



SPICER®
Off-Highway Products

Service Manual

Axle
42R
Hydralock Differential

ASM-0182
February 2003



FOREWORD

This manual has been prepared to provide the customer and the maintenance personnel with information and instructions on the maintenance and repair of the Spicer Off Highway 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 and 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 the 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 Spicer Off Highway Products 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. Spicer Off Highway products does not warrant repair or replacement parts, nor failures resulting from the use of parts which are not supplied or approved by Spicer Off Highway Products. **Important:** Always furnish the distributor with the serial and model number when ordering parts.

CAUTION

To reduce the chance of personal injury and/or property damage, the following instructions must be 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 one of the same part number or with an equivalent 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 tools specifically designed for the purpose.

Accordingly, anyone who intends to use a replacement parts service procedure or tool, which is not recommended by SOHPD, must first determine that neither his safety nor 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, or the possibility that improper service or repair may damage the unit or render it unsafe. It is also important that these 'Cautions' and 'Notices' are not exhaustive, because it is impossible to warn of all the possible hazardous consequences that might result from failure to following these instructions.



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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. When drying bearings, use moisture-free compressed air, being careful to direct air stream across bearings as to avoid spinning. Bearings may be rotated slowly by hand to facilitate the drying process.

Housing

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 lintless 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" (MS107C).

Gears and Shafts

If magna-flux process is available, use process to check parts. Examine teeth and ground and 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. Inspect shafts to make certain they are not sprung, bent, or splines twisted, and that shafts are true. Differential pinions and side gears must be replaced as sets. Differential ring gear and spiral pinion must also be replaced as a set if either is damaged.



CLEANING and INSPECTION (Cont.)

Housing and Covers

Inspect housing, covers, planet spider, and differential case 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 condition which cause subsequent oil leaks or failures.

Reassembly of Axle

The reassembly instructions describe the procedure to be followed when reassembling and installing components of axle. Instructions covering reassembly of opposite side is identical unless otherwise noted.

Important: Class 8.8 and 10.9 and 12.9 fastening hardware has been used in the production of the axle assemblies covered in the manual. A table of proper torque values for the fastener classes above are provided within this manual. The class of hardware may be determined by the markings contained on the head of each capscrew. Class 12.9 torque values need to be used on all sockethead capscrew used with this assembly. Torque values specified in text of this manual are for class 8.8, 10.9 hardware where presently used in production. On all axles being overhauled, bolts should be identified as described above and torque value chart consulted for correct torque.

At Reassembly Apply Thread Locking Compound Where Noted

Guidelines for application where to apply:

- A. On bolts, capscrews, and studs (anchor end).
- B. On nuts, apply compound to the male thread of the mating fastener.
- C. Apply compound to coat the full length and circumference of thread engagement.
- D. Remove excess compound from mating parts after fastener installation.



RECOMMENDED LUBRICANTS FOR SPICER 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 Spicer 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.

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 baseline. 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.

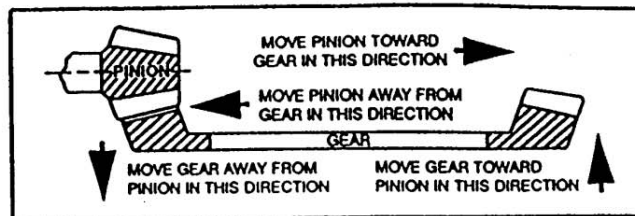
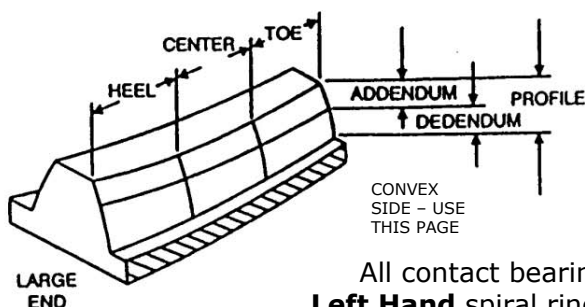
Friction Modifiers: Friction modifiers may be used with the lubricant to reduce Posi-Torq (limited slip) differential noise or liquid cooled brake noise. If friction modifiers are used, follow instructions on **TSB 278E**.

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										
						SAE 140				
					80W140 / 85W140					
				SAE90						
			80W90							
		75W90								
						75W				
DEG.C.	-40	-30	-20	-10	0	10	20	30	40	50
F.	-40	-22	-4	14	32	50	68	86	104	122



LEFT HAND SPIRAL

SPIRAL BEVEL AND HYPOID TOOTH BEARING CONTACT CHART



All contact bearings shown below are on **Left Hand** spiral ring gear – the drive is on the convex side of the tooth.

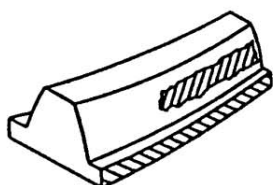


Fig. 1

Typical preferred bearing on both sides of tooth while under a light load.

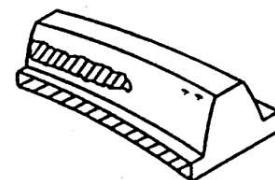


Fig. 2

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.

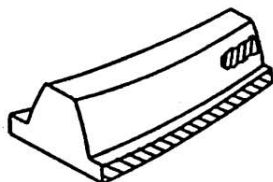


Fig. 3

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.

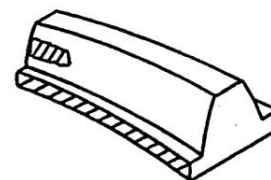


Fig. 4

Low bearing on gear and high bearing on pinion. Correct by pulling pinion away from gear (increase mounting distance).

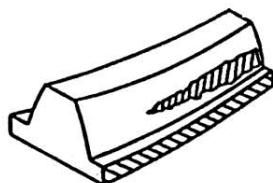
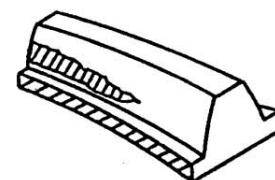


Fig. 5

High bearing on gear and low bearing on pinion. Correct by moving pinion toward gear (decrease mounting distance).



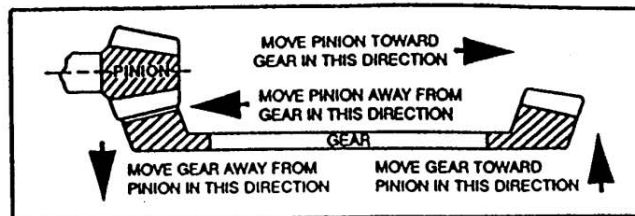
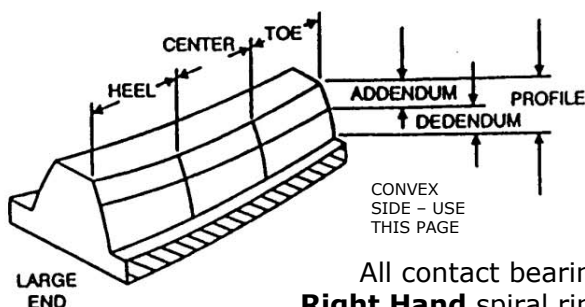
Backlash

Backlash should be measured with a dial indicator rigidly mounted with the stem perpendicular to the tooth surface at the extreme heel.



RIGHT HAND SPIRAL

SPIRAL BEVEL AND HYPOID TOOTH BEARING CONTACT CHART



All contact bearings shown below are on **Right Hand** spiral ring gear – the drive is on the convex side of the tooth.

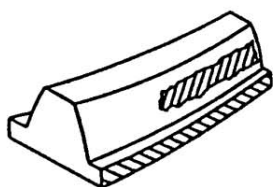


Fig. 1

Typical preferred bearing on both sides of tooth while under a light load.

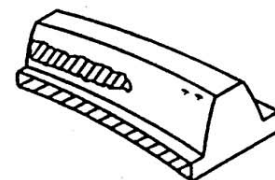


Fig. 2

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.

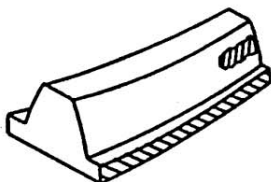


Fig. 3

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.

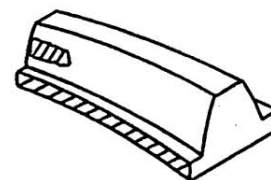


Fig. 4

Low bearing on gear and high bearing on pinion. Correct by pulling pinion away from gear (increase mounting distance).

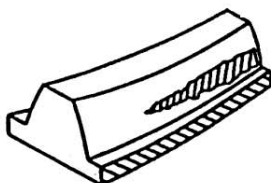
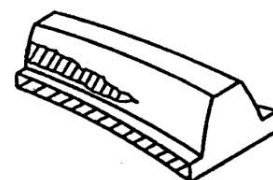


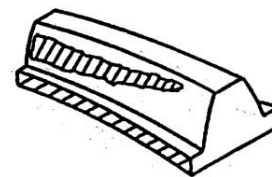
Fig. 5

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.





FASTENER TORQUE

**Grade 5 Identification, 3 Radial
Dashes 120 Degrees Apart on Head of Bolt**



Grade 5

**Grade 8 Identification, 6 Radial
Dashes 60 Degrees Apart on Head of Bolt**



Grade 8

Fastener Size

Lubricated and Plated

1/4-20 1/4-28	80-90 Lbs. In.	[9-10 Nm]
5/16-18 5/16-24	180-200 Lbs. In.	[21-23 Nm]
3/8-16 3/8-24	25-28 Lbs. Ft.	[34-38 Nm]
7/16-14 7/16-20	40-45 Lbs. Ft.	[54-61 Nm]
1/2-13 1/2-20	65-70 Lbs. Ft..	[88-95 Nm]
9/16-12 9/16-18	90-100 Lbs. Ft.	[125-135 Nm]
5/8-11 5/8-18	125-140 Lbs. Ft.	[170-190 Nm]
3/4-10 3/4-16	220-245 Lbs. Ft.	[300-330 Nm]
7/8-9 7/8-14	330-360 Lbs. Ft.	[450-490 Nm]
1-8 1-12	475-525 Lbs. Ft.	[645-710 Nm]
1-1/8-7 1-1/8-12	650-720 Lbs. Ft.	[880-975 Nm]
1-1/4-7 1-1/4-12	900-1000 Lbs.Ft.	[1220-1360 Nm]

Lubricated and Plated

110-120 Lbs. In.	[13-14 Nm]
215-240 Lbs. In.	[24-27 Nm]
35-40 Lbs. Ft.	[48-54 Nm]
60-65 Lbs. Ft.	[82-88 Nm]
90-100 Lbs. Ft.	[125-135 Nm]
125-140 Lbs. FT.	[170-190 Nm]
175-190 Lbs. Ft.	[240-260 Nm]
300-330 Lbs. Ft.	[410-450 Nm]
475-525 Lbs. Ft.	[645-710 Nm]
725-800 Lbs. Ft.	[985-1085 Nm]
1050-1175 Lbs. Ft.	[1425-1600 Nm]
1475-1625 Lbs. Ft.	[2000-2200 Nm]



FASTENER TORQUE



Coarse Threaded Fasteners

Thread Size Class 8.8	Torque	
	Nm	Lb-Ft
M5X0.8	5-6	43-53
M6X1	8-10	71-88
M8X1.25	20-25	177-221
		Lb-In
M10X1.5	40-45	30-33
M12X1.75	70-78	52-59
M14X2	110-125	81-92
M16X2	170-190	125-140
M20X2.5	340-380	251-280
M24X3	580-650	428-479
M30X3.5	1150-1300	848-959
M36X4	2000-2250	1479-1660



Coarse Threaded Fasteners

Thread Size Class 10.9	Torque	
	Nm	Lb-In
M5X0.8	7-8	62-71
M6X1	12-14	106-124
		Lb-Ft
M8X1.25	30-35	22-26
M10X1.5	60-65	40-48
M12X1.75	100-110	74-81
M14X2	155-180	114-133
M16X2	240-270	177-199
M20X2.5	450-500	332-369
M24X3	800-900	590-664
M30X3.5	1600-1800	1180-1328
M36X4	2800-3150	2065-2323



Coarse Threaded Fasteners

Thread Size Class 12.9	Torque	
	Nm	Lb-In
M5X0.8	8-10	71-88
M6X1	14-16	124-142
		Lb-Ft
M8X1.25	34-40	26-30
M10X1.5	70-75	52-55
M12X1.75	115-130	85-96
M14X2	180-210	133-155
M16X2	280-320	207-236
M20X2.5	550-600	406-443
M24X3	900-1050	664-774
M30X3.5	1850-2100	1364-1549
M36X4	3250-3700	2397-2729

SAE "O" Ring Thread

Thread Size	Torque	
	Nm	Lb-Ft
.3125-24	4-7	3-5
.3750-24	7-11	5-8
.4375-20	9-13	7-10
.5000-20	14-18	10-13
.5625-18	16-20	12-15
.7500-16	27-34	20-25
.8750-14	41-47	30-35
1.0625-12	61-38	45-50
1.3125-12	88-102	65-75
1.6250-12	102-115	75-85
1.8750-12	102-115	75-85

NOTE: Socket head capscrews are all Class 12.9



PINION STAKING

Staking of the pinion end to the inner pinion is required when the inner pinion bearing or the pinion shaft and ring gear are being replaced.

If a staking groove is in the pinion shaft, use procedure shown in Figure "A" and a square end staking tool.

If pinion has no staking groove use procedure in Figure "B" and a standard prick punch to up-set the metal over the bearing inner race.

