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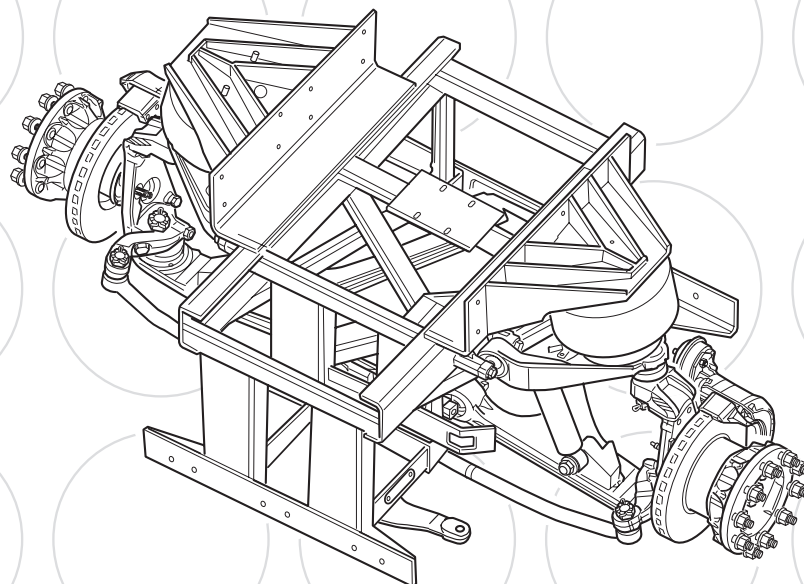
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Maintenance Manual MM-0368

RideStar™ RIS13EF and RIS16EF Series Independent Front Suspension (IFS) Systems

Issued 06-05



Service Notes

About This Manual

This manual provides maintenance and service information for the Meritor RideStar™ RIS13EF and RIS16EF Series Independent Front Suspension (IFS) systems.

Before You Begin

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


Hazard Alert Messages and Torque Symbols

WARNING

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

CAUTION

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

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

How to Obtain Additional Maintenance and Service Information

On the Web

Visit the DriveTrain Plus™ by ArvinMeritor Tech Library at arvinmeritor.com to easily access product and service information. The Library also offers an interactive and printable Literature Order Form.

ArvinMeritor's Customer Service Center

Call ArvinMeritor's Customer Service Center at 800-535-5560.

Technical Electronic Library on CD

The DriveTrain Plus™ by ArvinMeritor Technical Electronic Library on CD contains product and service information for most Meritor and Meritor WABCO products. \$20. Specify TP-9853.

How to Obtain Tools and Supplies Specified in This Manual

Call ArvinMeritor's Commercial Vehicle Aftermarket at 888-725-9355 to obtain Meritor tools and supplies.

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

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Asbestos and Non-Asbestos Fibers

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 ArvinMeritor.

Hazard Summary

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

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

Recommended Work Practices

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

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

2. Respiratory Protection. Wear a respirator equipped with a high-efficiency (HEPA) filter approved by NIOSH or MSHA for use with asbestos at all times when servicing brakes, beginning with the removal of the wheels.
3. Procedures for Servicing Brakes.
 - a. Enclose the brake assembly within a negative pressure enclosure. The enclosure should be equipped with a HEPA vacuum and worker arm sleeves. With the enclosure in place, use the HEPA vacuum to loosen and vacuum residue from the brake parts.
 - b. As an alternative procedure, use a catch basin with water and a biodegradable, non-phosphate, water-based detergent to wash the brake drum or rotor and other brake parts. The solution should be applied with low pressure to prevent dust from becoming airborne. Allow the solution to flow between the brake drum and the brake support or the brake rotor and caliper. The wheel hub and brake assembly components should be thoroughly wetted to suppress dust before the brake shoes or brake pads are removed. Wipe the brake parts clean with a cloth.
 - c. If an enclosed vacuum system or brake washing equipment is not available, employers may adopt their own written procedures for servicing brakes, provided that the exposure levels associated with the employer's procedures do not exceed the levels associated with the enclosed vacuum system or brake washing equipment. Consult OSHA regulations for more details.
 - d. Wear a respirator equipped with a HEPA filter approved by NIOSH or MSHA for use with asbestos when grinding or machining brake linings. In addition, do such work in an area with a local exhaust ventilation system equipped with a HEPA filter.
 - e. **NEVER** use compressed air by itself, dry brushing, or a vacuum not equipped with a HEPA filter when cleaning brake parts or assemblies. **NEVER** use carcinogenic solvents, flammable solvents, or solvents that can damage brake components as wetting agents.
4. Cleaning Work Areas. Clean work areas with a vacuum equipped with a HEPA filter or by wet wiping. **NEVER** use compressed air or dry sweeping to clean work areas. When you empty vacuum cleaners and handle used rags, wear a respirator equipped with a HEPA filter approved by NIOSH or MSHA for use with asbestos. When you replace a HEPA filter, wet the filter with a fine mist of water and dispose of the used filter with care.
5. Worker Clean-Up. After servicing brakes, wash your hands before you eat, drink or smoke. Shower after work. Do not wear work clothes home. Use a vacuum equipped with a HEPA filter to vacuum work clothes after they are worn. Launder them separately. Do not shake or use compressed air to remove dust from work clothes.
6. Waste Disposal. Dispose of discarded linings, used rags, cloths and HEPA filters with care, such as in sealed plastic bags. Consult applicable EPA, state and local regulations on waste disposal.

Regulatory Guidance

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

NON-ASBESTOS FIBERS WARNING

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

Hazard Summary

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

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

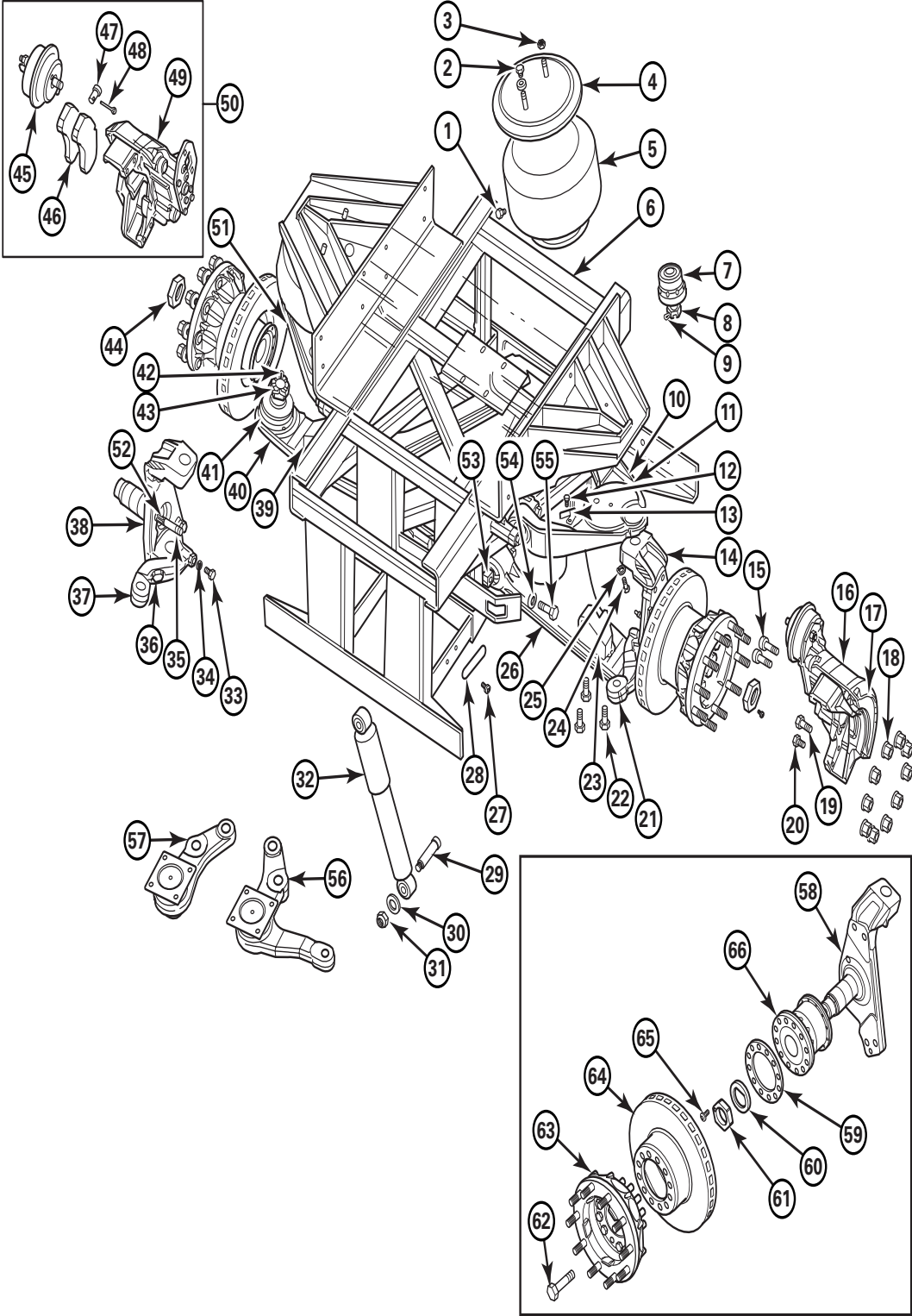
Recommended Work Practices

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

Regulatory Guidance

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

1 Exploded Views

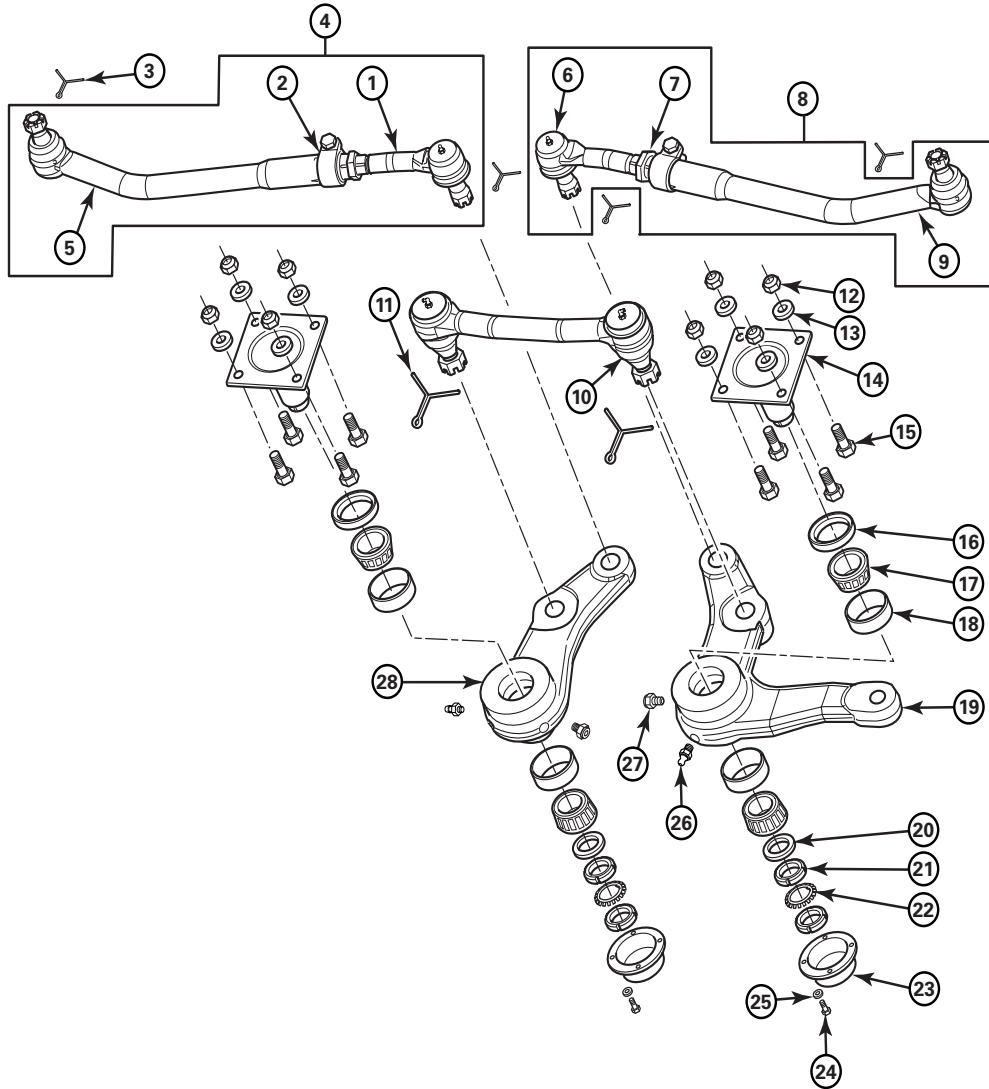


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1 Exploded Views

Item	Description	Item	Description
1	M16 x 1.5 to 3/8-18 NPTF Adapter	36	M20 x 1.5 x 70 Capscrew
2	M16 x 1.5 Plug	37	Right-Hand Steering Arm
3	M12 x 1.75 Locknut	38	Right-Hand Steering Knuckle
4	Air Spring Support Plate	39	Right Hand Shock Absorber Bracket
5	Air Spring	40	Right-Hand Lower Control Arm
6	Subframe Assembly	41	80 mm Ball Stud Assembly
7	65 mm Ball Stud Assembly	42	Cotter Pin
8	M36 x 1.5 Castle Nut	43	M42 x 1.5 Castle Nut
9	Cotter Pin	44	Right-Hand M55 x 2 Spindle Nut, Left-Hand Thread
10	Suspension Assembly	45	Brake Chamber Assembly
11	Left-Hand Upper Control Arm	46	Brake Shoe and Lining Assembly
12	M8 x 1.25 x 16 Capscrew	47	Clevis Pin
13	Level Sensor Bracket	48	Cotter Pin
14	Left-Hand Steering Knuckle Assembly	49	Right-Hand Disc Brake
15	M20 x 1.5 x 60 Socket Head Capscrew	50	Right-Hand Disc Brake Assembly
16	Left-Hand Disc Brake Assembly	51	Right-Hand Upper Control Arm
17	Left-Hand Disc Brake	52	Sensor Bushing
18	M22 x 1.5 Nut Assembly	53	Bushing Assembly
19	M20 x 1.5 x 60 Capscrew	54	Washer
20	M20 x 1.5 x 45 Capscrew	55	Capscrew
21	Left-Hand Steering Arm	56	Steering Relay Arm
22	M16 x 2 x 60 Socket Head Capscrew	57	Steering Idler Arm
23	Left-Hand Shock Absorber Bracket	58	Knuckle
24	M14 x 2 x 40 Capscrew	59	Spacer
25	M14 Lock Washer	60	Washer
26	Left-Hand Lower Control Arm	61	Left-Hand M55 x 2 Spindle Nut, Right-Hand Thread
27	Pop Rivet	62	M18 x 1.5 x 80 Capscrew
28	Name Plate	63	Wheel Adapter Assembly
29	0.75-10 Shoulder Bolt	64	Rotor
30	Flat Washer	65	M8 x 1.25 x 20 Socket Head Capscrew
31	3/4-10 Locknut	66	Unitized Wheel-End Assembly
32	Shock Absorber		
33	M14 x 1.5 Steering Stop Screw		
34	M14 Jam Nut		
35	ABS Sensor		

1 Exploded Views



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1 Exploded Views

Item	Description
1	Right-Hand Tie Rod End
2	Clamp Nut
3	1/8 x 2.0 Cotter Pin
4	Right-Hand Tie Rod Assembly
5	Right-Hand Tie Rod
6	Left-Hand Tie Rod End
7	Slotted Sleeve
8	Left-Hand Tie Rod Assembly
9	Left-Hand Tie Rod
10	Relay Rod Assembly
11	3/16 x 2.5 Cotter Pin
12	Locknut
13	Washer
14	Pivot Shaft
15	5/8"-11 Capscrew
16	Grease Seal
17	Bearing Cone
18	Bearing Cup
19	Steering Relay Arm
20	Washer
21	Locknut
22	Washer
23	Cover
24	Capscrew
25	Washer
26	Grease Fitting
27	Relief Fitting
28	Steering Idler Arm

2 Introduction

Description

The RideStar™ RIS13EF and RIS16EF Series Independent Front Suspension (IFS) systems are up to 16,000-lb capacity independent front suspension systems which include a short arm/long arm independent suspension, air springs, Gabriel shock absorbers, steering linkage and a subframe. Suspension travel is 3.5-inches (90 mm) of jounce travel and 3.5-inches (90 mm) of rebound travel.

For maintenance and service information about the other Meritor components, such as brakes, refer to the appropriate maintenance manual. To obtain these publications, refer to the Service Notes page on the front inside cover of this manual.

Model Nomenclature

Model Numbers and Designations

An identification tag is located on the lower left-hand side of the subframe. Figure 2.1. To obtain replacement parts, refer to the Service Notes page on the front inside cover of this manual and specify the complete model number on the tag. The model number on the identification tag provides the suspension designation. Figure 2.2.

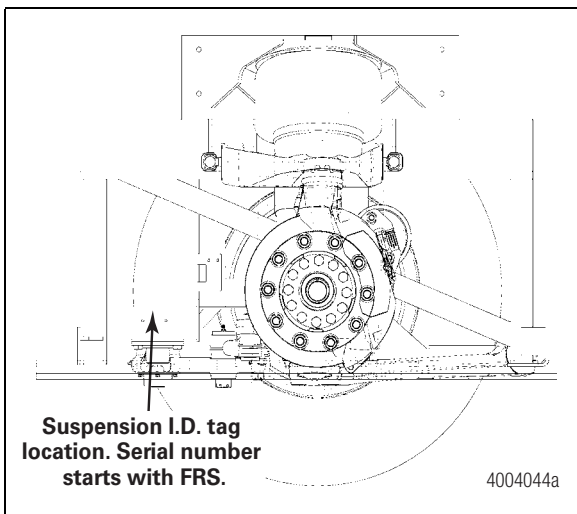


Figure 2.1

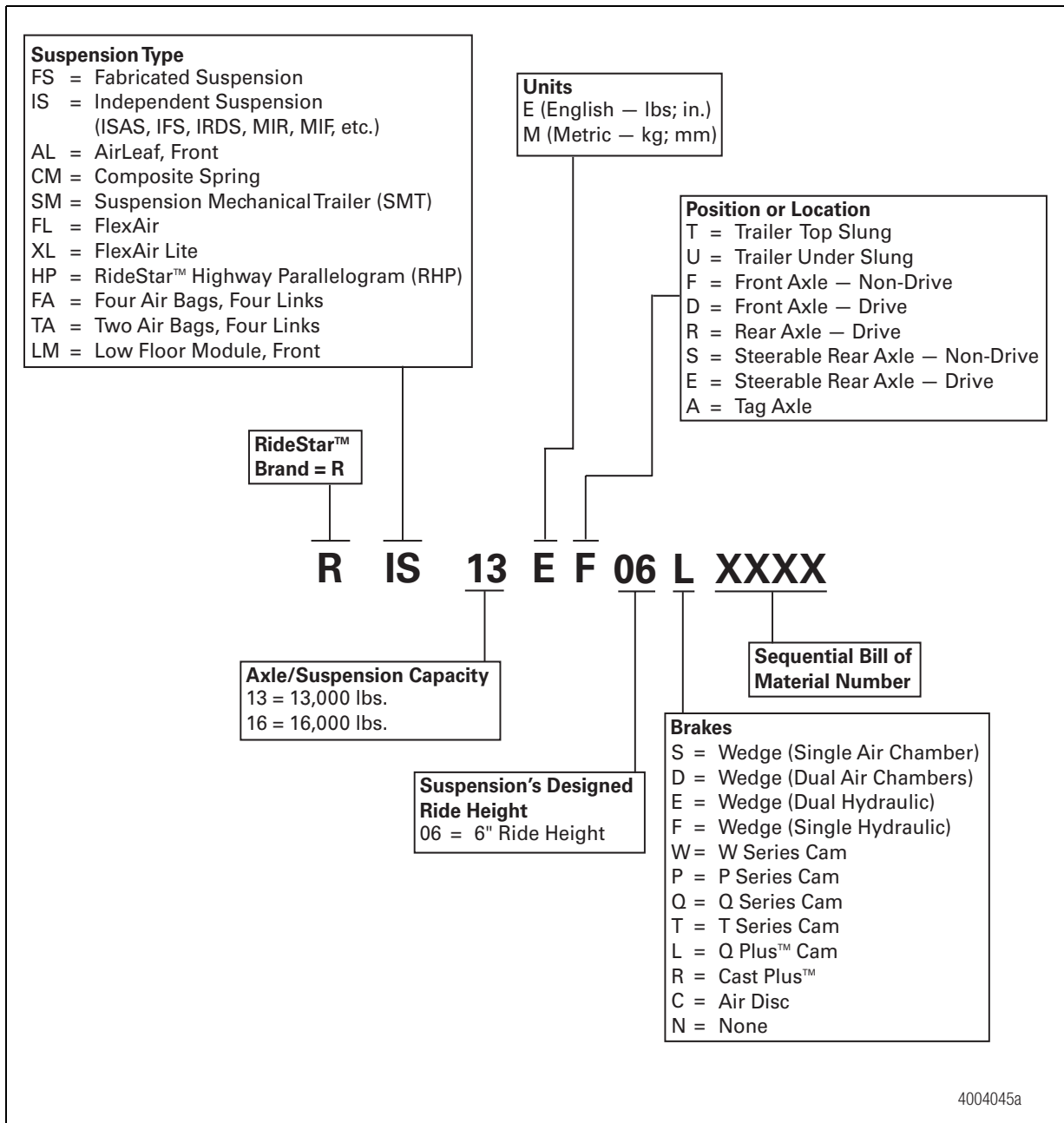


Figure 2.2

3 Suspension Ride Height, Travel and Tire Clearance

Suspension Ride Height

Suspension ride height is the distance from the centerline of the suspension to the underside of the vehicle frame. Figure 3.1.

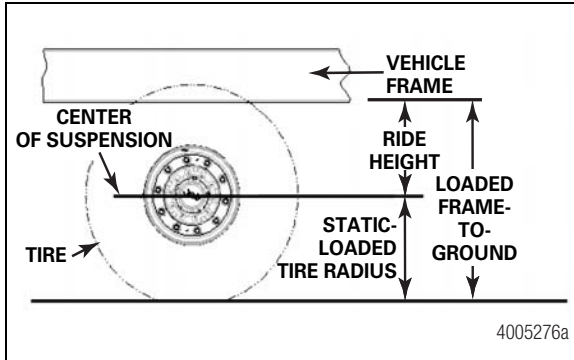


Figure 3.1

All Meritor air suspensions are designed to operate at a specific ride height, which must be maintained during the life of the suspension. Otherwise incorrect loading can occur, which can affect suspension performance, shorten component life and void the Meritor warranty.

Operating a vehicle with ride height higher than specified by the application can cause the vehicle to be over the legal height limit, depending on the type of vehicle and payload.

To obtain the correct ride-height specification, check the suspension's identification tag located on the lower left-hand side of the subframe.

How to Determine the Correct Ride Height

Consider the following factors when you determine the correct suspension ride height.

Vehicle Frame-to-Ground Distance

You must measure the distance from the bottom of the vehicle frame to the ground at each suspension location. Figure 3.2. This measurement determines the required vehicle height. Refer to the vehicle manufacturer's information for ride height specifications and adjustment procedures.

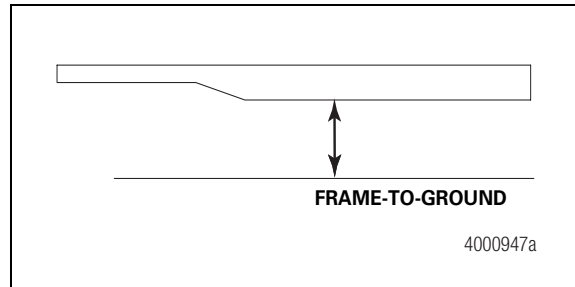


Figure 3.2

Suspension Ride Height Calculation

To calculate the required suspension ride height, subtract the tire's static-loaded radius from the loaded frame-to-ground dimension. Figure 3.1.

Suspension Travel

Jounce and Rebound

Jounce is the amount of upward suspension travel from the suspension's designed ride-height position. Figure 3.3. The suspension has 3.5-inches (90 mm) of jounce.

Rebound is the amount of downward suspension travel from the suspension's designed ride-height position. Figure 3.3. The suspension has 3.5-inches (90 mm) of rebound.

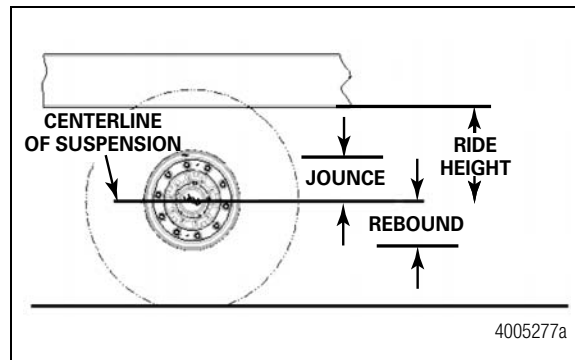


Figure 3.3

Hazard Alert Messages

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

WARNING

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

Take care when you use 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.

Always deflate the air springs before you begin service procedures. Do not service the air suspension on a vehicle with the air springs inflated. Serious personal injury and damage to components can result.

Check fastener torque values, tighten loose fasteners and replace damaged fasteners. Loose, damaged or missing fasteners can cause loss of vehicle control, serious personal injury and damage to components.

Intervals

Inspect the suspension components annually or at regular intervals during normal operation.

Before each trip, visually inspect the suspension system and listen for air leaks.

Inspect the shock absorbers, air springs and bushings when the axle or brakes are inspected. Replace the components as necessary.

After 1,000 miles (1609 km) of service on a new vehicle and after component replacement, tighten all fasteners to the specified torque. Refer to Section 9 for torque specifications.

At each preventive maintenance inspection, or annually, visually inspect all fasteners for looseness or movement. Tighten loose fasteners to the specified torque. Refer to Section 9 for torque specifications.

If the fastener has Loctite® threadlocker and turns, remove the fastener and clean off the threads. Apply new Loctite® threadlocker and install the fastener according to the instructions in Section 7.

Replace damaged fasteners to maintain the specified torque and to comply with warranty requirements.

When replacing any suspension component, never reuse capscrews, washers or locknuts.

Table A

Component	Service Intervals			
	20,000 Miles (32 200 km)	40,000 Miles (64 000 km)	80,000 Miles (128 747 km)	200,000 Miles (320 000 km)
Control Arm Bar Pin-to-Subframe Mounting Capscrews				I
Steering Assembly-to-Frame Locknuts				I
Tie Rod Ends ¹	I	L ²		
Tie Rod Assembly — Inspection for Movement	I			
Steering Arm Bolts				I
Steering Relay Assembly			L	
Steering Idler Assembly			L	
Sealed Hub Unit — Inspection	Refer to the unitized wheel-end inspection procedure for inspection intervals.			

¹ Tie rod ends with an anti-tilt style seal require lubrication every 10,000 miles (16 100 km).

² If power washers are used during vehicle cleaning operations, lubrication intervals need to be adjusted. Frequent power-washed vehicles will require more frequent lubrication.

I = Inspect

L = Lubricate

4 Inspection

Shock Absorbers

The following conditions may indicate that the shock absorbers should be replaced. If any of these conditions exist, inspect the shock absorbers and repair or replace parts as necessary.

- Uneven tire wear, check balance before replacing the shock absorbers
- Poor ride quality
- Excess vibration
- Premature wear on electrical and cooling system components
- Damaged air springs
- Leaking shock absorber

Inspection

Inspect the shock absorbers for the following conditions. If any of these conditions exist, repair or replace parts as necessary. Figure 4.1.

- Damaged upper or lower mount
- Damaged upper or lower bushing
- Incorrect installation
- Damaged dust tube
- Bent or dented shock absorber body

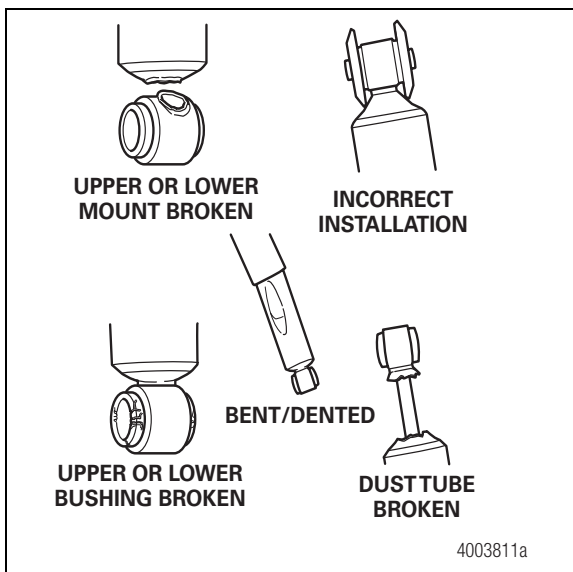


Figure 4.1

Leaking Shock Absorbers

Misting shock absorbers are often misdiagnosed as leaking shock absorbers. Misting is when very small amounts of shock absorber fluid evaporate at high operating temperatures through the shock absorber upper seal. When the mist reaches the cooler outside air, it condenses and forms a film on the outside of the shock absorber body. When mixed with road debris and dust, a grime will often coat the entire body of the shock absorber. Misting is a normal and necessary function of the shock absorber. The evaporating fluid lubricates the seal. A leaking shock absorber will have fluid leaking in streams from the upper seal. Inspect the shock absorbers for leaking when the shock absorber is fully extended. Figure 4.2.

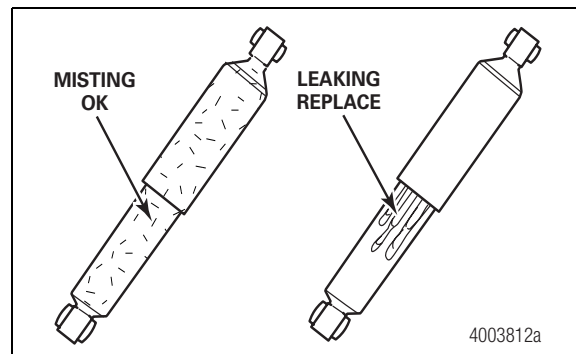


Figure 4.2

Heat Test

Shock absorbers operate at temperatures between ambient and 350°F (177°C). Shock absorbers should be slightly warm or hot after normal use. If poor ride quality exists and you suspect the shock absorber is not operating correctly, perform the following heat test.

1. Drive the vehicle at moderate speeds for at least 15 minutes.
2. Within a few minutes of driving the vehicle, touch the chassis near the shock absorber and then carefully touch each shock absorber body below the dust cover or tube. All shock absorbers should be warmer than the chassis.
 - If a shock absorber is cooler than the chassis or the shock absorber on the other end of the suspension: Remove the cooler shock absorber.
3. Shake the shock absorber to inspect it for internal damage. Listen for metal parts rattling inside the shock absorber. Loose metal parts inside the shock absorber can indicate internal damage.

Upper and Lower Control Arm Ball Joints and Bar Pin Bushings

Inspect the upper and lower control arm ball joints before you clean the suspension components. Grease or fluid on the ball joint boots may indicate a leak in the boots.

⚠ WARNING

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

1. Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving.
2. Inspect the four ball joint boots for tears and damage. The boot retaining ring must be in place. Check for grease on the boot. Figure 4.3 and Figure 4.4.
 - **If a boot is damaged or the retaining ring is missing:**
Replace the ball joint.

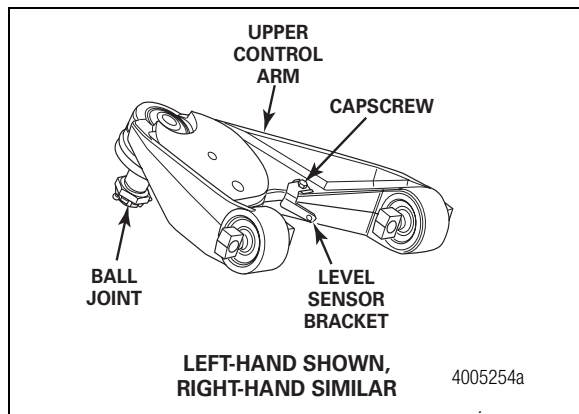


Figure 4.3

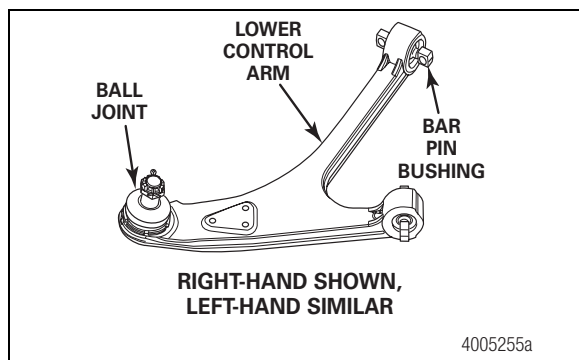


Figure 4.4

3. Inspect the eight bar pin bushings on the left-hand and right-hand upper and lower control arms for cracks in the rubber, wear and looseness. Replace damaged or worn bushings. Figure 4.3 and Figure 4.4.

Use a two-foot (61 cm) pry bar to check the arm pivot bushings for looseness and wear. Replace the bushings if any free play is detected. Check each location in both axial and radial directions.

Separation of the elastomer off the bar pin is permissible up to a third (1/3) of the circumference.

Replacement is also necessary if the following wear characteristics are determined:

- A. Cracks or fracture of the metal parts of the bushing. Figure 4.5.
- B. Plastic deformation of the sheet-metal race
- C. Inadequate bolted connection, i.e., loosened, broken or lost bolt
- D. Damage to the snap ring, snap ring detached from the groove, broken or lost

- **If damage to the inner housing contour or the snap ring groove is determined during replacement of the elastomeric bearing:** Replace the control arm.

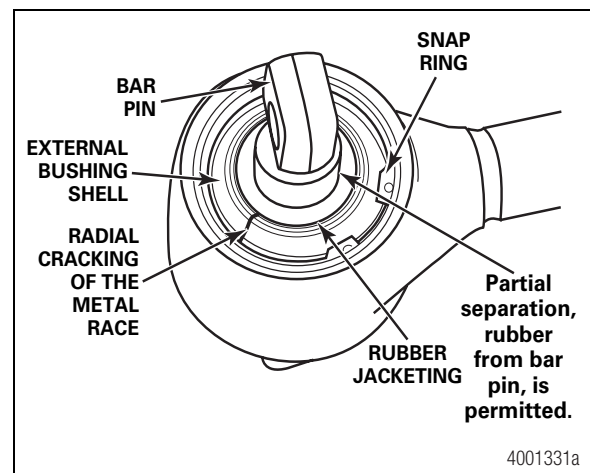


Figure 4.5

4. Check the upper and lower control arms for cracks and damage. Replace worn or damaged control arms.

4 Inspection

5. Use the following procedure to check for ball joint wear.
 - A. Using a suitable lift, raise the vehicle so that the front wheels are off the ground. Support the vehicle with safety stands.
 - B. Using a dial indicator or suitable measuring instrument, measure the distance between the bottom of the lower control arm and the top of the 80 mm lower ball joint, Dimension A. Figure 4.6.

⚠ CAUTION

Use care when positioning and lifting the pry bar to avoid damaging the boot. Do not allow the bar to slip and cut or tear the boot. Damage to components can result.

- C. Using a pry bar between the knuckle and the lower control arm, lift the ball joint to the maximum limit within the socket. Repeat the measurement made in Step B.
 - **If the difference between the two measurements is greater than 0.079-inch (2 mm):** Replace the ball joint.
- D. Repeat Steps B and C for the 65 mm upper ball joint.
 - **If the difference between the two measurements is greater than 0.059-inch (1.5 mm):** Replace the ball joint.

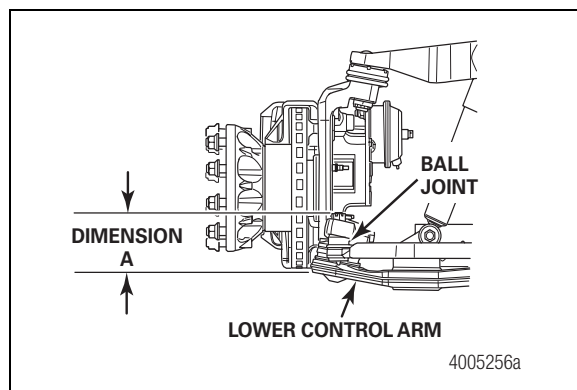


Figure 4.6

Air Springs

⚠ WARNING

Verify that all personnel are clear of the vehicle before you inflate or deflate the air springs. The air suspension system has various pinch points that can cause serious personal injury.

Only use soap and water, methyl alcohol, ethyl alcohol and isopropyl alcohol to clean air springs and air spring components. Do not use organic solvents, open flames, abrasives and direct pressurized steam. Serious personal injury and damage to components can result.

The following items should be inspected when the vehicle is in for periodic maintenance.

1. Always deflate the air springs before you begin service procedures. Do not service the air suspension on a vehicle with the air springs inflated.
2. Inspect the O.D. of the air spring. Check for signs of irregular wear or heat cracking.
3. Inspect the air lines to verify that contact doesn't exist between the air line and the O.D. of the air spring. Air lines can rub a hole in an air spring quickly.
4. Verify that there is sufficient clearance around the entire circumference of the air spring while at its maximum diameter.
5. Inspect the piston for foreign materials.
6. Correct ride height should be maintained. All vehicles with air springs have a specified ride height established by the vehicle manufacturer. This height should be maintained within 1/4-inch (6.35 mm). This dimension can be checked with the vehicle loaded or empty.
7. Leveling valves, or height control valves, ensure that the total air spring system works as required. Clean, inspect and replace, if necessary.
8. Verify that the correct shock absorbers are in place. Inspect the shock absorbers as described in this section. The shock absorber limits the rebound of an air spring and keeps it from overextending.
9. Check the tightness of all mounting hardware (nuts and bolts). If loose, tighten to specification. Do not over-tighten.

Brakes

Inspect the brake pads and rotors for wear. Repair or replace components as necessary. Refer to Technical Bulletin TP-02173, DiscPlus™ DX195 and DX225 Air Disc Brakes. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.

Steering Assembly

Inspect the tie rods, relay arm, relay rod and idler arm for wear, cracks and damage. Check that no axial or radial end play exists in the relay and idler arm assemblies. Grease the relay and idler arm assemblies per the intervals in Table A. Figure 4.7.

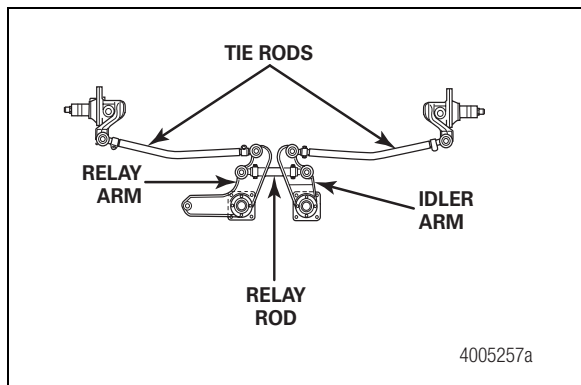


Figure 4.7

Tie Rod and Relay Rod Assemblies

Do not grease the tie rod and relay rod assemblies before you perform the inspection. 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 suspension components. Regularly-scheduled inspection and maintenance helps to minimize the effects of tie rod end wear on the vehicle. Refer to Table A for intervals. Figure 4.8.

