Spicer® Single Drive Axles

SPICER®

DANA

Service Manual

Spicer® Single Drive Axles

AXSM-0041

September 2007

Out of Vehicle Resetting

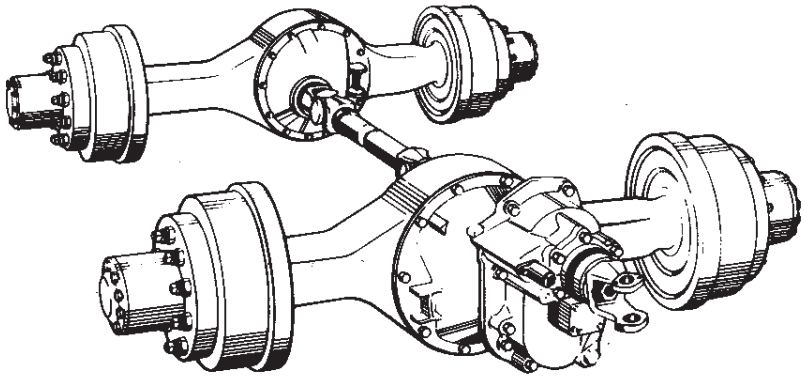
Introduction
Dana Corporation, presents this publication to aid in maintenance and overhaul of Dana tandem drive axles. Instructions contained herein cover four basic axle models. Their design is common, with differences in load capacity. Capacity variations are achieved by combining basic differential carrier assemblies in different axle housings, axle shafts and wheel equipment.

Load Capacity Model No.
34,000 lbs. DS340, 341
38,000 lbs. . . . . DS2380(P)
38,000 lbs. . . . . .. DS381(P)*
40,000 lbs. . . . . DS400-P, DS401-P, DS402(P), DS403(P)
45,000 lbs.. . . . . .. DS451-P

Some models (identified with letter “P”) are equipped with a gear-driven pump, designed to provide additional lubrication to the inter-axle differential and related parts. Instructions contained herein are applicable to all axle models, unless specified otherwise.

For brake information and axle mounting or suspension systems, refer to pertinent truck manufacturer’s literature.

Typical Dana Single Reduction Tandem Axle
Two design variations of tandem axles are included in this manual. The major difference is in the shaft spline design.
Note: DS381 (P) axles manufactured after April 1985 are rated at 40,000 lbs.



Axle and Carrier Assembly Model Identification

Drive Axle

DS - 461 - P

Gearing
D - Forward Tandem Axle
R - Rear Tandem Axle

S - Single Reduction
D - Single Reduction with Wheel Differential Lock
T - Dual Range
P - Planetary Double Reduction

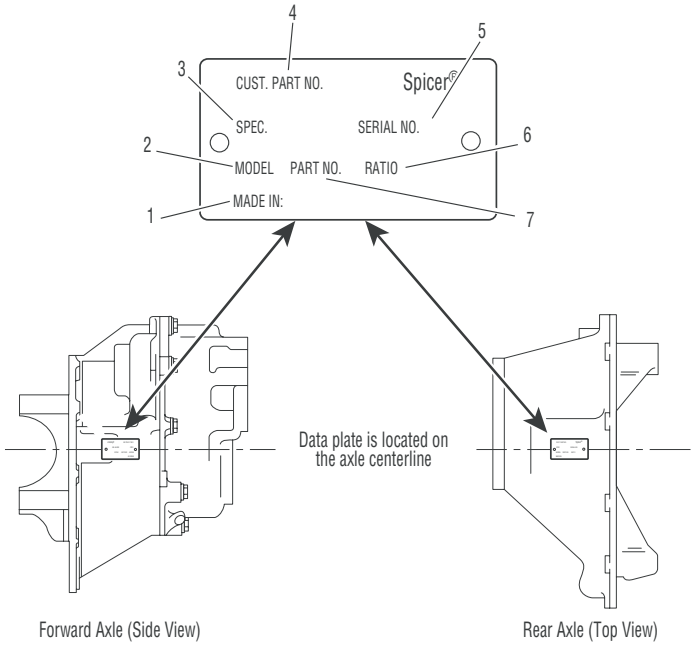
Example: DS = Forward Tandem Axle/Single Reduction
RS = Rear Tandem Axle/Single Reduction

Lube Pump
P = Standard
(P) = Optional

Design Level

Capacity (x 1000 lbs.)
Example: 46 = 46,000 lbs.

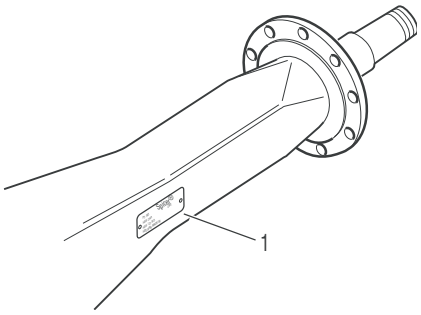
Note: Tags that do not include all the information shown here are older models (before May 1987).



1 - Country or origin
2 - Axle model identification
3 - Specification number assigned to the axle built by Spicer. Identifies all component parts of the axle including special OEM requirements such as yokes or flanges.
4 - OEM part number assigned to the axle build
5 - Carrier assembly serial number assigned by the manufacturing plant
6 - Axle gear ratio
7 - Carrier assembly production or service part number

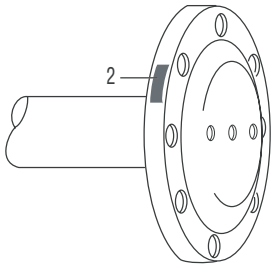
Part Identification

Axle Housing



1 - ID Tag

Axle Shaft

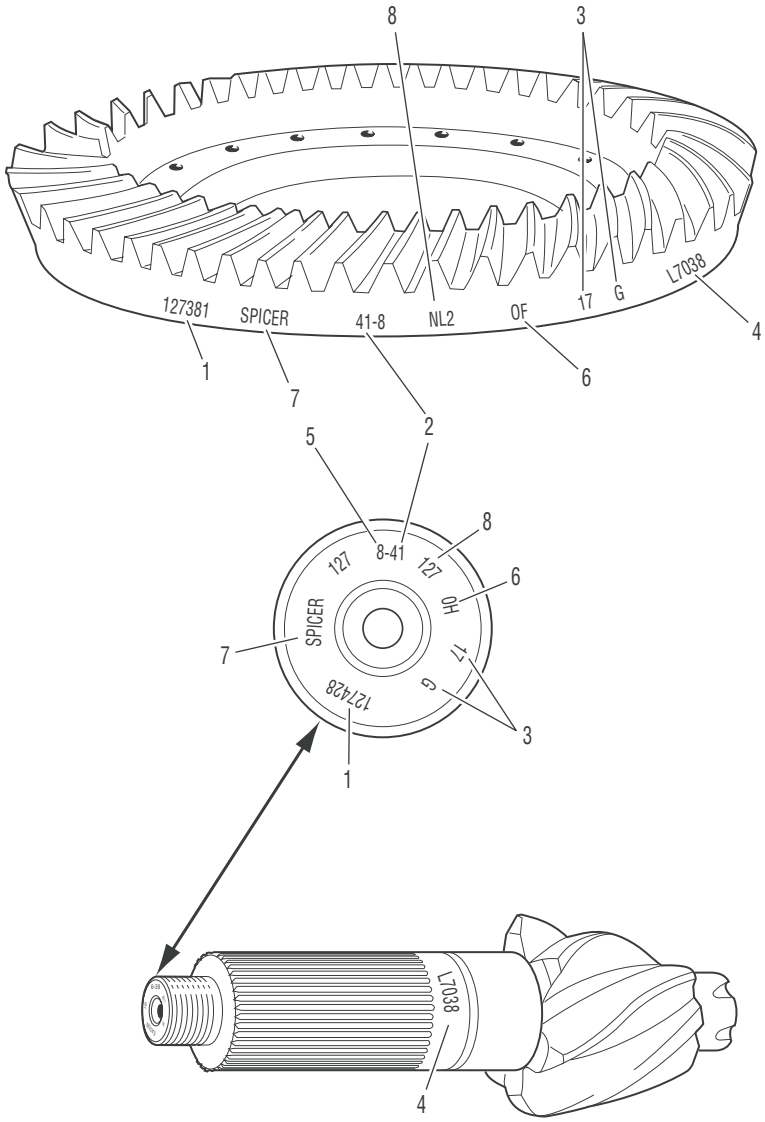


2 - Axle shaft part number

Axle Specification Number
The complete axle is identified by the specification number stamped on the side of the axle housing. This number identifies all component parts of the axle as built by Dana, including special OEM requirements such as yoke or flange. In addition, some axles may include a metal identification tage.

Ring Gear and Pinion

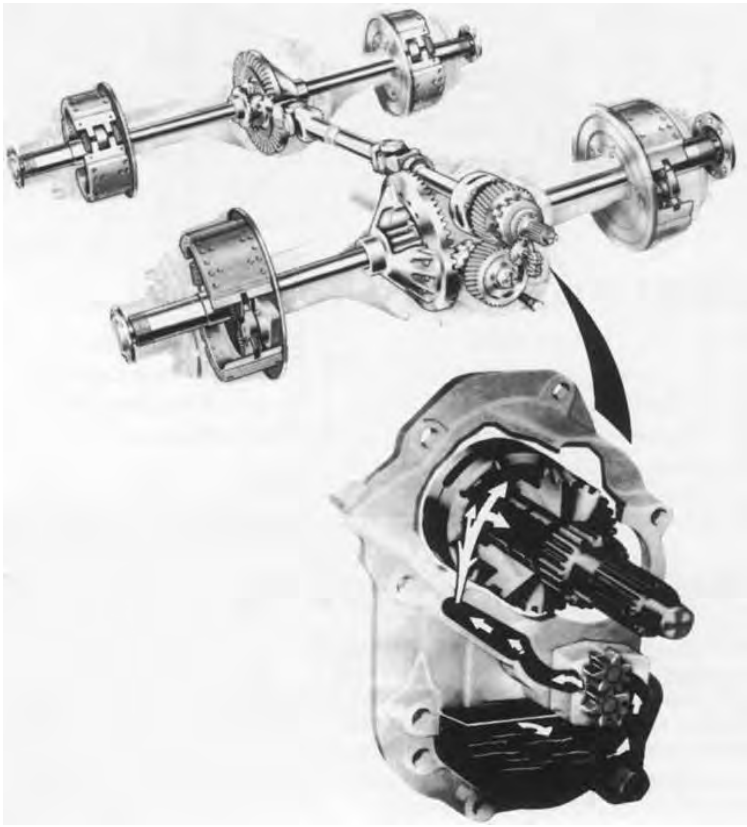
Note: Ring gear and drive pinion are matched parts and must be replaced in sets.



1 - Part number
2 - Number of ring gear teeth
3 - Manufacturing numbers
4 - Matching gear set number
5 - Number of pinion teeth
6 - Date code
7 - Indicates genuine Spicer parts
8 - Heat code

Power Flow and Torque Distribution

Spicer tandem drive axles described in this publication are single reduction units designed primarily for highway or turnpike. They are also for a variety of other applications. This type of axle provides a vehicle with superior load carrying and roadability characteristics by dividing its work between two axles. The complete tandem assembly consists of two axles coupled by a power divider.



Lube Pump System

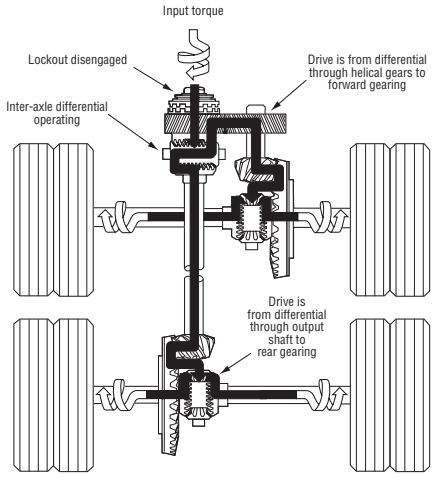
Power Divider
In operation, the power divider accepts the torque from the vehicle driveline and distributes it equally to the two axles. This assembly is of the two-gear design consisting of an input shaft, inter-axle differential, output shaft and two constant-mesh helical gears. The inter-axle differential compensates for axle speed variations in the same way the wheel differential works between the two wheels of a single drive axle. This unit also acts as a central point in distribution of torque to the two axles. The power divider also includes a driver-controlled, air-operated lockout. When lockout is engaged, it mechanically prevents inter-axle differentiation for better performance under poor traction conditions.

Gearing
The gearing for each axle is of the spiral bevel design with drive pinion positioned at centerline of the ring gear. The differential and drive pinion are mounted on tapered roller bearings. The wheel differential is a 4 pinion and 2 side gear design.

Lube Pump
Tandem Axles with suffix letter "P" in Model No. are equipped with a lube pump to provide positive lubrication to the inter- axle differential and other power divider parts. This pump is operated by a drive gear engaged with the input shaft splines. When vehicle is moving in a forward direction, pressurized lube is delivered to the vital power divider parts. The pump lube system incorporates a magnetic strainer screen. To keep the system clean, the magnet traps minute particles and the screen blocks out large particles of foreign material.

Torque Distribution with Lockout Disengaged (Inter-axle Differential is Operation)

Torque (power flow) from the vehicle driveline is transmitted to the input shaft and the inter-axle differential spider. At this point, the differential distributes torque equally to both axles. For the forward axle, torque is transmitted from the helical-side gear to the pinion helical gear, drive pinion, ring gear, wheel differential and axle shafts. For the rear axle, torque is transmitted from the output shaft side gear, through the output shaft, inter-axle driveline, to the drive pinion, ring gear, wheel differential and axle shafts.

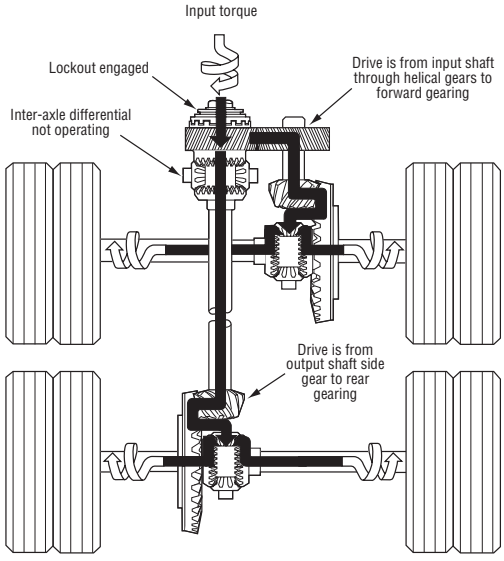


Torque is transmitted to both axles through inter-axle differential action.

Torque Distribution with Lockout Engaged (inter-axle Differential is Not Operation)

A lockout mechanism is incorporated in the power divider to enable the vehicle driver to lock out the inter-axle differential and provide maximum traction under adverse road conditions. In operation, an air cylinder (controlled by a cab-mounted valve) shifts a sliding clutch. To lock out inter-axle differential action, the clutch engages the helical-side gear and causes this gear, the input shaft and differential to rotate as one assembly. This action provides a positive drive to both axles. With Lockout engaged, torque is distributed to both-axles without differential action. The forward axle pinion and ring gear are driven by the helical side gear. The rear axle gearing is driven from the output shaft side gear and inter-axle driveline.

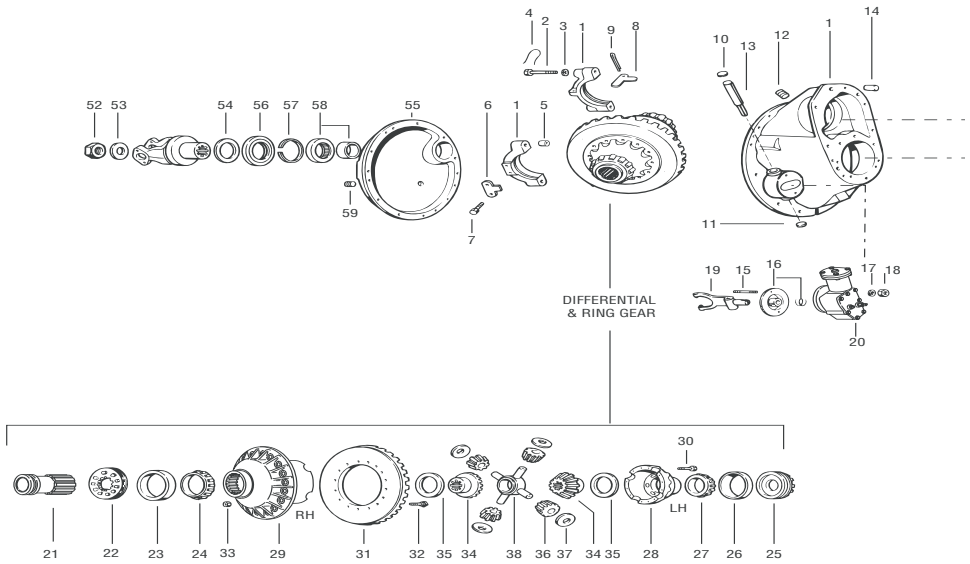
Note: Varied road surface conditions can result in unequal torque distribution between the two axle assemblies.



Torque is transmitted to both axles without inter-axle differential action.

Differential Carrier Assembly Exploded View

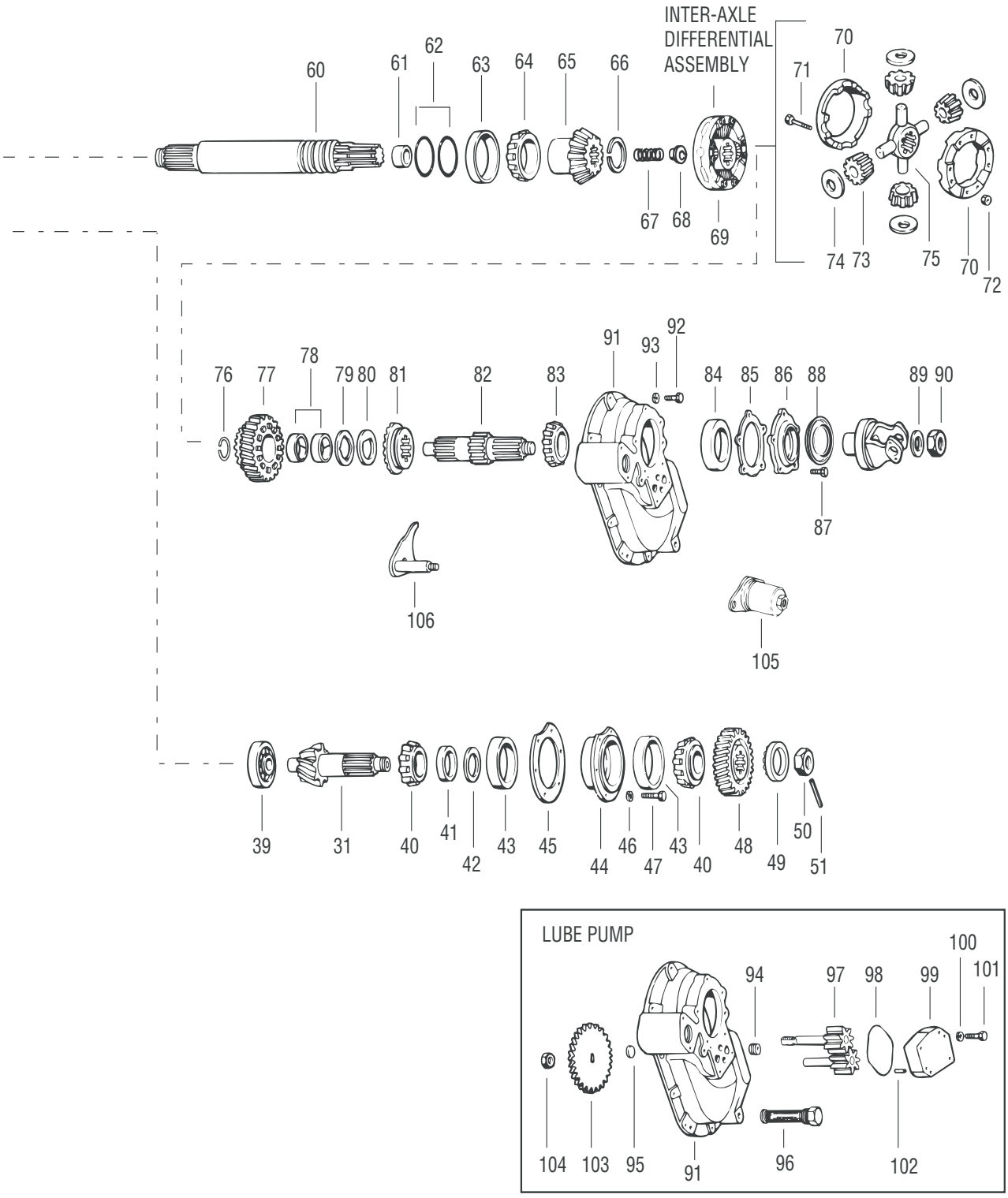
Forward Axle Carrier Assembly (Single Speed) with Diff. Lock



Other Design Variations

Axle Series	D340, 380(P),400-P	D341, 381(P), 401-P, 402(P), 403(P), 451-P
Output Shaft Splines	16	16
Side Gear End	16	16
Output End	10	34
Input Shaft Splines		
Input End	15	44
Diff End	36	36
Helical Gears	7 pitch	5 pitch
Drive Pinion Splines		
Forward Axle	10	41
Rear Axle	10	39
Axle Shaft Side Gear Splines		
	D340- 16	D341- 39
	D380(P)- 16	D381(P), 402(P), 403(P)- 41
	D400(P)- 33	D401-P, 451-P- 33

Axle Series D340, 380(P), 400-P, D341, 381(P), 401-P, 402(P), 403 (P), 451-P



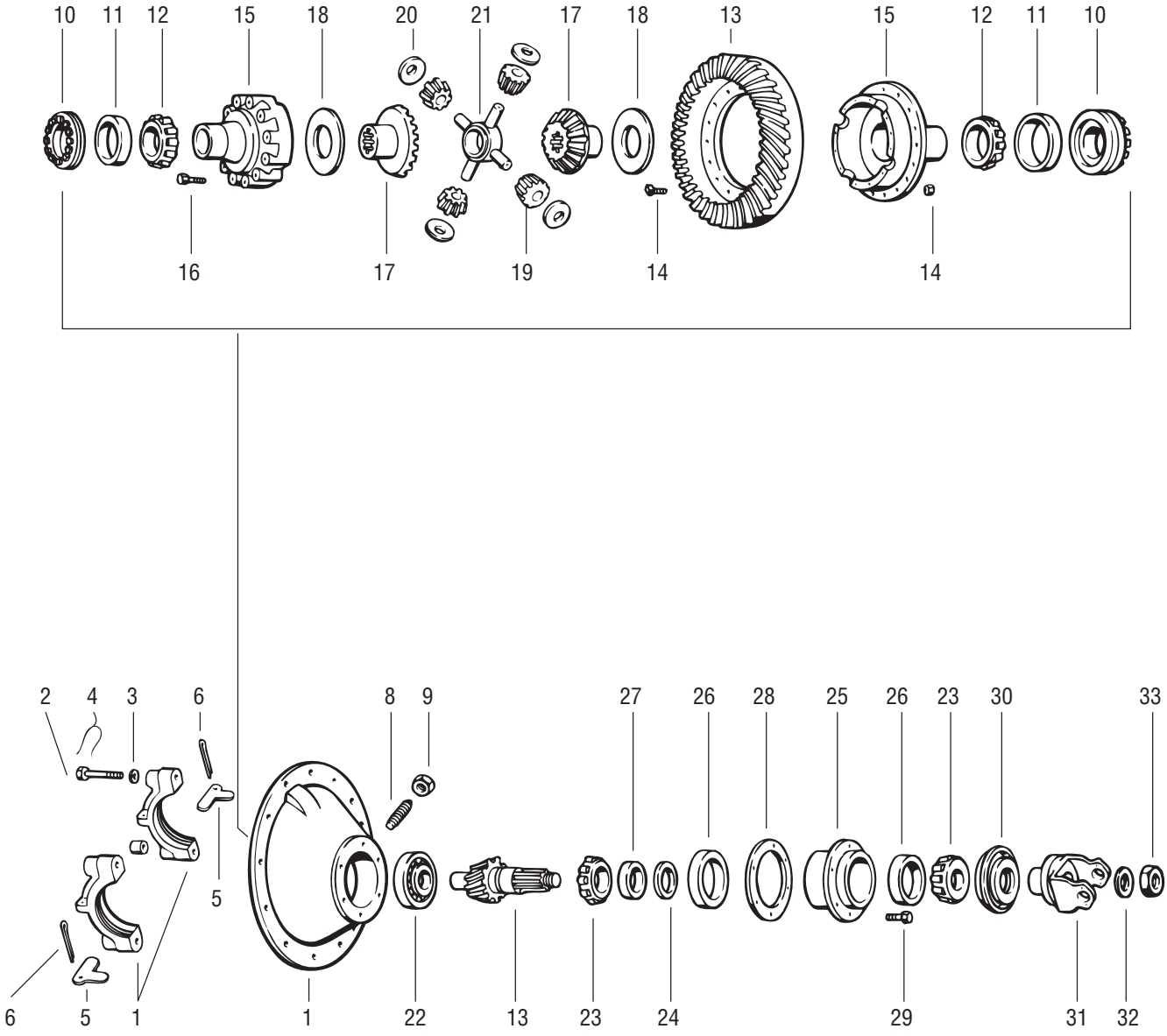
Note: Before Replacing Seals, Yokes, and Slingers, refer to the Repair and Replacement Instructions for interchangeability information.

Spicer Single Reduction Tandem Drive Axles

1 - Differential carrier & bearing caps
2 - Bearing capscrew
3 - Flat washer
4 - Lockwire
5 - Dowel bushing
6 - Bearing cap adjuster lock (RH)
7 - Capscrew
8 - Bearing cap adjuster lock (LH)
9 - Cotter pin (LH)
10 - Expansion plug (upper)
11 -Expansion plug (lower)
12 - Filler plug
13 - Shift fork shaft
14 - Carrier cover dowel pun
15 - Shift unit mounting stud
16 - Shift fork seal & spring assembly
17 - Flat washer
18 - Stud nut
19 - Shift fork & roller assembly
20 - Shift unit assembly
21 - Sliding clutch
22 - Differential bearing adjuster (RH)
23 - Differential bearing cup (RH)
24 - Differential bearing cone (RH)
25 - Differential bearing adjuster (LH)
26 - Differential bearing cup (LH)
27 - Differential bearing cone (LH)
28 - Differential case (plain half)
29 - Differential case (flanged half)
30 - Differential case capscrew
31 - Ring gear & drive pinion
32 - Bolt
33 - Nut
34 - Differential side gear
36 - Side pinion
37 - Side pinion thrust washer
38 - Spider
39 - Pinion pilot bearing
40 - Pinion bearing cone
41 - Pinion bearing spacer washer
42 - Pinion bearing spacer
43 - Pinion bearing cup
44 - Pinion bearing cage
45 - Pinion bearing cage shim
46 - Lock washer
47 - Bearing cage capscrew
48 - Pinion helical gear
49 - Outer pinion support bearing (one piece)
50 - Pinion shaft end nut
51 - Pinion nut spring pin
52 - Output shaft nut
53 - Output shaft washer
54 - Rear bearing retaining washer
55 - Axle housing cover
56 - Output shaft oil seal
57 - Bearing snap ring
58 - Output shaft bearing
59 - Filler plug
60 - Output shaft
61 - Output shaft bushing
62 - Output shaft O-ring
63 - Output shaft bearing cup
64 - Output shaft bearing cone
65 - Output shaft side gear
66 - Side gear snap ring
67 - Output shaft compression spring
68 - Output shaft thrust bearing
69 - Inter-axle differential assemble
70 - Inter-axle differential case half
71 - Case bolt
72 - Case nut
73 - Side pinion
74 - Side pinion thrust washer
75 - Spider
76 - Helical side gear snap ring
77- Helical side gear
78 - Helical side gear bushing
79 - Helical side gear thrust washer
80 - Helical side gear “D” washer
81 - Lockout sliding clutch
82 - Input shaft
83 - Input shaft bearing cone
84 - Input shaft bearing cup
85 - Input cover shim
86 - Input bearing cover
87 - Bearing cover capscrew
88 - Input shaft oil seal
89 - Input shaft nut washer
90 - Input shaft nut
91 - PDU carrier cover
92 - Carrier cover capscrew
93 - Lock washer
94 - Pipe plug
95 - Expansion plug
96 - Magnetic filter screen
97 - Pump gear & shaft assembly
98 - Cover O-ring
99 - Lube pump cover
100 - Lock washer
101 - Cover capscrew
102 - Cover dowel pin
103 - Pump drive gear
104 - Drive gear locknut
105 - Air-operated lockout assembly
106 - Shift fork & push rod assembly

Differential Carrier Assembly

Rear Axle RS340, 341, 380, 400, 401, 402, 403, 451



1 - Differential carrier & bearing caps
2 - Bearing capscrew
3 - Flat washer
4 - Lockwire
5 - Bearing cap adjuster lock
6 - Cotter pin
7 - Dowel bushing
8 - Ring gear thrust screw
9 - Thrust screw jam nut
10 - Differential bearing adjuster
11 - Differential bearing cup
12 - Differential bearing cone
13 - Ring gear & drive pinion
14 - Bolt and nut
15 - Differential case (flanged half)
16 - Differential case capscrew
17 - Differential side gear
18 - Side gear thrust washer
19 - Side pinion
20 - Side pinion thrust washer
21 - Spider
22 - Pinion pilot bearing
23 - Pinion bearing cone
24 - Pinion bearing spacer
25 - Pinion bearing cage
26 - Pinion bearing cup
27 - Pinion bearing spacer washer
28 - Pinion bearing cage shim
29 - Bearing cage capscrew
30 - Oil seal
31 - Input yoke
32 - Flat washer
33 - Pinion nut

Lubrication

The ability of a drive axle to deliver quiet, trouble free operation over a period of years is largely dependent upon the use of good quality gear lubricant in correct quantity. The most satisfactory results can be obtained by following the directions contained in this manual. The following lubrication instructions represent the most current recommendations from Dana Corporation.

