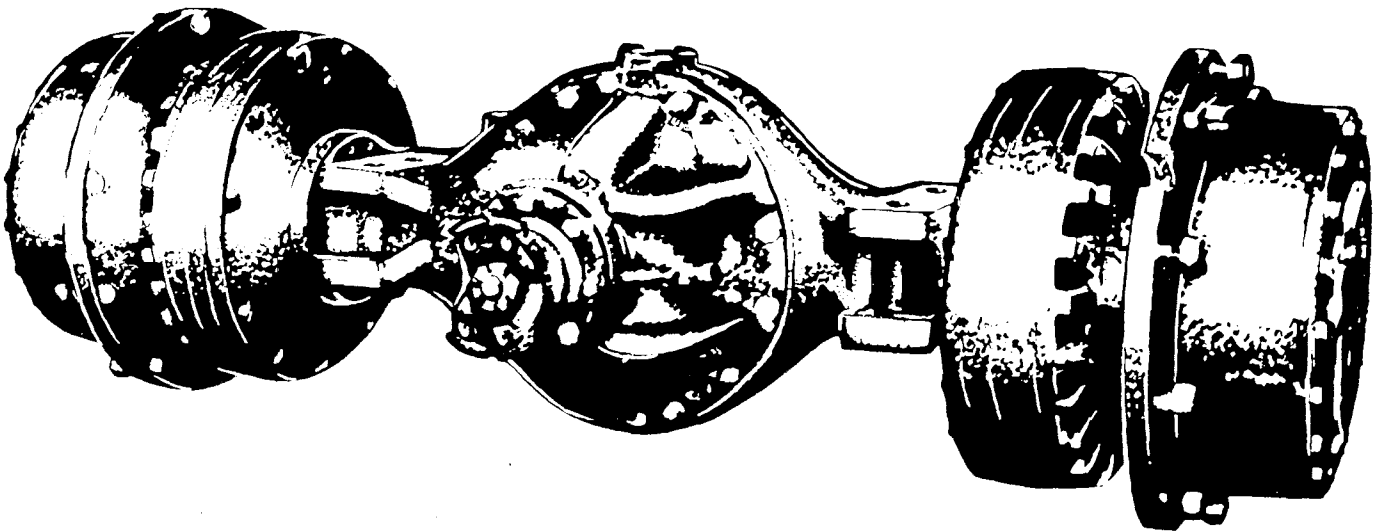


**D-17500
D-19640
D-33640**

**planetary
drive axle**

maintenance & service manual



(LCB) liquid cooled brakes

CLARK COMPONENTS

North America

A Business Unit of Clark Equipment Company

F O R E W O R D



This manual has been prepared to provide the customer and the maintenance personnel with information and instructions on the maintenance and repair of the Drive Axle Assembly with liquid cooled brakes.

Extreme care has been exercised in the design, selection of materials and manufacturing of these units. The slight outlay in personal attention and cost required to provide regular and proper lubrication, inspections 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 axle, its overhaul and adjustments, it is urged that the mechanic study the instructions in this manual carefully and use it as a reference when performing maintenance and repair operations.

To assure the best results and to maintain the original quality built into the axle, it is important that only Clark-approved parts be used when new parts are required. **IMPORTANT:** Always furnish the Distributor with the axle and differential serial number when ordering parts.

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NOTE: Metric Dimensions Shown in Brackets [].

DESCRIPTION

The axle assembly has a spiral bevel type ring gear and pinion with further reduction provided by planetary gear set within the wheel hub.

PRIMARY REDUCTION

The spiral bevel pinion and ring gear transmit power through the center differential pinions, side gears and to the axle shaft. The spiral bevel differential assembly is mounted on tapered roller bearings which are adjusted by positioning of the two threaded adjusting nuts mounted in the differential carrier and cap assembly. The tapered roller pinion bearing pre-load is adjusted and maintained by a hardened and precision ground spacer positioned between inner and outer bearings. Spacer is selected at assembly.

SECONDARY REDUCTION

In the wheel hub, a self-centering sun gear is spline fitted to the axle shaft and drives three planetary pinion gears. These gears in turn mesh with and react against a rigidly mounted internal ring gear. The planet gears rotate on needle roller bearings mounted on hardened and ground pins located in the planet

carrier which in turn drives the wheel hub. Positive lubrication keeps all moving parts bathed in lubricant to reduce friction, heat and wear.

(LCB) LIQUID COOLED BRAKES

The liquid cooled brake is ideal for use in contaminated or temperature sensitive environments and in machines where extra long maintenance intervals are required. Braking action of the liquid cooled brakes is achieved through the application of the hydraulic piston with the rotating graphitic friction surfaces which react with stationary stator plates. The stator plates are retained by scalloped tangs at the outside diameter, which, in turn, transfer the reaction torque to the rigid outside housing.

Tangs on the O.D. of the friction discs prevent the discs from dropping out of alignment when the wheel hub is removed for wheel bearing adjustments. This provides ease of service reassembly.

Hub splines are long enough to engage all friction discs before bearings or seals are set. This provides ease of assembly and assures the ability to accurately adjust wheel bearings.

Wheel bearings can be serviced as in any normal bearing service procedure.

Recommended Lubricants for Clark Drive Axles

Initial Fill

Grade 85W140 qualified MIL-L-2105C gear lubricant as specified in Clark MS-8 engineering standard is preferred for initial fill for most ambient temperatures. (See chart on page 4) For other ambient temperature ranges use proper viscosities of MIL-L-2105C.

Other lubricants approved to MIL-L-2105C specifications are acceptable for initial fill or top off.

Service Fill

Multipurpose gear lubricants approved to the MIL-L-2105C specifications are recommended.

MIL-L-2105C classifies multigrade gear lubricants on the basis of their viscosities at various temperatures.

Listed on page 4 are the recommended multigrade viscosities for use at the prevailing operating temperatures in Clark Drive Axles.

MS-8 Extreme Pressure Gear Lubricant

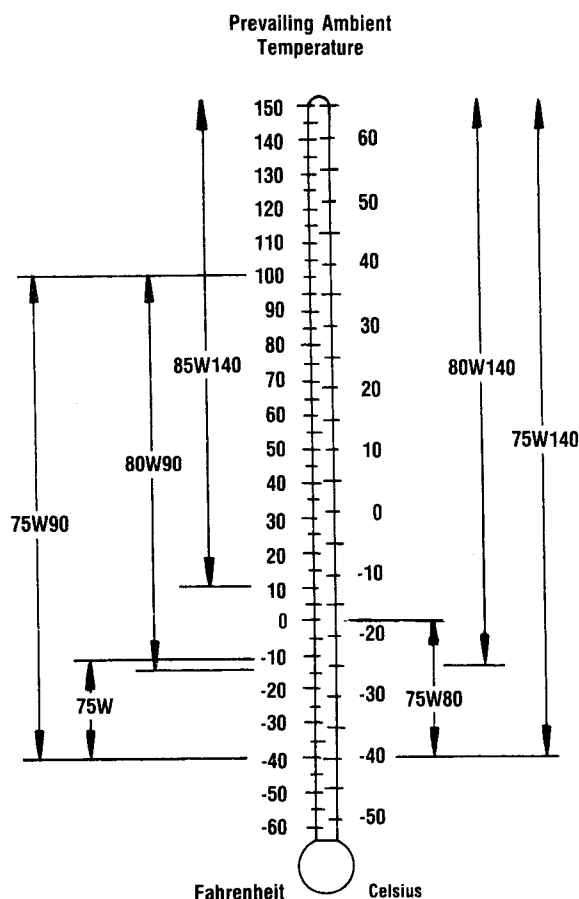
MS-8 specifications covers a gear lubricant for use in heavy-duty axles. It is a highly refined base stock properly compounded with selected extreme pressure additives. MS-8 meets MIL-L-2105C but is fortified with an additive package that provides added protection during the break-in period and reduced wear and improved efficiency during subsequent operation.

APPROXIMATE LUBRICANT CAPACITIES

Note: All quantities are shown in pints; 1 pint — 1 pound — 1 [liter]

Below listed capacities are approximate. There may be some axle variations that are not included in this list. If your model axle does not appear on the list, fill to proper level as instructed in this manual. Always fill wheel ends and axle centers to the bottom of the oil level plug hole.

Axle Series	Each Wheel Hub	Each Brake	Differential	Total
D-17500	10 [4, 5]	3 [1, 4]	26 [12, 3]	52 [24, 6]
D-19640	13 [6, 2]	3 [1, 4]	26 [12, 3]	58 [27, 4]
D-33640	13 [6, 2]	3 [1, 4]	34 [16, 1]	66 [31, 2]



For proper viscosity lube, refer to fahrenheit or celsius chart below.

Gear Lubricant Chart

Ambient Temperature Ranges		
-40°F to -10°F	(-40°C to -23°C)	
-40°F to 0°F	(-40°C to -18°C)	
-40°F to +100°F	(-40°C to +38°C)	
-40°F + Above	(-40°C + Above)	
-15°F to 100°F	(-26°C to 38°C)	
-15°F + Above	(-26°C + Above)	
+10°F + Above	(-12°C + Above)	

Multigrade Viscosities MIL-L-2105C

See (a) note below.	
75W See (b) note below.	
	75W80
	75W90
	75W140
	80W90
	80W140
	85W140

Notes:

- The MIL-L-2105C Specification replaced the MIL-L-2105B Specification.
- The MIL-L-2105C 75W Classification replaced the MIL-L-10324A Subartic Specification.

Note: Specifications are subject to change.

Liquid Cooled Brakes (LCB)

A. The following oils are allowable to use on the actuator side of the 10,000 & 20,000 series liquid cooled brakes.

- Motor Oil API SE/CD.
- MIL-L-46152B/MIL-L-2104 C or D.
- ATF C-3 or *DEXRON®. Not *DEXRON II® (See Note Below).
- Hydraulic Oils.
- Water/Oil Invert Emulsion.
- Synthetic Gear Oils (Chemical Ester)

B. Brake sump cooling oils (when external cooling is used). The following cooling oils are recommended in order of preference

- Organic Esters
- Hydraulic Oil
- MIL-L-46152B/MIL-L-2104 C or D.
- ATF C-3 or *DEXRON®. Not DEXRON II® (See Note Below).
- Motor Oil API SE/CD.
- Invert Emulsion

and all of the oils in A above can be used in the brake sump except water/oil invert emulsion must not be used with the LCB 10,000 series shipped from Clark before 1 June 1984 because of incompatibility with the friction discs.

C. Axle assemblies with Liquid Cooled Brakes having a common brake and gear sump (no brake external cooling used), use

- Gear Lubricant meeting Clark specifications MS-8,
- MIL-L-2105C.

NOTE: DEXRON II® is not compatible with graphic friction plate material unless it meets the approved C-3 specifications.

*DEXRON is a registered trade mark of General Motors Corporation.

Checking Oil Level in Drive Axles

For off-highway operation, check lubricant level after each 250 hours of operation. Always maintain lubricant level to bottom of filler plug hole. Drain oil every 2500 hours, or one year whichever comes first.

For highway operation, lubricant should be checked each 5000 miles [8000 km]. Maintain lubricant level to bottom of filler plug hole. Drain oil every 25,000 miles [40,000 km] or one year whichever comes first.

To check oil level in axles with differential drive and planetary wheel ends, the axle should be run first, then allowed to stand for a minimum of five minutes on level ground. This procedure will allow oil to drain back to its normal level. After the five minute interval, remove oil filler plug in axle center and in the planetary wheel ends for oil level inspection. If oil level is not to the bottom of the filler hole, add necessary lubricant.

Checking and Filling Planetary Wheel Ends

Always check lubricant level in planetary wheel ends with wheel hub oil level plug and/or arrow in a down position. Remove oil level plug. If lubricant is below oil level hole, remove filler plug and fill to oil level hole. Reinstall plugs.

Filling Drive Axles

Axles with single or double reduction at center: Fill axle housing through filler hole until lubricant is at bottom of filler hole.

Axles with planetary wheel ends. Follow procedure in "checking and filling planetary wheel ends."

Trunnion Mounted Axles

To grease the trunnion mount bushings, use a high quality Lithium 12-hydroxy-stearate base grease N.L.G.I. Grade No 2 that contains a minimum of 3% MoS₂ (Molybdenum disulfide) by weight.

N.L.G.I. National Lubricating Grease Institute.

Draining

Draining is best accomplished immediately after vehicle has operated a short time or completed a trip. The lubricant is then warm and will flow freely, allowing full drainage in minimum time. This is particularly desirable in cold weather.

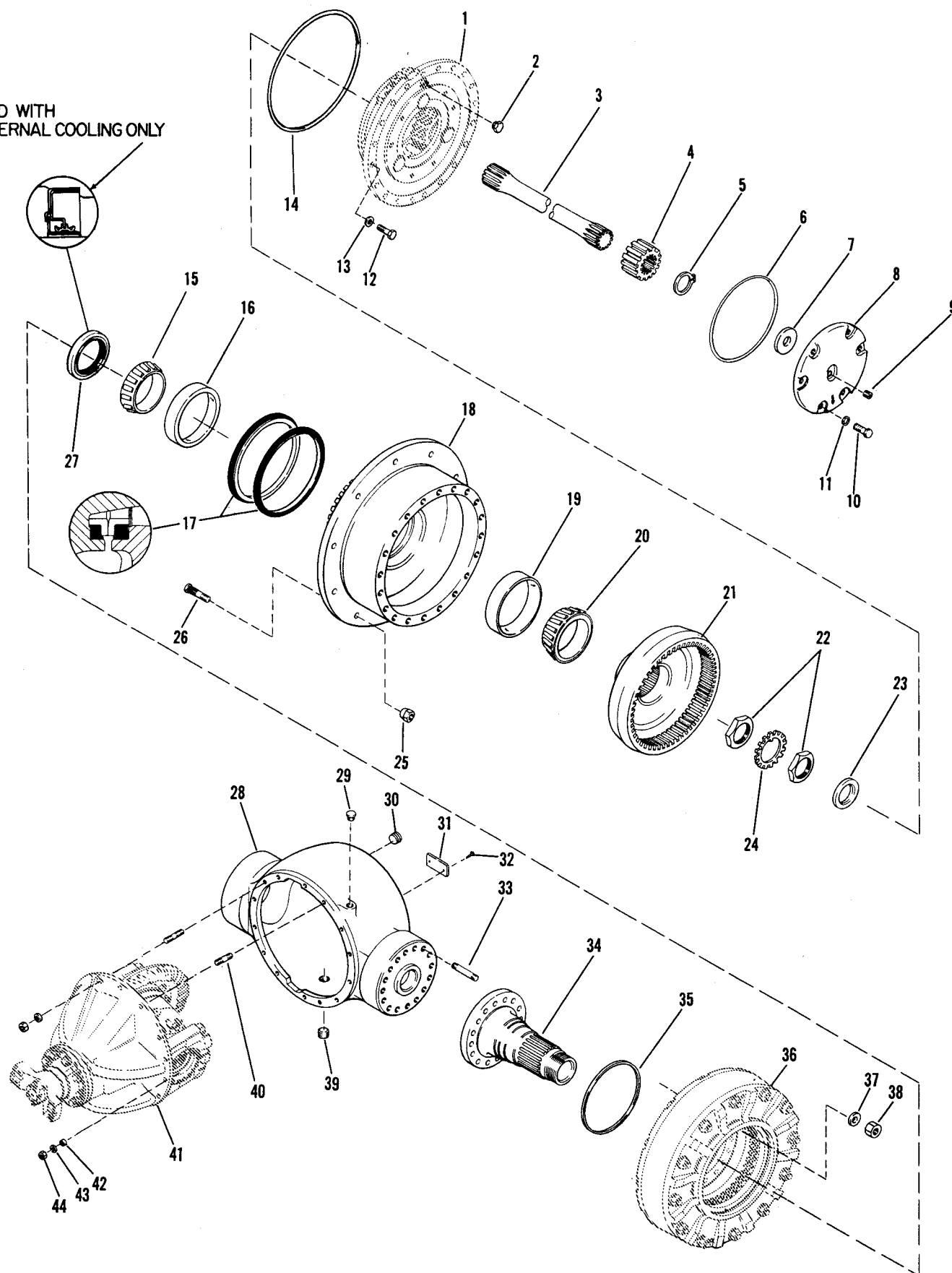
Remove plug at bottom of axle housing and allow sufficient time for lubricant to drain. With planetary wheel ends, rotate wheel until filler hole is down. Remove plug and allow sufficient time for draining. Be sure planet cover oil level hole is in proper position when refilling wheel ends.

Flushing

After draining, axles should be flushed. Replace drain plugs and fill axles to proper level with a light flushing oil. Operate the axles for a short period of time, then drain. Be sure to drain all of the flushing oil before refilling with new oil. Inspect the magnetic drain plug for metal particles or other foreign matter indicative of wear or possible failure. When refilling, cleanliness is extremely important.

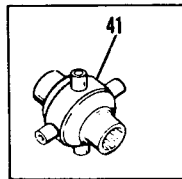
CLARK

USED WITH
EXTERNAL COOLING ONLY

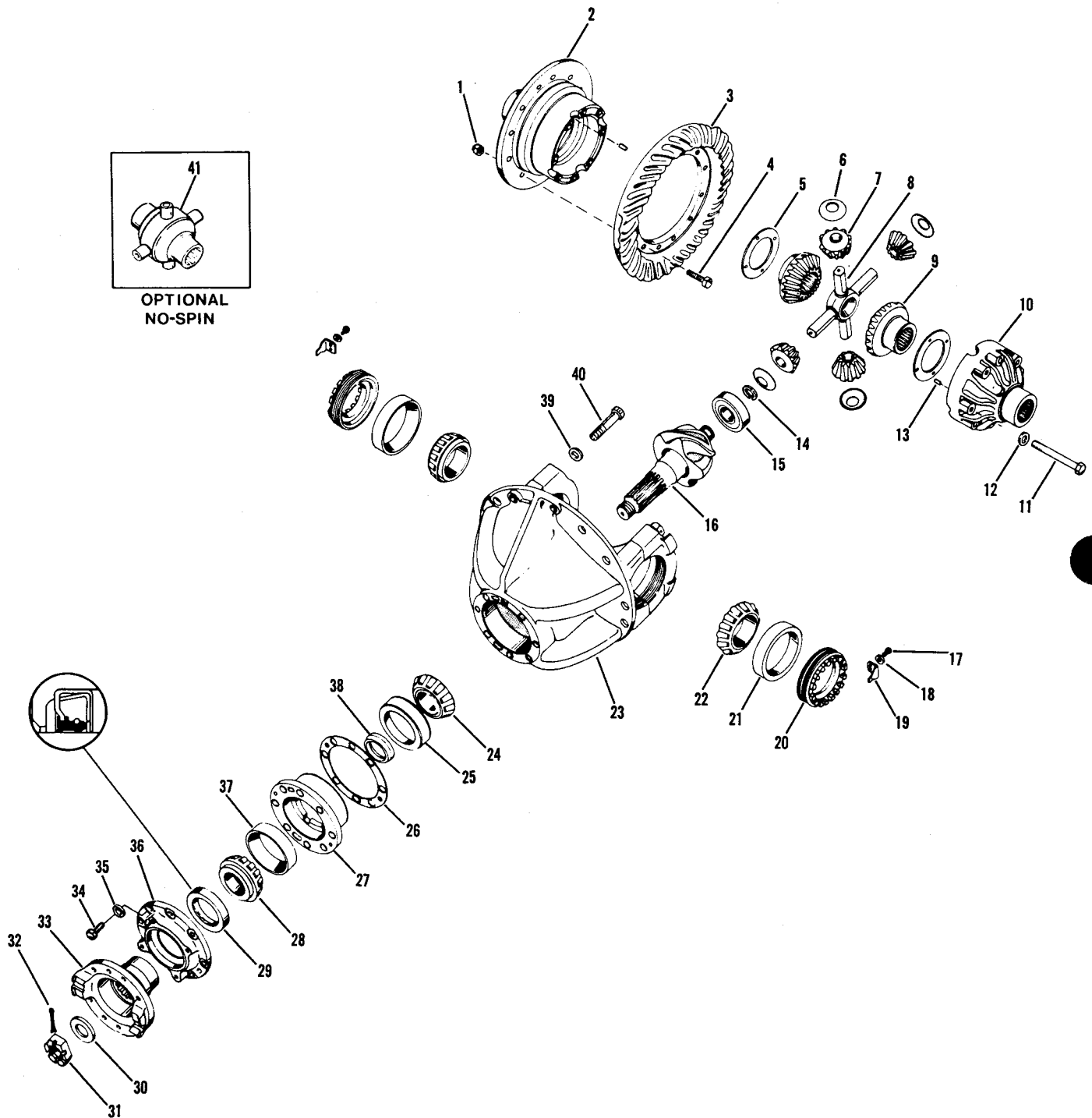


AXLE ASSEMBLY WITH MULTI-DISC LIQUID COOLED BRAKES

ITEM	DESCRIPTION	QTY.	ITEM	DESCRIPTION	QTY.
1	Planet Carrier Assembly.....	2	23	Sun Gear Thrust Ring	2
2	Planet Filler Hole Plug.....	2	24	Adjusting and Jam Nut Lock.....	2
3	Axle Shaft	2	25	Wheel Attaching Stud Nut	20
4	Sun Gear.....	2	26	Wheel Attaching Stud	20
5	Sun Gear Snap Ring	2	27	Hub Seal (Used with external cooling only).....	2
6	Planet Cover Sealing Ring.....	2	28	Axle Housing	1
7	Planet Cover Thrust Washer	2	29	Breather.....	1
8	Planet Cover	2	30	Housing Filler Plug.....	1
9	Planet Cover Attaching Capscrew.....	12	31	Name Plate	1
11	Planet Cover Attaching Capscrew Washer	12	32	Name Plate Screw	2
12	Planet Carrier Attaching Capscrew.....	40	33	Spindle and Brake Attaching Stud	32
13	Planet Carrier Attaching Capscrew Washer	40	34	Spindle	2
14	Planet Carrier Sealing Ring.....	1	35	Brake Spider Sealing Ring	2
15	Inner Hub Cone	2	36	Liquid Cooled Brake Assembly	2
16	Inner Hub Cup	2	37	Spindle and Brake Attaching Washer	32
17	Wheel Hub Face Seal	2	38	Spindle and Brake Attaching Nut.....	32
18	Wheel Hub	2	39	Housing Drain Hole Plug.....	1
19	Outer Hub Cup	2	40	Differential and Carrier Attaching Stud.....	14
20	Outer Hub Cone	2	41	Differential and Carrier Assembly.....	1
21	Internal Gear and Hub Assembly	2	42	Differential and Carrier Dowel.....	3
22	Wheel Bearing Adjusting and Jam Nut.....	4	43	Differential and Carrier Attaching Washer	14
			44	Differential and Carrier Attaching Nut.....	14



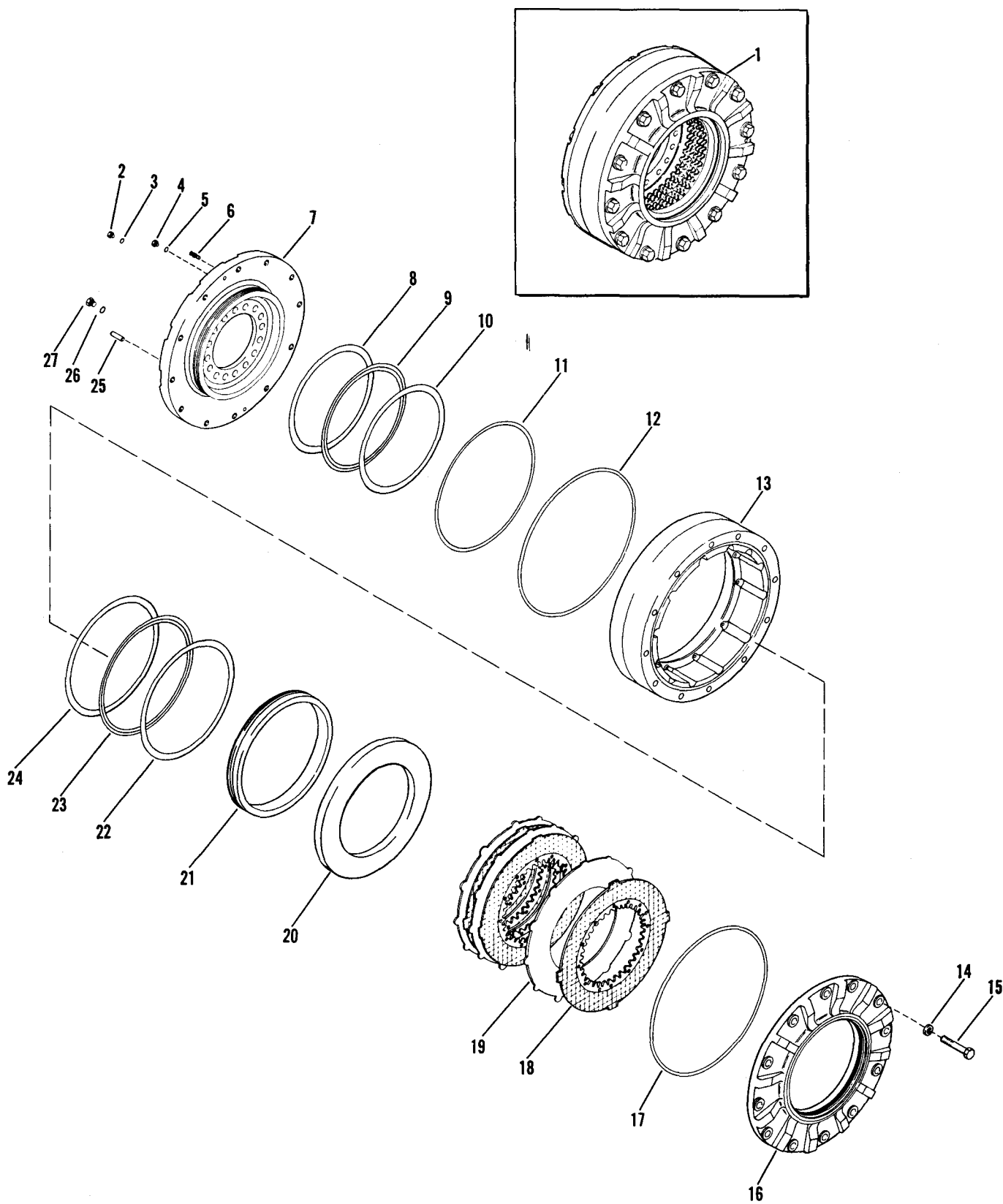
OPTIONAL
NO-SPIN



DIFFERENTIAL AND CARRIER ASSEMBLY

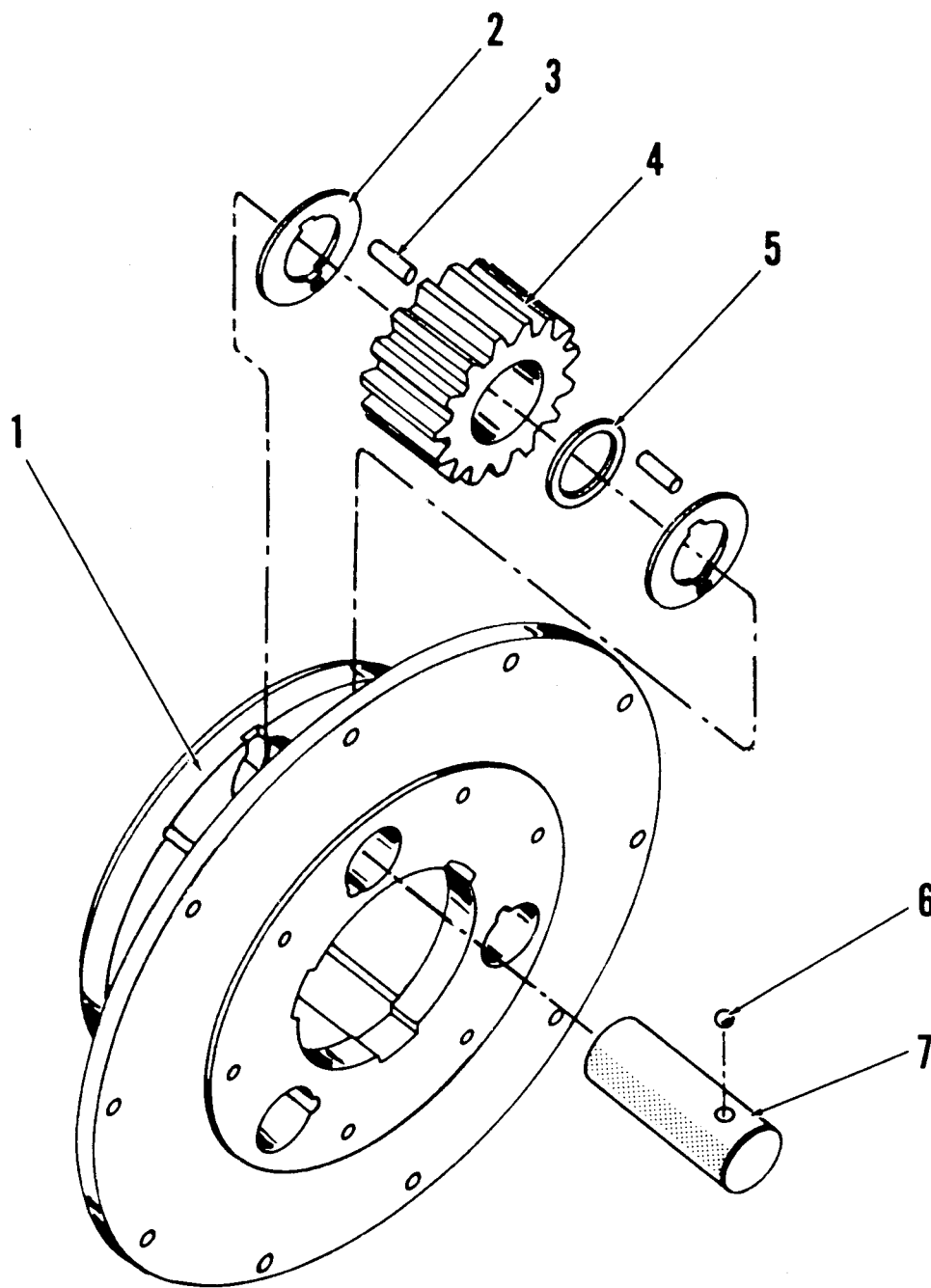
ITEM	DESCRIPTION	QTY.	ITEM	DESCRIPTION	QTY.
1	Ring Gear Bolt Nut.....	12	22	Differential Bearing Cone.....	2
2	Differential Case Flanged Half.....	1	23	Differential Carrier and Cap.....	1
3	Ring Gear	1	24	Center Pinion Bearing Cone	1
4	Ring Gear Bolt	12	25	Center Pinion Bearing Cup	1
5	Side Gear Thrust Washer	2	26	Bearing Cage Shim.....	AR
6	Pinion Thrust Washer	4	27	Bearing Cage	1
7	Pinion Gear.....	4	28	Outer Pinion Bearing Cone	1
8	Pinion Gear Spider.....	1	29	Pinion Oil Seal	1
9	Side Gear	2	30	Pinion Shaft Washer	1
10	Plain Half Case.....	1	31	Pinion Shaft Nut.....	1
11	Case Bolt.....	8	32	Pinion Shaft Nut Cotter	1
12	Case Bolt Washer.....	8	33	Companion Flange	1
13	Dowel Pin	4	34	Oil Seal Retainer Cap Screw.....	8
14	Inner Bearing Snap Ring.....	1	35	Oil Seal Retainer Cap Screw Lockwasher.....	8
15	Inner Pinion Bearing	1	36	Pinion Oil Seal Retainer	1
16	Pinion	1	37	Outer Pinion Bearing Cup	1
17	Adjusting Nut Lock Cap Screw.....	2	38	Pinion Bearing Spacer	1
18	Adjusting Nut Lock Cap Screw Lockwasher.....	2	39	Carrier Cap Lockwasher	4
19	Adjusting Nut Lock.....	2	40	Carrier Cap, Cap Screw	4
20	Differential Adjusting Nut	2	41	Optional No-Spin	1
21	Differential Bearing Cup.....	2			

