.
3. Verify that the bushings in the leaf springs are not worn or damaged.
4. Verify that the torque rods, if used, are correctly adjusted.
5. Verify that the frame is not bent.
6. Verify that the rear axle, especially a tandem axle, is correctly aligned. Refer to the procedure of the manufacturer of the vehicle or the suspension.
7. Refer to any additional rear axle and suspension recommendations and specifications from the vehicle manufacturer.

Adjustment

Front Wheel Alignment

Check the front wheel alignment:

1. Every 20,000 miles (32 000 km) or 24 months, normal maintenance.
2. When the vehicle does not steer correctly.
3. To correct a tire wear condition.

Minor Front Wheel Alignment

Perform a minor front wheel alignment for all normal maintenance conditions using the following procedure.

1. Inspect all the systems that affect the wheel alignment. Refer to the procedures in this section.
2. Check and adjust the wheel bearings or wheel bearing end play for the truck hub unit.
3. Check and adjust the toe-in.

Major Front Wheel Alignment

Perform a major front wheel alignment to correct steering and tire wear conditions using the following procedure.

1. Inspect all the systems that affect the wheel alignment. Refer to the procedures in this section.
2. Check and adjust the wheel bearings. For models with unitized hubs, check wheel bearing end play for the truck hub unit. Refer to Section 11 Lubrication and Maintenance on page 65.
3. Check and adjust the maximum turn angle.
4. If the vehicle has power steering, check and adjust the pressure relief in the power steering system.

5. Check and adjust the turning radius angle, toe-out on turns or Ackerman angle. Refer to the procedures in this section.

6. Check the steering axis, or king pin inclination. Refer to the procedures in this section.

7. Check the camber angle. Refer to the procedures in this section.

⚠ WARNING

Axle camber angle is not adjustable. Do not change the axle camber angle or bend an axle beam to change the axle camber angle. A bent axle beam reduces axle strength, affects vehicle operation and voids Meritor's warranty. Serious personal injury and damage to components can result.

8. Check and adjust the caster angle. Refer to the procedures in this section.

9. Check and adjust the toe-in. Refer to the procedures in this section.

Check and Adjust Wheel Bearings

Axles with Conventional Wheel Ends

⚠ DANGER

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

1. Park the vehicle on a level surface. Place blocks under the wheels not being serviced to prevent the vehicle from moving.

2. Raise the vehicle so that the wheels to be serviced are off the ground. Support the vehicle with safety stands.

3. Remove the capscrews and remove the gasket and the cap from the hub.

4. Verify that the brake drum and the hub fasteners are tightened to the manufacturer's specifications.

5. Attach a dial indicator with the magnetic base at the bottom of the hub or the brake drum.

6. Adjust the dial indicator so that the pointer is against the center of the knuckle. Set the dial indicator on ZERO. Figure 9.1.

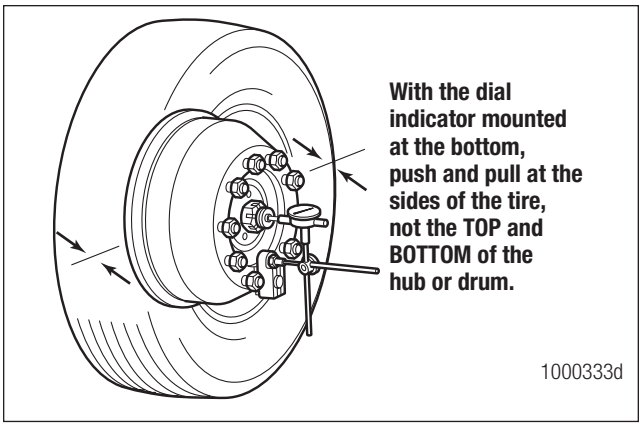


Figure 9.1

7. Measure the end play by pushing and pulling on each side of the hub or drum while looking at the indicator. The end play is the total travel observed. Do not push or pull at the top and the bottom of the hub or drum, which can affect the end play measurement. Figure 9.1.

   If the end play is not 0.000-0.002-inch (0.025-0.051 mm): Adjust the wheel bearings. Refer to Step 7 through Step 12.

8. Remove the outer jam nut and lock washer from the spindle. Figure 9.2.

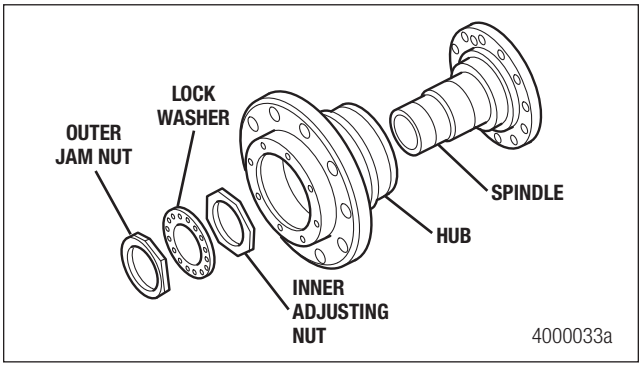


Figure 9.2

⚠ DANGER

Use a torque wrench to tighten or loosen the adjusting nuts. Do not use a hammer to directly hit the adjusting nuts, or to hit a chisel or drift placed against them. Damaged adjusting nuts can prevent you from obtaining correct wheel bearing end play, which can affect vehicle operation and cause the wheels to separate from the vehicle. Death or serious personal injury and damage to components will result.

9. Use a torque wrench to tighten the adjusting nut to 100 lb-ft (136 Nm). Figure 9.3.

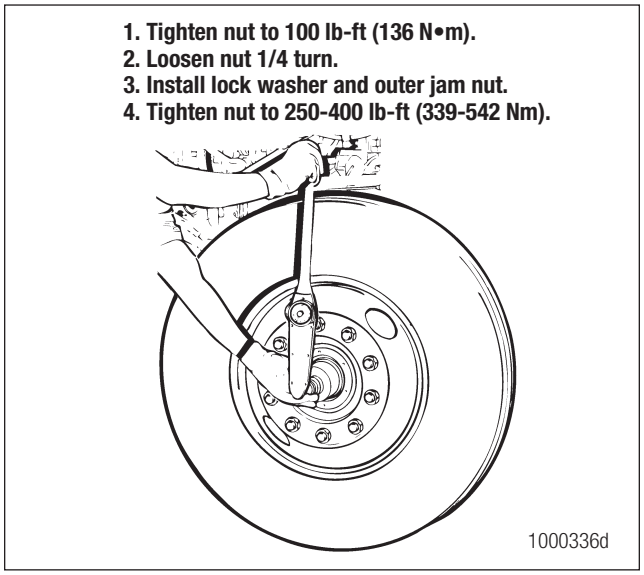


Figure 9.3

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

11. Back off the adjusting nut 1/4 turn, 2-1/2 studs of the drum bolt circle. Do not rotate the hub assembly after backing off the adjusting nut.

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

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

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

Maximum Turn Angle

⚠ CAUTION

Do not exceed the maximum turn angle specified by the vehicle manufacturer. Damage to the cross tube and the tie rod ends will result.

The stop bolt on the back of the knuckle controls the maximum turn angle. If the stop bolt is missing, bent or broken, the system requires adjustment.

Use an alignment machine to check the angle if the front tires rub against the frame, or if the steering gear has been serviced. Refer to the alignment equipment manufacturer's procedures.

The stop bolt should always have a minimum clearance of 1/16-inch (1.5 mm). Stop bolt contact is acceptable if no other stops are used for the maximum turn angle of the steering knuckle.

If the steering system is out-of-adjustment, inspect the steering arm for damage.

1. Use a magnetic particle or liquid dye penetrant inspection procedure to inspect the steering arm, especially the bend, taper and area near the ball stud.

2. Refer to the vehicle manufacturer's manual for additional inspection procedures.

In power steering systems, the hydraulic pressure should relieve or "drop off" at the steering stroke with 1/16-inch (1.5 mm) minimum clearance at the stop bolt. If the pressure does not relieve, damage to the front components will result. Refer to the vehicle manufacturer's manual for adjustment procedures.

Two-Piece Steering 3/4-Inch Bolt

1. Install the stop screw to a starting depth.
2. Turn the steering wheel until the stop bolt contacts the axle housing. Measure the turn angle.

   If the maximum turn angle does not meet the vehicle manufacturer's specifications: Correct the maximum angle by adjusting the stop bolt IN or OUT.
3. Once the correct turn angle is achieved, tighten the jam nut to 65-85 lb-ft (68-101 Nm).

Turning Radius Angle

When turning, the inner wheel must turn at a greater angle than the outer wheel. This angle is the turning radius angle, often called the Ackerman angle. Figure 9.4.

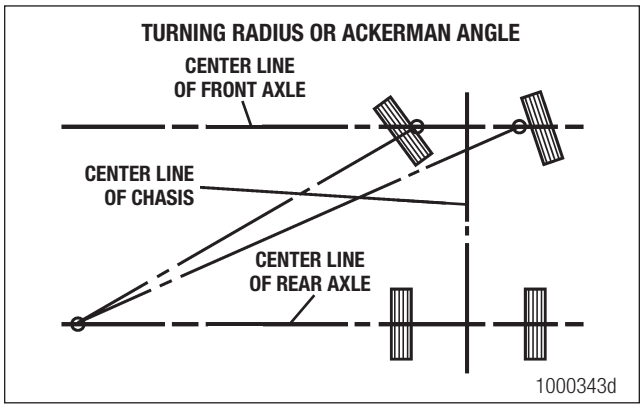


Figure 9.4

Check the turning radius angle with the radius plates on the alignment equipment. To determine the correct turning radius angle specification, refer to the vehicle manufacturer's manual.

If the angle is not within specifications: Premature tire wear will occur. Inspect the knuckle, tie rod arms, tie rod ends and cross tube for wear or damage. Service as necessary.

Steering Axis Inclination

Steering axis or king pin inclination is the angle measured between the center line of the knuckle cap and the vertical position, as viewed from the front of the vehicle. Refer to the vehicle manufacturer's steering axis inclination specifications. Figure 9.5.

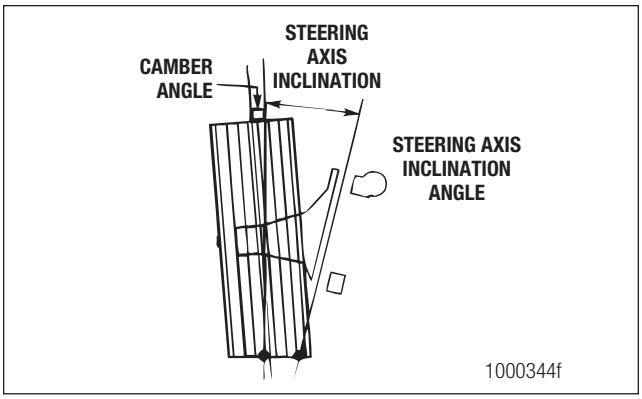


Figure 9.5

The steering axis inclination and the camber angle are designed into the axle to place the tire tread center line in contact with the road. This reduces steering effort and improves directional stability.