Approved Lubricants
General—Gear lubrications acceptable under military specification (MILSPEC) MIL-L-2105D (Lubricating Oils, Gear, Multipurpose) are approved for use in Spicer Drive Axles. The MIL-L-2105D specification defines performance and viscosity requirements for multigrade oils. It supersedes both MIL-L-2105B, MIL-L-2105C and cold weather specification MIL-L-I 0324A. This specification applies to both petroleum-based and synthetic based gear lubricants if they appear on the most current "Qualified Products List" (QPL-2105) for MIL-L-2105D.
Note: The use of separate oil additives and/or friction modifiers are not approved in Dana Drive Axles.

Synthetic based — Synthetic-based gear lubricants exhibit superior thermal and oxidation stability, and generally degrade at a lower rate when compared to petroleum-based lubricants. The performance characteristics of these lubricants include extended change intervals, improved fuel economy, better extreme temperature operation, reduced wear and cleaner component appearance. The family of Spicer TM gear lubricants represents a premium quality synthetic lube which fully meets or exceeds the requirements of MIL-L-2105D. These products, available in both 75W-90 and 80 W-140, have demonstrated superior performance in comparison to others qualified under the MILSPEC, as demonstrated by extensive laboratory and field testing. For a complete list of Spicer ® approved synthetic lubricants contact your local Spicer representative. See back cover of this manual for appropriate phone number.

Makeup Lube — Maximum amount of non-synthetic makeup lube is 100/o.

Viscosity / Ambient Temperature Recommendations -The following chart lists the varies SAE Grades covered by MIL-L- 2105D and the associated ambient temperature range from each. Those SAE grades shown with an asterisk (*). are available in the Roadranger family of synthetic gear lubricants.

The lowest ambient temperatures covered by this chart are -40°F and -40°C. Lubrication recommendations for those applications which consistently operate below this temperature range, must be obtained through tcontacting your local Spicer epresentative.

Grade	Ambient Temperature
75W	- 40 F to -150 F (-40 C to -26 C)
75W-80	- 40 F to 80 F (-40 C to 21 C)
75W-90	- 40 F to 100 F (-40 C to 38 C)
75W-140	- 40 F and above (-40 C and above)
80W-90	- 40 F to 100 F (-40 C to -38 C)
80W-140	- 40 F and above(-40 C and above)
85W-140	- 40 F and above (-40 C and above)

Lube Change Intervals
This product combines the latest manufacturing and part washing technology. When filled with an Spicer approved synthetic lubricant at the factory, the initial drain is not required.

Change the lubricant within the first 5,000 miles of operation when not using a Spicer approved synthetic lubricant in either a new axle or after a carrier head replacement. Base subsequent lubricant changes on a combination of the following chart and user assessment of the application and operating environment.

Severe Service Lubrication Change Intervals-Severe service applications are those where the vehicle consistently operates at or near its maximum GCW or GVW ratings, dusty or wet environments, or consistent operation on grades greater than 8%. For these applications, the ON/OFF HIGHWAY portion of the chart should be used. Typical applications are construction, logging, mining and refuse removal.
Note: Remove metallic particles from the magnetic filler plug and drain plugs. Clean or replace the breather at each lubricant change.

Guide Lines - Lube Change Intervals for Drive Axles

Lubricant Type	On-Highway Miles	Maximum change Interval	On/Off Highway Severe Service Miles	Maximum Change Interval
Mineral Based	100,000	Yearly	40,000	Yearly
Roadranger Approved Lubricant	250,000	3 Years	100,000	Yearly

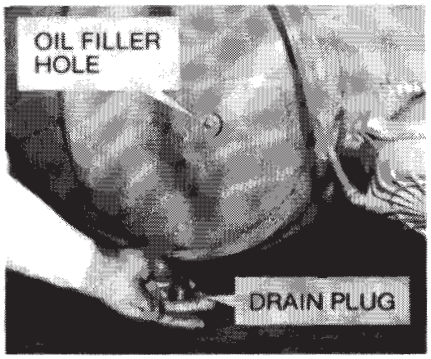
Changing Lube

Draining
Drain when the lube is at normal operating temperature. It will run freely and minimize the time necessary to fully drain the axle. Unscrew the magnetic drain plug on the underside of the axle housing and allow the lube to drain into a suitable container. Inspect drain plug for large quantities of metal particles. After initial oil change, these are signs of damage or extreme wear in the axle, and inspection of the entire unit may be warranted. Clean the drain plug and replace it after the lube has drained completely.

Axles with Lube Pump: Remove the magnetic strainer from the power divider cover and inspect for wear material in the same manner as the drain plug. Wash the magnetic strainer in solvent and blow dry with compressed air to remove oil and metal particles.

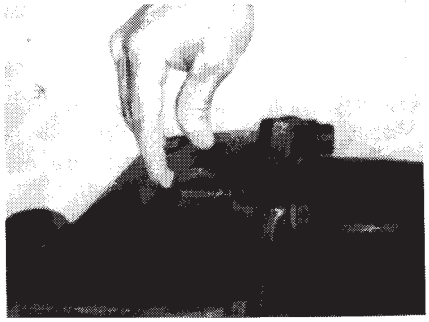
⚠ CAUTION

Exercise care to direct compressed air into safe area. Wear safety glasses.

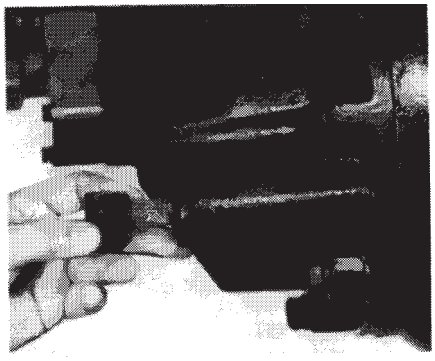


Filling
Remove the filler hole plug from the center of the axle housing cover and fill the axle with approved lubricant until level with the bottom of the hole.

Forward axles: Add two pints (0.94 liters) of lubricant through filler hole at the top of the differential carrier near the power divider cover.



Oil Filler Hole at top of Differential Carrier



Magnetic Strainer for Axle with Lube Pump

Note: Lube fill capacities in the adjacent chart are good guidelines but will vary somewhat on the basis of the angle the axle is installed in a particular chassis. Always use the filler hole as the final reference. If lube is level with the bottom of the hole, the axle is properly filled.

Axle Installation Angles
Axles installed at angles exceeding 10 degrees or operated regularly in areas of continuous and lengthy grades may require stand-pipes to allow proper fill levels.

For specific recommendations, contact your local Spicer representative. See back cover of this manual for phone numbers.

Lube Capacities, Dana Housings

Single Reduction Tandem Series	Forward Axle Pints (liters)	Rear Axle Pints (liters)
380(P), 381(P), 400-P, 401-P	39 (18.5)	36 (17.0)
402(P), 403(P),451-P	39 (18.5)	36 (17.0)

Forward Axle: Add an additional 2 pints (0.94 liters) axle lubricant through filler hole at the top of differential carrier near the power divider cover.

Capacities listed are approximate. The amount of lubricant will vary with angle of axle as installed in vehicle chassis.

Wheel End Lubrication

⚠ IMPORTANT

Before operating the axle, the wheel hub cavities and bearings must be lubricated to prevent failure. When wheel ends are serviced, follow Spicer's wheel end lubrication procedure before operating the axle.

Spicer axles may be equipped with either of two wheel end designs:

- Wheel ends with an oil fill hole.
- Wheel ends without an oil fill hole.

Wheel Ends with an oil fill hole proceed as follows: (Fig. 1)

1. Rotate the wheel end hub until the oil fill hole is up.
2. Remove the oil fill plug.
3. Pour 1/2 pint of axle sump lubricant into each hub through the wheel end fill hole.
4. Install oil fill plug and tighten to specified torque.

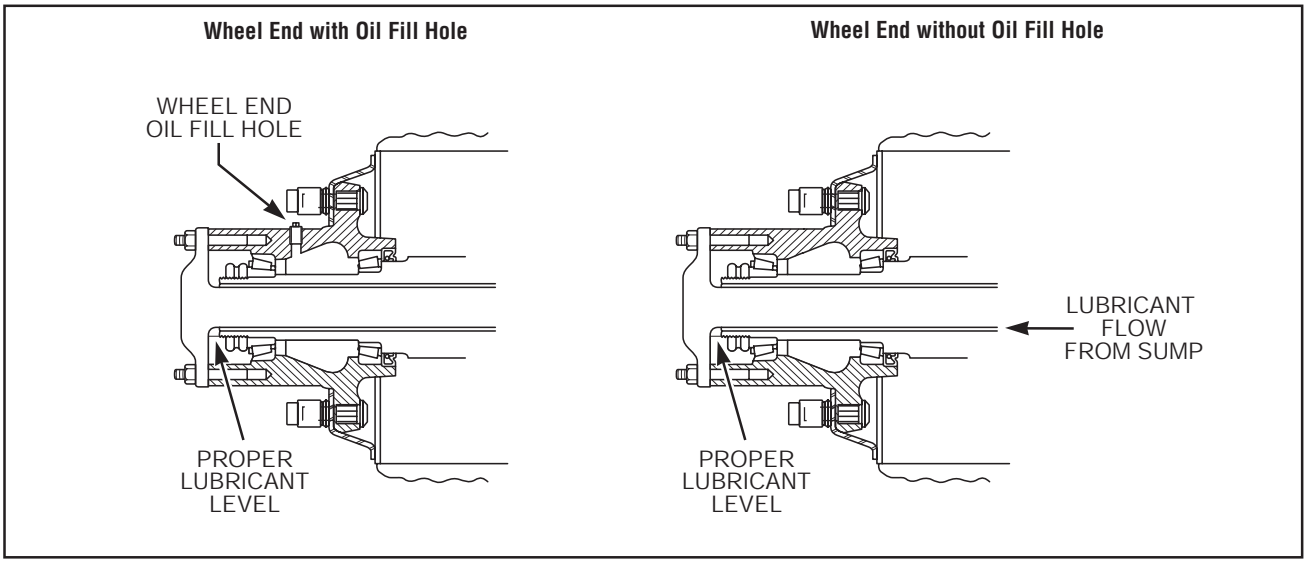


Fig. 1 Cutaway views of typical wheel and assemblies

Wheel Ends without an oil fill hole proceed as follows: (Fig. 2)

1. With axle level and wheel ends assembled, add lubricant through filler hole in axle housing cover until fluid is level with the bottom of filler hole.
2. Raise the left side of the axle 6 inches or more. Hold axle in this position for one minute.
3. Lower the left side.
4. Raise the right side of the axle 6 inches or more. Hold axle in this position for one minute.
5. Lower the right side.
6. With axle on a level surface, add lubricant through housing cover oil filler hole until fluid is level with the bottom of the hole.

Note: Axles without wheel end fill holes will require approximately 2.5 additional pints of lubricant to bring the lube level even with the bottom of fill hole.

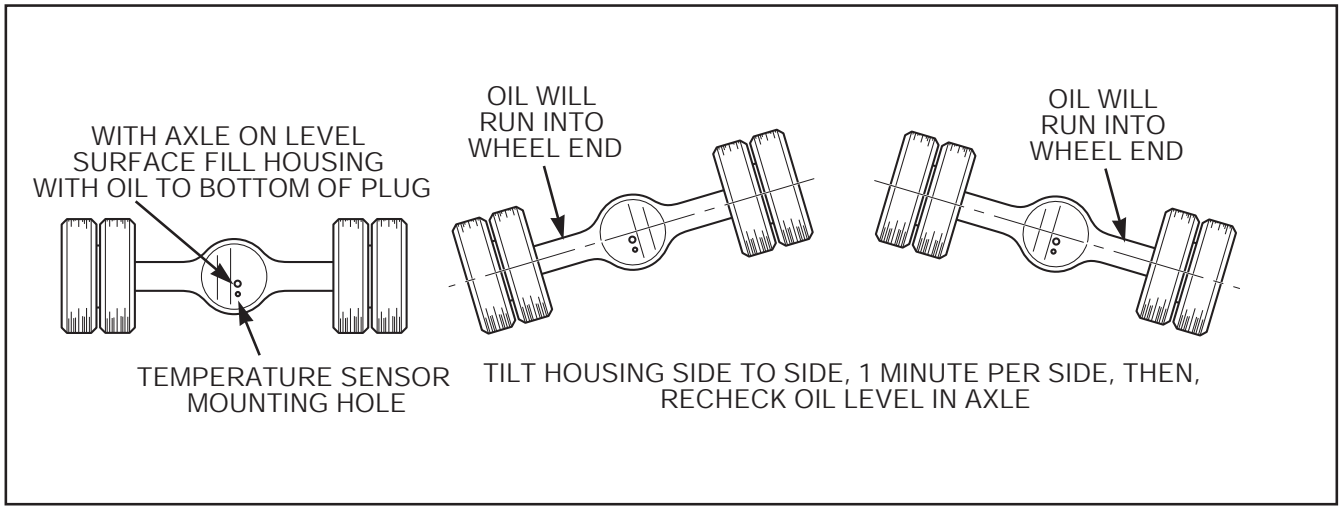


Fig. 2 Wheel end lubrication procedure

Cleaning, Inspection, Replacement

As the drive axle is disassembled, set all parts aside for thorough cleaning and inspection. Careful inspection will help determine whether parts should be reused. In many cases, the causes of premature wear or drive axle failure will also be revealed.

Cleaning

The differential carrier assembly may be steam-cleaned while mounted in the housing as long as all openings are tightly plugged. Once removed from its housing, do not steam clean differential carrier or any components. Steam cleaning at this time could allow water to be trapped in cored passages, leading to rust, lubricant contamination, and premature component wear. The only proper way to clean the assembly is to disassemble it completely. Other methods will not be effective except as preparatory steps in the process. Wash steel parts with ground or polished surfaces in solvent. There are many suitable commercial solvents available. Kerosene and diesel fuel are acceptable.

⚠ WARNING

Gasoline is not an acceptable solvent because of its extreme combustibiliy. It is unsafe in the workshop environment.

Wash castings or other rough parts in solvent or clean in hot solution tanks using mild alkali solutions. If a hot solution tank is used, make sure parts are heated thoroughly, before rinsing.

Rinse thoroughly to remove all traces of the cleaning solution. Dry parts immediately with clean rags.

Lightly oil parts if they are to be reused immediately. Otherwise, coat with oil and wrap in corrosion-resistant paper. Store parts in a clean, dry place.

Inspection

Inspect steel parts for notches, visible steps or grooves created by wear. Look for pitting or cracking along gear contact lines. Scuffing, deformation or discoloration are signs of excessive heat in the axle, usually related to low lubricant levels or improper lubrication practices.

Before reusing a gear set, inspect teeth for signs of excessive wear. Check tooth contact pattern for evidence of incorrect adjustment (see Adjustment Section for correct pattern). Inspect machined surfaces of cast or malleable parts. They must be free of cracks, scoring, and wear. Look for elongation of drilled holes, wear on surfaces machined for bearing fits and nicks or burrs in mating surfaces.

Inspect fasteners for rounded heads, bends, cracks or damaged threads. The axle housing should be examined for cracks or leaks. Also look for loose studs or cross-threaded holes. Inspect machined surfaces for nicks and burrs.

Repair and Replacement

⚠ IMPORTANT

To achieve maximum value from an axle rebuild. Replace lower-cost parts, such as thrust washers, seals, etc. These items protect the axle from premature wear or loss of lubricants. Replacing these parts will not increase rebuild cost significantly.

It is also important to replace other parts which display signs of heavy wear even though not cracked or broken. A significant portion of such a parts useful life has been expended and the damage caused, should the part fail, is far in excess of its cost.

Steel Parts- Gear sets, input and output shafts, differential parts and bearings are not repairable. Worn or damaged parts should be discarded without hesitation. Also discard mating parts in some cases. Gear sets, for example, must be replaced in sets.

Miscellaneous Parts - Seals and washers are routinely replaced. None of these parts can be reused if damaged. Fasteners using self-locking nylon patches may be reused if not damaged, but should be secured by a few drops of Loctite #277 on the threaded surface of the hole during installation and carefully torqued during installation.

Axle Housings - Repairs are limited to removal of nicks or burrs on machined surfaces and the replacement of loose or broken studs.

⚠ CAUTION

Any damage which affects the alignment or structural integrity of the housing requires housing replacement. Repair by welding or straightening should not be attempted. This process can affect the housing heat treatment and cause it to fail completely when under load.

Silicone Rubber Gasket Compound - For more effective sealing. Spicer uses silicone rubber gasket compound to seal the majority of metal-to-metal mating surfaces.

Spicer includes gasket compound and application instructions in many repair parts kits.

It is recommended that this compound be used in place of conventional gaskets. The compound will provide a more effective seal against lube and is easier to remove from mating surfaces when replacing parts.

Seals, Yoke & Slinger Service Information
During the 4th Quarter of 1990, new seals and yoke & slingers were used on the models in this publication. The new seals and slingers are noticeably different from the current seals and will affect interchangeability.

The upgraded seals can be used on axles originally equipped with the old seals.

Dana recommends the replacement of old yoke & slinger assemblies when the new seals are installed.

The old yokes and slingers will work with the new seals, but new yoke and slinger assemblies provide maximum sealing protection and prevent premature seal wear due to poor yoke condition.

New yoke and slinger assemblies cannot be used with the old seal design on the tandem forward axles.

New yoke and slinger assemblies can be used with the old seal on the tandem rear pinions.

Yoke Assembly & Oil Seal Kits contain oil seal, yoke & slinger and instructions.

Most non-Dana aftermarket seals will not be compatible with the new Dana Yoke and Slinger assemblies.

Spcier recommends the use of special installation tools conveniently packaged in one single kit (listed below).

Refer to Dana parts Book AXIP-0089 and Eaton Bulletin 90-06 for additional information.

Seal Driver Installation Kit 272139

126917 Driver (Rear Axle Pinion)

127787 Adapter (use with 126917 Driver for Forward Axle Input)

127786 Driver (Forward Axle Output)

Wheel Bearing Adjustment

Special Instructions

⚠ WARNING

Never work under a vehicle supported by only a jack. Always support vehicle with stands. Block the wheels and make sure the vehicle will not roll before releasing the brakes.

Procedure - Wheel End Seal

1. Remove:
   - The outer bearing and wheel.
   - The inner bearing.
   - The oil seal or grease retainer and discard.
   - The old wear sleeve (2-piece design only) with a ball peen hammer and discard.

   ⚠ IMPORTANT

   Wheel end seals can be easily damaged during handling. Leave the seal in its package until installation to prevent damage or contamination.

   ⚠ CAUTION

   Do not cut through the old wear sleeve. Damage to the housing may result.

2. Inspect:
   - The spindle journal and hub bore for scratches or burns. Recondition with emery cloth as required.

   Note: Deep gouges can be repaired by filling gouge with hardened gasket and smoothing with emery cloth.

3. Clean:
   - The hub cavity and bearing bores before reassembly. Be sure to remove contaminants from all recesses and corners.
   - The bearings thoroughly with solvent and examine for damage. Replace damaged or worn bearings.
   - Before installation, lubricate with the same lubricant used in the axle sump.
   - The inner bearing.
   - The wheel seal following the directors provided by the seal supplier.

   ⚠ IMPORTANT

   Always use the seal installation tool specified by the seal manufacturer. Using an improper tool can distort or damage the seal and cause premature seal failure.

Procedure - Wheel Bearing Adjustment

1. Identify the wheel nut system being installed. Three systems are available:
   - Three piece Dowel-type wheel nut system -Fig.1
   - Three piece Tang-type wheel nut system - Fig.2

- Four piece Tang/Dowel type wheel nut system - Fig.3

⚠ WARNING

Do not mix spindle nuts and lock washers from different systems. Mixing spindle nuts and lock washers can cause wheel separation.

Note: The lock washer for a four piece-dowel-type wheel system is thinner than the lock washer for a three piece tang-type wheel nut system and is not designed to bear against the inner nut.

Fig 1

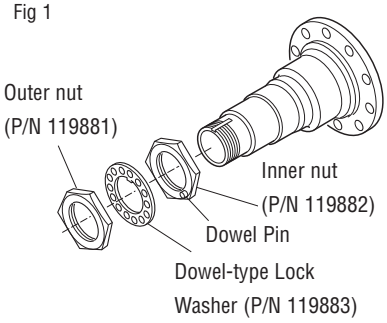


Fig 2

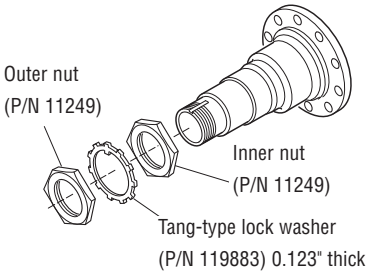
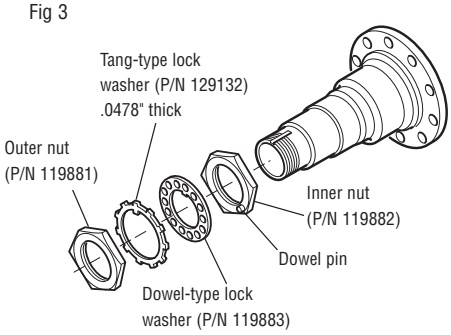


Fig 3



2. Inspect the spindle and nut threads for corrosion and clean thoroughly or replace as required.

   Note: Proper assembly and adjustment is not possible if the spindle or nut threads are corroded.

   - Inspect the tang-type washer (if used). Replace the washer if the tangs are broken, cracked, or damaged.

3. Install the hub and drum on the spindle with care to prevent damage or distortion to the wheel seal.

⚠ CAUTION

A wheel dolly is recommended during installation to make sure that the wheel seal is not damaged by the weight of the hub and drum. Never support the hub on the spindle with just the inner bearing and seal. This can damage the seal and cause premature failure.

- Completely fill the hub cavity between the inner and outer bearing races with the same lubricant used in the axle sump.

4. Before installation, lubricate the outer bearing with the same lubricant used in the axle sump.

   Note: Lubricate only with clean axle lubricant of the same type used in the axle sump. Do not pack the bearing with grease before installation. Grease will prevent the proper circulation of axle lubricant and may cause wheel seal failure.

5. Install the outer bearing on the spindle.
   - Install the inner nut on the spindle.
   - Tighten the inner nut to 200 lbs. ft. (271 N.M.) while rotating the wheel hub.

⚠ CAUTION

Never use an impact wrench to adjust wheel bearings. A torque wrench is required to assure that the nuts are property

tightened.

6. Back-off the inner nut one full turn. Rotate the wheel hub.
7. Re-tighten the inner nut to 50 lbs. ft. (68 N.M.) while rotating the wheel hub.
8. Back-off the inner nut exactly 1/4 turn.

   Note: This adjustment procedure allows the wheel to rotate freely with 0.001"-0.005" (0.025mm to 0.1 27mm) end-play.
9. Install the correct lock washer for the wheel nut system being used.

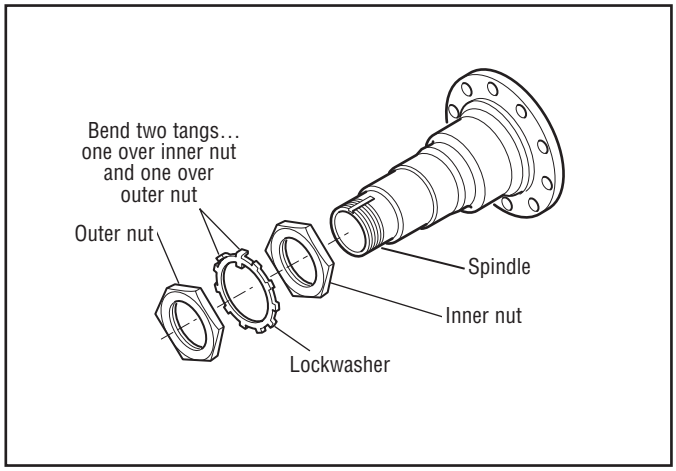
Procedure - Three piece tang-type lock washer system (see Fig. 2).

1. Install the Tang-type lock washer on the spindle.

⚠ IMPORTANT

Never tighten the inner nut for alignment. This can preload the bearing and cause premature failure.

2. Install the outer nut on the spindle and tighten to 250 lbs. ft. (339 N.M.).
3. Verify end-play (see End Play Verification Procedure)
4. After verifying end play, secure wheel nuts by bending one of the locking washer tangs over the outer wheel nut and another tang over the inner wheel nut as shown in Figure 4. (below)



Procedure - Three piece dowel-type lock washer system (see Fig. 1)

1. Install the Dowel-type lock washer on the spindle.

   Note: If the dowel pin and washer are not aligned, remove washer, turn it over and reinstall. If required, loosen the inner nut just enough for alignment.

⚠ IMPORTANT

Never tighten the inner nut for alignment. This can preload the bearing and cause premature failure.

2. Install the outer nut on the spindle and tighten to 350 lbs. ft. (475 N.M.).

3. Verify end-play (see End Play Verification Procedure)

Procedure - Four piece tang/dowel-type lock washer system (see Fig. 3)

1. First, install the Dowel-type lock washer on the spindle.

   Note: If the dowel pin and washer are not aligned, remove washer, turn it over and reinstall. If required loosen the inner nut just enough for alignment.

⚠ IMPORTANT

Never tighten the inner nut for alignment. This can preload the bearing and cause premature failure.

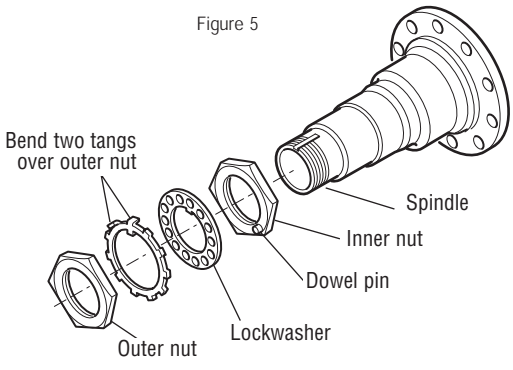
2. Install the Tang-type lock washer on the spindle.

3. Install the outer nut on the spindle and tighten to 250 lbs. ft. (339 N. M.)

4. Verify end-play (see End Play Verification Procedure)

5. After verifying end play, secure the outer nut by bending two opposing (180° apart) tangs of the locking washer over the outer nut as shown in Figure 5.

Figure 5



Procedure - Install

1. Install a new gasket at axle shaft flange.

2. Install axle shaft.

3. Install axle flange nuts and tighten to specified torque.

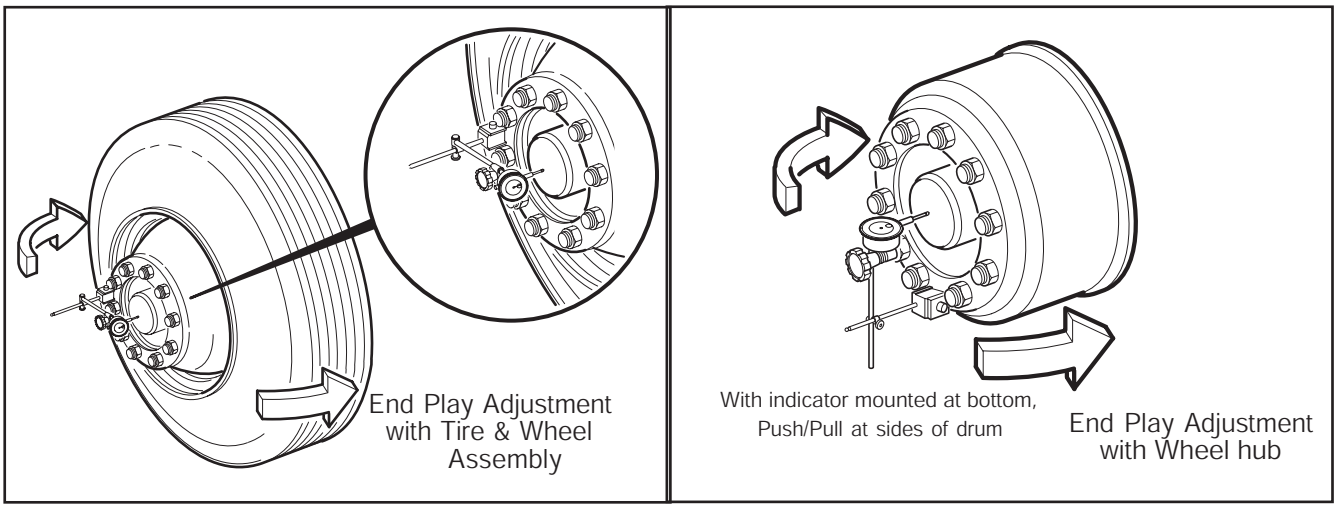
4. Lubricate axle wheel ends (see Wheel End Lubrication Procedure)

Procedure - End Play Verification Procedure

1. Verify that end-play meets specification using a dial indicator. An indicator with 0.001” (0.03 mm) resolution is required.