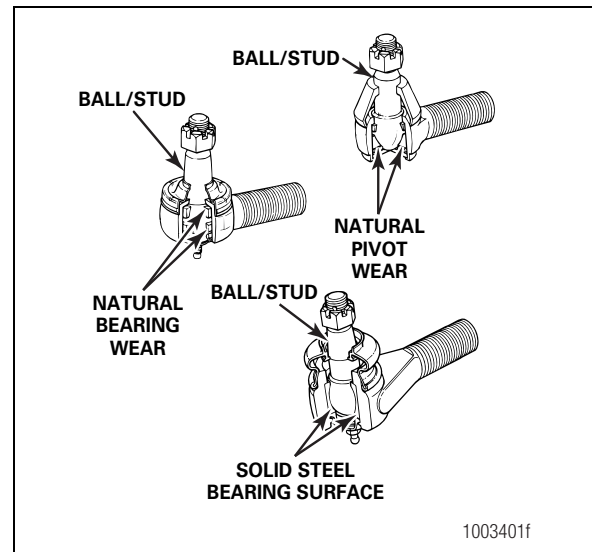


Figure 4.8

1. Park the vehicle on a level surface with the wheels STRAIGHT. Block the wheels to prevent the vehicle from moving. Set the parking brake.
2. Raise the vehicle so that the front wheels are off the ground. Support the vehicle with safety stands. Do not use a jack to support the vehicle.
3. With the engine off, turn the wheels from full left to full right. Return to the straight-ahead position. This step will require more force for vehicles with the power steering off.
4. Check the tie rod boot for cracks, tears or other damage. Also check the boot seals for damage. Replace the entire tie rod end if the boot is damaged or missing. Figure 4.9.

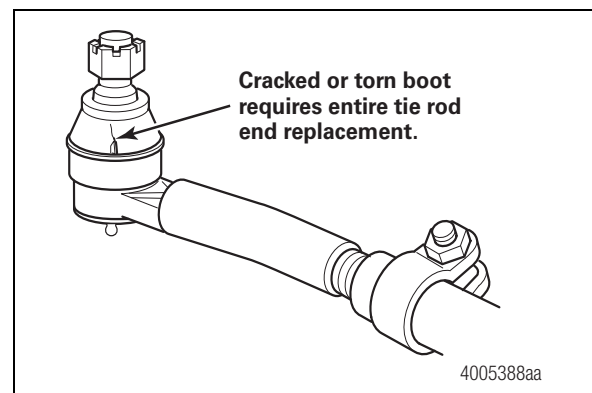



Figure 4.9

4 Inspection

⚠ WARNING

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

5. Check that the tie rod end nut is installed and secured with a cotter pin.
 - **If the cotter pin is missing:** Tighten the tie rod end nut to the correct torque specification. Continue tightening the nut to align the nut slot with the cotter pin hole. Do not back off the nut to obtain the alignment. Install a new cotter pin. Always tighten the tie rod end nut to the specified torque when setting the cotter pin.
6. Verify that the tie rods are the correct length and are within 1/8-inch (3 mm) of each other. The tie rod ends and slotted adjusting sleeve must have the correct engagement with the tie rod. Adjust the tie rod length and tie rod end engagement as necessary. Figure 4.10.
 - **To adjust the length:** Loosen the clamp nut and rotate the slotted sleeve until the appropriate length is achieved. Tighten the clamp nut to 130-150 lb-ft (176-203 N•m). 

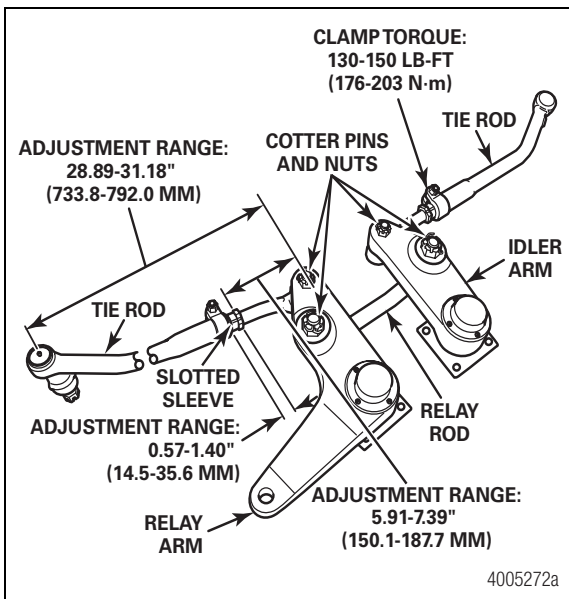


Figure 4.10

7. Check that the grease fittings are installed. Replace damaged grease fittings.
 - **If the tie rod ends are non-greaseable:** Do not install a grease fitting. Figure 4.11.

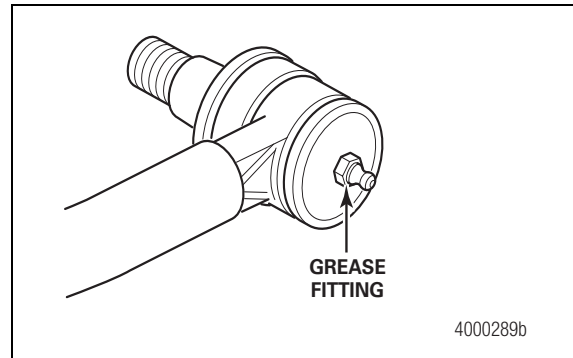


Figure 4.11

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

⚠ CAUTION

Only use your hands to check for movement or looseness of the tie rod assembly. Do not use a crow bar, pickle fork or 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 ground or with the wheels raised. Damage to components can result.

9. Apply hand pressure of approximately 100 pounds in a vertical PUSH and PULL motion several times. Check for any movement or looseness at both tie rod ends.
 - **If there is any movement in the tie rod assembly:** Replace the tie rod assembly.

⚠ CAUTION

Replace damaged tie rods with original equipment parts. Do not attempt to straighten a bent tie rod. Damage to components can result.

10. Inspect the relay rod, tie rods and clamps for damage. Figure 4.12.

- **If a tie rod or relay rod is damaged:** Replace it. Use original equipment parts of the same length, diameter and threads.
- **If the clamps are damaged:** Replace the tie rod.

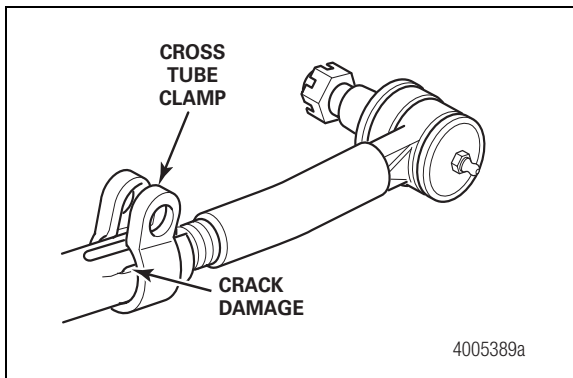


Figure 4.12

11. Relay Rod Only

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

- **If the relay rod will not rotate in either direction:** Replace the relay rod.

Department of Transportation Roadside Tie Rod Assembly Replacement Criteria

When the roadside check indicates tie rod end movement of 1/8-inch (3 mm) or more, immediately remove the vehicle from service to replace the tie rod. Figure 4.12.

- **If the roadside check is less than 1/8-inch (3 mm) tie rod end movement:** The vehicle does not need to be immediately removed from a service run. Schedule a major out-of-service inspection and maintenance as soon as possible.

Unitized Wheel Ends

⚠ WARNING

You must follow the unitized wheel-end maintenance and inspection procedures provided in this manual to prevent serious personal injury and damage to components.

Inspection Intervals

You must perform detailed and basic inspections at the following intervals.

Detailed Inspections

Refer to the detailed inspection in this section for procedures.

- After the initial 100,000 miles (160 900 km) of operation or one year, whichever comes first
- After every additional 100,000 miles (160 900 km) of operation or one year, whichever comes first
- At mileages greater than 800,000 miles (1 287 480 km), after every six months or 50,000 miles (80 467 km), whichever comes first

Basic Inspections

After the initial 100,000-mile (160 900 km) detailed inspection, perform a basic inspection at each scheduled preventive maintenance interval, not to exceed 50,000-mile (80 467 km) intervals or one year, whichever comes first.

If the Vehicle is Equipped with ABS

In addition to scheduled preventive maintenance, if driver reports indicate the ABS light has been coming ON, and ABS diagnostics indicate the sensor gap is out-of-adjustment, check for possible wheel-end looseness as the cause.

Tools Required

Basic Inspection

A jack, wheel blocks and safety stands

Detailed Inspection

A dial indicator and a torque wrench with 500 lb-ft (678 N•m) capacity

4 Inspection

Procedures

The unitized wheel end is sealed and greased for life and does not require lubrication. If you disassemble, or attempt to repair or lubricate a unitized wheel-end assembly, you will void the Meritor warranty. The inspection procedures provided in this manual do not instruct you to disassemble the unitized wheel end.

- Unitized wheel ends are not adjustable.
- Do not attempt to set or adjust end play.

Basic Inspection

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

WARNING

Release all air from the air suspension system before you raise the vehicle or remove any components. Pressurized air can cause serious personal injury.

Verify that all personnel are clear of the vehicle before you inflate or deflate the air springs. The air suspension system has various pinch points that can cause serious personal injury.

2. Raise the vehicle so that the front wheels are off the ground. Support the vehicle with safety stands. Do not use a jack to support the vehicle.
3. Visually inspect the unitized wheel end as you rotate the tire and unitized wheel-end assembly. Verify that it rotates smoothly and without noise.

If a ticking sound is detected during rotation, this does not indicate a hub problem. It is a normal occurrence.

While rotating the wheel, grasp the brake chamber and steering arm to feel for unitized wheel-end hub vibration.

- **If the tire and unitized wheel-end assembly does not rotate smoothly, you hear noise such as wheel bearing grind, or feel wheel-end hub vibration during rotation:** Perform a detailed inspection. Refer to Detailed Inspection in this section.
- **If the wheel end rotates smoothly:** Proceed to Step 4.

4. Grasp the tire and wheel-end assembly at the nine and three o'clock positions. Check for vertical and horizontal movement. With your hands, apply approximately 50 lb (23 kg) of force to the assembly. You should not feel or see any looseness or movement.

- **If you feel or see any movement or looseness in the tire and wheel-end assembly:** Perform a detailed inspection to determine the cause of the movement, such as worn upper or lower ball joints; worn bar pin bushings; wheel-to-hub-mounting end play; unitized wheel-end hub end play; or a combination of them all. To determine unitized wheel-end hub end play, refer to Detailed Inspection in this section.

If other suspension components, such as bar pin bushings or ball joints, require inspection or service, refer to the appropriate section of this manual.

Wheel-to-Hub Mounting

Before proceeding with the unitized wheel end inspection, first check the wheel-to-hub mounting.

1. Verify that the wheel is mounted correctly and all wheel-end fasteners and hardware are tightened to the correct specification.
2. Apply the service brake to lock the hub and spindle together. Grasp the tire and wheel-end assembly at the nine and three o'clock positions. Check for vertical and horizontal movement. With your hands, apply approximately 50 lb (23 kg) of force to the assembly. You should not feel or see any looseness or movement.

- **If you detect movement or looseness:** The upper and lower ball joints and bar pin bushings should be inspected. Refer to the procedure in this section.
- **If applying the service brake eliminates movement or looseness:** Proceed to Detailed Inspection to determine the unitized wheel-end hub end play.

Detailed Inspection

1. Park the vehicle on a level surface. Block the rear wheels to prevent the vehicle from moving.
2. Raise the vehicle so that the front wheels are off the ground. Support the vehicle with safety stands. Do not use a jack to support the vehicle.

4 Inspection

- Remove the wheel, wheel adapter, rotor and spacer. The outboard and inboard seals of the bearing may purge small amounts of grease that are visible during inspection. This is a normal occurrence. Attach the magnetic base of a dial indicator onto the end of the spindle. Touch the indicator stem against the unitized wheel end mounting face. Figure 4.13. and Figure 4.14.

It is important to note that the outboard and inboard seals may purge small amounts of grease that are visible during inspection. This is a normal occurrence. Figure 4.15.

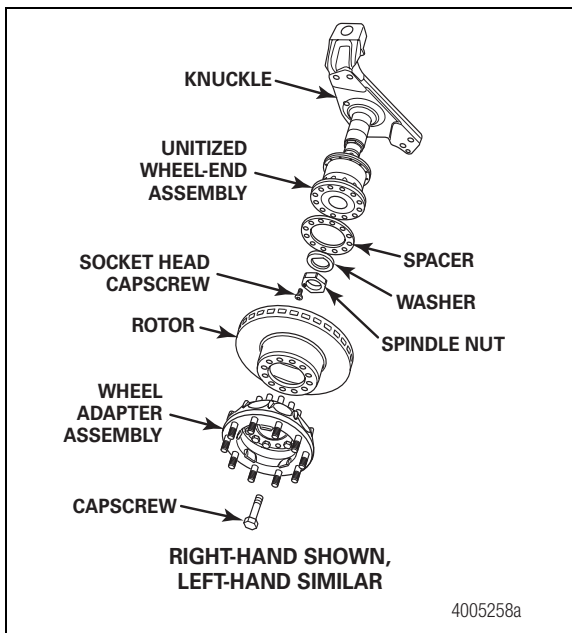


Figure 4.13

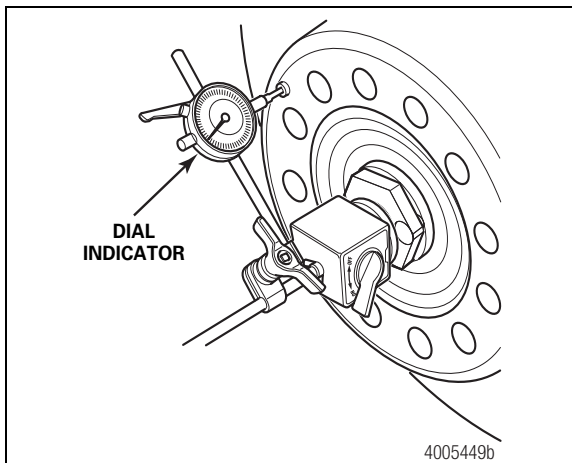


Figure 4.14

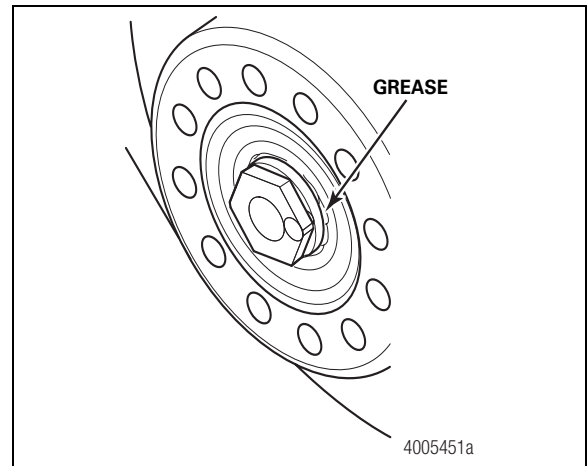


Figure 4.15

- Set the dial indicator to ZERO. Do not rotate the wheel end. Place your hands at the nine and three o'clock positions.
- Push the unitized wheel end straight IN. Note the reading. Pull the unitized wheel end straight OUT. Note the reading.
 - If the total movement of the dial indicator is less than 0.003-inch (0.08 mm): The inspection is complete. No adjustment is required.
 - If the total movement of the dial indicator is greater than 0.003-inch (0.08 mm) but less than 0.006-inch (0.15 mm): Record the measurement in a maintenance log, and perform a basic inspection at the next regularly-scheduled maintenance interval, or not to exceed 50,000 miles (80 467 km), whichever comes first.
 - If the total movement of the dial indicator is 0.006-inch (0.15 mm) or greater: Check the spindle nut torque. If the nut meets the torque specification, replace the unitized wheel end.

4 Inspection

6. Verify that the unitized wheel end rotates smoothly and without noise.

If a ticking sound is detected during rotation, this does not indicate a hub problem. It is a normal occurrence.

While rotating the unitized wheel end, grasp the brake chamber and steering arm to feel for unitized wheel-end hub vibration.

- **If the unitized wheel-end assembly does not rotate smoothly, you hear noise such as wheel bearing grind, or feel wheel-end hub vibration during rotation:** Replace the unitized wheel end. You must inspect a replacement hub before you install it. Refer to the replacement unitized wheel-end inspection information in this section.
- **If the wheel end rotates smoothly:** The inspection is complete. Reinstall the wheel-end equipment. Return the vehicle to service.

Replacement Unitized Wheel-End Inspection

1. Remove the unitized wheel end from the box and place it onto a clean surface.
2. Examine the interior of the unitized wheel end to verify the following.
 - A. The inner clip ring has not become dislodged in shipment and is in correct alignment with the inner and outer bearing sets. The gap between the inner and outer bearing sets and the clip ring must be equal. Figure 4.16.
 - B. The gap between the ends of the clip ring must be equal and not exceed 0.25-inch (6 mm). If necessary, adjust by hand. Figure 4.16.
 - C. The bearing face must be clean with no seal coating, dirt or dust.

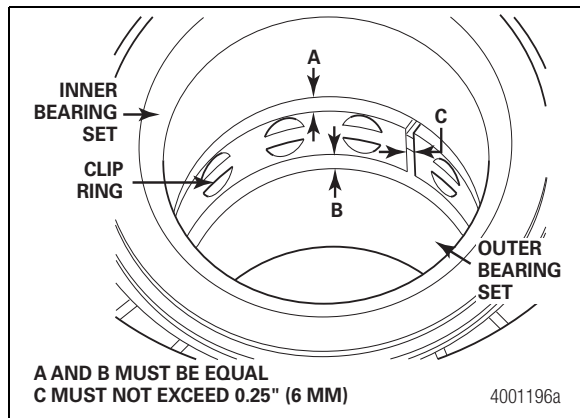


Figure 4.16

3. Examine the exterior of the unitized wheel end to verify the following.
 - A. There is no visible damage to the inboard or outboard seals and the bearings have not become unseated. Figure 4.17 and Figure 4.18.
 - B. The tone ring is not damaged or bent. Figure 4.18.

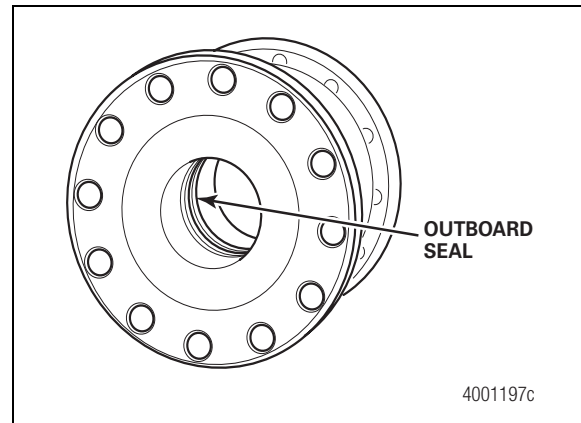


Figure 4.17

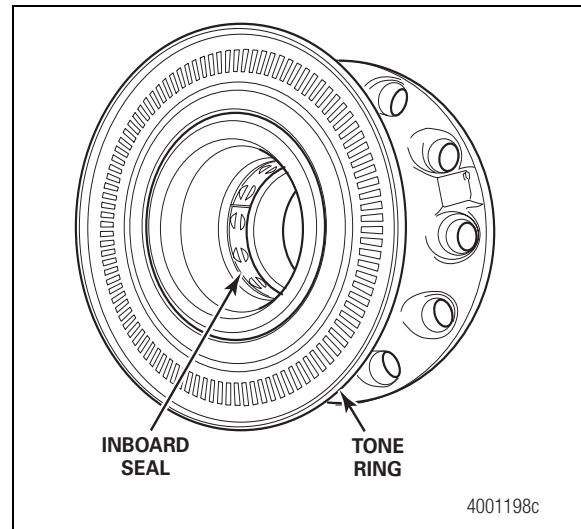


Figure 4.18

5 Removal and Disassembly

Hazard Alert Messages

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

⚠ WARNING

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

Release all air from the suspension system before you raise the vehicle or remove any components. Pressurized air can cause serious personal injury.

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

Removal

Wheel

1. Park the vehicle on a level surface. Set the parking brake. Block the wheels to prevent the vehicle from moving.
2. Drain the air from the air system.
3. Use a jack to raise the front of the chassis so that the front wheels are off the ground. Support the vehicle with safety stands.
4. Remove the wheel and tire assembly.

Caliper Assembly

Refer to Technical Bulletin TP-02173, DiscPlus™ DX195 and DX225 Air Disc Brakes, for caliper assembly removal procedures. Figure 5.1.

Wheel Adapter and Rotor

⚠ WARNING

Take care when you use lifting devices for service and maintenance procedures. Inspect lifting straps to ensure they are not damaged. Do not subject lifting straps to any shock or drop loading. Serious personal injury and damage to components can result.

1. Support the rotor so it does not fall when you remove the wheel adapter.
2. Remove the 12 capscrews from the wheel adapter. Figure 5.2.

3. Use a lifting device to remove the wheel adapter from the spindle.
4. Use a lifting device to remove the rotor.
5. Remove the spacer.

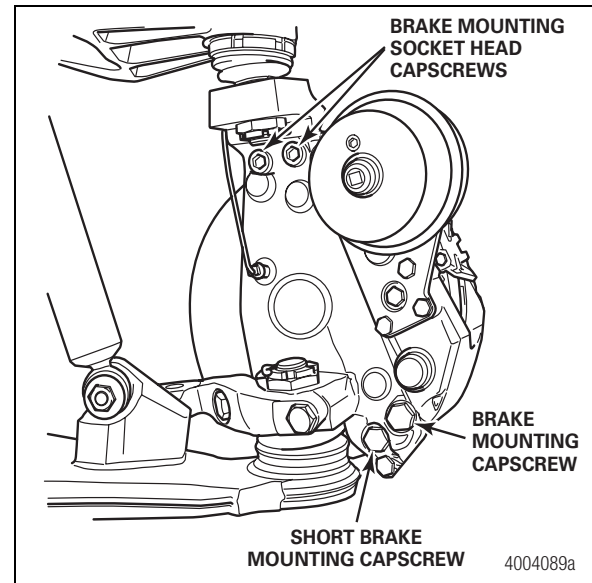


Figure 5.1

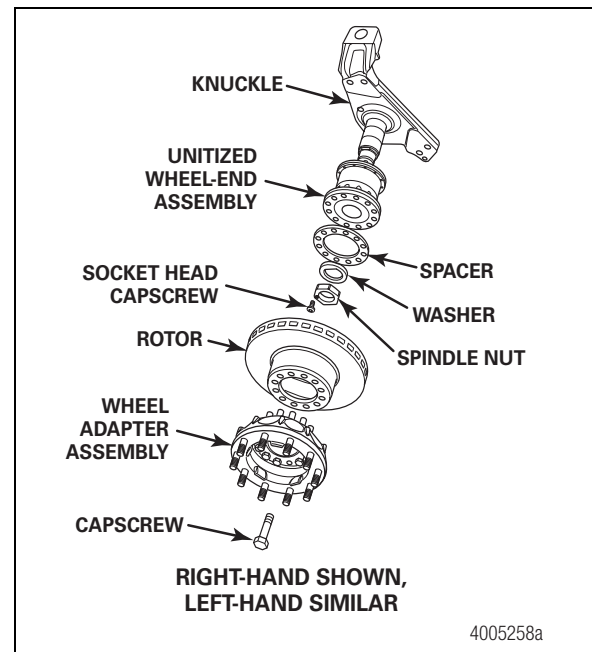


Figure 5.2

5 Removal and Disassembly

Unitized Wheel End

1. Remove the socket head capscrew from the spindle nut. Figure 5.2.
2. Remove the spindle nut from the spindle. The left-hand spindle nut has a right-hand thread and the right-hand spindle nut has a left-hand thread. Figure 5.2.
3. Remove the washer and unitized wheel end from the spindle. Figure 5.2.

Air Spring

⚠ WARNING

Verify that all personnel are clear of the vehicle before you inflate or deflate the air springs. The air suspension system has various pinch points that can cause serious personal injury.

1. Disconnect the air line from the air spring. Remove the two locknuts and washers that secure the air spring to the suspension subframe. Discard the locknuts and washers. Figure 5.3.

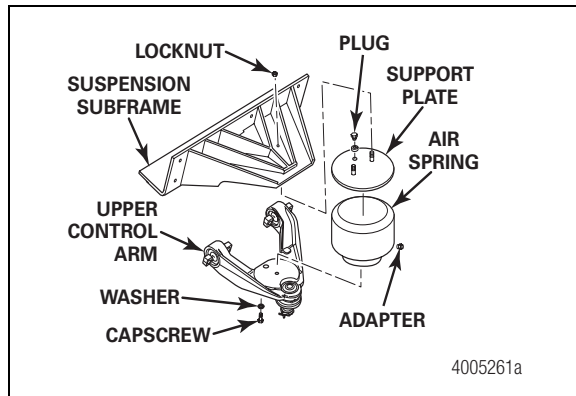


Figure 5.3

2. Remove the capscrew and washer that secure the air spring to the upper control arm. Remove the air spring.

Shock Absorber

⚠ CAUTION

Support the lower control arm before removing the shock absorber. Failure to do so can result in damage to the suspension.

1. Remove the lower shock absorber nut, washer and bolt. Figure 5.4.

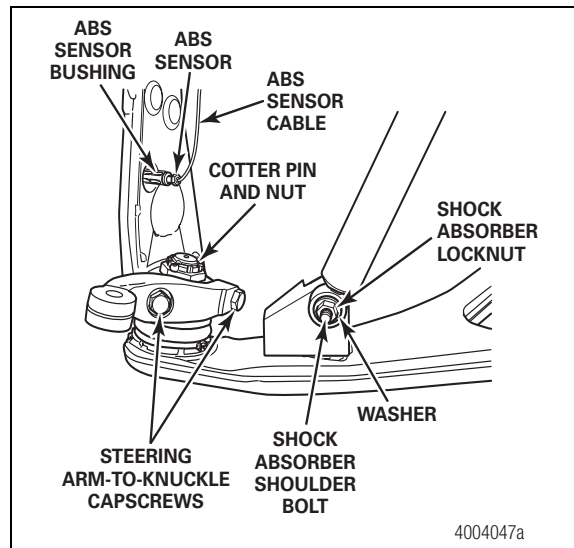


Figure 5.4

2. Remove the upper shock absorber locknut and washer. Remove the shock absorber shoulder bolt and the shock absorber. Discard the locknuts.

Steering Arm and Knuckle

⚠ CAUTION

Do not rotate the knuckle beyond the maximum allowable steer angles. Excessive rotation of the ball joint can damage the ball joints.

Ensure that the air springs are deflated before removing components.

1. Remove the cotter pin and nut that secure the tie rod to the steering arm. Separate the tie rod from the steering arm. Figure 5.5.

5 Removal and Disassembly

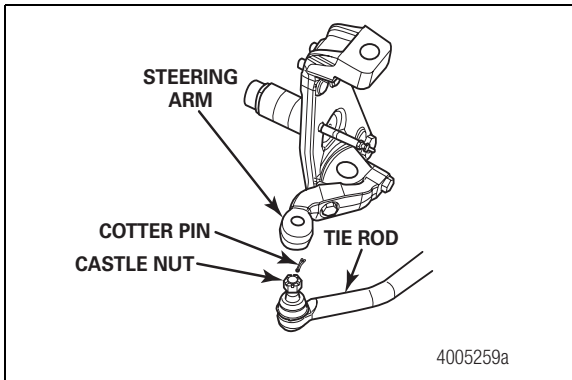


Figure 5.5

2. Remove the two capscrews that secure the steering arm to the knuckle. Remove the steering arm. Figure 5.4.
3. Remove the ABS sensor and ABS sensor bushing from the knuckle. Figure 5.4.
4. Support the knuckle so it does not fall during the following removal steps.
5. Remove the cotter pin and nut that secure the knuckle to the lower control arm ball joint. Figure 5.4.
6. Remove the cotter pin and nut that secure the knuckle to the upper control arm ball joint. Figure 5.6.

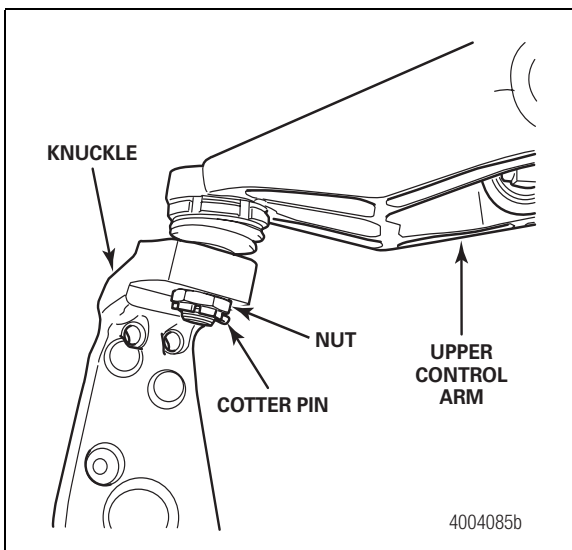


Figure 5.6

7. Use the correct tool to separate the upper control arm ball joint stud from the knuckle. Refer to Figure 10.1 in Section 10.

8. With the knuckle supported, use the correct tool to separate the lower ball joint stud from the knuckle. Refer to Figure 10.2 in Section 10. Remove the knuckle.

Upper and Lower Control Arm

1. Support the lower control arm. Figure 5.7.

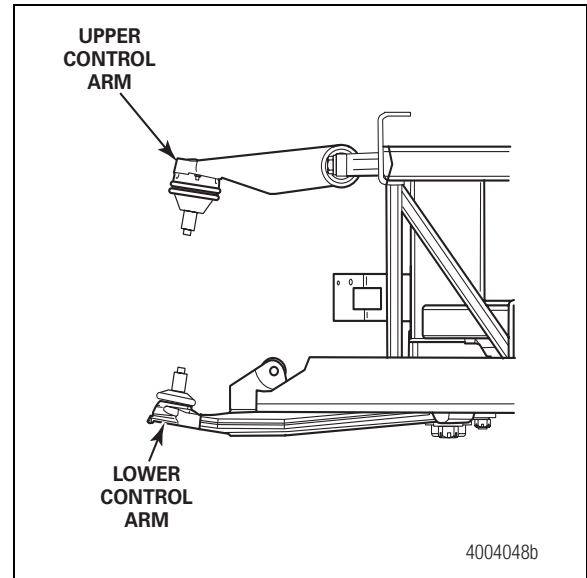


Figure 5.7

2. Remove the three capscrews that secure the lower shock absorber bracket to the lower control arm. Remove the lower shock absorber bracket. Figure 5.8.

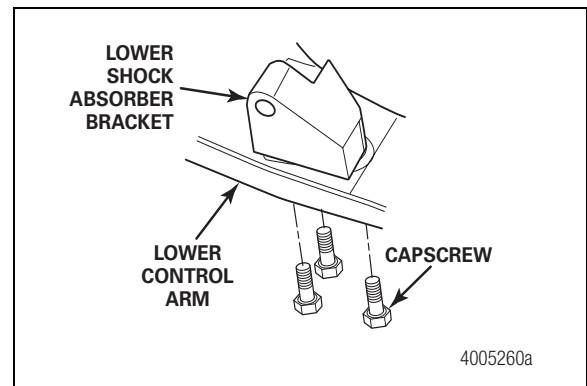


Figure 5.8

5 Removal and Disassembly

- Remove the four capscrews and washers that secure the lower control arm to the suspension subframe. Remove the lower control arm. Figure 5.9.

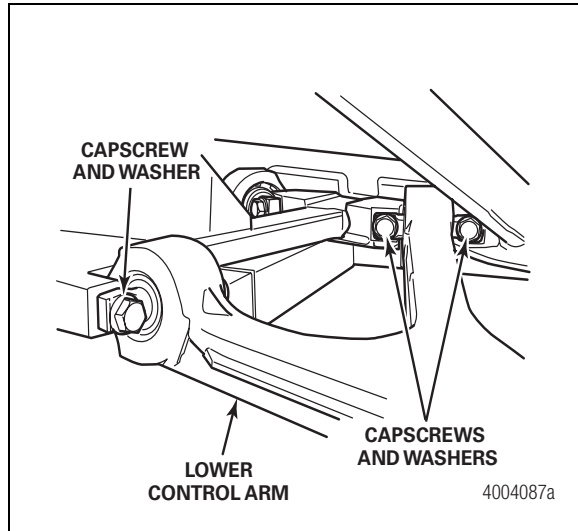


Figure 5.9

- Support the upper control arm. Figure 5.3.
- Remove the four capscrews and washers that secure the upper control arm to the suspension subframe. Remove the upper control arm. Figure 5.10.

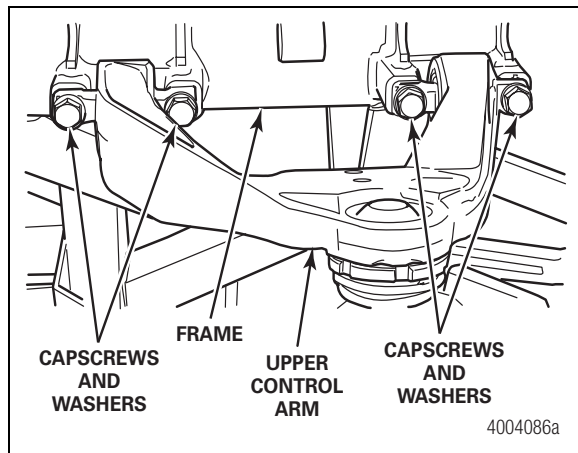


Figure 5.10

Disassembly

Upper and Lower Control Arms

Ball Joints

- Place the upper control arm into a suitable holding fixture with the ball joint stud facing UP. Figure 5.11.

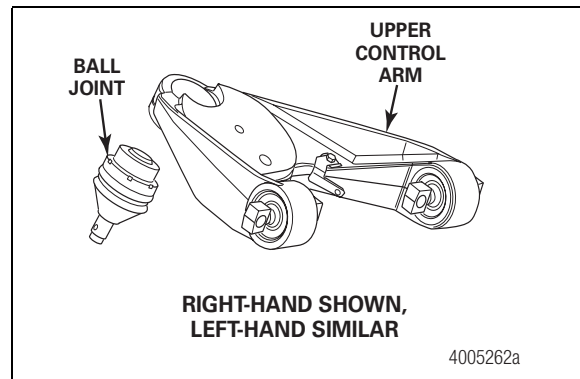


Figure 5.11

- Bend the flange on the ball joint up from the depression on the upper control arm. Use a 65 mm spanner socket to unscrew the ball joint from the threaded bore in the upper control arm. Refer to Figure 10.3 in Section 10.
- Place the lower control arm into a suitable holding fixture with the ball joint stud facing UP. Figure 5.12.

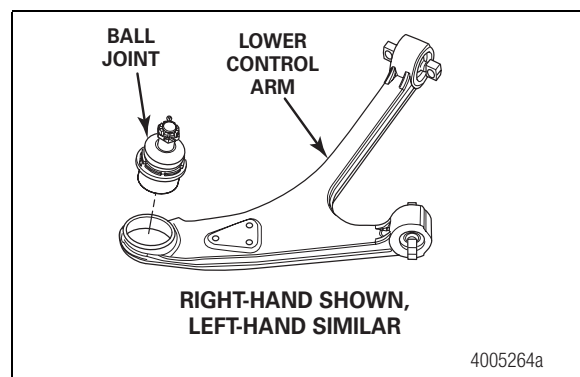


Figure 5.12

- Bend the flange on the ball joint up from the depression on the lower control arm. Use an 80 mm spanner socket to unscrew the ball joint from the threaded bore in the lower control arm. Refer to Figure 10.4 in Section 10.

5 Removal and Disassembly

Pin Bushings

1. Remove the snap ring from the outer bushing bore. Figure 5.13 and Figure 5.14.

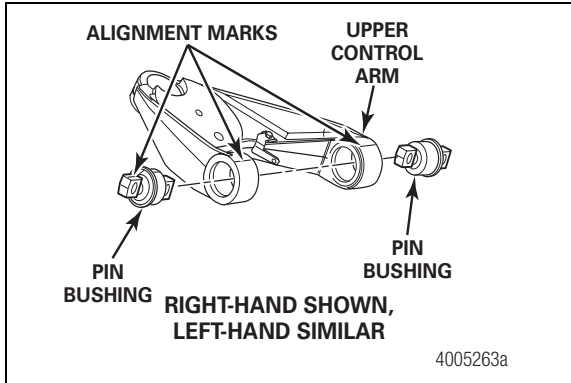


Figure 5.13

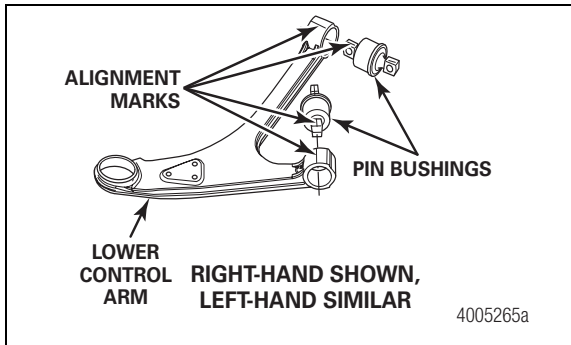


Figure 5.14

2. On the control arm, mark the position of the bushing's bar pin ears. You will need the mark to correctly align the bar pin ears when you install the new bushing.

⚠ WARNING

Observe all warnings and cautions provided by the press manufacturer to avoid damage to components and serious personal injury.

3. Place the control arm into a press with the pin bushing supported on a press plate. Pin bushings are removed from the CENTER OUT on upper control arms and from the CENTER IN on lower control arms, so it may be difficult to support the control arm in a press because of interference from the opposite pivot with the press ram. To avoid interference, position the control arm so that the control arm is pressed from the bushing.
4. Use suitable adapters to press the bar pin bushing from the control arm.

Removal

Steering Assembly

1. If necessary, remove the cotter pins and nuts that secure the tie rods to the steering, idler and relay arms. Separate the tie rods from the steering, idler and relay arms. Figure 5.15.

