Mack Chassis - ITC ECU, Software And Data File Part Numbers

Internal Content

ITC MODULE Part Number			
ITC Version	**Hardware P/N**	**Certif. year**	**Comments**
ITC 01	5010217680	US 91	Prod. date 03/93
ITC 12	5010214430	US 94	Prod date 10/94
ITC 36	5010271166	US 98	Prod date 9/96
ITC 37	5010271166	US 98	Prod date 01/97

V-MAC I data file part number				
Software P/N	**Engine rating**	**Mack Data File P/N**	**Renault VI Data File P/N**	**Comments**
ITC 01	180HP L2	1MS535P1	-	
	215HP M2	1MS535P2	-	
	190HP L2	1MS535P3	-	
	220HP M2	1MS535P4	-	
ITC 12	190HP L510	1MS535P5	5010258153	
	220HP M510	1MS535P6	5010258154	
ITC 36	190HP L511	1MS535P7	-	
	220HP M511	1MS535P8	-	
	190HP L710	1MS535P9	-	
	220HP M710	1MS535P10	-	
ITC 37	180HP L2	-	5010339226	US91
	215HP M2	-	5010339227	US91
	190HP L510	-	5010339228	US94
	220HP		5010339229	US94

Live UI

	M510	-	5010339229	US94
	190HP L710	-	5010339517	Replaced by 5010450205
	220HP M710	-	5010339518	Replaced by 5010450206
	190HP L710	-	5010450205	US98 consent decree step 1
	220HP M710	-	5010450206	US98 consent decree step 1
	185HP AA71	-	5010450243	L711 California
	190HP L711	-	5010450461	US98 consent decree step 2
	220HP M711	-	5010450462	US98 consent decree step 2
	180HP AB71	-	5010450466	M711 California
	220HP M711	-	5010450577	W/ Turbo MK21

V-MAC I Low NOx kit data file part number

Refer to Service Letter ML-210-009

Tags k34162617 mack

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Related links and attachments **Feedback**

No links or attachments available

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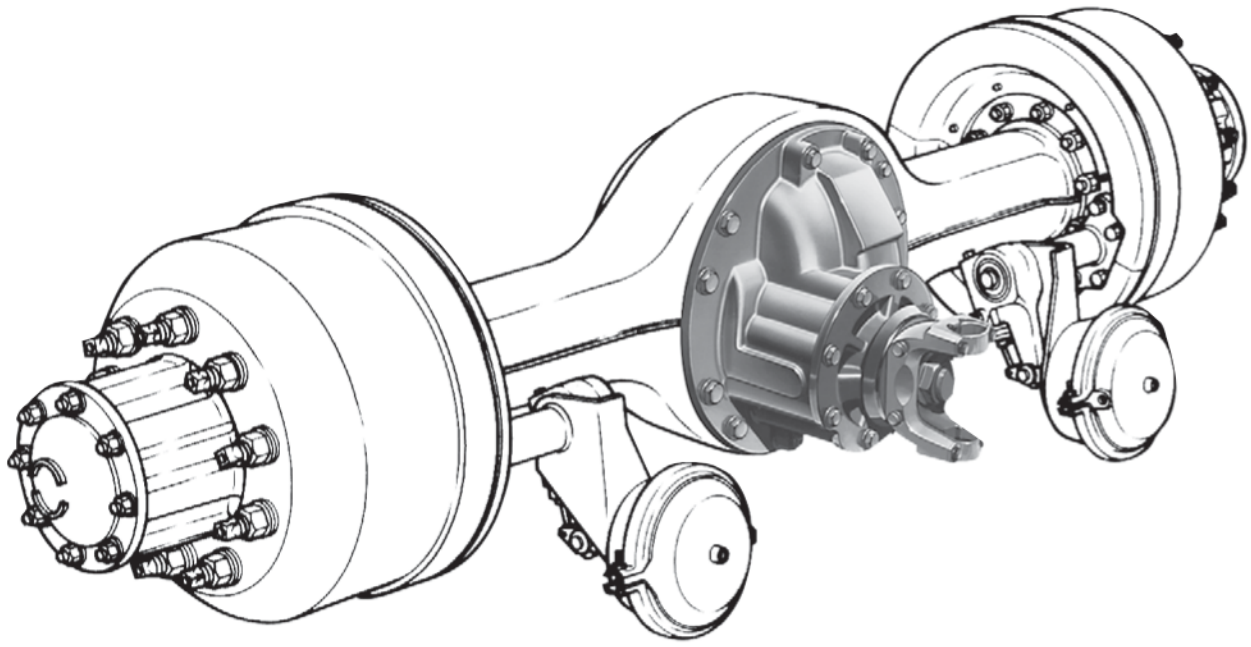
MERITOR

Maintenance Manual 5A

Single-Reduction Differential Carriers

Single Rear Drive Axles, Rear-Rear Tandem Drive Axles and Front Drive Steer Axles

Revised 02-18



About This Manual

This manual provides instructions for the Meritor MX, RS, RT and RF Series axles and 59000 Series angle drive carrier.

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.

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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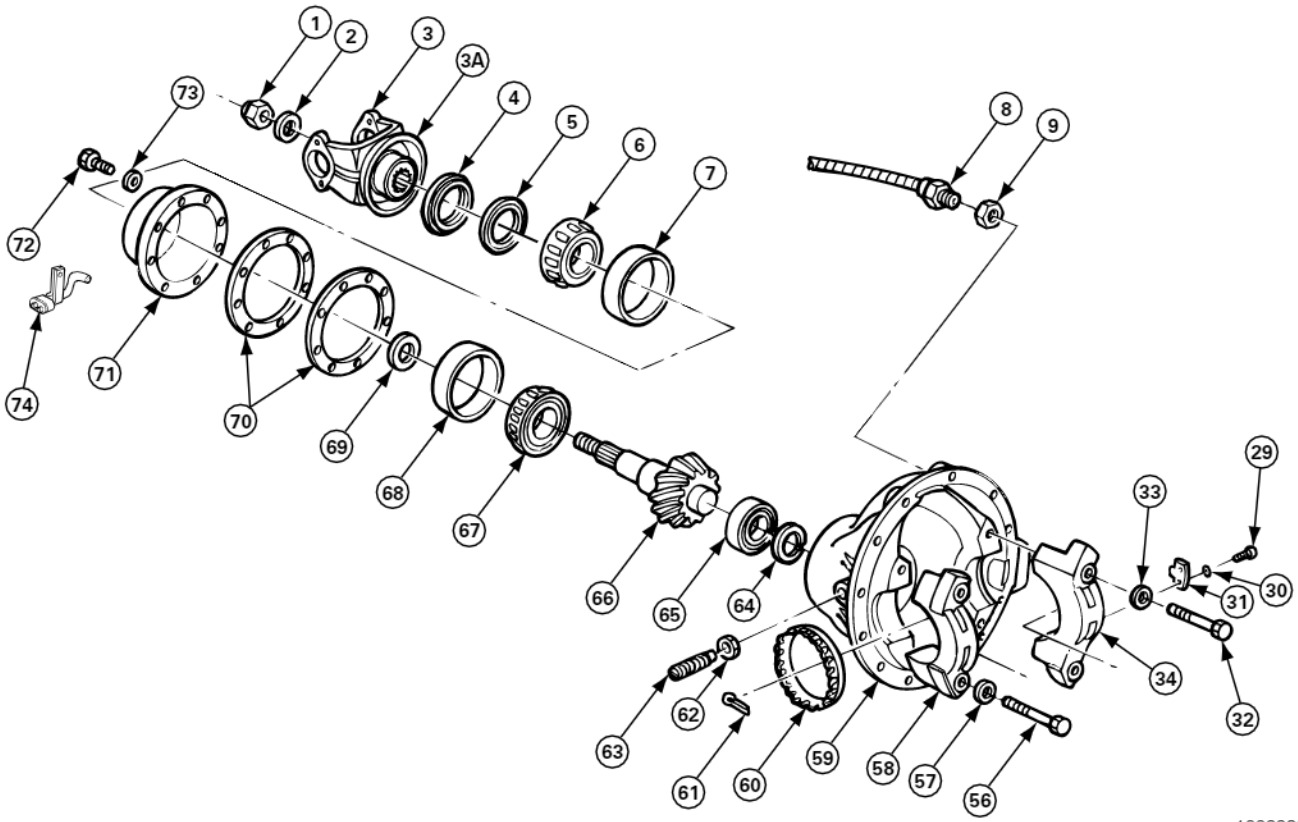
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Exploded Views

Single-Reduction Differential Carrier



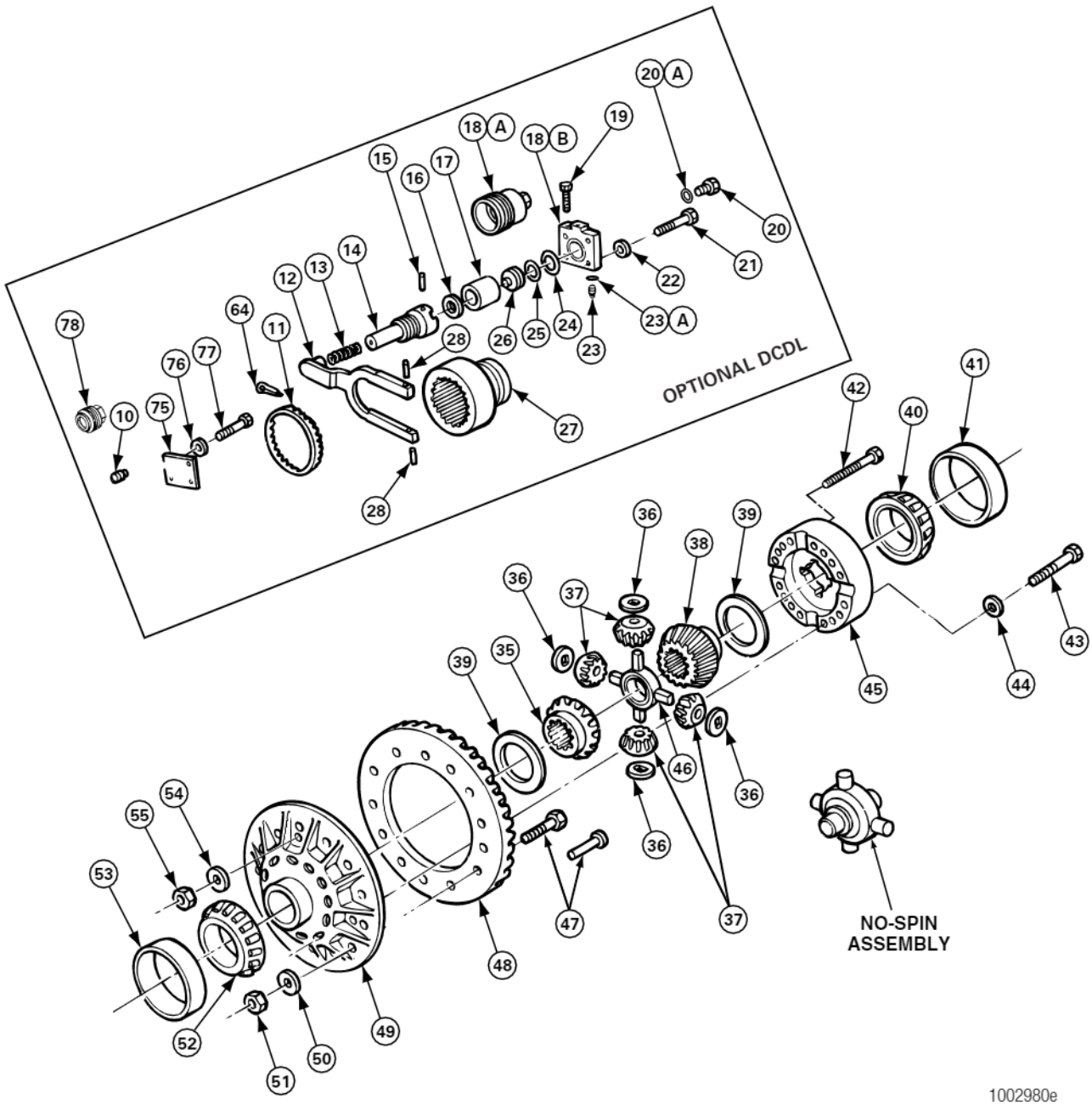
Item	Description
1	Drive Pinion Nut*
2	Drive Pinion Washer*
3	Input Yoke or Flange*
3A	Deflector
4	POSE™ Seal
5	Triple-Lip or Main Seal
6	Outer Bearing Cone
7	Inner Bearing Cup
8	Sensor Switch
9	Sensor Switch Locknut
29	Lock Plate Capscrews*
30	Lock Plate Washers*
31	Adjusting Ring Lock Plate

Item	Description
32	Differential Bearing Cap Capscrews
33	Washers
34	Differential Bearing Caps
56	Differential Bearing Cap Capscrews
57	Washers
58	Differential Bearing Cap
59	Carrier
60	Adjusting Ring
61	Adjusting Ring Cotter Pin, Spring Pin (Spirol™) or Capscrews
62	Thrust Screw Jam Nut*
63	Thrust Screw*
64	Snap Ring

1 Exploded Views

Item	Description
65	Spigot Bearing
66	Drive Pinion
67	Pinion Inner Bearing Cone
68	Pinion Inner Bearing Cup
69	Pinion Bearing Spacer
70	Shims
71	Drive Pinion Bearing Cage
72	Bearing Cage Capscrew
73	Washer
74	Clip and Cable Holder

* Some Meritor carriers do not have these parts.



Item	Description
10	Plug*
11	Right-Hand Adjusting Ring
12	Shift Fork
13	Shift Shaft Spring
14	Shift Shaft

Item	Description
15	Spring Retaining Pin
16	Air Cylinder Washer or Silastic*
17	Air Cylinder Tube
18A	Screw-In Differential Lock Cylinder
18B	Cylinder Cover

1 Exploded Views

Item	Description
19	Manual Actuation Capscrew
20	Cylinder Cover Plug
20A	Cover Plug Gasket
21	Cylinder Cover Capscrews
22	Cylinder Cover Washers
23	Cylinder Cover Plug
23A	Cover Plug Gasket
24	Cylinder Cover Copper Gasket
25	Piston O-Ring
26	Piston
27	Shift Collar
28	Shift Fork Pins
35	Differential Side Gears
36	Differential Pinion Thrust Washers
37	Differential Pinions
38	Differential Side Gears
39	Differential Side Gear Thrust Washers
40	Differential Bearing Cone
41	Differential Bearing Cup
42	Thru Bolt
43	Differential Case Bolts*
44	Differential Case Washers
45	Main Differential Case Assembly
46	Differential Spider
47	Ring Gear and Case Half Bolts or Rivets*
48	Ring Gear
49	Flange Case Half
50	Case Half Washers
51	Case Half Nuts*
52	Left-Hand Differential Bearing Cone
53	Left-Hand Differential Bearing Cup
54	Thru Bolt Washer
55	Thru Bolt Nut
64	Snap Ring
75	Bolt-On Cover
76	Washer
77	Bolt
78	Screw-In Cover

* Some Meritor carriers do not have these parts.

Description

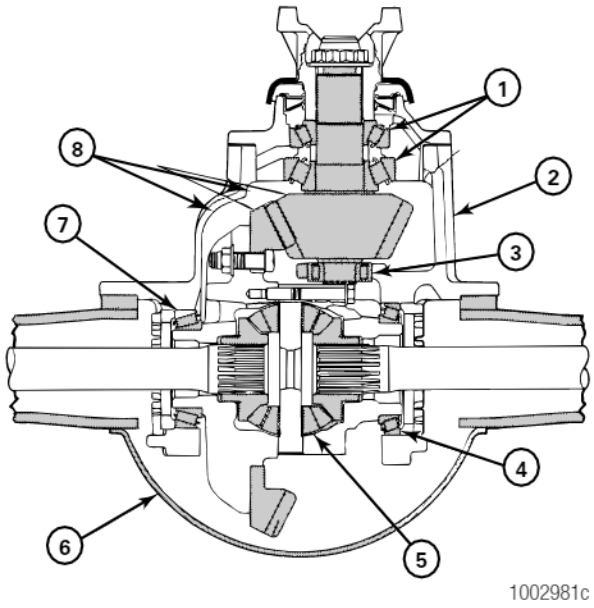
Standard Single-Reduction Carriers Without Differential Lock

Meritor single-reduction standard carriers are used in most Meritor single axles, rear of tandem axles and front drive steer axles. Figure 2.1.

The single-reduction carriers are front mounted into the axle housing. These carriers have a hypoid drive pinion and ring gear set and bevel gears in the differential assembly.

A straight roller bearing or spigot is mounted on the head of the drive pinion. All other bearings in the carrier are tapered roller bearings.

When the carrier operates, there is normal differential action between the wheels at all times.



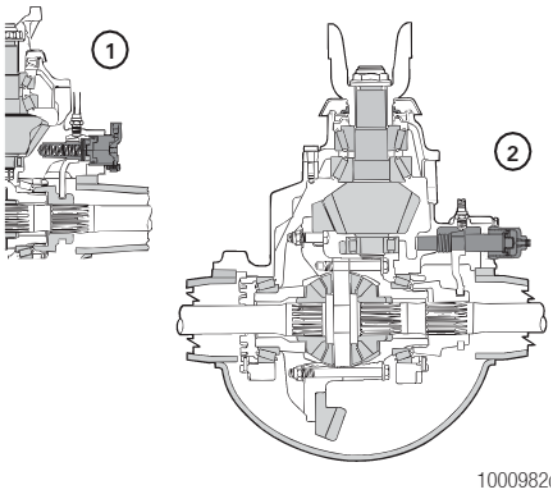
1 TAPERED ROLLER BEARINGS
2 CARRIER
3 STRAIGHT ROLLER BEARING
4 TAPERED ROLLER BEARING
5 BEVEL DIFFERENTIAL GEARS
6 HOUSING
7 TAPERED ROLLER BEARING
8 HYPOID DRIVE PINION AND RING GEAR

Figure 2.1

Single-Reduction Carriers with Driver-Controlled Main Differential Lock (DCDL)

Meritor single-reduction carriers with driver-controlled main differential lock (DCDL) have the same type of gears and bearings as the standard-type carriers. Figure 2.2. The differential lock is operated by an air-actuated shift assembly that is mounted on the carrier.

- When the differential lock is activated, the shift collar moves along the splines of the axle shaft toward the differential case.
- When the splines on the collar are engaged with splines on the differential case, the axle shafts and differential assembly are locked 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.



1 BOLT-IN STYLE
2 SCREW-IN OR THREADED STYLE

STANDARD CARRIER WITH DIFFERENTIAL LOCK (DCDL)

Figure 2.2

Axle Models Covered in This Manual

Table A, Table B, Table C and Table D list the axle models covered in this manual. For other models (non-MX, RS, RT and RF Series), refer to Maintenance Manual 5, Single-Reduction Differential Carriers. To obtain this publication, refer to the Service Notes page on the front inside cover of this manual.

Table A: RS and MS Series Single Drive Axles

RS-13-120	RS-17-145	RS-21-160	RS-23-186
RS-15-120	RS-17-145A	RS-21-160A	RS-25-160
RS-16-140	RS-19-144	RS-23-160	RS-25-160A
RS-16-141	RS-19-144A	RS-23-160A	RS-26-160
RS-16-145	RS-19-145	RS-23-161	RS-26-180
RS-17-140	RS-19-145A	RS-23-161A	RS-26-185
RS-17-141	RS-21-145	RS-23-180	RS-30-180
RS-17-144	RS-21-145A	RS-23-185	RS-30-185
RS-17-144A	MS-17-14X (hypoid)	MS-19-14X (hypoid)	MS-21-14X (hypoid)

Table B: Bus and Coach Application Single Drive Axles

59722	59753	61052	61152
59723	59842	61053	61153
59732	59843	61063	61163
59733	61042	61142	RC-23-160
59752	61043	61143	

Table C: Rear Axle of Tandem Axles

RT-34-140	RT-40-146	RT-44-145P	RT-46-169A
RT-34-144	RT-40-149	RT-44-149	RT-46-169P
RT-34-144A	RT-40-149A	RT-46-16HEH	RT-48-180
RT-34-144P	RT-40-149P	RT-46-16HP	RT-48-185
RT-34-145	RT-40-160	RT-46-160	RT-50-160
RT-34-145P	RT-40-160A	RT-46-160A	RT-50-160P
RT-34-146	RT-40-160P	RT-46-160P	RT-52-180
RT-40-140	RT-40-169	RT-46-164	RT-52-185
RT-40-145	RT-40-169A	RT-46-164EH	RT-58-180
RT-40-145A	RT-40-169P	RT-46-164P	RT-58-185
RT-40-145P	RT-44-145	RT-46-169	MT-34-14X (hypoid)
MT-40-14X (hypoid)	MT-44-14X (hypoid)		

Table D: Front Drive Steer Axles

MX-10-120	RF-7-120	RF-21-160
MX-12-120	RF-9-120	RF-21-185
MX-14-120	RF-12-120	RF-21-355
MX-16-120	RF-12-125	RF-22-166
MX-21-160	RF-16-145	RF-23-180
MX-21-160R	RF-21-155	RF-23-185
MX-23-160	RF-21-156	
MX-23-160R		

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.

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 can result.

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

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

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 3.1.

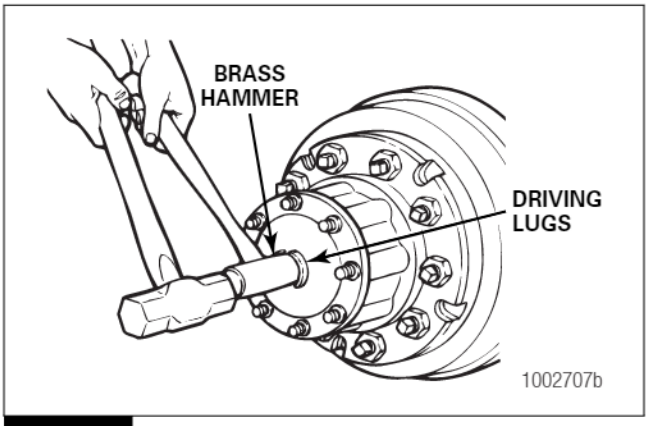


Figure 3.1

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 3.2.

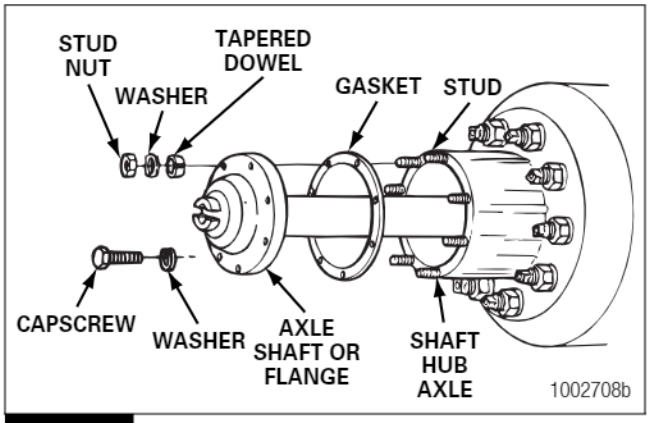


Figure 3.2

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 3.3.

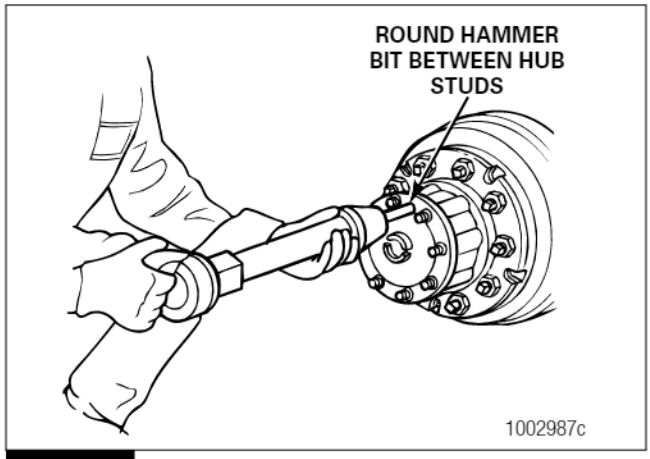


Figure 3.3

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 3.2.

Axle Shafts from the Axle Housing

NOTE: If the vehicle is equipped with a driver-controlled main differential lock, the DCDL collar must be engaged before removing the axle shafts. Refer to Section 6.

1. Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving. Figure 3.4.

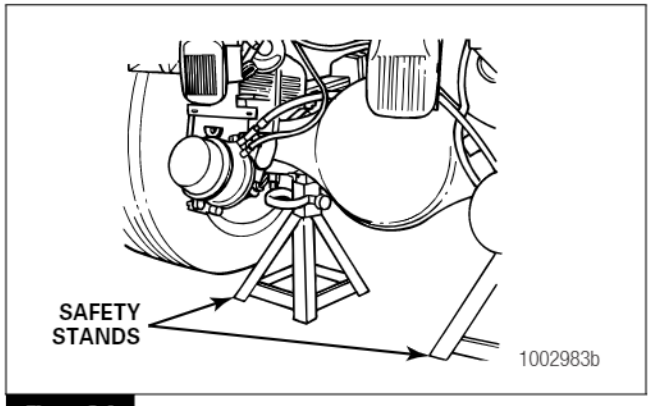
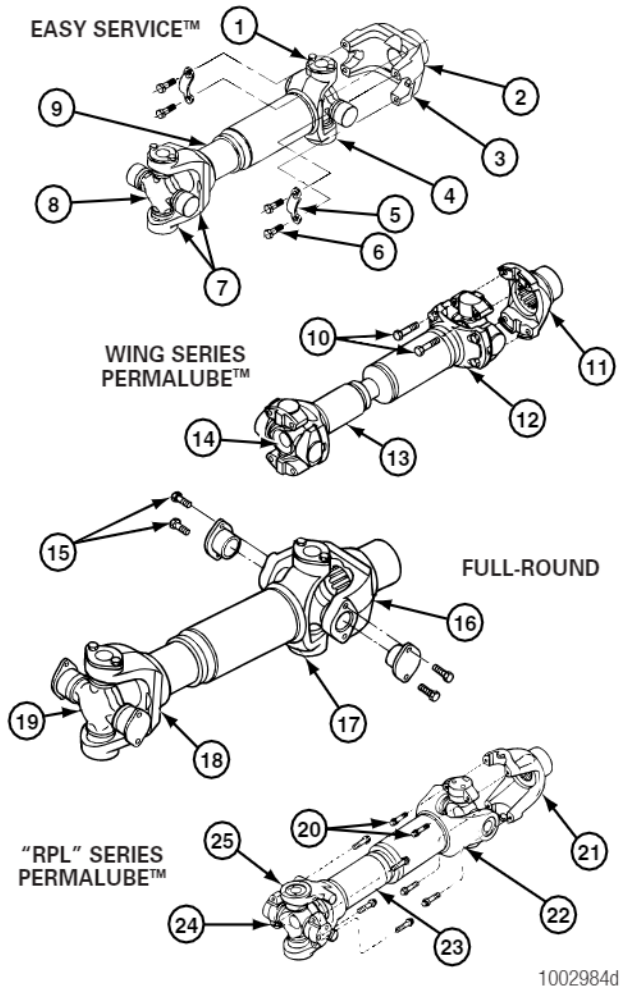


Figure 3.4

2. Use a jack or other lifting tool to raise the vehicle so that the wheels to be serviced are off the ground. Support the vehicle with safety stands. Figure 3.4.
3. Place a drain pan under the rear axle.

4. Remove the plug from the bottom of the axle housing. Drain the lubricant from the assembly.
5. Disconnect the driveline universal joint from the pinion input yoke or flange on the carrier. Figure 3.5.



1	FULL-ROUND BEARING CUPS	14	U-JOINT CROSS
2	END YOKE	15	CAPSCREWS
3	YOKE SADDLE	16	END YOKE
4	WELD YOKE	17	WELD YOKE
5	BEARING STRAP	18	SLIP YOKE
6	CAPSCREWS	19	U-JOINT CROSS
7	EASY SERVICE™ BEARING CUPS	20	CAPSCREWS
8	U-JOINT CROSS	21	END YOKE
9	SLIP YOKE	22	SLIP YOKE
10	CAPSCREWS	23	TUBING
11	END YOKE	24	U-JOINT CROSS
12	WELD YOKE	25	WELD YOKE
13	SLIP YOKE		

Figure 3.5

6. Remove the capscrews and washers or stud nuts and washers, if equipped, from the flanges of both axle shafts.
7. Loosen the tapered dowels, if equipped, in the axle flanges of both axle shafts. Refer to the procedures in this section.

Differential Carrier from the Axle Housing

1. Place a hydraulic roller jack under the differential carrier to support the assembly. Figure 3.6.

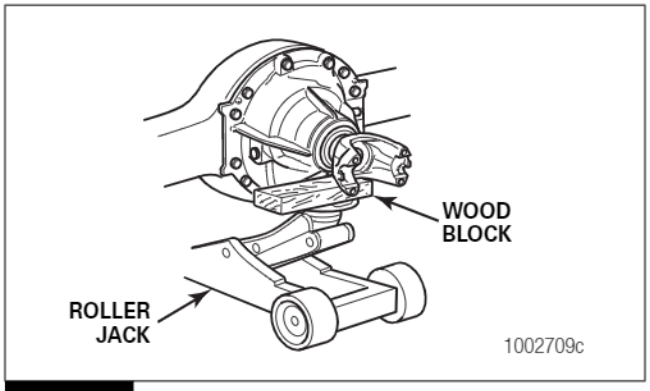


Figure 3.6

2. Remove all but the top two carrier-to-housing capscrews or stud nuts and washers.
3. Loosen the top two carrier-to-housing fasteners and leave attached to the assembly. The fasteners will hold the carrier in the housing.
4. Loosen the differential carrier in the axle housing. Use a leather mallet to hit the mounting flange of the carrier at several points.
5. After the carrier is loosened, remove the top two fasteners.

⚠ CAUTION

When you use 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.

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.

7. Use a lifting tool to lift the differential carrier by the input yoke or flange and place the assembly in a repair stand. Figure 3.7. Do not lift by hand. Refer to Section 10 to make a carrier repair stand.

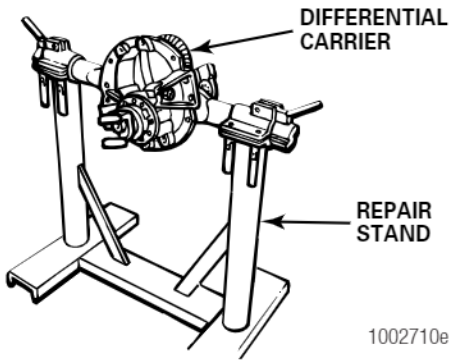


Figure 3.7

Measure Ring Gear Backlash

Before the differential carrier is disassembled, inspect the hypoid gear set for damage. If inspection shows no damage, the same gear set can be used again. 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 3.8.

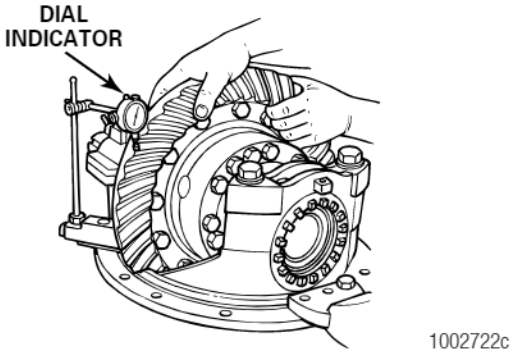


Figure 3.8

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 ring gears with a pitch diameter less than 17-inches (431.8 mm) or 0.010-0.020-inch (0.25-0.51 mm) for ring gears with a pitch diameter greater than 17-inches (431.8 mm):** Replace the ring gear and drive pinion as a set.

Differential and Ring Gear from the Carrier

1. Loosen the jam nut on the thrust screw, if equipped.
2. Remove the thrust screw and jam nut, if equipped, from the differential carrier. Figure 3.9 and Figure 3.10.

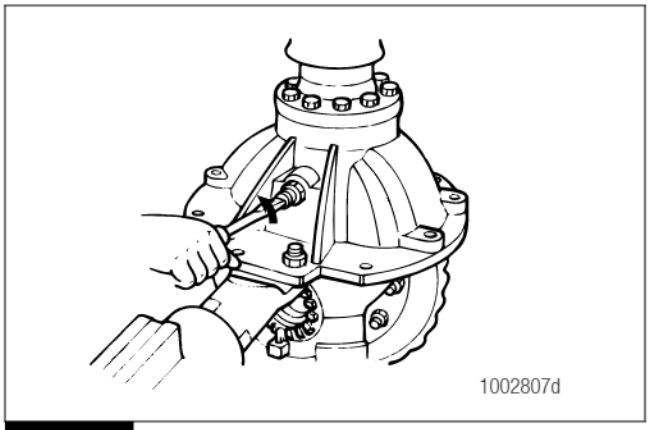


Figure 3.9

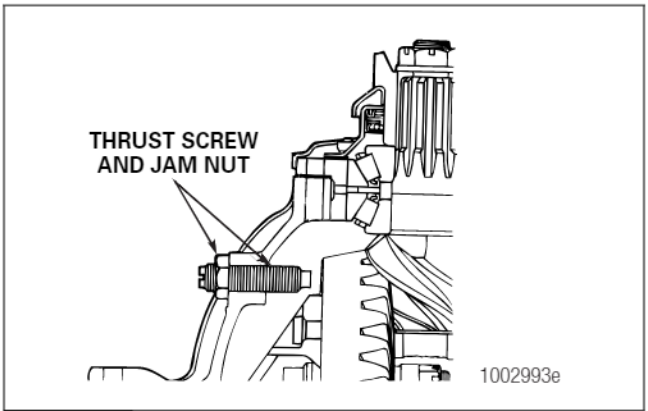


Figure 3.10

3. Rotate the differential carrier in the repair stand until the ring gear is at the top of the assembly.

4. Mark one carrier leg and bearing cap to correctly match the parts during carrier assembly. Mark the parts using a center punch and hammer. Figure 3.11.

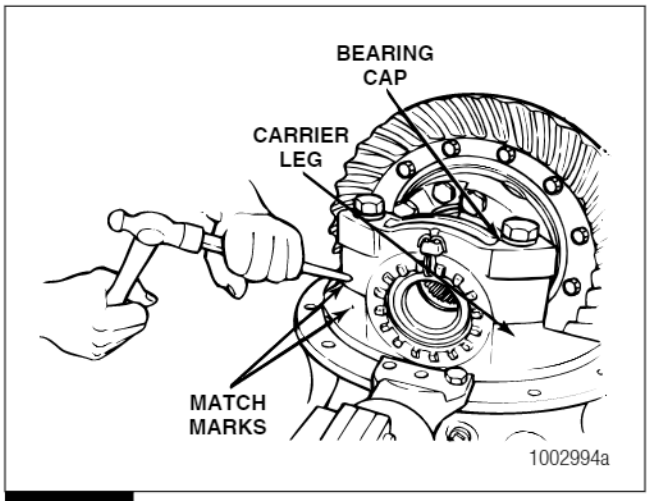


Figure 3.11

5. 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 3.12.