AR - As Required



3 PLATE MULTI-DISC BRAKE ASSEMBLY

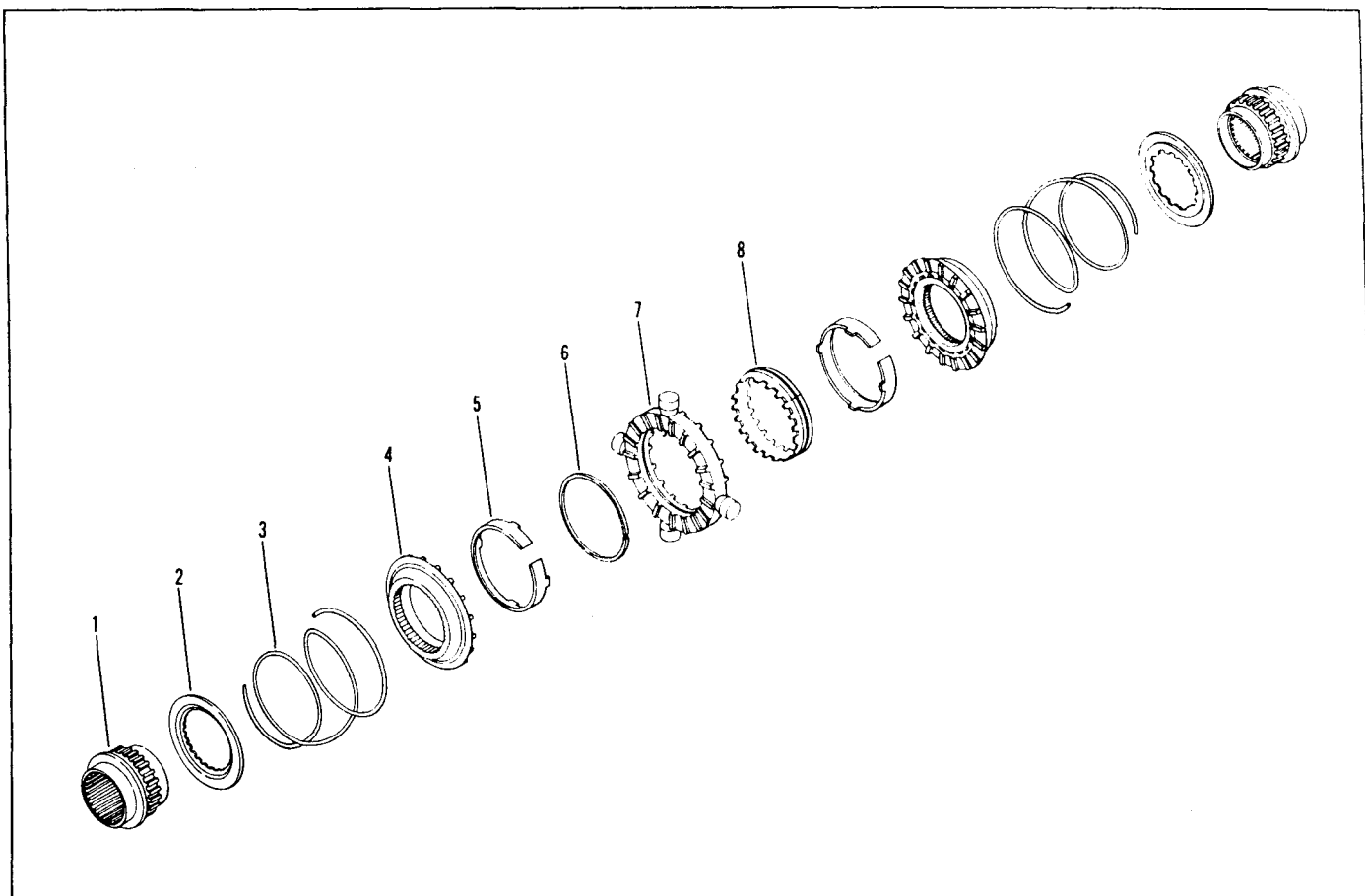
ITEM	DESCRIPTION	QTY.
1	Multi-Disc Brake Assembly (Quantity indicated for 1 wheel end).....	1
2	Cooling and Drain Plug	2
3	"O" Ring	2
4	Cooling Inlet Plug.....	1
5	"O" Ring	1
6	Bleeder Screw.....	1
7	Brake Spider	1
8	Backup Inner Ring	1
9	Piston Sealing Inner Ring	1
10	Backup Inner Ring	1
11	Housings and Spider Sealing Ring.....	1
12	Housing and Spider Sealing Ring.....	1
13	Brake Housing.....	1
14	Brake Cap Attaching Washer.....	12
15	Brake Cap Attaching Bolt.....	12
16	Brake End Cap.....	1
17	Housing and Spider Sealing Ring.....	1
18	Friction Plate and Lining Assembly	3
19	Reaction Plate.....	3
20	Piston Pressure Plate	1
21	Brake Piston	1
22	Backup Outer Ring	1
23	Piston Sealing Outer Ring	1
24	Backup Outer Ring	1
25	Spider and Housing Dowel Pin.....	2
26	"O" Ring	1
27	Plug	1



PLANET CARRIER ASSEMBLY

Parts Quantity For One (1) Planet Carrier Assembly

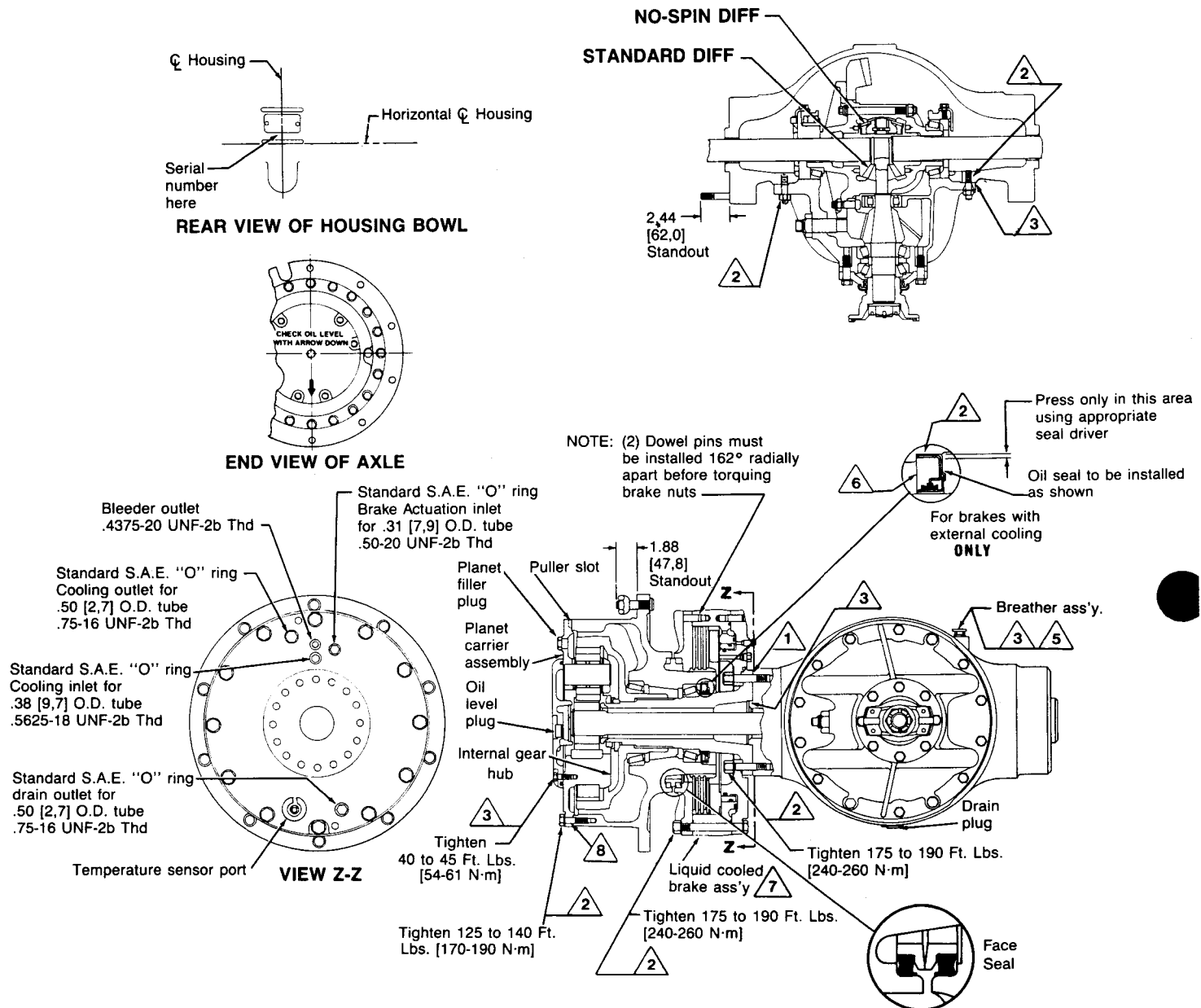
ITEM	DESCRIPTION	QTY.	ITEM	DESCRIPTION	QTY.
1	Planet Spider	1	5	Pinion Roller Spacer.....	3
2	Thrust Washer	6	6	Pinion Shaft Lock Ball	3
3	Pinion Needle Roller.....	150	7	Pinion Shaft	3
4	Planet Pinion	3			



NO-SPIN DIFFERENTIAL ASSEMBLY

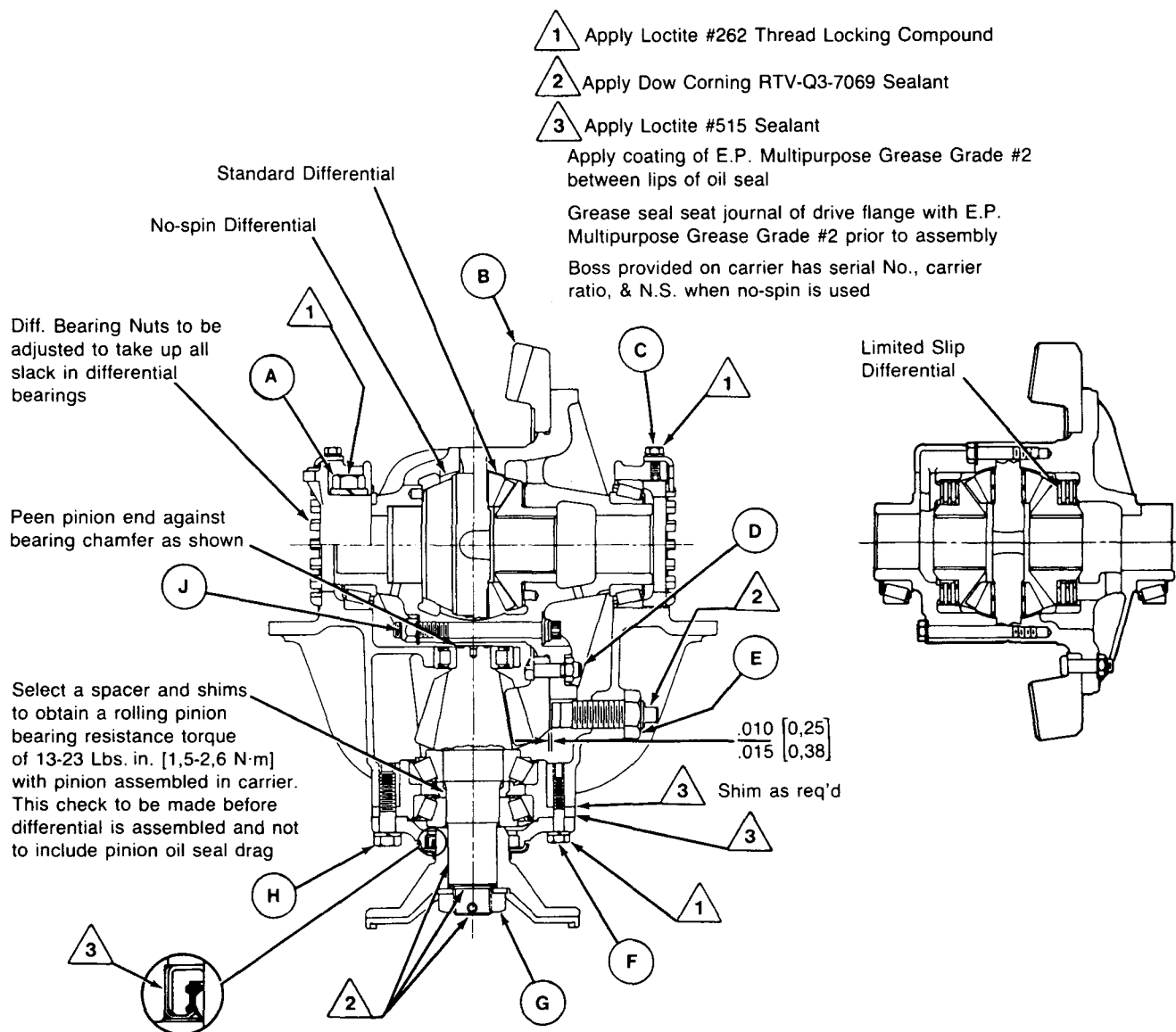
Item No.	Description	No. Req'd	Item No.	Description	No. Req'd
1	Side Gear.....	2	5	Holdout Ring	2
2	Spring Retainer	2	6	Snap Ring	1
3	Spring	2	7	Spider Assembly	1
4	Clutch Assembly	2	8	Center Cam	1

D-17500, D-19640, D-33640
AXLE ASSEMBLY INSTRUCTION ILLUSTRATION



1. These surfaces must be dry and free from sealing compounds, rust, nicks and burrs
2. Apply Loctite #262 Thread Locking Compound
3. Apply Dow Corning RTV-Q3-7069 Sealant
4. Apply Loctite #515 Sealant
5. Axle assembly to be air checked at 12 PSI (83 KPA) for 15 seconds with no drop in air pressure
6. Apply coating of E.P. Multi Purpose Grease Grade #2 to inside dia. of oil seals and to spindle seal journal dia. prior to assembly
7. Multi Disc Brake to be air checked at 100 P.S.I [689 KPA] for 15 seconds with no drop in air pressure.
8. On D-17500 series axle use Dow Corning RTV-Q3-7069 Sealant, on D-19640 and D-33640 series axle use sealing ring.

DIFFERENTIAL AND CARRIER INSTRUCTIONS



1530 Series Differential (Ring Gear Diameter) Assembly Instructions & Bolt Tightening Chart — Lbs. Ft. Torque [N·m]

- A — 330 to 360 Lbs. Ft. [450 - 490 N·m]
- B — Ring Gear Backlash Adjustment .009 - .013 [0,22 - 0,33 mm]
- C — 25 to 28 Lbs. Ft. [34 - 38 N·m]
- D — 128 to 141 Lbs. Ft. [174 - 191 N·m]
- E — 300 Lbs. Ft. [407 N·m]
- F — 90 to 100 Lbs. Ft. [125 - 135 N·m]
- G — 500 Lbs. Ft. [678 N·m]
- H — 125 to 140 Lbs. Ft. [170 - 190 N·m]
- J — 128 to 141 Lbs. Ft. [174 - 191 N·m]

1640 Series Differential (Ring Gear Diameter) Assembly Instructions & Bolt Tightening Chart — Lbs. Ft. Torque [N·m]

- A — 296 to 326 Lbs. Ft. [401 - 442 N·m]
- B — Ring Gear Backlash Adjustment .010 - .014 [0,25 - 0,35 mm]
- C — 25 to 28 Lbs. Ft. [34 - 38 N·m]
- D — 125 to 140 Lbs. Ft. [170 - 190 N·m]
- E — 300 Lbs. Ft. [407 N·m]
- F — 90 to 100 Lbs. Ft. [125 - 135 N·m]
- G — 600 Lbs. Ft. [813 N·m]
- H — 175 to 190 Lbs. Ft. [240 - 260 N·m]
- J — 175 to 190 Lbs. Ft. [240 - 260 N·m]

For 1390 Series Differential See Page 45

OVERHAUL OF AXLE ASSEMBLY WITH LIQUID COOLED BRAKES

The instructions contained herein cover the disassembly and reassembly of the axle assembly in a sequence that would normally be followed after the unit has been removed from the machine and is to be completely overhauled. Mount axle on steel horses or on V-blocks. Allow axle housing mounting pads to rest on crossbars of horses to provide necessary rigidity.

NOTE: Drain axle wheel ends and center section thoroughly before disassembly. See liquid cooled brake lubrication section for draining and filling brakes.

CAUTION: Cleanliness is of extreme importance in the repair and overhaul of this unit. Before attempting any repairs, the exterior of the unit must be thoroughly cleaned to prevent the possibility of dirt and foreign matter entering the mechanism.

DISASSEMBLY OF AXLE

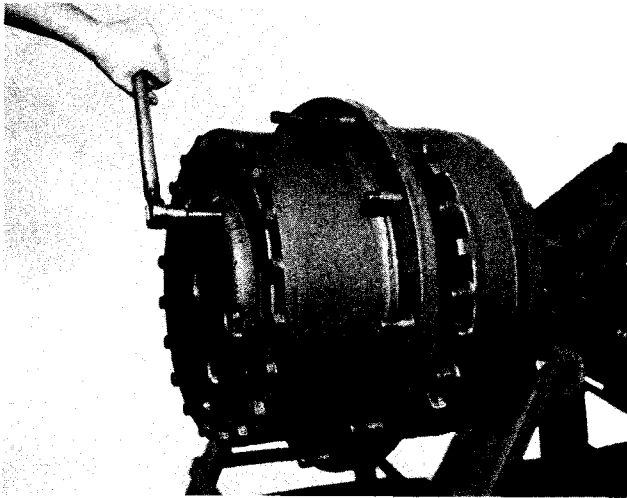


Figure 1

Remove planet cover cap screws. If planet carrier and cover are one piece proceed to Figure 5.

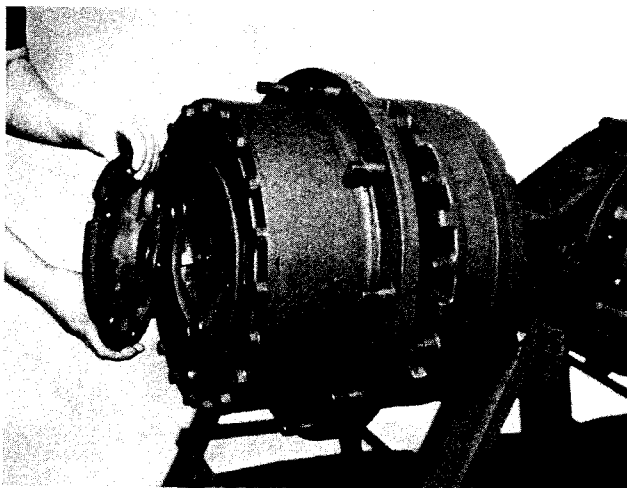


Figure 2

Remove planet cover.

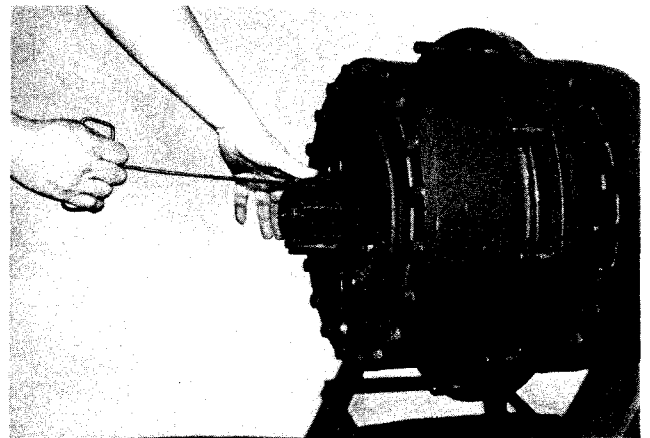


Figure 3

Using a heavy wire hook, pull axle shaft and sun gear out of wheel end. If only the differential is to be removed repeat procedures 1 thru 3 on opposite wheel end.

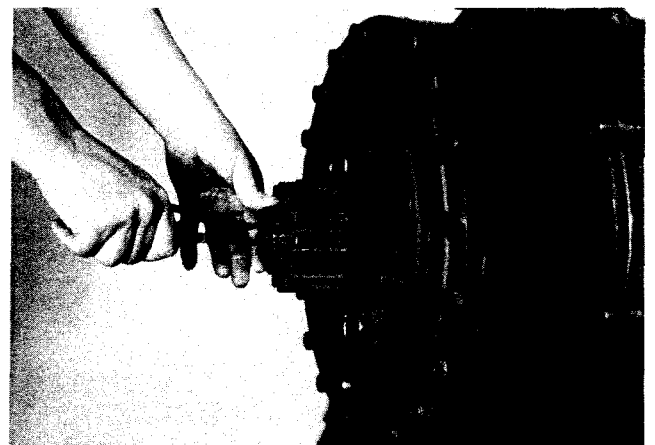


Figure 4

If axle shaft or sun gear are to be replaced, remove sun gear retainer ring and sun gear from shaft. Remove axle shaft from housing.

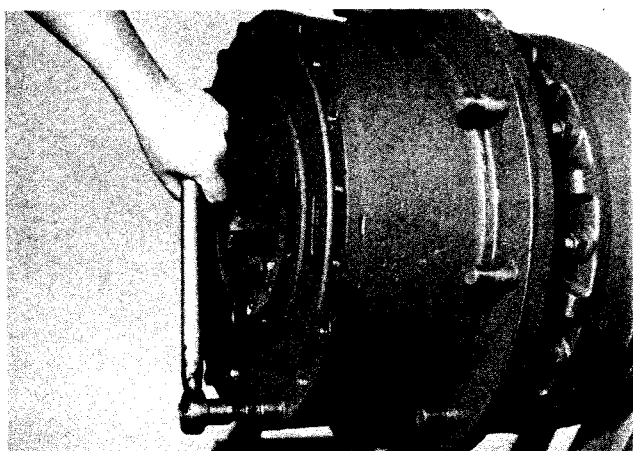


Figure 5
Remove planet carrier capscrews.

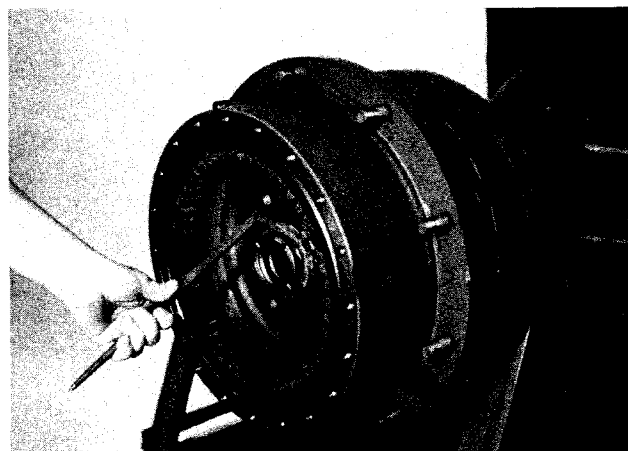


Figure 8
Remove sun gear thrust ring.

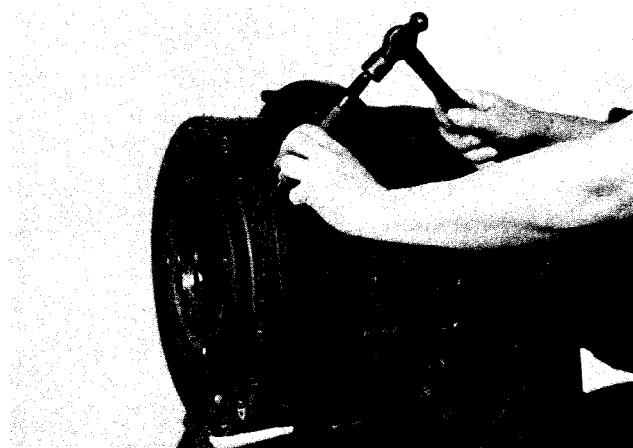


Figure 6
Tap planet carrier from wheel hub far enough to install chain hoist and hook.

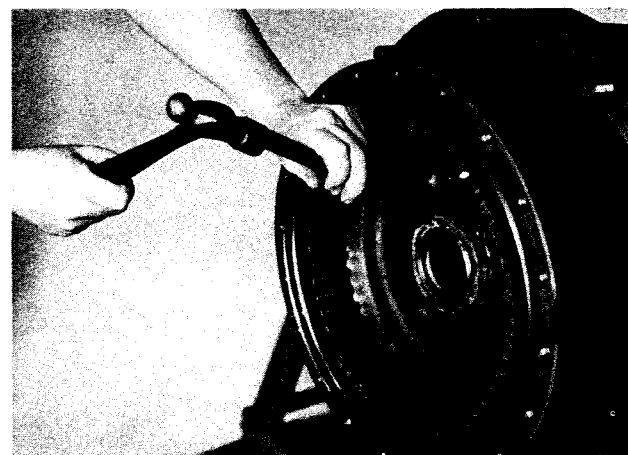


Figure 9
Straighten wheel nut lock tang from outer jam nut.

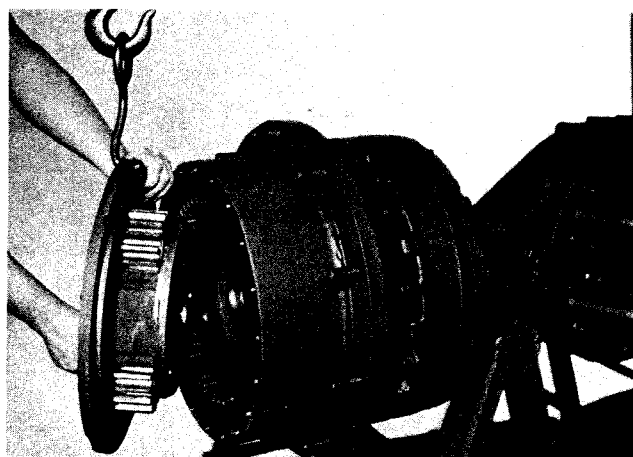


Figure 7
Remove planet carrier assembly

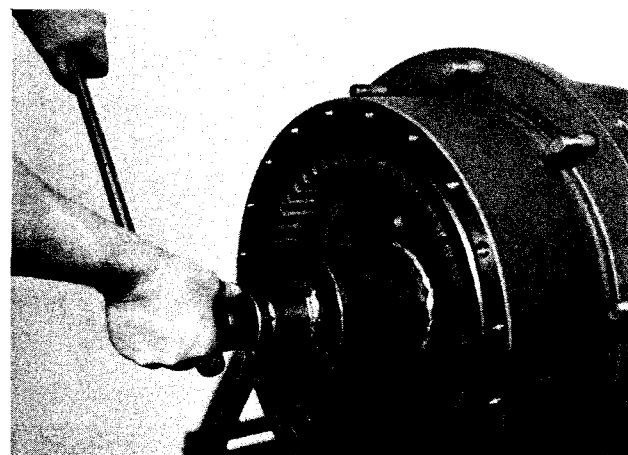


Figure 10
Remove outer jam nut and nut lock. Loosen wheel bearing adjusting nut but do not remove.