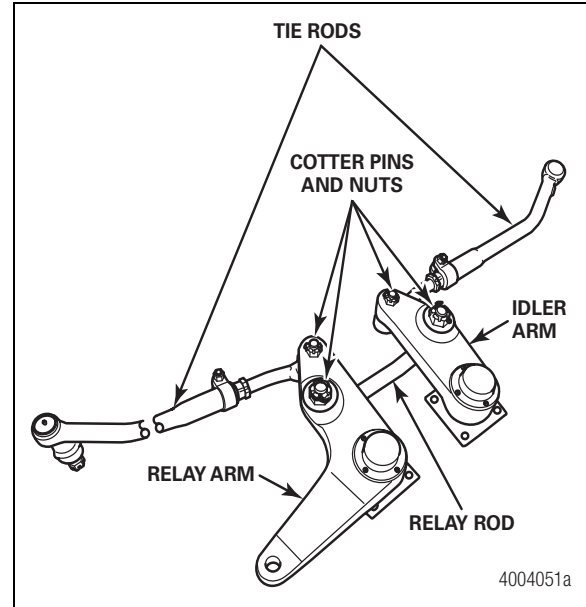


Figure 5.15

2. Loosen, but do not remove, the eight capscrews that secure the idler and relay arm assemblies to the suspension subframe. Lower the idler and relay arm assemblies so that the relay rod clears the subframe. This will provide more room to work when removing the castle nuts. Figure 5.16.

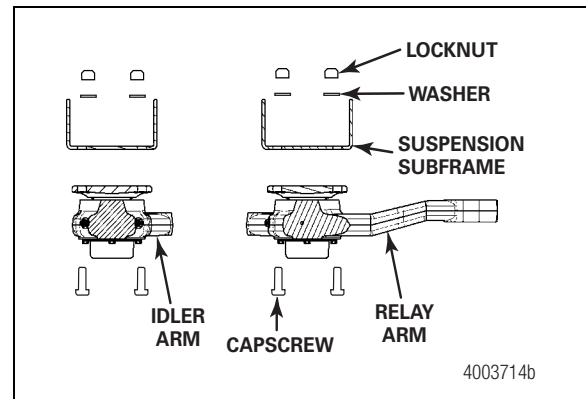


Figure 5.16

5 Removal and Disassembly

3. Remove the cotter pins and nuts that secure the relay rod to the idler and relay arms. Remove the relay rod. Figure 5.15.
4. Remove the four locknuts, capscrews and washers that secure the relay arm assembly to the suspension subframe. Remove the relay arm assembly. Figure 5.16.
5. Remove the four locknuts, capscrews and washers that secure the idler arm assembly to the suspension subframe. Remove the idler arm assembly. Figure 5.16.
6. Place the steering assembly components on a workbench.

Disassembly

Idler Arm and Relay Arm

1. Remove the capscrews and lock washers from the cover on the idler arm. Remove the cover. Figure 5.17.

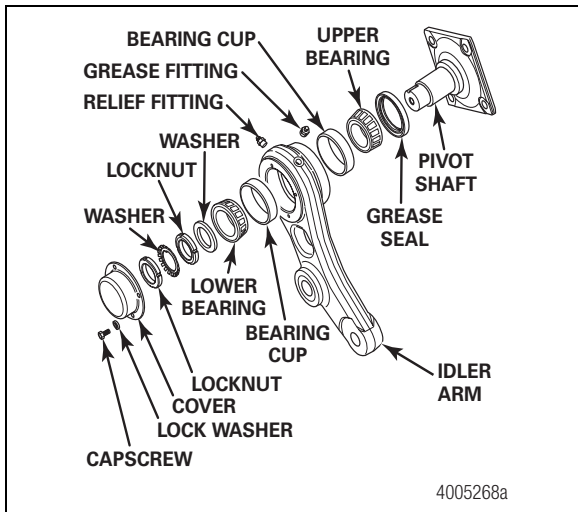


Figure 5.17

2. Use a spanner socket to remove the outer locking nut, tabbed lock washer, inner locking nut and washer from the pivot shaft. Refer to Section 10.
3. Remove the pivot shaft.
4. Remove the lower bearing cone.
5. Remove the grease seal from the idler arm.
6. Remove the upper bearing cone from the idler arm.
7. Remove the upper and lower bearing cups from the idler arm.

8. Repeat the procedure to disassemble the relay arm. Figure 5.18.

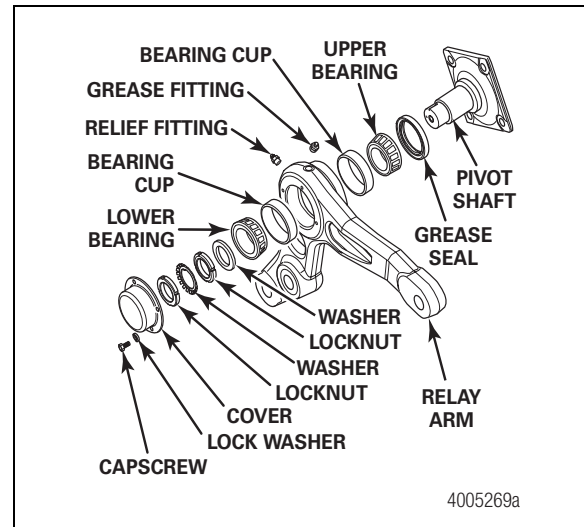


Figure 5.18

6 Prepare Parts for Assembly

Hazard Alert Messages

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

WARNING

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

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

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

CAUTION

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

Clean, Dry and Inspect Parts

Ground or Polished Parts

Use a cleaning solvent to clean the ground or polished parts and surfaces. Kerosene or diesel fuel can be used for this purpose. DO NOT USE GASOLINE.

Do NOT clean ground or polished parts in a hot solution tank or with water, steam or alkaline solutions. These solutions will cause corrosion of the parts.

Rough Parts

Rough parts can be cleaned with the ground or polished parts. Rough parts also can be cleaned in hot solution tanks with a weak alkaline solution. Parts must remain in the hot solution tanks until they are completely cleaned and heated.

Dry Cleaned Parts

Parts must be dried immediately after cleaning. Dry parts with clean paper or rags, or compressed air. Do not dry bearings by spinning with compressed air.

Prevent Corrosion on Cleaned Parts

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 rotors.

If the parts are to be stored, apply a good corrosion preventative to all surfaces. Do NOT apply the material to the brake linings or the brake rotors. Store the parts inside special paper or other material that prevents corrosion.

All tapered joints must be clean and dry with no lubrication or corrosion preventative applied to the mating surfaces.

Inspection

WARNING

Use only dye penetrant inspection techniques on unitized wheel-end hub units. Be careful not to get penetrant fluids into the bore of the hub unit. Do not use fluid immersion-based crack inspection techniques. The fluids can enter the joint between the inner bearing cones through the bore of the hub unit and damage the lubricant. Serious personal injury and damage to components can result.

Carefully inspect all disassembled parts before assembly. Inspect and replace any parts that are worn, cracked or damaged. Check for cracks with dye penetrant, magnetic flux or fluorescent particle testing methods.

Steering Arm and Knuckle

Inspect the knuckle and arm and replace any worn or damaged parts.

1. Inspect the upper and lower tapered bores in the knuckle for wear and damage. Inspect the taper on the ball joint studs.
2. Inspect the bearing contact surfaces and spindle for wear and damage.
3. Inspect the steering arm for cracks and the tapered bores in the steering arm for wear and damage. Inspect the taper on the tie rod ends.

6 Prepare Parts for Assembly

Tie Rod Grease Fittings

1. If a grease fitting is missing, install a new one. Figure 6.1.

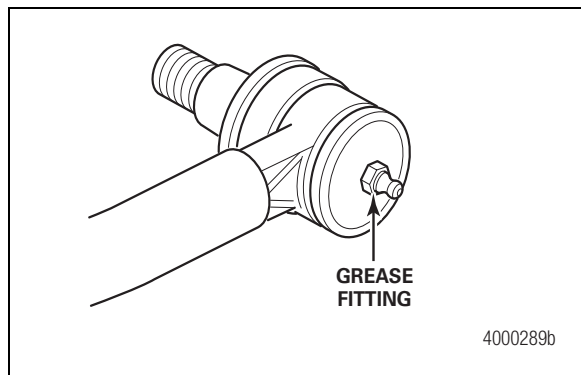



Figure 6.1

2. Tighten all grease fittings to 25 lb-in (2.8 N•m). Figure 6.2. 

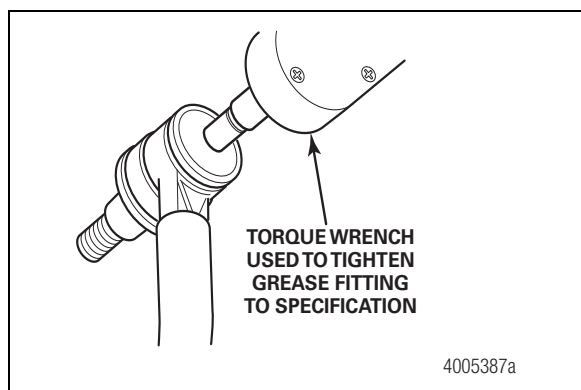


Figure 6.2

7 Assembly and Installation

Hazard Alert Messages

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

⚠ WARNING

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

Take care when you use 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.

Assembly

Upper and Lower Control Arms

Pin Bushings

1. Place the housing support sleeve onto a suitable press. Place the control arm onto the housing support sleeve with the bore facing UP. Refer to Section 10 for tool drawings. Figure 7.1, Figure 7.2 and Figure 7.3.

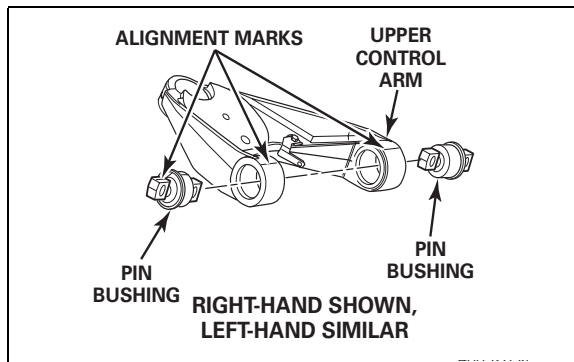


Figure 7.1

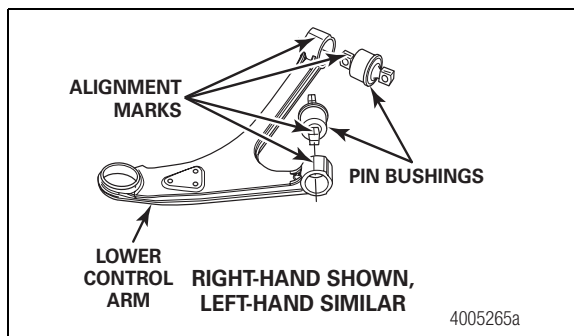


Figure 7.2

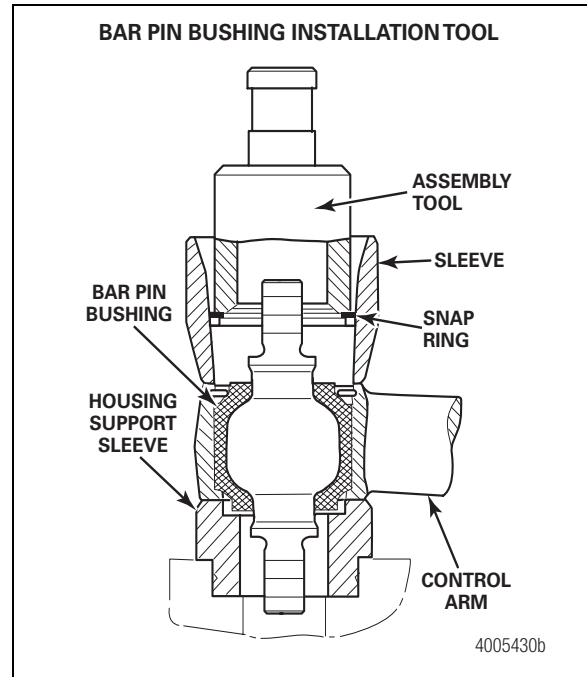


Figure 7.3

2. Place a new pin bushing into the control arm bore. Align the bar pin ears with the alignment marks on the control arm.
3. Place the installation sleeve over the pin bushing.
4. Place the assembly tool and the pin bushing snap ring through the installation sleeve.
5. Use a press to apply force on the assembly tool until the snap ring is seated in the housing.
6. Verify that the snap ring is fully seated.

7 Assembly and Installation

Ball Joints

1. Check the bore for deformed threads, burrs, cracks and damage. Replace as necessary. Figure 7.4 and Figure 7.5.

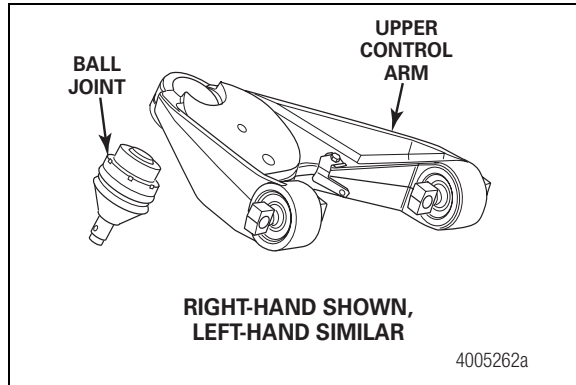


Figure 7.4

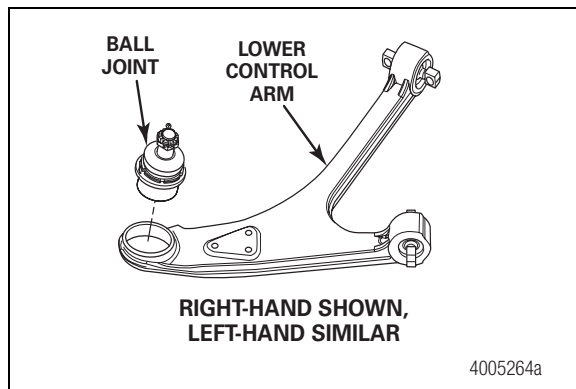



Figure 7.5

2. Clean the bore threads.
3. Apply Loctite® 243 threadlocker to the ball joint threads.
4. Install a new ball joint into the control arm. The upper control arm uses a 65 mm ball joint. The lower control arm uses an 80 mm ball joint.
5. Use the correct spanner socket to tighten the ball joint into the control arm bore to 1033-1106 lb-ft (1400-1500 N•m). Refer to Section 10. 
6. Peen the ball joint lip into the adjacent recess on the control arm. Figure 7.6 and Figure 7.7.

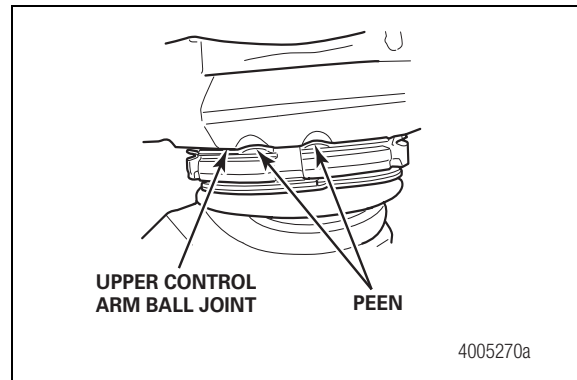


Figure 7.6

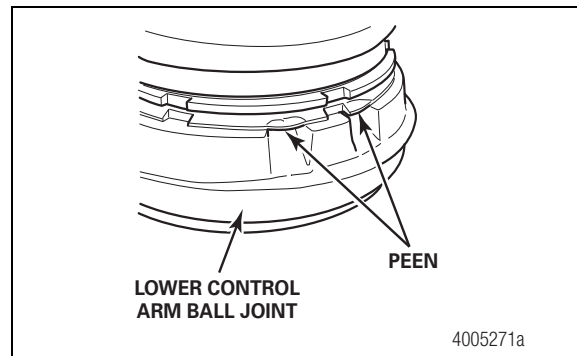


Figure 7.7

Installation

Upper and Lower Control Arm

1. Apply Loctite® 271 adhesive to the internal threads of the upper and lower control arm mounting brackets on the subframe.
2. Position the upper control arm onto the frame. Support the upper control arm. Install the four capscrews and washers that secure the upper control arm to the frame. The capscrews will be M18 or M20 depending on the suspension. Tighten the M18 capscrews to 225-273 lb-ft (305-370 N•m). Tighten the M20 capscrews to 369-480 lb-ft (500-650 N•m). Figure 7.8.



7 Assembly and Installation

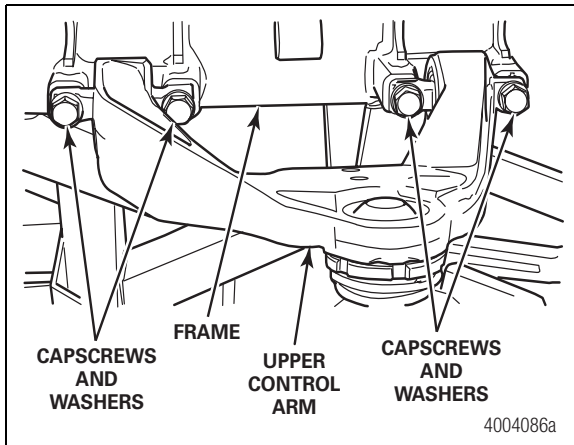


Figure 7.8

- Position the lower control arm onto the frame. Support the lower control arm. Install the four capscrows and washers that secure the lower control arm to the frame. The capscrows will be M18 or M20 depending on the suspension. Tighten the M18 capscrows to 225-273 lb-ft (305-370 N•m). Tighten the M20 capscrows to 369-480 lb-ft (500-650 N•m). Figure 7.9.

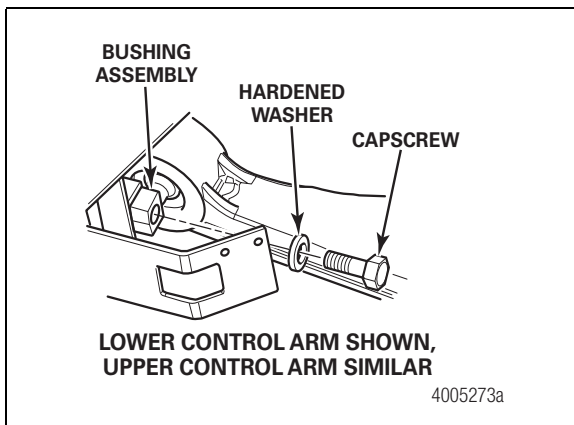


Figure 7.9

- Position the lower shock absorber bracket onto the lower control arm. Install the three capscrows that secure the lower shock absorber bracket to the lower control arm. Tighten the capscrows to 180-188 lb-ft (245-255 N•m). Figure 7.10.

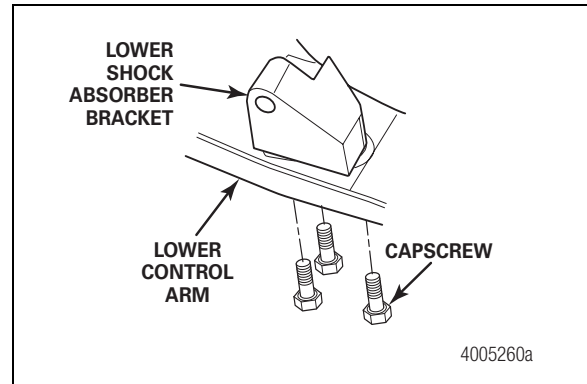


Figure 7.10

Steering Arm and Knuckle

- Position the knuckle onto the lower control arm ball joint stud. Insert the upper control arm ball joint stud into the knuckle.
- Install the nut that secures the knuckle to the lower control arm ball joint. Tighten the nut to 922-959 lb-ft (1250-1300 N•m). Continue to tighten the nut to align the nut slot with the cotter pin hole. Do not back off the nut to align the nut slot with the cotter pin hole. Install the cotter pin into the nut. Figure 7.11.

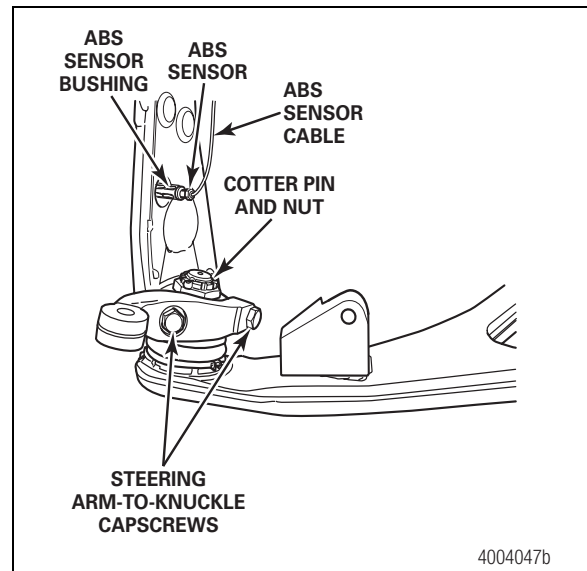



Figure 7.11

7 Assembly and Installation

3. Install the nut that secures the upper control arm ball joint to the knuckle. Tighten the nut to 553-590 lb-ft (750-800 N•m). Continue to tighten the nut to align the nut slot with the cotter pin hole. Do not back off the nut to align the nut slot with the cotter pin hole. Install the cotter pin into the nut. Figure 7.12. 

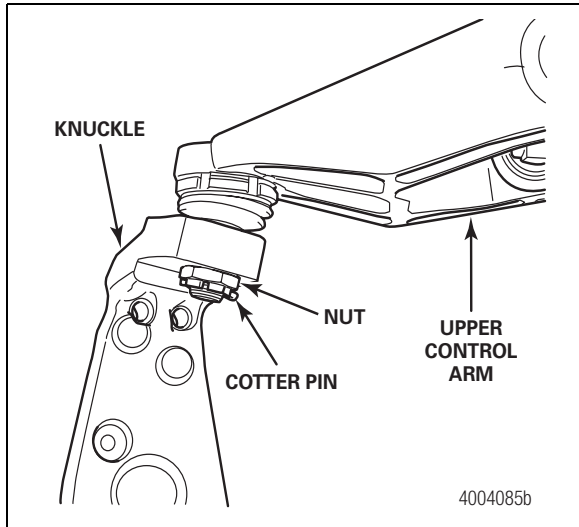



Figure 7.12

4. Position the steering arm onto the knuckle. Apply Loctite® 242 threadlocker, Meritor specification 2297-W-5431, to the two capscrews. Install the two capscrews that secure the steering arm to the knuckle. Tighten the capscrews to 406-428 lb-ft (550-580 N•m). Figure 7.11. 
5. Install the ABS sensor bushing and ABS sensor into the knuckle using the procedure in technical bulletin TP-02102, Installation Instructions for Meritor WABCO Wheel Speed Sensor Replacement Kit. For service instructions for ABS braking systems, refer to Maintenance Manual 28, Anti-Lock Braking Systems (ABS) for Trucks, Tractors and Buses, For C Version ECUs; and Maintenance Manual 30, Anti-Lock Braking Systems (ABS) for Trucks, Tractors and Buses, For D Version ECUs. To obtain these publications, refer to the Service Notes page on the front inside cover of this manual. Figure 7.11.

Unitized Wheel End

Inspect the unitized wheel end according to the replacement unitized wheel end inspection procedure in Section 4.

1. Clean the unitized wheel end inner bore and spindle with a clean dry rag. Do not apply any solvent.
2. Check the bore of the unitized wheel end for any obstructions and check the spindle for any nicks or burrs.

WARNING

Do not apply anti-seize or anti-fretting compound to the spindle threads. These compounds decrease a fastener assembly's capability to maintain clamp load, which can cause wheels to loosen and separate from the vehicle. Serious personal injury and damage to components can result.

3. Coat the inside of the unitized wheel end with anti-seize compound. Verify that the inner and outer bearing races are covered. Do not apply anti-seize or anti-fretting compound to the spindle or threads. Remove any anti-seize or anti-fretting compound that may have dripped onto the spindle threads.

CAUTION

Align the unitized wheel end STRAIGHT onto the spindle. Do not allow the assembly to misalign and contact the spindle threads. Bearing damage can occur that requires replacement of the entire unitized wheel end.

4. Carefully align the unitized wheel end bore with the spindle and slide the unitized wheel end STRAIGHT onto the spindle. Figure 7.13.
 - **If the unitized wheel end does not slide on easily:**
Do not force it onto the spindle. The unitized wheel end can become jammed on the spindle if it is not aligned correctly with the spindle.
 - **If the unitized wheel end becomes jammed on the spindle:** Carefully remove the unitized wheel end from the spindle so that the inner bearings do not disassemble or loosen from the unitized wheel end.

7 Assembly and Installation

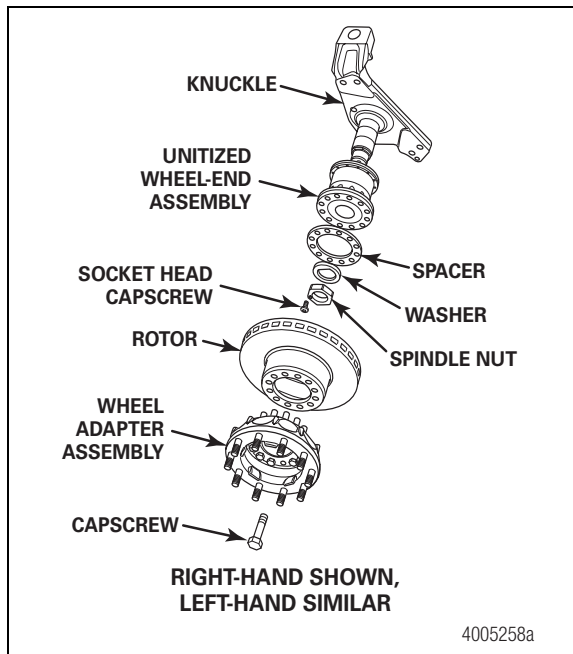


Figure 7.13

5. Install the "D" washer and locknut onto the spindle. The left-hand spindle nut has a right-hand thread and the right-hand spindle nut has a left-hand thread. Tighten the locknut to 406-420 lb-ft (550-570 N•m).
6. Apply Loctite® 242 threadlocker, Meritor specification 2297-W-5431, to the socket head capscrew. Install the socket head capscrew into the locknut. Tighten the capscrew to 22-26 lb-ft (30-35 N•m).

Wheel Adapter and Rotor

WARNING

Take care when you use lifting devices for service and maintenance procedures. Inspect lifting straps to ensure they are not damaged. Do not subject lifting straps to any shock or drop loading. Serious personal injury and damage to components can result.

1. Install the spacer into the rotor.
2. Use a lifting device to position the rotor onto the wheel bearing assembly.
3. Use a lifting device to position the wheel adapter onto the wheel bearing assembly.

4. Apply Loctite® 242 threadlocker, Meritor specification 2297-W-5431, to the 12 capscrews. Install the capscrews into the wheel adapter. Tighten the capscrews to 321-339 lb-ft (435-460 N•m). Figure 7.13.

Caliper Assembly

1. Position the caliper assembly onto the rotor.
2. Install the four brake mounting capscrews. Tighten the capscrews to 402-494 lb-ft (545-670 N•m). You must install the short capscrew into the correct position. Figure 7.14.

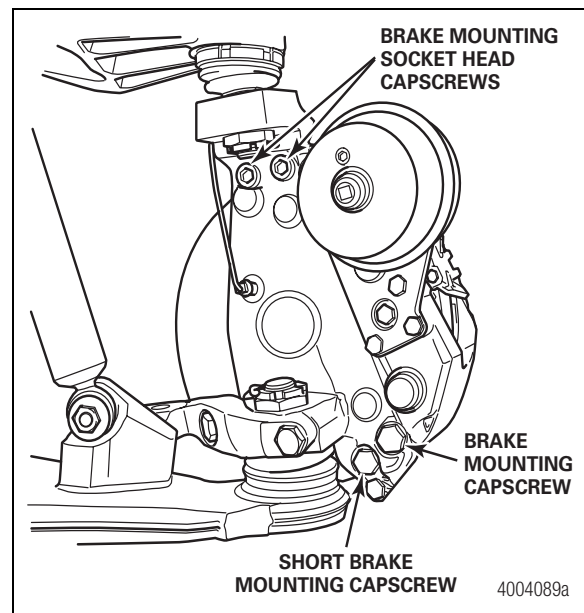



Figure 7.14

3. Remove the plug from the hole in the brake chamber. Connect the air line to the brake chamber.
4. Adjust the brake. Refer to Technical Bulletin TP-02173, DiscPlus™ DX195 and DX225 Air Disc Brakes. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.
5. Install the tire and wheel assembly onto the wheel adapter. Tighten the wheel lug nuts to specification. Refer to the vehicle manufacturer's manual for the tightening sequence and the wheel lug nut torque specifications.

7 Assembly and Installation

Air Spring

1. Position the air spring onto the upper control arm. Install the bolt and washer that secure the air spring to the upper control arm. Tighten the bolt to 96-100 lb-ft (130-135 N•m).

Figure 7.15. 

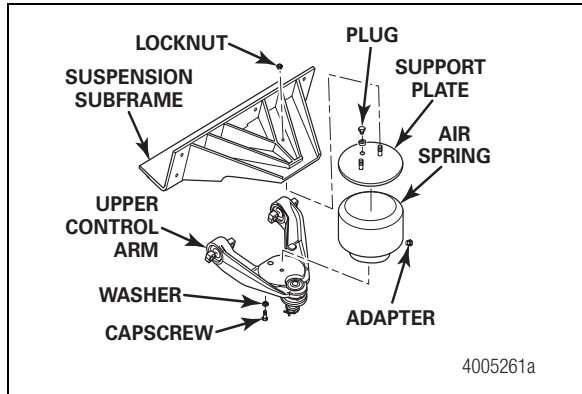





Figure 7.15

2. Install the two nuts and washers that secure the air spring support plate to the subframe. Tighten the nuts to 69-87 lb-ft (94-118 N•m). Install the adapter and tighten it to 30-33 lb-ft (40-44 N•m). Connect the air line to the air spring adapter. Install the plug and tighten it to 41-44 lb-ft (55-60 N•m).

Figure 7.15. 

Shock Absorber

1. Position the shock absorber and install the upper shock absorber shoulder bolt, nut and washer. Tighten the nut to 270-350 lb-ft (366-474 N•m). Figure 7.16. 
2. Install the lower shock absorber shoulder bolt, nut and washer. Tighten the nut to 270-350 lb-ft (366-474 N•m). Figure 7.17. 

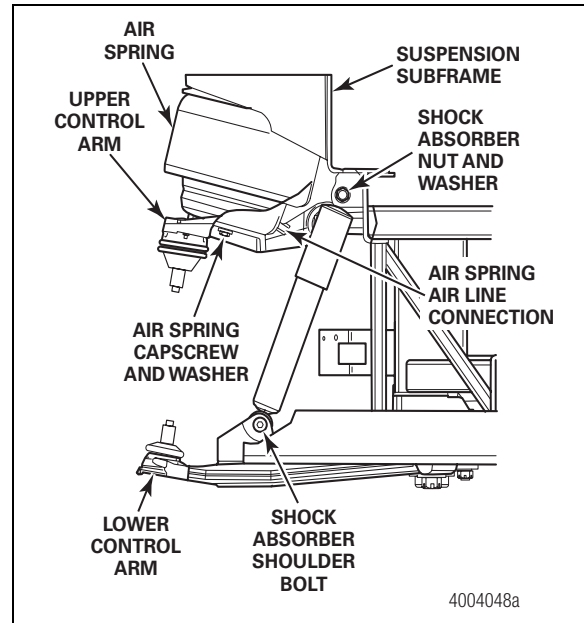


Figure 7.16

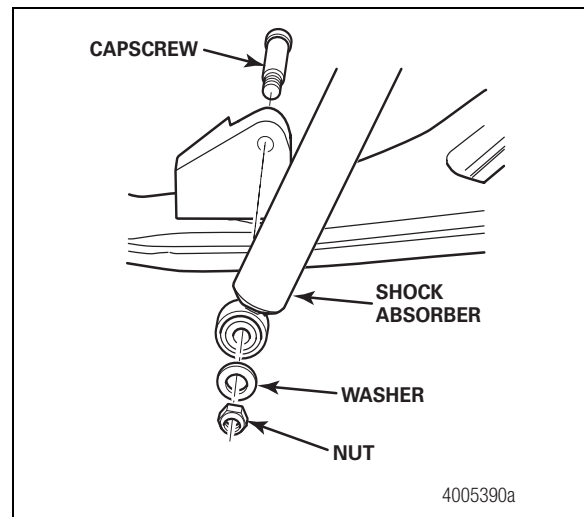


Figure 7.17

Assembly

Idler Arm and Relay Arm

1. Install the upper and lower bearing cups into the idler arm.
Figure 7.18.

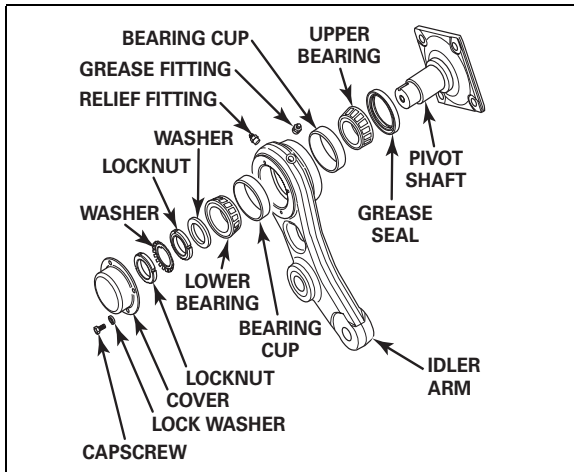


Figure 7.18

2. Pack both bearing cones with grease. Use grease that meets the specifications shown in Table D.
3. Install the upper bearing cone into the upper bearing cup in the idler arm.
4. Install the grease seal 0.118-inch (3 mm) into the idler arm.
Figure 7.19.

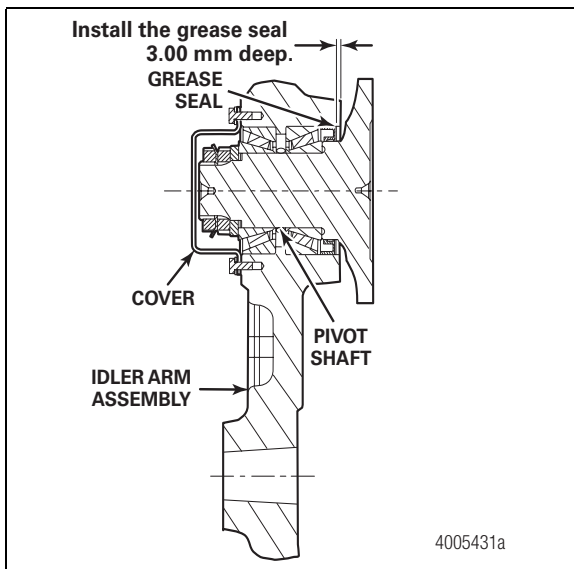


Figure 7.19

5. Install the pivot shaft into the idler arm.
6. Install the lower bearing cone into the lower bearing cup in the idler arm.
7. Install the washer onto the pivot shaft.
8. Install the inner locknut onto the pivot shaft. Use a spanner socket to tighten the locknut to 74 lb-ft (100 N•m). Refer to Section 10. **ⓘ**
9. Rotate the idler arm a minimum of five times, plus and minus 1/2 turn. Tighten the locknut to 74 lb-ft (100 N•m). **ⓘ**
10. Rotate the idler arm a minimum of five times, plus and minus 1/2 turn. Loosen the inner locknut.
11. Use a spanner socket to tighten the inner locknut to 37 lb-ft (50 N•m). Refer to Section 10. **ⓘ**
12. Install the tabbed lock washer onto the pivot shaft.
13. Install the outer locknut onto the pivot shaft. Use a spanner socket to tighten the outer locknut to 37 lb-ft (50 N•m). Refer to Section 10. **ⓘ**
14. Continue to tighten the outer locknut until one slot of the locknut aligns with the lock washer tab.
15. Bend the lock washer tab into the outer locknut slot.
16. Hold the outer locknut and use a spanner socket to tighten the inner locknut against the outer locknut to 166-202 lb-ft (225-275 N•m). Refer to Section 10. **ⓘ**
17. Apply Loctite® Gasket Maker 518 sealant to the idler arm surface where the cover contacts the arm.
18. Install the cover, lock washers and capscrews onto the idler arm. Tighten the capscrews to 7-9 lb-ft (10-12 N•m). **ⓘ**
19. Fill the idler arm with grease until grease purges from the relief fitting.

7 Assembly and Installation

20. Repeat the procedure to assemble the relay arm. Figure 7.20.

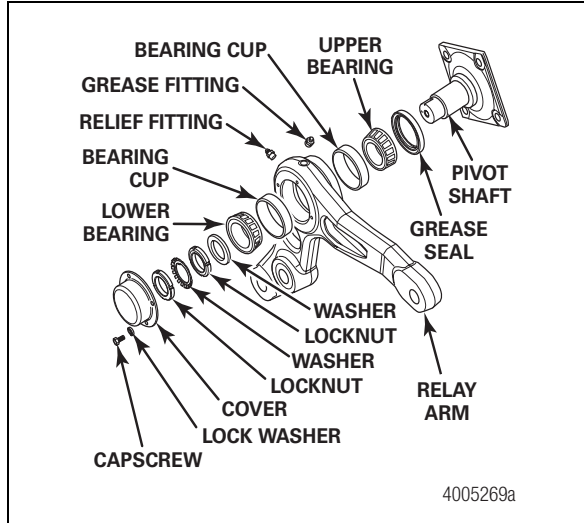


Figure 7.20

Installation

Steering Assembly

⚠ WARNING

Before you perform the assembly procedures, thoroughly clean the mounting surfaces. Rust and oil decrease a fastener assembly's capability to maintain clamp load. Serious personal injury and damage to components can result.

1. Clean any rust or oil from the subframe in the area under the eight washers. Figure 7.21.

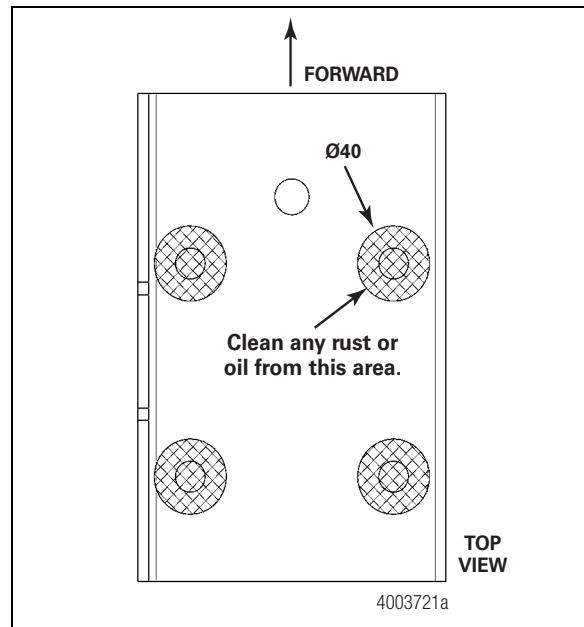


Figure 7.21

2. Clean any rust or oil from the subframe in the area that the relay and idler shaft are installed. Figure 7.22.

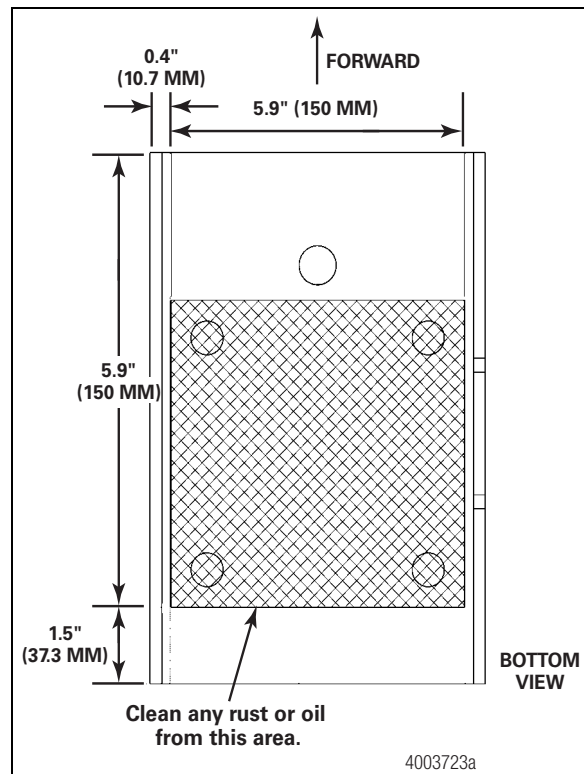


Figure 7.22

7 Assembly and Installation

3. Verify that the pivot shaft mounting flanges on the idler arm and relay arm assemblies are clean.
4. Install the relay arm and idler arm assemblies to the subframe with eight new 5/8-11 x 2.0 capscrews, locknuts and hardened washers. Do not tighten the locknuts completely. Ensure that the locknut is threaded onto the capscrew at least 5/8-inch (15.88 mm). Leave enough room to install the relay rod. Figure 7.23.