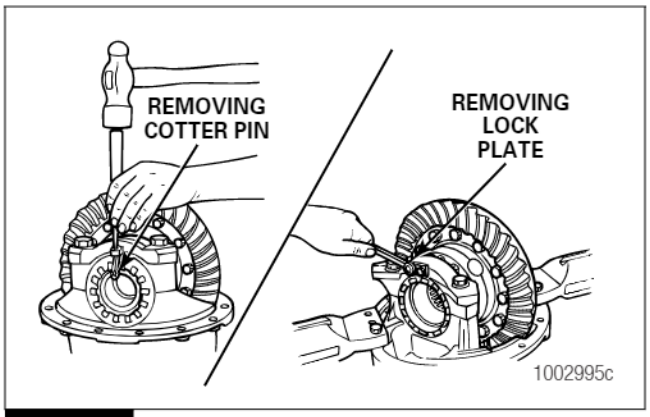


Figure 3.12

6. Remove the capscrews and washers that hold the two bearing caps on the carrier. Each cap is held in position by two capscrews and washers. Figure 3.13.

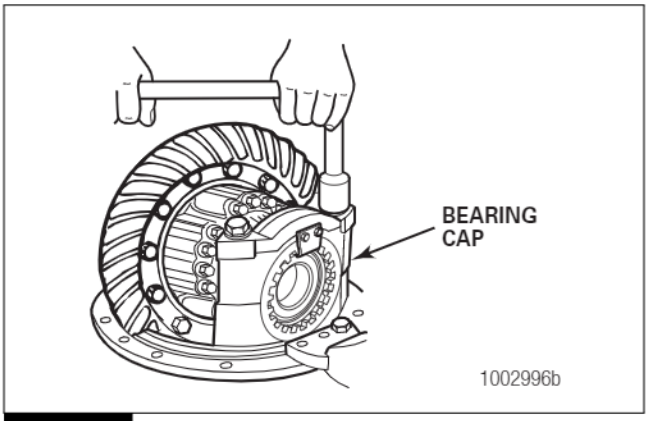


Figure 3.13

7. Remove the bearing caps and bearing adjusting rings from the carrier. Figure 3.14.

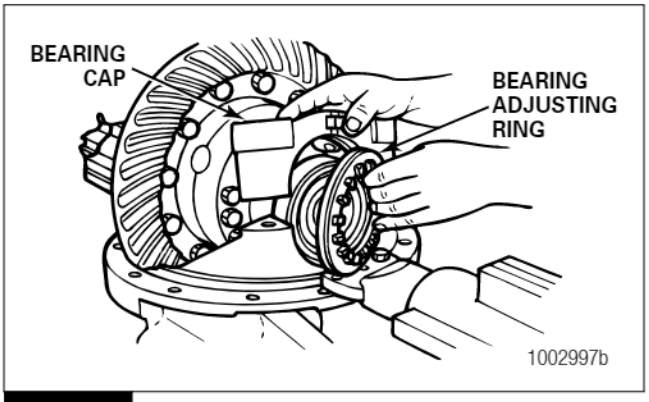


Figure 3.14

8. Safely lift the main differential and ring gear assembly from the carrier. Place the assembly on a workbench. Figure 3.15.

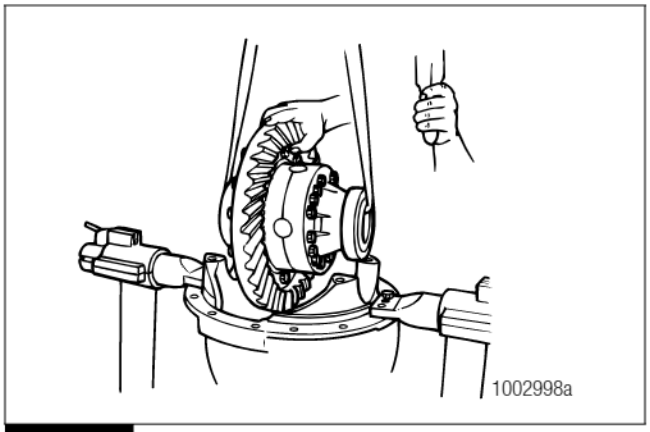


Figure 3.15

Disassembly

Differential and Ring Gear Assembly

1. If the match marks on the case halves of the differential assembly are not visible, mark each case half with a center punch and hammer. Figure 3.16.

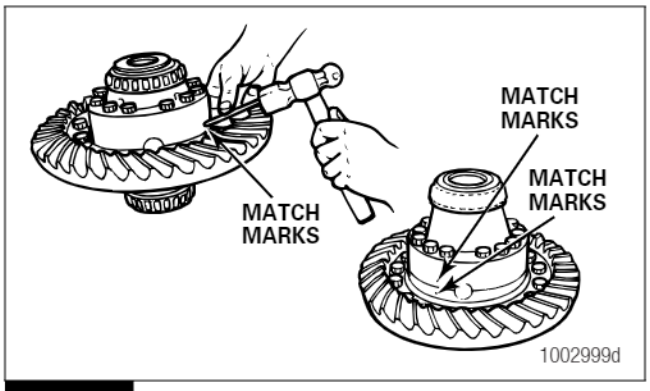


Figure 3.16

2. Remove the capscrews and washers or bolts, nuts and washers, if equipped, that hold the case halves together.
3. Separate the case halves. If necessary, use a brass, plastic or leather mallet to loosen the parts.
4. Remove the differential spider or cross, four pinion gears, two side gears and six thrust washers from inside the case halves. Figure 3.17.

   NOTE: There are two different design versions of the pinions and side gears: the original design and a new version with tooth profile enhancements. If the pinions or side gears must be replaced, the replacement part must be of the same design version as the mating part. Do not mix original design pinions with new design side gears and vice versa. Refer to Section 4 for further information about replacing these parts.

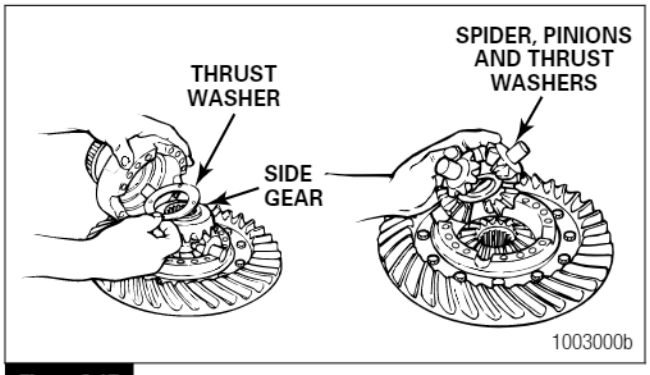


Figure 3.17

5. If the ring gear needs to be replaced, remove the bolts, nuts and washers, if equipped, that hold the gear to the flange case half.

⚠ CAUTION

Do not remove the rivets or rivet heads with a chisel and hammer. Using a flat edge tool can cause damage to the flange case.

6. If rivets hold the ring gear to the flange case half, remove the rivets as follows.
   A. Carefully center punch each rivet head in the center, on the ring gear side of the assembly. Do not use a chisel and hammer. Figure 3.18.
   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 0.03125-inch (0.79375 mm) smaller than the body diameter of the rivets. Figure 3.18.
   C. Press the rivets through holes in the ring gear and flange case half. Press from the drilled rivet head.

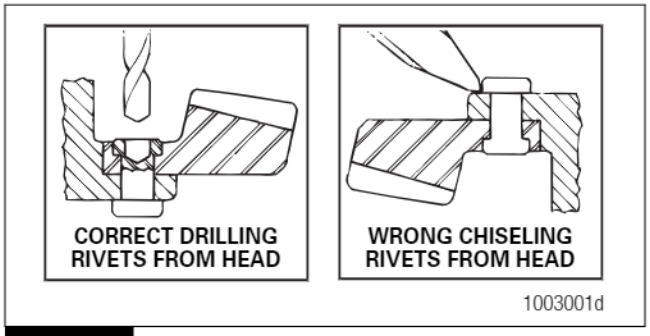


Figure 3.18

7. Use a press to separate the case half and ring gear. Support the assembly under the ring gear with metal or wood blocks. Press the case half through the gear. Figure 3.19.

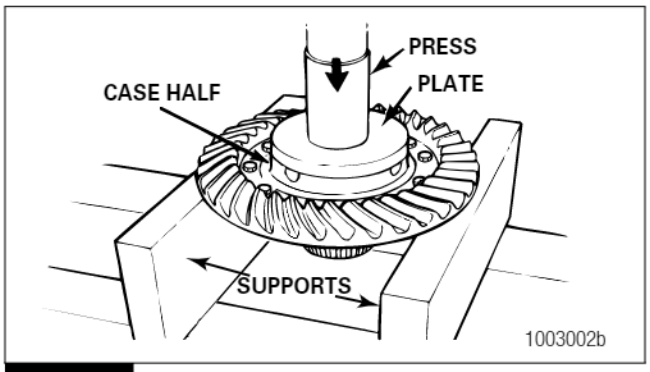


Figure 3.19

8. If the differential bearings need to be replaced, use a bearing puller or press to remove the bearing cones from the case halves. Figure 3.20.

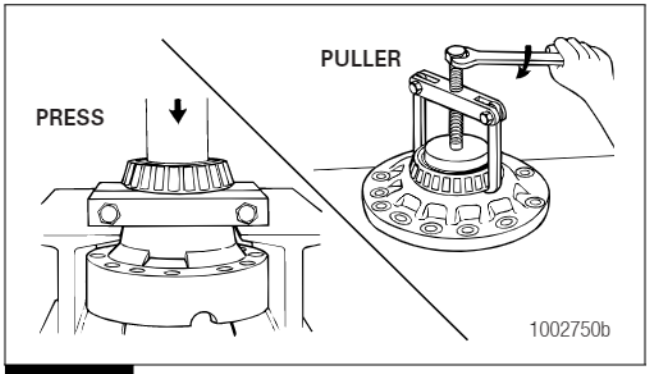


Figure 3.20

Removal

Drive Pinion and Bearing Cage from the Carrier

1. Fasten a flange bar to the input yoke or flange. When the nut is removed, the bar will hold the drive pinion in position. Figure 3.21.

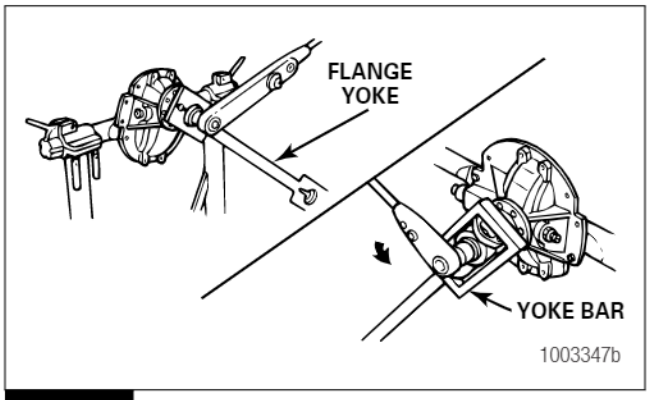


Figure 3.21

2. Remove the nut and washer, if equipped, from the drive pinion. Figure 3.21.
3. Remove the yoke or flange bar.

⚠ CAUTION

Do not use a hammer or mallet to loosen and remove the yoke or flange. A hammer or mallet can damage the parts and cause driveline runout or driveline imbalance.

4. Remove the yoke or flange from the drive pinion. Do not use a hammer or mallet.
   - **If the yoke or flange is tight on the pinion:** Use a puller for removal. Figure 3.22.

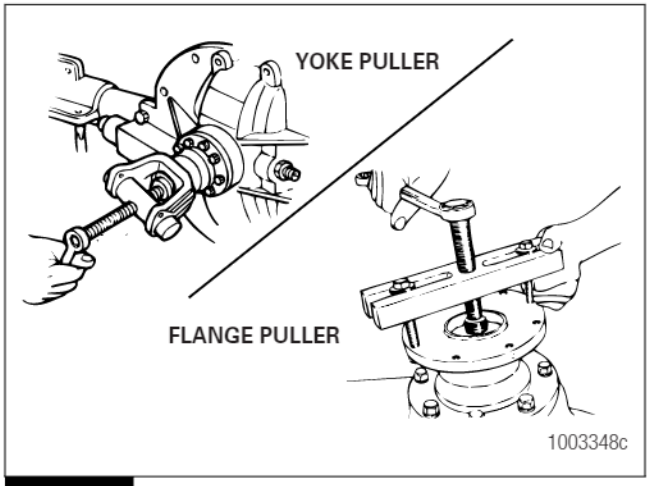


Figure 3.22

5. Remove the capscrews and washers that hold the bearing cage in the carrier. Figure 3.23.

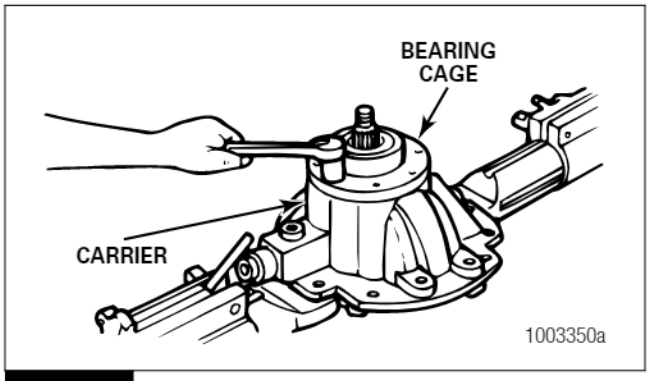


Figure 3.23

⚠ CAUTION

Do not use a pry bar to remove the bearing cage from the carrier. A pry bar can damage the bearing case, shims and carrier.

6. Remove the drive pinion, bearing cage and shims from the carrier. Do not use a pry bar.
   - **If the bearing cage is tight in the carrier:** Hit the bearing cage at several points around the flange area with a leather, plastic or rubber mallet. Figure 3.24.

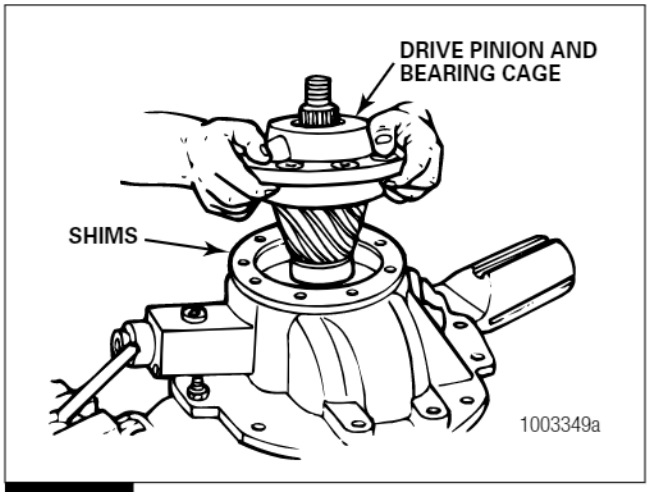


Figure 3.24

7. If the shims are in good condition, keep the shims together to use when the carrier is assembled.
8. If shims are to be discarded because of damage, first measure the total thickness of the pack. Make a note of the dimension. The dimension will be needed to calculate the depth of the drive pinion in the carrier when the gear set is installed.

Disassembly

Drive Pinion and Bearing Cage

1. Place the drive pinion and bearing cage in a press. The pinion shaft must be toward the top of the assembly. Figure 3.25.

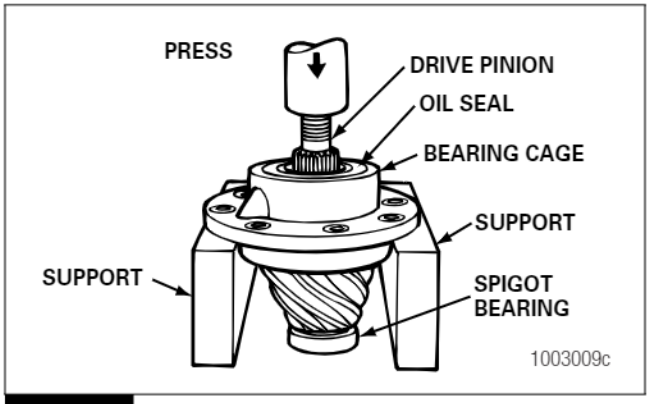


Figure 3.25

2. Support the bearing cage under the flange area with metal or wood blocks. Figure 3.25.
3. Press the drive pinion through the bearing cage. The inner bearing cone and bearing spacer will remain on the pinion shaft. Figure 3.25.
   - **If a press is not available:** Use a leather, plastic or rubber mallet to drive the pinion through the bearing cage.

⚠ CAUTION

Be careful when you remove the seal. Do not damage the wall of the bore. Damage to the bore wall can result in oil leaks.

4. Use a press and a sleeve to remove the triple-lip or unitized oil seal from the bearing cage.
   - **If a press is not available:** Place a tool with a flat blade under the flange to remove the oil seal from the cage. Figure 3.26.

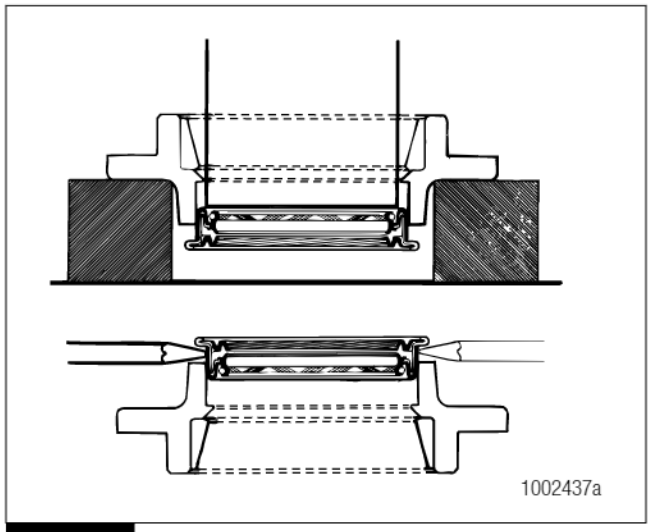


Figure 3.26

5. If the pinion bearings need to be replaced, remove the inner and outer bearing cups from the inside of the cage. Figure 3.27. Use a press and sleeve, bearing puller or a small drift hammer. The type of tool used depends on the design of the bearing cage. Figure 3.28.

   When a press is used, support the bearing cage under the flange area with metal or wood blocks.

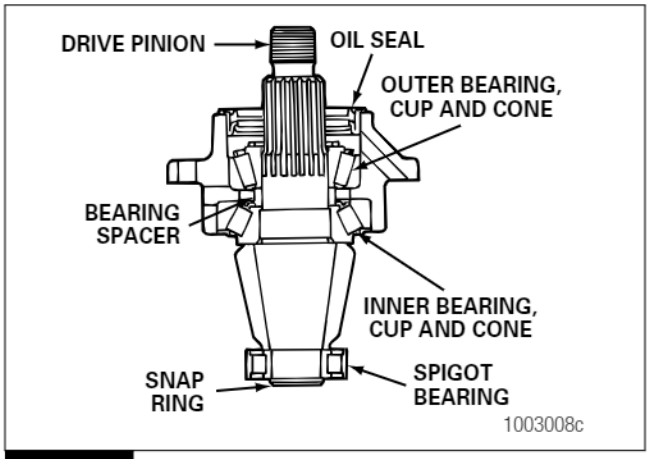


Figure 3.27

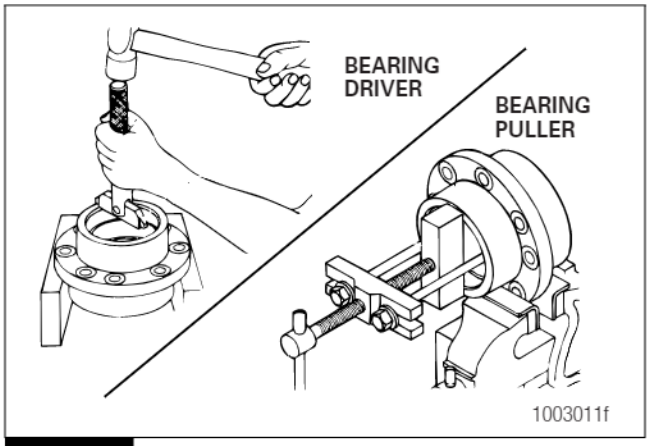


Figure 3.28

6. If the pinion bearings need to be replaced, remove the inner bearing cone from the drive pinion with a press or bearing puller. The puller must fit under the inner race of the cone to remove the cone correctly without damage. Figure 3.29.

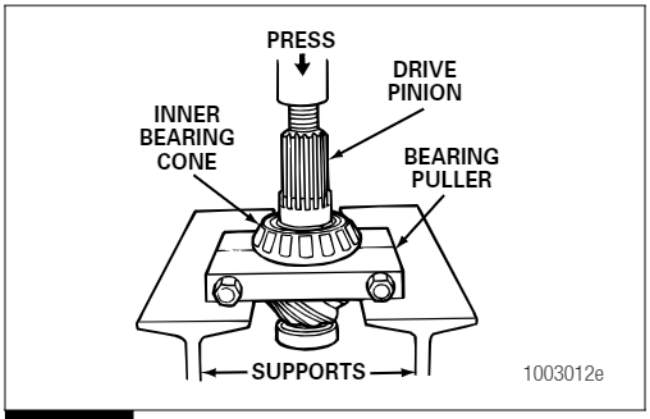


Figure 3.29

7. If the spigot bearing needs to be replaced, place the drive pinion in a vise. Install a soft metal cover over each vise jaw to protect the drive pinion.

8. Remove the snap ring, if equipped, from the end of the drive pinion with snap ring pliers that expand. Figure 3.30.

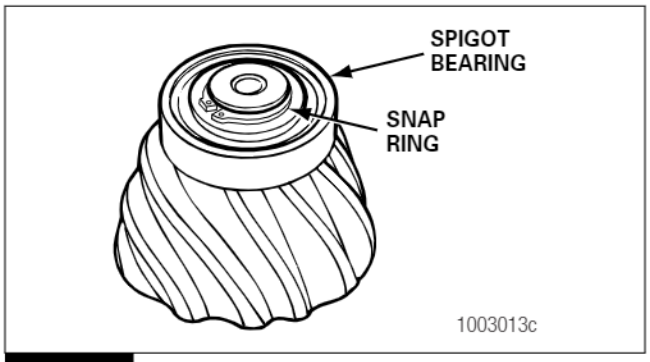


Figure 3.30

9. Remove the spigot bearing from the drive pinion with a bearing puller. Figure 3.31. Some spigot bearings are fastened to the drive pinion with a special peening tool. Figure 3.32.

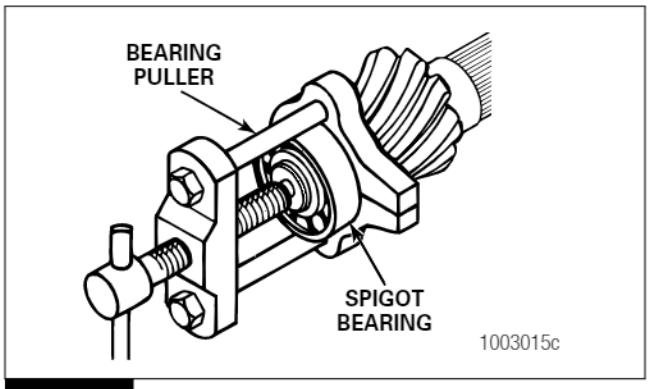


Figure 3.31

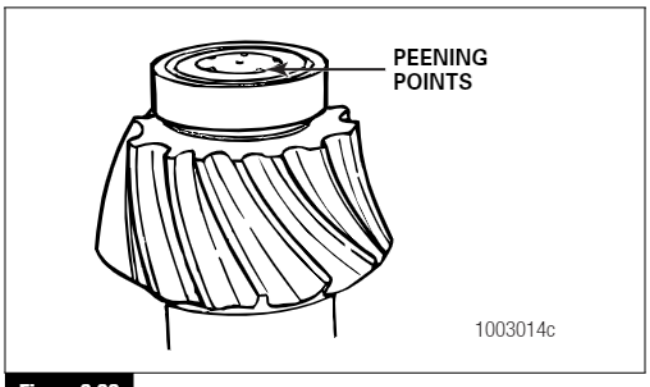


Figure 3.32

10. If the spigot bearings are a two-piece assembly, remove the inner race from the pinion with a bearing puller. Remove the outer race and roller assembly from the carrier with a drift or a press. Figure 3.33.

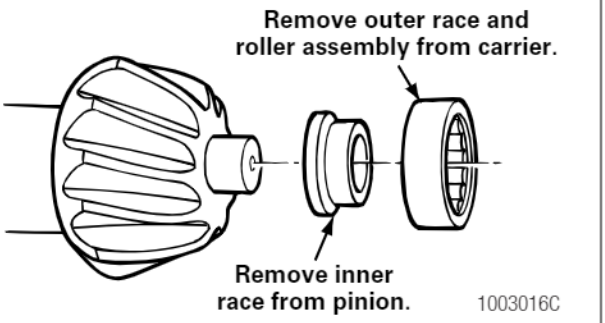


Figure 3.33

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

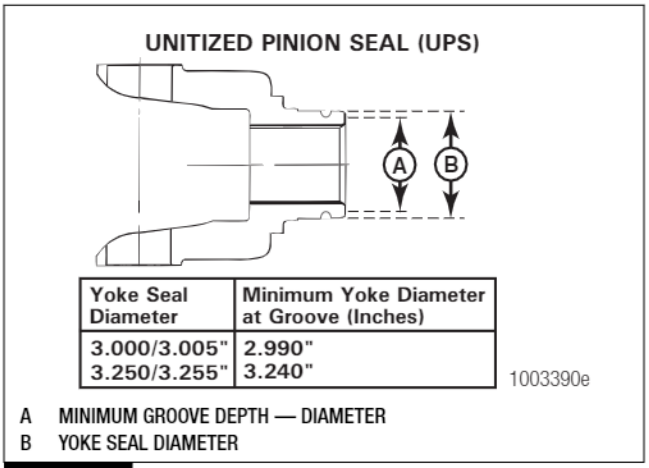
Do not install a press-on shaft excluder or POSE™ seal after you install a unitized pinion seal. The use of a POSE™ seal will prevent correct seating of the unitized pinion seal on the yoke and will result in lubricant leakage at the seal. POSE™ seal installation is recommended only for triple-lip and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



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

1003390e

A MINIMUM GROOVE DEPTH — DIAMETER
B YOKE SEAL DIAMETER

Figure 4.1

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.
   - 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.

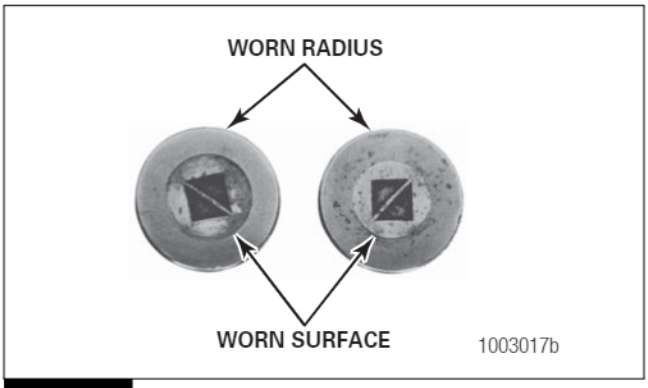


Figure 4.2

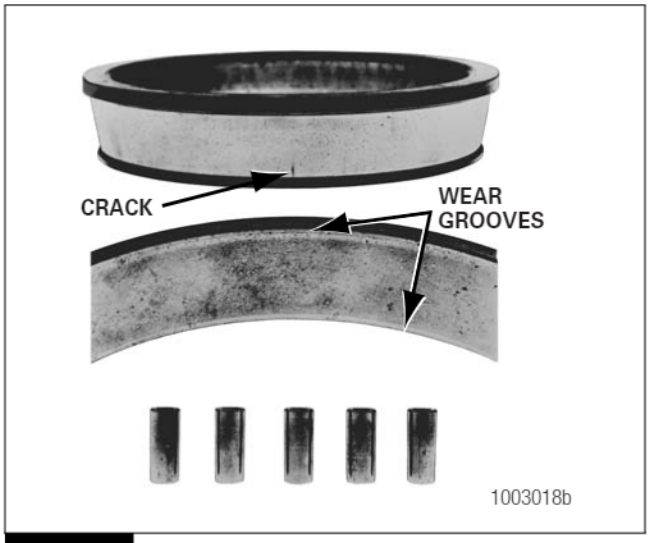


Figure 4.3

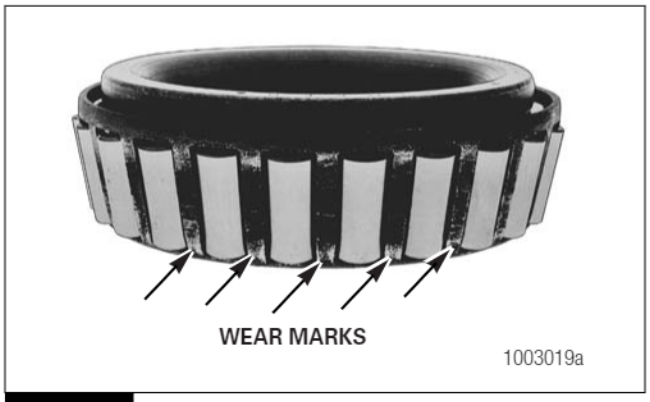


Figure 4.4

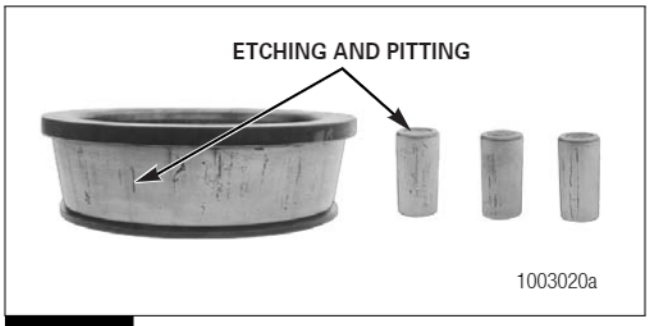


Figure 4.5

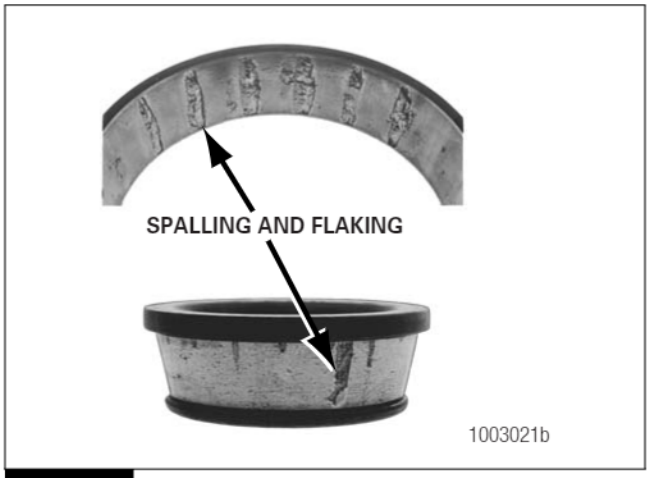


Figure 4.6

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

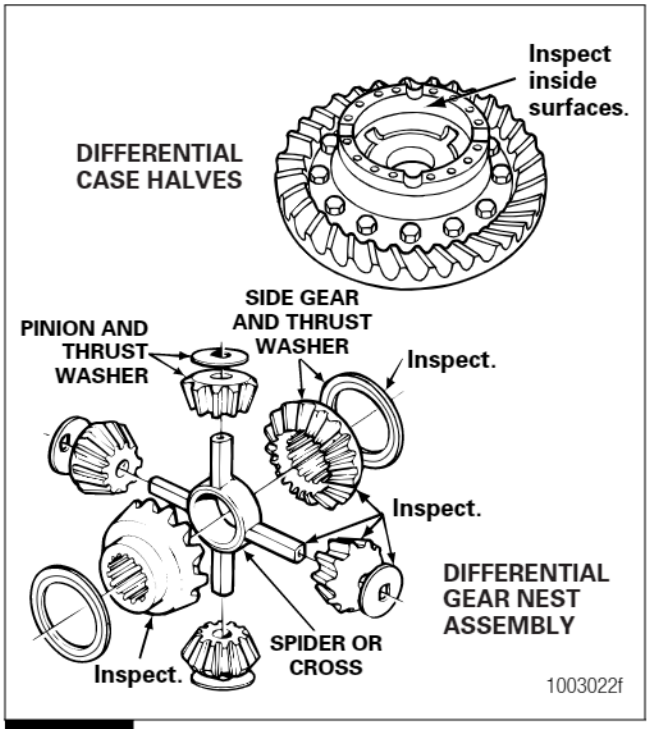


Figure 4.7

Important Note about Replacing Differential Pinions and Side Gears

The main differential pinions and side gears on 14X/145 series differential carriers have been redesigned as of May 1, 2017. The new design, shown in Figure 4.8, features tooth profile enhancements from the original version, shown in Figure 4.9. If the pinions or side gears must be replaced, the replacement part must be of the same design version as the mating part, i.e., original design pinions used only with original design side gears. Original design pinions must NOT be used with new design side gears and vice versa.

NOTE: If original design version parts are not available to match the original design version mating part, you must replace BOTH the pinions and side gears using new design version parts.

