



SPICER®
Off-Highway Products

Service Manual

36R Hydraloc Differential Axle

ASM-0159
September 2009



FOREWORD

This manual has been prepared to provide the customer and maintenance personnel with information and instructions on the maintenance and repair of Dana Products.

Extreme care has been exercised in the design and selection of materials and manufacturing of these units. The slight outlay in personal attention and cost required to provide regular and proper lubrication, inspection at stated intervals, and such adjustments as may be indicated will be reimbursed many times in low cost operation and trouble free service.

In order to become familiar with the various parts of the product, it's principle of operation, troubleshooting, and adjustments it is urged that mechanics study the instructions in this manual carefully and use it as a reference when performing maintenance and repair operations.

Whenever repair or replacement of component parts is required, only Dana approved parts as listed in the applicable parts manual should be used. Use of "will fit" or non-approved parts may endanger proper operation and performance of the equipment. Dana does not warrant repair, replacement parts or failures resulting from the use of parts which are not supplied or approved by Dana. Important: Always furnish serial and model numbers when ordering parts.

SAFETY PRECAUTIONS

To reduce the chance of personal injury and/or property damaged, the following instructions must be carefully observed.

Proper service and repair are important to the safety of the service technician and the safe, reliable operation of the machine. If replacement parts are required the part must be replaced with a Dana specified replacement part. Do not use a replacement part of lesser quality.

The service procedures recommended in this manual are effective methods of performing service and repair. Some of these procedures require the use of purpose designed tools.

Accordingly, anyone who intends to use a replacement part, service procedure or tool which is not recommended must first determine that neither his safety or the safe operation of the machine will be jeopardized by the replacement part, service procedure or tool selected.

It is important to note that this manual contains various "Cautions and Notices" that must be carefully observed in order to reduce the risk of personal injury during service or repair. Improper service or repair may damage the unit or render it unsafe. It is important to understand that these "Cautions and Notices" are not exhaustive. It is impossible to warn of all possible hazardous consequences that may result from following or failing to follow these instructions.



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BEARING HEATING AND FREEZING GUIDELINES

Bearings often must be cooled or heated to aid in assembly or removal. Since temperature extremes can cause permanent bearing metallurgical damage, it is important to take proper precautions and use correct methods when heating and cooling bearings.

Cups that are to be assembled in hubs or housings with a press fit may be shrunk in a deep freeze unit. Standard class bearings should not be cooled below -65° F (-54° C). In addition to cooling the bearing cup, in some instances it may be necessary to heat the housing.

To control temperature, is best to use a thermostat along with a freezer unit or a properly calibrated thermometer. If a suitable freezer or thermometer is not available, your Timken service representative can suggest liquid combinations that freeze the bearing cup at the optimal temperatures. Regardless of the method, check the cup's final seating against the housing shoulder with feeler gauges.

Take extreme care that standard product bearings are never heated above 149° C [300° F]. If bearings are heated above this temperature, their metallurgical structure may soften, rendering them unsuitable for use.

There are a number of recommended methods for heating bearings. Electric ovens or electrically heated oil baths may be used, but only when accompanied by proper thermostatic control. If you use a hot plate to heat the oil, never rest bearings directly on the bottom of the pan. Instead, protect bearings from the heat source with a simple wire screen holder or similar device.

Use heat-resistant gloves to handle heated cones. Hold the hot cone solid against the cold shoulder on the shaft until the cone grabs on to the shaft. The hot cone will pull away from the cold shoulder unless it is held in position. Use .002 [.05 mm] feeler gages to make sure the cone is fully seated against the shoulder after the parts are cooled. Many loose bearing settings (excessive end play) are caused by an unseated cone working back against the shoulder in service.



CLEANING AND INSPECTION

CLEANING

Clean all parts thoroughly using solvent type cleaning fluid. It is recommended that parts be immersed in cleaning fluid and agitated slowly until parts are thoroughly cleaned of all old lubricants and foreign materials.

CAUTION: Care should be exercised to avoid skin rashes, fire hazards and inhalation of vapors when using solvent type cleaners.

BEARINGS

Remove bearings from cleaning fluid and strike larger side of cone flat against a block of wood to dislodge solidified particles of lubricant. Immerse again in cleaning fluid to flush out particles. Repeat above operation until bearings are thoroughly clean. Dry bearings using moisture free compressed air. Be careful to direct air stream across bearings to avoid spinning. Bearings may be rotated slowly by hand to facilitate the drying process.

HOUSINGS, COVERS AND CAPS

Clean interior and exterior of housings, bearing caps, etc., thoroughly. Cast parts may be cleaned in hot solution tanks with mild alkali solutions, providing these parts do not have ground or polished surfaces. Parts should remain in solution long enough to be thoroughly cleaned and heated. This will aid the evaporation of the cleaning solution and rinse water. Parts cleaned in solution tanks must be thoroughly rinsed with clean water to remove all traces of alkali. Cast parts may also be cleaned with steam cleaner.

CAUTION: Care should be exercised to avoid skin rashes and inhalation of vapors when using alkali cleaners. Thoroughly dry all parts cleaned immediately by using moisture-free compressed air or soft lintless absorbent wiping rags free of abrasive materials such as metal filings, contaminated oil or lapping compound.

INSPECTION

The importance of careful and thorough inspection of all parts cannot be overstressed. Replacement of all parts showing indication of wear or stress will eliminate costly and avoidable failures at a later date.

BEARINGS

Carefully inspect all rollers, cages and cups for wear, chipping or nicks to determine fitness of bearings for further use. Do not replace a bearing without replacing the mating cup or cone at the same time. After inspection, dip bearings in clean light oil and wrap in clean lint free cloth or paper to protect them until installed.

OIL SEALS, GASKETS AND RETAINING RINGS

Replacement of spring loaded oil seals, gaskets, and snap rings is more economical when unit is disassembled than to risk premature overhaul to replace these parts at a future time. Loss of lubricant through a worn seal may result in failure of other more expensive parts of the assembly. Sealing member should be handled carefully, particularly when being installed. Cutting, scratching or curling under lip of seal seriously impairs its efficiency. At reassembly, lubricate lips of oil seals with Multipurpose Lithium grease "Grade 2".



CLEANING AND INSPECTION - CONT.

GEARS AND SHAFTS

If Magna-Flux or a dye penetrant process is available use process to check parts. Examine teeth and the ground/polished surfaces of all gears and shafts carefully for wear, pitting, chipping, nicks, cracks, or scoring. If gear teeth are cracked or show spots where case hardening is worn through, replace with new gear. Small nicks may be removed with suitable hone stone. Inspect shafts to make certain they are not sprung, bent or have twisted splines.

HOUSINGS, COVERS AND CAPS

Inspect housings and covers to be certain they are thoroughly cleaned and that mating surfaces, bearing bores, etc. are free from nicks or burrs. Check all parts carefully for evidence of cracks or conditions which can cause oil leaks or failures.



FASTENER TORQUE CHART

STANDARD FASTENERS				
Lubricated and Plated Bolts, CapScrews, and Studs				
Size	Grade 5		Grade 8	
	3 Radial Dashes On Bolt Head		6 Radial Dashes On Bolt Head	
	LBF / FT	[Nm]	LBF / FT	[Nm]
1/4-20	10	14	11	15
1/4-28	11	15	13	18
5/16-18	16	22	30	41
5/16-24	20	27	32	43
3/8-16	25	34	36	49
3/8-24	29	39	41	56
7/16-14	41	56	57	77
7/16-20	45	61	64	87
1/2-13	63	85	88	119
1/2-20	70	95	99	134
9/16-12	90	122	127	172
9/16-18	100	136	141	191
5/8-11	124	168	175	237
5/8-18	141	191	198	268
3/4-10	220	298	310	420
3/4-16	245	332	347	470

METRIC FASTENERS						
Lubricated and Plated Bolts, CapScrews, and Studs						
Size	Class 8.8		Class 10.9		Class 12.9	
	8.8 on Bolt Head		10.9 on Bolt Head		12.9 on Bolt Head	
	LBF / FT	[Nm]	LBF / FT	[Nm]	LBF / FT	[Nm]
M4	2.2	3	3.2	4.4	7.4	10
M5	4.4	5.9	6.4	8.7	7.4	10
M6	7.4	10	11	15	13	18
M8	18	25	26	36	32	43
M10	36	49	51	72	62	84
M12	63	85	92	125	107	145
M14	100	135	147	200	173	235
M16	155	210	229	310	269	365
M18	221	300	317	430	369	500
M20	313	425	450	610	524	710
M22	428	580	605	820	708	960
M24	538	730	774	1050	900	1220



PLUG & ELASTIC STOP NUT TORQUE CHARTS

O-RING PLUGS			
P / N	Size	LBF / FT	[Nm]
5/16-24	24K-1	5	7
3/8-24	24K-2	8	11
7/16-20	24K-3	10	14
1/2-20	24K-4	13	18
9/16-18	24K-5	15	20
3/4-16	24K-6	25	34
7/8-14	24K-7	35	47
1 1/16-12	24K-8	50	68
1 3/16-12	24K-9	60	81
1 5/16-12	24K-10	75	102
1 5/8-12	24K-11	85	115
1 7/8-12	24K-12	85	115

PIPE PLUGS		
Size (NPTF)	LBF / FT	[Nm]
1/16-27	7	9
1/8-27	10	14
1/4-18	20	27
3/8-18	30	41
1/2-14	35	47
3/4-14	45	61
1-11 1/2	55	75
1 1/4-11 1/2	65	88

ELASTIC STOP NUTS		
Size	LBF / FT	[Nm]
1-20	200	270
1 1/4-18	250	340
1 1/2-18	350	475
1 3/4-12	450	610



RECOMMENDED LUBRICANTS FOR DRIVE AXLES

Recommendations: Extreme pressure gear lubricant is recommended for use in all drive-steer and rigid drive axles except where explicitly stated differently by Dana Off-Highway Products Engineering.