Wheel end play is the free movement of the tire and wheel assembly along the spindle axis.

2. Attach a dial indicator with its magnetic base to the hub or brake drum as shown below:



3. Adjust the dial indicator so that its plunger or pointer is against the end of the spindle with its line of action approximately parallel to the axis of the spindle.

4. Grasp the wheel assembly at the 3 o'clock and 9 o'clock positions. Push the wheel assembly in and out while oscillating it to seat the bearings. Read bearing end play as the total indicator movement.

⚠ CAUTION

If end play is not within specification, readjustment is required.

Procedure - End Play Readjustment Procedure

1. Excessive End Play - If end play is greater than.005" (.127 mm), remove the outer nut and pull the lock washer away from the inner nut, but not off the spindle. Tighten the inner nut to the next alignment hole of the dowel-type washer (if used). Reassemble the washer and torque the outer nut. Verify end play with a dial indicator.

2. Insufficient End Play - If end play is not present, remove the outer nut and pull the lock washer away from the inner nut, but not off the spindle. Loosen the inner nut to the next adjustment hole of the dowel-type washer (if used). Reassemble the washer and re-torque the outer nut. Verify end play with a dial indicator.

3. Fine Tuning the End Play - If, after performing the readjustment procedures, end play is still not within the.001"-.005" (.025 mm to.127 mm) range, disassemble and inspect the components. If parts are found to be defective, replace the defective parts, reassemble and repeat wheel bearing adjustment procedure. Verify end play with a dial indicator.

Differential Carrier Adjustments

Adjustments help provide optimum axle life and performance by correctly positioning bearings and gears under load. The tandem axles covered in this manual require the following adjustments:

Bearing Preload: This adjustment is performed for both pinion and differential bearings. It maintains proper gear alignments by creating correct bearing cone and cup relationships for free rotation under load. The pinion pilot bearing does not require a preload adjustment.

Ring Gear Tooth Contact: This adjustment positions ring gear and pinion for best contact under load. Correct adjustment distributes torque evenly over gear teeth and helps maximize gear set life.

I**nput Shaft End Play (Forward Axles):** This adjustment controls gear mesh in the inter-axle differential. Proper adjustment helps maximize life of all power divider parts.

Adjust Input Shaft End Play

Specifications: Input shaft end play requirements will vary with operating conditions, mileage and rebuild procedures. These variations are shown in the following chart.

Input Shaft End Play
New or Rebuild with new parts: 0.003" to 0.007".

Rebuild with reused parts: 0.013" to 0.017".
Note: Because of manufacturing variations in individual parts, correctly adjusted end play could vary 0.010", after the unit is rotated.

Acceptable End Play Tolerances when measuring as a regular maintenance procedure with axle in truck.

Up to 0.060" with over 100,000 miles or 1 year service off-road.

Up to 0.040" with less than 100,000 miles or 1 year service on- road.
Note: If end play exceeds limits, disassemble power divider and replace worn parts.

Procedure - Measure and Adjust End Play

1.

⚠ IMPORTANT

In September 1988, a Spring and a Thrust Button between the input and output shafts. End play tolerances are the same for axles with or without this Spring and Button. However, end play measurement procedure is different than described below. Refer to Service Bulletin Supplement at back of this manual for procedure variances.

With power divider assembled to differential carrier, measure end play with dial indicator positioned at yoke end of input shaft. Move input shaft axially and measure end play. If end play is not correct (see chart), adjust as follows.

2. Remove input shaft nut, flat washer and yoke. Remove bearing cover cap screws and lock washers. Remove cover and shim pack.

3. To increase end play, add shims:

   Desired end play: 0.003" to 0.007"

   Measured endplay (Step 1): 0.001" - 0.001"

   Add shims to provide desired end play : 0.002" to 0.006"

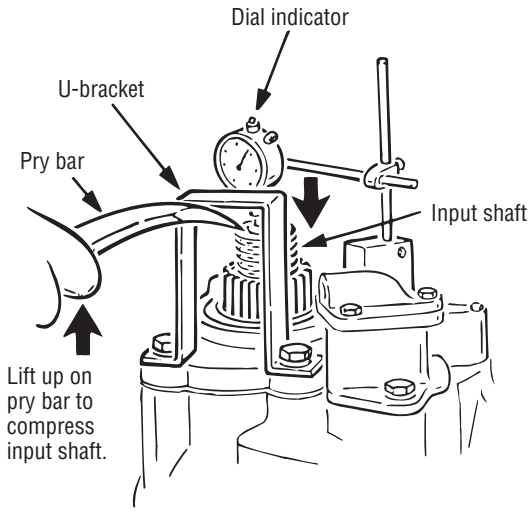
4. To decrease end play, remove shims:

   Measured end play (Step 1): 0.015" - 0.015"

   Desired end play: 0.003" to 0.007"

   Remove shims to provide desired end play : 0.012" to 0.008"

5. To reassemble input shaft, install the adjusted shim pack and bearing cover. Install cap screws and lock washers. Torque screws to 75-85 ft. lbs. (101-115 N.m).



Measuring End Play with Dial Indicator

Note: If difficulty is experienced in achieving correct torque on the input yoke nut, torque the nut with truck on the ground and axle shafts installed.

6. Install yoke, flat washer and nut. Tighten nut snugly. Tap end of input shaft lightly to seat bearings.

7. Measure input shaft end play with dial indicator. If end play is still incorrect, repeat Steps 2 through 6.

8. With end play correct, seal shim pack to prevent lube leakage, then torque input shaft nut and cover cap screws (see chart).

Note: When power divider has been disassembled and reassembled, it may be desirable to adjust end play by measuring bearing cover clearance and calculating shim pack size. For procedures, see page 39.

Torque Chart

	ft. lbs.	N.m
Input Shaft Nut		
1 5/8 - 18	780-960	1057 - 1301
*M42 x 1.5	840 - 1020	1140 - 1383
Bearing Cover Capscrew		
1/2 - 13	75 - 85	101 - 115

*Metric Nut used on Axles produced after 1-3-95

Pinion Bearing Preload

Special Instructions

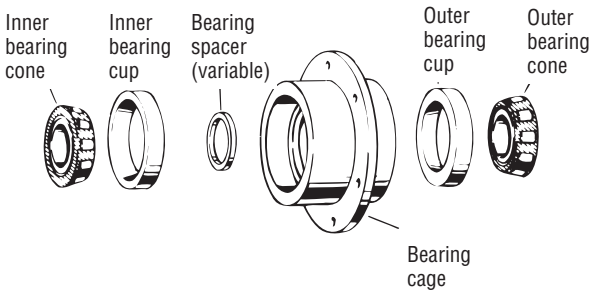
Most late model axles are provided with a “press-fit” outer bearing on the drive pinion. Some of the early model axles use an outer bearing which slips over the drive pinion. Procedures for adjusting both types of pinion bearing design are contained in this section.

Procedure - Adjust Pinion Bearing Preload for Axles with “Press-fit” Outer Pinion Bearings

1. Trial Build-up

   Assemble pinion bearing cage, bearings and spacer (without drive pinion or oil seal). Center bearing spacer between two bearing cones.

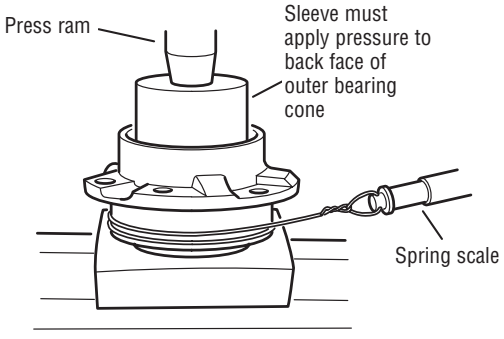
Assemble these Parts for Trial Build-up.



   Note: When new gear set or pinion bearings are used, select nominal size spacer from the specification chart below. If original parts are used, use spacer removed during disassembly.

2. With the bearings well lubricated, place the assembly in the press. Position sleeve so that load is applied directly to the backface of the outer bearing cone.

Cage in Press to Check Bearing Preload.



3. Apply press load (see chart below) to the assembly and check rolling torque. Wrap soft wire around the bearing cage, attach spring scale and pull. Preload is correct when torque required to rotate the pinion bearing cage is from 10-20 in. lbs.. This specification is translated into spring scale readings in the chart below.

Specifications for Pinion Bearing Trial Build-up Preload Test ("Press-fit" Outer Pinion Bearings)

	Nominal Bearing Spacer Thickness			Press Loads			Spring Scale Reading (without pinion seal) (for 10-20 in. lbs. torque) (1.1-2.3 N.m)		
Axle Models	in.		mm	Tons		Metric Tons	lbs.		Kgs.
Forward Axles									
D340, 380(P), 400-P	0.638		16.21	13.5 - 15.5		122- 140	3-7		2-3
D341, 381, (P), 401-P, 402(P), 403(P), 451-P	0.496		12.60	17 - 19		154 - 172	3-7		1.4-32
Rear Axles	0.638		16.21	14 - 15		127 - 136	4-8		18-36

4. If necessary, Adjust Pinion Bearing Preload by changing the pinion bearing spacer. A thicker spacer will decrease preload. A thinner spacer will increase preload.

⚠ IMPORTANT

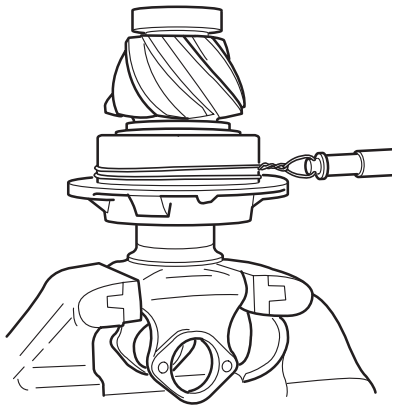
Once correct bearing preload has been established, note the spacer size used. Select a spacer 0.001" larger for use in the final pinion bearing cage assembly. The larger spacer compensates for slight "growth" in the bearings which occurs when they are pressed on the pinion shank. The trial build-up will result in proper pinion bearing preload in three of four cases.

Do not assume that all assemblies will retain proper preload once bearings are pressed on pinion shank. Final preload test must be made in every case.

Final Pinion Bearing Preload Test

Procedure -

1. Assemble the complete pinion bearing cage unit as recommending the assembly section of this manual.



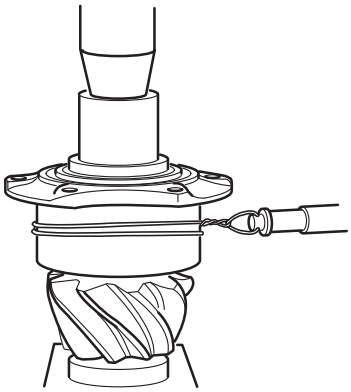
Measuring Bearing Preload with Pinion in Vise

Note: Forward axle pinion is equipped with helical gear. For easier disassembly during bearing adjustment procedure, use a dummy yoke (if available) in place of helical gear.

2. Apply clamp load to the pinion bearing cage assembly. Either install the yoke (or helical gear) and torque the pinion nut to specifications or use a press to simulate nut torque (see chart below).

   Vise Method - If the yoke and nut are used, mount the assembly in a vise, clamping yoke firmly.

   Press Method - If a press is used, position a sleeve or spacer so that load is applied directly to the back-face of the outer bearing cone.



Measuring Bearing Preload with Pinion in Press

3. Measure Pinion Bearing Preload - Use a spring scale to test the assembly rolling torque. To use the spring scale, wrap soft wire around the bearing cage, attach the scale and pull. Preload is correct when torque required to rotate the pinion bearing cage is from 15 to 35 in. lbs.. This specification is translated into spring scale readings in the chart below.

Final Pinion Bearing Preload Test

Axle Model	Nut Torque ft. lbs. (N.m)	Press Load- Tons (Metric tons)	Spring Seal Reading (without pinion seal)- lbs (kg)
Forward Axle			
D340, 380(P), 400-P	560 - 700 (759 - 949) Self Locking Nut	13.5 - 15.5 (12.2 - 14.0)	5-12 (2.3-5.4)
D341, 381(P), 401-P, 402(P), 403(P), 451-P	780 - 960 (1057-1301) Self Locking Nut	17 - 19 (15.4 - 17.2)	5-12 (2.3-5.4)
	840-1020 (1140-1383) Metric Nut	17 - 19 (15.4 - 17.2)	5-12 (2.3-5.4)
	840* (1139) Slotted Nut and role pin	17 - 19 (15.4 - 17.2)	5-12 (2.3-5.4)
Rear Axle (All models)	560-700 (759-949)	14-15 (12.7-13.6)	6-14 (2.7-6.4)

*Torque nut to 840 ft-lbs. (1 139 N.m), Then continue tightening nut to align nut slot to nearest hole in pinion shank.

4. Adjust Pinion Bearing Preload - If necessary, adjust pinion bearing preload. Disassemble the pinion bearing cage as recommended in this -manual and change the pinion bearing spacer. A thicker spacer will decrease preload. A thinner spacer will increase preload.

⚠ IMPORTANT

Use the correctly sized spacer. Do not use shim stock or grind spacers. These practices can lead to loss of bearing preload and gear or bearing failure.

Adjust Pinion Bearing Preload for Axles with "Slip-fit" Outer Pinion Bearings

Procedure -

1. Lubricate bearings and assemble the drive pinion, bearings, and pinion bearing cage as recommended in the assembly section of this manual. Use the pinion bearing spacer removed from the axle during disassembly. If the original spacer cannot be used, install the nominal spacer recommended in the adjacent chart.

Nominal Pinion Bearing Spacers

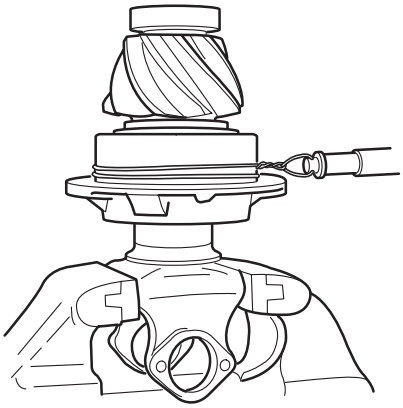
Axle Model	Spacer Thickness in (mm)
Forward Axle	
D340, 380(P), 400-P	0.638 (16.205)
D341, 381(P), 401-P, 402(P), 403(P), 451-P	0.492 (12.497)
Rear Axle (all models)	0.638 (16.205)

Note: Forward axle pinion is equipped with helical gear, For easier disassembly during bearing adjustment procedure, use a dummy yoke (if available) in place of helical gear.

2. Apply clamp load to the pinion bearings. Install the yoke (or helical gear) and torque the nut to specification or use a press to simulate nut torque by applying pressure to the assembly (see chart below).

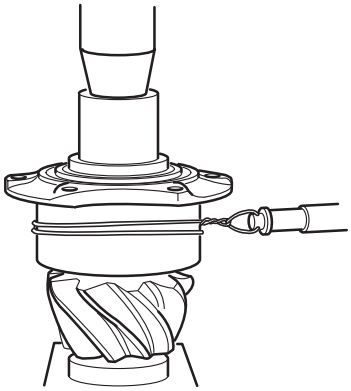
   Vise Method - If the yoke and nut are used, mount the assembly in a vise, clamping yoke firmly.

   Press Method - If a press is used, position a sleeve or spacer so that load is applied directly to the back-face of the outer bearing cone.



Measuring Bearing Preload with Pinion in Vise

3. Measure Pinion Bearing Preload - Use a spring scale to test the assembly rolling torque. To use the spring scale, wrap soft wire around the bearing cage, attach the scale and pull. Preload is correct when torque required to rotate the pinion bearing cage is from 15 to 35 in. lbs. This specification is translated into spring scale readings in the chart below.



Measuring Bearing Preload with Pinion in Press

4. Adjust Pinion Bearing Preload - If necessary, adjust pinion bearing preload. Disassemble the pinion bearing cage as recommended in this manual and change the pinion bearing spacer. A thicker spacer will decrease preload. A thinner spacer will increase preload.

⚠ IMPORTANT

Use the correctly sized spacer, Do not use shim stock or grind spacers. These practices can lead to loss of bearing preload and gear or bearing failure.

Final Pinion Bearing Preload Test (Slip fit outer pinion bearings)

Axle Model	Nut Torque ft. lbs (N.m)	Press Load- Tons (Metric tons)	Spring Seal Reading (without pinion seal)- lbs (kg)
Forward Axle			
D340, 380(P), 400-P	560 - 700 (759 - 949) Self Locking Nut	13.5 - 15.5 (12.2 - 14.0)	5-12 (2.3-5.4)
D341, 381(P), 401-P, 402(P), 403(P), 451-P	780 - 960 (1057-1301) Self Locking Nut	17 - 19 (15.4 - 17.2)	5-12 (2.3-5.4)
	840-1020 (1140-1383) Metric Nut	17 - 19 (15.4 - 17.2)	5-12 (2.3-5.4)
	840* (1139) Slotted Nut and role pin	17 - 19 (15.4 - 17.2)	5-12 (2.3-5.4)
Rear Axle (All models)	560-700 (759-949)	14-15 (12.7-13.6)	6-14 (2.7-6.4)

*Torque nut to 840 ft-lbs. (1 139 N.m), Then continue tightening nut to align nut slot to nearest hole in pinion shank.

Differential Bearing Preload and Ring Gear Backlash Adjustment

Special Instructions

Correct differential bearing preload insures proper location of these bearings under load and helps position the ring gear for proper gear tooth contact.

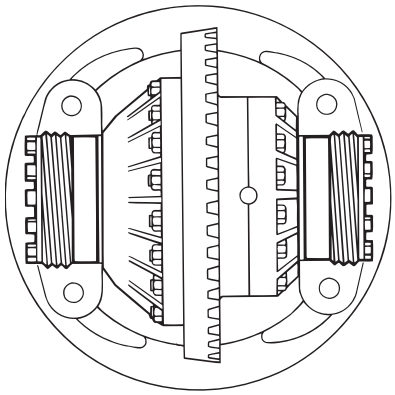
Procedure - Adjust Diff. Bearing Preload

1. Lubricate differential bearings.

⚠ IMPORTANT

When installing bearing caps and adjuster, exert care not to cross threads.

2. Install adjusters and bearing caps. Tighten bearing cap screws finger-tight. If this is difficult, use a hand wrench.



Note: Ring gear position for rear axle is illustrated.

3. Loosen the bearing adjuster on the same side as the ring gear teeth until its first thread is visible.

4. Tighten the bearing adjuster on the back-face side of the ring gear until there is no backlash.

   This can be tested by facing the ring gear teeth and pushing the gear away from the body while gently rocking the gear from side to side. There should be no free movement.

   Rotate the ring gear and check for any point where the gear may bind. If such a point exists, loosen and re-tighten the back side adjuster. Make all further adjustments from the point of tightest mesh.

5. At teeth side of ring gear, tighten adjuster until it contacts the bearing cup. Continue tightening adjuster two or three notches and this will preload bearings and provide backlash.

6. Measure backlash with a dial indicator.

   USED GEARING — Reset to backlash recorded before disassembly.

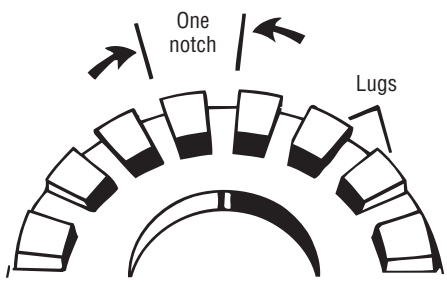
   NEW GEARING — Backlash should be between 0.006" and 0.016".

   If backlash is incorrect, proceed as described below to readjust.

Procedure - Adjust Ring Gear Backlash

1. To add backlash: Loosen the adjuster on the teeth side of the ring gear several notches. Loosen the opposite adjuster one notch. Return to adjuster on teeth side of the ring gear and tighten adjuster until it contacts the bearing cup. Continue tightening the same adjuster 2 or 3 notches. Recheck backlash.

2. To remove backlash: Loosen the adjuster on the teeth side of the ring gear several notches. Tighten the opposite adjuster one notch. Return to adjuster on teeth side of ring gear and tighten adjuster until it contacts the bearing cup. Continue tightening the same adjuster 2 or 3 notches. Recheck backlash.



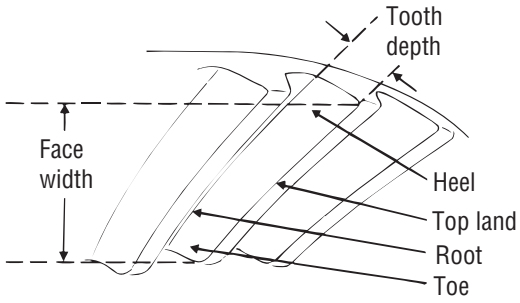
3. Moving adjuster one notch is the movement of the lead edge of one adjuster lug to the lead edge of the next lug past a preselected point.

Ring Gear and Pinion Tooth Contact

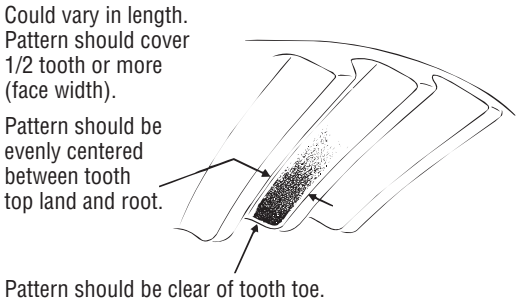
Note: Rear axle gearing is shown in the following instructions. Correct tooth contact patterns and adjustments are the same for forward and rear axles.

Check Tooth Contact Pattern (NEW GEAR)

Paint twelve ring gear teeth with marking compound and roll the gear to obtain a contact pattern. The correct pattern is well-centered on the ring gear tooth with lengthwise contact clear of the toe. The length of the pattern in an unloaded condition is approximately one-half to two-thirds of the ring gear tooth in most models and ratios.



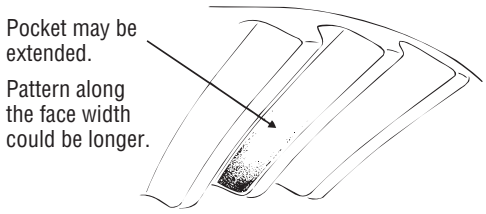
Correct Pattern New Gearing



Check Tooth Contact Pattern (USED GEAR)

Used gearing will not usually display the square, even contact pattern found in new gear sets. The gear will normally have a "pocket" at the toe-end of the gear tooth which tails into a contact line along the root of tooth. The more use a gear has had, the more the line becomes the dominant characteristic of the pattern. Adjust used gear sets to display the same contact pattern observed before disassembly. A correct pattern is clear of the toe and centers evenly along the face width between the top land and root. Otherwise, the length and shape of the pattern are highly variable and is considered acceptable as long as it does not run off the tooth at any point.

Correct Pattern Used Gearing

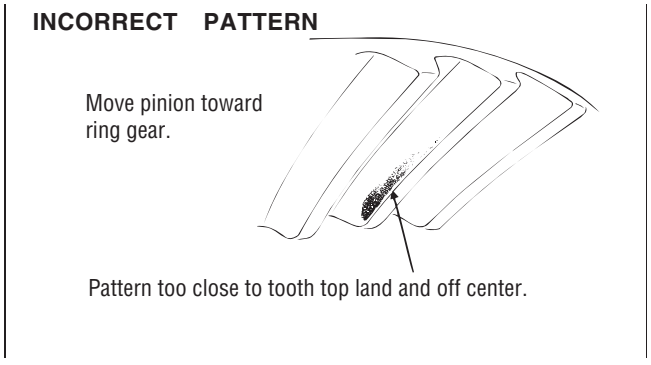


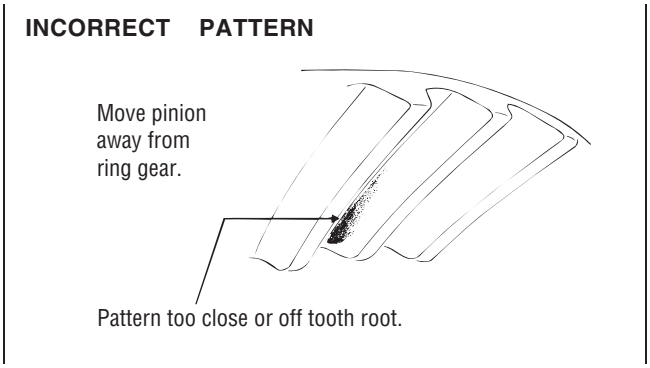
Adjust Tooth Contact Patterns

If necessary, adjust the contact pattern by moving the ring gear and drive pinion. Ring gear position controls the backlash. This adjustment moves the contact pattern along the face width of the gear tooth, Pinion position is determined by the size of the pinion bearing cage shim pack. It controls contact on the tooth depth of the gear tooth. These adjustments are interrelated. As a result, they must be considered together even though the pattern is altered by two distinct operations. When making adjustments, first adjust the pinion, then the backlash. Continue this sequence until the pattern is satisfactory.

Adjust Pinion Position

If the gear pattern shows incorrect tooth depth contact, change drive pinion position by altering the shim pack. Used gears should achieve proper contact with the same shims removed from the axle at disassembly.

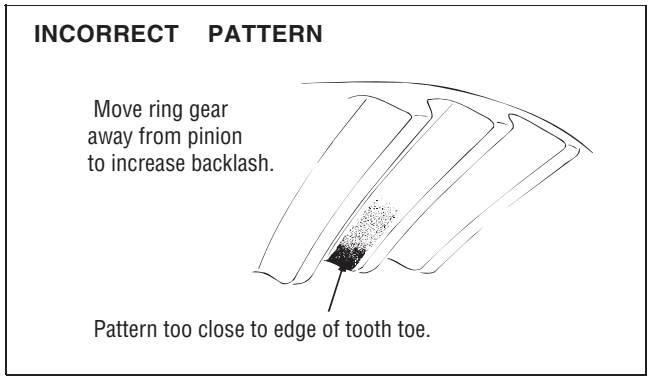


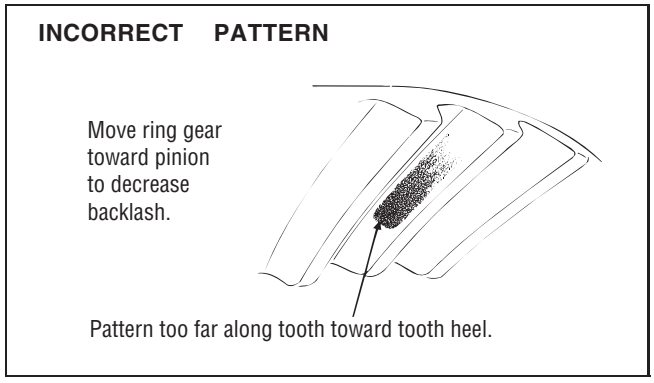


If the pattern is too close to the top land of the gear tooth, remove pinion shims. If the pattern is too close to the root of the gear tooth, add pinion shims. Check ring gear backlash after each shim change and adjust if necessary to maintain the 0.006” to 0.016” specifications.

Adjust Backlash

If the gear pattern shows incorrect face width contact, change backlash.



