Rear Axle

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Sub-Headings

Rear Axle

Safety

The purpose of this safety summary is twofold. First, it is to ensure the safety and health of individuals performing service on, and operation of, the Blue Bird All American Series bus. Second, it is to help protect equipment. Before performing any service or operating procedure on the All American bus, individuals should read and adhere to the applicable warnings, cautions and notes located throughout this Blue Bird Service Manual.

Warnings

Warnings apply to a procedure or practice that, if not correctly adhered to, could result in injury or death. Particular attention should be paid to sections of this manual where warnings appear.

Cautions

Cautions apply to a procedure or practice that, if not correctly adhered to, could result in damage to or destruction of equipment.

Notes

Notes are used to explain, clarify or otherwise give additional insight for a given subject, product or procedure. Please note that on occasion, notes, too, may advise of potential safety issues.

Introduction

The purpose of this section is to provide instructions for service maintenance on the Blue Bird All American Series rear axle components.

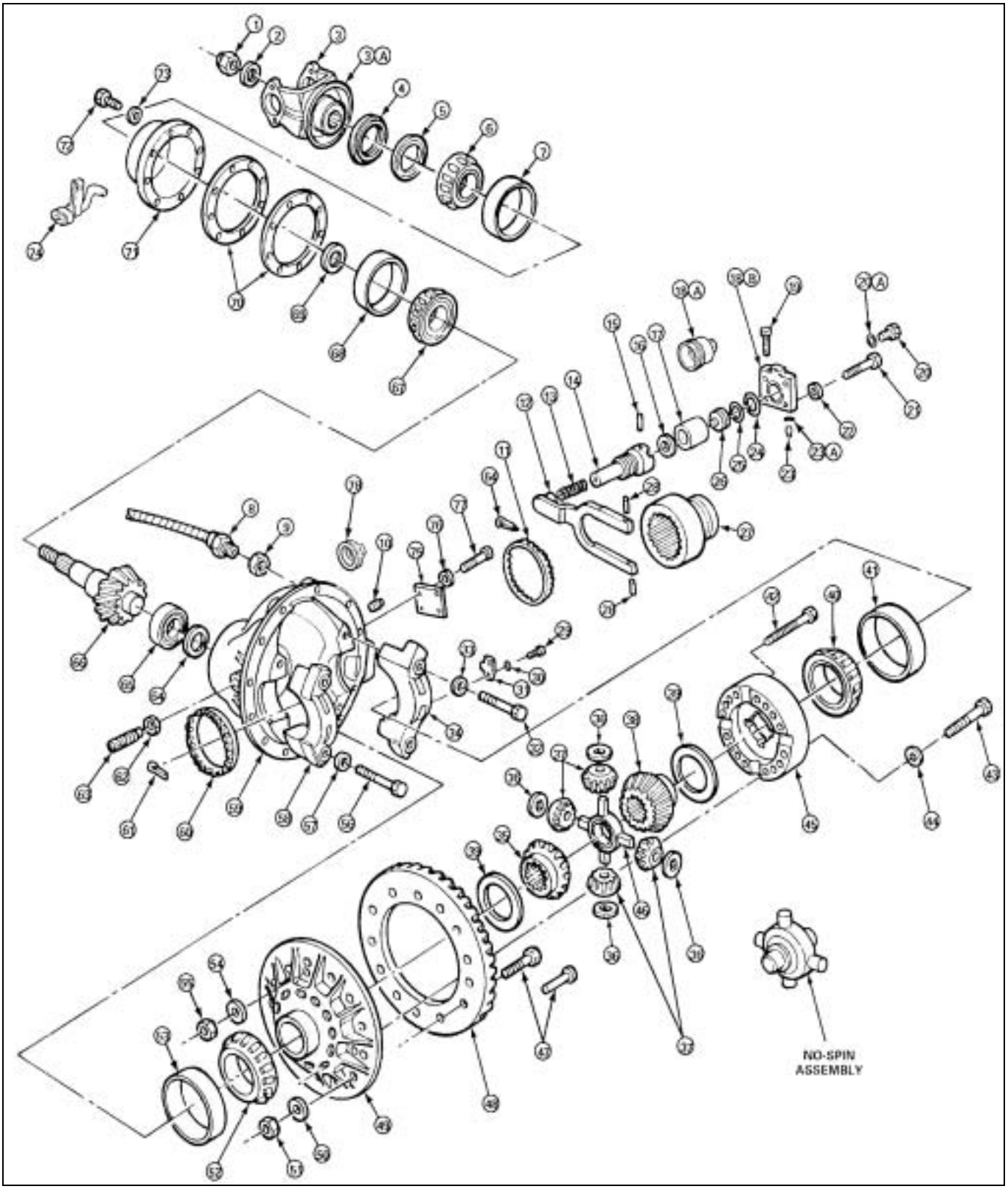


Figure 1

Item	Description
1	Nut – Drive Pinion*
2	Washer – Drive Pinion*
3	Input Yoke* or Flange*
3A	Deflector
4	POSE™ Seal
5	Triple Lip (Main) Seal
6	Bearing Cone – Outer
7	Bearing Cup – Inner
8	Sensor Switch
9	Lock Nut – Sensor Switch
10	Plug
11	Adjusting Ring – Right Hand
12	Shift Fork
13	Spring – Shift Shaft
14	Shift Shaft
15	Pin – Spring Retaining
16	Washer* or Silastic* - Air Cylinder
17	Tube – Air Cylinder
18A	Screw-In Differential Lock Cylinder
18B	Cylinder Cover
19	Capscrew – Manual Actuation
20	Plug – Cylinder Cover
20A	Gasket – Plug Cover
21	Capscrews – Cylinder Cover
22	Washers – Cylinder Cover
23	Plug – Cylinder Cover
23A	Gasket – Cover Plug
24	Copper Gasket – Cylinder Cover
25	O-Ring – Piston
26	Piston
27	Shift Collar
28	Pins – Shift Fork
29	Capscrews* – Lock Plate*
30	Washers* – Lock Plate*
31	Lock Plate – Adjusting Plate
32	Capscrews – Differential Bearing Cap
33	Washers
34	Caps – Differential Bearing
35	Side Gears – Differential
36	Thrust Washers – Differential Pinion
37	Pinions – Differential
38	Differential – Side Gears
39	Thrust Washers – Differential Side Gear
40	Cone – Differential Bearing
41	Cup – Differential Bearing
42	“Thru” Bolt
43	Bolts*– Differential Case
44	Washers – Differential Case
45	Case Assembly – Main Differential
46	Spider – Differential
47	Bolts* or Rivets* - Ring Gear and Case Half
48	Ring Gear (Pinion Drive Gear)
49	Case Half – Flange
50	Washers – Case Half
51	Nuts* - Case Half
52	Bearing Cone Differential Left Hand
53	Bearing Cup Differential Left Hand
54	Washer for “Thru” Bolt
55	Nut for “Thru” Bolt
56	Capscrews Differential Bearing Cup
57	Washers
58	Caps – Differential Bearing
59	Carrier
60	Adjusting Ring
61	Cotter Pin – Adjusting Ring
62	Jam Nut* – Thrust Screw*
63	Thrust Screw*
64	Snap Ring
65	Spigot Bearing
66	Drive Pinion
67	Bearing Cone – Pinion Inner
68	Bearing Cup – Pinion Inner
69	Spacer – Pinion Bearing
70	Shims
71	Bearing Cage – Drive Pinion
72	Capscrews – Bearing Cage
73	Washer
74	Clip and Cable Holder
75	Cover – Bolt-On
76	Washer
77	Bolt
78	Cover – Screw-In

Note

**Some Meritor carriers do not have these described parts.*

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 steering axles. **Figure 1a**. The single reduction carrier models 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 (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 all the time.

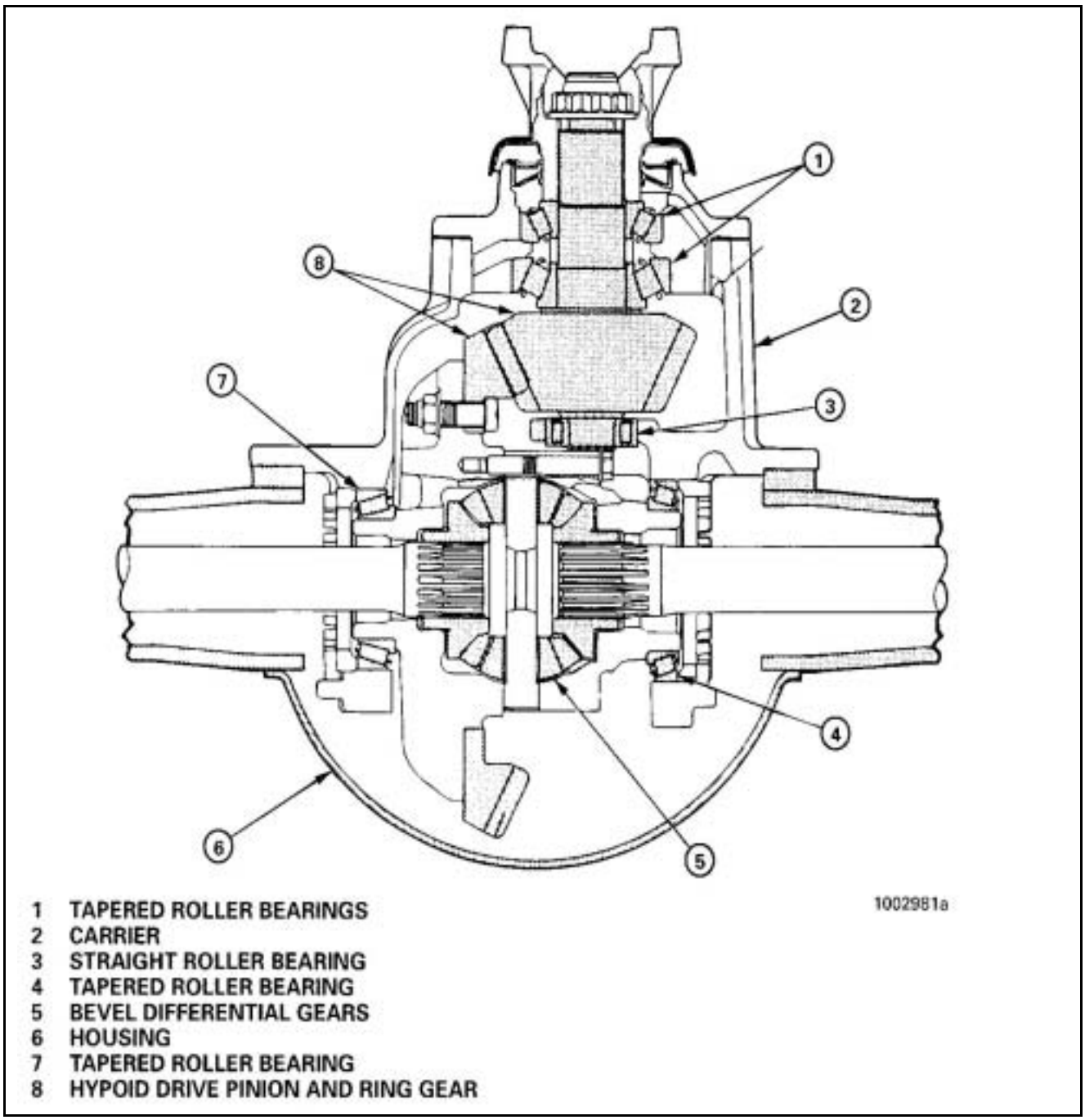


Figure 1a

Disassembly

Remove Differential Carrier from Axle Housing

Warning

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

1. Raise the end of vehicle where the axle is mounted. Use a jack or other lifting tool, and place safety stands under each side of the axle. **Figure 2.**

Warning

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.

2. Place jack stands under each spring seat of the axle to hold vehicle in the raised position.
3. Remove the plug from bottom of axle housing and drain lubricant from the assembly.
4. Disconnect the driveline universal joint from the pinion input yoke or flange on the carrier. **Figure 3.**

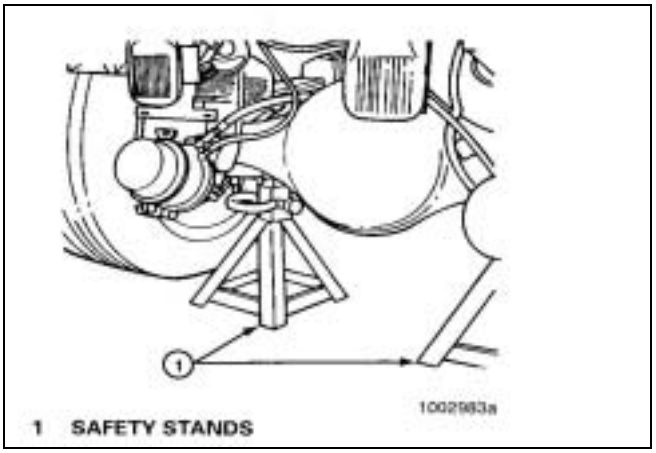


Figure 2

5. Remove the capscrews* and washers or stud nut* and washers from t he flanges of both axle shafts.
6. Loosen the tapered dowels* in the axle flanges of both axle shafts using one of the following methods.

Note

**Some Meritor carriers do not have these described parts.*

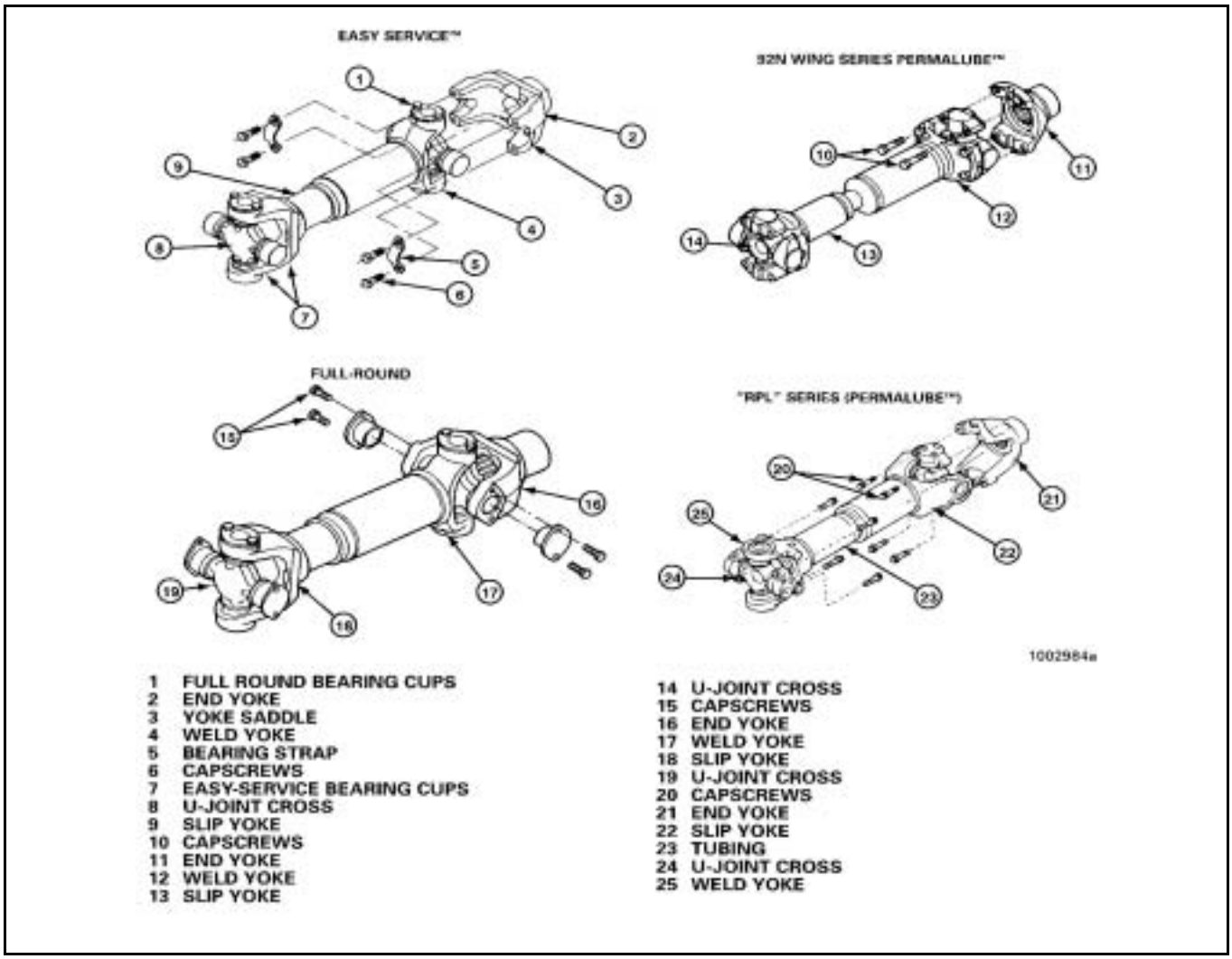


Figure 3

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 against the center of the axle shaft, inside the round driving lugs. **Figure 4.**

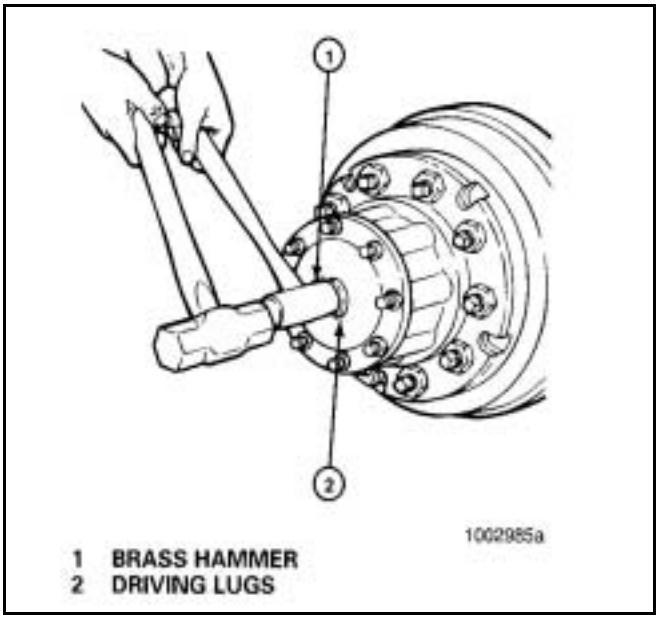


Figure 4

Note
A 1-1/2 inch diameter brass hammer can be used as a drift.

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 to identify 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 5.**
5. Install a cover over the open end of each axle assembly hub where an axle shaft was removed.

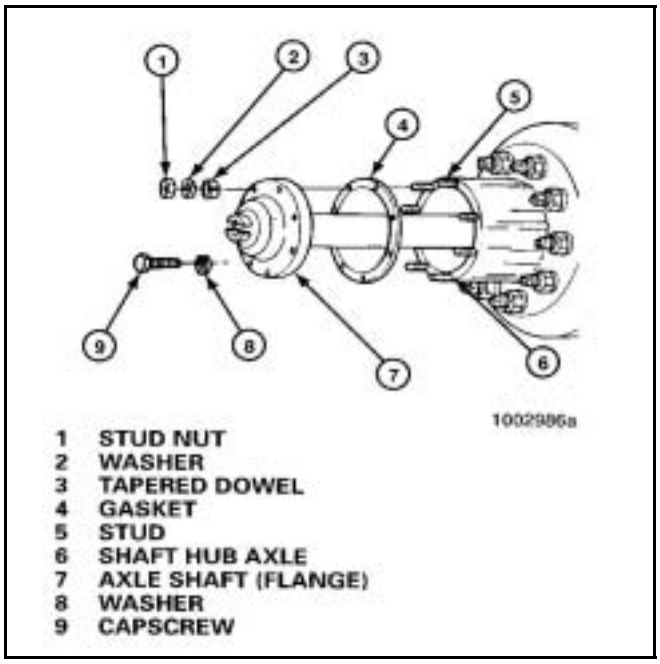


Figure 5

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/or the axle hub.

1. Use a round hammer bit and an air hammer such as Chicago Pneumatic CP-4181-Puler, or equivalent, to loosen tapered dowels and axle shaft.
2. Place the round hammer bit against the axle shaft (flange) between the hub studs. Operate the air hammer at alternate locations between the studs to loosen the tapered dowels and axle shaft from the hub. **Figure 6.**

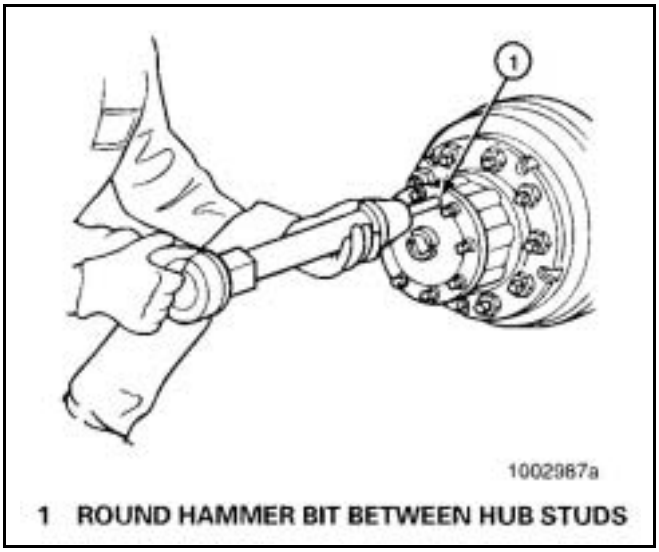


Figure 6

3. Mark to identify 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 5.**

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/or the axle hub.

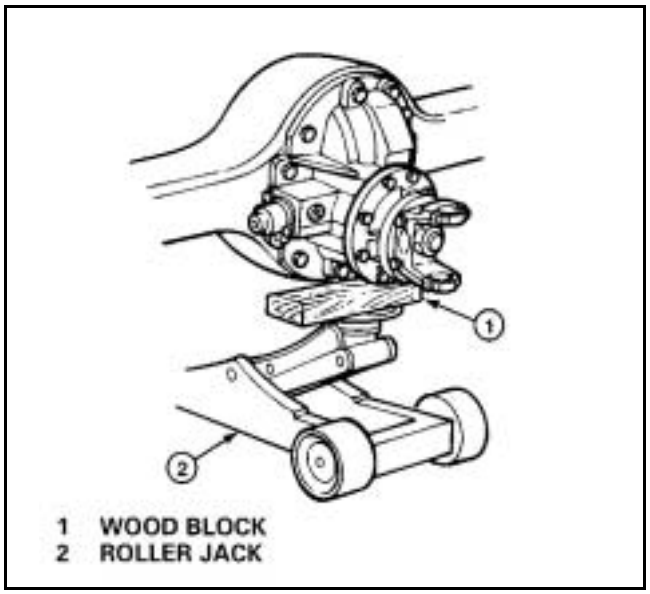
Carrier Removal from Axle

1. Place a hydraulic roller jack under the differential carrier to support the assembly. **Figure 7.**
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 carrier at several points.
5. After the carrier is loosened, remove the top two fasteners.

Note

*A carrier stand, part number J 3409-D is available from **Kent-Moore, Heavy-Duty Division, 28635 Mound Road, Warren, MI 48092**.*



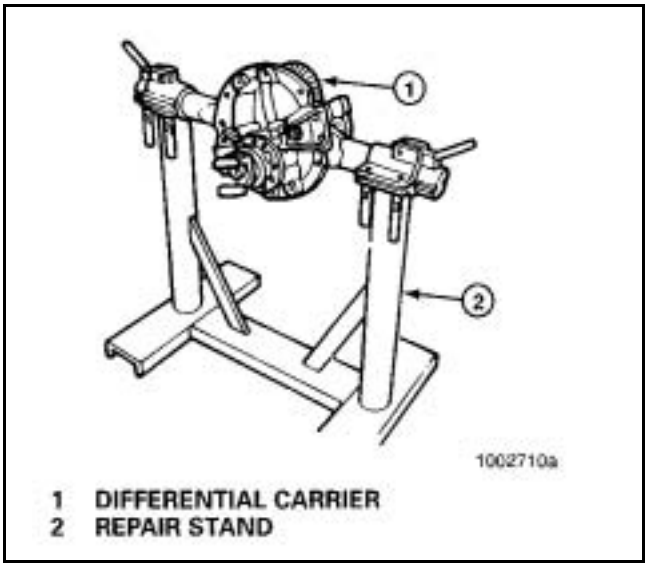
1 WOOD BLOCK
2 ROLLER JACK

Figure 7

Caution

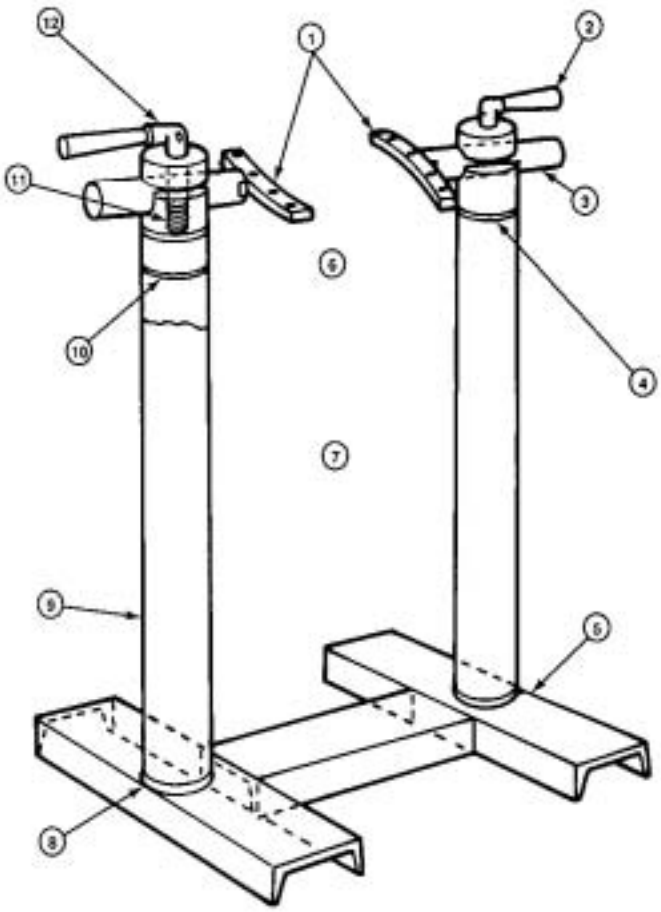
When using a pry bar, be careful not to damage the carrier or housing flange. Damage to these surfaces will cause oil leaks.