Mineral Based: Acceptable lubricants must meet **API GL-5/MT** or **MIL-PRF2105E** qualifications. The highest viscosity grade must be used given the prevailing ambient temperatures from the chart below. Limited slip designated GL-5 oil brands are preferred for quiet operating characteristics.

Universal Tractor Transmission Oils (UTTO Fluids): Acceptable lubricants must meet Dana MS266 or J. Deere J20C specifications. Use the highest viscosity grade for the ambient temperatures from the temperature chart below.

Synthetics: Synthetic lubricants are recommended providing they meet **API GL-5/MT-1** qualifications. The highest viscosity grade must be used given the prevailing ambient temperatures from the chart below. In general synthetic oils have a lower pressure viscosity response than mineral oil lubricants as the contact pressure between the gears increases. This produces a thickening of the mineral oil at the contact point. This increase in viscosity helps to maintain lubricant film thickness reducing the possibility of surface and spalling fatigue. Synthetic lubricants do not thicken as much under pressure unless specifically formulated to do so. Before using a synthetic lubricant in heavy applications, the customer must check with the lubricant supplier on the issue of high-pressure lubricant applications.

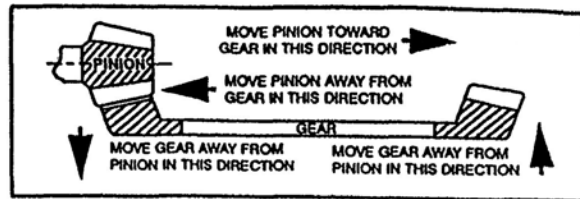
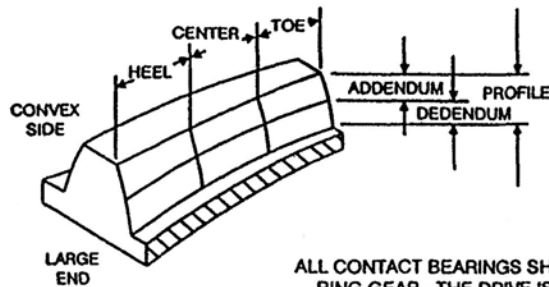
Normal Oil Change Intervals: Oil change intervals for mineral based lubricants in normal environmental and duty cycle conditions is 1000 hours in all off-highway applications and 10,000 miles in on-highway applications. Severe or sustained high operating temperature or very dusty atmospheric conditions will result in accelerated deterioration or contamination. Judgement must be used to determine the required change intervals for extreme conditions.

Extended Oil Change Interval: Extended oil service may result when using synthetic lubricants. Appropriate change intervals must be determined for each application by measuring oxidation and wear metals over time to determine a base line. Wear metal analysis can provide useful information, but an axle should not be removed from service based solely on this analysis. Vehicles, which are prone to high levels of ingested water in the axle, or water as a result of condensation, should not use extended drain intervals.

Friction Modifiers: Friction modifiers may be used with the lubricant to reduce Posi-Torq (limited slip) differential noise or liquid cooled brake noise. If friction modifiers are used, follow instructions on **TSB 278E**.

The use of aftermarket lubricant additives other than those specified is not recommended and may reduce the life of the axle and void the warranty!									
Viscosity Based on Prevailing Ambient Temperature									
UTTO – SAE 15-30									
UTTO – SAE 30									
SAE 90									
80W90									
75W90									
75W									
-40	-30	-20	-10	0	10	20	30	40	50
-40	-22	-4	14	32	50	68	86	104	122

LEFT HAND SPIRAL SPIRAL BEVEL AND HYPOID TOOTH BEARING CHART



ALL CONTACT BEARINGS SHOWN BELOW ARE ON **LEFT HAND SPIRAL**
RING GEAR - THE DRIVE IS ON THE CONVEX SIDE OF THE TOOTH.

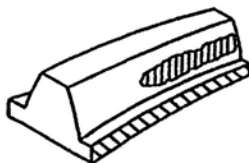


FIG.1
TYPICAL PREFERRED BEARING ON BOTH SIDES OF TOOTH
WHILE UNDER A LIGHT LOAD

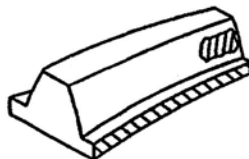
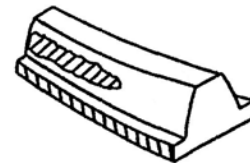


FIG.2
TOE BEARING ON BOTH SIDES OF TOOTH - GEAR SET NOISY. TO MOVE
BEARING TOWARD HEEL INCREASE BACKLASH WITHIN LIMITS BY
MOVING GEAR AWAY FROM PINION.

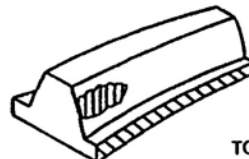
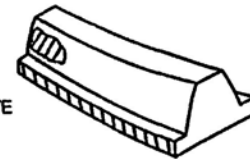


FIG.3
HEEL BEARING ON BOTH SIDES OF TOOTH - GEAR SET NOISY AND
COULD RESULT IN EARLY GEAR FAILURE. TO MOVE BEARING TOWARD
TOE DECREASE BACKLASH WITHIN LIMITS BY MOVING GEAR TOWARD PINION

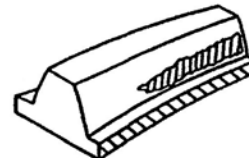
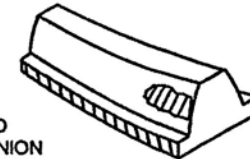


FIG.4
LOW BEARING ON GEAR AND HIGH BEARING ON PINION. CORRECT
BY PULLING PINION AWAY FROM GEAR (INCREASE MOUNTING DISTANCE)

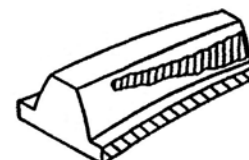
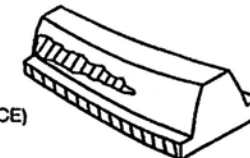
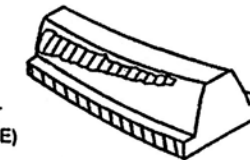


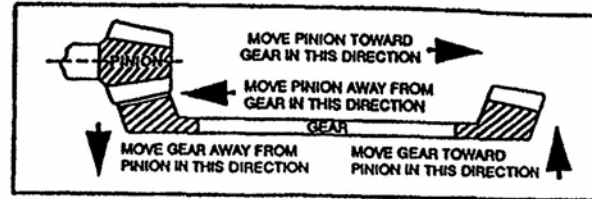
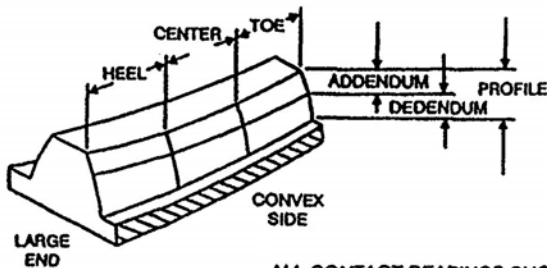
FIG.5
HIGH BEARING ON GEAR AND LOW BEARING ON PINION. CORRECT
BY MOVING PINION TOWARD GEAR (DECREASE MOUNTING DISTANCE)



BACKLASH

BACKLASH SHOULD BE MEASURED WITH A DIAL INDICATOR RIGIDLY MOUNTED WITH THE STEM PERPENDICULAR TO
THE TOOTH SURFACE AT THE EXTREME HEEL. SEE SHEET NO. 2 FOR BACKLASH VALUES.

RIGHT HAND SPIRAL SPIRAL BEVEL AND HYPOID TOOTH BEARING CHART



ALL CONTACT BEARINGS SHOWN BELOW ARE ON **RIGHT HAND SPIRAL** RING GEAR - THE DRIVE IS ON THE CONVEX SIDE OF THE TOOTH.

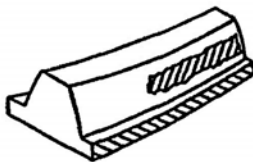


FIG. 1
TYPICAL PREFERRED BEARING ON BOTH SIDES OF TOOTH WHILE UNDER A LIGHT LOAD

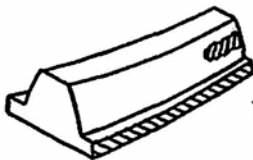
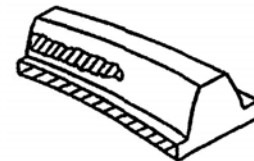


FIG. 2
TOE BEARING ON BOTH SIDES OF TOOTH - GEAR SET NOISY. TO MOVE BEARING TOWARD HEEL INCREASE BACKLASH WITHIN LIMITS BY MOVING GEAR AWAY FROM PINION.