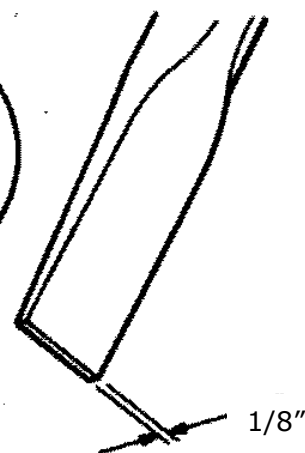
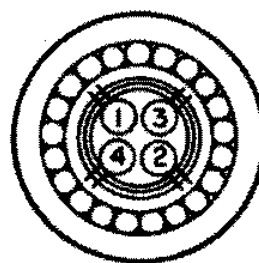
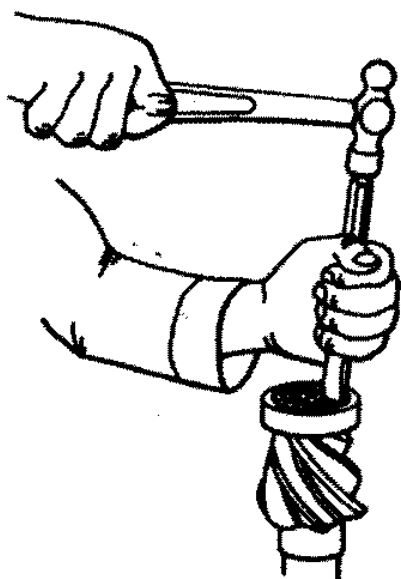
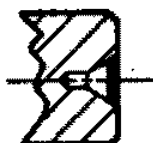
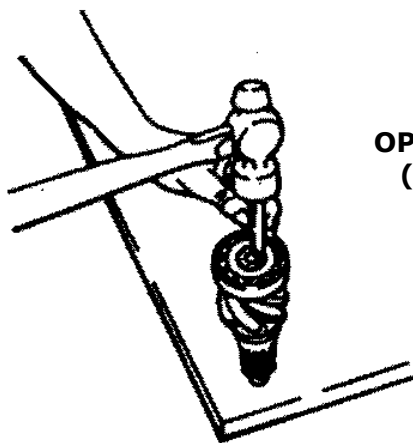


FIGURE A



**OPTIONAL CONSTRUCTION
(NO STAKING GROOVE)**

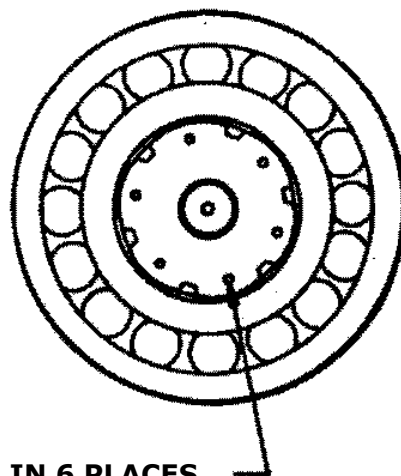
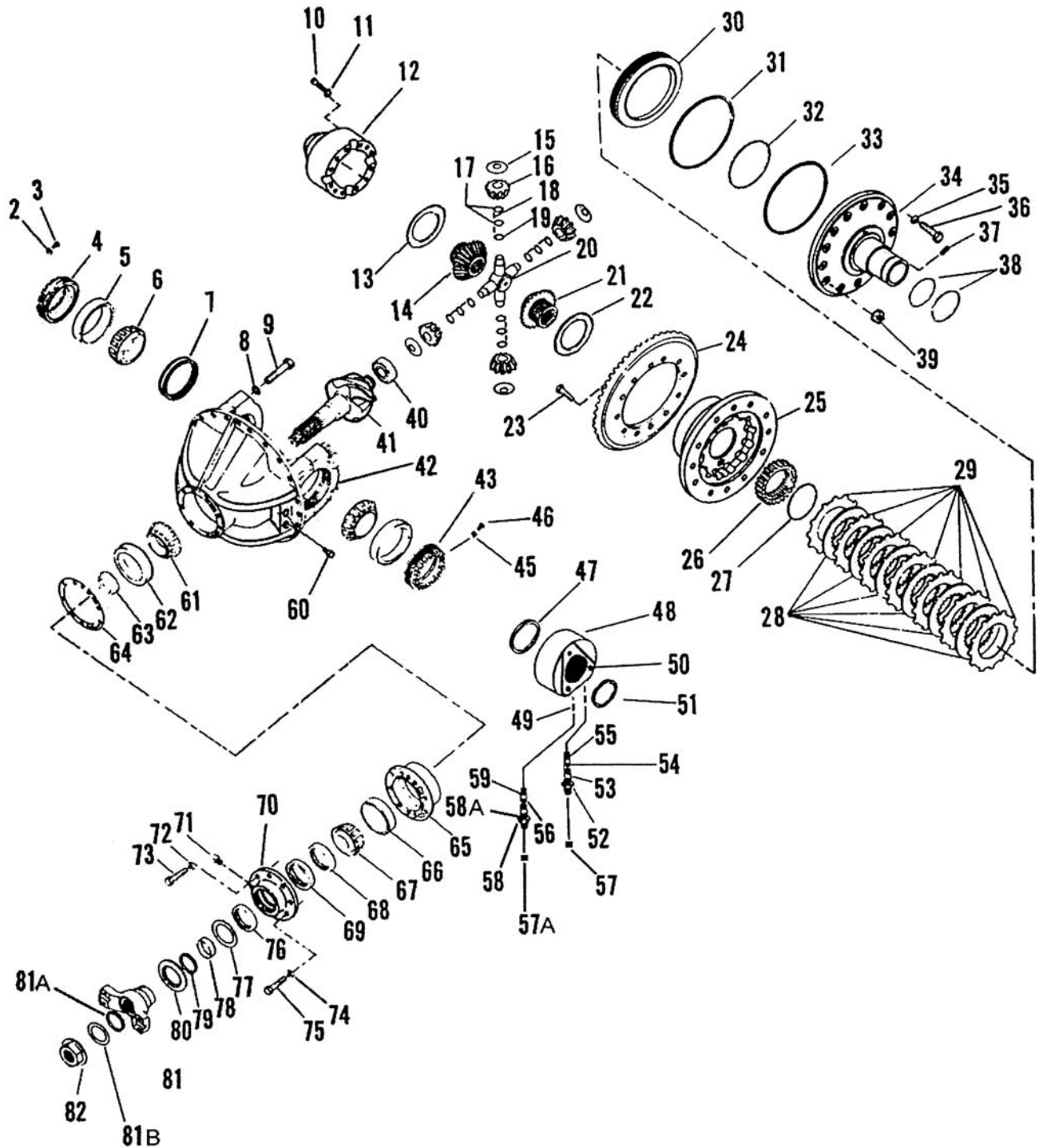


FIGURE B STAKE IN 6 PLACES



EXPLODED VIEW



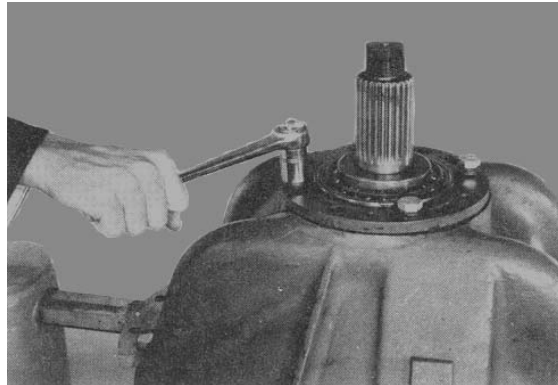


DIFFERENTIAL ASSEMBLY DESCRIPTION

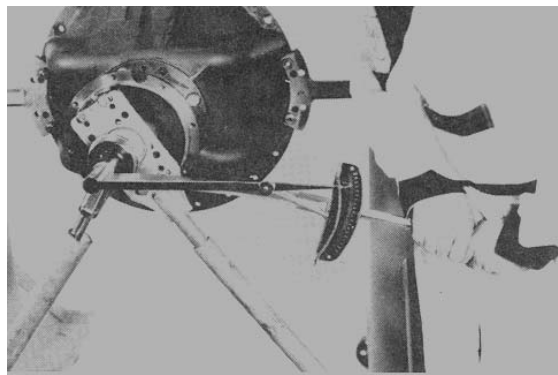
ITEM			ITEM		
<u>No.</u>	<u>DESCRIPTION</u>	<u>QTY</u>	<u>No.</u>	<u>DESCRIPTION</u>	<u>QTY</u>
1	Not Used In This Model		46	Adjusting Nut Capscrew	1
2	Adjusting Nut Lockwasher	1	47	Lip Seal Inner	1
3	Adjusting Nut Capscrew	1	48	Seal Retainer	1
4	Differential Adjusting Nut	1	49	Plug	2
5	Differential Bearing Cup	2	50	Cap Screws - Seal Retainer	3
6	Differential Bearing Cone	2	51	Lip Seal Outer	1
7	Differential Case Seal	1	52	Nipple	1
8	Carrier Cap Washer	4	53	O Ring Nipple	1
9	Carrier Cap Capscrew	4	54	Back Up Ring Tank Port	1
10	Case Capscrew	12	55	Square Cut Seal Tank Port	1
11	Case Washer	12	56	Back Up Ring Pressure Port	1
12	Plain Half Case	1	57	Cap	1
13	Side Thrust Washer	1	57A	Cap	1
14	Side Gear	1	58	Pressure Nipple	1
15	Pinion Gear Thrust Washer	4	58A	Nipple O-Ring	1
16	Pinion Gear	4	59	Seal Square Cut Pressure Port	1
17	Needle Roller Thrust Washer	8	60	Plug	2
18	Pinion Needle Rollers	328	61	Inner Pinion Bearing Cone	1
19	Needle Roller Thrust Washer	4	62	Inner Pinion Bearing Cup	1
20	Differential Cross	1	63	Pinion Bearing Spacer Kit	1
21	Clutch Side Gear	1	64	Bearing Cage Shim - .007	AR
22	Side Thrust Washer	1	64A	Bearing Cage Shim - .010	AR
23	Ring Gear Capscrew	12	65	Pinion Bearing Cage Assy	1
24	Ring Gear	1	66	Outer Pinion Bearing Cup	1
25	Clutch Housing	1	67	Outer Pinion Bearing Cone	1
26	Clutch Driver	1	68	Pinion Seal	1
27	Snap Ring Driver	1	69	Not Used In This Model	
28	Friction Plate	6	70	Pinion Seal Retainer	1
29	Reaction Plate	7	71	Grease Fitting	2
30	Clutch Plate	1	72	Seal Retainer Lockwasher	7
31	Piston Outer Seal	1	73	Seal Retainer Capscrew	7
32	Piston Inner Seal	1	74	Seal Retainer Lockwasher	1
33	Piston Wave Seal	1	75	Seal Retainer Capscrew	1
34	Flange Half Case	1	76	Grease Seal	1
35	Case Washer	3	77	Thrust Washer	1
36	Case Capscrew	3	78	Not Used In This Model	
37	Case Plug	1	79	V-Ring Seal	1
38	Piston Rings Rotary Seal	2	80	Not Used In This Model	
39	Gear Nut	12	81	Flange	1
40	Inner Pinion Bearing	1	81A	O Ring	1
41	Pinion Gear	1	81B	Spacer O Ring	1
42	Differential Carrier and Cap Assy	1	82	Flange Nut	1
43	Differential Adjusting Nut	2	83	Differential Case Assy	1
44	Not Used In This Model		84	Differential Body Assy	1
45	Adjusting Nut Washer	1	85	Drive Gear and Pinion Set	1



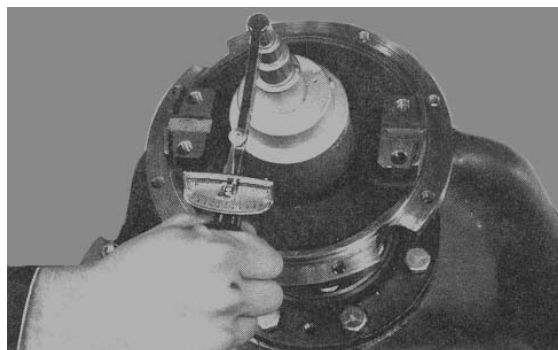
Pinion Bearing Rolling Torque Instructions



Install bearing cage and pinion shaft assembly in differential carrier without bearing cage shims. Use (4) oil pinion seal retainer bolts with flat washers to pull pinion shaft assembly fully into carrier assembly. Make sure oil passages are aligned. Install (3) flat washers on each bolt to prevent them from bottoming.



Temporarily install companion flange on end of pinion shaft without installing pinion oil seal retainer. Install companion flange retaining tool on companion flange and torque flange nut to 600 LBF-LB (850 Nm).



Remove companion flange retaining tool and use "inch-pound" torque wrench to check bearing preload. If bearing preload is not between 13 and 23 LBF-IN (1-3 Nm) the flange will have to be removed and the cage disassembled. Shims can then be added or removed as needed to obtain proper reading. Add shims to increase preload, remove shims to reduce preload. Reassemble unit and check again.

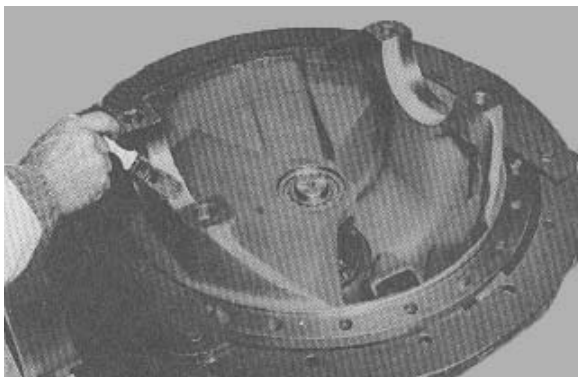


Pinion Mounting Distance Instructions

A pinion setting gauge must be used to achieve a precise mounting distance between the ring and pinion. The use of the gauge will determine the amount of shims needed to achieve the proper mounting distance. The shims will be placed under the pinion bearing cage to achieve an exact mounting distance between the ring gear and pinion. By using the gauge and adding the proper thickness of shims, an optimum tooth contact will be obtained. Setting the ring and pinion mounting distance without the gauge will require a trial and error procedure. A shim must be installed under the pinion bearing cage and then the unit must be completely assembled per service manual instructions. The procedure must be repeated until proper tooth contact is obtained.