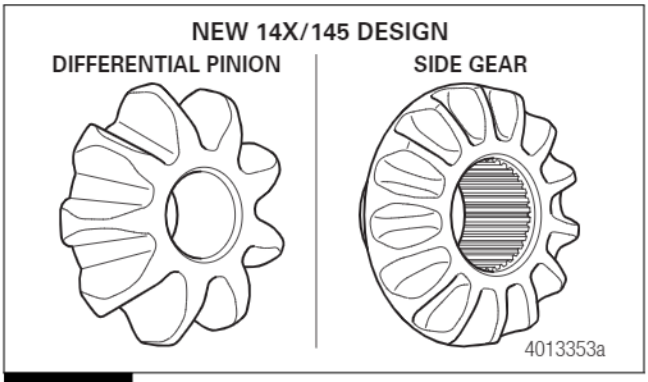


Figure 4.8

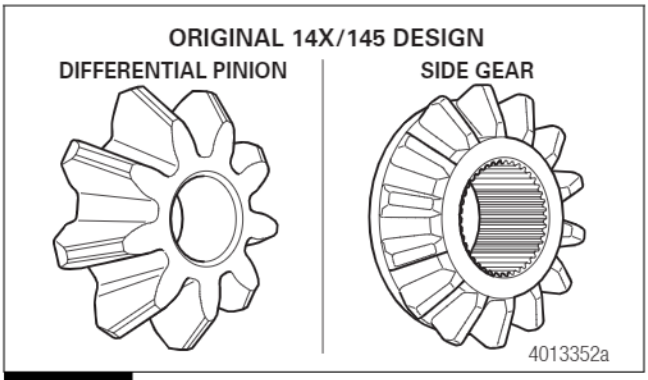


Figure 4.9

⚠ CAUTION

Original and new design parts must NOT be mixed together during service. The differential pinion version must match the side gear version used. Mixing original design parts with new design parts will result in a locked up differential and possible damage to components.

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 4.10.

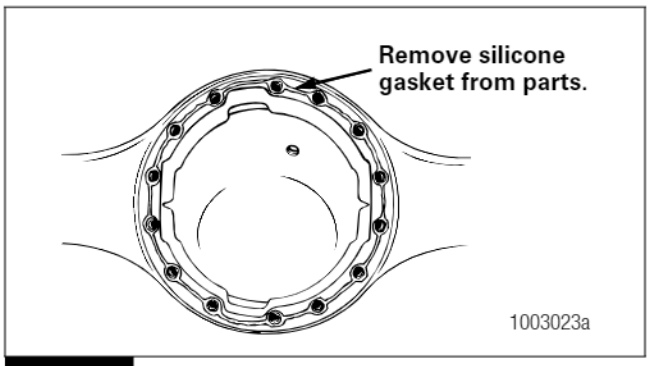


Figure 4.10

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.

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-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. Figure 4.11.

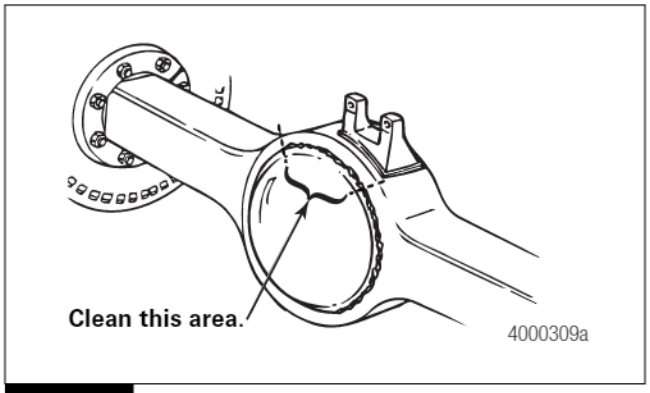


Figure 4.11

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. Figure 4.12 and Figure 4.13.

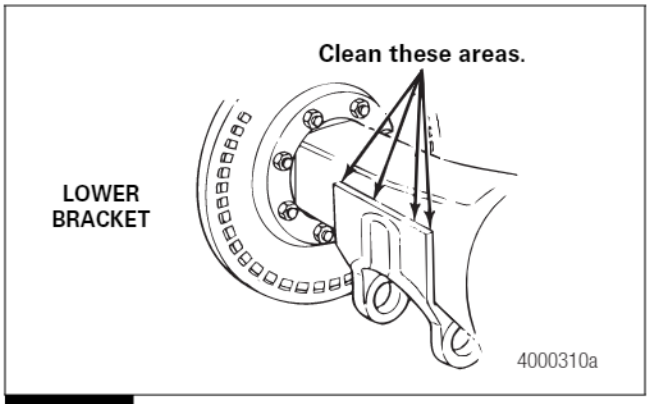


Figure 4.12

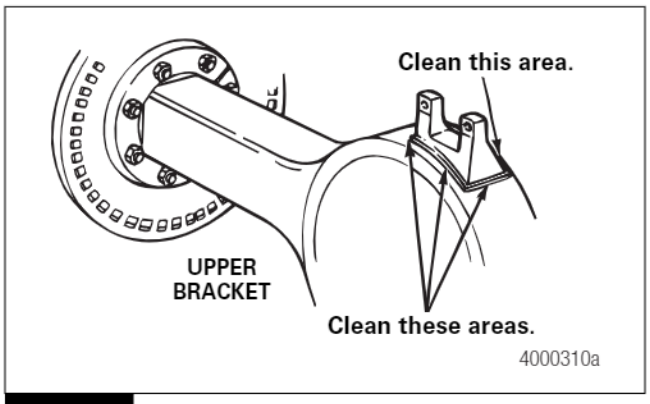


Figure 4.13

⚠ 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.

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 4.14.

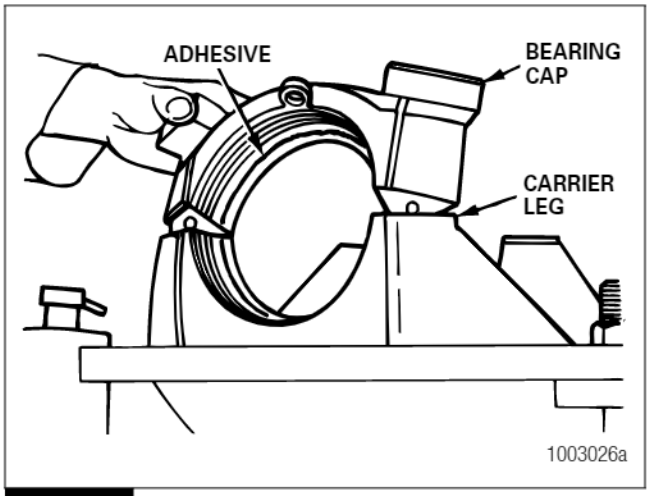


Figure 4.14

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 surface.

3. Use a rotary tool with a mild, non-abrasive pad to clean all silicone residue from the housing and carrier faces. Figure 4.15. Surfaces must be clean, dry and free of foreign matter. The surfaces must not be oily to the touch.



Figure 4.15

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 0.25-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.

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 4.16.

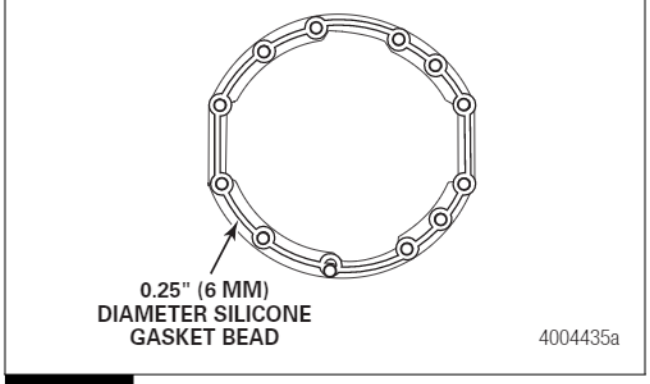


Figure 4.16

11. Install two long studs in the carrier to guide the carrier into the housing. Tighten the studs until no threads are exposed.
12. Immediately install the carrier into the housing to permit 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.
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 4.17.

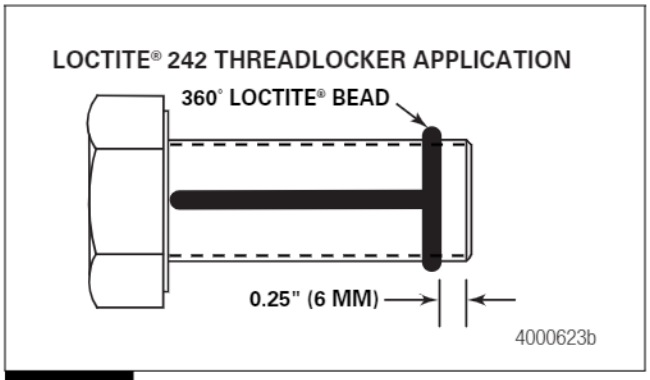


Figure 4.17

14. Install the capscrews. Use a crossing pattern to tighten the capscrews evenly. Refer to the correct torque value in Section 8. The capscrews must be tightened within 10 minutes of initial application of Loctite® 242 threadlocker.
15. Apply Loctite® 242 threadlocker to the stud threads.
16. Install the stud nuts and tighten. Refer to the correct torque value in Section 8.

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

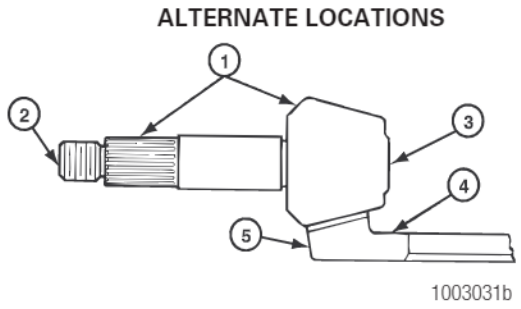
General Yoke and U-Joint Reassembly

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 E, Table F, Table G and Table H 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 4.18.



1 PART NUMBER, TOOTH COMBINATION NUMBER, GEAR SET MATCH NUMBER, PINION CONE VARIATION NUMBER
2 PART NUMBER, TOOTH COMBINATION NUMBER
3 GEAR SET MATCH NUMBER, PINION CONE VARIATION NUMBER
4 PART NUMBER, TOOTH COMBINATION NUMBER, GEAR SET MATCH NUMBER
5 PART NUMBER, TOOTH COMBINATION NUMBER, GEAR SET MATCH NUMBER

Figure 4.18

Examples

Table E: 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
Hypoid ring gear	36786 K or 36786 K2	On the front face or outer diameter
Hypoid drive pinion	36787 K or 36787 K2	At the end at threads

Table F: 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 G: 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 H: Pinion Cone Variation Number

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

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.

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.

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.

Assembly

Drive Pinion, Bearings and Bearing Cage

1. Place the bearing cage in a press. Figure 5.1.

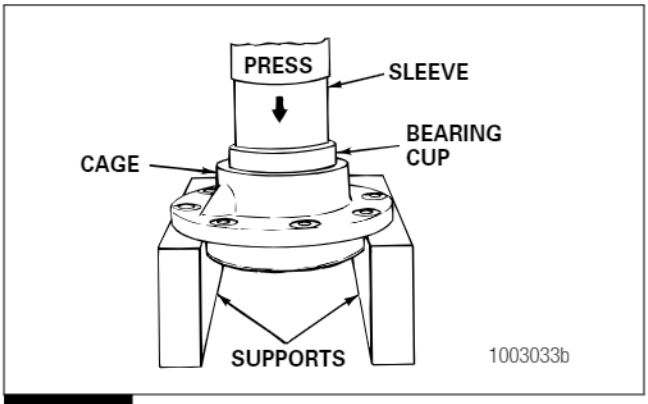


Figure 5.1

2. Support the bearing cage with metal or wood blocks.
3. Press the bearing cup into the bore of the bearing cage until the cup is flat against the bottom of the bore. Use a sleeve of the correct size to install the bearing cup. Use the same procedure for both bearing cups. Figure 5.1.
4. Place the drive pinion in a press with the gear head or teeth toward the bottom. Figure 5.2.

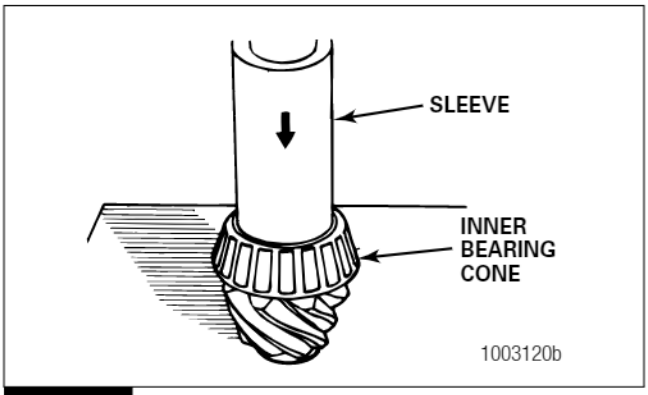


Figure 5.2

5. Press the inner bearing cone on the shaft of the drive pinion until the cone is flat against the gear head. Use a sleeve of the correct size against the bearing inner race.

NOTE: Spigot bearings are usually fastened to the drive pinion with a snap ring. Some are fastened with a peening tool, and some are a two-piece bearing assembly with the inner race pressed on the nose of the pinion and the outer race pressed into its bore in the carrier.

6. Install the spigot bearing using one of the following three procedures.

Installation

One-Piece Spigot Bearing on the Drive Pinion with a Snap Ring

NOTE: The following procedure applies to all axles except:

- Some 160 Series single axles may use snap rings.
- Some 160 and 180 Series rear-rear tandem axles may use snap rings.

1. Place the drive pinion in a press with the gear head or the teeth toward the top. Figure 5.3.

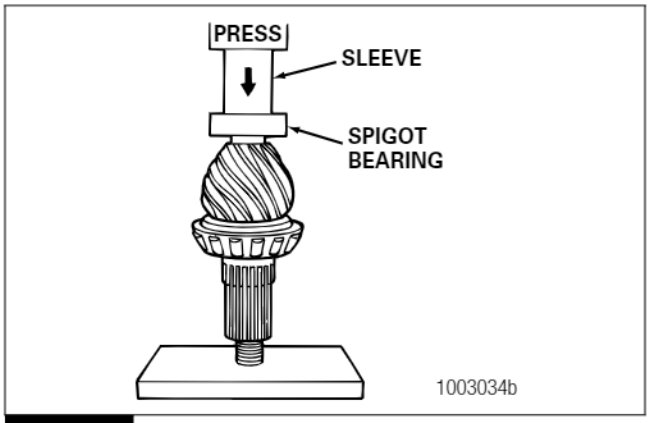


Figure 5.3

2. Press the spigot bearing on the end of the drive pinion. The bearing must be flat against the gear head. Use a sleeve of the correct size against the bearing inner race. Figure 5.3.
3. Use snap ring pliers to install the snap ring, if equipped, into the groove in the end of the drive pinion. Figure 5.4.

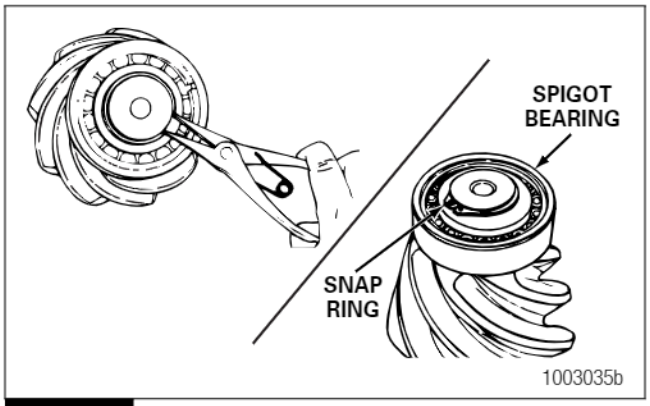


Figure 5.4

One-Piece Spigot Bearing on the Drive Pinion Without a Snap Ring

NOTE: The following procedure applies to some 180 Series rear-rear tandem axles with existing snap ring components.

To obtain the staking tool, refer to the Service Notes page on the front inside cover of this manual. Figure 5.5.

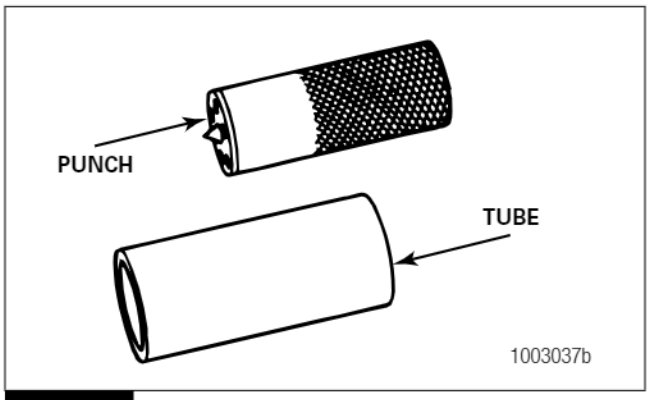


Figure 5.5

1. Place the drive pinion and the tube of the staking tool into a press with the spigot bearing toward the top. Figure 5.6.

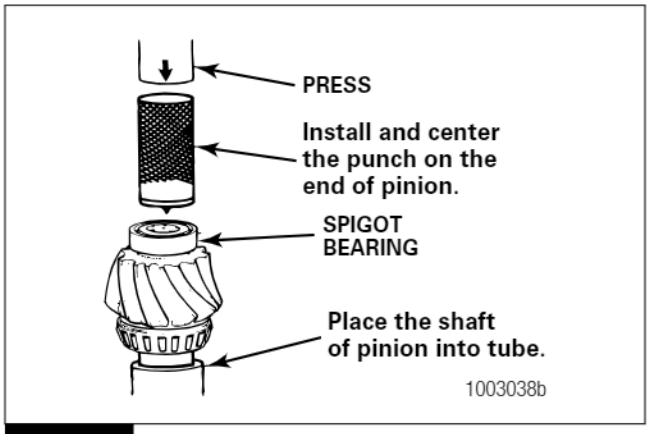


Figure 5.6

2. When you use a staking tool and press, apply 6,614 lb (3 000 kg) force on a 0.375-inch (10 mm) ball. Calculate the force required on the tool as follows.
   - 6,614 lb (3000 kg) x amount of balls in tool = pounds or kilograms
   - **Example:** 6,614 lb (3000 kg) x three balls = 19,842 pounds (9000 kg)

3. Place the punch of the staking tool over the end of the pinion and spigot bearing. Apply the required amount of force on the punch. Figure 5.6.

⚠ CAUTION

Do not align new points with the grooves in the end of the drive pinion or in old points. If the new staked points are placed in the wrong areas, the spigot bearing will not be held correctly on the pinion shaft.

NOTE: If a three-ball stake tool is used, rotate the tool 180 degrees.

4. Stake the end of the drive pinion at a minimum of five points. Figure 5.7. Rotate the punch as many times as required for a minimum of five points. Repeat Step 3 for each point.

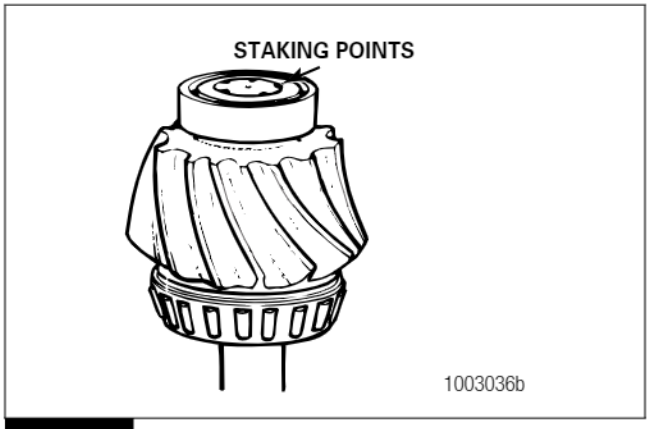


Figure 5.7

Two-Piece Spigot Bearing on the Drive Pinion

NOTE: This procedure applies to some 160 Series single rear axles and rear-rear tandem axles. These axles may also use a one-piece spigot bearing with a snap ring retainer.

NOTE: The inner race of the two-piece spigot bearings must be staked in place on RS and RR-160 Series rear axles. Before you stake the pinion, you must heat the pinion stem to soften it.

NOTE: SPX Kent-Moore kit number J-39039 includes the staking tool, temperature indicating liquid, heat shield and plastigage needed for this procedure. To obtain this kit, refer to the Service Notes page on the front inside cover of this manual.

1. Apply two stripes of temperature indicating liquid on the pinion stem from the top to the bottom. Figure 5.8. Apply a green stripe to indicate 400°F (205°C) and a blue stripe to indicate 500°F (260°C).

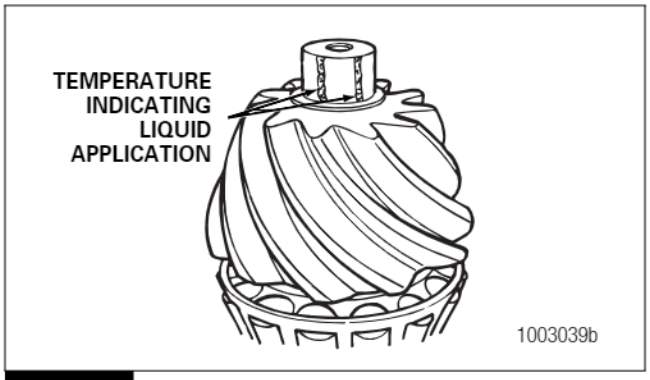


Figure 5.8

⚠ CAUTION

You must use the heat shield when you heat the pinion stem. Do not heat the pinion stem without the heat shield in place. Damage to components can result.

2. Place the heat shield over the pinion stem so that you can see the temperature indicating liquid through the hole in the shield. Figure 5.9.

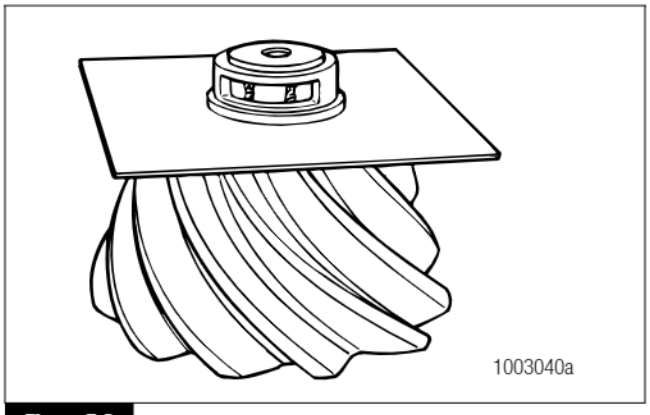


Figure 5.9

⚠ WARNING

Read the manufacturer's instructions before using a torch. Always wear safe clothing, gloves and eye protection when working with a torch for heating parts to prevent serious personal injury during assembly.

3. Put on safe clothing, gloves and eye protection.

⚠ CAUTION

Do not overheat the pinion stem or you will weaken the metal. Damage to components can result.

NOTE: Correct heating will take approximately 25-35 seconds, depending on how hot the torch is.

4. Light and adjust the torch until the white part of the flame is approximately 0.25-inch (6 mm) long. Keep the white part of the flame approximately 0.125-inch (3 mm) from the top of the stem. Figure 5.10. Move the flame around the outer diameter of the top of the pinion stem. The green temperature indicating liquid will turn black before the blue liquid does. Heat the stem until the blue liquid turns black at a point in the middle of the window.

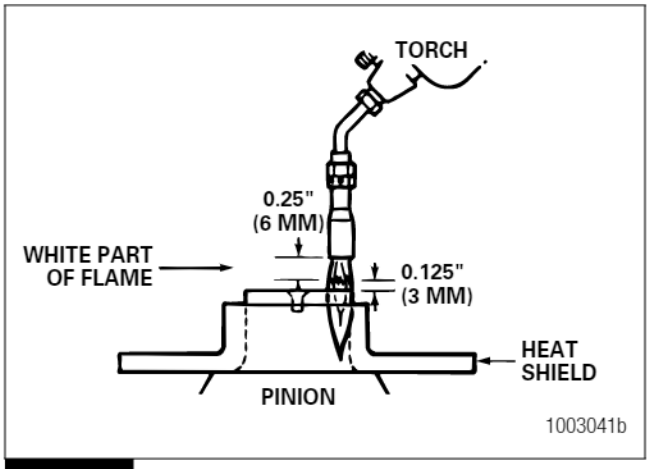


Figure 5.10

5. Remove the flame and the heat shield from the pinion. Let the pinion air cool for 10 minutes. Use a razor blade to remove the temperature indicating liquid.

⚠ CAUTION

Do not press or directly strike the new inner race. Damage to the bearing will result.

6. Use a press, if available, or a brass hammer to install the new inner race. Use the old inner race as a sleeve. The face is completely seated when you cannot fit a 0.002-inch (0.0508 mm) feeler gauge between the race and the pinion shoulder.

NOTE: To hold the races in place, use a staking tool, not the old race, to start the new race on the stem. The old race can be used to completely seat the new race.

7. Place the staking tool over the bearing race. Cut a one-inch (25 mm) piece from the green plastigage strip and place in between the punch and the staking tool. You do not need to use the plastigage for every stake. Use the plastigage until you are sure that you are hitting the punch with the correct amount of force. Figure 5.11.

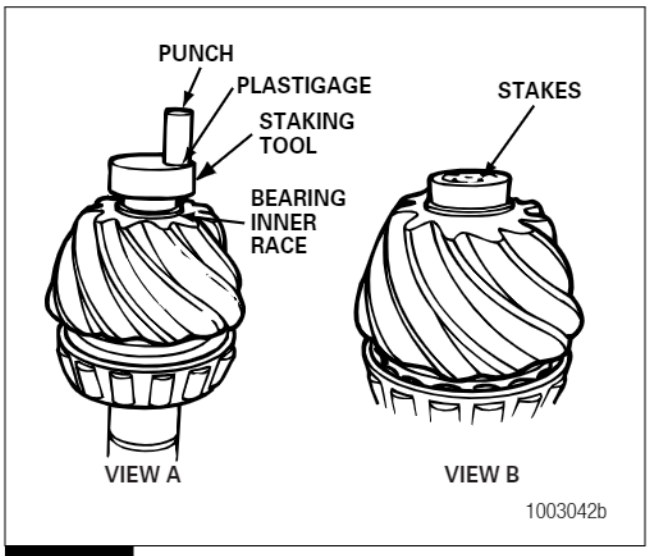


Figure 5.11

8. Strike the punch with a two-three pound (0.9-1.4 kg) brass hammer to upset the end of the pinion stem. Remove the strip and measure its thickness against the gauge on the strip's wrapper. The strip must not be less than 0.003-inch (0.0762 mm) thick. This thickness indicates that you are using enough force when you hit the punch. If the strip is too thin, then you must hit the punch harder so the stake will hold the race in place. Rotate the tool and repeat this procedure until there are six evenly spaced stake marks around the stem. Figure 5.11.

9. With a press or a soft mallet and sleeve, install the outer race and roller assembly into its bore in the carrier. Use a sleeve that is the same size as the outer race. Press the bearing until it is squarely seated against the shoulder in the bottom of its bore.

Drive Pinion

1. Apply axle lubricant to the bearing cups and to the bearing cones in the cage.
2. Install the drive pinion into the bearing cage.
3. Install the bearing spacer or spacers onto the pinion shaft against the inner bearing cone. Figure 5.12. The spacer or spacers control the preload adjustment of the drive pinion bearings.

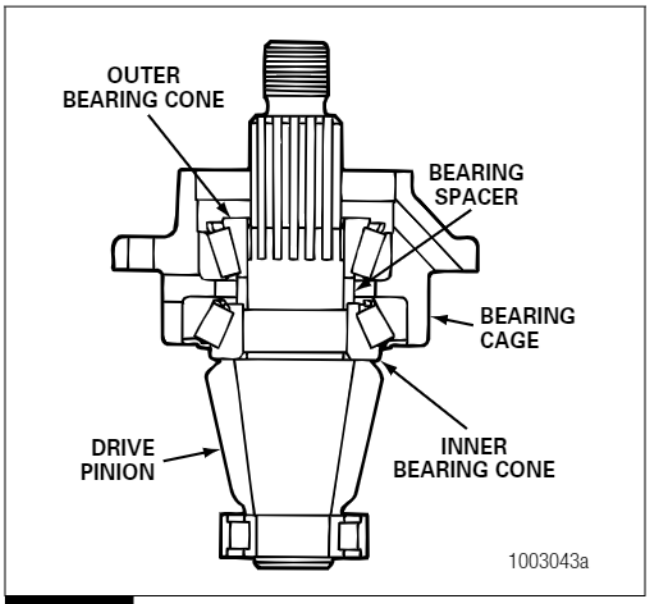


Figure 5.12

4. Install the outer bearing cone onto the pinion shaft against the spacer. Do not install the pinion seal into the bearing cage. Figure 5.12.

Adjustment

Pinion Bearing Preload

Press Method

If a press is not available, or the press does not have a pressure gauge, use the yoke or flange method to adjust the pinion bearing preload.

NOTE: Do not read the starting torque. Read only the torque value after the cage starts to rotate. The starting torque will give an incorrect reading.

1. Place the drive pinion and cage assembly into a press with the gear head or teeth toward the bottom.
2. Install a sleeve of the correct size against the inner race of the outer bearing. Figure 5.13.

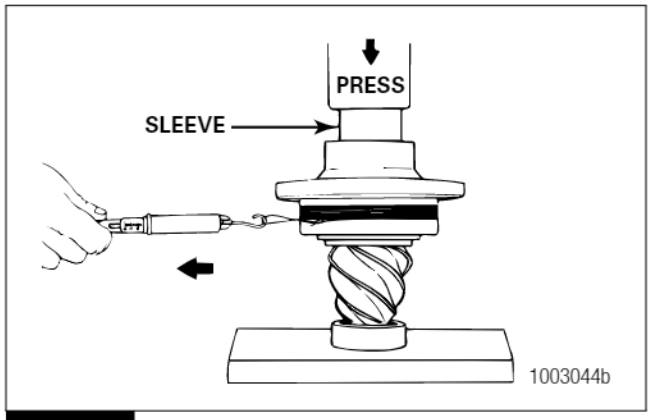


Figure 5.13

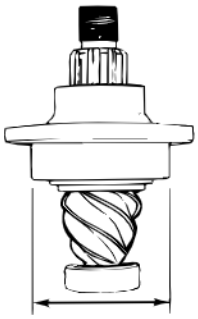
3. Apply and hold the correct amount of pressure to the pinion bearings. Refer to Table I. As pressure is applied, rotate the bearing cage several times so that the bearings make normal contact.

Table I:

Thread Size of Pinion Shaft	Press Pressure Needed on Bearings for Correct Preload		Torque Value Needed on Pinion Nut for Correct Bearing Preload	
	pounds/ tons	kg/metric tons	lb-ft	N•m
7/8″-20	22,000/1	9979/10	200-275	271-373
1″-20	30,000/15	13 608/ 13.6	300-400	407-542
1-1/4″-12	54,000/27	24 494/ 24.5	700-900	949-1220
1-1/4″-18	54,000/27	24 494/ 24.5	700-900	949-1220
1-1/2″-12	54,000/27	24 494/ 24.5	800-1100	1085-1491

Thread Size of Pinion Shaft	Press Pressure Needed on Bearings for Correct Preload		Torque Value Needed on Pinion Nut for Correct Bearing Preload	
	pounds/ tons	kg/metric tons	lb-ft	N•m
1-1/2″-18	54,000/27	24 494/ 24.5	800-1100	1085-1491
1-3/4″-12	50,000/25	22 680/ 22.7	900-1200	1220-1627
2″-12	50,000/25	22 680/ 22.7	1200-1500	1627-2034

4. While pressure is held against the assembly, wind a cord around the bearing cage several times.
5. Attach a spring scale to the end of the cord.
6. Pull the cord on a horizontal line. As the bearing cage rotates, read the value indicated on the scale. Record the reading. Figure 5.13.
7. Measure the diameter of the bearing cage where the cord was wound. Measure in inches or centimeters. Figure 5.14.



Measure diameter of cage. 1003045b

Figure 5.14

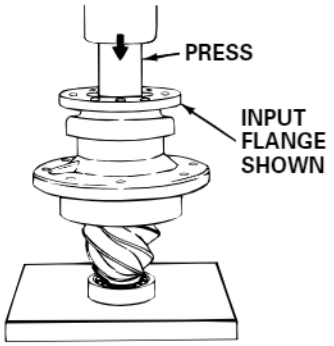
8. Divide the dimension in half to get the radius. Record the radius dimension.
9. Use the following procedure to calculate the bearing preload or torque.
   - Pounds Pulled x Radius (inches) = lb-in Preload
     — Preload x 0.113 = N•m Preload
   - Kilograms Pulled x Radius (cm) = kg-cm lb-in Preload
     — Preload x 0.098 = N•m Preload
   - Reading from spring scale = 7.5 pounds (3.4 kg)
   - Diameter of bearing cage = 6.62-inches (16.8 cm)
   - Radius of bearing cage = 3.31-inches (8.4 cm)
     — 7.5 lb x 3.31-inches = 24.8 in-lb Preload
     Preload x 0.113 = 2.8 N•m Preload
     — 3.4 kg x 8.4 cm = 28.6 kg-cm Preload
     Preload x 0.098 = 2.8 N•m Preload
10. If the preload or torque of the pinion bearings is not within 5-45 lb-in (0.56-5.08 N•m) for new pinion bearings or 10-30 lb-in (1.13-3.39 N•m) for used pinion bearings in good condition, adjust the spacer and repeat Step 1 through Step 9.
    - **To increase preload:** Install a thinner bearing spacer.
    - **To decrease preload:** Install a thicker bearing spacer.
11. Check the bearing preload with the drive pinion and cage assembly installed in the carrier. Follow the procedures to adjust the pinion bearing preload using the yoke or flange method.

Yoke or Flange Method

⚠ CAUTION

Do not install tight-fitting yokes or flanges onto shafts using a hammer or mallet. A hammer or mallet will damage the yoke or flange.

1. Use a press to install the input yoke or flange, nut and washer, if equipped, onto the drive pinion. The yoke or flange must be seated against the outer bearing. Figure 5.15.



1003046b

Figure 5.15

2. Install the drive pinion and cage assembly into the carrier. Do not install shims under the bearing cage. Figure 5.16.

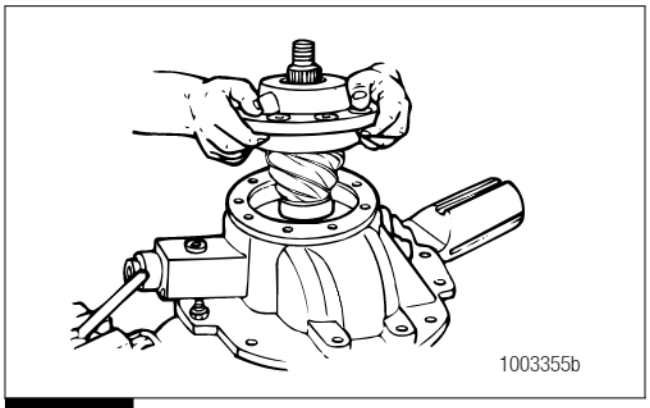


Figure 5.16

3. Install the bearing cage-to-carrier capscrews. Washers are not required at this time. Hand-tighten the capscrews.
4. Fasten a yoke or flange bar to the input yoke or flange. The bar will hold the drive pinion in position when the nut is tightened. Figure 5.17.