Use an alignment machine to check the steering axles inclination angle. Refer to the vehicle manufacturer's inclination angle specifications.

The steering axis inclination is not adjustable. If the inclination is not at the specified angle, check the axle beam and knuckle for damage. Service as necessary.

Camber Angle

⚠ WARNING

Axle camber angle is not adjustable. Do not change the axle camber angle or bend an axle beam to change the axle camber angle. A bent axle beam reduces axle strength, affects vehicle operation and voids Meritor's warranty. Serious personal injury and damage to components can result.

Camber is the angle of the tire with respect to the ground. Camber is positive when the distance between the top of the wheels is greater than the distance at the ground. Figure 9.6.

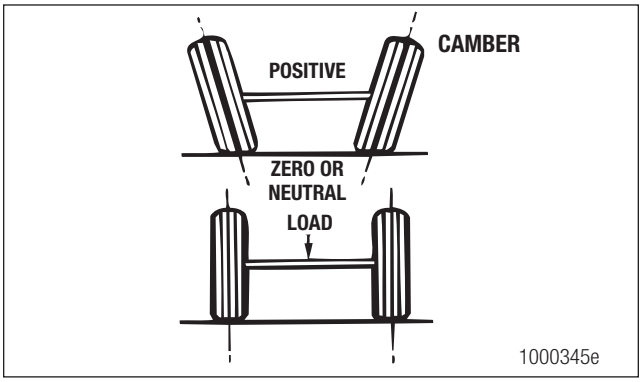


Figure 9.6

A small amount of positive camber is built into the knuckle, because camber changes with load. This results in a zero camber angle when the vehicle is operated at normal load.

If camber is out of specification by more than 1-1/2 degrees, rapid or uneven tire wear will occur. Bias ply tires show excess camber easily. Excess camber will not be as evident on vehicles equipped with radial tires.

The camber angle is not adjustable. The camber angle is machined into both the axle beam and the knuckle. If the camber angle is not at the specified angle, check the axle beam and the steering knuckle for damage. Service as necessary.

Table B: Camber Angle Recommendations

Conditions	Left and Right Sides
Camber angles machined into axles • Load not applied on axle	+1/4 Nominal
Camber angles under load • Axle installed in vehicle	+3/16 to –3/16 (final reading)

Use an alignment machine to check the camber angle. Refer to the alignment equipment manufacturer's procedures and vehicle manufacturer's instructions to determine specifications for the correct camber setting. The table above shows the specifications Meritor builds into an axle, but always use the vehicle manufacturer's specifications.

Caster Angle

Caster is the FORWARD or REARWARD tilt of the king pin center line when viewed from the side of the vehicle. The caster angle is the angle from the vertical position to the center line of the king pin. If the top of the king pin axis is toward the rear of the vehicle, the caster is positive.

A slight positive caster creates a self-aligning action that helps to stabilize the vehicle after turning and stabilizes it for driving straight ahead. Figure 9.7.

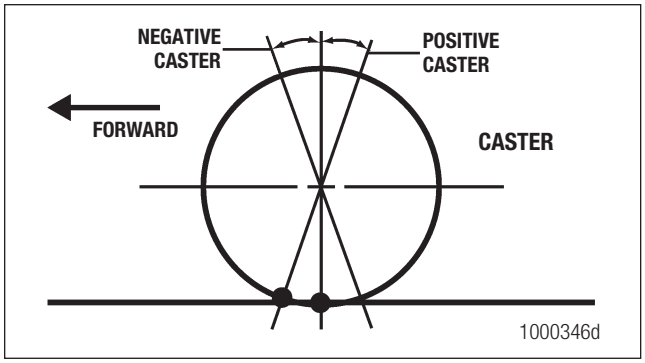


Figure 9.7

Always use an alignment machine to check the caster angle. When checking caster, refer to the alignment equipment manufacturer's procedures.

If caster angle is greater than specification, steering effort can increase a shimmy condition.

The caster angle is controlled by the angle of the housing pad or by tapered shims installed under the leaf springs. Adjust caster according to the vehicle manufacturer's specifications and procedures.

Caster specifications are set by the vehicle manufacturer. Refer to the vehicle manufacturer's specifications for the caster setting. If caster specifications are not available from the vehicle manufacturer, Meritor recommends a caster setting of +1 degrees to +2-1/2 degrees for vehicles with manual steering and +2 degrees to +4-1/2 degrees for vehicles with power steering.

Measure and Adjust the Toe

⚠ DANGER

Incorrect toe settings affect tire wear. Do not change camber or caster settings to correct tire wear problems. If the axle assembly is bent to change caster or camber, the strength of the axle is reduced, which affects vehicle operation and voids Meritor's warranty. Death or serious personal injury and damage to components can result.

Toe is the relationship of the distance between the front of the front tires and the rear of the front tires.

When the front distance is less than the rear distance, the wheels are toed in. Toe-in is designed into the vehicle to counteract the tendency of the tires to toe-out when the vehicle is driven.

Incorrect toe setting will result in rapid tire wear. The toe setting for part-time 4x4 or 6x6 vehicles depends on the vocation. Frequent front-drive axle use requires a nominal toe-out setting, while infrequent front-drive axle use requires a nominal toe-in setting. Contact the vehicle manufacturer for the correct toe.

Contact the vehicle manufacturer for the correct toe setting. Refer to the table below for a sample toe recommendation.

Front-Drive Axle Use	Toe Recommendation	
	Unloaded (in.)	Loaded (in.)
Frequent (>75%)	+0 ± 1/32	–1/32 ± 1/32, toe out
Normal (25-75%)	+1/32 ± 1/32	+0 ± 1/32
Infrequent (<25%)	+1/16 ± 1/32	+1/32 ± 1/32, toe in

9 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.

1. Park the vehicle on a level surface. Place blocks under the rear wheels to prevent the vehicle from moving.
2. Raise the vehicle so that the front tires are off the ground. Support the front axle with safety stands.
3. Use paint or chalk to mark the center area of both front tires around the complete outer surface of the tire.
4. Place the pointers of a trammel bar on the marks of each tire. Rotate the tires. Verify that a straight line is marked on the outer surface of the tire. Figure 9.8.

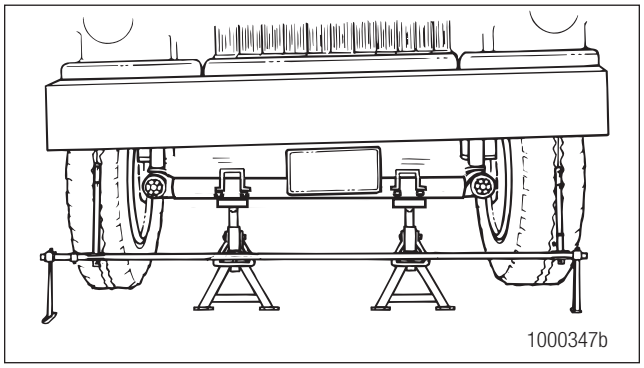


Figure 9.8

5. Lower the vehicle to the floor. Do not measure toe with the front axle in the raised position. Move the vehicle FORWARD and BACKWARD 10 feet (3 meters).
6. Place the trammel bar at the back of the tires. Raise the pointers so that the pointers are level with the spindles. Align the pointers with the marks on the tires. Measure and record the distance between the pointers.
7. Repeat Step 6 for the front of the tires.
8. To obtain the toe measurement, subtract the distance between the front of the tires from the distance between the back of the tires. Figure 9.9.

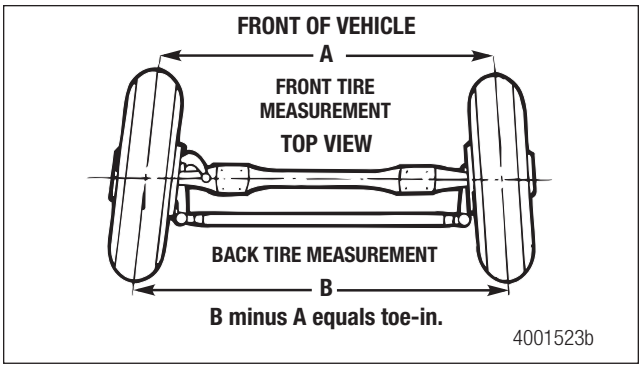


Figure 9.9

9. Perform the following procedure if toe measurement is not within specification.
   a. Loosen the tube clamp nut and bolt on each end of the cross tube.
   b. Turn the cross tube until the specified toe-in distance is obtained.
   c. Install the threaded portion of the tie rod end into the cross tube beyond the point where the tube slot stops. Figure 9.10.

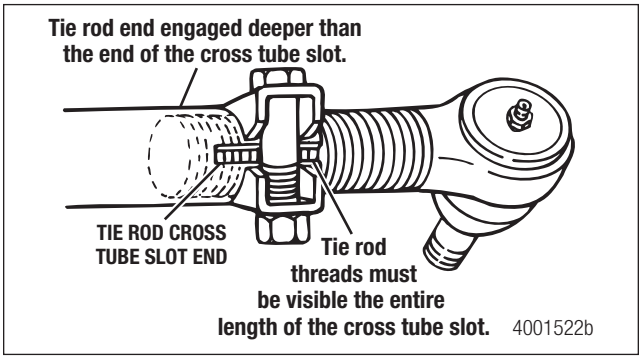


Figure 9.10

   d. Tighten the nut and bolt on each end of the cross tube to 80-90 lb-ft (108-122 Nm).
   e. Repeat Step 1 through Step 8 to check the toe-in dimension.

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.

Front Drive Steer Axle 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 that 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.

10 Troubleshooting

Condition	Cause	Correction
Bent or broken cross tube, tie rod end ball stud, steering arm or tie rod end. Component requires replacement.	Too much pressure in the power steering system; pressure exceeds vehicle manufacturer's specification	Adjust the power steering system to the specified pressure.
	Power steering system cut-off pressure, out of adjustment	Adjust the power steering system to the specified pressure.
	Vehicle operated under severe conditions	Verify that the vehicle is operated correctly.
	Add-on type of power steering system not installed correctly	Correctly install the add-on power steering system.
	Steering gear overtravel poppets incorrectly set or malfunctioning	Check for correct operation or adjust the overtravel of poppets to vehicle manufacturer's specifications.
	Axle stops incorrectly set	Set the axle stops to vehicle manufacturer's specification.
Worn or broken steering ball stud.	Drag link fasteners tightened higher than OEM specified	Tighten the drag link fasteners to the specified torque.
	Lack of lubrication or incorrect lubricant	Lubricate the linkage with the specified lubricant.
	Power steering stops out-of-adjustment	Adjust the stops to the specified dimension.
Worn king pins and king pin bushings.	Worn or missing seals and gaskets	Replace the seals and gaskets.
	Incorrect lubricant	Lubricate the axle with the specified lubricant.
	Axle not lubricated at scheduled frequency	Lubricate the axle at the scheduled frequency.
	Incorrect lubrication procedures	Use the correct lubrication procedures.
	Lubrication schedule does not match operating conditions	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.