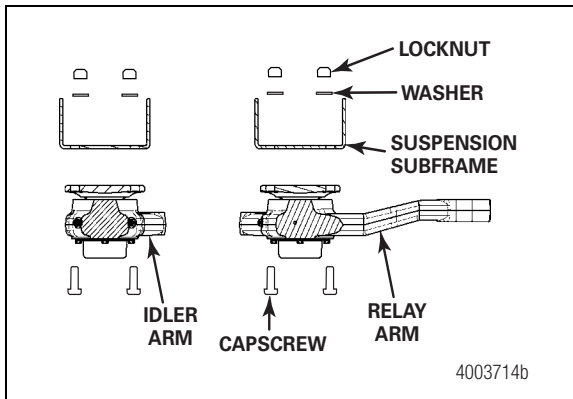



Figure 7.23

5. Position the relay rod into the idler arm and relay arm. Install the castle nuts that secure the relay rod to the idler arm and relay arm. Tighten the nuts to 245-260 lb-ft (332-353 N•m). Continue tightening the nuts to align the nut slot with the cotter pin hole. Do not back off the nuts to align the nut slot with the cotter pin hole. Install the cotter pins. Figure 7.24. 

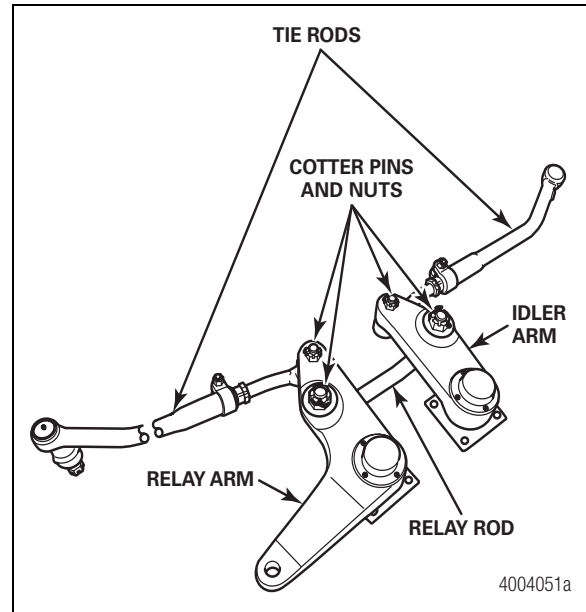



Figure 7.24

6. Tighten the idler arm and relay arm nuts to 180-210 lb-ft (245-286 N•m). Use a crossing pattern to tighten the nuts. Figure 7.25. 

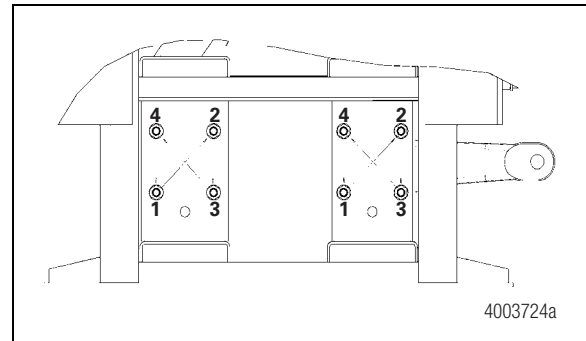



Figure 7.25

7. Position the tie rods into the idler arm and relay arm. Install the castle nuts and bolts that secure the tie rods to the idler arm and relay arm. Tighten the nuts to 245-260 lb-ft (332-353 N•m). Continue tightening the nuts to align the nut slot with the cotter pin hole. Do not back off the nuts to align the nut slot with the cotter pin hole. Install the cotter pins. Figure 7.24. 

7 Assembly and Installation

- Verify that the tie rods are the correct length and are within 1/8-inch (3 mm) of each other. The tie rod ends and the slotted adjustment sleeves must have the correct engagement with the tie rod. Adjust the tie rod length as necessary. Figure 7.26.

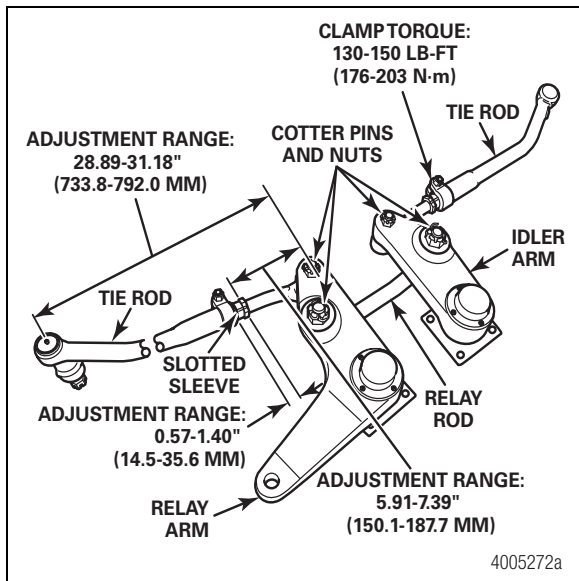



Figure 7.26

- Position the tie rod into the steering arm. Install the nut that secures the tie rod to the steering arm. Tighten the nut to 245-260 lb-ft (332-353 N·m). Continue tightening the nut to align the nut slot with the cotter pin hole. Do not back off the nut to align the nut slot with the cotter pin hole. Install the cotter pin. Figure 7.27. 

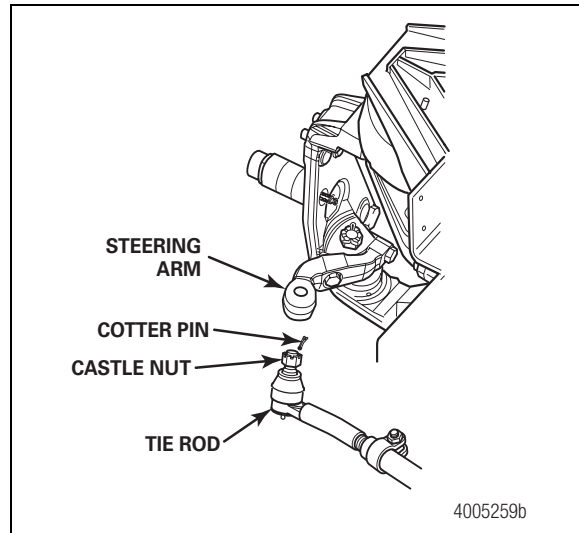


Figure 7.27

Hazard Alert Messages

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

⚠ WARNING

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

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

Release all air from the air suspension system before you raise the vehicle or remove any components. Pressurized air can cause serious personal injury.

Adjustment

Inspection Before Alignment

Before aligning the vehicle, perform a complete inspection and adjust the vehicle ride height.

Wheels and Tires

Verify that the wheels and tires meet the vehicle manufacturer's specifications. Verify that the tires are inflated to the pressure specified by the vehicle manufacturer.

Suspension

Inspect the suspension. Refer to Section 4.

Inspect the rear drive and tag axles, and suspension if equipped. Repair or replace any worn or damaged components. Refer to the suspension or vehicle manufacturer's instructions for the correct procedures.

Vehicle Ride Height Adjustment

The specified ride height is located on the suspension identification tag on the lower left-hand side of the subframe. Refer to the vehicle manufacturer's instructions to adjust the ride height.

Adjust the rear suspensions to the ride height specified by the suspension or vehicle manufacturer.

Maximum Turn Angle

⚠ CAUTION

Do not exceed the maximum turn angle specified by the suspension or vehicle manufacturer. If the angle is exceeded, the steering arms, tie rods and tie rod ends will be damaged.

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 the mechanical stop in the steering system to adjust the pressure relief.

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

The stop bolt should NOT touch the lower control arm. The stop bolt should always have a minimum clearance of 1/8-inch (3 mm) when the knuckle is in the full-turn position as shown in Figure 8.1.

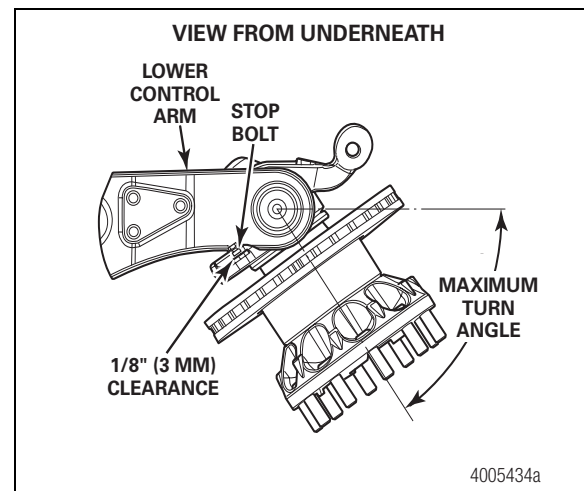


Figure 8.1

If the steering system is out-of-adjustment, inspect the steering arm for damage. Use a magnetic particle or liquid dye penetrant inspection procedure to inspect the steering arm. Pay particular attention to the bend, the taper and the area near the ball stud. Refer to the vehicle manufacturer's manual for additional inspection procedures.

8 Adjustment

Stop Bolt Adjustment

1. Place a 1/8-inch (3 mm) spacer between the stop bolt and the boss on the lower control arm.
2. Turn the steering wheel until the boss on the lower control arm touches the spacer in front of the stop bolt. Measure the turn angle. Figure 8.2.

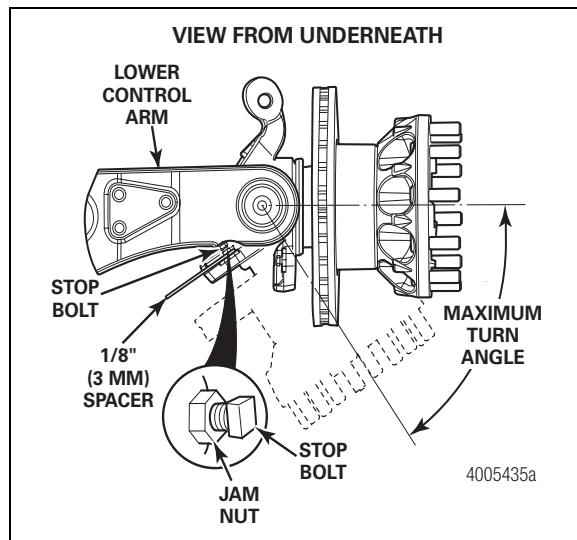


Figure 8.2

3. If the maximum turn angle does not meet the vehicle manufacturer's specifications, correct the maximum angle. Adjust the pressure relief.
4. When the maximum turn angle is correct:
 - A. Loosen the stop bolt jam nut. Figure 8.2.
 - B. Insert a 1/8-inch (3 mm) spacer and adjust the stop bolt.
 - C. Tighten the jam nut to 103-111 lb-ft (140-150 N•m).

Adjust the Pressure Relief in the Power Steering System, Set the Maximum Turn Angle

CAUTION

In power steering systems, the hydraulic pressure should relieve or “drop off” at the end of the steering stroke, with 1/8-inch (3 mm) minimum clearance at the stop bolt. If the pressure does not relieve, the steering system components will be damaged.

The pressure relief in the power steering system stops or reduces forces applied to the axle when the wheel is moved in the full-turn position.

Check the pressure relief if the steering arm is damaged or the power steering gear is serviced.

Two types of systems are used to adjust the pressure relief.

- Mechanical stop on the Pitman arm or in the assist cylinder
- Hydraulic pressure relief in the power steering gear

CAUTION

Meritor does not recommend a power steering system that does not have mechanical stops or pressure relief before the maximum turn angle is obtained. Damage to the axle can result.

Mechanical Stop

Use the mechanical stop in the steering system to adjust the pressure relief. Do not use the stop bolt on the knuckle alone to adjust the poppet valve pressure relief.

Refer to the vehicle manufacturer's procedures.

CAUTION

Use a pressure gauge to verify that the pressure drops from the maximum system delivery pressure to gear box manufacturing recommendation BEFORE the full turning angle is achieved. If the pressure does not drop, damage to the front axle components will result.

Steering systems with mechanical stops are adjusted when the wheels are turned to the full-right and full-left turn positions. The stop travel is set at 1/8-inch (3 mm) before the stop bolt contacts the lower control arm boss. Figure 8.3 and Figure 8.4.

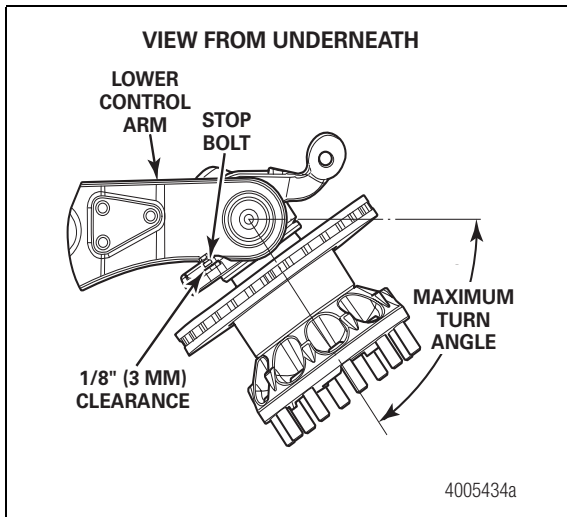


Figure 8.3

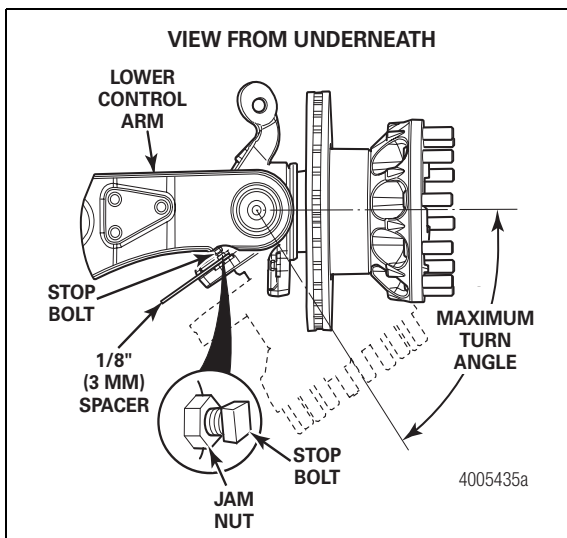


Figure 8.4

Hydraulic Pressure Relief in the Steering Gear

Refer to the vehicle manufacturer's procedure. The stop bolt should always have a minimum clearance of 1/8-inch (3 mm) between the stop bolt and the lower control arm boss.

Hydraulic steering gears with poppet valves are adjusted with a spacer between the stop bolt in the knuckle and the boss on the lower control arm. The poppet valves are adjusted to stop or reduce steering forces from the 1/8-inch (3 mm) specified distance between the lower control arm boss and the spacer. Figure 8.3 and Figure 8.4.

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 8.5.

Check the turning radius angle with the radius plates on the alignment equipment. To determine 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 relay rod for wear or damage. Service as necessary.

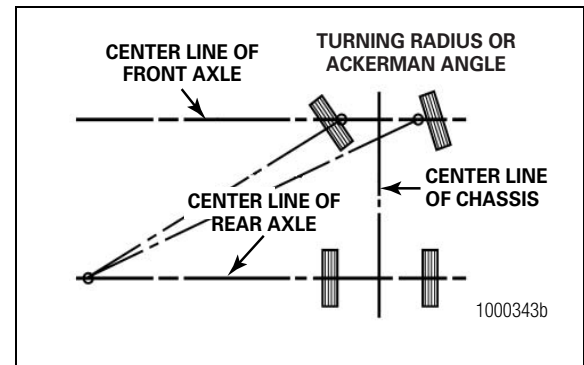


Figure 8.5

Measure and Adjust the Toe

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 will result in rapid tire wear.

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

⚠ WARNING

Release all air from the air suspension system before you raise the vehicle or remove any components. Pressurized air can cause serious personal injury.

2. Use jacks to 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.

8 Adjustment

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.
5. 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.
6. Repeat Step 5 for the front of the tires. Figure 8.6.

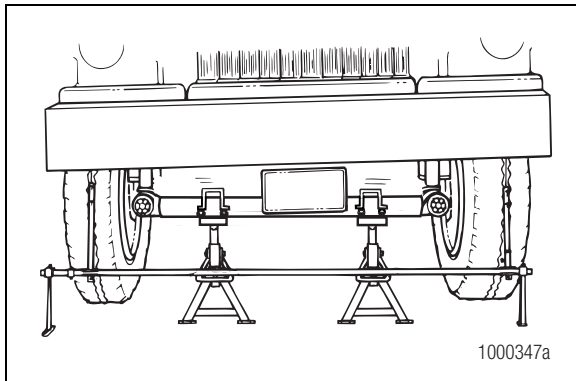


Figure 8.6

7. To obtain the toe measurement, subtract the distance reading between the front of the tires from the distance reading between the back of the tires. Figure 8.7.
 - **If the toe measurement is not 1/16-inch \pm 1/16-inch (1.58 mm \pm 1.58 mm) at 21.5-inches (546.1 mm) from the centerline of the suspension:** Use the following procedure to adjust the toe.
 - A. Loosen the tube clamp nut and bolt on each end of the tie rod.
 - B. Turn the adjusting sleeve until the specified toe distance is obtained.
 - C. Verify that the tie rods are the correct length and within 1/8-inch (3 mm) of each other. The tie rod end and the adjusting sleeve must have the correct engagement with the tie rod. Figure 8.8.
 - D. Tighten the tube clamp nut and bolt on each end of the cross tube to 130-150 lb-ft (176-203 N•m). Ensure that the tie rod is within the adjustment range. Figure 8.8.

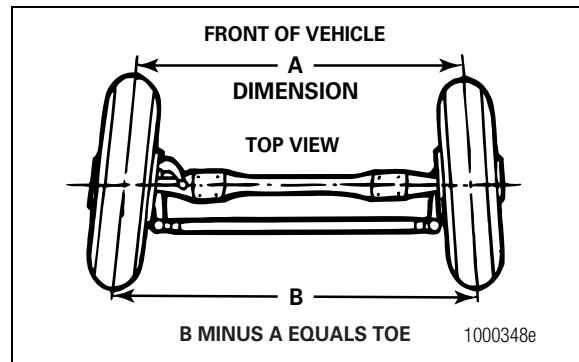


Figure 8.7

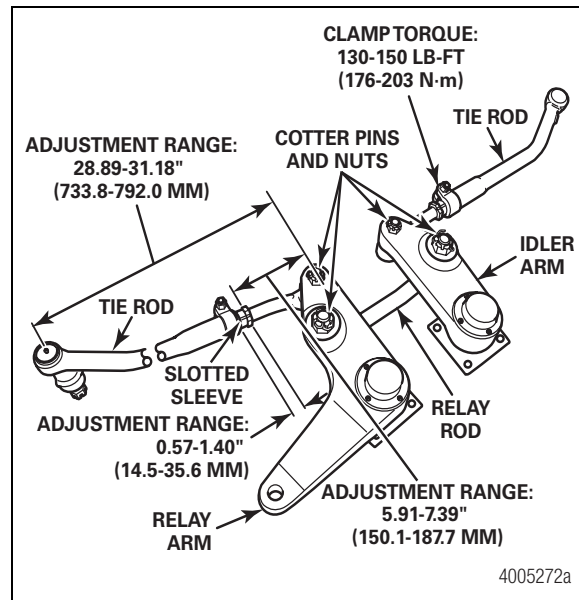


Figure 8.8

8. Repeat Steps 1-7 to check the toe dimension.

Table B: Tolerances and Limits

Description	Specification
Control Arm Ball Joint	65 mm ball joint: 0.059-inch (1.5 mm), 80 mm ball joint: 0.079-inch (2 mm) maximum axial free play
Hub Bearing End Play	0.001-0.005-inch (0.0254-0.127 mm)
Steering Relay Arm	No axial or radial free play allowed
Turn Angle	54 degrees maximum

Table C: Torque Values for Fasteners

Description	Size	Torque Range	
		Lb-Ft	N•m
Air Spring-to-Control Arm Mounting Capscrews	M14 x 2 x 40	96-100	130-135
Air Spring-to-Subframe Nuts	M12 x 1.75	69-87	94-118
Air Spring Adapters	M16 x 1.5 to 3/8-18 NPTF	30-33	40-44
Air Spring Plugs	M16 x 1.5	41-44	55-60
Lower Ball Joint	80 mm	1033-1106	1400-1500
Upper Ball Joint	65 mm	1033-1106	1400-1500
Lower Control Arm Ball Joint Stud-to-Knuckle Retaining Nuts	—	922-959	1250-1300
Upper Control Arm Ball Joint Stud-to-Knuckle Retaining Nuts	—	553-590	750-800
Control Arm Bar Pin-to-Subframe Mounting Capscrews	M18 x 2.5 x 60	225-273	305-370
	M20 x 2.5 x 60	369-480	500-650
Spindle Nuts	—	406-420	550-570
Spindle Nut Socket Head Capscrew	M8 x 1.25 x 20	22-26	30-35
Wheel Adapter Capscrews	M18 x 1.25 x 80	321-332	435-450
Brake Mounting Socket Head Capscrews	M20 x 1.5	402-494	545-670
Brake Mounting Hex Head Capscrews	M20 x 1.5	402-494	545-670
Shock Absorber Bracket Retaining Socket Head Capscrews	M16 x 2 x 60	180-188	245-255
Shock Absorber Locknuts	3/4"-10	270-350	366-474
Steering Arm Mounting Capscrews	M20 x 1.5 x 70	406-428	550-580
Steering Relay Arm and Idler Arm Cover Capscrews	M6 x 1.0 x 12	8-9	10-12
Steering Assembly-to-Frame Nuts	5/8"-11	180-210	244-285
Tie Rod Clamp Nuts	—	130-150	176-203
Ball Stud-to-Steering Arm Stud Nuts	—	245-260	332-353
Steering Stop Locknuts	—	103-111	140-150
Leveling Valve Bracket Capscrew	M8 x 1.25	18-26	25-35

Table D: Lubricants

Item	Lubricant Specification
Tie Rod Ends, Relay Arm Bearing, Idler Arm Bearing	Meritor Specification O-617-A or equivalent, Multi-Purpose Chassis Grease, 6% 12-hydroxy lithium stearate grease, NLGI Grade 1, preferred
	Meritor Specification O-617-B or equivalent, Multi-Purpose Chassis Grease, 8% 1-hydroxy lithium stearate grease, NLGI Grade 2, acceptable

10 Special Tools

Tool Drawings

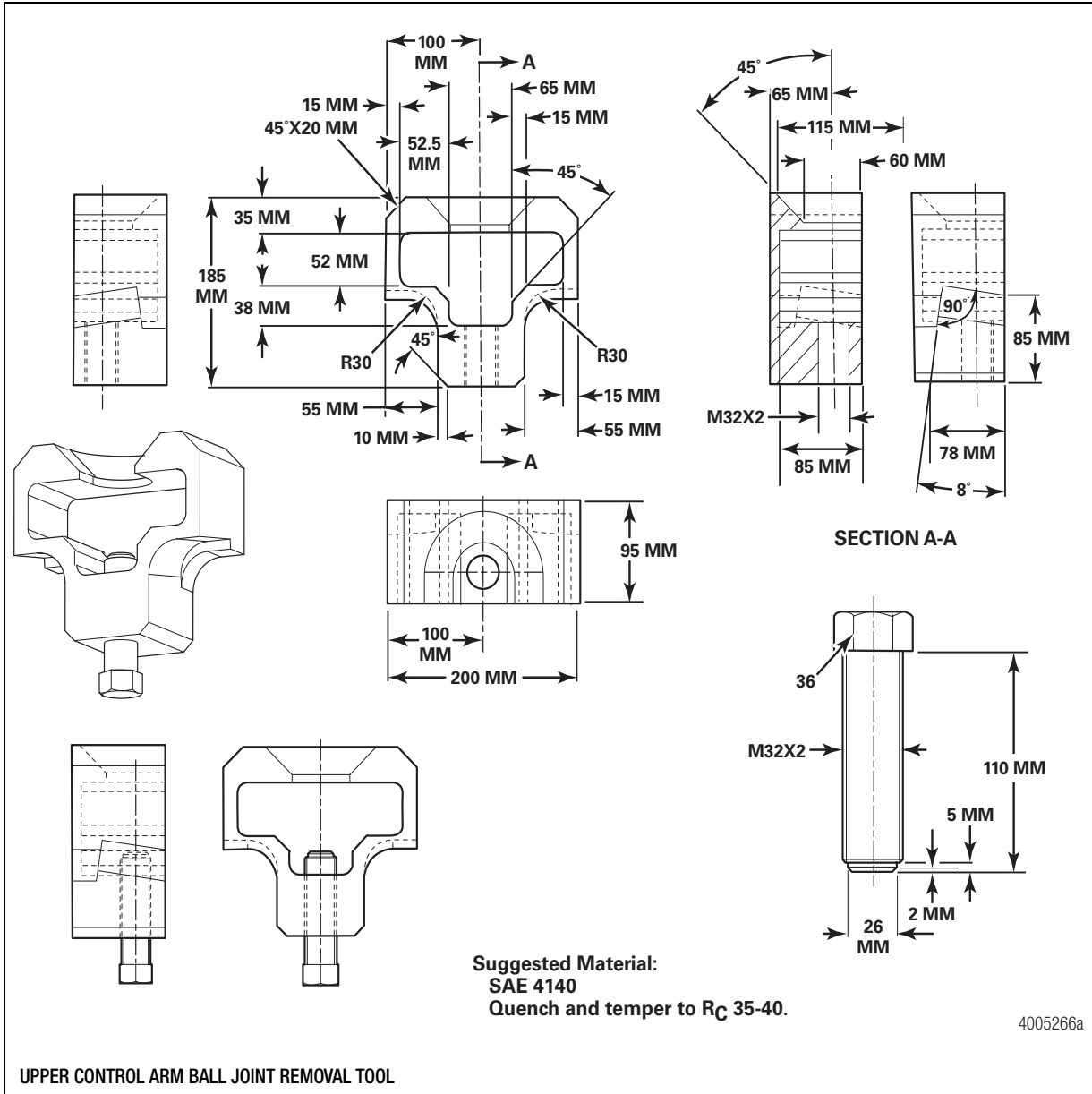


Figure 10.1

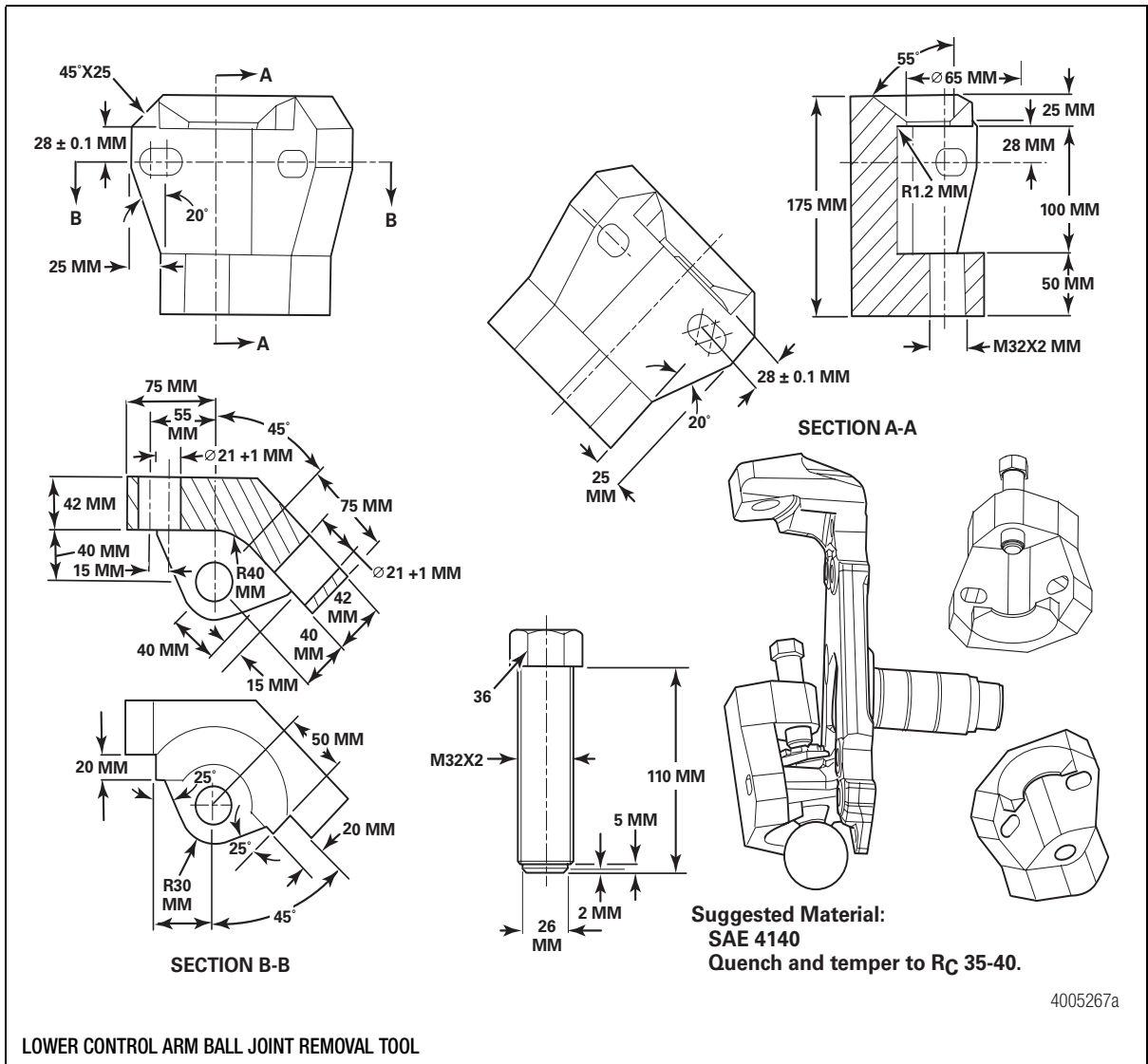
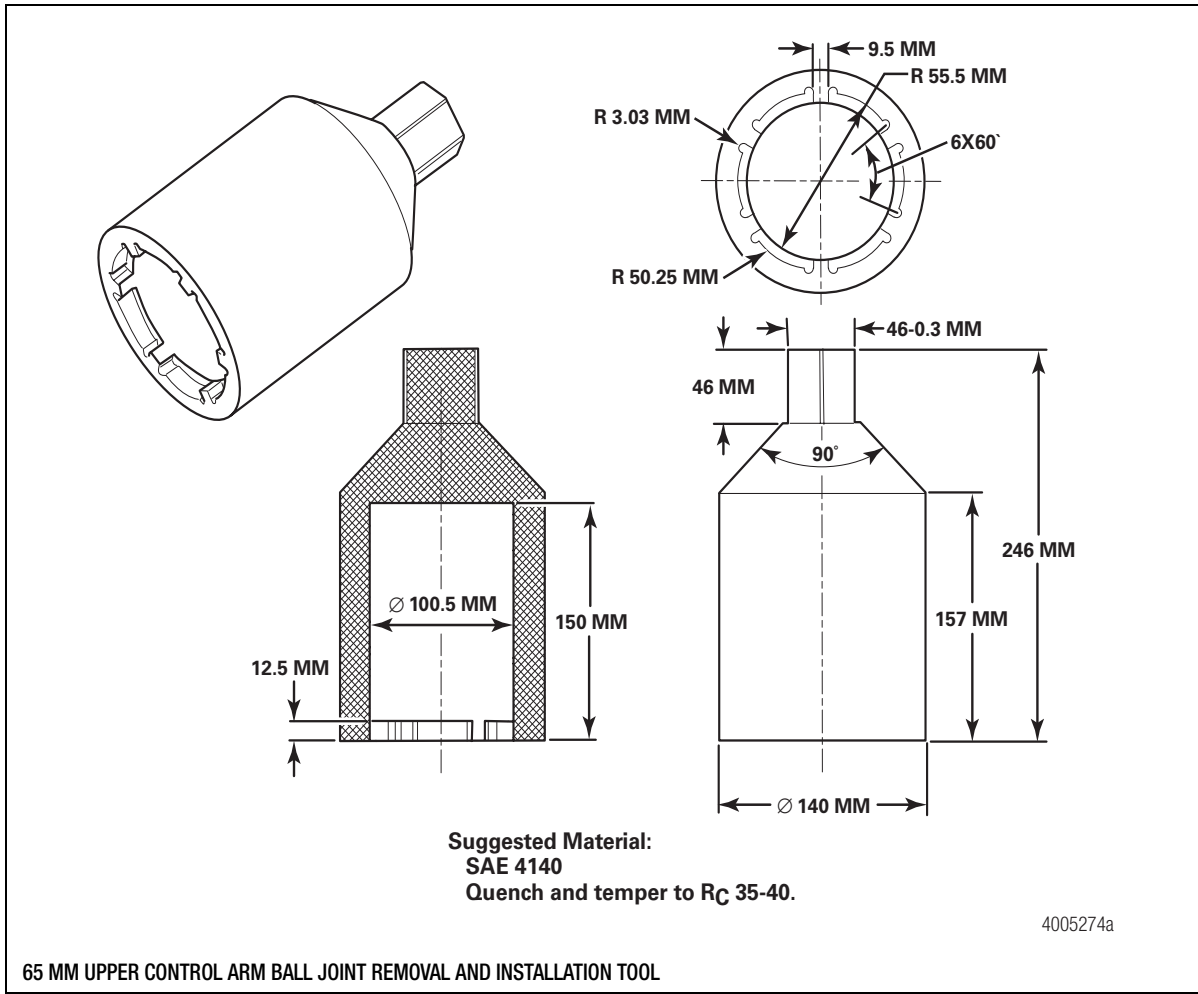


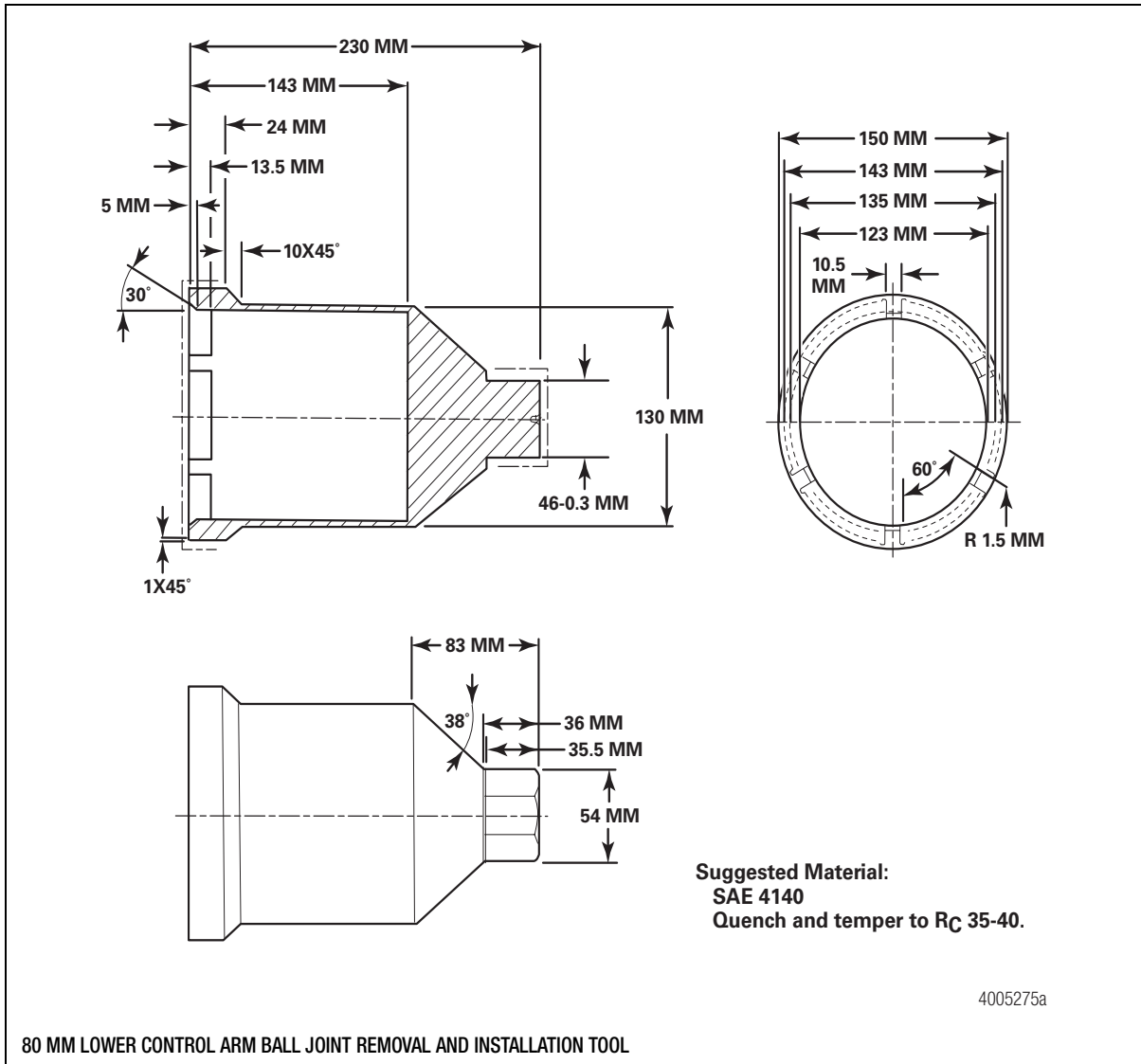
Figure 10.2

10 Special Tools



65 MM UPPER CONTROL ARM BALL JOINT REMOVAL AND INSTALLATION TOOL

Figure 10.3



80 MM LOWER CONTROL ARM BALL JOINT REMOVAL AND INSTALLATION TOOL

Figure 10.4

10 Special Tools

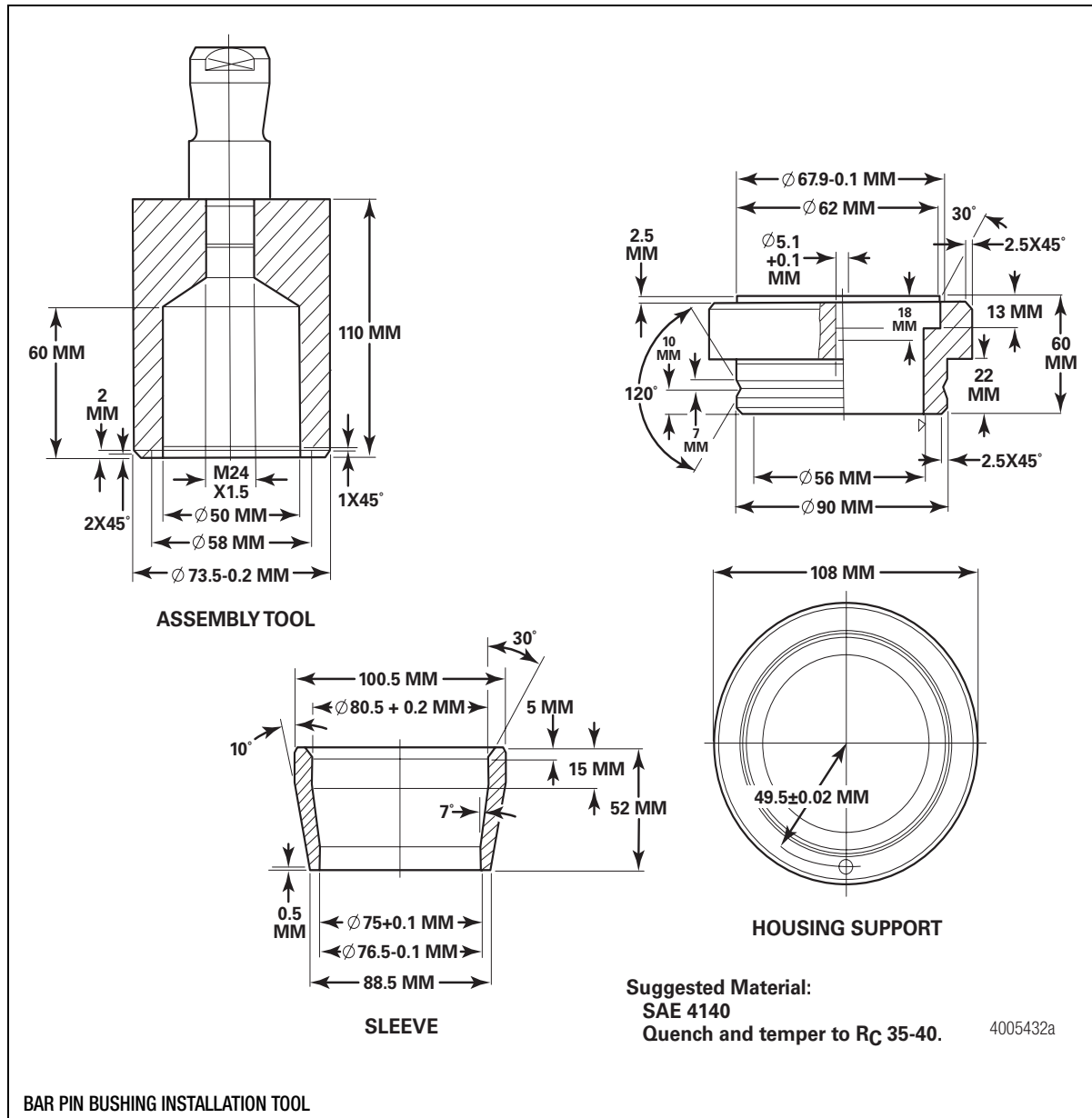


Figure 10.5

Spanner Socket

The spanner socket for the relay arm and idler arm assemblies is available from the following.