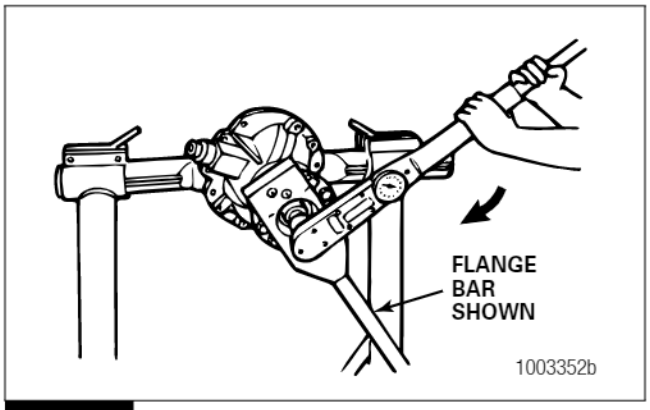


Figure 5.17

5. Tighten the drive pinion nut to the correct torque value. Figure 5.17. Refer to Table I.
6. Remove the yoke or flange bar.
7. Attach a torque wrench onto the drive pinion nut. Rotate the drive pinion and read the value indicated on the torque wrench. Figure 5.18.

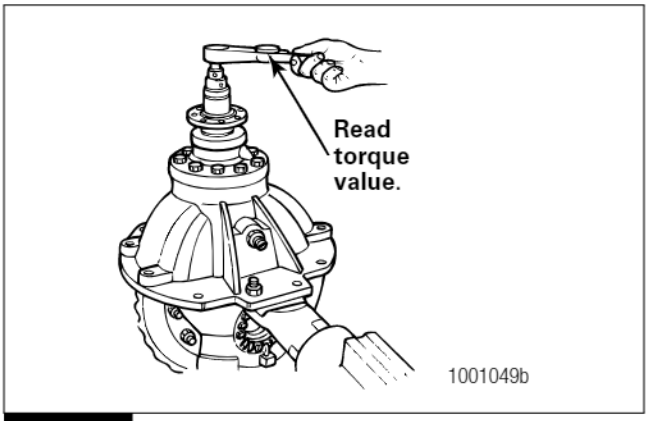


Figure 5.18

8. If the pinion bearing preload or torque is not within 5-45 lb-in (0.56-5.08 N•m) for new pinion bearings or 10-30 lb-in (1.13-3.39 N•m) for used pinion bearings in good condition, remove the pinion and cage assembly from the carrier. Adjust the spacer and repeat Step 1 through Step 7.
   - **To increase preload:** Install a thinner bearing spacer.
   - **To decrease preload:** Install a thicker bearing spacer.
9. After adjusting the pinion bearing preload, remove the drive pinion and bearing cage from the carrier. Refer to Section 3.

Shim Pack Thickness for a New Drive Pinion

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 0.045-inch (1.14 mm) for the initial pinion position. Figure 5.19.

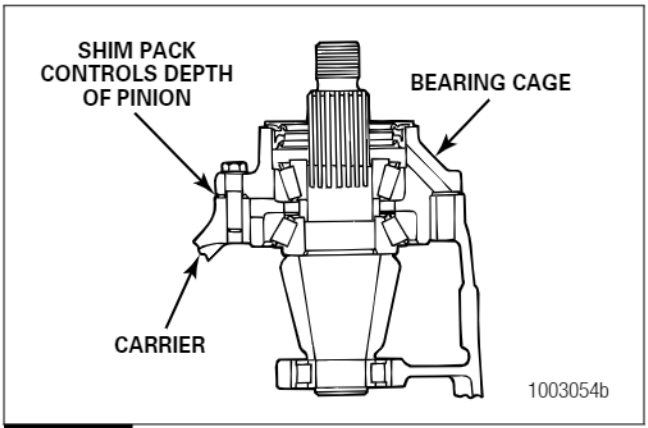


Figure 5.19

1. Use a micrometer to measure the thickness of the shim pack that was removed from under the pinion cage. Record the measurement. Figure 5.20.

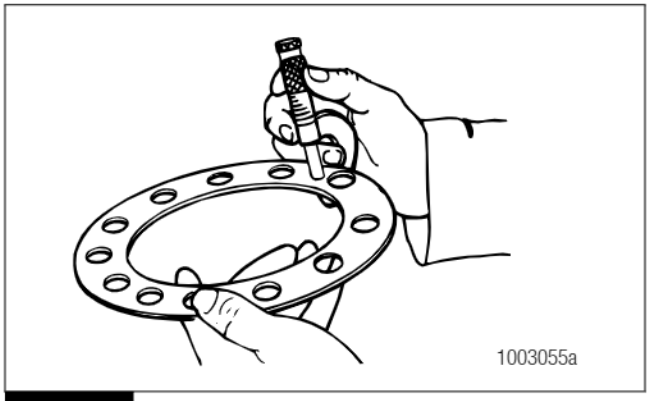


Figure 5.20

2. Find the pinion cone (PC) variation number on the drive pinion you'll replace. Figure 5.21. Record the number. The pinion cone number can be one of the following values.
   - PC +3, PC –3, +3 or –3 = 0.003-inch
   - PC +0.03, PC 0.03 mm, +0.03 mm or –0.03 = 0.03 mm

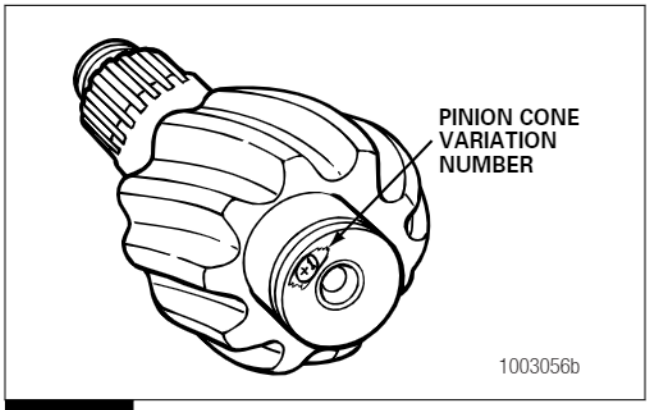


Figure 5.21

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.
4. If the old pinion cone number is a plus (+) number, subtract the number from the old shim pack thickness that was measured in Step 2.
5. If the old pinion cone number is a minus (–) number, add the number to the old shim pack thickness that was measured in Step 2.
6. Find the pinion cone (PC) variation number on the new drive pinion that will be installed. Record the number.
7. If the new pinion cone number is a plus (+) number, 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 correct thickness. Refer to Table J.

Table J:

Examples	Inches	mm
1. Old Shim Pack Thickness. Old PC Number, PC +2-inches (+0.05 mm)	0.030 – 0.002 = 0.028 + 0.005 = 0.033	0.760 – 0.050 = 0.710 + 0.130 = 0.840
Standard Shim Pack Thickness. New PC Number, PC +5-inches (+0.13 mm)		
New Shim Pack Thickness		
2. Old Shim Pack Thickness. Old PC Number, PC –2-inches (–0.05 mm)	0.030 + 0.002 = 0.032 + 0.005 = 0.037	0.760 + 0.050 = 0.810 + 0.130 = 0.940
Standard Shim Pack Thickness. New PC Number, PC +5-inches (+0.13 mm)		
New Shim Pack Thickness		
3. Old Shim Pack Thickness. Old PC Number, PC +2-inches (+0.05 mm)	0.030 – 0.002 = 0.028 – 0.005 = 0.023	0.760 – 0.050 = 0.710 – 0.130 = 0.580
Standard Shim Pack Thickness. New PC Number, PC –5-inches (–0.13 mm)		
New Shim Pack Thickness		
4. Old Shim Pack Thickness. Old PC Number, PC –2-inches (–0.05 mm)	0.030 + 0.002 = 0.032 – 0.005 = 0.027	0.760 + 0.050 = 0.810 – 0.130 = 0.680
Standard Shim Pack Thickness. New PC Number, PC –5-inches (–0.13 mm)		
New Shim Pack Thickness		

8. If the new pinion cone number is a minus (–) number, 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 correct thickness. Refer to Table J.

Installation

Drive Pinion, Bearing Cage and Shim Pack into the Carrier

NOTE: If a new drive pinion and ring gear set is installed, or if the depth of the drive pinion has to be adjusted, calculate the thickness of the shim pack. Refer to the procedure in this section.

1. Select the correct shim pack and install it between the bearing cage and carrier. Figure 5.22.

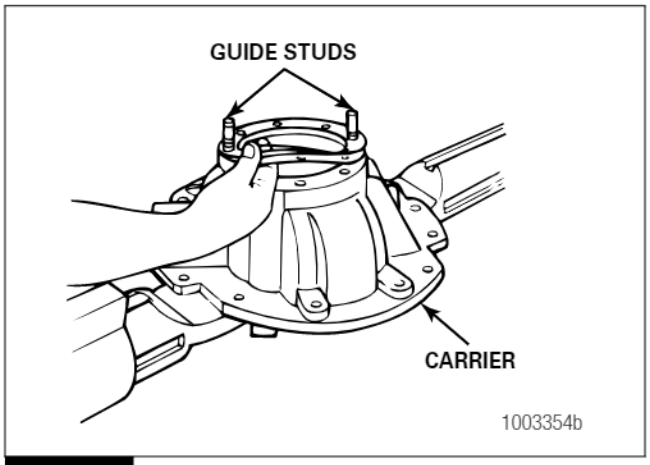


Figure 5.22

2. Apply Loctite® 518 Gasket Eliminator to the carrier face.
3. Align the oil slots in the shims with the oil slots in the bearing cage and carrier. Use guide studs to help align the shims. Figure 5.22.
4. Apply Loctite® 518 Gasket Eliminator to the top of the shim pack.
5. Install the drive pinion and bearing cage into the carrier. If necessary, use a rubber, plastic or leather mallet to hit the assembly into position. Figure 5.23.

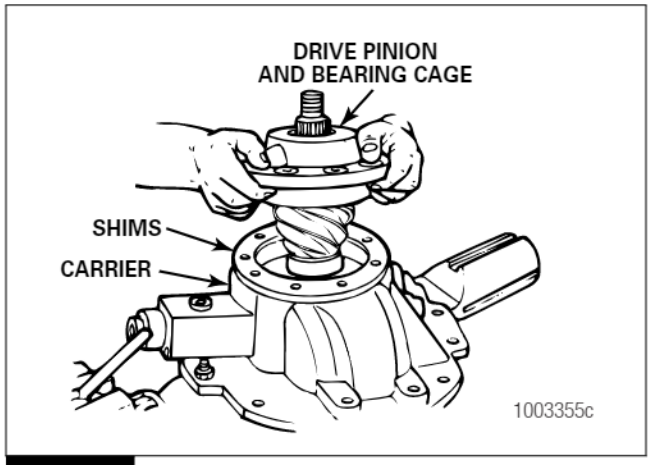


Figure 5.23

6. Install the bearing cage-to-carrier capscrews and washers. Tighten the capscrews to the correct torque value. Figure 5.24. Refer to Section 8.

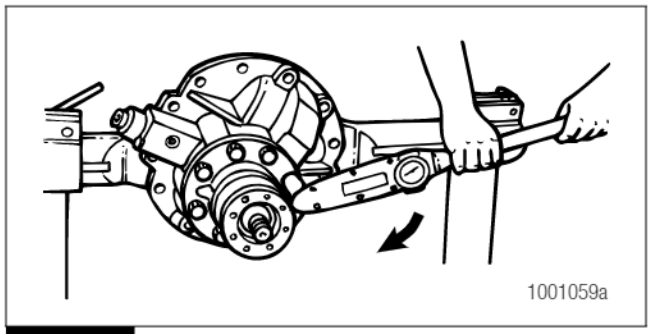


Figure 5.24

Tight Fit Yokes and POSE™ Seal

⚠ CAUTION

Do not use a hammer or mallet to install tight fit yokes onto shafts. A hammer or mallet can damage the yoke.

The seal lips must be clean. Dirt and particles may cause a leak between the yoke and the POSE™ seal.

NOTE: Do not install a POSE™ seal all the way against the yoke shoulder. This seal is designed to position itself as the yoke is installed.

1. Apply axle lubricant on the yoke seal.
2. Inspect all surfaces of the yoke hub for damage.

3. If the carrier uses a POSE™ seal element, install a new POSE™ seal.
   A. Lightly lubricate the yoke journal with the same lubricant used in the axle housing.
   B. Partially install the POSE™ seal onto the yoke 0.25-0.50-inch (6.4-12.7 mm). Figure 5.25.
   C. Before you install the yoke onto the drive pinion, lubricate the yoke with the same lubricant used in the axle housing.

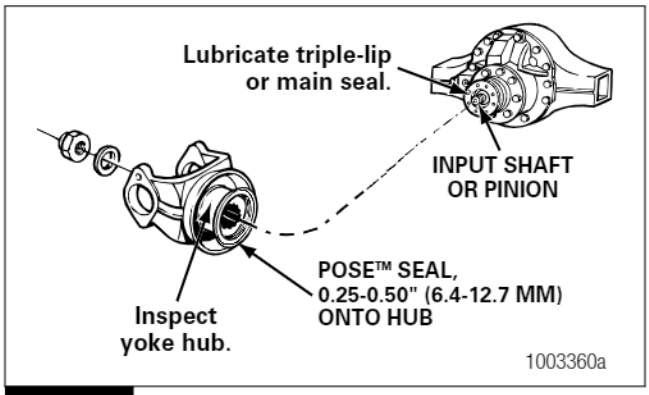


Figure 5.25

4. Slide the yoke over the input shaft pinion. Align the yoke splines with the shaft splines.

⚠ CAUTION

Do not use a hammer or mallet to install the yoke to the input pinion shaft. A hammer or mallet can damage the yoke or flange.

5. Install the input yoke flange onto the drive pinion shaft. The yoke or flange must be fully seated against the outer differential bearing before the nut is tightened to specifications.
6. Install the drive pinion nut and washer onto the input pinion shaft and against the yoke collar. Tighten the nut against yoke collar to torque specifications. Figure 5.26. Refer to Section 8.

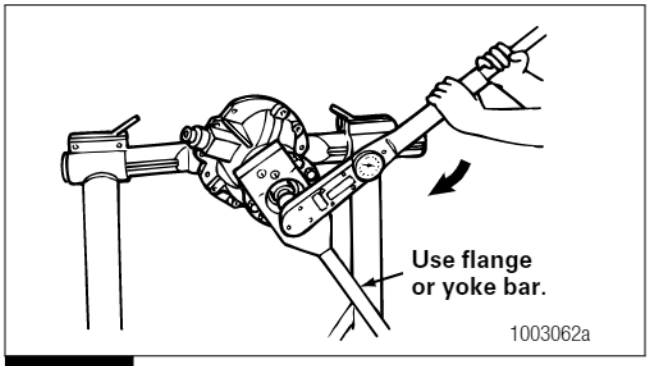


Figure 5.26

⚠ CAUTION

The seal lips must be clean. Dirt and particles may cause a leak between the yoke and the seal.

7. Install a new triple-lip seal.
   A. Apply the same lubricant used in the axle housing to the outer surface of the seal and the seal bore in the bearing cage. Figure 5.27.
   B. Place the drive pinion and cage assembly into a press with the seal bore toward the top.
   C. Press the seal into the bearing cage. The seal flange must be flat against the top of the bearing cage. Use a sleeve or seal driver of the correct size that fits against the metal seal flange. The diameter of the sleeve or driver must be larger than the flange diameter. Figure 5.28.
      - **If a press is not available:** Use a mallet and the sleeve or driver to install the seal. Figure 5.29.
   D. After the triple-lip seal is installed, a gap of approximately 0.015-0.030-inch (0.38-0.76 mm) between the flange and bearing cage is normal. Figure 5.30.
   E. Check the gap with a feeler gauge at several points around the seal. The gap must be within 0.015-0.030-inch (0.38-0.76 mm). The difference between the largest and smallest gap measurement must not exceed 0.010-inch (0.0254 mm).

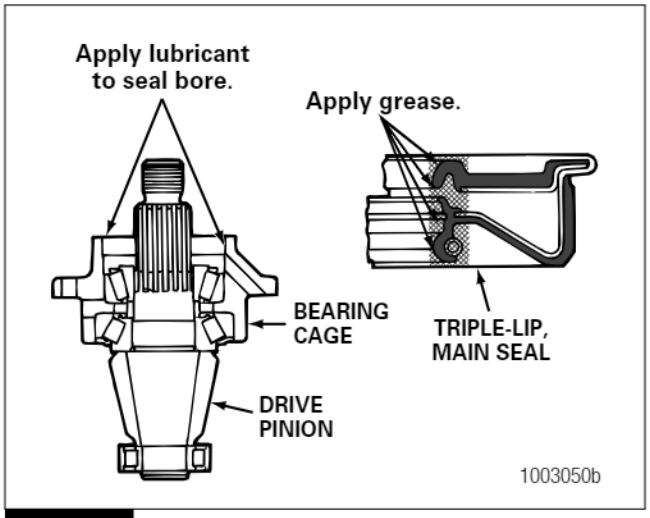


Figure 5.27

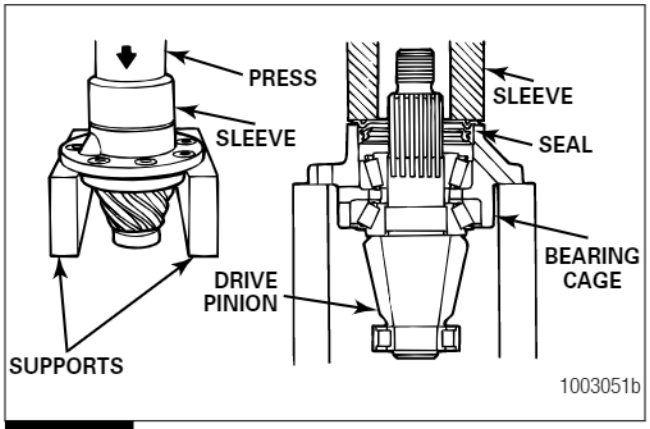


Figure 5.28

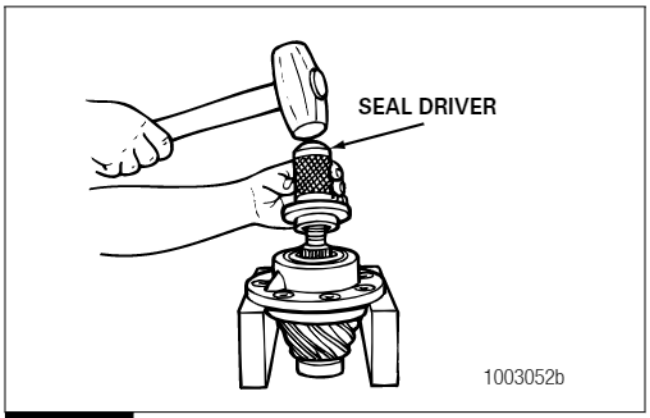


Figure 5.29

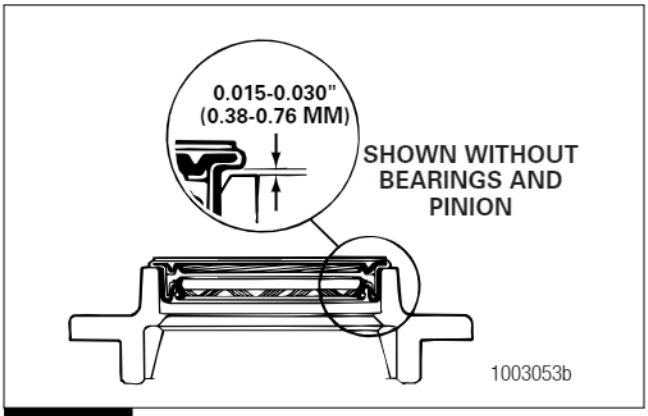


Figure 5.30

Any Type Yoke with a Unitized Pinion Seal (UPS)

1. Remove the replacement unitized seal from the package. Figure 5.31.

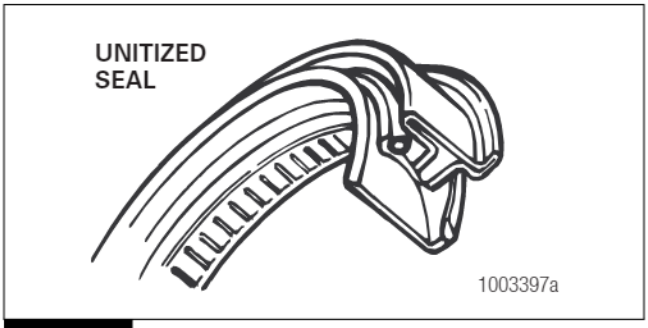


Figure 5.31

⚠ 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.

2. Select the correct seal driver from Table K. 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.
3. Position the seal on the driver.

⚠ 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.

4. 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 5.32.

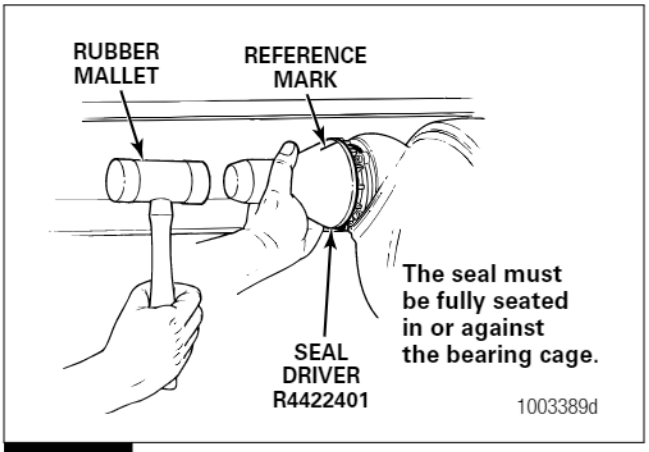


Figure 5.32

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

Table K: Unitized Pinion Seals and Seal Drivers

Single Models	Tandem Models	Meritor Unitized Pinion Seal	Seal Installation Location	Meritor Seal Driver	Yoke Seal Diameter Inches
RS-17-145	RT-34-144 /P	A-1205-R-2592	Tandem Forward Input — 145 models from November 1993 to present	R4422402	3.250
RS-19-145	RT-34-145 /P				3.255
RS-21-145	RT-40-145 /A /P	A-1205-P-2590	Tandem Forward Output — Tandem Forward Input 145 models before November 1993 with seal A-1205-F-2424	R4422401	3.000
RS-21-160	RT-40-149 /A /P				3.005
RS-23-160 /A	RT-44-145 /P				
RS-23-161 /A	RT-40-160 /A /P				
RS-25-160 /A	RT-40-169 /A /P				
RS-23-186	RT-46-160 /A /P	A-1205-N-2588	Tandem and Single Rear Input — 145 models	R4422401	3.000
RS-26-185	RT-46-169 /A /P				3.005
RS-30-185	RT-46-164EH /P	A-1205-Q-2591	Tandem and Single Rear Input — 160/164/185 models	R4422402	3.250
	RT-46-16HEH /P				3.255
	RT-50-160 /P				
	RT-52-185*				
	RT-58-185*				

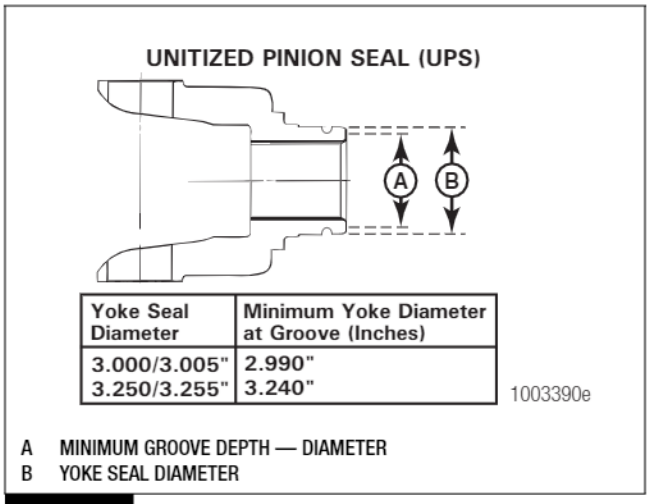
*Forward and rear input only.

Clean, Inspect and Install the Yoke After Installing a Unitized Pinion Seal

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 5.33, replace the yoke.



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

A MINIMUM GROOVE DEPTH — DIAMETER
B YOKE SEAL DIAMETER

Figure 5.33

⚠ 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 cause the seal to leak.

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

⚠ CAUTION

Do not use a hammer or mallet to install the yoke to the input pinion shaft. A hammer or mallet can damage the yoke or flange.

5. Install the input yoke flange onto the drive pinion shaft. The yoke or flange must be fully seated against the outer differential bearing before the nut is torqued to specifications.
6. Apply a single bead of Loctite® 277 adhesive (part number 1199Y3795) or Loctite® 270 adhesive (part number 2297M5213) at the top of the input shaft threads from inboard to outboard. The bead should be 0.120-inch wide.
7. Install the drive pinion nut, and washer if required, onto the input pinion shaft and against the yoke collar. Tighten the nut against the yoke collar to torque specifications. Figure 5.34. Refer to Section 8.

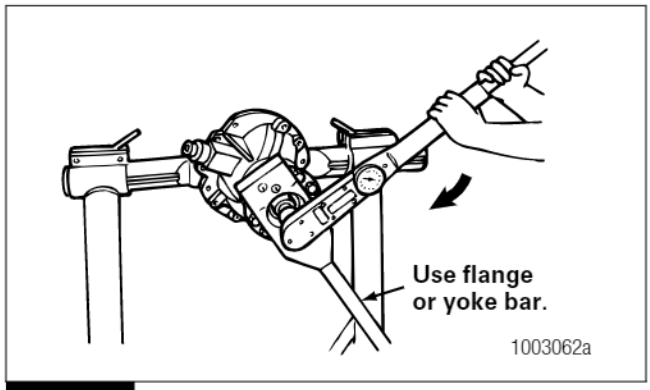


Figure 5.34

Any Type Yoke with a Multiple Lip Seal (MLS)

1. Remove the replacement multiple lip seal from the package. Figure 5.35.

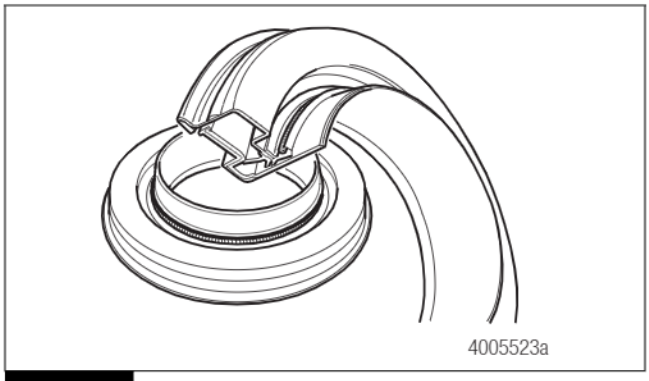


Figure 5.35

⚠ CAUTION

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

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

2. 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.
3. Position the seal on the driver.
4. 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 5.36.

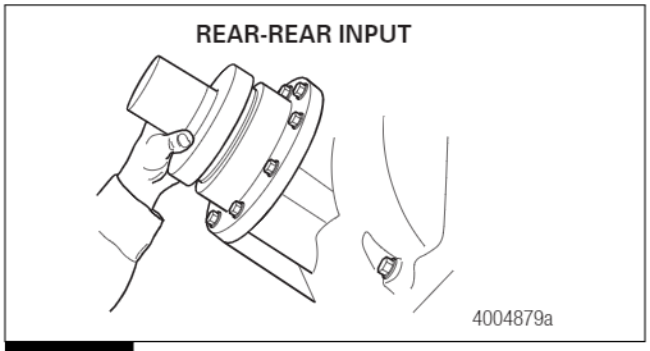


Figure 5.36

5. 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.
   - **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.

Table L: Multiple Lip 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 Forward-Rear Unit Input (FUI)	A1-1205X2728	A-1205R2592	2728T1	2728T2
MX-23-160R	RT-34-145 /P					
RF-16-145	MT-40-143					
RF-21-160	RT-40-145 /A /P	14X/16X Forward-Rear Unit Output (FUO)	A1-1205Y2729	A-1205P2590	2729T1	2729T2
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					
RS-21-145	RT-46-160 /A /P	16X/18X Rear-Rear Unit Input (RUI)	A1-1205A2731	A-1205Q2591	2731T1	Not Required — Sleeve is unitized
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.

If the Yoke or Inner Sleeve of the Multiple Lip Seal was Removed at Any Time During Installation

1. The original multiple lip seal will be damaged. Remove and discard the seal to prevent damage to components.
2. Install a new multiple lip seal.

Yoke

1. Before you install the yoke, lightly lubricate or coat the yoke seal journal with axle oil.

⚠ CAUTION

Do not use a hammer or mallet to install the yoke onto the pinion shaft, which can damage the yoke.

2. Install the pinion yoke onto the drive pinion shaft.

⚠ CAUTION

Only use a press and a sleeve, or a special yoke/flange driver tool, to install the yoke to ensure it seats correctly against the outer bearing. Do not use the nut to draw on the yoke.

3. Use a press and a sleeve, or a special yoke/flange driver tool (kit MST-YT113 for 113 and 120 models or kit MST-YT114 for all others), to install the yoke. Do not use the nut to draw on the yoke. To obtain kits, refer to the Service Notes page on the front inside cover of this manual. Figure 5.37.
   - **If you use a press or sleeve:** Verify the pinion shaft is well-supported.

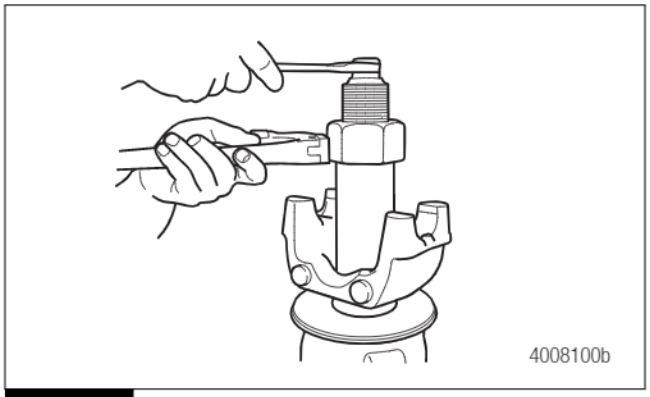


Figure 5.37

4. Install the drive pinion nut, and washer if required, onto the pinion shaft and against the yoke collar.
5. Use a flange or yoke bar to tighten the nut against the yoke collar to torque specifications. Figure 5.38. Refer to Section 8.

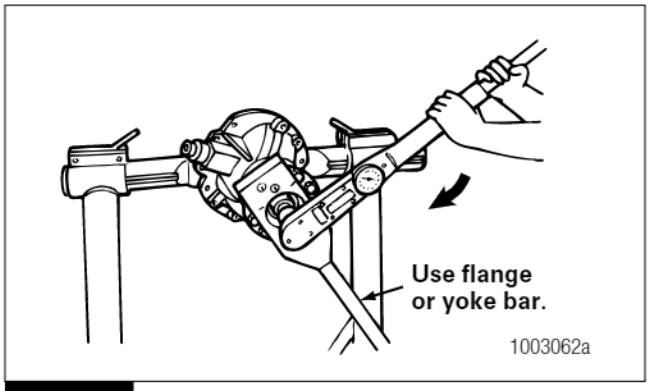


Figure 5.38

Assembly

Main Differential and Ring Gear Assembly

⚠ 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. Heat the ring gear in a tank of water to a temperature of 160-180°F (71-82°C) for 10 to 15 minutes.

⚠ WARNING

Wear safe clothing and gloves when working with the hot ring gear to prevent serious personal injury.

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 onto the case half:** Heat the gear again.
4. Align the ring gear and the flange case half fastener holes. Rotate the ring gear as necessary.
5. Install the bolts, nuts and washers that hold the ring gear to the flange case half. Install the bolts from the gear side of the assembly. The bolt heads must be against the ring gear. Figure 5.39.
   - **If rivets were used to hold the ring gear to the flange case half:** Replace them with bolts, nuts and washers.

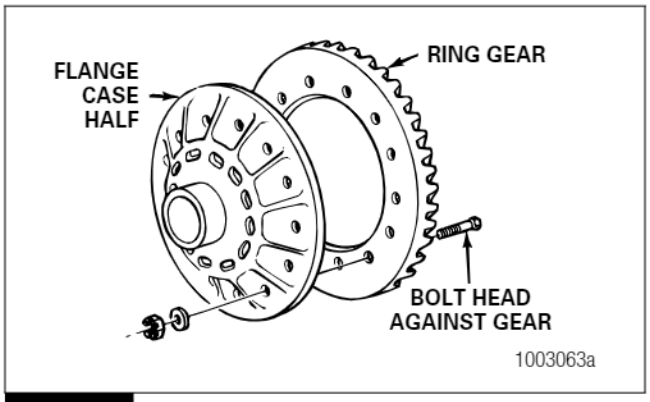


Figure 5.39

6. Tighten the bolts and nuts to the correct torque value. Refer to Section 8.
   - **For 59000 Series carriers:** Apply four to six drops of red Loctite® 277 threadlocker to the threaded holes in the ring gear. Install the capscrews. Tighten the capscrews to 360-470 lb-ft (490-639 N•m).
7. Use a 0.003-inch (0.08 mm) feeler gauge to check for gaps between the back surface of the ring gear and the case flange. Check for gaps at four points around the assembly. Figure 5.40.
   - **If the gaps exceed specifications:** Check the flange case half and ring gear for the problem that causes the gap. Repair or replace parts. Assemble the ring gear onto the flange case half.

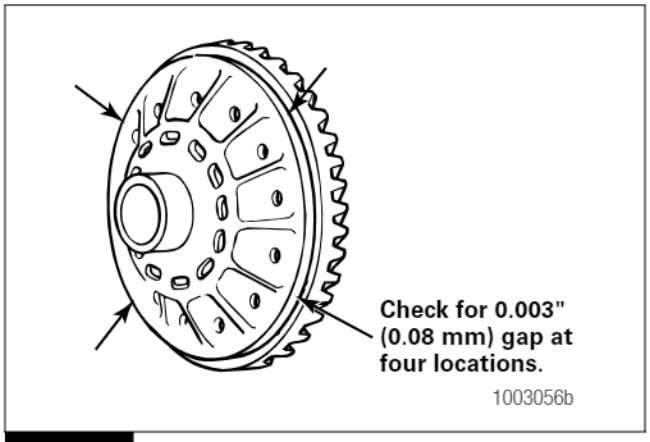


Figure 5.40

8. Use a press and the correct size sleeve to install the bearing cones on both of the case halves. Figure 5.41.

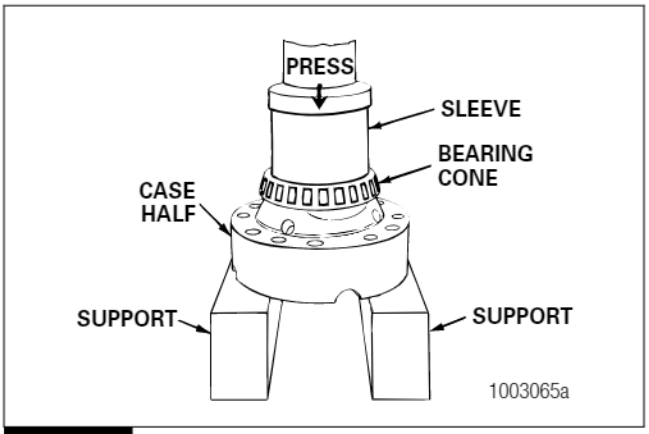


Figure 5.41

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 on a bench with the ring gear teeth toward the top.
11. Install one thrust washer and side gear into the flange case half. Figure 5.42.