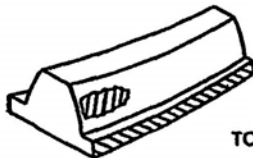
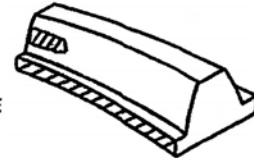


FIG. 3
HEEL BEARING ON BOTH SIDES OF TOOTH - GEAR SET NOISY AND COULD RESULT IN EARLY GEAR FAILURE. TO MOVE BEARING TOWARD TOE DECREASE BACKLASH WITHIN LIMITS BY MOVING GEAR TOWARD PINION

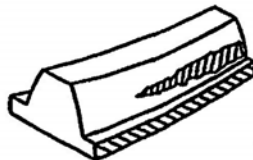
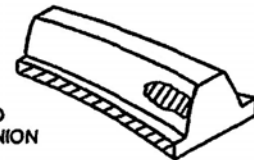


FIG. 4
LOW BEARING ON GEAR AND HIGH BEARING ON PINION. CORRECT BY PULLING PINION AWAY FROM GEAR (INCREASE MOUNTING DISTANCE)

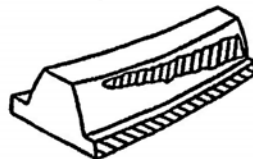
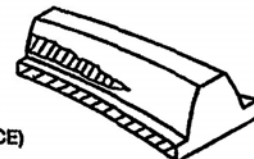
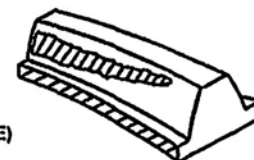


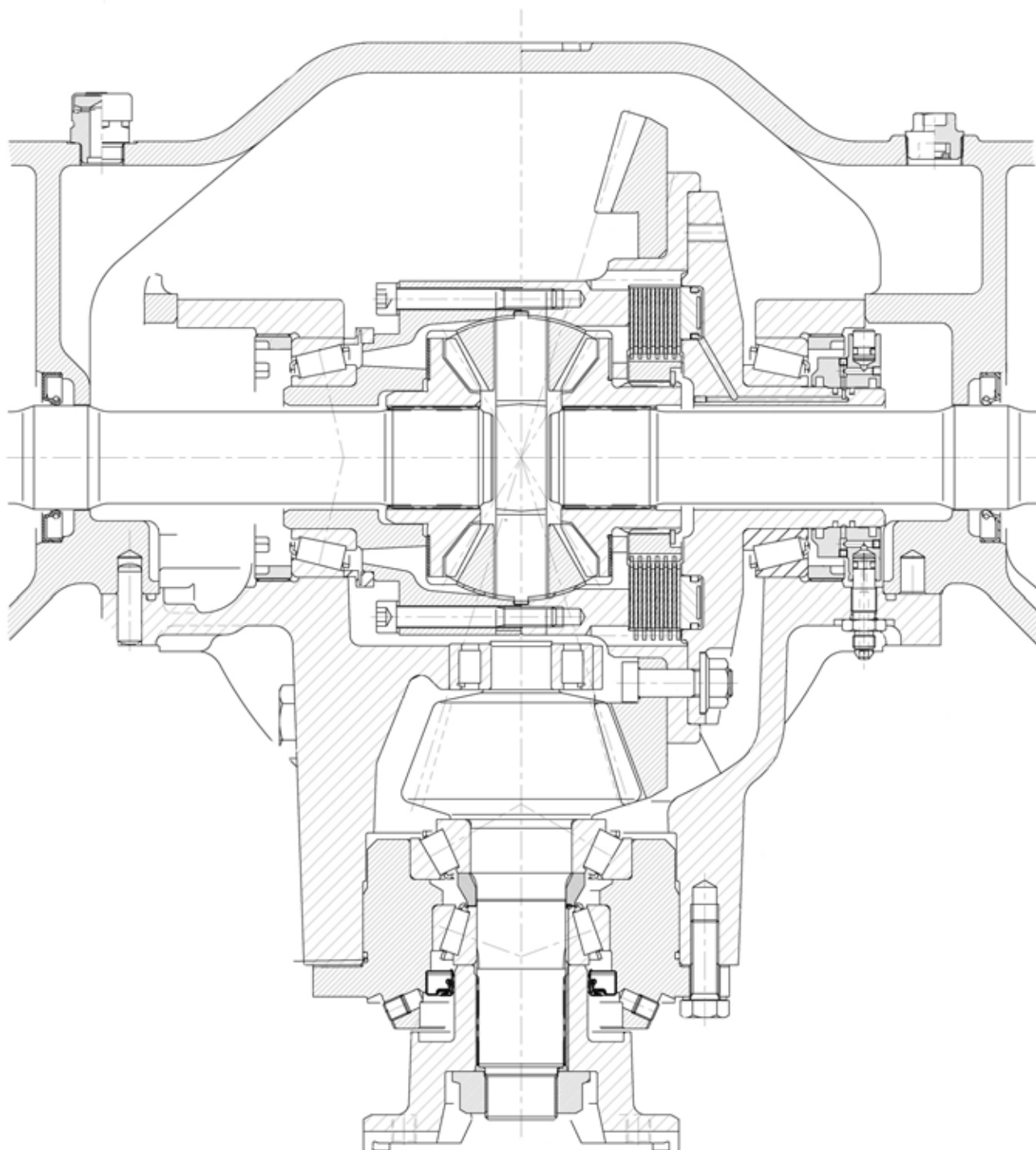
FIG. 5
HIGH BEARING ON GEAR AND LOW BEARING ON PINION. CORRECT BY MOVING PINION TOWARD GEAR (DECREASE MOUNTING DISTANCE)



BACKLASH

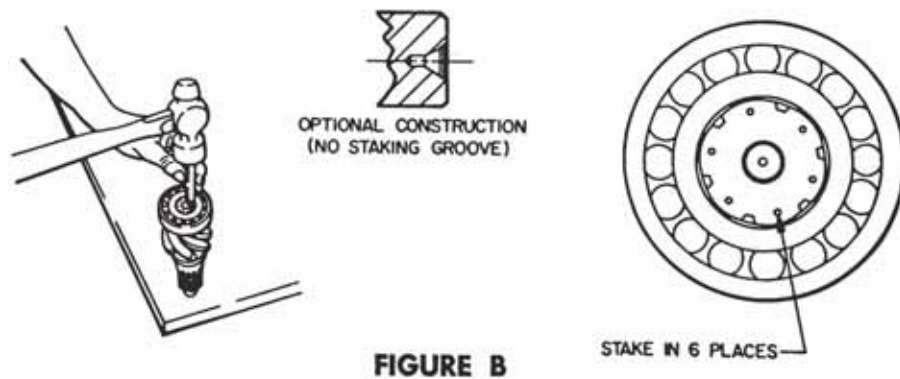
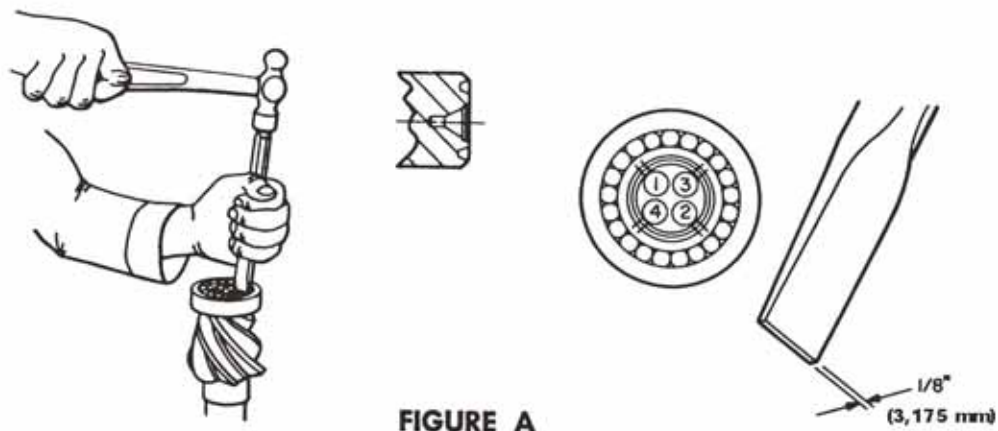
BACKLASH SHOULD BE MEASURED WITH A DIAL INDICATOR RIGIDLY MOUNTED WITH THE STEM PERPENDICULAR TO THE TOOTH SURFACE AT THE EXTREME HEEL. SEE SHEET NO. 2 FOR BACKLASH VALUES.

CROSS SECTION



INNER PINION BEARING STAKING

When the inner pinion bearing or the pinion shaft and ring gear are being replaced staking of the pinion end to the inner pinion bearing is required. If a staking groove is in the pinion shaft use procedure shown in Figure "A" and a square end staking tool as shown. If pinion has no staking groove use procedure in Figure "B" and a standard prick punch to upset the metal over the bearing inner race.