- SKF, part number HN 8-9
- Snap-on®, part number 58695C



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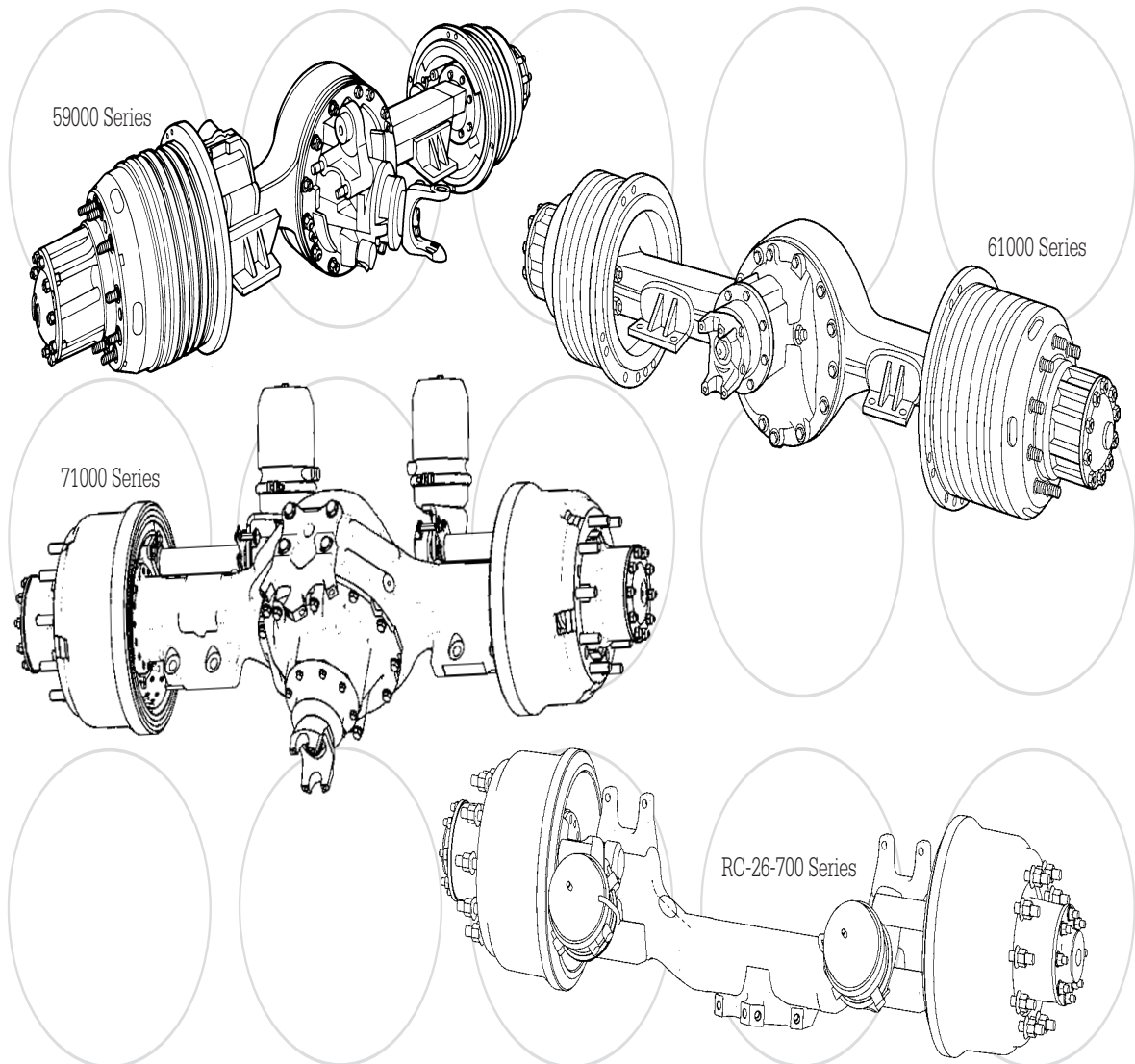


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Maintenance Manual 23A

Bus and Coach Rear Axles

Revised 03-05



Service Notes

About This Manual

This manual provides maintenance and service information for the Meritor 59000, 61000, 71000, RC-23-160 and RC-26-700 Series bus and coach rear and center axles and T Series parking brake.

Before You Begin

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


Hazard Alert Messages and Torque Symbols

WARNING

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

CAUTION

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

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

How to Obtain Additional Maintenance and Service Information

On the Web

Visit the DriveTrain Plus™ by ArvinMeritor Tech Library at arvinmeritor.com to easily access product and service information. The Library also offers an interactive and printable Literature Order Form.

ArvinMeritor's Customer Service Center

Call ArvinMeritor's Customer Service Center at 800-535-5560.

Technical Electronic Library on CD

The DriveTrain Plus™ by ArvinMeritor Technical Electronic Library on CD contains product and service information for most Meritor and Meritor WABCO products. \$20. Specify TP-9853.

How to Obtain Tools, Supplies and Brake Conversion Kits Specified in This Manual

Call ArvinMeritor's Commercial Vehicle Aftermarket at 888-725-9355 to obtain Meritor tools and supplies. Lined shoe kits and brake hardware kits are available. You also can obtain the following conversion kits.

- A kit to convert Q Series cam brake shoes (except models with cast shoes) to Q Series brakes with "quick change" shoes
- A kit to convert standard 16.5-inch Q Series cam brakes to Q Plus™ cam brakes

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

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Asbestos and Non-Asbestos Fibers

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 ArvinMeritor.

Hazard Summary

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

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

Recommended Work Practices

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

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

2. Respiratory Protection. Wear a respirator equipped with a high-efficiency (HEPA) filter approved by NIOSH or MSHA for use with asbestos at all times when servicing brakes, beginning with the removal of the wheels.
3. Procedures for Servicing Brakes.
 - a. Enclose the brake assembly within a negative pressure enclosure. The enclosure should be equipped with a HEPA vacuum and worker arm sleeves. With the enclosure in place, use the HEPA vacuum to loosen and vacuum residue from the brake parts.
 - b. As an alternative procedure, use a catch basin with water and a biodegradable, non-phosphate, water-based detergent to wash the brake drum or rotor and other brake parts. The solution should be applied with low pressure to prevent dust from becoming airborne. Allow the solution to flow between the brake drum and the brake support or the brake rotor and caliper. The wheel hub and brake assembly components should be thoroughly wetted to suppress dust before the brake shoes or brake pads are removed. Wipe the brake parts clean with a cloth.
 - c. If an enclosed vacuum system or brake washing equipment is not available, employers may adopt their own written procedures for servicing brakes, provided that the exposure levels associated with the employer's procedures do not exceed the levels associated with the enclosed vacuum system or brake washing equipment. Consult OSHA regulations for more details.
 - d. Wear a respirator equipped with a HEPA filter approved by NIOSH or MSHA for use with asbestos when grinding or machining brake linings. In addition, do such work in an area with a local exhaust ventilation system equipped with a HEPA filter.
 - e. **NEVER** use compressed air by itself, dry brushing, or a vacuum not equipped with a HEPA filter when cleaning brake parts or assemblies. **NEVER** use carcinogenic solvents, flammable solvents, or solvents that can damage brake components as wetting agents.
4. Cleaning Work Areas. Clean work areas with a vacuum equipped with a HEPA filter or by wet wiping. **NEVER** use compressed air or dry sweeping to clean work areas. When you empty vacuum cleaners and handle used rags, wear a respirator equipped with a HEPA filter approved by NIOSH or MSHA for use with asbestos. When you replace a HEPA filter, wet the filter with a fine mist of water and dispose of the used filter with care.
5. Worker Clean-Up. After servicing brakes, wash your hands before you eat, drink or smoke. Shower after work. Do not wear work clothes home. Use a vacuum equipped with a HEPA filter to vacuum work clothes after they are worn. Launder them separately. Do not shake or use compressed air to remove dust from work clothes.
6. Waste Disposal. Dispose of discarded linings, used rags, cloths and HEPA filters with care, such as in sealed plastic bags. Consult applicable EPA, state and local regulations on waste disposal.

Regulatory Guidance

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

NON-ASBESTOS FIBERS WARNING

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

Hazard Summary

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

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

Recommended Work Practices

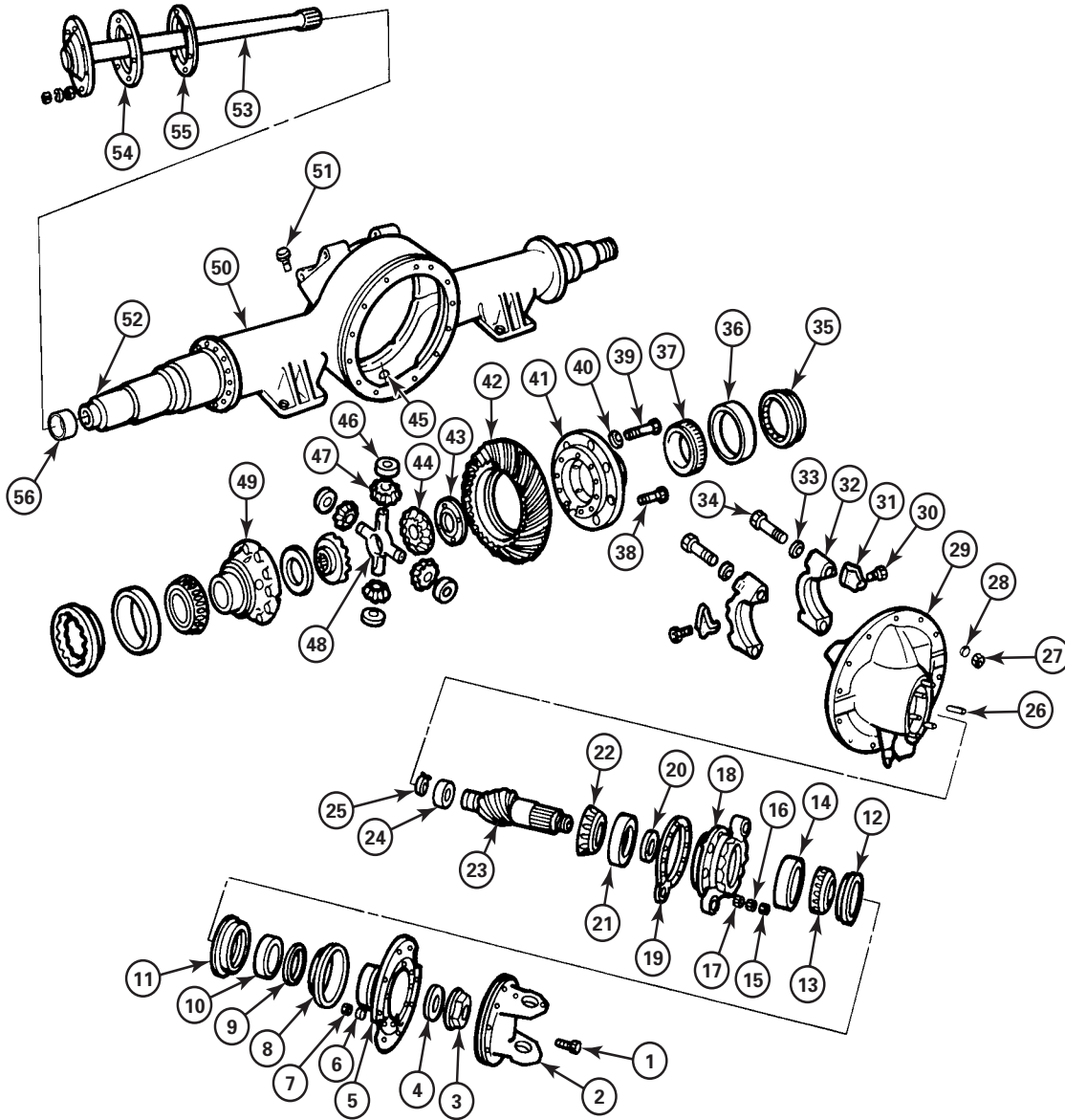
1. Separate Work Areas. Whenever feasible, service brakes in a separate area away from other operations to reduce risks to unprotected persons.
 2. Respiratory Protection. OSHA has set a maximum allowable level of exposure for silica of 0.1 mg/m³ as an 8-hour time-weighted average. Some manufacturers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

Regulatory Guidance

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

1 Exploded Views

59000 Series Rear Axle



4001366a

1 Exploded Views

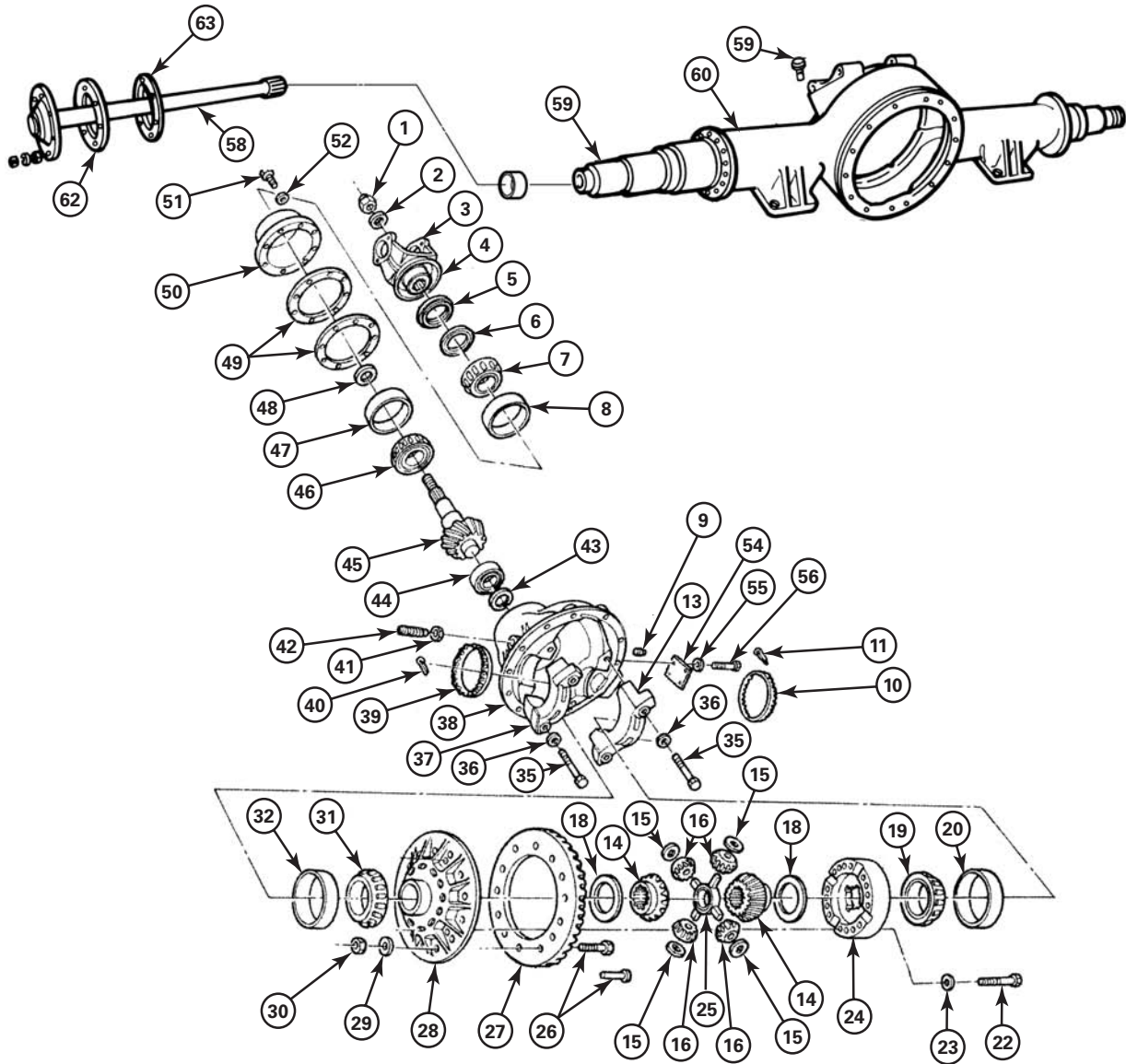
Item	Description
1	Bolt
2	Propeller Shaft Yoke Flange
3	Pinion Nut
4	Washer
5	Differential Companion Flange
6	Washer
7	Flange Nut
8	Dust Wiper
9	Oil Seal
10	Oil Seal Wiper
11	Oil Deflector
12	Oil Seal Retainer
13	Outer Bearing Cone
14	Outer Bearing Cup
15	Nut
16	Washer
17	Dowel
18	Pinion Cage, Spider
19	Shim*
20	Spacer*
21	Inner Bearing Cup
22	Inner Bearing Cone
23	Drive Pinion
24	Rear Bearing
25	Lock Ring
26	Spider Stud
27	Nut
28	Washer
29	Differential Carrier
30	Lock Bolt
31	Adjusting Ring Lock
32	Bearing Cap
33	Washer
34	Differential Bearing Capscrew
35	Adjusting Ring

Item	Description
36	Differential Bearing Cup
37	Differential Bearing Cone
38	Drive Gear Capscrew
39	Differential Case Capscrew
40	Washer
41	Differential Left-Half Case
42	Drive Gear
43	Side Gear Thrust Washer
44	Side Gear
45	Magnetic Drain Plug
46	Pinion Thrust Washer
47	Differential Side Pinion
48	Spider
49	Differential Right-Half Case
50	Axle Housing
51	Breather
52	Load Tube
53	Axle Shaft
54	Gasket
55	Grease Seal, Optional
56	Grease Seal Sleeve, Optional

* Thickness as required

1 Exploded Views

61000 Series Rear Axle



4001367a

1 Exploded Views

Item	Description
1	Drive Pinion Nut
2	Drive Pinion Washer
3	Input Yoke or Flange
4	Deflector
5	POSE™ Seal
6	Triple Lip or Main Seal
7	Outer Bearing Cone
8	Inner Bearing Cup
9	Plug ¹
10	Right-Half Adjusting Ring
11	Adjusting Ring Cotter Pin
12	Not Applicable
13	Not Applicable
14	Differential Side Gears
15	Differential Pinion Thrust Washers
16	Differential Pinions
18	Differential Side Gear Thrust Washers
19	Differential Right-Half Bearing Cone
20	Differential Right-Half Bearing Cup
22	Differential Case Capscrew
23	Differential Case Washers
24	Main Differential Case, Plain Half
25	Differential Spider
26	Ring Gear-to-Case Half Bolts or Rivets ²
27	Ring Gear, Pinion Drive Gear
28	Main Differential Case, Flange Half
29	Ring Gear Bolt Washer
30	Ring Gear Bolt Nut
31	Differential Left-Half Bearing Cone
32	Differential Left-Half Bearing Cup
35	Differential Bearing Cap Capscrews
36	Washers
37	Differential Left-Half Bearing Cap
38	Carrier
39	Adjusting Ring
40	Adjusting Ring Cotter Pin

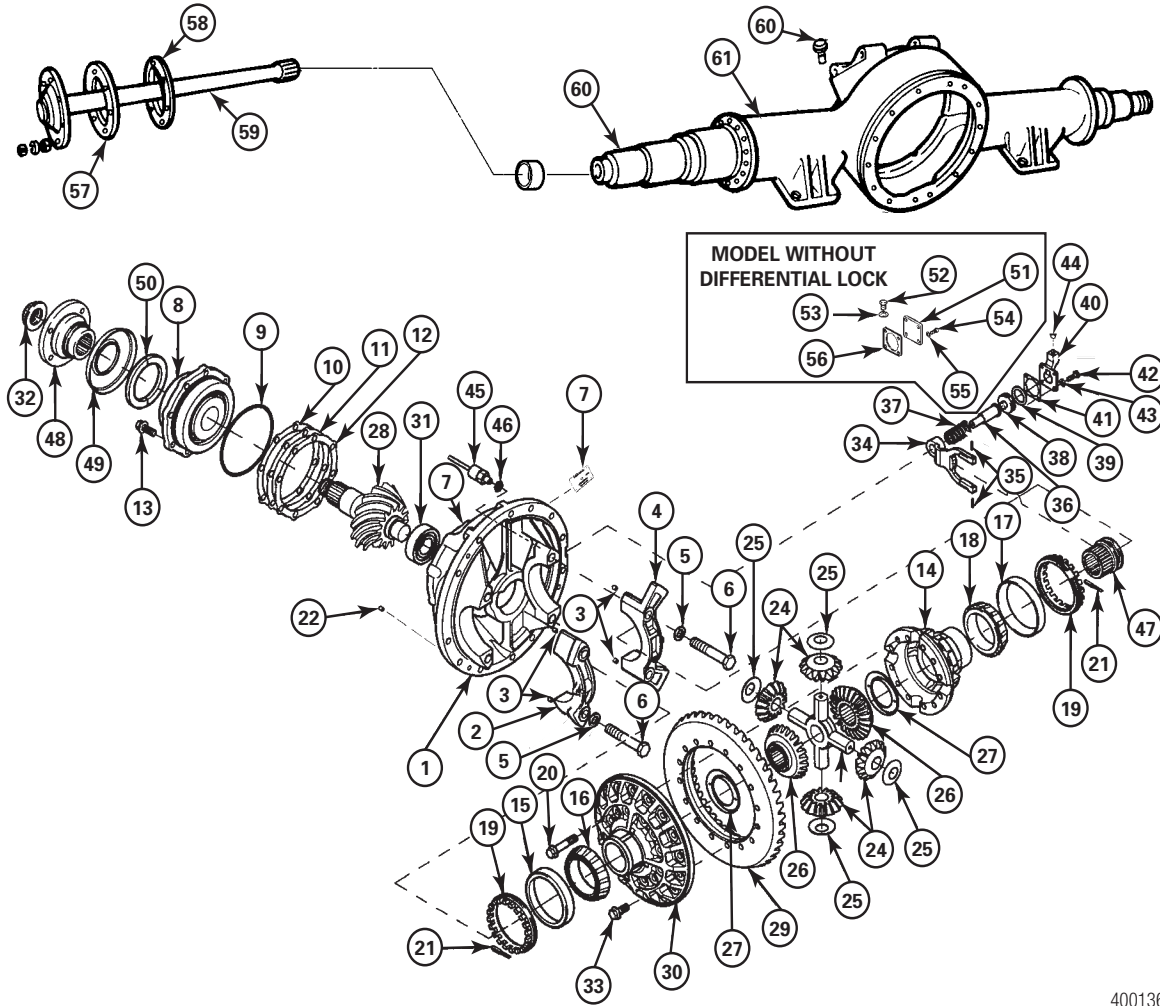
Item	Description
41	Thrust Screw Jam Nut ¹
42	Thrust Screw ¹
43	Snap Ring
44	Spigot Bearing
45	Drive Pinion
46	Pinion Inner Bearing Cone
47	Pinion Inner Bearing Cup
48	Pinion Bearing Spacer ²
49	Shims ²
50	Drive Pinion Bearing Cage
51	Bearing Cage Capscrew
52	Washer
54	Bolt-On Cover ¹
55	Washer ¹
56	Bolt ¹
58	Axle Shaft
59	Load Tube
60	Axle Housing
61	Breather
62	Gasket
63	Grease Seal, Optional
64	Grease Seal Sleeve, Optional

¹ Not available on all designs

² Thickness as required

1 Exploded Views

71000 Series Rear Axle



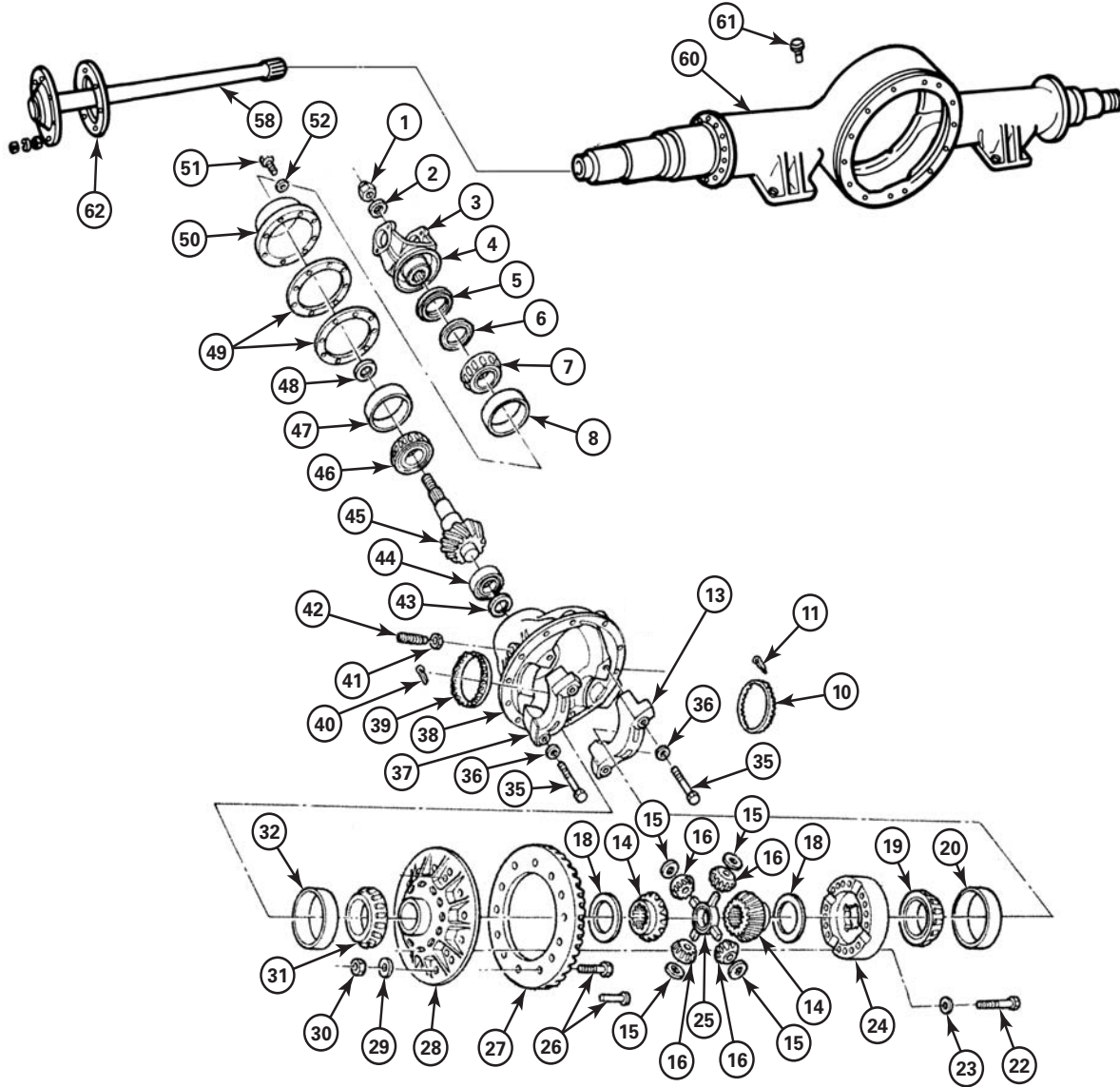
4001368b

1 Exploded Views

Item	Description	Item	Description
1	Carrier	36	Shift Shaft
2	Left-Half Bearing Cap	37	Shift Shaft Spring
3	Pin	38	Piston
4	Right-Half Bearing Cap	39	Piston O-Ring
5	Bearing Cap Washer	40	Cylinder End Cover
6	Bearing Cap Capscrew	41	Cylinder Cover Gasket
7	Identification Plate	42	Cover Capscrew
8	Pinion Bearing Cage	43	Cover Capscrew Washer
9	O-Ring, Pinion Cage	44	Plug
10	Pinion Cage Shim	45	Sensor Switch
11	Pinion Cage Shim	46	Locknut Sensor Switch
12	Pinion Cage Shim	47	Clutch Collar
13	Pinion Cage Capscrew	48	Companion Flange
14	Plain Half Differential Case	49	Deflector
15	Differential Left-Half Bearing Cup	50	Pinion-Pac Seal
16	Differential Left-Half Bearing Cone		Model Without Differential Lock
17	Differential Right-Half Bearing Cup	51	End Cover
18	Differential Right-Half Bearing Cone	52	Sensor Switch Hole Blanking Plug
19	Adjusting Ring	53	Washer Plug
20	Differential Case Screw	54	End Cover Capscrew
21	Cotter Pin	55	End Cover Capscrew Washer
22	Plug	56	End Cover Gasket
23	Differential Spider	57	Gasket
24	Differential Pinion	58	Grease Seal, Optional
25	Differential Pinion Thrust Washer	59	Axle Shaft
26	Differential Side Gear	60	Load Tube
27	Side Gear Thrust Washer	61	Axle Housing
28	Drive Pinion		
29	Drive Gear		
30	Flange Half Differential Case		
31	Pinion Spigot Bearing		
32	Drive Pinion Nut		
33	Drive Gear Screw		
34	Shift Fork		
35	Shift Fork Pin		

1 Exploded Views

RC-23-160 Series Rear Axle



4001369a

1 Exploded Views

Item	Description
1	Drive Pinion Nut
2	Drive Pinion Washer
3	Input Yoke or Flange
4	Deflector
5	POSE™ Seal
6	Triple Lip or Main Seal
7	Outer Bearing Cone
8	Inner Bearing Cup
9	Not Applicable
10	Right-Half Adjusting Ring
11	Adjusting Ring Cotter Pin
12	Not Applicable
13	Not Applicable
14	Differential Side Gears
15	Differential Pinion Thrust Washers
16	Differential Pinions
18	Differential Side Gear Thrust Washers
19	Differential Right-Half Bearing Cone
20	Differential Right-Half Bearing Cup
22	Differential Case Capscrew
23	Differential Case Washers
24	Main Differential Case, Plain Half
25	Differential Spider
26	Bolts or Rivets — Ring Gear-to-Case Half ¹
27	Ring Gear, Pinion Drive Gear
28	Main Differential Case, Flange Half
29	Ring Gear Bolt Washer
30	Ring Gear Bolt Nut
31	Differential Left-Half Bearing Cone
32	Differential Left-Half Bearing Cup
35	Differential Bearing Cap Capscrews
36	Washers
37	Differential Left-Half Bearing Cap
38	Carrier

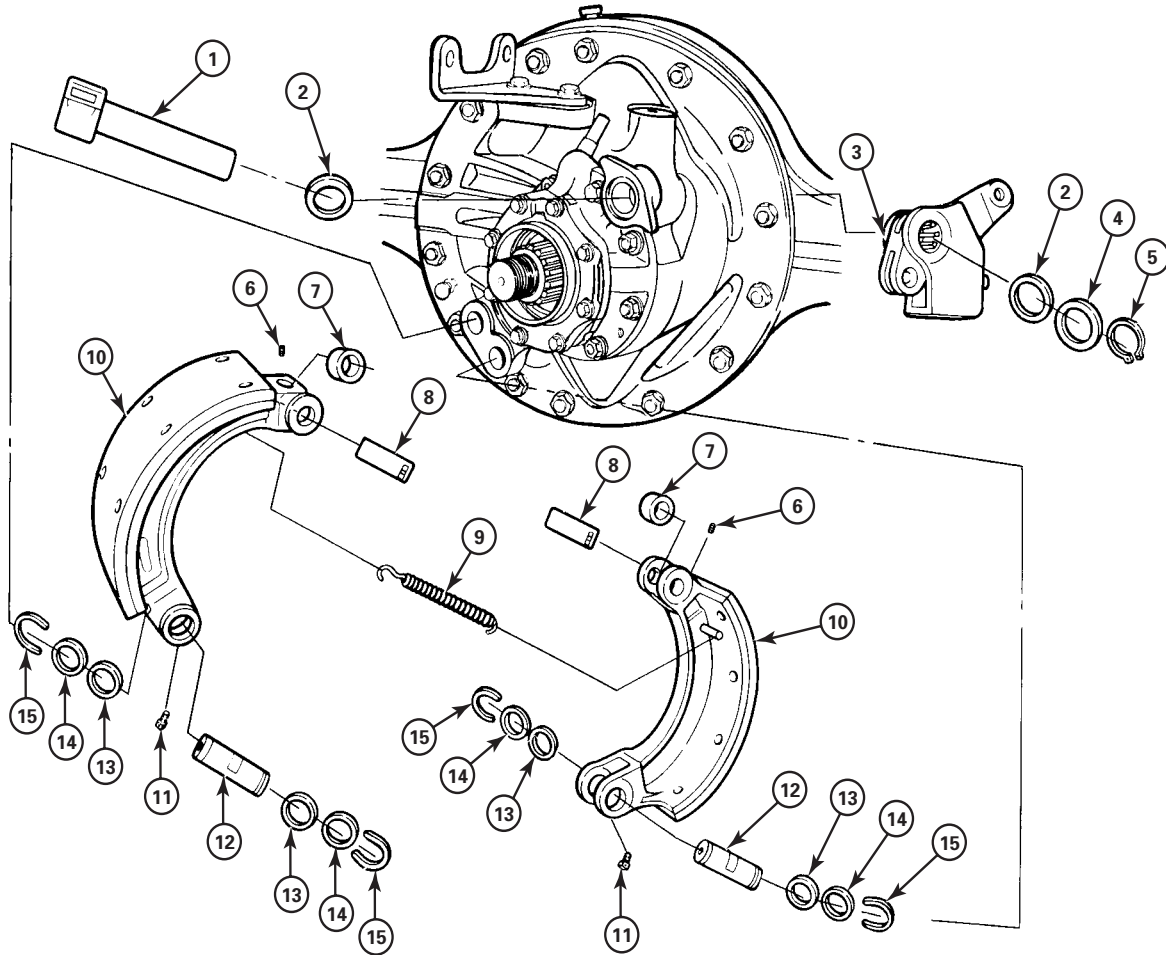
Item	Description
39	Adjusting Ring
40	Adjusting Ring Cotter Pin
41	Thrust Screw Jam Nut ²
42	Thrust Screw ²
43	Snap Ring
44	Spigot Bearing
45	Drive Pinion
46	Pinion Inner Bearing Cone
47	Pinion Inner Bearing Cup
48	Pinion Bearing Spacer ¹
49	Shims ¹
50	Drive Pinion Bearing Cage
51	Bearing Cage Capscrew
52	Washer
53	Not Applicable
54	Not Applicable
55	Not Applicable
56	Not Applicable
58	Axle Shaft
59	Not Applicable
60	Axle Housing
61	Breather
62	Gasket

¹ Thickness as required

² Not available on all designs

1 Exploded Views

T Series Parking Brake — 59000 Series Rear Axle



4001370a

Item	Description
1	Camshaft
2	Washer
3	Adjuster Assembly
4	Washer
5	Snap Ring
6	Set Screw
7	Cam Roller
8	Shaft
9	Spring

Item	Description
10	Brake Shoe Assembly
11	Lock Screw
12	Anchor Pin
13	Oil Seal
14	Oil Seal Retainer
15	Anchor Pin Lock

2 Introduction

Models Covered

59722	59843	61143	71163
59723	61042	61152	RC-23-160
59732	61043	61153	RC-26-700
59733	61052	61162	T Series Parking Brake
59752	61053	61163	
59753	61063	71063	
59842	61142	71162	

Description

Rear Axles

The Meritor bus and coach rear drive axles are available in the 59000, 61000, 71000 and RC-23-160 Series.