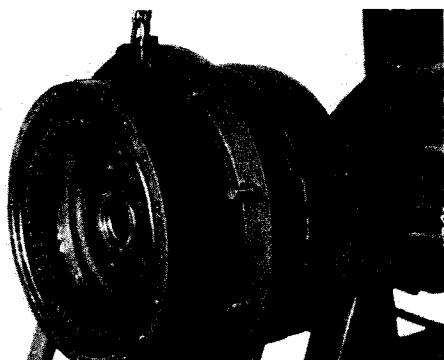


Figure 11

NOTE: Before removing wheel hub and brake assembly block opposite wheel end to prevent axle assembly from flipping off repair stand.

Support wheel hub with a chain hoist.



Figure 12

Remove wheel bearing adjusting nut. Remove internal gear and hub assembly.

NOTE: There are two types of liquid cooled brakes shown in this service manual. An original design like the one shown being removed in this text and a redesign type being disassembled on page 35.

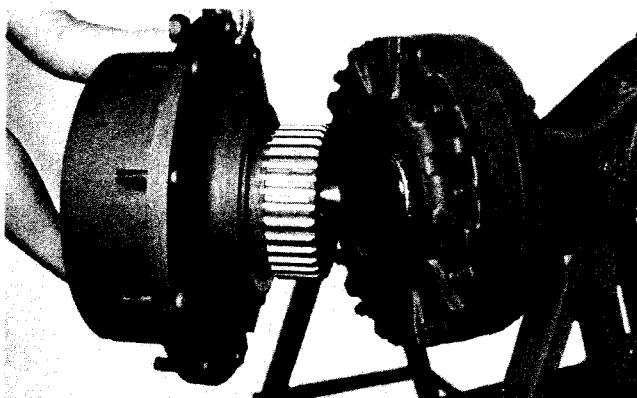


Figure 13

Remove wheel hub straight out of brake assembly to prevent binding in brake discs. **NOTE:** Steel hub face seals on one axle end must not be mixed with face seals on the opposite axle end.

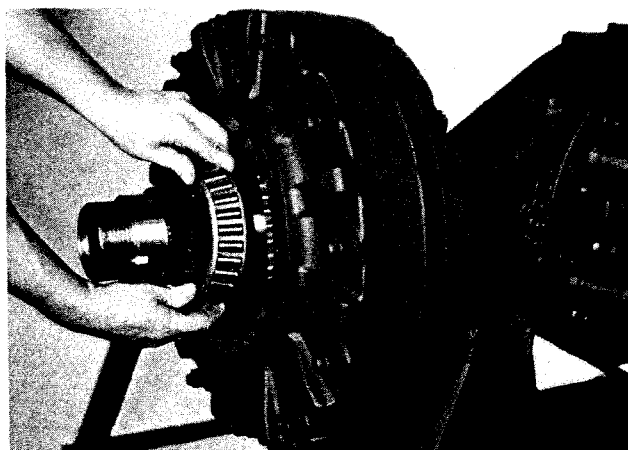


Figure 14

Remove wheel hub inner bearing from spindle.

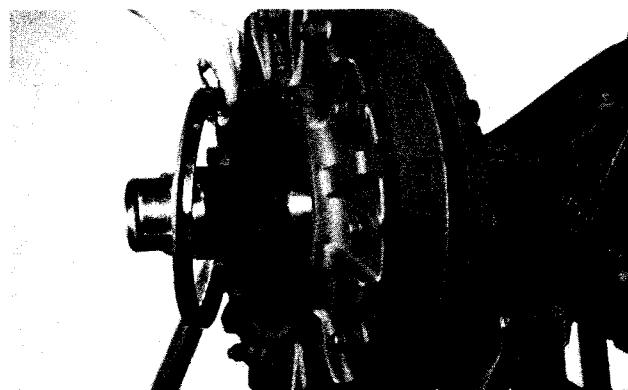


Figure 15

Remove inner hub oil seal from brake assembly. See note in Figure 13.

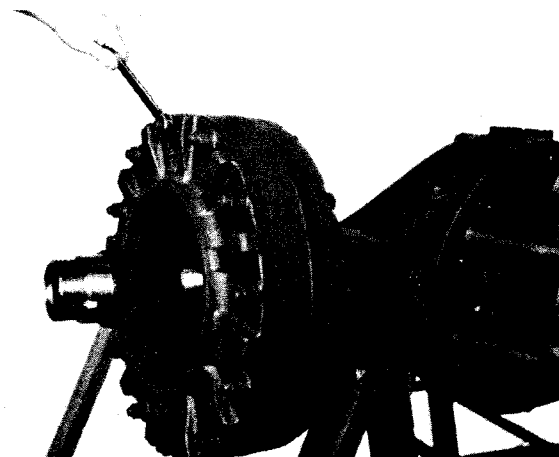


Figure 16

Remove one top brake clamping bolt and nut on original design brake or remove a brake cap attaching bolt on the redesign brake.

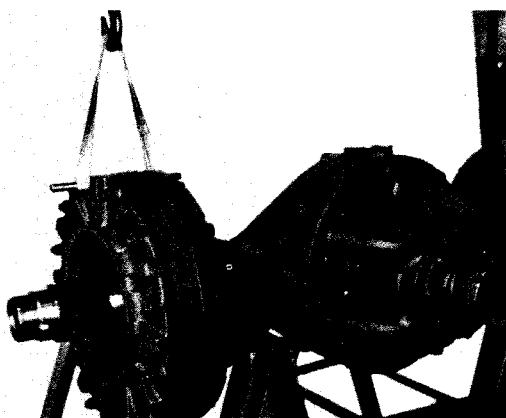


Figure 17

Insert a heavy rod through clamping bolt hole. Using a heavy strap and chain hoist, secure brake assembly as shown. On redesign brake if a rod is not used, use the strap on the outer diameter of the brake housing.

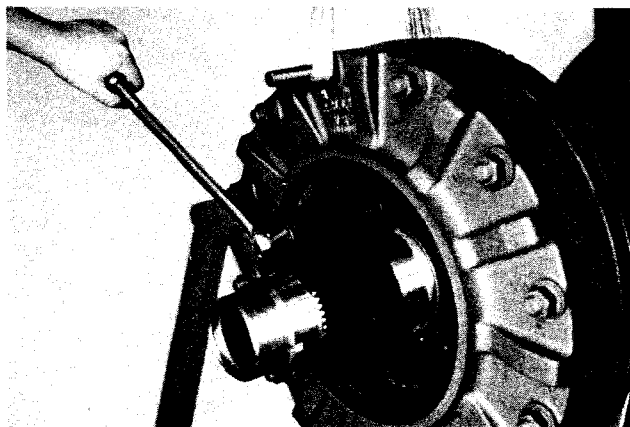


Figure 18

Remove brake and spindle attaching nuts and washers.

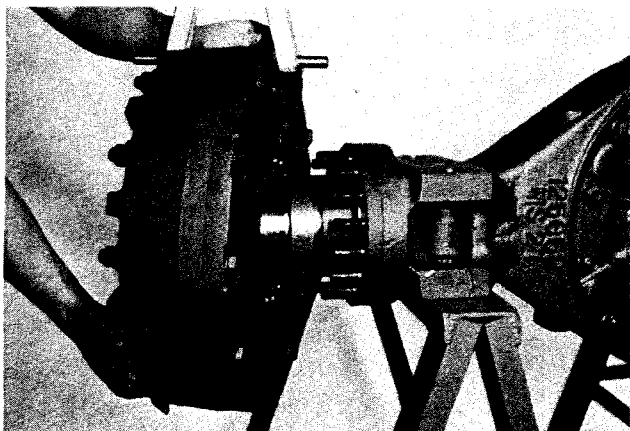


Figure 19

Remove brake assembly.

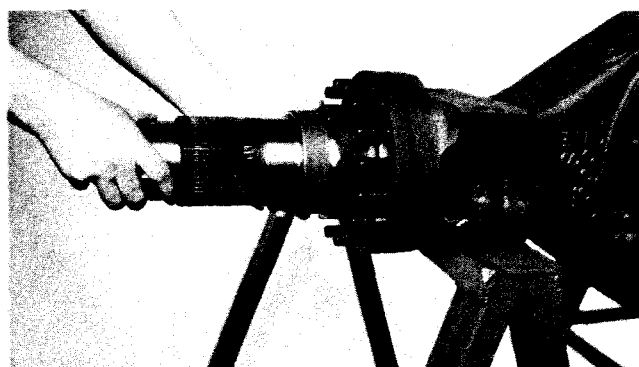


Figure 20

Remove spindle from axle housing.
Repeat procedures 1 thru 20 for opposite wheel end disassembly.

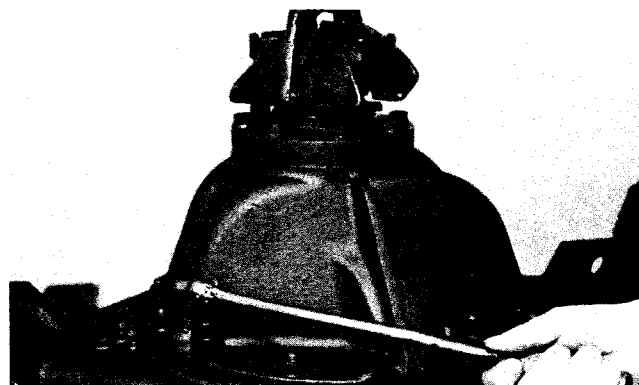


Figure 21

With differential positioned as shown remove stud nuts, washers and taper dowels.

Remove differential assembly from axle housing.
NOTE: Differential must be removed straight off of studs.

DISASSEMBLY OF DIFFERENTIAL

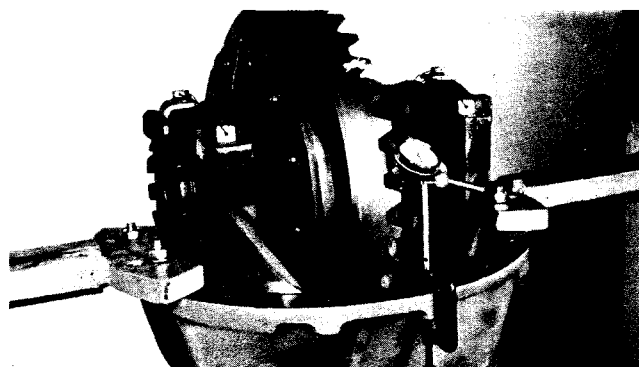


Figure 22

Mount differential on differential overhaul stand. Check and record ring gear backlash with a dial indicator. This information is necessary for reassembly unless a new gear set is installed.

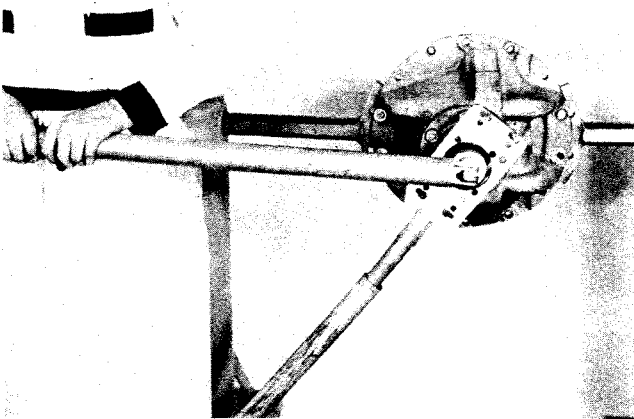


Figure 23

Install companion flange retainer tool, remove cotter pin, and loosen nut securing flange to pinion shaft. This will facilitate later flange removal.

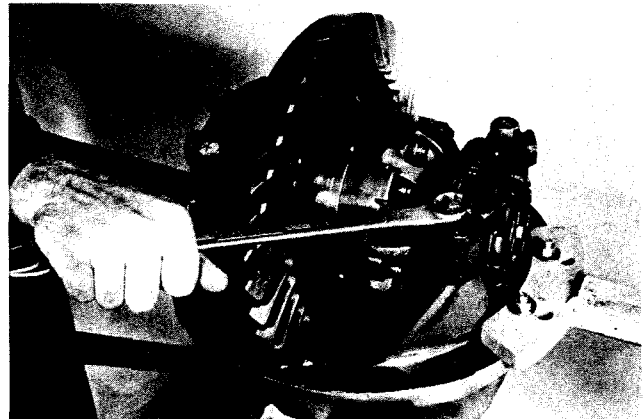


Figure 26

Remove bolts securing bearing caps to carrier assembly. Remove caps and adjusting nuts. Insert metal bar through differential to facilitate hoisting.

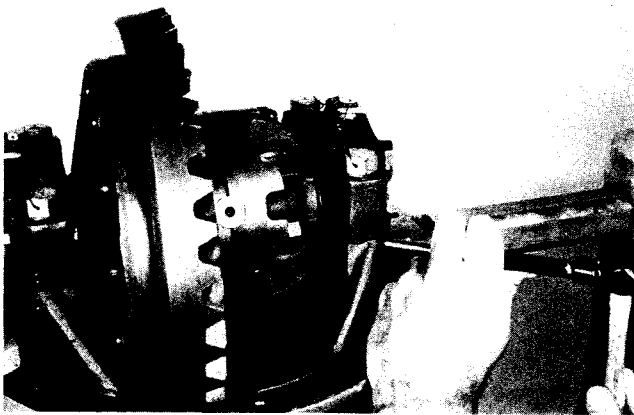


Figure 24

Use center punch to matchmark bearing caps to carrier assembly. This is to insure correct match in reassembly.

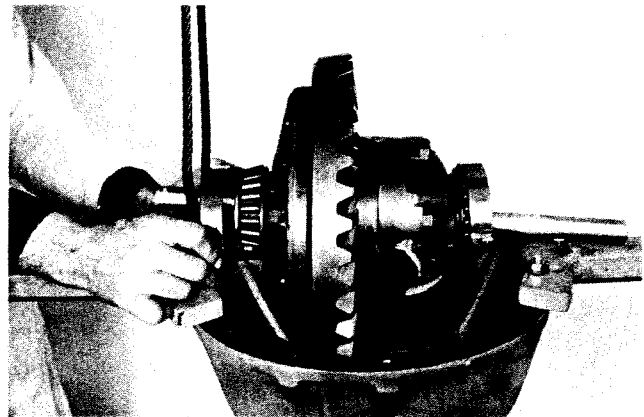


Figure 27

Raise ends individually and remove bearing cups.

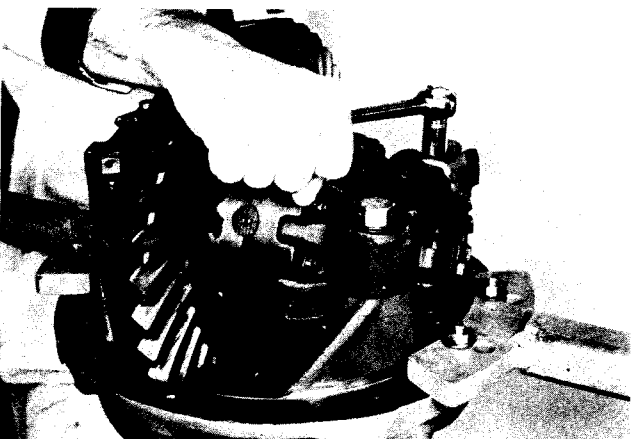


Figure 25

Remove lockwire and remove adjusting nut lock.

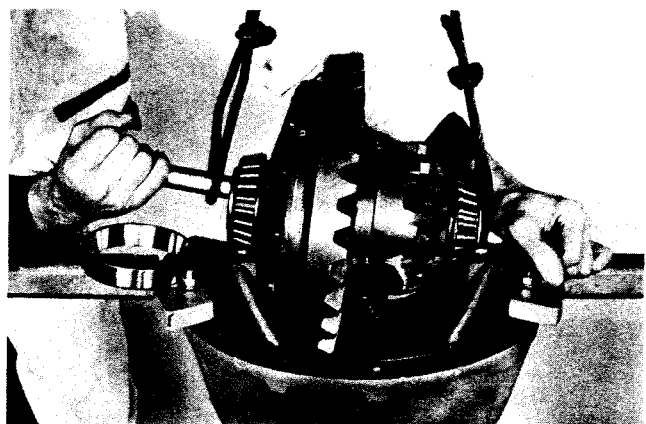


Figure 28

While hoisting carefully, tilt differential to angle and position shown. This will permit ring gear to clear pinion shaft inner bearing boss in carrier assembly. Remove differential.

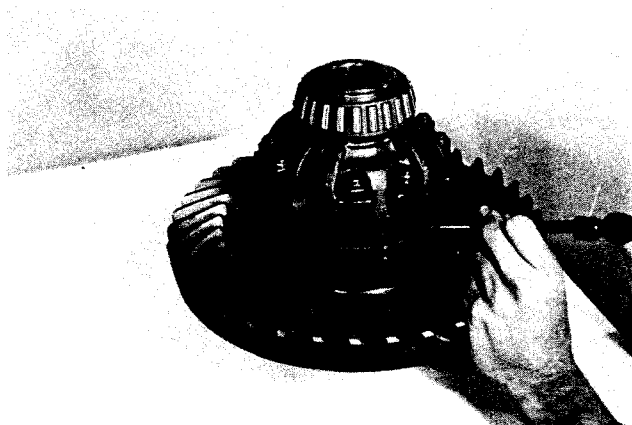


Figure 29

Matchmark case halves to insure correct reassembly.
NOTE: For limited slip differential see page 49.

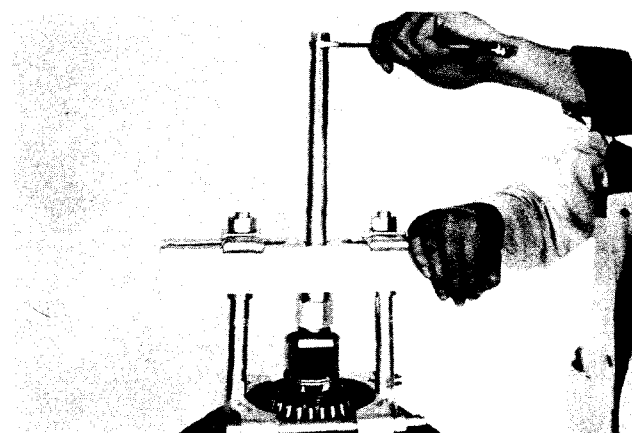


Figure 30

If replacement is required, remove either or both differential bearings. **NOTE:** Two recesses are provided under the bearing mounts in each casting to facilitate use of two-arm type puller.

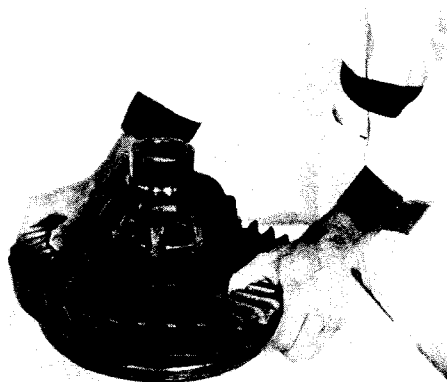
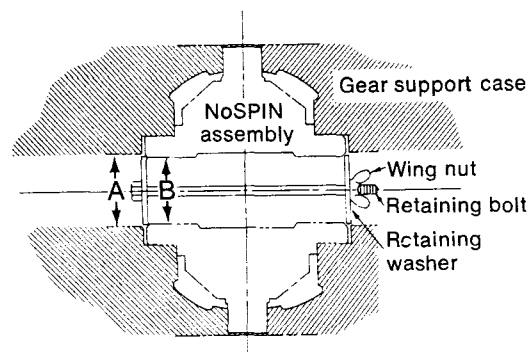


Figure 31

Remove nuts and bolts; remove ring gear.

If No-Spin differential is **NOT** used proceed with Figure 32. If No-Spin is used, use the following for removing and proceed to Figure 35.



1. Mark the mating halves of the differential case with a center punch so they can be reassembled in the original position when repairs or inspection is completed.
2. Insert a retaining bolt and washer assembly, (as shown), threading the nut finger-tight against the washer.
3. Separate the case halves and lift out the No-Spin assembly.

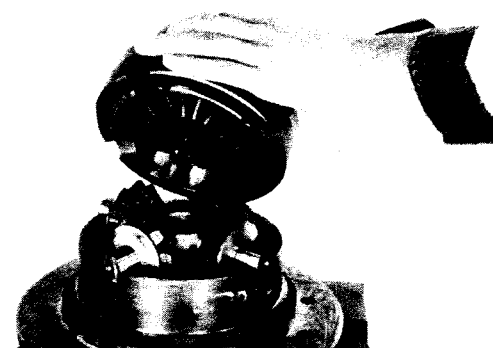


Figure 32

Remove differential bolts securing case halves, lift off case half. Use soft mallet if necessary to aid removal.

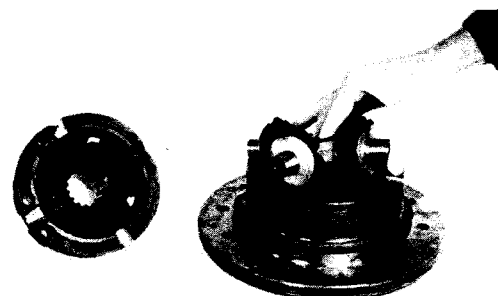


Figure 33

Remove spider, pinions, and thrust washers.

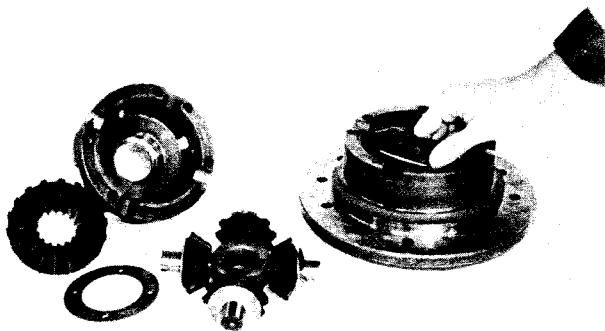


Figure 34

Remove side gears and thrust washers from case halves.

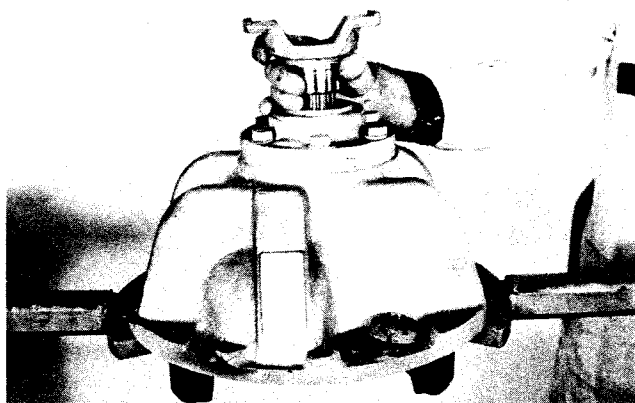


Figure 35

Remove nut, washer and companion flange. Use puller if necessary to remove flange.

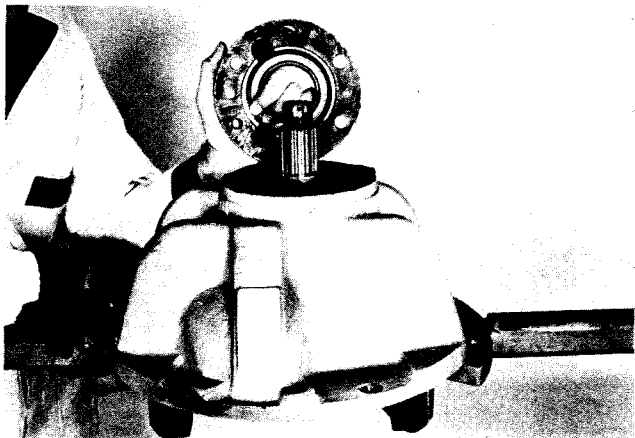


Figure 36

Remove bolts securing seal retainer to carrier, remove retainer. If necessary, tap with soft mallet to break seal between parts.

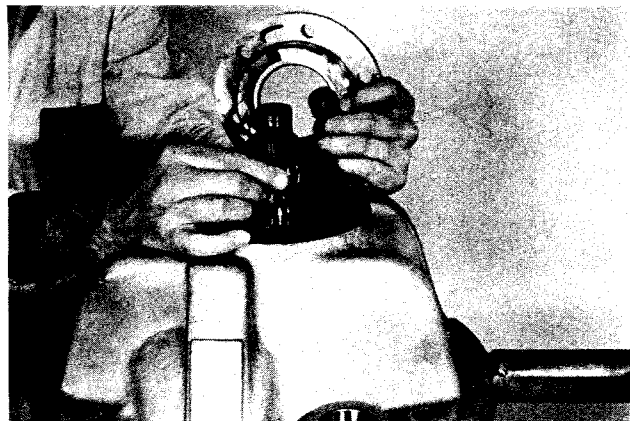


Figure 37

Using pry slots provided, remove bearing cone, bearing cage, bearing spacer and bearing cage shims. Retain bearing cage shim pack intact for reuse in reassembly.

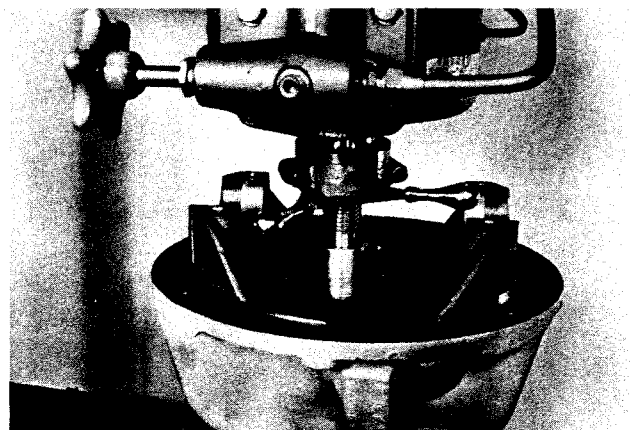


Figure 38

Press pinion assembly from carrier.

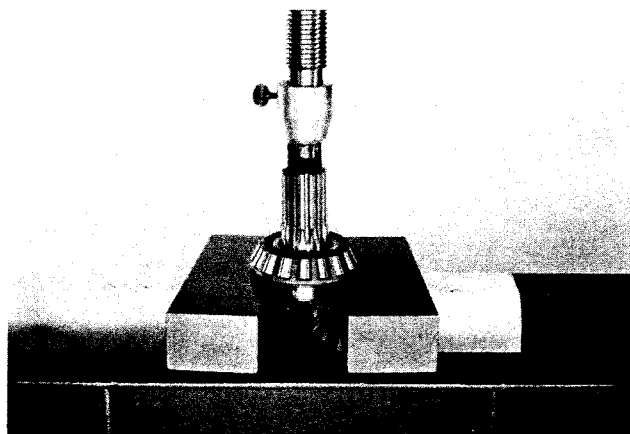


Figure 39

Press center bearing cone from pinion assembly.

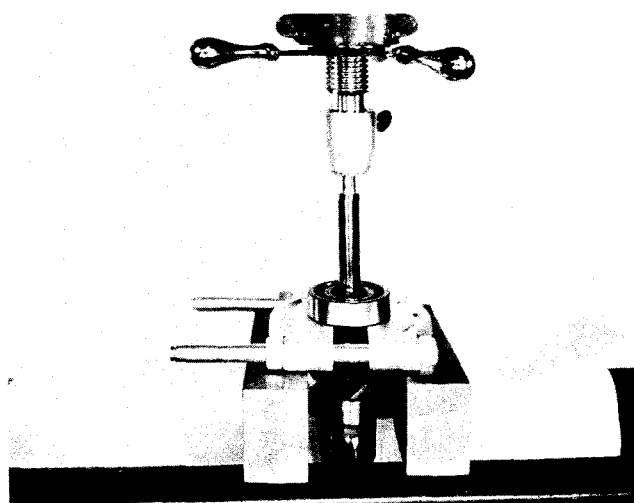


Figure 40

Press inner bearing from pinion assembly.

CLEANING AND INSPECTION

CLEANING

Clean all parts thoroughly using solvent type cleaning fluid. It is recommended that parts be immersed in cleaning fluid and moved up and down slowly until all old lubricant and foreign material is dissolved and parts are thoroughly cleaned.