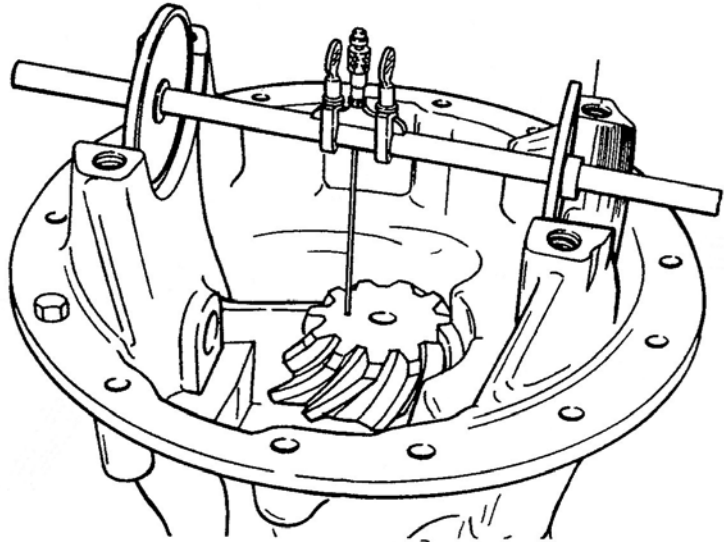


PINION DEPTH SETTING PROCEDURE

The function of the pinion setting gauge is to measure the distance from the centerline of the differential bearing bores to the ground surface on the gear end of the pinion. This measurement when subtracted from the value etched on the ring gear will indicate the size of the shim pack required to position the pinion gear in proper relation to the ring gear.

On the outer diameter of the ring gear, a ring gear to pinion distance will be etched, add .4649 [11.808 mm] to it. (.4649 [11.808 mm] is half the thickness of the gauge bar).

Record this value. This value may be different on each ring and pinion set due to manufacturing variations.



Use a file and emery cloth to remove all burrs and nicks from machined bearing surfaces of carrier housing.

Paint bearing surfaces with bearing contact checking compound.

Insert an extension depth micrometer (Starrett #44B-6RC and extension #99347 7" [178 mm] or equivalent is recommended) into the guide bore of the micrometer arbor and slide clamps over base of micrometer. With the thumb screws reacting on base, secure micrometer.

IMPORTANT: The micrometer extension must pass freely through the micrometer bar guide bore and base of the micrometer must rest on the micrometer arbor when mounted.

Mount adapter discs on micrometer arbor and set in position in carrier housing. Exercise care to be sure that micrometer and extension do not contact any part of the carrier in this operation. Apply pressure by hand and rotate adapter discs slightly to obtain a contact with bearing surfaces.

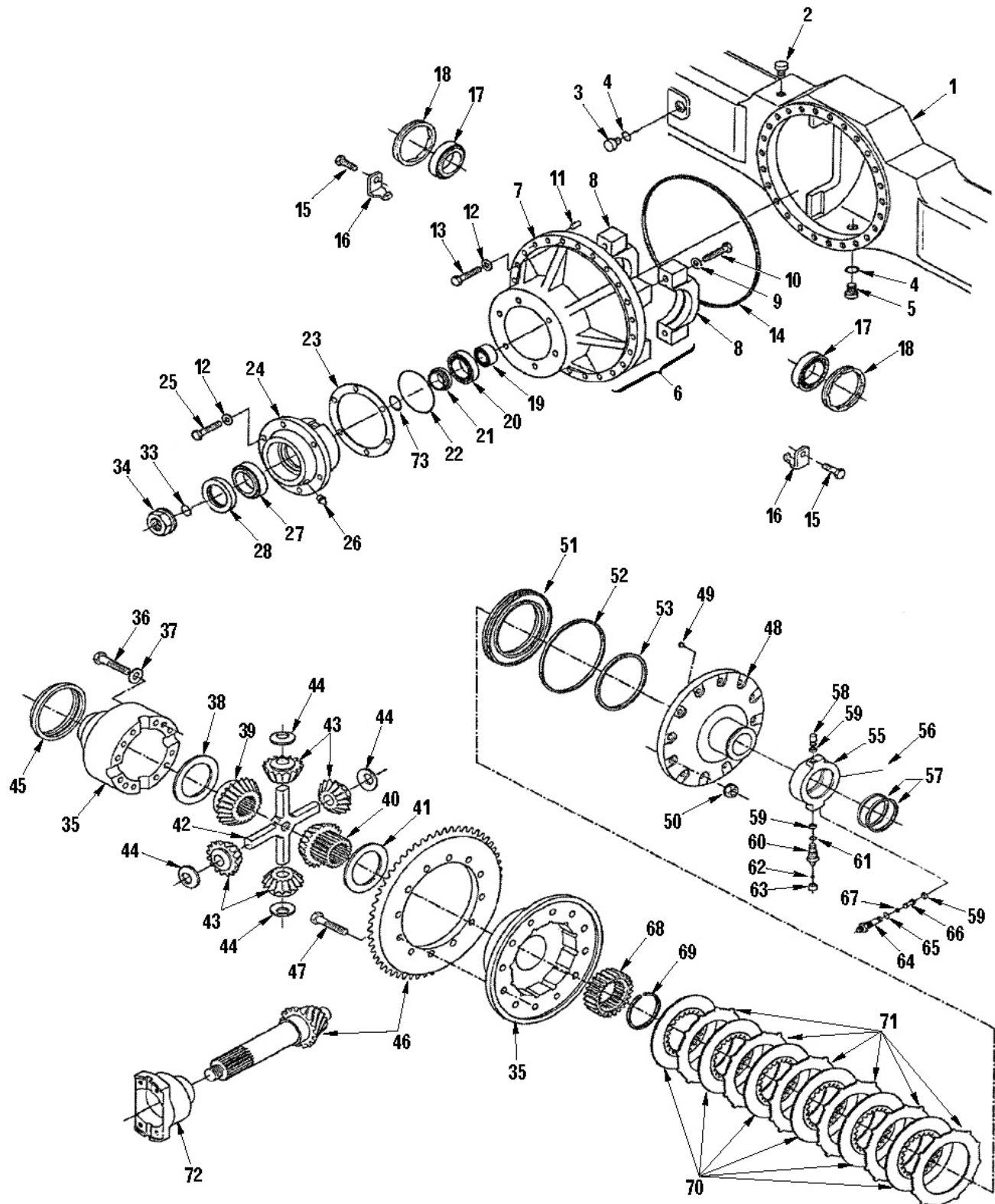
Remove checking gauge assembly and check for full bearing contact on bearing surfaces.

If contact is full and proper, again position checking gauge assembly in carrier and check distance to ground surface on pinion. Do not apply pressure to arbor or micrometer. Turn micrometer carefully and evenly until the flat tip of the micrometer extension contacts the ground surface of the pinion squarely. Subtract this reading from the value previously recorded and this equals the amount of shims to be added between the inner pinion bearing cup and the carrier housing.

EXAMPLE:

5.289	[134.341 mm]	Value etched on ring gear.
+0.469	[011.913 mm]	Constant (1/2 thickness of gauge bar).
5.758	[146.253 mm]	Total
-5.728	[145.491 mm]	Initial micrometer reading.
0.030	[.762 mm]	Add this value in shims under inner pinion bearing cup.

DIFFERENTIAL ASSEMBLY EXPLODED VIEW





DIFFERENTIAL ASSEMBLY PARTS DESCRIPTION

<u>ITEM</u>	<u>QTY</u>	<u>DESCRIPTION</u>	<u>ITEM</u>	<u>QTY</u>	<u>DESCRIPTION</u>
1	1	AXLE HOUSING	39	1	SIDE GEAR
2	1	VENT	40	1	CLUTCH SIDE GEAR
3	1	FILL PLUG	41	1	THRUST WASHER
4	2	PLUG O-RING	42	1	DIFFERENTIAL CROSS
5	1	MAGNET DRAIN PLUG	43	4	DIFFERENTIAL PINION GEAR
6	1	CARRIER AND CAP ASSY.	44	4	THRUST WASHER
7	1	CARRIER	45	1	DIFFERENTIAL CASE SEAL
8	1	CARRIER CAP	46	1	RING & PINION SET
9	4	CARRIER CAP WASHER	47	12	RING GEAR MOUNTING BOLT
10	4	CARRIER CAP BOLT	48	1	CASE FLANGE HALF
11	1	DOWEL PIN	49	1	PLUG
12	30	LOCK WASHER	50	12	NUT
13	24	BOLT	51	1	CLUTCH PISTON
14	1	O-RING	52	1	OUTER SEALING RING
15	2	ADJUSTING NUT LOCK BOLT	53	1	INNER SEALING RING
16	2	NUT LOCK	55	1	SEAL RETAINER
17	2	TAPERED BEARING	56	6	OIL PASSAGE PLUG
18	2	ADJUSTING NUT	57	2	PISTON RING
19	1	ROLLER BEARING	58	1	BALANCE PISTON
20	1	CENTER PINION BEARING	59	3	O-RING
21	1	PINION SPACER	60	1	NIPPLE - PRESSURE PORT
22	1	O-RING	61	1	O-RING
23	AR	BEARING RETAINER SHIM	62	1	FILTER
24	1	BEARING RETAINER	63	2	PLUG
25	6	BEARING RETAINER BOLT	64	1	NIPPLE - TANK PORT
26	2	BEARING RETAINER PLUG	65	1	O-RING
27	1	OUTER PINION BEARING	66	1	EXTENSION TUBE
28	1	OIL SEAL	67	1	SEALING RING
33	1	PINION NUT O-RING	68	1	CLUTCH DRIVER
34	1	PINION NUT	69	1	SNAP-RING
35	1	CASE ASSEMBLY	70	6	INNER DISC.
36	16	CASE BOLT	71	6	OUTER DISC.
37	16	CASE WASHER	72	1	PINION FLANGE
38	1	THRUST WASHER	73	AR	PINION BEARING SHIM

DIFFERENTIAL ASSEMBLY REMOVAL

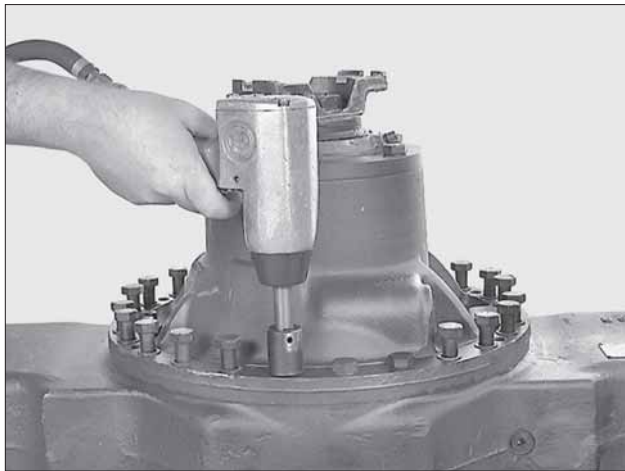


Figure 1

Remove differential to axle bolts and washers.