59000 Series

- Spiral bevel gearing is used in an angle drive carrier. The pinion is at a 63 angle to the axis of the axle shafts.
- Optional conventional single-reduction and double-reduction carriers with hypoid gearing are also available.
- A driveline parking brake is installed on the flange of some angle drive carriers.
- The housing is designed with replaceable axle tubes at the wheel spindles. Figure 2.1.

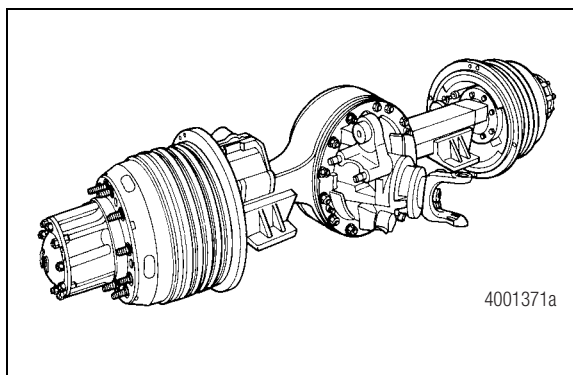


Figure 2.1

61000 Series

- The single-reduction carrier is combined with a hypoid drive pinion and a ring gear.
- Optional double-reduction carriers are also available.
- The housing is designed with replaceable axle tubes at the wheel spindles.
- The housing has weld-on torque rod brackets. Figure 2.2.

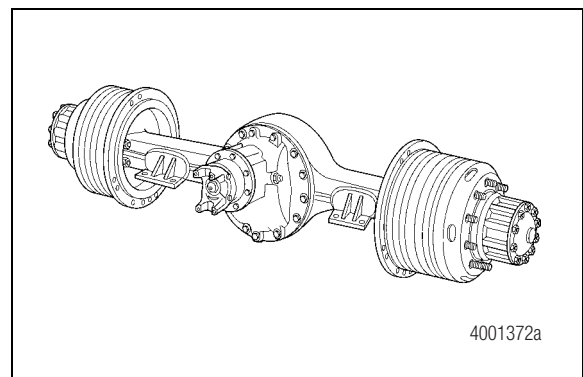


Figure 2.2

2 Introduction

71000 Series

- The single-reduction carrier is combined with a hypoid drive pinion and a ring gear.
- The housing is designed with replaceable axle tubes at the wheel spindles.
- The housing has bolt-on torque rod brackets. Figure 2.3.

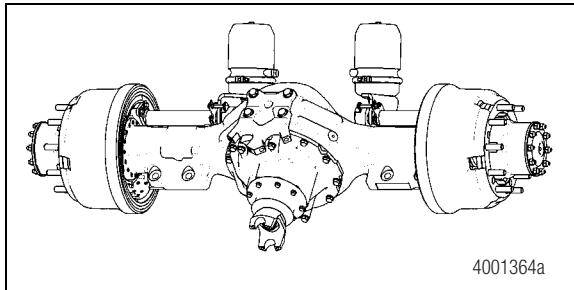


Figure 2.3

RC-23-160 Series

- The single-reduction carrier is combined with a hypoid drive pinion and a ring gear.
- The housing is designed without replaceable axle tubes at the wheel spindles. Figure 2.2.

Center Axles

The Meritor bus and coach center axles are available in the 61000, 71000 and RC-26-700 Series.

61000 and 71000 Series

- Center axles are identical to the 61000 and 71000 Series drive axles except without carriers or axle shafts.
- The spindle ends are capped so only the wheel end is filled with lubricant.
- A hubcap is used to keep lubricant in the wheel end instead of an axle shaft. Figure 2.4.

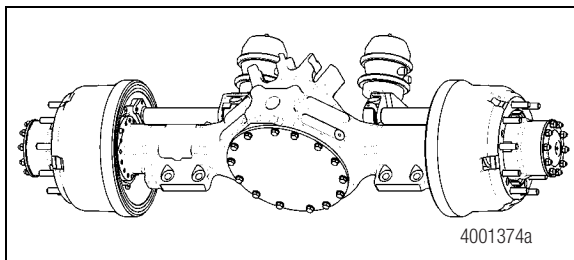


Figure 2.4

RC-26-700 Series

- Tubular deep-drop axles are designed for low floor applications. Figure 2.5.

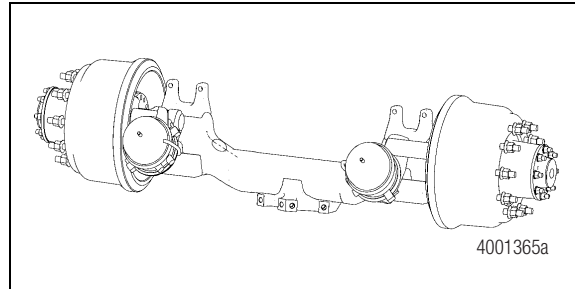


Figure 2.5

T Series Parking Brake

The 59000 Series parking brake is a Meritor T Series brake installed on the drive pinion bearing cage in the differential carrier.

- An air chamber with an automatic slack adjuster is attached to the parking brake camshaft.
- A brake drum is installed on the yoke flange.
- The brake assembly has an outer diameter of 12-inches (304 mm).
- The brake shoes are 4.5-inches (114 mm) wide. Figure 2.6.

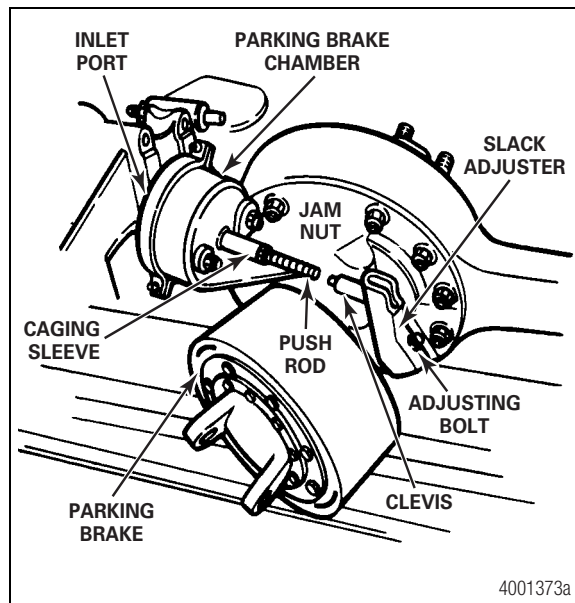


Figure 2.6

2 Introduction

When the slack adjuster push rod moves, the camshaft rotates and moves the brake shoes against the drum.

Anchor pins allow the brake shoes to move. The anchor pins are fastened to the bearing cage with a lock screw and a lock wire. Each anchor pin has a replaceable bushing. A roller is installed into the cam end of each brake shoe. Rivets fasten a one-piece lining to each shoe. Figure 2.7.

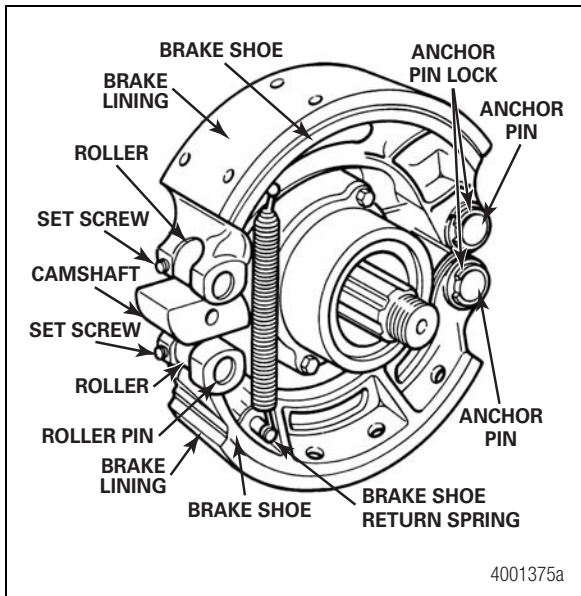


Figure 2.7

The camshaft is installed into bushings in the drive pinion bearing cage and the differential carrier. A fitting lubricates each bushing. The adjusting lever is installed onto the splined end of the camshaft. Figure 2.7.

Identification

Table A: Number Cross Reference

Previous Number	Current Number
59732	59752
59733	59753
61132	61152
61143	61153
	RC-23-160

An identification tag is located on the axle housing or the differential carrier. Use the model number and the ratio number marked on the tag to order replacement parts. Figure 2.8.

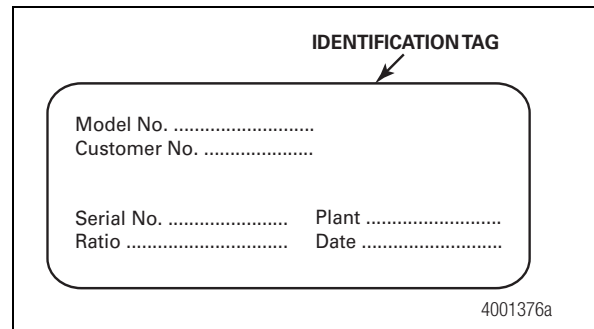


Figure 2.8

The model number designation for the 59000, 61000 and 71000 Series axles are identified in Figure 2.9 and Figure 2.10.

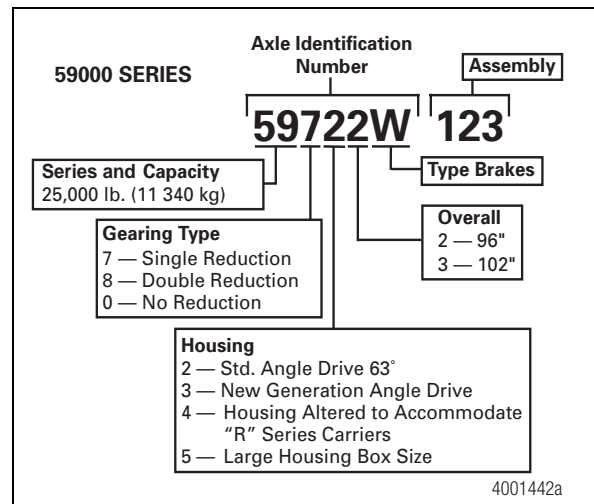


Figure 2.9

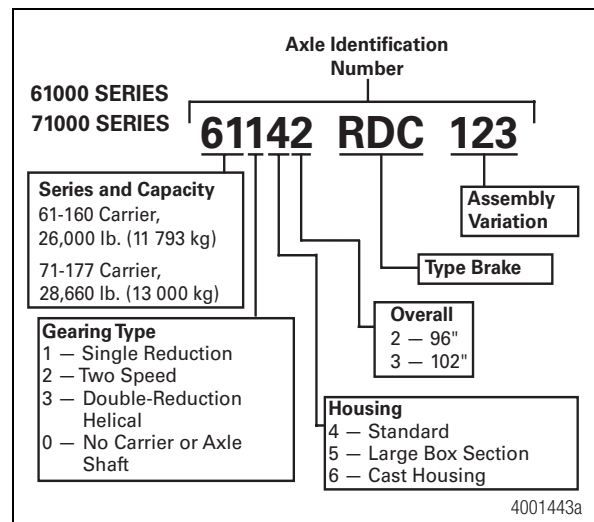


Figure 2.10

2 Introduction

The RC-23-160 coach rear axle is identified by a letter and number system that provides information about the specific axle model. The first seven positions of the designation identify a basic axle model. The second group of letters and numbers identify complete axle specifications. Figure 2.11.

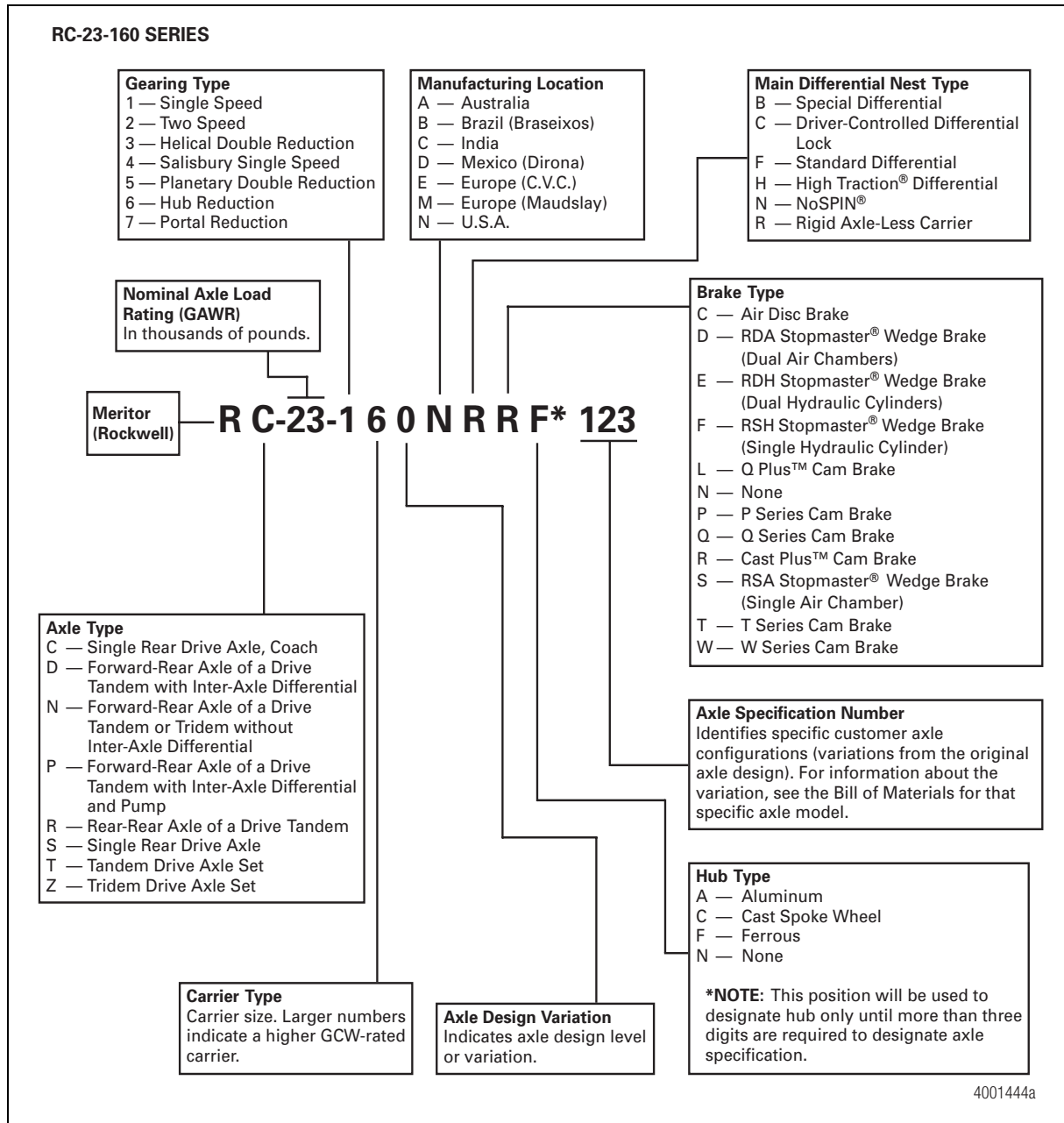


Figure 2.11

3 Removal and Disassembly

Hazard Alert Messages

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

⚠ WARNING


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

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

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

Removal

Differential Carrier from the Axle Housing

1. Park the vehicle on a level surface. Block the wheels not being serviced 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. Place a drain pan under the axle housing.
4. Remove the drain plug from the bottom of the axle housing. Drain the lubricant from the assembly. Install the drain plug and tighten it to 35 lb-ft (47 N•m). 

⚠ WARNING

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

5. Cage the spring in the parking brake air chamber. Refer to the air chamber manufacturer's procedure.
6. Remove the stud nuts and washers from the flanges of both axle shafts. Figure 3.1.

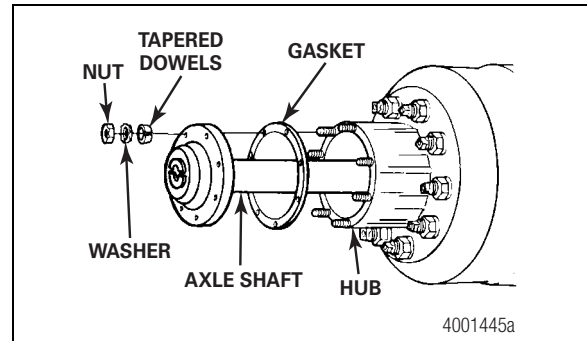


Figure 3.1

⚠ WARNING

Do not strike the round driving lugs on the flange of an axle shaft. Pieces can break off and cause serious personal injury.

⚠ CAUTION

Do not use a chisel or wedge to loosen the axle shafts and the dowels. Damage to the hub, the axle shafts and, if used, the oil seals can result.

7. If used, loosen the tapered dowels in the flanges of both axle shafts.
 - A. Hold a 1.5-inch (38.1 mm) diameter brass drift or brass hammer against the center of the axle shaft inside the round driving lugs. Figure 3.2.
 - B. Use a five-six lb (2.3-2.7 kg) hammer to strike the end of the drift to loosen the axle shaft and tapered dowels.

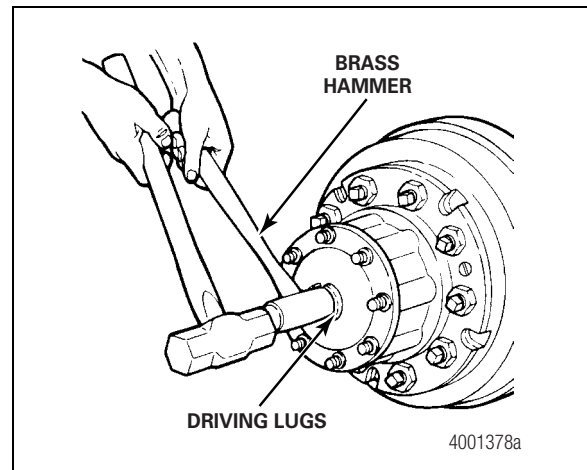


Figure 3.2

3 Removal and Disassembly

8. Remove the tapered dowels. Remove both axle shafts from the axle assembly.
9. Disconnect the drive shaft from the yoke.
10. Disconnect the air lines and the electrical connectors.
11. Place a hydraulic roller jack under the differential carrier to support the assembly. Figure 3.3.

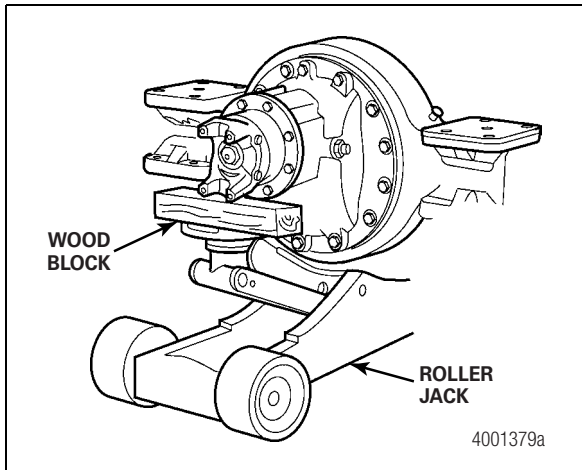


Figure 3.3

NOTE: Two capscrews or stud nuts and washers in the TOP of the carrier housing secure the carrier.

12. Remove all of the capscrews or stud nuts and washers that secure the carrier to the axle housing, except the two fasteners in the TOP of the carrier.
13. Loosen the two fasteners in the TOP of the carrier, but do not remove them.
14. Loosen the differential carrier by striking the mounting flange at several points with a leather mallet. Remove the two fasteners in the TOP of the carrier that secure the carrier to the axle housing.
15. Use a hydraulic roller jack and a pry bar with a round end to remove the carrier from the axle housing. Take care when you use the pry bar so that you don't damage the carrier or the housing flange.

⚠ WARNING

To avoid serious personal injury and damage to components, take care when using lifting devices during service and maintenance procedures. Inspect a lifting strap to ensure that it is not damaged. Do not subject the lifting straps to shocks or drop-loading.

NOTE: A carrier stand is available from SPX Kent-Moore. Refer to the Service Notes page on the front inside cover of this manual to obtain the stand.

16. Use a lifting tool to lift the differential carrier by the input yoke or the flange and place the assembly into a carrier repair stand. Figure 3.4.

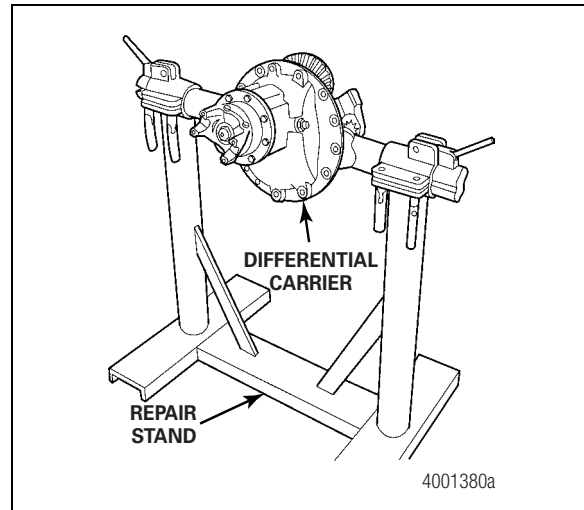


Figure 3.4

17. Place a holding tool on the yoke. Remove the nut that secures the yoke to the input shaft. Remove the washer.
18. Use a puller tool to remove the yoke.

NOTE: The POSE™ seal will remain on the yoke or the flange as the yoke or the flange is removed from the carrier.

19. If a POSE™ seal is on the hub, remove it from the hub with your hand.
20. If equipped, remove the parking brake. Refer to the procedure in this section.

3 Removal and Disassembly

21. Disassemble and assemble the differential carrier. For disassembly and assembly procedures for single-reduction carriers, refer to Maintenance Manual 5 or 5A, Single-Reduction Differential Carriers, or Maintenance Manual MM-0140, Single-Reduction Differential Carrier, Series 7. For optional carriers, refer to Maintenance Manual 6, Double-Reduction Differential Carriers. To obtain these publications, refer to the Service Notes page on the front inside cover of this manual.

Axle Shafts from the Axle Housing

1. Park the vehicle on a level surface. Block the wheels not being serviced 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. For drive axles, remove the stud nuts and the washers from the flanges of both axle shafts. For center axles, remove the nuts and the washers from both hubcaps. Remove the hubcaps. Figure 3.5.

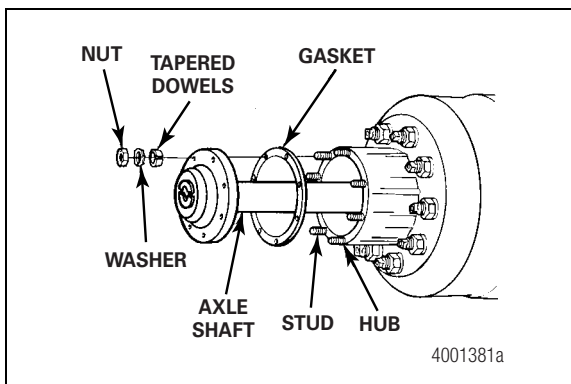


Figure 3.5

4. For drive axles, loosen the tapered dowels in the flanges of both axle shafts using one of the following methods.

Brass Drift Method

⚠ WARNING

Do not strike the round driving lugs on the flange of an axle shaft. Pieces can break off and cause serious personal injury.

1. Hold a 1-1/2-inch (38 mm) diameter brass drift or hammer against the center of the axle shaft, inside the round driving lugs. Figure 3.6.

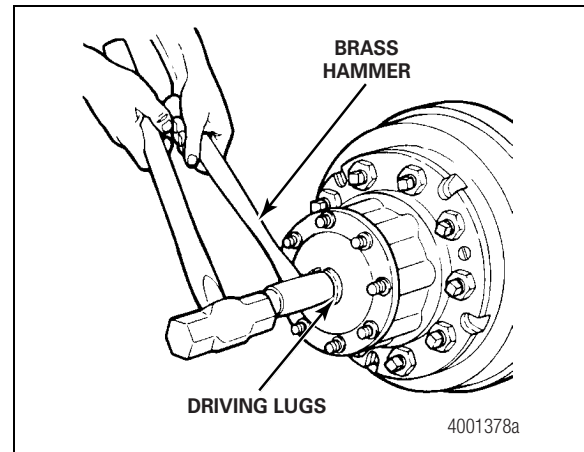


Figure 3.6

2. Use a five-six lb (2-3 kg) hammer to strike the end of the drift to loosen the axle shaft and the tapered dowels.
3. Mark each axle shaft before it is removed from the axle assembly.
4. Remove the tapered dowels and separate the axle shafts from the main axle hub assembly. Figure 3.5.
5. Install a cover over the open end of each axle assembly hub where an axle shaft was removed.

Air Hammer Vibration Method

⚠ WARNING

Wear safe eye protection when using an air hammer. When using power tools, axle components can loosen and break off causing serious personal injury.

⚠ CAUTION

Do not use a chisel or a wedge to loosen the axle shafts and the dowels. Damage to the hub, the axle shafts and, if used, the oil seals can result.

1. Use a round hammer bit and an air hammer to loosen the tapered dowels and the axle shaft.
2. Place the round hammer bit against the axle shaft, flange, between the hub studs. Operate the air hammer at alternate locations between the studs to loosen the tapered dowels and the axle shaft from the hub. Figure 3.7.

3 Removal and Disassembly

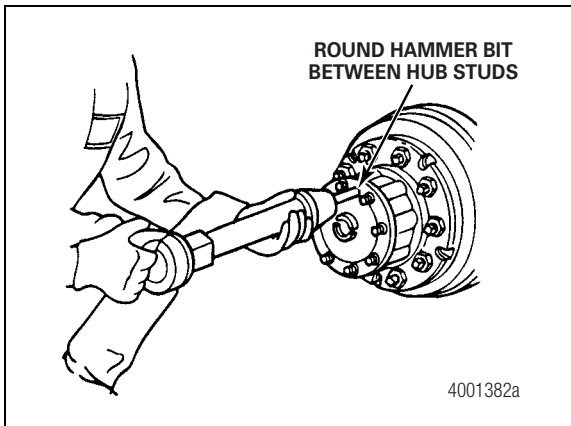


Figure 3.7

3. Mark each axle shaft before it is removed from the axle assembly.
4. Remove the tapered dowels and separate the axle shaft from the main axle hub assembly. Figure 3.6.

Hub and Drum Assembly or Hub and Rotor Assembly from the Axle Housing

⚠ WARNING

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

1. Cage the spring in the parking brake air chamber. Refer to the air chamber manufacturer's procedure.

⚠ WARNING

When you perform a wheel bearing adjustment, observe the following guidelines.

- Always use the correct size wrench socket.
- Always use a torque wrench to tighten the adjusting nuts to the correct adjusting torque.
- Do not tighten or loosen the adjusting nuts by hitting the nuts with a hammer or by hitting a chisel or a drift placed against the nuts with a hammer. Damage to the nuts can result. Damaged adjusting nuts can prevent a correct wheel bearing adjustment, cause possible loss of vehicle wheel-end equipment and cause serious personal injury.

2. For optional grease-lubricated wheel ends, remove the grease seal on the outboard end of the hub. Discard the seal. Figure 3.8.

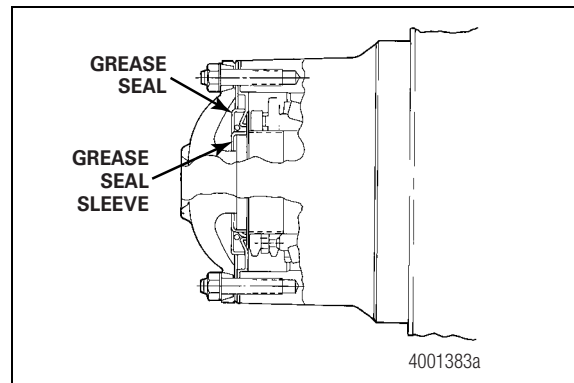


Figure 3.8

3. If equipped, straighten the stamped retainer from the outer wheel bearing nut. Remove the outer wheel bearing nut, stamped retainer, lock washer and inner wheel bearing nut from the spindle. Figure 3.9.

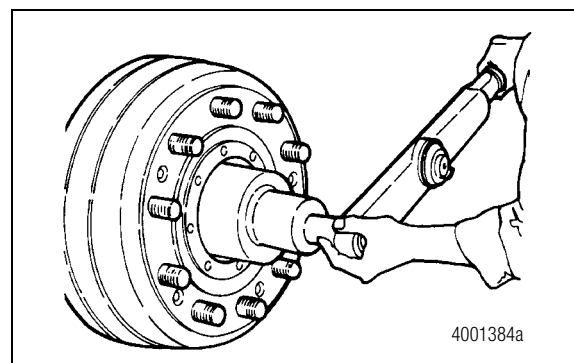


Figure 3.9

3 Removal and Disassembly

NOTE: You can remove the hub, drum or rotor, and wheel assembly as an assembly. To support the weight, use an appropriate wheel dolly.

4. Pull the hub, drum or rotor, and wheel assembly STRAIGHT off the spindle. If necessary, hit the inside of the wheel with a mallet to loosen it. Be careful that the outer bearing cone does not fall when the hub is removed.

Disassembly

⚠ WARNING

Observe all warnings and cautions provided by the press manufacturer to avoid damage to components and serious personal injury.

Hub Assembly Without ABS: 59000, 61000, 71000 and RC-26-700 Series

1. Remove the wheel and tire assembly from the hub.
2. To disassemble the drum from the hub, remove the flat-head capscrews from the drum, if equipped.

⚠ WARNING

Do not hit the wheel studs with a steel hammer or remove the studs by twisting. Damage to the parts can occur and metal fragments can cause serious personal injury.

3. If it is necessary to remove the wheel studs from the hub, remove the nuts from the inside of the hub flange. Remove the oil deflector, if equipped. Place the hub into a press with the drum mounting surface supported by the press. Press the studs through the hub. If a press is not available, use a brass hammer or a drift.
4. The wheel seal is in a seal retainer. If you are only removing the oil seal, use a long screwdriver to remove the oil seal from the hub. Discard the old seal. Figure 3.10.

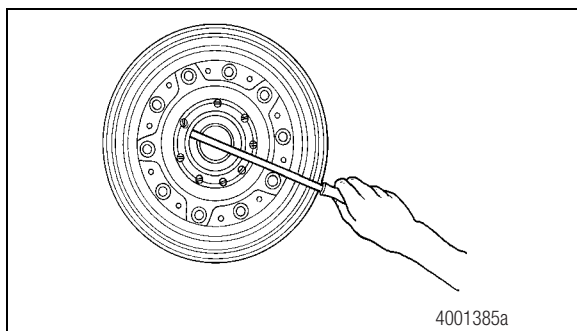


Figure 3.10

5. To remove the inner bearing cone, remove the screws that secure the seal retainer to the hub and remove the seal retainer.
6. Use a press and a sleeve, or a bearing puller, to remove the inner and the outer bearing cups from the hub. Remove the oil seal sleeve from the axle housing.
7. For optional grease-lubricated wheel ends, remove the grease seal sleeve from the end of the spindle.

Hub Assembly with ABS: 59000, 61000, 71000 and RC-26-700 Series

1. Remove the wheel and tire assembly from the hub.
2. To remove the drum from the hub, remove the flat-head capscrews from the drum, if equipped.
3. If it is necessary to remove the wheel studs from the hub, remove the nuts from the inside of the hub flange. Remove the oil deflector, if used. Place the hub into a press with the drum mounting surface supported by the press. Press the studs through the hub. Figure 3.11.

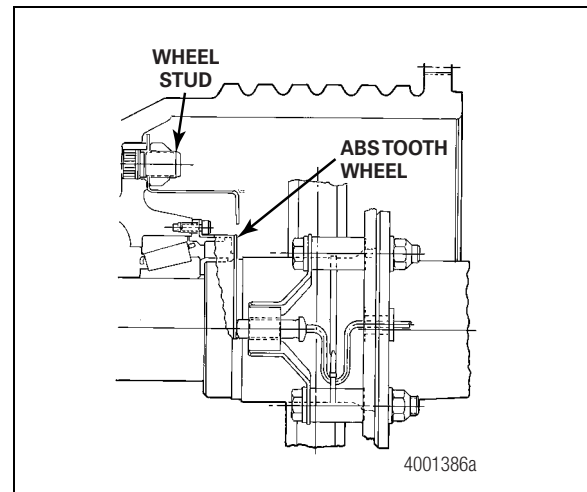


Figure 3.11

4. The wheel seal is located in a seal retainer located below the ABS tooth wheel. Remove the capscrews that secure the ABS tooth wheel and the seal retainer to the hub. Figure 3.11.
5. Use a press and a suitable driver to remove the oil seal from the seal retainer. Discard the old seal.
6. Remove the inner bearing cone from the hub.

3 Removal and Disassembly

7. Use a press and a sleeve, or a bearing puller, to remove the inner and the outer bearing cups from the hub.
8. Remove the oil seal sleeve from the axle housing.
9. For optional grease-lubricated wheel ends, remove the grease seal sleeve from the end of the spindle.

Hub Assembly with Drum Brakes: RC-23-160 Series

1. Remove the wheel and tire assembly from the hub.
2. Remove the brake drum.
3. 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. If a press is not available, use a brass hammer or a drift.

⚠ WARNING

Do not hit the wheel studs with a steel hammer or remove the studs by twisting. Damage to the parts can occur and metal fragments can cause serious personal injury.

4. If necessary, use a long screwdriver to remove the oil seal from the hub. Discard the oil seal. Figure 3.12.

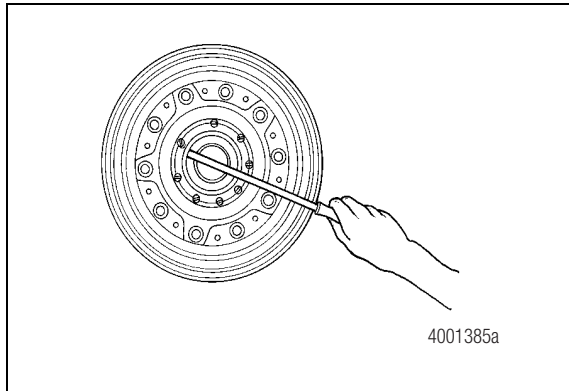


Figure 3.12

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

⚠ CAUTION

If not removed, protect the ABS tone wheel to prevent the teeth from being nicked or damaged while handling the hub.

7. If necessary, use a suitable puller to remove the ABS tooth wheel from the hub.

Hub Assembly with Disc Brakes: RC-23-160 Series

1. Remove the wheel and tire assembly from the hub.
2. If it is necessary to remove the rotor, remove the 10 socket-head capscrews that secure the rotor to the hub. Remove the rotor from the hub. Figure 3.13.

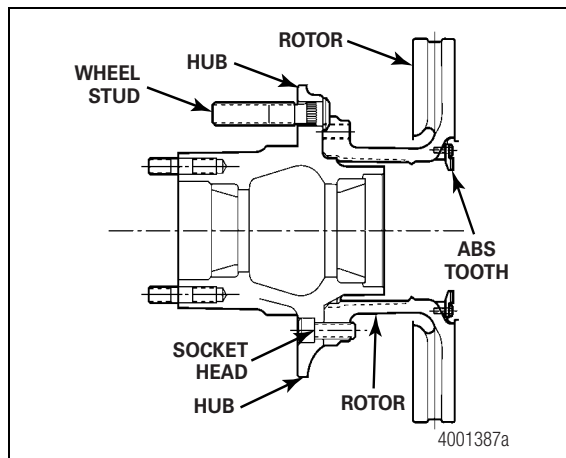


Figure 3.13

⚠ CAUTION

If not removed, protect the ABS tooth wheel to prevent the teeth from being nicked or damaged while handling the hub.

3. If necessary, remove the ABS tooth wheel from the rotor by removing the retaining capscrews.

⚠ WARNING

Do not hit the wheel studs with a steel hammer or remove the studs by twisting. Damage to the parts can occur and metal fragments can cause serious personal injury.

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

3 Removal and Disassembly

5. If necessary, use a long screwdriver to remove the oil seal from the hub. Discard the oil seal. Figure 3.14.

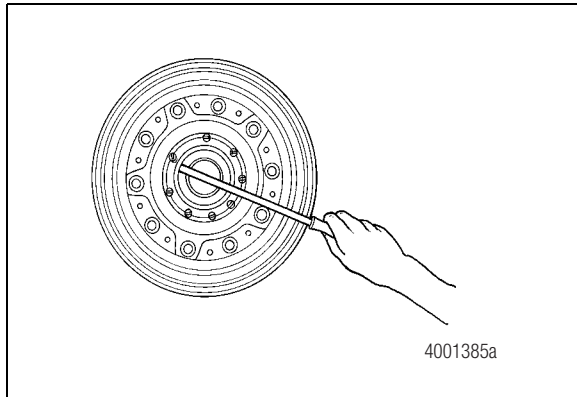


Figure 3.14

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

Brakes from the Housing Without ABS: 59000, 61000, 71000 and RC-26-700 Series

1. Disassemble the brake. Refer to Maintenance Manual 23B, Bus and Coach Brakes. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.
2. Remove the bolts, nuts and washers that secure the brake spider to the housing.
3. Drill out the rivets that secure the brake spider to the housing. Verify that the spider and the housing are not damaged.
4. Remove the brake spider from the housing.

Brakes from the Housing: 59000, 61000, 71000 and RC-26-700 Series with ABS

1. Disassemble the brake. Refer to Maintenance Manual 23B, Bus and Coach Brakes. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.
2. Remove the bushing on the ABS sensor cable where the cable comes through the housing brake flange. Figure 3.15.

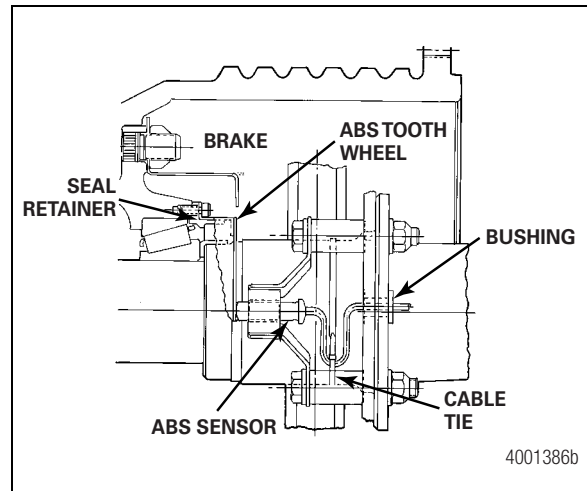


Figure 3.15

3. Cut the cable tie.
4. Pull the cable through the brake flange.
5. If required, remove the hose clamp that secures the ABS block to the housing.
6. Remove the bolts, nuts and washers that secure the brake spider to the housing.
7. If required, remove the ABS block mounting capscrows. Figure 3.16.