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 bearing to avoid spinning. Do not spin bearings when drying. Bearings may be rotated slowly by hand to facilitate drying process.

Housings

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 cone or cup individually 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 members 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 Lubriplate.

Gears and Shafts

If magna-flux process is available, use process to check parts. Examine teeth and ground and polished surfaces on all gears and shafts carefully for wear, pitting, chipping, nicks, cracks or scores. 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 bevel pinion must also be replaced as a set if either is damaged.

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 conditions which cause subsequent oil leaks or failures.

At reassembly apply thread locking compound where noted.

Guidelines for application where to apply.

- A. On bolts, cap screws and studs (anchor end) apply compound on female threaded component part.
- 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.

REASSEMBLY OF DIFFERENTIAL RING GEAR AND DIFFERENTIAL CASE

NOTE: Lubricate all differential bearings, gears, and thrust washers.



Figure 41

Check ring gear mounting surface of flanged half of differential case for burrs. Remove burrs with file.

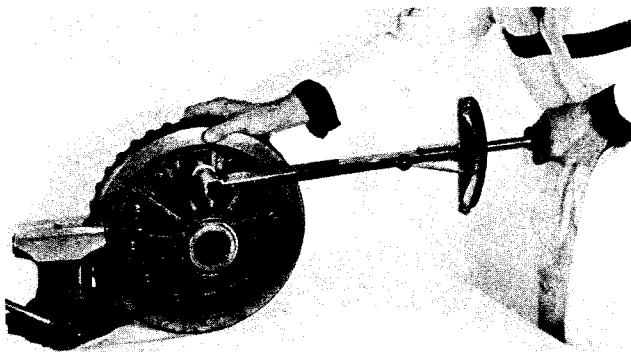


Figure 42

Position ring gear on flanged half case. Install bolts. Install bolt nuts, tighten to specified torque (See page 15). If No-Spin is used install in case half as an assembly and proceed to Figure 45. For limited slip see page 49.

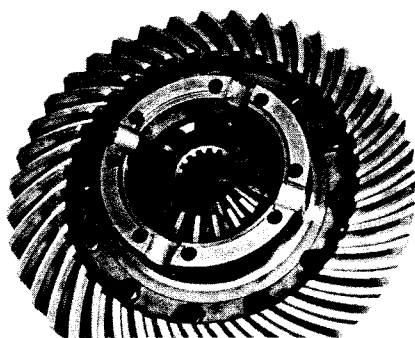


Figure 43

Lubricate and install thrust washer and side gear in differential case.

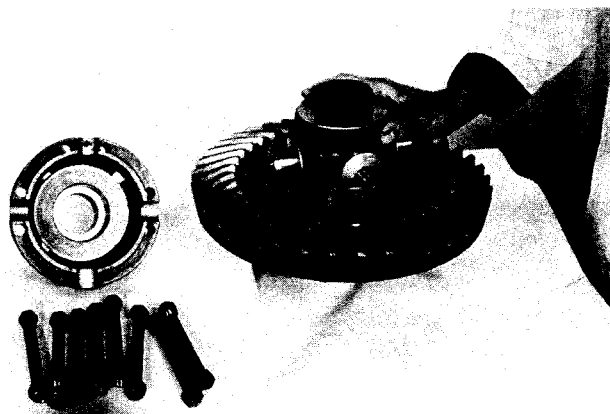


Figure 44

Place pinions and thrust washers on differential spider, lubricate and set in position on installed side gear. Lubricate and install side gear and thrust washer on pinions. Apply Loctite #262 to internal threads in flanged half case.

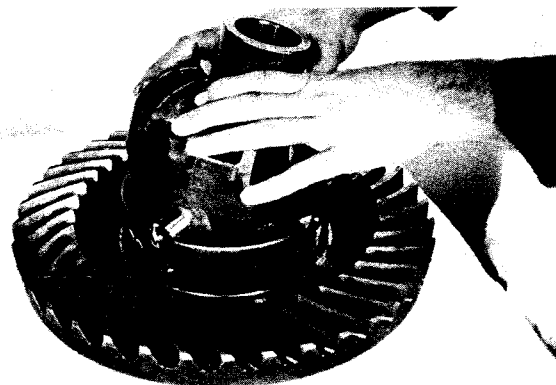


Figure 45

Align matchmarks and install plain half case on flanged half assembly, making sure of full gear engagement. Install bolts and tighten to specified torque (See page 15).

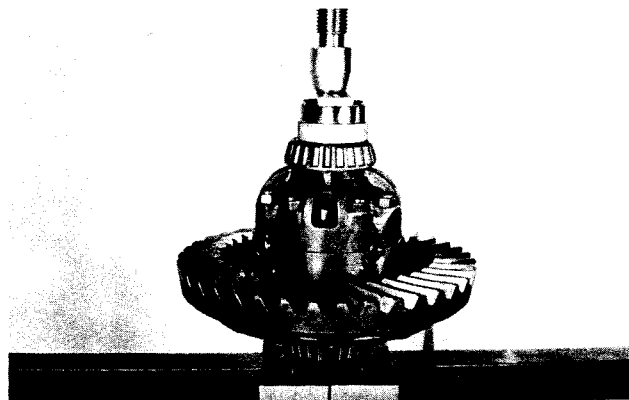


Figure 46

Press differential bearing cones on case halves.

REASSEMBLY OF PINION SHAFT

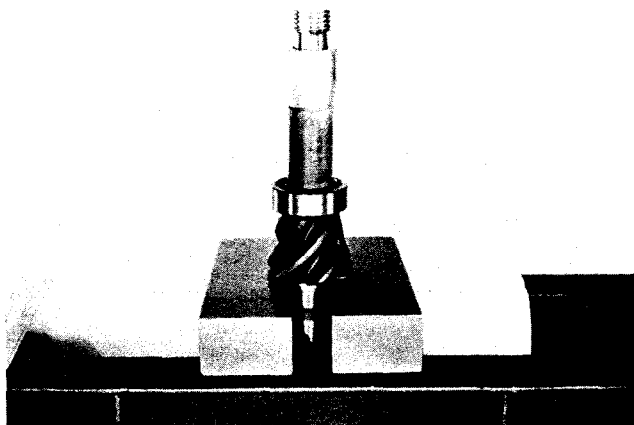


Figure 47
Press inner bearing on pinion shaft.

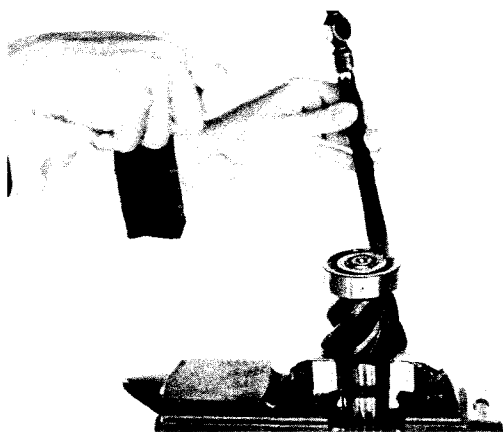


Figure 48
Stake bearing in four places equally spaced around diameter. Use square end staking tool as shown. See page 59.

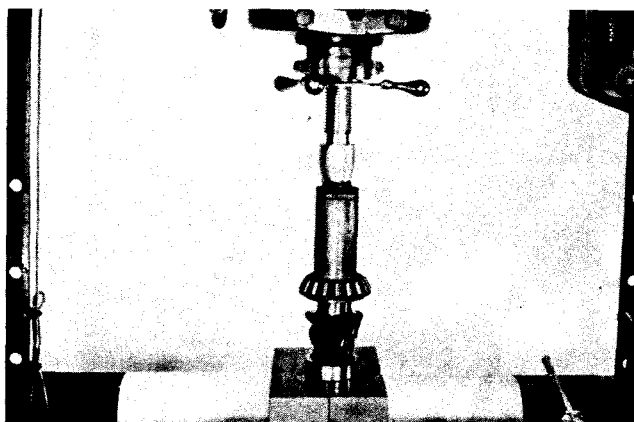


Figure 49
Press center bearing onto pinion shaft.

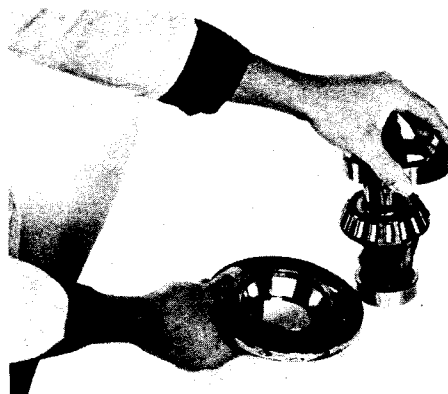


Figure 50
Position center bearing cup and bearing cage on pinion shaft.

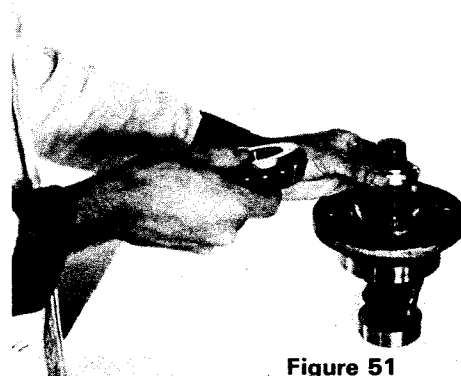


Figure 51
If pinion and bearing cage parts were disassembled for cleaning and inspection only and none of the parts were replaced, use original pinion bearing spacer. If parts were changed a pinion bearing spacer and shim kit is provided for service repair of differential and carrier assemblies. This kit, consisting of a spacer and quantity of shims, is used to obtain proper pinion bearing preload as described in Figure 55. Position bearing spacer (with chamfer toward threaded end of shaft) and one .010 [0,25 mm] shim on pinion shaft and install outer pinion bearing cone.

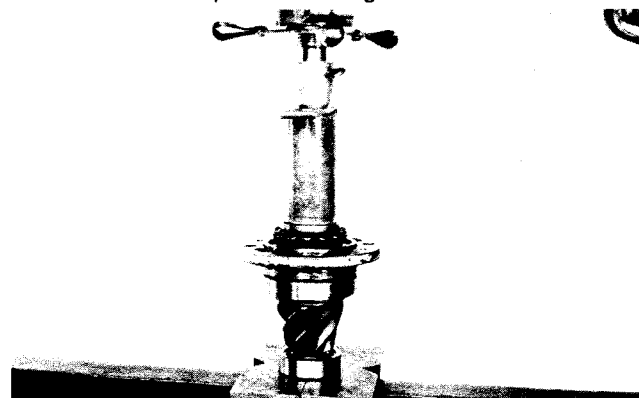


Figure 52
Press outer pinion bearing cone on pinion shaft.

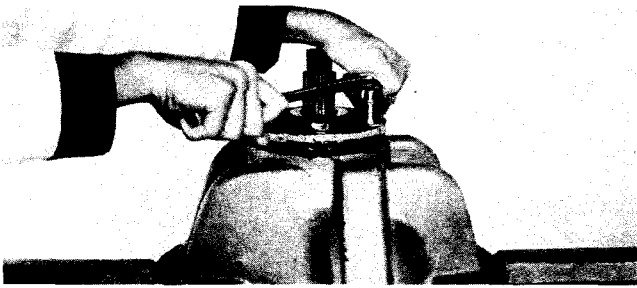


Figure 53

Install bearing cage shims (use original shim packs or their equivalent thickness) and pinion shaft assembly in differential carrier housing. Use five identical oil seal retainer bolts with flat washers to pull pinion shaft assembly fully into carrier assembly. Make sure oil passages are aligned. Tighten five bolts to specified torque (See page 15).

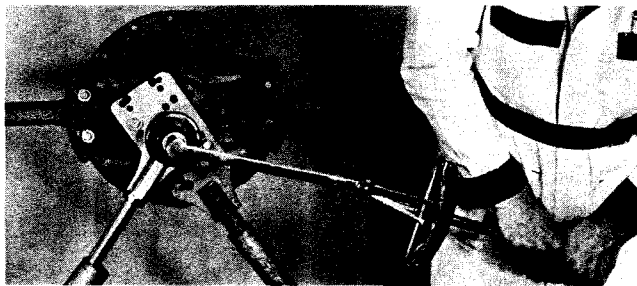


Figure 54

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 companion flange nut to specified torque (See page 15).

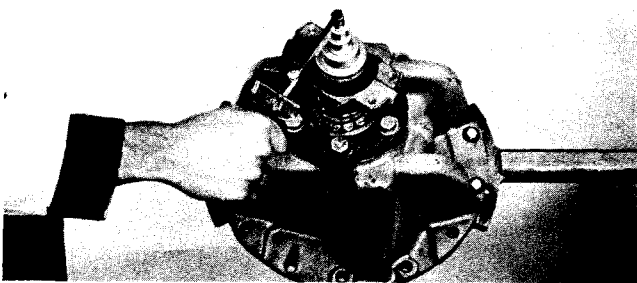


Figure 55

Use "inch-pound" torque wrench to check bearing preload. If bearing preload is not between 13 and 23 in. lbs. [1-3 N.m], disassemble parts and add shims to decrease preload or remove shims to increase preload. If preload is satisfactory, remove nut and companion flange. Remove bolts and flat washers securing pinion bearing cage to differential carrier. Remove pinion and cage assembly, coat shim surface of carrier housing and shim surface of bearing cage with Loctite Sealer #515. Reinstall shims and pinion and cage assembly on carrier housing.

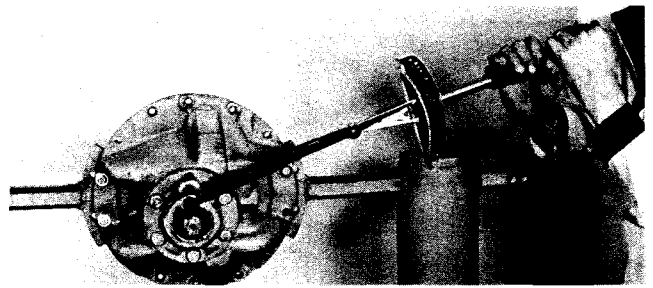


Figure 56

Apply Loctite Sealer #515 to oil seal retainer bore. Install seal in retainer with lip of seal toward oil side. Coat retainer to cage surface with same sealer. Coat lip of seal with lubriplate. Coat internal threads with Loctite Sealer #262. Install oil seal retainer bolts and tighten to specified torque (See page 15).

Coat flange splines with Dow Corning RTV-Q3-7069 Sealant. Position companion flange on pinion shaft. Install washer and nut. Tighten nut to specified torque (See page 15).

REASSEMBLY OF DIFFERENTIAL AND CARRIER

NOTE: See page 58 for ring and pinion gear timing.

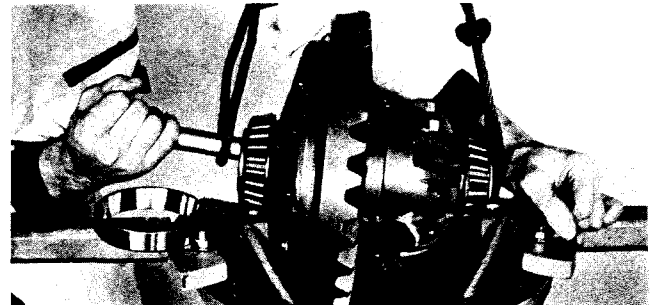


Figure 57

Insert bar through differential to facilitate hoisting. Position differential into carrier, tilting it so that ring gear will clear inner bearing boss in carrier. See Note Above.



Figure 58

Position differential bearing cup and adjusting nut on lifting bar on one side of differential and lift bar slightly with hoist. Position bearing cup and adjusting nut on carrier. Repeat procedure and install opposite bearing cup and adjusting nut. Turn adjusting nuts by hand to be sure of proper thread alignment.

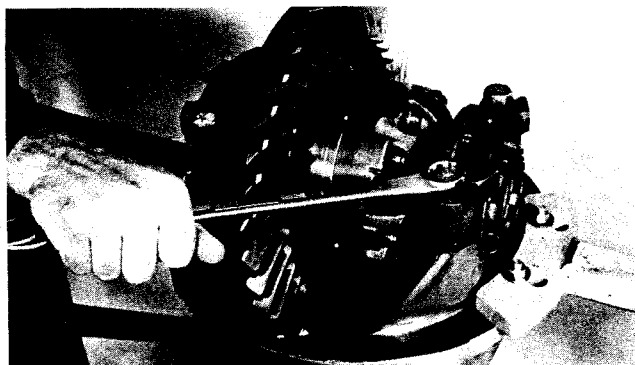


Figure 59

Position bearing caps on bearings and adjusting nuts, making sure matchmarks made during disassembly are properly aligned. Install cap bolts, and tighten lightly. Do not torque at this time.

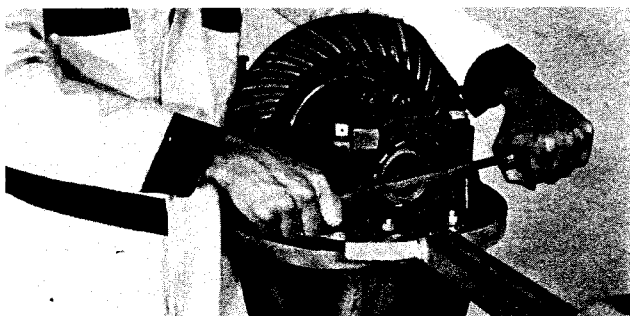


Figure 60

Tighten bearing adjusting nuts to adjust bearings to zero end play.

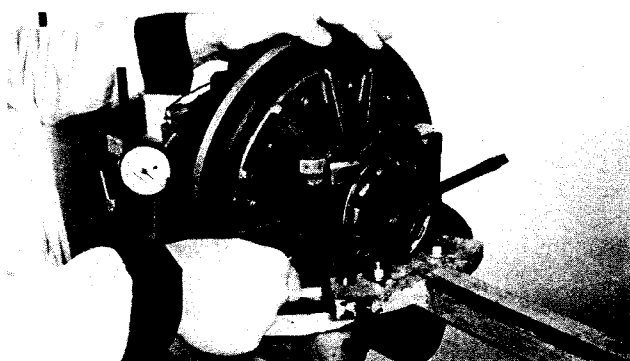


Figure 61

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 (See page 15 for new gear set), or adjust to backlash noted at disassembly for used gears. When proper backlash is achieved, tighten opposite adjusting nut to set pre-load on taper bearings. Using only thumb and forefinger move ring gear. When ring gear becomes difficult to move, pre-load on bearing is set.



Figure 62

Check ring and pinion gear for proper tooth contact. Paint ring gear with a mixture of red lead and linseed oil. When ring and pinion gears are rotated, the red lead 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 chart. 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. Split shims are provided to permit removal or insertion between bearing cage and differential housing. Remove retainer bolts. Using pry slots provided, pry bearing cage outward sufficiently to permit insertions or removal of split shims as required. Reinstall oil seal retainer bolts and tighten to specified torque (See page 15).

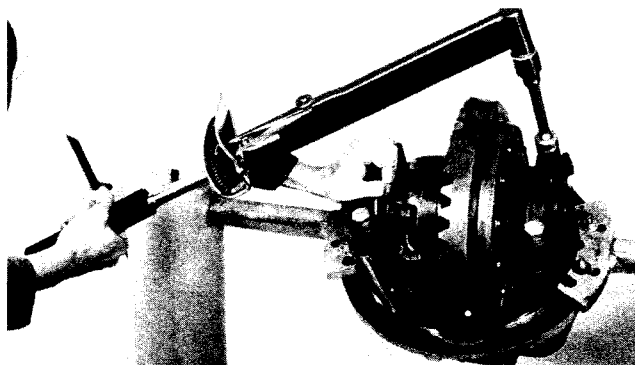


Figure 63

Tighten differential cap bolts to specified torque (See page 15). With dial indicator, recheck ring gear and pinion backlash. Recheck differential bearings for pre-load as described in Figure 61.

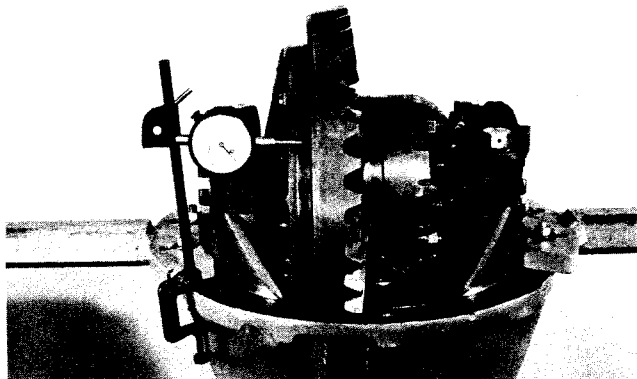


Figure 64

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

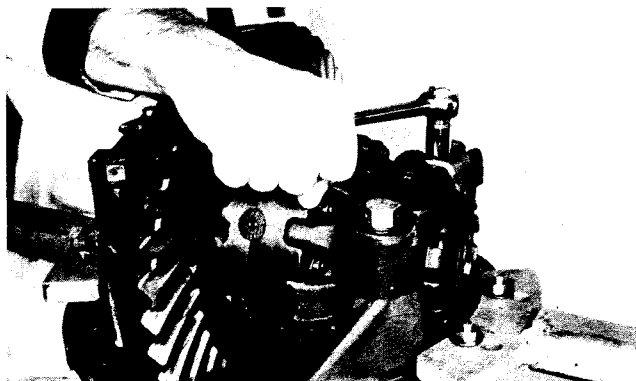


Figure 65

Apply a coat of Loctite #262 to internal threads and install adjusting nut lock with bolt and lockwasher. Tighten to specified torque (See page 15).

DISASSEMBLY OF PLANET CARRIER ASSEMBLY

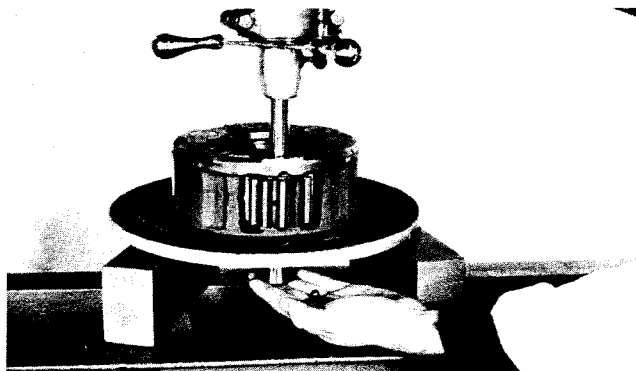


Figure 66

Press pinion shaft from planet carrier assembly as shown. Use caution as not to lose pinion shaft lock ball.

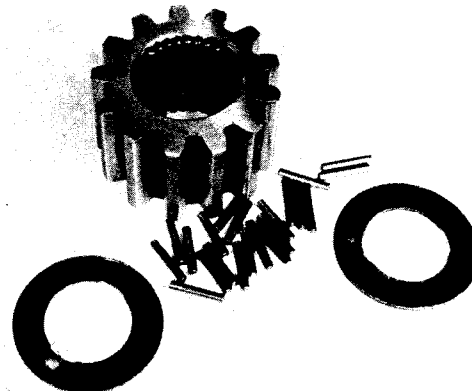


Figure 67

Remove pinion gear, pinion rollers, roller spacer and thrust washers from carrier housing.

REASSEMBLY OF PLANET CARRIER ASSEMBLY

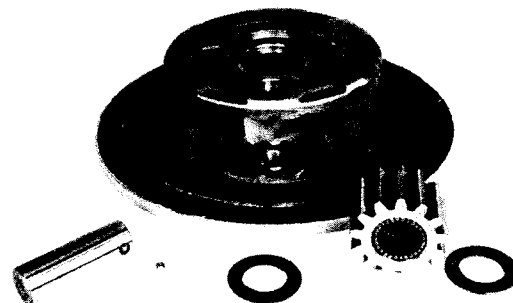


Figure 68

Coat inside of planet pinion with chassis grease to retain pinion needle rollers. Each pinion gear contains a double row of needle rollers with spacer between rows.



Figure 69

Position assembled pinion and two pinion thrust washers in planet spider assembly, making sure tangs on thrust washers engage the grooves in the spider.

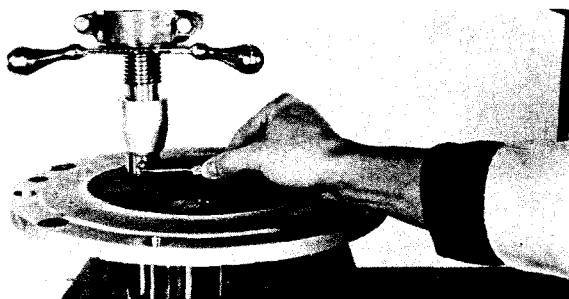


Figure 70

Align pinion shaft lock ball with notch in planet carrier. Press shaft into position using caution as not to disturb rollers in pinion gear. Press end of shaft flush or slightly below face of carrier.

REASSEMBLY OF AXLE

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

IMPORTANT: Both Grade 5 and Grade 8 fastening hardware have been used in the production of the axle assemblies covered by this manual. A table of proper torque values for both Grade 5 and Grade 8 hardware is provided at the rear of this manual. Grade of hardware may be determined by the "hash" marks contained on the head of each bolt; Grade 5 having three hash marks and Grade 8 having six hash marks as indicated on page 57.

Torque values specified in text of this manual are for Grade 8 hardware where presently used in production. Grade 5 torque values are also specified when that grade hardware is presently used. On all axles being overhauled, bolts should be identified as described above and torque value chart consulted for correct torque.

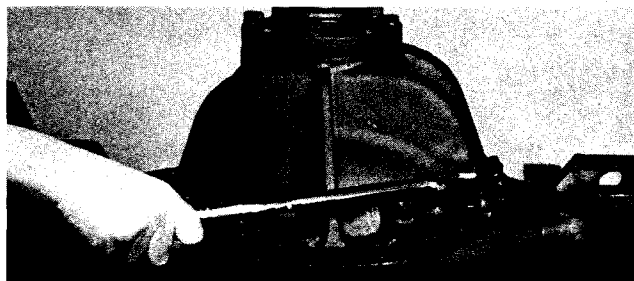


Figure 71

Check differential mounting flange of axle housing to be sure it is free of dirt and burrs. Coat differential to axle housing surface with Dow Corning RTV-Q3-7069. Align differential assembly with axle housing studs. Lower into position. Use caution as not to damage studs. Apply Loctite #262 to threads of studs.

Install taper dowels on studs. Install lockwashers and stud nuts. Tighten taper dowel stud nuts first. Tighten to specified torque—See torque chart page 57.

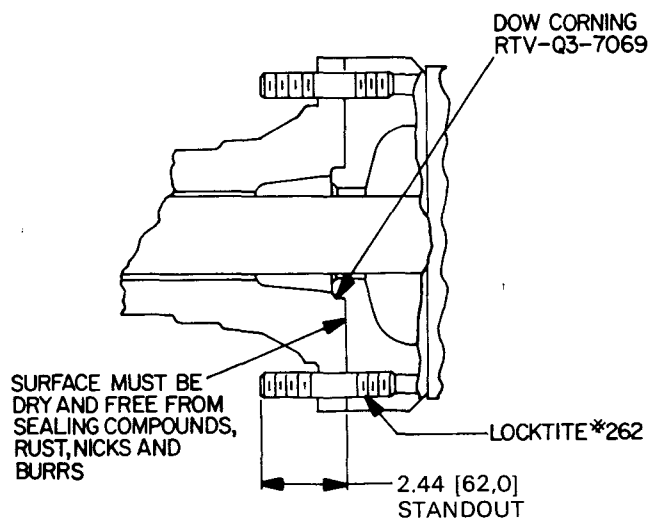


Figure 72

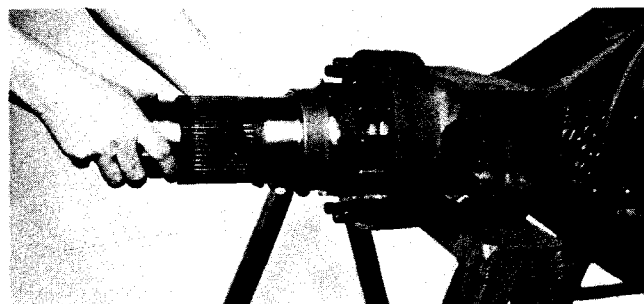


Figure 73

See Figure 72. Install spindle on housing studs.

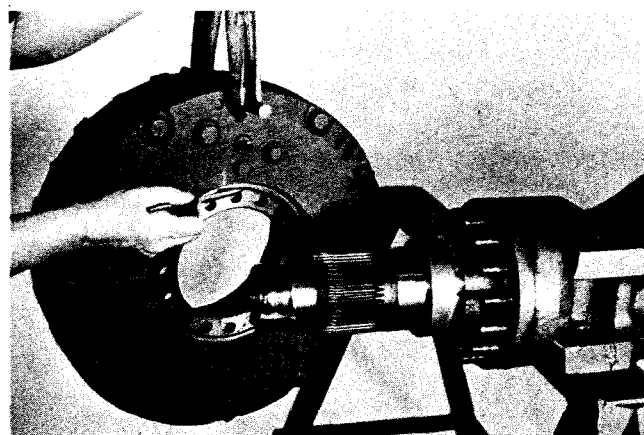


Figure 74

Position new "O" ring on brake spider.