Lubrication and Maintenance

Hazard Alert Messages

Read and observe all hazard alert messages in this publication.

⚠ DANGER

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

Always remove excess grease after application. Excessive grease that can fall from the vehicle is a DOT violation in some states and Canada and should be avoided.

Lubrication

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

Magnets and Magnetic Drain Plugs

Meritor front driving axles are equipped with magnetic drain plugs that have a minimum pickup capacity of 1.5 pounds (0.7 kilograms) of low carbon steel.

The magnetic drain plug can be reused if, after cleaning, the plug has a minimum pickup capacity of 1.5 pounds (0.7 kilograms) of low carbon steel. Inspect the magnetic drain plug each time the oil is changed. Use the correct part. Pipe plugs will leak if used as a drain plug.

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.

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

Breather

⚠ CAUTION

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

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

Refer to Section 12 Specifications on page 77 for breather torque.

Temperature Indicators

⚠ CAUTION

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

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

Check and Adjust the Axle Oil Level

1. Verify that the vehicle is parked on a level surface.
2. Remove the fill plug from the axle.
3. The oil level must be even with the bottom of the fill plug hole.

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

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

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

Drain and Replace the Axle Oil

1. Verify that the vehicle is parked on a level surface. Place a large container under the axle.
2. Remove the drain plug from the bottom of the axle. Drain and discard the oil correctly.
3. Clean, install and tighten the drain plug to 35-50 lb-ft (48-67 Nm).
4. Remove the fill plug from the axle.
5. Fill the axle to the bottom of the fill plug hole with the specified oil. Allow enough time for oil to circulate through the axle assembly.
6. Install and tighten the fill plug to 35-50 lb-ft (48-67 Nm).

Hub Check, Drain and Fill Procedures for Drive Axles Equipped with Wheel-End Fill Plugs

Wheel Hub Oil Level Inspection

1. Park the vehicle on a level surface. Place blocks under the wheels not being serviced to prevent the vehicle from moving.
2. Raise the vehicle so that the wheels to be serviced are off the ground. Support the vehicle with safety stands.
3. Rotate the hub so the fill/drain plug is at 3 or 9 o'clock position.
4. Remove the plug and check if the oil is even with the bottom of the plug hole.

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

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

Wheel Hub Oil Drain

1. Park the vehicle on a level surface. Place blocks under the wheels not being serviced to prevent the vehicle from moving.
2. Raise the vehicle so that the wheels to be serviced are off the ground. Support the vehicle with safety stands.
3. Rotate the hub so the fill/drain plug is at 6 o'clock position.
4. Place a drain pan under the wheel end to catch the oil.
5. Remove the drain/fill plug and drain the oil until it stops flowing.

Wheel Hub Oil Fill

1. Rotate the hub so the fill/drain plug is at 12 o'clock position. Figure 11.1.

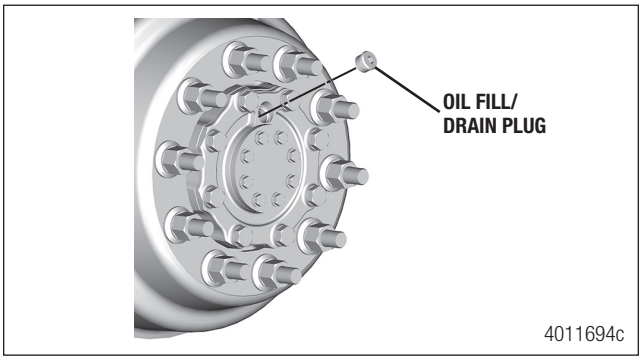


Figure 11.1

2. Refill the hub with 2 pints (1 L) of oil, and then perform the Road Test for Wheel End Oil Level procedure in this section.
3. Install the drain/fill plug and tighten to 51-59 lb-ft (69-80 Nm).

Road Test for Wheel End and Axle Housing Oil Level

1. Road test the vehicle after initial hub fill procedure in an unloaded condition for one to two miles at safe speeds, but no higher than 25 mph (40 km/h).
2. Wait approximately ten minutes after completing the road test for the oil to settle.
3. Rotate the wheel hub so the fill/drain plug is at 3 or 9 o'clock position.
4. Remove the wheel end oil fill/drain plug and check if the oil level is at the bottom of the plug hole. Perform oil level check on both wheel-end hubs.
5. Install the drain/fill plug and tighten to 51-59 lb-ft (69-80 Nm).

6. Remove the axle fill plug from the housing bowl and check if the oil is at the bottom of the plug hole.

7. If necessary, add the specified oil until the level reaches the bottom of the plug hole.

8. Install and tighten the axle fill plug to 35-50 lb-ft (48-67 Nm).

Knuckle King Pins

With the vehicle weight on the wheel end, pump grease through the grease fittings located on the upper cap or steering arm and lower cap assemblies. Grease should purge through and completely around the seals and thrust bearing.

1. Verify that the vehicle weight is on the wheel end. Do not raise the vehicle.

2. Clean all grease fittings prior to lubrication.

3. Lubricate the king pins through the grease fittings. The fittings may be located on the upper cap or steering arm and lower cap, or on the axle. Figure 11.2 and Figure 11.3.

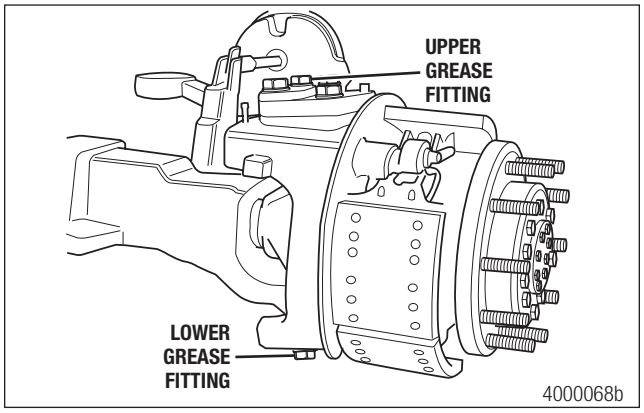


Figure 11.2

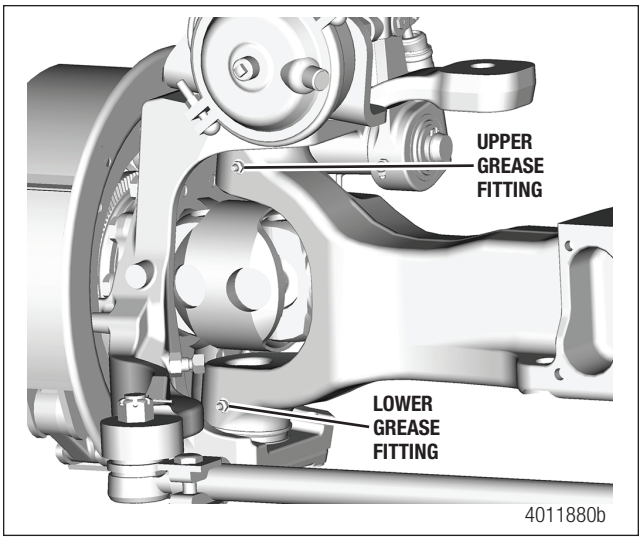


Figure 11.3

4. Wipe the grease fitting clean prior to applying grease.

5. Apply the specified grease until new grease purges through and completely around the seals and thrust bearing. Wipe away excess grease.

   If new grease does not purge: Turn the hub assembly and/or lift the axle and apply grease until it purges. If grease still does not purge, disassemble the knuckle, inspect the components and service as necessary.

Cross Tube End Assembly

1. Turn the vehicle wheels straight ahead. Figure 11.4.

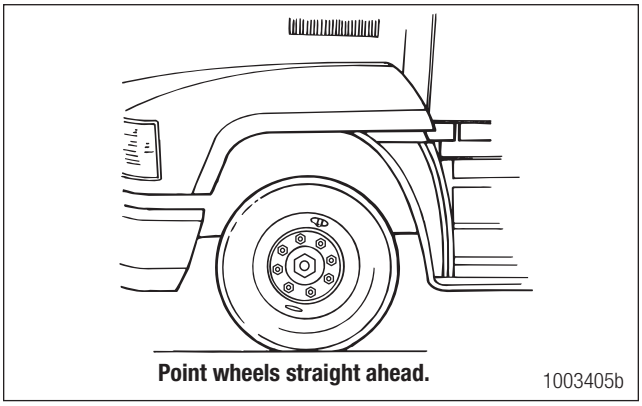


Figure 11.4

2. Wipe the grease fitting and seal boot with shop towels.

3. Apply the specified grease at the grease fitting until new grease purges from the seal. If using air pressure, do not exceed 150 psi (1035 kPa). Grease should purge from the holes near the boot crimp or bellows area, usually at three or more places. Wipe away excess grease. Figure 11.5.