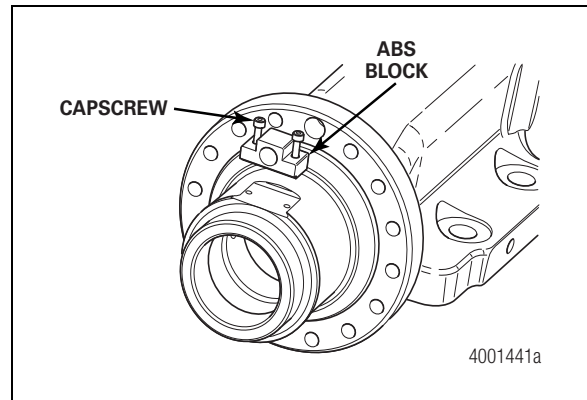


Figure 3.16

3 Removal and Disassembly

- Use hand pressure to disassemble the ABS sensor from the ABS spring clip and the ABS support bracket. Figure 3.17.

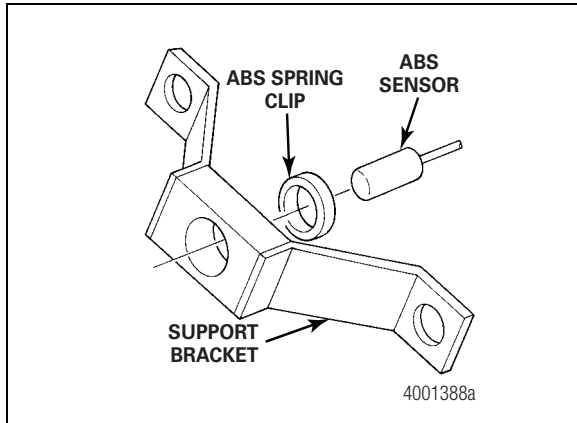


Figure 3.17

- Drill out the rivets that secure the brake spider to the housing. Verify that the spider and the housing are not damaged.
- Remove the brake spider from the housing.

Drum Brakes from the Housing: RC-23-160 Series

- Disassemble the brake. Refer to Maintenance Manual 23B, Bus and Coach Brakes. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.
- Disassemble the ABS sensor block from the housing by removing the two socket-head capscrews that secure the upper block to the lower block.
- Use your hand to remove the ABS sensor from the bushing and the upper block.

Disc Brakes from the Housing: RC-23-160 Series

- Remove the brake caliper from the torque plate. Refer to the brake manufacturer's procedure.
- Remove the ABS sensor from the torque plate.
- Use your hand to remove the ABS sensor from the bushing and the upper block.
- Remove the bolts, nuts and washers that secure the brake spider or the torque plate to the housing.
- Remove the brake spider or the torque plate from the housing.

Removal

Axle Tube: 59000, 61000 and 71000 Series

The following tools are required to remove and install the axle tube. The tools are available from the Wright Tool Company. The adapters, clamping strap and pilot plate must be ordered separately. To obtain these tools, refer to the Service Notes page on the front inside cover of this manual.

- Tool set WTC HY-100 includes a hydraulic ram, two-speed hydraulic pump, puller tube, two puller screws, connecting nut, hex nut, speed nut and electric hydraulic pump.
- Two pulling adapters: Measure dimension "A" and "B" on the axle tube. The adapter outer diameter must be slightly smaller than the tube outer diameter. Figure 3.18.
- Tube adapter: Measure dimension "A" on the axle tube. The tube adapter inner diameter must be slightly larger than the tube outer diameter. Figure 3.19.
- One pilot plate and one clamping strap: The pilot plate prevents the axle housing from collapsing when the tube is installed. Measure dimension "A" in the axle housing. The clamping strap fits all pilot plates. Figure 3.20 and Figure 3.21.

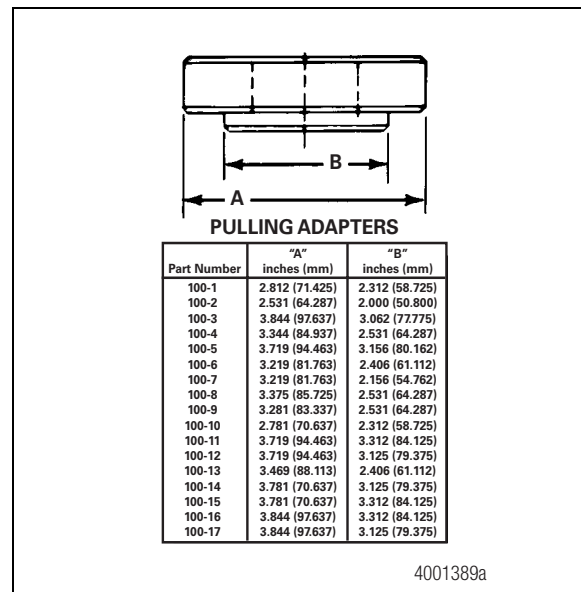


Figure 3.18

3 Removal and Disassembly

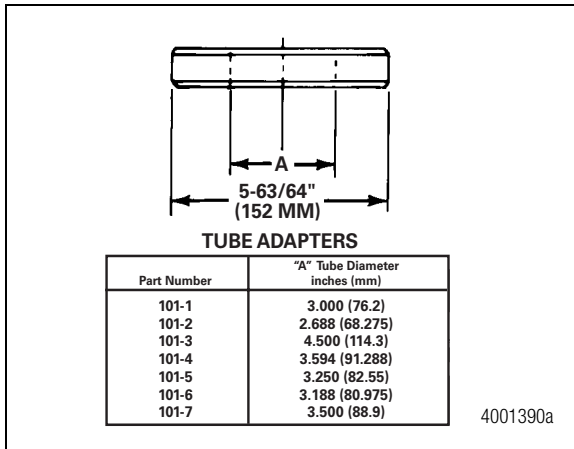


Figure 3.19

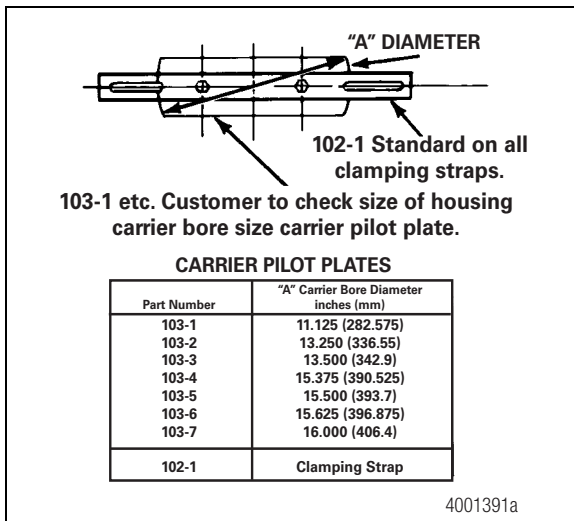


Figure 3.20

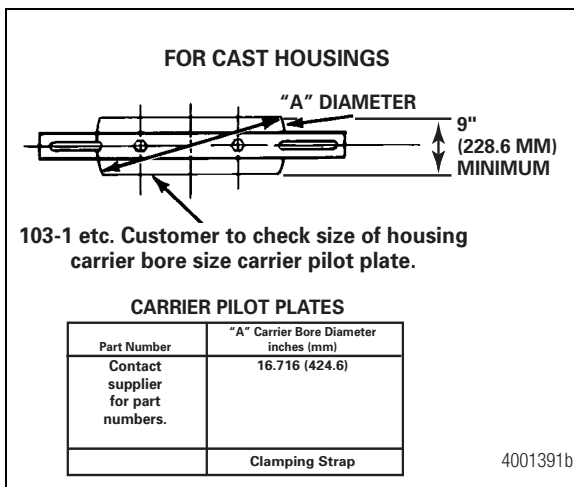


Figure 3.21

1. Remove the tire and wheel assembly and the hub and drum assembly. Refer to the manufacturer's procedure.
2. Remove the axle shafts and the differential carrier. Refer to the procedure in this section.
3. For models with a cast housing, a dowel is located on the axle centerline on the carrier side of the spindle. Drill a 0.5-inch (13 mm) diameter hole in the middle of the dowel. The hole should be 0.63-0.79-inch (16-20 mm) deep. Tap the hole and use a puller to remove the dowel.
4. Install the pulling adapter into each end of the axle tube. Figure 3.22.

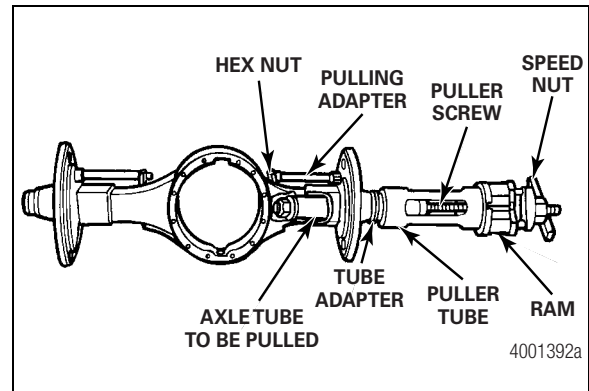


Figure 3.22

5. Place the tube adapter into the hub side of the axle tube. Figure 3.22.
6. Install the puller tube against the tube adapter. Figure 3.22.
7. Connect the hydraulic ram to the puller tube. Install the speed nut onto the hydraulic ram. Figure 3.22.
8. Connect the hydraulic ram to the hydraulic pump. Apply pressure and remove the axle tube from the housing. Figure 3.22.

3 Removal and Disassembly

Parking Brake Shoes

1. Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving.
2. Release the brake system air pressure.

⚠ WARNING

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

3. Cage the spring in the spring chamber, if used. Refer to the spring chamber manufacturer's procedure.
4. Remove the bolts and the washers that secure the brake drum to the flange on the yoke. Slide the drum onto the drive shaft. Figure 3.23.

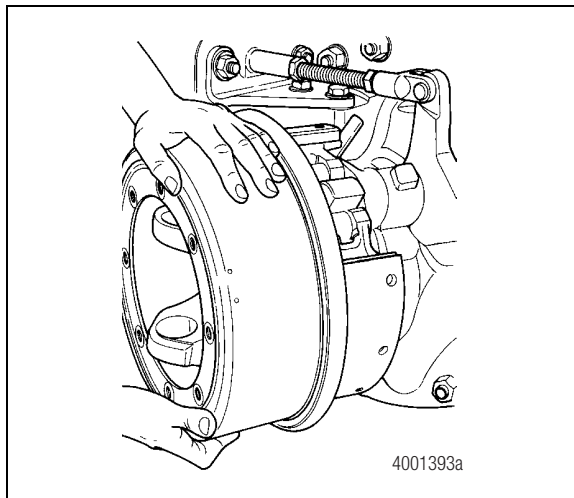


Figure 3.23

5. To remove the brake drum, disconnect the drive shaft. Remove the brake drum.
6. Remove the spring from the brake shoes. Figure 3.24.

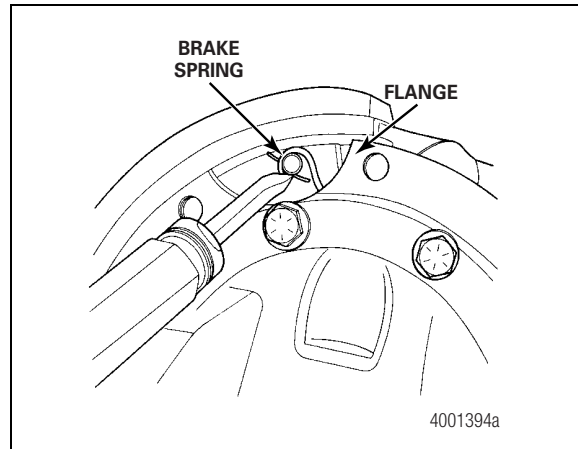


Figure 3.24

7. Remove the lock that secures the shoe to the anchor pin. Remove the oil seal retainer and the oil seal from the anchor pin. Figure 3.25.

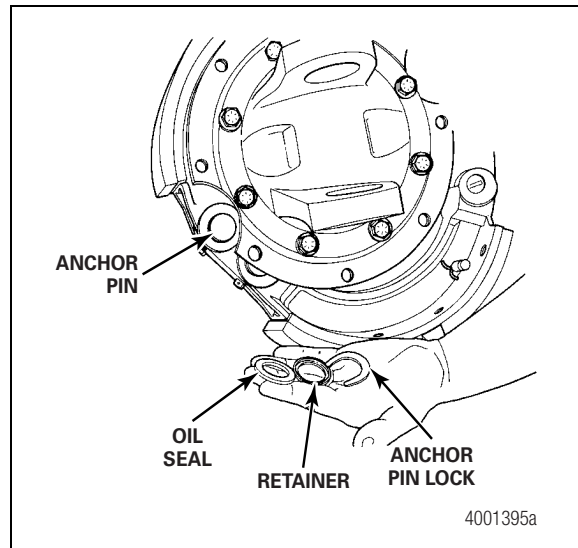


Figure 3.25

8. Remove the lock wire from the anchor pin. Loosen the lock screws for the anchor pin.
9. Use a brass drift and a punch to remove the anchor pin from the bearing cage. Remove the brake shoes. Figure 3.26.

3 Removal and Disassembly

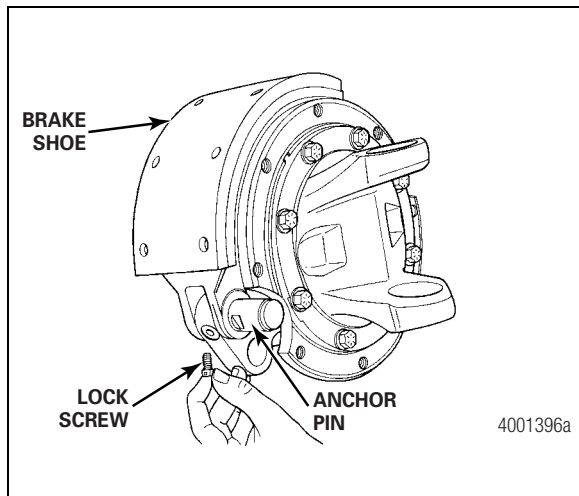


Figure 3.26

10. If necessary, remove the cam roller. Remove the set screw that secures the shaft to the shoe. Remove the roller and the shaft from the shoe. Figure 3.27.

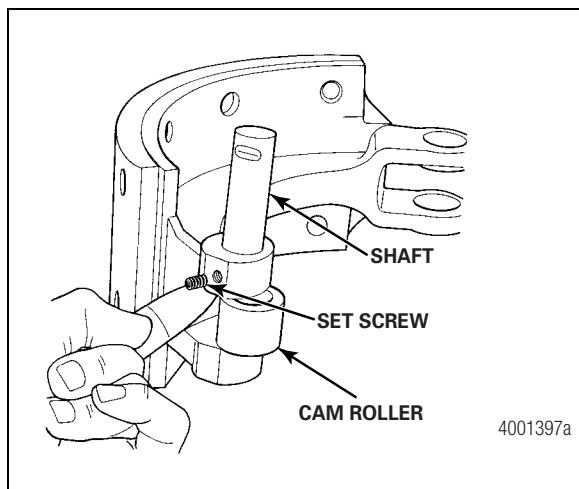


Figure 3.27

Camshaft

1. Remove the brake shoes and the drum. Refer to the procedure in this section.
2. Remove the yoke from the drive pinion. Refer to the procedure in this section.
3. Disconnect the parking brake linkage from the adjusting lever.

4. Remove the snap ring and the washers that secure the adjusting lever to the camshaft. Remove the lever. Figure 3.28.

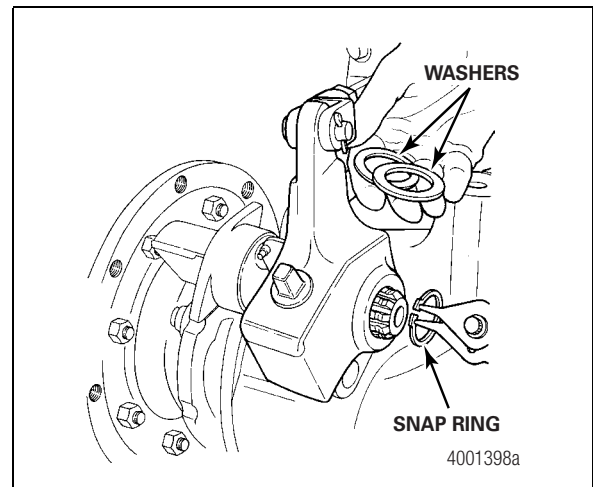


Figure 3.28

5. Remove the camshaft from the front of the bearing cage. Figure 3.29.

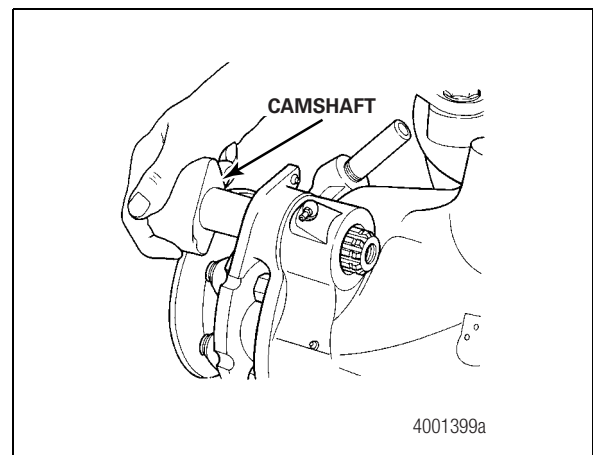


Figure 3.29

6. If worn or damaged, remove the oil seal in the bearing cage.
7. If worn or damaged, replace the camshaft bushings in the differential carrier and the bearing cage. Use a hammer and a driver tool to remove the bushings.

3 Removal and Disassembly

Torque Rod Brackets: 61000 Series Axles with Cast Housing and 71000 Series Axles

1. Remove the bolts and the washers that secure the torque rod bracket to the housing.
2. The bracket is connected to the housing with a press-fit dowel. Pull the bracket perpendicular to the mounting surface to remove the bracket. It may be necessary to rotate the bracket around the dowel while pulling to remove the bracket.
3. Remove the dowel from the housing.
 - **If any of the threaded holes in the housing are stripped or the dowel hole is elongated out-of-round:** Replace the housing.

4 Prepare Parts for Assembly

Hazard Alert Messages

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

WARNING

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

ASBESTOS AND NON-ASBESTOS FIBERS WARNING

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

WARNING

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

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

Clean, Dry and Inspect Parts

Ground and Polished Parts

Use a cleaning solvent to clean ground or polished parts or surfaces. Kerosene or diesel fuel oil can be used for this purpose. DO NOT USE GASOLINE.

- Do NOT clean ground or polished parts in a hot solution tank, water, steam or alkaline solutions.
- Use a knife, if required, to remove gasket material from parts. Be careful not to damage the ground or polished surfaces.

Rough Parts

Rough parts can be cleaned with cleaning solvent or in a hot solution tank with a weak alkaline solution.

Parts must remain in hot solution tanks until completely cleaned and heated.

When removed from the hot solution, wash the parts with water until the alkaline solution is removed.

Dry Cleaned Parts

Parts must be dried immediately after cleaning and washing.

Dry the parts using soft clean paper or cloth rags.

CAUTION

Bearings can be damaged if dried by rotating with compressed air.

Except for bearings, parts can be dried with compressed air. Do not dry bearings by spinning with compressed air.

Prevent Corrosion on Cleaned Parts

Apply a light oil to cleaned and dried parts that are not damaged and are to be immediately assembled.

If parts are to be stored, apply a good corrosion preventative to all surfaces. Store the parts inside special paper or other material that prevents corrosion.

Inspect Parts

Tapered Roller Bearings

Inspect the cup, cone, rollers and cage of all tapered roller bearings in the assembly. If you find any of the following conditions, replace the bearing.

- The center of the large-diameter end of the rollers is worn level or below the outer surface.

4 Prepare Parts for Assembly

- The radius at the large-diameter end of the rollers is worn to a sharp edge. Figure 4.1.

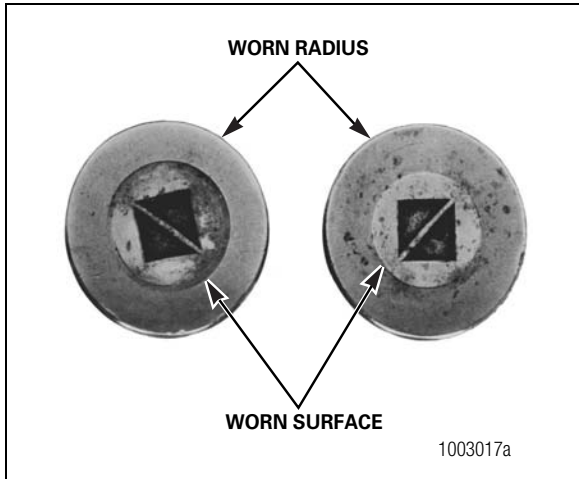


Figure 4.1

- You find a roller groove at the small- or large-diameter end of the cup or cone inner race surfaces.
- You can see deep cracks or breaks in the cup, cone, and inner race or roller surfaces. Figure 4.2.

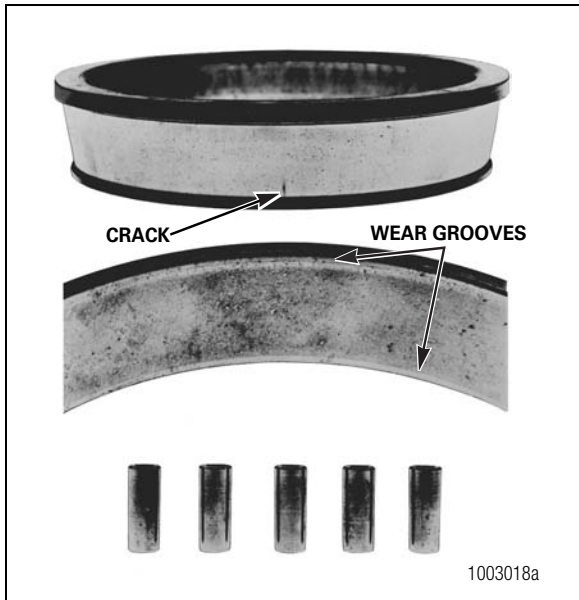


Figure 4.2

- You can see bright wear marks on the outer surface of the roller cage. Figure 4.3.

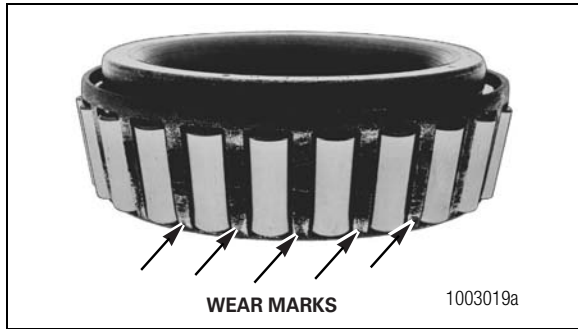


Figure 4.3

- The rollers are damaged. Figure 4.4.

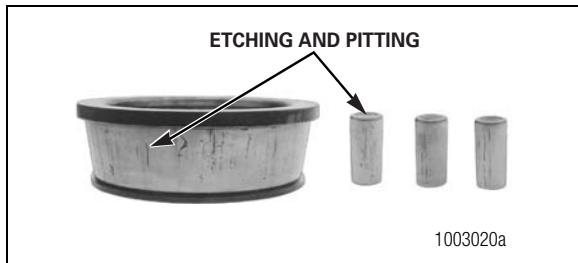


Figure 4.4

- The cup and cone inner race surfaces that touch the rollers are damaged. Figure 4.5.

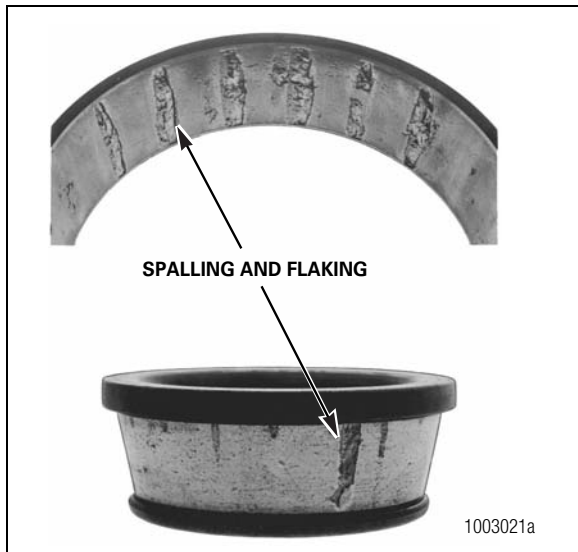


Figure 4.5

4 Prepare Parts for Assembly

Brakes

Meritor recommends that you replace the following parts at each reline.

- Springs
- Clevis pins
- Rollers
- Camshaft seals
- Anchor pins

For additional brake information, refer to Maintenance Manual 23B, Bus and Coach Brakes. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.

Brake Drums

Replace a drum if the drum is cracked, worn or damaged.

- **If a drum is out-of-round:** Remove material from the inside of the drum.
- **If the inner diameter of a drum is more than 12.09-inches (307 mm):** Replace the drum.

Bushings and Linings

Replace the linings if they are worn to the top of the rivet.

Replace the bushings if they are worn or damaged.

Camshaft

If the camshaft is worn or damaged, replace the camshaft.

Replace the camshaft bushings if they are worn or damaged.

Disc Brake Caliper and Brake Pads

Refer to the brake manufacturer's inspection procedures.

Disc or Rotor

⚠ WARNING

You must replace a damaged disc. The brake system may not operate correctly. Damage to components and serious personal injury can result.

When you reline the brakes, you must measure the thickness of the disc.

When you inspect the brakes, also inspect both sides and the outer diameter of the disc. Inspect for the following.

- Cracks
- Heat checking
- Grooves or scores
- Blue marks or bands

Cracks

A crack can extend through a section of the disc and can cause the two sides of the crack to separate. Figure 4.6.

- **If you find any cracks:** Replace the disc.

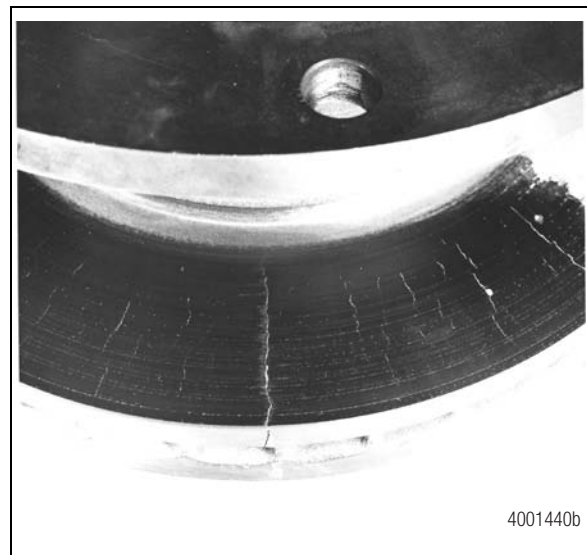


Figure 4.6

4 Prepare Parts for Assembly

Heat Checking

Heat checking produces cracks in the surface of the disc. Heat checking can be light or heavy. Light heat checking is very fine, tight, small cracks. Light heat checking is normal. You can continue to use a disc with light heat checking. Heavy heat checking produces surface cracks that have width and depth. Figure 4.7.

- **If you find heavy heat checking:** Replace the disc.

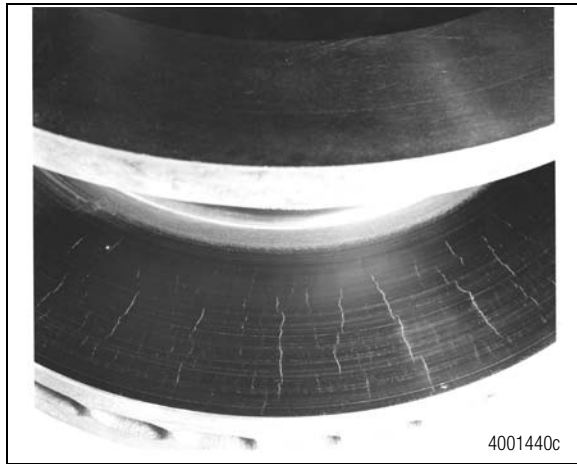


Figure 4.7

Grooves or Scores

Check both sides of the disc for deep grooves or scores. Light scoring is normal in rotors. Figure 4.8.

- **If the grooves or scores are deep:** Replace the disc.



Figure 4.8

Blue Marks or Bands

Blue marks or bands indicate that the disc was very hot. Figure 4.9.

- **If blue marks or bands are present:** Check for dragging brake linings or severe overloading.

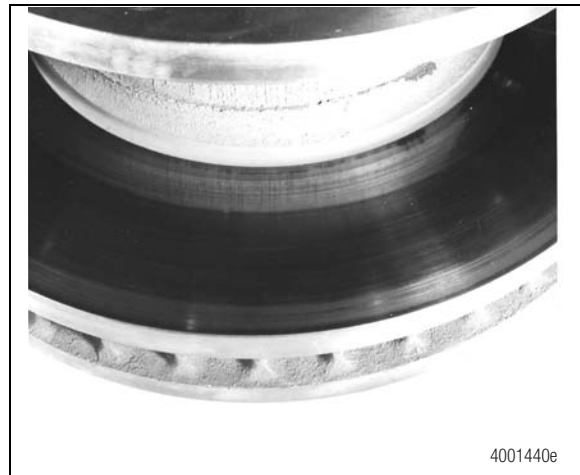


Figure 4.9

Measure the Disc Thickness

Measure the disc thickness when you reline the brakes. Discs with vents must be at least 1.626-inches (41.3 mm) thick. Figure 4.10.

- **If the disc thickness is less than the specification:** Replace the disc.

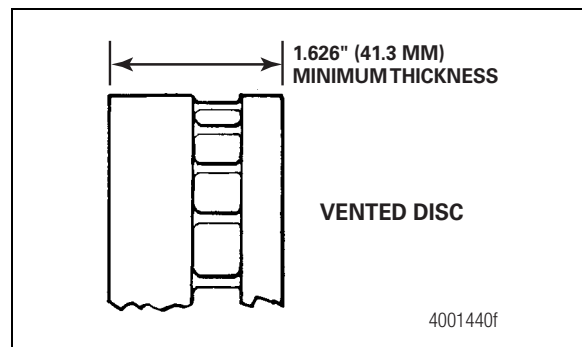


Figure 4.10

4 Prepare Parts for Assembly

Applying Adhesive and Silicone Gasket Material

Silicone Gasket Material

⚠ WARNING

When you apply 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 a silicone gasket material gets into your eyes, follow the manufacturer's emergency procedures. Have your eyes checked by a physician as soon as possible.

Take care when you use 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.

NOTE: You can use the following silicone gasket products, or equivalent, on Meritor components.

The following products are available in three oz. (85 gram) tubes.

- Three Bond Liquid Gasket number TB 1216 (Grey), Meritor part number 2297-Z-7098
- Loctite® Ultra Grey Flange Sealant number 5699, Meritor part number 2297-A-7021

The following product is available in 120 oz. (3.4 kg) cartridges.

- Three Bond RTV1216 (Grey), Meritor part number 2297-A-7051

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.
3. Apply a 0.125-inch (3.18 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 4.11.

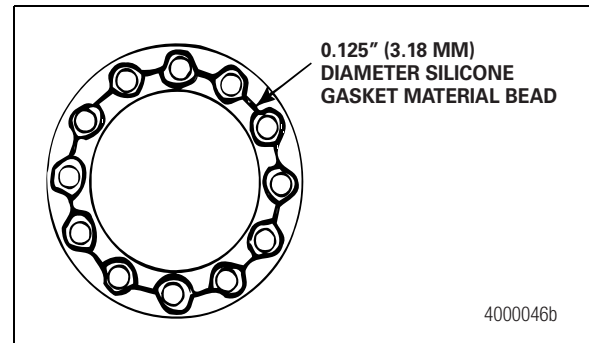


Figure 4.11

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 7.
6. Wait 20 minutes before filling the assembly with lubricant. Refer to Section 7.

Repair Welding on Axle Housings

For complete repair welding instructions, refer to Maintenance Manual 8, Drive Axle Housings. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.

⚠ WARNING

Do not repair weld on ductile cast iron housings. Repair welding can weaken the structural integrity of a component; in particular, heat-treated parts. Serious personal injury and damage to components can result.

Do Not Bend or Straighten a Damaged Drive Axle Housing

⚠ WARNING

Replace damaged or out-of-specification axle components. Do not 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. Serious personal injury and damage to components can result.

Always replace a damaged drive axle housing. Do not bend or straighten a damaged housing, which can misalign or weaken it, and void Meritor's warranty.

5 Assembly and Installation

Hazard Alert Messages

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

⚠ WARNING

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

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

Installation

Differential Carrier into the Axle Housing

⚠ WARNING

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

- Wear safe eye protection.
 - Wear clothing that protects your skin.
 - Work in a well-ventilated area.
 - Do not use gasoline, or solvents that contain gasoline. Gasoline can explode.
 - You must use hot solution tanks or alkaline solutions correctly. Read the manufacturer's instructions before using hot solution tanks and alkaline solutions. Then carefully follow the instructions.
1. Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving. Support the vehicle with safety stands. Do not work under a vehicle supported only by jacks. Jacks can slip and fall over. Serious personal injury and damage to components can result.
 2. Inspect the inside of the axle housing and the carrier mounting surface. Use a cleaning solvent to remove dirt. Use compressed air to dry the cleaned areas.

3. Inspect the axle housing for damage. If necessary, repair or replace the axle housing.
4. Check for loose studs, if used, in the housing mounting surface. Remove and clean loose studs.
5. Apply liquid adhesive to threaded holes. Install the studs into the axle housing. Tighten to specification. Refer to Section 7.
6. If used, install the parking brake onto the differential carrier. Refer to the procedure in this section.

POSE™ Seal

1. Apply the lubricant used in the axle housing to the yoke or the flange hub.
2. Verify that the lips of the POSE™ seal, and the outer retainer of the triple-lip seal or the main seal, are clean and free from dirt and particles that may contribute to oil leakage between the seals.

NOTE: The POSE™ seal will position itself correctly as the yoke or the flange is pressed onto the shaft.

3. Install the POSE™ seal onto the yoke or the flange hub by hand. The lips of the seal must face toward the end of the hub, opposite the shoulder. Slide the POSE™ seal onto the hub until the lips are 0.25-0.50-inch (6.4-12.7 mm) from the end of the hub. Do not install the POSE™ seal against the shoulder. Figure 5.1.

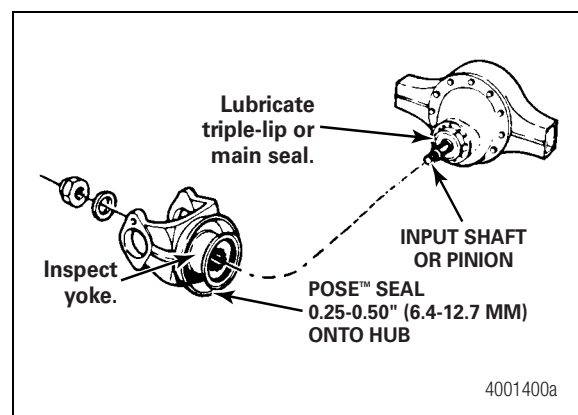


Figure 5.1

5 Assembly and Installation

NOTE: After you install the POSE™ seal onto the yoke hub, immediately install the yoke and seal assembly to the pinion shaft. If you do not immediately install the yoke and POSE™ seal to the pinion shaft, the self-positioning capabilities of the seal could be hindered and contamination or damage to the POSE™ seal system may occur. The yoke must be completely seated before you tighten the pinion nut to the input shaft.

4. Before you install the yoke or the flange onto the input shaft or the pinion, apply the lubricant used in the axle housing to the hub area where the POSE™ seal has wiped off the lubricant.
5. Install the yoke or the flange.

Yoke

NOTE: A yoke installation tool, D80T-4859-B, is available from OTC Tool and Equipment Division. To obtain this tool, refer to the Service Notes page on the front inside cover of this manual.

1. Use the yoke installation tool, D80T-4859-B or equivalent, to install the yoke.
2. Install the washer and the nut that secure the yoke to the drive pinion. Use a holding tool and tighten the nut. Refer to Section 8.
3. Apply silicone gasket material to the carrier mounting surface on the housing. Refer to Section 4.

⚠ CAUTION

Do not use a hammer or a mallet to install the carrier. A hammer or a mallet will damage the carrier mounting flange and cause leaks.

4. Use a hydraulic roller jack or a lifting tool to install the carrier into the axle housing.
5. Install the nuts or capscrews and washers into the four corner locations around the carrier and the axle housing. Hand-tighten the fasteners. Figure 5.2.

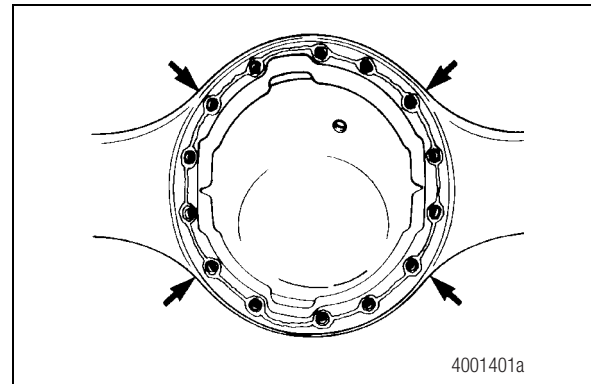


Figure 5.2

6. Carefully push the carrier into position. Tighten the four fasteners two or three turns each in a crisscross pattern. Figure 5.2.
7. Repeat Step 6 until the four fasteners are tightened to the correct torque value. Refer to Section 8.
8. Install the remaining fasteners and washers that hold the carrier in the axle housing. Tighten the fasteners to the correct torque value. Refer to Section 8.
9. Connect the drive shaft to the yoke.
10. For grease-lubricated wheel ends, install a new grease seal onto the hub studs and the housing spindle.
11. Install the gaskets and the axle shafts into the axle housing and the carrier. The gasket and the axle shaft flange must fit flat against the wheel hub.
12. Install the tapered dowels at each stud and into the axle shaft flange. Use a punch or a drift and hammer if necessary. Figure 5.3.

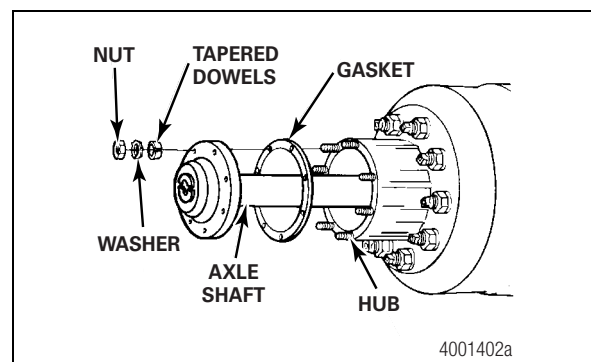


Figure 5.3

5 Assembly and Installation

13. Install the nuts and the washers onto the studs. Tighten the nuts to the correct torque value. Refer to Section 8.
14. Connect the air lines and the electrical connectors.