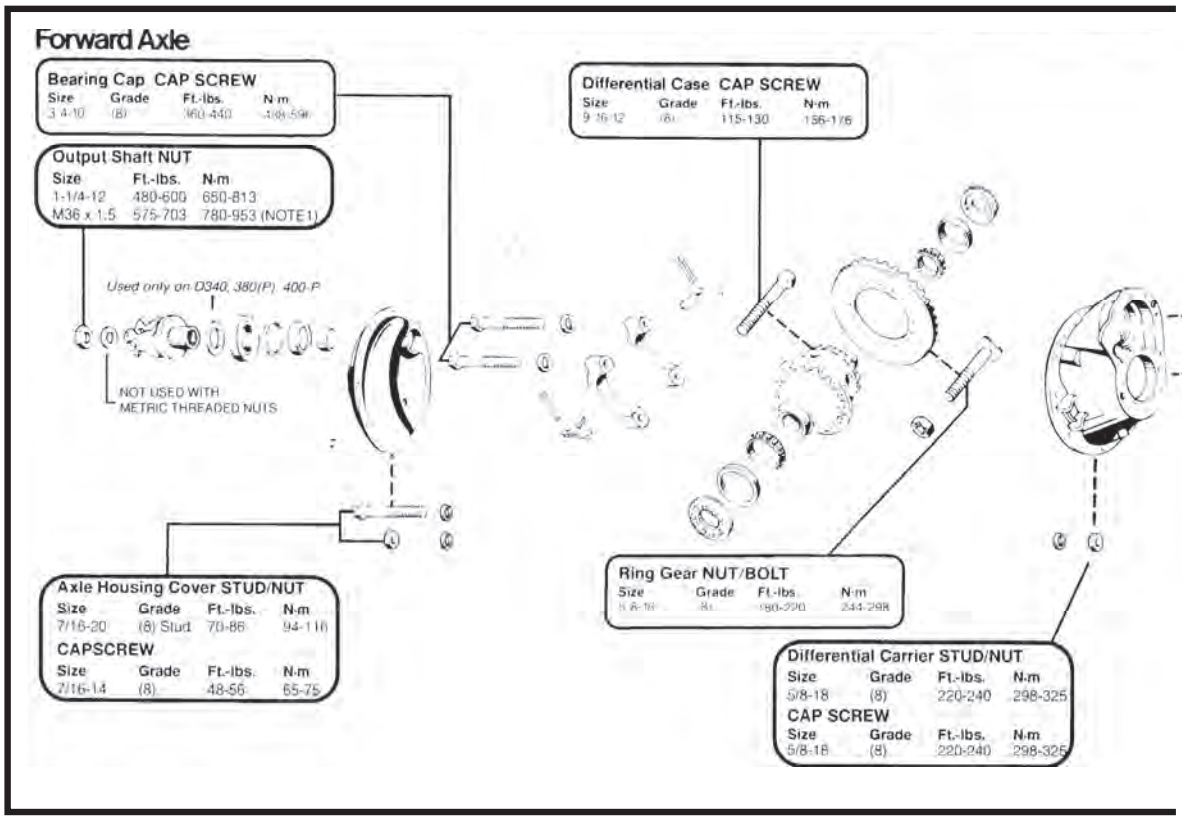


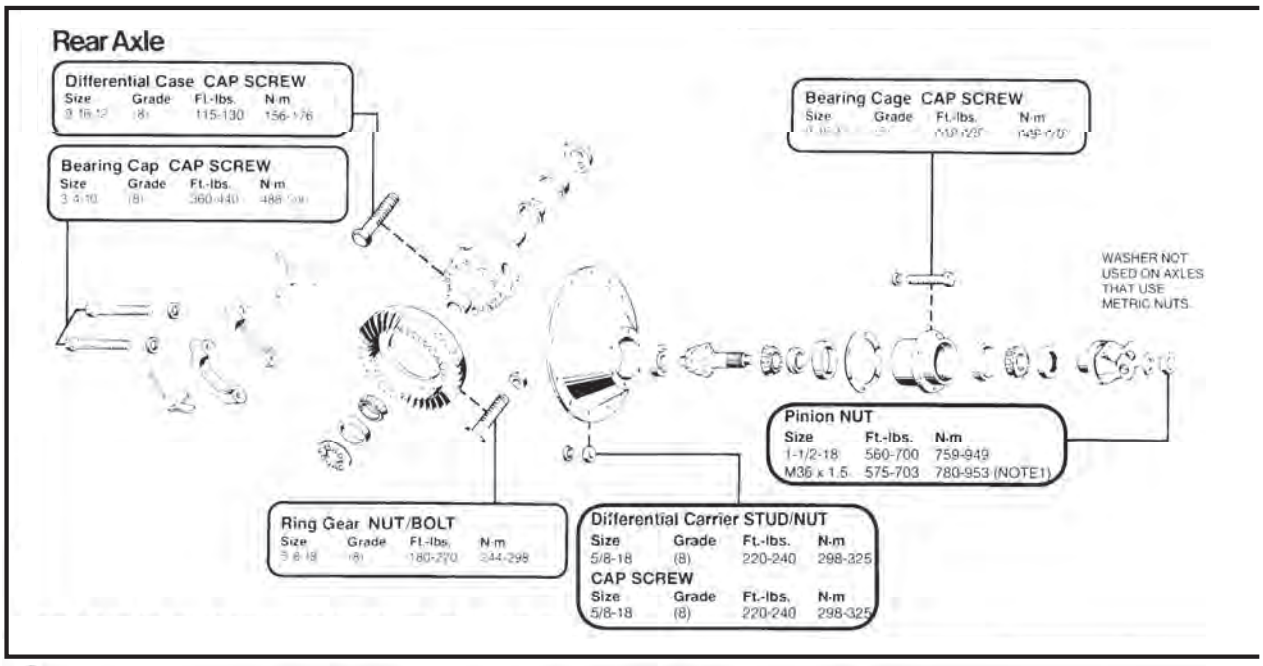
With the pattern concentrated at the toe (too far down the tooth), add backlash by loosening the bearing adjuster on the teeth side of ring gear several notches. Loosen the opposite adjuster one notch. Return to adjuster on teeth side of ring gear and tighten adjuster until it contacts the bearing cup. Continue tightening the same adjuster 2 or 3 notches. Recheck backlash.

If the pattern is concentrated at the heel (too far up-the tooth), remove backlash by loosening the bearing adjuster on the teeth side of ring gear several notches. Tighten the opposite adjuster one notch. Return to adjuster on teeth side of ring gear and tighten adjuster until it contacts the bearing cup. Continue tightening the same adjuster 2 or 3 notches. Recheck backlash.

Fastener Tightening Specifications

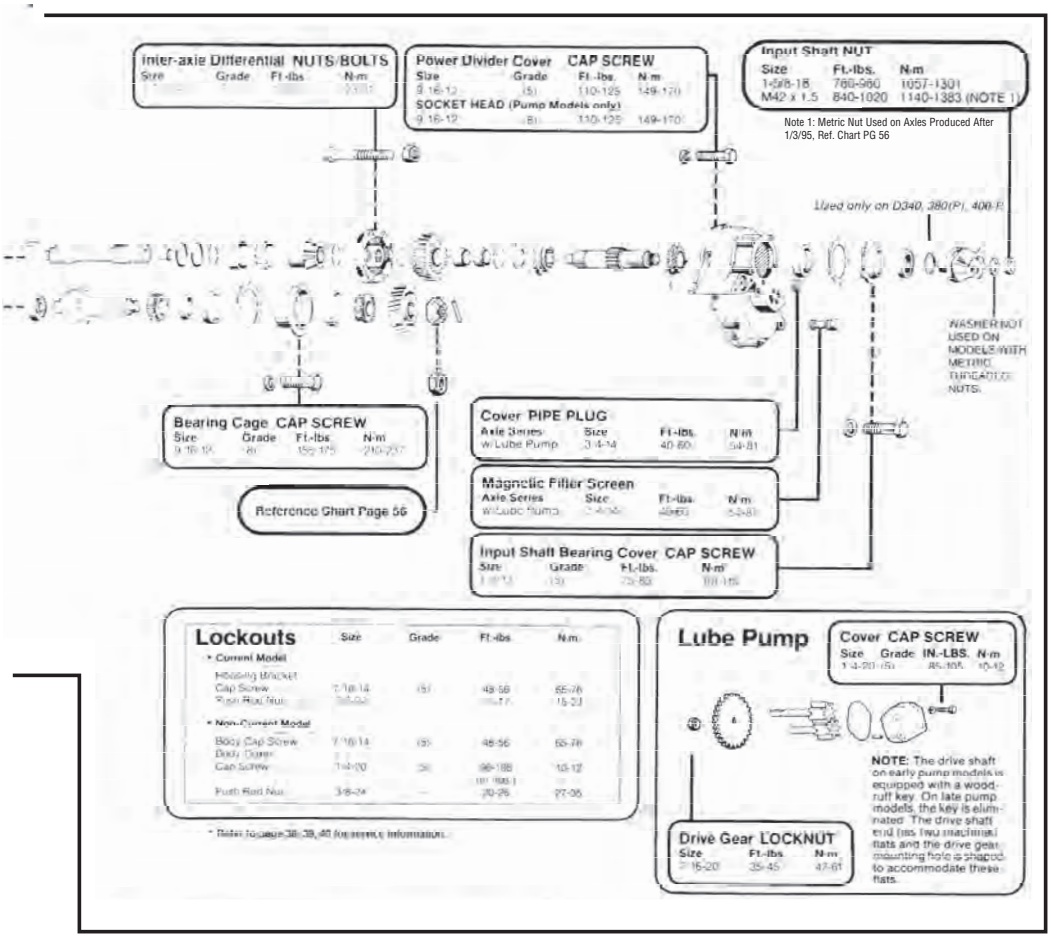
Specifications are for all axle models unless specified otherwise.





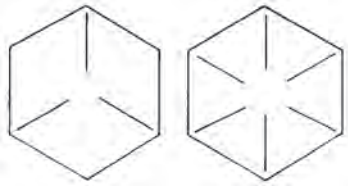
Dana Single Reduction Tandem Models

D340, 380(P), 400-P D341, 381 (P), 401-P, 402(P), 403(P), 451-P



- Correct tightening torque values are extremely important to assure long Dana Axle life and dependable performance. Under-tightening of attaching parts is just as harmful as over-tightening.
- Exact compliance with recommended torque values will assure the best results.
- The data includes fastener size, grade and torque tightening values. Axle models are included to pinpoint identification of fasteners for your particular axle.
- To determine bolt or cap screw grade, check for designation stamped on bolt head (see illustration).

Bolt head markings for grade identification



Grade 5 **Grade 8**

Remove Differential Carrier Assembly from Axle Housing

Special Instructions

⚠ IMPORTANT

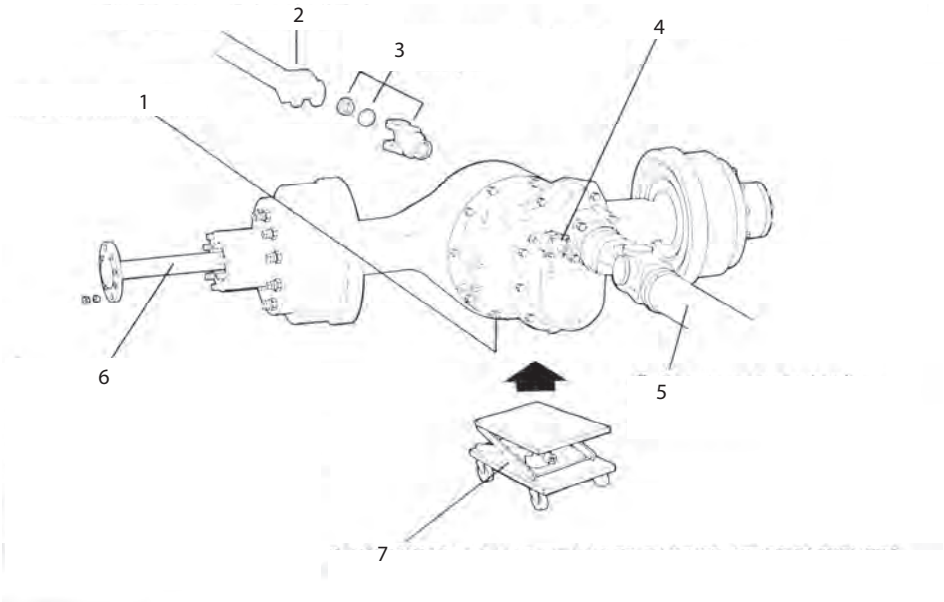
D341, 381 (P), 401-P, 402(P), 403(P), 451-P models do NOT use and output shaft Rear Bearing Retaining Washer.

⚠ WARNING

The output shaft rear bearing retaining washer is frequently lost when the differential carrier assembly is removed. It may adhere to the yoke, to the face of the output shaft bearing, fall on the floor or into the housing. Locate this washer before continuing! If it is not reinstalled, the end of the yoke will wear the output shaft bearing very quickly. If it is left in the housing, it can be picked up by the ring gear motion and cause premature axle failure.

Procedure -

1. Drain axle lubricant



2. Disconnect inner axle driveline.
3. Remove output shaft but, flat washer and yoke.
4. Disconnect differential lockout air line.
5. Disconnect main driveline. Losen inputshaft yoke nut but do not remove.
6. Remove stud nuts and axle shafts(if used, remove lockwashers and taper dowels.) If necessary, loosen dowels by holding a

brass drift in the center of the shaft head and striking the drift with a sharp blow from a hammer.

⚠ IMPORTANT

Do not strike the shaft head with a hammer. Do not use chisels or wedges to loosen shaft or dowels.

7. Remove nuts and lockwashers fastening the carrier to the axle housing. Remove the differentail carrier assembly.

⚠ WARNING

Do not lie under the carrier after fasteners are removed. Use transmission jack to support the differential carrier assemble during removal.

8. **Axle Housing Cover and Output Shaft Bearing Parts:** The bearing parts can be replaced with cover removed or installed. If necessary, remove axle housing cover. It is fastened with cap screws, nuts and lock washers.

9. Remove oil seal and discard.

10. Remove bearing retaining washer.

⚠ IMPORTANT

D341, 381(P), 401-P, 402(P), 403(P), 451-P models do not use and output shaft rear bearing retaining washer.

11. If replacement is necessary, remove snap ring, rear bearing and bearing sleeve.

⚠ WARNING

Snap ring is spring steel and may pop off. Wear safety glasses when removing.

Install Differential Carrier Assembly

Special Instructions

⚠ IMPORTANT

D341, 381 (P), 401-P, 402(P), 403(P), 451-P models do NOT use and output shaft Rear Bearing Retaining Washer.

Before installing carrier assembly, inspect and thoroughly clean interior of axle housing.

⚠ WARNING

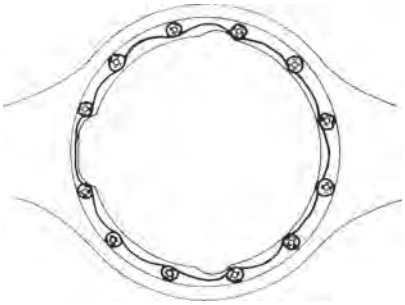
When installing differential carrier assembly, it is important to follow correct procedures to assure useful life. Failure to correctly install rear bearing and retaining washer could result in premature axle failure.

Note: Use silicone rubber gasket compound on axle housing mating surface as shown in the illustrations. Compound will set in 20 minutes. Install carrier and axle housing cover before compound sets or reapply.

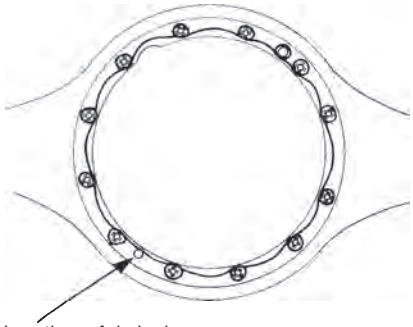
Procedure -

1. Apply silicone gasket compound. Install differential carrier assembly in axle housing. Install nuts and lock washers. Tighten to correct torque. (See Chart).

SILICONE GASKET COMPOUND PATTERN DIFFERENTIAL CARRIER MATING SURFACE



SILICONE GASKET COMPOUND PATTERN. HOUSING COVER MATING SURFACE.



Location of hole in rear cover.

Torque Chart

Size	Torque- ft. lbs. (N.m)
Differential Carrier	
5/8-18 (Grade 8 stud)	220-240 (298-325)
Axle Housing Cover	
7/16 - 20 (Grade 8 stod)	78-86 (94 - 116)
Cap screw size	
7/16 - 14 (Grade 5)	48-56 (65 - 75)
5/8 - 18 (Grade 8)	220 - 240 (298 - 325)

2. Axle Housing Cover and Output Shaft Bearing Parts. If removed, install cover and fasten with nuts, cap screws and lockwashers. Tighten to correct torque. If removed, install bearing parts (see steps 3 through 6).

3. Install output shaft rear bearing. Tap the outer race (with a sleeve or drift) until it is seated firmly in the machined pocket of the cover. Secure with snap ring.

4. Lubricate and install the rear bearing sleeve on the output shaft. Make certain it fits snugly against the shoulder at the forward edge of the shaft splines.

5. Install a new output shaft seal in the axle housing cover.*

   Note: Check carrier date – code. on units built prior to 1988, Julian calendar date code could be found on the metal tag on the differential.

   Units built before March 13,1987 (87072), seal should be flush with bottom of chamfer. Units built after March 13,1987 (87072), seal should be installed until 3/32" deeper than bottom of chamfer. Lubricate the seal diameter to prevent damage during yoke installation.

6. Slide the rear bearing retaining washer over the splines of the outer shaft until it seats flush against the output shaft bearing.

⚠ IMPORTANT

***D341, 381(P), 401-P, 402(P), 403(P), 451-P models do NOT use an output shaft Rear Bearing Retaining Washer.**

7. Install output yoke, flat washer and self-locking nut. Tighten to correct torque.

8. Install axle shafts, and stud nuts. (if used, also install lock- washers and taper dowels).

9. Connect main and inter-axle drivelines.

10. Fill axle with correct lubricant (see Lubrication Section).

11. Connect differential lockout air line.

⚠ IMPORTANT

When axle has been disassembled or housing, gears, axle shafts or wheel equipment replaced, check axle assembly for proper differential action before operating vehicle. Wheels must rotate freely and independently.

***Refer to page 13 for service information on seals, yokes & slingers.**

Note: Washer not used on axles with metric threaded nuts. Reference bulletin AXIB-9409.

Power Divider Replacement (with differential carrier assembled to axle housing)

Special Instructions

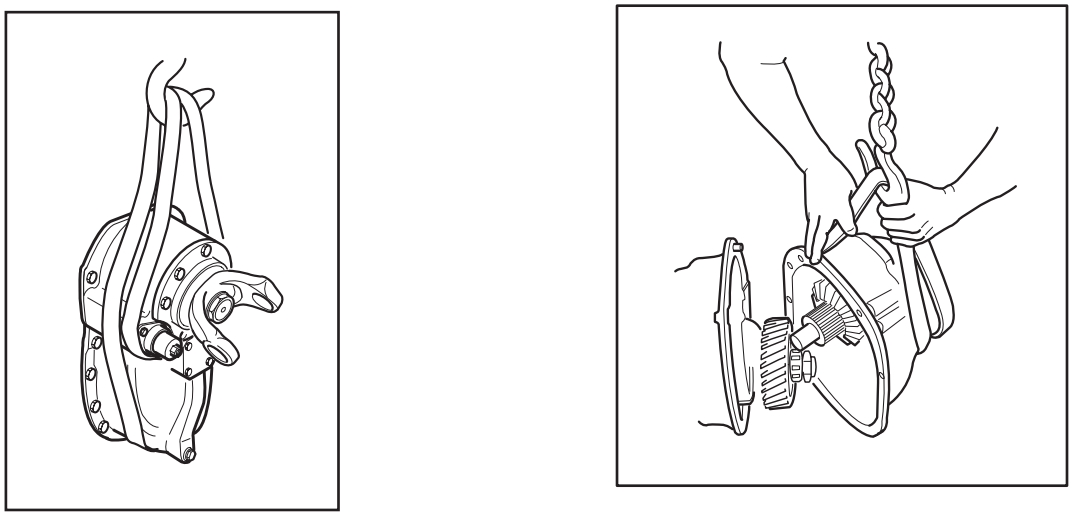
The power divider can be replaced with the axle assembly in or out of chassis and with differential carrier assembled to axle housing.

⚠ WARNING

During removal and installation, the power divider assembly must be supported as a safety precaution. During removal or installation, the Inter-axle differential may fall from carrier. Exert caution to prevent damage or injury.

Procedure - Removing and Installing Power Divider

1. With axle out of chassis, use chain hoist. Fasten chain to input yoke to remove power divider.



Removing Power Divider with Chain Hoist and Sling

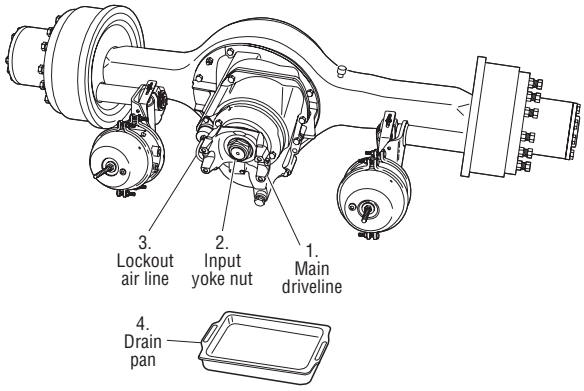
Note: Lifting mechanism may create nicks and burrs on input yoke. Remove if present,

2. With axle installed in chassis, use a transmission jack or a chain hoist and a sling. Wrap sling strap around power divider and attach to chain hoist hook as shown in drawings.

Power Divider Replacement

Procedure - Remove Power Divider from Differential Carrier

1. Disconnect main driveline.



2. Loosen, but do not remove input yoke nut.

3. Disconnect lockout air line.

4. Position drain pan under power divider cover.

5. To remove power divider assembly, remove cover cap screws and lock washers. Support power divider (see instructions above). Then, tap back-face of input yoke to dislodge cover from differential carrier. If cover does not dislodge easily, strike the sides of the cover near the dowel pin locations (see illustration). Drain lube.

⚠ CAUTION

During removal of power divider, the Inter-axle differential may fall from carrier. Exert caution to prevent damage or injury.

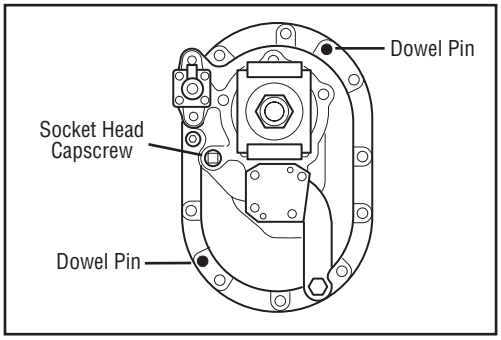
6. Pull power divider assembly forward until it is completely free of carrier, then remove the assembly.

7. With power divider removed, the inter-axle differential can be lifted off output shaft side gear .

Note: Late model axles may be equipped with a compression spring and thrust button mounted between the input shaft and output shaft .

8. Output Shaft. If necessary, remove output shaft as follows: Disconnect inter-axle driveline. Remove nut, flat washer and output shaft yoke. Pull output shaft assembly out of carrier.

9. Axle Housing Cover and Output Shaft Bearing Parts. If necessary, remove these parts following instructions.



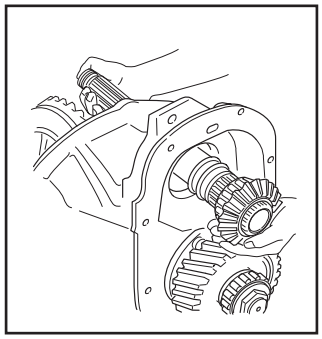
Install Power Divider on Differential Carrier

Special Instructions

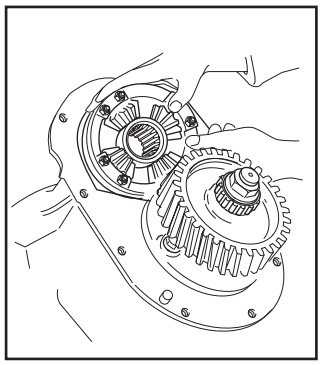
Lubricate all parts before installation.

Procedure -

1. **Axle Housing Cover and Output Shaft Bearing Parts.** If removed, install these parts following instructions on page 27.

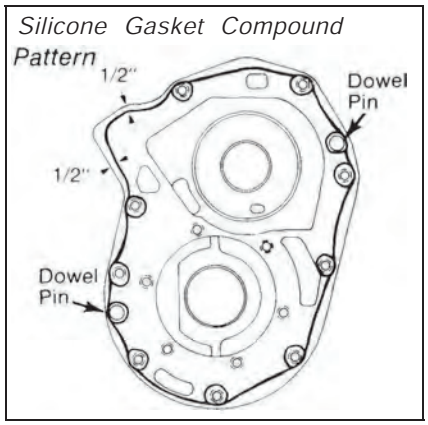


2. **Output Shaft.** If removed, lubricate "O" rings, then install shaft assembly in differential carrier and housing cover. Lubricate seal lip. Make sure yoke is clean and dry, then install yoke, flat washer* and self-locking nut. Torque nut to correct specification.



Note: Late Model Axles may be equipped with a spring and thrust button mounted in end of output shaft.

3. **Inter-axle Differential**- Install this assembly on output shaft side gear (with nuts facing away from side gear).



4. **Power Divider Assembly**- Use silicone rubber gasket compound on differential carrier mating surface as shown in the illustration.

Note: Compound will set in 20 minutes. Install power divider before compound sets or reapply.

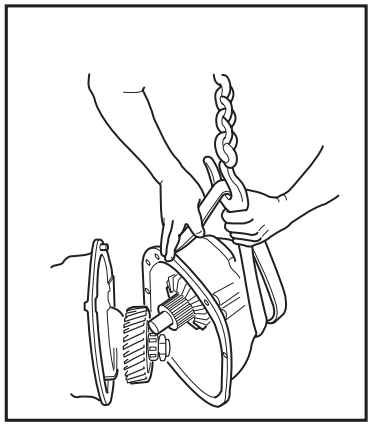
⚠ CAUTION

During installation of power divider, the inter-axle differential may fall from carrier. Exert caution to prevent damage or injury.

5. Make certain dowel pins are installed in carrier (see drawing above), then install power divider assembly.

   Use a transmission jack or a chain hoist and sling (see photo).

   During installation, rotate input shaft to engage input shaft splines with inter-axle differential, After installation, again rotate input shaft to check for correct assembly. Output shaft should turn when input shaft is rotated.

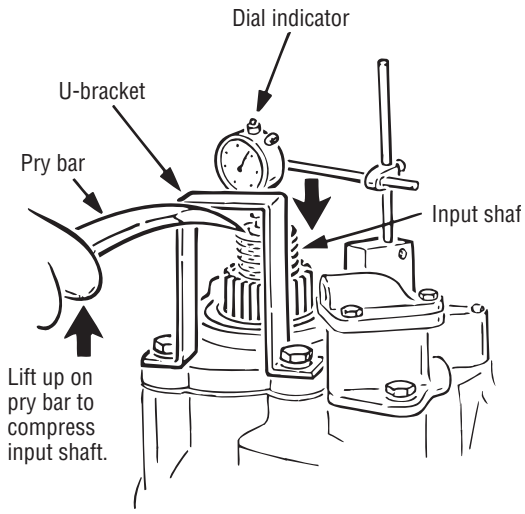


Installing Power Divider Assembly with Chain Hoist and Sling

Procedure - Installing Power Divider Assembly with Chain Hoist and Sling.

1. Install power divider cover cap screws and lock washers. On pump models only, install socket-head cap screw in correct location (see drawing on preceding page). Torque cap screw to 110-125 ft. lbs. (149-170 N.m).

2. **Check and Adjust Input Shaft End Play**- With power divider assembled to differential carrier. Check end play with dial indicator. If necessary, adjust end play. After input shaft end play is within specifications, complete assembly procedure as follows:



Measuring Input shaft End Play with Dial Indicator

3. Measuring Input Shaft End Play with Dial Indicator.

4. Connect drivelines. Connect lockout air line.

5. Fill axle to proper lube level (see Lubrication Section).

⚠ IMPORTANT

When axle has been disassembled or housing, gears, axle shafts or wheel equipment replaced, check axle assembly for proper differential action before operating vehicle. Wheels must rotate freely and independently.

*Washer not used on axles with metric threaded nuts.

Remove Differential Carrier Assembly from Axle Housing

Procedure - Install Differential Carrier Assembly

1. Drain Lubricant

2. Disconnect inter-axle driveline.

   Note: For easier disassembly, the drive pinion nut can be loosened after driveline is disconnected.

3. Remove axle shaft, stud nuts, lock washers and taper dowels (if used). If necessary, loosen dowels by holding a brass drift in the center of the shaft head and striking it a sharp blow with a hammer.

   ⚠ IMPORTANT

   Do not strike the shaft head with a hammer. Do not use chisels or wedges to loosen shaft or dowels.

4. Remove nuts and lock washers fastening carrier to axle housing. Remove differential carrier assembly.

   ⚠ WARNING

   Do not lie under carrier after fasteners are removed. Use transmission jack to support and remove differential carrier assembly.

   ⚠ IMPORTANT

   Before installing carrier assembly, inspect and thoroughly clean interior of axle housing.

