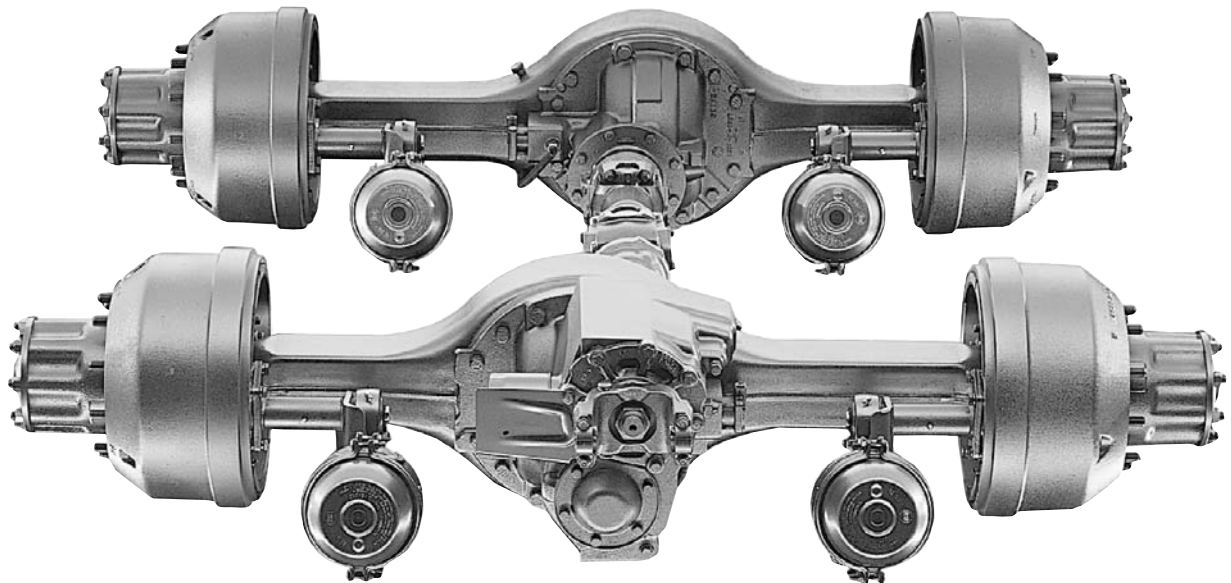


Maintenance Manual 5L

Single-Reduction Forward Differential Carriers on Tandem and Tridem Axles

Revised 08-15



Service Notes

About This Manual

This manual provides maintenance and service information for the Meritor forward tandem drive axles, including the RT-140; -144; -145; -149; -160; -169; RZ-166; -186 and -188 Series models.

Before You Begin

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

Hazard Alert Messages and Torque Symbols

WARNING

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

CAUTION

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

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

How to Obtain Additional Maintenance, Service and Product Information

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

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

If Tools and Supplies are Specified in This Manual

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

SPX Kent-Moore, 28635 Mound Road, Warren, Michigan, 48092. Call the company's customer service center at 800-345-2233, or visit their website at spxkentmoore.com.

Kiene Diesel Accessories, Inc., 325 S. Fairbanks Street, Addison, IL 60101. Call the company's customer service center at 800-264-5950, or visit their website at kienediesel.com.

SPX/OTC Service Solutions, 655 Eisenhower Drive, Owatonna, MN 55060. Call the company's customer service center at 800-533-6128, or visit their website at otctools.com.

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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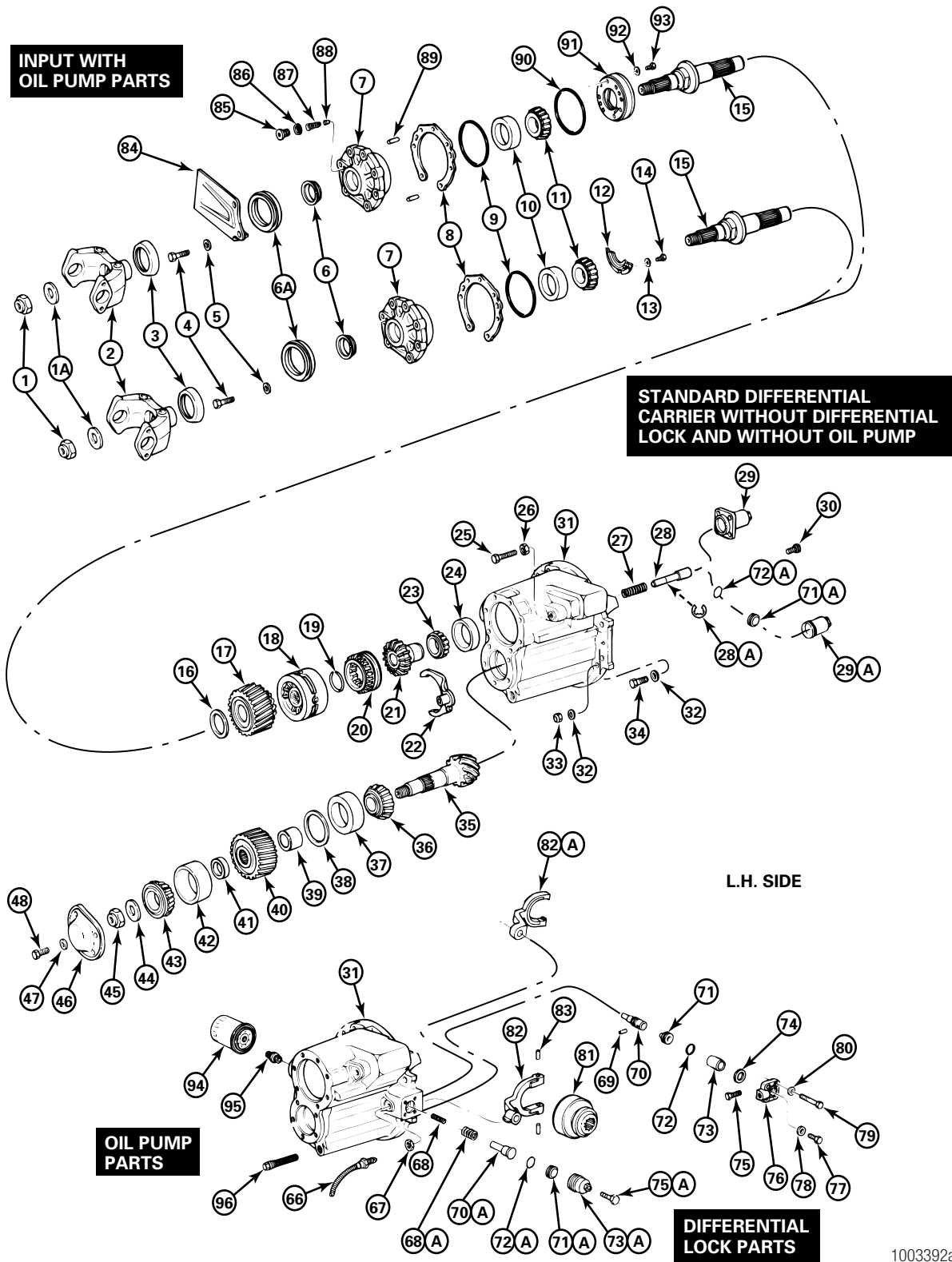
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Single-Reduction Forward Differential Carrier

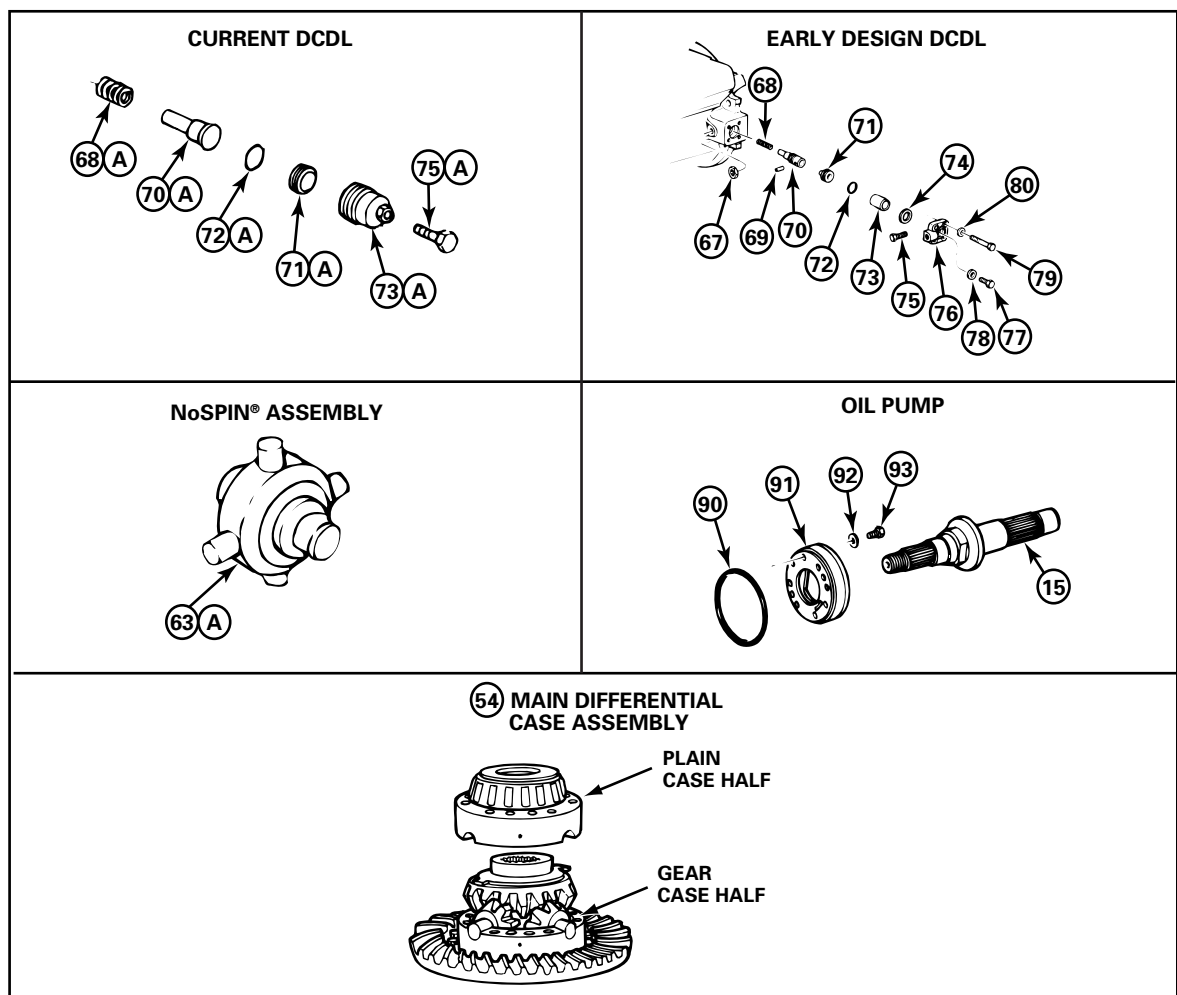
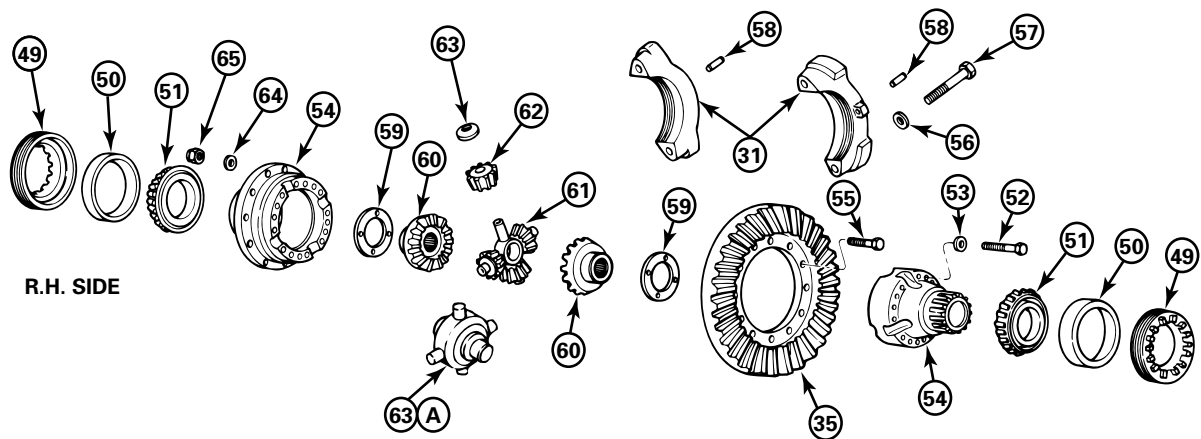
Item	Description	Item	Description	Item	Description
1	Nut — Input Yoke	36	Inner Bearing Cone — Drive Pinion	70A	Shift Shaft — Main Differential Lock — Current Design
1A	Washer — Input Yoke	37	Inner Bearing Cup — Drive Pinion	71	Piston — Main Differential Lock
2	Input Yoke	38	Shims	71A	Piston — Main Differential Lock — Current Design
3	Deflector	39	Inner Spacer	72	O-Ring — Piston
4	Capscrew — Cage-to-Carrier	40	Helical Driven Gear	72A	O-Ring — Piston — Current Design
5	Washer — Cage-to-Carrier	41	Outer Spacer	73	DCDL Cylinder — Shift Shaft
6	Oil Seal — Triple-Lip (Main) Seal	42	Outer Bearing Cup — Drive Pinion	73A	DCDL Cylinder — Shift Shaft — Current Screw-In DCDL Design
6A	POSE™ Seal	43	Outer Bearing Cone — Drive Pinion	74	Copper Gasket — Cover (160 Series)
7	Input Bearing Cage	44	Washer — Drive Pinion	75	Capscrew — Manual Engaging
8	Shims	45	Nut — Drive Pinion	75A	Capscrew — Manual Engaging — Current Design
9	O-Ring — Input Bearing Cage	46	Cover — Drive Pinion	76	Cover — Main Differential Lock (Early Design)
10	Bearing Cup — Input Shaft	47	Washer — Drive Pinion Cover	77	Plug — Manual Engaging (Early Design)
11	Bearing Cone — Input Shaft	48	Capscrew — Drive Pinion Cover	78	Washer — Manual Engaging Capscrew
12	Oil Baffle (Units Without Oil Pump)	49	Bearing Adjusting Ring	79	Capscrew — Cover (Early Design)
13	Washer — Oil Baffle	50	Cup — Main Differential Bearing	80	Washer — Cover (Early Design)
14	Capscrew — Oil Baffle	51	Cone — Main Differential Bearing	81	Shift Collar — Main Differential Lock
15	Input Shaft	52	Capscrew — Main Differential Case Halves	82	Shift Fork — Main Differential Lock
16	Thrust Washer — Helical Drive Gear	53	Washer — Main Differential Case Halves	82A	Shift Fork — Main Differential Lock — Current Design
17	Helical Drive Gear	54	Main Differential Case Assembly	83	Roll Pin — Shift Fork (Early Design)
18	Inter-Axle Differential Case Assembly	55	Bolt — Ring Gear (145 and 160 Series)	84	Oil Filter Shield
19	Snap Ring — Inter-Axle Differential Case	56	Washer — Differential Bearing Cap	85	Plug — Oil Pressure Relief Valve
20	Clutch Collar — Inter-Axle Differential Case	57	Capscrew — Differential Bearing Cap	86	Washer — Oil Pressure Relief Valve
21	Rear Side Gear	58	Roll Pin, Cotter Pin or Capscrew — Differential Bearing Cap	87	Spring — Oil Pressure Relief Valve
22	Shift Fork	59	Thrust Washer — Main Differential Side Gear	88	Oil Pressure Relief Valve
23	Bearing Cone — Rear Side Gear	60	Side Gear — Main Differential	89	Dowel — Input Cage to Oil Pump (Early Design)
24	Bearing Cup — Rear Side Gear	61	Spider — Main Differential	90	O-Ring — Oil Pump
25	Adjusting Screw — Shift Shaft	62	Pinion Gear — Main Differential	91	Oil Pump
26	Jam Nut — Adjusting Screw	63	Thrust Washer — Main Differential	92	Washer — Oil Pump
27	Spring — Shift Shaft	63A	NoSPIN® Main Differential ¹	93	Capscrew — Oil Pump
28	Shift Shaft and Piston	64	Washer — Ring Gear (145 and 160 Series)	94	Oil Filter
28A	"E" Clip (Reverse Shift IAD Only)	65	Nut — Ring Gear (145 and 160 Series)	95	Adapter — Oil Filter
29	Air Shift Chamber Assembly — Bolt-On IAD	66	Sensor Switch — Main Differential Lock	96	Oil Screen and Plug Assembly
29A	Air Shift Chamber Assembly — Screw-In IAD	67	Locknut — Main Differential Lock Sensor Switch (Early Design)		
30	Capscrew — Air Shift Chamber Assembly	68	Spring — Main Differential Lock		
31	Differential Carrier and Caps	68A	Spring — Main Differential Lock — Current Design		
32	Washer — Differential Carrier-to-Axle Housing	69	Lock Pin — Spring Retaining (Early Design)		
33	Nut — Differential Carrier-to-Axle Housing	70	Shift Shaft — Main Differential Lock		
34	Capscrew — Differential Carrier-to-Axle Housing				
35	Ring Gear and Drive Pinion				

¹ NoSPIN® is a registered trademark of Tractech, a division of Dyneer Corp.

1 Exploded Views



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1002701c

Description

Forward Tandem Axle

The inter-axle differential is located behind the helical gear on the input shaft. The forward side gear of the inter-axle differential is part of the upper helical gear hub. The thru-shaft is splined to the rear side gear of the inter-axle differential. Figure 2.1.

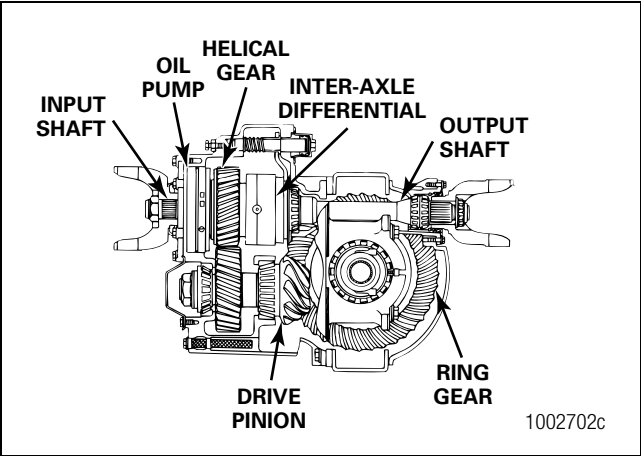


Figure 2.1

The Meritor 140, 145 and 160 forward tandem axles use a single-reduction, thru-drive carrier. The drive gearing is a two-helical gear train and a hypoid ring gear and pinion. Bevel gears are used in the main differential and the inter-axle differential. Figure 2.1 and Figure 2.2.

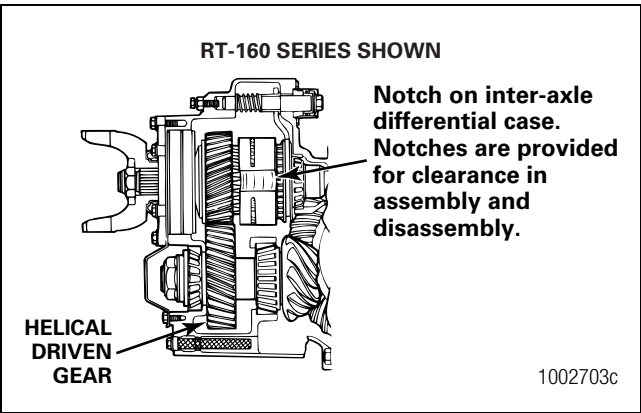


Figure 2.2

Axle Models Covered in This Manual

Tandem Models		
RT-34-140	RT-40-145P	RT-46-160
RT-34-144	RT-40-149	RT-46-160EH
RT-34-145	RT-40-160	RT-46-160P
RT-34-145P	RT-40-169	RT-46-169
RT-40-140	RT-44-145	RT-50-160
MT-40-143	RT-44-145P	RT-50-160P
RT-40-145	RT-46-16H EH	RT-52-160P
RT-40-145A		
Tridem Models		
RZ-166	RZ-186	RZ-188

NOTE: For service procedures on rear carriers, refer to Maintenance Manual 5, Single-Reduction Differential Carriers, for models preceding RS-, RT- and RF-Series, and Maintenance Manual 5A, Single-Reduction Differential Carriers, for MX-, RS-, RT- and RF-Series. To obtain these publications, refer to the Service Notes page on the front inside cover of this manual.

Optional Pressurized Lubrication System

The forward axles can be equipped with an optional pressurized lubrication system. This filtered system has an oil pump driven by the input shaft. The pump circulates lubricant to the journals in the forward and rear input shaft bearings and directly to the inter-axle differential.

Optional Driver-Controlled Main Differential Lock (DCDL)

Both the forward and rear axles can be equipped with an optional driver-controlled main differential lock (DCDL). The differential lock is operated by an air-actuated shift unit located on the forward axle carrier.

- When the differential lock is activated, the shift collar moves along the splines of the axle shaft toward the differential case.
- When the collar splines engage with the splines on the differential case, the axle shaft and the differential assembly lock together.
- When the carrier operates with the DCDL in the locked position, there is no differential action between the wheels.
- When the carrier is operated in the unlocked position, there is normal differential action between the wheels at all times.

Inter-Axle Main Differential (IAD)

The Meritor inter-axle differential (IAD) is a driver-controlled, air-actuated traction device. The IAD allows for speed differences between the forward and rear axles in a tandem while also providing equal pulling power from each axle of the tandem. By activating the IAD switch located in the vehicle dash, improved traction is provided for each axle.

The inter-axle differential is also known as a power divider or third differential.

Stall-Testing Can Damage a Drive Axle

Stall-testing is a procedure used to troubleshoot transmissions, evaluate vehicle performance, and test the service and park brakes.

During stall-testing, or any similar procedure, the drive axle input receives multiplied torque, which can exceed the specified torque rating. Excessive torque can damage a drive axle, which will affect axle performance and component life. A drive axle damaged by stall-testing will void Meritor's warranty.

Call the Meritor OnTrac™ Customer Call Center at 866-668-7221 if you have questions regarding stall-testing.

Use of Traction Chains

Meritor recommends that if you are using traction chains, you should install chains on both tires on each side of all drive axles on the vehicle.

Identification

Model Number

An identification tag is riveted on the axle housing or on the differential carrier. Figure 2.3 and Figure 2.4. Use the model number and the ratio number marked on the identification tag and the number on the carrier to order replacement parts.

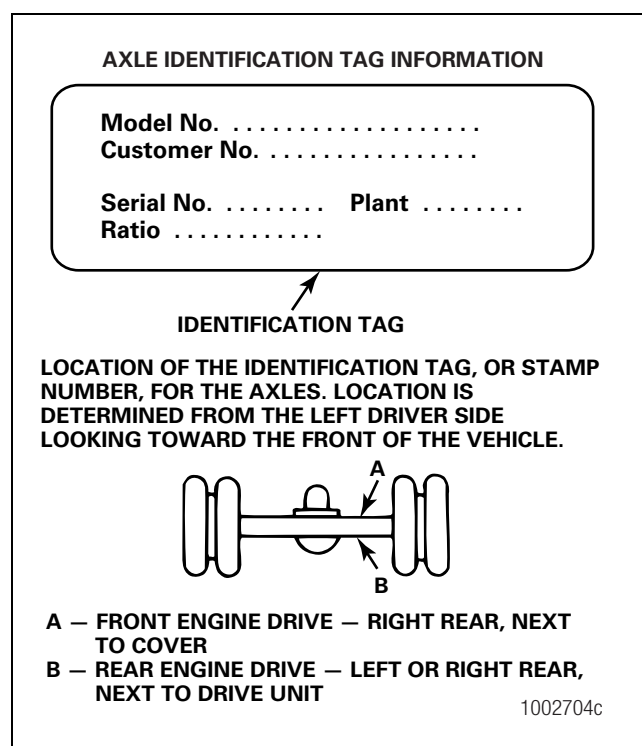


Figure 2.3

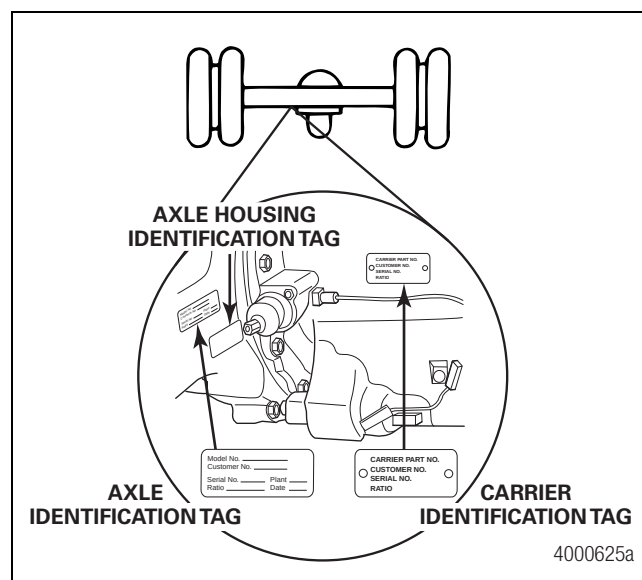


Figure 2.4

Refer to Figure 2.5 for an explanation of the model number.

2 Introduction

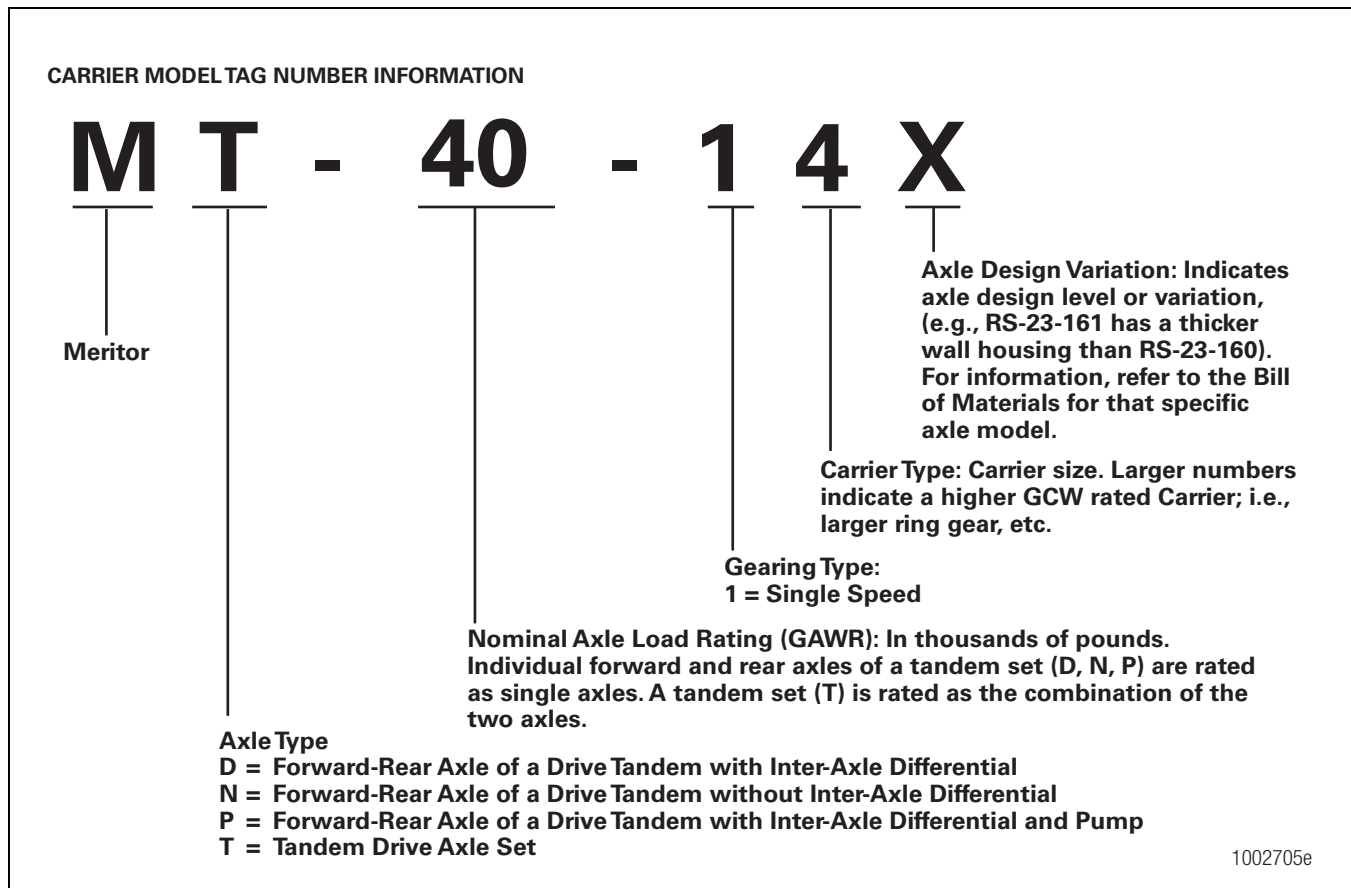


Figure 2.5

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.

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.

Removal

Axle Shafts

Before the axle shafts and differential carrier can be removed or installed, the driver-controlled differential lock (DCDL), if equipped, must be shifted into and held in the locked or engaged position. The locked position gives enough clearance between the shift collar and the axle housing to permit the removal or installation of the axle shafts and carrier. Refer to Section 6 for service information on the DCDL. If the drive axle is not equipped with DCDL, continue on with axle shaft removal in this section.

Axle Shaft Removal Methods

Use Special Tools Recommended by Meritor

To help prevent serious personal injury and damage to components when you remove the axle shaft from the housing, Meritor recommends that you use the following tools in the table below. Refer to the Service Notes page at the front inside cover of this manual for information on how to contact the manufacturers to obtain the tools.

- If the tools are not available when you remove the axle shaft: Follow procedures for using the Brass Drift Method or the Air Vibration Method.

Tool	Part Number	Manufacturer
Axle Shaft Remover	K-1280	Kiene Diesel Accessories, Inc.
Axle Stud Cone Plier	7077	SPX OTC

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 wedge to loosen the axle shaft and tapered dowels. Using a chisel or wedge can result in damage to the axle shaft, the gasket and seal, and the axle hub.

1. Use a round hammer bit and an air hammer to loosen the tapered dowels and axle shaft.
2. Place the round hammer bit against the axle shaft or flange between the hub studs. Operate the air hammer at alternate locations between the studs to loosen the tapered dowels and axle shaft from the hub. Figure 3.1.

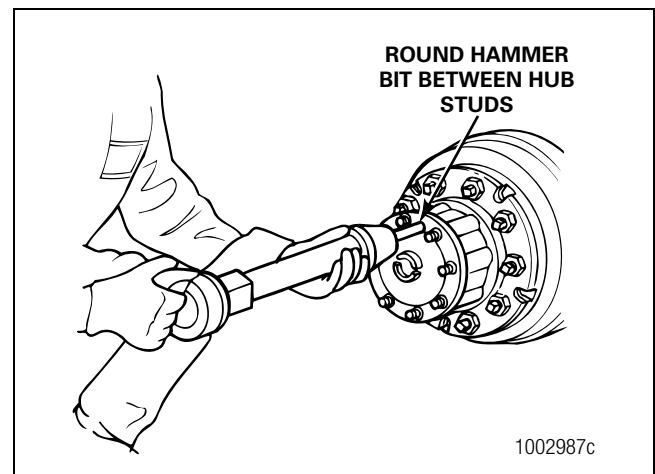


Figure 3.1

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 3.1.

3 Removal and Disassembly

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 diameter brass drift or brass hammer against the center of the axle shaft, inside the round driving lugs. Figure 3.2.

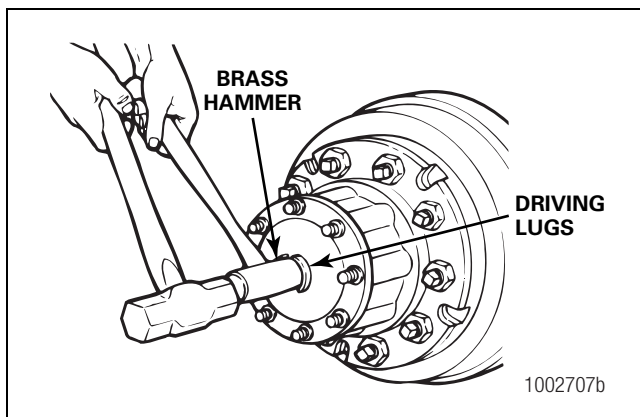


Figure 3.2

2. Strike the end of the drift with a large hammer, five to six pounds, and the axle shaft and tapered dowels will loosen.
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 3.3.

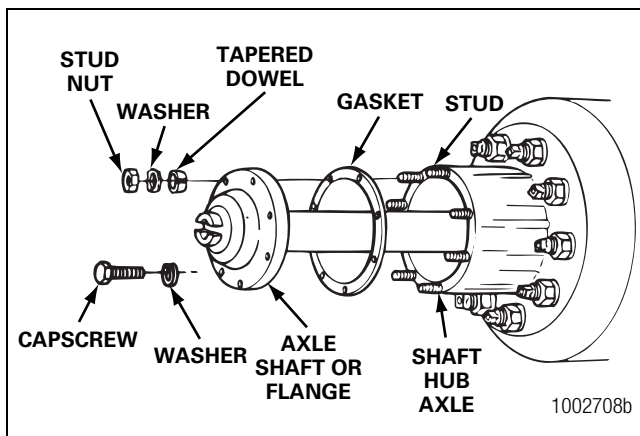


Figure 3.3

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 wedge to loosen the axle shaft and tapered dowels. Using a chisel or wedge can result in damage to the axle shaft, the gasket and seal, and the axle hub.

1. Use a round hammer bit and an air hammer to loosen the tapered dowels and axle shaft.
2. Place the round hammer bit against the axle shaft or flange between the hub studs. Operate the air hammer at alternate locations between the studs to loosen the tapered dowels and axle shaft from the hub. Figure 3.4.

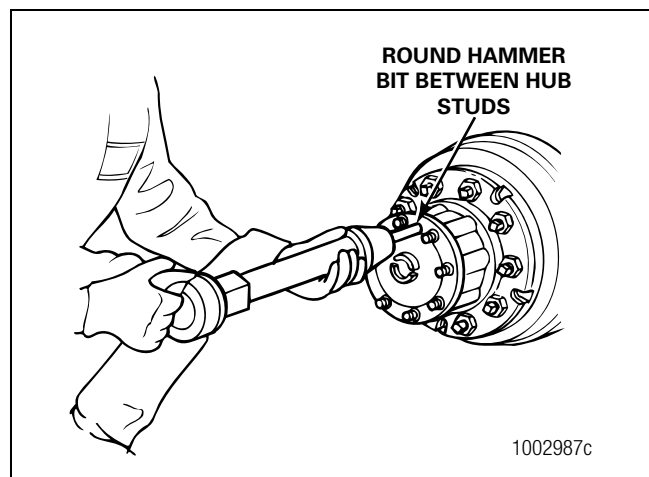


Figure 3.4

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 3.4.

Axle Shafts from the Axle Housing

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 or 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. Set the parking brake.
2. Use a jack to raise the vehicle so that the wheels to be serviced are off the ground. Support the vehicle with safety stands.
3. Remove the oil drain plug from the bottom of the axle housing. Drain the axle lubricant from the housing assembly.
4. For axles with an oil pump, remove the oil filter shield from the input bearing cage.
5. Use a filter strap wrench to remove the oil filter. Be careful that the oil inside does not spill when removing the filter. Discard the filter. Figure 3.1.

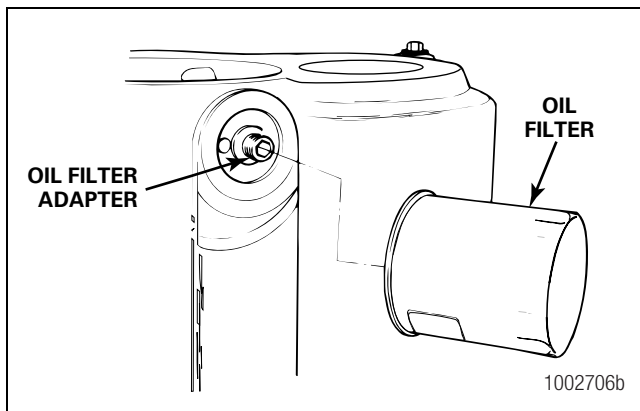


Figure 3.5

An alternate method to obtain clearance is to remove the cover of the air shift unit from the differential carrier. Remove the piston. Remove the shift shaft and spring from the fork. The fork and the clutch collar will fall into the carrier and the carrier can be removed. Remove the fork and the clutch collar after the carrier is removed.

8. Disconnect the driveline universal joint from the pinion input yoke or flange on the carrier. Figure 3.2.

6. Inspect the oil filter adapter threads.
 - **If the adapter threads are damaged:** Remove and replace the oil filter adapter.
7. On an axle with a driver-controlled main differential lock, shift the lock into and hold the lock in the locked or engaged position. The locked position provides enough clearance between the shift collar and the axle housing for carrier removal. Refer to Section 6.

3 Removal and Disassembly

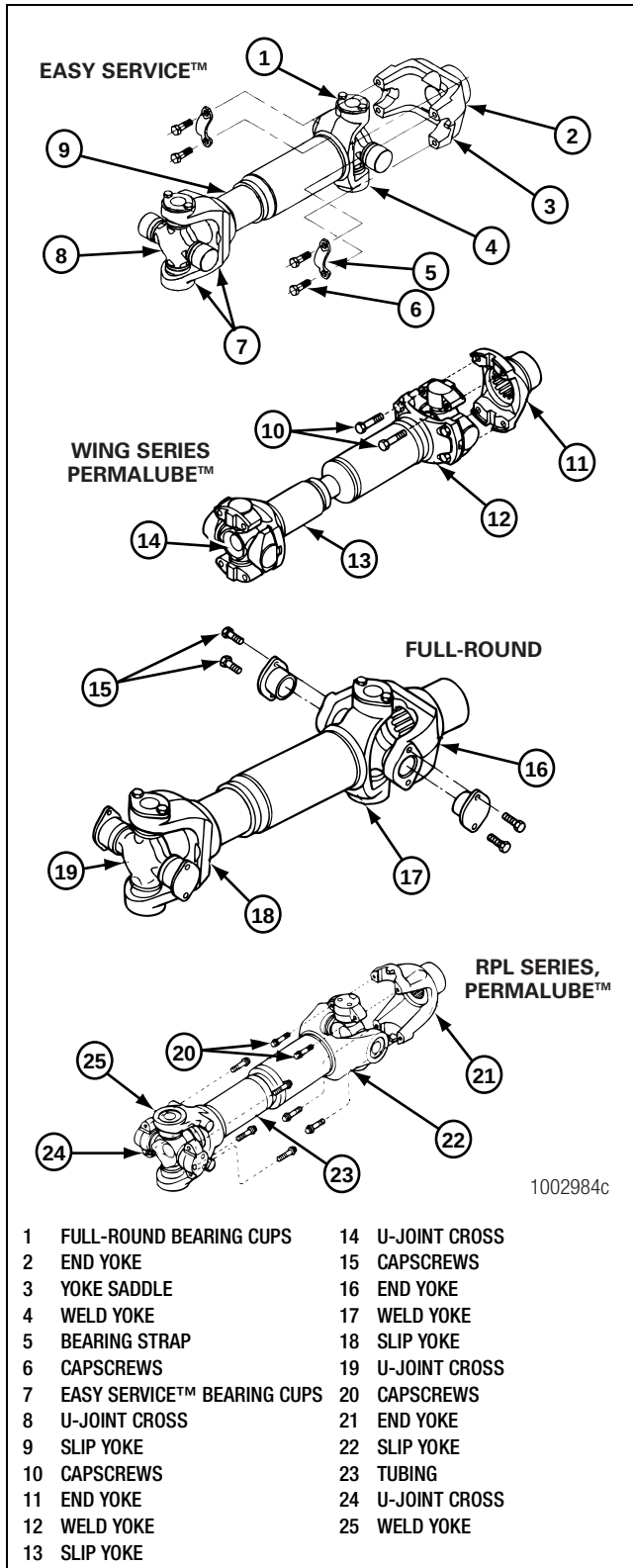


Figure 3.6

9. Remove the capscrews and washers or stud nuts and washers, if equipped, from the flanges of both axle shafts.
10. Loosen the tapered dowels, if equipped, in the axle flanges of both axle shafts. Refer to the removal methods in this section.

Thru-Shaft

1. Disconnect the forward and rear drive shafts.

⚠ CAUTION

Always use a flange or yoke bar during removal and installation of the flange yoke nut to prevent damage to the gearing.

2. Attach a flange bar to the flange or place a yoke bar over the input or output yoke to hold the yoke or flange while you remove the pinion nut. Figure 3.7. Refer to Section 10 to make a yoke bar.

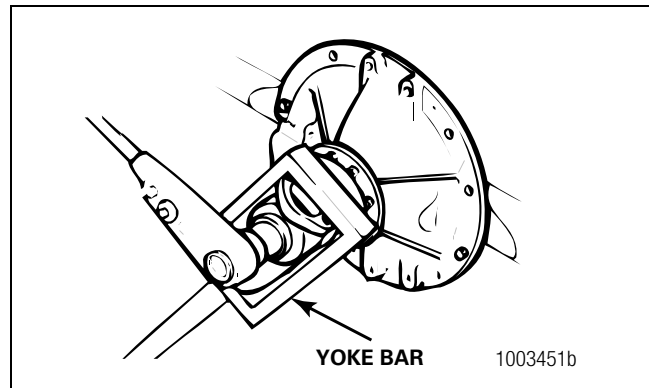


Figure 3.7

3. Disconnect the air lines at the inter-axle differential shift unit.
4. Remove the thru-shaft nut, washer and yoke or flange. Use a puller tool to remove the yoke or flange from the shaft. Figure 3.8.

3 Removal and Disassembly

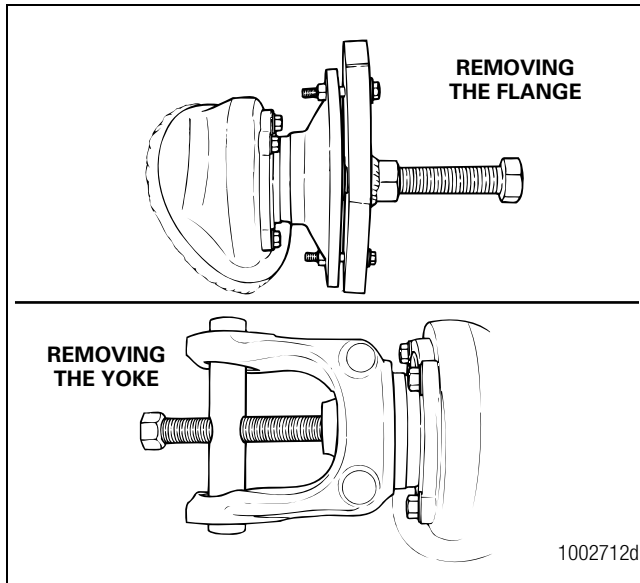


Figure 3.8

5. Remove the thru-shaft bearing cage capscrews and washers.
6. Pull the bearing cage, bearings and shaft assembly from the axle housing. If necessary, loosen the cage from the housing with a soft mallet. Figure 3.9.

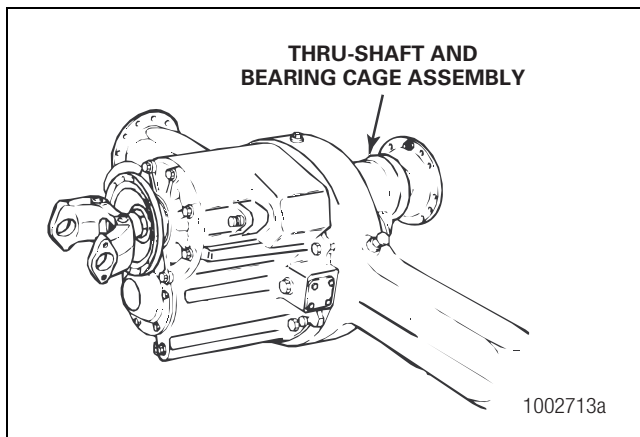


Figure 3.9

Differential Carrier from the Axle Housing

1. Place a hydraulic roller jack under the differential carrier to support the assembly. Figure 3.10.

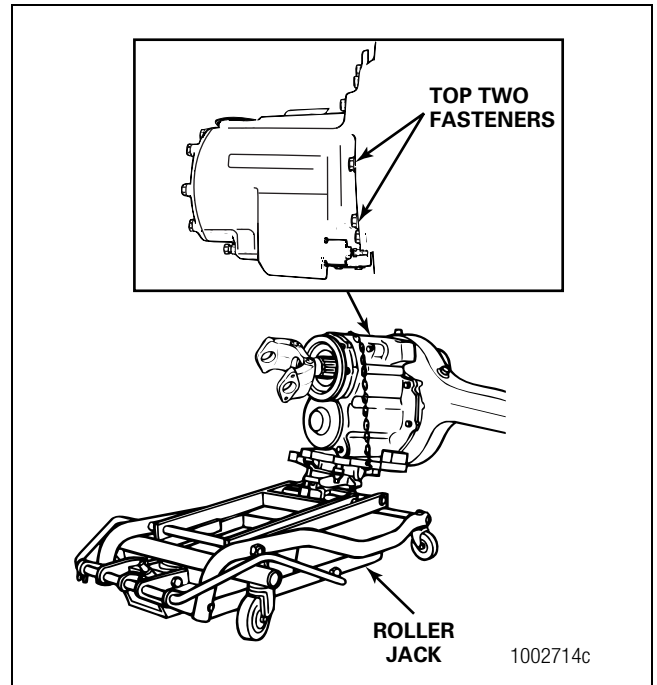


Figure 3.10

2. Remove all but the top two carrier-to-housing capscrews or stud nuts and washers. Figure 3.10.
3. Loosen, but do not remove, the top two carrier-to-housing fasteners. The fasteners will hold the carrier in the housing.
4. Loosen the differential carrier in the axle housing. Use a plastic mallet to hit the carrier mounting flange at several points.
5. After the carrier is loosened, remove the top two stud nuts and washers that hold the assembly in the axle housing.

⚠ CAUTION

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

6. Use the hydraulic roller jack to remove the carrier from the axle housing. Use a pry bar that has a round end to help remove the carrier from the housing.
7. On axles with a driver-controlled main differential lock, if air pressure is used to shift the differential to the locked or engaged position, release the air pressure. Disconnect the air hose from the shift unit.

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.

3 Removal and Disassembly

8. Use a lifting tool to lift the differential carrier by the input yoke or flange and place the assembly in a repair stand. Do not lift by hand. Refer to Section 10 to make a carrier repair stand. Figure 3.11.

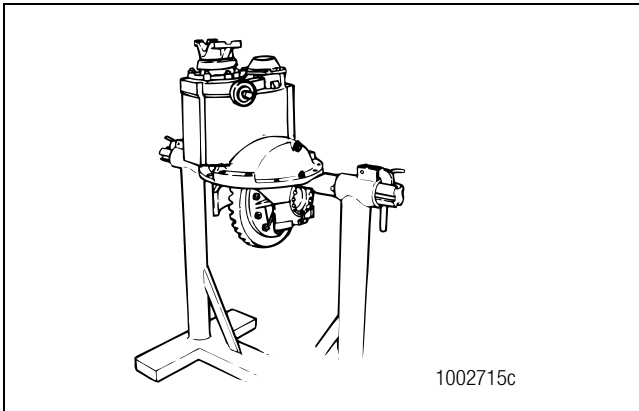


Figure 3.11

Disassembly

Thru-Shaft and Output Bearing Cage Assembly

1. Remove and discard the original oil seal. Use a new triple-lip or main oil seal when the carrier is assembled. Figure 3.12.

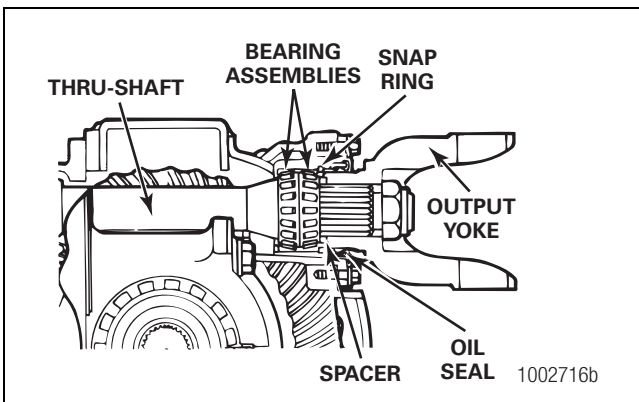


Figure 3.12

NOTE: If you replace either the bearing cup or the cone, replace both parts in a fully-matched set from the same manufacturer.

2. Remove the external snap ring or yoke-to-cone spacer from the thru-shaft.
3. Remove the internal snap ring that holds the bearing cup in the output cage. Figure 3.13.

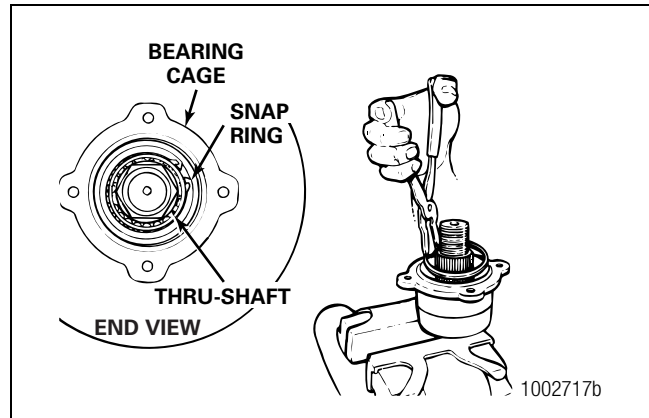


Figure 3.13

NOTE: When you press the thru-shaft from the cage, the inner cup remains in the cage. The outer cup is removed with the thru-shaft and the cones.

4. If necessary, remove the thru-shaft and the bearing cones as an assembly from the output bearing cage.
 - A. Place the thru-shaft and the output bearing cage in a press. Figure 3.14.
 - B. Press the thru-shaft and cones from the bearing cage.
 - C. Remove the outer cup from the thru-shaft.

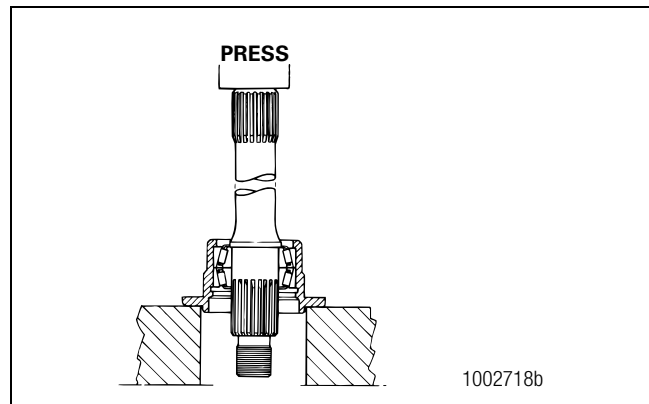


Figure 3.14

5. Use a press or a bearing puller to remove the bearing cones from the thru-shaft. Refer to the procedure in this section.

Removal

Bearing Cone from the Thru-Shaft

Press Method

1. Place a used bearing cup on the inner bearing cone.
2. Place the thru-shaft into a press. Figure 3.15. The used bearing cup supports the thru-shaft.

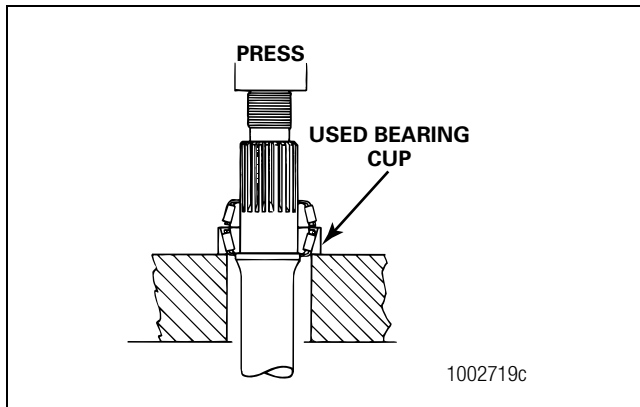


Figure 3.15

3. Press the thru-shaft through the bearing cones. Discard the bearing cones.

Bearing Puller Method

1. Place a used bearing cup on the inner bearing cone.
2. Install a bearing puller tool onto the thru-shaft. Figure 3.16. The bearing cup supports the thru-shaft.

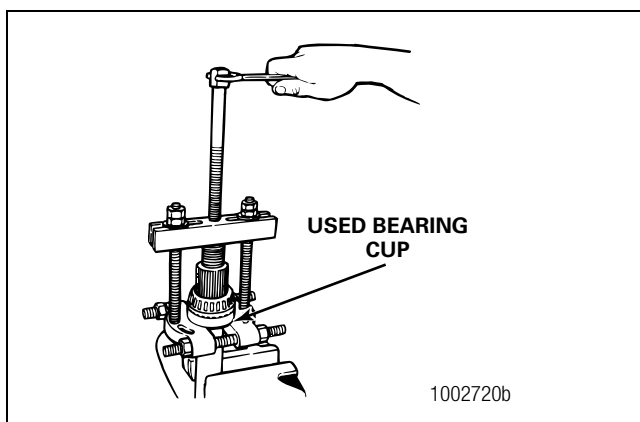


Figure 3.16

3. Remove the bearing cones from the thru-shaft. Discard the bearing cones.
4. If necessary, use a brass drift and hammer to carefully tap the inner cup from the cage. Discard the cup. Figure 3.17.

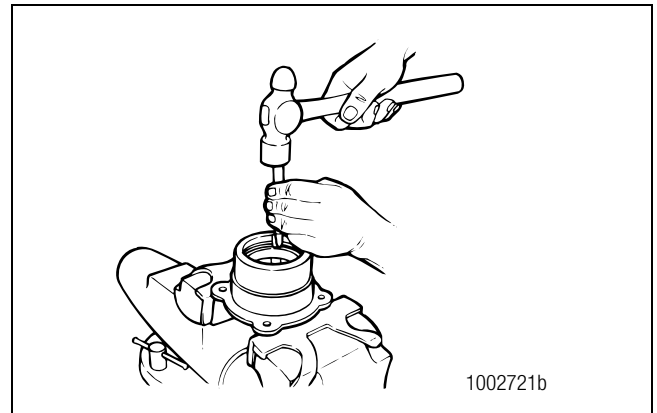


Figure 3.17

Measure Ring Gear Backlash

Before the carrier is disassembled, use a dial indicator to measure and record ring gear backlash at three locations on the ring gear. This will help you to correctly reassemble the ring gear and drive pinion.

1. Rotate the carrier in the stand to access the ring gear teeth.
2. Install a dial indicator onto the flange of the carrier. Place the tip of the indicator against the drive side of a ring gear tooth. Adjust the dial indicator to ZERO. Figure 3.18.

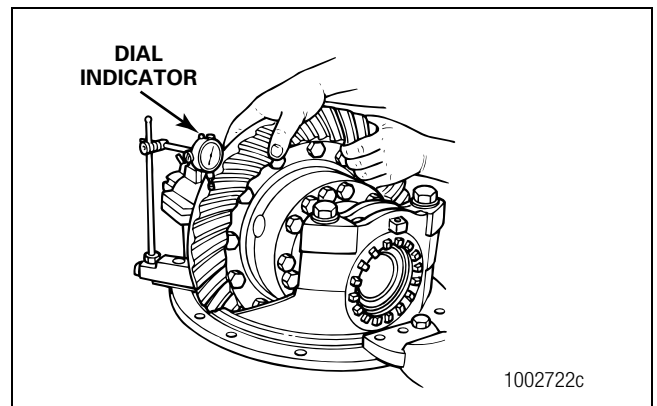


Figure 3.18

3 Removal and Disassembly

3. Read the dial indicator while you slightly rotate the ring gear in both directions. When you rotate the ring gear to measure the backlash, the drive pinion must not move. Record the reading on the dial indicator.
4. Repeat the procedure at two more locations on the ring gear.
 - If the smallest of the three measurements is not 0.008-0.018-inch (0.20-0.46 mm) for 145 Series or 0.010-0.020-inch (0.25-0.51 mm) for 160 Series: Replace the ring gear and drive pinion as a set.

Input Shaft and Inter-Axle Differential Assembly

1. Rotate the carrier in the stand to access the input shaft.
2. Remove the capscrews and the washers that fasten the drive pinion cover to the differential carrier. Remove the cover. Remove all gasket material from the cover and the differential carrier. Figure 3.19.

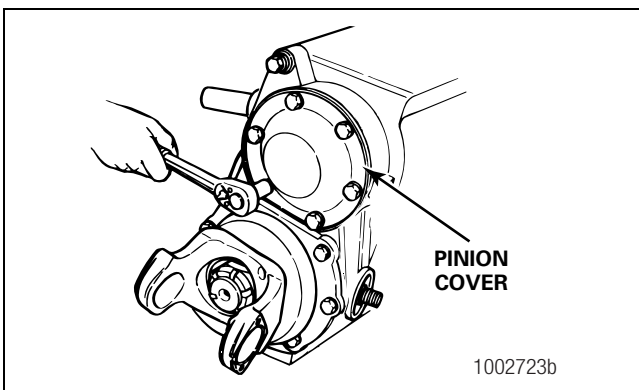


Figure 3.19

3. Use the correct tool to hold the input yoke or flange. Loosen, but do not remove, the drive pinion nut. Figure 3.20.

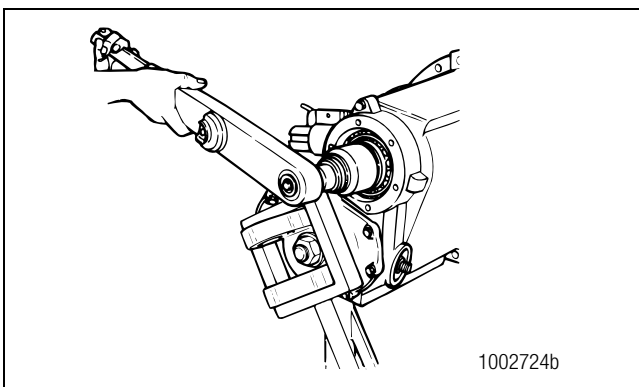


Figure 3.20

4. Use the correct tool to hold the input yoke or flange. Loosen, but do not remove, the nut that fastens the yoke or flange to the input shaft. Figure 3.21.