WARNING

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

15. Release the spring in the air chamber. Refer to the manufacturer's instructions.

Assembly

WARNING

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


Observe all warnings and cautions provided by the press manufacturer to avoid damage to components and serious personal injury.

Hub with W-Series Brakes Without ABS: 59000, 61000, 71000 and RC-26-700 Series

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

CAUTION

Replacing wheel studs can affect the fit of the drum onto the hub. If new wheel studs have been installed in the hub, there may be some localized swelling on the hub flange. When there is swelling on the hub flange, use a hand grinder to remove a small amount of material over each stud. Do not remove material from the flange area between the studs, which will weaken the drum mounting area. Damage to components can result.

2. Use a ring gauge measuring 12.7510-12.7520-inches (323.875-323.900 mm) to check the flange diameter.
 - **If the ring gauge fits over the flange:** Proceed to Step 3.
 - **If the ring gauge does not fit over the hub flange because of swelling:** Use one of the following methods to remove the swelling on the hub flange. Remove only enough material to allow for an easy ring gauge or drum fit. Do not remove material from the flange area between the studs, which will weaken the drum mounting area.
 - A. Use a hand grinder to remove a small amount of material over each stud. Check the ring gauge or drum fit frequently to ensure that you're not removing too much material.
 - B. Use a lathe to machine the hub flange and remove any swells. Locate the lathe on the bearing cups. Check the ring gauge or drum fit frequently to ensure that you're not removing too much material.
3. Install the oil deflector. Install the nuts. Tighten the nuts to 175-250 lb-ft (237-339 N•m). 
4. Use a press and a sleeve to install the inner and the outer bearing cups into the hub.
5. Use a suitable driver to install a new oil seal into the oil seal retainer. The seal must be flush with the top of the retainer.
 - **If the seals are higher than the seal retainer bore length:** Use a suitable driver to install the seals until the seal seats in the retainer.

5 Assembly and Installation

NOTE: Meritor specification O-617-B grease is thinner than O-617-A grease and permits easier packing of the wheel bearings.

- For optional grease-lubricated wheel ends, pack the areas of the hub between the two bearings with Meritor specification O-617-A or O-617-B grease up to the smallest diameter of the bearing cups. Figure 5.4.

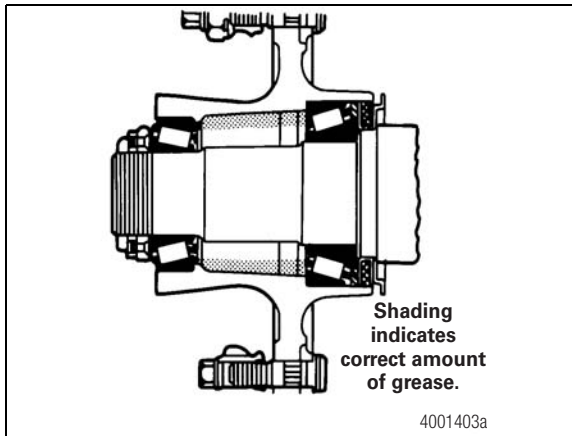



Figure 5.4

- Pack the inner bearing cone with Meritor specification O-617-A or O-617-B grease.
- Install the inner wheel bearing cone into the hub. Install the seal retainer into the hub. Tighten the retainer capscrews to 20-30 lb-ft (27-41 N•m). 
- Use a suitable driver to install the seal wiper onto the housing.
- For optional grease-lubricated wheel ends, use a suitable driver to install the grease seal sleeve onto the end of the spindle.

Brake to the Housing Without ABS: 59000 and 61000 Series

- Install the brake spider onto the housing.
- Install the bolts and the nuts that secure the spider to the housing. Use a hardened washer under the head of the bolt and under the nut. Tighten the nuts to the correct torque. Refer to Section 8.
- If the rivets were removed, replace them with bolts, washers and locknuts.
 - For stamped steel housings:** Use 5/8"-18 Grade 8 bolts, hardened washers and Grade 8 locknuts.
 - For cast housings:** Use M16x2 Grade 10.9 bolts, hardened washers and Grade 10.9 locknuts.

- Reassemble the brake. Refer to Maintenance Manual 23B, Bus and Coach Brakes. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.

Hub to the Axle Without ABS: 59000, 61000, 71000 and RC-26-700 Series

- Install the hub assembly onto the spindle. Do not damage the oil seal when you install the hub. Press the hub until the inner bearing is flat against the face of the spindle.

NOTE: Meritor specification O-617-B grease is thinner than O-617-A grease and permits easier packing of the wheel bearing.

- For optional grease-lubricated wheel ends, pack the outer bearing cone with Meritor specification O-617-A or O-617-B grease.
- Install the outer bearing cone onto the spindle and push it into its cup inside the hub.
- Adjust the wheel bearings. Refer to the procedure in this section.
- Install the brake drum.
- Use wheel nuts and spacers, if required, to ensure that the brake drum is in contact with the hub.
- Attach the magnetic base of a dial indicator to the housing. Measure brake drum total indicator runout (TIR) approximately one-inch (25 mm) from the open end of the drum. The runout should not exceed 0.015-inch (0.381 mm).

- If runout exceeds specifications:** Remove the drum from the hub. Rotate the drum and install it. Verify that runout does not exceed 0.015-inch (0.381 mm).
- If you are unable to rotate the drum to provide the correct runout:** Remove and turn the drum. The maximum diameter should be at least 0.1-inch (2.5 mm) less than the maximum dimension marked on the outer edge of the drum to maintain correct drum wear allowance. Verify that runout does not exceed 0.015-inch (0.381 mm).
- If turning the drum does not provide the correct runout:** Replace the drum.


5 Assembly and Installation

Hub with W-Series Brakes with ABS: 59000, 61000, 71000 and RC-26-700 Series

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

CAUTION

Replacing wheel studs can affect the fit of the drum onto the hub. If new wheel studs have been installed in the hub, there may be some localized swelling on the hub flange. When there is swelling on the hub flange, use a hand grinder to remove a small amount of material over each stud. Do not remove material from the flange area between the studs, which will weaken the drum mounting area. Damage to components can result.

2. Use a ring gauge measuring 12.7510-12.7520-inches (323.875-323.900 mm) to check the flange diameter.
 - **If the ring gauge fits over the flange:** Proceed to Step 3.
 - **If the ring gauge does not fit over the hub flange because of swelling:** Use one of the following methods to remove the swelling on the hub flange. Remove only enough material to allow for an easy ring gauge or drum fit. Do not remove material from the flange area between the studs, which will weaken the drum mounting area.
 - A. Use a hand grinder to remove a small amount of material over each stud. Check the ring gauge or drum fit frequently to ensure that you're not removing too much material.
 - B. Use a lathe to machine the hub flange and remove any swells. Locate the lathe on the bearing cups. Check the ring gauge or drum fit frequently to ensure that you're not removing too much material.
3. Install the oil deflector. Install the nuts. Tighten the nuts to 175-250 lb-ft (237-339 N•m). 
4. Use a press and a sleeve to install the inner and the outer bearing cups into the hub.
5. For optional grease-lubricated wheel ends, pack the area of the hub between the two bearings with Meritor specification O-617-A or O-617-B grease up to the smallest diameter of the bearing cups.

6. Use a suitable driver to install a new oil seal into the oil seal retainer. The seal must be flush with the top of the retainer.

- **If the seals are higher than the seal retainer bore length:** Use a suitable driver to install the seals until the seal seats in the retainer.

NOTE: Meritor specification O-617-B grease is thinner than O-617-A grease and permits easier packing of the wheel bearings.

7. Pack the inner bearing cone with Meritor specification O-617-A or O-617-B grease. Figure 5.5.

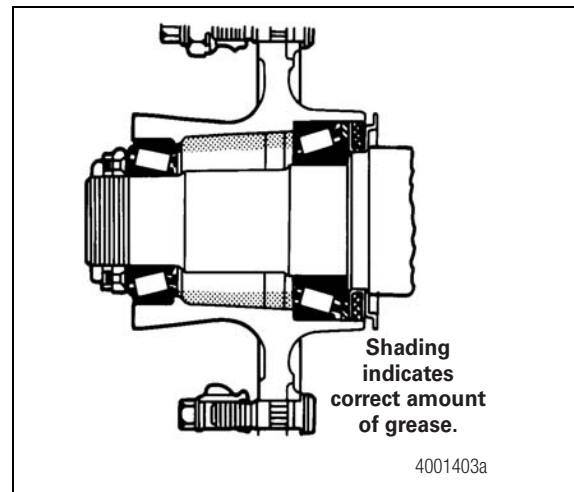



Figure 5.5

8. Install the inner wheel bearing cone into the hub. Install the seal retainer and the ABS tooth wheel onto the hub. Tighten the retaining capscrews to 20-30 lb-ft (27-41 N•m). 
9. Use a suitable driver to install the seal wiper onto the housing.
10. For optional grease-lubricated wheel ends, use a suitable driver to install the grease seal sleeve onto the end of the spindle.
11. Use wheel nuts and spacers, if required, to ensure that the brake drum contacts the hub.

5 Assembly and Installation

- Attach the magnetic base of a dial indicator to the housing. Measure brake drum total indicator runout (TIR) approximately one-inch (25 mm) from the open end of the drum. The runout should not exceed 0.015-inch (0.381 mm).

- **If runout exceeds specifications:** Remove the drum from the hub. Rotate the drum and install it. Verify that runout does not exceed 0.015-inch (0.381 mm).
- **If you are unable to rotate the drum to provide the correct runout:** Remove and turn the drum. The maximum diameter should be at least 0.1-inch (2.5 mm) less than the maximum dimension marked on the outer edge of the drum to maintain correct drum wear allowance. Verify that runout does not exceed 0.015-inch (0.381 mm).
- **If turning the drum does not provide the correct runout:** Replace the drum.

Hub with Drum Brakes: RC-23-160 Series

- If the wheel studs were removed from the hub, place the hub into a press with the wheel mounting surface pointing down. If a press is not available, use a brass hammer.
- Align the serrations on the stud with the serration marks in the hub, if the hub was previously used. Press the stud into the hub.
- Use a press and a sleeve to install the inner and the outer bearing cups into the hub.
- Use a suitable driver to install the ABS tooth wheel onto the hub. Do not damage the tooth wheel.

NOTE: Meritor specification O-617-B grease is thinner than O-617-A grease and permits easier packing of the wheel bearings.

- Pack the inner bearing cone with Meritor specification O-617-A or O-617-B grease.
- Install the inner wheel bearing cone into the hub.
- Use a suitable driver to install a new seal into the hub until the seal is seated in the hub.

Brake to the Housing with ABS: 59000, 61000, 71000 and RC-26-700 Series

- Install the brake spider onto the housing.
- Assemble the ABS spring clip and the ABS sensor into the ABS support bracket. Figure 5.6.

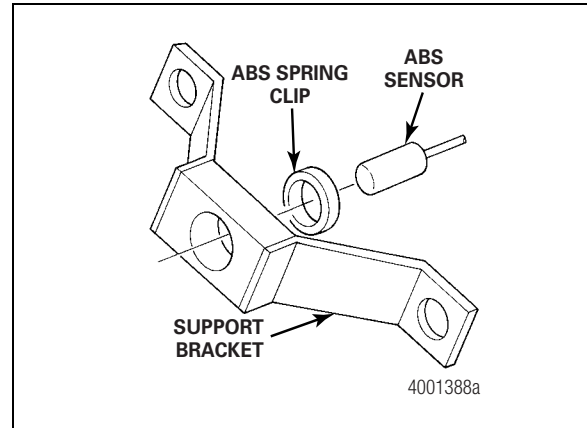


Figure 5.6

- Route the connector end of the ABS sensor through the exit hole in the brake spider and the housing brake flange. Figure 5.7.

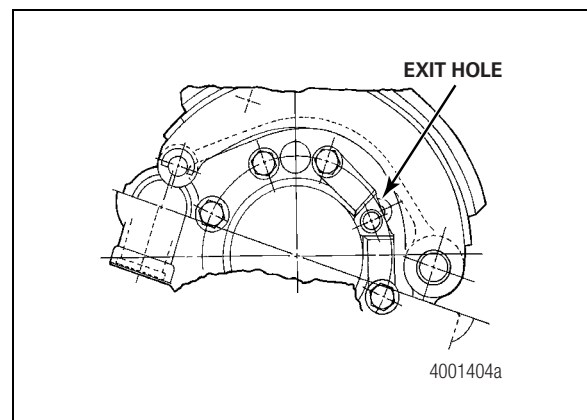


Figure 5.7

5 Assembly and Installation

- With the ABS sensor block in contact with the housing, use the bolts, washers and nuts to secure the support bracket assembly to the brake spider. Use washers under the bolt heads and under the nuts. Tighten the nuts to hold the bracket in position. Figure 5.8.

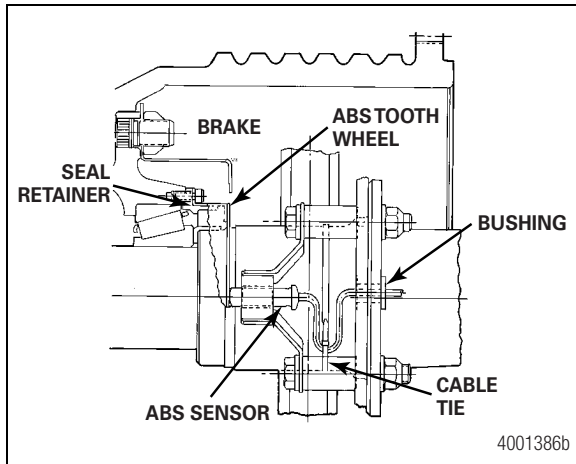


Figure 5.8

- For cast housings, use M6x1 socket-head capscrews to secure the ABS sensor block to the housing. Tighten the capscrews to 8-12 lb-ft (11-16 N•m). Figure 5.9.

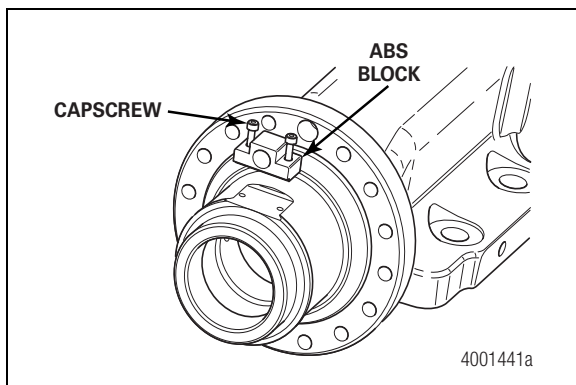


Figure 5.9

- Tighten all other spider attachment fasteners to the correct torque. Refer to Section 8.
- If required, install the hose clamp that secures the ABS sensor to the housing. The ABS sensor mounting block must contact the housing.

- If the rivets have been removed, replace them with bolts, washers and locknuts.
 - For stamped steel housings:** Use 5/8"-18 Grade 8 bolts, hardened washers and Grade 8 locknuts.
 - For cast housings:** Use M16x2 Grade 10.9 bolts, hardened washers and Grade 10.9 locknuts.

Hub to the Axle with ABS: 59000, 61000, 71000 and RC-26-700 Series

- Install the hub assembly onto the spindle. Do not damage the oil seal when you install the hub assembly. Press the hub until the inner bearing is flat against the face of the spindle.

NOTE: Meritor specification O-617-B grease is thinner than O-617-A grease and permits easier packing of the wheel bearing.

- For optional grease-lubricated wheel ends, pack the outer bearing cone with Meritor specification O-617-A or O-617-B grease.
- Install the outer bearing cone onto the spindle and push it into its cup inside the hub.
- Adjust the wheel bearings. Refer to the procedure in this section.
- For stamped steel housings, verify that the ABS sensor and the ABS tooth wheel on the hub are aligned and the ABS sensor block contacts the housing. Tighten the two bracket mounting bolts to 180-230 lb-ft (244-312 N•m).
- For cast housings, use M6x1 socket-head capscrews to secure the ABS block to the housing. Tighten the capscrews to 8-12 lb-ft (11-16 N•m).
- Push the ABS sensor toward the tooth wheel until contact is made.
- Rotate the hub. Check the relationship of the ABS sensor and the tooth wheel. A 0.020-inch (0.5 mm) maximum gap is allowed between the sensor and the tooth wheel.
- Fasten the sensor wire to the housing with a cable tie. Install the bushing onto the ABS cable at the exit hole.

5 Assembly and Installation

10. Complete the brake assembly. Refer to Maintenance Manual 23B, Bus and Coach Brakes. For ABS braking systems, refer to Maintenance Manual 28, ABS for Trucks, Tractors and Buses (C Version ECUs) and Maintenance Manual 30, ABS for Trucks, Tractors and Buses (D Version ECUs). To obtain these publications, refer to the Service Notes page on the front inside cover of this manual.

Brake to the Housing with Drum Brakes: RC-23-160 Series

1. Install the brake spider onto the housing.
2. Install the bolts and the nuts that secure the spider or the torque plate to the housing. Use a hardened washer under the bolt head and under the nut. Tighten to the correct torque. Refer to Section 8.
3. Assemble the brake. Refer to Maintenance Manual 23B, Bus and Coach Brakes. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.
4. Install the ABS sensor spring clip into the upper ABS mounting block in the direction of the arrow on the block.
5. Install the ABS sensor fully into the spring clip.
6. Route the ABS sensor cable through the hole in the brake flange.

Hub to the Axle with Drum Brakes: RC-23-160 Series



1. Install the hub assembly onto the spindle. Do not damage the oil seal when you install the hub assembly. Press the hub until the inner bearing is flat against the face of the spindle.
2. Install the outer bearing cone onto the spindle. Push it into its cup inside the hub.
3. Adjust the wheel bearings. Refer to the procedure in this section.
4. Push the ABS sensor toward the tooth wheel on the hub until the sensor contacts the tooth wheel.
5. Rotate the hub. Check the relationship of the ABS sensor and the tooth wheel. A 0.020-inch (0.5 mm) maximum gap is allowed between the ABS sensor and the tooth wheel. For ABS braking systems, refer to Maintenance Manual 28, ABS for Trucks, Tractors and Buses (C Version ECUs) and Maintenance Manual 30, ABS for Trucks, Tractors and Buses (D Version ECUs). To obtain these publications, refer to the Service Notes page on the front inside cover of this manual.

6. Install the brake drum. Use wheel nuts and spacers, if required, to ensure that the brake drum contacts the hub.
7. Attach the magnetic base of a dial indicator to the housing. Measure brake drum total indicator runout (TIR) approximately one-inch (25 mm) from the open end of the drum. The runout should not exceed 0.015-inch (0.381 mm).
 - **If runout exceeds specifications:** Remove the drum from the hub. Rotate the drum and install it. Verify that runout does not exceed 0.015-inch (0.381 mm).
 - **If you are unable to rotate the drum to provide the correct runout:** Remove and turn the drum. The maximum diameter should be at least 0.1-inch (2.5 mm) less than the maximum dimension marked on the outer edge of the drum to maintain correct drum wear allowance. Verify that runout does not exceed 0.015-inch (0.381 mm).
 - **If turning the drum does not provide the correct runout:** Replace the drum.

Hub with Disc Brakes: RC-23-160 Series

1. If the wheel studs were removed from the hub, place the hub into a press with the wheel mounting surface facing down. If a press is not available, use a brass hammer.
2. If the hub was previously used, align the serrations on the stud with the serration marks in the hub. Press the stud into the hub.
3. Use a press and a sleeve to install the inner and the outer bearing cups into the hub.

NOTE: Meritor specification O-617-B is thinner than O-617-A grease and permits easier packing of the wheel bearings.

4. Pack the inner bearing cone with Meritor specification O-617-A or O-617-B grease.
5. Install the inner wheel bearing cone into the hub.
6. Use a suitable driver to install a new seal into the hub until the seal is seated in the hub.
7. If the ABS tooth wheel was removed from the rotor, install the tooth wheel. Tighten the 1/4"-20 capscrews to 105-135 lb-in (12-15 N•m). 
8. If the rotor was removed from the hub, install the rotor. Tighten the 5/8"-18 socket-head capscrews to 180-230 lb-ft (244-312 N•m). 

5 Assembly and Installation

Brake to the Housing with Disc Brakes: RC-23-160 Series

1. If the ABS sensor bushing was removed from the torque plate, use a suitable driver to install the bushing. The bushing must extend beyond the torque plate 0.977-1.007-inches (24.82-25.58 mm). Figure 5.10.

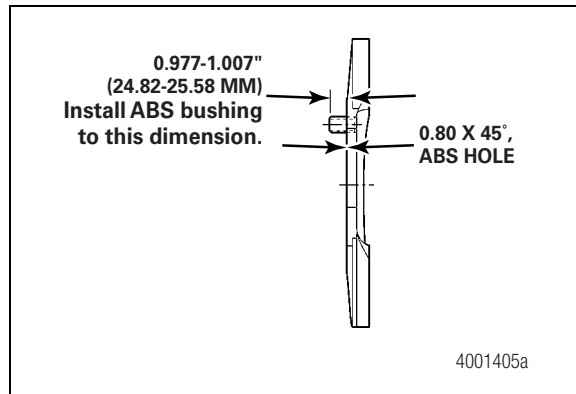


Figure 5.10

2. Install the torque plates onto the housing.
3. Install the bolts and the nuts that secure the torque plate to the housing. Use a hardened washer under the bolt head and under the nut. Tighten the nut to the correct torque. Refer to Section 8.
4. Install the ABS sensor spring clip into the sensor bushing in the torque plate. Install the clip through the brake flange in the housing.
5. Install the ABS sensor fully into the spring clip.

Hub to the Axle with Disc Brakes: RC-23-160 Series

1. Install the hub assembly onto the spindle. Do not damage the oil seal when you install the hub assembly. Press the hub until the inner bearing is flat against the face of the spindle.
2. Install the outer bearing cone onto the spindle. Push the cone into its cup inside the hub.
3. Adjust the wheel bearings. Refer to the procedure in this section.
4. Push the ABS sensor toward the tooth wheel on the rotor until the sensor contacts the tooth wheel.

5. Rotate the hub. Check the relationship of the ABS sensor and the tooth wheel. A 0.020-inch (0.5 mm) maximum gap is allowed between the ABS sensor and the tooth wheel. Refer to Maintenance Manual 28, ABS for Trucks, Tractors and Buses (C Version ECUs) and Maintenance Manual 30, ABS for Trucks, Tractors and Buses (D Version ECUs) for ABS braking systems. To obtain these publications, refer to the Service Notes page on the front inside cover of this manual.
6. Assemble the brake. Refer to the disc brake manufacturer's instructions.
7. Attach the magnetic base of a dial indicator to the housing. Measure the disc brake rotor inside surface runout. The runout should not exceed 0.015-inch (0.381 mm).
 - **If runout exceeds specifications:** Remove the rotor from the hub. Rotate the rotor and install it. Verify that runout does not exceed 0.015-inch (0.381 mm).
 - **If you are unable to rotate the rotor to provide the correct runout:** Remove and turn the rotor. The minimum dimension should be at least 1.626-inches (41.3 mm). You must turn both sides of the rotor to ensure that the braking surfaces are parallel to each other. Verify that runout does not exceed 0.015-inch (0.381 mm).
 - **If turning the rotor does not provide the correct runout:** Replace the rotor.

Drum to Hub with W-Series Brakes: 59000, 61000 and 71000

⚠ WARNING

You must carefully follow installation procedures when you install a brake drum onto a hub. An incorrect installation can cause the drum to fracture, which will affect braking performance. Loss of vehicle control, serious personal injury and damage to components can result.

NOTE: Replacing wheel studs can affect the fit of the drum onto the hub. If new wheel studs have been installed in the hub, there may be some localized swelling on the hub flange.

A Hub Mounted on the Axle

1. Use a wire brush to remove any rust, burrs and debris on both mating surfaces. Use a cloth dampened with water or a water-base solution to clean the brake drum pilot on both the brake drum and the hub flange.

5 Assembly and Installation

2. Install the drum onto the hub. Carefully slide the drum onto the hub flange. Do not force the brake drum over the flange.
 - **If the brake drum does not install easily over the hub flange:** Refer to the hub assembly procedure in this section to adjust the fit of the drum on the flange.
3. Install the wheel nuts and suitable spacers to fasten the drum to the hub.
4. Attach the magnetic base of a dial indicator to the axle housing. Measure brake drum total indicator runout (TIR) approximately one-inch (25 mm) from the open end of the drum. The runout should not exceed 0.015-inch (0.381 mm).
 - **If runout exceeds specifications:** Remove the drum from the hub. Rotate the drum and install it. Verify that runout does not exceed 0.015-inch (0.381 mm).
 - **If you are unable to rotate the drum to provide the correct runout:** Remove and turn the drum. The maximum diameter should be at least 0.1-inch (2.5 mm) less than the maximum dimension marked on the outer edge of the drum to maintain correct drum wear allowance. Install the drum. Verify that runout does not exceed 0.015-inch (0.381 mm).
 - **If turning the drum does not provide correct runout:** Replace the drum.
4. Attach the magnetic base of a dial indicator to the spindle base. Measure brake drum total indicator runout (TIR) approximately one-inch (25 mm) from the open end of the drum. The runout should not exceed 0.015-inch (0.381 mm).
 - **If runout exceeds specifications:** Remove the drum from the hub. Rotate the drum and install it. Verify that runout does not exceed 0.015-inch (0.381 mm).
 - **If you are unable to rotate the drum to provide the correct runout:** Remove and turn the drum. The maximum diameter should be at least 0.1-inch (2.5 mm) less than the maximum dimension marked on the outer edge of the drum to maintain correct drum wear allowance. Install the drum. Verify that runout does not exceed 0.015-inch (0.381 mm).
 - **If turning the drum does not provide correct runout:** Replace the drum.
5. Mount the hub assembly onto the axle. Refer to the procedure in this section.

A Hub Not Mounted on the Axle

1. Use a wire brush to remove any rust, burrs and debris on both mating surfaces. Use a cloth dampened with water or a water-base solution to clean the brake drum pilot on both the brake drum and the hub flange.
2. Assemble the hub, drum and wheel. Do not force the brake drum over the flange.
 - **If the brake drum does not install easily over the hub flange:** Refer to the hub assembly procedure in this section to adjust the fit of the drum on the flange.
3. Mount the hub, drum and wheel assembly onto a suitable spindle with the wheel bearings correctly adjusted.

Adjustment

Wheel Bearings

WARNING

When you perform a wheel bearing adjustment, observe the following guidelines.

- Always use the correct size wrench socket.
 - Always use a torque wrench to tighten the adjusting nuts to their correct adjusting torque.
 - Do not tighten or loosen the adjusting nuts by hitting the nuts with a hammer or by hitting a chisel or a drift placed against the nuts with a hammer. Damage to the nuts can result. Damaged adjusting nuts can prevent a correct wheel bearing adjustment, cause possible loss of vehicle wheel-end equipment and cause serious personal injury.
1. Install the inner wheel bearing adjusting nut onto the spindle and against the outer bearing. Figure 5.11.

5 Assembly and Installation

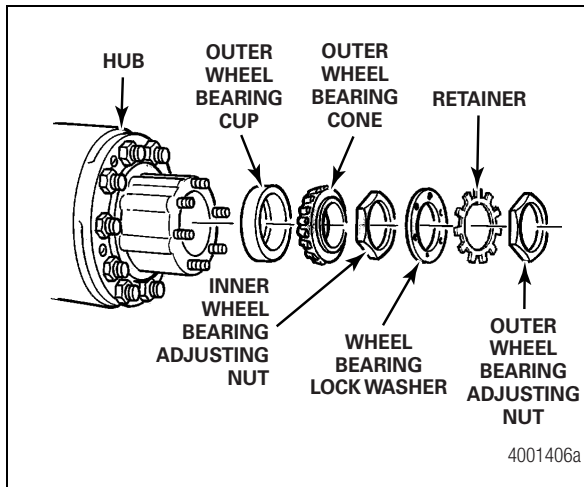


Figure 5.11

2. Tighten the adjusting nut to 100 lb-ft (136 N•m) while rotating the hub a minimum of eight revolutions to fully seat the wheel bearings. **ⓘ**
3. Loosen the inner adjusting nut one full turn.
4. Retighten to 50 lb-ft (68 N•m). **ⓘ**
5. Loosen the inner adjusting nut 1/3 turn.
6. Install the lock washer. If the hole in the washer is not aligned with the inner adjusting nut pin, remove the washer, turn the washer over and install it. The pin and the hole should now be aligned. If not, slightly adjust the inner adjusting nut. Use whichever lock washer causes the least movement of the adjusting nut. Figure 5.12.

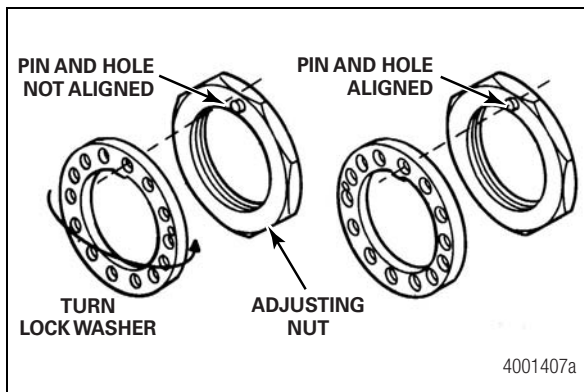


Figure 5.12

7. Assemble the stamped retainer and the outer wheel bearing adjusting nut onto the spindle.
8. Tighten the jam nut to 250-400 lb-ft (339-542 N•m). This should provide 0.001-0.010-inch (0.025-0.25 mm) of wheel end play. **ⓘ**
9. Use the following procedure to check end play.
 - A. Attach the magnetic base of a dial indicator to the axle housing. Touch the dial indicator stem against the back of the hub flange.
 - B. Slightly rotate the hub in both directions while pushing inward until the dial indicator does not change. Set the dial indicator to ZERO.
 - C. Slightly rotate the hub in both directions while pulling OUTWARD until the dial indicator does not change.
10. The dial indicator reading is the end play.
 - **If end play does not meet specification:** Remove the outer wheel bearing adjusting nut, the stamped retainer and the lock washer. Tighten or loosen the inner adjusting nut as required to set the correct end play. Repeat Step 6 through Step 9.
11. When end play is correct, bend the two opposing tabs on the stamped retainer over the flats of the outer wheel bearing adjusting nut.
12. For optional grease-lubricated wheel ends, install a new grease seal onto the hub studs and the housing spindle. Refer to Section 3.
13. Install the axle shafts, gasket and tapered dowels at each stud.
14. Install the nuts and the washers onto the studs. Tighten the nuts to the correct torque value. Refer to Section 8.

Installation

Axle Tube: 59000 and 61000 Series

1. Install the two puller screws into the axle housing. Connect the puller screws with the connecting nut. Figure 5.13.

5 Assembly and Installation

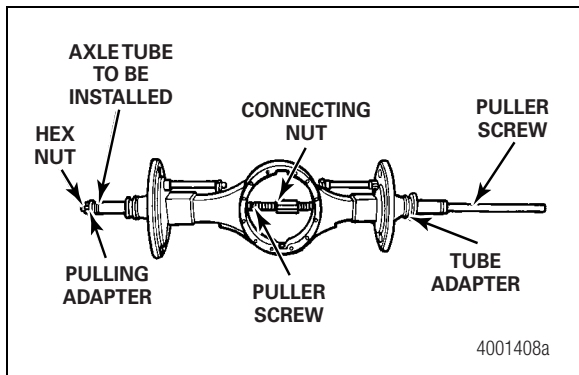


Figure 5.13

2. Install the pulling adapter into each end of the axle tube. Figure 5.13.
3. Install the axle tube and the adapters into the housing. Install the hex nut. Figure 5.13.
4. Position the tube adapter at the opposite end of the axle housing. Figure 5.13.
5. Install the puller tube onto the tube adapter. Figure 5.14.
6. Install the hydraulic ram onto the puller tube. Install the speed nut onto the puller screw. Tighten the nut to secure the ram and the tube to the axle housing. Figure 5.14.

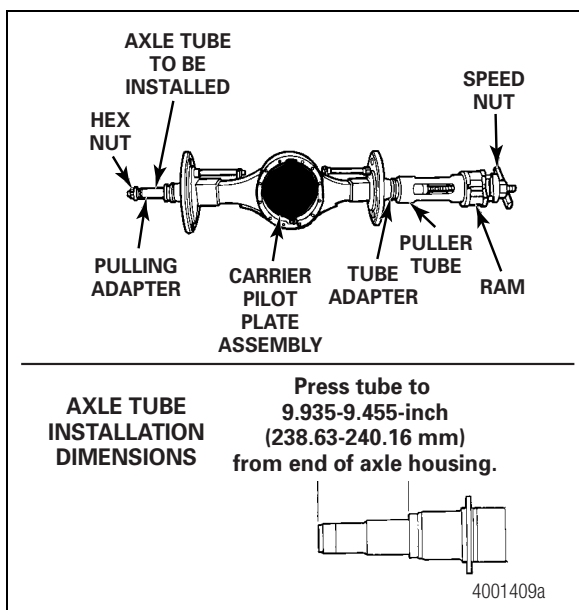


Figure 5.14

7. Install the carrier plate assembly to support the carrier ring during tube installation.
8. Connect the hydraulic ram to a hydraulic pump. Figure 5.14.
9. Apply pressure to install the axle tube into the housing. Press the axle tube into the housing until the end of the tube is 9.935-9.455-inches (238.63-240.16 mm) from the end of the axle housing. Figure 5.14.

⚠ WARNING

Take care when you use 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.

NOTE: The hole for the dowel must not go through the spindle. If the hole goes through the spindle, oil will leak out of the dowel hole and the housing will not pass a pressure test.

10. Install a dowel into the housing and the spindle. Figure 5.15.

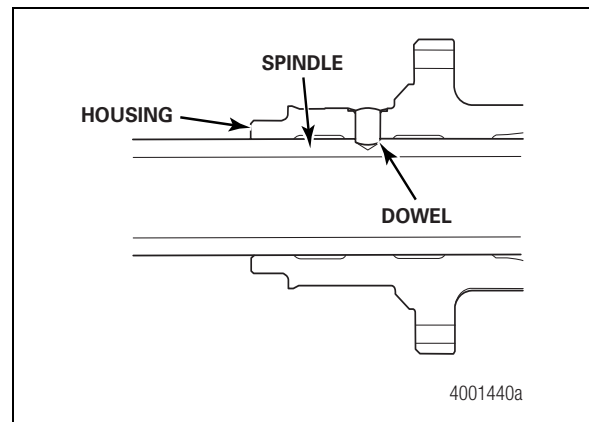


Figure 5.15


- A. Drill a 0.79-inch (20 mm) diameter hole in the new spindle with a tolerance of +0.005-inch (0.130 mm) and -0.00004-inch (0.001 mm). The hole should be 1.2-1.3-inches (30.5-32.5 mm) deep. Measure the depth from the flat spotface on the housing to the tip of the drill bit. Align the hole with the hole in the housing.
- B. Apply Loctite® 277 threadlocker to the surface of the dowel. Install the dowel into the housing and the spindle. Use a hammer to fully seat the dowel. The dowel should be approximately flush with the spotface on the housing.

5 Assembly and Installation

11. Install the differential carrier. Refer to the procedure in this section.
12. Install the hub and drum assembly, axle shafts and tire and wheel assembly. Refer to the vehicle manufacturer's instructions.

Torque Rod Brackets: 61000 with Cast Housing and 71000 Series Axles

NOTE: An anti-seize lubricant may be used for easier dowel installation.

1. Use a hammer to install the dowel into the housing. The dowel must be fully seated in the hole.
2. Verify that the mounting surfaces on the housing and the bracket are clean and dry. If an anti-seize lubricant was used in Step 1, wipe any excess from the housing surface.
3. Use a hammer to install the bracket onto the dowel. The bracket must be fully seated against the housing.
4. Install the M20x2.5 capscrews and the hardened washers. Tighten the capscrews to 340-400 lb-ft (460-540 N•m). 

Camshaft

1. If removed, install the bushings into the differential carrier and the bearing cage. Use a hammer and a driver tool to install the bushings.
2. Install a new oil seal into the bearing cage. The seal lip must be installed toward the bushing. Figure 5.16.

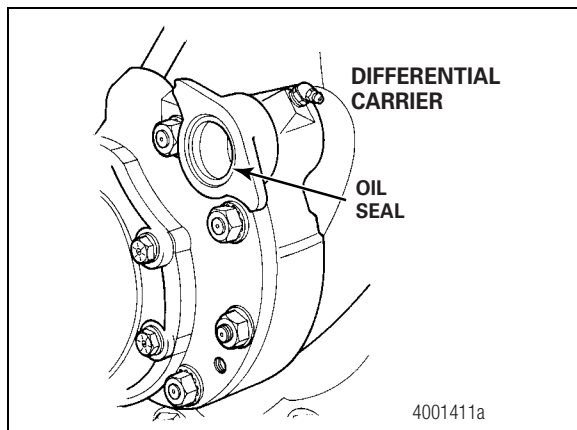


Figure 5.16

3. Lubricate the camshaft and the camshaft bushing. Refer to Section 7.
4. Install the splined end of the camshaft through the bearing cage and the differential carrier. Be careful not to damage the bushings and the oil seal when you install the camshaft. Figure 5.17.

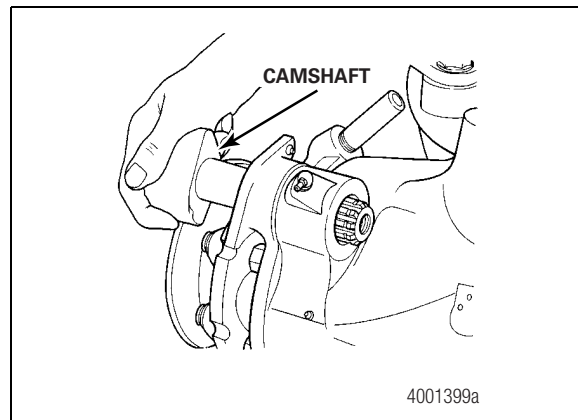


Figure 5.17

5. Install a washer onto the end of the camshaft.
6. Lubricate the camshaft splines with an anti-seize lubricant, Meritor specification O-637 or equivalent.
7. Install the adjusting lever onto the camshaft. Install the washers and the snap ring. Figure 5.18.

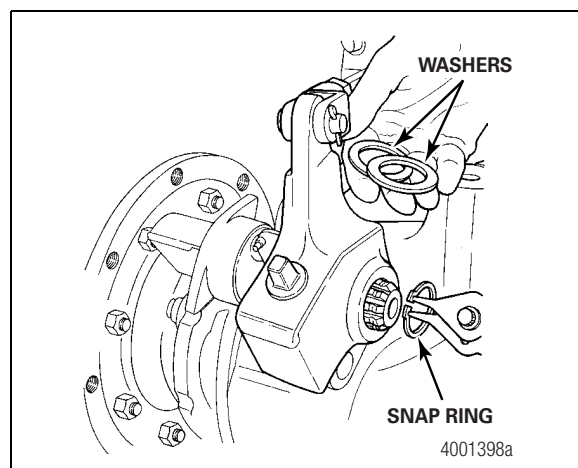


Figure 5.18