   Note: Use silicone rubber gasket compound on axle housing mating surface as shown in the illustration. Compound will set in 20 minutes. Install carrier before compound sets or reapply.

Axle Housing Silicone Gasket Compound Pattern

5. Install differential carrier assembly in axle housing. Install stud nuts and lock washers. Tighten to correct torque (see chart).

   ⚠ IMPORTANT

   When axle has been disassembled or housing, gears, axle shafts or wheel equipment replaced, check axle assembly for proper differential action before operating vehicle. Wheels must rotate freely and independently.

6. Install axle shafts and stud nuts.(If used, also install lock washers and taper dowels.)

7. Connect inter-axle driveline.

8. Fill axle with correct lube [size 5/8-18 Grade 8, 220-240 Ft. lbs. (298-325 N-m)].

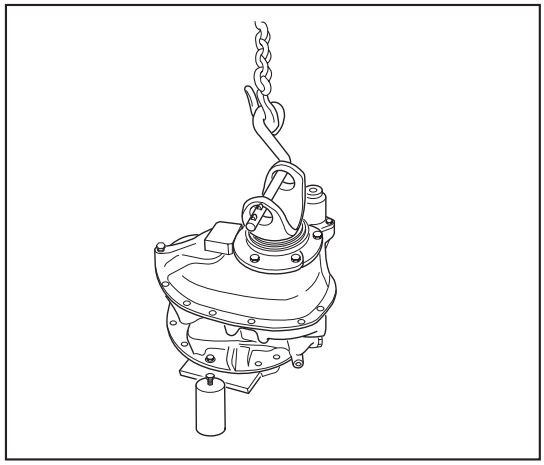
Remove Power Divider from Differential Carrier (with carrier removed from axle housing)

Special Instructions

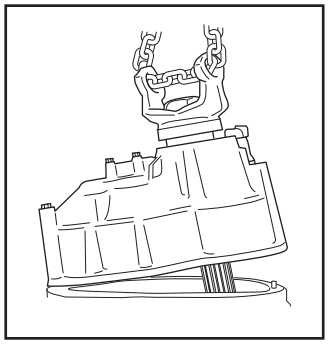
Note: It is assumed that the differential carrier and power divider assembly have been removed from axle housing prior to starting the following procedures:

Procedure -

1. Mount differential carrier in repair stand. Loosen input shaft nut.

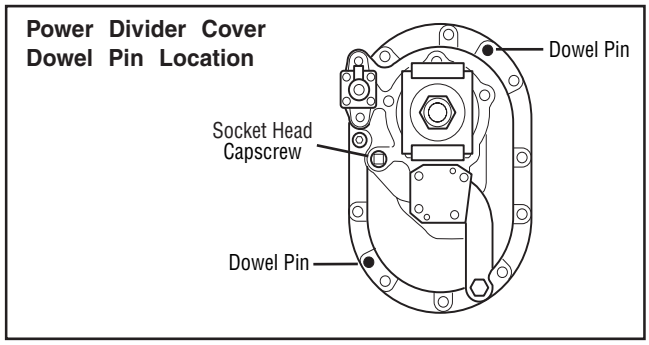


2. Remove power divider cover cap screws and lock washers.



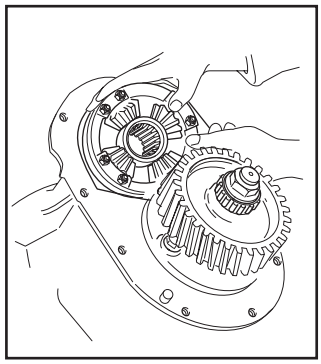
⚠ CAUTION

During removal of power divider, the Inter-axle differential may fall off input shaft from differential carrier. Exert caution to prevent damage or injury.

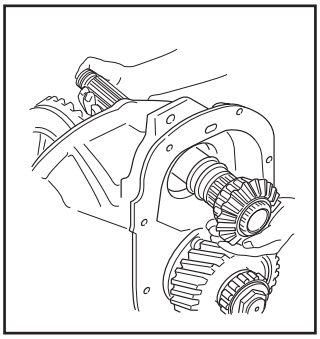


3. Attach chain hoist to input yoke and lift power divider off carrier, If power divider does not separate easily, strike the cover near the dowel pin locations with a mallet (see illustration).

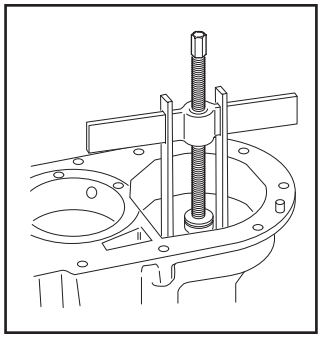
Note: Lifting mechanism may create nicks or burrs on input yoke. Remove if present.



4. Inter-axle Differential. Lift differential assembly off output shaft side gear.



5. Output Shaft. Tilt carrier and remove the output shaft assembly.



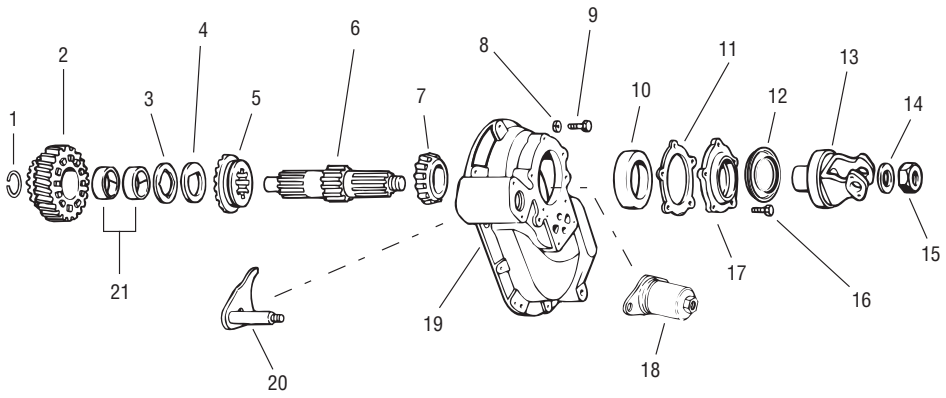
6. Output Shaft Side Gear Bearing Cup. If replacement is necessary, use puller to remove bearing cup from carrier.

   Note: Late Model Axles may be equipped with a spring and thrust button mounted between the input shaft and output shaft.

   Note: For instructions on removing axle housing cover and output shaft rear bearing parts, see page 26.

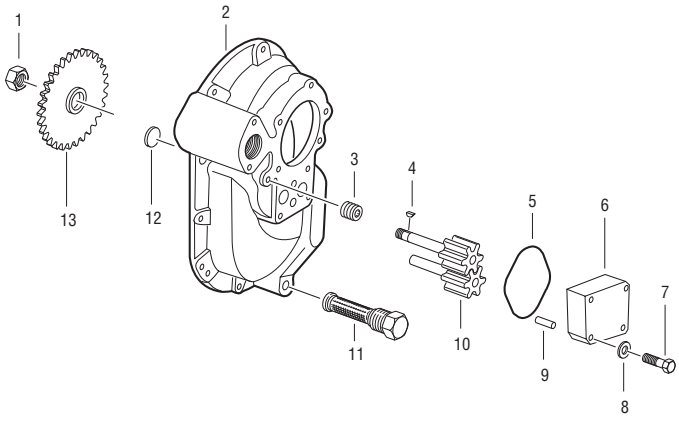
Disassemble Power Divider Cover

Power Divider Cover and Input Shaft (without Lube Pump)



1	Snap ring	9	Capscrew	17	Bearing cover
2	Helical side gear	10	Bearing cup	18	Lockout unit (See lockout service instructions for design variations
3	Thrust washer	11	Shim		
4	D washer	12	Oil seal	19	Power divider cover
5	Lockout sliding clutch	13	Yoke	20	Shift fork and push rod
6	Input shaft	14	Flat washer	21	Bushings
7	Bearing cone	15	Nut		
8	Lockwasher	16	Capscrew		

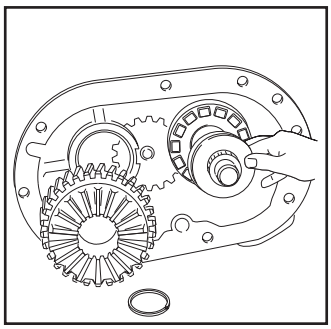
1	Lock nut
2	Power divider cover
3	Pipe plug
4	Woodruff key*
5	O-ring
6	Pump cover
7	Capscrew
8	Lockwasher
9	Dowel pin
10	Pump gears
11	Magnetic strainer
12	Expansion plug
13	Pump drive gear



***NOTE:** The drive shaft on early pump models is equipped with a woodruff key. On late pump models, the key is eliminated. The drive shaft end has two machined flats and the drive gear mounting hole is shaped to accommodate these flats.

Procedure -

1. Remove snap ring from machined groove at rear of input shaft.



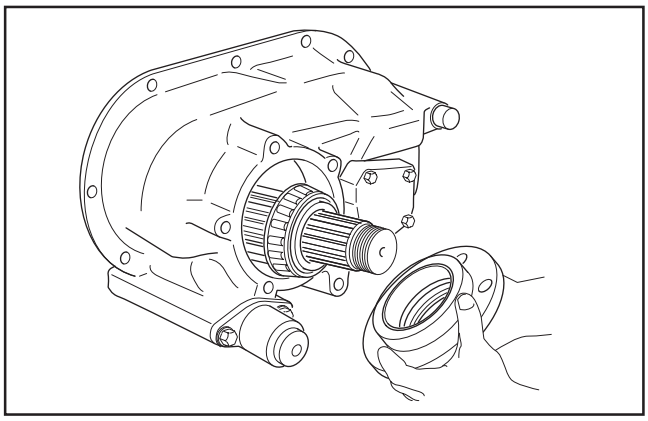
⚠ WARNING

Snap ring is spring steel and may pop off wear safety glasses when removing. with snap ring removed, the helical side gear may fall off shaft. Exert care to prevent damage or injury,

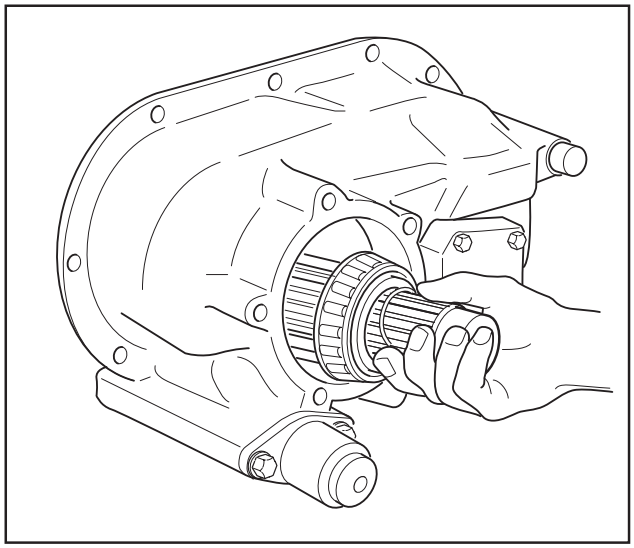
Slide helical-side gear off input shaft, then remove bronze thrust washer and "D" washer from shaft.

2. **Axles with Lube Pump**- At this point in disassembly, it is desirable to remove lube pump drive gear nut. Hold input shaft yoke to secure drive gear, then loosen and remove drive gear nut.

3. Remove nut, flat washer and yoke from input shaft.



4. Remove cap screws lock-washers and input bearing cover and shim pack.

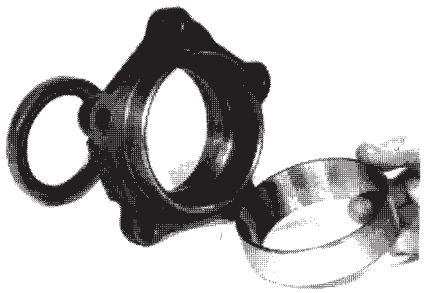


5. Slide input shaft assembly out of cover. Remove bearing spacer from shaft (used only on D340, 380(P), 400-P).

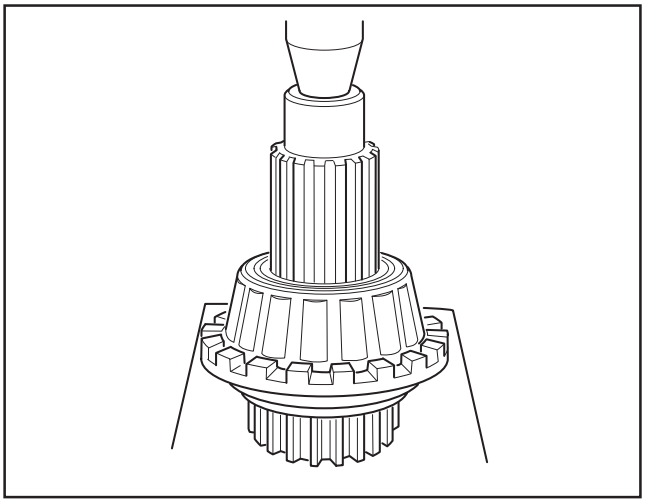
6. **Remove Lockout, Sliding Clutch and Shift Fork**.. Starting with axles built early in 1991, the sliding clutch and helical slide gear curvic teeth diameter was increased to provide greater tooth engagements. For additional parts and service information, refer to Bulletin 91-01.

   To remove the larger-diameter sliding clutch, first remove the lockout (see pages 40-42). Then remove the sliding clutch and shift fork (with the two parts engaged). Grasp the assembly by hand and maneuver the assembly past restrictions in the power divider cover.

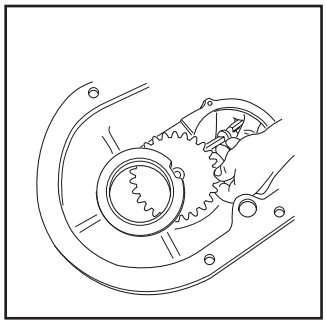
   To remove the smaller-diameter sliding clutch, (used on earlier model axles), the clutch can be disengaged and removed without removal of the lockout and shift fork.



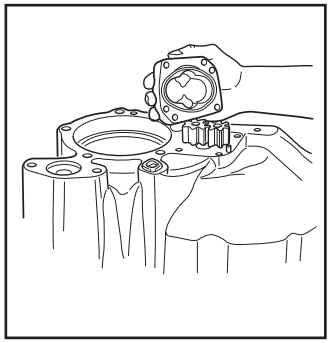
7. Remove oil seal from input bearing cover. Remove bearing cup from cover.



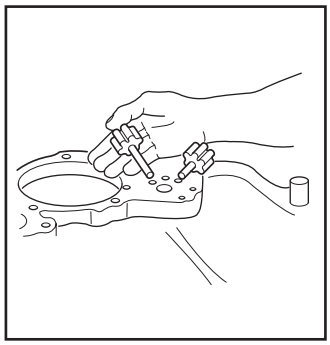
8. Remove input shaft bearing cone. Temporarily place lockout sliding clutch over rear of input shaft, teeth toward bearing cone. Place shaft in press and remove bearing cone.



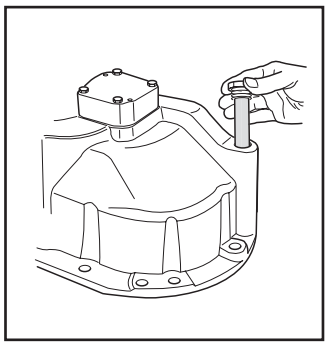
9. Axles with Lube Pump: With drive gear locknut previously removed (step 2) and working through power divider cover input shaft bore, gently pry oil pump drive gear from its shaft. See steps 10 through 12 for pump disassembly.



10. Remove oil pump cover cap screws and lock washers. Remove pump cover and "O" ring.



11. *__NOTE:__ When used, remove woodruff key from gear shaft. Remove pump gears from power divider cover.



12. Unscrew and remove magnetic screen from power divider cover.

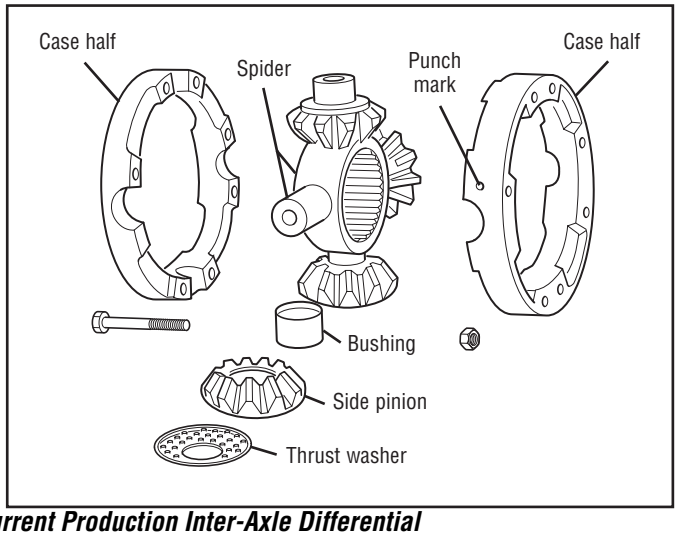
Disassemble Inter-axle Differential

Procedure -

1. Punch mark differential case halves for correct position during reassembly.
2. Remove locknuts and bolts. Separate case halves and remove thrust washers, side pinions, bushings, and spider.

   Note: Side Pinion Bushings. Not used on tandems built after November 1, 1991. Use when originally equipped.

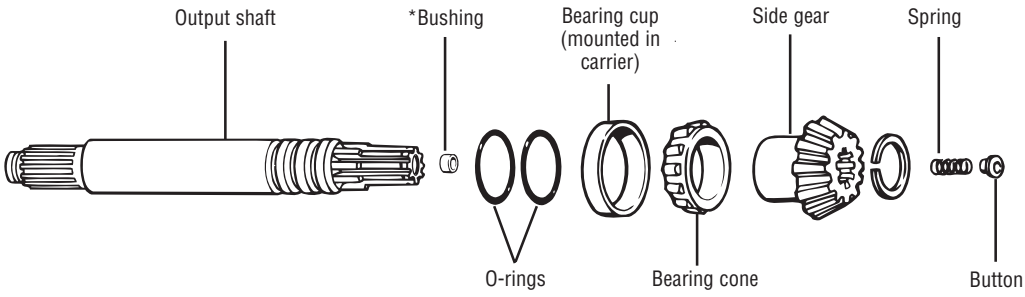
   Current production Inter-Axle Differential Assemblies are only serviced as a complete assembly.



Non-Current Production Inter-Axle Differential

Disassemble Output Shaft

Output Shaft Assembly

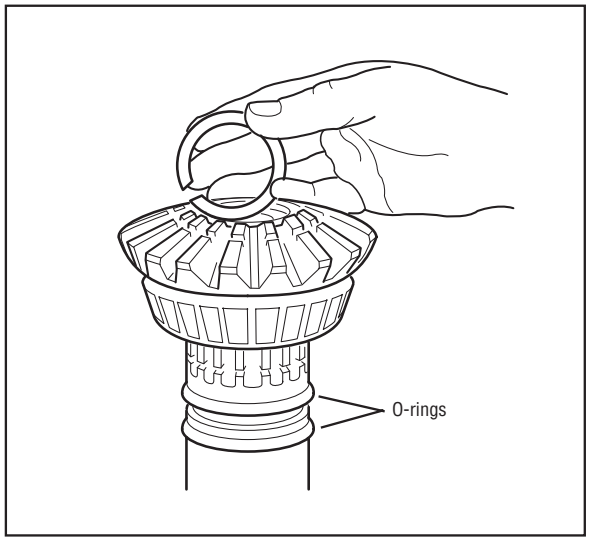


NOTE: Late Model Axles may be equipped with a spring and thrust button mounted between the input shaft and output shaft.

*Bushing removed from current production axles in Sept. 1994. Output shafts with P/N 129016 do not use bushings.

Procedure -

1. Mount shaft assembly in vise using brass vise jaw protectors. Remove outer snap ring, side gear and bearing cone assembly. If replacement is necessary, remove inner snap ring.



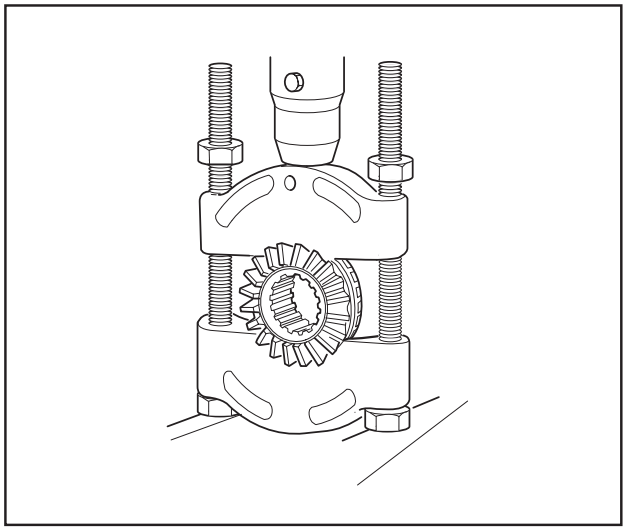
⚠ WARNING

Snap ring is spring steel and may pop off, wear safety glasses when removing.

2. Remove output shaft "O" rings, If replacement is necessary, remove bushing mounted in end of output shaft. (NOTE 1) .

3. Remove bearing cone from side gear using press and split-type puller.

Note: For instructions covering output shaft rear bearing parts, see page 26.



Removing Bearing Cone from Output Shaft Side Gear

Note: Starting in June 1993, production axles were made with bushing less output shaft 128736. Do not attempt to install bushings in shafts with P/N's 128736 or 129194* stamped into them. Ref. bulletin AXIB-93-06 *(output shaft w/metric threads used in axles after 1-3-95).

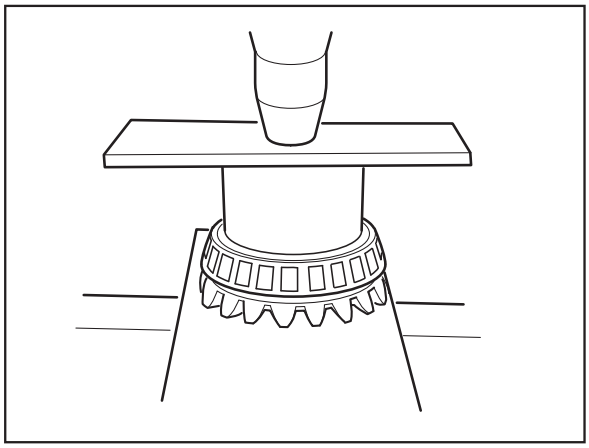
Assemble Output Shaft

Special Instructions

Lubricate parts with gear lube during assembly.

Procedure -

1. Press bearing cone on output shaft side gear.

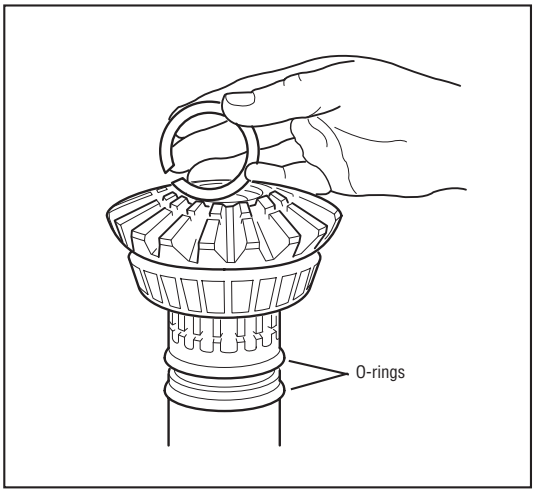


⚠ IMPORTANT

Provide protection against possible gear teeth damage during press operation.

2. Mount output shaft in vise. Lubricate and install "O" rings. If removed, install bushing in end of output shaft. (NOTE 1)

3. If removed, install inner snap ring on shaft, then install side gear and bearing cone assembly, and outer snap ring.



⚠ WARNING

SNAP RING IS SPRING STEEL AND MAY POP OFF. WEAR SAFETY GLASSES WHEN INSTALLING.

Note: Late Model Axles may be equipped with a spring and thrust button mounted between the input shaft and output shaft (see page 54).

Assemble Inter-axle Differential

Special Instructions

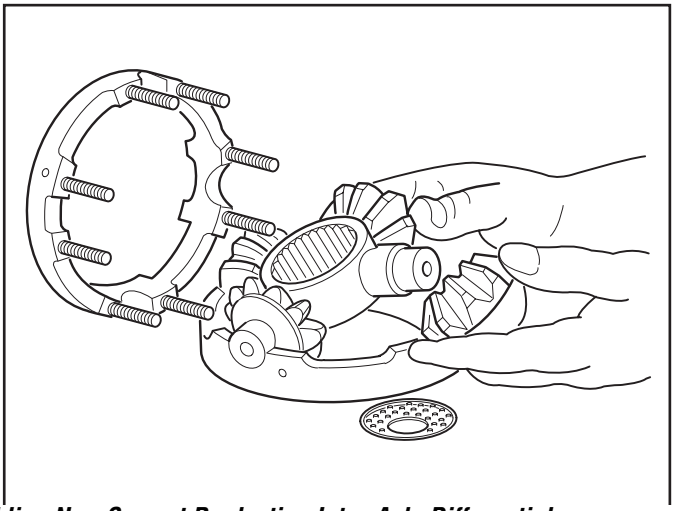
Lubricate parts with gear lube during assembly

Procedure -

1. Install bushings, side pinions and thrust washers on inter-axle differential spider.

2. Install spider assembly in one differential case half, align punch marks and install other case half, secure assembly with bolts and locknuts, tighten to correct torque (17-23 ft. lbs, 23-31 N.m).

   Note: Side Pinion Bushings. Not used on tandems built after November 1, 1991. Use when originally equipped.

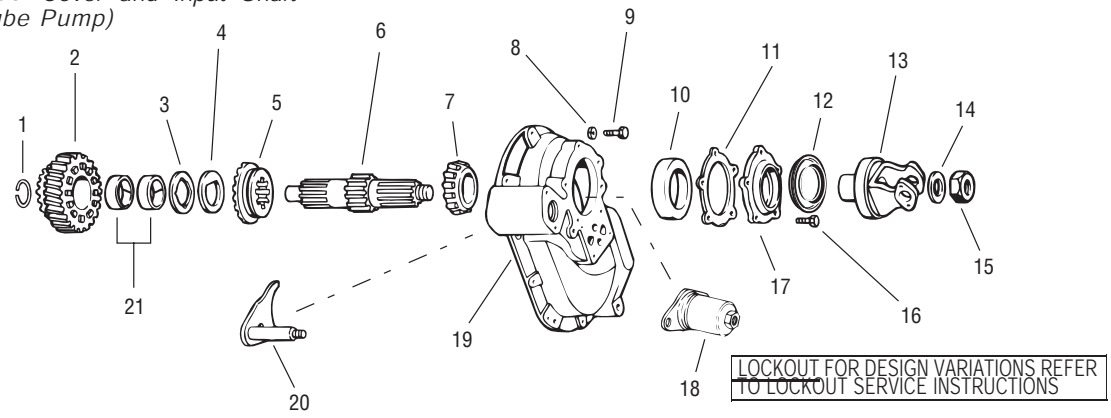


Assembling Non-Current Production Inter-Axle Differentials

Note: Starting in June 1993, production axles were made with bushing less output shaft 128736. Do not attempt to install bushings in shafts with P/N's 128736 or 129194* stamped into them. Ref. bulletin AXIB-93-06* (output shaft w/metric threads used in axles after 1-3-95).

Assemble Power Divider Cover

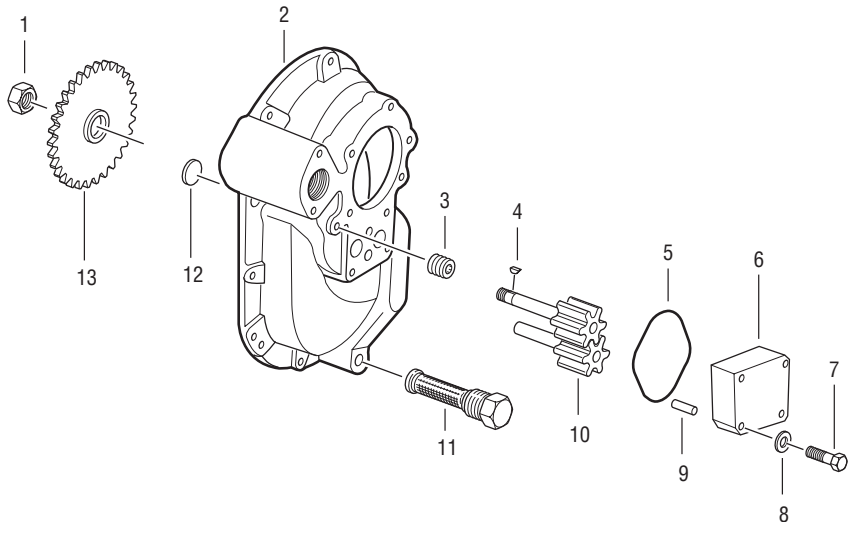
Power Divider Cover and Input Shaft (without Lube Pump)



1	Snap ring	9	Capscrew	17	Bearing cover
2	Helical side gear	10	Bearing cup	18	Lockout unit (See lockout service instructions for design variations
3	Thrust washer	11	Shim	19	Power divider cover
4	D washer	12	Oil seal	20	Shift fork and push rod
5	Lockout sliding clutch	13	Yoke	21	Bushings
6	Input shaft	14	Flat washer		
7	Bearing cone	15	Nut		
8	Lockwasher	16	Capscrew		

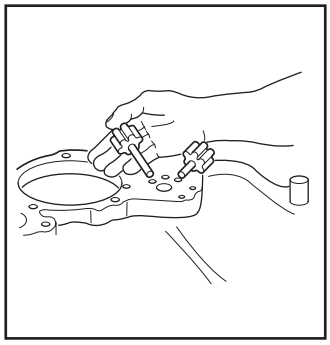
Power Divider Cover with Lube Pump.