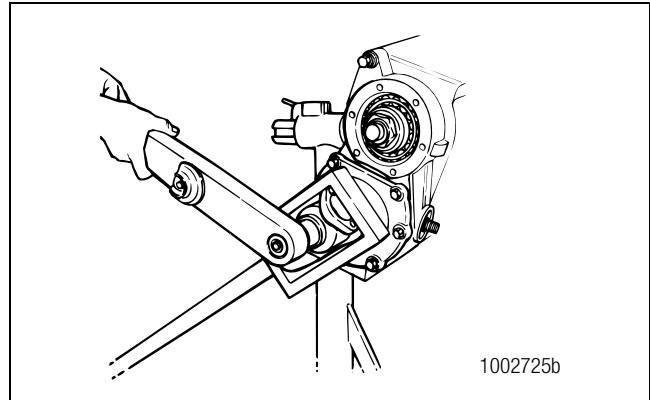


Figure 3.21

5. Remove the capscrews and washers that fasten the input bearing cage to the differential carrier. Figure 3.22.

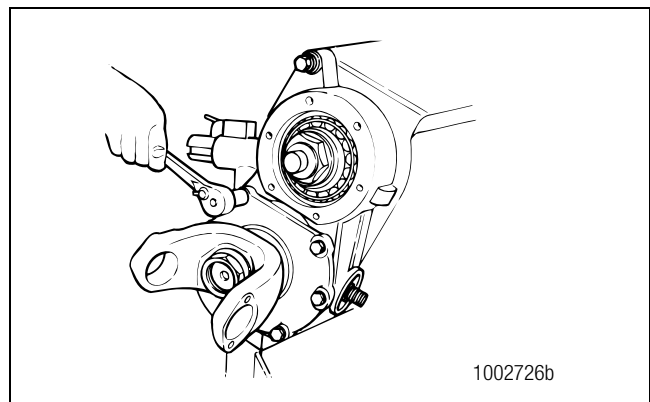


Figure 3.22

6. Rotate the carrier in the stand until the yoke or flange is on top. Connect a lifting device to the input yoke.

NOTE: Paint alignment marks on the helical drive gear and the helical driven gear before you remove the input shaft assembly from the carrier. This will ensure exact reassembly for the original mesh of the mated gears.

7. Paint alignment marks on the helical drive gear and the helical driven gear.
 - **For a driven gear:** Paint the ends of two adjacent teeth.

3 Removal and Disassembly

- **For a drive gear:** Paint the top land of the matching tooth and guide it into the two painted teeth of the driven gear.

⚠ CAUTION

On all 160 Series carriers and 145 Series carriers manufactured before September 1998, there are two notches on the side of the inter-axle differential case. One of the notches on the case must be aligned with the helical driven gear. If the notch is not aligned over the gear, the gear will prevent the removal of the input shaft assembly and cause damage to the assembly.

8. Remove the input shaft, oil pump, if used, and inter-axle differential from the carrier.
 - A. Lift the input shaft assembly until the bearing cage is separated from the carrier. If necessary, tap on the bearing cage with a brass or plastic mallet to separate the cage from the carrier. Figure 3.23.
 - B. For 160 Series carriers and 145 Series carriers manufactured after September 1998, slowly lift the input shaft assembly.
 - **If the input shaft assembly comes out of the carrier easily:** Remove the assembly.
 - **If the input shaft assembly cannot be removed easily:** The inter-axle differential case must be rotated. Rotate the input shaft until one of the notches on the case is aligned over the helical driven gear. Remove the input shaft assembly from the carrier. Figure 3.24 and Figure 3.25.
 - C. Place the input shaft assembly on a bench.

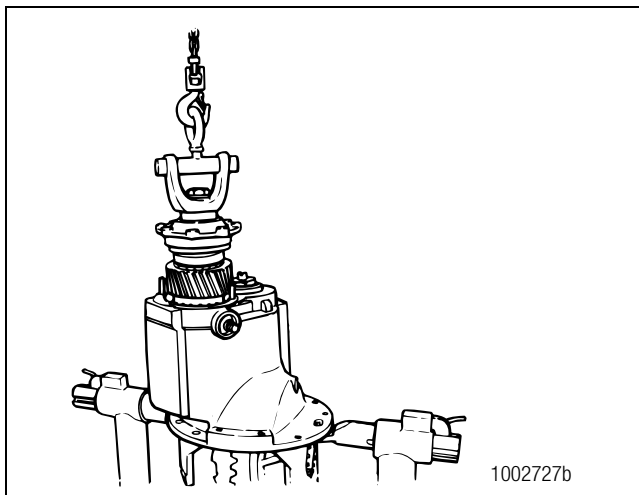


Figure 3.23

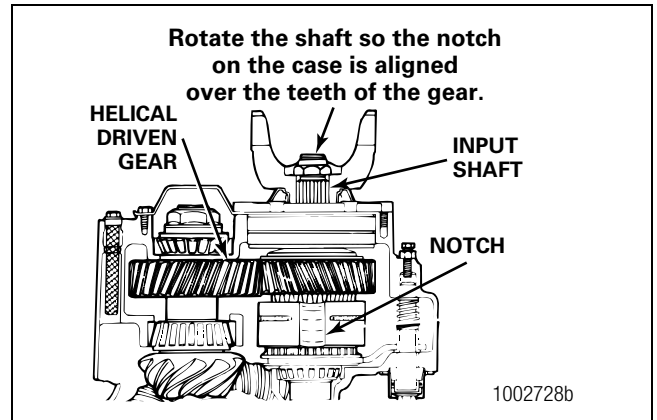


Figure 3.24

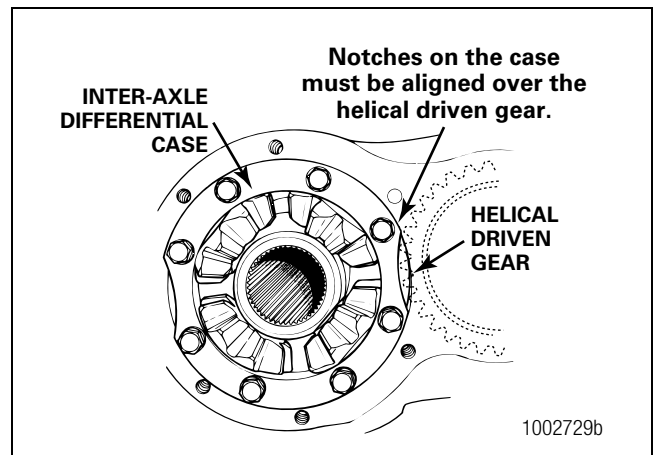


Figure 3.25

9. Remove the shims from between the bearing cage and the differential carrier.
10. Remove the rear side gear and the bearing cone from the carrier. Remove the collar. Figure 3.26.

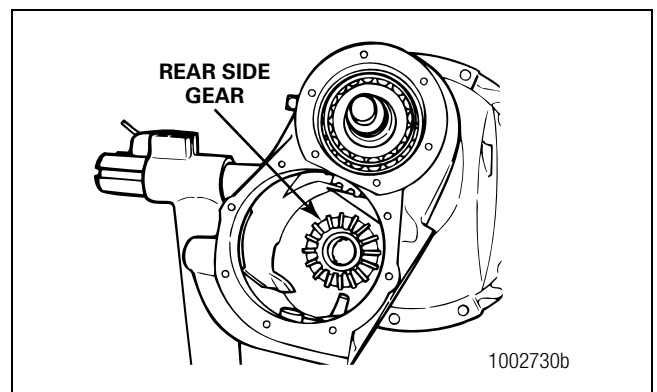


Figure 3.26

3 Removal and Disassembly

NOTE: If you replace either the bearing cup or the cone, replace both parts in a fully-matched set from the same manufacturer.

11. Use a press, sleeve and bearing puller to remove the cone from the rear side gear. Figure 3.27.

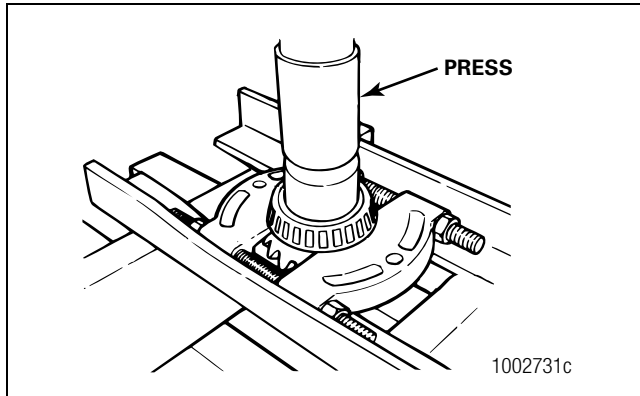


Figure 3.27

12. Use a brass drift and hammer to remove the cup of the rear side gear cone from the differential side of the carrier.

Disassembly

Input Shaft, Bearing Cage, Oil Pump and Inter-Axle Differential

1. Use the correct tool to remove the yoke or flange from the input shaft. Figure 3.28. If the carrier is not equipped with an oil pump, remove the bearing cage from the input shaft. Figure 3.29.

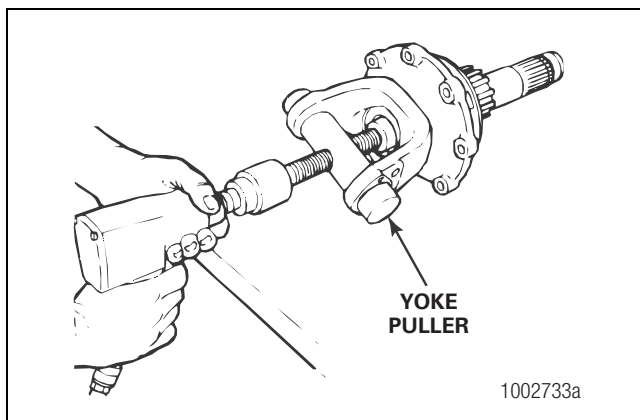


Figure 3.28

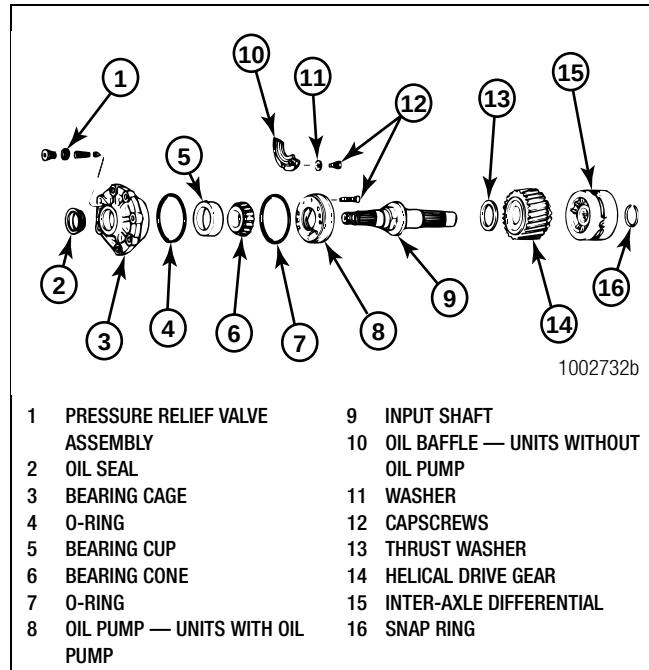


Figure 3.29

⚠ CAUTION

Carefully remove the pinion seal from the yoke or carrier. Do not damage the seal bore when you remove the seal. Damage to components can result.

NOTE: Meritor recommends replacing all seals with the triple-lip or main oil seal. The addition or replacement of a POSE™ seal is also highly recommended.

2. Pry under the oil seal flange to remove the oil seal from the input bearing cage. Discard the oil seal. Figure 3.30.

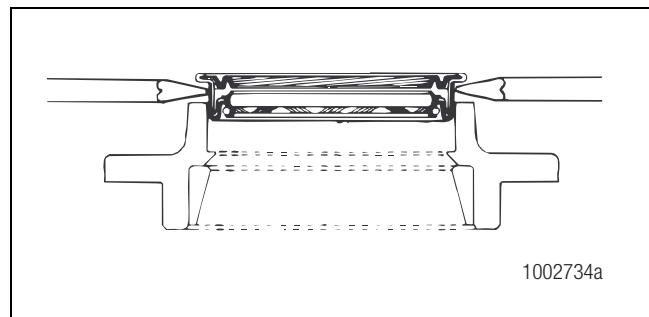


Figure 3.30

3 Removal and Disassembly

3. Remove the snap ring that fastens the inter-axle differential assembly to the input shaft. Remove the inter-axle differential assembly from the input shaft. Figure 3.31.

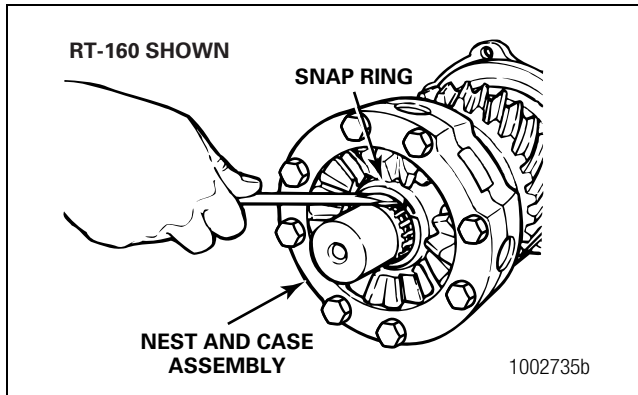


Figure 3.31

NOTE: Disassemble the bolted inter-axle differential and inspect the components. The welded inter-axle differential is serviced as an assembly and cannot be disassembled.

4. Disassemble the bolted inter-axle differential case. Inspect the components. Replace any damaged components.
 - A. Use a punch and hammer to place an alignment mark on each half of the inter-axle differential case. The alignment marks will help you mate the case halves correctly during assembly. Figure 3.32.
 - B. Remove the capscrews that fasten the case halves of the inter-axle differential. Separate the case halves.
 - C. Remove the spider assembly from the case halves. Remove the four pinion gears and the four thrust washers from the spider.

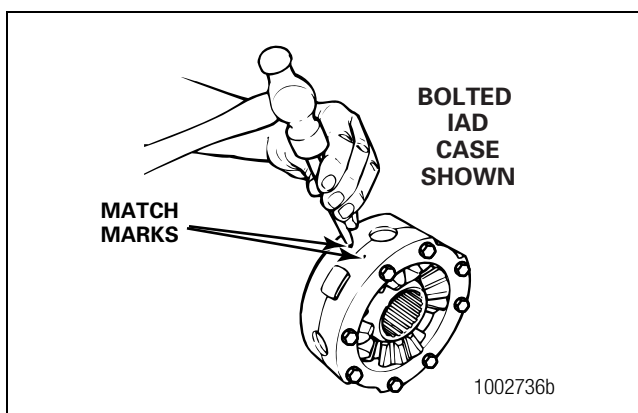


Figure 3.32

5. Remove the helical drive gear from the input shaft. Remove the thrust washer from the gear. Figure 3.33.

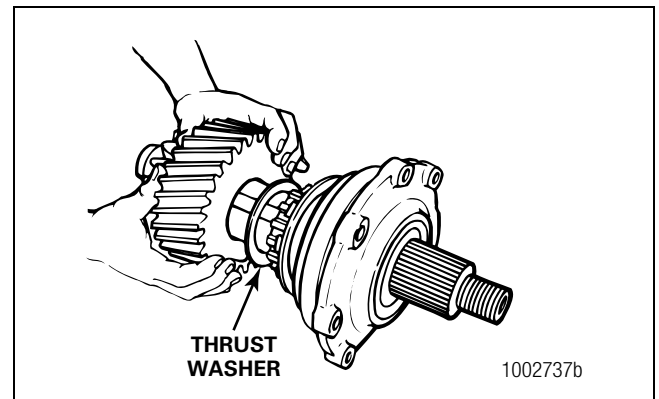


Figure 3.33

CAUTION

If the following procedure is not followed, the oil pump or the bearing cage will be damaged during removal. Never apply direct pressure to the surface of the pump or the bearing cage.

6. If an oil pump is used, remove the input bearing cage and the oil pump from the input shaft.
 - A. Place a bearing puller under the oil pump. The rivets on the back of the pump must not touch the bearing puller. The bearing puller provides a level surface so that the shaft can be pressed straight out of the assembly. Figure 3.34.
 - B. Place the assembly on a press so that it rests on the puller. Figure 3.35.
 - C. Place a protector on top of the threaded part of the shaft. Press the input shaft from the assembly. Remove the bearing puller. Figure 3.35.
 - D. Remove the capscrews that fasten the oil pump to the input bearing cage. Separate the oil pump from the cage. Figure 3.36.
 - E. If the pump is worn or damaged, replace the pump. If the drive flats or the splines in the pump do not move, replace the pump.

3 Removal and Disassembly

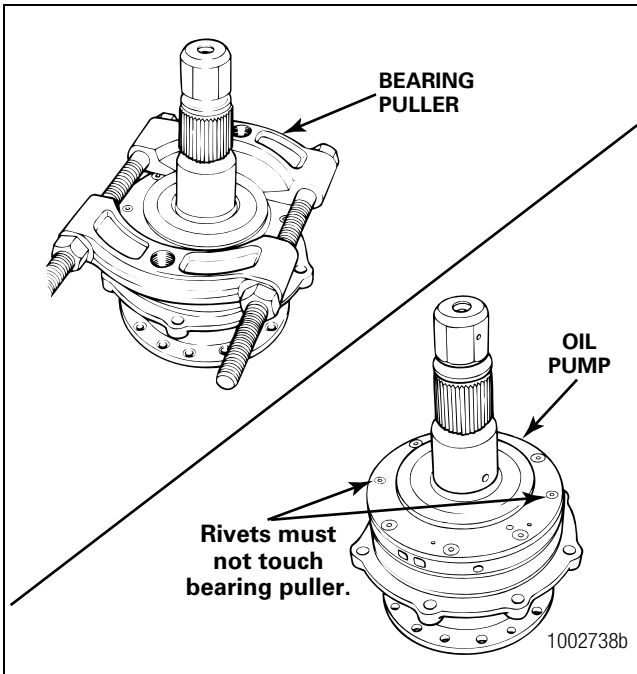


Figure 3.34

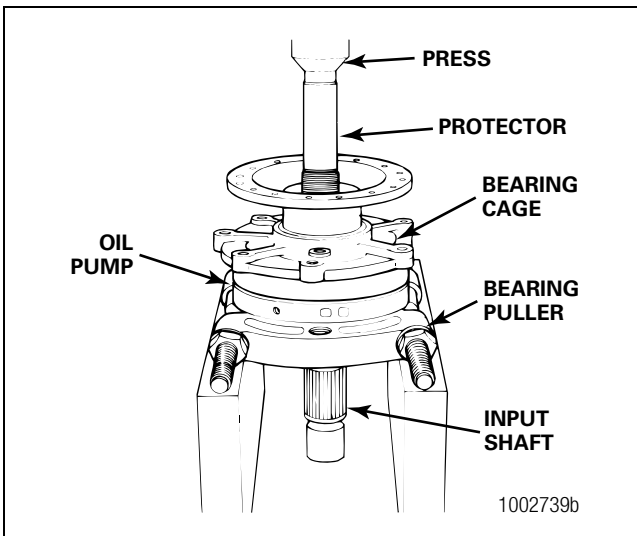


Figure 3.35

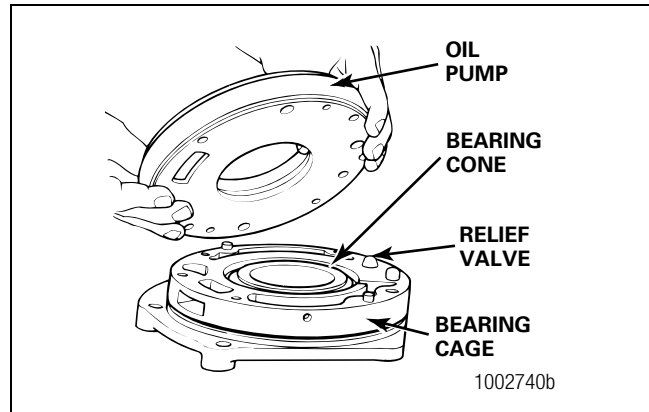


Figure 3.36

7. Remove the O-rings from the bearing cage and, if used, the oil pump assembly.
8. Remove the cone from the input bearing cage.

NOTE: If you replace either the bearing cup or the cone, replace both parts in a fully-matched set from the same manufacturer.

9. If necessary, use a press and sleeve to remove the cup from the input bearing cage.
10. If necessary, remove the pressure relief valve assembly from the front of the bearing cage. Remove the plug, spring and relief valve from the bore. Figure 3.37.

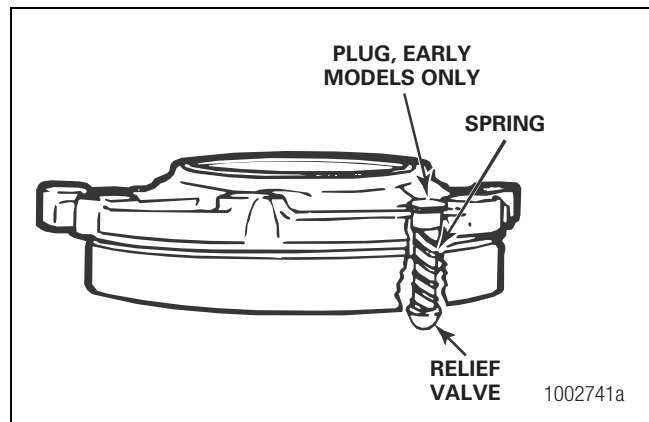


Figure 3.37

11. Remove the oil screen and plug assembly from the suction line at the front of the carrier. Figure 3.38.

3 Removal and Disassembly

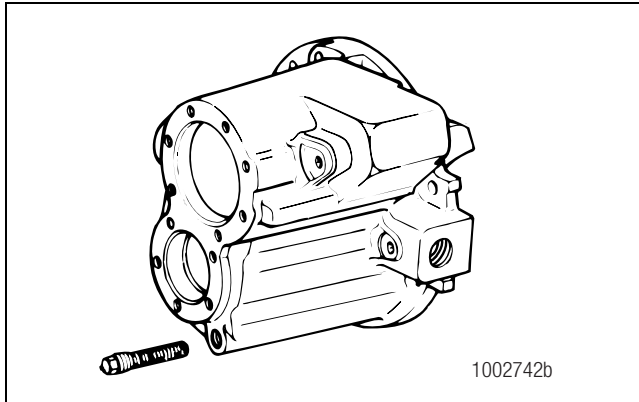


Figure 3.38

12. Clean the oil screen. Refer to Section 4.

Removal

Inter-Axle Differential Lock IAD Shift Unit

Air Applied and Spring Release Models, Standard

1. Remove the cylinder.
 - A. For flange-type cylinders, remove the capscrews that fasten the cylinder to the carrier. Remove the cylinder.
 - B. For threaded cylinders, remove the cylinder.
2. Remove the piston from the shift shaft. Figure 3.39.

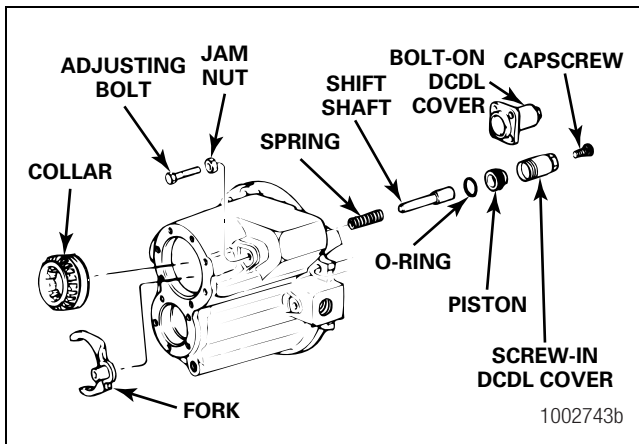


Figure 3.39

3. Remove the shift shaft from the differential carrier. When you remove the shift shaft, the fork and the spring may fall.

- **If the shift shaft cannot be removed by hand:** Remove the adjusting bolt and jam nut. Place a brass drift through the adjusting bolt hole against the rear of the shift shaft. Use a hammer on the brass drift to remove the shift shaft. Inspect the shift shaft for damage.

4. From the input shaft bore, remove the collar and fork.
5. If necessary, remove the jam nut and the adjusting bolt.

Spring Applied and Air Release Models, Reverse Shifter

1. Remove the four capscrews that fasten the shift cylinder cover to the differential carrier.
2. Remove the two capscrews and washers that fasten the cover to the shift cylinder. Remove the cover and spring. Figure 3.40.

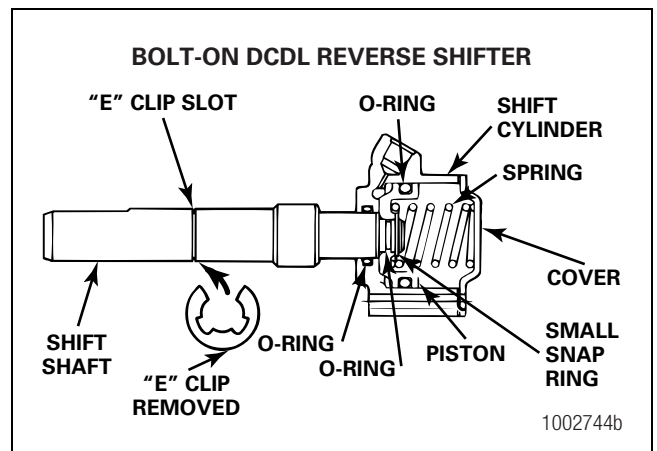


Figure 3.40

3. Remove the small snap ring from the cover end of the shift shaft.
4. Remove the cylinder assembly from the shaft.
5. Rotate the shift shaft until the "E" clip ahead of the shift fork is at approximately the five o'clock position. Figure 3.41.

3 Removal and Disassembly

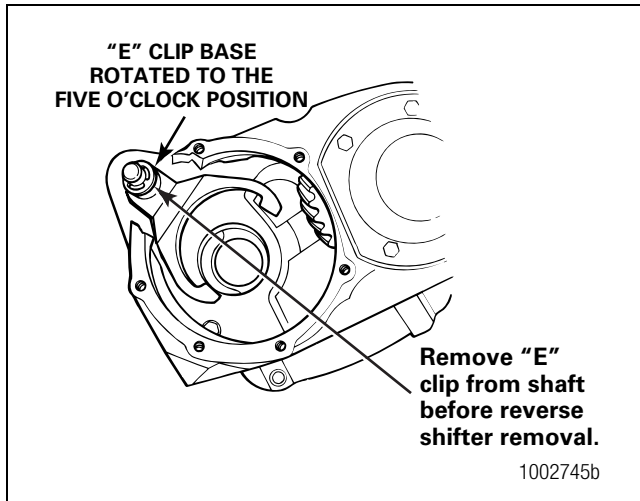


Figure 3.41

6. With the "E" clip base in the five o'clock position, use needlenose vise grips or equivalent to remove the "E" clip.
7. Remove the shift shaft from the carrier. When you remove the shaft, the fork may fall.
8. Remove the piston from the shift cylinder. Inspect the O-rings for wear and damage. Replace the O-rings, if necessary.

Driver-Controlled Main Differential Lock (DCDL)

If the axle is equipped with a driver-controlled main differential lock, refer to Section 6 for removal procedures.

Main Differential Case and Ring Gear Assembly

1. Rotate the carrier in the stand until the ring gear is toward you.
2. Use a punch and hammer to mark the position of each bearing cap on the differential carrier legs. The marks help you correctly match the caps to the carrier legs during assembly. Figure 3.42.

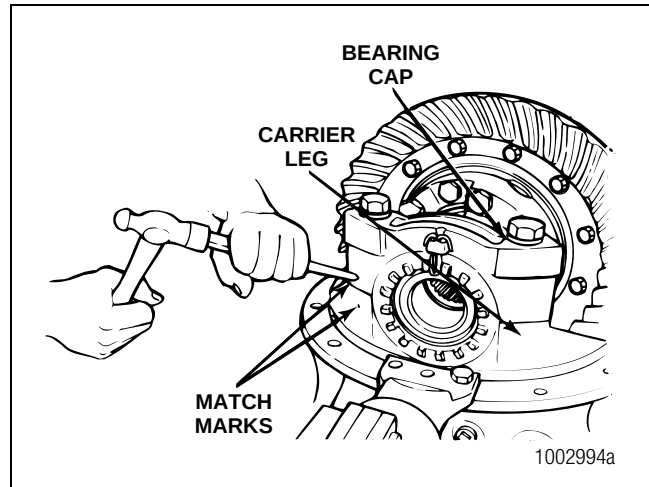


Figure 3.42

3. Remove the capscrews, cotter pins, roll pins or lock plates, if equipped, that hold the bearing adjusting rings in position. Use a small drift and hammer to remove the pins. Each lock plate is held in position by two capscrews. Figure 3.43.

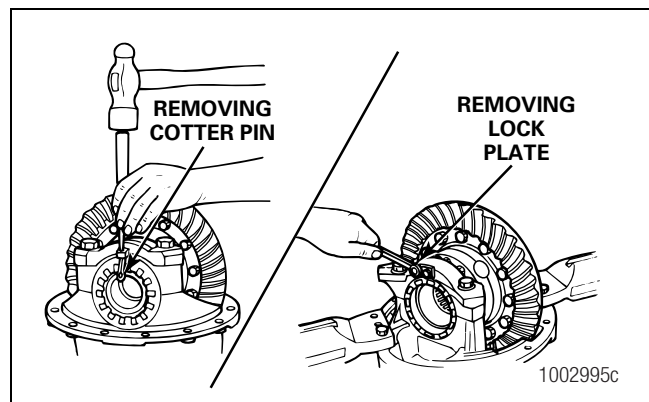


Figure 3.43

⚠ CAUTION

Do not hit the adjusting ring with a hammer. Do not use a hammer and a drift to loosen the adjusting rings. Using these methods will damage the adjusting rings.

4. Use a T-bar wrench or equivalent tool to loosen the adjusting rings. Do not remove the adjusting rings. If necessary, loosen, but do not remove, the capscrews on the bearing caps to move the adjusting rings. Figure 3.44.

3 Removal and Disassembly

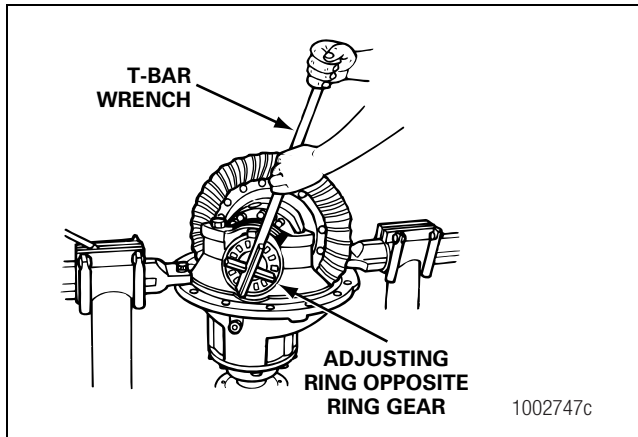


Figure 3.44

5. Remove the capscrews and washers that fasten the bearing caps to the differential carrier. Mark the bearing caps and the carrier to help you correctly assemble the caps into the carrier.

NOTE: Each bearing cap must be installed on the carrier leg from which it was removed. The caps are matched to the carrier legs. Do not mix bearing caps on carrier legs.

6. Remove the bearing caps, adjusting rings and bearing cups from the differential carrier. Figure 3.45.

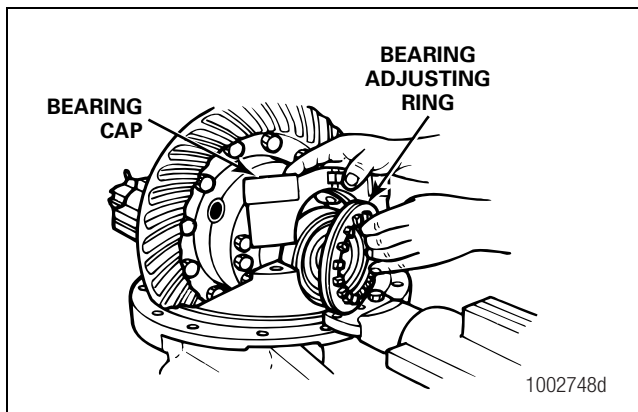


Figure 3.45

7. Use an appropriate lifting device to remove the main differential case and ring gear assembly from the carrier. Figure 3.46.

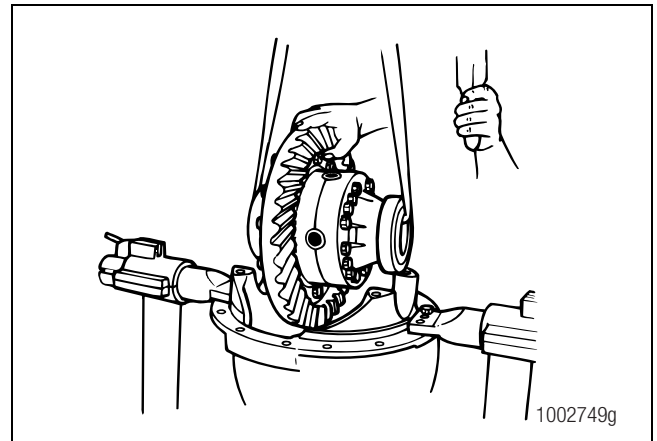


Figure 3.46

NOTE: If you replace either the bearing cup or the cone, replace both parts in a fully-matched set from the same manufacturer. The bearing cones are not interchangeable.

8. If the bearing cones on the main differential case need to be replaced, use a bearing puller to remove the cones. Figure 3.47.

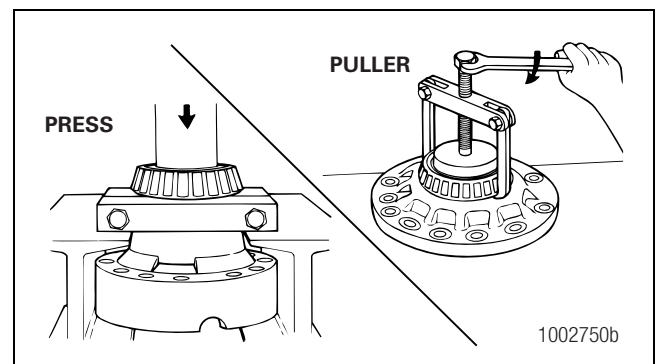


Figure 3.47

Disassembly

Main Differential Case and Ring Gear

1. Use a punch and hammer to mark the case halves. The marks will help you correctly align the case halves during assembly. Figure 3.48.

3 Removal and Disassembly

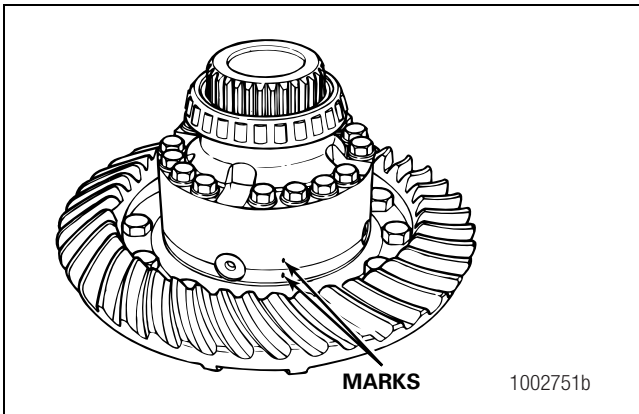


Figure 3.48

2. Remove the capscrews and washers that fasten the halves of the main differential together.
3. Remove the spider, pinions, thrust washers and side gears from the separated case assembly. Figure 3.49.

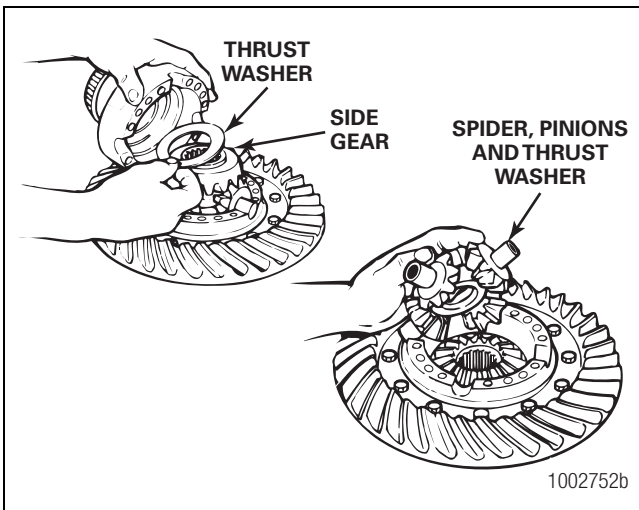


Figure 3.49

Removal

Ring Gear from the Differential Case

1. For 145 and 160 Series axles, remove the bolts, washers and nuts that fasten the ring gear to the differential case.

⚠ CAUTION

Do not remove the rivets or the rivet heads with a chisel and hammer. A chisel and hammer can damage the differential case.

2. For 140 Series axles, remove the rivets that fasten the ring gear to the differential case.
 - A. Carefully center-punch each rivet head in the center on the ring gear side of the assembly.
 - B. Drill each rivet head on the ring gear side of the assembly to a depth equal to the thickness of one rivet head. Use a drill bit that is 0.0312-inch (0.8000 mm) smaller than the body diameter of the rivets. Figure 3.50.
 - C. Press the rivets through the holes in the ring gear and the differential case. Press on the drilled rivet head.

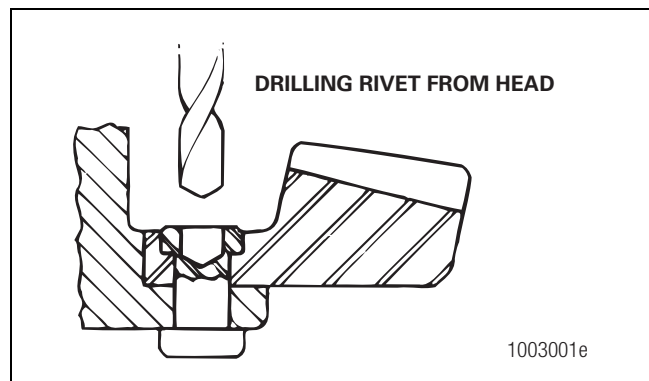


Figure 3.50

3. Place the ring gear and case assembly on a press so that the teeth of the gear are toward you. Place supports under the gear.
4. Place a sleeve or a flat metal plate on top of the case. Press the main differential case from the ring gear. Figure 3.51.

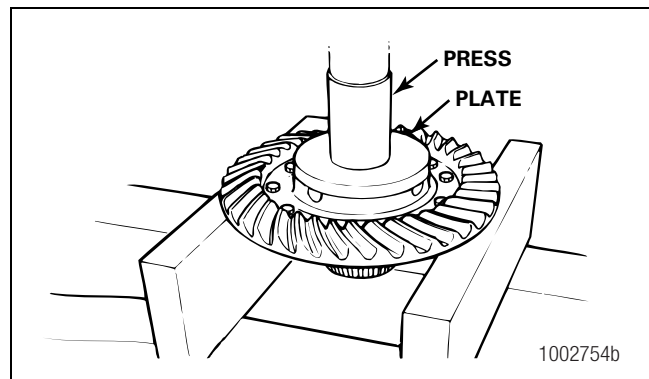


Figure 3.51

Drive Pinion Assembly

Before You Work on a Differential Carrier

Inspect the hypoid ring gear set for damage. If it is not damaged, you can reuse the ring gear set at assembly. Measure and record the gear set backlash. Figure 3.8. Refer to Measure Ring Gear Backlash in this section.

Assembly Procedures

1. Remove the nut and washer from the drive pinion. You loosened the drive pinion nut when you removed the input shaft assembly. Figure 3.52.

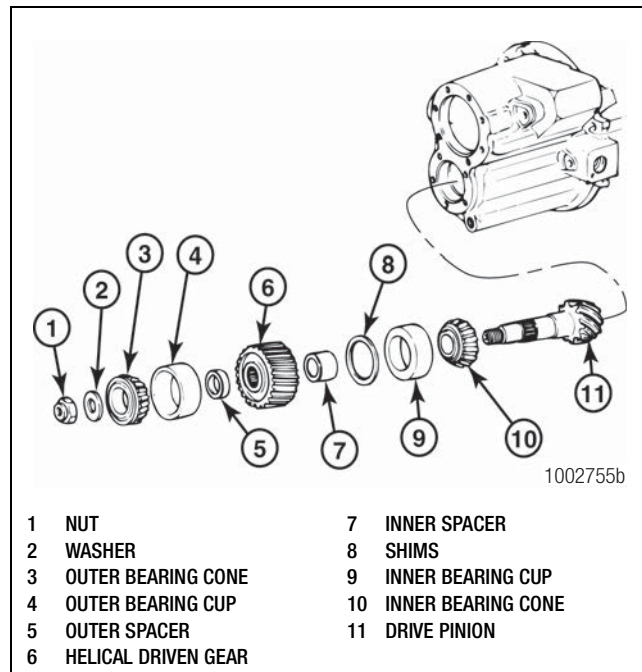


Figure 3.52

2. Remove the drive pinion from the carrier.
 - A. Place the differential carrier into a press so that the threaded end of the drive pinion is facing UP. Place supports under the carrier mounting flange.
 - B. Place a protector onto the top of the drive pinion shaft. Figure 3.53.

⚠ CAUTION

The drive pinion must not fall on the floor when the drive pinion is pressed from the carrier. If the drive pinion falls to the floor, the gear teeth may be damaged.

- C. Press the pinion through the outer bearing cone and the helical driven gear. Remove the drive pinion from the bottom of the carrier.
- D. Remove the outer spacer, outer bearing cone and helical driven gear from the carrier. Remove the inner spacer from the drive pinion.

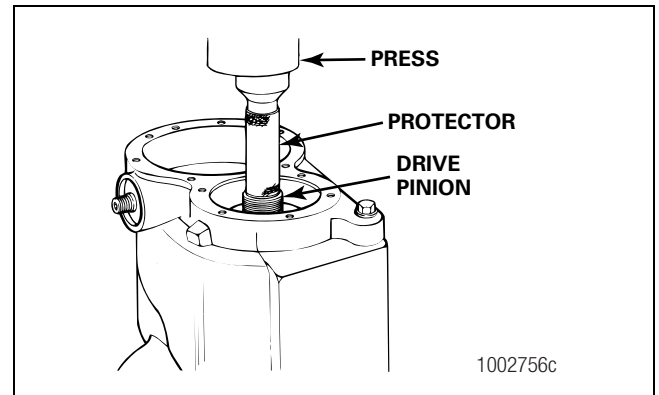


Figure 3.53

NOTE: If you replace either the bearing cup or the cone, replace both parts in a fully-matched set from the same manufacturer.

NOTE: If a new ring gear and drive pinion are being installed, the inner bearing cup must be removed to change the shim pack between the cup and the carrier.

3. If necessary, remove the inner and the outer bearing cups from the carrier. Use a hammer and drift to remove the cups from the carrier. Replace any shims that are damaged. Measure and record the thickness of the shim pack for assembly. Figure 3.54.

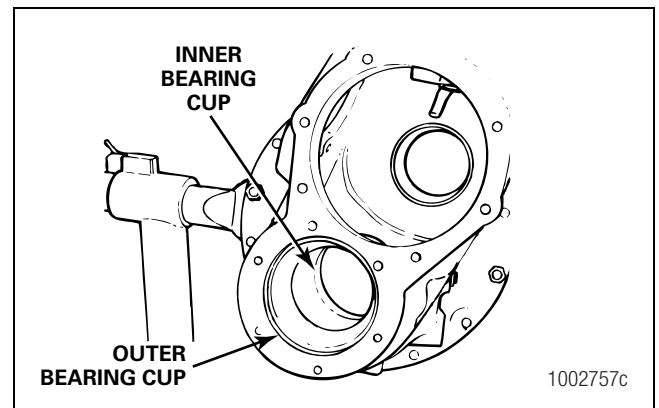


Figure 3.54

3 Removal and Disassembly

4. If necessary, remove the inner bearing cone from the drive pinion. Place a bearing puller under the inner race to support the bearing. Place a protector on top of the pinion shaft and press the drive pinion out of the bearing cone. Figure 3.55.

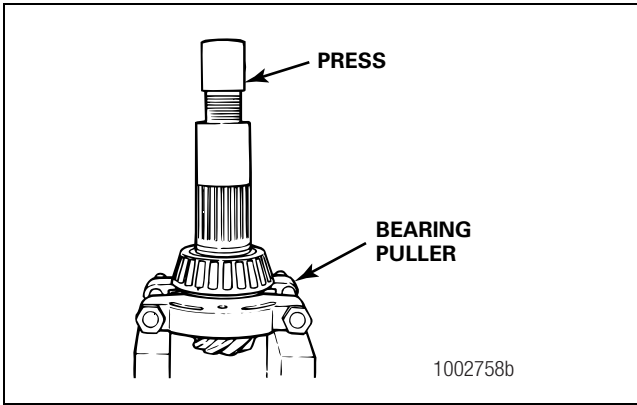


Figure 3.55

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.

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. If Loctite® adhesive material gets into your eyes, follow the manufacturer's emergency procedures. Have your eyes checked by a physician as soon as possible.

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.

Clean, Dry and Inspect Parts

Clean and Inspect Yokes

CAUTION

Do not install a press-on shaft excluder or POSE™ seal after you install a unitized pinion seal. The use of a POSE™ seal will prevent correct seating of the unitized pinion seal on the yoke and will result in lubricant leakage at the seal. POSE™ seal installation is recommended only for triple-lip and other previous design seals.

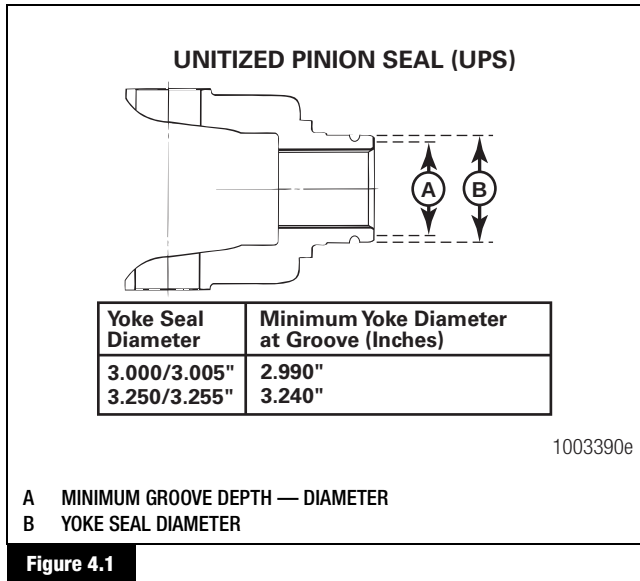
Do not use thin metal wear sleeves to refresh the yoke surface. Wear sleeves pressed onto the yoke will prevent correct seating of the pinion seal and damage the pinion seal assembly. Wear sleeve usage will cause the seal to leak.

1. Clean the ground and polished surface of the yoke journal using a clean shop towel and a safe cleaning solvent. Do not use abrasive cleaners, towels or scrubbers to clean the yoke or flange surface. Do not use gasoline.

NOTE: The unitized seal features a rubber inner sleeve that is designed to seal and rotate with the yoke. This feature allows you to reuse a yoke with minor grooves.

2. Inspect the yoke seal surface for grooves.
 - **If you find grooves on yoke hubs used with single or triple-lip seals:** Replace the yokes.
 - **If you find grooves on the yoke:** Use calipers to measure the groove diameters. If any groove diameter measures less than the dimensions shown in Figure 4.1, replace the yoke.

4 Prepare Parts for Assembly



Clean Ground and Polished Parts

1. Use a cleaning solvent, kerosene or diesel fuel to clean ground or polished parts or surfaces. Do not use gasoline.
2. Use a tool with a flat blade if required, to remove sealant material from parts. Be careful not to damage the polished or smooth surfaces.

CAUTION

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

3. Do not clean ground or polished parts with water or steam. Do not immerse ground or polished parts in a hot solution tank or use strong alkaline solutions for cleaning, or the smooth sealing surface may be damaged.

Clean Rough Parts

1. Clean rough parts with the same method as cleaning ground and polished parts.
2. Rough parts can be cleaned in hot solution tanks with a weak or diluted alkaline solution.
3. Parts must remain in hot solution tanks until heated and completely cleaned.
4. Parts must be washed with water until all traces of the alkaline solution are removed.

Clean Axle Assemblies

1. A complete axle assembly can be steam cleaned on the outside to remove dirt.
2. Before the axle is steam cleaned, close or place a cover over all openings in the axle assembly. Examples of openings are breathers or vents in air chambers.

Drying Parts After Cleaning

1. Parts must be dried immediately after cleaning and washing.
2. Dry the parts using soft, clean paper or cloth rags.

CAUTION

Damage to bearings can result when they are rotated and dried with compressed air.

3. Except for bearings, parts can be dried with compressed air.

Prevent Corrosion on Cleaned Parts

1. Apply axle lubricant to cleaned and dried parts that are not damaged and are to be assembled.
2. To store parts, apply a special material that prevents corrosion to all surfaces. Wrap cleaned parts in a special paper that will protect the parts from moisture and prevent corrosion.

Inspect Parts

It is very important to inspect all parts carefully and completely before the axle or carrier is assembled. Check all parts for wear and replace damaged parts.

1. Inspect the cup, cone, rollers and cage of all tapered roller bearings in the assembly. If any of the following conditions exist, replace the bearing.
 - The center of the large-diameter end of the rollers is worn level with or below the outer surface. Figure 4.2.
 - The radius at the large-diameter end of the rollers is worn to a sharp edge. Figure 4.2.
 - There is a visible roller groove in the cup or cone inner race surfaces. The groove can be seen at the small- or large-diameter end of both parts. Figure 4.3.
 - There are deep cracks or breaks in the cup, cone inner race or roller surfaces. Figure 4.3.
 - There are bright wear marks on the outer surface of the roller cage. Figure 4.4.

4 Prepare Parts for Assembly

- There is damage on the rollers and on the surfaces of the cup and cone inner race that touch the rollers. Figure 4.5.
- There is damage on the cup and cone inner race surfaces that touch the rollers. Figure 4.6.

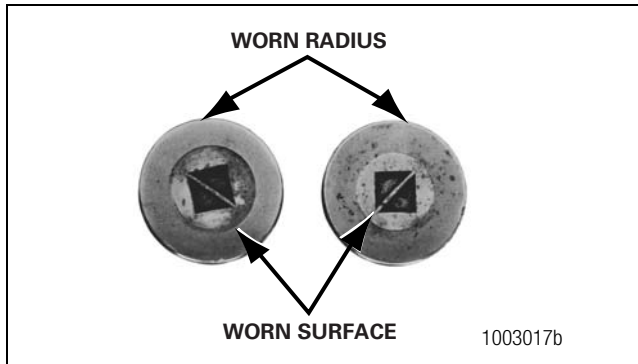


Figure 4.2

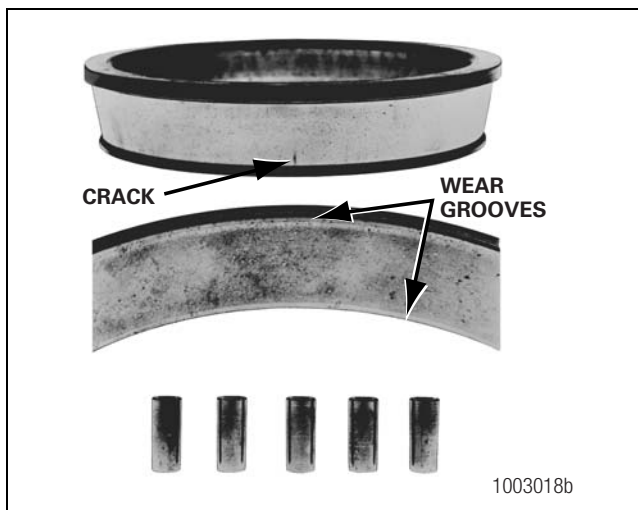


Figure 4.3

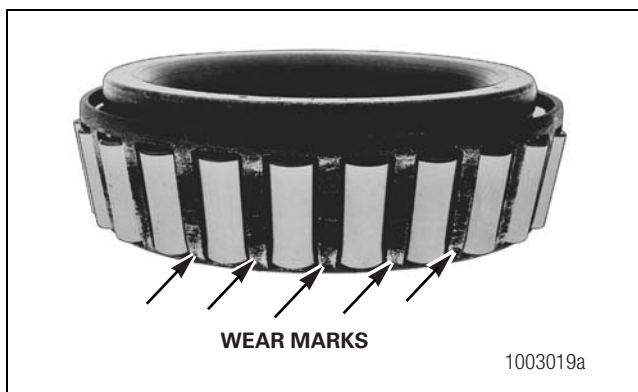


Figure 4.4

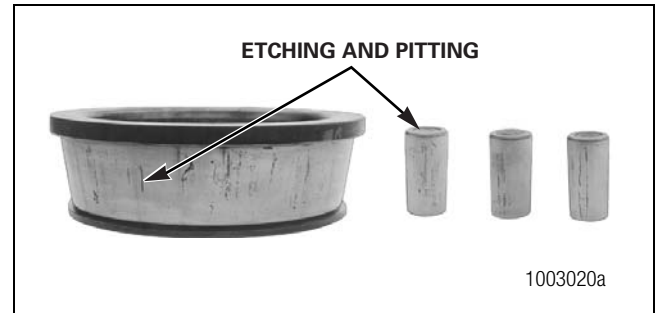


Figure 4.5

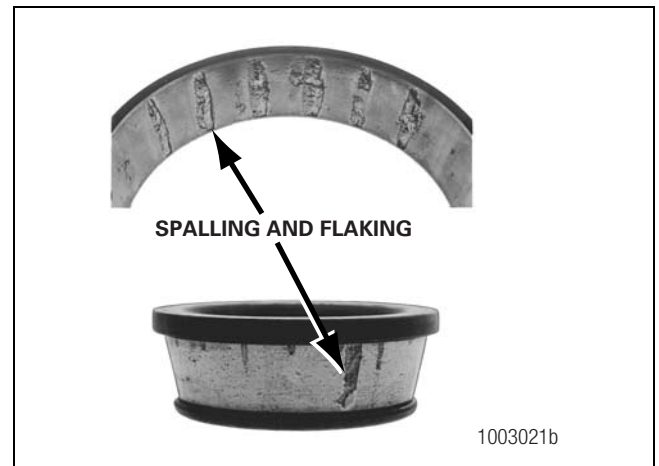


Figure 4.6

⚠ CAUTION

A drive pinion and ring gear are machined as a matched set. When you replace either a drive pinion or a ring gear, you must replace both parts as a matched set. Do not mix old and new parts. Damage to components can result.

2. Inspect hypoid pinions and gears for wear and damage. Replace gears that are worn or damaged.

⚠ CAUTION

A thrust washer, differential side gear and pinion gear are machined as a matched set. When you replace any of these parts, you must install a new matched set. Do not mix old and new parts. Damage to components can result.

3. Inspect the following main differential assembly parts for wear or stress. Replace parts that are damaged. Figure 4.7.
 - Inside surfaces of both case halves
 - Both surfaces of all thrust washers

4 Prepare Parts for Assembly

- The four trunnion ends of the spider or cross
- Teeth and splines of both differential side gears
- Teeth and bore of all differential pinions

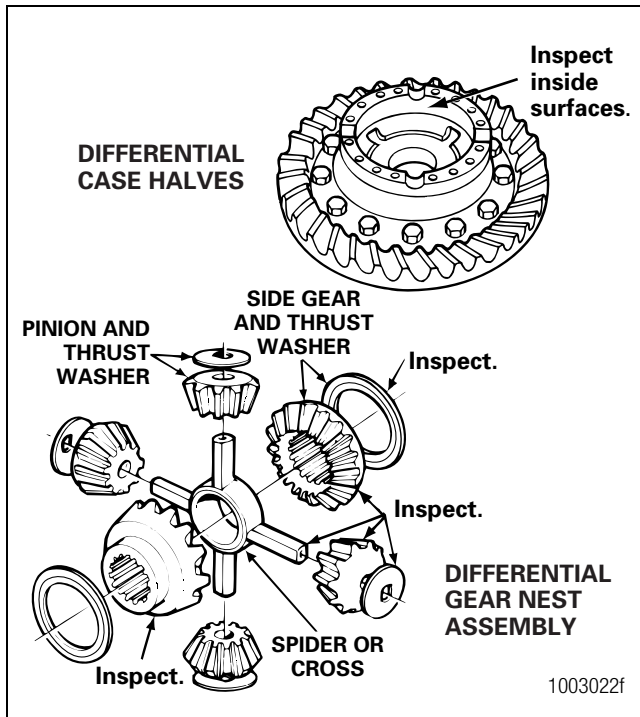


Figure 4.7

4. Inspect the axle shafts for wear and cracks at the flange, shaft and splines. Replace the axle shafts, if required.
5. Inspect the breather.
 - A. Remove the breather from the axle housing.
 - B. Clean the breather.
 - If the breather remains dirty after cleaning: Replace the breather.
 - C. Apply compressed air to the breather.
 - If compressed air does not pass through the breather: Replace the breather.
 - D. Install the breather into the axle housing.

Repair or Replace Parts

Threads must be without damage and clean so that accurate adjustments and correct torque values can be applied to fasteners and parts.

1. Replace any fastener if the corners of the head are worn.
2. Replace the washers if damaged.
3. Replace the gaskets, oil seals or grease seals at the time of axle or carrier repair.
4. Clean the parts and apply new silicone gasket material where required when the axle or carrier is assembled. Figure 4.8.

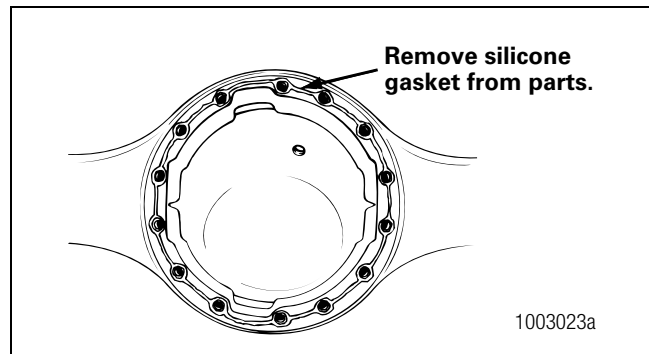


Figure 4.8

5. Remove nicks, mars and burrs from parts with machined or ground surfaces. Use a fine file, india stone, emery cloth or crocus cloth.
6. Clean and repair the threads of fasteners and holes. Use a die or tap of the correct size or a fine file.

Welding on Axle Housings

WARNING

Wear safe clothing and eye protection when you use welding equipment. Welding equipment can burn you and cause serious personal injury. Follow the operating instructions and safety procedures recommended by the welding equipment manufacturer.

Axle weld locations and welding procedures must adhere to Meritor standards. Welding at locations other than those authorized by Meritor will void the warranty and can reduce axle beam fatigue life. Serious personal injury and damage to components can result.

4 Prepare Parts for Assembly

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.

Meritor permits drive axle housing assembly repair welding in the following locations only.

- Housing-to-cover weld joints
- Snorkel welds
- Housing seam welds between the suspension attaching brackets
- Bracket welding to the drive axle housing

Prepare the Axle

WARNING

The high temperature caused by the open flame from the cutting torch can ignite the oil in the axle housing and can cause serious personal injury.

1. Remove the oil drain plug from the bottom of the axle housing and drain the lubricant from the assembly.

CAUTION

Remove the differential carrier from the axle housing before you weld onto an axle. Do not weld onto an axle with the differential carrier installed. Electrical arcing and damage to components can result.

2. Remove the differential carrier from the axle housing. Refer to the correct Meritor carrier maintenance manual or the vehicle manufacturer's instructions.

CAUTION

Remove the brake air chambers before you weld onto an axle. Do not expose a brake air chamber to more than 250°F (121°C). Damage to the air chamber can result.