    NOTE: There are two different design versions of the pinions and side gears: the original design and a new version with tooth profile enhancements. If the pinions or side gears must be replaced, the replacement part must be of the same design version as the mating part. Do not mix original design pinions with new design side gears and vice versa. Refer to Section 4 for further information about replacing these parts.

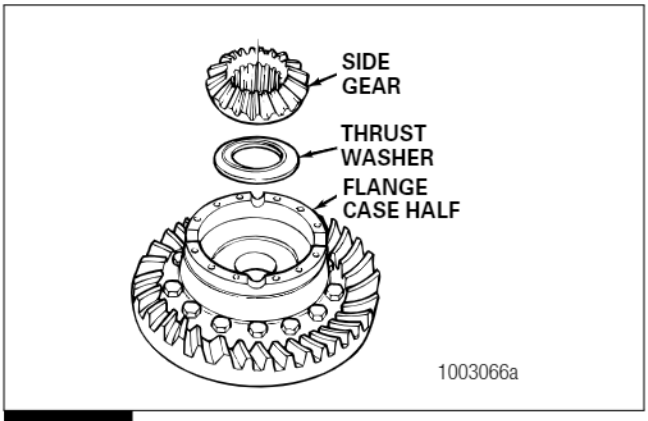


Figure 5.42

⚠ 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.

12. Install the spider or cross, differential pinions and thrust washers into the flange case half. Figure 5.43.

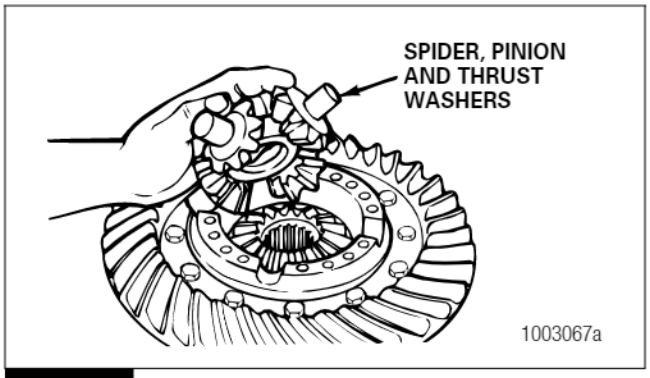


Figure 5.43

13. Install the second side gear and thrust washer over the spider and differential pinions. Figure 5.44.

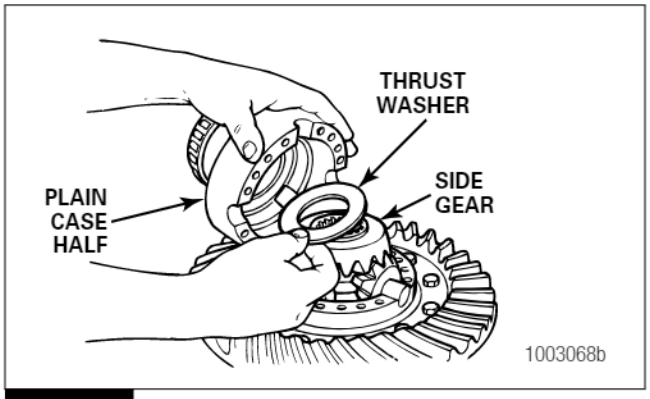


Figure 5.44

14. Place the plain half of the differential case over the flange half and gears. Rotate the plain half to align the match marks. Figure 5.44 and Figure 5.45.

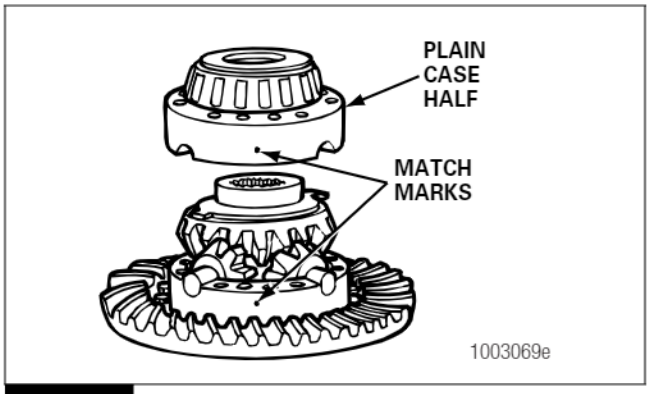


Figure 5.45

15. Install Dri-Loc® fasteners into the case halves. Refer to Section 6.
    A. Install four capscrews and washers or bolts, nuts and washers, if equipped, into the case halves. The distance between the fasteners must be equal. Tighten the fasteners to the correct torque value in a progressive crisscross pattern opposite each other. Refer to Section 8. Figure 5.46.
    B. Install the other fasteners into the case halves. Tighten the fasteners to the correct torque value. Refer to Section 8.

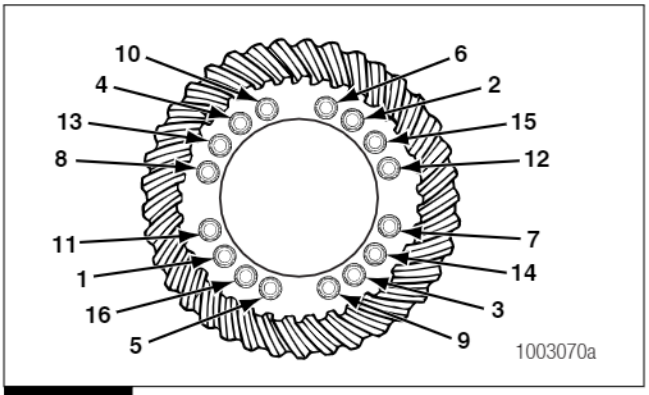


Figure 5.46

16. Check the differential gears rotating resistance.

Inspection

Differential Gears Rotating Resistance

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 5.47.

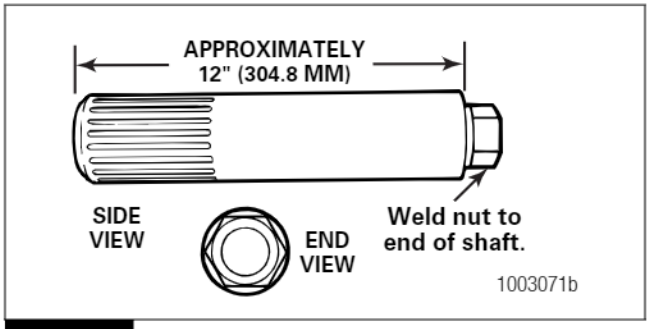


Figure 5.47

2. Place the differential and ring gear assembly in a vise. Install soft metal covers over the vise jaws to protect the ring gear. Figure 5.48.

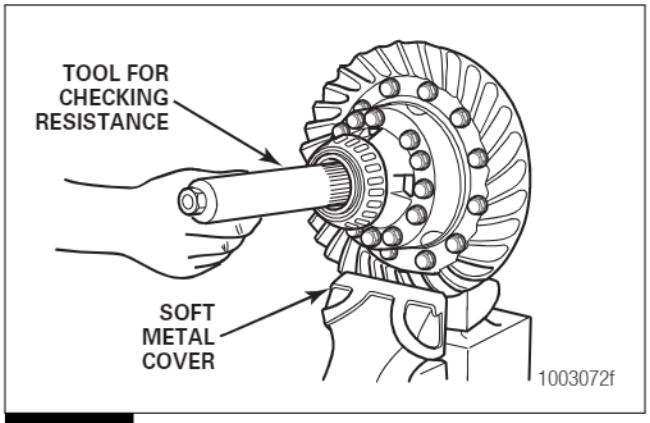


Figure 5.48

3. Install the tool into the differential until the splines of the tool are engaged with one side gear. Figure 5.48.
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 5.49.
   - **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.

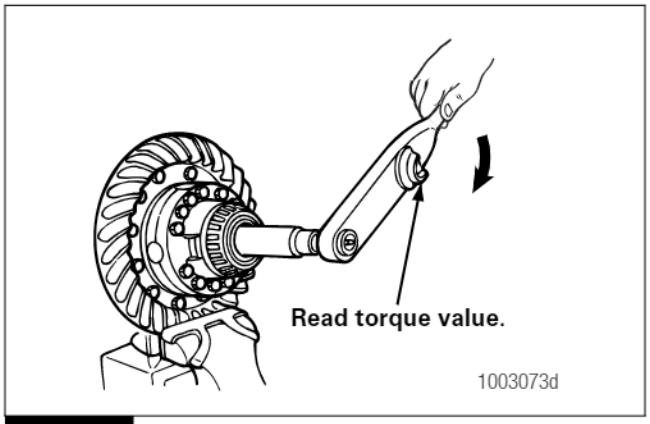


Figure 5.49

Installation

Differential and Ring Gear Assembly

1. Clean and dry the bearing cups and bores of the carrier legs and bearing caps.
2. Apply axle lubricant on the inner diameter of the bearing cups and on both bearing cones that are assembled on the case halves.
3. Apply green Loctite® 635 or 680 adhesive into the bearing bores of the carrier legs and bearing caps so that the Loctite® adhesive is spread out 360 degrees. Adhesive must not contact the adjusting ring threads. Refer to Section 6. Figure 5.50.

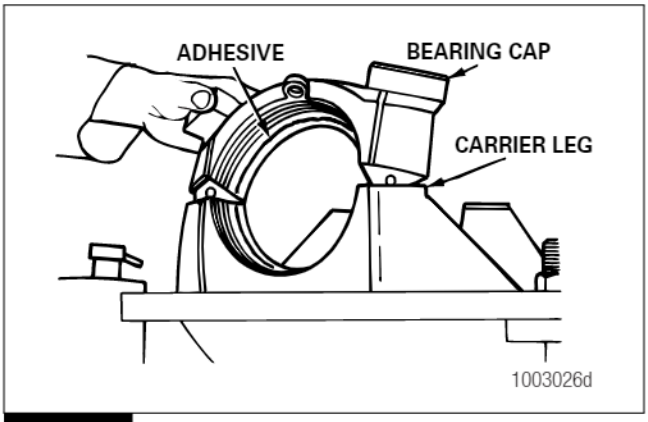


Figure 5.50

4. Install the bearing cups over the bearing cones that are assembled on the case halves. Figure 5.51.

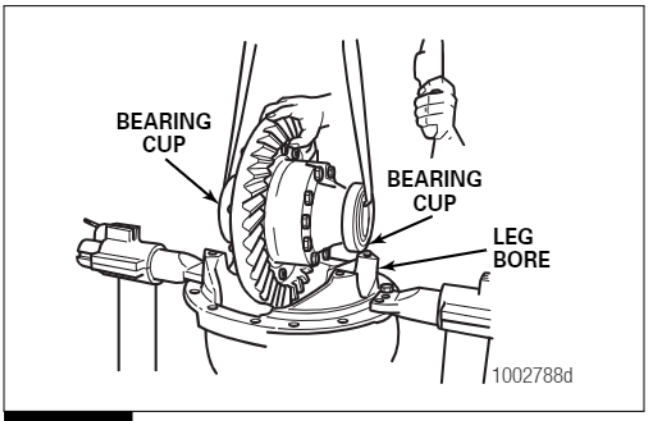


Figure 5.51

5. 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 5.51.
6. Install both of the bearing adjusting rings into position between the carrier legs. Turn each adjusting ring hand-tight against the bearing cup. Figure 5.52.

- **For 59000 Series carriers:** Apply green Loctite® 635 or 680 adhesive to the adjusting ring threads on the carrier legs and bearing caps so that the Loctite® adhesive is spread out 360 degrees. Do not apply Loctite® adhesive between the bearing cup and adjusting ring. You must adjust the preload within the "set-time" of the Loctite® adhesive used. Refer to the manufacturer's instructions for these set-times. Also, during and after setting the bearings, verify that no Loctite® adhesive gets into the interface between the bearing cup and the adjusting ring.

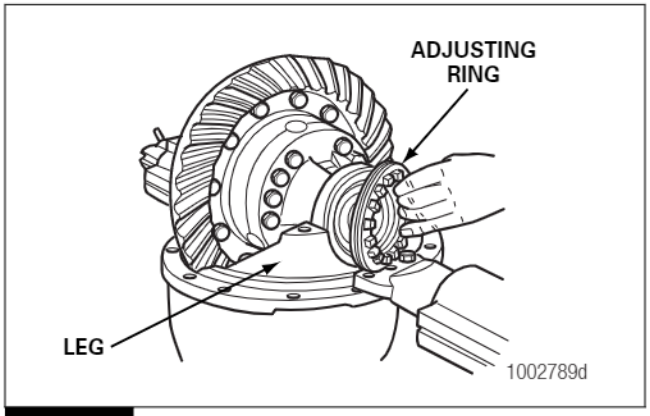


Figure 5.52

7. Install the bearing caps over the bearings and adjusting rings. Align the match marks you made when you removed the caps. Figure 5.53.

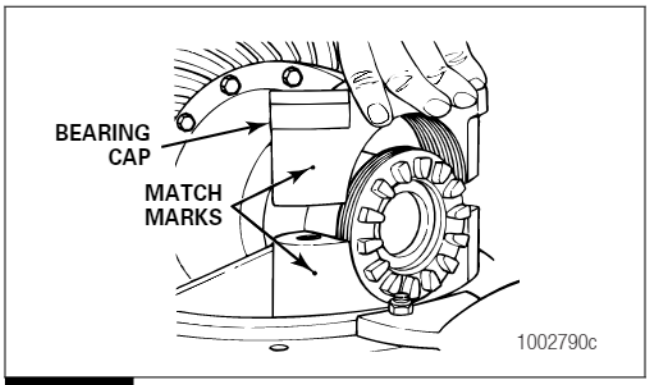


Figure 5.53

⚠ CAUTION

If the bearing caps are not installed in the correct locations, the bores and threads in the caps will not match the carrier. You will have problems assembling the caps on the carrier and damage to parts can occur. Do not force the bearing caps into position.

8. Seat each bearing cap with a light leather, plastic or rubber mallet. 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 6 through Step 8.
9. Install the capscrews and washers that hold the bearing caps to the carrier. Hand-tighten the capscrews four to six turns. Tighten the capscrews to the correct torque value. Refer to Section 8.

   Do not install the capscrews, cotter pins, roll pins or lock plates, if equipped, that hold the bearing adjusting rings in position.
10. Adjust the differential bearing preload and hypoid gear backlash. Check the tooth contact patterns.

Adjustment

Differential Bearing Preload

Method 1

1. Attach a dial indicator onto the carrier mounting flange so that the plunger or pointer is against the ring gear back surface. Figure 5.54.

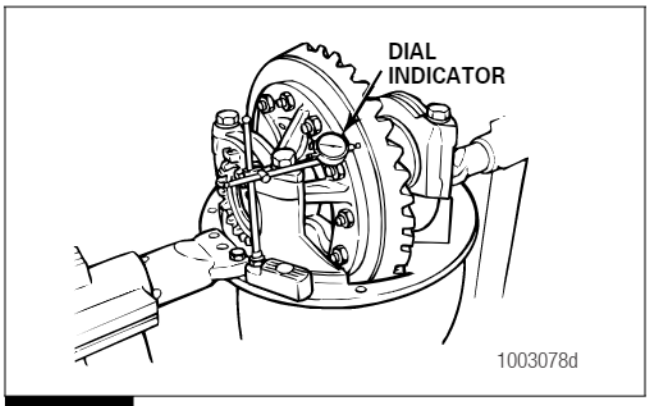


Figure 5.54

⚠ 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.

2. Use a "T" bar wrench to loosen the bearing adjusting ring that is opposite the ring gear. A small amount of end play will show on the dial indicator. Figure 5.55.

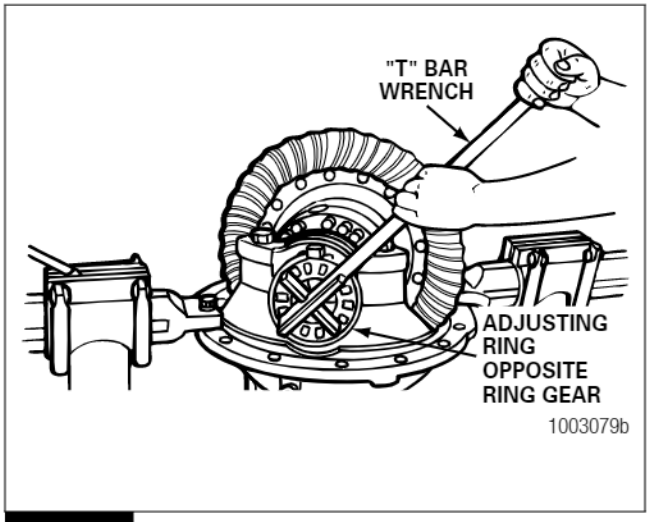


Figure 5.55

3. Use one of the following methods to move the differential and ring gear to the left and right while you read the dial indicator.
   A. Insert two pry bars between the bearing adjusting rings and ends of the differential case. The pry bars must not touch the differential bearings. Figure 5.56.
   B. Insert two pry bars between the differential case or ring gear and the carrier at locations other than described in Step A. The pry bars must not touch the differential bearings. Figure 5.57.

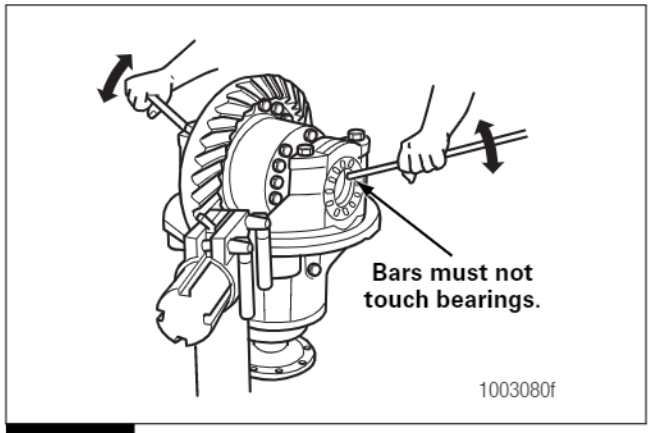


Figure 5.56

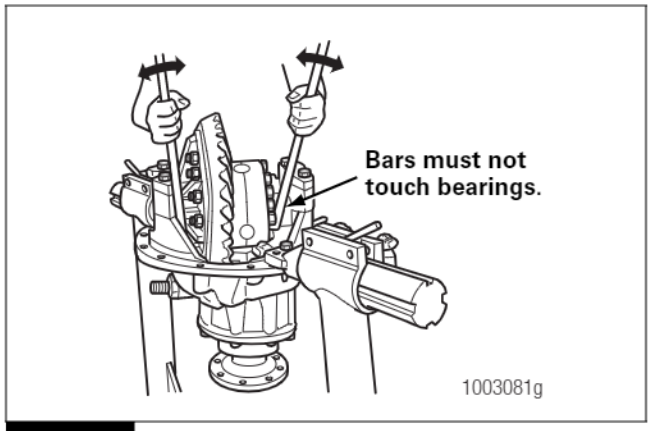


Figure 5.57

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.
6. Proceed to check ring gear runout.

Method 2

1. Hand-tighten both adjusting rings against the differential bearings.
2. Use a micrometer to measure distance X or Y between the opposite surfaces of the bearing caps. Figure 5.58 and Figure 5.59. Record the measurement.

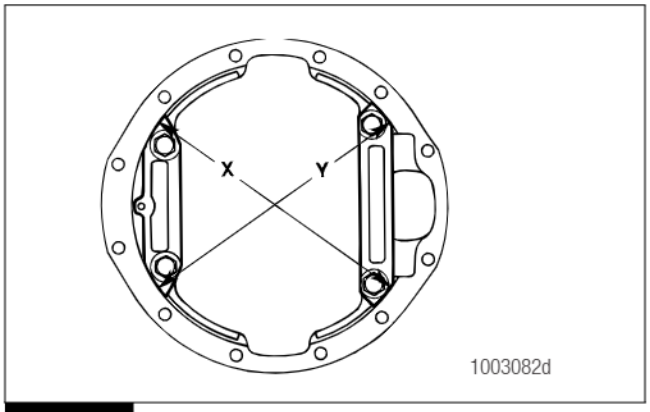


Figure 5.58

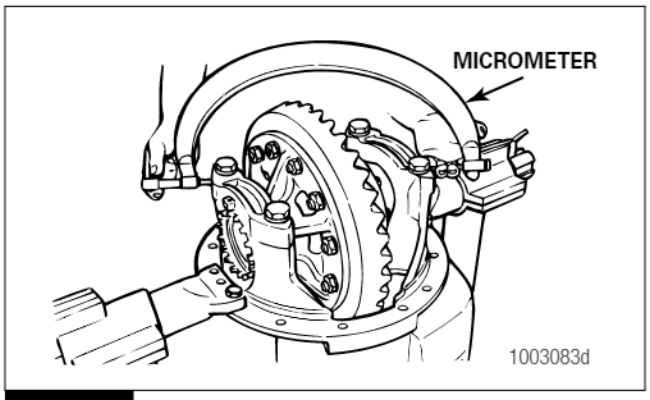


Figure 5.59

3. Tighten each bearing adjusting ring one notch.
4. Measure distance X or Y again. Compare the measurement with the one you obtained in Step 2. The difference between the two dimensions is the amount the bearing caps have expanded. Refer to the example in Table M.
   - **If the dimension is within the specification in Table N:** Continue by checking ring gear runout.
   - **If the dimension is less than the specification in Table N:** Repeat Step 3 and Step 4 as needed.

Table M: Example

RS-145 Carrier Measurements
Distance X or Y before tightening the adjusting rings = 13.927-inches (353.74 mm)
Distance X or Y after tightening the adjusting rings = 13.936-inches (353.97 mm)
13.936-inches – 13.927-inches = 0.009-inch (0.23 mm) difference

Table N: Specification

Differential Bearing Preload	Expansion Between Bearing Caps	
	RS-140, RS-145 and RS-160 carrier models	RS-120 and all other carrier models
15-35 lb-in (1.7-3.9 N•m)	0.002-0.009-inch (0.05-0.229 mm)	0.006-0.013-inch (0.15-0.33 mm)

Ring Gear Runout

1. Attach a dial indicator onto the carrier mounting flange. Figure 5.60.

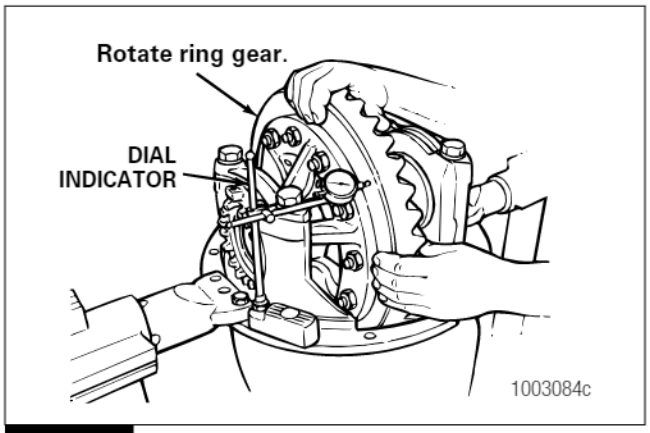


Figure 5.60

2. Adjust the dial indicator so that the plunger or pointer is against the back surface of the ring gear. Figure 5.60. 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 0: 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 5.61.

- **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.

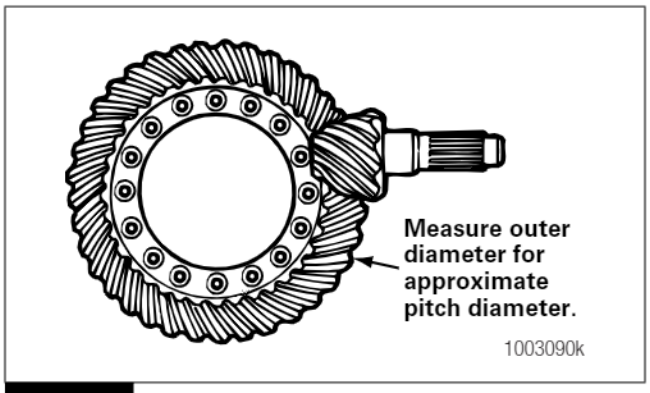


Figure 5.61

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 5.62.

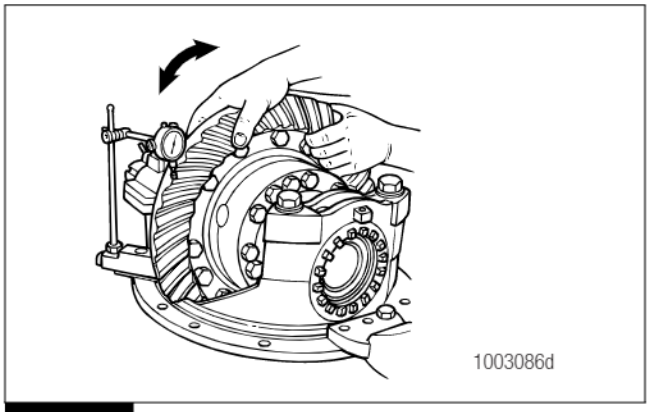


Figure 5.62

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 5.63.
   - **To decrease the backlash:** Move the ring gear toward the drive pinion. Figure 5.64.

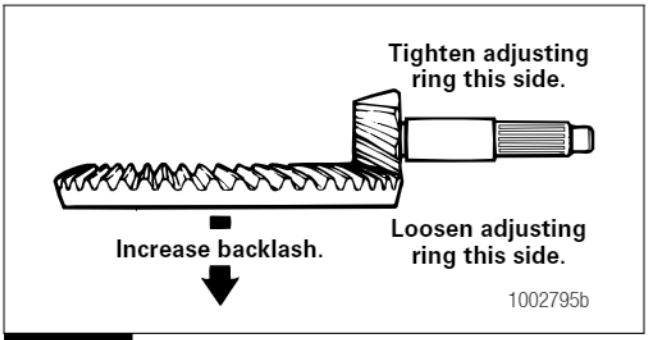


Figure 5.63

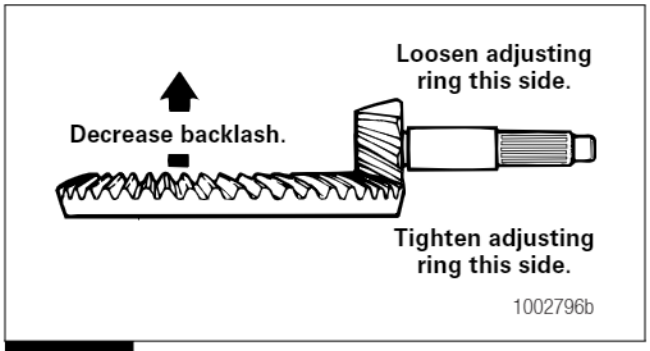


Figure 5.64

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)

Some Meritor carriers have a 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 5.65 for the location of part numbers. Refer to Section 4.

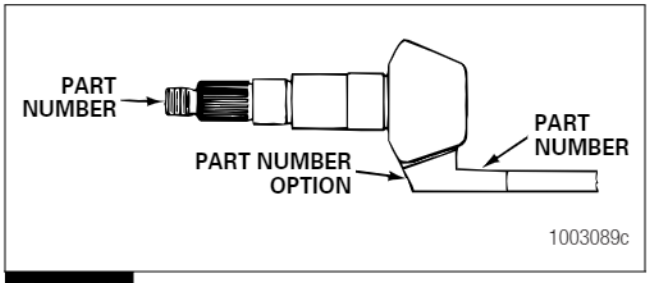


Figure 5.65

The following are examples of part numbers for hypoid 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 in the length of the tooth is indicated as toward the heel or toe of the ring gear. Figure 5.66.

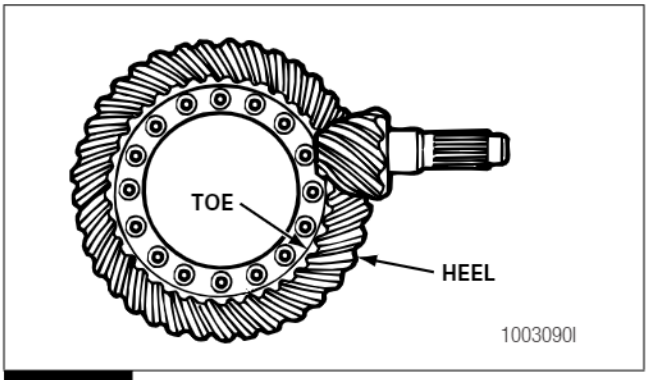


Figure 5.66

Always check the tooth contact patterns on the drive side of the gear teeth. Figure 5.67.

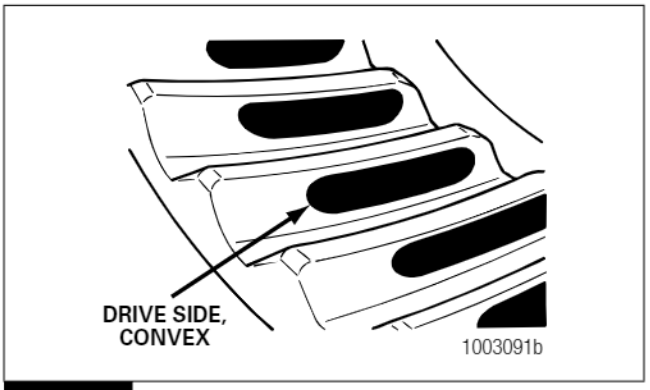


Figure 5.67

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 you measured before the carrier was disassembled. Refer to the 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 5.68.

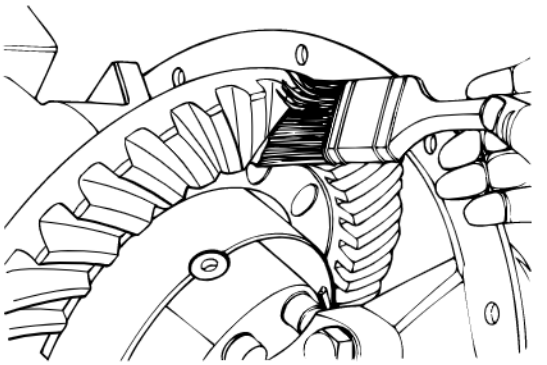


Figure 5.68

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 patterns. Repeat if needed to get a clearer pattern.
4. Look at the contact patterns on the ring gear teeth. Compare the patterns to Figure 5.69, Figure 5.70 and Figure 5.71.

   The location of good hand-rolled contact patterns for new conventional and hypoid gear sets is toward the toe of the gear tooth and in the center between the top and bottom of the tooth. Figure 5.69.

   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 5.72.

   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 patterns require 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.

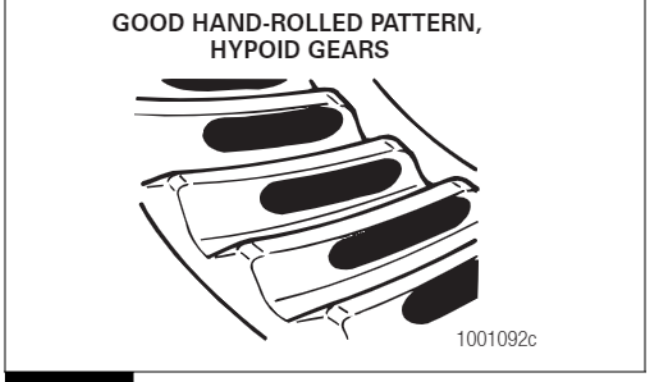


Figure 5.69

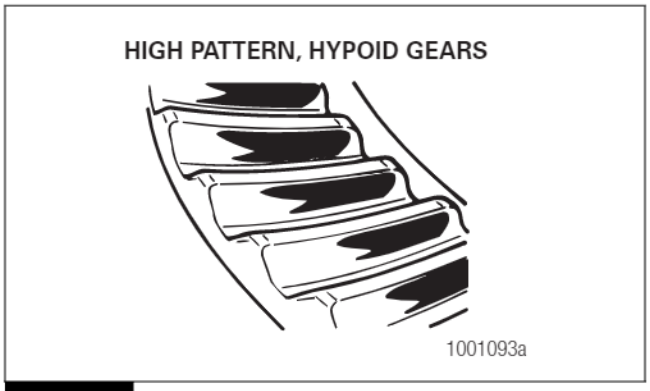


Figure 5.70

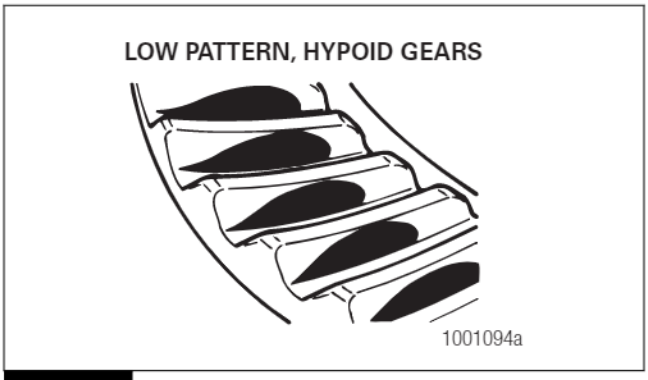


Figure 5.71

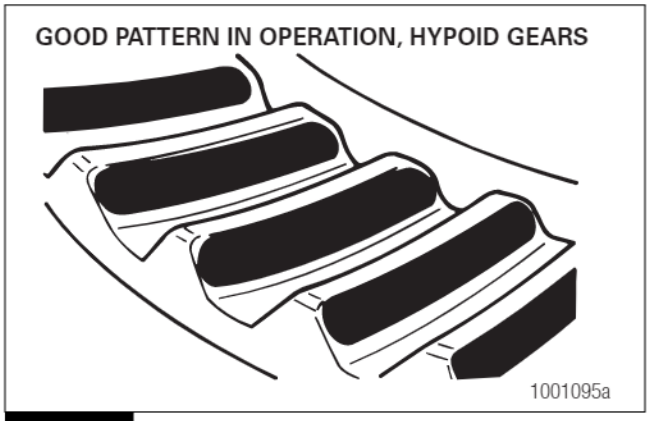


Figure 5.72

5. Change the thickness of the shim pack under the bearing cage to move the contact patterns between the top and bottom of the gear teeth. Use the following procedure.
   A. Remove the drive pinion and bearing cage from the carrier. Refer to Section 3.
      - **To correct a high contact pattern:** Decrease the thickness of the shim pack under the bearing cage. When decreasing the thickness of the shim pack, the drive pinion will move toward the ring gear. Figure 5.73.
      - **To correct a low contact pattern:** Increase the thickness of the shim pack under the bearing cage. When increasing the thickness of the shim pack, the drive pinion will move away from the ring gear. Figure 5.74.
   B. Install the drive pinion, bearing cage and shims 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.