Figure 2

Install (4) pusher bolts in the threaded holes in the carrier flange. Attach lifting device to input flange.



Figure 3

Tighten (4) pusher bolts evenly and lift differential assembly straight up and off of dowel pin.

Mount differential on suitable overhaul stand.

IMPORTANT: Using a dial indicator check and record ring gear backlash at this time. This information is necessary for reassembly unless a new gear set is installed.

DISASSEMBLY



Figure 4

Loosen flange nut.



Figure 5

Remove flange nut.
Remove flange nut o-ring.



Figure 6

Remove flange.



Figure 7
Remove tank and pressure port nipples.

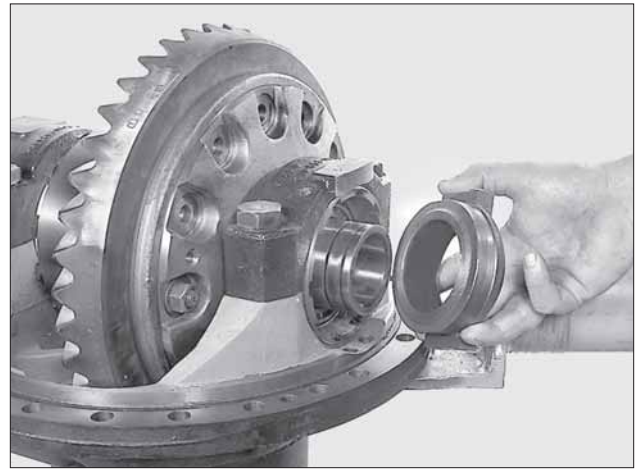


Figure 10
Remove seal retainer. Remove (2) seal rings.

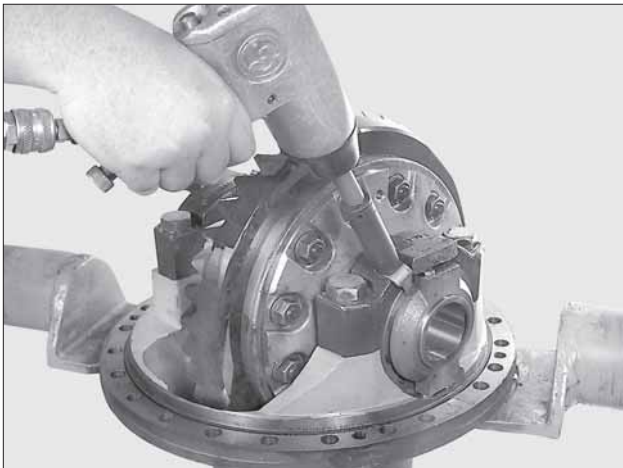


Figure 8
Remove (2) adjusting nut lock bolts.

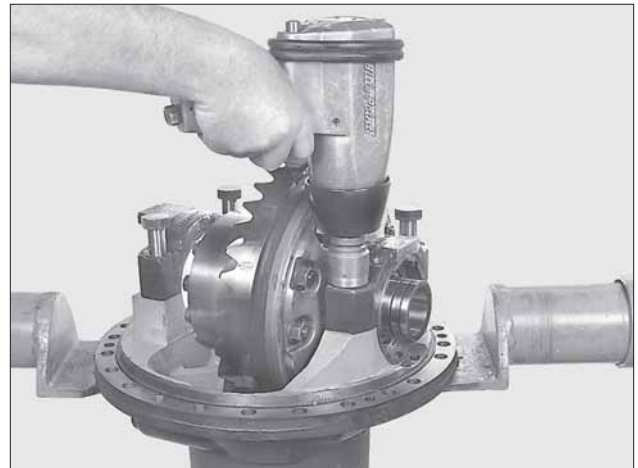


Figure 11
Match mark differential caps for reassembly.
Remove (4) cap bolts and washers.



Figure 9
Remove (2) adjusting nut locks.

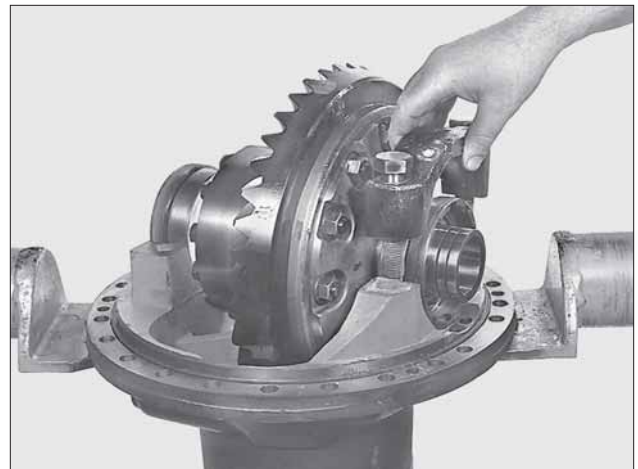


Figure 12
Remove (2) differential caps.

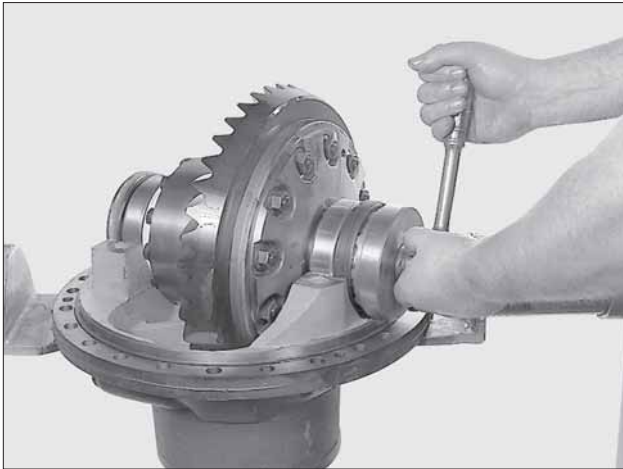


Figure 13

Remove (2) differential bearing adjusting nuts.

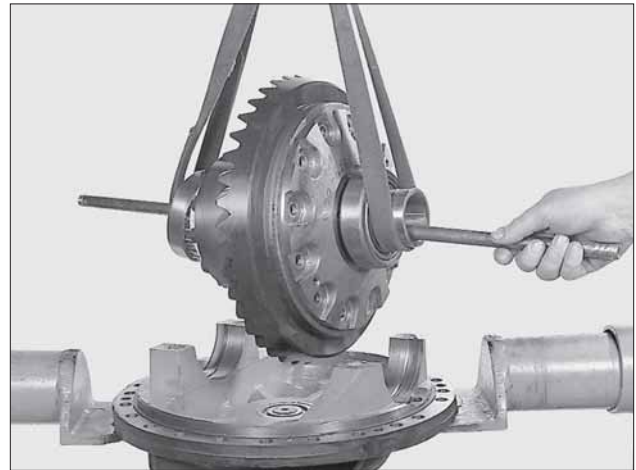


Figure 16

Remove differential assembly from carrier.
Remove bearing cones.



Figure 14

Remove (12) ring gear mounting bolt nuts.

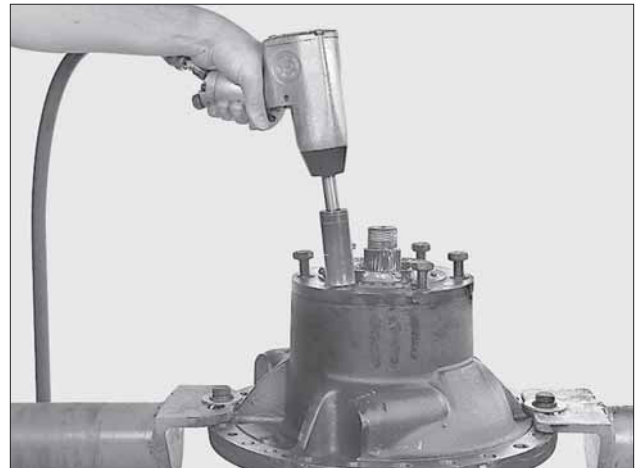


Figure 17

Remove (6) bearing retainer bolts and washers.



Figure 15

Drive ring gear bolts through ring gear and remove.



Figure 18

Remove pinion shaft and bearing retainer.



Figure 19

Remove shims. Press pinion from bearing retainer.
Remove bearing cups and oil seal from retainer.