3. Remove the wheel-end components and brake air chambers from the axle. Refer to the correct Meritor brake maintenance manual or the vehicle manufacturer's instructions.
4. For housing-to-cover welds, clean the outside housing-to-cover weld area two to three-inches (50.8-76.2 mm) past each end or side of the crack. Clean the inside area where the cover mates with the housing. Clean the area completely around the cover. Use a wire brush and a cleaning solvent that will remove dirt and grease from these areas.

5. For suspension bracket welds, clean both lower and upper suspension brackets and the areas of the axle housing around each bracket. Use a wire brush and a cleaning solvent that will remove dirt and grease from these areas.

WARNING

The axle housing must be 70°F (21°C) or warmer before you weld onto the axle. Do not weld onto a cold axle or weld cold parts onto an axle. Cracks in the weld area, damage to components, and serious personal injury can result.

6. Ensure that the axle housing temperature measures 70°F (21°C) or warmer.
 - **If the axle housing temperature measures less than 70°F (21°C):** Store the axle in a heated room until the housing reaches the correct temperature.
7. Heat the damaged area to approximately 300°F (149°C) before you begin welding.
8. Use suitable weld wire electrodes when you weld. Suitable weld wire electrodes include either BS EN 499 – E 42 2 B 32 H5 or BS EN 440 – G 42 2 M GSi (American Welding Society equivalents E7018 and ER70S3, respectively).
9. For complete 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.

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.

Removing Fasteners Secured with Adhesive

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

4 Prepare Parts for Assembly

When you remove fasteners secured with adhesive, slowly heat the fastener to 350°F (177°C). Do not exceed this temperature, or heat fasteners quickly. Damage to components can result.

1. Heat the fastener for three to five seconds. Try to loosen the fastener with a wrench. Do not use an impact wrench or hit the fastener with a hammer.
2. Repeat Step 1 until you can remove the fastener.

New Fasteners with Pre-Applied Adhesive

1. Use a wire brush to clean the oil and dirt from threaded holes.
2. Install new fasteners with pre-applied adhesive to assemble parts. Do not apply adhesives or sealants to fasteners with pre-applied adhesive, or to fastener holes.
3. Tighten the fasteners to the required torque value for that size fastener. No drying time is required for fasteners with pre-applied adhesive.

Original or Used Fasteners

1. Use a wire brush to clean the oil, dirt and old adhesive from all threads and threaded holes.
2. Apply liquid adhesive to the bolt threads or bore threads as required for the specific component.
3. Tighten the fasteners to torque specified in Section 8.

Meritor Specification 2297-T-4180 Adhesive in the Differential Bearing Bores

NOTE: Use Meritor specification 2297-T-4180 adhesive for all axles.

1. Clean the oil and dirt from the outer diameters of the bearing cups and bearing bores in the carrier and bearing caps. There is no special cleaning required.
2. Apply axle lubricant to the bearing cones and the inner diameters of the bearing cups of the main differential. Do not get oil on the outer diameter of the bearing cup and do not permit oil to drip onto the bearing bores.

NOTE: Meritor specification 2297-T-4180 adhesive will dry in approximately two hours. You must complete the procedure within two hours from the time you apply the adhesive. If two hours have passed since application, clean the adhesive from the parts and apply new adhesive.

3. Apply a single continuous bead of the adhesive to the bearing bores in the carrier and bearing caps. Apply the adhesive around the circumference of the smooth, ground surfaces only. Do not place the adhesive on the threaded areas. Figure 4.9.

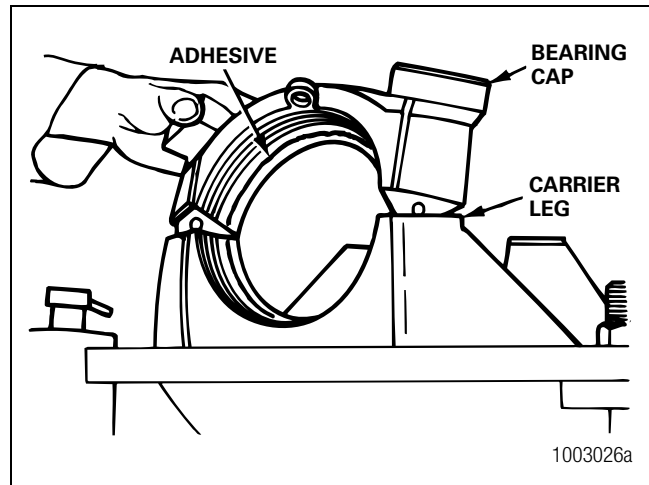


Figure 4.9

4. Install the main differential assembly, bearing cups and bearing caps into the carrier. Refer to Section 5.
5. Adjust the preload of the differential bearings, backlash and tooth contact patterns of the gear set as required. Refer to Section 5.

Carrier-to-Housing Joint Sealing Procedure

1. Remove the carrier from the housing. Refer to Section 3.
2. Remove all debris from inside the housing.

CAUTION

Use a mild, non-abrasive pad for cleaning the housing and carrier faces. Do not use an abrasive scour pad or other similar material, which can result in the removal of metal and damage the mounting face.

3. Use a rotary tool with a mild, non-abrasive pad to clean all silicone residue from the housing and carrier faces. Figure 4.10. Surfaces must be clean, dry and free of foreign matter. The surfaces must not be oily to the touch.

4 Prepare Parts for Assembly



Figure 4.10

4. Remove metal filings from the magnets inside the housing.
5. Use solvent to clean the inside of the housing.
6. Use Loctite® ODC Free cleaner or brake cleaner to clean the housing and carrier faces.
7. Dry the housing and carrier faces.

⚠ CAUTION

New capscrew kits have blue Dri-Loc® STS threadlocker, an equivalent to Loctite® 242 threadlocker, applied to the capscrews. Do not remove the blue Dri-Loc® STS threadlocker from the capscrews. Damage to components can result.

8. If you reuse the carrier-to-housing capscrews, use a rotary wire brush to remove any threadlocker material and clean the capscrew threads. Use a clean cloth to wipe the threads.
9. Use a tap to clean the internal threads in the housing.

⚠ CAUTION

Apply silicone gasket material in a continuous 0.125-inch (3 mm) bead. If you use more than this amount, gasket material can break off and plug lubrication passages. Damage to components can result.

10. Apply a 0.25-inch (6 mm) bead of Loctite® 5699 silicone gasket material to the housing face. Do not use ThreeBond 1216E silicone products. Figure 4.11.

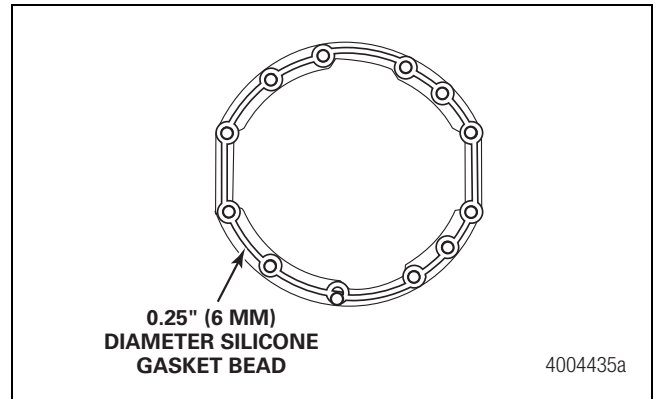


Figure 4.11

11. Install two long studs in the carrier to guide the carrier into the housing.
12. Immediately install the carrier into the housing to enable the silicone gasket material to compress evenly between the faces. If using a new capscrew kit with blue Dri-Loc® STS pre-applied threadlocker, skip the next step.

⚠ CAUTION

Apply silicone gasket material in a continuous 0.25-inch (6 mm) bead. If you use more than this amount, gasket material can break off and plug lubrication passages. Damage to components can result.

13. Apply a 0.125-inch (3 mm) bead of Loctite® 242 threadlocker around the capscrew threads approximately 0.25-inch (6 mm) from the end. Apply a 0.125-inch (3 mm) bead of Loctite® 242 threadlocker across the length of the threads. Figure 4.12.

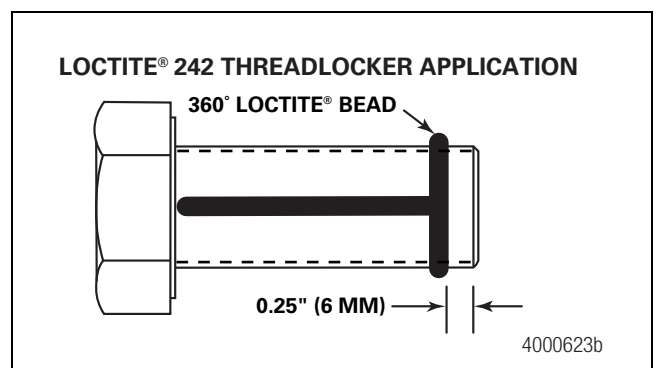


Figure 4.12

14. Install the capscrews. Use a crossing pattern to tighten the capscrews evenly. The capscrews must be tightened within 10 minutes of initial application of Loctite® 242 threadlocker.

4 Prepare Parts for Assembly

- Tighten the 1/2-inch capscrews to 140 lb-ft (190 N•m). 
- Tighten the 5/8-inch capscrews to 225 lb-ft (306 N•m). 

15. Wait a minimum of 60 minutes before filling the assembly with lubricant. Refer to Section 7.

General Yoke and U-Joint Reassembly

Install the end yoke hub capscrews by hand after seating the U-joint. Tighten the capscrews according to the manufacturer's torque specifications.

Identification

Gear Sets

Refer to Table A, Table B, Table C and Table D for information on identifying gear sets with matched parts. Always check match numbers to verify that the gear set you will install has matched parts. Figure 4.13.

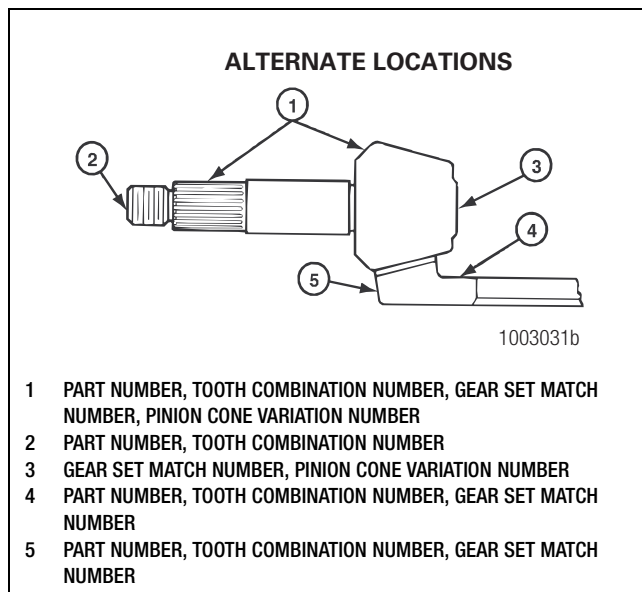


Figure 4.13

Examples

Table A: Gear Set Part Numbers

Part	Number	Location
Conventional ring gear	36786	On the front face or outer diameter
Conventional drive pinion	36787	At the end at threads

Part	Number	Location
Generoid ring gear	36786 K or 36786 K2	On the front face or outer diameter
Generoid drive pinion	36787 K or 36787 K2	At the end at threads

Table B: Gear Set Tooth Combination Number

Gear Set Teeth	Drive Pinion Location	Ring Gear Location
5-37 = gear set has a five-tooth drive pinion and a 37-tooth ring gear	At the end at threads	On the front face or outer diameter

NOTE: Meritor drive pinions and ring gears are only available as matched sets. Each gear in a set has an alphanumeric match number.

Table C: Gear Set Match Number

Match Number	Drive Pinion Location	Ring Gear Location
M29	At the end of the gear head	On the front face or outer diameter

NOTE: Don't use the pinion cone variation number when you check for a matched gear set. Use this number when you adjust the pinion depth of the carrier. Refer to Section 5.

Table D: Pinion Cone Variation Number

Pinion Cone (PC) Variation Number	Drive Pinion Location	Ring Gear Location
PC+3	At the end of the pinion gear head	On the outer diameter
+2		
+0.01 mm		
PC-5		
-1		
-0.02 mm		

Check for Mismatched Ratios on Tandem Axles

For a tandem axle pair to function correctly, the forward and rear axles must operate with axle ratios within one percent. A mismatched tandem axle pair can cause carrier overheating, hypoid gear set wear, metal debris to collect on the magnetic drain plug, carrier lubricant additive depletion, excessive inter-axle wear and noise.

To determine if the tandem axle ratios operate within allowable limits, refer to one of the following procedures. Perform the procedure that will work best for the vehicle you are servicing.

Hypoid Gear Set Ratios Listed on the Identification Tags

1. Locate the identification tags riveted to the forward and rear axle differential carriers. Figure 4.14.

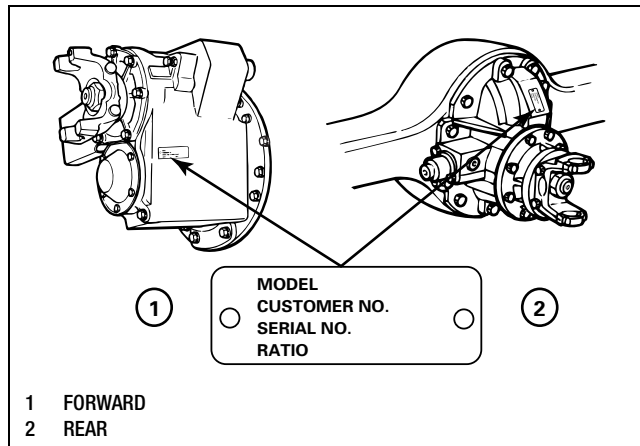


Figure 4.14

2. Compare the axle ratios shown on both tags. To operate correctly, the axle ratios for both axles must be within one percent of each other. To calculate the percentage difference between the axle ratios, refer to the equation in Table E.

Table E:

$$\frac{\text{Larger Ratio} - \text{Smaller Ratio}}{\text{Smaller Ratio}} \times 100 = \text{Percentage Difference Between Axle Ratios}$$

- If the axle ratios shown on the identification tags are not within one percent of each other: Refer to the vehicle manufacturer for further information.

Rotate the Forward Drive Shaft to Check the Hypoid Gear Set Ratio

⚠ 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.
2. Engage the power divider and shift the transmission into NEUTRAL.
3. Block the wheels to prevent the vehicle from moving.
4. Use a jack to raise the vehicle until all the tandem drive axle wheels clear the ground. Support the vehicle with safety stands.
5. Mark the forward and rear tires at identical relative positions. Figure 4.15.

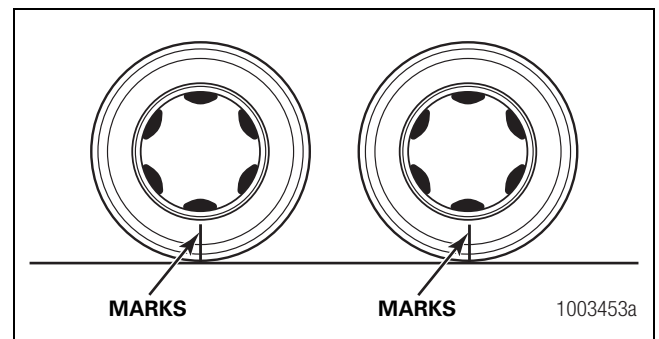


Figure 4.15

6. Turn the forward drive shaft in one direction by hand until the forward tire completes two rotations. Figure 4.16. The forward tire must rotate two times only. If the forward tire rotates more than or less than two rotations, the angle measurements you make in Step 7 will be inaccurate.

4 Prepare Parts for Assembly

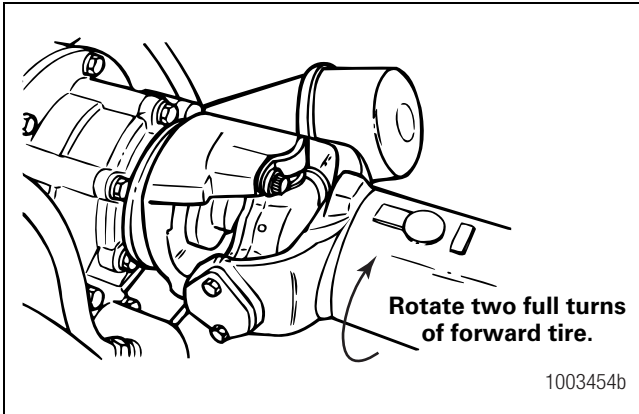


Figure 4.16

7. Note the positions of the tire marks you previously made. On a correctly matched tandem axle gear set, both tire marks will be within ± 3.6 degrees of each other. Figure 4.17.
 - If the positions of the tire marks are more than 3.6 degrees from each other: Refer to the vehicle manufacturer for further information.

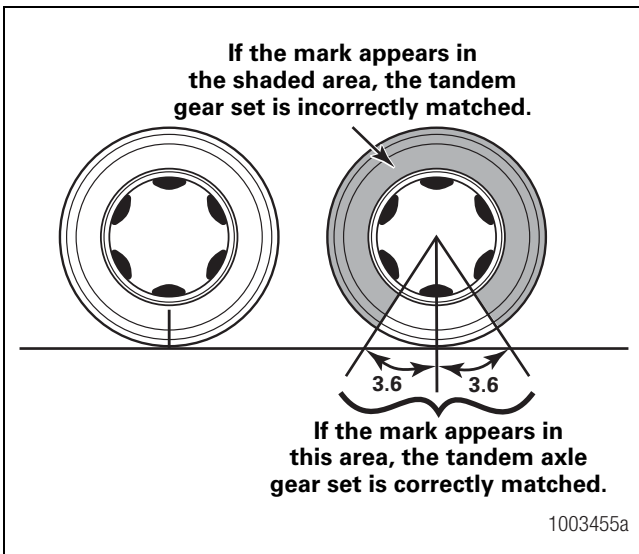


Figure 4.17

8. Remove the safety stands and lower the vehicle.

Hypoid Gear Set Teeth Numbers Stamped on the Forward and Rear Axle Drive Pinions

When the inter-axle driveline or differential carrier is removed for service, you can check the hypoid gear set teeth numbers stamped on the forward and rear axle drive pinions.

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.
2. Block the wheels to prevent the vehicle from moving.

To Identify the Gear Teeth Number on the Forward Axle Drive Pinion

1. Remove the forward carrier pinion cover. Refer to the vehicle manufacturer's procedures.
2. Look into the carrier housing. Identify and record the gear set teeth numbers stamped on the drive pinion end. Figure 4.18.

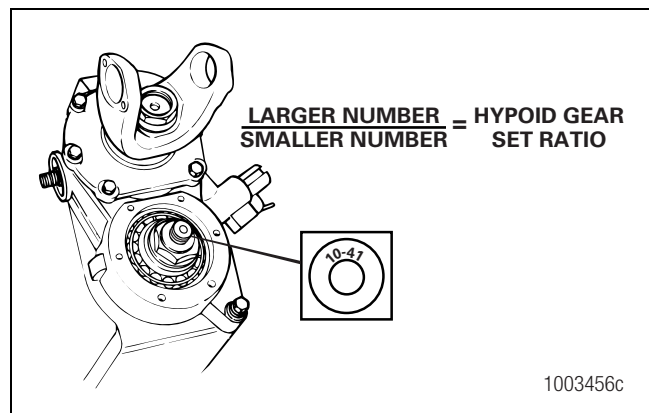


Figure 4.18

3. Calculate the hypoid gear set ratio by dividing the larger number by the smaller number. Figure 4.18.

To Identify the Gear Teeth Number on the Rear Axle Drive Pinion

1. Remove the inter-axle drive shaft. Refer to the vehicle manufacturer's procedures.
2. Identify and record the gear set teeth numbers stamped on the end of the rear axle drive pinion. Figure 4.19.

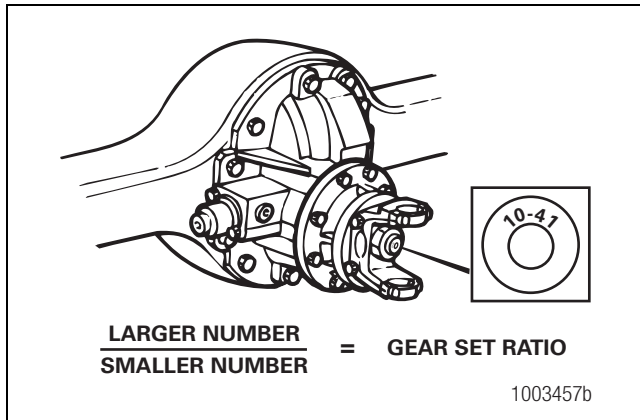


Figure 4.19

3. Calculate the hypoid gear set ratio by dividing the larger number by the smaller number. Figure 4.19.

Compare Both Hypoid Gear Set Ratios

1. Both ratios must be within one percent of each other. To calculate the percentage difference between the axle ratios, refer to the equation in Table E.
 - **If the axle ratios shown on the identification tags are not within one percent of each other:** Refer to the vehicle manufacturer for further information.
2. Install the inter-axle drive shaft. Refer to the vehicle manufacturer's procedures.
3. Install the pinion cover. Refer to the vehicle manufacturer's procedures.
4. Remove the safety stands and lower the vehicle.

Verify the Actual Hypoid Gear Set Ratios

You can check the actual hypoid gear set ratios when you remove the differential carriers from the axle housings for service or repair. Refer to the following procedure to calculate the actual gear set ratios.

1. Count the number of ring gear teeth. Figure 4.20.

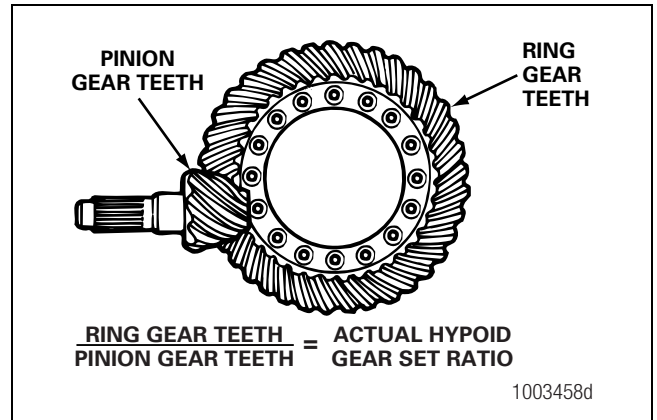


Figure 4.20

2. Count the number of pinion gear teeth. Figure 4.20.
3. Divide the number of ring gear teeth by the number of pinion gear teeth to determine the actual hypoid gear set ratio for each axle. Figure 4.20.
4. Calculate the percentage difference between the hypoid gear set ratios using the equation in Table E. All ratios must match within one percent.
 - **If the actual hypoid gear set ratios are not within one percent of each other:** Refer to the vehicle manufacturer for further information.

Inspection

Yoke

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

Check for Yoke Wear

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.

4 Prepare Parts for Assembly

2. Use a jack to raise the vehicle so that the wheels to be serviced are off the ground. Support the vehicle with safety stands.
3. Remove the driveline.
4. Remove the input, output or pinion shaft nut.
5. Attempt to remove the yoke by hand.
 - **If you can remove the yoke by hand:** The yoke is worn. Replace the yoke.
6. Use a correct yoke puller tool to remove the yoke.

Check for a Tight-Fit Condition

NOTE: You can check for a tight-fit condition when you install any serviceable yoke.

1. Attempt to install the yoke by hand.
 - **If the yoke bottoms out against the adjacent bearing:** Replace the yoke.
2. Use a correct yoke installation tool to install the yoke.
3. As you install the yoke, you should detect resistance between the yoke and shaft.
 - **If you do not detect resistance between the yoke and shaft:** Replace the yoke.
4. Install and tighten the input, output or pinion shaft nut to the correct torque. Refer to Section 8.
5. Install the driveline.
6. Remove the safety stands.
7. Lower the vehicle.

Tire Matching for Tandem and Tridem Axles

CAUTION

Unmatched tires on both tandem drive units and tridem drive units will cause tire wear and scuffing and possible damage to the drive units. Meritor recommends that the tires be matched to within 0.125-inch (3.18 mm) of the same rolling radius, 0.75-inch (19.05 mm) of the same rolling circumference.

Tandem Axles

The four largest tires should never be installed onto one driving axle or the four smallest tires onto the other driving axle. Such tire mounting will cause an inter-axle fight, unusually high axle lubricant temperatures that result in premature lubricant breakdown and possible costly axle service.

In addition to matching individual tire rolling radii or rolling circumference, Meritor recommends matching, as nearly as possible, the total tire circumference of one driving axle to the total tire circumference of the other driving axle. This will usually result in satisfactory tandem axle lubricant temperatures that lengthen drive unit service with higher tire mileage.

Park the vehicle on a level surface. The vehicle must carry a correctly distributed rated capacity load. All the tires must be the same size. Measure new tires to verify that they will be correctly matched.

1. Inflate all tires to the same pressure.
2. Carefully measure the rolling circumference of each tire with a steel tape.
3. Mark the size on each tire with chalk and arrange the tires in order of size, largest to smallest.
4. Mount the two largest tires onto one side of one axle and mount the two smallest onto the opposite side of the same axle.
5. Mount the four other tires onto the other axle in the same manner.
6. Test run the vehicle to gather accurate rear axle lubricant temperature readings on the two axle lubricant temperature gauges.
7. Vary tire air pressure within the tire manufacturer's recommended range so the lubricant temperature of both axles is within 30°F (–1°C) of each other and not in excess of 250°F (121°C). This will usually result in uniform tire loading and good tire life.

Tridem Axles

When three driving axles are used together in a tridem series, unmatched tires will compound the problems described in the preceding paragraphs. Meritor recommends matching, as nearly as possible, the total tire circumference of each of the three driving axles.

To match tires on tridem units, follow the same procedure used for tandem units.

Arrange the tires in order of size.

- The two largest and two smallest go on one axle.
- The next two largest and smallest go on the second axle.
- The remaining four tires go on the third axle.

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.

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

Installation

Installing the Drive Pinion and Adjusting Pinion Depth and Preload

There are two procedures for adjusting pinion depth. The procedure in this manual is to install the pinion, bearings and calculated shim pack into the case WITHOUT the helical gear and two spacers. After you check the tooth contact patterns to determine the correct pinion position, you must disassemble the carrier to install the helical gear and two spacers.

An optional procedure is to install the pinion, bearings and calculated shim pack into the case WITH the helical gear and two spacers. After you check the tooth contact patterns to determine the correct pinion position, you only need to disassemble the carrier if an adjustment is necessary. Both procedures are acceptable.

Adjustment

Shim Pack Thickness for a New Drive Pinion

NOTE: Use this procedure if you'll install a new drive pinion and ring gear set or if you have to adjust the depth of the drive pinion. If the pinion depth shims are misplaced during carrier repair, use 0.030-inch (0.76 mm) for 145 Series axles and 0.050-inch (1.27 mm) for 160 Series axles for the initial pinion position. Figure 5.1.

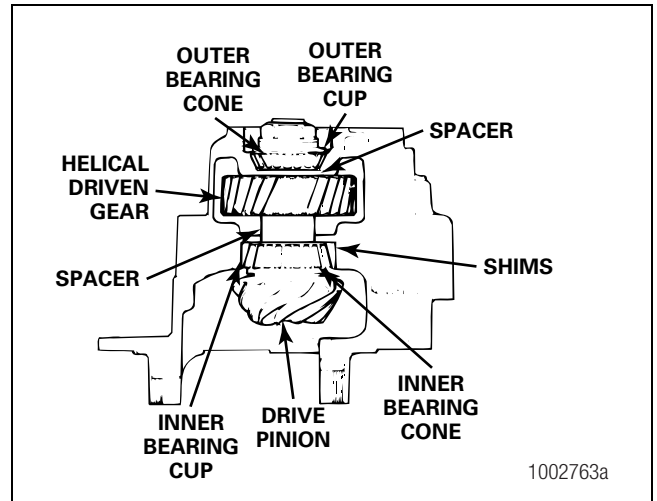


Figure 5.1

1. Use a micrometer to measure the thickness of the shim pack that was removed from the differential carrier. Record the measurement. Figure 5.2.

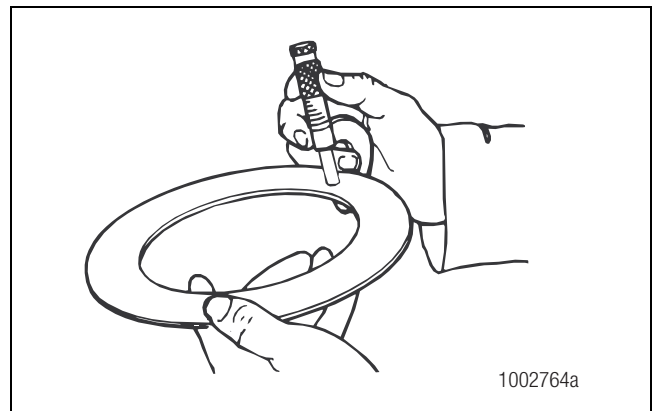


Figure 5.2

2. Find the pinion cone (PC) variation number on the drive pinion you'll replace. Record the number. Figure 5.3. The pinion cone number can be one of the following values.
 - PC +3, PC -3, +3 or -3 = 0.003-inch
 - PC +.03, PC 0.03 mm, +0.03 mm or -0.03 = 0.03 mm

5 Assembly and Installation

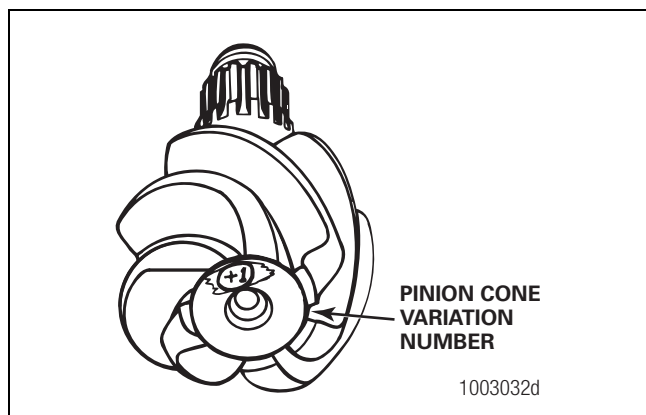


Figure 5.3

3. If you can't find the PC number or it's unreadable, install a new shim pack of the same thickness that you measured in Step 1.

NOTE: The following calculation is the opposite for a rear carrier, tandem or single.

4. If the old pinion cone number of a forward tandem carrier is a plus (+), ADD the cone number to the old shim pack thickness that was measured in Step 1.
5. If the old pinion cone number of a forward tandem carrier is a minus (-), SUBTRACT the cone number from the old shim pack thickness that was measured in Step 1.
6. Find the pinion cone variation number on the new drive pinion that will be installed. Record the number.
7. If the new pinion cone number of a forward tandem carrier is a plus (+), SUBTRACT the number from the standard shim pack thickness that was calculated in Step 4 or Step 5. Use new shims to make a shim pack to the determined thickness. Refer to Table F.
8. If the new pinion cone number of a forward tandem carrier is a minus (-), ADD the number to the standard shim pack thickness that was calculated in Step 4 or Step 5. Use new shims to make a shim pack to the determined thickness. Refer to Table F.

Table F

Examples	Inches	mm
1. Old Shim Pack Thickness	0.030	0.760
Old PC Number, PC +2	+ 0.002	+ 0.050
Standard Shim Pack Thickness	= 0.032	= 0.810
New PC Number, PC +5	- 0.005	- 0.120
New Shim Pack Thickness	= 0.027	= 0.690
2. Old Shim Pack Thickness	0.030	0.760
Old PC Number, PC -2	- 0.002	- 0.050
Standard Shim Pack Thickness	= 0.028	= 0.710
New PC Number, PC +5	- 0.005	- 0.120
New Shim Pack Thickness	= 0.023	= 0.590
3. Old Shim Pack Thickness	0.030	0.760
Old PC Number, PC +2	+ 0.002	+ 0.050
Standard Shim Pack Thickness	= 0.032	= 0.810
New PC Number, PC -5	+ 0.005	+ 0.120
New Shim Pack Thickness	= 0.037	= 0.930
4. Old Shim Pack Thickness	0.030	0.760
Old PC Number, PC -2	- 0.002	- 0.050
Standard Shim Pack Thickness	= 0.028	= 0.710
New PC Number, PC -5	+ 0.005	+ 0.120
New Shim Pack Thickness	= 0.033	= 0.830

Assembly

Drive Pinion Assembly

The depth of the drive pinion and ring gear contact is controlled by the thickness of the shim pack. Figure 5.4.

- **To increase the thickness of the drive pinion contact:** Increase the thickness of the shim pack.
- **To decrease the depth of the drive pinion pattern:** Decrease the thickness of the shim pack.

5 Assembly and Installation

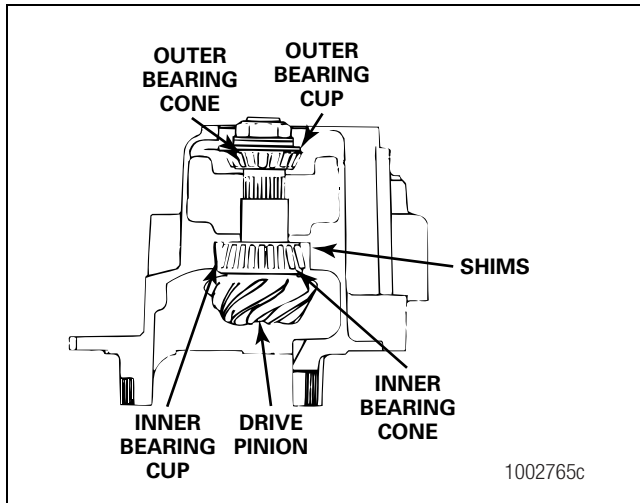


Figure 5.4

The preload of the bearings on the drive pinion is controlled by a spacer between the outer bearing cone and the helical driven gear.

Adjust the preload by changing the size of the spacer.

- **To decrease the preload:** Use a thicker spacer.
- **To increase the preload:** Use a thinner spacer.

If the depth of the drive pinion is changed, the thickness of the spacer must also be changed the same amount. Refer to the following examples.

- **If a 0.003-inch (0.076 mm) shim is ADDED to the shim pack to INCREASE the depth of the drive pinion:** A 0.003-inch (0.076 mm) larger spacer must be installed to keep the preload on the bearings.
- **If a 0.003-inch (0.076-mm) shim is REMOVED from the shim pack to DECREASE the depth of the drive pinion:** A 0.003-inch (0.076 mm) smaller spacer must be installed to keep the preload on the bearings.

NOTE: The helical driven gear and the spacers are installed when the bearing preload on the drive pinion is inspected and adjusted.

1. If you are installing a new ring gear and drive pinion, the correct thickness of the shim pack between the pinion inner bearing cup and the carrier must be determined. Refer to the procedure in this section before temporarily assembling and installing the drive pinion assembly according to this procedure.

If you are installing the original ring gear and drive pinion, temporarily install the drive pinion assembly.

2. If removed, use a press and a sleeve to install the inner bearing cone onto the drive pinion. Place the sleeve onto the inner race of the bearing. Apply pressure until the bottom of the cone touches the shoulder on the pinion. Figure 5.5.

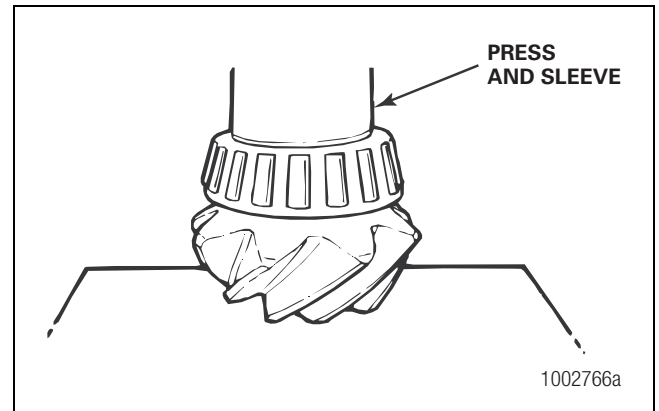


Figure 5.5

3. Apply axle lubricant to the bearing cups and cones.
4. If removed, install the shim pack and the inner bearing cup of the drive pinion.
 - A. Place the carrier into a press so that the legs of the carrier are toward the TOP of the press.
 - B. Install the correct amount of shims into the bore for the inner bearing cup of the drive pinion. Figure 5.6.
 - C. Place the cup into the bore. Figure 5.6.
 - D. Place supports under the differential carrier so that the carrier is level.
 - E. Place a sleeve or a bearing driver tool onto the cup and press the cup into the bore until the bottom of the cup touches the shims. If a press is not available, use a sleeve, a brass drift or a bearing driver tool and a hammer to install the cup. Figure 5.7.

5 Assembly and Installation

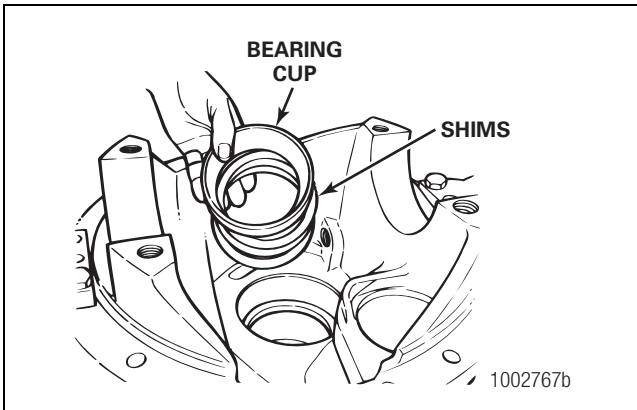


Figure 5.6

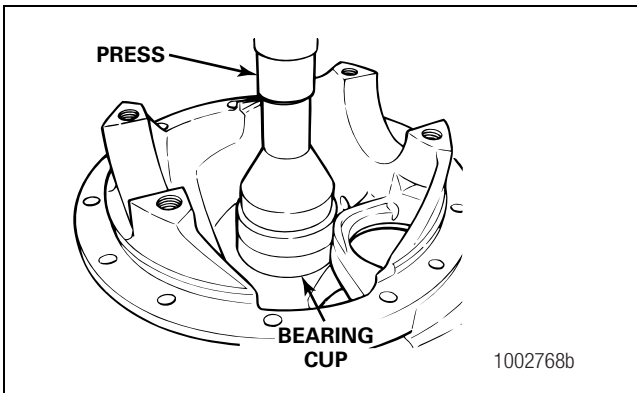


Figure 5.7

5. If removed, install the outer bearing cup for the drive pinion.
 - A. Place the carrier into a press so that the legs of the carrier are toward the BOTTOM of the press. Place supports under the carrier so that the carrier is level.
 - B. Place the outer bearing cup for the drive pinion into the bore of the carrier.
 - C. Use a sleeve or a bearing driver tool and a press to install the cup. Press the cup into the carrier until the bottom of the cup touches the bottom of the bore. If a press is not available, use a sleeve, a brass drift or a bearing driver tool and a hammer to install the cup. Figure 5.8.

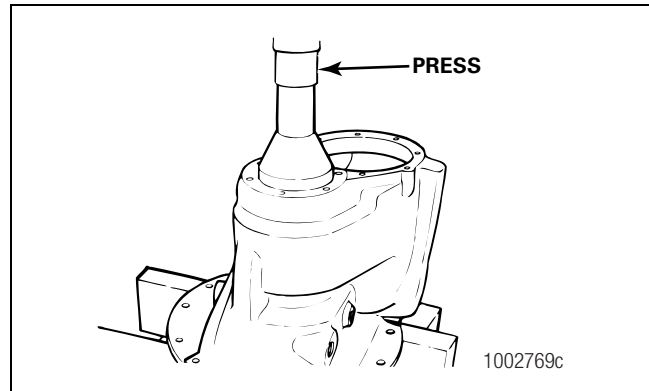


Figure 5.8

Installation

Drive Pinion Assembly

1. Place the drive pinion into the carrier so that the pinion is through the inner and the outer bearing cups.
2. Place the carrier into a press so that the legs of the carrier are toward the BOTTOM of the press. Place supports under the carrier so that the carrier is level. Place a support under the head of the drive pinion so that the inner bearing cone on the pinion shaft touches the inner bearing cup in the carrier.
3. Place the outer bearing cone onto the pinion shaft.
4. Use a press and a sleeve to install the bearing cone onto the pinion. Apply no more than two tons (1814 kg) of force to verify that the bearing cone is correctly installed. Figure 5.9.

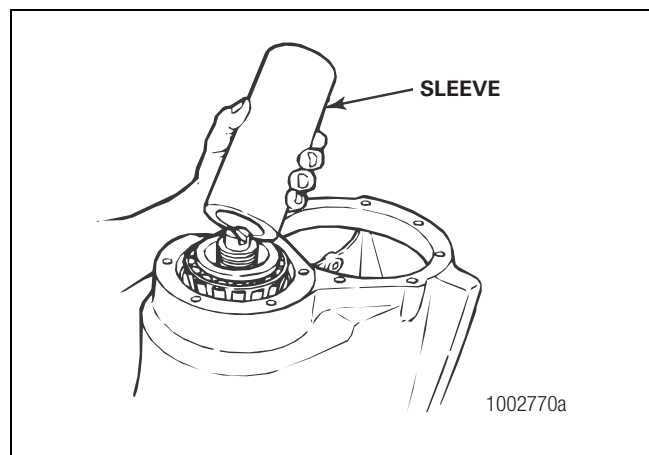


Figure 5.9

Adjustment

Drive Pinion Bearing Preload

NOTE: If the depth of the drive pinion was changed, then the amount of the change must be added or subtracted to the thickness of the spacer between the outer bearing cup and the helical driven gear.

After you obtain the correct gear tooth contact pattern and the correct shim pack thickness, you must adjust the bearing preload on the drive pinion. The preload is controlled by the thickness of the spacer between the helical driven gear and the outer bearing cone. Figure 5.10.

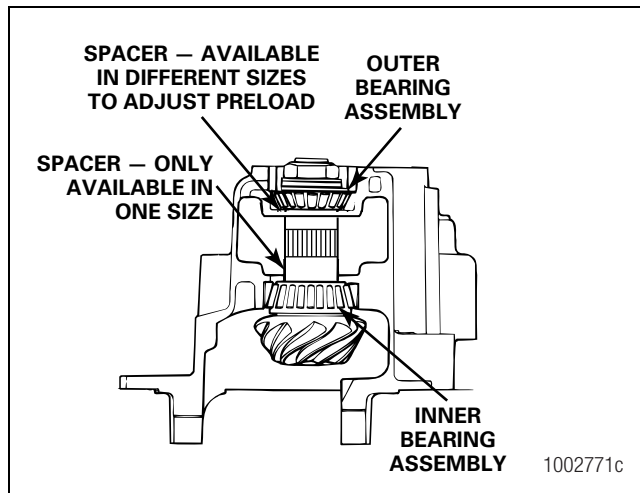


Figure 5.10

1. Place the carrier into a press so that the threaded end of the pinion is UP. Place supports under the flange of the carrier so that the carrier is level. Place a wood block under the head of the pinion. Figure 5.11.
2. Press the drive pinion out of the outer bearing cone. Remove the cone. Figure 5.11.

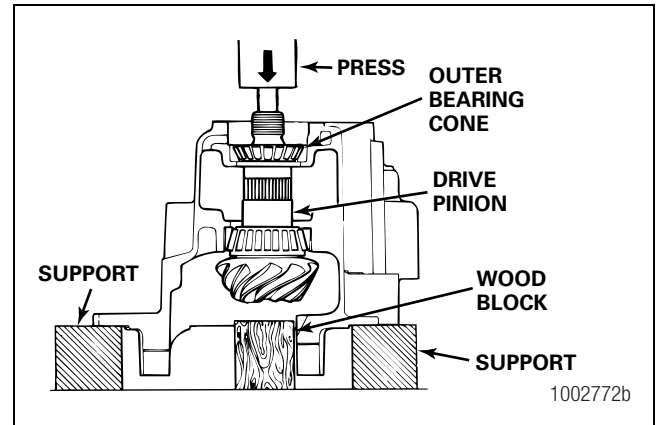


Figure 5.11

3. Turn the carrier over so that the legs of the carrier are UP. Place supports under the carrier so that the carrier is level.
4. Place the helical driven gear over the pinion bore in the carrier so that the splines inside the gear are toward the FRONT of the carrier. Place the large spacer on top of the helical driven gear so that the spacer is toward the inner bearing cup. Figure 5.12.

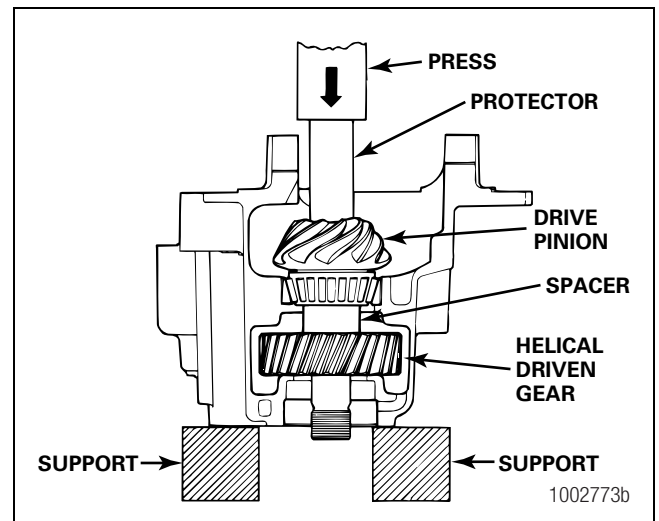


Figure 5.12

5. Install the drive pinion into the helical driven gear. Verify that the splines on the pinion engage the splines inside the gear. Figure 5.12.

5 Assembly and Installation

⚠ CAUTION

Do not apply pressure after the inner bearing cone touches the inner bearing cup. If more pressure is applied, the cup, cone and drive pinion will be damaged.

6. Place a protector onto the head of the drive pinion. Use a press to install the pinion into the carrier so that the inner bearing cone touches the bearing cup. At this time, the helical driven gear will not be completely installed on the drive pinion. Figure 5.12.
7. Place the carrier into a press so that the threaded end of the pinion is toward the TOP of the press. Place supports under the flange of the carrier so that the carrier is level. Place a wood block under the head of the drive pinion so the inner pinion bearing cone touches the inner bearing cup. Figure 5.13.

⚠ CAUTION

Do not apply pressure after the helical driven gear touches the spacer in front of the inner bearing on the drive pinion. If pressure is applied after the parts touch each other, the gear will damage the spacer.

8. Use a press and a sleeve to completely install the helical driven gear onto the drive pinion. Use a sleeve on the hub of the gear that fits inside the pinion bore in the carrier. Press the gear onto the drive pinion until the gear touches the spacer. Figure 5.13.

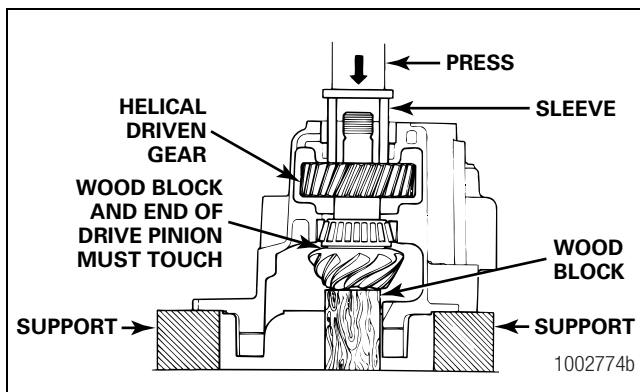


Figure 5.13

9. Cut two pieces of lead or solder approximately 0.5625-inch (14 mm) long and 0.625-inch (16 mm) wide. Use the two pieces of solder or lead as gauge blocks to determine the correct thickness of the spacer between the helical driven gear and the outer bearing.

10. Place the two pieces of lead or solder so that the pieces are opposite each other on top of the helical driven gear.
11. Place the outer bearing cone into the cup over the two pieces of lead or solder on top of the helical driven gear.
12. Remove the support from the flange of the carrier. Place a sleeve on top of the outer bearing cone. Use a press to apply two tons (1814 kg) of force to the outer bearing cone. The force of the press compresses the lead or solder pieces to the correct size. Do not apply more than two tons (1814 kg) of force. Figure 5.14.

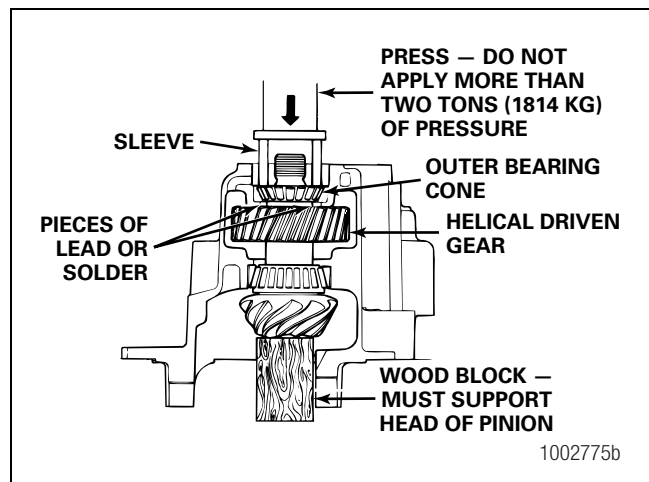


Figure 5.14

13. Release the pressure and remove the wood block from under the head of the drive pinion.
14. Use a press and a sleeve to press the shaft of the drive pinion out of the outer bearing cone. Do not press the shaft of the drive pinion out of the helical driven gear.
15. Remove the outer bearing cone and the two pieces of lead or solder from the outer bearing cone.
16. Use a micrometer to measure the thicknesses of the compressed pieces of lead or solder. Add the measurements of the two pieces and divide by two (2) to determine the average size of the pieces. Add 0.004-inch (0.100 mm) to the average size. Use this dimension to determine the size of the spacer to install between the helical driven gear and the outer bearing. Refer to Table G.

Table G

Example	Inch	(mm)
Thickness of piece number 1	0.504	(12.800)
Thickness of piece number 2	<u>+0.506</u>	<u>(12.852)</u>
Total thickness	1.010	(25.652)
Divide by two (2) to determine the average thickness	0.505	(12.826)
Add 0.004-inch (0.100 mm) to determine the thickness of the spacer	0.509	(12.926)

17. Place a wood block under the head of the drive pinion so that the inner bearing cone on the pinion touches the inner bearing cup in the carrier. Remove the supports from the carrier. Figure 5.15.

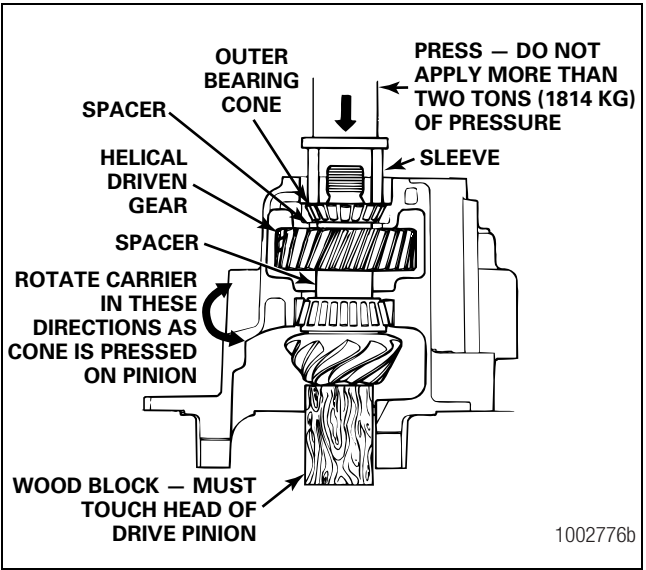


Figure 5.15

CAUTION

Do not apply pressure after the helical driven gear touches the spacer in front of the inner bearing on the drive pinion. If pressure is applied after the parts touch each other, the gear will damage the spacer.

NOTE: The inner bearing cone on the drive pinion must touch the inner bearing cup in the carrier when the helical driven gear is being installed.

18. Use a press and a sleeve to completely install the helical driven gear onto the drive pinion. Use a sleeve on the hub of the gear that fits inside the pinion bore in the carrier. Press the gear onto the drive pinion until the gear touches the spacer. Do not remove the wood block at this time. Figure 5.14.
19. Install the correct size spacer onto the shaft of the pinion in front of the helical driven gear.

NOTE: Verify that the wood block is still under the head of the drive pinion. The inner bearing cone on the pinion must touch the cup in the carrier.

20. Install the outer bearing cone onto the shaft of the drive pinion. Figure 5.15.
- A. Place the outer bearing cone onto the shaft of the drive pinion.
 - B. Place a sleeve onto the top, inner race, of the outer bearing cone.
 - C. Use a press to apply two tons (1814 kg) of force on the bearing cone to install the cone onto the shaft of the drive pinion. Rotate the carrier in both directions, so that the carrier pivots on the drive pinion, while the cone is being installed to verify that the bearing cone is correctly installed.
21. Release the pressure and remove the carrier from the press. Place the carrier in a repair stand.
22. Install the washer and the nut onto the drive pinion. Prevent the drive pinion assembly from rotating by using a fixture to hold the teeth of the helical driven gear or place wood blocks between the head of the pinion and the carrier wall. Tighten the nut to the specified torque. Refer to Section 8. Remove the holding fixture or the wood blocks.
23. Use an inch-pound torque wrench or a spring scale to inspect the preload of the bearings on the drive pinion.

Torque Wrench Method

1. Place an inch-pound (N·m) torque wrench and the correct socket onto the drive pinion nut. Figure 5.16.

5 Assembly and Installation

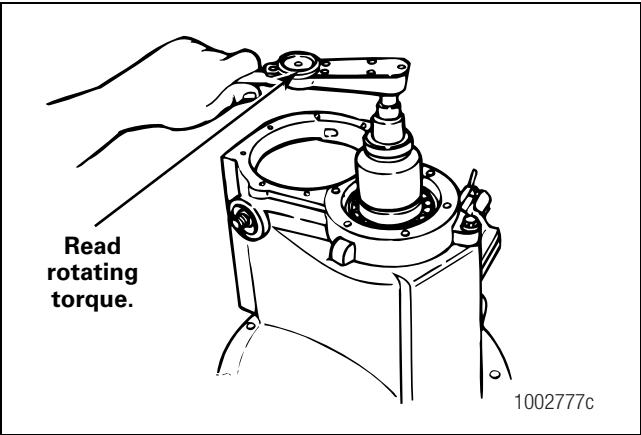


Figure 5.16

- 2. Use the torque wrench to rotate the drive pinion assembly. Inspect and record the torque level. Read while rotating the assembly. Record the dynamic or rotating torque not the breakaway torque.
- 3. The preload of the drive pinion bearings must be within the following limits.
 - For new pinion bearings: 5-45 lb-in (0.56-5.08 N•m) rotational torque
 - For used pinion bearings: 10-30 lb-in (1.13-3.39 N•m) rotational torque
 - **If the preload is not within the specified limits:** Remove and replace the spacer between the outer bearing cone and the helical driven gear. Refer to the procedure below.
 - **To decrease the preload:** Install a thicker spacer.
 - **To increase the preload:** Install a thinner spacer.

Spring Scale Method

- 1. Wind a cord around the washer under the nut of the drive pinion.
- 2. Attach a spring scale to the end of the cord.
- 3. Pull the spring scale and cord in a horizontal direction while looking at the reading on the spring scale. Figure 5.17.

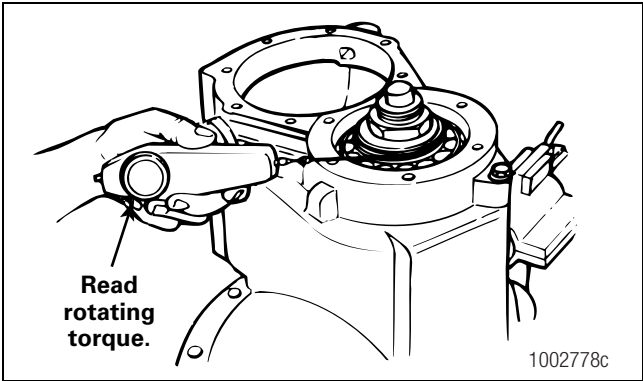


Figure 5.17

- 4. Measure the outer diameter of the washer under the drive pinion. Divide the outer diameter of the washer by two (2) to get the radius of the washer. Multiply the radius of the washer by the reading on the spring scale to get the preload on the pinion bearings.

Table H: Example

Outer diameter of the washer = 3.00-inches (76.20 mm)
Spring scale reading = 9 lbs (4 kg)

	Inch	(mm)
Outer diameter of the washer	3.00	(76.20)
Divide the outer diameter by two (2) to get the radius of the washer	1.50	(38.10)
Multiply the radius of the washer by the spring scale reading	13.50 lb-in	(1.49 N•m)

- 5. The preload of the drive pinion bearings must be within the following limits.
 - For new pinion bearings: 5-45 lb-in (0.56-5.08 N•m) rotational torque
 - For used pinion bearings: 10-30 lb-in (1.13-3.39 N•m) rotational torque
 - **If the preload is not within the specified limits:** Remove and replace the spacer between the outer bearing cone and the helical driven gear. Refer to the procedure below.
 - **To decrease the preload:** Install a thicker spacer.
 - **To increase the preload:** Install a thinner spacer.

Spacer Replacement

NOTE: Do not grind spacers by hand. The surfaces must be parallel within 0.0001-inch (0.0020 mm). You must use the correct spacers.

1. Prevent the drive pinion assembly from rotating by using a fixture to hold the teeth of the helical driven gear or place wood blocks between the head of the pinion and the carrier wall. Remove the nut and the washer from the shaft of the drive pinion. Figure 5.18.

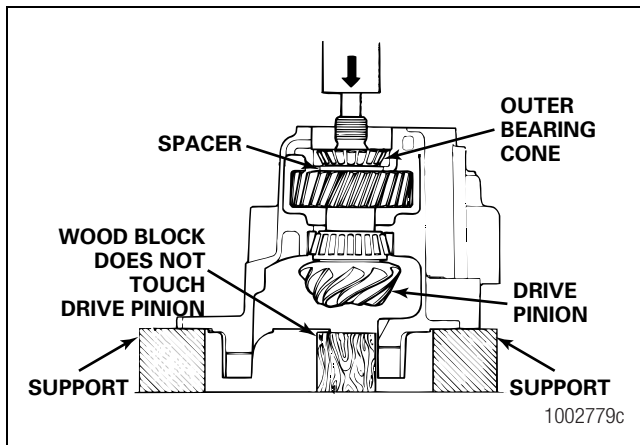


Figure 5.18

2. Place the carrier into a press so that the threaded end of the pinion is toward the TOP of the press. Place supports under the flange of the carrier so that the carrier is level. Place a wood block under the head of the pinion. Verify that the wood block does not touch the head of the drive pinion.
3. Press the drive pinion out of the bearing cone. Remove the outer bearing cone from the differential carrier.
4. Install the correct size spacer onto the shaft of the pinion over the helical driven gear.
5. Repeat Step 20 through Step 23 under Section 5 in this section.
6. When the preload is within the specified range, install the main differential case and ring gear assembly into the carrier. Refer to procedure in this section.

Assembly

Main Differential and Ring Gear

⚠ CAUTION

Heat the ring gear before seating it onto the differential case. Do not press a cold ring gear on the flange case half. A cold ring gear will damage the case half because of the tight fit.