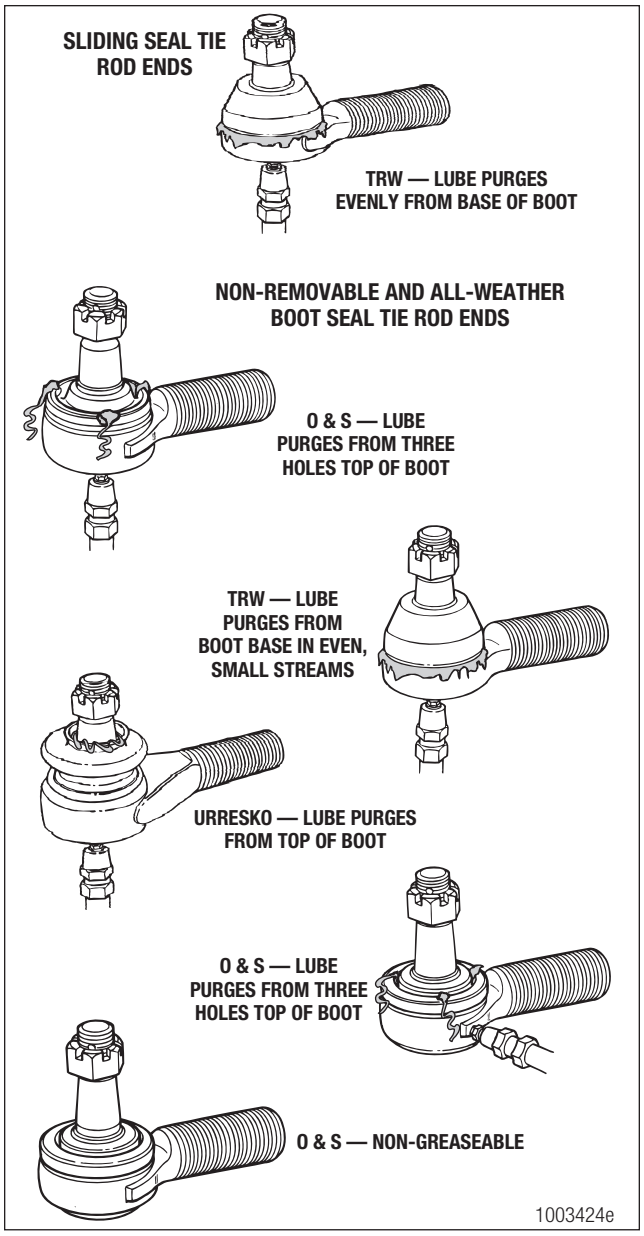


Figure 11.5

4. If new grease does not purge at the seal, perform the following procedure.
   a. Confirm the grease fitting is the correct size and properly fits the grease gun.
   b. Remove the grease fitting.
   c. Inspect the threaded grease fitting hole in the tie rod end and remove any obstructions.
   d. Install a new grease fitting.
   e. Continue the lubrication procedure.
5. If new grease still does not purge at the seal, replace the tie rod end. If the tie rod assembly has been in operation on the vehicle (not new), replace both tie rod ends as a set.

Wheel Bearings and Hub Seal

1. Park the vehicle on a level surface. Place blocks under the wheels not being serviced to prevent the vehicle from moving.
2. Raise the vehicle so that the wheels to be serviced are off the ground. Support the vehicle with safety stands.
3. Remove the tire and wheel assembly.
4. For grease lubricated bearings, refer to the procedures in Section 7 Assembly and Installation – MX-120 Series on page 36.
5. For oil lubricated bearings, refer to the procedures in Section 8 Assembly and Installation – MX-120-EVO Series on page 46.

Camshaft Retainer Bushing and Cam Bushing

Pump grease until it purges through the seals. Figure 11.6.

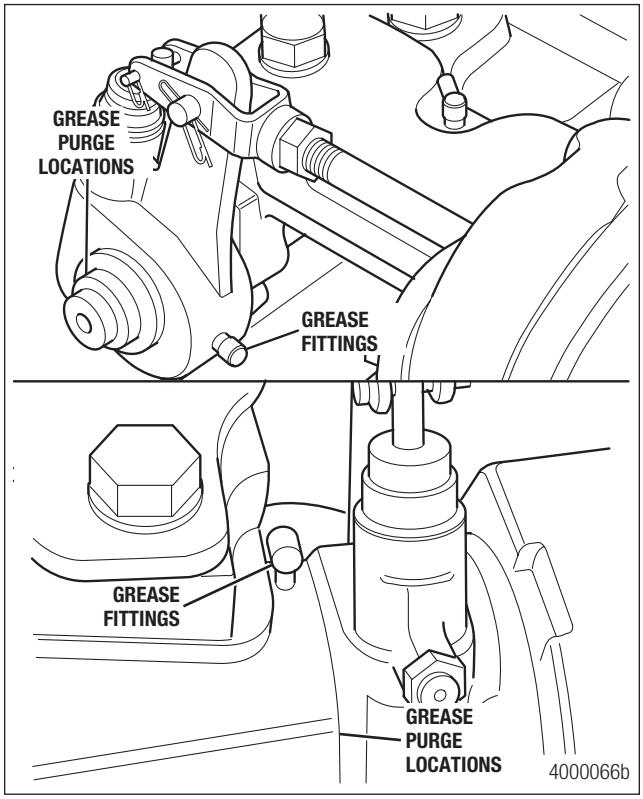


Figure 11.6

Front Drive Axle Greasing Intervals and Specifications

NOTE: Axle lube oil capacity is 3.25 gallons (12.3 liters).

Component	Greasing Intervals	Grease/Oil	Meritor Specification	NLGI Grade	Grease Classification	Outside Temperature
Knuckle King Pins	Every 3,000 miles (4800 km) or 200 hours of operation, whichever comes first.	Multi-Purpose Grease	O-617-A (preferred) or O-617-B (acceptable)	1 or 2	Lithium 12-Hydroxy Stearate or Lithium Complex	Refer to the grease manufacturer's specifications for the temperature service limits.
Brake Camshaft Bushings and Seals						
Cross Tube End Assembly						
Greased Wheel Bearings	On-Highway: 30,000 miles (48 000 km) or once a year, whichever comes first. On/Off Highway and Off-Highway: 15,000 miles (24 140 km) or twice a year, whichever comes first.					
Spindle Axle Shaft Bushing	Every 100,000 miles (160 000 km) or 2 years, whichever comes first.					

Front Drive Axle and Wheel End Oil Intervals and Specifications

Front Drive Steer Axle Oil Change Intervals

NOTE: If the axle lubricant type is changed from synthetic to petroleum or from petroleum to synthetic, all seals and O-rings that are in contact with the lubricant should also be changed at that time to ensure adequate seal performance.

Operation	Interval
Check Oil Level	5,000 miles (8000 km), once a month, or the fleet maintenance interval, whichever comes first*
Petroleum Oil Change	25,000 miles (40 000 km) or annually, whichever comes first. See note above.
Synthetic Oil Change	50,000 miles (80 000 km) or annually, whichever comes first. See note above.

*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.

EVO Lube Bath Wheel End Oil Change Intervals

NOTE: For EVO axles with oil-lubricated wheel-ends, if the lubricant type is changed from synthetic to petroleum or from petroleum to synthetic, the wheel-end seals and O-rings should also be changed at that time to ensure adequate seal performance.

Operation	On-Highway/Off-Highway
Check Oil Level	1,000 miles (1600 km)
Synthetic or Petroleum Oil Change	Whichever comes first. Seals replaced. Brakes relined. 50,000 miles (80 000 km). Once a year. See note above.

Lubricant Specifications

Meritor Specification	Description	Approval	Oil Description	Outside Temperature			
				°F		°C	
				Min.	Max.	Min.	Max.
0-76-A	Gear Oil	SAE J2360	GL-5, SAE 85W/140	10	None	–12	None
0-76-D	Gear Oil		GL-5, SAE 80W/90	–15	None	–26	None
0-76-E	Gear Oil		GL-5, SAE 75W/90	–40	None	–40	None
0-76-J	Gear Oil		GL-5, SAE 75W	–40	35	–40	–2
0-76-L	Gear Oil		GL-5, SAE 75W/140	–40	None	–40	None
0-76-M	Full-Synthetic Oil		GL-5, SAE 75W/140	–40	None	–40	None
0-76-N	Full-Synthetic Oil		GL-5, SAE 75W/90	–40	None	–40	None
0-76-P	Semi-Synthetic Oil		GL-5, SAE 80W/90	–15	None	–26	None
0-76-Q	Extended-Drain Group II Petroleum Oil		GL-5, SAE 75W/90	–40	None	–40	None
			GL-5, SAE 75W/140	–40	None	–40	None
			GL-5, SAE 80W/90	–15	None	–26	None
0-76-R	Extended-Drain Group II Petroleum Oil		GL-5, SAE 75W/90	–40	None	–40	None
			GL-5, SAE 75W/140	–40	None	–40	None
			GL-5, SAE 80W/90	–15	None	–26	None
0-76-S	Extended-Drain Synthetic Oil		GL-5, SAE 75W/85	–40	None	–40	None

Maintenance

Inspection and Maintenance

⚠ 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.

⚠ 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.

Before performing an inspection of axle components, verify that the correct tools are available. Using the correct tools will ensure safety and provide the most accurate results. Check for the following tools:

- Dial indicator
- Tire blocks
- Jack
- Safety stands
- Pry bar
- Torque wrench

Components

Axle

Inspect the axle for oil and grease leaks daily. Repair as necessary.

Brakes

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

Inspect the brakes every two weeks during the first four-month period for hardened or contaminated grease and for the absence of grease to help determine lubrication intervals.

Lubricate more often for severe-duty applications.

Carrier

Replace the carrier seal as required or whenever the carrier is repaired. Refer to Maintenance Manual 5A, Single-Reduction Differential Carriers.

Breather

⚠ CAUTION

Cover the breather when steam cleaning the housing to prevent water from entering the housing and contaminating the oil. Damage to components can result.

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

During operation, an oil mist may be noticeable at the breather and its surrounding area. This occurrence is normal and may be exaggerated by a build-up of dust and other airborne contaminants. Perform a weekly inspection and clean the breather as necessary. If a leak is found, repair as required.

Fasteners

Verify that all fasteners are tightened to the specified torque. Use a torque wrench to check the torque in a tightening direction. As soon as the fastener starts to move, record the torque. Correct if necessary. Replace any worn or damaged fasteners.

Wear and Damage

Inspect the parts of the axle for wear and damage. Look for bent or cracked parts. Replace all worn or damaged parts.

Pivot Points

Verify that looseness does not exist at the pivot points. Verify that the pivot points are lubricated.

Operation

Verify that all the parts move freely through the complete turning radius.

Tire Wear

Inspect the tires for wear patterns that indicate suspension damage or misalignment.

Steering Arm Bolts

Check torque every 200,000 miles (320 000 km). Refer to Inspect Steering Arm Bolts in this section.

Checking the Steering Knuckle Vertical End Play

1. Park the vehicle on a level surface and block the wheels to prevent the vehicle from moving.
2. Use a jack to raise the vehicle until the front wheels are off the ground. Support the front axle with safety stands.
3. Install a dial indicator for each side of the axle beam.
   a. Turn the wheels straight ahead.
   b. Install the dial base onto the axle beam.
   c. Place the dial indicator tip onto the upper knuckle cap.
   d. Place a jack and a wood block, with a hole that allows clearance for the lower grease fitting, under the lower king pin cap area. Figure 11.7.