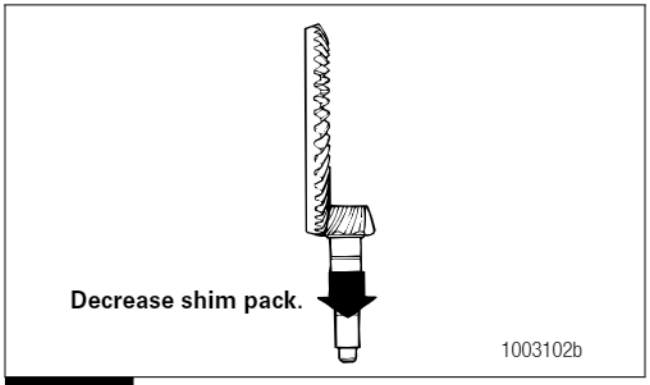


Figure 5.73

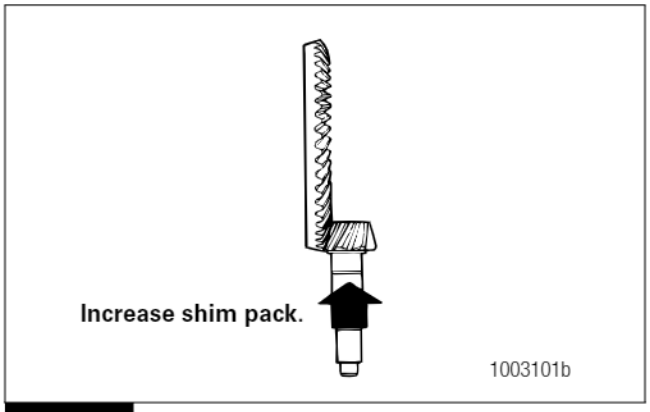


Figure 5.74

6. Adjust the backlash of the ring gear within the specification range to move the contact patterns to the correct location in the length of the gear teeth. Refer to the procedure in this section.
   A. Decrease the backlash to move the contact patterns toward the toe of the ring gear teeth. Figure 5.75.
   B. Increase the backlash to move the contact patterns toward the heel of the ring gear teeth. Figure 5.76.
   C. Repeat Step 2 through Step 4 and Step 6 until the contact patterns are at the correct location in the length of the gear teeth.

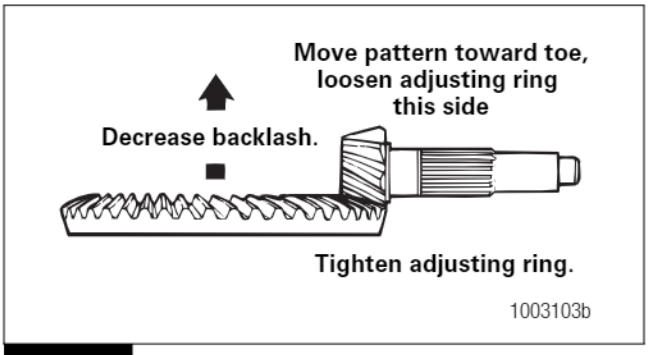


Figure 5.75

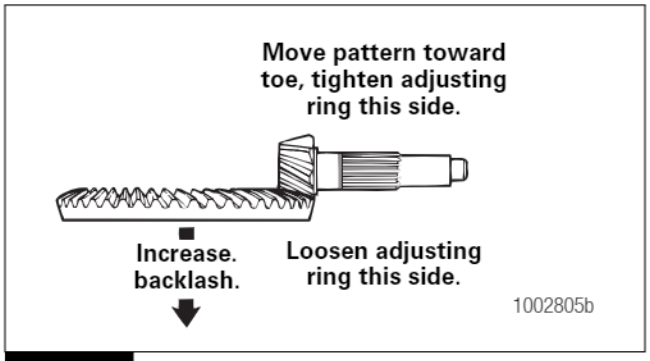


Figure 5.76

⚠ 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 5.77.
   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 5.77.
   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 5.77.
   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 5.77.
      - **For 59000 Series carriers:** Apply two to three drops of red Loctite® 277 threadlocker to the sides of the locking tab threaded holes. Apply Loctite® 277 threadlocker even if the capscrews have a locking patch.

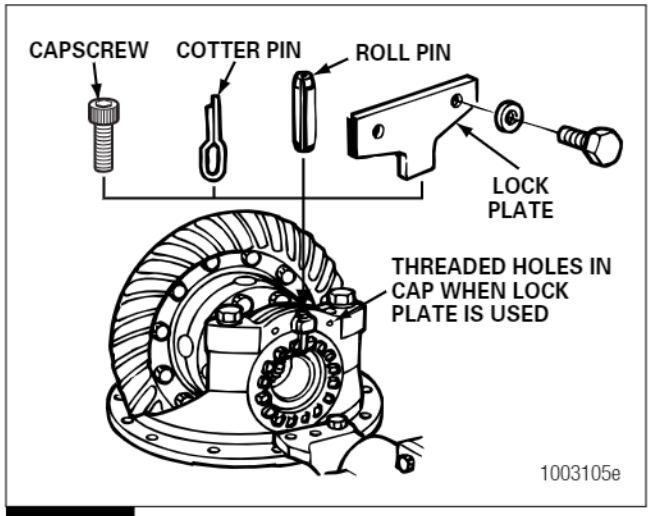


Figure 5.77

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 5.78.

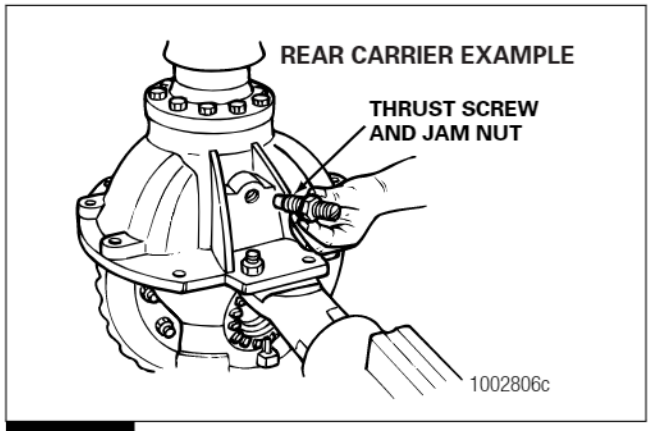


Figure 5.78

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 5.79.

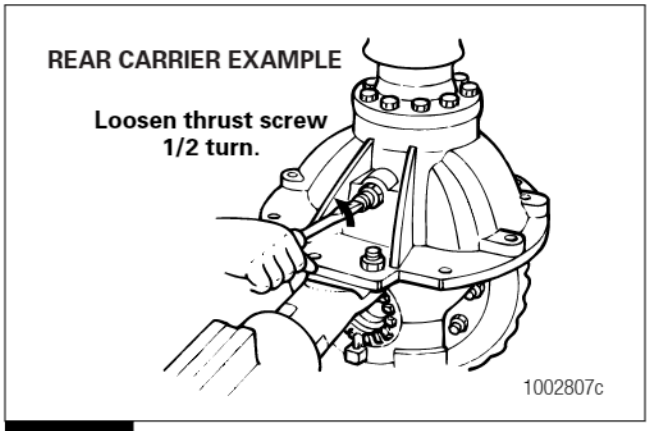


Figure 5.79

5. Tighten the jam nut, if equipped, to the correct torque value against the carrier. Refer to Section 8. Figure 5.80.

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

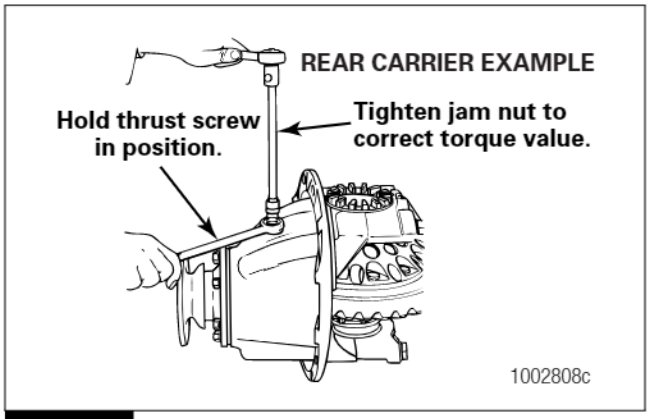


Figure 5.80

Differential Carrier into the Axle Housing

⚠ 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.

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.
2. Inspect the axle housing for damage. Repair or replace the axle housing.
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. Apply liquid adhesive to the threaded holes. Install the studs into the axle housing. Tighten the studs until there are no threads exposed.

⚠ 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 5.81.

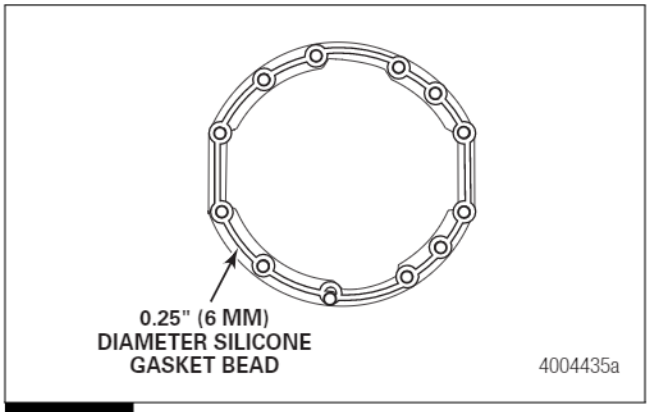


Figure 5.81

⚠ CAUTION

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

6. Use a hydraulic roller jack or a lifting tool to install the carrier into the axle housing.
7. Install nuts and washers or capscrews and washers, if equipped, into the four corner locations around the carrier and axle housing. Hand-tighten the fasteners. Figure 5.82.

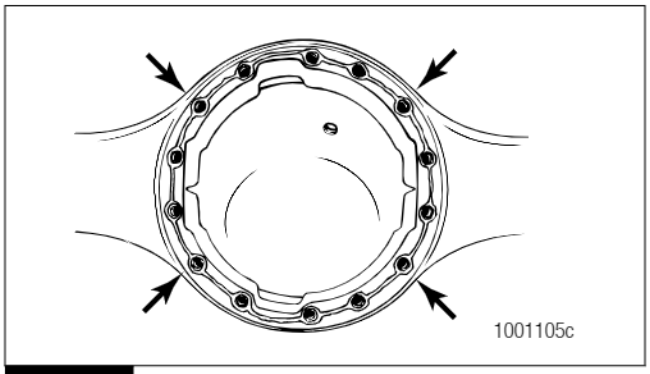


Figure 5.82

8. Carefully push the carrier into position. Tighten the four fasteners two or three turns each in a pattern opposite each other. Figure 5.82.
9. Repeat Step 8 until the four fasteners are tightened to the correct torque value. Refer to Section 8.
10. Install the other fasteners and washers that hold the carrier in the axle housing. Tighten fasteners to the correct torque value. Refer to Section 8.
11. If equipped with studs, apply Loctite® 242 threadlocker to the stud threads. Install the stud nuts and tighten to the correct torque value. Refer to Section 8.
12. Connect the driveline universal joint to the pinion input yoke or flange on the carrier.
13. 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 5.83.

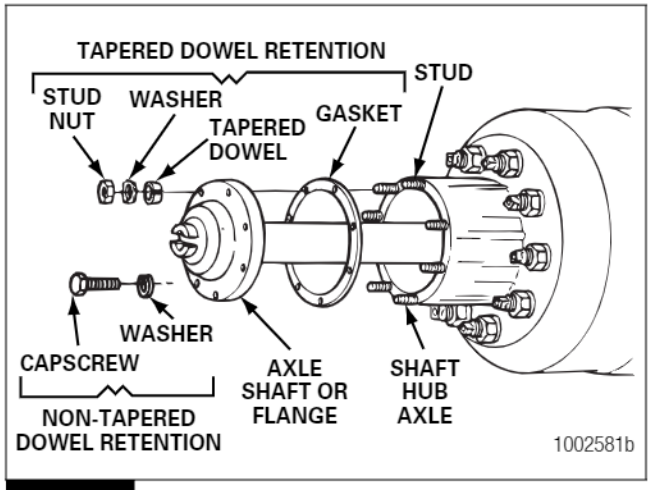


Figure 5.83

Straight Holes, Nuts and Hardened Washers

1. Clean the mating surfaces of the axle shaft and the 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 gasket and the axle shaft into the housing. The gasket and the flange of the axle shaft must fit flat against the wheel hub. Figure 5.83.
4. 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 P.

Table P: 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, Axle Shaft	0.62-18	150-230 (244-312)	130-190 (203-258)
	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.	

Tapered Dowel, Hardened Washer and Hardened Nut

1. Clean the mating surfaces of the axle shaft and the 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 gasket and the axle shaft into the housing. The gasket and the flange of the axle shaft must fit flat against the wheel hub. Figure 5.83.
4. 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.
5. 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 Q.

Table Q: 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, Axle Shaft	0.44-20	50-75 (81-102)	40-65 (67-88)
	0.50-20	75-115 (115-156)	65-100 (102-136)
	0.56-18	110-165 (176-224)	100-145 (149-197)
	0.62-18	150-230 (244-312)	130-190 (203-258)
Studs	All	Install the coarse thread end of the stud into the hub and tighten to the last thread.	

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

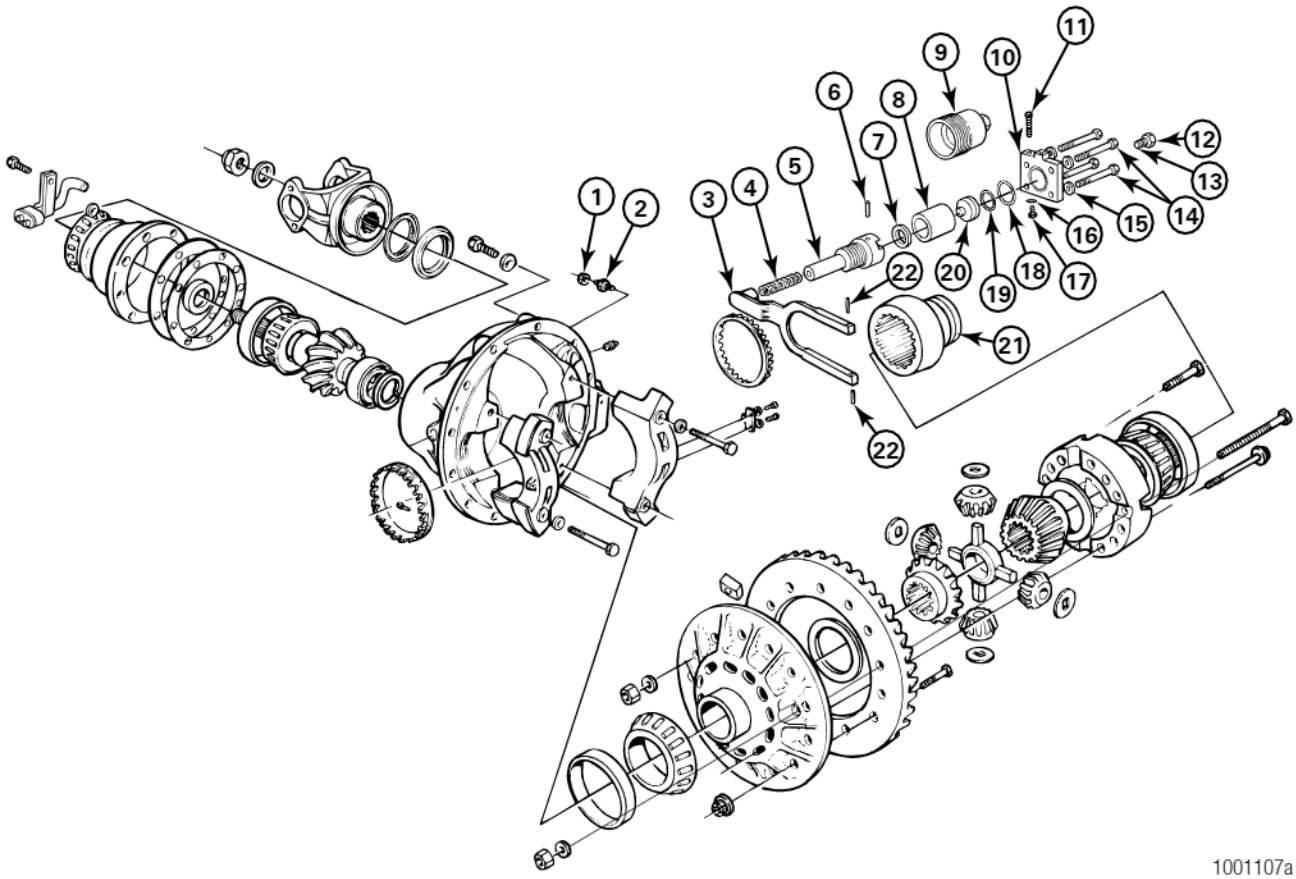
To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.

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.

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 that is installed on the splines of the axle shaft. When engaged, the collar locks the axle shafts together with a second set of splines on the differential case. When the DCDL is engaged, there is no differential action. Figure 6.1.



1	SENSOR SWITCH LOCKNUT	12	WASHER, OPERATING POSITION
2	SENSOR SWITCH	13	PLUG GASKET, OPERATING POSITION
3	SHIFT FORK	14	COVER CAPSCREWS
4	SHIFT SHAFT SPRING	15	WASHERS
5	SHIFT SHAFT	16	PLUG GASKET, STORAGE POSITION
6	SPRING RETAINING PIN	17	COVER PLUG, STORAGE POSITION
7	FLAT WASHER, OR SILASTIC AS REQUIRED	18	COVER COPPER GASKET
8	AIR CYLINDER TUBE	19	PISTON O-RING
9	SCREW-IN DIFFERENTIAL LOCK	20	PISTON
10	CYLINDER COVER	21	SHIFT COLLAR
11	MANUAL ACTUATION CAPSCREW, STORAGE POSITION	22	SHIFT FORK ROLL PINS

Figure 6.1

NOTE: The 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.

Vehicle Towing

⚠ CAUTION

If the vehicle must be towed to a service facility with the drive axle wheels on the ground, remove the axle shafts before the vehicle is towed. Damage to components can result.

1. Remove the axle shafts before the vehicle is towed. Refer to Section 11.
2. Install the axle shafts after the vehicle is towed. Refer to Section 11.
3. If the differential carrier must be removed from the axle housing, use the following procedures.

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.

NOTE: If the axle shafts were removed for towing with the differential in the unlocked or disengaged position, install the right-hand axle shaft into the housing before removing the differential carrier. Refer to Section 11.

To shift into the locked position, refer to the procedure in this section.

Axle Setup for DCDL Disassembly

⚠ WARNING

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

1. Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving.
2. Remove the drain plug from the bottom of the housing and drain the lubricant.

⚠ WARNING

During DCDL disassembly, when the DCDL is in the locked or engaged position and the vehicle's wheels are 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.

3. Use a jack to raise the vehicle so that the wheels to be serviced are off the ground. Place safety stands under the spring seats to hold the vehicle in the raised position.
4. Disconnect the driveline from the pinion input yoke.
5. Disconnect the vehicle air line from the differential lock actuator assembly.

DCDL Assembly Manual Engaging Methods

Bolt-On Style Differential Lock Cylinder

Use the following manual engaging method to lock out the bolt-on DCDL assembly. Figure 6.2.

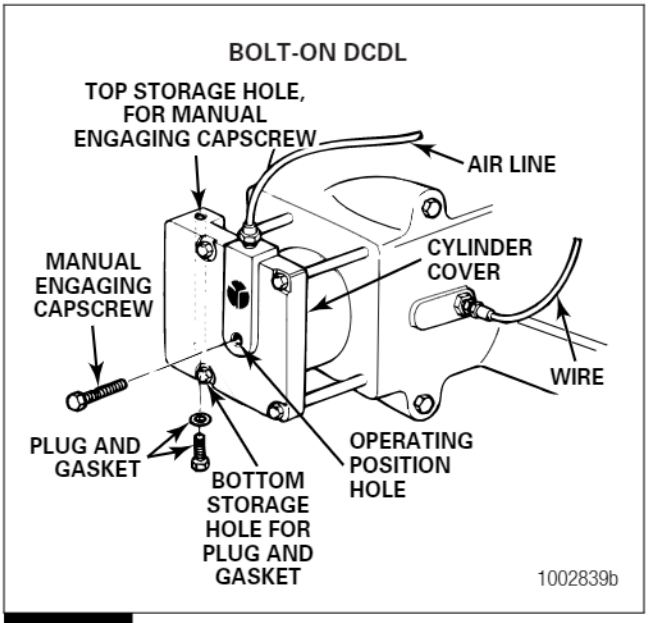


Figure 6.2

1. Follow Step 2 through Step 5 of Axle Setup for DCDL Disassembly in this section.
2. Remove the plug and gasket from the hole in the center of the cylinder cover.

NOTE: The storage hole for the plug and gasket is located on the opposite side of the cylinder cover where the storage hole for the manual engaging capscrew is located.

3. Remove the manual engaging capscrew from the top storage hole in the cylinder cover.
4. Install the plug and gasket into the bottom storage hole in the cylinder cover.
5. Install the manual engaging capscrew into the threaded hole in the center of the cylinder cover.

⚠ 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 and capscrew threads will be damaged.

6. Turn the manual adjusting capscrew to the right until the head is approximately 0.25-0.5-inch (6-13 mm) from the cylinder cover. Do not turn the capscrew beyond its normal stop. If the 0.25-10.5-inch (6-13 mm) service position of the capscrew is achieved, the main differential lock is completely engaged.

   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 drive pinion or right-hand wheel to align the splines of the shift collar and case half while you turn in the manual engaging capscrew.

   B. When a normal amount of spring resistance is 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.

7. Remove the carrier from the axle housing. Refer to Section 3.

Screw-In Style Differential Lock Cylinder

Use the following manual engaging method to lock out the screw-in DCDL assembly.

1. Follow Step 2 through Step 5 of Axle Setup for DCDL Disassembly in this section.
2. Remove the manual engaging capscrew from the storage hole in the carrier casting, next to the cylinder. Figure 6.3.

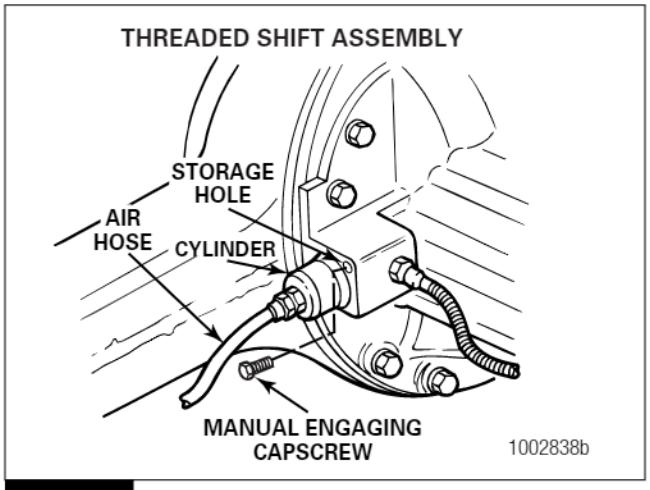


Figure 6.3

3. Remove the air line and fitting. Install the manual engaging capscrew into the threaded hole in the center of the cylinder cover.
4. 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.
5. Remove the carrier from the axle housing. Refer to Section 3.

Differential and Gear Assembly

Differential Lock Sliding Collar

1. For carriers with roll pins, tap out the two retainer roll pins, if equipped, until they are level with the inner face of the shift fork. Release the differential lock if it is manually engaged. Figure 6.4.

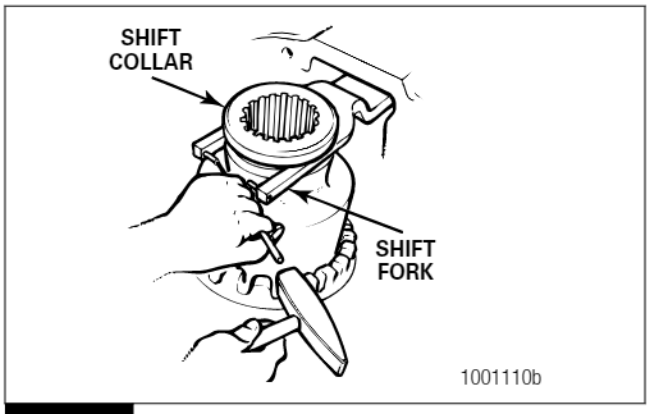


Figure 6.4

2. For carriers without roll pins, snap out the collar from the fork.
3. If required, remove the DCDL assembly at this time.

NOTE: On some bolt-on assemblies, 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.

A. **Bolt-on style differential lock cylinder:** Remove the sensor switch and locknut.

B. Remove the four capscrews and washers that hold the cylinder cover to the carrier. Remove the cylinder cover and copper gasket. Figure 6.5.

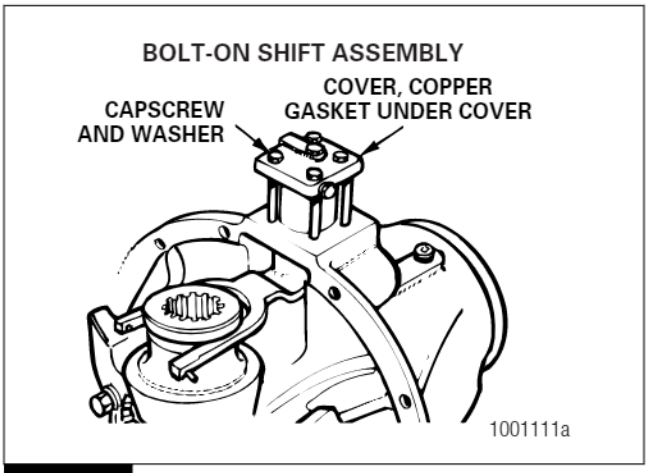


Figure 6.5

C. Remove the shift unit cylinder and piston. Remove the O-ring from the piston.

D. Remove the shift shaft from the shift fork. The shaft may be secured with liquid adhesive or pre-applied adhesive material.

E. Remove the shift shaft spring and flat washer. Some models use silastic seal instead of the flat washer.

F. Remove the shift fork.

A. **Screw-in style differential lock cylinder:** Remove the sensor switch.

B. Remove the cylinder by turning the hex nut at the top of the cylinder with a wrench. The cylinder may be secured to the carrier casting with Loctite® adhesive or equivalent pre-applied liquid adhesive.

C. Remove the shift shaft, spring and shift fork.

4. Remove the capscrews, cotter pins, roll pins or lock plates, if equipped, that hold the two 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.
5. Mark one bearing cap and one carrier leg so that these parts will be assembled in the correct positions. Remove the bearing cap capscrews and washers, the bearing caps and the adjusting rings.
6. Lift the differential and gear assembly from the carrier. Tilt the assembly as required to permit the ring gear to clear the support for the pinion spigot bearing. Figure 6.6.

   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.

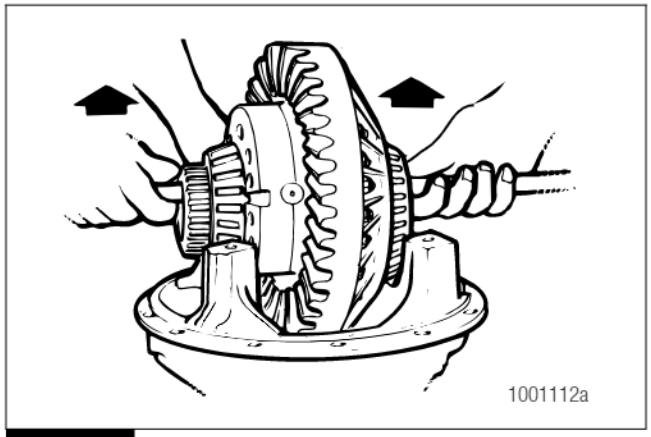


Figure 6.6

Installation

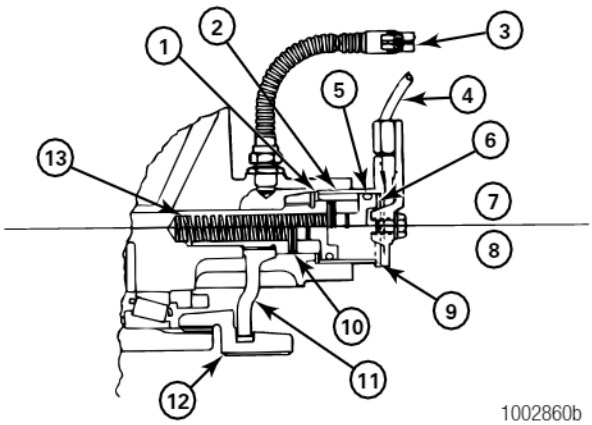
DCDL Assembly into the Carrier

Bolt-On Style Differential Lock Assembly

Install the differential shift assembly after the differential carrier is assembled and the gear and bearing adjustments are completed. Figure 6.7.

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 6.8. Do not install the pins completely at this time.
2. On models without roll pins, snap the fork into position.
3. Apply Loctite® 222 threadlocker, Meritor part number 2297-B-6112, to the threads of the shift shaft.

4. Install the shift fork into its correct position in the carrier case. Figure 6.9.



1 FLAT WASHER OR SILASTIC AS REQUIRED
2 CYLINDER
3 ELECTRIC CONNECTION FOR SENSOR
4 AIR LINE
5 O-RING
6 PISTON
7 DISENGAGED
8 ENGAGED
9 COPPER GASKET
10 PIN
11 SHIFT FORK
12 COLLAR
13 SHIFT SHAFT AND SPRING

Figure 6.7

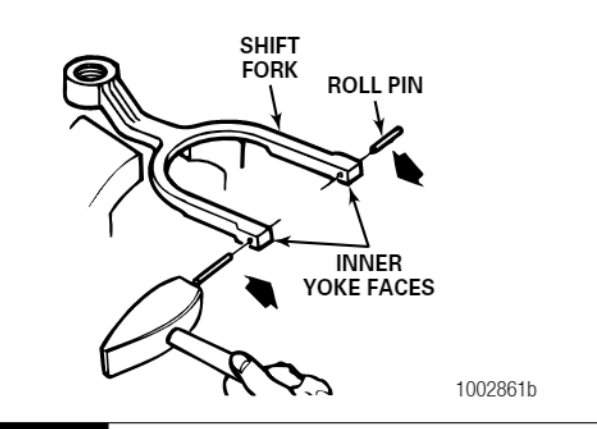


Figure 6.8

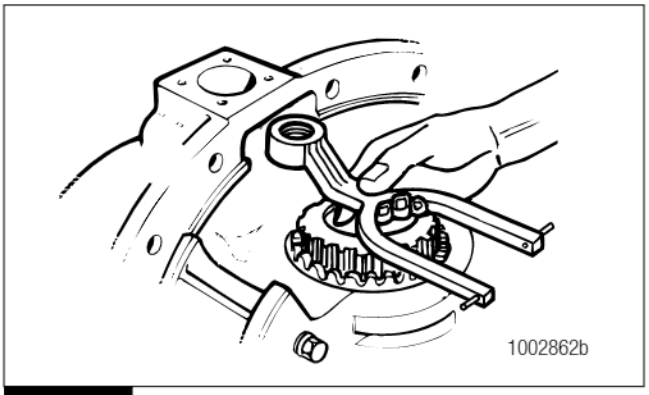


Figure 6.9

5. 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 6.10.

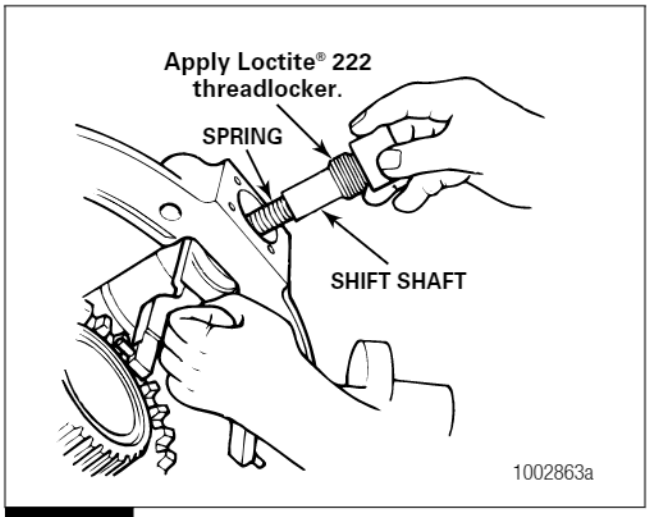


Figure 6.10

6. Slide the shift shaft over the spring. Install the shaft into the shift fork. Tighten to 37-48 lb-ft (50-65 N•m).
7. Install the flat washer, when used, or apply silastic sealant, Meritor part number 1199-Q-2981, to the bottom of the cylinder bore. Figure 6.11.

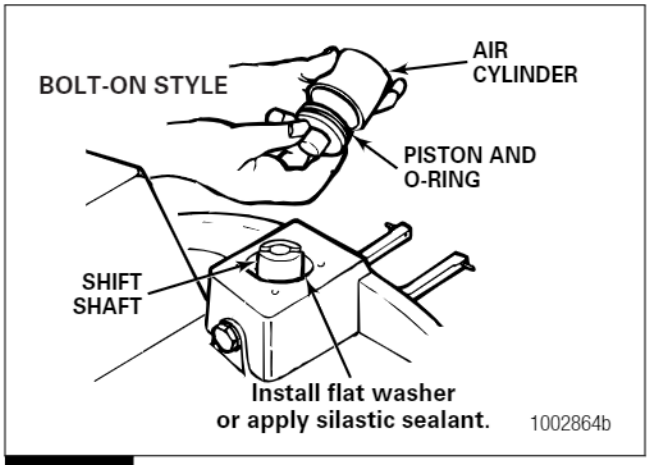


Figure 6.11

8. Install the O-ring into its groove on the piston. Lubricate the O-ring with axle lubricant. Install the piston into the air cylinder. Figure 6.11.
9. Install the cylinder into the housing bore. Verify that the pilot journal on the piston is against its bore on the shift shaft. Figure 6.12.