1. Expand the ring gear by heating the gear in a tank of water to 160-180°F (71-82°C) for 10 to 15 minutes.

⚠ WARNING

Wear safe clothing and gloves for protection from injury when working with the hot ring gear.

2. Use a lifting tool to safely lift the ring gear from the tank of water.
3. Install the ring gear onto the flange case half immediately after the gear is heated.
 - If the ring gear does not fit easily on the case half: Heat the gear again.
4. Align the ring gear and flange case half fastener holes. Rotate the ring gear as necessary.

NOTE: If rivets were used to hold the ring gear to the flange case half, replace them with bolts, nuts and washers. 140 Series carriers with rivets are serviced with bolt kits for reassembly.

5. Install the bolts, nuts and washers, if equipped, that hold the ring gear to the flange case half. Install the bolts from the front side of the gear. The bolt threads must be installed from the inside face of the ring gear and the nuts tightened from the back of the ring gear. Figure 5.19.

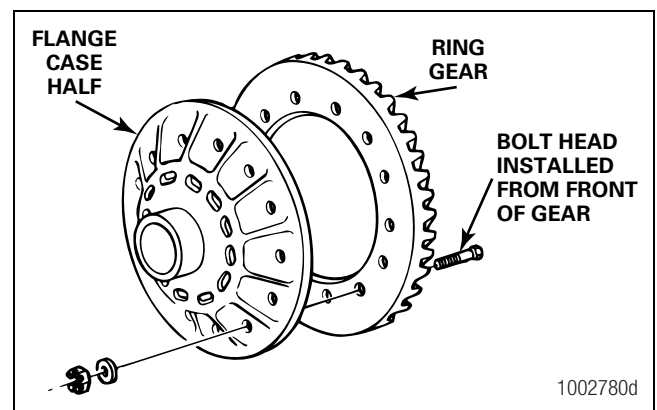


Figure 5.19

5 Assembly and Installation

6. Tighten the bolts and nuts, if equipped, to the correct torque value. Refer to Section 8.
7. Inspect for gaps between the back surface of the ring gear and the case flange. Use a 0.003-inch (0.080 mm) feeler gauge to inspect at four points around the assembly. Figure 5.20.
 - **If the gaps exceed specification:** Inspect the flange case half and ring gear for the problem that causes the gap. Repair or replace parts as necessary. Reassemble the ring gear on the flange case half. Reinspect for gaps.

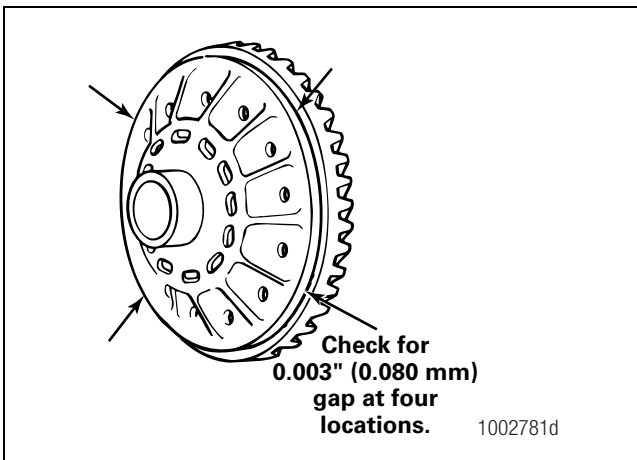


Figure 5.20

8. Use a press and the correct size sleeve to install the bearing cones onto both of the case halves. Figure 5.21.

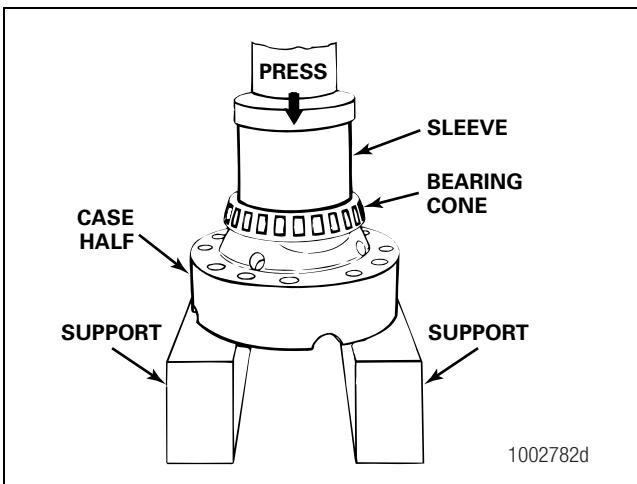


Figure 5.21

9. Apply axle lubricant on the inside surfaces of both case halves, spider or cross, thrust washers, side gears and differential pinions.
10. Place the flange case half onto a bench with the ring gear teeth toward the TOP.

⚠ CAUTION

The side gears in some carrier models have hubs of different lengths. Install the correct length side gear into the flange case half. Damage to components can result.

11. Install one thrust washer and side gear into the flange case half. Figure 5.22.

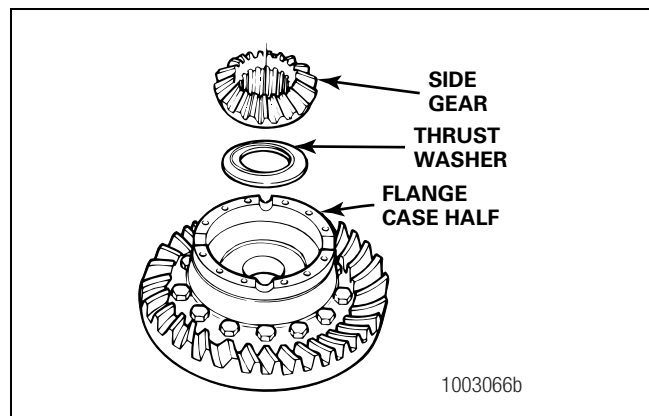


Figure 5.22

12. Install the spider or cross, differential pinions and thrust washers into the flange case half. Figure 5.23.

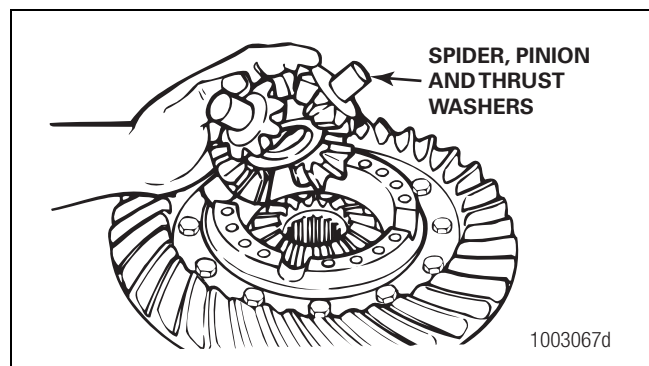


Figure 5.23

13. Install the second side gear and thrust washer over the spider and differential pinions. Figure 5.24.

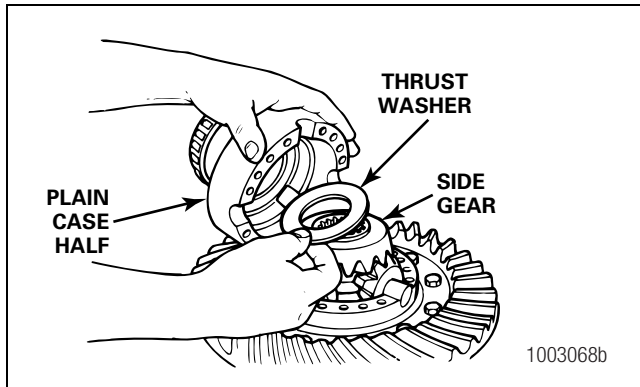


Figure 5.24

14. Place the plain half of the differential case over the flange half and gears. Rotate the plain half as needed to align the match marks. Figure 5.24 and Figure 5.25.

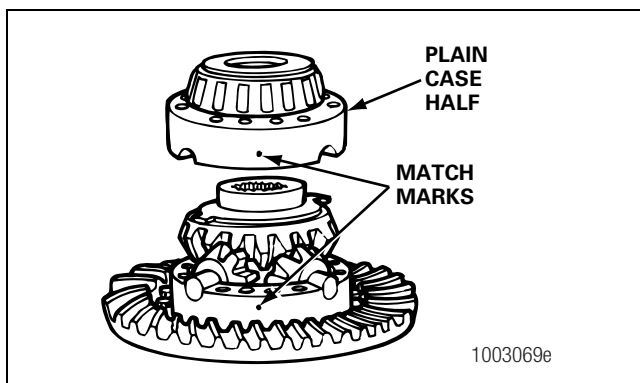


Figure 5.25

15. Install Dri-Loc® or equivalent fasteners into the case halves. Refer to Section 4.
 - A. Install four capscrews and washers or bolts, nuts and washers into the case halves. The distance between the fasteners must be equal. Tighten the fasteners to the correct torque value in a crisscross pattern opposite each other. Refer to Section 8. Figure 5.26.
 - B. Install the other fasteners into the case halves. Tighten the fasteners to the correct torque value. Refer to Section 8.

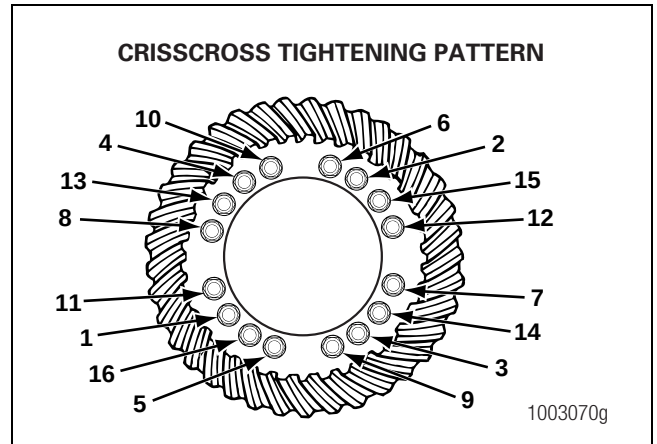


Figure 5.26

16. Check the rotating resistance of the differential gears. The differential assembly must rotate freely.

Check the Rotating Resistance of the Differential Assembly

1. Make an inspection tool using an axle shaft that matches the spline size of the differential side gear. Cut the shaft to approximately 12-inches (304.8 mm). Weld a nut onto the end of the shaft. Figure 5.27.

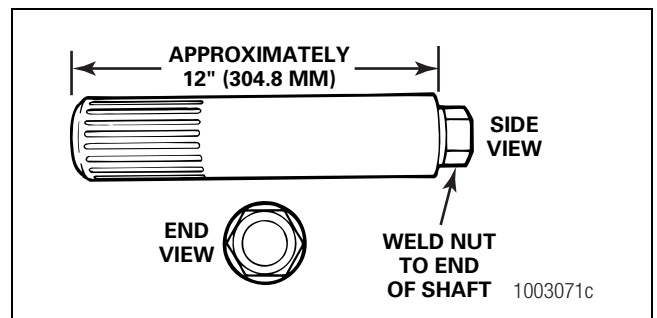


Figure 5.27

2. Place the differential and ring gear assembly into a vise. Install soft metal covers over the vise jaws to protect the ring gear. Figure 5.28.

5 Assembly and Installation

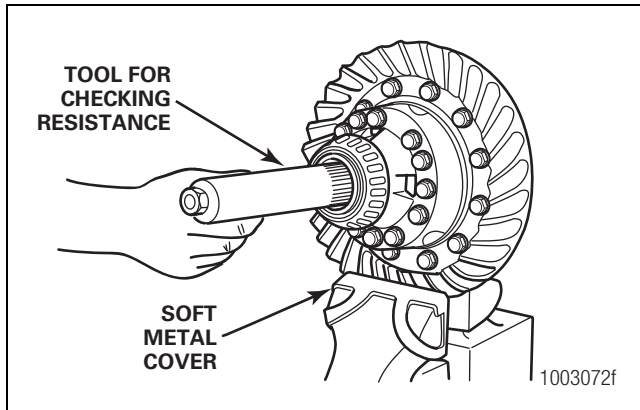


Figure 5.28

3. Install the tool into the differential until the splines of the tool are engaged with one side gear. Figure 5.28.
 4. Place a torque wrench onto the nut of the tool and rotate the differential gears. As the differential gears rotate, read the value indicated on the torque wrench. Figure 5.29.
- **If the torque value exceeds 50 lb-ft (67.8 N•m):**
Disassemble the differential gears from the case halves. Inspect the case halves, spider, gears and thrust washers. Repair or replace parts. Assemble the parts and repeat Step 2 through Step 4.

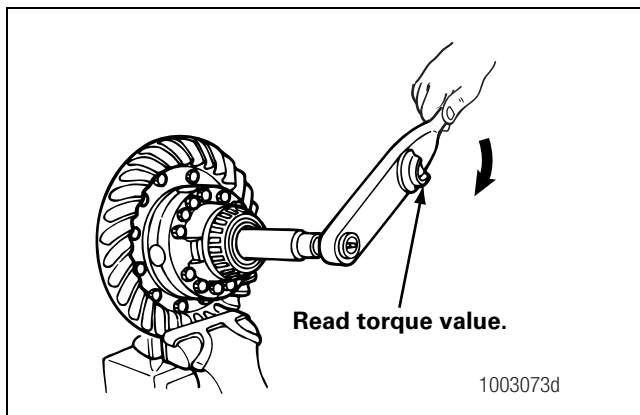


Figure 5.29

Installation

Main Differential Case and Ring Gear Assembly Into the Carrier

1. If the bearing cones on the main differential case were removed, install a new cone and cup in a fully-matched set from the same manufacturer. The bearing cones are not interchangeable. Use a press and sleeve to install the cones onto the case. Press only on the inner race of the bearing. Figure 5.30.

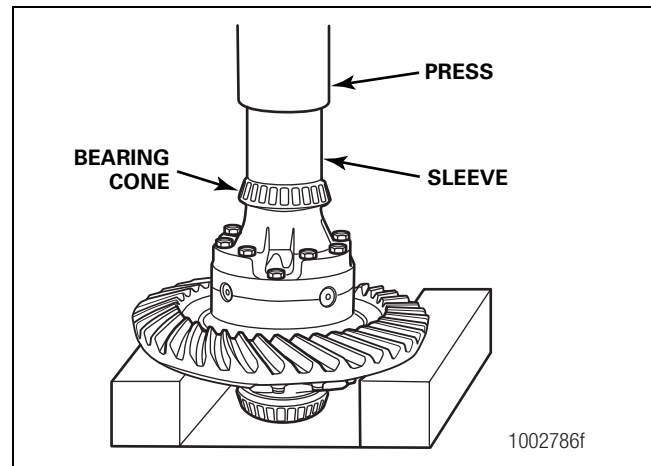


Figure 5.30

2. Clean and dry the bearing cups and bores of the carrier legs and bearing caps.
3. Apply axle lubricant to the bearing cups and cones.
4. Apply Meritor specification 2297-T-4180 adhesive evenly in the bearing bores of the carrier legs and bearing caps. Cover the surfaces completely. The adhesive must not contact the adjusting ring threads. Figure 5.31. Refer to Section 4.

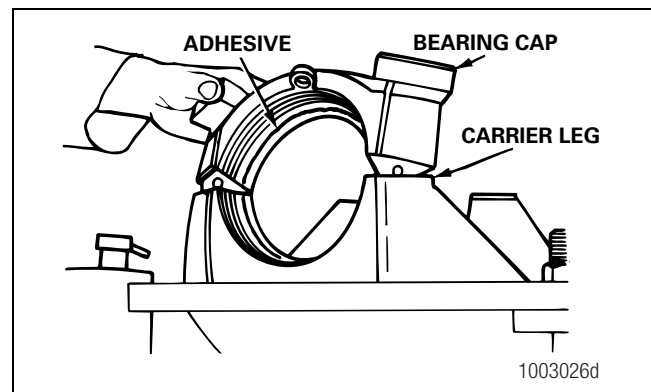


Figure 5.31

5. Install the bearing cups over the bearing cones in the case halves. Figure 5.32.

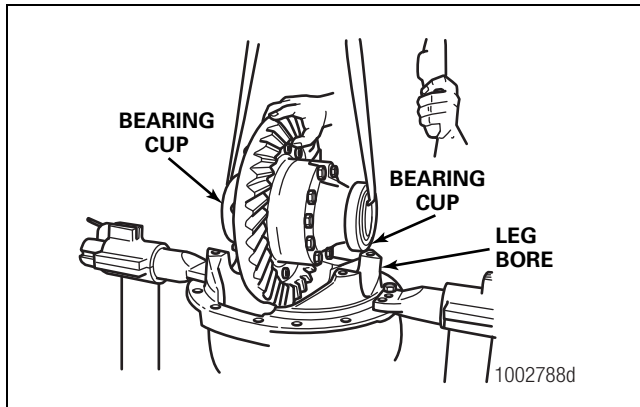


Figure 5.32

6. Safely lift the differential and ring gear assembly and install it into the carrier. The bearing cups must be flat against the bores between the carrier legs. Figure 5.32.
7. Install the bearing adjusting rings between the carrier legs. Hand-tighten the adjusting rings against the bearing cups. Figure 5.33.

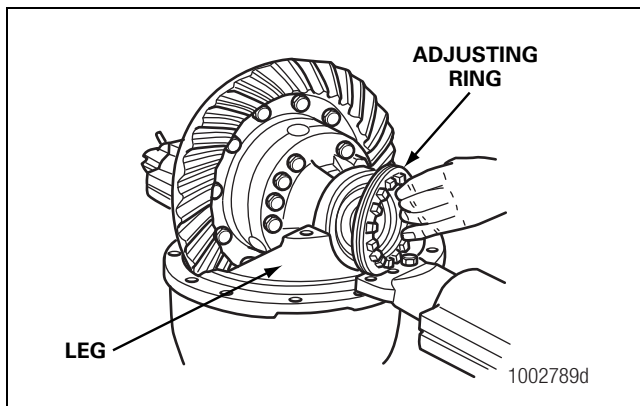


Figure 5.33

CAUTION

The bearing caps must be correctly installed or the adjusting rings will be damaged by cross-threading. Forcing the caps into position can damage the caps and the carrier housing.

8. Install the bearing caps over the bearings and adjusting rings in the correct location as marked before removal. Figure 5.34.

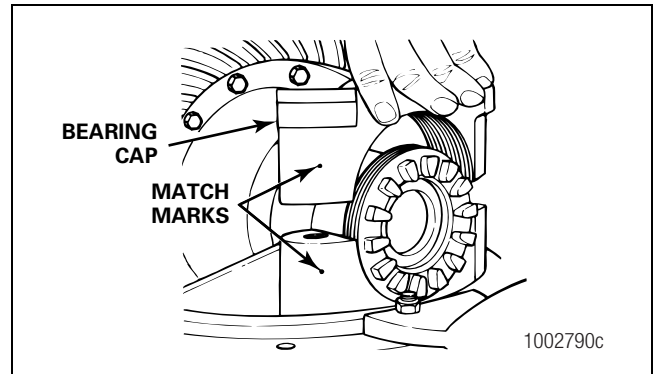


Figure 5.34

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.

CAUTION

If bearing caps are not installed correctly in the original carrier locations, the bores and threads in the caps will not match the carrier. Forcing the bearing caps into the incorrect position will result in damage to the carrier.

9. Use a light leather plastic or rubber mallet to seat each bearing cap. The caps must fit easily against the bearings, adjusting rings and carrier. Do not force the bearing caps into position.
 - **If the bearing caps do not correctly fit into position:**
Check the alignment of the match marks between the caps and carrier. Remove the caps and repeat Step 7 through Step 9.
10. Install the capscrews and washers that secure the bearing caps to the carrier. Hand-tighten the capscrews four to six turns, then tighten the capscrews to the correct torque value. Refer to Section 8.

Do not install the capscrews, cotter pins or roll pins, if equipped, that secure the bearing adjusting rings in position. Continue by adjusting the preload of the differential bearings, adjust the backlash of the hypoid gear and inspect the tooth contact patterns.

5 Assembly and Installation

Adjustment

Differential Bearings Preload

Use either the dial indicator or the large micrometer method to inspect and adjust the main differential side bearings preload.

NOTE: The roll pins for the adjusting rings are installed after the tooth contact pattern is checked.

Dial Indicator Method

1. Attach a dial indicator onto the carrier mounting flange so that the plunger or the pointer is against the back surface of the ring gear. Figure 5.35.

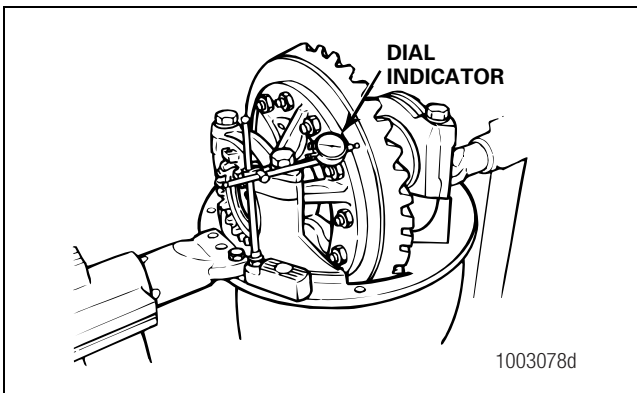


Figure 5.35

⚠ CAUTION

When you turn the adjusting rings, always use a tool that engages two or more opposite notches in the ring. A T-bar wrench can be used for this purpose. If the tool does not correctly fit into the notches, damage to the lugs will occur.

NOTE: On 160 Series axles, half of the bearing assembly extends out of the bearing cap and carrier.

2. Use a T-bar wrench to loosen the adjusting ring that is opposite the ring gear. A small amount of end play will show on the dial indicator. Figure 5.36.

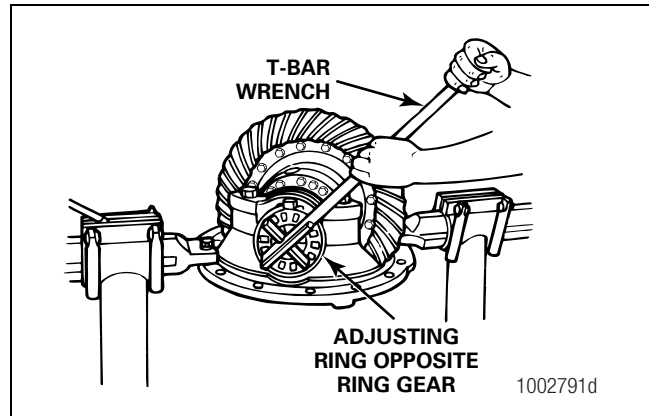


Figure 5.36

3. Use one of the following methods to move the differential and the ring gear carefully to the left and right while you read the dial indicator.
 - A. Insert two pry bars between the bearing adjusting rings and the ends of the differential case. The pry bars must not touch the differential bearings. Figure 5.37.
 - B. Insert two pry bars between the differential case or the ring gear and the carrier at locations other than described in Step A. The pry bars must not touch the differential bearings. Figure 5.38.

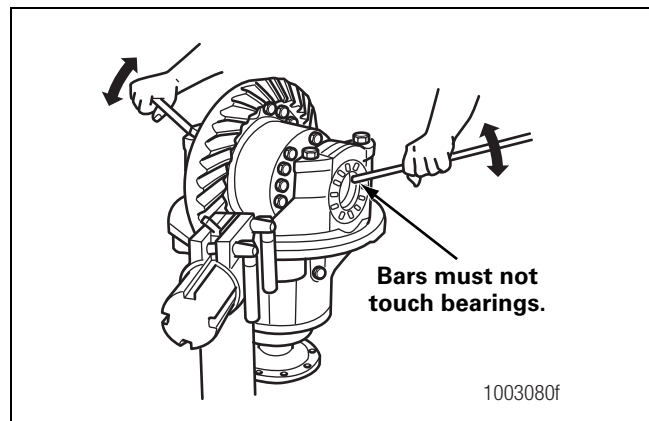


Figure 5.37

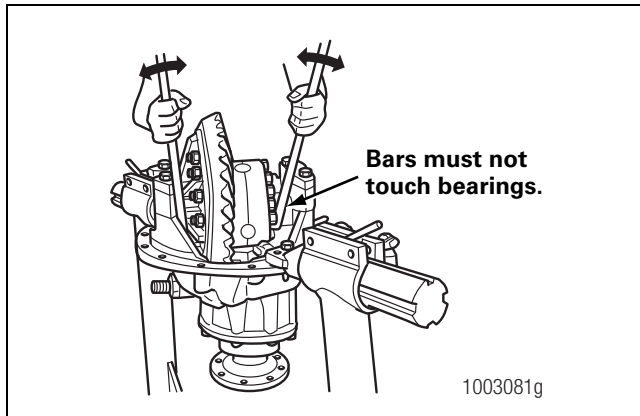


Figure 5.38

4. Tighten the bearing adjusting ring until the dial indicator reads ZERO end play. Move the differential and ring gear to the left and right as needed. If necessary, repeat Step A or Step B.
5. Tighten each bearing adjusting ring one notch from ZERO. The side bearings of the differential should have a preload of 15-35 lb-in (1.7-3.9 N•m). Figure 5.39. 

This procedure should expand the caps 0.008-0.010-inch (0.203-0.254 mm), and place the correct preload on the bearings when they are installed into the banjo housing.

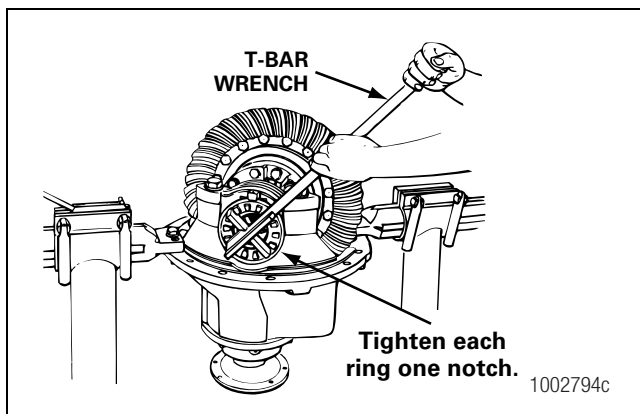


Figure 5.39

6. Proceed to check ring gear runout.

Large Micrometer Method

1. Hand-tighten the adjusting rings against the differential bearings.
2. Use a large micrometer to measure distance X and Y between the opposite surfaces of the bearing caps. Record the measurement. Figure 5.40 and Figure 5.41.

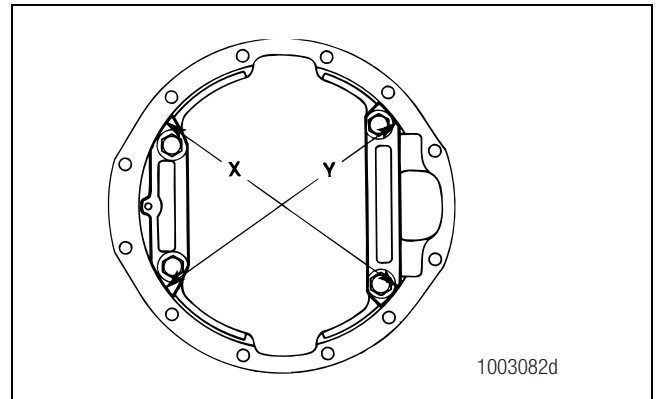


Figure 5.40

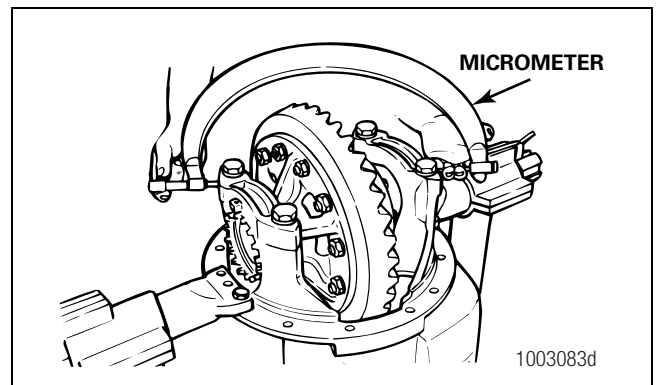


Figure 5.41

CAUTION

When turning the adjusting rings, always use a tool that engages two or more opposite notches in the ring. A T-bar wrench can be used for this purpose. If the tool does not correctly fit into the notches, damage to the lugs will occur.

3. Use a T-bar wrench to tighten each bearing adjusting ring one notch. Figure 5.36.
4. Measure distance X and Y again. Compare the measurements with the distances X and Y measured in Step 2. The difference between the two distances is the amount the bearing caps have expanded. Refer to Table I.

5 Assembly and Installation

Table I: Example

Distances X and Y BEFORE tightening the adjusting rings	= 15.315-inches (389 mm)
Distances X and Y AFTER tightening the adjusting rings	= 15.324-inches (389.230 mm)
15.324-inches – 15.315-inches	= 0.009-inch difference
389.230 mm – 389.000 mm	= 0.230 mm difference

5. **If the difference is at or within the specification in Table J:**
Continue by checking the runout.

If the difference is less than the specification: Repeat as needed.

Table J: Expansion Between Bearing Caps

RS-140, RS-145 and RS-160 carrier models	0.002-0.009-inch (0.050-0.229 mm)
RS 120 and all other carrier models	0.006-0.013-inch (0.15-0.33 mm)

Ring Gear Runout

1. Attach a dial indicator onto the carrier mounting flange. Figure 5.42.

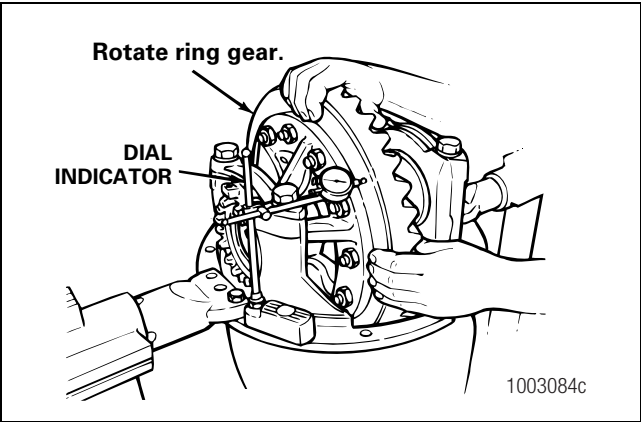


Figure 5.42

2. Adjust the dial indicator so that the plunger or pointer is against the back surface of the ring gear. Figure 5.42. Set the dial indicator to ZERO.
3. Rotate the differential and ring gear. Read the dial indicator. The ring gear runout must not exceed 0.008-inch (0.200 mm).

- **If the ring gear runout is within the specification:**
Proceed to Ring Gear Backlash.
- **If the ring gear runout exceeds the specification:**
Remove the differential and ring gear assembly from the carrier. Refer to Section 3.
 - A. Inspect the differential parts, including the carrier, for wear and damage. Repair or replace parts as necessary.
 - B. Install the main differential case and ring gear assembly into the carrier. Refer to the procedure in this section.
 - C. Repeat the procedure for preload adjustment of the differential side bearings.

Ring Gear Backlash

Table K: Specifications

Ring Gear Pitch Diameter	Range of Backlash Setting	Backlash Setting for New Gear Sets
Less than 17-inches (431.8 mm)	0.008-0.018-inch (0.20-0.46 mm)	0.012-inch (0.30 mm)
Greater than 17-inches (431.8 mm)	0.010-0.020-inch (0.25-0.51 mm)	0.015-inch (0.38 mm)

Measure the outer diameter of the ring gear for the approximate pitch diameter. Figure 5.43.

- **If the old gear set is installed:** Adjust the backlash to the setting that was measured before the carrier was disassembled.
- **If a new gear set is installed:** Adjust the backlash to the correct specification for new gear sets.

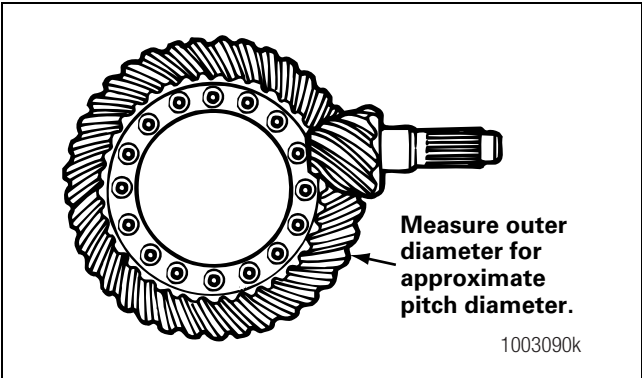


Figure 5.43

After checking the tooth contact patterns, the backlash can be adjusted within the specification limits, if needed. To change the location of the pattern, use the following procedures.

1. Attach a dial indicator onto the carrier mounting flange. Figure 5.44.

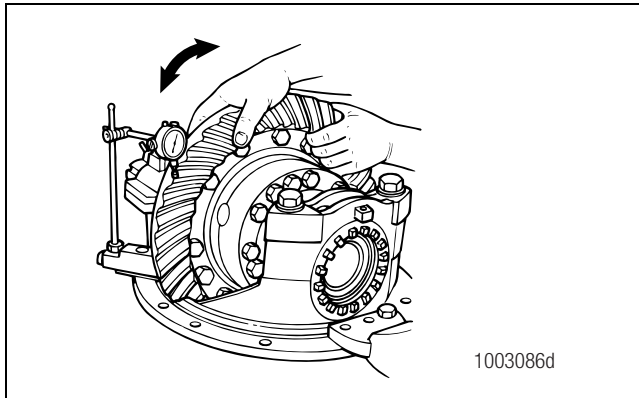


Figure 5.44

2. Adjust the dial indicator so that the plunger is against the tooth surface.
3. Adjust the dial indicator to ZERO. Hold the drive pinion in position.
4. After reading the dial indicator, rotate the differential and ring gear a small amount in both directions against the drive pinion teeth.
 - **If the backlash reading is within the specification:** Check the tooth contact patterns.
 - **If the backlash reading is not within the specification:** Adjust the backlash as needed.
5. Loosen one bearing adjusting ring one notch. Tighten the opposite ring by the same amount.
 - **To increase the backlash:** Move the ring gear away from the drive pinion. Figure 5.45.
 - **To decrease the backlash:** Move the ring gear toward the drive pinion. Figure 5.46.

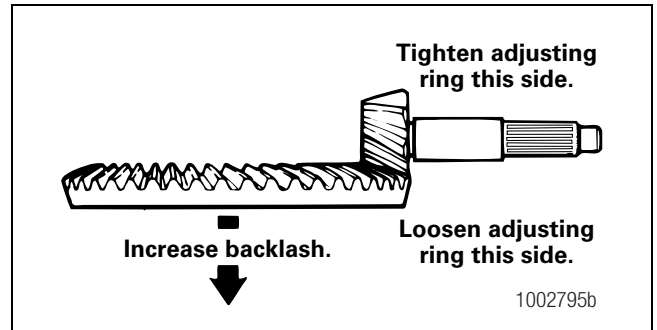


Figure 5.45

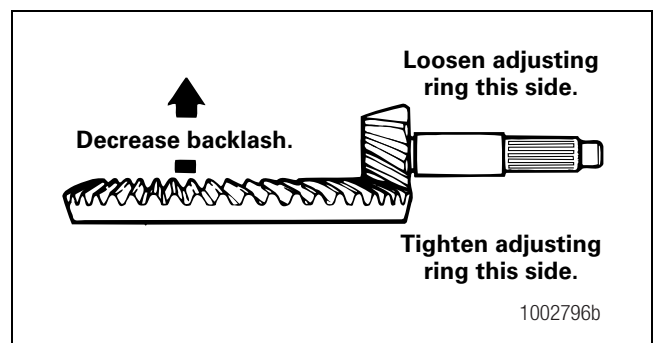


Figure 5.46

NOTE: When you adjust the backlash, only move the ring gear. Do not move the drive pinion.

6. Repeat Step 2 through Step 5 until the backlash is within specification. Record the setting for use when you adjust the pinion bearing preload.

Gear Set Tooth Contact Patterns, Backlash

Meritor carriers can have a conventional or a generoid hypoid gear set. The tooth contact patterns for each type of gear set are different. Check the part numbers to determine what type of gear set is in the carrier. Refer to Figure 5.47 for the location of part numbers. Refer to Section 4.

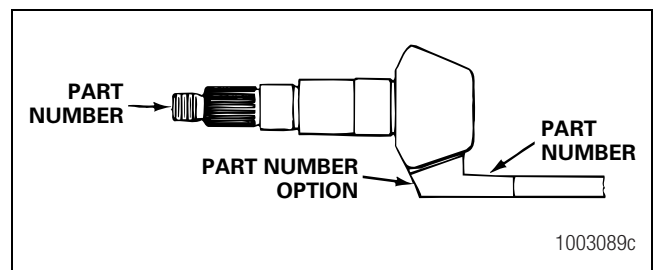


Figure 5.47

5 Assembly and Installation

Examples

The following are part numbers for generoid gear sets.

- 36786-K or 36786-K2 for the ring gear
- 36787-K or 36787-K2 for the drive pinion

In the following procedures, movement of the contact pattern along the length of the tooth is indicated as toward the heel or toe of the ring gear. Figure 5.48.

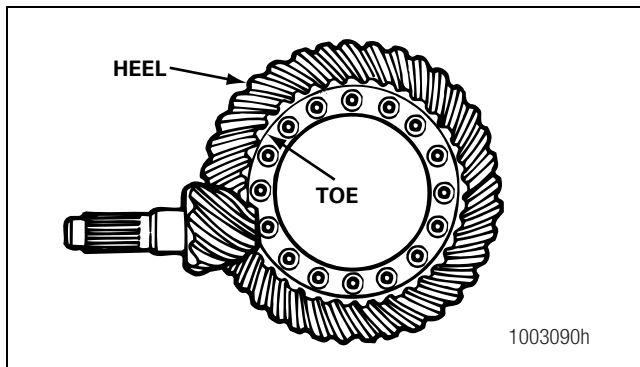


Figure 5.48

Always check the tooth contact patterns on the drive side of the gear teeth. Figure 5.49.

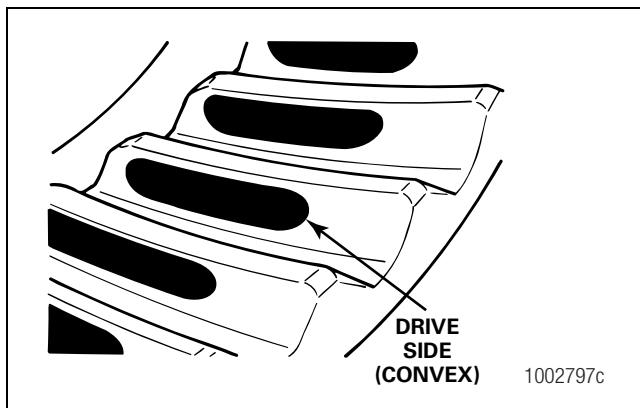


Figure 5.49

1. Adjust the backlash of a new gear set to either 0.012-inch (0.305 mm) or 0.015-inch (0.380 mm) depending on the size of the ring gear. Adjust the backlash of an old gear set to the setting that was measured before the carrier was disassembled. Refer to procedure in this section.
2. Apply a marking compound onto approximately 12 gear teeth of the ring gear. Rotate the ring gear so that the 12 gear teeth are next to the drive pinion. Figure 5.50.

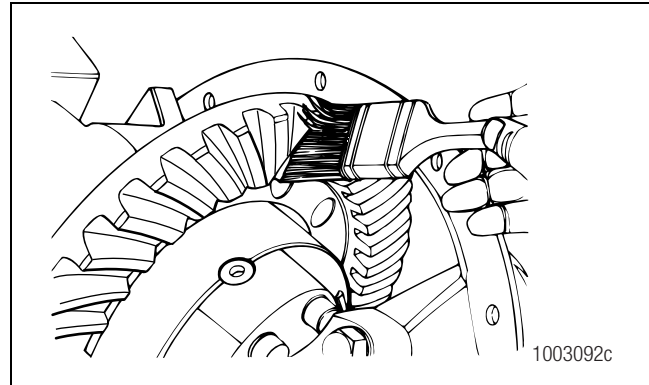


Figure 5.50

3. Rotate the ring gear forward and backward so that the 12 gear teeth go past the drive pinion six times to get the contact pattern. Repeat, if needed, to get a more clear pattern.
4. Look at the contact patterns on the ring gear teeth. Compare the patterns to Figure 5.51, Figure 5.52 and Figure 5.53.

The location of a good hand-rolled contact pattern for a new gear set is toward the toe of the gear tooth and in the center between the top and bottom of the tooth.

When the carrier is operated, a good pattern will extend approximately the full length of the gear tooth. The top of the pattern will be near the top of the gear tooth. Figure 5.54.

The location of a good hand-rolled contact pattern for an old gear set must match the wear pattern in the ring gear. The new contact pattern will be smaller in area than the old wear pattern.

A high contact pattern indicates that the drive pinion was not installed deep enough into the carrier. A low contact pattern indicates that the drive pinion was installed too deep in the carrier.

- **If the contact pattern requires adjustment:** Continue by following Step 5 to move the contact patterns between the top and bottom of the gear teeth.
- **If the contact patterns are in the center of the gear teeth:** Continue by following Step 6.



Figure 5.51

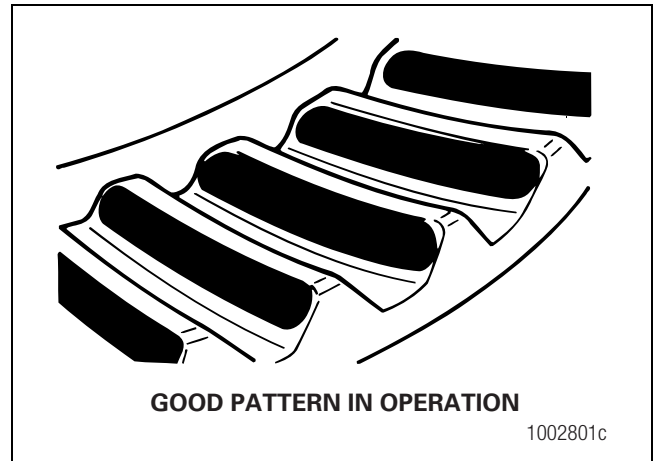


Figure 5.54

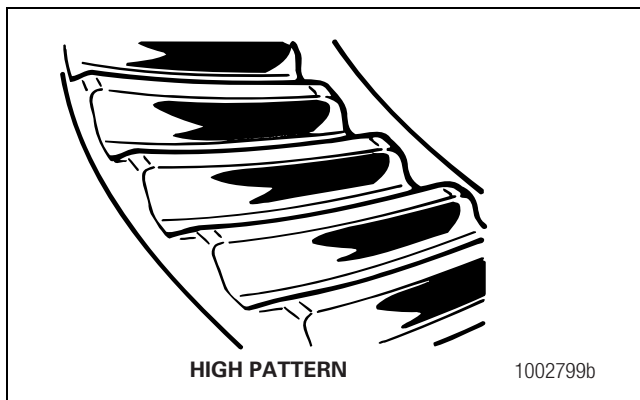


Figure 5.52

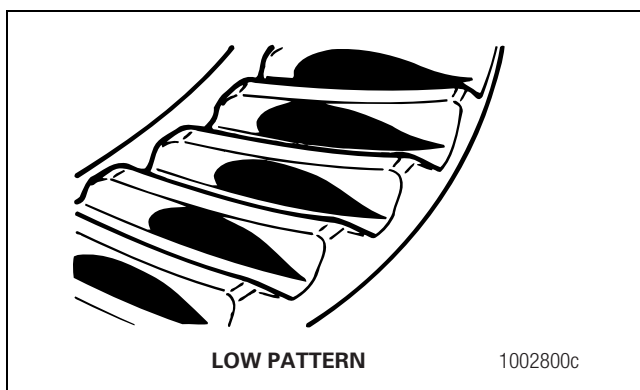


Figure 5.53

5. Change the thickness of the shim pack between the pinion inner bearing cup and the differential carrier to move the contact patterns between the top and the bottom of the gear teeth.
 - A. Remove the drive pinion, inner bearing cup and shims from the carrier. Refer to Section 3.
 - **To correct a high-contact pattern:** Increase the thickness of the shim pack. When you increase the thickness of the shim pack, the drive pinion will move toward the ring gear. Figure 5.55.
 - **To correct a low contact pattern:** Decrease the thickness of the shim pack. When you decrease the thickness of the shim, the drive pinion will move away from the ring gear. Figure 5.56.
 - B. Install the inner bearing cup, the shims and the drive pinion into the carrier. Refer to the procedure in this section.
 - C. Repeat Step 2 through Step 5 until the contact patterns are in the center between the top and bottom of the gear teeth.

5 Assembly and Installation



Figure 5.55

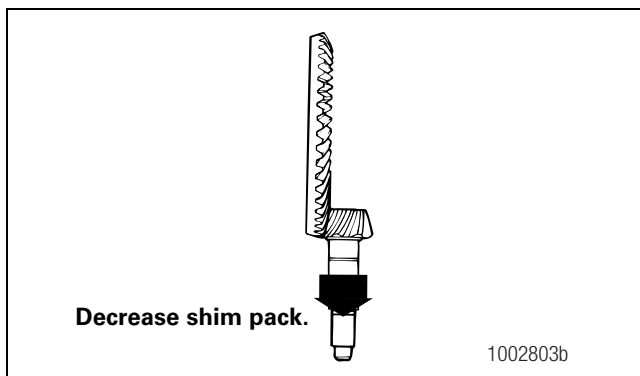


Figure 5.56

6. Adjust the ring gear backlash within the specification range to move the contact patterns to the correct location along the length of the gear teeth. Refer to procedure in this section.
 - A. Decrease the backlash to move the contact patterns toward the toe of the ring gear teeth. Figure 5.57.
 - B. Increase the backlash to move the contact patterns toward the heel of the ring gear teeth. Figure 5.58.
 - C. Repeat Step 2 through Step 4 and Step 6 until the contact patterns are at the correct location along the length of the gear teeth.

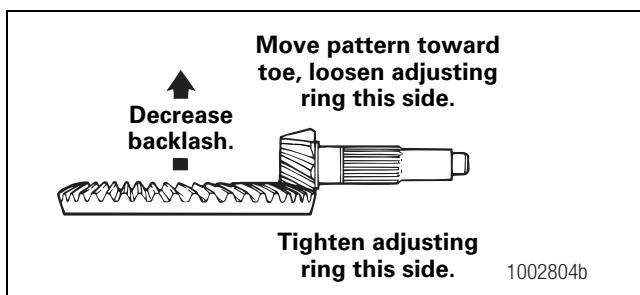


Figure 5.57

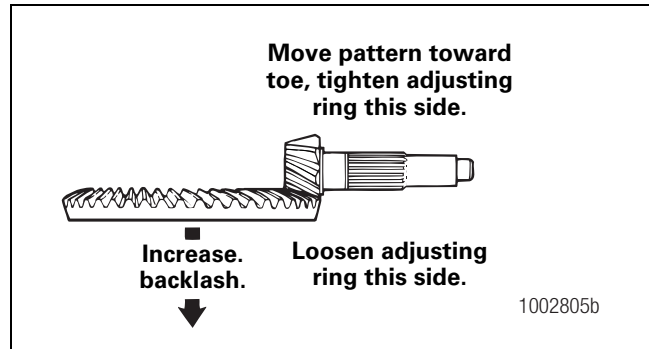


Figure 5.58

CAUTION

If the carrier has cotter pins or capscrews, lock the adjusting rings only with cotter pins or capscrews. If the carrier has roll pins, reuse the roll pins. Do not force a roll pin into a cotter pin hole. Damage to components can result.

7. Install the capscrews, cotter pins, roll pins or lock plates, if equipped, that hold the two bearing adjusting rings in position. Use the following procedures.
 - A. Install capscrews between the lugs of the adjusting ring and through the boss of the bearing cap. New capscrews include a locking patch, which can only be used once. If you are installing used capscrews, apply Loctite® threadlocker to the capscrew threads before you install the capscrews. Figure 5.59.
 - B. Install cotter pins between the lugs of the adjusting ring and through the boss of the bearing cap. Bend the two ends of the cotter pin around the boss. Figure 5.59.
 - C. Use a drift and hammer to install the roll pin through the boss of the bearing cap until the roll pin is between the lugs of the adjusting ring. Figure 5.59.
 - D. Install the lock plate onto the bearing cap so that the tab is between the lugs of the adjusting ring. Install the two capscrews and washers that hold the lock plate to the bearing cap. Tighten the capscrews to the correct torque value. Refer to Section 8. Figure 5.59.

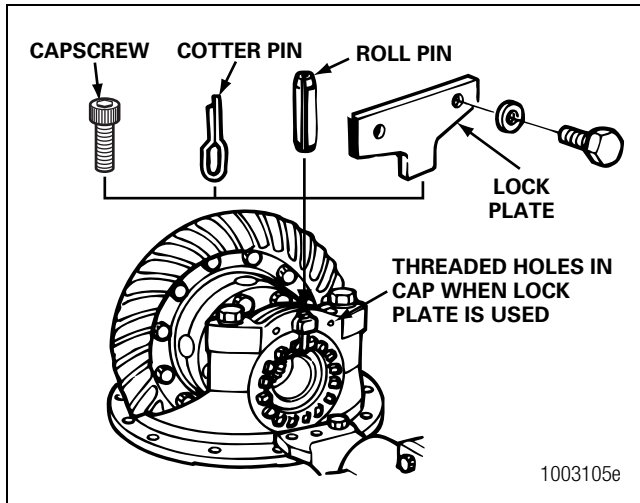


Figure 5.59

Installation

Thrust Screw (If Equipped)

1. Rotate the carrier in the repair stand until the back surface of the ring gear is toward the TOP.
2. Install the jam nut onto the thrust screw. Thread the jam nut to the middle of the thrust screw. Figure 5.60.

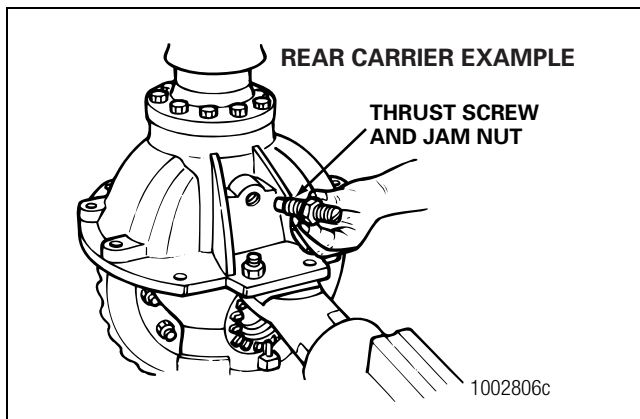


Figure 5.60

3. Install the thrust screw into the carrier. Use a feeler gauge to verify that the clearance between the thrust screw and the ring gear is 0.025-0.045-inch (0.65-1.14 mm).
4. Loosen the thrust screw one-half turn or 180 degrees. Figure 5.61.

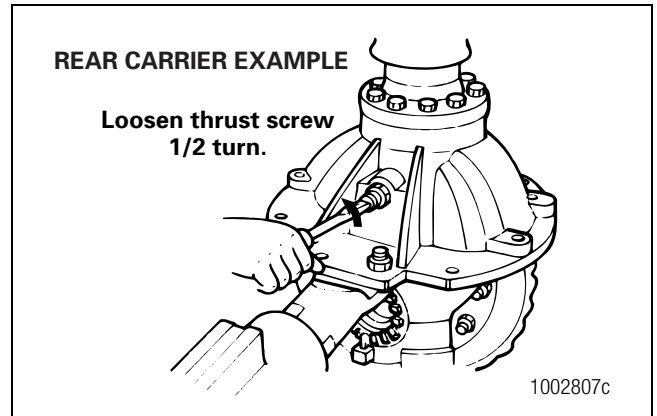


Figure 5.61

5. Tighten the jam nut, if equipped, to the correct torque value against the carrier. Refer to Section 8. Figure 5.62.

To complete the assembly of axles equipped with driver-controlled main differential locks, refer to Section 6.

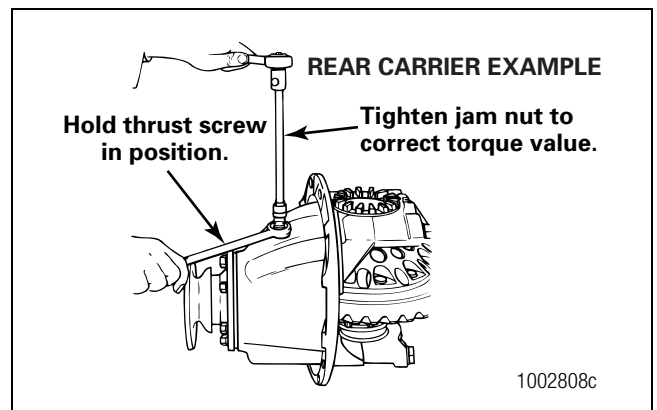


Figure 5.62

Air Shift Unit for the Inter-Axle Differential Lock

Air Applied and Spring Release Models, Standard

1. Inspect the shift shaft for damage. Use an emery cloth to remove any small damage. If necessary, replace the shift shaft. Figure 5.63.

5 Assembly and Installation

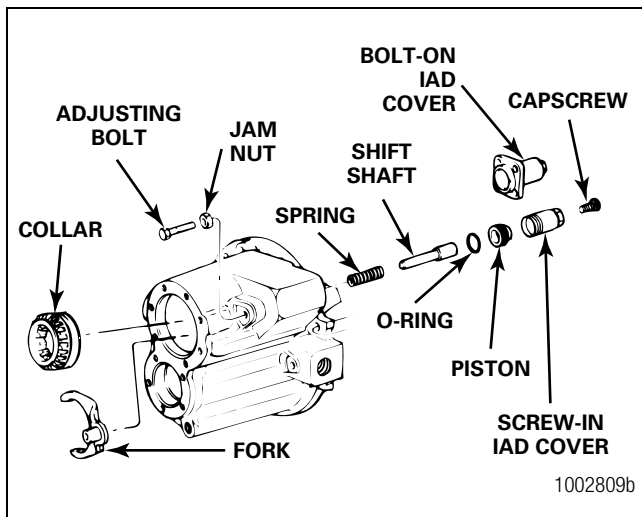


Figure 5.63

2. Place the spring and the shift fork into position in the carrier. The spring must touch the screw side of the carrier. The boss on the fork must be toward the adjusting bolt.
3. Install the shift shaft so the smaller part of the shaft goes through the fork and the spring.
4. If removed, install the O-ring onto the piston. Apply axle lubricant to the O-ring.
5. Install the piston onto the shift shaft.

⚠ 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.

6. On flange-type cylinders, apply silicone gasket material onto the mounting surface of the cylinder.

On threaded cylinders, apply a continuous 0.06-inch (1.5 mm) diameter bead of Loctite® flange sealant, Meritor part number 2297-D-7076, around the cylinder thread circumference.
7. Install the cylinder. On flange-type cylinders, install and tighten the capscrews 7-12 lb-ft (10-16 N•m).

NOTE: The adjusting screw is set to the specified distance after the input shaft assembly is installed.

8. Install the adjusting bolt and the jam nut.

Spring Applied and Air Release Models (Reverse Shift Systems)

1. Lubricate all the parts with axle lubricant. Figure 5.64.

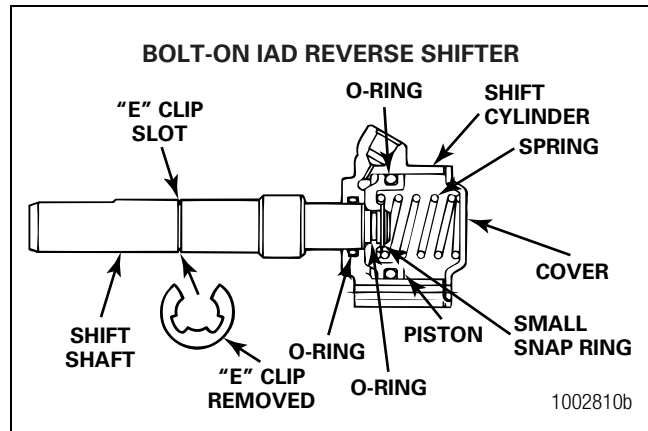


Figure 5.64

2. Inspect the shift shaft for damage. If necessary, replace the shift shaft.
3. If removed, install new O-rings into the groove in the shift shaft, into the groove in the shift cylinder and onto the piston.
4. Lubricate the bore of the shift cylinder with axle lubricant.
5. Install the piston into the shift cylinder.
6. Insert the shift shaft into the piston and shift cylinder assembly.
7. Install the small snap ring that fastens the piston onto the shift shaft.
8. Install the spring into the piston bore.
9. Install the gasket so that the tab on the gasket is under the right capscrew bore.
10. Place the shift cover onto the shift cylinder housing. Install two capscrews and washers to fasten the shift cover to the cylinder.
11. Install the assembly into the carrier so that the shift shaft is in the bore of the shift fork.
12. Install the "E" clip onto the shift shaft slot in front of the shift fork.

13. Install the capscrews and washers that fasten the assembly to the carrier. Tighten the capscrews to 7-12 lb-ft (10-16 N•m).



NOTE: The adjusting screw is set to the specified distance after the input shaft assembly is installed.

14. Install the adjusting bolt and jam nut.

Assembly

Input Shaft, Bearing Cage, Oil Pump and Inter-Axle Differential

1. Apply axle lubricant to the parts as they are being assembled. Figure 5.65.

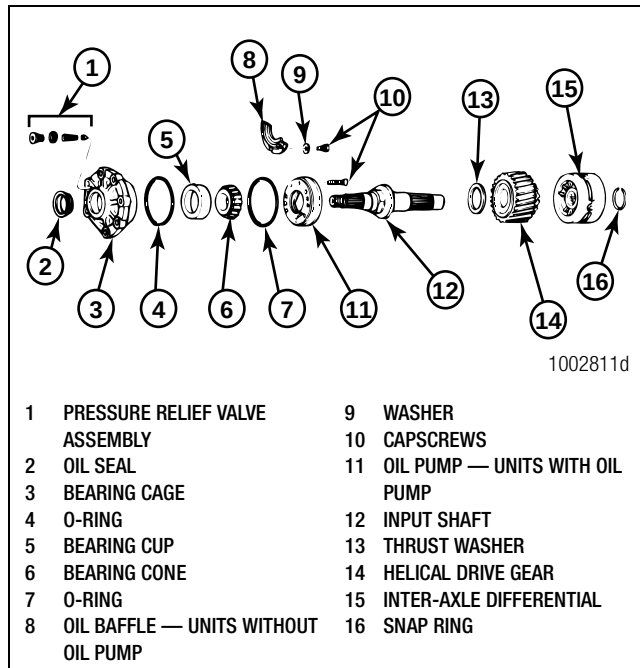


Figure 5.65

2. If removed, install the bearing cup into the input bearing cage. Use a press and a sleeve to install the cup into the cage. The cup is correctly installed when the bottom of the cup is fully seated in the cage bore.
3. If removed, install a new oil seal into the input bearing cage.
 - **For unitized pinion seals:** Refer to the unitized pinion seal installation procedure in this section and then proceed to Step 4. Figure 5.66.

- **For all other seals:** Refer to the following instructions.