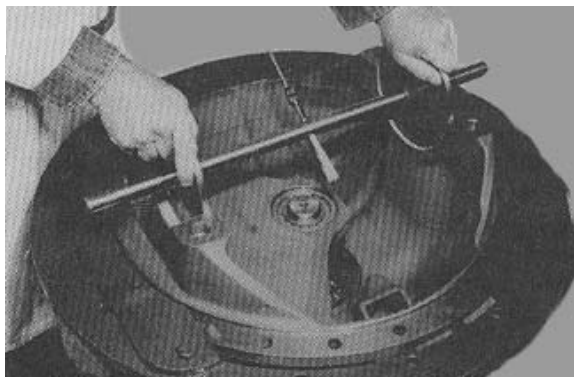
The position of the pinion as described will produce a proper tooth contact with the ring gear when it and the differential assembly are assembled and adjusted to proper backlash setting. The function of the gauge is to measure the distance from the centerline of the differential bearing bores to the ground surface on the end of the pinion gear. 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 mounting distance value will be etched. Add 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. Insert a 4" base 5/32" diameter extension depth micrometer and 5"- 6" extension into the guide bore of the micrometer arbor.

1



Paint bearing surfaces of carrier housing with gear tooth marking compound.

2



Mount adapter discs on micrometer arbor and set in position in carrier housing. 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.

3

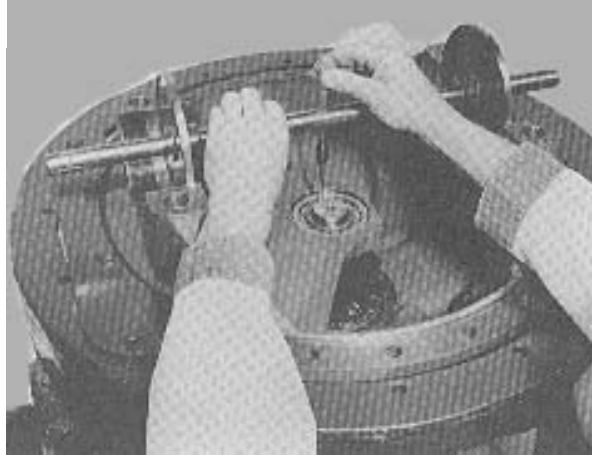


Remove checking gauge assembly and check for full bearing contact on bearing surfaces.



Pinion Mounting Distance Instructions (Cont.)

4



If contact is full and proper, position checking gauge assembly in carrier and check distance to ground surface on pinion (Figure 4). **DO NOT APPLY PRESSURE** to arbor or micrometer. Turn micrometer carefully and evenly until tip of extension contacts the ground surface of the pinion. In the assembly shown the distance measures 5.159 inches, the reading on the micrometer being .159 inch. Subtract this reading from the value etched on the ring gear, this equals the amount of shims to be added between the pinion bearing cage and the carrier housing.

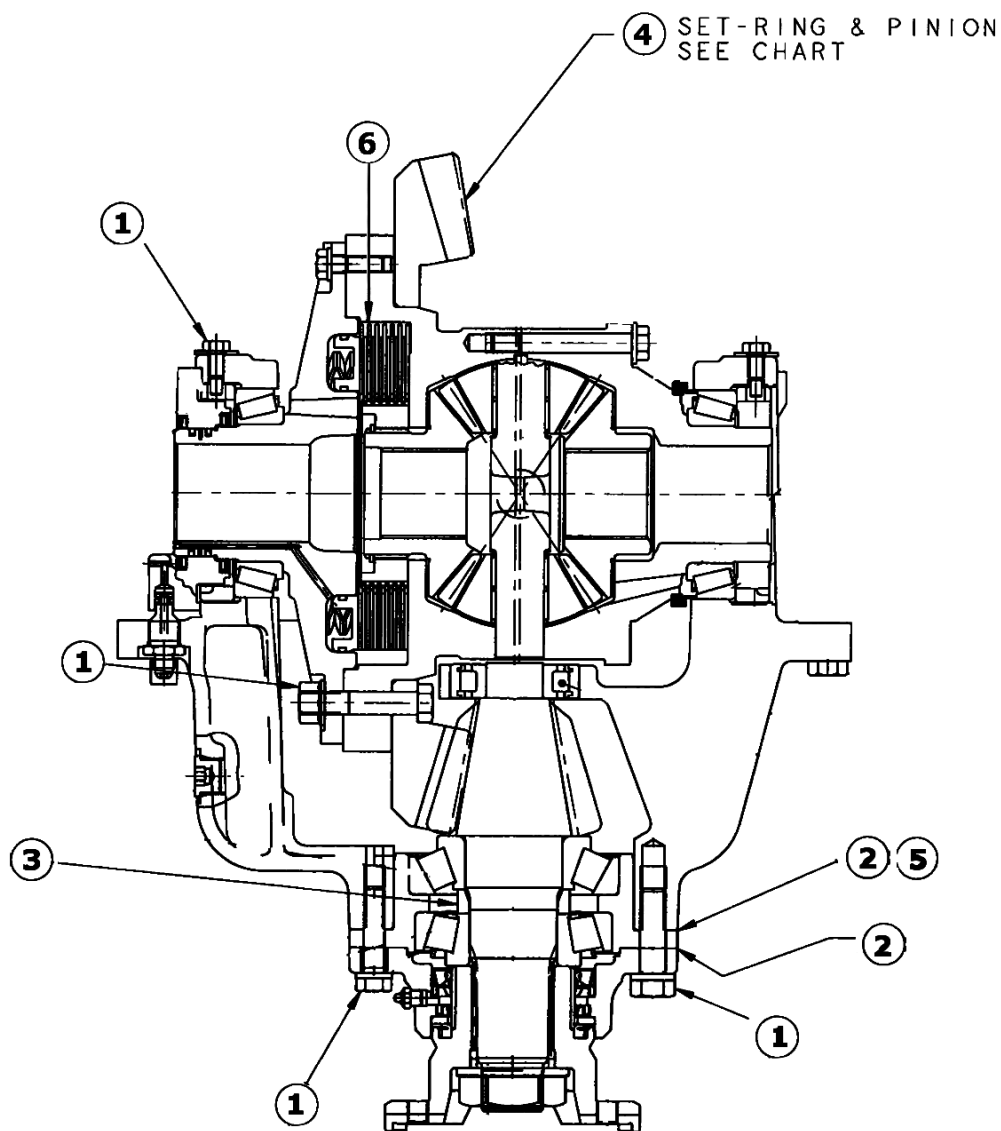
Example: 5.159 - Value etched on ring gear and half the thickness of the gauge bar.
5.129 - Initial micrometer reading.
.030 - Add this value in shims.

Remove bolts holding pinion bearing cage in differential carrier and remove bearing cage and pinion assembly. Install required shim pack and reinstall cage and pinion assembly in carrier. Tighten cage screws 177-199 LBF-FT (240-270 Nm) temporarily. After adding required amount of shims, again mount checking gauge assembly and recheck reading. The reading should now be .159 (5.159 inches) plus or minus .002 inch. In other words, the reading should be equal to value etched on the ring gear within .004 inch.



Differential Assembly Instruction

1. Apply Loctite 262
2. Apply Loctite 515
3. Select spacer to obtain a pinion bearing rolling torque of 13-23 LBF/IN (1.5-2.6 Nm) with pinion assembled in carrier. This check to be made before differential is assembled and not to include pinion oil seal drag.
4. Differential assembly to be adjusted to obtain a backlash of .010 (.254 mm) to .014 (.355 mm) between ring gear and pinion.
5. Shim as required
6. Apply MS266 oil to both sides of clutch plates. First install one friction plate and then one reaction plate, repeat until all plates are installed. Align all grooves in plates with grooves in diff clutch housing.

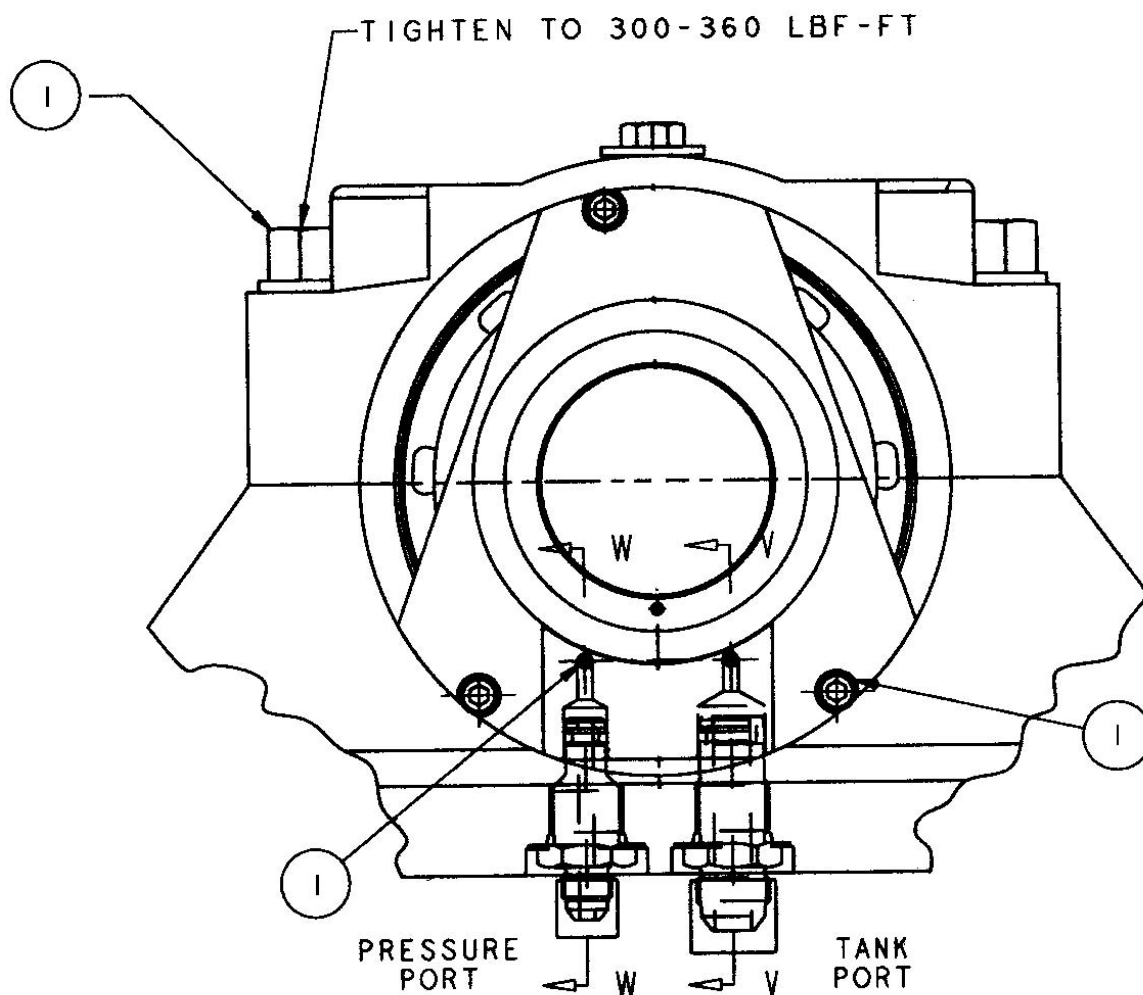




Differential Assembly Instruction (Cont.)
Instruction Drawing For Hydralock Differential Assemblies.
Pressure Test Procedure.

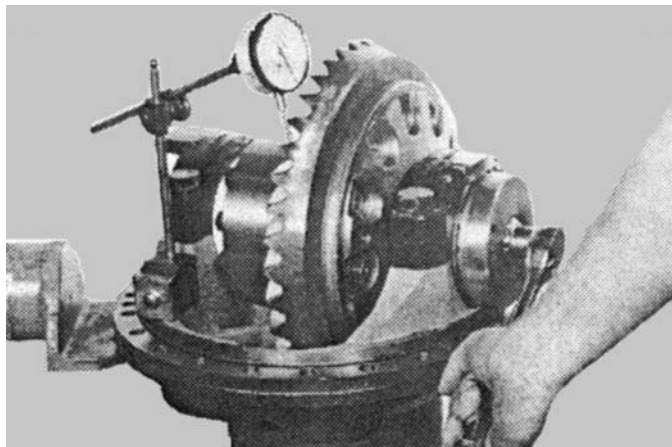
Air pressure test the pressure and tank port seals and system (Port W & V).
Apply 12 psi (83 kPa) to pressure and tank ports simultaneously. Allow stabilization period of 20 seconds min. Lock off pressure and measure decay in 10 seconds. Alternate decay / period is .1 psi (.69 kPa) per 5 minutes.

Hydraulic pressure test the pressure port seals and system (port W).
Apply 600 psi (4137 kPa) to pressure port. Place open tank line back to tank. Allow stabilization period of 20 seconds min and release. Reapply 600 psi (4137 kPa) and monitor fluid for a one minute period. Fluid flow rate is not to Exceed .75 gpm (2.83 l pm).