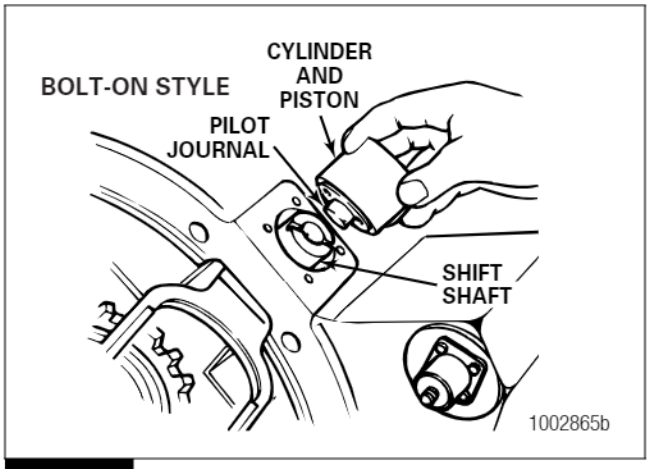


Figure 6.12

10. Install the copper gasket into its bore on the inside of the cylinder cover. Place the cover in 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 7.4-8.9 lb-ft (10-12 N•m). Figure 6.7 and Figure 6.13.

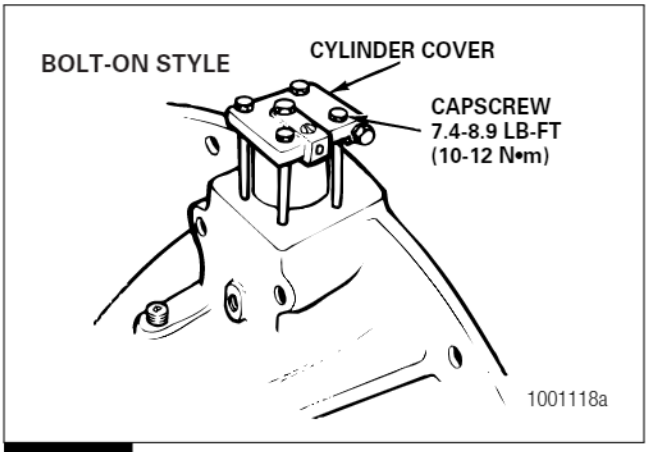


Figure 6.13

11. Slide the shift collar into the fork. Engage the shift collar splines with the splines of the differential case. Use the manual actuation capscrew to move the shift collar splines into the differential case splines. Refer to the procedure in this section.
12. Hold the shift collar in the locked or engaged position. If employed, tap the two roll pins into the shift fork ends until they are level with the outer yoke faces. Figure 6.14.

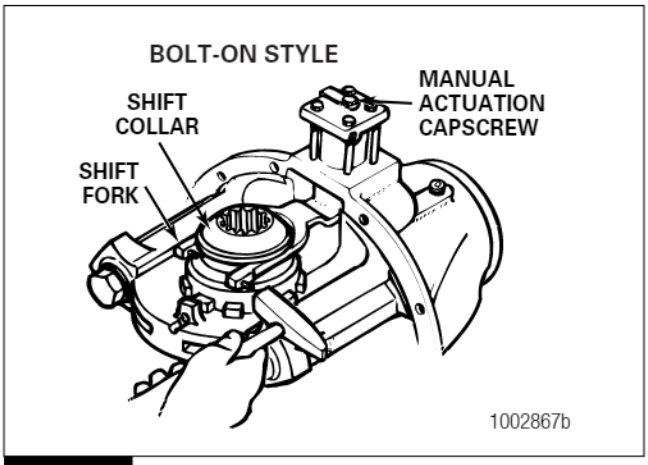


Figure 6.14

13. While the shift collar is still in the locked position, place the sensor switch, with the jam nut loosely attached into its hole.
14. 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 revolution. Tighten the jam nut to 26-33 lb-ft (34-45 N•m).

Screw-In Style Differential Lock Assembly with O-Ring

Install the differential shift assembly after the differential carrier is assembled and the gear and bearing adjustments are completed. Figure 6.15.

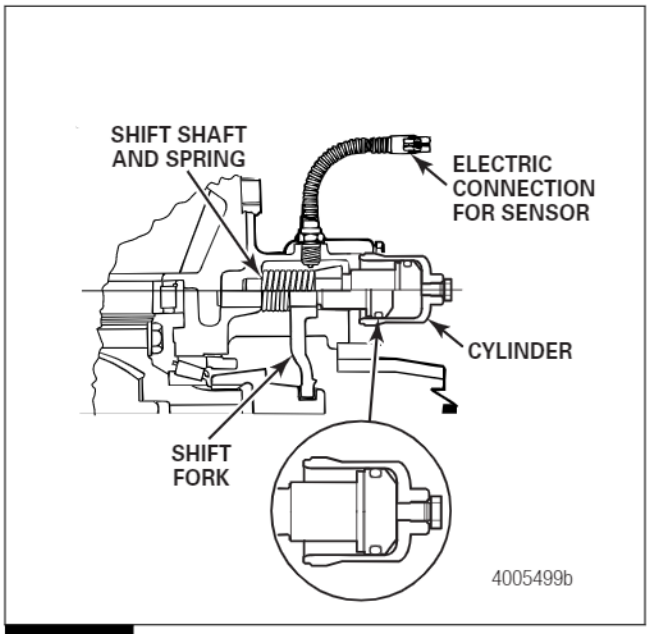


Figure 6.15

1. Install the shift spring and fork into the correct position in the carrier case. Compress the spring slightly while installing the fork.
2. Install the shift shaft into the shaft bore of the carrier. Slide the shaft through the shift fork bore and shift spring inside diameter.
3. Inspect the piston O-ring. Replace the O-ring if there is any evidence of cuts, cracks, abrasion or wear.
4. Lightly lubricate the O-ring and DCDL cylinder bore with the same lubricant used in the axle housing.
5. Install the piston and O-ring assembly into the DCDL cylinder. Slide the piston to the port end of the cylinder.
6. Apply a continuous 0.06-inch (1.5 mm) bead of Loctite® flange sealant, Meritor part number 2297-D-7076, around the DCDL cylinder threads.
7. Screw the DCDL cylinder in place. Tighten the cylinder to 80-100 lb-ft (109-136 N•m). Figure 6.16.

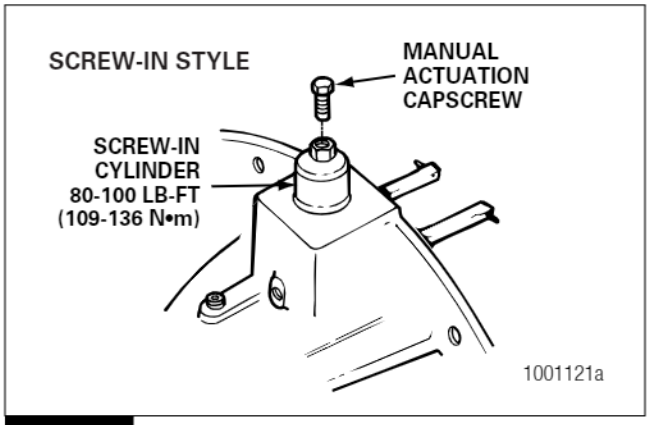


Figure 6.16

8. Snap the shift collar into the fork. Engage the shift collar splines with the splines of the differential case. Use the manual actuation capscrew to move the shift collar splines into the differential case splines. Refer to the procedure in this section.
9. Install the sensor switch into its hole. Tighten the switch to 25-35 lb-ft (35-45 N•m).
10. 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 value is over one ohm:** Check the sensor.
    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.

Screw-In Style Differential Lock Assembly with Bonded Lip Seal Piston

Install the differential shift assembly after the differential carrier is assembled and the gear and bearing adjustments are completed. Figure 6.17.

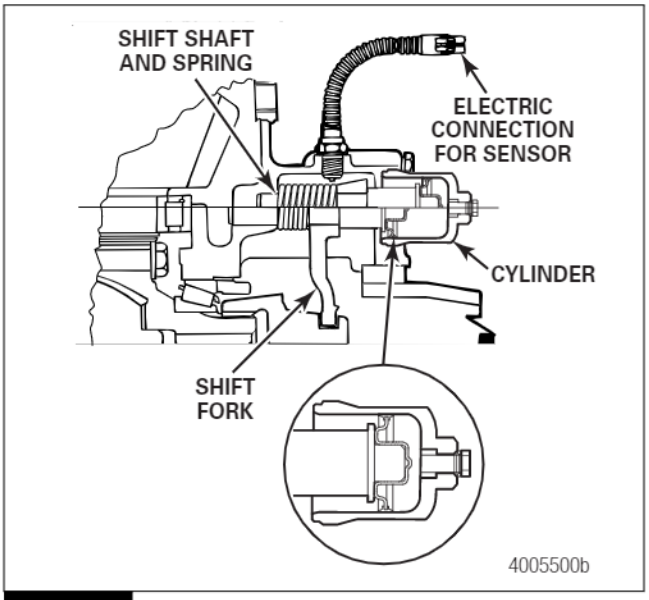


Figure 6.17

1. Install the shift spring and fork into the correct position in the carrier case. Compress the spring slightly while installing the fork.
2. Install the shift shaft into the shaft bore of the carrier. Slide the shaft through the shift fork bore and shift spring inside diameter.
3. Inspect the bonded lip seal piston. Replace the piston if there is any evidence of cuts, cracks, abrasion or wear.
4. Lightly lubricate the bonded lip seal piston and DCDL cylinder bore with the same lubricant used in the axle housing.
5. Install the bonded lip seal piston assembly into the DCDL cylinder. Slide the piston to the port end of the cylinder.
6. Apply a continuous 0.06-inch (1.5 mm) bead of Loctite® flange sealant, Meritor part number 2297-D-7076, around the DCDL cylinder threads.
7. Screw the DCDL cylinder in place. Tighten the cylinder to 80-100 lb-ft (109-136 N•m). Figure 6.18.

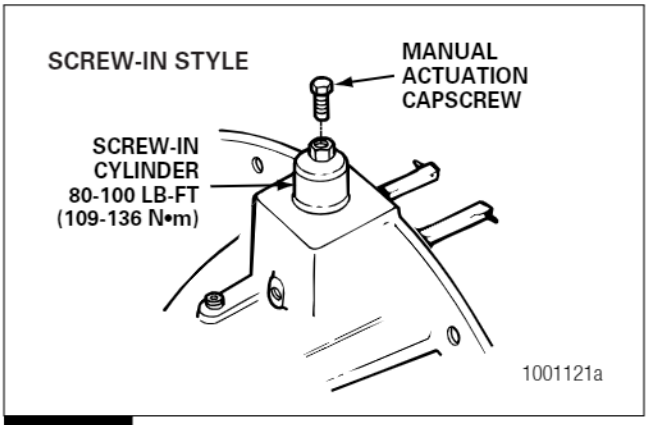


Figure 6.18

8. Snap the shift collar into the fork. Engage the shift collar splines with the splines of the differential case. Use the manual actuation capscrew to move the shift collar splines into the differential case splines. Refer to the procedure in this section.
9. Install the sensor switch into its hole. Tighten the switch to 25-35 lb-ft (35-45 N•m).
10. 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 value is over one ohm:** Check the sensor.
    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.

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 Cover Plate Assemblies

1. Install the washer and plug into the hole for the sensor switch. Tighten the plug to 45-55 lb-ft (60-74 N•m). Figure 6.19.

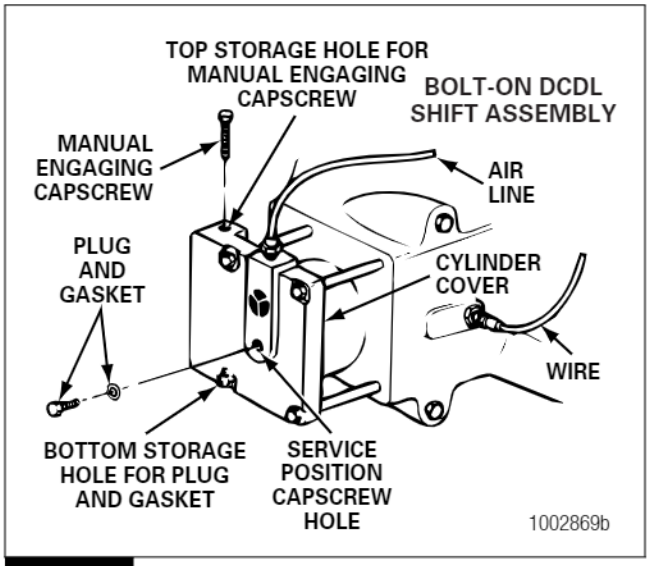


Figure 6.19

2. Apply silicone gasket material to the cover plate mounting surface on the carrier.
3. Install the four washers and capscrews. Tighten the capscrews to 7.4-8.9 lb-ft (10-12 N•m). Figure 6.20.

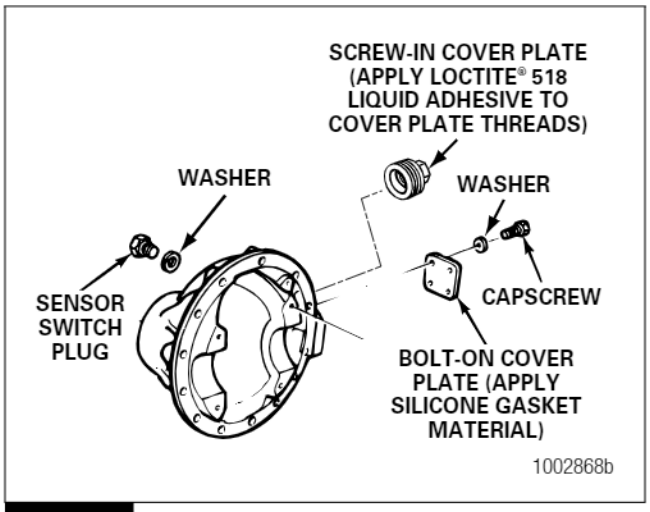


Figure 6.20

Screw-In Cover Plate Assemblies

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

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 mounting surface. Blow dry the cleaned areas with compressed air. Refer to Section 4.
2. Inspect the axle housing for damage. If necessary, repair or replace the housing. Refer to Section 4.
3. Check for loose studs in the mounting surface of the housing where the carrier fastens. Remove and replace any studs where required.
4. Install the differential carrier into the housing, using the Manual Engaging Method.

Manual Engaging Method

1. Align the splines of the shift collar and the differential case half by hand or by installing the right-hand axle shaft through the shift collar and into the side gear.
2. Install the manual engaging capscrew into the threaded hole in the center of the cylinder cover.

⚠ CAUTION

There will be a small amount of spring resistance 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. Damage to components can result.

3. Turn the manual adjusting capscrew to the right until the distance from the head of the capscrew is approximately 0.25-0.50-inch (6-13 mm) from the cylinder cover. Do not turn the capscrew beyond its normal stop. When the capscrew head is in the service position 0.25-0.50-inch (6-13 mm) from the top of the DCDL, the main differential lock is manually engaged.

   A high resistance on the capscrew indicates that the splines of the shift collar and the differential case half are not aligned or engaged.

   Lift the shift collar as required and rotate to align the splines of collar and case half while turning the manual engaging capscrew inward. 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 0.25-0.50-inch (6-13 mm) service position is achieved.

4. Clean both the DCDL actuator and the housing mounting surfaces.

5. Apply silicone gasket material to the cleaned housing surface for the DCDL actuator.

6. Remove the short plug and gasket from the storage hole of the DCDL.

7. Remove the long manual engaging capscrew from the service position in the center of the DCDL to disengage the main differential lock.

8. Clean the plug, gasket, cylinder cover and threaded service position hole in the center of the DCDL cylinder cover.

9. Install the manual engaging capscrew into the DCDL storage hole in the bolt-on or the screw-in DCDL assembly. Figure 6.19 and Figure 6.21. The sealing gasket must be under the head of the capscrew.

   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 6.19.

   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 6.21.

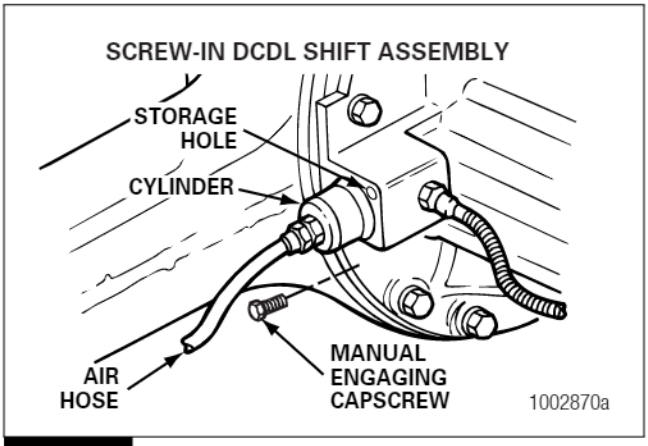


Figure 6.21

10. Tighten the plug, if equipped, 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 style cylinders and to 7-11 lb-ft (10-15 N•m) for screw-in type reverse shifters. ❶

11. Connect the vehicle air line to the differential lock actuator assembly.

12. Install the electrical connection on the sensor switch located in the carrier, below the actuator assembly.

13. Install the right- and left-hand axle shafts. Refer to Section 11.

14. Remove the safety stands from under the drive axle. Lower the vehicle to the floor.

15. Proceed 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 6.22. 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 6.22

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.

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 R and Table S for standard information on lubricants and schedules.

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

Meritor Lubricant Specification	Description	Cross Reference	Minimum Outside Temperature	Maximum Outside Temperature
0-76-A	Hypoid Gear Oil	GL-5, S.A.E. 85W/140	10°F (–12.2°C)	*
0-76-B	Hypoid Gear Oil	GL-5, S.A.E. 80W/140	–15°F (–26.1°C)	*
0-76-D	Hypoid Gear Oil	GL-5, S.A.E. 80W/90	–15°F (–26.1°C)	*
0-76-E	Hypoid Gear Oil	GL-5, S.A.E. 75W/90	–40°F (–40°C)	*
0-76-J	Hypoid Gear Oil	GL-5, S.A.E. 75W	–40°F (–40°C)	35°F (1.6°C)
0-76-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 S: Oil Change Intervals and Specifications for All Front Drive and 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
Initial Oil Change	Not required	Not required	Not required	Not required
Check Oil Level 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]
Petroleum-Based Oil 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
Synthetic Oil 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]
Filter Change 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.)

Fasteners

The torque values in Table T are for fasteners that have a light application of oil on the threads.

- **If the fasteners are dry:** Increase the torque values by 10 percent.
- **If the fasteners have a heavy application of oil on the threads:** Decrease the torque values by 10 percent.

If you do not know the size of the fastener that is being installed, measure the fastener. Use the following procedure.

Compare the size of the fastener measured to the list of fasteners in Table T to find the correct torque value.

American Standard Fasteners

1. Measure the diameter of the threads in inches, dimension X. Figure 8.1.

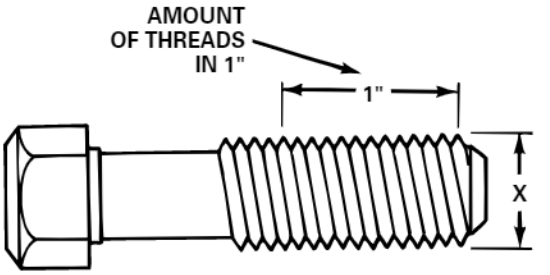


Figure 8.1

2. Count the amount of threads in one-inch. Figure 8.1.

Example

American Standard size fastener is 0.50-13.

- 0.50 is the diameter of the fastener in inches or dimension X.
- 13 is the amount of threads in one-inch.

Metric Fasteners

1. Measure the diameter of the threads in millimeters (mm), dimension X. Figure 8.2.

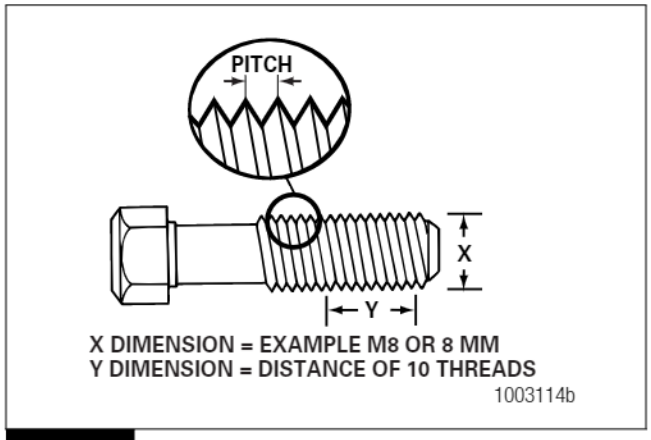


Figure 8.2

2. Measure the distance of 10 threads, point to point in millimeters (mm), dimension Y. Make a note of dimension Y. Figure 8.2.
3. Divide dimension Y by 10. The result will be the distance between two threads or pitch.

Example

Metric size fastener is M8 x 1.25.

- M8 is the diameter of the fastener in millimeters (mm) or dimension X.
- 1.25 is the distance between two threads or pitch.

Torque Specifications

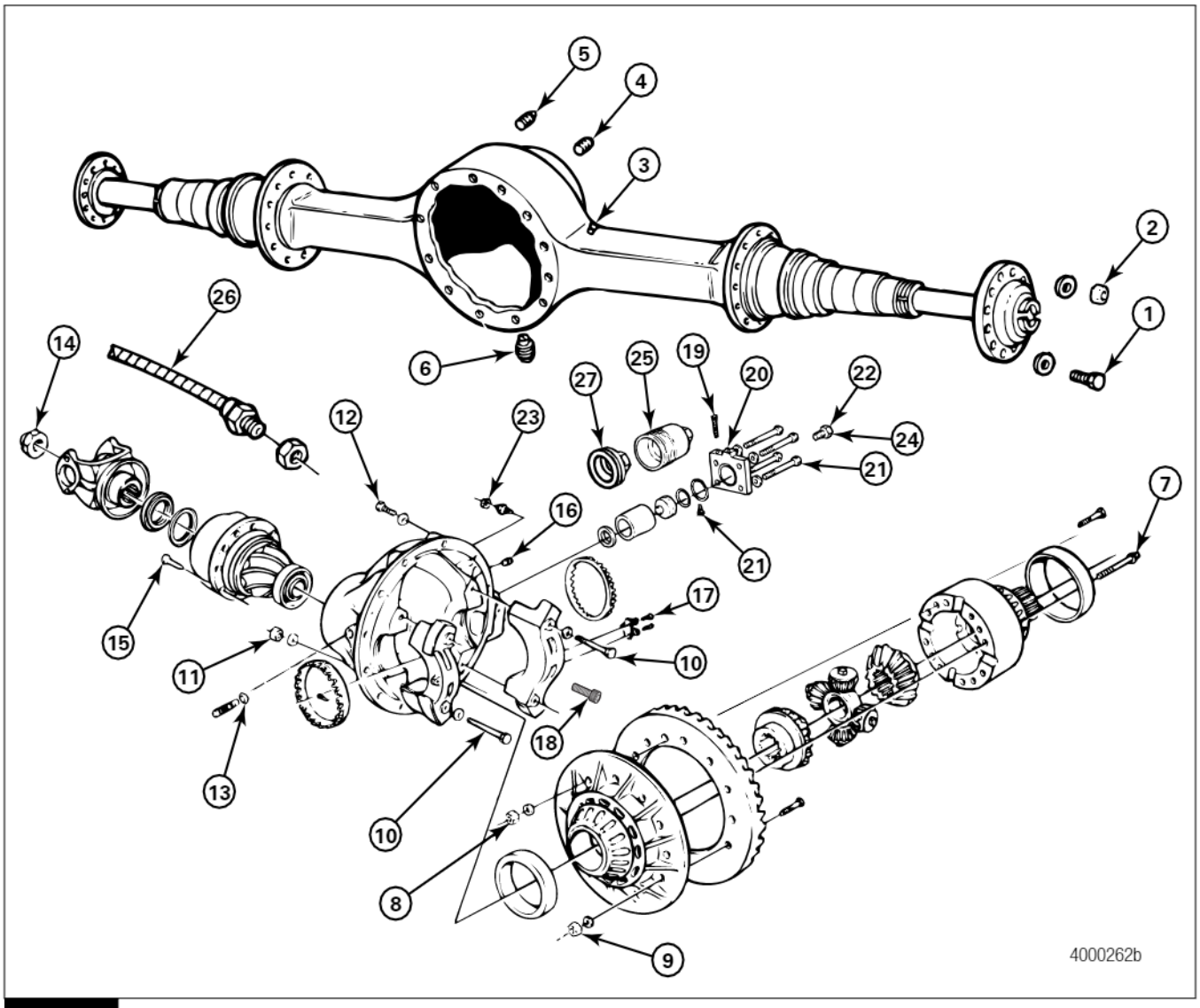


Figure 8.3

Table T: Torque Chart

Fastener		Thread Size	Torque lb-ft	Torque N•m
1	Axle Shaft Capscrew	0.31-24	18-24	24-33
		0.50-13	85-115	115-156
2	Axle Shaft Stud Nut	Plain Nut		
		0.44-20	50-75	68-102
		0.50-20	75-115	102-156
		0.56-18	110-165	149-224
		0.62-18	150-230	203-312
		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
3	Breather	0.38-18	20 minimum	27 minimum
4	Housing Oil Fill Plug	0.75-14	35 minimum	47.5 minimum
5	Heat Indicator Plug	0.50-14	25 minimum	34 minimum
6	Oil Drain Plug	0.50-14	25 minimum	34 minimum
7	Differential Case Capscrew	0.38-16	35-50	48-68
		0.44-14	60-75	81-102
		0.50-13	85-115	115-156
		0.56-12	130-165	176-224
		0.62-11	180-230	244-312
		M12 x 1.75, Grade 10.9 Flange Head	85-103	115-140
		M12 x 1.75, Grade 10.9 Standard Hex Head	74-96	100-130
		M12 x 1.75, Grade 12.9 Standard Hex Head	105-125	143-169
		M16 x 2, Grade 12.9 Flange Head	203-251	275-340
		M16 x 2, Grade 12.9 Standard Head	220-310	300-420

Fastener		Thread Size	Torque lb-ft	Torque N•m
8	Differential Case Bolt Nut	0.50-13	75-100	102-136
		0.50-20	85-115	115-156
		0.62-11	150-190	203-258
		0.62-18	180-230	244-312
		0.87-14	600-700	815-950
		M12 x 1.75	74-96	100-130
		M16 x 2	220-310	300-420
9	Ring Gear Bolt Nut	0.50-13	75-100	102-136
		0.50-20	85-115	115-156
		0.62-11	150-190	203-258
		0.62-18	180-230	244-312
		0.87-14	600-700	816-952
		M12 x 1.25	66-81	90-110
		M12 x 1.75	77-85	104-115
		M16 x 1.5, Flange Head	192-214	260-190
		M16 x 1.5, Standard Hex Head	196-262	265-355
10	Bearing Cap Capscrew	0.56-12	110-145	149-197
		0.62-11	150-190	203-258
		0.75-10	270-350	366-475
		0.88-14	360-470	488-637
		0.88-9	425-550	576-746
		M16 x 2	181-221	245-300
		M20 x 2.5	347-431	470-585
		M22 x 2.5	479-597	650-810
11	Housing-to-Carrier Stud Nut	0.44-20	50-75	68-102
		0.50-20	75-115	102-156
		0.56-18	110-165	149-224
		0.62-18	190-230	258-312

Fastener		Thread Size	Torque lb-ft	Torque N•m
12	Carrier-to-Housing Capscrew	0.44-14	50-75	68-102
		0.50-13	75-115	102-156
		0.56-12	110-165	149-224
		0.62-11	210-240	285-325
		0.75-10	270-400	366-542
		M12 x 1.75	74-89	100-120
		M16 x 1.5 (Preferred)	Torque plus angle: 74 lb-ft (100 N•m) + 105-115 degrees	
		M16 x 1.5 (Optional)	191-207	260-280
		M16 x 2	181-221	245-300
13	Thrust Screw Jam Nut	0.75-16	150-190	203-258
		0.88-14	150-300	203-407
		1.12-16	150-190	203-258
		M22 x 1.5	148-210	200-285
		M30 x 1.5	236-295	320-400
14	Input Yoke-to-Input Shaft Nut	Refer to Table U.		
15	Bearing Cage Capscrew	0.38-16	30-50	41-68
		0.44-14	50-75	68-102
		0.50-13	75-115	102-156
		0.56-12	110-165	149-224
		0.62-11	150-230	203-312
		M12 x 1.75 (Hex Capscrew and Washer)	70-110	95-150
		M12 x 1.75 (Flanged Capscrew)	100-120	135-163
16	Carrier Oil Fill Plug	0.75-14	25 minimum	34 minimum
		1.5-11.5	120 minimum	163 minimum
		M24 x 1.5	35 minimum	47 minimum
17	Lock Plate Capscrew	0.31-18	20-30	27-41
		M8 x 1.25	21-26	28-35
18	Adjusting Rings Capscrews	—	21-28	28-38
Torque Values for Carriers with Bolt-On Style Differential Lock Cylinders				
19	Manual Actuation Storage Position Capscrew	M10 x 1.5	15-25	20-35

Fastener		Thread Size	Torque lb-ft	Torque N•m
20	Air Cylinder Adapter	M12 x 1.5	22-30	30-40
21	Air Cylinder Cover Capscrew	M6 x 1	7-12	10-16
22	Air Cylinder Cover Capscrew/Plug, Operating and Storage Position	M10 x 1.5	15-25 15-25	20-35 20-35
23	Sensor Switch Locknut	M16 x 1	25-35	35-45
Torque Values for Carriers with Screw-In Style Differential Lock Cylinders				
24	Manual Actuation Storage Position Capscrew	M10 x 1.25	7-11	10-15
25	Air Cylinder	M60 x 2.0	80-100	109-136
26	Sensor Switch	M16 x 1.0	25-35	35-45
27	Screw-In DCDL Cylinder Plug or Cap	M60 x 2.0	80-100	109-136

Input and Output Yoke Pinion Nut Fastener Torque Specifications

Table U: Single and Rear of Tandem Axles

Axle Model Pinion Nut Location	RS-120, RS-125, RS-140	RS-144/145 MS-14X (hypoid)	RF-166, 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 (1000-1245 N•m)	920-1130 lb-ft (1250-1535 N•m)	1000-1230 lb-ft (1350-1670 N•m)	740-920 lb-ft (1000-1245 N•m)	740-920 lb-ft (1000-1245 N•m)	800-1100 lb-ft (1085-1496 N•m)
Fastener Size	M32 x 1.5	M39 x 1.5	M45 x 1.5	M32 x 1.5	M39 x 1.5	1-1/2 - 12 UNF

Hazard Alert Messages

Table V: Drive Pinion Bearings — Preload

Specification	New bearings 5-45 lb-in (0.56-5.08 N•m) Used bearings in good condition 5-25 lb-in (1.7-2.8 N•m)
Adjustment	Preload is controlled by the thickness of the spacer between the bearings. To increase the preload, install a thinner spacer. To decrease the 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	Conventional gear set Toward the toe of the gear tooth and in the center between the top and bottom of the tooth. Hypoid gear set Between the center and toe of the 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 pinion bearing cage and carrier and by ring gear backlash. To move the contact pattern lower, decrease the thickness of the shim pack under the pinion bearing cage. To move the contact pattern higher, increase the thickness of the shim pack under the pinion bearing cage. To move the contact pattern toward the toe of the tooth, decrease the backlash of the ring gear. To move the contact pattern toward the heel of the tooth, increase the 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 RS-140, RS-145 and RS-160 carrier models — 0.002-0.009-inch (0.05-0.229 mm) All other carrier models — 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

Table AA: Ring Gear — Backlash

Specification	Ring gears that have a pitch diameter of less than 17-inches (431.8 mm) Range: 0.008-0.018-inch (0.20-0.46 mm) 0.012-inch (0.30 mm) for a new gear set Ring gears that have a pitch diameter of 17-inches (431.8 mm) or greater Range: 0.010-0.020-inch (0.25-0.51 mm) 0.015-inch (0.38 mm) for a new gear set
Adjustment	Backlash is controlled by the position of the ring gear. Change the backlash within specifications to get a good tooth contact pattern. To increase the backlash, move the ring gear away from the drive pinion. To decrease the backlash, move the ring gear toward the drive pinion.

Table AB: Ring Gear — Runout

Specification	0.008-inch (0.20 mm) maximum

Table AC: DCDL Sensor Switch — Installation

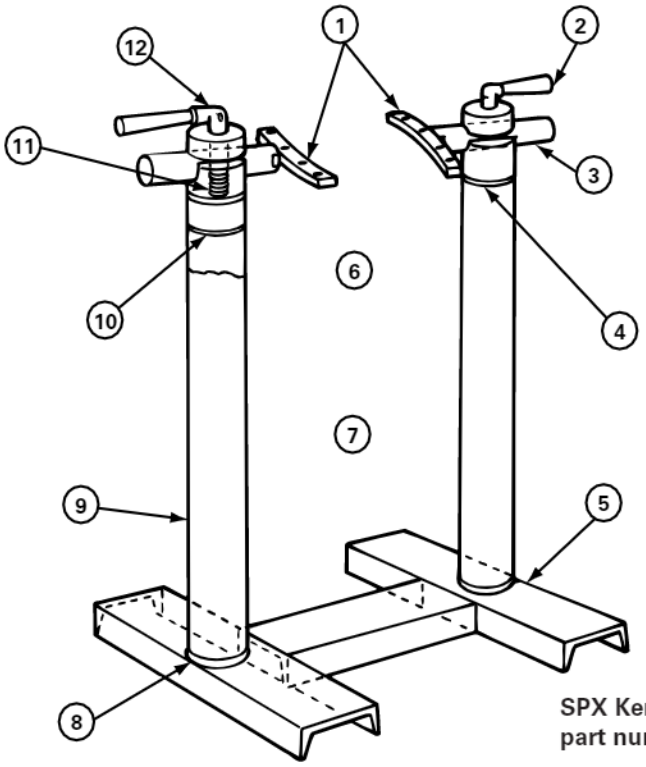
Adjustment	Shift the differential to the locked position. Tighten the sensor switch into the carrier until the test light illuminates. Tighten the sensor switch one additional turn. Tighten the jam nut to the specified torque.