6. Carefully remove the carrier from the axle housing using the hydraulic roller jack. Use a pry bar that has a round end to help remove the carrier from the housing.
7. Lift the differential carrier by the input yoke or flange and place the assembly in a repair stand. **Figure 8.** Use a lifting tool for this procedure. Do not lift by hand. A carrier stand can be built by referring to **Figure 9.**



1 DIFFERENTIAL CARRIER
2 REPAIR STAND

Figure 8



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

CARRIER STAND

Figure 9

Remove the Differential and Ring Gear from the Carrier

Note

Before working on the differential carrier, inspect the hypoid gear set for damage. If inspection shows no damage, the same gear set can be used again. Measure the backlash of the gear set and make a record of the dimension. ***Figure 10****. (Refer to "Ring Gear Backlash Adjustment", steps 1-5 and Figure 108) During differential reassembly, adjust the backlash to the original recorded dimension when the gear set is installed into the carrier.*

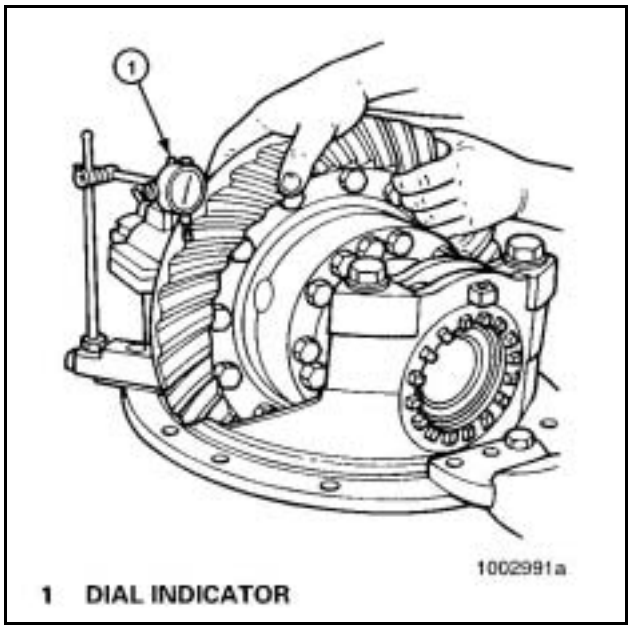


Figure 10

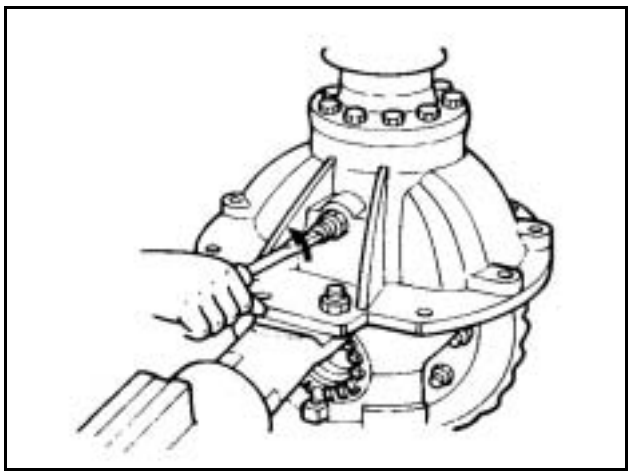


Figure 11

1. Loosen the jam nut* on the thrust screw.
2. Remove the thrust screw* and jam nut* from the differential carrier**. Figure 11 and Figure 12.**

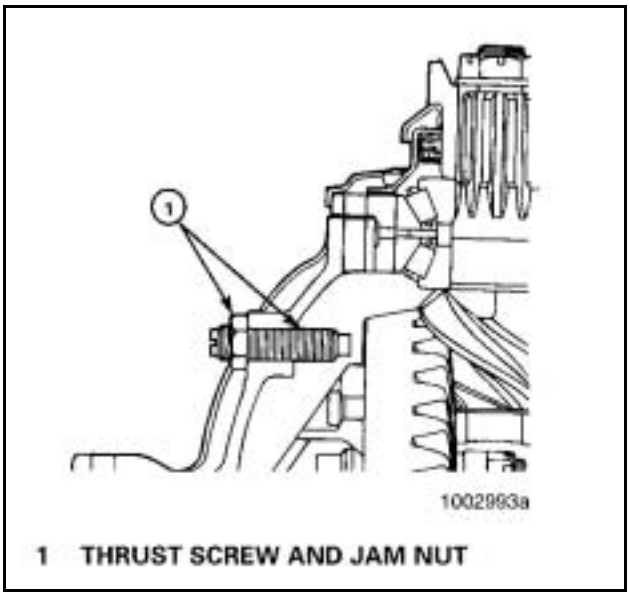


Figure 12

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 13.**

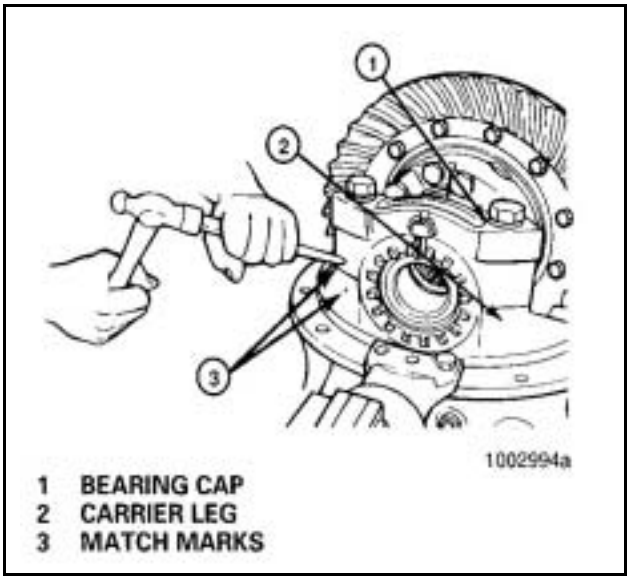


Figure 13

Note

**Some Meritor carriers do not have these described parts.*

5. Remove the cotter keys*, pins*, or lock plates* that hold the bearing adjusting rings in position. Use a small drift and hammer to remove pins. Each lock plate is held in position by two capscrews. **Figure 14.**
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 15.**
7. Remove the bearing caps and bearing adjusting rings from the carrier. **Figure 16.**
8. Safely lift the main differential and ring gear assembly from the carrier. Place the assembly on a work bench. **Figure 17.**

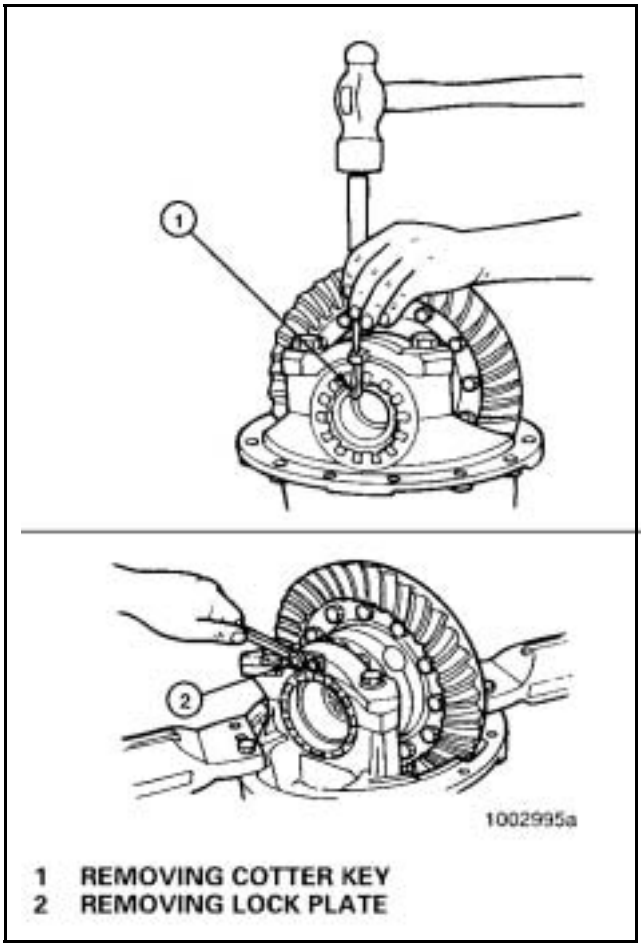


Figure 14

Note

**Some Meritor carriers do not have these described parts.*

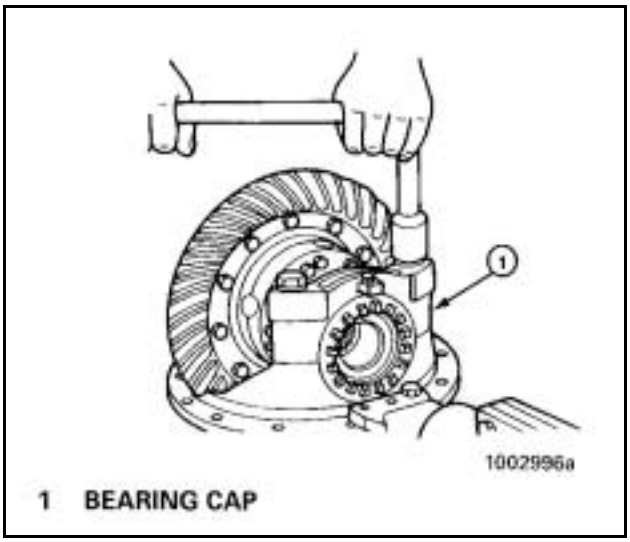


Figure 15

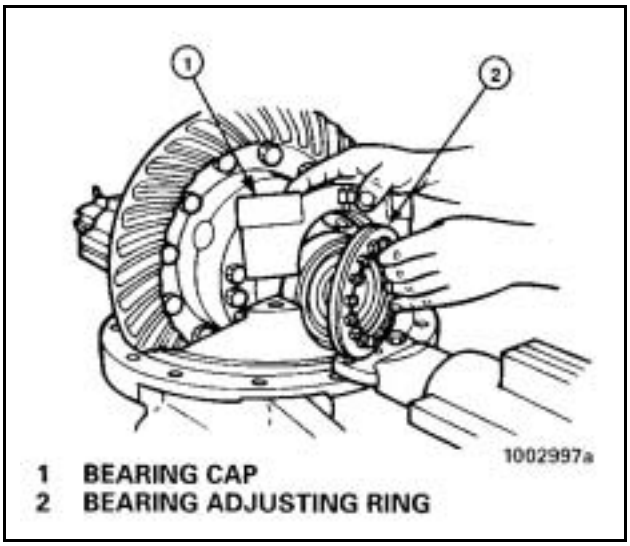


Figure 16

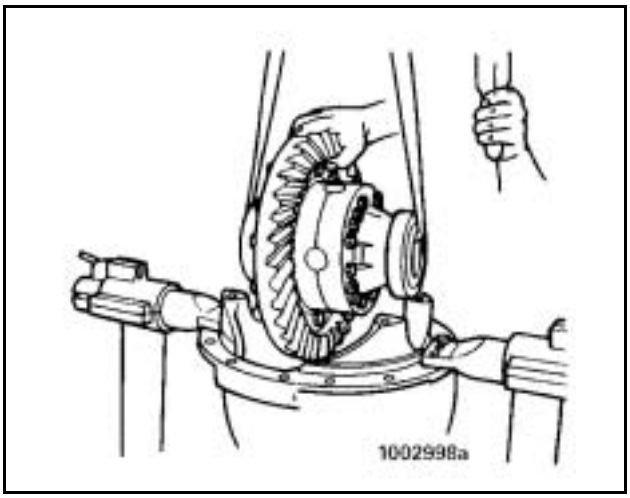


Figure 17

Disassemble the Differential and Ring Gear Assembly

1. If the matching marks on the case halves of the differential assembly are not visible, mark each case half with a center punch and hammer. The purpose of the marks is to match the plain half and flange half correctly when you assemble the carrier. **Figure 18.**

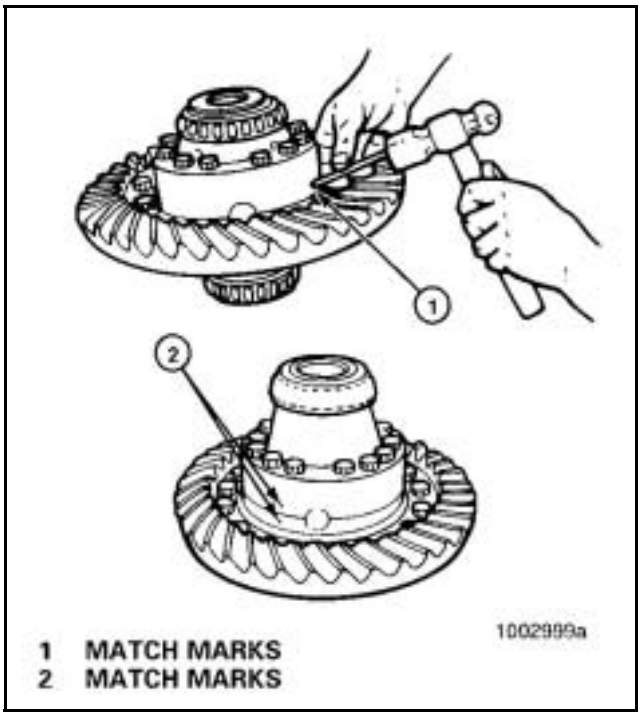


Figure 18

2. Remove the capscrews* and washers* or bolts*, nuts* and washers that hold the halves together.

Warning

Use a brass or leather mallet for assembly and disassembly procedures. D not hit steel parts with a steel hammer. Pieces of a part can break off and cause serious personal injury.

3. Separate the case halves. If necessary, use a brass, plastic or leather mallet to loosen the parts.
4. Remove the differential spider (cross), four pinion gears, two side gears and six thrust washers from inside the case halves. **Figure 19.**
5. If the ring gear needs to be replaced, remove the bolts*, nuts*, and washers* that hold the gear to the flange case half.

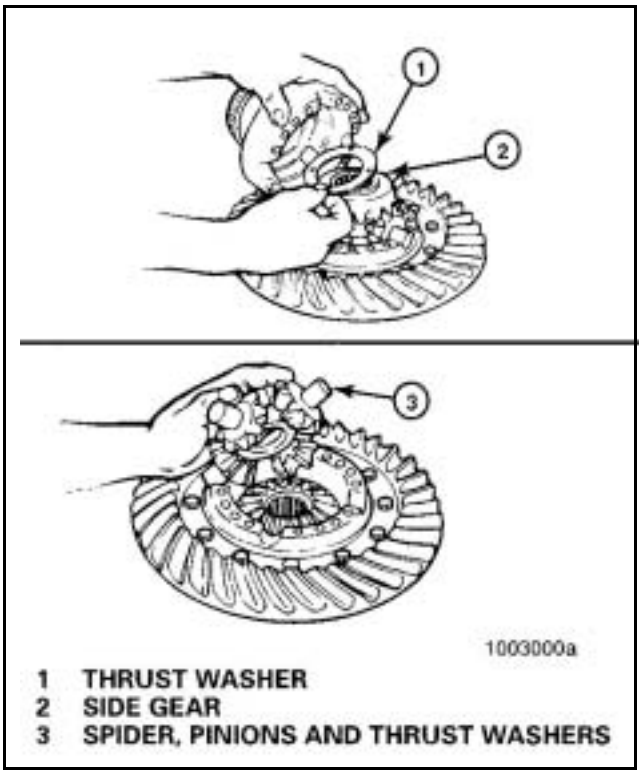


Figure 19

Warning

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

Note

** Some Meritor carriers do not have these described parts.*

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. Refer to Figure 20.

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, o the ring gear side of the assembly.

b. Drill each rivet head on the ring gear side of the assembly to a depth equal to the thickness of one rivet head. Use a drill bit that is 1/32 of an inch smaller than the body diameter of the rivets. **Figure 20.**

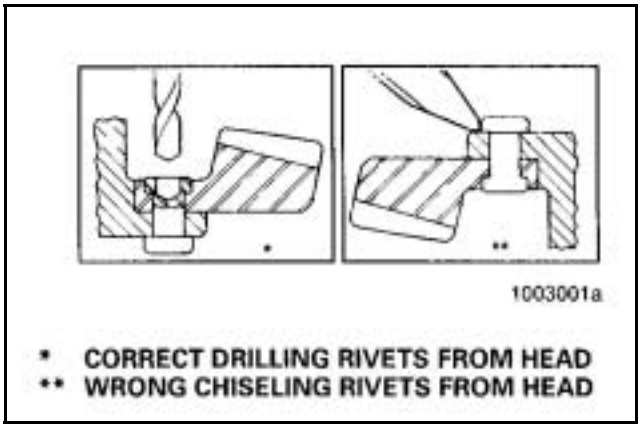


Figure 20

c. Press the rivets through holes in the ring gear and flange case half. Press from the drilled rivet head.

Warning

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

7. Separate the case half and ring gear using a press. Support the assembly under the ring gear with metal or wood blocks and press the case half through the gear. **Figure 21.**
8. If the differential bearings need to be replaced, remove the bearing cones from the case halves. Use a bearing puller or press. **Figure 21a.**

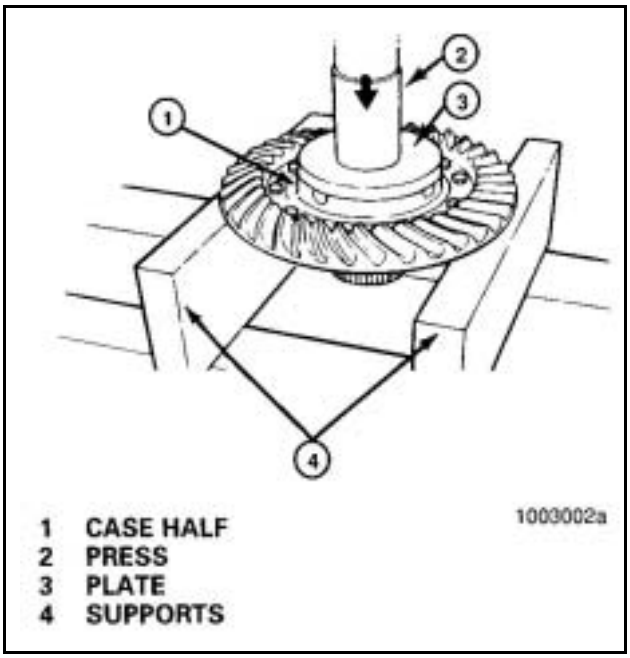


Figure 21

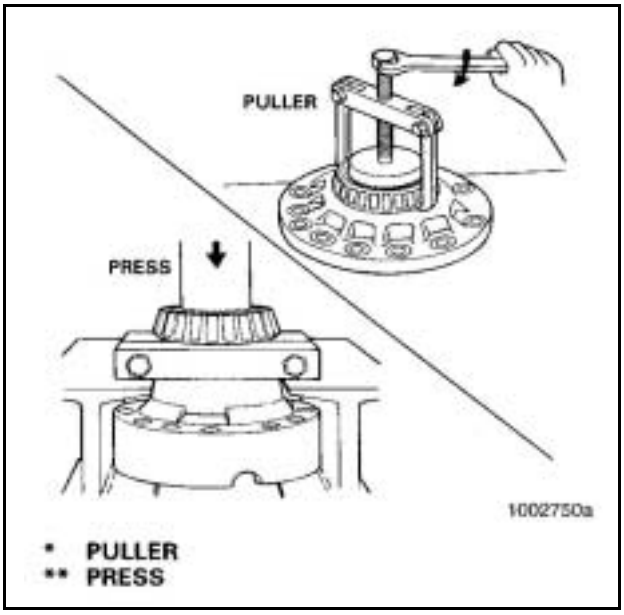


Figure 21a

Remove the Drive Pinion and Bearing Cage from 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 22.**

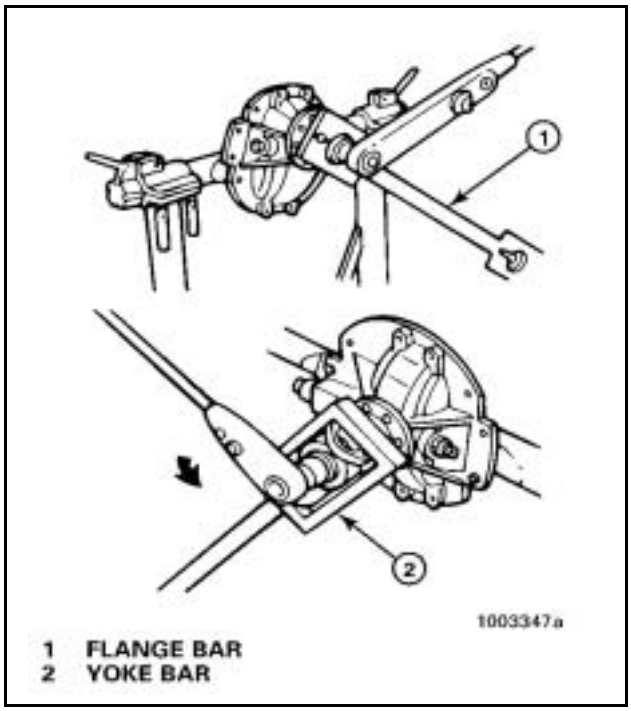


Figure 22

2. Remove the nut and washer* from the drive pinion. **Figure 22.**
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 problems after carrier to driveline assembly.

4. Remove the yoke or flange from the drive pinion. If the yoke or flange is tight on the pinion, use a puller for removal. **Figure 23.**
5. Remove the capscrews and washers that hold the bearing cage in the carrier. **Figure 24.**

Note

**Some Meritor carriers do not have these described parts.*

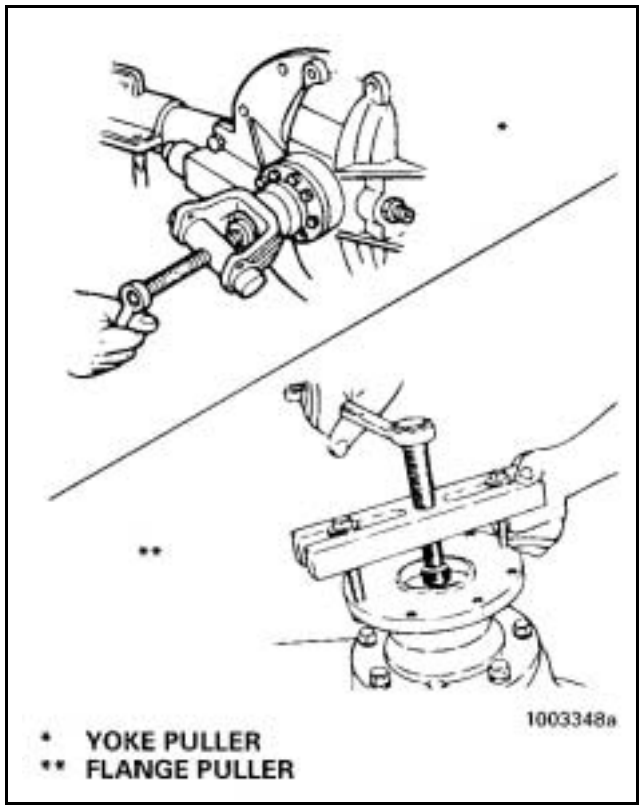


Figure 23

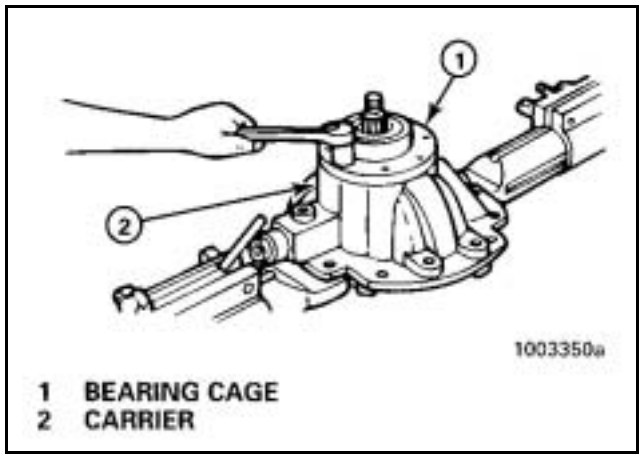


Figure 24

Warning

Use a brass or leather mallet for assembly and disassembly procedures. Do not hit steel parts with a steel hammer. Pieces of a part can break off and cause serious personal injury.

Caution

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

6. Remove the drive pinion, bearing cage and shims from the carrier. 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 25.**

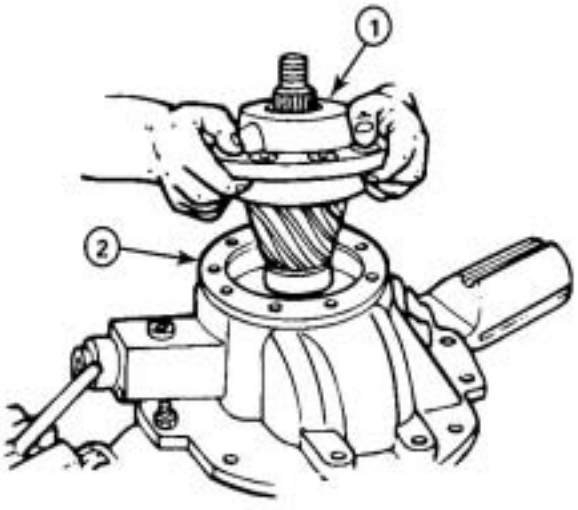


Figure 25

7. If the shims are in good condition, keep the shims together for use later 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.

Disassemble the Drive Pinion and Bearing Cage

Warning

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

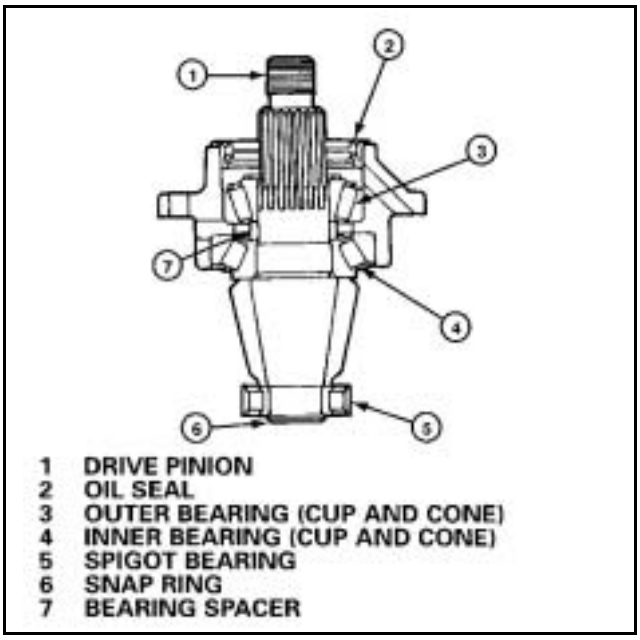


Figure 26

1. Place the drive pinion and bearing cage in a press. The pinion shaft must be toward the top of the assembly. **Figure 27.**

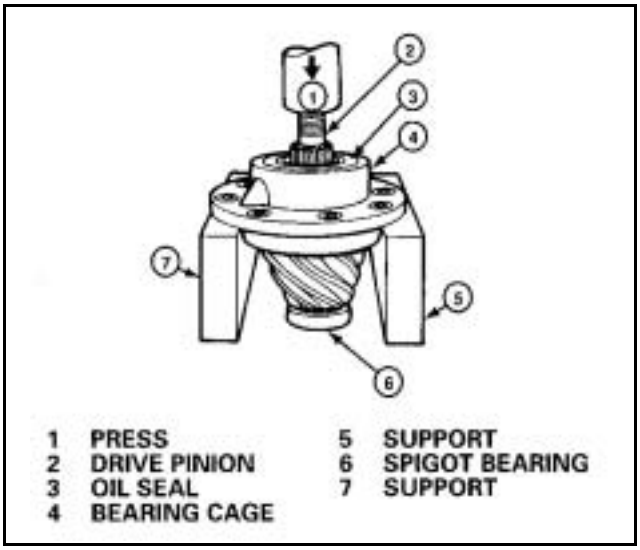


Figure 27

2. Support the bearing cage under the flange area with metal or wood blocks. **Figure 27.**
3. Press the drive pinion through the bearing cage. **Figure 27.**

Warning

Use a brass or leather mallet for assembly and disassembly procedures. Do not hit steel parts with a steel hammer. Pieces of a part can break off and cause serious personal injury.

Note

The inner bearing cone and bearing spacer will remain on the pinion shaft.

4. 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 removing the seal. Do not damage the wall of bore. Damage to the bore wall can result in oil leaks.

Note

When the oil seal has been removed, always replace it with a new seal during component reassembly.

5. 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 28.**

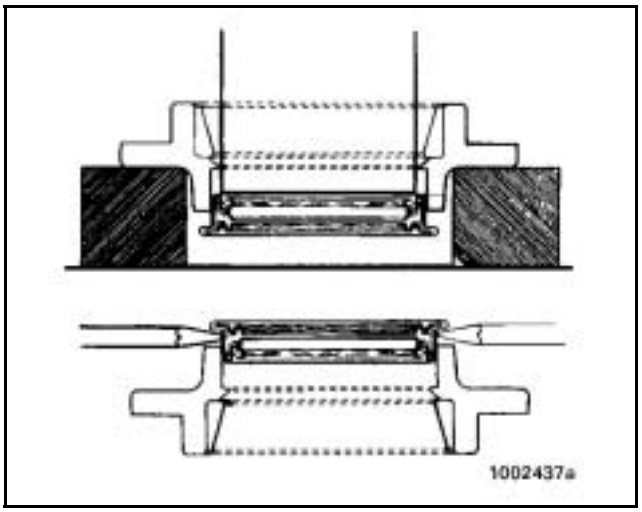


Figure 28

Warning

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

6. If the pinion bears need to be replaced, remove the inner and outer bearing cups from the inside of cage. 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 29.** When a press is used, support the bearing cage under the flange area with metal or wood blocks.

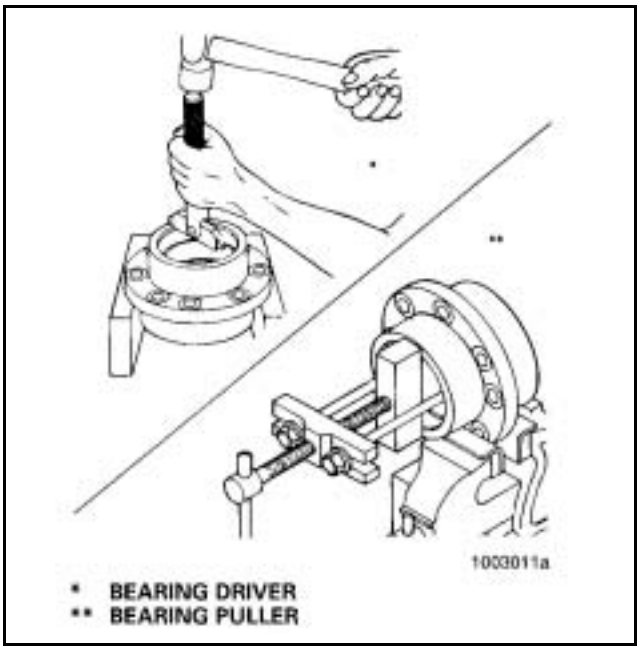


Figure 29

7. 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 30.**

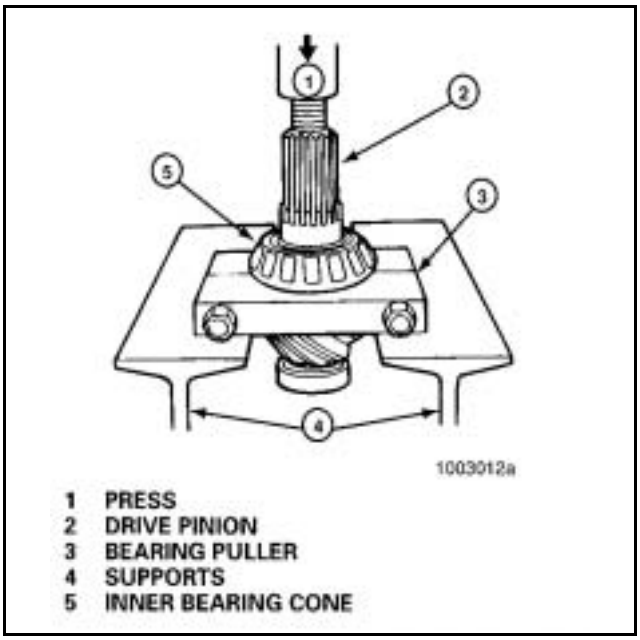


Figure 30

8. 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.