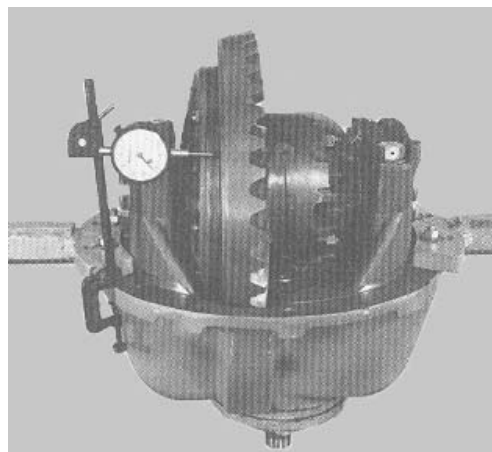
Backlash and Ring Gear Runout Instructions



Tighten bearing adjusting nuts to achieve "Zero Backlash". Loosen the adjusting nut opposite the ring gear until it no longer contacts the differential assembly. Tighten the nut on the ring gear side until the ring gear contacts the pinion and zero backlash is obtained. Tighten the other adjusting nut until snug. Mount a dial indicator as shown in the photo, plunger contacting the gear tooth.

Set backlash by loosening adjuster on ring gear side then alternately tightening the other adjuster. Gently rock ring gear back and forth while observing the dial indicator reading. Compare the dial indicator reading against the specs found in the Assembly Instructions section, page (16). Continue procedure until proper spec is obtained.

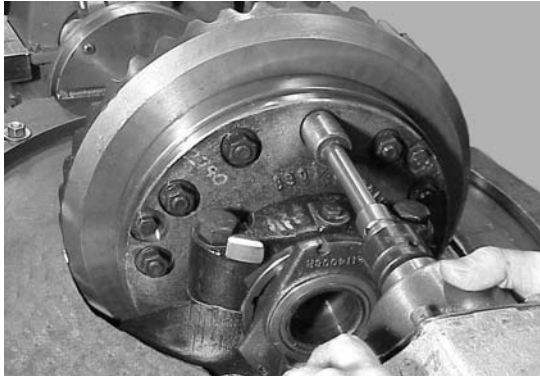
Once proper backlash has been obtained tighten adjusting nut opposite ring gear to set bearing preload. Using only thumb and forefinger, move ring gear back and forth. When ring gear becomes difficult to move bearing preload has been set.



Use dial indicator to check back face of ring gear. Rotate at least one full turn. Runout must not exceed .005 [0,12mm] total indicator reading. If runout is excessive remove assembly and check for burrs or dirt under mounting surface of ring gear. Reassemble and recheck.

Disassembly

1 Ring Gear Bolt Removal



Loosen (4) ring gear nuts.

2



Remove the (4) nuts.

3



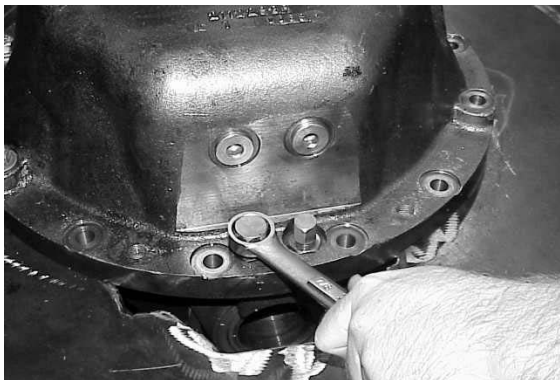
Carefully remove the (4) bolts with a brass driver.

4



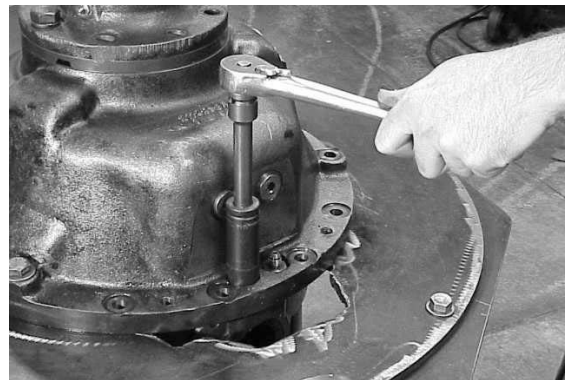
Rotate the ring gear until the empty holes align with the pinion.

5 Fitting Removal



Remove fitting caps.

6



Loosen fittings.

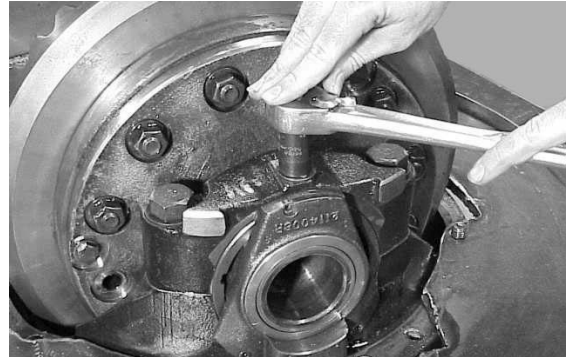
7



Remove fittings.

8

Cap Removal



Loosen lock bolt.

9



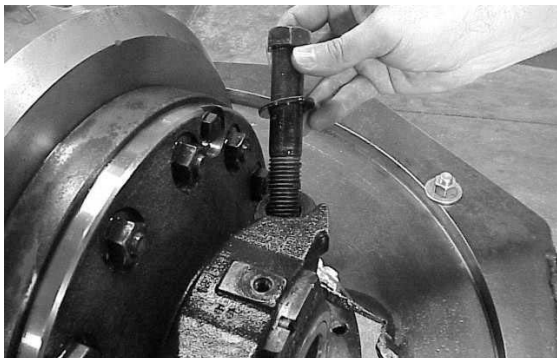
Remove lock bolt.

10



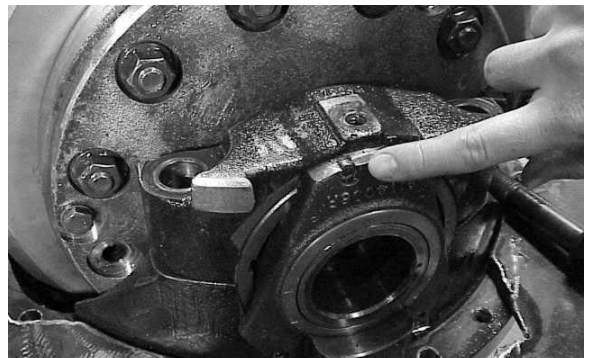
Loosen (4) cap bolts.

11



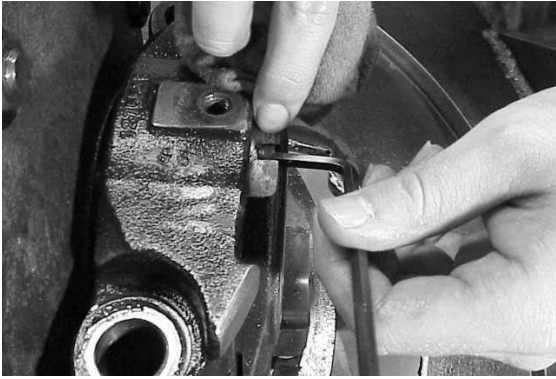
Remove (4) cap bolts.

12



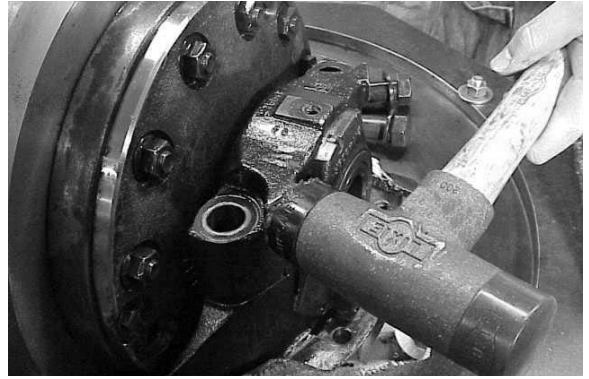
Loosen (3) retainer screws.

13



Remove screws.

14



Use rubber hammer to loosen caps.

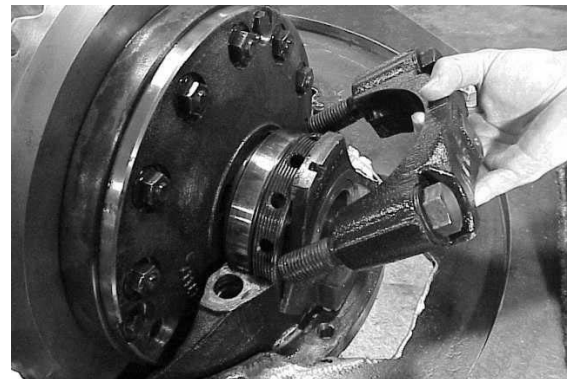
15

"WARNING"



Once the caps are removed the ring gear and differential assembly can roll out of the carrier housing.

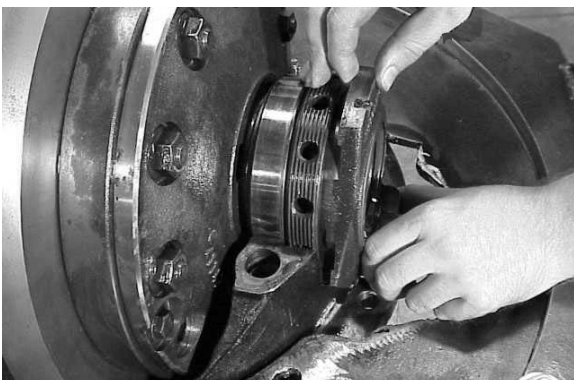
16



Remove caps.

17

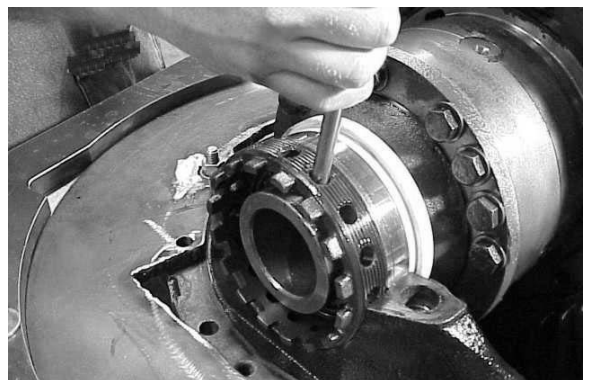
Seal Retainer Removal



Remove seal retainer.

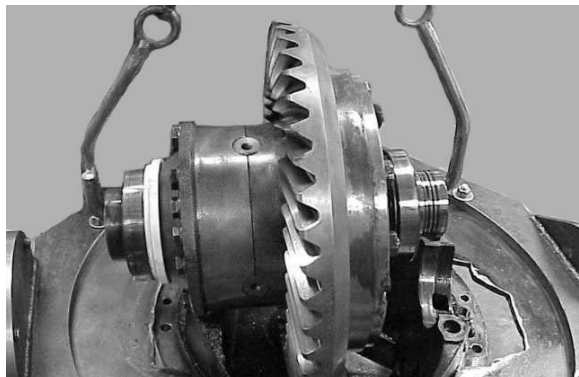
18

Adjuster Removal



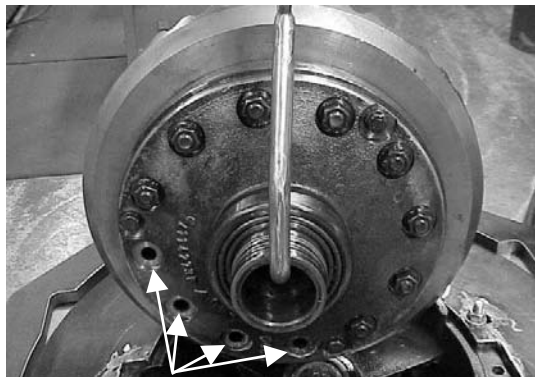
Loosen adjusters and remove.

19 Differential Assembly Removal



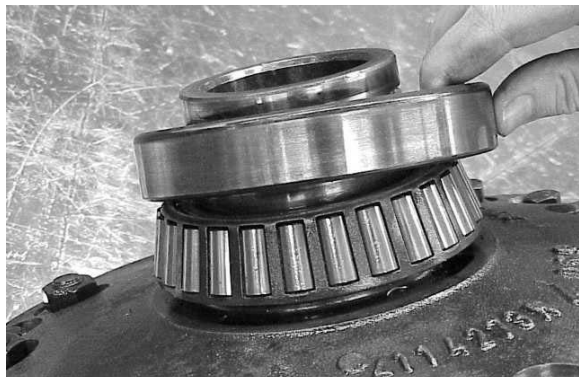
Remove differential assembly from housing.

20



Note: Empty holes must be aligned with pinion centerline before removal.

21 Case Half Disassembly



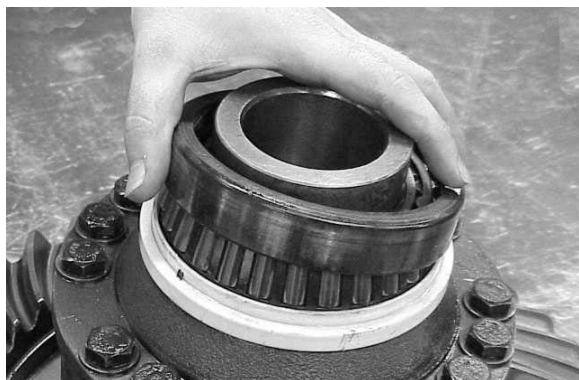
Remove bearing cup.

22



Carefully remove piston rings. Note: Edges of rings can cut fingers.

23



Remove bearing cup opposite side.