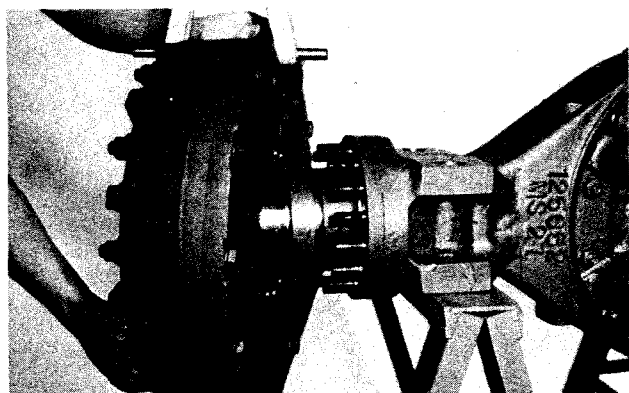


Figure 75

Align brake spider holes with housing and spindle studs. Use caution as not to damage threads on studs. Install brake assembly.

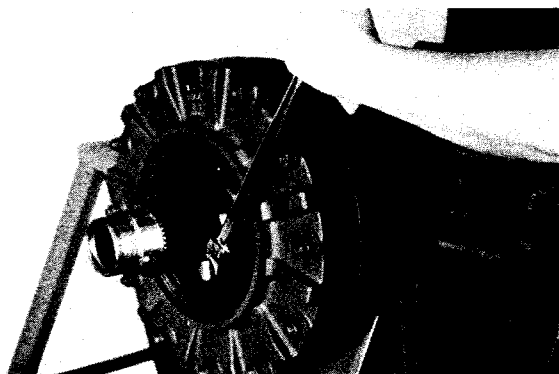


Figure 76

Install brake and spindle attaching washers and nuts. Tighten 175 to 190 ft. lbs. torque [240 - 260 N.m].

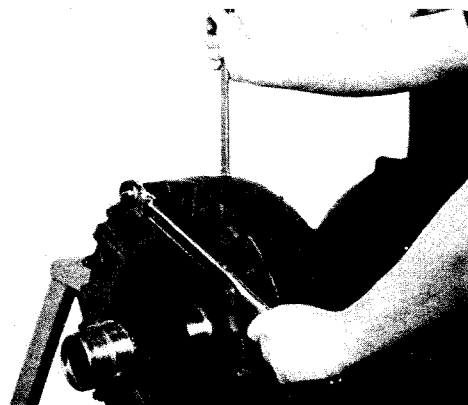


Figure 77

Install brake clamping bolt in top hole of brake assembly. Torque all brake clamping bolts in a criss-cross sequence 175 to 190 ft. lbs. torque [240-260 N.m]. Original design brakes have clamping bolts, nuts and washers. Redesign brakes have just bolts and washers for clamping.

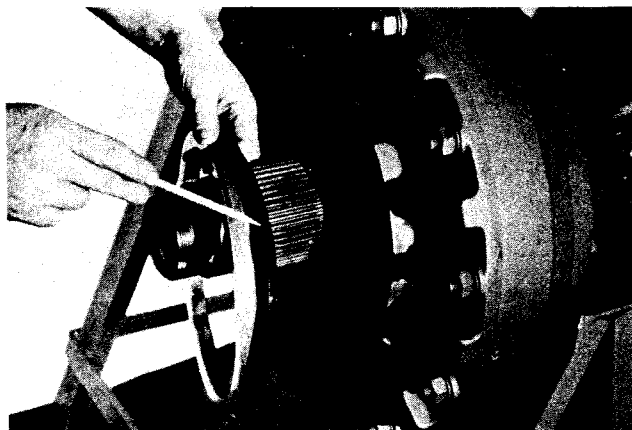


Figure 78

See page 53 and 54 for new face seal installation or rebuilding used seal. Position one wheel hub face seal in brake end as explained on page 54. **For external cooling brake see page 41 for hub seal installation.**

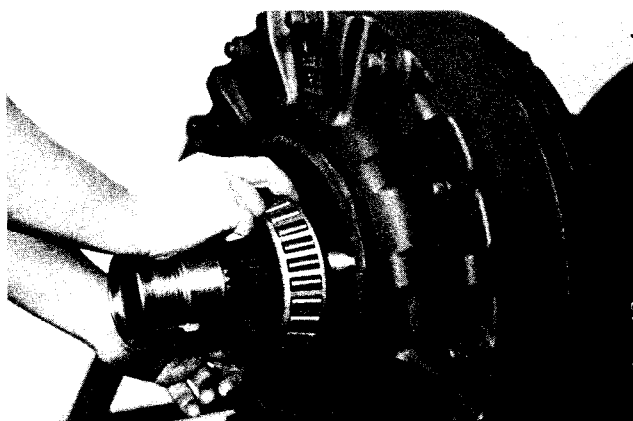


Figure 79

Position inner wheel hub bearing on spindle with large diameter of taper inward.

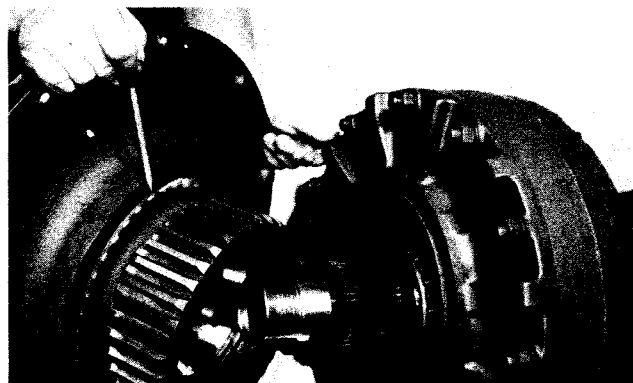
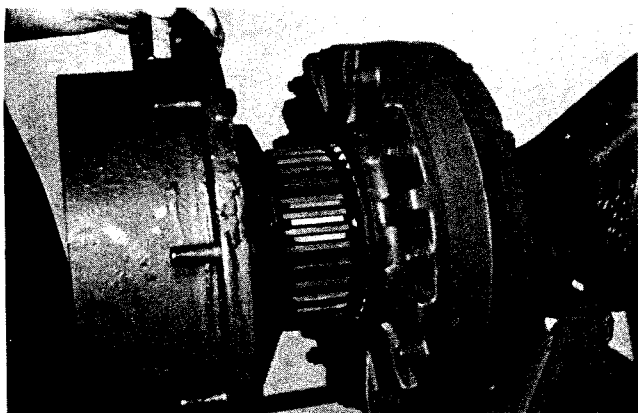
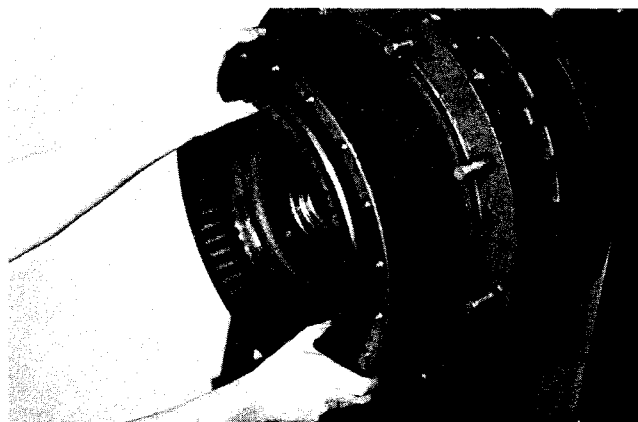


Figure 80

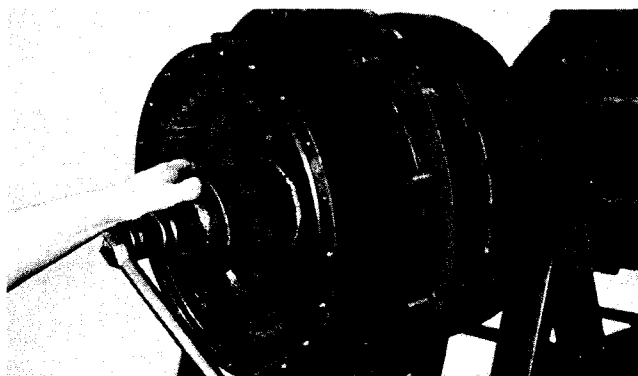
Position wheel hub face seal in hub as explained on page 54.


Figure 81

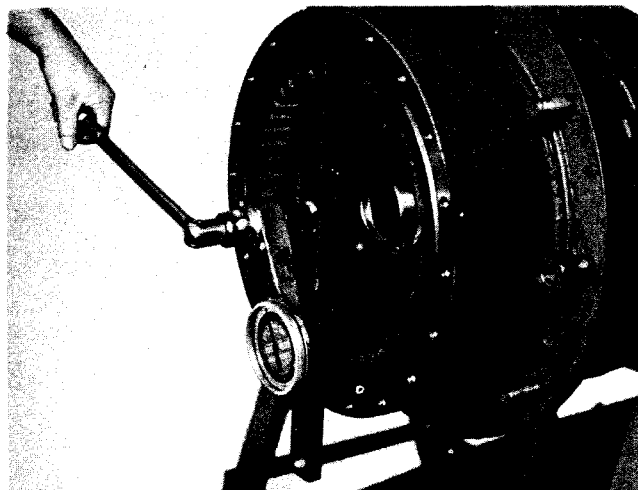
Align wheel hub splines with brake discs. Insert hub splines into brake assembly. Use caution as not to damage hub seal. (Use with external cooling only) Align hub splines with friction plates in brake assembly—do not force this operation. When fully into position face seals in hub and brake will be together.


Figure 82

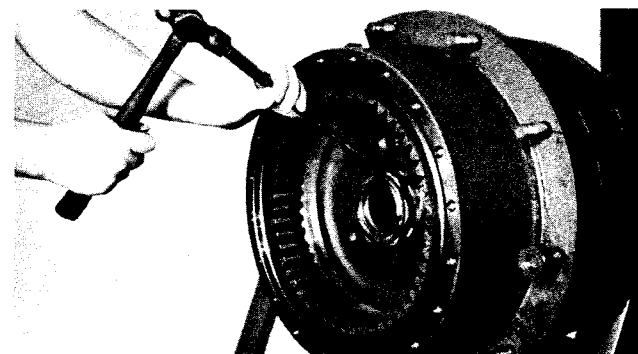
Install internal gear and hub assembly into wheel hub and on spindle splines.


Figure 83

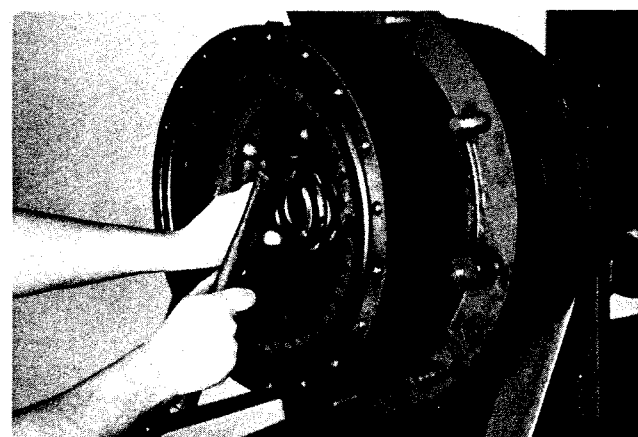
Install wheel bearing adjusting nut. See drive axle wheel bearing adjusting procedure page 55.


Figure 84

Tighten the wheel bearing adjusting nut to achieve a proper rolling torque (See page 55).


Figure 85

When proper wheel bearing preload is achieved, install adjusting nut lock and outer jam nut. See page 55 and 56 for proper jam nut torque and procedure. Recheck rolling torque, torque must be in proper torque range before bending tangs of nut lock.


Figure 86

Tap sun gear thrust ring into end of spindle.

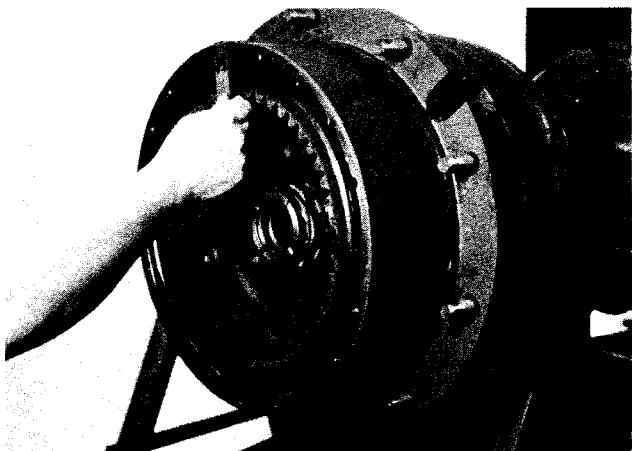


Figure 87

Coat wheel hub to planet carrier surface with Dow Corning RTV-Q3-7069.

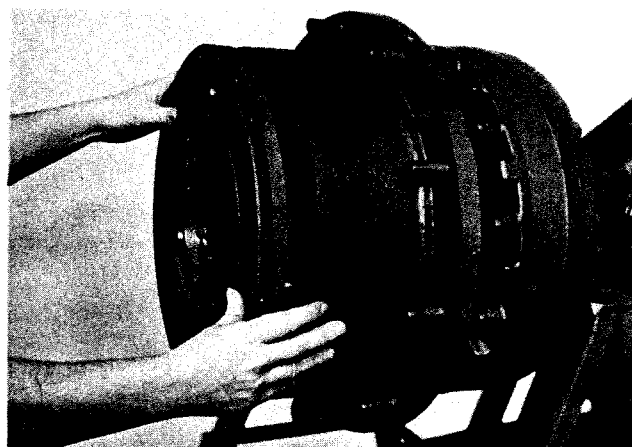


Figure 88

Install planet carrier assembly into wheel hub.



Figure 89

Apply Loctite #262 to planet carrier bolts, install planet carrier to wheel hub washers and bolts. Tighten bolts 125 to 140 ft. lbs. torque [170-190 N.m]

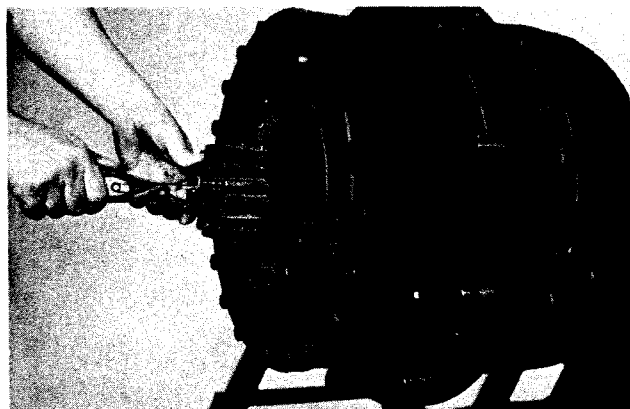


Figure 90

Install axle shaft in housing. Position sun gear on shaft and secure with retainer ring. Align axle shaft splines with splines in differential side gear and position sun gear with planet gears.

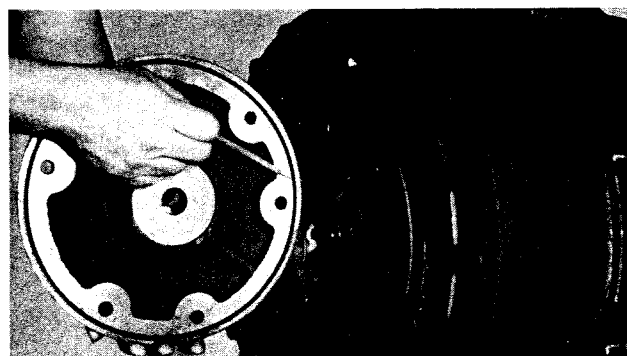


Figure 91

Position new planet cover seal ring on planet cover. With wheel hub filler plug in a horizontal position, install planet cover (with arrow on cover pointing down) on planet carrier.



Figure 92

Install planet cover cap screws and tighten 40 to 45 ft. lbs. torque [54 - 61 N.m].

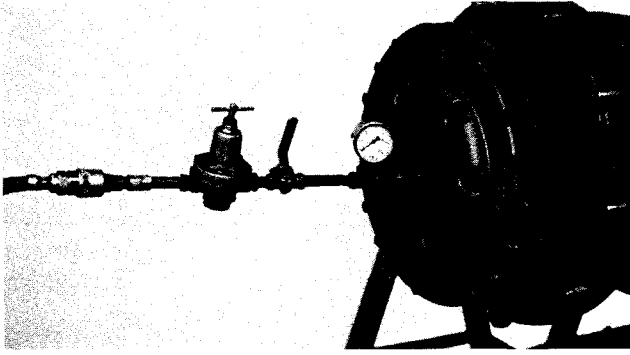


Figure 93

It is recommended an air check be made on each wheel end after assembly. This checking device is comprised of a minimum 30 P.S.I. [206 Kpa] air guage, an air shut-off valve, an air regulator valve, pipe tee, pipe nipple, reducing bushing and air line connector. The oil level plug is removed from the planet cover and the ckecking device is installed in its place. Remove the breather in the axle center and install a pipe plug in the breather hole. The regulator is opened to 12 P.S.I. [82 Kpa] on the gauge. The air shut-off (installed between the regulator and gauge) is then closed. A 12 P.S.I. [82 Kpa] pressure must be retained for 15 seconds. If there is a pressure drop in less than 15 seconds there is an air leak at the wheel hub oil seal. If an air leak is detected it will require a wheel end disassembly to correct the leak. Make both wheel end air checks and the following center section air checks before disassembling any of the axle to correct an airleak.

Air check the axle center section the same way as the wheel ends except the checking device is installed in the air breather hole in the axle center. If an air leak is detected, locate leak and correct. After air check is made, reinstall air breather in axle center.

See page 41 for liquid cooled brake testing procedure.

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There is no text or other markings on the paper.

SERVICE INSTRUCTIONS

The following instructions will cover the disassembly and reassembly of the liquid cooled brake in a sequence that would normally be followed after the unit is removed from the axle assembly and is to be completely overhauled.

CAUTION: Cleanliness is of extreme importance and an absolute must in the repair and overhaul of this unit. Before attempting any repairs, the exterior of the unit must be thoroughly cleaned to prevent the possibility of dirt and foreign matter entering the mechanism.

LIQUID COOLED MULTI-DISC BRAKE (3 PLATE)

DISASSEMBLY

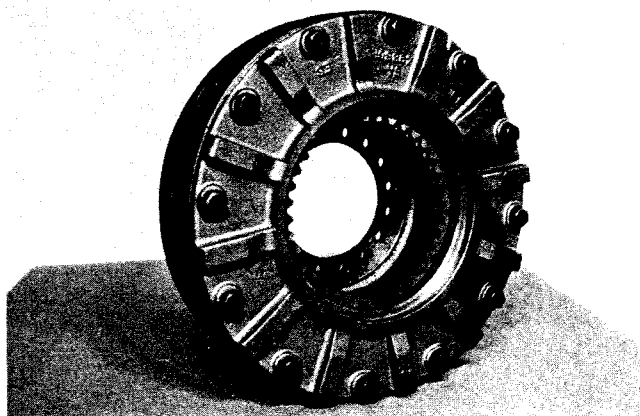


Figure 1

Multi disc brake removed from axle as an assembly. Wheel hub seal removed.

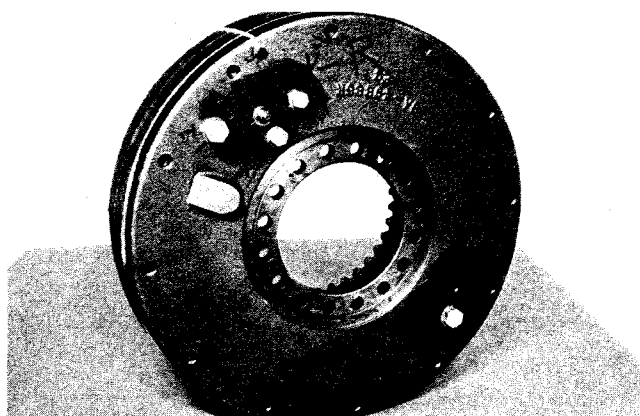


Figure 2

Inner side of brake and brake assembly. **NOTE:** Fluid ports were plugged before exterior cleaning to prevent contamination of piston and pressure plate area.

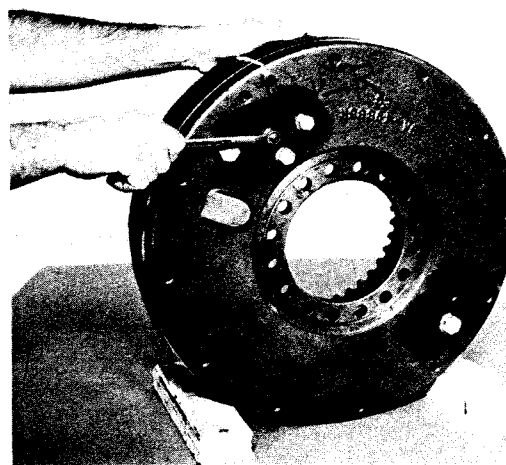


Figure 3

Remove bleeder screw. Mark end cap, housing and brake spider to facilitate reassembly.

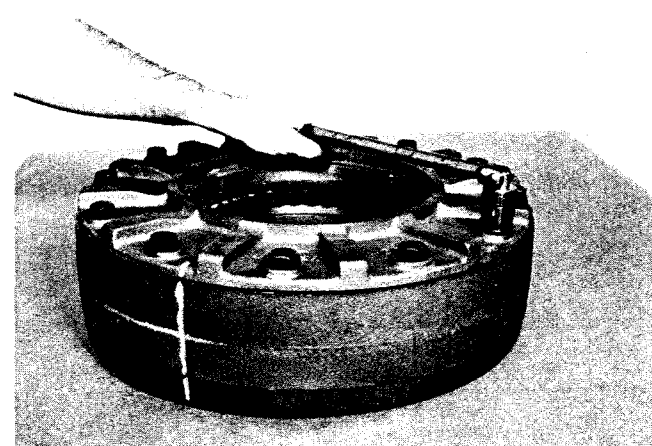


Figure 4

Lay assembly over on bench and remove bolts and washers.

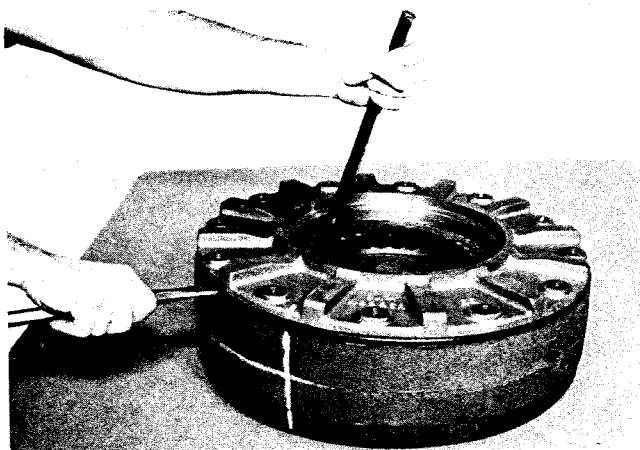


Figure 5
Pry carefully to separate brake housing.

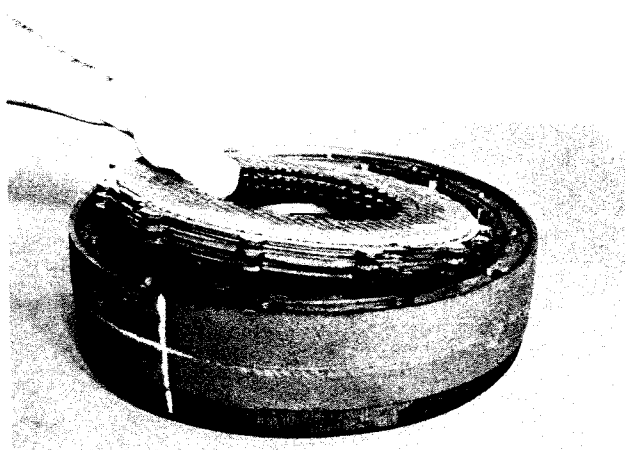


Figure 8
Remove friction and reaction plates.

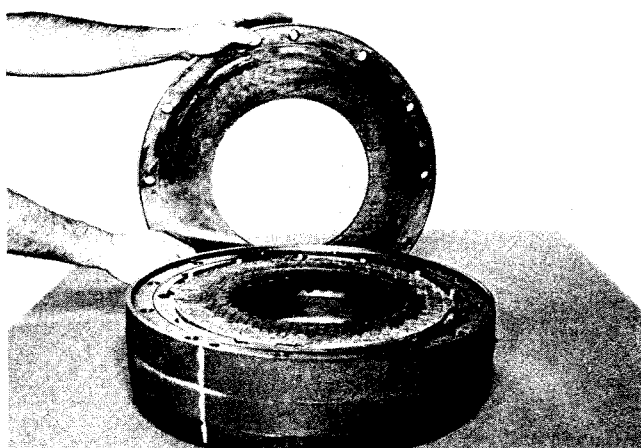


Figure 6
Remove brake end cap.

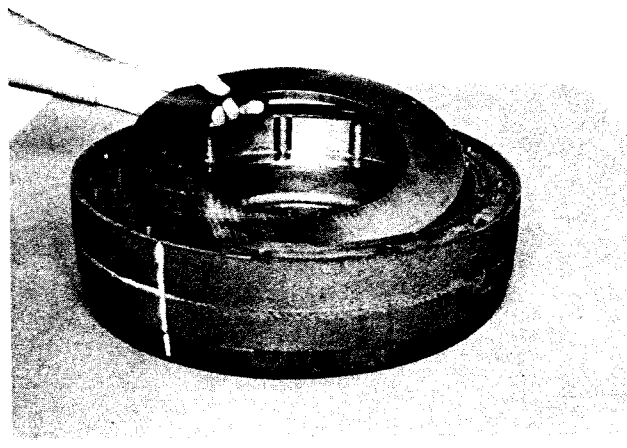


Figure 9
Remove pressure plate.

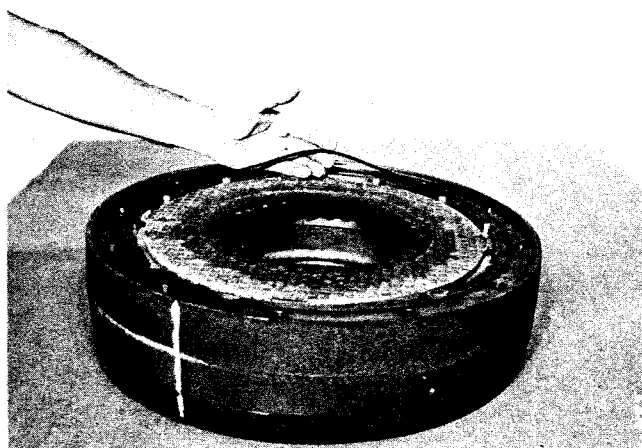


Figure 7
Remove housing seal ring.

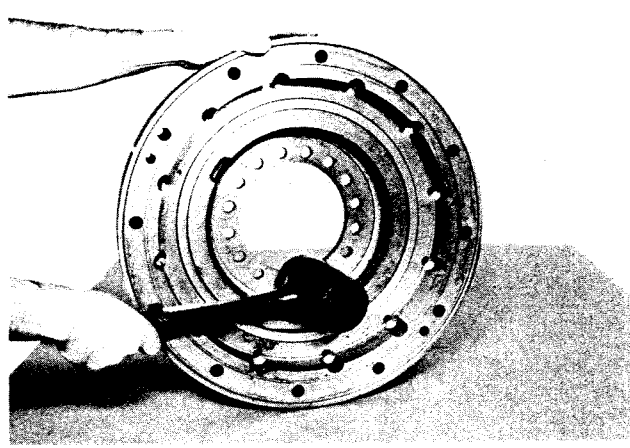


Figure 10
Tap brake spider from housing.

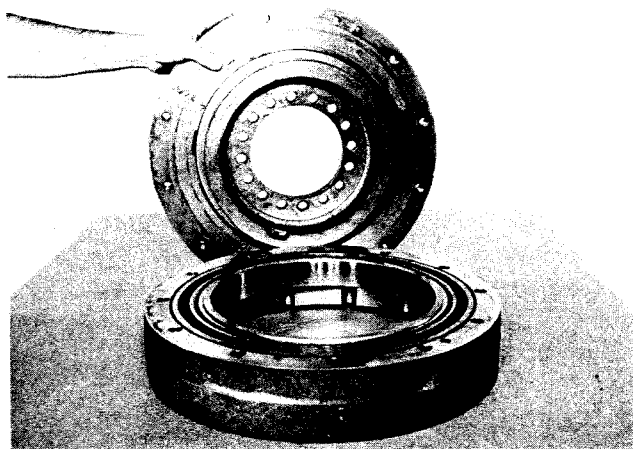


Figure 11
Remove brake spider.