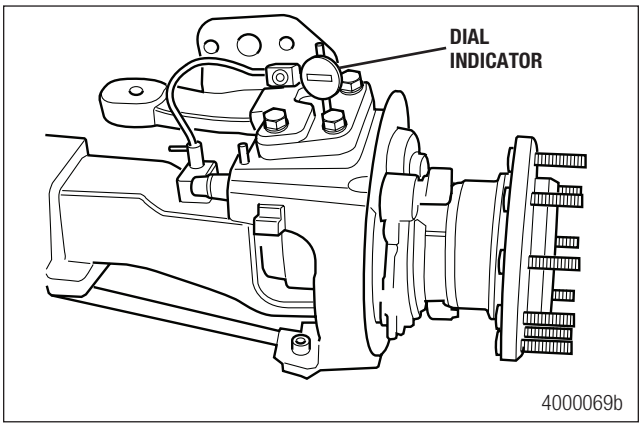


Figure 11.7

   e. Set the dial indicator on ZERO.
   f. Raise the jack until you start to lift the axle beam off the safety stands. Measure and record the dial indicator reading.
   g. Lower the jack.
4. The reading must be 0.005-0.015-inch (0.127-0.381 mm). Figure 11.7. Add or remove shims from between the upper knuckle cap/steering arm and the housing to obtain the correct end play.

Upper and Lower Knuckle Bushings

1. Park the vehicle on a level surface. Place blocks under the wheels not being serviced to prevent the vehicle from moving.
2. Raise the vehicle so that the wheels to be serviced are off the ground. Support the vehicle with safety stands.
3. Check the upper king pin bushing for wear. Install the base of a dial indicator onto the axle beam. Place the indicator tip against the side of the knuckle top, curbside, or the place indicator tip against the king pin cap, driver side. Figure 11.8.

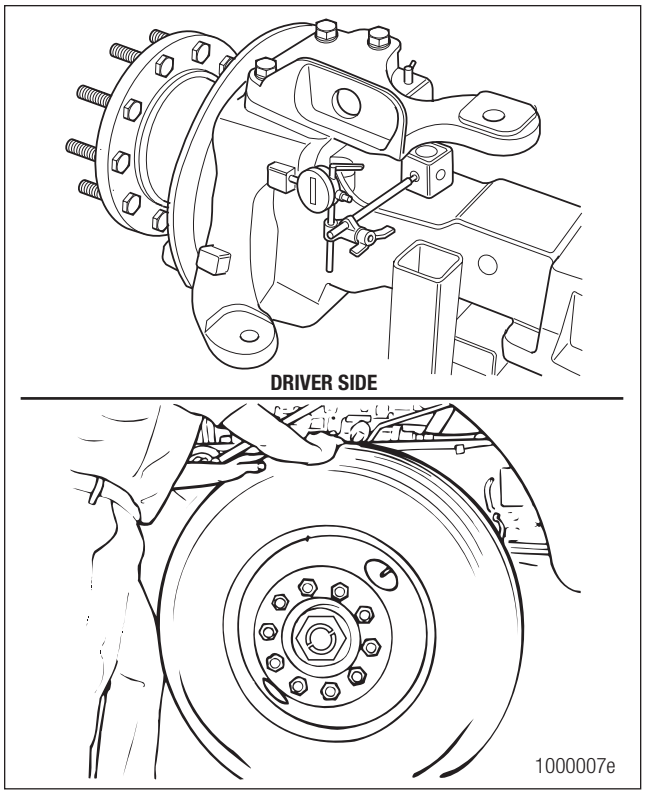


Figure 11.8

4. Set the dial indicator on ZERO.

5. Move the top of the tire side-to-side TOWARD and AWAY from the vehicle.

   If the dial indicator moves a total of 0.010-inch (0.254 mm): The upper bushing is worn or damaged. Replace both bushings in the knuckle. Refer to Section 4 Removal and Disassembly – MX-120 and MX-120-HR Series on page 13 and Section 7 Assembly and Installation – MX-120 Series on page 36. Figure 11.8.

6. Check the lower king pin bushing. Install a dial indicator so that the base is on the I-beam and the tip is against the side of the bottom of the knuckle. Figure 11.9.

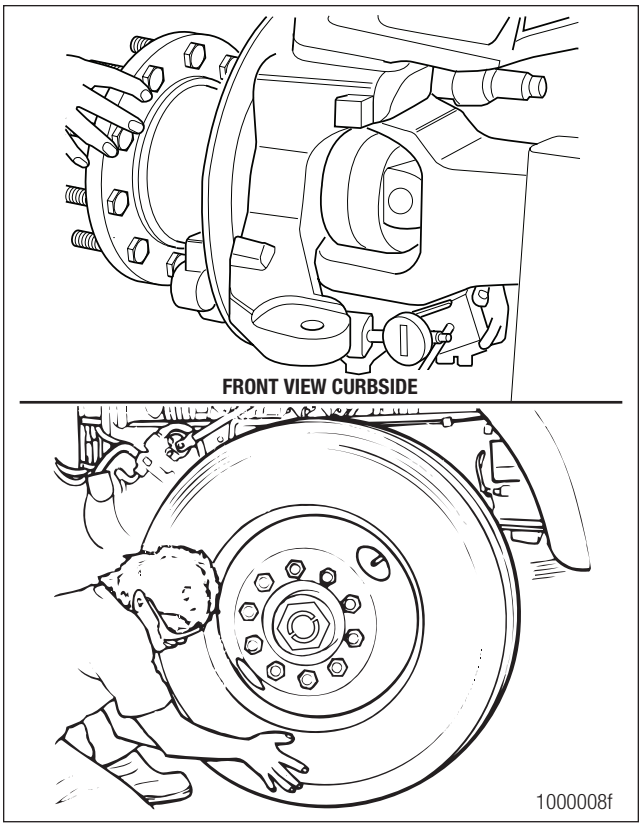


Figure 11.9

7. Set the dial indicator on ZERO.

8. Move the bottom of the tire side-to-side TOWARD and AWAY from the vehicle.

   If the dial indicator moves a total of 0.010-inch (0.254 mm): The lower bushing is worn or damaged. Replace both bushings in the knuckle. Refer to Section 4 Removal and Disassembly – MX-120 and MX-120-HR Series on page 13, Section 6 Prepare Parts for Assembly on page 28 and Section 7 Assembly and Installation – MX-120 Series on page 36. Figure 11.9.

Sealed Hub Units

Inspect the truck hub unit end play every 50,000 miles (80 000 km) or six months, whichever comes first.

1. Park the vehicle on a level surface. Place blocks under the wheels not being serviced to prevent the vehicle from moving.

2. Raise the vehicle so that the wheels to be serviced are off the ground. Support the vehicle with safety stands.

3. Remove the wheel and tire. Remove the hubcap.

NOTE: As the truck hub unit warms up during operation, some small amounts of grease will purge out the OUTBOARD dust seal as pressure is released from inside the truck hub unit. The grease purge is permissible if it does not exceed two grams or about one-half teaspoon. Do not replace the truck hub unit if the grease purge does not exceed two grams.

4. Attach the magnetic base of a dial indicator stand to the end of the spindle. Touch the indicator stem against the face of the wheel pilot of the truck hub unit.

5. Set the dial indicator on ZERO.

6. Slightly rotate the truck hub unit in both directions while pushing INWARD until the dial indicator doesn't change. Repeat this step while pulling OUTWARD. The difference between the two readings is the end play.

   If the end play is 0.0-inch: This reading is approved for the truck hub unit. Do not replace the unit if you obtain this reading.

   If the end play is greater than 0.003-inch (0.076 mm): Recheck the torque on the inner wheel bearing nut as specified in Section 9 Adjustment on page 57.

7. Repeat Step 4. Record measurements greater than 0.003-inch (0.076 mm) and less than 0.009-inch (0.229 mm) in a maintenance log.

8. Check that the truck hub unit rotates smoothly.

   If the end play reaches 0.009-inch (0.229 mm) or the truck hub unit is very rough or noisy while rotating: Replace the truck hub unit.

Tie Rod Ends

1. Park the vehicle on a level surface with the front wheels in the straight-ahead position.

2. Place blocks under the rear wheels to prevent the vehicle from moving.

3. Remove dirt and grease from the tie rod end seals.

4. Place the dial indicator base on the BOTTOM of the tie rod arm.

5. Place the indicator tip near the tie rod end grease fitting. Figure 11.10. Set the dial indicator on ZERO.

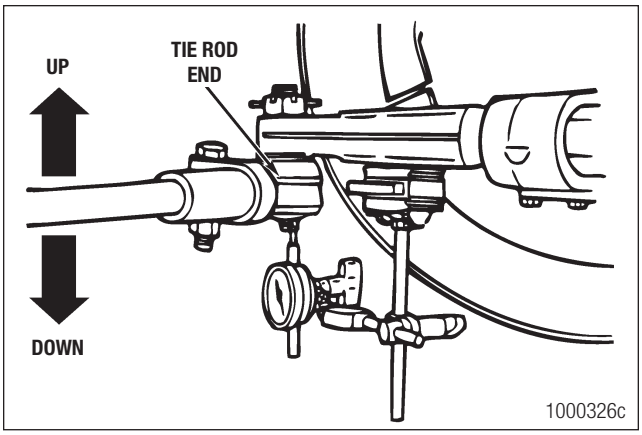


Figure 11.10

⚠ CAUTION

Check the tie rod end play by hand. Do not use a pry bar which can affect the accuracy of the dial indicator reading. Damage to components can result.

6. Move the tie rod and cross tube assembly UP and DOWN by hand. Record the dial indicator reading.

   If the dial indicates a reading of more than 0.060-inch (1.52 mm): Replace the tie rod end.

7. Place the dial indicator on the tie rod end assembly at the opposite side of vehicle. Repeat Step 1 through Step 6.

Inspect the Tie Rod Assembly for Movement

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

1. Park the vehicle on a level surface. Place blocks under the rear wheels to prevent the vehicle from moving.

2. Raise the front end of the vehicle off the ground. Support the vehicle with safety stands.

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

NOTE: The boot may be missing completely or may not completely cover the ball joint.

4. Check that the boot is in place and completely installed over the tie rod end.

5. Check for cracking or tears in the boot. Also check the boot seals for damage. Replace the entire tie rod end if the boot is damaged or missing. Figure 11.11.

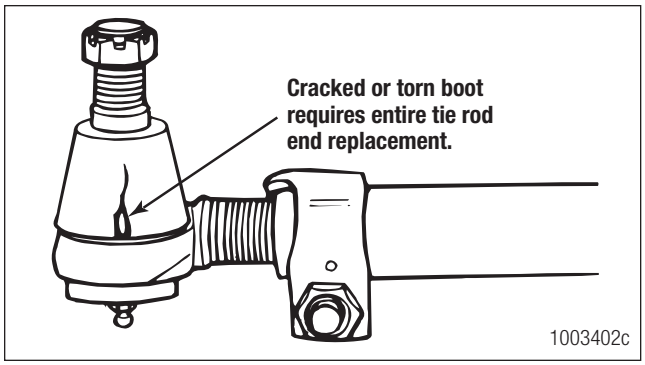


Figure 11.11

⚠ DANGER

Verify the cotter pin is installed through the tie rod end, and the tie rod end nut is tightened to the correct torque specification. Replace missing cotter pins and tighten a loose tie rod end nuts. A missing cotter pin or loose tie rod end nut can cause loss of steering control. Death or serious personal injury and damage to components can result.