9. Remove the snap ring* from the end of drive pinion with snap ring pliers that expand. **Figure 31.**

Note

Some spigot bearings are fastened to the drive pinion with a special peening tool. ***Figure 32****.*

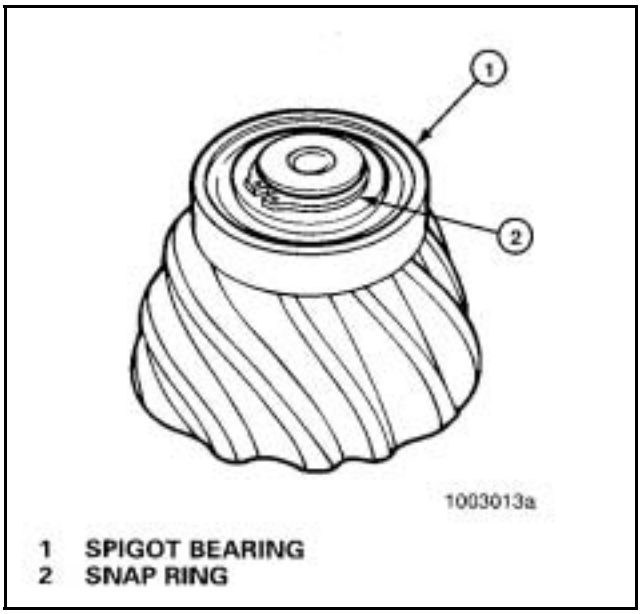


Figure 31

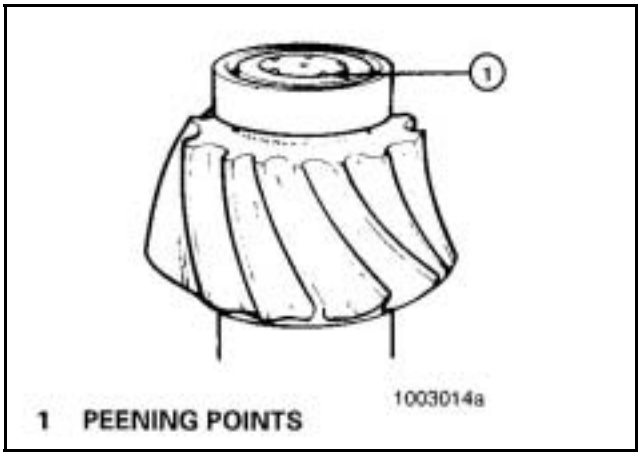


Figure 32

Note

**Some Meritor carriers do not have these described parts.*

10. Remove the spigot bearing from the drive pinion with a bearing puller. **Figure 33.**

Note

Some spigot bearings are a two-piece assembly. Remove the inner race from the pinion with a bearing puller. Remove the outer race/roller assembly from carrier with a drift or a press. ***Figure 34****.*

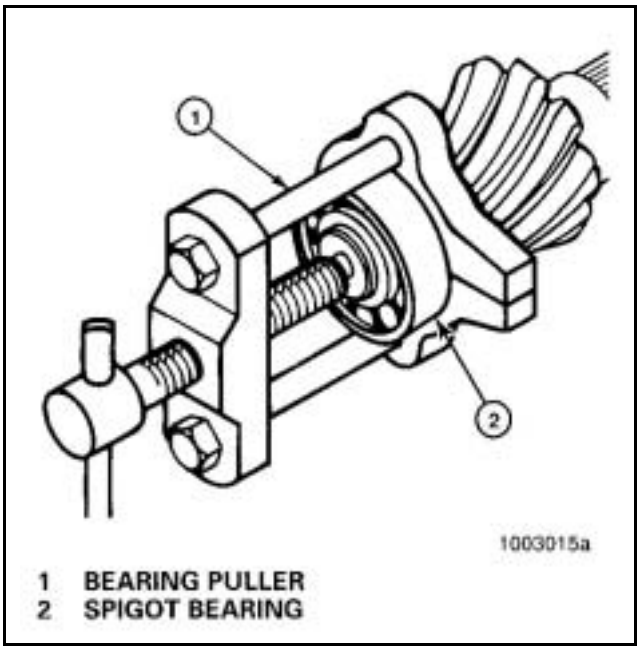


Figure 33

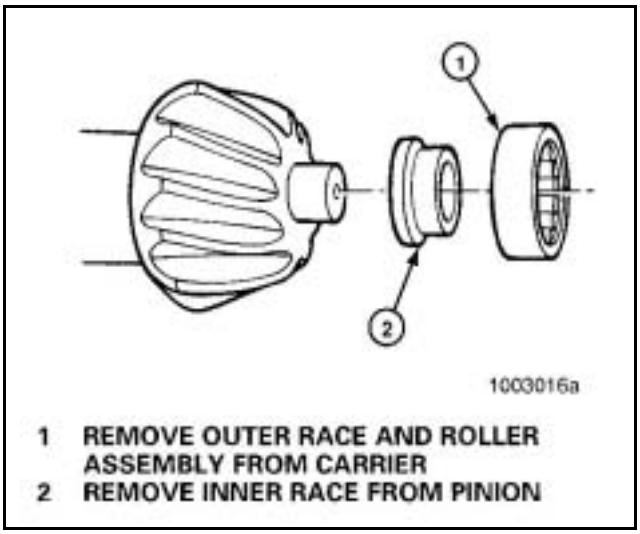


Figure 34

Preparing Parts for Assembly

Clean and Inspect Yokes

Warnings

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 tetraphcloride, emulsion-type cleaners and petroleum-based cleaners. To avoid serious personal injury when you use solvent cleaners, you must carefully follow the manufacturer's product instructions and these procedures:

- *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. Follow the manufacturer's instructions carefully.*

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 yoke or flange surface. DO NOT USE GASOLINE.
2. Inspect the original yoke seal surface for any grooves.
    a. The rubber inner sleeve of the unitized pinion seal (UPS) allows the reuse of yokes with grooves unless the groove depths are excessively deep. If grooves are present, measure the groove diameters with calipers. Refer to **Figure 35** to determine if yoke is usable.
    b. If grooves are present on yoke hubs that are used with single or triple lip seals, then the yokes must be replaced.
3. If any of the yoke grooves measure less than the dimensions in **Figure 35**, replace the yoke. The rubber inner sleeve of the unitized pinion seal (UPS) is designed to seal on the yoke and rotate with the yoke.

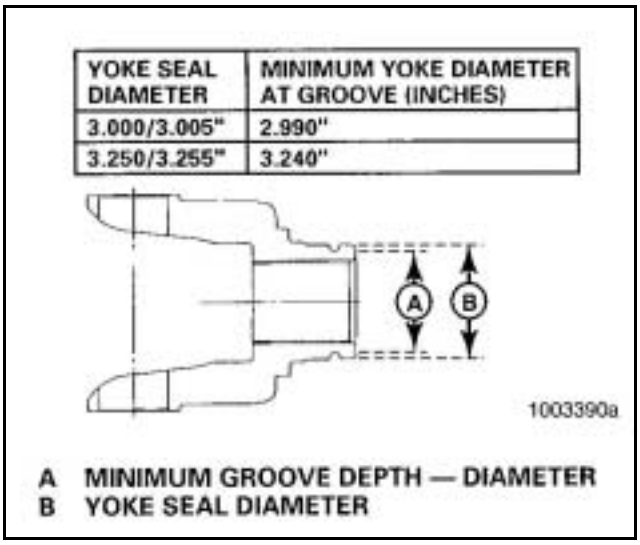


Figure 35

Caution

Do not install a press on shaft excluder (or POSE™ seal) after installation of 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.

Cleaning Ground and Polished Parts

Warning

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

1. Use a cleaning solvent to clean ground or polished parts or surfaces. Kerosene or diesel fuel oil can be used for this purpose. Do not use gasoline.

Warning

Solvent cleaners can be flammable, poisonous and cause burns. Examples of solvent cleaners are carbon tetrachloride, emulsion-type cleaners and petroleum-based cleaners. To avoid serious personal injury when you use solvent cleaners, you must carefully follow the manufacturer's product instructions and these procedures:

- *Wear safe eye protection.*
- *Wear clothing the 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. Follow the manufacturer's instructions carefully.*

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 will 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.

Cleaning 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.

Warning

Solvent cleaners can be flammable, poisonous and cause burns. Examples of solvent cleaners are carbon tetrachloride, emulsion-type cleaners and petroleum-based cleaners. To avoid serious personal injury when you use solvent cleaners, you must carefully follow the manufacturer's product instructions and these procedures:

- *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. Follow the manufacturer's instructions carefully.*

4. Parts must be washed with water until all traces of the alkaline solution are removed.

Cleaning 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. Dr 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.

Preventing 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.

Inspecting 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. Replacement of damaged or worn parts now, will prevent failure of the assembly later.

1. Inspecting Tapered Roller Bearings:

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

   a. The center of large-diameter end of rollers worn level with or below the outer surface. **Figure 36.**
   b. The radius at large-diameter end of rollers worn to a sharp edge. **Figure 36.**

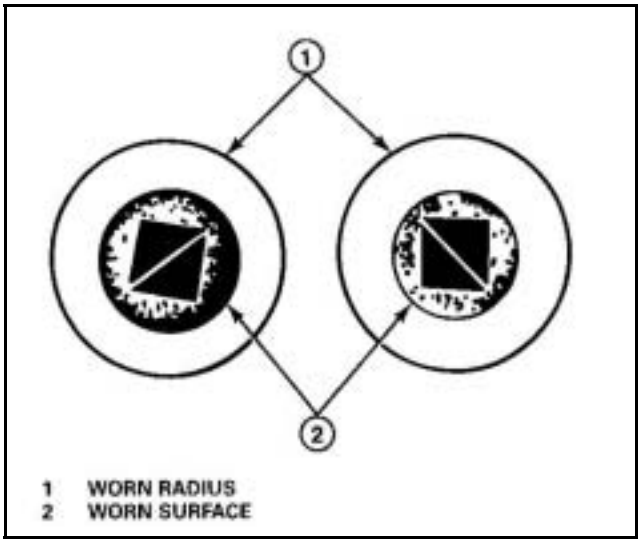


Figure 36

   c. 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 37.**
   d. Deep cracks or breaks in the cup, cone inner race or roller surfaces. **Figure 37.**
   e. Bright wear marks on the outer surface of the roller cage. **Figure 38.**
   f. Damage on rollers and on surfaces of the cup and cone inner race that touch the rollers. **Figure 39.**

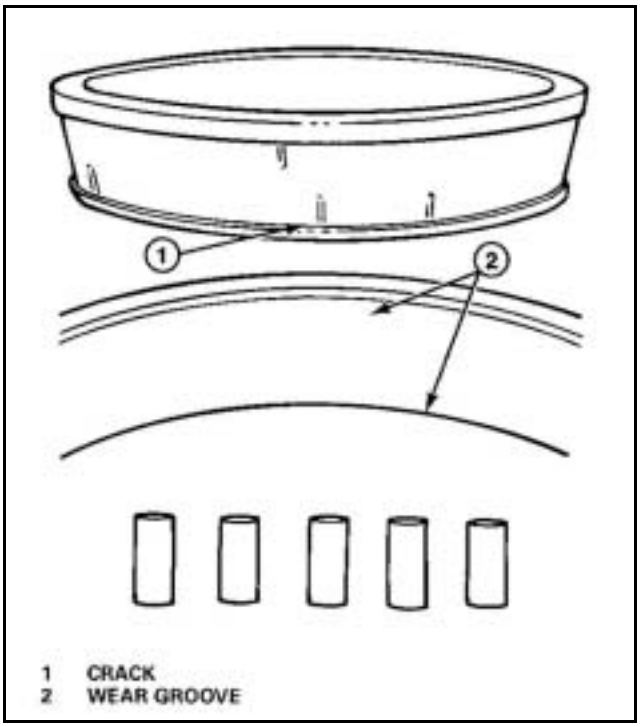


Figure 37

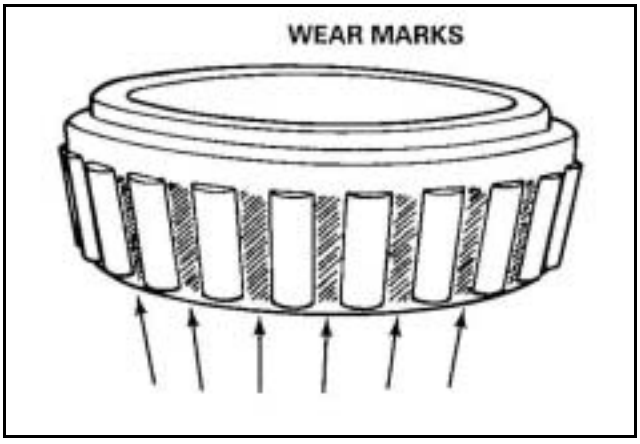


Figure 38

   g. Damage on the cup and cone inner race surfaces that touch the rollers. **Figure 40.**

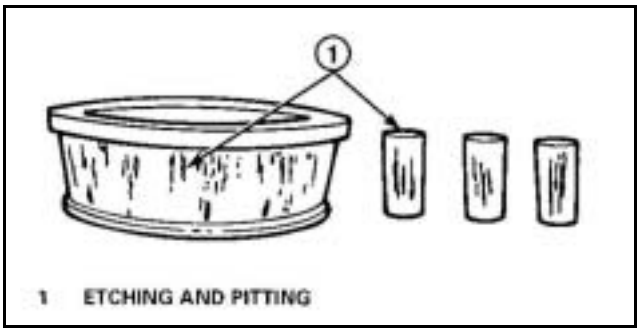


Figure 39

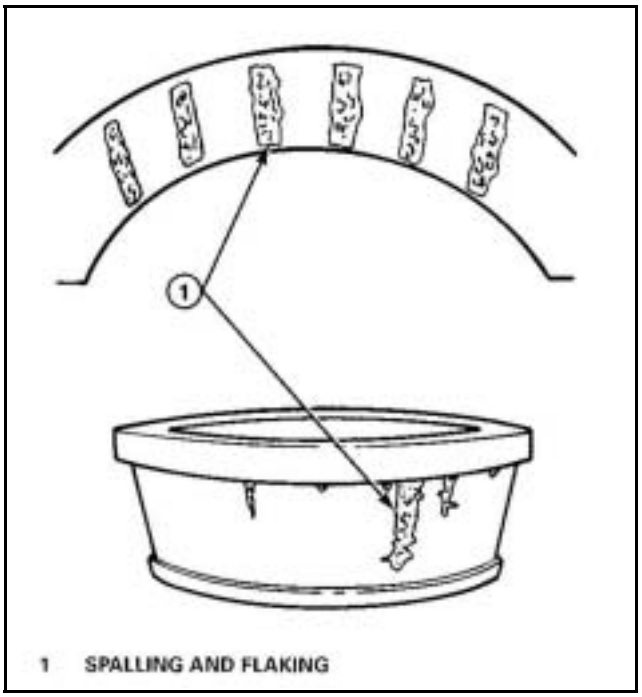


Figure 40

Caution

Hypoid drive pinions and ring gears are machined in matched sets. When a drive pinion or ring gear of a hypoid set needs to be replaced, both drive gear and pinion must be replaced at the same time.

2. Inspect hypoid pinions and gears for wear or damage. Gears that are worn or damaged **must** be replaced.

Caution

Always replace thrust washers, differential side gears and pinion gears in full matched sets. A higher stress on original parts and early failure of the entire assembly will result if a new part is used in combination with parts that are older or worn.

3. Inspect the Main Differential Assembly:

   Inspect the following parts for wear or stress. Parts that are damaged must be replaced. **Figure 41.**

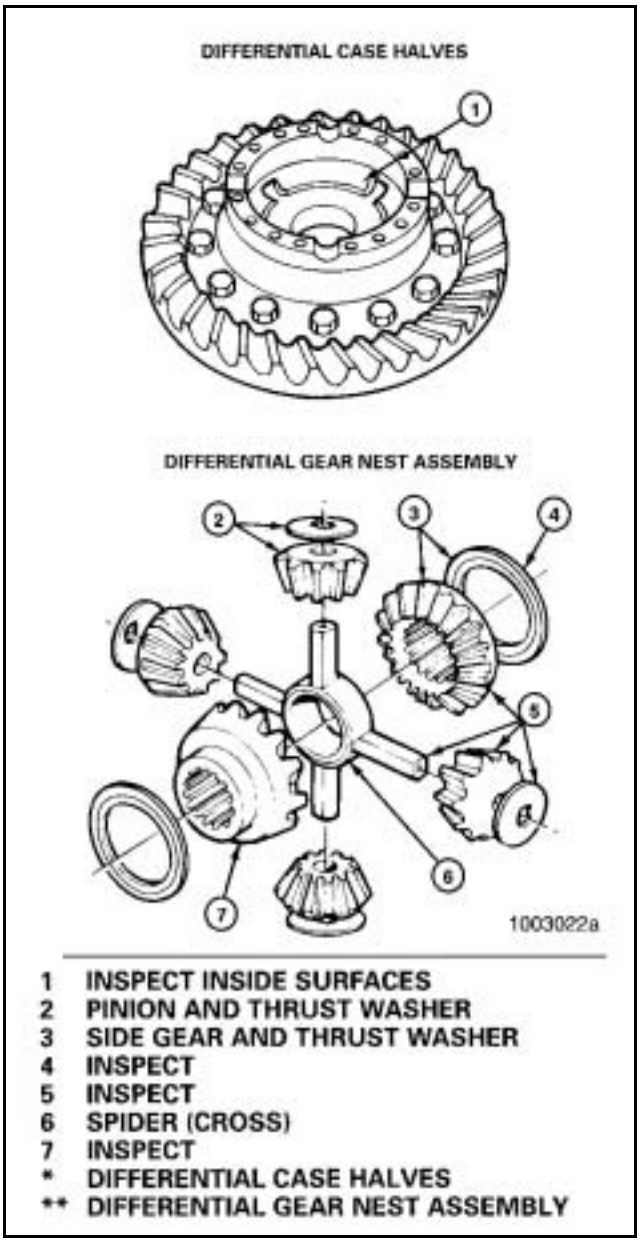


Figure 41

   a. Inside surfaces of both case halves.
   b. Both surfaces of all thrust washers.
   c. The four trunnion ends of the spider (cross).
   d. Teeth and splines of both differential side gears.
   e. Teeth and bore of all differential pinions.

4. Inspect Axle Shafts:
   a. Inspect axle shafts for wear and cracks at the flange, shaft and splines.
   b. Replace axle shafts, if required.

Repair or Replacement of Parts, General

Replace worn or damaged parts of an axle assembly. The following are some examples in checking for part replacement or repair.

1. Replace any fastener if corners of the head are worn.
2. Replace washers if damaged.
3. Replace gaskets, oil seals or grease seals at the time of axle or carrier repair.
4. Clean parts and apply new silicone gasket material where required when axle or carrier is assembled. **Figure 42.**

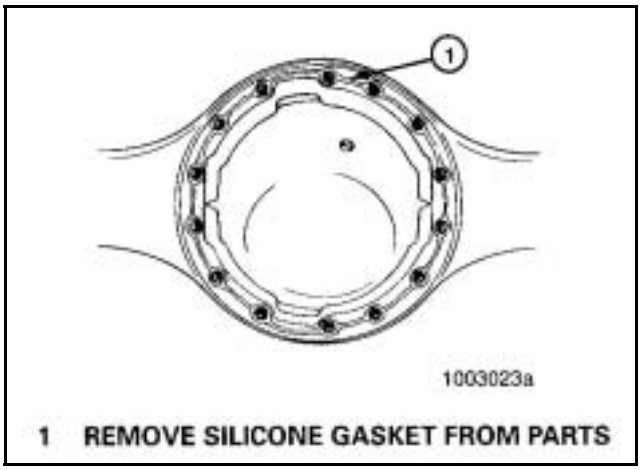


Figure 42

5. Remove nicks, mars and burrs from parts with machined or ground surfaces. Use a fine file, india stone, emery cloth or crocus cloth for this purpose.

Caution

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

6. Clean and repair threads of fasteners and holes. Use a die or tap of the correct size or a fine file for this purpose.

Warning

Repair of axle housings by bending or straightening will cause poor or unsafe vehicle operation and early failure at the axle.

Repair Axle by Welding

1. Meritor will permit repairing drive axle housing assemblies by welding only in the following areas:

   a. Only RT-46-160 axles housing to cover weld joints. Refer to TP-9599.
   b. Snorkel welds.
   c. Housing seam welds between t he suspension attaching brackets.
   d. Bracket welding to drive axle housing. Refer to TP-9421.
   e. Refer to Meritor Maintenance Manual 8 for approved axle welding procedures.

Warnings

Using wrong welding procedures or welding at locations other than the three areas permitted by Meritor will make the heat-treated component weak. A weak component will cause poor or unsafe operation of the vehicle and early axle failure. The following procedure must be used.

Solvent cleaners can be flammable, poisonous and cause burns. Examples of solvent cleaners are carbon tetrachloride, emulsion-type cleaners and petroleum-based cleaners. To avoid serious personal injury when you use solvent cleaners, you must carefully follow the manufacturer's product instructions and these procedures:

- *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. Follow the manufacturer's instructions carefully.*

Caution

Welding can be used when the crack or damaged area is within the old weld material. Replace the axle housing if the crack extends into the metal next to the old weld. A repaired housing must be used in correct applications.

2. Welding Procedure
   a. Drain the lubricant from the axle assembly.

b. Remove the axle shafts and differential carrier from the axle housing.
c. Remove hub, drum, wheel bearing and brake air chambers.
d. Clean the damaged area inside and outside the housing. Cleaning solvent can be used.
e. Grind the damaged weld to the base metal.
f. Warm the complete axle housing to a temperature of 70° F-80° F (21° C-27° C) or higher.
g. Before you start welding, heat the damaged area to be repaired to approximately 300° F (149° C).
h. Use a 70,000 psi tensile weld material and the correct voltage and amperage for the diameter weld rod used. Examples of weld rods that can be used are E-7018 or ER-70S-3.
i. Fill in the weld gap as follows:

Cautions

If the E-7018 weld rod is used, the rod must be kept dry. Electrodes that are not stored in the correct sealed containers must be heated at 700° F (371° C) for one hour before welding. Wet electrodes must be dried at 180° F (82° C) for one to two hours and then heated at 700 F (371° C) for one hour before welding.

Do not connect the ground cable at any point on the axle assembly that will place a bearing between the ground cable and weld area. If a bearing is between the ground cable and weld, the bearing will be damaged because of electricity arcing.

A good location to connect the ground cable is the spring mounting pad of the housing.

1. The opening in cover welds **must** be filled level with the old weld.
2. The opening in seam welds must be ground out to 70% of the wall thickness. The wall thickness can be measured at the carrier opening of housing.
3. Clean the new weld area. Carefully remove all the rough weld material.
4. Install the differential carrier and axle shafts.
5. Fill the axle assembly with the correct amount of lubricant. Refer to Maintenance Manual 1, Lubrication, for information on lubricants.

Note

Before welding brackets or other components to the axle housing, contact Meritor for proper welding procedures.

Bending or Straightening Drive Axle Housings

Meritor is emphatically opposed to any attempt to correct or modify drive axle housings by bending or straightening. All damaged drive axle housings should be replaced.

Warning

Do not bend or straighten damaged drive axle housings. Any bending or straightening process may result in misalignment or weakening of the axle housing and result in component damage or serious personal injury.

Removing Dri-Loc® Fasteners

If it is difficult to remove fasteners from components, the strength of Dri-Loc®, Meritor adhesive or Loctite® 277 can be decreased b heating. Use the following procedure:

1. Heat the fastener for three to five seconds only and try to loosen the fastener with a wrench. **Do not** use an impact wrench to loosen the fastener or hit the fastener with a hammer.

Caution

Do not exceed 350° F (177° C) maximum. Heating must be done slowly to prevent thermal stresses in the other components.

2. Repeat step 1 until the fastener can be removed.

General Information

Installing Fasteners with Pre-Applied Adhesive, Meritor Liquid Adhesive 2297-C-7049, Loctite® 680 Liquid Adhesive or Equivalent

Installing New Fasteners with Pre-Applied Adhesive Patches

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

1. Clean the oil and dirt from threaded holes. Use a wire brush. There is no other special cleaning required.

Caution
Do not apply adhesives or sealants on new fasteners with pre-applied adhesive patches or inside closed threaded holes. If other adhesives or sealants are used, the new adhesive will not function correctly.

2. Assemble parts using the new pre-applied adhesive fasteners.

Note
There is no drying time required for fasteners with pre-applied adhesive.

3. Tighten the fasteners to the required torque value for that size fastener.

Installing Original or Used Fasteners Using Meritor Liquid Adhesive 2297-C-7049 or Loctite® 680 or Equivalent

1. Clean the oil, dirt and old adhesive from all threads and threaded holes. Use a wire brush.
2. Apply four or five drops of Meritor Liquid Adhesive, Loctite® 680 or equivalent inside each threaded hole or bore ONLY. Make sure the adhesive is applied inside to the bore threads. **Figure 43.**

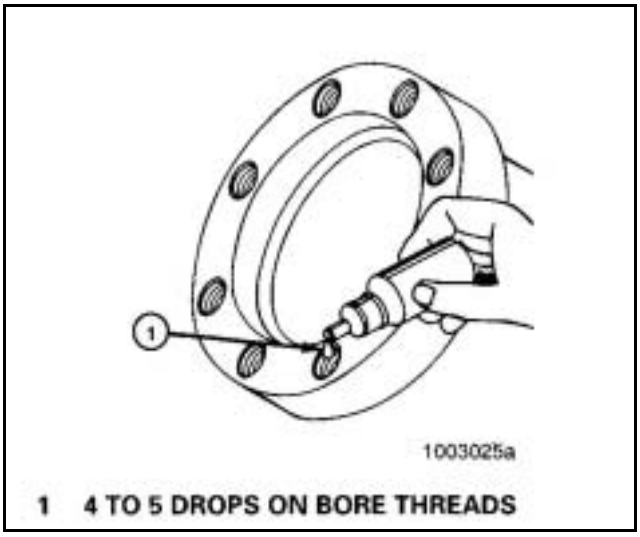


Figure 43

Caution
Do not apply adhesive directly to the fastener threads. Air pressure in a closed hole will push the adhesive out and away from mating surfaces as the fastener is installed.

3. Tighten the fasteners to the required torque value for that size fastener.

Note
There is no drying time required for Meritor Liquid Adhesive 2297-C-7049, Loctite® 680 or equivalent.

Application of Meritor Adhesive 229-T-4180 in Bearing Bores for the Differential

Use adhesive 2297-T-4180 for all axles.

1. Clean the oil and dirt from outer diameters of 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 on the bearing bores.
3. Apply a single continuous bead of the adhesive to the bearing bores in the carrier and bearing caps. Apply the adhesive 360 degrees around the smooth, ground surfaces only. **Do not** place adhesive on threaded areas. **Figure 44.**

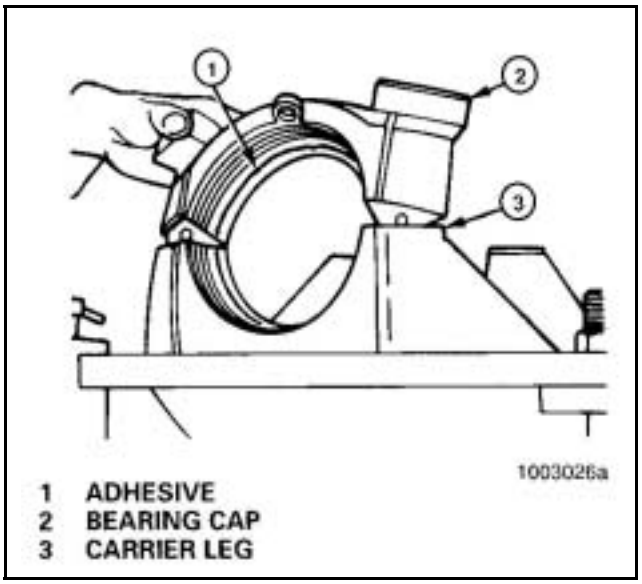


Figure 44

Note

Meritor adhesive 2297-T-4180 will become hard (dry) in approximately two hours. The following two steps of the procedure must be done in two hours from the time the adhesive was applied. If two hours have passed since application, clean the adhesive from the parts again and apply new adhesive.

4. Install the main differential assembly, bearing cups and bearing caps into the carrier. Use the normal procedure, refer to "Install the Differential and Ring Gear Assembly" and **Figure 96** through **Figure 99.**
5. Adjust preload of the differential bearings, backlash and tooth contact patterns of the gear set as required using the normal procedures. Refer to "Adjust Preload of Differential Bearings" through "Install Differential Carrier into Axle Housing".

Application of Three Bond 1216 or Equivalent Silicone Gasket Material

Warning

When you apply some silicone gasket materials, small amounts of acid vapor are present. To prevent possible serious injury, the work area must be well ventilated. If the silicone gasket material gets into your eyes, flush them with water for 15 minutes. Have your eyes checked by a doctor as soon as possible.

Note

The following silicone gasket products or equivalent can be used for Meritor components:

- *Three Bond Liquid Gasket No. TB 1216 (Grey)*
- *Loctite® Ultra Grey Adhesive/Sealant #18581*
- *From Meritor: Ten ounce tubes, Part No. 2297-F-7052.*

1. Remove all old gasket material from both surfaces. **Figure 45.**
2. Clean the surfaces where silicone gasket material will be applied. Remove all oil, grease, dirt and moisture without damaging the mating surfaces. **Figure 45.**
3. Dry both surfaces.

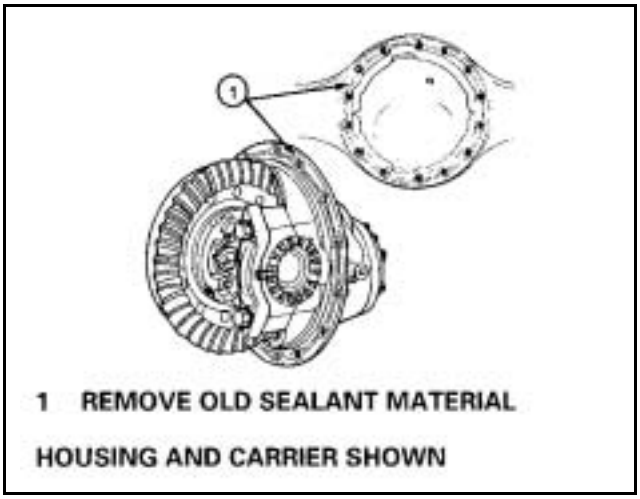


Figure 45

Caution

The amount of silicone gasket material applied must not exceed 0.125 inch (3 mm) diameter bead.

Too much gasket material can block lubrication passages and result in damage to the components.