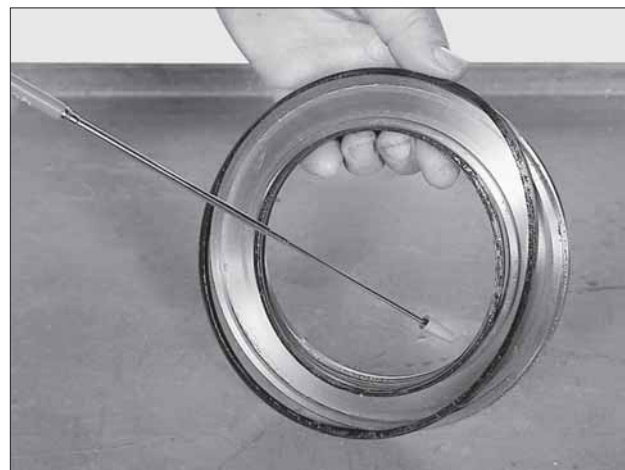


Figure 22

Remove inner and outer piston seals.

DIFFERENTIAL DISASSEMBLY

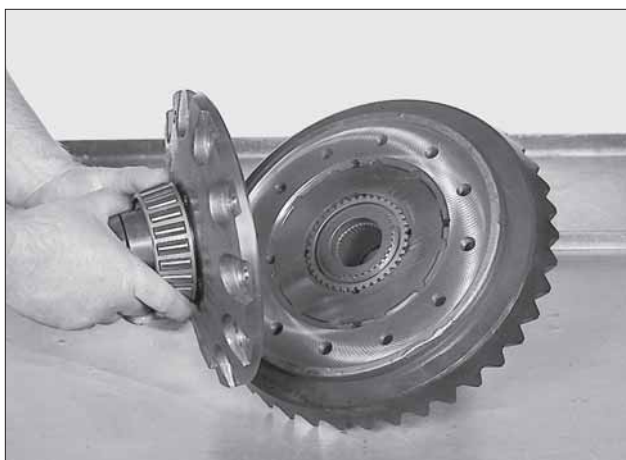


Figure 20

Mark flange half, clutch housing and case half with alignment marks for reassembly. Remove case flange half.



Figure 23

Remove ring gear.



Figure 21

Install a seal retainer and piston rings as shown. Carefully and slowly apply compressed air to port in distributor to remove piston. Using appropriate puller remove bearing cone if replacement is required.



Figure 24

Remove clutch driver snap ring.

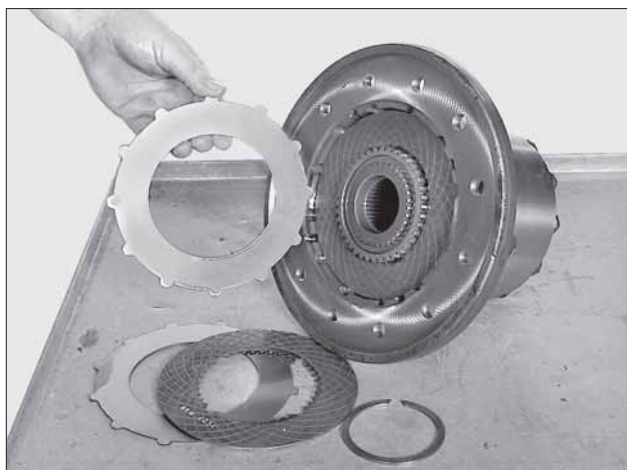


Figure 25
Remove friction and reaction plates.



Figure 28
Remove (16) case cap half to
clutch housing bolts and washers.



Figure 26
Remove clutch driver.



Figure 29
Separate case halves.



Figure 27
Remove differential case seal.
Using appropriate puller remove bearing cone if
replacement is required.



Figure 30
Remove side gear and thrust washer
from case cap half.

DIFFERENTIAL REASSEMBLY

NOTE: All parts must be lubricated
with axle lubricant at reassembly.
No part should assembled dry.



Figure 31
Remove differential cross, pinions
and thrust washers from clutch housing.



Figure 32
Remove clutch side gear.



Figure 33
Remove clutch side gear thrust washer.



Figure 34
Position side gear thrust washer in clutch housing.



Figure 35
Install clutch side gear.



Figure 36
Assemble differential cross, (4) pinions and
(4) thrust washers and install as an assembly.



Figure 37
Position standard side gear on
pinion and cross assembly.



Figure 40
Install (16) case bolts and install with washers.
Tighten to 71-88 Nm [52-65 LBF/FT].



Figure 38
Place side gear thrust washer on side gear.

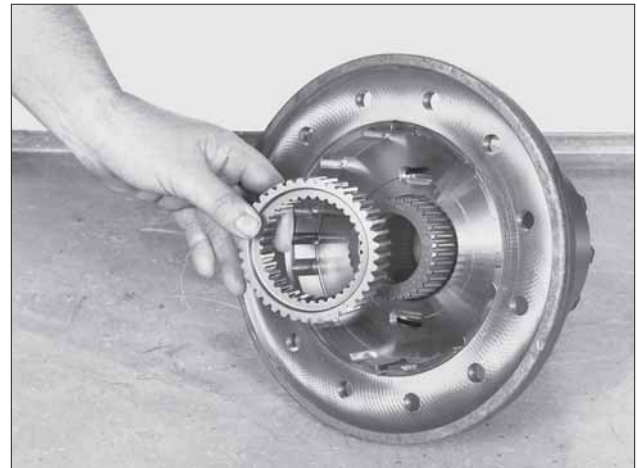


Figure 41
Position clutch driver on splines of clutch side gear.



Figure 39
Using appropriate driver install bearing cone on case
cap half. Position case cap half and bearing on clutch
housing. **NOTE:** Be sure to match up alignment
marks made during disassembly.

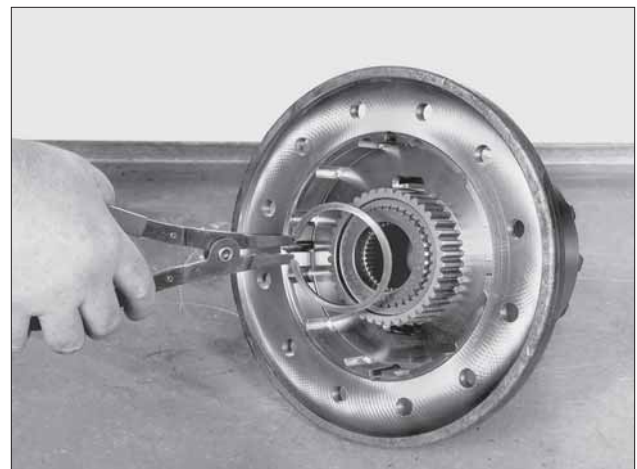


Figure 42
Install clutch driver to gear snap ring.



Figure 43

Install (1) friction plate in clutch housing.

NOTE: Identify notch in splines.

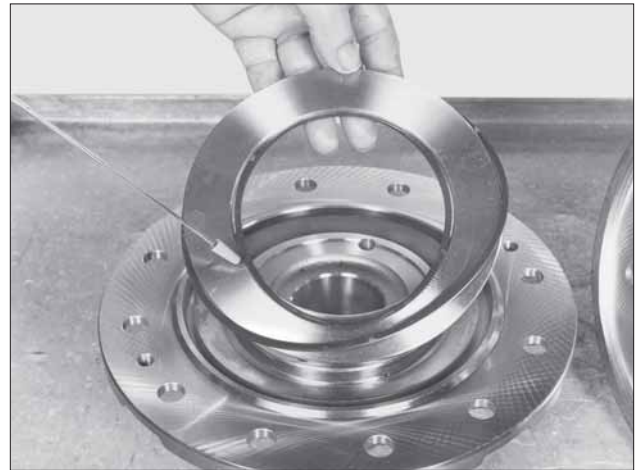


Figure 46

Install new inner and outer seal rings on piston.
Lubricate rings and piston bore in housing with grease.



Figure 44

Install (1) reaction plate.



Figure 47

Using soft faced hammer evenly tap piston into clutch housing. **NOTE:** Be careful not to damage seal rings.



Figure 45

Install friction plate aligning notch with previous friction plate. Alternate reaction and friction plates until (6) of each are installed. **NOTES:** The notch in each friction plate must be aligned with the notch in the proceeding plate. Be sure plates are lubricated with axle lubricant on both sides.



Figure 48

Align screw holes and match marks made at disassembly on flange half case with clutch housing.



Figure 49

Install case flange half. Using appropriate driver install bearing cone on flange half case.



Figure 50

Turn differential body assembly over. Heat ring gear to 93-100°C [200-212°F] and install using (2) ring gear bolts located 180° apart in ring gear to aid in alignment of bolt holes.

CAUTION: Use gloves to avoid injury.
Temporarily install (2) nuts
and tighten to 135 Nm [100 LBF/FT].



Figure 51

Press inner bearing on pinion.



Figure 52

Stake pinion to bearing inner race
in (4) places equally spaced around diameter.
Refer to instructions on page 12.



Figure 53

Press center bearing on pinion shaft with the large
diameter of bearing towards gear teeth.



Figure 54

If the ring and pinion, tapered bearings or bearing retainer were not replaced install the original bearing spacer and shim. If new parts are used a shim kit should be used. Install the spacer provided in the kit along with same thickness shim removed plus an additional shim.



Figure 55

Install center and outer bearing cups in bearing retainer.