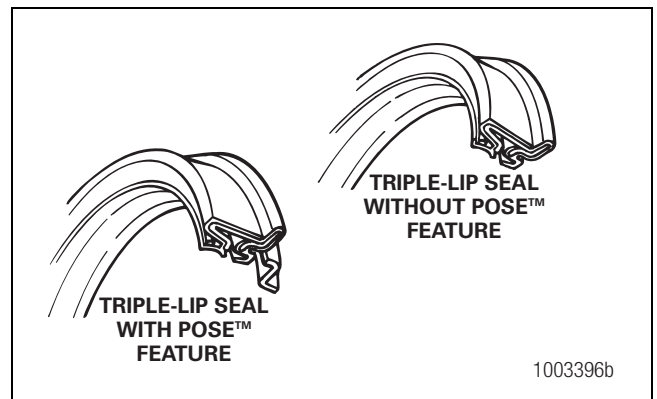


Figure 5.66

- A. Apply axle lubricant to the inner bore of the bearing cage or the outer diameter of the new oil seal.

⚠ CAUTION

Hold the seal only on the outer diameter. Do not touch the lips in the inner diameter of the seal. If you touch the lips on the inner diameter of the seal, you will contaminate the lips and could cause a leak between the shaft and the seal.

- B. Place the oil seal into the bearing cage so that the flange is parallel to the top of the cage.
- C. Use a press and driver or flat metal plate to install the oil seal into the bearing cage. Figure 5.67.

⚠ CAUTION

Do not apply pressure after the seal flange touches the top of the cage or you will damage the cage.

- D. Apply pressure until the metal flange of the seal is seated to the top of the cage.
- E. After the seal is installed, a gap of 0.015-0.030-inch (0.381-0.762 mm) can exist between the flange and the cage. The gap is a normal condition because of the flexible coating on the flange of the seal. Use a feeler gauge to measure the gap between the complete flange-to-cage area.
 - **If the gap varies more than 0.010-inch (0.254 mm) between the highest and lowest measurement:** Remove and reseal the seal. Figure 5.68.

5 Assembly and Installation

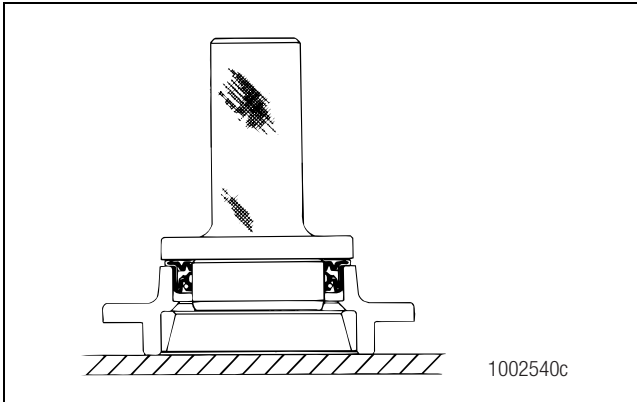


Figure 5.67

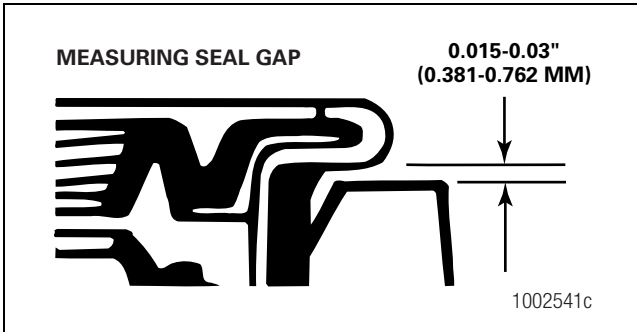


Figure 5.68

NOTE: If you replace either the bearing cup or cone, replace both parts in a fully-matched set from the same manufacturer.

4. On carriers that do not use an oil pump, install the input bearing cage.
 - A. If removed, install the bearing cone onto the input shaft. Use a press and sleeve to install the cone onto the input shaft until it bottoms on the shoulder of the shaft. Figure 5.69.
 - B. Install the O-ring onto the input bearing cage.
 - C. Place the cage over the input shaft so that the cup in the cage is against the bearing cone.

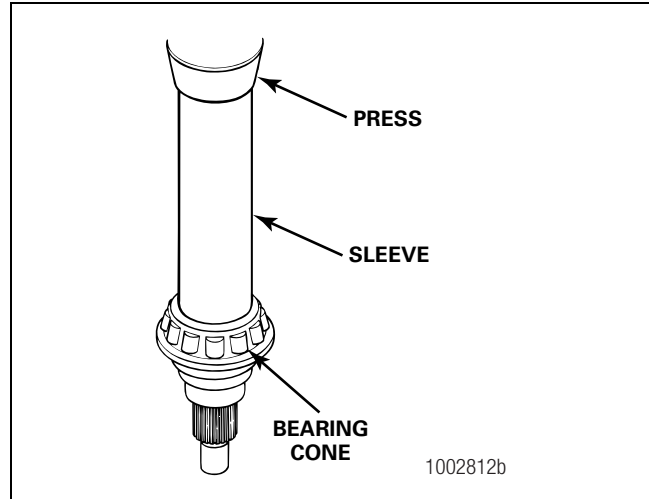


Figure 5.69

⚠ CAUTION

On early design forward carriers, verify that the drive flats in the bore of the pump are aligned with the flats on the input shaft. If the flats are not aligned, the pump will be damaged.

NOTE: If you replace either the bearing cup or cone, replace both parts in a fully-matched set from the same manufacturer.

5. On carriers that use an oil pump, install the input bearing cage and oil pump.
 - A. Position the input shaft so that the threads are toward you.
 - **If dowel pins are used:** Install the oil pump onto the input shaft so that the dowel pin hole in the pump is toward the threads on the shaft.
 - **If a drive flat design pump is used:** Verify that the drive flats in the bore of the pump are aligned with the flats on the input shaft.
 - **If a spline design pump is used:** Verify that the splines in the pump are aligned with the splines on the shaft. Figure 5.70.

⚠ CAUTION

When the bearing cone and the oil pumps are installed on the input shaft, place supports under the input shaft. Do not place supports under the oil pump. The oil pump will be damaged if pressure is applied to the body of the pump.

- B. Place supports under the input shaft.

- C. Use a press and a sleeve to install the bearing cone onto the input shaft. The cone is correctly installed when the bottom of the cone touches the shoulder on the shaft. Figure 5.71.
- D. If removed, install the pressure relief valve assembly into the input bearing cage. Install the relief valve, spring and plug into the bore. Tighten the plug to 20-40 lb-ft (27-54 N•m). Figure 5.72. 
- E. Install the input bearing cage over the input shaft on the oil pump.
 - **If dowel pins are used:** Verify that the dowel pins in the cage are aligned with the holes in the oil pump.
- F. Install the capscrews that fasten the oil pump to the input bearing cage. Tighten the capscrews to 22-23 lb-ft (30-31 N•m). 
- G. Install the O-rings onto the oil pump and input bearing cage.

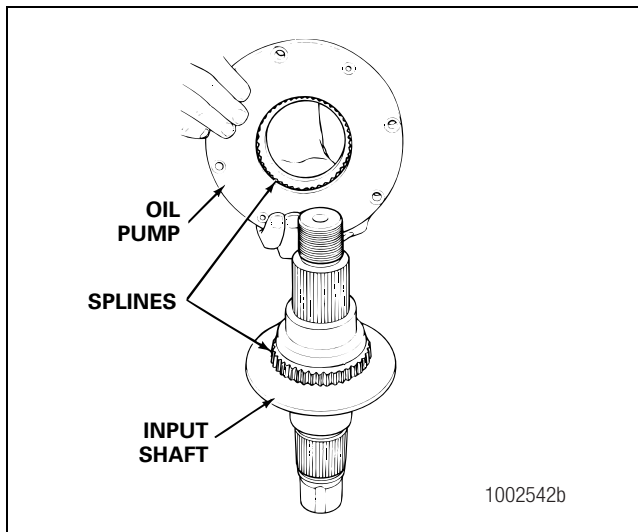


Figure 5.70

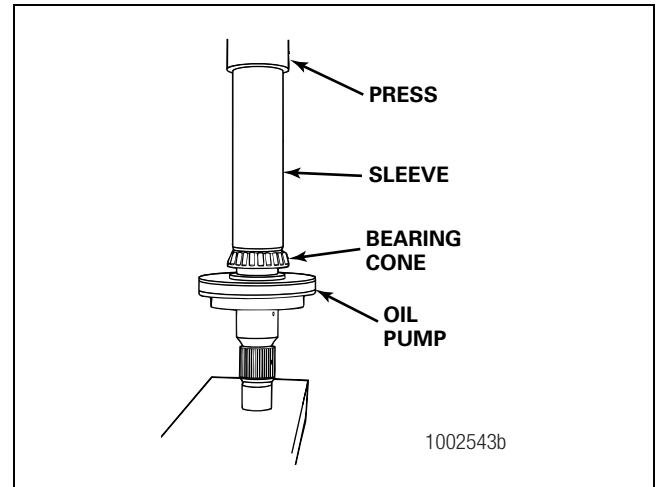


Figure 5.71

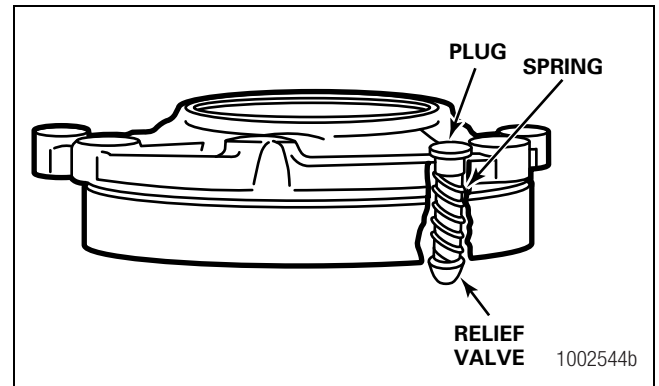


Figure 5.72

CAUTION

Do not use a Speedi-Sleeve with Meritor triple-lip oil seals. The edge of the sleeve will catch and roll the center dust lip and result in early seal leakage. Damage to components can result.

6. Inspect the yoke surface.
 - **If you installed a unitized pinion seal on the output bearing cage:** Refer to the clean and inspect the yoke after installing a unitized pinion seal procedure in this section and then proceed to Step 7. Figure 5.66.
 - **For all other seals:** Refer to the following instructions.
- A. Inspect the yoke for scratches, corrosion or a wear track from the previous oil seal. Replace the yoke if any of these conditions exist.

5 Assembly and Installation

- B. Inspect the lead chamfer of the yoke for nicks and burrs which may damage the sealing tip during installation.
- C. Wipe clean the yoke sealing surface and face.
 - **If a yoke POSE™ seal is used:** Install the seal 1/2-inch (13 mm) onto the yoke hub. Refer to procedure in this section.

⚠ CAUTION

Use a press and a sleeve or yoke installation tool to install the yoke. Do not use a hammer or mallet. Using a hammer or mallet can damage the bearings, yoke or flange.

- 7. Use a press and sleeve or an installation tool to install the yoke or the flange onto the input shaft. If a press and sleeve are used, verify that the input shaft is well supported. Figure 5.73.

If a yoke is removed after it has been partially or fully installed, the unitized pinion seal will be damaged. Remove and discard the original unitized pinion seal and replace it with a new one.

If a yoke has been installed into the unitized pinion seal and then removed, the inner sleeve of the seal will be damaged. Install a new seal.

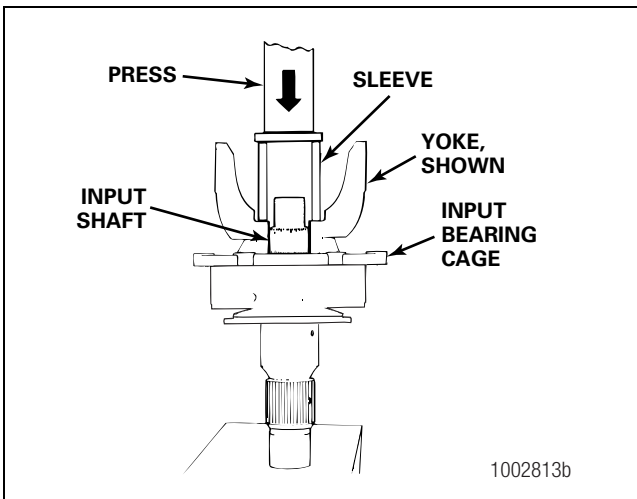


Figure 5.73

- 8. Install the nut that fastens the yoke or the flange to the input shaft. Hand-tighten the nut. Do not tighten the nut to the specified torque until the bearing cage and pump assembly is installed into the housing.

- 9. Place the thrust washer into the pilot bore on the end of the helical drive gear. The oil groove in the thrust washer must face the input shaft flange. Install the helical drive gear and the thrust washer onto the input shaft so that the thrust washer is toward the input bearing cage. Figure 5.74.

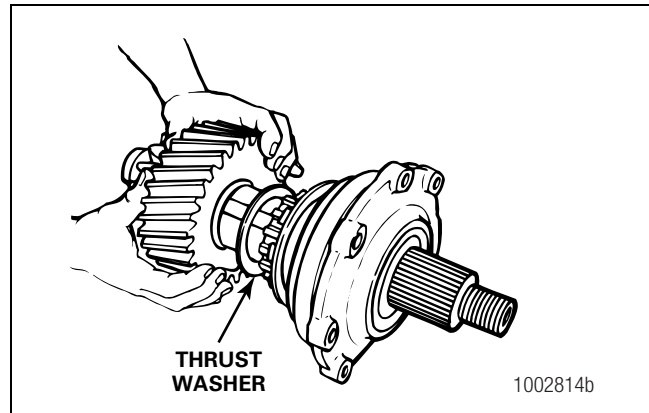


Figure 5.74

- 10. If disassembled, assemble the inter-axle differential.
 - A. Apply axle lubricant to all of the inter-axle differential parts.
 - B. Install the pinion gears and the thrust washers onto the spider.
 - C. Place the spider and pinion assembly into one of the case halves of the inter-axle differential.
 - D. Install the remaining case half over the case half with the spider assembly. Verify that the marks on each case half are aligned.
 - E. Install four of the capscrews that fasten the case halves together. Install the capscrews so that the capscrews are the same distance away from each other. Equally tighten the capscrews to bring the case halves together.
 - F. Install the rest of the capscrews. Tighten the capscrews to 45-55 lb-ft (60-75 N•m). 
- 11. Install the inter-axle differential to the input shaft so that the teeth in the differential case are away from the helical drive gear. Install the snap ring that fastens the case to the shaft. Figure 5.75.

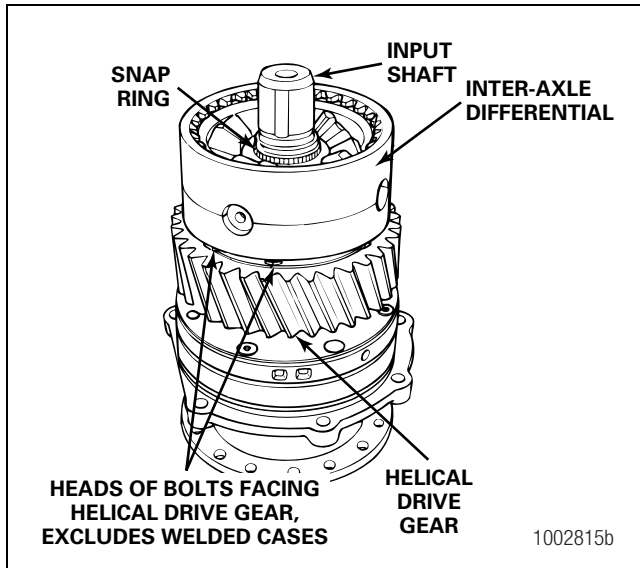


Figure 5.75

NOTE: If you replace either the bearing cup or the cone, replace both parts in a fully-matched set from the same manufacturer.

12. If removed, install the bearing cup for the rear side gear into the differential carrier. Use a press and a sleeve to install the cup into the carrier. If a press is not available, use a sleeve or a long, brass drift and a hammer to install the cup. The cup is correctly installed when the bottom of the cup is seated against the bottom of the bore. Figure 5.76.

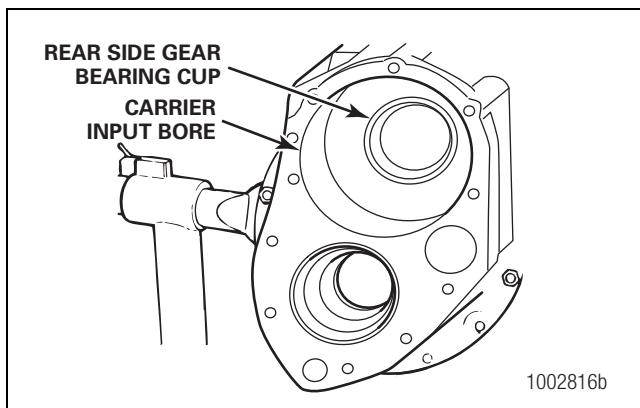


Figure 5.76

NOTE: If you replace either the bearing cup or the cone, replace both parts in a fully-matched set from the same manufacturer.

13. If removed, install the bearing cone onto the rear side gear. Use a press and sleeve to install the cone onto the gear. The cone is correctly installed when the bottom of the cone touches the shoulder on the side gear.
14. Install the oil screen and plug assembly into the suction line in front of the carrier. Tighten the screen and plug assembly to 48 lb-ft (65 N•m). Figure 5.77. 

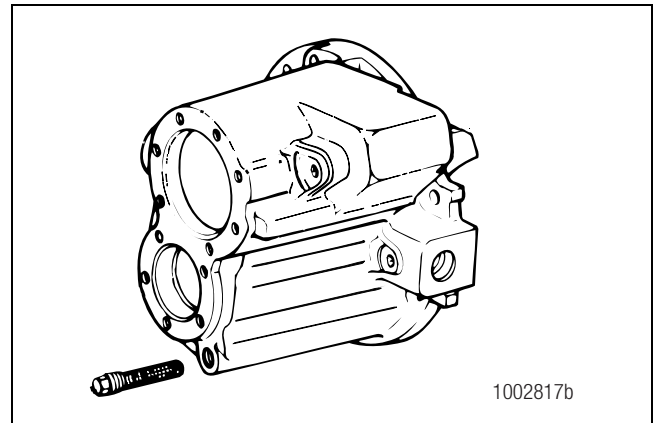


Figure 5.77

Installation

Input Shaft Assembly

NOTE: The shim pack under the input bearing cage is installed after the end play of the input bearing is inspected and adjusted.

1. Place the differential carrier into a repair stand so that the ring gear is facing DOWN.
2. If necessary, place the clutch collar into the differential carrier so that the teeth on the outside of the collar are toward the input yoke. Install the clutch collar onto the shift fork so the tabs of the fork fit into the slot of the clutch collar.
3. Install the rear side gear and bearing assembly through the clutch collar and into the differential carrier. Figure 5.78.

5 Assembly and Installation

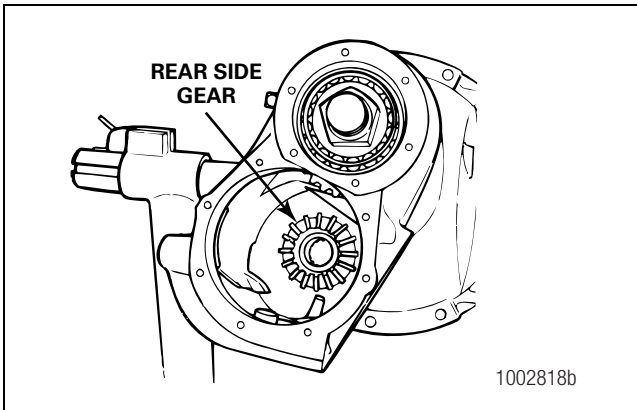


Figure 5.78

4. Verify that the painted alignment marks on the teeth of the helical gears are visible during the installation of the input shaft assembly. Figure 5.79.

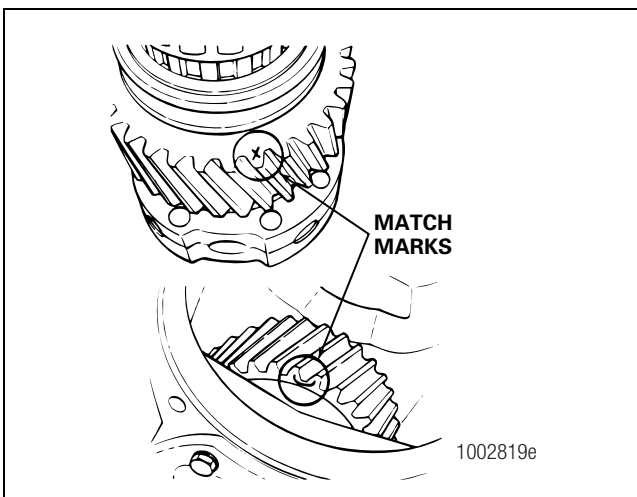


Figure 5.79

5. Install the input shaft assembly into the differential carrier.
 - A. Connect a lifting device to the input yoke. Lift the input shaft assembly over the bore in the differential carrier.
 - B. Lubricate the O-rings with axle oil.
 - C. On 160 Series carriers, rotate the inter-axle differential case so that one of the notches on the case is aligned with the helical driven gear in the carrier. Figure 5.80.
 - D. Lower the input shaft assembly into the differential carrier. Figure 5.81.

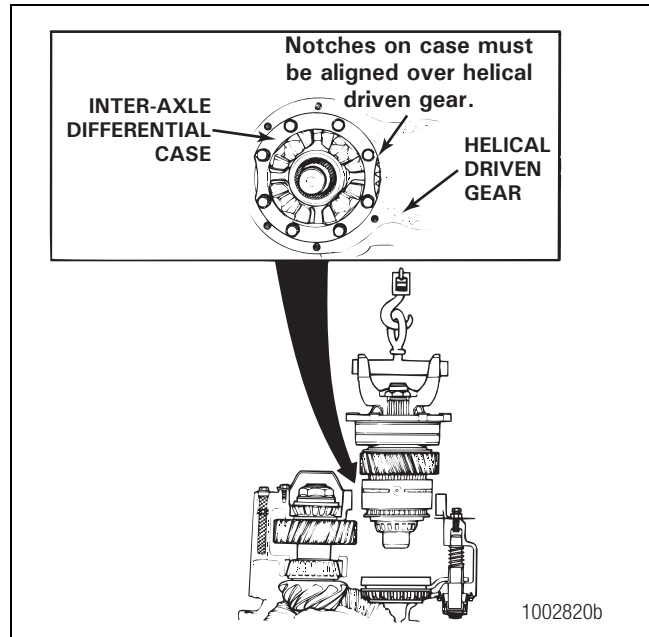


Figure 5.80

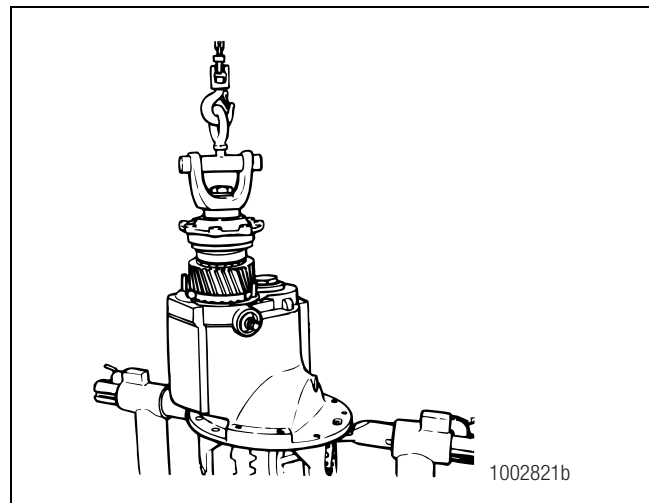


Figure 5.81

Inspection

Adjust the Input Bearing End Play

1. Install the capscrews, but not the washers, that fasten the input bearing cage to the carrier. Rotate the input shaft in each direction to verify that the bearings are correctly installed while you hand-tighten the capscrews. Do not tighten the capscrews.

5 Assembly and Installation

2. Use a feeler gauge to measure the gap between the input bearing cage and the differential carrier. Inspect the gap at four equally-spaced places on the cage. Figure 5.82.

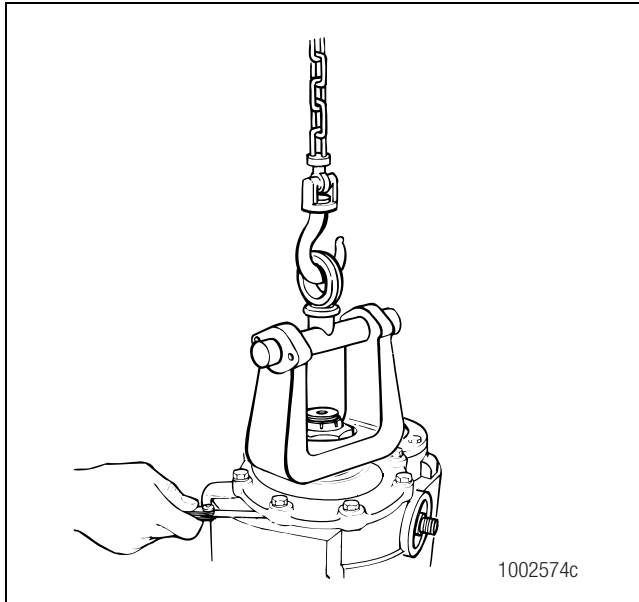


Figure 5.82

3. Add up the four measurements and determine the average gap between the cage and the carrier. Add 0.005-inch (0.130 mm) to the average gap measurement to determine the size of the shim pack between the cage and the carrier. Figure 5.83.

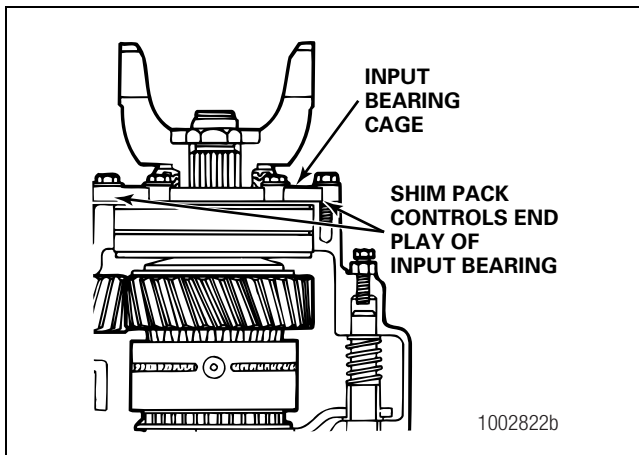


Figure 5.83

4. Build a shim pack. Use at least three shims when you build a shim pack. Always place the thickest shims in the middle of the shim pack.

5. Remove the capscrews that fasten the input bearing cage to the carrier.
6. Install the shim pack.
 - A. Connect a lifting device to the input yoke. Lift the input shaft assembly until there is 0.25-0.50-inch (6-12 mm) between the cage and carrier mounting surface.
 - B. Install the shim pack under the bearing cage. Verify that the hole pattern of the shim pack matches the hole pattern of the cage. Figure 5.84.
 - C. Install the capscrews and washers that fasten the cage to the carrier. Verify that the capscrews are aligned with the holes in the shim pack. Tighten the capscrews so that the threads engage in the holes of the carrier.
 - D. Lower the input shaft assembly so that the cage and the shim pack are installed against the carrier. Remove the lifting device from the yoke or flange.
 - E. Tighten the capscrews to 75-95 lb-ft (100-127 N•m) while rotating the input shaft in each direction to verify that the bearings are correctly installed. 

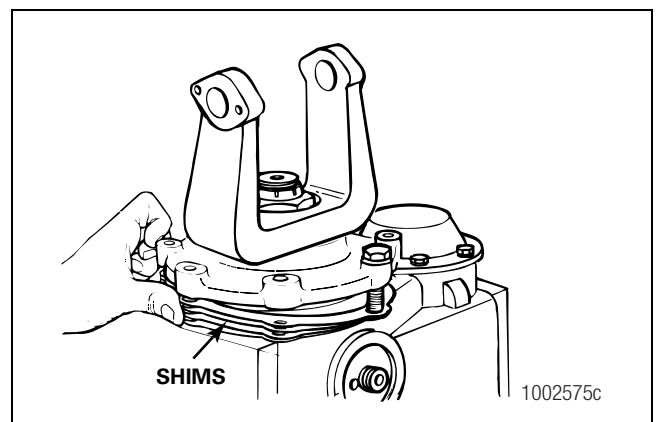


Figure 5.84

7. Apply Loctite® 277 threadlocker to the input shaft threads of all forward carriers prior to installation of the nut. Begin at the top of the threaded area and allow the Loctite® threadlocker to run down the length of the threaded area.
8. Place a holding tool onto the input yoke or flange and tighten the nut to the specified torque. Refer to Section 8.
9. Rotate the yoke at least one full turn after you tighten the yoke nut to the correct torque specification to ensure that the seal seats correctly.

5 Assembly and Installation

10. Inspect the end play of the input shaft.
 - A. Rotate the input shaft in each direction and push the yoke or flange toward the bearing cage. This ensures that the input shaft assembly is at the bottom of its travel.
 - B. Use a dial indicator with a magnetic base or a C-clamp base to inspect the end play of the input bearing. Verify that the pointer of the dial indicator is against the top of the input shaft. Set the dial indicator to ZERO. Figure 5.85.
 - C. Use a pry bar and a support to push the yoke or the flange away from the carrier. Read the dial indicator. The reading must be 0.002-0.008-inch (0.050-0.200 mm). Figure 5.86.
 - **If the end play of the input bearing is not 0.002-0.008-inch (0.050-0.200 mm):** Add or remove shims from the shim pack. Repeat Step 5 through Step 9.

11. Place the shield for the oil filter onto the bearing cage.

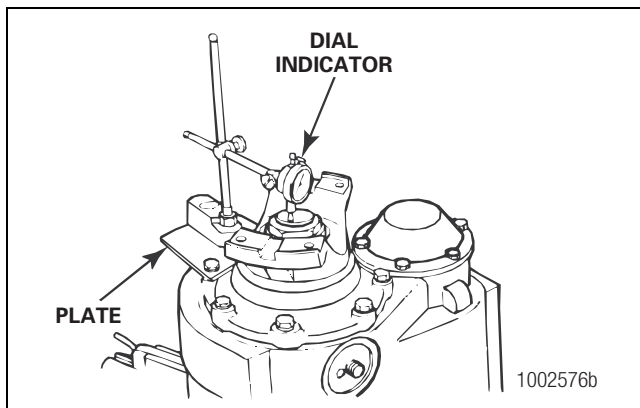


Figure 5.85

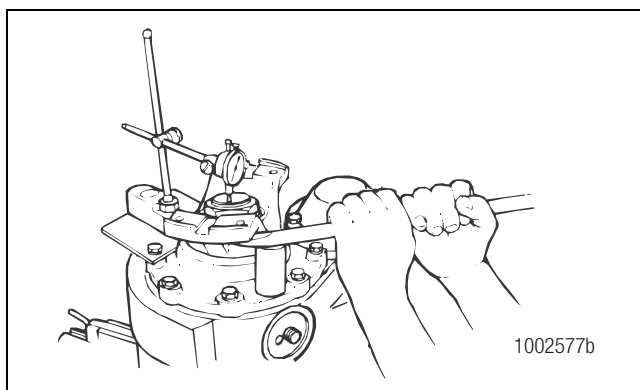


Figure 5.86

12. On RT-145 carriers that do not use an oil pump, use the following procedure.

- A. Remove the input shaft assembly from the carrier.

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. If Loctite® adhesive material gets into your eyes, follow the manufacturer's emergency procedures. Have your eyes checked by a physician as soon as possible.

- B. Spray Loctite® Primer N sealant on the cage and carrier faces around the perimeter of the lube trough hole at the two o'clock position. Figure 5.87. Allow the primer to dry three to five minutes.
 - C. Carefully apply Loctite® 518 sealant to the cage and carrier faces around the lube trough hole. Avoid allowing any excess Loctite® sealant accumulation in the bearing cage bore. Figure 5.87.
 - D. Use guide studs to install the input shaft and cage assembly with the appropriate shim pack. Tighten the capscrews to 95 lb-ft (128 N•m). 
 - E. Allow four hours for the Loctite® 518 sealant to cure before returning the vehicle to service.

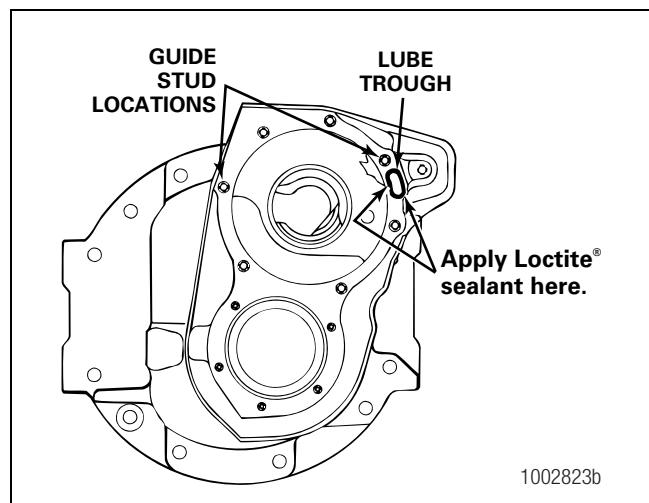


Figure 5.87

Installation

Driver-Controlled Main Differential Lock

Refer to Section 6 for installation procedures.

Output Bearings and Thru-Shaft

1. Apply axle lubricant to bearing cups and cones. Figure 5.88.

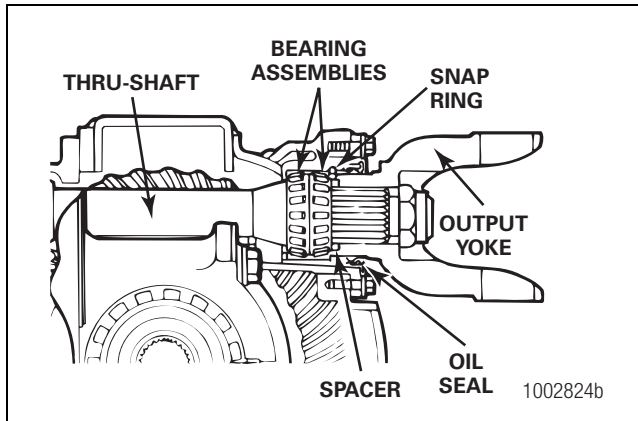


Figure 5.88

NOTE: If you replace either the bearing cup or the cone, replace both parts in a fully-matched set from the same manufacturer.

2. If the bearing cones were removed from the thru-shaft, install new bearing cones. Place both cones back-to-back onto the thru-shaft. Use a press and sleeve to install both cones. Apply pressure until the inner cone seats onto the shoulder of the thru-shaft. Figure 5.89.

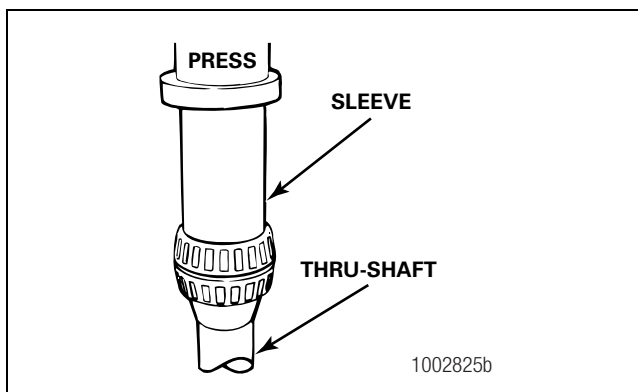


Figure 5.89

3. Use a press and sleeve to install the inner bearing cup into the cage. Place the thru-shaft and bearing assembly into the cage.

4. Use a press and sleeve to install the outer bearing cup into the cage over the thru-shaft. Figure 5.90.

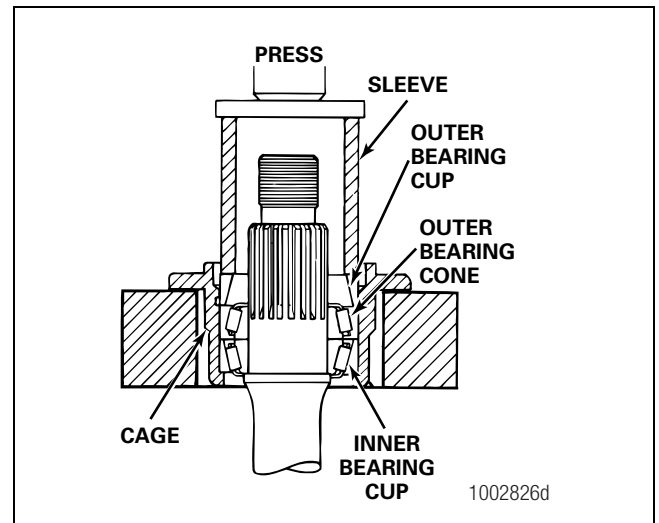


Figure 5.90

5. Install the snap ring that fastens the outer cup in the cage. The snap ring controls the end play of the output bearing. Figure 5.91.

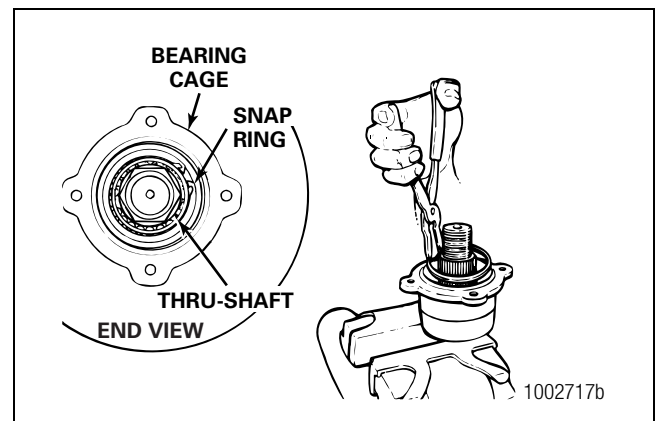


Figure 5.91

6. Install the snap ring or the yoke-to-cone spacer onto the thru-shaft until the snap ring touches the outer cone.
7. Inspect and adjust the end play of the thru-shaft bearing.

5 Assembly and Installation

Inspection

Adjust the Output Bearing End Play

The output bearing end play is controlled by the size of the snap ring that holds the bearings in the output cage. The snap rings are available in increments of 0.003-inch (0.076 mm). Install the snap ring which results in an end play of 0.001-0.004-inch (0.025-0.102 mm).

1. Place the thru-shaft and the bearing cage assembly into a vise with soft metal covers on the jaws of the vise.
2. Use an installation tool to install the yoke or flange onto the thru-shaft. Do not use the nut to draw the yoke onto the shaft. Do not install the oil seal at this time.
3. Install the nut that fastens the yoke or flange to the thru-shaft. Place a holding tool on the yoke or flange and tighten the nut to the specified torque. Refer to Section 8.
4. Push the yoke or flange toward the cage and rotate the shaft in each direction to verify that the bearings are correctly installed.
5. Install a dial indicator so that the base of the indicator is on the mounting flange of the cage. The pointer of the indicator must touch the yoke or flange end of the thru-shaft. Set the dial indicator to ZERO. Figure 5.92.

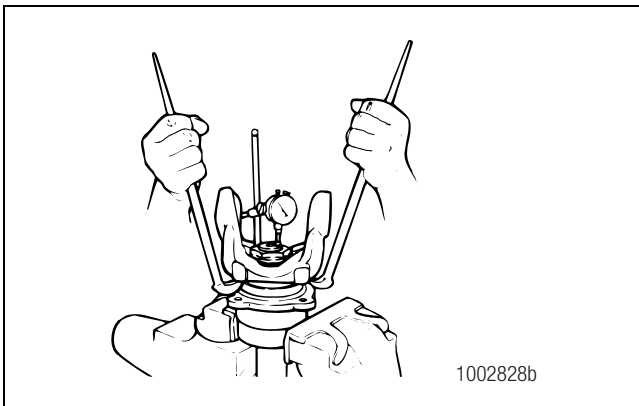


Figure 5.92

6. Place pry bars under the yoke or flange and push the yoke or flange away from the cage. Record the reading on the dial indicator. The reading must be 0.001-0.004-inch (0.025-0.102 mm). The reading is the measurement of the end play on the output bearing.

- If the end play reading is not 0.001-0.004-inch (0.025-0.102 mm): Remove and replace the snap ring that fastens the bearings in the cage. Install a thinner snap ring to increase the end play. Install a thicker snap ring to decrease the end play. Figure 5.93.

7. Remove the nut that fastens the yoke or flange to the thru-shaft. Use the correct puller tool to remove the yoke.

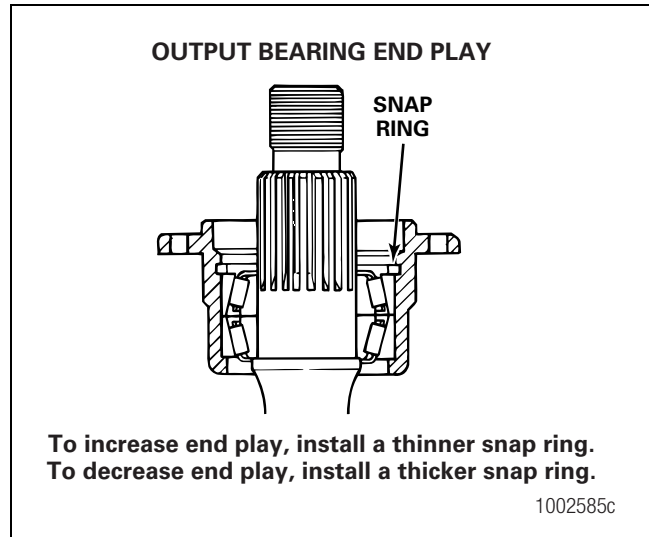


Figure 5.93

Installation

Unitized Pinion Seal

1. Remove the old seal. Do not damage the bearing cage seal surface area. Do not touch or allow dirt or grease to contaminate the sealing surface areas or the adjacent bearings.
2. Inspect the bearing cage seal area for damage that could cause lubricant leaks after you install the seal. Use emery paper or an equivalent product to remove scratches, nicks or burrs only.

CAUTION

Inspect the axle breather for contaminants, such as dirt, lubrication or debris, which can cause pressure to build inside the axle. Damage to the seal and premature seal lip wear can result. Remove the axle breather. Use a safe cleaning solvent to clean the inside and outside of the breather.

3. Inspect the axle breather for contaminants, such as dirt, lubrication or debris.
 - **If you find contaminants in the axle breather:** Remove the axle breather. Use a safe cleaning solvent to clean the inside and outside of the breather.
4. Remove the replacement unitized seal from the package. Figure 5.94.

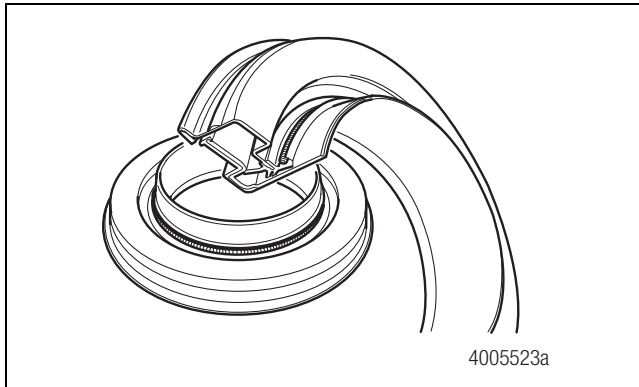


Figure 5.94

CAUTION

If a yoke is removed after it has been partially or fully installed, the unitized pinion seal will be damaged. Remove and discard the original unitized pinion seal and replace it with a new one.

If a yoke has been installed into the unitized pinion seal and then removed, the inner sleeve of the seal will be damaged. Install a new seal.

5. Select the correct seal driver from Table L. Each seal driver is designed to correctly install a specific diameter seal. To determine the yoke seal diameter, measure the yoke journal. To obtain the Meritor seal driver KIT 4454, refer to the Service Notes page on the front inside cover of this manual.

5 Assembly and Installation

Table L: Unitized Pinion Seals and Seal Drivers*

Single Models	Tandem Models	Axle Model and Position	Seal Service Part Number	Previous Seal Part Number	Seal Drivers	Sleeve Drivers
MX-21-160	RT-34-144 /P	14X/16X/18X/38X	A1-1205X2728	A-1205R2592	2728T1	2728T2
MX-23-160R	RT-34-145 /P	Forward-Rear Unit Input (FUI)				
RF-16-145	MT-40-143	14X/16X Forward-Rear Unit Output (FUO)	A1-1205Y2729	A-1205P2590	2729T1	2729T2
RF-21-160	RT-40-145 /A /P	14X Rear-Rear Unit Input (RUI)	A1-1205Z2730	A-1205N2588	2730T1	Not Required — Sleeve is unitized
RF-22-166	RT-40-149 /A /P	16X/18X Rear-Rear Unit Input (RUI)	A1-1205A2731	A-1205Q2591	2731T1	Not Required — Sleeve is unitized
RS-17-145	RT-40-160 /A /P					
RS-19-145	RT-40-169 /A /P					
RS-21-145	RT-46-160 /A /P					
RS-21-160	RT-46-169 /A /P					
RS-23-160 /A	RT-46-164EH /P					
RS-23-161 /A	RT-46-16HEH /P					
RS-25-160 /A	RT-50-160 /P					
RS-23-186	RT-52-185*					
RS-26-185	RT-58-185*					
RS-30-185						

* Forward and rear input only.

Forward input and output seals must be serviced with the seal and sleeve. The service part number provides both when required.

6. Position the driver and seal. Figure 5.95.

- **If you use the R4422401 driver tool to install a forward tandem axle seal:** The driver tool outer spokes or fins must fit between the bearing cage bolts. Ensure that the bolts on the bottom of the bearing cage are not in the path of the driver spokes.
- **If the driver spokes contact the bearing cage bolts:** The driver will incorrectly install the seal into the bearing cage seat and can also result in damage to the driver. The reference mark on the driver tool must be in the 12 o'clock or the 6 o'clock positions when you install the new seal.

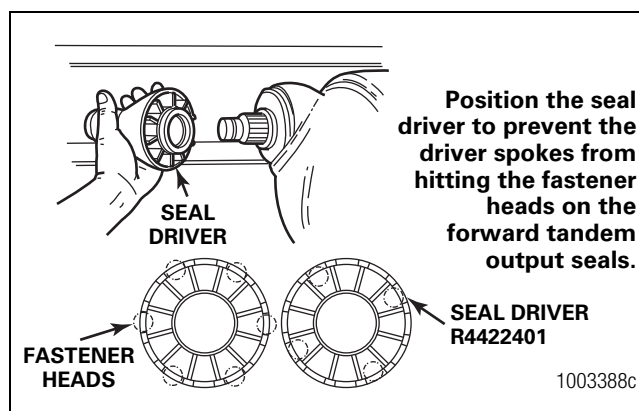


Figure 5.95

CAUTION

Use a rubber mallet to install the seal. Do not use a steel, brass or plastic hammer. Using a steel, brass or plastic hammer can damage the seal and driver tool.

7. Use a rubber mallet to drive the seal into or against the bearing cage. The seal must fully seat into or against the bearing cage. Figure 5.96.

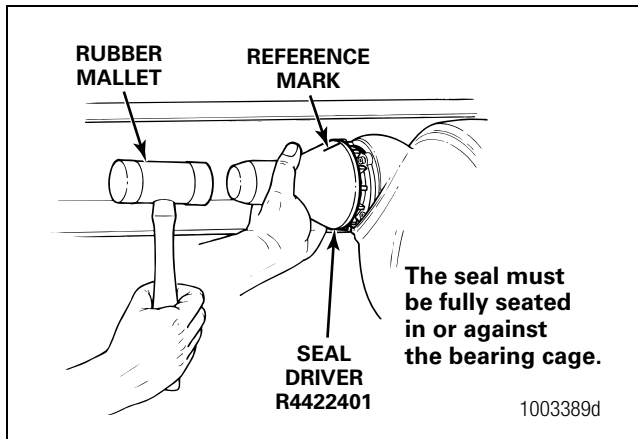


Figure 5.96

8. Visually inspect the seal to verify that it is seated correctly.

Installing a Multiple-Lip Seal (MLS)

140, 160 and 180 Series Single Drive Axles

140, 160, 180 and 380 Series Tandem Drive Axles

Meritor multiple-lip seals feature a separable sleeve installed onto the yokes at the tandem forward-rear input and forward-rear output positions. No sleeve is used on the rear-rear input.

Installation of the new seals requires a set of four seal drivers and two sleeve drivers. Refer to Table M for part numbers.

Forward input and output seals must be serviced with the seal and sleeve. The service part number provides both when required. Check your application carefully before installing the multiple-lip seal.

5 Assembly and Installation

Table M: Multiple-Lip Seal (MLS) Seal Drivers and Sleeves Part Numbers

Axle Model and Position	Seal Service Part Number	Previous Seal Part Number	Seal Drivers	Sleeve Drivers
140, 160, 180 and 380 Forward-Rear Unit Input (FUI)	A1-1205X2728	A-1205R2592	2728T1	2728T2
140 and 160 Forward-Rear Unit Output (FUO)	A1-1205Y2729	A-1205P2590	2729T1	2729T2
140 Rear-Rear Unit Input (RUI)	A1-1205Z2730	A-1205N2588	2730T1	Not Required — Sleeve is unitized
160 and 180 Rear-Rear Unit Input (RUI)	A1-1205A2731	A-1205Q2591	2731T1	Not Required — Sleeve is unitized

Special Tools for Installing Multiple-Lip Seals (MLS)

There are six new installation drivers required for replacement of the multiple-lip axle yoke seals. Figure 5.97. To obtain these sleeves, seals and drivers, call Meritor's Commercial Vehicle Aftermarket at 888-725-9355.

- A sleeve driver and seal driver for the forward-rear input
- A sleeve driver and seal driver for the forward-rear output
- Two model specific seal drivers for the rear-rear input

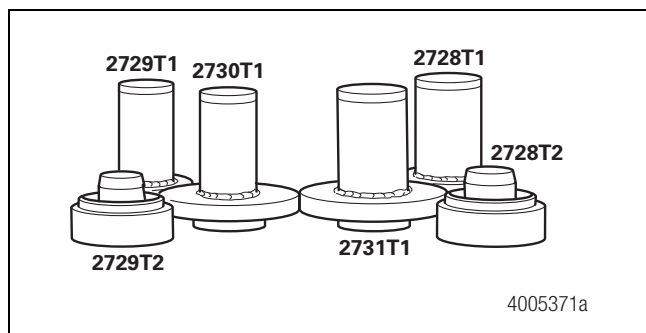


Figure 5.97

⚠ 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. Clean the ground and polished surface of the yoke journal using a clean shop towel and a safe cleaning solvent. Do not use abrasive cleaners, towels or scrubbers to clean the yoke or flange surface. Do not use gasoline.
2. Inspect the yoke seal area for damage that could cause lubricant leaks after you install the seal. Use emery paper or an equivalent product to remove scratches, nicks or burrs only.
3. Install the deflector, if equipped, onto the yoke. You must install the deflector before you install the sleeve into the yoke. Figure 5.98.

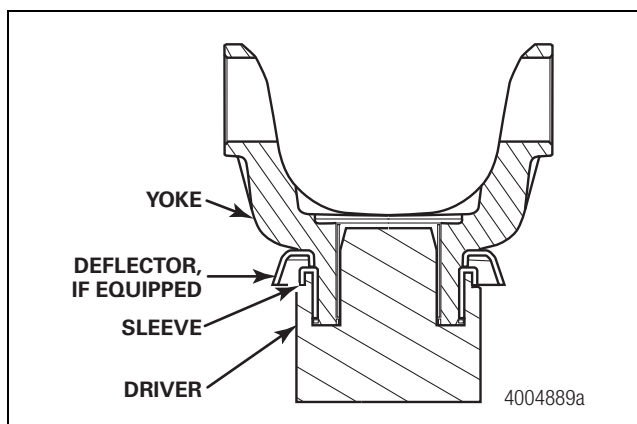


Figure 5.98

WARNING

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

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.

4. Apply a light coat of axle oil to the yoke seal journal. Position the sleeve into the forward-rear axle output yoke sleeve driver. Do not touch the greased areas of the sleeve. The sleeve must be kept clean prior to assembly into the seal. Use an arbor press and the appropriate driver to install the sleeve into the yoke. Verify that the sleeve is fully-seated in the yoke to prevent damage to components. Figure 5.99.

The yoke must be fully pressed into the sleeve driver until the end of the yoke bottoms out in the sleeve driver. This will correctly position the sleeve on the yoke. When correctly seated, the forward-rear output sleeve is positioned $0.200\text{-inch} \pm 0.030\text{-inch}$ ($5\text{ mm} \pm 0.75\text{ mm}$) from the end of the yoke. Figure 5.100.

- **If you do not have a press:** Position the yoke on a five-inch (127 mm) spacer on a workbench. Use a dead-blow hammer and the appropriate driver to install the sleeve into the yoke. Figure 5.101.

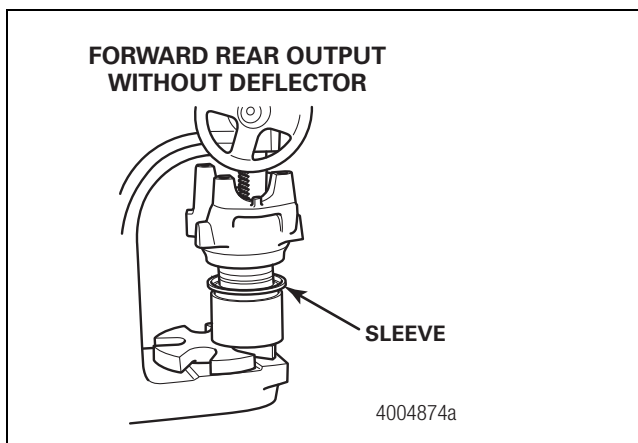


Figure 5.99

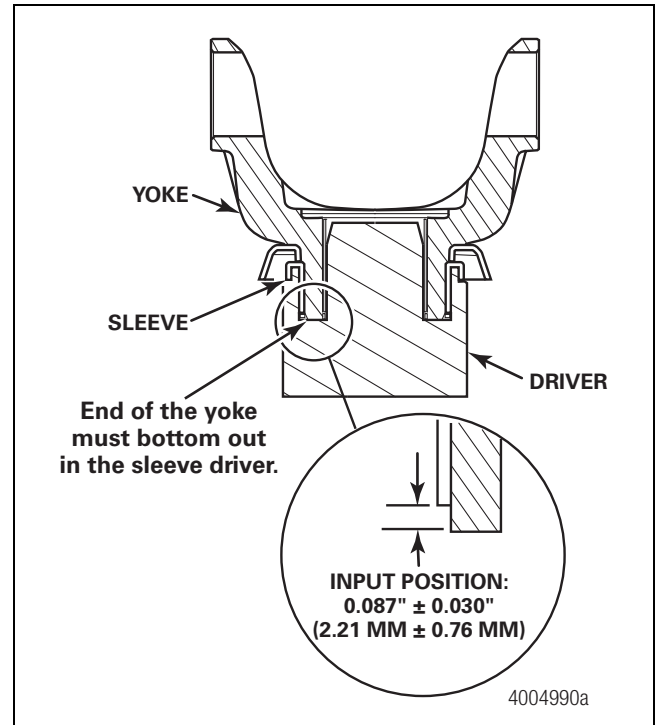


Figure 5.100

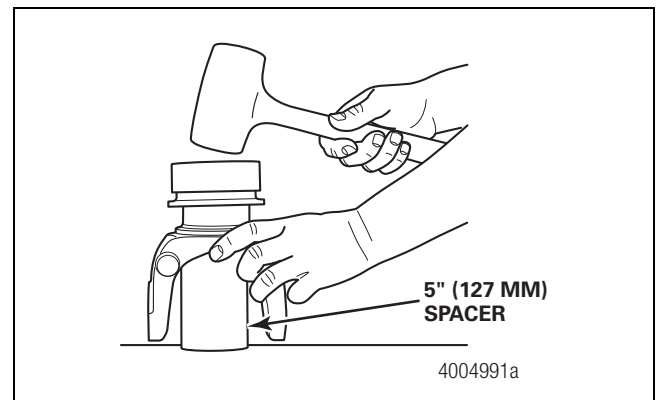


Figure 5.101

5. Apply a light coat of axle oil to the yoke seal journal. Position the sleeve into the forward-rear axle input yoke sleeve driver. Do not touch the greased areas of the sleeve. The sleeve must be kept clean prior to assembly into the seal. Use an arbor press and the appropriate driver to install the sleeve into the yoke. Verify that the sleeve is fully-seated in the yoke. Figure 5.102.

5 Assembly and Installation

The yoke must be fully pressed into the sleeve driver until the end of the yoke bottoms out in the sleeve driver. This will correctly position the sleeve on the yoke. When correctly seated, the forward-rear input sleeve is positioned 0.030-inch $\pm$ 0.030-inch (0.75 mm $\pm$ 0.75 mm) from the end of the yoke. Figure 5.100.

- **If you do not have a press:** Position the yoke on a five-inch (127 mm) spacer on a workbench. Use a dead-blow hammer and the appropriate driver to install the sleeve into the yoke. Figure 5.101.

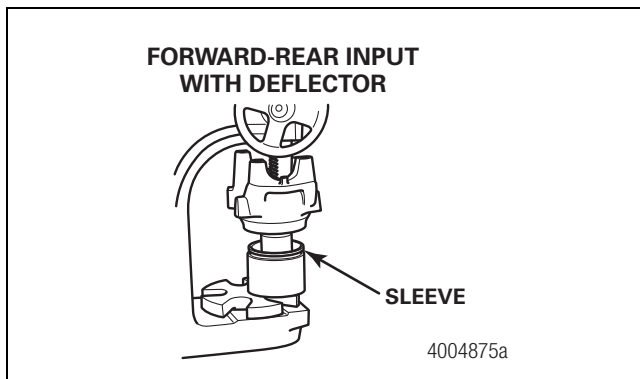


Figure 5.102

⚠ CAUTION

Hold the sleeve and seal only on the outer diameter. Do not touch the greased inner diameter of the seal and the greased area of the sleeve. This can contaminate the seal and cause a leak between the shaft and the seal. Damage to components can result.

6. Install the forward-rear axle input seal. Hold the sleeve and seal only on the outer diameter. Position the seal into the seal driver and align it with the forward-rear axle input bearing cage. Do not touch the lips in the inner diameter of the seal. Use a dead-blow hammer and the appropriate driver to install the seal into the bearing cage. Figure 5.103.

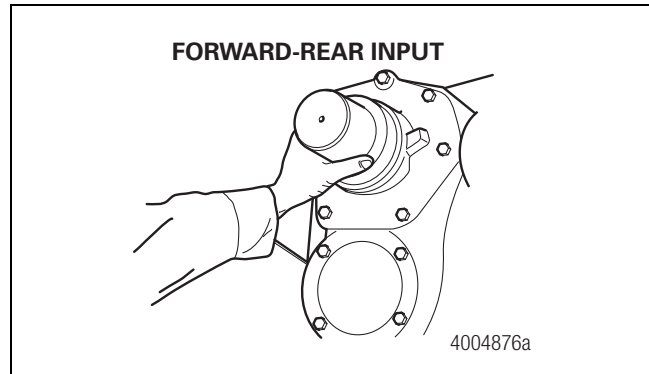


Figure 5.103

⚠ CAUTION

On axles that have the bolt-on deflector on the forward-rear output shaft bearing cage, the deflector must be removed and discarded. The new forward output sleeve will not assemble correctly to the new output seal with the bolt-on deflector in place. Remove the deflector from the output shaft bearing cage and reassemble the output cage hex-head capscrews and washers according to the appropriate maintenance manual instructions. Damage to components can result.