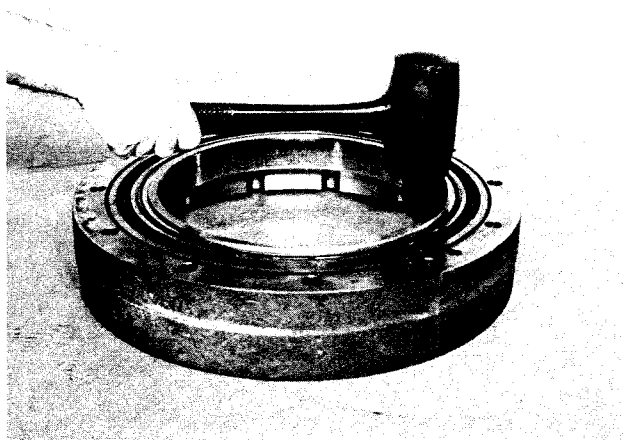


Figure 12
Tap piston from housing.

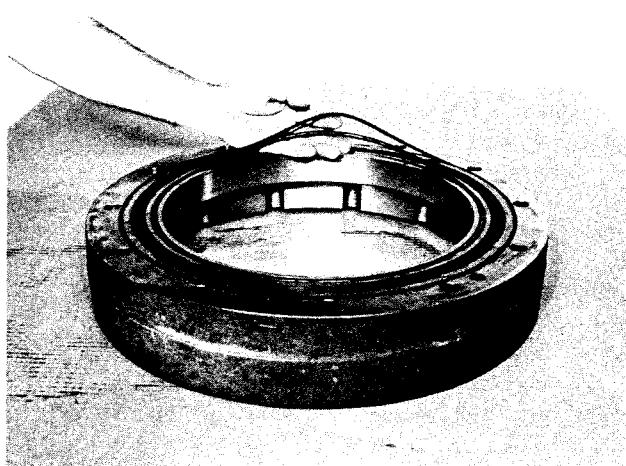


Figure 13
Remove "O" ring and seal ring from housing.

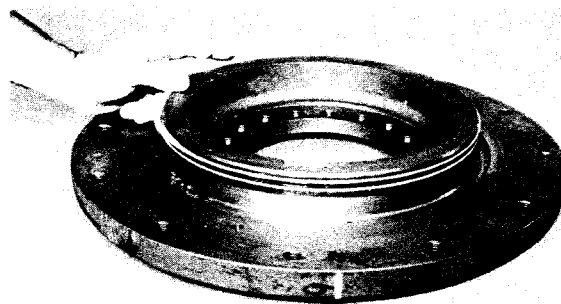


Figure 14
Remove inner and outer back-up rings and sealing ring from brake spider.

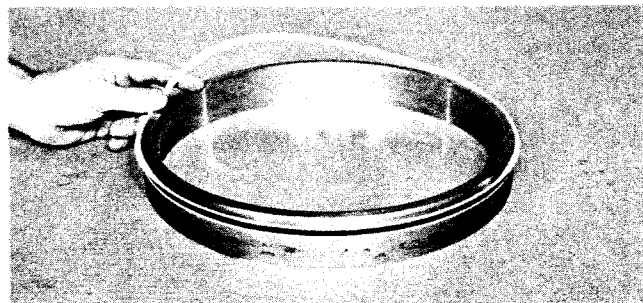


Figure 15
Remove inner and outer back-up rings and sealing ring from brake piston.

CLEANING AND INSPECTION

CLEANING

Clean all parts thoroughly using solvent type cleaning fluid. It is recommended that parts be immersed in cleaning fluid and moved up and down slowly until all old lubricant and foreign material is dissolved and parts are thoroughly cleaned.

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.

Housing, Covers, etc.

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

Piston and Housing Seals

Replacement of seals is more economical when unit is disassembled than premature overhaul to replace these parts at a future time. Further loss of lubricant through a worn seal may result in failure of other more expensive parts of the assembly. Sealing members should be handled carefully, particularly when being installed. Cutting or scratching, seriously impairs its efficiency.

REASSEMBLY

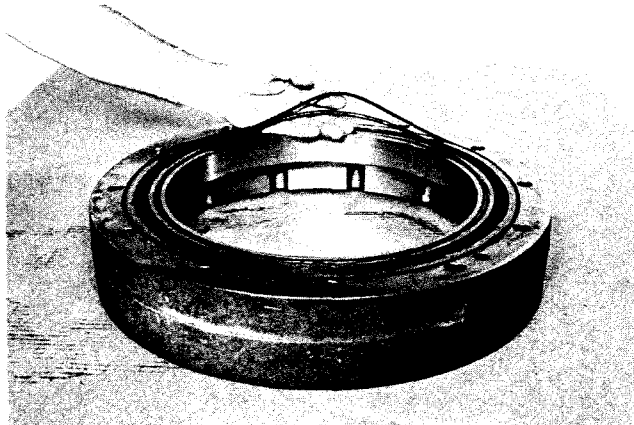


Figure 16
Position new "O" ring and seal ring on housing.

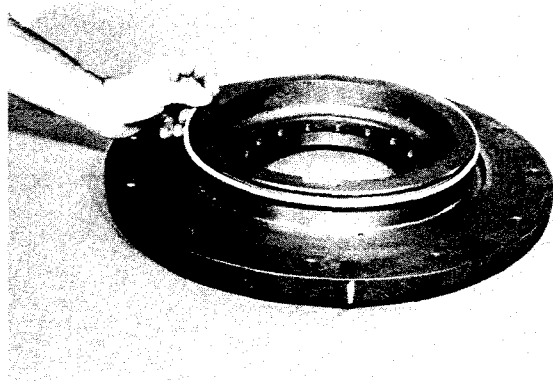


Figure 17
Install brake spider inner back-up ring.

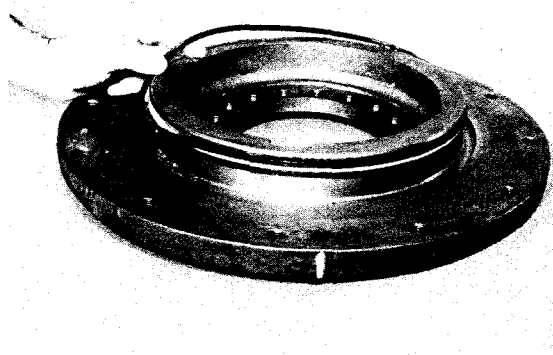


Figure 18
Install brake spider sealing ring.

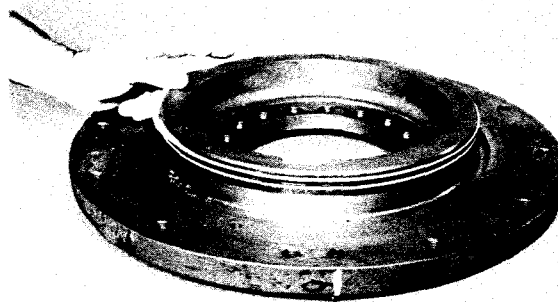


Figure 19
Install brake spider outer back-up ring.

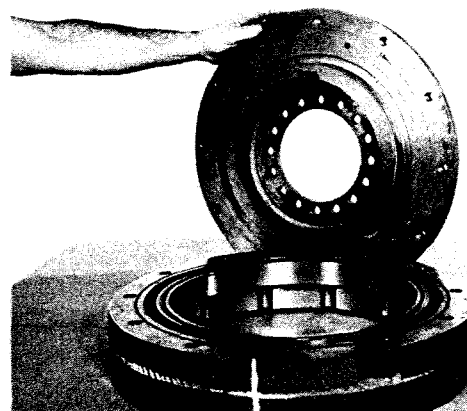


Figure 20
Align dowel holes in brake spider with dowel holes in brake housing. Position spider on housing. Use caution as not to damage seal rings.

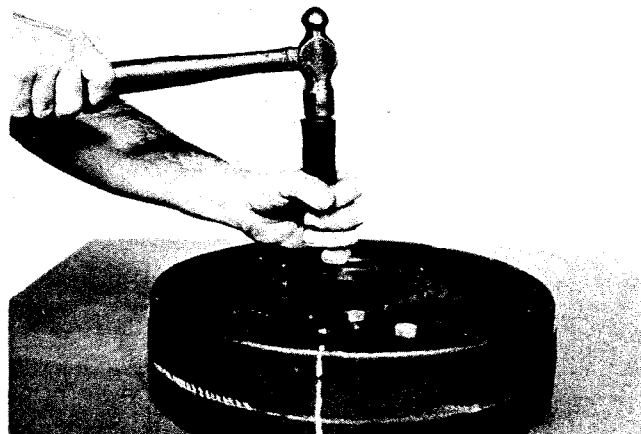


Figure 21
Tap dowel pins into brake housing.



Figure 22
Install piston inner back-up ring.

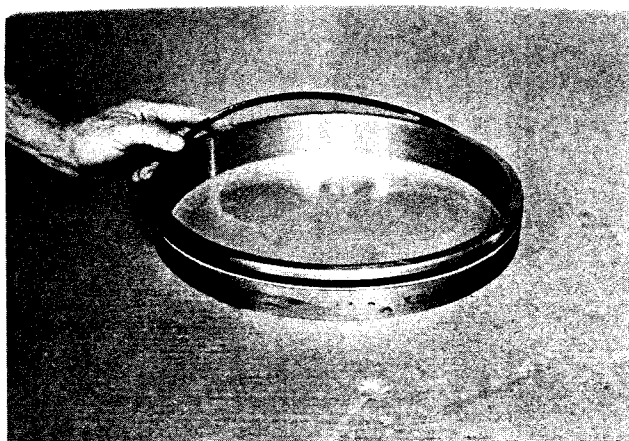


Figure 23
Install piston sealing ring.

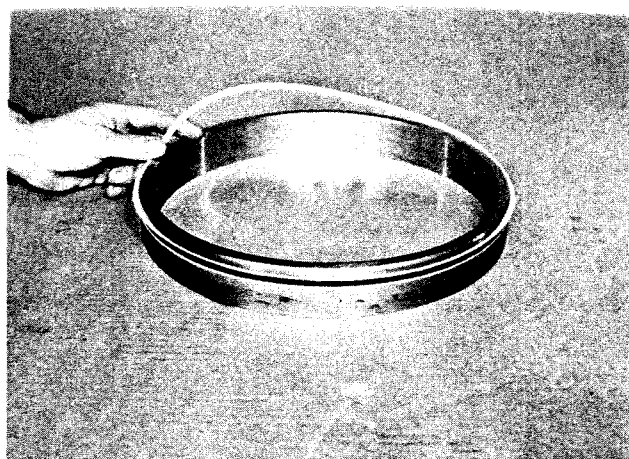


Figure 24
Install piston outer back-up ring.

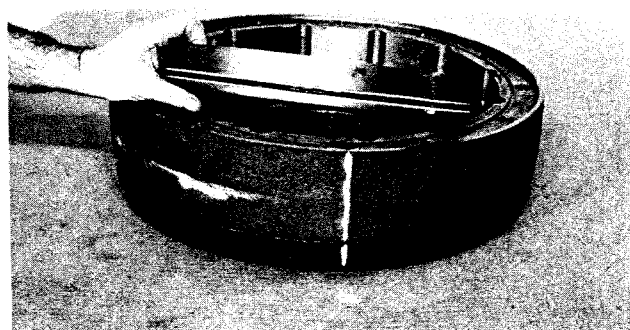


Figure 25
With sealing ring and back-up rings down, carefully position piston into housing.

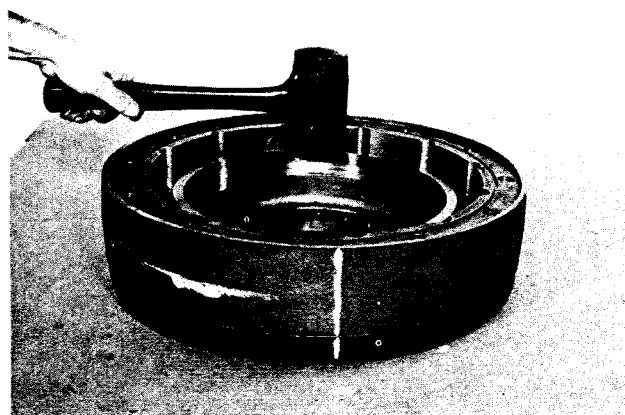


Figure 26
Tap piston into brake housing. Use caution as not to damage sealing and back-up rings on brake spider and piston.

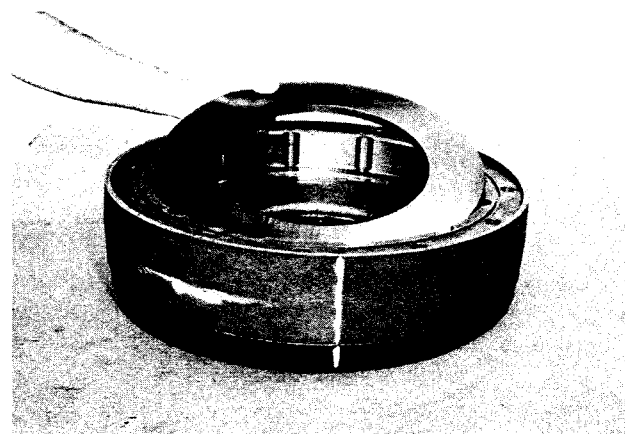


Figure 27
Install piston pressure plate in housing.

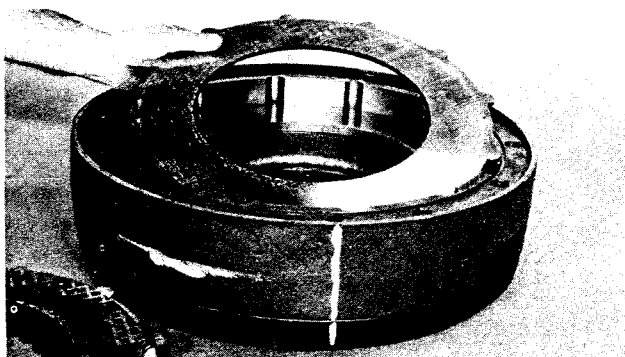


Figure 28
Install 1st steel reaction plate.

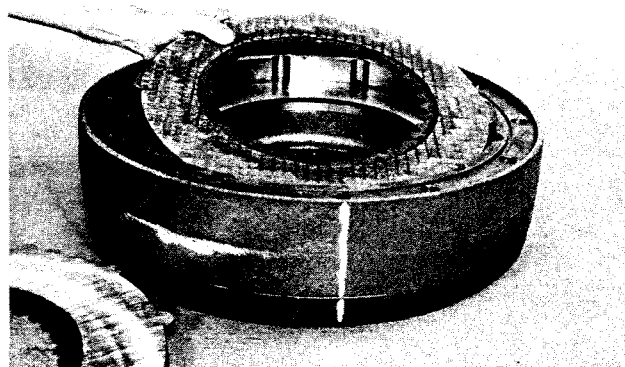


Figure 29
Install 1st friction plate. Alternate steel and friction plates until 3 steel and 3 friction plates have been installed. Start with a steel and end with a friction plate.

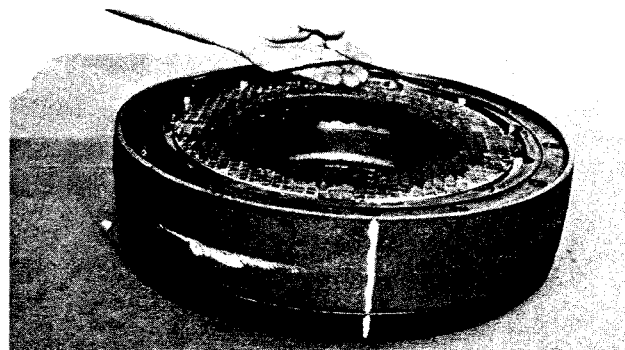


Figure 30
Install new seal ring on housing.

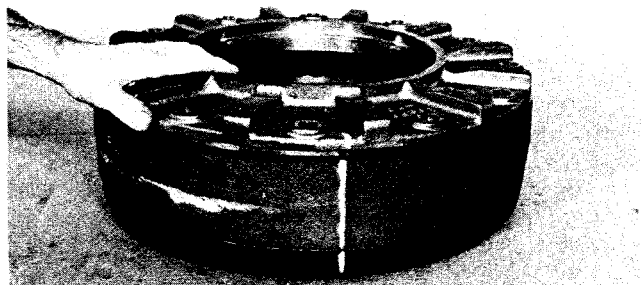


Figure 31
Align match mark on end cap with mark on housing and install end cap.

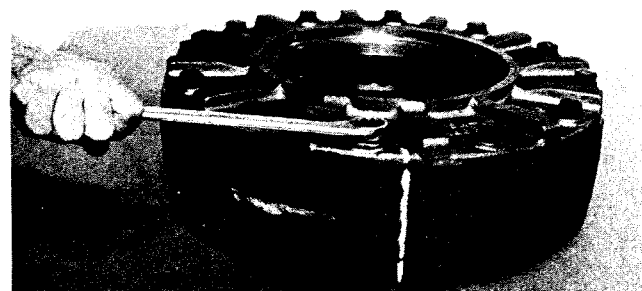


Figure 32
Install bolts and washers. Tighten securely. (Bolts will be torqued after brake assembly is installed on axle).

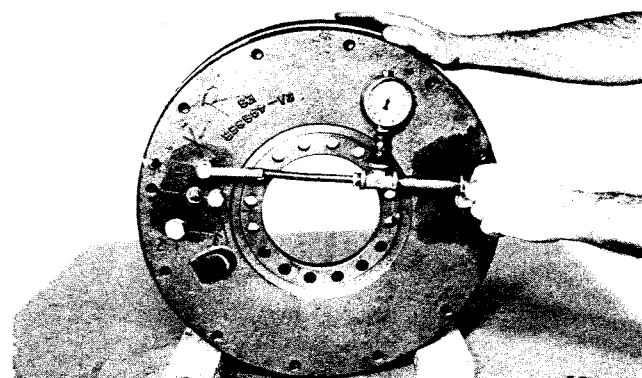


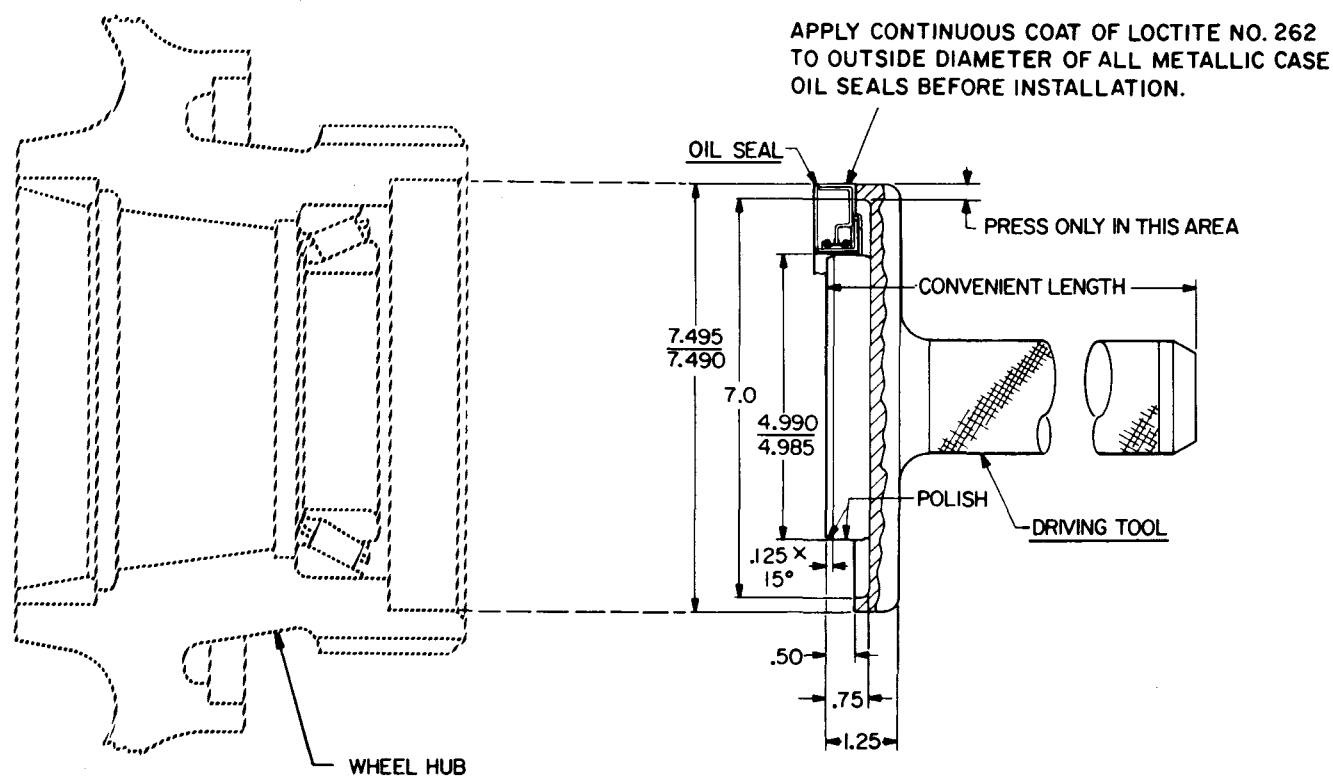
Figure 33
See page 41 for brake testing procedure.

LIQUID COOLED BRAKE TESTING PROCEDURE

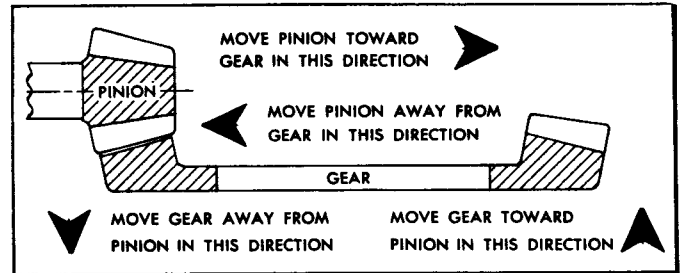
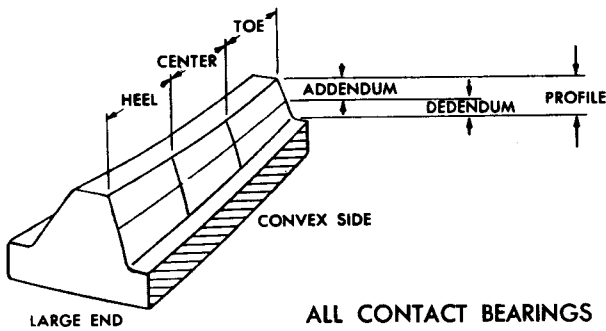
1. Connect a porto-power unit to brake line inlet.
2. Pump porto-power up to about 1000 psi and bleed brake. After all air is out of brake, pump porto-power up to 1800 psi and lock off. The gage will show about 100 psi drop. At this point the gage should hold. After 3 to 5 minutes unlock gage, let pressure bleed off so the gage shows zero, then pump porto-power up to about 300 psi. Lock off porto-power. Gage should hold at 300 psi. Let stand for about five minutes. If the pressure holds, the brake does not leak. If there is a drop in pressure on the gage the brake is leaking and will require a complete disassembly to replace the piston inner and/or outer sealing ring.
3. After making a satisfactory test, relieve pressure on the porto-power and remove. Reinstall brake line and bleed brakes in a normal manner.

WHEEL HUB OIL SEAL INSTALLATION

(Used only when liquid cooled brake is externally cooled).



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.

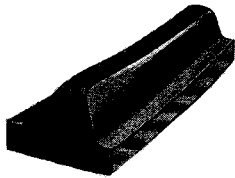


FIG. 1

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

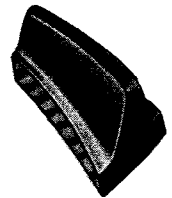


FIG. 2

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.

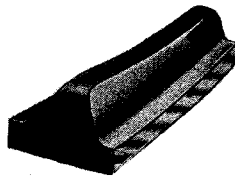


FIG. 3

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

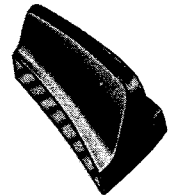


FIG. 4

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

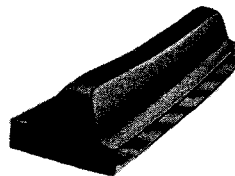
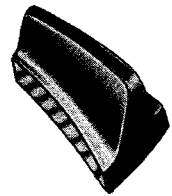


FIG. 5

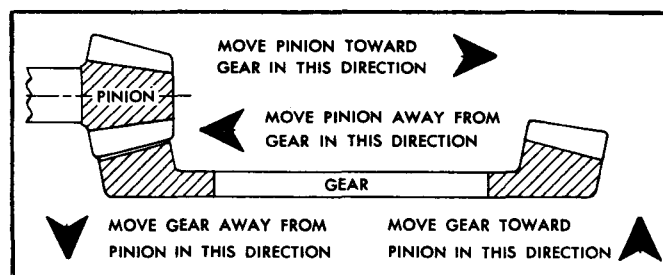
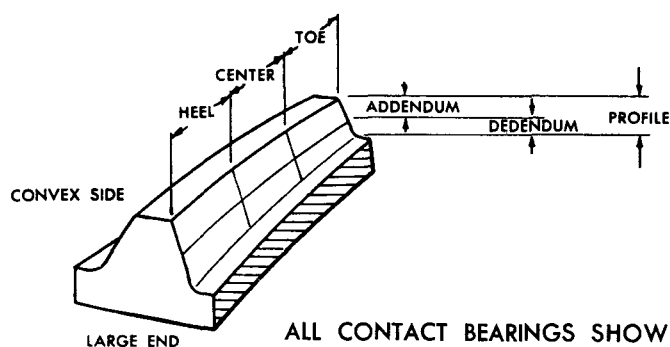
HIGH BEARING ON GEAR AND LOW BEARING ON PINION. CORRECT BY MOVING PINION IN TOWARD GEAR (DECREASE MOUNTING DISTANCE).



BACKLASH

BACKLASH SHOULD BE MEASURED WITH A DIAL INDICATOR RIGIDLY MOUNTED WITH THE STEM PERPENDICULAR TO THE TOOTH SURFACE AT THE EXTREME HEEL.

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.

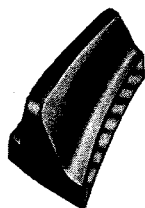


FIG. 1

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

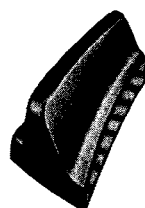
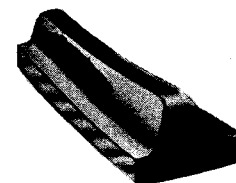


FIG. 2

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.

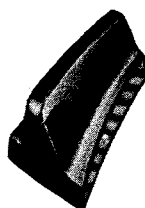
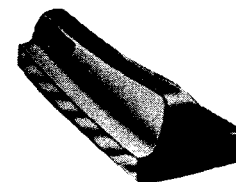


FIG. 3

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

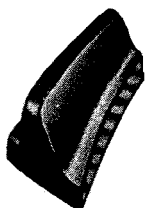
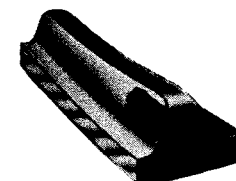


FIG. 4

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

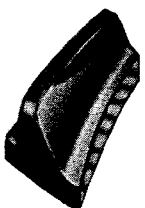
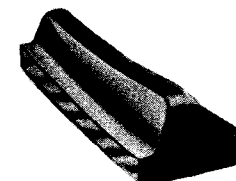
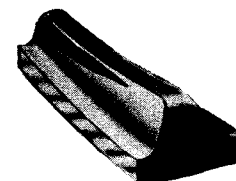


FIG. 5

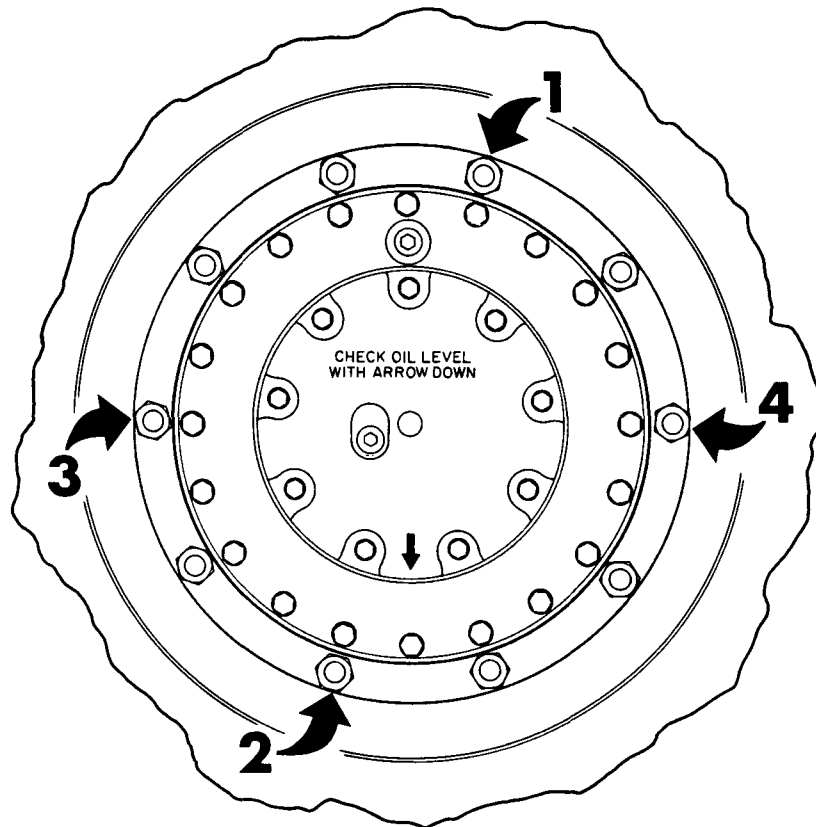
HIGH BEARING ON GEAR AND LOW BEARING ON PINION. CORRECT BY MOVING PINION IN TOWARD GEAR (DECREASE MOUNTING DISTANCE).