1	Lock nut
2	Power divider cover
3	Pipe plug
4	Woodruff key*
5	O-ring
6	Pump cover
7	Capscrew
8	Lockwasher
9	Dowel pin
10	Pump gears
11	Magnetic strainer
12	Expansion plug
13	Pump drive gear



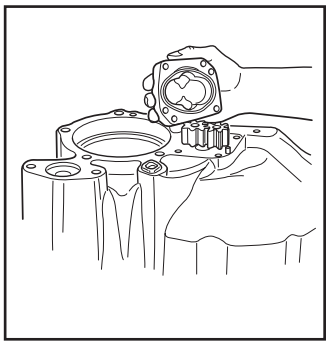
***NOTE:** The drive shaft on early pump models is equipped with a woodruff key. On late pump models, the key is eliminated. The drive shaft end has two machined flats and the drive gear mounting hole is shaped to accommodate these flats.

Note: Axles with Lube Pump. Assemble and install lube pump and magnetic screen. See steps 1 to 4.

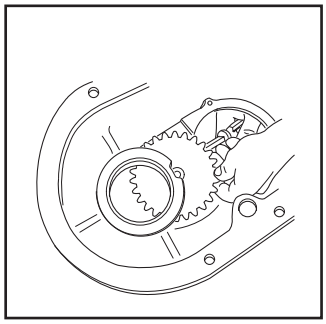


Procedure -

1. See note on exploded view. Install pump gears in power divider cover (position gear with long shaft in opening adjacent to input shaft).



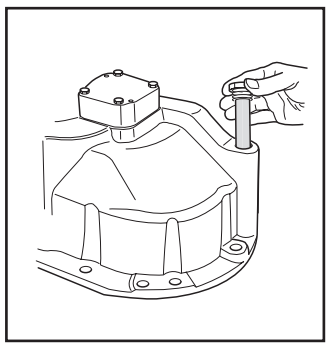
2. Install "O" ring in pump cover, making sure "O" ring is seated firmly in cover. If removed, install dowel pins. Install pump cover on power divider cover and secure with cap screws and lock washers. Tighten to correct torque (85-105 in. lbs., 10-12 N.m).



3. Install Pump Drive Gear. Install drive gear on pump shaft end.

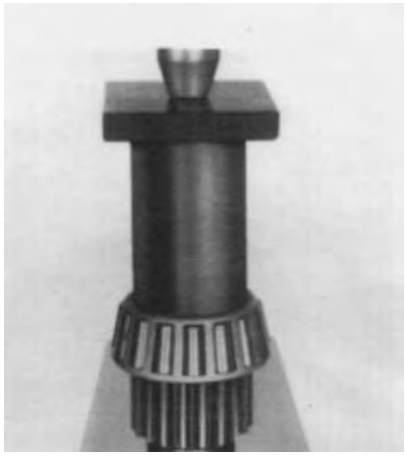
   Note: Some pump drive shafts use a woodruff key. When key is used. place key in shaft slot. Position gear on shaft engaging key. Then install gear with driver and hammer.

   Note: Install and tighten drive gear nut after input shaft is assembled to power divider cover (see step 10).



4. Install magnetic screen in power divider cover. Tighten to correct torque (40-60 ft. lbs., 54-81 N.m).

5. Press bearing cone on input shaft.



⚠ IMPORTANT

To prevent bearing damage, be careful to use sleeve that only contacts the inner race of bearing cone.

6. **SEAL INSTALLATION IMPORTANT:** Before installing seal, refer to page 13 for service information on Seals, Yokes & Slingers.

Press oil seal in cover using a seal driver or suitable sleeve.

Note: Check carrier date code (see page 27, note before 5). Units built before October 26, 1987 (87299), seal should be flush with bottom of chamfer. Units built after October 26, 1987 (87299), seal should be installed until 3/32" deeper than bottom of chamfer.

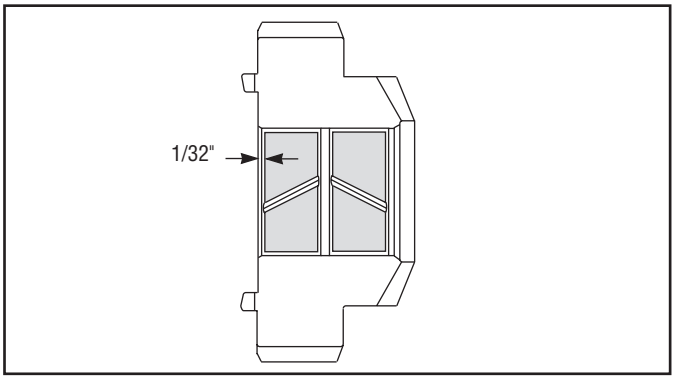
Press bearing cup in input bearing cover.

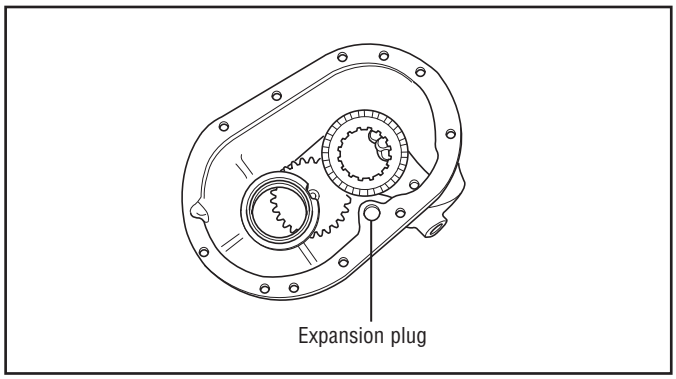
⚠ IMPORTANT

For correct cup installation, use appropriate sleeve. Take care to make sure cup is not cocked and is firmly seated all around.

7. Install bronze bushings in helical-side gear.

Note: Helical Gears made after 1/3/95 have a "step" at the end of Inner Bore. Bushings must reinstalled from the Curvic Tooth side, inward towards this step. Press flush against the shoulder of the step.

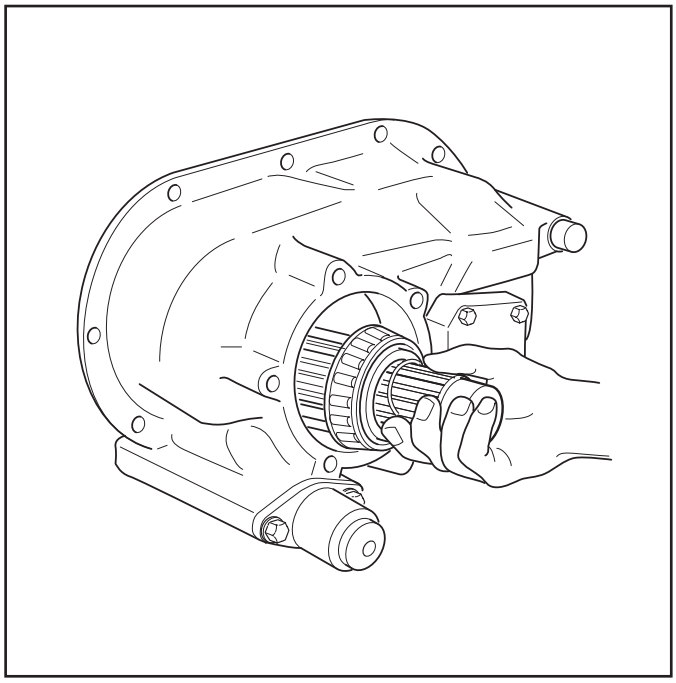




8. Check expansion plug in power divider cover (see photo) to make sure it is in place and firmly seated. If loose, seat by tapping with a hammer. Replace plug if necessary.

   Assemble lockout shift fork and sliding clutch with clutch teeth facing the helical-side gear, then install this assembly in power divider cover.

   Note: At this point in reassembly, assemble and install lock-out (see pages 40-42).



9. Slide input shaft and bearing assembly into power divider cover from the front side. Engage shaft splines in lock-out clutch.

   Install bearing spacer on input shaft (used only on D340, 380, 380-P, 400-P). Temporarily install input bearing cover assembly, cap screws and lock washers.

   Note: Do not install any shims under bearing cover at this time. Correct shim pack will be determined after the power divider is installed on differential carrier (Refer to "Adjust Input Shaft End Play" page 39).

   ⚠ IMPORTANT

   For Axles with Spring and Thrust Button between input shaft and output shaft: For preliminary adjustment of input shaft end play, install a 0.045" (0.024 mm) shim pack under bearing cover (see Service Bulletin Supplement, page 54). Tighten bearing cover cap screws finger-tight. Install input yoke, flat washer and nut. Temporarily tighten nut snugly.

10. **Axles with Lube Pump: Install and tighten lube pump drive gear locknut, holding input shaft to secure gear. Torque nut to 35-45 ft. lbs. (47-61 N.m).**

11. Slide "D" washer over input shaft up to base of sliding clutch splines.

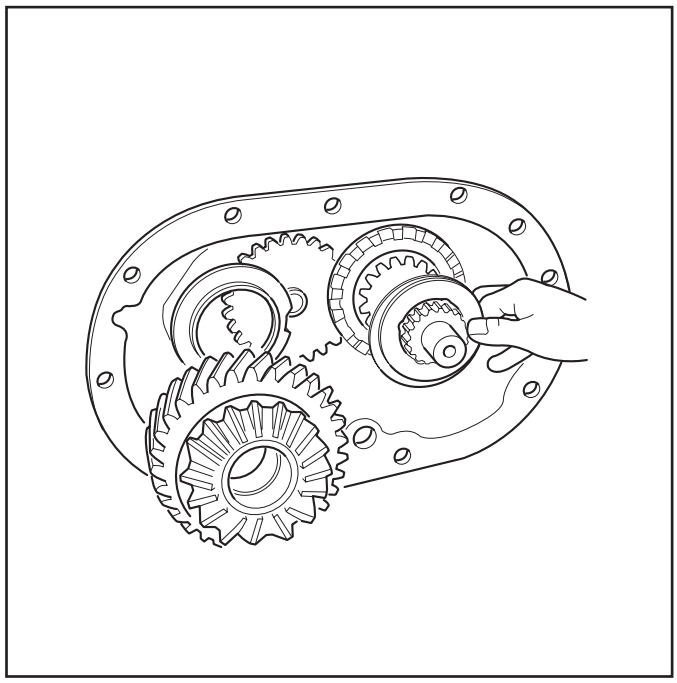
    Note: Make sure flat part of washer inside diameter engages shaft properly.

    Install bronze washer. Install helical gear. Secure with snap ring.

    ⚠ WARNING

    Snap ring is spring steel and may pop off. Wear safety glasses when installing.

12. Install power divider cover assembly on differential carrier (see page 38).



Install Power Divider on Differential Carrier (with carrier removed from axle housing)

Special Instructions

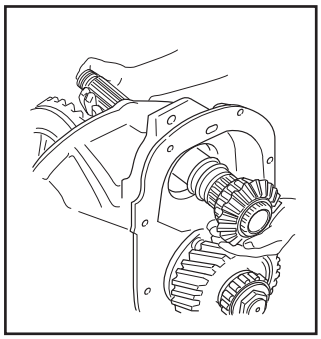
Note: The following instructions pertain to installation of power divider on differential carrier with carrier removed from axle housing.

Note: Before installing power divider, install related parts as follows

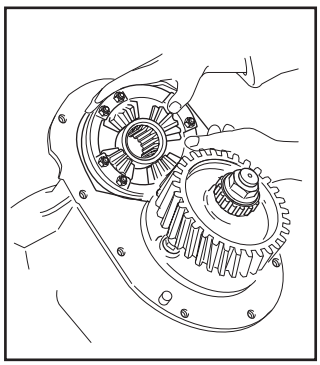
Procedure -

1. Output Shaft Side Gear Bearing Cup. If removed, press bearing cup in carrier. Use a press and appropriate sleeve or use a brass drift and a mallet. Tap bearing cup into its' bore making certain cup is evenly and firmly seated.

   Note: Late Model Axles may be equipped with a spring and thrust button mounted between the input shaft and output shaft (see page 54).

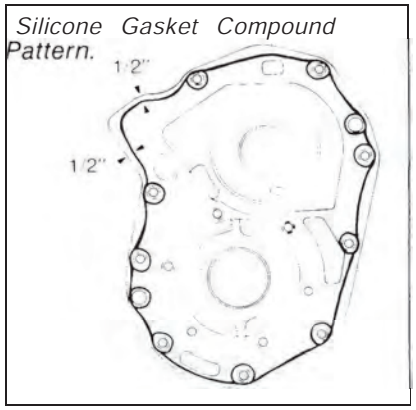


2. Output Shaft. Lubricate "O" rings, then install output shaft assembly in carrier.



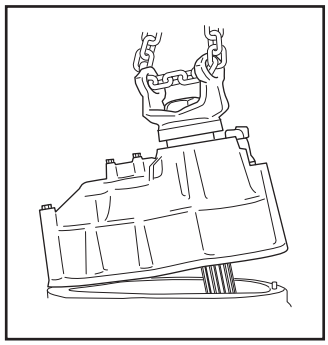
3. Inter-axle Differential. Install differential assembly on output shaft side gear (with nuts facing away from output shaft side gear).

4. Apply silicone gasket compound on carrier mating surface (see illustration).

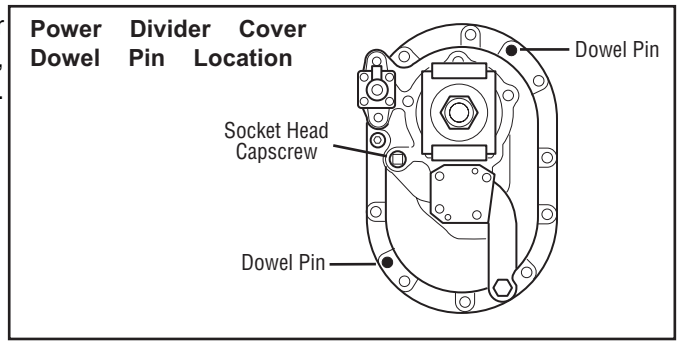


5. Install Power Divider. Attach chain hoist to input yoke and install power divider assembly During installation, rotate input shaft to engage input shaft splines with inter-axle differential. After installation, again rotate input shaft. Output shaft should turn when input shaft is rotated if assembly is correct.

   Note: Lifting mechanism may create nicks and burrs on input yoke. Remove if present.



6. If removed, install dowel pins in carrier. Install power divider cover cap screws and lock-washers. (On pump models only, place socket-head cap screw at location shown on drawing. Torque cap screws to 110-125 ft. lbs. (149-170 N.m).



7. Adjust Input Shaft End Play. Adjust end play with the power divider assembled to the differential carrier. (See page 39.)

Measure and Adjust Input Shaft End Play

Special Instructions

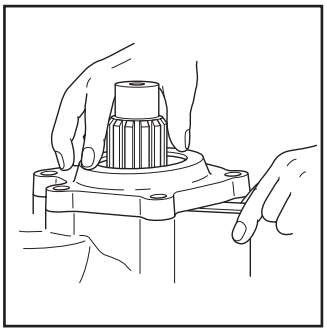
Note: After power divider overhaul and installation in power divider, check and adjust input shaft end play.

Correct end play when new parts are used in overhaul is 0.003" to 0.007", with reused parts 0.013" to 0.017". Refer to page 15 for other variations.

⚠ IMPORTANT

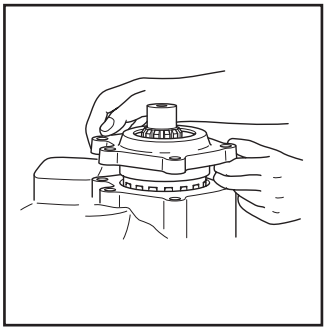
September 1988, A Spring and a Thrust Button were added between the input and output shafts. End play tolerances are the same for axles with or without this Spring and Button. However, end play measurement procedure is different than described below. Refer to Service Bulletin Supplement at back of this manual for procedure variances.

Procedure -



1. Remove input shaft nut, flat washer and yoke. Remove input bearing cover cap screws and lock washers. Remove bearing cover (and shim pack if installed).

2. Reinstall bearing cover without shims. Hold in position with hand pressure and measure clearance between power divider cover and bearing cover, using a feeler gauge.

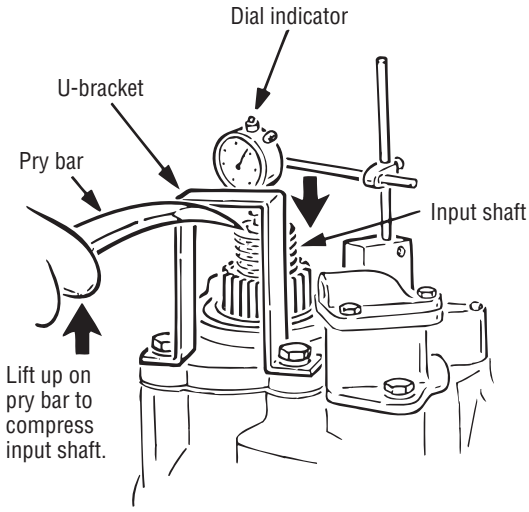


3. The bearing cover clearance measured in Step 2 plus 0.005" will equal shim pack thickness required for desired end play (rebuild with new parts). Add 0.015" to shim pack for rebuild with used parts.

   Install shim pack and bearing cover. Install cap screws and lock-washers, Torque screws to 75-85 ft. lbs. (101-115 N.m).

4. Install yoke, flat washer and nut. Tighten nut snugly. Tap end

of input shaft lightly to seat bearings.



5. Check input shaft end play with dial indicator positioned at yoke end of input shaft. Move input shaft axially and measure end play. If end play is correct, seal shim pack to prevent lube leakage then torque input shaft nut and cover cap screws (see chart).

6. If end play is incorrect, change shim pack size, as follows:

Add shims to increase end play.

Example: Desired end play (New Parts): 0.003" to 0.007"

Measured end play (Step 6): 0.001" - 0.001"

Add shims to provide desired end play: 0.002" to 0.006"

Remove shims to decrease end play.

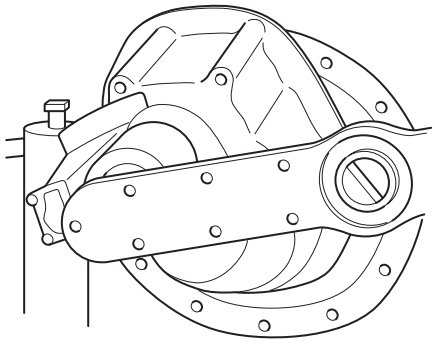
Example: Measured end play (Step 6): 0.015" - 0.015"

Desired end play (New Parts): 0.003" to 0.007"

Remove shims to provide desired end play: 0.012" to 0.008"

7. To add or remove shims, remove input shaft nut, flat washer and yoke. Remove cap screws, lockwashers and bearing cover. Add or remove shims as required.

8. Install bearing cover, cap screws and lockwashers. Install yoke, flat washer and nut. Seal shim pack to prevent lube leakage then torque input shaft nut and cover cap screws (see chart).



Torque Chart

Size	Ft. lbs.	N.m
Input Shaft Nut		
1-5/8 -18	780-960	1057-1301
M42 x 1.5	840-1020	1140-1383
Bearing Cover Cap Screw		
1/2-13 (Grade 5)	75-85	101-115

*Metric Nut used in Production Axles after 1/3/95

Inter-Axle Differential Lockout Overhaul.

"Standard" or "Current" Model Lockout Overhaul

Special Instructions

Three differential model lockouts are used on Dana Tandem Axles. To identify the lockout used on your axle, refer to the illustrations and related service instructions below.

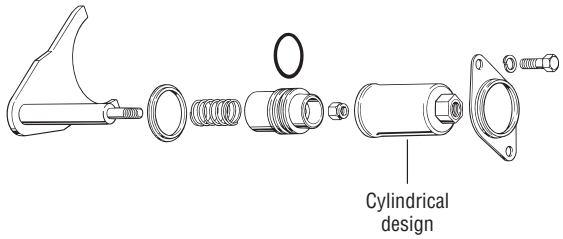
“Standard” Lockouts (Current and Non-Current Models). The “current” model is an improved version of and replaces the “non-current” lockout. Both are air-operated to engage the lockout and spring-released to disengage the lockout.

Dana Axles may be equipped with either of these lockouts. The “current” model is interchangeable with the “non-current” model as an assembly. For service information, refer to the following page.

“Reverse-Air” Lockout. The “Reverse-Air” lockout is spring- operated to engage the lockout and air-operated to disengage the lockout. This model is similar to the “non-current” “standard” lockout. It is not available in the new “current” lockout.

Procedure - Disassemble and Remove Lockout.

1. With axle installed in vehicle, place differential lock selector valve in the disengaged (or unlocked) position. Disconnect the air line at the lockout piston housing.



"Standard" "Current" Model Lockout

2. Remove cap screws and lock washers fastening mounting bracket to power divider cover. Remove bracket and piston housing.

3. Remove locknut, piston with “O” ring, compression spring and shoulder washer from push rod.

   Note: The shift fork and push rod cannot be removed with power divider cover installed (see Power Divider instructions).

Procedure - Assemble and Install Lockout

1. With shift fork and sliding clutch installed, place the shoulder washer (white plastic) over push rod. The large diameter side of the washer must face the power divider cover.

2. Install compression spring on push rod.

3. Lubricate “O” ring with silicone-based lubricant and install “O” ring on piston.

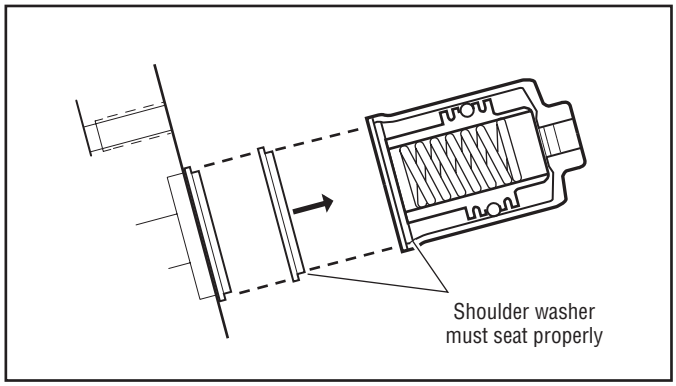
4. Place piston assembly on push rod. The large diameter end of piston must face power divider cover.

5. Install locknut on push rod and tighten to 13-17 lft. lbs. (l8-23 N.m).

6. Install piston housing, making sure the housing is correctly seated and piloted in the shoulder washer.

7. Place mounting bracket over housing and position on power divider cover. Install cap screws and lock washers and tighten to 48-56 ft. lbs. (65-76 N.m).

Note: If axle is installed in vehicle, apply sealant to air line fitting and connect air line. When tightening air line, hold piston housing in mounting position using a wrench applied to the hexagon configuration at outer end of housing.



Note: A new style “Inter-Axle Differential Lockout” was being released as this publication was being printed. If the Inter- Axle Differential Lockout Assembly on your axle is not shown in this publication, call your local Spicer representative.

"Standard" or "Non-Current" Model Lockout Overhaul

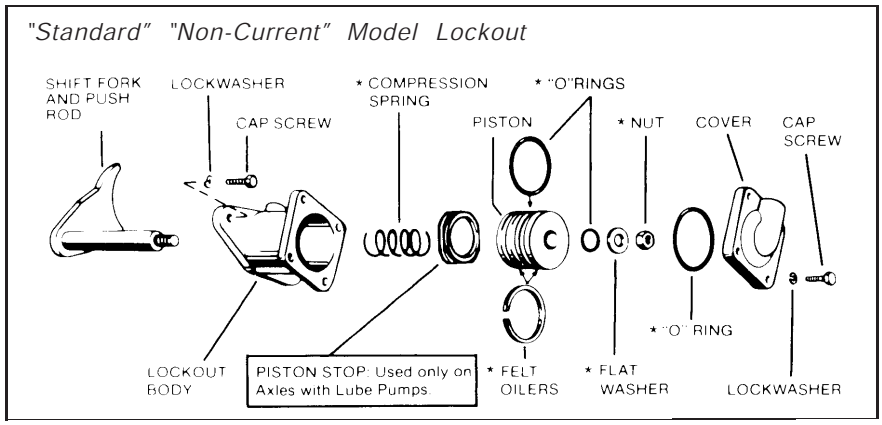
Retrofit "Non-Current" to "Current" Model Lockout
The "current" model (only as an assembly) is interchangeable with the "non-current" lockout. The original shift fork and push rod can be used for either model lockout and need not be replaced. Retrofit Kits are available to convert the "non-current" model to the "current" lockout. Parts (except the shift fork), included in these kits are shown in the illustration on the preceding page. For additional information, refer to Dana Parts Books (see back cover). Retrofit as follows:

Disassemble and remove "non-current" lockout. Refer to instructions below.

Assemble and install "current" lockout following instructions on preceding page.
Note: Do not use mounting screws from "non-current" model. They are too long to use with the new "current" model.

Special Instructions

Service Parts Availability: The "non-current" lockout assembly, body, piston and body cover are no longer available. If any of these items are not serviceable, replace lockout with the new "current" model per instructions above. For other parts, a Service Parts Kit (see illustration) is available to service the "non-current" lockout.



**Asterisk Identifies parts included in Service Kit 211201*

Note: Axles with Lube Pumps: These axle models are equipped with a piston stop located at base of piston. It is important that this stop be reinstalled in reassembly.

Procedure - Disassemble and Remove Lockout

1. Remove cap screws and lock washers fastening cover to the body. Remove cover and "O" ring.

2. Remove nut, flat washer and "O" ring from push rod.

3. Remove body cap screws and lock washers, then remove body and piston as an assembly. Remove "O" ring and felt oilers from the piston.

   Note: The shift fork and push rod cannot be removed with power divider cover installed (see Power Divider instructions).

Procedure - Assemble and Install Lockout

1. With shift fork and sliding clutch installed in power divider cover, assemble and install lockout as follows.

2. Apply silicone gasket compound to mounting surface on power divider cover. See illustration.

3. Install lockout body. Secure with cap screws and lock washers. Torque cap screws to 48-56 ft. lbs. (65-76 N.m).

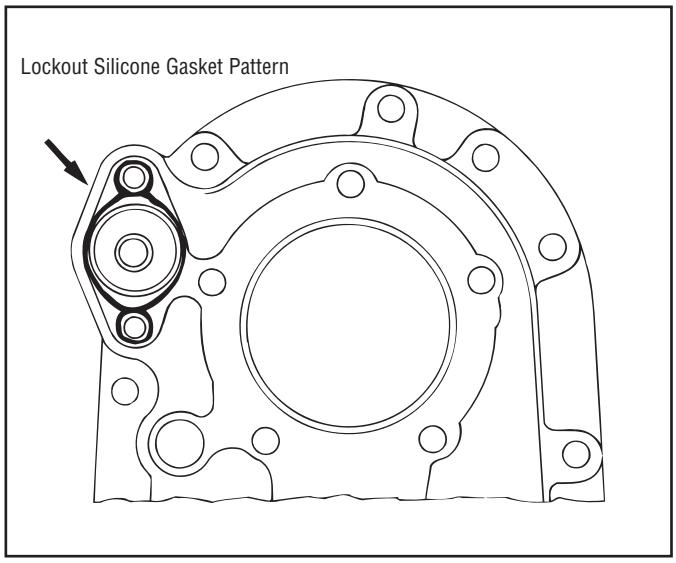
   Note: Before installation, soak piston felt oilers in SAE 30 engine oil and lubricate “O’’ rings with a high-viscosity silicone oil or barium grease “O’’ ring lubricant.

4. Install felt oilers and large “O” ring on piston.

5. Axles with Lube Pump. Before installing piston, place piston stop at base of lockout body.

6. Install compression spring over shift fork push rod. Install piston in body and secure with “O” ring, flat washer and nut. Torque nut to 20-26 ft. lbs. (27-35 N.m).