7. Install the forward-rear axle output seal. Hold the sleeve and seal only on the outer diameter. Position the seal onto the seal driver and align it with the forward-rear axle output shaft. Do not touch the lips in the inner diameter of the seal. Use a dead-blow hammer and the appropriate driver to install the seal onto the output shaft. Figure 5.104.

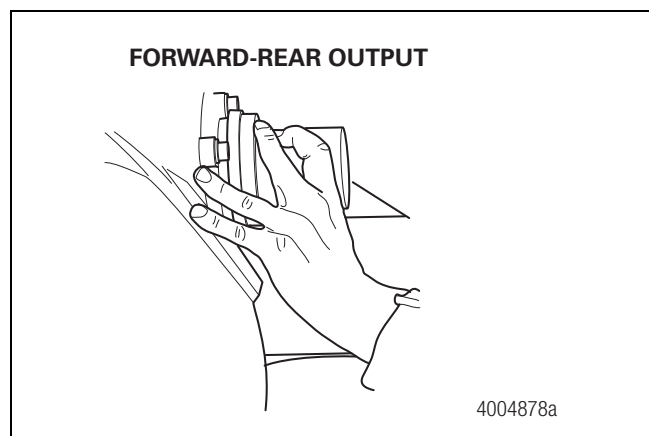


Figure 5.104

8. Install the rear-rear axle input seal. Hold the seal only on the outer diameter. Position the seal into the seal driver and align it with the rear-rear axle input bearing cage. Use a dead-blow hammer and the appropriate driver to install the seal into the bearing cage. Figure 5.105.

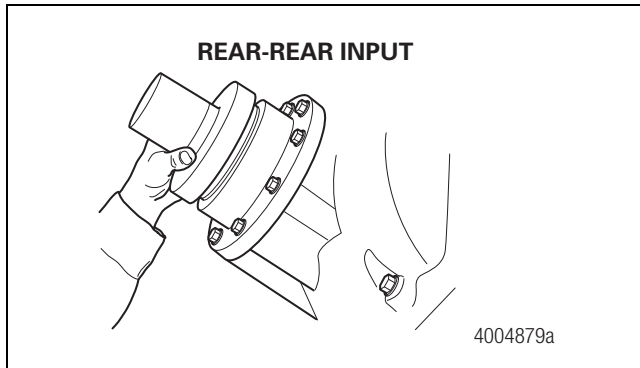


Figure 5.105

9. Use a feeler gauge to check the seal gap at all three axle positions. The seal is correctly installed if the gap is less than 0.005-inch (0.127 mm) around the circumference of the seal flange. Figure 5.106.
 - **If the gap is more than 0.005-inch (0.127 mm):** Use a dead-blow hammer and the appropriate driver to completely install the seal.

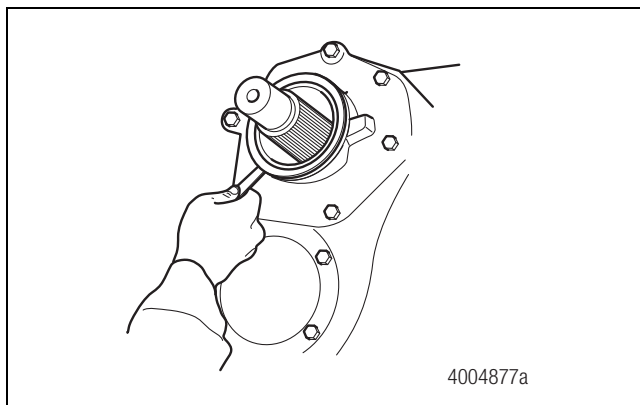


Figure 5.106

Clean and Inspect the Yoke After Installing a Unitized Pinion Seal

⚠ 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. Use a clean shop towel and a safe cleaning solvent to clean the ground and polished surface of the yoke journal. Do not use gasoline, abrasive cleaners, towels or scrubbers to clean the yoke. Do not attempt to polish the yoke.

NOTE: The unitized seal features a rubber inner sleeve that is designed to seal and rotate with the yoke. This feature allows you to reuse a yoke with minor grooves.

2. Inspect the yoke seal surface for grooves.
 - **If you find grooves on the yoke:** Use calipers to measure the groove diameters. If any groove diameter measures less than the dimensions shown in Figure 5.107, replace the yoke.

5 Assembly and Installation

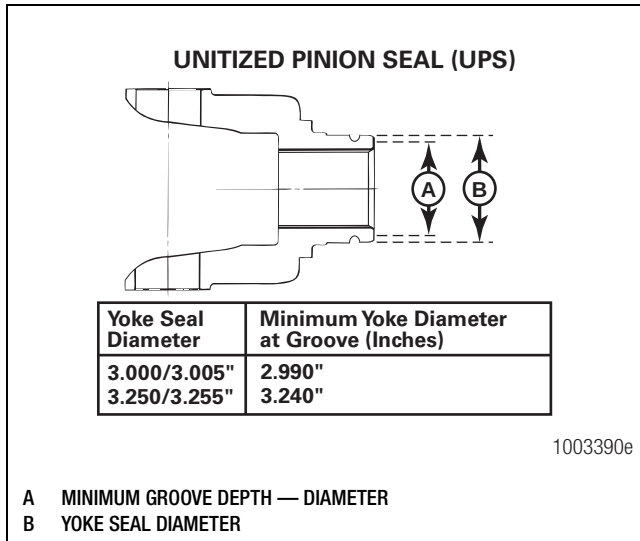


Figure 5.107

⚠ CAUTION

Do not install a POSE™ seal after you install a unitized pinion seal. The use of a POSE™ seal will prevent correct seating of the unitized pinion seal on the yoke and can result in lubricant leakage at the seal. POSE™ seal installation is recommended only for triple-lip and other previous design seals.

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

- Before you install the yoke, lightly lubricate or coat the yoke seal journal with axle oil.
- Align the yoke splines with the shaft splines. Slide the yoke over the shaft spline.

Tight Fit Yokes and POSE™ Seal

- Apply axle lubricant to the hub of the yoke or flange. Figure 5.108.

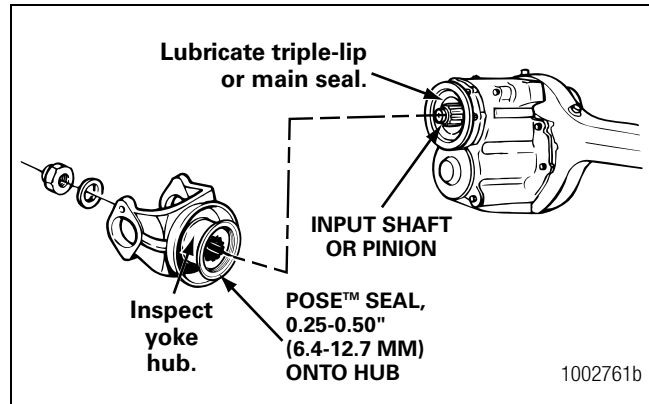


Figure 5.108

- Verify that the lips of the POSE™ seal and the outer retainer of the triple-lip seal or main seal are clean and free from dirt and particles that may cause lubricant leakage between the seals.
- Install the POSE™ seal onto the hub of the yoke or flange by hand. The lips of the seal must face toward the end of the hub, opposite 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 5.109.

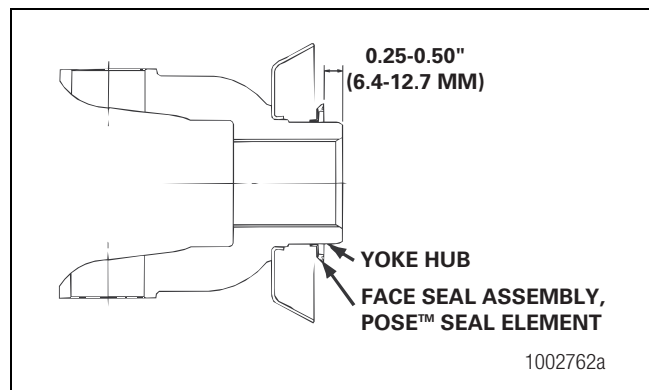


Figure 5.109

- Before you install the yoke or flange onto the shaft, apply axle lubricant to the hub.

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

- Install the yoke or flange using the correct procedure. The yoke must be completely seated before you tighten the pinion nut to the input shaft.

Output Yoke or Flange and Oil Seal for the Output Bearing Cage

⚠ CAUTION

Hold the seal only on the outer diameter. Do not touch the lips in the inner diameter of the seal. If you touch the lips on the inner diameter of the seal, you will contaminate the lips and cause a leak between the shaft and the seal.

Do not apply pressure after the flange of the seal touches the top of the cage or you will damage the seal.

1. Prepare the seal for installation.
 - A. Apply axle lubricant to the inner bore of the output bearing cage or the outer diameter of the new oil seal.
 - B. Place the oil seal into the cage so that the flange is parallel to the top of the cage.
 - C. Use a press and sleeve, or a mallet and sleeve, to install the seal into the cage. The seal is correctly installed when the metal flange of the seal seats on the top of the cage. Figure 5.110.

NOTE: The gap cannot be measured in the RT-40-145. The seal seats below the lip.

- D. After the seal is installed, a gap of 0.015-0.030-inch (0.381-0.762 mm) can exist between the flange and the cage. The gap is a normal condition because of the flexible coating on the flange of the seal. Use a feeler gauge to measure the gap around the complete flange-to-cage area.
 - **If the gap varies more than 0.010-inch (0.254 mm) between the highest and lowest measurement:** Remove and reseal the seal. Figure 5.111.

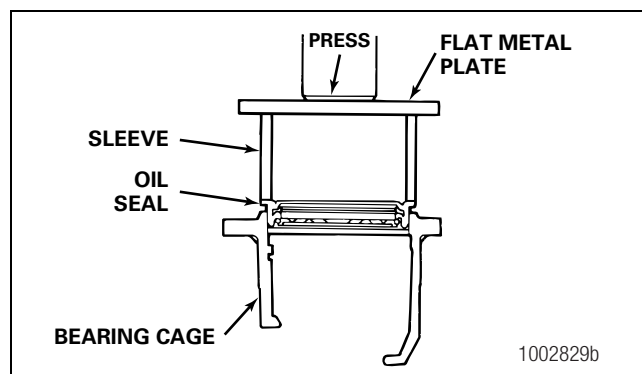


Figure 5.110

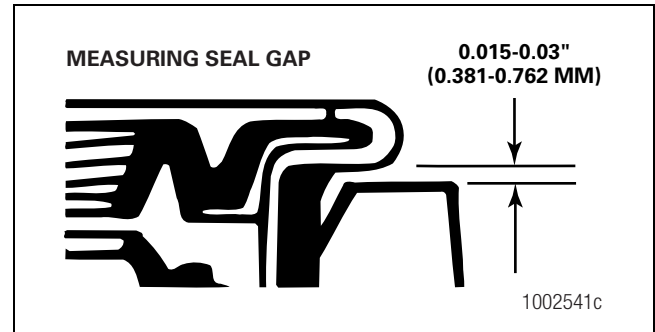


Figure 5.111

⚠ CAUTION

Do not use a Speedi-Sleeve with Meritor triple-lip oil seals. The edge of the sleeve will catch and roll the center dust lip and result in early seal leakage.

2. Inspect the yoke surface.
 - **If you installed a unitized pinion seal on the output bearing cage:** Refer to the clean and inspect the yoke after installing a unitized pinion seal procedure in this section and then proceed to Step 3.
 - **For all other seals:** Refer to the instructions below.
 - A. Inspect the yoke surface for scratches, corrosion or a wear track from the previous oil seal. Replace the yoke if any of these conditions exist.
 - B. Inspect the lead chamfer of the yoke for nicks and burrs which may damage the sealing lip during installation. Use an emery cloth to repair nicks and burrs.
 - C. Wipe clean the yoke sealing surface and face.
 - D. Clean the splines in the yoke or flange and on the thru-shaft.
 - E. Apply axle lubricant to the splines in the yoke or flange and the thru-shaft.
 - **If a POSE™ seal is used:** Refer to the tight fit yokes and POSE™ seal installation procedure in this section.

5 Assembly and Installation

CAUTION

Use a press and a sleeve or yoke installation tool to install the yoke. Do not use a hammer or mallet. Using a hammer or mallet can damage the bearings, yoke or flange.

If a yoke is removed after it has been partially or fully installed, the unitized pinion seal will be damaged. Remove and discard the original unitized pinion seal and replace it with a new one.

If a yoke has been installed into the unitized pinion seal and then removed, the inner sleeve of the seal will be damaged. Install a new seal.

3. Use a press and sleeve or an installation tool to install the yoke or flange onto the thru-shaft. Verify that the splines inside the yoke or flange are aligned with the splines on the thru-shaft. If a press and sleeve are used, verify that the thru-shaft is supported.
4. Apply a single bead of Loctite® 277 adhesive (part number 1199Y3795) or Loctite® 270 adhesive (part number 2297M5213) at the top of the thru-shaft threads from inboard to outboard. The bead should be 0.120-inch wide.
5. Install the nut that fastens the output yoke or flange to the thru-shaft. Place a holding tool on the yoke or flange and tighten the nut to the specified torque. Refer to Section 8.
6. Rotate the yoke at least one full turn after the yoke nut is tightened to the correct torque specification. This ensures correct seating of the seal.

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. Use a cleaning solvent and rags to clean the inside of the axle housing and the carrier mounting surface. Refer to Section 4.
2. Inspect the axle housing for damage. Repair or replace the axle housing. Refer to Section 4.
3. Check for loose studs, if equipped, in the mounting surface of the housing where the carrier fastens. Remove and clean the studs that are loose.
4. Install the studs into the axle housing. Refer to procedure in this section. Tighten the studs to 150-230 lb-ft (203-312 N•m). 

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.

CAUTION

Apply silicone gasket material in a continuous 0.25-inch (6 mm) bead. If you use more than this amount, gasket material can break off and plug lubrication passages. Damage to components can result.

5. Apply a 0.25-inch (6 mm) continuous bead of silicone gasket material to the mounting surface of the housing where the carrier fastens. Figure 5.112.

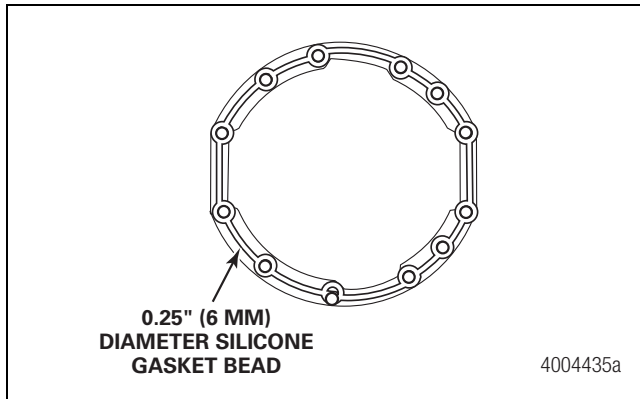


Figure 5.112

6. On an axle with a driver-controlled main differential lock, shift the lock into and hold the lock in the locked or engaged position. The locked position provides enough clearance between the shift collar and the axle housing for carrier installation. Refer to Section 6.
7. Use a hydraulic roller jack or a lifting tool to install the carrier into the axle housing. Figure 5.113.

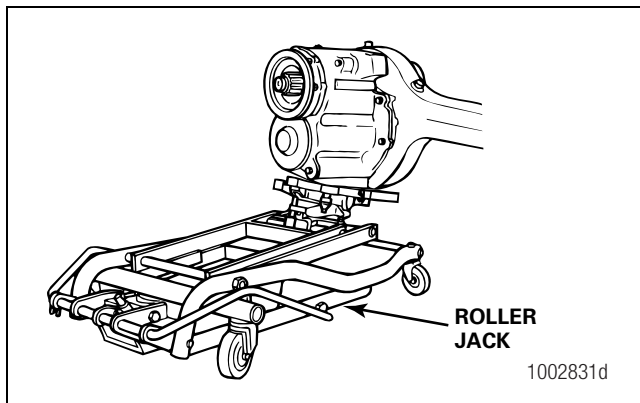


Figure 5.113

⚠ 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. If Loctite® adhesive material gets into your eyes, follow the manufacturer's emergency procedures. Have your eyes checked by a physician as soon as possible.

8. Spray the capscrew threads with Loctite® sealant. Allow the primer to dry for three to five minutes.

⚠ CAUTION

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

NOTE: Nord-Lock® washers are reusable, but replace them if they are leaking.

9. Install the nuts and washers or the capscrews and washers into the four corner locations around the carrier and the axle housing. Hand-tighten the fasteners. Do not tighten to the specified torque.
 - **For fasteners with Nord-Lock® washers:** Install the washers with the radial teeth side facing the carrier. Figure 5.114.
10. Carefully push the carrier into position. Alternately tighten the four fasteners two or three turns. Figure 5.115.

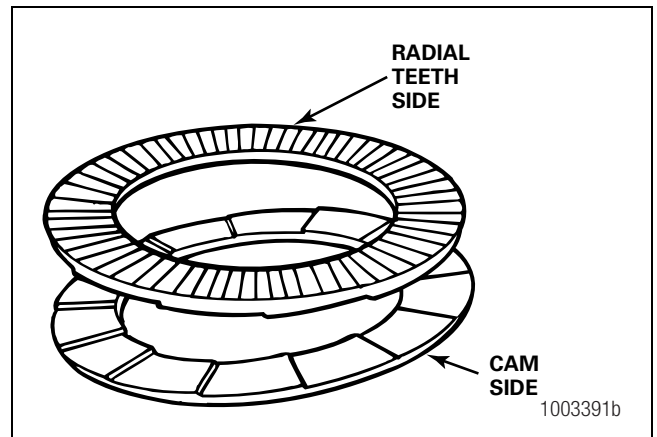


Figure 5.114

5 Assembly and Installation

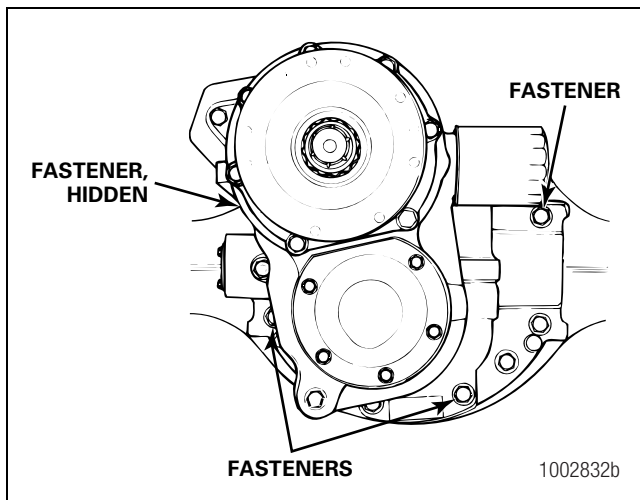


Figure 5.115

11. Repeat Step 10 until the four fasteners are tightened to the correct torque value.
 - **For fasteners with standard flat washers:** Tighten the fasteners to 150-230 lb-ft (204-312 N•m).
 - **For fasteners with Nord-Lock® washers:** Tighten the fasteners to 210 lb-ft (287 N•m).
12. Install the remaining fasteners and the washers that hold the carrier in the axle housing. Tighten the fasteners to the correct torque value. Refer to Section 8.
13. Install the washers and tighten the capscrews that fasten the output bearing cage to the axle housing. Tighten the capscrews to 35-50 lb-ft (48-67 N•m).
14. Adjust the shift fork for the inter-axle differential lock. The movement of the shift fork is controlled by the adjusting screw for the air-shift cylinder.
 - A. Loosen the jam nut on the adjusting screw. Loosen the adjusting screw so that the screw does not touch the shift shaft. Figure 5.116.
 - B. Apply and hold 60 psi (413 kPa) of air pressure to the shift cylinder so that the shift collar engages the splines in the inter-axle differential case.
 - C. Verify that the adjusting screw does not touch the shift shaft when the shift collar engages the inter-axle differential case.
 - D. Tighten the adjusting screw until the tip of the screw touches the end of the shift shaft. Release the air pressure.

- E. When the screw touches the shaft, tighten the adjusting screw an additional one turn. Apply air pressure, then tighten the jam nut. Figure 5.117.
- F. Disengage the inter-axle differential lock by holding the input yoke or flange and rotating the output yoke or flange. The output yoke or flange should rotate with less than 50 lb-ft (67 N•m) of torque applied.
- G. Apply and hold 60 psi (413 kPa) of air pressure to the shift cylinder to verify that the shift collar engages the splines in the inter-axle differential case. When the input yoke or flange is rotated, the output yoke or flange must rotate. Release the air pressure.
- H. Apply a rust prevention oil such as Meritor part number 1199-U-1113 or equivalent to the inlet of the air cylinder.

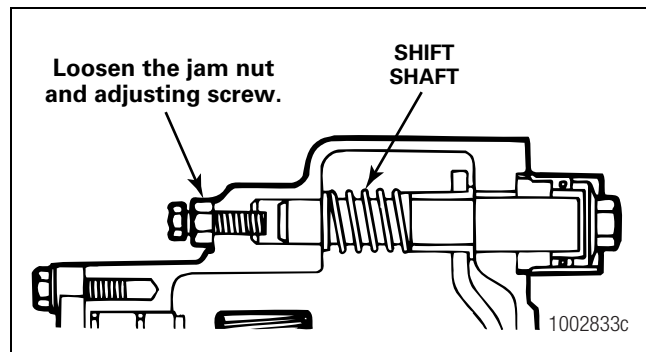


Figure 5.116

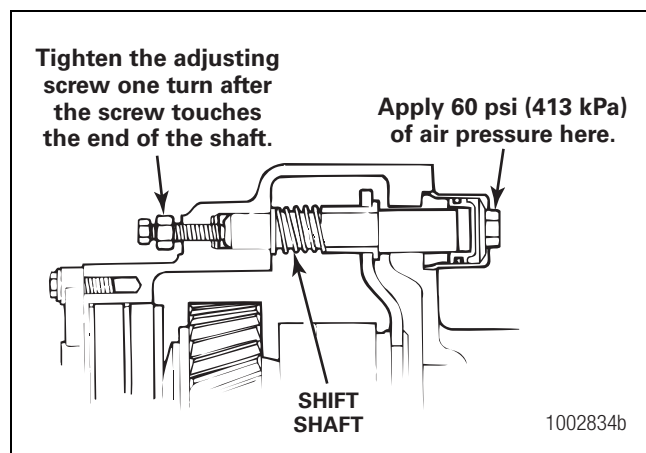


Figure 5.117

15. Connect the vehicle driveshafts to the input and the thru yokes or flanges.

16. Connect the air lines to the inter-axle differential air cylinder and, if used, the main differential lock cylinder.
17. On axles with a main differential lock, connect the electrical connector of the sensor unit. Verify that the main differential lock is disengaged.
18. If removed, install the oil filter adapter onto the differential carrier. Use Meritor specification 2297-T-4180 adhesive or equivalent. Refer to Section 4. Tighten the adapter to 40-60 lb-ft (55-80 N•m). Figure 5.118. 

CAUTION

If the oil filter is tightened more than 3/4 of a turn after it contacts the carrier, the oil filter will be damaged and leak fluid. Damage to components can result.

19. Apply axle lubricant to the gasket of the new oil filter. Install the oil filter onto the adapter. When the gasket on the filter contacts the carrier, tighten the oil filter an additional 3/4 of a turn. If necessary, use an oil filter wrench to tighten the filter. Figure 5.118.

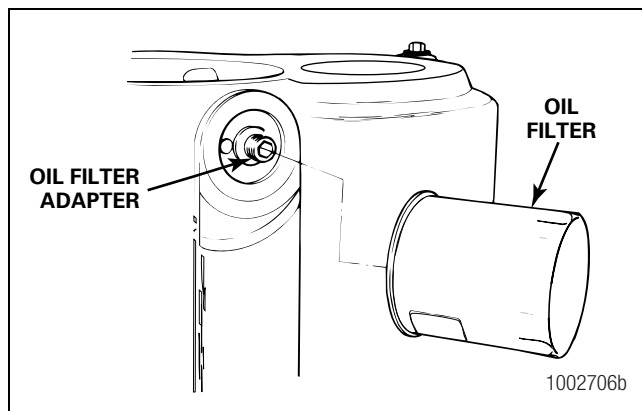


Figure 5.118

Axle Shaft

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. If Loctite® adhesive material gets into your eyes, follow the manufacturer's emergency procedures. Have your eyes checked by a physician as soon as possible.

Tapered Dowel, Hardened Washer and Hardened Nut

1. Clean the mating surfaces of the axle shaft and wheel hub.
2. If silicone gasket material is used, apply a 0.125-inch (3 mm) diameter bead of the gasket material around the mating surface of the hub and around the edge of each fastener hole.
3. Install the gaskets and axle shafts into the axle housing and carrier. The gasket and flange of the axle shafts must fit flat against the wheel hub. Figure 5.119.
4. If the wheel hubs have tapered hole studs, install solid tapered dowels onto each stud and onto the flange of the axle shaft. Figure 5.119.

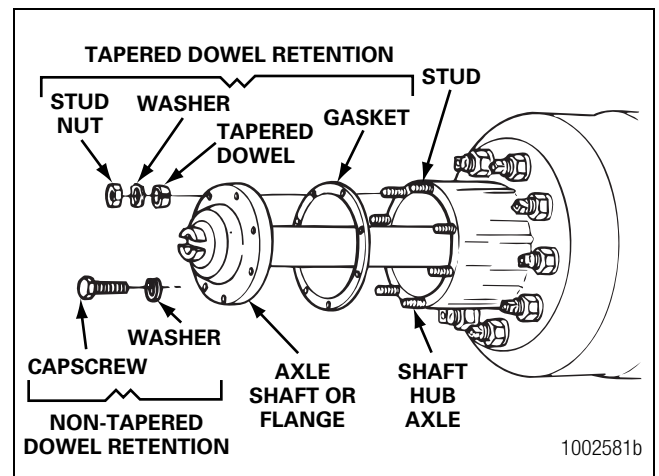


Figure 5.119

5. If the wheel hubs have straight hole studs, install the nuts and washers onto the studs. Figure 5.119. Tighten the nuts to the correct torque value. Refer to Section 8.
6. Position the gasket between the thru-shaft bearing cage and the axle housing.
7. Install the thru-shaft and bearing cage assembly into the axle housing. Rotate the thru-shaft to align the splines of the thru-shaft with the splines of the rear side gear.

5 Assembly and Installation

8. Clean the cage-to-housing capscrews. Remove RTV residue from the thru-drilled tapped holes.
9. Apply a 0.25-inch (6 mm) length bead of Loctite® 518 sealant in the thru-drilled tapped holes located at the two, five and eight o'clock positions. Figure 5.120.
10. Install the gasket and axle shaft into the housing. The gasket and flange of the axle shaft must fit flat against the wheel hub. Figure 5.119.

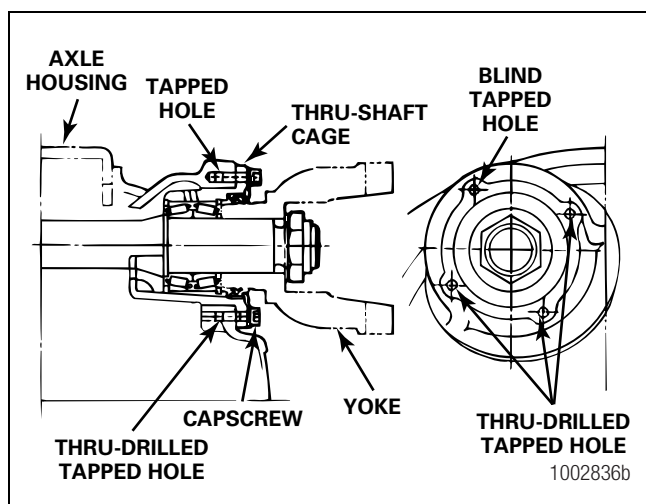


Figure 5.120

11. Install solid tapered dowels over each stud and into the flange of the axle shaft. Use a punch or a drift and hammer, if necessary.
12. Install the Grade 8 nuts and hardened washers onto the stud. Lock washers are an acceptable alternative. Tighten the stud nuts to the torque specified in Table N.

Table N: Shaft-to-Hub Torque Fastener Chart — Tapered Dowel Applications

Fastener	Thread Size	Torque Value — Grade 8 Nuts lb-ft (N•m)	
		Plain Nut	Locknut
Stud Nut or Axle Shaft	0.44-20	50-75 (68-102)	40-65 (54-88)
	0.50-20	75-115 (102-156)	65-100 (88-136)
	0.56-18	110-165 (150-224)	100-145 (136-197)
	0.62-18	150-230 (204-312)	130-190 (176-258)
Studs	All	Install the coarse thread end of the stud into the hub and tighten to the last thread.	

13. Fill the axle with the specified lubricant. Refer to procedure in this section.

Straight Holes, Nuts and Hardened Washers

1. Clean the mating surfaces of the axle shaft and wheel hub.
2. If silicone gasket material is used, apply a 0.125-inch (3 mm) diameter bead of the gasket material around the mating surface of the hub and around the edge of each fastener hole.
3. Install the gaskets and axle shafts into the axle housing and carrier. The gasket and flange of the axle shafts must fit flat against the wheel hub. Figure 5.119.
4. If the wheel hubs have tapered hole studs, install solid tapered dowels onto each stud and onto the flange of the axle shaft. Figure 5.119.
5. If the wheel hubs have straight hole studs, install the nuts and washers on the studs. Tighten the nuts to the correct torque value. Refer to Section 8.
6. Position the gasket between the thru-shaft bearing cage and the axle housing.
7. Install the thru-shaft and bearing cage assembly into the axle housing. Rotate the thru-shaft to align the splines of the thru-shaft with the splines of the rear side gear.
8. Clean the cage-to-housing capscrews. Remove RTV residue from the thru-drilled tapped holes.
9. Apply a 0.25-inch (6 mm) length bead of Loctite® 518 sealant in the thru-drilled tapped holes located at the two, five and eight o'clock positions. Figure 5.121.

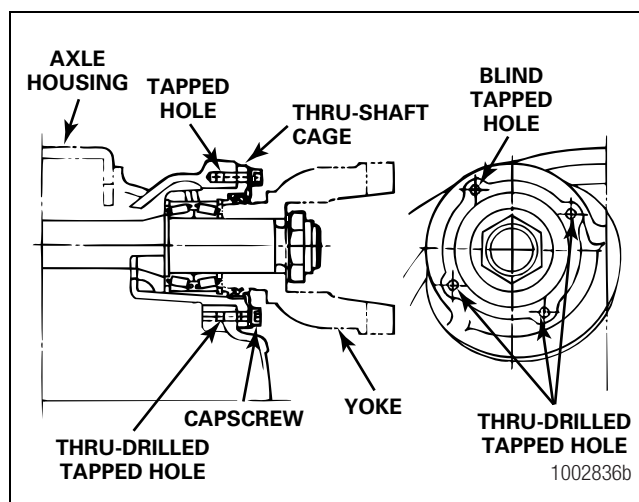


Figure 5.121

10. Install the gasket and axle shaft into the housing. The gasket and flange of the axle shaft must fit flat against the wheel hub. Figure 5.119.
 11. Install the Grade 8 nuts and hardened washers on the stud. Lock washers are an acceptable alternative. Tighten the stud nuts to the torque specified in Table O.
 12. Fill the axle with the specified lubricant. Refer to procedure in this section.
3. Fill the axle with lubricant until the lubricant level is to the bottom of the fill plug hole. Refer to Section 7.
 4. Install the fill plug. Tighten the fill plug to 35 lb-ft (47 N•m). When correctly installed, one complete thread of the fill plug is visible between the housing and plug head. 
 5. Road test the vehicle in an unloaded condition for one to two miles (1.6-3.2 km) at speeds not more than 25 mph (40 kmh). Recheck the lubricant levels and all the fasteners.
 6. If used, inspect the operation of the driver-controlled main differential lock. Refer to Section 6.

Table O: Shaft-to-Hub Torque Fastener Chart — Non-Tapered Dowel Applications

Fastener	Thread Size	Torque Value — Grade 8 Nuts lb-ft (N•m)	
		Plain Nut	Locknut
Stud Nut	0.62-18	150-230 (203-312)	130-190 (176-258)
or Axle Shaft	0.75-16	310-400 (420-542)	270-350 (366-475)
Studs	All	Install the coarse thread end of the stud into the hub and tighten to the last thread.	

Fill the Axle with Lubricant

NOTE: For additional lubrication information, refer to Maintenance Manual 1, Preventive Maintenance and Lubrication. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.

1. Park the vehicle on a level surface. When the angle of the drive pinion changes, the lubricant capacity of the axle will change.
2. Remove the fill plug from the side of the bowl cover of the axle housing. Figure 5.122.

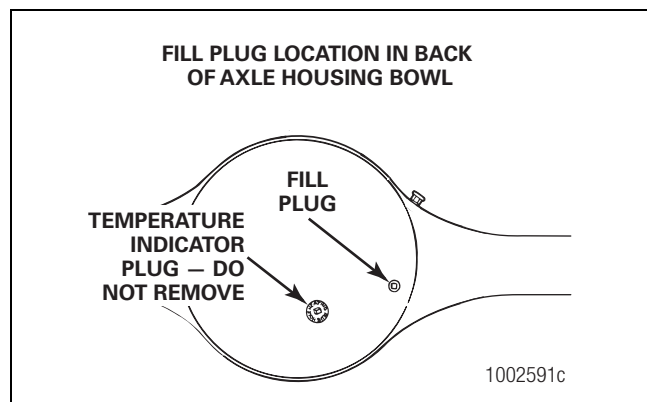


Figure 5.122

6 Driver-Controlled Main Differential Lock

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.

Description

Some Meritor drive axle models have a driver-controlled main differential lock (DCDL). This differential lock is operated by a carrier-mounted, air-actuated shift unit. When activated, the shift unit moves a sliding collar which is installed on the splines of the axle shaft. When engaged, the collar locks the axle shaft to a second set of splines on the differential case. Both driven wheels are then simultaneously engaged. Figure 6.1.

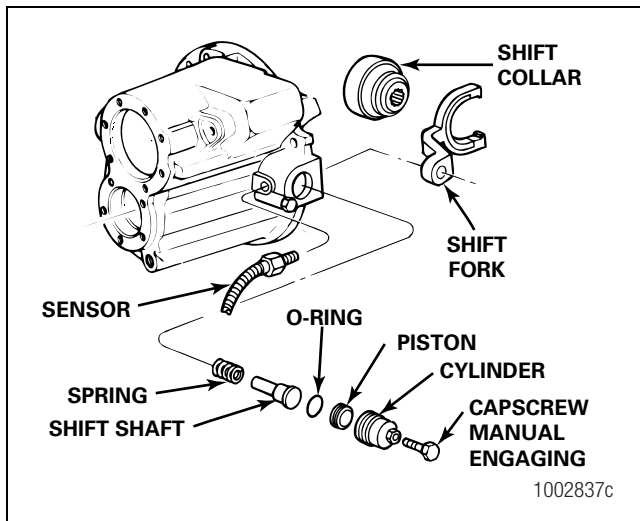


Figure 6.1

Meritor carrier models with driver-controlled differential lock equipment are manufactured in metric dimensions and sizes. When these carriers are serviced, it is important to use the correct metric size tools on the fasteners. Refer to Section 8.

Removal

Differential Carrier from the Axle Housing

Before the differential carrier can be removed or installed, the differential lock must be shifted into and held in the locked or engaged position. The locked position gives enough clearance between the shift collar and the axle housing to permit the removal or installation of the carrier.

The Axle Shafts Were Removed for Towing with the Differential in the Unlocked or Disengaged Position

Install the left-hand axle shaft into the housing before continuing. Perform the following steps for reinstalling the axle shafts into the axle housing.

1. Remove the protective covers, if used, from the wheel-end hubs.
2. If the drive axles are equipped with a main differential lock, shift the differential to the unlocked or disengaged position. Install the axle shafts with two sets of splines and new gaskets in the correct location as follows. Figure 5.119.
 - A. Push the axle shaft and gasket into the hub and housing until the shaft stops against the differential lock collar.
 - B. Push down and in on the axle shaft flange and rotate the shaft until the splines of the shaft and the shift collar are engaged.
 - C. Push the axle shaft further into the housing until the shaft stops against the differential side gear.
 - D. Push down on the axle shaft flange and rotate the shaft until the splines of the shaft and the side gear are engaged.
 - E. Push the axle shaft completely into the housing until the axle shaft flange and gasket are flush against the wheel hub.

Engagement or Lockout of the DCDL

⚠ WARNING

During DCDL disassembly or carrier removal, when the DCDL is in the locked or engaged position and one of the vehicle's wheels is raised from the floor, do not start the engine and engage the transmission. The vehicle can move and cause serious personal injury. Damage to components can result.

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.

Manual Method

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

If an auxiliary air supply is not available or if the differential carrier is to be stored for later use, use this manual engaging method for the DCDL. Figure 6.2 and Figure 6.3.

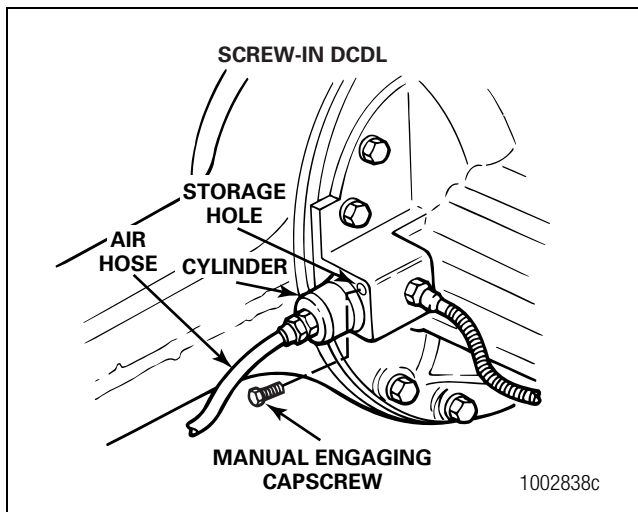


Figure 6.2

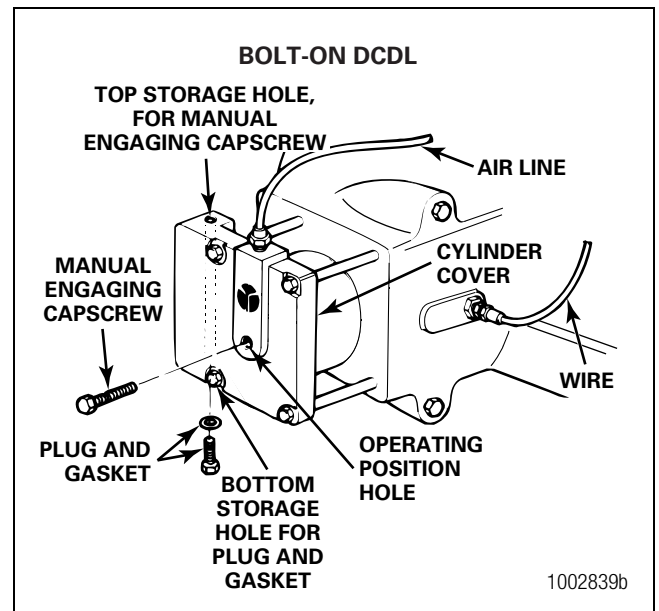


Figure 6.3

1. Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving.
2. Remove the drain plug from the bottom of the housing and drain the lubricant.
3. Use a jack to raise the left-hand wheel of the drive axle.
4. Place a jackstand under the left-hand spring seat to hold the vehicle in the raised position.
5. Disconnect the driveline from the input yoke.
6. Disconnect the vehicle air line from the inter-axle differential and main differential lock actuator assemblies.
7. For a bolt-on style differential lock cylinder, remove the plug and gasket from the hole in the center of the screw-in DCDL cylinder or bolt-on DCDL cover.
8. Remove the manual engaging capscrew from the top storage hole in the cylinder cover or the shift tower of the carriers with the threaded type shift assembly. Figure 6.2 and Figure 6.3.

NOTE: For a bolt-on DCDL shift assembly, the storage hole for the plug and gasket is the opposite end of the storage hole for the manual engaging capscrew. Figure 6.3.

9. Install the plug and gasket into the bottom storage hole in the cylinder cover or in the shift tower.

6 Driver-Controlled Main Differential Lock

10. Install the manual engaging capscrew into the threaded hole in the center of the cylinder cover or cylinder.

CAUTION

There will be a small amount of spring resistance felt when you turn in the manual engaging capscrew. If a high resistance is felt before reaching the locked or engaged position, stop turning the capscrew, or the cover, fork and capscrew threads will be damaged.

11. Turn the manual adjusting capscrew to the right until the head is approximately 0.25-inch (6 mm) from the cylinder cover. Do not turn the capscrew beyond its normal stop.

A high resistance on the capscrew indicates that the splines of the shift collar and the differential case half are not aligned or engaged. To align the splines, use the following procedure.

- A. Rotate the left-hand wheel to align the splines of the shift collar and case half while you turn in the manual engaging capscrews.
 - B. When the normal amount of spring resistance is again felt on the capscrew, the splines are engaged. Continue to turn in the manual engaging capscrew until the head is approximately 0.25-inch (6 mm) from the cylinder cover. The capscrew is now in the service position and the main differential lock is completely engaged.
12. Remove the carrier from the axle housing. Refer to Section 3.
 13. Release the differential lock by removing the manual engaging capscrew and seal from the cylinder cover or cylinder.

Auxiliary Air Supply Method

1. Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving.
2. Use a jack to raise the left-hand wheel of the drive axle. Place a safety stand under the left-hand axle housing leg to support the vehicle in the raised position.
3. Remove the drain plug from the bottom of the housing and drain the lubricant.
4. Disconnect the driveline from the input yoke.
5. Disconnect the vehicle air line from the inter-axle differential and main differential lock actuator assemblies.
6. Install a suitable air line coupling into the main differential actuator assembly.

7. Install the air line into the coupling.

CAUTION

When you use an auxiliary air supply to engage the DCDL, you must supply air to the DCDL until you remove the carrier. Do not disconnect the air line or reduce air pressure to the DCDL before you remove the carrier from the housing. Damage to components can result.

8. Supply 120 psi (827 kPa) regulated air pressure through the air line.
9. Verify that the DCDL is engaged.
10. Remove the carrier from the axle housing. Refer to Section 3.
11. Shut-off the air supply to the DCDL.
12. Disconnect the air line from the main differential actuator assembly coupling.

Differential and Gear Assembly and Main Differential Lock

Screw-In DCDL Shift Assembly

The current design shift fork does not employ roll pins. Nubs on the inner face of the fork hold the shift collar in place. Figure 6.4.

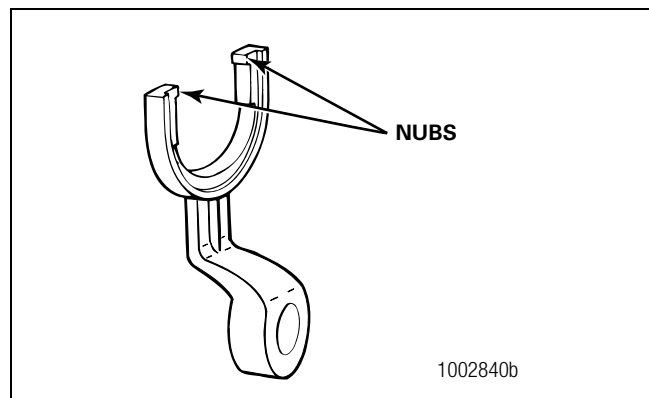


Figure 6.4

1. Verify that the differential lock is released and the engaging capscrew and seal are removed from the shift cylinder.
2. Tap the shift collar with a rubber mallet to loosen and remove the collar from the shift fork. Figure 6.5.

6 Driver-Controlled Main Differential Lock

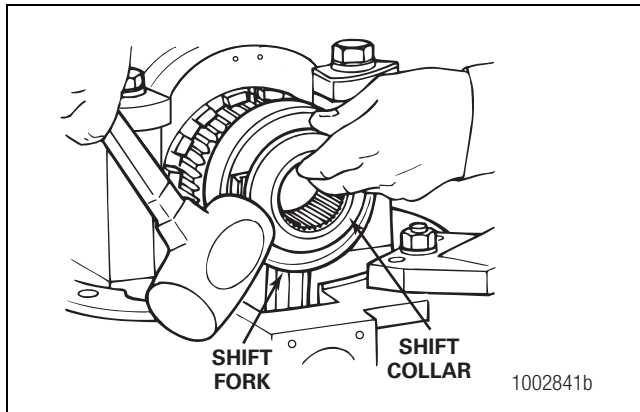


Figure 6.5

3. Remove the differential lock sensor switch, if used, and jam nut from the carrier. Figure 6.6.

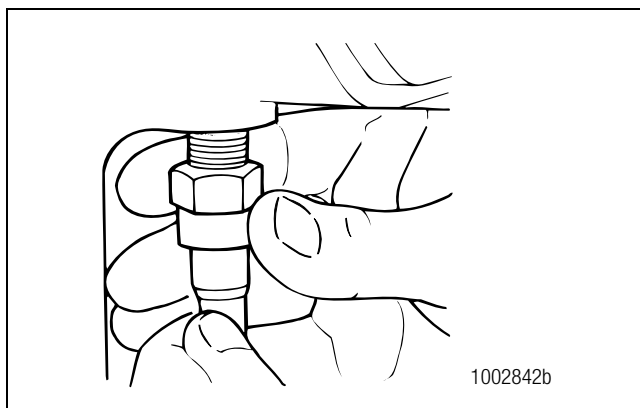


Figure 6.6

4. Remove the shift cylinder and piston assembly from the carrier by turning it to the left. Figure 6.7.

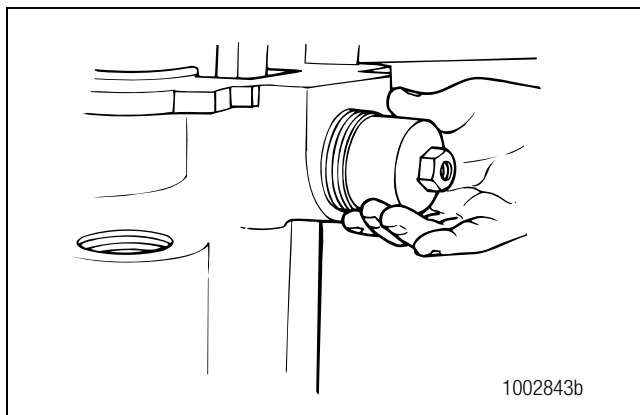


Figure 6.7

5. Place the shift cylinder and piston assembly in a vise that has brass covers over the jaws. Remove the piston and O-ring from inside the cylinder. Use a narrow drift through the hole in the top of the cylinder to push out the piston. It may be necessary to use a mallet to tap out the piston. Figure 6.8.

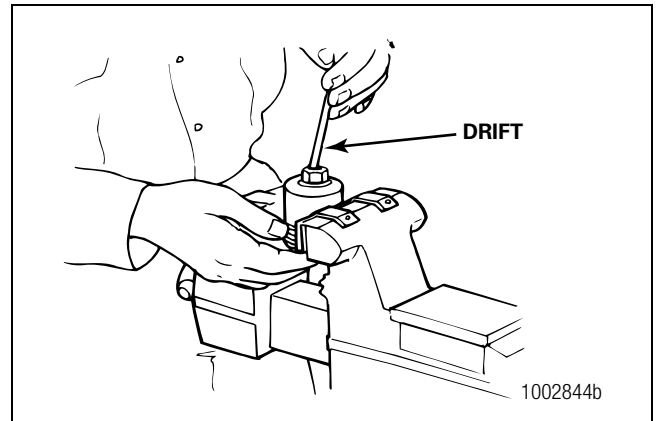


Figure 6.8

6. Carefully remove the O-ring from the piston. Use a thin pointed tool to remove the O-ring. Do not damage the piston. Figure 6.9.

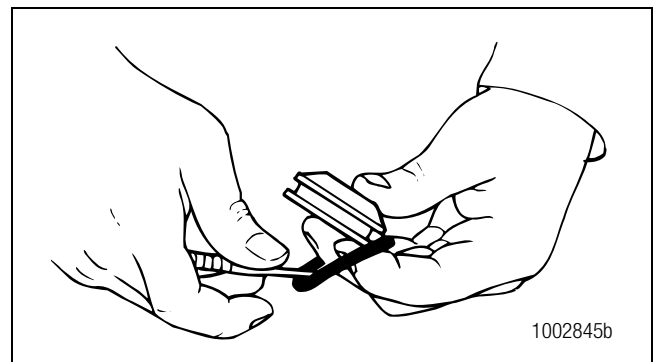


Figure 6.9

7. Inspect the O-ring for any damage such as cracks, cuts or breaks.
 - **If the O-ring is damaged:** Replace it with a new O-ring when you assemble the components.
8. Clean and inspect all shift assembly parts. Refer to Section 4.
9. Pull the shift shaft from the fork and out of the carrier. Figure 6.10.

6 Driver-Controlled Main Differential Lock

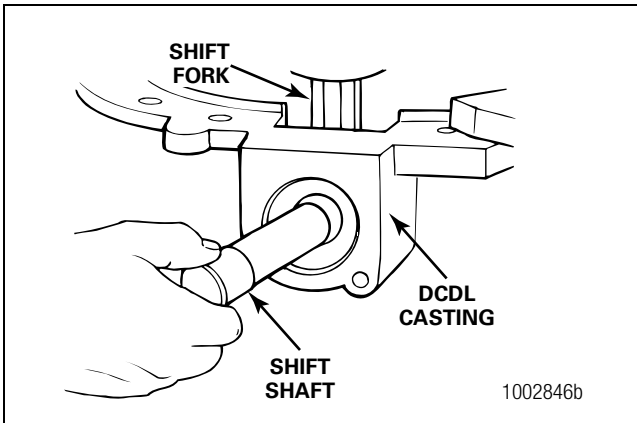


Figure 6.10

10. Remove the shift shaft spring and fork from the carrier.
Figure 6.11.

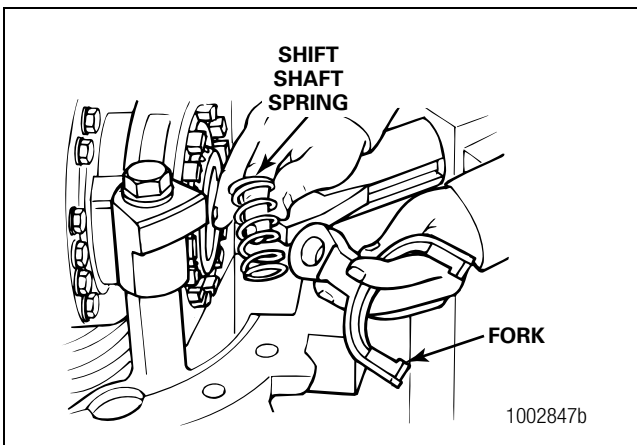


Figure 6.11

11. If roll pins are used, use a hammer and brass drift to remove the roll pins for the adjusting rings on the bearing caps. If capscrews or cotter pins are used, remove the capscrews or cotter pins.
12. Remove the bearing cap capscrews and washers, the bearing caps and adjusting rings. Match mark one bearing cap and one carrier leg so that these parts will be assembled in the correct positions.
13. Lift the differential and gear assembly from the carrier.
Figure 6.12.

Further disassembly of these carriers is the same as axles without the driver-controlled main differential lock. To continue disassembly, follow the procedures in Section 3.

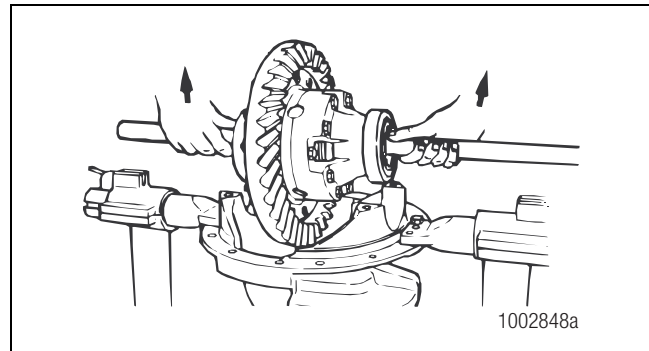


Figure 6.12

Bolt-On DCDL Shift Assembly

1. To remove the differential lock sliding shift collar, tap out the two retainer roll pins until they are level with the inner face of the shift fork. Figure 6.13.

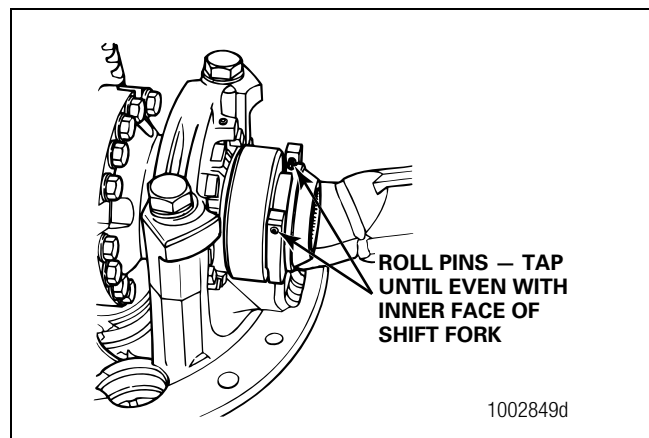


Figure 6.13

2. If required, remove the differential lock shift unit.
 - A. Remove the sensor switch and jam nut.
 - B. Remove the four capscrews and washers that hold the cylinder cover. Remove the cover. On the 160 Series, remove the copper gasket. Figure 6.14.
 - C. Remove the shift cylinder and piston.
 - D. Remove the shift shaft from the shift fork. It may be necessary to use heat to separate the shaft from the fork to loosen it.

NOTE: Some models use silastic seal instead of the flat washer in Step E. Also, a roll pin is installed in the shift shaft and is used as a stop for the shift shaft spring. It is not necessary to remove this roll pin during a normal disassembly.

- E. Remove the shift shaft spring and flat washer.
- F. Remove the shift fork and continue with Step 11 in the previous procedure.

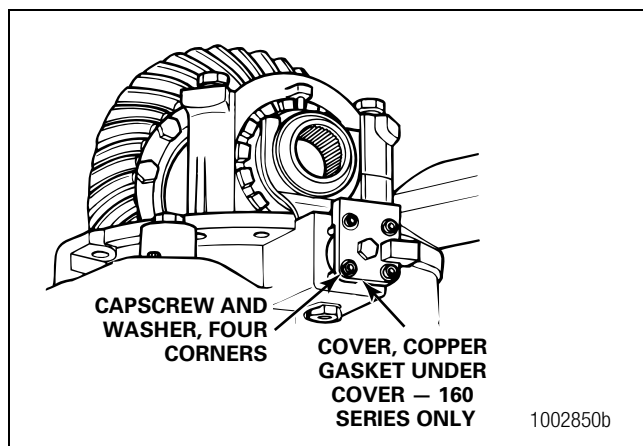


Figure 6.14

Installation

Differential Shift Assembly

⚠ 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. If Loctite® adhesive material gets into your eyes, follow the manufacturer's emergency procedures. Have your eyes checked by a physician as soon as possible.

Screw-In DCDL Shift Assembly

Install the differential shift assembly after the differential carrier is assembled and the gear and bearing adjustments are made. The screw-in DCDL shift assembly is shown in Figure 6.15 and Figure 6.16.

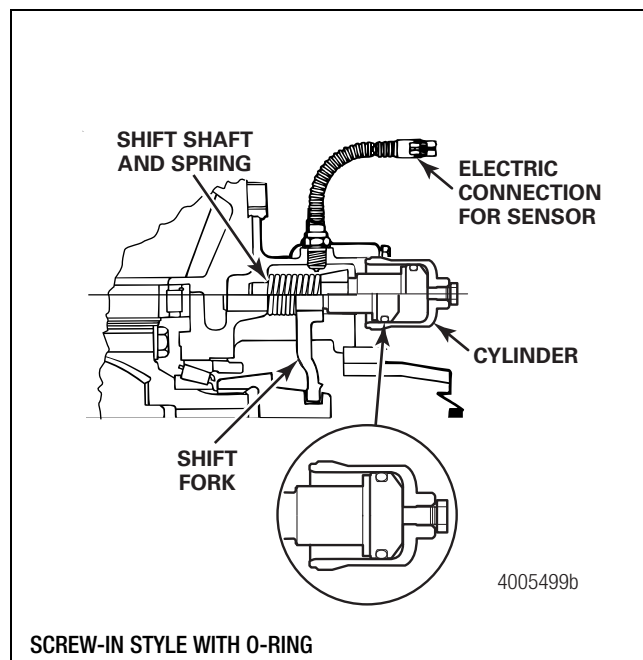


Figure 6.15

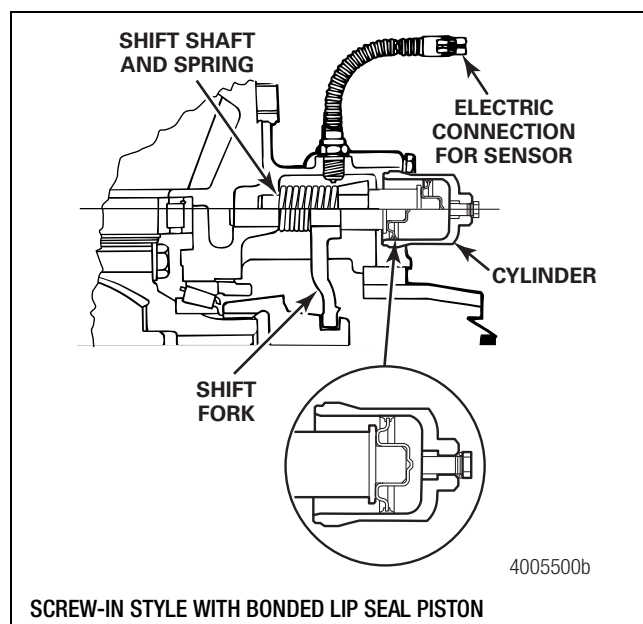


Figure 6.16

6 Driver-Controlled Main Differential Lock

1. Install the shift fork into the shift of the carrier. The "L" shape of the fork and the bore for the shift shaft must face out toward the cylinder bore in the side of the carrier. Figure 6.17.

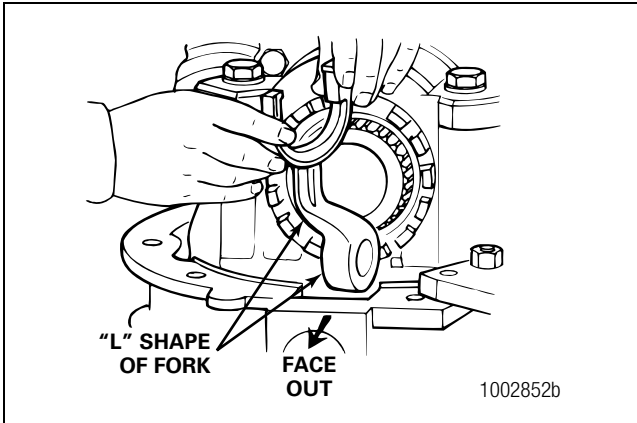


Figure 6.17

2. Compress the shift shaft spring as required and install it between the back of the fork and carrier wall inside the carrier. Figure 6.18.