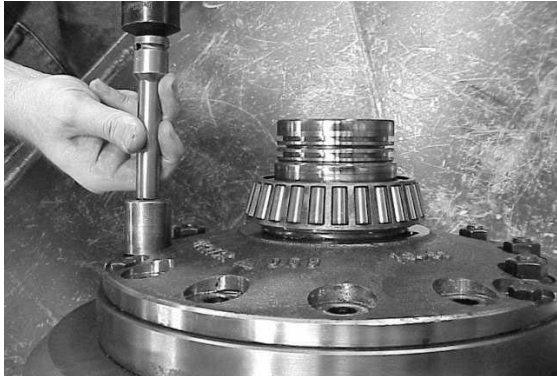
24



Remove differential case seal.

25

Ring Gear Removal



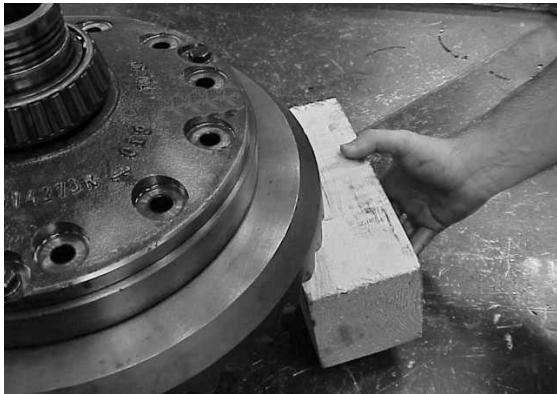
Loosen and remove all ring gear nuts.

26



Remove all ring gear bolts with brass driver.

27



Place wooden blocks under ring gear.

28



Use rubber hammer to remove ring gear.

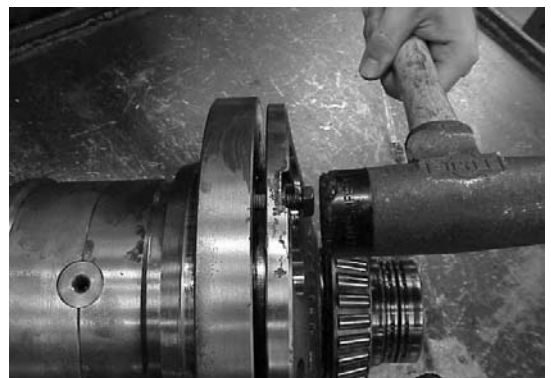
29

Flanged Case Half Removal



Remove flanged case half bolts.

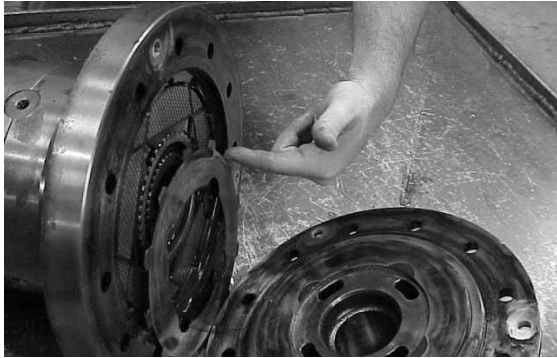
30



Use rubber hammer to remove flanged case half.

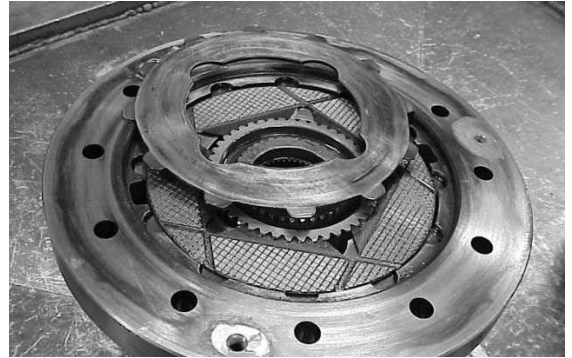
Friction and Reaction Plate Removal

31



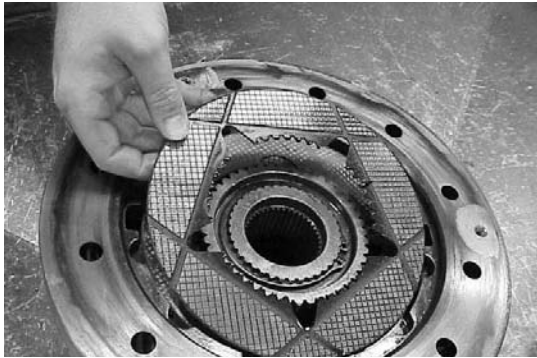
Note: Friction and reaction plates may fall out when flanged case half is removed.

32



Remove reaction plates.

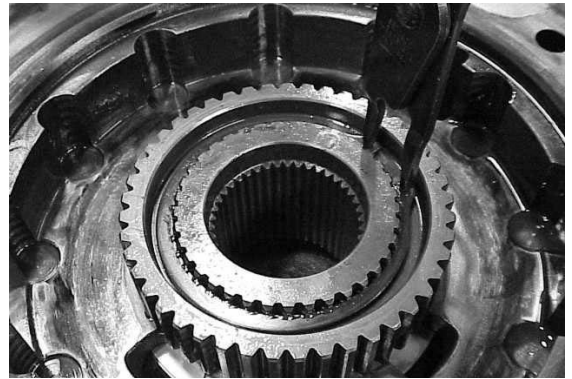
33



Remove friction discs.

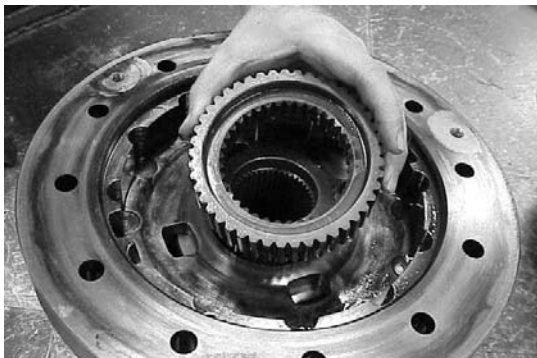
34

Clutch Driver Removal



Remove snap ring.

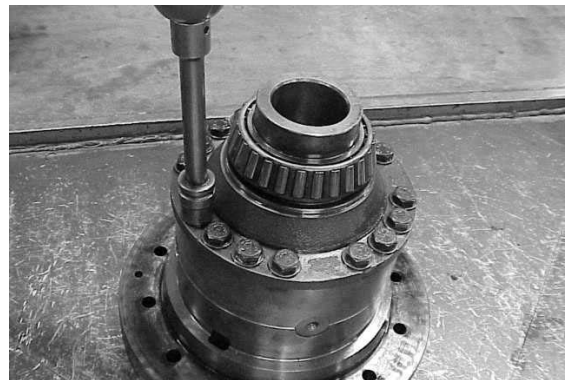
35



Remove clutch driver.

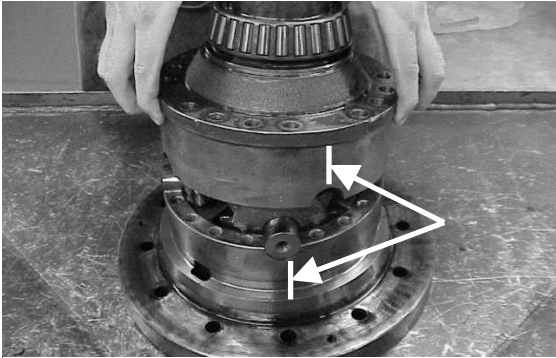
36

Case Half Removal



Remove bolts.

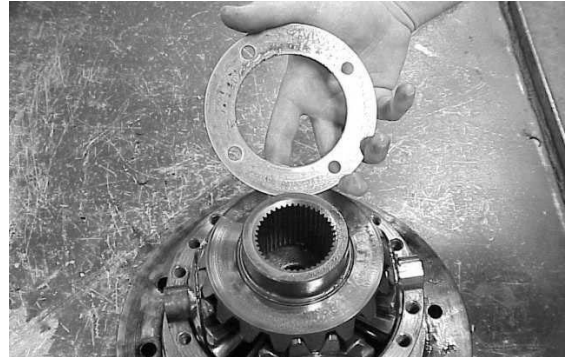
37



Be sure to mark case halves before separating case halves.

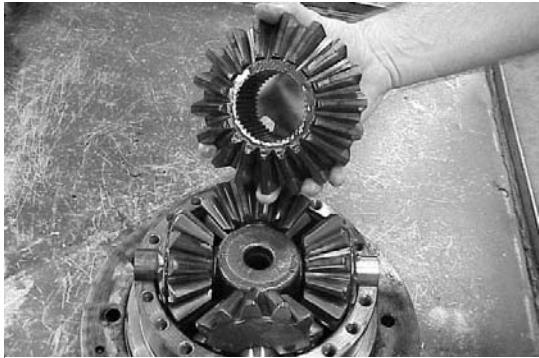
Side Gears and Spider Disassembly

38



Remove side thrust washer.

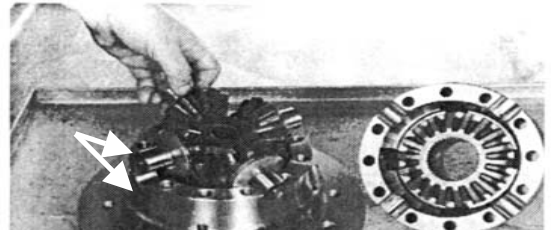
39



Remove differential side gear.

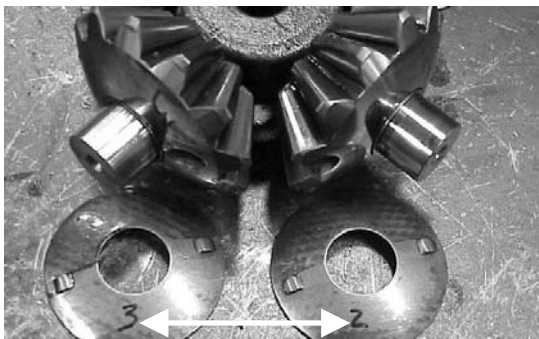
40

Inspect cross and gears for wear.
Replace as needed.



Remove the cross and pinion assembly. Mark the cross and diff body section for easy alignment during reassemble.

41



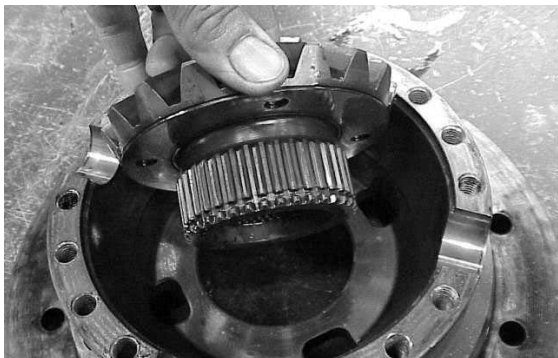
Remove thrust washers. Number each washer as removed.

42



Remove differential pinion gears one at a time and place with proper thrust washer.

43



Remove clutch side gear.

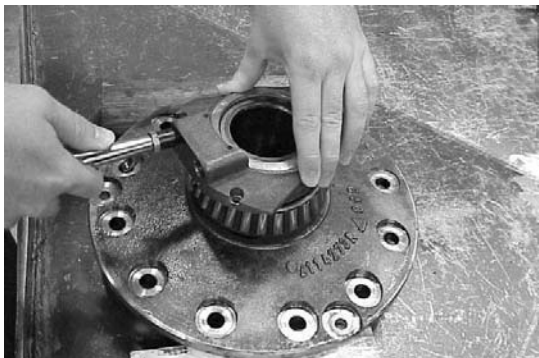
44



Remove side thrust washer.

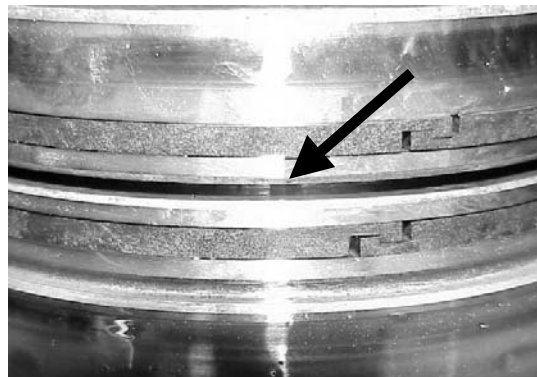
45

Clutch Piston Disassembly



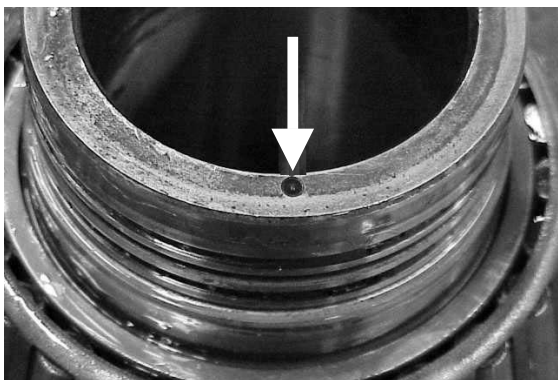
Install seal retainer. Carefully apply air to hole in seal retainer to remove clutch piston.

46



Passage must be free of dirt or damage.

47



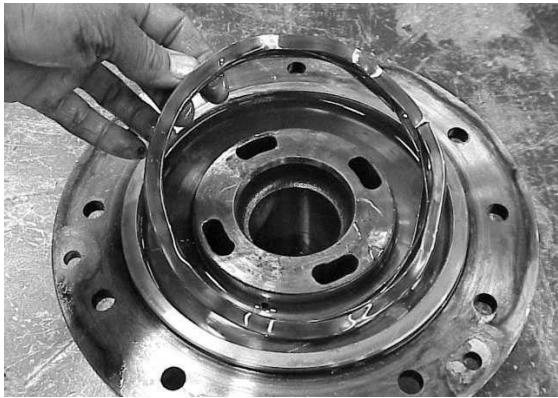
Passage must be free of dirt or damage.