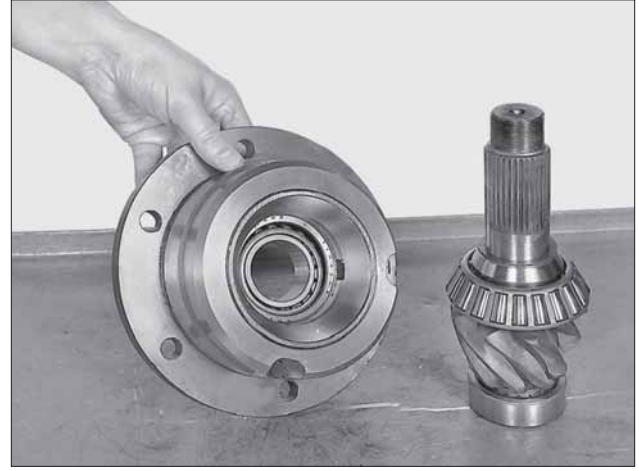


Figure 56

Position bearing retainer on pinion.
Press outer bearing cone in place.

PINION BEARING SETTING PROCEDURE



Figure 57

Install input flange, and flange nut. Tighten nut to minimum 800 Nm [590 LBF/FT] (dry thread). Secure bearing retainer in vise to allow pinion to rotate. Using an "inch pound" torque wrench check rolling resistance torque. Rolling resistance should be 1.1-3.4 Nm [10-30 LBF/IN]. If not within specifications add shim thickness to decrease torque or remove shim to increase torque.

IMPORTANT: This rolling torque check must be made again with seal retainer assembly installed in the carrier housing. Install seal retainer assembly in housing with original bearing cage shims and (4) retainer screws and washers. Tighten screws to 182-202 Nm [134-149 LBF/FT]. Repeat rolling resistance check. Rolling resistance must be 1.1-3.4 Nm [10-30 LBF/IN].

NOTE: The flange will be removed after ring gear to pinion contact and backlash has been set.

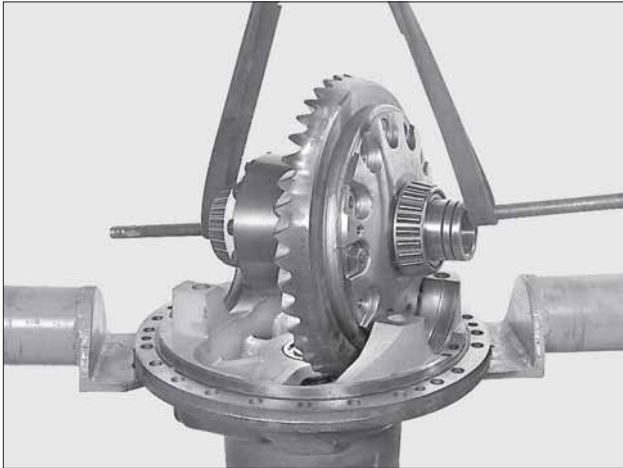


Figure 58

Insert a bar as shown to facilitate lifting. Position differential into carrier, tilting it so that ring gear will clear inner bearing bore boss in carrier.

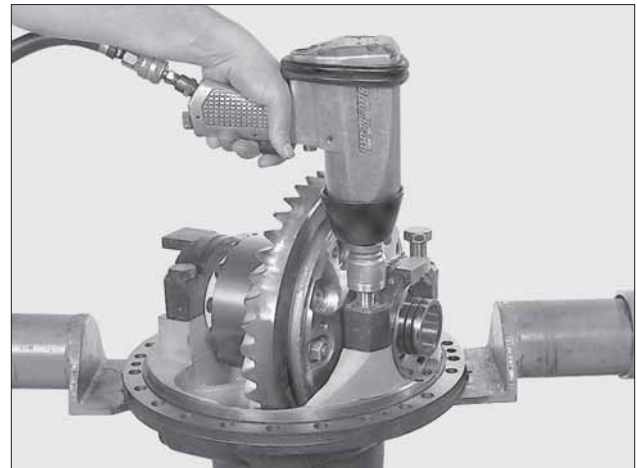


Figure 61

Position bearing caps on bearings and adjusting nuts making sure match marks made during disassembly are properly aligned. Install (4) cap bolts and washers.

NOTE: Tighten to snug up.

Do not torque at this time.



Figure 59

Position differential bearing cups on each side over bearing cones.



Figure 60

Install adjusting nuts on each side against bearing cup. **NOTE:** Turn adjusting nuts by hand to be sure of proper thread alignment.



Figure 62

Remove (2) temporarily installed ring gear bolt nuts. Install (10) ring gear mounting bolts. Apply Loctite 242 or equivalent to bolt threads and install (12) nuts. Hold pinion flange and tighten nuts to 182-202 Nm [134-149 LBF/FT].

RING AND PINION BACKLASH SETTING

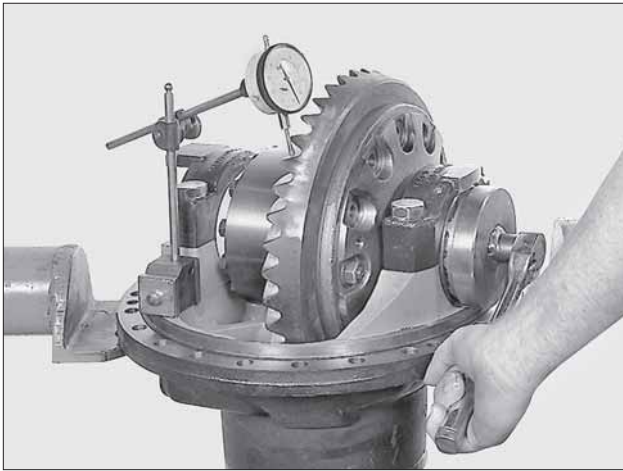


Figure 63

Use a dial indicator as shown. Move ring gear by loosening one adjusting nut and tightening opposite adjusting nut. Adjust position until gear backlash is to backlash specifications of 0.23-0.33 mm [.009-.013"]. Use 0.33 mm [.013"] for new ring gear set, or adjust to backlash recorded at disassembly for used gears. **Refer to Figure 3.** When proper backlash is achieved, tighten opposite adjusting nut to remove all end play on tapered bearings. Using only thumb and forefinger, move ring gear. When ring gear becomes difficult to move, preload on bearing is set. Recheck backlash.

RING GEAR TO PINION MOUNTING DISTANCE SETTING PROCEDURE

If mounting distance pinion setting gauge is used follow instruction supplied with gauge.

Refer to procedure on page 13.

Use the following procedure when the pinion setting gauge is not used:

Check ring and pinion gear for proper tooth contact. Paint ring gear with a gear tooth marking compound.

When ring and pinion gears are rotated, the compound is squeezed away by the contact of the teeth, leaving bare areas the exact size, shape and location of the contacts. As a rule, painting about 10 or 12 teeth is sufficient for checking purposes. Sharper impressions may be obtained by applying a small amount of resistance to the ring gear with a flat steel bar and using a wrench to rotate the pinion. Gears should be rotated, under slight load, until ring gear has turned at least one revolution in both directions. Check tooth contact pattern on drive side (convex side) of ring gear teeth. Coast side will automatically correct when drive side pattern is correct. **Refer to gear tooth contact charts on pages 9&10.** If proper tooth contact pattern is not as shown, readjust backlash or, add to or subtract from shim pack between bearing cage flange and differential housing. Addition of or subtraction of shims should be made in small increments until proper contact is established. After optimum tooth contact is made, the differential and pinion must be removed from the carrier, this will allow for proper sealing measures at reassembly.

Figure 64

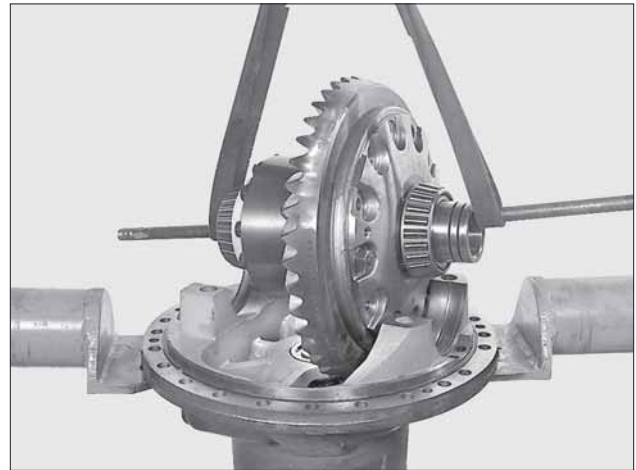


Figure 65

Remove differential assembly from carrier.
Refer to Figures 11-13.

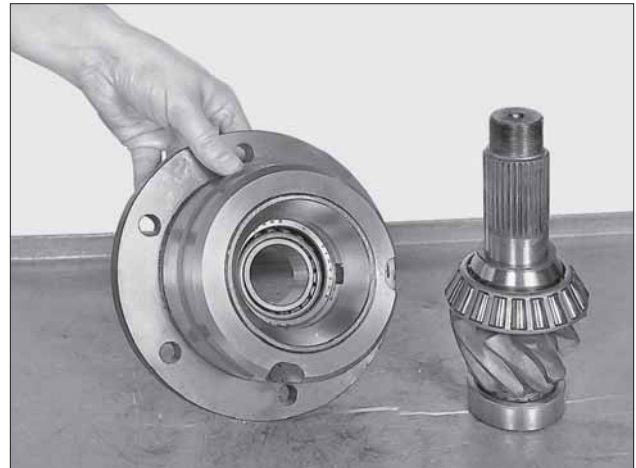


Figure 66

Remove pinion shaft and retainer assembly from carrier. Remove flange from pinion. Remove pinion from bearing retainer.