4. Apply 0.125 inch (3 mm) diameter continuous bead of the silicone gasket material around one surface. Also apply the gasket material around the edge of all fastener holes on that surface. **Figure 46.**
5. Assemble the components immediately to permit the silicone gasket material to compress evenly between the parts. Tighten fasteners to the required torque value for that size fastener. There is no special procedure or additional torque value required. Refer to Table J.
6. Wait 20 minutes before filling the assembly with lubricant.

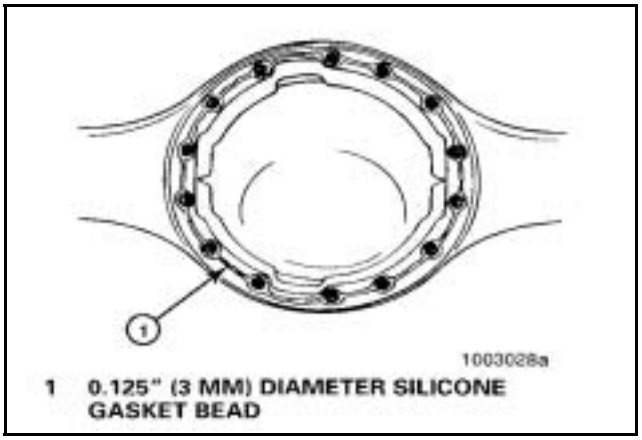


Figure 46

Installing Tight Fit Yokes and POSE™ Seal

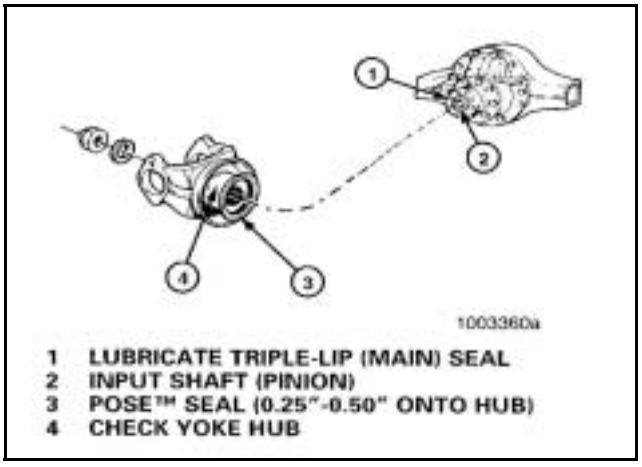


Figure 47

1. Apply the same lubricant used in the axle housing to the hub of the yoke or flange.
2. Inspect and make sure the lips of the POSE™ seal and the outer retainer of the triple-lip seal (main seal) are clean and free from dirt and particles that may cause lubricant leakage between the seals.
3. Install the POSE™ seal on the hub of the yoke or flange by hand. The lips of the seal must face toward the end of the hub (opposite shoulder). Slide the POSE™ seal on the hub until the lips are from 0.25 inch to 0.50 inch (6.4 mm-12.7 mm) from the end of the hub**. Do not install the POSE™ seal against the shoulder. Figure 48.**

Note

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

4. Before you install the yoke or flange on the shaft, again apply the same lubricant used in the axle housing to the hub.

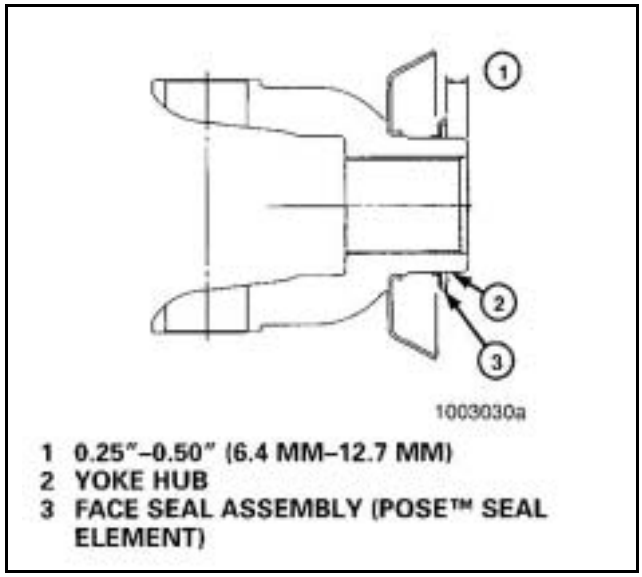


Figure 48

5. Before you install the yoke or flange on the shaft, again apply the same lubricant used in the axle housing to the hub.

Note

The yoke must be completely seated before tightening pinion nut to the input shaft.

Installing Any Type Yoke with a Unitized Pinion Seal (UPS)

Cautions

Once the yoke is partially or fully installed and the removed for any reason, the unitized pinion seal will be damaged and unusable. If the yoke and unitized pinion seal are removed after partial of full installation, remove and discard the ***original*** *unitized pinion seal and replace it with another new unitized pinion seal.*

If the inner sleeve of the seal is removed, the seal is not usable. A new seal is required. This will occur is a yoke is installed into the seal and then removed.

1. Remove the replacement unitized seal from the package. **Figure 49.**
2. Select the correct seal driver from **Table A.** Each seal driver is designed to correctly install a specific diameter seal. To determine the yoke seal diameter, measure the yoke journal. Refer to **Table A – Unitized Pinion Seals and Seal Drivers.**
3. Position the seal on the driver.

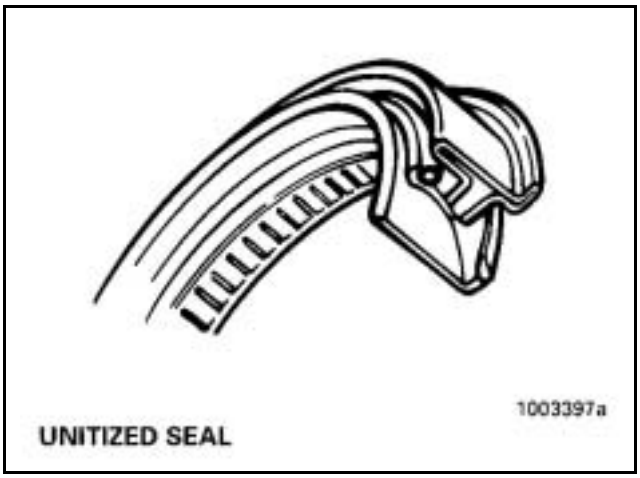


Figure 49

Single Models	Tandem Models	Meritor Unitized Pinion Seal	Seal Installation Location	Meritor Seal Driver	Yoke Seal Diameter Inches
RS-17-145 RS-19-145 RS-121-145 RS-21-160 RS-23-160/A RS-23-161/A RS-25-160/A RS-23-186 RS-185 RS-30-185	RT-34-144/P RT-34-145/P RT-40-145/A/P RT-40-149/A/P RT-44-145/P RT-40-160/A/P RT-40-169/A/P RT-46-160/A/P RT-46-169/A/P RT-46-164EH/P RT-46-16HEH/P RT-50-160/P RT-52-185* RT-58-185*	A-1205-R-2592	Tandem Forward Input (145 models from 11/93 to present)	R4422402	3.250 3.255
		A-1205-P-2590	Tandem Forward Output (Tandem Forward Input 145 models before 11/93 with seal A-1205-F-2424)	R4422401	3.000 3.005
		A-1205-N-2588	Tandem and Single Rear Input (145 models)	R4422401	3.000 3.005
		A-1205-Q-2591	Tandem and Single Rear Input (160/164/185 models)	R4422402	3.250 3.255
To obtain Meritor seal driver KIT 4454, call 888-725-9355					

* Forward and rear input only.

Table A — Unitized Pinion Seals and Seal Drivers

Caution

Use a rubber mallet to install the seal. Do not use a steel, brass or plastic hammer to install the seal. Using a steel, brass or plastic hammer can damage the sea 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 50.**

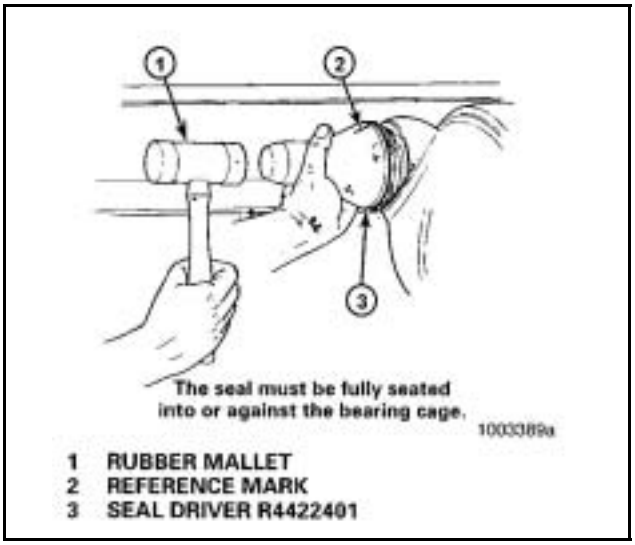


Figure 50

5. Use a 0.010 inch shim to check for clearance between the entire seal flange circumference and the bearing cage.
   - **If the 0.010-inch shim slides between the seal flange and bearing cage:** Correctly position the seal driver and drive the seal into the bore until the 0.010-inch shim cannot slide between the seal flange and bearing cage at any point around the seal flange. **Figure 51.**

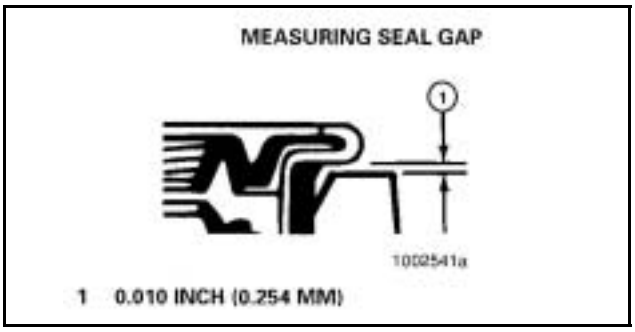


Figure 51

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

Warning

Solvent cleaners can be flammable, poisonous and cause burns. Examples of solvent cleaners are carbon tetrachloride, emulsion-type cleaners and petroleum-based cleaners. To avoid serious personal injury when you use solvent cleaners, you must carefully follow the manufacturer's product instructions and these procedures:

- *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. Follow the manufacturer's instructions carefully*

1. Clean the ground and polished surface of the yoke journal using a clean shop towel and a safe cleaning solvent. 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 52**, replace the yoke.

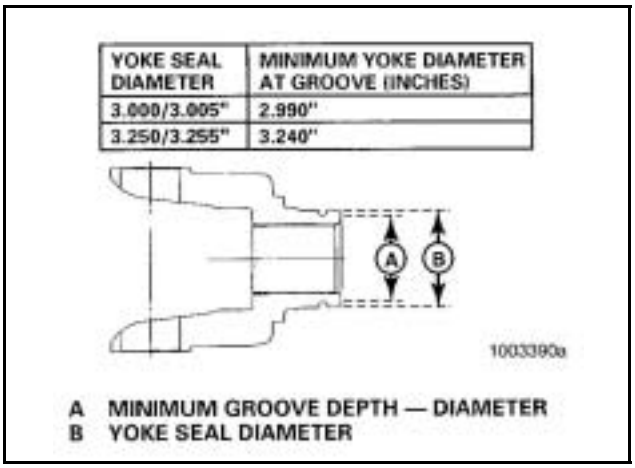


Figure 52

Cautions

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

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

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.

General Yoke and U-Joint Reassembly

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

Gear Set Information (Drive Pinion and Ring Gear Marks)

Note

*Read the following information before installing a new gear set in the carrier. Always check the gear set for correct marks to make sure the gears are a matched set. The location of the marks is shown in **Figure 53**.*

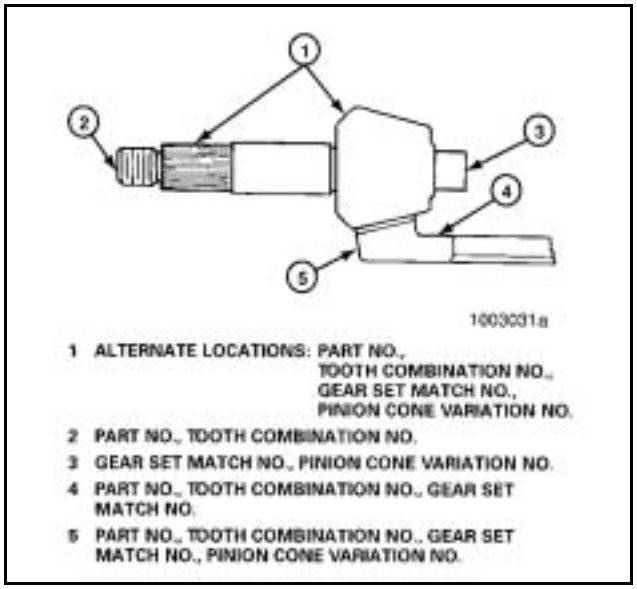


Figure 53

1. **Part Number**
   a. **Examples of gear set part numbers:**
      - Conventional ring gear, 36786
      - Conventional drive pinion, 36787
      - Generoid ring gear, 36786 K or 36786 K2
      - Generoid drive pinion, 36787 K or 36787 K2

Note

The last digit in part numbers for Generoid gears is a letter or letter and number.

   b. **Location on Drive Pinion:** End at threads.
   c. **Location on Ring Gear:** Front face or outer diameter.

2. **Tooth Combination Number**
   a. **Example of a tooth combination number:** 5-37.

Note
A 5-37 Gear set has a 5-tooth drive pinion and a 37-tooth ring gear.

   b. **Location on Drive Pinion:** Ends at threads.
   c. **Location on Ring Gear:** Front face or outer diameter.
3. **Gear Set Match Number**

Meritor drive pinions and ring gears are available only as matched sets. Both gears of a set have a match number.

   a. **Example of a gear set match number:** M29.

Note
A gear set match number has any combination of a number or letter and number.

   b. **Location on Drive Pinion:** End of gear head.
   c. **Location on Ring Gear:** Front face or outer diameter.

4. **Pinion Cone Variation Number**

Note
The pinion cone variation number is not used when checking for a matched gear set. The number is used when you adjust the depth of the pinion in the carrier. Refer to the procedure for adjusting the shim pack thickness under the pinion cage in "Adjusting Shim Pack Thickness for the Pinion Cage (Depth of Pinion)".

   a. **Examples** – refer to **Figure 54.** Pinion cone variation numbers:
      - PC+3
      - +2
      - +0.01 mm
      - PC-5
      - -1
      - -0.02 mm
   b. **Location on Gear Set:** End of pinion gear head or outer diameter of ring gear.

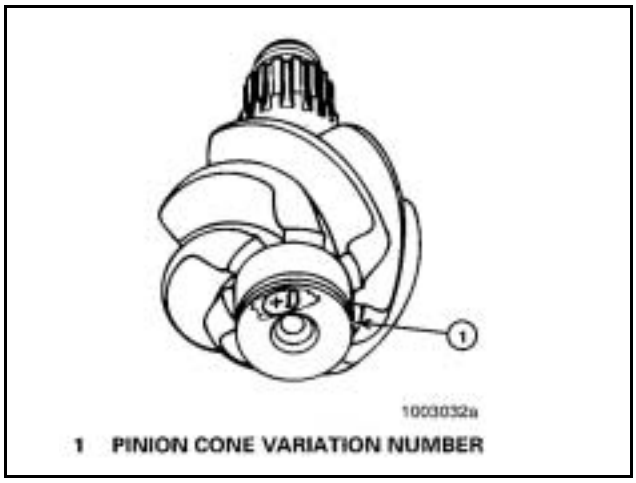


Figure 54

Assembly

Assemble the Drive Pinion, Bearings and Bearing Cage

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

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

1. Place the bearing cage in a press**. Figure 55.**

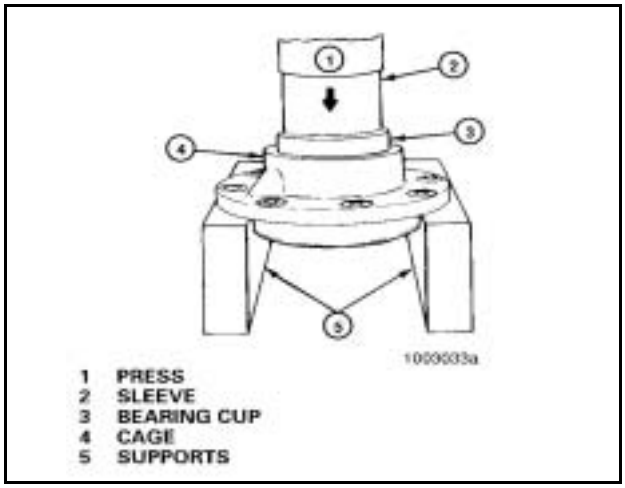


Figure 55

2. Support the bearing cage with metal or wood blocks.
3. Press the bearing cup into the bore of bearing cage until cup is flat against bottom of bore. Use a sleeve of the correct size to install bearing cup. **Figure 55.**

Note

Use the same procedure for both bearing cups.

4. Place the drive pinion in a press, gear head (teeth) toward the bottom. **Figure 56.**

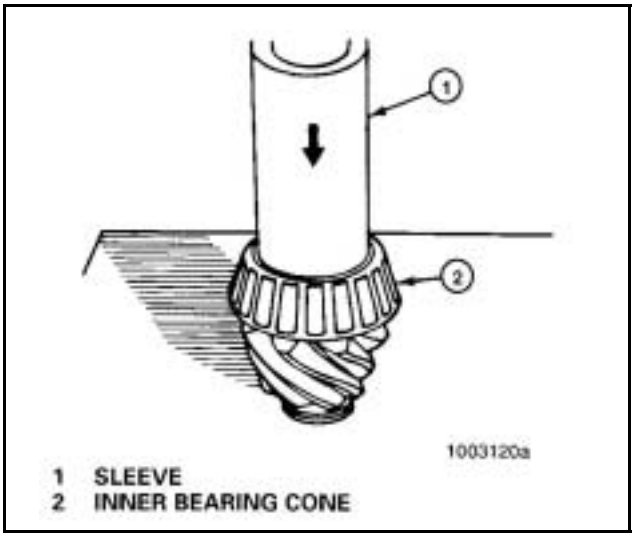


Figure 56

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.

Notes

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 hose of the pinion and the outer race pressed into its bore in the carrier. Use the following procedure to install the spigot bearing.

The following procedure applies to all axles except:

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

6. **Installing the One-Piece Spigot Bearing on the Drive pinion with Snap Ring**

   a. Place the drive pinion in a press, gear head (teeth) toward the top. **Figure 56a.**
   b. Press the spigot bearing on the end of drive pinion until the bearing is flat against the gear head. Use a sleeve of the correct size against the bearing inner race. **Figure 56a.**

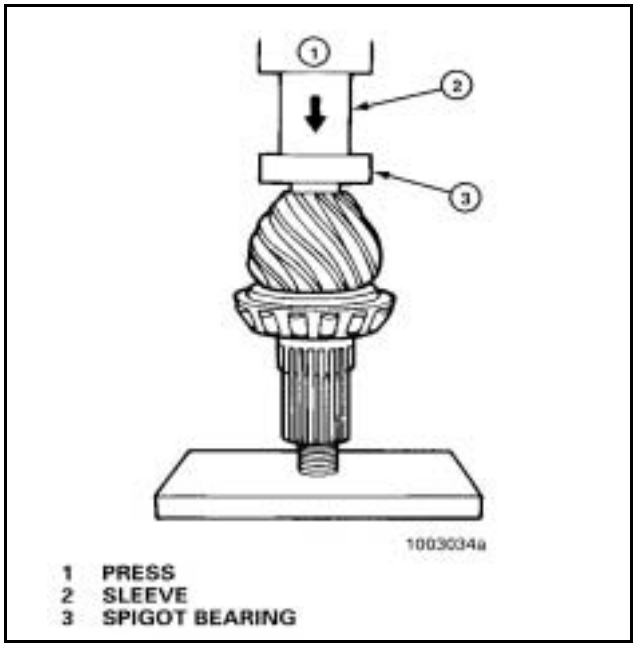


Figure 56a

   c. Install the snap ring* into groove in end of drive pinion with snap ring pliers. **Figure 57.**

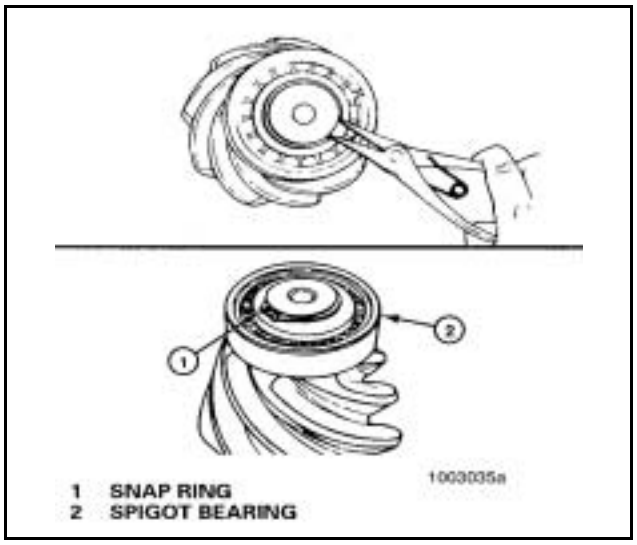


Figure 57

Note

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

7. Staking the One-Piece Spigot Bearing on the Drive Pinion (Without Snap Ring)

Specification

- Apply 6,614 lb (3,000 kg) force on a 0.375-inch (10 mm) ball.
- Stake the end of drive pinion at a minimum of five points. **Figure 57a.**

Note

**Some Meritor carriers do not have these described parts.*

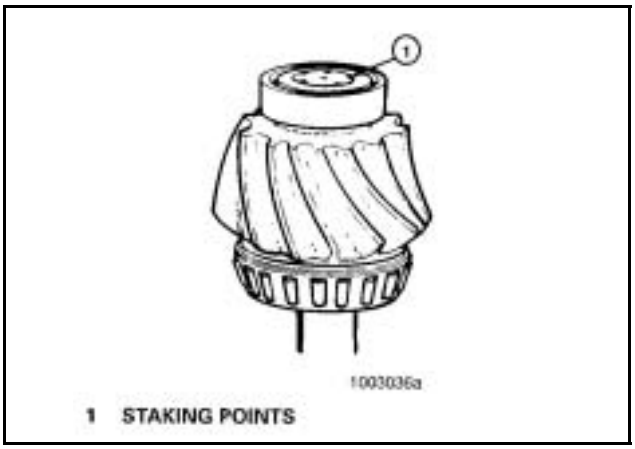


Figure 57a

When using a staking tool and press (**Figure 57a**), calculate the force required on the tool as follows.

6,614 lb (3,000 kg) x amount of balls in tool = pounds or kilograms

Example

6,614 lb x 3 balls = 19,842 pounds

For information about the staking tool, contact your local Meritor representative. **Figure 57b.**

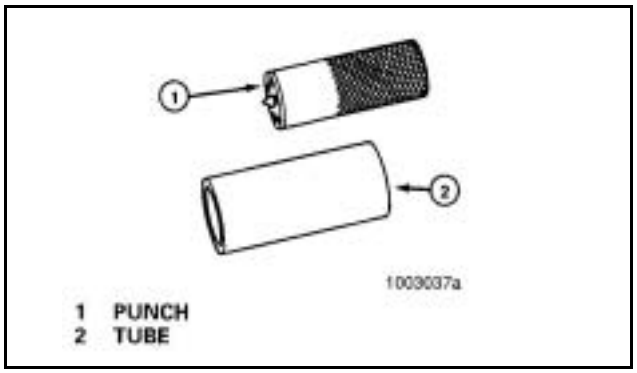


Figure 57b

a. Place the drive pinion and the tube of the staking tool in a press, spigot bearing toward the top. **Figure 57c.**
b. Calculate the amount of force that will be required on the staking tool. Refer to specification and example calculation.
c. 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 57c.**

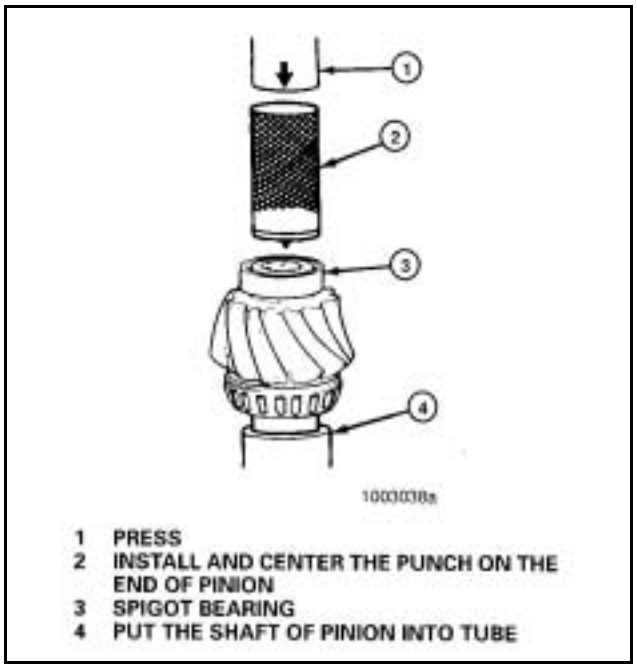


Figure 57c

Caution

Do not align new points with grooves in end of 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.

d. Rotate the punch as many times as required for a minimum of five points. Repeat step **C** for each point.

Note

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

8. Installing and Staking the Two-Piece Spigot Bearing on the Drive Pinion

Notes

- *This procedure applies to some 160 Series single rear axles and rear tandem axles. These axles may also use a one-piece spigot bearing with a snap ring retainer.*
- *The inner race of 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.*

- *Kent-Moore Kit J-39039 includes the staking tool, temperature indicating liquid, heating shield and plastigage needed for this job.*

a. Apply two stripes of temperature indicating liquid on the pinion stem from the top to the bottom. **Figure 58.** Apply a green stripe to indicate 400 degrees F (205 degrees C) and a blue stripe to indicate 500 degrees F (260 degrees C).

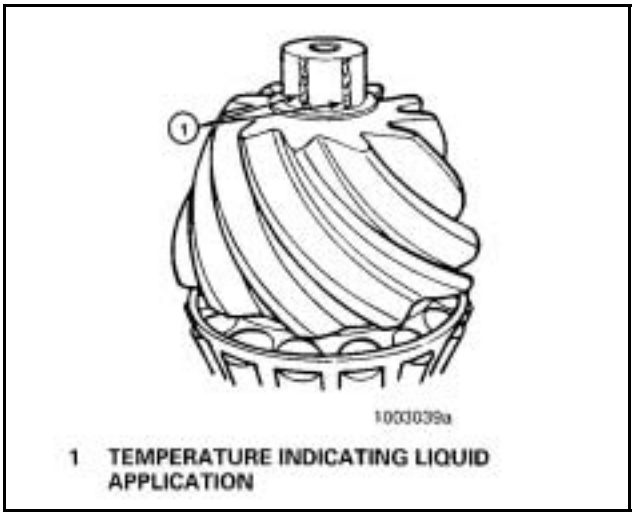


Figure 58

b. Place the heating shield over the pinion stem so that you can see the temperature indicating liquid through the hole in the shield. **Figure 59.**

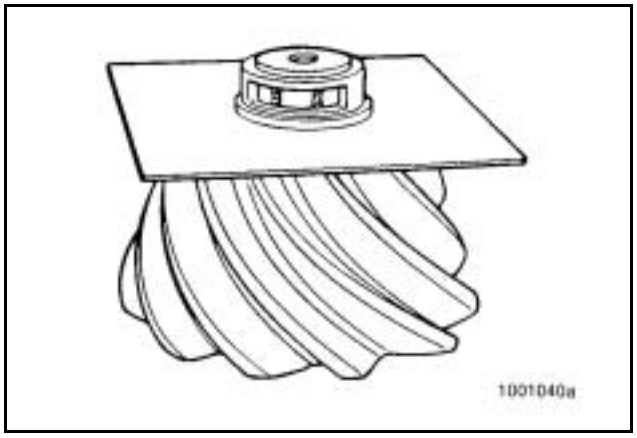


Figure 59

Warning

Always wear safe clothing, gloves and eye protection when working with a torch for heating parts to prevent serious personal injury during assembly.

Caution

Do not heat the pinion stem without the heat shield in place. Also, do not overheat the pinion stem or you will weaken the metal, which can cause early failure. Correct heating will take approximately 25-35 seconds, depending on how hot the torch is.

c. Light and adjust the torch until the white part of the flame is approximately ¼ inch long. Keep the white part of the flame approximately 1/8 inch from the top of the stem. **Figure 60.** 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.

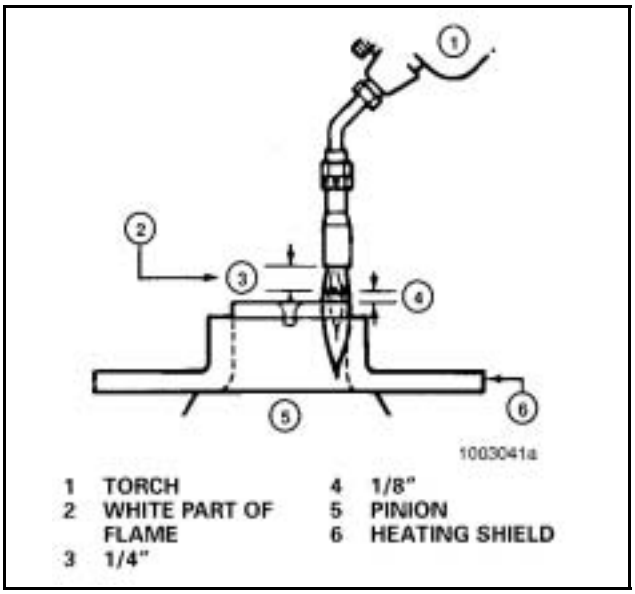


Figure 60

d. 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.

Warning

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

Caution

Do not press or directly strike the new inner race in step e or damage to the bearing will result.

e. 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 fir a 0.002-inch feeler gauge between the race and the pinion shoulder.