48



Remove clutch piston.

49



Remove piston wave spring.

50



Remove inner and outer piston seals.

51

Seal Retainer Disassembly



Remove inner and outer lip seals.

52

Flange Disassembly



Loosen flange nut.

53



Remove flange nut.

54



Carefully remove flange with puller.

55



Remove spacer O ring.

56



Remove O ring.

57

Pinion Cage Removal



Remove bolts from seal retainer.

58



Remove pinion seal retainer.

59



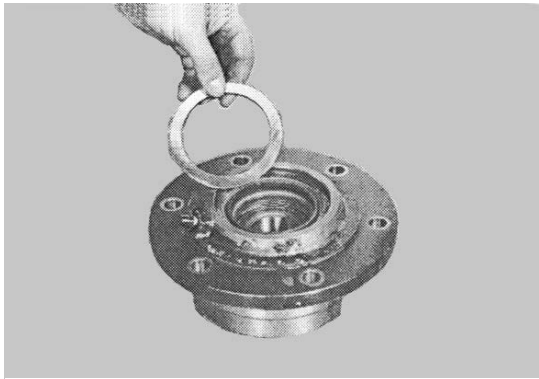
Install flange and flange nut.

60



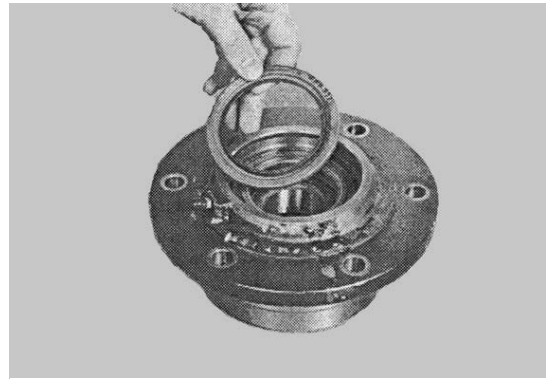
Remove pinion cage assembly.

61 Seal Retainer Disassembly



Remove thrust washer.

62



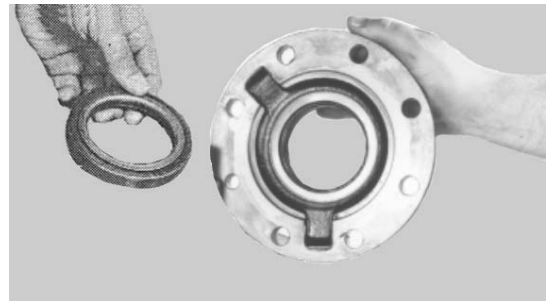
Remove grease seal.

63 Pinion Cage Disassembly



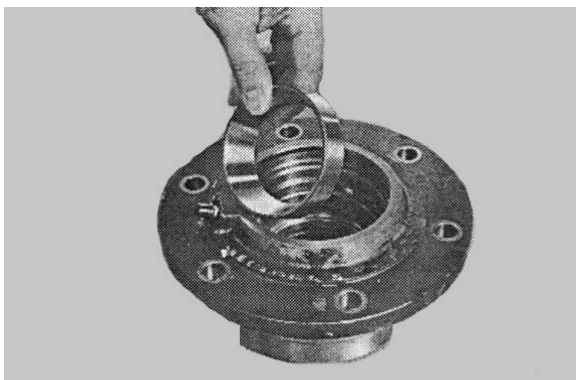
Place pinion inside of press. Press pinion, inner and outer cones out of cage.

64



Remove pinion seal.

65



Remove inner and outer bearing cups.

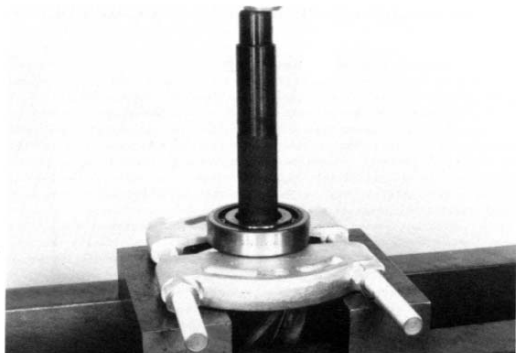
66

Pinion Disassembly



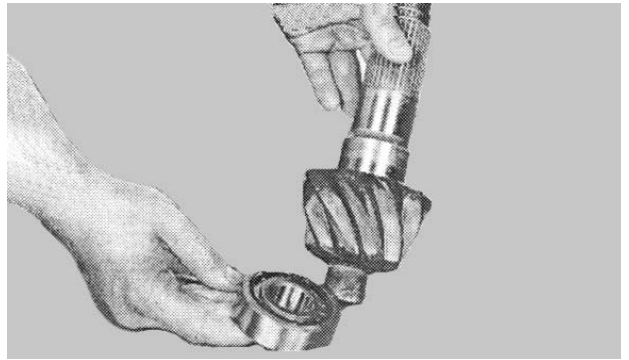
Remove pinion bearing spacer.

67



Press inner bearing off of pinion.

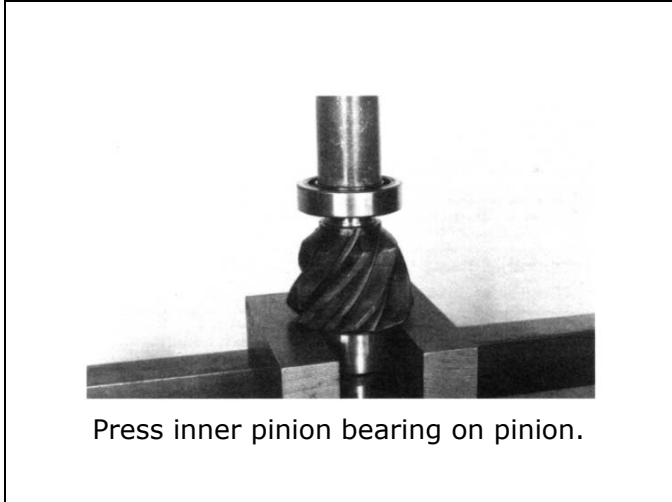
68



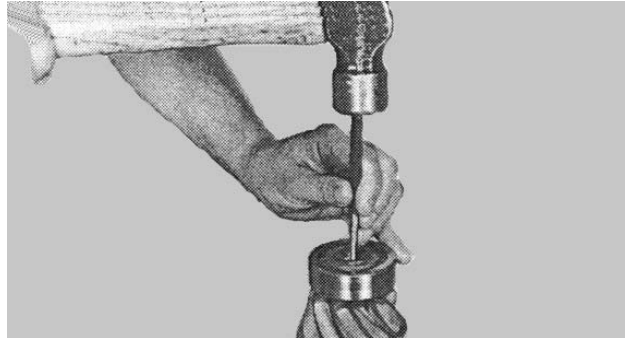
Check for wear on pinion and bearing.
Replace as required.

Reassembly

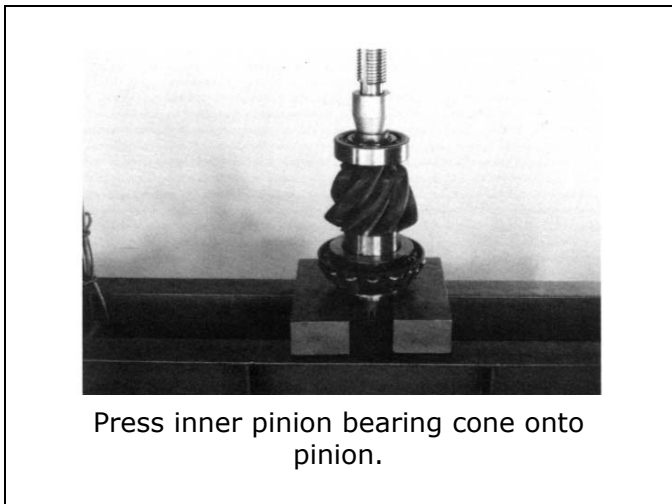
1 Pinion Reassembly



2 **Note:** All parts must be lubricated prior to reassembly, do not assemble dry.



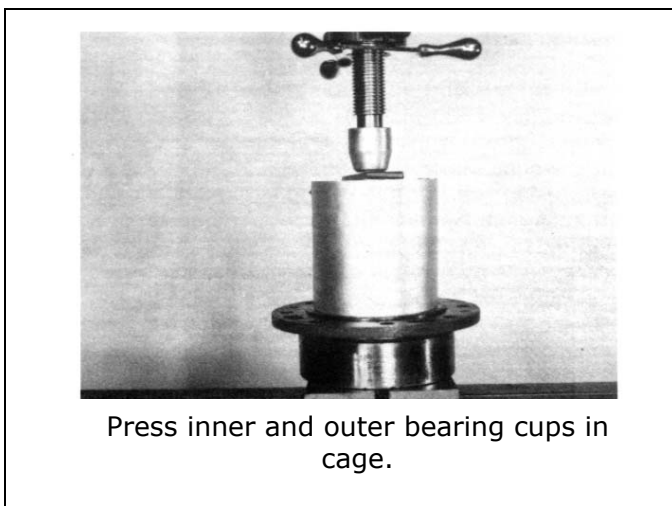
3



4 Pinion Cage Reassembly



5



6



7



Press bearing into cage assembly.

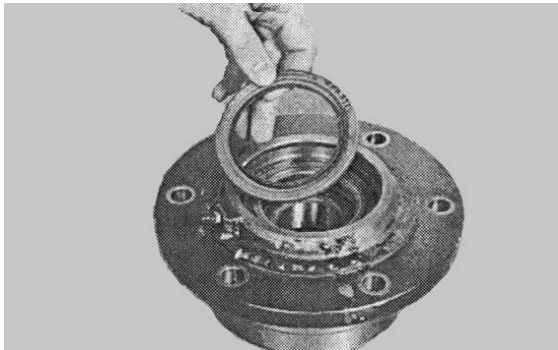
8

Check/adjust pinion bearing rolling torque following the procedure listed in the Assembly Instructions section pages (3 and 13).

Pinion mounting distance must be set following the procedure on pages (14 and 15).

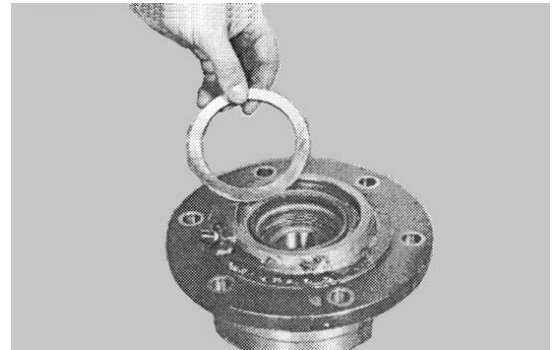
9

Seal Retainer Installation



Use correct driver to install the grease seal and pinion seal (2) in the seal retainer.

10



Install thrust washer into pinion seal retainer.

11

Pinion Cage Installation



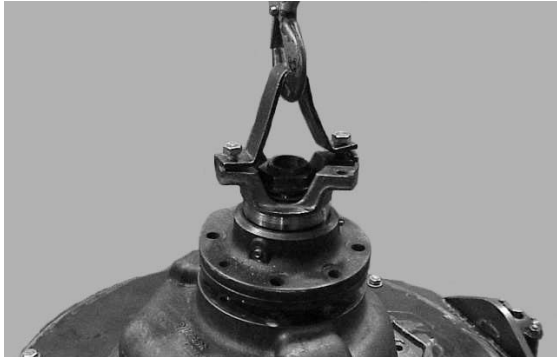
Apply Loctite #515 to bearing cage shims and joining surfaces in a continuous bead. Cover entire surface.

12



Install bearing cage shim.

13



Position pinion cage assembly in carrier housing.

14



Remove flange nut and flange.

15



Apply Loctite #515 to pinion bearing cage in a continuous bead across entire surface.

16



Install pinion seal retainer.

17



Apply Loctite #262 to seal retainer capscrews.

18



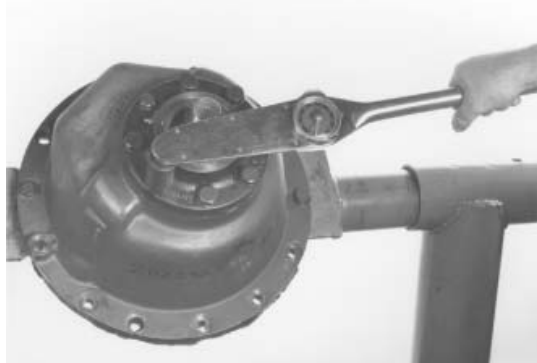
Install seal retainer capscrews.

19



Torque (7) cap screws to 177-199 LBF-FT (240-270 Nm).

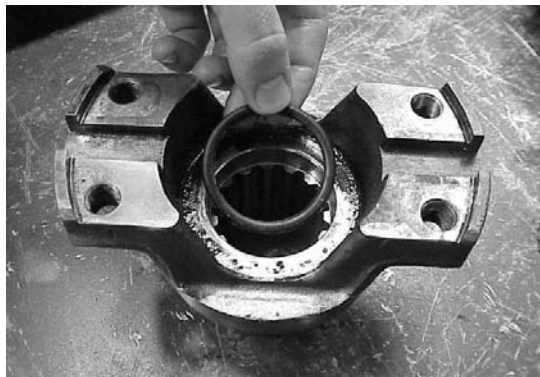
20



Torque (1) cap screw to 74-81 LBF-FT (100-110 Nm).