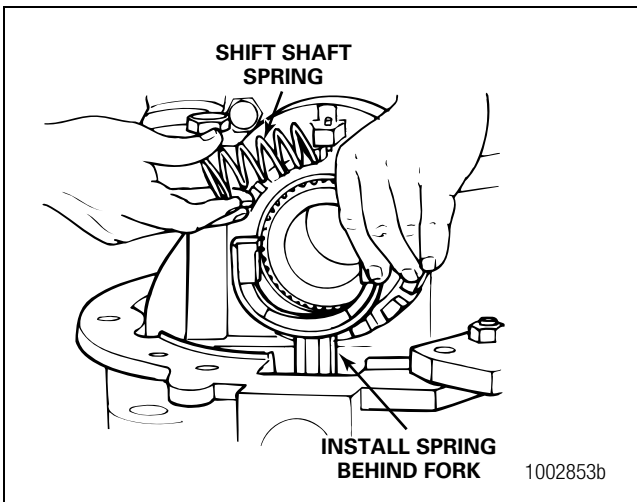


Figure 6.18

3. Align the spring and bore in the shift fork with the shift shaft bore in the carrier.
4. Install the shift shaft through the bore in the carrier, fork and spring until it is against the shift fork. Figure 6.19.

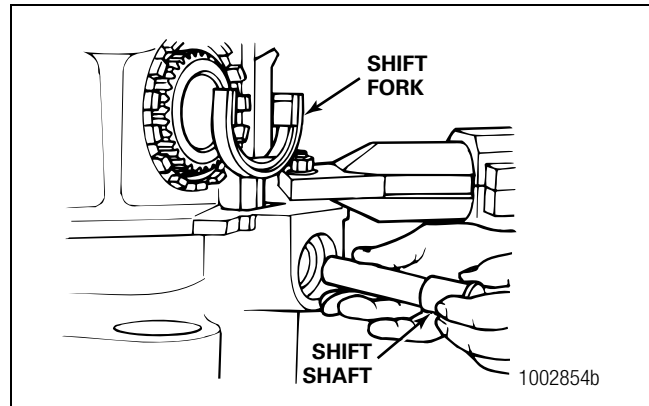


Figure 6.19

5. If required, lubricate a new O-ring with axle lubricant. Install the O-ring into the piston groove.
6. Install the piston and O-ring assembly into the shift cylinder, bevel end first. Push on the piston until it is against the bottom of the cylinder. Figure 6.20.

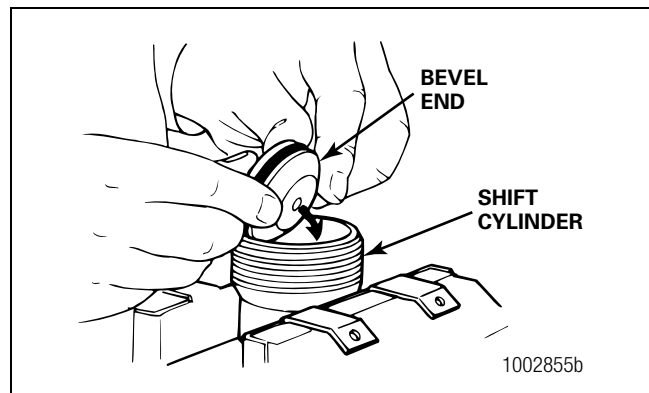


Figure 6.20

7. Apply a continuous 0.06-inch (1.5 mm) diameter bead of Loctite® flange sealant, Meritor part number 2297-D-7076, around the DCDL cylinder threads.
8. Turn the shift cylinder and piston assembly to the right until it bottoms in the carrier casting bore. Figure 6.21.

6 Driver-Controlled Main Differential Lock

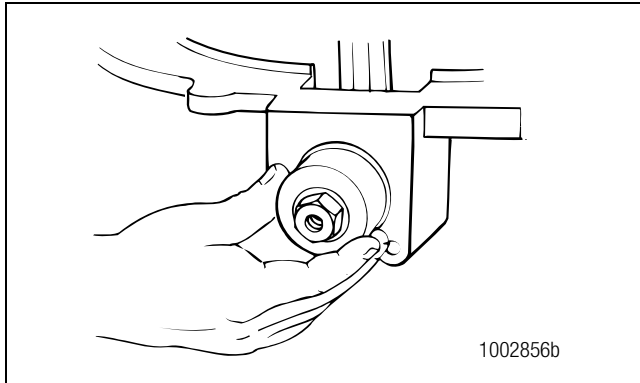


Figure 6.21

9. Position the shift collar over the fork. The large splines of the collar must face toward the main differential. Use a rubber mallet to tap the shift collar through the nubs of the shift fork. Figure 6.22.

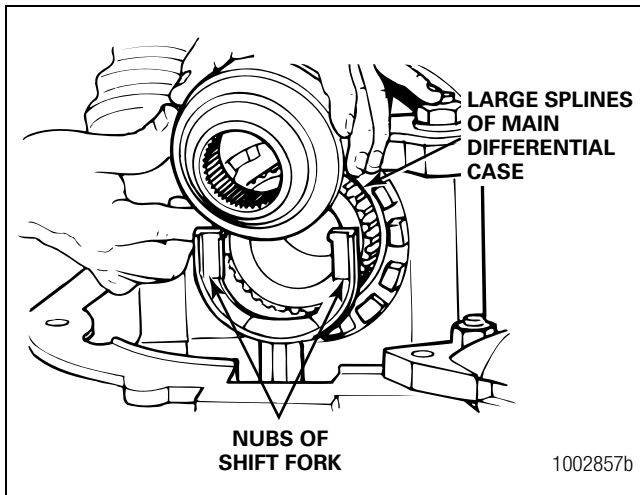


Figure 6.22

10. Engage the splines of the collar with the splines of the differential case. Insert the manual engaging capscrew through the top of the shift cylinder to move the shift collar toward the differential case. Rotate the collar as necessary to align the splines. Figure 6.23.

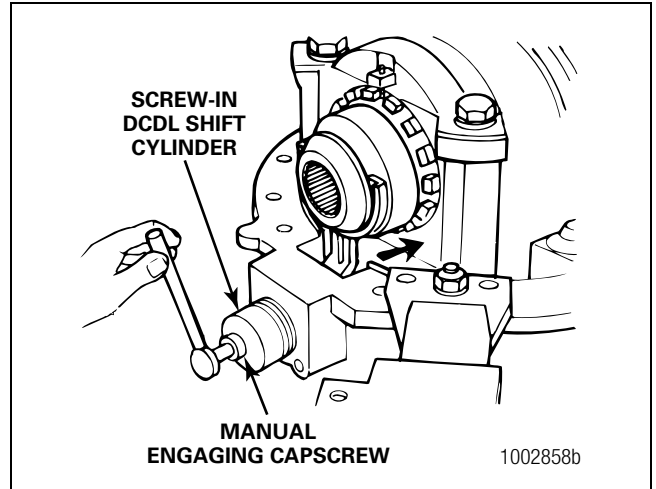


Figure 6.23

11. Turn the manual adjusting capscrew to the right until the head is approximately 0.25-inch (6 mm) from the cylinder cover. Do not turn the capscrew beyond its normal stop. The capscrew is now in the service position and the main differential lock is completely engaged.

NOTE: The differential must be in the locked position to install the axle shaft into the axle housing.

12. With the shift collar in the locked position, install the sensor switch into the threaded hole in the front of the carrier. Figure 6.24.

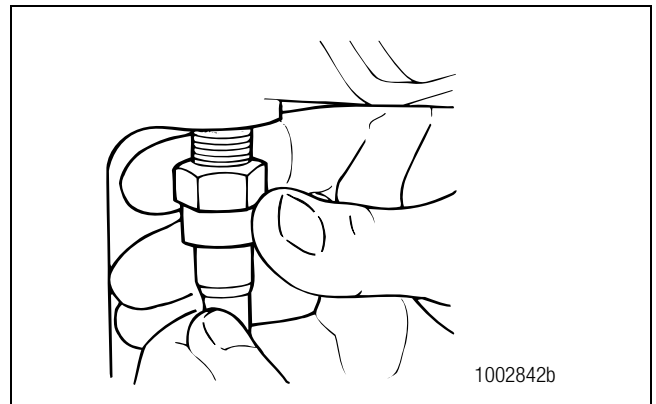


Figure 6.24

13. Connect a volt-ohm meter to the sensor switch. Select ohms on the meter. With the DCDL engaged, the circuit should be closed, showing less than one ohm resistance. If the resistance is over one ohm, check the sensor.

6 Driver-Controlled Main Differential Lock

- A. Verify that the fork is aligned with the sensor switch when it is in the engaged position.
- B. Check for a loose wiring connection. The connector must be tightly seated.
- C. Verify that the sensor switch is fully seated against the carrier.
 - If the resistance is greater than one ohm after these checks: Replace the sensor switch.

Bolt-On DCDL Shift Assembly

Install the differential shift assembly after the differential carrier is assembled and the gear and bearing adjustments are made. The bolt-on type shift assembly is shown in Figure 6.25.

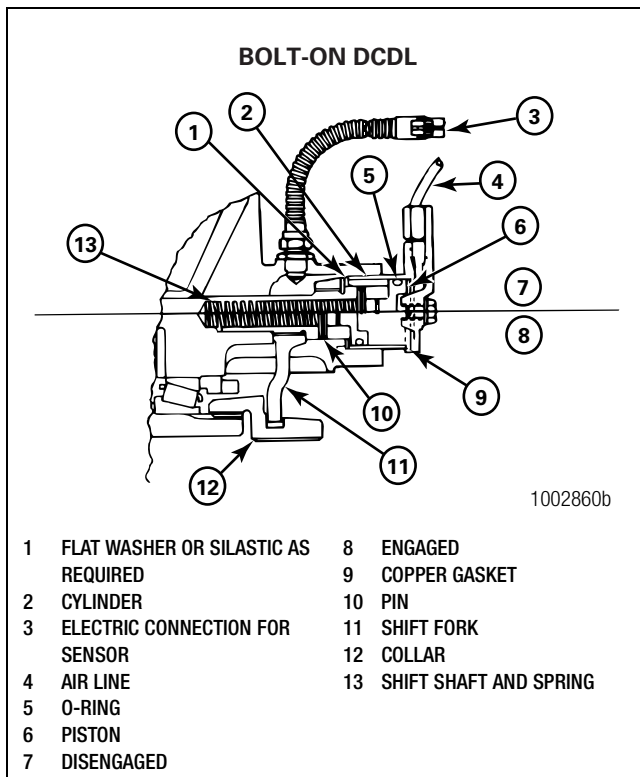


Figure 6.25

1. On carrier models with shift fork roll pins, install the two roll pins into the ends of the shift fork. Tap the pins into position until they are level with the inner yoke face. Figure 6.26. Do not install completely at this time.

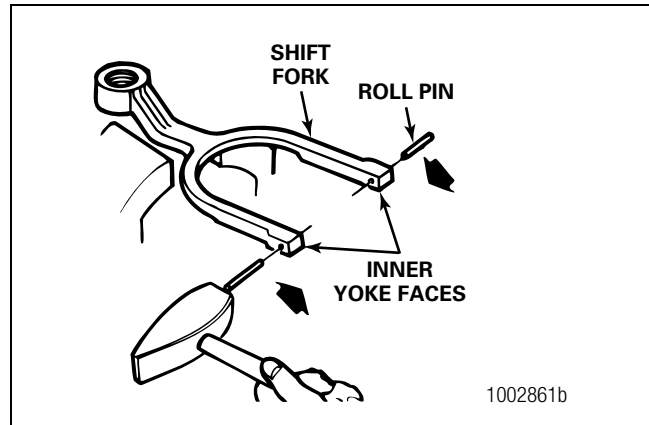


Figure 6.26

2. If the spring stop roll pin was removed from the head of the shift shaft, reinstall the pin at this time.
3. On models without roll pins, snap the fork into position.
4. Apply Loctite® 222 threadlocker, Meritor part number 2297-B-6112, to the threads of the shift shaft.
5. Install the shift fork into its correct position in the carrier case. Figure 6.27.

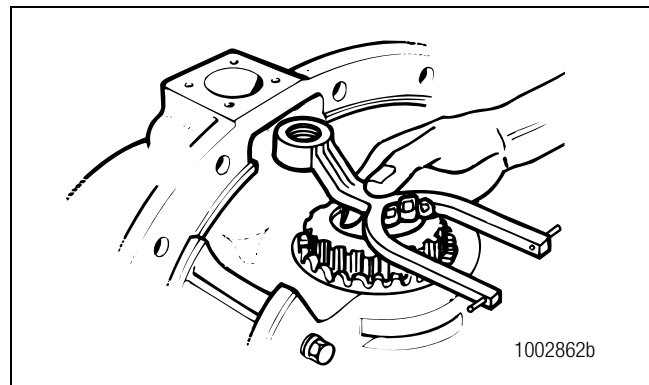


Figure 6.27

6. Hold the shift fork in position. Install the shift shaft spring into the shift shaft opening in the carrier, through the shift fork bore and into the bore for the shift shaft spring. Figure 6.28.

6 Driver-Controlled Main Differential Lock

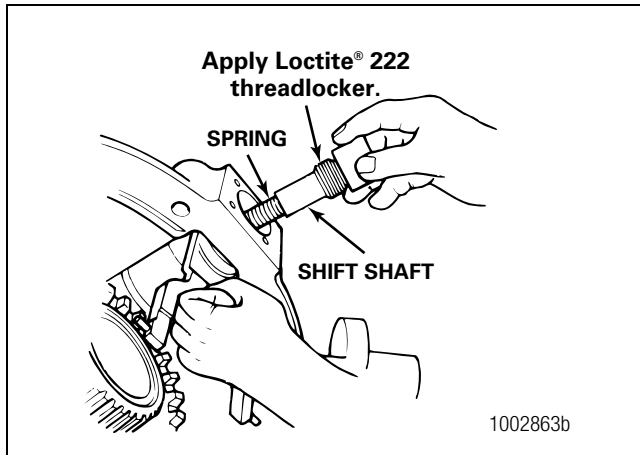


Figure 6.28

7. Slide the shift shaft over the spring. Install the shaft into the shift fork. Tighten it to 20-25 lb-ft (27-34 N•m). 
8. Install the copper gasket or apply silastic sealant, Meritor part number 1199-Q-2981, to the bottom of the cylinder bore. Figure 6.29.

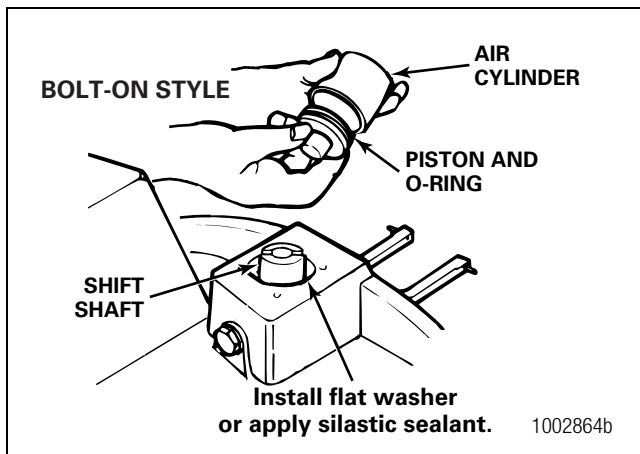


Figure 6.29

9. Lubricate the O-ring with axle lubricant. Install the O-ring into its groove on the piston. Carefully install the piston into the air cylinder. Figure 6.29. Do not damage the O-ring.
10. Install the cylinder into the housing bore. Verify that the pilot journal on the piston is against its bore on the shift shaft. Figure 6.30.

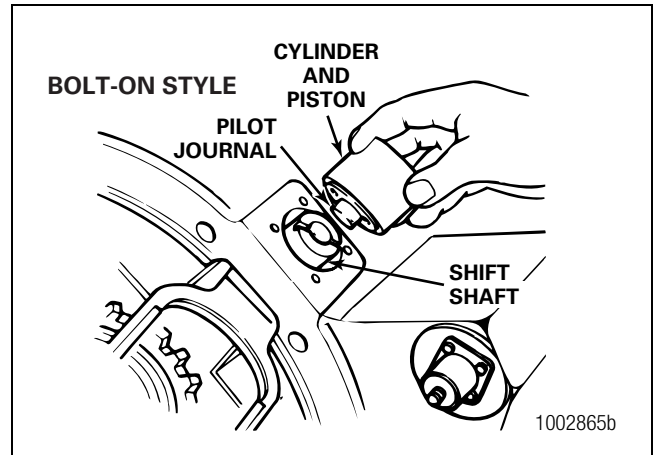


Figure 6.30

11. Install the copper gasket, if used, into its bore on the inside of the cylinder cover. Place the cover into position over the cylinder so that the air intake port will point up when the carrier is installed into the housing. Install the cover with the four attaching capscrews and washers. Tighten the capscrews to 4-6 lb-ft (5.5-8.5 N•m). Figure 6.31. 

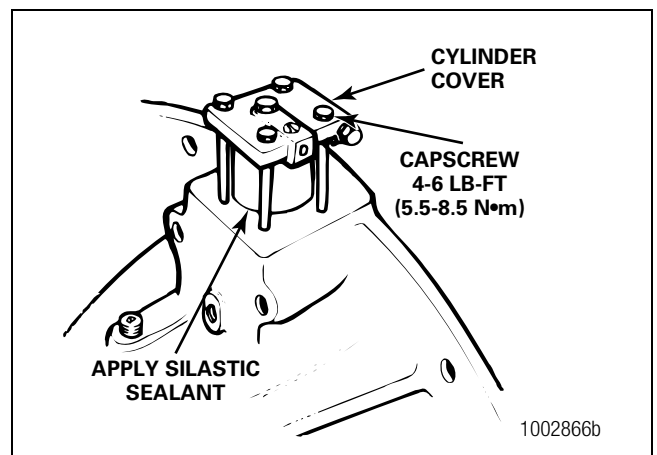


Figure 6.31

12. Apply a bead of silastic sealant, Meritor part number 1199-Q-2981, to the cylinder housing joint.
13. Slide the shift collar into the fork and engage the shift collar splines with the splines of the differential case. Use the manual actuation capscrew to move the shift collar splines onto the differential case splines. Refer to Section 6 in this section.
14. Hold the shift collar in the locked or engaged position and tap in the two roll pins in the shift fork ends until they are even with the outer yoke faces. Figure 6.32.

6 Driver-Controlled Main Differential Lock

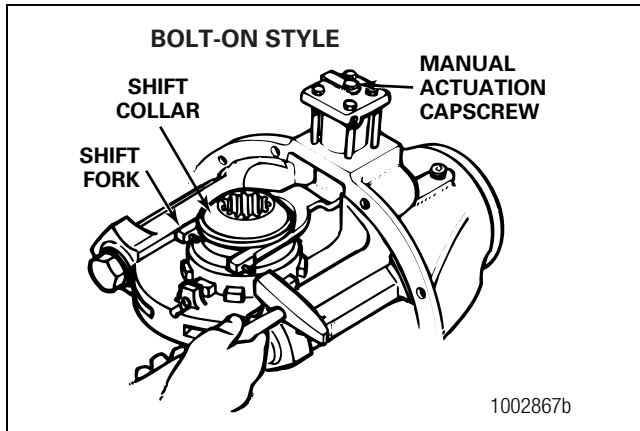


Figure 6.32

15. While the shift collar is still in the locked position, place the sensor switch, with the locknut loosely attached, into its hole.
16. Connect a volt-ohm meter to the sensor switch. Select ohms on the meter. Rotate the switch CLOCKWISE until the meter reading changes from infinity to less than one ohm. Turn the switch one additional turn and tighten the locknut to 25-35 lb-ft (35-45 N•m).

Differential Lock Assembly Cover Plates

For carriers without the differential lock or air shift, assemble the sensor switch plug and cover plate as follows.

Bolt-On DCDL Cover Plate Assemblies

1. Install the washer and plug into the hole for the sensor switch. Tighten the plug from 45-55 lb-ft (60-74 N•m). Figure 6.33.

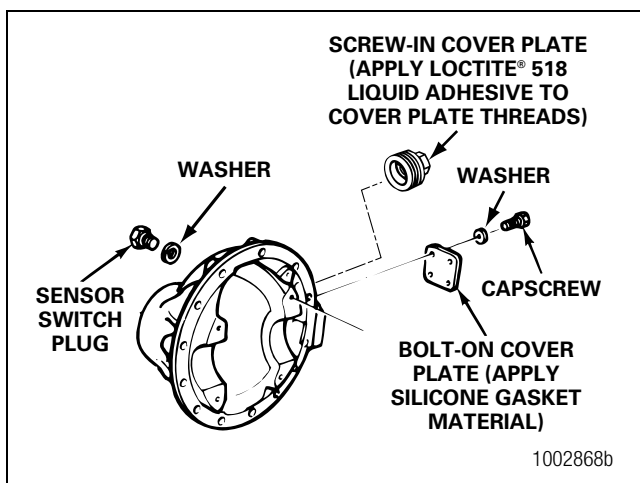


Figure 6.33

2. Apply silicone gasket material to the cover plate mounting surface on the carrier. Refer to Section 4.
3. Install the four washers and capscrews. Tighten the capscrews to 7.4-8.9 lb-ft (10-12 N•m). Figure 6.33.

Screw-In DCDL Cover Plate Assemblies

1. Apply Loctite® 518 liquid adhesive to the plate threads.
2. Install the bolts and washers and tighten the plate into the carrier opening to 7.5-9.0 lb-ft (10-12 N•m).

Differential Carrier Into the Forward 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.

NOTE: When you install the carrier into the axle housing, the shift collar must be held in the engaged position. This can be done by keeping the air pressure applied to the shift cylinder by using the manual engaging cap screw. Refer to the procedure in this section. The differential must be in the locked or engaged position to install the carrier assembly into the axle housing. After you install the carrier into the axle housing, shift the differential into the unlocked or disengaged position to permit the installation of the left-hand axle shaft.

Manual Method

1. Use a cleaning solvent and rags to clean the inside of the axle housing and the carrier mounting surface. Refer to Section 4.

6 Driver-Controlled Main Differential Lock

2. Check the axle housing for damage. If necessary, repair or replace the housing. Refer to Section 4.
3. Check for loose studs in the carrier mounting surface. Remove and replace the studs where required. Apply liquid adhesive to the holes. Install and tighten the stud to 150-230 lb-ft (204-312 N•m). 
4. The differential lock must be manually engaged before installing the differential carrier into the housing. Refer to the procedure in this section.
5. Install the differential carrier into the housing. Refer to Section 5.
6. Install and tighten the carrier-to-housing capscrews to the specified torque.
7. Install the right- and left-hand axle shafts. Refer to Section 5.

NOTE: When the manual engaging capscrew is removed from the service position in the center of the DCDL actuator, the main differential lock is disengaged.

8. Remove the long manual engaging capscrew from the center of either the bolt-on or screw-in DCDL.
9. Clean the plug, gasket, cylinder cover and threaded service position hole in the center of the bolt-on DCDL cylinder cover, or in the center of the screw-in DCDL.
10. Verify that the sealing gasket is under the head of the capscrew.
11. Install the manual engaging capscrew into the DCDL storage hole in the bolt-on or the screw-in DCDL assembly. Figure 6.34 and Figure 6.35.

- A. On a bolt-on DCDL shift assembly, remove the short plug and gasket from the storage hole of the DCDL.
Install the short plug and gasket into the service position hole in the center of the DCDL. Figure 6.34.
- B. On a screw-in DCDL shift assembly, install the short screw or plug into the storage hole located in the top of the screw-in DCDL shift assembly. Figure 6.35.

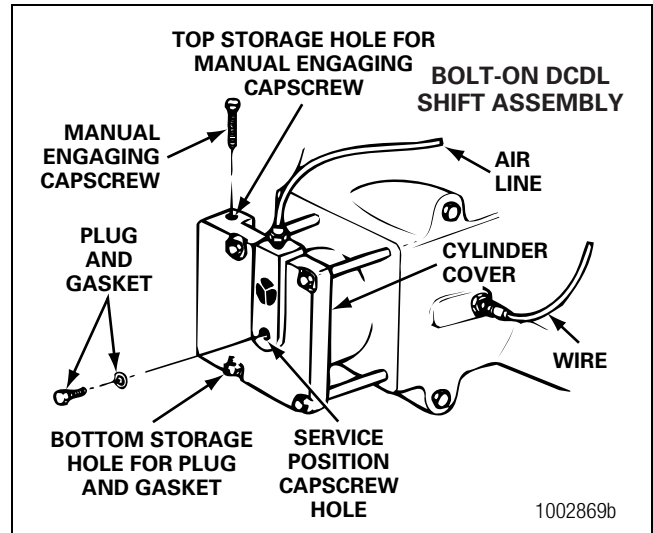


Figure 6.34

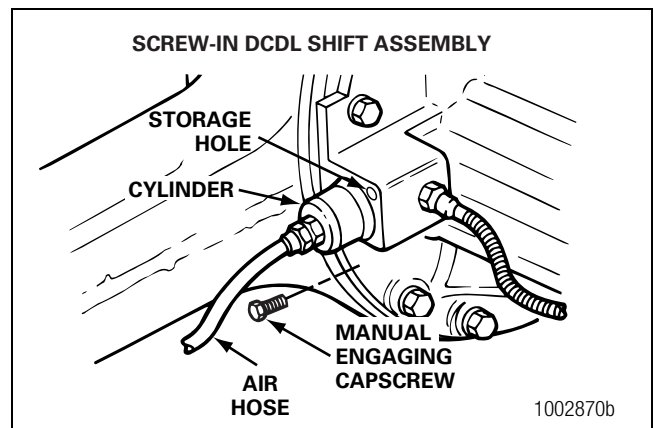


Figure 6.35

12. Tighten the plug to 44-55 lb-ft (60-75 N•m). Tighten the manual engaging capscrew to 22-28 lb-ft (30-38 N•m) for bolt-on DCDL style cylinders and to 7-11 lb-ft (10-15 N•m) for screw-in DCDL type reverse shifters. 
13. Connect the vehicle air line to the differential lock actuator assembly.
14. Install the electrical connection on the sensor switch located in the carrier, below the actuator assembly.
15. Remove the jackstand from under the drive axle. Lower the vehicle to the floor.
16. Fill the axle with lubricant. Refer to Section 7.
17. Proceed to the procedure in this section to check the differential lock.

6 Driver-Controlled Main Differential Lock

Auxiliary Air Supply Method

1. Use a cleaning solvent and rags to clean the inside of the axle housing and the carrier mounting surface. Refer to Section 4.
2. Check the axle housing for damage. If necessary, repair or replace the housing. Refer to Section 4.
3. Check for loose studs in the carrier mounting surface. Remove and replace the studs where required. Apply liquid adhesive to the holes. Install and tighten the stud to 150-230 lb-ft (204-312 N•m). 
4. Connect an air line to the main differential lock actuator assembly coupling.
5. Supply 120 psi (827 kPa) regulated air pressure through the air line.
6. Verify that the DCDL engaged.
7. Install the differential carrier into the housing. Refer to Section 5.
8. Install and tighten the carrier-to-housing capscrews to the specified torque.
9. Install the right- and left-hand axle shafts. Refer to Section 5.
10. Remove the air line coupling from the main differential actuator assembly.
11. Clean the plug, gasket, cylinder cover and threaded service position hole in the center of the bolt-on DCDL cylinder cover, or in the center of the screw-in DCDL.
12. Tighten the plug to 44-55 lb-ft (60-75 N•m). Tighten the manual engaging capscrew to 22-28 lb-ft (30-38 N•m) for bolt-on DCDL style cylinders and to 7-11 lb-ft (10-15 N•m) for screw-in DCDL type reverse shifters. 
13. Connect the vehicle air line to the differential lock actuator assembly.
14. Install the electrical connection onto the sensor switch located in the carrier, below the actuator assembly.
15. Remove the jackstand from under the drive axle. Lower the vehicle to the floor.
16. Fill the axle with lubricant. Refer to Section 7.
17. Proceed to the procedure in this section to check the differential lock.

Check the Differential Lock

1. Shift the vehicle transmission into neutral. Start the engine to get the system air pressure to the normal level.

WARNING

During DCDL disassembly, when the DCDL is in the locked or engaged position and one of the vehicle's wheels is raised from the floor, do not start the engine and engage the transmission. The vehicle can move and cause serious personal injury and damage to components.

2. Place the differential lock switch in the cab of the vehicle in the unlocked or disengaged position.
3. Drive the vehicle at 5-10 mph (8-16 km/h) and check the differential lock indicator light. The light must be off when the switch is in the unlocked or disengaged position.
4. Continue to drive the vehicle and place the differential lock switch in the locked or engaged position. Let up on the accelerator to remove the driveline torque and permit the shift. The light must be on when the switch is in the locked position.
 - **If the indicator light remains ON with the switch in the unlocked position:** The differential is still in the locked position. Verify that the manual engaging capscrew was removed from the cylinder cover of the DCDL shift assembly. Refer to the procedure in this section.

DCDL Driver Caution Alert Label

Verify that the driver caution label is installed in the vehicle cab. Figure 6.36. The caution label must be placed in a location that is easily visible to the driver. The recommended location is on the instrument panel, next to the differential lock switch and lock indicator light.

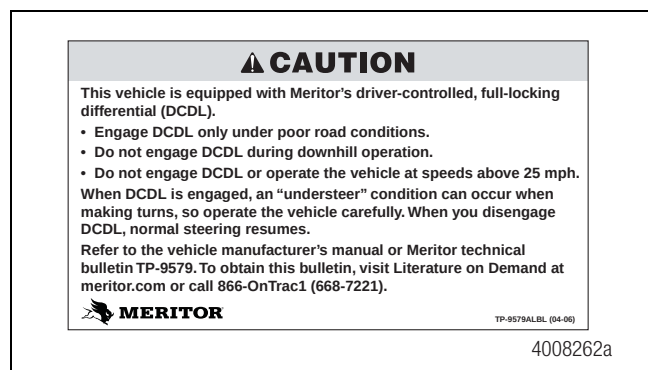


Figure 6.36

Driver Instruction Information Available

Refer to the Service Notes page on the front inside cover of this manual to obtain the following publications

- DCDL Caution Alert Label/Order part number TP9579ALBL.
- DCDL Driver Instruction Kit/Contains a compilation of technical bulletins covering DCDL and inter-axle differential (IAD) operation; the DCDL Caution alert label; and instructions to prepare an axle for towing or new vehicle drive-away (piggybacking). Order part number TP9579.
- Traction Controls for Drive Axles DVD/Order part number SP03105.

7 Lubrication

Specifications

Meritor recommends using a lubricant analysis program. Perform lubricant analysis at regularly-scheduled preventive maintenance intervals.

For complete information on lubricating drive axles and carriers as well as lubricant capacities, refer to Maintenance Manual 1, Preventive Maintenance and Lubrication. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.

Refer to Table P and Table Q for standard information on lubricants and schedules.

Table P: Lubricant Cross Reference (Viscosity) and Temperature Chart

Meritor Lubricant Specification	Description	Cross Reference	Minimum Outside Temperature	Maximum Outside Temperature
O-76-A	Hypoid Gear Oil	GL-5, S.A.E. 85W/140	+10°F (−12.2°C)	*
O-76-B	Hypoid Gear Oil	GL-5, S.A.E. 80W/140	−15°F (−26.1°C)	*
O-76-D	Hypoid Gear Oil	GL-5, S.A.E. 80W/90	−15°F (−26.1°C)	*
O-76-E	Hypoid Gear Oil	GL-5, S.A.E. 75W/90	−40°F (−40°C)	*
O-76-J	Hypoid Gear Oil	GL-5, S.A.E. 75W	−40°F (−40°C)	+35°F (+1.6°C)
O-76-L	Hypoid Gear Oil	GL-5, S.A.E. 75W/140	−40°F (−40°C)	*

*There is no upper limit on these outside temperatures, but the axle sump temperature must never exceed 250°F (+121°C).

Table Q: Oil Change Intervals and Specifications for All Rear Drive Axles

Vocation or Vehicle Operation	Linehaul	Intercity Coach	City Delivery, School Bus, Fire Truck, Motorhome	Construction, Transit Bus, Refuse, Yard Tractor, Logging, Heavy Haul, Mining, Oil Field, Rescue
<u>Initial Oil Change</u>	Not required	Not required	Not required	Not required
<u>Check Oil Level</u> Add the correct type and amount of oil as required.	Every 25,000 miles (40 000 km), or the fleet maintenance interval, whichever comes first	Every 25,000 miles (40 000 km), or the fleet maintenance interval, whichever comes first	Every 10,000 miles (16 000 km), once a month, or the fleet maintenance interval, whichever comes first	Every 5,000 miles (8000 km), once a month, or the fleet maintenance interval, whichever comes first ¹
<u>Petroleum-Based Oil</u> Change on axles with or without a pump and filter system.	Every 100,000 miles (160 000 km) or annually, whichever comes first	Every 100,000 miles (160 000 km) or annually, whichever comes first	Every 50,000 miles (80 000 km) or annually, whichever comes first	Every 25,000 miles (40 000 km) or annually, whichever comes first

Vocation or Vehicle Operation	Linehaul	Intercity Coach	City Delivery, School Bus, Fire Truck, Motorhome	Construction, Transit Bus, Refuse, Yard Tractor, Logging, Heavy Haul, Mining, Oil Field, Rescue
<u>Synthetic Oil</u> Change on axles with or without a pump and filter system. ²	Every 500,000 miles (800 000 km), or every 4 years, whichever comes first	Every 250,000 miles (400 000 km), or every 4 years, whichever comes first	Every 250,000 miles (400 000 km), or every 3 years, whichever comes first	Every 100,000 miles (160 000 km), or every 2 years, whichever comes first ³
<u>Filter Change</u> Change on axles with a pump and filter system.	Every 100,000 miles (160 000 km)	Every 100,000 miles (160 000 km)	Every 100,000 miles (160 000 km)	Every 100,000 miles (160 000 km)

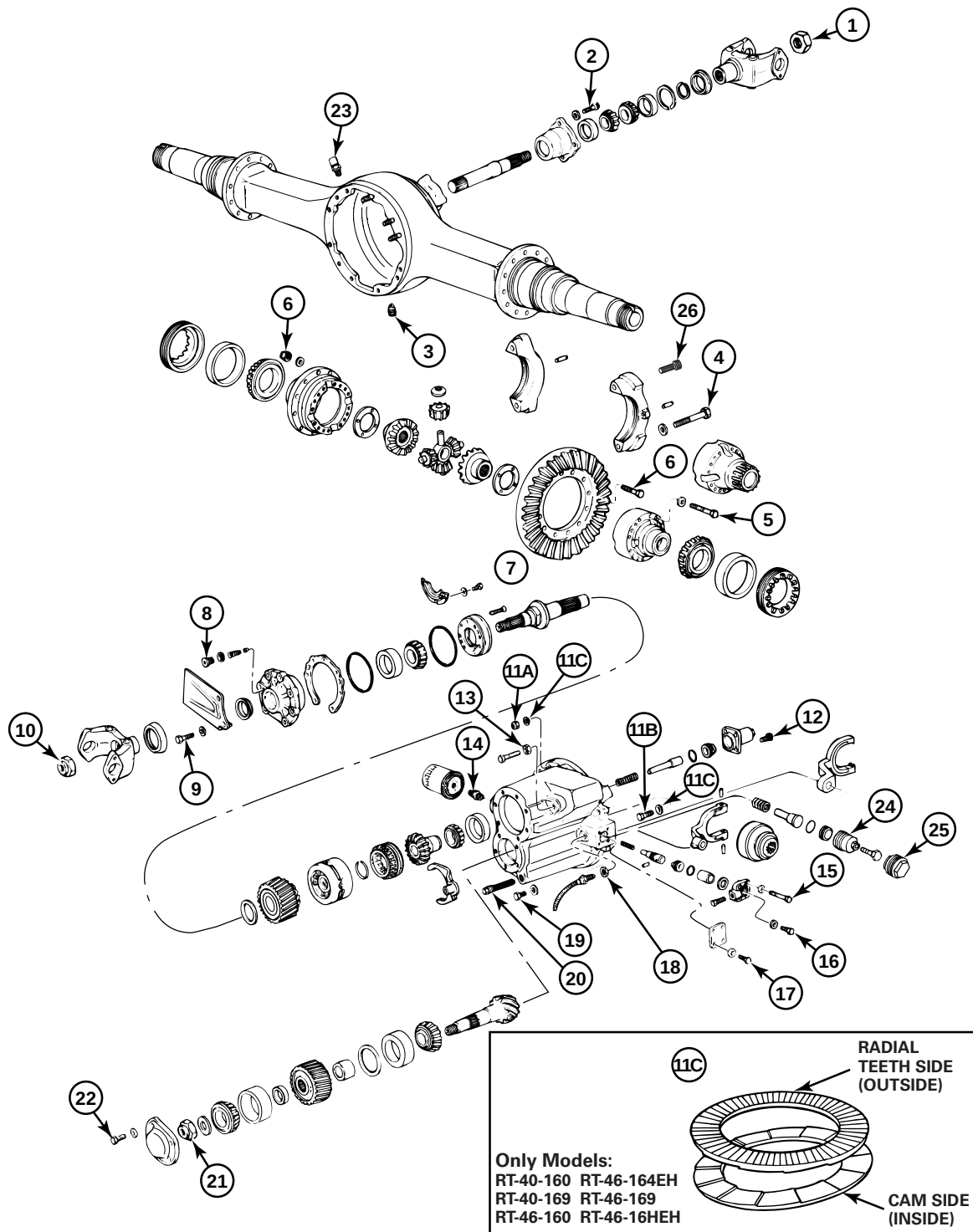
¹ For continuous heavy-duty operation, check the oil level every 1,000 miles (1600 km).

² This interval applies to approved semi-synthetic and full-synthetic oils only. For a list of approved extended-drain axle oils, refer to TP-9539, Approved Rear Drive Axle Lubricants. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.

³ The change interval for transit bus can be increased to 150,000 miles (241 401 km) or three years, whichever comes first, contingent upon the following three conditions.

- Documentation verifies a 10% fleet oil sampling with results that are below the guidelines specified in Maintenance Manual 1, Preventive Maintenance and Lubrication. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.
- There is a minimum of six magnets in the housing. Meritor 61163/71163 drive axles come standard with six magnets in the housing.
- Approved extended-drain interval lubricants are used according to TP-9539, Approved Rear Drive Axle Lubricants. (Drive axles excluded are RC-26-633/634 and RC-26/27-720.)

8 Specifications



1002872c

Table R: Torque Specifications

Item	Description	Axle Application	Size	Torque	
				Lb-Ft	N•m
1	Output Yoke-to-Thru-Shaft Nut	Refer to Table S, Table T or Table U			
2	Output Bearing Cage-to-Carrier Capscrew	All	0.38"-16	35-50	47-68
3	Drain and Fill Plugs*	All	0.75"-14	35 Min.	47.5 Min.
4	Bearing Cap-to-Carrier Capscrew	140 and 145	M20 x 2.5	320-400	430-540
		160	M22 x 2.5	480-600	650-810
5	Main Differential Case Halves Capscrew	140 and 145	M12 x 1.75	105-125	143-168
			Class 12.9		
			Std. Hex Head		
		140 and 145	M12 x 1.75	75-95	100-127
			Class 10.9		
		160	M16 x 2.0	220-310	300-420
6	Ring Gear-to-Case Nut and Bolt		Class 12.9		
			Std. Hex Head		
		180 and 380	0.87-14	600-700	816-952
		145	M16 x 1.5	160-210	220-290
			Class 10		
			Std. Hex Head		
7	Oil Pump-to-Input Bearing Cage Capscrew	160	M16 x 1.5	196-262	265-355
			Class 12		
			Std. Hex Head		
8	Pressure Relief Valve Plug	145 and 160	M8 x 1.25	22-33	30-45
9	Input Bearing Cage-to-Carrier Capscrew	145 and 160	M16 x 1.5	20-40	27-54
10	Input Yoke-to-Input Shaft Nut	All	M12 x 1.75	75-95	100-129
11A	Differential Carrier-to-Axle Housing Nut	Refer to Table S, Table T or Table U			
11B	Differential Carrier-to-Axle Housing Capscrew	All	5/8"-18	150-230	203-312
11C	Nord-Lock® Washer	All — Standard or Nylon Fasteners	5/8"-11	150-230	203-312
		RT-40-160	—	210	285
		RT-40-169			
		RT-46-160			
		RT-46-164EH			
		RT-46-169			
	RT-46-16HEH				

8 Specifications

Item	Description	Axle Application	Size	Torque	
				Lb-Ft	N·m
12	Air Shift Cylinder-to-Carrier Capscrew — Inter-Axle Differential	All	M6 x 1.0	7-12	10-16
13	Air Shift Adjusting Screw Jam Nut — Inter-Axle Differential	All	M12 x 1.5	40-55	55-75
14	Oil Filter Adapter-to-Carrier	145 and 160	M22 x 2.5	40-60	55-80
15	Main Differential Lock Cover-to-Carrier Capscrew	All	M6 x 1.0	7-12	10-16
16	Manual Actuation Plug — Main Differential Lock	All	M10 x 1.5	15-25	20-35
17	Cover Capscrew — Axles without Main Differential Lock	All	M6 x 1.0	7-12	10-16
—	Air Line-to-Main Differential Lock Cover Adapter	All	M12 x 1.5	22-30	30-40
18	Main Differential Lock Sensor Jam Nut	All	M16 x 1.0	25-35	35-45
19	Plug — Axles without Main Differential Lock Sensor	All	M16 x 1.0	45-55	60-75
20	Carrier Oil Screen and Plug Assembly	All	M26 x 1.5	48 Min.	65 Min.
21	Drive Pinion Nut	All	M50 x 2.0	1200-1500	1625-2035
22	Drive Pinion Cover-to-Carrier Capscrew	All	M10 x 1.5	35-50	48-68
23	Breather Vent	All	3/8"-18	20 Min.	27 Min.
—	Heat Indicator Plug	All	1/2"-14	25 Min.	34 Min.
—	Axle Shaft-to-Wheel Hub Capscrew	All	1/2"-13	85-115	115-156
—	Axle Shaft-to-Wheel Hub Nut	All	Plain Nut	75-115	102-156
			1/2"-20	150-230	203-312
			5/8"-18		
			Locknut	65-100	88-136
			1/2"-20	130-190	176-258
			5/8"-18		
—	Inter-Axle Differential Case Half	All	M10 x 1.5	45-55	60-75
—	Stud-to-Carrier	All	5/8" x 11	150-230	203-312
—	Axle Shaft Stud Nut	All	Plain Nut	310-400	420-542
			3/4"-16		
			Locknut	270-350	366-475
			3/4"-16		
24	Screw-In DCDL Assembly Housing	Current DCDL Option	M60 x 2.0	80-100	109-136

Item	Description	Axle Application	Size	Torque	
				Lb-Ft	N•m
25	Screw-In DCDL Plug or Cap	Non-DCDL Options	M60 x 2.0	80-100	109-136
26	Adjusting Rings Capscrews	145 and 160	—	21-28	28-38

*Minimum torque. Tighten until one thread is visible.

Input and Output Yoke Pinion Nut Fastener Torque Specifications

Table S: Single Axles

Axle Model	RS-120, RS-125, RS-140	RS-145	RS-160, RS-161, RS-185, RS-186	RS-210, RS-220, RS-230	RS-240	RS-380
Carrier Input Yoke	740-920 lb-ft	920-1130 lb-ft	1000-	740-920 lb-ft	740-920 lb-ft	800-1100 lb-ft
Fastener Size	(1000- 1245 N•m) M32 X 1.5	(1250- 1535 N•m) M39 X 1.5	1230 lb-ft (1350- 1670 N•m) M45 X 1.5	(1000- 1245 N•m) M32 X 1.5	(1000- 1245 N•m) M39 X 1.5	(1085- 1496 N•m) 1-1/2 - 12 UNF

Table T: Tandem Axles

Axle Model	RT-140	RT-145, RT-149	RT-160, RT-164, RT-169	RT-185	RT-380 With IAD	RT-380 Without IAD
First Carrier Input Yoke	750-850 lb-ft (1020- 1150 N•m) M45 X 1.5	750-850 lb-ft (1020- 1150 N•m) M45 X 1.5	750-850 lb-ft (1020- 1150 N•m) M45 X 1.5	750-850 lb-ft (1020- 1150 N•m) 1-3/4 - 12 UN	750-850 lb-ft (1020- 1150 N•m) 1-3/4 - 12 UN	900-1200 lb-ft (1224- 1632 N•m) 1-3/4 - 12 UN
First Carrier Output Yoke*	600-700 lb-ft (815-950 N•m) M32 X 1.5	600-700 lb-ft (815-950 N•m) M39 X 1.5	600-700 lb-ft (815-950 N•m) M39 X 1.5	600-700 lb-ft (815-950 N•m) 1-1/2 - 12 UNF	600-700 lb-ft (815-950 N•m) 1-1/2 - 12 UNF	600-700 lb-ft (815-950 N•m) 1-1/2 - 12 UNF
Second Carrier Input Yoke*	740-920 lb-ft (1000- 1245 N•m) M32 X 1.5	920-1130 lb-ft (1250- 1535 N•m) M39 X 1.5	1000- 1230 lb-ft (1350- 1670 N•m) M45 X 1.5	1000- 1230 lb-ft (1350- 1670 N•m) M45 X 1.5	800-1100 lb-ft (1085- 1496 N•m) 1-1/2 - 12 UNF	800-1100 lb-ft (1085- 1496 N•m) 1-1/2 - 12 UNF

*Apply Loctite® 277 threadlocker to the input shaft threads before installing the nut.

8 Specifications

Table U: Tridem Axles

Axle Model				
Pinion Nut Location	RZ-164	RZ-166	RZ-186	RZ-188
First Carrier Input Yoke	600-800 lb-ft (815-1085 N•m)	600-800 lb-ft (815-1085 N•m)	600-800 lb-ft (815-1085 N•m)	600-800 lb-ft (815-1085 N•m)
Fastener Size	M45 X 1.5	M45 X 1.5	1-3/4 - 12 UN	1-3/4 - 12 UN
First Carrier Output Yoke	450-650 lb-ft (610-880 N•m)	450-650 lb-ft (610-880 N•m)	450-650 lb-ft (610-880 N•m)	450-650 lb-ft (610-880 N•m)
Fastener Size	M39 X 1.5	M39 X 1.5	1-1/2 -12 UNF	1-1/2 - 12 UNF
Second Carrier Input Yoke	600-800 lb-ft (815-1085 N•m)	600-800 lb-ft (815-1085 N•m)	600-800 lb-ft (815-1085 N•m)	600-800 lb-ft (815-1085 N•m)
Fastener Size	M45 X 1.5	M45 X 1.5	M45 X 1.5	1-3/4 - 12 UN
Second Carrier Output Yoke	450-650 lb-ft (610-880 N•m)	450-650 lb-ft (610-880 N•m)	450-650 lb-ft (610-880 N•m)	450-650 lb-ft (610-880 N•m)
Fastener Size	M39 X 1.5	M39 X 1.5	M39 X 1.5	1-1/2 - 12 UNF
Third Carrier Input Yoke	920-1130 lb-ft (1250-1535 N•m)	1000-1230 lb-ft (1350-1670 N•m)	1000-1230 lb-ft (1350-1670 N•m)	1000-1230 lb-ft (1350-1670 N•m)
Fastener Size	M39 X 1.5	M45 X 1.5	M45 X 1.5	M45 X 1.5

Table V: Drive Pinion Bearings — Preload

Specification	New bearings
	5-45 lb-in (0.56-5.08 N•m)
	Used bearings in good condition
	10-30 lb-in (1.13-3.39 N•m)
Adjustment	Preload is controlled by the thickness of the spacer between bearing cones.
	To increase preload, install a thinner spacer.
	To decrease preload, install a thicker spacer.

Table W: Drive Pinion — Depth in Carrier

Specification	Install the correct amount of shims between the inner bearing cup of the drive pinion and the carrier. To calculate, use the old shim pack thickness and the new and old pinion cone numbers.
Adjustment	Change the thickness of the shim pack to get a good gear tooth contact pattern.

Table X: Hypoid Gear Set — Tooth Contact Patterns (Hand Rolled)

Specification	Toward the toe of the gear tooth and in the center between the top and bottom of the tooth.
Adjustment	Tooth contact patterns are controlled by the thickness of the shim pack between the inner bearing cone of the drive pinion and the carrier and by ring gear backlash.
	To move the contact pattern lower, increase the thickness of the shim pack between the inner bearing cup of the drive pinion and the carrier.
	To move the contact pattern higher, decrease the thickness of the shim pack between the inner bearing cup of the drive pinion and the carrier.
	To move the contact pattern toward the toe of the tooth, decrease backlash of the ring gear.
	To move the contact pattern toward the heel of the tooth, increase backlash of the ring gear.

Table Y: Main Differential Bearings — Preload

Specification	15-35 lb-in (1.7-3.9 N•m)
	or
	Expansion between bearing caps
	140 and 145 Series — 0.003-0.009-inch (0.08-0.22 mm)
	160 Series — 0.006-0.013-inch (0.15-0.33 mm)
Adjustment	Preload is controlled by tightening both adjusting rings after zero end play is reached.

Table Z: Main Differential Gears — Rotating Resistance

Specification	50 lb-ft (68 N•m) maximum torque applied to one side gear
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Table AA: Input Shaft End Play Adjustment

End Play of the Input Shaft	0.002-0.008-inch (0.050-0.200 mm)
------------------------------------	-----------------------------------

9 Adjustment

Table AB: Output Bearing — End Play and Preload

Specification	0.001-0.004-inch (0.025-0.102 mm) bearing end play
Adjustment	End play is controlled by the size of the snap ring in the output bearing cage. Increase end play by installing a thinner snap ring. Decrease end play by installing a thicker snap ring. NOTE: If the end play on the output bearing measures ZERO, a thinner snap ring is required.

Table AC: Ring Gear — Backlash

Specification	145 Series: Range: 0.008-0.018-inch (0.20-0.460 mm) Backlash setting for new gear sets: 0.012-inch (0.300 mm) 160 Series: Range: 0.010-0.020-inch (0.25-0.510 mm) Backlash setting for new gear sets: 0.012-inch (0.300 mm)
Adjustment	Backlash is controlled by the position of the ring gear. Change backlash within specifications to get a good tooth contact pattern. To increase backlash, move the ring gear away from the drive pinion. To decrease backlash, move the ring gear toward the drive pinion.

Table AD: Ring Gear — Runout

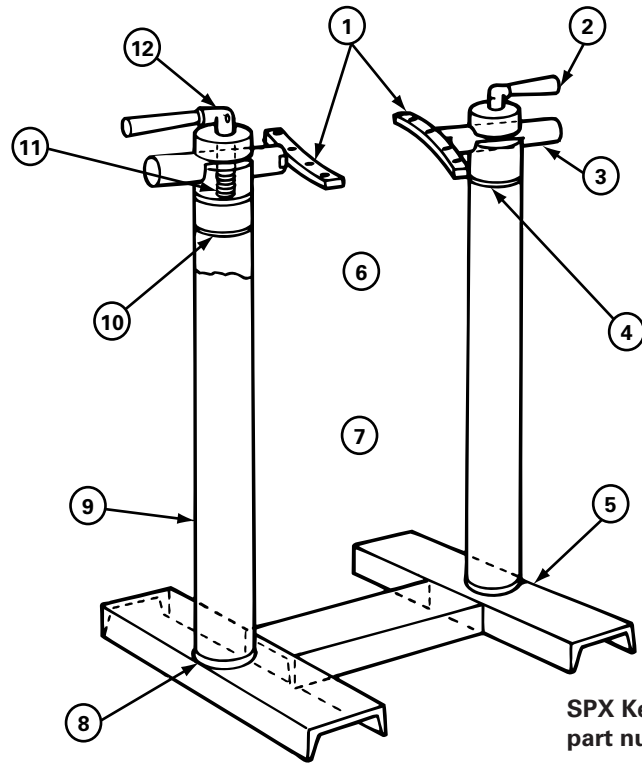
Specification	0.008-inch (0.200 mm) maximum
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Table AE: Sensor Switch — Installation (Carriers with Differential Lock Only)

Adjustment	Shift the differential to the locked position. Tighten the sensor switch into the carrier until the test light illuminates. Tighten the sensor switch one additional turn. Tighten the jam nut to the specified torque.
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Specifications

Carrier Repair Stand



SPX Kent-Moore
part number J-3409-D

1002990f

- 1 PLATES 8' LONG x 3/4" THICK x 1-1/4" WIDE WITH A TONGUE TO FIT SLOT IN BAR WELD PLATES TO BAR
- 2 HANDLE 7" LONG WITH SLOT IN ONE END TO FIT CLAMP SCREW
- 3 BAR 2" DIAMETER x 9" LONG WITH ONE END SLOTTED TO FIT PLATE
- 4 WELD ALL AROUND AFTER PRESSING PLUG IN PIPE
- 5 WELD
- 6 SHAPE AND SIZE OF HOLES TO FIT CARRIER
- 7 23-1/2" CENTER TO CENTER OF PIPE
- 8 CHAMFER END OF PIPE FOR WELDING
- 9 4" DIAMETER PIPE
- 10 PLUG 4" DIAMETER x 7" LONG WITH ONE END TURNED 3" LONG TO FIT PIPE. DRILL 2" HOLE AND MILL 3/16" WIDE SLOT 2" FROM TOP
- 11 SCREW 3-1/2" LONG x 5/8" DIAMETER WITH FLATS ON END TO FIT HANDLE AND 2-1/2" LENGTH OF THREAD ON OTHER END
- 12 DRILL 3/8" HOLE THROUGH HANDLE AND SCREW

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

10 Special Tools

How to Make a Yoke Bar

1. Measure dimensions A and B of the yoke you are servicing.
Figure 10.1.

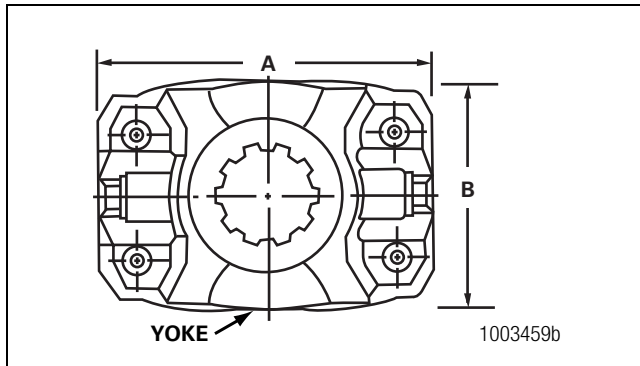


Figure 10.1

2. Calculate dimensions C and D of the yoke bar by adding 0.125-0.250-inch to dimensions A and B of the yoke.
Figure 10.2.

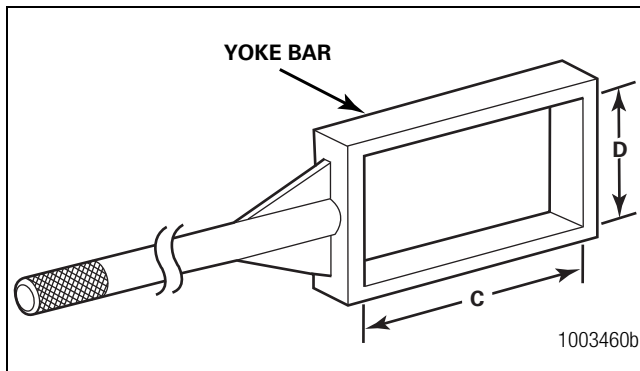


Figure 10.2

⚠ WARNING

Wear safe clothing and eye protection when you use welding equipment. Welding equipment can burn you and cause serious personal injury. Follow the operating instructions and safety procedures recommended by the welding equipment manufacturer.

3. To make the box section, cut and weld one-inch x two-inch mild steel square stock according to dimensions C and D.
Figure 10.2.
4. Cut a four-foot x 1.25-inch piece of mild steel round stock to make the yoke bar handle. Center weld this piece to the box section. Figure 10.2.

- **To increase yoke bar rigidity:** Weld two angle pieces onto the handle. Figure 10.2.

How to Make a Drive Flange Retainer Tool

1. Obtain a 1/4-inch thick piece of flat steel.
2. Cut and drill the plate using the dimensions in Figure 10.3.

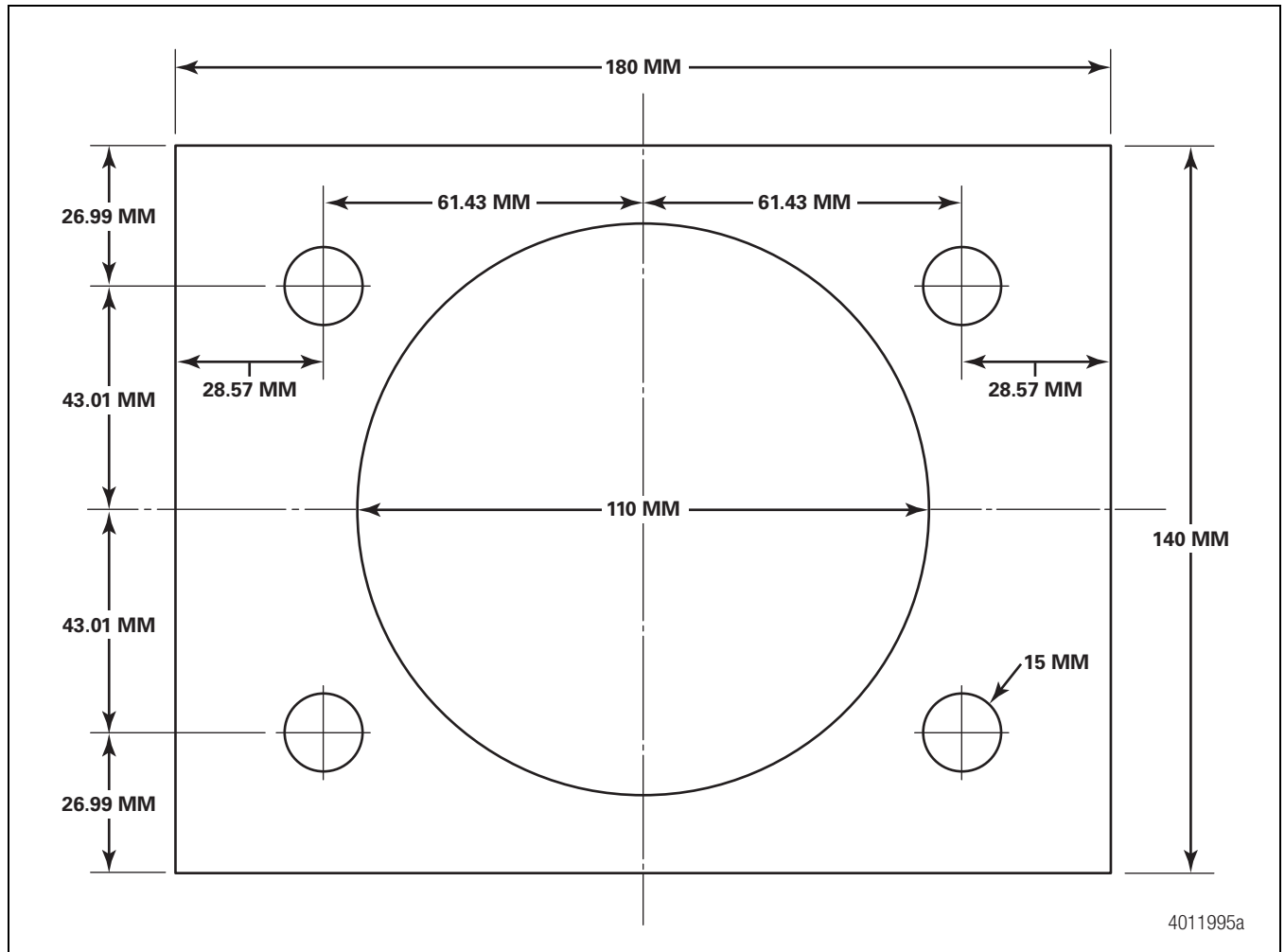


Figure 10.3

10 Special Tools

WARNING

Wear safe clothing and eye protection when you use welding equipment. Welding equipment can burn you and cause serious personal injury. Follow the operating instructions and safety procedures recommended by the welding equipment manufacturer.