Notes

- *To hold the races in place, use a staking tool, instead of the old race, to start the new race on the stem. The old race can be used to completely seat the new race.*
- *In Step f, you do not need to use the plastigage for every stake. Use the plastigage until you are sure you are hitting the punch with the correct amount of force.*

f. Place the staking tool over the bearing race. Cut a one inch piece from the green plastigage strip and place in between the punch and the staking tool. **Figure 61 – View A.**

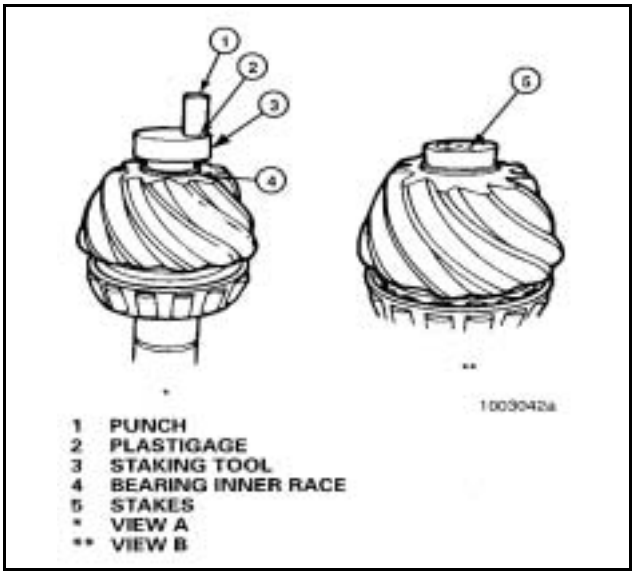


Figure 61

g. Strike the punch with a two-three pound brass hammer to upset the end of the pinion stem. Then, remove the strip and measure its thickness against the gauge on the wrapper that the strip came in. The strip must not be less than 0.003 inch 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 61 – View B.**

h. 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 and press the bearing until it is squarely against the shoulder in the bottom of its bore.

9. Apply axle lubricant to the bearing cups and t the bearing cones in the cage.
10. Install the drive pinion into the bearing cage.

11. Install the bearing spacer or spacers on pinion shaft against the inner bearing cone. **Figure 62.**

Note
The spacer or spacers control the preload adjustment of the drive pinion bearings.

12. Install the outer bearing cone on pinion shaft against the spacer. **Figure 62.**

Note
Do not install pinion seal in bearing cage. Continue with adjusting preload of pinion bearings.

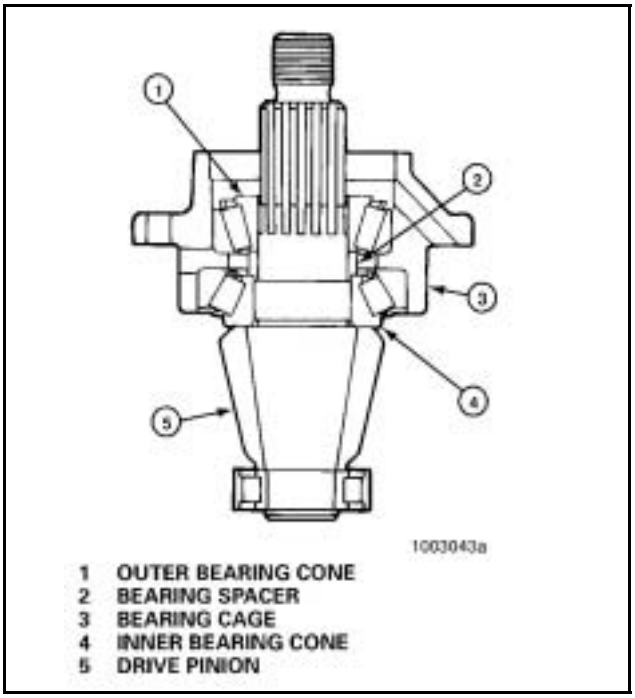


Figure 62

Adjusting Preload of Pinion Bearings

Specifications

- New pinion bearings – torque
  - 5 to 45 lb-in (0.56-5.08 N•m)

- New pinion bearing in good condition – torque
  - 10 to 30 lb-in (1.13-3.39 N•m)

Press Method

Notes
If a press is not available, or the press does not have a pressure gauge, use the yoke or flange method to adjust pinion bearing preload. Refer to "Yoke or Flange Method". Do not read starting torque. Read only the torque value after the cage starts to rotate. Starting torque will give a false reading.

a. Place the drive pinion and cage assembly in a press, gear head (teeth) toward the bottom.
b. Install a sleeve of the correct size against the inner race of the outer bearing. **Figure 63.**
c. Apply and hold the correct amount pressure to the pinion bearings. Refer to **Table B.** As pressure is applied, rotate the bearing cage several times so that bearings make normal contact.

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	(13608/13.6)	300-400	(407-542)
1 ¼"-12	54,000/27	(24494/24.5)	700-900	(949-1220)
1 ¼" - 18	54,000/27	(24494/24.5)	700-900	(949-1220)
1 ½"-12	54,000/27	(24494/24.5)	800-1100	(1085-1491)
1 ½"-18	54,000/27	(24494/24.5	800-1100	(1085-1491)
1 ¾"-12	50,000/25	(22680/22.7)	900-1200	(1220-1627)
2"-12	50,000/25	(22680/22.7)	1200-1500	(1627/2034)

Table B

d. While pressure is held against the assembly, wind a cord around the bearing cage several times.
e. Attach a spring scale to the end of the cord.
f. Pull the cord with scale on a horizontal line. As the bearing cage rotates, read the value indicated on scale. Write down and record the reading. **Figure 63.**

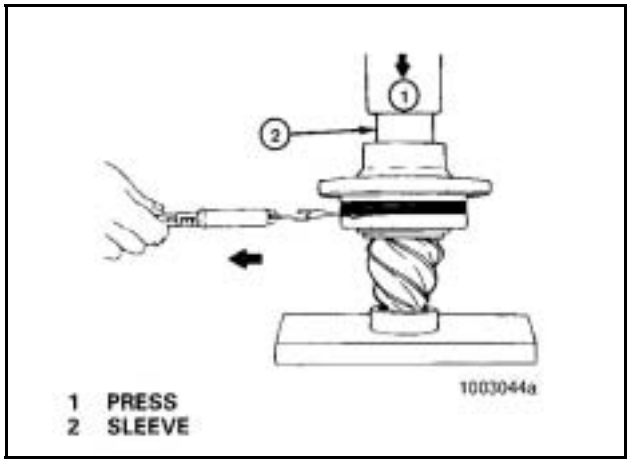


Figure 63

g. Measure the diameter of bearing cage where the cord was wound. Measure in inches or centimeters. **Figure 64.**
h. Divide the dimension in half to get the radius. Write down and record the radius dimension.

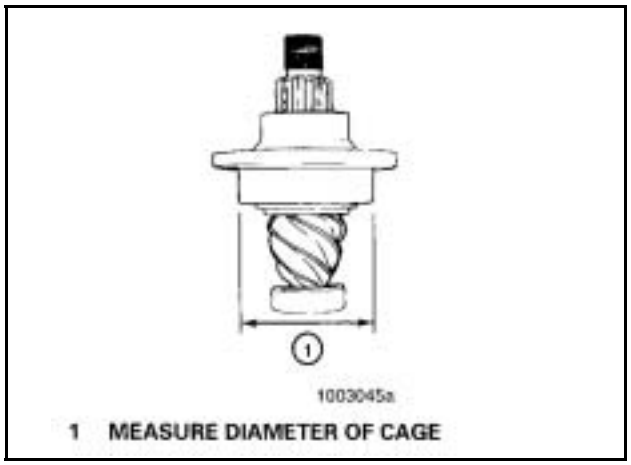


Figure 64

i. Use the following procedure to calculate the bearing preload (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

or

Examples

- 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 in. = 24.8 in-lb Preload
Preload x 0.113 = 2.8 N•m Preload

or

3.4 kg x 8.4 cm = 28.6 kg-cm Preload
Preload x 0.098 = 2.8 N•m Preload

j. If the preload (torque) of pinion bearings is not within specifications, do the following procedure, then repeat steps **a** through **i**.

To increase preload, install a thinner bearing spacer. To decrease preload, install a thicker bearing spacer.

k. Check the bearing preload with the drive pinion and cage assembly installed in the carrier. Follow the procedures to adjust preload of pinion bearings, yoke or flange method.

Yoke or Flange Method

Warning

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

Caution

Do not install tight fit yokes or flanges on shafts using a hammer or mallet. A hammer or mallet will damage the yoke or flange.

Note

Use a press to install the yoke or flange. ***Figure 65.***

a. Install the input yoke or flange, nut and washer* on the drive pinion. The yoke or flange **must** be seated against the outer bearing.
b. Temporarily install the drive pinion and cage assembly in the carrier. Do not install shims under the bearing cage. **Figure 66.**

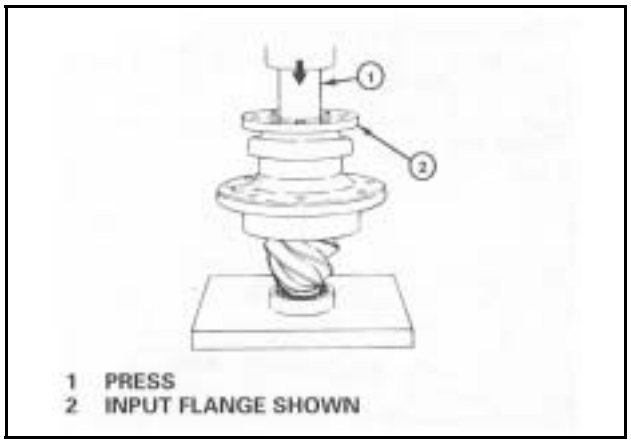


Figure 65

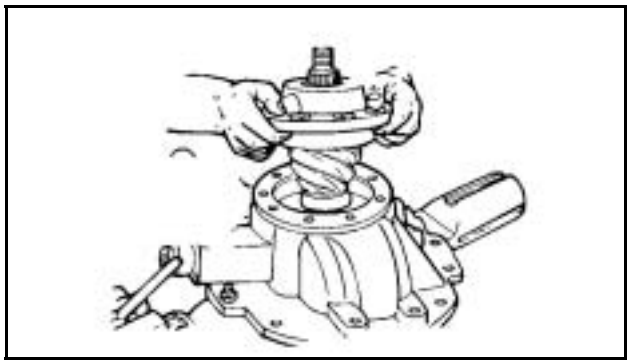


Figure 66

Note

**Some Meritor carriers do not have these described parts.*

c. Install the bearing cage to carrier capscrews. Washers are not required at this time. Tighten the capscrews by hand until snug.
d. 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 67.**

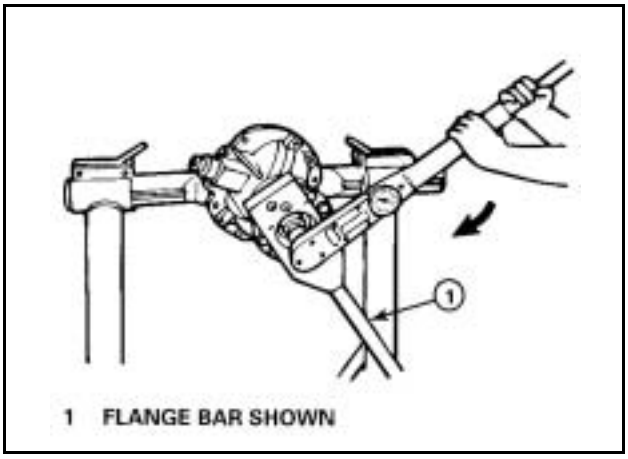


Figure 67

e. Tighten the nut on drive pinion to the correct torque value. **Figure 67.** Refer to **Table B.**
f. Remove the yoke or flange bar.
g. Attach a torque wrench on the drive pinion nut. Rotate the drive pinion and read the value indicated on torque wrench. **Figure 68.**

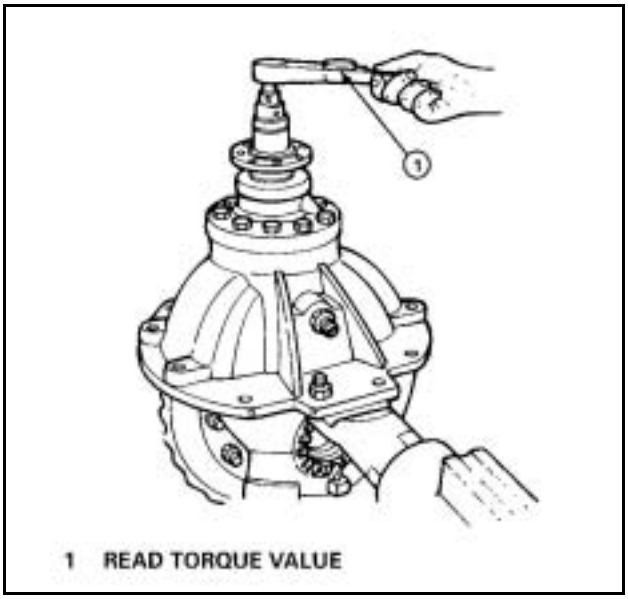


Figure 68

h. If t he preload (torque) of pinion bearings is not within specifications, remove the pinion and cage assembly from carrier. Do the following procedures, then repeat steps **a** through **g.**

- To **increase** preload, install a thinner bearing spacer.
- To **decrease** preload, install a thicker bearing spacer.

13. After adjusting preload of pinion bearings, remove the drive pinion and bearing cage from carrier. Follow steps 1-5 in "Remove the Drive Pinion and Bearing Cage from Carrier".
14. Install a new triple-lip seal as follows.

Caution

Make sure that the seal lips are clean and free from dirt and particles that will cause a leak between the yoke and the 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 69.**

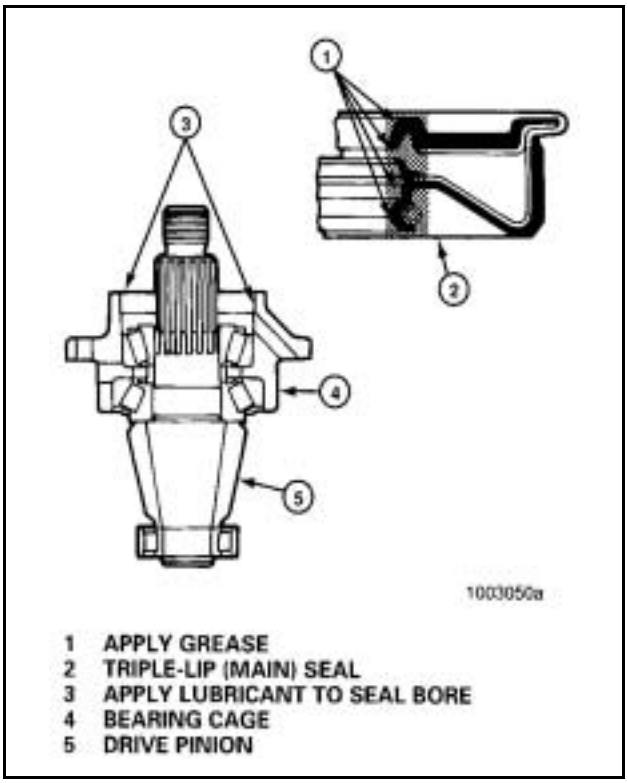


Figure 69

b. Place the drive pinion and cage assembly in a press, seal bore toward the top.

Note

If a press is not available, use a mallet and the sleeve or driver to install the seal. ***Figure 71****.*

c. Press the seal into bearing cage until flange is flat against the top of bearing cage. Use a sleeve or seal driver of the correct size that fits against the metal flange of seal. The diameter of the sleeve or driver **must** be larger than the diameter of the flange. **Figure 70.**

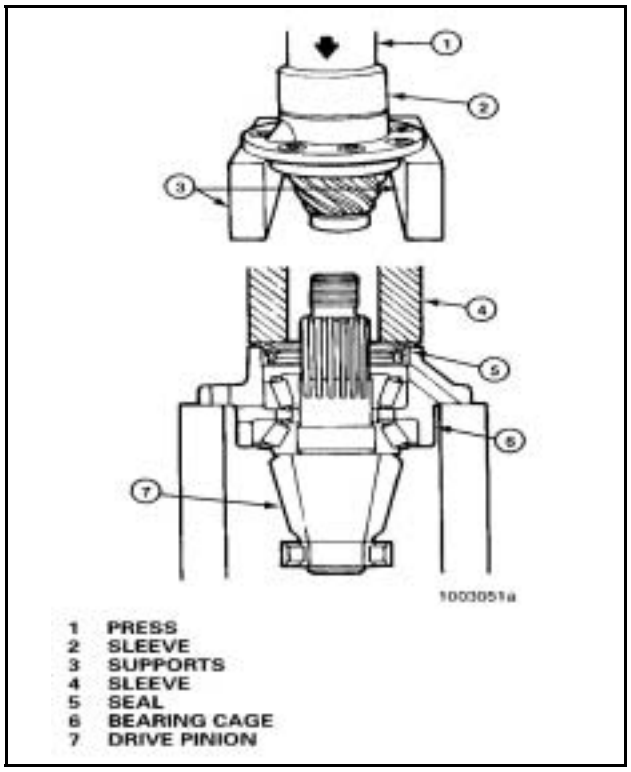


Figure 70

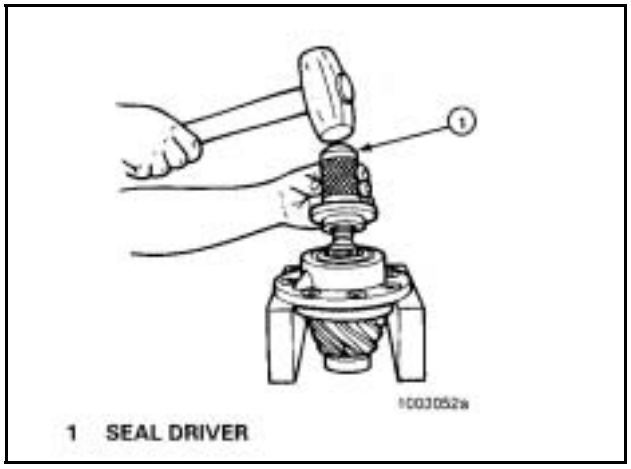


Figure 71

Warning

Use a brass or leather mallet for assembly and disassembly procedures. Do not hit steel parts with a steel hammer. Pieces of a part can break off and cause serious personal injury.

d. After the triple-lip seal is installed, a gap of approximately 0.015 to 0.030 inch (0.38-0.76 mm) between the flange and bearing cage is normal. **Figure 72.**

Check the gap with a feeler gauge at several points around the seal. The gap must be within 0.015 to 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).

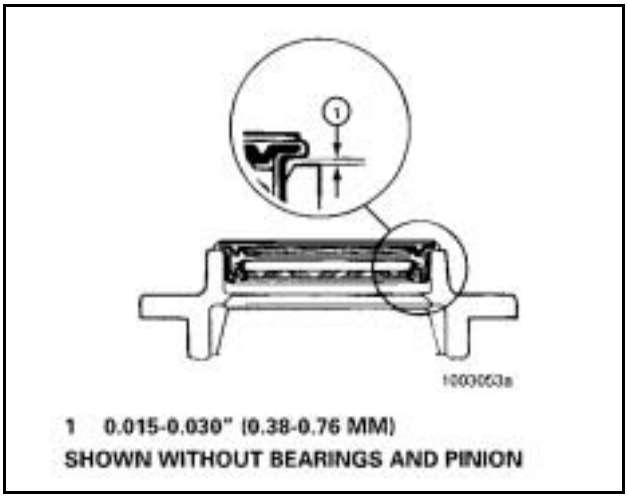


Figure 72

Adjusting Shim Pack Thickness for the Pinion Cage (Depth of Pinion)

Note

Use this procedure if a new drive pinion and ring gear is installed, or if the depth of the drive pinion has to be adjusted. ***Figure 73.***

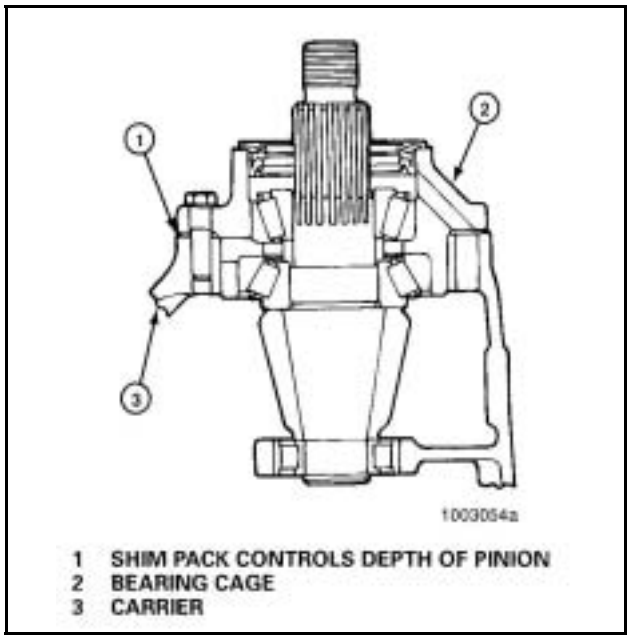


Figure 73

1. Measure the thickness of the old shim pack that was removed from under the pinion cage with a micrometer. Record the measurement for use later**. Figure 74.**

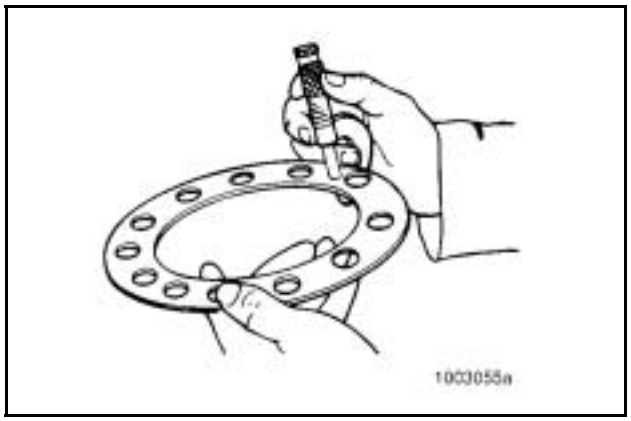


Figure 74

2. Look at the pinion cone (PC) variation number on the old drive pinion that is being replaced. Refer to Gear Set Information at the end of Section 4 for examples and location of the number. Record the number for later use. If (PC) variation number cannot be located, assembly gear set with shim pack thickness found in step 1. **Figure 75.**

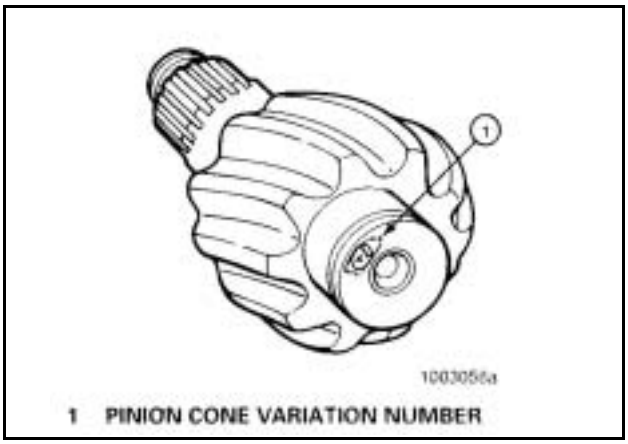


Figure 75

Note

The pinion cone number can be either 100ths of a millimeter or 1,000ths of an inch. Refer to the following examples:

PC +3, PC –3, +3, or –3= 0.003 inch

PC +.03, PC 0.03 mm, +0.03 m or –0.03=0.03 mm

To change millimeters to inches – millimeters x 0.039

3. 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.
4. If the old pinion cone number is a minus (-1) number, add the number to the old shim pack thickness that was measured in step 2.
5. Look at the pinion cone (PC) variation number on the new drive pinion that will be installed. Record the number for later use.
6. If the new pinion cone number is a plus (+) number, add the number to the standard shim pack thickness that was calculated in step 3 or 4.
7. If the new pinion cone number is a minus (-) number, subtract the number from the standard shim pack thickness that was calculated in step 3 or 4.
8. Install the drive pinion bearing cage and new shim pack into the carrier.

Note

The value calculated in step 3 or 4 is the thickness of the stand shim pack, without a variation. To change inches to millimeters – inches x 25.40

The value calculated in step 6 or 7 is the thickness of the new shim pack that will be installed. Refer to the following examples, Table C.

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

Table C

Note

Drive pinions and ring gears MUST be replaced as fully matched sets.

Installing the 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 "Adjusting Shim Pack Thickness for the Pinion Cage (Depth of Pinion)".

1. Select the correct shim pack between the bearing cage and carrier. **Figure 76.**
2. Apply Loctite® 518 Gasket Eliminator to face of carrier.
3. Align the oil slots in the shims with oil slots in the bearing cage and carrier. The use of guide studs will help align the shims. **Figure 76.**

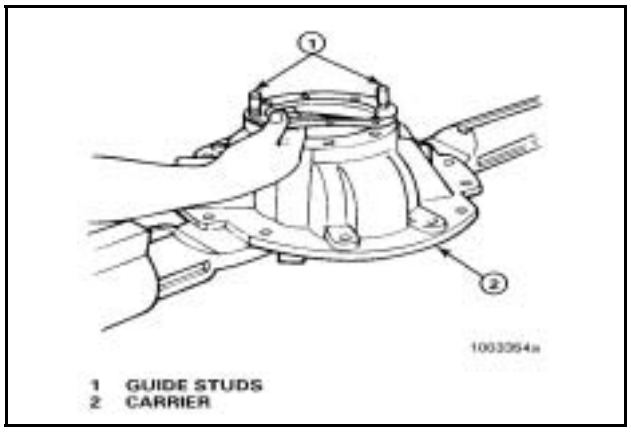


Figure 76

Note

If the pack is made from different thickness shims, install the thinnest shims on both sides of the pack for maximum sealing.

4. Apply Loctite® 518 Gasket Eliminator to top of shim pack.

Warning

Use a brass or leather mallet for assembly and disassembly procedures. Do not hit steel parts with a steel hammer. Pieces of a part can break off and cause serious personal injury.

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 76a.**

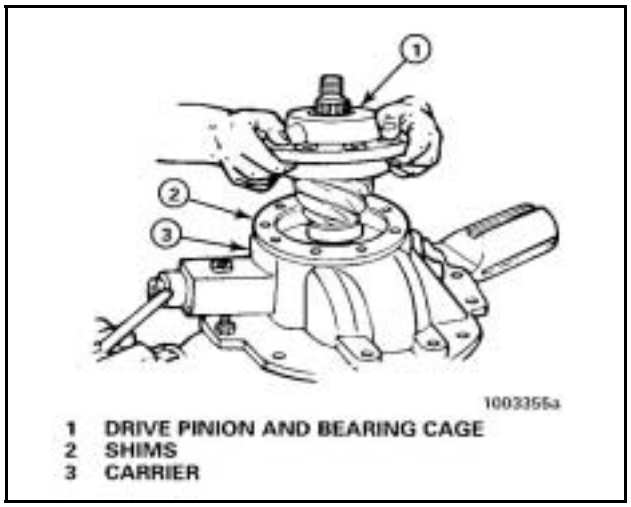


Figure 76a

6. Install the bearing cage to carrier capscrews and washers. Tighten capscrews to correct torque value. Refer to **Table J. Figure 77.**

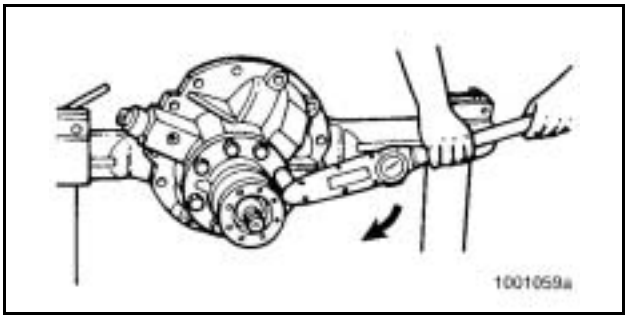


Figure 77

Installing Tight Fit Yokes and POSE™ Seal

Cautions

Make sure that the seal lips are clean and free from dirt and particles that will cause a leak between the yoke and the seal.

Do not install tight fit yokes on shafts using a hammer or mallet. Using a hammer or mallet can damage the yoke.

Make sure that the seal lips are clean and free from dirt and particles that can cause a leak between the yoke and the POSE™ seal.

Note

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

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

   If carrier uses a POSE™ seal element, install a new POSE™ seal as follows:

   a. Lightly lubricate yoke journal with same lubricant used in the axle housing.

b. Partially install the POSE™ seal onto the yoke to ¼ inch – ½ inch as shown in **Figure 78.**

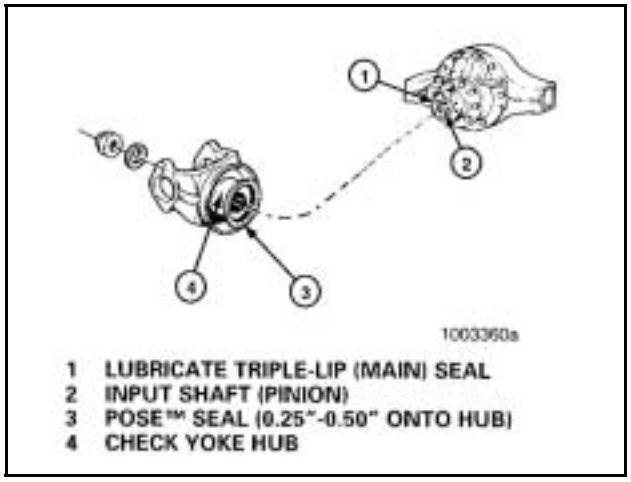


Figure 78

c. Before installing the yoke onto the drive pinion, lubricate the yoke again with the same lubricant used in the axle housing.