21

Flange Reassembly



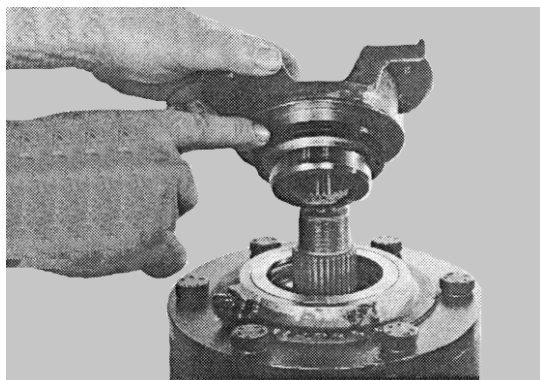
Install "O" ring.

22



Install spacer "O" ring.

23



Install V-Ring seal onto flange.

24



Grease seal seat journal of drive flange with MS-107C.

25



Apply Loctite #515 to pinion threads.

26



Install flange nut.

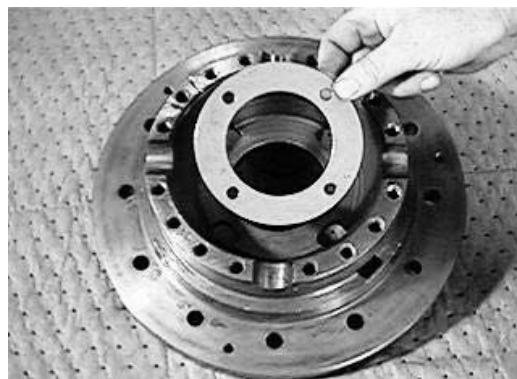
27



Run nut down, then torque flange nut to 600 LBF-LB (815 Nm).

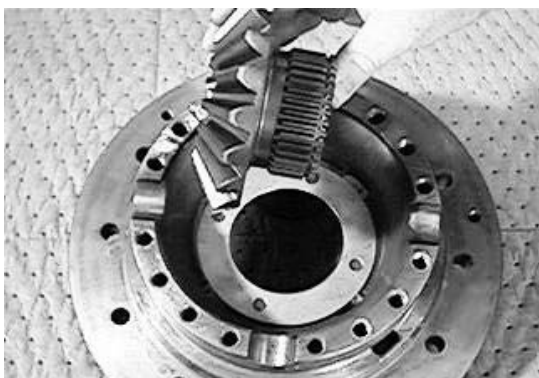
28

Side Gear and Spider Reassembly



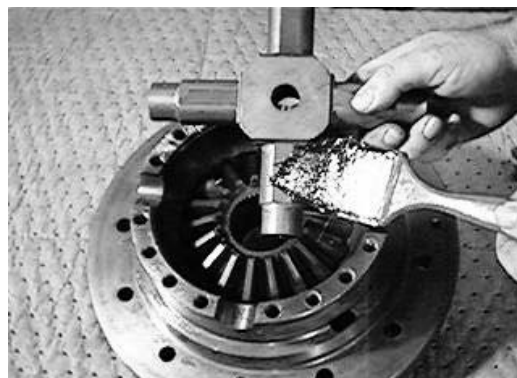
Install side thrust washer.

29



Lubricate clutch side gear and install.

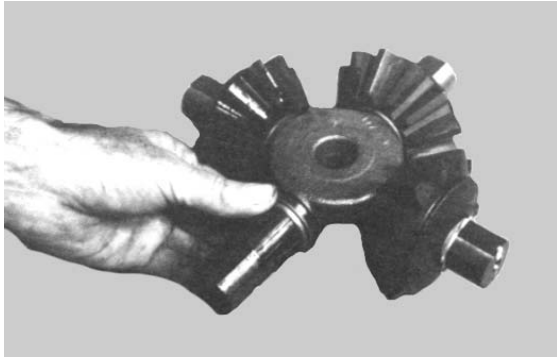
30



Grease differential cross.

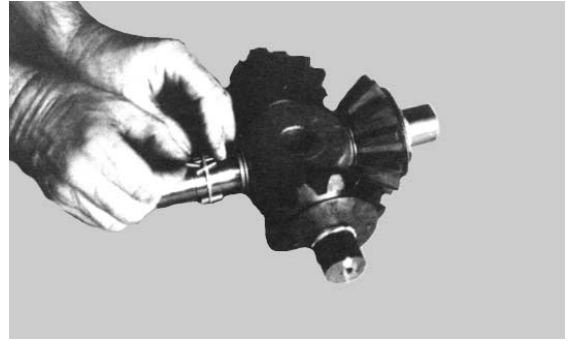
Note: If new parts are not being used the cross must be assembled using the numbering system as directed in disassembly process.

31



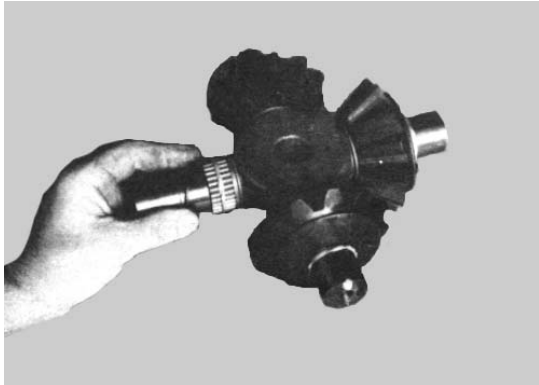
Position inner needle roller bearing spacer on differential spider.

32



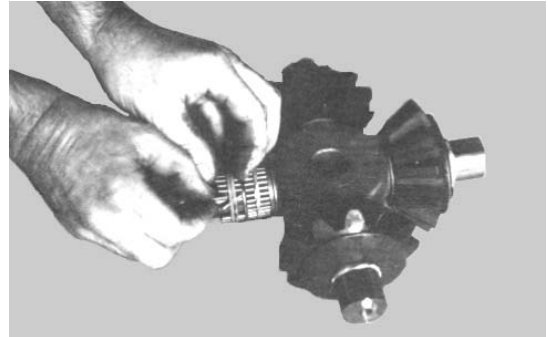
Using a rubber band to facilitate assembly, install one row of needle roller bearings.

33



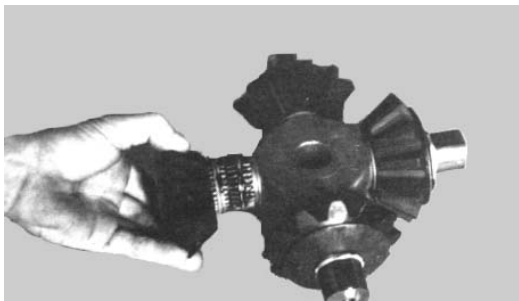
Install center roller bearing spacer.

34



Using another rubber band install outer row of needle roller bearings.

35



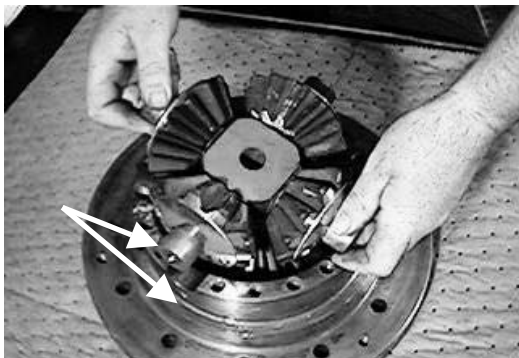
Position pinion gear on needles as shown. Remove first rubber band. Slide pinion gear over second row of needles, remove second rubber band.

36



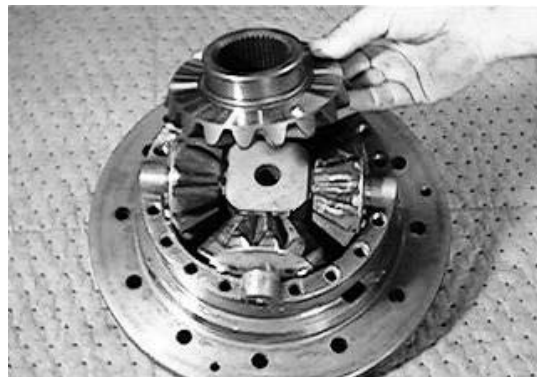
Install outer roller bearing spacer and pinion thrust washer.

37



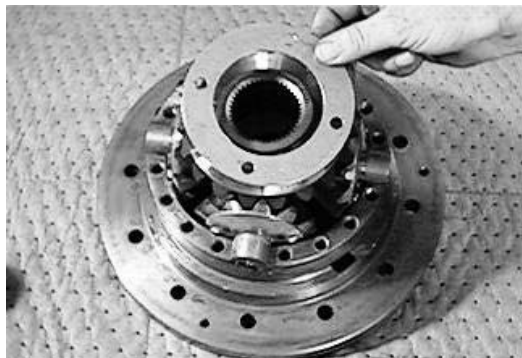
Install differential spider. Align case and spider marks.

38



Install side gear.

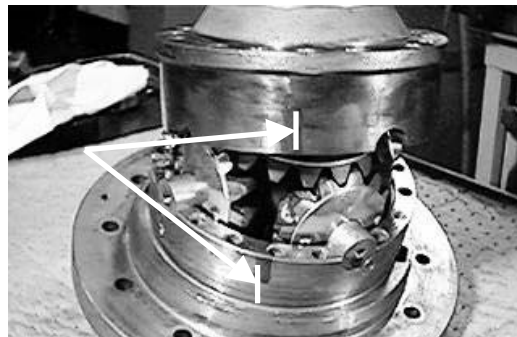
39



Install side thrust washer.

40

Case Half Reassembly



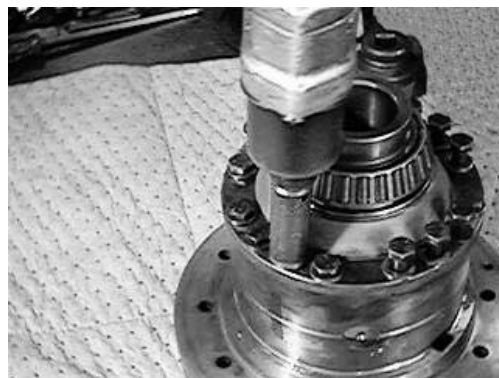
Align marks on plain half case with mark on flanged half case. Install plain half case.

41



Apply Loctite #262 to case capscrews.

42



Install case capscrews.

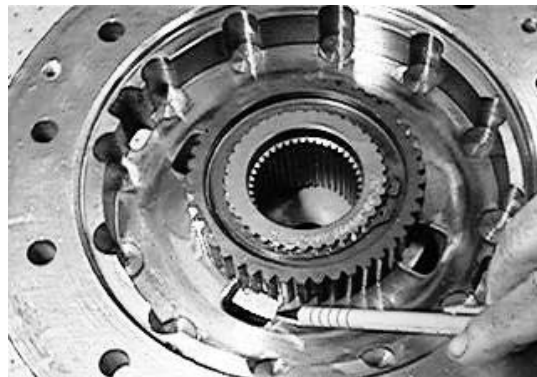
43



Torque to 74-81 LBF-FT (100-110 Nm).

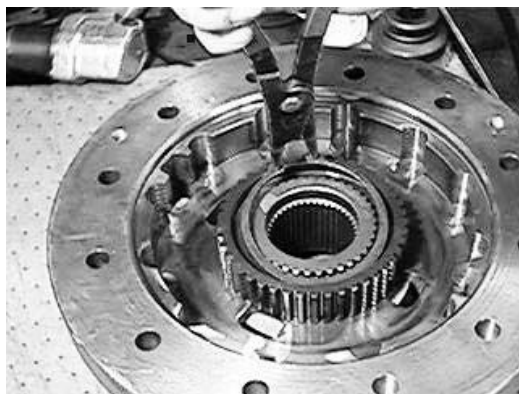
44

Clutch Driver Reassembly



Install clutch driver. Note: The five holes in the clutch housing.

45



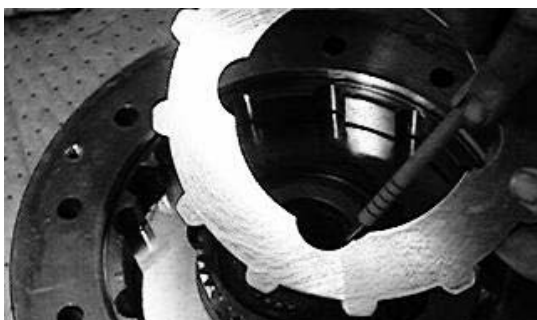
Install snap ring.

46 Friction and Reaction Plate Reassembly



Install first friction plate.
Note: Align plate holes with holes in clutch housing.

47



Install first reaction plate.
Note: Align reaction plate holes with holes in friction plate.

48



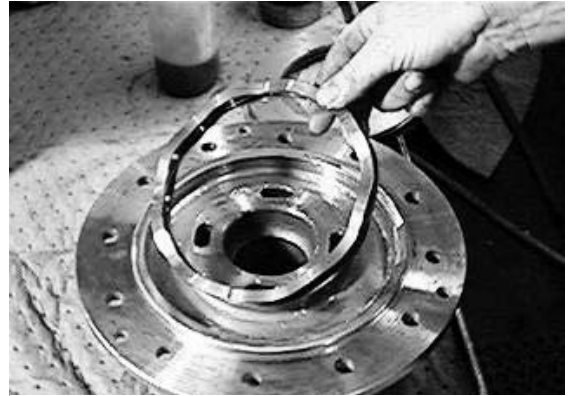
Install all plates in order.
Note: See assembly instructions page (16).