7. Install “O’’ ring in lockout body cover. Install cover and secure with cap screws and lock washers. Torque cap screws to 96-108 in. lbs. (10-12 N.m).

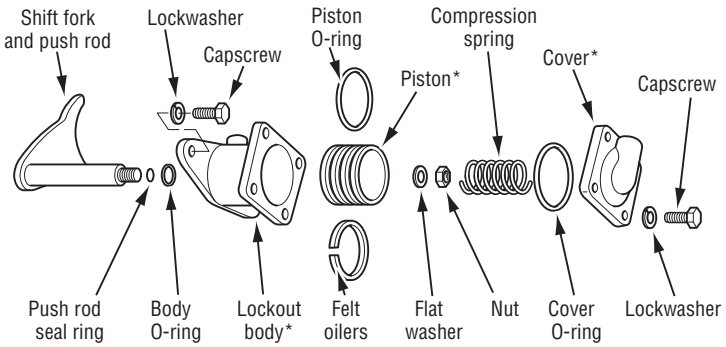


"Reverse-Air" Lockout Overhaul

The "reverse-air" lockout unit is spring-operated to engage lockout and air-operated to disengage lockout. A clutch engages or disengages the helical-side gear to lock or unlock the inter-axle differential.

Service Parts Availability
A new design of the original "Reverse-Air" Lockout has not been released at this writing. The piston, body and cover of the original lockout are no longer available as individual parts. If these parts are not serviceable, replace the complete unit. For other parts, use a Service Parts Kit (see illustration for contents). For additional information, refer to Dana Parts Books (see back cover).

"Reverse-Air" Lockout



*Non-serviceable parts

Procedure - Disassemble Lockout.

1. Remove cap screws and lock washers fastening cover to body. Remove cover, "O" ring and compression spring.

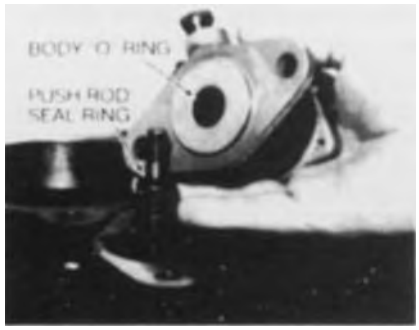
2. Remove push rod nut and flat washer.

3. Remove body cap screws and lock washers. Then remove body, body "O" ring, and piston as an assembly. Remove seal ring from threaded end of push rod.

Procedure - Assemble and Install Lockout

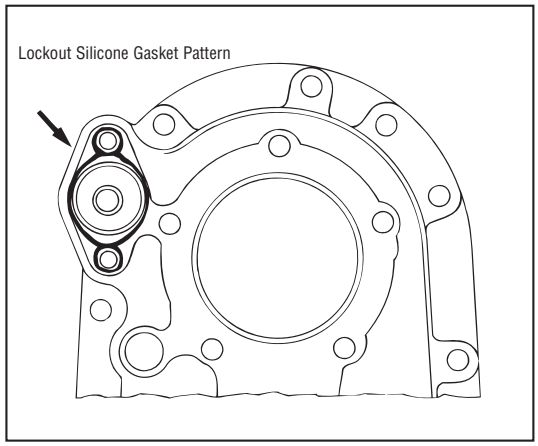
1. With shift fork and sliding clutch installed in power divider cover, assemble and install lockout as follows:

2. Install seal ring on shift fork push rod (threaded end). Install "O" ring in body.



3. Apply silicone gasket compound to lockout mounting surface (see illustration).

4. Install lockout body, cap screws and lock washers. Torque cap screws to 48-56 ft. lbs. (65-76 N.m).



5. Install felt oilers and "O" ring on piston. Install piston assembly in body and secure to push rod with flat washer and nut. Torque nut to 20-26 ft. lbs. (27-35 N.m).

   Note: Before installation, soak piston felt oilers in SAE 30 engine oil and lubricate "O" rings with a high-viscosity silicone oil or barium grease "O" ring lubricant.

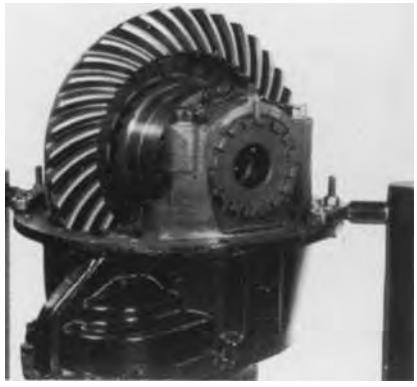
6. Place "O" ring on body cover. Install compression spring, cover, cap screws and lockwashers. Torque cap screws to 96-108 in. lbs. (10-12 N.m).

Disassemble Differential Carrier (with power divider removed)

Special Instructions

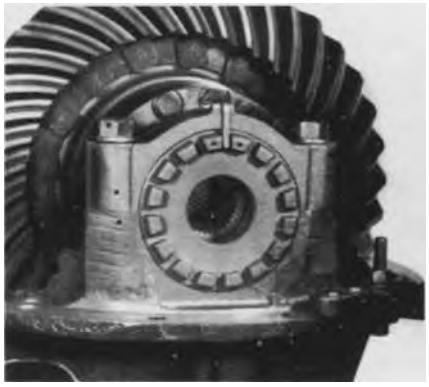
If gear set is to be reused, check tooth contact pattern and ring gear backlash before disassembling differential carrier. Best results are obtained when established wear patterns are maintained in using gearing. Omit this step if the gear set is to be replaced.

Procedure -



1. Mount differential carrier in repair stand.

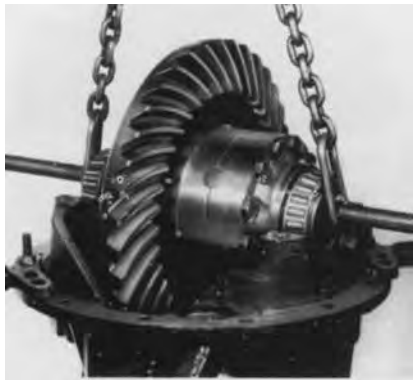
   Note: For easier disassembly, loosen but do not remove pinion self-locking nut. When forward axle pinion is equipped with slotted nut, remove roll pin with a pin punch then loosen nut.



2. Punch mark differential bearing caps. If reusing gear set, also punch mark bearing adjusters for reference during assembly.

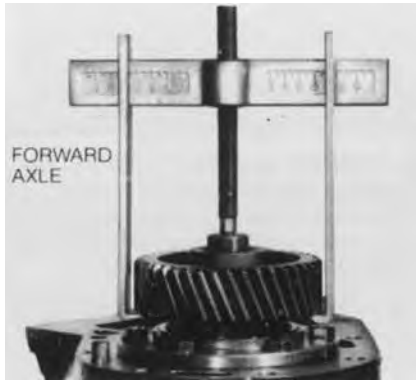
3. Cut lock-wire. Remove cap screws, flat washers and bearing caps.

4. Using a chain hoist, lift ring gear and differential assembly out of carrier.



5. **Forward Axle:** Remove pinion nut (see NOTE under Step 1). Remove helical drive gear, using puller if necessary.

   Note: Remove outer pinion bearing cone if Slip-fit.



6. **Forward Axle:** Remove pinion bearing cage cap screws. Remove drive pinion and cage assembly from carrier. Remove shim pack.

7. **Rear Axle:** Remove pinion bearing cage cap screws, then drive pinion, cage and yoke assembly out of carrier.

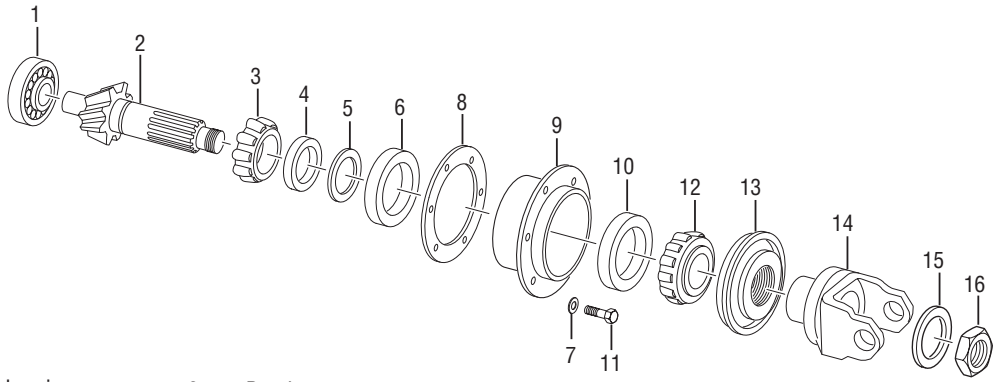
   ⚠ IMPORTANT

   Do not allow pinion to drop on hard surface. Remove shim pack.

   Forward and Rear Axle: If gear set is to be reused, keep pinion bearing cage shim pack intact for use in reassembly. If the original shims cannot be reused, record the number and size of shims in the pack.

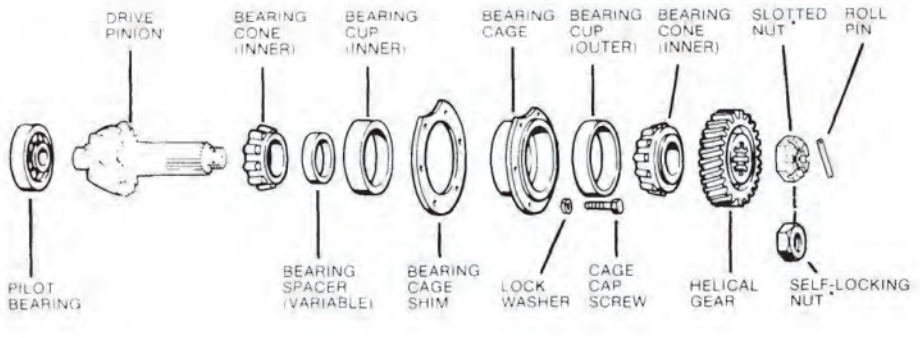
Disassembly Drive Pinion

Rear Axle Pinion Illustrated.



1	Pinion pilot bearing	9	Bearing cage
2	Drive Pinion	10	Bearing cup (outer)
3	Bearing cone (inner)	11	Cage capscrew
4	Spacer washer	12	Bearing cone (outer)
5	Bearing spacer (variable)	13	Oil seal
6	Bearing cup (inner)	14	Input yoke
7	Lockwasher	15	Flat washer
8	Bearing cage shim	16	Pinion nut

Forward Axle Pinion Illustrated.



D341, 381(P), 401-P, 402(P), 403(P), 451-P use self-locking or slotted nut and roll pm. Metric self-locking nuts used as of 1-3-95.
D340, 380(P), 400-P use self-locking nut only.

Note: Dana drive axles may be equipped with either slip-fit or press-fit outer pinion bearings. Procedures are contained in-this section for disassembly of both types.

Special Instructions

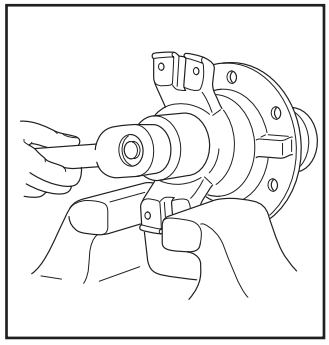
⚠ IMPORTANT

During the following yoke removal procedure, the drive pinion may fall out of bearings and cage. Do not allow pinion to drop on hard surface.

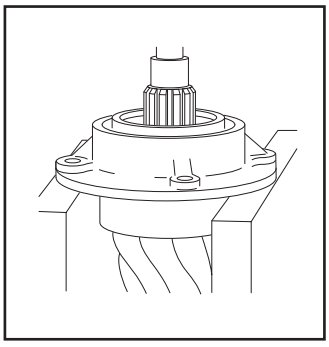
Procedure -

1. Rear Axle Pinion Yoke: Remove yoke. If pinion nut was not loosened during earlier disassembly, clamp assembly in vise jaws, use brass pads to prevent damage.

   Loosen and remove pinion nut and flat washer.

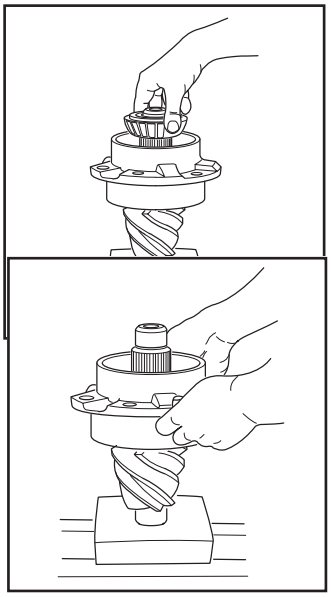


2. Forward and Rear Axle Pinion Bearing Cage: For pinion with press-fit bearing cone, support cage and press pinion out of bearing cage and bearing cone.

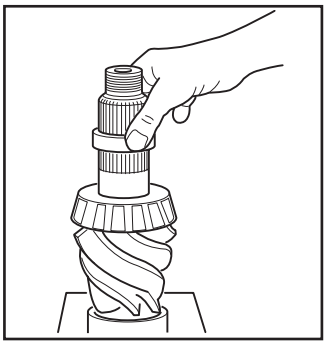


3. For pinion with slip-fit bearing cone, the cage, outer bearing and pinion can usually be disassembled easily without a press. If difficulty is experienced, use a press.

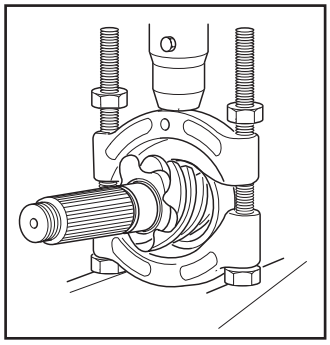
4. Removing Bearing Cage (Rear Axle illustrated).



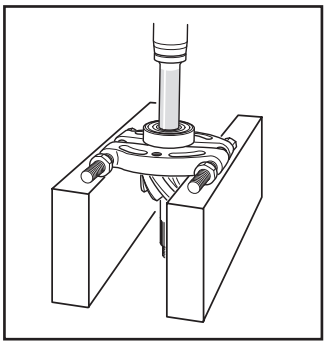
5. Rear Axle Pinion Oil Seal and Outer Bearing Cone: Remove oil seal and bearing cone from cage. Discard oil seal. Remove bearing cups with suitable puller.



6. Remove and retain bearing spacer from pinion.



7. Mount puller vertically to split the bearing.



8. Mount puller horizontally to press pinion out of bearing.

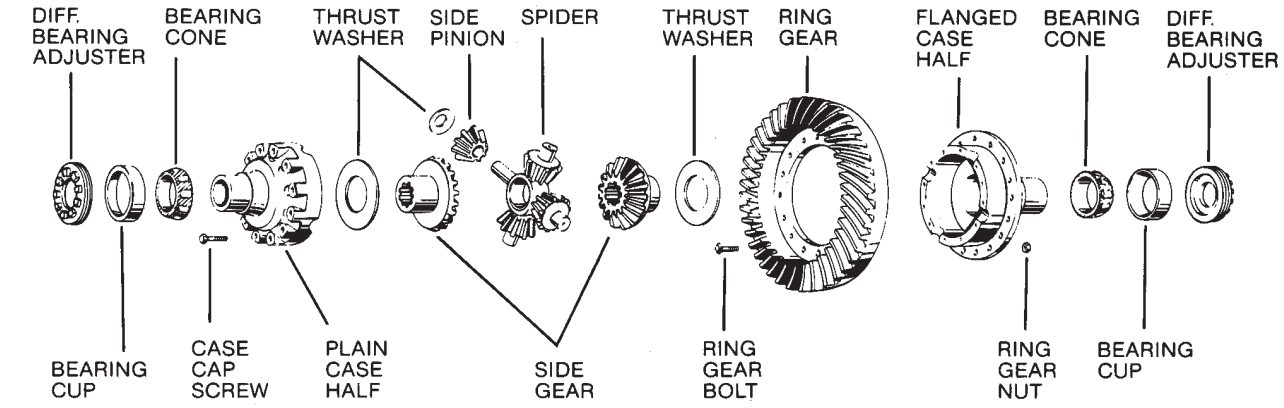
9. Remove pilot bearing and inner bearing cone from pinion, using a split-type puller. Use two procedure steps to remove each bearing (see photos above).

   This action will force puller halves under bearing and start moving bearing off pinion.

   The same procedure can be used to remove pilot bearing and pinion inner bearing cone.

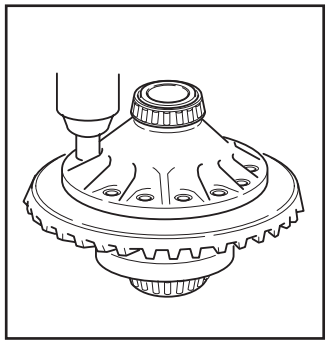
Disassemble Wheel Differential

Rear Axle Differential Illustrated.

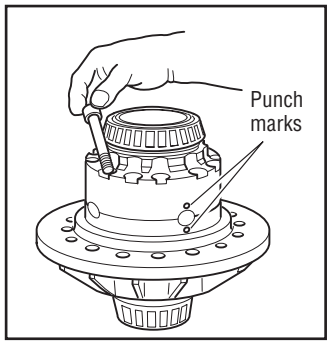


Procedure -

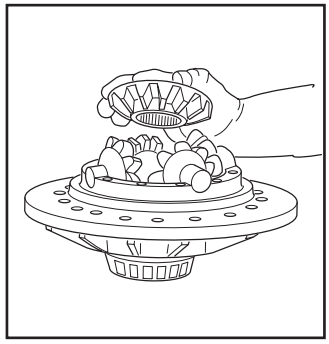
1. Remove nuts and bolts fastening ring gear to differential cases, allowing gear to fall free. If gear does not fall, tap outer diameter with soft mallet to loosen.

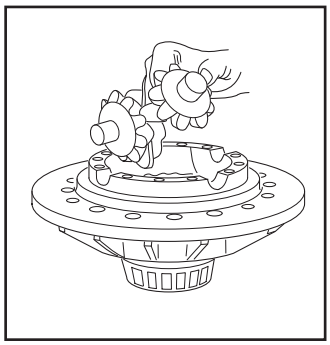


2. Punch mark differential cases for correct location during assembly. Remove cap screws and lift off plain differential case half.

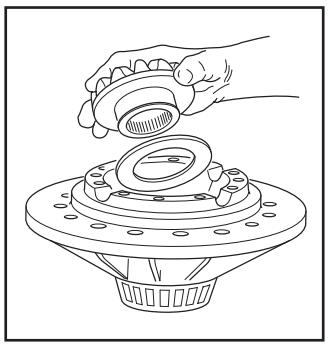


3. Lift out side gear and thrust washer.

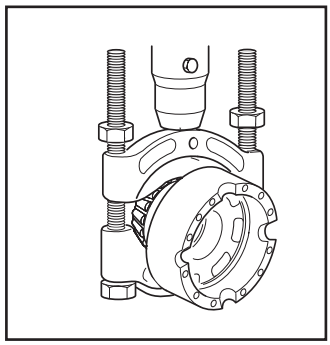




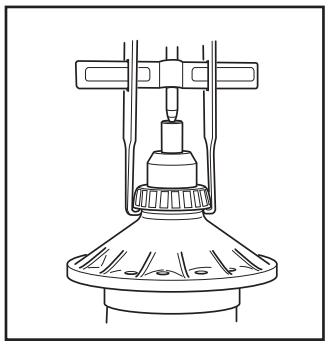
4. Lift out spider, side pinions and thrust washers.



5. Remove side gear and thrust washer.



6. Puller Mounted Vertically to Split Bearing.



7. Remove bearing cones from case halves using suitable puller (see photos).

8. Removing Bearing Cone from Flanged Case Half.

   Remove bearing cone from plain case half in two steps: First, mount puller vertically to split bearing (see photo). This action will start moving bearing off case. Second, mount puller vertically to remove cone.

9. Remove bearing cone from flanged case half using suitable puller.

Assemble Wheel Differential

Special Instructions

Lubricate differential parts with gear lube during reassembly

Procedure -

1. Press bearing cones on differential case halves (see photos).

⚠ IMPORTANT

To prevent bearing damage, use suitable sleeve that only contacts the inner race of the cone.

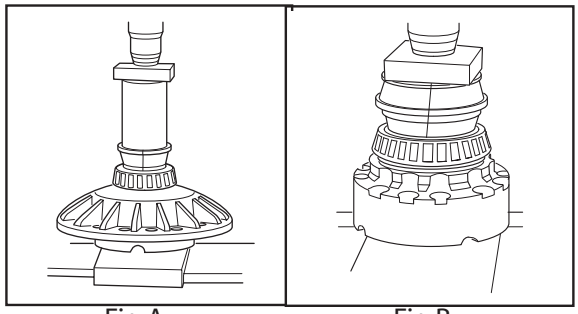
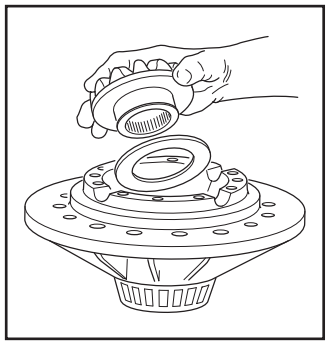


Fig A Fig B

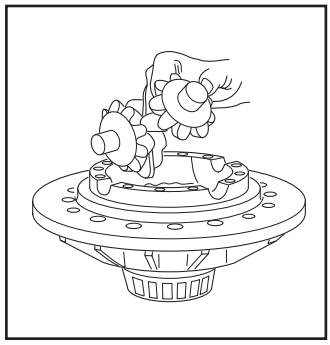
Fig A: Press Bearing Cone on Flanged Differential Case.

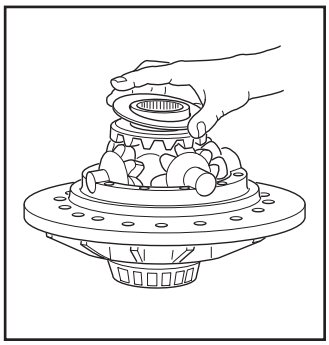
Fig B: Press Bearing Cone on Plain Differential/ Case.

2. Place thrust washer and side gear in flanged differential case.

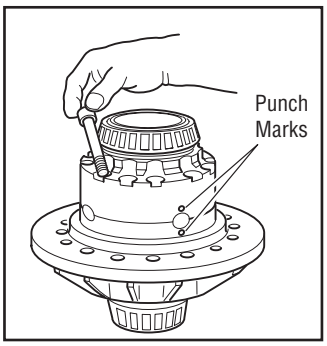


3. Assemble side pinion and thrust washers on spider. Place this assembly in flanged differential case. Rotate gears and check for proper mesh.





4. Place side gear and thrust washer on side pinions.

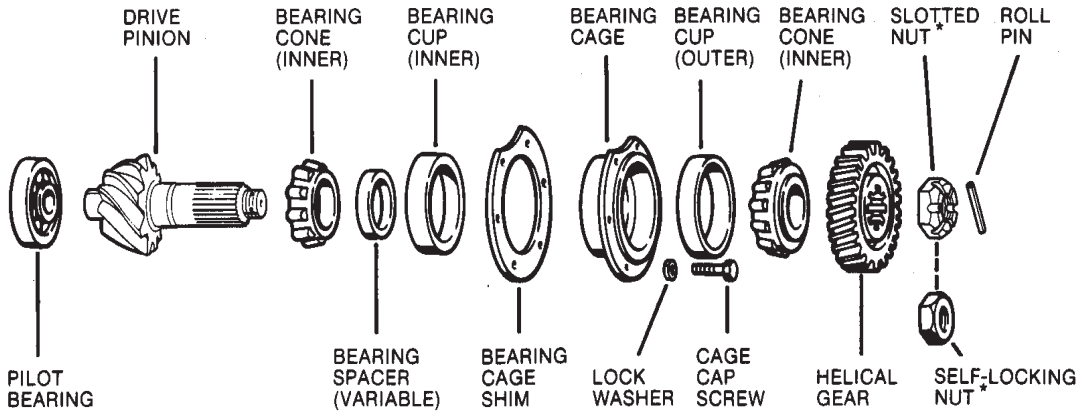


5. Align punch marks and install plain case half. Install cap screws and tighten to correct torque. Check differential for free rotation by turning side gear hub. Differential may require up to 50 ft. lbs. (68 N.m) torque to rotate.

6. Install ring gear. Secure with bolts and nuts. Torque nuts to 180- 220 ft. lbs. (244-298 N.m).

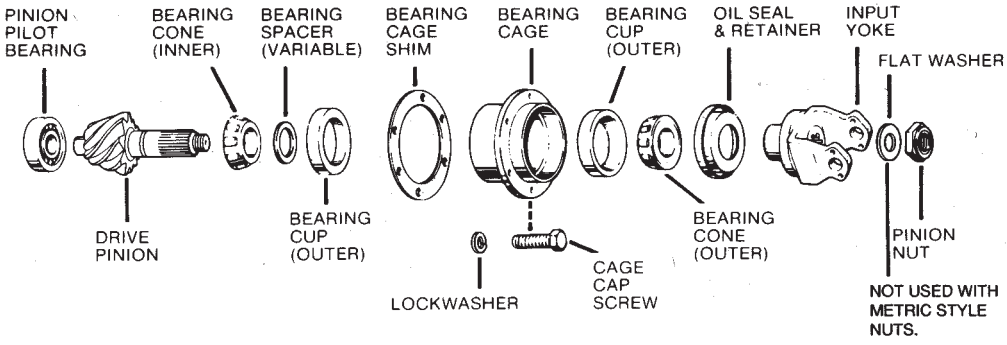
Assemble Drive Pinion ("Press-fit" outer pinion bearing)

Forward Axle Pinion Illustrated.



*D341, 381(P), 401-P, 402(P), 451-P use self-locking or slotted nut and roll pin.
D340, 380(P), 400-P use self-locking nut only.

Rear Axle Pinion Illustrated.



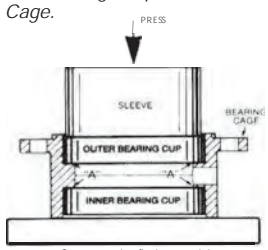
Special Instructions

Dana drive axles may be equipped with either “slip-fit” or ‘press-fit” outer pinion bearings. Procedures are contained in this section for assembly of both types.

Lubricate parts with gear lube during reassembly.

Differential Carrier Overhaul (Forward and Rear Axle)

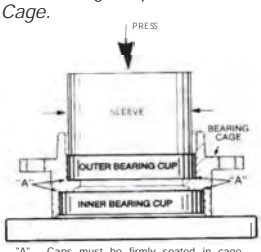
Forward Axle Pinion. Press Bearing Cups in Cage.



- Cups must be firmly seated in cage Check with feeler gauge (1.0001") after installation

NOTE: Install cups one at a time.

Rear Axle Pinion. Press Bearing Cups in Cage.



"A" - Caps must be firmly seated in cage Check with feeler gauge (0.001") after installation.

NOTE: Install cups one at a time.

Procedure -

1. Using appropriate sleeve, press bearing cups in cage (see adjacent drawings).

   Note: On rear axles, do not install oil seal in cage until bearing preload is correctly adjusted.

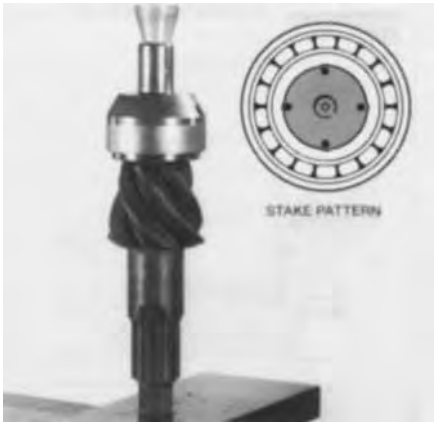
⚠ IMPORTANT

After bearing cups are installed, preselect pinion bearing spacer using the "trial build-up" procedure described in the Adjustments Section of this manual.

2. Press pilot bearing on pinion.

⚠ IMPORTANT

To prevent bearing damage, use suitable sleeve that only contacts inner bearing race.



3. Stake pilot bearing using staking tool, this is essential to retain the bearing.

   Note: During pinion bearing installation, locate each part in same position that was used in "Trial Build-up" Preload Test.

4. Press inner bearing cone on pinion.

⚠ IMPORTANT

To prevent bearing damage, use suitable sleeve that only contacts inner race of bearing cone.

5. Install preselected bearing spacer on pinion.

6. Install bearing cage on drive pinion.

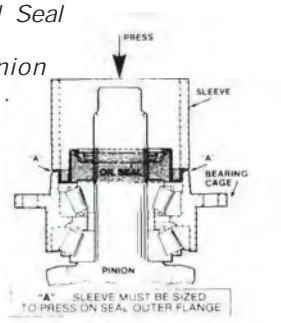
7. Press outer bearing cone on pinion.