3. 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. Using a hammer or mallet can damage the yoke or flange.

4. 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.
5. Install the drive pinion nut and washer* on the input pinion shaft and against the yoke collar. Tighten the nut against yoke collar to torque specifications. **Figure 79.** Refer to **Table J.**

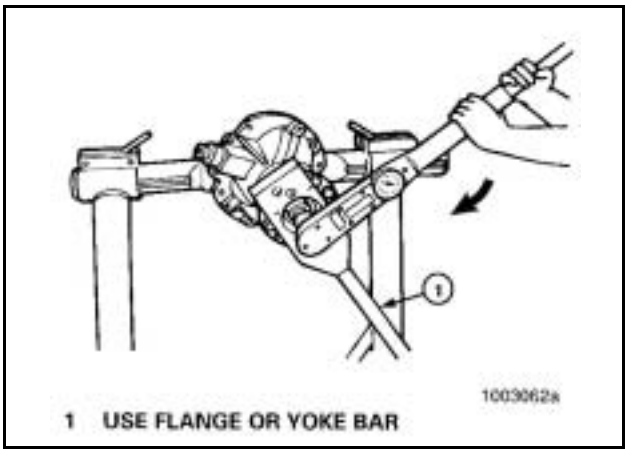


Figure 79

Note

**Some Meritor carriers do not have these described parts.*

Installing Any Type Yoke with a Unitized Pinion Seal (UPS)

Cautions

Once the yoke is partially or fully installed and then removed for any reason, the unitized pinion seal will be damaged and unusable. If the yoke and unitized pinion seal are removed after partial or full installation, remove and discard the original unitized pinion seal and replace it with another new unitized pinion seal.

If the inner sleeve of the seal is removed, the seal is not usable. A new seal is required. This will occur if a yoke is installed into the seal and then removed.

1. Remove the replacement unitized seal from the package. **Figure 80.**
2. Select the correct seal driver **from Table D.** Each seal driver is designed to correctly install a specific diameter seal. To determine the yoke seal diameter, measure the yoke journal. Refer to **Table D.**
3. Position the seal on the driver.

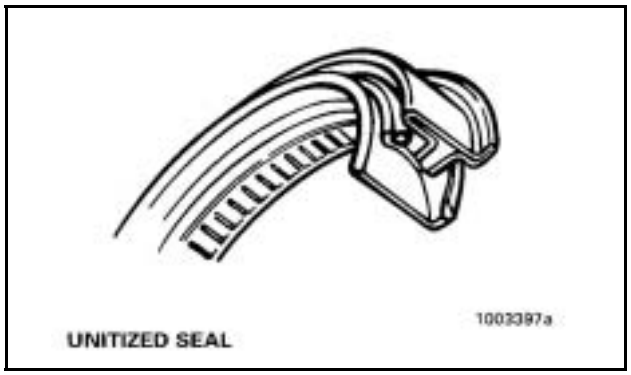


Figure 80

Single Models	Tandem Models	Meritor Unitized Pinion Seal	Seal Installation Location	Meritor Seal Driver	Yoke Seal Diameter Inches
RS-17-145 RS-19-145 RS-21-145 RS-21-160 RS-23-160/A RS-23-161/A RS-25-160/A RS-23-186 RS-26-185 RS-30-185	RT-34-144/P RT-34-145/P RT-40-145/A/P RT-44-145/P RT-40-160/A/P RT-40-169/A/P RT-46-160/A/P RT-46-169/A/P RT-46-164EH/P RT-46-16HEH/P RT-50-160/P RT-52-185* RT-58-185*	A-1205-R-2592	Tandem Forward Input (145 Models from 11/93 to present)	R4422402	3.250 3.255
		A-1205-P-2590	Tandem Forward Output (Tandem Forward Input 145 Models before 11/93 with seal A-1205-F-2424)	R4422401	3.000 3.005
		A-1205-N-2588	Tandem and Single Rear Input (145 models)	R4422401	3.000 3.005
		A-1205-Q-2591	Tandem and Single Rear Input (160/164/185 models)	R4422402	3.250 3.255
		To obtain Meritor seal driver KIT 4454, call 888-725-9355.			

* Forward and rear input only.

Table D – Unitized Pinion Seals and Seal Drivers

Caution

Use a rubber mallet to install the seal. Do not use a steel, brass or plastic hammer to install the seal. 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 be fully seated into or against the bearing cage. **Figure 81.**

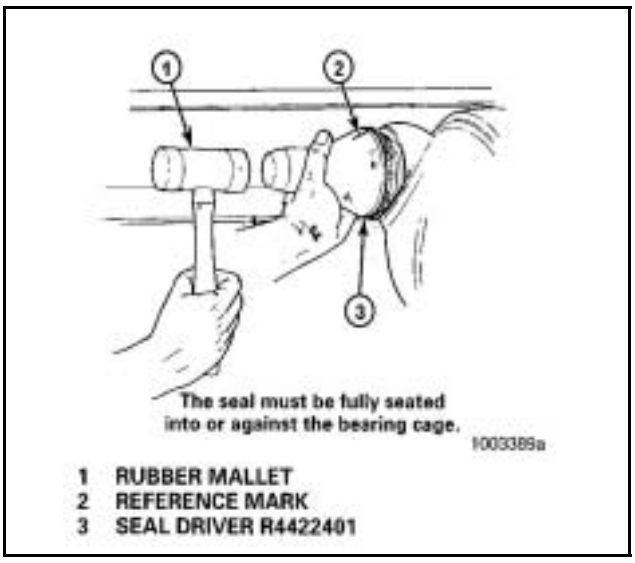


Figure 81

5. Use a 0.010-inch shim to check for clearance between the entire seal flange circumference and the bearing cage.

   - **If the 0.010-inch shim slides between the seal flange and bearing cage:** Correctly position the seal driver and drive the seal into the bore until the 0.010-inch shim cannot slide between the seal flange and bearing cage at any point around the seal flange. **Figure 82.**

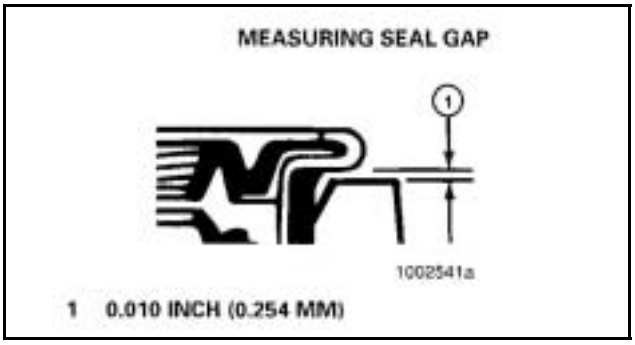


Figure 82

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

Warning

Solvent cleaners can be flammable, poisonous and cause burns. Examples of solvent cleaners are carbon tetrachloride, emulsion-type cleaners and petroleum-based cleaners. To avoid serious personal injury when you use solvent cleaners, you must carefully follow the manufacturer's product instructions and these procedures:

- *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. Follow the manufacturer's instructions carefully.*

1. Clean the ground and polished surface of the yoke journal using a clean shop towel and a safe cleaning solvent. 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 83**, replace the yoke.

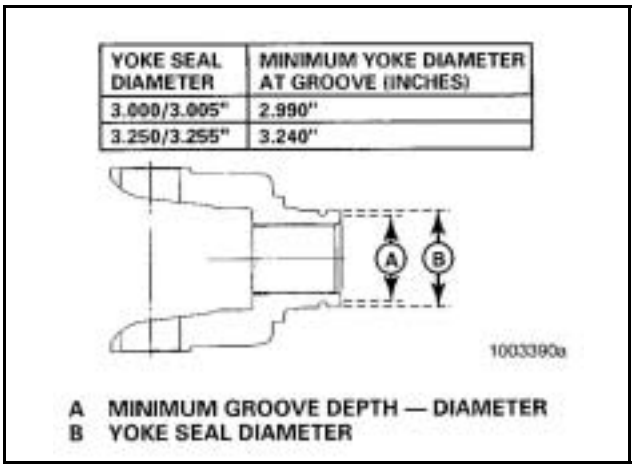


Figure 83

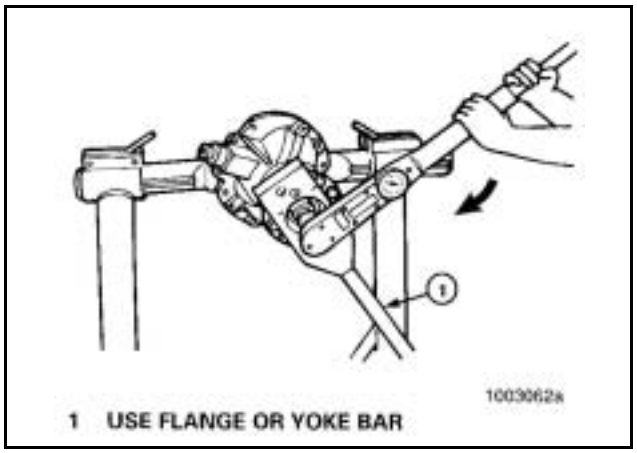


Figure 84

Cautions

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 t he pinion seal, damage the pinion seal assembly and can 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. Using 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. Install the drive pinion nut (and washer if required) on the input pinion shaft and against the yoke collar. Tighten the nut against yoke collar to torque specifications. **Figure 84.** Refer to **Table J.**

Assemble the Main Differential and Ring Gear Assembly

Caution

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. Metal particles between the parts will cause gear runout that exceeds the Meritor specification of 0.008 inch (0.2 mm).

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

Warning

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

2. Safely lift the ring gear from the tank of water using a lifting tool.
3. Install the ring gear on the flange case half immediately after the gear is heated. If the ring gear does not fit easily on the case half, heat the gear again. Repeat step 1.
4. Align fastener holes of the ring gear and flange case half. Rotate the ring gear as needed.
5. If rivets* were used to hold the ring gear to the flange case half, replace them with bolts, nuts and washers.

6. 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 85.**

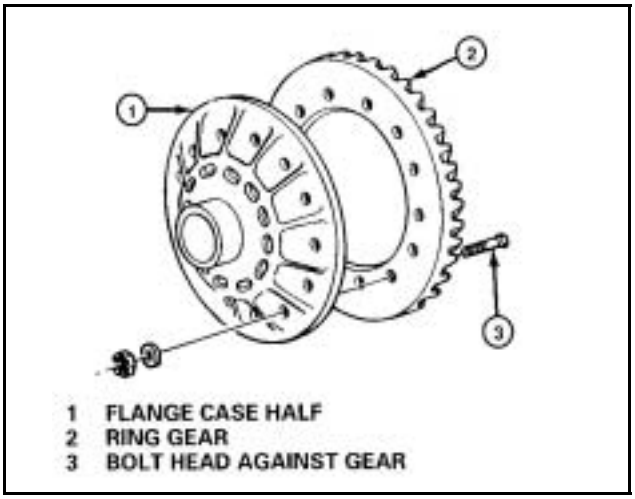


Figure 85

7. Tighten the bolts* and nuts* to the correct torque value. Refer to **Table J.**

   a. After the bolts are installed, check for gaps between the back surface of the ring gear and the case flange. Use an 0.08 mm (0.003 inch) feeler gauge and check at four points around the assembly. **Figure 86.**
   b. Check the flange case half and ring gear for the problem that causes the gap. Repair or replace parts.
   c. After the parts are repaired or replaced, assemble the ring gear on the flange case half. Repeat the procedure in "Installing Tight Fit Yokes and POSE™ Seal", and steps **a** through **c**.

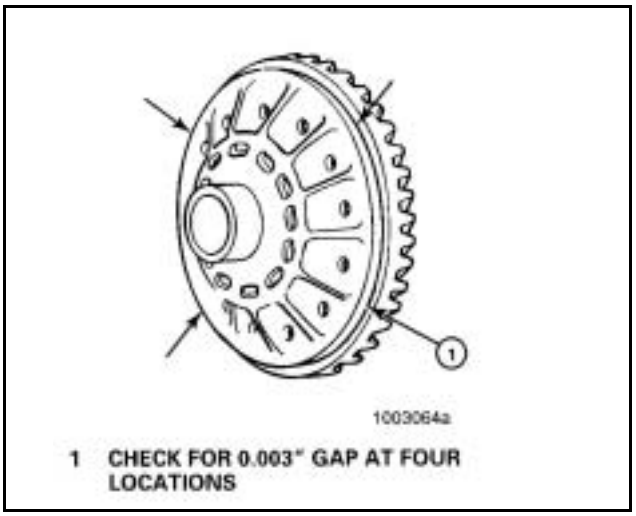


Figure 86

8. Install the bearing cones on both of the case halves. Use a press and sleeve of the correct size. **Figure 87.**

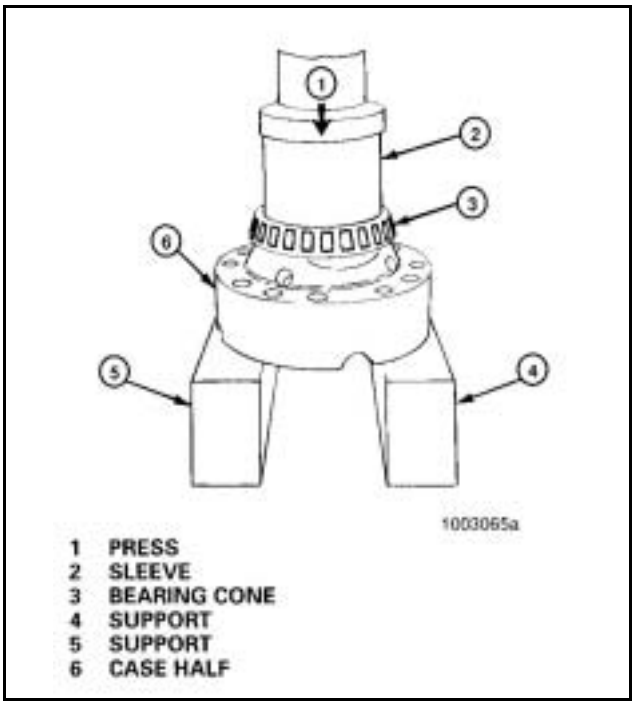


Figure 87

Note

**Some Meritor carriers do not have these described parts.*

9. Apply axle lubricant on the inside surfaces of both case halves, spider (cross), thrust washers, side gears and differential pinions.
10. Place the flange case half on a bench, ring gear teeth toward top.
11. Install one thrust washer and side gear into the flange case half. **Figure 88.**

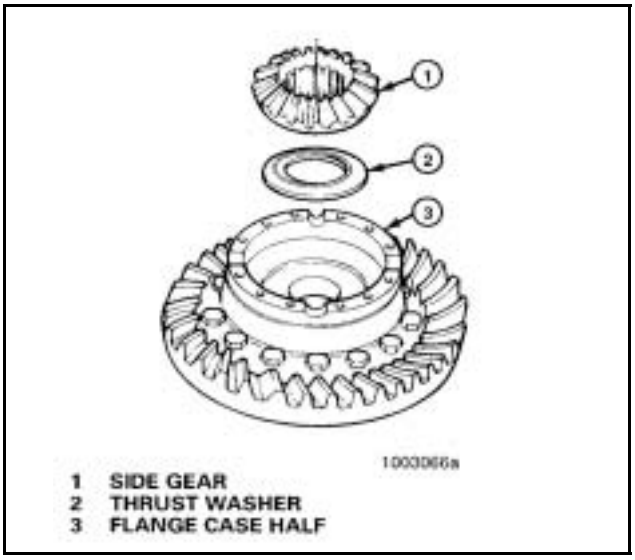


Figure 88

Caution

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

12. Install the spider (cross), differential pinions and thrust washers into the flange case half. **Figure 89.**
13. Install the second side gear and thrust washer over spider and differential pinions. **Figure 90.**

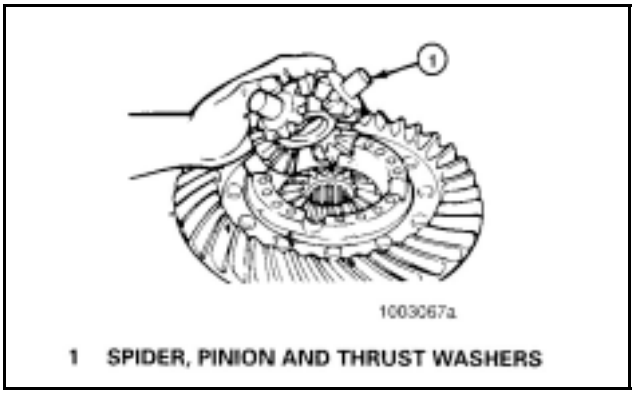


Figure 89

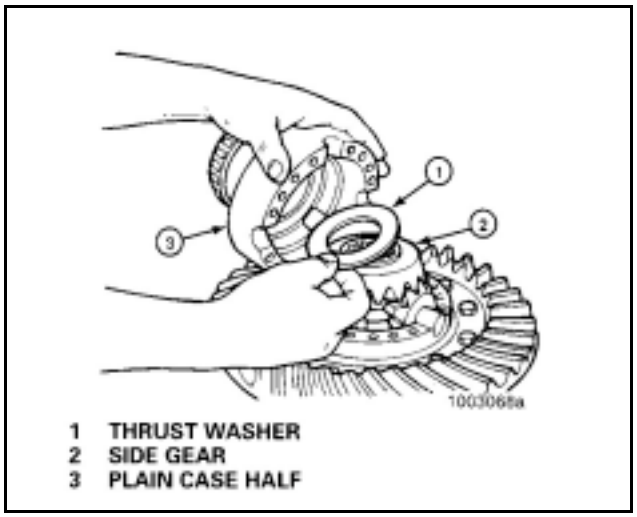


Figure 90

14. Place the plain half of the differential case over the flange half and gears. Rotate the plain half as needed to align the match marks. **Figure 90** and **Figure 91.**

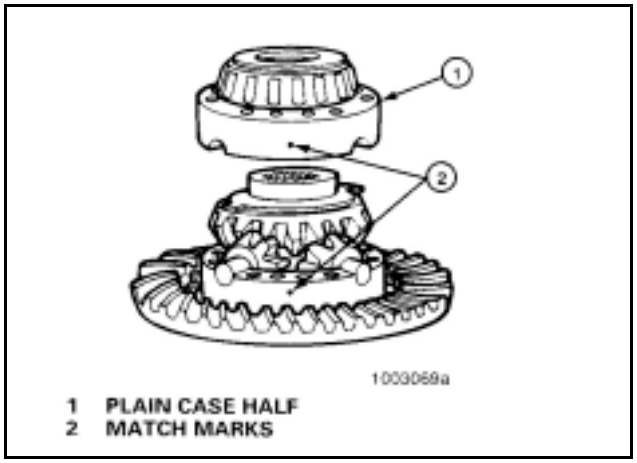


Figure 91

15. Install Dri-Loc® fasteners into the case halves. Refer to "General Information" and the following steps **a** and **b**.

    a. Install four capscrews and washers or bolts*, nuts* and washers* into the case halves. The distance between the fasteners **must** be equal. Tighten the fasteners to the correct torque value in a progressive criss-cross pattern opposite each other. Refer to **Figure 92** and **Table J.**

b. Install the other fasteners into the case halves. Tighten the fasteners to the correct torque value. Refer to **Table J.**

Note

**Some Meritor carriers do not have these described parts.*

16. Check the rotating resistance of the differential gears. Use the following procedures:

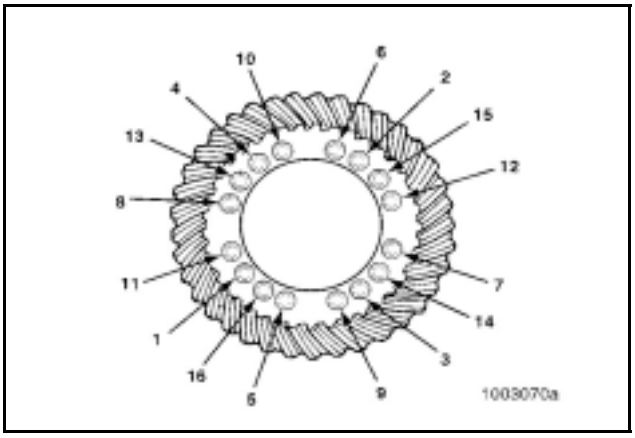


Figure 92

Rotating Resistance Check of Differential Gears

Specification

- 50 lb-ft (67.8 N•m) maximum torque applied to one side gear.

Note

Make a tool for checking the rotating resistance of the differential gears. The tool can be made from an axle shaft that matches the spline size of the differential side gear. Refer to Figure 93.

a. Install soft metal covers over vise jaws to protect the ring gear. **Figure 94.**
b. Place the differential and ring gear assembly in the vise.

c. Install the tool into the differential until the splines of the tool and one side gear are engaged. **Figure 94.**

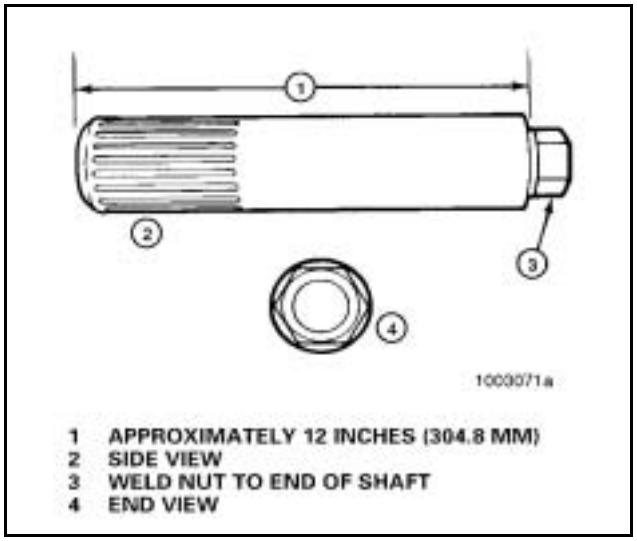


Figure 93

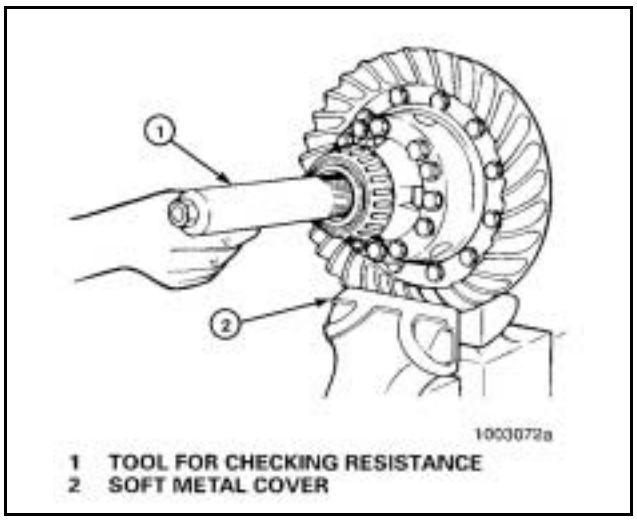


Figure 94

d. Attach a torque wrench to the nut of the tool and rotate the differential gears. As the differential gears rotate, read the value indicated on the torque wrench. **Figure 95.**

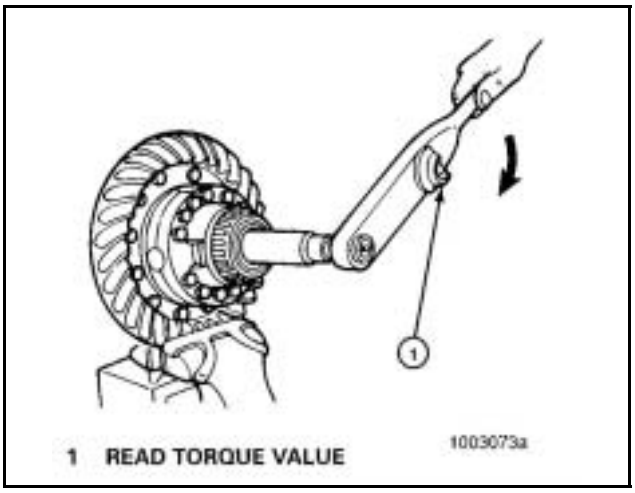


Figure 95

e. If the torque value exceeds the specification, disassemble the differential gears from the case halves.
f. Check the case halves, spider, gears and thrust washers for the problem that causes the torque value to exceed the specification. Repair or replace parts.

After the parts are repaired or replaced, assemble the parts and repeat steps **a** through **f**.

Install the 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 Meritor Adhesive into the bearing bores of the carrier legs and bearing caps. Make certain not to allow adhesive to contact adjusting ring threads. Refer to "General Information". **Figure 96.**

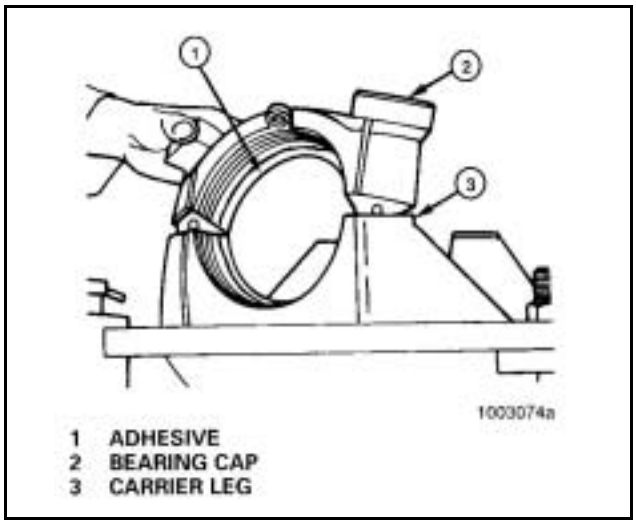


Figure 96

4. Install the bearing cups over the bearing cones that are assembled on the case halves. **Figure 97.**
5. Safely lift the differential and ring gear assembly and install into the carrier. The bearing cups **must** be flat against the bores between the carrier legs. **Figure 97.**

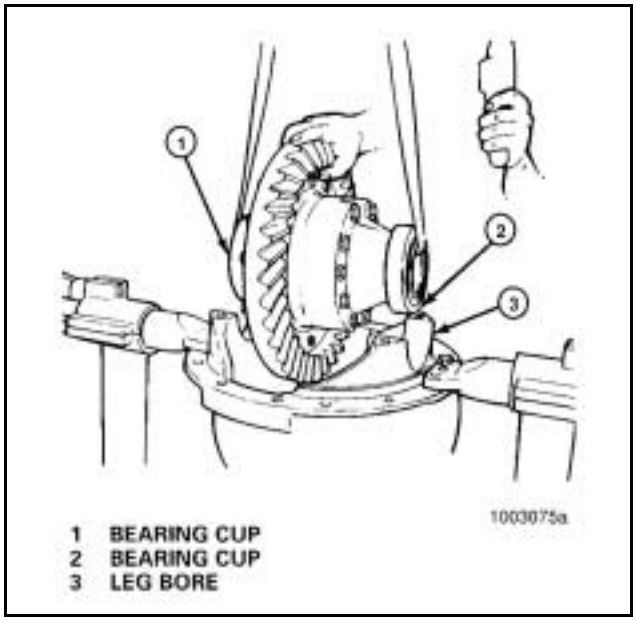


Figure 97

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 98.**

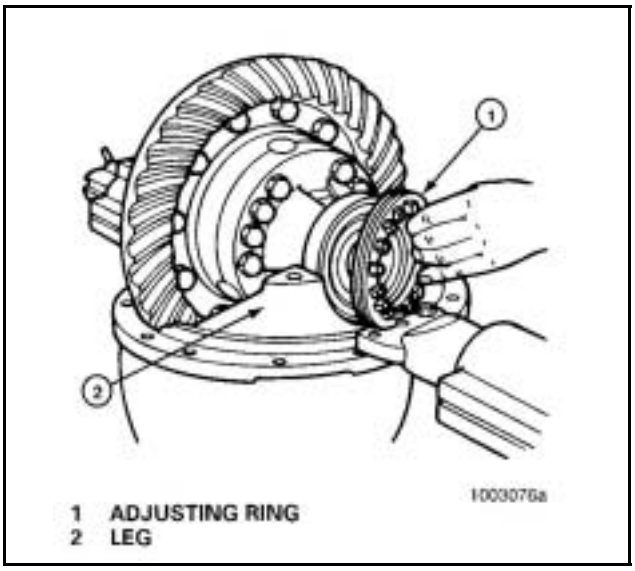


Figure 98

7. Install the bearing caps over the bearings and adjusting rings in the correct location as marked before removal. **Figure 99.**

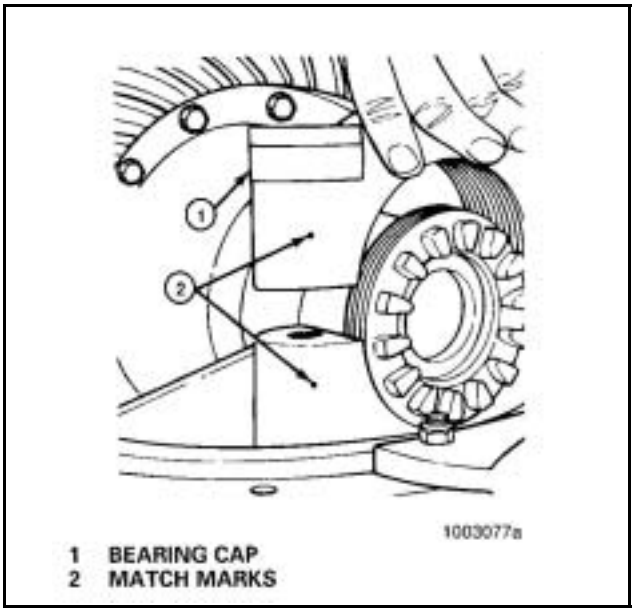


Figure 99

Warning

Use a brass or leather mallet for assembly and disassembly procedures. Do not hit steel parts with a steel hammer. Pieces of a part can break off and cause serious personal injury.

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.**

Caution

If bearing caps are not installed in correct locations, the bores and threads in 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.