6. Check that the tie rod nut is installed and secured with a cotter pin.

   If the cotter pin is missing: Check the nut torque specification. Install a new cotter pin. Always tighten the tie rod nut to 300 lb-ft (407 Nm) when installing the cotter pin. Figure 11.12.

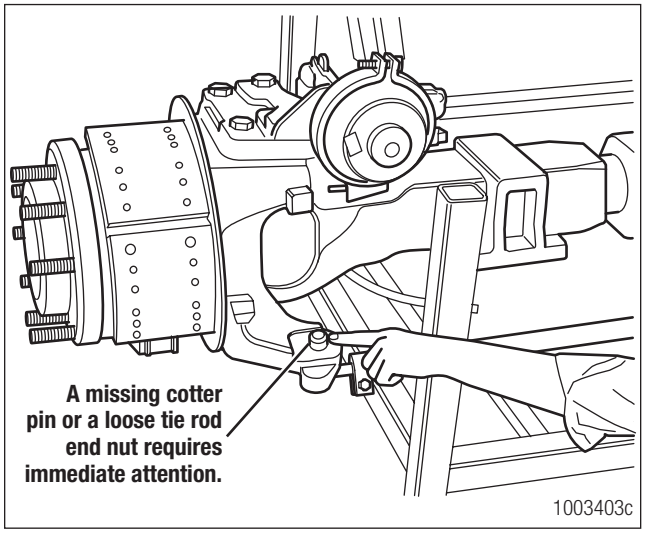


Figure 11.12

7. Check that the tie rod end is threaded correctly into the cross tube and installed deeper than the end of the cross tube slot. The tie rod end must be visible the entire length of the cross tube slot. Figure 11.13.

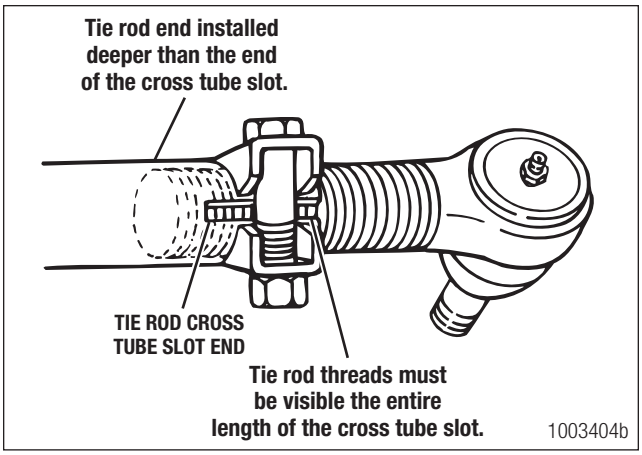


Figure 11.13

8. Check that grease fittings are installed. Replace a damaged grease fitting.

   If the tie rod ends are non-greaseable: Do not install a grease fitting if the tie rod end is the non-greaseable type. Figure 11.14.

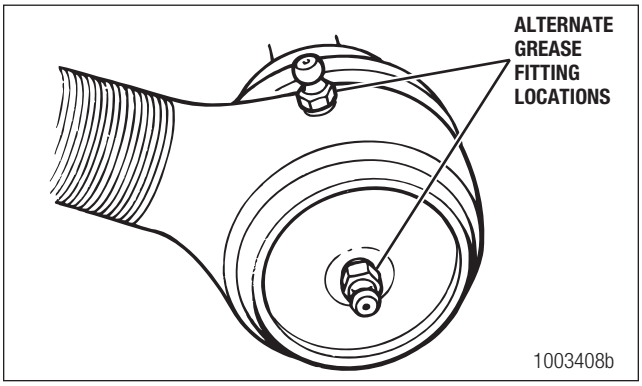


Figure 11.14

9. By hand or using a pipe wrench with jaw protectors to avoid gouging the cross tube, rotate the cross tube toward the FRONT of the vehicle and then toward the REAR.

   After rotating: Center the cross tube.

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

10. Position yourself directly underneath the ball stud socket. Grasp the end of the tie rod assembly with both hands as close as possible to the socket. Your hands should be within six-inches (152.4 mm) of the socket.

⚠ CAUTION

Only use your hands to check for movement or looseness of the tie rod assembly. Do not use a crow bar, pickle fork or two-by-four. Do not apply pressure or force to tie rod assembly ends or joints. Do not rock the tires with the vehicle on the round or with the wheels raised. Damage to components can result.

11. Use a push-pull movement to apply approximately 100 pounds (45 kg) of hand pressure several times to the tie rod assembly. Check for movement or looseness at both tie rod ends. Figure 11.15.

    If there is movement or looseness in the tie rod assembly: Replace both tie rod ends.

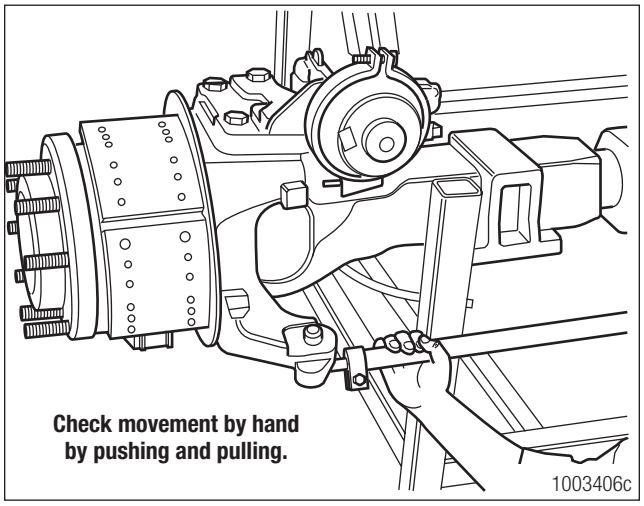


Figure 11.15

⚠ CAUTION

Replace bent or damaged cross tubes with original equipment parts of the same length, diameter and threads. Do not attempt to straighten a bent cross tube. Damage to components can result.

12. Inspect the cross tube and clamps for damage. Figure 11.16.

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

    If the clamps are damaged: Replace them.

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

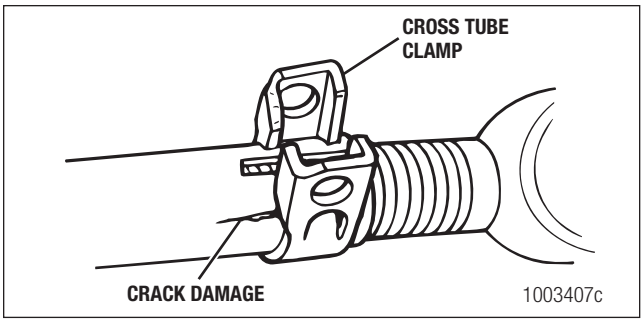


Figure 11.16

Servicing the Tie Rod End

Use a service pit, if available. Otherwise, use one of the following procedures.

1. Park the vehicle on a level surface. Place blocks under the wheels not being serviced to prevent the vehicle from moving.
2. Raise the vehicle so that the area to be serviced is off the ground. Support the vehicle with safety stands.
3. Inspect and lubricate the tie rod ends.

Ramps

1. Drive the vehicle onto ramps. Follow the ramp manufacturer's instructions.
2. Inspect and lubricate the tie rod ends.

Why It's Important to Inspect the Tie Rod Ends for Wear and Allowable Movement at Regularly-Scheduled Intervals

You may not be able to detect loose or worn tie rod ends during operation. Under normal operating conditions, wear occurs over time. The preload bearings inside each tie rod end provide less resistance, which can affect steering control, front tire wear and other axle components. Figure 11.17.

11 Lubrication and Maintenance

Regularly-scheduled inspection and maintenance helps to minimize the effects of tie rod end wear on the vehicle. Figure 11.17.

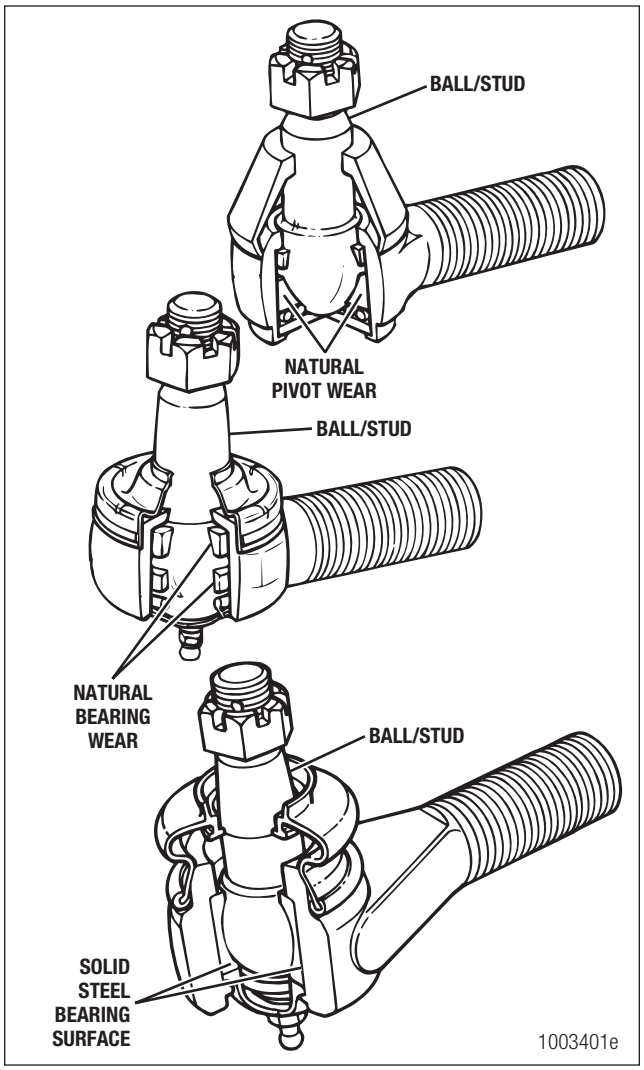


Figure 11.17

Inspect Steering Arm Bolts

⚠ 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. Inspect the steering arm bolts. Verify that torque is a minimum of 300 lb-ft (406 Nm).

   If the steering arm bolt torque is below 300 lb-ft (406 Nm): Remove the bolts, clean all threads and install new Loctite® 680 sealant, Meritor part number 2297-K-5523. Tighten the bolts to 300-450 lb-ft (406-610 Nm).