⚠ IMPORTANT

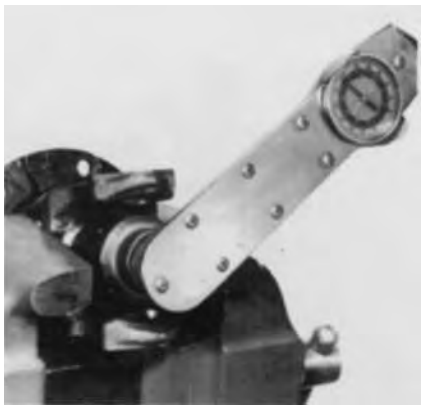
To prevent bearing damage, use suitable sleeve that only contacts inner race of bearing cone.

At this stage of assembly, "final-check" pinion bearing preload. See Adjustment Section of this manual.

Rear Axle Pinion. Press Oil Seal in Cage (with pinion installed .



8. Rear Axle Only. With pinion installed and bearing preload adjustment complete, Install oil seal with a press. **



9. Rear Axle Only. Prior to installation of yoke, lubricate oil seal and make sure yoke is clean and dry. Install yoke, flat washer* and nut. Torque nut to proper specification. (see page 24).

   Note: After tightening pinion nut, recheck pinion bearing rolling torque. See Adjustment Section for "Press-fit" outer pinion bearing.

10. Forward Axle Pinion Helical Gear and Nut: These parts are installed during pinion installation (see page 53).

⚠ IMPORTANT

****Refer to page 13 for service information on Seals, Yokes & Slingers.**

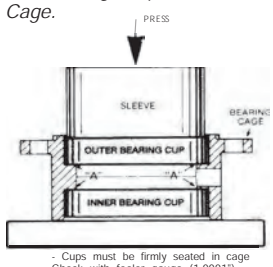
* Nuts used on production axles after 1/3/95 are metric and do not use flat washer.

Assemble Drive Pinion ("Slip-fit" outer pinion bearing)

Procedure -

1. Using appropriate sleeve, press bearing cups in cage (see adjacent drawings).

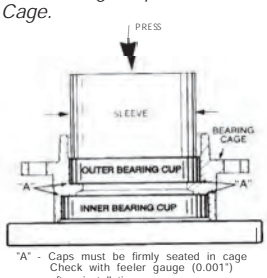
Forward Axle Pinion. Press Bearing Cups in Cage.



- Cups must be firmly seated in cage Check with feeler gauge (1.0001") after installation

NOTE: Install cups one at a time.

Rear Axle Pinion. Press Bearing Cups in Cage.



"A" - Caps must be firmly seated in cage Check with feeler gauge (0.001") after installation.

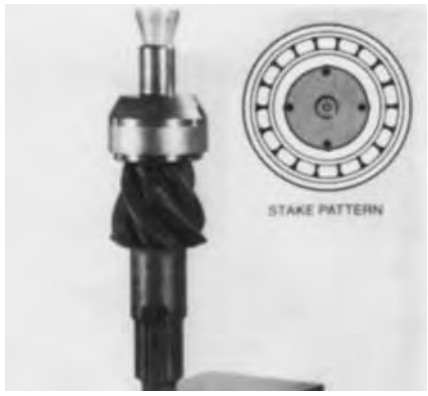
NOTE: Install cups one at a time.

2. Press pilot bearing in pinion.

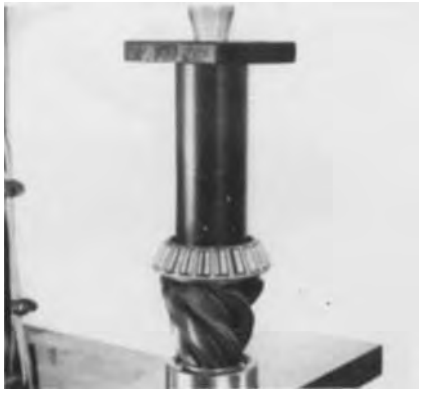
⚠ IMPORTANT

To prevent bearing damage, use suitable sleeve that only contacts inner bearing race.

3. Stake pilot bearing using staking tool and press. This is essential to retain the bearing.



Service Procedure



4. Press inner bearing cone on pinion.

⚠ IMPORTANT

To prevent bearing damage, use suitable sleeve that only contacts inner race of bearing cone.

5. Install bearing spacer on pinion.

Note: When new gear set or pinion bearings are used, select nominal size spacer (see chart page 20). If original parts are used, use spacer removed during disassembly.

6. Install bearing cage on drive pinion.

7. Install pinion outer bearing cone.

Note: At this stage in assembly, check pinion bearing preload de-scribed in Adjustment Section of this manual for "slip fit" outer pinion bearing. Rear Axle: Do not install oil seal until adjustment incomplete.

8. Rear Axle Oil Seal and Yoke: Installation of these parts is the same for "slip-fit" and "press-fit" bearings. See page 49 (step 8 and 9) for instructions.

Note: For "slip-fit" bearings, pinion may be temporarily removed to simplify seal installation.

9. Forward Axle Helical Gear and Nut: See page 53 for instructions.

Procedure - Assemble and Install Lockout

1. With shift fork and sliding clutch installed, place the shoulder washer (white plastic) over push rod. The large diameter side of the washer must face the power divider cover.

2. Install compression spring on push rod.

3. Lubricate “O” ring with silicone-based lubricant and install “O” ring on piston.

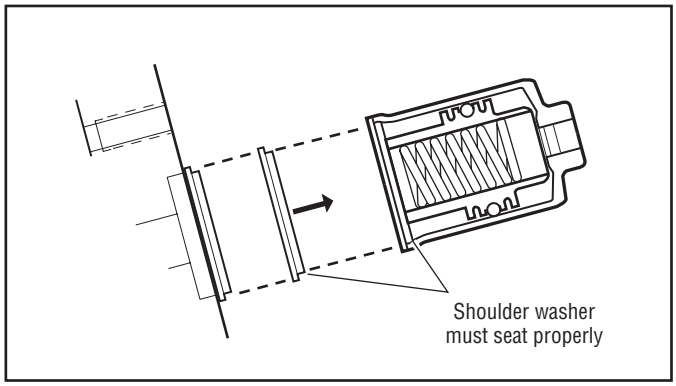
4. Place piston assembly on push rod. The large diameter end of piston must face power divider cover.

5. Install locknut on push rod and tighten to 13-17 lft. lbs. (l8-23 N.m).

6. Install piston housing, making sure the housing is correctly seated and piloted in the shoulder washer.

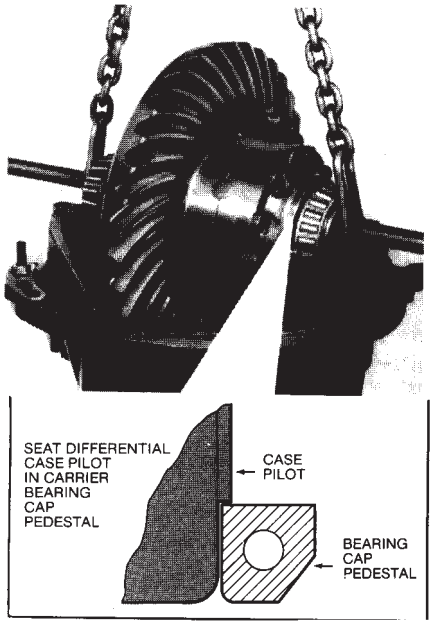
7. Place mounting bracket over housing and position on power divider cover. Install cap screws and lock washers and tighten to 48-56 ft. lbs. (65-76 N.m).

Note: If axle is installed in vehicle, apply sealant to air line fitting and connect air line. When tightening air line, hold piston housing in mounting position using a wrench applied to the hexagon configuration at outer end of housing.



Note: A new style “Inter-Axle Differential Lockout” was being released as this publication was being printed. If the Inter- Axle Differential Lockout Assembly on your axle is not shown in this publication, call your local Spicer representative.

4. Rear Axle Drive Pinion: Install pinion assembly. Install bearing cage cap screws and lock washers. Torque cap screws to 110-125 ft. lbs. (149-170 N.m).

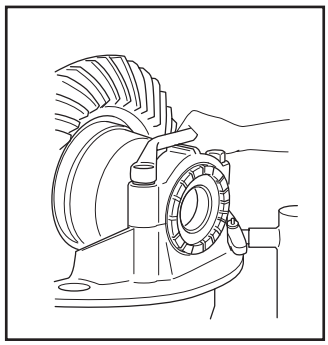


5. Place ring gear and differential assembly in carrier. During installation, tilt carrier to allow differential case pilot to mesh properly with edge of bearing cap pedestal (see photo above).

6. Install bearing cups at both sides of differential case.

   Install bearing adjusters and caps.

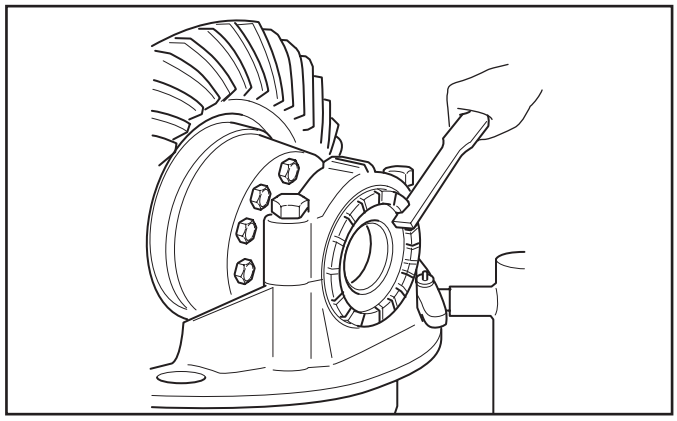
7. Install and tighten bearing cap screws finger tight. If this is difficult, use hand wrench. The assembly is now read-y for-adjustment of differential bearing preload, ring gear backlash and gear tooth contact.



8. At the teeth-side of ring gear, position bearing adjuster until its first thread is visible.

9. At the back-face side of ring gear, tighten adjuster until there is no backlash.

10. At the teeth-side of ring gear, tighten adjuster until it contacts the bearing cup. Continue tightening adjuster two or three notches. This will preload bearings and provide backlash.

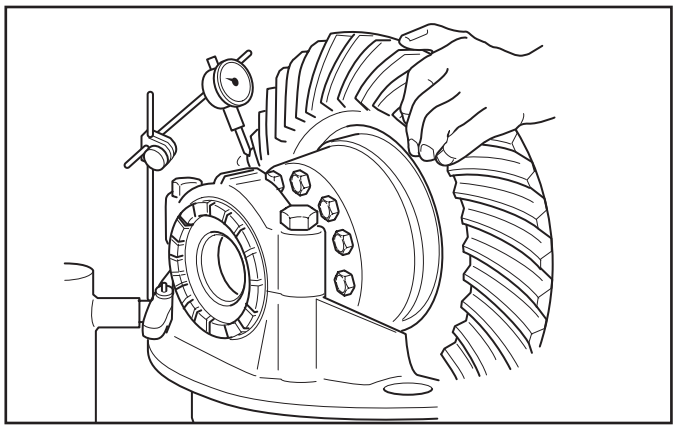


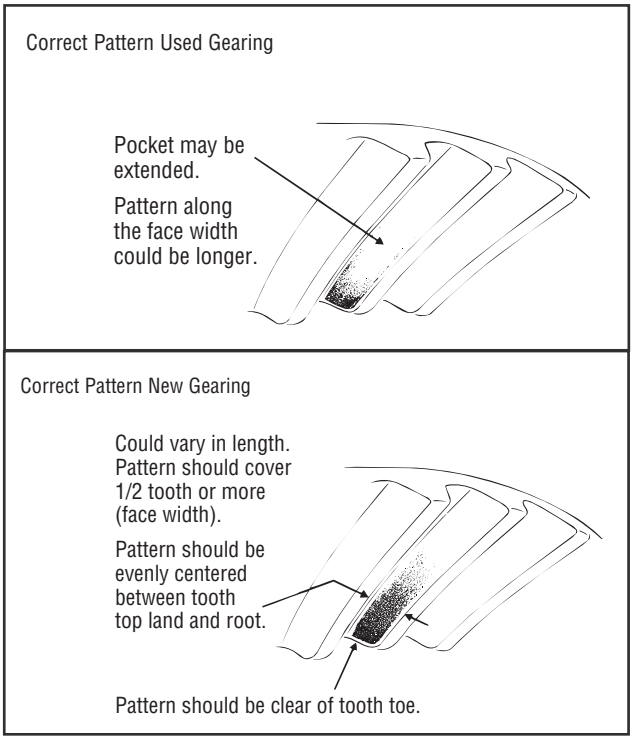
11. Check Ring Gear Backlash. Measure backlash with a dial indicator. Specifications are listed below. Refer to page 21 for detailed instructions on adjusting backlash.

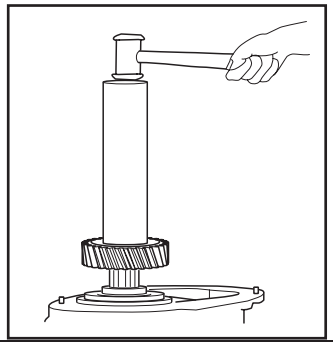
    Ring Gear Backlash Specifications

    USED GEARING - Reset to backlash recorded before disassembly.

    NEW GEARING - Backlash should be between 0.006" and 0.016".

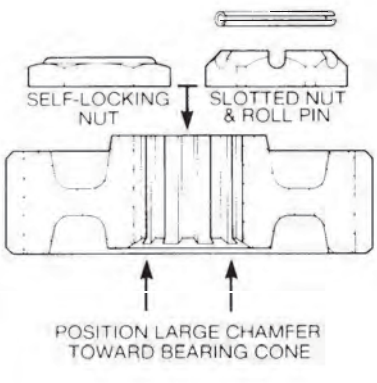






Pinion Helical Gear Mounting Position

NOTE: See Torque Chart for Pinion Nut Variations



12. Check Ring Gear Tooth Contact. Paint ring gear teeth and check tooth contact pattern. Correct tooth patterns are illustrated below. For checking and adjusting procedures, see page 22.

13. With ring gear and pinion adjusted correctly, align adjusters and locks, then tighten differential bearing cap screws to correct torque (360-440 ft. lbs., 488-596 N.m). Install adjuster locks and cotter pins. Lock-wire differential bearing cap screws.

14. Forward Axle Helical Gear. If dummy yoke was used, remove nut and yoke. Install helical gear on pinion, positioned as shown in the illustration. Install nut and tighten to correct torque (see chart)

Torque Chart

Size	Ft. lbs	N.m
Forward Axle Pinion Nut		
(D340, 380(P), 400-P) 1 1/2-18	560-700	759-949
(D341, 381(P), 401-P, 402(P), 451-P) 1 5/8-18	780-960	1057-1301
(D341, 402(P) 403(P), 451-P) M42 x 1.5	840-1020	1140-1383
Slotted Nut and Roll Pin		
(D-341, 381(P), 401-P, 402(P), 451-P only) 1 5/8-18	840	1139

⚠ IMPORTANT

***Torque to 840 ft. lbs. (1139 N.m), then continue tightening nut to align slot with the nearest hole in pinion shank. Install roll pin**.

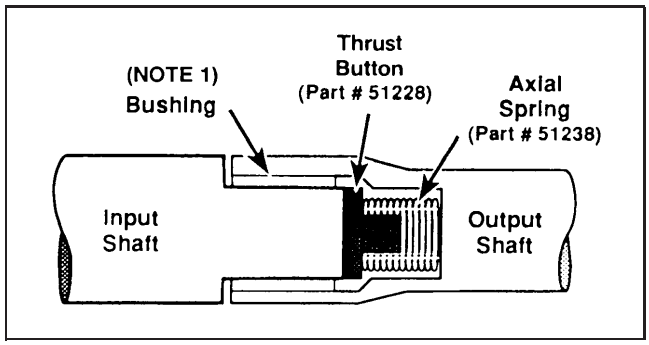
15. Installing Pinion Helical Gear.

Note: See Torque Chart for Pinion Nut Variations

Service Bulletin Supplement

Input Shaft End Play for Axle Models equipped with an Input Shaft Axial Spring and Thrust Button.

In September 1988, an Axial Spring and Thrust Button were added between the input and output shafts. The addition of these parts reduces shaft end play movement by loading the shafts axially in the direction of the yoke.



Location of Axial Spring and Thrust Button.

End play tolerances are the same for axles with or without the new Spring and Thrust Button. However, end play measurement procedure is different as described below.

Input Shaft End Play:
New or Rebuild with new parts 0.003” to 0.007”

Rebuild with reused parts 0.013” to 0.017”
Note: Because of manufacturing variations in individual parts, correctly adjusted end play could vary 0.010,” after the unit is rotated.

Acceptable End Play Tolerances when measuring as a regular maintenance procedure with axle in truck.

Up to 0.060” with over 100,000 miles or 1 year service off-road

Up to 0.040” with less than 100,000 miles or 1 year service on-road
Note: If end play exceeds limits, disassemble power divider and replace worn parts.

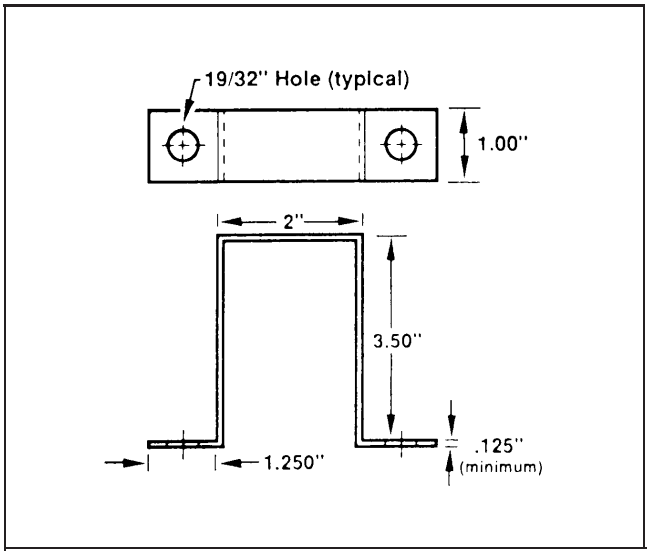
Appendix

Special Instructions

The addition of the Spring and Thrust Button between the input and output shafts necessitates the fabrication of a “U” bracket to assist in measuring the shaft end play. Proceed as follows:

Procedure - Measure and Adjust Input Shaft End Play

1. Fabricate a “U” bracket from 1“ flat stock (minimum thickness 0.125”) as specified in the illustration.

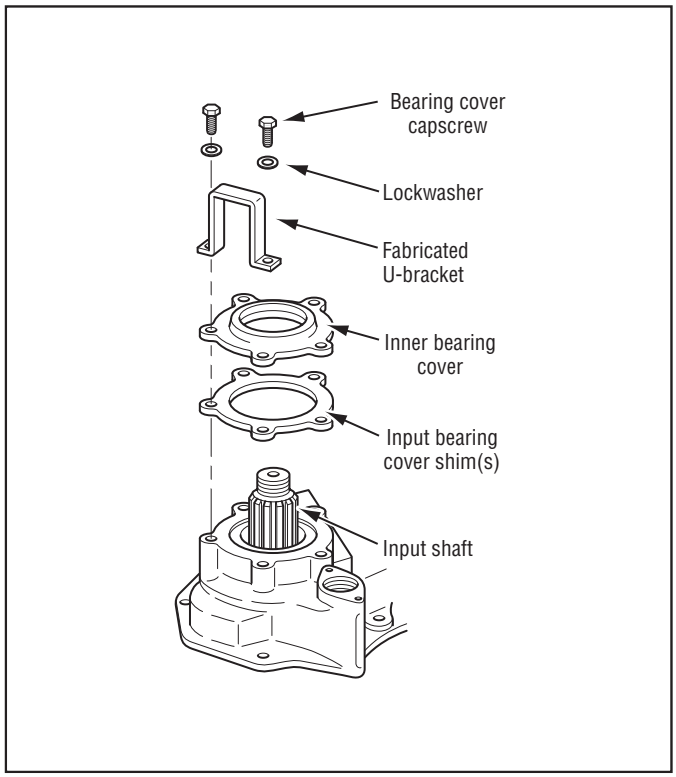


2. If axle is disassembled, build up a 0.045” (0.024 mm) thick shim pack and place shim pack and bearing cover on power divider cover. Then proceed with Step 3.

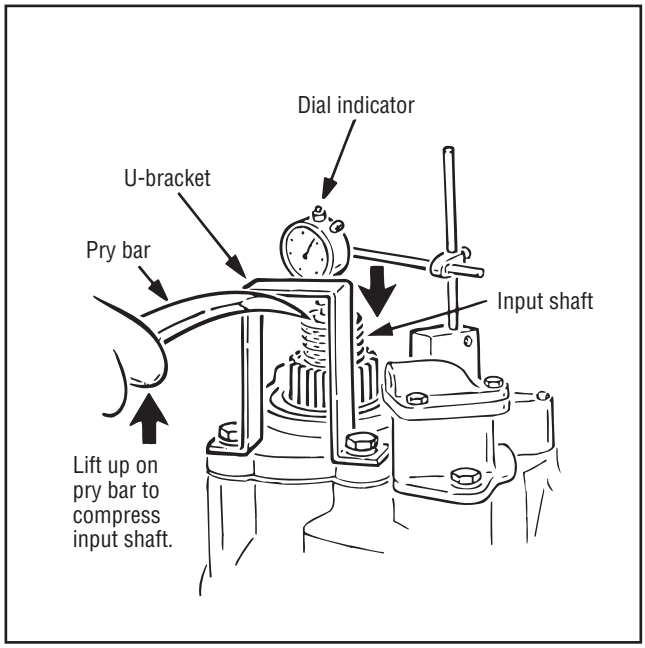
   If axle is assembled, remove input shaft nut, flat washer and yoke. (NOTE: Axles built with metric threaded nuts do NOT use flat washers) Then proceed with Step 3.

   Note: Bushing removed from current production output shafts, See notes on page 35.

3. Install the “U” bracket on bearing cover, using two bearing cover cap screws (see illustration). In- tall all other cover cap screws and torque to 75-85 ft. lbs. (101-115 N.m).



4. Position a dial indicator on the end of the input shaft (see illustration).



5. Insert a pry bar through the “U” bracket with the end of the bar resting on the end of the input shaft. (see illustration).

6. Zero the dial indicator and lift up on the pry bar to move the input shaft axially until it bottoms out within the bearing cover. Measure the end play.

7. If end play is acceptable (see chart), remove “U” bracket and bearing cover. Seal shim pack to prevent lube leak age. Reinstall bearing cover and cap screws. Torque cap screws to 75-85 ft. lbs. (101-115 N.m). Continue axle assembly as necessary.

8. If end play is incorrect, change shim pack size as follows:

Add shims to increase end play.	
Desired end play	0.003” to 0.007”
Measured end play (Step 6)	0.001 “ — 0.001“
Add shims to provide desired end play	0.002” to 0.006”
Remove shims to decrease end play.	
Measured end play (Step 6)	0.015” — 0.015”
Desired end play	0.003” to 0.007”
Remove shims to provide desired end play	0.01 2“ to 0.008”

9. Recheck end play and adjust as necessary until end play is within acceptable tolerance.

10. When end play is correct, remove “U” bracket and bearing cover. Seal shim pack to prevent lube leakage. Reinstall bearing cover and cap screws. Torque cap screws to 75-85 ft. lbs. (101-115 N.m). Continue axle assembly as necessary.

Gear Pinion Nut Fastening Chart

Style	Model	Size	Ft-lbs	N.m
Self Locking Pinion Nut	D340; 380(P); 400-P	1-1/2 - 18	560-700	759-949
	D341;381 (P); 401(P); 402(P); 403(P); 451-P	1 5/8 - 18	780-960	1057-1301
	R-All Modles	1 1/2 - 18	560-700	759-949
Slotted Nut and Roll Pin	D341; 381(P); 401-P; 402(P); 403-(P); 451-P	1 5/8 - 18	840	1139
		Note: Torque to 840 ft. lbs. (1139 N.m) then continue tightening nut to align slot with the nearest hole in pinion shank)		
Metric self locking Pinion Nut	D341; 402(P); 403(P); 451-P	M42 x 1.5	840-1020	1140-1383
		Metric nuts produced after 4/95 incorporate a pre applied thread locking compund		
	R- All models	M36 x 1.5	575-703	780-953

Nut Torques

Nut Part number	Threads	Nut Size	Socket Size	Location
95206	English	1 1/2 - 18	2.25”	R-Pinion
118806	English	1 5/8 - 18	2.50”	D-Pinion
127589	Metric	M36 x 1.5	55mm	R-Pinion
126182	Metric	M42 x 1.5	65mm	D-Pinion

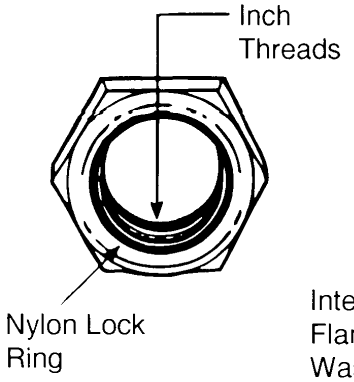
Gear Pinion Nut Fastening Chart:

Note: Reference Bulletin AXIB-9409 and AXIB-9503 for more information.

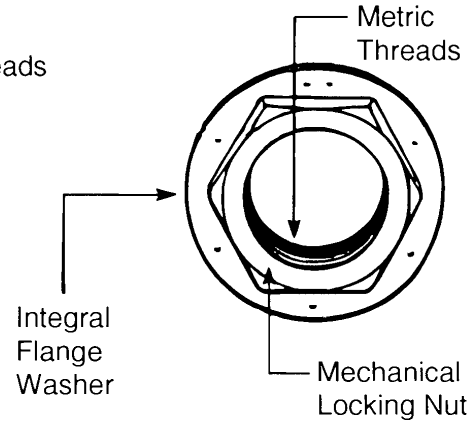
⚠ CAUTION

Metric nuts have an integral flange washer built into them. Do not use separate washer in conjunction with these nuts.

English (Inch) Style Nut



Metric Style Nut



Related Publications

Parts Book

Model	Publication
Single Reduction Tandem Drive Axles	
34,000 — 45,000 lbs. (340, 380, 400, 341, 381, 401, 402, 403, 451)	AXIP-0089
34,000 — 45,000 lbs. (344, 404, 454)	AXIP-0200
34,000 — 52,000 lbs. (With Controlled Traction Differentials)	AXIP-0084
Dual Range, Planetary Double Reduction Tandem Drive Axles	
34,000 — 45,000 lbs	AXIP-0087
Single Reduction, Dual Range, Planetary Double Reduction (Tandem Drive Axles)	
46,000 — 65,000 lbs. (Axle Series 461,521,581, 601, 651, 652)	AXIP-0085
(Diff. Lock Models 461,521, 581)	AXIP-0085A
Spicer ® Brakes	
All Models	BRIP-0065
Spicer ® Steer Axles	
All Models	AXIP-0074

Service Manual

Model	Publication
Single Reduction Tandem Drive Axles	
34,000 -- 45,000 lbs. (Axle Series 340 — 402, 451)	AXSM-0041
34,000 — 45,000 lbs. (Axle Series 344, 404, 454)	.AXSM-0046
44,000 — 58,000 lbs. (Axle Series 440, 460 — 651)	AXSM-0042
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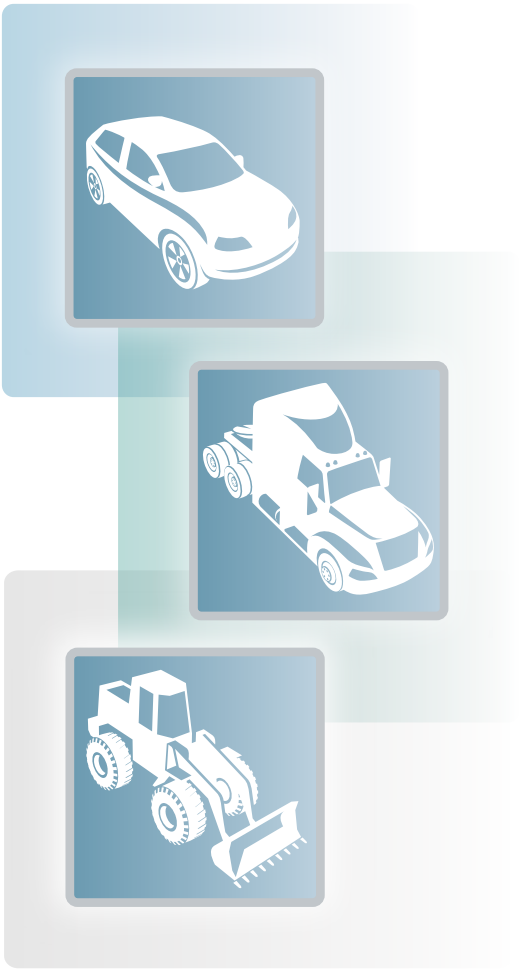

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