9. If bearing caps do not correctly fit into position, check the alignment of match marks between caps and carrier. Remove the caps and repeat steps 6-8.
10. Install the capscrews and washers that hold bearing caps to the carrier. Tighten the capscrews by hand four to six turns, and then tighten the capscrews to the correct torque value. Refer to **Table J.**

Note

Do not install the cotter keys, pins*, or lock plates* that hold the bearing adjusting rings in position. Continue by adjusting the preload of differential bearings, adjust backlash of the hypoid gear and check tooth contact patterns.*

Note

**Some Meritor carriers do not have these described parts.*

Adjust Preload of Differential Bearings

Specifications

- Preload of differential bearings (all carrier models)

  - 15 to 35 lb-in (1.7-3.9 N•m) torque

- Expansion between bearing caps (leg spread)

  - RS-140, RS-145 and RS-160 carrier models: 0.002 to 0.009 inch (0.05-0.229 mm)

  - RS 120 and all other carrier models: 0.006 to 0.013 inch (0.15-0.33 mm)

Method 1

1. Attach a dial indicator on the mounting flange of the carrier.
2. Adjust the dial indicator so that the plunger or pointer is against the back surface of the ring gear. **Figure 100.**

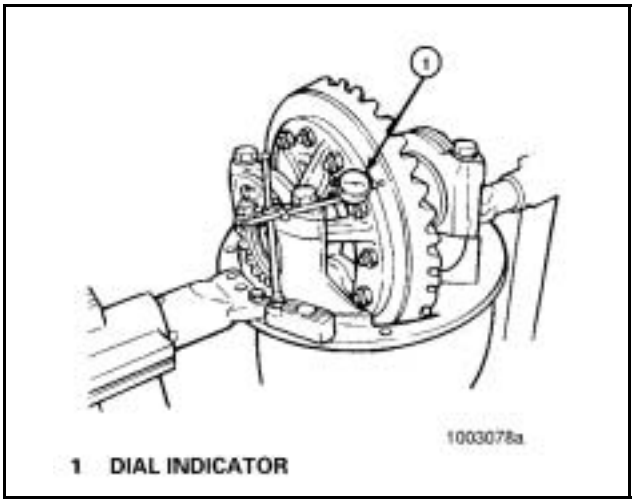


Figure 100

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. ***Figure 101.***

3. Loosen the bearing adjusting ring that is opposite the ring gear so that a small amount of end play shows on the dial indicator. **Figure 101.** Move the differential and ring gear to the left and right with pry bars while you read the dial indicator. Use the following step **a** or **b**.

   a. Use two pry bars that fit between the bearing adjusting rings and ends of the differential case. The pry bars **must not** touch the differential bearings. **Figure 102.**

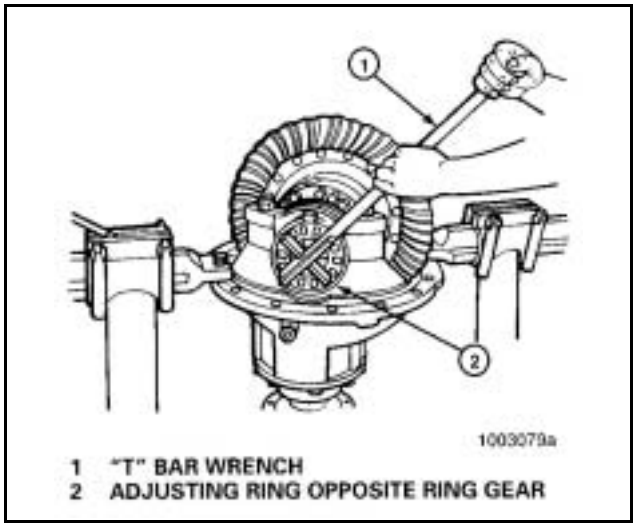


Figure 101

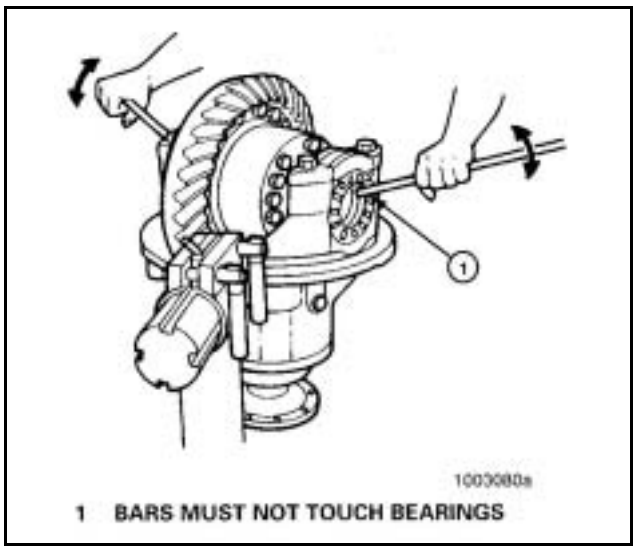


Figure 102

   b. Use two pry bars between the differential case or ring gear and the carrier at the locations other than described in step **a**. The pry bars **must not** touch the differential bearings. **Figure 103.**

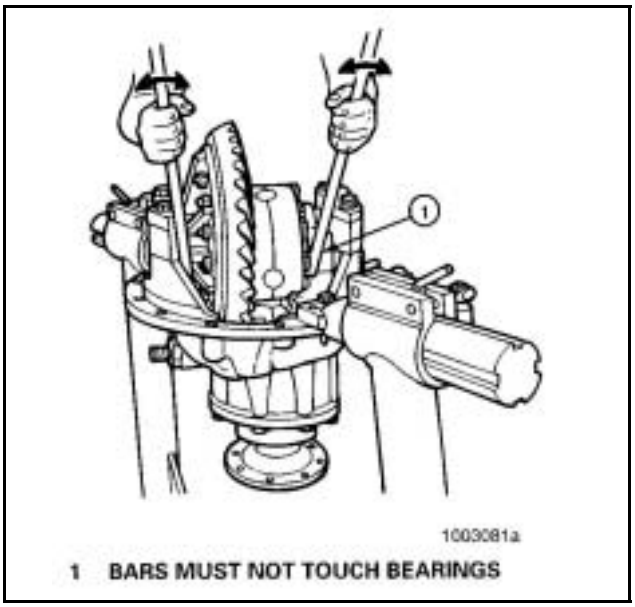


Figure 103

4. Tighten the same bearing adjusting ring so that no end play shows on the dial indicator. Move the differential and ring gear to the left and right as needed. Repeat step **a** or **b**.
5. Tighten each bearing adjusting ring one notch from the zero end play measured in step 4.
6. Continue by checking runout of the ring gear.

Method 2

A second method of checking preload is to measure the expansion between the bearing caps (leg spread) after the adjusting rings are tightened. Use the following procedure.

1. Turn both adjusting rings hand tight against the differential bearings.
2. Measure the distance X or Y between opposite surfaces of the bearing caps. Use a large micrometer of the correct size. **Figure 104** and **Figure 105.** Record the measurement.

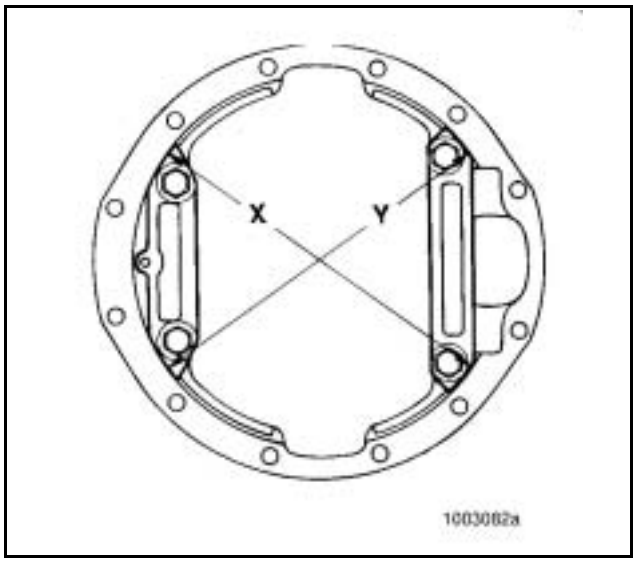


Figure 104

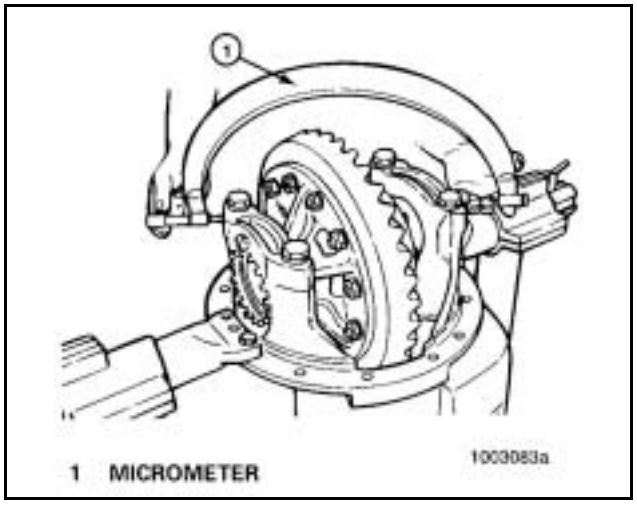


Figure 105

3. Tighten each bearing adjusting ring one notch.
4. Measure the distance X or Y again. Compare the dimension with the distance X or Y measured in step 2. The difference between the two dimensions is the amount the bearing caps have expanded.

Example

- Measurement of RS-145 carrier

- Distance X or Y
  - before tightening adjusting rings = 13.927 inch (353.75 mm)

- Distance X or Y
  - after tightening adjusting rings = 13.936 inch (353.97 mm)

- 13.936 inch – 13.927 inch = 0.009 inch (0.23 mm) difference.

If the dimension is within specifications, continue by checking runout of the ring gear. If the dimension is less than specifications, repeat steps 3 and 4 as needed.

Check Runout of Ring Gear

Runout Specification

0.008 inch (0.20 mm)

1. Attach a dial indicator on the mounting flange of the carrier. **Figure 106.**

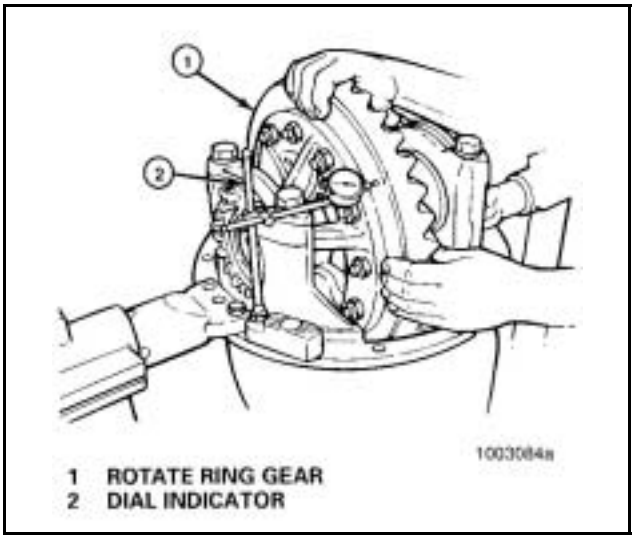


Figure 106

2. Adjust the dial indicator so that the plunger or pointer is against the back surface of the ring gear.
3. Set the dial indicator to zero (0).
4. Rotate the differential and ring gear and read the dial indicator. The runout of the ring gear **must not exceed** 0.008 inch (0.20 mm). **Figure 106.**

   If the runout of the ring gear exceeds specifications, remove the differential and ring gear assembly from the carrier. Refer to "Remove the Differential and Ring Gear from the Carrier" and the following steps 5 and 6.

5. Check the differential parts including the carrier for the problem that causes the runout of gear to exceed specifications. Repair or replace parts.
6. After the parts are repaired or replaced, install the differential and ring gear into the carrier. Refer to "Install the Differential and Ring Gear Assembly".
7. Repeat preload adjustment of differential bearings.

Ring Gear Backlash Adjustment

Runout Specifications

- Ring gears that have a pitch diameter of less than 17 inches (431.8 mm)

  - range of backlash setting:
    0.08 to 0.018 inch (0.20-0.46 mm)

  - backlash setting for new gear sets:
    0.012 inch (0.30 mm)

- Ring gears that have a pitch diameter greater than 17 inches (431.8 mm)

  - range of backlash setting:
    0.010 to 0.020 inch (0.25-0.51 mm)

  - backlash setting for new gear sets:
    0.015 inch (0.38 mm)

Note

*Measure the outer diameter of ring gear for approximate pitch diameter. **Figure 107**.*

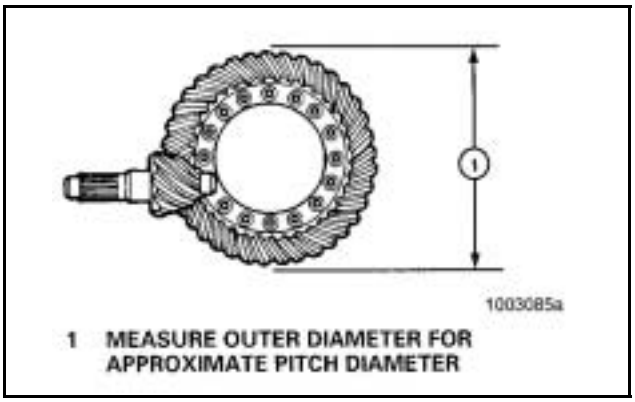


Figure 107

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.

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

1. Attach a dial indicator on the mounting flange of the carrier. **Figure 108.**

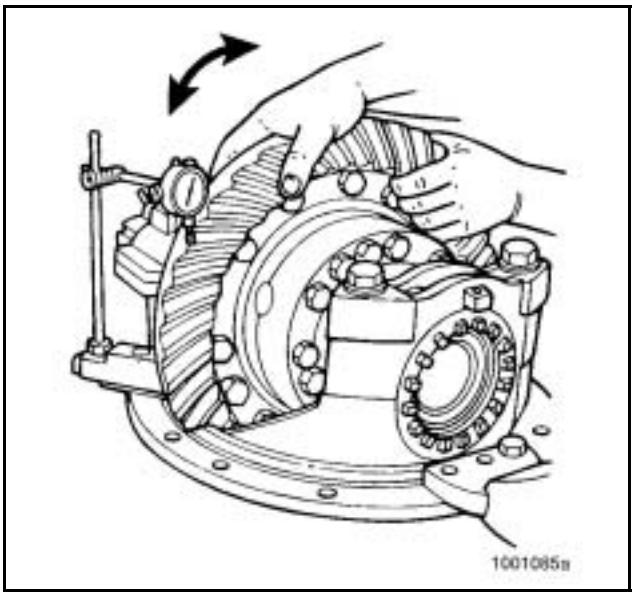


Figure 108

2. Adjust the dial indicator so that the plunger or pointer is against the tooth surface. **Figure 108.**
3. Adjust the indicator dial to zero (0).
4. Hold the drive pinion in position.
5. 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 specification, continue checking tooth contact patterns. If the backlash reading is not within specifications, adjust backlash as needed. Continue following steps 6 and 7.

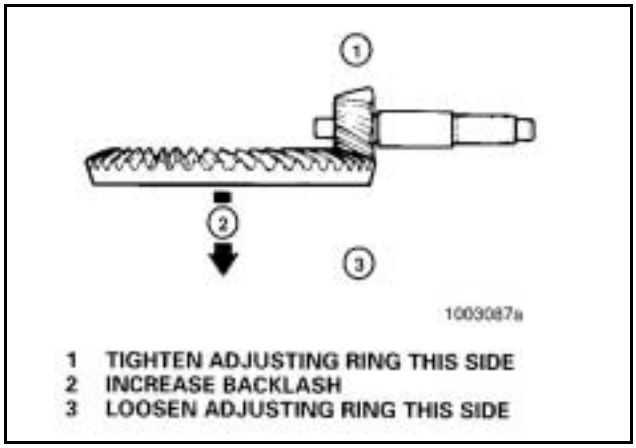


Figure 109

Notes

Backlash is increased by moving the ring gear away from the drive pinion. ***Figure 109.***

Backlash is decreased by moving the ring gear toward the drive pinion. ***Figure 110****.*

6. Loosen one bearing adjusting ring one notch, then tighten the opposite ring the same amount. Refer to **Figure 109** and **Figure 110.**

Note

When you adjust backlash, move the ring gear ONLY. Do not move the drive pinion.

7. Repeat steps 2-6 until the backlash is within specifications.

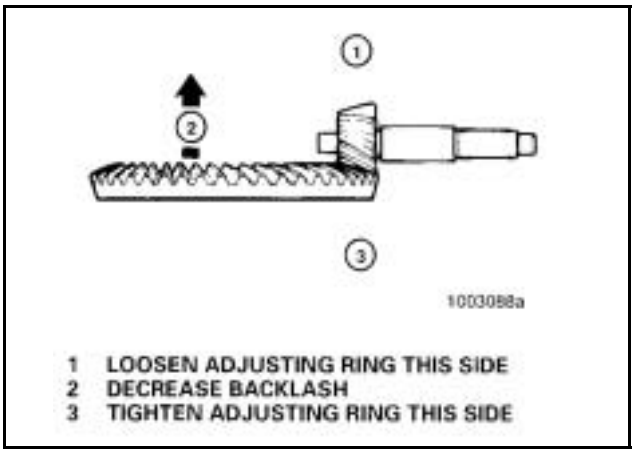


Figure 110

Checking Tooth Contact Patterns (Backlash) of the Gear Set

General Information

Meritor carriers can have a **generoid** hypoid gear set. The tooth contact patterns for each type of gear set are different. Look at the part numbers to see what type of gear set is in the carrier. Refer to **Figure 111** for the location of part numbers.

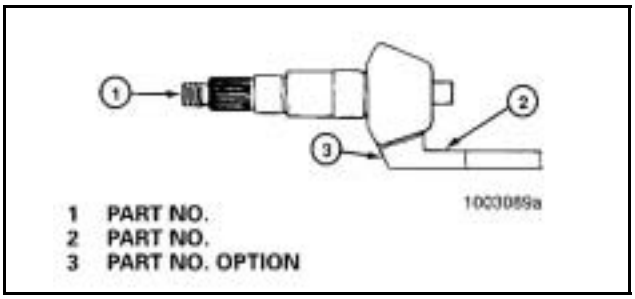


Figure 111

Examples

Part Numbers for generoid gear sets

- 36786-K or 36786-K2 for the ring gear

- 36787-K or 36787-K2 for the drive pinion

In the following procedures, movement of contact pattern in the length of the tooth is indicated as toward the 'heel' or 'toe' of the ring gear. **Figure 112.**

Always check tooth contact patterns on the drive side of the gear teeth. **Figure 113.**

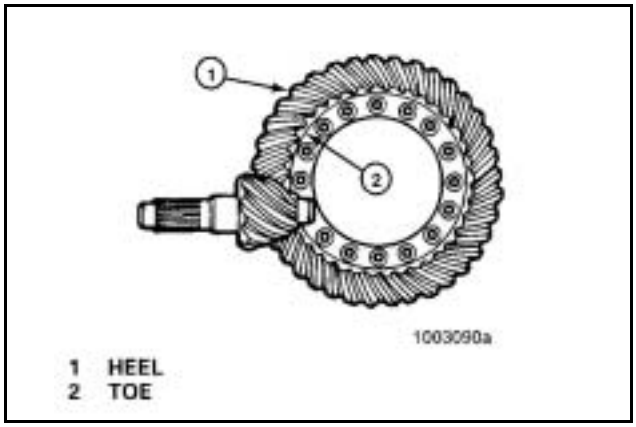


Figure 112

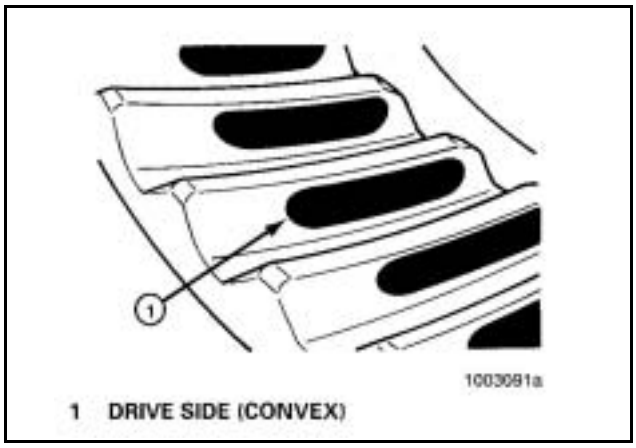


Figure 113

Tooth Contact Patterns of Generoid Hypoid Gear Sets

1. Adjust the backlash of a new gear set to either 0.012 inch (0.305 mm) or 0.015 inch (0.380 mm) depending on the size of the ring gear. Adjust the backlash of an old gear set to the setting that was measured before the carrier was disassembled. Refer to "Ring Gear Backlash Adjustment".
2. Apply a marking compound to 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 114.**

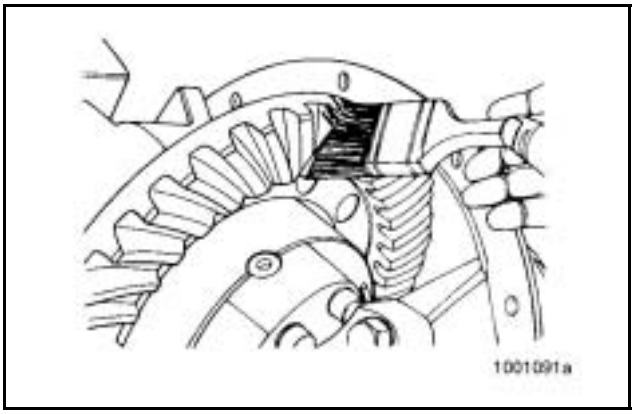


Figure 114

3. Rotate 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.

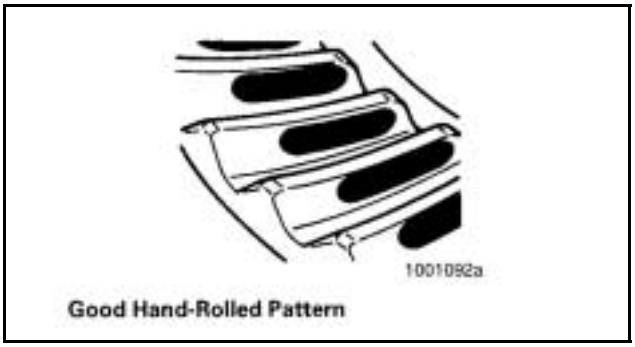


Figure 115

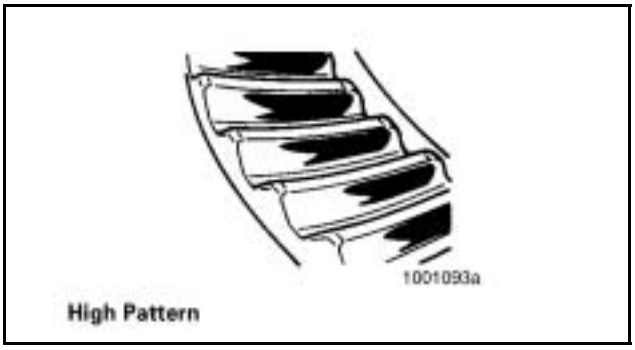


Figure 116

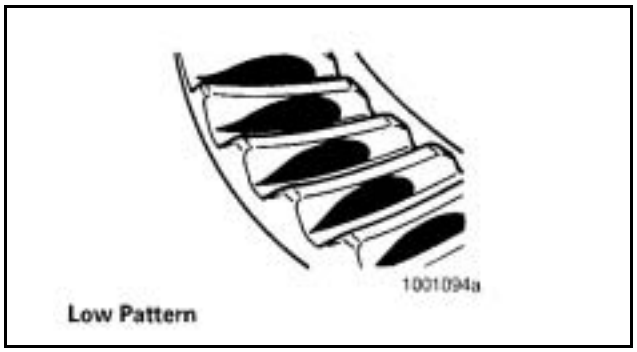


Figure 117

4. Look at the contact patterns on the ring gear teeth. Compare the patterns to **Figure 115, Figure 116**, and **Figure 117.**

The Location of Good Hand-Rolled Contact Patterns

New Conventional and Generoid Gear Sets - toward the toe of the gear tooth and in the center between the top and bottom of the tooth. Refer to **Figure 115.**

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. Refer to **Figure 118.**

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.

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.

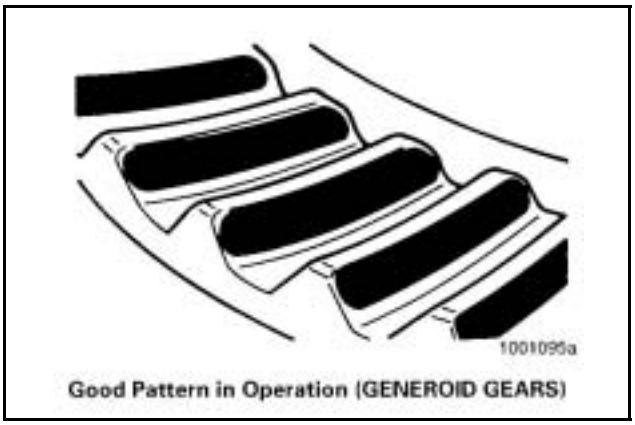


Figure 118

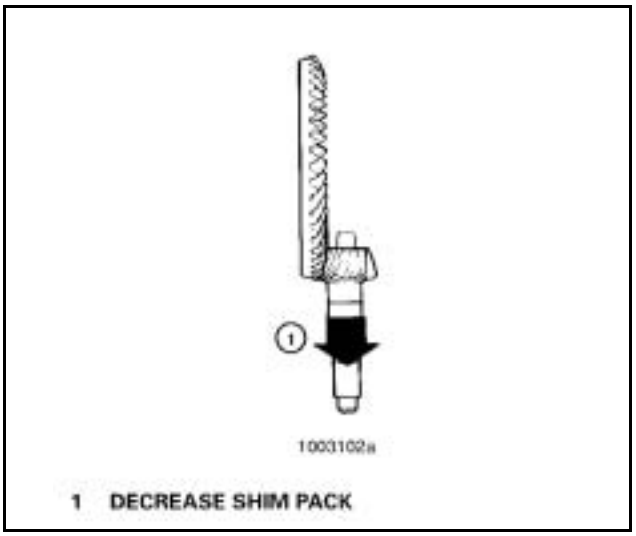


Figure 119

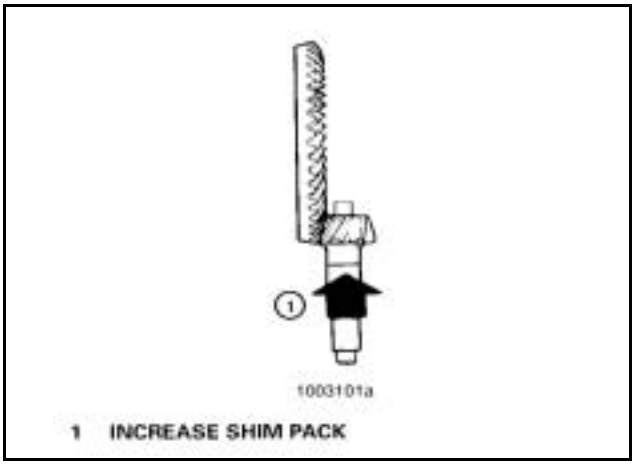


Figure 120

Note

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.

5. Change the thickness of the shim pack under bearing cage to move the contact patterns between the top and bottom of the gear teeth. Use the following procedures.

    a. Remove the drive pinion and bearing cage from the carrier. Refer to "Remove the Drive Pinion and Bearing Cage from Carrier".
    b. To correct a high contact pattern, **Figure 116**, 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 119.**

        To correct a low contact pattern, **Figure 120**, increase the thickness of shim pack under the bearing cage. When increasing the thickness of the shim pack, the drive pinion will move away from the ring gear.

    c. Install the drive pinion, bearing cage and shims into the carrier. Refer to "Adjusting Shim Pack Thickness for the Pinion Cage (Depth of Pinion)".
    d. Repeat steps 2-5 until the contact patterns are in the center between the top and bottom of the gear teeth.

6. Adjust backlash of the ring gear within specification range to move the contact patterns to the correct location in the length of the gear teeth. Refer to "Ring Gear Backlash Adjustment".

    a. Decrease backlash to move the contact patterns toward the toe of the ring gear teeth. **Figure 121.**
    b. Increase backlash to move the contact patterns toward the heel of the ring gear teeth. **Figure 122.**

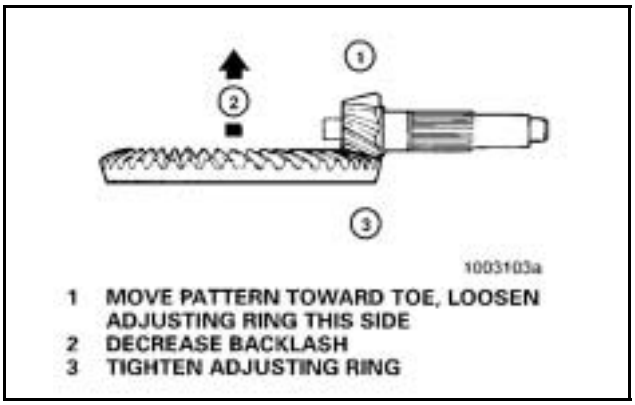


Figure 121

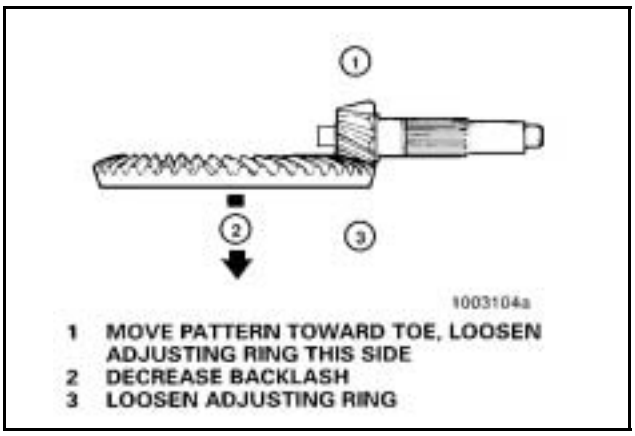


Figure 122

c. Repeat steps 2-4 and 6 until the contact patterns are at the correct location in the length of the gear teeth.