BACKLASH

BACKLASH SHOULD BE MEASURED WITH A DIAL INDICATOR RIGIDLY MOUNTED WITH THE STEM PERPENDICULAR TO THE TOOTH SURFACE AT THE EXTREME HEEL.

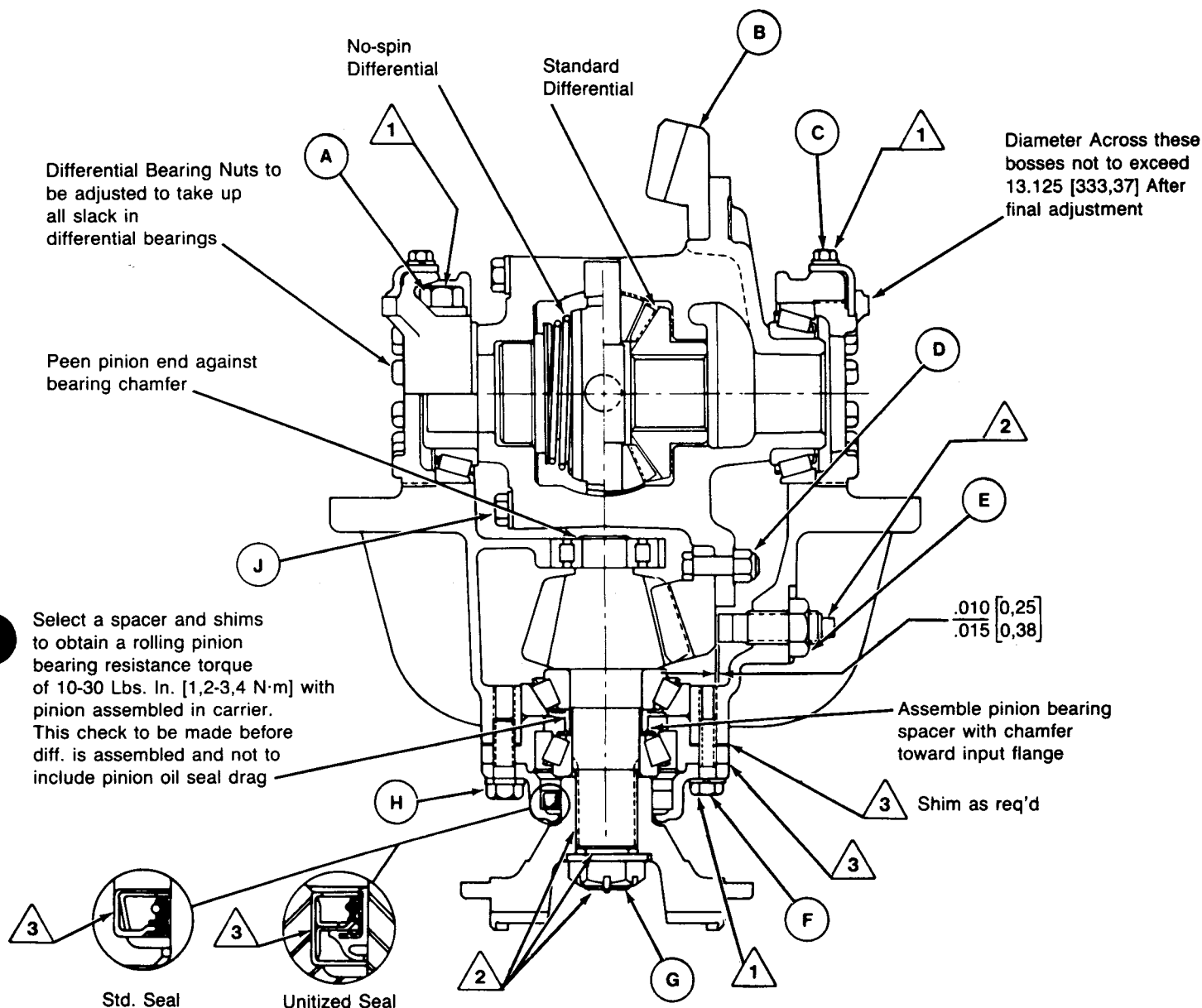
CLARK RECOMMENDED WHEEL MOUNTING TORQUE



PROPER TIGHTENING PROCEDURE

(Use Tightening Sequence Shown)

Thread Size	Flat Nuts and Hardened Washer	Flat Nuts with Rim Clamps	Spherical Nuts
5/8 (.625)	175 - 190 Lbs. Ft. [240 - 260 N.m]	---	240 - 275 Lbs. Ft. [325 - 375 N.m]
3/4 (.750)	300 - 330 Lbs. Ft. [410 - 450 N.m]	250 Max. Lbs. Ft. [340 N.m]	450 - 500 Lbs. Ft. [610 - 680 N.m]
7/8 (.875)	475 - 525 Lbs. Ft. [645 - 710 N.m]	350 Max. Lbs. Ft. [475 N.m]	600 - 700 Lbs. Ft. [815 - 950 N.m]
1 (1.000)	725 - 800 Lbs. Ft. [985 - 1085 N.m]	---	750 - 900 Lbs. Ft. [1015 - 1220 N.m]



1390 Series Differential (Ring Gear Diameter) Assembly Instructions & Bolt Tightening Chart — Lbs. Ft. Torque [N·m]

- A — 220 to 245 Lbs. Ft. [300 - 330 N·m]
- B — Ring Gear Backlash Adjustment .009 - .013 [0,22 - 0,33 N·m]
- C — 25 to 28 Lbs. Ft. [34 - 38 N·m]
- D — 90 to 100 Lbs. Ft. [125 - 135 N·m]
- E — 275 Lbs. Ft. [373 N·m]
- F — 90 to 100 Lbs. Ft. [125 - 135 N·m]
- G — 480 to 520 Lbs. Ft. [651 - 705 N·m]
- H — 125 to 140 Lbs. Ft. [170 - 190 N·m]
- J — 80 to 88 Lbs. Ft. [108 - 119 N·m]

- 1 Apply Loctite #262 Thread Locking Compound
- 2 Apply Dow Corning RTV-Q3-7069 Sealant
- 3 Apply Loctite #515 Sealant

Apply coating of E.P. Multipurpose Grease Grade #2 between lips of oil seal

Grease seal seat journal of drive flange with E.P. Multipurpose Grease Grade #2 prior to assembly

Boss provided on carrier has serial No., carrier ratio, & N.S. when no-spin is used

CLARK

NoSPIN®

automatic positive locking
traction differential

NoSPIN differentials are ideal for vehicles that operate off-road, in bad weather, or under other adverse traction conditions.

PRIME FUNCTIONS

- Assures "maximum traction" at all times.
- Automatically permits wheel speed differentiation when vehicle turns or operates on uneven surfaces.

OPERATION

When a vehicle equipped with a NoSPIN differential is operated in forward or reverse over a smooth surface, the NoSPIN remains locked. Both wheels thus turn at the same speed. If one wheel loses traction or leaves the ground, the opposite wheel, which still has traction, continues to drive the vehicle until traction is regained by both wheels. There can be no one-wheel spinout when using NoSPIN differentials. (Fig. 1)

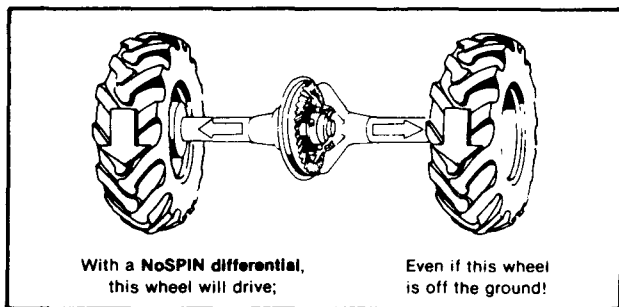


Fig. 1

When the vehicle turns a corner, or when one wheel passes over an obstruction, the outside wheel, or the wheel passing over the obstruction, must travel a greater distance and therefore faster than the other wheel. When this occurs, the NoSPIN differential automatically allows for the necessary difference in wheel speed. (Fig. 2)

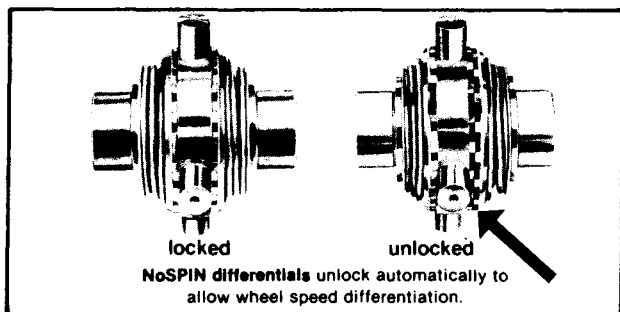


Fig. 2

A comprehensive NoSPIN differential operation and maintenance manual is available at a nominal charge. Contact service publications for information as to how to order.

MAINTENANCE

Lubrication

The NoSPIN differential is designed to operate in those lubricants recommended by the vehicle/axle manufacturer. No special lubricant is needed. For certain cold weather applications, use the lightest oil the axle manufacturer will allow.

Routine Inspection

Follow the recommended lubrication, preventative maintenance and inspection procedures of the vehicle/axle manufacturer as part of NoSPIN differential preventative maintenance. Maintenance, inspection and lubrication requirements of NoSPIN differential equipped vehicles are the same as for vehicles with conventional differentials.

Adjustments

No adjustments or alterations should be made to the NoSPIN differential.

VEHICLE PERFORMANCE

The performance of a vehicle equipped with a NoSPIN differential will differ from that of a vehicle equipped with a conventional differential. For example:

When turning a corner, the sound of gear disengagement and reengagement may be audible, and the transfer of driving torque from both wheels to one wheel may be noticeable.

When going from drive (acceleration) to coast (deceleration) in a turn, a "metallic" sound may be heard as torque flow is reversed (inside wheel engaged during acceleration; outside wheel engaged during deceleration).

These characteristics are normal because of backlash designed into the NoSPIN differential.

When negotiating a turn under conditions of poor traction, the inside wheel may receive excessive torque which will cause it to break traction. This will cause the inside wheel to slip until the turn is completed or until the inside wheel catches up with the outside wheel.



CAUTION

Operator

Turn the engine off and raise all driving wheels of a NoSPIN differential equipped axle when changing tires to prevent the vehicle from moving. Axles equipped with NoSPIN differentials deliver power to both wheels—even when only one wheel is on the ground.

Do not operate the vehicle if both wheels of a NoSPIN differential equipped axle are not driving. Power to only one wheel can cause serious steering problems.

Distribute the load evenly side-to-side; do not exceed the vehicle's rated payload capacity; keep the diameter of the tires equal. Failure to observe these measures can create a difference in individual wheel speeds which can cause the NoSPIN differential to deliver power to only one side of the vehicle and thus cause steering problems.

Operate in low gear when coasting downhill into a turn. Braking capacity is reduced when a NoSPIN differential equipped vehicle makes a turn while coasting downhill.

Mechanic

NoSPIN differentials have compressed springs. Use a retaining bolt or some other restraining means when separating the differential case halves.

* NoSPIN is a registered trademark of Tractech, Inc.

LIMITED SLIP DIFFERENTIAL

General Description

The limited slip differential is similar in construction to the torque proportioning or conventional differential. The difference is that the limited slip differential contains a set of discs, like those used in the Clark transmission, which are mounted between the differential side gears and differential case. These discs limit the amount of "differential" according to the amount of torque transmitted through the differential assembly.* The purpose of the limited slip differential is to give better traction characteristics than a torque proportioning or conventional differential and to give better "differential action" when turning than the "no-spin" differential. The result is a compromise which provides good traction and less tire wear.

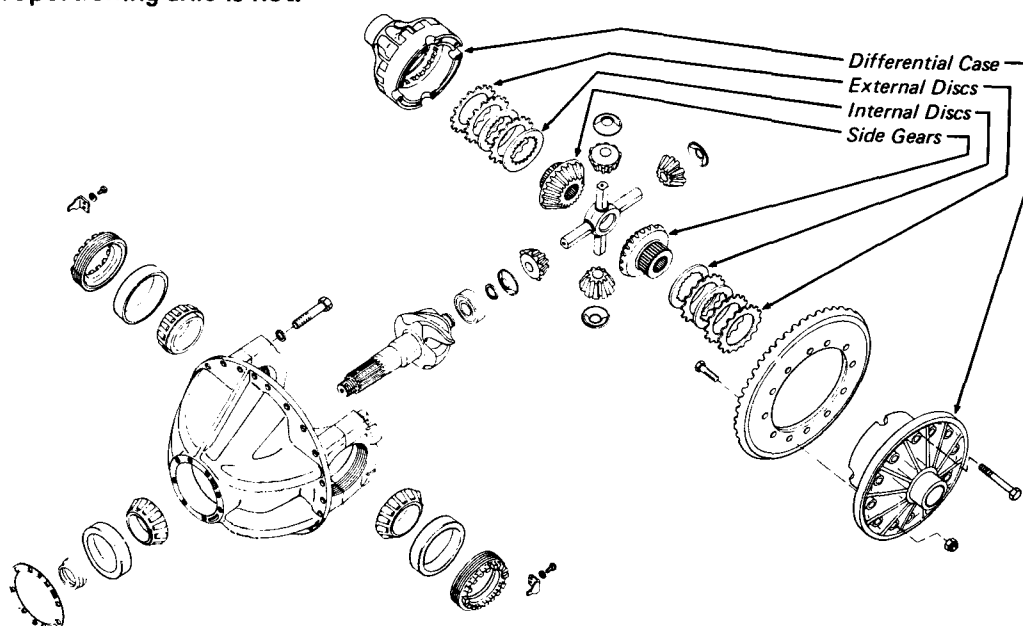
*Differential action is that function of a differential which allows the outside wheel to rotate faster than the inside wheel when turning a machine.

Operation

In the limited slip differential there is a set of internally splined discs and a set of externally splined discs behind each side gear. The internal discs are splined to the side gear and must rotate when the side gear rotates. The external discs are splined to the differential case and must rotate when the differential case rotates. The amount of torque transmitted through the differential assembly determines the force the side gears exert against the discs. When a small amount of torque is transmitted through the axle assembly, the side gears have little side thrust. When a high amount of torque is transmitted through the differential assembly, the side gears have a high side thrust and the discs are compressed together.

When a machine is traveling straight, the side gears and the differential case are rotating at the same speed and there is no slipping action between the discs. When a machine is turning, the side gears must rotate at a different speed than the differential case. The discs must slip. The amount the discs slip is controlled by the pressure exerted by the side gear and the degree the machine is turned. If the torque transmitted through the axle is low, the discs are free to slip easily and "differential action" takes place easily. When the torque transmitted through the axle is high, the discs are compressed together by the force of the side gears and the "differential action" will not take place as easily.

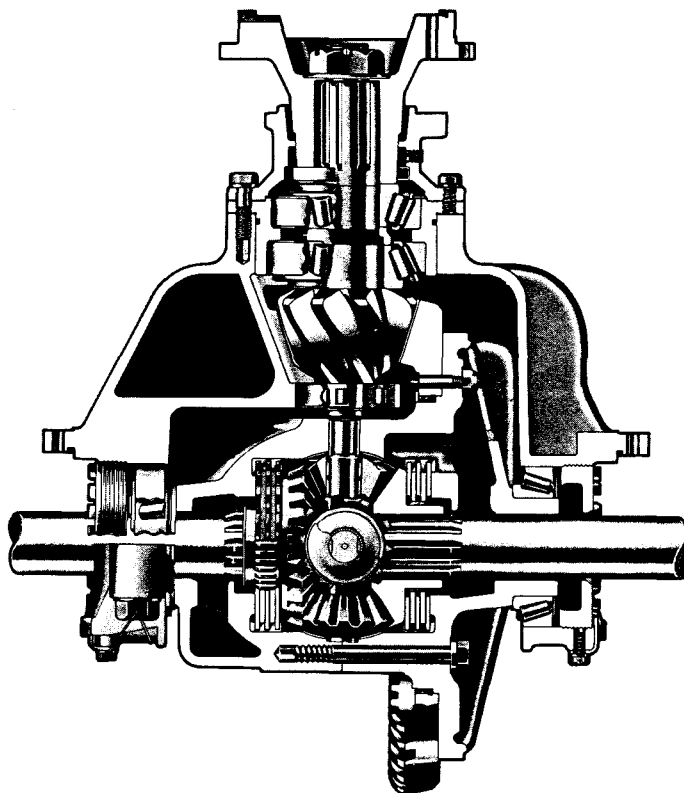
As the discs wear through normal use, the side gears move farther outward. The limited slip differential is self-adjusting or self-compensating for wear — the torque proportioning axle is not.



Lubrication and Service

The limited slip differential uses the same type of lubricant recommended for torque proportioning or conventional axles and the service interval is the same. For proper lubrication of the discs the oil level in the axle housing had to be raised to the center line of the housing. Any axle that comes from the factory equipped with the limited slip differential will have an oil level plug properly located in the center line of the housing.

It is extremely important that the oil level be kept at the level plug. If the oil level becomes too low the discs will not receive sufficient lubrication and will wear rapidly.



Disc Replacement in the Limited Slip Differential

Disc replacement time is determined by the amount of material collected on the magnetic drain plug. When the oil level is checked, examine the drain plug for metal particles. A considerable increase in the amount of metal particles found on the magnetic drain plug indicates the necessity for replacing the discs.

Disassembly and Assembly of the Differential Unit

The limited slip differential unit is disassembled and assembled like the conventional or torque proportioning differential unit. The only difference being the removal and installation of the discs. Note the position of the internally and externally splined discs when disassembling and replace the discs in the same position.

DIFFERENTIAL DISASSEMBLY

(Limited Slip)

NOTE: Match mark case halves and spider to insure correct reassembly.

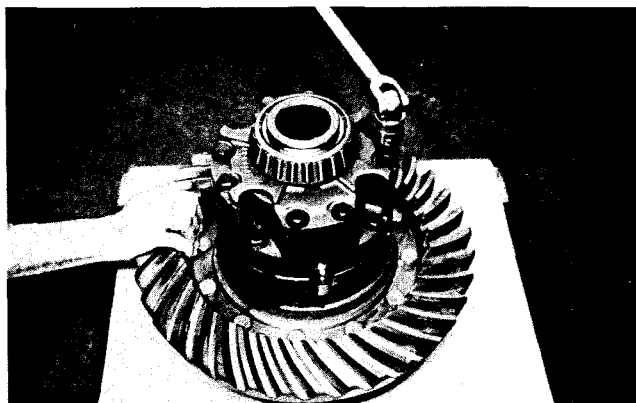


Figure A

Remove differential half case bolts.

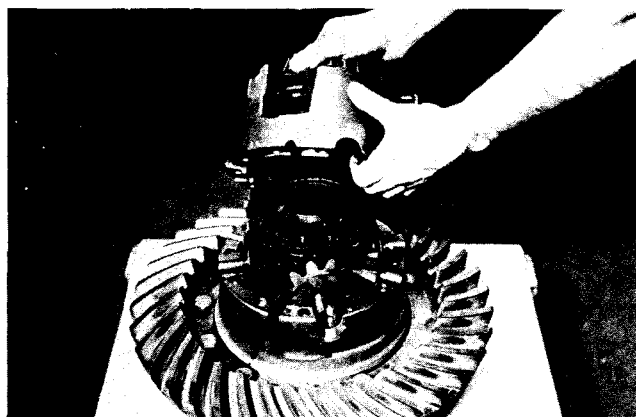


Figure B

Remove differential plain half case. Limited slip discs and side gear may remain in half case. Remove discs and side gear.

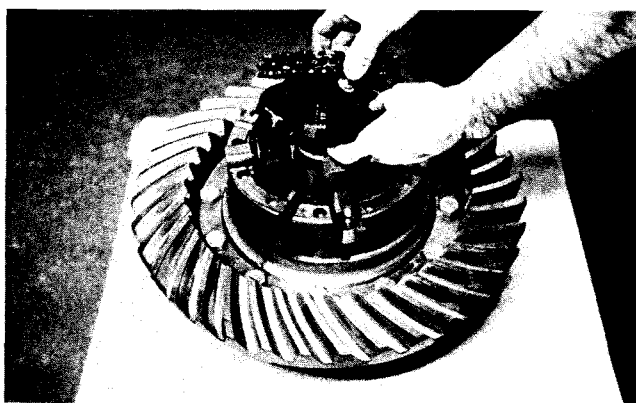


Figure C

If side gear and discs remained on differential pinions, remove from pinions.

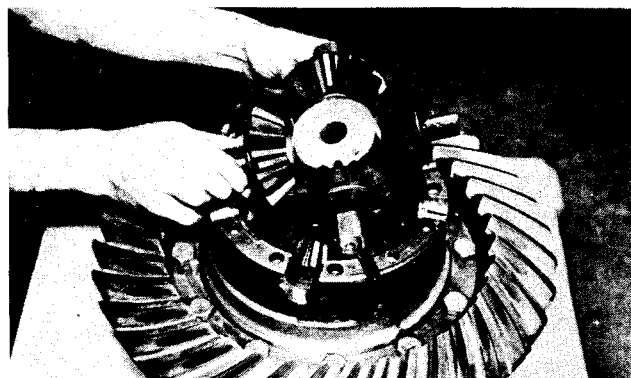


Figure D

Remove differential pinions, washers and spider as an assembly. **NOTE:** There are two rows of needle rollers under each pinion gear, do not lose these rollers.

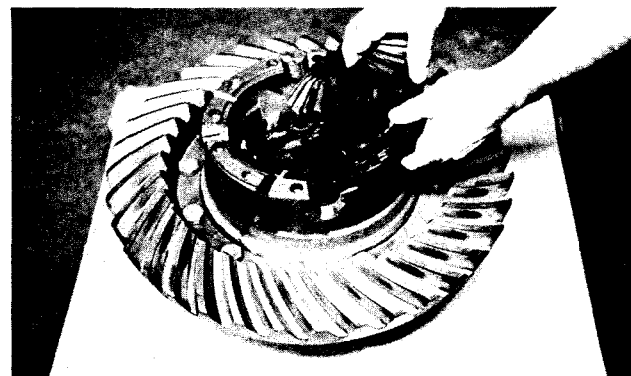


Figure E

Remove flange half case side gear and limited slip discs from case. Use a split puller if half case taper bearings are to be replaced. Remove ring gear nuts and bolts if ring gear is to be replaced.

DIFFERENTIAL REASSEMBLY

(Limited Slip)

NOTE: All parts must be lubricated with Clark recommended axle lubricant when reassembling. No part should be reassembled dry.

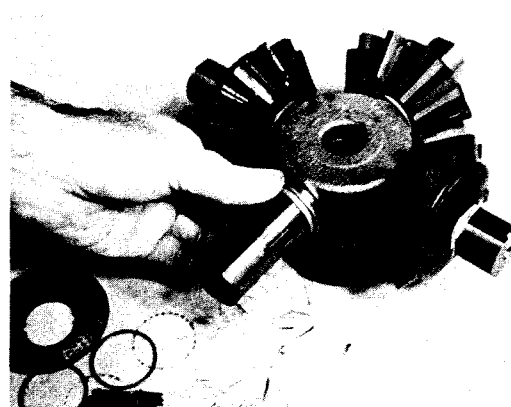


Figure F

Position inner needle roller bearing spacer on differential spider. See Fig. K-A for cross section reference..



Figure G

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

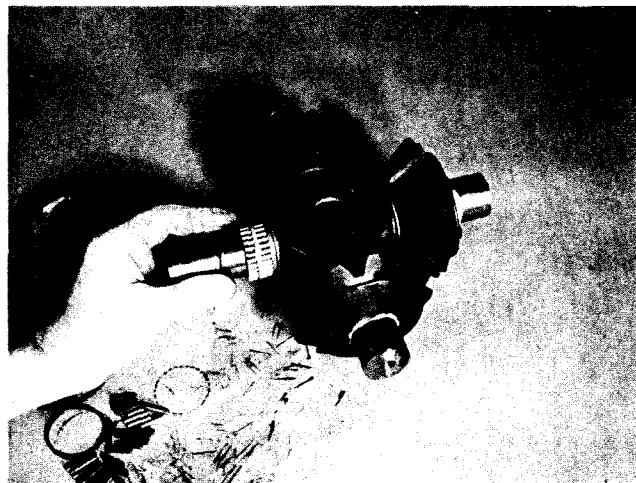


Figure H

Install center roller bearing spacer.



Figure I

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



Figure J

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

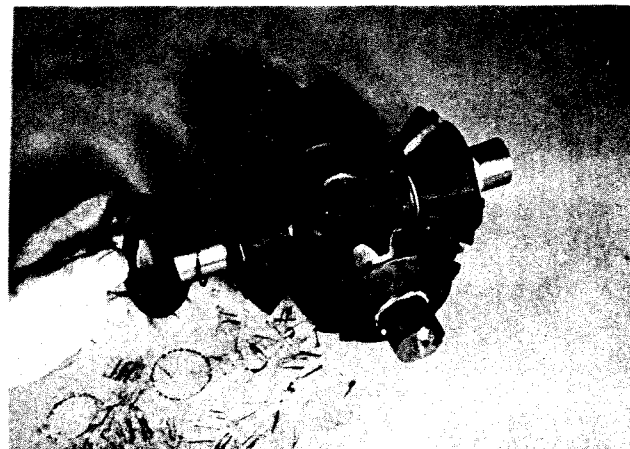


Figure K

Install outer roller bearing spacer and pinion thrust washer. A rubber band was used on each end of the spider after pinion installation to keep each pinion gear in place until assembly into flange half case.

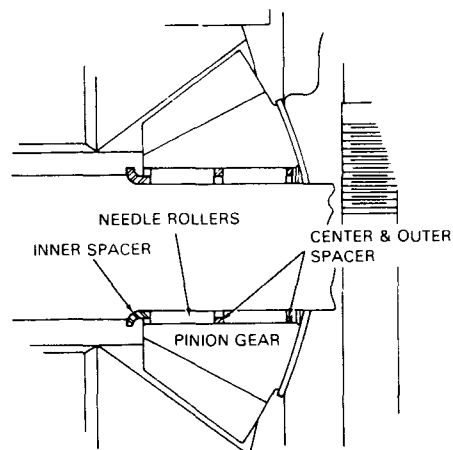


Figure K-A

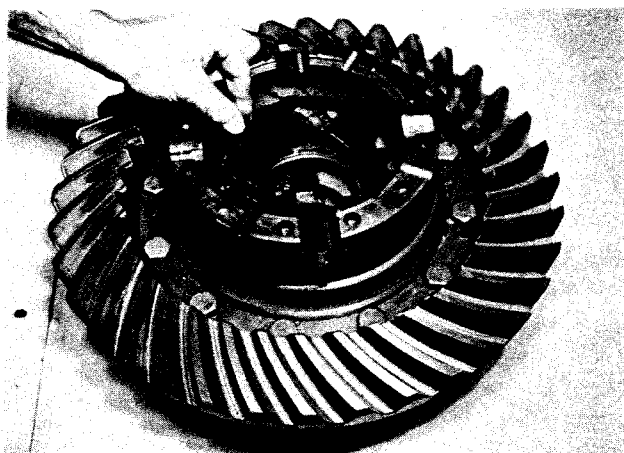


Figure L

Install one limited slip outer clutch disc. (Teeth on the outer diameter). See Fig. N-A for cross section reference.

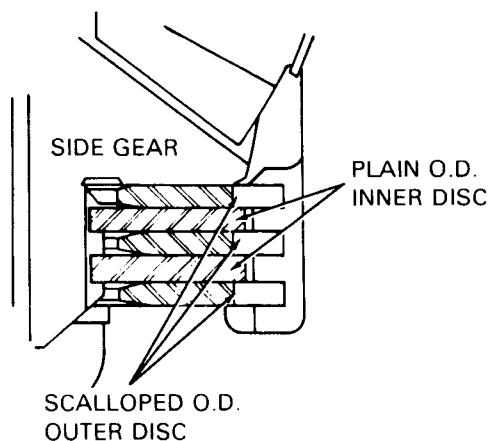


Figure N-A

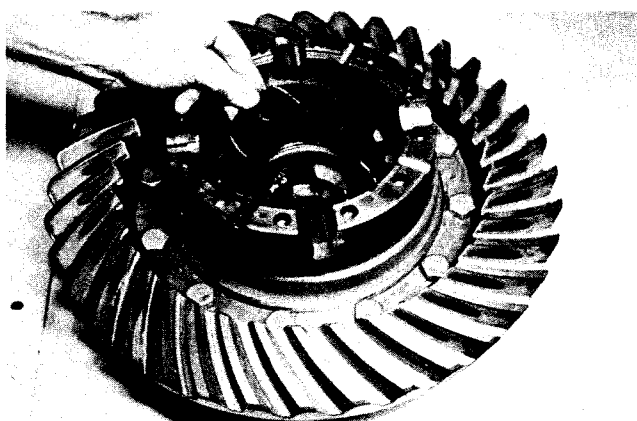


Figure M

Install one limited slip inner clutch disc. (Teeth on the inner diameter).