2. Check the steering arm bolt torque every 200,000 miles (320 000 km) or 24 months, whichever comes first.

Specifications

MX-120 and MX-120-HR Series

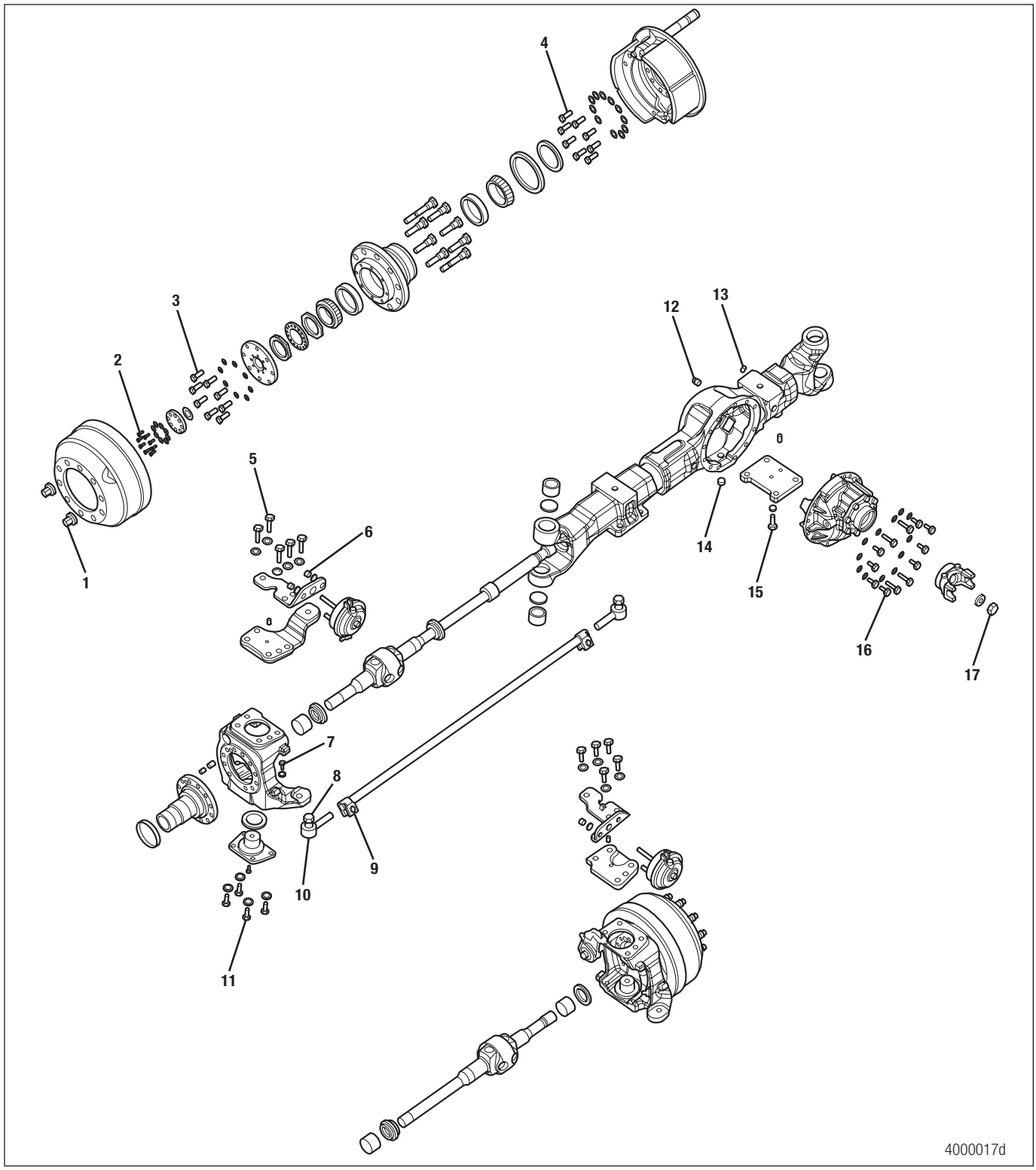


Figure 12.1

12 Specifications

Table C: Fastener Torque Chart

Item	Fastener	Thread Size (Inches)	Wrench Torque lb-ft (Nm)
1	Wheel Nut	1-1/8-16 1-3/16-12	Refer to the manufacturer's specifications.
2	Hubcap Bolt	3/8-16	35-50 (47-68)
3	Drive Flange Bolt	5/8-11	180-230 (244-312)
4	Spindle and Brake Attachment Capscrew	5/8-11	180-230 (244-312)
5	Upper Knuckle Cap Bolt/Steering Arm Capscrew	7/8-9	500-650 (678-881)
6	Brake Chamber Attachment Nut	5/8-11	125-155 (169-210)
7	Stop Screw Jam Nut	9/16-12	75-100 (101-135)
8	Tie Rod End Nut	7/8-14	160-215, initial (217-292) 320 max, (after assembly) (434)
9	Tie Rod Clamp Sleeve Adjuster Locknut	5/8-11	40-60 (54-81)
10	Tie Rod Grease Fitting	1/4-28 UNF	3.0 (4.1)
11	Lower Knuckle Cap Bolt	3/4-10	310-400 (420-542)
12	Housing Oil Fill Plug	3/4-14	35 minimum (47.5)
13	Breather Assembly	3/8-18	20 minimum (27)
14	Housing Drain Plug	3/4-14	35 minimum (47.5)
15	Spring Plate Bolt	1/2-13	100-115 (136-156)
16	Carrier Bolts	1/2-13	110-120 (149-165)
17	Pinion Nut	M32 x 1.5 (metric)	700-900 (950-1220)

MX-120-EVO Series

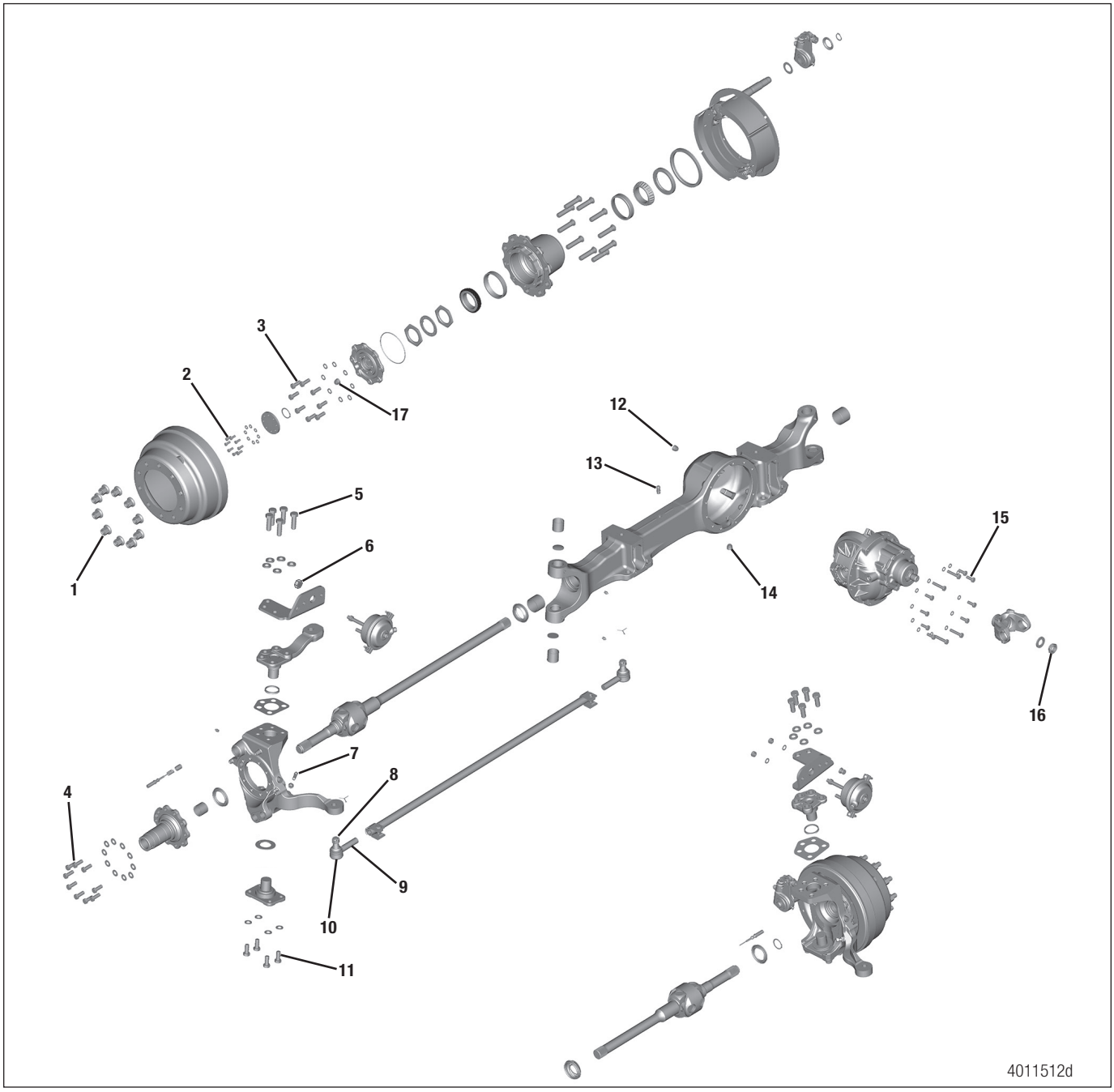


Figure 12.2

12 Specifications

Table D: Fastener Torque Chart

Item	Fastener	Thread Size (Inches)	Wrench Torque lb-ft (Nm)
1	Wheel Nut	1-1/8-16 1-3/16-12	Refer to the manufacturer's specifications.
2	Hubcap Bolt	3/8-16	35-50 (47-68)
3	Drive Flange Bolt	5/8-11	180-230 (244-312)
4	Spindle and Brake Attachment Capscrew	5/8-11	180-230 (244-312)
5	Upper Knuckle Cap Bolt/Steering Arm Capscrew	7/8-9	500-650 (678-881)
6	Brake Chamber Attachment Nut	5/8-11	125-155 (169-210)
7	Stop Screw Jam Nut	9/16-12	75-100 (101-135)
8	Tie Rod End Nut	7/8-14	160-215, initial (217-292) 320 max, (after assembly) (434)
9	Tie Rod Clamp Sleeve Adjuster Locknut	5/8-11	40-60 (54-81)
10	Tie Rod Grease Fitting	1/4-28 UNF	3.0 (4.1)
11	Lower Knuckle Cap Bolt	3/4-10	310-400 (420-542)
12	Housing Oil Fill Plug	3/4-14	35 minimum (47.5)
13	Breather Assembly	3/8-18	20 minimum (27)
14	Housing Drain Plug	3/4-14	35 minimum (47.5)
15	Carrier Bolts	1/2-13	110-120 (149-163)
16	Pinion Nut	M32 x 1.5 (metric)	700-900 (950-1220)
17	Hub Oil Fill/Drain Plug	M22 x 1.5	51-59 (69-80)

Special Tools

Tool Drawings

Axle Shaft Seal Driver

To fabricate the axle shaft seal driver tool, refer to Figure 12.1. Assemble the tool with the following additional parts.