Table AD: Spigot Bearing — Peening on the Drive Pinion

Specification	Apply 6,614 lb (3000 kg) load on a 0.375-inch (10 mm) ball. Peen the end of the drive pinion at a minimum of five points. Softening of the pinion stem end by heating may be required.

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

Figure 10.1

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

How to Make a Yoke Bar

1. Measure dimensions A and B of the yoke you are servicing. Figure 10.2.

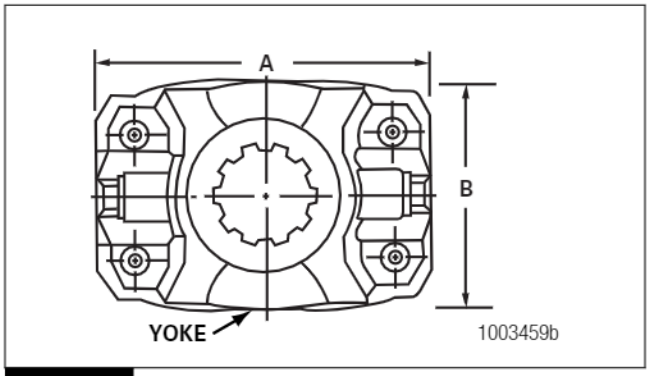


Figure 10.2

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 10.3.

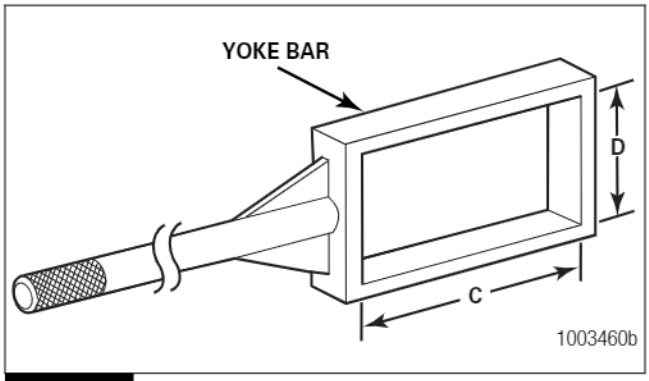


Figure 10.3

⚠ 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 10.3.
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 10.3.

- **To increase yoke bar rigidity:** Weld two angle pieces onto the handle. Figure 10.3.

Unitized Pinion Seals and Seal Drivers

Refer to Table AE 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.

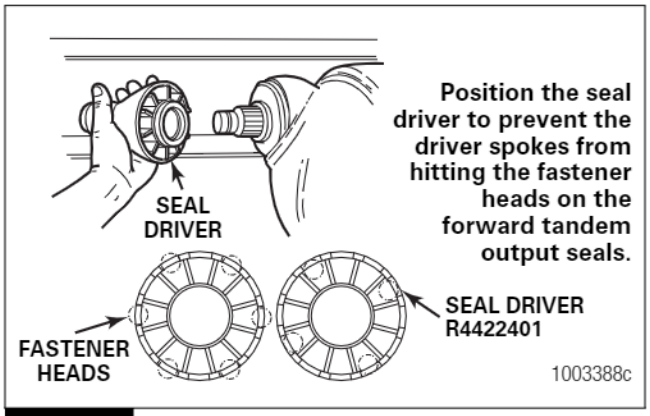


Figure 10.4

Table AE: Unitized Pinion Seals and Seal Drivers

Single Models	Tandem Models	Meritor Unitized Pinion Seal	Seal Installation Location	Meritor Seal Driver	Yoke Seal Diameter Inches
RS-17-145	RT-34-144 /P	A-1205-R-2592	Tandem Forward Input — 145 models from November 1993 to present	R4422402	3.250 3.255
RS-19-145	RT-34-145 /P				
RS-21-145	RT-40-145 /A /P	A-1205-P-2590	Tandem Forward Output — Tandem Forward Input 145 models before November 1993 with seal A-1205-F-2424	R4422401	3.000 3.005
RS-21-160	RT-40-149 /A /P				
RS-23-160 /A	RT-44-145 /P				
RS-23-161 /A	RT-40-160 /A /P				
RS-25-160 /A	RT-40-169 /A /P				
RS-23-186	RT-46-160 /A /P	A-1205-N-2588	Tandem and Single Rear Input — 145 models	R4422401	3.000 3.005
RS-26-185	RT-46-169 /A /P				
RS-30-185	RT-46-164EH /P	A-1205-Q-2591	Tandem and Single Rear Input — 160/164/185 models	R4422402	3.250 3.255
	RT-46-16HEH /P				
	RT-50-160 /P				
	RT-52-185*				
	RT-58-185*				

*Forward and rear input only.

Multiple Lip Seals (MLS) and Seal Drivers

Refer to Table AF for information on multiple lip 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.

Table AF: Multiple Lip 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 Forward-Rear Unit Input (FUI)	A1-1205X2728	A-1205R2592	2728T1	2728T2
MX-23-160R	RT-34-145 /P					
RF-16-145	MT-40-143					
RF-21-160	RT-40-145 /A /P	14X/16X Forward-Rear Unit Output (FUO)	A1-1205Y2729	A-1205P2590	2729T1	2729T2
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					
RS-21-145	RT-46-160 /A /P	16X/18X Rear-Rear Unit Input (RUI)	A1-1205A2731	A-1205Q2591	2731T1	Not Required — Sleeve is unitized
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.

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

Single Axle with DCDL — Screw-In (Threaded) Shift Assembly, or Tandem Axle with DCDL — Screw-In (Threaded) 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.

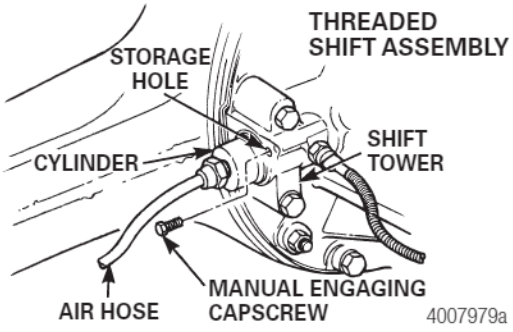


Figure 11.1

B. Remove the manual engaging 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 11.1.

C. Install the manual engaging capscrew into the threaded hole in the center of the cylinder. Figure 11.2.

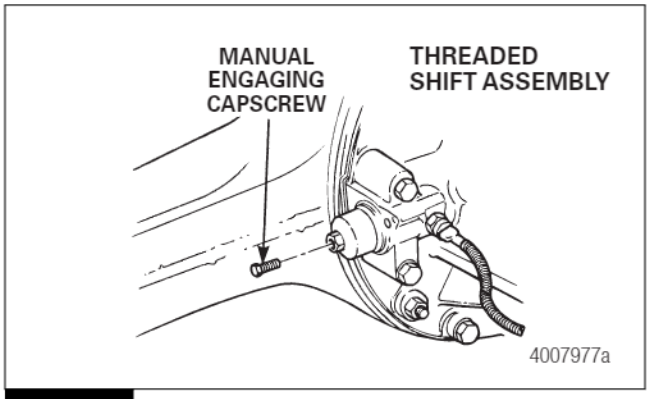


Figure 11.2

⚠ CAUTION

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

D. Turn the capscrew to the right until the head is approximately 0.25 to 0.50-inch (6.4 to 12.7 mm) from the cylinder. The capscrew is now in the service position and the DCDL shift collar is locked (engaged). Figure 11.3. When turning the capscrew 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 capscrew head and cylinder, STOP TURNING THE CAPSCREW and continue with Steps E and F.

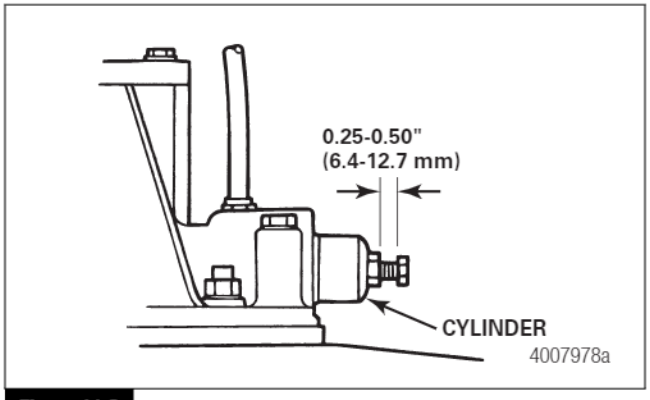


Figure 11.3

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.

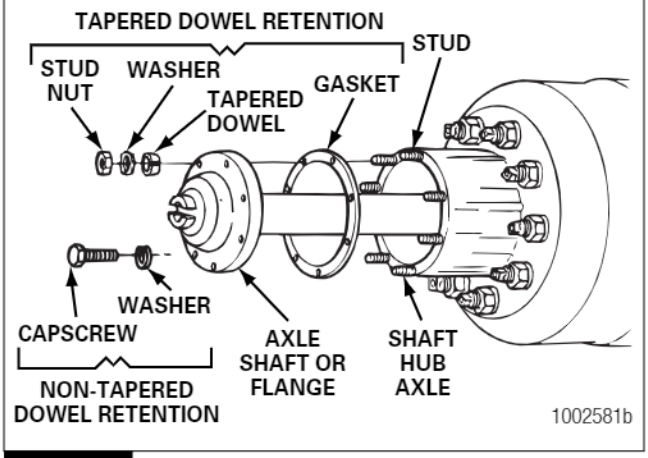


Figure 11.4

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 Table AG.

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.

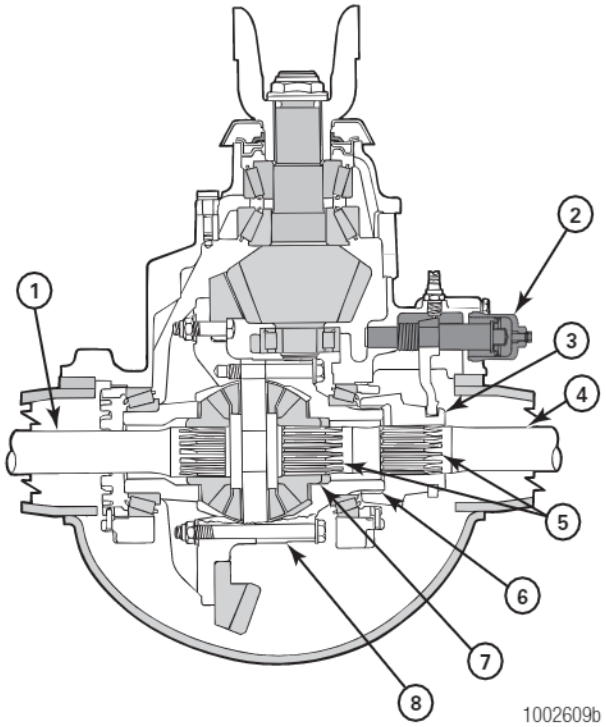
4. Remove the covers from the hubs.

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.

SINGLE AXLE OR REAR AXLE OF TANDEM SHOWN WITH SCREW-IN DCDL SHIFT ASSEMBLY AND SHOWN IN THE LOCKED OR ENGAGED POSITION



1 LEFT-HAND, ROADSIDE, AXLE SHAFT
2 SHIFT ASSEMBLY
3 SHIFT COLLAR
4 RIGHT-HAND, CURBSIDE, AXLE SHAFT
5 DOUBLE ROW OF SPLINES
6 SHIFT COLLAR AND DIFFERENTIAL CASE SPLINES ENGAGED OR LOCKED
7 SIDE GEAR
8 DIFFERENTIAL CASE

Figure 11.5

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	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 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.
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.

Single Axle with DCDL — Bolt-On Shift Assembly, or Tandem Axle with DCDL — Bolt-On 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.

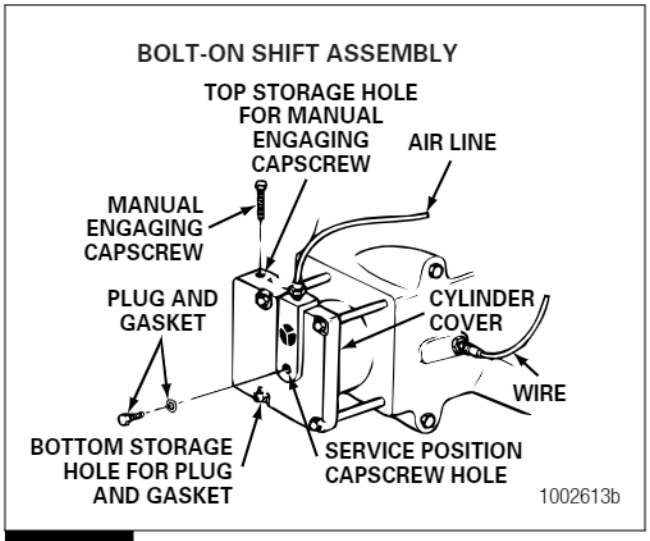


Figure 11.6

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.

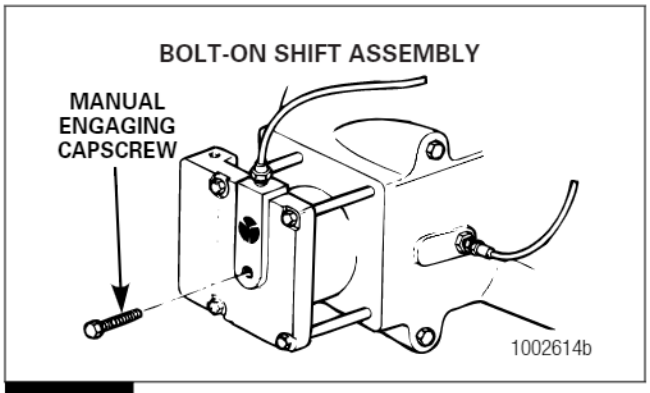


Figure 11.7

⚠ CAUTION

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

D. Turn the capscrew to the right until the head is approximately 0.25 to 0.50-inch (6.4 to 12.7 mm) from the cylinder. The capscrew is now in the service position and the DCDL shift collar is locked (engaged). Figure 11.8. When turning the capscrew 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 capscrew head and cylinder, STOP TURNING THE CAPSCREW and continue with Steps E and F.

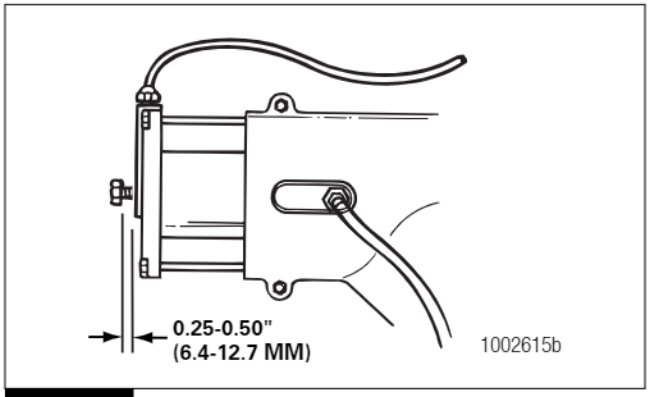


Figure 11.8

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 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 11.9.

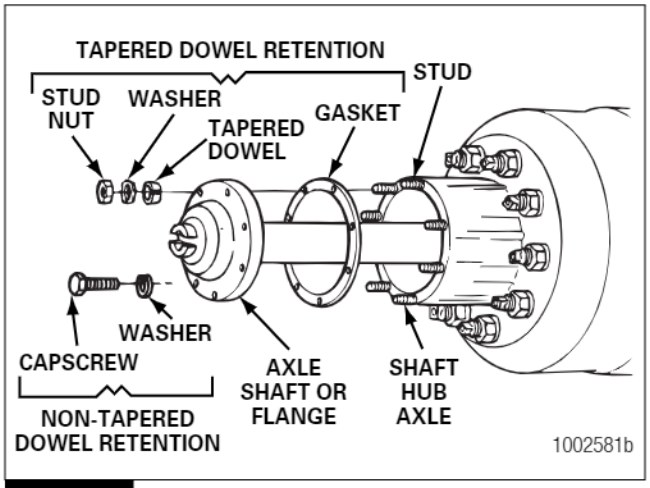


Figure 11.9

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.

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.

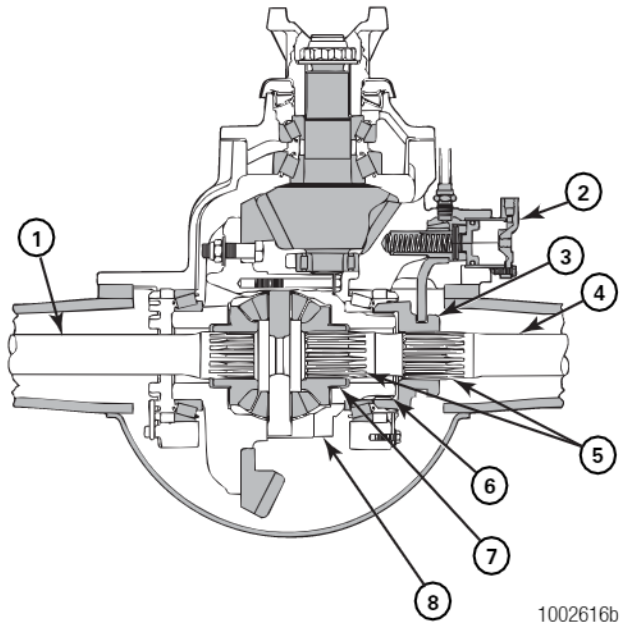
⚠ WARNING

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.



SINGLE AXLE OR REAR AXLE OF TANDEM SHOWN WITH BOLT-ON DCDL SHIFT ASSEMBLY AND SHOWN IN THE LOCKED, ENGAGED POSITION

1 LEFT-HAND, ROADSIDE, AXLE SHAFT
2 SHIFT ASSEMBLY
3 SHIFT COLLAR
4 RIGHT-HAND, CURBSIDE, AXLE SHAFT
5 DOUBLE ROW OF SPLINES
6 SHIFT COLLAR AND DIFFERENTIAL CASE SPLINES ENGAGED OR LOCKED
7 SIDE GEAR
8 DIFFERENTIAL CASE

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.

Single Axle Without DCDL or Tandem Axle Without DCDL and 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.

NOTE: For a single axle, continue with Step 6. For a tandem axle, continue with Step 3.

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.

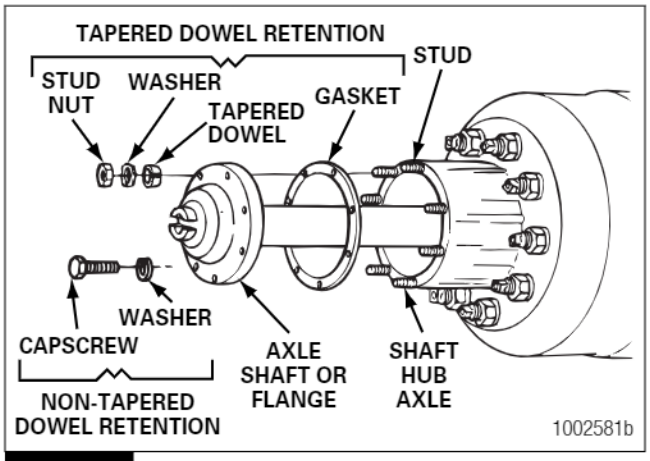


Figure 11.11

8. 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.
9. Remove the tapered dowels, gasket, if used, and the axle shaft from the axle assembly. Figure 11.11.
10. 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.

11. 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.
12. 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.
13. 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.
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 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.
6. Install the dowels, if used, over each stud and into the tapered holes of the flange.
7. 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 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)

8. 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

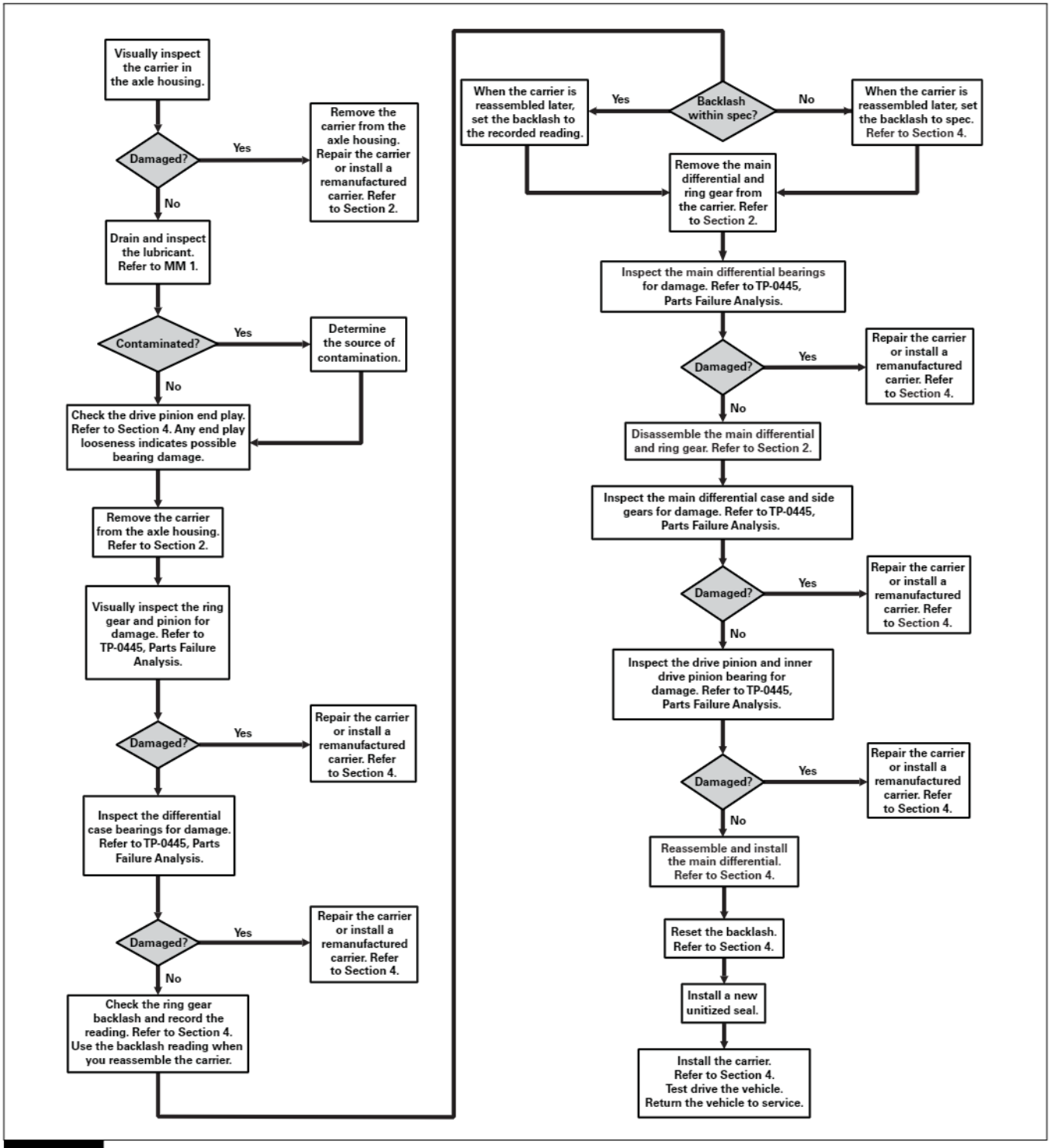


Figure 12.1

Differential Making Noise

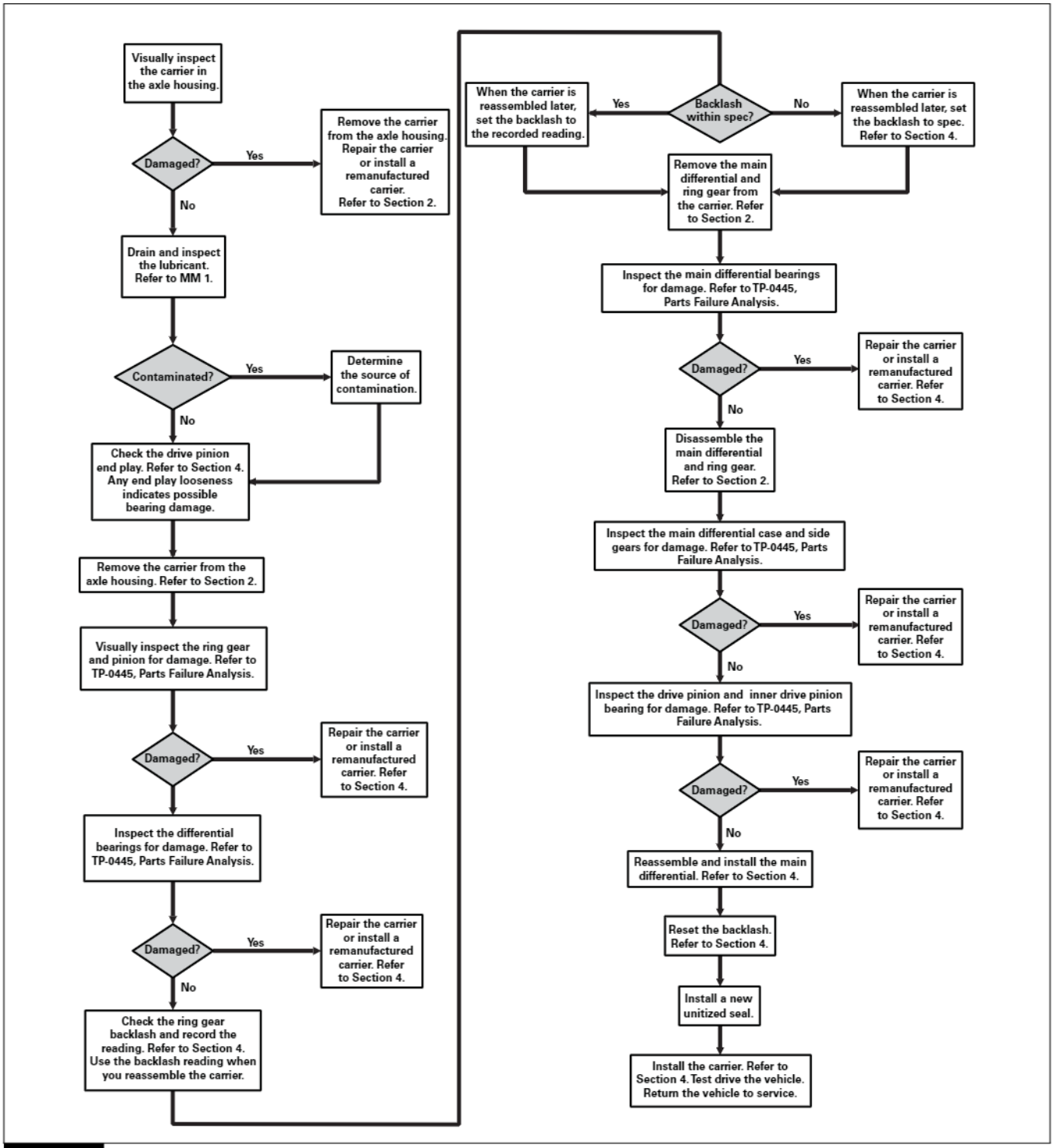


Figure 12.2

Oil Leak

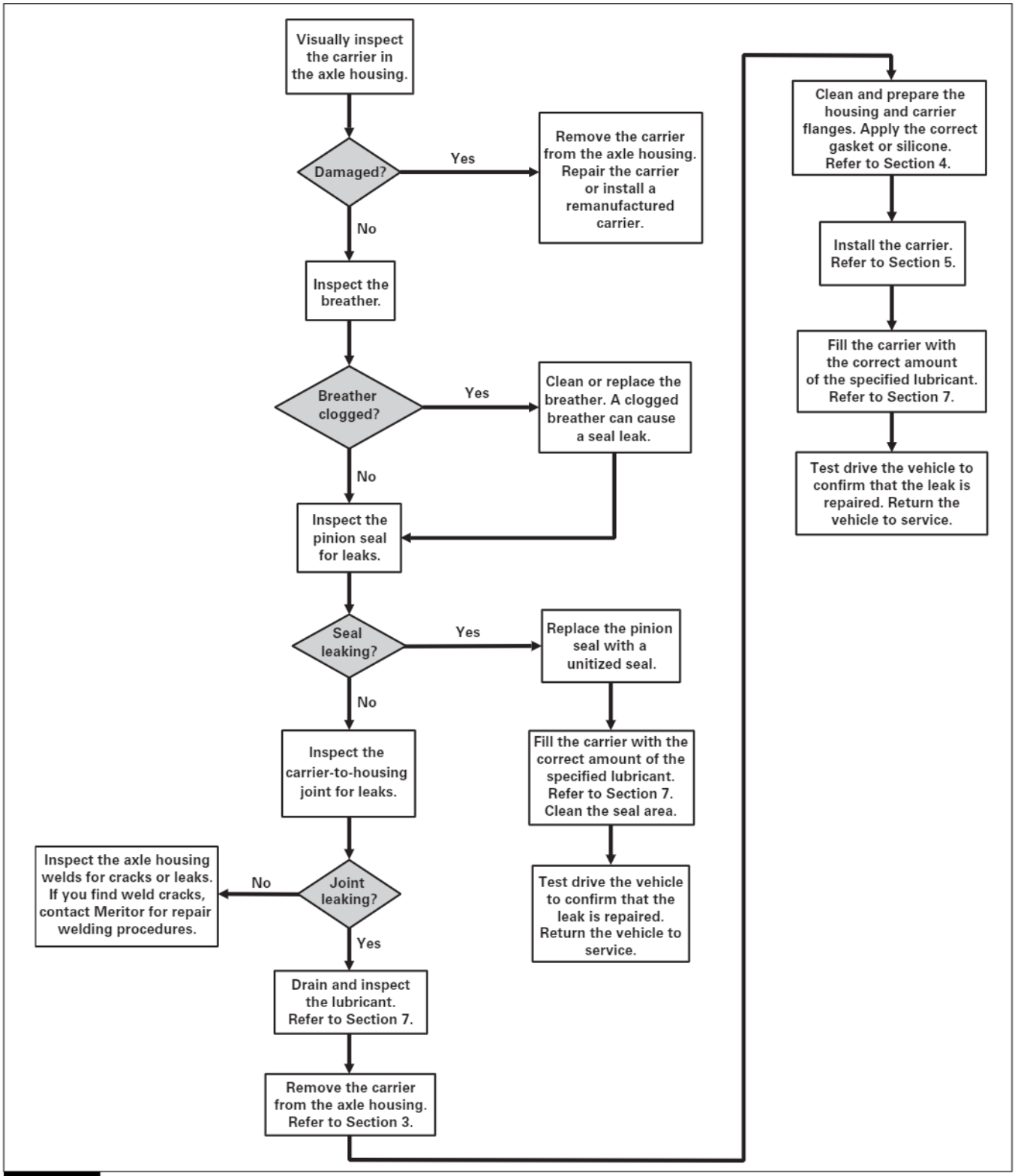


Figure 12.3

Contaminated Lubricant Found During Preventive Maintenance

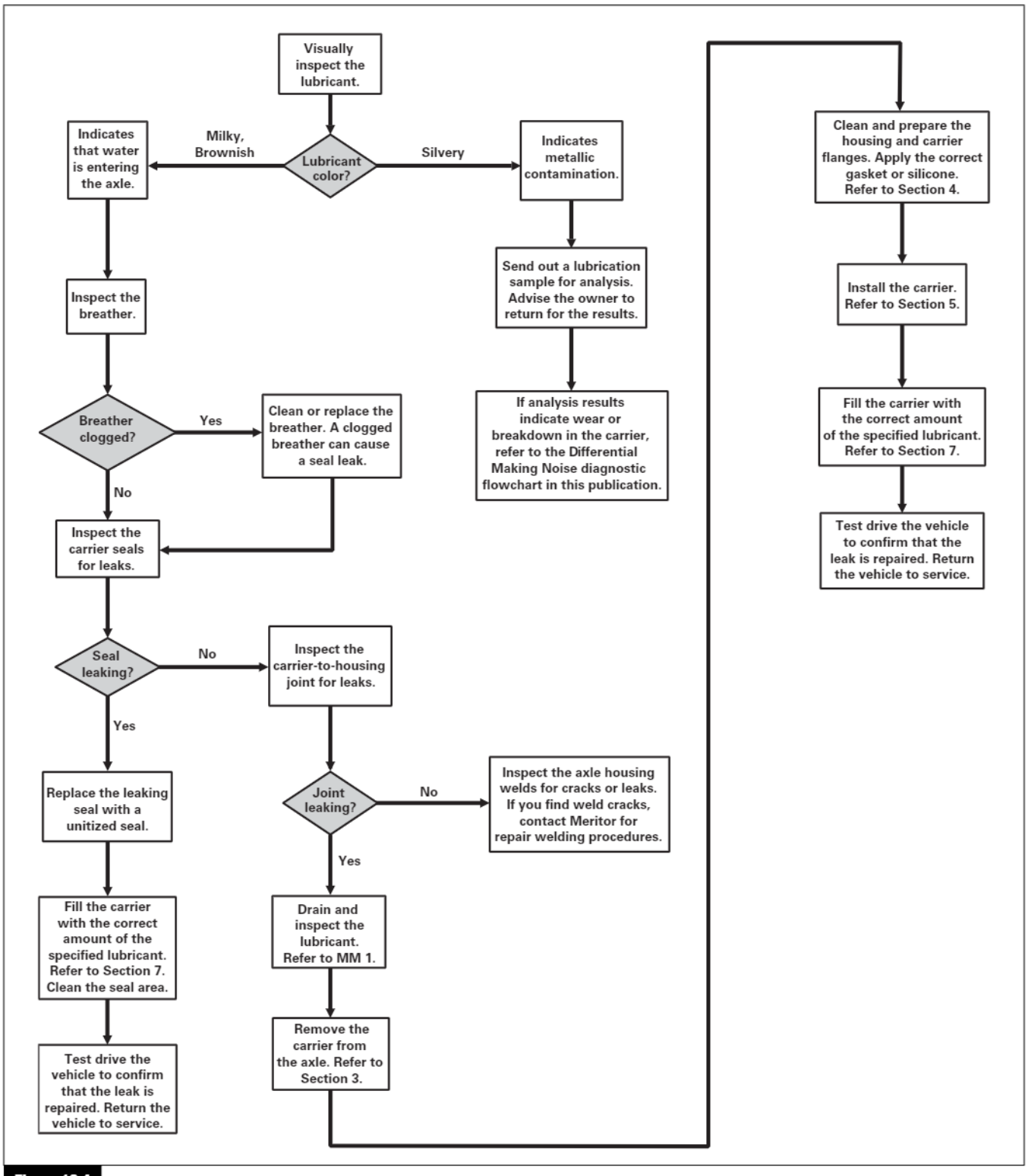


Figure 12.4

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