Caution

If the carrier has cotter keys, lock the adjusting rings only with cotter keys. If you carrier has roll pins, reuse the roll pins or lock the adjusting rings with cotter keys. Do not force a roll pin into a cotter key hole.

7. Install cotter keys*, pins*, or lock plates* that hold the two bearing adjusting rings in position. Use the following procedures.
   a. **Cotter Keys*** – Install cotter keys between lugs of the adjusting ring and through the boss of the bearing cap. Bend the two ends of the cotter key around the boss. **Figure 123.**
   b. **Pins*** – Install pin through boss of the bearing cap until the pin is between lugs of the adjusting ring. Use a drift and hammer to install the pin. **Figure 123.**
   c. **Lock Plates*** – Install lock plate on bearing cap so that the tab is between lugs of the adjusting ring. Install the two capscrews that hold the lock plate to the bearing cap. Tighten the capscrews to correct torque value. Refer to **Table J. Figure 123.**

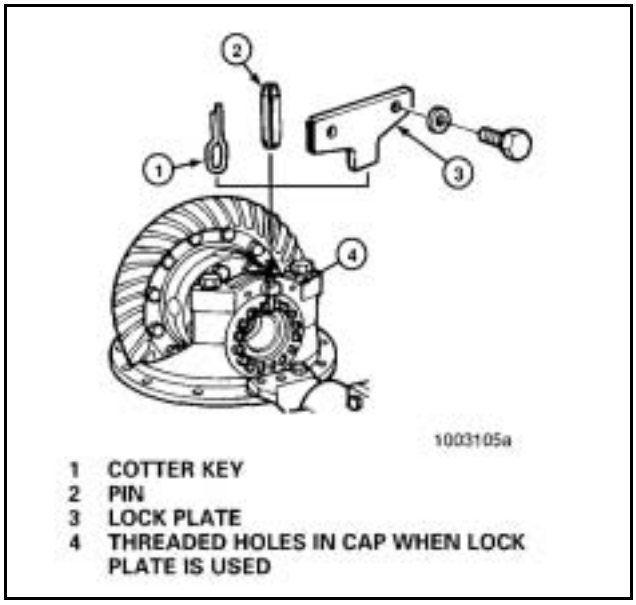


Figure 123

Note

**Some Meritor carriers do not have these described parts.*

Install and Adjust the Thrust Screw*

Specification

- Clearance between thrust screw and ring gear - 0.025 to 0.045 inch (0.65-1.14 mm)
- Loosen the thrust screw ½ turn or 180 degrees.

1. Rotate the carrier in the repair stand until the back surface of ring gear is toward the top.
2. Install the jam nut* on the thrust screw*, one half the distance between both ends. **Figure 124.**
3. Loosen the thrust screw* ½ turn, 180 degrees. **Figure 125.**

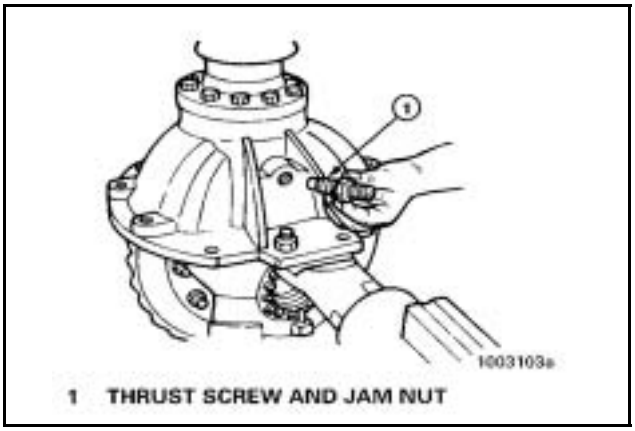


Figure 124

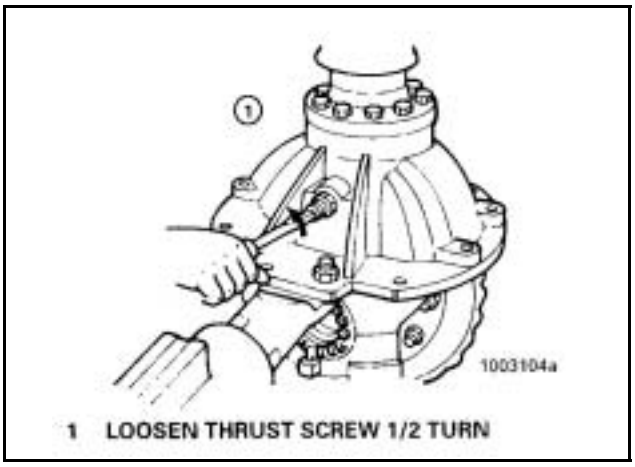


Figure 125

4. Tighten the jam nut* to the correct torque value against the carrier. Refer to **Table J. Figure 126.**

Note

To complete the assembly of axles equipped with driver-controlled main differential locks, refer to "Installation of the DCDL Assembly into Carrier" through "Traction Control Video Package". Start with "Installation of the DCDL Assembly into Carrier".

**Some Meritor carriers do not have these described parts.*

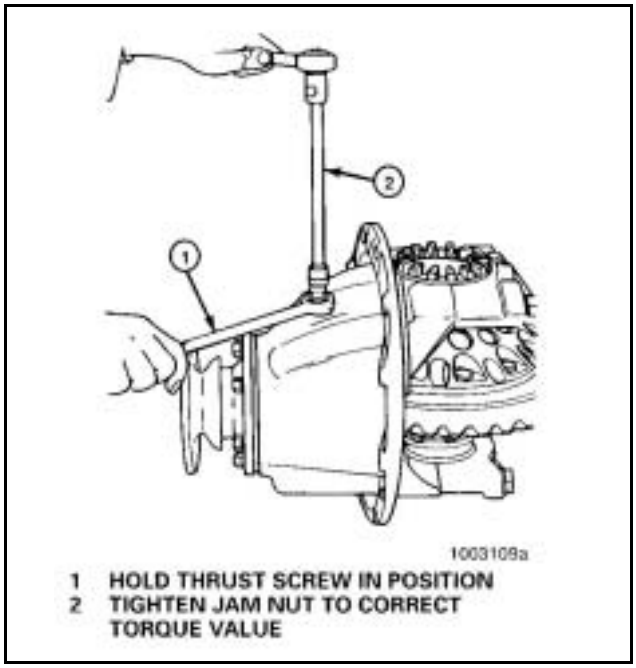


Figure 126

Install Differential Carrier into Axle Housing

Warning

Solvent cleaners can be flammable, poisonous and cause burns. Examples of solvent cleaners are carbon tetrachloride, emulsion-type cleaners and petroleum-based cleaners. To avoid serious personal injury when you use solvent cleaners, you must carefully follow the manufacturer's product instructions and these procedures.

- *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. Follow the manufacturer's instructions carefully.*

1. Clean the inside of axle housing and the mounting surface where the carrier fastens.

Use a cleaning solvent and rags to remove dirt. Blow dry the cleaned areas with air. Also, refer to "Cleaning Axle Assemblies".

2. Inspect the axle housing for damage. Repair or replace the axle housing. Refer to "Repair or Replacement of Parts, General", "Repair Axle by Welding", and "Bending or Straightening Drive Axle Housings".
3. Check for loose studs* 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 and install the studs* into axle housing. Refer to "Application of Meritor Adhesive 2297-T-4180 in Bearing Bores for the Differential." Tighten studs* to correct torque value. Refer to **Table J.**
5. Apply silicone gasket material to the mounting surface of the housing where the carrier fastens. Refer to the "Application of Three Bond 1216 or Equivalent Silicone Gasket Material". **Figure 127.**

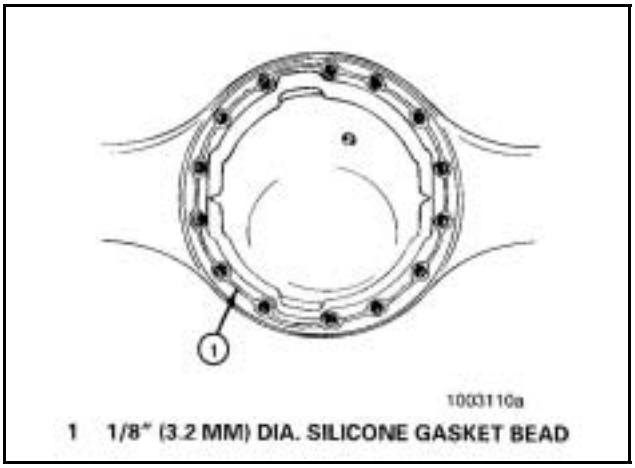


Figure 127

6. Install the carrier into the axle housing. Use a hydraulic roller jack or a lifting tool.

Caution

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

7. Install nuts* and washers or capscrews and washers in the four corner locations around the carrier and axle housing. Tighten the fasteners hand tight at this time. **Figure 128.**
8. Carefully push the carrier into position. Tighten the four fasteners two or three turns each in a pattern opposite each other. Refer to **Figure 128**.

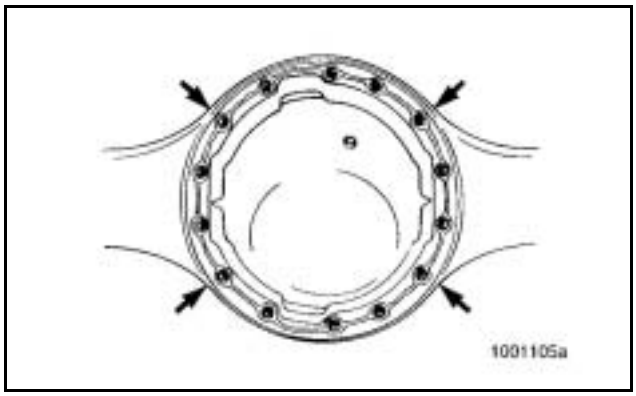


Figure 128

9. Repeat step 8 until the four fasteners are tightened to the correct torque value. Refer to **Table J.**
10. Install the other fasteners and washers that hold the carrier in the axle housing. Tighten fasteners to the correct torque value Refer to **Table J.**
11. Connect the driveline universal joint to the pinion input yoke or flange on the carrier.
12. 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 129.**

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 1/8 inch diameter bead of the gasket material around the mating surface of the hub and around the edge of each fastener hole in that surface.
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. Refer to **Figure 129**.
4. Install the Grade 8 nuts and hardened washers on the stud. (Lock washers are an acceptable alternative.) Tighten the stud nuts to the torque specified in **Table E.**

Fastener	Thread Size	Torque Value – Grade 8 Nuts lb-ft (N•m)	
		Plain Nut	Lock Nut
Stud Nut (Axle Shaft)	62-18 .75-16	150-230 (244-312) 310-400 (420-542)	130-190 (203-258) 270-350 (366-475)
Studs	All	Install the course thread end of stud into hub and tighten to last thread.	

Table E – Shaft-to-Hub Torque Fastener Chart – Non-Tapered Dowel Applications

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 1/8 inch diameter bead of the gasket material around the mating surface of the hub and around the edge of each fastener hole in that surface.
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. Refer to **Figure 129**.
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 on the stud. (Lock washers are an acceptable alternative.) Tighten the stud nuts to the torque specified in **Table F.**

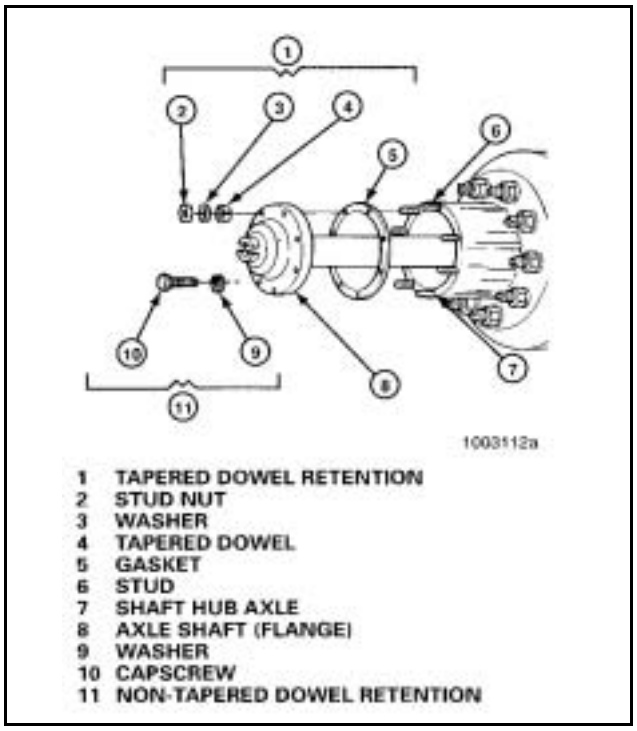


Figure 129

Fastener	Thread Size	Torque Value-Grade 8 Nuts lb-ft (N•m)	
		Plain Nut	Lock Nut
Stud Nut (Axle Shaft)	.44-20 .50-20 .56-18 .62-18	50-75 (81-102) 75-115 (115-156) 110-165 (176-224) 150-230 (244-312)	40-65 (67-88) 65-100 (102-136) 100-145 (1149-197) 130-190 (203-258)
Studs	All	Install the course thread end of stud into hub and tighten to last thread.	

Table F-Shaft-to-Hub Torque Fastener Chart-Tapered Dowel Applications

Lubrication

Note

For complete information on lubricating drive axles and carriers, refer to Maintenance Manual 1, Lubrication.

Refer to **Table G**, **Table H** and **Table I** for standard information on lubricants, schedules and capacities.

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	-40°F (-40°C)	--- **
** There is no upper limit on these outside temperatures, but the axle sump temperature must never exceed +121° C (250° F)				

Table G- Lubricant Cross Reference (Viscosity) and Temperature Chart

Vocation or Vehicle Operation	Linehaul Motorhome Intercity Coach	City Delivery School Bus Fire Truck	Construction, Transit Bus, Refuse, Yard Tractor, Logging, Heavy Haul, Mining, Oil Field, Rescue
Initial Oil Change	No longer required as of January 1, 1993		
Check Oil Level	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 (8 000 km), once a month or the fleet maintenance interval (whichever comes first)(2)
Petroleum based oil change on axle WITH or WITHOUT pump and filter system	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
Synthetic oil change on axle WITHOUT pump and filter system(3)	Every 250,000 miles (400 000 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
Synthetic oil change on axle WITH pump and filter system(3)	Every 500,000 miles (800 000 km)	Every 250,000 miles (400 000 km)	Every 100,000 miles (160 000 km)
Filter change on axle with 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)

Table H – Oil Change Intervals and Specifications for All Front Drive and Rear Drive Axles (1)

(1) If a No-Spin differential is installed, change the oil (petroleum or synthetic) at a minimum interval of 40,000 miles (64 000 km) or a maximum interval of 50,000 miles (80 000 km).
(2) For continuous heavy-duty operation, check the oil level every 1,000 miles (1,600 km). Add the correct type and amount of oil as required.
(3) 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 order this publication, call ***ArvinMeritor's Customer Service Center at 800-535-5560.***

Lubricant Capacities

Use the following lubricant capacities as a guide only. The capacities are measured with the drive pinion in the horizontal position. When the angle of the drive pinion changes, the lubricant capacity of the axle will change.

	Capacity	
Axle Model	U.S. Pints	Liters
Single Drive Axles		
RS-19-144	32.3	15.3
RS-19-145	36	17.3
RS-21-145	35	16.9
RS-21-160	39.5	18.7
RS-23-160	43/41	20.7/19.5

Torque Values for Fasteners

General Information

1. The torque values in **Table J** are for fasteners that have a light application of oil on the threads.
2. If the fasteners are dry, increase the torque values by ten percent (10%).
3. If the fasteners have a heavy application of oil on the threads, decrease the torque values by ten percent (10%).
4. If you do not know the size of the fastener that is being installed, measure the fastener. Use the following procedures.

American Standard Fasteners

a. Measure the diameter of the threads in inches, dimension X. Figure 8.1.
b. Count the amount of threads there are in one inch (1.0 inch). **Figure 130.**

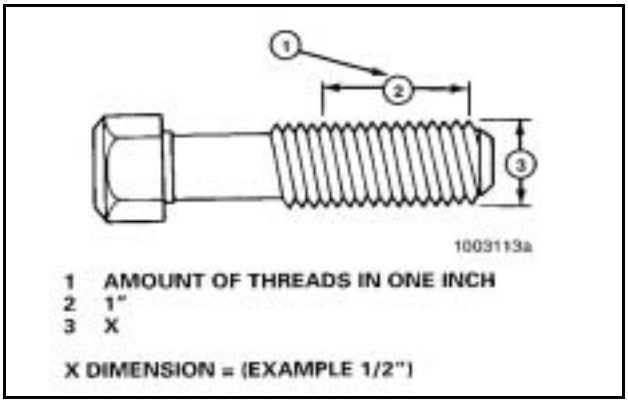


Figure 130

Example

- American Standard size fastener is .50-13.

  - 0.50 is the diameter of the fastener in inches or dimension X.
  - 13 is the amount of threads in one inch (1.0 inch)

Metric Fasteners

a. Measure the diameter of the threads in millimeters (mm), dimension X. **Figure 131.**

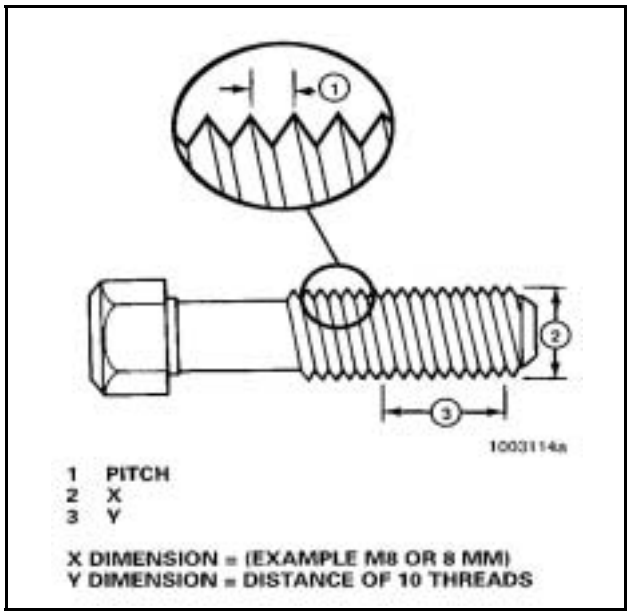


Figure 131

b. Measure the distance of ten (10 threads, point to point in millimeters (mm), dimension Y. Make a note of dimension Y. **Figure 131.**
c. Divide dimension Y by ten (10). The result will be the distance between two threads or pitch.

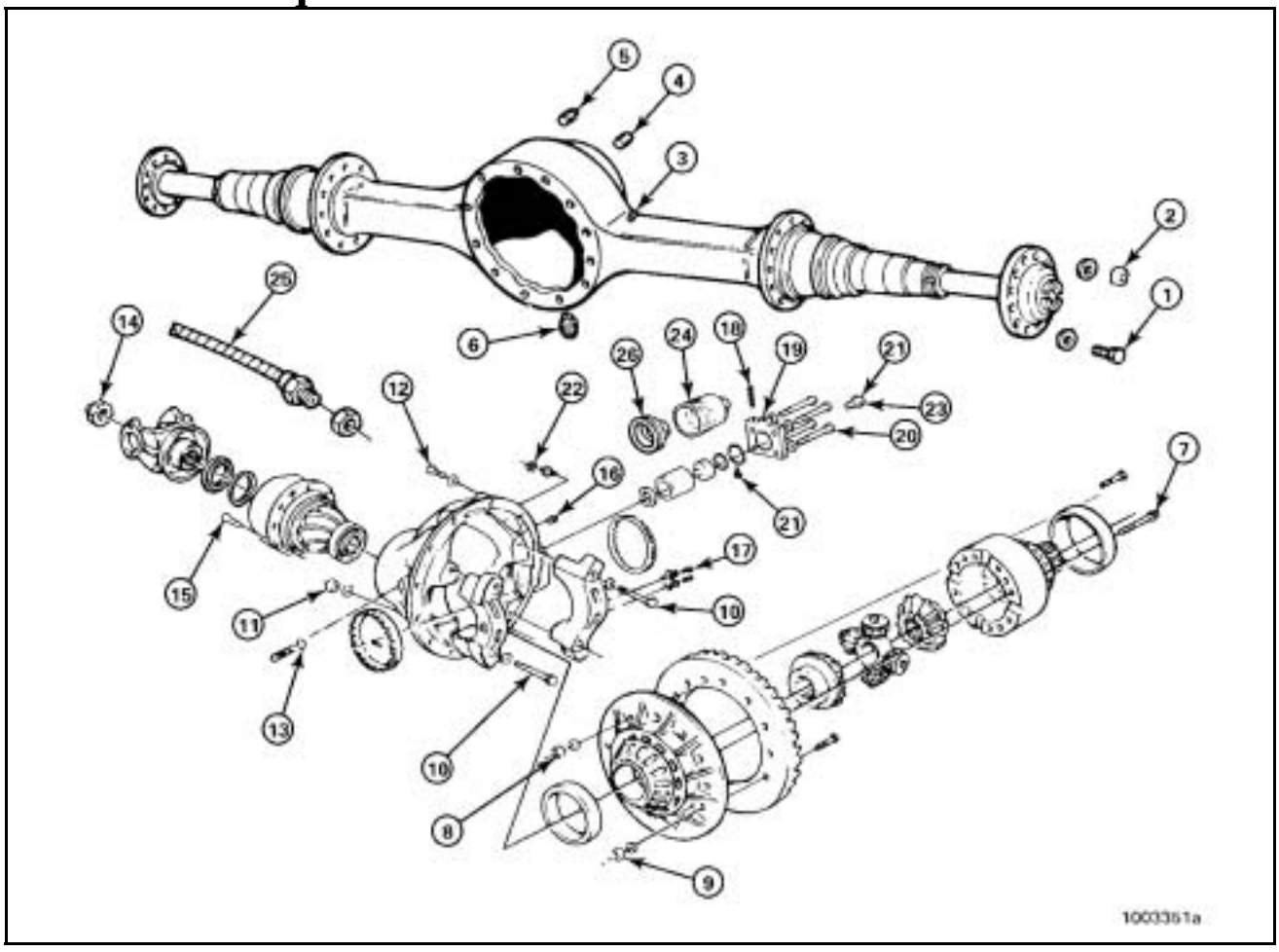
Example

- 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 thread or pitch.

5. Compare the size of fastener measured in step 4 to the list of fasteners in Table J to find the correct torque value.

Fastener Torque Information



Fastener		Thread Size	Torque Value lb (N•m)	
1.	Capscrew, Axle Shaft	.31-24	18-24	(24-33)
		.50-13	85-115	(115-156)
2.	Nut, Axle Shaft Stud	Plain Nut	50-75	(68-102)
		.44-20	75-115	(102-156)
		.50-20	110-165	(149-224)
		.56-18	150-230	(203-312)
		.62-18		
		Lock Nut	40-65	(54-88)
		.44-20	65-100	(88-136)
		.50-20	100-145	(136-197)
		.56-18	130-190	*176-258)
		.62-18		
3.	Breather	.38-18	20 minimum (27 minimum)	
4.	Plug, Oil Fill (Housing	.75-14	35 minimum (47.5 minimum)	
5.	Plug, Heat Indicator	.50-14	25 minimum (34 minimum)	
6.	Plug, Oil Drain	.50-14	25 minimum (34 minimum)	
7.	Capscrew, Differential Case	.38-16	35-50	(48-68)
		.44-14	60-75	(81-102)
		.50-13	85-115	(115-156)
		.56-12	130-165	*176-224)
		.62-11	180-230	(244-312)
	Grade 10.9 Flange head	M12 x 1.75	85-103	(115-140)
	Grade 10.9 Standard Flex Head	M12 x 1.75	74-96	(100-130)
	Grade 12.9 Standard Flex Head	M12 x 1.75	105-125	(143-169)
	Grade 12.9 Flange Head	M16 x 2	203-251	(275-340)
	Grade 12.9 Standard Head	M16 x 2	220-310	(300-420)
8.	Nut, Differential Case Bolt	.50-13	75-100	(102-136)
		.50-20	85-115	(115-156)
		.62-11	150-190	(203-258)
		.62-18	180-230	(244-312)
		M12 x 1.75	74-96	(100-130)
		M16 x 2	220-310	(300-420)
9.	Nut, Ring Gear Bolt	.50-13	75-100	(102-136)
		.50-20	85-115	(115-156)
		.62-11	150-190	(203-258)
		.62-18	180-230	(244-312)
		M12 x 1.25	66-81	(90-110)
		M12 x 1.75	77-85	(104-115)
	Flange Head	M16 x 1.5	192-214	(260-190)
	Standard Hex Head	M16 x 1.5	196-262	(265-355)
10.	Capscrew, Bearing Cap	.56-12	110-145	(149-197)
		.62-11	150-190	(203-258)
		.75-10	270-350	(366-475)
		.88-14	360-470	(488-637)
		.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.	Nut, Housing to Carrier Stud	.44-20 .50-20 .56-18 .62-18	50-75 75-115 110-165 150-230	(68-102) (102-156) (149-224) (203-312)
12.	Capscrew, Carrier to Housing	.44-14 .50-13 .56-12 .62-11 .75-10 M12 x 1.75 M16 x 2	50-75 75-115 110-165 150-230 270-400 74-89 181-221	(68-102) (102-156) (149-224) (203-312) (366-542) (100-120) (245-300)
13.	Jam Nut, Thrust Screw	.75-16 .88-14 1.12 – 16 M22 x 1.5 M30 x 1.5	150-190 150-300 150-190 148-210 236-295	(203-258) (203-407) (203-258) (200-285) (320-400)
14.	Input Yoke to Input Shaft Nut	Refer to table K.		
15.	Capscrew, Bearing Cage	.38-16 .44-14 .50-13 .56-12 .62-11 M12 x 1.75	30-50 50-75 75-115 110-165 150-230 70-110	(41-68) (68-102) (102-156) (149-224) (203-312) (90-150)
16.	Plug, Oil Fill (Carrier)	.75-14 1.5-11.5 M24 x 1.5	25 minimum (34 minimum) 120 minimum (163 minimum) 35 minimum (47 minimum)	
17.	Capscrew, Lock Plate	.31-18 M8 x 1.25	20-30 21-26	(27-41) (28-35)
Torque Values are for Carriers with Bolt-On Style Differential Lock Cylinders				
Fastener		**Thread Size**	**Torque Value lb-ft (N•m)**	
18.	Capscrew, Manual Actuation (Storage Position)	M10 x 1.5	15-25	(20-35)
19.	Adapter, Air Cylinder	M12 x 1.5	22-30	(30-40)
20.	Capscrew, Air Cylinder Cover	M6 x 1	7-12	(10-16)
21.	Capscrew/Plug, Air Cylinder Cover Operating Position Storage Position	M10 x 1.5	 15-25 15-25	 (20-35) (20-35)
22.	Lock Nut, Sensor Switch	M16 x 1	25-35	(35-45)
Torque Values are for Carriers with Screw-In Style Differential Lock Cylinders				
Fastener		**Thread Size**	**Torque Value lb-ft (N•m)**	
23.	Capscrew, Manual Actuation (Storage Position)	M10 x 1.25	7-11	(10-15)
24.	Air Cylinder	M60 x 2.0	80-100	(109-136)
25.	Sensor Switch	M16 x 1.0	25-35	(35-45)
26.	Screw-In DCDL Cylinder Plug or Cap	M60 x 2.0	80-100	(109-136)

Table J – Torque Charts

Single and Rear of Tandem Axles

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

Table K-Input and Output Yoke Pinion Nut Fastener Torque Specification

Adjustments and Specifications

Drive Pinion Bearings – Preload (Refer to Section on "Assembly")

Specification	New bearings - 15 to 25 lb-in (1.7-2.8 N•m) Used bearings - 15 to 25 lb-in (1.7-2.8 N•m)
Adjustment	Preload is controlled by the thickness of the spacer between bearings. - To increase preload install a thinner spacer - To decrease preload install a thicker spacer

Drive Pinion – Depth in Carrier (Refer to Section on "Assembly")

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

Hypoid Gear Set – Tooth Contact Patterns (Hand Rolled) (Refer to Section on "Assembly)

Specification	Conventional gear set - Toward the toe of the gear tooth and in the center between the top and bottom of the tooth Generoid gear set Between the center and toe of the tooth and in the center between the top and bottom of the top
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 backlash of the ring gear. - To move the contact pattern toward the heel of the tooth, increase backlash of the ring gear.

Main Differential Bearings – Preload (Refer to Section on "Assembly")

Specification	15 to 35 lb-in (1.7-3.9 N•m) torque or Expansion between bearing capscrew - RS-140, RS-145 and RS-160 carrier models – 0.002 to 0.009 inch (0.05-0.229 mm) - All other carrier models – 0.006 to 0.013 inch (0.15-0.33 mm)
Adjustment	Preload is controlled by tightening both adjusting rings after zero end play is reached

Main Differential Gears – Rotating Resistance (Refer to Section on "Assembly")

Specification	50 lb-ft (68 N•m) torque applied to one side gear

Ring Gear – Backlash (Refer to Section 5 on "Assembly")

Specification	Ring gears that have a pitch diameter of less than 17 inches (431.8 mm) - Range: 0.008 to 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 to 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 backlash within specifications to get a good tooth contact pattern. - To increase backlash, move the ring gear away from the drive pinion. - To decrease backlash, move the ring gear toward the drive pinion.

Ring Gear – Runout (Refer to Section on "Assembly")

Specification	0.008 inch (0.20 mm) maximum

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