3. Cut a 4-foot x 1.25-inch piece of mild steel round stock to make the handle. Center weld the handle to the flat plate section. Weld two angle pieces to the plate to increase the rigidity as shown in Figure 10.2.

Unitized Pinion Seals and Seal Drivers

Refer to Table AF and Figure 10.4 for information on unitized pinion seals and seal drivers. To obtain Meritor seal driver KIT 4454, refer to the Service Notes page on the front inside cover of this manual.

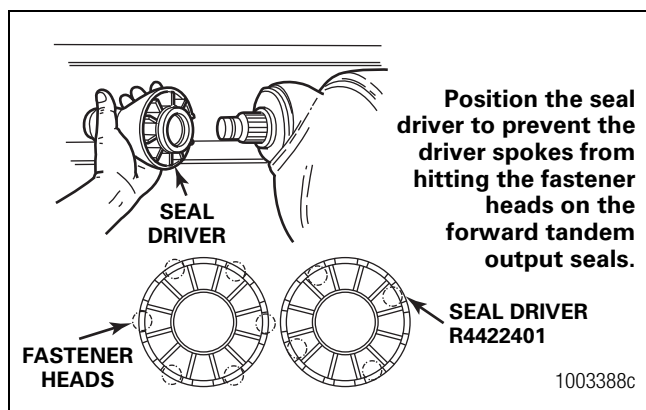


Figure 10.4

Table AF: Unitized Pinion Seals and Seal Drivers*

Single Models	Tandem Models	Axle Model and Position	Seal Service Part Number	Previous Seal Part Number	Seal Drivers	Sleeve Drivers
MX-21-160	RT-34-144 /P	14X/16X/18X/38X	A1-1205X2728	A-1205R2592	2728T1	2728T2
MX-23-160R	RT-34-145 /P	Forward-Rear Unit Input (FUI)				
RF-16-145	MT-40-143	14X/16X	A1-1205Y2729	A-1205P2590	2729T1	2729T2
RF-21-160	RT-40-145 /A /P	Forward-Rear Unit Output (FUO)				
RF-22-166	RT-40-149 /A /P					
RF-23-185	RT-44-145 /P	14X Rear-Rear Unit Input (RUI)	A1-1205Z2730	A-1205N2588	2730T1	Not Required — Sleeve is unitized
RS-17-145	RT-40-160 /A /P					
RS-19-145	RT-40-169 /A /P	16X/18X Rear-Rear Unit Input (RUI)	A1-1205A2731	A-1205Q2591	2731T1	Not Required — Sleeve is unitized
RS-21-145	RT-46-160 /A /P					
RS-21-160	RT-46-169 /A /P					
RS-23-160 /A	RT-46-164EH /P					
RS-23-161 /A	RT-46-16HEH /P					
RS-25-160 /A	RT-50-160 /P					
RS-23-186	RT-52-185*					
RS-26-185	RT-58-185*					
RS-30-185						

Forward input and output seals must be serviced with the seal and sleeve. The service part number provides both when required.

*Forward and rear input only.

11 Vehicle Towing Instructions

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.

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.

Engage the parking brake to prevent the vehicle from moving before you begin maintenance or service procedures that require you to be under the vehicle. Serious personal injury can result.

CAUTION

If the vehicle is equipped with a front drive axle, tow the vehicle from the front, with the front wheels off the ground. If this is not possible, you must remove the front drive shaft before towing. Damage to components can result.

Do not use a chisel or wedge to loosen the axle shaft and tapered dowels. A chisel or wedge can result in damage to the axle shaft, the gasket and seal, and the axle hub.

NOTE: For complete towing information, refer to Technical Bulletin TP-9579, Driver Instruction Kit. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.

These instructions supersede all other instructions for the purpose of transporting vehicles for service or new vehicle drive-away dated before April 1995, including those contained in Meritor maintenance manuals.

When transporting a vehicle with the wheels of one or both drive axles on the road, it is possible to damage the axles if the wrong procedure is used before transporting begins. Meritor recommends that you use the following procedure.

Type of Axle

Forward Tandem Axle, with Driver-Controlled Main Differential Lock (DCDL — Screw-In DCDL Shift Assembly) and with Inter-Axle Differential (IAD)

Before Towing or Drive-Away

1. Apply the vehicle parking brakes using the switch inside the cab of the vehicle.
2. Shift the transmission into neutral and start the vehicle’s engine.
3. Shift the DCDL to the unlocked or disengaged position using the switch inside the cab of the vehicle. The DCDL indicator light in the cab will go off. Shift the IAD to the unlocked or disengaged position using the switch inside the cab of the vehicle. The IAD indicator light in the cab will go off, if equipped.
4. Stop the engine.
5. Refer to and identify which axle shafts must be removed based on how the vehicle will be towed.

Table AG

Single Axles
Remove both axle shafts.
Tandem Axles
Forward Axle (Towing from Front):
No need to remove axle shafts.
Forward Axle (Towing from Rear):
Remove both axle shafts.
Rear Axle (Towing from Front):
Remove both axle shafts.
Rear Axle (Towing from Rear):
No need to remove axle shafts.

6. On axles equipped with a DCDL, the shift collar splines must be engaged with the differential case splines before removing the axle shaft. Engage the DCDL shift collar using the Manual Engaging Method as follows.

⚠ CAUTION

On single and tandem rear axles equipped with a DCDL, when removing the curb-side (right) axle shaft, the DCDL shift collar splines must be engaged with the differential case splines. The collar splines must be completely engaged with the differential case splines. This must be done to prevent the shift collar from dropping out of position when removing the axle shaft. Cage (engage) the shift collar with the differential case before removing the axle shaft or damage to components can result.

- A. Disconnect the air hose from the shift cylinder.
Figure 11.1.

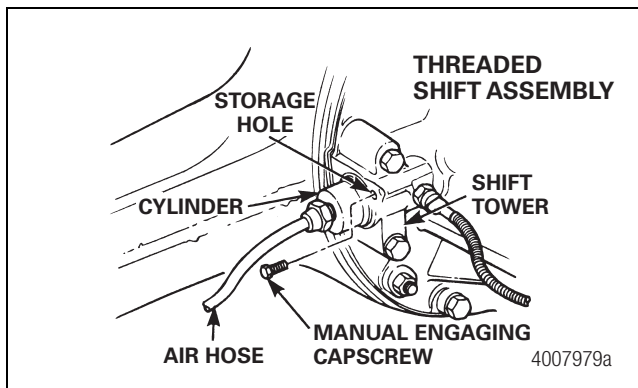


Figure 11.1

- B. Remove the manual engaging cap screw from the storage hole. The storage hole of threaded shift assemblies is located in the shift tower of the carrier, next to the cylinder. Figure 11.1.
- C. Install the manual engaging cap screw into the threaded hole in the center of the cylinder. Figure 11.2.

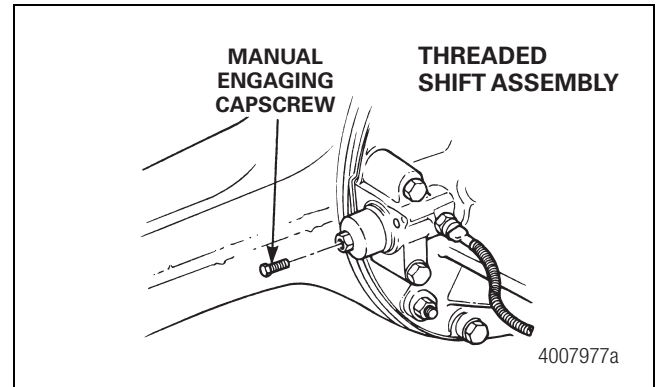


Figure 11.2

⚠ CAUTION

When you turn the cap screw in Step D and you feel a high resistance, STOP TURNING THE CAPSCREW. A high resistance against the cap screw indicates that the splines of the shift collar and differential case are not aligned. Damage to the threads of the cylinder and cap screw will result. To align the splines, continue with Steps D and F.

- D. Turn the cap screw to the right until the head is approximately 0.25- to 0.50-inch (6.4 to 12.7 mm) from the cylinder. The cap screw is now in the service position and the DCDL shift collar is locked (engaged).
Figure 11.3. When turning the cap screw you will feel a small amount of resistance. This is normal. If you feel a high resistance before achieving the 0.25- to 0.50-inch distance between the cap screw head and cylinder, STOP TURNING THE CAPSCREW and continue with Steps E and F.

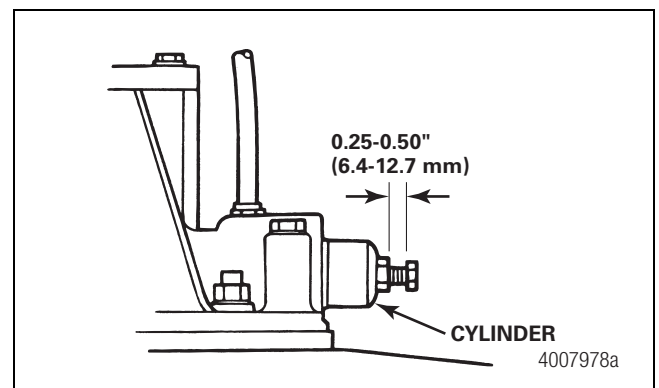


Figure 11.3

11 Vehicle Towing Instructions

- E. Raise the tire and wheel (DCDL axle side) off of the floor (leave the opposite tire and wheel on the floor) and support the axle with jack stands. Slowly rotate the wheel of the DCDL axle shaft that is to be removed by hand.
- F. Verify that the clutch collar is engaged by attempting to rotate the elevated wheel. If it does not rotate, the collar is successfully caged. The axle shaft can now be removed.
 - **If you still feel a high resistance:** Stop turning the capscrew, disassemble and inspect components for damage and wear. Replace as necessary.
7. Identify each axle shaft to be removed from the axle assembly so they can be installed in the same location after transporting or repair is completed. (Example: Match mark a mating axle shaft and hub.)
8. Remove the stud nuts or capscrews and the washers from the flange of the axle shaft. Figure 11.4.

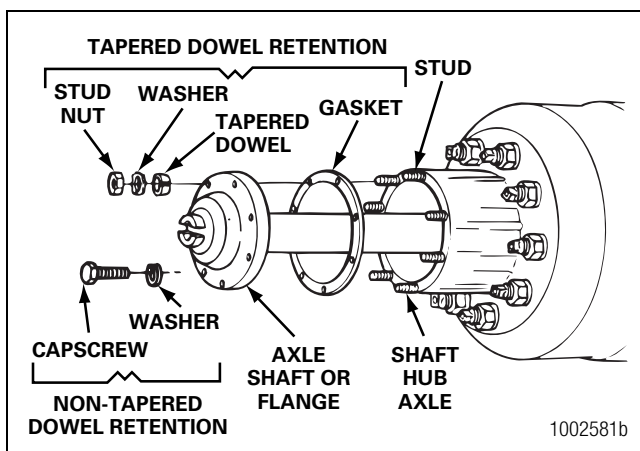


Figure 11.4

9. Loosen the tapered dowels, if used, in the flange of the axle shaft. Refer to Section 3 for the recommended tools and removal procedures. Figure 11.4.
10. Remove the tapered dowels, the axle shafts and gaskets, if used. Figure 11.4.
11. Remove the remaining axle shaft(s) as necessary from the axle(s) that will remain on the road when the vehicle is transported according to .
12. Install a cover over the open end of each hub where an axle shaft was removed. This will prevent dirt from entering the bearing cavity and minimize loss of lubricant.

NOTE: If an air supply will be used for the brake system of the transported vehicle, continue with Steps 13 and 14, otherwise continue with Step 15.

13. Connect an auxiliary air supply to the brake system of the vehicle that is being transported. Before moving the vehicle, charge the brake system with the correct amount of air pressure to operate the brakes. Refer to the instructions supplied by the manufacturer of the vehicle for procedures and specifications. If an auxiliary air supply is not used, continue with Step 15.
14. When the correct amount of air pressure is in the brake system, release the parking brakes of the vehicle that is being transported. Step 15 is not required.

⚠ WARNING

When you work on a spring chamber, carefully follow the service instructions of the chamber manufacturer. Sudden release of a compressed spring can cause serious personal injury.

15. If there are spring or parking brakes on the axle(s) that will remain on the road when the vehicle is transported, and they cannot be released by air pressure, manually compress and lock each spring so that the brakes are released. Refer to the manufacturer's instructions.

After Towing or Drive-Away

1. If an auxiliary air supply was used, apply the vehicle parking brakes using the switch inside the cab of the vehicle. If an auxiliary air supply was not used, begin with Step 2.

⚠ WARNING

When you work on a spring chamber, carefully follow the service instructions of the chamber manufacturer. Sudden release of a compressed spring can cause serious personal injury.

2. Apply the vehicle spring or parking brakes by manually releasing each spring that was compressed before transporting started. Refer to the manufacturer's instructions.
3. Disconnect the auxiliary air supply, if used, from the brake system of the vehicle that was transported. Connect the vehicle's air supply to the brake system.
4. Remove the covers from the hubs.
5. Install the axle shaft(s) indicated in Table AH. Axle shafts with a DCDL have a double row of splines that engage with the splines of the side gear and shift collar in the differential case. Figure 11.5. Continue with Step 6.

Table AH

Single Axles

Remove both axle shafts.

Tandem Axles

Forward Axle (Towing from Front):

No need to remove axle shafts.

Forward Axle (Towing from Rear):

Remove both axle shafts.

Rear Axle (Towing from Front):

Remove both axle shafts.

Rear Axle (Towing from Rear):

No need to remove axle shafts.

NOTE: Make sure to engage the axle shaft splines for the differential side gear and the shift collar. They must be fully engaged.

6. Install the gasket, if used, and axle shaft into the axle housing and carrier in the same location. The gasket and flange of the axle shaft must be flat against the hub. Rotate the axle shaft or the driveline as necessary to align the splines and the holes in the flange with the studs in the hub. Figure 11.4.
7. Install the dowels, if used, over each stud and into the tapered holes of the flange.
8. Install the washers and capscrews or stud nuts. Determine the size of the fasteners and tighten the capscrews or nuts to the corresponding torque value shown in Table AI.

Table AI

Fastener	Thread Size	Torque Value lb-ft (N·m)
Capscrews	0.31"-24	18-24 (24-33)
	0.50"-13	85-115 (115-156)
Stud Nuts	0.44"-20	50-75 (68-102)
	Plain Nut	0.50"-20
	0.56"-18	110-165 (149-224)
	0.62"-18	150-230 (203-312)
	0.75"-16	310-400 (420-542)
Locknut	0.44"-20	40-65 (54-88)
	0.50"-20	65-100 (88-136)
	0.56"-18	100-145 (136-197)
	0.62"-18	130-190 (176-258)
	0.75"-16	270-350 (366-475)

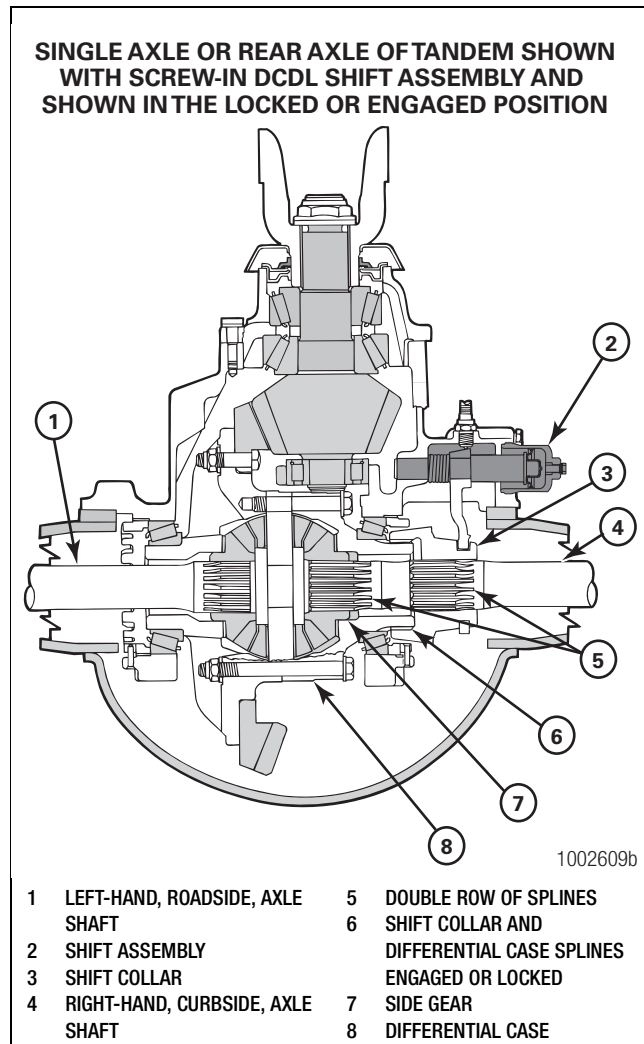


Figure 11.5

9. Unlock or disengage the DCDL by removing the manual engaging capscrew from the shift assembly.
10. Install the manual engaging capscrew into the storage hole. The storage hole of threaded shift assemblies is located in the shift tower of the carrier next to the cylinder. Tighten the capscrew to 15-25 lb-ft (20-35 N•m). Figure 11.1.
11. Connect the air hose to the shift cylinder. Tighten the air hose to 22-30 lb-ft (30-40 N•m).
12. Install the remaining axle shaft into the axle housing and carrier.

11 Vehicle Towing Instructions

13. Check the lubricant level in the axles and hubs where the axle shafts were removed. Add the correct type and amount of lubricant if necessary. Refer to Section 7.

Forward Tandem Axle, with Driver-Controlled Main Differential Lock (DCDL — Bolt-On DCDL Shift Assembly) and with Inter-Axle Differential (IAD)

Before Towing or Drive-Away

1. Apply the vehicle parking brakes using the switch inside the cab of the vehicle.
2. Shift the transmission into neutral and start the vehicle's engine.
3. Shift the DCDL to the unlocked or disengaged position using the switch inside the cab of the vehicle. The DCDL indicator light in the cab will go off. Shift the IAD to the unlocked or disengaged position using the switch inside the cab of the vehicle. The IAD indicator light in the cab will go off, if equipped.
4. Stop the engine.
5. Refer to and identify which axle shafts must be removed based on how the vehicle will be towed.

Table AJ

Single Axles

Remove both axle shafts.

Tandem Axles

Forward Axle (Towing from Front):

No need to remove axle shafts.

Forward Axle (Towing from Rear):

Remove both axle shafts.

Rear Axle (Towing from Front):

Remove both axle shafts.

Rear Axle (Towing from Rear):

No need to remove axle shafts.

6. On axles equipped with a DCDL, the shift collar splines must be engaged with the differential case splines before removing the axle shaft. Engage the DCDL shift collar using the Manual Engaging Method as follows.

⚠ CAUTION

On single and tandem rear axles equipped with a DCDL, when removing the curb-side (right) axle shaft, the DCDL shift collar splines must be engaged with the differential case splines. The collar splines must be completely engaged with the differential case splines. This must be done to prevent the shift collar from dropping out of position when removing the axle shaft. Cage (engage) the shift collar with the differential case before removing the axle shaft or damage to components can result.

- A. Disconnect the air hose from the shift cylinder. Figure 11.6.

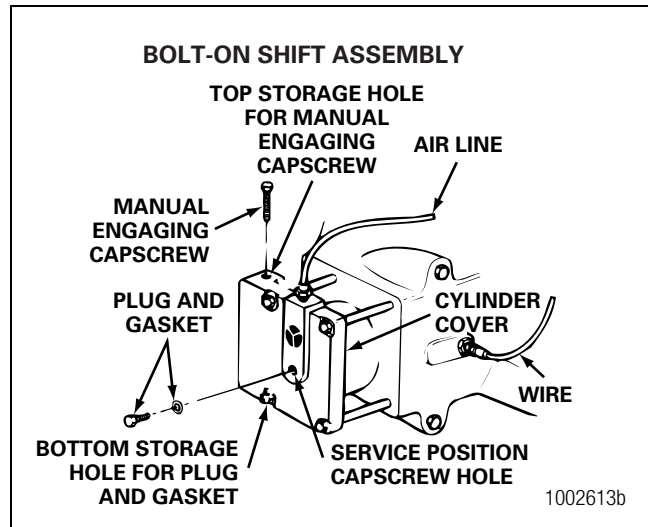


Figure 11.6

- B. Remove the manual engaging capscREW from the storage hole. The storage hole of threaded shift assemblies is located in the shift tower of the carrier, next to the cylinder. Figure 11.6.
- C. Install the manual engaging capscREW into the threaded hole in the center of the cylinder. Figure 11.7.

11 Vehicle Towing Instructions

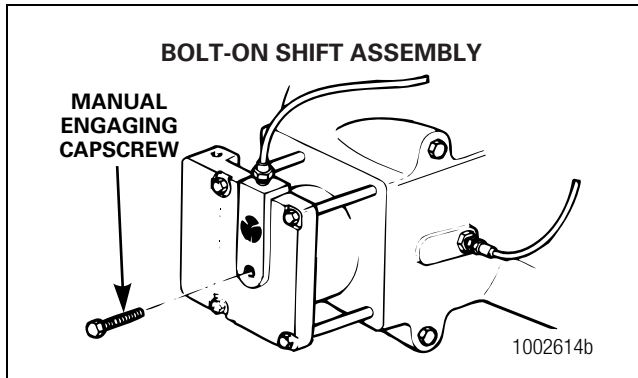


Figure 11.7

⚠ CAUTION

When you turn the cap screw in Step D and you feel a high resistance, STOP TURNING THE CAPSCREW. A high resistance against the cap screw indicates that the splines of the shift collar and differential case are not aligned. Damage to the threads of the cylinder and cap screw will result. To align the splines, continue with Steps E and F.

- D. Turn the cap screw to the right until the head is approximately 0.25- to 0.50-inch (6.4 to 12.7 mm) from the cylinder. The cap screw is now in the service position and the DCDL shift collar is locked (engaged). Figure 11.8. When turning the cap screw you will feel a small amount of resistance. This is normal. If you feel a high resistance before achieving the 0.25- to 0.50-inch distance between the cap screw head and cylinder, STOP TURNING THE CAPSCREW and continue with Steps E and F.

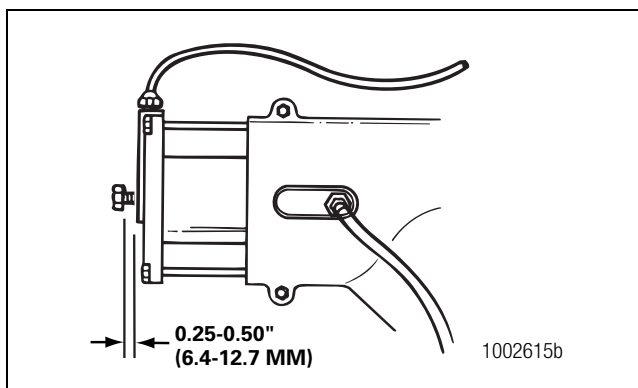


Figure 11.8

- E. Raise the tire and wheel (DCDL axle side) off of the floor (leave the opposite tire and wheel on the floor) and support the axle with jack stands. Slowly rotate the wheel of the DCDL axle shaft that is to be removed by hand.
- F. Verify that the clutch collar is engaged by attempting to rotate the elevated wheel. If it does not rotate, the collar is successfully caged. The axle shaft can now be removed.

- **If you still feel a high resistance:** Stop turning the cap screw, disassemble and inspect components for damage and wear. Replace as necessary.

7. Identify each axle shaft to be removed from the axle assembly so they can be installed in the same location after transporting or repair is completed. (Example: Match mark a mating axle shaft and hub.)
8. Remove the stud nuts or cap screws and the washers from the flange of the axle shaft. Figure 11.9.

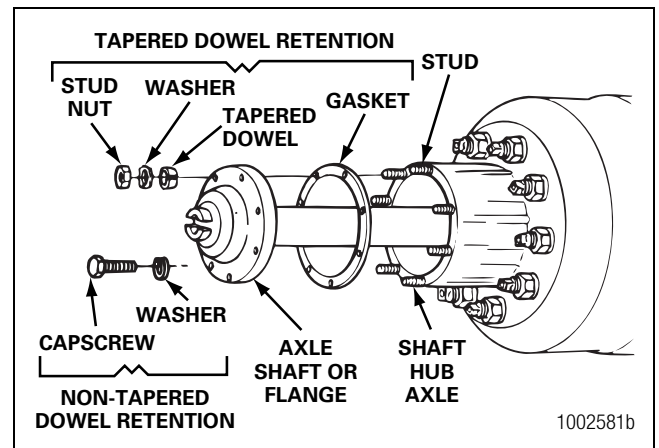


Figure 11.9

9. Loosen the tapered dowels, if used, in the flange of the axle shaft. Refer to Section 3 for the recommended tools and removal procedures. Figure 11.9.
10. Remove the tapered dowels, the axle shafts and gaskets, if used. Figure 11.9.
11. Remove the remaining axle shaft(s) as necessary from the axle(s) that will remain on the road when the vehicle is transported according to Table AJ.
12. Install a cover over the open end of each hub where an axle shaft was removed. This will prevent dirt from entering the bearing cavity and minimize loss of lubricant.

11 Vehicle Towing Instructions

NOTE: If an air supply will be used for the brake system of the transported vehicle, continue with Steps 13 and 14, otherwise continue with Step 15.

- 13. Connect an auxiliary air supply to the brake system of the vehicle that is being transported. Before moving the vehicle, charge the brake system with the correct amount of air pressure to operate the brakes. Refer to the instructions supplied by the manufacturer of the vehicle for procedures and specifications. If an auxiliary air supply is not used, continue with Step 15.
- 14. When the correct amount of air pressure is in the brake system, release the parking brakes of the vehicle that is being transported. Step 15 is not required.

⚠ WARNING

When you work on a spring chamber, carefully follow the service instructions of the chamber manufacturer. Sudden release of a compressed spring can cause serious personal injury.

- 15. If there are spring or parking brakes on the axle(s) that will remain on the road when the vehicle is transported, and they cannot be released by air pressure, manually compress and lock each spring so that the brakes are released. Refer to the manufacturer's instructions.

After Towing or Drive-Away

- 1. If an auxiliary air supply was used, apply the vehicle parking brakes using the switch inside the cab of the vehicle. If an auxiliary air supply was not used, begin with Step 2.

⚠ WARNING

When you work on a spring chamber, carefully follow the service instructions of the chamber manufacturer. Sudden release of a compressed spring can cause serious personal injury.

- 2. Apply the vehicle spring or parking brakes by manually releasing each spring that was compressed before transporting started. Refer to the manufacturer's instructions.
- 3. Disconnect the auxiliary air supply, if used, from the brake system of the vehicle that was transported. Connect the vehicle's air supply to the brake system.
- 4. Remove the covers from the hubs.

- 5. Install the axle shaft(s) indicated in Table AK. Axle shafts with a DCDL have a double row of splines that engage with the splines of the side gear and shift collar in the differential case. Figure 11.10. Continue with Step 6.

Table AK

Single Axles

Remove both axle shafts.

Tandem Axles

Forward Axle (Towing from Front):

No need to remove axle shafts.

Forward Axle (Towing from Rear):

Remove both axle shafts.

Rear Axle (Towing from Front):

Remove both axle shafts.

Rear Axle (Towing from Rear):

No need to remove axle shafts.

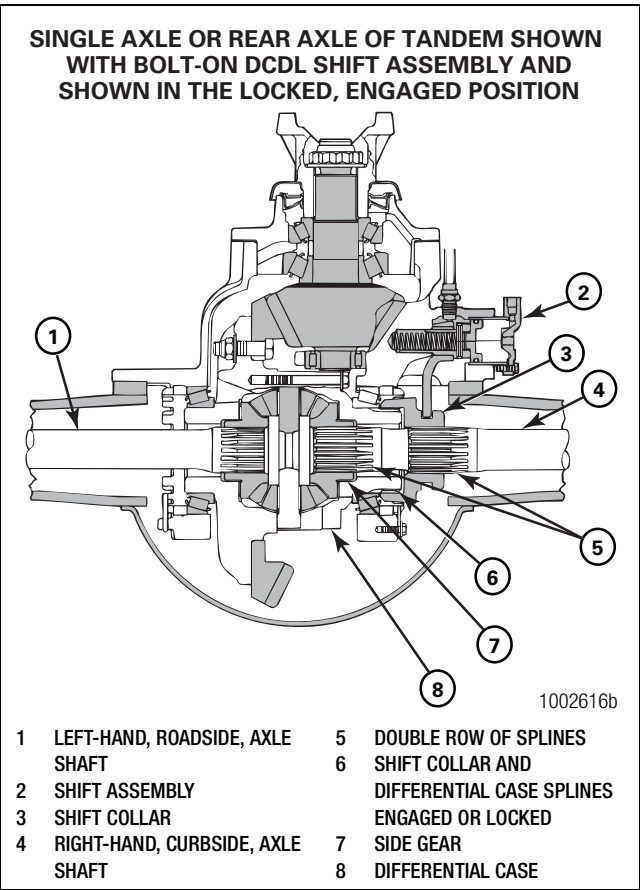


Figure 11.10

NOTE: Make sure to engage the axle shaft splines for the differential side gear and the shift collar. They must be fully engaged.

6. Install the gasket, if used, and axle shaft into the axle housing and carrier in the same location. The gasket and flange of the axle shaft must be flat against the hub. Rotate the axle shaft or the driveline as necessary to align the splines and the holes in the flange with the studs in the hub. Figure 11.9.
7. Install the dowels, if used, over each stud and into the tapered holes of the flange.
8. Install the washers and capscrews or stud nuts. Determine the size of the fasteners and tighten the capscrews or nuts to the corresponding torque value shown in Table AL.

Table AL

Fastener	Thread Size	Torque Value lb-ft (N•m)
Capscrews	0.31"-24	18-24 (24-33)
	0.50"-13	85-115 (115-156)
Stud Nuts	0.44"-20	50-75 (68-102)
	Plain Nut 0.50"-20	75-115 (102-156)
	0.56"-18	110-165 (149-224)
	0.62"-18	150-230 (203-312)
	0.75"-16	310-400 (420-542)
	Locknut 0.44"-20	40-65 (54-88)
	0.50"-20	65-100 (88-136)
	0.56"-18	100-145 (136-197)
	0.62"-18	130-190 (176-258)
	0.75"-16	270-350 (366-475)

9. Unlock or disengage the DCDL by removing the manual engaging capscrew from the shift assembly.
10. Install the manual engaging capscrew into the storage hole. The storage hole of bolted on shift assemblies is located in the top side of the shift cylinder cover. Tighten the capscrew to 15-25 lb-ft (20-35 N•m). Figure 11.6. 
11. Remove the plug and gasket from the storage hole. Install the plug and gasket into the threaded hole in the center of the shift cylinder cover. Tighten to 15-25 lb-ft (20-35 N•m). 
12. Install the remaining axle shaft(s) into the axle housing and carrier. Follow Steps 6-8.

13. Check the lubricant level in the axles and hubs where the axle shafts were removed. Add the correct type and amount of lubricant if necessary. Refer to Section 7.

Forward Tandem Axle, without Driver-Controlled Main Differential Lock (DCDL), with Inter-Axle Differential (IAD)

Before Towing or Drive-Away

1. Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving.
2. Apply the vehicle parking brakes using the switch inside the cab of the vehicle.
3. Shift the transmission into neutral and start the vehicle's engine.
4. Shift the IAD to the unlocked or disengaged position using the switch inside the cab of the vehicle. The indicator light in the cab will go off.
5. Stop the engine.

NOTE: Remove both axle shafts from the axle(s) that will remain on the road when the vehicle is transported.

6. Remove the stud nuts or capscrews and washers from the flange of the axle shaft. Figure 11.11.
7. Loosen the tapered dowels, if used, in the flange of the axle shaft. Figure 11.11. Refer to Section 3.

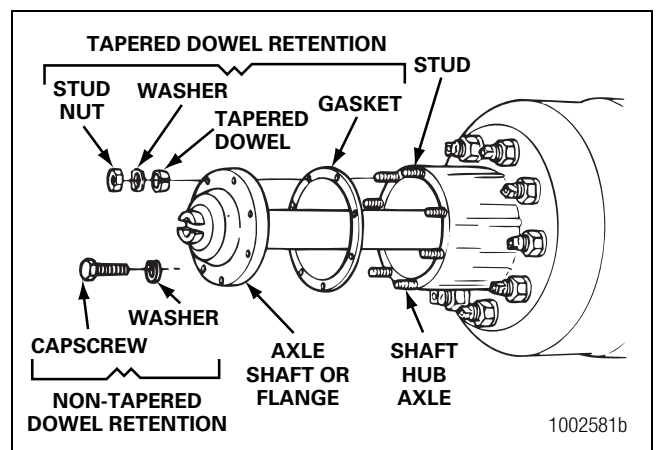


Figure 11.11

11 Vehicle Towing Instructions

- Identify each axle shaft that is removed from the axle assembly so they can be installed in the same location after transporting or repair is completed.
- Remove the tapered dowels, gasket, if used, and the axle shaft from the axle assembly. Figure 11.11.
- Install a cover over the open end of each hub where an axle shaft was removed. This will prevent dirt from entering the bearing cavity and loss of lubricant.

NOTE: If an air supply will be used for the brake system of the transported vehicle, continue with Step 11 and Step 12, otherwise continue with Step 13.

- Connect an auxiliary air supply to the brake system of the vehicle that is being transported. Before moving the vehicle, charge the brake system with the correct amount of air pressure to operate the brakes. Refer to the instructions supplied by the manufacturer of the vehicle for procedures and specifications. If an auxiliary air supply is not used, continue with Step 13.
- When the correct amount of air pressure is in the brake system, release the parking brakes of the vehicle that is being transported. Step 13 is not required.
- If there are spring or parking brakes on the axle(s) that will remain on the road when the vehicle is transported, and they cannot be released by air pressure, manually compress and lock each spring so that the brakes are released. Refer to the manufacturer's instructions.

After Towing or Drive-Away

- If an auxiliary air supply was used, apply the vehicle parking brakes using the switch inside the cab of the vehicle. If an auxiliary air supply was not used, begin with Step 2.
- Apply the vehicle spring or parking brakes by manually releasing each spring that was compressed before transporting started. Refer to the manufacturer's instructions.
- Disconnect the auxiliary air supply, if used, from the brake system of the vehicle that was transported. Connect the vehicle's air supply to the brake system.
- Remove the covers from the hubs.

- Install the gasket, if used, and axle shaft into the axle housing and carrier in the same location. The gasket and flange of the axle shaft must be flat against the hub. Rotate the axle shaft or the driveline as necessary to align the splines and the holes in the flange with the studs in the hub. Figure 11.11.
- Install the dowels, if used, over each stud and into the tapered holes of the flange.
- Install the washers and capscrews or stud nuts. Determine the size of the fasteners and tighten the capscrews or nuts to the torque value shown in Table AM.

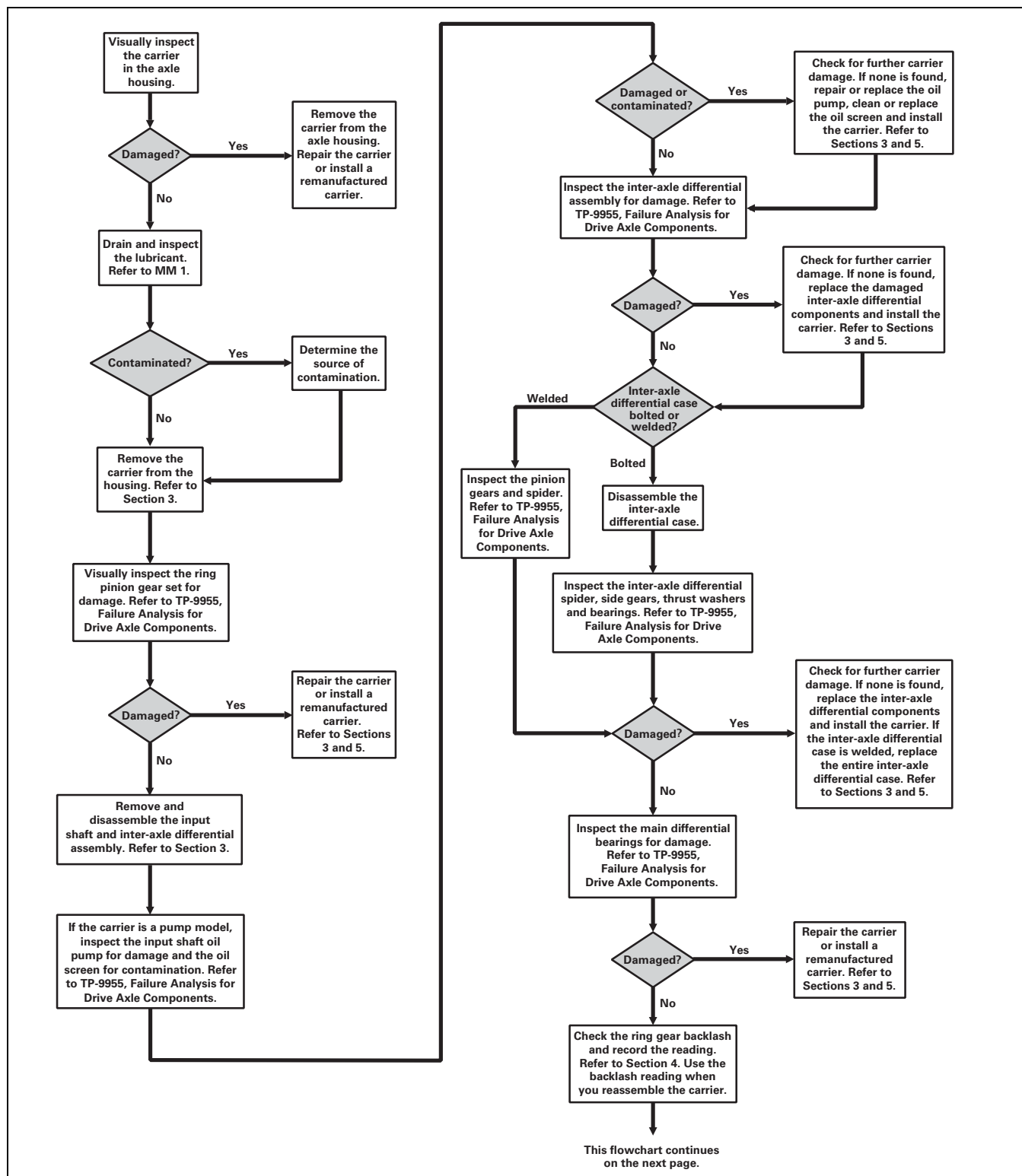
Table AM

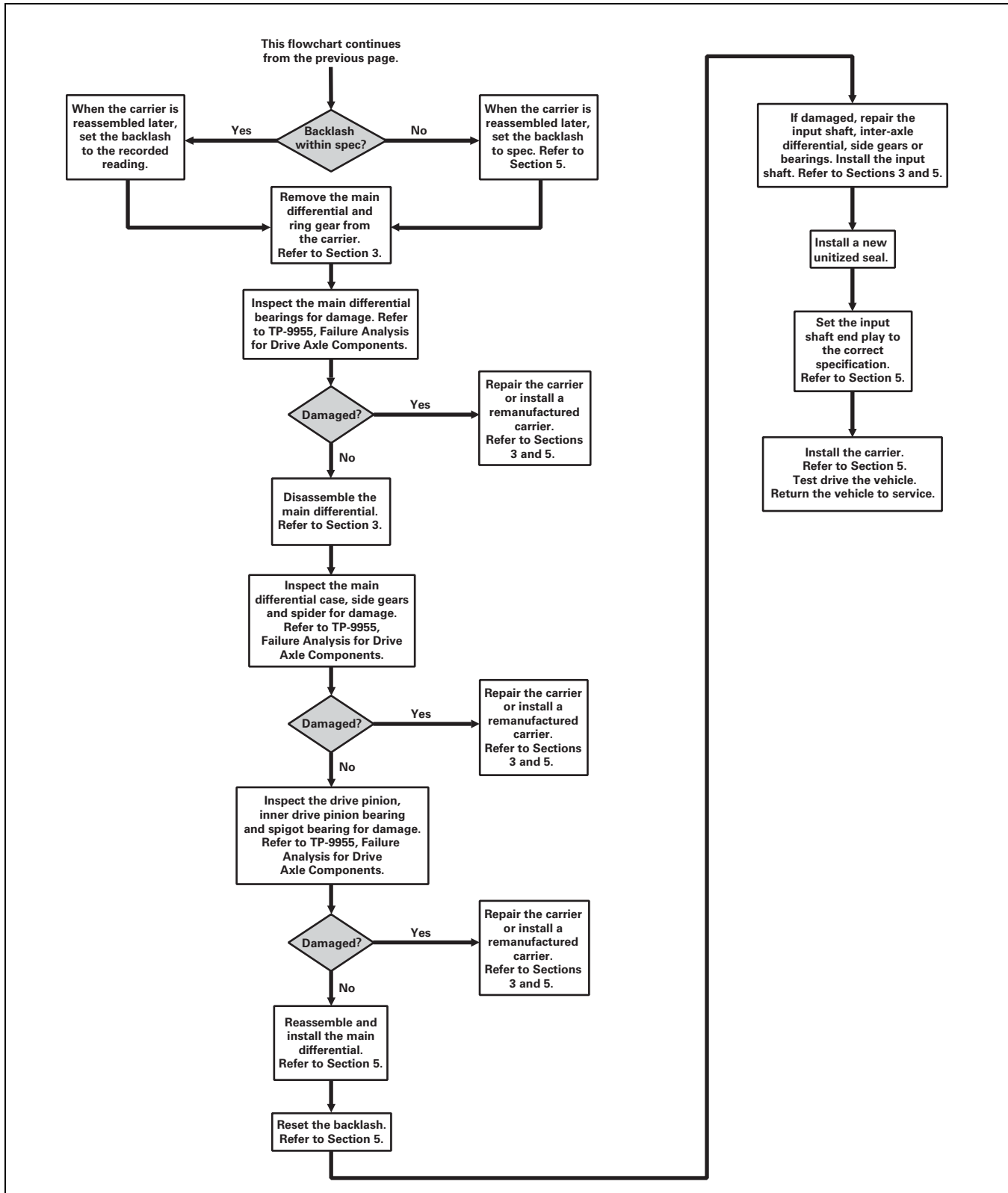
Fastener	Thread Size	Torque Value lb-ft (N•m)
Capscrews	0.31"-24	18-24 (24-33)
	0.50"-13	85-115 (115-156)
Stud Nuts	0.44"-20	50-75 (68-102)
Plain Nuts	0.50"-20	75-115 (102-156)
	0.56"-18	110-165 (149-224)
	0.62"-18	150-230 (203-312)
	0.75"-16	310-400 (420-542)
Locknut	0.44"-20	40-65 (54-88)
	0.50"-20	65-100 (88-136)
	0.56"-18	100-145 (136-197)
	0.62"-18	130-190 (176-258)
	0.75"-16	270-350 (366-475)

- Check the lubricant level in the axles and hubs where the axle shafts were removed. Add the correct type and amount of lubricant if necessary. Refer to Section 7.

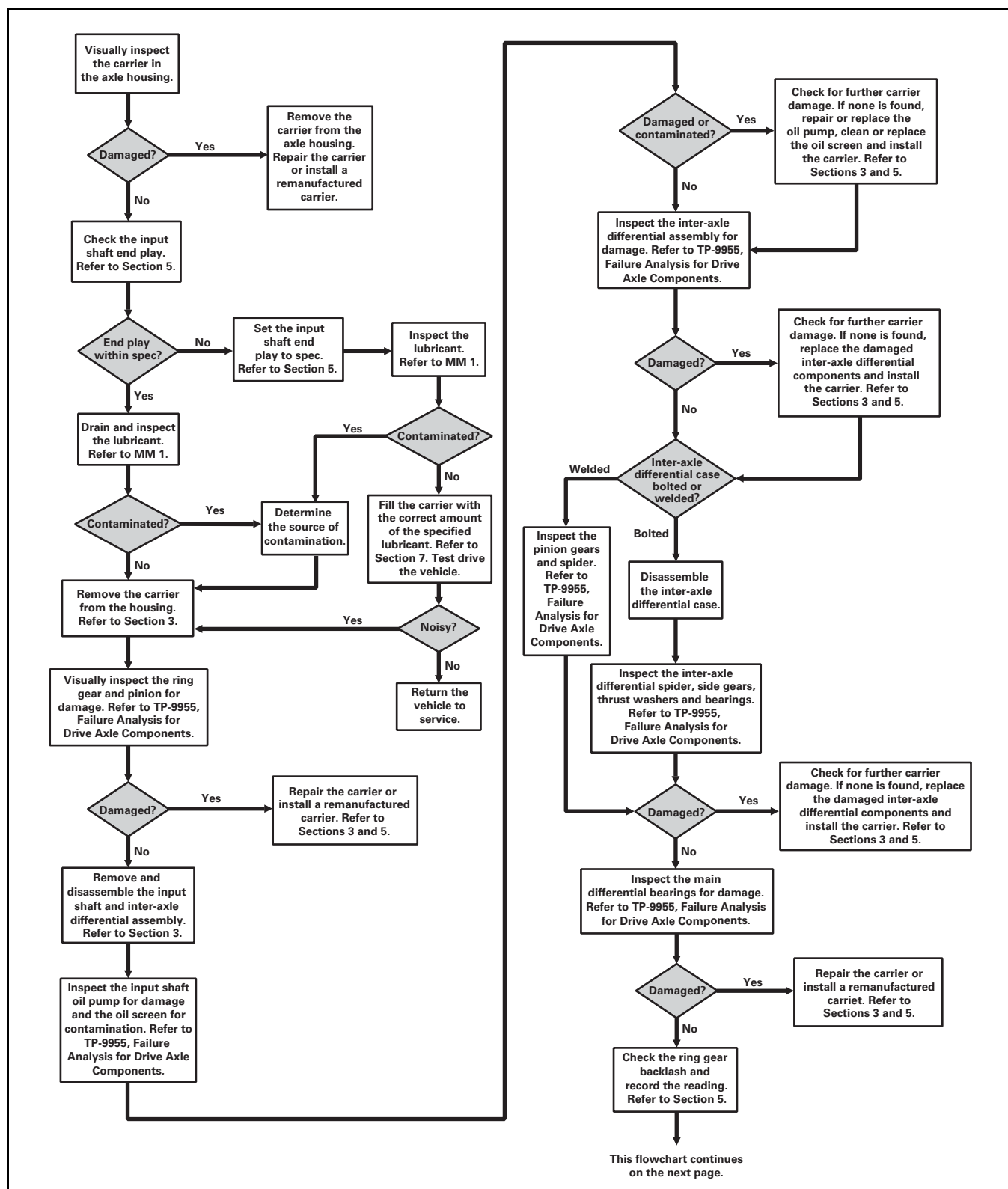
Troubleshooting

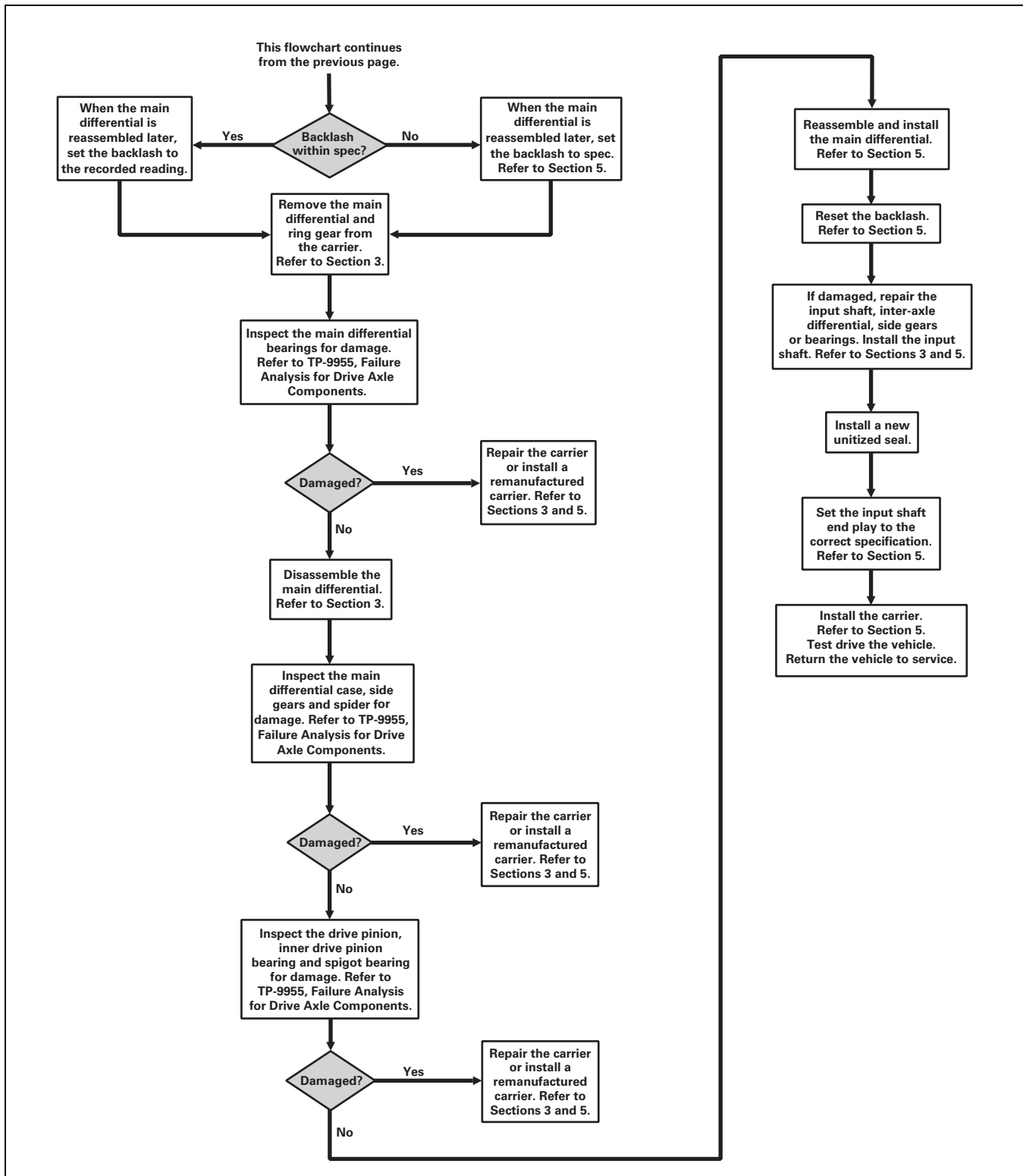
Vehicle Will Not Move



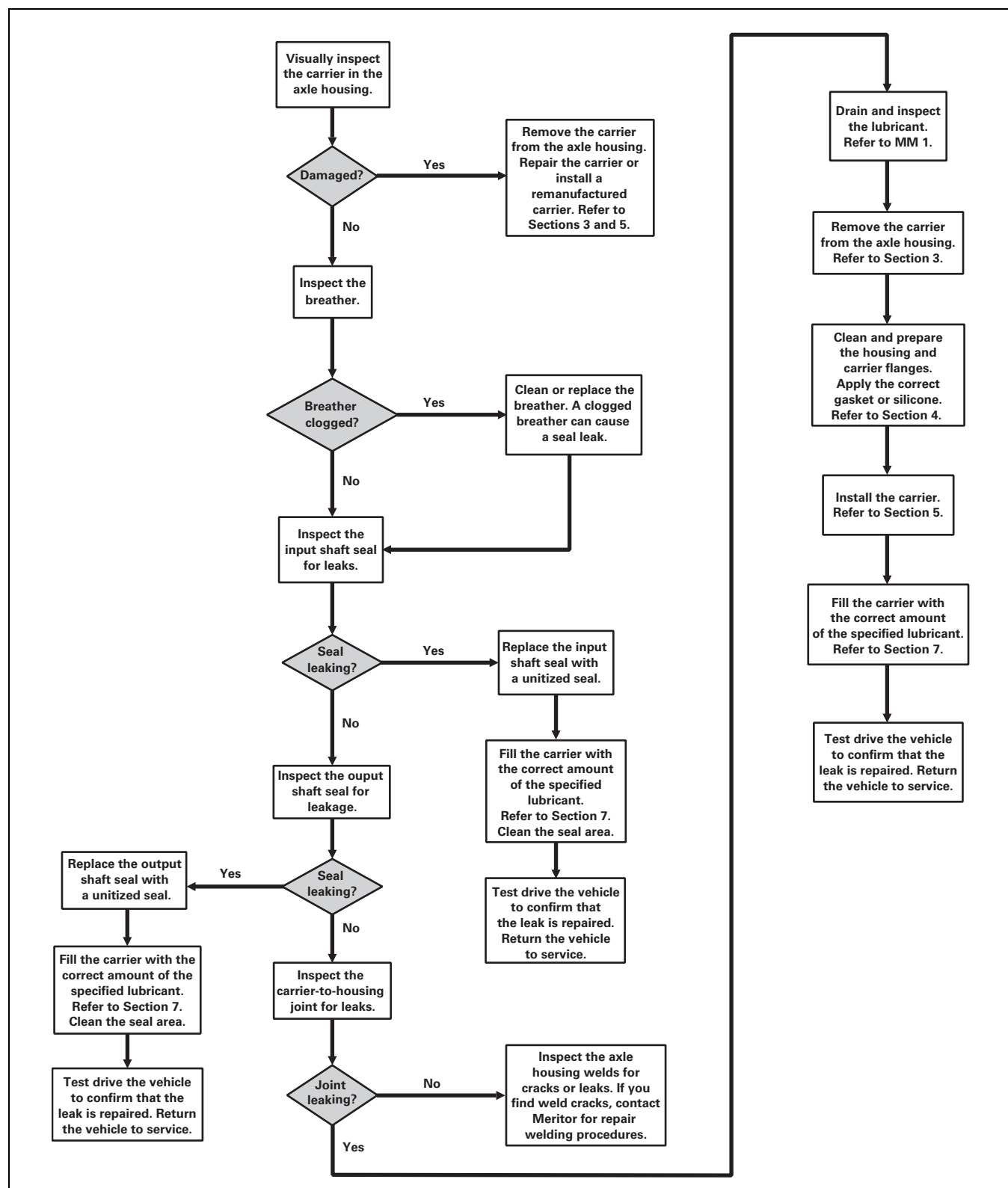


Differential Making Noise

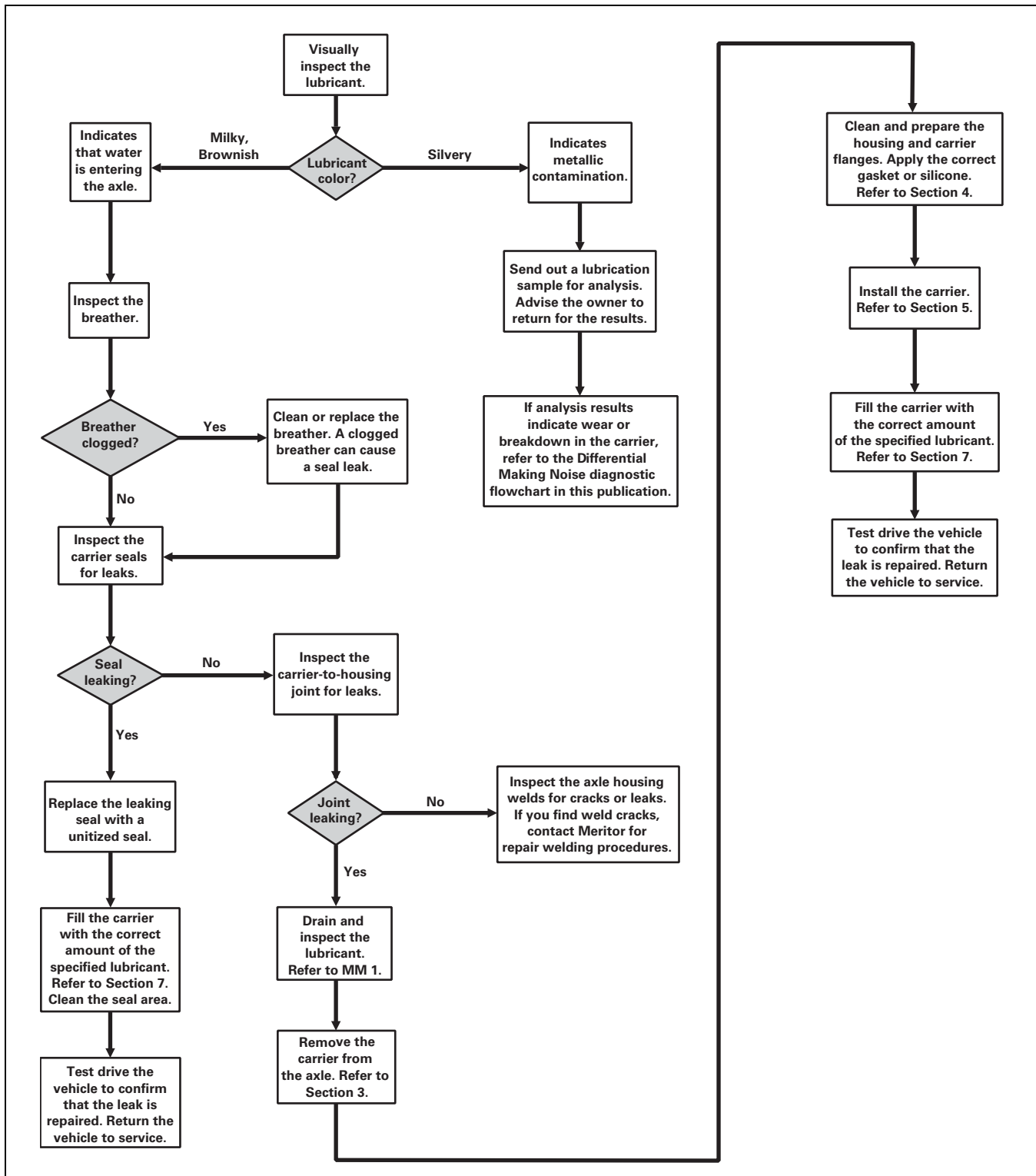




Oil Leak



Contaminated Lubricant Found During Preventive Maintenance



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