Figure 67

Apply Loctite 515 or equivalent to outer diameter of pinion oil seal. Using appropriate driver install seal with lip of seal facing in/down.

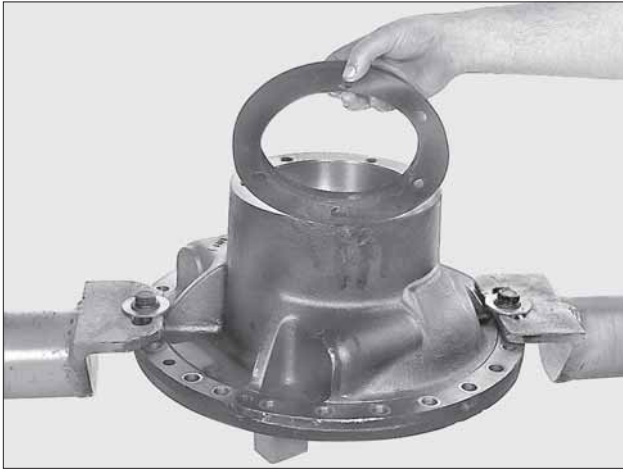


Figure 68
Install bearing retainer shims. **NOTE:** Install with reference hole in shims opposite ring gear.



Figure 69
Press pinion into bearing retainer assembly. Install pinion and retainer assembly in carrier housing.
NOTE: Line up oil holes in retainer and carrier housing.

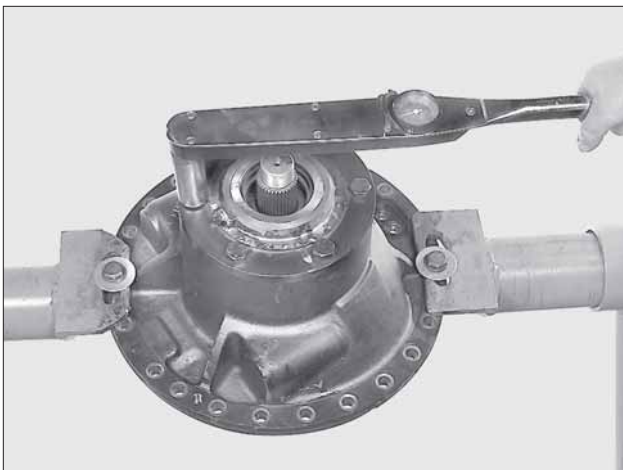


Figure 70
Install (6) bearing retainer bolts and washers. Tighten to 182-202 Nm [134-149 LBF/FT].



Figure 71
Install flange and flange o-ring. Apply Loctite 270 or equivalent to threads and install flange nut. Tighten to 600-800 Nm [443-590 LBF/FT].

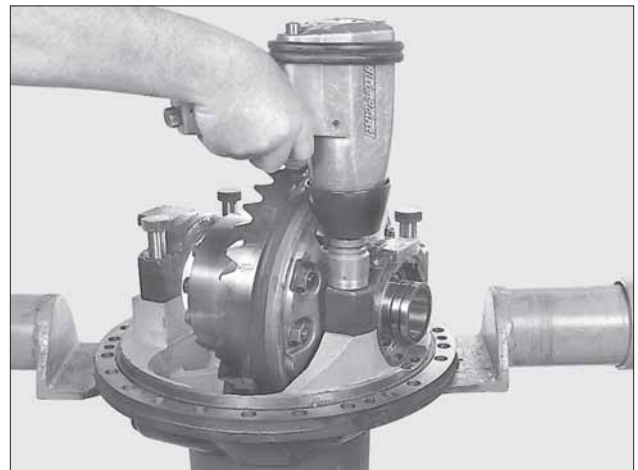


Figure 72
Reinstall bearing caps, cap bolts and washers. Tighten to snug up. **Refer to Figures 63 & 64** to set ring gear backlash, bearing preload and recheck tooth contact pattern. After optimum settings are made remove cap bolts and adjusting nuts, one side at a time, apply Loctite 242 or equivalent to bolt threads, Loctite 222 or equivalent to adjusting nut threads reinstall and tighten bolts to 495-611 Nm [365-451 LBF/FT].
NOTE: Recheck for proper ring gear backlash and bearing adjustment after final torquing.

DIFFERENTIAL INSTALLATION



Figure 73

Install (2) piston rings on carrier journal. Lubricate rings and seal retainer with grease. Install seal retainer.



Figure 74

Apply Loctite 242 or equivalent to bearing nut lock bolt and install with nut lock. Tighten to 16-26 Nm [22-19 LBF/FT]. Repeat with bolt and nut lock on opposite side.



Figure 75

Install new square cut seals and o-rings to nipples. Install nipples in carrier housing and tighten to 40-50 Nm [29-37 LBF/FT].

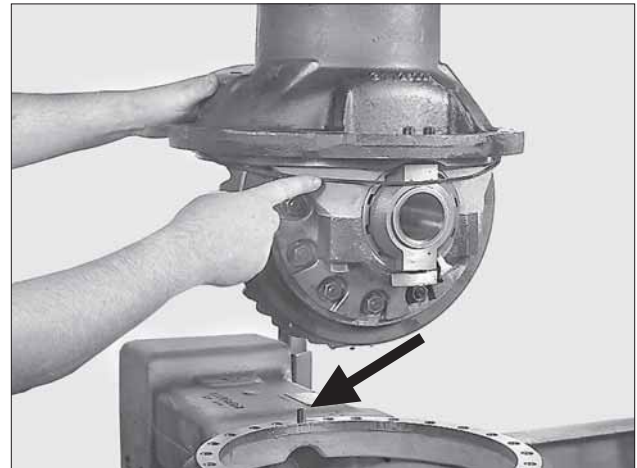


Figure 76

Install new carrier to axle housing o-ring on carrier. Install alignment dowel pin in axle housing.

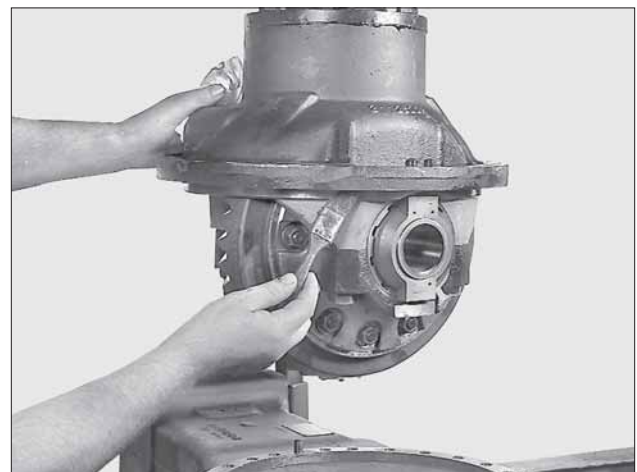


Figure 77

Apply light coat of grease to pilot on flange of carrier. Lower assembly carefully into axle housing. Align dowel pin with hole in carrier. Tap lightly at dowel pin location while lowering assembly into position.

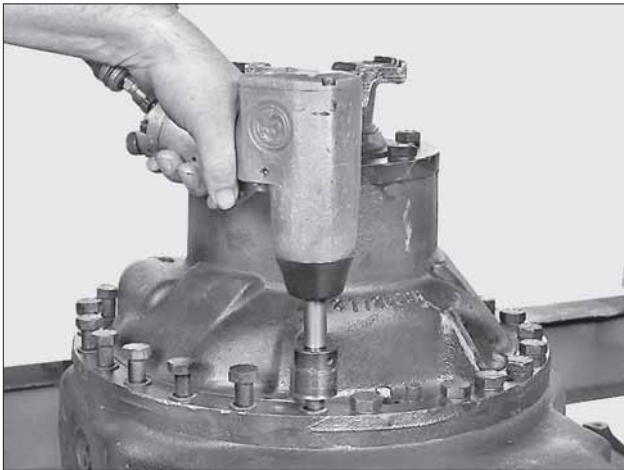


Figure 78
Install (24) carrier to
axle housing bolts and washers.

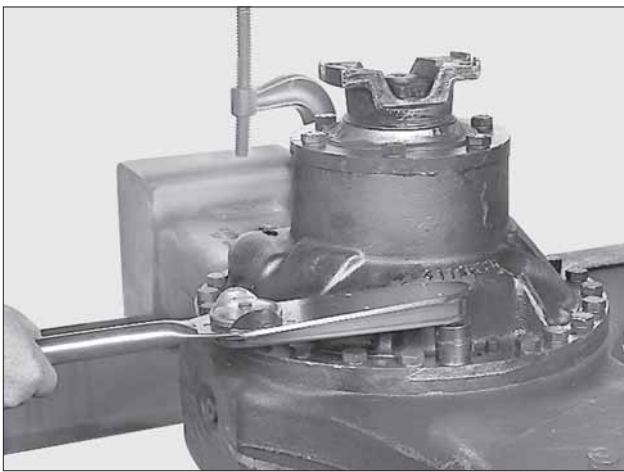


Figure 79
Tighten (24) bolts to 182-202 Nm [134-149 LBF/FT].

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