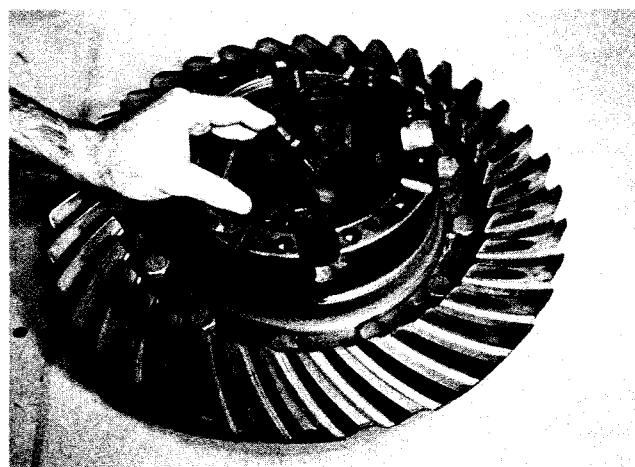


Figure O

Align side gear splines with teeth in inner clutch discs.

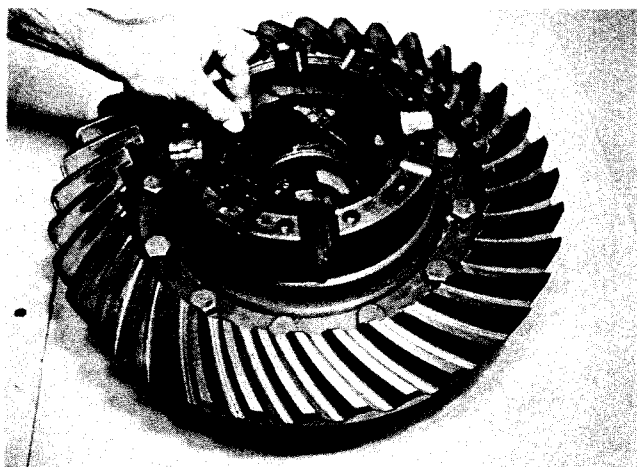


Figure N

Alternate outer and inner clutch discs, starting with an outer disc and ending with an outer disc. Quantity of discs are 3 outer discs and 2 inner discs for each side gear.

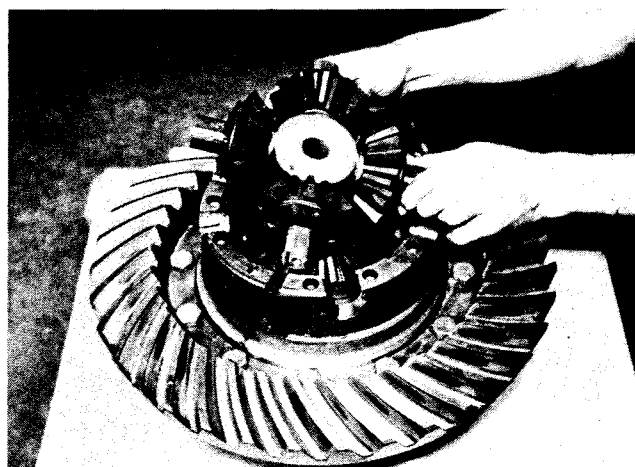


Figure P

Remove rubber bands holding pinion gears into position on differential spider. Place spider assembly on side gear.

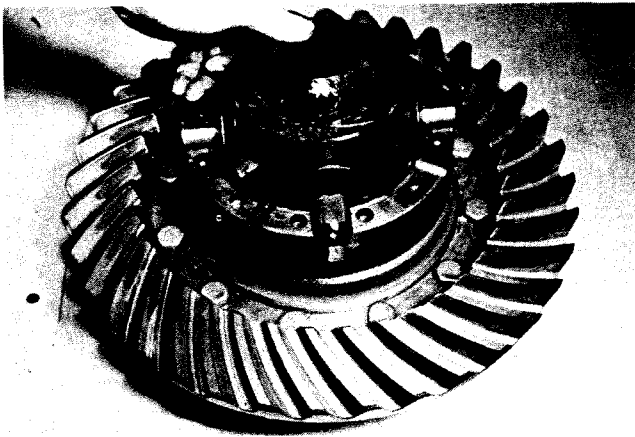


Figure Q

Position side gear on pinions.

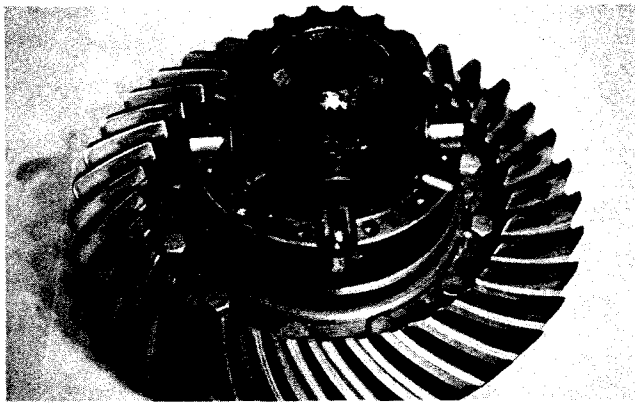


Figure R

Install one outer disc and one inner disc on side gear, alternate discs until a quantity of 3 outer discs and 2 inner discs are installed. Start with an outer disc and end with an outer disc. Align outer clutch disc teeth to facilitate assembly into plain half case.

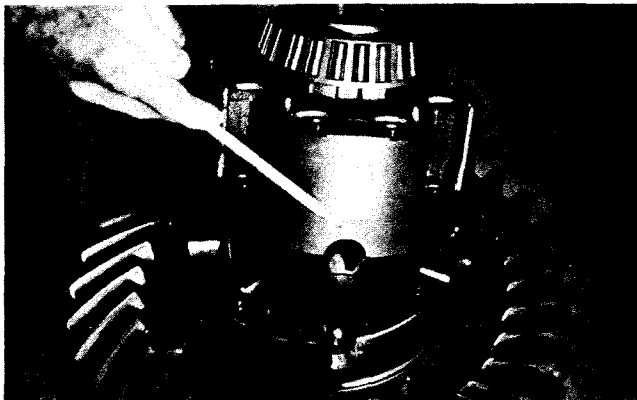


Figure S

Align match mark on plain half case with mark on flanged half case. Install plain half case over limited slip clutch plates and side gear. Apply Loctite #262 thread locking compound to threads of case bolts. Tighten bolts to specified torque (See page 15). Proceed with Fig. 47.

SEAL REBUILDING INSTRUCTIONS FOR SPLIT SEAL INSTALLATION

1. The rebuilding kit includes two (2) rubber rings (see Figure 1) and two (2) lint free wiping cloths. Both of the rubber rings must have barbs as shown in the drawing.

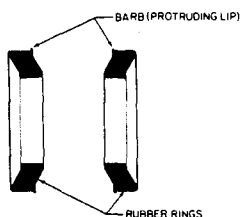


Figure 1

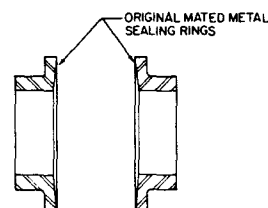


Figure 2

NOTE: In rebuilding the seal do not intermix metal sealing rings. Keep original mated metal sealing rings as a set (see Figure 2).

2. Before rebuilding the seal inspect the two metal sealing rings in the following manner to determine if it is acceptable for rebuilding.
 - (a) The sealing band must be within the outer half of the sealing face (see Figures 3 and 4). The sealing band is a narrow highly polished band on the sealing face.

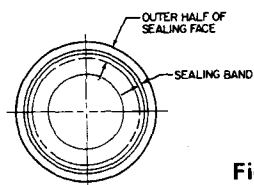


Figure 3

Seal acceptable for rebuilding.

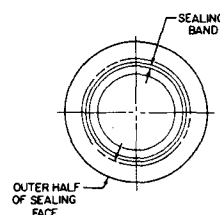


Figure 4

Sealing band not within outer half of sealing face.

Seal not acceptable for rebuilding.

- (b) The sealing band must be uniform in width and must be concentric with the I.D. and O.D. of the sealing face (see Figure 5).

If the metal sealing rings do not meet the proper specifications, do not rebuild the seal—use a completely new seal.

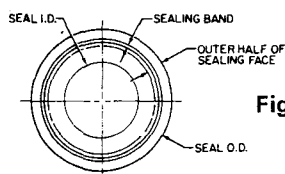


Figure 5

Sealing band not concentric with I.D. and O.D. of sealing face.
Seal not acceptable for rebuilding.

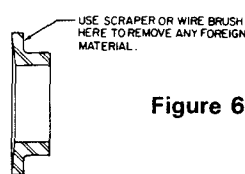


Figure 6

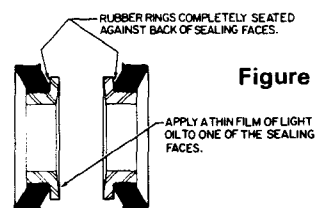
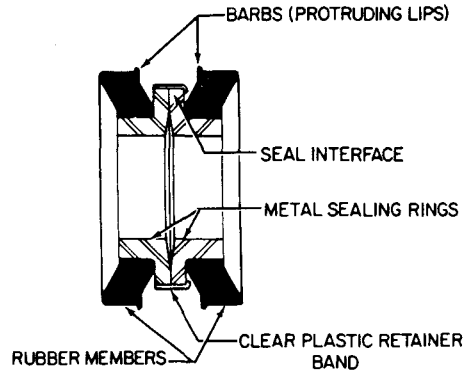


Figure 7

3. The metal sealing rings must be cleaned as follows:
 - (a) Remove any foreign material from the back of the metal sealing rings with a scraper or wire brush (see Figure 6).
 - (b) Clean the metal sealing rings with a clean degreasing solvent then wipe with the lint free wiping cloths furnished in the rebuilding kit (see Figure 6).
4. Assemble the rubber rings to the metal sealing rings. Be sure the rubber rings are completely seated against the back of sealing faces (see Figure 7).
5. Apply a thin film of light oil to one of the sealing faces, being careful not to wet other surfaces with oil (see Figure 7). Cleanliness is critical when handling these seals.
6. See page 54 for face seal installation instructions.

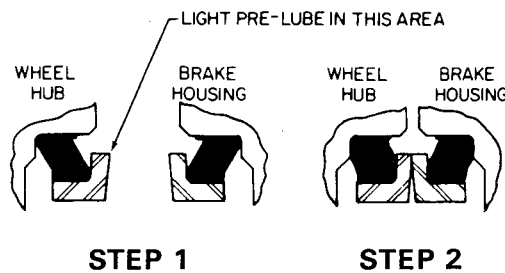
FACE SEAL INSTALLATION INSTRUCTIONS



1. Examine the seal carefully and note its four basic parts. It has two rubber members and two lapped metal sealing rings. On new face seals a clear plastic retainer band is optional and is used only to hold the seals together. Discard plastic band. Note that both rubber members have barbs at the O.D. The barbs are there to hold the seal halves concentrically in their bores while you are making the assembly; that is their only function.

It is possible to push a rubber member off of the neck of the metal sealing ring. Do not install the seal while it is in this condition—the rubber member will not go back on the neck of the metal sealing ring by itself. Before installing the seal, you must push the rubber member back on the neck of the metal sealing ring. When installing the seal you must hold it so that you will not dislodge the rubber members from the metal sealing rings.

INSTALLATION



2. The seal is intended to be held in its operating position by two counterbores.
One (1) of these bores will be in the wheel hub (a rotating member) and the other bore will be stationary (in the liquid cooled brake housing.)
The function of this seal is to prevent dirt from entering the axle end or axle lube from leaking.
3. An important point to note is that there must be no oil or dirt on the bores, rubber members, or any area of the casting except the lapped face as explained below. Any oil or dirt in these areas must be removed with a clean degreasing solvent. (A new seal is packaged and shipped clean of oil and dirt, and need not be re-cleaned unless it has become contaminated.)
4. Seals for split seal assembly may be shipped with their lapped sealing faces (interface) lightly pre-lubed for installation under clean environmental conditions. If the seal has not been pre-lubed or has become contaminated, the lapped face must be wiped clean and a few drops of light oil applied as a pre-lube.
5. **Seal installation.**
 - (a) Remove oil and dirt from the seal bores using a clean degreasing solvent.
 - (b) If the seal was shipped with a clear plastic retainer band, remove retainer band.
 - (c) Install one-half of the seal all the way into one bore, being careful not to get oil or dirt on the O.D. of the rubber member or dislodge it from its metal sealing ring. (See drawing installation, Step 1.) Repeat the other half of the seal assembly into the other bore. Note that the barbs hold the seal halves concentrically in the bores.
 - (d) Follow pre-lube note in Step 4.
 - (e) When the installation is complete (wheel hub to brake), rotate the wheel hub 3 complete revolutions to seat the seal faces.

DRIVE AXLE WHEEL BEARING ADJUSTMENT PROCEDURE

Before wheel bearing adjustment is made, it is imperative all tapered bearings and bearing cups be pressed to a fully seated position. Do not depend on the wheel bearing adjustment nut to "shoulder" tapered bearings and cups.

1. The wheel bearing adjusting nut should be tightened to approximately 500 ft. lbs. torque [677,9 N.m] while rolling the wheel. Strike the wheel hub and surrounding parts with a mallet to shock the wheel end and better seat the parts (cups and cones) that may not already be seated. Reverse the adjusting nut and again strike the wheel hub with a mallet. Loosen adjusting nut until a slight bearing end play is detected.
2. Using the torque wrench adaptor bar shown in **FIGURE 1** determine the rolling torque of the wheel end with the bearings in a no-load end play condition. Due to unbalance of parts, etc., there will be a variation of rolling torque as the wheel hub is rotated. Record the maximum value of rolling torque throughout a revolution. This figure is the "No-load rolling torque" value.

3. Using the following chart, tighten the adjusting nut to achieve a bearing pre-load in foot pounds above the "no-load rolling torque" value recorded. It is best to use the lowest pre-load value as the pre-load may increase when the jam nut is installed and tightened.

Example: 35 ft. lbs.[47,5 N.m] "No-load rolling torque"
7 ft. lbs. [9,5 N.m] "New Bearings"

42 ft. lbs. [56,9 N.m] Pre-loaded rolling torque

When proper pre-load is achieved install adjusting nut lock. Coat inner face of jam nut with E.P. multipurpose grease and install. **NOTE:** The nut socket used to torque the jam nut should be depth controlled to prevent contact between the socket face and outer tangs of the nut lock (see Figure 2). This controlled depth will prevent torque from being transmitted from the socket face to the nut lock outer tangs and the possibility of shearing the nut lock inner tang. Tighten jam nut to full recommended torque shown on chart below. Recheck final rolling torque, which should not be greater than the sum of the "No-load" rolling torque plus the highest value of rolling torque specified below.

When proper pre-load is achieved bend two tangs of nut lock on flats on inner nut and two tangs on flat of jam nut. See Figure 3 on page 56.

Adjusting **NEW** tapered bearings:

Readjusting **USED** tapered bearings:

Rolling Torque Range	Jam Nut Torque
7 to 12 ft. lbs. torque [9,5-16,2 N.m] Greater than "No-load rolling torque" value.	500 ft. lbs. [677,9 N.m]
3 to 5 ft. lbs. torque [4,1-6,7 N.m] Greater than "No-load rolling torque" value.	500 ft. lbs. [677,9 N.m]

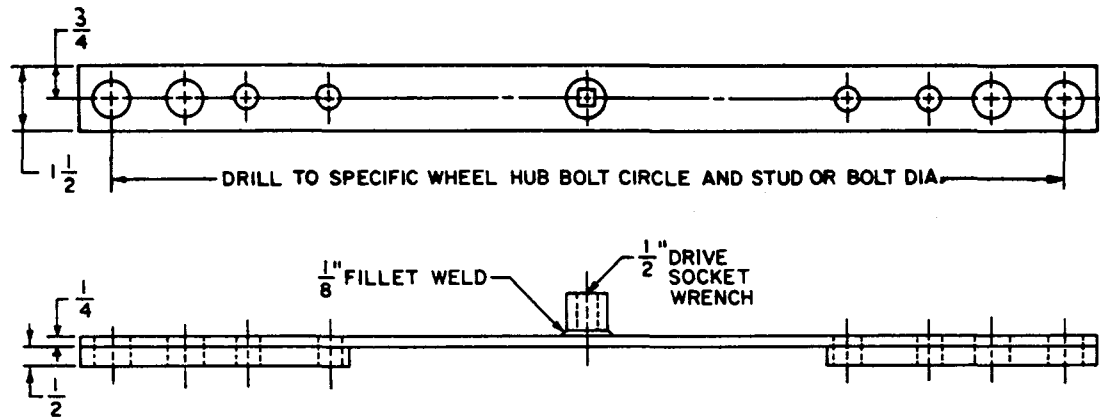
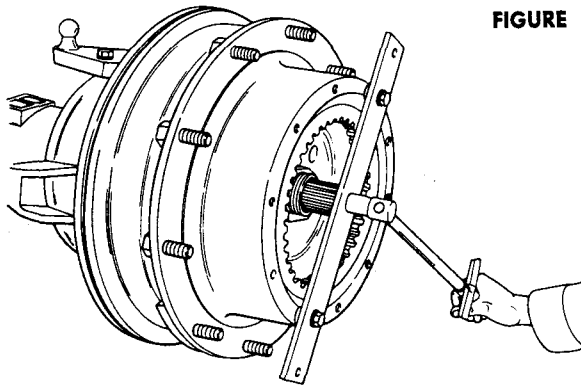


FIGURE 1



DEPTH CONTROLLED
TO PREVENT FACE
OF SOCKET FROM
CONTACTING NUT LOCK

NUT SOCKET

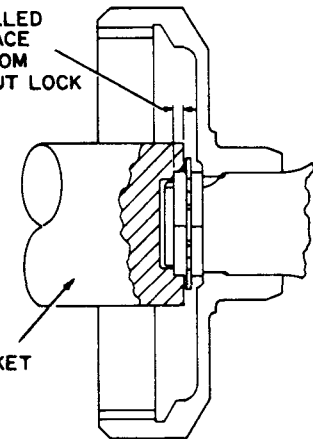


FIGURE 2

When proper pre-load is achieved install adjusting nut lock. Coat inner face of jam nut with E.P. multipurpose grease and install. **NOTE:** The nut socket used to torque the jam nut should be depth controlled to prevent contact between the socket face and outer tangs of the nut lock (see Figure 2). This controlled depth will prevent torque from being transmitted from the socket face to the nut lock outer tangs and the possibility of shearing the nut lock inner tang. Tighten jam nut to full recommended torque shown on chart. Recheck final rolling torque, which should not be greater than the sum of the "No-load" rolling torque plus the highest value of rolling torque specified for respective axle series shown in chart on the reverse side.

WHEN PROPER PRE-LOAD IS ACHIEVED BEND TWO TANGS OF NUT LOCK ON FLATS OF INNER NUT (ADJUSTING) AND TWO TANGS ON FLAT OF JAM NUT.

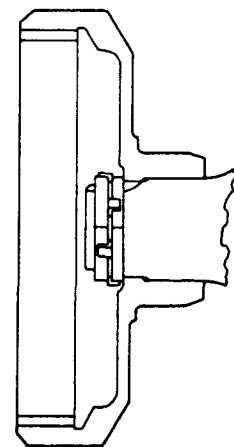
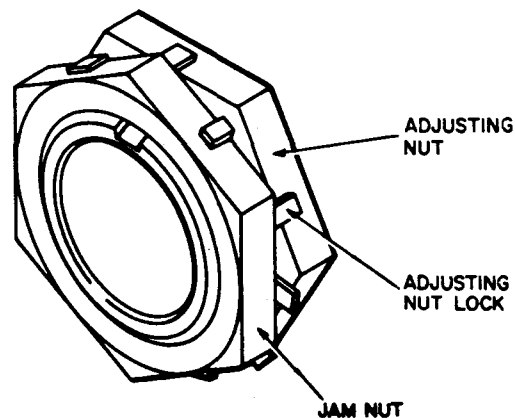
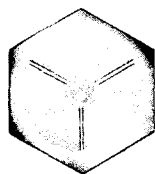


FIGURE 3

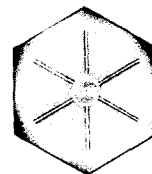
TORQUE FOR BOLTS, CAPSCREWS, STUDS AND NUTS AS SUPPLIED BY CLARK EQUIPMENT

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



Grade 5

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



Grade 8

**Fastener
Size**

Lubricated and Plated

Lubricated and Plated

1/4 - 20	80 - 90 Lbs. In.	[9 - 10 N.m]	110 - 120 Lbs. In.	[13 - 14 N.m]
1/4 - 28				
5/16 - 18	180 - 200 Lbs. In.	[21 - 23 N.m]	215 - 240 Lbs. In.	[24 - 27 N.m]
5/16 - 24				
3/8 - 16	25 - 28 Lbs. Ft.	[34 - 38 N.m]	35 - 40 Lbs. Ft.	[48 - 54 N.m]
3/8 - 24				
7/16 - 14	40 - 45 Lbs. Ft.	[54 - 61 N.m]	60 - 65 Lbs. Ft.	[82 - 88 N.m]
7/16 - 20				
1/2 - 13	65 - 70 Lbs. Ft.	[88 - 95 N.m]	90 - 100 Lbs. Ft.	[125 - 135 N.m]
1/2 - 20				
9/16 - 12	90 - 100 Lbs. Ft.	[125 - 135 N.m]	125 - 140 Lbs. Ft.	[170 - 190 N.m]
9/16 - 18				
5/8 - 11	125 - 140 Lbs. Ft.	[170 - 190 N.m]	175 - 190 Lbs. Ft.	[240 - 260 N.m]
5/8 - 18				
3/4 - 10	220 - 245 Lbs. Ft.	[300 - 330 N.m]	300 - 330 Lbs. Ft.	[410 - 450 N.m]
3/4 - 16				
7/8 - 9	330 - 360 Lbs. Ft.	[450 - 490 N.m]	475 - 525 Lbs. Ft.	[645 - 710 N.m]
7/8 - 14				
1 - 8	475 - 525 Lbs. Ft.	[645 - 710 N.m]	725 - 800 Lbs. Ft.	[985 - 1085 N.m]
1 - 12				
1-1/8 - 7	650 - 720 Lbs. Ft.	[880 - 975 N.m]	1050 - 1175 Lbs. Ft.	[1425 - 1600 N.m]
1-1/8 - 12				
1-1/4 - 7	900 - 1000 Lbs. Ft.	[1220 - 1360 N.m]	1475 - 1625 Lbs. Ft.	[2000 - 2200 N.m]
1-1/4 - 12				

Bevel Ring Gear and Pinion Gear Timing

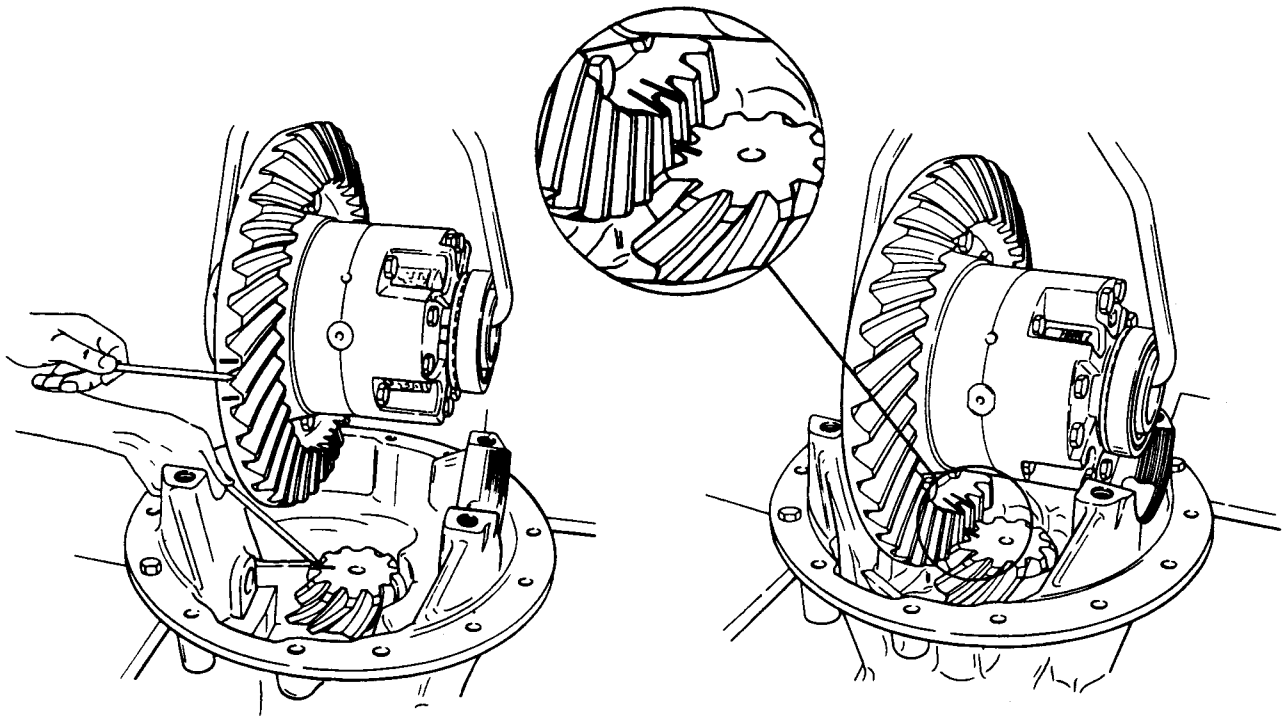
Timing is necessary when there is a common denominator in the Bevel Ring Gear and Pinion, i.e., 38-6 ratio, common denominator is 2. The gear sets are lapped, tested and assembled in the differential in the same timed position.

Timing is achieved by marking two teeth on the ring gear and one tooth on the pinion. The timing marks are ground in both gears and are also marked with a non-soluble paint.

To facilitate reassembly it may be necessary to remark the ring gear and pinion as shown.
NOTE: Ring gear is marked on outer and inner diameters.

Ratio combinations that are currently being timed are as follows:

30-9 34-12 36-8 38-6 39-6 40-6 44-6



Mark ring gear and pinion as shown

Pinion tooth between two marked ring gear teeth

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.

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.

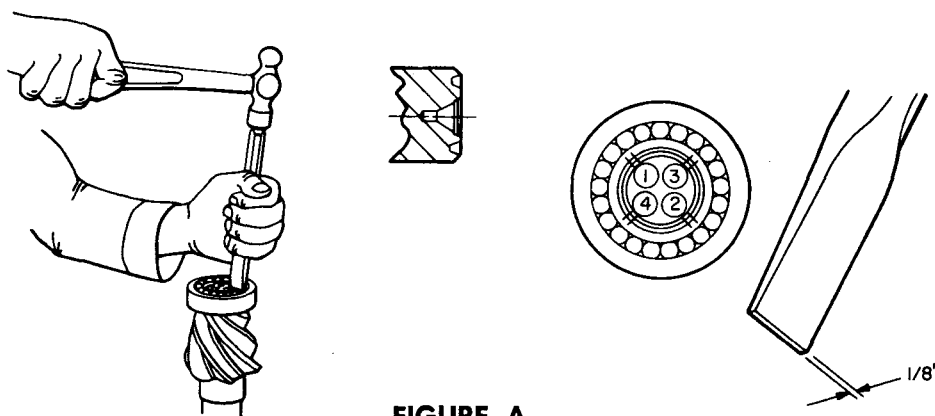


FIGURE A

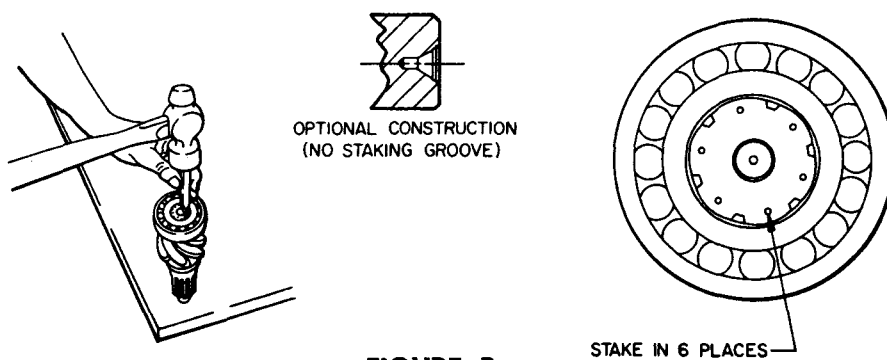


FIGURE B

NOTES

A series of horizontal lines for writing notes, with three binder holes punched along the right margin.