49 Clutch Piston Reassembly



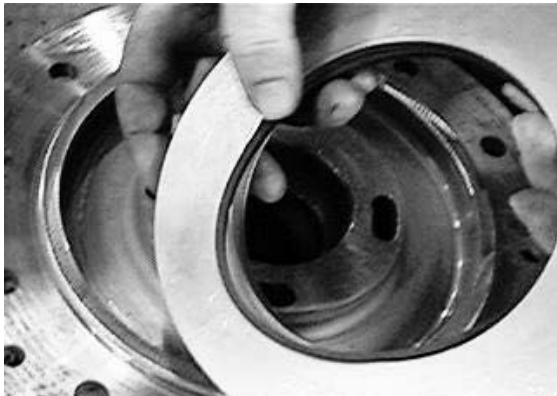
Lubricate flange half case.

50



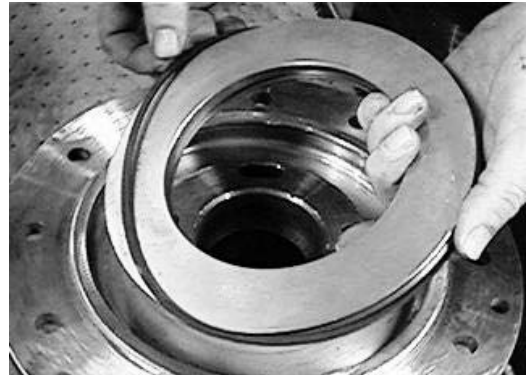
Install piston wave spring.

51



Install inner piston seal.

52



Install piston outer seal.

53



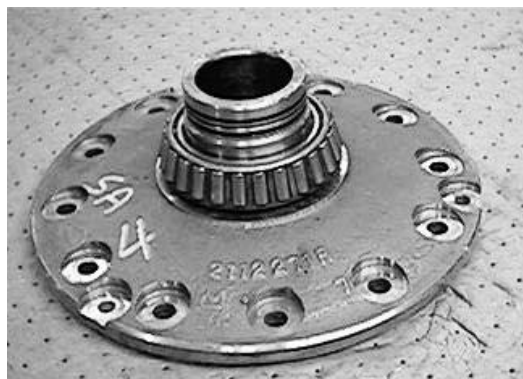
Lubricate seals.

54



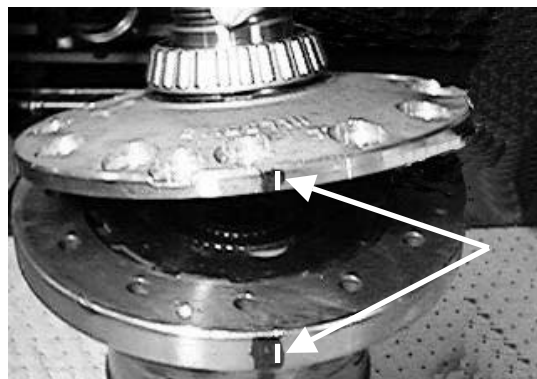
Use rubber hammer to install clutch piston.

55 Flanged Half Case Reassembly



Install bearing using press.

56



Align marks and install flange half case onto clutch housing.

57



Apply Loctite #262 to capscrews.

58



Install capscrews.

59



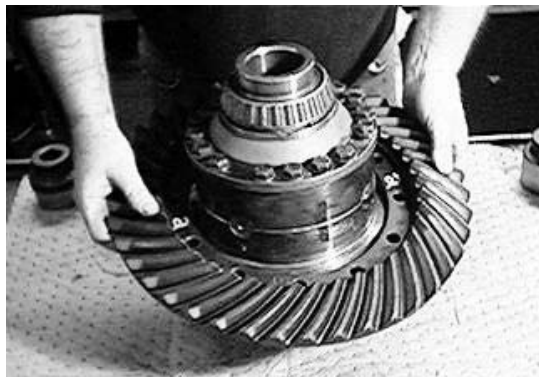
Torque capscrews to 44-48 LBF-FT
(60-65 Nm)

60



Install bearing and seal.

61 Ring Gear Reassembly



Install ring gear.

62



Use rubber hammer to seat ring gear flush. Align holes in ring gear and case.

63 **"Note: Leave four bolts out for pinion clearance."**



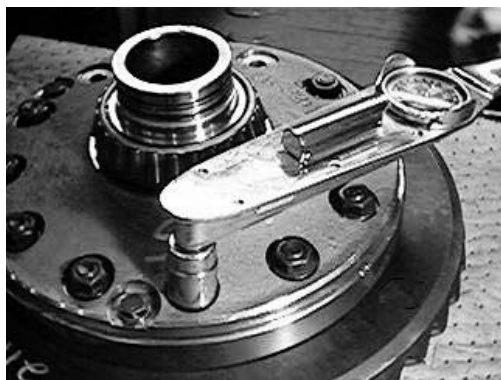
Apply Loctite #262 to cap screws and install. Leave (4) capscrews out.

64



Install nuts

65



Torque nuts 150-168 LBF-FT
(203-228 Nm).

66

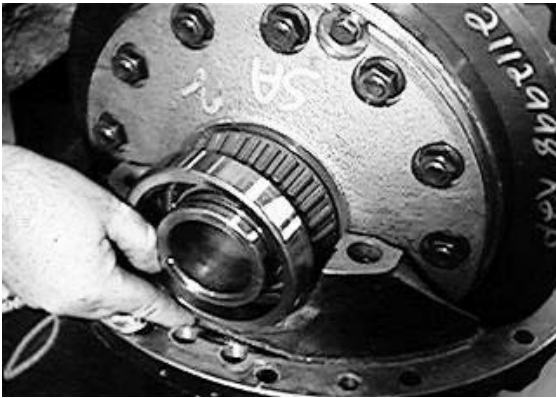
Differential Assembly



Install diff body assembly into carrier.

"Note: Four holes rotated to the bottom."

67



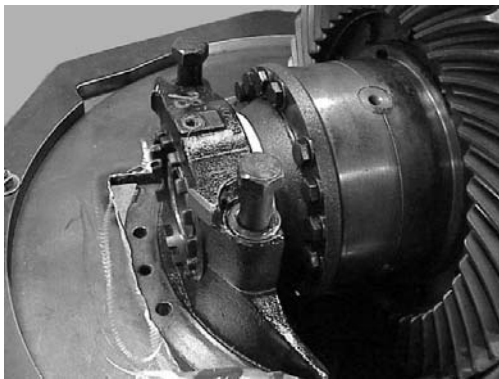
Install differential bearing cup.

68



Install differential adjusting nut.

69



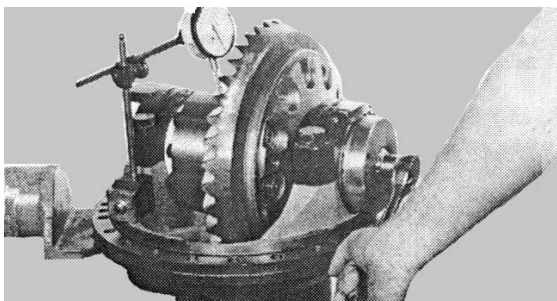
Install cap and capscrews.

70



Tighten lightly do not torque.

71



Note: See Assembly Instructions for backlash setting procedure and ring gear runout checking procedure. See pages (16 and 18).

72

Cap Installation



Apply Loctite #262 to capscrews.

73



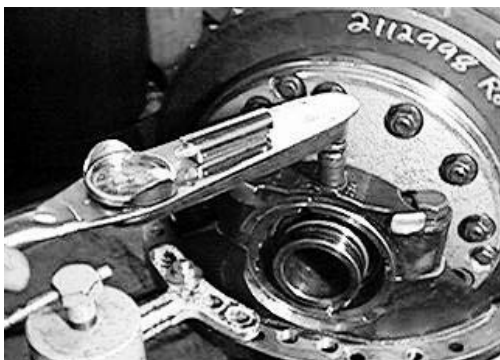
Install caps and capscrews. Torque to 300-360 LBF-FT (407-488 Nm).
Recheck backlash, correct as needed.

74



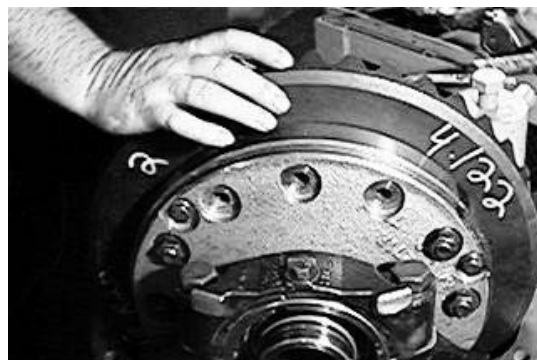
Apply Loctite #262 to adjusting lock capscrew and install.

75



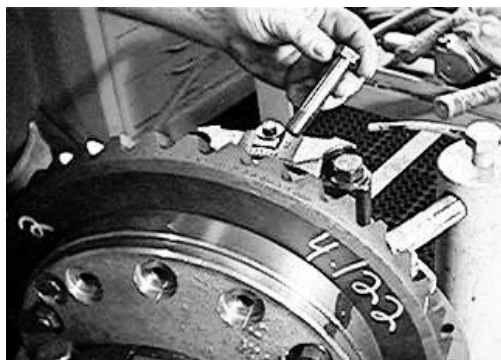
Torque capscrew to 25-28 LBF-FT (34-38 Nm).

76



Rotate empty ring gear holes to the top.

77



Install capscrews and nuts.

78



Torque nuts 150-168 LBF-FT (203-228 Nm).

79



Install piston rings.

80

Seal Retainer Installation



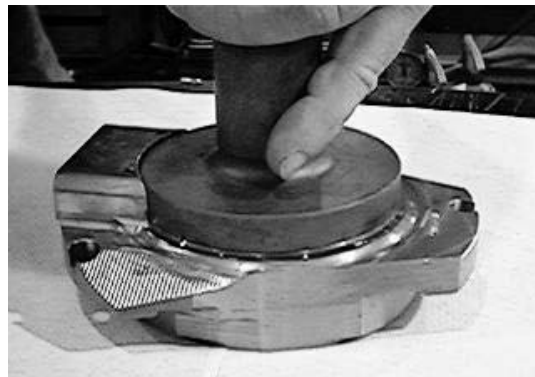
Apply Loctite #262 to seal retainer.

81



Apply Loctite #620 to outer lip seal.

82



Using proper driver, install outer lip seal.

83



Apply Loctite #620 to seal retainer.

84



Lightly apply Loctite #620 to inner lip seal.

85



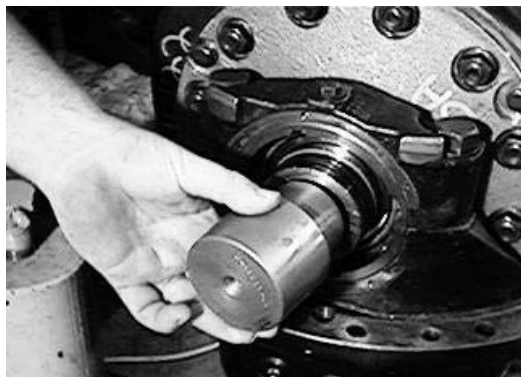
Use proper driver to install inner lip seal.

86



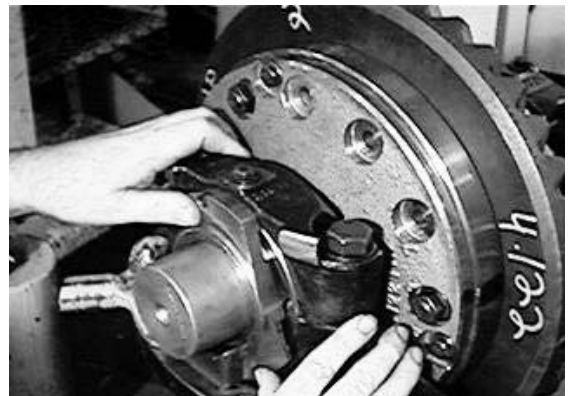
Lubricate piston rings.

87



Install seal retainer guide.

88



Install seal retainer.

89



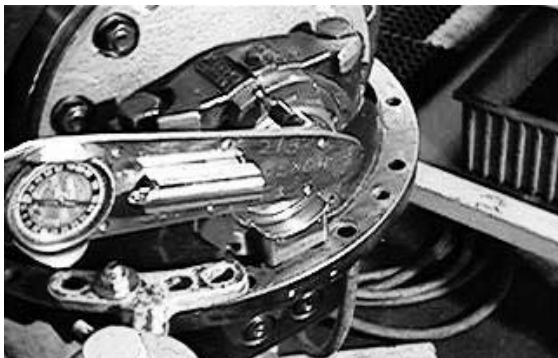
Apply Loctite #262 to capscrews.

90



Install capscrews.

91



Torque screws 10-20 LBF-IN
(1-2 Nm).

92

Fitting Installation



Install O Ring on fitting.

93



Install back up ring and then the square
cut seal on fitting.

94



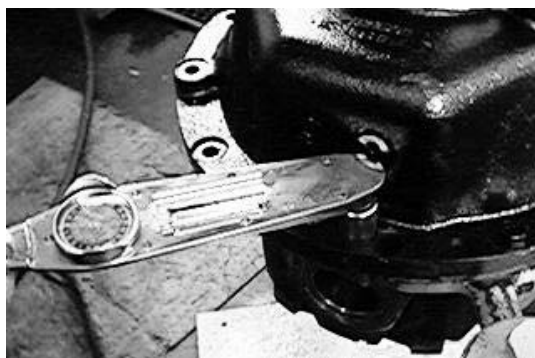
Repeat procedure for other fitting.

95



Install fittings.

96



Tighten fittings to 15 LBF-FT (20 Nm)
and install caps.

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