- Two 3/4-inch SAE washers, zinc plated
- One 3/4-inch split lock washer
- One 3/4-inch hex nut

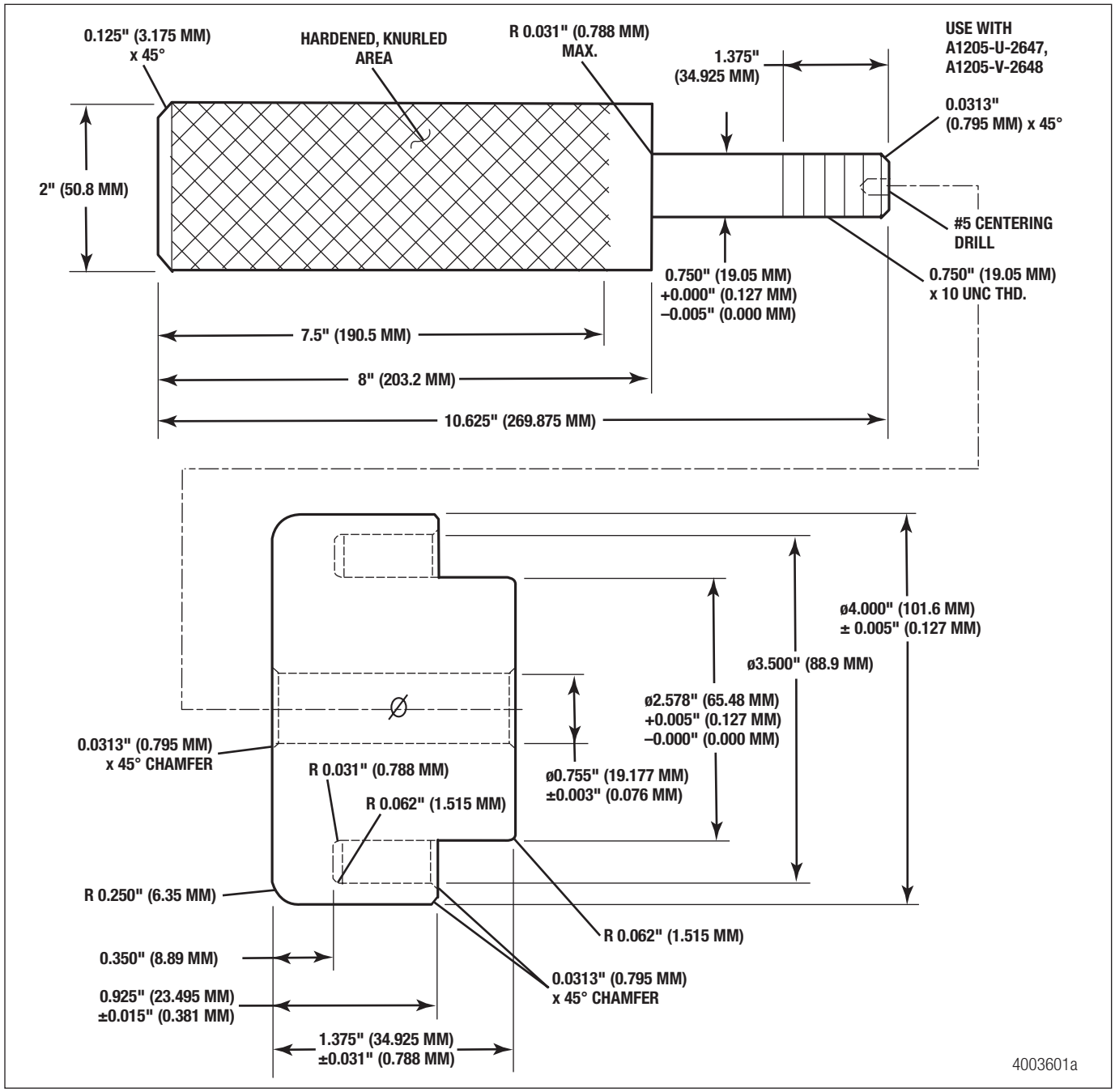


Figure 13.1

Hub Seal Driver

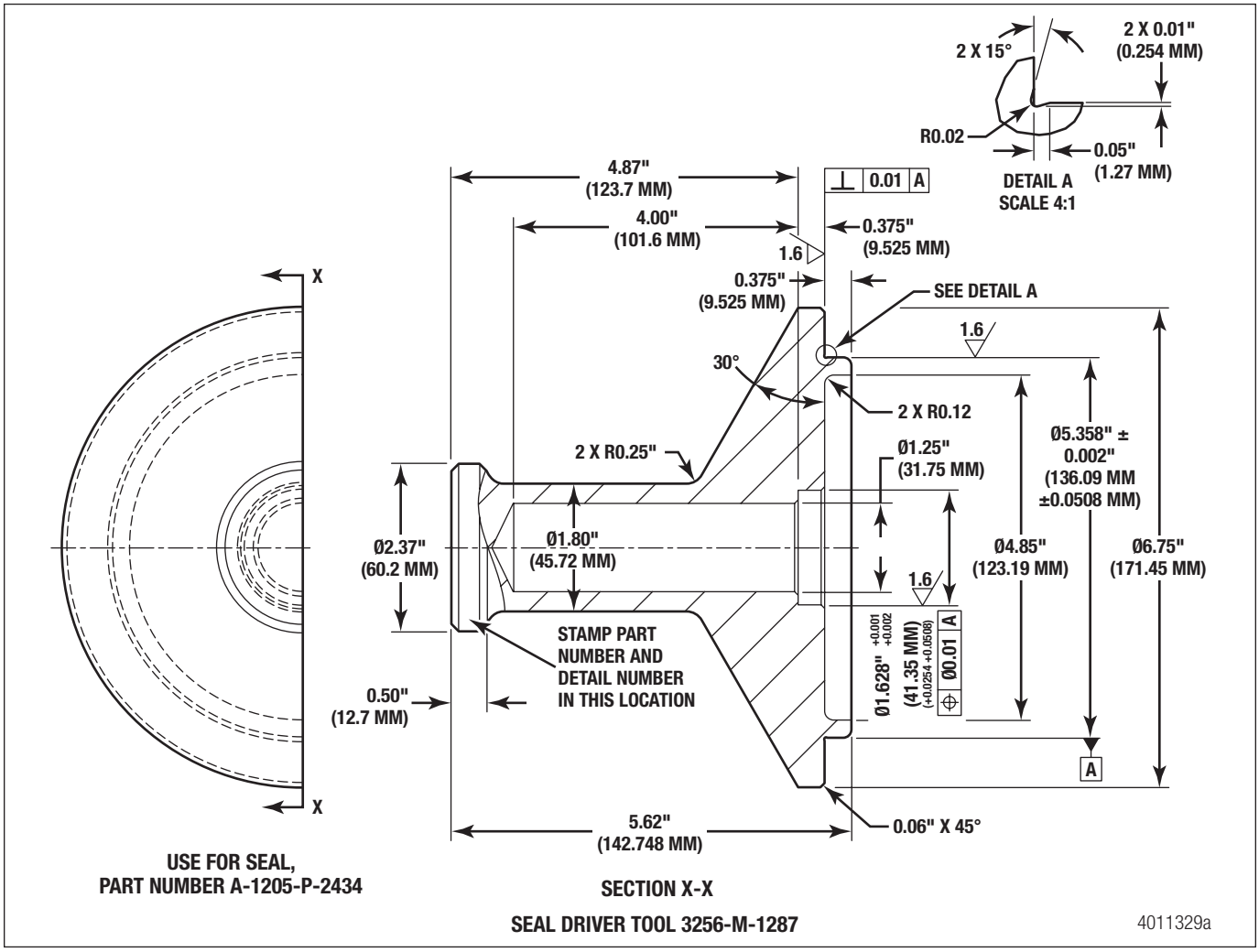


Figure 13.2

Bushing Driver

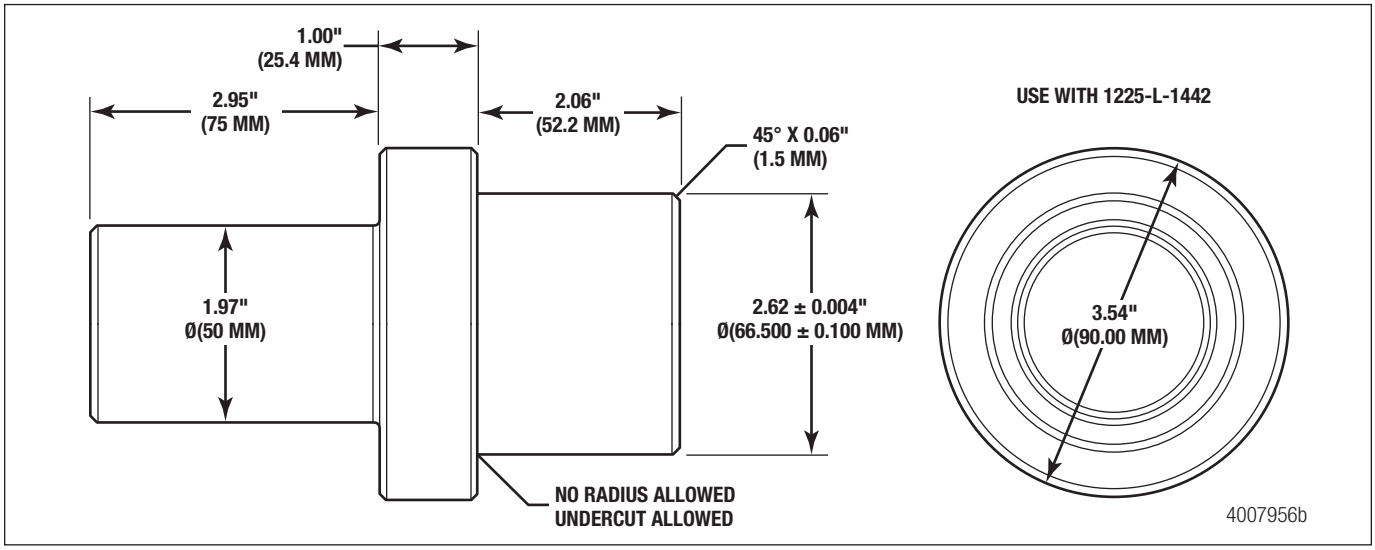


Figure 13.3

Meritor Heavy Vehicle Systems, LLC
2135 West Maple Road
Troy, MI 48084 USA
866-OnTrac1 (668-7221)
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MM-0170
Revised 03-23
(16579)